

# Aluminum Capacitors +125 °C, Miniature, Radial Lead



## FEATURES

- +125 °C performance
- Suitable for tantalum foil replacement applications
- Low DC leakage currents
- Very stable, long life
- Case sizes through 0.709" x 1.417" [18.0 mm x 36.0 mm]
- Optional third lead on diameters  $\geq 0.492$ " [12.5 mm]
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

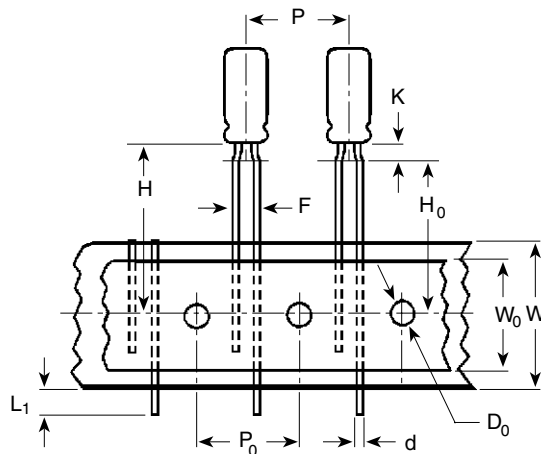


| QUICK REFERENCE DATA                       |   |
|--|---|
| DESCRIPTION                                | VALUE   |
| Nominal case size<br>Ø D x L in mm         | 0.236" x 0.433" [6.0 x 11.0]<br>to 0.709" x 1.417" [18.0 x 36.0]  |
| Operating temperature                      | -40 °C to +125 °C   |
| Rated capacitance range, C <sub>R</sub>    | 1.0 µF to 6800 µF   |
| Tolerance on C <sub>R</sub>                | ± 20 %  |
| Rated voltage range, U <sub>R</sub>        | 6.3 WV <sub>DC</sub> to 63 WV <sub>DC</sub>   |
| Termination                                | 2 and 3 radial leads  |
| Life validation test at 125 °C             | 2000 h: ΔCAP ≤ 15 %<br>(6.3 WV <sub>DC</sub> to 10 WV <sub>DC</sub> ),<br>≤ 10 % (16 WV <sub>DC</sub> to 63 WV <sub>DC</sub> )<br>from initial measurement.<br>ΔDF ≤ 1.25 x initial specified limit.<br>ΔDCL ≤ initial specified limit. |
| Shelf life at 105 °C                       | 500 h: ΔCAP ≤ 12 % from<br>initial measurement.<br>ΔDF ≤ 1.25 x initial specified limit.<br>ΔDCL ≤ 2.0 x initial specified limit.   |
| DC leakage current<br>(after 2 min charge) | I = 0.01 CV<br>I in µA, C in µF, V in Volts   |

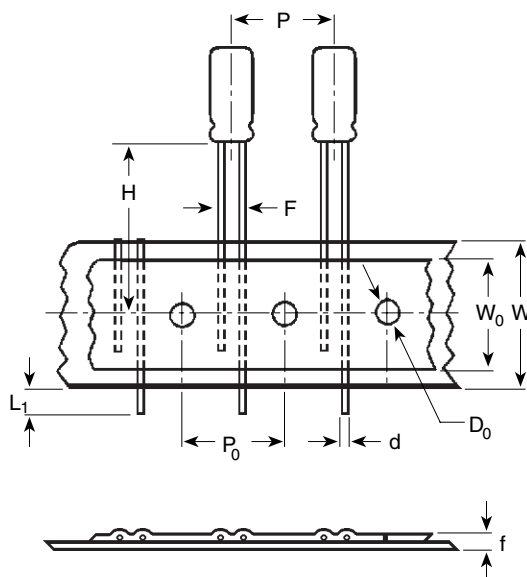
| RIPPLE CURRENT MULTIPLIERS |          |             |            |           |
|----------------------------|----------|-------------|------------|-----------|
| TEMPERATURE                |          |             |            |           |
| AMBIENT TEMPERATURE        |          | MULTIPLIERS |            |           |
| +125 °C                    |          | 0.4         |            |           |
| +105 °C                    |          | 1.0         |            |           |
| +85 °C                     |          | 1.41        |            |           |
| +75 °C                     |          | 1.58        |            |           |
| ≤ +65 °C                   |          | 1.73        |            |           |
| FREQUENCY (Hz)             |          |             |            |           |
| FREQUENCY (Hz)             | 50 TO 60 | 100 TO 120  | 300 TO 400 | 1K AND UP |
| MULTIPLIERS                | 0.85     | 1.00        | 1.05       | 1.10      |
|                            | 0.80     | 1.00        | 1.30       | 1.40      |

