

Aluminum Capacitors Power Long Life Snap-In

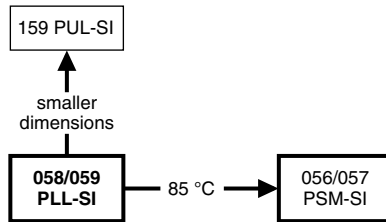


Fig. 1


**RoHS
COMPLIANT**

FEATURES

- Long useful life: 10 000 h at +105 °C
- High ripple current capability
- Keyed polarity version available
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, minimized dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Computer, telecommunication and industrial systems
- Smoothing and filtering applications
- Standard and switched mode power supplies
- Energy storage in pulse systems

MARKING

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

- Rated capacitance (in μF)
- Tolerance code on rated capacitance, code letter in accordance with IEC 60062 (M for $\pm 20\%$)
- Rated voltage (in V)
- Date code (YYMM)
- Name of manufacturer
- Code for factory of origin
- “-” sign to identify the negative terminal, visible from the top and side of the capacitor
- Code number
- Climatic category in accordance with IEC 60068

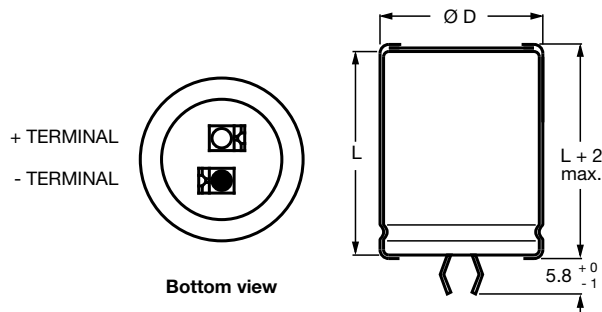
| QUICK REFERENCE DATA | | |
|---|---|------------------|
| DESCRIPTION | VALUE | |
| | 058 | 059 |
| Nominal case sizes ($\varnothing D \times L$ in mm) | 22 x 25 to 35 x 50 | |
| Rated capacitance range (E6 series), C_R | 33 μF to 47 000 μF | |
| Tolerance on C_R | $\pm 20\%$ | |
| Rated voltage range, U_R | 10 V to 100 V | 200 V to 400 V |
| Category temperature range | -40 °C to 105 °C | -25 °C to 105 °C |
| Endurance test at 105 °C | ≤ 50 V: 2000 h; ≥ 63 V: 5000 h | |
| Useful life at 105 °C | ≤ 50 V: 5000 h; ≥ 63 V: 10 000 h | |
| Useful life at 40 °C, 1.9 x I_R applied | ≤ 50 V: 125 000 h; ≥ 63 V: 250 000 h | |
| Shelf life at 0 V, 105 °C | 500 h | |
| Based on sectional specification | IEC 60384-4/EN130300 | |
| Climatic category IEC 60068 | 40/105/56 | 25/105/56 |

| SELECTION CHART FOR C_R , U_R , AND RELEVANT NOMINAL CASE SIZES FOR 058 SERIES ($\varnothing D \times L$ in mm) | | | | | | | |
|--|-----------|----|----|---------|---------|---------|---------|
| C_R (μF) | U_R (V) | | | | | | |
| | 10 | 16 | 25 | 40 | 50 | 63 | 100 |
| 330 | - | - | - | - | - | - | 22 x 25 |
| 470 | - | - | - | - | - | - | 22 x 30 |
| 680 | - | - | - | - | - | 22 x 25 | 25 x 30 |
| | - | - | - | - | - | - | 22 x 40 |
| 1000 | - | - | - | - | 22 x 25 | 22 x 30 | 30 x 30 |
| | - | - | - | - | - | - | 25 x 40 |
| 1500 | - | - | - | 22 x 25 | 22 x 30 | 25 x 30 | 30 x 40 |
| | - | - | - | - | - | 22 x 40 | 25 x 50 |



| SELECTION CHART FOR C_R, U_R, AND RELEVANT NOMINAL CASE SIZES FOR 058 SERIES (∅ D x L in mm) | | | | | | | |
|---|--------------------|---------|---------|---------|---------|---------|---------|
| C _R (μF) | U _R (V) | | | | | | |
| | 10 | 16 | 25 | 40 | 50 | 63 | 100 |
| 2200 | - | - | 22 x 25 | 22 x 30 | 25 x 30 | 30 x 30 | 35 x 40 |
| | - | - | - | - | 22 x 40 | 25 x 40 | 30 x 50 |
| 3300 | - | 22 x 25 | 22 x 30 | 25 x 30 | 30 x 30 | 30 x 40 | 35 x 50 |
| | - | - | - | 22 x 40 | 25 x 40 | 25 x 50 | - |
| 4700 | 22 x 25 | 22 x 30 | 25 x 30 | 30 x 30 | 30 x 40 | 35 x 40 | - |
| | - | - | 22 x 40 | 25 x 40 | 25 x 50 | 30 x 50 | - |
| 6800 | 22 x 30 | 25 x 30 | 30 x 30 | 30 x 40 | 35 x 40 | 35 x 50 | - |
| | - | 22 x 40 | 25 x 40 | 25 x 50 | 30 x 50 | - | - |
| 10 000 | 25 x 30 | 30 x 30 | 30 x 40 | 35 x 40 | 35 x 50 | - | - |
| | 22 x 40 | 25 x 40 | 25 x 50 | 30 x 50 | - | - | - |
| 15 000 | 30 x 30 | 30 x 40 | 35 x 40 | 35 x 50 | - | - | - |
| | 25 x 40 | 25 x 50 | 30 x 50 | - | - | - | - |
| 22 000 | 30 x 40 | 35 x 40 | 35 x 50 | - | - | - | - |
| | 25 x 50 | 30 x 50 | - | - | - | - | - |
| 33 000 | 35 x 40 | 35 x 50 | - | - | - | - | - |
| | 30 x 50 | - | - | - | - | - | - |
| 47 000 | 35 x 50 | - | - | - | - | - | - |

