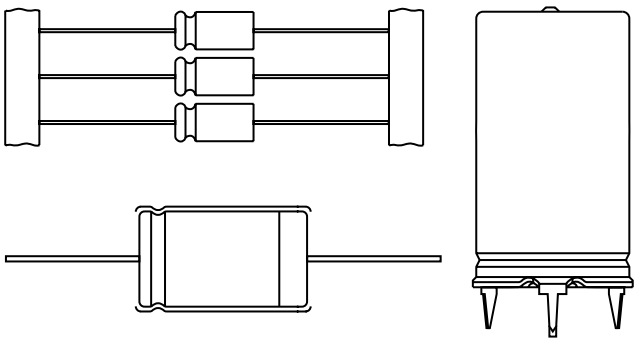
Aluminum Capacitors
Axial and Mounting Ring Capacitors Style



Component outlines

Obsolete - please refer to: www.vishay.com/doc?28334

FEATURES

- Polarized aluminum electrolytic capacitors
- High ripple current capability
- Very long lifetime
- Charge/discharge proof
- Extended temperature range: 125 °C
- Mounting Ring available
- Compliant to RoHS directive 2002/95/EC

Pb-free
RoHS COMPLIANT

APPLICATIONS

- Industrial and automotive electronics, telecommunication, power supply units
- Coupling, smoothing, filtering, buffering and timing

QUICK REFERENCE DATA

DESCRIPTION	UNIT	LOW VOLTAGE		HIGH VOLTAGE	
Nominal case size (Ø D x L)	mm	6.5 x 18 to 10 x 25	12 x 30 to 21 x 40	6.5 x 18 to 10 x 25	12 x 30 to 21 x 40
Rated capacitance range C_R	µF	1 to 1500	68 to 10 000	4.7 to 10	22 to 100
Capacitance tolerance	%	± 20			
Rated voltage range	V	6.3 to 100		200	
Category temperature range	°C	- 40 to 125	- 55 to 125	- 40 to 125	- 55 to 125
Endurance test at 125 °C	h	2000	3000	2000	3000
Useful life at 125 °C and I_R applied	h	4000	8000	4000	8000
Useful life at 85 °C and I_R applied	h	11 000	18 000	11 000	14 000
Useful life at 40 °C, 1.8 x I_R applied	h	500 000	1 000 000	500 000	1 000 000
Shelf Life (0 V, 125 °C)	h	100			
Failure rate (0.8 U_R, 40 °C)	10^{-9}/h	≤ 14	≤ 8	≤ 14	≤ 10
Based on sectional specification		IEC 60384-4, EN130300			
Endurance test at 150 °C	h	500		-	
Climatic category IEC 60068		40/125/56			

SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)

C_R (µF)	U_R (V)							
	6.3	10	16	25	40	63	100	200
1.0	→	→	→	→	→	6.5 x 18	-	-
2.2	→	→	→	→	→	6.5 x 18	-	-
4.7	→	→	→	→	→	6.5 x 18	6.5 x 18	8 x 18
10	→	→	→	→	→	6.5 x 18	6.5 x 18	10 x 25
22	→	→	EBL		→	6.5 x 18	8 x 18	12 x 30
33	→	→			→	6.5 x 18	10 x 25	15 x 30
47	→	→	→	→	6.5 x 18	8 x 18	10 x 25	18 x 30
68	→	→	→	→	8 x 18	10 x 18	12 x 30	18 x 38
100	→	→	→	6.5 x 18	8 x 18	10 x 25	12 x 30	21 x 38
150	→	→	6.5 x 18	8 x 18	10 x 18	12 x 30	15 x 30	-
220	→	6.5 x 18	8 x 18	10 x 18	10 x 25	12 x 30	18 x 30	-
330	→	8 x 18	10 x 18	10 x 25	12 x 30	15 x 30	18 x 38	-
470	→	8 x 18	10 x 18	10 x 25	12 x 30	18 x 30	21 x 38	-

