

Dipped Mica & Metal Clad CAPACITORS



DIPPED MICA CAPACITORS

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DIPPED MICA CAPACITORS

DESIGN AND CONSTRUCTION

Dielectric

Semco dipped mica capacitors are fabricated from the finest India Ruby Muscovite Mica that is available. This particular form exhibits the best characteristics which may be obtained from mica and results in a capacitor with optimum high temperature characteristics and excellent stability.

Mica is a natural inorganic material, an aluminum silicate mineral, having toughness, elasticity, and adaptability to thin splitting. When these physical attributes are combined with the excellent electrical characteristics of mica, its value as a capacitor dielectric can be readily recognized.

Electrodes

Silvered mica construction permits intimate contact between the electrodes and the dielectric enabling uniform control of capacitance and a great increase in order of stability.

The electrodes are silver which is applied to the mica dielectric by a screening process, and then fired in an oxidizing atmosphere to obtain a permanent bond. This method provides a plate which will always remain in the same relative position with the dielectric.

The silver is applied in the form of a paste. The screening process, which positions the silvered pattern and determines the margins, is also controlled and is accurate to within 0.001".

Section

Depending upon capacitance value desired, a number of silvered mica films is stacked together to form a capacitor section.

Contact to the silver electrodes is made by means of either tin-lead foil strips, or pure silver foil strips, which are laid in so as to cover a portion of the silvered area. These foil contacts extend beyond the edge of the mica with each foil being extended alternately on the opposite sides of the silvered films. The joining of these foil extensions at each end, converts the series capacitors to one in which each silvered mica film is in parallel with the next. This joining is accomplished by folding the foil contacts over the top of the section.

The section is then compressed, and clinched tightly in the hot tinned lead and clamp assembly to assure positive contact. Once this has been accomplished, the entire assembly becomes known as an insert and is ready for dipping.

Coating

For protection, the inserts are encased with a number of coats of a mineral filled phenolic compound which is then vacuum impregnated with an epoxy resin. The result is a rugged coating which protects the capacitor against shock and vibration, and has outstanding resistance to humidity.

SILVERED ELECTRONIC MICA CO., INC.

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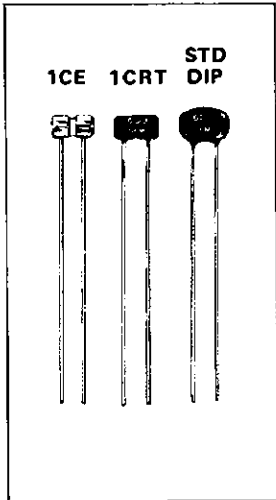
STYLE DM5



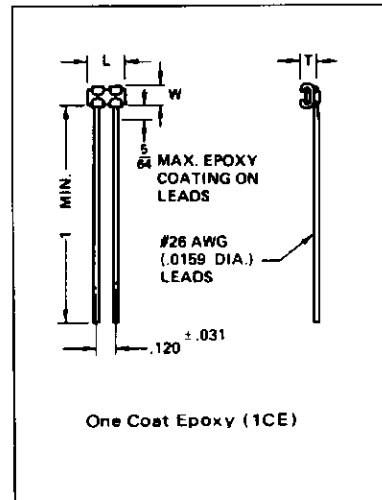
Military Styles CMR03 - (MIL - C - 39001)

All DM5 capacitors are constructed with pure silver foil contacts.

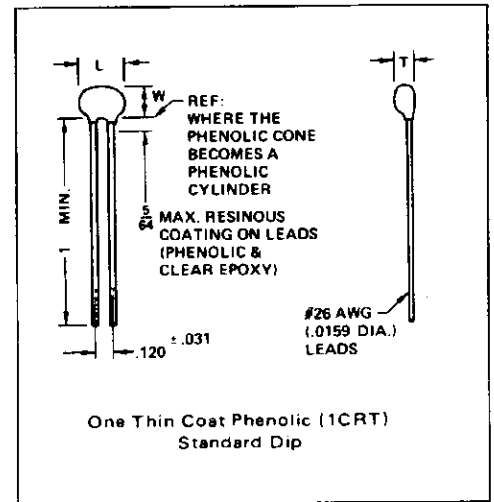
DM5



1CE



1CRT and STANDARD DIP



DIMENSIONS FOR CAPACITANCE VALUES

1CE

CAPACITANCE VALUE IN pF	300 WV			100 WV			50 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 6	.240	.140	.080	.240	.140	.080	.240	.140	.080
7 - 8	.240	.140	.090	.240	.140	.080	.240	.140	.080
10 - 18	.240	.140	.090	.240	.140	.090	.240	.140	.080
20 - 24	.240	.140	.100	.240	.140	.090	.240	.140	.090
27 - 30	.240	.150	.100	.240	.140	.090	.240	.140	.090
33	.240	.150	.100	.240	.140	.100	.240	.140	.090
36 - 39	.240	.150	.110	.240	.140	.100	.240	.140	.090
43 - 47	.240	.150	.110	.240	.150	.100	.240	.140	.090
51 - 56	.240	.150	.120	.240	.150	.100	.240	.140	.090
62	.240	.150	.130	.240	.150	.110	.240	.140	.090
68	.240	.150	.130	.240	.150	.110	.240	.140	.100
75	.240	.160	.130	.240	.150	.110	.240	.140	.100
82	.240	.160	.140	.240	.150	.120	.240	.150	.100
91 - 100	.240	.160	.150	.240	.150	.120	.240	.150	.100
110	.240	.160	.160	.240	.150	.130	.240	.150	.100
120	.240	.170	.170	.240	.160	.130	.240	.150	.110
130 - 150				.240	.160	.140	.240	.150	.110
160				.240	.160	.150	.240	.150	.110
170				.240	.160	.150	.240	.150	.120
180				.240	.160	.160	.240	.150	.120
200				.240	.170	.170	.240	.150	.120
220 - 240							.240	.160	.130
270 - 300							.240	.160	.140
330							.240	.160	.150
360 - 390							.240	.160	.160
400							.240	.170	.170

*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

1CRT

CAPACITANCE VALUE IN pF	300 WV			100 WV			50 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 12	.250	.160	.090	.250	.160	.090	.250	.160	.090
15 - 20	.250	.170	.100	.250	.160	.090	.250	.160	.090
22	.250	.170	.100	.250	.160	.100	.250	.160	.090
24	.250	.170	.100	.250	.170	.100	.250	.160	.090
27 - 36	.250	.170	.110	.250	.170	.100	.250	.160	.090
39	.250	.180	.110	.250	.170	.100	.250	.160	.090
43	.250	.180	.120	.250	.170	.100	.250	.170	.100
47 - 51	.250	.180	.120	.250	.170	.110	.250	.170	.100
56 - 62	.250	.180	.130	.250	.170	.110	.250	.170	.100
68	.250	.190	.130	.250	.180	.110	.250	.170	.100
75 - 82	.250	.190	.140	.250	.180	.120	.250	.170	.100
91	.250	.190	.150	.250	.180	.120	.250	.170	.110
100	.250	.200	.160	.250	.180	.130	.250	.170	.110
110	.250	.200	.160	.250	.190	.130	.250	.170	.110
120	.250	.210	.170	.250	.190	.140	.250	.170	.110
130				.250	.190	.140	.250	.170	.110
150				.250	.190	.150	.250	.180	.120
160				.250	.200	.150	.250	.180	.120
170 - 180				.250	.200	.160	.250	.180	.120
200				.250	.210	.170	.250	.180	.130
220							.250	.190	.130
240 - 270							.250	.190	.140
300							.250	.190	.150
330 - 360							.250	.200	.160
390 - 400							.250	.210	.170

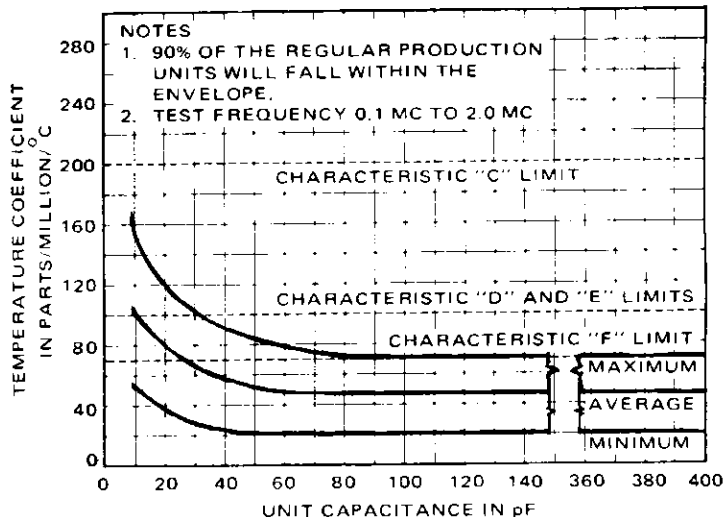
*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

STYLE DM5

VOLTAGE and CAPACITANCE RANGES

WORKING VOLTAGE	CHARACTERISTIC	CAPACITANCE RANGE
50VDC	C D,E F	1pF - 400pF 20pF - 400pF 85pF - 400pF
100VDC	C D,E F	1pF - 200pF 20pF - 200pF 85pF - 200pF
300VDC	C D,E F	1pF - 120pF 20pF - 120pF 85pF - 120pF

TYPICAL TEMPERATURE COEFFICIENT RANGE FOR DM5 DIPPED MICA CAPACITORS



DIMENSIONS FOR CAPACITANCE VALUES

4CR

CAPACITANCE VALUE IN pF	300 WV			100 WV			50 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 12	.270	.190	.110	.270	.190	.110	.270	.190	.110
15	.270	.190	.120	.270	.190	.110	.270	.190	.110
18 - 20	.270	.200	.120	.270	.190	.110	.270	.190	.110
22 - 24	.270	.200	.120	.270	.190	.120	.270	.190	.110
27	.270	.200	.130	.270	.190	.120	.270	.190	.110
30 - 33	.270	.200	.130	.270	.200	.120	.270	.190	.110
36	.270	.210	.130	.270	.200	.120	.270	.190	.110
39	.270	.210	.130	.270	.200	.120	.270	.190	.120
43	.270	.210	.140	.270	.200	.120	.270	.190	.120
47 - 51	.270	.210	.140	.270	.200	.130	.270	.190	.120
56	.270	.220	.150	.270	.200	.130	.270	.190	.120
62	.270	.220	.150	.270	.210	.130	.270	.200	.120
68	.270	.220	.150	.270	.210	.140	.270	.200	.120
75 - 82	.270	.230	.160	.270	.210	.140	.270	.200	.120
91	.270	.230	.170	.270	.210	.140	.270	.200	.130
100 - 110	.270	.240	.180	.270	.220	.150	.270	.200	.130
120	.270	.250	.190	.270	.220	.160	.270	.200	.130
130				.270	.230	.160	.270	.210	.130
150				.270	.230	.170	.270	.210	.140
160				.270	.240	.170	.270	.210	.140
170 - 180				.270	.240	.180	.270	.210	.140
200				.270	.250	.190	.270	.220	.150
220							.270	.220	.150
240							.270	.220	.160
270							.270	.230	.160
300							.270	.230	.170
330 - 360							.270	.240	.180
390 - 400							.270	.250	.190

*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

All DM5 capacitors are constructed with pure silver foil contacts so as to make positive connection to the small silver electrode patterns printed on the mica films, and so as to eliminate problems encountered during the soldering operation of small capacitors when lead-tin contact foils reach the melting point and flow, causing open or shorted units.

Because of its small size, the terminal pull test must be in the direction of the leads rather than perpendicular to the leads.

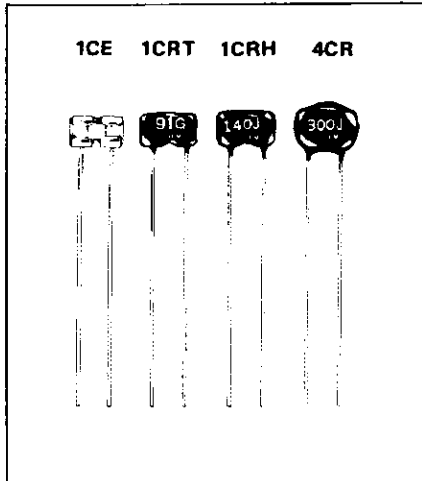
STYLE DM10



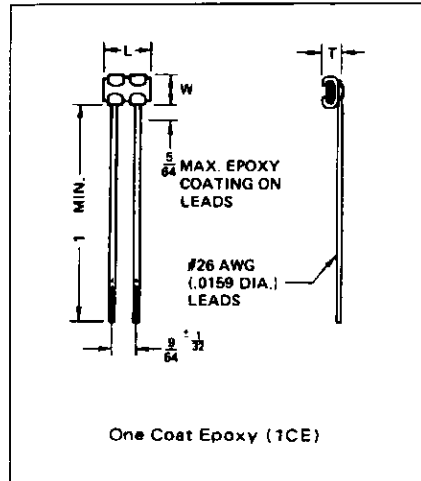
Military Styles: CMR04 (MIL - C - 39001) CM04 — CM09 (MIL - C - 5)

All DM10 capacitors are constructed with pure silver foil contacts.

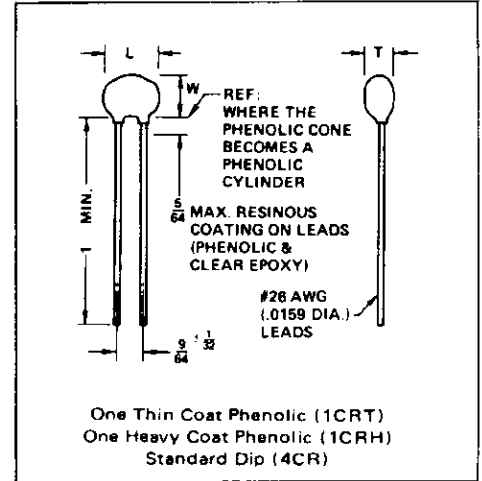
DM10



1CE



1CRT, 1CRH, 4CR



DIMENSIONS FOR CAPACITANCE VALUES

1CE

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 56	.290	.180	.090	.290	.180	.090	.290	.180	.090
62 - 68	.290	.180	.100	.290	.180	.090	.290	.180	.090
75 - 91	.290	.180	.100	.290	.180	.100	.290	.180	.090
100	.290	.180	.100	.290	.180	.100	.290	.180	.100
110 - 120	.290	.180	.110	.290	.180	.100	.290	.180	.100
130 - 160	.290	.180	.110	.290	.180	.110	.290	.180	.100
180	.290	.180	.120	.290	.180	.110	.290	.180	.110
200	.290	.180	.120	.290	.180	.120	.290	.180	.110
220 - 240	.290	.180	.130	.290	.180	.120	.290	.180	.110
250	.290	.180	.130	.290	.180	.130	.290	.180	.110
270 - 300				.290	.180	.130	.290	.180	.120
330				.290	.180	.140	.290	.180	.120
360				.290	.180	.140	.290	.180	.130
390 - 400							.290	.180	.130
430 - 470							.290	.180	.140

1CRT

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 56	.310	.210	.100	.310	.210	.100	.310	.210	.100
62 - 68	.310	.210	.110	.310	.210	.100	.310	.210	.100
75 - 91	.310	.210	.110	.310	.210	.110	.310	.210	.100
100	.310	.210	.110	.310	.210	.110	.310	.210	.110
110 - 120	.310	.220	.120	.310	.210	.110	.310	.210	.110
130 - 160	.310	.220	.120	.310	.220	.120	.310	.210	.110
180	.310	.220	.130	.310	.220	.120	.310	.220	.120
200	.310	.220	.130	.310	.220	.130	.310	.220	.120
220 - 240	.310	.230	.140	.310	.220	.130	.310	.220	.120
250	.310	.230	.140	.310	.230	.140	.310	.220	.120
270 - 300				.310	.230	.140	.310	.220	.130
330				.310	.240	.150	.310	.220	.130
360				.310	.240	.150	.310	.230	.140
390 - 400							.310	.230	.140
430 - 470							.310	.240	.150

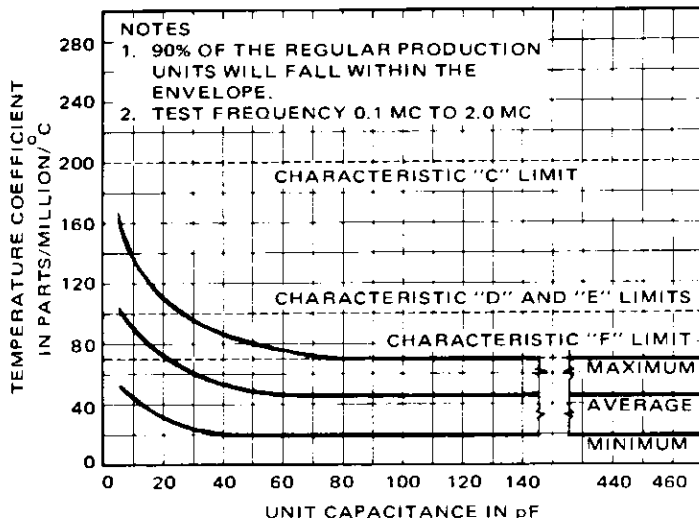
Like the DM5, all DM10 capacitors are constructed with pure silver foil contacts. The benefits of using this foil are twofold. First of all, positive connection to the small silver electrode areas is ensured. Secondly, the pure silver contact foils do not reach the melting point and flow during the soldering operation, as is the case when lead-tin contact foils are used in small size capacitors.

