

## Aluminum Capacitors

### General Purpose, Miniature, Radial Lead

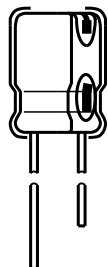


Fig.1 Component outline

#### FEATURES

- + 105 °C
- Suitable for long life applications



| QUICK REFERENCE DATA                    |                                                                                                                                                                                                                                                                                      |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DESCRIPTION                             | VALUE                                                                                                                                                                                                                                                                                |
| Nominal case size<br>Ø D x L in mm      | 0.236" x 0.433" [6.0 x 11.0]<br>to 0.709" x 1.417" [18.0 x 36.0]                                                                                                                                                                                                                     |
| Operating temperature                   | - 40 °C to + 105 °C                                                                                                                                                                                                                                                                  |
| Rated capacitance range, C <sub>R</sub> | 1 µF to 10 000 µF                                                                                                                                                                                                                                                                    |
| Tolerance on C <sub>R</sub>             | ± 20 %                                                                                                                                                                                                                                                                               |
| Rated voltage range, U <sub>R</sub>     | 6.3 WV <sub>DC</sub> to 250 WV <sub>DC</sub>                                                                                                                                                                                                                                         |
| Termination                             | 2 or 3 radial leads                                                                                                                                                                                                                                                                  |
| Life validation test at 105 °C          | 1000 h<br>(diameter ≤ 0.315" [8.0]):<br>2000 h<br>(diameter > 0.315" [8.0]):<br>Δ CAP ≤ 15 % (6.3 WV <sub>DC</sub> to<br>16 WV <sub>DC</sub> ),<br>≤ 10 % (25 WV <sub>DC</sub> to 250 WV <sub>DC</sub> )<br>from initial measurement.<br>Δ ESR ≤ 1.2 x initial .<br>specified limit. |
| Shelf life at 105 °C                    | 500 h: Δ CAP ≤ 10 % from initial<br>measurement. Δ ESR<br>1.2 x initial specified limit.<br>Δ DCL ≤ 2 x initial specified limit.                                                                                                                                                     |
| DC leakage current                      | 6.3 WV <sub>DC</sub> to 63 WV <sub>DC</sub> units:<br>I = 0.005 CV<br>100 WV <sub>DC</sub> to 250 WV <sub>DC</sub> units:<br>I = 0.01 CV<br>I in µA, C in µF, V in Volts                                                                                                             |

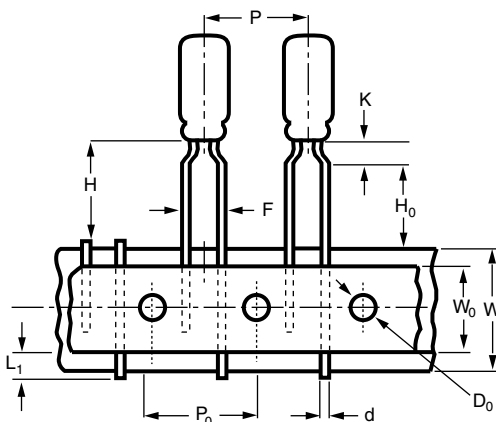
| RIPPLE CURRENT MULTIPLIERS |          |            |             |            |
|----------------------------|----------|------------|-------------|------------|
| TEMPERATURE                |          |            |             |            |
| AMBIENT TEMPERATURE        |          |            | MULTIPLIERS |            |
| + 105 °C                   |          |            | 0.4         |            |
| + 95 °C                    |          |            | 0.7         |            |
| + 85 °C                    |          |            | 1.0         |            |
| + 75 °C                    |          |            | 1.2         |            |
| ≤ + 65 °C                  |          |            | 1.4         |            |
| FREQUENCY (Hz)             |          |            |             |            |
| WV <sub>DC</sub>           | 50 to 60 | 100 to 120 | 300 to 400  | 1K to 100K |
| 6.3 to 25                  | 0.85     | 1.00       | 1.05        | 1.1        |
| 26 to 250                  | 0.80     | 1.00       | 1.30        | 1.4        |

| LEAD LENGTH FOR D TERMINATION |                    |                    |
|-------------------------------|--------------------|--------------------|
| CASE CODE                     | L <sub>1</sub> (-) | L <sub>2</sub> (+) |
| D                             | 0.591 [15.0]       | 0.787 [20.0]       |

