



## Aluminum Capacitors Radial Style



### FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case
- High CV-product per unit volume
- Temperature range up to 105 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



RoHS  
COMPLIANT

### APPLICATIONS

- General purpose, industrial and audio-video
- Coupling, decoupling, timing, smoothing, filtering, buffering in SMPS
- Portable and mobile equipment

QUICK REFERENCE DATA			
DESCRIPTION	UNIT	VALUE	
Nominal case size (Ø D x L)	mm	5 x 11 to 8 x 11.5	10 x 12.5 to 18 x 40
Rated capacitance range C <sub>R</sub>	µF	2.2 to 22 000	
Capacitance tolerance	%	± 20	
Rated voltage range	V	6.3 to 100	160 to 350 400 to 450
Category temperature range	°C	-55 to +105	-40 to +105 -25 to +105
Load life	h	1000	2000
Based on sectional specification		IEC 60384-4 / EN 130300	
Climatic category IEC 60068		55 / 105 / 56	40 / 105 / 56 25 / 105 / 56

SELECTION CHART FOR C <sub>R</sub> , U <sub>R</sub> , AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)								
C <sub>R</sub> (µF)	RATED VOLTAGE (V) (> 100 V see next page)							
	6.3	10	16	25	35	50	63	100
2.2	→	→	→	→	→	→	5 x 11	5 x 11
3.3	→	→	→	→	→	→	5 x 11	5 x 11
4.7	→	→	→	→	→	→	5 x 11	5 x 11
6.8	→	→	→	→	→	→	5 x 11	5 x 11
10	→	→	→	→	→	→	5 x 11	5 x 11
15	→	→	→	→	→	→	5 x 11	6.3 x 11
22	→	→	→	→	→	→	5 x 11	6.3 x 11
33	→	→	→	→	→	5 x 11	6.3 x 11	8 x 11.5
47	→	→	→	→	5 x 11	→	6.3 x 11	10 x 12.5
68	→	→	→	5 x 11	6.3 x 11	→	8 x 11.5	10 x 16
100	→	→	5 x 11	→	6.3 x 11	→	8 x 11.5	10 x 20
150	→	5 x 11	→	6.3 x 11	8 x 11.5	→	10 x 12.5	12.5 x 20
220	→	5 x 11	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 16	12.5 x 25
330	→	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 16	10 x 20	16 x 25
470	→	6.3 x 11	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	16 x 25
680	8 x 11.5	→	10 x 12.5	10 x 16	12.5 x 16	12.5 x 20	12.5 x 25	16 x 31.5
1000	8 x 11.5	10 x 12.5	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 25	18 x 40
1500	→	10 x 16	12.5 x 16	12.5 x 20	16 x 20	16 x 25	16 x 35.5	-
2200	→	10 x 20	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	16 x 35.5	-
3300	12.5 x 16	12.5 x 20	12.5 x 25	16 x 25	16 x 35.5	16 x 35.5	18 x 40	-
4700	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	16 x 35.5	-	-	-
6800	12.5 x 25	16 x 25	16 x 31.5	18 x 35.5	-	-	-	-
10 000	16 x 25	16 x 35.5	18 x 35.5	-	-	-	-	-
15 000	16 x 35.5	18 x 35.5	-	-	-	-	-	-
22 000	18 x 40	-	-	-	-	-	-	-

SELECTION CHART FOR $C_R$ , $U_R$ AND RELEVANT NOMINAL CASE SIZES ( $\varnothing D \times L$ in mm)						
$C_R$ ( $\mu F$ )	RATED VOLTAGE (V)					
	160	200	250	350	400	450
2.2	→	→	6.3 x 11	→	8 x 11.5	10 x 12.5
3.3	→	6.3 x 11	→	8 x 11.5	10 x 12.5	10 x 16
4.7	6.3 x 11	→	8 x 11.5	→	10 x 12.5	10 x 16
6.8	8 x 11.5	→	10 x 12.5	→	10 x 16	10 x 20
10	→	→	10 x 12.5	10 x 16	10 x 20	12.5 x 20
15	→	→	10 x 16	10 x 20	12.5 x 20	12.5 x 25
22	→	10 x 16	10 x 20	12.5 x 20	12.5 x 25	16 x 25
33	→	10 x 20	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5
47	→	12.5 x 20	12.5 x 25	16 x 25	16 x 31.5	16 x 35.5
68	12.5 x 25	16 x 20	16 x 25	16 x 31.5	18 x 35.5	18 x 40
100	12.5 x 25	16 x 25	16 x 31.5	18 x 35.5	18 x 40	-
150	16 x 25	16 x 35.5	18 x 35.5	18 x 40	-	-
220	16 x 31.5	18 x 35.5	18 x 40	-	-	-
330	18 x 35.5	18 x 40	-	-	-	-
470	18 x 40	-	-	-	-	-