STYLE DM10

VOLTAGE and CAPACITANCE RANGES

WORKING VOLTAGE	CHARACTERISTIC	CAPACITANCE RANGE
100VDC	C D,E F	1pF - 470pF 20pF - 470pF 85pF - 470pF
300VDC	C D,E F	1pF - 360pF 20pF - 360pF 85pF - 360pF
500VDC	C D,E F	1pF - 250pF 20pF - 250pF 85pF - 250pF

TYPICAL TEMPERATURE COEFFICIENT RANGE FOR DM10 DIPPED MICA CAPACITORS



DIMENSIONS FOR CAPACITANCE VALUES

1CRH

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 56	.310	.230	.120	.310	.230	.120	.310	.230	.120
62 - 68	.320	.230	.130	.310	.230	.120	.310	.230	.120
75 - 81	.320	.230	.130	.320	.230	.130	.310	.230	.120
100	.320	.230	.130	.320	.230	.130	.320	.230	.130
110 - 120	.320	.240	.140	.320	.230	.130	.320	.230	.130
130 - 160	.320	.240	.140	.320	.240	.140	.320	.230	.130
180	.330	.240	.150	.320	.240	.140	.320	.240	.140
200	.330	.240	.150	.330	.240	.150	.320	.240	.140
220 - 240	.340	.250	.160	.330	.240	.150	.320	.240	.140
250	.340	.250	.160	.340	.250	.160	.320	.240	.140
270 - 300				.340	.250	.160	.330	.240	.150
330				.350	.260	.170	.330	.240	.150
360				.350	.260	.170	.340	.250	.160
390 - 400							.340	.250	.160
430 - 470							.350	.260	.170

4CR

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 24	.360	.330	.190	*	*	*	*	*	*
27	.370	.330	.190	*	*	*	*	*	*
30 - 36	.370	.340	.190	*	*	*	*	*	*
39	.370	.340	.190	.370	.340	.190	.360	.330	.190
43	.370	.340	.190	.370	.340	.190	.370	.330	.190
47 - 68	.370	.340	.190	.370	.340	.190	.370	.340	.190
75	.370	.340	.200	.370	.340	.190	.370	.340	.190
82	.370	.350	.200	.370	.340	.190	.370	.340	.190
91 - 100	.370	.350	.200	.370	.350	.200	.370	.340	.190
110	.380	.350	.200	.370	.350	.200	.370	.340	.190
120	.380	.350	.200	.370	.350	.200	.370	.340	.200
130	.380	.360	.200	.380	.350	.200	.370	.350	.200
150	.380	.360	.210	.380	.350	.200	.370	.350	.200
160	.380	.360	.210	.380	.360	.200	.370	.350	.200
180	.390	.370	.210	.380	.360	.210	.380	.350	.200
200	.390	.370	.220	.380	.360	.210	.380	.350	.200
220	.390	.370	.220	.390	.370	.210	.380	.360	.210
240 - 250	.390	.380	.220	.390	.370	.220	.380	.360	.210
270				.390	.380	.220	.380	.370	.210
300				.390	.380	.220	.390	.370	.210
330				.400	.390	.230	.390	.370	.220
360				.400	.390	.230	.390	.380	.220
390 - 400							.390	.380	.220
430 - 470							.400	.390	.230

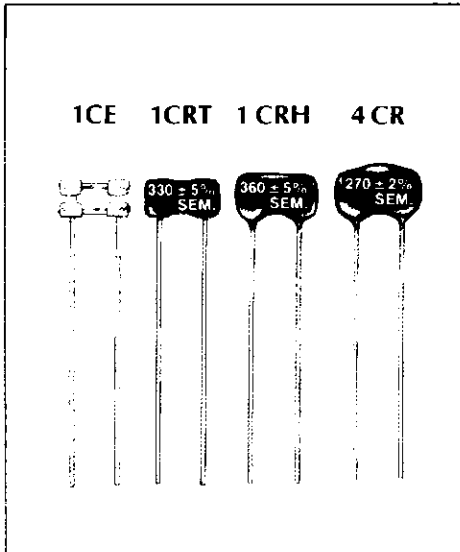
*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

STYLE DM15

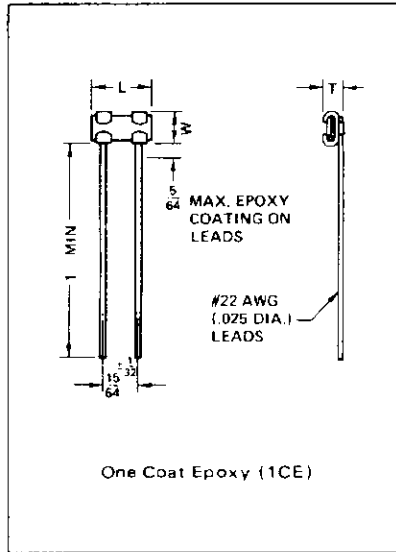
Military Styles: CMR05 (MIL-C-39001)
CM05 (MIL-C-5)



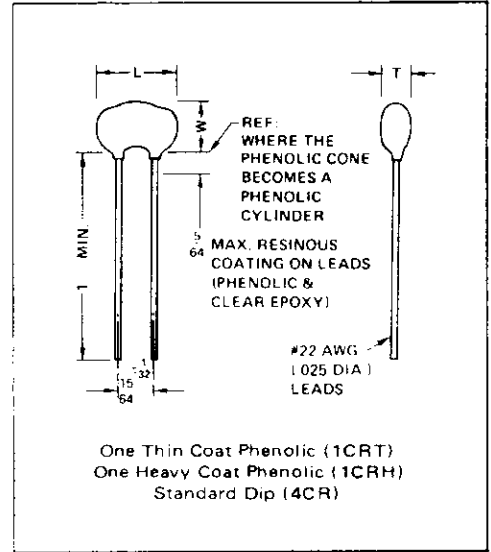
DM15



1CE



1CRT, 1CRH, 4CR



DIMENSIONS FOR CAPACITANCE VALUES

1CE

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 120	.380	.230	.110	*	*	*	*	*	*
130 - 240	.380	.230	.120	*	*	*	*	*	*
270	.380	.240	.120	*	*	*	*	*	*
300 - 390	.380	.240	.130	*	*	*	*	*	*
430	.380	.240	.130	.380	.230	.120	*	*	*
470 - 510	.380	.240	.140	.380	.230	.120	*	*	*
560 - 620	.380	.240	.150	.380	.230	.120	*	*	*
680	.390	.240	.160	.380	.240	.130	*	*	*
750	.400	.250	.170	.380	.240	.130	*	*	*
820				.380	.240	.130	.380	.240	.130
910				.380	.240	.140	.380	.240	.140
1000				.380	.240	.150	.380	.240	.150
1100				.390	.240	.160	.380	.240	.150
1200				.400	.250	.170	.390	.240	.160

*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

1CRT

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 100	.400	.260	.120	*	*	*	*	*	*
110 - 120	.400	.270	.120	*	*	*	*	*	*
130 - 200	.400	.270	.130	*	*	*	*	*	*
220 - 270	.400	.280	.130	*	*	*	*	*	*
300 - 390	.400	.290	.140	*	*	*	*	*	*
430	.400	.290	.140	.400	.270	.130	*	*	*
470 - 510	.400	.290	.150	.400	.270	.130	*	*	*
560	.400	.290	.160	.400	.280	.130	*	*	*
620	.400	.300	.160	.400	.280	.130	*	*	*
680				.410	.300	.170	.400	.280	.140
750				.420	.300	.180	.400	.280	.140
820							.400	.290	.140
910							.400	.290	.150
1000							.400	.300	.160
1100							.410	.300	.170
1200							.420	.300	.170

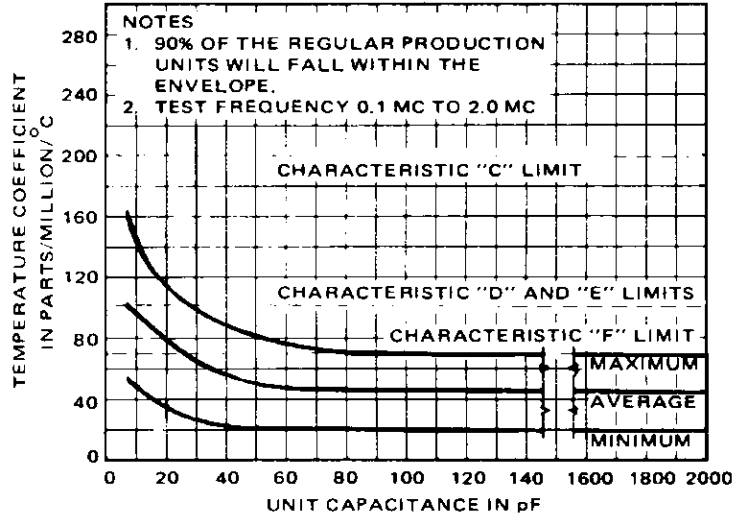
*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

STYLE DM15

VOLTAGE and CAPACITANCE RANGES

WORKING VOLTAGE	CHARACTERISTIC	CAPACITANCE RANGE
100VDC	C	1pF - 1200pF
	D, E	20pF - 1200pF
	F	5pF - 1200pF
300VDC	C	1pF - 1200pF
	D, E	20pF - 1200pF
	F	85pF - 1200pF
500VDC	C	1pF - 750pF
	D, E	20pF - 750pF
	F	85pF - 750pF

TYPICAL TEMPERATURE COEFFICIENT RANGE FOR DM15 DIPPED MICA CAPACITORS



DIMENSIONS FOR CAPACITANCE VALUES

1CRH

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 62	.430	.280	.140	*	*	*	*	*	*
75 - 100	.430	.280	.150	*	*	*	*	*	*
110 - 150	.440	.280	.150	*	*	*	*	*	*
180 - 200	.440	.290	.160	*	*	*	*	*	*
220 - 270	.440	.300	.160	*	*	*	*	*	*
300 - 390	.450	.310	.160	*	*	*	*	*	*
430 - 470	.450	.310	.170	.440	.290	.150	*	*	*
510	.450	.310	.180	.440	.290	.150	*	*	*
500	.450	.310	.180	.440	.300	.160	*	*	*
620	.450	.320	.190	.440	.300	.160	*	*	*
680	.460	.320	.200	.450	.300	.160	*	*	*
750	.460	.320	.210	.450	.300	.160	*	*	*
820				.450	.310	.170	.450	.310	.160
910				.450	.310	.180	.450	.310	.170
1000				.450	.320	.190	.450	.310	.170
1100				.460	.320	.200	.450	.310	.180
1200				.460	.320	.210	.450	.320	.190

*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

4CR

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 62	.450	.360	.170	*	*	*	*	*	*
75 - 82	.450	.360	.180	*	*	*	*	*	*
91 - 100	.460	.360	.180	*	*	*	*	*	*
110 - 130	.460	.370	.180	*	*	*	*	*	*
150 - 180	.460	.370	.190	*	*	*	*	*	*
200	.460	.380	.190	*	*	*	*	*	*
220 - 240	.460	.380	.200	*	*	*	*	*	*
270 - 390	.470	.390	.210	*	*	*	*	*	*
430	.470	.390	.210	.480	.380	.200	*	*	*
470 - 510	.470	.400	.220	.460	.380	.200	*	*	*
560 - 620	.480	.410	.230	.460	.380	.200	*	*	*
680	.490	.420	.240	.470	.390	.210	*	*	*
750	.500	.430	.250	.470	.390	.210	*	*	*
820				.470	.390	.210	.470	.390	.210
910				.470	.400	.220	.470	.400	.220
1000				.480	.400	.230	.480	.400	.230
1100				.490	.420	.240	.480	.400	.230
1200				.500	.430	.250	.490	.420	.240

*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

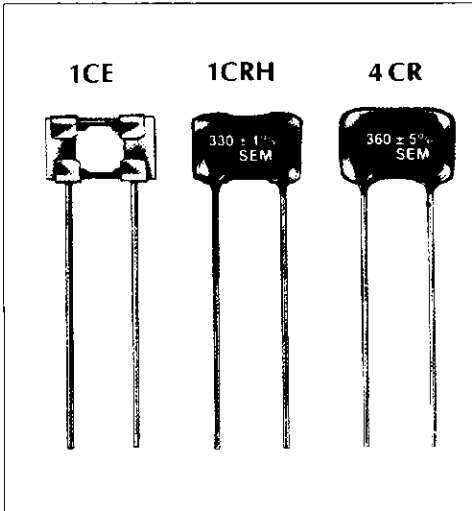
STYLE DM19

Military Styles: CMR06 (MIL-C-39001)
CM06 (MIL-C-5)

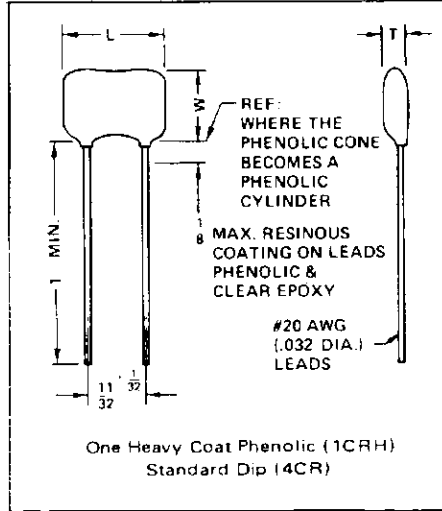


For temperature Coefficient, see DM20 curves.

DM19



1CRH, 4CR



VOLTAGE and CAPACITANCE RANGES

WORKING VOLTAGE	CHARACTERISTIC	CAPACITANCE RANGE	
100VDC	C	1pF	8200pF
	D,E	180pF	8200pF
	F	430pF	8200pF
300VDC	C	1pF	6800pF
	D,E	180pF	6800pF
	F	430pF	6800pF
500VDC	C	1pF	5100pF
	D,E	180pF	5100pF
	F	430pF	5100pF
1000VDC†	C	1pF	3000pF
	D,E	180pF	3000pF
	F	430pF	3000pF

†Maximum dimensions for capacitors having voltages greater than 500VDC are available on request

DIMENSIONS FOR CAPACITANCE VALUES

1CRH

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
10 - 240	.610	.450	.130	*	*	*	*	*	*
270 - 560	.610	.450	.140	*	*	*	*	*	*
620 - 820	.610	.460	.150	*	*	*	*	*	*
910 - 1100	.620	.460	.160	*	*	*	*	*	*
1200 - 1500	.620	.460	.170	*	*	*	*	*	*
1600 - 1800	.620	.460	.180	*	*	*	*	*	*
2000 - 2200	.630	.460	.190	*	*	*	*	*	*
2400	.630	.470	.210	*	*	*	*	*	*
2700	.630	.470	.220	*	*	*	*	*	*
3000	.630	.470	.230	*	*	*	*	*	*
3300	.630	.480	.240	.630	.470	.210	*	*	*
3600	.640	.480	.250	.630	.470	.210	*	*	*
3900	.640	.480	.260	.630	.470	.210	*	*	*
4300	.650	.490	.280	.630	.470	.220	*	*	*
4700	.650	.490	.300	.630	.470	.230	*	*	*
5100	.660	.500	.320	.630	.480	.240	*	*	*
5600				.640	.480	.250	*	*	*
6200				.640	.480	.260	.640	.480	.250
6800				.640	.490	.270	.640	.480	.260
7500							.650	.490	.280
8200							.650	.490	.300

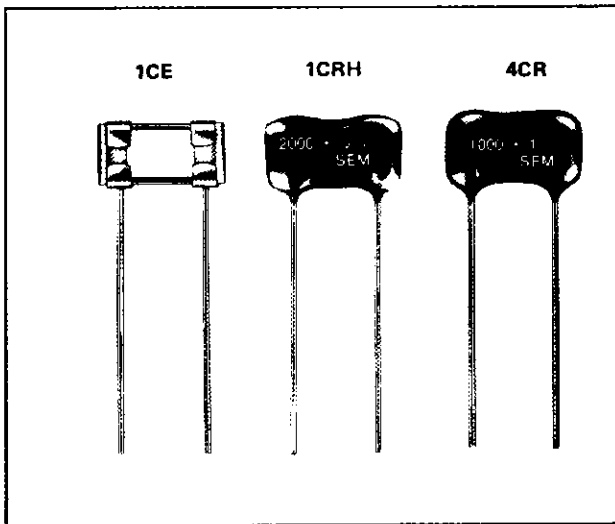
*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

4CR

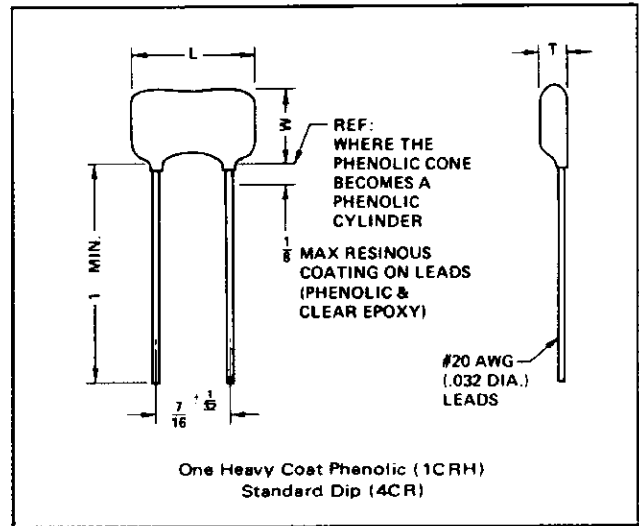
CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
10 - 330	.640	.500	.190	*	*	*	*	*	*
360 - 470	.640	.510	.200	*	*	*	*	*	*
510 - 620	.650	.510	.200	*	*	*	*	*	*
680 - 910	.650	.510	.210	*	*	*	*	*	*
1000 - 1100	.650	.520	.220	*	*	*	*	*	*
1200 1300	.660	.520	.220	*	*	*	*	*	*
1500	.660	.520	.230	*	*	*	*	*	*
1600	.660	.530	.230	*	*	*	*	*	*
1800 - 2000	.670	.530	.240	*	*	*	*	*	*
2200	.670	.530	.250	*	*	*	*	*	*
2400	.670	.540	.260	*	*	*	*	*	*
2700	.680	.540	.270	*	*	*	*	*	*
3000	.680	.550	.280	*	*	*	*	*	*
3300	.680	.550	.290	.670	.540	.260	*	*	*
3600	.680	.560	.300	.680	.540	.270	*	*	*
3900	.690	.560	.310	.680	.540	.270	*	*	*
4300	.690	.570	.330	.680	.550	.280	*	*	*
4700	.700	.580	.350	.680	.550	.290	*	*	*
5100	.710	.590	.370	.680	.550	.300	*	*	*
5600				.680	.560	.310	*	*	*
6200				.690	.560	.320	.690	.560	.310
6800				.690	.570	.330	.690	.570	.320
7500							.700	.570	.340
8200							.700	.580	.350

