Aluminum Capacitors
Radial Low Profile, 5 mm

Fig. 1

FEATURES

- Useful life: 1500 h at 85 °C
- Very low profile, 5 mm height
- Extremely miniaturized
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case, insulated with a blue sleeve
- Charge and discharge proof
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

Pb-free

RoHS COMPLIANT

APPLICATIONS

- General purpose, industrial, automotive and audio-video
- Coupling, decoupling, smoothing, filtering and timing
- High mounting density
- Portable and mobile equipment (very small size and very low mass), low profile equipment

MARKING

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

- Rated capacitance (in µF)
- Rated voltage (in V)
- Negative terminal identification
- Code indicating factory of origin
- Name of manufacturer
- Date code, in accordance with IEC 60062
- Series number (134)

QUICK REFERENCE DATA	
DESCRIPTION	**VALUE**
Nominal case sizes (Ø D x L in mm)	4 x 5 to 6.3 x 5
Rated capacitance range, C_R	1.0 µF to 100 µF
Tolerance on C_R	± 20 %
Rated voltage range, U_R	6.3 V to 50 V
Category temperature range	- 40 °C to + 85 °C
Endurance test at 85 °C	1000 h
Useful life at 85 °C	1500 h
Useful life at 40 °C, 1.4 x I_R applied	40 000 h
Shelf life at 0 V, 85 °C	500 h
Based on sectional specification	IEC 60384-4/EN 130300
Climatic category IEC 60068	40/085/56

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**	**35**	**50**
1.0	-	-	-	-	-	4 x 5
2.2	-	-	-	-	-	4 x 5
3.3	-	-	-	-	-	4 x 5
4.7	-	-	-	-	4 x 5	5 x 5
10	-	-	4 x 5	-	5 x 5	6.3 x 5
22	4 x 5	-	5 x 5	-	6.3 x 5	-
33	-	5 x 5	-	6.3 x 5	-	-
47	5 x 5	-	6.3 x 5	-	-	-
100	6.3 x 5	-	-	-	-	-

DIMENSIONS in millimeters **AND AVAILABLE FORMS**

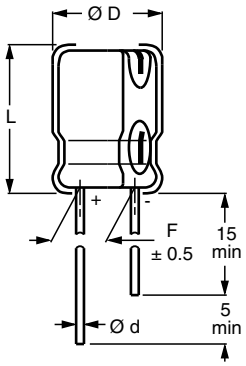
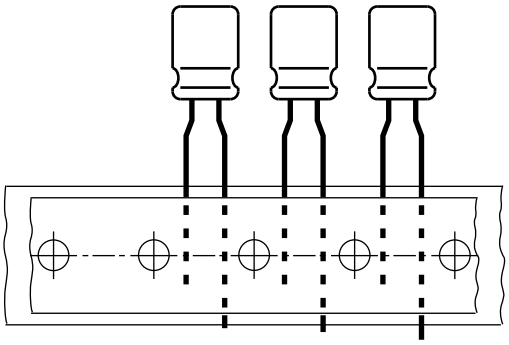
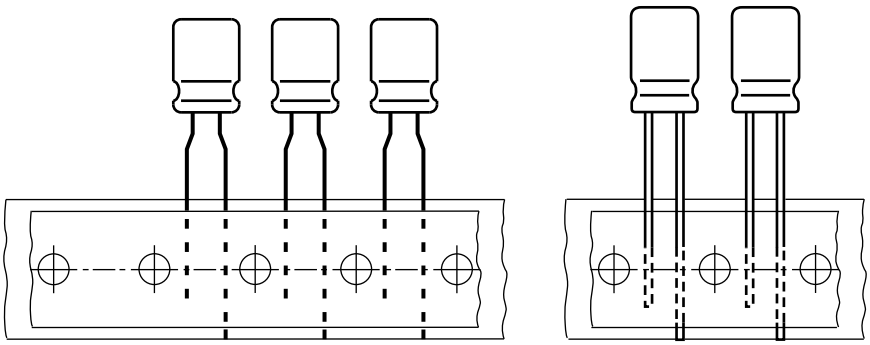


