CONTENTS

LIST OF PRODUCTS

■ CONDUCTIVE POLYMER ALUMINUM SOLID CAPACITORS

Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
Conductive Polymer Aluminum Solid Capacitors(reLLeap™)	Surface mount	APV	Vertical type, 125°C, Low ESR	125°C 2,000hrs			●		●	SMD	10~35	8.2~82	17
		AXV Upgrade	Vertical type, 105°C, Super Low ESR	105°C 2,000hrs			●		●	SMD	2.5~16	68~2,700	19
		ASV Upgrade	Vertical type, 105°C, Low ESR	105°C 2,000hrs			●		●	SMD	2.5~35	6.8~1,500	21
	Radial	AXA Upgrade	Radial type, 105°C, Super Low ESR	105°C 2,000hrs			●		●	Radial	2.5~16	68~2,700	23
		ASA Upgrade	Radial type, 105°C, Low ESR	105°C 2,000hrs			●		●	Radial	2.5~35	6.8~1,500	25

■ SURFACE MOUNT ALUMINUM ELECTROLYTIC CAPACITORS

Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
Surface mount	General Purpose	MVG	5.5~22.0mm max. height, downsized	85°C 1,000~2,000hrs	●				●	SMD	4~450	0.1~10,000	41
		BDS(MVK)	5.5~22.0mm max. height	105°C 1,000~2,000hrs		●			●	SMD	6.3~450	0.1~6,800	43
		BXA	5.6~10.5mm max. height, Low Imp	105°C 1,000~2,000hrs			●		●	SMD	6.3~50	2.2~1,500	45
		BXE	5.6~10.5mm max. height, Ultra Low Imp	105°C 1,000~2,000hrs			●		●	SMD	6.3~35	4.7~1,500	47
		BXJ Upgrade	5.6~10.5mm max. height, Low Imp, Long Life	105°C 2,000~5,000hrs			●	●	●	SMD	6.3~50	4.7~1,500	49
		BDA	5.5~6.0mm max. height, Long life	105°C 2,000hrs				●	●	SMD	4~50	0.1~100	51
		BLA	5.5~10.5mm max. height, Long life	105°C 5,000hrs				●	●	SMD	4~50	0.1~470	53
		BLH	10.5mm max. height, Long life	105°C 10,000hrs				●	●	SMD	10~50	33~470	55
		CLZ Upgrade	5.5~22.0mm max. height, Wide temp. Low ESR	125°C 1,000~5,000hrs			●	●	●	SMD	10~400	10~4,700	57
		CLX Upgrade	10.5~14.0mm max. height, Wide temp. Ultra low ESR	125°C 2,000~4,000hrs			●	●	●	SMD	10~50	33~1,000	59
		VDA	10.5~14.0mm max. height, Wide temp.	150°C 1,000hrs				●	●	SMD	10~50	47~1,000	61
	Bi-Polar	MVG(MV)-BP	5.5mm max. height, Bi-polar	85°C 2,000hrs					●	SMD	4~50	0.1~47	63
		BDS(MVK)-BP	5.5mm max. height, Bi-polar	105°C 1,000hrs				●	●	SMD	6.3~50	0.1~47	63

■ MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (VDC)	Capacitance range (μF)	Page
Miniature	Low Profile	DSA / DZA	5mm height, Downsized / Reflow Application	85°C 2,000hrs		●				Radial	4~50	0.1~330	66
		GSA / GZA	7mm height, Downsized / Reflow Application	85°C 2,000hrs	●					Radial	6.3~63	0.1~470	68
		EMA	5mm height, Wide temp. Long Life	105°C 2,000hrs				●		Radial	4~50	0.1~100	70
		HMA	7mm height, Wide temp. Long Life	105°C 2,000hrs				●		Radial	6.3~50	0.1~150	71
	General Purpose	MHA	High capacitance, Downsized	85°C 2,000hrs	●					Radial	4~500	0.1~15,000	72
		KMG	High capacitance, Downsized	105°C 1,000~2,000hrs	●	●			●	Radial	6.3~450	0.1~22,000	
		NHA	High capacitance, Downsized	105°C 1,000~2,000hrs	●					Radial	6.3~500	0.1~15,000	74
	Low Leakage	GSA(SRA)-LL/LL	Height 7mm / General	85°C 2,000hrs		●				Radial	6.3~100	0.1~4,700	76
	Bi-polar	DSA(SRE)-BP	5mm height	85°C 1,000hrs		●				Radial	4~50	0.1~47	78
		GSA-BP	7mm height	85°C 2,000hrs		●				Radial	6.3~50	0.1~47	79
		MHA-BP	General	85°C 2,000hrs		●				Radial	6.3~250	3.3~6,800	80
		NHA-BP	General, Wide temp.	105°C 1,000hrs		●			●	Radial	6.3~250	3.3~6,800	82
		SSP	Speaker network	85°C 2,000hrs		●				Radial	25~63	1~100	84
		KSA	Horizontal deflection, Wide temp	105°C 1,000hrs		●			●	Radial	25, 50	2.2~10	86

LIST OF PRODUCTS

■ MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

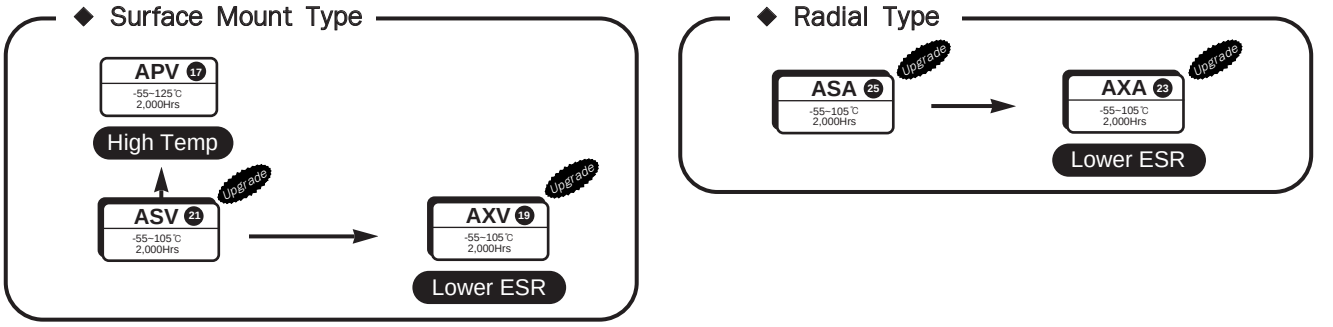
Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (Vdc)	Capacitance range (μF)	Page
Miniature	ESR. Low Imp.	EXB	Height 5mm Ultra Low Imp.	105℃ 2,000hrs			●	●	●	Radial	6.3~35	1~100	87
		HXB	Height 7mm Ultra Low Imp.	105℃ 2,000hrs			●	●		Radial	6.3~50	10~330	88
		HXL	Height 7mm Ultra Low Imp. Long life	105℃ 3,000hrs			●	●		Radial	6.3~50	10~330	89
		NXL(LXV)	Low Imp., Long life	105℃ 2,000~5,000hrs			●	●	●	Radial	6.3~100	18~15,000	90
		NXP(LXZ) Upgrade	Low Imp., Long life, Downsized	105℃ 2,000~5,000hrs			●	●	●	Radial	6.3~50	33~18,000	93
		NXA	Low Imp., Long life	105℃ 4,000~10,000hrs			●	●		Radial	6.3~100	6.8~18,000	95
		NXB	Low Imp., Long life	105℃ 2,000~5,000hrs			●	●		Radial	6.3~100	3.3~8,200	98
		NXH	Low Imp., Long life	105℃ 6,000~10,000hrs			●	●		Radial	6.3~50	27~8,200	101
		NXJ	Low Imp., High ripple	105℃ 5,000hrs			●	●		Radial	16~63	10~680	
		NXQ NEW	Low Imp., Long life, High ripple	105℃ 6,000~10,000hrs			●	●		Radial	6.3~100	12~8,200	103
		NXK	Low Imp., Long life, High ripple	105℃ 4,000~5,000hrs			●	●		Radial	10~50	100~2,700	106
		NXF	Ultra Low ESR	150℃ 2,000 hrs			●			Radial	6.3~16	470~3,300	108
		NXE	Ultra Low ESR, Long life	105℃ 3,000~4,000hrs			●	●		Radial	6.3~50	150~3,300	110
	High Reliability	NFD(KMF)	High ripple	105℃ 2,000hrs			●			Radial	160~450	3.3~330	
		NZE Upgrade	High ripple, Downsized	105℃ 2,000hrs			●			Radial	160~500	1~470	112
		NFC	Long life, High ripple	105℃ 2,000~5,000hrs			●	●		Radial	160~500	4.7~330	114
		NFK NEW	Long life, High ripple	105℃ 5,000hrs			●	●		Radial	160~500	22~68	117
		NFS	Long life, High ripple	105℃ 5,000hrs			●	●		Radial	200~400	3.3~330	
		NFA Upgrade	Long life, High ripple	105℃ 8,000~10,000hrs			●	●		Radial	160~500	22~68	120
		NFL Upgrade	Long life, High ripple	105℃ 10,000~12,000hrs			●	●		Radial	160~500	3.3~470	122
		NLA	Long life	105℃ 4,000~10,000hrs			●	●		Radial	6.3~50	10~18,000	125
		NLC	Long life	105℃ 10,000hrs			●	●		Radial	6.3~50	10~680	127
		PXB	Wide temp., Imp. Long life	125℃ 2,000~5,000hrs			●	●	●	Radial	10~450	4.7~4,700	129
		PXD Upgrade	Wide temp., Ultra Low Imp. Long life	125℃ 2,000~4,000hrs			●	●	●	Radial	10~50	10~4,700	131
		PHA	Wide temp.	150℃ 1,000hrs				●	●	Radial	10~50	100~3,300	133
	Special Application	AHS	Audio grade, Downsized	85℃ 2,000hrs	●					Radial	10~100	0.1~10,000	135
		PHL	For photo flash	5~35℃ 5,000Times						Radial	300~330	5~160	137
		NZD	Air bag	105℃ 5,000hrs				●	●	Radial	16~35	820~5,600	138

■ LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

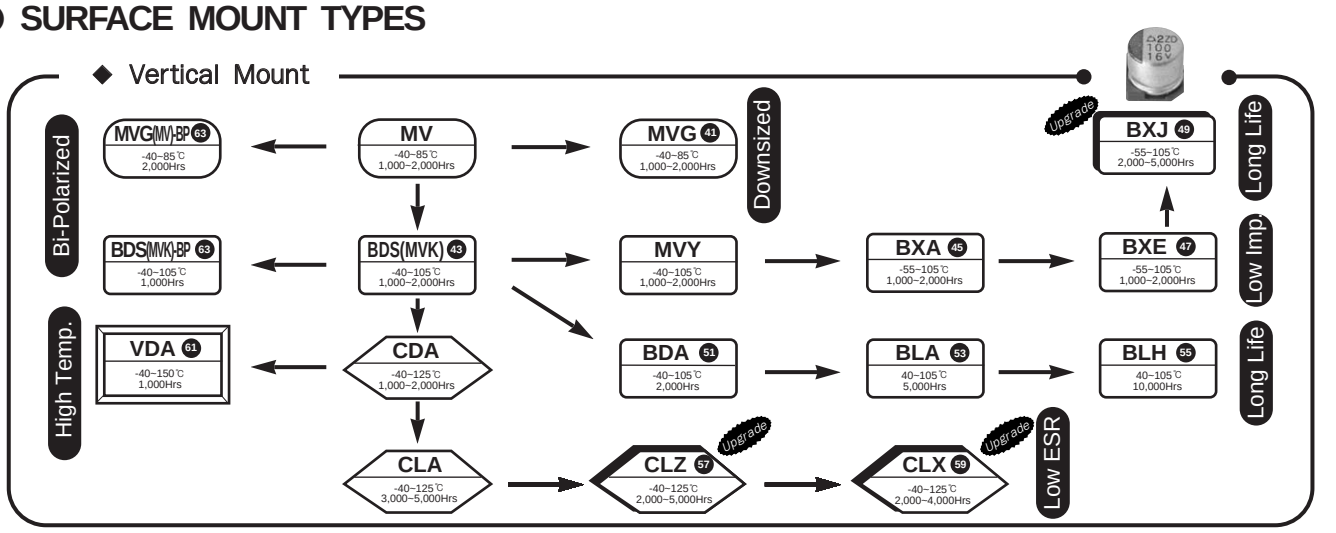
Series			Applications	Load life Time (Hrs)	Miniature	Standard type	Low impedance	Long life	Solvent-proof	Termi-nal type	Rated voltage range (Vdc)	Capacitance range (μF)	Page
PCB Terminal Type	General Purpose	RDC	More Downsized	85℃ 2,000hrs	●					Pin	16~500	68~56,000	140
		TDA	Miniature	105℃ 2,000hrs	●					Pin	16~500	47~47,000	144
		TDC	More Downsized	105℃ 2,000hrs	●					Pin	160~450	68~1,200	148
		TEA	15mm height	105℃ 2,000hrs	●					Pin	160~400	39~390	151
	High Reliability	RLS NEW	Miniature, Long life	85℃ 3,000hrs				●		Pin	160~450	47~1,200	153
		TLA	Downsized, Long life, Wide temp.	105℃ 3,000hrs				●		Pin	160~500	56~2,200	155
		TLS	Downsized, Long life, Wide temp. High ripple	105℃ 3,000hrs				●		Pin	160~450	100~3,300	158
		UDA	Wide Temp.	125℃ 1,000hrs				●		Pin	16~250	100~10,000	160
		TLC(LXG)	Miniature, Long life	105℃ 5,000hrs				●		Pin	10~500	47~47,000	163
		TLB	Miniature, Long life	105℃ 7,000hrs	●			●		Pin	160~450	47~2,200	167
	Special Applic-ation	RVA	No spark with DC overvoltage	85℃ 2,000hrs						Pin	200~450	68~2,200	169
		TVA	No spark with DC overvoltage	105℃ 2,000hrs						Pin	200~450	68~2,200	171
		DL	General Audio	85℃ 2,000hrs		●				Pin	50~100	3,300~22,000	173
		AHS	Hi-Fi Audio Miniature	85℃ 2,000hrs	●					Pin	50~100	3,300~22,000	174
Screw-Bolt Terminal Type	General Purpose	TGA(KMH)	General, Wide temp.	105℃ 2,000hrs		●				Screw	10~400	180~680,000	176
	For Inverter	RFC(RWF)	High ripple, Long life	85℃ 5,000hrs				●		Screw	350~450	2,700~15,000	179
		RGA	High ripple, High voltage	85℃ 2,000hrs						Screw	500~600	100~3,900	181
		RFA	High ripple, Long life	85℃ 20,000hrs				●		Screw	350~500	2,200~12,000	183
		TFA	High ripple, Long life	105℃ 5,000hrs				●		Screw	350~450	2,200~10,000	185
	Special Application	PH	For photo flash	5~35℃ 5,000Times						Pin/ Screw	330	165~2,000	187
		DH	For Welding machine	40℃ 1,000,000Times							315, 475	100~330	188

SERIES GROUP CHART

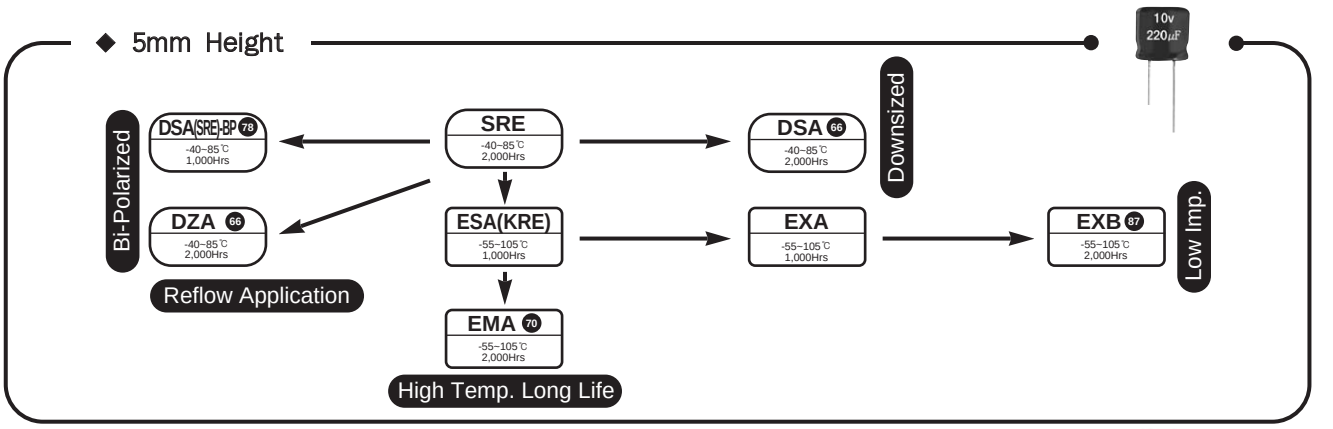
● Conductive Polymer Aluminum Solid Capacitors (reALcap™)

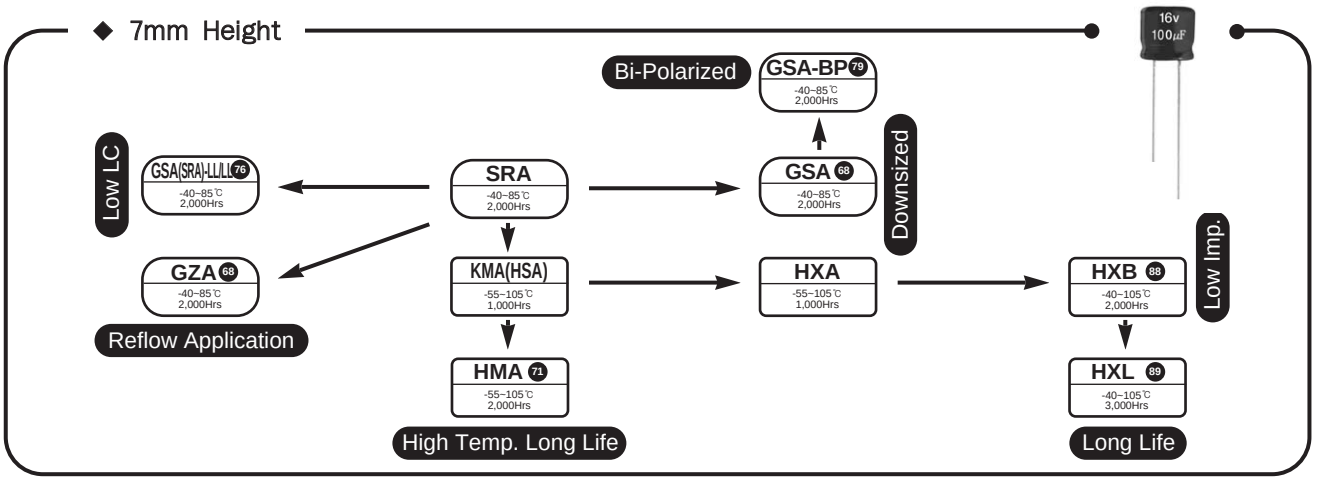


● SURFACE MOUNT TYPES



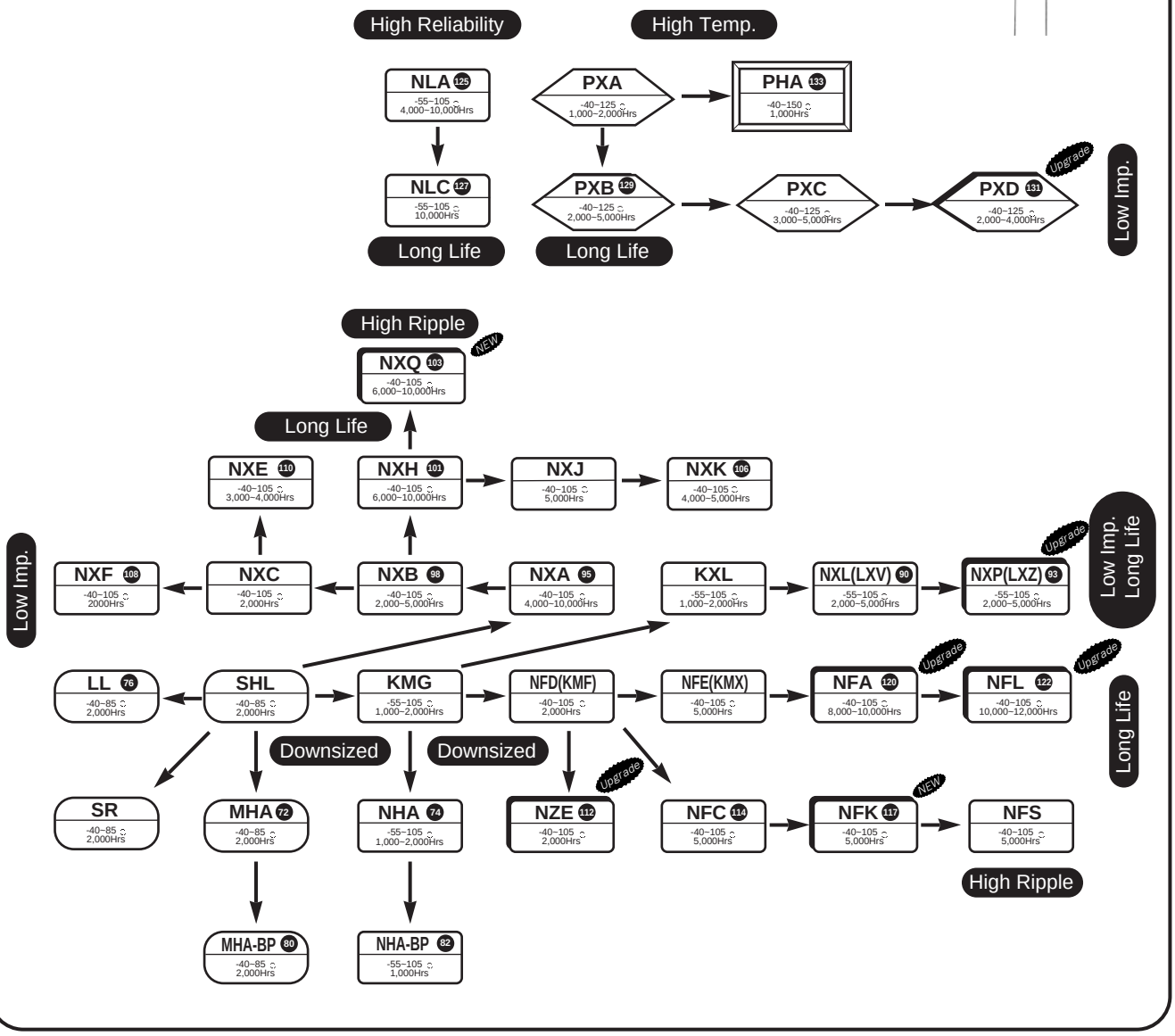
● MINIATURE TYPES





● MINIATURE TYPES

◆ CM-I, CM-II

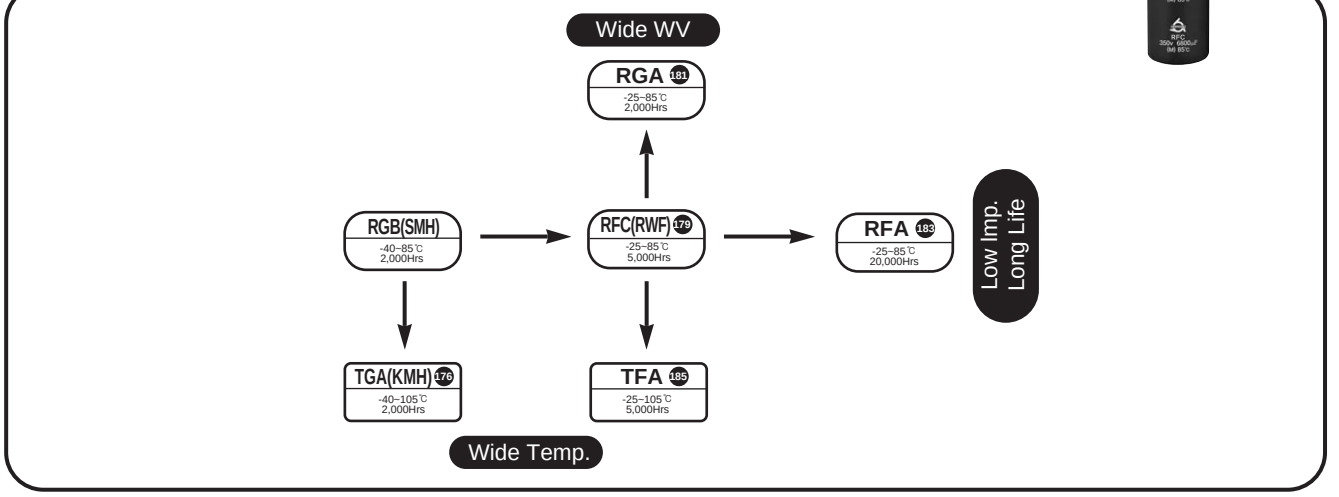


◆ Special Applications

● LARGE TYPES

◆ PCB Terminals

◆ Screw-Bolt Terminals



◆ Special Applications

* For General Audio

* For Hi-Fi Audio

* No Sparks with DC Overvoltage

* For Photo Flash

* For Welding Machine

DETAIL SPECIFICATIONS OF TAPING METHOD

■ SURFACE MOUNT TYPE

TAPING DIMENSIONS

Fig.1

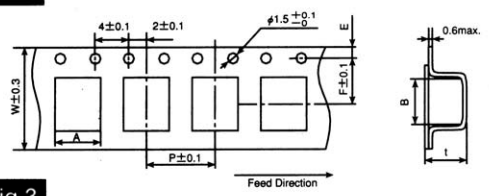


Fig.2

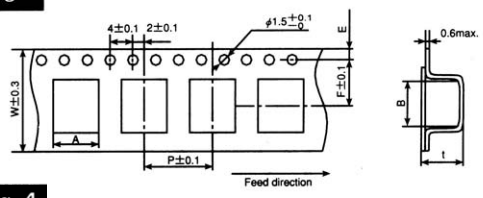


Fig.3

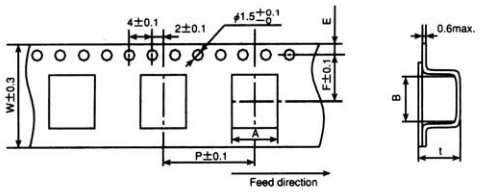
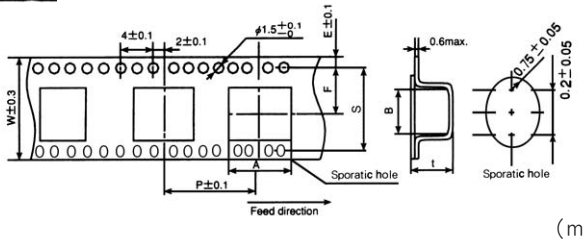


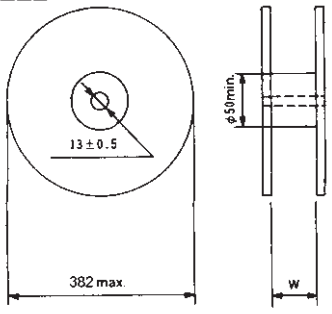
Fig.4



(mm)

Series	Case Code	Fig	W	A	B	F	E	P	t	S
AL CHIP reALcap™	φ3(B55)	1	12	3.5±0.2	3.5±0.2	5.5	1.75±0.1	8	5.9±0.2	-
	φ4(D55,D56,D60)	1	12	4.7±0.2	4.7±0.2	5.5	1.75±0.1	8	5.7±0.2(D55,D56) 6.3±0.2(D60)	-
	φ5(E55,E56,E60)	2	12	5.7±0.2	5.7±0.2	5.5	1.75±0.1	12	5.7±0.2(E55,E56) 6.3±0.2(E60)	-
	φ6.3(F55,F56,F60)	2	16	7.0±0.2	7.0±0.2	7.5	1.75±0.1	12	5.7±0.2(F55,F56) 6.3±0.3(F60)	-
	φ6.3×8L(F80)	2	16	7.0±0.2	7.0±0.2	7.5	1.75±0.1	12	8.2±0.2	-
	φ8×6L(H63)	2	16	8.7±0.2	8.7±0.2	7.5	1.75±0.1	12	6.8±0.2	-
	φ8×6.7L(H70)	2	24	8.7±0.2	8.7±0.2	11.5	1.75±0.1	12	7.3±0.2	-
	φ8×10L(H10)	3	24	8.7±0.2	8.7±0.2	11.5	1.75±0.1	16	11.0±0.2	-
	φ8×11.5L(H12)	3	24	8.7±0.2	8.7±0.2	11.5	1.75±0.1	16	12.3±0.2	-
	φ10×10L(J10)	3	24	10.7±0.2	10.7±0.2	11.5	1.75±0.1	16	11.0±0.2	-
	φ10×12.2L(J12)	3	24	10.7±0.2	10.7±0.2	11.5	1.75±0.1	16	13.0±0.2	-
	φ12.5×13.5L(K14)	4	32	13.4±0.2	13.4±0.2	14.2	1.75±0.1	24	14.0±0.2	28.4±0.1

REEL

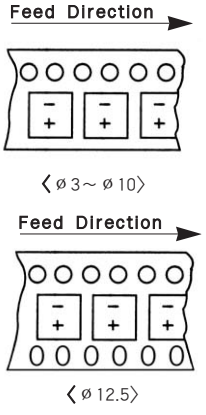


QUANTITY PER REEL

Series	Case Code	W(mm)	Q'ty(pcs/reel)	Q'ty(pcs/box)
AL CHIP reALcap™	φ3(B55)	14	2,000	20,000
	φ4(D55,D56,D60)	14	2,000	20,000
	φ5(E55,E56,E60)	14	1,000	10,000
	φ6.3(F55,F56,F60)	18	1,000	10,000
	φ6.3×8L(F80)	18	900	9,000
	φ8×6L(H63)	18	1,000	10,000
	φ8×6.7L(H70)	26	1,000	6,000
	φ8×10L(H10)	26	500	3,000
	φ8×11.5L(H12)	26	400	2,400
	φ10×10L(J10)	26	500	3,000
	φ10×12.2L(J12)	26	400	2,400
	φ12.5×13.5L(K14)	34	200	1,000

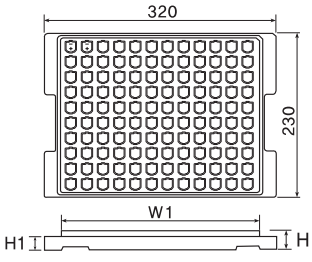
ORIENTATION OF POLARITY

- AL CHIP
- reALcap™



■ SURFACE MOUNT TYPE(TRAY)

DIMENSIONS(mm)



QUANTITY PER TRAY/BOX

Case Code	H (mm)	W1 (mm)	H1 (mm)	Q'ty (pcs/tray)	Q'ty (pcs/box)
L17~L22	28.0	284	24.0	80	160, 400
M17~M22	28.0	284	24.0	60	120, 300

■ MINIATURE TYPE

Unit(mm)

Fig.1
ØD = Ø3~6.3

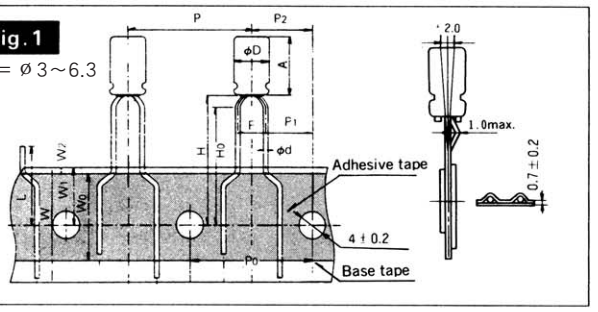


Fig.2
ØD = Ø5
ØD = Ø8

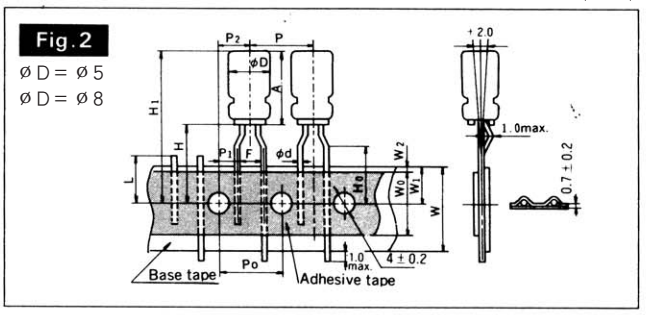


Fig.3
ØD = Ø6.3, 8
ØD = Ø10, 12.5

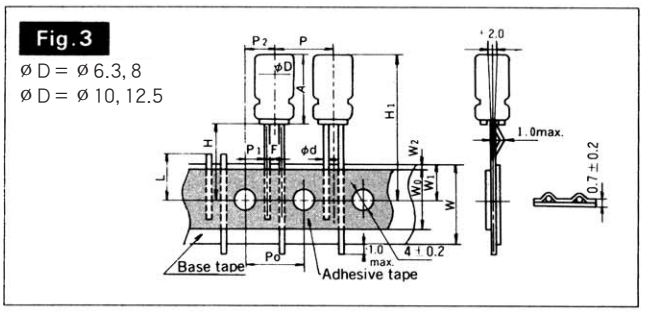
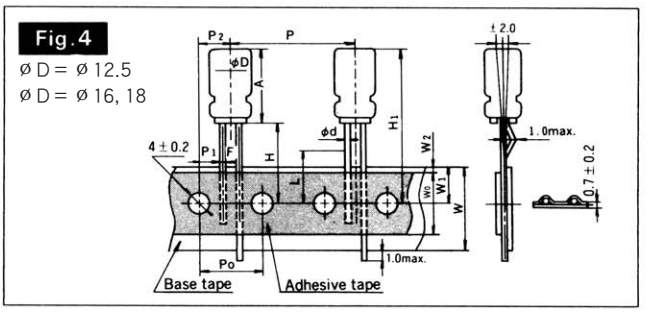


Fig.4
ØD = Ø12.5
ØD = Ø16, 18



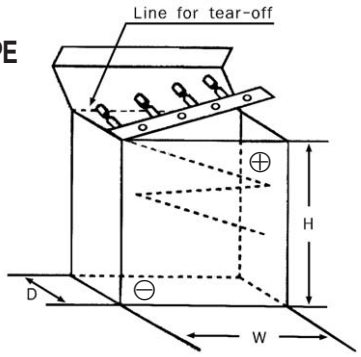
Code	Case size ØD	Case size A	Ød	P	P0	P1	P2	F	W	W0	W1	W2	H	H0	H1	L	Fig.
Tol.	±0.5	※1)	±0.05	±1.0	±0.2	±0.7	±1.0	+0.8 -0.2	±0.5	min.	±0.5	max.	±0.75	±0.5	-	max.	
Nominal	3	5	0.4	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	6	9.0	1.5	18.2 / 17.5	- / 16.0	H1 = H + A Check insertion machine specs.	11.0	1 / 2
	3.5	5	0.4	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	6	9.0	1.5	18.2 / 17.5	- / 16.0		11.0	1 / 2
	4	5~7	0.45	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	6	9.0	1.5	18.2 / 17.5	- / 16.0		11.0	1 / 2
	5	5~7	0.45	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	6	9.0	1.5	18.2 / 17.5	- / 16.0		11.0	1 / 2
		11~15	0.5	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	10	9.0	1.5	18.5	16.0		11.0	2
	6.3	5~7	0.45	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	6	9.0	1.5	18.2 / 17.5	- / 16.0		11.0	3 / 2
		9~15	0.5	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	10	9.0	1.5	18.5	- / 16.0		11.0	3 / 2
	8	※2) 5	0.45	12.7	12.7	5.1 / 3.85	6.35	2.5 / 5	18.0	6	9.0	1.5	18.2 / 17.5	- / 16.0		11.0	3 / 2
		7	0.45	12.7	12.7	5.1 / 3.85	6.35	3.5 / 5	18.0	10	9.0	1.5	20 / 18.5	- / 16.0		11.0	3 / 1
		9~20	0.6	12.7	12.7	5.1 / 3.85	6.35	3.5 / 5	18.0	10	9.0	1.5	18.5	- / 16.0		11.0	3 / 2
Tol.	±0.5	max.	±0.05	±1.0	±0.3	±0.7	±1.3		±0.5	min.	±0.5	max.	±0.75	-		max.	
Nominal	10	27	0.6	12.7	12.7	3.85	6.35	5	18.0	12.5	9.0	1.5	18.5	-		11.0	3
	12.5	27	0.6	15	15	5.0	7.5	5	18.0	12.5	9.0	1.5	18.5	-		11.0	3
			● 0.6	25.4	12.7	3.85	6.35	5	18.0	12.5	9.0	1.5	18.5	-		11.0	4
	16	37.5	0.8	30	15	3.75	7.5	7.5	18.0	12.5	9.0	3.0	18~20	-		11.0	4
	18	37.5	0.8	30	15	3.75	7.5	7.5	18.0	12.5	9.0	3.0	18~20	-		11.0	4

● P=25.4 taping is not standard. Use P=15 taping.
※1) Refer to the drawing of each series for tolerance.
※1) Ø8×5L(Height) is 6.5mm max.

PACKING QUANTITY

■ MINIATURE TYPE

TAPING



Packing quantity (ø3～ø18) is changable.

Item		Inner Box (PCS)	Out Box (PCS)	Box Dimension D×W×H(mm)
RMV ø6.3		1,500	9,000	41×330×232
RMV ø8	7～9L	1,000	6,000	41×330×232
	11.5L	1,000	5,000	51×330×230
RMV ø10		500	2,500	53×330×190
SRE ø3, 3.5		3,000	18,000	41×330×232
SRE, A ø4		2,500	15,000	41×330×232
SRE, A ø5		2,000	12,000	41×330×232
SRE, A ø6.3		1,500	9,000	41×330×232
SRE, A ø8		1,000	6,000	41×330×232
ø5		2,000	10,000	51×330×230
ø6.3		1,500	7,500	48×330×211
ø8	11.5L	1,000	5,000	51×330×230
	15L	1,000	5,000	51×330×230
	20L	800	4,000	62×330×198
ø10	16L max.	500	2,500	53×330×190
	25L max.			62×330×190
	33L max.		2,000	68×330×190
ø12.5	25L max.	400	2,000	61×324×235
ø16	25L max.	250	1,250	62×342×245
	35.5L max.		1,000	73×342×245
ø18	25L max.	200	1,000	62×342×245
	35.5L max.		800	73×342×245

LONG AND FORMING CUT

Item	ø D×L(mm)	Terminal Conf.	Vinyl Bag (PCS)	Inner Box (PCS)	Out Box (PCS)
RMV	ø6.3	Long	500	2,000	24,000
	ø8	Long	200	1,000	12,000
	ø10	Long	100	2,000	8,000
SRE	ø3～ø4	Long/Forming	500	4,000	48,000
	ø5	Long/Forming	500	3,000	36,000
	ø6.3	Long/Forming	500	3,000	30,000
	ø8	Long/Forming	200	1,000	12,000
SRA	ø4～ø5	Long/Forming	500	3,000	36,000
	ø6.3	Long/Forming	500	2,000	24,000
	ø8	Long/Forming	200	1,000	12,000
SR	ø6×9L	Long/Forming	500	2,000	24,000
	ø8×9L	Long	200	1,000	12,000
		Forming		2,000	24,000
CM-Ⅰ	ø5	Long	200	2,000	24,000
		Forming			
	ø6.3	Long	200	2,000	20,000
		Forming			24,000
	ø8×11.5L	Long/Forming	200	1,000	12,000
	ø8×15L	Long	100	500	6,000
	ø8×20L	Long	100	500	6,000

Item	ø D×L(mm)	Terminal Conf.	Vinyl Bag (PCS)	Inner Box (PCS)	Out Box (PCS)
CM-Ⅱ	ø10×12.5L	Forming	100	2,500	10,000
		Long	100	2,000	8,000
	ø10×15～16L	Forming	100	2,000	8,000
		Long	100	1,500	6,000
	ø10×20L	Forming	100	1,600	6,400
		Long	100	1,200	4,800
	ø10×25～30L	Forming	100	1,200	4,800
		Long	100	1,000	4,000
	ø10×45～50L	Long	50	500	2,000
	ø12.5×13L	Forming	100	1,500	6,000
		Long	100	1,500	6,000
	ø12.5×15～16L	Forming	100	1,000	4,000
		Long	100	1,000	4,000
	ø12.5×20～25L	Forming	100	1,000	4,000
		Long	100	800	3,200
	ø12.5×30～35L	Forming	50	600	2,400
		Long	50	500	2,000
	ø12.5×42.5L	Forming	50	500	2,000
		Long	50	400	1,600
	ø12.5×45～50L	Long	50	400	1,600
	ø16×15L	Forming	50	600	2,400
		Long	50	600	2,400
	ø16×20～25L	Forming	50	600	2,400
		Long	50	500	2,000
	ø16×31.5L	Forming	50	400	1,600
		Long	50	400	1,600
	ø16×40L	Forming	50	400	1,600
		Long	25	250	1,000
	ø18×20～25L	Forming	50	400	1,600
		Long	50	400	1,600
	ø18×30～40L	Forming	25	300	1,200
		Long	25	250	1,000
	ø20×40L	Forming	-	150	600
		Long	20	160	640
	ø22×20～30L	Forming	-	100	400
		Long	20	200	800
	ø22×35～40L	Forming	-	100	400
		Long	20	160	640
	ø22×45L	Forming	-	100	300
		Long	20	160	640
	ø22×50L	Long	15	120	480
	ø25.4×25L	Forming	-	100	400
		Long	20	160	640
	ø25.4×40L	Forming	-	100	400
		Long	15	120	480
	ø25.4×45～50L	Forming	-	100	300
		Long	15	120	480

GENERAL PACKAGE

Size		Terminal Config.	Product Q'ty Per Inner Box(pcs)	Product Q'ty Per Out Box(pcs)
ø D(mm)	L(mm)			
14.5	35	LA	320	1,280
16	25～45		250	1,000
	50		250	750
20	25～45	LA, VN, VS	150	600
	50		150	450
22～30	15～45		100	400
	50～60		100	300
35～40	15～45	VN, VS, VR, LA, LR, LI	50	200
	50～60		50	150
35	70～80		80	160
40	70～80		50	100
35	-	LA, LG, LR	-	50
50	-		-	32
63.5～89	-		-	10

Conductive Polymer Aluminum Solid Capacitors

PRECAUTIONS AND GUIDELINES (CONDUCTIVE POLYMER SOLID CAPACITORS)

DESIGNING DEVICE CIRCUITS

1. Types of circuits where reALcap capacitors are not to be used

The leakage current may increase due to soldering and other processes. Since large leakage current can bring problems, avoid the use of conductive polymer solid capacitors(hereafter called solid capacitors) in the following circuits.

1) High impedance circuits
2) Time constant circuits
   The capacitance can be varied depending the operating conditions. The change of capacitance affects the time constant circuit.
3) Coupling circuits
4) Other circuits where circuits are affected by leakage current.

2. Polarity

Solid Capacitors are polarized. Do not apply either reverse voltage or AC voltage to the solid capacitor. Reverse voltage may cause a short circuit.

3. Rated voltage

Do not apply voltage exceeding rated voltage. Overvoltage may cause a short circuit.

4. Operating Temperature

Do not use the solid capacitor at temperature which exceeds the specified range. High temperature may cause decrease the life of the solid capacitor.

5. Ripple current

Do not apply the exceeding current which value exceeds the rated ripple current. The over ripple current cause decrease the life of the solid capacitor.

6. Charge and discharge

Do not use the solid capacitor in circuits for rapid charge and discharge repetitively.
Repetitively charge and discharge of capacitors may reduce the capacitance.

회로 설계시 주의 사항

1. 고체콘덴서 사용을 피해야 하는 회로

누설전류는 납땜이나 다른 이유로 인해 증가할 수 있습니다. 누설전류는 문제를 야기할 수 있기 때문에 아래의 회로에는 고체콘덴서 사용을 피하여 주십시오. (전도성 고분자 고체 콘덴서를 축약하여 고체 콘덴서로 표기함.)

1) 큰 임피던스를 갖는 회로
2) 시정수용 회로
   고체콘덴서는 작동 조건에 따라 용량이 변할 수 있습니다.
   용량의 변화는 시정수 회로에 영향을 줍니다.
3) 커플링 회로
4) 누설전류에 의해 영향을 받는 회로

2. 극성

고체콘덴서는 극성을 갖고 있습니다. 역전압이나 교류전압을 고체콘덴서에 인가하지 마십시오. 역전압은 고체콘덴서를 쇼트 시킬 수 있습니다.

3. 정격전압

정격전압을 초과하는 전압을 인가하지 마십시오.
과전압은 고체콘덴서를 쇼트 시킬 수 있습니다.

4. 사용 온도

보증 온도를 초과하는 온도에서 고체콘덴서를 사용하지 마십시오. 높은 온도는 고체콘덴서의 수명을 줄어들게 합니다.

5. 리플 전류

정격 리플전류를 초과하는 전류를 인가하지 마십시오. 과도한 리플전류는 고체콘덴서의 수명을 줄어들게 합니다.

6. 충전과 방전

고체콘덴서를 빠르게 충전과 방전을 반복하는 회로에 사용하지 마십시오. 반복적인 충전과 방전은 용량을 줄어들게 합니다.

7. Insulation

Aluminum case, cathode lead wire, anode lead wire and circuit pattern should be electrically isolated.

8. Solid Capacitor Usage Environment

The following environment should be avoided.

1) Damp conditions such as water, saltwater spray, or oil spray or fumes.
   High humidity or humidity condensation situations.
2) Hazardous gas/fumes such as hydrogen sulfide, sulfurous acid gas, nitrous acid, chlorine gas or ammonia.
3) Ozone, ultraviolet rays or radiation.
4) Severe vibration or mechanical shock.

9. Capacitor Mounting

1) Surface Mount Type
   Land pattern on PCB board should comply with the specification.
2) Radial Type
   Interval of terminal holes on the PCB is in accordance with the specification.

7. 절연

알루미늄 케이스, 음극 단자선, 양극 단자선 그리고 회로 패턴은 전기적으로 절연상태에 있어야 합니다.

8. 고체콘덴서 사용 환경

아래의 환경은 피해 주십시오.

1) 습한 환경
(물, 소금물, 기름이 있는 환경)

2) 유해한 가스
(황화 수소, 아황산 가스, 아질산, 염소, 암모니아)가 있는 환경

3) 오존, 자외선이 있는 환경
4) 진동과 기계적 충격이 있는 환경

9. 고체콘덴서의 장착

1) SMD 타입 제품
PCB의 패턴은 규정과 일치해야 합니다.

2) RADIAL 타입 제품
PCB의 홀 간격은 규정과 일치해야 합니다.

INSTALLING CAPACITORS

1. Installing

1) Do not reuse capacitors which already assembled.
2) The capacitor may have self-charge during storage time. In this case, discharge the capacitor through about 1kΩ resistor before use.
3) Leakage current of capacitors may be increased during storage. In this case, the capacitors can be reformed by the voltage treatment through about 1kΩ resistor.

<Voltage Treatment>
Applying rated voltage for 120 minutes at maximum operating temperature range.

4) Do not apply severe vibration or mechanical shock.

콘덴서 설치

1. 설치

1) 장착되었던 콘덴서를 다시 사용하지 마십시오.

2) 고체콘덴서는 보관 중에 충전될 수 있습니다. 이 경우에는, 사용 전에 약 1kΩ 저항을 통하여 방전하십시오.

3) 누설전류는 보관 중에 증가할 수 있습니다. 이 경우에, 고체콘덴서는 1kΩ 저항을 통하여 전압처리를 한 후에 사용하십시오.

〈전압처리〉
최고사용온도에서 120분 동안 정격 전압 인가.

4) 진동이나 기계적 충격을 주지 마십시오.

2. Soldering

The leakage current may increase due to thermal stress that occur during soldering. Ensure the soldering conditions meet the specifications.

2-1. Soldering with a soldering iron

1) Ensure the lead spacing of the solid capacitor meets the hole spacing on the PCB board.
2) Ensure the soldering conditions meets the approval sheet.
3) Soldering iron should not touch the solid capacitor' s body.

2-2. Reflow soldering

1) Reflow soldering must not be used for radial type solid capacitors.
2) Soldering conditions(preheat, solder temperature and reflow time) should be within the limits prescribed in the catalogs or product specifications.
3) For setting a degree of heating infrared heaters, consider that the infrared absorption may vary in the color and materials of a solid capacitor.
4) Do not solder solid capacitors more than once by reflow.

3. Handling after soldering

1) Do not lean or twist the solid capacitor' s body after soldering on PCB.
2) Do not pick-up or move PCB by holding the soldered solid capacitors.

4. Cleaning PCB boards

4-1. Agents must be avoided

1) Do not wash boards by using the following agents.
   - Halogenated solvents
   - Alkali system solvents
   - Petroleum system solvents
   - Xylene, Acetone
2) Monitor conductivity, pH, specific gravity and the water content before cleaning boards.

2. 납땜

누설전류는 납땜 중에 발생하는 열 충격에 의하여 증가할 수 있습니다. 납땜조건이 규정을 만족하는지 확인하십시오.

2-1. 인두를 사용한 납땜

1) 고체콘덴서의 단자간격이 PCB 기판의 홀 간격과 일치하는지 확인하십시오.
2) 납땜 조건이 승인원을 만족하는지 확인하십시오.
3) 납땜 인두로 고체콘덴서 몸체를 접촉하지 마십시오.

2-2. 리플로 납땜

1) 리플로 솔더링은 RADIAL 타입 고체콘덴서에 적용하지 마십시오.
2) 솔더링 조건(온도 및 시간)은 카탈로그나 제품승인원에서 규정한 제한치 이내이어야 합니다.
3) 적외선 히터 사용시, 고체콘덴서 색상과 재질에 따라 적외선 흡수율이 상이함을 고려하십시오.
4) 고체콘덴서를 2회 이상 리플로를 통과시키지 마십시오.

3. 납땜 후 관리

1) 납땜 후 고체콘덴서의 몸체를 기울이거나 비틀지 마십시오.
2) 납땜되어진 고체콘덴서를 잡고 PCB 기판을 들어올리거나 움직이지 마십시오.

4. PCB 기판 세척

4-1. 피해야 할 세척제

1) 아래의 약품으로 세척하지 마십시오.
   - Halogenated solvents
   - Alkali system solvents
   - Petroleum system solvents
   - Xylene, Acetone
2) 기판 세척 전에, 세척제의 전도도, pH, 비중과 수분함유량을 확인하십시오.

3) Influence of cleaning agents
(Halogenated solvents)
Solid capacitors are easily affected by halogen ions, particularly by chloride ions. When halogen ions enter the inside of the solid capacitor, the capacitor may be failed due to corrosion of capacitor' s foil.

4-2. Recommended Agents

1) Higher alcohol cleaning agents
Solid capacitors may withstand immersion or ultrasonic cleaning for 10 minutes at a maximum liquid temperature of 60℃
2) IPA(Isopropyl Alcohol)
Solid capacitors are capable of withstanding any one of immersion, ultrasonic or vapor cleaning for 5 minutes.

5. Using adhesives and coating materials

1) Do not use halogenated adhesives and coating materials.
2) Flux and cleaning agents should be removed before using adhesives or coating materials.
3) Do not cover up the whole surface of the solid capacitor. Make coverage only partial.
(The sealing area 30%)

THE OPERATION OF DEVICES

- Do not directly touch the solid capacitor terminals.
- Do not connect with conductors between the terminals.
- The following environment should be avoided when using solid capacitors.

  - Damp conditions such as water, saltwater spray, or oil spray or fumes, High humidity or humidity condensation situations.
  - Hazardous gas/fumes such as hydrogen sulfide, sulfurous acid gas, nitrous acid,

3) 할로겐계 세척제의 문제점

고체콘덴서는 할로겐 이온(특히 염소 이온)에 의해 쉽게 영향을 받습니다. 할로겐 이온들이 고체콘덴서 내부에 침투하게 되면, 콘덴서 박의 부식에 의해 고장날 수 있습니다.

4-2. 권장 세척제

1) Higher alcohol cleaning agents
고체콘덴서는 침적 혹은 초음파 세척을 최대 60℃에서 10분 동안 견딜 수 있습니다.

2) IPA(Isopropyl Alcohol)
고체콘덴서는 침적이나 초음파 혹은 증기 세척을 5분 동안 견딜 수 있습니다.

5. 제품의 고정제와 코팅제

1) 할로겐계의 고정제와 코팅제를 사용하지 마십시오.

2) 고정제와 코팅제를 사용하기 전에, 플럭스와 세척제를 제거하십시오.
3) 고체콘덴서 봉구부 전체를 밀봉시키지 마십시오.
(봉구부의 30% 이하)

기기 작동 중 주의사항

- 콘덴서 단자를 직접적으로 만지지 마십시오.
- 단자 사이를 도전체로 연결하지 마십시오.
- 아래의 환경에서는 고체콘덴서 사용을 피하여 주십시오.

  - 습한 환경 (물, 소금물, 기름이 있는 환경)

  - 유해 가스 (황화 수소, 아황산 가스, 아질산, 염소, 암모니아 등) 에 노출된 환경

chlorine gas or ammonia.
- Exposure to ozone, ultraviolet rays or radiation.

- 오존, 자외선에 노출된 환경

EMERGENCY ACTION

- If a short circuit occurs and odorous gas is released, immediately turn off the main power switch or pull out the plug from the power outlet.
- If the gas comes in contact with eyes or skin, rinse immediately. If the gas is inhaled, gargle immediately.

응급 조치

- 콘덴서가 쇼트 되거나 냄새가 나는 가스를 배출하면, 즉시 전원을 끄십시오.
- 배출된 가스가 눈이나 피부에 닿게되면, 즉시 세척하십시오. 가스 흡입 시 입안을 닦아 주십시오.

CONDITIONS OF STORAGE

- Do not store solid capacitors at a high temperature and high humidity. Store the solid capacitors indoors at a temperature 5~35℃ and a humidity of less than 75%RH.
- Store solid capacitors in places free from water, oil or salt water.
- Store solid capacitors in places free from toxic gases(hydrogen sulfide, sulfurous acid, nitrous acid, chlorine, ammonium, etc.)
- Store solid capacitors in places out of ozone, ultraviolet rays or radiation.
- Keep solid capacitors in the package.

보관 조건

- 고체콘덴서를 고온/다습한 환경에서 보관하지 마십시오. 온도가 5~35℃, 습도가 75%RH 이하인 실내에서 보관하여 주십시오.
- 물이나 소금물, 기름이 없는 장소에 보관하십시오.
- 유해 가스(황화 수소, 아황산 가스, 아질산, 염소, 암모니아 등)가 없는 환경에서 보관하십시오.
- 오존, 자외선이 없는 곳에서 보관하십시오.
- 고체콘덴서를 포장된 상태에서 보관하십시오.

OTHERS

- Case sizes and other product standards specified in this catalog may be changed or modified without notice for improvement of quality.

기타

- 카탈로그에 규정된 케이스 사이즈나 다른 제품 기준은 품질 개선을 위하여 귀사에 통지 없이 변경될 수 있습니다.

reALcap™ APV Series

- Higher heat resistance (125℃)
- High Ripple Current
- Endurance 125℃, 2,000hrs

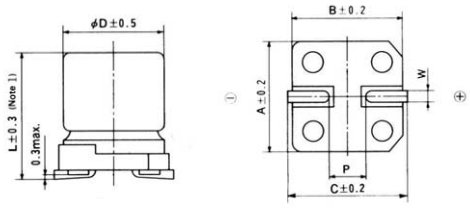
ASV → APV
High Temp.