| DIMENSIONS in inches [millimeters] |              |              |                |              |                |              |                  |                 |               |         |
|------------------------------------|--------------|--------------|----------------|--------------|----------------|--------------|------------------|-----------------|---------------|---------|
| CASE CODE                          | NOMINAL      |              | STYLES 2 AND 4 |              | STYLES 3 AND 5 |              | LEAD SPACING     |                 | LEAD DIAMETER |         |
|                                    | D            | L            | D (max.)       | L (max.)     | D (max.)       | L (max.)     | S ± 0.024 [0.60] | T ± 0.02 [0.50] | NOMINAL       | AWG NO. |
| AA                                 | 0.236 [6.0]  | 0.433 [11.0] | 0.256 [6.5]    | 0.472 [12.0] | 0.256 [6.5]    | 0.512 [13.0] | 0.098 [2.5]      | N/A             | 0.025 [0.63]  | 22      |
| BB                                 | 0.315 [8.0]  | 0.472 [12.0] | 0.335 [8.5]    | 0.512 [13.0] | 0.335 [8.5]    | 0.551 [14.0] | 0.138 [3.5]      | N/A             | 0.025 [0.63]  | 22      |
| CC                                 | 0.394 [10.0] | 0.512 [13.0] | 0.413 [10.5]   | 0.563 [14.3] | 0.413 [10.5]   | 0.630 [16.0] | 0.197 [5.0]      | N/A             | 0.025 [0.63]  | 22      |
| CD                                 | 0.394 [10.0] | 0.630 [16.0] | 0.413 [10.5]   | 0.669 [17.0] | 0.413 [10.5]   | 0.740 [18.8] | 0.197 [5.0]      | N/A             | 0.025 [0.63]  | 22      |
| CG                                 | 0.394 [10.0] | 0.787 [20.0] | 0.413 [10.5]   | 0.846 [21.5] | 0.413 [10.5]   | 0.906 [23.0] | 0.197 [5.0]      | N/A             | 0.025 [0.63]  | 22      |
| DG                                 | 0.492 [12.5] | 0.787 [20.0] | 0.512 [13.0]   | 0.846 [21.5] | 0.512 [13.0]   | 0.906 [23.0] | 0.197 [5.0]      | 0.098 [2.5]     | 0.032 [0.81]  | 20      |
| DK                                 | 0.492 [12.5] | 0.984 [25.0] | 0.512 [13.0]   | 1.043 [26.5] | 0.512 [13.0]   | 1.142 [29.0] | 0.197 [5.0]      | 0.098 [2.5]     | 0.032 [0.81]  | 20      |
| EK                                 | 0.630 [16.0] | 0.984 [25.0] | 0.650 [16.5]   | 1.031 [26.2] | 0.650 [16.5]   | 1.098 [27.9] | 0.295 [7.5]      | 0.150 [3.8]     | 0.032 [0.81]  | 20      |
| EN                                 | 0.630 [16.0] | 1.260 [32.0] | 0.650 [16.5]   | 1.319 [33.5] | 0.650 [16.5]   | 1.417 [36.0] | 0.295 [7.5]      | 0.150 [3.8]     | 0.032 [0.81]  | 20      |
| ER                                 | 0.630 [16.0] | 1.417 [36.0] | 0.650 [16.5]   | 1.476 [37.5] | 0.650 [16.5]   | 1.575 [40.0] | 0.295 [7.5]      | 0.150 [3.8]     | 0.032 [0.81]  | 20      |
| FR                                 | 0.709 [18.0] | 1.417 [36.0] | 0.728 [18.5]   | 1.476 [37.5] | 0.728 [18.5]   | 1.575 [40.0] | 0.295 [7.5]      | 0.150 [3.8]     | 0.032 [0.81]  | 20      |

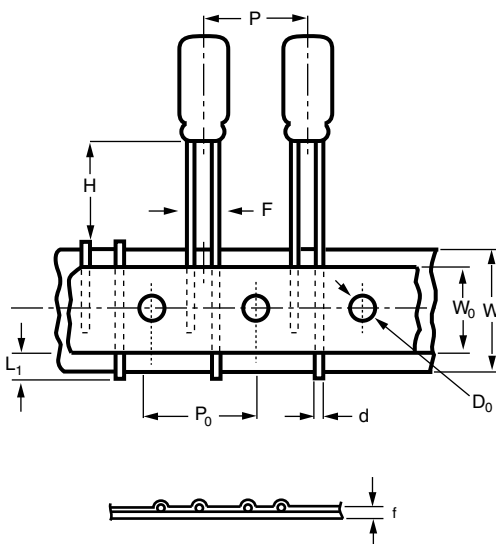
**TAPE AND REEL, SPECIFICATIONS TO EIA-468** in inches [millimeters]

