

Aluminum Capacitors Axial Standard

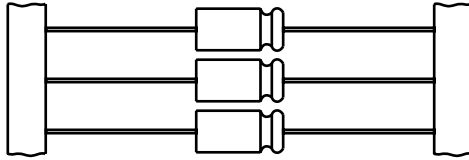
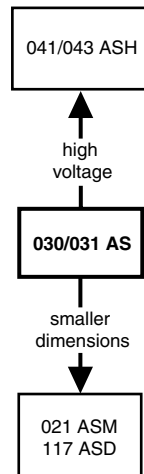


Fig.1 Component outlines



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Axial leads, cylindrical aluminum case, insulated with a blue sleeve
- Taped version available for automatic insertion
- Charge and discharge proof
- Useful life: 3000 hours at 85 °C (case Ø D = 3.3 mm: 1500 hours)
- Standard dimensions
- Lead (Pb)-free versions are RoHS compliant
- Compliant to RoHS directive 2002/95/EC


**RoHS
COMPLIANT**

APPLICATIONS

- General purpose and industrial, automotive, telecommunication, audio-video
- Coupling, decoupling, timing, smoothing, filtering, buffering in SMPS
- Boards with restricted mounting height, vibration and shock resistant

MARKING

The capacitors are marked (where possible) with the following information:

- Rated capacitance (in μF)
- Tolerance on rated capacitance, code letter in accordance with IEC 60062 (T for - 10 % to + 50 %)
- Rated voltage (in V)
- Date code in accordance with IEC 60062
- Code factory of origin
- Name of manufacturer
- Band to indicate the negative terminal
- '+' sign to identify the positive terminal (not for case sizes $L < 18$ mm)
- Series number (030 or 031)

QUICK REFERENCE DATA		
DESCRIPTION	VALUE	
Nominal case sizes ($\varnothing D \times L$ in mm)	3.3 x 11	4.5 x 10 to 10 x 25
Rated capacitance range, C_R	0.47 μF to 1000 μF	
Tolerance on C_R	- 10 % to + 50 %	
Rated voltage, U_R	6.3 V to 100 V	
Category temperature range	- 40 °C to + 85 °C	
Endurance test at 85 °C	1000 hours	2000 hours
Useful life at 85 °C	1500 hours	3000 hours
Useful life at 40 °C, 1.4 x I_R applied	40 000 hours	80 000 hours
Shelf life at 0 V, 85 °C	500 hours	
Based on sectional specification	IEC 60384-4/EN130300	
Climatic category IEC 60068	40/085/56	

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

C _R (μF)	U _R (V)						
	6.3	10	16	25	40	63	100
0.47	-	-	-	-	-	-	4.5 x 10
1.0	-	-	-	-	-	4.5 x 10	4.5 x 10
	-	-	-	-	-	3.3 x 11	-
2.2	-	-	-	-	3.3 x 11	4.5 x 10	4.5 x 10
3.3	-	-	-	-	-	4.5 x 10	4.5 x 10
4.7	-	-	3.3 x 11	-	-	4.5 x 10	6 x 10
6.8	-	-	-	-	-	4.5 x 10	6 x 10
10	3.3 x 11	-	-	4.5 x 10	4.5 x 10	6 x 10	8 x 11
	-	-	-	-	-	-	6.5 x 18
15	-	-	-	-	4.5 x 10	6 x 10	-
22	-	-	-	4.5 x 10	6 x 10	8 x 11	8 x 18
	-	-	-	-	-	6.5 x 18	-
33	-	-	4.5 x 10	-	6 x 10	-	10 x 18
47	-	4.5 x 10	-	6 x 10	8 x 11	8 x 18	10 x 25
	-	-	-	-	6.5 x 18	-	-
68	4.5 x 10	-	6 x 10	-	-	10 x 18	-
100	-	6 x 10	-	8 x 11	8 x 18	10 x 25	-
	-	-	-	6.5 x 18	-	-	-
150	6 x 10	-	8 x 11	8 x 18	10 x 18	-	-
	-	-	6.5 x 18	-	-	-	-
220	-	8 x 11	8 x 18	10 x 18	10 x 25	-	-
	-	6.5 x 18	-	-	-	-	-
330	-	8 x 18	10 x 18	10 x 25	-	-	-
470	8 x 18	10 x 18	10 x 25	-	-	-	-
680	10 x 18	10 x 25	-	-	-	-	-
1000	10 x 25	-	-	-	-	-	-

