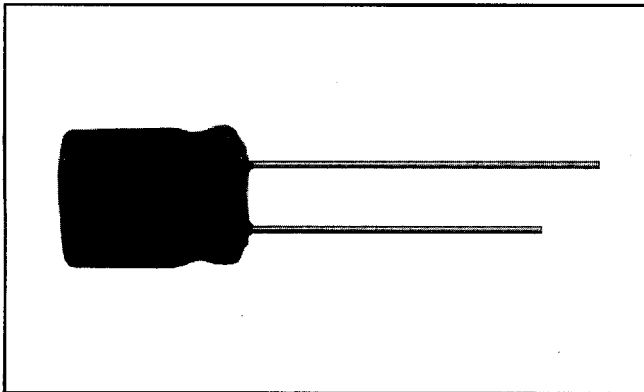


TYPE 678D Aluminum Capacitors + 105°C, Miniature, Radial Lead



FEATURES

- Improved SMPS output capacitors
- Highest ripple current ratings per case size
- High CV



PERFORMANCE CHARACTERISTICS

Operating Temperature: - 55°C to + 105°C.

Capacitance Range: 33µF to 6800µF.

Capacitance Tolerance: ± 20%.

Voltage Rating: 6.3 WVDC to 63 WVDC.

Case Size Range: .394" x .472" [10.0 x 12.0]
to .709" x 1.575" [18.0 x 40.0].

Termination: 2 and 3 lead radial and axial mount.

Life Validation Test:

4000 hours @ + 105°C (≥ .512" [13.0] diameter):
3000 hours @ + 105°C (.394" [10.0] diameter):
Δ CAP ≤ 20% (6.3 WVDC to 25 WVDC),
≤ 15% (40 WVDC to 63 WVDC) from initial measurements.

Δ ESR ≤ 1.3 x initial specified limit.
Δ DCL ≤ 2 x initial specified limit.

Shelf Test: 1000 hours @ + 105°C:

Δ CAP ≤ 20% (6.3 WVDC to 25 WVDC),
≤ 15% (40 WVDC to 63 WVDC) from initial measurements.

Δ ESR ≤ 1.3 x initial specified limit.
Δ DCL ≤ 2 x initial specified limit.

DC Leakage Current:

I = 0.01 CV, 2 minute charge time.

I = 0.03 CV, 1 minute charge time.
I in µA, C in µF, V in Volts.

| RIPPLE CURRENT MULTIPLIERS | | | | | |
|----------------------------|---------|-----------|-------------|----------|------------|
| TEMPERATURE | | | | | |
| Ambient Temperature | | | Multipliers | | |
| + 105°C | | | 1.0 | | |
| + 85°C | | | 2.2 | | |
| + 75°C | | | 2.7 | | |
| ≤ + 65°C | | | 3.0 | | |
| FREQUENCY (Hz) | | | | | |
| WVDC | 50 - 60 | 100 - 120 | 300 - 400 | 1k - 19k | 20k - 200k |
| 6.3 - 63 | 0.60 | 0.70 | 0.75 | 0.82 | 1.0 |

| LOW TEMPERATURE PERFORMANCE | | | | |
|---|-------------|--------------|-------------|--------------|
| CAPACITANCE RATIO C - 55°C/C + 25°C MINIMUM @ 120Hz | | | | |
| MAXIMUM CAPACITANCE CHANGE | Voltage | | Multiplier | |
| | | 6.3 V - 16 V | 25 V - 63 V | 0.75 0.85 |
| MAXIMUM IMPEDANCE CHANGE | Voltage | | Multiplier | |
| | | 6.3 V - 16 V | 25 V - 63 V | 2.0 1.5 |
| ESL (TYPICAL VALUES @ 1MHz to 10MHz) | | | | |
| NOMINAL DIAMETER | .394 [10.0] | .512 [13.0] | .630 [16.0] | .709 [18.0] |
| TYPICAL ESL (nH) | 4 | 7 | 10 | 12 |