SPECIFICATIONS

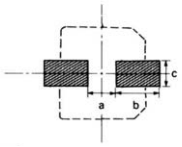
Item	Characteristics
Category temperature range	-55 to +125℃
Rated voltage range	10 to 35VDC
Surge voltage	Rated Voltage(WV): 10 / 16 / 25 / 35 Surge Voltage(SV): 11.5 / 18.4 / 29 / 40
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of APV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of APV series. (at 20℃, 2minutes)
ESR	Shall not exceed the value in Ratings of APV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Z(-55℃)/Z(+20℃) ≦ 1.25 Z(+125℃)/Z(+20℃) ≦ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 125℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value ESR ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 500 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value ESR ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Surge voltage	The following specifications shall be satisfied when the capacitors are restored to +20℃ after the surge voltage is at a cycle of 360seconds which consist charge for 30 seconds and discharge for 330 seconds, for 1000 cycles at 125℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1 : If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 125℃)

DIMENSIONS

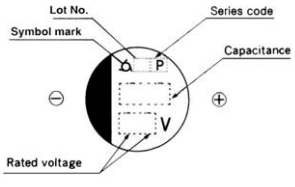


Recommended solder land on PC board



▨ : Solder land on PC board

MARKING



Note 1 : L±0.5 for 8×11.5(H12) ~ 10×12.2(J12) Unit(mm)

Case code	ø D	L	A	B	C	W	P	a	b	c
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J12	10.0	12.2	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

RATINGS OF APV Series

Case Code	Rated Voltage (V)	Rated Capacitance (μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current (mArms) at 100kHz		Tangent of loss angle	Leakage Current (μA)
				105℃<Temp.≤125℃	Temp.≤105℃		
F60	25	10	65	474	1,500	0.10	50
	10	56	45	538	1,700	0.12	112
H70	35	8.2	70	400	1,300	0.10	57
	25	22	48	580	1,835	0.10	110
	16	82	40	670	2,120	0.12	262
H12	35	22	50	700	2,300	0.12	154
	25	47	30	943	2,980	0.12	235
J12	35	47	30	1,150	3,650	0.12	329
	25	82	28	1,202	3,800	0.12	410

reALcap™ AXV Series

- Super Low ESR, Large Capacitance
- High Ripple Current
- -55℃ ~ +105℃
- Endurance 105℃, 2,000hrs

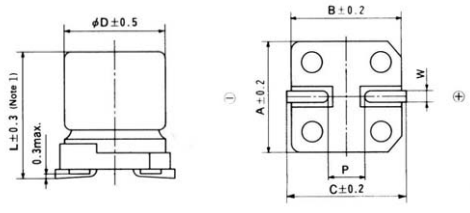
ASV → AXV
Lower ESR

SPECIFICATIONS

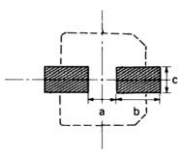
Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	2.5 to 16VDC
Surge voltage	Rated Voltage(WV): 2.5 / 4 / 6.3 / 10 / 16 Surge Voltage(SV): 3.3 / 5.2 / 8.2 / 11.5 / 18.4
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AXV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AXV series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of AXV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance / Ratio Z(-55℃)/Z(+20℃) ≦ 1.25 Z(+105℃)/Z(+20℃) ≦ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Surge voltage	The following specifications shall be satisfied when the capacitors are restored to +20℃ after the surge voltage is at a cycle of 360seconds which consist charge for 30 seconds and discharge for 330 seconds, for 1000 cycles at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1 : If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment: Applying rated voltage for 120minutes at 105℃)

DIMENSIONS

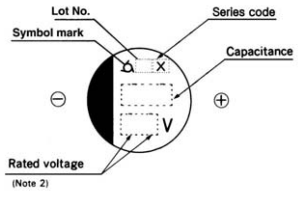


Recommended solder land on PC board



▨ : Solder land on PC board

MARKING



Note 1 : L±0.5 for 8×10.0(H10)~10×12.2(J12)
Note 2 : 6.3WV is marked by 6V

Unit(mm)

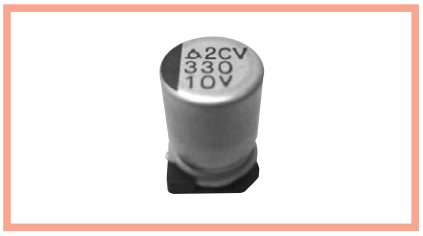
Case code	ø D	L	A	B	C	W	P	a	b	c
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H10	8.0	10.0	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J12	10.0	12.2	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

RATINGS OF AXV Series

Case Code	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms) at 100kHz	Tangent of loss angle	Leakage Current (μA)
F60	16	68	30	2,200	0.12	300
	10	120	27	2,320	0.12	300
	10	150	27	2,320	0.12	300
	6.3	220	27	2,320	0.12	300
	6.3	330	27	2,320	0.12	415
	4	330	27	2,320	0.12	300
	2.5	390	25	2,410	0.12	300
	2.5	390	15	3,160	0.12	300
H70	16	120	27	2,900	0.12	500
	16	150	22	3,220	0.12	500
	10	270	22	3,220	0.12	500
	6.3	390	22	3,220	0.12	491
	4	560	22	3,220	0.12	500
	2.5	680	20	3,370	0.12	500
H10	16	220	12	5,060	0.12	704
H12	6.3	820	12	4,700	0.15	1,033
	4	560	9	5,380	0.15	500
	4	1,200	12	4,700	0.15	960
	2.5	1,500	10	5,150	0.15	750
J12	2.5	2,700	12	5,080	0.15	1,350

reALcap™ ASV Series

- Low ESR (at 100kHz~300kHz)
- High Ripple Current
- -55℃ ~ +105℃
- Endurance 105℃, 2,000hrs

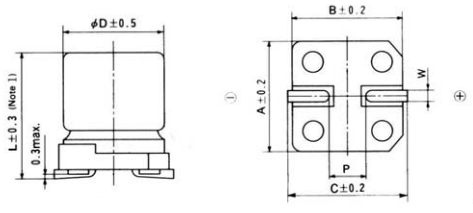


SPECIFICATIONS

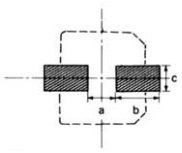
Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	2.5 to 35VDC
Surge voltage	Rated Voltage(WV) 2.5 4 6.3 10 16 20 25 35 / Surge Voltage(SV) 3.3 5.2 8.2 11.5 18.4 23.0 29.0 40.0
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of ASV series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of ASV series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of ASV series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance / Ratio: Z(-55℃)/Z(+20℃) ≦ 1.25; Z(+105℃)/Z(+20℃) ≦ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Surge voltage	The following specifications shall be satisfied when the capacitors are restored to +20℃ after the surge voltage is at a cycle of 360seconds which consist charge for 30 seconds and discharge for 330 seconds, for 1000 cycles at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

※ 1 : If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment : Applying rated voltage for 120minutes at 105℃)

DIMENSIONS

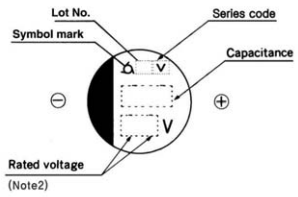


Recommended solder land on PC board



▨ : Solder land on PC board

MARKING



Note 1 : L±0.5 for 8×10.0(H10)~10×12.2(J12)
Note 2 : 6.3WV is marked by 6V

Unit(mm)

Case code	ϕD	L	A	B	C	W	P	a	b	c
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H70	8.0	6.7	8.3	8.3	9.0	0.5-0.8	3.1	3.1	4.2	1.6
H10	8.0	10.0	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
H12	8.0	11.5	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10.0	10.0	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2
J12	10.0	12.2	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

CONDUCTIVE POLYMER ALUMINUM SOLID CAPACITORS

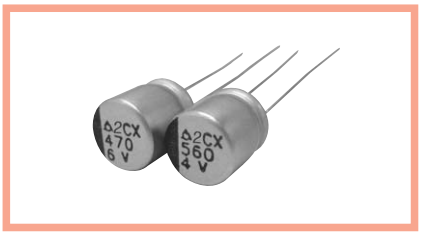
RATINGS OF ASV Series

Case Code	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms) at 100kHz	Tangent of loss angle	Leakage Current (μA)
F60	35	10	80	1,380	0.12	70
	25	10	45	1,840	0.10	125
	25	6.8	45	1,840	0.10	85
	20	22	40	1,950	0.10	88
	20	27	40	1,950	0.10	108
	16	39	35	2,080	0.10	125
	16	47	35	2,080	0.10	150
	10	47	30	2,250	0.12	94
	10	56	30	2,250	0.12	112
	6.3	82	30	2,250	0.12	103
	6.3	100	30	2,250	0.12	126
	6.3	120	30	2,250	0.12	151
	4	150	30	2,250	0.12	120
H70	20	33	45	1,890	0.12	132
	20	47	45	1,890	0.12	188
	16	56	45	1,890	0.12	179
	16	82	40	2,120	0.12	262
	10	120	35	2,560	0.12	240
	10	150	35	2,560	0.12	300
	6.3	220	35	2,560	0.12	277
	4	150	35	2,560	0.12	120
	4	330	35	2,560	0.12	264
H10	25	47	30	2,640	0.12	588
	20	68	25	2,890	0.12	272
	16	180	20	3,240	0.12	576
	10	220	17	3,510	0.12	440
	6.3	270	17	3,510	0.12	340
	4	330	17	3,510	0.12	264
H12	35	22	35	2,000	0.12	154
	35	33	35	2,000	0.12	231
	25	33	30	2,980	0.12	413
	20	100	24	3,320	0.15	400
	16	180	20	3,640	0.15	576
	10	330	17	3,950	0.15	660
	6.3	470	15	4,210	0.15	592
	4	560	13	4,520	0.15	448
	4	680	13	4,520	0.15	544
	2.5	680	13	4,520	0.15	340
J10	25	56	25	3,430	0.12	1,250
	20	150	20	3,830	0.12	600
	16	330	16	4,280	0.12	1,056
	10	470	14	4,570	0.12	940
	6.3	560	13	4,750	0.12	706
	4	680	13	4,750	0.12	544
	4	1,200	13	4,750	0.12	960
	2.5	1,500	13	4,750	0.12	750
J12	25	56	28	3,800	0.12	700
	20	150	20	4,320	0.15	600
	16	330	16	4,720	0.15	792
	10	560	13	5,230	0.15	840
	6.3	820	12	5,440	0.15	775
	4	1,200	12	5,440	0.18	960
	2.5	1,500	12	5,440	0.18	750

reALcap™ AXA Series

- Super Low ESR, Large Capacitance
- High Ripple Current
- -55℃ ~ +105℃
- Endurance 105℃, 2,000hrs

ASA → AXA
Lower ESR



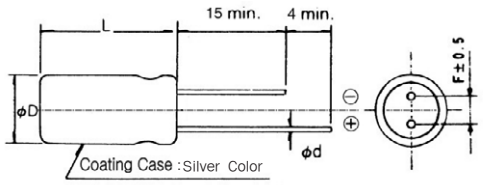
SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	2.5 to 16VDC
Surge voltage	Rated Voltage(WV): 2.5 / 4 / 6.3 / 10 / 16 Surge Voltage(SV): 3.3 / 5.2 / 8.2 / 11.5 / 18.4
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of AXA series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of AXA series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of AXA series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Z(-55℃)/Z(+20℃) ≦ 1.25 Z(+105℃)/Z(+20℃) ≦ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Surge voltage	The following specifications shall be satisfied when the capacitors are restored to +20℃ after the surge voltage is at a cycle of 360seconds which consist charge for 30 seconds and discharge for 330 seconds, for 1000 cycles at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

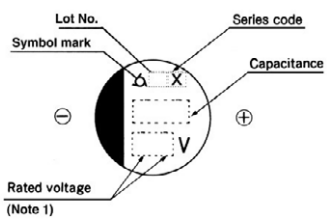
※ 1 : If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment: Applying rated voltage for 120minutes at 105℃)

DIMENSIONS

Coating Case Type



MARKING



Note 1 : 6.3WV is marked by 6V

Unit(mm)

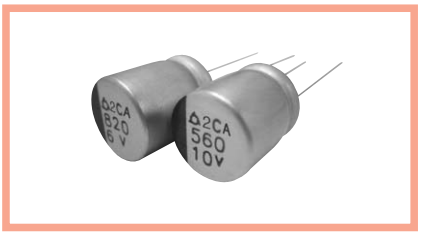
φD(+0.5max.)	6.3	8.0	8.0	8.0	8.0	10.0
L	6.0	7.0	9.0	10.0	11.5	12.5
Lmax.	6.0max.	7.0max.	9.0max.	10max.	11.5max.	12.5max.
φd(±0.05)	0.45	0.45	0.6	0.6	0.6	0.6
F(±0.5)	2.5	3.5	3.5	3.5	3.5	5.0

RATINGS OF AXA Series

Case Size (ø D×L) (mm)	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms) at 100kHz	Tangent of loss angle	Leakage Current (μA)
6.3×6	16	150	30	2,490	0.12	480
	16	100	30	2,200	0.12	320
	16	68	30	2,200	0.12	300
	10	120	27	2,320	0.12	300
	10	150	27	2,320	0.12	300
	6.3	270	27	2,320	0.12	340
	6.3	220	27	2,320	0.12	300
	4	330	27	2,320	0.12	300
6.3×11.5	6.3	680	20	3,160	0.12	856
8×7	16	120	27	2,900	0.12	500
	16	150	22	3,220	0.12	500
	10	270	22	3,220	0.12	500
	6.3	390	22	3,220	0.12	491
	4	560	22	3,220	0.12	500
	2.5	680	20	3,370	0.12	500
8×9	6.3	470	8	5,700	0.10	592
	4	560	7	6,100	0.10	500
	2.5	560	8	5,700	0.10	500
	2.5	820	7	6,100	0.10	500
8×10	6.3	620	15	3,760	0.10	1,033
8×11.5	16	270	14	3,890	0.12	864
	16	180	16	3,640	0.10	576
	10	680	14	3,500	0.10	1,360
	6.3	470	8	5,700	0.10	592
	4	560	7	6,100	0.10	500
	2.5	820	7	6,100	0.10	500
10×12.5	16	470	10	6,100	0.10	1,504
	6.3	1,500	10	5,560	0.10	1,890
	2.5	2,700	10	5,560	0.10	1,350

reALcap™ ASA Series

- Low ESR (at 100kHz~300kHz)
- High Ripple Current
- -55℃ ~ +105℃
- Endurance 105℃, 2,000hrs



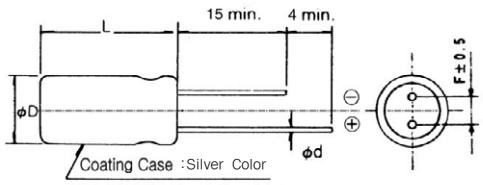
SPECIFICATIONS

Item	Characteristics
Category temperature range	-55 to +105℃
Rated voltage range	2.5 to 35VDC
Surge voltage	Rated Voltage(WV): 2.5 / 4 / 6.3 / 10 / 16 / 20 / 25 / 32 / 35 Surge Voltage(SV): 3.3 / 5.2 / 8.2 / 11.5 / 18.4 / 23.0 / 29.0 / 37.0 / 40.0
Capacitance tolerance	±20%(M) (at 20℃, 120Hz)
Tangent of loss angle	Shall not exceed the value in Ratings of ASA series. (at 20℃, 120Hz)
Leakage Current ※ 1	Shall not exceed the value in Ratings of ASA series. (at 20℃, 2 minutes)
ESR	Shall not exceed the value in Ratings of ASA series. (at 20℃, 100kHz)
Impedance Ratio (Characteristics at low temp.)	Impedance Ratio Z(-55℃)/Z(+20℃) ≦ 1.25 Z(+105℃)/Z(+20℃) ≦ 1.25 (at 100kHz)
Endurance	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Bias Humidity	The following specifications shall be satisfied when the capacitors are restored to 20℃ after subjecting them to the DC rated voltage at 60℃, 90~95%RH for 1,000 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Surge voltage	The following specifications shall be satisfied when the capacitors are restored to +20℃ after the surge voltage is at a cycle of 360seconds which consist charge for 30 seconds and discharge for 330 seconds, for 1000 cycles at 105℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 150% of the initial specified value ESR ≦ 150% of the initial specified value Leakage current ≦ The initial specified value

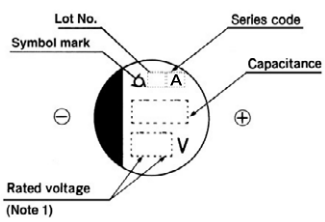
※ 1 : If any doubt arises, remeasure the leakage current after following voltage treatment.(Voltage treatment: Applying rated voltage for 120minutes at 105℃)

DIMENSIONS

Coating Case Type



MARKING



Note 1 : 6.3WV is marked by 6V

Unit(mm)

ø D(+0.5max.)	6.3	8.0	8.0	8.0	8.0	10.0	10.0
L	6.0	7.0	8.0	10.0	11.5	10.0	12.5
Lmax.	6.0max.	7.0max.	8.0max.	10.0max.	11.5max.	10.0max.	12.5max.
ø d(±0.05)	0.45	0.45	0.5	0.6	0.6	0.6	0.6
F(±0.5)	2.5	3.5	3.5	3.5	3.5	5.0	5.0

RATINGS OF ASA Series

Case Size (ØD×L) (mm)	Rated Voltage (V)	Rated Capacitance(μF)	ESR(mΩ) (at 100kHz)	Rated Ripple Current(mArms) at 100kHz	Tangent of loss angle	Leakage Current (μA)
6.3×6	35	10	80	1,380	0.12	70
	32	22	35	2,300	0.12	140
	32	18	80	1,380	0.10	115
	25	33	45	1,840	0.10	413
	25	10	45	1,840	0.10	125
	25	6.8	45	1,840	0.10	85
	20	22	40	1,950	0.10	220
	16	39	35	2,080	0.10	312
	10	56	30	2,250	0.12	280
	10	68	30	2,250	0.12	340
	6.3	82	30	2,250	0.12	258
	4	100	30	2,250	0.12	200
	4	150	30	2,250	0.12	300
8×7	35	8.2	70	1,300	0.10	57
	25	22	60	1,630	0.10	275
	20	33	45	1,890	0.12	132
	20	47	45	1,890	0.12	188
	16	56	45	1,890	0.12	179
	16	82	40	2,120	0.12	262
	10	120	35	2,560	0.12	240
	10	150	35	2,560	0.12	300
	6.3	220	35	2,560	0.12	277
	4	150	35	2,560	0.12	120
	4	330	35	2,560	0.12	264
8×8	20	120	45	1,890	0.12	480
	32	68	70	1,500	0.10	435
8×10	25	47	30	2,640	0.12	588
	20	150	25	2,890	0.12	600
	20	68	25	2,890	0.12	272
	16	180	20	3,240	0.12	576
	10	220	17	3,510	0.12	440
	6.3	270	17	3,510	0.12	340
	4	330	17	3,510	0.12	264
8×11.5	35	22	35	2,000	0.12	154
	35	33	35	2,000	0.12	231
	25	33	30	2,980	0.15	413
	20	100	24	3,320	0.15	400
	16	180	20	3,640	0.15	576
	10	330	17	3,950	0.15	660
	6.3	470	15	4,210	0.15	592
	4	560	13	4,520	0.15	448
	2.5	680	13	4,520	0.15	340
10×10	25	56	25	3,430	0.12	700
	20	150	20	3,830	0.12	600
	16	330	16	4,280	0.12	1,056
	10	470	13	4,750	0.12	940
	6.3	560	13	4,750	0.12	706
	4	680	13	4,750	0.12	544
10×12.5	35	56	30	3,270	0.12	392
	25	56	28	3,800	0.12	700
	20	150	20	4,320	0.15	600
	16	330	16	4,720	0.15	792
	10	560	13	5,230	0.15	840
	6.3	820	12	5,440	0.15	775
	4	1,200	12	5,440	0.18	960
	2.5	1,500	12	5,440	0.18	750

Aluminum Electrolytic Capacitors

LIST OF SUBSTITUTE FOR DISCONTINUED SERIES

The following series are discontinued.
Please use the recommended replacements in the table.

◆LIST OF SMD REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	MV	MVG
Low Impedance	MVY	BXA
High Temperature	CDA, CLA	CLZ

◆LIST OF RADIAL REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	SL,SM,SMS,SRF,SHL,SR	MHA
105℃ standard	KM,KMC,KME,KRF,KMG	NHA
85℃ Bi-polarized	SRE-BP,SRA-BP	DSA-BP,GSA-BP
85℃ Bi-polarized	SM-BP(D), SMS-BP,SH-BP	MHA-BP
105℃ Bi-polarized	KM-BP(D),KME-BP,KMG-BP	NHA-BP
85℃ Bi-polarized	SM-BP(P)	SSP
85℃ Bi-polarized	SM-BP(S),SSA	KSA
105℃ Bi-polarized	KM-BP(S)	KSA
Low Impedance	LXF	NXL(LXV),NXP(LXZ)
Low Impedance	RX,RZ,SXA,SXC,SXE,LXJ,KXL	NXL(LXV)
Ultra Low ESR	NXC	NXE
High Ripple	KHR,NFD(KMF),NFE(KMX)	NZE
High Reliability	KU,KUX	NXL(LXV)
High Temperature	KXC,PXA	PXB
High Temperature, Low Impedance	PXC	PXD
7L Standard	SRA	GSA
Solvent - proof (5L, 7L)	SRM,SRJ,KRE(ESA),KMA(HAS)	EMA,HMA
5L Standard	SRE	DSA
5L Low Impedance	EXA	EXB
7L Low Impedance	HXA	HXB

◆LIST OF SNAP-IN REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	SM,NM,SMS,SHL,SMK,SMG,SMH, SLT,RDA	RDC
105℃ standard	KM,KME,KMG,KMH,KLT	TDA
Protecting Overvoltage	KLG	RVA,TVA

◆LIST OF SCREW-BOLT REPLACEMENTS

Characteristics	Discontinued Series	Substitute Series
85℃ standard	RGB(SMH)	TGA(KMH)
105℃ standard	KME	TGA(KMH)
For Inverter	GW,RWA	RFC(RWF)

PRECAUTIONS AND GUIDELINES TO USERS

PRECAUTION FOR USE OF ALUMINUM ELECTROLYTIC CAPACITORS

Select the capacitors suited to their installation and operating environment, and use them within the performance limits prescribed in their catalog or product specifications, please pay attention to the points listed below.

- Allowable operating temperature range is exceed
- PCB board cleaning conditions
- Reverse voltage
- Voltage exceeds rated working voltage
- Rapid charging and discharging
- Severe vibration or mechanical shock

Please pay attention to right circuit pattern design. When you fail to follow above precautions, you can expect the leakage of electrolyte or opening of the vent in a capacitor because of sudden heating and increased internal pressure.

CAUTION DURING CIRCUIT DESIGN

1. Rated voltage

If a voltage exceeding the capacitor's rated voltage is applied, the capacitor may be damaged as leakage current increases. When using the capacitor with AC voltage superimposed on DC voltage, care must be exercised that the peak value of AC voltage does not exceed the rated voltage.

2. Operating Temperature

Do not use Aluminum Electrolytc Capacitors at temperature which exceeds the specified operating temperature range. Applying capacitors surpassing guaranteed conditions may cause destruction due to rappid characteristic det-erioration. Where, temperature of a capacitor in-cludes radiation heat of Power transistor, IC, Re-sitor, etc. and self heat by ripple current as well as ambient temperature of a set.

3. Ripple Current

Do not apply excessive current to the capacitors, which exceeds the specfied maximum permissible ripple current. If you apply over-rated ripple current, you can expect initial failure in your set. When the value of direct bias voltage is small, even though you apply permissible ripple current, reversed voltage can be occurred. Please take deep attention to possible reversed voltage.

4. Charge and discharge

General Aluminum Electrolytic Capacitors are not suitable for rapid charge and discharge app-

알루미늄 전해 콘덴서의 사용상의 주의점

콘덴서를 사용하고자 할때 카다로그나 승인원에 제시된 범위 내에서 설치 및 사용 환경에 맞게 선정하고 검토시 아래 사항에 대해 유의하시길 바랍니다.

- 허용 사용온도 범위 초과
- 기판 세척 조건
- 역전압
- 정격 전압을 초과하는 과전압
- 급격한 충전 방전
- 가혹한 진동과 기계적 쇼크

상기와 같은 경우, 급격한 발열 및 내압 상승으로 인한 전해액 누설 또는 방폭변 동작으로 발열, 발화되는 경우가 있으므로 회로 패턴 설계시 주의하여 주시기 바랍니다.

회로 설계시 주의 사항

1. 정격 전압

정격전압 이상의 전압을 인가하면 콘덴서의 누설전류가 증대되어 파손되어 버립니다. 또 DC에 AC를 중첩하여 사용할 때에는 AC전압의 Peak치가 정격전압 이하가 되도록 주의하여 주십시오.

2. 사용 온도

규정되어 있는 사용온도 범위를 초과하여 사용하지말아 주십시오. 보증범위를 초과하는 조건에서의 사용은 급격한 특성 열화가 발생되어 파손되는 경우가 있습니다. 온도는 Set의 주위 온도 뿐만 아니라 Set내의 발열체(Power TR, IC, 저항 등)의 방사열, 리플 전류에 따른 자기발열 등이 모두 포함된 콘덴서의 실제온도를 확인하여 주십시오.

3. 리플 전류

과전류(허용 리플을 초과하는 전류)를 흘리지 말아주십시오. 정격치 이상의 리플전류가 흐르게 되면 초기고장이 발생할 수 있습니다. 허용 리플치 이하에서 사용하더라도 직류 Bias 전압이 작을 때는 역전압이 인가되는 경우가 있습니다. 역전압이 인가되지 않는 범위에서 사용하여 주십시오.

4. 충 · 방전

일반적인 Al전해 콘덴서는 급격한 충방전이 이루어지는 회로에 사용하지 말아 주십시오.

lications. Consult with samyoung about specially designed capacitors for rapid charge and discharge.

충방전 목적의 회로에 적용할 경우에는 폐사에 연락 바랍니다.

5. Polarization

Aluminum Electrolytic Capacitors are normally polarized. Reverse voltage or AC voltage should not be applied. When polarity of applied voltage is uncertain or when the polarity may flip over, non-polar type capacitors should be used. But the non-polar type cannot be used for AC circuit. Please confirm the polarity to avoid applying any reverse voltage or ac voltage to the capacitors. Polarity is indicated as below:

- Negative polarity is indicated on the side of body by meams of a stripe or an arrow.
- On radial leaded Aluminum Electrolytic Capacitors, the shorter lead is the negative terminal.
- On Snap-In and Lug Terminal type capacitors, the knurled rivets 〔 ▨ , ● 〕 indicates the negative terminal.
- On Surface Mount Capacitors, the mark 〔 ◖ 〕 indicates the direction of Negative Polarity.

5. 극성

Al 전해 콘덴서는 극성이 있습니다. 역전압 또는 교류 전압을 인가하지 말아 주십시오. 극성이 불확실하거나 극성이 반전하는 회로에는 무극성 콘덴서를 사용하십시오. 그러나 무극성 콘덴서라 하더라도 교류 회로에는 사용하실 수가 없습니다.
역전압 혹은 교류전압이 인가되어지지 않을 경우에도 확인 후 사용해 주십시오. 극성은 아래와 같이 표시되어 집니다.

- 음극은 제품 옆면에 띠 또는 실선 인쇄로 표시되어집니다.
- 리드선 단자 동일 방향 콘덴서는 리드선이 짧은 쪽이 음극을 표시합니다.
- 기판 자립형(pcb terminal)인 LUG 단자의 콘덴서는 〔 ▨ , ● 〕로 음극을 표시합니다.
- SMD Type은 〔◖ 〕 로 음극을 표시합니다.

6. INSULATION

- Aluminum case, cathode lead wire, anode lead wire and circuit pattern should be electrically isolated.
- The blank terminals must not be connected to a solder trace on the pc board, but be electrically isolated from negative or positve terminal.
- The PVC sleeve of Aluminum Electrolytic Capacitors is not recognized as an insulator, and therefore, the standard capacitor should not be used in a place where insulation function is needed. Please consult with Samyoung should your require a higher grade of insulating sleeve.

6. 절연

- Al 케이스와 음극 리드선, 양극 리드선을 회로적으로 완전히 격리시켜 주십시오.
- BLANK 단자는 PCB 회로에서 음극 또는 양극 단자와 연결납땜하지 말아 주십시오.
- 콘덴서의 외장 PVC Sleeve는 절연이 보장되어 있지 않습니다. 절연기능이 필요한 경우에는 사용하지 말아 주십시오. Sleeve의 절연 기능이 필요한 경우에는 폐사에 연락바랍니다.

7. Surge Voltage

The surge voltage rating is the maximum DC overvoltage to which the capacitor may be subjected for short periods not exceeding approximately 30 seconds at infrequent intervals of not more than six minutes. According to KS C IEC 60384-4, the test shall be continued 1000 cycles at room temperature for the capacitors of characteristic KS C IEC 60384-4 or at the maximum operating temperature for the capacitors of characteristics B and C of KS C IEC 60384-4 with voltage applied through a series resistance of 1000 ohms without discharge, the electrical characteristics of the capacitor after the test are specified in KS C IEC 60384-4 unless otherwise specified, the surge voltages are as follows:.

7. 써지전압

써지전압이란 DC 최대 과전압으로 6분의 주기로 약 30초간 견딜수 있는 전압을 말합니다.
(30초 충전, 5분 30초 방전)
시험방법은 직렬저항 1000Ω을 통하여 상온에서 충·방전하여 1000회 실시하게 되어 있습니다.
시험 후의 전기적 특성은 KS C IEC 60384-4 규격을 참조바랍니다. 특별한 언급이 없을 경우 써지전압은 아래의 표와 같습니다.

Rated Voltage (WV)	4	6.3	10	16	25	35	50	63	80	100	160	200	250	315	350	400	420	450	500	550	600
Surge Voltage (SV)	5	8	13	20	32	44	63	79	100	125	200	250	300	365	400	450	470	500	550	600	650

8. LEAD STRESS

Do not apply excessive force to the lead wires or

8. 리드 스트레스

콘덴서의 리드선이나 단자에 무리한 힘을 가하지 마십시오.

terminals. If excessive force is applied to the lead wires and/or terminals, they may break and cause an open circuit. After mounting, avoid holding or applying force to the capacitor. Do not twist or carry the PC board by grasping the capacitor body after the capacitor are soldered to the PC board.

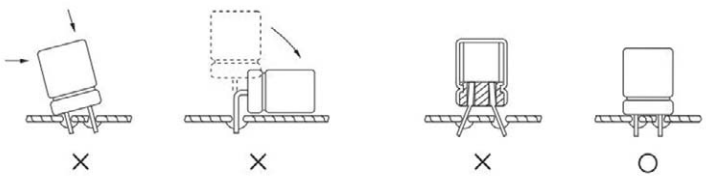
9. MOUNTING

The distance between the terminal holes on the circuit board should be the same as that between the lead wires or terminals of the capacitor. Excessive force in mounting on circuit boards should be avoided.
Improper insertion of the lead wires in circuit board may cause electrolyte leakage, break the lead wires or impair their connection with the internal elements.
When the distance between the two terminal holes on the circuit board cannot be reduced to that between the lead wires, lead formed capacitors are recommended.

리드선이나 단자의 단선 및 회로의 개방을 초래할 수 있습니다.
기판 장착 후에도 콘덴서에 무리한 힘을 가하지 마십시오.
회로기판에 장착 후 콘덴서를 잡고 이동하거나 비틀지 마십시오.

9. 기판 장착

회로기판에서 단자 홀(hole) 간격은 콘덴서의 리드선이나 단자 간의 간격과 같아야 합니다.
회로기판에 장착시 무리한 힘을 가하지 마십시오.
회로기판에 리드선을 무리하게 삽입할 경우 전해액의 누설, 리드선의 손상, 내부 요소와의 접속부위의 파손 등이 발생할 수 있습니다.
회로기판의 홀(hole) 간격과 리드선의 간격이 맞지 않을 때에는 리드선이 가공된 콘덴서를 사용하십시오.

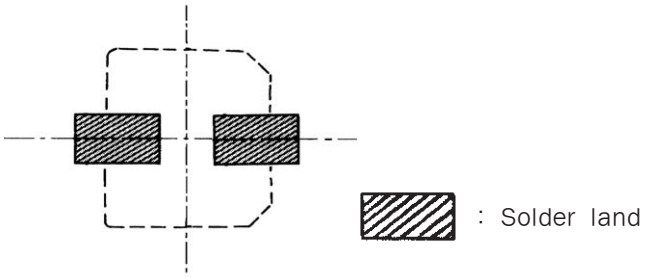


CONSIDERATION TO ASSEMBLY CONDITION

- Design the appropriate hole spacing to match the lead pitch of capacitors.
- Do not locate any wiring and circuit patterns directly above the capacitor`s vent.
- The sealing side of the screw terminal type should not face down in the application. When the capacitors are mounted horizontally, the anode screw terminals must be positioned at the upper side.
- Parts which radiate heat should not be placed Capacitors on the PCB board.
- Land pattern of Surface Mount Capacitors should comply with the specification which is mentioned in the catalog or specification sheets.
  (Refer to SMD Type)
- Torque of tightening screw terminals should not exceed the specified maximum value which is described in the catalog or specification sheets.

취급 환경 설계

- 콘덴서 단자 간격에 맞게 PCB 구멍을 설계해 주십시오.
- 콘덴서 안전장치(방폭변)부분 위에 배선 및 PCB 회로패턴이 닿지 않게 설계해 주십시오.
- Screw 단자형 콘덴서의 봉구부를 밑으로 향하게 하지 말아주십시오. 만약 제품을 옆으로 눕힐 경우에는 양극 단자를 위로 향하게 하여 주십시오.
- 콘덴서의 주변 및 PCB 의 반대쪽(제품 밑)에 발열 부품의 배치를 피해주십시오.
- SMD Type형 콘덴서의 PCB 패턴의 납땜 Land는 Catalog 또는 승인원에 규정된 범위내에서 연결하여 주시길 바랍니다. (SMD Type 참조)
- Screw 단자에 회로를 연결하실 때의 토르크는 Catalog 또는 승인원에 규정된 범위내에서 연결하여 주시기 바랍니다.



- Consider current balance when 2 or more Aluminum Electrolytic Capacitors are connected in parallel.
- Use bleeder resistors when 2 or more Aluminum Electrolytic Capacitors are connected in series. In this case, the resitors should be connected parallel to the capacitors.
- Aluminum Electrolytic Capacitors may accumulate charge maturally during storage. In this case, discharge through about 1kΩ resistor before use.
- Leakage current of Aluminum Electrolytic Capacitors may be increased during long storage time. In this case, the capacitors should be subject to voltage treatment through about 1kΩ resistor before use.

- 콘덴서를 2개이상 병렬로 연결할 때는 전류 Balance를 고려해 주시길 바랍니다.
- 콘덴서 2개이상을 직렬로 연결하실때는 전압 Balance를 고려해서 콘덴서에 병렬로 분압 저항기를 삽입하여 주십시오.
- 전해 콘덴서는 재기 전압이 발생할 경우가 있습니다. 이런 경우에는 사용하기 전에 약 1kΩ 의 저항을 통해 방전 처리 후 사용하여 주십시오.
- 전해 콘덴서의 누설전류는 장기간 사용치 않고 보관시 증가됩니다. 이런 경우에는 약1kΩ 의 저항을 통해 전압처리후 사용하여 주시길 바랍니다.

1. Soldering

- Kindly follow the soldering conditions (temperature and time) defined on your approval sheet, otherwise less 10 seconds at 260℃.
- In case lead wire reforming is needed due to inappropriate pitch between capacitor and holes on PCB stress to the capacitor should be avoided.
- In case soldered capacitor has to be withdrawn from the PCB by soldering irons, the capacitor should be removed after solder has melted sufficiently in order to avoid stress to the capacitor or lead wires.
- Soldering iron should never touch the capacitor's body.

1. 납땜

- 납땜 조건(온도, 시간)은 승인원에 규정된 범위내 또는 260℃, 10초 이하의 조건에서 사용하여 주십시오.
- 리드선 간격과 PCB기판 구멍이 달라 리드선의 가공이 필요한 경우 납땜하기전 콘덴서 본체에 스트레스가 가해지지 않도록 주의 바랍니다.
- 납땜된 콘덴서를 떼어내어 다시 사용코자할 때에는 납땜전에 콘덴서의 단자에 스트레스가 가지않도록 납을 충분히 묻혀 주십시오.
- 납땜 인두가 콘덴서 본체에 닿지 않도록 하여주십시오.

2. Flow soldering

- Do not dip capacitor's body into melted solder.
- Soldering conditions (preheat, solder temperature and dipping time) should be within the limits prescribed in the catalogs of product specifications.
- Do not put flux on any part of capacitors others than their terminals.
- Do not let other components lean against the capacitors while soldering.

2. Flow 납땜

- 콘덴서의 본체를 납 용융되는 곳에 넣지 말아 주십시오.
- 납땜 조건(예비가열, 납땜온도, 침적시간)은 카다로그 또는 승인원에 규정된 범위내에서 하여 주십시오.
- 단자부 이외 부분에 플럭스가 부착되지 않도록 해주십시오.
- 납땜중에 콘덴서에 다른 부품들이 닿지 않도록 하여주십시오.

3. Reflow soldering (Refer to page 67)

- Soldering conditions (preheat, solder temperatur and reflow time) should be within the limits precribed in the catalogs or product specifications.
- For setting a degree of heating infrared heater consider that the color and material of a capacitvary their infrared absorption.
- Do not solder capacitors more than once by refolw.

3. Reflow 납땜 (65page 참조)

- 납땜 조건(예비가열, 납땜온도, Relfow시간)은 카다로그 또는 승인원에 규정된 범위내에서 하여 주십시오.
- 적외선 히터를 사용할때에는 콘덴서의 색깔이나 재질에 따라 적외선 흡수율이 다르기 때문에 가열 온도를 맞추어 주십시오.
- 한번 Reflow를 통과한 것에 대해서 다시 하지 말아주십시오.

4. Handling after soldering

- Do not bend of twist the capacitor' s body after soldering on PCB.
- Do not pick-up or move PCB by holding the soered capacitors.
- Do not hit the capacitors and isolate capacitor from the PCB of their device when stacking PCB store.

4. 납땜후 제품 취급 요령

- PCB에 콘덴서를 납땜한 후 제품을 비틀지 말아 주십시오.
- 납땜 되어진 콘덴서를 잡고 PCB를 올리거나 이동시키지 말아 주십시오.
- PCB에 콘덴서가 장착된 상태로 PCB를 쌓을 경우 PCB나 기타 제품이 닿지 않게 하여 주십시오.

5. Mounting Capacitors with pressure Relief Vent

- Make the following open space over the pressure relief vent of the capacitor so that the vent can operate.

5. 안전변이 있는 제품의 장착

- 콘덴서 안전변이 동작할 수 있는 공간이 있어야 합니다.

ø D(mm)	6.3～16	18～35	40～
space	2mm min.	3mm min.	5mm min.

- Do not locate any wire or copper trace over the vent of the capacitor
- If the capacitor is mounted with its vent faced down on the PCB, make a ventilation hole in the PCB in place.
- In designing double-sided PCB, do not locate any copper trace under the seal side of a capacitor.
  If it is absolutely unavoidable, these traces must be sufficiently spaced at least 1 or 2 mm apart..

- 콘덴서의 안전변 위에 배선이나 회로 패턴이 없도록 하여 주십시오.
- 만약 콘덴서의 안전변이 PCB쪽으로 향할경우 PCB에 구멍을 설치하여야 합니다.
- 양면 PCB를 사용한 경우 콘덴서 밑으로 회로를 설계 하지 말고 만약 불가피할 경우 최소한 콘덴서로 부터 1mm ～ 2mm 정도 떨어지게 설계해 주십시오.

6. Protecting Vibration

- Radial lead type : Applicable to items with over 10g in weight, diameter of 18mm or longer than 30mm in length
- PCB terminal type : Applicable to items with diameter of 22mm and longer than 40mm in length.

6. 진동대비

- 리드 동일방향형 : 질량 10g, Ø 18 이상 또는 L치수 30이상 제품
- PCB Terminal Type : Ø 22, L치수 40이상 제품

In order to prevent possible damage by vibration on the PCB, kindly bond our capacitors on the PCB or use any fastening devices.

진동으로 문제시되는 PCB에 상기 제품을 장착하는 경우에는 반드시 PCB와 제품 바닥면을 Bonding하여 사용하거나 별도 지그를 부착하여 사용하십시오.

7. Adhesive and Coating Materials

- Do not use halogenated adhesives and coating materials to fix Aluminum Electrolytic Capacitors.
- Flux between the surface of capacitors should be cleaned before using adhesives or coating materials.
- Solvents should be dried up before using adhesives or coating materials.
- Do not cover up all the sealing area of capacitor with adhesives or coating materials. Make coverag only partial. (The sealing area 30%)

7. 제품 고정제와 코팅

- 할로겐계 용제를 포함하는 고정제, 코팅제는 사용하지 말아 주십시오.
- 고정제, 코팅제를 사용하기 전에 기판과 콘덴서 봉구부 부분에 플럭스가 남거나 오염된 채로 놓아두지 말아주십시오.
- 기판 세척제는 고정제, 코팅제를 사용하기 전에 완전히 건조시켜 주십시오.
- 고정제, 코팅제를 사용할 때 콘덴서 봉구부 전체를 밀봉시키지 말아 주십시오.(봉구부의 30% 이하)

8. Influence of cleaning solvent for aluminum electrolytic capacitors

- Aluminum electrolytic capacitors are easily affected by halogen ions, particularly by chloride ions. Excessive amounts of halogen ions, if happened to enter the inside of the capacitors, will give corrosion accidents-rapid capacitance drop and vent open. The extent of corrosion accidents varies with kinds of electrolytes and seal-materials.
- Therefore, the prevention of halogen ion contamination is the most important check point for quality lines. At present, halogenated hydrocarbon-contained organic solvents tcontained organic solvents such as Trichloroethylene,1-1-1 Trich-loroethane, and Freon are used to remove flux from circuit boards. However, if general types of aluminum, electroytic capacitors, whose seal constructions are not solvent-proof, are cleaned with such solvents, the solvents may gradually penetrate the seal portion and erode.
- The inside of the capacitors, the mechanism of corrosion of aluminum electrolytic capacitors by halogen ions can be explained as follows:
  Halides(RX) are absorbed and diffused into thseal portion. The halides then enter the inside of the capacitors and contact with the electrolyte of the capacitors, where by halogen ions are made free by a hydrolysis with water in the electrolyte:
  $RX + H2O \rightarrow ROH + H+ + X-$

8. 알루미늄 전해 콘덴서 세척용 용매의 영향

- 알루미늄 전해 콘덴서는 할로겐계 이온, 특히 염소 이온에 쉽게 영향을 받습니다. 할로겐계 이온이 콘덴서 내부로 침투하게 되면 부식활동에 의해 급속한 용량감소 및 방폭변이 개변등의 현상이 일어납니다. 부식활동의 정도는 전해액 및 봉합물질의 종류에 따라 달라지게 됩니다.
- 따라서 폐사의 생산 라인에서는 할로겐계 이온의 침투 방지를 품질관리의 최고 중점관리 사항으로 관리하고 있습니다. 현재 Trichloroethylene, 1-1-1 Trichloroethane 및 Freon과 같은 탄화수소 화합물이 들어있는 유기용제들이 회로기판의 플럭스를 제거하기 위해 사용됩니다. 그러나 봉구 구조가 내세척용이 아닌 일반 전해콘덴서에 그와같은 용매로 세척할 경우 점차적으로 봉입부분으로 흘러들어가 콘덴서 내부의 부식이 발생합니다.
- 할로겐이온에 의한 부식의 진행은 다음과 같이 설명되어 집니다. 할로겐화물이 수분과 반응하여 다음식과 같이 해리된 다음 봉입부분으로 확산되어 집니다.
  $RX + H2O \rightarrow ROH + H+ + X-$

The halogen ions(X-) react with the dielectric substance (Al2O3) of aluminum electrolytic capacitors:

$Al_2O_3 + 6H^+ + 6X^- \rightarrow 2AlX_3 + 3H_2O$

AlX3 is dissociated with water:

$AlX_3 + 3H_2O \rightarrow Al(OH)_3 + 3H^+ + 3X^-$

할로겐 이온(X−)은 알루미늄 전해콘덴서의 유전체(Al2O3)와 반응합니다.

$Al_2O_3 + 6H^+ + 6X^- \rightarrow 2AlX_3 + 3H_2O$

AlX3 는 물과 반응하면 할로겐 이온을 해리시키면서 알루미늄 하이드록사이드로 됩니다.

$AlX_3 + 3H_2O \rightarrow Al(OH)_3 + 3H^+ + 3X^-$

- Aluminum electrolytic capacitors have been exposed to halogenated hydrolcarbon cleaning and defluxing solvents are susceptible to attack by these solvents. this exposure can result in solvent penetration into the capacitors, leading to internal corrosion and potential failure.
- Common type of halogenated cleaning agent are listed below.

- 세척 및 플럭스 제거용으로 사용된 할로겐계 탄화수소 용매에 접한 알루미늄 콘덴서는 이러한 용매들에 의해 손상을 받을 우려가 있습니다. 콘덴서 내부로 용매가 침투하면서 내부부식으로 인한 불량을 유발할 수 있습니다.
- 할로겐계의 세척제의 일반적인 유형은 아래 표와 같습니다.

Chemical Name	Structual Formula	Representative Brand Name
Trichlorotrifluoroethane	$C_2Cl_3F_3$	Freon TF , Daiflon S-3
Fluorotrichloromethane	CCl_3F	Freon-11 , Daiflon S-1
1,1,1-Trichloroethane	$F_2H_3Cl_3$	Chloethane
Trichloroethylene	C_2HCl_3	Trichene
Methyl Chloride	CH_3Cl	MC

화학명	구조식	대표 상품명
Trichlorotrifluoroethane	$C_2Cl_3F_3$	Freon TF , Daiflon S-3
Fluorotrichloromethane	CCl_3F	Freon-11 , Daiflon S-1
1,1,1-Trichloroethane	$F_2H_3Cl_3$	Chloethane
Trichloroethylene	C_2HCl_3	Trichene
Methyl Chloride	CH_3Cl	MC

- We would like to recommend you the below cleaning materials for your stable cleaning condition taking place of previous materials.
- Isopropyl Alcohol(IPA) or water
  Cleaning method: One of immersion, ultrasonic or vapor cleaning Maximum cleaning time: 5minutes.

  ∗ Do not use AK225AES
- Standard Aluminum Electrolytic Capacitors should be free from halogenated solvents during PCB cleaning after soldering, Use solvent-proof capacitor and follow the specified cleaning condition when halogenated solvents are used.
- Solvent-proof capacitors in the catalogue is mark with the solvent-proof.

  Solvent-proof
- Solvents should have well controlled conductivity ph, specific gravity and water contents during the cleaning of solvent-proof capacitors. Chlorine levels can rise with contamination and adversely affect the performance of the capacitor.

- 폐사에서는 안정적인 세척을 위해서 다음의 세척제를 권장합니다.
- Isopropyl Alcohol(이소프로필 알코올)또는
  물 세척방법 : 침적, 증기세척
  최대 세척시간: 5분

  ∗ AK225AES는 사용하지 마십시오.
- 콘덴서는 할로겐용제등으로 세척할 수 없습니다. 다만 세척이 필요한 경우에는 내세척용 콘덴서를 사용하고 카다로그 또는 승인원에 규정된 범위 내에서 사용하시기 바랍니다.
- 카다로그 내에서 내세척용 콘덴서는

  Solvent-proof 로 표시합니다.
- 내세척용 콘덴서를 세척할 때 세척제의 오염관리 (도전도, pH, 비중, 수분량 등)를 하여 주십시오. 세척제가 오염되었을 때에는 염소농도가 높게되어 콘덴서 내부가 부식되는 경우가 있습니다.

EMERGENCY ACTION

- When the vent is open and some gas blows out from the capacitor, please turn the main swich of the equipment off or pull out the plug from the power outlet immediately.
- During vent operation, extremly hot gas(over 100℃) may blow out from the capacitors. Do not stand close to the capacitors. In case of eye contact, flush the open eye(s) with large amount or clean water immediately, do not swallow. Do not touch electrolyte but wash skin with soap and water in case or skin contact.

만일의 경우

- 사용중 콘덴서가 개변되어 Gas가 분출될 경우 Set의 주 전원 장치의 스위치를 끄거나 플러그를 뽑아 주십시오.

- 콘덴서의 안전변 동작시 +100℃를 초과하는 고온Gas가 분출하기 때문에 얼굴을 가까이 대지 말아주십시오. 분출한 Gas가 눈에 들어 가거나 흡입한 경우에는 즉시 물로 눈을 씻거나 삼키지 말고 입안을 닦아주시기 바랍니다. 전해액은 만지지 말고 만약 피부에 묻었을 경우 물이나 비누로 닦아 주시길 바랍니다.

CONDITION OF STORAGE/USE

If electrolytic capacitors temperatures caused by such things as direct sunlight,the life of the capacitor may be adversely affected. Storage in a high humidity atmosphere may affect the solderability of lead wires and terminals.

1. STORAGE AREA

- Do not store capacitors at a high temperature and high humidity. Store the capacitors indoors at a temperature of 5 to 35℃ and a humidity of less than 75%RH.
- Store the capacitors in places free from water, oil or salt water.
- Store the capacitors in places free from toxic gasses (hydrogen sulfide, sulrurous acid, nitrous acid, chlorine, ammonium, etc.)
- Store the capacitors in places out of ozone, ultraviolet rays or radiation.
- Keep capacitors in the package.

2. CONDITIONS OF USE

The following environment should be avoided when using aluminum electrolytic capacitors.

- Damp conditions such as water, saltwater spray, or oil spray or fumes, High humidity or humidity condensation situations.
- Hazardous gas/fumes such as hydrogen sulfide, sulfurous acid gas,nitrous acid, chlorine gas or ammonia.
- Exposure to ozone, ultraviolet rays or radiation.

3. VOLTAGE TREATMENT

If the electrolytic capacitor is allowed to stand for a long time, its withstand voltage is liable to drop, resulting in increased leakage current. If the rated voltage is applied to such a product, a large

보관/사용 조건

전해 콘덴서를 직사광을 받는 장소, 고온장소에 보관하게 되면 제품 수명에 악영향을 초래하며 또 다습한 장소에 보관 하게 되면 리드선과 단자의 납땜성이 나빠질 우려가 있습니다.

1. 보관 장소

- 콘덴서를 고온 다습 조건에 보관하지 말아 주십시오. 실내 온도가 5~35℃, 습도는 75%RH 이하 조건에서 보관하시길 바랍니다.

- 콘덴서를 물, 기름 또는 소금물에 오염되지 않도록 해주십시오.
- 콘덴서를 유해 Gas(유화 수소, 아황산, 아질산, 염소, 암모늄 등)에 노출된 환경에서 보관하지 말아주십시오.

- 콘덴서를 오존, 자외선 및 방사선에 노출되는 환경에서 보관하지 말아 주십시오.
- 포장 상태에서 보관하여 주십시오.

2. 사용 조건

다음의 환경에서는 전해 콘덴서를 사용하지 말아 주십시오.

- 직접수, 염수, 기름이 근접해 있거나 다습 또는 결로 상태가 되는 환경

- 유해 Gas(유화수소, 아황산, 아질산, 염소, 암모니아 등)가 가득한 환경

- 오존, 자외선 또는 방사선에 노출된 환경

3. 전압 처리

전해 콘덴서는 장시간 방치하게 되면 내압이 떨어져 누설전류가 증가하는 경향이 있습니다. 이러한 제품에 전압을 인가하면 과대한 누설전류로 인한 내부 발열로 파손되는 일이 있습니다. 장기간 방치된 제품에 대해서는 전압처리후 사용하여

leakage current occurs and this generates internal heat, which damaged the capacitor. Of the electrolytic capacitor is allowed to stand for a long time, therefore, use it after giving voltage treatment.
Voltage treatment shall be performed by increasing voltage up to the capacitor's voltage rating gradually while lowering the leakage current. In this case, the leakage current of the electrolytic capacitor is less than specified value.
Meanwhile, the voltage treatment time may be effectively shortened if the ambient temperature is increased (within the maximum operating temperature range).

주십시오.
전압처리란 인가전압을 누설 전류가 낮아질때까지 서서히 정격전압까지 인가함을 말하며, 이 때의 누설전류치는 규격보다 작아야 합니다. 만일 주위온도가 상승되어 지면 전압 처리 시간이 단축되어 질수 있습니다.(최고 사용온도 이내)

4. RECOVERY VOLTAGE

After discharged aluminum electrolytic capacitor, the voltage will be increasing again. This phenomenon is called by “Recovery Voltage”, it happens very often and commonly for all aluminum electrolytic capacitors. In this case, discharge through a 1KΩ resistance before use at your process, because you may have trouble on sensitive device and frighten a person working with the capacitor.

4. 재기전압

알루미늄 전해 콘덴서를 방치하면 전압이 다시 상승하게 됩니다. ‘재기전압’이라고 하는 이 현상은 알루미늄 전해 콘덴서에서 자주 발생할 수 있는 흔한 현상입니다. 콘덴서를 이용한 공정 시 이러한 재기전압으로 인해 민감한 장치에는 트러블을 일으키고 작업자 또한 놀랄 수 있으므로 작업 전 1kΩ 의 저항으로 콘덴서를 방전 시키는 것이 좋습니다.

DESTRUCTING CAPACITORS

In case of destructing our capacitors, kindly take following instructions.

- Burn capacitors up after making holes on them or scrapping. When you try to destrory them by fire, you may expect explosion in the capacitors.
- In order to prevent hazardous gas like chlorine gas, burn our capacitors on high temperature range. Burning sleeve on low temperature may cause producting chlorine gas.
- When you do not have burning facilities, please contact special industrial wastes processing companies.

폐기에 대하여

콘덴서를 폐기할 경우에는 다음의 방법대로 하여주십시오.

- 콘덴서에 구멍을 내거나 충분히 부순 후에 소각하여 주십시오. 소각시 콘덴서가 폭발하는 경우가 있습니다.
- 콘덴서는 외장슬리브(폴리염화비닐)가 씌워져 있기 때문에 고온 소각을 하여 주십시요. 저온 소각을 하면 염소 Gas등의 유해 Gas가 발생되는 원인이 됩니다.
- 콘덴서를 소각하지 않는 경우는 전문 산업폐기물 처리업체에 의뢰하여 주십시오.

OTHERS

- Since it has possibilities for electric shock or burns, kindly discharge it at the level of 1kΩ in advance.(sufficient and safe resistance values should be considered before applying)
- Capacitor case sizes and other product standards specified in this catalog may be changed or modified without notice for improvement of quality.
- For methods of testing, refer to KS C IEC 60384-4 (JIS C 5101-1, JIS C 5101-4)

기타

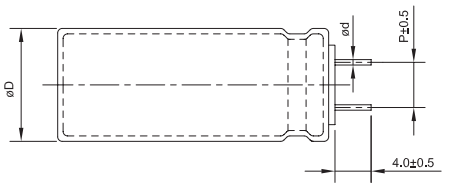
- 감전 및 화상의 우려가 있으므로 사용전에 1kΩ (전압, 용량에 따라 충분히 여유를 고려한 저항 선택)의 저항을 통해서 방전처리해 주십시오.
- 카다로그에 규정된 제품 케이스 사이즈 및 기타 제품기준은 품질 개선의 필요성으로 인하여 귀사에 통지없이 변경될 수 있습니다.
- 기타 시험규격에 대해서는 KS C IEC 60384-4 (JIS C 5101-1, JIS C 5101-4)을 참조 바랍니다.

LEAD CUTTING/FORMING SPECIFICATIONS

(mm)

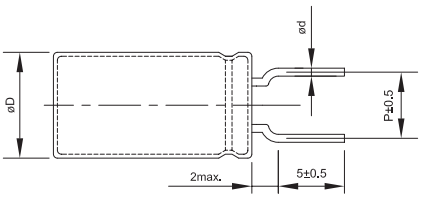
● Lead configuration : CC

ØD = 3 to 25.4



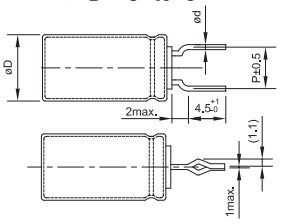
● Lead configuration : FC

ØD = 5 to 8



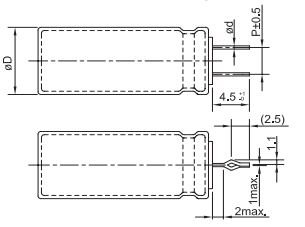
● Lead configuration : FM

ØD = 5 to 8



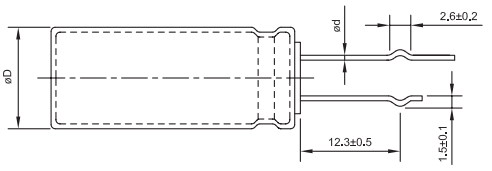
● Lead configuration : MC

ØD = 10 to 25.4



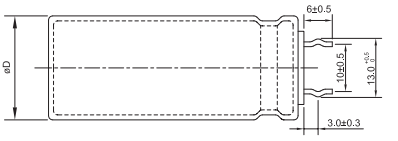
● Lead configuration : LF

ØD = 10 to 16



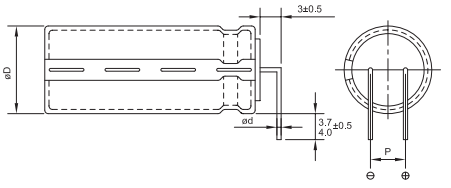
● Lead configuration : DC

ØD = 22 to 25.4



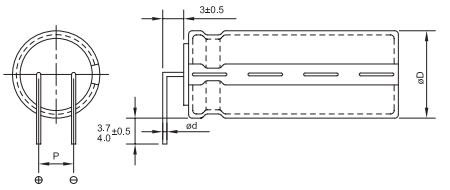
● Lead configuration : RB

ØD = 10 to 22



● Lead configuration : LB

ØD = 10 to 22



■ LEAD SPACING & RECOMMENDED PCB DIMENSIONS

(mm)

Dimensions / ø D	ø d	P	PC Board		Lead Configuration
			Hole diameter	Thickness	
5	0.5	5.0	0.8	1.6	CC
6.3	0.5	5.0	0.8		FC
8	0.6	5.0	1.0		FM
10	0.6	5.0	1.0	1.6	LF, CC, RB/LB, MC
12.5	0.6	5.0	1.0		
16	0.8	7.5	1.2		
18	0.8	7.5	1.2		
20	0.8	7.5	1.2		
22	0.8	10	1.2		
25.4	1.0	10	1.4		
	1.0	12.5	1.4		
	1.0	10	2.0	1.6	DC

※ Note : Other case sizes are available upon request.
Please check with us about individual size and dimensions.

