

Aluminum Electrolytic Capacitors Power Ultra Miniature Snap-In


**RoHS
COMPLIANT**

FEATURES

- Up to 500 V
- Useful life: 5000 h at 85 °C
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, very small dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Keyed polarity version available
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- General purpose, industrial and audio/video systems
- Smoothing and filtering
- 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 on rated capacitance, code letter in accordance with IEC 60062 (M for $\pm 20\%$)
- Rated voltage (in V)
- Date code (YYMM or in 2 digits according to IEC 60062)
- 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, last 8 digits 157 xxxxx
- Climatic category in accordance with IEC 60068

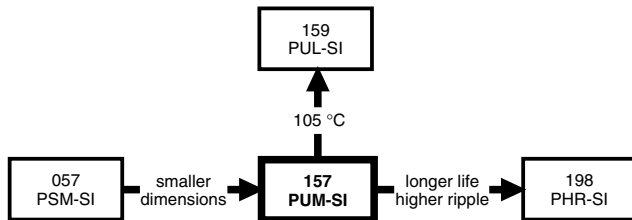


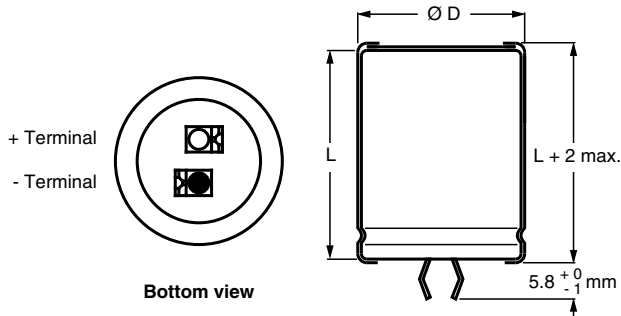
Fig. 1

| QUICK REFERENCE DATA | |
|--|--|
| DESCRIPTION | VALUE |
| Nominal case sizes (Ø D x L in mm) | 22 x 25 to 35 x 60 |
| Rated capacitance range (E6/E12 series), C_R | 56 μF to 2200 μF |
| Tolerance on C_R | $\pm 20\%$ |
| Rated voltage range, U_R | 200 V, 250 V 400 V, 450 V, 500 V |
| Category temperature range | -25 °C to +85 °C |
| Endurance test at 85 °C | 3000 h |
| Load life at 85 °C | 3000 h |
| Useful life at 85 °C | 5000 h |
| Useful life at 40 °C, 1.4 x I_R applied | 90 000 h |
| Shelf life at 0 V, 85 °C | 1000 h |
| Based on sectional specification | IEC 60384-4/EN130300 |
| Climatic category IEC 60038 | 25 / 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) | | | | |
| | 200 | 250 | 400 | 450 | 500 |
| 47 | - | - | - | - | 22 x 25 |
| 56 | - | - | - | 22 x 25 | - |
| 68 | - | - | 22 x 25 | 22 x 30 | 22 x 30 |
| | - | - | - | - | 25 x 25 |
| 82 | - | - | 22 x 25 | 22 x 30 | - |
| | - | - | - | 25 x 25 | - |
| 100 | - | - | 22 x 30 | 22 x 35 | 22 x 35 |
| | - | - | - | 25 x 30 | 25 x 30 |
| | - | - | - | - | 30 x 25 |



