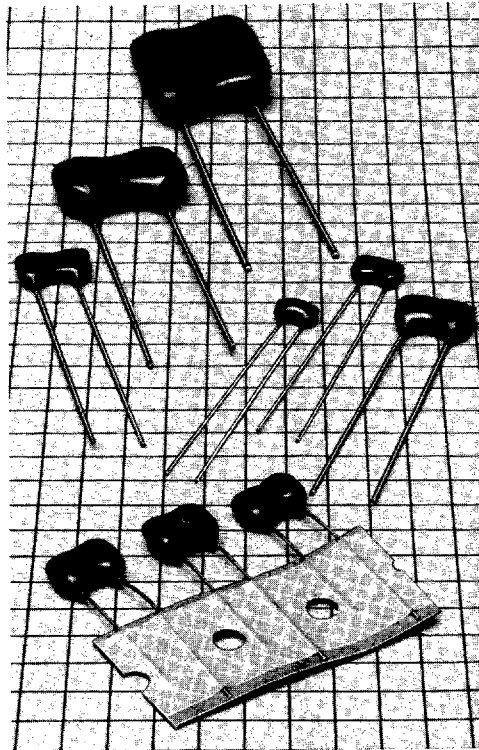


# DIPPED MICA CAPACITORS



## Quality...a fact!

Mica is a natural organic dielectric, an aluminum silicate mineral, having toughness, elasticity, and adaptability to thin splitting. Arco Dipped Mica Capacitors are fabricated from the very finest India Ruby Mica available. Using this mica, with its unique electrical characteristics, results in a capacitor with optimum high temperature & frequency performance as well as outstanding stability.

Arco has set the industry standard for dipped silvered mica & is now the most widely used mica capacitor in the world. New levels of reliability, ruggedness, and electrical excellence have been attained in the design of the product. The distinct improvements in performance afforded by Arco capacitors have resulted in their wholesale adoption & use by the electronics industry for both military and commercial applications. All Arco dipped micas not only meet but far exceed the latest revision of MIL-C-5.

## General Specifications

The industry's most complete capacitance range of 1 pf to 91,000 pf is spanned by case sizes DM5 through DM30. Conversion from the Arco type to the relevant MIL style is shown below:

ARCO Type	Capacitance Range	MILITARY
DM5	1-390	None
DM10	1-390	CM04
DM12	1-1200	None
DM15	1-2000	CM05
DM19	430-4700	CM06
DM30	5100-20000	CM07

## CONSTRUCTION

Depending upon the capacitance value desired, a pre-determined number of silvered mica films are stacked to form a capacitor section. Silver electrodes are applied to the mica dielectric by a screening process, and then fired in a proprietary oxidizing atmosphere to obtain a permanent bond. This method insures that the plate will always remain in the same relative physical position with the dielectric.

Contact to the silver electrodes is accomplished by foil strips which are laid so as to cover an exact area. These foil contacts extend beyond the edge of the mica with each foil being extended alternately on the opposite sides of the silvered mica. This joining is accomplished by the precise folding of the foil contacts over the section.

The section is then compressed, and clinched tightly in a 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.

For protection, the "inserts" are encased with a number of coats of mineral-filled phenolic compound and then are vacuum impregnated with an epoxy resin. The result is a rugged coating which protects the capacitor against shock, vibration, and humidity. The standard encapsulation process consists of four coats.

A variation of the multi-coat is the Arco Single Coat Dipped Mica, the SCDM. This unit was developed to meet critical size requirements without sacrificing any of the inherent qualities of mica.

Type SCDM more than meets all of the electrical and environmental requirements of RS-153 and MIL-C-5D. It is available in case styles DM10 and DM15 in the same capacitances, tolerances, voltages, characteristics and temperature ranges as the standard multi-dip DM equivalent.

# Dipped Mica Capacitors

## Type Designation

### MARKING

Standard commercial marking consists of the capacitance in PF, Tolerance in "%", and Arco's name or symbol. Parts supplied to the military specification will also bear the full military designation as required by MIL-C-5.