*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

DM20



1CRH, 4CR



DIMENSIONS FOR CAPACITANCE VALUES

1CRH

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 100	.700	.450	.120	*	*	*	*	*	*
200 - 620	.700	.450	.130	*	*	*	*	*	*
750 - 1200	.700	.450	.140	*	*	*	*	*	*
1300 - 1600	.700	.460	.150	*	*	*	*	*	*
1800	.710	.460	.150	*	*	*	*	*	*
2000 - 2200	.710	.460	.160	*	*	*	*	*	*
2400 - 2700	.710	.460	.200	*	*	*	*	*	*
3000 - 3300	.720	.470	.220	*	*	*	*	*	*
3600	.720	.470	.230	*	*	*	*	*	*
3900	.720	.480	.240	*	*	*	*	*	*
4300	.720	.480	.250	.720	.470	.210	*	*	*
4700	.730	.480	.260	.720	.470	.220	*	*	*
5100	.730	.490	.270	.720	.470	.230	*	*	*
5600	.730	.490	.280	.720	.480	.240	*	*	*
6200	.740	.490	.300	.720	.480	.250	.720	.470	.220
6800	.740	.500	.320	.730	.480	.260	.720	.470	.230
7500	.750	.500	.340	.730	.490	.270	.720	.480	.240
8200	.750	.510	.360	.730	.490	.280	.720	.480	.250
9100	.760	.520	.380	.740	.490	.290	.730	.480	.260
10000	.760	.530	.400	.740	.490	.300	.730	.490	.270
11000				.740	.500	.320	.730	.490	.280
12000				.750	.500	.340	.740	.490	.290
12300				.750	.510	.360	.740	.490	.300
13000							.740	.500	.310
15000							.750	.500	.330
16000							.750	.510	.350
18000							.760	.520	.370

4CR

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1 - 100	.750	.500	.180	*	*	*	*	*	*
200 - 620	.750	.500	.190	*	*	*	*	*	*
750 - 1200	.750	.510	.200	*	*	*	*	*	*
1300 - 1600	.750	.510	.210	*	*	*	*	*	*
1800 - 2200	.760	.520	.220	*	*	*	*	*	*
2400	.770	.530	.250	*	*	*	*	*	*
2700	.770	.540	.260	*	*	*	*	*	*
3000	.770	.540	.270	*	*	*	*	*	*
3300	.780	.550	.280	*	*	*	*	*	*
3600	.780	.550	.290	*	*	*	*	*	*
3900	.780	.560	.300	*	*	*	*	*	*
4300	.780	.560	.310	.770	.540	.270	*	*	*
4700	.790	.560	.320	.770	.540	.270	*	*	*
5100	.790	.570	.330	.780	.550	.280	*	*	*
5600	.790	.570	.340	.780	.550	.290	*	*	*
6200	.790	.580	.350	.780	.560	.300	.780	.550	.290
6800	.800	.590	.370	.790	.560	.320	.780	.560	.300
7500	.800	.600	.390	.790	.570	.330	.780	.560	.300
8200	.810	.610	.410	.790	.570	.340	.780	.560	.310
9100	.810	.620	.430	.800	.580	.360	.790	.570	.330
10000	.820	.630	.450	.800	.580	.370	.790	.570	.340
11000				.800	.590	.380	.790	.580	.350
12000 - 12300				.810	.600	.400	.800	.580	.360
13000							.800	.590	.380
15000							.810	.600	.400
16000							.810	.610	.410
18000							.820	.620	.440

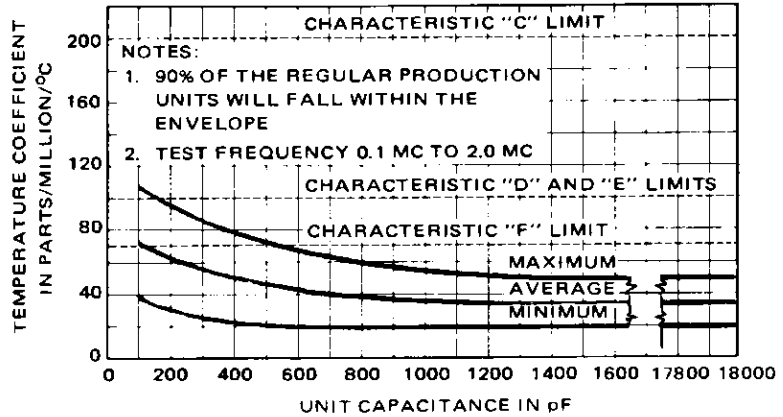
*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

STYLE DM20

VOLTAGE and CAPACITANCE RANGES

WORKING VOLTAGE	CHARACTERISTIC	CAPACITANCE RANGE
100VDC	C D,E F	1pF - 18000pF 180pF - 18000pF 430pF - 18000pF
300VDC	C D,E F	1pF - 12300pF 180pF - 12300pF 430pF - 12300pF
500VDC	C D,E F	1pF - 10000pF 180pF - 10000pF 430pF - 10000pF
1000VDC	C D,E F	1pF - 5600pF 180pF - 5600pF 430pF - 5600pF
1500VDC	C D,E F	1pF - 2900pF 180pF - 2900pF 430pF - 2900pF
2000VDC	C D,E F	1pF - 1600pF 180pF - 1600pF 430pF - 1600pF
2500VDC	C D,E F	1pF - 750pF 180pF - 750pF 430pF - 750pF

TYPICAL TEMPERATURE COEFFICIENT RANGE FOR DM20 DIPPED MICA CAPACITORS



DIMENSIONS FOR CAPACITANCE VALUES (HIGHER VOLTAGES)

4CR

4CR

4CR

4CR

CAPACITANCE VALUE IN pF	2500 WV		
	L	W	T
	MAXIMUM		
1 - 10	.750	.500	.180
12 - 36	.750	.500	.190
39 - 62	.750	.510	.200
68 - 82	.750	.510	.210
91 - 110	.760	.520	.220
120 - 130	.760	.520	.230
150 - 160	.760	.520	.240
180 - 200	.770	.530	.250
220	.770	.540	.260
240	.770	.540	.270
270	.780	.550	.280
300	.780	.550	.290
330	.780	.560	.300
360	.780	.560	.310
390	.790	.560	.320
430	.790	.570	.330
470	.790	.580	.350
510	.800	.590	.370
560	.800	.600	.390
620	.810	.610	.410
680	.810	.620	.430
750	.820	.630	.450

CAPACITANCE VALUE IN pF	2000 WV		
	L	W	T
	MAXIMUM		
1 - 30	.750	.500	.180
43 - 91	.750	.500	.190
100 - 150	.750	.510	.200
160 - 200	.760	.510	.210
220 - 270	.760	.520	.220
300 - 330	.760	.520	.230
360 - 390	.760	.520	.240
430	.770	.530	.250
470	.770	.540	.260
510	.770	.540	.270
560	.780	.550	.280
620	.780	.550	.290
680	.780	.560	.300
750	.780	.560	.310
820	.790	.560	.320
910	.790	.570	.330
1000	.790	.570	.340
1100	.790	.580	.350
1200	.800	.590	.370
1300	.800	.600	.390
1500	.810	.610	.420
1600	.820	.620	.440

CAPACITANCE VALUE IN pF	1500 WV		
	L	W	T
	MAXIMUM		
1 - 91	.750	.500	.190
100 - 180	.750	.510	.200
200 - 270	.750	.510	.210
300	.750	.520	.210
330 - 390	.760	.520	.220
430 - 510	.760	.520	.230
560 - 620	.760	.520	.240
680 - 750	.770	.530	.250
820	.770	.540	.260
910	.770	.540	.270
1000	.780	.550	.280
1100	.780	.550	.290
1200	.780	.560	.300
1300	.780	.560	.310
1500	.790	.570	.320
1600	.790	.570	.330
1800	.790	.580	.350
2000	.800	.590	.370
2200	.800	.600	.390
2400	.810	.610	.410
2700	.810	.620	.430
2900	.820	.630	.450

CAPACITANCE VALUE IN pF	1000 WV		
	L	W	T
	MAXIMUM		
1 - 200	.750	.500	.190
220 - 430	.750	.510	.200
510	.750	.510	.210
620	.760	.510	.210
750 - 910	.760	.520	.220
1000 - 1100	.760	.520	.230
1200 - 1300	.760	.520	.240
1500 - 1600	.770	.530	.250
1800	.770	.540	.260
2000	.770	.540	.270
2200	.780	.550	.280
2400	.780	.550	.290
2700	.780	.560	.300
3000	.780	.560	.310
3300	.790	.570	.320
3600	.790	.570	.330
3900	.790	.580	.340
4300	.800	.590	.360
4700	.800	.600	.380
5100	.810	.610	.400
5600	.810	.620	.420

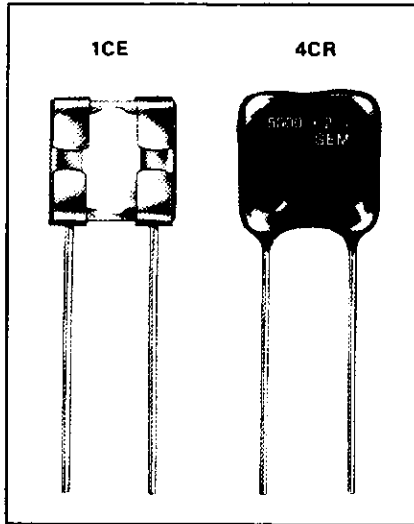
Maximum dimension for 1CE capacitors are available on request.

STYLE DM30

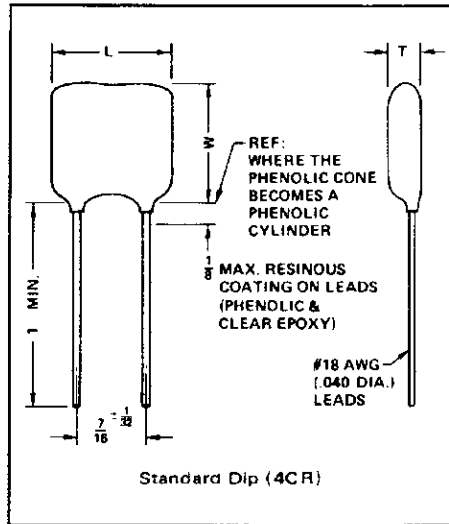
Military Styles: CMR07 (MIL-C-39001)
CM07 (MIL-C-5)



DM30



4CR



VOLTAGE and CAPACITANCE RANGES

WORKING VOLTAGE	CHARACTERISTIC	CAPACITANCE RANGE
100VDC	C,D,E,F	470pF - 4000pF
300VDC	C,D,E,F	470pF - 3000pF
500VDC	C,D,E,F	470pF - 2200pF
1000VDC†	C	5pF - 1200pF
	D,E	120pF - 1200pF
	F	470pF - 1200pF
1500VDC†	C	5pF - 710pF
	D,E	120pF - 710pF
	F	470pF - 710pF
2000VDC†	C	5pF - 410pF
	D,E	120pF - 410pF
	F	470pF - 410pF
2500VDC†	C	5pF - 270pF
	D,E	120pF - 270pF
	F	470pF - 270pF

†Maximum dimensions for capacitors having voltages greater than 500VDC are available on request.

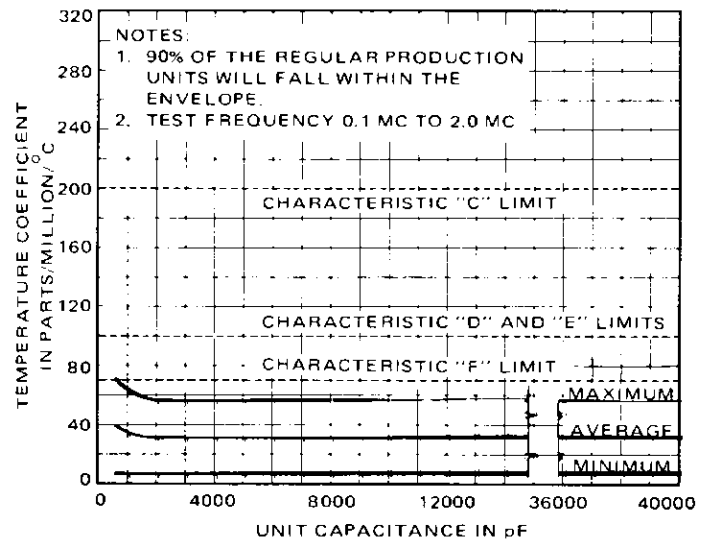
DIMENSIONS FOR CAPACITANCE VALUES

4CR

CAPACITANCE VALUE IN pF	500 WV			300 WV			100 WV		
	L	W	T	L	W	T	L	W	T
	MAXIMUM			MAXIMUM			MAXIMUM		
1000	.760	.840	.230	*	*	*	*	*	*
1100 - 2000	.770	.850	.240	*	*	*	*	*	*
2200 - 2700	.770	.850	.250	*	*	*	*	*	*
3000	.770	.860	.250	*	*	*	*	*	*
3300 - 3900	.770	.860	.260	*	*	*	*	*	*
4300 - 4700	.780	.860	.270	*	*	*	*	*	*
5100	.780	.860	.280	*	*	*	*	*	*
5600 - 6200	.780	.870	.290	*	*	*	*	*	*
6800	.780	.870	.300	*	*	*	*	*	*
7500	.790	.880	.310	.780	.860	.270	*	*	*
8200	.790	.880	.320	.780	.860	.280	*	*	*
9100	.790	.880	.330	.780	.870	.280	*	*	*
10000	.800	.890	.340	.780	.870	.290	*	*	*
11000	.800	.890	.350	.780	.870	.300	*	*	*
12000	.800	.890	.360	.790	.880	.310	*	*	*
13000	.810	.890	.370	.790	.880	.310	*	*	*
15000	.810	.900	.390	.790	.880	.330	*	*	*
16000	.820	.900	.410	.800	.890	.340	*	*	*
18000	.820	.910	.430	.800	.890	.360	*	*	*
20000	.830	.920	.450	.810	.890	.370	*	*	*
22000	.840	.930	.480	.810	.900	.390	.810	.890	.370
24000				.820	.900	.410	.810	.900	.380
27000				.820	.910	.430	.810	.900	.400
30000				.830	.920	.460	.820	.910	.420
33000							.830	.910	.440
36000							.830	.920	.450
39000							.830	.920	.470
40000							.840	.920	.470

*NOTE: Where dimensions are not given for a particular capacitance value, use dimensions for next greater voltage rating.

TYPICAL TEMPERATURE COEFFICIENT RANGE FOR DM30 DIPPED MICA CAPACITORS



Maximum dimension for 1CE capacitors are available on request.

ORDERING DATA

SEMCO Type Designation

	DM20	E	D	101	K	O	1CRT
PREFIX	STYLE	CHARACTERISTIC	VOLTAGE	CAPACITANCE	TOLERANCE	TEMPERATURE RANGE	DIPPED COATING

Prefix

This part of the type designation is normally left blank and is used when the following is desired:

“HR” — These letters designate a debugging or burn-in operation to which the capacitor has been subjected so as to improve its reliability, (see page 16)

“M2” — This letter-number combination designates special processing techniques applied to the capacitor so as to obtain optimum performance and reliability.

Style

The style is identified by two letters followed by two numbers: the combination of letters and numbers indicates the shape and dimensions of the capacitor.

Characteristic

The characteristic letter designates the performance requirements of the dipped mica capacitor with changing temperature. First, it specifies a rate of change of capacitance with temperature, which is commonly called temperature coefficient of capacitance and is given as a range in parts per million per degrees centigrade. Second, it specifies the deviation of capacitance from the original value after temperature cycling, which is known as capacitance drift and is given as a maximum change. The parameters are normally measured at 1 KHz or 1 MHz depending upon the nominal capacitance value.

LETTER DESIGNATION	TEMPERATURE COEFFICIENT	CAPACITANCE DRIFT
C	$\pm 200P/10^6/^{\circ}C$	$\pm (0.5\% + 0.1pF)$
D	$\pm 100P/10^6/^{\circ}C$	$\pm (0.3\% + 0.1pF)$
E	$20 \text{ to } +100P/10^6/^{\circ}C$	$\pm (0.1\% + 0.1pF)$
F	$0 \text{ to } +70P/10^6/^{\circ}C$	$\pm (0.05\% + 0.1pF)$

DC Voltage Rating

The voltage letter designates the voltage rating of the dipped mica capacitor. Semco dipped mica capacitors are available in voltage ratings from 50 through 2500 VDC. All the dipped mica capacitors listed will withstand an application of a DC potential equal to twice the DC working voltage for one to five seconds, without damaging, arcing or breaking down. The surge current should be limited to a maximum of five milliamperes.

LETTER DESIGNATION	VOLTAGE RATING	LETTER DESIGNATION	VOLTAGE RATING
A	100	K	2500
C	300	L	3000
D	500	M	4000
F	1000	N	5000
H	1500	Y	50
J	2000		

Capacitance

The nominal capacitance value is expressed in pF and is normally identified by a three-digit number. The first two digits represent significant figures and the last digit specifies the number of zeros to follow. In special cases where three significant figures are needed, the nominal capacitance in pF is identified by a four-digit number. In this case, the first three digits represent significant figures and the last specifies the number of zeros to follow. For capacitance values less than 10 pF the letter "R" will be employed. (Example, "1R0")

The capacitance values as listed in this catalog represent the nominal capacitance value at +25°C. Capacitance is measured at 1 MHz for nominal values of 1000 pF or less, and at 1 KHz for nominal values greater than 1000 pF.

Tolerance

The tolerance letter designates the tolerance in percent of the nominal capacitance value at +25°C.

LETTER DESIGNATION	CAPACITANCE TOLERANCE*	LETTER DESIGNATION	CAPACITANCE TOLERANCE*
A	±1pF	H	±3%
B	±0.5pF	J	±5%
E	±1/2%	K	±10%
F	±1%	M	±20%
G	±2%		

*For capacitance values of 100 pF or less, the minimum standard available tolerance is ±0.5 pF.

Temperature Range

The temperature letter designates the guaranteed temperature range over which the dipped mica capacitor may be successfully operated.

LETTER DESIGNATION	TEMPERATURE RANGE
D	-55 to +125°C
P	-55 to +150°C

Dipped Coating

SEMCO DM capacitors are dipped in a mineral filled phenolic compound which is then vacuum impregnated with an epoxy resin to form the case material surrounding the capacitor. The result is a rugged casing that protects the capacitor section against

shock, vibration, humidity, and voltage. The dipped coating is completely solid, will not drip under any operating temperature, and will easily resist the high temperatures of soldering. The case will withstand a potential of 1000 VDC when more than one coat of phenolic is applied. In order to assure trouble free use of these parts in printed circuit application, the amount of resin on the leads is carefully controlled.

1CE: These capacitors actually have no phenolic coating, but are merely vacuum impregnated with an epoxy resin for mechanical strength; the epoxy impregnation offers no moisture or case insulation protection. These parts are ideally suited for use where extreme small size is required. It is recommended that 1CE units be used only where they will later be encapsulated or receive some other environmental protection.