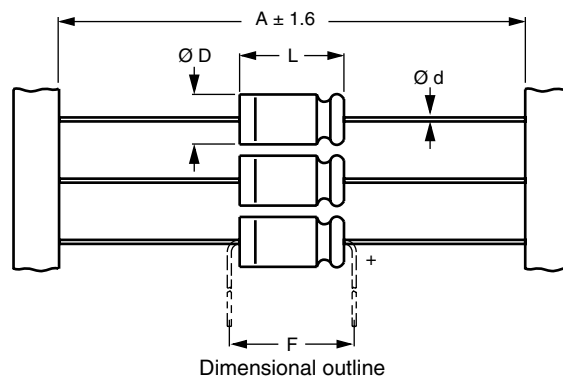
DIMENSIONS in millimeters AND AVAILABLE FORMS

Fig.2 Form BR: Taped on reel, non-preferred

Table 1

AXIAL; DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES									
NOMINAL CASE SIZE ∅ D x L	CASE CODE	AXIAL FORM BA and BR					MASS (g)	PACKAGING QUANTITIES	
		∅ d	A	∅ D _{max.}	L _{max.}	F _{min.}		FORM BA	FORM BR
3.3 x 11	1	0.6	63.5 ± 1.5	3.5	12	17.5	≈ 0.35	1000	4000
4.5 x 10	2	0.6	63.5 ± 1.5	5.0	10.5	15	≈ 0.5	1000	3000
6 x 10	3	0.6	63.5 ± 1.5	6.3	10.5	15	≈ 0.7	1000	1000
8 x 11	5a	0.6	63.5 ± 1.5	8.5	11.5	15	≈ 1.1	500	500
6.5 x 18	4	0.8	73 ± 1.6	6.9	18.5	25	≈ 1.3	1000	1000
8 x 18	5	0.8	73 ± 1.6	8.5	18.5	25	≈ 1.7	500	500
10 x 18	6	0.8	73 ± 1.6	10.5	18.5	25	≈ 2.5	500	500
10 x 25	7	0.8	73 ± 1.6	10.5	25.0	30	≈ 3.3	500	500

Note

Detailed tape dimensions see section 'PACKAGING'.



Aluminum Capacitors
Axial Standard

Vishay BCcomponents

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	rated capacitance at 100 Hz, tolerance - 10 % to + 50 %
I_R	rated RMS ripple current at 100 Hz, 85 °C
I_{L1}	max. leakage current after 1 minute at U_R
I_{L5}	max. leakage current after 5 minutes at U_R
$\tan \delta$	max. dissipation factor at 100 Hz
ESR	equivalent series resistance at 100 Hz (calculated from $\tan \delta_{max}$ and C_R)
Z	max. impedance at 10 kHz

ORDERING EXAMPLE

Electrolytic capacitor 031 series

330 μ F/10 V; - 10 %/+ 50 %

Nominal case size: \varnothing 8 mm x 18 mm; Form BA

Ordering code: MAL203134331E3

Former 12NC: 2222 031 34331

Note

Unless otherwise specified, all electrical values in Table 2 apply at $T_{amb} = 20$ °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %.