| DIMENSIONS [Numbers in brackets indicate 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 ± .024 [.60] | T ± .02 [.50] | NOMINAL | AWG NO. |
| CC | .394 [10.0] | .512 [13.0] | .413 [10.5] | .563 [14.3] | .413 [10.5] | .630 [16.0] | .197 [5.0] | N/A | .025 [0.63] | 22 |
| CD | .394 [10.0] | .630 [16.0] | .413 [10.5] | .669 [17.0] | .413 [10.5] | .740 [18.8] | .197 [5.0] | N/A | .025 [0.63] | 22 |
| CG | .394 [10.0] | .787 [20.0] | .413 [10.5] | .846 [21.5] | .413 [10.5] | .906 [23.0] | .197 [5.0] | N/A | .025 [0.63] | 22 |
| DG | .492 [12.5] | .787 [20.0] | .512 [13.0] | .846 [21.5] | .512 [13.0] | .906 [23.0] | .197 [5.0] | .098 [2.5] | .032 [0.81] | 20 |
| DK | .492 [12.5] | .984 [25.0] | .512 [13.0] | 1.043 [26.5] | .512 [13.0] | 1.142 [29.0] | .197 [5.0] | .098 [2.5] | .032 [0.81] | 20 |

TYPE 678D

| DIMENSIONS [Numbers in brackets indicate 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 ± .002 [.05] | T ± .002 [.05] | NOMINAL | AWG NO. |
| DM | .492 [12.5] | 1.043 [26.5] | .512 [13.0] | 1.102 [28.0] | .512 [13.0] | 1.161 [29.5] | .197 [5.0] | .098 [2.5] | .032 [0.81] | 20 |
| DT | .492 [12.5] | 1.319 [33.5] | .512 [13.0] | 1.346 [34.2] | .512 [13.0] | 1.417 [36.0] | .197 [5.0] | .098 [2.5] | .032 [0.81] | 20 |
| DS | .492 [12.5] | 1.673 [42.5] | .512 [13.0] | 1.720 [43.7] | .512 [13.0] | 1.791 [45.5] | .197 [5.0] | .098 [2.5] | .032 [0.81] | 20 |
| EK | .630 [16.0] | .984 [25.0] | .650 [16.5] | 1.031 [26.2] | .650 [16.5] | 1.098 [27.9] | .295 [7.5] | .150 [3.8] | .032 [0.81] | 20 |
| EN | .630 [16.0] | 1.260 [32.0] | .650 [16.5] | 1.319 [33.5] | .650 [16.5] | 1.417 [36.0] | .295 [7.5] | .150 [3.8] | .032 [0.81] | 20 |
| ER | .630 [16.0] | 1.417 [36.0] | .650 [16.5] | 1.476 [37.5] | .650 [16.5] | 1.575 [40.0] | .295 [7.5] | .150 [3.8] | .032 [0.81] | 20 |
| EU | .630 [16.0] | 1.575 [40.0] | .650 [16.5] | 1.642 [41.7] | .650 [16.5] | 1.669 [42.4] | .295 [7.5] | .150 [3.8] | .032 [0.81] | 20 |
| FR | .709 [18.0] | 1.417 [36.0] | .728 [18.5] | 1.476 [37.5] | .728 [18.5] | 1.575 [40.0] | .295 [7.5] | .150 [3.8] | .032 [0.81] | 20 |
| FV | .709 [18.0] | 1.575 [40.0] | .728 [18.5] | 1.654 [42.0] | .728 [18.5] | 1.693 [43.0] | .295 [7.5] | .150 [3.8] | .032 [0.81] | 20 |

