



MULTILAYER CERAMIC LEADED CAPACITORS

Introduction:

Radial and Axial Epoxy coated multilayer ceramic capacitors available in popular NPO, X7R and Z5U dielectrics. Ideal for industrial and general purpose electronics applications. These capacitors are available in both Bulk and Tape & Reel packing for automatic insertion.

Series Specifications:

Temperature Range in °C:
 Dissipation Factor % @25°C & 1KHz:
 Insulation Resistance @ 25°C:
 (minimum of)

	NPO	X7R	Z5U
Temperature Range in °C:	-55 to +125	-55 to +125	+10 to +85
Dissipation Factor % @25°C & 1KHz:	0.25 max	2.5 max	3.0 max
Insulation Resistance @ 25°C: (minimum of)	1 G Ohm or 100 Ohm F	1 G Ohm or 100 Ohm F	1 G Ohm or 100 Ohm F

Radial Leaded SERIES

Features

- NPO & X7R dielectrics in 50 and 100 volt rating. Z5U in 50 volt rating.
- Radial configuration with choice of 2 standard lead spacings.
- Available in Bulk and Tape & Reel Packing (EIA Standard).

Radial Series CRNPO

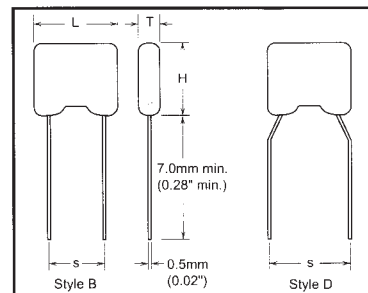
Rated Voltage V DC	Dielectric	Temperature Coefficient	Capacitance		Dimensions		
			Range pF	Tolerance	L max.	H max.	T max.
50	COG (NPO)	±30 ppm / °C	10 to 3300	J(±5%), K(±10%)	5.08 mm 0.200"	5.08 mm 0.200"	3.18 mm 0.125"
100	COG (NPO)	±30 ppm / °C	10 to 3300	J(±5%), K(±10%)	5.08 mm 0.200"	5.08 mm 0.200"	3.18 mm 0.125"

Radial Series CRX7R

Rated Voltage V DC	Dielectric	Temperature Coefficient	Capacitance		Dimensions		
			Range pF	Tolerance	L max.	H max.	T max.
50	X7R	±15%	220 to 100000	K(±10%), M(±20%)	5.08 mm 0.200"	5.08 mm 0.200"	3.18 mm 0.125"
100	X7R	±15%	220 to 68000	K(±10%), M(±20%)	5.08 mm 0.200"	5.08 mm 0.200"	3.18 mm 0.125"

Radial Series CRZ5U

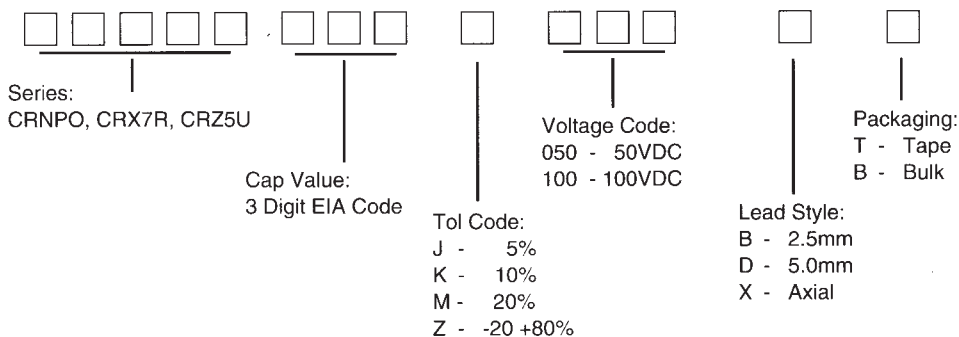
Rated Voltage V DC	Dielectric	Temperature Coefficient	Capacitance		Dimensions		
			Range pF	Tolerance	L max.	H max.	T max.
50	Z5U	+22 to -56%	10000 to 150000	M(±20%)	5.08 mm 0.200"	5.08 mm 0.200"	3.18 mm 0.125"



Style B -
 $s = 2.5 \pm 1.0\text{mm}$ ($0.1 \pm 0.04"$)
 measured 1mm(0.04") below body.

Style D -
 $s = 5 \pm 1.0\text{mm}$ ($0.2 \pm 0.04"$)
 measured 1mm(0.04") below the lead form.

PART NUMBERING





Introduction:

Radial and Axial Epoxy coated multilayer ceramic capacitors available in popular NPO, X7R and Z5U dielectrics. Ideal for industrial and general purpose electronics applications. These capacitors are available in both Bulk and Tape & Reel packing for automatic insertion.

Series Specifications:	NPO	X7R	Z5U
Temperature Range in °C:	-55 to +125	-55 to +125	+10 to +85
Dissipation Factor % @25°C & 1kHz:	0.25 max	2.5 max	3.0 max
Insulation Resistance @ 25°C: (minimum of)	1 G Ohm or 100 Ohm F	1 G Ohm or 100 Ohm F	1 G Ohm or 100 Ohm F

MULTILAYER CERAMIC LEADED CAPACITORS

Axial Leaded SERIES

Features

- Available in the three popular dielectrics.
- Axial configuration suitable for a variety of mounting options.
- Available in Bulk and Tape & Reel Packing (EIA Standard).

Axial Series CANPO

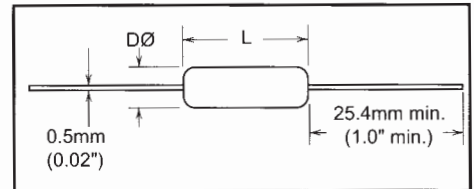
Rated Voltage V DC	Dielectric	Temperature Coefficient	Capacitance		Dimensions	
			Range pF	Tolerance	L max.	D max.
50	COG (NPO)	±30 ppm / °C	10 to 750	J(±5%), K(±10%)	5.0 mm 0.200"	3.0 mm 0.120"

Axial Series CAX7R

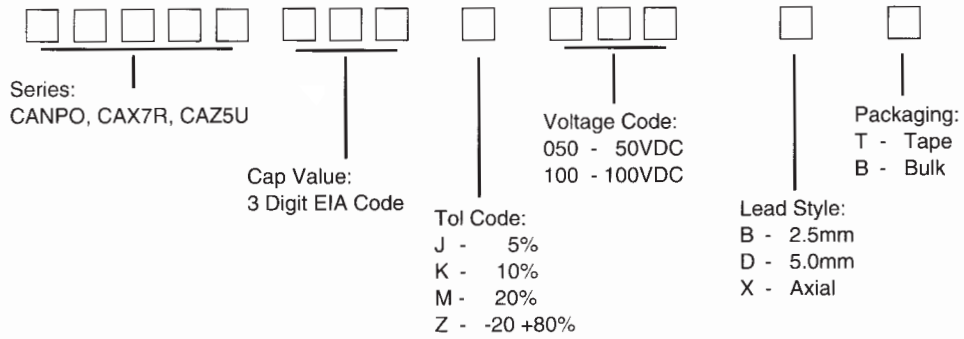
Rated Voltage V DC	Dielectric	Temperature Coefficient	Capacitance		Dimensions	
			Range pF	Tolerance	L max.	D max.
50	X7R	±15%	560 to 15000	K(±10%), M(±20%)	5.0 mm 0.200"	3.0 mm 0.120"

Axial Series CAZ5U

Rated Voltage V DC	Dielectric	Temperature Coefficient	Capacitance		Dimensions	
			Range pF	Tolerance	L max.	D max.
50	Z5U	+22 to -56%	1000 to 100000	M(±20%) Z(-20 to +80%)	5.0 mm 0.200"	3.0 mm 0.120"



PART NUMBERING





DIPPED TANTALUMS

DIPPED TANTALUM CAPACITORS

ORDERING INFORMATION

Example below indicates:

TD Series, E Case Size, 10µF, 20% Tol., 10 Volts, Straight leads, Uneven, 5mm LS, Bulk pack.

(EXAMPLE) T D E 1 0 6 M 1 0 C B

Series

Series Code: TD

Case Code

Case Code: A Through H

CASE DIMENSIONS IN MILLIMETERS

Case Size	A	B	C	D	E	F	G	H
D Max.	4.5	4.5	5	5	5.5	6	6.5	7
H Max.	8.5	9	10	10.5	10.5	11.5	11.5	12

Case Size	J	K	L	M	N	P	R
D Max.	8	8.5	9	9	9	10	10
H Max.	13	14	14	14.5	16	17	18.5



Capacitance

3 Digit Capacitance Code:

Capacitance µF	Code	Capacitance µF	Code
0.1	104	10	106
0.15	154	15	156
0.22	224	22	226
0.33	334	33	336
0.47	474	47	476
0.68	684	68	686
1.0	105	100	107
1.5	155	150	157
2.2	225	220	227
3.3	335	330	337
4.7	475	470	477
6.8	685	680	687

First Two Digits Represent Significant Figures of Capacitance in Picofarads.
Third Digit Indicates Number of Zeros

Tolerance

Capacitance Tolerance Code:

Capacitance Tolerance	± 20%	± 10%	± 5%
Code	M	K	J

Rated Voltage

2 Digit Voltage Code:

Rated Voltage	4V	6.3V	10V	16V	20V	25V	35V
Code	04	06	10	16	20	25	35

Lead Style Code

Straight, Uneven, 5mm Lead Spacing	A
Straight, Even, 2.5mm Lead Spacing	B
Straight, Uneven, 2.5mm Lead Spacing	C
Straight, Even, 5mm Lead Spacing	D
Outside Hockey Stick, Even, 5mm Lead Spacing	E

Package Style Code

Bulk	B
Tape & Reel	T
Ammo Packing	A

MARKING

The capacitance value, voltage and polarity details are marked on the capacitors. Polarity is indicated by a '+' SIGN and/or a thick line near the positive terminal. For marking the capacitance and voltage, different conventions are used. The methods generally followed are mentioned below:

1. Capacitance value is indicated in digits followed by the symbol for micro farads (µ) and voltage is indicated in digits followed by 'V'.
2. Capacitance value in micro farads and voltage in volts are indicated in digits without mentioning any or either of the units.
3. Capacitance value is indicated as per the three digit capacitance code shown on page 29. Voltage is indicated in voltage codes as shown in Table 3.

Additional marking options:

The parts may have the following additional markings based on the part size and process convenience.

1. Tolerance marking of ±5%, ±10%, ±20% or J, K, M, indicating the corresponding tolerances.
2. Brand marking indicating the manufacturer's name or logo.

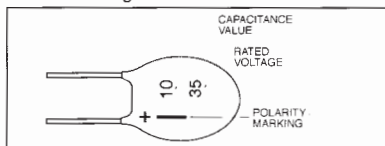


TABLE 3

Voltage Rating	Voltage Code
3.15	F
6.3	J
10	A
16	C
20	D
25	E
35	V
50	H



TD SERIES

INTRODUCTION

The TD Series, due to its good electrical characteristics, is recommended for professional and industrial applications. The extremely stable oxide layer of the TD solid tantalum capacitor allows only a very low leakage current even after long storage. The solid electrolyte provides stable electrical performance over wide ranges and long time periods.

FEATURES:

- HIGH TEMPERATURE RANGE OF -55 TO +125°C
- LOW LEAKAGE CURRENT AND DISSIPATION FACTOR
- COMPACT SIZE FOR SPACE SAVING DESIGN
- NO DEGRADATION EVEN AFTER PROLONGED STORAGE
- HUMIDITY, SHOCK AND VIBRATION RESISTANT SELF INSULATING ENCAPSULATION
- DECREASING FAILURE RATE INDICATING ABSENCE OF "WEAR-OUT" MECHANISM

GENERAL SPECIFICATIONS

CAPACITANCE: 0.1 μ F to 330 μ F.

VOLTAGE RANGE: 6.3VDC to 50VDC.

CAPACITANCE TOLERANCE: $\pm 20\%$, $\pm 10\%$, (5% upon request).

TEMPERATURE RANGE: -55°C to +125°C with Derating above 85°C as per Table 4.

DISSIPATION FACTOR: 0.1 to 1.5 μ F $\leq 4\%$, 2.2 to 6.8 μ F $\leq 6\%$, 10 to 68 μ F $\leq 8\%$, >68 μ F $\leq 10\%$ at 120Hz.

LEAKAGE CURRENT: Not More Than 0.01CV μ Amps or 0.5 μ A which ever is greater.

FAILURE RATE: 1% per 1000 Hrs.

LIFE TEST DETAILS

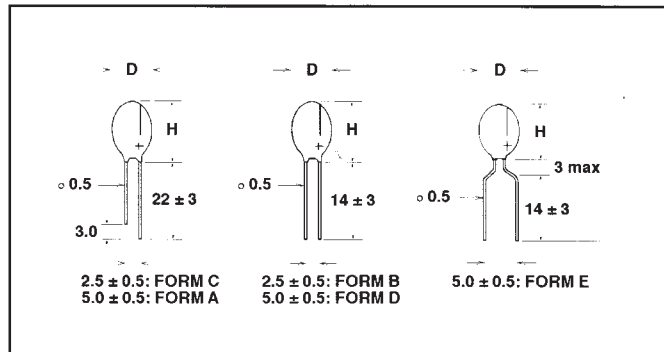
Capacitors shall withstand rated DC Voltage applied at 85°C for 2,000 Hours. After the test:

1. Capacitance change shall not exceed $\pm 10\%$ of the initial value.
2. Dissipation factor shall be within the normal specified limits.
3. Leakage current shall be within the normal specified limit.
4. No remarkable change in the appearance. Marking shall remain legible.

TABLE 4
VOLTAGE DERATING (85°C - 125°C)

VR	6.3	10	16	20	25	35	50
VO	4	6.3	10	13	16	22	32
VS	5	8	13	16	20	28	40

VR - Rated Voltage, VO - Operating Voltage, VS - Surge Voltage



Case Dimensions TD Series

Case Code	Dimensions in mm		Dimensions in Inches	
	D max.	H max.	D max.	H max.
A	4.5	8.5	0.177	0.335
B	4.5	9.0	0.177	0.354
C	5.0	10.0	0.197	0.394
D	5.0	10.5	0.197	0.413
E	5.5	10.5	0.217	0.413
F	6.0	11.5	0.236	0.453
G	6.5	11.5	0.256	0.453
H	7.0	12.0	0.276	0.472
J	8.0	13.0	0.315	0.512
K	8.5	14.0	0.335	0.551
L	9.0	14.0	0.354	0.551
M	9.0	14.5	0.354	0.571
N	9.0	16.0	0.354	0.630
P	10.0	17.0	0.394	0.669
R	10.0	18.5	0.394	0.728

Case Codes TD Series

Capacitance		Rated Voltage V DC						
μ F	Code	6.3	10	16	20	25	35	50
0.1	104						A	A
0.15	154						A	A
0.22	224						A	A
0.33	334						A	A
0.47	474						A	A
0.68	684						A	B
1	105				A	A	A	C
1.5	155			A	A	A	A	D
2.2	225		A	A	A	A	B	E
3.3	335	A	A	A	B	B	C	F
4.7	475	A	A	B	C	C	E	F
6.8	685	A	B	C	D	D	F	G
10	106	B	C	D	E	E	F	H
15	156	C	D	E	F	F	H	K
22	226	D	E	F	H	H	J	L
33	336	E	F	F	J	J	K	
47	476	F	G	J	K	M	N	
68	686	G	H	L	N	N		
100	107	H	K	N	N			
150	157	K	N	N				
220	227	M	P					
330	337	P						



DIPPED TANTALUMS

6.3 VDC RATED VOLTAGE

SURGE VOLTAGE 8 VDC at 85°C and 5 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDA335K06CB	3.3	335	A	6	0.5
TDA475K06CB	4.7	475	A	6	0.5
TDA685K06CB	6.8	685	A	6	0.5
TDB106K06CB	10	106	B	8	0.5
TDC156K06CB	15	156	C	8	0.7
TDD226K06CB	22	226	D	8	1.1
TDE336K06CB	33	336	E	8	1.6
TDF476K06CB	47	476	F	8	2.3
TDG686K06CB	68	686	G	8	3.4
TDH107K06CB	100	107	H	10	5.0
TDK157K06CB	150	157	K	10	7.5
TDM227K06CB	220	227	M	10	11.0
TDP337K06CB	330	337	P	10	16.6

10 VDC RATED VOLTAGE

SURGE VOLTAGE 13 VDC at 85°C and 8 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDA225K10CB	2.2	225	A	6	0.5
TDA335K10CB	3.3	335	A	6	0.5
TDA475K10CB	4.7	475	A	6	0.5
TDB685K10CB	6.8	685	B	8	0.5
TDC106K10CB	10	106	C	8	0.8
TDD156K10CB	15	156	D	8	1.2
TDE226K10CB	22	226	E	8	1.7
TDF336K10CB	33	336	F	8	2.6
TDG476K10CB	47	476	G	8	3.7
TDH686K10CB	68	686	H	10	5.4
TDK107K10CB	100	107	K	10	8.0
TDN157K10CB	150	157	N	10	12.0
TDP227K10CB	220	227	P	10	17.6

16 VDC RATED VOLTAGE

SURGE VOLTAGE 20 VDC at 85°C and 13 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDA155K16CB	1.5	155	A	4	0.5
TDA225K16CB	2.2	225	A	6	0.5
TDA335K16CB	3.3	335	A	6	0.5
TDB475K16CB	4.7	475	B	6	0.6
TDC685K16CB	6.8	685	C	6	0.8
TDD106K16CB	10	106	D	8	1.2
TDE156K16CB	15	156	E	8	1.9
TDF226K16CB	22	226	F	8	2.8
TDF336K16CB	33	336	F	8	4.2
TDJ476K16CB	47	476	J	8	6.0
TDL686K16CB	68	686	L	10	8.7
TDN107K16CB	100	107	N	10	12.8
TDN157K16CB	150	157	N	10	19.2

20 VDC RATED VOLTAGE

SURGE VOLTAGE 25 VDC at 85°C and 16 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDA105K20CB	1	105	A	4	0.5
TDA155K20CB	1.5	155	A	4	0.5
TDA225K20CB	2.2	225	A	6	0.5
TDB335K20CB	3.3	335	B	6	0.5
TDC475K20CB	4.7	475	C	6	0.7
TDD685K20CB	6.8	685	D	6	1.0
TDE106K20CB	10	106	E	8	1.6
TDF156K20CB	15	156	F	8	2.4
TDH226K20CB	22	226	H	8	3.5
TDJ336K20CB	33	336	J	8	5.2
TDK476K20CB	47	476	K	8	7.5
TDN686K20CB	68	686	N	8	10.8
TDN107K20CB	100	107	N	10	16.0

25 VDC RATED VOLTAGE

SURGE VOLTAGE 32 VDC at 85°C and 20 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDA105K25CB	1	105	A	4	0.5
TDA155K25CB	1.5	155	A	4	0.5
TDA225K25CB	2.2	225	A	6	0.5
TDB335K25CB	3.3	335	B	6	0.6
TDC475K25CB	4.7	475	C	6	0.9
TDD685K25CB	6.8	685	D	6	1.3
TDE106K25CB	10	106	E	8	2.0
TDF156K25CB	15	156	F	8	3.0
TDH226K25CB	22	226	H	8	4.4
TDJ336K25CB	33	336	J	8	6.6
TDM476K25CB	47	476	M	8	9.4
TDN686K25CB	68	686	N	8	13.6

35 VDC RATED VOLTAGE

SURGE VOLTAGE 44 VDC at 85°C and 28 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDA104K35CB	0.1	104	A	4	0.5
TDA154K35CB	0.15	154	A	4	0.5
TDA224K35CB	0.22	224	A	4	0.5
TDA334K35CB	0.33	334	A	4	0.5
TDA474K35CB	0.47	474	A	4	0.5
TDA684K35CB	0.68	684	A	4	0.5
TDA105K35CB	1	105	A	4	0.5
TDA155K35CB	1.5	155	A	4	0.5
TDB225K35CB	2.2	225	B	6	0.6
TDC335K35CB	3.3	335	C	6	0.9
TDE475K35CB	4.7	475	E	6	1.3
TDF685K35CB	6.8	685	F	6	1.9
TDF106K35CB	10	106	F	8	2.8

TD SERIES SPECIFICATIONS

35 VDC RATED VOLTAGE (Continued)

SURGE VOLTAGE 44 VDC at 85°C and 28 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDH156K35CB	15	156	H	8	4.2
TDK226K35CB	22	226	K	8	6.1
TDM336K35CB	33	336	M	8	9.2
TDN476K35CB	47	476	N	8	10.0

50 VDC RATED VOLTAGE

SURGE VOLTAGE 63 VDC at 85°C and 40 VDC at 125°C

Part Number	Cap Value μ F	Cap Code	Case Size	DF% (max) @25°C	DCL (max) μ A
TDA104K50CB	0.1	104	A	4	0.5
TDA154K50CB	0.15	154	A	4	0.5
TDA224K50CB	0.22	224	A	4	0.5
TDA334K50CB	0.33	334	A	4	0.5
TDA474K50CB	0.47	474	A	4	0.5
TDB684K50CB	0.68	684	B	4	0.5
TDC105K50CB	1	105	C	4	0.5
TDD155K50CB	1.5	155	D	4	0.6
TDE225K50CB	2.2	225	E	6	0.8
TDF335K50CB	3.3	335	F	6	1.3
TDG475K50CB	4.7	475	G	6	1.8
TDH685K50CB	6.8	685	H	6	2.7
TDJ106K50CB	10	106	J	8	4.0
TDK156K50CB	15	156	K	8	6.0
TDL226K50CB	22	226	L	8	8.8

Note: Part numbers indicated are for 20% tolerance parts with straight uneven leads and 2.5mm lead spacing. Please refer to ordering information for details of other tolerances and lead styles.



SOLID TANTALUM CAPACITORS

FEATURES:

- ULTRA LOW LEAKAGE CURRENT
- HIGH FREQUENCY AND LOW IMPEDANCE
- MINIATURE SIZE
- LONG TERM STABILITY
- OUTSTANDING PERFORMANCE OVER WIDE TEMPERATURE RANGE
- FLAME RETARDENT, MOISTURE RESISTANT EPOXY ENCAPSULATED
- LASER MARKED WITH VOLTAGE, CAPACITANCE AND POLARITY
- ISO-9002 CERTIFIED

APPLICATIONS

- GENERAL CONSUMER ELECTRONICS
- TELECOMMUNICATION SWITCHING EQUIPMENT
- COMPUTERS
- ELECTRONIC INSTRUMENT
- AUTOMOTIVE ELECTRONIC APPLICATIONS

GENERAL SPECIFICATIONS

CAPACITANCE: 0.1 μ F to 680 μ F.

CAPACITANCE TOLERANCE: $\pm 5\%$,(J) $\pm 10\%$ K, $\pm 20\%$ (M),

OPERATING TEMPERATURE RANGE: -55°C to +125°C

(Max. operating temperature at rated voltage shall be up to 85°C, use under derated voltages when above 85°C).