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION											
U_R (V)	C_R 100 Hz (μ F)	NOMINAL CASE SIZE \varnothing D x L (mm)	CASE CODE	I_R 100 Hz 85 °C (mA)	I_{L1} 1 min (μ A)	I_{L5} 5 min (μ A)	$\tan \delta$ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)	ORDERING CODE MAL2.....	
										TAPED ON REEL FORM BR	TAPED IN BOX FORM BA
6.3	10	3.3 x 11	1	15	5	5.1	0.30	47.8	20	03023109E3	03033109E3
	68	4.5 x 10	2	75	22	5.9	0.25	5.86	2.9	03023689E3	03033689E3
	150	6 x 10	3	120	10	6.9	0.25	2.66	1.3	03023151E3	03033151E3
	470	8 x 18	5	330	22	11	0.25	0.85	0.43	03123471E3	03133471E3
	680	10 x 18	6	430	30	14	0.25	0.59	0.29	03123681E3	03133681E3
	1000	10 x 25	7	560	42	18	0.25	0.40	0.20	03123102E3	03133102E3
	10	47	4.5 x 10	2	70	24	5.9	0.20	6.78	3.4	03024479E3
100		6 x 10	3	110	10	7.0	0.20	3.19	1.6	03024101E3	03034101E3
220		8 x 11	5a	210	18	9.4	0.20	1.45	0.73	03024221E3	03034221E3
220		6.5 x 18	4	210	18	9.4	0.20	1.45	0.73	03124221E3	03134221E3
330		8 x 18	5	310	24	12	0.20	0.97	0.48	03124331E3	03134331E3
470		10 x 18	6	410	33	14	0.20	0.68	0.34	03124471E3	03134471E3
680		10 x 25	7	510	45	19	0.20	0.47	0.24	03124681E3	03134681E3
16	4.7	3.3 x 11	1	15	5	5.1	0.20	67.8	26	03025478E3	03035478E3
	33	4.5 x 10	2	65	27	6.1	0.16	7.72	3.6	03025339E3	03035339E3
	68	6 x 10	3	110	11	7.2	0.16	3.75	1.8	03025689E3	03035689E3
	150	8 x 11	5a	200	19	9.8	0.16	1.70	0.80	03025151E3	03035151E3
	150	6.5 x 18	4	200	19	9.8	0.16	1.70	0.80	03125151E3	03135151E3
	220	8 x 18	5	270	26	12	0.16	1.16	0.55	03125221E3	03135221E3
	330	10 x 18	6	410	36	16	0.16	0.78	0.36	03125331E3	03135331E3
25	470	10 x 25	7	480	49	20	0.16	0.55	0.26	03125471E3	03135471E3
	10	4.5 x 10	2	50	13	5.5	0.14	22.3	9	03026109E3	03036109E3
	22	4.5 x 10	2	60	28	6.1	0.14	10.2	4.1	03026229E3	03036229E3
	47	6 x 10	3	100	12	7.4	0.14	4.8	1.9	03026479E3	03036479E3
	100	8 x 11	5a	160	19	10	0.14	2.23	0.90	03026101E3	03036101E3
	100	6.5 x 18	4	160	19	10	0.14	2.23	0.90	03126101E3	03136101E3
	150	8 x 18	5	240	27	13	0.14	1.49	0.60	03126151E3	03136151E3
220	10 x 18	6	350	37	16	0.14	1.02	0.41	03126221E3	03136221E3	
330	10 x 25	7	460	54	22	0.14	0.68	0.27	03126331E3	03136331E3	

ELECTRICAL DATA AND ORDERING INFORMATION											
U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE Ø D x L (mm)	CASE CODE	I _R 100 Hz 85 °C (mA)	I _{L1} 1 min (μA)	I _{L5} 5 min (μA)	tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)	ORDERING CODE MAL2.....	
										TAPED ON REEL FORM BR	TAPED IN BOX FORM BA
40	2.2	3.3 x 11	1	15	5	5.1	0.15	109	32	03027228E3	03037228E3
	10	4.5 x 10	2	50	20	5.8	0.11	17.6	7	03027109E3	03037109E3
	15	4.5 x 10	2	55	30	6.2	0.11	11.7	4.7	03027159E3	03037159E3
	22	6 x 10	3	75	9	6.8	0.11	8.0	3.2	03027229E3	03037229E3
	33	6 x 10	3	95	12	7.7	0.11	5.31	2.1	03027339E3	03037339E3
	47	8 x 11	5a	150	16	8.8	0.11	3.73	1.5	03027479E3	03037479E3
	47	6.5 x 18	4	150	16	8.8	0.11	3.73	1.5	03127479E3	03137479E3
	100	8 x 18	5	220	28	13	0.11	1.75	0.70	03127101E3	03137101E3
	150	10 x 18	6	300	40	17	0.11	1.17	0.47	03127151E3	03137151E3
220	10 x 25	7	430	57	23	0.11	0.80	0.32	03127221E3	03137221E3	
63	1.0	3.3 x 11	1	10	5	5.1	0.12	191	55	03090067E3	03090068E3
	1.0	4.5 x 10	2	13	5	5.1	0.09	143	55	03028108E3	03038108E3
	2.2	4.5 x 10	2	25	7	5.3	0.09	65.2	25	03028228E3	03038228E3
	3.3	4.5 x 10	2	35	11	5.4	0.09	46.5	17	03028338E3	03038338E3
	4.7	4.5 x 10	2	40	15	5.6	0.09	30.5	12	03028478E3	03038478E3
	6.8	4.5 x 10	2	46	22	5.9	0.09	21.1	8.1	03028688E3	03038688E3
	10	6 x 10	3	70	7	6.3	0.08	12.8	5.5	03028109E3	03038109E3
	15	6 x 10	3	79	10	6.9	0.08	8.5	3.7	03028159E3	03038159E3
	22	8 x 11	5a	110	13	7.8	0.08	5.79	2.5	03028229E3	03038229E3
	22	6.5 x 18	4	110	13	7.8	0.08	5.79	2.5	03128229E3	03138229E3
	47	8 x 18	5	190	22	11	0.08	2.71	1.2	03128479E3	03138479E3
	68	10 x 18	6	250	30	14	0.08	1.88	0.81	03128689E3	03138689E3
100	10 x 25	7	300	42	18	0.08	1.28	0.55	03128101E3	03138101E3	
100	0.47	4.5 x 10	2	9	5	4.3	0.08	271	96	03029477E3	03039477E3
	1.0	4.5 x 10	2	20	5	4.6	0.08	128	45	03029108E3	03039108E3
	2.2	4.5 x 10	2	30	11	5.3	0.08	57.9	21	03029228E3	03039228E3
	3.3	4.5 x 10	2	40	17	6.0	0.08	38.6	14	03029338E3	03039338E3
	4.7	6 x 10	3	50	13	6.8	0.07	23.7	9.6	03029478E3	03039478E3
	6.8	6 x 10	3	70	18	8.0	0.07	16.4	6.6	03029688E3	03039688E3
	10	8 x 11	5a	90	24	10	0.07	11.2	4.5	03029109E3	03039109E3
	10	6.5 x 18	4	90	24	10	0.07	11.2	4.5	03129109E3	03139109E3
	22	8 x 18	5	120	48	18	0.07	5.07	2.1	03129229E3	03139229E3
	33	10 x 18	6	200	70	24	0.07	3.38	1.4	03129339E3	03139339E3
	47	10 x 25	7	260	98	33	0.07	2.37	0.96	03129479E3	03139479E3