Fig. 2 - **Form CA:** Long leads



Case Ø D = 4 mm to 6.3 mm; pitch F = 5 mm

Fig. 3 - **Form TFA:** Taped in box (ammopack)



Pitch F = 2.5 mm
Case Ø D = 4 mm to 6.3 mm

Fig. 4 - **Form TNA:** Taped in box (ammopack)

Table 1

DIMENSIONS in millimeters **AND PACKAGING QUANTITIES**								
NOMINAL CASE SIZE Ø D x L	**CASE CODE**	**Ø d**	**Ø $D_{max.}$**	**$L_{max.}$**	**F**	**PACKAGING QUANTITIES**		
						FORM CA	**FORM TFA**	**FORM TNA**
4 x 5	53	0.45	4.5	6.0	1.5 ± 0.5	2000	2000	2000
5 x 5	54	0.45	5.5	6.0	2.0 ± 0.5	2000	2000	2000
6.3 x 5	55	0.45	6.8	6.0	2.5 ± 0.5	2000	2000	2000

Note

- For detailed tape dimensions please see www.vishay.com/doc?28360

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	Rated capacitance at 120 Hz, tolerance ± 20 %
I_R	Rated RMS ripple current at 120 Hz, 85 °C
I_{L2}	Max. leakage current after 2 min at U_R
tan δ	Max. dissipation factor at 120 Hz
Z	Max. impedance at 100 kHz