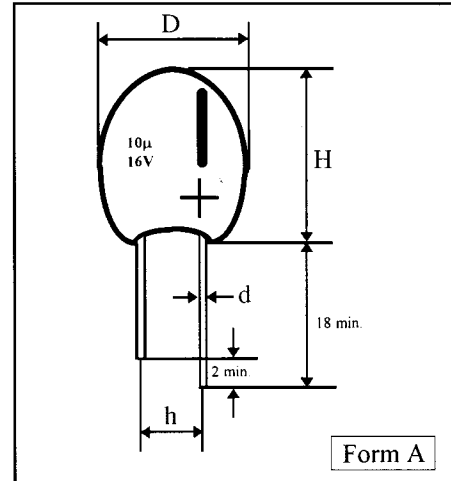
RATED VOLTAGE (V_R): $\leq 85^\circ\text{C}$ 3 4 6.8 10 16 20 25 35 50 VDC

CATAGORY VOLTAGE (V_c): $\leq 125^\circ\text{C}$ 1.9 3 4 6.3 10 13 16 22 32 VDC

SURGE VOLTAGE (V_s): $\leq 85^\circ\text{C}$ 4 5.2 8 13 20 26 33 46 65 VDC

LEAKAGE CURRENT I_o (+20°C): $\leq 0.02\text{CV}$ or 1 μ A, whichever is greater

DISSIPATION FACTOR: 0.1 ~ 1 μ F	4% Max
1.5 ~ 6.8 μ F	6% Max
10 ~ 6.8 μ F	8% Max
68 ~ 680 μ F	10% Max



STANDARD CAPACITANCE RATINGS

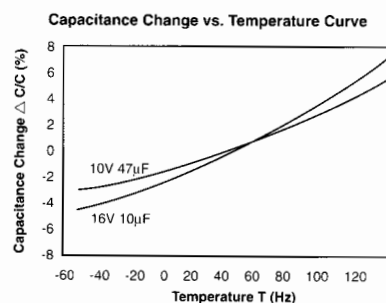
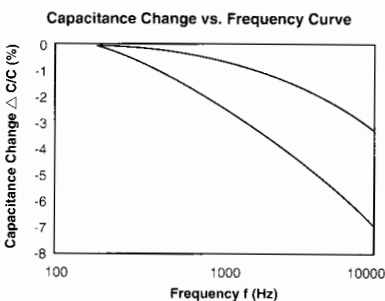
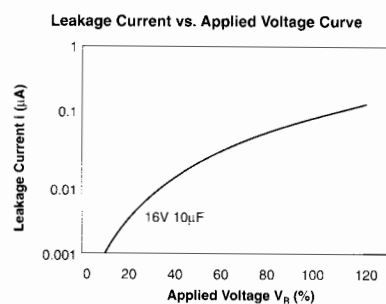
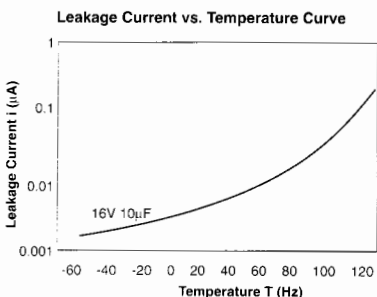
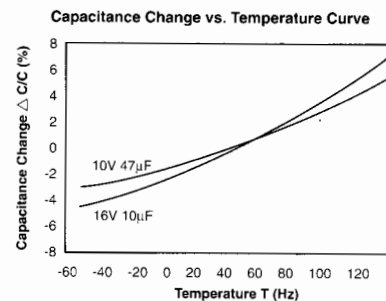
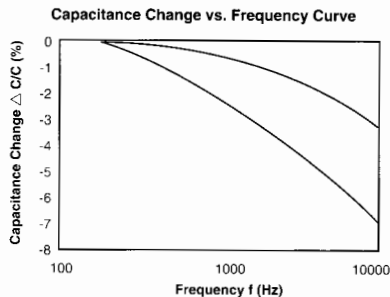
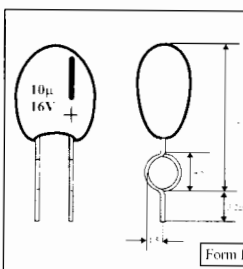
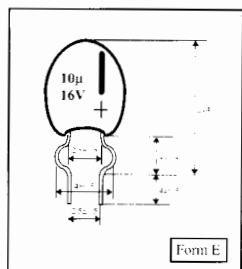
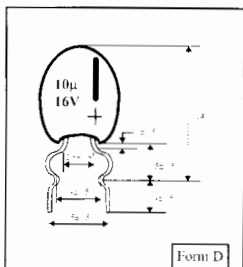
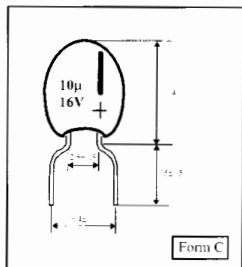
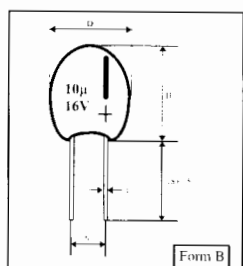
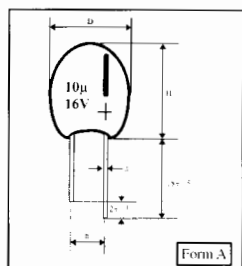
CR (μ F)	Rated Voltage (Volts DC)								
	3	4	6.3	10	16	20	25	35	50
0.10								A	A
0.15								A	A
0.22								A	A
0.33								A	A
0.47								A	A
0.68								A	A
1.0					A	A	A	A	B
1.5					A	A	A	A	C
2.2					A	A	A	A	C
3.3				A	A	B	B	B	D
4.7	A		A	A	B	B	B	C	D
6.8	A	A	A	B	B	C	C	D	F
10	A	A	B	B	C	C	C	D	F
15	A	A	B	C	C	D	D	E	F
22	B	B	C	C	D	D	D	E	F
33	B	B	C	D	D	E	E	F	
47	C	C	D	D	E	E	E	F	
68	D	D	D	D	E	F	F		
100	D	D	D	E	F	F			
150	D	E	E	E	F				
220	E	E	E	F					
330	E	F	F						
470	F								
680	F								

CASE DEMENSIONS				
Case Code	H	D	d	h ± 0.76
A	7.1	4.5	0.5	2.5
B	7.6	5.0	0.5	2.5
C	9.1	5.5	0.5	2.5
D	10.2	6.0	0.5	2.5
E	12.5	8.6	0.6	5.0
F	16.5	9.6	0.6	5.0

TEMPERATURE CHARACTERISTICS										
CR (μ F)	Capacitance Change (%)			Max. tg δ (%)				Max. Leakage Current (μ A)		
	-55°C	+85°C	+125°C	-55°C	+20°C	+85°C	+125°C	+20°C	+85°C	+125°C
0.1-1.0	± 10	± 15	± 20	6	4	6	6	I _o	10 x I _o	15 x I _o
1.5-6.8				8	6	8	8			
10-68				10	8	10	10			
100-680				12	10	12	12			



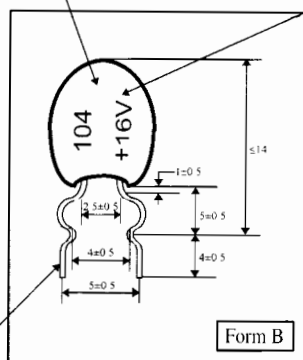
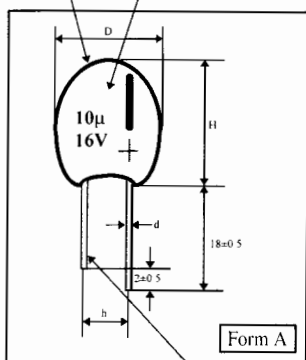
SOLID TANTALUM CAPACITORS



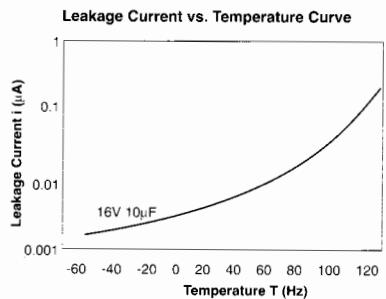
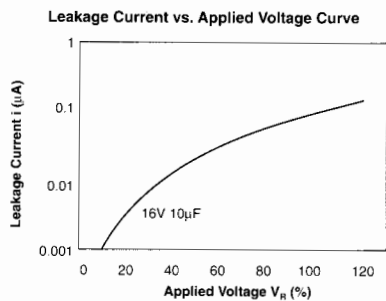
Capacitors are coated with flame retardant, moisture resistant epoxy in A, A, C, D, E, and F standard case sizes.

Capacitance, Rated Voltage, and polarity are laser-marked on the capacitors in one of two standard mark forms

High quality tantalum powder provides low leakage current, high frequency, and low impedance.



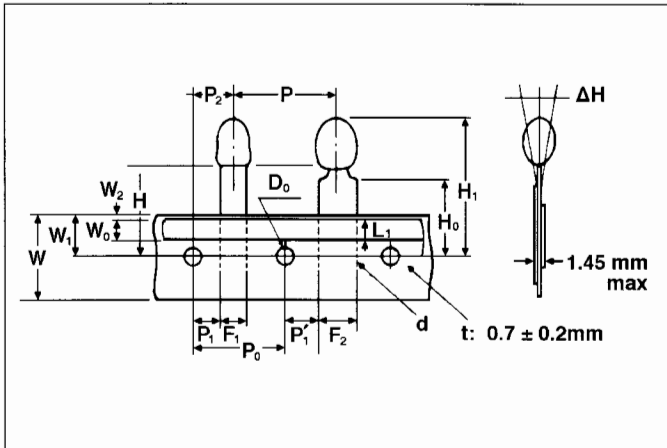
A variety of lead/terminal forms allow easy insertions.





TAPE AND REEL SPECIFICATIONS

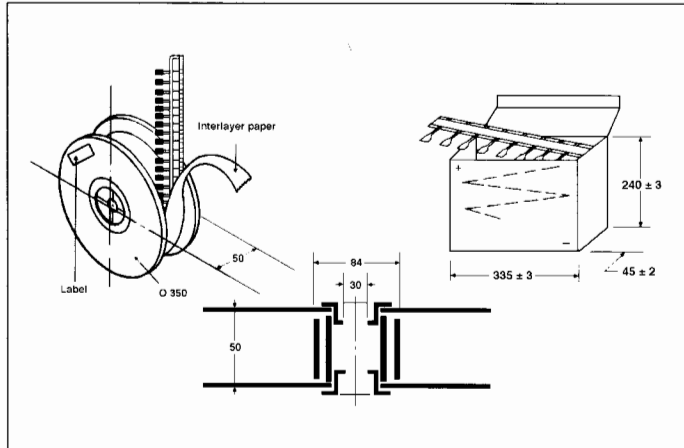
Taping Specification



Taping Dimensions

Item	Symbol	Length (mm)	Tolerance (mm)
Lead Diameter	d	0.5	±0.05
Component pitch	P	12.7	±1.0
Feed hole pitch	P0	12.7	±0.2
Hole center to lead	P1/P1	3.85/5.5	±0.5
Feed hole center to component center	P2	6.35	±0.5
Lead to lead distance	F1/F2	2.5/5.0	±0.5/+0.8 -0.2
Component alignment F-R	ΔH	0	±2.0
Tape width	W	18.0	±0.5
Hold down tape width	W0	6.0	±0.5
Hole position	W1	9.0	+0.75, -0.5
Hold down tape position	W2	2.0	max
Height of component from tape center	H	19	±0.5
Lead-wire clinch height	H0	16.0	±0.5
Component height	H1	32.25	max
Feed hole diameter	D0	4	±0.3
Lead protrusion	L1	7	+2.0, -2.5

Reel and Ammo Specifications



Reel Taping Packaging

Size	Quantity	Inner Box	Outer Box
A - C & Q - Z	2 K Pcs.	1 Reel	5 - I.B. (10 K Pcs.)
D - G	1.5 K Pcs.	1 Reel	5 - I.B. (7.5 K Pcs.)
H - J	2 K Pcs.	1 Reel	5 - I.B. (5 K Pcs.)

Ammo Taping Packaging

Size	Inner Box	Outer Box
A - C & Q - Z	3 K Pcs.	5 - I.B. (15 K Pcs.)
D - G	2.5 K Pcs.	5 - I.B. (12.5 K Pcs.)
H - J	2 K Pcs.	5 - I.B. (10 K Pcs.)

Bulk Packaging

Size	Vinyl Bag	Inner Box	Outer Box
A - C & Q - Z	500 pcs	16 V.B. (8 K Pcs.)	9 - I.B. (72 K Pcs.)
D - I	300 pcs	15 V.B. (4.5 K Pcs.)	9 - I.B. (40.5 K Pcs.)
J - L	200 pcs	15 V.B. (3 K Pcs.)	9 - I.B. (27 K Pcs.)
M	200 pcs	10 V.B. (2 K Pcs.)	9 - I.B. (18 K Pcs.)
N - P	200 pcs	5 V.B. (1 K Pcs.)	9 - I.B. (9 K Pcs.)

Note: V.B. = Vertical Boxes, I.B. = Inner Boxes.



WST SERIES

INTRODUCTION

The WST Series of sub-miniature wet-slug capacitors have outstanding performance characteristics and very high capacitance value with respect to volume as well as weight. These capacitors also have the lowest leakage current ratings among the electrolytic type of capacitors.

FEATURES

- Wide range of case sizes to ensure maximum volumetric efficiency
- Lowest leakage current in electrolytic capacitors
- Highest capacitance per unit weight
- Suitable for circuits where large capacitance values are required

GENERAL SPECIFICATIONS

Dissipation factor: 10 % to 50% when measured at 120 Hz.
(Please refer to Dissipation Factor details)

Capacitance tolerance: -15 to +75%(U), ±20%(M), ±10%(K) and ±5%(J)

Max. DC leakage current: 2 µA for case size up to 5C.
4 µA for case size 6C (at 25° C).

Surge Voltage: 115% of rated DC Voltage (Max.)

Temperature range: -55 to +85° C without any voltage derating

Ripple Voltage: The maximum allowable ripple voltage which is a function of capacitance and case size is furnished in Figure 3.

Polarity: The red epoxy end along with the "+" sign indicates the positive terminal of the capacitor. Operation in conditions other than 120 Hz. and 25° C: Please refer to Voltage Multiplication Factor Table.

LIFE TEST DETAILS:

Capacitors shall withstand 100% DC rated voltage applied at 85 °C for 1000 hours. After the test:

1. Capacitance change shall remain within +15 to -20% of the initial value for 6 and 10 V DC rated parts and within ±15% for all other parts.
2. DC leakage current shall be within the initial limits.
3. Dissipation Factor shall be within 1.5 times the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

VOLTAGE MULTIPLICATION FACTOR

FREQUENCY Hz.	TEMPERATURE			
	25 °C	45 °C	65 °C	85 °C
60	1.50	1.50	1.20	0.75
120	1.00	1.00	0.80	0.50
400	0.33	0.33	0.27	0.17
1000	0.15	0.15	0.12	0.08
10000	0.03	0.03	0.02	0.01

DISSIPATION FACTOR DETAILS

CASE SIZE	DISSIPATION FACTOR % FOR RATED VOLTAGE OF						
	6 VDC	10 V DC	15 V DC	25 V DC	35 V DC	50 V DC	60 V DC
3A, 3B	18	16	14	13	12	10	10
3C	20	18	16	14	13	13	13
4A, 4B, 4C	21	20	18	16	16	13	13
5A, 5B, 5C	35	26	21	18	17	15	13
6C	50	40	35	25	20	15	15

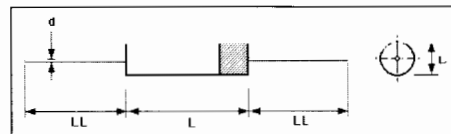
DIMENSIONS AND TOLERANCE

Dimension "d" -
0.020 ±0.002"
(0.5±0.05mm)

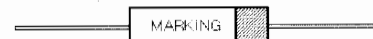
Dimension "LL" -
1.5 ±0.06"
(38.1 ±1.6 mm)

Tolerance on Diameter "D" - ±0.005" (±0.13 mm)

Tolerance on Length "L" - ±0.015" (±0.38 mm)



Part Marking Information



EIA Date Code

According to the EIA Date Code the first two digits indicate the Year of manufacture (94 for 1994, 95 for 1995 etc.). The next two digits indicate the week number on which the part was tested and marked.

Value Voltage and Tolerance

Value is marked in micro Farads without mentioning any units. The rated DC Voltage is marked followed by V. Tolerance is marked as ±5%, ±10% or ±20%.

Manufacturer's Logo

The letter "CSII" is marked on the capacitor to represent the manufacturers' logo.

Polarity

Polarity is marked by a "+" sign next to the manufacturers logo to indicate the positive terminal. The red resin also represents the polarity.

Packing Details

Bulk packing in Poly bags

Case Code	Quantity per bag in numbers
3A to 5B	100
5C and 6C	50

Tape reel and Ammo pack

CSII capacitors are also available in Tape and Ammo Packing or Tape and Reel Packing for large volume users.

CASE DIMENSIONS in Millimeters (Inches)

CASE SIZE	LENGTH		DIAMETER	
	L	(mm)	D	(mm)
3A	7.4	(0.290)	2.7	(0.105)
3B	8.9	(0.350)	2.7	(0.105)
3C	11.7	(0.460)	2.7	(0.105)
4A	10.8	(0.425)	3.4	(0.133)
4B	10.8	(0.425)	3.8	(0.148)
4C	12.7	(0.500)	3.4	(0.133)
5A	12.4	(0.490)	4.9	(0.193)
5B	14.5	(0.570)	4.9	(0.193)
5C	19.1	(0.750)	4.9	(0.193)
6C	19.1	(0.750)	5.6	(0.220)

LEAKAGE CURRENT Limits at 85 °C

CASE SIZE	MAXIMUM DC LEAKAGE CURRENT
3A, 3B	6.0 µA
3C	7.0 µA
4A, 4B, 4C	8.0 µA
5A, 5B, 5C	10.0 µA
6C	15.0 µA

AXIAL TANTALUMS



ORDERING INFORMATION

Example below indicates: SWT Series, 3C Case, 10 µF, 10% Tolerance, 35 V DC, Standard Leakage Current, Standard Product.

(EXAMPLE) **W** **S** **T** **3** **C** **1** **0** **6** **K** **0** **3** **5** **S** **X**

Series

Series Code: WST, HST & NST

Case Size

(Reference WST Series "Rating Case Code Table" for Case Codes)

Capacitance

First Two Digits Represent Significant Figures of Capacitance in Picofarads.
Third Digit Indicates Number of Zeros

Tolerance

Capacitance Tolerance Code:

Capacitance Tolerance Code	±5%	±10%	±20%	-15%+75%
J		K	M	U

Rated Voltage

3 Digit Voltage Code:

DC Voltage	6V	10V	15V	25V	35V	50V	60V
Voltage Code	006	010	015	025	035	050	060

Leakage Current Code

S = Standard Leakage Current
L = Low Leakage Current

Product Code

X = Standard
C = Non-standard

RATINGS CASE CODE TABLE

CAP VALUE µF	RATED DC VOLTAGE						
	6 V	10 V	15 V	25 V	35 V	50 V	60 V
1.0					3A	3A	3A
1.2					3A	3A	3A
1.5					3A	3A	3A
1.8					3A	3A	3A
2.0					3A	3A	3A
2.2					3A	3A	3A
2.5					3A	3A	3B
2.7					3A	3B	3B
3.0					3A	3B	3B
3.3				3A	3B	3B	3B
3.9				3A	3B	3B	3B
4.0				3A	3B	3B	3B
4.7			3A	3B	3B	3B	3C
5.0			3A	3B	3B	3B	3C
5.6			3A	3B	3B	3B	3C
6.0			3A	3B	3B	3B	3C
6.8	3B	3B	3B	3B	3B	3B	3C
7.0	3B	3B	3B	3B	3C	3C	3C
7.5	3B	3B	3B	3B	3C	3C	3C
8.0	3B	3B	3B	3B	3C	3C	3C
8.2	3B	3B	3B	3B	3C	3C	3C
10	3B	3B	3B	3C	3C	3C	4A
12	3B	3B	3B	3C	3C	3C	4A
15	3C	3C	3C	3C	4A	4A	4B
18	3C	3C	3C	3C	4A	4A	4C
20	3C	3C	3C	3C	4A	4A	4C
22	3C	3C	3C	4A	4B	4B	5A
25	3C	3C	3C	4A	4B	4B	5A
27	3C	3C	3C	4B	4C	4C	5A
30	3C	3C	3C	4B	4C	4C	5A
33	3C	3C	3C	4B	4C	4C	5A

CAP VALUE µF	RATED DC VOLTAGE						
	6 V	10 V	15 V	25 V	35 V	50 V	60 V
39	3C	3C	4A	4C	5A	5A	5B
40	3C	3C	4A	4C	5A	5A	5B
47	3C	3C	4A	4C	5A	5A	5B
50	3C	3C	4B	5A	5A	5A	5B
56	3C	4A	4B	5A	5A	5B	5C
60	3C	4A	4C	5A	5A	5B	5C
68	4A	4A	4C	5A	5A	5B	5C
70	4A	4B	4C	5A	5B	5C	5C
75	4B	4B	4C	5A	5B	5C	6C
80	4B	4B	4C	5A	5B	5C	6C
82	4B	4B	5A	5A	5C	5C	6C
100	4C	4C	5A	5A	5C	6C	6C
120	4C	4C	5A	5B	5C	6C	
150	5A	5A	5B	5C	5C	6C	
180	5A	5A	5B	5C	6C		
200	5A	5A	5C	5C	6C		
220	5A	5B	5C	5C	6C		
250	5B	5B	5C	6C			
270	5B	5B	5C	6C			
300	5B	5C	5C	6C			
330	5B	5C	5C				
390	5C	5C	5C				
400	5C	5C	5C				
470	5C	5C	6C				
500	5C	5C	6C				
560	5C	5C	6C				
600	5C	5C	6C				
680	6C	6C					
750	6C	6C					
820	6C	6C					
1000	6C						

Note: The sum of the DC voltage plus the peak AC voltage must not exceed the DC rated voltage. The DC voltage must be sufficiently high to ensure that the negative peak to the AC will not cause a voltage reversal on the capacitor.

LOW DCL SERIES - LX: Capacitors with ultra low leakage currents in the region of 0.00019CV+0.05 µA are available in "LX" series. Please call for specific requirements.



HST SERIES AXIAL LEADED SOLID-TANTALUM CAPACITORS

FEATURES:

- HERMETICALLY SEALED METAL CASES
- SMALL SIZES
- WIDE OPERATING TEMPERATURE RANGE
- LONG TERM STABILITY
- LONG STORAGE AND OPERATION LIFE
- OPTIONAL OUTER PLASTIC-FILM INSULATION

APPLICATIONS

- TELECOMMUNICATION SWITCHING EQUIPMENT
- ELECTRONIC INSTRUMENT
- INDUSTRIAL ELECTRONIC CONTROL DEVICES
- AUTOMOTIVE ELECTRONIC APPLICATIONS

SPECIFICATIONS

RATED CAPACITANCE RANGE: 0.047 to 470 μF .

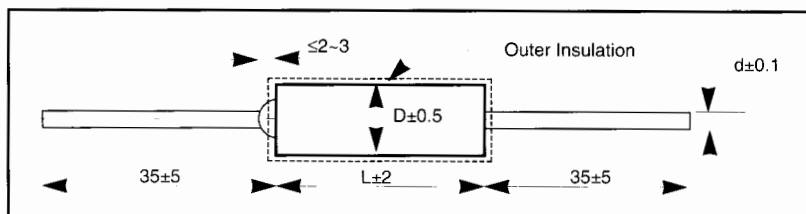
OPERATING TEMPERATURE RANGE: -55°C to $+125^{\circ}\text{C}$

(Max. operating temperature at rated voltage shall be up to 85°C , use under derated voltages when above 85°C).

