

## 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](http://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  $\mu\text{F}$ )
- 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 $\mu\text{F}$ to 2200 $\mu\text{F}$ |
| 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) |           |     |         |         |         |
|-------------------------------------------------------------------------------------|-----------|-----|---------|---------|---------|
| $C_R$<br>( $\mu\text{F}$ )                                                          | $U_R$ (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 ( $\varnothing D \times L$ in mm) |           |         |         |         |         |
|-------------------------------------------------------------------------------------------------------|-----------|---------|---------|---------|---------|
| $C_R$<br>( $\mu F$ )                                                                                  | $U_R$ (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   | -       | -       | -       | -       |

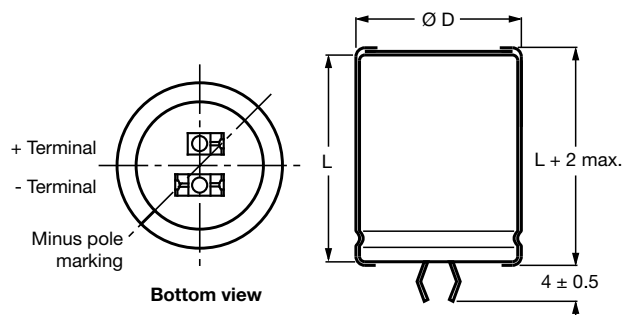
**DIMENSIONS in millimeters AND AVAILABLE FORMS**
**TWO TERMINAL SNAP-IN**


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

Fig. 2 - Two terminal snap-in

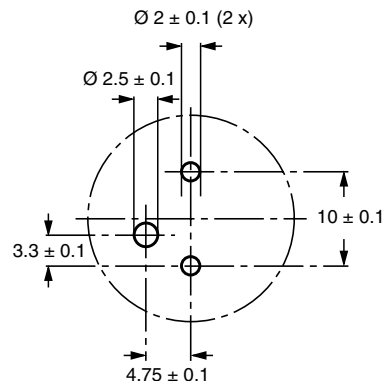


Fig. 3 - Mounting hole diagram

**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

| <b>DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES</b> |                           |                         |                     |                                                 |
|-----------------------------------------------------------------|---------------------------|-------------------------|---------------------|-------------------------------------------------|
| <b>NOMINAL CASE SIZE<br/>Ø D x L</b>                            | <b>Ø D<sub>max.</sub></b> | <b>L<sub>max.</sub></b> | <b>MASS<br/>(g)</b> | <b>PACKAGING QUANTITIES<br/>(units per box)</b> |
| 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<br>CASE SIZE<br>Ø D x L | Ø D <sub>max.</sub> | L <sub>max.</sub> | MASS<br>(g) | PACKAGING QUANTITIES<br>(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 <sub>R</sub>  | Rated capacitance at 100 Hz/120 Hz                              |
| I <sub>R</sub>  | Rated RMS ripple current at 120 Hz, 85 °C                       |
| I <sub>L5</sub> | Max. leakage current after 5 min at U <sub>R</sub>              |
| ESR             | Typ./max. equivalent series resistance at 100 Hz <sup>(1)</sup> |
| Z               | Typ./max. impedance at 10 kHz                                   |

**Notes**

- <sup>(1)</sup> ESR at 120 Hz is approximately 0.95 x ESR 100 Hz
- Unless otherwise specified, all electrical values in Table 2 apply at T<sub>amb</sub> = 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 <sub>R</sub><br>(V)                    | C <sub>R</sub><br>100 Hz<br>(μF) | NOMINAL<br>CASE SIZE<br>Ø D x L<br>(mm) | I <sub>R</sub><br>120 Hz<br>85 °C<br>(A) | I <sub>L5</sub><br>5 min<br>(mA) | TYP. ESR<br>100 Hz <sup>(1)</sup><br>(mΩ) | MAX. ESR<br>100 Hz <sup>(1)</sup><br>(mΩ) | TYP. Z<br>10 kHz<br>(mΩ) | MAX. Z<br>10 kHz<br>(mΩ) | ORDERING CODE<br>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**

| $U_R$<br>(V) | $C_R$<br>100 Hz<br>( $\mu$ F) | NOMINAL<br>CASE SIZE<br>$\varnothing D \times L$<br>(mm) | $I_R$<br>120 Hz<br>85 °C<br>(A) | $I_{L5}$<br>5 min<br>(mA) | TYP. ESR<br>100 Hz <sup>(1)</sup><br>(m $\Omega$ ) | MAX. ESR<br>100 Hz <sup>(1)</sup><br>(m $\Omega$ ) | TYP. Z<br>10 kHz<br>(m $\Omega$ ) | MAX. Z<br>10 kHz<br>(m $\Omega$ ) | ORDERING CODE<br>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 |
| 450          | 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 |
|              | 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**

