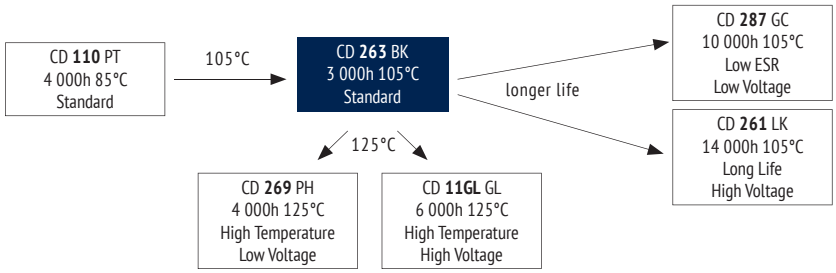
ALUMINUM ELECTROLYTIC CAPACITORS · RADIAL TYPE

CD **263** BK SERIES

2 000 - 3 000h at 105°C

· Standard 105°C



ITEM — CHARACTERISTICS

Operating Temperature Range (°C)	-40 ~ +105	-25 ~ +105
Voltage Range (V)	6,3 ~ 250	350 ~ 500
Capacitance Range (µF)	0,1 ~ 15 000	
Capacitance Tolerance (20°C, 120Hz)	± 20%	

The usage at lower temperatures than indicated may be possible. Please contact the Jianghai Europe sales office for approval.

Leakage Current	Rated Voltage (V)	6,3 ~ 100	160 ~ 500
	$I_{LEAKAGE}$	After 2 minutes at 20°C application of rated voltage, leakage current is not more than specified in table.	After 1 minute at 20°C application of rated voltage, leakage current is not more than specified in table.

Stability at Low Temperature (Impedance Ratio at 120Hz)	Rated Voltage (V)	6,3	10	16	25	35	50	63	100	160	200	250	350	400	420	450	500
	$Z_{-25°C} / Z_{+20°C}$	4	3	2						3							6
	$Z_{-40°C} / Z_{+20°C}$	8	6	4	3					-			-				-

ITEM	USEFUL LIFE		LOAD LIFE	ENDURANCE TEST	SHELF LIFE	
Lifetime	Ø ≤ 8 : 2 000h Ø ≥ 10 : 3 000h	> 100 000h	Ø ≤ 8 : 1 000h Ø ≥ 10 : 2 000h	2 000h	1 000h	
Leakage Current	Not more than specified value		Not more than specified value	Not more than specified value	Not more than specified value	
Capacitance Change	Within ± 30% of initial value		Within ± 20% of initial value	Within ± 20% of initial value	Within ± 20% of initial value	
Dissipation Factor	Not more than 300% of specified value		Not more than 200% of specified value	Not more than 150% of specified value	Not more than 200% of specified value	
Condition: Applied Voltage Applied Current Applied Temperature	U_R I_R 105°C	U_R 1,4 x I_R 40°C	U_R I_R 105°C	U_R I_R = 0 105°C IEC 60384	U_R = 0 I_R = 0 105°C	After test: U_R to be applied for 30 min > 24h before measurement

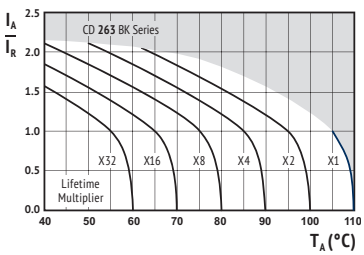
MULTIPLIER FOR RIPPLE CURRENT (FREQUENCY COEFFICIENT)

Rated Voltage (V)	Capacitance (µF) \ Frequency	50Hz	120Hz	1kHz	10kHz	100kHz
6,3 ~ 100	0,47 ~ 4,7	0,32	0,40	0,70	0,80	1,00
	10 ~ 47	0,40	0,50	0,80	0,90	1,00
	100 ~ 220	0,56	0,70	0,90	0,90	1,00
	330 ~ 1 000	0,64	0,80	0,90	1,00	1,00
	2 200 ~ 15 000	0,72	0,90	1,00	1,00	1,00
160 ~ 500	0,47 ~ 10	0,80	1,00	1,75	2,00	2,50
	22 ~ 56	0,80	1,00	1,60	1,80	2,00
	68 ~ 220	0,80	1,00	1,30	1,40	1,65

Multipliers for typical operating conditions.

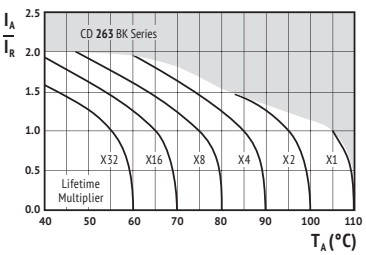
MULTIPLIER FOR LIFETIME (LIFETIME DIAGRAM)

LIFETIME DIAGRAM 6,3 ~ 100V



I_A = actual ripple current at 100kHz,
I_R = rated ripple current at 100kHz, 105°C
Multiplier of Useful Life as a function of ambient temperature & ripple current load

LIFETIME DIAGRAM 160 ~ 500V



I_A = actual ripple current at 120Hz,
I_R = rated ripple current at 120Hz, 105°C
Multiplier of Useful Life as a function of ambient temperature & ripple current load

ENVIRONMENTAL

The products are RoHS, WEEE and REACh compliant. The detailed version please see seperate "Environmental Certificates" document or www.jianghai-europe.com

SAFETY FACTOR

This diagram includes a safety margin. In many cases the allowed current capability/lifetime may be increased. For details and approvals please contact the Jianghai Europe sales office.

U_{RDC} (Surge Voltage) Code (V)	C_R Rated Capacitance (µF)	ESR_{max} Equivalent Series Resistance 20°C 120Hz (Ω)	Z_{max} Max Impedance 20°C 100kHz (Ω)	tanδ Dissipation Factor 20°C 120Hz	I_{leak} Leakage Current (µA)	I_{RAC} Rated Ripple Current 105°C 100kHz (mArms)	Size øD x L (mm)	ORDER CODE ◊◊ = pin style & length ΔΔ = pitch code Details: Page 6
6,3 (7,2) 0J	33	8,9	2,5	0,22	3	105	5x11,5	ECR0JBK330M◊◊ΔΔ0511
	47	6,3	1,5	0,22	3	120	5x11,5	ECR0JBK470M◊◊ΔΔ0511
	100	3,0	1,2	0,22	7	130	5x11,5	ECR0JBK101M◊◊ΔΔ0511
	220	1,4	1,2	0,22	14	180	5x11,5	ECR0JBK221M◊◊ΔΔ0511
		1,4	0,87	0,22	14	180	6,3x11,5	ECR0JBK221M◊◊ΔΔ0611
	330	0,89	0,58	0,22	21	220	6,3x11,5	ECR0JBK331M◊◊ΔΔ0611
	470	0,63	0,55	0,22	30	250	6,3x11,5	ECR0JBK471M◊◊ΔΔ0611
		0,63	0,39	0,22	30	315	8x11,5	ECR0JBK471M◊◊ΔΔ0811
	1 000	0,30	0,37	0,22	63	435	8x11,5	ECR0JBK102M◊◊ΔΔ0811
		0,30	0,23	0,22	63	500	10x12,5	ECR0JBK102M◊◊ΔΔ1012
	2 200	0,15	0,095	0,24	139	765	10x20	ECR0JBK222M◊◊ΔΔ1020
		0,15	0,095	0,24	139	1000	12,5x20	ECR0JBK222M◊◊ΔΔ1220
	3 300	0,11	0,12	0,26	208	882	10x20	ECR0JBK332M◊◊ΔΔ1020
		0,11	0,090	0,26	208	1050	12,5x20	ECR0JBK332M◊◊ΔΔ1220
	4 700	0,080	0,090	0,28	297	1120	12,5x20	ECR0JBK472M◊◊ΔΔ1220
		0,080	0,061	0,28	297	1670	16x25	ECR0JBK472M◊◊ΔΔ1625
	6 800	0,063	0,090	0,32	429	1380	12,5x20	ECR0JBK682M◊◊ΔΔ1220
		0,063	0,056	0,32	429	1740	16x25	ECR0JBK682M◊◊ΔΔ1625
	10 000	0,054	0,045	0,40	630	2110	16x31,5	ECR0JBK103M◊◊ΔΔ1631
		0,054	0,061	0,40	630	1750	16x25	ECR0JBK103M◊◊ΔΔ1625
	15 000	0,045	0,042	0,50	945	2040	16x35,5	ECR0JBK153M◊◊ΔΔ1635
		0,045	0,036	0,50	945	2580	18x35,5	ECR0JBK153M◊◊ΔΔ1835
10 (13) 1A	22	11,5	2,5	0,19	3	92	5x11,5	ECR1ABK220M◊◊ΔΔ0511
	33	7,7	1,9	0,19	4	105	5x11,5	ECR1ABK330M◊◊ΔΔ0511
	47	5,4	1,5	0,19	5	120	5x11,5	ECR1ABK470M◊◊ΔΔ0511
	100	2,6	1,2	0,19	10	130	5x11,5	ECR1ABK101M◊◊ΔΔ0511
	220	1,2	0,58	0,19	22	220	6,3x11,5	ECR1ABK221M◊◊ΔΔ0611
	330	0,77	0,54	0,19	33	230	6,3x11,5	ECR1ABK331M◊◊ΔΔ0611
		0,77	0,47	0,19	33	265	8x11,5	ECR1ABK331M◊◊ΔΔ0811
	470	0,54	0,39	0,19	47	315	8x11,5	ECR1ABK471M◊◊ΔΔ0811
	1 000	0,25	0,25	0,19	100	500	10x12,5	ECR1ABK102M◊◊ΔΔ1012
		0,25	0,18	0,19	100	615	10x16	ECR1ABK102M◊◊ΔΔ1016
	2 200	0,13	0,17	0,21	220	761	10x20	ECR1ABK222M◊◊ΔΔ1020
		0,13	0,090	0,21	220	1050	12,5x20	ECR1ABK222M◊◊ΔΔ1220
	3 300	0,10	0,086	0,23	330	1010	12,5x20	ECR1ABK332M◊◊ΔΔ1220
		0,10	0,068	0,23	330	1300	12,5x25	ECR1ABK332M◊◊ΔΔ1225
	4 700	0,071	0,068	0,25	470	1250	12,5x25	ECR1ABK472M◊◊ΔΔ1225
		0,071	0,056	0,25	470	1740	16x25	ECR1ABK472M◊◊ΔΔ1625
	6 800	0,057	0,056	0,29	680	1570	16x25	ECR1ABK682M◊◊ΔΔ1625
		0,057	0,045	0,29	680	2110	16x31,5	ECR1ABK682M◊◊ΔΔ1631
	10 000	0,050	0,042	0,37	1000	1910	16x35,5	ECR1ABK103M◊◊ΔΔ1635
		0,050	0,036	0,37	1000	2580	18x35,5	ECR1ABK103M◊◊ΔΔ1835
16 (20) 1C	10	21,3	2,5	0,16	3	92	5x11,5	ECR1CBK100M◊◊ΔΔ0511
	22	9,7	1,9	0,16	4	105	5x11,5	ECR1CBK220M◊◊ΔΔ0511
	33	6,5	1,5	0,16	6	120	5x11,5	ECR1CBK330M◊◊ΔΔ0511
	47	4,6	1,2	0,16	8	130	5x11,5	ECR1CBK470M◊◊ΔΔ0511
	100	2,2	1,2	0,16	16	150	5x11,5	ECR1CBK101M◊◊ΔΔ0511
		2,2	0,58	0,16	16	220	6,3x11,5	ECR1CBK101M◊◊ΔΔ0611
	220	1,0	0,54	0,16	36	250	6,3x11,5	ECR1CBK221M◊◊ΔΔ0611
		1,0	0,47	0,16	36	290	8x11,5	ECR1CBK221M◊◊ΔΔ0811
	330	0,65	0,39	0,16	53	315	8x11,5	ECR1CBK331M◊◊ΔΔ0811
	470	0,46	0,66	0,16	76	350	8x11,5	ECR1CBK471M◊◊ΔΔ0811
		0,46	0,23	0,16	76	500	10x12,5	ECR1CBK471M◊◊ΔΔ1012
	1 000	0,22	0,21	0,16	160	610	10x16	ECR1CBK102M◊◊ΔΔ1016
		0,22	0,12	0,16	160	825	10x20	ECR1CBK102M◊◊ΔΔ1020
	2 200	0,11	0,095	0,18	352	961	12,5x20	ECR1CBK222M◊◊ΔΔ1220
		0,11	0,068	0,18	352	1300	12,5x25	ECR1CBK222M◊◊ΔΔ1225
	3 300	0,081	0,068	0,20	528	1 200	12,5x25	ECR1CBK332M◊◊ΔΔ1225
		0,081	0,056	0,20	528	1740	16x25	ECR1CBK332M◊◊ΔΔ1625
	4 700	0,063	0,052	0,22	752	1490	16x25	ECR1CBK472M◊◊ΔΔ1625
		0,063	0,045	0,22	752	2110	16x31,5	ECR1CBK472M◊◊ΔΔ1631
	6 800	0,051	0,042	0,26	1088	1830	16x35,5	ECR1CBK682M◊◊ΔΔ1635
		0,051	0,036	0,26	1088	2580	18x35,5	ECR1CBK682M◊◊ΔΔ1835