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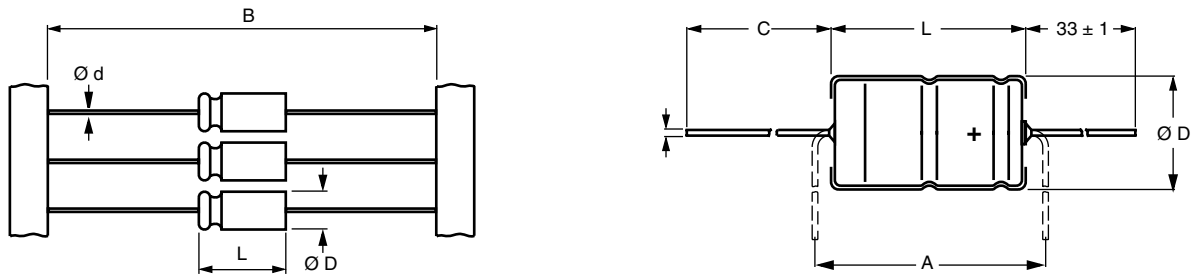
SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)

C_R (µF)	U_R (V)							
	6.3	10	16	25	40	63	100	200
680	→	10 x 18	10 x 25	12 x 30	15 x 30	18 x 38	-	-
1000	10 x 18	10 x 25	12 x 30	12 x 30	18 x 30	21 x 38	-	-
1500	10 x 25	12 x 30	12 x 30	15 x 30	18 x 38	-	-	-
2200	→	12 x 30	15 x 30	18 x 30	21 x 38	-	-	-
3300	→	15 x 30	18 x 30	18 x 38	-	EGL		-
4700	→	18 x 30	18 x 38	21 x 38	-			-
4800	→	18 x 38	21 x 38	-	-	-	-	-
10 000	→	21 x 38	-	-	-	-	-	-

DIMENSIONS in millimeters AND AVAILABLE FORMS



AXIAL STYLE: DIMENSIONS in millimeters, MASS, PACKAGING QUANTITIES AND ORDERING CODE

NOMINAL CASE SIZE Ø D x L	Ø d	C	Ø $D_{max.}$	$L_{max.}$	$A_{min.}$	B	MASS APPROX. (g)	PACKAGING, ENDING OF ORDERING CODE, QUANTITIES					
								BULK IN BOX		TAPED ON REEL		TAPED AMMO	
								CODE	PCS.	CODE	PCS.	CODE	PCS.
6.5 x 18	0.8	-	6.9	18.5	25	73.0 ± 1.6	1.3	-		..A0W	1000	..B0W	1000
8 x 18	0.8	-	8.5	18.5	25	73.0 ± 1.6	1.7	-		..A0W	500	..B0W	500
10 x 18	0.8	-	10.5	18.5	25	73.0 ± 1.6	25	-		..A0W	500	..B0W	500
10 x 25	0.8	-	10.5	25.0	30	73.0 ± 1.6	3.3	-		..A0W	500	..B0W	500
12 x 30	0.8	55	12.5	30.5	35	73.0 ± 1.6	6	..00W	260	..A0W	400	n.a	
15 x 30	0.8	55	15.5	30.5	35	73.0 ± 1.6	8	..00W	300	..A0W	250	n.a	
18 x 30	0.8	55	18.5	30.5	35	73.0 ± 1.6	10	..00W	200	..A0W	200	n.a	
18 x 38	0.8	34	18.5	40.0	45	-	15	..00W	120	n.a		n.a	
21 x 38	0.8	34	21.5	40.0	45	-	21	..00W	100	n.a		n.a	

Axial style capacitors are insulated.