PART NUMBER INDICATION CHART

1. CATALOG NUMBERING SYSTEM

Capacitance tolerance	Symbol	Capacitance tolerance	Symbol
-10% ~ +10%	K	-20% ~ +20%	M
0% ~ +100%	P	-30% ~ +30%	N
-10% ~ +50%	T	-10% ~ +30%	Q
-10% ~ +100%	W	-10% ~ +20%	V
0% ~ +20%	R	0% ~ +30%	S

Nominal values are used.
10V → 10
100V → 100
450V → 450

Miniature	Large Sized					
VB	VN	VR	LA	LI	LG	VL

MHA	6.3	VB	1000	M	
Series	Rated voltage	Lead type	Capacitance	Cap. tolerance	Supplement

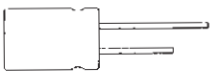
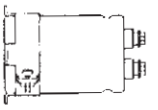
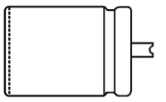
Capacitance(μF)	Code
0.1	R1
1	1
4.7	4R7
10	10
100	100

Taping Clinch	Code
2.5mm	2.5TP
3.5mm	3.5TP
5.0mm	5.0TP
7.5mm	7.5TP

	Code
Bi-Polar	BP
Lead Cut, Formed Type	CC, MC, LF, FM, FC, DC, RB, LB

2. SUBSTANCE

Terminal Type

Symbol	Configuration	Type
VB		CE04 (SINGLE ENDED) TYPE (ø 3 ~ ø 25.4)
VN/VS		PCB TERMINAL TYPE (ø 20 ~ ø 40 : 2 TERMINALS)
LG		SCREW-BOLT TERMINALS TYPE (ø 35 ~ ø 89)
L R		PCB TERMINAL TYPE (ø 35 ~ ø 63.5 : 2 TERMINALS)
VR		PCB TERMINAL TYPE (ø 35 ~ ø 50 : 4 TERMINALS)
LA		CE62 TYPE (ø 14.5 ~ ø 50 : 2 TERMINALS)
LI		PCB TERMINAL TYPE (ø 30 ~ ø 35 : 2 TERMINALS)

STANDARD FREQUENCY MULTIPLYING FACTOR

μF \ Frequency(Hz)	60	120	300	1k	10k	100k
0.1 ~ 3.3	0.65	1	1.35	1.75	2.30	2.50
4.7 ~ 33	0.75	1	1.25	1.50	1.75	1.80
47 ~ 1,000	0.80	1	1.15	1.30	1.40	1.50
2,200 ~	0.85	1	1.03	1.05	1.08	1.08

MVG Series

• 85℃ 1,000～2,000Hrs assured.

Solvent-proof

WV ≦ 63Vdc

- Vertical SMD Type.
- Downsized of MV Series.
- For CD/DVD-ROM, Navigation, LCD MT/TV
- RoHS compliant.
- Halogen-free capacitors are also available.

MV → MVG

Downsized

SPECIFICATIONS

Item	Characteristics		
Rated Voltage Range	4 ～ 450 Vdc		
Operating Temperature Range	-40 ～ +85℃		
Capacitance Tolerance	±20% (M)		(at 20℃, 120Hz)
Leakage Current	Rated Volatag(Vdc)	4～100	160～450
	Max. leakage current(μA)	0.01CV (μA) or 3μA, whichever is greater. (at 20℃, 2 minutes)	0.04CV+100(μA) (at 20℃, 1 minute)
	Where, C:Nominal capacitance(μF), V:Rated voltage(Vdc)		

Dissipation Factor Tanδ(Max.)

Rated Voltage(Vdc)	4	6.3	10	16	25～50	63～100	160～250	400～450
Tanδ(Max.)	0.42	0.40	0.30	0.20	0.15	0.12	0.20	0.25

(at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated Voltage(Vdc)	4	6.3	10	16	25	35～50	63～100	160～250	400～450
Z(-25℃)/Z(+20℃)	7	4	3	2	2	2	3	3	6
Z(-40℃)/Z(+20℃)	15	10	8	6	4	3	4	6	10

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. (where, 1,000 hours for ø3)

Rated Voltage(Vdc)	4 ～ 6.3	10 ～ 100	160～450
Capacitance change	≦±30% of the initial value	≦±25% of the initial value	≦±20% of the initial value
Tanδ	≦ 300% of the initial specified value		≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value		

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. (where, 500 hours for ø3)

Rated Voltage(Vdc)	4 ～ 6.3	10 ～ 100	160～450
Capacitance change	≦±30% of the initial value	≦±25% of the initial value	≦±20% of the initial value
Tanδ	≦ 300% of the initial specified value		≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value		

Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

MVG 16 VC 22 M D56 TP

- TP: With tape
- D56: Case code
- M: Capacitance tolerance(±20%)
- 22: Nominal capacitance code
- VC: Lead type
- 16: Rated voltage in volts
- MVG: Series name

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

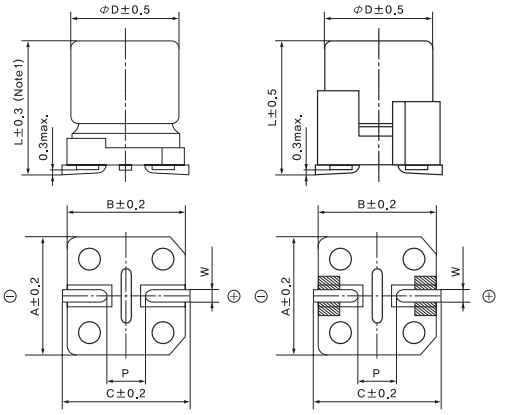
DIMENSIONS OF MVG Series(Type:VC)

Unit(mm)

DIMENSIONS

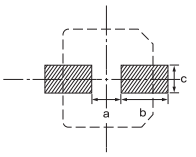
● Vibration Resistance

〈Size code:B55~M22〉 〈Size code:L17~M22〉



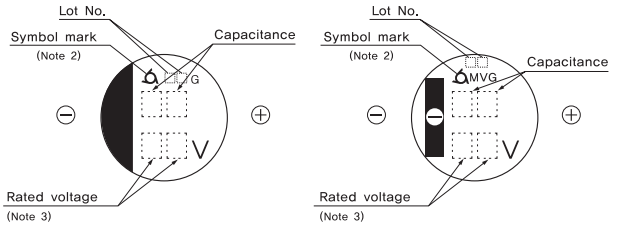
▩ : Dummy terminals

Recommended Solder land on PC board



▨ : Solder land on PC board

MARKING



〈B55 ~ J10〉 〈K14~M22〉

Note 1 : L±0.5 for 8×6.3(H63) ~ 18×21.5(M22)
Note 2 : 3×5.2(B55), 4×5.3(D56), 5×5.3(E56)is excluded symbol mark
Note 3 : 6.3WV is marked by 6V

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
B55	3	5.2	3.3	3.3	3.7	0.45-0.75	0.8	0.8	2.2	1.6			
D56	4	5.3	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6			
E56	5	5.3	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6			
F56	6.3	5.3	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6			
F80	6.3	7.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6			
H63	8	6.3	8.3	8.3	9.0	0.5-0.8	2.3	2.3	4.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2			
J10	10	10	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2			
K14	12.5	13.5	13.0	13.0	13.7	1.0-1.3	4.2	4.0	5.7	2.5			
L17	16	16.5	17.0	17.0	18.0	1.0-1.3	6.5	6.0	6.9	2.5	4.7	7.8	9.6
L22	16	21.5	17.0	17.0	18.0	1.0-1.3	6.5	6.0	6.9	2.5			
M17	18	16.5	19.0	19.0	20.0	1.0-1.3	6.5	6.0	7.9	2.5	4.7	8.8	9.6
M22	18	21.5	19.0	19.0	20.0	1.0-1.3	6.5	6.0	7.9	2.5			

● Vibration Resistance

RATINGS OF MVG Series

VDC / μF	4		6.3		10		16		25		35		50		63		100	
0.1													B55 D56	1.1 1.3	D56	1.3		
0.22													B55 D56	2.0 2.9	D56	3.0		
0.33													B55 D56	3.0 3.5	D56	4.0		
0.47													B55 D56	3.8 4.2	D56	5.0		
1													B55 D56	5.6 6.2	D56	8.0		
2.2											B55 D56	7.7	B55 D56	8.3 10	D56	12		
3.3											B55 D56	9.4	D56	14	E56	17		
4.7									B55 D56	10.5	D56	15	D56	19	E56	20		
10					B55 D56	12.8	B55 D56	14 17	D56	20	D56	25	E56	29	F60	32		
22	B55 D56	14	B55 D56	23	D56	27	D56	27	E56	28	F56	33	F60	40	F80	60	H10	90
33	D56	23	D56	30	D56	30	E56	40	E56	40	F56	40	F80	55	H10	110	J10	120
47	D56	27	D56	33	E56	45	E56	45	F56	60	F60	55	H63	140	H10	130	J10	144
68	E56	38	E56	49	F56	54	F56	78	F60	90	H63	157	H10	170	J10	170	K14	380
100	E56	46	E56	55	F56	65	F60	85	F80 H63	145	H10	175	H10	190	K14	380	K14	440
220	F56	74	F60	75	F80 H63	130	F80	130	H10	260	H10	260	J10	320	K14	580	M17	800
330			F80 H63	135	H10	270	H10	270	H10	300	J10	360	K14	600	L17	820	M22	1000
470			H10	280	H10	280	H10	280	J10	400	K14	600	L17	850	M17	1000		
1,000			J10	430	J10	430	K14	710	K14	820	L17	1100	L22	1300				
1,500			J10	480	K14	850												
2,200			K14	890	K14	960	L17	1150	M17	1400	M22	1700						
3,300			L17	1200	L17	1300	M17	1450	M22	1800								
4,700			L17	1400	M17	1600	M22	1750										
6,800			M17	1700	M22	1850												
10,000			M22	2000														

VDC / μF	160		200		250		400		450	
4.7							K14	120	K14	120
10	J10	55	K14	150	K14	150	L17	140	L17	140
22	K14	240	K14	240	L17	300	M17	280	L22	280
33	K14	260	L17	350	L17	340	M22	350	M22	350
47	L17	400	L17	420	M17	420				
68	L17	500	M17	510	M22	490				
100	M17	590	M22	590						

Rated Ripple Current(mArms/85°C, 120Hz)
Case code

* Height 4.6mm max. is available request. Please check with us about individual size and dimensions.

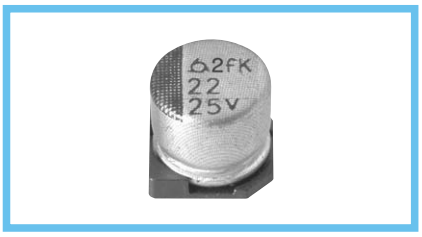
BDS(MVK) Series

• 105℃ 1,000~2,000Hrs assured.

Solvent-proof

WV ≦ 63VDC

- Vertical SMD type.
- Wide Temperature range.
- For CD/DVD-ROM, Navigation, LCD MT/TV
- RoHS compliant.
- Halogen-free capacitors are also available.



MV → BDS (MVK)

Wide Temp.

SPECIFICATIONS

Item	Characteristics		
Rated Voltage Range	6.3 ~ 450 VDC		
Operating Temperature Range	-40 ~ +105℃		
Capacitance Tolerance	±20%(M)		(at 20℃, 120Hz)
Leakage Current	Rated Voltage(VDC)	6.3~100	160~450
	Max. Leakage current(μA)	0.01CV (μA) or 3μA , whichever is greater. (at 20℃, 2 minutes)	0.04CV+100(μA) (at 20℃, 1 minute)
	Where, C:Nominal capacitance(μF), V:Rated voltage(VDC)		

Dissipation Factor Tanδ(Max.)

Rated voltage(VDC)	6.3	10	16	25	35	50~100	160~250	400~450
ø4~ø6.3	0.30	0.24	0.20	0.16	0.14	0.12	-	-
ø8~ø18	0.40	0.30	0.26	0.16	0.14	0.12	0.15	0.20

(at 20℃, at 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated voltage(VDC)	6.3	10	16	25	35	50~100	160~250	400~450
Z(-25℃)/Z(+20℃)	4	3	2	2	2	3	3	6
Z(-40℃)/Z(+20℃)	10	8	6	4	3	4	6	10

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions.

ø4~ø6.3:105℃, 1,000 hours, ø8~ø18:105℃, 2,000 hours.

Capacitance change
- ø4~ø6.3 ≦ ±30% of the initial value
- ø8~ø18 ≦ ±20% of the initial value

Tanδ
- ø4~ø6.3 ≦ 300% of the initial specified value
- ø8~ø18 ≦ 200% of the initial specified value

Leakage current ≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for the specified time at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

ø4~ø6.3:105℃, 500 hours, ø8~ø18:105℃, 1,000 hours.

Capacitance change
- ø4~ø6.3 ≦ ±25% of the initial value
- ø8~ø18 ≦ ±20% of the initial value

Tanδ ≦ 200% of the initial specified value

Leakage current ≦ The initial specified value

Others

Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BDS 50 VC R47 M D55 TP

- TP: With tape
- D55: Case code
- M: Capacitance tolerance(±20%)
- R47: Nominal capacitance code
- VC: Lead type
- 50: Rated voltage in volts
- BDS: Series name

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

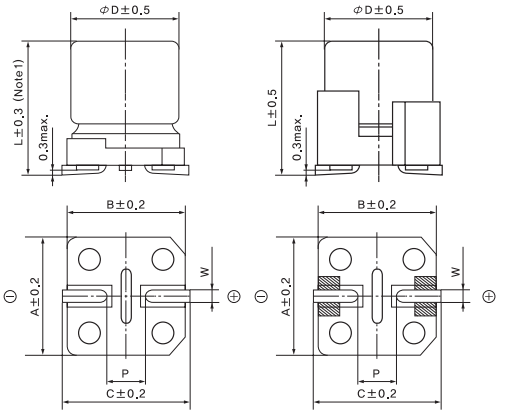
DIMENSIONS OF BDS(MVK) Series(Type:VC)

Unit(mm)

DIMENSIONS

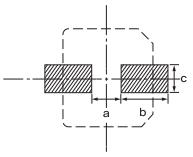
● Vibration Resistance

〈Size code:D55~M22〉 〈Size code:L17~M22〉



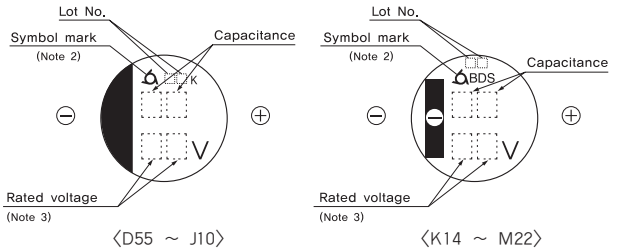
▨ : Dummy terminals

Recommended Solder land on PC board



▨ : Solder land on PC board

MARKING



〈D55 ~ J10〉 〈K14 ~ M22〉

Note 1 : L±0.5 for 8×6.3(H63) ~ 18×21.5(M22)
Note 2 : 4×5.2(D55), 5×5.2(E55) is excluded symbol mark
Note 3 : 6.3WV is marked by 6V

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6			
E55	5	5.2	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6			
F55	6.3	5.2	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6			
F80	6.3	7.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6			
H63	8	6.3	8.3	8.3	9.0	0.5-0.8	2.3	2.3	4.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2			
J10	10	10	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2			
K14	12.5	13.5	13.0	13.0	13.7	1.0-1.3	4.2	4.0	5.7	2.5			
L17	16	16.5	17.0	17.0	18.0	1.0-1.3	6.5	6.0	6.9	2.5	4.7	7.8	9.6
L22	16	21.5	17.0	17.0	18.0	1.0-1.3	6.5	6.0	6.9	2.5			
M17	18	16.5	19.0	19.0	20.0	1.0-1.3	6.5	6.0	7.9	2.5	4.7	8.8	9.6
M22	18	21.5	19.0	19.0	20.0	1.0-1.3	6.5	6.0	7.9	2.5			

● Vibration Resistance

RATINGS OF BDS(MVK) Series

μF \ VDC	6.3		10		16		25		35		50		63		100	
0.1											D55	1.3	D55	1.3		
0.22											D55	2.6	D55	3.0		
0.33											D55	3.2	D55	4.0		
0.47											D55	3.8	D55	5.0		
1											D55	5.6	D55	8.0		
2.2											D55	10	D55	12		
3.3											D55	14	E55	17		
4.7									D55	15	E55	19	E55	20		
10					D55	16	E55	25	E55	25	F55	29	F60	32	H63	48
22	D55	21	E55	30	E55	30	F55	40	F55	40	H63	70	H10	80	H10	90
33	E55	34	E55	34	F55	45	F55	45	H63	80	H10	140	H10	145	J10	150
47	E55	36	F55	48	F55	48	F60|H63	52|80	H63	140	H10	170	H10	180	K14	250
100	F55|F60	56	F60|H63	90	F60|H10	110|180	F80|H63	135	H10	250	J10	310	K14	380	K14	380
220	H63	150	F80|H63	150	F80|H10	150|275	H10	275	J10	375	K14	420	K14	470	M17	750
330	F80|H10	127|290	J10	450	J10	450	J10	450	K14	480	K14	500	L17	700	M22	980
470	J10	460	J10	460	J10	460	J10	460	K14	520	L17	700	M17	900		
1,000	J10	520	J10	540	K14	550	K14	550	L17	750	M22	1200				
1,500	J10	550	K14	620												
2,200	K14	680	L17	850	M17	1000	M22	1300	M22	1450						
3,300	M17	1000	M17	1100	M17	1200										
4,700	L22	1200	M22	1350												
6,800	M22	1350														

μF \ VDC	160		200		250		400		450	
3.3							K14	30	K14	40
4.7					K14	65	L17	60	L17	60
10	J10	45	K14	80	L17	100	L17	85	L17	85
22	K14	85	K14	85	L17	180	M22	130	M22	130
33	K14	95	L17	220	M17	230				
47	L17	260	M17	270	M22	280				
68	M17	320	M22	330						
100	L22	380								

Rated Ripple Current(mArms/105℃, 120Hz)
Case code

BXA Series

• 105℃ 1,000~2,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Low impedance.
- For STB, Satellite Radio, Computer Server
- RoHS compliant.
- Halogen-free capacitors are also available.

MVY → BXA
Low Imp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Opertating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor Tanδ(Max.)	(at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. ø4~ø6.3 : 105℃, 1,000 hours, ø8 & ø10 : 105℃, 2,000 hours. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

SIZE \ Rated Voltage(V_{DC})	6.3	10	16	25	35	50
D56~H63	0.24	0.20	0.16	0.14	0.12	0.12
H10~J10	0.28	0.24	0.20	0.16	0.14	0.12

Rated voltage(V_{DC})	6.3	10	16	25	35	50
Z(-25℃)/Z(20℃)	3	2	2	2	2	2
Z(-55℃)/Z(20℃)	5	4	4	3	3	3

PART NUMBERING SYSTEM

BXA 16 VC 100 M F60 TP

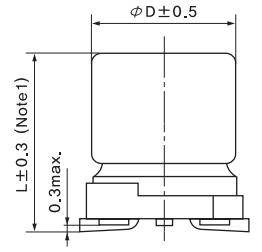
- TP : With tape
- F60 : Case code
- M : Capacitance tolerance(±20%)
- 100 : Nominal capacitance code
- VC : Lead type
- 16 : Rated voltage in volts
- BXA : Series name

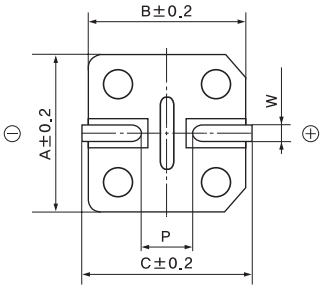
Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF BXA Series(Type : VC)

Unit(mm)

DIMENSIONS





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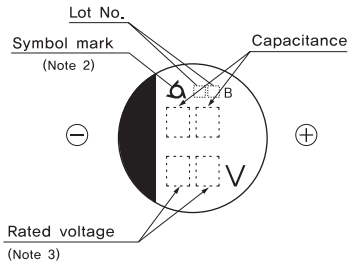
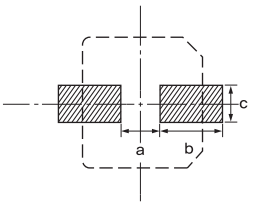


Note 1 : L±0.5 for 8×10(H10), 10×10(J10).
Note 2 : 4×5.3(D56), 5×5.3(E56) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6
E56	5	5.3	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F80	6.3	7.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H63	8	6.3	8.3	8.3	9.0	0.5-0.8	2.3	2.3	4.5	1.6
H10	8	10	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BXA Series

μF \ VDC	6.3			10			16			25			35			50		
2.2																D56	4.8	30
4.7													D56	2.10	80	E56	3.0	50
10										D56	2.10	80	E56	0.90	150	F60	2.0	70
22				D56	2.10	80	E56	0.90	150	E56	0.90	150	E56	0.90	150	F60	2.0	70
33	D56	2.10	80	E56	0.90	150	F60	0.44	230	F60	0.44	230	F60	0.44	230	F80	1.0	170
47	E56	0.90	150	F60	0.44	230	F60	0.44	230	F60	0.44	230	F60	0.44	230	H63	0.9	150
68	F60	0.44	230	F60	0.44	230	F60	0.44	230	F60	0.44	230	F80	0.34	280	H10	0.44	230
100	F60	0.44	230	F60	0.44	230	F60	0.44	230	F80	0.34	280	H10	0.17	450	H10	0.44	230
										H63	0.32	300						
220	F60	0.44	230	F80	0.34	280	F80	0.34	280	H10	0.17	450	H10	0.17	450	J10	0.30	350
330	F80	0.34	280	H10	0.17	450	H10	0.17	450	H10	0.17	450	J10	0.09	670			
470	H10	0.17	450	H10	0.17	450	H10	0.17	450	J10	0.09	670						
1,000	H10	0.17	450	J10	0.09	670												
1,500	J10	0.09	670															

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case code

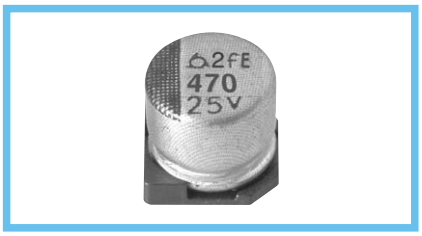
BXE Series

• 105℃ 1,000~2,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Very low impedance.
- For STB, Satellite Radio, Computer Server
- RoHS compliant.
- Halogen-free capacitors are also available.

BXA → BXE
Low Imp.



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 V_{DC}
Opertating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 Tan δ (Max.) 0.26 / 0.19 / 0.16 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 Z(-25℃)/Z(20℃) 3 / 2 / 2 / 2 / 2 Z(-55℃)/Z(20℃) 5 / 4 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. φ4~φ6.3 : 105℃, 1,000 hours, φ8 & φ10 : 105℃, 2,000 hours. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BXE 16 VC 100 M F60 TP

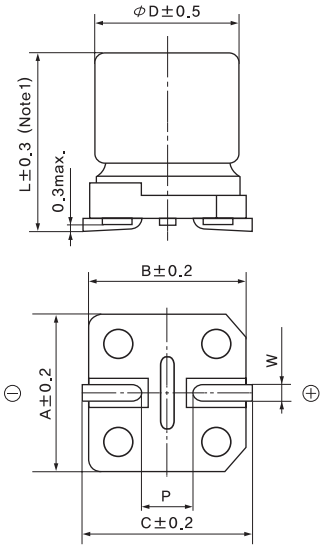
- TP: With tape
- F60: Case code
- M: Capacitance tolerance(±20%)
- 100: Nominal capacitance code
- VC: Lead type
- 16: Rated voltage in volts
- BXE: Series name

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF BXE Series(Type : VC)

Unit(mm)

DIMENSIONS



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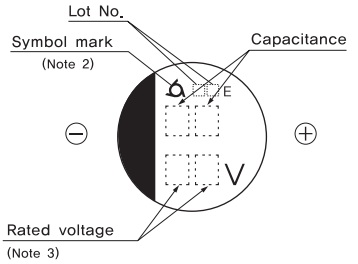
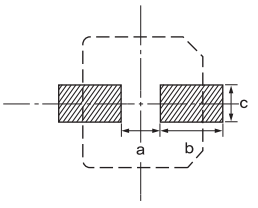


Note 1 : L±0.5 for 8×10(H10), 10×10(J10).
Note 2 : 4×5.3(D56), 5×5.3(E56) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6
E56	5	5.3	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F80	6.3	7.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H10	8	10	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BXE Series

μF \ VDC	6.3			10			16			25			35		
4.7													D56	1.8	85
10										D56	1.8	85	E56	0.8	155
22				D56	1.8	85	E56	0.8	155	E56	0.8	155	E56	0.8	155
33	D56	1.8	85	E56	0.8	155	F60	0.36	240	F60	0.36	240	F60	0.36	240
47	E56	0.8	155	F60	0.36	240	F60	0.36	240	F60	0.36	240	F60	0.36	240
68	F60	0.36	240	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.34	280
100	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.34	280	H10	0.16	600
220	F60	0.36	240	F80	0.34	280	F80	0.34	280	H10	0.16	600	H10	0.16	600
330	F80	0.34	280	H10	0.16	600	H10	0.16	600	H10	0.16	600	J10	0.08	850
470	H10	0.16	600	H10	0.16	600	H10	0.16	600	J10	0.08	850			
1,000	H10	0.16	600	J10	0.08	850									
1,500	J10	0.08	850												

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case code

BXJ Series

• 105℃ 2,000~5,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Very low impedance, Long Life.
- For STB, Tuner
- RoHS compliant.
- Halogen-free capacitors are also available.

BXE → BXJ
Long Life.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Opertating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}) 6.3 10 16 25 35 50 Tan δ (Max.) 0.26 0.19 0.16 0.14 0.12 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 6.3 10 16 25 35 50 Z(-25℃)/Z(+20℃) 3 2 2 2 2 2 Z(-55℃)/Z(+20℃) 5 4 4 3 3 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. D56~H63 : 105℃, 2,000 hours, H10 & J10 : 105℃, 5,000 hours. Capacitance change D56~H63 ≦ ±30% of the initial value H10, J10 ≦ ±35% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change D56~H63 ≦ ±30% of the initial value H10, J10 ≦ ±35% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BXJ 6.3 VC 220 M F60 TP

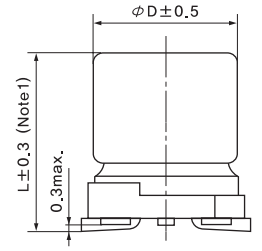
- TP : With tape
- F60 : Case code
- M : Capacitance tolerance(±20%)
- 220 : Nominal capacitance code
- VC : Lead type
- 6.3 : Rated voltage in volts
- BXJ : Series name

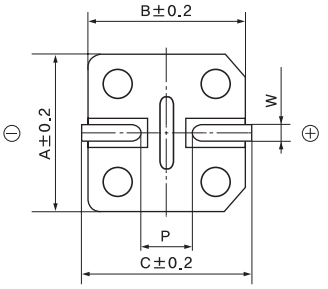
Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF BXJ Series(Type : VC)

Unit(mm)

DIMENSIONS





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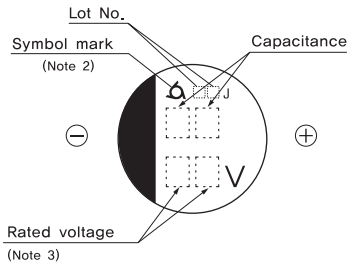
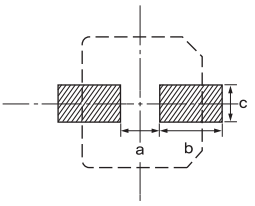


Note 1 : L±0.5 for 8×6.3(H63)~10×10(J10).
Note 2 : 4×5.3(D56), 5×5.3(E56) is excluded symbol mark.
Note 3 : 6.3WV is marked by 6V.

Case code	ØD	L	A	B	C	W	P	a	b	c
D56	4	5.3	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6
E56	5	5.3	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6
F55	6.3	5.2	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F80	6.3	7.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H63	8	6.3	8.3	8.3	9.0	0.5-0.8	2.3	2.3	4.5	1.6
H10	8	10	8.3	8.3	9.0	0.7-1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7-1.1	4.5	4.5	4.4	2.2

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BXJ Series

μF \ VDC	6.3			10			16			25			35			50		
4.7													D56	1.8	85	E56	3.0	55
10										D56	1.8	85	E56	0.8	155	F60	1.2	120
22				D56	1.8	85	E56	0.8	155	E56	0.8	155	F55	0.55	220	F60	1.2	120
33	D56	1.8	85	E56	0.8	155	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.9	150
47	E56	0.8	155	F60	0.36	240	F60	0.36	240	F60	0.36	240	F60	0.36	240	H63	0.75	200
68	F60	0.36	240	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.34	280	H10	0.42	300
													H63	0.26	300			
100	F60	0.36	240	F60	0.36	240	F60	0.36	240	F80	0.34	280	H10	0.16	600	H10	0.42	300
										H63	0.26	300	J10	0.08	850	J10	0.25	420
220	F60	0.36	240	F80	0.34	280	F80	0.34	280	H10	0.16	600	H10	0.16	600	J10	0.25	420
330	F80	0.34	280	H10	0.16	600	H10	0.16	600	H10	0.16	600	J10	0.08	850			
470	H10	0.16	600	H10	0.16	600	H10	0.16	600	J10	0.08	850						
1,000	H10	0.16	600	J10	0.08	850												
1,500	J10	0.08	850															

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max, 120℃, 100kHz)
Case code

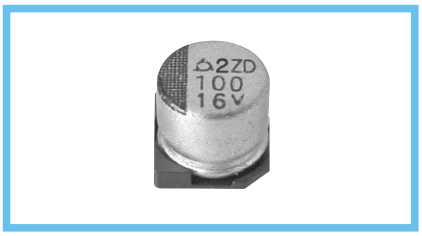
BDA Series

• 105℃ 2,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Long life of BDS(MVK) Series.
- For LCD MT/TV, Copying Machine
- RoHS compliant.
- Halogen-free capacitors are also available.

BDS → BDA
Long life.



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	4 ~ 50 V_{DC}
Opertating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)

Dissipation Factor Tanδ(Max.)

Rated voltage(V_{DC})	4	6.3	10	16	25	35	50
Tanδ(Max.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12

(at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated voltage(V_{DC})	4	6.3	10	16	25~50
Z(-25℃)/Z(20℃)	6	3	3	2	2
Z(-40℃)/Z(20℃)	12	8	5	4	3

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied for 2,000 hours at 105℃.

Rated voltage(V_{DC})	4 ~ 16V_{DC}	25 ~ 50V_{DC}
Capacitance change	≦ ±25% of the initial value	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value	
Leakage current	≦ The initial specified value	

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

Rated voltage(V_{DC})	4 ~ 16V_{DC}	25 ~ 50V_{DC}
Capacitance change	≦ ±25% of the initial value	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value	
Leakage current	≦ The initial specified value	

Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BDA 16 VC 100 M F60 TP

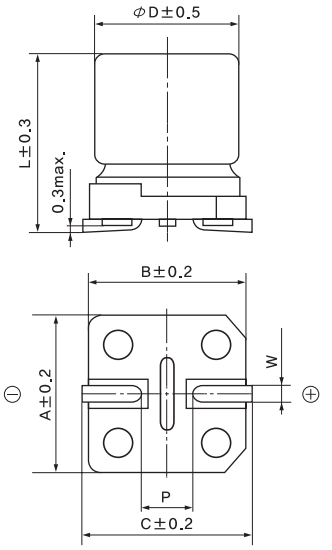
- TP: With tape
- F60: Case code
- M: Capacitance tolerance(±20%)
- 100: Nominal capacitance code
- VC: Lead type
- 16: Rated voltage in volts
- BDA: Series name

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF BDA Series (Type : VC)

Unit(mm)

DIMENSIONS



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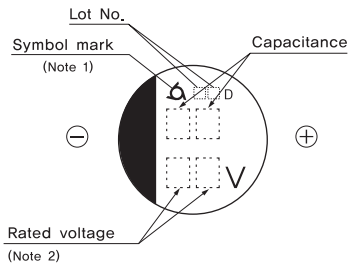
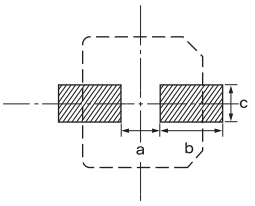


Note 1 : 4×5.2(D55), 5×5.2(E55) is excluded symbol mark
Note 2 : 6.3WV is marked by 6V

Case code	ø D	L	A	B	C	W	P	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6
E55	5	5.2	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6
F55	6.3	5.2	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6

Recommended solder land on PC board



▨ : Solder land on PC board

RATINGS OF BDA Series

WVDC / μF	4		6.3		10		16		25		35		50	
0.1													D55	1.3
0.22													D55	2.6
0.33													D55	3.2
0.47													D55	3.8
1													D55	5.6
2.2													D55	10
3.3													D55	14
4.7									D55	13	D55	15	E55	19
10							D55	16	E55	25	E55	25	F55	29
22	D55	19	D55	21	E55	30	E55	30	F55	40	F55	40		
33	E55	30	E55	34	E55	34	F55	45	F55	45				
47	E55	34	E55	36	F55	48	F55	48	F60	52				
100	E55	45	F60	56	F60	90	F60	110						

Rated Ripple Current (mArms/105℃, 120Hz)

Case code

BLA Series

• 105℃ 5,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Long life of BDA Series
- For LCD MT, AVN
- RoHS compliant.
- Halogen-free capacitors are also available.

BDA → BLA
Long life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	4 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor Tanδ(Max.)	(at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 5,000 hours at 105℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

Rated voltage(V_{DC})	4	6.3	10	16	25	35	50
Tanδ(Max.)	0.37	0.28	0.24	0.20	0.16	0.13	0.12

Rated voltage(V_{DC})	4	6.3	10	16	25~50
Z(-25℃)/Z(+20℃)	8	4	3	2	2
Z(-40℃)/Z(+20℃)	14	10	7	5	3

PART NUMBERING SYSTEM

BLA 16 VC 100 M F60 TP

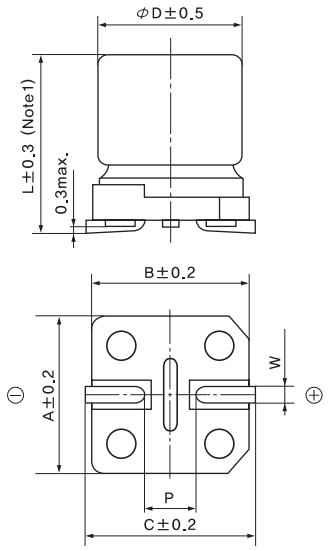
- BLA — Series name
- 16 — Rated voltage in volts
- VC — Lead type
- 100 — Nominal capacitance code
- M — Capacitance tolerance(±20%)
- F60 — Case code
- TP — With tape

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF BLA Series (Type : VC)

Unit(mm)

DIMENSIONS



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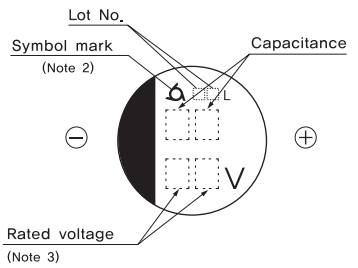
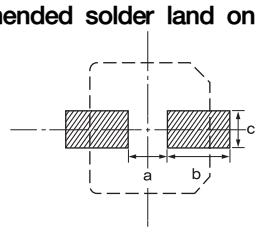


Recommended solder land on PC board



: Solder land on PC board

Note 1 : L±0.5 for 8×10(H10), 10×10(J10)
Note 2 : 4×5.2(D55), 5×5.2(E55) is excluded symbol mark
Note 3 : 6.3WV is marked by 6V

Case code	ø D	L	A	B	C	W	P	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6
E55	5	5.2	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6
F55	6.3	5.2	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F80	6.3	7.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
H10	8	10	8.3	8.3	9	0.7-1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11	0.7-1.1	4.5	4.5	4.4	2.2

RATINGS OF BLA Series

Vdc / μF	4		6.3		10		16		25		35		50	
0.1													D55	1.3
0.22													D55	2.6
0.33													D55	3.2
0.47													D55	3.8
1													D55	5.6
2.2													D55	10
3.3													D55	14
4.7									D55	13	D55	15	E55	19
10							D55	16	E55	25	E55	25	F55	29
22	D55	19	D55	21	E55	30	E55	30	F55	40	F55	40	F60	43
33	E55	30	E55	34	E55	34	F55	45	F55	45	F80	57	H10	77
47	E55	34	E55	36	F55	48	F55	48	F60	52	H10	92	H10	92
100	E55	45	F60	56	F60	90	F60	110	H10	116	J10	151	J10	151
220					F80	120	H10	140	J10	216	J10	216		
330					H10	170	J10	238	J10	238				
470					J10	254	J10	254						

Rated Ripple Current (mArms/105℃, 120Hz)

Case code

BLH Series

• 105℃ 10,000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Long life of BLA Series
- For LCD MT/TV, AVN
- RoHS compliant.
- Halogen-free capacitors are also available.

BLA → BLH
Long life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.13 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 10 / 16 / 25~50 Z(-25℃)/Z(+20℃): 3 / 2 / 2 Z(-40℃)/Z(+20℃): 7 / 5 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 10,000 hours at 105℃ Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

BLH 16 VC 220 M H10 TP

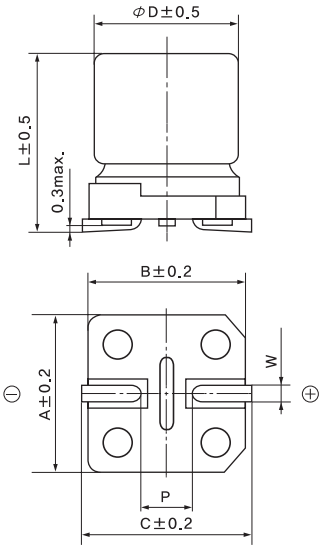
- TP: With tape
- H10: Case code
- M: Capacitance tolerance(±20%)
- 220: Nominal capacitance code
- VC: Lead type
- 16: Rated voltage in volts
- BLH: Series name

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF BLH Series (Type : VC)

Unit(mm)

DIMENSIONS



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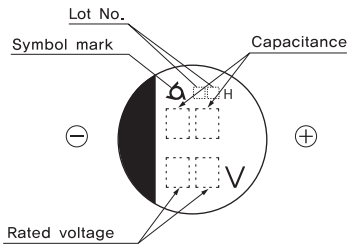
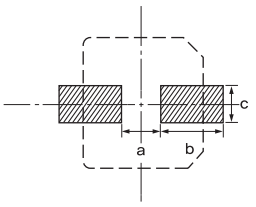


Case code	ø D	L	A	B	C	W	P	a	b	c
H10	8	10	8.3	8.3	9	0.7-1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11	0.7-1.1	4.5	4.5	4.4	2.2

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF BLH Series

VDC / μF	10		16		25		35		50	
33									H10	77
47							H10	92	H10	92
100					H10	116	J10	151	J10	151
220			H10	140	J10	218	J10	216		
330	H10	170	J10	238	J10	238				
470	J10	254	J10	254						

Rated Ripple Current (mArms/105℃, 120Hz)

Case code

CLZ Series

• 125℃ 1,000~5,000Hrs assured.

Solvent-proof

WV ≦ 80VDC

- Vertical SMD type.
- LOW ESR of CLA Series
- For ECU, ESA
- RoHS compliant.
- Halogen-free capacitors are also available.

CLA → CLZ

Low ESR.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 400 VDC
Operating Temperature Range	-40 ~ +125℃
Capacitance Tolerance	±20%(M)
Leakage Current	Rated voltage(VDC): 10~100 / 160~400 Max. Leakage current (μA): I=0.01CV(μA) or 3μA, whichever is greater. (at 20℃, 2 minutes) / 0.04CV + 100(μA) (at 20℃, 2 minutes) Where, C : Nominal capacitance(μF), V : Rated voltage(VDC)
Dissipation Factor (Tanδ)	Rated voltage(VDC): 10 / 16 / 25 / 35 / 50~80 / 100 / 160~250 / 400 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.20 / 0.24 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 10 / 16 / 25 / 35~100 / 160~250 / 400 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 3 / 6 Z(-40℃)/Z(+20℃): 8 / 6 / 4 / 3 / 6 / 10 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for the specified time at 125℃ Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value Case Code: D55~F60: 10~80V 1,000Hrs, 100V -, 160~400V -; H63: 3,000Hrs, -, -; H10: 5,000Hrs, 2,000Hrs, -; J10: 5,000Hrs, 2,000Hrs, 2,000Hrs; K14~M22: 5,000Hrs, 5,000Hrs, 2,000Hrs
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. (Where, D55 ~ F60 is 500 hours) Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ 500% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

CLZ 16 VC 330 M J10 TP

- TP : With tape
- J10 : Case code
- M : Capacitance tolerance(±20%)
- 330 : Nominal capacitance code
- VC : Lead type
- 16 : Rated voltage in volts
- CLZ : Series name

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

SURFACE MOUNT ALUMINUM ELECTROLYTIC CAPACITORS

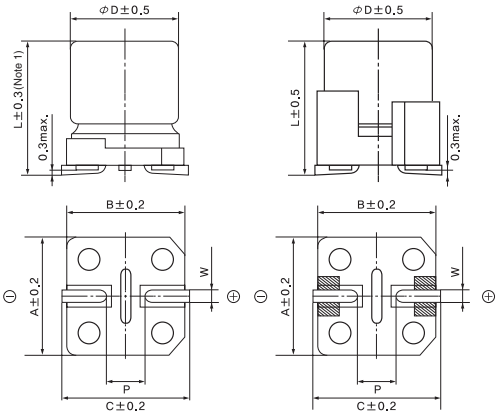
DIMENSIONS OF CLZ Series (Type : VC)

Unit(mm)

DIMENSIONS

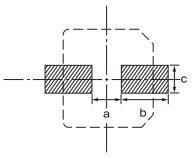
● Vibration Resistance

〈Size code:H63~M22〉 〈Size code:L17~M22〉



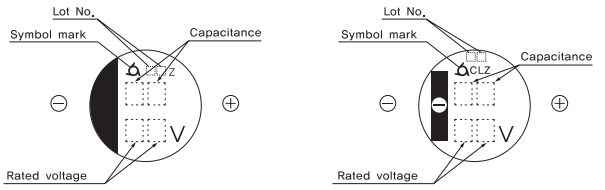
▨ : Dummy terminals

Recommended solder land on PC board



▨ : Solder land on PC board

MARKING



〈D55~J10〉 〈K14~M22〉

Note 1 : L±0.5 for 8×6.3(H63)~18×21.5(M22)
Note 2 : 4×5.2(D55), 5×5.2(E55)is excluded symbol mark

Case code	ØD	L	A	B	C	W	P	a	b	c	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5~0.8	1.0	1.0	2.6	1.6			
E55	5	5.2	5.3	5.3	5.9	0.5~0.8	1.4	1.4	3.0	1.6			
F55	6.3	5.2	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
F60	6.3	5.7	6.6	6.6	7.2	0.5~0.8	1.9	1.9	3.5	1.6			
H63	8	6.3	8.3	8.3	9.0	0.5~0.8	2.3	2.3	4.5	1.6			
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2			
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2			
K14	12.5	13.5	13.0	13.0	13.7	1.0~1.3	4.2	4.0	5.7	2.5			
L17	16	16.5	17.0	17.0	18.0	1.0~1.3	6.5	6.0	6.9	2.5	4.7	7.8	9.6
L22	16	21.5	17.0	17.0	18.0	1.0~1.3	6.5	6.0	6.9	2.5			
M17	18	16.5	19.0	19.0	20.0	1.0~1.3	6.5	6.0	7.9	2.5	4.7	8.8	9.6
M22	18	21.5	19.0	19.0	20.0	1.0~1.3	6.5	6.0	7.9	2.5			

● Vibration Resistance

RATINGS OF CLZ Series

VDC / μF	10				16				25				35				50				63				80				100			
10					D55	7.00	105	12	E55	3.30	49.5	23	F60	1.60	24.0	69	F60	2.80	42.0	51	H63	2.00	110	60	H10	1.20	50.0	70	H10	1.60	50.0	70
22	E55	3.30	49.5	23	E55	3.30	49.5	23	F55	2.00	30.0	40	F60	1.60	24.0	69	H63	1.60	30.0	83	H10	1.00	35.0	70	J10	0.55	35.0	115	J10	1.60	50.0	70
33	E55	3.30	49.5	23	F55	2.00	30.0	40	F60	1.60	24.0	69	H63	0.90	14.0	110	H10	0.70	11.0	160	J10	0.55	25.0	115	J10	0.55	35.0	115	J10	0.80	35.0	115
47	F55	2.00	30.0	40	F60	1.60	24.0	69	H63	0.90	14.0	110	H10	0.40	6.0	220	J10	0.50	11.0	247	J10	0.55	25.0	115	K14	0.33	16.5	450	K14	0.33	16.5	450
100	H63	0.90	14.0	110	H63	0.90	14.0	110	H10	0.40	6.0	220	H10	0.40	6.0	220	J10	0.50	7.5	247	K14	0.33	12.5	450	L17	0.24	9.0	650	K14	0.33	16.5	450
220	H10	0.40	6.0	220	H10	0.40	6.0	220	J10	0.30	4.5	296	J10	0.30	4.5	296	K14	0.23	3.5	550	L17	0.24	9.0	650	M17	0.16	2.5	950				
330	J10	0.30	4.5	296	J10	0.30	4.5	296	K14	0.14	2.1	750	K14	0.14	2.1	750	L17	0.15	2.3	850	L17	0.24	9.0	650								
470	J10	0.30	4.5	296	K14	0.14	2.1	750	L17	0.10	1.5	1000	M17	0.10	1.5	1000	M17	0.15	2.3	920	L22	0.16	5.5	950								
1,000	K14	0.14	2.1	750	M17	0.10	1.5	1200	M22	0.058	0.87	1550																				
2,200	L17	0.10	1.5	1000																												
3,300	M17	0.10	1.5	1200																												
4,700	M22	0.058	0.87	1550																												

Rated Ripple Current (mArms/125℃, 100kHz)
ESR (Ω max./-40℃, 100kHz)
ESR (Ω max./20℃, 100kHz)
Case code

VDC / μF	160		200		250		400	
1							J10	18
2.2							J10	26
3.3							J10	37
4.7							K14	70
10	K14	100	K14	100	L17	120	L22	140
22	L17	180	L17	180	M17	205		
33	M17	245	M17	245	M22	260		
47	M22	315	M22	315				
68	M22	380						

Rated Ripple Current (mArms/125℃, 120Hz)
Case code

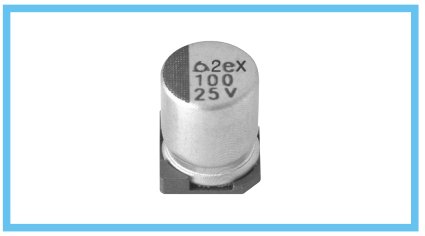
CLX Series

• 125℃ 2,000~4000Hrs assured.

Solvent-proof

- Vertical SMD type.
- Low ESR of CLZ Series.
- For ECU, ESA
- RoHS compliant.
- Halogen-free capacitors are also available.

CLZ → CLX
Low ESR.



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +125 ℃
Capacitance Tolerance	±20%(M)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor Tanδ(Max.)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.16 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35, 50 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 Z(-40℃)/Z(+20℃): 10 / 8 / 6 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions. H10:125℃, 2,000hours, J10:125℃, 3,000hours, K14:125℃, 4,000hours. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

CLX 16 VC 330 M J10 TP

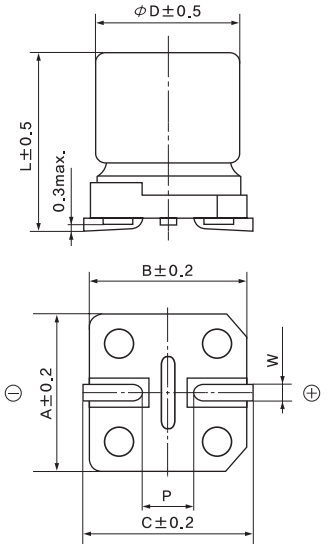
- TP: With tape
- J10: Case code
- M: Capacitance tolerance(±20%)
- 330: Nominal capacitance code
- VC: Lead type
- 16: Rated voltage in volts
- CLX: Series name

Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF CLX Series(Type : VC)

Unit(mm)

DIMENSIONS



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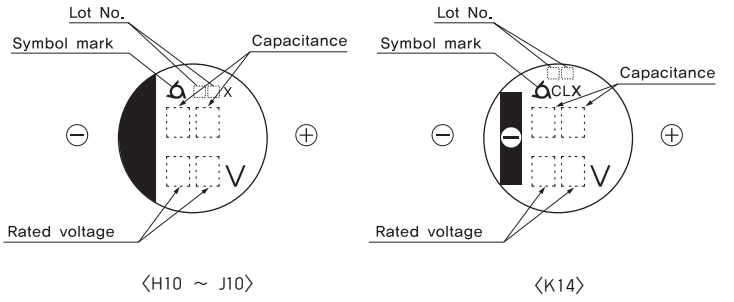
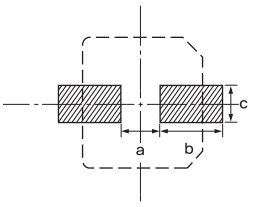


〈H10 ~ J10〉 〈K14〉

Case code	ø D	L	A	B	C	W	P	a	b	c
H10	8	10	8.3	8.3	9.0	0.7~1.1	3.1	3.1	4.2	2.2
J10	10	10	10.3	10.3	11.0	0.7~1.1	4.5	4.5	4.4	2.2
K14	12.5	13.5	13.0	13.0	13.7	1.0~1.3	4.2	4.0	5.7	2.5

Recommended solder land on PC board



: Solder land on PC board

RATINGS OF CLX Series

VDC / μF	10V				16V				25V				35V				50V			
33																	H10	0.53	8.0	192
47													H10	0.30	4.5	264	J10	0.38	5.7	296
100									H10	0.30	4.5	264	H10	0.30	4.5	264	J10	0.38	5.7	296
220	H10	0.30	4.5	264	H10	0.30	4.5	264	J10	0.23	3.5	355	J10	0.23	3.5	355	K14	0.18	2.7	650
330	J10	0.23	3.5	355	J10	0.23	3.5	355	K14	0.11	1.7	950	K14	0.11	1.7	950				
470	J10	0.23	3.5	355	K14	0.11	1.7	950												
1000	K14	0.11	1.7	950																

Rated Ripple Current (mArms/ 125℃, 100kHz)
ESR (Ω max./-40℃, 100kHz)
ESR (Ω max./20℃, 100kHz)
Case code

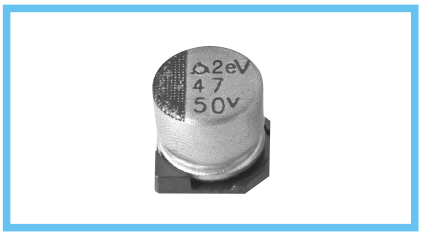
VDA Series

• 150℃ 1,000Hrs assured.

- Vertical SMD type.
- Wide Temperature range.
- For ECU, ESA
- Ecological capacitors are also available.
- **Halogen-free capacitors are also available.**

Solvent-proof

CDA → VDA
Wide Temp.



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +150 ℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(㎂) or 3㎂, whichever is greater. Where, I:Max. Leakage current(㎂) C:Nominal capacitance(㎌) V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor Tanδ(Max.)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.14 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Z(-25℃)/Z(+20℃): 6 / 4 / 3 / 2 / 2 Z(-40℃)/Z(+20℃): 12 / 10 / 8 / 6 / 6 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 1,000 hours at 150℃ Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 150℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

VDA 16 VC 330 M J10 TP

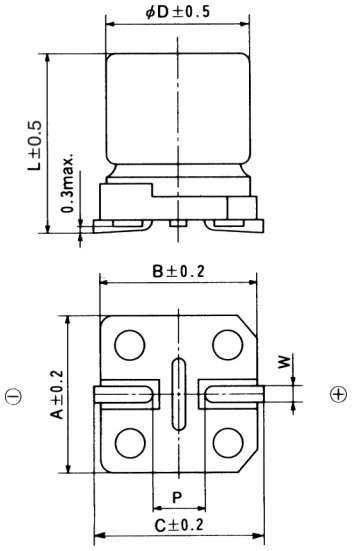
- TP: With tape
- J10: Case code
- M: Capacitance tolerance(±20%)
- 330: Nominal capacitance code
- VC: Lead type
- 16: Rated voltage in volts
- VDA: Series name

Capacitance	Code
0.1㎌	R1
0.47㎌	R47
1.0㎌	1
4.7㎌	4R7
10㎌	10
100㎌	100

DIMENSIONS OF VDA Series(Type : VC)

Unit(mm)

DIMENSIONS



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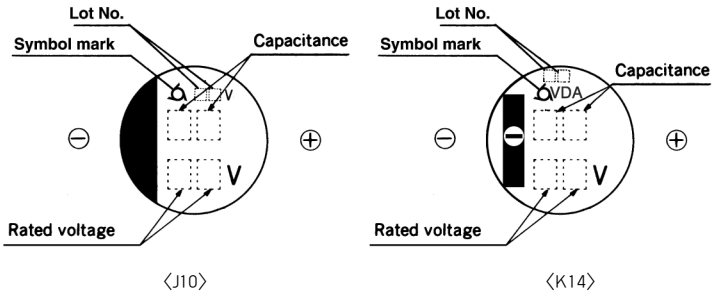
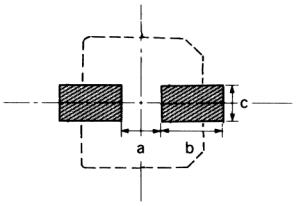


Recommended solder land on PC board



▨ : Solder land on PC board

Case code	ø D	L	A	B	C	W	P	a	b	c
J10	10	10	10.3	10.3	11.0	0.7～1.1	4.5	4.5	4.4	2.2
K14	12.5	13.5	13.0	13.0	13.7	1.0～1.3	4.2	4.0	5.7	2.5

RATINGS OF VDA Series

VDC / μF	10		16		25		35		50	
47							J10	90	J10	90
100					J10	123	J10	132	K14	167
220			J10	163	J10	183	K14	249		
330	J10	183	J10	200	K14	285				
470	J10	218	K14	304						
1,000	K14	405								

Rated ripple current (mArms/150˚C, 120Hz)

Case code

MVG(MV)-BP Series

• 85℃ 2,000Hrs assured.

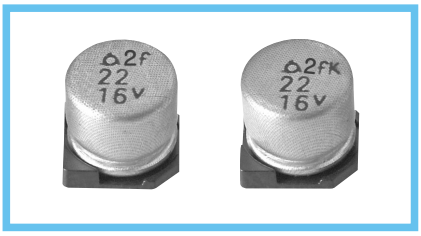
- Vertical SMD type.
- Bi-polarized.
- For LCD MT / TV
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

BDS(MVK)-BP Series

• 105℃ 1,000Hrs assured.

- Vertical SMD type.
- Bi-polarized.
- Wide temperature range.
- For LCD MT / TV
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

Solvent-proof



MV → MVG(MV) -BP → BDS(MVK) -BP

Bi-polarized Wide Temp.

SPECIFICATIONS

Item	Characteristics	
Series Name	MVG(MV)-BP	BDS(MVK)-BP
Rated Voltage Range	4 ~ 50 VDC	6.3 ~ 50 VDC
Operating Temperature Range	-40 ~ +85℃	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current (In both directions)	I=0.05CV or 10μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, after 2 minutes)	

Dissipation Factor Tanδ(Max.)

Rated Voltage(VDC)	4	6.3	10	16	25	35~50
MV-BP	0.45	0.32	0.26	0.24	0.22	0.20
MVK-BP	-	0.35	0.26	0.24	0.20	0.18

(at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated Voltage(VDC)	4	6.3	10	16	25	35~50
Z(-25℃)/Z(20℃)	7	4	3	2	2	2
Z(-40℃)/Z(20℃)	15	10	8	6	4	3

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied with the following conditions with its polarization reversed every 250 hours.

Series Name	MVG(MV)-BP	BDS(MVK)-BP
Test time & temperature	2,000 hours at 85℃	1,000 hours at 105℃
Capacitance change	≦±20% of the initial value	≦±30% of the initial value
Tanδ	≦200% of the initial specified value	≦300% of the initial specified value
Leakage current	≦The initial specified value	≦The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 85℃(**MVG(MV)-BP**) or 105℃(**BDS(MVK)-BP**) without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

Series Name	MVG(MV)-BP	BDS(MVK)-BP
Capacitance change	≦±15% of the initial value	≦±25% of the initial value
Tanδ	≦150% of the initial specified value	≦200% of the initial specified value
Leakage current	≦The initial specified value	≦The initial specified value

Others

Satisfied characteristics KS C IEC 60384-4

PART NUMBERING SYSTEM

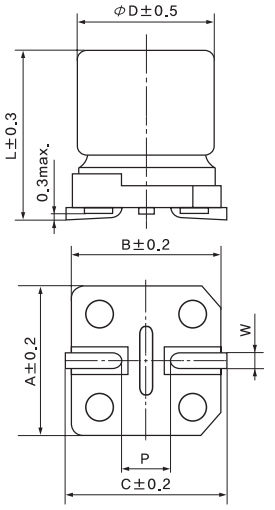
MVG 50 VC R47 M BP D55 TP

- MVG — Series name
- 50 — Rated voltage in volts
- VC — Lead type
- R47 — Nominal capacitance code
- M — Capacitance tolerance(±20%)
- BP — Bi-polar type
- D55 — Case code
- TP — With tape

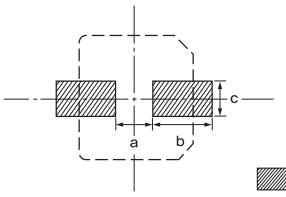
Capacitance	Code
0.1μF	R1
0.47μF	R47
1.0μF	1
4.7μF	4R7
10μF	10
100μF	100

DIMENSIONS OF MVG(MV)-BP, BDS(MVK)-BP Series(Type :VC)

Unit(mm)



Recommended solder land on PC board



Solder land on PC board

Case code	ø D	L	A	B	C	W	P	a	b	c
D55	4	5.2	4.3	4.3	5.1	0.5-0.8	1.0	1.0	2.6	1.6
E55	5	5.2	5.3	5.3	5.9	0.5-0.8	1.4	1.4	3.0	1.6
F55	6.3	5.2	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6
F60	6.3	5.7	6.6	6.6	7.2	0.5-0.8	1.9	1.9	3.5	1.6

RATINGS OF MVG(MV)-BP, BDS(MVK)-BP Series

MVG(MV)-BP

μF \ VDC	4		6.3		10		16		25		35		50	
0.10													D55	1.3
(0.15)													D55	1.9
0.22													D55	2.3
0.33													D55	2.8
0.47													D55	3.4
(0.68)													D55	4.1
1.0													D55	5.5
(1.5)													D55	6.5
2.2											D55	8	E55	9
3.3									D55	9	→		E55	11
4.7							D55	11	→		E55	13	F55	14
(6.8)					D55	12	→		E55	15	F55	17		
10			D55	13	→		E55	18	→		F55	21		
(15)	D55	14	→		E55	21	→		F55	24				
22	→		E55	23	→		F55	28	↑ Rated Ripple Current(mArms/ 85℃, 120Hz)					
33	→		→		F55	33			↑ Case code					
47	→		F55	36										

BDS(MVK)-BP

μF \ VDC	6.3		10		16		25		35		50	
0.10											D55	1.2
(0.15)											D55	1.7
0.22											D55	2.2
0.33											D55	2.7
0.47											D55	3.2
(0.68)											D55	4.0
1.0											D55	5.3
(1.5)											D55	7.2
2.2									D55	7	E55	9.0
3.3							D55	8	→		E55	12
4.7					D55	10	→		E55	14	F60	16
(6.8)			D55	11	→		E55	16	→		F60	20
10	D55	12	→		E55	18	→		F60	23		
(15)	→		E55	20	→		F60	28				
22	E55	23	→		F60	32						
33	→		F60	35								
47	F60	39										

↑ Rated Ripple Current (mA rms/105℃, 120Hz)
↑ Case code

Note : → Use next higher voltage part.
Parenthesized capacitance is not standard part.

