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678D

Vishay Sprague

Aluminum Capacitors 105 °C, Miniature, Radial Lead



QUICK REFERENCE DATA					
DESCRIPTION	VALUE				
Nominal case size Ø D x L in inches [mm]	0.394 x 0.472 [10.0 x 12.0] to 0.709 x 1.575 [18.0 x 40.0]				
Operating temperature	-55 °C to +105 °C				
Rated capacitance range, C _R	33 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 and axial mount.				
Life validation test at 105 °C	$\begin{array}{l} 4000 \ h (\geq 0.512'' \ [13.0] \ diameter): \\ 3000 \ h (0.394'' \ [10.0] \ diameter): \\ \Delta CAP \leq 20 \ \% \ (6.3 \ WV_{DC} \ to \\ 25 \ WV_{DC}), \\ \leq 15 \ \% \ (40 \ WV_{DC} \ to \ 63 \ WV_{DC}) \\ from \ initial \ measurement. \\ \Delta ESR \leq 1.3 \ x \ initial \\ specified \ limit. \\ \Delta DCL \leq 2 \ x \ initial \ specified \ limit. \end{array}$				
Shelf life at 105 °C	$\begin{array}{l} 1000 \text{ h: } \Delta CAP \leq 20 \ \% \\ (6.3 \ WV_{DC} \ to \ 25 \ WV_{DC}), \\ \leq 15 \ \% \ (40 \ WV_{DC} \ to \ 63 \ WV_{DC}) \\ \text{from initial measurements.} \\ \Delta ESR \leq 1.3 \ x \ \text{initial} \\ \text{specified limit.} \end{array}$				
DC leakage current	$ I = 0.01 \ CV (2 \ min \ charge \ time) I = 0.03 \ CV (1 \ min \ charge \ time) I \ in \ \mu A, C \ in \ \mu F, V \ in \ Volts $				

FEATURES

- Improved SMPS output capacitors
- Highest ripple current ratings per case size
- High CV
- Material categorization: for definitions of compliance please see <u>www.vishay.com/doc?99912</u>

RIPP	RIPPLE CURRENT MULTIPLIERS						
	TEMPERATURE						
AMBIENT TEMPERATURE MULTIPLIERS					RS		
	+105 °C 1.0						
	+85 °C 2.2			2.2			
+75 °C			2.7				
	≤ +65 °C			3.0			
		FREC	UENCY (Hz)			
WV _{DC}	50 TO 60	100 TO 120	300 TO 400 1K TO 19K 20K TO 2006				
6.3 to 63	0.60	0.70	0.75	0.82	1.0		

LOW TEMPERATURE PERFORMANCE							
CAPACITANCE RATIO C ^{-55 °C} / C ^{+25 °C} MINIMUM AT 120 Hz							
ΜΑΧΙΜUΜ	VOL	TAGE	MULTIPLIER				
CAPACITANCE	6.3 V t	:o 16 V	0.	75			
CHANGE	25 V t	o 63 V	0.85				
ΜΑΧΙΜUΜ	VOL	TAGE	MULTIPLIER				
IMPEDANCE	6.3 V t	o 16 V	2.0				
CHANGE	25 V t	o 63 V	1.5				
ESL (TYPICA	L VALUES	AT 1 MHz	TO 10 MH	z)			
NOMINAL	0.394	0.512	0.630	0.709			
DIAMETER	[10.0]	[13.0]	[16.0]	[18.0]			
TYPICAL ESL (nH)	4.0	7.0	10.0	12.0			

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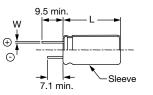


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BULK SPECIFICATIONS in millimeters