1CRT: These single, thin phenolic dip and epoxy impregnated capacitors, which are guaranteed to meet 5 cycles of 16 hours at 40°C and 90% RH, followed by 8 hours at room conditions (for a total of 120 hours), are ideally suited for use where size must be as small as possible, and where moisture protection is needed, but where moisture is not a major problem.

1CRH: These single, heavy phenolic dip and epoxy impregnated capacitors, which are guaranteed to meet the 10 cycle moisture resistance test given in the MIL-C-5 specification, are ideally suited for use where a compromise has to be made with size and moisture protection.

4CR (standard dip): Our normal production dipped mica capacitors are manufactured with four coats of phenolic resin which are then vacuum impregnated with an epoxy resin. These units easily meet the requirements after the 10 cycle moisture resistance test given in the MIL-C-5 specification, and the 20 cycle moisture resistance test given in the MIL-C-39001 specification.

5CR: Where the ultimate is desired for moisture protection, dipped mica capacitors are also manufactured with 5 coats of phenolic resin before being vacuum impregnated with an epoxy resin.

ORDERING DATA

Case Insulation

Where the case insulation test voltage is 150 VDC or less, the full voltage is normally applied. However, where the case insulation voltage exceeds 150 VDC, the test voltage should be increased at the rate of 500 volts per second. Limits are given in the chart below:

MAXIMUM INSULATION BREAKDOWN

CASE STYLE	VDC TEST VOLTAGE	METHODS			
		PARALLEL PLATES	#9 BUCKSHOT	WIRE PROBE	WATER
1CE	0	NO	NO	NO	NO
1CRT	25	YES	NO	NO	NO
1CRH	100	YES	YES	NO	NO
4CR	1000	YES	YES	YES	YES
5CR	2000	YES	YES	YES	YES

Leads

Standard straight leads: All SEMCO dipped mica capacitors are normally supplied with straight radial wire leads. The dimension between the centers of the leads is measured at the point of emergence from the case.

Copper-clad: All SEMCO dipped mica capacitors are manufactured with copper-clad steel leads. The copper-clad leads are annealed and manufactured with steel wire #SAE 1010 or #SAE 1006, having a 30% minimum conductivity copper coating. The leads are finished with a solder coating (60% tin and 40% lead), having a minimum thickness of 0.0001".

Brass: Upon request, all of the SEMCO dipped mica capacitors can be manufactured with brass leads. These brass leads are annealed and have a composition of 70% copper and 30% zinc. The leads are finished with a solder coating (60% tin and 40% lead), having a minimum thickness of 0.0001".

Standard crimped leads: Crimped leads can be supplied, when specified, and are normally manufactured with copper-clad steel leads having the same composition and finish as previously indicated.

Special Leads

In addition to the leads previously described, we are able to supply Dumet wire leads having a gold plating of 50 microinches minimum, and 200 microinches maximum, over a nickel flash of 50 microinches minimum, and 100 microinches maximum. This material is ideally suited when welding methods are employed.

Marking

All SEMCO dipped mica capacitors are permanently marked with a special white ink which is extremely durable and will withstand all the environmental conditioning in the EIA and MIL specifications. These markings will also meet the permanency and durability requirements after the abrasion test, corrosion test and the solvents test of military specification MIL-M-13231, as well as other "Permanency of Markings" specifications.

In addition to the information described below, we are prepared to stamp the capacitor with the customer's part number, the SEMCO type designation, or any other special requirements that might be specified.

All units are normally stamped with the nominal capacitance value, capacitance tolerance in percent, and the SEMCO identification.

1CE: 1CE capacitor styles are **not** normally identified with any markings. However, where size permits it is possible to stamp some identification. In the very small 1CE styles, it is possible to supply the unit with a colored identification dot.

Temperature Coefficient

The typical temperature coefficient curves shown on other pages of this catalog have envelopes indicating the extreme temperature coefficient limits within which 90% of the dipped mica capacitors will fall. When special temperature coefficient limits are required, or when it is desired that the units be separated into temperature coefficient cells, we are prepared to perform a 100% measurement of the temperature coefficient and capacitance drift parameters.

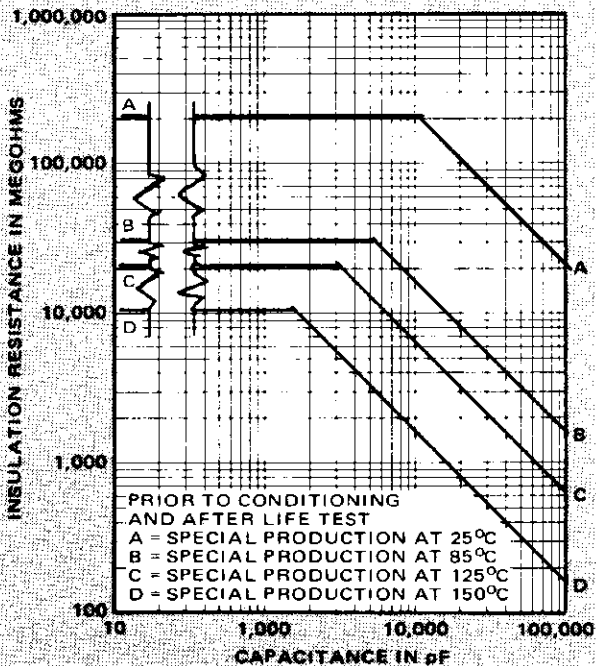
High Temperature

Insert capacitors having no body coating, can be designed and supplied for operating temperatures in the area of 400°C. Where capacitors will be used in a special application, we are often able to design parts when we are aware of your special requirements.

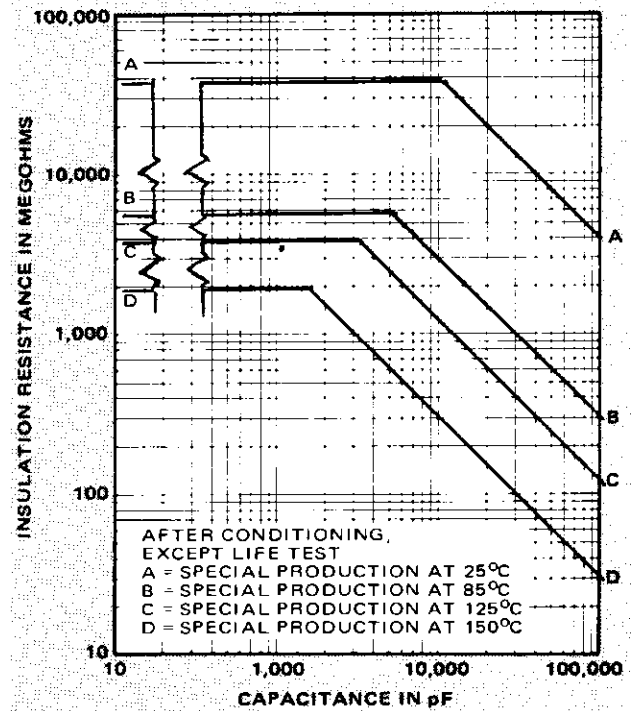
Insulation Resistance

Since insulation resistance is a function of both capacitance and temperature, it of necessity is lower with higher capacitance values and higher operating temperatures. However, dipped mica capacitors having higher insulation resistance values than specified in the commercial and military specifications, are available. Following are curves of insulation resistance requirements which are normally employed for special production dipped mica capacitors.

INSULATION RESISTANCE VS CAPACITANCE FOR SPECIAL PRODUCTION DIPPED MICA CAPACITORS



INSULATION RESISTANCE VS CAPACITANCE FOR SPECIAL PRODUCTION DIPPED MICA CAPACITORS



M2DM Design

Units having the M2DM construction, are parts which incorporate all the special processing techniques which can be applied to dipped mica capacitors so as to obtain operational improvement in all areas. These high reliability capacitors normally have a failure rate ranging from 0.001% to 0.0001% per thousand hours at a 90% confidence level.

The M2DM dipped mica dielectric capacitors are manufactured with the best available grade of capacitor mica which is as free from visual imperfections as the best manufacturing conditions permit. The electrodes are silver and contact to them is made by means of silver foil strips. These silver foil contacts extend beyond the edge of the mica in order that they can be folded over and clinched in the lead clamp for preliminary mechanical contact. The lead clamp ears are then soldered to the silver foil for permanent electrical connection. The silvered mica capacitor insert is encased with a number of coats of phenolic; the phenolic coating is then vacuum impregnated with an epoxy resin.

The high reliability dipped mica capacitors are guaranteed to exhibit a capacitance change of not more than 0.5% or 0.5 pF (whichever is greater) after being subjected to such environmental testing as vibration, shock, acceleration, altitude, corrosion, temperature and immersion cycling, moisture resistance, and life test.

QUALITY AND RELIABILITY

Acceptable Quality Levels

TEST OR CONDITIONING	AQL'S FOR NORMAL PRODUCTION
Visual & Mechanical Major	0.4%
Electrical Dielectric Strength Insulation Resistance "Q" or Dissipation Factor Capacitance	0.25%
Environmental Insulation Resistance at Elevated Temperature	0.65%
Temperature Coefficient and Capacitance Drift	2.5%
Vibration	1.5%
Temperature and Immersion Cycling	2.5%
Terminal Strength Moisture Resistance	2.5%

Findings

Analysis of life test results has revealed the following comparisons, with all operating factors equal:

- Failure rate varies directly with capacitance value in a given case style. As the capacitance of the unit increases, the number of mica films required for construction increases. By far the principal cause of failure is puncture of mica film. As a result, the probability of failure goes up with the addition of mica films to the capacitive section.
- It follows that, for a given capacitance value, the larger case style will have greater reliability. The larger capacitors enable use of mica film with larger area capable of more capacitance per film. as a result, fewer films are required to obtain a given capacity value when a larger case style is employed. Fewer films result in less failures and greater reliability.
- Statistical analysis of life tests run at various degrees of voltage and temperature stress have made possible the establishment of the effects of variation of these stresses on failure rate. It has been found that expected life of a mica capacitor will decrease 50% with each 10°C rise in temperature. As for voltage, test results show that life expectancy varies inversely with the eighth power of voltage.

Debugging

The major portion of mica capacitor failures takes place very early in life of operation. Undetected defects in construction which are invisible and impossible to screen will usually appear after a brief

period of actual operation. These inherent weaknesses cannot be detected through severe screening unless stress level is high enough to damage otherwise good units. A time factor, therefore, becomes essential to detection of these flaws, hence, the debugging technique has been introduced.

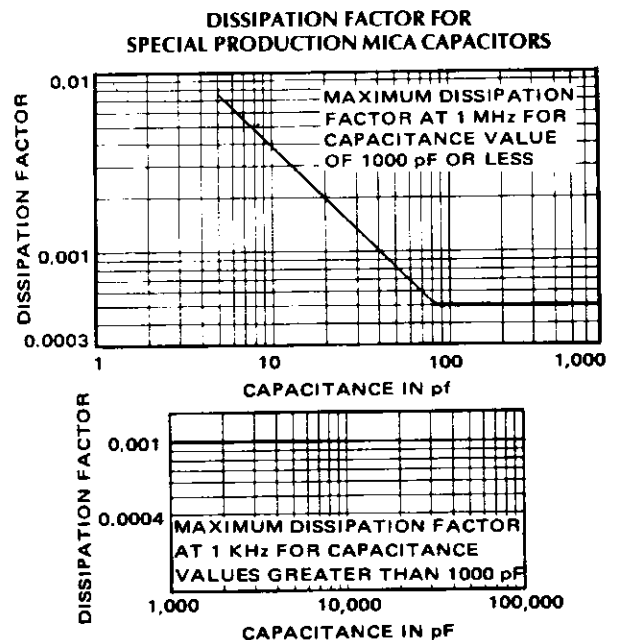
Debugging is the process of subjecting components to a short term accelerated life test designed to eliminate early failures. After careful experimentation and analysis of past test results, a set of parameters has been established to effect safe and efficient detection of the borderline capacitors which produce early failures. The test is of sufficient stringency to destroy most of the potential failures while leaving good units undamaged, and is extended for a sufficient length of time to provide a maximum screening effect. The result is elimination of at least 80% of all units which would have otherwise failed under continuation of life test.

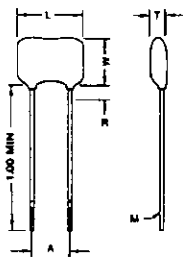
STANDARD DEBUGGING TEST CONDITIONS

RATED CONDITIONS		DEBUGGING TEST CONDITIONS		
TEMP.	VOLTAGE	TIME	VOLTAGE	TEMP.
125°C	≤ 1000 VDC	48 HRS.	2 X RATED	150°C
150°C	≤ 1000 VDC	72 HRS.	2 X RATED	150°C

Dissipation Factor

Below are shown dissipation factor curves normally used when lower dissipation factor values are required.





HIGH RELIABILITY

CMR03 - DM5
 CMR04 - DM10
 CMR05 - DM15
 CMR06 - DM19
 CMR07 - DM30

Levels
 M, P, R



MIL-C-39001

DIPPED MICA CAPACITORS

IMPORTANT NOTE: MIL-C-5 capacitor styles CM04, CM05, CM06, CM07, CM09, CM10, CM11 and CM12 are no longer standard items for use in design after 21 December 1970. They are suitable for use in design contracts current to that date and to support existing military equipment. MIL-C-39001 styles are preferred for design, and regardless of their failure rate level designation, they can be substituted for the inactivated capacitors.

SEMCO dipped mica capacitors are fabricated from the finest India Ruby Muscovite Mica that is available. This particular form exhibits the best characteristics which may be obtained from mica and results in a capacitor with optimum high temperature characteristics and excellent stability.

Style

The style is identified by CMR and two numbers for CMR03, CMR04, CMR05, CMR06, CMR07 (see size charts).

Characteristics

- C** = Temperature Coefficient of ± 200 P/PM/°C
 Capacitance drift of $\pm(5\% + 0.1 \text{ pF})$
- E** = Temperature Coefficient of $-20 + 100$ P/PM/°C
 Capacitance drift of $\pm(0.1\% + 0.1 \text{ pF})$
- F** = Temperature Coefficient of 0 to $+70$ P/PM/°C
 Capacitance drift of $\pm(0.05\% + 0.1 \text{ pF})$

Electrical Characteristics

1. Operating Temperature -55°C to $+125^\circ\text{C}$
 -55°C to $+150^\circ\text{C}$
2. DC Rated Voltage 50, 100, 300, 500
 as indicated on size charts
3. Capacitance Range 1 pF thru 20,000 pF
4. Capacitance Tolerance $\pm 5\text{pF}$, $\pm 1\%$, $\pm 2\%$, $\pm 5\%$
5. Dielectric Withstanding Voltage 2 X Rated Voltage
 for not less than 1 second
 nor more than 5 seconds

Capacitance

The nominal capacitance value is expressed in pF and is identified by a three digit number. The first two digits represent significant figures and the last digit specifies the number of zeros to follow.

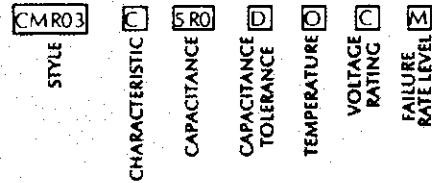
Capacitance Range

CMR03	1	through	400 pF
CMR04	1	through	390 pF
CMR05	1	through	390 pF
CMR06	430	through	4,700 pF
CMR07	5100	through	20,000 pF

TOLERANCE J = 5% G = 2% F = 1% D = .5 pF

TEMPERATURE 0 = -55 to $+125^\circ\text{C}$
 P = -55 to $+150^\circ\text{C}$

SEMCO Catalog Number



Marking

JAN and J marking. The United States Government has adopted, and is exercising legitimate control over, the certification marks "JAN" and "J" respectively, to indicate electrical equipment; namely resistors, capacitors, electron tubes and the like, procured by, or manufactured for use by, or for the Government in accordance with standard Government specifications. Accordingly, capacitors procured to, and meeting all of the requirements specified herein and in applicable specification sheets shall bear the certification mark "JAN," except that capacitors too small to bear the certification mark "JAN" shall bear the letter "J."

Capacitors furnished under contracts or orders which either permit or require deviation from the conditions or requirements specified herein and in applicable specification sheet, the manufacturer shall remove the "JAN" or the "J" from the sample tested and also from all capacitors represented by the sample. The United States Government has obtained Certificate of Registration No. 504,860 for the certification mark "JAN." An established reliability (ER) part manufactured in accordance with this specification may be marked and furnished as a non-ER part from MIL-C-5, if produced on the same assembly line, and provided it is subjected to and meets all the inspection requirements of the ER part.

Failure Rate

These capacitors have a failure rate level ranging from 1.0 percent per 1,000 hours to .01 percent per 1,000 hours. The failure rate level is established at a 90% confidence level. The failure rate is referred to operational life at full rated voltage at 125°C .

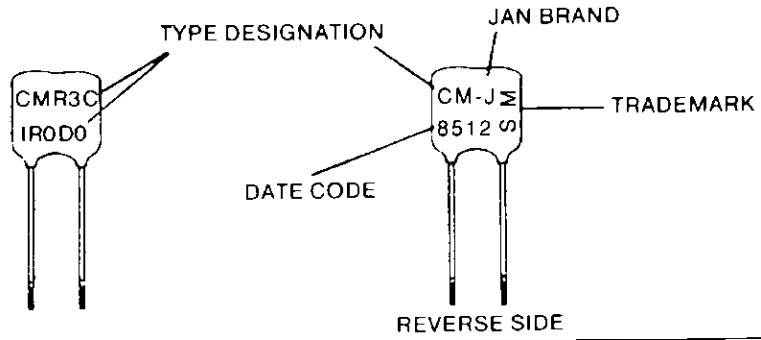
VOLTAGE RATING	
D	= 500 WV
C	= 300 WV
A	= 100 WV
Y	= 50 WV

FAILURE RATE	
M	= 1.0% per 1000 hrs.
P	= 1% per 1000 hrs.
R	= .01% per 1000 hrs.

NOTE: All other electrical requirements are in full qualification to the established military reliability specification MIL-C-39001. Additional information available on request.

STYLE CMR03

Marking Example.



(A) DIMENSION $.120 \pm .031$

(M) LEADS ARE $.016 \pm .002$ DIA.

(R) RESINOUS COATING $.078$ MAX.