PRECAUTIONS TO USERS

Soldering method
The capacitors of Alchip have no capability to withstand such dip or wave soldering as totally immerses a components into a solder bath.

Reflow soldering
Use the capacitors within the Recommended Reflow Soldering Conditions, and also make sure to check the temperature stress to the capacitors because the following makes a difference in the stress to the capacitors. If any other reflow soldering conditions are applied, please consult us.

① Location of components. (The edge sides of a PC board increases its temperature more than the center does.)
② Population of components. The less the component population is the more the temperature is increased.
③ Material of printed circuit board. As a ceramic board needs heating up more than a glass epoxy board to reach the same board temperature, the capacitors may be damaged.
④ Thickness of PC board. A thick PC board needs heating up more than a thin board. It may damage the capacitors.
⑤ Size of PC board. A large PC board needs heating up more than a small board, and it may damage the capacitors.
⑥ Location of infrared ray lamps. On IR reflow as well as hot plate reflow, heating only the reverse side of the PC board will reduce a stress to the capacitors.

Rework of soldering
Avoid soldering more than once by reflow. Use a soldering iron for rework of solder, and do not exceed an iron tip temperature of 300℃ and a max. exposure time of 5 seconds.

Mechanical stress
Do not lift up or push the capacitor after soldering. Avoid curvature of the PC board. These may damage the capacitor.

Cleaning of assembly board
For the cleaning conditions, see page 34~35.
Immediately after solvent cleaning, evaporate a residual solvent for at least 10 minutes with a hot forced air. If the assembly board is inadequately dried after a washing process, the capacitors will keep suffering from a residual solvent for long periods of time, and will be corroded while in service.

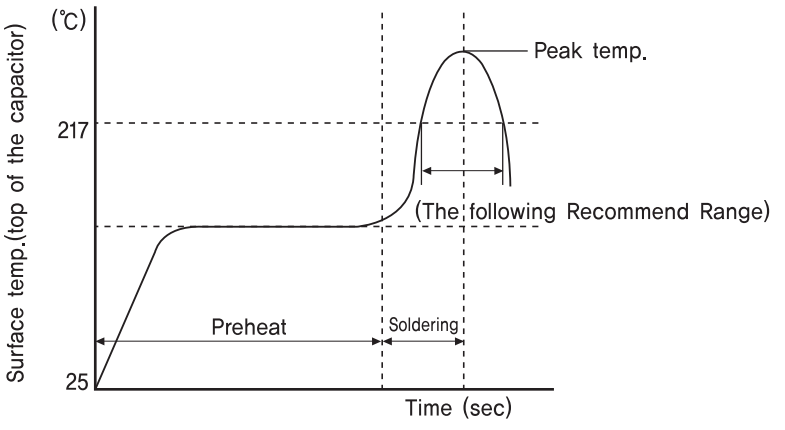
Coating on assembly board
① Before coating, evaporate cleaning solvents from the assembly board.
② Before the conformal coating, using a buffer pre-coat which does not contain chloride is recommanded to reduce stress to the capacitors.

Molding by resin
Inner pressure of a capacitor slowly increases over the service life of the capacitor with gas being produced by internal chemical reaction. If the end seal of the capacitor is completely be in danger. Also if the resin contains a large amount of chlorine ion, it will penetrate into the end seal, get into the inside element of the capacitor, and damage the capacitor while in service.

Others
The Precautions to Users for Aluminum Electrolytic Capacitors shall be applied. (page 31)

RECOMMENDED PB-FREE REFLOW SOLDERING CONDITIONS

The following conditions are recomended for air or infrared reflow soldering of the surface mount capacitors onto a glass epoxy circuit board of 90×50×0.8mm (with resist) by cream solder (eutectic solder) . The temperatures shown are the surface temperature values of the top of the capacitor.



TEMPERATURE PROFILE

CASE CODE	Time of Preheat temp. (from 150℃ to 200℃)	Time to be Maintained Above 217℃	Time to be Maintained Above 230℃	Peak Temp.	Reflow Cycle
B55, D55, D56 E55, F55, F60, F80 H63, H10, J10, K14	60 ~ 100 Sec	60 ~ 70 Sec	20 ~ 30 Sec	250 (10 Sec ↓)	1 TIME
L17, L22 M17, M22	60 ~ 100 Sec	50 ~ 60 Sec	-	230 (10 Sec ↓)	1 TIME

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

DSA Series

- 85℃ 2,000Hrs assured.
- RoHS compliant.
- Halogen-free capacitors are also available.

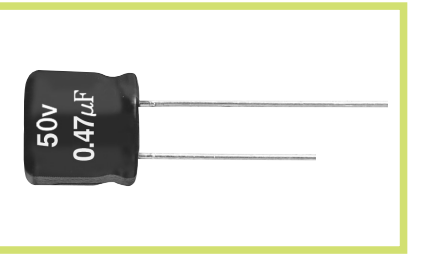
- Non-solvent proof.
- Height 5mm.
- For CAR-Audio, Tuner

DZA Series

- 85℃ 2,000Hrs assured.
- RoHS compliant.
- Halogen-free capacitors are also available.

- Solvent proof.
- Height 5mm.
- Reflow Application.
- For CAR-Audio, Tuner

SRE → DSA (Downsized) → DZA (Reflow Application) — Solvent-proof

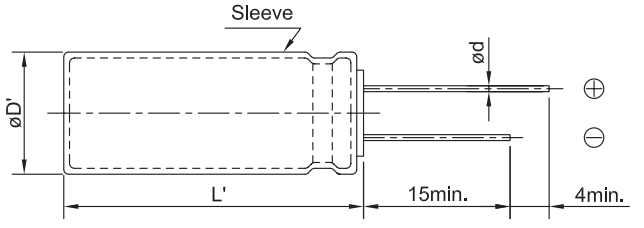


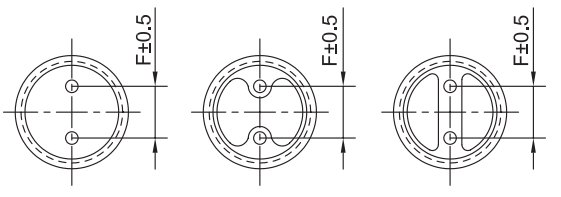
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	4 ~ 50 V_{DC}
Operating Temperature Range	- 40 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA)or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 4 / 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.38 / 0.35 / 0.32 / 0.30 / 0.18 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 4 / 6.3 / 10 / 16 / 25 / 35~50 Z(-25℃)/Z(20℃): 7 / 4 / 3 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 15 / 10 / 8 / 5 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value Leakage current ≦ 200% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF DSA/DZA

Unit(mm)





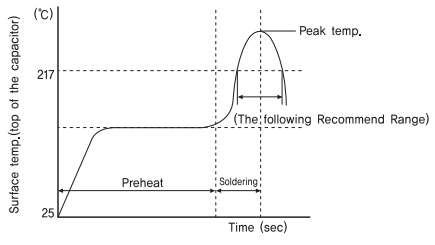
ø D	3	3.5	4	5	6.3	8
ø d	0.4	0.4	0.45	0.45	0.45	0.45
F	1.0	1.0	1.5	2.0	2.5	2.5
ø D′	ø D+0.5 max.					
L′	L+1.0 max.					L+1.5 max.

Marking- DSA : BLACK SLEEVE, WHITE INK
DZA : GREEN SLEEVE, BLACK INK

RATINGS OF DSA/DZA Series

μF \ VDC	4	6.3	10	16	25	35	50
0.1							3×5 1.3
0.15							3×5 2.0
0.22							3×5 2.9
0.33							3×5 3.5
0.47							3×5 4.2
0.68							3×5 5.1
1							3×5 6.2
1.5							3×5 7.3
2.2						3×5 8.3	3×5 9.0
3.3					3×5 9.5	3×5 10	3.5×5 12
4.7				3×5 10	3×5 11	3.5×5 13	4×5 17
6.8			3×5 11	3×5 12	3.5×5 14	4×5 18	5×5 22
10		3×5 12	3×5 13	3×5 15	4×5 21	5×5 25	5×5 27
15	3×5 10	3×5 15	3.5×5 18	4×5 24	5×5 28	5×5 31	6.3×5 36
22	3.5×5 15	3.5×5 21	4×5 27	5×5 32	5×5 35	6.3×5 40	6.3×5 45
33	3.5×5 20	4×5 30	5×5 35	5×5 40	6.3×5 45	6.3×5 50	8×5 61
47	4×5 28	4×5 36	5×5 43	6.3×5 50	6.3×5 59	8×5 65	
68	5×5 33	5×5 48	6.3×5 54	6.3×5 60	8×5 74		
100	5×5 48	6.3×5 60	6.3×5 72	6.3×5 77	8×5 90		
150	6.3×5 70	6.3×5 72	8×5 88				
220	6.3×5 79	8×5 93	8×5 98				
330	8×5 95	8×5 141	← Case Size ø D×L (mm) ← Rated Ripple Current (mArms/85℃, 120Hz)				

RECOMMENDED REFLOW SOLDERING CONDITIONS(For DZA Series)



TEMPERATURE PROFILE

Time of Preheat temp. (from 150℃ to 200℃)	Time to be Maintained Above 217℃	Time to be Maintained Above 230℃	Peak Temp.	Reflow Cycle
60 ~ 100 Sec	60 ~ 70 Sec	20 ~ 30 Sec	250 (10 Sec↓)	1 TIME

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

GSA Series

- Non-solvent proof.
- Height 7mm.
- For CAR-Audio, Tuner

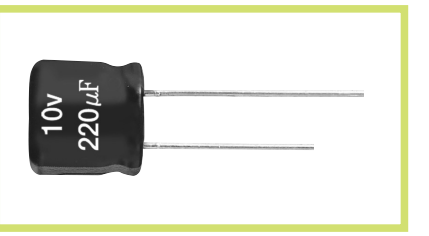
- 85℃ 2,000Hrs assured.
- RoHS compliant.
- Halogen-free capacitors are also available.

GZA Series

- Solvent proof.
- Height 7mm.
- For CAR-Audio, Tuner

- 85℃ 2,000Hrs assured.
- RoHS compliant.
- Halogen-free capacitors are also available.

SRA → GSA (Downsized) → GZA (Reflow Application) + Solvent-proof

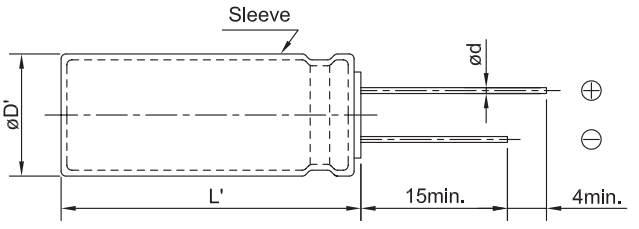


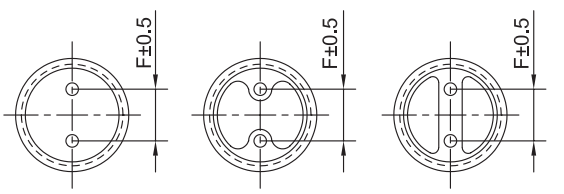
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 63 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA)or 3μA, whichever is greater. where, I:Max. Leakage current(μA) C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 Tanδ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.11 / 0.08 ※6.3 VB 220(0.27) , 16 VB 100(0.19) (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50~63 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 8 / 6 / 4 / 3 / 3 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±25% of the initial value (where, ±20% for GZA Series) Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied.The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% of initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF GSA/GZA Series

Unit(mm)





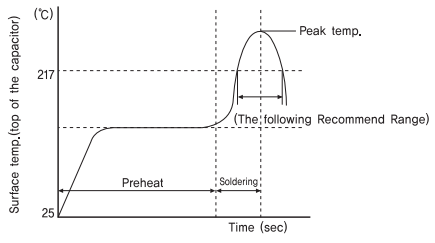
ø D	4	5	6.3	8
ø d	0.45			
F	1.5	2.0	2.5	3.5
ø D′	ø D+0.5 max.			
L′	L+1.0 max.			

Marking- GSA : BLACK SLEEVE, WHITE INK
GZA : GREEN SLEEVE, BLACK INK

RATINGS OF GSA / GZA Series

μF \ VDC	6.3	10	16	25	35	50	63
0.1						4×7 1.3	4×7 1.3
0.15						4×7 2.0	4×7 2.0
0.22						4×7 2.9	4×7 3.0
0.33						4×7 3.5	4×7 3.7
0.47						4×7 5.0	4×7 5.4
0.68						4×7 7.1	4×7 7.6
1						4×7 10	4×7 11
1.5						4×7 12	4×7 13
2.2						4×7 15	4×7 17
3.3					4×7 17	4×7 18	4×7 20
4.7				4×7 19	4×7 20	4×7 22	4×7 25
6.8				4×7 20	4×7 23	5×7 25	5×7 28
10			4×7 25	4×7 26	4×7 27	5×7 31	6.3×7 38
15			4×7 28	4×7 30	5×7 36	6.3×7 48	6.3×7 51
22	4×7 31	4×7 32	4×7 34	5×7 41	5×7 44	6.3×7 58	6.3×7 62
33	4×7 35	4×7 38	5×7 45	5×7 50	6.3×7 64	6.3×7 68	8×7 72
47	4×7 42	5×7 50	5×7 55	6.3×7 65	6.3×7 70	8×7 84	
68	4×7 56	5×7 60	6.3×7 83	6.3×7 85	8×7 91		
100	5×7 68	6.3×7 80	6.3×7 95	6.3×7 101			
150	6.3×7 90	6.3×7 95	8×7 199	8×7 127			
220	6.3×7 120	6.3×7 122	8×7 140				
330	6.3×7 141	8×7 152					
470	8×7 168	← Case Size ø D × L (mm) ← Rated Ripple Current (mArms/85℃, 120Hz)					

RECOMMENDED REFLOW SOLDERING CONDITIONS(For GZA Series)



TEMPERATURE PROFILE

Time of Preheat temp. (from 150℃ to 200℃)	Time to be Maintained Above 217℃	Time to be Maintained Above 230℃	Peak Temp.	Reflow Cycle
60 ~ 100 Sec	60 ~ 70 Sec	20 ~ 30 Sec	250 (10 Sec ↓)	1 TIME

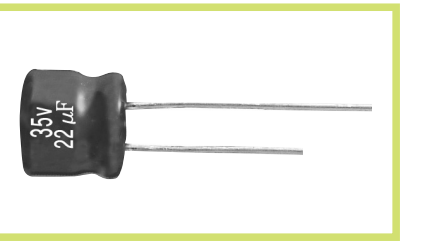
MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

EMA Series

• 105℃ 2,000Hrs assured.

- Height 5mm.
- Wide Temperature range.
- Long Life of KRE Series
- For CAR-Audio, Tuner
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

Solvent-proof



KRE → EMA

Long life.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	4 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA)or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 4 / 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.30 / 0.27 / 0.23 / 0.19 / 0.15 / 0.13 / 0.11 ※For ø3×5L EMA, 0.02 shall be added to the above value. (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	W.V: 4 / 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(20℃): 6 / 3 / 3 / 2 / 2 Z(-40℃)/Z(20℃): 12 / 9 / 7 / 5 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shell be applied to the capacitors for a minimum of 30minutes, at least 24hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATINGS OF EMA Series

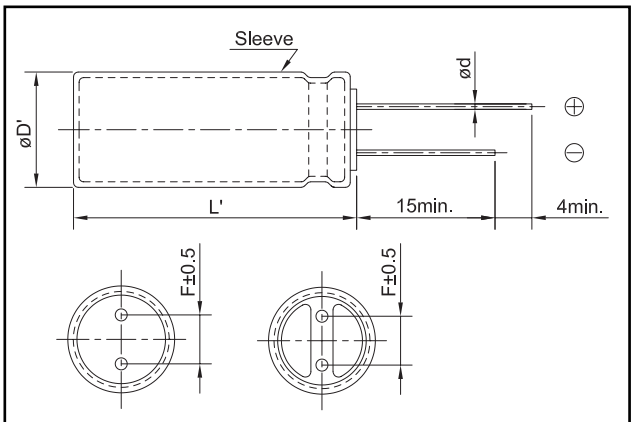
V_{DC} / μF	4		6.3		10		16		25		35		50	
0.1													3×5	1.3
0.15													3×5	2.0
0.22													3×5	2.6
0.33													3×5	3.2
0.47													3×5	3.8
0.68													3×5	4.6
1													3×5	5.6
1.5													3×5	6.9
2.2											3×5	7.7	3.5×5	10
3.3									3×5	8.8	3.5×5	11	4×5	14
4.7							3×5	9.4	3.5×5	11	4×5	15	5×5	19
6.8					3×5	11	3.5×5	13	4×5	16	5×5	20	6.3×5	24
10			3×5	12	3.5×5	14	3.5×5	16	5×5	23	5×5	25	6.3×5	29
15	3.5×5	15	3.5×5	16	4×5	20	5×5	25	6.3×5	30	6.3×5	33		
22	4×5	21	4×5	21	5×5	27	5×5	30	6.3×5	37	6.3×5	40		
33	4×5	29	5×5	30	5×5	34	6.3×5	40	6.3×5	45				
47	4×5	36	5×5	36	6.3×5	43	6.3×5	48						
68	5×5	45	6.3×5	46	6.3×5	52								
100	5×5	55	6.3×5	56										

Rated Ripple Current (mArms/105℃, 120Hz)

Case Size øD×L(mm)

DIMENSIONS OF EMA Series

Unit(mm)



Marking: BROWN SLEEVE, WHITE INK

ø D	3	3.5	4	5	6.3
ø d	0.4	0.4	0.45	0.45	0.45
F	1.0	1.0	1.5	2.0	2.5
ø D'	ø D+0.5 max.				
L'	L+1.0 max.				

HMA Series

• 105℃ 2,000Hrs assured.

- Height 7mm.
- Wide Temperature range.
- Long Life of KMA Series.
- For CAR-Audio, Tuner
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

Solvent-proof

KMA → HMA
Long life.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA)or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.) 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}) 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(+20℃) 4 / 3 / 2 / 2 Z(-40℃)/Z(+20℃) 8 / 6 / 6 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value(where, ±25% for 6.3 V_{DC}~16 V_{DC}) Tan δ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied.The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of initial value(where, ±25% for 6.3 V_{DC}~16 V_{DC}) Tan δ ≦ 200% of initial specified value Leakage current ≦ 200% of initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

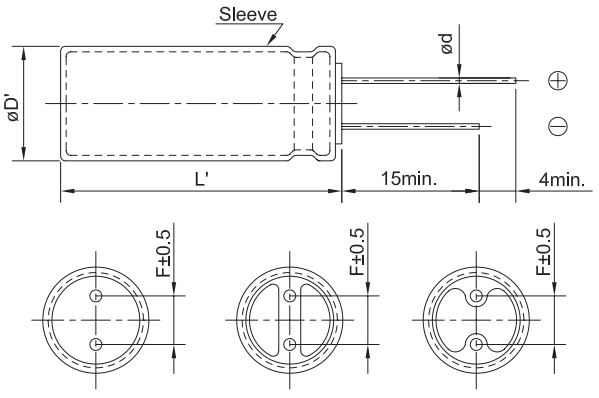
RATINGS OF HMA Series

μF \ V_{DC}	6.3		10		16		25		35		50	
0.1											4×7	1.3
0.15											4×7	2.0
0.22											4×7	2.9
0.33											4×7	3.5
0.47											4×7	5.0
0.68											4×7	7.1
1											4×7	10
1.5											4×7	12
2.2											4×7	15
3.3									4×7	17	4×7	18
4.7							4×7	19	4×7	20	5×7	23
6.8					4×7	20	5×7	23	5×7	24	6.3×7	28
10					4×7	25	5×7	28	5×7	30	6.3×7	34
15			4×7	28	5×7	31	6.3×7	35	6.3×7	37	6.3×7	41
22	4×7	31	5×7	35	5×7	39	6.3×7	43	6.3×7	47	6.3×7	52
33	5×7	39	5×7	43	6.3×7	49	6.3×7	53	8×7	62	8×7	68
47	5×7	47	6.3×7	53	6.3×7	59	8×7	68				
68	6.3×7	57	6.3×7	63	8×7	76						
100	6.3×7	71	6.3×7	80								
150	8×7	94	8×7	94								

Rated Ripple Current (mArms/105℃, 120Hz)
Case Size øD×L(mm)

DIMENSIONS OF HMA Series

Unit(mm)



Marking: BROWN SLEEVE, WHITE INK

ø D	4	5	6.3	8
ø d	0.45			
F	1.5	2.0	2.5	3.5
ø D'	ø D+0.5 max.			
L'	L+1.0 max.			

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

MHA Series

• 85℃ 2,000Hrs assured

- Non-solvent proof.
- Downsized of SHL series.
- For Digital Household Appliance
- RoHS compliant.
- Halogen-free capacitors are also available.

SHL → MHA

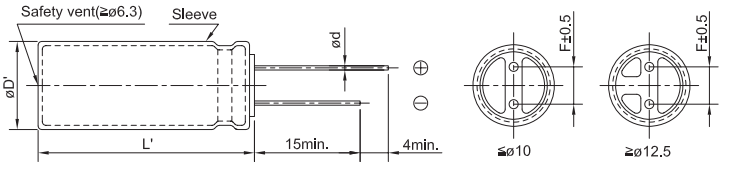
Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	6.3 ~ 100 V_{DC}	160 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ +85℃	-25 ~ +85℃
Capacitance Tolerance	±20% (M)	(at 20℃, 120Hz)
Leakage Current	After 1 minute:0.03 CV(μA) or 4 μA, whichever is greater After 2 minutes:0.01 CV(μA) or 3 μA, whichever is greater	After 1 minute: CV≦1,000: 0.1CV+40; CV>1,000: 0.04CV+100 After 5 minutes: CV≦1,000: 0.03CV+15; CV>1,000: 0.02CV+25
	Where, C=Nominal capacitance(μF) V=Rated Voltage(V_{DC})	(at 20℃)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 100 / 160~250 / 350~500 Tanδ(Max.): 0.34 / 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.10 / 0.09 / 0.20 / 0.24 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase.	(at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63~100 / 160 / 200~250 / 350~500 Z(-25℃)/Z(20℃): 5 / 4 / 3 / 2 / 2 / 2 / 3 / 4 / 8 / 16 Z(-40℃)/Z(20℃): 12 / 10 / 8 / 5 / 4 / 3 / 4 / - / - / -	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value (where, 200% for ≧ WV 160 V_{DC})	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF MHA Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18	22
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0
øD'	øD+0.5 max.							
L'	L+1.5 max.			L+2.0 max.				

※ø8 X 9L, øD'≤D+0.5 and L≤L+1.0

RATINGS OF MHA Series

μF \ Vdc	6.3	10	16	25	35	50	63	100	160	200	250	350	400	450	500
0.1						5×11 5.5	5×11 6.2	5×11 6.5							
0.22						5×11 8	5×11 9	5×11 11							
0.33						5×11 10	5×11 11	5×11 13							
0.47						5×11 15	5×11 16	5×11 17	6.3×11 18	6.3×11 18	6.3×11 19	6.3×11 20	6.3×11 20		
0.68						5×11 18	5×11 19	5×11 19	6.3×11 21	6.3×11 21	6.3×11 22	6.3×11 23	6.3×11 23		
1						5×11 22	5×11 24	5×11 24	6.3×11 23	6.3×11 23	6.3×11 27	6.3×11 28	6.3×11 29	6.3×11 24	6.3×11 20
2.2						5×11 34	5×11 35	5×11 37	6.3×11 33	6.3×11 39	6.3×11 41	6.3×11 43	6.3×11 44	8×11.5 40	8×11.5 34
3.3						5×11 41	5×11 43	5×11 44	6.3×11 46	6.3×11 47	6.3×11 48	8×11.5 56	8×11.5 59	10×12.5 54	10×12.5 50
4.7					5×11 35	5×11 48	5×11 53	5×11 55	6.3×11 56	6.3×11 55	8×11.5 66	8×11.5 68	10×12.5 73	10×16 72	10×16 68
6.8					5×11 46	5×11 59	5×11 63	5×11 64	8×11.5 78	8×11.5 80	8×11.5 82	10×12.5 92	10×16 100	10×20 90	10×20 85
10			5×11 39	5×11 49	5×11 53	5×11 71	5×11 76	5×11 76	8×11.5 82	8×11.5 96	10×12.5 113	10×16 118	10×20 134	12.5×20 120	12.5×20 110
22		5×11 52	5×11 68	5×11 73	5×11 80	5×11 106	5×11 113	6.3×11 130	10×16 150	10×16 168	10×20 198	12.5×20 233	10×25 229	16×20 216	16×20 140
33	5×11 41	5×11 70	5×11 76	5×11 83	5×11 100	5×11 129 8×9 98	6.3×11 159	8×11.5 187	10×20 243	10×20 245	12.5×20 286	12.5×25 300	12.5×25 321	16×20 297	16×31.5 220
47	5×11 59	5×11 88	5×11 98	5×11 126	5×11 138 8×9 98	6.3×11 177 8×9 110	6.3×11 190	8×15 246	10×20 301	12.5×20 343	12.5×25 371	16×20 395	16×25 437	16×31.5 397	18×31.5 247
68	5×11 90	5×11 110	5×11 130	5×11 151	6.3×11 191	6.3×11 213	8×11.5 269	10×12.5 311	12.5×20 410	12.5×25 480	16×20 490	16×25 500	16×31.5 563	16×35.5 555	18×35.5 278
100	5×11 135	5×11 150	5×11 170	5×11 184 8×9 115	6.3×11 231	8×11.5 306	8×11.5 321	10×16 416	12.5×25 541	16×20 543	16×25 572	16×35.5 688	18×35.5 720	18×40 630	
220	5×11 211	5×11 229 8×9 150	6.3×11 290 8×9 290	6.3×11 318	8×11.5 405	10×12.5 506	10×16 615	12.5×20 742	16×25 906	16×31.5 1,029	18×35.5 1,061	22×40 1,100	22×45 1,150		
330	6.3×11 297 8×9 170	6.3×11 322	6.3×11 360	8×11.5 453	8×15 547	10×16 706	10×20 823	12.5×25 987	18×31.5 1,304	18×35.5 1,324	22×40 1,366				
470	6.3×11 355 8×9 241	6.3×11 384	8×11.5 499	8×15 597	10×16 753	10×20 918	10×20 1,039	16×25 1,394	22×35 1,457	22×40 1,494					
680	8×11.5 503	8×11.5 546	8×15 655	10×16 826	10×20 988	12.5×20 1,296	12.5×25 1,512	16×35.5 1,620	22×40 1,680						
1,000	8×11.5 610	8×15 751	10×16 928	10×20 1,094	10×20 1,163	12.5×25 1,715	16×25 1,850	18×35.5 1,995							
2,200	10×16 1,059	10×20 1,226	10×20 1,340	12.5×25 1,800	12.5×35 2,055	16×31.5 2,320	18×35.5 2,740								
3,300	10×20 1,350	10×25 1,657	10×30 1,804	12.5×30 2,159	16×31.5 2,498	18×35.5 3,218									
4,700	12.5×20 1,822	12.5×25 2,103	16×20 2,200	16×25 2,464	16×35.5 3,061										
6,800	12.5×20 2,235	12.5×35 2,706	16×25 2,690	16×31.5 2,992											
10,000	16×25 2,760	16×31.5 2,960	16×35.5 3,490												
15,000	16×31.5 3,453	18×35.5 3,826	← Case Size ØD×L(mm) ← Rated Ripple Current(mArms/85℃, 120Hz)												

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	60	120	300	1k	10k~
~6.8	0.65	1.00	1.35	1.75	2.30
10~68	0.75	1.00	1.25	1.50	1.75
100~1,000	0.80	1.00	1.15	1.30	1.40
2,200~15,000	0.85	1.00	1.03	1.05	1.08

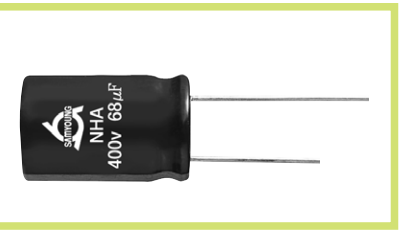
MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NHA Series

• 105℃ 1,000~2,000Hrs assured

Solvent-proof

WV≦100VDC



- Downsized of KMG series.
- For Digital Household Appliance
- RoHS compliant.
- Halogen-free capacitors are also available.

KMG → NHA

Downsized

SPECIFICATIONS

Item	Characteristics		
Rated Voltage Range	6.3 ~ 100 VDC	160 ~ 400 VDC	450 ~ 500 VDC
Operating Temperature Range	-55 ~ +105℃	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20% (M)		(at 20℃, 120Hz)
Leakage Current	After 1 minute:0.03 CV(μA) or 4 μA, whichever is greater After 2 minutes:0.01 CV(μA) or 3 μA, whichever is greater		

After 1 minute		After 5 minutes	
CV≦1,000	CV>1,000	CV≦1,000	CV>1,000
0.1CV+40	0.04CV+100	0.03CV+15	0.02CV+25

Where, C=Nominal capacitance(μF) V=Rated Voltage(VDC) (at 20℃)

Dissipation Factor (Tanδ)

Rated Voltage(VDC)	6.3	10	16	25	35	50	63	100	160~250	350~500
Tanδ(Max.)	0.34	0.24	0.20	0.16	0.14	0.12	0.10	0.09	0.20	0.24

When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)

Temperature Characteristics (Max. Impedance ratio)

Rated Voltage(VDC)	6.3	10	16	25	35	50	63~100	160	200~400	450~500
Z(-25℃)/Z(20℃)	5	4	3	2	2	2	3	3	6	6
Z(-40℃)/Z(20℃)	12	10	8	5	4	3	4	5	6	-

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃.(where, 1,000 hours ≤ ø8)

Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied.(where, 500 hours ≤ ø8)
The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

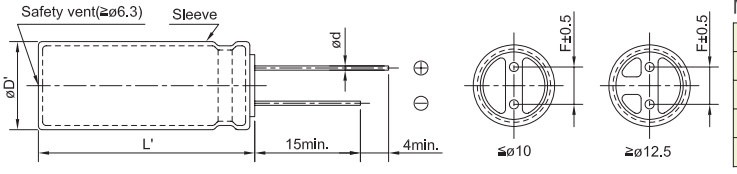
Capacitance change ≦ ±20% of the initial value
Tanδ ≦ 200% of the initial specified value
Leakage current ≦ The initial specified value (where, 200% for ≧ WV 160 VDC)

Others

Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NHA Series

Unit(mm)



Marking : BROWN SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18	22
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0
øD'	øD+0.5 max.							
L'	L+1.5 max.			L+2.0 max.				

RATINGS OF NHA Series

μF \ Vdc	6.3	10	16	25	35	50	63	100	160	200	250	350	400	450	500
0.1						5×11 2.1	5×11 3.2	5×11 3.6							
0.22						5×11 3.2	5×11 4.3	5×11 4.8							
0.33						5×11 6.3	5×11 7.2	5×11 7.8							
0.47						5×11 10	5×11 11	5×11 12	6.3×11 12	6.3×11 12	6.3×11 12	6.3×11 12			
0.68						5×11 12	5×11 13	5×11 14	6.3×11 14	6.3×11 15	6.3×11 15	6.3×11 15			
1						5×11 13	5×11 15	5×11 16	6.3×11 14	6.3×11 15	6.3×11 17	6.3×11 18	6.3×11 19	6.3×11 14	6.3×11 13
2.2						5×11 18	5×11 19	5×11 21	6.3×11 20	6.3×11 24	6.3×11 27	8×11.5 29	8×11.5 30	8×11.5 25	8×11.5 22
3.3						5×11 30	5×11 33	5×11 34	6.3×11 35	6.3×11 36	6.3×11 37	8×11.5 38	10×12.5 41	10×12.5 35	10×16 32
4.7				5×11 25	5×11 27	5×11 37	5×11 39	5×11 40	6.3×11 41	6.3×11 43	8×11.5 45	8×11.5 45	10×12.5 46	10×16 42	10×16 40
6.8				5×11 31	5×11 33	5×11 44	5×11 48	5×11 49	8×11.5 52	8×11.5 54	8×11.5 56	10×16 62	10×16 65	10×20 59	10×20 55
10			5×11 35	5×11 37	5×11 40	5×11 54	5×11 59	5×11 59	8×11.5 60	8×11.5 62	10×16 74	10×20 79	10×20 86	10×20 76	12.5×20 72
22		5×11 48	5×11 53	5×11 56	5×11 67	5×11 79	5×11 87	6.3×11 100	10×16 111	10×16 113	10×20 127	12.5×20 150	10×25 157	12.5×25 136	16×25 132
33	5×11 52	5×11 56	5×11 60	5×11 75	5×11 80	5×11 97	6.3×11 122	8×11.5 144	10×20 156	10×20 158	12.5×20 184	12.5×25 189	16×20 210	12.5×30 189	16×31.5 178
47	5×11 61	5×11 66	5×11 77	5×11 80	5×11 101	6.3×11 133	6.3×11 146	8×15 189	10×20 202	12.5×20 220	12.5×25 238	16×20 246	16×25 280	16×31.5 240	18×31.5 200
68	5×11 69	5×11 83	5×11 92	5×11 113	6.3×11 138	6.3×11 156	8×11.5 207	10×16 264	12.5×20 274	12.5×25 288	16×20 300	16×31.5 348	16×35.5 384	18×35.5 349	
100	5×11 90	5×11 100	5×11 125	6.3×11 159	6.3×11 168	8×11.5 229	10×12.5 251	10×20 349	12.5×25 360	16×20 366	16×25 405	16×35.5 447	18×40 461	22×35 425	
220	5×11 153	5×11 170	6.3×11 213	6.3×11 238	8×11.5 294	10×12.5 395	10×16 474	12.5×20 572	16×25 656	16×31.5 684	18×40 730	22×45 780			
330	6.3×11 216	6.3×11 239	6.3×11 265	8×11.5 340	8×15 398	10×16 529	10×20 633	16×20 810	18×31.5 848	18×40 880	22×40 900				
470	6.3×11 258	6.3×11 286	8×11.5 366	8×15 447	10×16 547	10×20 690	12.5×20 886	16×25 1,072	22×35 1,130	22×40 1,156					
680	8×11.5 365	8×11.5 405	8×15 455	10×16 620	12.5×16 777	12.5×20 973	12.5×25 1,160	16×31.5 1,364	22×45 1,463						
1,000	8×11.5 443	8×15 542	10×16 680	10×20 821	12.5×20 1,023	12.5×25 1,287	16×25 1,565	18×40 2,020							
2,200	10×16 772	10×20 886	12.5×20 1,108	12.5×25 1,297	16×25 1,497	16×31.5 1,724	18×35.5 1,938								
3,300	10×20 1,032	12.5×20 1,205	12.5×25 1,389	16×25 1,646	16×31.5 1,808	18×35.5 2,260									
4,700	12.5×20 1,280	12.5×25 1,492	16×20 1,610	16×31.5 2,012	18×35.5 2,335										
6,800	12.5×25 1,554	16×25 1,824	16×31.5 2,081	18×35.5 2,452	18×40 2,642										
10,000	16×25 1,897	16×31.5 2,082	18×31.5 2,365	18×40 2,692											
15,000	16×35.5 2,344	← Case Size ØD×L(mm) ← Rated Ripple Current(mArms/105℃, 120Hz)													

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	60	120	300	1k	10k~
~6.8	0.65	1.00	1.35	1.75	2.30
10~68	0.75	1.00	1.25	1.50	1.75
100~1,000	0.80	1.00	1.15	1.30	1.40
2,200~15,000	0.85	1.00	1.03	1.05	1.08

* SMT Products are available upon request.
Please check with us about individual characteristics.

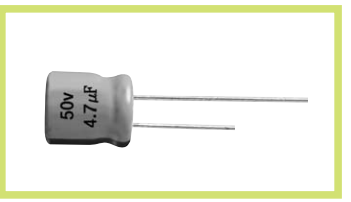
MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

GSA(SRA)-LL Series

- 85℃ 2,000Hrs assured.
- Non-solvent proof.
- Height 7mm.
- Low leakage current.
- For CAR-Audio
- RoHS compliant.
- Halogen-free capacitors are also available.

GSA → GSA(SRA)-LL

Low Leakage current



LL Series

- 85℃ 2,000Hrs assured.
- Non-solvent proof.
- Very low leakage current.
- For CAR-Audio
- RoHS compliant.
- Halogen-free capacitors are also available.

SHL → LL

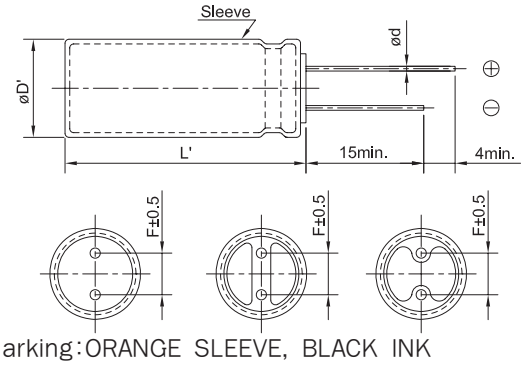
Low Leakage current

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current(Max.)	GSA(SRA)-LL Series : I=0.004V(μA) or 0.4μA, whichever is greater. LL Series : I=0.002CV(μA) or 0.2μA, whichever is greater. Where, I:Max. leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50~63 / 100 Tan δ(Max.): 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.10 / 0.07 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): GSA(SRA)-LL Series: — ; LL Series: 6.3 / 10 / 16 / 25 / 35~100 Z(-25℃)/Z(+20℃): 4 / 4 / 3 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 8 / 8 / 6 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF GSA(SRA)-LL Series

Unit(mm)

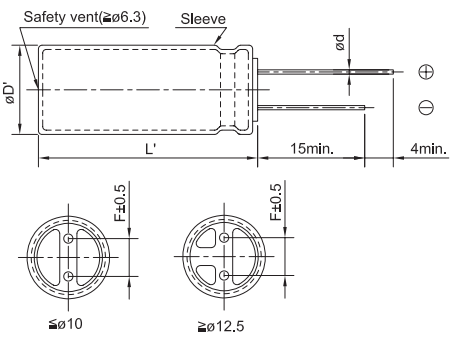


Marking:ORANGE SLEEVE, BLACK INK

ø D	4	5	6.3
ø d	0.45		
F	1.5	2.0	2.5
ø D′	ø D+0.5 max.		
L′	L+1.0 max.		

DIMENSIONS OF LL Series

Unit(mm)



Marking : ORANGE SLEEVE, BLACK INK.

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD′	øD+0.5 max.						
L′	L+1.5 max.			L+2.0 max.			

RATINGS OF GSA(SRA)-LL Series

μF \ VDC	6.3		10		16		25		35		50	
0.1					4×7	1.0					4×7	1.5
0.15					4×7	1.5					4×7	2.0
0.22					4×7	2.0					4×7	3.1
0.33					4×7	3.1					4×7	3.7
0.47					4×7	4.2					4×7	5.2
0.68					4×7	6.8					4×7	7.3
1					4×7	9.2					4×7	12
1.5					4×7	11					4×7	14
2.2					4×7	12					4×7	17
3.3					4×7	15	4×7	17	4×7	18	5×7	21
4.7					4×7	20	4×7	21	5×7	22	6.3×7	25
6.8					5×7	23	5×7	25	6.3×7	28	6.3×7	31
10			4×7	25	5×7	27	5×7	30	6.3×7	33	6.3×7	40
15	4×7	28	5×7	30	6.3×7	33	6.3×7	37	6.3×7	39		
22	5×7	33	5×7	37	6.3×7	42	6.3×7	45	6.3×7	49		
33	5×7	41	6.3×7	45	6.3×7	52	6.3×7	55				
47	6.3×7	49	6.3×7	55	6.3×7	62						
68	6.3×7	59	6.3×7	65								
100	6.3×7	73										

Rated Ripple Current (mArms/85℃, 120Hz)
Case Size ø D×L(mm)

RATINGS OF LL Series

μF \ VDC	6.3		10		16		25		35		50		63		100	
0.1											5×11	5			5×11	6
0.22											5×11	7			5×11	9
0.33											5×11	9			5×11	11
0.47											5×11	11			5×11	13
1											5×11	16			5×11	19
2.2											5×11	23			6.3×11	31
3.3											5×11	28			8×11.5	44
4.7							5×11	28	5×11	31	6.3×11	38			8×11.5	52
10					5×11	39	6.3×11	47	6.3×11	51	8×11.5	64	8×11.5	64	10×16	100
22			5×11	51	6.3×11	66	8×11.5	80	8×11.5	87	10×12.5	112	10×16	124	10×20	160
33			6.3×11	72	6.3×11	80	8×11.5	98	10×12.5	125	10×16	151	10×16	151	12.5×20	217
47			6.3×11	86	8×11.5	110	10×12.5	138	10×12.5	149	10×16	181	10×20	196	12.5×25	282
100			8×11.5	143	10×12.5	189	10×16	223	10×20	260	12.5×20	316	12.5×25	344	16×25	455
220	10×12.5	229	10×16	276	10×20	335	12.5×20	397	12.5×25	466	16×25	564	16×31.5	607	18×35.5	775
330	10×16	309	10×20	367	12.5×20	454	12.5×25	528	12.5×25	631	16×31.5	744	16×35.5	761	18×40	964
470	10×20	399	12.5×20	485	12.5×20	542	16×25	697	16×25	753	16×35.5	908	18×35.5	948		
1,000	12.5×25	702	12.5×25	769	16×25	951	18×35.5	1,120	16×25	1,262	18×40	1,404				
2,200	16×25	1,107	16×31.5	1,295	18×35.5	1,529	18×40	1,647								
3,300	16×35.5	1,438	16×35.5	1,554	18×40	1,804										
4,700	18×35.5	1,676	18×40	1,820												

Rated Ripple Current (mArms/85℃, 120Hz)
Case Size ø D×L(mm)

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

DSA(SRE)-BP Series

• 85℃ 1,000Hrs assured.

- Non-solvent proof.
- Height 5mm.
- Bi-polarized
- For CAR-Audio
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

DSA → DSA-BP

Bi-polarized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	4 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current (In both directions)	I=0.06CV or 10μA, whichever is greater Where, I:Max.Leakage current(μA), C:Nominal capacitance(μF), V:rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated Voltage(V_{DC}): 4 / 6.3 / 10 / 16 / 25 / 35~50 Tanδ(Max.): 0.35 / 0.24 / 0.20 / 0.17 / 0.17 / 0.15 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 4 / 6.3 / 10 / 16 / 25 / 35~50 Z(-25℃)/Z(20℃): 7 / 4 / 3 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 15 / 10 / 8 / 6 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 1,000 hours at 85℃. During this test, the rated voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 85℃, without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tan δ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATINGS OF DSA(SRE)-BP Series

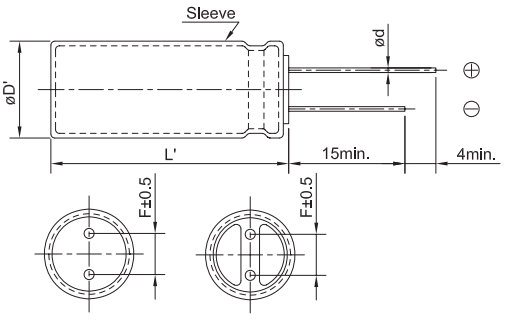
Vdc / μF	4		6.3		10		16		25		35		50	
0.1													3.5×5	1.3
0.15													3.5×5	1.9
0.22													3.5×5	2.3
0.33													3.5×5	2.8
0.47													3.5×5	3.4
0.68													3.5×5	4.1
1											3.5×5	5.0	3.5×5	5.5
1.5									3.5×5	5.7	3.5×5	6.7	4×5	7.5
2.2							3.5×5	7.0	3.5×5	8.0	4×5	9.1	5×5	10
3.3					3.5×5	7.8	3.5×5	9.0	4×5	10	5×5	12	5×5	13
4.7			3.5×5	8.6	3.5×5	10	4×5	12	5×5	14	5×5	15	6.3×5	16
6.8	3.5×5	8.5	3.5×5	11	4×5	14	5×5	17	5×5	18	6.3×5	20	6.3×5	20
10	3.5×5	11	4×5	15	4×5	19	5×5	21	6.3×5	22	6.3×5	24		
15	4×5	15	5×5	22	5×5	23	6.3×5	27	6.3×5	28				
22	5×5	22	5×5	26	5×5	31	6.3×5	33						
33	6.3×5	28	6.3×5	36	6.3×5	38								
47	6.3×5	34	6.3×5	41										

Rated Ripple Current (mArms/85℃, 120Hz)

Case Size ø D×L(mm)

DIMENSIONS OF DSA(SRE)-BP Series

Unit(mm)



Marking:BLACK SLEEVE, WHITE INK

ø D	3.5	4	5	6.3
ø d	0.4	0.45	0.45	0.45
F	1.0	1.5	2.0	2.5
ø D'	ø D+0.5 max.			
L'	L +1.0 max.			

GSA-BP Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- Height 7mm.
- Bi-polarized
- Downsized of SRA-BP series.
- For CAR-Audio, VCR
- RoHS compliant.
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current (In both directions)	I=0.06CV(μA) or 10μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor(Tanδ)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.24 / 0.20 / 0.17 / 0.16 / 0.15 / 0.14 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35~50 Z(-25℃)/Z(20℃): 4 / 3 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 10 / 8 / 6 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated is voltage for 2,000 hours at 85℃. During the test, the rated voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

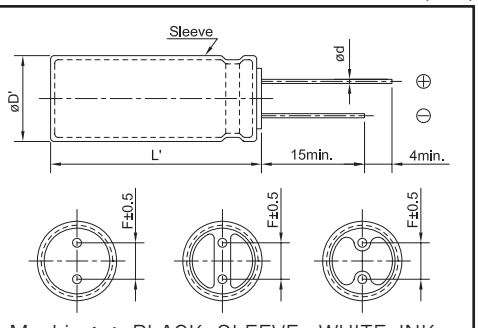
RATINGS OF GSA-BP Series

μF \ V_{DC}	6.3		10		16		25		35		50	
0.1											4×7	2.1
0.22											4×7	4.5
0.33											4×7	5.6
0.47											4×7	6.6
1											4×7	9.7
2.2									4×7	13	4×7	14
3.3							4×7	15	4×7	15	4×7	17
4.7					4×7	18	4×7	18	5×7	20	5×7	21
10			4×7	23	4×7	25	5×7	27	6.3×7	33	6.3×7	35
22	4×7	31	4×7	35	5×7	39	6.3×7	44				
33	5×7	40	5×7	48	6.3×7	49						
47	6.3×7	49	6.3×7	53								

Rated Ripple Current(mArms/85℃, 120Hz)
Case Size øD×L(mm)

DIMENSIONS OF GSA-BP Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

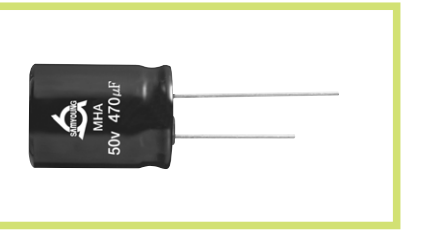
ø D	4	5	6.3
ø d	0.45		
F	1.5	2.0	2.5
ø D′	ø D+0.5max.		
L′	L+1.0max.		

MHA-BP Series

• 85℃ 2,000Hrs assured

- Non-solvent proof.
- Bi-polarized
- Downsized of SHL-BP series.
- For Digital Household Appliances
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

SHL-BP → MHA-BP
Downsized



SPECIFICATIONS

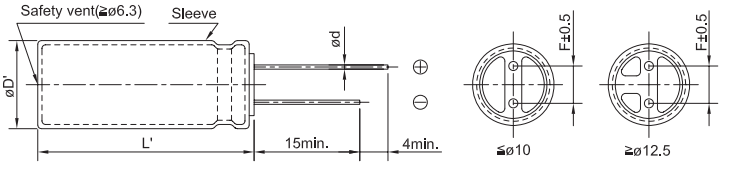
Item	Characteristics	
Rated Voltage Range	6.3 ~ 100 VDC	160 ~ 250 VDC
Operating Temperature Range	-40 ~ +85℃	-25 ~ +85℃
Capacitance Tolerance	±20% (M)	(at 20℃, 120Hz)
Leakage Current (In both directions)	I=0.03CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)	
Dissipation Factor (Tanδ)	See table below When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	See table below (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. During this test, the rated voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 85℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

Rated Voltage(VDC)	6.3	10	16~25	35	50	63~100	160	200~250
Tanδ(Max.)	0.25	0.24	0.20	0.16	0.14	0.12	0.15	0.20

Rated Voltage(VDC)	6.3	10	16	25~100	160	160~250
Z(-25℃)/Z(20℃)	4	3	2	2	4	6
Z(-40℃)/Z(20℃)	10	8	6	4	-	-

DIMENSIONS OF MHA-BP Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18	22
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0
øD'	øD+0.5 max.							
L'	L+1.5 max.			L+2.0 max.				

RATINGS OF MHA-BP Series

μF \ VDC	6.3		10		16		25		35		50	
10									5×11	50	5×11	52
22							5×11	66	6.3×11	71	6.3×11	89
33							6.3×11	90	6.3×11	104	8×11.5	124
47			5×11	86	5×11	89	6.3×11	107	8×11.5	142	10×12.5	174
100	5×11	126	6.3×11	144	6.3×11	148	8×11.5	179	10×12.5	244	10×16	284
220	6.3×11	213	8×11.5	244	10×12.5	295	10×16	345	10×20	432	12.5×20	500
330	8×11.5	298	10×12.5	352	10×16	399	10×20	458	12.5×20	543	16×20	666
470	10×12.5	420	10×16	463	10×20	515	12.5×20	606	12.5×25	704	16×25	877
1,000	10×20	732	12.5×20	791	12.5×25	882	16×20	961	16×31.5	1,223	18×35.5	1,409
2,200	12.5×25	1,291	16×20	1,275	16×31.5	1,557	18×31.5	1,699	18×40	1,838		
3,300	16×20	1,581	16×31.5	1,859	18×35.5	2,034	18×40	2,122				
4,700	16×31.5	2,219	18×31.5	2,290								
6,800	18×31.5	2,754	18×40	2,890								

μF \ VDC	63		100		160		200		250	
3.3			5×11	35					10×12.5	48
4.7	5×11	40	6.3×11	48			10×12.5	58	10×16	65
10	6.3×11	63	8×11.5	80	10×16	104	10×20	96	12.5×20	107
22	8×11.5	106	10×12.5	140	12.5×20	185	12.5×25	180	16×20	190
33	8×11.5	137	10×16	189	12.5×25	247	16×20	239	16×25	257
47	10×12.5	183	10×20	244	16×25	325	16×25	325	18×31.5	324
100	10×20	327	12.5×25	430	18×31.5	450	18×40	496		
220	12.5×25	585	16×31.5	759						
330	16×25	791	18×35.5	934						
470	16×31.5	992								
1,000	18×40	1,431								

Rated Ripple Current(mArms/85℃, 120Hz)
Case Size ØD×L(mm)

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NHA-BP Series

• 105℃ 1,000Hrs assured

Solvent-proof

WV≦100VDC

- Bi-polarized
- Downsized of KMG-BP series.
- For Digital Household Appliances
- RoHS compliant.
- Halogen-free capacitors are also available.

KMG-BP → NHA-BP

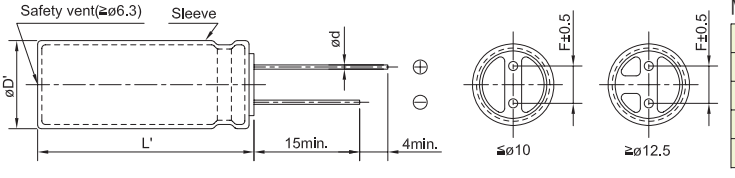
Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	6.3 ~ 100 VDC	160 ~ 250 VDC
Operating Temperature Range	-55 ~ +105℃	-40 ~ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)	
Leakage Current (In both directions)	I=0.03CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)	
Dissipation Factor (Tanδ)	Rated Voltage(VDC): 6.3 / 10 / 16~25 / 35 / 50 / 63~100 / 160 / 200~250 Tanδ(Max.): 0.25 / 0.24 / 0.20 / 0.16 / 0.14 / 0.12 / 0.15 / 0.20 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 6.3 / 10 / 16 / 25~100 / 160~250 Z(-25℃)/Z(20℃): 4 / 3 / 2 / 2 / 3 Z(-40℃)/Z(20℃): 8 / 6 / 4 / 3 / 4 (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 1,000 hours at 105℃. During this test, the rated voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 150% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value (where, ±25% for ≦ 16 VDC) Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NHA-BP Series

Unit(mm)



Marking : BROWN SLEEVE, WHITE INK

øD	5	6.3	8	10	12.5	16	18	22
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0
øD'	øD+0.5 max.							
L'	L+1.5 max.			L+2.0 max.				

RATINGS OF NHA-BP Series

μF \ VDC	6.3		10		16		25		35		50	
10									5×11	33	5×11	37
22							5×11	47	6.3×11	55	6.3×11	63
33							6.3×11	66	6.3×11	68	8×11.5	88
47			5×11	57	5×11	64	6.3×11	78	8×11.5	93	10×12.5	123
100	5×11	79	6.3×11	94	6.3×11	107	8×11.5	131	10×12.5	159	10×16	198
220	6.3×11	134	8×11.5	160	10×12.5	215	10×16	252	10×20	283	12.5×20	354
330	8×11.5	188	10×12.5	231	10×16	290	10×20	335	12.5×20	371	16×20	471
470	10×12.5	264	10×16	304	10×20	375	12.5×20	429	12.5×25	481	16×25	620
1,000	10×20	460	12.5×20	533	12.5×25	623	16×20	679	16×31.5	836	18×35.5	996
2,200	12.5×25	823	16×20	859	16×31.5	1,101	18×31.5	1,238	18×40	1,342		
3,300	16×20	1,008	16×31.5	1,253	18×35.5	1,438	18×40	1,592				
4,700	16×31.5	1,432	18×31.5	1,544								
6,800	18×31.5	1,778	18×40	1,949								

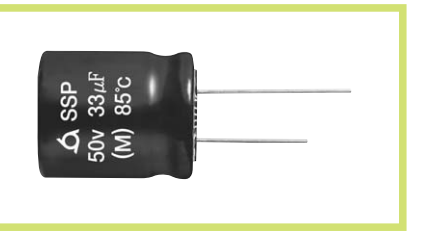
μF \ VDC	63		100		160		200		250	
3.3			5×11	25					10×12.5	34
4.7	5×11	28	6.3×11	34			10×12.5	41	10×16	45
10	6.3×11	47	8×11.5	57	10×16	66	10×20	71	12.5×20	79
22	8×11.5	79	10×12.5	99	12.5×20	117	12.5×25	125	16×20	127
33	8×11.5	97	10×16	134	12.5×25	154	16×20	156	16×25	172
47	10×12.5	136	10×20	173	16×25	206	16×25	206	18×31.5	229
100	10×20	238	12.5×25	304	18×31.5	334	18×40	350		
220	12.5×25	403	16×31.5	537						
330	16×25	545	18×35.5	661						
470	16×31.5	702								
1,000	18×40	1,108								

Rated Ripple Current(mArms/105℃, 120Hz)
Case Size ø D×L(mm)

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

SSP Series

• 85℃ 2,000Hrs assured.



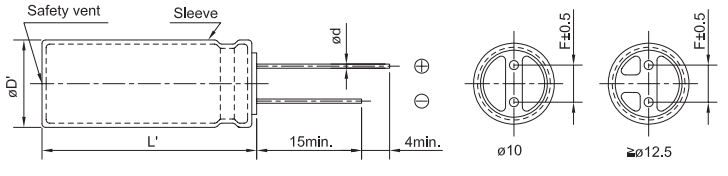
- Non-solvent proof.
- Bi-polarized.
- For Speaker Cross-Over Network.
- RoHS compliant.
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	25 ~ 63 VDC
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20% (M) (at 1kHz, 20℃)
Leakage Current (In both directions)	After 1 minute: I=0.06CV(μA) or 10 μA, whichever is greater After 5 minutes: I=0.03CV(μA) or 3 μA, whichever is greater Where, I:MAX.Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃)
Dissipation Factor(Tanδ)	Rated Voltage(VDC): 25 / 50 / 63 Tanδ(Max.): 0.12 / 0.10 / 0.09 0.20 at 10kHz (Applicable to the capacitances of 10μF or less) (at 1kHz, 20℃)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 25 / 50 / 63 Z(-25℃)/Z(20℃): 2 / 2 / 2 Z(-40℃)/Z(20℃): 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after rated DC voltage is applied for 2,000 hours at 85℃. During this test, the rated DC voltage shall be reversed on the capacitor every 250 hours. Capacitance change ≦ ±15% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for 1,000 hours without voltage applied. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% The of initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF SSP Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

øD	10	12.5	16
ød	0.6	0.6	0.8
F	5.0	5.0	7.5
øD'	øD+0.5 max.		
L'	L+2.0 max.		