RATED VOLTAGE (V_R): 6.3 to 100 VDC

CAPACITANCE TOLERANCE: $\pm 10\%$ (K) $\pm 20\%$ (M), $+30/-10\%$ (Q)

LEAKAGE CURRENT ($+20^{\circ}\text{C}$): $\leq 0.02C_V$ or $1\mu\text{A}$, whichever is greater



STANDARD CAPACITANCE, RATED VOLTAGE, DIMENSIONS, AND MAXIMUM WEIGHT

Rated Voltage (VDC)		6.3	10	16	25	32	40	63	75	100	
Derated Voltage (VDC)		4	6.3	10	16	20	25	40	50	63	
DxL (mm)	d (mm)	Max. Wt.(g)	Rated Capacitance (μF)								
3.2x8	0.4	0.7	1.0	0.68	0.33	0.33	0.22	0.22	0.22	0.22	0.047
			1.5	1.0	0.47	0.47	0.33	0.33	0.33	0.33	0.068
			2.2	1.5	0.68	0.68	0.47	0.47	0.47		0.1
			3.3	2.2	1.0	1.0	0.68	0.68			0.15
			4.7	3.3	1.5	1.5	1.0	1.0			0.22
			6.8	4.7	2.2	2.2	1.5				
			10	6.8	3.3						
5x12	0.6	2.5	15	10	4.7	3.3	2.2	1.5	0.68	0.47	0.33
			22	15	6.8	4.7	3.3	2.2	1.0	0.68	0.47
			33	22	10	6.8	4.7	3.3	1.5	1.0	0.68
			47	33	15	10	6.8	4.7	2.2	1.5	1.0
			68	47	22	15	10	6.8	3.3	2.2	1.5
6x14	0.6	3.5	100	68	47	22	15	10	4.7	3.3	2.2
				100	68	33		15		4.7	3.3
8x14	0.8	6	150	150	100	47	22	22	6.8	6.8	4.7
						68	33	33	10	10	6.8
8x22	0.8	10	330	220	150	100	47	47	15	15	10
				470	330	220	68		22		

Note: D is 0.3 and L 0.9mm more for plastic-film insulated capacitors.

TEMPERATURE CHARACTERISTICS

CR (μF)	Capacitance Change (%)			Max. tg δ (%)				Max. Leakage Current (μA)		
	-55°C	$+85^{\circ}\text{C}$	$+125^{\circ}\text{C}$	-55°C	$+20^{\circ}\text{C}$	$+85^{\circ}\text{C}$	$+125^{\circ}\text{C}$	$+20^{\circ}\text{C}$	$+85^{\circ}\text{C}$	$+125^{\circ}\text{C}$
≤ 1	± 8	± 8	± 12	6	4	6	6	lo	10 x lo	12.5 x lo
1.5~6.8				8	6	8	8			
100~330				12	10	12	12			
470				15	12	15	15			



NST NON-SOLID TANTALUM CAPACITORS

FEATURES:

- SEALED IN SILVER OR TANTALUM CASE w/ INSULATING SLEEVE
- SMALL SIZES
- SINTERED ANODE
- WIDE OPERATING TEMPERATURE RANGE
- LONG TERM STABILITY AND LONG OPERATION LIFE
- LOW LEAKAGE CURRENT

APPLICATIONS

- TELECOMMUNICATION SWITCHING EQUIPMENT
- ELECTRONIC INSTRUMENT
- INDUSTRIAL ELECTRONIC CONTROL DEVICES
- AUTOMOTIVE ELECTRONIC APPLICATIONS
- AEROSPACE APPLICATIONS

SPECIFICATIONS

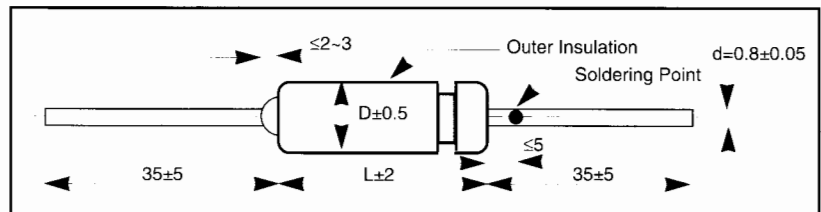
RATED CAPACITANCE RANGE: 1.0 to 1000 μ F.

OPERATING TEMPERATURE RANGE: -55°C to +125°C
(Max. operating temperature at rated voltage shall be up to 85°C, use under derated voltages when above 85°C).

RATED VOLTAGE (V_R): 6.3 to 125 VDC

CAPACITANCE TOLERANCE: \pm 10%.(K) \pm 20%.(M), +30/-10%.(Q)

LEAKAGE CURRENT I_o (+20°C): 0.001CV or 1 μ A, whichever is greater; 8xl_o @ +85°C; 10xl_o @ +125°C.



STANDARD CAPACITANCE, RATED VOLTAGE, DIMENSIONS, AND MAXIMUM WEIGHT										
Rated Voltage (VDC)			6.3	10	16	25	40	63	100	125
Derated Voltage (VDC)			4	6.3	10	16	25	40	63	75
Case No.	DxL (mm)	Max. Wt.(g)	Rated Capacitance (μ F)							
A1	5x14	4	22	15	10	6.8	4.7	2.2	1.5	1.0
			33	22	15	10	6.8	3.3	2.2	1.5
			47	33	22	15	10	4.7	3.3	2.2
			68	47	33	22	15	6.8	4.7	3.3
			100	68	47	33	22	10	6.8	4.7
A2	6x16	5	150	100	68	47	33	15	10	6.8
			220	150	100	68	47	22	15	10
A3	8x16	7	330	220	150	100	68	33	22	15
			470	330	220	150	100	47	33	22
A4	8x22	10	680	470	330	220	150	68	47	33
A5	10x22	14	1000	680	470	330	220	100	68	47
A6	10x25	17		1000	680	470	330	150	100	68

Note: D is 0.3 mm more for plastic-film insulated capacitors.

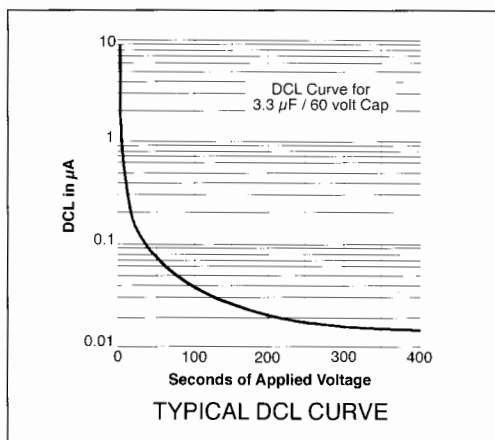
MAXIMUM TANGENT OF LOSS ANGLE, tg δ , MEASURED AT 20°C, 100Hz (%)

C _R / V _R	1.0-2.2	3.3	4.7	6.8	10	15	22	33	47	68	100	150	220	330	470	680	1000
6.3							15	20	25	30	35	40	70	50	85	80	90
10						10	15	15	15	30	20	50	45	70	75	65	80
16					10	10	10	12	20	20	35	35	60	70	50	70	
25				8	8	10	10	20	15	30	25	50	50	40	50		
40			6	8	8	10	20	12	25	20	35	35	30	45			
63	6	6	6	8	8	10	10	18	12	25	20	28					
100	6	6	6	8	10	18	15	25	28	20	25						
125	6	6	6	8	15	15	23	23	20	23							



PERFORMANCE CHARACTERISTICS

FIGURE 1



Polarity

WST Type capacitors are of Polar design. The red epoxy end along with the "+" sign indicates the positive terminal of the capacitor. Polarity indications should be followed while mounting the capacitor and No reverse voltage should appear across the capacitor under any conditions. Reverse voltage on non-solid electrolytic capacitors can cause short circuit, over heating, electrolytic leak etc.. which can damage the PCB or the equipment. Precautions should also be taken while soldering to ensure that the case temperature does not exceed 85 °C.

DC Leakage Current

Rated voltage is applied through a series resistor of 1000 Ohms at 25 °C. Leakage Current when measured after 5 minutes for case sizes up to 5B and after 10 minutes for case sizes 5C and 6D shall meet the values furnished in the specifications. The leakage current measured at 85 °C will be within the values furnished in Table for Leakage Current Limits.

Lead Pull

The leads shall withstand a 3 lbs. axial pull for 5 seconds

Lead Bend:

At the point of egress from the capacitor, the leads shall withstand three 90° bends around a radius equal to the lead diameter.

Marking

Capacitor polarity is indicated by the red epoxy end and by a "+" sign. The date code, capacitance, voltage and tolerance are also printed on the case.

FIGURE 2

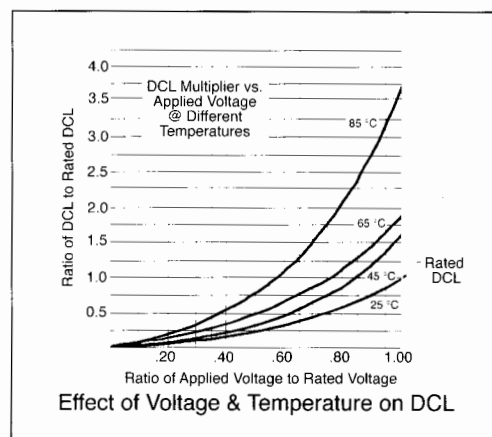
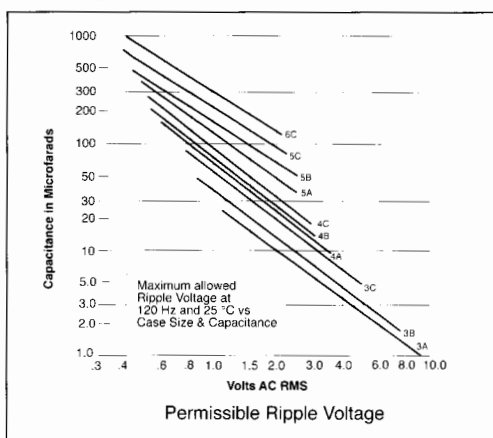


FIGURE 3



Variation pattern of DC Leakage Current with time

The Leakage current flowing through the dielectric of a tantalum capacitor is a function of time, as shown in Figure 1. The high initial current decays rapidly to a comparatively low value. The DCL after 5 minutes is still slightly higher than the ultimate value of DCL. The DC Leakage current ratings for all wet type tantalum capacitors are measured after 5 minutes of application of rated voltage.

The Effect of Voltage and temperature on DC Leakage Current

DC Leakage Current is affected by temperature and by applied voltage. The ratings given by manufacturers are for operation at 25 °C and full rated working voltage. Increasing either the temperature or the applied voltage increases the DCL. Note that the relationship between applied voltage and DCL is non-linear. Typically half the voltage yields less than half the DCL. This is illustrated in Figure 2.

Permissible Ripple Voltage

The maximum permissible ripple voltage depends upon the case size and the capacitance value of the component. The maximum allowed ripple voltage values at 120 Hz and 25°C for different case sizes and capacitance values are shown in Figure 3.



MPD SERIES

INTRODUCTION:

The MPD Series Metallized Polyester Film Capacitors cover a wide range of values and voltages. They are suitable for applications such as Blocking, By-passing and Coupling and are widely used in General communication equipment.

FEATURES:

- Wide value and Voltage range
- Self healing capability
- Flame retardant powder epoxy encapsulation
- Minimum overall dimensions due to dip coated construction

GENERAL SPECIFICATIONS:

Dissipation factor: < 0.0100 at 1 K Hz for capacitance ≤ 1.0 μF, < 0.0150 at 1 K Hz for capacitance > 1.0 μF. **Insulation resistance:** For 100 VDC rated parts; ≥ 9,000 M Ohms for C ≤ 0.33 μF, ≥ 3,000 seconds for C > 0.33 μF, at a temperature of 25 ± 5 °C, For 250 to 630 VDC rated parts; ≥ 15,000 M Ohms for C ≤ 0.33 μF, ≥ 5,000 seconds for C > 0.33 μF, at a temperature of 25 ± 5 °C. **Capacitance tolerance:** ±5%(J), ±10%(K) and ±20%(M) (Special parts with close tolerance of ±1% and ±2% available on request). **Voltage Test:** 1.6 times the rated voltage applied between terminals for 2 seconds. at a temperature of 25 ± 5 °C **Temperature range:** -55 to 85 °C. **Climatic category:** F M F

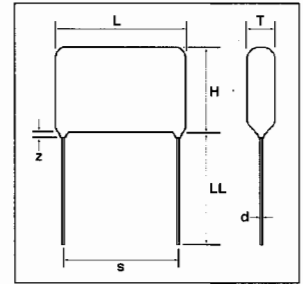
LIFE TEST DETAILS:

Capacitors shall withstand 125% DC rated voltage or 100% AC rated voltage applied at 85 °C for 1000 hours. After the test:

1. Capacitance change shall remain within ±5%.
2. Dissipation Factor shall be within 1.5 times the original limits.
3. Insulation Resistance shall be above 50% of the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

DIMENSIONS AND TOLERANCES:

d - 0.6 mm (0.024")
for
Lead Spacing "s" =
10.0 mm (0.40")
d - 0.8 mm (0.032")
for
Lead Spacing "s" >
10.0 mm (0.40")
z - 1.5mm (0.06")
max.



LL" - 20.0 mm min.(0.78")
Tolerance on "s" ± 1.0mm (0.04")

PULSE RISE TIME (dv/dt) Volts per μsec.

Rated Voltage	LEAD SPACING mm (inches)			
	10.0 (0.40)	15.0 (0.60)	22.5 (0.89)	27.0 (1.06)
100	6	3	2	1
250	11	7	4	3
400	20	10	5.5	5
630	30	15	8	7

ORDERING INFORMATION

Example below indicates: MPD185 Series, 0.1μF, 5% Tol., 100 Volts, Bulk.

(EXAMPLE) **M** **P** **D** **1** **8** **5** **1** **0** **4** **J** **1** **0** **1**

Series

Enter Series Code: (Up to 6 Digits)
MPD185, MPDS185, MPDSS185

Capacitance

Enter EIA Capacitance Code: (3 Digits)

First Two Digits Represent Significant Figures of Capacitance in Picofarads.
Third Digit Indicates Number of Zeros

Example: 1000pF = 102
0.01μF = 103

Tolerance

Enter Capacitance Tolerance Code: (1 Digit)

Tolerance	SPCL	± 1%	± 2%	± 3%	± 5%	± 6%	± 10%	± 20%
Code	A	F	G	L	J	H	K	M

Rated Voltage

Enter Voltage Code: (3 Digits)

First Two Digits Represent Significant Figures of DC Voltage unless individual data sheet specifies Only AC Rating.
Third Digit Indicates Number of Zeros

Example: 50V DC = 500
250V DC = 251

Product Packaging Code

Standard for Film Capacitors is Bulk packing. No Packaging Code Required for Bulk S
For other packaging styles, Enter packaging code listed below. (1 Digit)

Packaging Code	Packaging Style
T	Tape / Reel
A	Ammo
(no code)	Bulk



MPD SERIES CASE DIMENSIONS

Case Dimensions in Millimeters 100V • 250V • 400V • 630V

Capacitance in μF	VOLTAGE DC/AC							
	100 V DC / 63 V AC				250 V DC / 160 V AC			
	Dimensions in Millimeters				Dimensions in Millimeters			
	L	H	T	S	L	H	T	S
0.01					12.5	8.5	4.5	10.0
0.015					12.5	9.0	4.5	10.0
0.022					12.5	9.0	4.5	10.0
0.033					12.5	9.0	4.5	10.0
0.047					12.5	9.5	5.0	10.0
0.068					12.5	9.5	5.0	10.0
0.1	12.5	9.5	5.0	10.0	12.5	10.0	5.5	10.0
0.15	12.5	10.0	5.0	10.0	18.0	10.5	5.5	15.0
0.22	12.5	10.0	5.5	10.0	18.0	11.5	6.5	15.0
0.33	18.0	10.5	5.5	15.0	18.0	12.5	7.0	15.0
0.47	18.0	11.5	6.0	15.0	26.0	12.5	7.0	22.5
0.68	18.0	12.0	6.5	15.0	26.0	14.5	8.0	22.5
1.0	18.0	14.0	7.5	15.0	26.0	16.0	9.0	22.5
1.5	26.0	14.0	7.5	22.5	31.0	17.0	9.5	27.0
2.2	26.0	16.0	9.0	22.5	31.0	19.0	11.5	27.0
3.3	26.0	19.0	11.0	22.5	31.0	23.0	14.0	27.0
4.7	31.0	23.0	12.0	27.0	31.0	27.0	16.5	27.0
6.8	31.0	25.0	14.0	27.0				

Capacitance in μF	VOLTAGE DC/AC							
	400 V DC / 200 V AC				630 V DC / 220 V AC			
	Dimensions in Millimeters				Dimensions in Millimeters			
	L	H	T	S	L	H	T	S
0.01	12.5	9.0	4.5	10.0	12.5	9.0	4.5	10.0
0.015	12.5	9.5	4.5	10.0	12.5	9.5	5.0	10.0
0.022	12.5	9.5	5.0	10.0	12.5	10.5	6.0	10.0
0.033	12.5	10.5	5.5	10.0	18.0	11.0	6.0	15.0
0.047	12.5	10.5	6.0	10.0	18.0	11.5	6.5	15.0
0.068	18.0	10.5	6.0	15.0	18.0	12.5	7.0	15.0
0.1	18.0	11.5	6.5	15.0	26.0	13.0	7.0	22.5
0.15	26.0	12.5	6.0	22.5	26.0	14.0	8.5	22.5
0.22	26.0	13.5	7.0	22.5	26.0	16.5	10.0	22.5
0.33	26.0	15.5	8.5	22.5	31.0	17.5	10.5	27.0
0.47	26.0	18.0	9.5	22.5	31.0	19.5	12.0	27.0
0.68	31.0	17.5	10.0	27.0	31.0	22.5	15.0	27.0
1.0	31.0	20.0	12.0	27.0	31.0	27.5	19.0	27.0
1.5	31.0	23.5	13.5	27.0				
2.2	31.0	26.0	16.5	27.0				

Case Dimensions in Inches 100V • 250V • 400V • 630V

Capacitance in μF	VOLTAGE DC/AC							
	100 V DC / 63 V AC				250 V DC / 160 V AC			
	Dimensions in Inches				Dimensions in Inches			
	L	H	T	S	L	H	T	S
0.01					0.492	0.335	0.177	0.394
0.015					0.492	0.354	0.177	0.394
0.022					0.492	0.354	0.177	0.394
0.033					0.492	0.354	0.177	0.394
0.047					0.492	0.374	0.197	0.394
0.068					0.492	0.374	0.197	0.394
0.1	0.492	0.374	0.197	0.394	0.492	0.394	0.217	0.394
0.15	0.492	0.394	0.197	0.394	0.709	0.413	0.217	0.591
0.22	0.492	0.394	0.217	0.394	0.709	0.453	0.256	0.591
0.33	0.709	0.413	0.217	0.591	0.709	0.492	0.276	0.591
0.47	0.709	0.453	0.236	0.591	1.024	0.492	0.276	0.886
0.68	0.709	0.472	0.256	0.591	1.024	0.571	0.315	0.886
1.0	0.709	0.551	0.295	0.591	1.024	0.630	0.354	0.886
1.5	1.024	0.551	0.295	0.886	1.220	0.669	0.374	1.063
2.2	1.024	0.630	0.354	0.886	1.220	0.748	0.453	1.063
3.3	1.024	0.748	0.433	0.886	1.220	0.906	0.551	1.063
4.7	1.220	0.906	0.472	1.063	1.220	1.063	0.650	1.063
6.8	1.220	0.984	0.551	1.063				

Capacitance in μF	VOLTAGE DC/AC							
	400 V DC / 200 V AC				630 V DC / 220 V AC			
	Dimensions in Inches				Dimensions in Inches			
	L	H	T	S	L	H	T	S
0.01	0.492	0.354	0.177	0.394	0.492	0.354	0.177	0.394
0.015	0.492	0.374	0.177	0.394	0.492	0.374	0.197	0.394
0.022	0.492	0.374	0.197	0.394	0.492	0.413	0.236	0.394
0.033	0.492	0.413	0.217	0.394	0.709	0.433	0.236	0.591
0.047	0.492	0.413	0.236	0.394	0.709	0.453	0.256	0.591
0.068	0.709	0.413	0.236	0.591	0.709	0.492	0.276	0.591
0.1	0.709	0.453	0.256	0.591	1.024	0.512	0.276	0.886
0.15	1.024	0.492	0.236	0.886	1.024	0.551	0.335	0.886
0.22	1.024	0.531	0.276	0.886	1.024	0.650	0.394	0.886
0.33	1.024	0.610	0.335	0.886	1.220	0.689	0.413	1.063
0.47	1.024	0.709	0.374	0.886	1.220	0.768	0.472	1.063
0.68	1.220	0.689	0.394	1.063	1.220	0.886	0.591	1.063
1.0	1.220	0.787	0.472	1.063	1.220	1.083	0.748	1.063
1.5	1.220	0.925	0.531	1.063				
2.2	1.220	1.024	0.650	1.063				

MPD SERIES

INTRODUCTION:

The MPD Series Metallized Polyester Film Capacitors cover a wide range of values and voltages. This series has lead spacing starting from 7.5mm. and covers more values than the conventional series. They are suitable for applications such as Blocking, By-passing and Coupling and are widely used in General communication equipment.

FEATURES:

- Wide value and Voltage range
- Self healing capability
- Flame retardant powder epoxy encapsulation
- Minimum overall dimensions due to dip coated construction

GENERAL SPECIFICATIONS:

Dissipation factor: < 0.0100 at 1 K Hz for capacitance \leq 1.0 μF , < 0.0150 at 1 K Hz for capacitance > 1.0 μF . **Insulation resistance:** For 100 VDC rated parts; \geq 9,000 M Ohms for $C \leq$ 0.33 μF , \geq 3,000 seconds for $C >$ 0.33 μF at a temperature of $25 \pm 5^\circ\text{C}$. For 250 to 630 VDC rated parts; \geq 15,000 M Ohms for $C \leq$ 0.33 μF , \geq 5,000 seconds for $C >$ 0.33 μF at a temperature of $25 \pm 5^\circ\text{C}$. **Capacitance tolerance:** $\pm 5\%$ (J), $\pm 10\%$ (K) and $\pm 20\%$ (M). **Voltage Test:** 1.6 times the rated voltage applied between terminals for 2 seconds. at a temperature of $25 \pm 5^\circ\text{C}$. **Temperature range:** -55 to 85°C **Climatic category:** F M F

LIFE TEST DETAILS:

Capacitors shall withstand 125% DC rated voltage or 100% AC rated voltage applied at 85°C for 1000 hours. After the test:

1. Capacitance change shall remain within $\pm 5\%$.
2. Dissipation Factor shall be within 1.5 times the original limits.
3. Insulation Resistance shall be above 50% of the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

DIMENSIONS AND TOLERANCES:

d - 0.6 mm (0.024")

for

Lead Spacing "s" =

10.0 mm (0.40")

d - 0.8 mm (0.032")

for

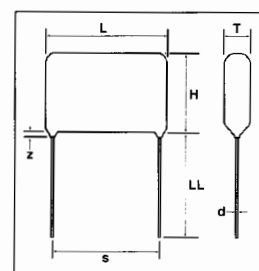
Lead Spacing "s" >

10.0 mm (0.40")

z - 1.5mm (0.06") max.

LL" - 20.0 mm min.(0.78")

Tolerance on "s" \pm 1.0mm (0.04")



PULSE RISE TIME (dv/dt) Volts per usec.