| STANDARD RATINGS [Numbers in brackets indicate millimeters] | | | | | | | |
|--|-----------------|----------------------------|-------------------------|-------|--------------------------|-------------------------------|--|
| CAPACITANCE (µF) | PART NUMBER | NOMINAL CASE SIZE D x L | Max. ESR @ +25°C (Ohms) | | Max. RIPPLE @ +105°C (A) | Max. IMPEDANCE @ +25°C (Ohms) | |
| | | | 20Hz | 20kHz | 20kHz - 100kHz | 100Hz | |
| 6.3 WVDC @ +105°C, SURGE = 9 V | | | | | | | |
| 330.0 | 678D337M6R3CC3D | .394 x .512 [10.0 x 13.0] | 0.540 | 0.213 | 0.36 | 0.213 | |
| 470.0 | 678D477M6R3CD3D | .394 x .630 [10.0 x 16.0] | 0.340 | 0.133 | 0.49 | 0.132 | |
| 1000.0 | 678D108M6R3DG3D | .492 x .787 [12.5 x 20.0] | 0.200 | 0.071 | 0.83 | 0.070 | |
| 2200.0 | 678D228M6R3EK3D | .630 x .984 [16.0 x 25.0] | 0.110 | 0.041 | 1.36 | 0.045 | |
| 3300.0 | 678D338M6R3DS3D | .492 x 1.673 [12.5 x 42.5] | 0.067 | 0.031 | 1.67 | 0.032 | |
| 4700.0 | 678D478M6R3FR3D | .709 x 1.417 [18.0 x 36.0] | 0.066 | 0.029 | 2.02 | 0.031 | |
| 10 WVDC @ +105°C, SURGE = 13 V | | | | | | | |
| 330.0 | 678D337M010CD3D | .394 x .630 [10.0 x 16.0] | 0.350 | 0.135 | 0.46 | 0.134 | |
| 470.0 | 678D477M010CG3D | .394 x .787 [10.0 x 20.0] | 0.235 | 0.092 | 0.63 | 0.090 | |
| 1000.0* | 678D108M010DM3D | .492 x 1.043 [12.5 x 26.5] | 0.120 | 0.062 | 0.98 | 0.061 | |
| 2200.0 | 678D228M010EK3D | .630 x .984 [16.0 x 25.0] | 0.115 | 0.042 | 1.52 | 0.046 | |
| 3300.0 | 678D338M010EN3D | .630 x 1.260 [16.0 x 32.0] | 0.085 | 0.038 | 1.56 | 0.041 | |
| 4700.0 | 678D478M010FR3D | .709 x 1.417 [18.0 x 36.0] | 0.070 | 0.031 | 1.97 | 0.033 | |
| 16 WVDC @ +105°C, SURGE = 20 V | | | | | | | |
| 220.0* | 678D227M016CC3D | .394 x .512 [10.0 x 13.0] | 0.585 | 0.217 | 0.40 | 0.217 | |
| 330.0* | 678D337M016CD3D | .394 x .630 [10.0 x 16.0] | 0.370 | 0.137 | 0.52 | 0.136 | |
| 470.0 | 678D477M016CG3D | .394 x .787 [10.0 x 20.0] | 0.250 | 0.098 | 0.70 | 0.094 | |
| 1000.0* | 678D108M016DM3D | .492 x 1.043 [12.5 x 26.5] | 0.130 | 0.066 | 1.00 | 0.065 | |
| 2200.0 | 678D228M016ER3D | .630 x 1.417 [16.0 x 36.0] | 0.074 | 0.032 | 1.78 | 0.034 | |
| 3300.0 | 678D338M016FR3D | .709 x 1.417 [18.0 x 36.0] | 0.074 | 0.032 | 1.94 | 0.034 | |
| 20 WVDC @ +105°C, SURGE = 30 V | | | | | | | |
| 220.0 | 678D227M020CD3D | .394 x .630 [10.0 x 16.0] | 0.380 | 0.150 | 0.41 | 0.148 | |
| 330.0 | 678D337M020CG3D | .394 x .787 [10.0 x 20.0] | 0.270 | 0.100 | 0.61 | 0.098 | |
| 470.0 | 678D477M020DG3D | .492 x .787 [12.5 x 20.0] | 0.250 | 0.077 | 0.45 | 0.075 | |
| 1000.0 | 678D108M020DT3D | .492 x 1.280 [12.5 x 33.5] | 0.115 | 0.048 | 0.78 | 0.045 | |
| 2200.0 | 678D228M020ER3D | .630 x 1.417 [16.0 x 36.0] | 0.077 | 0.032 | 1.80 | 0.034 | |
| 3300.0 | 678D338M020FV3D | .709 x 1.575 [18.0 x 40.0] | 0.061 | 0.026 | 2.25 | 0.028 | |

* These values are normally stocked.