RATINGS OF SSP Series

μF \ VDC	25	50	63
1			10×12.5
1.5			10×12.5
2.2			10×12.5
3.3			10×12.5
4.7		10×12.5	10×16
6.8	10×12.5	10×16	10×20
10	10×16	10×16	12.5×20
15	10×16	10×20	12.5×20
22	10×20	10×20	12.5×25
33	10×20	12.5×20	16×25
47	10×20	12.5×20	16×25
68	12.5×20	12.5×25	16×31.5
100	12.5×25	16×25	16×35.5

Case Size ø D×L(mm)

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

KSA Series

• 105℃ 1,000Hrs assured.

- Bi-polarized.
- High ripple capability.
- For Horizontal Deflection Circuit, CRT TV/MT
- RoHS compliant.
- Halogen-free capacitors are also available.

Solvent-proof

SSA → KSA

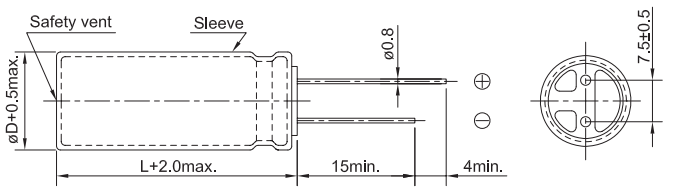
Wide temp.

SPECIFICATIONS

Item	Characteristics					
Rated Voltage Range	25, 50 VDC					
Operating Temperature Range	-55 ~ +105℃					
Nominal Capacitance	2.2(μF)	3.3(μF)	4.7(μF)	6.8(μF)	8.2(μF)	10(μF)
Case size øD×L (mm)	16×25	16×31.5	16×35.5	16×35.5	16×35.5	16×35.5
Permissible Ripple Current(Ap-p)	3.4	4.1	4.5	4.6	4.9	5.4
	(at max. operating temperature, 15.75kHz)					
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)					
Leakage Current(in both directions)	100μA max. (at 20℃, 3 minutes)					
Dissipation Factor(Tanδ)	0.05 max. (at 20℃, 120Hz)					
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC)	25	50	(at 120Hz)		
	Z(-25℃)/Z(20℃)	2	2			
	Z(-40℃)/Z(20℃)	4	3			
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the specified ripple current (ACpp Voltage + applied DC voltage≦WV) applied for 1,000 hours at 105℃. Capacitance change ≦ ±15% of the initial value Tan δ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value					
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours. at 105℃ without voltage and ripple current applied. Capacitance change ≦ ±15% of the initial value Tan δ ≦ 200% of the initial specified value Leakage current ≦ 200% of the initial specified value					
Others	Satisfied characteristics KS C IEC 60384-4					

DIMENSIONS OF KSA Series

Unit(mm)



Marking : BROWN SLEEVE, WHITE INK

※ $I_R(rms) = \frac{I_R(p\text{-}p)}{2\sqrt{3}}$

$I_R(p\text{-}p)$ is peak-to-peak value at specifications.
$I_R(rms)$ is effective current value.

EXB Series

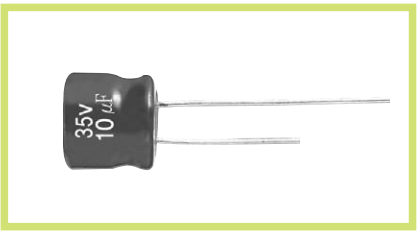
• 105℃ 2,000Hrs assured.

Solvent-proof

- Ultra Low Impedance, Long Life
- Height 5mm.
- For LCD/PDP TV PSU, DVD Driver
- RoHS compliant.
- Halogen-free capacitors are also available.

EXA → EXB

Low Imp. Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 VDC
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 6.3 / 10 / 16 / 25 / 35 Tanδ(Max.): 0.22 / 0.20 / 0.18 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 6.3 / 10 / 16 / 25 / 35 Z(-25℃)/Z(20℃): 3 / 3 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 9 / 7 / 5 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

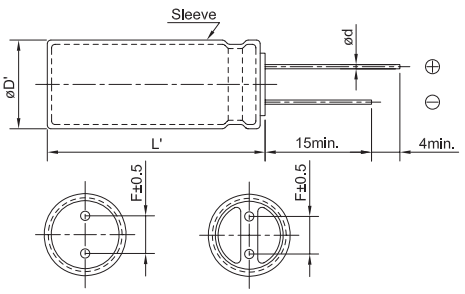
RATINGS OF EXB Series

μF \ VDC	6.3			10			16			25			35		
1													5×5	3.0	80
1.5													5×5	3.0	80
2.2													5×5	3.0	80
3.3													5×5	3.0	80
4.7													5×5	3.0	80
6.8													5×5	3.0	80
10										5×5	1.6	100	5×5	1.6	100
15							5×5	1.6	100	5×5	1.6	100	5×5	1.6	100
22							5×5	1.6	100	5×5	1.6	100	6.3×5	0.8	140
33	5×5	1.6	100	5×5	1.6	100	5×5	1.6	100	6.3×5	0.8	140	6.3×5	0.8	140
47	5×5	1.6	100	5×5	1.6	100	6.3×5	0.8	140	6.3×5	0.8	140			
68	6.3×5	0.8	140	6.3×5	0.8	140	6.3×5	0.8	140						
100	6.3×5	0.8	140	6.3×5	0.8	140									

Rated Ripple Current(mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case Size øD×L(mm)

DIMENSIONS OF EXB Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3
ød	0.45	
F	2.0	2.5
øD'	øD+0.5max	
L'	L+1.0max	

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
1~100	0.40	0.75	0.90	1.00

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

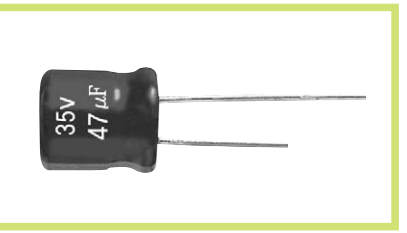
HXB Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Ultra Low Impedance, Long Life
- Height 7mm.
- For LCD/PDP TV PSU, DVD Driver
- RoHS compliant.
- Halogen-free capacitors are also available.

HXA → HXB

Low Imp. Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(20℃): 2 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 6 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATINGS OF HXB Series

VDC / μF	6			10			16			25			35			50		
2.2																5X7	1.15	120
4.7																5X7	0.70	165
10																6.3X7	0.35	260
22													5X7	0.70	165	6.3X7	0.35	260
33	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	6.3X7	0.35	260	8X7	0.17	450
47	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	6.3X7	0.35	260	8X7	0.17	450	8X7	0.17	450
68	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450			
100	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450						
150	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450									
220	8X7	0.17	450	8X7	0.17	450												
330	8X7	0.17	450															

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case Size øD×L(mm)

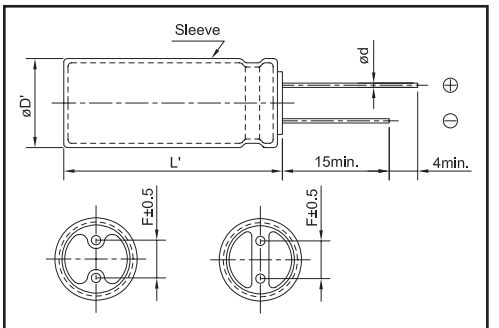
RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
2.2~180	0.40	0.75	0.90	1.00
220~330	0.50	0.85	0.94	1.00

DIMENSIONS OF HXB Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8
ød	0.45		
F	2.0	2.5	3.5
øD′	øD+0.5max		
L′	L+1.0max		

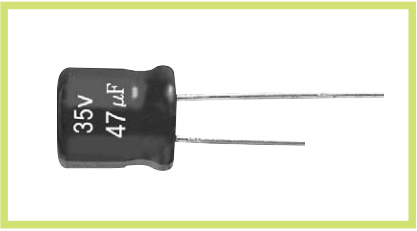
HXL Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof.
- Ultra Low Impedance, Long Life
- Height 7mm.
- For LCD/PDP TV PSU, DVD Driver
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

HXB → HXL

Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 VDC
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor(Tanδ)	Rated voltage(VDC): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 6.3 / 10 / 16 / 25~50 Z(-25℃)/Z(20℃): 2 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 6 / 4 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IFC 60384-4

RATINGS OF HXL Series

μF \ VDC	6.3			10			16			25			35			50		
2.2																5X7	1.15	120
10																6.3X7	0.35	260
22													5X7	0.70	165	6.3X7	0.35	260
33	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	6.3X7	0.35	260	8X7	0.17	450
47	5X7	0.70	165	5X7	0.70	165	5X7	0.70	165	6.3X7	0.35	260	8X7	0.17	450	8X7	0.17	450
68	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450			
100	6.3X7	0.35	260	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450						
150	6.3X7	0.35	260	6.3X7	0.35	260	8X7	0.17	450									
220	8X7	0.17	450	8X7	0.17	450												
330	8X7	0.17	450															

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case Size øD×L(mm)

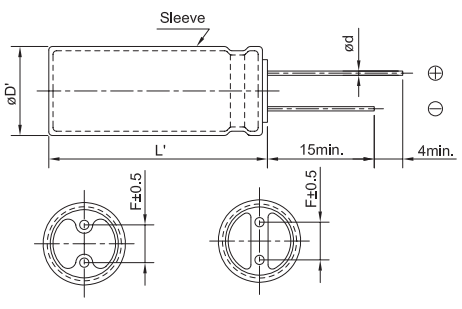
RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
2.2~180	0.40	0.75	0.90	1.00
220~330	0.50	0.85	0.94	1.00

DIMENSIONS OF HXL Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8
ød	0.45		
F	2.0	2.5	3.5
øD'	øD+0.5max		
L'	L+1.0max		

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NXL(LXV) Series

• 105℃ 2,000~5,000Hrs assured.

Solvent-proof

- Low impedance.
- For SMPS, IP-Board, Adaptor
- RoHS compliant.
- Halogen-free capacitors are also available.

KXL → NXL (LXV)

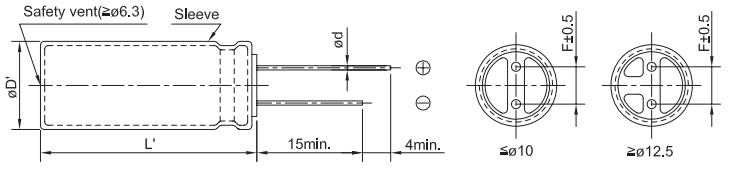
Low Imp. Long life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 3μA, whichever is greater. Where, I: Max.Leakage current(μA) C: Nominal capacitance (μF) V: Rated voltage (V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 100 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.08 / 0.07 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10~100 Capacitance change(Max.) : △C(-55℃)/C(20℃): 30% Impedance ratio(Max.) : Z(-55℃)/Z(20℃): 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the specified period of time. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value ØD: Life Time — Ø5, 6.3: 2,000 hours; Ø8, 10: 3,000 hours; Ø12.5~: 5,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXL(LXV) Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF NXL(LXV) Series

WVDC / μF	6.3			WVDC / μF	10			WVDC / μF	16		
	ø D×L(mm)	IMP.	Ripple		ø D×L(mm)	IMP.	Ripple		ø D×L(mm)	IMP.	Ripple
120	5×11	0.72	165	82	5×11	0.72	165	56	5×11	0.72	165
220	6.3×11	0.38	255	180	6.3×11	0.38	255	120	6.3×11	0.38	255
330	6.3×15	0.27	330	270	6.3×15	0.27	330	180	6.3×15	0.27	330
330	8×11.5	0.19	485	270	8×11.5	0.19	485	180	8×11.5	0.19	485
470	10×12.5	0.12	625	470	8×11.5	0.27	330	270	10×12.5	0.12	625
560	8×15	0.16	495	470	8×15	0.16	495	330	8×15	0.16	495
680	10×16	0.084	825	680	8×20	0.11	640	470	8×20	0.11	640
820	8×20	0.110	640	680	10×16	0.084	825	470	10×16	0.084	825
1,200	10×20	0.062	1,040	1,000	10×20	0.062	1,040	680	10×20	0.062	1,040
1,500	10×25	0.052	1,260	1,200	10×25	0.052	1,260	820	10×25	0.052	1,260
2,200	10×30	0.044	1,440	1,500	10×30	0.044	1,440	1,200	10×30	0.044	1,440
2,200	12.5×20	0.046	1,340	1,800	12.5×20	0.046	1,340	1,200	12.5×20	0.046	1,340
2,700	12.5×25	0.034	1,690	2,200	12.5×25	0.034	1,690	1,500	12.5×25	0.034	1,690
3,900	12.5×30	0.030	1,950	2,700	12.5×30	0.030	1,950	2,200	12.5×30	0.030	1,950
3,900	16×20	0.039	1,630	3,300	12.5×35	0.027	2,200	2,200	16×20	0.039	1,630
4,700	12.5×35	0.027	2,200	3,300	16×20	0.039	1,630	2,700	12.5×35	0.027	2,200
5,600	12.5×42.5	0.024	2,390	3,900	12.5×42.5	0.024	2,390	2,700	16×25	0.029	2,070
5,600	16×25	0.029	2,070	3,900	16×25	0.029	2,070	3,300	12.5×42.5	0.024	2,390
5,600	18×20	0.038	1,750	3,900	18×20	0.038	1,750	3,300	18×20	0.038	1,750
6,800	16×31.5	0.026	2,350	5,600	16×31.5	0.026	2,350	3,900	16×31.5	0.026	2,350
6,800	18×25	0.029	2,130	5,600	18×25	0.029	2,130	3,900	18×25	0.029	2,130
8,200	16×35.5	0.023	2,550	6,800	16×35.5	0.023	2,550	4,700	16×35.5	0.023	2,550
10,000	18×31.5	0.026	2,410	6,800	18×31.5	0.026	2,410	5,600	18×31.5	0.026	2,410
12,000	18×35.5	0.023	2,660	8,200	18×35.5	0.023	2,660	6,800	18×35.5	0.023	2,660
15,000	18×40	0.019	3,010	10,000	18×40	0.019	3,010	8,200	18×40	0.019	3,010

WVDC / μF	25			WVDC / μF	35			WVDC / μF	50		
	ø D×L(mm)	IMP.	Ripple		ø D×L(mm)	IMP.	Ripple		ø D×L(mm)	IMP.	Ripple
								4.7	5×11	3.0	100
								10	5×11	1.4	124
39	5×11	0.72	165	27	5×11	0.72	165	18	5×11	1.1	130
47	5×11	0.72	194	47	6.3×11	0.50	233	22	6.3×11	0.91	180
82	6.3×11	0.38	255	56	6.3×11	0.38	255	39	6.3×11	0.56	220
100	6.3×11	0.35	280	68	6.3×11	0.38	255	47	6.3×11	0.56	300
120	6.3×15	0.27	330	82	6.3×15	0.27	330	56	6.3×15	0.41	310
120	8×11.5	0.19	485	82	8×11.5	0.19	485	56	8×11.5	0.33	368
180	10×12.5	0.12	625	120	10×12.5	0.12	625	82	8×15	0.25	470
220	8×15	0.16	495	180	8×15	0.16	495	82	10×12.5	0.16	480
330	8×20	0.11	640	220	8×20	0.11	640	120	8×20	0.18	610
330	10×16	0.084	825	220	10×16	0.084	825	120	10×16	0.12	755
470	10×20	0.062	1,150	330	10×20	0.062	1,040	180	10×20	0.088	945
560	10×25	0.052	1,260	390	10×25	0.052	1,260	220	10×25	0.068	1,150
820	10×30	0.044	1,440	560	10×30	0.044	1,440	330	10×30	0.059	1,260
820	12.5×20	0.046	1,340	560	12.5×20	0.046	1,340	330	12.5×20	0.059	1,190
1,000	12.5×25	0.034	1,690	680	12.5×25	0.034	1,690	470	12.5×25	0.045	1,490
1,500	12.5×30	0.030	1,950	1,000	12.5×25	0.040	1,690	560	12.5×30	0.039	1,720
1,500	16×20	0.039	1,630	1,000	12.5×30	0.030	1,950	680	12.5×35	0.038	1,890
1,800	12.5×35	0.027	2,200	1,200	12.5×35	0.027	2,200	680	16×20	0.044	1,420
1,800	16×25	0.029	2,070	1,200	16×25	0.029	2,070	820	12.5×42.5	0.029	2,030
2,200	12.5×42.5	0.024	2,390	1,500	12.5×42.5	0.024	2,390	820	16×25	0.034	1,880
2,200	18×20	0.038	1,750	1,500	18×20	0.038	1,750	820	18×20	0.041	1,520
2,700	16×31.5	0.026	2,350	1,800	16×31.5	0.026	2,350	1,000	16×31.5	0.030	2,150
2,700	18×25	0.029	2,130	1,800	18×25	0.029	2,130	1,000	18×25	0.032	1,930
3,300	16×35.5	0.023	2,550	2,200	16×35.5	0.023	2,550	1,200	16×35.5	0.026	2,320
3,300	18×31.5	0.026	2,410	2,200	18×31.5	0.026	2,410	1,500	18×31.5	0.028	2,200
3,900	18×35.5	0.023	2,660	2,700	18×35.5	0.023	2,660	1,800	18×35.5	0.025	2,400
4,700	18×40	0.019	3,010	3,300	18×40	0.019	3,010	2,200	18×40	0.022	2,610

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Case Size

RATINGS OF NXL(LXV) Series

μF \ VDC	63			100		
	ø D×L(mm)	IMP.	Ripple	ø D×L(mm)	IMP.	Ripple
0.47	5×11	65.3	38	5×11	31.2	38
0.68	5×11	47.2	45	5×11	22.1	45
1	5×11	31.5	53	5×11	14.7	53
1.5	5×11	22.4	65	5×11	9.80	65
2.2	5×11	15.2	78	5×11	5.40	78
3.3	5×11	11.1	98	5×11	4.60	98
4.7	5×11	10.8	115	5×11	3.90	115
6.8	5×11	4.30	120	6.3×11	3.20	128
10	5×11	2.90	134	6.3×11	1.70	154
15	6.3×11	2.70	188	8×11.5	1.20	222
22	6.3×11	1.36	228	8×11.5	0.82	270
33	8×11.5	0.66	330	10×12.5	0.41	384
47	10×12.5	0.58	327	10×16	0.37	400
68	10×16	0.36	431	10×20	0.27	470
100	10×20	0.29	570	12.5×20	0.27	670
150	10×25	0.20	765	12.5×25	0.21	894
220	12.5×20	0.16	994	16×25	0.17	1,201
330	12.5×25	0.10	1,327	16×31.5	0.11	1,471
470	16×31.5	0.091	1,518	16×35.5	0.091	1,681
680	16×35.5	0.065	2,060	18×40	0.072	2,122
1,000	16×35.5	0.049	2,250	18×40	0.051	2,897

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Rated Voltage (VDC)	øD (mm)	Freq.(Hz)			
		120	1k	10k	100k
6.3～10	ø5～ø8	0.65	0.83	0.95	1.00
	ø10～ø12.5	0.70	0.85	0.96	1.00
	ø16～ø18	0.85	0.92	0.97	1.00
16～25	ø5～ø8	0.55	0.76	0.91	1.00
	ø10～ø12.5	0.65	0.83	0.93	1.00
	ø16～ø18	0.70	0.87	0.96	1.00
35～50	ø5～ø8	0.40	0.66	0.85	1.00
	ø10～ø12.5	0.50	0.73	0.89	1.00
	ø16～ø18	0.60	0.81	0.94	1.00
63～100	ø5～ø8	0.20	0.55	0.80	1.00
	ø10～ø12.5	0.35	0.65	0.85	1.00
	ø16～ø18	0.50	0.75	0.90	1.00

NXP(LXZ) Series

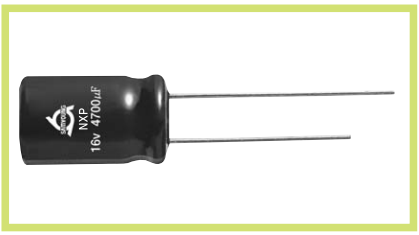
• 105℃ 2,000 ~ 5,000Hrs assured.

Solvent-proof

- Low impedance.
- Downsized of LXV series.
- For SMPS, IP-Board, Adaptor
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXL → NXP (LXZ)

Low Imp.
Downsized

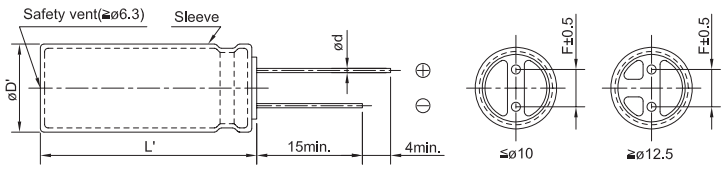


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 0.01CV (μA) or 3μA, whichever is greater. Where, I:Max. leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 / 50 TANδ(Max.) 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the specified period of time. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value ø5, 6.3: 2,000 hours; ø8: 3,000 hours; ø10~: 5,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXP(LXZ) Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD′	øD+0.5 max.						
L′	L+1.5 max.			L+2.0 max.			

RATED RIPPLE CURRENT MULTIPLIERS

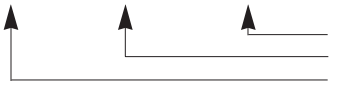
Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
33 ~ 180	0.40	0.75	0.90	1.00
220 ~ 560	0.50	0.85	0.94	1.00
680 ~ 1,800	0.60	0.87	0.95	1.00
2,200 ~ 3,900	0.75	0.90	0.95	1.00
4,700 ~ 18,000	0.85	0.95	0.98	1.00

RATINGS OF NXP(LXZ) Series

Vdc / øD×L(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	150	0.50	175	100	0.50	175	47	0.50	175
6.3×11	330	0.25	290	220	0.25	290	100	0.25	290
6.3×15	470	0.18	400	330	0.18	400	220	0.18	400
8×11.5	680	0.12	555	470	0.12	555	330	0.12	555
8×15	1,000	0.090	730	680	0.090	730	470	0.090	730
8×20	1,200	0.080	810	1,000	0.080	810	560	0.080	810
10×12.5	820	0.090	760	680	0.090	760	470	0.090	760
10×16	1,200	0.068	1,050	1,000	0.068	1,050	680	0.068	1,050
10×20	1,500	0.052	1,220	1,200	0.052	1,220	1,000	0.052	1,220
10×25	2,200	0.045	1,440	1,500	0.045	1,440	1,200	0.045	1,440
10×30	2,700	0.037	1,690	1,800	0.037	1,690	1,500	0.037	1,690
12.5×20	3,300	0.038	1,660	2,200	0.038	1,660	1,500	0.038	1,660
12.5×25	3,900	0.030	1,950	3,300	0.030	1,950	2,200	0.030	1,950
12.5×30	4,700	0.025	2,310	3,900	0.025	2,310	2,700	0.025	2,310
12.5×35	5,600	0.022	2,510	4,700	0.022	2,510	3,300	0.022	2,510
12.5×42.5	6,800	0.019	2,870	5,600	0.019	2,870	3,900	0.019	2,870
16×20	5,600	0.031	2,210	3,900	0.031	2,210	2,700	0.031	2,210
16×25	6,800	0.024	2,560	5,600	0.024	2,560	3,900	0.024	2,560
16×31.5	8,200	0.021	3,010	6,800	0.021	3,010	4,700	0.021	3,010
16×35.5	10,000	0.019	3,150	8,200	0.019	3,150	5,600	0.019	3,150
18×20	6,800	0.031	2,490	5,600	0.031	2,490	3,900	0.031	2,490
18×25	10,000	0.023	2,740	6,800	0.023	2,740	4,700	0.023	2,740
18×31.5	12,000	0.021	3,330	8,200	0.021	3,330	5,600	0.021	3,330
18×35.5	15,000	0.019	3,680	10,000	0.019	3,680	8,200	0.019	3,680
18×40	18,000	0.018	3,800	12,000	0.018	3,800	10,000	0.018	3,800

Vdc / øD×L(mm)	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	47	0.50	175	33	0.50	175	22	0.70	155
6.3×11	82	0.30	260	47	0.25	265	33	0.45	170
6.3×11	100	0.25	290	56	0.25	290	47	0.45	180
6.3×15	150	0.18	400	100	0.18	400	68	0.31	360
8×11.5	220	0.12	555	150	0.12	555	100	0.18	485
8×15	330	0.090	730	220	0.090	730	120	0.16	635
8×20	390	0.080	810	270	0.080	810	180	0.12	730
10×12.5	330	0.090	760	220	0.090	760	120	0.16	620
10×16	470	0.068	1,050	330	0.068	1,050	180	0.13	850
10×20	680	0.052	1,220	470	0.052	1,220	220	0.088	1,050
10×25	820	0.045	1,440	560	0.045	1,440	330	0.073	1,250
10×30	1,000	0.037	1,690	680	0.037	1,690	390	0.054	1,500
12.5×20	1,000	0.038	1,660	680	0.038	1,660	390	0.059	1,480
12.5×25	1,500	0.030	1,950	1,000	0.030	1,950	560	0.044	1,840
12.5×30	1,800	0.025	2,310	1,200	0.025	2,310	680	0.039	2,220
12.5×35	2,200	0.022	2,510	1,500	0.022	2,510	820	0.033	2,290
12.5×42.5	2,700	0.019	2,870	1,800	0.019	2,870	1,000	0.029	2,500
16×20	1,800	0.031	2,210	1,200	0.031	2,210	680	0.048	1,840
16×25	2,700	0.024	2,560	1,800	0.024	2,560	1,000	0.034	2,240
16×31.5	3,300	0.021	3,010	2,200	0.021	3,010	1,200	0.028	2,700
16×35.5	3,900	0.019	3,150	2,700	0.019	3,150	1,500	0.026	2,800
18×20	2,200	0.031	2,490	1,800	0.031	2,490	820	0.042	1,980
18×25	3,300	0.023	2,740	2,200	0.023	2,740	1,200	0.029	2,610
18×31.5	3,900	0.021	3,330	2,700	0.021	3,330	1,800	0.027	2,750
18×35.5	4,700	0.019	3,680	3,300	0.019	3,680	2,200	0.025	2,900
18×40	5,600	0.018	3,800	3,900	0.018	3,800	2,700	0.022	3,200



NXA Series

• 105℃ 4,000 ~ 10,000Hrs assured.

- Non-solvent proof.
- Low impedance, long life
- For SMPS, IP-Board, Adaptor, Noise Filter, Charger
- RoHS compliant.
- Halogen-free capacitors are also available.

SHL → NXA

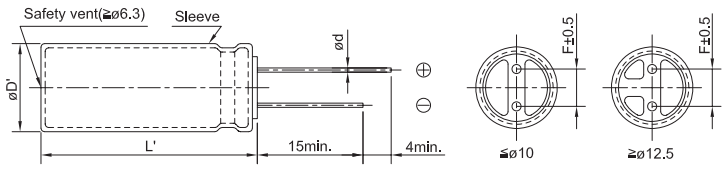
Low Imp.
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 80 / 100 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.09 / 0.09 / 0.08 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 80 / 100 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 2 / 2 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 8 / 6 / 4 / 3 / 3 / 3 / 3 / 3 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the specified period of time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value V_{DC} / ø5~ø6.3 / ø8~ø10 / ø12.5~ø18 6.3~10(V) / 4,000 hours / 6,000 hours / 8,000 hours 16~100(V) / 5,000 hours / 7,000 hours / 10,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXA Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF NXA Series

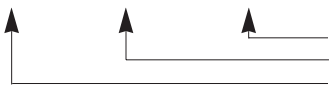
VDC / ØD×L(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	150	0.58	210	100	0.58	210	56	0.58	210
6.3×11	330	0.22	340	220	0.22	340	120	0.22	340
8×11.5	680	0.130	640	470	0.130	640	330	0.130	640
8×15	1,000	0.087	840	680	0.087	840	470	0.087	840
8×20	1,200	0.069	1,050	1,000	0.069	1,050	680	0.069	1,050
10×12.5	820	0.080	865	680	0.080	865	470	0.080	865
10×16	1,200	0.060	1,210	1,000	0.060	1,210	680	0.060	1,210
10×20	1,500	0.046	1,400	1,200	0.046	1,400	1,000	0.046	1,400
10×25	2,200	0.042	1,650	1,500	0.042	1,650	1,200	0.042	1,650
10×30	2,700	0.031	1,910	2,200	0.031	1,910	1,500	0.031	1,910
12.5×16	1,800	0.049	1,450	1,500	0.049	1,450	1,000	0.049	1,450
12.5×20	3,300	0.035	1,900	2,200	0.035	1,900	1,500	0.035	1,900
12.5×25	3,900	0.027	2,230	3,300	0.027	2,230	2,200	0.027	2,230
12.5×30	4,700	0.024	2,650	3,900	0.024	2,650	2,700	0.024	2,650
12.5×35	5,600	0.020	2,880	4,700	0.020	2,880	3,300	0.020	2,880
16×15	2,700	0.042	1,940	2,200	0.042	1,940	1,500	0.042	1,940
16×20	5,600	0.027	2,530	3,900	0.027	2,530	2,700	0.027	2,530
16×25	6,800	0.021	2,930	5,600	0.021	2,930	3,900	0.021	2,930
16×31.5	8,200	0.017	3,450	6,800	0.017	3,450	4,700	0.017	3,450
16×35.5	10,000	0.015	3,610	8,200	0.015	3,610	5,600	0.015	3,610
16×40	12,000	0.013	4,080	10,000	0.013	4,080	6,800	0.013	4,080
18×15	3,900	0.043	2,210	2,700	0.043	2,210	2,200	0.043	2,210
18×20	6,800	0.026	2,860	5,600	0.026	2,860	3,900	0.026	2,860
18×25	10,000	0.019	3,140	6,800	0.019	3,140	4,700	0.019	3,140
18×31.5	12,000	0.015	4,170	8,200	0.015	4,170	5,600	0.015	4,170
18×35.5	15,000	0.014	4,220	10,000	0.014	4,220	8,200	0.014	4,220
18×40	18,000	0.012	4,280	12,000	0.012	4,280	10,000	0.012	4,280

VDC / ØD×L(mm)	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	47	0.58	210	33	0.58	210	1	4.0	50
							2.2	2.5	51
							3.3	2.2	53
							10	1.5	100
6.3×11	100	0.22	340	56	0.22	340	22	0.30	295
							47	0.30	340
8×11.5	220	0.13	640	150	0.13	640	100	0.17	555
8×15	330	0.087	840	220	0.087	840	120	0.12	730
8×20	470	0.069	1,050	270	0.069	1,050	180	0.09	910
10×12.5	330	0.080	865	220	0.080	865	150	0.12	760
10×16	470	0.060	1,210	330	0.060	1,210	220	0.084	1,050
10×20	680	0.046	1,400	470	0.046	1,400	270	0.060	1,220
10×25	820	0.042	1,650	560	0.042	1,650	330	0.055	1,440
10×30	1,000	0.031	1,910	680	0.031	1,910	470	0.043	1,690
12.5×16	680	0.049	1,450	470	0.049	1,450	270	0.061	1,260
12.5×20	1,000	0.035	1,900	680	0.035	1,900	470	0.045	1,660
12.5×25	1,500	0.027	2,230	1,000	0.027	2,230	560	0.034	1,950
12.5×30	1,800	0.024	2,650	1,200	0.024	2,650	680	0.030	2,310
12.5×35	2,200	0.020	2,880	1,500	0.020	2,880	820	0.025	2,510
16×15	1,000	0.042	1,940	680	0.042	1,940	470	0.055	1,690
16×20	1,800	0.027	2,530	1,200	0.027	2,530	820	0.034	2,210
16×25	2,700	0.021	2,930	1,800	0.021	2,930	1,000	0.025	2,555
16×31.5	3,300	0.017	3,450	2,200	0.017	3,450	1,200	0.022	3,010
16×35.5	3,900	0.015	3,610	2,700	0.015	3,610	1,500	0.019	3,150
16×40	4,700	0.013	4,080	3,300	0.013	4,080	1,800	0.016	3,710
18×15	1,200	0.043	2,210	1,000	0.043	2,210	560	0.054	1,930
18×20	2,200	0.026	2,860	1,800	0.026	2,860	1,000	0.036	2,490
18×25	3,300	0.019	3,140	2,200	0.019	3,140	1,200	0.026	2,740
18×31.5	3,900	0.015	4,170	2,700	0.015	4,170	1,800	0.021	3,635
18×35.5	4,700	0.014	4,220	3,300	0.014	4,220	2,200	0.017	3,680
18×40	5,600	0.012	4,280	3,900	0.012	4,280	2,700	0.014	3,800

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Nominal Capacitance(μF)

RATINGS OF NXA Series

WVDC / ØD×L(mm)	63			80			100		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	15	0.88	165				6.8	1.4	125
6.3×11	33	0.35	265				15	0.57	205
8×11.5	47	0.22	500				22	0.50	310
	56	0.22	500				27	0.36	355
8×15	82	0.16	665				39	0.25	450
8×20	120	0.12	820				68	0.19	565
10×12.5	82	0.11	690	68	0.17	480	47	0.17	480
10×16	120	0.076	950	100	0.11	600	68	0.11	600
10×20	180	0.056	1,150	120	0.084	800	82	0.084	800
10×25	220	0.046	1,350	150	0.069	900	120	0.069	900
12.5×16	180	0.072	1,150	150	0.11	750	100	0.11	750
12.5×20	270	0.041	1,500	220	0.062	1,100	150	0.062	1,100
12.5×25	390	0.031	1,900	330	0.047	1,250	220	0.047	1,250
12.5×30	470	0.028	2,300	390	0.042	1,500	270	0.042	1,500
12.5×35	560	0.024	2,500	470	0.036	1,650	330	0.036	1,650
							390	0.036	1,650
16×20	470	0.032	2,000	330	0.048	1,350	220	0.048	1,350
16×25	680	0.025	2,600	470	0.038	1,700	330	0.036	1,650
16×31.5	820	0.021	2,850	680	0.032	1,850	470	0.032	1,850
16×35.5	1,000	0.019	2,900	820	0.029	2,000	560	0.029	2,000
16×40	1,200	0.018	3,400	1,000	0.027	2,200	680	0.027	2,200
18×20	680	0.030	2,500	470	0.038	1,700	330	0.045	1,500
18×25	820	0.024	2,800	680	0.036	1,750	470	0.036	1,750
18×31.5	1,200	0.020	3,300	820	0.030	1,900	560	0.030	1,900
18×35.5	1,500	0.018	3,400	1,000	0.027	2,200	680	0.027	2,200
18×40	1,800	0.017	3,500	1,200	0.026	2,700	820	0.026	2,700



Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Nominal Capacitance(μF)

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
6.8 ~ 180	0.40	0.75	0.90	1.00
220 ~ 560	0.50	0.85	0.94	1.00
680 ~ 1,800	0.60	0.87	0.95	1.00
2,200 ~ 3,900	0.75	0.90	0.95	1.00
4,700 ~ 18,000	0.85	0.95	0.98	1.00

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NXB Series

• 105℃ 2,000~5,000Hrs assured.

- Non-solvent proof.
- Very low impedance
- For SMPS, IP-Board, Adaptor, Noise Filter, Charger
- RoHS compliant.
- Halogen-free capacitors are also available.

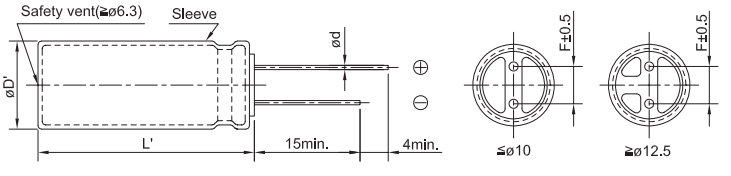
NXA → NXB
Low Imp

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor Tanδ	Rated voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 100 Tanδ(Max) 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.09 / 0.08 When the capacitance exceeds 1000μF, 0.02 shall be added every 1000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/Z(20℃) 2 Z(-40℃)/Z(20℃) 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the specified period of time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value Case Size(øD) / Life Time: øD 5, 6.3 — 2,000 hours; øD 8 — 3,000 hours; øD 10 — 4,000 hours; øD 12.5 ~ — 5,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXB Series

Unit(mm)



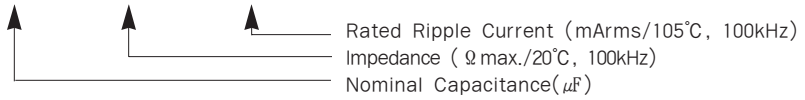
Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF NXB Series

WVDC / ØD×L(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	220	0.30	250	150	0.30	250	100	0.30	250
6.3×11	470	0.13	405	330	0.13	405	220	0.13	405
6.3×15	560	0.10	646	470	0.10	646	330	0.10	646
8×11.5	820	0.072	760	680	0.072	760	470	0.072	760
8×15	1,200	0.060	818	1,000	0.060	818	680	0.060	818
8×20	1,500	0.050	1,260	1,200	0.050	1,260	1,000	0.050	1,260
10×12.5	1,200	0.053	1,030	820	0.053	1,030	680	0.053	1,030
10×16	1,800	0.038	1,430	1,000	0.038	1,430	1,000	0.038	1,430
10×20	2,200	0.023	1,820	1,500	0.023	1,820	1,500	0.023	1,820
10×25	3,300	0.022	2,150	2,200	0.022	2,150	1,800	0.022	2,150
12.5×16	1,800	0.031	1,452	1,500	0.031	1,452	1,000	0.031	1,452
12.5×20	3,900	0.021	2,360	3,300	0.021	2,360	2,200	0.021	2,360
12.5×25	4,700	0.020	2,770	3,900	0.020	2,770	2,700	0.020	2,770
12.5×30	5,600	0.018	3,290	4,700	0.018	3,290	3,300	0.018	3,290
12.5×35	6,800	0.017	3,400	5,600	0.017	3,400	3,900	0.017	3,400
16×15	2,700	0.040	1,375	1,800	0.040	1,375	1,200	0.040	1,375
16×20	5,600	0.021	3,140	4,700	0.021	3,140	3,300	0.021	3,140
16×25	6,800	0.019	3,460	5,600	0.019	3,460	4,700	0.019	3,460
16×31.5	8,200	0.013	3,680	6,800	0.013	3,680	5,600	0.013	3,680
18×15	3,300	0.043	1,279	2,200	0.043	1,279	1,800	0.043	1,279
18×20	5,600	0.023	2,826	4,700	0.023	2,826	3,300	0.023	2,826
18×25	8,200	0.018	3,611	5,600	0.018	3,611	3,900	0.018	3,611

WVDC / ØD×L(mm)	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	68	0.30	250	47	0.30	250	1	2.5	53
							2.2	2.5	56
							4.7	1.5	82
							10	1.0	250
							27	0.30	250
6.3×11	150	0.13	405	100	0.13	405	56	0.14	385
6.3×15	220	0.10	646	150	0.10	646	100	0.10	646
8×11.5	220	0.072	760	150	0.072	760	100	0.072	724
8×15	390	0.060	818	270	0.060	818	120	0.060	818
8×20	560	0.050	1,260	390	0.050	1,260	180	0.050	1,260
10×12.5	470	0.053	1,030	330	0.053	1,030	150	0.061	979
10×16	680	0.038	1,430	470	0.038	1,430	220	0.042	1,370
10×20	820	0.023	1,820	560	0.023	1,820	330	0.030	1,580
10×25	1,000	0.022	2,150	680	0.022	2,150	470	0.028	1,870
12.5×16	680	0.031	1,452	470	0.031	1,452	270	0.042	1,071
12.5×20	1,500	0.021	2,360	1,000	0.021	2,360	470	0.027	2,050
12.5×25	1,800	0.020	2,770	1,200	0.020	2,770	560	0.023	2,410
12.5×30	2,200	0.018	3,290	1,500	0.018	3,290	680	0.021	2,860
12.5×35	2,700	0.017	3,400	1,800	0.017	3,400	820	0.019	2,960
16×15	820	0.040	1,375	560	0.040	1,375	390	0.046	1,196
16×20	2,200	0.021	3,140	1,500	0.021	3,140	820	0.023	2,730
16×25	3,300	0.019	3,460	1,800	0.019	3,460	1,000	0.021	3,010
16×31.5	3,300	0.013	3,680	2,200	0.013	3,680	1,500	0.014	3,201
18×15	1,200	0.043	1,279	680	0.043	1,279	470	0.049	1,122
18×20	2,200	0.020	3,250	1,500	0.020	3,250	1,000	0.022	2,850
18×25	2,700	0.018	3,611	1,800	0.018	3,611	1,200	0.020	3,140



ØD×L (mm) \ VDC	63		
	μF	IMP.	Ripple
5×11	10	0.45	165
6.3×11	33	0.30	265
6.3×15	47	0.25	420
8×11.5	47	0.20	500
10×12.5	68	0.16	600
10×16	100	0.10	945
10×20	150	0.080	1,100
10×25	220	0.070	1,300
12.5×20	330	0.040	1,495
16×20	470	0.035	1,990
16×25	680	0.030	2,780
16×35.5	1,000	0.020	2,835

ØD×L (mm) \ VDC	100		
	μF	IMP.	Rilpple
5×11	3.3	2.0	125
5×11	4.7	2.0	125
6.3×11	10	0.50	205
6.3×15	22	0.40	300
8×11.5	22	0.30	355
10×12.5	33	0.25	450
10×16	47	0.20	580
12.5×20	100	0.10	1,045
12.5×25	150	0.070	1,195
16×25	220	0.060	1,600
16×31.5	330	0.040	1,750
18×40	470	0.030	2,060

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Nominal Capacitance(μF)

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

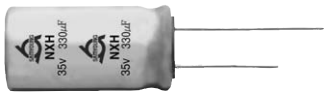
Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
1 ~ 180	0.40	0.75	0.90	1.00
220 ~ 560	0.50	0.85	0.94	1.00
680 ~ 1,800	0.60	0.87	0.95	1.00
2,200 ~ 3,900	0.75	0.90	0.95	1.00
4,700 ~ 18,000	0.85	0.95	0.98	1.00

NXH Series

• 105℃ 6,000~10,000Hrs assured.

- Non-solvent proof.
- Low impedance
- Long life.
- For LCD TV BLU Inverter, SMPS, IP-Board, Adaptor
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXB → NXH
Long Life



SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated voltage(V_{DC}) 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.) 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/Z(+20℃) 2 Z(-40℃)/Z(+20℃) 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the specified period of time.
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.
Others	Satisfied characteristics KS C IEC 60384-4

Load Life:

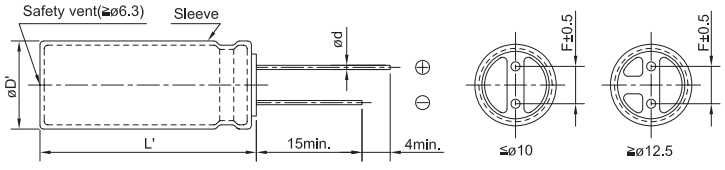
Rated voltage(V_{DC})	6.3~10	16~50
Capacitance change	≦±30% of the initial value	≦±25% of the initial value
Tanδ	≦200% of the initial specified value	
Leakage current	≦The initial specified value	

ØD	Life Time
Ø5~ Ø6.3	6,000 hours
Ø8	8,000 hours
Ø10~	10,000 hours

Shelf Life:

Rated voltage(V_{DC})	6.3~10	16~50
Capacitance change	≦±30% of the initial value	≦±25% of the initial value
Tanδ	≦200% of the initial specified value	
Leakage current	≦The initial specified value	

DIMENSIONS OF NXH Series



Marking : YELLOW SLEEVE, BLACK INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF NXH Series

V_{DC} / ØDxL(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	220	0.22	345	150	0.22	345	100	0.22	345
5×15	470	0.13	480	330	0.13	480	220	0.13	480
6.3×11	470	0.094	540	330	0.094	540	220	0.094	540
6.3×15	560	0.084	620	470	0.084	620	330	0.084	620
8×11.5	820	0.056	945	680	0.056	945	470	0.056	945
8×15	1,200	0.045	1,250	1,000	0.045	1,250	680	0.045	1,250
8×20	1,500	0.029	1,500	1,500	0.029	1,500	1,000	0.029	1,500
10×12.5	1,200	0.039	1,330	1,000	0.039	1,330	680	0.039	1,330
10×16	1,800	0.028	1,760	1,500	0.028	1,760	1,000	0.028	1,760
10×20	2,200	0.020	1,960	1,800	0.020	1,960	1,500	0.020	1,960
10×25	2,700	0.018	2,250	2,200	0.018	2,250	1,800	0.018	2,250
10×33	3,300	0.015	2,550	2,700	0.015	2,550	2,200	0.015	2,550
12.5×20	3,900	0.017	2,480	3,300	0.017	2,480	2,200	0.017	2,480
12.5×25	4,700	0.015	2,900	3,900	0.015	2,900	2,700	0.015	2,900
12.5×30	5,600	0.013	3,450	4,700	0.013	3,450	3,300	0.013	3,450
12.5×35	6,800	0.012	3,570	5,600	0.012	3,570	3,900	0.012	3,570
16×20	6,800	0.015	3,250	4,700	0.015	3,250	3,300	0.015	3,250
16×25	8,200	0.013	3,630	6,800	0.013	3,630	4,700	0.013	3,630
18×25	10,000	0.012	3,650	8,200	0.012	3,650	5,600	0.012	3,650

V_{DC} / ØDxL(mm)	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	68	0.22	345	47	0.22	345	2.2	2.5	120
							10	1.0	145
							22	0.40	195
							27	0.34	238
5×15	150	0.13	480	100	0.13	480	56	0.16	350
6.3×11	150	0.094	540	100	0.094	540	47	0.14	450
							56	0.14	450
6.3×15	220	0.084	620	150	0.084	620	100	0.12	586
8×11.5	330	0.056	945	220	0.056	945	100	0.074	724
8×15	390	0.045	1,250	270	0.045	1,250	120	0.061	950
8×20	560	0.029	1,500	390	0.029	1,500	180	0.046	1,190
10×12.5	470	0.039	1,330	330	0.039	1,330	150	0.061	979
10×16	680	0.028	1,760	470	0.028	1,760	220	0.042	1,370
10×20	820	0.020	1,960	560	0.020	1,960	270	0.030	1,580
10×25	1,000	0.018	2,250	680	0.018	2,250	330	0.028	1,870
10×33	1,200	0.015	2,550	1,000	0.015	2,550	470	0.025	2,110
12.5×20	1,500	0.017	2,480	1,000	0.017	2,480	470	0.027	2,050
12.5×25	1,800	0.015	2,900	1,200	0.015	2,900	560	0.023	2,410
12.5×30	2,200	0.013	3,450	1,500	0.013	3,450	680	0.021	2,860
12.5×35	2,700	0.012	3,570	1,800	0.012	3,570	820	0.019	2,960
16×20	2,200	0.015	3,250	1,500	0.015	3,250	820	0.023	2,730
16×25	3,300	0.013	3,630	2,200	0.013	3,630	1,000	0.021	3,010
18×25	3,900	0.012	3,650	2,700	0.012	3,650	1,500	0.019	3,290

Rated ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Nominal Capacitance(μF)

RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
2.2 ~ 22	0.40	0.66	0.85	1.00
27 ~ 33	0.42	0.70	0.90	1.00
39 ~ 270	0.50	0.73	0.92	1.00
330 ~ 680	0.55	0.77	0.94	1.00
820 ~ 1,800	0.60	0.80	0.96	1.00
2,200 ~ 10,000	0.70	0.85	0.98	1.00

NXQ Series

• 105℃ 6,000 ~ 10,000Hrs assured.

- Non-solvent proof.
- Low impedance, High ripple
- For LCD, LED TV BLU Inverter, SMPS, IP-Board, Adaptor
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXH → NXQ

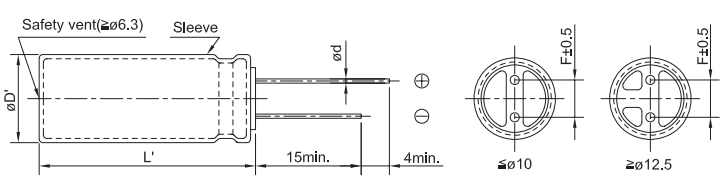
High Ripple

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 / 63 / 80 / 100 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.09 / 0.08 / 0.08 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	Z(-25℃)/Z(+20℃): 2 Z(-40℃)/Z(+20℃): 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the specified period of time. Rated voltage(V_{DC}) 6.3~10: Capacitance change ≦±30% of the initial value; Tanδ ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value Rated voltage(V_{DC}) 16~100: Capacitance change ≦±25% of the initial value; Tanδ ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value ØD: ø5~ø6.3 — Life Time 6.3V_{DC} 6,000hours, 10~50V_{DC} 7,000hours, 63~100V_{DC} 6,000hours ø8 X 11.5L — 8,000hours, 9,000hours, 8,000hours ø8 X 15L~20L — 5,000hours, 10,000hours, 9,000hours ø10 X 12.5L — 9,000hours ø10 X 16L~25L ø12.5~ — 10,000hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 500 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Rated voltage(V_{DC}) 6.3~10: Capacitance change ≦±30% of the initial value; Tanδ ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value Rated voltage(V_{DC}) 16~100: Capacitance change ≦±25% of the initial value; Tanδ ≦ 200% of the initial specified value; Leakage current ≦ The initial specified value
Others	Satisfied characteristics W of KS C 6421

DIMENSIONS OF NXQ Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	5	6.3	8	10	12.5	16	18
Ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
ØD'	ØD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF NXQ Series

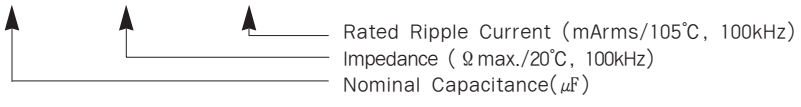
VDC / ØD×L(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	220	0.40	345	150	0.40	450	120	0.40	450
6.3×11	470	0.17	540	330	0.17	700	270	0.17	700
8×11.5	820	0.075	945	560	0.075	1,200	470	0.075	1,200
8×15	1,000	0.059	1,250	680	0.059	1,600	560	0.059	1,600
8×20	1,500	0.041	1,500	1,000	0.041	1,960	820	0.041	1,960
10×12.5	1,200	0.053	1,500	820	0.053	1,700	680	0.053	1,700
10×16	1,800	0.038	1,760	1,200	0.038	2,000	1,000	0.038	2,000
10×20	2,700	0.028	1,960	1,800	0.028	2,500	1,500	0.028	2,500
10×25	3,300	0.024	2,250	2,200	0.024	2,900	1,800	0.024	2,900
12.5×20	3,900	0.025	2,480	2,700	0.025	2,600	2,200	0.025	2,600
12.5×25	4,700	0.019	2,900	3,300	0.019	3,200	2,700	0.019	3,200
12.5×30	5,600	0.018	3,450	4,700	0.018	3,660	3,300	0.018	3,660
12.5×35	6,800	0.016	3,570	5,600	0.016	4,120	3,900	0.016	4,120
16×20	6,800	0.021	3,250	4,700	0.021	3,330	3,300	0.021	3,300
16×25	8,200	0.017	3,630	5,600	0.017	3,810	4,700	0.017	3,810

VDC / ØD×L(mm)	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	68	0.40	450	47	0.40	450	27	0.48	310
6.3×11	150	0.17	700	100	0.17	700	56	0.22	500
8×11.5	330	0.075	1,200	180	0.075	1,200	100	0.120	950
8×15	390	0.059	1,600	220	0.059	1,600	120	0.082	1,230
8×20	560	0.041	1,960	330	0.041	1,960	180	0.058	1,580
10×12.5	470	0.053	1,700	270	0.053	1,700	150	0.073	1,280
10×16	680	0.038	2,000	390	0.038	2,000	220	0.053	1,650
10×20	1,000	0.028	2,500	560	0.028	2,500	330	0.038	2,060
10×25	1,200	0.024	2,900	680	0.024	2,900	390	0.032	2,240
12.5×20	1,500	0.025	2,600	820	0.025	2,600	470	0.032	2,300
12.5×25	1,800	0.019	3,200	1,200	0.019	3,200	680	0.025	2,800
12.5×30	2,200	0.018	3,660	1,500	0.018	3,660	820	0.023	3,370
12.5×35	2,700	0.016	4,120	1,800	0.016	4,120	1,000	0.021	3,810
16×20	2,200	0.021	3,330	1,500	0.021	3,330	820	0.026	3,070
16×25	3,300	0.017	3,810	1,800	0.017	3,810	1,000	0.022	3,510

RATINGS OF NXQ Series

WVDC / ØD×L(mm)	63		
	μF	IMP.	Ripple
5×11	18	0.71	240
6.3×11	47	0.28	420
8×11.5	82	0.18	720
8×15	100	0.13	990
8×20	150	0.096	1,200
10×12.5	120	0.110	990
10×16	180	0.076	1,200
10×20	270	0.056	1,570
10×25	330	0.046	1,990
12.5×20	390	0.041	1,990
12.5×25	470	0.031	2,460
12.5×30	560	0.028	2,760
12.5×35	680	0.024	3,040
16×20	560	0.032	2,380
16×25	820	0.025	2,890

WVDC / ØD×L(mm)	80			100		
	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	12	1.2	220	8.2	1.2	220
6.3×11	27	0.46	370	18	0.46	370
8×11.5	47	0.29	620	33	0.29	620
8×15	56	0.20	780	47	0.20	780
8×20	82	0.16	1,040	68	0.16	1,040
10×12.5	68	0.17	780	47	0.17	780
10×16	100	0.11	1,040	68	0.11	1,040
10×20	150	0.084	1,430	100	0.084	1,430
10×25	180	0.069	1,620	120	0.069	1,620
12.5×16	150	0.110	1,430	100	0.11	1,430
12.5×20	220	0.062	1,750	150	0.062	1,750
12.5×25	270	0.047	2,210	220	0.047	2,210
12.5×30	330	0.042	2,400	270	0.042	2,400
12.5×35	390	0.036	2,600	330	0.036	2,600
12.5×40	470	0.032	2,860	390	0.032	2,860
16×20	330	0.048	1,950	270	0.048	1,950
16×25	470	0.038	2,430	390	0.038	2,430
16×31.5	560	0.032	2,640	470	0.032	2,640
16×35.5	680	0.029	2,860	560	0.029	2,860
16×40	820	0.027	3,510	680	0.027	3,510
18×20	470	0.045	2,270	390	0.045	2,270
18×25	680	0.036	2,500	470	0.036	2,500
18×31.5	820	0.030	2,860	560	0.030	2,860
18×35.5	1,000	0.027	3,510	680	0.027	3,510
18×40	1,200	0.026	3,860	820	0.026	3,860



RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
8.2 ~ 33	0.42	0.70	0.90	1.00
47 ~ 270	0.50	0.73	0.92	1.00
330 ~ 680	0.55	0.77	0.94	1.00
820 ~ 1,800	0.60	0.80	0.96	1.00
2,200 ~ 8,200	0.70	0.85	0.98	1.00

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

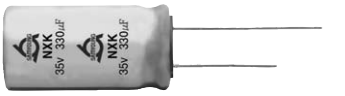
NXK Series

• 105℃ 4,000~5,000Hrs assured

- Non-solvent proof.
- Low impedance.
- High Ripple.
- For LCD TV BLU Inverter, SMPS, IP-Board, Adaptor
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXH → NXK

High Ripple

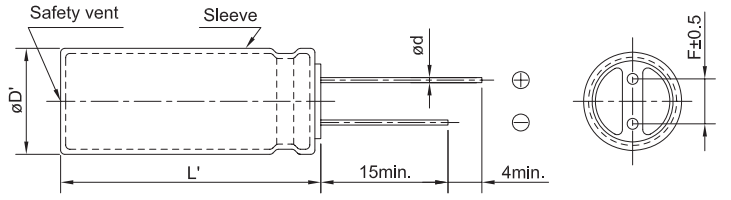


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ + 105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.19 / 0.16 / 0.14 / 0.12 / 0.10 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/ Z(+20℃): 2 Z(-40℃)/ Z(+20℃): 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for the specified period of time at 105℃. Rated voltage(V_{DC}): 10 / 16~50 Capacitance change: ≦±30% of the initial value / ≦±25% of the initial value Tanδ: ≦ 200% of the initial specified value Leakage current: ≦ The initial specified value Case Size(ø D) / Life Time: ø 8, ø 10x12.5L / 4,000Hrs; ø 10 / 5,000Hrs
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Rated voltage(V_{DC}): 10 / 16~50 Capacitance change: ≦±30% of the initial value / ≦±25% of the initial value Tanδ: ±200% of the initial specified value Leakage current: ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXK Series

Unit(mm)



Marking : YELLOW SLEEVE, BLACK INK

øD	8	10
ød	0.6	0.6
F	3.5	5.0
øD'	øD+0.5 max.	
L'	L+1.5 max.	L+2.0 max.