RADIAL STYLE: DIMENSIONS in millimeters									
$\varnothing D$	5	6.3	8	10	12.5	16	18	22	25
S	2.0	2.5	3.5	5.0	5.0	7.5	7.5	10.0	12.5
$\varnothing d$	0.5	0.5	0.6	0.6	0.6	0.8	0.8	1.0	1.0
$\beta$	1.5			2.0					
$\alpha$	0.5							1.0	

DIMENSIONS in millimeters AND AVAILABLE FORMS	
<p><math>\varnothing D \leq 18</math> long leads MALREKB00...</p>	<p><math>\varnothing D \leq 18</math> shortened leads MALREKB05... (S = 2 mm/2.5 mm/3.5 mm/5 mm/7.5 mm)</p>

**GENERAL NOTE**

- For Minimum Package Quantity (MPQ) and Minimum Order Quantity (MOQ) please refer to our price list or contact customer service
- For other packaging forms please refer to Vishay Roederstein General Information



ELECTRICAL DATA	
SYMBOL	DESCRIPTION
$U_R$	Rated voltage
$C_R$	Rated capacitance at 120 Hz
$\tan \delta$	Max. dissipation factor at 120 Hz
$R_{ESR}$	Calculated equivalent series resistance at 120 Hz
$I_R$	Rated ripple current (RMS) at 120 Hz and upper category temperature

**Note**

- Unless otherwise specified, all electrical values apply at  $T_a = 20\text{ }^\circ\text{C}$ ,  $P = 80\text{ kPa}$  to  $120\text{ kPa}$ ,  $RH = 45\%$  to  $75\%$

**ORDERING EXAMPLE**EKB 3300  $\mu\text{F}$  / 25 V,  $\pm 20\%$ , size: 16 mm x 25 mm

Leads: long

Ordering code: MALREKB00JG433E00K

Leads: short

Ordering code: MALREKB05...

ELECTRICAL DATA AND ORDERING INFORMATION							
$U_R$ (V)	$C_R$ 120 Hz ( $\mu\text{F}$ )	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	$R_{ESR}$ 120 Hz ( $\Omega$ )	$I_R$ 120 Hz / 105 $^\circ\text{C}$ (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
6.3	680	8 x 11.5	0.28	0.55	348	1.10	MALREKB00PB368B00K
	1000	8 x 11.5	0.28	0.37	422	1.10	MALREKB00PB410B00K
	3300	12.5 x 16	0.34	0.14	983	3.00	MALREKB00FD433B00K
	4700	12.5 x 20	0.36	0.10	1219	4.00	MALREKB00FE447B00K
	6800	12.5 x 25	0.40	0.08	1480	5.00	MALREKB00FG468B00K
	10 000	16 x 25	0.46	0.06	1807	8.50	MALREKB00JG510B00K
	15 000	16 x 35.5	0.56	0.05	2233	11.0	MALREKB00JL515B00K
	22 000	18 x 40	0.70	0.04	2652	14.6	MALREKB00KK522B00K
10	150	5 x 11	0.24	2.12	134	0.45	MALREKB00AA315C00K
	220	5 x 11	0.24	1.45	162	0.45	MALREKB00AA322C00K
	330	6.3 x 11	0.24	0.96	228	0.46	MALREKB00BA333C00K
	470	6.3 x 11	0.24	0.68	272	0.46	MALREKB00BA347C00K
	1000	10 x 12.5	0.24	0.32	544	2.05	MALREKB00DC410C00K
	1500	10 x 16	0.26	0.23	680	2.20	MALREKB00DD415C00K
	2200	10 x 20	0.28	0.17	844	3.10	MALREKB00DE422C00K
	3300	12.5 x 20	0.30	0.12	1148	4.00	MALREKB00FE433C00K
	4700	12.5 x 25	0.32	0.09	1421	5.00	MALREKB00FG447C00K
	6800	16 x 25	0.36	0.07	1737	8.50	MALREKB00JG468C00K
	10 000	16 x 35.5	0.42	0.06	2172	11.0	MALREKB00JL510C00K
	15 000	18 x 35.5	0.52	0.05	2482	14.0	MALREKB00KL515C00K
16	100	5 x 11	0.20	2.65	119	0.45	MALREKB00AA310D00K
	220	6.3 x 11	0.20	1.21	203	0.46	MALREKB00BA322D00K
	470	8 x 11.5	0.20	0.56	349	1.10	MALREKB00PB347D00K
	680	10 x 12.5	0.20	0.39	488	2.05	MALREKB00DC368D00K
	1000	10 x 16	0.20	0.27	648	2.20	MALREKB00DD410D00K
	1500	12.5 x 16	0.22	0.19	862	3.00	MALREKB00FD415D00K
	2200	12.5 x 20	0.24	0.14	1055	4.00	MALREKB00FE422D00K
	3300	12.5 x 25	0.26	0.10	1323	5.00	MALREKB00FG433D00K
	4700	16 x 25	0.28	0.08	1657	8.50	MALREKB00JG447D00K
	6800	16 x 31.5	0.32	0.06	1982	10.0	MALREKB00JS468D00K
		10 000	18 x 35.5	0.38	0.05	2409	14.0