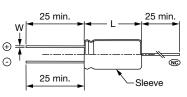
TERMINAL CODE C





TERMINAL CODE J⁽¹⁾



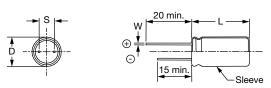


Notes

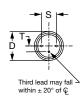
- ⑦ Positive terminal
- $\ensuremath{\boxdot}$ Negative terminal
- No charge potential
- ⁽¹⁾ Available for 12.5 mm, 16 mm, and 18 mm diameter units
- ⁽²⁾ Available for 12.5 mm, 16 mm, and 18 mm diameter units with epoxy end-seal

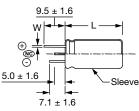
DIME	DIMENSIONS in inches [millimeters]									
CASE	NOM	IINAL	STYLES	2 AND 4	STYLES	3 AND 5	LEAD SPACING		LEAD DIAMETER	
CODE	D	L	D (max.)	L (max.)	D (max.)	L (max.)	S ± 0.024 [0.60]	T ± 0.020 [0.50]	NOMINAL	AWG
CC	0.394 [10.0]	0.512[13.0]	0.413[10.5]	0.563 [14.3]	0.413[10.5]	0.630 [16.0]	0.197 [5.0]	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
DM	0.492[12.5]	1.043 [26.5]	0.512[13.0]	1.102 [28.0]	0.512[13.0]	1.161 [29.5]	0.197 [5.0]	0.098 [2.5]	0.032 [0.81]	20
DT	0.492[12.5]	1.319 [33.5]	0.512[13.0]	1.346 [34.2]	0.512[13.0]	1.417 [36.0]	0.197 [5.0]	0.098 [2.5]	0.032 [0.81]	20
DS	0.492[12.5]	1.673 [42.5]	0.512[13.0]	1.720 [43.7]	0.512[13.0]	1.791 [45.5]	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
EU	0.630[16.0]	1.575 [40.0]	0.650[16.5]	1.642 [41.7]	0.650[16.5]	1.669 [42.4]	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
FV	0.709[18.0]	1.575 [40.0]	0.728[18.5]	1.653 [42.0]	0.728[18.5]	1.693 [43.0]	0.295 [7.5]	0.150 [3.8]	0.032 [0.81]	20

TERMINAL CODE D



TERMINAL CODE O ⁽²⁾



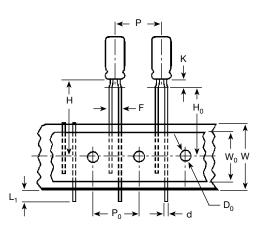




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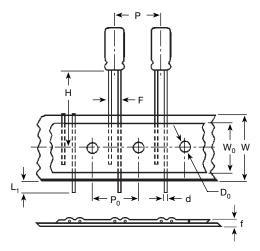
TAPE AND REEL, SPECIFICATIONS TO EIA-468D in inches [millimeters]

Formed Leads



DIMENSIONS in inches [millimeters] AND PACKAGING QUANTITIES							
CASE SIZE F LEAD SPACING STD. QTY/REEL							
0.236 x 0.453 [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 0.453 [6.0 x 11.0]	0.098 [2.5]	800				
0.315 x 0.472 [8.0 x 12.0]	0.140 ⁽¹⁾ [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

⁽³⁾ Available as special order.

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DIMENSIONS	in inches	[millimeters]
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	CASE SIZE (DIAMETER x LENGTH)						
ITEM	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

Terminal code "I" = tape and reel. Terminal code "+" = tape and ammo. ٠ Positive leader is standard. Negative leader is available by special order.

ORDERING EXAMPLE

Electrolytic capacitor 678D series: 678D 108 M 6R3 DG 3 D

DESCRIPTION	
CODE	EXPLANATION
678D	Product type
108	Capacitance value (1000 μF)
М	Tolerance (M = \pm 20 %)
6R3	Voltage rating at 105 °C (6R3 = 6.3 V)
DG	Can size (see Dimensions table)
3	Sleeve and sealing (3 = P.V.C. sleeve w/epoxy end seal)
D	Terminal code / packaging (D = bulk; straight leads)