For technical questions, contact: aluminumcaps1@vishay.com

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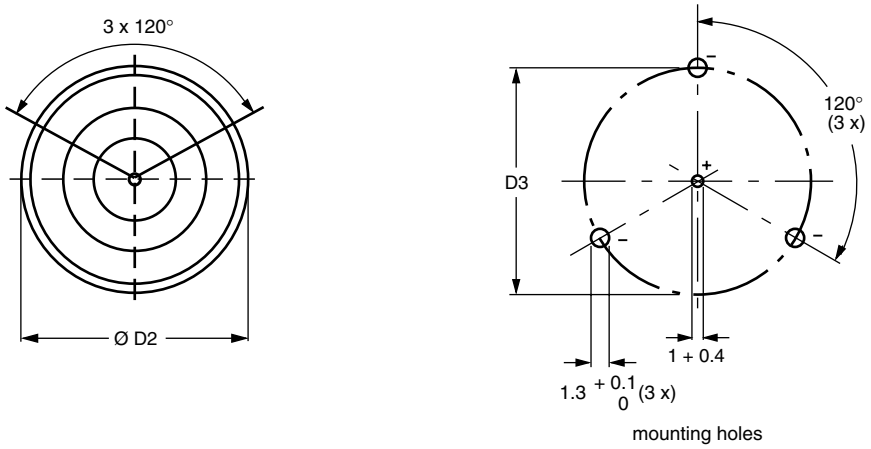
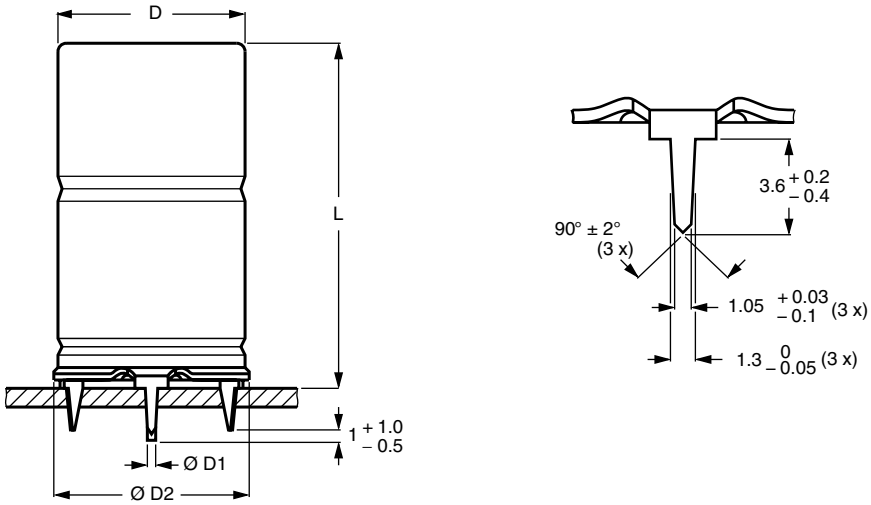
MOUNTING RING STYLE: DIMENSIONS in millimeters, MASS, PACKAGING QUANTITIES AND ORDERING CODE										
NOMINAL CASE SIZE Ø D x L	Ø D1	Ø $D2_{max.}$	Ø D3 ± 0.2	$L_{max.}$	MASS APPROX. (g)	STARTING OF ORDERING CODE	ENDING OF ORDERING CODE			PACKAGING QUANTITY pcs.
							KIND OF INSULATION			
							NO	SLEEVE	FULL	
15 x 30	0.8	17.5	16.5	33	10	MALAEGL03..	..00W	**..01W**	**..02W**	200
18 x 30	0.8	19.5	18.5	33	12	MALAEGL03..	..00W	**..01W**	**..02W**	240
18 x 38	0.8	19.5	18.5	41	17	MALAEGL03..	..00W	**..01W**	**..02W**	100
21 x 38	0.8	22.5	25.0	41	24	MALAEGL03..	..00W	**..01W**	**..02W**	100





MALAEGL03...
Cases of mounting ring style capacitors are not insulated.
Insulation on request.