**Formed Leads**



| DIMENSIONS in inches [millimeters] |                |               |
|------------------------------------|----------------|---------------|
| CASE SIZE                          | F LEAD SPACING | STD. QTY/REEL |
| 0.236 x 0.433 [6.0 x 11.0]         | 0.197 [5.0]    | 800           |
| 0.315 x 0.472 [8.0 x 12.0]         | 0.197 [5.0]    | 700           |

**Unformed Leads**



| DIMENSIONS in inches [millimeters] |                            |               |
|------------------------------------|----------------------------|---------------|
| CASE SIZE                          | F LEAD SPACING             | STD. QTY/REEL |
| 0.236 x 0.433 [6.0 x 11.0]         | 0.098 <sup>(1)</sup> [2.5] | 800           |
| 0.315 x 0.472 [8.0 x 12.0]         | 0.140 <sup>(1)</sup> [3.5] | 700           |
| 0.394 x 0.512 [10.0 x 13.0]        | 0.197 [5.0]                | 500           |
| 0.394 x 0.630 [10.0 x 16.0]        | 0.197 [5.0]                | 500           |
| 0.394 x 0.787 [10.0 x 20.0]        | 0.197 [5.0]                | 500           |

**Note**

<sup>(1)</sup> Available as special order

| DIMENSIONS in inches [millimeters]       |                               |                               |                                |                                |                                |
|------------------------------------------|-------------------------------|-------------------------------|--------------------------------|--------------------------------|--------------------------------|
| ITEM                                     | CASE SIZE (Diameter x Length) |                               |                                |                                |                                |
|                                          | 0.236 x 0.433<br>[6.0 x 11.0] | 0.315 x 0.472<br>[8.0 x 12.0] | 0.394 x 0.512<br>[10.0 x 13.0] | 0.394 x 0.630<br>[10.0 x 16.0] | 0.394 x 0.787<br>[10.0 x 20.0] |
| d - Lead-wire diameter                   | 0.025 [0.63]                  | 0.025 [0.63]                  | 0.025 [0.63]                   | 0.025 [0.63]                   | 0.020 [0.5]                    |
| P - Pitch of component                   | 0.500 [12.7]                  | 0.500 [12.7]                  | 0.500 [12.7]                   | 0.500 [12.7]                   | 0.500 [12.7]                   |
| P <sub>0</sub> - Feed hole pitch         | 0.500 [12.7]                  | 0.500 [12.7]                  | 0.500 [12.7]                   | 0.500 [12.7]                   | 0.500 [12.7]                   |
| F - Lead-to-lead distance                | 0.197 [5.0]                   | 0.197 [5.0]                   | 0.197 [5.0]                    | 0.197 [5.0]                    | 0.197 [5.0]                    |
| K - Clinch height                        | 0.098 [2.5]                   | 0.157 [4.0]                   | N/A                            | N/A                            | N/A                            |
| H - Height of component from tape center | 0.728 [18.5]                  | 0.787 [20.0]                  | 0.906 [23.0]                   | 0.906 [23.0]                   | 0.906 [23.0]                   |
| H <sub>0</sub> - Lead-wire clinch height | 0.630 [16.0]                  | 0.630 [16.0]                  | N/A                            | N/A                            | N/A                            |
| W - Tape width                           | 0.709 [18.0]                  | 0.709 [18.0]                  | 0.709 [18.0]                   | 0.709 [18.0]                   | 0.709 [18.0]                   |
| W <sub>0</sub> - Hold down tape width    | 0.591 [15.0]                  | 0.591 [15.0]                  | 0.591 [15.0]                   | 0.591 [15.0]                   | 0.591 [15.0]                   |
| D <sub>0</sub> - Feed hole diameter      | 0.157 [4.0]                   | 0.157 [4.0]                   | 0.157 [4.0]                    | 0.157 [4.0]                    | 0.157 [4.0]                    |
| t - Total tape thickness                 | 0.028 [0.7]                   | 0.028 [0.7]                   | 0.157 [4.0]                    | 0.157 [4.0]                    | 0.157 [4.0]                    |
| L <sub>1</sub> - Maximum lead protrusion | 0.118 [3.0]                   | 0.118 [3.0]                   | 0.118 [3.0]                    | 0.118 [3.0]                    | 0.118 [3.0]                    |

**Note**

Terminal code "I" = Tape and reel. Terminal code "+" = Tape and ammo. Positive leader is standard. Negative leader is available by special order.

