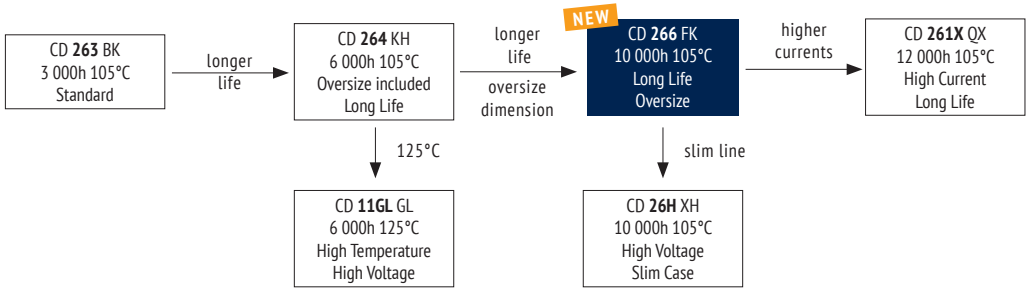
ALUMINUM ELECTROLYTIC CAPACITORS · RADIAL TYPE

CD **266** FK SERIES

10 000 at 105°C

- Professional Industry
- High Voltage up to 500V
- Oversize Dimensions
- Longer Life



ITEM	CHARACTERISTICS	
Operating Temperature Range (°C)	-40 ~ +105	-25 ~ +105
Voltage Range (V)	160 ~ 250	350 ~ 500
Capacitance Range (µF)	1 ~ 220	
Capacitance Tolerance (20°C, 120Hz)	± 20%	
Leakage Current (µA)	After 1 minute at 20°C application of rated voltage, leakage current is not more than specified in table.	

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

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

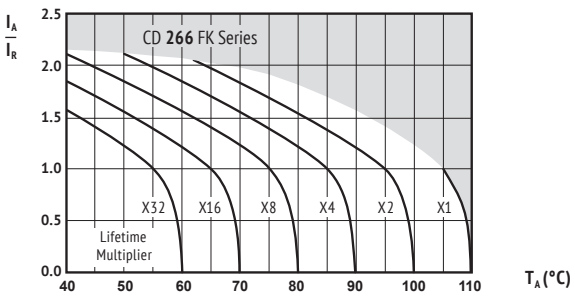
ITEM	USEFUL LIFE		LOAD LIFE	ENDURANCE TEST	SHELF LIFE	
Lifetime	Ø 10 : 8 000h Ø ⩾ 12,5 : 10 000h	Ø ⩾ 10 : 70 000h	Ø 10 : 4 000h Ø ⩾ 12,5 : 5 000h	Ø 10 : 6 000h Ø ⩾ 12,5 : 7 000h	1 000h	
Leakage Current	Not more than specified value		Not more than specified value	Not more than specified value	Not more 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 200% 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 60°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)

Frequency		50/60Hz	120Hz	1kHz	10kHz	50kHz	100kHz
Coefficient	1,0 ~ 10µF	0,8	1	1,75	2,0	2,4	2,5
	22 ~ 47µF	0,8	1	1,6	1,8	1,9	2,0
	56 ~ 220µF	0,8	1	1,3	1,4	1,55	1,6

Multipliers for typical operating conditions.

MULTIPLIER FOR LIFETIME (LIFETIME DIAGRAM)