| LOW TEMPERATURE PERFORMANCE                         |                       |
|---|-----------------------|
| CAPACITANCE RATIO C-55 °C/C+25 °C MINIMUM AT 120 Hz |                       |
| RATED VOLTAGE (WV <sub>DC</sub> )                   | CAPACITANCE REMAINING |
| 6.3 to 10   | 75 %                  |
| 16 to 25  | 80 %                  |
| 36 to 63  | 85 %                  |
| ESR RATIO ESR-55 °C/ESR+25 °C MAXIMUM AT 120 Hz     |                       |
| RATED VOLTAGE (WV <sub>DC</sub> )                   | MULTIPLIER            |
| 6.3 to 10   | 35                    |
| 16 to 25  | 30                    |
| 36 to 63  | 25                    |

| 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 ± 0.020 [0.50] | NOMINAL       | AWG NO. |
| 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      |
| BD                                 | 0.315 [8.0]  | 0.630 [16.0] | 0.335 [8.5]    | 0.669 [17.0] | 0.335 [8.5]    | 0.709 [18.0] | 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      |
| 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]      | 0.028 [0.71]  | 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      |
| 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      |

**DIMENSIONS** in inches [millimeters] **AND AVAILABLE FORMS**
**Formed Leads**


| <b>DIMENSIONS</b> in inches [millimeters] <b>AND PACKAGING QUANTITIES</b> |                |               |
|---|----------------|---------------|
| 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 (Straight) Leads**


| <b>DIMENSIONS</b> in inches [millimeters] <b>AND PACKAGING QUANTITIES</b> |                            |               |
|---|----------------------------|---------------|
| CASE SIZE   | F LEAD SPACING             | STD. QTY/REEL |
| 0.236 x 0.433 [6.0 x 11.0]  | 0.098 [2.5] <sup>(1)</sup> | 800           |
| 0.315 x 0.472 [8.0 x 12.0]  | 0.140 [3.5] <sup>(1)</sup> | 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]                   | 0.025 [0.63]                   |
| 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]                   | 0.028 [0.7]                    | 0.028 [0.7]                    | 0.028 [0.7]                    |
| 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**

- Positive leader is standard. Negative leader is available by special order.

**ORDERING EXAMPLE**

Electrolytic capacitor 510DX series: 510DX 227 M 050 DG 2 D

| DESCRIPTION |   |
|-------------|---|
| CODE        | EXPLANATION                               |
| 510DX       | Product type                              |
| 227         | Capacitance value (220 $\mu$ F)           |
| M           | Tolerance (M = $\pm$ 20 %)                |
| 050         | Voltage rating at 105 °C (050 = 50 V)     |
| DG          | Can size (see "Dimensions" table)         |
| 2           | Sleeve and sealing (2 = Polyester sleeve) |
| D           | Packaging (D = Bulk; straight leads)      |

