

Aluminum Capacitors Power Ultra Long Life Snap-In



Fig. 1

| QUICK REFERENCE DATA | |
|---|------------------------|
| DESCRIPTION | VALUE |
| Nominal case size (Ø D x L in mm) | 22 x 25 to 35 x 60 |
| Rated capacitance range (E6/E12 series), C _R | 56 µF to 1800 µF |
| Tolerance on C _R | ± 20 % |
| Rated voltage range, U _R | 200 V to 450 V 500 V |
| Category temperature range | -25 °C to +105 °C |
| Endurance test at 105 °C | 2000 h |
| Load life at 105 °C | 2000 h |
| Useful life at 105 °C | 5000 h 3000 h |
| Useful life at 40 °C and 1.6 x I _R applied | 500 000 h 300 000 h |
| Shelf life at 0 V, 105 °C | 1000 h |
| Based on sectional specification | IEC 60384-4/EN130300 |
| Climatic category IEC 60068 | 25/105/56 |

FEATURES

- Useful life: 3000 h to 5000 h at 105 °C
- Available up to 500 V
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, very small dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Low ESR, high ripple current capability
- Keyed polarity snap-in version available
- High reliability
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912


APPLICATIONS

- Solar PV inverters
- General purpose, industrial and audio/video systems
- Smoothing and filtering
- Standard and switched mode power supplies
- Energy storage in pulse systems

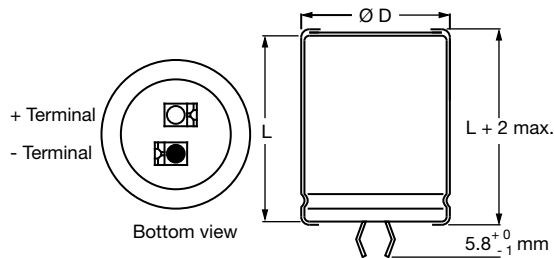
MARKING

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

- Rated capacitance (in µF)
- Tolerance code on rated capacitance, code letter in accordance with IEC 60062 (M for ± 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 159 xxxxx
- Climatic category in accordance with IEC 60068

| 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 |
| 56 | - | - | - | 22 x 25 | - |
| 68 | - | - | 22 x 25 | 22 x 30 | 22 x 30 |
| | - | - | - | 25 x 25 | - |
| 82 | - | - | 22 x 30 | 22 x 35 | 22 x 35 |
| | - | - | 25 x 25 | - | - |
| 100 | - | - | 22 x 35 | 22 x 40 | - |
| | - | - | 25 x 30 | 25 x 30 | 25 x 35 |
| | - | - | - | 30 x 25 | - |
| 120 | - | - | 22 x 35 | - | - |
| | - | - | 25 x 30 | 25 x 35 | 25 x 40 |
| | - | - | 30 x 25 | - | - |
| 150 | - | - | 22 x 40 | 25 x 40 | 25 x 45 |
| | - | - | 25 x 35 | 30 x 30 | 30 x 35 |
| | - | - | 30 x 30 | 35 x 25 | - |
| | - | - | 25 x 40 | 25 x 45 | - |
| 180 | - | - | 30 x 30 | 30 x 35 | 30 x 35 |
| | - | - | 35 x 25 | - | - |
| | - | 22 x 30 | 25 x 45 | 30 x 40 | 30 x 40 |
| 220 | - | 25 x 25 | 30 x 35 | 35 x 30 | - |
| | - | - | 35 x 30 | - | - |
| | - | - | - | - | - |