| SELECTION CHART FOR C_R, U_R, AND RELEVANT NOMINAL CASE SIZES FOR 059 SERIES (∅ D x L in mm) | | | | |
|---|--------------------|---------|---------|---------|
| C _R (μF) | U _R (V) | | | |
| | 200 | 250 | 385 | 400 |
| 33 | - | - | 22 x 25 | - |
| 47 | - | - | 22 x 30 | 22 x 30 |
| 68 | - | 22 x 25 | 22 x 35 | 22 x 35 |
| | - | - | 25 x 30 | 25 x 30 |
| 100 | 22 x 25 | 22 x 30 | 30 x 30 | 30 x 30 |
| | - | - | 25 x 40 | 25 x 40 |
| 150 | 22 x 30 | 22 x 35 | 25 x 50 | 30 x 35 |
| | - | 25 x 30 | 30 x 40 | 25 x 50 |
| 220 | 22 x 35 | 30 x 30 | 35 x 40 | 35 x 40 |
| | 25 x 30 | 25 x 35 | 30 x 50 | 30 x 50 |
| 330 | 30 x 30 | 30 x 35 | 35 x 50 | 35 x 50 |
| | 25 x 40 | 25 x 50 | - | - |
| 470 | 30 x 35 | 35 x 35 | - | - |
| | 25 x 50 | 30 x 45 | - | - |
| 680 | 35 x 35 | 35 x 45 | - | - |
| | 30 x 45 | - | - | - |
| 1000 | 35 x 50 | - | - | - |

DIMENSIONS in millimeters AND AVAILABLE FORMS
TWO TERMINAL SNAP-IN


The minus terminal can be marked with a black dot or with an imprinted “-” sign.

Fig. 2 - Two terminal snap-in

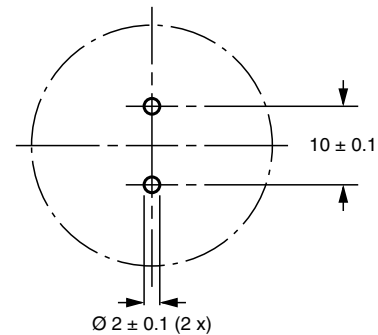
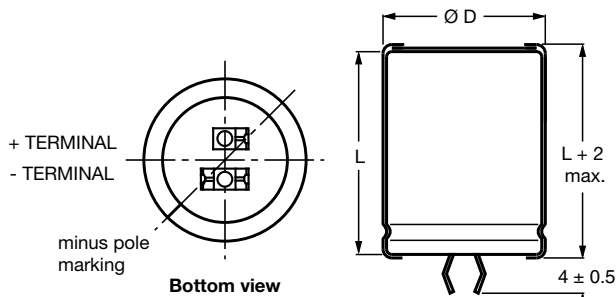
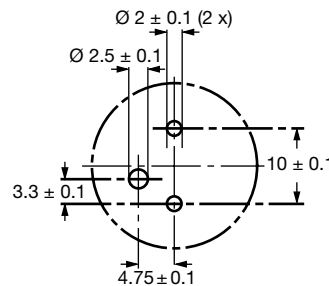


Fig. 3 - Mounting hole diagram

THREE TERMINAL SNAP-IN


The negative terminal has **TWO** pins which are **BOTH** electrically connected.

Fig. 4 - Three terminal snap-in



The 10 mm spacing of the 2 pin snap-in is used as the base layout and a third hole is added.

The third hole is closer to the negative primary hole so that polarization is always maintained, together with added mechanical stability.

Fig. 5 - Mounting hole diagram

Table 1

| DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES | | | | | |
|---|---------------------------|-------------------------|-----------------|---|---|
| NOMINAL CASE SIZE Ø D x L | Ø D_{MAX.} | L_{MAX.} | MASS (g) | PACKAGING QUANTITIES (units per box) | CARDBOARD BOX DIMENSIONS L x W x H |
| 22 x 25 | 23 | 27 | ≈ 12 | 100 | 260 x 250 x 39 |
| 22 x 30 | 23 | 32 | ≈ 16 | 100 | 260 x 250 x 44 |
| 22 x 35 | 23 | 37 | ≈ 20 | 100 | 260 x 250 x 49 |
| 22 x 40 | 23 | 42 | ≈ 23 | 100 | 260 x 250 x 54 |
| 25 x 30 | 26 | 32 | ≈ 22 | 100 | 290 x 280 x 44 |
| 25 x 35 | 26 | 37 | ≈ 24 | 100 | 290 x 280 x 49 |
| 25 x 40 | 26 | 42 | ≈ 27 | 100 | 290 x 280 x 54 |
| 25 x 50 | 26 | 52 | ≈ 38 | 100 | 290 x 280 x 64 |
| 30 x 30 | 31 | 32 | ≈ 30 | 100 | 340 x 330 x 44 |
| 30 x 35 | 31 | 37 | ≈ 35 | 100 | 340 x 330 x 49 |
| 30 x 40 | 31 | 42 | ≈ 40 | 100 | 340 x 330 x 54 |
| 30 x 45 | 31 | 47 | ≈ 45 | 100 | 340 x 330 x 59 |
| 30 x 50 | 31 | 52 | ≈ 50 | 100 | 340 x 330 x 64 |
| 35 x 35 | 36 | 37 | ≈ 48 | 50 | 390 x 198 x 49 |
| 35 x 40 | 36 | 42 | ≈ 55 | 50 | 390 x 198 x 54 |
| 35 x 45 | 36 | 47 | ≈ 63 | 50 | 390 x 198 x 59 |
| 35 x 50 | 36 | 52 | ≈ 72 | 50 | 390 x 198 x 64 |



| ELECTRICAL DATA | |
|-----------------|---|
| SYMBOL | DESCRIPTION |
| C _R | Rated capacitance at 100 Hz |
| I _R | Rated RMS ripple current at 100 Hz or ≥ 10 kHz and 105 °C |
| I _{L1} | Max. leakage current after 1 min at U _R |
| I _{L5} | Max. leakage current after 5 min at U _R |
| ESR | Max. equivalent series resistance at 100 Hz |
| Z | Max. impedance at 10 kHz |

Note

- Unless otherwise specified, all electrical values in Table 2 and 3 apply at T_{amb} = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %

Table 2

| ELECTRICAL DATA AND ORDERING INFORMATION FOR 058 SERIES (∅ D x L in mm) | | | | | | | | | | |
|---|----------------------------------|---|---|---|----------------------------------|----------------------------------|-----------------------|---------------------|-------------------------------|---------|
| U _R (V) | C _R 100 Hz (μF) | NOMINAL CASE SIZE ∅ D x L (mm) | I _R 100 Hz 105 °C (A) | I _R ≥ 10 kHz 105 °C (A) | I _{L1} 1 min (μA) | I _{L5} 5 min (μA) | ESR 100 Hz (mΩ) | Z 10 kHz (mΩ) | ORDERING CODE MAL2058..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 10 | 4700 | 22 x 25 | 1.95 | 2.30 | 286 | 98 | 82 | 57 | 54472E3 | 74472E3 |
| | 6800 | 22 x 30 | 2.44 | 2.88 | 412 | 140 | 61 | 44 | 54682E3 | 74682E3 |
| | 10 000 | 25 x 30 | 2.81 | 3.32 | 604 | 204 | 54 | 42 | 54103E3 | 74103E3 |
| | 10 000 | 22 x 40 | 3.29 | 3.88 | 604 | 204 | 43 | 32 | 44103E3 | 24103E3 |
| | 15 000 | 30 x 30 | 3.53 | 4.17 | 904 | 304 | 42 | 34 | 54153E3 | 74153E3 |
| | 15 000 | 25 x 40 | 3.78 | 4.46 | 904 | 304 | 38 | 30 | 44153E3 | 24153E3 |
| | 22 000 | 30 x 40 | 4.62 | 5.45 | 1324 | 444 | 31 | 25 | 54223E3 | 74223E3 |
| | 22 000 | 25 x 50 | 4.68 | 5.52 | 1324 | 444 | 31 | 24 | 44223E3 | 24223E3 |
| | 33 000 | 35 x 40 | 5.15 | 6.08 | 1984 | 664 | 30 | 24 | 54333E3 | 74333E3 |
| | 33 000 | 30 x 50 | 5.70 | 6.73 | 1984 | 664 | 24 | 21 | 44333E3 | 24333E3 |
| | 47 000 | 35 x 50 | 6.23 | 7.35 | 2824 | 944 | 24 | 21 | 54473E3 | 74473E3 |
| 16 | 3300 | 22 x 25 | 1.90 | 2.24 | 321 | 110 | 86 | 57 | 55332E3 | 75332E3 |
| | 4700 | 22 x 30 | 2.36 | 2.78 | 455 | 154 | 65 | 44 | 55472E3 | 75472E3 |
| | 6800 | 25 x 30 | 2.75 | 3.25 | 657 | 222 | 56 | 42 | 55682E3 | 75682E3 |
| | 6800 | 22 x 40 | 3.18 | 3.75 | 657 | 222 | 46 | 32 | 45682E3 | 25682E3 |
| | 10 000 | 30 x 30 | 3.44 | 4.06 | 964 | 324 | 44 | 34 | 55103E3 | 75103E3 |
| | 10 000 | 25 x 40 | 3.66 | 4.32 | 964 | 324 | 40 | 30 | 45103E3 | 25103E3 |
| | 15 000 | 30 x 40 | 4.55 | 5.37 | 1444 | 484 | 32 | 25 | 55153E3 | 75153E3 |
| | 15 000 | 25 x 50 | 4.55 | 5.37 | 1444 | 484 | 32 | 24 | 45153E3 | 25153E3 |
| | 22 000 | 35 x 40 | 5.07 | 5.98 | 2116 | 708 | 31 | 24 | 55223E3 | 75223E3 |
| | 22 000 | 30 x 50 | 5.67 | 6.69 | 2116 | 708 | 25 | 21 | 45223E3 | 25223E3 |
| | 33 000 | 35 x 50 | 6.23 | 7.35 | 3172 | 1060 | 25 | 21 | 55333E3 | 75333E3 |
| 25 | 2200 | 22 x 25 | 1.76 | 2.08 | 334 | 114 | 100 | 57 | 56222E3 | 76222E3 |
| | 3300 | 22 x 30 | 2.23 | 2.63 | 499 | 169 | 73 | 44 | 56332E3 | 76332E3 |
| | 4700 | 25 x 30 | 2.60 | 3.07 | 709 | 239 | 62 | 42 | 56472E3 | 76472E3 |
| | 4700 | 22 x 40 | 3.00 | 3.54 | 709 | 239 | 52 | 32 | 46472E3 | 26472E3 |
| | 6800 | 30 x 30 | 3.26 | 3.85 | 1024 | 344 | 49 | 34 | 56682E3 | 76682E3 |
| | 6800 | 25 x 40 | 3.49 | 4.12 | 1024 | 344 | 44 | 30 | 46682E3 | 26682E3 |
| | 10 000 | 30 x 40 | 4.37 | 5.16 | 1504 | 504 | 35 | 25 | 56103E3 | 76103E3 |
| | 10 000 | 25 x 50 | 4.37 | 5.16 | 1504 | 504 | 35 | 24 | 46103E3 | 26103E3 |
| | 15 000 | 35 x 40 | 4.91 | 5.79 | 2254 | 754 | 33 | 24 | 56153E3 | 76153E3 |
| | 15 000 | 30 x 50 | 5.43 | 6.41 | 2254 | 754 | 27 | 21 | 46153E3 | 26153E3 |
| | 22 000 | 35 x 50 | 6.07 | 7.16 | 3304 | 1104 | 27 | 21 | 56223E3 | 76223E3 |
| 40 | 1500 | 22 x 25 | 1.65 | 2.01 | 364 | 124 | 114 | 65 | 57152E3 | 77152E3 |
| | 2200 | 22 x 30 | 2.04 | 2.49 | 532 | 180 | 87 | 50 | 57222E3 | 77222E3 |
| | 3300 | 25 x 30 | 2.43 | 2.99 | 796 | 268 | 71 | 45 | 57332E3 | 77332E3 |
| | 3300 | 22 x 40 | 2.78 | 3.39 | 796 | 268 | 60 | 37 | 47332E3 | 27332E3 |
| | 4700 | 30 x 30 | 2.96 | 3.61 | 1132 | 380 | 59 | 40 | 57472E3 | 77472E3 |
| | 4700 | 25 x 40 | 3.26 | 3.90 | 1132 | 380 | 51 | 32 | 47472E3 | 27472E3 |
| | 6800 | 30 x 40 | 3.94 | 4.81 | 1636 | 548 | 42 | 29 | 57682E3 | 77682E3 |
| | 6800 | 25 x 50 | 4.10 | 5.00 | 1636 | 548 | 39 | 26 | 47682E3 | 27682E3 |
| | 10 000 | 35 x 40 | 4.18 | 5.10 | 2404 | 804 | 46 | 29 | 57103E3 | 77103E3 |
| | 10 000 | 30 x 50 | 4.98 | 6.08 | 2404 | 804 | 36 | 24 | 47103E3 | 27103E3 |
| | 15 000 | 35 x 50 | 5.21 | 6.36 | 3604 | 1204 | 36 | 24 | 57153E3 | 77153E3 |