Rated Voltage	LEAD SPACING mm (inches)				
	7.5 (0.30)	10.0 (0.40)	15.0 (0.60)	22.5 (0.89)	27.5 (1.08)
100	6	6	3	2	1
250	15	11	7	4	3
400	30	20	10	5.5	5
630	40	30	15	8	7



MPDS SERIES CASE DIMENSIONS

Case Dimensions in Millimeters 100V • 250V • 400V • 630V

Capacitance in μF	VOLTAGE DC/AC							
	100 V DC / 63 V AC				250 V DC / 160 V AC			
	Dimensions in Millimeters				Dimensions in Millimeters			
	L	H	T	S	L	H	T	S
0.01					10.5	7.5	5.0	7.5
0.012					10.5	8.0	4.5	7.5
0.015					10.5	8.0	4.5	7.5
0.018					10.5	8.0	4.5	7.5
0.022	10.5	7.5	4.5	7.5	10.5	8.0	4.5	7.5
0.027	10.5	7.5	4.5	7.5	10.5	8.5	5.0	7.5
0.033	10.5	7.5	4.5	7.5	10.5	9.0	5.5	7.5
0.039	10.5	7.5	4.5	7.5	10.5	9.0	5.5	7.5
0.047	10.5	7.5	4.5	7.5	13.0	9.5	5.5	10.0
0.056	10.5	7.5	4.5	7.5	13.0	10.0	6.0	10.0
0.068	10.5	7.5	4.5	7.5	18.0	9.5	5.5	15.0
0.082	10.5	7.5	4.5	7.5	18.0	10.5	5.5	15.0
0.1	10.5	7.5	4.5	7.5	18.0	11.0	6.0	15.0
0.12	10.5	8.5	5.0	7.5	18.0	11.5	6.5	15.0
0.15	10.5	9.0	5.5	7.5	18.0	12.0	7.0	15.0
0.18	13.0	9.0	4.5	10.0	18.0	12.5	7.5	15.0
0.22	13.0	9.5	5.0	10.0	21.0	11.5	6.5	17.5
0.27	13.0	9.5	5.5	10.0	21.0	12.0	7.0	17.5
0.33	13.0	10.0	6.0	10.0	21.0	12.5	8.0	17.5
0.39	13.0	10.5	6.5	10.0	21.0	13.5	8.0	17.5
0.47	13.0	11.0	7.0	10.0	21.0	14.5	8.0	17.5
0.56	18.0	10.5	5.5	15.0	29.0	14.0	7.5	25.0
0.68	18.0	11.0	6.0	15.0	29.0	15.0	8.0	25.0
0.82	18.0	11.5	6.5	15.0	29.0	15.5	9.0	25.0
1.0	18.0	12.0	7.0	15.0	29.0	18.5	9.0	25.0
1.2	18.0	13.0	7.5	15.0	29.0	19.5	9.5	25.0
1.5	18.0	14.0	8.5	15.0	29.0	20.5	10.5	25.0
1.8	21.0	14.0	8.5	17.5	29.0	21.5	12.0	25.0
2.2	21.0	15.0	9.0	17.5	29.0	22.5	13.0	25.0
2.7	21.0	16.0	10.0	17.5				
3.3	21.0	17.5	10.5	17.5				
3.9	21.0	18.5	11.0	17.5				

CAPACITANCE in μF	VOLTAGE DC/AC							
	400 V DC / 200 V AC				630 V DC / 220 V AC			
	Dimensions in Millimeters				Dimensions in Millimeters			
	L	H	T	S	L	H	T	S
0.01	10.5	7.5	5.0	7.5	18.0	8.5	5.0	15.0
0.012	10.5	8.0	4.5	7.5	18.0	8.5	4.5	15.0
0.015	10.5	8.0	4.5	7.5	18.0	9.0	5.0	15.0
0.018	18.0	8.0	4.5	15.0	18.0	9.5	5.5	15.0
0.022	18.0	8.5	4.5	15.0	18.0	10.5	5.5	15.0
0.027	18.0	9.0	5.0	15.0	18.0	10.5	6.5	15.0
0.033	18.0	9.5	5.5	15.0	18.0	11.0	7.0	15.0
0.039	18.0	10.0	6.0	15.0	21.0	10.5	6.0	17.5
0.047	18.0	10.5	6.5	15.0	21.0	11.0	6.0	17.5
0.056	18.0	11.0	7.0	15.0	21.0	11.5	6.5	17.5
0.068	18.0	11.5	7.5	15.0	21.0	12.0	7.0	17.5
0.082	21.0	11.0	6.0	17.5	21.0	12.5	8.0	17.5
0.1	21.0	11.5	6.5	17.5	21.0	14.5	8.5	17.5
0.12	21.0	12.0	7.0	17.5	21.0	15.5	9.0	17.5
0.15	21.0	13.0	8.0	17.5	29.0	14.0	8.5	25.0
0.18	21.0	14.5	8.0	17.5	29.0	15.5	9.0	25.0
0.22	21.0	15.0	8.5	17.5	29.0	16.0	9.0	25.0
0.27	21.0	16.0	9.5	17.5	29.0	18.5	9.0	25.0
0.33	29.0	15.0	8.5	25.0	31.0	19.0	9.5	27.5
0.39	29.0	16.0	9.5	25.0	31.0	20.0	10.5	27.5
0.47	29.0	16.5	10.0	25.0	31.0	21.0	11.5	27.5
0.56	29.0	19.5	10.0	25.0				
0.68	29.0	20.5	11.0	25.0				
0.82	29.0	21.5	12.0	25.0				
1.0	29.0	23.0	13.0	25.0				

Case Dimensions in Inches 100V • 250V • 400V • 630V

CAPACITANCE in μF	VOLTAGE DC/AC							
	100 V DC / 63 V AC				250 V DC / 160 V AC			
	Dimensions in Inches				Dimensions in Inches			
	L	H	T	S	L	H	T	S
0.01					0.413	0.295	0.197	0.295
0.012					0.413	0.315	0.177	0.295
0.015					0.413	0.315	0.177	0.295
0.018					0.413	0.315	0.177	0.295
0.022	0.413	0.295	0.177	0.295	0.413	0.315	0.177	0.295
0.027	0.413	0.295	0.177	0.295	0.413	0.335	0.197	0.295
0.033	0.413	0.295	0.177	0.295	0.413	0.354	0.217	0.295
0.039	0.413	0.295	0.177	0.295	0.413	0.354	0.217	0.295
0.047	0.413	0.295	0.177	0.295	0.512	0.374	0.217	0.394
0.056	0.413	0.295	0.177	0.295	0.512	0.394	0.236	0.394
0.068	0.413	0.295	0.177	0.295	0.709	0.374	0.217	0.591
0.082	0.413	0.295	0.177	0.295	0.709	0.413	0.217	0.591
0.1	0.413	0.295	0.177	0.295	0.709	0.433	0.236	0.591
0.12	0.413	0.335	0.197	0.295	0.709	0.453	0.256	0.591
0.15	0.413	0.354	0.217	0.295	0.709	0.472	0.276	0.591
0.18	0.512	0.354	0.177	0.394	0.709	0.492	0.295	0.591
0.22	0.512	0.374	0.197	0.394	0.827	0.453	0.256	0.689
0.27	0.512	0.374	0.217	0.394	0.827	0.472	0.276	0.689
0.33	0.512	0.394	0.236	0.394	0.827	0.492	0.315	0.689
0.39	0.512	0.413	0.256	0.394	0.827	0.531	0.315	0.689
0.47	0.512	0.433	0.276	0.394	0.827	0.571	0.315	0.689
0.56	0.709	0.413	0.217	0.591	1.142	0.551	0.295	0.984
0.68	0.709	0.433	0.236	0.591	1.142	0.591	0.315	0.984
0.82	0.709	0.453	0.256	0.591	1.142	0.610	0.354	0.984
1.0	0.709	0.472	0.276	0.591	1.142	0.728	0.354	0.984
1.2	0.709	0.512	0.295	0.591	1.142	0.768	0.374	0.984
1.5	0.709	0.551	0.335	0.591	1.142	0.807	0.413	0.984
1.8	0.827	0.551	0.335	0.689	1.142	0.846	0.472	0.984
2.2	0.827	0.591	0.354	0.689	1.142	0.886	0.512	0.984
2.7	0.827	0.630	0.394	0.689				
3.3	0.827	0.689	0.413	0.689				
3.9	0.827	0.728	0.433	0.689				

CAPACITANCE in μF	VOLTAGE DC/AC							
	400 V DC / 200 V AC				630 V DC / 220 V AC			
	Dimensions in Inches				Dimensions in Inches			
	L	H	T	S	L	H	T	S
0.01	0.413	0.295	0.197	0.295	0.709	0.335	0.197	0.591
0.012	0.413	0.315	0.177	0.295	0.709	0.335	0.177	0.591
0.015	0.413	0.315	0.177	0.295	0.709	0.354	0.197	0.591
0.018	0.709	0.315	0.177	0.591	0.709	0.374	0.217	0.591
0.022	0.709	0.335	0.177	0.591	0.709	0.413	0.217	0.591
0.027	0.709	0.354	0.197	0.591	0.709	0.413	0.256	0.591
0.033	0.709	0.374	0.217	0.591	0.709	0.433	0.276	0.591
0.039	0.709	0.394	0.236	0.591	0.827	0.413	0.236	0.689
0.047	0.709	0.413	0.256	0.591	0.827	0.433	0.236	0.689
0.056	0.709	0.433	0.276	0.591	0.827	0.453	0.256	0.689
0.068	0.709	0.453	0.295	0.591	0.827	0.472	0.276	0.689
0.082	0.827	0.433	0.236	0.689	0.827	0.492	0.315	0.689
0.1	0.827	0.453	0.256	0.689	0.827	0.571	0.335	0.689
0.12	0.827	0.472	0.276	0.689	0.827	0.610	0.354	0.689
0.15	0.827	0.512	0.315	0.689	1.142	0.551	0.335	0.984
0.18	0.827	0.571	0.315	0.689	1.142	0.610	0.354	0.984
0.22	0.827	0.591	0.335	0.689	1.142	0.630	0.354	0.984
0.27	0.827	0.630	0.374	0.689	1.142	0.728	0.354	0.984
0.33	1.142	0.591	0.335	0.984	1.220	0.748	0.374	1.083
0.39	1.142	0.630	0.374	0.984	1.220	0.787	0.413	1.083
0.47	1.142	0.650	0.394	0.984	1.220	0.827	0.453	1.083
0.56	1.142	0.768	0.394	0.984				
0.68	1.142	0.807	0.433	0.984				
0.82	1.142	0.846	0.472	0.984				
1.0	1.142	0.906	0.512	0.984				



MPDSS SERIES

INTRODUCTION:

The MPDSS Series Metallized Polyester Film Capacitors cover a wide range of values and voltages. This series provides alternative dimensions for the same values covered by the other MPDSS series. These capacitors are suitable for applications such as Blocking, By-passing and Coupling and are widely used in General communication equipment.

FEATURES:

- Wide value and Voltage range
- Self healing capability
- Flame retardant powder epoxy encapsulation
- Minimum overall dimensions due to dip coated construction

GENERAL SPECIFICATIONS:

Dissipation factor: < 0.0100 at 1 K Hz for capacitance ≤ 1.0 μF, < 0.0150 at 1 K Hz or capacitance > 1.0 μF. **Insulation resistance:** For 100 VDC rated parts; ≥ 9,000 M Ohms for C ≤ 0.33 μF, ≥ 3,000 seconds for C > 0.33 μF at a temperature of 25 ± 5 °C. For 250 to 630 VDC rated parts; ≥ 15,000 M Ohms for C ≤ 0.33 μF, ≥ 5,000 seconds for C > 0.33 μF at a temperature of 25 ± 5 °C. **Capacitance tolerance:** ±5%(J), ±10%(K) and ±20%(M). **Voltage Test:** 1.6 times the rated voltage applied between terminals for 2 seconds at a temperature of 25 ± 5 °C. **Temperature range:** -55 to 85 °C. **Climatic category:** F M F

LIFE TEST DETAILS:

Capacitors shall withstand 125% DC rated voltage or 100% AC rated voltage applied at 85 °C for 1000 hours. After the test:

1. Capacitance change shall remain within ±5%.
2. Dissipation Factor shall be within 1.5 times the original limits.
3. Insulation Resistance shall be above 50% of the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

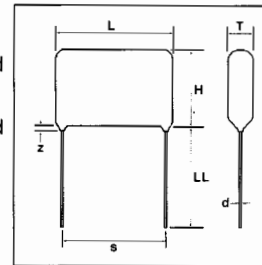
Case Dimensions in Millimeters 100V • 250V • 400V • 630V

Capacitance in μF	VOLTAGE DC/AC							
	100 V DC / 63 V AC				250 V DC / 160 V AC			
	Dimensions in Millimeters							
	L	H	T	S	L	H	T	S
0.01	13.0	10.0	5.5	10.0	13.0	10.0	5.5	10.0
0.015	13.0	10.0	6.0	10.0	13.0	10.0	6.0	10.0
0.022	13.0	10.0	6.0	10.0	13.0	10.0	6.0	10.0
0.033	13.0	10.0	6.0	10.0	13.0	10.0	6.0	10.0
0.047	13.0	10.0	6.0	10.0	13.0	10.0	6.0	10.0
0.068	13.0	11.0	6.5	10.0	13.0	11.0	6.5	10.0
0.1	13.0	12.5	7.0	10.0	13.0	12.5	7.0	10.0
0.15	13.0	12.5	8.0	10.0	13.0	12.5	8.0	10.0
0.22	13.0	12.5	8.0	10.0	18.0	13.0	7.0	15.0
0.33	13.5	14.0	9.0	10.0	18.0	14.0	8.0	15.0
0.47	13.5	15.0	10.0	10.0	18.0	16.0	9.5	15.0
0.68	18.0	13.5	8.0	15.0	24.0	14.0	9.5	20.0
1.0	18.0	16.5	9.5	15.0	24.0	18.0	10.5	20.0
1.5	18.0	19.0	11.5	15.0	24.0	23.0	13.5	20.0
2.2	24.0	21.0	12.5	20.0	30.0	23.0	13.5	27.5
3.3	24.0	22.0	13.0	20.0	30.0	24.0	16.5	27.5
4.7	30.0	23.5	14.0	27.5	33.0	24.0	18.0	30.0
6.8	30.0	24.0	15.5	27.5	33.0	26.0	20.0	30.0
10	30.0	26.0	21.5	27.5				

Capacitance in μF	VOLTAGE DC/AC							
	400 V DC / 200 V AC				630 V DC / 220 V AC			
	Dimensions in Millimeters							
	L	H	T	S	L	H	T	S
0.01	13.0	10.0	5.5	10.0	13.0	10.5	6.0	10.0
0.015	13.0	10.0	6.0	10.0	13.0	11.0	6.5	10.0
0.022	13.0	10.0	6.0	10.0	13.0	11.0	6.5	10.0
0.033	13.0	11.0	6.5	10.0	18.0	10.0	6.5	15.0
0.047	13.0	11.5	7.0	10.0	18.0	11.0	7.0	15.0
0.068	13.0	12.5	7.0	10.0	18.0	12.0	8.0	15.0
0.1	18.0	11.0	6.0	15.0	18.0	15.0	8.5	15.0
0.15	18.0	14.0	8.0	15.0	18.0	15.5	11.0	15.0
0.22	18.0	16.5	9.5	15.0	24.0	16.5	10.5	20.0
0.33	18.0	16.5	10.0	15.0	24.0	18.0	12.0	20.0
0.47	24.0	17.5	10.5	20.0	30.0	22.0	12.5	27.5
0.68	30.0	18.0	10.5	27.5	30.0	23.5	14.0	27.5
1.0	30.0	21.5	12.0	27.5	30.0	25.5	15.0	27.5
1.5	30.0	24.0	14.0	27.5	33.0	28.0	20.0	30.0
2.2	33.0	26.0	18.0	30.0				
3.3	33.0	28.0	21.0	30.0				

DIMENSIONS AND TOLERANCES:

d - 0.6 mm (0.024") for Lead Spacing "s" = 10.0 mm (0.40")
 d - 0.8 mm (0.032") for Lead Spacing "s" > 10.0 mm (0.40")
 z - 1.5mm (0.06") max.
 LL" - 20.0 mm min.(0.78")
 Tolerance on "s" ± 1.0mm (0.04") for s ≤ 15mm(0.6").
 Tolerance on "s" ± 1.5mm (0.06") for s ≤ 20mm(0.78").
 Tolerance on "s" ± 2.0mm (0.08") for s ≤ 27.5mm(1.08").



PULSE RISE TIME (dv/dt) Volts per μsec.

Rated Voltage	LEAD SPACING mm (inches)			
	10.0 (0.40)	15.0 (0.60)	22.5 (0.89)	27.0 (1.06)
100	6	3	2	1
250	11	7	4	3
400	20	10	5.5	5
630	30	15	8	7

Case Dimensions in Millimeters 100V • 250V • 400V • 630V

Capacitance in μF	VOLTAGE DC/AC							
	100 V DC / 63 V AC				250 V DC / 160 V AC			
	Dimensions in Inches							
	L	H	T	S	L	H	T	S
0.01	0.512	0.394	0.217	0.394	0.512	0.394	0.217	0.394
0.015	0.512	0.394	0.236	0.394	0.512	0.394	0.236	0.394
0.022	0.512	0.394	0.236	0.394	0.512	0.394	0.236	0.394
0.033	0.512	0.394	0.236	0.394	0.512	0.394	0.236	0.394
0.047	0.512	0.394	0.236	0.394	0.512	0.394	0.236	0.394
0.068	0.512	0.433	0.256	0.394	0.512	0.433	0.256	0.394
0.1	0.512	0.492	0.276	0.394	0.512	0.492	0.276	0.394
0.15	0.512	0.492	0.315	0.394	0.512	0.492	0.315	0.394
0.22	0.512	0.492	0.315	0.394	0.709	0.512	0.276	0.591
0.33	0.531	0.551	0.354	0.394	0.709	0.551	0.315	0.591
0.47	0.531	0.591	0.394	0.394	0.709	0.630	0.374	0.591
0.68	0.709	0.531	0.315	0.591	0.945	0.551	0.374	0.787
1.0	0.709	0.650	0.374	0.591	0.945	0.709	0.413	0.787
1.5	0.709	0.748	0.453	0.591	0.945	0.906	0.531	0.787
2.2	0.945	0.827	0.492	0.787	1.181	0.906	0.531	1.083
3.3	0.945	0.866	0.512	0.787	1.181	0.945	0.650	1.083
4.7	1.181	0.925	0.551	1.083	1.299	0.945	0.709	1.181
6.8	1.181	0.945	0.610	1.083	1.299	1.024	0.787	1.181
10	1.181	1.024	0.846	1.083				

Capacitance in μF	VOLTAGE DC/AC							
	400 V DC / 200 V AC				630 V DC / 220 V AC			
	Dimensions in Inches							
	L	H	T	S	L	H	T	S
0.01	0.512	0.394	0.217	0.394	0.512	0.413	0.236	0.394
0.015	0.512	0.394	0.236	0.394	0.512	0.433	0.256	0.394
0.022	0.512	0.394	0.236	0.394	0.512	0.433	0.256	0.394
0.033	0.512	0.433	0.256	0.394	0.709	0.394	0.256	0.591
0.047	0.512	0.453	0.276	0.394	0.709	0.433	0.276	0.591
0.068	0.512	0.492	0.276	0.394	0.709	0.472	0.315	0.591
0.1	0.709	0.433	0.236	0.591	0.709	0.591	0.335	0.591
0.15	0.709	0.551	0.315	0.591	0.709	0.610	0.433	0.591
0.22	0.709	0.650	0.374	0.591	0.945	0.650	0.413	0.787
0.33	0.709	0.650	0.394	0.591	0.945	0.709	0.472	0.787
0.47	0.945	0.689	0.413	0.787	1.181	0.866	0.492	1.083
0.68	1.181	0.709	0.413	1.083	1.181	0.925	0.551	1.083
1.0	1.181	0.846	0.472	1.083	1.181	1.004	0.591	1.083
1.5	1.181	0.945	0.551	1.083	1.299	1.102	0.787	1.181
2.2	1.299	1.024	0.709	1.181				
3.3	1.299	1.102	0.827	1.181				

SURFACE MOUNT TANTALUMS



PART NUMBERING & ORDERING INFORMATION

Example below indicates: SMT Series, B Case Size, 10µF, 10% Tol., 16 Volts, 7" Reel (-) orientation, 2000 pcs/reel.

(EXAMPLE) **S M T** **T** **1 0 6** **K** **1 6** **R**

Series
Series Code: SMT, SMR, SMF

Case Code
Case Code:

Case Code	R	A2	A	B2	B	H
EIA Code	2012	3216L	3216	3528L	3528	4726

Case Code	C2	C	D2	D	E	F
EIA Code	6032L	6032	6045	7343	7343H	7358

Capacitance
3 Digit Capacitance Code:

Capacitance µF	Code	Capacitance µF	Code
0.1	104	6.8	885
0.15	154	10	106
0.22	224	15	156
0.33	334	22	226
0.47	474	33	336
0.68	684	47	476
1.0	105	68	686
1.5	155	100	107
2.2	225	150	157
3.3	335	220	227
4.7	475	330	337

First Two Digits Represent Significant Figures of Capacitance in Picofarads.
Third Digit Indicates Number of Zeros

Tolerance

Capacitance Tolerance Code:

Capacitance Tolerance	±20%	±10%	±5%
Code	M	K	J

Rated Voltage

2 Digit Voltage Code:

Rated Voltage	4V	6.3V	10V	16V	20V	25V	35V	50V
Code	04	06	10	16	20	25	35	50

Product Orientation & Reel Pack Spec Code

Code	REEL Dia. mm (inch)	Product Orientation
R	178 (7)	Negative (-) side to the feed hole
L	178 (7)	Positive (+) side to the feed hole
P	330 (13)	Negative (-) side to the feed hole
N	330 (13)	Positive (+) side to the feed hole
B		BULK

7" Reel (178mm)

Case Code	R	A2	A	B2	B	H	C2	C	D2	D	E	F
Reel Qty Code	302	302	202	302	202	202	501	501	501	501	401	401
Reel Quantity	3000	3000	2000	3000	2000	2000	500	500	500	500	400	400

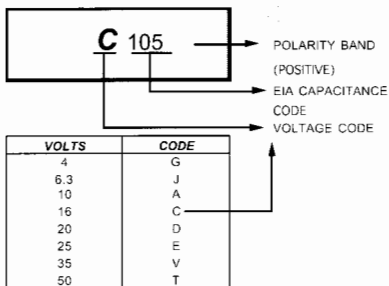
13" Reel (330mm)

Case Code	R	A2	A	B2	B	H	C2	C	D2	D	E	F
Reel Qty Code	103	153	902	103	802	802	302	302	252	252	152	152
Reel Quantity	10000	15000	9000	10000	8000	8000	3000	3000	2500	2500	1500	1500

CAPACITOR SPECIALISTS INTERNATIONAL INC., reserves the right to make, from time to time, such departures from the detail specifications as may be required to permit improvements in the design of its products. The information included herein is believed to be accurate and reliable. However, CAPACITOR SPECIALISTS INTERNATIONAL INC., assumes no responsibility for its use; nor for any infringements of patents or other rights of third parties which may result from its use.

PART MARKING: Parts will be marked by one of two methods shown below.

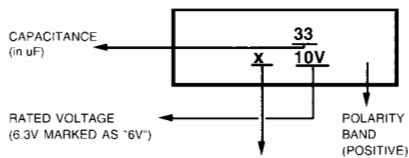
Method 1



VARIATIONS:
• POLARITY ON LEFT SIDE AND MARKING RIGHT SIDE UP ALLOWED.
• "CSII" BRAND AND DATE CODE OMISSIONS ALLOWED.