REVERSE SIDE

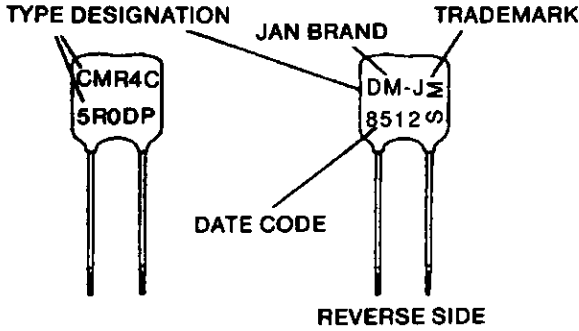
TYPE NUMBER	CAPACITANCE	TEMP.	TOL.	300 WVDC			100 WVDC			50 WVDC		
				L MAX.	W MAX.	T MAX.	L MAX.	W MAX.	T MAX.	L MAX.	W MAX.	T MAX.
CMR03C1R0DOC-	1.0	O	D	.270	.190	.110						
CMR03C1R5DOC-	1.5	O	D	.270	.190	.110						
CMR03C2R0DOC-	2.0	O	D	.270	.190	.110						
CMR03C2R5DOC-	2.5	O	D	.270	.190	.110						
CMR03C3R0DOC-	3.0	O	D	.270	.190	.110						
CMR03C3R5DOC-	3.5	O	D	.270	.190	.110						
CMR03C4R0DOC-	4.0	O	D	.270	.190	.110						
CMR03C4R5DOC-	4.5	O	D	.270	.190	.110						
CMR03C5R0DOC-	5.0	O	D	.270	.190	.110						
CMR03C6R0DOC-	6.0	O	D	.270	.190	.110						
CMR03C7R0DOC-	7.0	O	D	.270	.190	.110						
CMR03C8R0DOC-	8.0	O	D	.270	.190	.110						
CMR03C9R0DOC-	9.0	O	D	.270	.190	.110						
CMR03C100DOC	10	O	D	.270	.190	.110						
CMR03C110DOC	11	O	D	.270	.190	.110						
CMR03C120DOC	12	O	D	.270	.190	.110						
CMR03C150DO	15	O	D	.270	.190	.120	.270	.190	.110			
CMR03C180DO	18	O	D	.270	.200	.120	.270	.190	.110			
CMR03E200DO	20	O	D	.270	.200	.120	.270	.190	.110			
CMR03E220DO	22	O	D	.270	.200	.120	.270	.190	.120	.270	.190	.110
CMR03E240DO	22	O	D	.270	.200	.120	.270	.190	.120	.270	.190	.110
CMR03E270-O	27	O	GJ	.270	.200	.130	.270	.190	.120	.270	.190	.110
CMR03E300-O	30	O	GJ	.270	.200	.130	.270	.200	.120	.270	.190	.110
CMR03E330-O	33	O	GJ	.270	.200	.130	.270	.200	.120	.270	.190	.110
CMR03E360-O	36	O	GJ	.270	.210	.130	.270	.200	.120	.270	.190	.110
CMR03E390-O	39	O	GJ	.270	.210	.130	.270	.200	.120	.270	.190	.120
CMR03E430-O	43	O	GJ	.270	.210	.140	.270	.200	.120	.270	.190	.120
CMR03E470-O	47	O	GJ	.270	.210	.140	.270	.200	.130	.270	.190	.120
CMR03E510-O	51	O	GJ	.270	.210	.140	.270	.200	.130	.270	.190	.120
CMR03E560-O	56	O	GJ	.270	.220	.150	.270	.200	.130	.270	.190	.120
CMR03E620-O	62	O	GJ	.270	.220	.150	.270	.210	.130	.270	.200	.120
CMR03E680-O	68	O	GJ	.270	.220	.150	.270	.210	.140	.270	.200	.120
CMR03E750-O	75	O	GJ	.270	.230	.160	.270	.210	.140	.270	.200	.120
CMR03E820-O	82	O	GJ	.270	.230	.160	.270	.210	.140	.270	.200	.120
CMR03F910-O	91	O	GJ	.270	.230	.170	.270	.210	.140	.270	.200	.130
CMR03F101-O	100	O	GJ	.270	.240	.180	.270	.220	.150	.270	.200	.130
CMR03F111-O	110	O	GJ	.270	.240	.180	.270	.220	.150	.270	.200	.130
CMR03F121-O	120	O	GJ	.270	.250	.190	.270	.220	.160	.270	.200	.130
CMR03F131-O	130	O	GJ				.270	.230	.160	.270	.210	.130
CMR03F151-O	150	O	GJ				.270	.230	.170	.270	.210	.140
CMR03F161-O	160	O	GJ				.270	.240	.170	.270	.210	.170
CMR03F171-O	170	O	GJ				.270	.240	.180	.270	.210	.140
CMR03F181-O	180	O	GJ				.270	.240	.180	.270	.210	.140
CMR03F201-O	200	O	GJ				.270	.250	.190	.270	.220	.150
CMR03F221-O	220	O	GJ							.270	.220	.160
CMR03F241-O	240	O	GJ							.270	.220	.160
CMR03F271-O	270	O	GJ							.270	.230	.160
CMR03F301-OY	300	O	GJ							.270	.230	.170
CMR03F331-OY	330	O	GJ							.270	.240	.180
CMR03F361-OY	360	O	GJ							.270	.240	.180
CMR03F391-OY	390	O	GJ							.270	.250	.190
CMR03F401-OY	400	O	GJ							.270	.250	.190

STYLE CMR04, CMR05



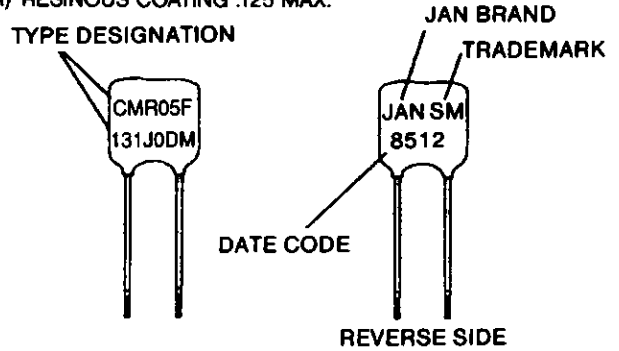
Marking Example.

- (A) DIMENSION .150 ± .031
- (M) LEADS ARE .016 ± .002 DIA.
- (R) RESINOUS COATING .125 MAX.



Marking Example.

- (A) DIMENSION .225 ± .031
- (M) LEADS ARE .025 ± .002 DIA.
- (R) RESINOUS COATING .125 MAX.



CMR04

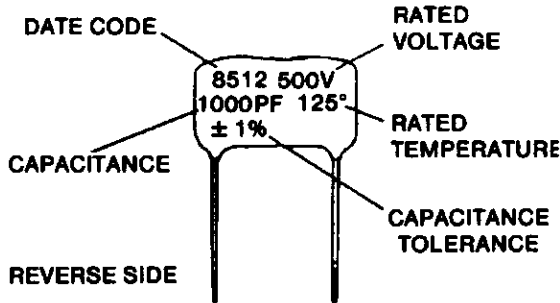
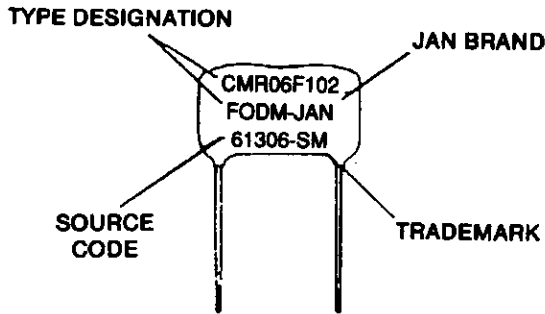
CMR05

TYPE NUMBER	pF CAPACITANCE	TEMP.	TOL.	L MAX.	W MAX.	T MAX.	WVDC	TYPE NUMBER	pF CAPACITANCE	TEMP.	TOL.	L MAX.	W MAX.	T MAX.	WVDC
CMR04C100-D	1.0	OP	D	.360	.330	.190	500	CMR05C100-D	1.0	OP	D	.450	.360	.170	500
CMR04C150-D	1.5	OP	D	.360	.330	.190	500	CMR05C150-D	1.5	OP	D	.450	.360	.170	500
CMR04C200-D	2.0	OP	D	.360	.330	.190	500	CMR05C200-D	2.0	OP	D	.450	.360	.170	500
CMR04C250-D	2.5	OP	D	.360	.330	.190	500	CMR05C250-D	2.5	OP	D	.450	.360	.170	500
CMR04C300-D	3.0	OP	D	.360	.330	.190	500	CMR05C300-D	3.0	OP	D	.450	.360	.170	500
CMR04C350-D	3.5	OP	D	.360	.330	.190	500	CMR05C350-D	3.5	OP	D	.450	.360	.170	500
CMR04C400-D	4.0	OP	D	.360	.330	.190	500	CMR05C400-D	4.0	OP	D	.450	.360	.170	500
CMR04C450-D	4.5	OP	D	.360	.330	.190	500	CMR05C450-D	4.5	OP	D	.450	.360	.170	500
CMR04C500-D	5.0	OP	D	.360	.330	.190	500	CMR05C500-D	5.0	OP	D	.450	.360	.170	500
CMR04C600-D	6.0	OP	D	.360	.330	.190	500	CMR05C600-D	6.0	OP	D	.450	.360	.170	500
CMR04C700-D	7.0	OP	D	.360	.330	.190	500	CMR05C700-D	7.0	OP	D	.450	.360	.170	500
CMR04C800-D	8.0	OP	D	.360	.330	.190	500	CMR05C800-D	8.0	OP	D	.450	.360	.170	500
CMR04C900-D	9.0	OP	D	.360	.330	.190	500	CMR05C900-D	9.0	OP	D	.450	.360	.170	500
CMR04C1000-D	10	OP	D	.360	.330	.190	500	CMR05C1000-D	10	OP	D	.450	.360	.170	500
CMR04C1100-D	11	OP	D	.360	.330	.190	500	CMR05C1100-D	11	OP	D	.450	.360	.170	500
CMR04C120J-D	12	OP	J	.360	.330	.190	500	CMR05C120J-D	12	OP	J	.450	.360	.170	500
CMR04C150J-D	15	OP	J	.360	.330	.190	500	CMR05C150J-D	15	OP	J	.450	.360	.170	500
CMR04C180J-D	18	OP	J	.360	.330	.190	500	CMR05C180J-D	18	OP	J	.450	.360	.170	500
CMR04E200J-D	20	OP	J	.360	.330	.190	500	CMR05E200J-D	20	OP	J	.450	.360	.170	500
CMR04E220J-D	22	OP	J	.360	.330	.190	500	CMR05E220J-D	22	OP	J	.450	.360	.170	500
CMR04E240J-D	24	OP	J	.360	.330	.190	500	CMR05E240J-D	24	OP	J	.450	.360	.170	500
CMR04E270-D	27	OP	GJ	.370	.330	.190	500	CMR05E270-D	27	OP	GJ	.450	.360	.170	500
CMR04E300-D	30	OP	GJ	.370	.340	.190	500	CMR05E300-D	30	OP	GJ	.450	.360	.170	500
CMR04E330-D	33	OP	GJ	.370	.340	.190	500	CMR05E330-D	33	OP	GJ	.450	.360	.170	500
CMR04E360-D	36	OP	GJ	.370	.340	.190	500	CMR05E360-D	36	OP	GJ	.450	.360	.170	500
CMR04E390-D	39	OP	GJ	.370	.340	.190	500	CMR05E390-D	39	OP	GJ	.450	.360	.170	500
CMR04E420-D	42	OP	GJ	.370	.340	.190	500	CMR05E420-D	42	OP	GJ	.450	.360	.170	500
CMR04E450-D	45	OP	GJ	.370	.340	.190	500	CMR05E450-D	45	OP	GJ	.450	.360	.170	500
CMR04E470-D	47	OP	GJ	.370	.340	.190	500	CMR05E470-D	47	OP	GJ	.450	.360	.170	500
CMR04E510-D	51	OP	FGJ	.370	.340	.190	500	CMR05E510-D	51	OP	FGJ	.450	.360	.170	500
CMR04E560-D	56	OP	FGJ	.370	.340	.190	500	CMR05E560-D	56	OP	FGJ	.450	.360	.170	500
CMR04E600-D	60	OP	FGJ	.370	.340	.190	500	CMR05E600-D	60	OP	FGJ	.450	.360	.170	500
CMR04E650-D	65	OP	FGJ	.370	.340	.190	500	CMR05E650-D	65	OP	FGJ	.450	.360	.190	500
CMR04E700-D	70	OP	FGJ	.370	.340	.200	500	CMR05E700-D	70	OP	FGJ	.450	.360	.190	500
CMR04E820-D	82	OP	FGJ	.370	.350	.200	500	CMR05E820-D	82	OP	FGJ	.450	.360	.180	500
CMR04F910-D	91	OP	FGJ	.370	.350	.200	500	CMR05F910-D	91	OP	FGJ	.450	.360	.180	500
CMR04F101-D	100	OP	FGJ	.370	.350	.200	500	CMR05F101-D	100	OP	FGJ	.450	.360	.180	500
CMR04F110-D	110	OP	FGJ	.380	.360	.210	500	CMR05F110-D	110	OP	FGJ	.450	.370	.180	500
CMR04F120-D	120	OP	FGJ	.380	.360	.210	500	CMR05F120-D	120	OP	FGJ	.450	.370	.180	500
CMR04F130-D	130	OP	FGJ	.380	.360	.210	500	CMR05F130-D	130	OP	FGJ	.450	.370	.180	500
CMR04F151-D	150	OP	FGJ	.380	.360	.210	500	CMR05F151-D	150	OP	FGJ	.450	.370	.190	500
CMR04F161-D	160	OP	FGJ	.380	.360	.210	500	CMR05F161-D	160	OP	FGJ	.450	.370	.190	500
CMR04F181-D	180	OP	FGJ	.390	.370	.210	500	CMR05F181-D	180	OP	FGJ	.450	.370	.190	500
CMR04F201-D	200	OP	FGJ	.390	.380	.220	500	CMR05F201-D	200	OP	FGJ	.450	.380	.200	500
CMR04F241-D	240	OP	FGJ	.390	.380	.220	500	CMR05F241-D	240	OP	FGJ	.450	.380	.200	500
CMR04F271-C	270	OP	FGJ	.390	.380	.220	300	CMR05F271-D	270	OP	FGJ	.470	.390	.210	500
CMR04F301-C	300	OP	FGJ	.390	.380	.220	300	CMR05F301-D	300	OP	FGJ	.470	.390	.210	500
CMR04F331-A	330	OP	FGJ	.390	.380	.220	100	CMR05F331-D	330	OP	FGJ	.470	.390	.210	500
CMR04F361-A	360	OP	FGJ	.390	.380	.220	100	CMR05F361-D	360	OP	FGJ	.470	.400	.220	500
CMR04F391-A	390	OP	FGJ	.390	.380	.220	100	CMR05F391-D	390	OP	FGJ	.470	.400	.220	500

STYLE CMR06, CMR07

CMR06

Marking Example.

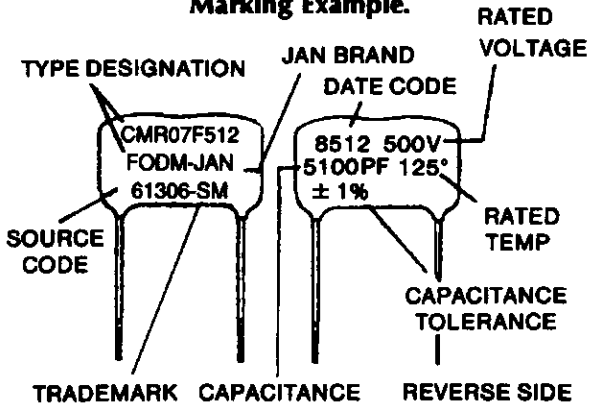


- (A) DIMENSION $.350 \pm .031$
- (M) LEADS ARE $.032$ DIA. $\pm .002$
- (R) RESINOUS COATING $.141$ MAX.

TYPE NUMBER	CAPACITANCE	TEMP.	TOL.	L MAX.	W MAX.	T MAX.	WVDC
CMR06F561-D	560	OP	FGJ	.650	.510	.200	500
CMR06F621-D	620	OP	FGJ	.650	.510	.200	500
CMR06F681-D	680	OP	FGJ	.650	.510	.210	500
CMR06F102-D	1000	OP	FGJ	.650	.520	.220	500
CMR06F112-D	1100	OP	FGJ	.650	.520	.220	500
CMR06F122-D	1200	OP	FGJ	.660	.520	.220	500
CMR06F182-D	1800	OP	FGJ	.670	.530	.240	500
CMR06F202-D	2000	OP	FGJ	.670	.530	.240	500
CMR06F222-D	2200	OP	FGJ	.670	.530	.250	500
CMR06F332-D	3300	OP	FGJ	.680	.550	.290	500
CMR06F362-D	3600	OP	FGJ	.680	.560	.300	500
CMR06F392-D	3900	OP	FGJ	.690	.560	.310	500

CMR07

Marking Example.



- (A) DIMENSION $.425 \pm .031$
- (M) LEADS ARE $.040$ DIA. $\pm .002$
- (R) RESINOUS COATING $.141$ MAX.

TYPE NUMBER	CAPACITANCE	TEMP.	TOL.	L MAX.	W MAX.	T MAX.	WVDC
CMR07F682-D	6800	OP	FGJ	.780	.870	.300	500
CMR07F752-D	7500	OP	FGJ	.790	.880	.310	500
CMR07F822-D	8200	OP	FGJ	.790	.880	.320	500
CMR07F123-D	12000	OP	FGJ	.800	.890	.360	500
CMR07F133-D	13000	OP	FGJ	.810	.890	.370	500
CMR07F153-D	15000	OP	FGJ	.810	.900	.390	500



MIL-C-87164 (USAF) JAN CLASS S METALLURGICALLY BONDED DIPPED MICA CAPACITORS

HIGH RELIABILITY



STYLES	
SEMCO	MILITARY
M2HRCMS03	CMS03
M2HRCMS04	CMS04
M2HRCMS05	CMS05
M2HRCMS06	CMS06
M2HRCMS07	CMS07

SCOPE

Semco M2HRCMS0 dipped mica capacitors are fabricated from the finest India Ruby Muscovite Mica that is available and is as free from visual imperfections as the best manufacturing conditions permit. The electrodes are silver and contact to them is made by means of silver foil strips. These silver foil contacts extend beyond the edge of the mica in order that they can be folded over and clinched in the lead clamp for preliminary mechanical contact. The lead clamp ears are then soldered to the silver foil for

permanent electrical connection. The silvered mica capacitor insert is encased with a number of coats of phenolic; the phenolic coating is then vacuum impregnated with an epoxy resin.