| SELECTION CHART FOR C _R , U _R , AND RELEVANT NOMINAL CASE SIZES (∅ D x L in mm) | | | | | |
|---|--------------------|---------|---------|---------|---------|
| C _R (μF) | U _R (V) | | | | |
| | 200 | 250 | 400 | 450 | 500 |
| 120 | - | - | 22 x 30 | 22 x 40 | 22 x 40 |
| | - | - | - | 25 x 30 | 25 x 35 |
| | - | - | - | 30 x 25 | - |
| 150 | - | - | 22 x 35 | 25 x 35 | 25 x 40 |
| | - | - | 25 x 30 | 25 x 40 | 30 x 30 |
| | - | - | - | 30 x 30 | - |
| 180 | - | - | 22 x 40 | 25 x 40 | 25 x 45 |
| | - | - | 25 x 35 | 30 x 35 | 30 x 35 |
| | - | - | - | 35 x 25 | - |
| 220 | - | 22 x 30 | 25 x 40 | 25 x 50 | 30 x 40 |
| | - | - | 30 x 30 | 30 x 40 | 35 x 30 |
| | - | - | 35 x 25 | 35 x 30 | - |
| 270 | 22 x 25 | 22 x 30 | 25 x 45 | 30 x 45 | 30 x 45 |
| | - | 25 x 25 | 30 x 35 | 35 x 35 | 35 x 35 |
| | - | - | 35 x 30 | - | - |
| 330 | 22 x 30 | 22 x 35 | 30 x 40 | 30 x 50 | 30 x 50 |
| | - | 25 x 30 | 35 x 30 | 35 x 40 | 35 x 40 |
| 390 | 22 x 30 | 22 x 40 | 30 x 45 | 35 x 45 | 35 x 45 |
| | - | 30 x 25 | 35 x 35 | - | - |
| 470 | 22 x 35 | 25 x 35 | 30 x 50 | 35 x 50 | 35 x 50 |
| | 25 x 30 | 30 x 30 | 35 x 40 | - | - |
| 560 | 22 x 40 | 25 x 40 | 35 x 45 | - | 35 x 60 |
| | 25 x 35 | 30 x 30 | - | - | - |
| | 30 x 25 | 35 x 25 | - | - | - |
| 680 | 25 x 40 | 25 x 45 | 35 x 50 | 35 x 60 | - |
| | 30 x 30 | 30 x 35 | - | - | - |
| | 35 x 25 | 35 x 30 | - | - | - |
| 820 | 25 x 45 | 30 x 40 | 35 x 60 | - | - |
| | 30 x 35 | 35 x 35 | - | - | - |
| | 35 x 30 | - | - | - | - |
| 1000 | 30 x 40 | 30 x 45 | - | - | - |
| | 35 x 30 | 35 x 40 | - | - | - |
| 1200 | 30 x 45 | 35 x 45 | - | - | - |
| | 35 x 35 | - | - | - | - |
| 1500 | 30 x 50 | 35 x 50 | - | - | - |
| | 35 x 40 | - | - | - | - |
| 1800 | 35 x 45 | - | - | - | - |
| 2200 | 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

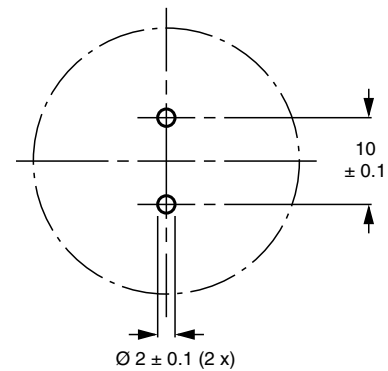
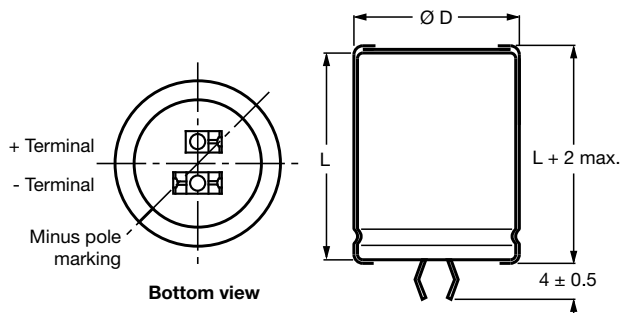
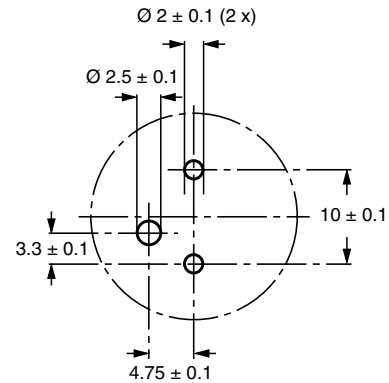


Fig. 3 - Mounting hole diagram

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) |
| 22 x 25 | 23 | 27 | ≈ 12 | 100 |
| 22 x 30 | 23 | 32 | ≈ 16 | 100 |
| 22 x 35 | 23 | 37 | ≈ 20 | 100 |
| 22 x 40 | 23 | 42 | ≈ 23 | 100 |
| 25 x 25 | 26 | 27 | ≈ 20 | 100 |
| 25 x 30 | 26 | 32 | ≈ 22 | 100 |
| 25 x 35 | 26 | 37 | ≈ 24 | 100 |
| 25 x 40 | 26 | 42 | ≈ 27 | 100 |
| 25 x 45 | 26 | 47 | ≈ 32 | 100 |
| 25 x 50 | 26 | 52 | ≈ 38 | 100 |