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage		$U_s \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1 \text{ V}$
Current		
Leakage current	After 1 minute at U_R : Case $\varnothing D \times L = 3.3 \text{ mm} \times 11 \text{ mm}$ and $4.5 \text{ mm} \times 10 \text{ mm}$	$I_{L1} \leq 0.05 C_R \times U_R$ or $5 \mu\text{A}$, whichever is greater
	Case $\varnothing D \times L = 6 \text{ mm} \times 10 \text{ mm}$ to $10 \text{ mm} \times 25 \text{ mm}$	I_{L1} for $CV \leq 1000$: $\leq 0.01 C_R \times U_R$ or $1 \mu\text{A}$, whichever is greater I_{L1} for $CV > 1000$: $\leq 0.006 C_R \times U_R + 4 \mu\text{A}$
	$U_R = 100 \text{ V}$	$I_{L1} = 0.02 C_R \times U_R + 4 \mu\text{A}$
	After 5 minutes: $U_R = 6.3 \text{ V}$ to 63 V	$I_{L5} \leq 0.002 C_R \times U_R + 5 \mu\text{A}$
	$U_R = 100 \text{ V}$	$I_{L5} \leq 0.006 C_R \times U_R + 4 \mu\text{A}$
Inductance		
Equivalent series inductance (ESL)	Case $\varnothing D \times L$ mm:	
	3.3 x 11	typ. 11 nH
	4.5 x 10	typ. 10 nH
	6 x 10	typ. 22 nH
	8 x 11	typ. 85 nH
	6.5 x 18	typ. 25 nH
	8 x 18	typ. 40 nH
	10 x 18	typ. 61 nH
10 x 25	typ. 38 nH	
Resistance		
Equivalent series resistance (ESR)	Calculated from $\tan \delta_{max}$ and C_R (see Table 2)	$ESR = \tan \delta / 2 \pi f C_R$

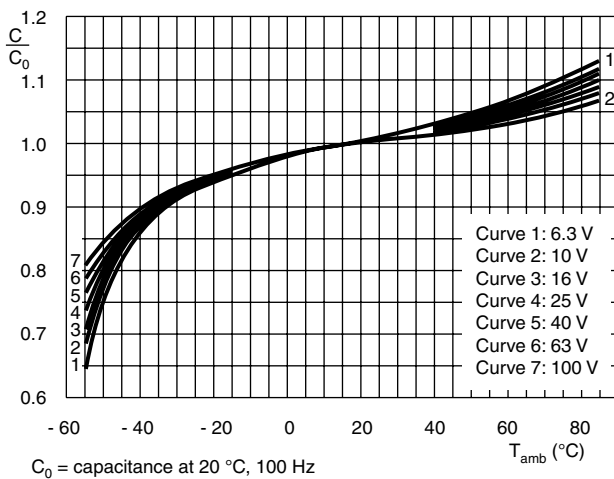
CAPACITANCE (C)