ORDERING EXAMPLE

Electrolytic capacitor 058 series

10 000 μF/25 V; ± 20 %

Nominal case size: ∅ 30 mm x 40 mm

2-terminal snap-in:

Ordering code: MAL2 058 56103 E3

Former 12NC: 2222 058 56103

3-terminal snap-in:

Ordering code: MAL2 058 76103 E3

Former 12NC: 2222 058 76103



| ELECTRICAL DATA AND ORDERING INFORMATION FOR 058 SERIES (Ø D x L in mm) | | | | | | | | | | |
|---|----------------------------------|---|---|---|----------------------------------|----------------------------------|-----------------------|---------------------|-------------------------------|---------|
| U _R (V) | C _R 100 Hz (µF) | NOMINAL CASE SIZE Ø D x L (mm) | I _R 100 Hz 105 °C (A) | I _R ≥ 10 kHz 105 °C (A) | I _{L1} 1 min (µA) | I _{L5} 5 min (µA) | ESR 100 Hz (mΩ) | Z 10 kHz (mΩ) | ORDERING CODE MAL2058..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 50 | 1000 | 22 x 25 | 1.50 | 1.83 | 304 | 104 | 138 | 69 | 51102E3 | 71102E3 |
| | 1500 | 22 x 30 | 1.88 | 2.29 | 454 | 154 | 102 | 54 | 51152E3 | 71152E3 |
| | 2200 | 25 x 30 | 2.27 | 2.77 | 664 | 124 | 82 | 47 | 51222E3 | 71222E3 |
| | 2200 | 22 x 40 | 2.55 | 3.11 | 664 | 124 | 71 | 38 | 41222E3 | 21222E3 |
| | 3300 | 30 x 30 | 2.81 | 3.43 | 994 | 334 | 66 | 41 | 51332E3 | 71332E3 |
| | 3300 | 25 x 40 | 3.07 | 3.75 | 994 | 334 | 57 | 33 | 41332E3 | 21332E3 |
| | 4700 | 30 x 40 | 3.77 | 4.60 | 1414 | 474 | 47 | 30 | 51472E3 | 71472E3 |
| | 4700 | 25 x 50 | 3.85 | 4.70 | 1414 | 474 | 43 | 27 | 41472E3 | 21472E3 |
| | 6800 | 35 x 40 | 4.01 | 4.89 | 2044 | 684 | 49 | 30 | 51682E3 | 71682E3 |
| | 6800 | 30 x 50 | 4.74 | 5.78 | 2044 | 684 | 38 | 24 | 41682E3 | 21682E3 |
| | 10 000 | 35 x 50 | 5.04 | 6.15 | 3004 | 1004 | 38 | 24 | 51103E3 | 71103E3 |
| 63 | 680 | 22 x 25 | 1.17 | 1.43 | 261 | 90 | 228 | 150 | 58681E3 | 78681E3 |
| | 1000 | 22 x 30 | 1.46 | 1.78 | 382 | 130 | 170 | 115 | 58102E3 | 78102E3 |
| | 1500 | 25 x 30 | 1.76 | 2.15 | 571 | 193 | 137 | 85 | 58152E3 | 78152E3 |
| | 1500 | 22 x 40 | 2.00 | 2.44 | 571 | 193 | 115 | 85 | 48152E3 | 28152E3 |
| | 2200 | 30 x 30 | 2.27 | 2.77 | 836 | 281 | 101 | 70 | 58222E3 | 78222E3 |
| | 2200 | 25 x 40 | 2.40 | 2.93 | 836 | 281 | 94 | 70 | 48222E3 | 28222E3 |
| | 3300 | 30 x 40 | 3.07 | 3.75 | 1251 | 420 | 70 | 50 | 58332E3 | 78332E3 |
| | 3300 | 25 x 50 | 3.07 | 3.75 | 1251 | 420 | 70 | 50 | 48332E3 | 28332E3 |
| | 4700 | 35 x 40 | 3.65 | 4.45 | 1781 | 596 | 60 | 45 | 58472E3 | 78472E3 |
| | 4700 | 30 x 50 | 3.88 | 4.73 | 1781 | 596 | 53 | 45 | 48472E3 | 28472E3 |
| | 6800 | 35 x 50 | 4.58 | 5.59 | 2574 | 861 | 46 | 35 | 58682E3 | 78682E3 |
| 100 | 330 | 22 x 25 | 0.92 | 1.12 | 202 | 70 | 370 | 250 | 59331E3 | 79331E3 |
| | 470 | 22 x 30 | 1.14 | 1.39 | 286 | 98 | 280 | 190 | 59471E3 | 79471E3 |
| | 680 | 25 x 30 | 1.35 | 1.65 | 412 | 140 | 232 | 140 | 59681E3 | 79681E3 |
| | 680 | 22 x 40 | 1.57 | 1.92 | 412 | 140 | 190 | 140 | 49681E3 | 29681E3 |
| | 1000 | 30 x 30 | 1.79 | 2.40 | 604 | 204 | 163 | 115 | 59102E3 | 79102E3 |
| | 1000 | 25 x 40 | 1.85 | 2.26 | 604 | 204 | 158 | 115 | 49102E3 | 29102E3 |
| | 1500 | 30 x 40 | 2.45 | 2.99 | 904 | 304 | 111 | 85 | 59152E3 | 79152E3 |
| | 1500 | 25 x 50 | 2.38 | 2.90 | 904 | 304 | 116 | 85 | 49152E3 | 29152E3 |
| | 2200 | 35 x 40 | 3.05 | 3.72 | 1324 | 444 | 86 | 65 | 59222E3 | 79222E3 |
| | 2200 | 30 x 50 | 3.13 | 3.82 | 1324 | 444 | 82 | 65 | 49222E3 | 29222E3 |
| | 3300 | 35 x 50 | 3.84 | 4.68 | 1984 | 664 | 64 | 50 | 59332E3 | 79332E3 |