Voltage Code Omissions Allowed for Small Case Sizes

Method 2



The DATE CODE may be used if space permits.

YEAR	JANUARY-- DECEMBER
1992	n p q r s t u v w x y z
1993	A B C D E F G H J K L M
1994	N P Q R S T U V W X Y Z
1995	a b c d e f g h i j k l m

Example: June 1992 = "1"
The date codes will resume in the same fashion for years 1996, 1997, 1998, 1999

OR

TWO DIGIT CODE AS PER IEC 62

Alphabetic code for the year - C for 1992, D for 1993, etc. Numeric/Alpha Code for the month 1 to 9 for January to September, O for October; N for November and D for December.

NOTE:
The "CSII" trademark may be used if space permits.

Example: November 1993 = DN

PART MARKING ADDITIONAL OPTIONS FOR TANTALUM

Cap Value in µF	Capacitance Code	Marking Code
0.10	104	A5
0.15	154	E5
0.22	224	J5
0.33	224	N5
0.47	474	S5
0.68	684	W5
1.0	105	A6
1.5	155	E6
2.2	225	J6
3.3	335	N6
4.7	475	S6
6.8	685	W6
10	106	A7
15	156	E7
22	226	J7
33	336	N7
47	476	S7
68	686	W7

Voltage VDC	Voltage Code
4	G
7	J
10	A
16	C
20	D
25	E
35	V



PERFORMANCE CHARACTERISTICS

ELECTRICAL - BASIC PARAMETERS

1.1 RATED CAPACITANCE

The nominal or rated value of the capacitor is measured at 25°C in a measuring bridge with 120 Hz source, free of harmonics, with 2.2V DC bias max. Capacitance is temperature and frequency dependent. Please refer to relevant series for the capacitance range covered. Nature of temperature and frequency dependence of capacitance is explained in sections 2.3 and 2.4 respectively.

1.2 CAPACITANCE TOLERANCE

The permitted variation of actual value from the nominal value is termed the tolerance. The tolerance is expressed in percentage. Please refer to relevant series for standard tolerances in which the component is available.

1.3 RATED VOLTAGE

This is the DC Voltage at which the capacitor can operate continuously up to a temperature of 85 °C. Values are listed under different voltages in each series.

1.4 CATEGORY VOLTAGE (FIG. 1.4)

The maximum voltage that may be applied continuously over the temperature range is termed the category voltage. This is the same as the rated voltage up to 85°C. After this and up to 125°C, linear derating of 2/3 rated voltage must be applied. Maximum permissible voltage at any temperature in this range follows the relation given below.

$$V_{max} = \left(1 - \frac{T-85}{120}\right) \times VR$$

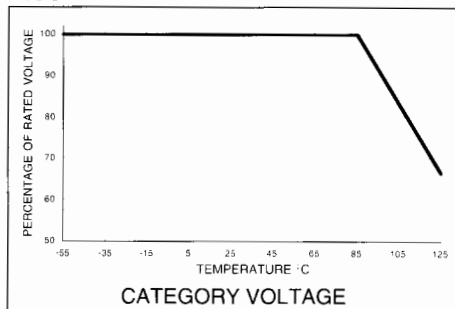
V_{max} - Derated voltage at any temperature in the 85° to 125°C range

VR - Rated voltage

T - Temperature in degrees centigrade in the 85° to 125°C range

This is also illustrated in FIGURE 1.4 below;

FIGURE 1.4



1.5 OPERATING TEMPERATURE

This is the temperature, within the range of -55° to +125°C, at which the component can function. Please refer to relevant sections for derating particulars for operating above 85°C.

1.6 DISSIPATION FACTOR

This is the measurement of tangent of loss angle (tan δ) and is expressed as a percentage. Measurement of dissipation factor is carried out at 25°C and 120 Hz with 2.2 V DC bias max. with an AC voltage, free of harmonics. Value of dissipation factor is temperature and frequency dependent. Nature of temperature and frequency dependence of dissipation factor is explained in sections 2.5 and 2.6 respectively. Quality factor Q is the reciprocal of dissipation factor.

1.7 EQUIVALENT SERIES RESISTANCE

Resistance of the component, contacts and the parallel current path etc., within a capacitor contribute to the resistance losses in the actual capacitor. These losses are considered the net Equivalent Series Resistance (ESR) of the capacitor. Measured at 25°C and 100 KHz, ESR is frequency and temperature dependent.

The electrical relation of ESR to other parameters is given below:

$$ESR = \frac{\tan \delta}{\omega C}$$

$$\omega = 2\pi f$$

$$ESR = \frac{\tan \delta}{2\pi f C}$$

ESR - Equivalent Series Resistance in ohms

f - Frequency in Hz.

C - Capacitance in farads

1.8 DC LEAKAGE CURRENT

DC leakage current is the current that flows through a capacitor at rated voltage, after the initial charging period. DC leakage current is measured at 25°C, after applying rated voltage through a 1 KΩ protective resistance for 3 minutes. Leakage current is voltage and temperature dependent.

1.9 IMPEDANCE (Z)

Impedance is the ratio of voltage to current at any given frequency. The capacitance, the resistance of the semi conducting layer and the inductance of the electrodes and leads influence the impedance of a tantalum electrolytic capacitor. The impedance is measured at 100 KHz., at 0.5 V rms and 25°C. Impedance is frequency dependent.

1.10 SURGE VOLTAGE

The highest voltage that the capacitor may be subjected to, for short periods of time, is the surge voltage. A period of 30 seconds at a time and up to 10 times in an hour is considered the maximum allowable. Surge voltage handling capacity should not be used as a parameter in the design of circuits if the capacitor has to be periodically charged and discharged but rather should be considered a built-in safety parameter. Please refer to relevant series rating tables for surge voltage values.

ELECTRICAL - EFFECTS AND RELATIONS

2.1 EFFECT OF SURGES

Like most other electrolytic capacitors the solid tantalum electrolytics have only limited ability to handle surges (15 to 30% of rated voltage). The component must be designed to ensure that the voltage across the capacitor does not exceed the surge voltage rating at any time. Short duration spikes can also cause damage. This is all the more important in low impedance circuits where the capacitor is likely to get the full impact of surges. If such situations are expected, a higher voltage rated capacitor should be considered. Please refer to rating and case code table for the relevant series to choose alternate components.

2.2 REVERSE VOLTAGE AND NON-POLAR OPERATIONS

Solid tantalum capacitors are not designed for non-polar or reverse voltage applications. However if such situations arise in the circuit, which are not continuous in nature, the peak rated voltage applied must not exceed:

1. 10% of rated DC voltage at 25°C or 1 V whichever is less
2. 3% of rated DC voltage at 85°C or 0.5 V whichever is less.
3. 1% of category DC working voltage or 0.1 V at 125°C whichever is less.

2.3 TEMPERATURE DEPENDENCE OF CAPACITANCE (FIG. 2.3)

Capacitance of a tantalum electrolytic capacitor varies with temperature. The variation depends upon rated voltage and capacitor size. Typical change of capacitance with temperature is shown in FIGURE 2.3



FIGURE 2.3

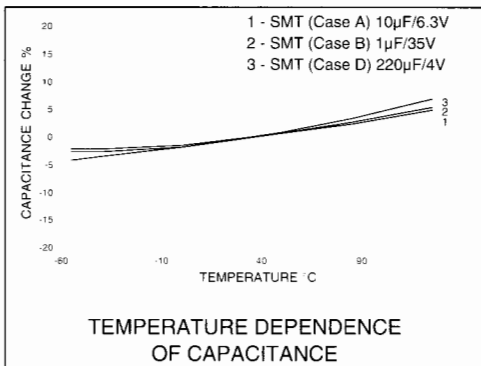
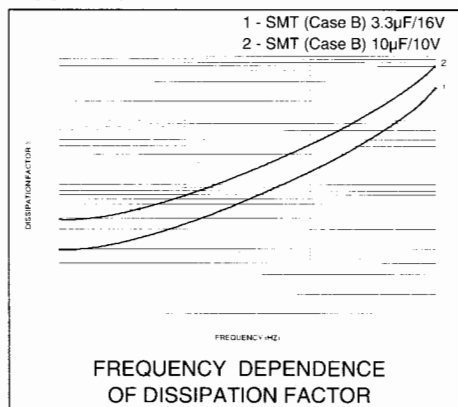


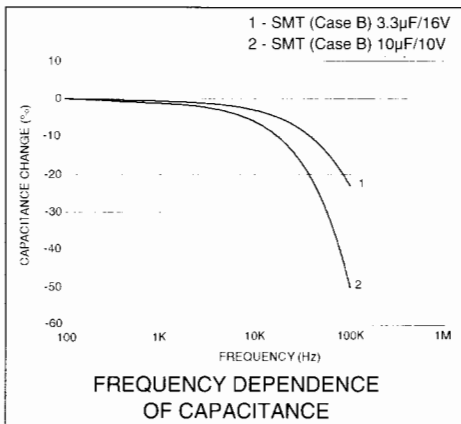
FIGURE 2.6



2.4 FREQUENCY DEPENDENCE OF CAPACITANCE (FIG. 2.4)

As the frequency goes up the effective capacitance comes down. Above 100 KHz the capacitance drops rapidly until resonance is reached. FIGURE 2.4 shows the typical variation of capacitance with frequency.

FIGURE 2.4

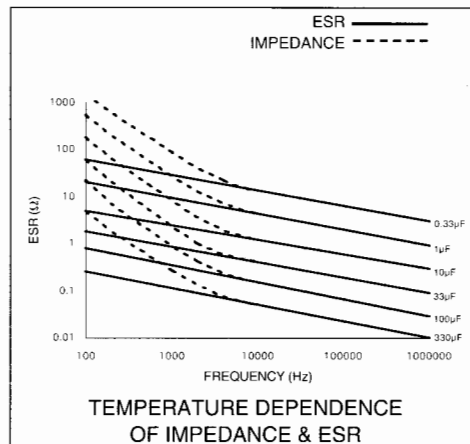


ELECTRICAL - EFFECTS AND RELATIONS

2.7 TEMPERATURE DEPENDENCE OF IMPEDANCE & ESR (FIG. 2.7)

Impedance and ESR are identical at 100 KHz. and decrease with increase in temperature. FIGURE 2.7 shows typical curves for selected values.

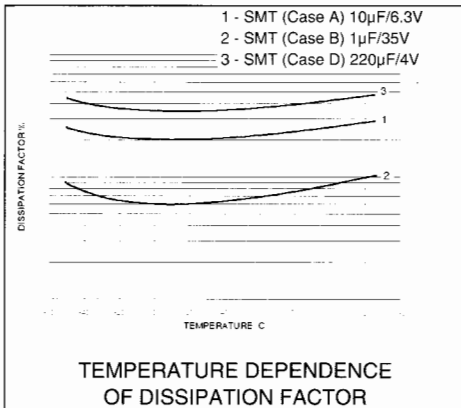
FIGURE 2.7



2.5 TEMPERATURE DEPENDENCE OF DISSIPATION FACTOR (FIG 2.5)

Dissipation factor varies with temperature. The minimum values of dissipation factor are achieved in the temperature range of 0 to 20°C. The variation pattern of dissipation factor with temperature for typical values is shown in FIGURE 2.5.

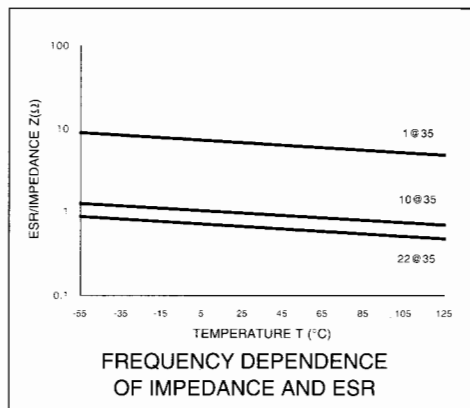
FIGURE 2.5



2.8 FREQUENCY DEPENDENCE OF IMPEDANCE AND ESR (FIG. 2.8)

Impedance and ESR are both inversely proportional to frequency. Impedance increases more rapidly at lower frequencies as extra contribution to impedance, due to resistance of semiconducting layer, becomes predominant. FIGURE 2.8 shows the variation for typical values.

FIGURE 2.8



2.6 FREQUENCY DEPENDENCE OF DISSIPATION FACTOR (FIG. 2.6)

Dissipation Factor increases with frequency. The normal effect of frequency on typical values see FIGURE 2.6.



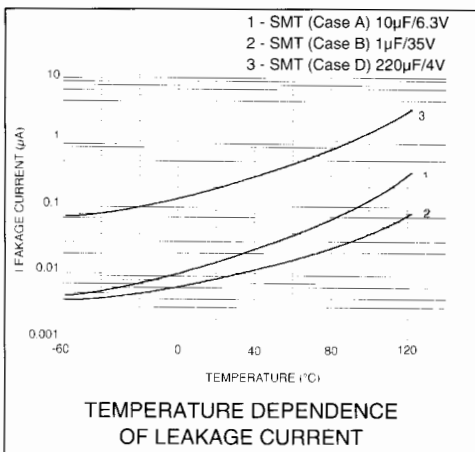
SURFACE MOUNT TANTALUMS

PERFORMANCE CHARACTERISTICS

2.9 TEMPERATURE DEPENDENCE OF LEAKAGE CURRENT (FIG. 2.9)

Leakage current increases as the temperature goes up. The variation pattern of leakage current for a typical component is shown in FIGURE 2.9.

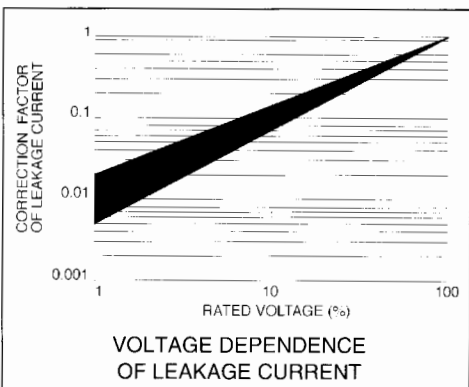
FIGURE 2.9



2.10 VOLTAGE DEPENDENCE OF LEAKAGE CURRENT (FIG 2.10)

The DC leakage current is reduced when applied voltage is reduced from the rated voltage. The pattern of reduction of leakage current with reduction of applied voltage, for a typical component, is shown in FIGURE 2.10. This feature can be used for derating a component to ensure higher reliability.

FIGURE 2.10



ELECTRICAL - RIPPLE RATINGS

3.1 RIPPLE RATINGS

When a capacitor is used in an AC circuit, the component becomes heated from within. The heat generated depends upon the signal form, amplitude and frequency of the AC signal, the ESR and the power dissipation capability of the component.

3.2 RIPPLE VOLTAGE AND RIPPLE CURRENT

The maximum permissible AC ripple voltage that may be applied on the chip tantalum capacitor is limited by the following criteria.

1. The peak AC voltage plus the DC bias voltage should be within the voltage rating of the capacitor.
2. The negative peak AC voltage, along with the DC bias voltage, should not exceed DC voltage rating specified in section 1.4
3. The power dissipated in the capacitor should be within the value specified in Table 1.

TABLE 1 - POWER DISSIPATION RATINGS

Case Size	Max Power Dissipation (W)
R	0.040
A2	0.060
A	0.070
B2	0.070
B	0.080
H	0.085
C2	0.090
C	0.110
D2	0.145
D	0.150
E	0.165
F	0.165

The actual power dissipation in a capacitor follows the relation:

$$P = I^2 R \quad I = \frac{E}{Z} \quad P = \frac{E^2}{Z^2} R$$

Where;

- I = Ripple current rms - amperes
- R = Equivalent Series Resistance in ohms
- E = Ripple voltage rms in volts
- P = Power dissipated in watts
- Z = Impedance at relevant frequency in ohms

From the above relation the maximum allowable ripple voltage rms will be:

$$E = Z \sqrt{\frac{P}{R}}$$

The value of maximum ripple voltage refers to operating temperature of 25°C. For operations at temperatures above 25°C the maximum allowable ripple voltage must be derated as follows:

$$\text{Erms (50°C)} - 0.7x \text{ Erms at 25°C}$$

$$\text{Erms (85°C)} - 0.5x \text{ Erms at 25°C}$$

3.3 MAXIMUM PERMISSIBLE POWER DISSIPATION

The maximum permissible power dissipation depends on the construction of the component as well as the case size. The values at 25°C for different case sizes are listed in Table 1. As the power dissipation capability of the component depends on the ambient temperature it has to be derated for operations above 25°C. Derating factors for different temperatures are furnished in Table 2. In actual application, factors such as circuit layout, signal wave form, ventilation etc.. will affect the power dissipation capabilities significantly. To ensure that the components are functioning within the temperature range, it is recommended to measure the temperature differential between the component and the ambient. The temperature differential must be maintained below 8°C up to 85°C and below 2°C between 85°C and 125°C.

MECHANICAL CHARACTERISTICS

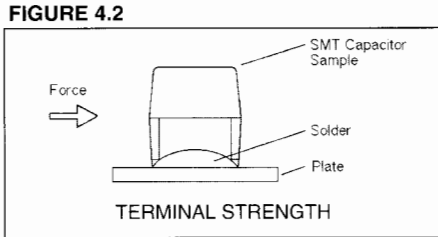
4.1 RESISTANCE TO SOLVENTS

When cleaned with Trichloroethene or Freon as a solvent in an ultrasonic cleaner with a frequency of 45 KHz and an output power of 500 watts, the specimen shall have legible markings and no remarkable abnormality after 5 minutes of cleaning. After immersing the sample into Trichloroethene solvent at room temperature for 60±10seconds and exposing it for 4 hours to room temperature, the values of leakage current and dissipation factor will be within the initial values. The capacitance shall be within ±3% of the initial value and there will be no abnormality in the appearance.



4.2 TERMINAL STRENGTH (FIG. 4.2)

A sample soldered to a base plate is pushed sideways horizontally with 1.5 Kg force as shown in Figure 4.2. It shall withstand the test with no evidence of mechanical degradation of terminals or the capacitor body.



4.3 SOLDERABILITY

Terminals of the capacitor being tested are immersed in the methanol (JIS K 1501) - rosin (JIS K 5902) solution at room temperature for 5 to 10 seconds and then dipped in a molten solder (JIS Z 3282, H63A) bath at $230 \pm 5^\circ\text{C}$ for 2 ± 1 sec. When removed, a minimum of 3/4 of the circumferential surface of the termination shall be covered with new solder.

4.4 VIBRATION

During the vibration test, capacitor samples will be subjected to vibration cycles consisting of 10 to 55 Hz and returning to 10 Hz in one minute with a total excursion of 1.5 mm. The vibration test shall be carried out on all three planes for a period of two hours per plane. When electrical tests are carried out in each plane, the values of leakage current and dissipation factor shall remain within the initial values. Capacitance shall be within $\pm 5\%$ of the initial value and the markings shall remain legible with no abnormalities in appearance.

ENVIRONMENTAL DATA

5.1 RESISTANCE TO MOISTURE

Capacitor samples will be subjected to temperature cycling at 90% to 95% relative humidity, from $+25^\circ\text{C}$ to $+65^\circ\text{C}$ and then to $+25^\circ\text{C}$ over a period of 8 hours. This cycle will be repeated for 1000 hours. After the test the values of leakage current and dissipation factor shall remain within the initial values. The capacitance shall remain within $\pm 10\%$ of the initial value.

5.2 RESISTANCE TO HUMIDITY

Capacitor samples will be exposed to 85% relative humidity and $+85^\circ\text{C}$ at full rated voltage for 1000 hours. After the test the leakage current shall not exceed two times the initial specified limit and the dissipation factor shall not exceed 1.5 times the initial specification. The capacitance shall remain within $\pm 10\%$ of the initial value.

RELIABILITY DATA

6.1 RELIABILITY

Solid tantalum capacitors do not show any wear during actual use. They also show a consistently decreasing failure rate during life test. However random failures can happen during operation. The three important operating conditions which influence failure are:

1. Operating voltage
2. Operating temperature
3. Circuit impedance

As the voltage and temperature decrease, the failure rate reduces. Failure rate also reduces with increase in circuit impedance. Operation reliability generally improves under these conditions.

6.2 FAILURE RATE

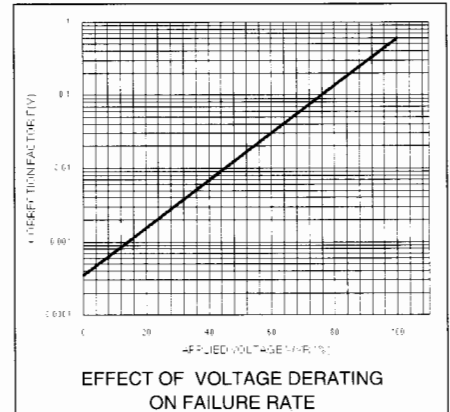
Standard solid tantalum capacitors conform to a failure rate of 1% per 1000 hrs. This corresponds to level M reliability. The high reliability series (CSII) has a reduced failure rate of 0.5% per 1000 hrs. These figures are to be considered as the base failure rate. The effect of actual operating conditions on failure rate is explained in sections 6.3 - 6.5

6.3 EFFECT OF VOLTAGE DERATING ON FAILURE RATE (FIG. 6.3)

When a capacitor with a higher rating is used in a circuit with a maximum operating voltage less than the rated voltage, it is known as voltage derating.

By reducing the operating voltage below the rated voltage the failure rate can be reduced. The relation between failure rate and voltage derating (expressed as a ratio of applied to rated voltage) is shown in the Figure 6.3. The correction factor $F(V)$ for any operating voltage, below the rated voltage can be obtained from this graph.

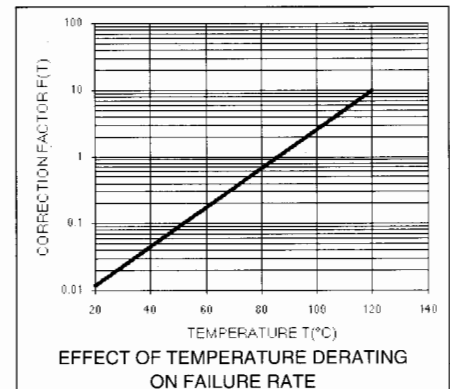
FIGURE 6.3



6.4 EFFECT OF TEMPERATURE DERATING ON FAILURE RATE (FIG. 6.4)

When a solid tantalum capacitor is operated at temperatures below the rated temperature the failure rate reduces and the operating reliability improves. The correction factor $F(T)$ for any operating temperature can be obtained from the Figure 6.4

FIGURE 6.4

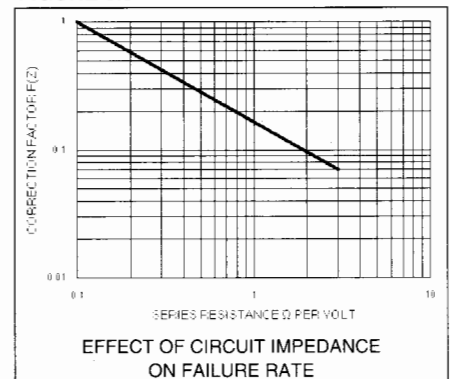


6.5 EFFECT OF CIRCUIT IMPEDANCE ON FAILURE RATE (FIG. 6.5)

As low circuit impedance causes an increase in failure rate, a series resistance is always recommended. As the circuit impedance increases the operating reliability improves.