| 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) |
| 30 x 25 | 31 | 27 | ≈ 25 | 100 |
| 30 x 30 | 31 | 32 | ≈ 30 | 100 |
| 30 x 35 | 31 | 37 | ≈ 35 | 100 |
| 30 x 40 | 31 | 42 | ≈ 40 | 100 |
| 30 x 45 | 31 | 47 | ≈ 45 | 100 |
| 30 x 50 | 31 | 52 | ≈ 50 | 100 |
| 35 x 25 | 36 | 27 | ≈ 33 | 50 |
| 35 x 30 | 36 | 32 | ≈ 40 | 50 |
| 35 x 35 | 36 | 37 | ≈ 48 | 50 |
| 35 x 40 | 36 | 42 | ≈ 55 | 50 |
| 35 x 45 | 36 | 47 | ≈ 63 | 50 |
| 35 x 50 | 36 | 52 | ≈ 72 | 50 |
| 35 x 60 | 36 | 62 | ≈ 82 | 50 |

| ELECTRICAL DATA | |
|------------------------|---|
| SYMBOL | DESCRIPTION |
| C _R | Rated capacitance at 100 Hz/120 Hz |
| I _R | Rated RMS ripple current at 120 Hz, 85 °C |
| I _{L5} | Max. leakage current after 5 min at U _R |
| ESR | Typ./max. equivalent series resistance at 100 Hz ⁽¹⁾ |
| Z | Typ./max. impedance at 10 kHz |

Notes

- ⁽¹⁾ ESR at 120 Hz is approximately 0.95 x ESR 100 Hz
- 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 157 series
 1000 µF/200 V; ± 20 %
 Nominal case size: Ø 30 x 40 mm
 2-terminal snap-in:
 Ordering code: MAL2 157 52102 E3
 Former 12NC: 2222 157 52102

3-terminal snap-in:
 Ordering code: MAL2 157 72102 E3
 Former 12NC: 2222 157 72102