RATINGS OF NXK series

WVDC	10		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)
680	8×11.5	1,417	0.073
1,000	8×15	2,050	0.059
1,000	10×12.5	2,190	0.053
1,500	8×20	2,380	0.041
1,500	10×16	2,550	0.038
1,800	10×20	2,880	0.028
2,200	10×25	3,160	0.024
2,700	10×33	3,570	0.020

WVDC	16		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)
470	8×11.5	1,417	0.073
680	8×15	2,050	0.059
680	10×12.5	2,190	0.053
1,000	8×20	2,380	0.041
1,000	10×16	2,550	0.038
1,500	10×20	2,880	0.028
1,800	10×25	3,160	0.024
2,200	10×33	3,570	0.020

WVDC	25		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)
330	8×11.5	1,417	0.073
390	8×15	2,050	0.059
470	10×12.5	2,190	0.053
560	8×20	2,380	0.041
680	10×16	2,550	0.038
820	10×20	2,880	0.028
1,000	10×25	3,160	0.024
1,200	10×33	3,570	0.020

WVDC	35		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)
220	8×11.5	1,417	0.073
270	8×15	2,050	0.059
330	10×12.5	2,190	0.053
390	8×20	2,380	0.041
470	10×16	2,550	0.038
560	10×20	2,880	0.028
680	10×25	3,160	0.024
1,000	10×33	3,570	0.020

WVDC	50		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	IMP. (Ω max./20℃, 100kHz)
100	8×11.5	1,086	0.096
120	8×15	1,558	0.080
150	10×12.5	1,612	0.083
180	8×20	1,888	0.065
220	10×16	1,985	0.057
270	10×20	2,322	0.042
330	10×25	2,626	0.037
470	10×33	2,954	0.033

RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
100 ~ 270	0.50	0.73	0.92	1.00
330 ~ 680	0.55	0.77	0.94	1.00
820 ~ 1,800	0.60	0.80	0.96	1.00
2,200 ~ 2,700	0.70	0.85	0.98	1.00

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NXF Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Ultra low impedance/ESR
- For MAIN-Board, SMPS, Noise Filter, Charger, Adapter
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXC → NXF

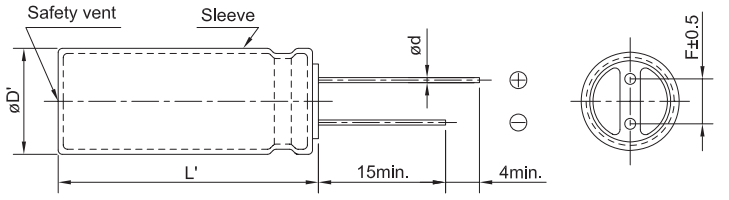
Low Imp.
Low ESR

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ + 105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I:Max. leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}) 6.3 / 10 / 16 Tanδ(Max.) 0.22 / 0.19 / 0.16 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/ Z(+20℃) 2 Z(-40℃)/ Z(+20℃) 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 2,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXF Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	8	10
ød	0.6	0.6
F	3.5	5.0
øD'	øD+0.5 max.	
L'	L+1.5 max.	L+2.0 max.

RATINGS OF NXF series

V_{DC}	6.3		
Capacitance (μF)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
820	8×11.5	1,311	0.031
1,200	8×15	1,713	0.024
1,500	10×12.5	1,771	0.022
1,800	8×20	2,150	0.016
1,800	10×16	2,300	0.016
2,200	10×20	2,770	0.011
3,300	10×25	3,200	0.010

V_{DC}	10		
Capacitance (μF)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
680	8×11.5	1,311	0.031
1,000	8×15	1,713	0.024
1,000	10×12.5	1,771	0.022
1,500	8×20	2,150	0.016
1,500	10×16	2,300	0.016
1,800	10×20	2,770	0.011
2,200	10×25	3,200	0.010

V_{DC}	16		
Capacitance (μF)	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
470	8×11.5	1,311	0.031
680	8×15	1,713	0.024
680	10×12.5	1,771	0.022
1,000	8×20	2,150	0.016
1,000	10×16	2,300	0.016
1,500	10×20	2,770	0.011
1,800	10×25	3,200	0.010

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
470 ~ 560	0.50	0.85	0.94	1.00
680 ~ 1,800	0.60	0.87	0.95	1.00
2,200 ~ 3,300	0.75	0.90	0.95	1.00

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NXE Series

• 105℃ 3,000~4,000Hrs assured

- Non-solvent proof.
- Ultra low impedance/ESR, Long Life.
- For MAIN-Board, SMPS
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NXC → NXE

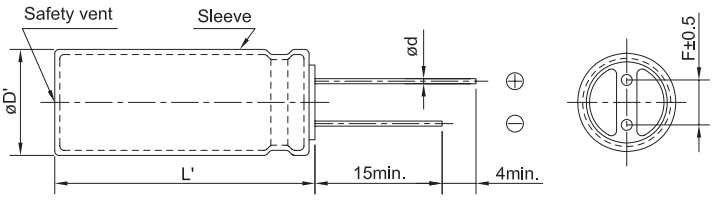
Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 35 VDC
Operating Temperature Range	-40 ~ + 105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.03CV(μA) or 4μA, whichever is greater. Where, I:Max. leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(VDC): 6.3 / 10 / 16 / 25 / 35 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/ Z(20℃): 2 Z(-40℃)/ Z(20℃): 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the specified period of time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value ØD: Life Time — Ø8: 3,000 hours; Ø10: 4,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 200% of the initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NXE Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	8	10
Ød	0.6	0.6
F	3.5	5.0
ØD'	ØD+0.5 max.	
L'	L+1.5max.	L+2.0max.

RATINGS OF NXE series

WVDC	6.3		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
820	8×11.5	1,140	0.036
1,200	8×15	1,490	0.028
1,500	10×12.5	1,540	0.026
1,800	8×20	1,870	0.019
1,800	10×16	2,000	0.019
2,200	10×20	2,550	0.013
3,300	10×25	2,800	0.012

WVDC	10		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
680	8×11.5	1,140	0.036
1,000	8×15	1,490	0.028
1,000	10×12.5	1,540	0.026
1,500	8×20	1,870	0.019
1,500	10×16	2,000	0.019
1,800	10×20	2,550	0.013
2,200	10×25	2,800	0.012

WVDC	16		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
470	8×11.5	1,140	0.036
680	8×15	1,490	0.028
680	10×12.5	1,540	0.026
1,000	8×20	1,870	0.019
1,000	10×16	2,000	0.019
1,500	10×20	2,550	0.013
1,800	10×25	2,800	0.012

WVDC	25		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
220	8×11.5	1,140	0.036
390	8×15	1,490	0.028
470	10×12.5	1,540	0.026
560	8×20	1,870	0.019
680	10×16	2,000	0.019
820	10×20	2,550	0.013
1,000	10×25	2,800	0.012
1,200	12.5×20	3,000	0.014

WVDC	35		
Capacitance (μF)	φD×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	ESR (Ω max./20℃, 100kHz)
150	8×11.5	1,140	0.036
270	8×15	1,490	0.028
330	10×12.5	1,540	0.026
390	8×20	1,870	0.019
470	10×16	2,000	0.019
560	10×20	2,550	0.013
680	12.5×20	2,800	0.012

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
150 ~ 560	0.50	0.85	0.94	1.00
680 ~ 1,800	0.60	0.87	0.95	1.00
2,200 ~ 3,300	0.75	0.90	0.95	1.00

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NZE Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Downsized , High ripple.
- For SMPS, IP-Board, Adaptor
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

KMF → NZE

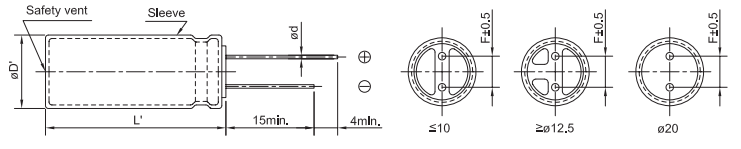
Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160 ~ 400 V_{DC}	450 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ + 105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 450~500 Z(-25℃)/Z(+20℃): 3 / 5 / 6 Z(-40℃)/Z(+20℃): 6 / 6 / — (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 2,000 hours at 105℃ . Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NZE Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	10	12.5	16	18	20	22
Ød	0.6	0.6	0.8	0.8	0.8	0.8
F	5.0	5.0	7.5	7.5	7.5	10.0
ØD'	ØD+0.5 max.					
L'	L+2.0 max.					

RATINGS OF NZE Series

Vdc	160		200		250	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)
22	10×20	192				
33	10×20	236	10×20	236	10×25	258
47	10×25	307	10×25	307	12.5×20	312
68	12.5×20	375	12.5×25	375	12.5×30	444
82	12.5×25	449	12.5×25	449	16×25	496
100	12.5×30	535	12.5×30	535	16×25	548
120	16×20	559	16×25	600	16×25	600
150	16×25	671	16×25	671	16×31.5	724
180	16×25	735	16×31.5	793	16×35.5	810
					18×31.5	819
220	16×31.5	876	16×31.5	876	16×40	924
					18×35.5	936
270	16×35.5	992	16×35.5	992	18×40	1,053
			18×31.5	1,004		
330	18×31.5	1,110	16×40	1,132		
			18×35.5	1,146		
390	18×35.5	1,246	18×40	1,266		

Vdc	350		400		450	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)
8.2					10×16	102
10	10×16	116	10×16	116	10×20	122
15	10×20	154	10×20	154	12.5×20	163
22	10×25	207	10×25	207	12.5×25	219
33	12.5×25	276	12.5×25	276	16×25	289
39	10×40	340				
47	16×25	364	16×25	364	16×25	353
53					10×50	400
56	16×25	397	16×25	397	16×31.5	415
68	16×31.5	472	16×31.5	472	16×35.5	467
	18×25	456				
82	16×35.5	529	16×35.5	529	12.5×50	670
	18×31.5	536	18×31.5	536	16×40	530
					18×31.5	520
100	18×31.5	591	16×40	603	12.5×60	790
			18×35.5	611	18×35.5	593
120	18×35.5	669	18×40	680	18×40	659
150					18×45	753
					20×40	757

Vdc	500	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)
22	12.5×30	238
33	12.5×45	327
39	12.5×50	358
60	12.5×60	470
68	18×35.5	489
82	18×40	560
100	18×45	620
	20×40	603
120	22×45	702
150	22×50	827

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1k	10k	100k
Factor	1.00	1.25	1.50	1.75

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NFC Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof.
- High ripple , Long Life.
- For SMPS, IP-Board, Adaptor
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

KMF (KMX) → NFC

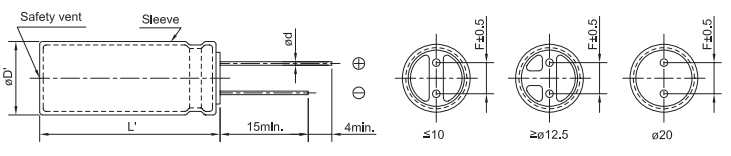
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160 ~ 400 V_{DC}	450~ 500 V_{DC}
Operating Temperature Range	-40 ~+ 105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I=0.1CV+40 / I=0.03CV+15 〉1000: I=0.04CV+100 / I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance (μF) V:Rated voltage (V_{DC})(at 20℃)	
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 450~500 Z(-25℃)/Z(+20℃): 3 / 5 / 6 Z(-40℃)/Z(+20℃): 6 / 6 / — (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 5,000 hours at 105℃. (where, 2,000 hours for Ø6.3) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFC Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

ØD	6.3	8	10	12.5	16	18	20	22
Ød	0.5	0.6	0.6	0.6	0.8	0.8	0.8	0.8
F	2.5	3.5	5.0	5.0	7.5	7.5	7.5	10.0
ØD′	ØD+0.5 max.							
L′	L+1.5max.	L+2.0 max.						

※ Ø8 x 50L, L′≦ L+2.0

RATINGS OF NFC Series

Vdc	160		200	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
3.3			6.3×11	36
10			8×11.5	75
22	8×20	135	8×20	135
	10×20	192	10×20	192
33	10×20	236	12.5×20	262
47	12.5×20	312	12.5×20	312
68	12.5×25	409	12.5×25	409
			8×50	320
82	8×50	360	16×20	462
100	16×25	548	16×25	548
150	16×25	701	16×25	701
220	16×31.5	876	18×31.5	906
330	18×31.5	1,110		

Vdc	250		350	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
6.8	8×11.5	70	8×15	65
10	8×20	95	8×20	90
	10×20	130	10×20	126
22	12.5×20	214	12.5×20	207
33	12.5×25	285	8×50	245
			16×20	284
47	8×50	250	16×25	364
	12.5×25	340		
68	16×25	452	16×31.5	472
100	16×31.5	591	18×31.5	591
150	18×31.5	748	18×40	760
220	18×35.5	936	22×45	970
330	20×40	1,196		

Vdc	400		450	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
1	6.3×11	19	6.3×11	12
1.5			8×11.5	23
2.2			8×15	38
3.3	8×11.5	42		
4.7			8×20	62
6.8	8×15	66	10×20	100
8.2	8×20	80	10×25	121
10	10×16	85	12.5×20	135
22	12.5×25	225	8×50	230
27	8×50	240	16×25	267
33	16×20	284	16×31.5	319
47	16×25	364	10×50	334
			18×25	368
68	16×31.5	472	18×31.5	473
82	18×31.5	536	12.5×50	473
			18×35.5	537
100	18×35.5	611	12.5×60	569
			18×40	602
120	18×40	680	18×40	657
150	18×40	760	18×45	753
			20×40	757
180	20×40	855	22×50	897
220	22×45	996		

RATINGS OF NFC Series

Vdc	500	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
6.8	10×20	100
10	12.5×20	135
15	12.5×25	182
22	12.5×30	210
27	10×50	253
33	18×25	308
	16×31.5	319
39	12.5×50	358
47	18×31.5	393
60	12.5×60	440
68	18×35.5	489
82	18×40	544
100	18×45	620
	20×40	618
120	22×45	702
150	22×50	827

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1k	10k	100k
Factor	1.00	1.25	1.50	1.75

NFK Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof.
- High ripple , Long Life.
- For SMPS, IP-Board, Adaptor
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NFC → NFK

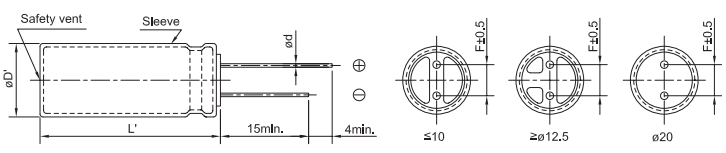
High Ripple

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160 ~ 400 V_{DC}	450 ~ 500 V_{DC}
Operating Temperature Range	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: After 1 minute / After 5 minutes ≦ 1000: I = 0.1CV + 40 / I = 0.03CV + 15 〉 1000: I = 0.04CV + 100 / I = 0.02CV + 25 Where, I:Max. Leakage current(μA) C:Nominal capacitance (μF) V:Rated voltage (V_{DC})(at 20℃)	
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 450~500 Z(-25℃)/Z(+20℃): 3 / 5 / 6 Z(-40℃)/Z(+20℃): 6 / 6 / — (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 5,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFK Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	8	10	12.5	16	18	20	22
ød	0.6	0.6	0.6	0.8	0.8	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5	7.5	10.0
øD'	øD+0.5 max.						
L'	L+1.5max.	L+2.0 max.					

RATINGS OF NFK Series

Vdc	160		200	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
25			8×20	160
33	10×20	236	10×20	236
47	12.5×20	340	12.5×20	340
68	12.5×25	436	12.5×25	436
100	12.5×30	550	12.5×30	550
150	16×25	736	16×25	736
220	16×31.5	912	18×31.5	985
330	18×31.5	1,200		

Vdc	250		350	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
10	8×15	95	8×20	120
	10×12.5	105	10×16	125
22	10×16	165	12.5×20	225
33	12.5×20	250	12.5×25	260
47	12.5×25	375	12.5×30	380
68	10×40	465	16×25	510
	12.5×30	463		
100	10×50	585	18×31.5	743
	16×25	591		
150	18×25	721	18×35.5	942
180	12.5×50	860	18×40	1,048
	18×31.5	813		
220	18×31.5	925		

Vdc	400		450	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
4.7			8×20	79
6.8	8×15	90	10×16	100
8.2	8×20	105	10×16	122
10	10×16	125	10×20	135
15	10×20	150	10×25	185
	12.5×16	140		
22	10×25	200	10×33	215
27	12.5×20	250	12.5×25	260
33	12.5×25	295	12.5×30	335
	16×20	305	16×25	340
47	10×45	352	10×50	400
	12.5×35	375	12.5×40	405
	16×25	436	16×25	368
68	12.5×40	475	18×25	500
	18×25	472		
82	18×31.5	700	12.5×50	670
			18×31.5	650
100	18×35.5	795	12.5×60	750
			18×35.5	700
120	18×40	912	18×40	800
150	18×40	1,020	18×45	920
			20×40	930
180	20×40	1,080	22×50	1,100
220	20×45	1,200		

RATINGS OF NFK Series

WVDC	500	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
27	10×50	305
33	12.5×45	365
39	12.5×50	425
47	18×31.5	468
60	12.5×60	515
68	18×35.5	585
82	18×40	653
100	18×45	750
	20×40	800
120	22×45	900
150	22×50	980

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1k	10k	50k	100k
Factor	1.00	1.25	1.50	1.75	2.00

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NFA Series

• 105℃ 7,000~10,000Hrs assured.

- Non-solvent proof.
- High ripple and long life.
- For ballasts stabilizer.
- RoHS compliant.
- Halogen-free capacitors are also available.

NFC → NFA

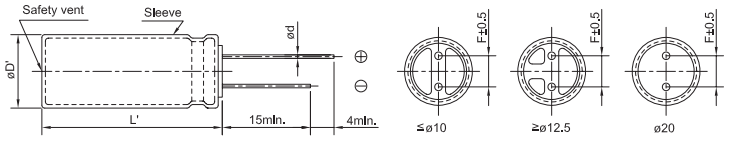
Long life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160~400 V_{DC}	450~500 V_{DC}
Operating Temperature Range	-40~+105℃	-25~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: ≦ 1000 → I=0.1CV+40 (After 1 minute), I=0.03CV+15 (After 5 minutes); 〉1000 → I=0.04CV+100, I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 450~500 Z(-25℃)/Z(20℃): 3 / 5 / 6 Z(-40℃)/Z(20℃): 6 / 6 / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 10,000 hours at 105℃. (where, 7,000 hours for ø8, 8,000 hours for ø10) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFA Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	8	10	12.5	16	18	20	22
ød	0.6	0.6	0.6	0.8	0.8	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5	7.5	10.0
øD'	øD+0.5 max.						
L'	L+1.5max.	L+2.0 max.					

RATINGS OF NFA Series

WVDC	160		200	
Items / μF	ØD×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ØD×L(mm)	Rated ripple current (mArms/105℃,120Hz)
22	10×20	192	10×20	192
33	10×20	236	10×20	236
			12.5×20	262
47	12.5×20	312	12.5×20	312
68	12.5×25	409	10×33	409
			12.5×25	409
100	16×25	548	16×25	548
150	16×31.5	724	16×31.5	701
220	16×31.5	876	18×31.5	906
330	16×35.5	1,110		

WVDC	250		350	
Items / μF	ØD×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ØD×L(mm)	Rated ripple current (mArms/105℃,120Hz)
10	10×20	130	10×20	126
22	12.5×20	214	12.5×20	207
33	12.5×25	285	16×20	284
47	12.5×25	340	16×25	364
56	10×33	350		
68	16×25	452	16×31.5	472
100	16×31.5	591	18×31.5	591
150	18×25	700	18×40	760
220	18×31.5	850	22×45	970
330	20×40	1,196		

WVDC	400		450	
Items / μF	ØD×L(mm)	Rated ripple current (mArms/105℃,120Hz)	ØD×L(mm)	Rated ripple current (mArms/105℃,120Hz)
2.2	8×11.5	27		
3.3	8×11.5	33	10×16	63
4.7	8×11.5	39	10×16	74
6.8	8×15	63	10×20	96
8.2	8×20	75	10×20	106
10	10×20	126	12.5×20	114
22	12.5×25	225	16×25	241
33	16×20	284	16×31.5	319
47	16×25	364	18×25	368
68	16×31.5	472	18×31.5	473
82	18×31.5	536	18×35.5	537
100	18×35.5	611	18×40	602
120	18×40	680	18×40	659
150	18×40	760	20×40	757
180	20×40	855	22×45	892
220	22×45	996		

WVDC	500	
Items / μF	ØD×L(mm)	Rated ripple current (mArms/105℃,120Hz)
10	12.5×20	120
22	16×25	228
33	18×25	260
47	18×31.5	393
68	18×35.5	489

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1k	10k	100k
Factor	1.00	1.25	1.50	1.75

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NFL Series

• 105℃ 10,000~12,000Hrs assured.

- Non-solvent proof.
- High ripple and long life.
- For ballasts stabilizer and other long life required applications.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

NFA → NFL

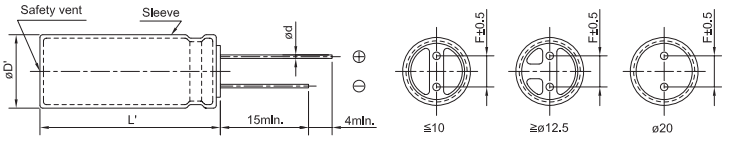
Long life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	160~400 V_{DC}	450~500 V_{DC}
Operating Temperature Range	-40~+105℃	-25~+105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)	
Leakage Current	C·V \ Time: ≦ 1000 → I=0.1CV+40 (After 1 minute), I=0.03CV+15 (After 5 minutes); 〉 1000 → I=0.04CV+100, I=0.02CV+25 Where, I:Max. Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃)	
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 160~250 / 350~500 Tanδ(Max.): 0.20 / 0.24 (at 20℃, 120Hz)	
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 160~250 / 350~400 / 450~500 Z(-25℃)/Z(20℃): 3 / 5 / 6 Z(-40℃)/Z(20℃): 6 / 6 / - (at 120Hz)	
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 12,000 hours at 105℃. (where, 8,000 hours for ø8, 10,000 hours for ø10, ø8x50L) Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measuremensts. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ 500% of the initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF NFL Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	8	10	12.5	16	18	20
ød	0.6	0.6	0.6	0.8	0.8	0.8
F	3.5	5.0	5.0	7.5	7.5	7.5
øD'	øD+0.5 max.					
L'	L+2.0max.					

※ ø8 x 11.5~20L, L'≤ L+1.5

RATINGS OF NFL Series

Vdc	160		200	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)
27			10×16	200
39	10×16	237	10×20	256
47	10×20	280	12.5×20	312
56	10×25	335	12.5×25	371
68	12.5×20	375	12.5×25	409
100	12.5×25	496	16×25	550
	10×45	562	10×50	591
150	16×31.5	724	16×25	671
			12.5×50	786
220	16×31.5	876	18×31.5	905
	12.5×50	952		
270	16×35.5	992	18×35.5	1,036
330	16×40	1,132	18×40	1,164
	18×31.5	1,109		
390	18×35.5	1,246		
470	18×40	1,389		

Vdc	250		350	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)
10	10×16	120	10×16	110
22	10×20	192	12.5×20	213
33	10×25	257	12.5×25	285
			8×50	245
39	10×30	290	10×40	340
47	8×50	250	10×50	405
	12.5×20	312	16×25	375
68	10×40	450	16×31.5	503
	12.5×30	441		
82	10×50	536	12.5×45	571
100	16×25	548	18×31.5	610
150	18×25	748		
180	12.5×50	800		
220	18×31.5	905		

Vdc	400		450	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)	ø D×L(mm)	Rated ripple current (mArms/105℃, 120Hz)
3.3	8×11.5	33		
4.7	8×15	42	10×16	70
6.8	8×20	59	10×20	90
10	10×20	110	12.5×20	120
22	12.5×20	208	8×50	230
			16×25	228
27	8×50	154		
33	16×20	261	16×31.5	270
39	10×45	340	10×50	305
47	16×25	335	18×31.5	360
68	16×31.5	460	12.5×50	473
	12.5×45	482	18×35.5	500
82	18×31.5	520	18×35.5	549
	12.5×50	527		
100	18×35.5	630	12.5×60	626
			18×40	670
120	18×40	700	20×40	720

RATINGS OF NFL Series

WVDC	500	
Items / μF	ø D×L(mm)	Rated ripple current (mArms/105℃,120Hz)
10	12.5×20	150
22	16×25	228
27	10×50	253
33	18×25	260
	16×31.5	270
39	12.5×50	358
47	18×31.5	360
60	12.5×60	467
68	18×35.5	500
82	18×40	606
100	20×40	657

RATED RIPPLE CURRENT MULTIPLIERS

Frequency Multipliers

Freq.(Hz)	120	1k	10k	50k	100k
Factor	1.00	1.25	1.50	1.60	1.75

NLA Series

• 105℃ 4,000~10,000Hrs assured.

Solvent-proof

- Low impedance.
- Long Life.
- For SMPS, IP-Board, Adaptor
- RoHS compliant.
- Halogen-free capacitors are also available.

LXA → NLA

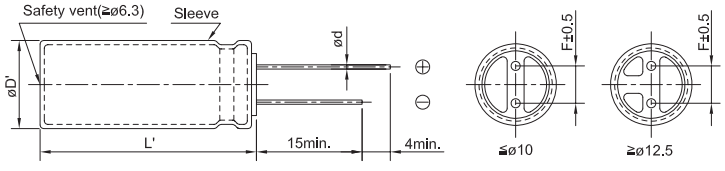
Low Imp.
Long life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 V_{DC}
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 3μA, whichever is greater. Where, I: Max.Leakage current(μA) C: Nominal capacitance (μF) V: Rated voltage (V_{DC}) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 Tanδ(Max.): 0.22 / 0.19 / 0.16 / 0.14 / 0.12 / 0.10 (at 20℃, 120Hz) When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase.
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}): 6.3 / 10 / 16 / 25 / 35 / 50 Z(-25℃)/Z(+20℃): 4 / 3 / 2 / 2 / 2 / 2 Z(-40℃)/Z(+20℃): 8 / 6 / 4 / 3 / 3 / 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied at 105℃ for the following test time. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value øD: 6.3~10V / 16~50V ø5~6.3: 4,000 hours / 5,000 hours ø8~10: 6,000 hours / 7,000 hours ø12.5~: 8,000 hours / 10,000 hours
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NLA Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.6	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

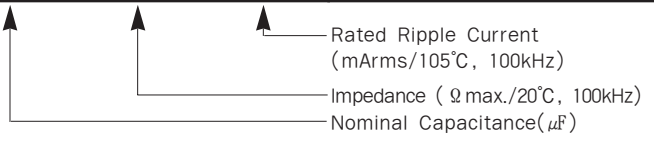
RATINGS OF NLA Series

ØD×L(mm) \ Vdc	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	150	0.50	175	100	0.50	175	47	0.50	175
6.3×11	330	0.25	290	220	0.25	290	100	0.25	290
8×11.5	680	0.12	555	470	0.12	555	330	0.12	555
8×15	1,000	0.090	730	680	0.090	730	470	0.090	730
8×20	1,200	0.080	810	1,000	0.080	810	560	0.080	810
10×12.5	820	0.090	760	680	0.090	760	470	0.090	760
10×16	1,200	0.068	1,050	1,000	0.068	1,050	680	0.068	1,050
10×20	1,500	0.052	1,220	1,200	0.052	1,220	1,000	0.052	1,220
10×25	2,200	0.045	1,440	1,500	0.045	1,440	1,200	0.045	1,440
10×30	2,700	0.037	1,690	1,800	0.037	1,690	1,500	0.037	1,690
12.5×16	1,800	0.053	1,270	1,500	0.053	1,270	1,000	0.053	1,270
12.5×20	3,300	0.038	1,660	2,200	0.038	1,660	1,500	0.038	1,660
12.5×25	3,900	0.030	2,310	3,300	0.030	2,310	2,200	0,030	2,310
12.5×30	4,700	0.025	2,510	3,900	0.025	2,510	2,700	0.025	2,510
12.5×35	5,600	0.022	2,870	4,700	0.022	2,870	3,300	0.022	2,870
16×15	2,700	0.048	1,690	2,200	0.048	1,690	1,500	0.048	1,690
16×20	5,600	0.031	2,210	3,900	0.031	2,210	2,700	0.031	2,210
16×25	6,800	0.024	2,560	5,600	0.024	2,560	3.900	0.024	2,560
16×31.5	8,200	0.021	3,010	6,800	0.021	3,010	4,700	0.021	3,010
16×35	10,000	0.019	3,250	8,200	0.019	3,250	5,600	0.019	3,250
16×40	12,000	0.016	3,560	10,000	0.016	3,560	6,800	0.016	3,560
18×15	3,900	0.051	1,920	2,700	0.051	1,920	2,200	0.051	1,920
18×20	6,800	0.031	2,490	5,600	0.031	2,490	3,900	0.031	2,490
18×25	10,000	0.023	2,740	6,800	0.023	2,740	4,700	0.023	2,740
18×31.5	12,000	0.021	3,330	8,200	0.021	3,330	5,600	0.021	3,330
18×35.5	15,000	0.019	3,680	10,000	0.019	3,680	8,200	0.019	3,680
18×40	18,000	0.018	3,800	12,000	0.018	3,800	10,000	0.012	4,280

ØD×L(mm) \ Vdc	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	47	0.50	175	33	0.50	175	10	2.0	100
6.3×11	100	0.25	290	56	0.25	290	22	1.6	150
8×11.5	220	0.12	555	150	0.12	555	47	0.80	180
8×15	330	0.090	730	220	0.090	730	100	0.50	230
8×20	390	0.080	810	270	0.080	810	120	0.30	360
10×12.5	330	0.090	760	220	0.090	760	100	0.28	380
10×16	470	0.068	1,050	330	0.068	1,050	150	0.19	525
10×20	680	0.052	1,220	470	0.052	1,220	220	0.14	610
10×25	820	0.045	1,440	560	0.045	1,440	270	0.11	720
10×30	1,000	0.037	1,690	680	0.037	1,690	330	0.091	845
12.5×16	680	0.053	1,270	470	0.053	1,270	220	0.15	630
12.5×20	1,000	0.038	1,660	680	0.038	1,660	330	0.098	830
12.5×25	1,500	0.030	2,310	1,000	0.030	2,310	470	0.074	975
12.5×30	1,800	0.025	2,510	1,200	0.025	2,510	680	0.062	1,150
12.5×35	2,200	0.022	2,870	1,500	0.022	2,870	820	0.052	1,250
16×15	1,000	0.048	1,690	680	0.048	1,690	390	0.11	845
16×20	1,800	0.031	2,210	1,200	0.031	2,210	680	0.070	1,100
16×25	2,700	0.024	2,560	1,800	0.024	2,560	820	0.052	1,280
16×31.5	3,300	0.021	3,010	2,200	0.021	3,010	1,000	0.045	1,500
16×35	3,900	0.019	3,250	2,700	0.019	3,250	1,200	0.039	1,680
16×40	4,700	0.016	3,560	3,300	0.016	3,560	1,500	0.033	1,850
18×15	1,200	0.051	1,920	1,000	0.051	1,920	390	0.11	965
18×20	2,200	0.031	2,490	1,800	0.031	2,490	680	0.074	1,250
18×25	3,300	0.023	2,740	2,200	0.023	2,740	1,000	0.054	1,370
18×31.5	3,900	0.021	3,330	2,700	0.021	3,330	1,200	0.043	1,810
18×35.5	4,700	0.019	3,680	3,300	0.019	3,680	1,500	0.035	1,850
18×40	5,600	0.012	4,280	3,900	0.012	4,280	1,800	0.029	1,900

RATED RIPPLE CURRENT MULTIPLIERS

Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
~ 180	0.40	0.75	0.90	1.00
220 ~ 560	0.50	0.85	0.94	1.00
680 ~ 1,800	0.60	0.87	0.95	1.00
2,200 ~ 3,900	0.75	0.90	0.95	1.00
4,700 ~18,000	0.85	0.95	0.98	1.00



NLC Series

• 105℃ 10,000Hrs assured.

Solvent-proof

- Low impedance.
- Long Life.
- For SMPS, IP-Board, Adaptor
- RoHS compliant.
- Halogen-free capacitors are also available.

NLA → NLC

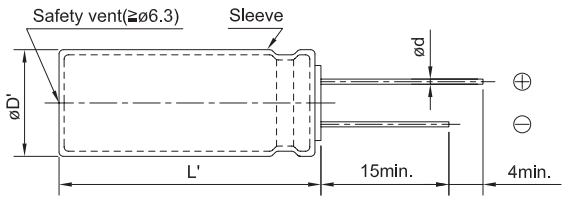
ø 8 ↓
Long life

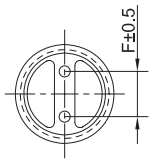
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	6.3 ~ 50 VDC
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) or 3μA, whichever is greater. Where, I: Max.Leakage current(μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(VDC) 6.3 10 16 25 35 50 Tanδ(Max.) 0.22 0.19 0.16 0.14 0.12 0.10 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC) 6.3 10 16 25~35 50 Z(-25℃)/Z(+20℃) 4 3 2 2 2 Z(-40℃)/Z(+20℃) 8 6 4 3 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 10,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NLC Series

Unit(mm)





Marking : DARK BROWN SLEEVE, SILVER INK

øD	5	6.3	8
ød	0.5	0.5	0.6
F	2.0	2.5	3.5
øD'	øD+0.5 max.		
L'	L+1.5max.		

RATINGS OF NLC Series

WVDC / ØD×L(mm)	6.3			10			16		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11	150	0.70	175	100	0.70	175	47	0.70	175
6.3×11	330	0.50	220	220	0.50	220	100	0.50	220
8×11.5	680	0.24	400	470	0.24	400	330	0.24	400

WVDC / ØD×L(mm)	25			35			50		
	μF	IMP.	Ripple	μF	IMP.	Ripple	μF	IMP.	Ripple
5×11							1	4.0	32
5×11							2.2	3.0	40
5×11							3.3	2.5	46
5×11	47	0.70	175	33	0.70	175	10	2.0	100
6.3×11	100	0.50	220	47	0.60	200	22	1.6	150
6.3×11				56	0.50	220			
8×11.5	220	0.24	400	150	0.24	400	47	0.8	180

Rated Ripple Current (mArms/105℃, 100kHz)
Impedance (Ω max./20℃, 100kHz)
Nominal Capacitance(μF)

RATED RIPPLE CURRENT MULTIPLIERS

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
~180	0.40	0.75	0.90	1.00
220~560	0.50	0.85	0.94	1.00
~680	0.60	0.87	0.95	1.00

PXB Series

• 125℃ 3,000~5,000Hrs assured.

Solvent-proof

WV ≦ 80VDC

- Low impedance.
- Wide Temperature range.
- Long Life
- For ECU, BLU, Cooling fan
- RoHS compliant.
- Halogen-free capacitors are also available.

PXA → PXB

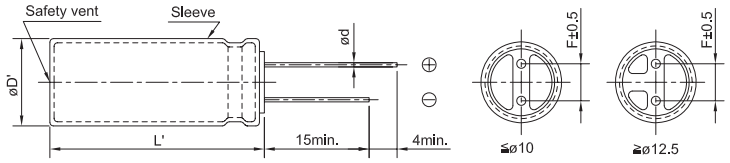
Long Life

SPECIFICATIONS

Item	Characteristics		
Rated Voltage Range	10 ~ 80 VDC	160 ~ 400 VDC	450 VDC
Operating Temperature Range	-40 ~ +125℃	-40 ~ +125℃	-25 ~ +125℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)		
Leakage Current	I=0.03CV (μA) or 4μA, whichever is greater	CV≤1,000: I=0.1CV+40 / CV 〉1,000: I=0.1CV+100	
	Where, I : Max. leakage current (μA) C: Nominal capacitance (μF)V: Rated voltage(VDC) (at 20℃, 1 minute)		
Dissipation Factor (Tan δ)	Rated voltage(VDC): 10 / 16 / 25 / 35 / 50~63 / 80 / 160~250 / 350~450 Tanδ(Max.): 0.20 / 0.16 / 0.14 / 0.12 / 0.10 / 0.08 / 0.20 / 0.24 When the capacitance exceeds 1.000μF, 0.02 shall be added every 1.000μF increase. (at 20℃, 120Hz)		
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 10 / 16~35 / 50~80 / 160~250 / 350~400 / 450 Z(-25℃)/Z(+20℃): 3 / 2 / 3 / 3 / 6 / 6 Z(-40℃)/Z(+20℃): 6 / 4 / 5 / 6 / 10 / - (at 120Hz)		
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 5,000 hours at 125℃. (where, 3,000 hours for Ø 8) Capacitance change ≦ ±30% of the initial value (where, ±20% for ≧ WV 160VDC) Tanδ ≦ 300% of the initial specified value (where, 200% for ≧ WV 160VDC) Leakage current ≦ The initial specified value		
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value (where, ±20% for ≧ WV 160VDC) Tanδ ≦ 300% of the initial specified value (where, 200% for ≧ WV 160VDC) Leakage current ≦ The initial specified value (where, 500% for ≧ WV 160VDC)		
Others	Satisfied characteristics KS C IEC 60384-4		

DIMENSIONS OF PXB Series

Unit(mm)



Marking : GREEN SLEEVE, BLACK INK

øD	8	10	12.5	16
ød	0.6	0.6	0.6	0.8
F	3.5	5.0	5.0	7.5
øD'	øD+0.5 max.			
L'	L+1.5max.	L+2.0max.		

RATINGS OF PXB Series

WVDC	10			16			25			35		
Items / μF	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)
100				8×11.5	0.35	325	8×11.5	0.35	325	8×11.5	0.35	325
										10×12.5	0.25	480
220	8×11.5	0.35	325	10×12.5	0.25	480	10×12.5	0.25	480	10×16	0.15	625
330	10×12.5	0.25	480	10×12.5	0.25	480	10×16	0.15	625	10×20	0.11	799
470	10×12.5	0.25	480	10×16	0.15	625	10×20	0.11	799	12.5×20	0.068	997
1,000	10×20	0.11	799	12.5×20	0.068	997	12.5×25	0.058	1,121	16×25	0.040	1,426
2,200	12.5×25	0.058	997	16×25	0.040	1,426	16×31.5	0.034	1,595			
3,300	16×25	0.040	1,426	16×31.5	0.034	1,595						
4,700	16×31.5	0.034	1,595									

WVDC	50			63			80		
Items / μF	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)	ØD×L (mm)	Imp. (Ω max.) (20℃,100kHz)	Rated Ripple Current (mArms) (125℃,100kHz)
10	8×11.5	0.75	180						
22	8×11.5	0.50	250				8×11.5	1.5	150
33	8×11.5	0.50	280	8×11.5	1.5	150	10×12.5	0.80	480
47	8×11.5	0.50	280	10×12.5	0.80	480	10×12.5	0.80	480
100	10×12.5	0.25	480	10×16	0.58	650	10×20	0.39	790
220	10×20	0.15	625	12.5×20	0.27	950	12.5×25	0.18	1,240
330	12.5×20	0.081	990	12.5×25	0.18	1,240	12.5×30	0.16	1,390
470	12.5×25	0.059	1,150	12.5×30	0.16	1,390	16×25	0.11	1,500
1,000	16×31.5	0.032	1,590	16×31.5	0.090	1,650			

WVDC	160		200		250		350		400		450(2W)	
Items / μF	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)	ØD×L (mm)	Rated Ripple Current (mArms) (125℃,120Hz)
4.7							10×16	53	10×20	53	10×25	58
10			10×16	78	10×20	78	10×20	85	12.5×20	86	12.5×20	86
22	10×16	115	10×20	126	12.5×20	128	12.5×25	139	12.5×30	142	16×25	154
33	10×20	154	12.5×20	157	12.5×25	171	16×25	189	16×25	189	16×31.5	203
47	12.5×20	187	12.5×25	204	16×25	225	16×31.5	243	16×31.5	243		
68	12.5×25	245	16×20	250	16×31.5	292						
100	16×25	329	16×25	329								
150	16×31.5	434										

RATED RIPPLE CURRENT MULTIPLIERS

(10～80V_{DC})

Cap.(μF) \ Freq.(Hz)	120	1k	10k	100k
4.7～100	0.40	0.75	0.90	1.00
220～470	0.50	0.85	0.94	1.00
1,000	0.60	0.87	0.95	1.00
2,200～3,300	0.75	0.90	0.95	1.00
～4,700	0.85	0.95	0.98	1.00

(160～450V_{DC})

Cap.(μF) \ Freq.(Hz)	120	300	1k	10k	100k
4.7～33	1.00	1.25	1.50	1.75	1.80
47～150	1.00	1.15	1.30	1.40	1.50

PXD Series

• 125℃ 2,000~4,000Hrs assured.

Solvent-proof

- Ultra low Impedance.
- Wide temperature range.
- Long Life
- For ECU, BLU, Cooling fan
- RoHS compliant.
- Halogen-free capacitors are also available.

PXC → PXD

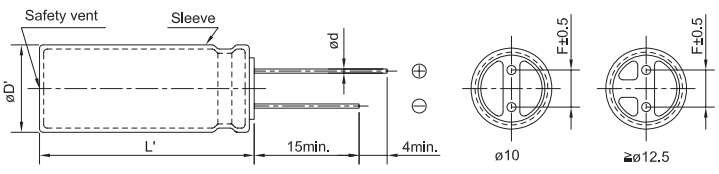
Low Imp.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +125℃
Capacitance Tolerance	±20%(M) (at 20℃,120Hz)
Leakage Current	I = 0.03CV (μA) or 4μA, whichever is greater. Where, I:Max. leakage current(μA),C:Nominal capacitance(μF),V:Rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor (Tanδ)	Rated Volatag(V_{DC}) 10 16 25 35 50 TANδ(Max.) 0.20 0.16 0.14 0.12 0.10 (at 20℃,120Hz) When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase.
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}) 10 16 ~ 35 50 Z(-25℃)/Z(+20℃) 3 2 3 Z(-40℃)/Z(+20℃) 6 4 5 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 4,000 hours at 125℃. (where, 2,000 hours ≦ 8ø) Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage Current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 125℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF PXD Series

Unit(mm)



Marking : GREEN SLEEVE, BLACK INK

øD	8	10	12.5	16
ød	0.6	0.6	0.6	0.8
F	3.5	5.0	5.0	7.5
øD'	øD+0.5 max.			
L'	L+1.5max.	L+2.0max.		

RATINGS OF PXD Series

Vdc	10				16			
Item / μF	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(125℃,100kHz)		20℃	-40℃	(125℃,100kHz)
100					8×11.5	0.24	3.6	400
220	8×11.5	0.24	3.6	400	10×12.5	0.11	1.1	720
330	10×12.5	0.11	1.1	720	10×12.5	0.11	1.1	720
470	10×12.5	0.11	1.1	720	10×16	0.071	0.71	950
1,000	10×20	0.056	0.56	1,100	12.5×20	0.044	0.31	1,250
2,200	12.5×25	0.030	0.21	1,550	16×25	0.023	0.16	2,000
3,300	16×25	0.023	0.16	2,000	16×31.5	0.019	0.13	2,500
4,700	16×31.5	0.019	0.13	2,500				

Vdc	25				35			
Item / μF	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(125℃,100kHz)		20℃	-40℃	(125℃,100kHz)
100	8×11.5	0.24	3.60	400	8×11.5	0.24	3.60	400
					10×12.5	0.11	1.10	720
220	10×12.5	0.11	1.10	720	10×16	0.071	0.71	950
330	10×16	0.071	0.71	950	10×20	0.056	0.56	1,100
470	10×20	0.056	0.56	1,100	12.5×20	0.044	0.31	1,250
1,000	12.5×25	0.030	0.21	1,550	16×25	0.023	0.16	2,000
2,200	16×31.5	0.019	0.13	2,500				

Vdc	50			
Item / μF	ØD×L (mm)	Imp. (Ω max./100kHz)		Rated Ripple Current (mArms)
		20℃	-40℃	(125℃,100kHz)
10	8×11.5	0.30	4.5	230
22	8×11.5	0.30	4.5	320
33	8×11.5	0.30	4.5	340
47	8×11.5	0.30	4.5	340
100	10×12.5	0.15	1.5	590
220	10×20	0.074	0.74	950
330	12.5×20	0.061	0.43	1,150
470	12.5×25	0.040	0.28	1,400
1,000	16×31.5	0.021	0.15	2,200

RATED RIPPLE CURRENT MULTIPLIERS

Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
10～100	0.40	0.75	0.90	1.00
220～470	0.50	0.85	0.94	1.00
1,000	0.60	0.87	0.95	1.00
2,200～3,300	0.75	0.90	0.95	1.00
～4,700	0.85	0.95	0.98	1.00

PHA Series

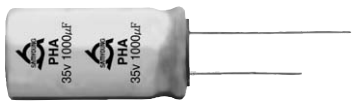
• 150℃ 1,000Hrs assured.

Solvent-proof

- Wide Temperature range.
- For ECU, Cooling fan
- RoHS compliant.
- Halogen-free capacitors are also available.

NHA → PHA

Wide Temp.

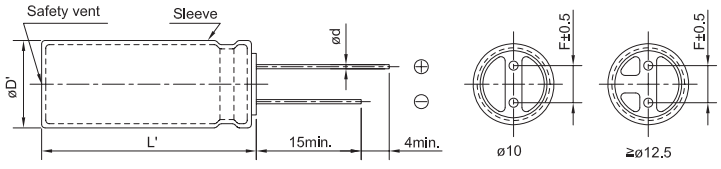


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 50 V_{DC}
Operating Temperature Range	-40 ~ +150℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I = 0.03CV (μA) or 4μA, whichever is greater. Where, I:Max. leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(V_{DC}) (at 20℃, 1 minute)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}) 10 16 25 35 50 Tanδ(Max.) 0.24 0.20 0.16 0.14 0.12 (at 20℃,120Hz)
Temperature Characteristics (Max. impedance ratio)	Rate Voltage(V_{DC}) 10 ~ 50 Z(-25℃)/Z(+20℃) 2 Z(-40℃)/Z(+20℃) 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied at 150℃ for 1,000 hours. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage Current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 150℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage Current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF PHA Series

Unit(mm)



Marking : YELLOW SLEEVE, BLACK INK

øD	10	12.5	16
ød	0.6	0.6	0.8
F	5.0	5.0	7.5
øD'	øD+0.5 max.		
L'	L+2.0 max.		

RATINGS OF PHA Series

WVDC	10		16		25	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)
220					10×16	370
330			10×16	370	12.5×20	600
470	10×16	370	12.5×20	600	16×31.5	1,100
1,000	12.5×20	600	16×31.5	1,100	16×35.5	1,150
2,200	16×31.5	1,100	16×35.5	1,150		
3,300	16×35.5	1,150				

WVDC	35		50	
Items / μF	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)	ØD×L(mm)	Rated Ripple Current (mArms/150℃,120Hz)
100	10×16	370	10×20	300
220	10×20	460	12.5×20	400
330	12.5×20	600	12.5×25	500
470	12.5×25	750	16×35.5	700
1,000	16×35.5	1,150		

RATED RIPPLE CURRENT MULTIPLIERS

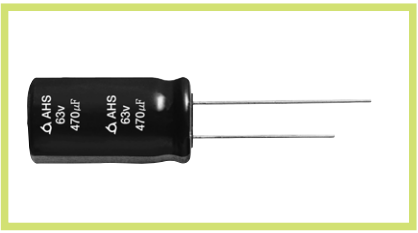
Freq.(Hz) / Cap.(μF)	120	1k	10k	100k
100 ~ 1,000	1.00	1.15	1.30	1.40
2,200 ~ 3,300	1.00	1.03	1.05	1.08

AHS Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- Downsized of AH series.
- For Hi-Fi Audio.
- RoHS compliant.
- Halogen-free capacitors are also available.

Downsized

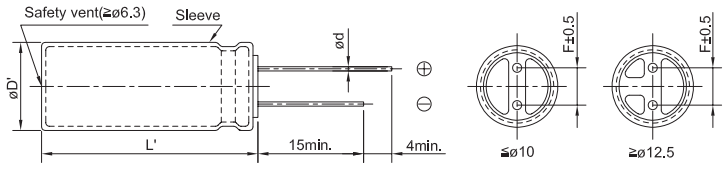


SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	10 ~ 100 V_{DC}
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.03CV (μA) or 4μA whichever is greater Where, I: Max. Leakage current(μA) C: Nominal capacitance (μF) V: Rated Voltage (V_{DC}) (at 20℃, 1 minute)
Dissipation Factor (Tanδ)	Rated Voltage(V_{DC}): 10 / 16 / 25 / 35 / 50 / 63 / 100 Tanδ(Max.): 0.19 / 0.16 / 0.14 / 0.12 / 0.10 / 0.09 / 0.08 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(V_{DC}): 10 / 16 / 25 / 35~100 Z(-25℃)/Z(20℃): 3 / 2 / 2 / 2 Z(-40℃)/Z(20℃): 8 / 6 / 4 / 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃. for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF AHS Series

Unit(mm)



Marking : DARK BROWN SLEEVE, GOLD INK

øD	5	6.3	8	10	12.5	16	18
ød	0.5	0.5	0.6	0.6	0.8	0.8	0.8
F	2.0	2.5	3.5	5.0	5.0	7.5	7.5
øD'	øD+0.5 max.						
L'	L+1.5 max.			L+2.0 max.			

RATINGS OF AHS Series

VDC / μF	10		16		25		35		50	
0.1									5×11	4
0.22									5×11	7
0.33									5×11	8
0.47									5×11	10
1									5×11	14
2.2									5×11	21
3.3									5×11	26
4.7							5×11	28	5×11	31
10					5×11	39	5×11	41	5×11	45
22	5×11	49	5×11	54	5×11	58	5×11	61	5×11	66
33	5×11	59	5×11	66	5×11	70	5×11	75	6.3×11	93
47	5×11	71	5×11	78	5×11	84	6.3×11	103	6.3×11	111
100	5×11	103	6.3×11	132	6.3×11	140	8×11.5	171	8×11.5	185
220	6.3×11	177	8×11.5	224	8×11.5	237	10×12.5	299	10×16	357
330	8×11.5	248	8×11.5	274	10×12.5	343	10×16	404	10×20	473
470	8×11.5	296	10×12.5	386	10×16	451	10×20	523	12.5×20	626
1,000	10×16	538	10×20	638	12.5×20	746	12.5×25	860	16×25	1,017
2,200	12.5×20	920	12.5×25	1,087	16×25	1,262	16×31.5	1,413	18×35.5	1,621
3,300	12.5×25	1,180	16×25	1,411	16×31.5	1,586	18×35.5	1,776		
4,700	16×25	1,458	16×31.5	1,678	18×35.5	2,120				
6,800	16×31.5	1,780	18×35.5	2,016						
10,000	18×35.5	2,134								

Rated Ripple Current (mArms/85℃, 120Hz)

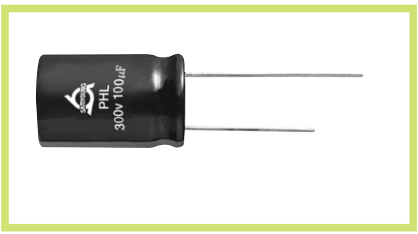
Case Size øD×L(mm)

VDC / μF	63		100	
0.1			5×11	5
0.22			5×11	7
0.33			5×11	9
0.47			5×11	11
1			5×11	16
2.2			5×11	23
3.3			5×11	28
4.7	5×11	34	5×11	34
10	5×11	49	6.3×11	56
22	6.3×11	83	8×11.5	95
33	6.3×11	102	10×12.5	137
47	8×11.5	136	10×16	181
100	10×12.5	239	12.5×20	316
220	10×20	423	16×25	564
330	12.5×20	575	16×25	691
470	12.5×25	745	16×31.5	891
1,000	16×31.5	1,182		

PHL Series

• 5~35℃ 5,000Times.

- Non-solvent proof.
- For Photo Flash.
- RoHS compliant.
- Halogen-free capacitors are also available.



SPECIFICATIONS

Item	Characteristics
Rated Voltage	300 ~ 330 VDC
Operating Temperature Range	-20~+55℃
Capacitance Tolerance	-10~+20%(V) (at 20℃, 120Hz)
Leakage Current	ØD(mm) | Ø5~8 | Ø10~ LC(Max.) | I=2.0×C | I=1.0×C Where, I:Max.Leakage current(μA) C: Nominal capacitance (μF) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	ØD(mm) | Ø5~8 | Ø10~ Tanδ(Max.) | 0.085 | 0.06 (at 20℃, 120Hz)
Charge and Discharge Characteristics	The following specifications shall be satisfied when the capacitors are restored to 20℃ after charge and discharge are repeated 5,000 times at room temperature (5 to 35℃) Discharge resistance or Xenon tube: 0.7~1.0Ω. Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1000 hours at 55℃ without voltage applied. Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value
Others	Satisfied characteristics EIAJ RC - 3801A

RATINGS OF PHL Series

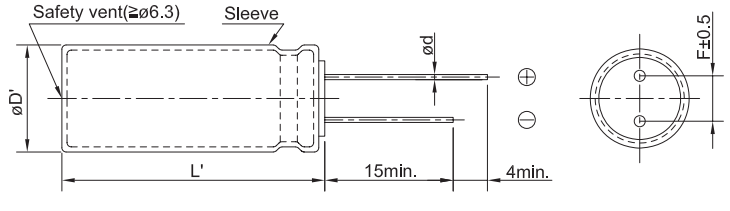
μF \ VDC	300			315			330		
5				5×16	6.3×10				
6.8					6.3×11				
10					6.3×15	8×11.5			
12.5					6.3×20	8×15			
15						8×17			
20						8×20			
30						8×23			
60	11.8×22						11.8×24		
80	11.8×27	13×25					11.8×29	13×27	
100	11.8×32	13×29	13.5×26				11.8×35	13×32	13.5×28
120		13×34	13.5×30					13×37	13.5×33
140		13×38	13.5×34					13×42	13.5×37
160		13×43	13.5×38						13.5×41

Note : Other case sizes, rated voltage or capacitance are also available upon request.

Case size ØD×L(mm)

DIMENSIONS OF PHL Series

Unit(mm)



Marking : BLACK SLEEVE, WHITE INK

ØD	5	6.3	8	11.8	13	13.5
Ød	0.5	0.5	0.6	0.6	0.6	0.8
F	2.0	2.5	3.5	5.0	5.0	5.0
ØD'	ØD+0.5 max.					
L'	L+1.0 max.					

MINIATURE ALUMINUM ELECTROLYTIC CAPACITORS

NZD Series

- 105℃ 5,000Hrs assured

Solvent-proof

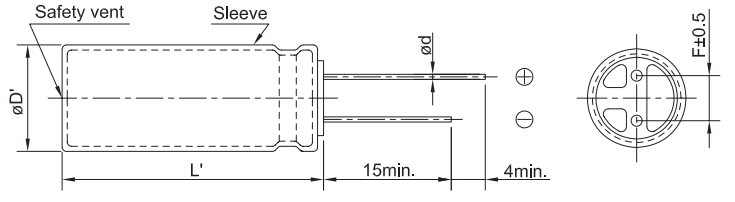
- For car air bag circuit
- RoHS compliant.
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	16 ~ 35 VDC
Operating Temperature Range	-55 ~ +105℃
Capacitance Tolerance	0% ~ 30%(S) (at 20℃, 120Hz)
Leakage Current	I=0.01CV(μA) Where, I:Max. leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 2 minutes)
Dissipation Factor (Tanδ)	Rated Voltage(VDC): 16 / 25 / 35 Tanδ(Max.): 0.16 / 0.14 / 0.12 When the capacitance exceeds 1,000μF, 0.02 shall be added every 1,000μF increase. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated Voltage(VDC): 16 / 25 / 35 Z(-55℃)/Z(20℃): 3 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage with the rated ripple current is applied for 5,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them for 1,000 hours at 105℃ without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF NZD Series

Unit(mm)



Marking : DARK BROWN SLEEVE, SILVER INK

øD	12.5	16	18
ød	0.6	0.8	0.8
F	5.0	7.5	7.5
øD'	øD+1.0 max.		
L'	L+2.0 max.		

DIMENSIONS OF NZD Series

VDC	16		
μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	Impedance (Ω max./20℃, 100kHz)
2,200	12.5×20	1,660	0.038
2,700	12.5×25	1,950	0.030
3,300	16×20	2,210	0.029
4,700	16×25	2,560	0.022
4,700	18×20	2,490	0.028
5,600	18×25	2,740	0.020

VDC	25		
μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	Impedance (Ω max./20℃, 100kHz)
1,200	12.5×20	1,660	0.038
1,800	12.5×25	1,950	0.030
2,200	16×20	2,210	0.029
3,300	16×25	2,560	0.022
2,700	18×20	2,490	0.028
3,900	18×25	2,740	0.020

VDC	35		
μF	ø D×L(mm)	Rated Ripple Current (mArms/105℃, 100kHz)	Impedance (Ω max./20℃, 100kHz)
820	12.5×20	1,660	0.038
1,200	12.5×25	1,950	0.030
1,500	16×20	2,210	0.029
1,800	16×25	2,560	0.022
1,800	18×20	2,490	0.028
2,700	18×25	2,740	0.020

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

RDC Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- Downsized of RDA series.
- For SMPS, Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	16 ～ 100 VDC	160 ～ 500 VDC
Operating Temperature Range	-40 ～ +85℃	-25 ～ +85℃
Capacitance Tolerance	±20% (M)	(at 20℃, at 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller Where, I:Max. leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC)	(at 20℃, 5 minutes)

※ Dissipation Factor (Tanδ)

Rated Voltage(VDC)	16	25	35	50～63	100	160～250	315～400	450～500
Tanδ(Max.)	0.40	0.35	0.30	0.25	0.20	0.15	0.15	0.20

(at 20℃, 120Hz)

Temperature Characteristics (Max.Impedance ratio)

Rated Voltage(VDC)	16	25	35	50～63	100	160～250	315～400	450～500
Z(-25℃)/Z(20℃)	4	3	3	2	2	4	4	8
Z(-40℃)/Z(20℃)	15	10	8	6	5	-	-	-

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃

Capacitance change	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 25 hours and not more than 48 hours before the measurements.

