

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 ≥ 0.492 " [12.5 mm]
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

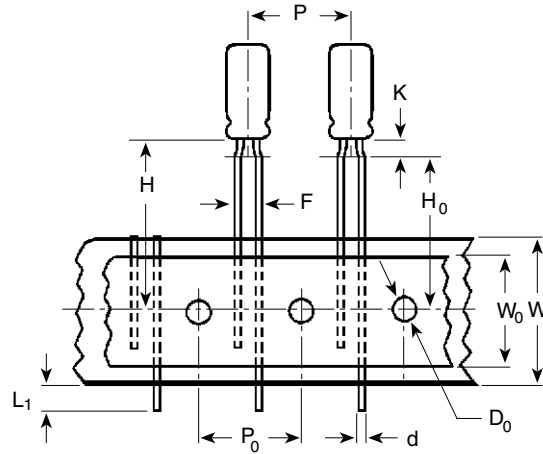


| QUICK REFERENCE DATA | |
|--|---|
| DESCRIPTION | VALUE |
| Nominal case size Ø D x L in mm | 0.236" x 0.433" [6.0 x 11.0] to 0.709" x 1.417" [18.0 x 36.0] |
| Operating temperature | -40 °C to +125 °C |
| Rated capacitance range, C _R | 1.0 µF to 6800 µF |
| Tolerance on C _R | ± 20 % |
| Rated voltage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

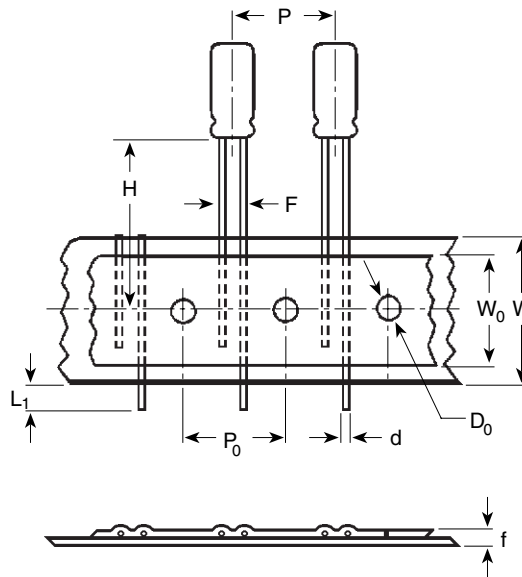
| RIPPLE CURRENT MULTIPLIERS | | | | |
|----------------------------|-------------|------------|------------|-----------|
| TEMPERATURE | | | | |
| AMBIENT TEMPERATURE | MULTIPLIERS | | | |
| +125 °C | 0.4 | | | |
| +105 °C | 1.0 | | | |
| +85 °C | 1.41 | | | |
| +75 °C | 1.58 | | | |
| ≤ +65 °C | 1.73 | | | |
| 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 _{DC}) | 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 _{DC}) | 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


| DIMENSIONS in inches [millimeters] AND PACKAGING QUANTITIES | | |
|---|-----------------------|----------------------|
| 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


| DIMENSIONS in inches [millimeters] AND PACKAGING QUANTITIES | | |
|---|----------------------------|----------------------|
| CASE SIZE | F LEAD SPACING | STD. QTY/REEL |
| 0.236 x 0.433 [6.0 x 11.0] | 0.098 [2.5] ⁽¹⁾ | 800 |
| 0.315 x 0.472 [8.0 x 12.0] | 0.140 [3.5] ⁽¹⁾ | 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
⁽¹⁾ Available as special order.



| DIMENSIONS in inches [millimeters] | | | | | |
|--|-------------------------------|-------------------------------|--------------------------------|--------------------------------|--------------------------------|
| ITEM | CASE SIZE (Diameter x Length) | | | | |
| | 0.236 x 0.433 [6.0 x 11.0] | 0.315 x 0.472 [8.0 x 12.0] | 0.394 x 0.512 [10.0 x 13.0] | 0.394 x 0.630 [10.0 x 16.0] | 0.394 x 0.787 [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 ₀ - 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 ₀ - 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 ₀ - 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 ₀ - 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 ₁ - 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 µF) |
| M | Tolerance (M = ± 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 (µF) | PART NUMBER (1) | NOMINAL CASE SIZE D x L IN INCHES (mm) | MAX. ESR AT +25 °C (mΩ) | | MAX. RIPPLE AT +105 °C (A) | | MAX. Z AT +25 °C (mΩ) 100 Hz |
| | | | 120 Hz | 20 kHz TO 40 kHz | 120 Hz | 20 kHz TO 40 kHz | |
| 6.3 WV_{DC} 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_{DC} 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_{DC} 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 (μ F) | PART NUMBER ⁽¹⁾ | NOMINAL CASE SIZE D x L IN INCHES (mm) | MAX. ESR AT +25 °C (m Ω) | | MAX. RIPPLE AT +105 °C (A) | | MAX. Z AT +25 °C (m Ω) 100 Hz |
| | | | 120 Hz | 20 kHz TO 40 kHz | 120 Hz | 20 kHz TO 40 kHz | |
| 25 WV_{DC} 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_{DC} 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_{DC} 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_{DC} 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 |

Statements about product lifetime are based on calculations and internal testing. They should only be interpreted as estimations. Also due to external factors, the lifetime in the field application may deviate from the calculated lifetime. In general, nothing stated herein shall be construed as a guarantee of durability.



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