### STABILITY:

Dipped mica capacitors from 91 pf and up will meet the "F" characteristic for capacitance drift per MIL-C-5 for DM5, DM10 & DM15; from 430 pf and up for DM19 and from 470 pf & up for DM30.

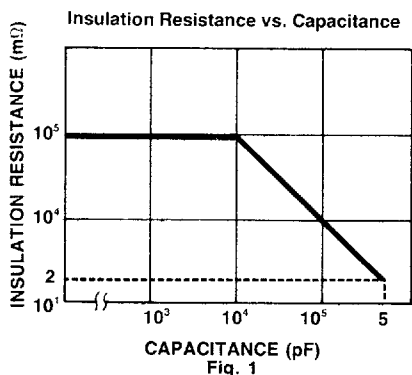
Lower values meet characteristics C and E. In operation under load and continually varying temperature, the average cumulative drift is in the order of 0.1%. Statistically, more than 80% of standard production will exhibit less than ± 0.2% drift after 250 hour accelerated life test (1½ x rated voltage and 125° C.) When subjected to normal operating temperatures and voltage, measurable drift can rarely be detected.

### MATERIALS FOR LEAD WIRE

Copper-clad steel wire (CP wire) plated with solder or tin.

### INSULATION RESISTANCE:

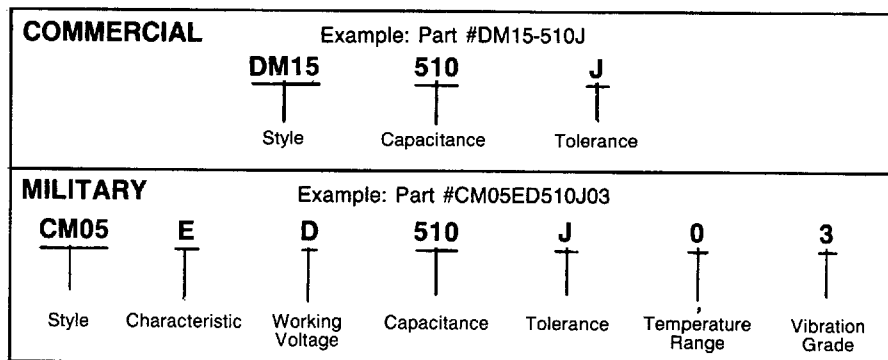
When measured at 50 ± 5V for capacitors rated at 50V, or at 100 ± 10V for those of other ratings, the insulation resistance shall exceed the value shown in Fig. 1.



### CAPACITANCE:

When measured at 1MHz ± 10% (C ≥ 1000 pf) or 1KHz ± 10% (C > 1000 pf) and 1 to 5 Vrms, the capacitance shall be within the specified tolerance.

The complete nomenclature of the part is included in the Type Designation as illustrated below:



### STYLE:

The style is identified by the two letter symbol CM followed by two digits. Combined, they designate the case size, and lead configuration.

### TEMPERATURE COEFFICIENT AND CAPACITANCE DRIFT:

The Characteristic is identified by a single letter which indicates the relative stability of the capacitor with temperature change. It may be expressed as temperature coefficient and/or capacitance drift. Capacitance drift represents the change in value from the initial measurement to after completion of temperature cycling.

LETTER	TEMPERATURE COEFFICIENT parts per million/degree C	CAPACITANCE DRIFT
C	-200 TO +200	MIL— ± (0.5% + 0.1 pF) EIA— ± (0.5% + 0.5 pF)
*D	-100 TO +100	± (0.3% + 0.1 pF)
E	-20 TO +100	± (0.1% + 0.1 pF)
F	0 TO +70	± (0.05% + 0.1 pF)

### TEMPERATURE CHARACTERISTICS

CAP. pF	D	F	G	J	K
	(±0.5 pF)	(±1%)	(±2%)	(±5%)	(±10%)
1-3	C	—	—	—	—
5-10	C	—	—	—	C
12-18	C	—	—	C	C
20-24	—	—	—	CDE	CDE
27-47	—	—	CDE	CDE	CDE
51-82	—	CDE	CDE	CDE	CDE
>91	—	CDEF	CDEF	CDEF	CDEF

\* Obsolete for Military Designations

### WORKING VOLTAGE:

The working DC voltage is expressed as a letter.