ELECTRICAL DATA AND ORDERING INFORMATION							
$U_R$ (V)	$C_R$ 120 Hz ( $\mu$ F)	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	$R_{ESR}$ 120 Hz ( $\Omega$ )	$I_R$ 120 Hz / 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
25	68	5 x 11	0.16	3.12	108	0.45	MALREKB00AA268E00K
	150	6.3 x 11	0.16	1.41	185	0.46	MALREKB00BA315E00K
	330	8 x 11.5	0.16	0.64	324	1.10	MALREKB00PB333E00K
	470	10 x 12.5	0.16	0.45	449	2.05	MALREKB00DC347E00K
	680	10 x 16	0.16	0.31	591	2.20	MALREKB00DD368E00K
	1000	10 x 20	0.16	0.21	782	3.10	MALREKB00DE410E00K
	1500	12.5 x 20	0.18	0.16	1017	4.00	MALREKB00FE415E00K
	2200	12.5 x 25	0.20	0.12	1235	5.00	MALREKB00FG422E00K
	3300	16 x 25	0.22	0.09	1562	8.50	MALREKB00JG433E00K
	4700	16 x 31.5	0.24	0.07	1916	10.0	MALREKB00JS447E00K
	6800	18 x 35.5	0.28	0.05	2335	14.0	MALREKB00KL468E00K
35	47	5 x 11	0.14	3.95	96	0.45	MALREKB00AA247F00K
	68	6.3 x 11	0.14	2.73	132	0.46	MALREKB00BA268F00K
	100	6.3 x 11	0.14	1.86	160	0.46	MALREKB00BA310F00K
	150	8 x 11.5	0.14	1.24	231	1.10	MALREKB00PB315F00K
	220	8 x 11.5	0.14	0.84	280	1.10	MALREKB00PB322F00K
	330	10 x 12.5	0.14	0.56	399	2.05	MALREKB00DC333F00K
	470	10 x 16	0.14	0.40	521	2.20	MALREKB00DD347F00K
	680	12.5 x 16	0.14	0.27	740	3.00	MALREKB00FD368F00K
	1000	12.5 x 20	0.14	0.19	974	4.00	MALREKB00FE410F00K
	1500	16 x 20	0.16	0.14	1188	6.00	MALREKB00JE415F00K
	2200	16 x 25	0.18	0.11	1426	8.50	MALREKB00JG422F00K
	3300	16 x 35.5	0.20	0.08	1857	11.0	MALREKB00JL433F00K
	4700	16 x 35.5	0.22	0.06	2224	14.0	MALREKB00JL447F00K
	50	33	5 x 11	0.12	4.82	92	0.45
220		10 x 12.5	0.12	0.72	376	2.05	MALREKB00DC322H00K
330		10 x 16	0.12	0.48	504	2.20	MALREKB00DD333H00K
470		10 x 20	0.12	0.34	657	3.10	MALREKB00DE347H00K
680		12.5 x 20	0.12	0.23	927	4.00	MALREKB00FE368H00K
1000		12.5 x 25	0.12	0.16	1226	5.00	MALREKB00FG410H00K
1500		16 x 25	0.14	0.12	1442	8.50	MALREKB00JG415H00K
2200		16 x 31.5	0.16	0.10	1442	10.0	MALREKB00JS422H00K
3300		16 x 35.5	0.18	0.07	1794	11.0	MALREKB00JL433H00K
63	2.2	5 x 11	0.10	60.29	26	0.45	MALREKB00AA122J00K
	3.3	5 x 11	0.10	40.19	32	0.45	MALREKB00AA133J00K
	4.7	5 x 11	0.10	28.22	38	0.45	MALREKB00AA147J00K
	6.8	5 x 11	0.10	19.50	46	0.45	MALREKB00AA168J00K
	10	5 x 11	0.10	13.26	56	0.45	MALREKB00AA210J00K
	15	5 x 11	0.10	8.84	68	0.45	MALREKB00AA215J00K
	22	5 x 11	0.10	6.03	83	0.45	MALREKB00AA222J00K
	33	6.3 x 11	0.10	4.02	116	0.46	MALREKB00BA233J00K
	47	6.3 x 11	0.10	2.82	139	0.46	MALREKB00BA247J00K
	68	8 x 11.5	0.10	1.95	197	1.10	MALREKB00PB268J00K
	100	8 x 11.5	0.10	1.33	239	1.10	MALREKB00PB310J00K
	150	10 x 12.5	0.10	0.88	340	2.05	MALREKB00DC315J00K
	220	10 x 16	0.10	0.60	451	2.20	MALREKB00DD322J00K
	330	10 x 20	0.10	0.40	603	3.10	MALREKB00DE333J00K
	470	12.5 x 20	0.10	0.28	844	4.00	MALREKB00FE347J00K
	680	12.5 x 25	0.10	0.20	1107	5.00	MALREKB00FG368J00K
	1000	16 x 25	0.10	0.13	1490	8.50	MALREKB00JG410J00K
	1500	16 x 35.5	0.12	0.11	1770	11.0	MALREKB00JL415J00K
	2200	16 x 35.5	0.14	0.08	1770	11.0	MALREKB00JL422J00K
	3300	18 x 40	0.16	0.06	2689	14.6	MALREKB00KK433J00K