The minimum circuit impedance required is 0.1 ohms per volt or 3 ohms max. The recommended circuit impedance is 1 ohm per volt. The correction factor for circuit impedance $F(Z)$, for different values can be obtained from the Figure 6.5

FIGURE 6.5





SURFACE MOUNT TANTALUMS

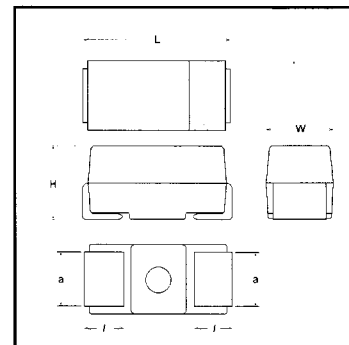
SMT SERIES

INTRODUCTION

The SMT series Tantalum Chip Capacitors cover a wide range of values and applications. The Extended range of this series cover higher capacitance values in smaller case sizes. Also included are low profile capacitors developed for special applications where height is critical.

FEATURES:

- HIGH SOLDER HEAT RESISTANCE - 269°C, 5 TO 10 SECS.
- ULTRA COMPACT SIZES IN EXTENDED RANGE (**BOLD PRINT**) ALLOWS HIGH DENSITY COMPONENT MOUNTING.
- LOW PROFILE CAPACITORS WITH HEIGHT 1.2MM MAX (A2 & B2) AND 1.5MM MAX (C2) FOR USE ON PCB'S, WHERE HEIGHT IS CRITICAL.
- COMPONENTS MEET IEC SPEC QC 300801/US0001 AND EIA 535BAAC. REEL PACKING STDS- EIAJ RC-1009B /EIA 481/IEC 286-3.
- EPOXY MOLDED COMPONENTS WITH CONSISTENT DIMENSIONS AND SURFACE FINISH. ENGINEERED FOR AUTOMATIC ONsertION.
- COMPATIBLE WITH ALL POPULAR HIGH SPEED ASSEMBLY MACHINES.



GENERAL SPECIFICATIONS

CAPACITANCE RANGE: 0.1 μ F to 330 μ F. **VOLTAGE RANGE:** 4VDC to 50VDC. **CAPACITANCE TOLERANCE:** \pm 20%(M), \pm 10%(K), (\pm 5%(J) - UPON REQUEST). **TEMPERATURE RANGE:** -55 to +125°C WITH DERATING ABOVE 85°C. **ENVIRONMENTAL CLASSIFICATION:** 55/125/56 (IEC68-2). **DISSIPATION FACTOR:** 0.1 to 1 μ F 4% MAX, 1.5 TO 6.8 μ F 6% MAX, 10 to 330 μ F 8% MAX. **LEAKAGE CURRENT:** NOT MORE THAN 0.01CV μ A or 0.5 μ A WHICH EVER IS GREATER. **FAILURE RATE:** 1% PER 1000 HRS.

LIFE TEST DETAILS

CAPACITORS SHALL WITHSTAND RATED DC VOLTAGE APPLIED AT 85°C FOR 2000 HRS OR DERATED DC VOLTAGE APPLIED AT 125°C FOR 1000 HRS. AFTER THE TEST:

1. CAPACITANCE CHANGE SHALL NOT EXCEED \pm 10% OF INITIAL VALUE.
2. DISSIPATION FACTOR SHALL BE WITHIN THE NORMAL SPECIFIED LIMITS.
3. DC LEAKAGE CURRENT SHALL BE WITHIN 125% OF NORMAL LIMIT.
4. NO REMARKABLE CHANGE IN APPEARANCE. MARKINGS TO REMAIN LEGIBLE.

CASE DIMENSIONS IN MILLIMETERS (INCHES)						
CASE	EIA/IEC	L	W	H	l	a
R	2012	2.05 \pm 0.2 (0.08 \pm 0.008)	1.3 \pm 0.2 (0.05 \pm 0.008)	1.2 \pm 0.2 (0.047 \pm 0.008)	0.5 \pm 0.3 (0.020 \pm 0.012)	1.2 \pm 0.1 (0.047 \pm 0.004)
A2	3216L	3.2 \pm 0.2 (0.126 \pm 0.008)	1.6 \pm 0.2 (0.063 \pm 0.008)	1.2 \pm 0.2 (0.047 \pm 0.008)	0.7 \pm 0.3 (0.028 \pm 0.012)	1.2 \pm 0.1 (0.047 \pm 0.004)
A	3216	3.2 \pm 0.2 (0.126 \pm 0.008)	1.6 \pm 0.2 (0.063 \pm 0.008)	1.6 \pm 0.2 (0.063 \pm 0.008)	0.8 \pm 0.3 (0.032 \pm 0.012)	1.2 \pm 0.1 (0.047 \pm 0.004)
B2	3528L	3.5 \pm 0.2 (0.138 \pm 0.008)	2.8 \pm 0.2 (0.110 \pm 0.008)	1.2 \pm 0.2 (0.047 \pm 0.008)	0.7 \pm 0.3 (0.028 \pm 0.012)	1.8 \pm 0.1 (0.071 \pm 0.004)
B	3528	3.5 \pm 0.2 (0.138 \pm 0.008)	2.8 \pm 0.2 (0.110 \pm 0.008)	1.9 \pm 0.2 (0.075 \pm 0.008)	0.8 \pm 0.3 (0.031 \pm 0.012)	2.2 \pm 0.1 (0.087 \pm 0.004)
H	4726	4.8 \pm 0.2 (0.189 \pm 0.008)	2.6 \pm 0.2 (0.102 \pm 0.008)	1.8 \pm 0.2 (0.071 \pm 0.008)	0.8 \pm 0.3 (0.032 \pm 0.012)	1.8 \pm 0.1 (0.071 \pm 0.004)
C2	6032L	5.8 \pm 0.2 (0.228 \pm 0.008)	3.2 \pm 0.2 (0.126 \pm 0.008)	1.5 \pm 0.2 (0.059 \pm 0.008)	0.7 \pm 0.3 (0.028 \pm 0.012)	2.2 \pm 0.1 (0.087 \pm 0.004)
C	6032	6.0 \pm 0.3 (0.236 \pm 0.012)	3.2 \pm 0.3 (0.126 \pm 0.012)	2.5 \pm 0.3 (0.098 \pm 0.012)	1.3 \pm 0.3 (0.051 \pm 0.012)	2.2 \pm 0.1 (0.087 \pm 0.004)
D2	6045	5.8 \pm 0.3 (0.228 \pm 0.012)	4.5 \pm 0.3 (0.177 \pm 0.012)	3.1 \pm 0.3 (0.122 \pm 0.012)	1.3 \pm 0.3 (0.051 \pm 0.012)	3.1 \pm 0.1 (0.122 \pm 0.004)
D	7343	7.3 \pm 0.3 (0.287 \pm 0.012)	4.3 \pm 0.3 (0.170 \pm 0.012)	2.8 \pm 0.3 (0.110 \pm 0.012)	1.3 \pm 0.3 (0.051 \pm 0.012)	2.4 \pm 0.1 (0.095 \pm 0.004)
E	7343H (TALLER)	7.3 \pm 0.3 (0.287 \pm 0.012)	4.3 \pm 0.3 (0.170 \pm 0.012)	4.0 \pm 0.3 (0.158 \pm 0.012)	1.3 \pm 0.3 (0.051 \pm 0.012)	2.4 \pm 0.1 (0.095 \pm 0.004)

SURFACE MOUNT TANTALUMS



SMT SERIES RATINGS AND CASE CODES

STD = STANDARD RANGE.
EXT = EXTENDED RANGE
& SPECIAL SIZES.
* = CONSULT FACTORY

CAPACITANCE CODE	μF	RATED VOLTAGE DC at 85 °C																																
		4V		6.3V		10V		16V		20V		25V		35V		50V																		
		STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT	STD	EXT																	
104	0.1																A2			A			A											
154	0.15																	A2			A			B	A									
224	0.22																	A2			A			B										
334	0.33																	A2			A			B										
474	0.47																	R, A2	A		B	A	C	B										
684	0.68																	R, A2	A	A2	A		B	A	C									
105	1.0									R, A2	A	A2	A					B2	B	A	B	A	C											
155	1.5																		A, B2	B	A	C	B		D2, D	C								
225	2.2																		A, B2	B		C	B*		D2, D	C								
335	3.3	A		A2	A														A, B2	B	A, B2	B		C	B	D	D2							
475	4.7	A																		A, B2	B	A, B2	B		C	B, H	C	D2, D	C	D				
685	6.8																			A, B2	B	A, B2	B	A	C	B, H, C2	C	B, C2	D	C	D2, D	C		E*
106	10	B																		A, B2	B	A	C	B, H, C2	C	B, C2*	D	C	D2, D	C	D	D2		E*
156	15	B																		A	C	B, H, C2	C	B, H, C2			C	D2, D	C	D	D2		E	
226	22	C																		B, H, C2	C	B, H, C2		B, C	D2, D	C	D	D2		D2, D		E		
336	33	C																		B, H, C2		B, C	D2, D	C	D	D2		D2, D		E				
476	47																			B, C	D2, D	C	D	D2		D2, D		E						
686	68	D2, D																		C	D	D2		D2		D		E						
107	100	D																		D2	D	D2	E	D		E								
157	150																			D2, D	E	D		E										
227	220	E																		D		E		E*										
337	330																			E*		E*												

SMT SERIES SPECIFICATIONS

NOTE: EXTENDED RANGE & SPECIAL CASE SIZES SHOWN IN BOLD. FOR 10% TOLERANCE CHANGE TOLERANCE CODE FROM M TO K. FOR 5% TOLERANCE CHANGE TOLERANCE CODE FROM M TO J. STANDARD REEL SIZE AND ORIENTATION = R. FOR OTHER SEE ORDERING INFORMATION ON PAGE 3. * = CONSULT FACTORY.

4 V DC Rated Voltage

Surge Voltage 5 V DC @ 85°C, 3.2 V DC @ 125°C

CSII NUMBER	CAP VALUE μF	DCL (MAX) μA	DF% (MAX) at +25 °C	ESR(max) OHMS at 100KHz	RIPPLE (max) Irms Amps at 100 KHz
SMT R 225 M 04 R	2.2	0.5	6	25.0	0.040
SMT A2 225 M 04 R	2.2	0.5	6	25.0	0.043
SMT A2 335 M 04 R	3.3	0.5	6	18.0	0.058
SMT A 335 M 04 R	3.3	0.5	6	9.0	0.088
SMT A 475 M 04 R	4.7	0.5	6	7.5	0.097
SMT A 685 M 04 R	6.8	0.5	6	6.5	0.104
SMT B2 685 M 04 R	6.8	0.5	6	6.5	0.104
SMT A 106 M 04 R	10	0.5	6	6.0	0.108
SMT B2 106 M 04 R	10	0.5	6	6.0	0.108
SMT B 106 M 04 R	10	0.5	6	4.0	0.141
SMT A 156 M 04 R	15	0.6	6	4.0	0.132
SMT B 156 M 04 R	15	0.6	6	3.5	0.151
SMT B 226 M 04 R	22	0.9	6	3.2	0.158
SMT H 226 M 04 R	22	0.9	6	3.2	0.163
SMT C2 226 M 04 R	22	0.9	6	3.2	0.168
SMT C 226 M 04 R	22	0.9	6	2.5	0.210
SMT B 336 M 04 R	33	1.3	6	2.4	0.183
SMT H 336 M 04 R	33	1.3	6	2.4	0.188
SMT C2 336 M 04 R	33	1.3	6	2.4	0.194
SMT C 336 M 04 R	33	1.3	6	2.2	0.224
SMT B 476 M 04 R	47	1.9	6	2.2	0.191
SMT C 476 M 04 R	47	1.9	6	1.8	0.247
SMT C 686 M 04 R	68	2.7	6	1.6	0.262
SMT D2 686 M 04 R	68	2.7	6	1.1	0.363
SMT D 686 M 04 R	68	2.7	6	1.1	0.369
SMT D2 107 M 04 R	100	4.0	8	0.9	0.401
SMT D 107 M 04 R	100	4.0	8	0.9	0.408
SMT D2 157 M 04 R	150	6.0	8	0.7	0.455
SMT D 157 M 04 R	150	6.0	8	0.7	0.463
SMT D 227 M 04 R	220	8.8	8	0.7	0.463
SMT E 227 M 04 R	220	8.8	8	0.6	0.524
SMT E* 337 M 04 R	330	13.2	8	0.6	0.524

6 V DC Rated Voltage

Surge Voltage 8 V DC @ 85°C, 5 V DC @ 125°C

CSII NUMBER	CAP VALUE μF	DCL (MAX) μA	DF% (MAX) at +25 °C	ESR(max) OHMS at 100KHz	RIPPLE (max) Irms Amps at 100 KHz
SMT R 155 M 06 R	1.5	0.5	6	25.0	0.040
SMT A2 155 M 06 R	1.5	0.5	6	25.0	0.049
SMT A2 225 M 06 R	2.2	0.5	6	20.0	0.055
SMT A 225 M 06 R	2.2	0.5	6	9.0	0.088
SMT A 335 M 06 R	3.3	0.5	6	7.5	0.097
SMT A 475 M 06 R	4.7	0.5	6	6.5	0.104
SMT B2 475 M 06 R	4.7	0.5	6	6.5	0.104

6 V DC Rated Voltage - Continued

Surge Voltage 8 V DC @ 85°C, 5 V DC @ 125°C

CSII NUMBER	CAP VALUE μF	DCL (MAX) μA	DF% (MAX) at +25 °C	ESR(max) OHMS at 100KHz	RIPPLE (max) Irms Amps at 100 KHz
SMT A 685 M 06 R	6.8	0.5	6	6.0	0.108
SMT B2 685 M 06 R	6.8	0.5	6	5.0	0.118
SMT B 685 M 06 R	6.8	0.5	6	4.0	0.141
SMT A 106 M 06 R	10	0.6	6	4.0	0.132
SMT B 106 M 06 R	10	0.6	6	3.5	0.151
SMT B 156 M 06 R	15	1.0	6	3.2	0.158
SMT H 156 M 06 R	15	1.0	6	3.0	0.168
SMT C2 156 M 06 R	15	1.0	6	3.0	0.173
SMT C 156 M 06 R	15	1.0	6	2.5	0.210
SMT B 226 M 06 R	22	1.4	6	2.4	0.183
SMT H 226 M 06 R	22	1.4	6	2.4	0.188
SMT C2 226 M 06 R	22	1.4	6	2.4	0.224
SMT C 226 M 06 R	22	1.4	6	2.2	0.224
SMT B 336 M 06 R	33	2.1	6	2.2	0.191
SMT C 336 M 06 R	33	2.1	6	1.8	0.247
SMT C 476 M 06 R	47	3.0	6	1.6	0.262
SMT D2 476 M 06 R	47	3.0	6	1.1	0.363
SMT D 476 M 06 R	47	3.0	6	1.1	0.369
SMT D2 686 M 06 R	68	4.3	6	0.9	0.401
SMT D 686 M 06 R	68	4.3	6	0.9	0.408
SMT D2 107 M 06 R	100	6.0	8	0.8	0.426
SMT D 107 M 06 R	100	6.0	8	0.8	0.433
SMT D 157 M 06 R	150	9.0	8	0.8	0.433
SMT E 157 M 06 R	150	9.0	8	0.6	0.524
SMT E 227 M 06 R	220	13.2	8	0.6	0.524
SMT E* 337 M 06 R	330	19.8	8	0.6	0.524

10 V DC Rated Voltage

Surge Voltage 13 V DC @ 85°C, 8 V DC @ 125°C

CSII NUMBER	CAP VALUE μF	DCL (MAX) μA	DF% (MAX) at +25 °C	ESR(max) OHMS at 100KHz	RIPPLE (max) Irms Amps at 100 KHz
SMT R 105 M 10 R	1	0.5	4	25.0	0.040
SMT A2 105 M 10 R	1	0.5	4	25.0	0.049
SMT A2 155 M 10 R	1.5	0.5	6	20.0	0.055
SMT A 155 M 10 R	1.5	0.5	6	10.0	0.084
SMT A 225 M 10 R	2.2	0.5	6	7.5	0.097
SMT A 335 M 10 R	3.3	0.5	6	6.5	0.104
SMT B2 336 M 10 R	3.3	0.5	6	6.5	0.104
SMT A 475 M 10 R	4.7	0.5	6	6.0	0.108
SMT B2 475 M 10 R	4.7	0.5	6	6.0	0.141
SMT B 475 M 10 R	4.7	0.5	6	4.0	0.141
SMT A 685 M 10 R	6.8	0.7	6	4.0	0.132
SMT B 685 M 10 R	6.8	0.7	6	3.5	0.151
SMT B 106 M 10 R	10	1.0	6	3.2	0.158



SURFACE MOUNT TANTALUMS

SMT SERIES SPECIFICATIONS - Continued

10 V DC Rated Voltage - Continued

Surge Voltage 13 V DC @ 85°C, 8 V DC @ 125°C

CSII NUMBER	CAP VALUE μF	DCL (MAX) μA	DF% (MAX) at+25°C	ESR(max) OHMS at 100KHz	RIPPLE (max) I rms Amps at 100 KHz
SMT H 106 M 10 R	10	1.0	6	3.2	0.163
SMT C2 106 M 10 R	10	1.0	6	3.2	0.168
SMT C 106 M 10 R	10	1.0	6	2.5	0.210
SMT B 156 M 10 R	15	1.5	6	2.4	0.183
SMT H 156 M 10 R	15	1.5	6	2.4	0.188
SMT C2 156 M 10 R	15	1.5	6	2.2	0.202
SMT C 156 M 10 R	15	1.5	6	2.2	0.224
SMT B 226 M 10 R	22	2.2	6	2.2	0.191
SMT C 226 M 10 R	22	2.2	6	1.8	0.247
SMT C 336 M 10 R	33	3.3	6	1.6	0.262
SMT D2 336 M 10 R	33	3.3	6	1.1	0.363
SMT D 336 M 10 R	33	3.3	6	1.1	0.369
SMT D2 476 M 10 R	47	4.7	6	0.9	0.401
SMT D 476 M 10 R	47	4.7	6	0.9	0.408
SMT D2 686 M 10 R	68	6.8	6	0.8	0.426
SMT D 686 M 10 R	68	6.8	6	0.8	0.433
SMT D 107 M 10 R	100	10.0	8	0.7	0.462
SMT E 107 M 10 R	100	10.0	8	0.7	0.486
SMT E 157 M 10 R	150	15.0	8	0.6	0.524
SMT E* 227 M 10 R	220	22.0	8	0.6	0.524

16 V DC Rated Voltage

Surge Voltage 20 V DC @ 85°C, 13 V DC @ 125°C

SMT R 684 M 16 R	0.68	0.5	4	25.0	0.040
SMT A2 684 M 16 R	0.68	0.5	4	25.0	0.049
SMT A2 105 M 16 R	1	0.5	4	20.0	0.055
SMT A 105 M 16 R	1	0.5	4	11.0	0.080
SMT A 155 M 16 R	1.5	0.5	6	8.0	0.094
SMT A 225 M 16 R	2.2	0.5	6	7.0	0.100
SMT B2 225 M 16 R	2.2	0.5	6	7.0	0.100
SMT B 225 M 16 R	2.2	0.5	6	5.5	0.121
SMT A 335 M 16 R	3.3	0.5	6	6.2	0.106
SMT B2 335 M 16 R	3.3	0.5	6	6.2	0.106
SMT B 335 M 16 R	3.3	0.5	6	4.4	0.135
SMT B 475 M 16 R	4.7	0.7	6	3.6	0.149
SMT B 685 M 16 R	6.8	1.1	6	3.3	0.156
SMT H 685 M 16 R	6.8	1.1	6	3.3	0.160
SMT C2 685 M 16 R	6.8	1.1	6	3.3	0.165
SMT C 685 M 16 R	6.8	1.1	6	2.6	0.206
SMT B 106 M 16 R	10	1.6	6	2.4	0.183
SMT C2* 106 M 16 R	10	1.6	6	2.4	0.171
SMT C 106 M 16 R	10	1.6	6	2.2	0.224
SMT C 156 M 16 R	15	2.4	6	1.8	0.247
SMT C 226 M 16 R	22	3.5	6	1.6	0.262
SMT D2 226 M 16 R	22	3.5	6	1.1	0.363
SMT D 226 M 16 R	22	3.5	6	1.1	0.369
SMT D2 336 M 16 R	33	5.3	6	0.9	0.401
SMT D 336 M 16 R	33	5.3	6	0.9	0.408
SMT D2 476 M 16 R	47	7.5	6	0.8	0.426
SMT D 476 M 16 R	47	7.5	6	0.8	0.433
SMT D 686 M 16 R	68	10.9	6	0.7	0.463
SMT E 686 M 16 R	68	10.9	6	0.8	0.454
SMT E 107 M 16 R	100	16.0	8	0.7	0.486

20 V DC Rated Voltage

Surge Voltage 26 V DC @ 85°C, 16 V DC @ 125°C

SMT A2 104 M 20 R	0.1	0.5	4	25.0	0.040
SMT A2 154 M 20 R	0.15	0.5	4	25.0	0.040
SMT A2 224 M 20 R	0.22	0.5	4	25.0	0.040
SMT A2 334 M 20 R	0.33	0.5	4	25.0	0.040
SMT R 474 M 20 R	0.47	0.5	4	25.0	0.040
SMT A2 474 M 20 R	0.47	0.5	4	25.0	0.040
SMT A2 684 M 20 R	0.68	0.5	4	25.0	0.040
SMT A 684 M 20 R	0.68	0.5	4	12.0	0.076
SMT B2 105 M 20 R	1	0.5	4	12.0	0.058
SMT A 105 M 20 R	1	0.5	4	10.0	0.084
SMT A 155 M 20 R	1.5	0.5	6	7.5	0.097
SMT B2 155 M 20 R	1.5	0.5	6	7.5	0.073
SMT A 225 M 20 R	2.2	0.5	6	6.0	0.082
SMT B2 225 M 20 R	2.2	0.5	6	6.0	0.082
SMT B 225 M 20 R	2.2	0.5	6	5.0	0.126
SMT B 335 M 20 R	3.3	0.7	6	3.8	0.145
SMT B 475 M 20 R	4.7	0.9	6	3.5	0.151
SMT H 475 M 20 R	4.7	0.9	6	3.5	0.156
SMT C 475 M 20 R	4.7	0.9	6	2.8	0.198
SMT B 685 M 20 R	6.8	1.4	6	2.8	0.169
SMT C2 685 M 20 R	6.8	1.4	6	2.8	0.179
SMT C 685 M 20 R	6.8	1.4	6	2.4	0.274
SMT C 106 M 20 R	10	2.0	6	2.0	0.235
SMT D 106 M 20 R	10	2.0	6	1.3	0.340
SMT C 156 M 20 R	15	3.0	6	1.7	0.254
SMT D2 156 M 20 R	15	3.0	6	1.1	0.363

20 V DC Rated Voltage - Continued

Surge Voltage 26 V DC @ 85°C, 16 V DC @ 125°C

CSII NUMBER	CAP VALUE μF	DCL (MAX) μA	DF% (MAX) at+25°C	ESR(max) OHMS at 100KHz	RIPPLE (max) I rms Amps at 100 KHz
SMT D 156 M 20 R	15	3.0	6	1.1	0.369
SMT D2 226 M 20 R	22	4.4	6	0.9	0.401
SMT D 226 M 20 R	22	4.4	6	0.9	0.408
SMT D2 336 M 20 R	33	6.6	6	0.8	0.426
SMT D 336 M 20 R	33	6.6	6	0.8	0.433
SMT E 476 M 20 R	47	9.4	6	0.7	0.486
SMT E 686 M 20 R	68	13.6	6	0.7	0.486