| $U_R$<br>(V) | $C_R$<br>100 Hz<br>( $\mu$ F) | NOMINAL<br>CASE SIZE<br>$\varnothing$ D x L<br>(mm) | $I_R$<br>120 Hz<br>85 °C<br>(A) | $I_{L5}$<br>5 min<br>(mA) | TYP. ESR<br>100 Hz <sup>(1)</sup><br>(m $\Omega$ ) | MAX. ESR<br>100 Hz <sup>(1)</sup><br>(m $\Omega$ ) | TYP. Z<br>10 kHz<br>(m $\Omega$ ) | MAX. Z<br>10 kHz<br>(m $\Omega$ ) | ORDERING CODE<br>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**<sup>(1)</sup> ESR at 120 Hz is approximately 0.95 x ESR 100 Hz**ADDITIONAL ELECTRICAL DATA**

| PARAMETER                          | CONDITIONS            | VALUE                             |
|------------------------------------|-----------------------|-----------------------------------|
| <b>Voltage</b>                     |                       |                                   |
| Surge voltage                      | $\geq 400$ V versions | $U_s = 1.1 \times U_R$            |
|                                    | $\leq 250$ V versions | $U_s = 1.15 \times U_R$           |
| Reverse voltage                    |                       | $\leq 1$ V                        |
| <b>Current</b>                     |                       |                                   |
| Leakage current                    | After 5 min at $U_R$  | $I_{L5} \leq 0.01 C_R \times U_R$ |
| <b>Inductance</b>                  |                       |                                   |
| Equivalent series inductance (ESL) | All case sizes        | Typ. 19 nH                        |
|                                    |                       | Max. 25 nH                        |

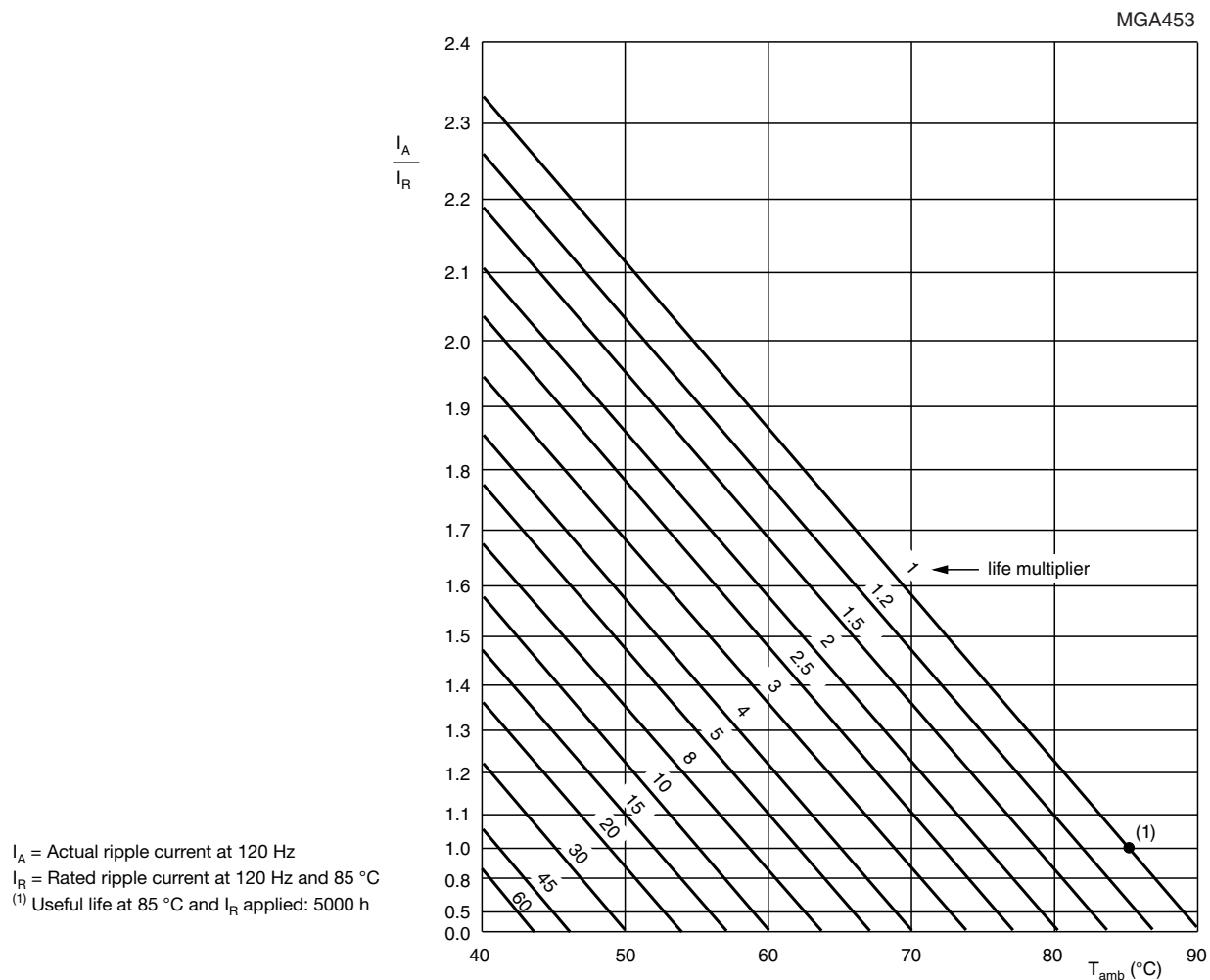
**RIPPLE CURRENT AND USEFUL LIFE**


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



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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 in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

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

## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.**

## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9