**ORDERING EXAMPLE**

Electrolytic capacitor 511D series: 511D 157 M 063 CG 4 D

| DESCRIPTION |                                        |
|-------------|----------------------------------------|
| CODE        | EXPLANATION                            |
| 511D        | Product type                           |
| 157         | Capacitance value (150 $\mu$ F)        |
| M           | Tolerance (M = $\pm$ 20 %)             |
| 063         | Voltage rating at 105 °C (063 = 63 V)  |
| DF          | Can size (see dimensions table)        |
| 4           | Sleeve and sealing (4 = P.V.C. sleeve) |
| D           | Packaging (D = bulk; straight leads)   |

**Note**

- For lead (Pb)-free/RoHS compliant products add suffix "E3" to part number.  
Example: 511D157M063CG4DE3

| STANDARD RATINGS in inches [millimeters]      |                 |                             |                             |                  |                           |                  |                                                |
|-----------------------------------------------|-----------------|-----------------------------|-----------------------------|------------------|---------------------------|------------------|------------------------------------------------|
| CAPACITANCE<br>(μF)                           | PART NUMBER     | NOMINAL CASE SIZE<br>D x L  | Max. ESR<br>at + 25 °C (mΩ) |                  | Max. RIPPLE<br>at + 85 °C |                  | Max.<br>IMPEDANCE<br>at + 25 °C (mΩ)<br>100 Hz |
|                                               |                 |                             | 120 Hz                      | 20 kHz to 40 kHz | 120 Hz                    | 20 kHz to 40 kHz |                                                |
| 6.3 WV <sub>DC</sub> at + 105 °C, SURGE = 8 V |                 |                             |                             |                  |                           |                  |                                                |
| 150.0                                         | 511D157M6R3AA4D | 0.236 x 0.433 [6.0 x 11.0]  | 3.130                       | 2.720            | 0.123                     | 0.132            | 2.800                                          |
| 1200.0                                        | 511D128M6R3CG4D | 0.394 x 0.787 [10.0 x 20.0] | 0.420                       | 0.270            | 0.590                     | 0.741            | 0.286                                          |
| 4700.0                                        | 511D478M6R3EK4D | 0.630 x 0.984 [16.0 x 25.0] | 0.121                       | 0.075            | 1.580                     | 2.010            | 0.090                                          |
| 10 000.0                                      | 511D109M6R3FR4D | 0.630 x 1.417 [16.0 x 36.0] | 0.068                       | 0.050            | 2.640                     | 3.070            | 0.061                                          |
| 10 WV <sub>DC</sub> at + 105 °C, SURGE = 13 V |                 |                             |                             |                  |                           |                  |                                                |
| 100.0 <sup>(1)</sup>                          | 511D107M010AA4D | 0.236 x 0.433 [6.0 x 11.0]  | 4.073                       | 2.800            | 0.108                     | 0.131            | 2.900                                          |
| 220.0 <sup>(1)</sup>                          | 511D227M010BB4D | 0.315 x 0.472 [8.0 x 12.0]  | 1.855                       | 1.150            | 0.198                     | 0.252            | 1.300                                          |
| 1000.0                                        | 511D108M010CG4D | 0.394 x 0.787 [10.0 x 20.0] | 0.407                       | 0.290            | 0.603                     | 0.715            | 0.290                                          |
| 3300.0                                        | 511D338M010EK4D | 0.630 x 0.984 [16.0 x 25.0] | 0.166                       | 0.086            | 1.350                     | 1.880            | 0.094                                          |
| 4700.0                                        | 511D478M010EN4D | 0.630 x 1.260 [16.0 x 32.0] | 0.122                       | 0.060            | 1.740                     | 2.480            | 0.067                                          |
| 16 WV <sub>DC</sub> at + 105 °C, SURGE = 20 V |                 |                             |                             |                  |                           |                  |                                                |
| 150.0                                         | 511D157M016BB4D | 0.315 x 0.472 [8.0 x 12.0]  | 2.433                       | 1.250            | 0.173                     | 0.241            | 1.250                                          |
| 470.0 <sup>(1)</sup>                          | 511D477M016CD4D | 0.394 x 0.630 [10.0 x 16.0] | 0.748                       | 0.442            | 0.419                     | 0.522            | 0.442                                          |
| 1500.0                                        | 511D158M016DK4D | 0.492 x 0.984 [12.5 x 25.0] | 0.243                       | 0.140            | 0.971                     | 1.270            | 0.140                                          |
| 2200.0                                        | 511D228M016EK4D | 0.630 x 0.984 [16.0 x 25.0] | 0.176                       | 0.090            | 1.310                     | 1.840            | 0.098                                          |
| 3300.0                                        | 511D338M016EN4D | 0.630 x 1.260 [16.0 x 32.0] | 0.147                       | 0.062            | 1.580                     | 2.440            | 0.067                                          |