TYPE 678D

| STANDARD RATINGS (Numbers in brackets indicate millimeters) | | | | | | |
|---|-----------------|----------------------------|-----------------------------|-------|--|--|
| CAPACITANCE (μ F) | PART NUMBER | NOMINAL CASE SIZE D x L | Max. ESR @ + 25°C (Ohms) | | Max. RIPPLE @ + 105°C (A) 20kHz - 100kHz | Max. IMPEDANCE @ + 25°C (Ohms) 100Hz |
| | | | 120Hz | 20kHz | | |
| 25 WVDC @ + 105°C, SURGE = 35 V | | | | | | |
| 100.0* | 678D107M025CC3D | .394 x .512 [10.0 x 13.0] | 0.700 | 0.250 | 0.32 | 0.250 |
| 220.0 | 678D227M025CG3D | .394 x .787 [10.0 x 20.0] | 0.300 | 0.105 | 0.59 | 0.100 |
| 330.0* | 678D337M025DG3D | .492 x .787 [12.5 x 20.0] | 0.270 | 0.078 | 0.79 | 0.076 |
| 470.0* | 678D477M025DM3D | .492 x 1.043 [12.5 x 26.5] | 0.160 | 0.067 | 0.97 | 0.068 |
| 1000.0 | 678D108M025DS3D | .492 x 1.673 [12.5 x 42.5] | 0.090 | 0.034 | 1.60 | 0.036 |
| 2200.0 | 678D228M025FV3D | .709 x 1.575 [18.0 x 40.0] | 0.062 | 0.026 | 2.22 | 0.028 |
| 40 WVDC @ + 105°C, SURGE = 55 V | | | | | | |
| 47.0 | 678D476M040CC3D | .394 x .512 [10.0 x 13.0] | 0.950 | 0.265 | 0.28 | 0.265 |
| 100.0* | 678D107M040CD3D | .394 x .630 [10.0 x 16.0] | 0.580 | 0.165 | 0.38 | 0.165 |
| 330.0* | 678D337M040DM3D | .492 x 1.043 [12.5 x 26.5] | 0.200 | 0.068 | 0.93 | 0.070 |
| 470.0* | 678D477M040EK3D | .630 x .984 [16.0 x 25.0] | 0.133 | 0.046 | 1.28 | 0.050 |
| 1000.0 | 678D108M040ER3D | .630 x 1.417 [16.0 x 36.0] | 0.080 | 0.033 | 1.76 | 0.035 |
| 50 WVDC @ + 105°C, SURGE = 75 V | | | | | | |
| 47.0 | 678D476M050CC3D | .394 x .512 [10.0 x 13.0] | 1.250 | 0.275 | 0.28 | 0.275 |
| 100.0* | 678D107M050CG3D | .394 x .787 [10.0 x 20.0] | 0.520 | 0.115 | 0.57 | 0.112 |
| 220.0 | 678D227M050DM3D | .472 x 1.043 [12.5 x 26.5] | 0.240 | 0.069 | 0.93 | 0.071 |
| 330.0 | 678D337M050EK3D | .630 x .984 [16.0 x 25.0] | 0.150 | 0.048 | 1.26 | 0.052 |
| 470.0 | 678D477M050DS3D | .492 x 1.673 [12.5 x 42.5] | 0.110 | 0.036 | 1.55 | 0.039 |
| 1000.0 | 678D108M050FV3D | .709 x 1.575 [18.0 x 40.0] | 0.077 | 0.028 | 2.15 | 0.032 |
| 63 WVDC @ + 105°C, SURGE = 80 V | | | | | | |
| 33.0 | 678D336M063CC3D | .394 x .512 [10.0 x 13.0] | 1.600 | 0.288 | 0.27 | 0.288 |
| 47.0 | 678D476M063CD3D | .394 x .630 [10.0 x 16.0] | 1.000 | 0.180 | 0.37 | 0.180 |
| 100.0 | 678D107M063DG3D | .492 x .787 [12.5 x 20.0] | 0.450 | 0.093 | 0.72 | 0.090 |
| 220.0 | 678D227M063DT3D | .492 x 1.280 [12.5 x 33.5] | 0.160 | 0.055 | 1.10 | 0.054 |
| 220.0* | 678D227M063EK3D | .630 x .984 [16.0 x 25.0] | 0.170 | 0.050 | 1.23 | 0.054 |
| 330.0 | 678D337M063DS3D | .492 x 1.673 [12.5 x 42.5] | 0.130 | 0.038 | 1.51 | 0.040 |
| 470.0 | 678D477M063ER3D | .630 x 1.417 [16.0 x 36.0] | 0.120 | 0.035 | 1.70 | 0.038 |

* These values are normally stocked.

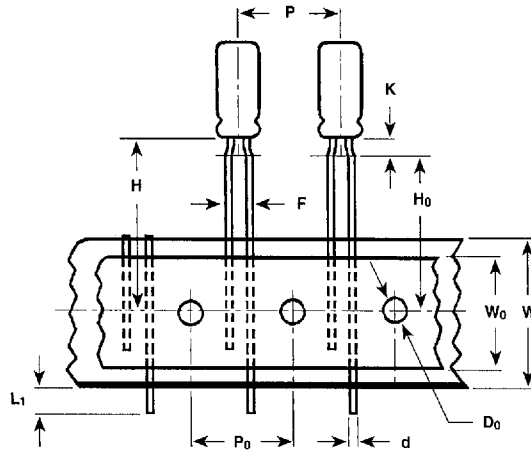
HOW TO ORDER

| | | | | | | |
|-------------|--|--------------------------|--|-----------------|-------------------------------------|-------------------------------|
| 678D | 108 | M | 6R3 | DM | 3 | D |
| TYPE | CAPACITANCE | CAPACITANCE TOLERANCE | DC VOLTAGE RATING @ + 105°C | CASE CODE | CASE STYLE | TERMINAL CODE |
| | This is expressed in picofarads. The first two digits are the significant figures. The third is the number of zeros to follow. | M = \pm 20%. Standard. | This is expressed in volts. To complete the three-digit block, zeros precede the voltage rating. A decimal point is indicated by an "R" (6R3 = 6.3 volts). | See Dimensions. | 3 = PVC sleeve with resin end seal. | D = Straight leads. Standard. |