Fig.3 Typical multiplier of capacitance as a function of ambient temperature

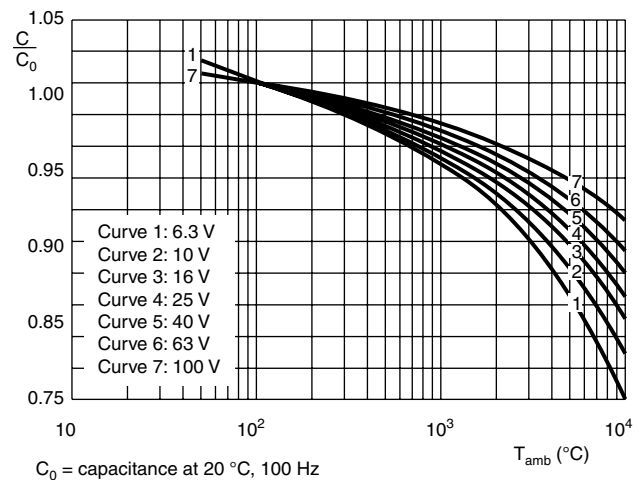


Fig.4 Typical multiplier of capacitance as a function of frequency

EQUIVALENT SERIES RESISTANCE (ESR)

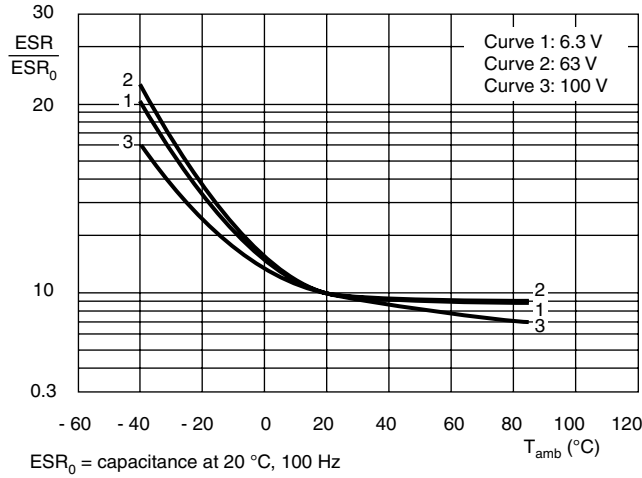


Fig.5 Typical multiplier of ESR as a function of ambient temperature

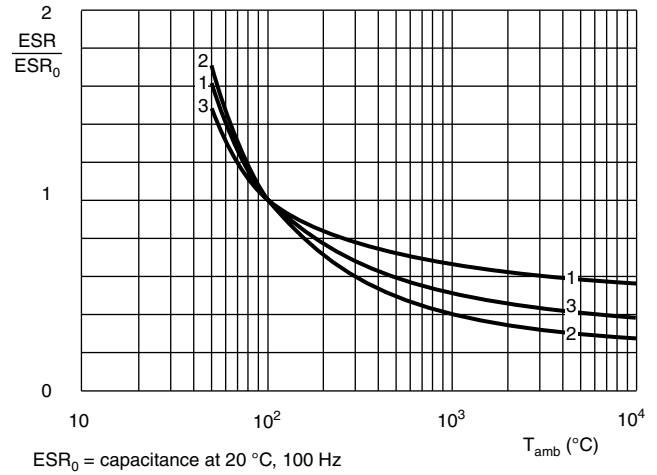


Fig.6 Typical multiplier of ESR as a function of frequency

IMPEDANCE (Z)

Table 3

IMPEDANCE VS. CAPACITANCE VALUES AT 10 kHz							
T_{amb}	$Z \times C_R (\Omega \times \mu F)$						
	6.3 V	10 V	16 V	25 V	40 V	63 V	100 V
+ 20 °C	≤ 200	≤ 160	≤ 120	≤ 90	≤ 70	≤ 55	≤ 45
- 25 °C	≤ 1200	≤ 750	≤ 560	≤ 400	≤ 300	≤ 180	≤ 130
- 40 °C	≤ 3200	≤ 2000	≤ 1500	≤ 1100	≤ 900	≤ 500	≤ 350