**Note**

<sup>(1)</sup> These values are normally stocked. See Original Ratings for more values that are stocked.

Aluminum Capacitors  
General Purpose, Miniature, Radial Lead

Vishay Sprague

**STANDARD RATINGS** in inches [millimeters]

| CAPACITANCE<br>( $\mu$ F)                       | PART NUMBER     | NOMINAL CASE SIZE<br>D x L  | Max. ESR<br>at + 25 °C (m $\Omega$ ) |                  | Max. RIPPLE<br>at + 85 °C |                  | Max. IMPEDANCE<br>at + 25 °C (m $\Omega$ )<br>100 Hz |
|-------------------------------------------------|-----------------|-----------------------------|--------------------------------------|------------------|---------------------------|------------------|------------------------------------------------------|
|                                                 |                 |                             | 120 Hz                               | 20 kHz to 40 kHz | 120 Hz                    | 20 kHz to 40 kHz |                                                      |
| 20 WV <sub>DC</sub> at + 105 °C, SURGE = 25 V   |                 |                             |                                      |                  |                           |                  |                                                      |
| 120.0                                           | 511D127M020BB4D | 0.315 x 0.472 [8.0 x 12.0]  | 2.650                                | 1.350            | 0.166                     | 0.232            | 1.350                                                |
| 220.0                                           | 511D227M020CC4D | 0.394 x 0.512 [10.0 x 13.0] | 1.472                                | 0.950            | 0.266                     | 0.331            | 0.900                                                |
| 330.0                                           | 511D337M020CD4D | 0.394 x 0.630 [10.0 x 16.0] | 0.981                                | 0.550            | 0.350                     | 0.468            | 0.500                                                |
| 470.0                                           | 511D477M020CG4D | 0.394 x 0.787 [10.0 x 20.0] | 0.679                                | 0.300            | 0.467                     | 0.703            | 0.305                                                |
| 1500.0                                          | 511D158M020EK4D | 0.630 x 0.984 [16.0 x 25.0] | 0.243                                | 0.110            | 1.120                     | 1.660            | 0.100                                                |
| 2200.0                                          | 511D228M020EN4D | 0.630 x 1.260 [16.0 x 32.0] | 0.163                                | 0.080            | 1.510                     | 2.150            | 0.080                                                |
| 3300.0                                          | 511D338M020FR4D | 0.630 x 1.417 [16.0 x 36.0] | 0.128                                | 0.060            | 1.920                     | 2.810            | 0.064                                                |
| 25 WV <sub>DC</sub> at + 105 °C, SURGE = 32 V   |                 |                             |                                      |                  |                           |                  |                                                      |
| 47.0 <sup>(1)</sup>                             | 511D476M025AA4D | 0.236 x 0.433 [6.0 x 11.0]  | 6.120                                | 2.940            | 0.089                     | 0.127            | 2.950                                                |
| 100.0                                           | 511D107M025BB4D | 0.315 x 0.472 [8.0 x 12.0]  | 2.914                                | 1.350            | 0.158                     | 0.232            | 1.350                                                |
| 1200.0                                          | 511D128M025EK4D | 0.630 x 0.984 [16.0 x 25.0] | 0.239                                | 0.110            | 1.127                     | 1.660            | 0.105                                                |
| 2200.0                                          | 511D228M025ER4D | 0.630 x 1.417 [16.0 x 36.0] | 0.162                                | 0.064            | 1.580                     | 2.520            | 0.074                                                |
| 35 WV <sub>DC</sub> at + 105 °C, SURGE = 44 V   |                 |                             |                                      |                  |                           |                  |                                                      |
| 120.0                                           | 511D127M035CC4D | 0.394 x 0.512 [10.0 x 13.0] | 1.830                                | 1.010            | 0.239                     | 0.323            | 0.980                                                |
| 330.0                                           | 511D337M035CG4D | 0.394 x 0.787 [10.0 x 20.0] | 0.677                                | 0.305            | 0.468                     | 0.697            | 0.310                                                |
| 1000.0                                          | 511D108M035EK4D | 0.630 x 0.984 [16.0 x 25.0] | 0.223                                | 0.110            | 1.170                     | 1.660            | 0.112                                                |
| 1500.0                                          | 511D158M035EN4D | 0.630 x 1.260 [16.0 x 32.0] | 0.165                                | 0.078            | 1.490                     | 2.180            | 0.078                                                |
| 2200.0                                          | 511D228M035FR4D | 0.709 x 1.417 [18.0 x 36.0] | 0.121                                | 0.060            | 1.980                     | 2.810            | 0.062                                                |
| 40 WV <sub>DC</sub> at + 105 °C, SURGE = 50 V   |                 |                             |                                      |                  |                           |                  |                                                      |
| 100.0                                           | 511D107M040CC4D | 0.394 x 0.512 [10.0 x 13.0] | 1.939                                | 1.010            | 0.232                     | 0.323            | 0.981                                                |
| 220.0                                           | 511D227M040CG4D | 0.394 x 0.787 [10.0 x 20.0] | 0.883                                | 0.305            | 0.411                     | 0.698            | 0.311                                                |
| 330.0                                           | 511D337M040DG4D | 0.492 x 0.787 [12.5 x 20.0] | 0.588                                | 0.210            | 0.573                     | 0.959            | 0.221                                                |
| 470.0                                           | 511D477M040DK4D | 0.492 x 0.984 [12.5 x 25.0] | 0.407                                | 0.151            | 0.719                     | 1.190            | 0.157                                                |
| 1000.0                                          | 511D108M040EN4D | 0.630 x 1.260 [16.0 x 32.0] | 0.193                                | 0.078            | 1.390                     | 2.180            | 0.078                                                |
