

TYPE 678D

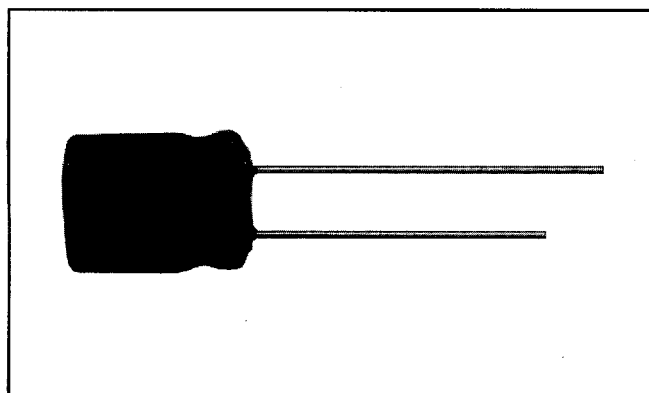
Aluminum Capacitors

+ 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

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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) 20Hz 20kHz		Max. RIPPLE @ + 105°C (A) 20kHz - 100kHz	Max. IMPEDANCE @ + 25°C (Ohms) 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.

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STANDARD RATINGS (Numbers in brackets indicate millimeters)						
CAPACITANCE (μ F)	PART NUMBER	NOMINAL CASE SIZE D x L	Max. ESR @ + 25°C (Ohms) 120Hz 20kHz		Max. RIPPLE @ + 105°C (A) 20kHz - 100kHz	Max. IMPEDANCE @ + 25°C (Ohms) 100Hz
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

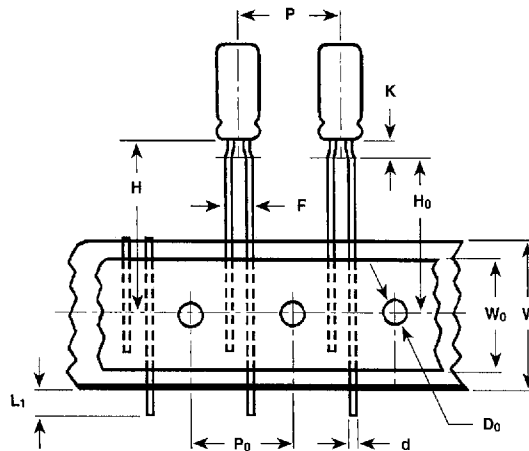
* These values are normally stocked.

HOW TO ORDER						
678D TYPE	108 CAPACITANCE	M CAPACITANCE TOLERANCE	6R3 DC VOLTAGE RATING @ + 105°C	DM CASE CODE	3 CASE STYLE	D 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.

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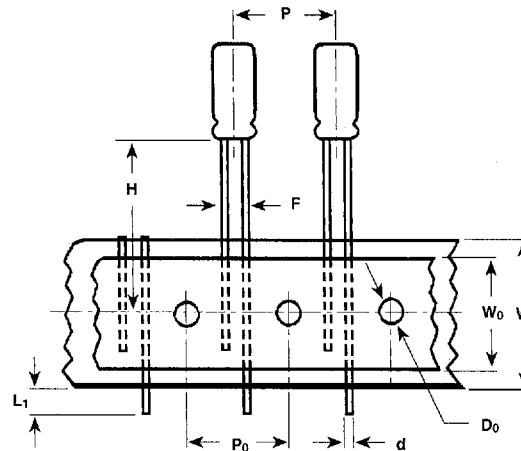
TAPE AND REEL, SPECIFICATIONS TO EIA-468D [Numbers in brackets indicate millimeters]

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]
P0 - 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]
H0 - 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]
W0 - Hold Down Tape Width	.591 [15.0]	.591 [15.0]	.591 [15.0]	.591 [15.0]	.591 [15.0]
D0 - 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]
L1 - 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.