| SELECTION CHART FOR C_R , U_R , AND RELEVANT NOMINAL CASE SIZES ($\varnothing D \times L$ in mm) | | | | | |
|---|-----------|---------|---------|---------|---------|
| C_R (μF) | U_R (V) | | | | |
| | 200 | 250 | 400 | 450 | 500 |
| 270 | - | 22 x 35 | 25 x 50 | 30 x 45 | 30 x 50 |
| | - | 25 x 30 | 30 x 40 | 35 x 35 | - |
| | - | 30 x 25 | 35 x 30 | - | - |
| 330 | 22 x 30 | 22 x 40 | 30 x 45 | 30 x 50 | - |
| | - | 25 x 30 | 35 x 35 | 35 x 40 | 35 x 45 |
| | - | 30 x 25 | - | - | - |
| 390 | 22 x 35 | 25 x 35 | 30 x 50 | 35 x 45 | 35 x 50 |
| | 25 x 30 | 30 x 30 | 35 x 40 | - | - |
| 470 | 22 x 40 | 25 x 40 | 35 x 45 | 35 x 50 | 35 x 55 |
| | 30 x 25 | 30 x 30 | - | 35 x 40 | - |
| 560 | - | 35 x 25 | - | - | - |
| | - | 25 x 45 | - | 35 x 60 | - |
| | 25 x 35 | 30 x 35 | - | - | - |
| | 30 x 30 | 35 x 30 | - | - | - |
| 680 | 25 x 45 | 30 x 40 | 35 x 60 | - | - |
| | 30 x 30 | 35 x 35 | - | - | - |
| | 35 x 25 | - | - | - | - |
| 820 | 25 x 50 | 30 x 45 | - | - | - |
| | 30 x 35 | 35 x 35 | - | - | - |
| | 35 x 30 | 35 x 40 | - | - | - |
| 1000 | 30 x 45 | 35 x 40 | - | - | - |
| | 35 x 35 | 35 x 45 | - | - | - |
| 1200 | 30 x 50 | 35 x 45 | - | - | - |
| | 35 x 35 | 35 x 50 | - | - | - |
| 1500 | 35 x 45 | - | - | - | - |
| 1800 | 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

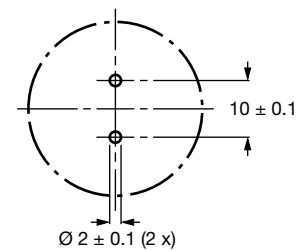
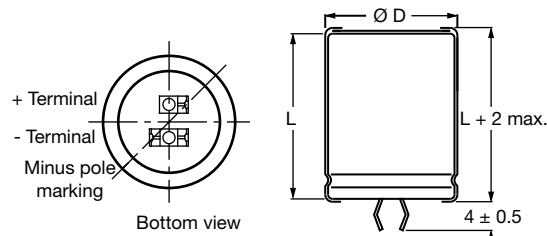


Fig. 3 - Mounting hole diagram

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 25 | 26 | 27 | ≈ 20 | 100 | 290 x 280 x 39 |
| 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 45 | 26 | 47 | ≈ 32 | 100 | 290 x 280 x 59 |
| 25 x 50 | 26 | 52 | ≈ 38 | 100 | 290 x 280 x 64 |
| 30 x 25 | 31 | 27 | ≈ 25 | 100 | 340 x 330 x 39 |
| 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 25 | 36 | 27 | ≈ 33 | 50 | 390 x 198 x 39 |
| 35 x 30 | 36 | 32 | ≈ 40 | 50 | 390 x 198 x 44 |
| 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 |
| 35 x 55 | 36 | 57 | ≈ 80 | 50 | 390 x 198 x 69 |
| 35 x 60 | 36 | 62 | ≈ 84 | 50 | 390 x 198 x 74 |

| ELECTRICAL DATA | |
|------------------------|---|
| SYMBOL | DESCRIPTION |
| C _R | Rated capacitance at 100 Hz |
| I _R | Rated RMS ripple current at 120 Hz, 105 °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

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

ORDERING EXAMPLE

Electrolytic capacitor 159 series

1000 µF/200 V; ± 20 %

Nominal case size: Ø 30 mm x 45 mm

2-terminal snap-in:

Ordering code: MAL215942102E3

Former 12NC: 222215942102

3-terminal snap-in:

Ordering code: MAL215922102E3

Former 12NC: 222215922102



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 105 °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 MAL2159..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 200 | 330 | 22 x 30 | 1.08 | 0.66 | 450 | 730 | 300 | 500 | 52331E3 | 72331E3 |
| | 390 | 22 x 35 | 1.23 | 0.78 | 380 | 610 | 280 | 470 | 42391E3 | 22391E3 |
| | 390 | 25 x 30 | 1.23 | 0.78 | 380 | 610 | 280 | 470 | 52391E3 | 72391E3 |
| | 470 | 22 x 40 | 1.37 | 0.94 | 300 | 505 | 240 | 400 | 32471E3 | 12471E3 |
| | 470 | 30 x 25 | 1.27 | 0.94 | 300 | 505 | 240 | 400 | 52471E3 | 72471E3 |
| | 560 | 25 x 35 | 1.50 | 1.12 | 260 | 425 | 235 | 390 | 42561E3 | 22561E3 |
| | 560 | 30 x 30 | 1.52 | 1.12 | 260 | 425 | 235 | 390 | 52561E3 | 72561E3 |
| | 680 | 25 x 45 | 1.82 | 1.36 | 210 | 350 | 205 | 340 | 42681E3 | 22681E3 |
| | 680 | 30 x 30 | 1.59 | 1.36 | 210 | 350 | 205 | 340 | 52681E3 | 72681E3 |
| | 680 | 35 x 25 | 1.44 | 1.36 | 210 | 350 | 205 | 340 | 62681E3 | 82681E3 |
| | 820 | 25 x 50 | 2.04 | 1.64 | 180 | 290 | 145 | 240 | 32821E3 | 12821E3 |
| | 820 | 30 x 35 | 1.83 | 1.64 | 180 | 290 | 145 | 240 | 42821E3 | 22821E3 |
| | 820 | 35 x 30 | 1.77 | 1.64 | 180 | 290 | 145 | 240 | 52821E3 | 72821E3 |
| | 1000 | 30 x 45 | 2.23 | 2.00 | 150 | 235 | 135 | 225 | 42102E3 | 22102E3 |
| | 1000 | 35 x 35 | 2.04 | 2.00 | 150 | 235 | 135 | 225 | 52102E3 | 72102E3 |
| | 1200 | 30 x 50 | 2.47 | 2.40 | 130 | 210 | 115 | 190 | 42122E3 | 22122E3 |
| 1200 | 35 x 35 | 2.07 | 2.40 | 130 | 210 | 115 | 190 | 52122E3 | 72122E3 | |
| 1500 | 35 x 45 | 2.56 | 3.00 | 100 | 170 | 95 | 155 | 52152E3 | 72152E3 | |
| 1800 | 35 x 50 | 2.80 | 3.60 | 90 | 150 | 80 | 130 | 52182E3 | 72182E3 | |
| 250 | 220 | 22 x 30 | 1.00 | 0.55 | 540 | 1080 | 420 | 700 | 43221E3 | 23221E3 |
| | 220 | 25 x 25 | 1.00 | 0.55 | 540 | 1080 | 420 | 700 | 53221E3 | 73221E3 |
| | 270 | 22 x 35 | 1.07 | 0.67 | 440 | 880 | 335 | 560 | 43271E3 | 23271E3 |
| | 270 | 25 x 30 | 1.08 | 0.67 | 440 | 880 | 335 | 560 | 53271E3 | 73271E3 |
| | 270 | 30 x 25 | 1.08 | 0.67 | 440 | 880 | 335 | 560 | 63271E3 | 83271E3 |
| | 330 | 22 x 40 | 1.20 | 0.82 | 360 | 720 | 255 | 430 | 33331E3 | 13331E3 |
| | 330 | 25 x 30 | 1.21 | 0.82 | 360 | 720 | 255 | 430 | 43331E3 | 23331E3 |
| | 330 | 30 x 25 | 1.19 | 0.82 | 360 | 720 | 255 | 430 | 53331E3 | 73331E3 |
| | 390 | 25 x 35 | 1.39 | 0.97 | 330 | 610 | 245 | 410 | 43391E3 | 23391E3 |
| | 390 | 30 x 30 | 1.41 | 0.97 | 330 | 610 | 245 | 410 | 53391E3 | 73391E3 |
| | 470 | 25 x 40 | 1.58 | 1.17 | 270 | 505 | 240 | 400 | 33471E3 | 13471E3 |
| | 470 | 30 x 30 | 1.57 | 1.17 | 270 | 505 | 240 | 400 | 43471E3 | 23471E3 |
| | 470 | 35 x 25 | 1.37 | 1.17 | 270 | 505 | 240 | 400 | 53471E3 | 73471E3 |
| | 560 | 25 x 45 | 1.78 | 1.40 | 230 | 425 | 185 | 310 | 43561E3 | 23561E3 |
| | 560 | 30 x 35 | 1.71 | 1.40 | 230 | 425 | 185 | 310 | 53561E3 | 73561E3 |
| | 560 | 35 x 30 | 1.67 | 1.40 | 230 | 425 | 185 | 310 | 63561E3 | 83561E3 |
| | 680 | 30 x 40 | 1.93 | 1.70 | 210 | 350 | 155 | 260 | 43681E3 | 23681E3 |
| | 680 | 35 x 35 | 1.92 | 1.70 | 210 | 350 | 155 | 260 | 53681E3 | 73681E3 |
| | 820 | 30 x 45 | 2.16 | 2.05 | 180 | 290 | 125 | 210 | 43821E3 | 23821E3 |
| | 820 | 35 x 35 | 1.97 | 2.05 | 180 | 290 | 125 | 210 | 53821E3 | 73821E3 |
| 820 | 35 x 40 | 2.16 | 2.05 | 180 | 290 | 125 | 210 | 63821E3 | 83821E3 | |
| 1000 | 35 x 40 | 2.22 | 2.50 | 140 | 235 | 105 | 180 | 53102E3 | 73102E3 | |
| 1000 | 35 x 45 | 2.41 | 2.50 | 140 | 235 | 105 | 180 | 63102E3 | 83102E3 | |
| 1200 | 35 x 45 | 2.46 | 3.00 | 130 | 200 | 95 | 160 | 43122E3 | 23122E3 | |
| 1200 | 35 x 50 | 2.65 | 3.00 | 130 | 200 | 95 | 160 | 53122E3 | 73122E3 | |