Note

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

Example: 678D108M6R3DG3DE3

CAPACITANCE	PART NUMBER	NOMINAL CASE SIZE	MAX. ESR AT +25 °C (Ω)		MAX. RIPPLE AT +105 °C (A)	MAX. IMPEDANCE
(μF)		DxL	20 Hz	20 kHz	20 kHz to 100 kHz	AT +25 °C (Ω) 100 kHz
		6.3 WV _{DC} at 105 °	°C, SURGE = 9	V	· · ·	
330.0	678D337M6R3CC3D	0.394 x 0.512 [10.0 x 13.0]	0.540	0.213	0.36	0.213
470.0	678D477M6R3CD3D	0.394 x 0.630 [10.0 x 16.0]	0.340	0.133	0.49	0.132
1000.0	678D108M6R3DG3D	0.492 x 0.787 [12.5 x 20.0]	0.200	0.071	0.83	0.070
2200.0	678D228M6R3EK3D	0.630 x 0.984 [16.0 x 25.0]	0.110	0.041	1.36	0.045
3300.0	678D338M6R3DS3D	0.492 x 1.673 [12.5 x 42.5]	0.067	0.031	1.67	0.032
4700.0	678D478M6R3FR3D	0.709 x 1.417 [18.0 x 36.0]	0.066	0.029	2.02	0.031
		10 WV _{DC} AT 105 °	C, SURGE = 1	3 V	· · ·	
330.0	678D337M010CD3D	0.394 x 0.630 [10.0 x 16.0]	0.350	0.135	0.46	0.134
470.0	678D477M010CG3D	0.394 x 0.787 [10.0 x 20.0]	0.235	0.092	0.63	0.090
1000.0	678D108M010DM3D	0.492 x 1.043 [12.5 x 26.5]	0.120	0.062	0.98	0.061
2200.0	678D228M010EK3D	0.630 x 0.984 [16.0 x 25.0]	0.115	0.042	1.52	0.046
3300.0	678D338M010EN3D	0.630 x 1.260 [16.0 x 32.0]	0.085	0.038	1.56	0.041
4700.0	678D487M010FR3D	0.709 x 1.417 [18.0 x 36.0]	0.070	0.031	1.97	0.033