Capacitance change	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value

Others: Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceed 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

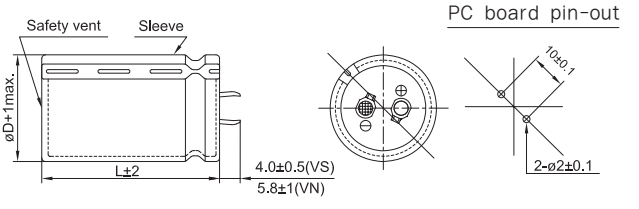
Frequency multiplying factor

VDC \ Freq.(Hz)	60	120	300	1k	10k～
16～50VDC	0.95	1.00	1.03	1.05	1.08
63～100VDC	0.92	1.00	1.07	1.13	1.19
160～250VDC	0.81	1.00	1.17	1.32	1.45
315～500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RDC Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type



Marking : BLACK SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF RDC Series

μF \ VDC / ø D	16				25				35			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
3,900									22×25 2.22			
4,700									22×30 2.41	25.4×25 2.42		
5,600					22×25 2.21				22×35 2.75	25.4×25 2.64		
6,800					22×30 2.40	25.4×25 2.56			22×40 2.80	25.4×30 2.74	30×25 2.97	
8,200	22×25 2.51				22×35 2.72	25.4×25 2.80			22×45 3.11	25.4×35 3.10	30×30 3.13	
10,000	22×25 2.77				22×40 3.09	25.4×30 3.12	30×25 3.21			25.4×40 3.53	30×30 3.46	35×25 3.20
12,000	22×30 2.86	25.4×25 2.95			22×45 3.48	25.4×35 3.43	30×30 3.86	35×25 3.54		25.4×45 3.98	30×35 4.01	35×30 4.02
15,000	22×35 3.29	25.4×30 3.46	30×25 3.66		22×50 4.00	25.4×40 3.95	30×30 4.00	35×25 3.95			30×40 4.90	35×35 5.01
18,000	22×40 3.72	25.4×35 3.98	30×30 3.98			25.4×45 4.45	30×35 4.46	35×30 4.63			30×45 5.43	35×40 5.54
22,000	22×50 4.37	25.4×40 4.26	30×30 4.21			25.4×50 5.02	30×45 5.21	35×35 5.16				35×45 6.04
27,000		25.4×45 4.72	30×35 4.82				30×50 5.94	35×40 5.92				35×50 6.89
33,000			30×40 5.36	35×30 5.15				35×45 6.75				
39,000			30×45 6.01	35×35 5.95				35×50 7.56				
47,000			30×50 6.79	35×40 6.76								
56,000				35×45 7.62								

μF \ VDC / ø D	50				63				100			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
820									22×25 1.86			
1,000									22×30 1.93			
1,200									22×30 2.09	25.4×25 2.10		
1,500									22×35 2.41	25.4×30 2.34	30×25 2.46	
1,800					22×25 1.82				22×40 2.71	25.4×35 2.75	30×25 2.72	
2,200	22×25 1.91				22×30 2.31	25.4×25 2.30			22×45 3.08	25.4×40 3.13	30×30 3.09	35×25 3.14
2,700	22×30 2.11	25.4×25 2.13			22×35 2.43	25.4×30 2.43				25.4×45 3.57	30×35 3.55	35×30 3.71
3,300	22×30 2.37	25.4×25 2.38			22×35 2.62	25.4×30 2.64	30×25 2.78			25.4×50 4.06	30×40 4.05	35×30 4.05
3,900	22×35 2.65	25.4×30 2.68			22×40 2.93	25.4×35 2.97	30×30 3.00				30×45 4.54	35×35 4.49
4,700	22×40 2.99	25.4×35 3.03	30×25 2.81		22×50 3.39	25.4×40 3.36	30×30 3.32	35×25 3.36			30×50 5.11	35×40 5.11
5,600	22×45 3.36	25.4×35 3.31	30×30 3.37	35×25 3.42		25.4×45 3.77	30×35 3.75	35×25 3.76				35×45 5.75
6,800	22×50 3.81	25.4×40 3.81	30×35 3.85	35×30 3.85		25.4×50 4.27	30×40 4.27	35×30 4.15				
8,200		25.4×50 4.37	30×40 4.36	35×30 4.41			30×45 4.83	35×35 4.79				
10,000			30×45 4.97	35×35 4.92			30×50 5.49	35×40 5.47				
12,000			30×50 5.60	35×40 5.58				35×45 6.19				
15,000				35×45 6.44								
18,000				35×50 6.71	← Case Size ø D×L(mm)							
20,000					← Rated Ripple Current(Arms/85°C, 120Hz)							

RATINGS OF RDC Series

VDC / μF \ ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
330									22×30 1.49	25.4×25 1.51	30×20 1.48	
390									22×35 1.67	25.4×30 1.63	30×25 1.66	
470					22×30 1.78	25.4×25 1.80			22×40 1.88	25.4×30 1.86	30×25 1.89	35×20 1.89
560	22×30 1.95				22×35 2.00	25.4×30 1.97	30×25 2.01		22×45 2.13	25.4×35 2.09	30×30 2.14	35×25 2.09
680	22×30 2.15				22×40 2.27	25.4×30 2.24	30×25 2.28			25.4×50 2.44	30×35 2.43	35×25 2.46
820	22×35 2.42	25.4×30 2.45			22×45 2.58	25.4×35 2.53	30×30 2.59				30×40 2.75	35×30 2.77
1,000	22×40 2.75	25.4×35 2.79				25.4×40 2.88	30×35 2.95	35×25 2.90			30×45 3.31	35×35 3.22
1,200		25.4×40 3.15	30×30 3.13	35×25 3.27			30×40 3.34	35×30 3.31				35×40 3.42
1,500		25.4×45 3.60	30×35 3.63	35×30 3.57			30×45 3.84	35×35 3.82				35×45 4.06
1,800			30×40 4.09	35×30 4.05				35×40 4.33				
2,200				35×35 4.63				35×45 4.92				
2,700				35×40 5.30								

VDC / μF \ ø D	315				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
150	22×25 0.98								22×30 1.02			
180	22×30 1.10				22×30 1.11				22×35 1.14			
220	22×35 1.26	25.4×25 1.23	30×20 1.25		22×35 1.26				22×40 1.29	25.4×30 1.27	30×25 1.30	
270	22×40 1.43	25.4×30 1.41	30×25 1.43	35×20 1.45	22×40 1.49	25.4×30 1.46	30×25 1.49		22×45 1.48	25.4×35 1.45	30×30 1.48	
330	22×45 1.62	25.4×35 1.61	30×25 1.62	35×20 1.61	22×45 1.66	25.4×35 1.63	30×30 1.67			25.4×40 1.65	30×30 1.65	35×25 1.67
390		25.4×40 1.79	30×30 1.78	35×25 1.86		25.4×40 1.88	30×30 1.88	35×25 1.94		25.4×45 1.84	30×35 1.85	35×30 1.88
470			30×35 2.02	35×30 2.07		25.4×45 2.18	30×35 2.20	35×30 2.25			30×40 2.09	35×30 2.07
560			30×40 2.28	35×35 2.33			30×45 2.40	35×30 2.37				35×35 2.34
680				35×40 2.66				35×35 2.78				35×45 2.74
820				35×45 3.00				35×40 3.15	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85℃, 120Hz)			

RATINGS OF RDC Series

VDC / μF \ ø D	450				500			
	22	25.4	30	35	22	25.4	30	35
68					22×30 0.40			
82					22×30 0.51	25.4×25 0.53		
100						25.4×35 0.69		
120	22×30 0.91	25.4×25 0.91				25.4×40 0.86		
150	22×35 1.04	25.4×30 1.05				25.4×45 0.91	30×30 0.88	
180	22×40 1.18	25.4×30 1.15	30×25 1.17			25.4×50 0.96	30×35 0.99	
220	22×45 1.33	25.4×35 1.31	30×30 1.36				30×40 1.15	
270		25.4×40 1.55	30×35 1.60	35×25 1.59			30×50 1.44	35×35 1.36
330			30×40 1.90	35×30 1.88				35×40 1.49
390			30×45 2.09	35×35 2.08				35×45 1.71
470				35×40 2.40				35×50 2.08
560				35×45 2.70	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85℃, 120Hz)			

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

TDA Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Downsized of KMH series.
- For SMPS, Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

KMH → TDA

Downsized

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	16 ～ 100 VDC	160 ～ 500 VDC
Operating Temperature Range	-40 ～ +105℃	-25 ～ +105℃
Capacitance Tolerance	±20% (M)	(at 20℃, at 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller Where, I:Max. leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC)	(at 20℃, 5 minutes)
※ Dissipation Factor (Tanδ)		(at 20℃, 120Hz)

Rated Voltage(VDC)	16	25～35	50～63	100	160～400	420～500
Tanδ(Max.)	0.40	0.35	0.25	0.20	0.15	0.20

Temperature Characteristics (Max.Impedance ratio)							
Rated Voltage(VDC)	16	25	35	50～63	100	160～400	420～500
Z(-25℃)/Z(20℃)	4	3	3	2	2	4	8
Z(-40℃)/Z(20℃)	15	10	8	6	5	-	-

(at 120Hz)

Load Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃

Capacitance change	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value

Shelf Life

The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements.

Capacitance change	≦ ±20% of the initial value
Tanδ	≦ 200% of the initial specified value
Leakage Current	≦ The initial specified value

Others: Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitors exceed 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

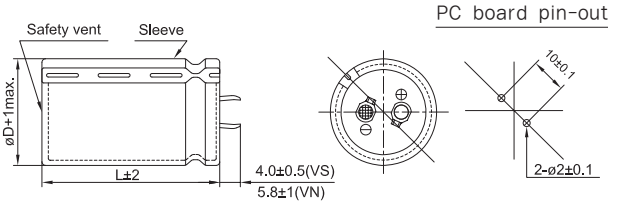
VDC \ Freq.(Hz)	60	120	300	1k	10k～
16～50VDC	0.95	1.00	1.03	1.05	1.08
63～100VDC	0.92	1.00	1.07	1.13	1.19
160～250VDC	0.81	1.00	1.17	1.32	1.45
315～500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TDA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TDA Series

VDC / μF \ ø D	16				25				35			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
3,300									22×25 1.40			
3,900									22×30 1.57			
4,700					22×25 1.50				22×30 1.72	25.4×25 1.80		
5,600					22×25 1.63				22×35 1.95	25.4×30 1.96	30×25 1.99	
6,800	22×25 1.57				22×30 1.86	25.4×25 1.87			22×40 2.20	25.4×35 2.23	30×25 2.19	
8,200	22×30 1.73				22×35 2.11	25.4×30 2.12	30×25 2.15		22×50 2.55	25.4×40 2.53	30×30 2.53	
10,000	22×30 1.97	25.4×25 1.97			22×40 2.39	25.4×35 2.42	30×25 2.39			25.4×45 2.87	30×35 2.90	35×30 2.75
12,000	22×35 2.22	25.4×30 2.24			22×45 2.69	25.4×40 2.74	30×30 2.70	35×25 2.74		25.4×50 3.24	30×40 3.23	35×30 3.23
15,000	22×40 2.55	25.4×35 2.58				25.4×45 3.15	30×35 3.13	35×30 3.27			30×45 3.72	35×35 3.67
18,000	22×45 2.87	25.4×40 2.92	30×30 2.88			25.4×50 3.54	30×40 3.54	35×30 3.50				35×40 4.37
22,000		25.4×45 3.32	30×35 3.29				30×45 4.04	35×35 3.97				35×50 4.92
27,000		25.4×50 3.78	30×40 3.77	35×30 3.45				35×45 4.73				
33,000			30×45 4.30	35×35 4.26				35×50 5.39				
39,000			30×50 4.81	35×40 4.79								
47,000				35×50 5.43								

VDC / μF \ ø D	50				63				100			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
560									22×25 1.06			
820									22×30 1.32	25.4×25 1.33		
1,000									22×35 1.50	25.4×30 1.51		
1,200					22×25 1.19				22×40 1.69	25.4×35 1.71	30×25 1.68	
1,500					22×25 1.33				22×45 1.94	25.4×40 1.98	30×30 1.95	
1,800	22×25 1.33				22×30 1.51	25.4×25 1.52				25.4×45 2.23	30×35 2.26	35×25 2.17
2,200	22×30 1.50				22×35 1.73	25.4×30 1.74				25.4×50 2.53	30×40 2.57	35×30 2.50
2,700	22×30 1.69	25.4×25 1.70			22×40 1.97	25.4×35 1.99	30×25 1.91				30×45 2.88	35×35 2.86
3.300	22×35 1.93	25.4×30 1.85			22×50 2.29	25.4×40 2.27	30×30 2.24				30×50 3.28	35×40 3.27
3,900	22×40 2.16	25.4×35 2.18	30×25 2.15			25.4×45 2.54	30×35 2.56	35×25 2.56				35×45 3.67
4,700	22×45 2.43	25.4×35 2.39	30×30 2.35	35×25 2.48		25.4×50 2.86	30×40 2.86	35×30 2.79				35×50 3.80
5,600	22×50 2.75	25.4×40 2.70	30×35 2.76	35×25 2.70			30×45 3.22	35×35 3.19				
6,800		25.4×50 3.30	30×40 3.30	35×30 3.25			30×50 3.66	35×40 3.64				
8,200			30×45 3.60	35×35 3.56				35×45 3.90				
10,000			30×50 4.04	35×40 4.03				35×50 4.40				
12,000				35×45 4.56	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)							

RATINGS OF TDA Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
100												
120										25.4×20 0.48		
150					22×20 0.53					25.4×20 0.59		
180					22×20 0.62	25.4×20 0.64			22×25 0.78	25.4×20 0.75		
220		25.4×20 0.66			22×25 0.70	25.4×20 0.70			22×30 0.96	25.4×25 0.95	30×20 0.93	
270		25.4×20 0.80			22×25 0.87	25.4×20 0.83			22×30 1.11	25.4×25 1.10	30×20 1.10	
330	22×25 1.20	25.4×20 1.10			22×30 1.20	25.4×25 1.21	30×20 1.20		22×35 1.20	25.4×30 1.20	30×25 1.26	35×20 1.17
390	22×30 1.30	25.4×25 1.29	30×20 1.19		22×30 1.28	25.4×25 1.27	30×25 1.25		22×40 1.45	25.4×35 1.49	30×25 1.44	35×25 1.49
470	22×30 1.36	25.4×25 1.39	30×20 1.31	35×20 1.35	22×35 1.41	25.4×30 1.41	30×25 1.50	35×20 1.30	22×45 1.53	25.4×35 1.50	30×30 1.57	35×25 1.57
560	22×35 1.46	25.4×30 1.51	30×25 1.54	35×20 1.41	22×45 1.56	25.4×35 1.53	30×30 1.57	35×25 1.52	22×50 1.77	25.4×40 1.74	30×30 1.73	35×25 1.72
680	22×40 1.66	25.4×30 1.65	30×25 1.68	35×20 1.69	22×45 1.73	25.4×35 1.69	30×30 1.74	35×25 1.72		25.4×50 1.84	30×35 1.94	35×30 1.97
820	22×45 1.99	25.4×30 1.95	30×30 2.00	35×25 1.91		25.4×45 1.99	30×35 2.00	35×30 2.04		25.4×60 2.20	30×40 2.10	35×35 1.98
1,000	22×50 2.18	25.4×40 2.14	30×30 2.15	35×25 2.17		25.4×50 2.21	30×40 2.23	35×35 2.30			30×50 2.31	35×40 2.30
1,200		25.4×45 2.39	30×35 2.37	35×30 2.41		25.4×60 2.57	30×45 2.53	35×35 2.57			30×60 2.50	35×45 2.43
1,500		25.4×60 2.87	30×40 2.74	35×35 2.79			30×50 3.01	35×40 2.99				35×50 2.80
1,800			30×45 3.14	35×35 3.11			30×60 3.47	35×45 3.38				
2,200			30×60 3.76	35×45 3.66				35×60 3.60				

μF \ VDC / ø D	315				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47									22×20 0.22			
68									22×25 0.51	25.4×20 0.46		
82	22×25 0.64				22×25 0.56				22×25 0.55	25.4×20 0.53		
100	22×30 0.68				22×25 0.67				22×30 0.67	25.4×25 0.67	30×20 0.60	
120	22×30 0.75	25.4×25 0.76			22×30 0.73	25.4×25 0.73			22×35 0.76	25.4×30 0.76	30×25 0.76	35×20 0.70
150	22×35 0.82	25.4×30 0.83			22×35 0.83	25.4×30 0.83	30×25 0.83		22×40 0.82	25.4×30 0.80	30×25 0.82	35×20 0.80
180	22×40 0.91	25.4×30 0.88	30×25 0.85		22×40 0.89	25.4×30 0.89	30×25 0.91		22×45 0.88	25.4×35 0.88	30×30 0.89	35×25 0.90
220	22×45 0.94	25.4×35 0.96	30×30 1.00		22×45 0.98	25.4×35 0.98	30×30 0.98	35×25 0.96	22×50 1.01	25.4×40 0.99	30×30 0.98	35×25 1.02
270		25.4×45 1.13	30×35 1.12	35×25 1.06	22×50 1.12	25.4×40 1.10	30×30 1.08	35×25 1.12		25.4×45 1.12	30×35 1.12	35×30 1.16
330		25.4×50 1.28	30×40 1.28	35×30 1.30		25.4×45 1.24	30×40 1.24	35×30 1.29		25.4×50 1.27	30×40 1.28	35×35 1.35
390			30×45 1.44	35×35 1.42		25.4×60 1.47	30×40 1.40	35×35 1.47		25.4×60 1.51	30×45 1.49	35×35 1.47
470			30×50 1.63	35×40 1.64		25.4×60 1.70	30×45 1.67	35×35 1.65			30×50 1.63	35×40 1.62
560				35×45 1.87			30×50 1.87	35×40 1.86			30×60 1.88	35×50 1.88
680				35×50 2.07			30×60 2.18	35×50 2.18				35×60 2.19
820								35×60 2.53	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

RATINGS OF TDA Series

VDC / μF \ ø D	420				450				500			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
56					22×25 0.40				22×35 0.46	25.4×30 0.46	30×30 0.48	
68	22×25 0.50				22×30 0.50	25.4×25 0.50			22×40 0.45	25.4×35 0.53	30×30 0.55	
82	22×25 0.51	25.4×25 0.63			22×30 0.55	24.5×25 0.54			22×45 0.56	25.4×35 0.58	30×35 0.58	
100	22×30 0.58	25.4×30 0.69			22×35 0.62	25.4×30 0.62	30×25 0.64			25.4×40 0.65	30×35 0.66	
120	22×35 0.72	25.4×30 0.73	30×25 0.75		22×40 0.70	25.4×35 0.71	30×30 0.72	35×25 0.73		25.4×45 0.75	30×40 0.76	35×30 0.78
150	22×45 0.79	25.4×35 0.74	30×25 0.75	35×25 0.81	22×45 0.77	25.4×40 0.75	30×30 0.74	35×25 0.75			30×45 0.80	35×35 0.81
180	22×50 0.89	25.4×40 0.89	30×30 0.88	35×25 0.87		25.4×45 0.84	30×35 0.87	35×30 0.88			30×50 0.90	35×40 0.93
220		25.4×45 1.01	30×35 1.00	35×30 1.05		25.4×50 0.98	30×40 0.98	35×30 1.00			30×60 1.10	35×45 1.11
270			30×45 1.19	35×35 1.19		25.4×60 1.17	30×45 1.15	35×35 1.17				35×50 1.28
330			30×50 1.36	35×40 1.39			30×50 1.38	35×40 1.38				35×60 1.50
390				35×45 1.57			30×60 1.60	35×45 1.56				
470				35×50 1.73				35×50 1.72				
560								35×60 1.98	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

TDC Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Downsized of TDA series.
- For SMPS, Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ～ 450 VDC
Operating Temperature Range	-25 ～ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller Where, I:Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)
※ Dissipation Factor (Tanδ)	Rated Voltage(VDC) 160～400 420～450 Tanδ(Max.) 0.15 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage(VDC) 160～400 420～450 Z(-25℃)/Z(20℃) 4 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated working voltage is applied for 2,000 hours at 105℃ Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at max. operating temperature for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

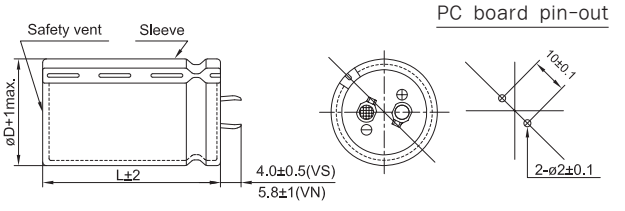
VDC \ Freq.(Hz)	60	120	300	1k	10k～
160～250VDC	0.81	1.00	1.17	1.32	1.45
315～450VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TDC Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TDC Series

VDC / μF \ ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
180									22×20 0.78			
220									22×25 1.00	25.4×20 0.95		
270					22×20 1.20					25.4×20 1.10		
330	22×20 1.20				22×25 1.28	25.4×20 1.27				25.4×25 1.20	30×20 1.26	35×20 1.17
390	22×25 1.32	25.4×20 1.39	30×20 1.31		22×25 1.31	25.4×20 1.43	30×20 1.43				30×20 1.44	35×20 1.49
470	22×30 1.46	25.4×25 1.51	30×20 1.54		22×30 1.45	25.4×25 1.53	30×20 1.53				30×25 1.57	35×20 1.57
560	22×30 1.66	25.4×25 1.68	30×25 1.68		22×40 1.67	25.4×30 1.67	30×25 1.67	35×20 1.67			30×30 1.80	35×25 1.72
680	22×35 1.87	25.4×30 1.88	30×25 1.96		22×45 1.75	25.4×35 1.75	30×25 1.74	35×20 1.72			30×30 1.94	35×30 2.10
820	22×40 2.09	25.4×30 2.14	30×25 2.15	35×25 2.04	22×50 2.04	25.4×40 2.04	30×30 2.04	35×25 2.04			30×35 2.29	35×30 2.36
1,000		25.4×35 2.38	30×30 2.40	35×25 2.55			30×35 2.30	35×30 2.30			30×45 2.59	35×35 2.63
1,200		25.4×40 2.66	30×35 2.69	35×30 2.86				35×30 2.65				

VDC / μF \ ø D	315				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
82									22×20 0.55			
100	22×25 0.75								22×25 0.66	25.4×20 0.67		
120	22×25 0.82				22×25 0.72					25.4×25 0.76		
150	22×30 0.91	25.4×25 0.94			22×30 0.84	25.4×25 0.89				25.4×25 0.86	30×20 0.89	
180		25.4×25 1.13			22×35 0.98	25.4×30 0.94				25.4×30 0.97	30×25 1.02	35×20 1.02
220		25.4×30 1.19	30×25 1.17		22×40 1.04	25.4×30 1.07	30×25 1.13			25.4×35 1.12	30×30 1.12	35×20 1.11
270		25.4×40 1.41	30×30 1.28	35×20 1.30		25.4×35 1.24	30×30 1.27			25.4×40 1.26	30×30 1.27	35×25 1.27
330			30×35 1.40	35×30 1.49		25.4×40 1.39	30×35 1.43	35×25 1.49		25.4×45 1.44	30×35 1.43	35×30 1.44
390			30×40 1.44	35×30 1.64		25.4×50 1.55	30×40 1.60	35×30 1.66		25.4×50 1.51	30×40 1.60	35×30 1.63
470			30×45 1.71	35×35 1.82		25.4×50 1.72	30×45 1.81	35×30 1.83			30×45 1.81	35×35 1.80
560				35×40 2.00				35×35 2.07	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

RATINGS OF TDC Series

μF \ VDC / ø D	420				450			
	22	25.4	30	35	22	25.4	30	35
68					22×20 0.50			
82	22×20 0.58				22×25 0.59	25.4×25 0.62		
100	22×25 0.66	25.4×25 0.69				25.4×25 0.70		
120	22×30 0.75	25.4×25 0.77	30×20 0.75			25.4×30 0.75		
150	22×40 0.86	25.4×30 0.88	30×25 0.88			25.4×30 0.88	30×25 0.87	
180	22×45 0.96	25.4×35 0.97	30×30 1.02	35×20 1.05		25.4×35 1.01	30×25 1.00	
220	22×50 1.11	25.4×40 1.14	30×30 1.14	35×20 1.12			30×35 1.10	
270		25.4×45 1.29	30×40 1.30	35×30 1.35			30×40 1.24	35×30 1.25
330			30×45 1.48	35×35 1.49				35×35 1.42
390				35×40 1.64				35×40 1.63
470				35×45 1.79	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			35×45 1.78

TEA Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof
- Height 15mm
- For SMPS, Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

TDA → TEA
Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 400 V_{DC}
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller. Where, I: Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 5 minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(V_{DC}) 160~400 Tanδ(Max.) 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 160~400 Z(-25℃)/Z(20℃) 4 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other conditions at 120Hz the maximum ripple current must be multiplied by the figure shown in the table

Frequency multiplying factor

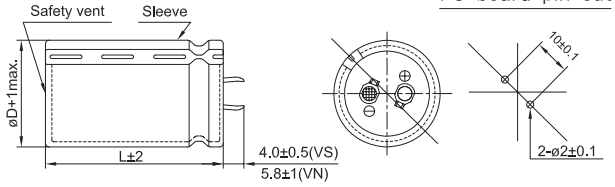
V_{DC} \ Freq.(Hz)	60	120	300	1k	10k~
160~250V_{DC}	0.81	1.00	1.17	1.32	1.45
350~400V_{DC}	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TEA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TEA series

μF \ VDC / ø D	160				200			
	22	25.4	30	35	22	25.4	30	35
120					22×15 0.61			
150	22×15 0.68					25.4×15 0.73		
180		25.4×15 0.79					30×15 0.79	
220		25.4×15 0.88					30×15 0.90	
270			30×15 0.96					35×15 1.00
330			30×15 1.06					35×15 1.07
390				35×15 1.20				

μF \ VDC / ø D	250				400			
	22	25.4	30	35	22	25.4	30	35
39					22×15 0.35			
47						25.4×15 0.40		
56						25.4×15 0.44		
68							30×15 0.46	
82	22×15 0.50						30×15 0.51	
100		25.4×15 0.59						35×15 0.56
120		25.4×15 0.65						35×15 0.62
150			30×15 0.71					
180			30×15 0.79					
220				35×15 0.90	← Case Size øD×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

RLS Series

• 85℃ 3,000Hrs assured.

- Non-solvent proof.
- Downsized of RDA series.
- For SMPS, Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

RDC → RLS

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ～ 450 VDC
Operating Temperature Range	-25 ～ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller Where, I:Leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)
※ Dissipation Factor (Tanδ)	Rated Voltage(VDC) 160～400 420～450 Tanδ(Max.) 0.15 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Rated Voltage(VDC) 160～400 420～450 Z(-25℃)/Z(20℃) 4 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated working voltage is applied for 3,000 hours at 85℃ Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at max. operating temperature for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurement. Capacitance change ≦ ±15% of the initial value Tanδ ≦ 150% of the initial specified value Leakage Current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

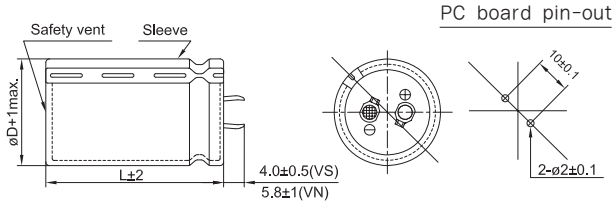
VDC \ Freq.(Hz)	60	120	300	1k	10k～
160～250VDC	0.81	1.00	1.17	1.32	1.45
350～450VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RLS Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF RLS Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
150									22×20 0.97			
180									22×20 1.06			
220					22×20 1.18				22×25 1.24	25.4×20 1.22		
270	22×20 1.30				22×20 1.37	25.4×20 1.35			22×30 1.54	25.4×20 1.32		
330	22×25 1.50				22×25 1.51	25.4×20 1.49			22×30 1.66	25.4×25 1.61	30×20 1.58	
390	22×25 1.62	25.4×20 1.62			22×30 1.73	25.4×25 1.71	30×20 1.71		22×35 1.88	25.4×30 1.88	30×25 1.86	35×20 1.71
470	22×30 1.86	25.4×25 1.86			22×30 1.97	25.4×25 1.95	30×20 1.88			25.4×35 2.15	30×25 2.05	35×20 1.88
560	22×30 2.15	25.4×25 2.15	30×20 2.05		22×40 2.18	25.4×30 2.15	30×25 2.15	35×20 2.05		25.4×35 2.35	30×30 2.36	35×25 2.35
680	22×35 2.35	25.4×30 2.33	30×25 2.33	35×20 2.26	22×40 2.48	25.4×30 2.48	30×25 2.48	35×20 2.36			30×30 2.71	35×25 2.58
820	22×40 2.68	25.4×30 2.65	30×25 2.64	35×20 2.49	22×45 2.81	25.4×40 2.79	30×30 2.80	35×25 2.83			30×35 2.98	35×30 2.88
1,000	22×45 3.02	25.4×35 3.00	30×30 2.96	35×25 3.31	22×50 3.28	25.4×40 3.28	30×35 3.15	35×30 3.26			30×40 3.56	35×35 3.48
1,200	22×50 3.47	25.4×40 3.43	30×30 3.41	35×25 3.4		25.4×45 3.61	30×35 3.61	35×30 3.57				

μF \ VDC / ø D	350				400				450			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47									22×20 0.54			
56									22×20 0.59			
68					22×20 0.65				22×25 0.71	25.4×20 0.68		
82	22×20 0.72				22×25 0.84	25.4×20 0.74			22×25 0.86	25.4×20 0.74	30×20 0.79	
100	22×25 0.80				22×25 0.99	25.4×20 0.82			22×30 0.95	25.4×25 0.97	30×20 0.87	
120	22×25 1.04	25.4×20 0.90			22×30 1.09	25.4×25 1.13	30×20 0.95		22×35 1.07	25.4×30 1.09	30×25 1.12	35×20 0.99
150	22×30 1.2	25.4×25 1.22	30×20 1.06		22×35 1.24	25.4×30 1.27	30×25 1.20		22×40 1.18	25.4×30 1.25	30×25 1.29	35×20 1.06
180	22×30 1.34	25.4×25 1.37	30×20 1.16		22×40 1.41	25.4×30 1.44	30×25 1.52	35×20 1.16	22×45 1.32	25.4×35 1.40	30×30 1.45	35×25 1.33
220	22×35 1.47	25.4×30 1.53	30×25 1.54	35×20 1.29	22×45 1.58	25.4×35 1.64	30×30 1.66	35×20 1.47	22×50 1.48	25.4×40 1.59	30×30 1.64	35×25 1.66
270		25.4×35 1.73	30×25 1.8	35×25 1.49	22×50 1.65	25.4×40 1.79	30×30 1.82	35×25 1.63		25.4×45 1.73	30×35 1.89	35×30 1.90
330			30×30 2.03	35×25 1.8		25.4×45 2.00	30×35 2.05	35×30 2.05		25.4×50 2.12	30×40 2.12	35×35 2.15
390			30×35 2.23	35×30 2.3		25.4×50 2.12	30×40 2.26	35×35 2.28			30×45 2.35	35×40 2.38
470			30×35 2.53	35×30 2.55			30×45 2.51	35×35 2.54			30×50 2.65	35×45 2.68
560				35×35 2.75			30×50 2.85	35×40 2.85				35×50 2.88
680				35×40 3.15					← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85℃, 120Hz)			

TLA Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof.
- Long Life.
- Equal to TDA case size
- For SMPS, Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

TDA → TLA

Long Life.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 500 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(VDC): 160~500 Tanδ(Max.): 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 160~400 / 420~500 Z(-25℃)/Z(20℃): 4 / 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at max. operating temperature for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

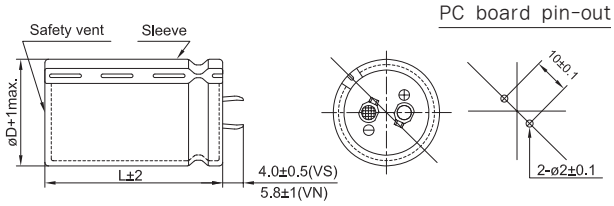
VDC \ Freq.(Hz)	60	120	300	1k	10k~
160~250VDC	0.81	1.00	1.17	1.32	1.45
350~500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLA Series

μF \ VDC / øD	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
180									22×25 0.78			
220									22×25 1.00	25.4×25 0.95		
270					22×25 1.10				22×30 1.18	25.4×25 1.18		
330	22×25 1.20				22×30 1.25	25.4×25 1.25			22×35 1.30	25.4×35 1.30	30×25 1.30	
390	22×25 1.30	25.4×25 1.26			22×30 1.35	25.4×25 1.35			22×40 1.49	25.4×35 1.49	30×25 1.49	
470	22×30 1.55	25.4×25 1.55			22×40 1.67	25.4×30 1.50	30×25 1.50		22×45 1.65	25.4×35 1.65	30×30 1.65	35×25 1.65
560	22×35 1.67	25.4×30 1.67	30×25 1.67		22×45 1.67	25.4×30 1.67	30×25 1.67		22×50 1.67	25.4×40 1.80	30×30 1.80	35×25 1.80
680	22×40 1.82	25.4×30 1.82	30×25 1.82		22×45 1.78	25.4×35 1.78	30×30 1.78	35×25 1.78		25.4×50 2.00	30×35 2.00	35×30 2.00
820	22×45 2.04	25.4×35 2.04	30×30 2.04	35×25 2.04		25.4×45 2.04	30×30 2.04	35×25 2.04		25.4×60 2.20	30×40 2.30	35×35 2.30
1,000	22×50 2.25	25.4×40 2.25	30×30 2.25	35×25 2.25		25.4×50 2.30	30×35 2.30	35×30 2.30			30×50 2.47	35×40 2.47
1,200		25.4×45 2.49	30×35 2.49	35×30 2.49		25.4×60 2.66	30×40 2.65	35×35 2.65			30×60 2.85	35×45 2.60
1,500		25.4×60 2.97	30×40 2.84	35×30 2.84			30×50 3.08	35×40 3.08				35×50 3.00
1,800			30×45 3.32	35×35 3.00			30×60 3.49	35×45 3.48				35×60 3.42
2,200			30×60 3.86	35×45 3.50				35×50 3.78	← Case Size øD×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

μF \ VDC / øD	350				400			
	22	25.4	30	35	22	25.4	30	35
56								
68					22×25 0.55			
82	22×25 0.55				22×25 0.64			
100	22×25 0.69				22×30 0.70	25.4×25 0.70		
120	22×30 0.75	25.4×25 0.75			22×35 0.75	25.4×25 0.75	30×25 0.80	
150	22×35 0.82	25.4×30 0.83	30×25 0.82		22×40 0.88	25.4×30 0.88	30×25 0.88	
180	22×40 0.92	25.4×30 0.92	30×25 0.90		22×45 0.98	25.4×35 0.98	30×30 0.98	35×25 0.98
220	22×45 1.05	25.4×35 1.04	30×30 1.02	35×25 1.04	22×50 1.10	25.4×40 1.10	30×30 1.10	35×25 1.0
270	22×50 1.16	25.4×40 1.18	30×30 1.17	35×25 1.20		25.4×45 1.22	30×35 1.22	35×30 1.22
330		25.4×45 1.29	30×35 1.34	35×30 1.22		25.4×50 1.44	30×40 1.44	35×30 1.44
390		25.4×50 1.51	30×40 1.51	35×35 1.47		25.4×60 1.51	30×45 1.60	35×35 1.60
470		25.4×60 1.66	30×45 1.65	35×35 1.69			30×50 1.90	35×40 1.90
560			30×50 1.85	35×40 1.90			30×60 2.10	35×45 2.12
680			30×60 2.15	35×50 1.99				35×60 2.27

RATINGS OF TLA Series

VDC / ØD / μF	420				450			
	22	25.4	30	35	22	25.4	30	35
56					22×25 0.40			
68	22×25 0.50				22×30 0.53	25.4×25 0.50		
82	22×25 0.64	25.4×25 0.58			22×30 0.64	25.4×25 0.64		
100	22×30 0.70	25.4×25 0.70			22×35 0.69	25.4×30 0.69	30×25 0.64	
120	22×35 0.75	25.4×30 0.75	30×25 0.73		22×40 0.80	25.4×30 0.80	30×25 0.80	35×25 0.73
150	22×40 0.88	25.4×35 0.88	30×25 0.88		22×45 0.88	25.4×35 0.88	30×30 0.88	35×25 0.75
180	22×45 0.95	25.4×35 0.95	30×30 0.95	35×25 0.94	22×50 1.00	25.4×40 1.00	30×30 1.00	
220	22×50 1.10	25.4×45 1.10	30×35 1.10	35×25 1.10		25.4×45 1.12	30×35 1.12	35×30 1.12
270		25.4×50 1.22	30×40 1.22	35×30 1.22		25.4×50 1.18	30×40 1.28	35×35 1.28
330		25.4×60 1.41	30×45 1.45	35×35 1.45			30×50 1.45	35×40 1.45
390			30×50 1.55	35×40 1.55			30×60 1.51	35×40 1.55
470			30×60 1.79	35×45 1.90	← Case Size ØD×L(mm) ← Rated Ripple Current(Arms/105°C, 120Hz)			35×50 1.85

VDC / ØD / μF	500			
	22	25.4	30	35
47				
56	22×35 0.46	25.4×30 0.46	30×30 0.48	
68	22×40 0.45	25.4×35 0.53	30×30 0.55	
82	22×45 0.56	25.4×35 0.58	30×35 0.58	
100		25.4×40 0.65	30×35 0.66	
120		25.4×45 0.75	30×40 0.76	35×30 0.78
150			30×45 0.80	35×35 0.81
180			30×50 0.90	35×40 0.93
220			30×60 1.10	35×45 1.11
270				35×50 1.28
330				35×60 1.50
390				
470				
560				

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

TLS Series

• 105℃ 3,000Hrs assured.

- Non-solvent proof.
- Downsized.
- High ripple capability
- For SMPS, Inverter
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

Downsized

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 450 V_{DC}
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(V_{DC}) (at 20℃, 5minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(V_{DC}) 160~400: 0.15; 450: 0.2 Tanδ(Max.) (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(V_{DC}) 160~400: 4; 450: 8 Z(-25℃)/Z(20℃) (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 3,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at max. operating temperature for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※For capacitors with CV products >100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

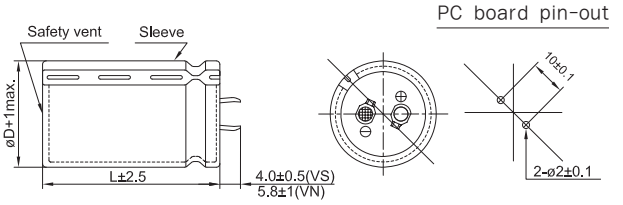
V_{DC} \ Freq.(Hz)	60	120	300	1k	10k~
160~250V_{DC}	0.81	1.00	1.17	1.32	1.45
350~450V_{DC}	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLS Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLS Series

VDC / μF \ øD	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
270									22×25 1.11			
330					22×25 1.23				22×30 1.29			
390					22×30 1.40				22×35 1.44	25.4×25 1.40		
470	22×25 1.47				22×30 1.54				22×40 1.61	25.4×30 1.57		
560	22×30 1.68				22×35 1.72	25.4×25 1.67			22×45 1.79	25.4×35 1.79	30×25 1.87	
680	22×35 1.86	25.4×25 1.84			22×40 1.94	25.4×30 1.89	30×25 2.05		22×50 2.02	25.4×40 2.02	30×30 2.08	35×25 2.19
820	22×40 2.12	25.4×30 2.08			22×45 2.17	25.4×35 2.17	30×30 2.28			25.4×45 2.26	30×35 2.34	35×30 2.44
1,000	22×45 2.40	25.4×35 2.40	30×25 2.50			25.4×40 2.45	30×30 2.52	35×25 2.66		25.4×50 2.53	30×40 2.66	35×30 2.70
1,200	22×50 2.69	25.4×40 2.68	30×30 2.77	35×25 2.91		25.4×45 2.78	30×35 2.83	35×30 2.96			30×45 2.99	35×35 3.00
1,500		25.4×45 3.05	30×35 3.17	35×30 3.30			30×40 3.26	35×35 3.36				35×40 3.48
1,800		25.4×50 3.40	30×40 3.57	35×30 3.62			30×50 3.72	35×40 3.81				35×50 3.98
2,200			30×45 4.05	35×35 4.07				35×45 4.32				
2,700			30×50 4.56	35×40 4.67				35×50 4.88				
3,300				35×50 5.40								

VDC / μF \ øD	315				400				450			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
100									22×25 0.70			
120					22×25 0.77				22×30 0.81			
150					22×30 0.90				22×35 0.92	25.4×25 0.90		
180	22×25 0.95				22×35 1.02	25.4×25 0.99			22×40 1.02	25.4×35 1.05	30×25 1.06	
220	22×30 1.10				22×40 1.15	25.4×30 1.13			22×45 1.17	25.4×35 1.16	30×30 1.18	
270	22×35 1.24	25.4×25 1.21			22×45 1.29	25.4×35 1.30	30×25 1.29			25.4×40 1.32	30×30 1.30	35×25 1.37
330	22×40 1.40	25.4×30 1.38	30×25 1.43		22×50 1.47	25.4×40 1.47	30×30 1.45			25.4×45 1.48	30×35 1.51	35×30 1.54
390	22×45 1.56	25.4×35 1.57	30×30 1.57			25.4×45 1.63	30×35 1.61	35×25 1.65		25.4×50 1.65	30×40 1.65	35×30 1.67
470	22×50 1.70	25.4×40 1.76	30×30 1.73	35×25 1.82		25.4×50 1.82	30×40 1.82	35×30 1.85			30×45 1.86	35×35 1.87
560		25.4×45 1.96	30×35 1.93	35×30 2.02			30×45 2.04	35×35 2.05				35×40 2.05
680			30×40 2.19	35×30 2.20			30×50 2.30	35×40 2.34				35×50 2.44
820			30×45 2.47	35×35 2.48				35×45 2.63				
1,000				35×40 2.83				35×50 2.96				
1,200				35×45 3.18	← Case Size øD×L(mm) ← Rated Ripple Current(Arms/105°C, 120Hz)							

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

UDA Series

• 125℃ 1,000Hrs assured.

- Non-solvent proof.
- Wide Temperature range.
- For automotive and industrial machine.
- RoHS compliant.
- Halogen-free capacitors are also available.

TDA → UDA

Wide Temp.

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	16 ～ 80 VDC	160 ～ 250 VDC
Operating Temperature Range	-40 ～ +125℃	-25 ～ +125℃
Capacitance Tolerance	±20% (M)	(at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller Where, I:Leakage current(㎂) C:Nominal capacitance(㎌) V:Rated voltage(VDC)	(at 20℃, 5 minutes)
※ Dissipation Factor (Tanδ)		(at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)		(120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated working voltage is applied for 1,000 hours at 125℃ Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at max. operating temperature for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurement. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ The initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

Rated Voltage(VDC)	16	25	35	50～80	160～250
Tanδ(Max.)	0.45	0.40	0.35	0.30	0.20

Rated Voltage(VDC)	16	25	35	50～80	160～250
Z(-25℃)/Z(20℃)	4	3	3	2	4
Z(-40℃)/Z(20℃)	15	10	8	6	-

※ For capacitors with CV products ＞ 100,000 Higher Tanδ value may apply.
When the capacitance exceeds 1,000㎌, 0.01 shall be added every 1,000㎌ increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

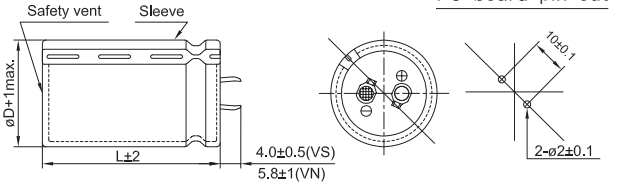
VDC \ Freq.(Hz)	60	120	300	1k	10k～
16～50VDC	0.95	1.00	1.03	1.05	1.08
63～100VDC	0.92	1.00	1.07	1.13	1.19
160～250VDC	0.81	1.00	1.17	1.32	1.45

DIMENSIONS OF UDA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : GREEN SLEEVE, BLACK INK
The standard design has no bottom plate.

RATINGS OF UDA Series

μF \ VDC / ø D	16				25				35			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
1,000									22×30 0.85			
1,500					22×30 0.95				22×40 1.16	25.4×30 1.14		
2,200	22×30 1.00				22×40 1.28	25.4×30 1.41			22×50 1.54	25.4×40 1.54	30×30 1.50	
3,300	22×40 1.36	25.4×35 1.41			22×50 1.72	25.4×40 1.72	30×30 1.68				30×40 2.04	35×30 2.09
4,700	22×50 1.78	25.4×40 1.77	30×30 1.74			25.4×50 2.23	30×40 2.22	35×30 2.17				35×40 2.61
6,800			30×40 2.31	35×30 2.26			30×50 2.90	35×40 2.87				
10,000				35×45 3.14								

μF \ VDC / ø D	50				63				80			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
330					22×35 0.69	25.4×30 0.71			22×30 0.59			
470					22×40 0.87	25.4×35 0.91	30×30 0.93		22×40 0.79	25.4×35 0.82		
680	22×30 0.78					25.4×45 1.21	30×35 1.19	35×30 1.22		25.4×40 1.04	30×35 1.07	
1,000	22×40 1.06	25.4×30 1.04					30×45 1.60	35×40 1.65			30×45 1.42	35×35 1.40
1,500	22×50 1.42	25.4×40 1.42	30×30 1.39					35×50 2.16				35×45 1.86
2,200			30×40 1.86	35×35 1.91								
3,300				35×40 2.45	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/125℃, 120Hz)							

RATINGS OF UDA Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
100									22 × 30 0.32			
150	22 × 30 0.37				22 × 35 0.42				22 × 40 0.44	25.4 × 30 0.43		
220	22 × 40 0.50	25.4 × 30 0.49			22 × 45 0.56	25.4 × 40 0.58	30 × 30 0.57		22 × 50 0.58	25.4 × 40 0.58	30 × 35 0.60	35 × 30 0.61
330	22 × 50 0.67	25.4 × 40 0.67	30 × 30 0.65			25.4 × 50 0.77	30 × 40 0.77	35 × 30 0.75			30 × 45 0.80	35 × 35 0.79
470		25.4 × 50 0.87	30 × 40 0.86	35 × 30 0.84				35 × 40 0.98				35 × 45 1.03
680			30 × 50 1.12	35 × 40 1.11				35 × 50 1.28				35 × 50 1.28
1,000				35 × 50 1.46	◀— Case Size ø D × L(mm) ◀— Rated Ripple Current(Arms/125°C, 120Hz)							

TLC(LXG) Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof.
- Long life.
- Almost equal to KMG case sizes.
- For SMPS, Inverter
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

KMG → TLC (LXG)

High Reliability
Long Life

SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	10 ~ 100 VDC	200 ~ 500 VDC
Operating Temperature Range	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M)	(at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)	
※ Dissipation Factor(Tanδ)		

Rated Voltage(VDC)	10	16	25	35	50	63~400	420~500
Tanδ(Max.)	0.60	0.45	0.30	0.25	0.20	0.15	0.20

(at 20℃,120Hz)

Temperature Characteristics (Max.Impedance ratio)

Rated Voltage(VDC)	10~16	25	35	50~63	80~100	200~400	420~500
Z(-25℃)/Z(20℃)	4	3	3	2	2	4	8
Z(-40℃)/Z(20℃)	15	10	8	6	5	-	-

(at 120Hz)

Load Life	After the capacitor are subjected to DC voltage and the rated ripple current applied for 5,000 hours at 105℃, the following specifications shall be satisfied when the capacitors are restored to 20℃. The sum of DC voltage and peak AC voltage must not exceed the full rated voltage of the capacitor. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 250% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 105℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF , 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other conditions at 120Hz the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

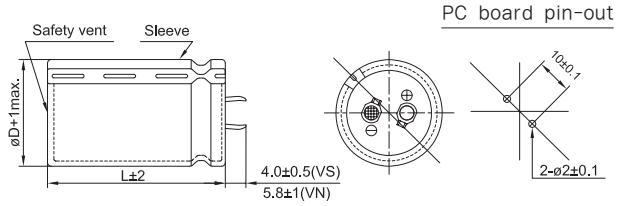
VDC \ Freq.(Hz)	50	120	300	1k	10k~
10~50VDC	0.95	1.00	1.03	1.05	1.08
63~100VDC	0.92	1.00	1.07	1.13	1.19
200, 250VDC	0.81	1.00	1.17	1.32	1.45
350~500VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLC(LXG) Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLC(LXG) Series

VDC / μF \ ø D	10				16				25			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
3,900									22×25 1.31			
4,700									22×30 1.51	25.4×25 1.51		
5,600					22×25 1.44				22×35 1.70			
6,800	22×25 1.30				22×30 1.66	25.4×25 1.66			22×40 1.92	25.4×30 1.87	30×25 1.90	
8,200					22×35 1.87					25.4×35 2.14	30×30 2.15	35×25 2.19
10,000	22×30 1.65	25.4×25 1.64			22×40 2.12	25.4×30 2.07	30×25 2.11		22×50 2.45	25.4×40 2.43		
12,000	22×35 1.85	25.4×30 1.85	30×25 1.89			25.4×35 2.37	30×30 2.37	35×25 2.42		25.4×50 2.78	30×35 2.70	35×30 2.76
15,000	22×40 2.12	25.4×35 2.16			22×50 2.74	25.4×40 2.71					30×40 3.13	35×35 3.16
18,000	22×50 2.45	25.4×40 2.43	30×30 2.37	35×25 2.42		25.4×50 3.11	30×35 3.02	35×30 3.09			30×50 3.64	35×40 3.61
22,000			30×35 2.73	35×30 2.79			30×40 3.46	35×35 3.49				
27,000		25.4×50 3.11	30×40 3.13				30×50 4.07	35×40 4.04				35×50 4.70
33,000				35×35 3.49								
39,000			30×50 3.99	35×40 3.96				35×50 5.16				
47,000				35×50 4.62								

VDC / μF \ ø D	35				50				63			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
1,000									22×25 1.00			
1,200									22×30 1.15	25.4×25 1.15		
1,500					22×25 1.02				22×35 1.32			
1,800					22×30 1.17	25.4×25 1.17			22×40 1.49	25.4×30 1.45	30×25 1.48	
2,200	22×25 1.10				22×35 1.33					25.4×35 1.67	30×30 1.68	35×25 1.71
2,700					22×40 1.51	25.4×30 1.47	30×25 1.50		22×50 1.92	25.4×40 1.90	30×35 1.93	
3,300	22×30 1.42	25.4×25 1.41				25.4×35 1.70	30×30 1.70	35×25 1.74		25.4×50 2.20		35×30 2.18
3,900	22×35 1.58	25.4×30 1.58			22×50 1.91	25.4×40 1.89					30×40 2.41	35×35 2.43
4,700	22×40 1.78		30×35 1.77				30×35 2.11	35×30 2.16			30×50 2.80	35×40 2.78
5,600		25.4×35 1.98	30×30 1.98	35×25 2.03		25.4×50 2.38	30×40 2.39	35×35 2.41				
6,800	22×50 2.26	25.4×40 2.24					30×50 2.79	35×40 2.78				35×50 3.55
8,200		25.4×50 2.57	30×35 2.50	35×30 2.55								
10,000			30×40 2.86	35×35 2.88				35×50 3.57				
12,000			30×50 3.32	35×40 3.30								
18,000				35×50 4.29	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)							

RATINGS OF TLC(LXG) Series

μF \ VDC / ø D	80				100				200			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
180									22X25 0.63			
270									22X30 0.81	25.4X25 0.81		
330									22X35 0.92	25.4X30 0.92	30X25 0.94	
390					22X25 0.78				22X40 1.02			
470									22X50 1.17	25.4X35 1.15	30X30 1.15	35X25 1.22
560					22X30 0.99	25.4X25 0.98				25.4X40 1.28	30X35 1.30	
680	22X25 0.97				22X35 1.12					25.4X50 1.48	30X40 1.49	35X30 1.47
820	22X30 1.12				22X40 1.26	25.4X30 1.23	30X25 1.25					35X35 1.65
1,000	22X35 1.27	25.4X25 1.23				25.4X35 1.41	30X30 1.42	35X25 1.45			30X50 1.91	35X40 1.90
1,200	22X40 1.42	25.4X30 1.39	30X25 1.41		22X50 1.60	25.4X40 1.59	30X35 1.61					35X50 2.21
1,500		25.4X35 1.62				25.4X50 1.86	30X40 1.87	35X30 1.85				
1,800	22X50 1.84	25.4X40 1.82	30X30 1.78	35X25 1.82				35X35 2.07				
2,200		25.4X50 2.11	30X35 2.05	35X30 2.09			30X50 2.40	35X40 2.39				
2,700			30X40 2.35	35X35 2.37				35X50 2.81				
3,300			30X50 2.75	35X40 2.73								
4,700				35X50 3.46								

μF \ VDC / ø D	250				350				400			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
56									22X25 0.34			
68					22X25 0.39				22X30 0.44	25.4X25 0.40		
82					22X30 0.49				22X35 0.50			
100					22X35 0.52	25.4X25 0.51				25.4X30 0.52	30X25 0.52	
120					22X40 0.56	25.4X30 0.55	30X25 0.56		22X40 0.57	25.4X35 0.58		35X25 0.61
150	22X25 0.57					25.4X35 0.60		35X25 0.69	22X50 0.67	25.4X40 0.66	30X30 0.65	
180	22X30 0.66	25.4X25 0.66			22X50 0.73	25.4X40 0.72	30X30 0.71				30X35 0.74	35X30 0.76
220	22X35 0.75					25.4X50 0.93	30X35 0.82	35X30 0.83		25.4X50 0.84	30X40 0.84	35X35 0.94
270	22X40 0.85	25.4X30 0.83	30X25 0.85				30X40 0.94	35X35 1.04			30X50 1.10	35X40 1.09
330		25.4X35 0.96	30X30 0.96	35X25 1.02			30X50 1.19	35X40 1.19				
390	22X50 1.08	25.4X40 1.07										35X50 1.26
470		25.4X50 1.22	30X35 1.19	35X30 1.22				35X50 1.38				
560			30X40 1.35	35X35 1.36								
680			30X50 1.58	35X40 1.57								
1,000				35X50 2.02	← Case Size ø D×L (mm) ← Rated Ripple Current (Arms/105°C, 120Hz)							

RATINGS OF TLC(LXG) Series

μF \ VDC / ø D	420				450				500			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47					22×25 0.30				22×35 0.32			
56					22×30 0.36				22×35 0.38	25.4×30 0.36	30×30 0.39	
68	22×30 0.44				22×35 0.44	25.4×30 0.45			22×40 0.45	25.4×35 0.47	30×30 0.44	
82	22×30 0.50	25.4×30 0.50			22×35 0.50	25.4×30 0.50			22×45 0.54	25.4×35 0.54	30×35 0.50	
100	22×35 0.52	25.4×30 0.52			22×40 0.53	25.4×35 0.52	30×30 0.53			25.4×40 0.55	30×35 0.56	
120	22×40 0.56	25.4×35 0.56	30×30 0.57		22×45 0.57	25.4×35 0.58	30×30 0.58	35×30 0.59		25.4×45 0.62	30×40 0.62	35×30 0.63
150	22×45 0.67	25.4×40 0.67	30×30 0.67		22×50 0.67	25.4×40 0.67	30×35 0.67	35×30 0.68			30×45 0.70	35×30 0.74
180	22×50	25.4×40 0.74	30×35 0.75	35×30 0.76		25.4×45 0.76	30×35 0.76				30×50 0.85	35×40 0.86
220		25.4×50 0.84	30×40 0.84	35×30 0.84		25.4×50 0.84	30×40 0.84	35×35 0.86			30×60 1.00	35×35 0.96
270			30×45 1.10	35×35 1.10			30×45 1.10	35×40 1.11				35×40 1.44
330			30×50 1.22	35×40 1.22			30×50 1.22	35×45 1.23				35×60 1.55
390				35×45 1.35				35×50 1.35				
470				35×50 1.47					← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

TLB Series

• 105℃ 7,000Hrs assured.

- Non-solvent proof
- Long life
- Downsized of LXG series
- For SMPS, Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	160 ~ 450 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV(μA) or 3mA, whichever is smaller. Where, I: Max. Leakage current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)
※Dissipation Factor(Tanδ)	Rated voltage(VDC): 160 ~ 450 Tanδ(Max.): 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 160 ~400 / 450 Z(-25℃)/Z(20℃): 4 / 8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 7,000 hours at 105℃. Capacitance change ≦ ±25% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitors are operated in any other conditions at 120Hz the maximum ripple current must be multiplied by the figure shown in the table.