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25 (32) 1E	4,7	39,6	3,0	0,14	3	85	5x11,5	ECR1EBK4R7M◊◊ΔΔ0511
	10	18,6	2,5	0,14	3	92	5x11,5	ECR1EBK100M◊◊ΔΔ0511
	22	8,5	1,9	0,14	6	105	5x11,5	ECR1EBK220M◊◊ΔΔ0511
	33	5,7	1,5	0,14	9	120	5x11,5	ECR1EBK330M◊◊ΔΔ0511
	47	4,0	1,2	0,14	12	130	5x11,5	ECR1EBK470M◊◊ΔΔ0511
	100	1,9	0,58	0,14	25	220	6,3x11,5	ECR1EBK101M◊◊ΔΔ0611
	220	0,85	0,39	0,14	55	315	8x11,5	ECR1EBK221M◊◊ΔΔ0811
	330	0,57	0,23	0,14	83	500	10x12,5	ECR1EBK331M◊◊ΔΔ1012
	470	0,40	0,21	0,14	118	429	10x12,5	ECR1EBK471M◊◊ΔΔ1012
		0,40	0,18	0,14	118	615	10x16	ECR1EBK471M◊◊ΔΔ1016
	1 000	0,19	0,12	0,14	250	705	10x20	ECR1EBK102M◊◊ΔΔ1020
		0,19	0,090	0,14	250	1050	12,5x20	ECR1EBK102M◊◊ΔΔ1220
	2 200	0,10	0,056	0,16	550	1740	16x25	ECR1EBK222M◊◊ΔΔ1625
	3 300	0,073	0,056	0,18	825	1440	16x25	ECR1EBK332M◊◊ΔΔ1625
		0,073	0,045	0,18	825	2110	16x31,5	ECR1EBK332M◊◊ΔΔ1631
	4 700	0,057	0,050	0,20	1175	1880	16x31,5	ECR1EBK472M◊◊ΔΔ1631
		0,057	0,036	0,20	1175	2580	18x35,5	ECR1EBK472M◊◊ΔΔ1835
35 (44) 1V	4,7	33,9	2,5	0,12	3	92	5x11,5	ECR1VBK4R7M◊◊ΔΔ0511
	10	16,0	1,8	0,12	4	105	5x11,5	ECR1VBK100M◊◊ΔΔ0511
	22	7,3	1,5	0,12	8	120	5x11,5	ECR1VBK220M◊◊ΔΔ0511
	33	4,9	1,5	0,12	12	130	5x11,5	ECR1VBK330M◊◊ΔΔ0511
	47	3,4	1,7	0,12	17	90	5x11,5	ECR1VBK470M◊◊ΔΔ0511
		3,4	0,58	0,12	17	220	6,3x11,5	ECR1VBK470M◊◊ΔΔ0611
	100	1,6	0,80	0,12	35	151	6,3x11,5	ECR1VBK101M◊◊ΔΔ0611
		1,6	0,39	0,12	35	315	8x11,5	ECR1VBK101M◊◊ΔΔ0811
	220	0,73	0,23	0,12	77	500	10x12,5	ECR1VBK221M◊◊ΔΔ1012
	330	0,49	0,25	0,12	116	384	10x12,5	ECR1VBK331M◊◊ΔΔ1012
		0,49	0,18	0,12	116	615	10x16	ECR1VBK331M◊◊ΔΔ1016
	470	0,34	0,21	0,12	165	470	10x16	ECR1VBK471M◊◊ΔΔ1016
		0,34	0,12	0,12	165	825	10x20	ECR1VBK471M◊◊ΔΔ1020
	1 000	0,16	0,095	0,12	350	857	12,5x20	ECR1VBK102M◊◊ΔΔ1220
		0,16	0,068	0,12	350	1300	12,5x25	ECR1VBK102M◊◊ΔΔ1225
	2 200	0,085	0,056	0,14	770	1380	16x25	ECR1VBK222M◊◊ΔΔ1625
		0,085	0,045	0,14	770	2110	16x31,5	ECR1VBK222M◊◊ΔΔ1631
	3 300	0,065	0,042	0,16	1155	1780	16x35,5	ECR1VBK332M◊◊ΔΔ1635
		0,065	0,036	0,16	1155	2580	18x35,5	ECR1VBK332M◊◊ΔΔ1835
	4 700	0,051	0,036	0,18	1645	2120	18x35,5	ECR1VBK472M◊◊ΔΔ1835
50 (63) 1H	0,10	1.327	18,0	0,10	3	10	5x11,5	ECR1HBK0R1M◊◊ΔΔ0511
	0,22	603	13,0	0,10	3	15	5x11,5	ECR1HBKR22M◊◊ΔΔ0511
	0,33	402	10,0	0,10	3	18	5x11,5	ECR1HBKR33M◊◊ΔΔ0511
	0,47	283	7,0	0,10	3	23	5x11,5	ECR1HBKR47M◊◊ΔΔ0511
	1,0	133	4,9	0,10	3	35	5x11,5	ECR1HBK010M◊◊ΔΔ0511
	2,2	60,3	4,2	0,10	3	53	5x11,5	ECR1HBK2R2M◊◊ΔΔ0511
	3,3	40,2	3,9	0,10	3	65	5x11,5	ECR1HBK3R3M◊◊ΔΔ0511
	4,7	28,3	3,6	0,10	3	82	5x11,5	ECR1HBK4R7M◊◊ΔΔ0511
	10	13,3	2,7	0,10	5	100	5x11,5	ECR1HBK100M◊◊ΔΔ0511
	22	6,1	1,9	0,10	11	125	5x11,5	ECR1HBK220M◊◊ΔΔ0511
	33	4,1	1,9	0,10	17	90	5x11,5	ECR1HBK330M◊◊ΔΔ0511
		4,1	1,1	0,10	17	195	6,3x11,5	ECR1HBK330M◊◊ΔΔ0611
	47	2,9	0,90	0,10	24	245	6,3x11,5	ECR1HBK470M◊◊ΔΔ0611
	100	1,4	0,50	0,10	50	385	8x11,5	ECR1HBK101M◊◊ΔΔ0811
	220	0,61	0,38	0,10	110	314	10x12,5	ECR1HBK221M◊◊ΔΔ1012
		0,61	0,27	0,10	110	505	10x16	ECR1HBK221M◊◊ΔΔ1016
	330	0,41	0,27	0,10	165	421	10x16	ECR1HBK331M◊◊ΔΔ1016
		0,41	0,18	0,10	165	675	10x20	ECR1HBK331M◊◊ΔΔ1020
	470	0,29	0,12	0,10	235	895	12,5x20	ECR1HBK471M◊◊ΔΔ1220
	1 000	0,14	0,076	0,10	500	1495	16x25	ECR1HBK102M◊◊ΔΔ1625
	2 200	0,073	0,065	0,12	1100	1660	16x35,5	ECR1HBK222M◊◊ΔΔ1635
		0,073	0,050	0,12	1100	2190	18x35,5	ECR1HBK222M◊◊ΔΔ1835