ELECTRICAL DATA AND ORDERING INFORMATION							
$U_R$ (V)	$C_R$ 120 Hz ( $\mu$ F)	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	$R_{ESR}$ 120 Hz ( $\Omega$ )	$I_R$ 120 Hz / 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
100	2.2	5 x 11	0.08	48.23	26	0.45	MALREKB00AA122L00K
	3.3	5 x 11	0.08	32.15	32	0.45	MALREKB00AA133L00K
	4.7	5 x 11	0.08	22.58	38	0.45	MALREKB00AA147L00K
	6.8	5 x 11	0.08	15.60	46	0.45	MALREKB00AA168L00K
	10	5 x 11	0.08	10.61	56	0.45	MALREKB00AA210L00K
	15	6.3 x 11	0.08	7.07	78	0.46	MALREKB00BA215L00K
	22	6.3 x 11	0.08	4.82	95	0.46	MALREKB00BA222L00K
	33	8 x 11.5	0.08	3.22	137	1.10	MALREKB00PB233L00K
	47	10 x 12.5	0.08	2.26	190	2.05	MALREKB00DC247L00K
	68	10 x 16	0.08	1.56	251	2.20	MALREKB00DD268L00K
	100	10 x 20	0.08	1.06	332	3.10	MALREKB00DE310L00K
	150	12.5 x 20	0.08	0.71	477	4.00	MALREKB00FE315L00K
	220	12.5 x 25	0.08	0.48	630	5.00	MALREKB00FG322L00K
	330	16 x 25	0.08	0.32	856	8.50	MALREKB00JG333L00K
	470	16 x 25	0.08	0.23	1021	8.50	MALREKB00JG347L00K
680	16 x 31.5	0.08	0.16	1344	10.0	MALREKB00JS368L00K	
1000	18 x 40	0.08	0.11	1925	14.6	MALREKB00KK410L00K	
160	4.7	6.3 x 11	0.15	42.33	34	0.46	MALREKB00BA147M00K
	6.8	8 x 11.5	0.15	29.26	49	1.10	MALREKB00PB168M00K
	68	12.5 x 25	0.15	2.93	273	5.00	MALREKB00FG268M00K
	100	12.5 x 25	0.15	1.99	331	5.00	MALREKB00FG310M00K
	150	16 x 25	0.15	1.33	450	8.50	MALREKB00JG315M00K
	220	16 x 31.5	0.15	0.90	596	10.0	MALREKB00JS322M00K
	330	18 x 35.5	0.15	0.60	822	14.0	MALREKB00KL333M00K
	470	18 x 40	0.15	0.42	1015	14.6	MALREKB00KK347M00K
200	3.3	6.3 x 11	0.15	60.29	29	0.46	MALREKB00BA133S00K
	22	10 x 16	0.15	9.04	111	2.20	MALREKB00DD222S00K
	33	10 x 20	0.15	6.03	149	3.10	MALREKB00DE233S00K
	47	12.5 x 20	0.15	4.23	208	4.00	MALREKB00FE247S00K
	68	16 x 20	0.15	2.93	279	6.00	MALREKB00JE268S00K
	100	16 x 25	0.15	1.99	368	8.50	MALREKB00JG310S00K
	150	16 x 35.5	0.15	1.33	517	11.0	MALREKB00JL315S00K
	220	18 x 35.5	0.15	0.90	671	14.0	MALREKB00KL322S00K
	330	18 x 40	0.15	0.60	850	14.6	MALREKB00KK333S00K
250	2.2	6.3 x 11	0.15	90.43	23	0.46	MALREKB00BA122N00K
	4.7	8 x 11.5	0.15	42.33	40	1.10	MALREKB00PB147N00K
	6.8	10 x 12.5	0.15	29.26	56	2.05	MALREKB00DC168N00K
	10	10 x 12.5	0.15	19.89	68	2.05	MALREKB00DC210N00K
	15	10 x 16	0.15	13.26	92	2.20	MALREKB00DD215N00K
	22	10 x 20	0.15	9.04	121	3.10	MALREKB00DE222N00K
	33	12.5 x 20	0.15	6.03	175	4.00	MALREKB00FE233N00K
	47	12.5 x 25	0.15	4.23	227	5.00	MALREKB00FG247N00K
	68	16 x 25	0.15	2.93	303	8.50	MALREKB00JG268N00K
	100	16 x 31.5	0.15	1.99	402	10.0	MALREKB00JS310N00K
	150	18 x 35.5	0.15	1.33	554	14.0	MALREKB00KL315N00K
	220	18 x 40	0.15	0.90	694	14.6	MALREKB00KK322N00K