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

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)	ESR_{TYP} Equivalent Series Resistance 20°C 120Hz (Ω)	tanδ Dissipation Factor 20°C 120Hz	I_{leak} Leakage Current (mA)	I_{RAC} Rated Ripple Current 105°C 120Hz (mArms)	Size øD x L (mm)	ORDER CODE ◊◊ = pin style & length ΔΔ = pitch code Details: Page 4
160 (200) 2C	10	15,9	7,0	0,12	0,118	95	10x12,5	ECR2CFK100M◊◊501012
	22	7,2	3,5	0,12	0,176	145	10x16	ECR2CFK220M◊◊501016
	33	4,8	2,2	0,12	0,228	190	10x20	ECR2CFK330M◊◊501020
	47	3,4	1,5	0,12	0,296	280	12,5x20	ECR2CFK470M◊◊501220
	100	1,6	0,7	0,12	0,550	380	16x25,5	ECR2CFK101M◊◊751625
		1,6	0,7	0,12	0,550	380	18x20	ECR2CFK101M◊◊751820
	220	0,7	0,3	0,12	1,126	630	16x35,5	ECR2CFK221M◊◊751635
200 (250) 2D	4,7	33,9	14,0	0,12	0,096	60	10x12,5	ECR2DFK4R7M◊◊501012
	10	15,9	7,0	0,12	0,130	95	10x16	ECR2DFK100M◊◊501016
	22	7,2	3,5	0,12	0,202	145	10x20	ECR2DFK220M◊◊501020
	33	4,8	2,2	0,12	0,268	190	12,5x20	ECR2DFK330M◊◊501220
	47	3,4	1,5	0,12	0,352	280	12,5x25	ECR2DFK470M◊◊501225
		3,4	1,5	0,12	0,352	280	16x20	ECR2DFK470M◊◊751620
	100	1,6	0,7	0,12	0,670	410	16x25,5	ECR2DFK101M◊◊751625
		1,6	0,7	0,12	0,670	410	18x20	ECR2DFK101M◊◊751820
250 (300) 2E	4,7	33,9	14,0	0,12	0,105	60	10x12,5	ECR2EFK4R7M◊◊501012
	10	15,9	7,0	0,12	0,145	105	10x16	ECR2EFK100M◊◊501016
	22	7,2	3,5	0,12	0,235	180	12,5x20	ECR2EFK220M◊◊501220
	33	4,8	2,2	0,12	0,318	250	12,5x25	ECR2EFK330M◊◊501225
		4,8	2,2	0,12	0,318	250	16x20	ECR2EFK330M◊◊751620
	47	3,4	1,5	0,12	0,423	300	16x25,5	ECR2EFK470M◊◊751625
		3,4	1,5	0,12	0,423	300	18x20	ECR2EFK470M◊◊751820
	100	1,6	0,7	0,12	0,820	410	16x31,5	ECR2EFK101M◊◊751631
		1,6	0,7	0,12	0,820	410	18x25,5	ECR2EFK101M◊◊751825
	150	1,1	0,5	0,12	1,195	500	18x25,5	ECR2EFK151M◊◊751825
	220	0,7	0,3	0,12	1,720	700	18x36	ECR2EFK221M◊◊751836
350 (400) 2V	4,7	42,3	19,0	0,15	0,119	65	10x16	ECR2VFK4R7M◊◊501016
	10	19,9	10,0	0,15	0,175	120	10x20	ECR2VFK100M◊◊501020
	22	9,0	4,0	0,15	0,301	180	12,5x20	ECR2VFK220M◊◊501220
	33	6,0	2,5	0,15	0,417	210	12,5x25	ECR2VFK330M◊◊501225
	47	4,2	1,8	0,15	0,564	300	16x25,5	ECR2VFK470M◊◊751625
		4,2	1,8	0,15	0,564	300	18x20	ECR2VFK470M◊◊751820
	100	2,0	0,8	0,15	1,120	528	18x31,5	ECR2VFK101M◊◊751831
400 (450) 2G	2,2	90,5	40,0	0,15	0,093	40	10x12,5	ECR2GFK2R2M◊◊501012
	3,3	60,3	28,0	0,15	0,110	50	10x16	ECR2GFK3R3M◊◊501016
	4,7	42,3	19,0	0,15	0,126	70	10x20	ECR2GFK4R7M◊◊501020
	10	19,9	10,0	0,15	0,190	120	12,5x20	ECR2GFK100M◊◊501220
	22	9,0	4,0	0,15	0,334	200	12,5x25	ECR2GFK220M◊◊501225
	33	6,0	2,5	0,15	0,466	245	16x25,5	ECR2GFK330M◊◊751625
		6,0	2,5	0,15	0,466	245	18x20	ECR2GFK330M◊◊751820
	47	4,2	1,8	0,15	0,634	380	16x31,5	ECR2GFK470M◊◊751631
		4,2	1,8	0,15	0,634	380	18x25,5	ECR2GFK470M◊◊751825
	68	2,9	1,2	0,15	0,886	500	18x25,5	ECR2GFK680M◊◊751825
	82	2,4	1,0	0,15	1,054	610	18x31,5	ECR2GFK820M◊◊751831
	100	2,0	0,8	0,15	1,270	700	18x36	ECR2GFK101M◊◊751836
	120	1,7	0,6	0,15	1,510	785	18x40	ECR2GFK121M◊◊751840
	150	1,3	0,5	0,15	1,870	840	20x41	ECR2GFK151M◊◊ΔΔ2041
450 (500) 2W	1	266	80,0	0,20	0,067	30	10x12,5	ECR2WFK010M◊◊501012
	2,2	121	40,0	0,20	0,099	45	10x16	ECR2WFK2R2M◊◊501016
	3,3	80,4	24,0	0,20	0,115	65	10x20	ECR2WFK3R3M◊◊501020
	4,7	56,5	17,0	0,20	0,133	80	12,5x20	ECR2WFK4R7M◊◊501220
	10	26,5	8,0	0,20	0,205	140	12,5x25	ECR2WFK100M◊◊501225
	22	12,1	3,5	0,20	0,367	220	16x25,5	ECR2WFK220M◊◊751625
	33	8,0	2,5	0,20	0,516	280	16x31,5	ECR2WFK330M◊◊751631
	47	5,6	2,0	0,20	0,705	420	16x31,5	ECR2WFK470M◊◊751631
	56	4,7	1,7	0,20	0,826	470	18x25,5	ECR2WFK560M◊◊751825
	68	3,9	1,4	0,20	0,988	610	18x31,5	ECR2WFK680M◊◊751831
	82	3,2	1,1	0,20	1,177	680	18x31,5	ECR2WFK820M◊◊751831
	100	2,7	0,9	0,20	1,420	800	18x36	ECR2WFK101M◊◊751836
	120	2,2	0,8	0,20	1,690	875	18x40	ECR2WFK121M◊◊751840
	150	1,8	0,6	0,20	2,095	935	20x41	ECR2WFK151M◊◊ΔΔ2041
	180	1,5	0,5	0,20	2,500	1100	22x41	ECR2WFK181M◊◊102241
	220	1,2	0,4	0,20	3,010	1200	22x45	ECR2WFK221M◊◊102245