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63 (79) 1J	4,7	25,4	5,8	0,09	3	74	5x11,5	ECR1JBK4R7M◊◊ΔΔ0511
	10	12,0	3,6	0,09	7	95	5x11,5	ECR1JBK100M◊◊ΔΔ0511
	22	5,5	2,1	0,09	14	130	6,3x11,5	ECR1JBK220M◊◊ΔΔ0611
	33	3,7	1,7	0,09	21	160	6,3x11,5	ECR1JBK330M◊◊ΔΔ0611
	47	2,6	1,8	0,09	30	120	6,3x11,5	ECR1JBK470M◊◊ΔΔ0611
		2,6	1,2	0,09	30	305	8x11,5	ECR1JBK470M◊◊ΔΔ0811
	100	1,2	0,65	0,09	63	395	10x12,5	ECR1JBK101M◊◊ΔΔ1012
	220	0,55	0,48	0,09	139	335	10x16	ECR1JBK221M◊◊ΔΔ1016
		0,55	0,32	0,09	139	505	10x20	ECR1JBK221M◊◊ΔΔ1020
	330	0,37	0,32	0,09	208	510	10x20	ECR1JBK331M◊◊ΔΔ1020
		0,37	0,22	0,09	208	660	12,5x20	ECR1JBK331M◊◊ΔΔ1220
	470	0,26	0,16	0,09	297	640	12,5x20	ECR1JBK471M◊◊ΔΔ1220
		0,26	0,16	0,09	297	850	12,5x25	ECR1JBK471M◊◊ΔΔ1225
	1 000	0,12	0,13	0,09	630	930	16x25	ECR1JBK102M◊◊ΔΔ1625
		0,12	0,098	0,09	630	1430	16x31,5	ECR1JBK102M◊◊ΔΔ1631
100 (125) 2A	0,47	226	13,0	0,08	3	30	5x11,5	ECR2ABKR47M◊◊ΔΔ0511
	1,0	107	11,0	0,08	3	45	5x11,5	ECR2ABK010M◊◊ΔΔ0511
		48,3	9,2	0,08	3	60	5x11,5	ECR2ABK2R2M◊◊ΔΔ0511
	3,3	32,2	7,2	0,08	4	67	5x11,5	ECR2ABK3R3M◊◊ΔΔ0511
	4,7	22,6	6,3	0,08	5	75	5x11,5	ECR2ABK4R7M◊◊ΔΔ0511
	10	10,7	3,3	0,08	10	110	6,3x11,5	ECR2ABK100M◊◊ΔΔ0611
	22	4,9	3,5	0,08	22	93	6,3x11,5	ECR2ABK220M◊◊ΔΔ0611
		4,9	1,4	0,08	22	165	8x11,5	ECR2ABK220M◊◊ΔΔ0811
	33	3,3	1,5	0,08	33	130	8x11,5	ECR2ABK330M◊◊ΔΔ0811
		3,3	0,94	0,08	33	305	10x12,5	ECR2ABK330M◊◊ΔΔ1012
	47	2,3	1,1	0,08	47	165	10x12,5	ECR2ABK470M◊◊ΔΔ1012
		2,3	0,68	0,08	47	320	10x16	ECR2ABK470M◊◊ΔΔ1016
	100	1,1	0,50	0,08	100	265	10x20	ECR2ABK101M◊◊ΔΔ1020
		1,1	0,28	0,08	100	585	12,5x20	ECR2ABK101M◊◊ΔΔ1220
	220	0,49	0,22	0,08	220	440	12,5x25	ECR2ABK221M◊◊ΔΔ1225
		0,49	0,16	0,08	220	1120	16x25	ECR2ABK221M◊◊ΔΔ1625
	330	0,33	0,13	0,08	330	1290	16x25	ECR2ABK331M◊◊ΔΔ1625
	470	0,23	0,11	0,08	470	1350	16x31,5	ECR2ABK471M◊◊ΔΔ1631

U_{RDC} (Surge Voltage) Code (V)	C_R Rated Capacitance (µF)	ESR_{max} Equivalent Series Resistance 20°C 120Hz (Ω)	Z_{max} Max Impedance 20°C 100kHz (Ω)	tanδ Dissipation Factor 20°C 120Hz	I_{leak} Leakage Current (µA)	I_{RAC} Rated Ripple Current 105°C 120Hz (mArms)	Size øD x L (mm)	ORDER CODE ◊◊ = pin style & length ΔΔ = pitch code Details: Page 6
160 (200) 2C	0,47	424	-	0,15	48	12	6,3x11,5	ECR2CBKR47M◊◊ΔΔ0611
	1,0	199	-	0,15	56	18	6,3x11,5	ECR2CBK010M◊◊ΔΔ0611
	2,2	90,5	-	0,15	76	26	6,3x11,5	ECR2CBK2R2M◊◊ΔΔ0611
	3,3	60,3	-	0,15	93	28	6,3x11,5	ECR2CBK3R3M◊◊ΔΔ0611
		60,3	-	0,15	93	37	8x11,5	ECR2CBK3R3M◊◊ΔΔ0811
	4,7	42,4	-	0,15	116	34	6,3x11,5	ECR2CBK4R7M◊◊ΔΔ0611
		42,4	-	0,15	116	44	8x11,5	ECR2CBK4R7M◊◊ΔΔ0811
	10	19,9	-	0,15	164	58	8x11,5	ECR2CBK100M◊◊ΔΔ0811
		19,9	-	0,15	164	75	10x12,5	ECR2CBK100M◊◊ΔΔ1012
	22	9,1	-	0,15	241	135	10x16	ECR2CBK220M◊◊ΔΔ1016
	33	6,1	-	0,15	312	175	10x20	ECR2CBK330M◊◊ΔΔ1020
	47	4,3	-	0,15	401	230	12,5x20	ECR2CBK470M◊◊ΔΔ1220
	100	2,0	-	0,15	740	299	12,5x25	ECR2CBK101M◊◊ΔΔ1225
		2,0	-	0,15	740	330	16x25,5	ECR2CBK101M◊◊ΔΔ1625
	220	1,0	-	0,15	1508	500	16x35,5	ECR2CBK221M◊◊ΔΔ1635
	330	0,61	-	0,15	2212	764	18x36	ECR2CBK331M◊◊ΔΔ1836
200 (250) 2D	0,47	424	-	0,15	50	12	6,3x11,5	ECR2DBKR47M◊◊ΔΔ0611
	1,0	199	-	0,15	60	18	6,3x11,5	ECR2DBK010M◊◊ΔΔ0611
	2,2	90,5	-	0,15	84	26	6,3x11,5	ECR2DBK2R2M◊◊ΔΔ0611
	3,3	60,3	-	0,15	106	28	6,3x11,5	ECR2DBK3R3M◊◊ΔΔ0611
		60,3	-	0,15	106	37	8x11,5	ECR2DBK3R3M◊◊ΔΔ0811
	4,7	42,4	-	0,15	134	40	8x11,5	ECR2DBK4R7M◊◊ΔΔ0811
		42,4	-	0,15	134	50	10x12,5	ECR2DBK4R7M◊◊ΔΔ1012
	10	19,9	-	0,15	180	66	10x12,5	ECR2DBK100M◊◊ΔΔ1012
		19,9	-	0,15	180	80	10x16	ECR2DBK100M◊◊ΔΔ1016
	22	9,1	-	0,15	276	135	10x20	ECR2DBK220M◊◊ΔΔ1020
	33	6,1	-	0,15	364	190	12,5x20	ECR2DBK330M◊◊ΔΔ1220
	47	4,3	-	0,15	476	230	12,5x25	ECR2DBK470M◊◊ΔΔ1225
	100	2,0	-	0,15	900	360	16x25,5	ECR2DBK101M◊◊ΔΔ1625
	220	1,0	-	0,15	1860	525	18x31,5	ECR2DBK221M◊◊ΔΔ1831
250 (300) 2E	0,47	424	-	0,15	52	12	6,3x11,5	ECR2EBKR47M◊◊ΔΔ0611
	1,0	199	-	0,15	65	18	6,3x11,5	ECR2EBK010M◊◊ΔΔ0611
	2,2	90,5	-	0,15	95	23	6,3x11,5	ECR2EBK2R2M◊◊ΔΔ0611
		90,5	-	0,15	95	30	8x11,5	ECR2EBK2R2M◊◊ΔΔ0811
	3,3	60,3	-	0,15	123	43	8x11,5	ECR2EBK3R3M◊◊ΔΔ0811
		60,3	-	0,15	123	43	10x12,5	ECR2EBK3R3M◊◊ΔΔ1012
	4,7	42,4	-	0,15	147	40	8x11,5	ECR2EBK4R7M◊◊ΔΔ0811
		42,4	-	0,15	147	50	10x12,5	ECR2EBK4R7M◊◊ΔΔ1012
	10	19,9	-	0,15	200	90	10x16	ECR2EBK100M◊◊ΔΔ1016
	22	9,1	-	0,15	320	155	12,5x20	ECR2EBK220M◊◊ΔΔ1220
	33	6,1	-	0,15	430	190	12,5x25	ECR2EBK330M◊◊ΔΔ1225
	47	4,3	-	0,15	570	205	12,5x25	ECR2EBK470M◊◊ΔΔ1225
		4,3	-	0,15	570	225	16x25,5	ECR2EBK470M◊◊ΔΔ1625
	100	2,0	-	0,15	1100	340	16x31,5	ECR2EBK101M◊◊ΔΔ1631
	150	1,3	-	0,15	1600	405	18x25,5	ECR2EBK151M◊◊ΔΔ1825
	220	0,90	-	0,15	2300	570	18x36	ECR2EBK221M◊◊ΔΔ1836
350 (400) 2V	0,47	565	-	0,20	57	11	6,3x11,5	ECR2VBKR47M◊◊ΔΔ0611
	1,0	266	-	0,20	75	18	8x11,5	ECR2VBK010M◊◊ΔΔ0811
	2,2	121	-	0,20	117	30	8x11,5	ECR2VBK2R2M◊◊ΔΔ0811
		121	-	0,20	117	30	10x12,5	ECR2VBK2R2M◊◊ΔΔ1012
	3,3	80,4	-	0,20	147	36	10x12,5	ECR2VBK3R3M◊◊ΔΔ1012
	4,7	56,5	-	0,20	166	45	10x12,5	ECR2VBK4R7M◊◊ΔΔ1012
		56,5	-	0,20	166	47	10x16	ECR2VBK4R7M◊◊ΔΔ1016
	10	26,6	-	0,20	240	95	10x20	ECR2VBK100M◊◊ΔΔ1020
	22	12,1	-	0,20	408	130	12,5x20	ECR2VBK220M◊◊ΔΔ1220
	33	8,0	-	0,20	562	180	12,5x25	ECR2VBK330M◊◊ΔΔ1225
		8,0	-	0,20	562	160	16x25,5	ECR2VBK330M◊◊ΔΔ1625
	47	5,7	-	0,20	758	330	16x25,5	ECR2VBK470M◊◊ΔΔ1625
	100	3,0	-	0,20	1500	620	18x31,5	ECR2VBK101M◊◊ΔΔ1831