These capacitors are used in critical applications where the utmost in stability and dependability is required and where variations in capacitance with respect to temperature, voltage, frequency and life cannot be tolerated, such as in space, missile, and other high reliability applications.

SILVERED ELECTRONIC MICA CO., INC.

P.O. Box 505 • 107 Boston Post Road
Willimantic, Connecticut 06226

Tel. (860) 456-0831 • Fax # 860-423-3506

E-Mail Address: @semco-usa.com

World Wide Web Address: <http://www.semco-usa.com>

ORDERING DATA

SEMCO Type Designation

M2HR	CMS04	E	D	470	G	O
PREFIX	STYLE	CHARACTERISTIC	VOLTAGE	CAPACITANCE	TOLERANCE	TEMPERATURE RANGE

Characteristic

SYMBOL	TEMPERATURE COEFFICIENT	CAPACITANCE DRIFT
	Parts/Million/°C	
C	- 200 to + 200	±(0.5% + 0.1 pF)
E	- 20 to + 100	±(0.1% + 0.1 pF)
F	0 to 70	±(0.05% + 0.1 pF)

Electrical Characteristics

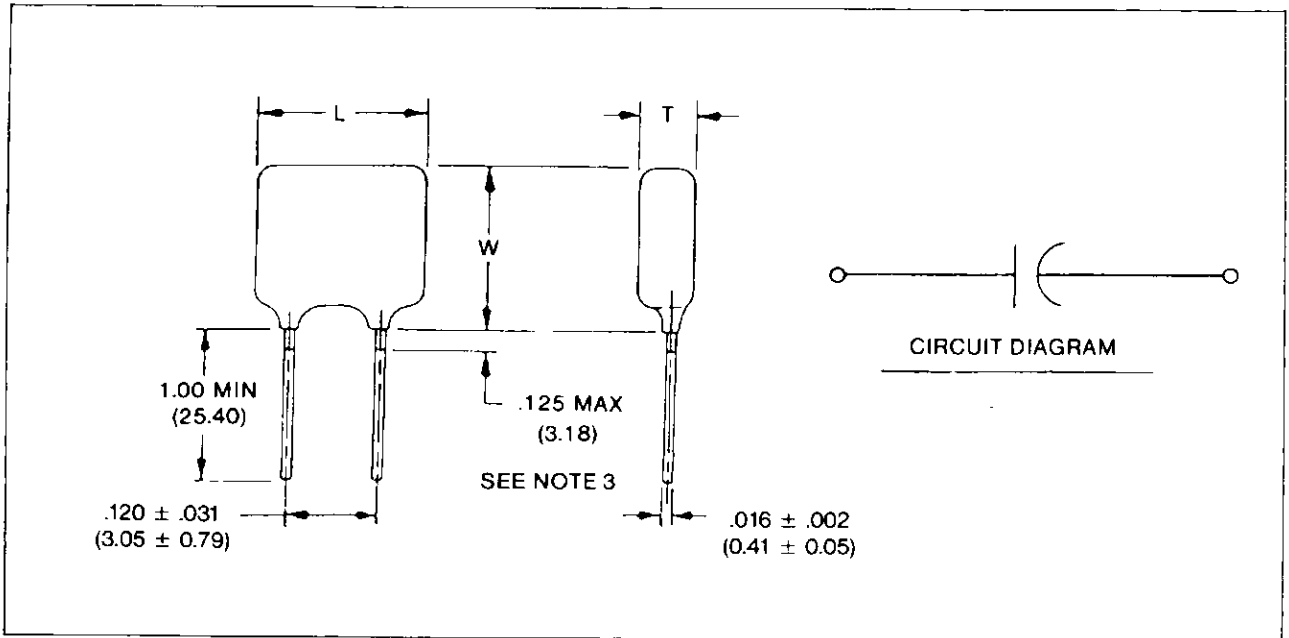
Operating Temperature	- 55°C to + 125°C
D.C. Voltage Rating	500
Capacitance Range	1 pF through 22000 pF
Capacitance Tolerance	± .5pF 1% 2% 5%
Dielectric Withstanding Voltage	2 X Rated Voltage for not less than 1 second not more than 5 seconds

Capacitance Range

M2HRCMS03	1 through 120 pF
M2HRCMS04	1 through 200 pF
M2HRCMS05	1 through 240 pF
M2HRCMS06	270 through 2700 pF
M2HRCMS07	3000 through 22000 pF

STYLE M2HRCMS03

Capacitors, Fixed Mica Dielectric, High Reliability



DIMENSIONS

CAPACITANCE (pF)	L		T		W Maximum
	Minimum ^{1/}	Maximum	Minimum ^{1/}	Maximum	
1 - 12	.230 (5.84)	.290 (7.37)	.090 (2.29)	.140 (3.56)	.210 (5.33)
15	.230 (5.85)	.290 (7.37)	.090 (2.29)	.140 (3.56)	.210 (5.33)
18 - 20	.230 (5.84)	.290 (7.37)	.090 (2.29)	.140 (3.56)	.220 (5.59)
22 - 24	.240 (6.10)	.300 (7.62)	.090 (2.29)	.150 (3.81)	.220 (5.59)
27	.240 (6.10)	.300 (7.62)	.100 (2.54)	.160 (4.06)	.230 (5.84)
30 - 33	.240 (6.10)	.300 (7.62)	.100 (2.54)	.160 (4.06)	.230 (5.84)
36	.240 (6.10)	.300 (7.62)	.100 (2.54)	.160 (4.06)	.240 (6.10)
39	.240 (6.10)	.310 (7.87)	.110 (2.79)	.170 (4.32)	.240 (6.10)
43	.240 (6.10)	.310 (7.87)	.110 (2.79)	.170 (4.32)	.240 (6.10)
47 - 51	.240 (6.10)	.310 (7.87)	.110 (2.79)	.180 (4.57)	.250 (6.35)
56	.250 (6.35)	.320 (8.13)	.120 (3.05)	.180 (4.57)	.250 (6.35)
62	.250 (6.35)	.320 (8.13)	.130 (3.30)	.180 (4.57)	.250 (6.35)
68	.250 (6.35)	.330 (8.38)	.130 (3.30)	.190 (4.83)	.260 (6.60)
75 - 82	.250 (6.35)	.330 (8.38)	.140 (3.56)	.190 (4.83)	.260 (6.60)
91	.260 (6.60)	.330 (8.38)	.150 (3.81)	.200 (5.08)	.270 (6.86)
100 - 110	.260 (6.60)	.340 (8.64)	.160 (4.06)	.210 (5.33)	.280 (7.11)
120	.270 (6.86)	.350 (8.89)	.160 (4.06)	.220 (5.59)	.290 (7.37)

^{1/} Minimum dimensions are listed for information only.

NOTES:

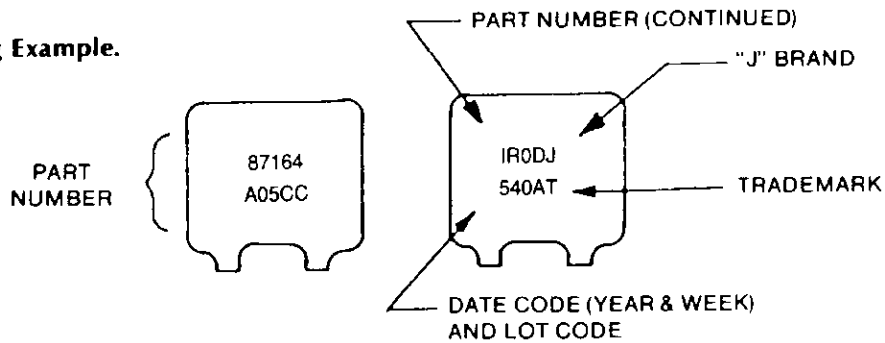
1. Dimensions are in inches.
2. Metric equivalents are in parentheses.
3. This dimension may not be solderable as it may be covered by a clear epoxy coating.

STYLE M2HRCMS03

Capacitors, Fixed Mica Dielectric, High Reliability



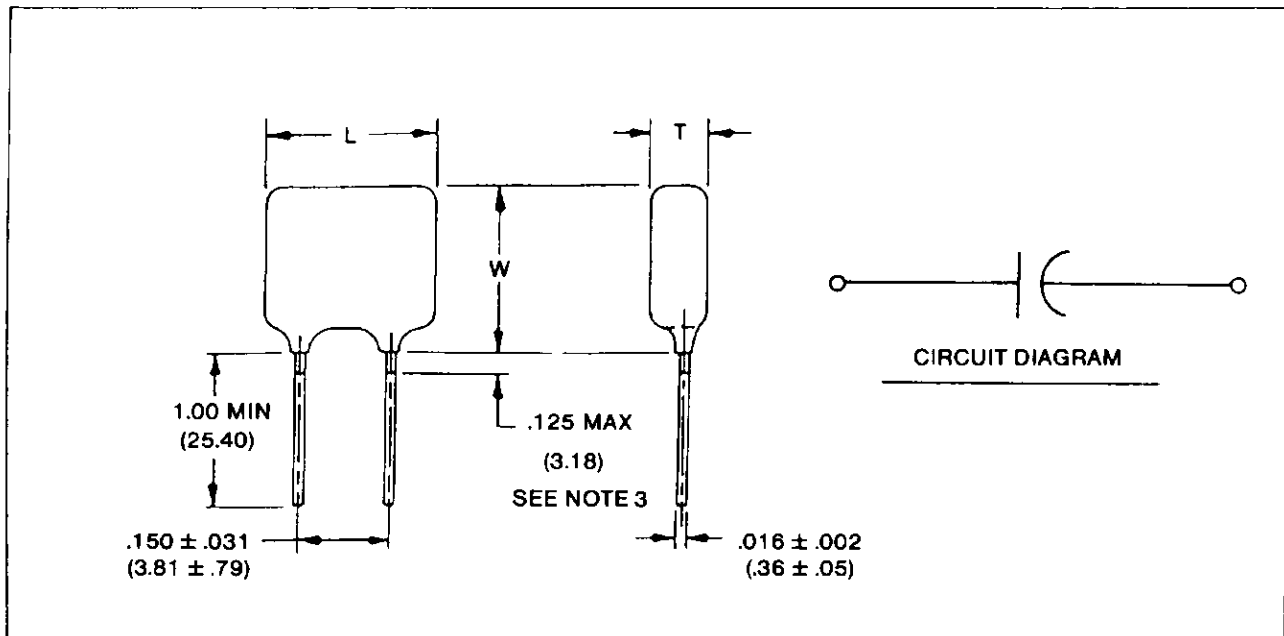
Marking Example.



Electrical Characteristics and Part Numbers

SEMCO PART NUMBER M2HRCMS03	MILITARY PART NUMBER ^{1/} M87164A05	CAPACITANCE VALUE (pF)	CAPACITANCE TOLERANCE
CC1R0D0	CC1R0D	1.0	D
CC1R5D0	CC1R5D	1.5	D
CC2R0D0	CC2R0D	2.0	D
CC2R5D0	CC2R5D	2.5	D
CC3R0D0	CC3R0D	3.0	D
CC3R5D0	CC3R5D	3.5	D
CC4R0D0	CC4R0D	4.0	D
CC4R5D0	CC4R5D	4.5	D
CC5R0D0	CC5R0D	5.0	D
CC6R0D0	CC6R0D	6.0	D
CC7R0D0	CC7R0D	7.0	D
CC8R0D0	CC8R0D	8.0	D
CC9R0D0	CC9R0D	9.0	D
CC100D0	CC100D	10	D
CC110D0	CC110D	11	D
CC120J0	CC120J	12	J
CC150J0	CC150J	15	J
CC180J0	CC180J	18	J
EC200J0	EC200J	20	J
EC220J0	EC220J	22	J
EC240J0	EC240J	24	J
EC270-0	EC270-	27	G, J
EC300-0	EC300-	30	G, J
EC330-0	EC330-	33	G, J
EC360-0	EC360-	36	G, J
EC390-0	EC390-	39	G, J
EC430-0	EC430-	43	G, J
EC470-0	EC470-	47	G, J
EC510-0	EC510-	51	G, J, F
EC560-0	EC560-	56	G, J, F
EC620-0	EC620-	62	G, J, F
EC680-0	EC680-	68	G, J, F
EC750-0	EC750-	75	G, J, F
EC820-0	EC820-	82	G, J, F
EC910-0	EC910-	91	G, J, F
EC101-0	EC101-	100	G, J, F
EC111-0	EC111-	110	G, J, F
EC121-0	EC121-	120	G, J, F

^{1/} The complete part number will include a letter symbol to indicate the capacitance tolerance; e.g., **M87164A05CC1R0D**.



DIMENSIONS

CAPACITANCE (pF)	L		T		W
	Minimum 1/	Maximum	Minimum 1/	Maximum	Maximum
1 to 24, incl.	.300 (7.62)	.370 (9.40)	.100 (2.54)	.190 (4.83)	.350 (8.89)
27	.300 (7.62)	.370 (9.40)	.100 (2.54)	.190 (4.83)	.350 (8.89)
30 to 68, incl.	.300 (7.62)	.380 (9.65)	.100 (2.54)	.200 (5.08)	.350 (8.89)
75	.300 (7.62)	.380 (9.65)	.100 (2.54)	.210 (5.33)	.360 (9.14)
82	.300 (7.62)	.380 (9.65)	.100 (2.54)	.210 (5.33)	.360 (9.14)
91 and 100	.300 (7.62)	.390 (9.91)	.100 (2.54)	.210 (5.33)	.370 (9.40)
110 & 120	.300 (7.62)	.390 (9.91)	.100 (2.54)	.220 (5.59)	.380 (9.65)
130	.300 (7.62)	.390 (9.91)	.100 (2.54)	.220 (5.59)	.380 (9.65)
150 & 160	.300 (7.62)	.390 (9.91)	.110 (2.79)	.230 (5.84)	.380 (9.65)
180	.300 (7.62)	.400 (10.16)	.120 (3.05)	.230 (5.84)	.390 (9.91)
200	.300 (7.62)	.400 (10.16)	.120 (3.05)	.240 (6.10)	.390 (9.91)

1/ Minimum dimensions are listed for information only.

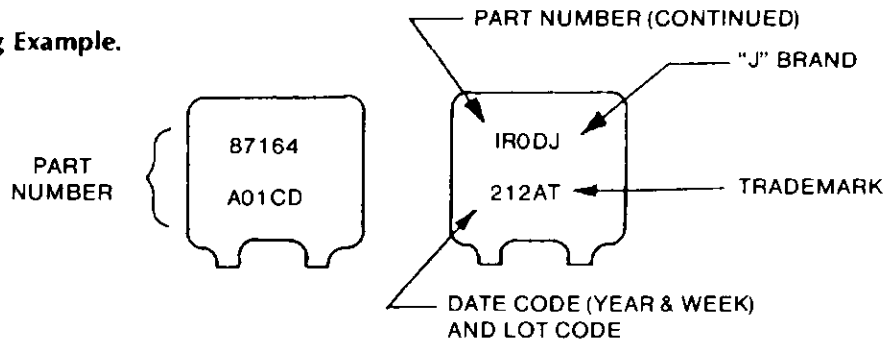
NOTES:

1. Dimensions are in inches.
2. Metric equivalents are in parentheses.
3. This dimension may not be solderable as it may be covered by a clear epoxy coating.

STYLE M2HRCMS04

Capacitors, Fixed Mica Dielectric, High Reliability

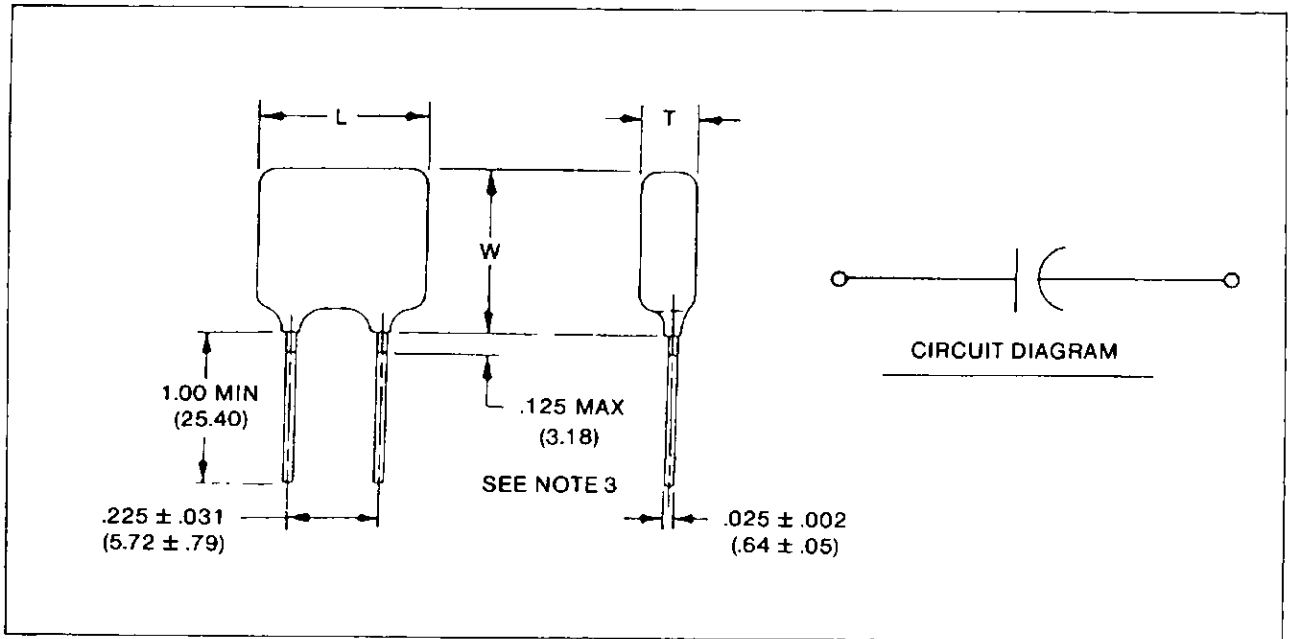
Marking Example.