U_{RDC} (Surge Voltage) Code (V)	C_R Rated Capacitance (µF)	ESR_{MAX} Equivalent Series Resistance 20°C 120Hz (Ω)	ESR_{TYP} Equivalent Series Resistance 20°C 120Hz (Ω)	tanδ Dissipation Factor 20°C 120Hz	I_{leak} Leakage Current (mA)	I_{RAC} Rated Ripple Current 105°C 120Hz (mArms)	Size øD x L (mm)	ORDER CODE ◊◊ = pin style & length ΔΔ = pitch code Details: Page 4
500 (550) 2H	1	265	106	0,20	0,070	32	10x12,5	ECR2HFK010M◊◊501012
	2,2	121	48,0	0,20	0,103	49	10x16	ECR2HFK2R2M◊◊501016
	3,3	80,4	32,0	0,20	0,120	68	10x20	ECR2HFK3R3M◊◊501020
	4,7	56,5	22,6	0,20	0,141	84	12,5x20	ECR2HFK4R7M◊◊501220
	10	26,5	10,6	0,20	0,220	145	12,5x25	ECR2HFK100M◊◊501225
	22	12,1	4,8	0,20	0,400	230	16x25,5	ECR2HFK220M◊◊751625
	33	8,0	3,2	0,20	0,565	295	16x31,5	ECR2HFK330M◊◊751631
	47	5,6	2,3	0,20	0,775	415	18x31,5	ECR2HFK470M◊◊751831
	56	4,7	1,9	0,20	0,910	470	18x31,5	ECR2HFK560M◊◊751831
	68	3,9	1,6	0,20	1,090	620	18x36	ECR2HFK680M◊◊751836
	82	3,2	1,3	0,20	1,300	680	18x36	ECR2HFK820M◊◊751836
	100	2,7	1,1	0,20	1,570	860	18x46	ECR2HFK101M◊◊751846
		2,7	1,1	0,20	1,570	860	20x41	ECR2HFK101M◊◊ΔΔ2041
	120	2,2	0,9	0,20	1,870	900	22x45	ECR2HFK121M◊◊102245
	150	1,8	0,7	0,20	2,320	980	22x45	ECR2HFK151M◊◊102245