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U_{RDC} (Surge Voltage) Code (V)	C_R Rated Capacitance (µF)	ESR_{max} Equivalent Series Resistance 20°C 120Hz (Ω)	Z_{max} Max Impedance 20°C 100kHz (Ω)	tanδ Dissipation Factor 20°C 120Hz	I_{leak} Leakage Current (µA)	I_{RAC} Rated Ripple Current 105°C 120Hz (mArms)	Size øD x L (mm)	ORDER CODE ◊◊ = pin style & length ΔΔ = pitch code Details: Page 6
400 (450) 2G	1,0	266	-	0,20	80	16	6,3x11,5	ECR2GBK010M◊◊ΔΔ0611
		266	-	0,20	80	18	8x11,5	ECR2GBK010M◊◊ΔΔ0811
	2,2	121	-	0,20	128	25	8x11,5	ECR2GBK2R2M◊◊ΔΔ0811
		121	-	0,20	128	30	10x12,5	ECR2GBK2R2M◊◊ΔΔ1012
	3,3	80,4	-	0,20	153	35	10x12,5	ECR2GBK3R3M◊◊ΔΔ1012
		80,4	-	0,20	153	40	10x16	ECR2GBK3R3M◊◊ΔΔ1016
	4,7	56,5	-	0,20	176	47	10x12,5	ECR2GBK4R7M◊◊ΔΔ1012
		56,5	-	0,20	176	52	10x16	ECR2GBK4R7M◊◊ΔΔ1016
	10	26,6	-	0,20	260	80	10x16	ECR2GBK100M◊◊ΔΔ1016
		26,6	-	0,20	260	95	10x20	ECR2GBK100M◊◊ΔΔ1020
		26,6	-	0,20	260	120	12,5x20	ECR2GBK100M◊◊ΔΔ1220
	22	12,1	-	0,20	452	150	12,5x25,5	ECR2GBK220M◊◊ΔΔ1225
		12,1	-	0,20	452	150	16x25,5	ECR2GBK220M◊◊ΔΔ1625
	33	8,1	-	0,20	628	180	12,5x25	ECR2GBK330M◊◊ΔΔ1225
		8,1	-	0,20	628	180	16x20	ECR2GBK330M◊◊ΔΔ1620
		8,1	-	0,20	628	215	16x25,5	ECR2GBK330M◊◊ΔΔ1625
	47	5,7	-	0,20	852	360	16x25,5	ECR2GBK470M◊◊ΔΔ1625
	68	3,9	-	0,20	1188	470	18x25,5	ECR2GBK680M◊◊ΔΔ1825
	82	3,2	-	0,20	1412	575	18x31,5	ECR2GBK820M◊◊ΔΔ1831
	100	2,7	-	0,20	1700	675	18x36	ECR2GBK101M◊◊ΔΔ1836
	120	2,2	-	0,20	2020	735	18x40	ECR2GBK121M◊◊ΔΔ1840
	150	1,8	-	0,20	2500	825	20x41	ECR2GBK151M◊◊ΔΔ2041
420 (470) 2X	1,0	266	-	0,20	82	16	8x11,5	ECR2XBK010M◊◊ΔΔ0811
		266	-	0,20	82	19	10x12,5	ECR2XBK010M◊◊ΔΔ1012
	2,2	121	-	0,20	133	24	8x11,5	ECR2XBK2R2M◊◊ΔΔ0811
		121	-	0,20	133	29	10x12,5	ECR2XBK2R2M◊◊ΔΔ1012
	3,3	80,4	-	0,20	156	34	10x12,5	ECR2XBK3R3M◊◊ΔΔ1012
		80,4	-	0,20	156	38	10x16	ECR2XBK3R3M◊◊ΔΔ1016
	4,7	56,5	-	0,20	179	46	10x16	ECR2XBK4R7M◊◊ΔΔ1016
		56,5	-	0,20	179	52	10x20	ECR2XBK4R7M◊◊ΔΔ1020
	10	26,5	-	0,20	268	100	10x20	ECR2XBK100M◊◊ΔΔ1020
		26,5	-	0,20	268	116	12,5x20	ECR2XBK100M◊◊ΔΔ1220
	22	12,1	-	0,20	470	162	12,5x25	ECR2XBK220M◊◊ΔΔ1225
	33	8,0	-	0,20	655	204	16x20	ECR2XBK330M◊◊ΔΔ1620
		8,0	-	0,20	655	228	16x25,5	ECR2XBK330M◊◊ΔΔ1625
	47	5,6	-	0,20	890	380	16x31,5	ECR2XBK470M◊◊ΔΔ1631
	56	4,7	-	0,20	1041	420	16x31,5	ECR2XBK560M◊◊ΔΔ1631
		4,7	-	0,20	1041	420	18x25,5	ECR2XBK560M◊◊ΔΔ1825
	68	3,9	-	0,20	1243	542	16x36	ECR2XBK680M◊◊ΔΔ1636
		3,9	-	0,20	1243	542	18x31,5	ECR2XBK680M◊◊ΔΔ1831
	82	3,2	-	0,20	1478	608	16x40	ECR2XBK820M◊◊ΔΔ1640
		3,2	-	0,20	1478	608	18x31,5	ECR2XBK820M◊◊ΔΔ1831
	100	2,7	-	0,20	1780	713	16x45	ECR2XBK101M◊◊ΔΔ1645
		2,7	-	0,20	1780	713	18x36	ECR2XBK101M◊◊ΔΔ1836
	120	2,2	-	0,20	2116	779	16x50	ECR2XBK121M◊◊ΔΔ1650
		2,2	-	0,20	2116	779	18x40	ECR2XBK121M◊◊ΔΔ1840
	150	1,8	-	0,20	2620	874	16x60	ECR2XBK151M◊◊ΔΔ1660
		1,8	-	0,20	2620	874	20x41	ECR2XBK151M◊◊ΔΔ2041
450 (500) 2W	1,0	266	-	0,20	85	16	8x11,5	ECR2WBK010M◊◊ΔΔ0811
		266	-	0,20	85	19	10x12,5	ECR2WBK010M◊◊ΔΔ1012
	2,2	121	-	0,20	139	26	10x12,5	ECR2WBK2R2M◊◊ΔΔ1012
		121	-	0,20	139	29	10x16	ECR2WBK2R2M◊◊ΔΔ1016
	3,3	80,4	-	0,20	160	38	10x16	ECR2WBK3R3M◊◊ΔΔ1016
		80,4	-	0,20	160	42	10x20	ECR2WBK3R3M◊◊ΔΔ1020
	4,7	56,5	-	0,20	185	49	10x16	ECR2WBK4R7M◊◊ΔΔ1016
		56,5	-	0,20	185	54	10x20	ECR2WBK4R7M◊◊ΔΔ1020
	10	26,6	-	0,20	280	120	10x20	ECR2WBK100M◊◊ΔΔ1020
	22	12,1	-	0,20	496	170	12,5x25	ECR2WBK220M◊◊ΔΔ1225
	33	8,1	-	0,20	694	240	16x25,5	ECR2WBK330M◊◊ΔΔ1625
	47	5,6	-	0,20	946	400	16x31,5	ECR2WBK470M◊◊ΔΔ1631
	56	4,7	-	0,20	1108	440	16x31,5	ECR2WBK560M◊◊ΔΔ1631
		4,7	-	0,20	1108	440	18x25,5	ECR2WBK560M◊◊ΔΔ1825
	68	4,0	-	0,20	1324	490	16x36	ECR2WBK680M◊◊ΔΔ1636
		4,0	-	0,20	1324	570	18x31,5	ECR2WBK680M◊◊ΔΔ1831
	82	3,2	-	0,20	1576	640	16x40	ECR2WBK820M◊◊ΔΔ1640
		3,2	-	0,20	1576	640	18x31,5	ECR2WBK820M◊◊ΔΔ1831