Table 2

| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | |
|--|----------------------------------|---|--|----------------------------------|---|---|--------------------------|--------------------------|-------------------------------|---------|
| U _R (V) | C _R 100 Hz (μF) | NOMINAL CASE SIZE Ø D x L (mm) | I _R 120 Hz 85 °C (A) | I _{L5} 5 min (mA) | TYP. ESR 100 Hz ⁽¹⁾ (mΩ) | MAX. ESR 100 Hz ⁽¹⁾ (mΩ) | TYP. Z 10 kHz (mΩ) | MAX. Z 10 kHz (mΩ) | ORDERING CODE MAL2157..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 200 | 270 | 22 x 25 | 1.15 | 0.54 | 550 | 880 | 420 | 700 | 52271E3 | 72271E3 |
| | 330 | 22 x 30 | 1.36 | 0.66 | 430 | 720 | 300 | 500 | 52331E3 | 72331E3 |
| | 390 | 22 x 30 | 1.46 | 0.78 | 390 | 650 | 295 | 490 | 52391E3 | 72391E3 |
| | 470 | 22 x 35 | 1.68 | 0.94 | 350 | 580 | 240 | 400 | 32471E3 | 12471E3 |
| | 470 | 25 x 30 | 1.67 | 0.94 | 350 | 580 | 240 | 400 | 52471E3 | 72471E3 |
| | 560 | 22 x 40 | 1.91 | 1.12 | 255 | 425 | 235 | 390 | 42561E3 | 22561E3 |
| | 560 | 25 x 35 | 1.91 | 1.12 | 255 | 425 | 235 | 390 | 32561E3 | 12561E3 |
| | 560 | 30 x 25 | 1.89 | 1.12 | 255 | 425 | 235 | 390 | 52561E3 | 72561E3 |
| | 680 | 25 x 40 | 2.18 | 1.36 | 210 | 350 | 205 | 340 | 42681E3 | 22681E3 |
| | 680 | 30 x 30 | 2.04 | 1.36 | 210 | 350 | 205 | 340 | 52681E3 | 72681E3 |
| | 680 | 35 x 25 | 2.06 | 1.36 | 210 | 350 | 205 | 340 | 62681E3 | 82681E3 |
| | 820 | 25 x 45 | 2.46 | 1.64 | 170 | 290 | 145 | 240 | 62821E3 | 82821E3 |
| | 820 | 30 x 35 | 2.35 | 1.64 | 170 | 290 | 145 | 240 | 32821E3 | 12821E3 |
| | 820 | 35 x 30 | 2.29 | 1.64 | 170 | 290 | 145 | 240 | 52821E3 | 72821E3 |
| | 1000 | 30 x 40 | 2.66 | 2.00 | 140 | 235 | 135 | 225 | 52102E3 | 72102E3 |
| | 1000 | 35 x 30 | 2.33 | 2.00 | 140 | 235 | 135 | 225 | 62102E3 | 82102E3 |
| | 1200 | 30 x 45 | 2.98 | 2.40 | 120 | 200 | 110 | 190 | 32122E3 | 12122E3 |
| | 1200 | 35 x 35 | 2.69 | 2.40 | 120 | 200 | 110 | 190 | 62122E3 | 82122E3 |
| 1500 | 30 x 50 | 3.31 | 3.00 | 110 | 180 | 95 | 155 | 42152E3 | 22152E3 | |
| 1500 | 35 x 40 | 3.04 | 3.00 | 110 | 180 | 95 | 155 | 52152E3 | 72152E3 | |
| 1800 | 35 x 45 | 3.36 | 3.60 | 100 | 160 | 80 | 130 | 42182E3 | 22182E3 | |
| 2200 | 35 x 50 | 3.68 | 4.40 | 90 | 150 | 65 | 105 | 52222E3 | 72222E3 | |
| 250 | 220 | 22 x 30 | 1.23 | 0.55 | 600 | 1080 | 420 | 700 | 53221E3 | 73221E3 |
| | 270 | 22 x 30 | 1.32 | 0.67 | 490 | 880 | 335 | 560 | 43271E3 | 23271E3 |
| | 270 | 25 x 25 | 1.23 | 0.67 | 490 | 880 | 335 | 560 | 53271E3 | 73271E3 |
| | 330 | 22 x 35 | 1.53 | 0.82 | 400 | 720 | 255 | 430 | 33331E3 | 13331E3 |
| | 330 | 25 x 30 | 1.56 | 0.82 | 400 | 720 | 255 | 430 | 53331E3 | 73331E3 |
| | 390 | 22 x 40 | 1.74 | 0.97 | 330 | 610 | 250 | 425 | 43391E3 | 23391E3 |
| | 390 | 30 x 25 | 1.58 | 0.97 | 330 | 610 | 250 | 425 | 53391E3 | 73391E3 |
| | 470 | 25 x 35 | 1.87 | 1.17 | 280 | 505 | 190 | 320 | 33471E3 | 13471E3 |
| | 470 | 30 x 30 | 1.89 | 1.17 | 280 | 505 | 190 | 320 | 53471E3 | 73471E3 |
| | 560 | 25 x 40 | 2.12 | 1.40 | 240 | 425 | 185 | 310 | 43561E3 | 23561E3 |
| | 560 | 30 x 30 | 1.97 | 1.40 | 240 | 425 | 185 | 310 | 53561E3 | 73561E3 |
| | 560 | 35 x 25 | 1.80 | 1.40 | 240 | 425 | 185 | 310 | 63561E3 | 83561E3 |
| | 680 | 25 x 45 | 2.29 | 1.70 | 200 | 350 | 155 | 260 | 63681E3 | 83681E3 |
| | 680 | 30 x 35 | 2.28 | 1.70 | 200 | 350 | 155 | 260 | 33681E3 | 13681E3 |
| | 680 | 35 x 30 | 2.20 | 1.70 | 200 | 350 | 155 | 260 | 53681E3 | 73681E3 |
| | 820 | 30 x 40 | 2.57 | 2.05 | 160 | 290 | 125 | 210 | 53821E3 | 73821E3 |
| | 820 | 35 x 35 | 2.54 | 2.05 | 160 | 290 | 125 | 210 | 63821E3 | 83821E3 |
| | 1000 | 30 x 45 | 2.88 | 2.50 | 140 | 235 | 105 | 180 | 33102E3 | 13102E3 |
| 1000 | 35 x 40 | 2.86 | 2.50 | 140 | 235 | 105 | 180 | 53102E3 | 73102E3 | |
| 1200 | 35 x 45 | 3.17 | 3.00 | 120 | 200 | 95 | 160 | 43122E3 | 23122E3 | |
| 1500 | 35 x 50 | 3.49 | 3.75 | 90 | 160 | 85 | 140 | 53152E3 | 73152E3 | |



| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | |
|--|----------------------------------|---|--|----------------------------------|---|---|--------------------------|--------------------------|-------------------------------|---------|
| U _R (V) | C _R 100 Hz (μF) | NOMINAL CASE SIZE Ø D x L (mm) | I _R 120 Hz 85 °C (A) | I _{L5} 5 min (mA) | TYP. ESR 100 Hz ⁽¹⁾ (mΩ) | MAX. ESR 100 Hz ⁽¹⁾ (mΩ) | TYP. Z 10 kHz (mΩ) | MAX. Z 10 kHz (mΩ) | ORDERING CODE MAL2157..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 400 | 68 | 22 x 25 | 0.71 | 0.27 | 1400 | 2800 | 1170 | 1950 | 56689E3 | 76689E3 |
| | 82 | 22 x 25 | 0.77 | 0.33 | 1250 | 2500 | 970 | 1620 | 56829E3 | 76829E3 |
| | 100 | 22 x 30 | 0.94 | 0.40 | 1125 | 2250 | 750 | 1220 | 56101E3 | 76101E3 |
| | 120 | 22 x 30 | 0.97 | 0.48 | 990 | 1980 | 700 | 1140 | 56121E3 | 76121E3 |
| | 150 | 22 x 35 | 1.13 | 0.60 | 750 | 1500 | 540 | 900 | 36151E3 | 16151E3 |
| | 150 | 25 x 30 | 1.16 | 0.60 | 750 | 1500 | 540 | 900 | 56151E3 | 76151E3 |
| | 180 | 22 x 40 | 1.29 | 0.72 | 630 | 1260 | 435 | 725 | 46181E3 | 26181E3 |
| | 180 | 25 x 35 | 1.35 | 0.72 | 630 | 1260 | 435 | 725 | 36181E3 | 16181E3 |
| | 220 | 25 x 40 | 1.54 | 0.88 | 520 | 1040 | 355 | 590 | 46221E3 | 26221E3 |
| | 220 | 30 x 30 | 1.50 | 0.88 | 520 | 1040 | 355 | 590 | 56221E3 | 76221E3 |
| | 220 | 35 x 25 | 1.42 | 0.88 | 520 | 1040 | 355 | 590 | 66221E3 | 86221E3 |
| | 270 | 25 x 45 | 1.72 | 1.08 | 430 | 860 | 335 | 560 | 66271E3 | 86271E3 |
| | 270 | 30 x 35 | 1.74 | 1.08 | 430 | 860 | 335 | 560 | 36271E3 | 16271E3 |
| | 270 | 35 x 30 | 1.71 | 1.08 | 430 | 860 | 335 | 560 | 56271E3 | 76271E3 |
| | 330 | 30 x 40 | 1.97 | 1.32 | 350 | 700 | 315 | 525 | 56331E3 | 76331E3 |
| | 330 | 35 x 30 | 1.76 | 1.32 | 350 | 700 | 315 | 525 | 66331E3 | 86331E3 |
| | 390 | 30 x 45 | 2.19 | 1.56 | 300 | 610 | 250 | 420 | 56391E3 | 76391E3 |
| | 390 | 35 x 35 | 2.04 | 1.56 | 300 | 610 | 250 | 420 | 36391E3 | 16391E3 |
| | 470 | 30 x 50 | 2.40 | 1.88 | 250 | 505 | 210 | 350 | 46471E3 | 26471E3 |
| | 470 | 35 x 40 | 2.30 | 1.88 | 250 | 505 | 210 | 350 | 56471E3 | 76471E3 |
| 560 | 35 x 45 | 2.55 | 2.24 | 210 | 425 | 180 | 305 | 46561E3 | 26561E3 | |