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

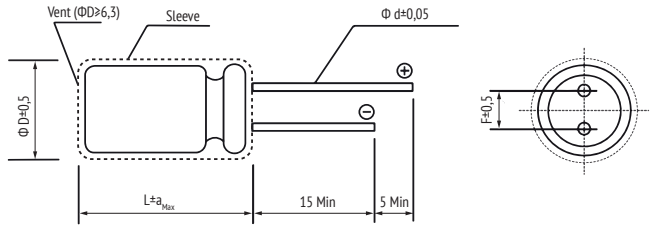
Techno-logy	Terminal Type		Rated Voltage Code		Series Code		Capacitance Code		Capacitance Tolerance		Terminal Style		Terminal / Pitch		Dimension (mm)		Material Code		Rubber Type	
EC Electrolytric Capacitor	Radial	R	6,3V	0J	CD 110	PT	0,1	0R1	**±20%**	M	Taped	FF	2,0mm	20	4x7	0407	Standard	-	Standard	-
			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 261L	DE	1,0	010	+30 / -10%	Q	Cut 5,0mm	CB	3,5mm	35	10x20	1020	PET	E	Stand-Off	S
			20V	1D	CD 261X	QX	2,2	2R2	+20 / -0%	R	Cut 4,5mm	CC	5,0mm	50	12,5x25	1225				
			25V	1E	CD 263	BK	100	101	±15%	L	Cut 4,0mm	CD	7,5mm	75						
			35V	1V	CD 264	KH	1 000	102	+20 / -10%	V	Cut 3,5mm	CE	10,0mm	10						
			40V	1G	CD 266	FK	10 000	103	■ = preferred		Cut 3,0mm	CF	12,5mm	12						
			50V	1H	CD 26H	XH														
			63V	1J	CD 26HS	XS														
			80V	1K	CD 269L	HL														
			100V	2A	CD 281	LL														
			125V	2B	CD 281L	LH														
			160V	2C	CD 282L	YL														
			180V	2K	CD 282X	EQ														
			200V	2D	CD 284	XY														
			250V	2E	CD 284L	LY														
			350V	2V	CD 285	HY														
			385V	2J	CD 287	GC														
			400V	2G	CD 28L	QL														
			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		

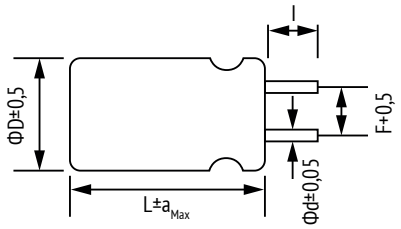
For diameter 20 pitch 7,5 or 10.

in mm

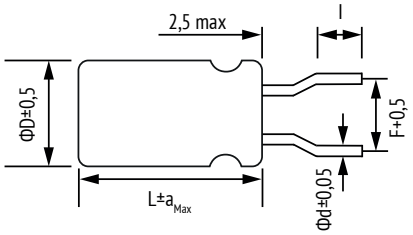
DIMENSIONS FOR LOOSE, SHORT CUT LEADS (BULK)

· ORDER CODE: CC (CB, CD, CE, CF)

STRAIGHT LEAD



BENDED LEAD



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

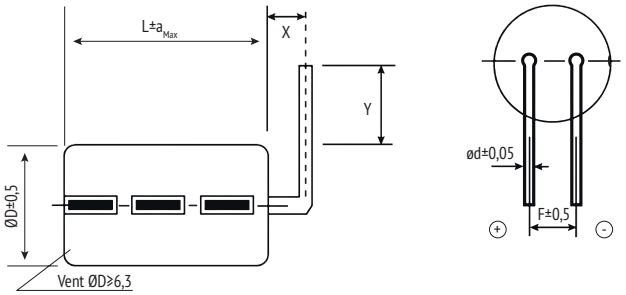
= preferred

in mm

EXAMPLE OF ALTERNATIVE BENDINGS

· ORDER CODE: WS

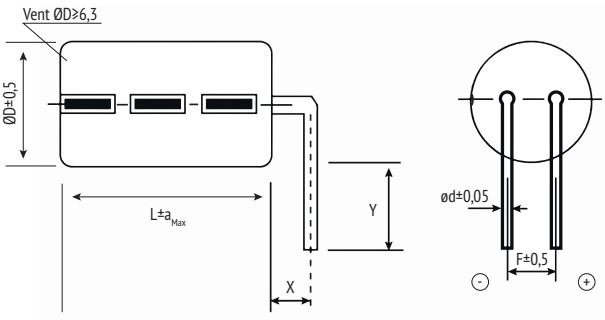
90° LEADS UP
Diameter ≥ 10mm



X: 3,0±0,5
Y: 3,7±0,3

· ORDER CODE: WX

90° LEADS DOWN
Diameter ≥ 10mm



X: 3,0±0,5
Y: 3,7±0,3

DIMENSIONS FOR AMMOPACK TAPING FOR ELECTROLYTIC CAPACITORS

· ORDER CODE: FF (FD)