| 50 WV <sub>DC</sub> at + 105 °C, SURGE = 63 V   |                 |                             |                                      |                  |                           |                  |                                                      |
| 47.0                                            | 511D476M050BB4D | 0.315 x 0.472 [8.0 x 12.0]  | 3.884                                | 1.510            | 0.137                     | 0.221            | 1.450                                                |
| 120.0                                           | 511D127M050CD4D | 0.394 x 0.630 [10.0 x 16.0] | 1.320                                | 0.466            | 0.302                     | 0.509            | 0.488                                                |
| 270.0                                           | 511D277M050DG4D | 0.492 x 0.787 [12.5 x 20.0] | 0.601                                | 0.221            | 0.567                     | 0.937            | 0.231                                                |
| 1000.0                                          | 511D108M050ER4D | 0.630 x 1.417 [16.0 x 36.0] | 0.161                                | 0.065            | 1.590                     | 2.510            | 0.068                                                |
| 1500.0                                          | 511D158M050FR4D | 0.709 x 1.417 [18.0 x 36.0] | 0.153                                | 0.065            | 1.760                     | 2.710            | 0.068                                                |
| 63 WV <sub>DC</sub> at + 105 °C, SURGE = 79 V   |                 |                             |                                      |                  |                           |                  |                                                      |
| 47.0                                            | 511D476M063CC4D | 0.394 x 0.512 [10.0 x 13.0] | 3.076                                | 1.170            | 0.184                     | 0.299            | 1.110                                                |
| 150.0                                           | 511D157M063CG4D | 0.394 x 0.787 [10.0 x 20.0] | 1.010                                | 0.331            | 0.385                     | 0.671            | 0.341                                                |
| 470.0                                           | 511D477M063EK4D | 0.630 x 0.984 [16.0 x 25.0] | 0.307                                | 0.125            | 0.995                     | 1.560            | 0.125                                                |
| 1200.0                                          | 511D128M063FR4D | 0.709 x 1.417 [18.0 x 36.0] | 0.165                                | 0.065            | 1.690                     | 2.710            | 0.068                                                |
| 75 WV <sub>DC</sub> at + 105 °C, SURGE = 90 V   |                 |                             |                                      |                  |                           |                  |                                                      |
| 33.0                                            | 511D336M075CC4D | 0.394 x 0.512 [10.0 x 13.0] | 4.440                                | 1.210            | 0.153                     | 0.295            | 1.210                                                |
| 100.0                                           | 511D107M075CG4D | 0.394 x 0.787 [10.0 x 20.0] | 1.460                                | 0.341            | 0.318                     | 0.661            | 0.341                                                |
| 150.0                                           | 511D157M075DG4D | 0.492 x 0.787 [12.5 x 20.0] | 1.010                                | 0.261            | 0.439                     | 0.862            | 0.261                                                |
| 220.0                                           | 511D227M075DK4D | 0.492 x 0.984 [12.5 x 25.0] | 0.666                                | 0.211            | 0.589                     | 1.050            | 0.211                                                |
| 470.0                                           | 511D477M075EN4D | 0.630 x 1.260 [16.0 x 32.0] | 0.307                                | 0.105            | 1.110                     | 1.880            | 0.105                                                |
| 100 WV <sub>DC</sub> at + 105 °C, SURGE = 125 V |                 |                             |                                      |                  |                           |                  |                                                      |
| 4.7 <sup>(1)</sup>                              | 511D475M100AA4D | 0.236 x 0.433 [6.0 x 11.0]  | 30.79                                | 4.310            | 0.041                     | 0.106            | 4.210                                                |
| 10.0 <sup>(1)</sup>                             | 511D106M100BB4D | 0.314 x 0.472 [8.0 x 12.0]  | 14.63                                | 1.810            | 0.071                     | 0.202            | 1.710                                                |
| 33.0                                            | 511D336M100CD4D | 0.394 x 0.630 [10.0 x 16.0] | 4.440                                | 0.531            | 0.165                     | 0.477            | 0.531                                                |
| 120.0                                           | 511D127M100DK4D | 0.492 x 0.984 [12.5 x 25.0] | 1.210                                | 0.215            | 0.437                     | 1.030            | 0.215                                                |
| 330.0                                           | 511D337M100ER4D | 0.630 x 1.260 [16.0 x 32.0] | 0.444                                | 0.076            | 0.958                     | 2.320            | 0.078                                                |
| 470.0                                           | 511D477M100FR4D | 0.709 x 1.417 [18.0 x 36.0] | 0.361                                | 0.071            | 1.150                     | 2.610            | 0.074                                                |
| 160 WV <sub>DC</sub> at + 105 °C, SURGE = 185 V |                 |                             |                                      |                  |                           |                  |                                                      |
| 10.0                                            | 511D106M160CD4D | 0.394 x 0.630 [10.0 x 16.0] | 16.09                                | 4.910            | 0.086                     | 0.157            | 4.910                                                |
| 22.0                                            | 511D226M160DG4D | 0.492 x 0.787 [12.5 x 20.0] | 7.330                                | 3.210            | 0.162                     | 0.245            | 3.210                                                |
| 33.0                                            | 511D336M160DK4D | 0.492 x 0.984 [12.5 x 25.0] | 4.880                                | 2.250            | 0.216                     | 0.319            | 2.250                                                |
| 100.0                                           | 511D107M160ER4D | 0.630 x 1.260 [16.0 x 32.0] | 1.610                                | 0.531            | 0.504                     | 0.876            | 0.531                                                |