Table 3

| ELECTRICAL DATA AND ORDERING INFORMATION FOR 059 SERIES | | | | | | | | | | |
|---|----------------------------------|---|---|----------------------------------|----------------------------------|-----------------------|---------------------|-------------------------------|---------|--|
| U _R (V) | C _R 100 Hz (µF) | NOMINAL CASE SIZE Ø D x L (mm) | I _R 100 Hz 105 °C (A) | I _{L1} 1 min (µA) | I _{L5} 5 min (µA) | ESR 100 Hz (mΩ) | Z 10 kHz (mΩ) | ORDERING CODE MAL2059..... | | |
| | | | | | | | | 2-TERM. | 3-TERM. | |
| 200 | 100 | 22 x 25 | 0.53 | 124 | 44 | 1280 | 730 | 52101E3 | 72101E3 | |
| | 150 | 22 x 30 | 0.67 | 184 | 64 | 850 | 540 | 52151E3 | 72151E3 | |
| | 220 | 22 x 35 | 0.86 | 268 | 92 | 610 | 430 | 32221E3 | 12221E3 | |
| | 220 | 25 x 30 | 0.87 | 268 | 92 | 610 | 430 | 52221E3 | 72221E3 | |
| | 330 | 30 x 30 | 1.12 | 400 | 136 | 435 | 300 | 52331E3 | 72331E3 | |
| | 330 | 25 x 40 | 1.12 | 400 | 136 | 435 | 300 | 42331E3 | 22331E3 | |
| | 470 | 30 x 35 | 1.46 | 568 | 192 | 335 | 225 | 32471E3 | 12471E3 | |
| | 470 | 25 x 50 | 1.25 | 568 | 192 | 335 | 225 | 42471E3 | 22471E3 | |
| | 680 | 30 x 45 | 1.87 | 820 | 276 | 235 | 155 | 32681E3 | 12681E3 | |
| | 680 | 35 x 35 | 1.85 | 820 | 276 | 235 | 155 | 62681E3 | 82681E3 | |
| | 1000 | 35 x 50 | 2.45 | 1204 | 404 | 160 | 125 | 52102E3 | 72102E3 | |
| 250 | 68 | 22 x 25 | 0.49 | 106 | 38 | 1640 | 760 | 53689E3 | 73689E3 | |
| | 100 | 22 x 30 | 0.62 | 154 | 54 | 1110 | 570 | 53101E3 | 73101E3 | |
| | 150 | 22 x 35 | 0.82 | 229 | 79 | 795 | 440 | 33151E3 | 13151E3 | |
| | 150 | 25 x 30 | 0.82 | 229 | 79 | 795 | 440 | 53151E3 | 73151E3 | |
| | 220 | 25 x 35 | 1.03 | 334 | 114 | 540 | 300 | 33221E3 | 13221E3 | |
| | 220 | 30 x 30 | 1.06 | 334 | 114 | 540 | 300 | 53221E3 | 73221E3 | |
| | 330 | 30 x 35 | 1.43 | 499 | 169 | 385 | 225 | 33331E3 | 13331E3 | |
| | 330 | 25 x 50 | 1.40 | 499 | 169 | 385 | 225 | 43331E3 | 23331E3 | |
| | 470 | 30 x 45 | 1.79 | 709 | 239 | 270 | 155 | 33471E3 | 13471E3 | |
| | 470 | 35 x 35 | 1.79 | 709 | 239 | 270 | 155 | 63471E3 | 83471E3 | |
| | 680 | 35 x 45 | 2.25 | 1024 | 344 | 190 | 125 | 43681E3 | 23681E3 | |



| ELECTRICAL DATA AND ORDERING INFORMATION FOR 059 SERIES | | | | | | | | | |
|---|----------------------------|--------------------------------|----------------------------------|----------------------------|----------------------------|-----------------|---------------|----------------------------|---------|
| U _R (V) | C _R 100 Hz (μF) | NOMINAL CASE SIZE Ø D x L (mm) | I _R 100 Hz 105 °C (A) | I _{L1} 1 min (μA) | I _{L5} 5 min (μA) | ESR 100 Hz (mΩ) | Z 10 kHz (mΩ) | ORDERING CODE MAL2059..... | |
| | | | | | | | | 2-TERM. | 3-TERM. |
| 385 | 33 | 22 x 25 | 0.32 | 80 | 29 | 3860 | 3000 | 58339E3 | 78339E3 |
| | 47 | 22 x 30 | 0.41 | 113 | 40 | 2710 | 2100 | 58479E3 | 78479E3 |
| | 68 | 22 x 35 | 0.53 | 161 | 56 | 1870 | 1460 | 38689E3 | 18689E3 |
| | 68 | 25 x 30 | 0.52 | 161 | 56 | 1870 | 1460 | 58689E3 | 78689E3 |
| | 100 | 30 x 30 | 0.72 | 235 | 81 | 1270 | 1010 | 58101E3 | 78101E3 |
| | 100 | 25 x 40 | 0.72 | 235 | 81 | 1270 | 1010 | 48101E3 | 28101E3 |
| | 150 | 30 x 40 | 0.99 | 351 | 119 | 850 | 675 | 58151E3 | 78151E3 |
| | 150 | 25 x 50 | 0.99 | 351 | 119 | 850 | 675 | 48151E3 | 28151E3 |
| | 220 | 35 x 40 | 1.31 | 512 | 173 | 580 | 465 | 58221E3 | 78221E3 |
| | 220 | 30 x 50 | 1.31 | 512 | 173 | 580 | 465 | 48221E3 | 28221E3 |
| | 330 | 35 x 50 | 1.75 | 766 | 258 | 390 | 320 | 58331E3 | 78331E3 |
| 400 | 47 | 22 x 30 | 0.30 | 117 | 42 | 4260 | 3490 | 56479E3 | 76479E3 |
| | 68 | 22 x 35 | 0.38 | 167 | 58 | 2950 | 2420 | 36689E3 | 16689E3 |
| | 68 | 25 x 30 | 0.41 | 167 | 58 | 2950 | 2420 | 56689E3 | 76689E3 |
| | 100 | 30 x 30 | 0.55 | 244 | 84 | 2020 | 1660 | 56101E3 | 76101E3 |
| | 100 | 25 x 40 | 0.55 | 244 | 84 | 2020 | 1660 | 46101E3 | 26101E3 |
| | 150 | 30 x 35 | 0.68 | 364 | 124 | 1350 | 1110 | 36151E3 | 16151E3 |
| | 150 | 25 x 50 | 0.78 | 364 | 124 | 1350 | 1110 | 46151E3 | 26151E3 |
| | 220 | 35 x 40 | 0.94 | 532 | 180 | 930 | 760 | 56221E3 | 76221E3 |
| | 220 | 30 x 50 | 0.94 | 532 | 180 | 930 | 760 | 46221E3 | 26221E3 |
| | | 330 | 35 x 50 | 1.25 | 796 | 260 | 620 | 510 | 56331E3 |