Note

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



| 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 105 °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 MAL2159..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 400 | 68 | 22 x 25 | 0.51 | 0.27 | 1600 | 3200 | 1170 | 1950 | 56689E3 | 76689E3 |
| | 82 | 22 x 30 | 0.60 | 0.33 | 1200 | 2400 | 910 | 1520 | 46829E3 | 26829E3 |
| | 82 | 25 x 25 | 0.60 | 0.33 | 1200 | 2400 | 910 | 1520 | 56829E3 | 76829E3 |
| | 100 | 22 x 35 | 0.69 | 0.40 | 990 | 1980 | 740 | 1240 | 46101E3 | 26101E3 |
| | 100 | 25 x 30 | 0.70 | 0.40 | 990 | 1980 | 740 | 1240 | 56101E3 | 76101E3 |
| | 120 | 22 x 35 | 0.76 | 0.48 | 800 | 1600 | 660 | 1100 | 46121E3 | 26121E3 |
| | 120 | 25 x 30 | 0.76 | 0.48 | 800 | 1600 | 660 | 1100 | 56121E3 | 76121E3 |
| | 120 | 30 x 25 | 0.77 | 0.48 | 800 | 1600 | 660 | 1100 | 66121E3 | 86121E3 |
| | 150 | 22 x 40 | 0.86 | 0.60 | 700 | 1400 | 510 | 860 | 36151E3 | 16151E3 |
| | 150 | 25 x 35 | 0.89 | 0.60 | 700 | 1400 | 510 | 860 | 46151E3 | 26151E3 |
| | 150 | 30 x 30 | 0.92 | 0.60 | 700 | 1400 | 510 | 860 | 56151E3 | 76151E3 |
| | 180 | 25 x 40 | 1.01 | 0.72 | 590 | 1170 | 420 | 700 | 36181E3 | 16181E3 |
| | 180 | 30 x 30 | 0.99 | 0.72 | 590 | 1170 | 420 | 700 | 46181E3 | 26181E3 |
| | 180 | 35 x 25 | 0.96 | 0.72 | 590 | 1170 | 420 | 700 | 56181E3 | 76181E3 |
| | 220 | 25 x 45 | 1.15 | 0.88 | 470 | 940 | 350 | 590 | 46221E3 | 26221E3 |
| | 220 | 30 x 35 | 1.15 | 0.88 | 470 | 940 | 350 | 590 | 56221E3 | 76221E3 |
| | 220 | 35 x 30 | 1.14 | 0.88 | 470 | 940 | 350 | 590 | 66221E3 | 86221E3 |
| | 270 | 25 x 50 | 1.31 | 1.08 | 380 | 760 | 330 | 550 | 46271E3 | 26271E3 |
| | 270 | 30 x 40 | 1.30 | 1.08 | 380 | 760 | 330 | 550 | 56271E3 | 76271E3 |
| | 270 | 35 x 30 | 1.21 | 1.08 | 380 | 760 | 330 | 550 | 66271E3 | 86271E3 |
| 330 | 30 x 45 | 1.47 | 1.32 | 320 | 640 | 270 | 450 | 56331E3 | 76331E3 | |
| 330 | 35 x 35 | 1.40 | 1.32 | 320 | 640 | 270 | 450 | 66331E3 | 86331E3 | |
| 390 | 30 x 50 | 1.63 | 1.56 | 270 | 540 | 240 | 410 | 46391E3 | 26391E3 | |