Letter	VDCW	Letter	VDCW
Y.....	50	D.....	500
A.....	100	F.....	1000
C.....	300		

### Withstanding Voltage

200% of the rated voltage shall be applied for 1 to 5 seconds. The limiting value of surge current shall not exceed 50mA.

### 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; the third digit represents the decimal multiplier. In the illustrated nomenclature, the capacitance value is 51pf. In special cases where three significant figures are needed, the nominal capacitance is designated by a four digit number where the final digit again specifies the decimal multiplier.

### TOLERANCE

Tolerance is indicated by a letter is the allowable percentage of variation from the nominal capacity.

Letter		Letter	
D.....	± 0.5pf	G.....	± 2%
K.....	± 10%	F.....	± 1%
J.....	± 5%	E.....	± ½%

### TEMPERATURE RANGE:

A letter identifies the Temperature Range.

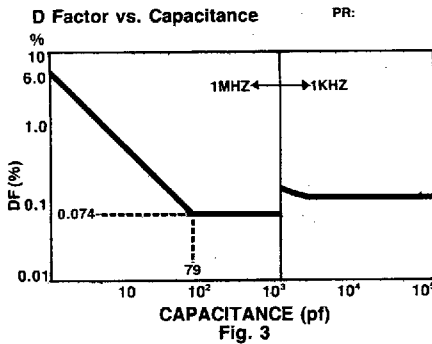
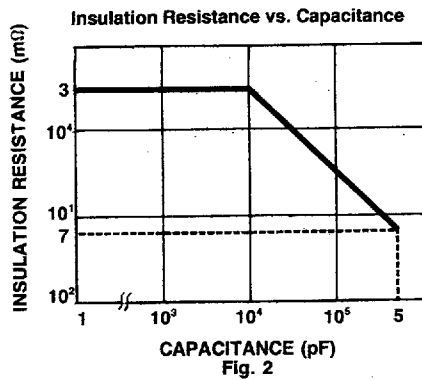
Letter	
O.....	-55 to +125° C
P.....	-55 to +150° C

### VIBRATION GRADE:

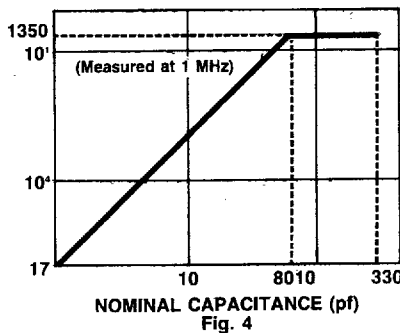
The Vibration Grade is identified by a number.

Number	Vibration Frequency
3.....	10 to 2000 cps

# Dipped Mica Capacitors



Dissipation Factor (Nominal capacitance greater than 330pF) D factor shall not exceed the values shown in Fig. 3.



Quality Factor (Q) (Nominal capacitance less than 330 pf)

Q shall exceed the values shown in Fig. 4.

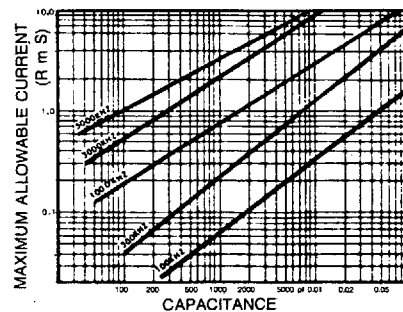
## MARKING:

All Arco dipped micas are permanently stamped with a specially formulated silver ink which will withstand all the environmental conditions of the MIL and EIA Specs. These markings also meet the permanency and durability requirements after the abrasion, corrosion and solvents tests of MIL Spec. 13231. All dipped micas are marked in accordance with MIL-C-5 and/or with the equivalent commercial designation. All Arco mica Capacitors are manufactured in accordance with MIL-C-5 military specifications and EIA specifications RS-153.