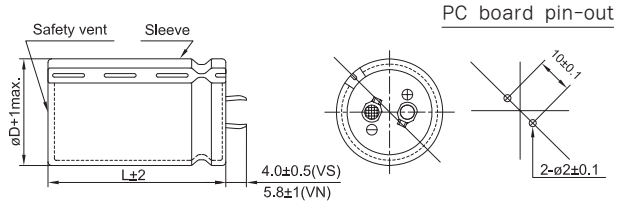
Frequency multiplying factor

VDC \ Freq.(Hz)	60	120	300	1k	10k~
160~250VDC	0.81	1.00	1.17	1.32	1.45
350~450VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TLB Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF TLB Series

μF \ VDC / ø D	160				200				250			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
220					22×25 0.90				22×30 0.95			
270					22×30 1.05				22×35 1.08	25.4×25 1.05		
330	22×25 1.11				22×30 1.16	25.4×25 1.16			22×40 1.22	25.4×30 1.19		
390	22×30 1.26				22×35 1.29	25.4×30 1.29			22×45 1.36	25.4×35 1.35	30×25 1.32	
470	22×30 1.39	25.4×25 1.38			22×40 1.46	25.4×30 1.42	30×25 1.45		22×50 1.49	25.4×40 1.52	30×30 1.49	
560	22×35 1.55	25.4×30 1.55			22×45 1.63	25.4×35 1.62	30×30 1.62			25.4×45 1.70	30×35 1.69	
680	22×40 1.75	25.4×35 1.78	30×25 1.74			25.4×40 1.83	30×30 1.79			25.4×50 1.91	30×40 1.93	35×30 1.90
820	22×50 1.97	25.4×40 2.01	30×30 1.96			25.4×45 2.06	30×35 2.04				30×45 2.19	35×35 2.13
1,000		25.4×45 2.27	30×35 2.26				30×45 2.42	35×30 2.30				35×40 2.46
1,200		25.4×50 2.54	30×40 2.56	35×30 2.52			30×50 2.71	35×45 2.70				35×50 2.86
1,500			30×45 2.96	35×35 2.89				35×45 3.11				
1,800			30×50 3.32	35×40 3.30				35×50 3.50				
2,200				35×50 3.87								

μF \ VDC / ø D	350				400				450			
	22	25.4	30	35	22	25.4	30	35	22	25.4	30	35
47									22×25 0.46			
56									22×30 0.52			
68					22×25 0.55				22×30 0.58	25.4×25 0.58		
82					22×30 0.63				22×35 0.65	25.4×30 0.65		
100	22×25 0.67				22×30 0.70	25.4×25 0.70			22×40 0.74	25.4×30 0.72	30×25 0.73	
120	22×30 0.77	25.4×25 0.76			22×35 0.79	25.4×30 0.79			22×45 0.83	25.4×35 0.82	30×30 0.82	
150	22×35 0.88	25.4×30 0.88			22×40 0.90	25.4×30 0.88	30×25 0.90			25.4×40 0.94	30×35 0.96	
180	22×40 0.99	25.4×30 0.96	30×25 0.98		22×45 0.99	25.4×35 1.01	30×30 1.01			25.4×45 1.06	30×35 1.05	35×30 1.07
220	22×45 1.12	25.4×35 1.11	30×30 1.11			25.4×40 1.14	30×35 1.16				30×40 1.20	35×35 1.21
270		25.4×40 1.26	30×35 1.28			25.4×50 1.32	30×40 1.33	35×30 1.31			30×50 1.41	35×40 1.40
330		25.4×45 1.40	30×35 1.42	35×30 1.45			30×45 1.52	35×35 1.48				35×45 1.60
390			30×40 1.60	35×35 1.61			30×50 1.69	35×40 1.68				35×50 1.79
470			30×50 1.86	35×40 1.85				35×45 1.91				
560				35×40 2.02				35×50 2.14				
680				35×50 2.36					← Case Size øD×L (mm) ← Rated Ripple Current (Arms/105°C, 120Hz)			

RVA Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- No sparks with DC overvoltage.
- For SMPS(SET is specified Safety Standard)
- RoHS compliant.
- Halogen-free capacitors are also available.

RDA → RVA

High Reliability

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	200 ~ 450 VDC
Operating Temperature Range	-25 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(VDC): 200~400 / 450; Tanδ(Max.): 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 200~400 / 450; Z(-25℃)/Z(20℃): 4 / 8 (at 120Hz)
DC Over Voltage Test	When an excessive DC voltage is applied to the capacitors under the test conditions on next page, the voltage shall operate and than the capacitors shall come to open-circuit without flaming materials.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 85℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

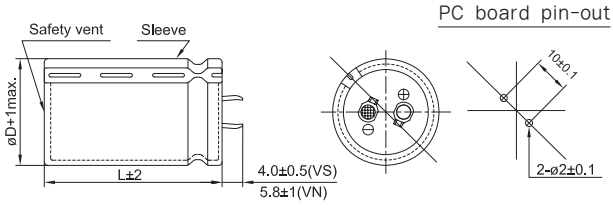
VDC \ Freq.(Hz)	60	120	300	1k	10k~
200~250VDC	0.81	1.00	1.17	1.32	1.45
350~450VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF RVA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BLACK SLEEVE, SILVER INK
The standard design has no bottom plate.

RATINGS OF RVA Series

μF \ VDC / ø D	200				250			
	22	25.4	30	35	22	25.4	30	35
120					22×20 0.80			
150	22×20 0.88				22×25 0.95	25.4×20 0.98		
180	22×25 1.05				22×25 1.12	25.4×20 1.13		
220	22×25 1.18	25.4×20 1.20			22×30 1.15	25.4×25 1.18	30×20 1.20	
270	22×30 1.27	25.4×25 1.24	30×20 1.26		22×35 1.31	25.4×30 1.32	30×20 1.28	
330	22×30 1.45	25.4×25 1.42	30×20 1.44		22×40 1.49	25.4×30 1.51	30×25 1.48	35×20 1.51
390	22×35 1.59	25.4×30 1.58	30×20 1.58	35×20 1.26	22×45 1.67	25.4×35 1.63	30×30 1.66	35×25 1.67
470	22×40 1.78	25.4×30 1.80	30×25 1.80	35×20 1.80	22×50 1.88	25.4×40 1.86	30×30 1.89	35×25 1.89
560	22×45 2.00	25.4×35 1.97	30×25 2.01	35×25 2.03		25.4×45 2.09	30×35 2.14	35×30 2.09
680	22×50 2.27	25.4×40 2.24	30×30 2.28	35×25 2.28		25.4×50 2.44	30×40 2.43	35×30 2.46
820		25.4×40 2.53	30×35 2.59	35×30 2.60			30×45 2.75	35×35 2.77
1,000		25.4×45 2.88	30×40 2.95	35×30 2.90			30×50 3.31	35×40 3.22
1,200			30×45 3.34	35×35 3.31				35×45 3.42
1,500			30×50 3.84	35×40 3.82				35×50 4.06
1,800				35×45 4.33				
2,200				35×50 4.92				

μF \ VDC / ø D	400				450			
	22	25.4	30	35	22	25.4	30	35
47	22×20 0.36							
56	22×20 0.40							
68	22×25 0.46	25.4×20 0.48			22×30 0.64			
82	22×30 0.71	25.4×20 0.72			22×30 0.70			
100	22×30 0.78	25.4×25 0.78	30×20 0.79		22×35 0.80	25.4×30 0.80		
120	22×35 0.88	25.4×30 0.87	30×25 0.90		22×40 0.91	25.4×30 0.91	30×25 0.92	
150	22×40 1.02	25.4×30 1.02	30×25 1.03	35×20 1.03	22×45 1.04	25.4×35 1.05	30×30 1.03	
180	22×45 1.14	25.4×35 1.11	30×30 1.13	35×25 1.14	22×50 1.18	25.4×40 1.15	30×30 1.17	35×25 1.20
220	22×50 1.29	25.4×40 1.27	30×30 1.30	35×25 1.27		25.4×45 1.31	30×35 1.36	35×30 1.35
270		25.4×45 1.45	30×35 1.48	35×30 1.49		25.4×50 1.55	30×40 1.60	35×35 1.59
330		22×50 1.65	30×40 1.65	35×30 1.67			30×45 1.90	35×40 1.88
390			30×45 1.85	35×35 1.88			30×50 2.09	35×45 2.08
470			30×50 2.09	35×40 2.07				35×50 2.40
560				35×45 2.34				
680				35×50 2.74	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/85℃, 120Hz)			

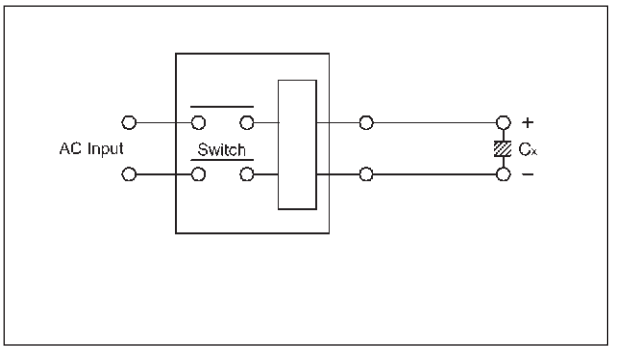
DC OVERVOLTAGE TEST CONDITIONS

The safety vent will operate and the capacitor shall become an open circuit without burning materials when the following excess DC voltage is applied.

- Test DC voltage

Rated voltage	Nominal capacitance	Current Limit	Test voltage
200VDC	〈 330μF	4A	300/375VDC
	330μF≦C〈470μF	5A	
	≧470μF	7A	
250VDC	〈 100μF	4A	350/450VDC
	100μF≦C〈220μF	5A	
	≧220μF	7A	
400VDC	〈 100μF	4A	500/600VDC
	100μF≦C〈220μF	5A	
	≧220μF	7A	
450VDC	〈 100μF	4A	550/675VDC
	100μF≦C〈220μF	5A	
	≧220μF	7A	

- Test circuit



TVA Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- No sparks with DC overvoltage.
- For SMPS(SET is specified Safety Standard)
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

TDA → TVA

High Reliability

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	200 ~ 450 VDC
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 3mA, whichever is smaller. Where, I:Leakage Current(μA), C:Nominal capacitance(μF), V:Rated voltage(VDC) (at 20℃, 5 minutes)
※ Dissipation Factor(Tanδ)	Rated voltage(VDC): 200~400 / 450; Tanδ(Max.): 0.15 / 0.20 (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Rated voltage(VDC): 200~400 / 450; Z(-25℃)/Z(20℃): 4 / 8 (at 120Hz)
DC Over Voltage Test	When an excessive DC voltage is applied to the capacitors under the test conditions on next page, the voltage shall operate and than the capacitors shall come to open-circuit without flaming materials.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage is applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ ±200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

※ For capacitors with CV products 〉 100,000 higher Tanδ value may apply.
When the capacitance exceeds 1,000μF, 0.01 shall be added every 1,000μF increase.

RATED RIPPLE CURRENT

When capacitor are operated in any other condition at 120Hz, the maximum ripple current must be multiplied by the figure shown in the table.

Frequency multiplying factor

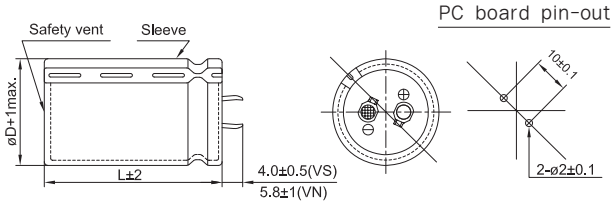
VDC \ Freq.(Hz)	60	120	300	1k	10k~
200~250VDC	0.81	1.00	1.17	1.32	1.45
350~450VDC	0.77	1.00	1.16	1.30	1.41

DIMENSIONS OF TVA Series

Unit(mm)

ø D= ø 22~ ø 35 VN/VS type

PC board pin-out



Marking : BROWN SLEEVE, SILVER INK
The standard design has no bottom plate.

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

RATINGS OF TVA Series

μF \ VDC / ø D	200				250			
	22	25.4	30	35	22	25.4	30	35
120					22×20 0.68			
150					22×25 0.77			
180	22×25 0.82				22×30 0.87	25.4×25 0.93		
220	22×25 0.92				22×30 1.00	25.4×25 1.02		
270	22×30 1.02				22×35 1.14	25.4×30 1.13	30×25 1.25	
330	22×35 1.20	25.4×25 1.20			22×40 1.28	25.4×30 1.29	30×25 1.38	
390	22×40 1.35	25.4×30 1.35			22×45 1.42	25.4×35 1.46	30×30 1.52	35×25 1.62
470	22×45 1.52	25.4×30 1.45	30×25 1.47			25.4×40 1.64	30×30 1.67	35×25 1.81
560	22×50 1.74	25.4×35 1.60	30×30 1.60			25.4×45 1.82	30×35 1.87	35×30 1.99
680		25.4×40 1.82	30×30 1.81	35×25 1.86		25.4×50 1.96	30×40 2.12	35×30 2.19
820		25.4×50 2.11	30×35 2.11	35×30 2.11			30×45 2.39	35×35 2.42
1,000			30×40 2.40	35×30 2.40			30×50 2.52	35×40 2.57
1,200			30×50 2.65	35×35 2.65				35×45 2.70
1,500				35×45 3.08				35×50 3.00
1,800				35×50 3.31				

μF \ VDC / ø D	400				450			
	22	25.4	30	35	22	25.4	30	35
56	22×25 0.45							
68	22×30 0.51				22×30 0.53			
82	22×30 0.58				22×35 0.64			
100	22×35 0.66	25.4×25 0.66			22×40 0.69	25.4×30 0.69		
120	22×40 0.76	25.4×30 0.76			22×45 0.80	25.4×35 0.80		
150	22×45 0.85	25.4×35 0.85	30×30 0.85		22×50 0.88	25.4×40 0.88	30×30 0.88	
180	22×50 0.94	25.4×40 0.95	30×30 0.95			25.4×45 1.00	30×35 1.00	
220		25.4×45 1.24	30×35 1.24	35×30 1.24		25.4×50 1.12	30×40 1.12	35×30 1.12
270		25.4×50 1.30	30×40 1.30	35×30 1.30			30×45 1.28	35×35 1.28
330			30×45 1.47	35×35 1.47			30×50 1.45	35×40 1.45
390			30×50 1.62	35×40 1.62				35×45 1.55
470				35×45 1.90				35×50 1.85
560				35×50 2.12	← Case Size ø D×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)			

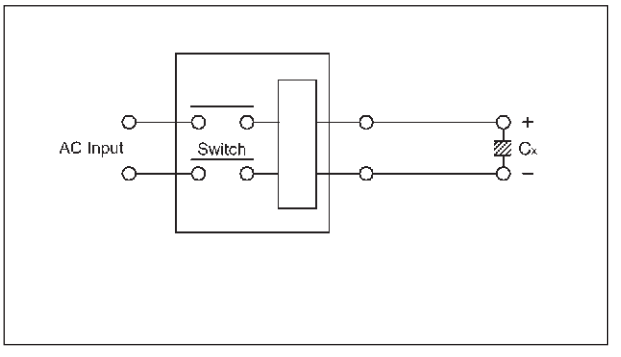
DC OVERVOLTAGE TEST CONDITIONS

The safety vent will operate and the capacitor shall become an open circuit without burning materials when the following excess DC voltage is applied.

● Test DC voltage

Rated voltage	Nominal capacitance	Current Limit	Test voltage
200VDC	〈 330μF	4A	300/375VDC
	330μF≦C〈470μF	5A	
	≧470μF	7A	
250VDC	〈 100μF	4A	350/450VDC
	100μF≦C〈220μF	5A	
	≧220μF	7A	
400VDC	〈 100μF	4A	500/600VDC
	100μF≦C〈220μF	5A	
	≧220μF	7A	
450VDC	〈 100μF	4A	550/675VDC
	100μF≦C〈220μF	5A	
	≧220μF	7A	

● Test circuit



DL Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- For AMP, AVR
- General Audio grade
- RoHS compliant..
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	50 ~ 100 VDC
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 2mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	Refer to the below table. (at 20℃, 120Hz)
Temperature Characteristics (Max. Impedance ratio)	Z(-25℃)/Z(20℃) 4 Z(-40℃)/Z(20℃) 15 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied for 2,000 hours at 85℃ Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at max. operating temperature for ½ assurance load life time without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value.
Charge & Discharge	5,000 times (at 70℃) After this test is completed, the capacitors shall be satisfied the following specifications Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 150% of the initial specified value. Leakage current ≦ The initial specified value. where, Charge resistance : 2.2Ω Charge conditions: rated volt. 1(A) Discharge resistance: 100Ω Charge and discharge time:30 sec(each)
Others	Satisfied characteristics KS C IEC 60384-4

RATINGS OF DL Series

μF \ VDC	50			63			80			100		
3,300	25.4×30	0.20	1.81	25.4×40	0.20	1.96	25.4×50	0.20	1.07	30×60	0.20	2.32
	30×25	0.20	1.86	30×30	0.25	1.75	30×40	0.20	1.08	35×50	0.20	2.32
							35×35	0.25	1.86	40×40	0.25	2.28
4,700	25.4×40	0.25	2.09	25.4×50	0.25	2.21	25.4×60	0.25	2.33	35×60	0.25	2.62
	30×30	0.25	2.09	30×40	0.25	2.22	30×50	0.25	2.35	40×50	0.25	2.61
				35×30	0.30	2.03	35×40	0.30	2.73			
6,800	25.4×50	0.25	2.65	30×50	0.30	2.58	30×60	0.30	2.72	40×60	0.25	3.29
	30×40	0.25	2.67	35×40	0.30	2.57	35×50	0.30	2.72			
	35×35	0.25	2.67				40×40	0.30	2.72			
8,200	30×50	0.35	2.63	30×60	0.35	2.77	35×60	0.30	3.16			
	35×40	0.35	2.61	35×50	0.35	2.77	40×50	0.30	3.15			
				40×40	0.35	2.77						
10,000	30×50	0.35	2.90	35×60	0.35	3.23	40×60	0.35	3.37			
	35×40	0.35	2.88	40×50	0.35	3.22						
12,000	30×60	0.35	3.32	35×60	0.40	3.31	50×50	0.40	3.50			
	35×50	0.35	3.34	40×50	0.40	3.30						
	40×40	0.35	3.35									
15,000	35×60	0.35	3.85	40×60	0.40	3.86						
	40×50	0.35	3.92									
22,000	40×60	0.35	5.00									

Rated Ripple Current (Arms/85℃, 120Hz)
Tanδ(Max.)
Case Size øD×L(mm)

DIMENSIONS : Refer to page 174.

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

AHS Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- Hi-Fi Audio grade.
- For Audio, AMP, AVR
- RoHS compliant.
- Halogen-free capacitors are also available.

DL → AHS

High reliability

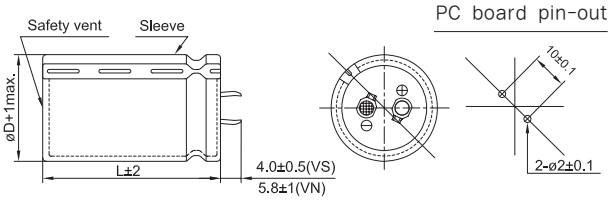
SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	50 ~ 100 VDC
Operating Temperature Range	-40 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.01CV or 2mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	Tanδ shall not exceed the value shown in the table of RATINGS. (at 20℃, 120Hz)
Temperature Characteristics (Max.Impedance ratio)	Z(-25℃)/Z(20℃) 4 Z(-40℃)/Z(20℃) 15 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the rated voltage applied for 2,000 hours at 85℃ Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at max. operating temperature for ½ assurance load life time without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value. Tanδ ≦ 200% of the initial specified value. Leakage current ≦ The initial specified value
Charge & Discharge	5,000 times (at 70℃) After this test is completed, the capacitors shall be satisfied the following specifications. Capacitance change ≦ ±20% of the initial value. Tan δ ≦ 150% of the initial specified value. Leakage current ≦ The initial specified value No visible damage and no leakage electrolyte where, Charge resistance: 2.2Ω Charge conditions: rated volt. 1(A) Discharge resistance: 100Ω Charge and discharge time: 30 sec(each)
Others	Satisfied characteristics KS C IEC 60384-4

DIMENSIONS OF AHS/DL Series

Unit(mm)

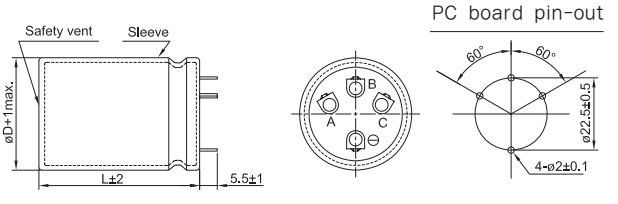
ø D= ø 22~ ø 35 VN/VS type



Marking : AHS-DARK BROWN SLEEVE, GOLD INK
DL-BLACK SLEEVE, SILVER INK

The standard design has no bottom plate.

ø D= ø 35~ ø 40 VR type (4 terminals)



B: Positive terminal.
A, C: Terminals not connected electrically but used for mechanical support only. (Blank Termimals)

Note: Sleeve has an insulating role.

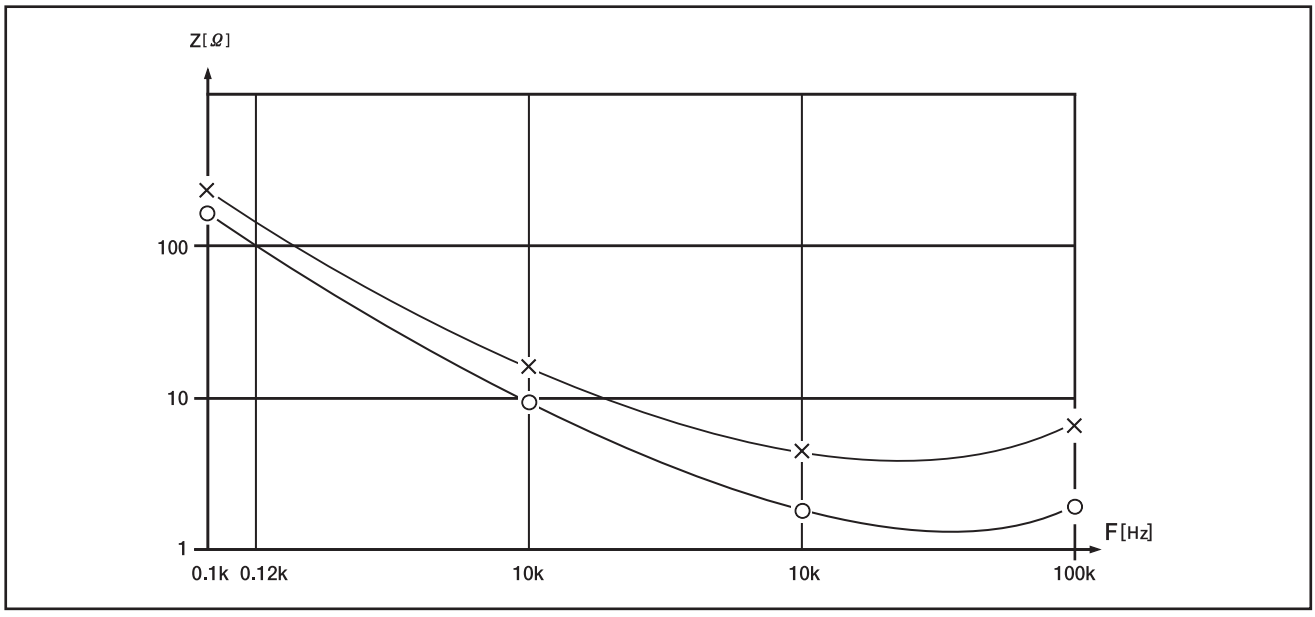
CAUTION: Please use the blank termimals for mechanical support only. The blank terminals must not be connected to a solder trace on the PC board, but be electrically isolated from negative or positive terminal.

RATINGS OF AHS Series

μF \ VDC	50			63			80			100		
3,300	25.4×30	0.20	1.84	25.4×40	0.20	1.96	25.4×50	0.15	2.39	30×60	0.15	2.68
	30×25	0.20	1.86	30×30	0.20	1.96	30×40	0.15	2.40	35×50	0.15	2.69
							35×35	0.15	2.40	40×40	0.15	2.68
4,700	25.4×40	0.20	2.34	25.4×50	0.20	2.47	25.4×60	0.15	3.01	35×60	0.15	2.98
	30×30	0.20	2.36	30×40	0.20	2.48	30×50	0.15	3.04	40×50	0.20	2.92
				35×30	0.20	2.48	35×40	0.15	3.02			
6,800	25.4×50	0.22	2.83	30×50	0.22	3.02	30×60	0.15	3.35	40×60	0.20	3.68
	30×40	0.22	2.85	35×40	0.22	3.00	35×50	0.15	3.35			
	35×35	0.25	2.67				40×40	0.20	3.34			
8,200	30×50	0.25	3.11	30×60	0.25	3.27	35×60	0.20	3.87			
	35×40	0.25	3.09	35×50	0.25	3.28	40×50	0.20	3.86			
				40×40	0.25	3.28						
10,000	30×50	0.25	3.43	35×60	0.25	3.82	40×60	0.20	4.46			
	35×40	0.25	3.41	40×50	0.25	3.81						
12,000	30×60	0.25	3.66	35×60	0.25	4.19						
	35×50	0.30	3.62	40×50	0.25	4.18						
	40×40	0.30	3.62									
15,000	35×60	0.30	4.27	40×60	0.30	4.46						
	40×50	0.30	4.26									
22,000	40×60	0.30	5.40									

Rated Ripple Current (Arms/85℃, 120Hz)
Tanδ(Max.)
Case Size øD×L(mm)

Frequency vs. Impedance Graph



o - o AHS 80 VR 8200
× - × DL 80 VR 8200

TGA(KMH) Series

• 105℃ 2,000Hrs assured.

- Non-solvent proof.
- Wide temperature range.
- For UPS
- RoHS compliant.
- Halogen-free capacitors are also available.

KME → TGA

Downsized

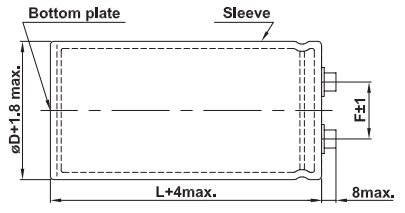
SPECIFICATIONS

Item	Characteristics	
Rated Voltage Range	10 ~ 100 VDC	160 ~ 400 VDC
Operating Temperature Range	-40 ~ +105℃	-25 ~ +105℃
Capacitance Tolerance	±20%(M)	(at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC)	(at 20℃, 5 minutes)
Dissipation Factor (tanδ)	Tanδ shall not exceed the values shown in the RATINGS.	(at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	Rated Voltage(VDC): 10~100 / 160~400 C(-25℃)/C(20℃): - / ≧0.7 C(-40℃)/C(20℃): ≧0.6 / -	(at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after the ripple duplicated voltage(≦WV) applied for 2,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 105℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value	
Others	Satisfied characteristics KS C IEC 60384-4	

DIMENSIONS OF TGA(KMH) Series

Unit(mm)

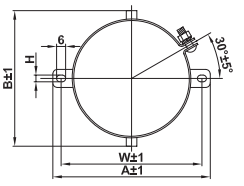
Marking : BROWN SLEEVE, SILVER INK



〈Screw specifications〉

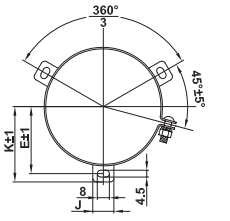
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

B type mounting clamp



øD	A	B	W	H	F
35	58	44	48	3.5	12.7
50	78	64	68	4.5	22.4
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

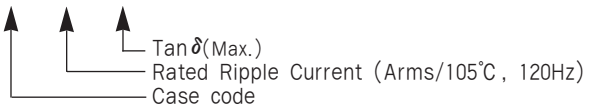
C type mounting clamp



øD	E	K	J	F
50	32.5	37.0	14	22.4
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5

RATINGS OF TGA(KMH) Series

μF \ VDC	10			16			25			35			50			63			80		
2,200																			A5	2.4	0.15
2,700																A5	2.3	0.20	A5	2.7	0.15
3,300																A5	2.5	0.20	A5	3.0	0.15
3,900													A5	2.8	0.20	A5	2.8	0.20	A6	3.4	0.15
4,700													A5	3.1	0.20	A5	3.1	0.20	A6	3.7	0.15
5,600													A5	3.3	0.20	A6	3.5	0.20	A8	4.5	0.15
6,800													A5	3.5	0.25	A6	3.9	0.20	A8	4.9	0.15
8,200										A5	3.3	0.30	A6	3.8	0.25	A8	4.7	0.20	A10	5.1	0.20
10,000										A5	3.6	0.30	A8	4.6	0.25	A8	4.9	0.25	A12	6.1	0.20
12,000							A5	3.7	0.35	A6	4.2	0.30	A8	5.1	0.25	A10	5.5	0.25	C8	6.7	0.20
15,000							A5	4.1	0.35	A6	4.7	0.30	A8	5.7	0.25	A12	6.6	0.25	C10	8.3	0.20
18,000				A5	4.2	0.45	A6	4.8	0.35	A8	5.7	0.30	A8	6.0	0.25	A12	6.9	0.25	C12	9.9	0.20
22,000	A5	4.9	0.70	A5	4.7	0.45	A6	5.3	0.35	A8	6.8	0.30	A10	6.7	0.25	C8	7.4	0.25	C12	11.0	0.20
27,000	A5	5.1	0.70	A6	5.5	0.45	A8	6.4	0.35	A10	7.5	0.30	C8	9.1	0.25	C12	10.9	0.25	D10	11.4	0.25
33,000	A6	5.9	0.70	A6	5.7	0.45	A8	6.7	0.40	A12	9.0	0.30	C10	11.1	0.25	C12	12.0	0.25	E10	13.9	0.25
39,000	A8	6.3	0.70	A8	6.8	0.45	A10	7.8	0.40	C8	9.2	0.35	C12	13.1	0.25	D10	12.5	0.30	E10	14.5	0.30
47,000	A8	6.9	0.70	A8	7.1	0.50	A12	9.3	0.40	C10	11.2	0.35	C12	13.9	0.30	D12	14.9	0.30	E12	16.5	0.30
56,000	A8	7.4	0.70	A10	8.4	0.50	C8	9.7	0.45	C10	11.4	0.40	D10	14.9	0.35	D12	16.3	0.30	E12	18.1	0.30
68,000	A10	8.5	0.70	A10	8.8	0.55	C10	10.7	0.45	C12	13.6	0.40	D12	16.6	0.35	E12	18.4	0.35	E14	19.7	0.35
82,000	A10	8.9	0.70	C8	10.7	0.55	C10	11.2	0.50	D10	14.8	0.45	E12	18.9	0.40	E14	20.0	0.40	F14	22.1	0.40
100,000	A12	10.7	0.70	C8	10.8	0.65	C12	14.8	0.50	D12	16.5	0.45	E12	19.5	0.45	E14	20.5	0.50			
120,000	C8	11.0	0.75	C10	13.1	0.65	D10	14.9	0.65	D12	17.6	0.55	E12	21.0	0.55	F14	21.8	0.60			
150,000	C10	13.2	0.80	C12	15.3	0.70	D12	17.9	0.65	E12	18.5	0.65	F14	23.9	0.60						
180,000	C12	15.7	0.80	C12	15.7	0.80	D12	18.9	0.80	E12	19.8	0.80	F14	23.9	0.75						
220,000	C12	16.8	0.85	D12	19.2	0.85	E12	21.3	0.85	E14	23.4	0.80									
270,000	D12	19.6	1.00	D12	19.6	1.00	E12	21.7	1.00	F14	25.5	1.00									
330,000	D12	19.7	1.20	E12	21.1	1.30	E14	23.1	1.20												
390,000	E12	21.3	1.50	E12	21.3	1.50	F14	24.9	1.50												
470,000	E12	21.4	1.80	E14	24.2	1.60															
560,000	E14	23.6	2.00	F14	28.1	2.00															
680,000	F14	26.0	2.40	F14	28.5	2.40															

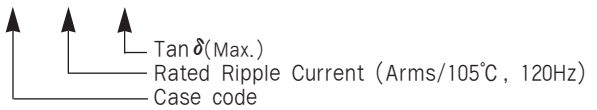


CASE CODE

Case Code	ØD (mm)	L (mm)	Case Code	ØD (mm)	L (mm)
A5	35	50	D10	63.5	100
A6	35	60	D12	63.5	120
A8	35	80	E10	76.5	100
A10	35	100	E12	76.5	120
A12	35	120	E13	76.5	130
C8	50	80	E14	76.5	140
C10	50	100	F13	89	130
C12	50	120	F14	89	140

RATINGS OF TGA(KMH) Series

μF \ VDC	100			160			200			250			315			350			400		
180													A5	0.8	0.10	A5	0.8	0.10	A5	0.8	0.10
220													A5	0.9	0.10	A5	0.9	0.10	A5	0.9	0.10
270										A5	0.8	0.15	A5	1.0	0.10	A5	1.0	0.10	A5	1.0	0.10
330							A5	0.9	0.15	A5	0.9	0.15	A5	1.1	0.10	A5	1.1	0.10	A6	1.2	0.10
390							A5	1.0	0.15	A5	1.0	0.15	A5	1.2	0.10	A5	1.1	0.10	A6	1.2	0.10
470							A5	1.1	0.15	A5	1.1	0.15	A6	1.4	0.10	A6	1.4	0.10	A8	1.4	0.10
560				A5	1.2	0.15	A5	1.2	0.15	A5	1.2	0.15	A6	1.5	0.10	A8	1.6	0.10	A8	1.4	0.15
680				A5	1.3	0.15	A5	1.3	0.15	A6	1.4	0.15	A8	1.7	0.10	A8	1.6	0.15	A10	1.7	0.15
820				A5	1.4	0.15	A5	1.4	0.15	A8	1.6	0.15	A8	1.7	0.15	A10	1.8	0.15	A12	2.0	0.15
1,000				A5	1.6	0.15	A6	1.7	0.15	A8	1.6	0.20	A10	2.0	0.15	A12	2.2	0.15	C8	2.2	0.15
1,200				A6	1.9	0.15	A6	1.9	0.15	A8	1.8	0.20	A12	2.4	0.15	C8	2.4	0.15	C10	2.7	0.15
1,500				A6	2.1	0.15	A8	2.3	0.15	A10	2.1	0.20	C8	2.7	0.15	C10	3.0	0.15	C12	3.3	0.15
1,800	A5	2.7	0.10	A8	2.5	0.15	A8	2.5	0.15	A12	2.5	0.20	C10	3.3	0.15	C12	3.6	0.15			
2,200	A5	3.0	0.10	A8	2.8	0.15	A10	2.7	0.15	A12	2.8	0.20	C10	4.0	0.15	C12	4.0	0.15	D10	4.2	0.15
2,700	A6	3.5	0.10	A10	3.3	0.15	A12	3.6	0.15	C10	3.5	0.20	C12	4.4	0.15	D10	4.6	0.15			
3,300	A8	4.2	0.10	A12	3.8	0.15	C8	4.1	0.15	C12	4.2	0.20	D10	5.1	0.15				D12	5.5	0.15
3,900	A8	4.5	0.12	C8	3.9	0.20	C10	4.9	0.15	C12	4.6	0.20	D12	6.0	0.15	E12	6.7	0.15			
4,700	A10	5.0	0.12	C10	4.6	0.20	D10	5.3	0.20	D12	5.7	0.20	E10	6.8	0.15				E13	7.6	0.15
5,600	A10	5.4	0.12	C10	5.1	0.20	D10	5.8	0.20	D12	6.3	0.20	E12	8.0	0.15	E13	8.3	0.15	F14	9.4	0.15
6,800	A12	5.8	0.15	C12	6.1	0.20	D12	6.9	0.20	E12	7.7	0.20	F13	9.2	0.15	E14	9.5	0.15	F14	10.4	0.15
8,200	C8	6.4	0.15	D10	7.0	0.20	D12	7.6	0.20	E12	8.4	0.20	F14	11.4	0.15	F14	11.4	0.15			
10,000	C10	7.8	0.15	D12	8.4	0.20	E12	9.3	0.20	E14	10.0	0.20	F14	12.6	0.15						
12,000	C12	9.3	0.15	E10	9.4	0.20	E12	10.2	0.20	F14	11.9	0.20									
15,000	C12	10.4	0.15	E12	11.4	0.20	E12	11.2	0.20	F14	12.2	0.20									
18,000	D10	11.0	0.20	E14	13.4	0.20	F14	13.1	0.25												
22,000	D12	12.5	0.20	F14	14.5	0.25															
27,000	E12	13.7	0.25	F14	16.0	0.25															
33,000	E12	15.2	0.25																		
39,000	E14	16.1	0.30																		
47,000	F14	19.3	0.30																		
56,000	F14	21.1	0.30																		



RATED RIPPLE CURRENT

Frequency Multiplying Factor

Rated voltage (Vdc)	ø D(mm)	Frequency (Hz)				
		60	120	300	1k	10k~
10~50	ø35~ø89	0.95	1.00	1.03	1.05	1.09
63~80	ø35	0.90	1.00	1.06	1.10	1.08
	ø50~ø89	0.95	1.00	1.03	1.05	1.09
100	ø35	0.82	1.00	1.12	1.22	1.30
	ø50	0.90	1.00	1.06	1.10	1.18
	ø63.5~ø89	0.95	1.00	1.03	1.05	1.09
160~250	ø35	0.80	1.00	1.19	1.34	1.46
	ø50~ø63.5	0.81	1.00	1.14	1.26	1.36
	ø76.5~ø89	0.82	1.00	1.12	1.22	1.30
315~400	ø35~ø89	0.80	1.00	1.19	1.34	1.46

RFC(RWF) Series

• 85℃ 5,000Hrs assured.

- Non-solvent proof.
- High ripple capability.
- Long life.
- For UPS, Industrial Inverter
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

RWA → RFC

Long Life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	350 ~ 450 VDC
Operating Temperature Range	-25 ~ +85℃
Capacitance Tolerance	±20%(M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	0.25max. (at 20℃, 120Hz)
Insulation Withstanding Voltage	When a voltage of 2,000VAC is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.
Load Life	After the capacitors are subjected to DC voltage with the rated ripple current applied for 5,000 hours at 85℃, the following specifications shall be satisfied when the capacitors are restored to 20℃. The sum of DC voltage and peak AC voltage must not exceed the full rated voltage of the capacitor. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATED RIPPLE CURRENT MULTIPLIERS

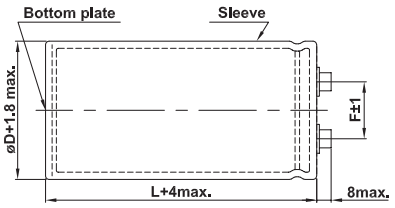
Frequency Multiplying Factor

Frequency(Hz)	60	120	300	1k	3k
Factor	0.8	1.0	1.1	1.3	1.4

DIMENSIONS OF RFC(RWF) Series

Unit(mm)

Marking : BLACK SLEEVE, GOLD INK

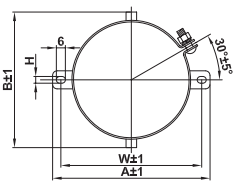


〈Screw specifications〉

øD = ø63.5~ ø89

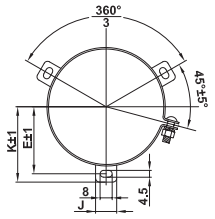
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

B type mounting clamp



øD	A	B	W	H	F
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



øD	E	K	J	F
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5

RATINGS OF RFC(RWF) Series

VDC / ØD / μF	350			400			450		
	63.5	76.5	89	63.5	76.5	89	63.5	76.5	89
2,700							63.5×120 10.1		
3,300				63.5×120 11.1			63.5×130 11.7		
3,900	63.5×120 12.1			63.5×130 12.7			63.5×160 13.8	76.5×120 13.4	
4,700	63.5×130 14.0			63.5×160 15.2	76.5×120 14.7		63.5×190 16.7	76.5×130 15.5	
5,600	63.5×160 16.6	76.5×120 16.1		63.5×190 18.2	76.5×130 16.9			76.5×160 18.3	
6,800	63.5×190 20.0	76.5×130 18.6			76.5×160 20.2			76.5×170 20.7	
8,200		76.5×160 22.2			76.5×170 22.8				89×160 24.1
10,000		76.5×170 25.2				89×160 26.6			89×170 27.8
12,000			89×160 29.1			89×170 30.0			
15,000			89×190 35.7	← Case Size ØD×L(mm) ← Rated Ripple Current(Arms/85℃, 120Hz)					

Note:When long life performance is required in actual use, the rms ripple current has to be reduced.

RGA Series

• 85℃ 2,000Hrs assured.

- Non-solvent proof.
- For inverter.
- Rated voltage range:500 to 600VDC
- For UPS, Industrial Inverter.
- **RoHS compliant.**
- **Halogen-free capacitors are also available.**

RWA → RGA

High voltage

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	500 ~ 600 VDC
Operating Temperature Range	-25 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Max. Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	0.25max. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	C(-25℃)/C(20℃)≧0.6 (at 120Hz)
Insulation Withstanding Voltage	When a voltage of 2,000VAC is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃. after subjected to DC voltage with the rated ripple current is applied 2,000 hours at 85℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATED RIPPLE CURRENT MULTIPLIERS

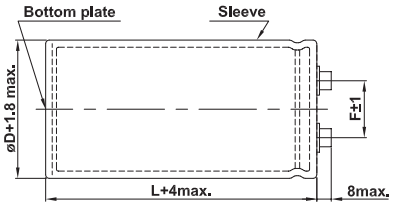
Frequency Multiplying Factor

Frequency(Hz)	60	120	300	1k	3k
Factor	0.8	1.0	1.1	1.3	1.4

DIMENSIONS OF RGA Series

Unit(mm)

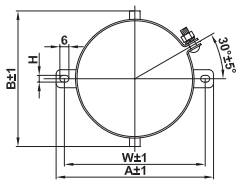
Marking:BLACK SLEEVE, GOLD INK.



〈Screw specifications〉

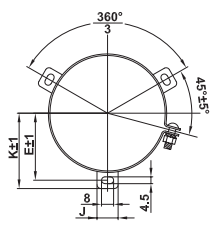
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

B type mounting clamp



ØD	A	B	W	H	F
35	58	44	48	3.5	12.7
50	78	64	68	4.5	22.4
63.5	90	76	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



ØD	E	K	J	F
50	32.5	37.0	14	22.4
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5

RATINGS OF RGA Series

VDC / ø D / μF	500					550				
	35	50	63.5	76.5	89	35	50	63.5	76.5	89
100						35×50 0.6				
120	35×50 0.7									
180						35×80 1.0				
270	35×80 1.2					35×100 1.3				
330	35×100 1.4					35×120 1.6				
390	35×120 1.7						50×75 1.7			
470		50×75 1.8								
560							50×95 2.1	63.5×95 2.5		
680		50×90 2.5					50×115 2.7	63.5×120 3.0		
820		50×120 2.9					50×130 3.1	63.5×130 3.5		
1,000		50×130 3.4	63.5×95 3.4							
1,200									76.5×95 4.2	
1,500			63.5×120 4.5	76.5×95 4.6					76.5×120 5.0	
1,800			63.5×130 5.2						76.5×130 5.8	
2,200				76.5×120 6.1					76.5×150 7.0	
2,700				76.5×160 7.7						
3,300										89×160 9.3
3,900					89×160 10.1					

VDC / ø D / μF	600				
	35	50	63.5	76.5	89
180	35×100 1.1				
270	35×120 1.4				
330		50×75 1.7			
390		50×95 1.8	63.5×95 2.1		
560		50×115 2.2	63.5×115 2.6		
680		50×130 2.9	63.5×130 3.2		
820				76.5×95 3.3	
1,200				76.5×115 4.4	
1,500				76.5×130 5.4	
1,800				76.5×150 6.5	
2,200					89×130 7.8
2,700					89×155 8.9

← Case Size ø D×L(mm)
← Rated Ripple Current(Arms/85℃, 120Hz)

Note:When long life performance is required in actual use, the rms ripple current has to be reduced.

RFA Series

• 85℃ 20,000Hrs assured.

- Non-solvent proof.
- High ripple capability.
- Long Life
- For Elevator, Industrial Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

RWF → RFA

Long life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	350 ~ 500 VDC
Operating Temperature Range	-25 ~ +85℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Max. Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (VDC) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	0.25max. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	C(-25℃)/C(20℃)≧0.7 (at 120Hz)
Insulation Withstanding Voltage	When a voltage of 2,000VAC is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃. after subjected to DC voltage with the rated ripple current is applied 20,000 hours at 85℃. Capacitance change ≦ ±30% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 85℃ for 500 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 300% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATED RIPPLE CURRENT MULTIPLIERS

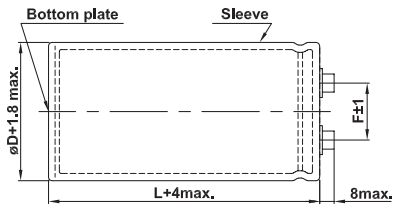
Frequency Multiplying Factor

Frequency(Hz)	60	120	300	1k	3k
Factor	0.8	1.0	1.1	1.3	1.4

DIMENSIONS OF RFA Series

Unit(mm)

Marking : BLACK SLEEVE, GOLD INK

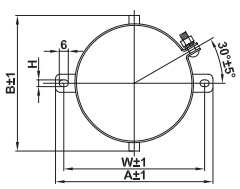


〈Screw specifications〉

øD= ø63.5~ ø89

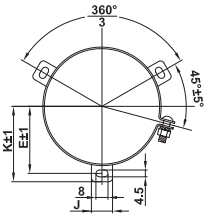
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

B type mounting clamp



øD	A	B	W	H	F
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



øD	E	K	J	F
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5

RATINGS OF RFA Series

WVDC / ØD / μF	350			400			450		
	63.5	76.5	89	63.5	76.5	89	63.5	76.5	89
2,200							63.5×120 9.1		
2,700				63.5×120 10.1			63.5×130 10.6	76.5×120 11.2	
3,300	63.5×120 11.1			63.5×130 11.7			63.5×160 12.7	76.5×130 13.0	
3,900	63.5×130 12.8			63.5×160 13.5	76.5×120 14.7		63.5×170 14.4		
4,700	63.5×160 15.2	76.5×120 14.7		63.5×170 15.8	76.5×130 15.5			76.5×160 16.7	
5,600	63.5×170 17.3	76.5×130 16.9		63.5×190 18.2	76.5×160 18.3			76.5×170 21.1	89×160 19.9
6,800	63.5×190 20.0	76.5×160 20.2			76.5×170 21.0				89×170 23.0
8,200		76.5×170 23.1				89×160 24.1			89×190 26.4
10,000			89×160 26.6			89×190 29.1			
12,000			89×190 32.0	← Case Size ØD×L(mm) ← Rated Ripple Current(Arms/85℃, 120Hz)					

WVDC / ØD / μF	500		
	63.5	76.5	89
1,200	63.5×90 5.3		
1,500	63.5×100 6.3		
1,800	63.5×120 7.4		
2,200		76.5×110 9.0	
2,700		76.5×130 10.3	
3,300		76.5×140 11.9	
3,900		76.5×150 13.3	
4,700			89×150 15.3
5,600			89×170 18.2
6,800			89×190 21.0

Note:When long life preformance is required in actual use, the rms ripple current has to be reduced.

TFA Series

• 105℃ 5,000Hrs assured.

- Non-solvent proof.
- High ripple capability.
- Long life
- For Elevator, Industrial Inverter
- RoHS compliant.
- Halogen-free capacitors are also available.

KMH → TFA

long life

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	350 ~ 450 V_{DC}
Operating Temperature Range	-25 ~ +105℃
Capacitance Tolerance	±20% (M) (at 20℃, 120Hz)
Leakage Current	I=0.02CV or 5mA, whichever is smaller. Where, I: Max. Leakage current (μA) C: Nominal capacitance (μF) V: Rated voltage (V_{DC}) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	0.15max. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	C(-25℃)/C(20℃)≧0.7 (at 120Hz)
Insulation Withstanding Voltage	When a voltage of 2,000V_{AC} is applied for one minute between the terminals shorted each other and the mounting clamp on the insulating sleeve covering the case, there shall not be electrical damage.
Load Life	The following specifications shall be satisfied when the capacitors are restored to 20℃. after subjected to DC voltage with the rated ripple current is applied 5,000 hours at 105℃. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 105℃ for 1,000 hours without voltage applied. The rated voltage shall be applied to the capacitors for a minimum of 30 minutes, at least 24 hours and not more than 48 hours before the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage current ≦ The initial specified value
Others	Satisfied characteristics KS C IEC 60384-4

RATED RIPPLE CURRENT MULTIPLIERS

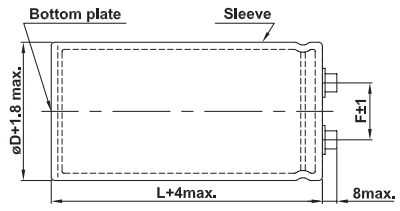
Frequency Multiplying Factor

Frequency(Hz)	120	300	1k	3k
Factor	1.0	1.1	1.3	1.4

DIMENSIONS OF TFA Series

Unit(mm)

Marking : BROWN SLEEVE, SILVER INK

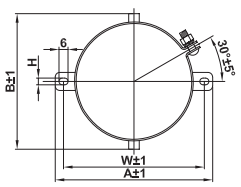


〈Screw specifications〉

ØD= Ø63.5~ Ø89

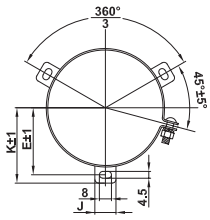
- Plus hexagon-headed screw: M5×0.8×12
- Maximum screw tightening torque:3.23N·m (33kg·cm)

B type mounting clamp



ØD	A	B	W	H	F
63.5	90	75	80	4.5	28.0
76.5	104.5	90	93.5	4.5	31.5

C type mounting clamp



ØD	E	K	J	F
63.5	38.1	43.5	14	28.0
76.5	44.5	50.0	14	31.5
89	50.8	56.5	16	31.5

RATINGS OF TFA Series

WVDC / ØD / μF	350			400			450		
	63.5	76.5	89	63.5	76.5	89	63.5	76.5	89
2,200							63.5×120 11.8		
2,700				63.5×120 13.1			63.5×130 13.7	76.5×120 14.5	
3,300	63.5×120 14.4			63.5×130 15.2			63.5×160 16.5	76.5×130 16.9	
3,900	63.5×130 16.6			63.5×160 17.9	76.5×120 18.2		63.5×170 18.7		
4,700	63.5×160 19.8	76.5×120 19.1		63.5×170 20.5	76.5×130 20.1			76.5×160 21.7	
5,600	63.5×170 22.5	76.5×130 21.9			76.5×160 23.8			76.5×190 26.1	89×160 24.1
6,800		76.5×160 26.2			76.5×170 27.3	89×160 26.6			89×170 27.8
8,200		76.5×170 30.0	89×160 29.2			89×170 30.5			89×190 32.0
10,000			89×170 33.7	← Case Size ØD×L(mm) ← Rated Ripple Current(Arms/105℃, 120Hz)					

Note:When long life performance is required in actual use, the rms ripple current has to be reduced.

PH Series

• 5~35℃ 5,000Times.

- Non-solvent proof.
- For photo flash.
- RoHS compliant.
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage	330 VDC
Operating Temperature Range	-20 ~ +55℃
Capacitance Tolerance	-10 ~ +20%(V) (at 20℃, 120Hz)
Leakage Current	I=1×C Where, I: Leakage current (μA) C: Nominal capacitance (μF) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	Cap. ≦600μF: 0.10 Cap. >600μF: 0.15 (at 20℃, 120Hz)
Charge and Discharge Characteristics	The following specifications shall be satisfied when the capacitors are restored to 20℃ after charge and discharge are repeated 5,000 times at room temperature. (5 to 35℃) Charge voltage: rated voltage Charge and discharge cycles:30 seconds Discharge resistance or Xenon tube:about 1Ω Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 150% of the initial specified value
Shelf Life	The following specifications shall be satisfied when the capacitors are restored to 20℃ after exposing them at 55℃ for 1,000 hours without voltage applied. Capacitance change ≦ ±10% of the initial value Tanδ ≦ 150% of the initial specified value Leakage current ≦ 300% of the initial specified value
Others	Satisfied EIAJ RC-3801A

RATINGS OF PH Series

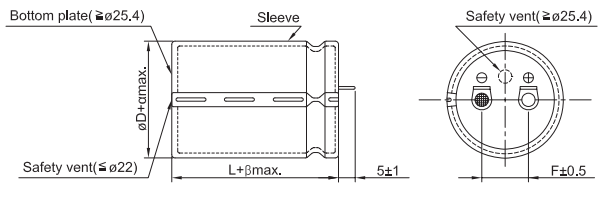
μF \ VDC / SV	330	350	μF \ VDC / SV	330	350
165	16×27		500	25.4×54	
180	14.5×35, 18×29		700	30×54	
250	16×39		950	35×50	
260	16×45		1,000	35×50	
280	20×28		1,500	30×110	
320	22×40		2,000	35×80	
420	22×50				

Case Size øD×L(mm)

Note: Case sizes are changeable upon your requests.

DIMENSIONS

Unit(mm)



Marking : BLACK SLEEVE, SILVER INK

øD	14.5	16	18	20	22	25.4	30	35
F	5.5	5.5	6	7	7	10	10	14
α	0.5	0.5	0.5	1	1	1	1	1
β	1	1	1	2	2	2	2	2

LARGE SIZED ALUMINUM ELECTROLYTIC CAPACITORS

DH Series

• 40℃ 1,000,000Times.

- Non-solvent proof.
- For Welding machine, Warning Light
- RoHS compliant.
- Halogen-free capacitors are also available.

SPECIFICATIONS

Item	Characteristics
Rated Voltage Range	315, 475 VDC
Operating Temperature Range	-25 ~ +70℃
Capacitance Tolerance	-10 ~ +50%(T) (at 20℃, 120Hz)
Leakage Current	I = 0.06CV or 3㎃, whichever is smaller. Where, I:Max. leakage current(μA) C:Nominal capacitance(μF) V:Rated voltage(VDC) (at 20℃, 5 minutes)
Dissipation Factor (Tanδ)	0.10 Max. (at 20℃, 120Hz)
Temperature Characteristics (Capacitance change ratio)	C(-10℃)/C(20℃) ≧ 0.8 (at 120Hz)
Load Life	The following specifications shall be satisfied when the capacitors are restored to 40℃ after the rated working voltage applied. And than charge and discharge (charge 0.8sec. discharge 0.2sec) are repeated 1,000,000 times. And than the capacitors are restored to 20℃ after the measurements. Capacitance change ≦ ±20% of the initial value Tanδ ≦ 200% of the initial specified value Leakage Current ≦ 200% of the initial specified value

RATINGS OF DH Series

μF \ VDC	315	475
100		35×110
150	35×100	
225		40×110
330	50×100	

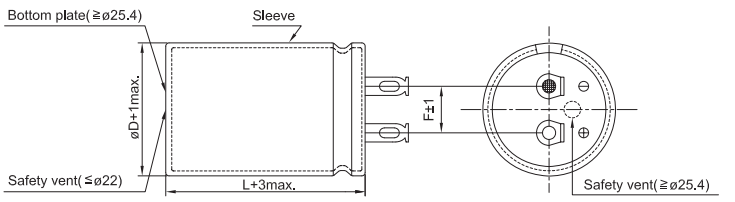
Case Size ØD×L(mm)

- Case sizes are changeable upon your requests.

Note: When long life performance is required in actual use, the rms ripple current has to be reduced.

DIMENSIONS

Unit(mm)



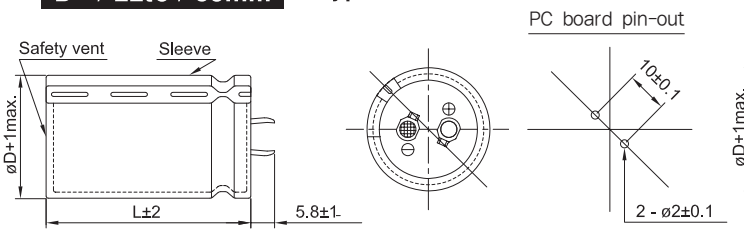
Marking : BLACK SLEEVE, SILVER INK

ø D	35	40		50
F	14	14	20	20

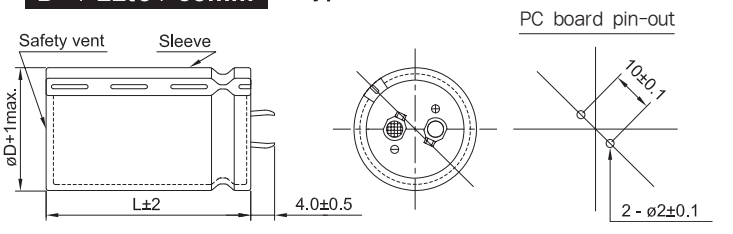
AVAILABLE TERMINALS

[mm]

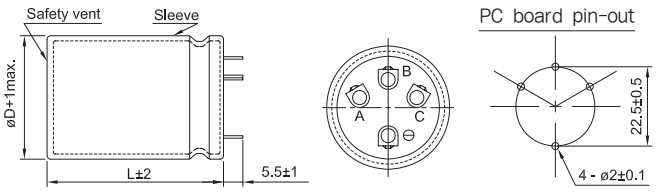
D=φ22toφ35mm Type : VN



D=φ22toφ35mm Type : VS

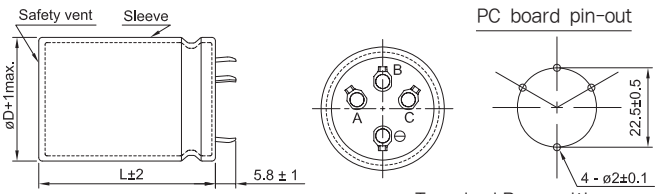


D=φ35toφ40mm Type : VR (4 Terminals)



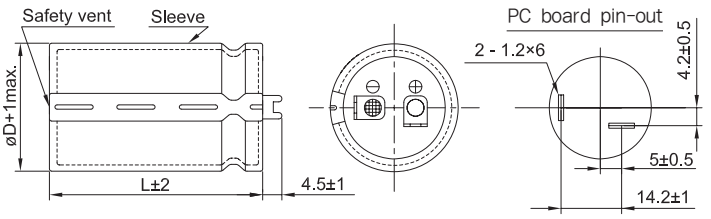
Terminal B = positive
Terminal A&C = blank

D=φ35toφ40mm Type : VN (4 Terminals)

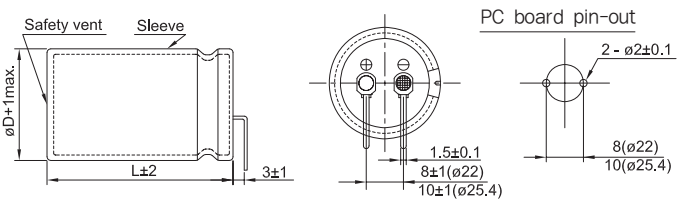


Terminal B = positive
Terminal A&C = blank

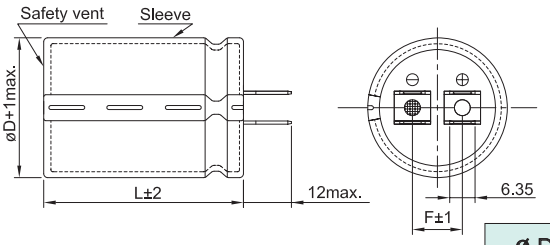
D=φ35toφ40mm Type : LI



D=φ22toφ25.4mm Type : VL



D=φ35toφ50mm Type : LR



ø D	35	40	50
F	12.5	14	

CAUTION

Use the blank terminals for mechanical support only.
The blank terminals must not be connected any copper on PC board.
Be sure to electrically isolate from negative or positive terminals.