| 680 | 35 x 50 | 2.79 | 2.72 | 190 | 380 | 160 | 265 | 56681E3 | 76681E3 | |
| 820 | 35 x 60 | 3.33 | 3.28 | 155 | 315 | 115 | 215 | 56821E3 | 76821E3 | |
| 450 | 56 | 22 x 25 | 0.68 | 0.25 | 1650 | 3300 | 1120 | 1880 | 57569E3 | 77569E3 |
| | 68 | 22 x 30 | 0.80 | 0.30 | 1400 | 2800 | 920 | 1530 | 57689E3 | 77689E3 |
| | 82 | 22 x 30 | 0.87 | 0.36 | 1200 | 2400 | 780 | 1290 | 47829E3 | 27829E3 |
| | 82 | 25 x 25 | 0.85 | 0.36 | 1200 | 2400 | 780 | 1290 | 57829E3 | 77829E3 |
| | 100 | 22 x 35 | 1.00 | 0.45 | 1000 | 2000 | 630 | 1050 | 37101E3 | 17101E3 |
| | 100 | 25 x 30 | 1.02 | 0.45 | 1000 | 2000 | 630 | 1050 | 57101E3 | 77101E3 |
| | 120 | 22 x 40 | 1.15 | 0.54 | 800 | 1600 | 530 | 885 | 47121E3 | 27121E3 |
| | 120 | 25 x 30 | 1.09 | 0.54 | 800 | 1600 | 530 | 885 | 57121E3 | 77121E3 |
| | 120 | 30 x 25 | 1.10 | 0.54 | 800 | 1600 | 530 | 885 | 67121E3 | 87121E3 |
| | 150 | 25 x 40 | 1.35 | 0.67 | 650 | 1300 | 420 | 705 | 47151E3 | 27151E3 |
| | 150 | 25 x 35 | 1.27 | 0.67 | 650 | 1300 | 420 | 705 | 67151E3 | 87151E3 |
| | 150 | 30 x 30 | 1.32 | 0.67 | 650 | 1300 | 420 | 705 | 57151E3 | 77151E3 |
| | 180 | 25 x 40 | 1.45 | 0.81 | 570 | 1150 | 360 | 605 | 47181E3 | 27181E3 |
| | 180 | 30 x 35 | 1.49 | 0.81 | 570 | 1150 | 360 | 605 | 57181E3 | 77181E3 |
| | 180 | 35 x 25 | 1.35 | 0.81 | 570 | 1150 | 360 | 605 | 67181E3 | 87181E3 |
| | 220 | 25 x 50 | 1.73 | 0.99 | 450 | 900 | 315 | 525 | 47221E3 | 27221E3 |
| | 220 | 30 x 40 | 1.72 | 0.99 | 450 | 900 | 315 | 525 | 57221E3 | 77221E3 |
| | 220 | 35 x 30 | 1.61 | 0.99 | 450 | 900 | 315 | 525 | 67221E3 | 87221E3 |
| | 270 | 30 x 45 | 1.95 | 1.21 | 380 | 770 | 270 | 450 | 37271E3 | 17271E3 |
| | 270 | 35 x 35 | 1.86 | 1.21 | 380 | 770 | 270 | 450 | 67271E3 | 87271E3 |
| 330 | 30 x 50 | 2.19 | 1.48 | 300 | 600 | 230 | 390 | 47331E3 | 27331E3 | |
| 330 | 35 x 40 | 2.10 | 1.48 | 300 | 600 | 230 | 390 | 57331E3 | 77331E3 | |
| 390 | 35 x 45 | 2.34 | 1.75 | 250 | 500 | 190 | 340 | 47391E3 | 27391E3 | |
| 470 | 35 x 50 | 2.60 | 2.11 | 210 | 420 | 170 | 290 | 57471E3 | 77471E3 | |
| 680 | 35 x 60 | 3.15 | 3.06 | 150 | 300 | 110 | 200 | 57681E3 | 77681E3 | |



| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | |
|--|----------------------------------|---|--|----------------------------------|---|---|--------------------------|--------------------------|-------------------------------|---------|
| U _R (V) | C _R 100 Hz (μF) | NOMINAL CASE SIZE Ø D x L (mm) | I _R 120 Hz 85 °C (A) | I _{L5} 5 min (mA) | TYP. ESR 100 Hz ⁽¹⁾ (mΩ) | MAX. ESR 100 Hz ⁽¹⁾ (mΩ) | TYP. Z 10 kHz (mΩ) | MAX. Z 10 kHz (mΩ) | ORDERING CODE MAL2157..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 500 | 47 | 22 x 25 | 0.68 | 0.24 | 2834 | 3540 | 2095 | 2930 | 59479E3 | 79479E3 |
| | 68 | 22 x 30 | 0.85 | 0.34 | 1961 | 2450 | 1451 | 2030 | 59689E3 | 79689E3 |
| | 68 | 25 x 25 | 0.86 | 0.34 | 1979 | 2470 | 1469 | 2060 | 49689E3 | 29689E3 |
| | 100 | 22 x 35 | 1.07 | 0.50 | 1339 | 1670 | 992 | 1390 | 59101E3 | 79101E3 |
| | 100 | 25 x 30 | 1.08 | 0.50 | 1349 | 1690 | 1003 | 1400 | 49101E3 | 29101E3 |
| | 100 | 30 x 25 | 1.13 | 0.50 | 1375 | 1720 | 1030 | 1440 | 39101E3 | 19101E3 |
| | 120 | 22 x 40 | 1.24 | 0.60 | 1117 | 1400 | 828 | 1160 | 59121E3 | 79121E3 |
| | 120 | 25 x 35 | 1.23 | 0.60 | 1122 | 1400 | 833 | 1170 | 49121E3 | 29121E3 |
| | 150 | 25 x 40 | 1.43 | 0.75 | 901 | 1130 | 670 | 940 | 59151E3 | 79151E3 |
| | 150 | 30 x 30 | 1.42 | 0.75 | 922 | 1150 | 693 | 970 | 49151E3 | 29151E3 |
| | 180 | 25 x 45 | 1.65 | 0.90 | 752 | 940 | 560 | 780 | 59181E3 | 79181E3 |
| | 180 | 30 x 35 | 1.61 | 0.90 | 765 | 960 | 573 | 800 | 49181E3 | 29181E3 |
| | 220 | 30 x 40 | 1.84 | 1.10 | 629 | 790 | 472 | 660 | 59221E3 | 79221E3 |
| | 220 | 35 x 30 | 1.83 | 1.10 | 660 | 830 | 505 | 710 | 49221E3 | 29221E3 |
| | 270 | 30 x 45 | 2.11 | 1.35 | 515 | 640 | 387 | 540 | 59271E3 | 79271E3 |
| | 270 | 35 x 35 | 2.09 | 1.35 | 534 | 670 | 408 | 570 | 49271E3 | 29271E3 |
| | 330 | 30 x 50 | 2.40 | 1.65 | 426 | 530 | 322 | 450 | 59331E3 | 79331E3 |
| | 330 | 35 x 40 | 2.36 | 1.65 | 441 | 550 | 337 | 470 | 49331E3 | 29331E3 |
| | 390 | 35 x 45 | 2.63 | 1.95 | 374 | 470 | 286 | 400 | 59391E3 | 79391E3 |
| | 470 | 35 x 50 | 2.92 | 2.35 | 316 | 400 | 244 | 340 | 59471E3 | 79471E3 |
| 560 | 35 x 60 | 3.40 | 2.80 | 262 | 330 | 201 | 280 | 59561E3 | 79561E3 | |