| 390 | 35 x 40 | 1.57 | 1.56 | 270 | 540 | 240 | 410 | 56391E3 | 76391E3 | |
| 470 | 35 x 45 | 1.72 | 1.88 | 230 | 450 | 200 | 330 | 56471E3 | 76471E3 | |
| 560 | 35 x 50 | 1.84 | 2.24 | 210 | 420 | 170 | 280 | 56561E3 | 76561E3 | |
| 680 | 35 x 60 | 2.24 | 2.72 | 180 | 350 | 130 | 230 | 56681E3 | 76681E3 | |
| 450 | 56 | 22 x 25 | 0.48 | 0.25 | 1600 | 3200 | 1120 | 1880 | 57569E3 | 77569E3 |
| | 68 | 22 x 30 | 0.56 | 0.30 | 1200 | 2400 | 910 | 1530 | 47689E3 | 27689E3 |
| | 68 | 25 x 25 | 0.56 | 0.30 | 1200 | 2400 | 910 | 1530 | 57689E3 | 77689E3 |
| | 82 | 22 x 35 | 0.64 | 0.36 | 1100 | 2200 | 770 | 1290 | 57829E3 | 77829E3 |
| | 100 | 22 x 40 | 0.74 | 0.45 | 900 | 1800 | 630 | 1050 | 37101E3 | 17101E3 |
| | 100 | 25 x 30 | 0.71 | 0.45 | 900 | 1800 | 630 | 1050 | 47101E3 | 27101E3 |
| | 100 | 30 x 25 | 0.73 | 0.45 | 900 | 1800 | 630 | 1050 | 57101E3 | 77101E3 |
| | 120 | 25 x 35 | 0.82 | 0.54 | 750 | 1500 | 530 | 885 | 57121E3 | 77121E3 |
| | 150 | 25 x 40 | 0.95 | 0.67 | 600 | 1200 | 420 | 705 | 47151E3 | 27151E3 |
| | 150 | 30 x 30 | 0.93 | 0.67 | 600 | 1200 | 420 | 705 | 57151E3 | 77151E3 |
| | 150 | 35 x 25 | 0.91 | 0.67 | 600 | 1200 | 420 | 705 | 67151E3 | 87151E3 |
| | 180 | 25 x 45 | 1.07 | 0.81 | 500 | 1000 | 360 | 605 | 47181E3 | 27181E3 |
| | 180 | 30 x 35 | 1.06 | 0.81 | 500 | 1000 | 360 | 605 | 57181E3 | 77181E3 |
| | 220 | 30 x 40 | 1.21 | 0.99 | 370 | 740 | 310 | 525 | 47221E3 | 27221E3 |
| | 220 | 35 x 30 | 1.14 | 0.99 | 370 | 740 | 310 | 525 | 57221E3 | 77221E3 |
| | 270 | 30 x 45 | 1.37 | 1.21 | 350 | 700 | 270 | 450 | 47271E3 | 27271E3 |
| | 270 | 35 x 35 | 1.32 | 1.21 | 350 | 700 | 270 | 450 | 57271E3 | 77271E3 |
| | 330 | 30 x 50 | 1.54 | 1.48 | 300 | 600 | 230 | 390 | 47331E3 | 27331E3 |
| | 330 | 35 x 40 | 1.49 | 1.48 | 300 | 600 | 230 | 390 | 57331E3 | 77331E3 |
| | 390 | 35 x 45 | 1.61 | 1.75 | 250 | 500 | 200 | 340 | 57391E3 | 77391E3 |
| 470 | 35 x 40 | 1.90 | 1.50 | 210 | 300 | 115 | 190 | 90103E3D | - | |
| 470 | 35 x 50 | 1.72 | 2.11 | 210 | 420 | 170 | 290 | 57471E3 | 77471E3 | |
| 560 | 35 x 60 | 2.11 | 2.52 | 190 | 380 | 140 | 240 | 57561E3 | 77561E3 | |