25 V DC Rated Voltage

Surge Voltage 32 V DC @ 85°C, 20 V DC @ 125°C

SMT A 474 M 25 R	0.47	0.5	4	14.0	0.071
SMT A 684 M 25 R	0.68	0.5	4	10.0	0.084
SMT A 105 M 25 R	1	0.5	4	9.0	0.088
SMT B 105 M 25 R	1	0.5	4	7.0	0.107
SMT A 155 M 25 R	1.5	0.5	6	7.0	0.100
SMT B 155 M 25 R	1.5	0.5	6	5.5	0.121
SMT B 225 M 25 R	2.2	0.6	6	4.5	0.133
SMT B 335 M 25 R	3.3	0.8	6	3.6	0.149
SMT C 335 M 25 R	3.3	0.8	6	2.8	0.198
SMT C 475 M 25 R	4.7	1.2	6	2.4	0.214
SMT C 685 M 25 R	6.8	1.7	6	2.0	0.235
SMT D 685 M 25 R	6.8	1.7	6	1.4	0.327
SMT C 106 M 25 R	10	2.5	6	1.8	0.247
SMT D2 106 M 25 R	10	2.5	6	1.2	0.348
SMT D 106 M 25 R	10	2.5	6	1.2	0.354
SMT D2 156 M 25 R	15	3.8	6	1.0	0.381
SMT D 156 M 25 R	15	3.8	6	1.0	0.387
SMT D2 226 M 25 R	22	5.5	6	0.8	0.426
SMT D 226 M 25 R	22	5.5	6	0.8	0.433
SMT E 336 M 25 R	33	8.3	6	0.7	0.486

35 V DC Rated Voltage

Surge Voltage 45 V DC @ 85°C, 28 V DC @ 125°C

SMT A 104 M 35 R	0.1	0.5	4	24.0	0.054
SMT A 154 M 35 R	0.15	0.5	4	21.0	0.058
SMT A 224 M 35 R	0.22	0.5	4	18.0	0.062
SMT A 334 M 35 R	0.33	0.5	4	15.0	0.068
SMT A 474 M 35 R	0.47	0.5	4	12.0	0.076
SMT B 474 M 35 R	0.47	0.5	4	10.0	0.089
SMT A 684 M 35 R	0.68	0.5	4	9.0	0.088
SMT B 684 M 35 R	0.68	0.5	4	8.0	0.100
SMT A 105 M 35 R	1	0.5	4	8.0	0.094
SMT B 105 M 35 R	1	0.5	4	6.5	0.111
SMT B 155 M 35 R	1.5	0.5	6	5.2	0.124
SMT C 155 M 35 R	1.5	0.5	6	4.5	0.156
SMT B* 225 M 35 R	2.2	0.8	6	4.2	0.138
SMT C 225 M 35 R	2.2	0.8	6	3.5	0.177
SMT C 335 M 35 R	3.3	1.2	6	2.5	0.210
SMT C 475 M 35 R	4.7	1.6	6	2.2	0.224
SMT D2 475 M 35 R	4.7	1.6	6	1.5	0.311
SMT D 475 M 35 R	4.7	1.6	6	1.5	0.316
SMT C 685 M 35 R	6.8	2.4	6	1.5	0.216
SMT D2 685 M 35 R	6.8	2.4	6	1.3	0.334
SMT D 685 M 35 R	6.8	2.4	6	1.3	0.340
SMT D2 106 M 35 R	10	3.5	6	1.0	0.381
SMT D 106 M 35 R	10	3.5	6	1.0	0.387
SMT E 156 M 35 R	15	5.3	6	0.8	0.454
SMT E 226 M 35 R	22	7.7	6	0.7	0.454

50 V DC Rated Voltage

Surge Voltage 63 V DC @ 85°C, 40 V DC @ 125°C

SMT A 104 M 50 R	0.1	0.5	4	22.0	0.056
SMT A 154 M 50 R	0.15	0.5	4	20.0	0.059
SMT B 154 M 50 R	0.15	0.5	4	17.0	0.069
SMT B 224 M 50 R	0.22	0.5	4	14.0	0.076
SMT B 334 M 50 R	0.33	0.5	4	12.0	0.082
SMT B 474 M 50 R	0.47	0.5	4	10.0	0.089
SMT C 474 M 50 R	0.47	0.5	4	8.0	0.117
SMT C 684 M 50 R	0.68	0.5	4	7.5	0.121
SMT C 105 M 50 R	1	0.5	4	5.5	0.141
SMT C 155 M 50 R	1.5	0.8	6	4.0	0.166
SMT D2 155 M 50 R	1.5	0.8	6	4.0	0.132
SMT D 155 M 50 R	1.5	0.8	6	3.5	0.141
SMT C 225 M 50 R	2.2	1.1	6	3.5	0.177
SMT D2 225 M 50 R	2.2	1.1	6	2.5	0.249
SMT D 225 M 50 R	2.2	1.1	6	2.5	0.241
SMT D2 335 M 50 R	3.3	1.7	6	2.0	0.269
SMT D 335 M 50 R	3.3	1.7	6	2.0	0.274
SMT D 475 M 50 R	4.7	2.4	6	1.4	0.327
SMT E* 685 M 50 R	6.8	3.4	6	1.2	0.371
SMT E* 106 M 50 R	10	5.0	6	1.0	0.406



SMC SERIES

Multi Layer Ceramic Chip Capacitors

Dielectric Types:

NPO Dielectric

The NPO series is a high Q, low K temperature compensating type of dielectric with stable electrical properties under varying voltage, temperature, frequency and time. The series is suitable for circuits requiring low loss, circuits with pulse, timing circuits and for tuning applications.

X7R Dielectric

The X7R dielectric has moderate K and is temperature stable. It shows moderate change in electrical properties under changing temperature, voltage and frequency and is suitable for bypassing, coupling and frequency discrimination circuit applications.

Z5U Dielectric

The Z5U dielectrics have relatively high K. The electrical properties of these dielectrics change considerably under changing temperature, voltage and time. They are suitable for all general purpose applications where high capacitance values are required and are ideal for room temperature applications with low DC bias.

Y5V Dielectric

The Y5V dielectrics have relatively high K. The electrical properties of these dielectrics change considerably under changing temperature, voltage and time. They are suitable for all general purpose applications where high capacitance values are required and are ideal for room temperature applications with low DC bias.

Part Numbering:

- Series: SMC for Multilayer Ceramic Chip Capacitors
- Case: 0402, 0603, 0805, 1206 & 1210..
- Dielectric: NPO, X7R, Z5U & Y5V.
- Cap.: Three digit EIA capacitance code.
- Tol.: EIA Tolerance Code.
- Volt.: 016 = 16, 025 = 25, 050 = 50 & 100 = 100 V DC.
- Term.: N = Nickel Barrier, P = Palladium Silver.
- Pack: T = Tape & Reel, B = Bulk.

Example below indicates :

SMC series, 1206 Case Size, NPO Dielectric,
100 pF capacitance, 5%Tolerance, 50 Volt, Nickel Barrier,
Tape/Reel packed Multilayer Ceramic Chip Capacitor.

Quick Reference Guide 50 V Rated Parts Only

CAPACITANCE		SERIES															
		COG (NPO)				X7R				Z5U				Y5V			
		50 V DC				50 V DC				50 V DC				50 V DC			
VALUE	CODE	0402	0603	0805	1206	0402	0603	0805	1206	0402	0603	0805	1206	0402	0603	0805	1206
0.5 pF	0R5																
1	1R0																
1.2	1R2																
1.5	1R5																
1.8	1R8																
2.2	2R2																
3.3	3R3																
4.7	4R7																
5.6	5R6																
6.8	6R8																
10	100																
22	220																
33	330																
39	390																
47	470																
56	560																
68	680																
82	820																
100	101																
120	121																
150	151																
180	181																
220	221																
270	271																
330	331																
390	391																
470	471																
560	561																
680	681																
820	821																
1000	102																
1200	122																
1500	152																
1800	182																
2200	222																
2700	272																
3300	332																
3900	392																
4700	472																
5600	562																
6800	682																
8200	822																
0.01 µF	103																
0.012	123																
0.015	153																
0.022	223																
0.027	273																
0.033	333																
0.039	393																
0.047	473																
0.056	563																
0.068	683																
0.082	823																
0.1	104																
0.12	124																
0.15	154																
0.18	184																
0.22	224																
0.27	274																
0.33	334																
0.39	394																
0.47	474																
0.56	564																
0.68	684																
0.82	824																
1	105																

SMC
Series

1206
Case

NPO
Dielectric

101
Cap.

J
Tol.

050
Volt.

N
Term.

T
Pack



SURFACE MOUNT CERAMICS

COG(NPO)

The NPO series is a high Q, low K temperature compensating type of dielectric with stable electrical properties under varying voltage, temperature, frequency and time. The series is suitable for circuits requiring low loss, circuits with pulse, timing circuits and for tuning applications. Features include:

- Very low temperature coefficient
- Stable electrical characteristics
- High capacitance and miniature size
- Consistent dimensions and surface finish
- Engineered for Automatic feeding and onsertion

GENERAL SPECIFICATIONS:

Operating temperature range: -55 to 125 °C

Capacitance range: 0402: 0.5 pF to 150 pF, 0603: 0.5 pF to 680 pF, 0805: 0.5 pF to 1800 pF, 1206: 0.5 pF to 3300 pF.

Capacitance tolerance: ±5%(J) and ±10%(K). ±0.25 pF and ±0.5 pF for values below 5 pF and 10 pF respectively.

Voltage range: 50 V DC standard. 100V DC available as special parts on request.

Temperature coefficient: ± 30ppm per °C

Dissipation factor at 25 °C: For ≥033 pF - 0.10 % max. at 1 KHz. For <033 pF - 0.25 % max. at 1 KHz.

Insulation resistance at 25 °C: 1G Ohm or 100 M Ohm x μF whichever is less.

Dielectric withstanding voltage: 2 x W V DC for 5 seconds.

LIFE TEST DETAILS:

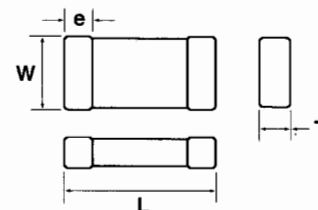
Capacitors shall withstand 200% DC rated voltage applied at 85 °C for 1000 hours. After the test and a stabilization time of 24 Hours at room temperature:

1. Capacitance change shall remain within ±5% or ±0.3 pF which ever is more.
2. Dissipation Factor shall be within 3 times the original limits.
3. Insulation Resistance shall above 50% of the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

COG / NPO is a dielectric with stable electrical properties under varying voltage, temperature, frequency and time.

This dielectric has the least value of temperature coefficient. The temperature coefficient characteristics is illustrated in Figure 1 Figure 2 illustrates the variation pattern of Dissipation Factor with respect to temperature.

The DC Voltage coefficient and AC Voltage coefficient are illustrated in Figures 3 and 4 respectively.



Dimensions

CODE	DIMENSIONS mm (inches)			
	L	W	T (max.)	e
0402	1.0 (0.040")	0.5 (0.020")	0.55 (0.022")	0.2 (0.008")
0603	1.60 (0.063")	0.8 (0.032")	0.9 (0.035")	0.30 (0.012")
0805	2.03 (0.080")	1.27 (0.050")	1.27 (0.050")	0.50 (0.020")
1206	3.20 (0.125")	1.60 (0.063")	1.35 (0.057")	0.50 (0.020")

Tolerance: "L" and "W": ± 0.25mm(0.01")

RATINGS CHART

CAPACITANCE		SERIES							
VALUE	CODE	COG (NPO)							
		50 V DC				100 V DC			
		0402	0603	0805	1206	0402	0603	0805	1206
0.5 pF	0R5								
1	1R0								
1.2	1R2								
1.5	1R5								
1.8	1R8								
2.2	2R2								
3.3	3R3								
4.7	4R7								
5.6	5R6								
6.8	6R8								
10	100								
22	220								
33	330								
39	390								
47	470								
56	560								
68	680								
82	820								
100	101								
120	121								
150	151								
180	181								
220	221								
270	271								
330	331								
390	391								
470	471								
560	561								
680	681								
820	821								
1000	102								
1200	122								
1500	152								
1800	182								
2200	222								
2700	272								
3300	332								

☐ - Indicates available range for specific Case code, TC and Voltage.

Characteristic Graphs for COG (NPO)

FIGURE 1

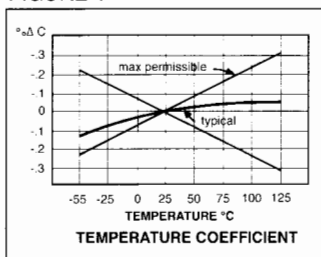


FIGURE 2

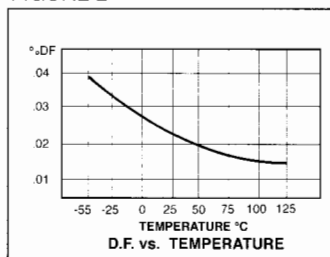


FIGURE 3

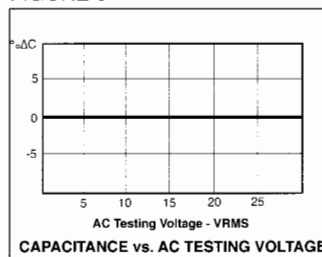
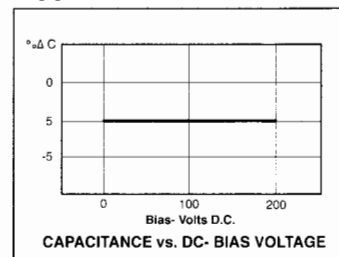


FIGURE 4



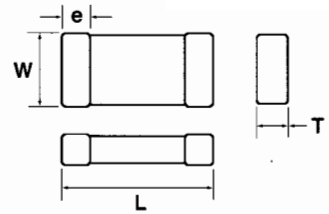
SURFACE MOUNT CERAMICS



X7R

The X7R dielectric has moderate K and is temperature stable. It shows moderate change in electrical properties under changing temperature, voltage and frequency and is suitable for by-passing, coupling and frequency discrimination circuit applications. Features included:

- Stable electrical characteristics
- High capacitance and miniature size
- Consistent dimensions and surface finish
- Engineered for Automatic feeding and onsertion



GENERAL SPECIFICATIONS:

Operating temperature range: -55 to 125 °C

Capacitance range: 0402: 220 pF to 0.01 μF, 0603: 270 pF to 0.1 μF, 0805: 330 pF to .47 μF, 1206: 330pF to 1 μF,

Capacitance tolerance: ±10%(K) standard. ±20%(M) on request.

Voltage range: 50 V DC. Other rated voltages of 16 and 25 VDC available on request.

Temperature coefficient: ±15%

Dissipation factor at 25 °C: 2.5% max. at 1 K Hz.

Insulation resistance at 25 °C: 100 M Ohm x μF

Dielectric withstanding voltage: 2 x W V DC

LIFE TEST DETAILS:

Capacitors shall withstand 200% DC rated voltage applied at 85 °C for 1000 hours. After the test and a stabilization time of 24 Hours at room temperature:

1. Capacitance change shall remain within ±12.5%
2. Dissipation Factor shall be within 1.5 times the original limits.
3. Insulation Resistance shall above 50% of the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

X7R is a moderately stable dielectric under changing temperature, voltage and frequency conditions.

This dielectric has moderate value of temperature coefficient. The temperature coefficient characteristics is illustrated in Figure 5. Figure 6 illustrates the variation pattern of Dissipation Factor with respect to temperature.

The DC Voltage coefficient and AC Voltage coefficient are illustrated in Figure 7 and 8 respectively.

Dimensions

CODE	DIMENSIONS mm (inches)			
	L	W	T (max.)	e
0402	1.0 (0.040")	0.5 (0.020")	0.55 (0.022")	0.2 (0.008")
0603	1.60 (0.063")	0.8 (0.032")	0.9 (0.035")	0.30 (0.012")
0805	2.03 (0.080")	1.27 (0.050")	1.27 (0.050")	0.50 (0.020")
1206	3.20 (0.125")	1.60 (0.063")	1.35 (0.057")	0.50 (0.020")

Tolerance: " L" and "W": ± 0.25mm(0.01")

RATINGS CHART

CAPACITANCE VALUE CODE		SERIES X7R											
		16 V DC				25 V DC				50 V DC			
		0402	0603	0805	1206	0402	0603	0805	1206	0402	0603	0805	1206
220	221												
270	271												
330	331												
390	391												
470	471												
560	561												
680	681												
820	821												
1000	102												
1200	122												
1500	152												
1800	182												
2200	222												
2700	272												
3300	332												
3900	392												
4700	472												
5600	562												
6800	682												
8200	822												
0.01 μF	103												
0.012	123												
0.015	153												
0.022	223												
0.027	273												
0.033	333												
0.039	393												
0.047	473												
0.056	563												
0.068	683												
0.082	823												
0.1	104												
0.22	224												
0.33	334												
0.47	474												
0.68	684												
1	105												

☐ - Indicates available range for specific Case code. TC and Voltage. Please call for other values and voltages.

X7R Characteristic Graphs

FIGURE 5

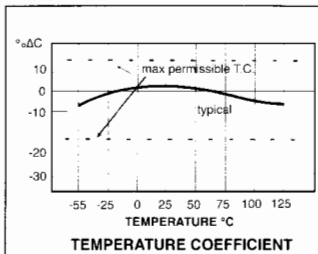


FIGURE 6

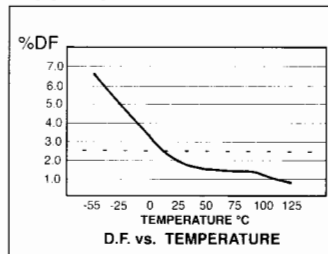


FIGURE 7

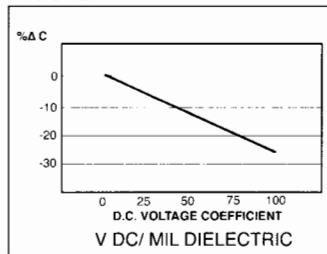
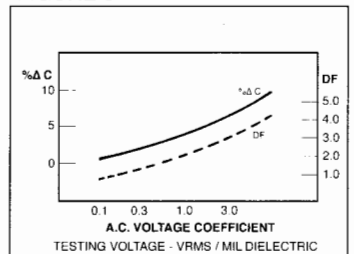


FIGURE 8



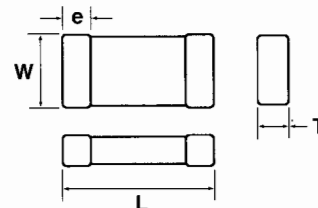


SURFACE MOUNT CERAMICS

Y5V

The Y5V dielectrics have relatively high K. The electrical properties of these dielectrics change considerably under changing temperature, voltage and time. They are suitable for all general purpose applications where high capacitance values are required and are ideal for room temperature applications with low DC bias. Features include:

- High capacitance value
- Miniature size
- Consistent dimensions and surface finish
- Engineered for Automatic feeding and onsertion



GENERAL SPECIFICATIONS: Y5V

Operating temperature range: -30 to 85° C

Capacitance range: 0402: 2200 pF to 0.1 μF, 0603: 0.01 μF to 0.47 μF, 0805: 0.01 μF to 1.2 μF, 1206: 0.047 μF to 3.3 μF.

Capacitance tolerance: -20 to +80% (Z) Std., ±20%(M) on request.

Voltage range: 50 V DC Std., 16 & 25 V DC upon request.

Temperature coefficient: + 22% to - 82%

Dissipation factor at 25° C: 5.0% max. at 1 K Hz.

Insulation resistance at 25° C: 100 M Ohm x μF

Dielectric withstanding voltage: 2 x W V DC

DIMENSIONS AND TOLERANCES

CODE	DIMENSIONS mm (inches)			
	L	W	T (max.)	e
0402	1.0 (0.040")	0.5 (0.020")	0.55 (0.022")	0.2 (0.008")
0603	1.60 (0.063")	0.8 (0.032")	0.9 (0.035")	0.30 (0.012")
0805	2.03 (0.080")	1.27 (0.050")	1.27 (0.050")	0.50 (0.020")
1206	3.20 (0.125")	1.60 (0.063")	1.35 (0.057")	0.50 (0.020")

Tolerance: "L" and "W": ± 0.25mm(0.01")

LIFE TEST DETAILS:

Capacitors shall withstand 200% DC rated voltage applied at 85 °C for 1000 hours. After the test and a stabilization time of 24 Hours at room temperature:

1. Capacitance change shall remain within ±12.5%
2. Dissipation Factor shall be within 1.5 times the original limits.
3. Insulation Resistance shall above 50% of the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

The Y5V dielectrics have high Dielectric Constants. The electrical properties of these dielectrics are not very stable with respect to changing temperature, voltage and time conditions. The temperature coefficient characteristics is illustrated in Figure 13 Figure 14 illustrated the variation pattern of Dissipation Factor with respect to temperature. The DC Voltage coefficient and aging pattern are illustrated in Figure 15 and 16 respectively.

Y5V RATINGS CHART

CAPACITANCE		SERIES											
		Y5V											
		16 V DC				25 V DC				50 V DC			
VALUE	CODE	0402	0603	0805	1206	0402	0603	0805	1206	0402	0603	0805	1206
0.01 μF	103												
0.012	123												
0.015	153												
0.022	223												
0.027	273												
0.033	333												
0.039	393												
0.047	473												
0.056	563												
0.068	683												
0.082	823												
0.1	104												
0.12	124												
0.15	154												
0.18	184												
0.22	224												
0.27	274												
0.33	334												
0.39	394												
0.47	474												
0.68	684												
0.82	824												
1.0	105												
1.5	155												
2.2	225												
3.3	335												

Characteristic Graphs for Y5V

FIGURE 13

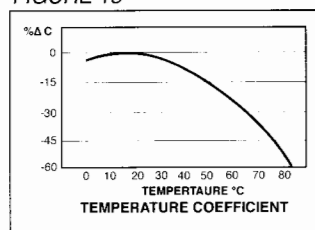


FIGURE 14

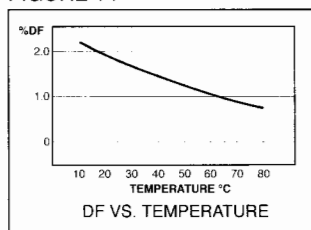


FIGURE 15

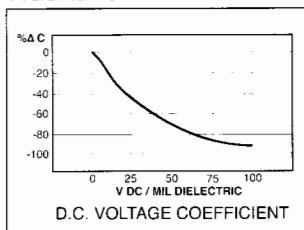
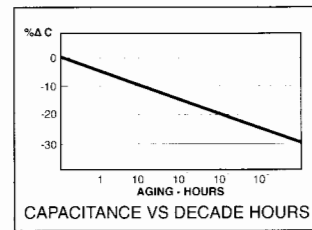


FIGURE 16

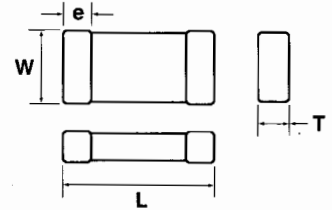




Z5U

The Z5U dielectrics have relatively high K. The electrical properties of these dielectrics change considerably under changing temperature, voltage and time. They are suitable for all general purpose applications where high capacitance values are required and are ideal for room temperature applications with low DC bias. Features include:

- High capacitance value
- Miniature size
- Consistent dimensions and surface finish
- Engineered for Automatic feeding and onsertion



GENERAL SPECIFICATIONS:

Operating temperature range: +10 to 85° C

Capacitance range: 0402:1000 pF to 0.015 μF, 0603:1000 pF to 0.068μF, 0805: 4700 pF to 0.33 μF, 1206: 0.01 μF to 0.47 μF.

Capacitance tolerance: -20 to +80% (Z) Std., ±20%(M) on request.