**Note**<sup>(1)</sup> These values are normally stocked. See Original Ratings for more values that are stocked.

**STANDARD RATINGS** in inches [millimeters]

| CAPACITANCE<br>(μF)                             | PART NUMBER     | NOMINAL CASE SIZE<br>D x L  | Max. ESR<br>at + 25 °C (mΩ) |                  | Max. RIPPLE<br>at + 85 °C |                  | Max.<br>IMPEDANCE<br>at + 25 °C (mΩ)<br>100 Hz |
|-------------------------------------------------|-----------------|-----------------------------|-----------------------------|------------------|---------------------------|------------------|------------------------------------------------|
|                                                 |                 |                             | 120 Hz                      | 20 kHz to 40 kHz | 120 Hz                    | 20 kHz to 40 kHz |                                                |
| 200 WV <sub>DC</sub> at + 105 °C, SURGE = 225 V |                 |                             |                             |                  |                           |                  |                                                |
| 1.5                                             | 511D155M200AA4D | 0.236 x 0.433 [6.0 x 11.0]  | 110.01                      | 33.110           | 0.021                     | 0.038            | 33.010                                         |
| 22.0                                            | 511D226M200DG4D | 0.492 x 0.787 [12.5 x 20.0] | 7.330                       | 3.210            | 0.162                     | 0.245            | 3.210                                          |
| 33.0                                            | 511D336M200DK4D | 0.492 x 0.984 [12.5 x 25.0] | 4.880                       | 2.250            | 0.216                     | 0.319            | 2.250                                          |
| 47.0                                            | 511D476M200EK4D | 0.630 x 0.984 [16.0 x 25.0] | 3.384                       | 1.210            | 0.299                     | 0.501            | 1.210                                          |
| 120.0                                           | 511D127M200FR4D | 0.709 x 1.417 [18.0 x 36.0] | 1.420                       | 0.481            | 0.577                     | 0.991            | 0.491                                          |
| 250 WV <sub>DC</sub> at + 105 °C, SURGE = 275 V |                 |                             |                             |                  |                           |                  |                                                |
| 10.0                                            | 511D106M250CG4D | 0.394 x .787 [10.0 x 20.0]  | 16.090                      | 3.760            | 0.096                     | 0.198            | 3.760                                          |
| 33.0                                            | 511D336M250EK4D | 0.630 x 0.984 [16.0 x 25.0] | 4.880                       | 1.270            | 0.249                     | 0.489            | 1.270                                          |
| 47.0                                            | 511D476M250EN4D | 0.630 x 1.260 [16.0 x 32.0] | 3.380                       | 0.721            | 0.331                     | 0.717            | 0.721                                          |