| ADDITIONAL ELECTRICAL DATA | | |
|------------------------------------|-------------------------------|--|
| PARAMETER | CONDITIONS | VALUE |
| Voltage | | |
| Surge voltage | ≤ 250 V versions | U _s = 1.15 x U _R |
| | ≥ 385 V versions | U _s = 1.1 x U _R |
| Reverse voltage | | U _{rev} ≤ 1 V |
| Current | | |
| Leakage current | After 1 min at U _R | I _{L1} ≤ 0.006 C _R x U _R + 4 μA |
| | After 5 min at U _R | I _{L5} ≤ 0.002 C _R x U _R + 4 μA |
| Inductance | | |
| Equivalent series inductance (ESL) | All case sizes | Typ. 19 nH |
| | | Max. 25 nH |

CAPACITANCE (C)

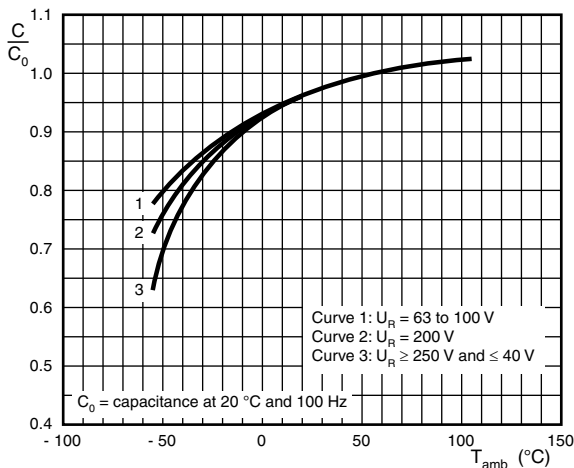


Fig. 6 - Typical multiplier of capacitance as a function of ambient temperature

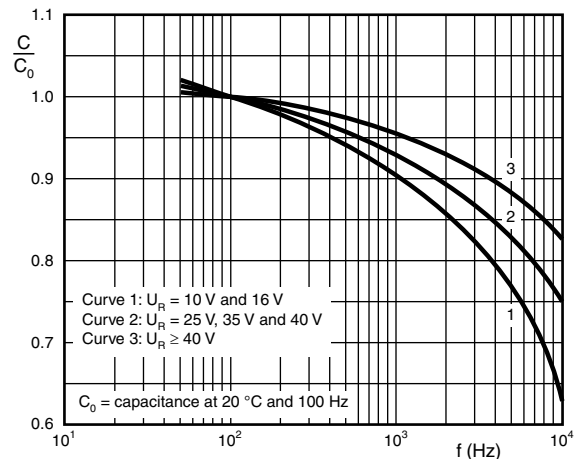


Fig. 7 - Typical multiplier of capacitance as a function of frequency



EQUIVALENT SERIES RESISTANCE (ESR)

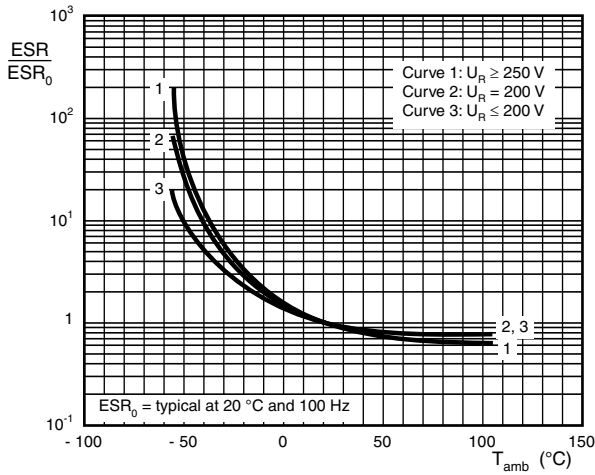


Fig. 8 - Typical multiplier of ESR as a function of ambient temperature

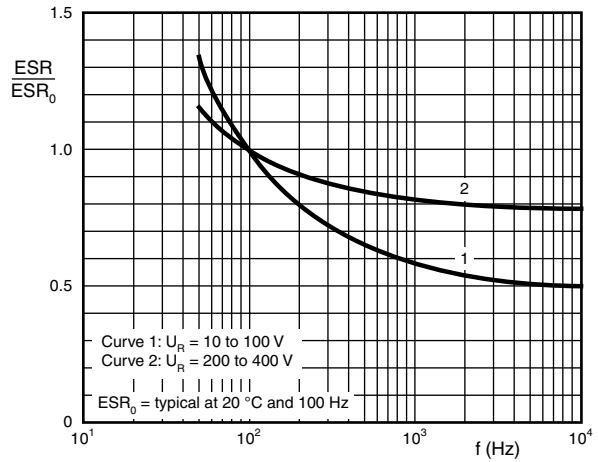


Fig. 9 - Typical multiplier of ESR as a function of frequency

IMPEDANCE (Z)