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ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	rated capacitance at 100 Hz
U_R	rated voltage
tan δ	max. dissipation factor at 100 Hz
R_{ESR}	equivalent series resistance at 100 Hz, (calculated from tan $\delta_{max.}$ and C_R)
Z	impedance at 10 kHz
I_R	rated alternating current (RMS) at 100 Hz and upper category temperature
T_{amb}	ambient temperature
T_{UC}	upper category temperature, 125 °C
RH	relative humidity
P	ambient pressure

Note

Unless otherwise specified, all electrical values apply at T_{amb} = 20 °C, P = kPa 86 to 106 kPa, RH = 45 % to 75 %.

ORDERING EXAMPLE

The following table gives the ordering number for standard version = axial leads, in bulk.

The 9th place of ordering code refers to termination style:

MALAEGL0<u>0</u>... <u>0</u> = axial leads
MALAEGL0<u>3</u>... <u>3</u> = mounting ring

The 16th place of ordering code refers to packaging for axial lead capacitors:

MALAEBL00GD310J... EBL 100 µF 63 V 10 x 25
MALAEBL00GD310J<u>0</u>0W <u>0</u> = in bulk (box)
MALAEBL00GD310J<u>A</u>0W <u>A</u> = taped on reel
MALAEBL00GD310J<u>B</u>0W <u>B</u> = taped ammo

Please see tables “Axial Styles” and “Mounting Ring Styles” for available versions.

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 100 Hz (µF)	NOMINAL CASE SIZE Ø D x L (mm)	tan δ 100 Hz MAX.	R_{ESR} 100 Hz (Ω)	Z 10 kHz MAX. (Ω)	I_R 100 Hz T_{UC}, 125 °C (mA)	CATALOG NUMBER MALA...
6.3	1000	10 x 18	0.50	0.79	0.80	251	EBL00GL410B00W
	1500	10 x 25	0.50	0.53	0.53	352	EBL00GD415B00W
10	220	6.5 x 18	0.35	2.53	2.10	109	EBL00DL322C00W
	330	8 x 18	0.35	1.69	1.40	150	EBL00FL333C00W
	470	8 x 18	0.35	1.19	1.00	179	EBL00FL347C00W
	680	10 x 18	0.35	0.82	0.80	240	EBL00GL368C00W
	1000	10 x 25	0.35	0.56	0.55	343	EBL00GD410C00W
	1500	12 x 30	0.32	0.34	0.28	740	EBL00HE415C00W
	2200	12 x 30	0.40	0.29	0.27	830	EBL00HE422C00W
	3300	15 x 30	0.40	0.19	0.18	1070	EGL00KE433C00W
	4700	18 x 30	0.46	0.155	0.15	1350	EGL00LE447C00W
	6800	18 x 38	0.53	0.100	0.10	1730	EGL00LG468C00W
	10 000	21 x 38	0.53	0.084	0.10	1860	EGL00MG510C00W
16	150	6.5 x 18	0.25	2.65	2.20	100	EBL00DL315D00W
	220	8 x 18	0.25	1.81	1.50	145	EBL00FL322D00W
	330	10 x 18	0.25	1.21	1.20	204	EBL00GL333D00W
	470	10 x 18	0.25	0.85	0.83	243	EBL00GL347D00W
	680	10 x 25	0.22	0.525	0.45	510	EBL00GD368D00W
	1000	12 x 30	0.22	0.345	0.28	720	EBL00HE410D00W
	1500	12 x 30	0.29	0.305	0.27	790	EBL00HE415D00W
	2200	15 x 30	0.29	0.205	0.18	1010	EGL00KE422D00W
	3300	18 x 30	0.34	0.165	0.15	1300	EGL00LE433D00W
	4700	18 x 38	0.34	0.105	0.10	1670	EGL00LG447D00W
	6800	21 x 38	0.38	0.088	0.10	1790	EGL00MG468D00W