Note

⁽¹⁾ ESR at 120 Hz is approximately 0.95 x ESR 100 Hz

| ADDITIONAL ELECTRICAL DATA | | |
|------------------------------------|-------------------------------|--|
| PARAMETER | CONDITIONS | VALUE |
| Voltage | | |
| Surge voltage | ≥ 400 V versions | U _s = 1.1 x U _R |
| | ≤ 250 V versions | U _s = 1.15 x U _R |
| Reverse voltage | | ≤ 1 V |
| Current | | |
| Leakage current | After 5 min at U _R | I _{L5} ≤ 0.01 C _R x U _R |
| Inductance | | |
| Equivalent series inductance (ESL) | All case sizes | Typ. 19 nH |
| | | Max. 25 nH |



RIPPLE CURRENT AND USEFUL LIFE

MGA453

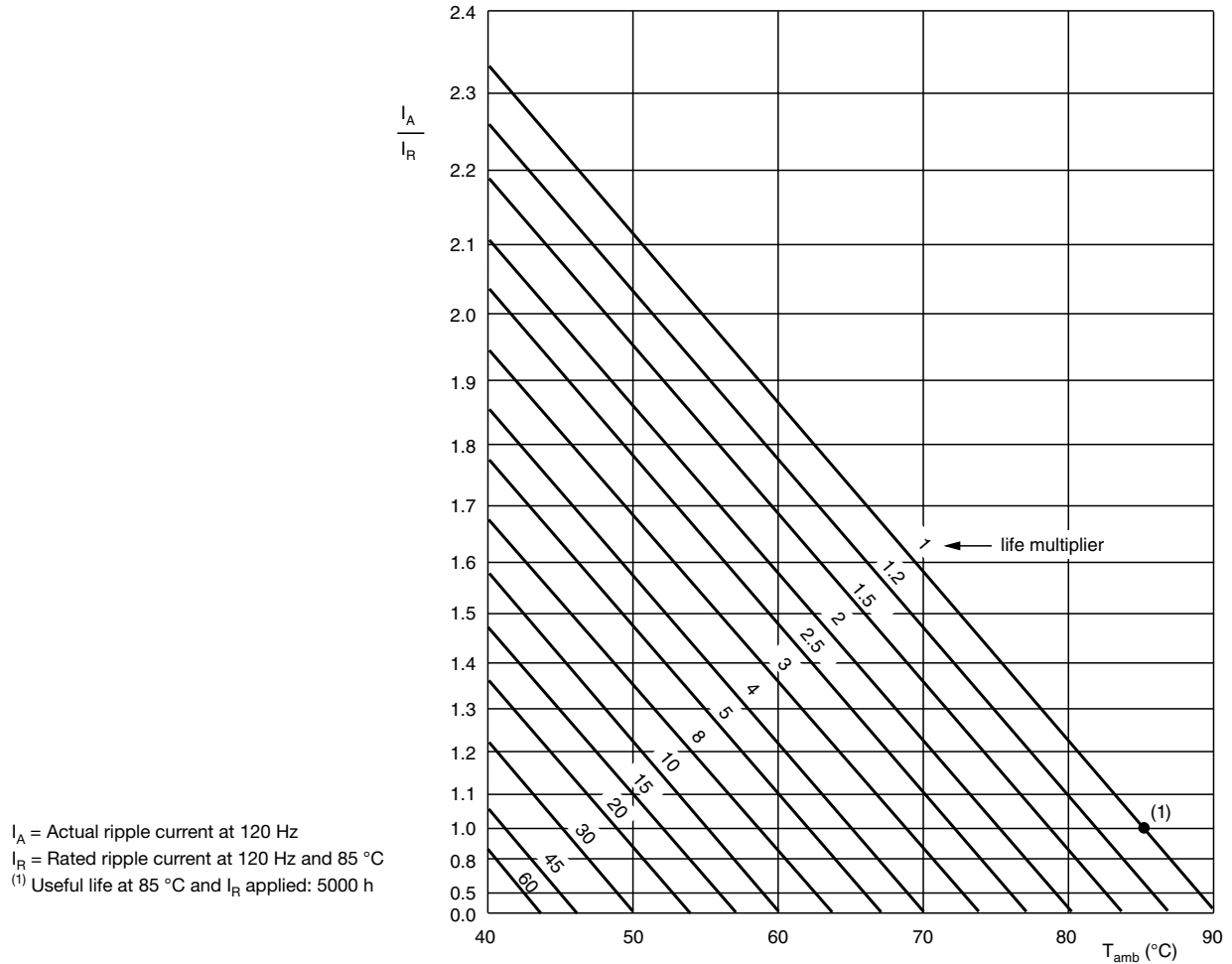


Fig. 6 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 3

| MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY | |
|---|------------------|
| FREQUENCY (Hz) | I_R MULTIPLIER |
| 50 | 0.90 |
| 100 | 0.95 |
| 120 | 1.00 |
| 200 | 1.15 |
| 1000 | 1.30 |
| ≥ 10 000 | 1.40 |



Table 4

| TEST PROCEDURES AND REQUIREMENTS | | | |
|--|--|--|--|
| TEST | | PROCEDURE (quick reference) | REQUIREMENTS |
| NAME OF TEST | REFERENCE | | |
| Endurance | IEC 60384-4/ EN130300 subclause 4.13 | $T_{amb} = 85\text{ }^{\circ}\text{C}$; U_R applied; 3000 h | $\Delta C/C: \pm 10\%$ $ESR \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ |
| Load life | | $T_{amb} = 85\text{ }^{\circ}\text{C}$; U_R and I_R applied; 3000 h | $\Delta C/C: \pm 20\%$ $ESR \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ |
| Useful life | CECC 30301 subclause 1.8.1 | $T_{amb} = 85\text{ }^{\circ}\text{C}$; U_R and I_R applied; 5000 h | $\Delta C/C: \pm 30\%$ $ESR \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage total failure percentage: $\leq 3\%$ |
| Shelf life (storage at high temperature) | IEC 60384-4/ EN130300 subclause 4.17 | $T_{amb} = 85\text{ }^{\circ}\text{C}$; no voltage applied; 1000 h After test: U_R to be applied for 30 min, 24 h to 48 h before measurement | $\Delta C/C: \pm 15\%$ $ESR \leq 1.5 \times \text{spec. limit}$ $I_{L5} \leq 1 \times \text{spec. limit}$ |



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