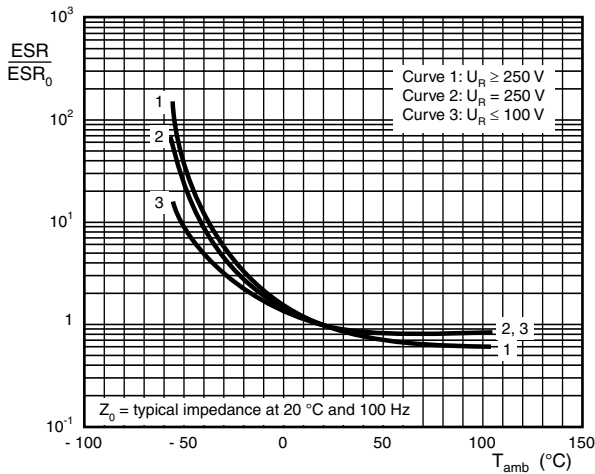


Fig. 10 - Typical multiplier of impedance as a function of ambient temperature

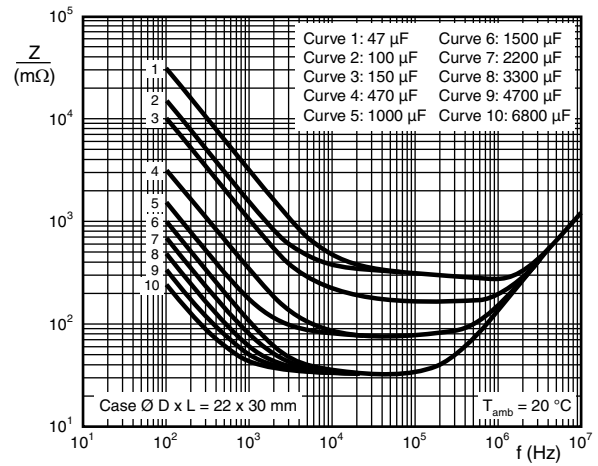


Fig. 12 - Typical impedance as a function of frequency

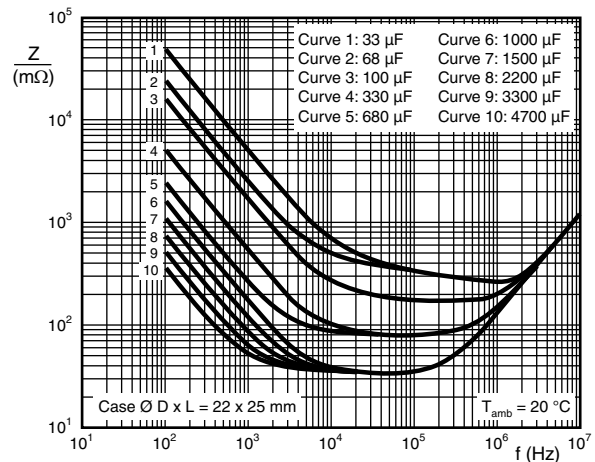


Fig. 11 - Typical impedance as a function of frequency

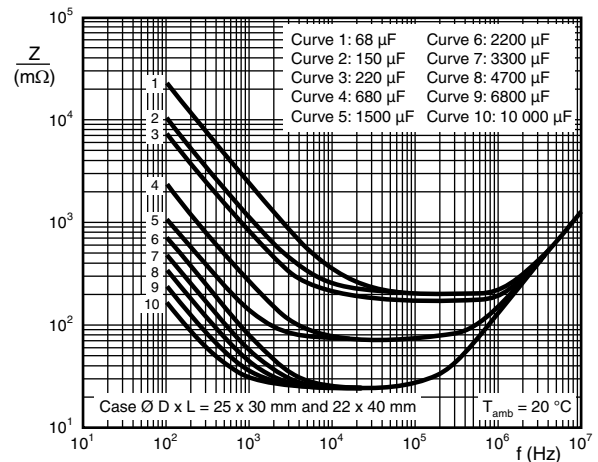


Fig. 13 - Typical impedance as a function of frequency



IMPEDANCE (Z)