TYPE 678D

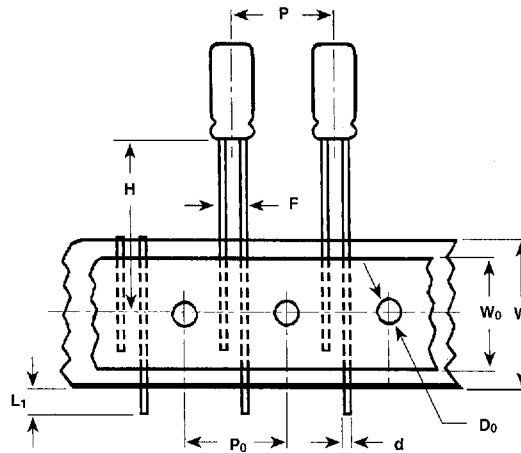
TAPE AND REEL, SPECIFICATIONS TO EIA-468D [Numbers in brackets indicate millimeters]

Formed Leads



| CASE SIZE | F LEAD SPACING | STD. QTY/REEL |
|-----------------------------|----------------|---------------|
| .236 x .453 [6.0 x 11.0] | .197 [5.0] | 800 |
| .315 x .472 [8.0 x 12.0] | .197 [5.0] | 700 |

Unformed (Straight) Leads



| CASE SIZE | F LEAD SPACING | STD. QTY/REEL |
|------------------------------|----------------|---------------|
| .236 x .453 [6.0 x 11.0] | .098 [2.5] | 800 |
| .315 x .472 [8.0 x 12.0] | .140* [3.5] | 700 |
| .394 x .512 [10.0 x 13.0] | .197 [5.0] | 500 |
| .394 x .630 [10.0 x 16.0] | .197 [5.0] | 500 |
| .394 x .787 [10.0 x 20.0] | .197 [5.0] | 500 |

* Available as special order.



| | CASE SIZE (Diameter x Length) | | | | |
|--|----------------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|
| | .236 x .433 [6.0 x 11.0] | .315 x .472 [8.0 x 12.0] | .394 x .512 [10.0 x 13.0] | .394 x .630 [10.0 x 16.0] | .394 x .787 [10.0 x 20.0] |
| d - Lead-wire Diameter | .025 [0.63] | .025 [0.63] | .025 [0.63] | .025 [0.63] | .025 [0.63] |
| P - Pitch of Component | .500 [12.7] | .500 [12.7] | .500 [12.7] | .500 [12.7] | .500 [12.7] |
| P ₀ - Feed Hole Pitch | .500 [12.7] | .500 [12.7] | .500 [12.7] | .500 [12.7] | .500 [12.7] |
| F - Lead-to-lead Distance | .197 [5.0] | .197 [5.0] | .197 [5.0] | .197 [5.0] | .197 [5.0] |
| K - Clinch Height | .098 [2.5] | .157 [4.0] | N/A | N/A | N/A |
| H - Height of Component from Tape Center | .728 [18.5] | .787 [20.0] | .906 [23.0] | .906 [23.0] | .906 [23.0] |
| H ₀ - Lead-wire Clinch Height | .630 [16.0] | .630 [16.0] | N/A | N/A | N/A |
| W - Tape Width | .709 [18.0] | .709 [18.0] | .709 [18.0] | .709 [18.0] | .709 [18.0] |
| W ₀ - Hold Down Tape Width | .591 [15.0] | .591 [15.0] | .591 [15.0] | .591 [15.0] | .591 [15.0] |
| D ₀ - Feed Hole Diameter | .157 [4.0] | .157 [4.0] | .157 [4.0] | .157 [4.0] | .157 [4.0] |
| f - Total Tape Thickness | .028 [0.7] | .028 [0.7] | .028 [0.7] | .028 [0.7] | .028 [0.7] |
| L ₁ - Maximum Lead Protrusion | .118 [3.0] | .118 [3.0] | .118 [3.0] | .118 [3.0] | .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.