Fig 1

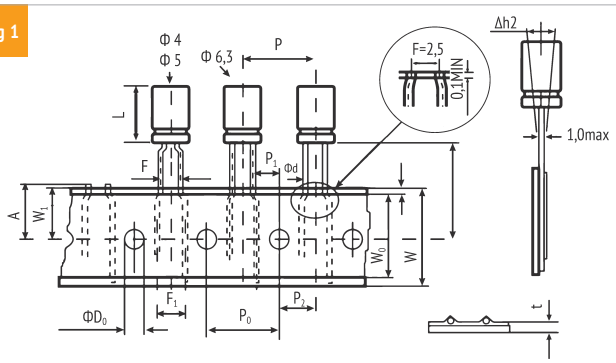


Fig 2

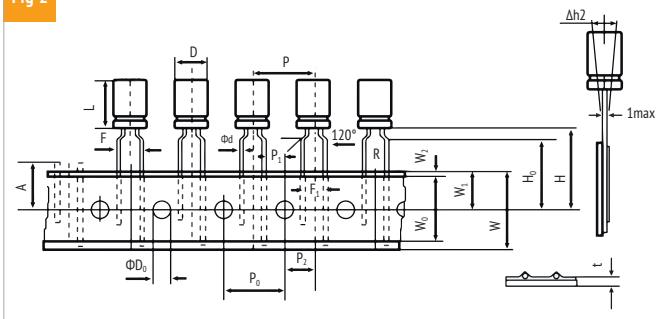


Fig 3a

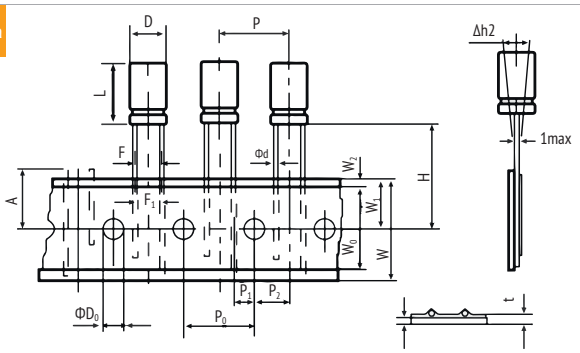


Fig 3b

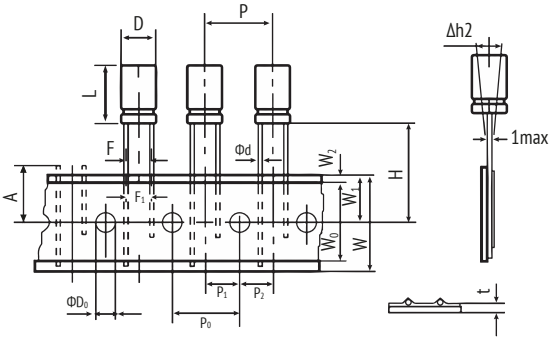
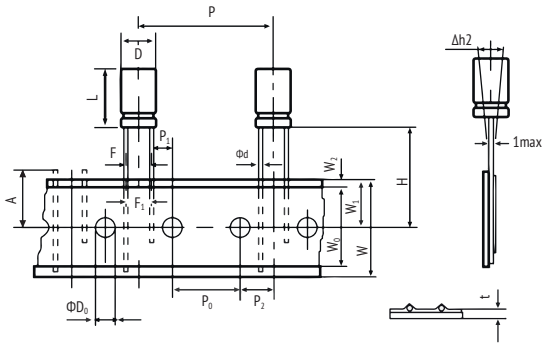


Fig 4



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

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. Never exceed a ripple voltage of $70V_{peak\text{-}peak}$ without additional approval of Jianghai.

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.

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 SMT 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. 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.

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
VERSION 9/2024

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 10K rule of Arrhenius. It is possible to estimate the Lifetime by rule of thumb: When the operational temperature is reduced by 10K, the Lifetime will double. The formula for $\mathbf{K_T}$ in detail is:

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

WHERE:

- T_0 Rated Temperature
- T_A Ambient Temperature

FREQUENCY CORRECTION FACTORS:

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

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

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 ~ 5K 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.