**ORIGINAL RATINGS**

| CAPACITANCE<br>( $\mu$ F)                             | CASE CODE | PART NUMBER     |
|-------------------------------------------------------|-----------|-----------------|
| <b>6.3 WV<sub>DC</sub> at + 105 °C, SURGE = 8 V</b>   |           |                 |
| 470.0                                                 | CC        | 511D477M6R3CC4D |
| 1000.0                                                | CG        | 511D108M6R3CG4D |
| 2200.0                                                | DK        | 511D228M6R3DK4D |
| <b>10 WV<sub>DC</sub> at + 85 °C, SURGE = 13 V</b>    |           |                 |
| 470.0                                                 | CD        | 511D477M010CD4D |
| 1000.0                                                | DG        | 511D108M010DG4D |
| 4700.0                                                | ER        | 511D478M010ER4D |
| <b>16 WV<sub>DC</sub> at + 105 °C, SURGE = 20 V</b>   |           |                 |
| 47.0 <sup>(1)</sup>                                   | AA        | 511D476M016AA4D |
| 100.0 <sup>(1)</sup>                                  | BB        | 511D107M016BB4D |
| 220.0                                                 | CC        | 511D227M016CC4D |
| <b>25 WV<sub>DC</sub> at + 105 °C, SURGE = 32 V</b>   |           |                 |
| 220.0                                                 | CD        | 511D227M025CD4D |
| 470.0                                                 | DG        | 511D477M025DG4D |
| 1000.0                                                | EK        | 511D108M025EK4D |
| <b>35 WV<sub>DC</sub> at + 105 °C, SURGE = 44 V</b>   |           |                 |
| 22.0                                                  | AA        | 511D226M035AA4D |
| 47.0                                                  | BB        | 511D476M035BB4D |
| 100.0 <sup>(1)</sup>                                  | CC        | 511D107M035CC4D |
| 220.0                                                 | CG        | 511D227M035CG4D |
| 470.0                                                 | DK        | 511D477M035DK4D |
| 1000.0                                                | EN        | 511D108M035EN4D |
| <b>50 WV<sub>DC</sub> at + 105 °C, SURGE = 63 V</b>   |           |                 |
| 47.0                                                  | CC        | 511D476M050CC4D |
| 220.0                                                 | DK        | 511D227M050DK4D |
| <b>63 WV<sub>DC</sub> at + 105 °C, SURGE = 70 V</b>   |           |                 |
| 10.0 <sup>(1)</sup>                                   | AA        | 511D106M063AA4D |
| 22.0                                                  | BB        | 511D226M063BB4D |
| 47.0 <sup>(1)</sup>                                   | CD        | 511D476M063CD4D |
| 100.0                                                 | CG        | 511D107M063CG4D |
| 220.0                                                 | EK        | 511D227M063EK4D |
| 470.0                                                 | EN        | 511D477M063EN4D |
| <b>100 WV<sub>DC</sub> at + 105 °C, SURGE = 125 V</b> |           |                 |
| 22.0                                                  | CD        | 511D226M100CD4D |
| 47.0                                                  | CG        | 511D476M100CG4D |
| 220.0                                                 | EN        | 511D227M100EN4D |

**Note**<sup>(1)</sup> These values are normally stocked



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