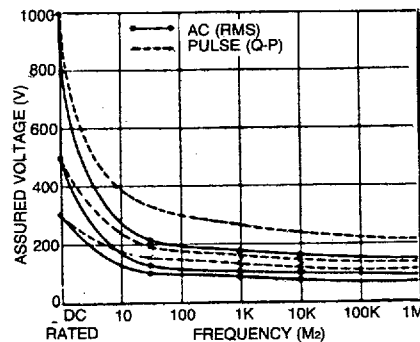
## ALLOWABLE HIGH FREQUENCY CURRENT

The allowable high frequency current of Arco dipped mica Capacitors is illustrated in Fig. 6. The maximum allowable current for various types, as determined by the electrode construction and the dimensions of lead wires and the body is given in the table below.

Style	Max. Current
DM05	0.15A
DM10	0.2A
DM15	0.3A
DM19	3.0A
DM20	3.0A
DM30	4.5A



## DERATING CURVE OF OPERATING VOLTAGE



While Arco dipped mica capacitors are specified in DC voltage, the derating curves in Fig. 5 should be used in case of applications under sinusoid wave or square pulse voltage. The curves represent the guaranteed voltage determined by corona characteristics, self-heating, and life test for various waveforms.

# Performance Specifications

## VIBRATION GRADE

The capacitors shall be subjected to a simple harmonic motion having an amplitude of 1.5 mm while the frequency is varied uniformly between the approximate limits of 10 and 55Hz. The entire frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 minute and the motion shall be applied for a period of 1 hour in each of 3 mutually perpendicular directions. After testing, electrical measurements shall be performed.

**Insulation Resistance:** Shall exceed the value shown in Fig. 2.

**Dissipation Factor:** Shall satisfy the value shown in Fig. 3.

**Capacitance Change:** Shall not exceed  $\pm 1\%$  or 1 pF, whichever is greater.

## SOLDERING HEAT RESISTANCE

Immersing both leads within  $4 \pm 0.8\text{mm}$  of the capacitor in molten solder for  $3 \pm 0.5$  seconds at  $270 \pm 5^\circ\text{C}$ .

**Withstanding Voltage:** Capacitors shall withstand 200 percent of the rated voltage for 1 to 5 seconds without damage, arcing or breakdown.

**Dissipation Factor:** Shall not exceed the value shown in Fig. 3.

**Capacitance Change:** Shall not exceed  $\pm 0.5\%$  or 1 pF, whichever is greater.

**MOISTURE RESISTANCE** (Applied to standard type)

Capacitors shall be subjected to a temperature of  $40 \pm 2^\circ\text{C}$  at 90 to 95% relative humidity for  $240 \pm 8$  hours.

**Withstanding Voltage:** Capacitor shall withstand 200 percent of the rated voltage for 1 to 5 seconds without damage, arcing or breakdown.

**Insulation Resistance:** Shall not be less than value shown in Fig. 2.

**Dissipation Factor:** Shall not exceed 150% of the value in Fig. 3.

**Capacitance Drift:** Shall not exceed  $\pm 3\%$  or 1 pF, whichever is greater.

**TEMPERATURE AND IMMERSION CYCLING** (Applied to standard type)

After 5 cycles of temperature sequence:

+0°  
-55° C (30 min) — normal  
-3 temperature (3 minutes  
max.)

+3°  
+125° C (30 min) — normal  
-0 temperature (3 minutes  
max.)

Capacitors shall be subjected to 2 cycles of immersion sequence:

+5°  
65° C  
-0°

fresh water for 15 minutes and  $0 \pm 3^\circ\text{C}$  saturated salt solution for 15 minutes. Afterward, capacitors shall be washed in running water, wiped off, and kept at normal temperature prior to measurement.