Electrical Characteristics and Part Numbers

SEMCO PART NUMBER M2HRCMS04	MILITARY 1/ PART NUMBER M87164A01	CAPACITANCE VALUE (pF)	CAPACITANCE TOLERANCE
CD1R0D0	CD1R0D	1.0	D
CD1R5D0	CD1R5D	1.5	D
CD2R0D0	CD2R0D	2.0	D
CD2R5D0	CD2R5D	2.5	D
CD3R0D0	CD3R0D	3.0	D
CD3R5D0	CD3R5D	3.5	D
CD4R0D0	CD4R0D	4.0	D
CD4R5D0	CD4R5D	4.5	D
CD5R0D0	CD5R0D	5.0	D
CD6R0D0	CD6R0D	6.0	D
CD7R0D0	CD7R0D	7.0	D
CD8R0D0	CD8R0D	8.0	D
CD9R0D0	CD9R0D	9.0	D
CD100D0	CD100D	10.0	D
CD110D0	CD110D	11.0	D
CD120J0	CD120J	12.0	J
CD150J0	CD150J	15.0	J
CD180J0	CD180J	18.0	J
ED200J0	ED200J	20.0	J
ED220J0	ED220J	22.0	J
ED240J0	ED240J	24.0	J
ED270-0	ED270-	27.0	G, J
ED300-0	ED300-	30.0	G, J
ED330-0	ED330-	33.0	G, J
ED360-0	ED360-	36.0	G, J
ED390-0	ED390-	39.0	G, J
ED430-0	ED430-	43.0	G, J
ED470-0	ED470-	47.0	G, J
ED510-0	ED510-	51.0	F, G, J
ED560-0	ED560-	56.0	F, G, J
ED620-0	ED620-	62.0	F, G, J
ED680-0	ED680-	68.0	F, G, J
ED750-0	ED750-	75.0	F, G, J
ED820-0	ED820-	82.0	F, G, J
ED910-0	ED910-	91.0	F, G, J
ED101-0	ED101-	100.0	F, G, J
ED111-0	ED111-	110.0	F, G, J
ED121-0	ED121-	120.0	F, G, J
ED131-0	ED131-	130.0	F, G, J
ED151-0	ED151-	150.0	F, G, J
ED161-0	ED161-	160.0	F, G, J
ED181-0	ED181-	180.0	F, G, J
ED201-0	ED201-	200.0	F, G, J

1/ The complete part number will include a letter symbol to indicate the capacitance tolerance; e.g., M87164A01ED201F.



DIMENSIONS

CAPACITANCE (pF)	L		T		W
	Minimum ^{1/}	Maximum	Minimum ^{1/}	Maximum	Maximum
1 to 62, incl.	.400 (10.16)	.460 (11.68)	.090 (2.29)	.180 (4.57)	.360 (9.14)
68 to 82, incl.	.400 (10.16)	.460 (11.68)	.090 (2.29)	.180 (4.57)	.370 (9.40)
91 & 100	.400 (10.16)	.460 (11.68)	.095 (2.41)	.190 (4.83)	.370 (9.40)
110 to 130, incl.	.400 (10.16)	.460 (11.68)	.095 (2.41)	.200 (5.08)	.380 (9.65)
150 to 180, incl.	.400 (10.16)	.470 (11.94)	.095 (2.41)	.210 (5.33)	.390 (9.91)
200	.400 (10.16)	.470 (11.94)	.110 (2.79)	.210 (5.33)	.390 (9.91)
220 & 240	.400 (10.16)	.470 (11.94)	.110 (2.79)	.220 (5.59)	.400 (10.16)

^{1/} Minimum dimensions are listed for information only.

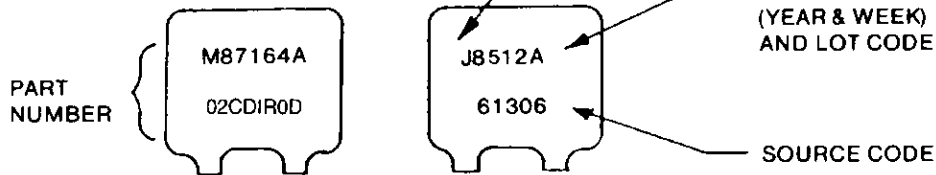
NOTES:

1. Dimensions are in inches.
2. Metric equivalents are in parentheses.
3. This dimension may not be solderable as it may be covered by a clear epoxy coating.

STYLE M2HRCMS05

Capacitors, Fixed Mica Dielectric, High Reliability

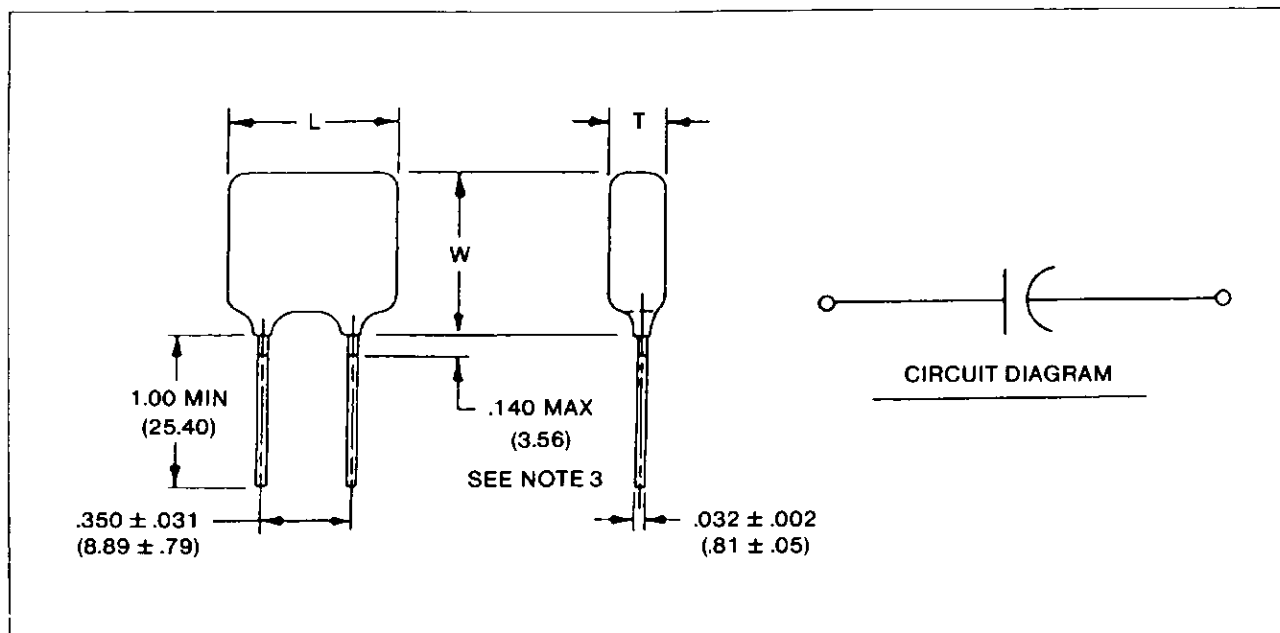
Marking Example.



Electrical Characteristics and Part Numbers

SEMCO PART NUMBER M2HRCMS05	MILITARY 1/ PART NUMBER M87164A02	CAPACITANCE VALUE (pF)	CAPACITANCE TOLERANCE
CD1R0D0	CD1R0D	1.0	D
CD1R5D0	CD1R5D	1.5	D
CD2R0D0	CD2R0D	2.0	D
CD2R5D0	CD2R5D	2.5	D
CD3R0D0	CD3R0D	3.0	D
CD3R5D0	CD3R5D	3.5	D
CD4R0D0	CD4R0D	4.0	D
CD4R5D0	CD4R5D	4.5	D
CD5R0D0	CD5R0D	5.0	D
CD6R0D0	CD6R0D	6.0	D
CD7R0D0	CD7R0D	7.0	D
CD8R0D0	CD8R0D	8.0	D
CD9R0D0	CD9R0D	9.0	D
CD100D0	CD100D	10.0	D
CD110D0	CD110D	11.0	D
CD120J0	CD120J	12.0	J
CD150J0	CD150J	15.0	J
CD180J0	CD180J	18.0	J
ED200J0	ED200J	20.0	J
ED220J0	ED220J	22.0	J
ED240J0	ED240J	24.0	J
ED270-0	ED270-	27.0	G, J
ED300-0	ED300-	30.0	G, J
ED330-0	ED330-	33.0	G, J
ED360-0	ED360-	36.0	G, J
ED390-0	ED390-	39.0	G, J
ED430-0	ED430-	43.0	G, J
ED470-0	ED470-	47.0	G, J
ED510-0	ED510-	51.0	F, G, J
ED560-0	ED560-	56.0	F, G, J
ED620-0	ED620-	62.0	F, G, J
ED680-0	ED680-	68.0	F, G, J
ED750-0	ED750-	75.0	F, G, J
ED820-0	ED820-	82.0	F, G, J
ED910-0	ED910-	91.0	F, G, J
ED101-0	ED101-	100.0	F, G, J
ED111-0	ED111-	110.0	F, G, J
ED121-0	ED121-	120.0	F, G, J
ED131-0	ED131-	130.0	F, G, J
ED151-0	ED151-	150.0	F, G, J
ED161-0	ED161-	160.0	F, G, J
ED181-0	ED181-	180.0	F, G, J
ED201-0	ED201-	200.0	F, G, J
ED221-0	ED221-	220.0	F, G, J
ED241-0	ED241-	240.0	F, G, J

1/ The complete part number will include a letter symbol to indicate the capacitance tolerance; e.g., M87164A02ED241F.



DIMENSIONS

CAPACITANCE (pF)	L		T		W
	Minimum 1/	Maximum	Minimum 1/	Maximum	Maximum
270 to 300, incl.	.550 (13.97)	.650 (16.51)	.090 (2.29)	.210 (5.33)	.510 (12.95)
360 & 390	.550 (13.97)	.650 (16.51)	.090 (2.29)	.210 (5.33)	.510 (12.95)
430 & 470	.560 (14.22)	.650 (16.51)	.090 (2.29)	.220 (5.59)	.510 (12.95)
510 to 620, incl.	.560 (14.22)	.650 (16.51)	.100 (2.54)	.230 (5.84)	.520 (13.21)
680 to 910, incl.	.560 (14.22)	.660 (16.78)	.100 (2.54)	.240 (6.10)	.530 (13.46)
1000 & 1100	.560 (14.22)	.670 (17.02)	.110 (2.79)	.250 (6.35)	.530 (13.46)
1200 & 1300	.570 (14.48)	.670 (17.02)	.110 (2.79)	.260 (6.60)	.530 (13.46)
1500	.570 (14.48)	.680 (17.27)	.120 (3.05)	.280 (7.11)	.540 (13.72)
1600	.570 (14.48)	.680 (17.27)	.120 (3.05)	.290 (7.37)	.550 (13.97)
1800 & 2000	.580 (14.73)	.680 (17.27)	.130 (3.30)	.310 (7.87)	.560 (14.22)
2200	.580 (14.73)	.690 (17.53)	.130 (3.30)	.330 (8.38)	.560 (14.22)
2400	.580 (14.73)	.690 (17.53)	.140 (3.56)	.340 (8.64)	.570 (14.48)
2700	.590 (14.99)	.700 (17.78)	.150 (3.81)	.350 (8.89)	.580 (14.73)

1/ Minimum dimensions are listed for information only.

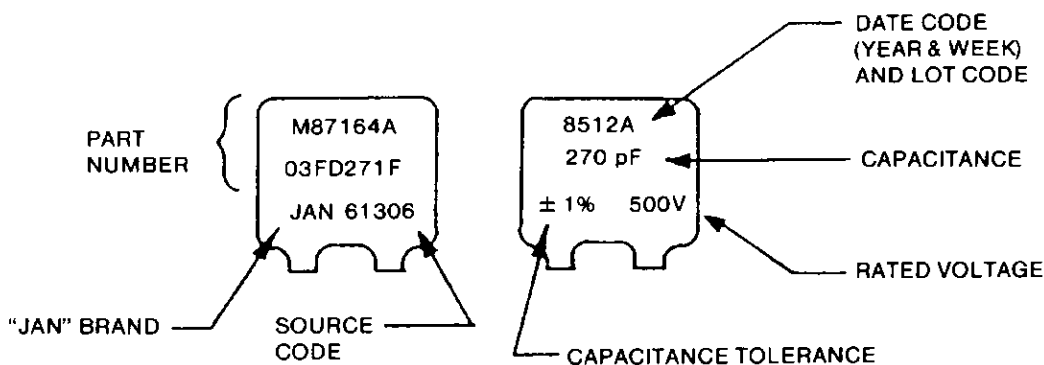
NOTES:

1. Dimensions are in inches.
2. Metric equivalents are in parentheses.
3. This dimension may not be solderable as it may be covered by a clear epoxy coating.

STYLE M2HRCMS06

Capacitors, Fixed Mica Dielectric, High Reliability

Marking Example.



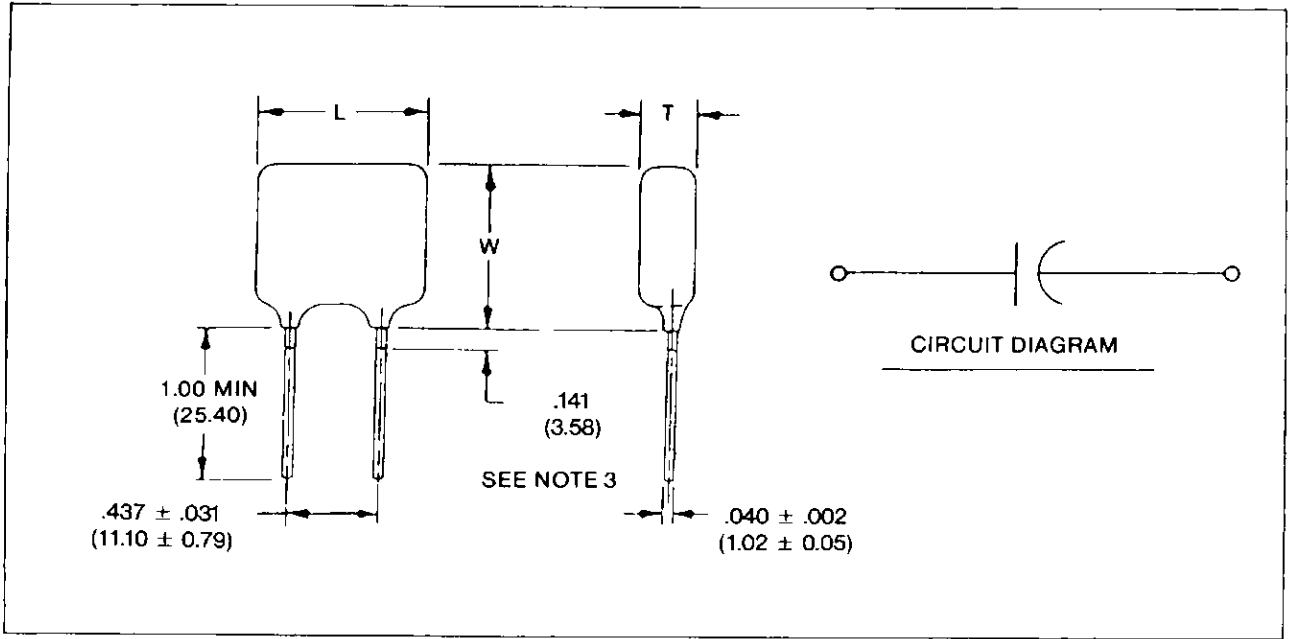
Electrical Characteristics and Part Numbers

SEMCO PART NUMBER M2HRCMS06	MILITARY PART NUMBERS ¹ M87164A03	CAPACITANCE VALUE (pF)	CAPACITANCE TOLERANCE
ED271-0	ED271-	270	FGJ
ED301-0	ED301-	300	FGJ
ED331-0	ED331-	330	FGJ
ED361-0	ED361-	360	FGJ
ED391-0	ED391-	390	FGJ
FD431-0	FD431-	430	FGJ
FD471-0	FD471-	470	FGJ
FD511-0	FD511-	510	FGJ
FD561-0	FD561-	560	FGJ
FD621-0	FD621-	620	FGJ
FD681-0	FD681-	680	FGJ
FD751-0	FD751-	750	FGJ
FD821-0	FD821-	820	FGJ
FD911-0	FD911-	910	FGJ
FD102-0	FD102-	1,000	FGJ
FD112-0	FD112-	1,100	FGJ
FD122-0	FD122-	1,200	FGJ
FD132-0	FD132-	1,300	FGJ
FD152-0	FD152-	1,500	FGJ
FD162-0	FD162-	1,600	FGJ
FD182-0	FD182-	1,800	FGJ
FD202-0	FD202-	2,000	FGJ
FD222-0	FD222-	2,200	FGJ
FD242-0	FD242-	2,400	FGJ
FD272-0	FD272-	2,700	FGJ

¹ - The complete part number will include a letter symbol to indicate the capacitance tolerance; e.g., M87164A03FD272F.

STYLE M2HRCMS07

Capacitors, Fixed Mica Dielectric, High Reliability



DIMENSIONS

CAPACITANCE (pF)	L		T		W Maximum
	Minimum ^{1/}	Maximum	Minimum ^{1/}	Maximum	
3,000 - 3,900	.720 (18.29)	.810 (20.57)	.190 (4.83)	.300 (7.62)	.900 (22.86)
4,300 - 4,700	.720 (18.29)	.820 (20.83)	.200 (5.08)	.310 (7.87)	.900 (22.86)
5,100	.720 (18.29)	.820 (20.83)	.210 (5.33)	.320 (8.13)	.900 (22.86)
5,600 - 6,200	.730 (18.54)	.820 (20.83)	.220 (5.59)	.330 (8.38)	.910 (23.11)
6,800	.730 (18.54)	.820 (20.83)	.230 (5.85)	.340 (8.64)	.910 (23.11)
7,500	.730 (18.54)	.830 (21.08)	.240 (6.10)	.350 (8.89)	.920 (23.36)
8,200	.730 (18.54)	.830 (21.08)	.250 (6.35)	.360 (9.14)	.920 (23.36)
9,100	.730 (18.54)	.830 (21.08)	.260 (6.60)	.370 (9.40)	.930 (23.62)
10,000	.730 (18.54)	.840 (21.33)	.270 (6.86)	.380 (9.65)	.930 (23.62)
11,000	.740 (18.80)	.840 (21.33)	.280 (7.11)	.390 (9.91)	.940 (23.87)
12,000	.740 (18.80)	.850 (21.59)	.290 (7.37)	.400 (10.16)	.940 (23.87)
13,000	.740 (18.80)	.850 (21.59)	.300 (7.62)	.420 (10.67)	.940 (23.87)
15,000	.740 (18.80)	.850 (21.59)	.330 (8.38)	.430 (10.92)	.940 (23.87)
16,000	.740 (18.80)	.860 (21.84)	.340 (8.64)	.450 (11.43)	.940 (23.87)
18,000	.750 (19.05)	.870 (22.10)	.360 (9.14)	.470 (11.94)	.950 (24.13)
20,000	.750 (19.05)	.870 (22.10)	.380 (9.65)	.490 (12.45)	.960 (24.38)
22,000	.760 (19.30)	.880 (22.35)	.400 (10.16)	.520 (13.91)	.970 (24.63)

^{1/} Minimum dimensions are listed for information only.