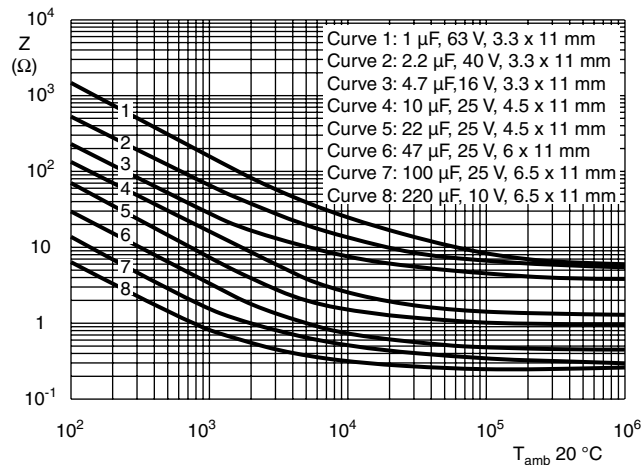


Fig.7 Typical impedance as a function of frequency

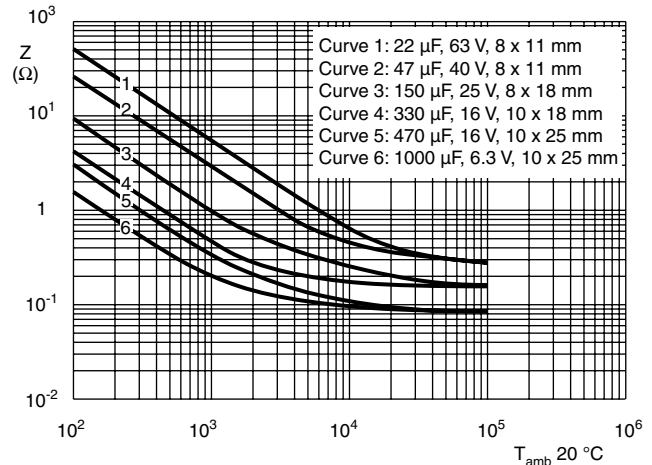


Fig.8 Typical impedance as a function of frequency

RIPPLE CURRENT AND USEFUL LIFE

CCC205

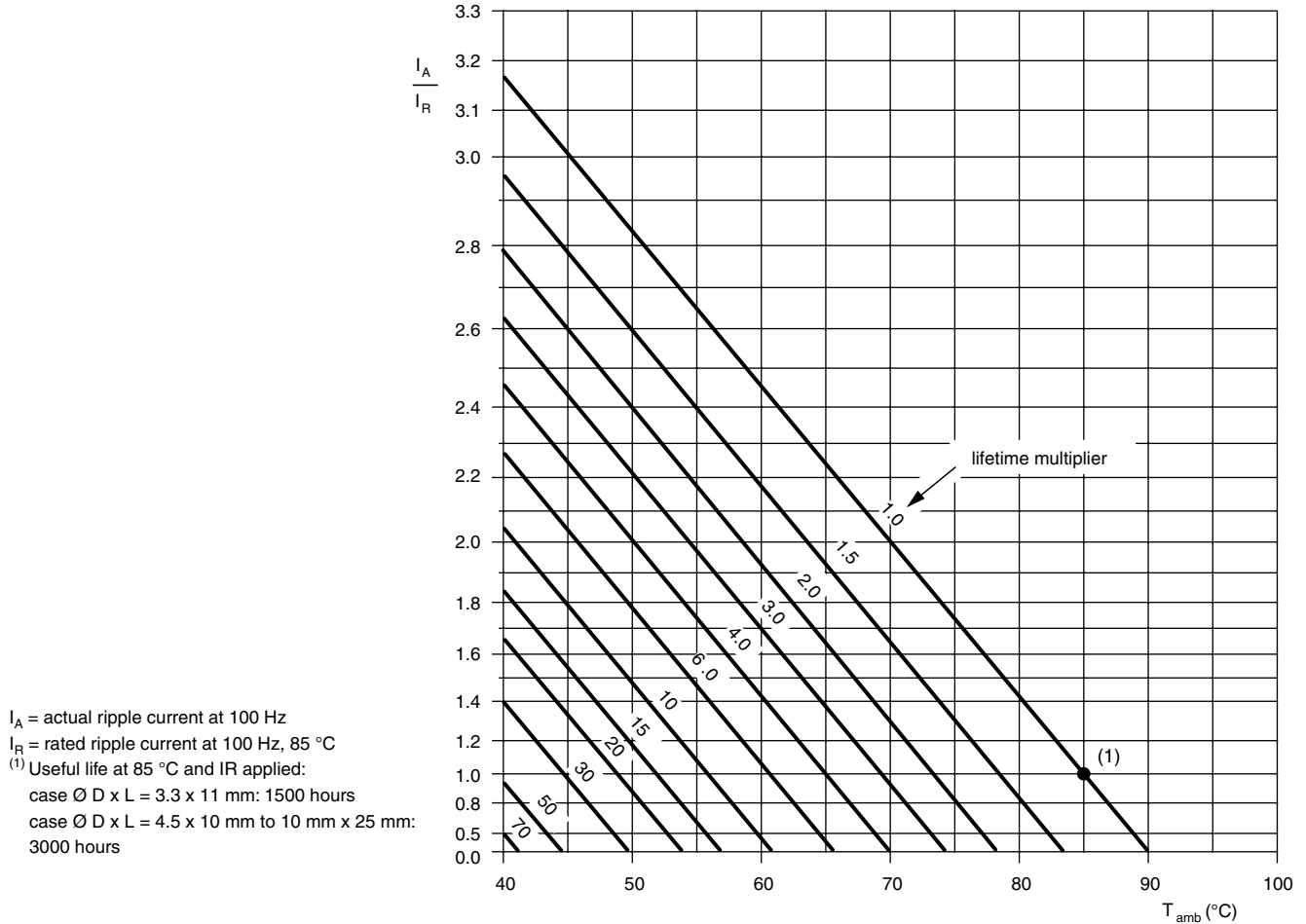


Fig.9 Multiplier of useful life as a function of ambient temperature and ripple current load

Table 4

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY			
FREQUENCY (Hz)	I_R MULTIPLIER		
	$U_R = 6.3$ V to 10 V	$U_R = 16$ V to 25 V	$U_R = 40$ V to 100 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
$\geq 10\ 000$	1.20	1.30	1.40

Table 5

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Case Ø D x L = 3.3 mm x 11 mm			
Endurance	IEC 384-4/ EN130300 subclause 4.13	$T_{amb} = 85\text{ °C}$; U_R applied; 1000 hours	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_L \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 85\text{ °C}$; U_R and I_R applied; 1500 hours	$\Delta C/C: \pm 50\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_L \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 3\%$
Shelf life (storage at high temperature)	IEC 384-4/ EN130300 subclause 4.17	$T_{amb} = 85\text{ °C}$; no voltage applied; 500 hours After test: U_R to be applied for 30 minutes, 24 hours to 48 hours before measurement	$\Delta C/C, \tan \delta, Z$: for requirements see 'Endurance test' above $I_L \leq 2 \times \text{spec. limit}$