**Visual Examination:** There shall be no cracks or other mechanical damage.

**Withstanding Voltage:** Capacitors shall withstand 200 percent of the rated voltage for 1 to 5 seconds without damage, arcing or breakdown.

**Insulation Resistance:** Shall not be less than value in Fig. 2.

**Dissipation Factor:** Shall not exceed 150% of the value in Fig. 3.

**Capacitance Change:** Shall not exceed  $\pm 3\%$  or 1 pF, whichever is greater.

**LIFE (Applied to standard type)**

Capacitors shall be subjected to a temperature of  $125^\circ\text{C}$  with 150 percent the rated voltage for 2000 — 0 hours. After testing, the following requirements shall be satisfied.

**Visual Examination:** There shall be no cracks or other mechanical damage.

**Withstanding Voltage:** Capacitors shall withstand twice the rated voltage for 1 to 5 seconds without damage, arcing or breakdown.

**Insulation Resistance:** Shall not be less than the value in Fig. 1.

**Dissipation Factor:** Shall exceed 150% of the value shown in Fig. 3.

**Capacitance Change:** Shall not exceed  $\pm 3\%$  for characteristic C and  $\pm 2\%$  for characteristic D,E,F or  $\pm 1\text{ pF}$ , whichever is greater.

**MOISTURE RESISTANCE LOADING**

Capacitors shall be subjected to a temperature of  $40^\circ \pm 2^\circ\text{C}$  at 90 to 95% relative humidity with rated voltage applied for  $500 \begin{smallmatrix} +48 \\ -0 \end{smallmatrix}$  hours. After being maintained at normal temperature and humidity for a period of 4 to 24 hours, the following requirements shall be satisfied.

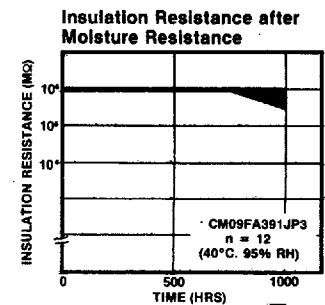
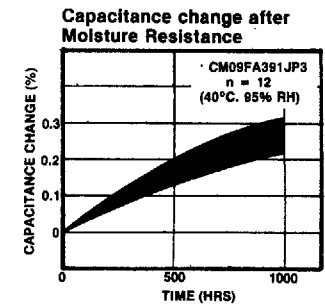
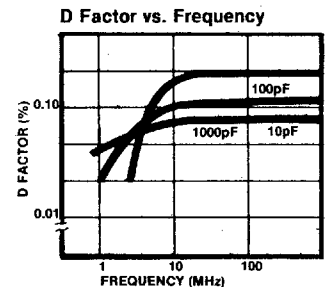
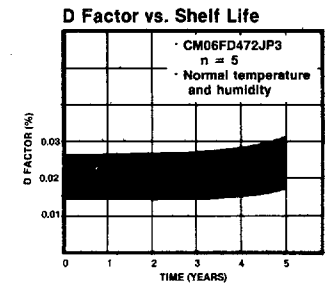
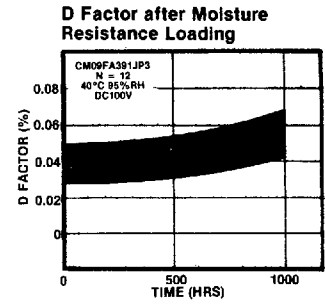
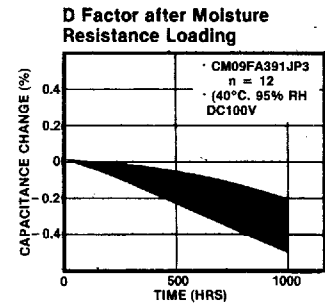
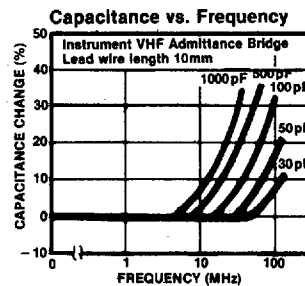
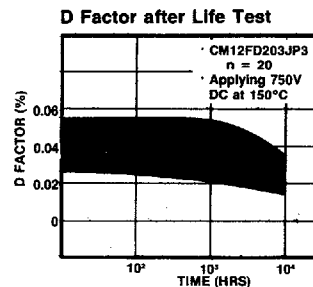
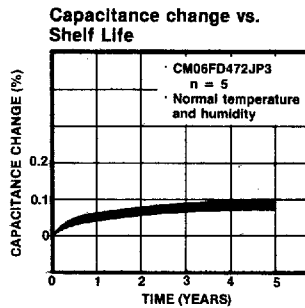
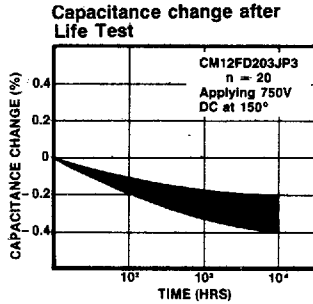
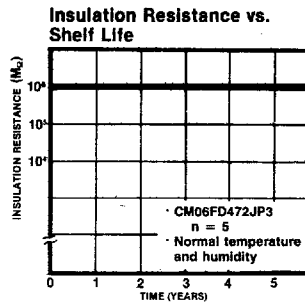
**Visual Examination:** There shall be no cracks or other mechanical damage.