ELECTRICAL DATA AND ORDERING INFORMATION

U_R (V)	C_R 100 Hz (µF)	NOMINAL CASE SIZE Ø D x L (mm)	tan δ 100 Hz MAX.	R_{ESR} 100 Hz (Ω)	Z 10 kHz MAX. (Ω)	I_R 100 Hz T_{UC}, 125 °C (mA)	CATALOG NUMBER MALA...
25	100	6.5 x 18	0.18	2.86	2.30	102	EBL00DL310E00W
	150	8 x 18	0.18	1.91	1.84	145	EBL00FL315E00W
	220	10 x 18	0.18	1.30	1.25	196	EBL00GL322E00W
	330	10 x 25	0.18	0.87	0.82	274	EBL00GD333E00W
	470	10 x 25	0.18	0.61	0.57	327	EBL00GD347E00W
	680	12 x 30	0.18	0.42	0.30	680	EBL00HE368E00W
	1000	12 x 30	0.24	0.375	0.28	760	EBL00HE410E00W
	1500	15 x 30	0.25	0.263	0.22	980	EGL00KE415E00W
	2200	18 x 30	0.26	0.185	0.17	1240	EGL00LE422E00W
	3300	18 x 38	0.26	0.120	0.11	1610	EGL00LG433E00W
	4700	21 x 38	0.28	0.095	0.10	1710	EGL00MG447E00W
40	47	6.5 x 18	0.11	3.72	2.80	90	EBL00DL247G00W
	68	8 x 18	0.11	2.58	1.92	110	EBL00FL268G00W
	100	8 x 18	0.11	1.75	1.30	147	EBL00FL310G00W
	150	10 x 18	0.11	1.17	1.00	207	EBL00GL315G00W
	220	10 x 25	0.11	0.80	0.68	287	EBL00GD322G00W
	330	12 x 30	0.11	0.53	0.33	570	EBL00HE333G00W
	470	12 x 30	0.11	0.38	0.30	620	EBL00HE347G00W
	680	15 x 30	0.11	0.255	0.23	810	EGL00KE368G00W
	1000	18 x 30	0.13	0.205	0.18	1070	EGL00LE410G00W
	1500	18 x 38	0.13	0.130	0.11	1390	EGL00LG415G00W
	2200	21 x 38	0.15	0.105	0.10	1540	EGL00MG422G00W
63	1.0	6.5 x 18	0.07	110	22	16.4	EBL00DL110J00W
	2.2	6.5 x 18	0.07	51	15	24.3	EBL00DL122J00W
	4.7	6.5 x 18	0.07	24	8.9	35.6	EBL00DL147J00W
	10	6.5 x 18	0.07	11	5.6	51.9	EBL00DL210J00W
	22	6.5 x 18	0.07	5.1	3.2	77	EBL00DL222J00W
	33	6.5 x 18	0.07	2.4	2.2	95	EBL00DL233J00W
	47	8 x 18	0.07	1.1	1.5	126	EBL00FL247J00W
	68	10 x 18	0.07	1.64	1.1	185	EBL00GL268J00W
	100	10 x 25	0.07	1.91	0.7	243	EBL00GD310J00W
	150	12 x 30	0.07	1.00	0.79	490	EBL00HE315J00W
	220	12 x 30	0.08	0.94	0.82	550	EBL00HE322J00W
	330	15 x 30	0.09	0.63	0.56	730	EGL00KE333J00W
	470	18 x 30	0.09	0.44	0.39	970	EGL00LE347J00W
	680	18 x 38	0.09	0.30	0.26	1230	EGL00LG368J00W
	1000	21 x 38	0.10	0.16	0.20	1400	EGL00MG410J00W
100	4.7	6.5 x 18	0.07	24	19	36	EBL00DL147L00W
	10	6.5 x 18	0.07	11	9.0	52	EBL00DL210L00W
	22	8 x 18	0.07	5.1	4.0	91	EBL00FL222L00W
	33	10 x 25	0.07	3.4	2.7	140	EBL00GD233L00W
	47	10 x 25	0.07	2.6	2.0	170	EBL00GD247L00W
	68	12 x 30	0.08	1.8	1.2	320	EBL00HE268L00W
	100	12 x 30	0.09	1.4	1.15	380	EBL00HE310L00W
	150	15 x 30	0.10	0.94	0.78	500	EGL00KE315L00W
	220	18 x 30	0.10	0.66	0.55	690	EGL00LE322L00W
	330	18 x 38	0.10	0.45	0.37	890	EGL00LG333L00W
	470	21 x 38	0.10	0.33	0.28	1050	EGL00MG347L00W
200	4.7	8 x 18	0.06	21	11	46	EBL00FL147S00W
	10	10 x 25	0.06	9.4	5.0	85	EBL00GD210S00W
	22	12 x 30	0.05	3.62	2.22	210	EBL00HE222S00W
	33	15 x 30	0.05	2.42	1.11	290	EGL00KE233S00W
	47	18 x 30	0.05	1.69	0.60	390	EGL00LE247S00W
	68	18 x 38	0.05	1.17	0.42	500	EGL00LG268S00W
	100	21 x 38	0.05	0.80	0.30	610	EGL00MG310S00W