U_{RDC} (Surge Voltage) Code (V)	C_R Rated Capacitance (µF)	ESR_{max} Equivalent Series Resistance 20°C 120Hz (Ω)	Z_{max} Max Impedance 20°C 100kHz (Ω)	tanδ Dissipation Factor 20°C 120Hz	I_{leak} Leakage Current (µA)	I_{RAC} Rated Ripple Current 105°C 120Hz (mArms)	Size øD x L (mm)	ORDER CODE ◊◊ = pin style & length ΔΔ = pitch code Details: Page 6
450 (500) 2W	100	2,7	-	0,20	1900	750	16x45	ECR2WBK101M◊◊ΔΔ1645
		2,7	-	0,20	1900	750	18x36	ECR2WBK101M◊◊ΔΔ1836
	120	2,2	-	0,20	2260	820	16x50	ECR2WBK121M◊◊ΔΔ1650
		2,2	-	0,20	2260	820	18x40	ECR2WBK121M◊◊ΔΔ1840
	150	1,8	-	0,20	2800	920	16x60	ECR2WBK151M◊◊ΔΔ1660
		1,8	-	0,20	2800	920	18x46	ECR2WBK151M◊◊ΔΔ1846
		1,8	-	0,20	2800	920	20x41	ECR2WBK151M◊◊ΔΔ2041
	180	1,5	-	0,20	3340	1100	22x41	ECR2WBK181M◊◊ΔΔ2241
500 (550) 2H	1,0	266	-	0,20	90	21	10x12,5	ECR2HBK010M◊◊ΔΔ1012
	2,2	121	-	0,20	144	35	10x16	ECR2HBK2R2M◊◊ΔΔ1016
	3,3	80,4	-	0,20	166	48	10x20	ECR2HBK3R3M◊◊ΔΔ1020
	4,7	56,5	-	0,20	194	63	12,5x20	ECR2HBK4R7M◊◊ΔΔ1220
	10	26,6	-	0,20	300	120	12,5x25	ECR2HBK100M◊◊ΔΔ1225
	22	12,1	-	0,20	540	180	16x25,5	ECR2HBK220M◊◊ΔΔ1625
	33	8,0	-	0,20	760	240	16x31,5	ECR2HBK330M◊◊ΔΔ1631
	47	5,6	-	0,20	1040	405	18x31,5	ECR2HBK470M◊◊ΔΔ1831
	56	4,7	-	0,20	1220	450	16x40	ECR2HBK560M◊◊ΔΔ1640
		4,7	-	0,20	1220	450	18x31,5	ECR2HBK560M◊◊ΔΔ1831
	68	3,9	-	0,20	1460	560	16x45	ECR2HBK680M◊◊ΔΔ1645
		3,9	-	0,20	1460	560	18x36	ECR2HBK680M◊◊ΔΔ1836
	82	3,2	-	0,20	1740	640	16x55	ECR2HBK820M◊◊ΔΔ1655
		3,2	-	0,20	1740	640	18x40	ECR2HBK820M◊◊ΔΔ1840
	100	2,7	-	0,20	2100	800	16x60	ECR2HBK101M◊◊ΔΔ1660
		2,7	-	0,20	2100	800	18x46	ECR2HBK101M◊◊ΔΔ1846
		2,7	-	0,20	2100	800	20x41	ECR2HBK101M◊◊ΔΔ2041
	120	2,2	-	0,20	2500	840	22x45	ECR2HBK121M◊◊ΔΔ2245
	150	1,8	-	0,20	3100	890	22x45	ECR2HBK151M◊◊ΔΔ2245

ORDER CODE FOR RADIAL CAPACITORS

EC	R	2G	QX	221	M	LL	50	1012	-	-	JExxxxx
Techno-logy	Terminal Type	Rated Voltage Code	Series Code	Capacitance Code	Capacitance Tolerance	Terminal Style	Terminal / Pitch	Dimension (mm)	Material Code	Rubber Type	for Specials only

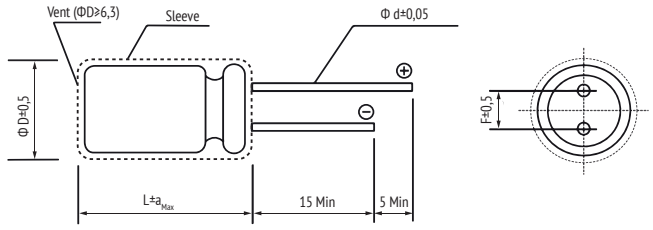
Techno-logy	Terminal Type		Rated Voltage Code		Series Code		Capacitance Code		Capacitance Tolerance		Terminal Style		Terminal / Pitch		Dimension (mm)		Material Code		Rubber Type	
EC Electrolytic Capacitor	Radial	R	6,3V	0J	CD 110	PT	0,1	0R1	**±20%**	M	Taped	FF	2,0mm	20	4x7	0407	Standard	-	Standard	-
			10V	1A	CD 11GL	GL	0,47	R47	±10%	K	Long Lead	LL	2,5mm	25	5x11,5	0511	PVC	V	Flat Rubber	F
			16V	1C	CD 261	LK	1,0	010	+30 / -10%	Q	Cut 5,0mm	CB	3,5mm	35	10x20	1020	PET	E	Stand-Off	S
			20V	1D	CD 261L	DE	2,2	2R2	+20 / -0%	R	Cut 4,5mm	CC	5,0mm	50	12,5x25	1225				
			25V	1E	CD 261X	QX	100	101	±15%	L	Cut 4,0mm	CD	7,5mm	75						
			35V	1V	CD 263	BK	1 000	102	+20 / -10%	V	Cut 3,5mm	CE	10,0mm	10						
			40V	1G	CD 269	PH	10 000	103	■ = preferred		Cut 3,0mm	CF	12,5mm	12						
			50V	1H	CD 269L	HL														
			63V	1J	CD 281	LL														
			80V	1K	CD 281L	LH														
			100V	2A	CD 282L	YL														
			125V	2B	CD 282X	EQ														
			160V	2C	CD 284	XY														
			180V	2K	CD 284L	LY														
			200V	2D	CD 285	HY														
			250V	2E	CD 287	GC														
			350V	2V	CD 28L	QL														
			385V	2J																
			400V	2G																
			415V	2P																
			420V	2X																
			450V	2W																
			500V	2H																
			550V	2Y																
			575V	2Z																
			600V	2S																
			630V	J2																

On request:
Alternative lead forms
(keyed polarity, 90° bended, others)

Packaging:
Taped: ammopack
Long lead & cut: bulk

DIMENSIONS FOR LOOSE, LONG-LEAD TYPE (BULK)

· ORDER CODE: LL



L	L ≤ 7					L ≥ 11									
Ø D	3	4	5	6,3	8	5	6,3	8	10	12,5	16	18	20	22	25
F	1,0	1,5	2,0	2,5	3,5	2,0	2,5	3,5	5,0		7,5		10,0		12,5
Ø d	0,4	0,45				0,5		0,6			0,8			1,0	
a_{Max}	1,0					2,0							2,5		

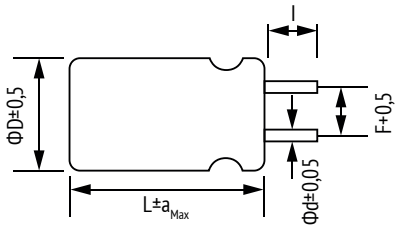
For diameter 20 pitch 7,5 or 10.

in mm

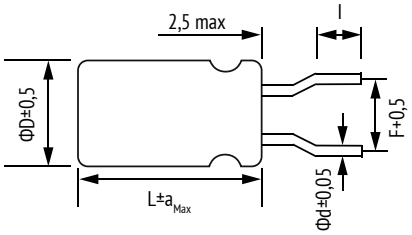
DIMENSIONS FOR LOOSE, SHORT CUT LEADS (BULK)

· ORDER CODE: CC (CB, CD, CE, CF)

STRAIGHT LEAD



BENDED LEAD



Code	CB	CC	CD	CE	CF
l	5,0 ± 0,5	**4,5 ± 0,5**	4,0 ± 0,5	3,5 ± 0,5	3,0 ± 0,5

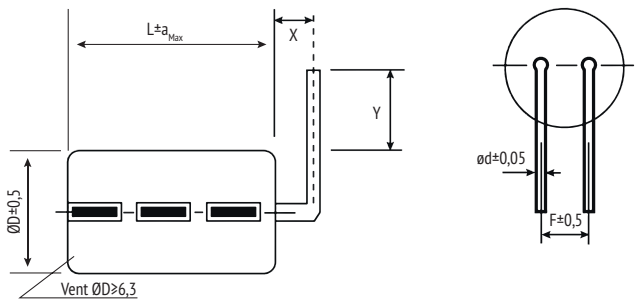
= preferred

in mm

EXAMPLE OF ALTERNATIVE BENDINGS

· ORDER CODE: WS

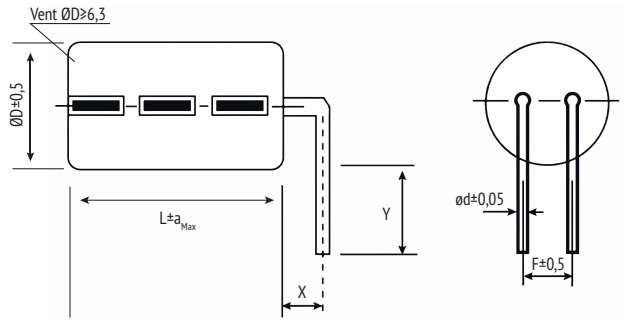
90° LEADS UP



X: 3,0±0,5
Y: 3,7±0,3

· ORDER CODE: WX

90° LEADS DOWN



X: 3,0±0,5
Y: 3,7±0,3

DIMENSIONS FOR AMMOPACK TAPING FOR ELECTROLYTIC CAPACITORS

· ORDER CODE: FF (FD)