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K_V VOLTAGE FACTOR

For Radial and SMT 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 and SMT Capacitors or $U_R \leqslant 160V$

$$K_V = 1$$

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

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

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

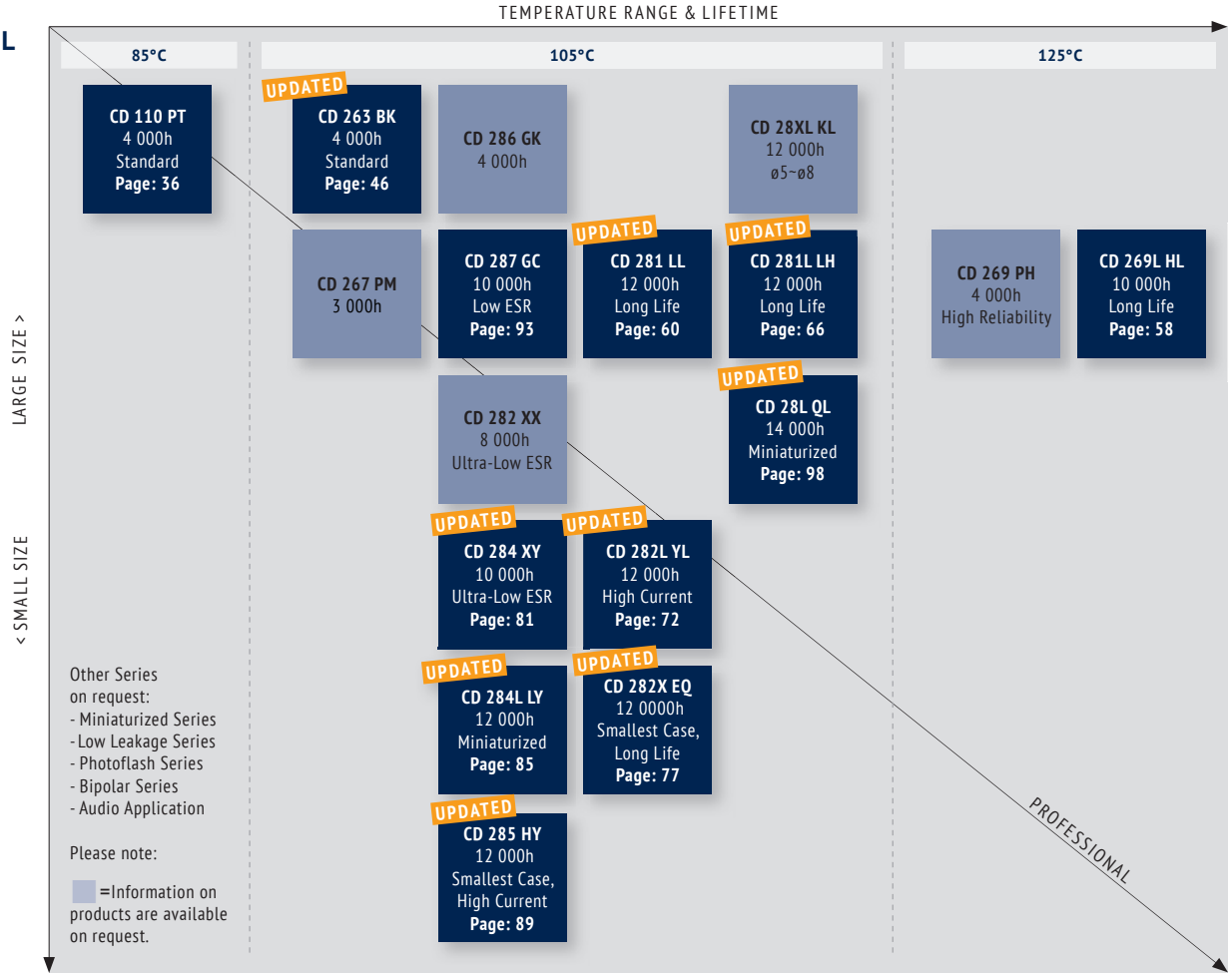
$$0 < \frac{U_A}{U_R} < 0{,}6 \rightarrow K_V = \left(\frac{U_A}{U_R}\right)^{-n} = 3{,}59$$

For $U_R \leqslant 160V$, Radial and SMT

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

OUR RADIALS IN RELATION TO ONE ANOTHER

RADIAL 6,3V ~ 100V



RADIAL 160V ~ 550V