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 %

ORDERING EXAMPLE

Electrolytic capacitor 134 series

22 µF/16 V; ± 20 %

Nominal case size: Ø 5 mm x 5 mm; form TFA

Ordering code: MAL213435229E3

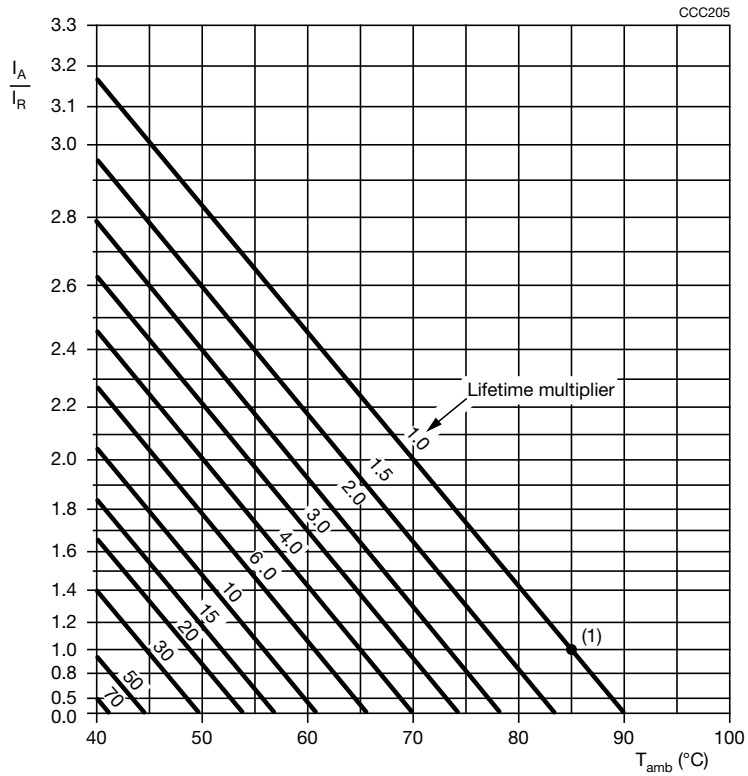
Former 12NC: 2222 134 35229

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION												
U_R (V)	C_R 120 Hz (µF)	NOMINAL CASE SIZE Ø D x L (mm)	I_R 120 Hz 85 °C (mA)	I_{L2} 2 min (µA)	tan δ 120 Hz	Z 100 kHz (Ω)	ORDERING CODE MAL2134.....					
							BULK LONG LEADS		TAPED AMMOPACK			
							FORM CA	F (mm)	FORM TFA	F (mm)	FORM TNA	F (mm)
6.3	22	4 x 5	23	3	0.24	11	53229E3	1.5	33229E3	5.0	73229E3	2.5
	47	5 x 5	38	3	0.24	5.2	53479E3	2.0	33479E3	5.0	73479E3	2.5
	100	6.3 x 5	60	7	0.24	3.4	53101E3	2.5	33101E3	5.0	73101E3	2.5
10	33	5 x 5	35	4	0.20	6.0	54339E3	2.0	34339E3	5.0	74339E3	2.5
16	10	4 x 5	20	3	0.16	12	95105E3	1.5	95103E3	5.0	95107E3	2.5
	22	5 x 5	32	4	0.16	6.4	55229E3	2.0	35229E3	5.0	75229E3	2.5
	47	6.3 x 5	50	8	0.16	4.2	55479E3	2.5	35479E3	5.0	75479E3	2.5
25	33	6.3 x 5	45	9	0.14	4.6	56339E3	2.5	36339E3	5.0	76339E3	2.5
35	4.7	4 x 5	15	3	0.12	27	50478E3	1.5	30478E3	5.0	70478E3	2.5
	10	5 x 5	25	4	0.12	17	50109E3	2.0	30109E3	5.0	70109E3	2.5
	22	6.3 x 5	40	8	0.12	11	50229E3	2.5	30229E3	5.0	70229E3	2.5
50	1.0	4 x 5	7.5	3	0.10	28	91105E3	1.5	91103E3	5.0	91107E3	2.5
	2.2	4 x 5	12	3	0.10	26	91225E3	1.5	91223E3	5.0	91227E3	2.5
	3.3	4 x 5	14	3	0.10	25	51338E3	1.5	31338E3	5.0	71338E3	2.5
	4.7	5 x 5	19	3	0.10	22	51478E3	2.0	31478E3	5.0	71478E3	2.5
	10	6.3 x 5	29	5	0.10	14	51109E3	2.5	31109E3	5.0	71109E3	2.5

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage		$U_s \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1$ V
Current		
Leakage current	After 2 min at U_R	$I_{L2} \leq 0.01\ C_R \times U_R$ or 3 µA (whichever is greater)
Resistance		
Equivalent series resistance (ESR)	Calculated from tan $\delta_{max.}$ and C_R (see Table 3)	ESR = tan $\delta/2\ \pi\ f\ C_R$

RIPPLE CURRENT AND USEFUL LIFE



I_A = Actual ripple current at 120 Hz
I_R = Rated ripple current at 120 Hz, 85 °C

(1) Useful life at 85 °C and I_R applied: 1500 h

Fig. 5 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 3

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY	
FREQUENCY (Hz)	I_R MULTIPLIER
50	0.60
120	1.00
400	1.20
800	1.30
≥ 2000	1.40

Table 4

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 60384-4/ EN 130300, subclause 4.13	T_{amb} = 85 °C; U_R applied; 1000 h	ΔC/C: ± 20 % tan δ ≤ 2 x spec. limit I_{L2} ≤ spec. limit
Useful life	CECC 30301, subclause 1.8.1	T_{amb} = 85 °C; U_R and I_R applied; 1500 h	ΔC/C: ± 50 % tan δ ≤ 3 x spec. limit Z ≤ 3 x spec. limit I_{L2} ≤ spec. limit no short or open circuit total failure percentage: ≤ 3 %
Shelf life (storage at high temperature)	IEC 60384-4/ EN 130300, subclause 4.17	T_{amb} = 85 °C; no voltage applied; 500 h After test: U_R to be applied for 30 min, 24 h to 48 h before measurement	ΔC/C, tan δ, Z: For requirements see “Endurance test” above I_{L2} ≤ spec. limit

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