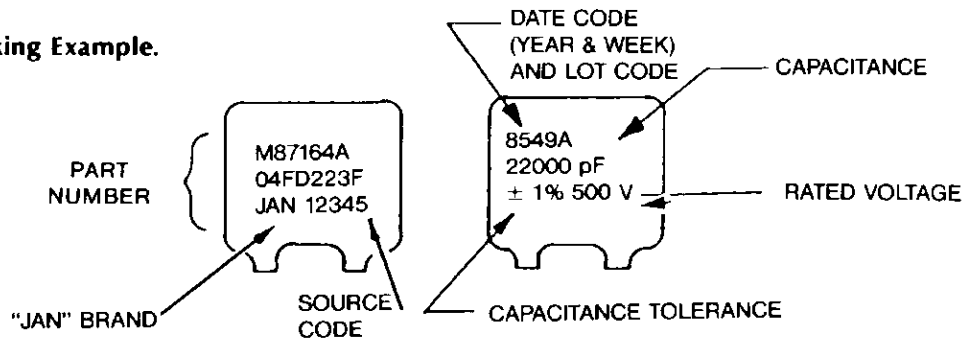
NOTES:

- Dimensions are in inches.
- Metric equivalents are in parentheses.
- This dimension may not be solderable as it may be covered by a clear epoxy coating.

STYLE M2HRCMS07

Capacitors, Fixed Mica Dielectric, High Reliability

Marking Example.



Electrical Characteristics and Part Numbers

SEMCO PART NUMBER M2HRCMS07	MILITARY PART NUMBER ^{1/} M87164A04	CAPACITANCE VALUE (pF)	CAPACITANCE TOLERANCE
FD302-0	FD302-	3,000	F, G, J
FD332-0	FD332-	3,300	F, G, J
FD362-0	FD362-	3,600	F, G, J
FD392-0	FD392-	3,900	F, G, J
FD432-0	FD432-	4,300	F, G, J
FD472-0	RD472-	4,700	F, G, J
FD512-0	FD512-	5,100	F, G, J
FD562-0	FD562-	5,600	F, G, J
FD622-0	FD622-	6,200	F, G, J
FD682-0	FD682-	6,800	F, G, J
FD752-0	FD752-	7,500	F, G, J
FD822-0	FD822-	8,200	F, G, J
FD912-0	RD912-	9,100	F, G, J
FD103-0	FD103-	10,000	F, G, J
FD113-0	FD113-	11,000	F, G, J
FD123-0	FD123-	12,000	F, G, J
FD133-0	FD133-	13,000	F, G, J
FD153-0	FD153-	15,000	F, G, J
FD163-0	FD163-	16,000	F, G, J
FD183-0	FD183-	18,000	F, G, J
FD203-0	FD203-	20,000	F, G, J
FD223-0	FD223-	22,000	F, G, J

^{1/} The complete part number will include a letter symbol to indicate the capacitance tolerance; e.g., M87164A04FD223F.

METAL CLAD MICA CAPACITORS

DESIGN AND CONSTRUCTION

The SEMCO type "MCM" and "MIN" are fixed, metal clad, impregnated, mica or silvered mica capacitors designed with low inductance terminals for operation in the gigahertz range.

The metal clad mica capacitors are fabricated from India Ruby Muscovite Mica. This particular form exhibits the best characteristics which may be obtained from mica and results in a capacitor with optimum high temperature characteristics and excellent stability.

The low capacitance units are stacked with pre-gaged thicknesses of unsilvered mica films, then clinched in a metal case and a low inductance terminal.

The high capacitance units are stacked with pre-tested silvered mica films then clinched in a metal case and a low inductance terminal.

Metal clad mica capacitors are supplied with various terminal configurations. All terminals and cases are silver plated for positive contact between the electrodes and terminals.

The metal clad mica capacitors are impregnated with either high temperature wax or silicone depending on the customer specification requirements.

Teflon Dielectric is supplied for values 51 pF and below for "MCM" styles, and 10 pF and below for "MIN" styles.

Electrical Characteristics

1. Capacitance range – 1 thru 1000pF for "MCM", 1 thru 350pF for "MIN".
2. Capacitance tolerance – +1/2%, +1%, +2%, +5%, +10%, +20%. For capacitance values of 100 pF or less, the minimum standard available tolerance is +0.5pF.
3. Dielectric strength – Minimum 200% of rated voltage for 5 seconds.
4. Insulation resistance – 1000 megohms uF. Need not exceed 100000 megohms at 25C.
5. Min. Q at 1MHz – See attached drawing.

Mechanical Characteristics

1. The thickness dimension will vary depending on the capacitance value and voltage specified. The maximum thickness dimension is available upon request.
2. The capacitance value is permanently stamped on the back of the case.

SILVERED ELECTRONIC MICA CO., INC.

P.O. Box 505 • 107 Boston Post Road
Willimantic, Connecticut 06226

Tel. (860) 456-0831 • Fax # 860-423-3506

E-Mail Address: @semco-usa.com

World Wide Web Address: <http://www.semco-usa.com>

ORDERING DATA

SEMCO Type Designation

MCM01

001

C

D

101

J

0

STYLE

TERMINAL
CONFIGURATION

CHARACTERISTIC

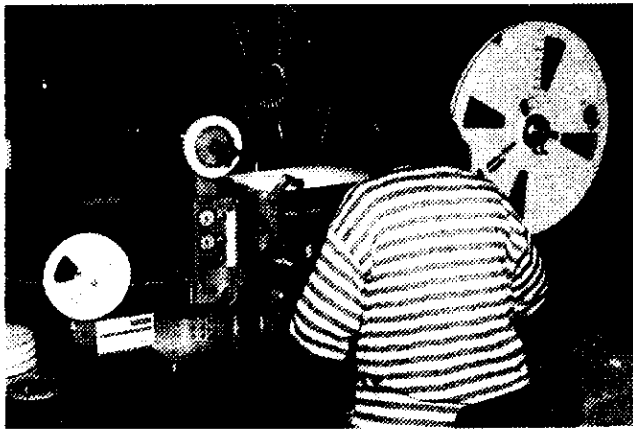
VOLTAGE

CAPACITANCE

TOLERANCE

TEMPERATURE
RANGE

Tape and Reel



Tape and Reel is available on selected styles.

Style

The style is identified by a three-letter symbol "MCM" or "MIN" followed by a two-digit number; the letters identify metal clad mica capacitors and the number identifies the shape and dimensions of the capacitor.

Terminal Configuration

This three-digit number identifies the terminal configuration required. The various constructions are shown in the detail drawings.

Characteristic

The characteristic letter designates the performance requirements of the metal clad mica capacitor with changing temperature. First, it specifies a rate of change of capacitance with temperature, which is commonly called temperature coefficient of capacitance and is given as a range in parts per million per degrees centigrade. Second, it specifies the deviation of capacitance from the original value after temperature cycling, which is known as capacitance drift and is given as a maximum change. The parameters are normally measured at 1KHz or 1MHz depending upon the nominal capacitance value.

LETTER DESIGNATION	TEMPERATURE COEFFICIENT	CAPACITANCE DRIFT
C	$\pm 200P/10^6/^\circ C$	$\pm (0.5\% + 0.1pF)$
D	$+ 100P/10^6/^\circ C$	$+ (0.3\% + 0.1pF)$
E	20 to $+100P/10^6/^\circ C$	$\pm (0.1\% + 0.1pF)$
F	0 to $+70P/10^6/^\circ C$	$\pm (0.05\% + 0.1pF)$

ORDERING DATA



DC Voltage Rating

The voltage letter designates the voltage rating of the metal clad mica capacitor. Standard SEMCO metal clad mica capacitors are available in voltage ratings from 50 to 500VDC. Higher voltage ratings available upon request. All the metal clad mica capacitors listed will withstand an application of a DC potential equal to a minimum of twice the DC working voltage for one to five seconds, without damaging, arcing, or breaking down. The surge current should be limited to a maximum of five milliamperes.

LETTER DESIGNATION	VOLTAGE RATING*
A	100
B	250
C	300
D	500
Y	50

* max voltage rating for "MIN" style 300V.

Capacitance

The nominal capacitance value is expressed in pF and is normally identified by a three-digit number. The first two digits represent significant figures and the last digit specifies the number of zeros to follow. In special cases where three significant figures are needed, the nominal capacitance in pF is identified by a four-digit number. In this case, the first three digits represent significant figures and the last specifies the number of zeros to follow. For capacitance values less than 10 pF the letter "R" will be employed. (Example: "1R0").

The capacitance values as listed in this catalog represent the nominal capacitance value at +25°C. Capacitance is measured at 1 MHz for nominal values of 1000 pF or less.

Tolerance

The tolerance letter designates the tolerance in percent of the nominal capacitance value at +25°C.

LETTER DESIGNATION	CAPACITANCE TOLERANCE*	LETTER DESIGNATION	CAPACITANCE TOLERANCE*
A	±1pF	H	±3%
D	±0.5pF	J	±5%
E	±1/2%	K	±10%
F	±1%	M	±20%
G	±2%		

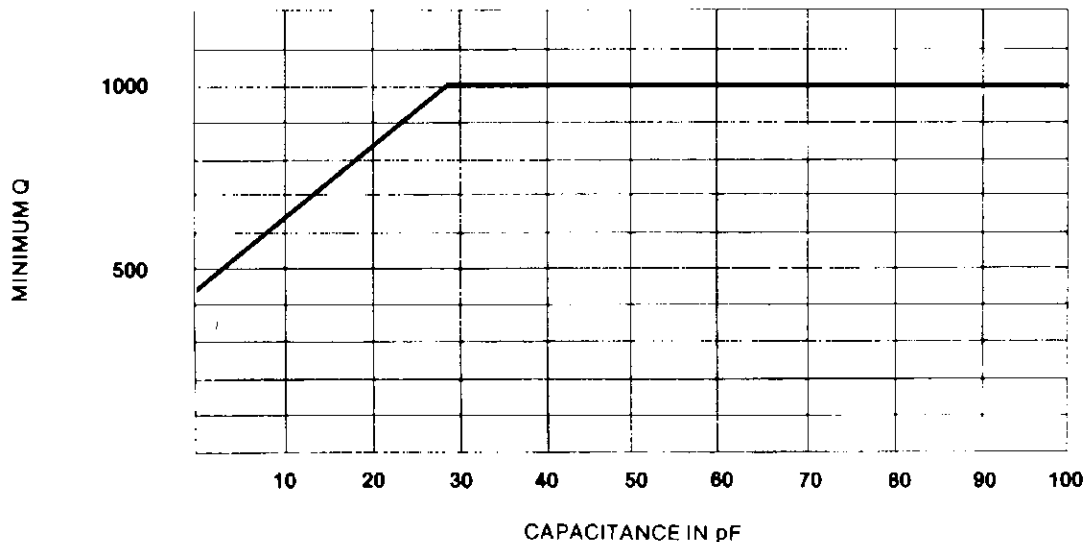
*For capacitance values of 100 pF or less, the minimum standard available tolerance is ±0.5 pF.

Temperature Range

The temperature letter designates the guaranteed temperature range over which the metal clad mica capacitor may be successfully operated.

LETTER DESIGNATION	TEMPERATURE RANGE
D	-55 to +125°C
P	-55 to +150°C

MINIMUM Q VS CAPACITANCE AT 1 MHZ



Technical Data for Metal Clad Capacitors

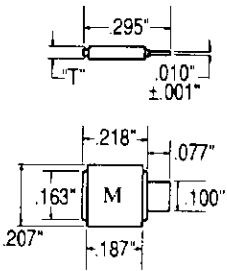
MIN-02 STYLE

CAPACITANCE VALUE IN PF	VOLTAGE				DIELECTRIC
	500WV	300WV	250WV	100WV	
1 - 9		X	X	X	Teflon
10 - 60		X	X	X	Mica
61 - 120		X	X	X	Mica
121 - 180		X	X	X	Mica
181 - 240		X	X	X	Mica
241 - 300			X	X	Mica
301 - 350			X	X	Mica
MCM-02 STYLE					
5 - 25	X	X	X	X	Teflon
26 - 150	X	X	X	X	Mica
151 - 300	X	X	X	X	Mica
301 - 450	X	X	X	X	Mica
MCM-01 STYLE					
1 - 51	X	X	X	X	Teflon
52 - 250	X	X	X	X	Mica
251 - 500	X	X	X	X	Mica
501 - 750	X	X	X	X	Mica
751 - 1000	X	X	X	X	Mica

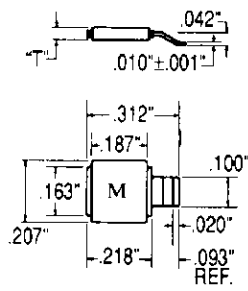
**Higher Capacitance Values and Voltages
Available Upon Request**

X Indicates Available Voltages

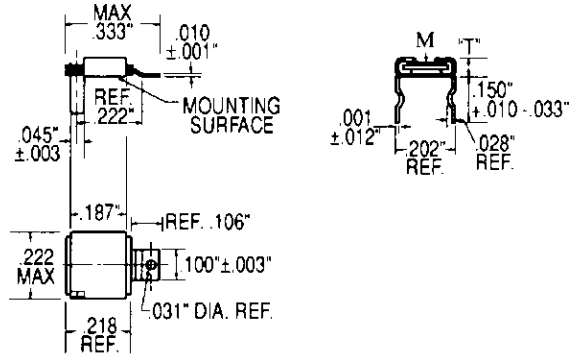
MIN02/001



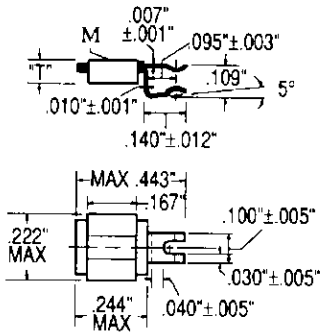
MIN02/002



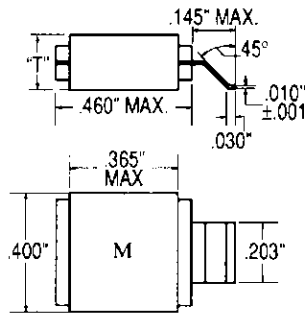
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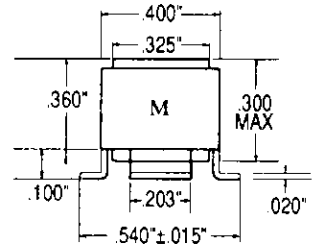
MIN02/005



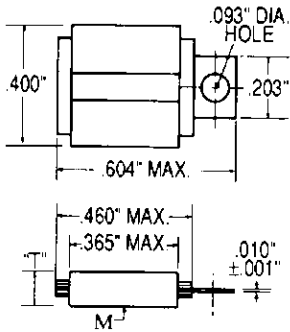
MCM01/009



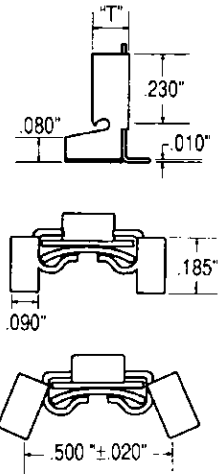
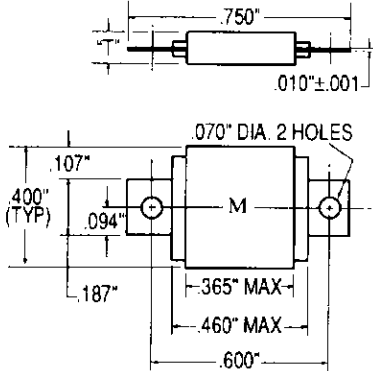
MCM02/001



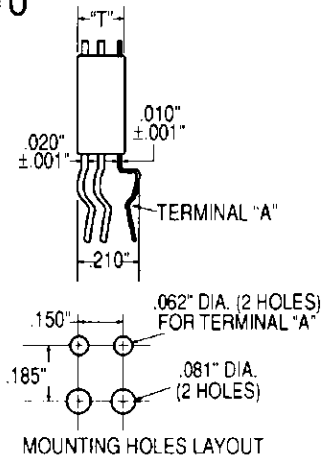
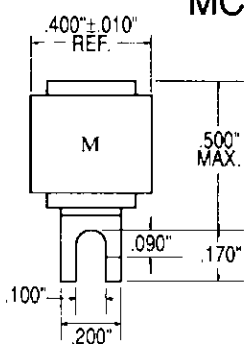
MCM01/001



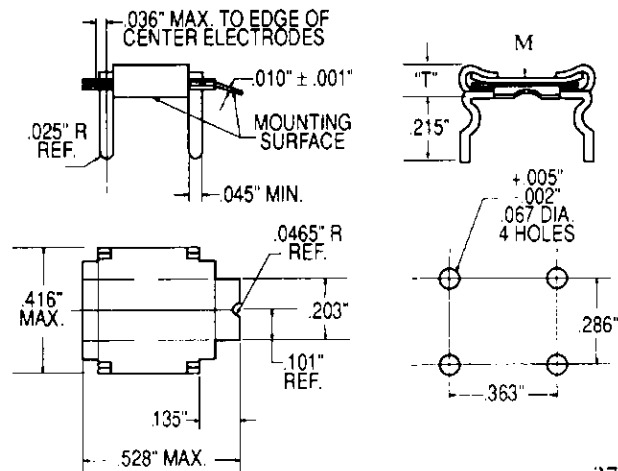
MCM01/002



MCM01/010



MCM01/008



"T" VARIES WITH CAPACITANCE
M DESIGNATES MARKING SURFACE