Case Ø D L = 4.5 mm x 10 mm to 10 mm x 25 mm			
Endurance	IEC 384-4/ EN130300 subclause 4.13	$T_{amb} = 85\text{ °C}$; U_R applied; 2000 hours	$U_R \leq 6.3\text{ V}$; $\Delta C/C: + 15\%/- 30\%$ $U_R > 6.3\text{ V}$; $\Delta C/C: \pm 15\%$ $\tan \delta \leq 1.3 \times \text{spec. limit}$ $Z \leq 2 \times \text{spec. limit}$ $I_L \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 85\text{ °C}$; U_R and I_R applied; 3000 hours	$U_R \leq 6.3\text{ V}$; $\Delta C/C: + 45\%/- 50\%$ $U_R > 6.3\text{ V}$; $\Delta C/C: \pm 45\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_L \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 1\%$
Shelf life (storage at high temperature)	IEC 384-4/ EN130300 subclause 4.17	$T_{amb} = 85\text{ °C}$; no voltage applied; 500 hours After test: U_R to be applied for 30 minutes, 24 hours to 48 hours before measurement	$\Delta C/C, \tan \delta, Z$: for requirements see 'Endurance test' above $I_L \leq 2 \times \text{spec. limit}$



Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



Тел: +7 (812) 336 43 04 (многоканальный)

Email: org@lifeelectronics.ru