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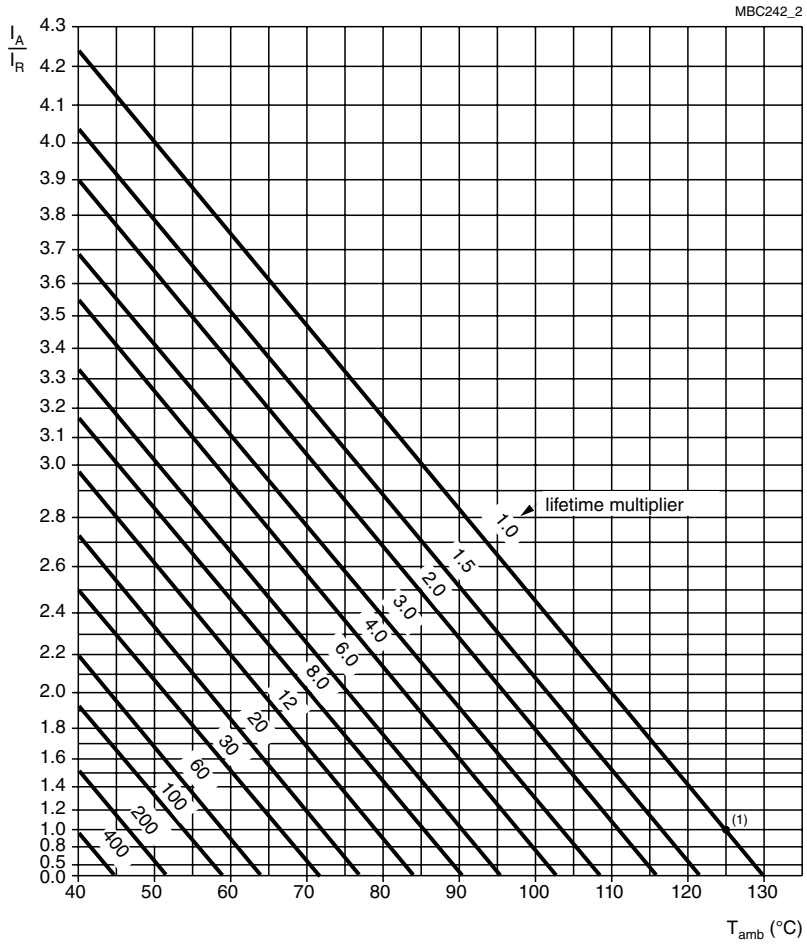
ADDITIONAL ELECTRICAL DATA