Fig 1

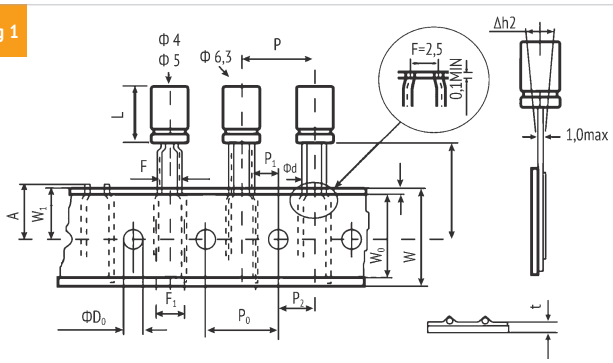


Fig 2

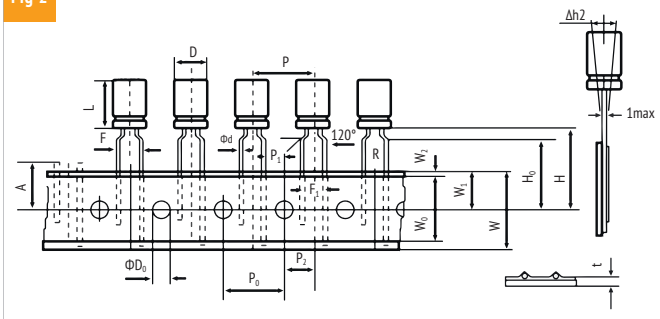


Fig 3a

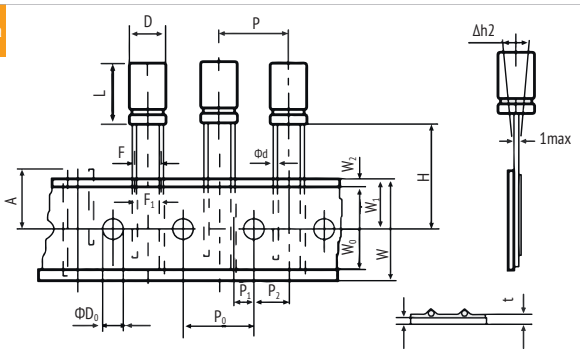


Fig 3b

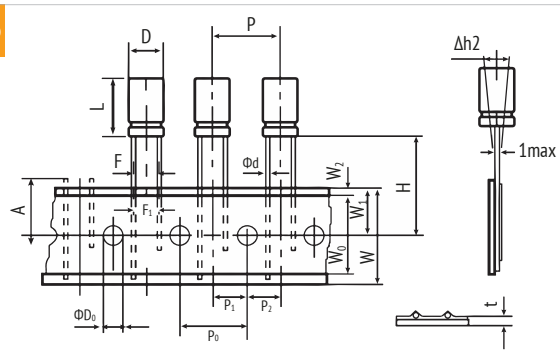
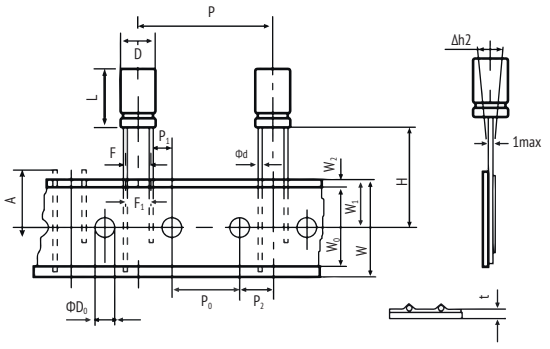


Fig 4

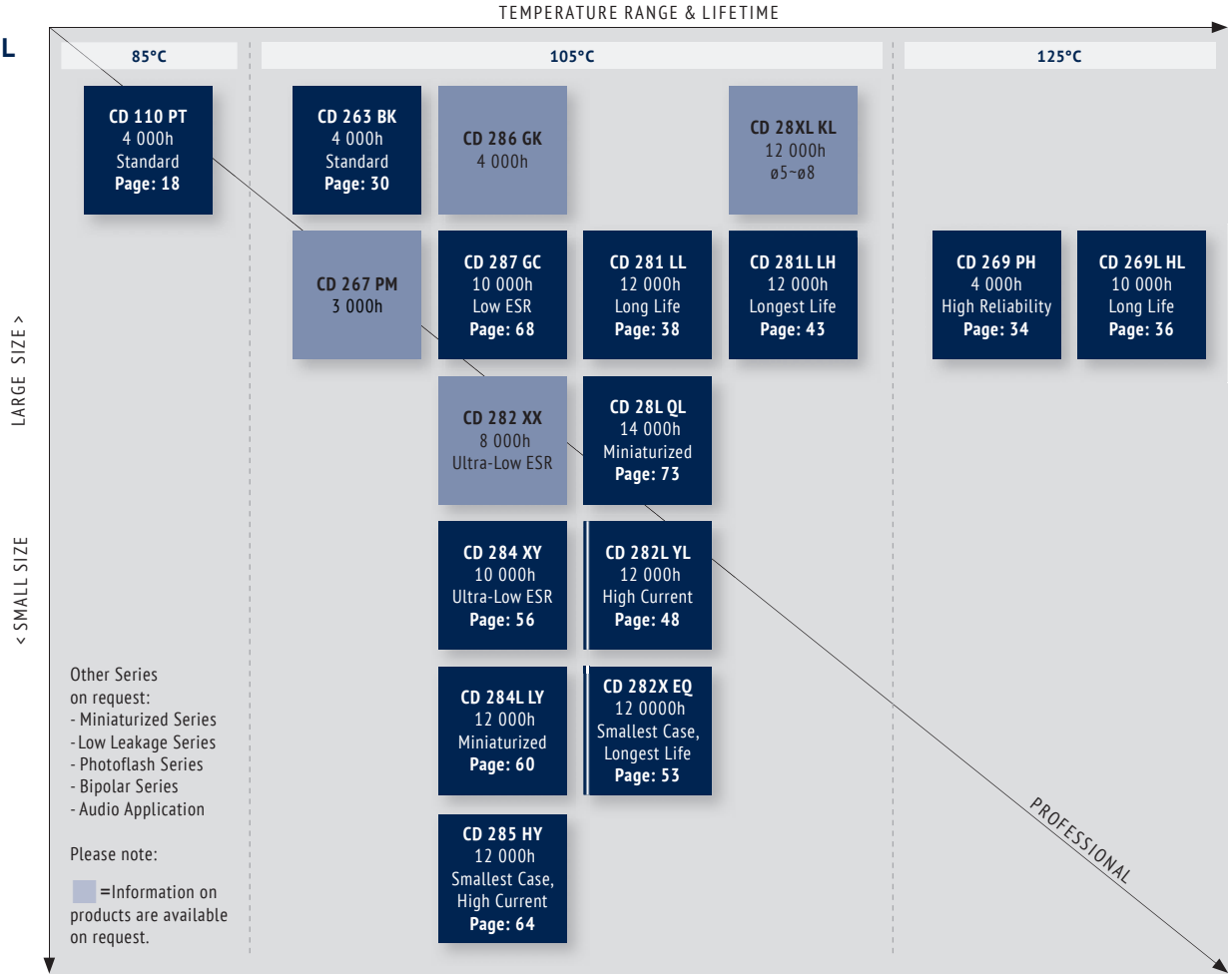


OTHER TAPING STYLES AVAILABLE ON REQUEST.