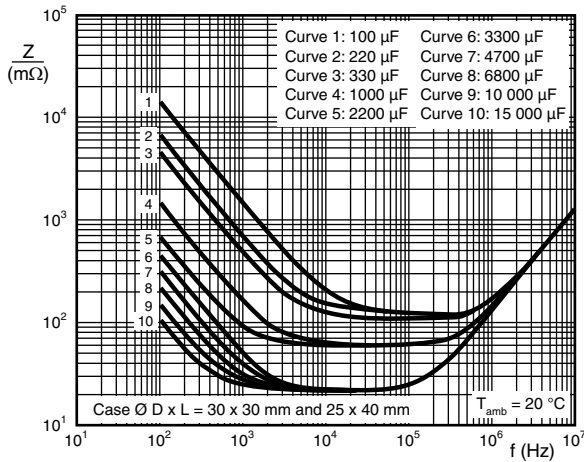


Fig. 14 - Typical impedance as a function of frequency

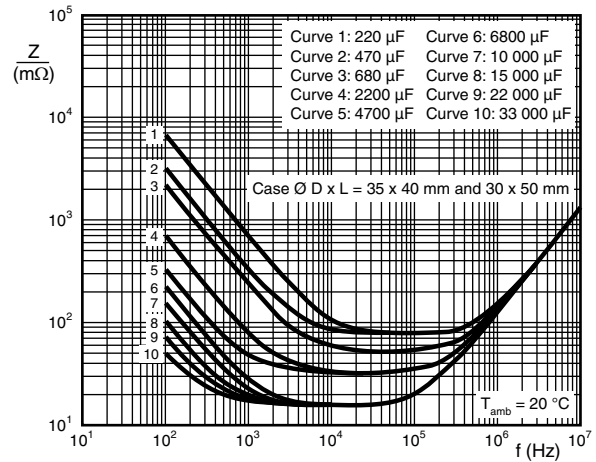


Fig. 16 - Typical impedance as a function of frequency

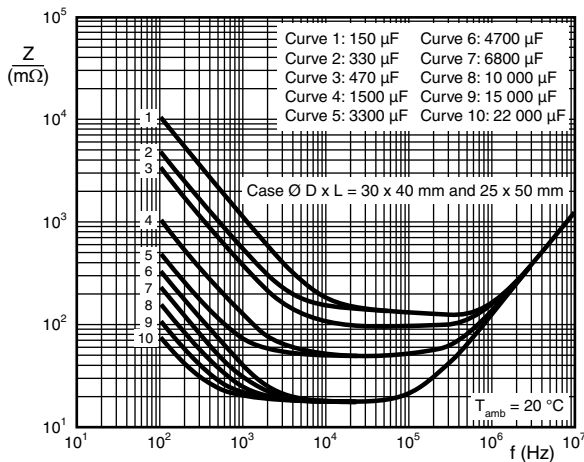


Fig. 15 - Typical impedance as a function of frequency

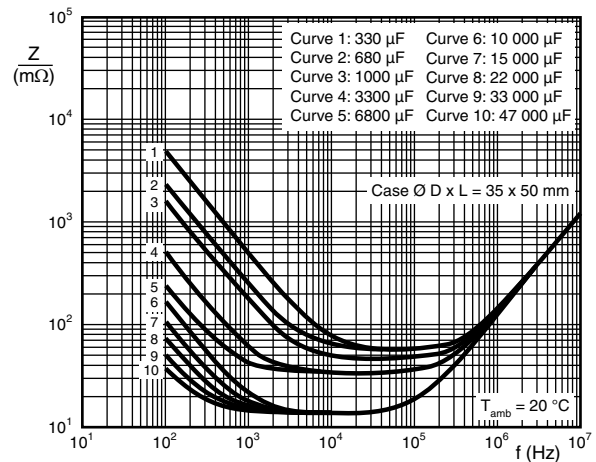


Fig. 17 - Typical impedance as a function of frequency

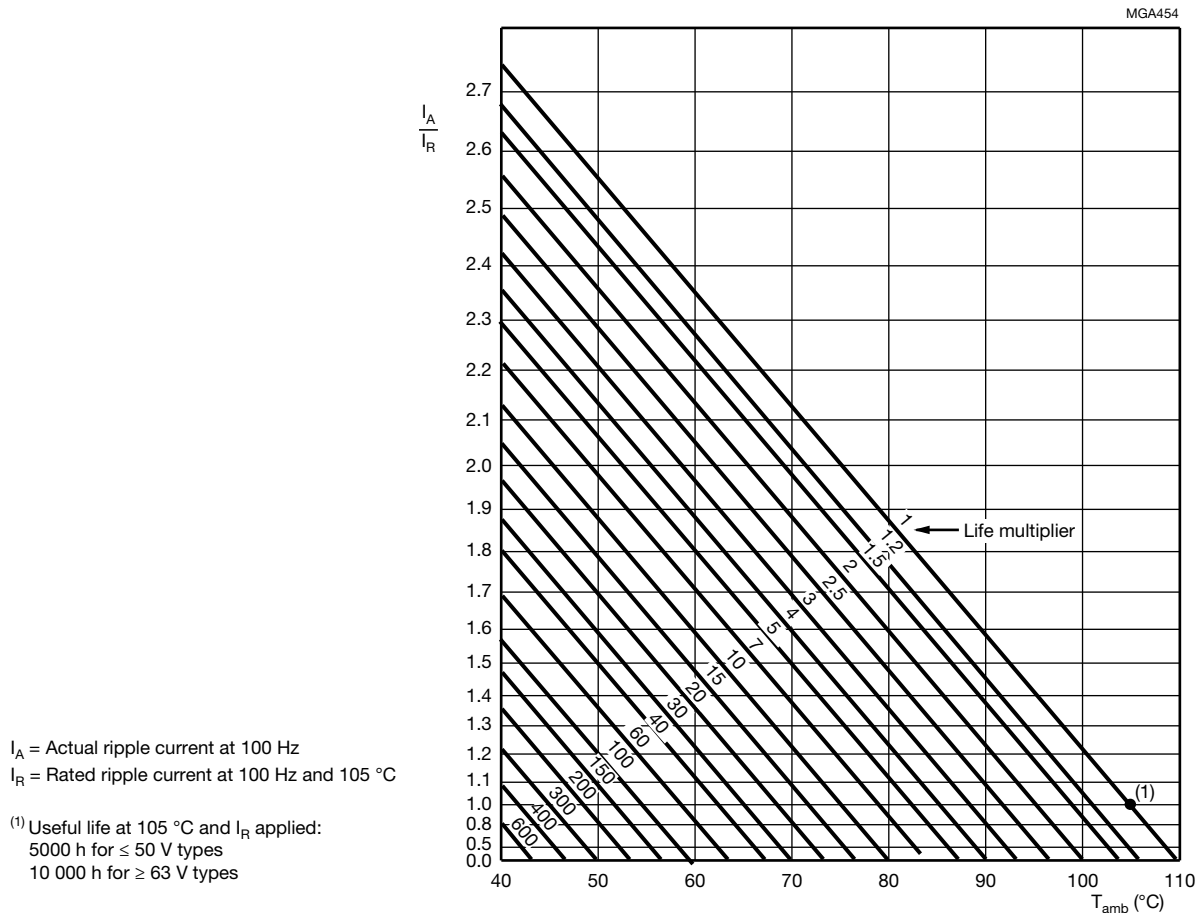
RIPPLE CURRENT AND USEFUL LIFE


Fig. 18 - 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 | | |
| | $U_R = 10\text{ V TO }25\text{ V}$ | $U_R = 40\text{ V TO }100\text{ V}$ | $U_R > 100\text{ V}$ |
| 50 | 0.93 | 0.91 | 0.86 |
| 100 | 1.00 | 1.00 | 1.00 |
| 200 | 1.04 | 1.05 | 1.13 |
| 400 | 1.07 | 1.09 | 1.21 |
| 1000 | 1.11 | 1.13 | 1.29 |
| 2000 | 1.13 | 1.15 | 1.32 |
| 4000 | 1.15 | 1.18 | 1.35 |
| ≥ 10 000 | 1.18 | 1.22 | 1.40 |



Table 5

| TEST PROCEDURES AND REQUIREMENTS | | | |
|--|---|---|--|
| TEST | | PROCEDURE (quick reference) | REQUIREMENTS |
| NAME OF TEST | REFERENCE | | |
| Endurance | IEC 60384-4/ EN 130300 subclause 4.13 | $T_{amb} = 105\text{ }^{\circ}\text{C}$; U_R applied; $\leq 50\text{ V}$ types: 2000 h; $\geq 63\text{ V}$ types: 5000 h | $U_R \leq 100\text{ V}$; $\Delta C/C: \pm 15\%$ $U_R > 100\text{ V}$; $\Delta C/C: \pm 10\%$ $ESR \leq 1.3 \times \text{spec. limit}$ $Z \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ |
| Useful life | CECC 30301 subclause 1.8.1 | $T_{amb} = 105\text{ }^{\circ}\text{C}$; U_R and I_R applied; $\leq 50\text{ V}$ types: 5000 h; $\geq 63\text{ V}$ types: 10 000 h | $U_R \leq 100\text{ V}$; $\Delta C/C: \pm 45\%$ $U_R > 100\text{ V}$; $\Delta C/C: \pm 30\%$ $ESR \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage total failure percentage; $U_R > 100\text{ V}: \leq 3\%$ |
| Shelf life (storage at high temperature) | IEC 60384-4/ EN 130300 subclause 4.17 | $T_{amb} = 105\text{ }^{\circ}\text{C}$; no voltage applied; 500 h After test: U_R to be applied for 30 min 24 h to 48 h before measurement | $\Delta C/C: \pm 10\%$ $ESR \leq 1.2 \times \text{spec. limit}$ $I_{L5} \leq 2 \times \text{spec. limit}$ |



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