**Withstanding Voltage:** Capacitors shall withstand twice the rated voltage for 1 to 5 seconds without damage, arcing or breakdown.

**Insulation Resistance:** Shall be not less than the value shown in Fig. 2.

**Dissipation Factor:** Shall not exceed the value shown in Fig. 3.

**Capacitance Change:** Shall not exceed  $\pm 5\%$  or 1 pF, whichever is greater.



# Dipped Mica Capacitors

## TYPE DM05 – 300V, 100V, 50V DCW

### 300VDC

Cap. Pf.	Arco Style DM05	MAX. DIM.				
		L (mm)		W (mm)		T (mm)
1	CC010D	.270 (6.8)	.190 (4.8)	.110 (2.7)		
2	CC020D					
3	CC030D					
4	CC040D					
5	CC050D					
6	CC060D					
7	CC070D					
8	CC080D					
9	CC090D					
10	CC100(J,D)					
11	CC110(J,D)					
12	CC120(J,D)					
15	CC150(J,D)		.200 (5.0)	.120 (3.0)		
18	CC180(J,D)			.120 (3.0)		
20	CC200(J,D)			.120 (3.0)		
22	CC220(J,D)			.120 (3.0)		
24	CC240(J,D)			.120 (3.0)		
27	CC270J			.130 (3.3)		
30	EC300J			.130 (3.0)		
33	EC330J			.130 (3.0)		
36	EC360J		.210 (5.3)	.130 (3.0)		
39	EC390J			.130 (3.0)		
43	EC430J			.140 (3.5)		
47	EC470J			.140 (3.5)		
50	EC500J			.140 (3.5)		
51	EC510J			.140 (3.5)		
56	EC560J		.220 (5.5)	.150 (3.8)		
62	EC620J		.220 (5.5)	.150 (3.8)		
66	EC660J		.220 (5.5)	.150 (3.8)		
75	EC750J		.230 (5.8)	.160 (4.0)		
82	EC820J		.230 (5.8)	.160 (4.0)		
91	FC910J		.230 (5.8)	.170 (4.3)		
100	FC101J		.240 (6.0)	.180 (4.5)		
110	FC111J		.240 (6.0)	.180 (4.5)		
120	FC121J		.250 (6.3)	.190 (4.8)		