Note

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



| 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 105 °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 MAL2159..... | |
| | | | | | | | | | 2-TERM. | 3-TERM. |
| 500 | 68 | 22 x 30 | 0.60 | 0.072 | 1220 | 1630 | 850 | 1110 | 59689E3 | 79689E3 |
| | 82 | 22 x 35 | 0.69 | 0.086 | 1010 | 1350 | 700 | 920 | 59829E3 | 79829E3 |
| | 100 | 25 x 35 | 0.80 | 0.104 | 830 | 1110 | 580 | 760 | 59101E3 | 79101E3 |
| | 120 | 25 x 40 | 0.91 | 0.124 | 700 | 930 | 490 | 640 | 59121E3 | 79121E3 |
| | 150 | 25 x 45 | 1.08 | 0.154 | 560 | 750 | 390 | 510 | 59151E3 | 79151E3 |
| | 150 | 30 x 35 | 1.06 | 0.154 | 590 | 780 | 420 | 550 | 49151E3 | 69151E3 |
| | 180 | 30 x 35 | 1.13 | 0.184 | 480 | 640 | 350 | 450 | 59181E3 | 79181E3 |
| | 220 | 30 x 40 | 1.30 | 0.224 | 400 | 530 | 280 | 370 | 59221E3 | 79221E3 |
| | 270 | 30 x 50 | 1.58 | 0.274 | 320 | 430 | 230 | 300 | 59271E3 | 79271E3 |
| | 330 | 35 x 45 | 1.74 | 0.334 | 290 | 380 | 210 | 270 | 49331E3 | 69331E3 |
| | 390 | 35 x 50 | 1.94 | 0.394 | 230 | 310 | 170 | 220 | 59391E3 | 79391E3 |
| 470 | 35 x 55 | 2.15 | 0.474 | 200 | 260 | 150 | 190 | 59471E3 | 79471E3 | |