**Note**

- For lead (Pb)-free/RoHS compliant products add suffix "E3" to part number.  
Example: 510DX227M050DG2DE3

| ELECTRICAL DATA AND ORDERING INFORMATION    |                            |  |                            |                  |                               |                  |                                       |
|---|----------------------------|--|----------------------------|------------------|-------------------------------|------------------|---------------------------------------|
| CAPACITANCE<br>(μF)                         | PART NUMBER <sup>(1)</sup> | NOMINAL CASE SIZE<br>D x L<br>IN INCHES (mm) | MAX. ESR<br>AT +25 °C (mΩ) |                  | MAX. RIPPLE<br>AT +105 °C (A) |                  | MAX. Z<br>AT +25 °C<br>(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 125 °C, SURGE = 8 V |                            |  |                            |                  |                               |                  |                                       |
| 330.0                                       | 510DX337M6R3CC2D           | 0.394 x 0.512 [10.0 x 13.0]                  | 1206.0                     | 507.0            | 0.294                         | 0.454            | 457.0                                 |
| 1000.0                                      | 510DX108M6R3DG2D           | 0.492 x 0.787 [12.5 x 20.0]                  | 398.0                      | 201.0            | 0.697                         | 0.984            | 181.0                                 |
| 1500.0                                      | 510DX158M6R3DK2D           | 0.492 x 0.984 [12.5 x 25.0]                  | 265.0                      | 133.0            | 0.931                         | 1.313            | 121.0                                 |
| 4700.0                                      | 510DX478M6R3ER2D           | 0.630 x 1.417 [16.0 x 36.0]                  | 85.0                       | 40.0             | 2.193                         | 3.193            | 36.0                                  |
| 10 WV <sub>DC</sub> AT 125 °C, SURGE = 13 V |                            |  |                            |                  |                               |                  |                                       |
| 150.0                                       | 510DX157M010BB2D           | 0.315 x 0.472 [8.0 x 12.0]                   | 2210.0                     | 948.0            | 0.182                         | 0.278            | 854.0                                 |
| 220.0                                       | 510DX227M010BD2D           | 0.315 x 0.630 [8.0 x 16.0]                   | 1507.0                     | 528.0            | 0.247                         | 0.417            | 475.0                                 |
| 1200.0                                      | 510DX128M010DK2D           | 0.492 x 0.984 [12.5 x 25.0]                  | 276.0                      | 138.0            | 0.911                         | 1.287            | 124.0                                 |
| 4700.0                                      | 510DX478M010FR2D           | 0.709 x 1.417[18.0 x 36.0]                   | 71.0                       | 37.0             | 2.582                         | 3.576            | 33.0                                  |
| 16 WV <sub>DC</sub> AT 125 °C, SURGE = 20 V |                            |  |                            |                  |                               |                  |                                       |
| 150.0                                       | 510DX157M016BD2D           | 0.315 x 0.630 [8.0 x 16.0]                   | 1415.0                     | 549.0            | 0.255                         | 0.409            | 494.0                                 |
| 470.0                                       | 510DX477M016DG2D           | 0.492 x 0.787 [12.5 x 20.0]                  | 451.0                      | 216.0            | 0.654                         | 0.946            | 194.0                                 |
| 2200.0                                      | 510DX228M016ER2D           | 0.630 x 1.417 [16.0 x 36.0]                  | 96.0                       | 43.0             | 2.060                         | 3.078            | 39.0                                  |