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ELECTRICA	L DATA AND OR	DERING INFORMAT	ION			
CAPACITANCE (μF)	PART NUMBER	NOMINAL CASE SIZE D x L	AT +2	. ESR 5 °C (Ω)	MAX. RIPPLE AT +105 °C (A)	MAX. IMPEDANCE AT +25 °C (Ω)
			20 Hz	20 kHz	20 kHz to 100 kHz	100 kHz
		16 WV _{DC} AT 105 °	°C, SURGE = 2	0 V		
220.0	678D227M016CC3D	0.394 x 0.512 [10.0 x 13.0]	0.585	0.217	0.40	0.217
330.0	678D337M016CD3D	0.394 x 0.630 [10.0 x 16.0]	0.370	0.137	0.52	0.136
470.0	678D477M016CG3D	0.394 x 0.787 [10.0 x 20.0]	0.250	0.098	0.70	0.094
1000.0	678D108M016DM3D	0.492 x 1.043 [12.5 x 26.5]	0.130	0.066	1.00	0.065
2200.0	678D228M016ER3D	0.630 x 1.417 [16.0 x 36.0]	0.074	0.032	1.78	0.034
3300.0	678D338M016FR3D	0.709 x 1.417 [18.0 x 36.0]	0.074	0.032	1.94	0.034
		20 WV _{DC} AT 105 °	C, SURGE = 3	0 V		
220.0	678D227M020CD3D	0.394 x 0.630 [10.0 x 16.0]	0.380	0.150	0.41	0.148
330.0	678D337M020CG3D	0.394 x 0.787 [10.0 x 20.0]	0.270	0.100	0.61	0.098
470.0	678D477M020DG3D	0.492 x 0.787 [12.5 x 20.0]	0.250	0.077	0.45	0.075
1000.0	678D108M020DT3D	0.492 x 1.280 [12.5 x 33.5]	0.115	0.048	0.78	0.045
2200.0	678D228M020ER3D	0.630 x 1.417 [16.0 x 36.0]	0.077	0.032	1.80	0.034
3300.0	678D338M020FV3D	0.709 x 1.575 [18.0 x 40.0]	0.061	0.026	2.25	0.028
		25 WV _{DC} AT 105 °	°C, SURGE = 3	5 V		
100.0	678D107M025CC3D	0.394 x 0.512 [10.0 x 13.0]	0.700	0.250	0.32	0.250
220.0	678D227M025CG3D	0.394 x 0.787 [10.0 x 20.0]	0.300	0.105	0.59	0.100
330.0	678D337M025DG3D	0.492 x 0.787 [12.5 x 20.0]	0.270	0.078	0.79	0.076
470.0	678D477M025DM3D	0.492 x 1.043 [12.5 x 26.5]	0.160	0.067	0.97	0.068
1000.0	678D108M025DS3D	0.492 x 1.673 [12.5 x 42.5]	0.090	0.034	1.60	0.036
2200.0	678D228M025FV3D	0.709 x 1.575 [18.0 x 40.0]	0.062	0.026	2.22	0.028
		40 WV _{DC} AT 105 °	°C, SURGE = 5	5 V		
47.0	678D476M040CC3D	0.394 x 0.512 [10.0 x 13.0]	0.950	0.265	0.28	0.265
100.0	678D107M040CD3D	0.394 x 0.630 [10.0 x 16.0]	0.580	0.165	0.38	0.165
330.0	678D337M040DM3D	0.492 x 1.043 [12.5 x 26.5]	0.200	0.068	0.93	0.070
470.0	678D477M040EK3D	0.630 x 0.984 [16.0 x 25.0]	0.133	0.046	1.28	0.050
1000.0	678D108M040ER3D	0.630 x 1.417 [16.0 x 36.0]	0.080	0.033	1.76	0.035
		50 WV _{DC} AT 105 °	C, SURGE = 7	5 V		
47.0	678D476M050CC3D	0.394 x 0.512 [10.0 x 13.0]	1.250	0.275	0.28	0.275
100.0	678D107M050CG3D	0.394 x 0.787 [10.0 x 20.0]	0.520	0.115	0.57	0.112
220.0	678D227M050DM3D	0.472 x 1.043 [12.5 x 26.5]	0.240	0.069	0.93	0.071
330.0	678D337M050EK3D	0.630 x 0.984 [16.0 x 25.0]	0.150	0.048	1.26	0.052
470.0	678D477M050DS3D	0.492 x 1.673 [12.5 x 42.5]	0.110	0.036	1.55	0.039
1000.0	678D108M050FV3D	0.709 x 1.575 [18.0 x 40.0]	0.077	0.028	2.15	0.032
		63 WV _{DC} AT 105 °	°C, SURGE = 8	0 V		
33.0	678D336M063CC3D	0.394 x 0.512 [10.0 x 13.0]	1.600	0.288	0.27	0.288
47.0	678D476M063CD3D	0.394 x 0.630 [10.0 x 16.0]	1.000	0.180	0.37	0.180
100.0	678D107M063DG3D	0.492 x 0.787 [12.5 x 20.0]	0.450	0.093	0.72	0.090
220.0	678D227M063DT3D	0.492 x 1.280 [12.5 x 33.5]	0.160	0.055	1.10	0.054
220.0	678D227M063EK3D	0.630 x 0.984 [16.0 x 25.0]	0.170	0.050	1.23	0.054
330.0	678D337M063DS3D	0.492 x 1.673 [12.5 x 42.5]	0.130	0.038	1.51	0.040
470.0	678D477M063ER3D	0.630 x 1.417 [16.0 x 36.0]	0.120	0.035	1.70	0.038

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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