PARAMETER	CONDITIONS	VALUE	
		AXIAL	MOUNTING RING
Voltage			
Surge voltage		$U_s \leq 1.15 \times U_R$	
Reverse voltage		$U_{rev} \leq 1$ V	
Current			
Leakage current	After 1 minute at U_R	$I_{L1} \leq 0.006\ C_R \times U_R + 4\ \mu A$ or 20 µA (whichever is greater)	
	After 5 minutes at U_R	$I_{L5} \leq 0.002\ C_R \times U_R + 4\ \mu A$	
Inductance			
Equivalent series inductance (ESL)	Case Ø D x L mm:		
	6.5 x 18	typ. 15 nH	-
	8 x 18	typ. 35 nH	-
	10 x 18	typ. 69 nH	-
	10 x 25	typ. 38 nH	-
	10 x 30	typ. 38 nH	-
	12.5 x 30	typ. 46 nH	-
	15 x 30	typ. 48 nH	typ. 39 nH
	18 x 30	typ. 50 nH	typ. 39 nH
	18 x 38	typ. 54 nH	typ. 39 nH
	21 x 38	typ. 59 nH	typ. 39 nH



I_A = actual ripple current at 100 Hz.
I_R = rated ripple current at 100 Hz, 125 °C

(1) Useful life at 125 °C and I_R applied:
Case Ø D x L = 6.5 x 18 to 10 x 25 mm: 4000 hours
Case Ø D x L = 10 x 30 to 21 x 40 mm: 8000 hours

Multiplier of useful life as a function of ambient temperature and ripple current load

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY			
FREQUENCY (Hz)	I_R MULTIPLIER		
	U_R = 6.3 to 25 V	U_R = 40 to 63 V	U_R = 100 to 200 V
50	0.95	0.90	0.85
100	1.00	1.00	1.00
300	1.07	1.12	1.20
1000	1.12	1.20	1.30
3000	1.15	1.25	1.35
≥ 10 000	1.20	1.30	1.40

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 60384-4/ EN130300 subclause 4.13	T_{amb} = 125 °C; U_R applied Case sizes: (6.5 x 18 to 10 x 25) mm: 2000 hours (10 x 30 to 21 x 38) mm: 3000 hours	$U_R \leq 6.3$ V; ΔC/C: + 15/- 30 % $U_R > 6.3$ V; ΔC/C: ± 15 % tan δ ≤ 1.3 x spec. limit Z ≤ 2 x spec. limit $I_{L5} \leq$ spec. limit
Useful life	CECC 30301 subclause 1.8.1	T_{amb} = 125 °C; U_R and I_R applied Case Ø D x L = (6.5 x 18 to 10 x 25) mm: 4000 hours Case Ø D x L = (10 x 30 to 21 x 38) mm: 8000 hours	$U_R \leq 6.3$ V; ΔC/C: + 45/- 50 % $U_R > 6.3$ V; ΔC/C: ± 45 % tan δ ≤ 3 x spec. limit Z ≤ 3 x spec. limit $I_{L5} \leq$ spec. limit No short or open circuit Total failure percentage: ≤ 1 % (200 V ≤ 3 %)
Shelf life (storage at high temperature)	IEC 60384-4/ EN130300 subclause 4.17	T_{amb} = 125 °C; no voltage applied U_R = 6.3 to 63 V: 500 hours U_R = 100 and 200 V: 100 hours After test: U_R to be applied for 30 minutes 24 hours to 48 hours before measurement	ΔC/C, tan δ, Z: For requirements see 'Endurance test' above $I_{L5} \leq 2$ x spec. limit
Reverse voltage	IEC 60384-4/ EN130300 subclause 4.15	T_{amb} = 125 °C: 125 hours at U = -1 V followed by 125 hours at U_R	ΔC/C: ± 20 % tan δ ≤ spec. limit $I_{L5} \leq$ spec. limit

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