**ELECTRICAL DATA AND ORDERING INFORMATION**

| CAPACITANCE<br>( $\mu$ F)                   | PART NUMBER <sup>(1)</sup> | NOMINAL CASE SIZE<br>D x L<br>IN INCHES (mm) | MAX. ESR<br>AT +25 °C (m $\Omega$ ) |                  | MAX. RIPPLE<br>AT +105 °C (A) |                  | MAX. Z<br>AT +25 °C<br>(m $\Omega$ )<br>100 Hz |
|---|----------------------------|--|-------------------------------------|------------------|-------------------------------|------------------|--|
|   |                            |  | 120 Hz                              | 20 kHz TO 40 kHz | 120 Hz                        | 20 kHz TO 40 kHz |  |
| 25 WV <sub>DC</sub> AT 125 °C, SURGE = 32 V |                            |  |                                     |                  |                               |                  |  |
| 100.0                                       | 510DX107M025BD2D           | 0.315 x 0.630 [8.0 x 16.0]                   | 1459.0                              | 571.0            | 0.251                         | 0.401            | 514.0  |
| 100.0                                       | 510DX107M025CC2D           | 0.394 x 0.512 [10.0 x 13.0]                  | 1459.0                              | 571.0            | 0.268                         | 0.428            | 514.0  |
| 330.0                                       | 510DX337M025DG2D           | 0.492 x 0.787 [12.5 x 20.0]                  | 442.0                               | 224.0            | 0.661                         | 0.927            | 202.0  |
| 470.0                                       | 510DX477M025DK2D           | 0.492 x 0.984 [12.5 x 25.0]                  | 310.0                               | 150.0            | 0.859                         | 1.238            | 135.0  |
| 1500.0                                      | 510DX158M025ER2D           | 0.630 x 1.417 [16.0 x 36.0]                  | 97.0                                | 45.0             | 2.049                         | 3.009            | 40.0   |
| 35 WV <sub>DC</sub> AT 125 °C, SURGE = 44 V |                            |  |                                     |                  |                               |                  |  |
| 47.0  | 510DX476M035BB2D           | 0.315 x 0.472 [8.0 x 12.0]                   | 2822.0                              | 1067.0           | 0.161                         | 0.262            | 960.0  |
| 100.0                                       | 510DX107M035CC2D           | 0.394 x 0.512 [10.0 x 13.0]                  | 1326.0                              | 593.0            | 0.281                         | 0.421            | 534.0  |
| 220.0                                       | 510DX227M035CG2D           | 0.394 x 0.787 [10.0 x 20.0]                  | 603.0                               | 248.0            | 0.496                         | 0.774            | 223.0  |
| 470.0                                       | 510DX477M035DK2D           | 0.492 x 0.984 [12.5 x 25.0]                  | 282.0                               | 156.0            | 0.901                         | 1.214            | 140.0  |
| 1200.0                                      | 510DX128M035EN2D           | 0.630 x 1.260 [16.0 x 32.0]                  | 111.0                               | 58.0             | 1.826                         | 2.527            | 52.0   |
| 1500.0                                      | 510DX158M035ER2D           | 0.630 x 1.417 [16.0 x 36.0]                  | 88.0                                | 47.0             | 2.151                         | 2.944            | 42.0   |
| 50 WV <sub>DC</sub> AT 125 °C, SURGE = 63 V |                            |  |                                     |                  |                               |                  |  |
| 220.0                                       | 510DX227M050DG2D           | 0.492 x 0.787 [12.5 x 20.0]                  | 543.0                               | 243.0            | 0.597                         | 0.892            | 218.0  |
| 330.0                                       | 510DX337M050DK2D           | 0.492 x 0.984 [12.5 x 25.0]                  | 362.0                               | 162.0            | 0.796                         | 1.191            | 146.0  |
| 1000.0                                      | 510DX108M050ER2D           | 0.630 x 1.417 [16.0 x 36.0]                  | 119.0                               | 49.0             | 1.847                         | 2.883            | 44.0   |
| 63 WV <sub>DC</sub> AT 125 °C, SURGE = 79 V |                            |  |                                     |                  |                               |                  |  |
| 47.0  | 510DX476M063BD2D           | 0.315 x 0.630 [8.0 x 16.0]                   | 1975.0                              | 642.0            | 0.215                         | 0.378            | 578.0  |
| 47.0  | 510DX476M063CC2D           | 0.394 x 0.512 [10.0 x 13.0]                  | 1975.0                              | 642.0            | 0.231                         | 0.404            | 578.0  |
| 220.0                                       | 510DX227M063DK2D           | 0.492 x 0.984 [12.5 x 25.0]                  | 422.0                               | 168.0            | 0.737                         | 1.167            | 151.0  |
| 1000.0                                      | 510DX108M063FR2D           | 0.709 x 1.417 [18.0 x 36.0]                  | 93.0                                | 45.0             | 2.256                         | 3.243            | 41.0   |



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