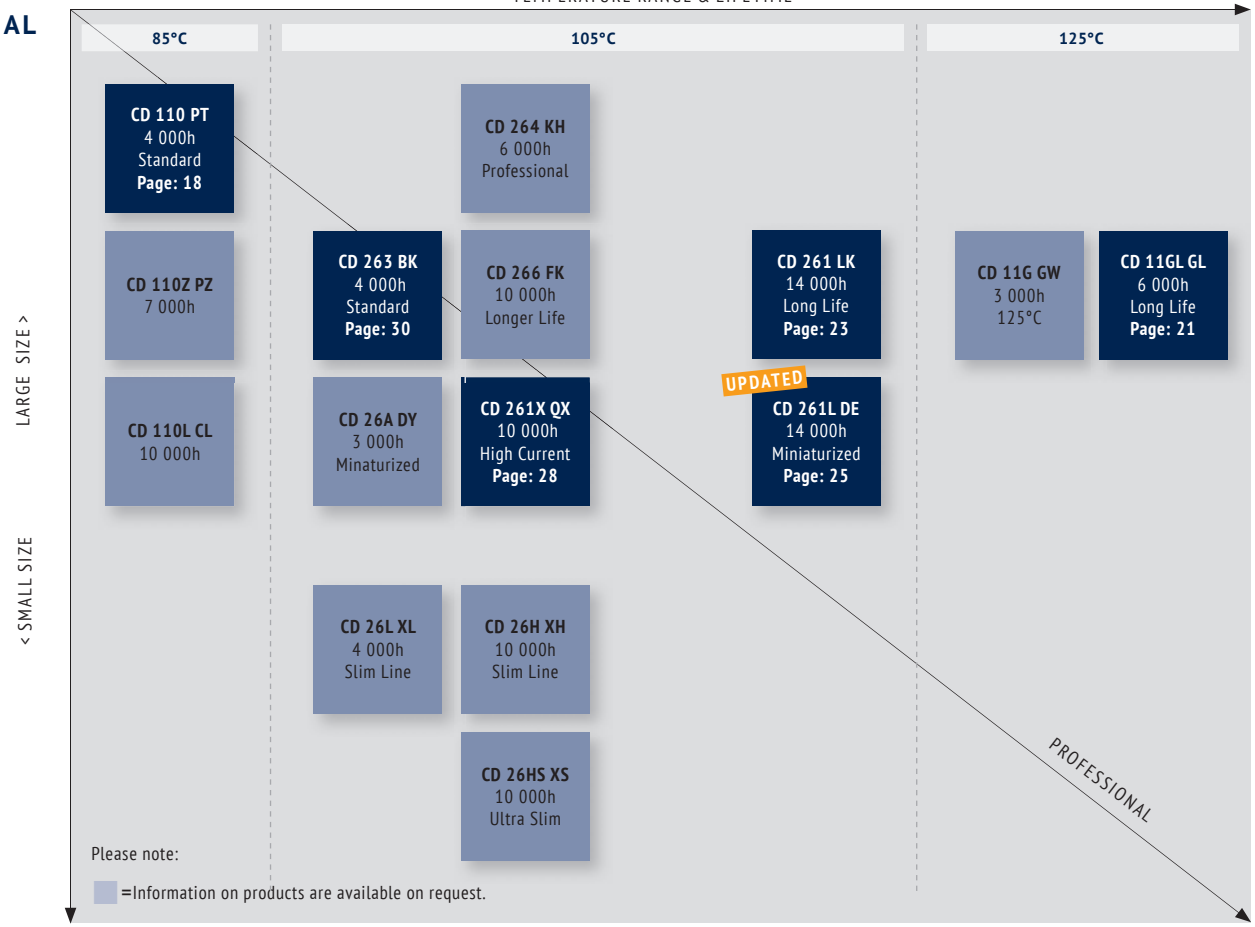
ITEM	D	L	Ød	P	P_0	P_1	P_2	F	F_1	W	W_0	W_1	W_2	H	H_0	A	$ØD_0$	$Δh_2$	t	Fig.	Taping Code
Tol.	± 0,5	± 2,0	± 0,05	± 1,0	± 0,2	± 0,5	± 1,0	+ 0,8 - 0,2	± 1,0	± 0,5	min	± 0,5	max	+ 0,75 - 0,5	± 0,5	max	± 0,5	max	± 0,2		
Nominal	4	7	0,45	12,7	12,7	5,1	6,35	2,5	3,5	18,0	10,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	1	FF
						3,85		5	5					17,5	16,0					2	FF
	5	7	0,45	12,7	12,7	5,1	6,35	2,5	3,5	18,0	10,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	1	FF
						3,85		5	5					17,5	16,0					2	FF
		11,5~15	0,5	12,7	12,7	5,1	6,35	2,5	3,5	18,0	10,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	1	FF
						3,85		5	5						16,0					2	FF
	6,3	7	0,45	12,7	12,7	5,1	6,35	2,5	3,5	18,0	10,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	1	FF
						3,85		5	5					17,5	16,0					2	FF
		11,5~15	0,5	12,7	12,7	5,1	6,35	2,5	3,5	18,0	10,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	1	FF
						3,85		5	5						16,0					2	FF
	8	11,5~20	0,6	12,7	12,7	4,6	6,35	3,5	3,5	18,0	10,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	3a	FF
						3,85		5	5					20,0	16,0					2	FF
	10	12,5~36	0,6	12,7	12,7	3,85	6,35	5	5	18,0	10,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	3b	FF
	12,5	15~36	0,6	15	15	5,0	7,5	5	5	18,0	12,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	3b	FF
				25,4	12,7	3,85	6,35													4	FD
	16	15~31,5	0,8	30	15	3,75	7,5	7,5	7,5	18,0	12,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	4	FD
	18	15~25,5	0,8	30	15	3,75	7,5	7,5	7,5	18,0	12,0	9,0	1,5	18,5	-	11,0	4,0	1,0	0,7	4	FD
	Other taping styles available on request																				

in mm

RADIAL 6,3V ~ 100V



RADIAL 160V ~ 550V



LIFETIME ESTIMATION OF ALUMINUM ELECTROLYTIC CAPACITORS FROM JIANGHAI

To estimate the Lifetime of a non-solid Aluminum Electrolytic Capacitor from Jianghai, the following formulas can be utilized. The Lifetime depends mainly on the ambient temperature, the ripple current and, within certain limits, the operating voltage applied. Other parameters may also affect the Lifetime. Moreover, L_0 can be interpreted in many different ways, which has a fundamental influence on the numerical result. Jianghai offers a high transparency by publishing the different typical definitions of Lifetimes in each datasheet. Lifetime estimations are approximations by nature. Please let JIANGHAI EUROPE confirm any result before using it. The formulas given here do not constitute part of a contract nor of a specification. The formulas do not cover additional aging effects of certain electrolytic systems or other chemical effects. Also the dimensions of the components may have an effect. Forced cooling or other additional cooling-methods have a strong impact on the Lifetime and are not covered by the formulas as defined. For the estimation and interpretation of Lifetime, a close collaboration with JIANGHAI EUROPE is strongly advised.

STRUCTUAL FORMULA

$$L = L_0 \cdot K_T \cdot K_R \cdot K_V$$

WHERE:

- L Total Lifetime
- L_0 Lifetime under Nominal Load at Upper Category Temperature (see catalogue)
- K_T Temperature Factor
- K_R Ripple Current Factor
- K_V Voltage Factor

K_T TEMPERATURE FACTOR

Aluminum Electrolytic Capacitors follow roughly the 10 K rule of Arrhenius. It is possible to estimate the Lifetime by rule of thumb: When the operational temperature is reduced by 10 K, the Lifetime will double. The formula for **K_T** in detail is:

$$K_T = 2^{\frac{T_0 - T_A}{10K}}$$

WHERE:

- T_0 Rated Temperature
- T_A Ambient Temperature

K_R RIPPLE CURRENT FACTOR

To estimate the influence of ripple current on lifetime, Jianghai uses a safety factor K_i. Under certain conditions this value can be set to K_i=2, which is prolonging the lifetime. Please contact Jianghai Europe for details and approval.

$$K_R = K_i^{A\frac{\Delta T_0}{10K}}$$

WITH:

$$A = 1 - \left(\frac{I_A}{I_R}\right)^2$$

WHERE:

- I_A Actual Rated Ripple Current
- I_R Ripple Current at Upper Category Temperature (databook value)
- ΔT_0 Core Temperature Rise of the capacitor (typically 3,5 ~ 5 K for T_0 = 105°C and 3,5 ~ 10K for T_0= 85°C, see databook value)
- K_i Basis, typically defined as

T_0 = 105°C	$I_A > I_R$:	K_i=4
	$I_A \leq I_R$:	K_i=2
T_0 = 85°C		K_i=2

Remark: Safety Factor K_i may be set as K_i=2 under certain defined conditions. Please contact Jianghai Europe for approval.

K_V VOLTAGE FACTOR

For Radial Electrolytic Capacitors, this part of the formula has no impact (K_V = 1). But for some bigger capacitors like Snap-In and Screw-Terminal types with rated voltages above 160V, the operating voltage will affect their Lifetime. It is expressed as follows:

FOR:

$$0{,}6 \leq \frac{U_A}{U_R} \leq 1$$

$$K_V = \left(\frac{U_A}{U_R}\right)^{-2{,}5}$$

WHERE:

- U_A Actual Operating Voltage
- U_R Rated Voltage

FOR:

$$0 < \frac{U_A}{U_R} < 0{,}6$$

$$K_V = 3{,}59$$

FOR:

$$\frac{U_A}{U_R} > 1 \; not\; allowed$$

$$K_V = 1$$

FOR: Radial Capacitors or $U_R \leqslant 160V$

$$K_V = 1$$

FREQUENCY CORRECTION FACTORS:

If the actual Ripple Currents are not given at the same frequency like I_0, correction factors need to be applied.

$$I_A = \sqrt{\left(\frac{I_{f1}}{F_{f1}}\right)^2 + \left(\frac{I_{f2}}{F_{f2}}\right)^2 + \ldots \left(\frac{I_{fn}}{F_{fn}}\right)^2}$$

JIANGHAI ELECTROLYTIC CAPACITOR LIFETIME ESTIMATION FORMULA (incl. Safety Factors):

$$L = L_0 \cdot 2^{\frac{T_0 - T_A}{10K}} \cdot K_i^{\left[1 - \left(\frac{I_A}{I_R}\right)^2\right] \cdot \frac{\Delta T_0}{10K}} \cdot \underbrace{\left(\frac{U_A}{U_R}\right)^{-n}}_{K_V}$$

WITH TYPICAL VALUES:

$T_0 = 105°C$ $\quad I_A > I_R$: $K_i = 4$

$\quad\quad\quad\quad\quad\quad I_A \leqslant I_R$: $K_i = 2$

$T_0 = 85°C$ $\quad\quad\quad\quad\quad K_i = 2$

ΔT_0= depending on the series: 3,5~10K, see databook value

$$0{,}6 \leq \frac{U_A}{U_R} \leq 1 \rightarrow n = 2{,}5$$

$$0 < \frac{U_A}{U_R} < 0{,}6 \rightarrow K_V = \left(\frac{U_A}{U_R}\right)^{-n} = 3{,}59$$

For $U_R \leqslant 160V$, Radial and

$$\frac{U_A}{U_R} > 1 \rightarrow K_V = 1$$

HANDLING PRECAUTIONS FOR ALUMINUM ELECTROLYTIC CAPACITORS FROM JIANGHAI

WARNING

JIANGHAI is not liable for any extent of possible injuries or damages to persons or things, of any kind, caused by the improper application of and/or operating conditions harmful to electrolytic capacitors. Misapplications which may cause failures include, but are not limited to: ripple current or peak current or voltage above specification, operating voltage above surge voltage specified, temperature exposure outside the specified operating temperature range. Examples of harmful operating conditions comprise, but are not limited to: unusual storage or transport temperatures, excessive and/or rapid changes of ambient temperature or humidity, heavy mechanical shock or vibration, corrosive and abrasive particles in the ambient (cooling) air, conducting dust in the ambient (cooling) air, oil or water vapor or corrosive substances, explosive gas or dust, operation under extremely high or low ambient pressure conditions (below or above sea level), superimposed radio frequency voltages, radioactivity. In case of doubt about the impact of operating conditions on capacitor performance, please contact JIANGHAI.

PERSONAL SAFETY

Electrical or mechanical misapplication of electrolytic capacitors may be hazardous. Personal injury or property damage may result from explosion of a capacitor or from the expulsion of electrolyte due to mechanical disruption or the release of a safety vent of a capacitor. In case of injury or skin or eye exposure to electrolyte, immediately seek professional medical advice. Before using electrolytic capacitors in any application, please read these Handling Precautions, familiarizing thoroughly with the information contained herein. Please check before using any of our electrolytic capacitors if these components fulfill the requirements of your application and that warnings and instructions for use are followed.