ELECTRICAL DATA AND ORDERING INFORMATION							
$U_R$ (V)	$C_R$ 120 Hz ( $\mu$ F)	DIMENSIONS D x L (mm)	$\tan \delta$ 120 Hz	$R_{ESR}$ 120 Hz ( $\Omega$ )	$I_R$ 120 Hz / 105 °C (mA)	WEIGHT (g)	CATALOG NUMBER (Long Leads)
350	3.3	8 x 11.5	0.20	80.38	34	1.10	MALREKB00PB133O00K
	10	10 x 16	0.20	26.53	75	2.20	MALREKB00DD210O00K
	15	10 x 20	0.20	17.68	100	3.10	MALREKB00DE215O00K
	22	12.5 x 20	0.20	12.06	143	4.00	MALREKB00FE222O00K
	33	12.5 x 25	0.20	8.04	190	5.00	MALREKB00FG233O00K
	47	16 x 25	0.20	5.64	252	8.50	MALREKB00JG247O00K
	68	16 x 31.5	0.20	3.90	332	10.0	MALREKB00JS268O00K
	100	18 x 35.5	0.20	2.65	407	14.0	MALREKB00KL310O00K
	150	18 x 40	0.20	1.77	523	14.6	MALREKB00KK315O00K
400	2.2	8 x 11.5	0.20	120.6	28	1.10	MALREKB00PB122X00K
	3.3	10 x 12.5	0.20	80.38	39	2.05	MALREKB00DC133X00K
	4.7	10 x 12.5	0.20	56.44	47	2.05	MALREKB00DC147X00K
	6.8	10 x 16	0.20	39.01	62	2.20	MALREKB00DD168X00K
	10	10 x 20	0.20	26.53	82	3.10	MALREKB00DE210X00K
	15	12.5 x 20	0.20	17.68	118	4.00	MALREKB00FE215X00K
	22	12.5 x 25	0.20	12.06	155	5.00	MALREKB00FG222X00K
	33	16 x 25	0.20	8.04	211	8.50	MALREKB00JG233X00K
	47	16 x 31.5	0.20	5.64	276	10.0	MALREKB00JS247X00K
	68	18 x 35.5	0.20	3.90	373	14.0	MALREKB00KL268X00K
100	18 x 40	0.20	2.65	427	14.6	MALREKB00KK310X00K	
450	2.2	10 x 12.5	0.20	120.6	27	2.05	MALREKB00DC122P00K
	3.3	10 x 16	0.20	80.38	36	2.20	MALREKB00DD133P00K
	4.7	10 x 16	0.20	56.44	43	2.20	MALREKB00DD147P00K
	6.8	10 x 20	0.20	39.01	56	3.10	MALREKB00DE168P00K
	10	12.5 x 20	0.20	26.53	80	4.00	MALREKB00FE210P00K
	15	12.5 x 25	0.20	17.68	107	5.00	MALREKB00FG215P00K
	22	16 x 25	0.20	12.06	144	8.50	MALREKB00JG222P00K
	33	16 x 31.5	0.20	8.04	193	10.0	MALREKB00JS233P00K
	47	16 x 35.5	0.20	5.64	242	11.0	MALREKB00JL247P00K
	68	18 x 40	0.20	3.90	352	14.6	MALREKB00KK268P00K