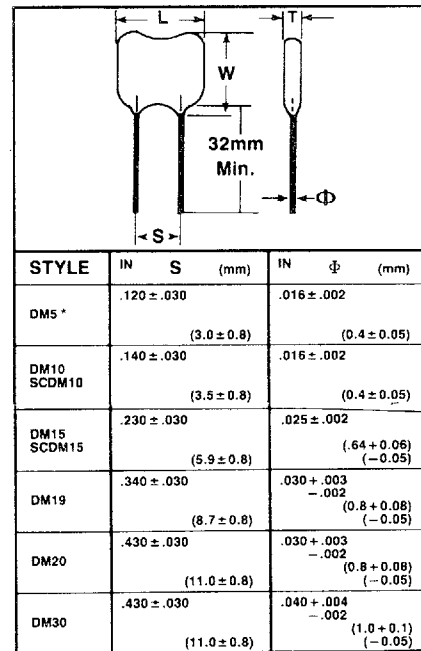
### 100VDC

Cap. Pf.	Arco Style DM05	MAX. DIM.				
		L (mm)		W (mm)		T (mm)
22	CA220(J,D)	.270 (6.8)	.190 (4.8)	.120 (3.0)		
24	CA240(J,D)		.190 (4.8)			
27	EA270J		.190 (4.8)			
30	EA300J		.200 (5.0)			
33	EA330J					
36	EA360J					
39	EA390J					
43	EA430J					.130 (3.3)
47	EA470J					
51	EA510J					.130 (3.3)
56	EA560J		.210 (5.3)	.130 (3.3)		
62	EA620J		.210 (5.3)	.130 (3.3)		
68	EA680J	.270 (6.8)	.210 (5.3)	.140 (3.5)		
75	EA750J		.210 (5.3)	.140 (3.5)		
82	EA820J		.210 (5.3)	.140 (3.5)		
91	FA910J		.210 (5.3)	.140 (3.5)		
100	FA101J		.220 (5.5)	.150 (3.8)		
110	FA111J		.220 (5.5)	.150 (3.8)		
120	FA121J		.230 (5.8)	.160 (4.0)		
130	FA131J		.230 (5.8)	.160 (4.0)		
150	FA151J		.230 (5.8)	.170 (4.3)		
160	FA161J		.240 (6.0)	.180 (4.5)		
180	FA181J		.240 (6.0)	.180 (4.5)		
200	FA201J		.250 (6.3)	.190 (4.8)		

### 50VDC

Cap. Pf.	Arco Style DM05	MAX. DIM.				
		L (mm)		W (mm)		T (mm)
22	CY220J	.270 (6.8)	.190 (4.8)	.110 (2.7)		
24	CY240J					
27	EY270J					
30	EY300J					
33	EY330J					
36	EY360J					
39	EY390J				.120 (3.0)	
43	EY430J					
47	EY470J					
51	EY510J					
56	EY560J					
62	EY620J					
68	EY680J		.200 (5.0)			
75	EY750J					
82	EY820J					
91	FY910J			.130 (3.3)		
100	FY101J			.130 (3.3)		
110	FY111J			.130 (3.3)		
120	FY121J		.210 (5.3)	.130 (3.3)		
130	FY131J		.210 (5.3)	.140 (3.5)		
150	FY151J		.210 (5.3)	.140 (3.5)		
160	FY161J		.210 (5.3)	.140 (3.5)		
170	FY171J		.210 (5.3)	.140 (3.5)		
180	FY181J		.210 (5.3)	.140 (3.5)		
200	FY201J		.220 (5.5)	.150 (3.8)		
220	FY221J		.220 (5.5)	.150 (3.8)		
240	FY241J		.220 (5.5)	.150 (3.8)		
250	FY251J		.230 (5.8)	.160 (4.0)		
270	FY271J		.230 (5.8)	.170 (4.3)		
300	FY301J		.230 (5.8)	.170 (4.3)		
330	FY331J		.240 (6.0)	.180 (4.5)		
360	FY361J		.240 (6.0)	.180 (4.5)		
390	FY391J		.250 (6.3)	.190 (4.8)		

### OUTLINE DIMENSIONS



\*The new easy insert lead length for the DM5 is 16mm minimum. A suffix of "-SL" will be added to the part number to designate this shorter length.

Standard items are in shaded area.  
Non-standard items are available as specials. Select tolerance desired from those listed in parenthesis.