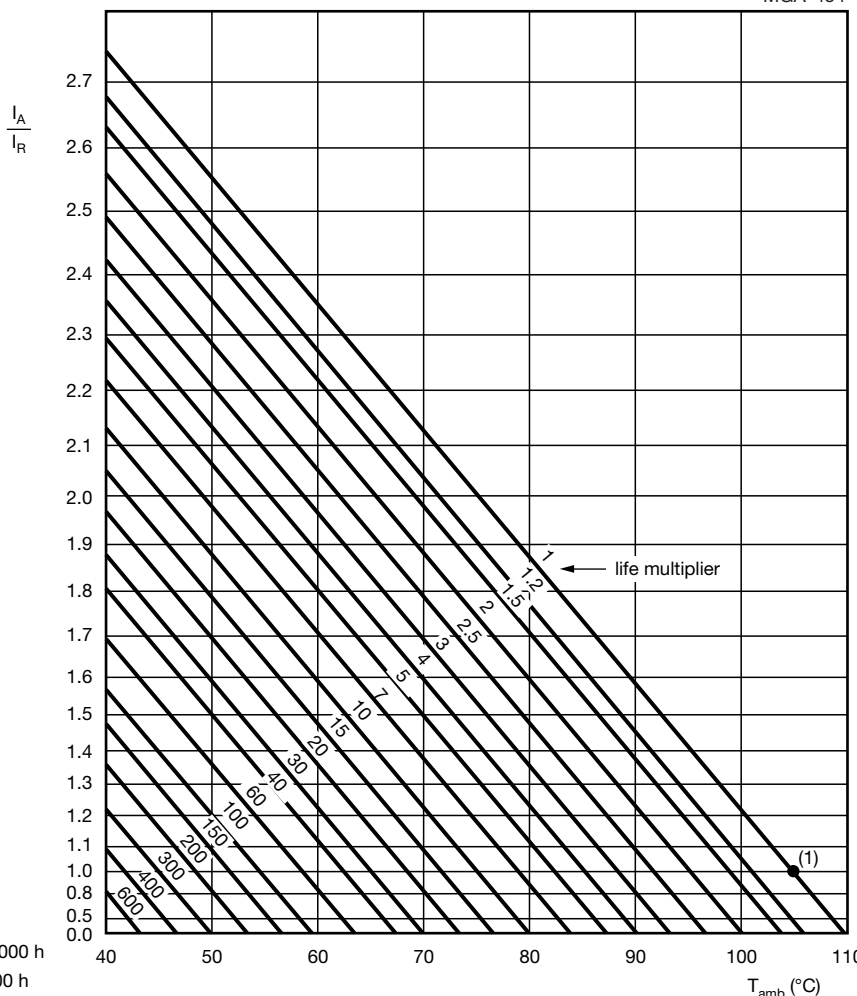
Note

⁽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

MGA 454



I_A = Actual ripple current at 120 Hz
 I_R = Rated ripple current at 120 Hz and 105 °C

(1) Useful life at 105 °C and I_R applied: ≤ 450 V = 5000 h
 500 V = 3000 h

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 | $T_{amb} = 105\text{ }^{\circ}\text{C}$; U_R applied; 2000 h | $\Delta C/C: \pm 15\%$ $ESR \leq 1.3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ |
| Load life | | $T_{amb} = 105\text{ }^{\circ}\text{C}$; U_R and I_R applied; 2000 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 | $T_{amb} = 105\text{ }^{\circ}\text{C}$; U_R and I_R applied; $\leq 450\text{ V} = 5000\text{ h}$, $500\text{ V} = 3000\text{ h}$ | $\Delta C/C: \pm 30\%$ $ESR \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ total failure percentage: $\leq 3\%$ |
| Shelf life (storage at high temperature) | IEC 60384-4/ EN130300 subclause 4.17 | $T_{amb} = 105\text{ }^{\circ}\text{C}$; no voltage applied; 1000 h after test: U_R to be applied for 30 min, 24 h to 48 h before measurement | $\Delta C/C: \pm 15\%$ $ESR \leq 1.5 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ |



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