LOW TEMPERATURE BEHAVIOR										
IMPEDANCE RATIO $Z(T_2)/Z(T_1)$	RATED VOLTAGE (V)									
	6.3	10	16	25	35	50 ~ 100	160	200 ~ 350	400	450
-25 °C / +20 °C	5	4	3	2	2	2	3	4	6	10
-40 °C / +20 °C	10	8	6	4	3	3	4	8	-	-

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
<b>Current</b>		
Leakage current (test conditions: $U_R$ , 20 °C)	After 1 min at $U_R$	$I_{L1} \leq 0.03 \times C_R \times U_R$ or 4 $\mu$ A for $U_R \leq 100$ V (whichever is greater)
	After 2 min at $U_R$	$I_{L2} \leq 0.01 \times C_R \times U_R$ or 3 $\mu$ A for $U_R \leq 100$ V (whichever is greater)
	After 5 min at $U_R$	$I_{L5} \leq 0.02 \times C_R \times U_R$ + 15 $\mu$ A for $U_R > 100$ V (whichever is greater)
<b>Resistance</b>		
Equivalent series resistance (ESR)	Calculated from $\tan \delta_{max}$ and $C_R$	$ESR = \tan \delta / 2 \pi f C_R$



MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY			
FREQUENCY (Hz)	$I_R$ MULTIPLIER FOR $U_R \leq 100$ V		
	$C_R \leq 47 \mu\text{F}$	$C_R = 68 \mu\text{F}$ to $680 \mu\text{F}$	$C_R \geq 1000 \mu\text{F}$
50	0.75	0.80	0.85
120	1.00	1.00	1.00
300	1.35	1.25	1.10
1000	1.55	1.35	1.15
$\geq 10\,000$	2.00	1.50	1.15

MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY		
FREQUENCY (Hz)	$I_R$ MULTIPLIER FOR $U_R$ 160 V to $\leq 450$ V	
	$C_R = 47 \mu\text{F}$ to $220 \mu\text{F}$	$C_R \geq 330 \mu\text{F}$
50	0.80	0.90
120	1.00	1.00
300	1.25	1.10
1000	1.40	1.13
$\geq 10\,000$	1.60	1.15

TEST PROCEDURES AND REQUIREMENTS		
TEST	PROCEDURE (quick reference)	REQUIREMENTS
Load life	$T_{\text{amb}} = 105 \text{ }^\circ\text{C}$ $U_R$ and $I_R$ applied After 1000 h $\varnothing 5$ mm, $\varnothing 6.3$ mm, $\varnothing 8$ mm After 2000 h $\geq \varnothing 10$ mm	$\Delta C/C: \pm 25 \%$ of initial value $I_L \leq \text{spec. limit}$ $\tan \delta \leq 2 \times \text{spec. limit}$
Shelf life	$T_{\text{amb}} = 105 \text{ }^\circ\text{C}$ No voltage applied After 1000 h After test: $U_R$ to be applied for 30 min 24 h to 48 h before measurement	$\Delta C/C: \pm 20 \%$ of initial value $I_L \leq \text{spec. limit}$ $\tan \delta \leq 2 \times \text{spec. limit}$

Statements about product lifetime are based on calculations and internal testing. They should only be interpreted as estimations. Also due to external factors, the lifetime in the field application may deviate from the calculated lifetime. In general, nothing stated herein shall be construed as a guarantee of durability.



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