WARRANTY

The information contained in this catalogue does not form part of any quotation or contract, is believed to be accurate, reliable and up to date. Quality data are based on the statistical evaluations of a large quantity of parts and do not constitute a guarantee in a legal sense. However, agreement on these specifications does mean that the customer may claim for replacement of individual defective capacitors within the terms of delivery. We will not assume any liability beyond the replacement of defective components. This applies in particular to any consequential damage caused by component failure. Furthermore it must be taken into consideration that the figures stated for lifetime, failure rates and outlier percentages refer to the average production status and are therefore to be understood as mean values (statistic expectations) for a large number of delivery lots of identical capacitors. These figures are based on application experience and data obtained from preceding tests under normal conditions, or – for purpose of accelerated aging – more severe conditions. JIANGHAI reserves the right to change these specifications without prior notice. Any application information given is advisory and does not form part of any specification. The products are not primarily designed for use in life support applications, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. JIANGHAI customers using or selling these products for use in such applications without prior written consent of JIANGHAI do so at their own risk and agree fully to indemnify JIANGHAI for any damage resulting from such improper use or sale. This version of the catalogue supersedes all previous versions. Latest versions of datasheets can be found on our homepage: www.jianghai-europe.com. For more details on precautions and guidelines for aluminum electrolytic capacitors, please refer to CENELEC Technical Report CLC/TR 50454:2008 E, "Guide for the application of aluminum electrolytic capacitors".

POLARITY

Electrolytic capacitors are polar and shall never be used with incorrect polarity, as there is a possible danger of shorting or destruction.

RATED VOLTAGE U_R

The rated voltage is marked on the capacitor and defined in the datasheets as U_R. This voltage should never be exceeded and is the maximum peak voltage including any ripple voltages allowed to avoid a shortening of the lifetime or damage of the capacitor. When a ripple current is applied to the capacitor, the sum of the peak ripple voltage and bias DC voltage shall never exceed the rated voltage. It might be necessary to lower the maximum allowed bias DC voltage, when certain ripple currents are applied to the capacitor.

SURGE VOLTAGE

Maximum voltage, which may be applied to the capacitor for short periods of time: max. 1000 cycles of 30 sec. per 6 min., max. 5 pulses per hour. Capacitance drift +/- 15% max.

REVERSE VOLTAGE

Reverse voltages or voltages < 0V are not allowed.

RECOVERY VOLTAGE

Electric potential between the positive and negative terminal may exist as a result of dielectric absorption. Please take action that this load does not damage other devices or scare workers during the production process (sparks possible). If needed please discharge the capacitor through a 1kΩ resistor.

TEMPERATURE RANGE

Use electrolytic capacitors only within the specified operating temperature range.

OVER-CURRENT

Currents exceeding the rated ripple currents should be avoided.

RIPPLE CURRENT/VOLTAGE

The combined value of DC voltage and peak AC voltage (due to ripple current) shall not exceed the rated voltage and shall never be < 0V. Use of aluminum electrolytic capacitors under ripple current with wide amplitudes is equivalent to rapid charge-discharge operation.

RAPID CHARGING/DISCHARGING

Rapid charging/discharging generates severe heat and gas may be emitted which may lead to explosion. Consult JIANGHAI about specially designed capacitors suitable for such kind of applications. Example: Servo Drive Application

BALANCING RESISTORS

Balancing resistors should be utilized if capacitors are used in serial connection. Please choose low-tolerance resistors to limit voltage drift.

CHARGE-DISCHARGE PROOF

JIANGHAI capacitors are charge-discharge proof, which means that 10^6 switching cycles will cause capacitance reduction of less than 10%.

LIFETIME

There are many different lifetime definitions known without any true standard definition. Take special care when capacitors are compared that the capacitors fulfill the needed requirements. JIANGHAI publishes all conditions to be as transparent as possible. In the case of lifetime tests with additional ripple currents, the bias DC voltage must be reduced, so that the sum of bias DC voltage and the peak of the ripple voltage does not exceed the Rated Voltage U_R.

Load life: Period of time, during which the technical parameters of all capacitors stay within the given limits. JIANGHAI defines this without allowing for outliers.

Useful life: Defined like load life, but with a lager range of parameter change.

Endurance test: IEC 60384-4 defines the acceptable drift criteria of electrical parameters after the endurance tests (continuous voltage test).

Shelf Life: Definition of time with acceptable drift of capacitor parameters after storage at upper category temperature without load.

VIBRATION AND MECHANICAL STRESS

Capacitors are sensitive to vibration and mechanical forces applied on the leads. Do not use capacitors, which have been dropped onto a rigid surface.

INSULATION

If any defect of the sleeve is visible, the component should not be used – the same holds for any kind of visible damage. A capacitor should be electrically isolated from the following parts: aluminum case, cathode lead wire, anode lead wire and circuit pattern, and auxiliary terminal of snap-in type. The sleeve is not recognized as an isolator and therefore the standard capacitor should not be used in a place where insulation function is needed. Please contact JIANGHAI if a higher grade of insulation is required.

ENVIRONMENTAL CONDITIONS

Avoid direct contact with water, salt solution, oil, dewing conditions. Halogens generally, especially fumigation treatment with bromides and flame retardant agents containing halogens must be avoided. Avoid exposing to direct sunshine, ozone, ultraviolet rays and x-ray radiation. Air Pressure: Max. 150kPa, min. 8kPa. For usage >2000m altitude above sea level current deratings might be necessary. No heavy air pressure changes are allowed. Do not use or store in an environment containing any hazardous gas (e.g., hydrogen sulphide, sulphurous acid, nitrous acid, chlorine, ammonia, bromine, methyl bromide, other halogens) or acidic or alkaline solutions.

STORAGE

Temperature 5 to 35°C, relative humidity below 75%. Electrolytic capacitors may accumulate charge naturally during storage. In this case discharge through a 1kOhm resistor before use (Recovery voltage). Leakage current may be increased after long storage time. In this case the capacitor should be subjected to the rated voltage treatment through a 1kOhm resistor before use for 1 hour, then it should be discharged through a resistor of about 1 Ohm/Volt. Storage times above 1 year should be avoided or rated voltage treatment may be necessary. In accordance to IEC 60384-4 electrolytic capacitors are subject to a reforming process before acceptance testing. Rated voltage is applied via a series resistance (100Ω: $U_R \leq$ 100VDC, 1kΩ: $U_R >$ 100VDC).

SOLDERING

Soldering conditions (temperature, times) should be within specified conditions, especially for SMD components. Avoid high soldering temperatures as this may reduce lifetime or damage the capacitor. Do never dip the capacitor body into molten solder. Flux should not be adhered to the capacitor's body but only to its terminals. For details and different methods please contact us.

GLUEING, CLEANING AND COATING

Do not use fixing agents or cleaning substances containing halogens. Do not use coating and moulding components that completely seal the capacitor from the environment. Also, never use solvents containing: halogenated hydrocarbons, alkali, petroleum, trichloroethylene/-ethane, xylene, acetones, trichlorotrifluoroethane, tetrachloroethylene, methylenechloride, chloroform, acetates, ketones, esters, chlorides and bromides.

MOUNTING

Other devices, which are mounted near the capacitor, should not touch the capacitor. Additional heat coming from other components near the capacitor may reduce the lifetime of the capacitor. Do never bend or twist the capacitor after soldering to avoid stress on the leads. Radial capacitors are not protected against mechanical forces on the leads. Forces on the pins might damage the capacitor. No printed circuit board tracks are allowed between the lead pads of the capacitor. Screw Terminal capacitors should only be mounted in an upright position.

TRANSPORT

Avoid fumigation and spraying insecticides (especially with bromides) in the import or export procedures which can cause corrosion. This applies also to the finished devices.

MAINTENANCE

Periodical inspection should be carried out for the capacitor: visual inspection to check pressure relief open or leakage of electrolyte, electrical characteristics as leakage current, capacitance, and dissipation factor.

ELECTROLYTE AND SEPARATOR PAPER

Electrolyte and separator paper used in aluminum capacitors may be flammable. Also, electrolyte is electrically conductive. Therefore, in case electrolyte gets in contact with PC board it may cause corrosion of circuit pattern or cause short circuit between patterns, and may lead to smoke generation or ignition in worst case.

CAUTION DURING USE OF CAPACITORS

Do not touch the terminals of capacitors. Keep the capacitor free from conductive solution, such as acids, alkali and so on. Ensure that the operating environment of the equipment into which the capacitor has been built is within the specified conditions mentioned in the catalogue or specification sheets.

SAFETY VENT

The safety vent needs some free space to open properly. Allow for free headroom of at least 2mm for diameter ≤16mm, more than 3mm for diameter 18-35mm, more than 5mm for case diameter 40mm and larger.

EMERGENCY ACTIONS

When the pressure relief vent is open and some gas blows out from the capacitor, please turn the main switch of the equipment off or pull out the plug from the power outlet immediately. During safety vent operation, extremely hot gas (>100°C) may blow out of the capacitors. Do not stand close to the capacitors. In case of eye contact, rinse the open eye(s) with clean water immediately. In case of ingestion, gargle with water immediately, do not swallow. Do not touch electrolyte but wash skin with soap and water in case of skin contact.

DEFINITION OF ELECTRICAL PARAMETERS

Separate documents as application notes, equivalent circuit diagrams and so on are available on request.

PACKAGING

Please refer to the data book for details. Further information is available on request.

DISPOSAL

Scrapped capacitors are classified as scrapped metal. For disposal they are handled as controllable industrial waste because of the nature of the contents (electrolyte). Most of the material is aluminum and cannot be completely burned.

Jianghai Europe Electronic Components GmbH

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