Voltage range: 50 V DC Std., 16 & 25 V DC upon request.

Temperature coefficient: + 22% to - 56%

Dissipation factor at 25° C: 3.0% max. at 1 K Hz.

Insulation resistance at 25° C: 100 M Ohm x μF

Dielectric withstanding voltage: 2 x W V DC

DIMENSIONS

CODE	DIMENSIONS mm (inches)			
	L	W	T (max.)	e
0402	1.0 (0.040")	0.5 (0.020")	0.55 (0.022")	0.2 (0.008")
0603	1.60 (0.063")	0.8 (0.032")	0.9 (0.035")	0.30 (0.012")
0805	2.03 (0.080")	1.27 (0.050")	1.27 (0.050")	0.50 (0.020")
1206	3.20 (0.125")	1.60 (0.063")	1.35 (0.057")	0.50 (0.020")

Tolerance "L" and "W": ± 0.25mm(0.01")

LIFE TEST DETAILS:

Capacitors shall withstand 200% DC rated voltage applied at 85 °C for 1000 hours. After the test and a stabilization time of 24 Hours at room temperature:

1. Capacitance change shall remain within ±12.5%
2. Dissipation Factor shall be within 1.5 times the original limits.
3. Insulation Resistance shall above 50% of the initial limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

Z5U RATINGS CHART

CAPACITANCE		SERIES											
		Z5U											
		16 V DC				25 V DC				50 V DC			
VALUE	CODE	0402	0603	0805	1206	0402	0603	0805	1206	0402	0603	0805	1206
1000	102												
1200	122												
1500	152												
1800	182												
2200	222												
2700	272												
3300	332												
3900	392												
4700	472												
5600	562												
6800	682												
8200	822												
0.01 μF	103												
0.012	123												
0.015	153												
0.022	223												
0.027	273												
0.033	333												
0.039	393												
0.047	473												
0.056	563												
0.068	683												
0.082	823												
0.1	104												
0.12	124												
0.15	154												
0.18	184												
0.22	224												
0.27	274												
0.33	334												
0.47	474												

Characteristic Graphs for Z5U

FIGURE 9

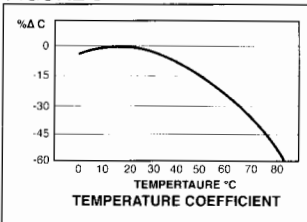


FIGURE 10

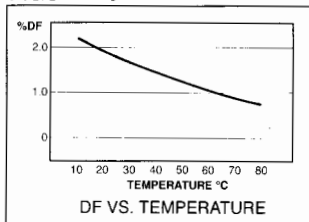


FIGURE 11

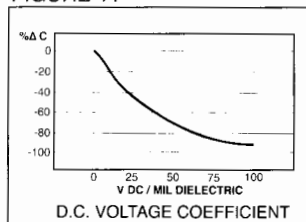
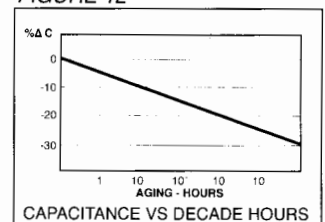


FIGURE 12





SURFACE MOUNT CERAMICS

Test Conditions and Reliability Information

Parameter	Specification	Test Method
Capacitance Dissipation Factor (Tan δ and Q)	Within tolerance specified in the part number Class (I) C<30 pF: Q≥400+20xC C30 pF: Q>1000 Class (II) X7R: DF≤3%, Z5U: DF≤3%, Y5V: DF≤5%	Class (I) C≤1000 pF: 1 MHz. ±10% 0.5 to 5 V rms C>1000 pF: 1 KHz. ±10% 1.0 ±0.2 V rms Class (II) 1 KHz. ±10%, 1.0 ±0.2 V rms
Insulation Resistance (IR)	C≤50,000 IR: >10 G Ohms C≤50,000 IR: >500 Ohms.F	Apply rated voltage for 60 seconds at room temperature and normal humidity (70% max.)
Dielectric Withstanding Voltage	There shall be no evidence of damage or flash over during the test.	Apply rated voltage (Class I) or 2.5 x rated voltage (Class II) to both terminations for 5 seconds. Charge and discharge current are less than 50 mA.
Termination Adherence	No mechanical damage	After soldering capacitor on the glass-epoxy PWB, 50 gms of steady pull is applied in direction of arrow for 10 seconds. (See Figure 1)
Bend Strength	No mechanical damage	After soldering capacitor on the glass-epoxy PWB, 2 mm of bending shall be applied for 10 seconds as shown in the drawing. (See Figure 2)
Life Test (High Temperature Loading test) - Capacitance Change	Class (I): No more than ±3% or ±0.3 pf which ever is more. Class (II): X7R: ±10% max. Z5U, Y5V: ±30% max.	Apply 2 x rated voltage at maximum operating temperature for 1000 hours. The surge current shall not exceed 50 mA. After this, the samples shall be kept in room temperature for 24 hours (Class I) or 48 hours (class II) and then measured for the parameters indicated.
Life Test (High Temperature Loading test) - DF or Q	Class (I) C<10 pF: Q≥200+10xC 10 pF≤C < 30 pF Q≥275+2xC: C>30 pF: Q>350 Class (II) X7R: DF≤5% Z5U & Y5V: DF≤7.5%	
Life Test (High Temperature Loading test) - IR	1000 M Ohms or 50 Ohms.F whichever is less	

Figure 1

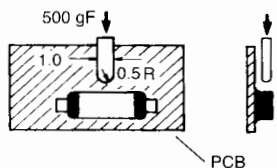
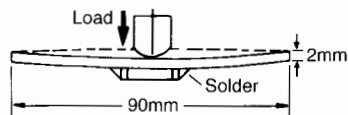
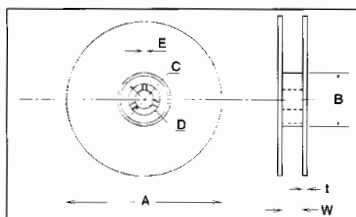


Figure 2



Parameter	Specification	Test Method
Moisture Resistance Test - Capacitance change	Class (I): No more than ±5% or ±0.5 pf which ever is more. Class (II): X7R: ±10% max. Z5U & Y5V: ±30% max.	The capacitor shall be subjected to 40 °C and 90 to 95% RH for 500 hours. After this, samples shall be
Moisture Resistance Test - Q or DF	Class (I) C<10 pF: Q≥200+10xC 10 pF≤C < 30 pF Q≥275+2xC: C≥30 pF: Q≥350 Class (II) X7R: DF≤5% Z5U & Y5V: DF≤7.5%	kept in room temperature for 24 hrs. (Class I) or 48 hrs. (Class II), and then shall be measured (Class I) or 48 hours (Class II) and then measured for the parameters indicated.
Moisture Resistance Test - IR	1000 M Ohms or 50 Ohms.F whichever is less	
Humidity Load Test - Capacitance change	Class (I): No more than ±7.5% or ±0.75 pf which ever is more. Class (II): X7R: ±12.5% max. Z5U, Y5V: ±30% max.	The capacitor shall be subjected to rated voltage at 40 °C and 90 to 95 % RH for 500 hours. Surge current shall not exceed 50 mA. After this, samples shall be kept in room temperature for 24 hrs. (Class I) or 48 hours (Class II), and then measured for the parameters indicated.
Humidity Load Test Q or DF	Class (I) C<30 pF: Q≥ 100+3xC C ≥ 30 pF: Q≥200 Class (II) X7R: DF≤5% Z5U & Y5V: DF≤7.5%	
Humidity Load Test - IR	500 M Ohms or 25 Ohms.F whichever is less	
Temperature Cycling Test - Capacitance change	Class (I): No more than ±2.5% or ±0.25 pf which ever is more. Class (II): X7R: ±7.5% max. Z5U, Y5V: ±20% max.	Perform 5 cycles as follows: 1. Room temperature dwell for 15 minutes. 2. Minimum operating temperature dwell for 30 minutes. 3. Room temperature dwell for 30 minutes. 4. Maximum operating temperature dwell for 30 minutes. After the above testing condition, samples shall be kept in room temperature for 24 hrs. (Class I) or 48 hours (Class II), and then shall be measured (Class I) or 48 hours (class II) and then measured for the parameters indicated.
Temperature Cycling Test - Q or DF	Parts to meet the initial specifications	
Temperature Cycling Test - IR	Parts to meet the initial specifications	
Solderability	Termination area shall be at least 75% covered with a new solder coating. There shall be no crack and ceramic exposure of terminated surface due to melting.	The capacitors are completely immersed for 4 ±0.5 seconds in the molten solder with a temperature of 230±5°C solder.
Resistance to Solder Heat Test - Capacitance Change	No more than ±2.5% or ±0.25 pf which ever is more. Class (II): X7R: ±7.5% max. Z5U, Y5V: ±20% max.	The capacitors are completely immersed for 10 ±1.0 seconds in the molten solder with a temperature of 270±5°C solder. Preheat before immersion, 1. 80 to 100 °C for 2 minutes 2. 150 to 180 °C for 2 minutes The capacitance measurement shall be made after the samples have been kept at room temperature for 24 hours.
Resistance to Solder Heat Test - Q or DF	Parts to meet the initial specifications	
Resistance to Solder Heat Test - IR	Parts to meet the initial specifications	

Real Dimensions



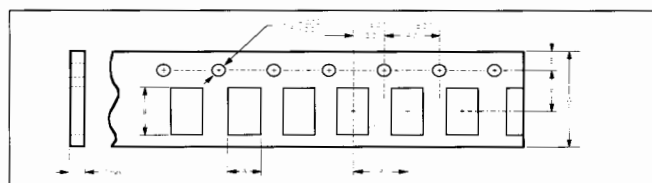
Reel Dimensions in Millimeters

A	B	C	D	E	W	t
ø178 ±2.0	ø50 min.	13.0 ±0.5	21.0 ±0.8	2.0 ±0.8	8.8/12.8 ±1.5	2.0 ±0.5
ø330 ±2.0	ø100 min.	13.0 ±0.5	21.0 ±0.8	2.0 ±0.8	8.8/12.8 ±1.5	2.0 ±0.6

Reel Dimensions in Inches

A	B	C	D	E	W	t
ø7 ±0.08	ø2.0 min.	5.0 ±0.02	0.83 ±0.03	0.08 ±0.3	0.35/0.50 ±0.06	0.08 ±0.02
ø13 ±0.08	ø4.0 min.	5.0 ±0.3	0.83 ±0.03	0.08 ±0.3	0.35/0.50 ±0.06	0.08 ±0.02

Taping Dimensions



SIZE CODE	A	B	W	F	E	P	Tmax
0402	±0.1 mm or ±0.004"	±0.1 mm or ±0.004"	±0.3 mm or ±0.012	±0.1 mm or ±0.004"	±0.1 mm or ±0.004"	±0.1 mm or ±0.004"	1.7 (0.067)
0603	1.1 (0.043)	1.8 (0.075)	8.0 (0.315)	3.5 (0.138)	1.75 (0.069)	4.0 (0.157)	1.7 (0.067)
0805	1.7 (0.067)	2.4 (0.094)	8.0 (0.315)	3.5 (0.138)	1.75 (0.069)	4.0 (0.157)	1.7 (0.067)
1206	2.0 (0.079)	3.6 (0.142)	8.0 (0.315)	3.5 (0.138)	1.75 (0.069)	4.0 (0.157)	1.7 (0.067)

STANDARD PACKING QUANTITIES

BULK PACKING: 5000 PCS. PER PACK. OTHER QUANTITIES ON REQUEST.
PAPER TAPING: 4000 PCS. PER REEL.



PART NUMBERING & ORDERING INFORMATION

Example below indicates: RL Series radial, 10 μ F, 20% Tol., 50 VDC in Ammo Packing.

(EXAMPLE) R L 1 0 6 K 0 5 0 F 1 2 0 T

► **Series**

Series Code: RL, RLS.

► **Capacitance**

3 Digit EIA Capacitance Code:

First Two Digits Represent Significant Figures

Capacitance in PF. Third Digit Indicates Number of Zeros

► **Tolerance**

Capacitance Tolerance Code:

Capacitance Tolerance (%)	± 10	± 20
Code	K	M

► **Rated Voltage**

3 Digit Voltage Code:

Rated Voltage	6.3V	10V	16V	25V	35V	50V	63V	80V
Code	6R3	010	016	025	035	050	063	080

Rated Voltage	100V	125V	160V	200V	250V	315V	350V	400V	450V
Code	100	125	160	200	250	315	350	400	450

► **Case - Diameter in Millimeters**

Case Code:

Diameter (mm)	3	4	5	6	6.3	8	10	12
Code	A	B	C	D	E	F	G	H

Diameter (mm)	13	16	18	20	22	25	30	35	40
Code	I	J	K	L	M	N	O	P	Q

► **Case - Length in Millimeters**

Length (mm)	5	7.5	11	11.5	12.5	13	16	19	20	25	25.5
Code	050	7R5	110	115	125	130	160	190	200	250	255

Length (mm)	26	27	29	35	35.5	36	40	42	45	50	52	62
Code	260	270	290	350	355	360	400	420	450	500	520	620

► **Forming**

Description	Taping (F:5M/M) (Ammo Pack)	Taping (F:5M/M) (Reel Pack)	Bulk Pack	Lead Cut	Lead Forming Cut	Lead Forming Only
Type	Axial & Radial			Radial		
Code	T	R	B	C	E	F



RL RADIAL SERIES

INTRODUCTION

RL Series Radial Lead Aluminum Electrolytic capacitors cover a wide range of values and voltages. These capacitors are suitable for general industrial and commercial designs requiring continuous duty applications. This is a cost effective capacitor suitable for general purpose applications.

FEATURES

- Wide value and voltage range
- Special encapsulation with safety vent
- Reduced case dimensions for use in thickly populated boards
- Low leakage current

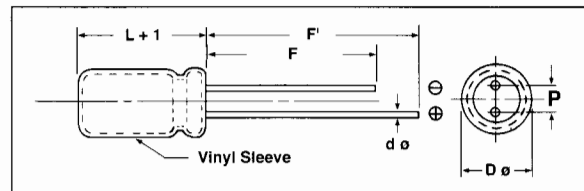
GENERAL SPECIFICATIONS

Temperature range: -40 to 85 °C for voltage ratings up to 100 V DC -25 to 85 °C for voltage ratings above 100 V DC. **Capacitance tolerance:** ±10%(k) and ±20%(M), Other tolerances on request. **Leakage current:** <0.01CV or 3.0µA whichever is greater, when measured after 1 minute of application of rated voltage at 20 °C for rated voltage up to 100 V DC. <0.01CV + 100µA, when measured after 1 minute of application of rated voltage at 20 °C for rated voltage above 100 V DC. **Dissipation factor:** 0.10 to 0.25 at 120 Hz and 20 °C. Please refer to the ratings table for the details corresponding to the actual capacitance and voltage.

LOAD LIFE TEST DETAILS

Capacitors shall withstand 100% DC rated voltage applied at 85 °C for 1000 hours. After the test:

1. Capacitance change shall remain within ±20% of the initial value.
2. Dissipation Factor shall be within 2.0 times the original limits.
3. The leakage current shall remain within the original specified limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.



DIMENSIONS AND TOLERANCES:

- "d" - 0.5 mm (0.020") for case dia 5.0 mm(0.2")
 - "d" - 0.6 mm (0.024") for case dia 6.3mm to 13.0 mm (0.25 to 0.51")
 - "d" - 0.8 mm (0.030") for case dia 16.0 mm(0.63") and above
- Cathode lead length "F"- 15.0mm (0.6") min.
Anode lead length "F" - 20.0mm (0.79") min.
Tolerance on lead spacing "s" - 0.5 (0.20")

SHELF LIFE TEST DETAILS:

The capacitors shall be stored at 85 °C for 500 hours without application of voltage. When tested after 500 hours:

1. Capacitance change shall remain within ±20% the original specified limits.
2. Dissipation Factor shall be within 2.0 times the original limits.
3. The leakage current shall remain within 200% of the initial value.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

**Case Dimensions
in Millimeters
6.3V • 10V • 16V • 25V • 35V**

RATED VOLT SURGE VOLT Capacitance in µF	6.3 V DC			10 V DC			16 V DC			25 V DC			35 V DC		
	8.0 V DC			13 V DC			20 V DC			32 V DC			44 V DC		
	Dimensions			Dimensions			Dimensions			Dimensions			Dimensions		
	D	L	S	D	L	S	D	L	S	D	L	S	D	L	S
0.47	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
1.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
2.2	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
3.3	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
4.7	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
10	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
15	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
22	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
33	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5
47	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5
68	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5
100	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5
150	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5	10.0	12.5	5.0
220	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5	10.0	12.5	5.0	10.0	12.5	5.0
330	8.0	11.5	3.5	8.0	11.5	3.5	8.0	11.5	3.5	10.0	12.5	5.0	10.0	16.0	5.0
470	8.0	11.5	3.5	8.0	14.0	3.5	10.0	12.5	5.0	10.0	16.0	5.0	13.0	20.0	5.0
1000	10.0	12.5	5.0	10.0	16.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0
1500	10.0	20.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5
2200	13.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5	16.0	32.0	7.5
3300	13.0	20.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5	16.0	32.0	7.5	18.0	36.0	7.5
4700	16.0	25.0	7.5	16.0	25.0	7.5	16.0	32.0	7.5	18.0	36.0	7.5			
6800	16.0	25.0	7.5	16.0	32.0	7.5	18.0	36.0	7.5						
10000	16.0	32.0	7.5	18.0	36.0	7.5									

**Case Dimensions
in Millimeters
50V • 63V • 80V • 100V**

RATED VOLT SURGE VOLT Capacitance in µF	50 V DC			63 V DC			80 V DC			100 V DC		
	63 V DC			79 V DC			100 V DC			125 V DC		
	Dimensions			Dimensions			Dimensions			Dimensions		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
1.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
2.2	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
3.3	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
4.7	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
10	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5	6.3	11.0	2.5
15	5.0	11.0	2.0	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5
22	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5	8.0	14.0	3.5
33	6.3	11.0	2.5	8.0	11.5	3.5	8.0	11.5	3.5	10.0	12.5	5.0
47	8.0	11.5	3.5	8.0	11.5	3.5	10.0	12.5	5.0	10.0	16.0	5.0
68	8.0	11.5	3.5	10.0	12.5	5.0	10.0	12.5	5.0	10.0	20.0	5.0
100	10.0	12.5	5.0	10.0	16.0	5.0	10.0	16.0	5.0	10.0	20.0	5.0
150	10.0	16.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0
220	10.0	16.0	5.0	13.0	20.0	5.0	13.0	20.0	5.0	16.0	25.0	7.5
330	10.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0	16.0	32.0	7.5
470	13.0	20.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5	16.0	32.0	7.5
1000	16.0	25.0	7.5	16.0	32.0	7.5	18.0	36.0	7.5			
1500	16.0	32.0	7.5	18.0	36.0	7.5						
2200	18.0	36.0	7.5									



RL RADIAL SERIES

Case Dimensions in Millimeters
160V • 250V • 350V • 450V

RATED VOLT SURGE VOLT Capacitance in μ F	160 V DC 200 V DC			250 V DC 300 V DC			350 V DC 400 V DC			450 V DC 500 VDC		
	Dimensions			Dimensions			Dimensions			Dimensions		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5
1.0	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5
2.2	6.3	11.0	2.5	8.0	11.5	3.5	8.0	11.5	3.5	10.0	12.5	5.0
3.3	8.0	11.5	3.5	10.0	12.5	5.0	10.0	16.0	5.0	10.0	20.0	5.0
4.7	10.0	12.5	5.0	10.0	12.5	5.0	10.0	16.0	5.0	10.0	20.0	5.0
10	10.0	12.5	5.0	10.0	20.0	5.0	13.0	20.0	5.0	13.0	20.0	5.0
15	10.0	16.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0	16.0	25.0	7.5
22	10.0	16.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0	16.0	25.0	7.5
33	10.0	20.0	5.0	13.0	25.0	5.0	13.0	25.0	5.0	16.0	36.0	7.5
47	13.0	20.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5	18.0	40.0	7.5
68	13.0	25.0	5.0	16.0	25.0	7.5	16.0	32.0	7.5	22.0	40.0	10.0
100	16.0	25.0	7.5	16.0	32.0	7.5	18.0	36.0	7.5			
150	16.0	32.0	7.5									
220	18.0	36.0	7.5									
330	18.0	40.0	7.5									

Case Dimensions in Inches
6.3V • 10V • 16V • 25V • 35V

RATED VOLT SURGE VOLT Capacitance in μ F	6.3 V DC 8.0 V DC			10 V DC 13 V DC			16 V DC 20 V DC			25 V DC 32 V DC			35 V DC 44 V DC		
	Dimensions			Dimensions			Dimensions			Dimensions			Dimensions		
	D	L	S	D	L	S	D	L	S	D	L	S	D	L	S
0.47	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
1.0	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
2.2	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
3.3	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
4.7	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
10	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
15	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
22	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
33	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098
47	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098
68	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138
100	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138
150	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138
220	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.492	0.197
330	0.315	0.453	0.138	0.315	0.453	0.138	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.492	0.197
470	0.315	0.453	0.138	0.315	0.551	0.138	0.394	0.492	0.197	0.394	0.630	0.197	0.512	0.787	0.197
1000	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197
1500	0.394	0.787	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197	0.630	0.984	0.295
2200	0.512	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197	0.630	0.984	0.197	0.630	1.260	0.295
3300	0.512	0.787	0.197	0.512	0.984	0.197	0.630	0.984	0.295	0.630	0.984	0.295	0.709	1.417	0.295
4700	0.630	0.984	0.295	0.630	0.984	0.295	0.630	1.260	0.295	0.709	1.417	0.295			
6800	0.630	0.984	0.295	0.630	1.260	0.295	0.709	1.417	0.295						
10000	0.630	1.260	0.295	0.709	1.417	0.295									

Case Dimensions in Inches
50V • 63V • 80V • 100V

RATED VOLT SURGE VOLT Capacitance in μ F	50 V DC 63 V DC			63 V DC 79 V DC			80 V DC 100 V DC			100 V DC 125 V DC		
	Dimensions			Dimensions			Dimensions			Dimensions		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
1.0	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
2.2	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
3.3	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
4.7	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
10	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098	0.248	0.433	0.098
15	0.197	0.433	0.079	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138
22	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138	0.315	0.551	0.138
33	0.248	0.433	0.098	0.315	0.453	0.138	0.315	0.453	0.138	0.394	0.492	0.197
47	0.315	0.453	0.138	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.630	0.197
68	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.492	0.197	0.394	0.787	0.197
100	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.630	0.197	0.394	0.787	0.197
150	0.394	0.630	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197
220	0.394	0.630	0.197	0.512	0.787	0.197	0.512	0.787	0.197	0.630	0.984	0.295
330	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197	0.630	1.260	0.295
470	0.512	0.787	0.197	0.512	0.984	0.197	0.630	0.984	0.295	0.630	1.260	0.295
1000	0.630	0.984	0.295	0.630	1.260	0.295	0.709	1.417	0.295			
1500	0.630	1.260	0.295	0.709	1.417	0.295						
2200	0.709	1.417	0.295									

Case Dimensions in Inches
160V • 250V • 350V • 450V

RATED VOLT SURGE VOLT Capacitance in μ F	160 V DC 200 V DC			250 V DC 300 V DC			350 V DC 400 V DC			450 V DC 500 VDC		
	Dimensions			Dimensions			Dimensions			Dimensions		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098
1.0	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138
2.2	0.248	0.433	0.098	0.315	0.453	0.138	0.315	0.453	0.138	0.394	0.492	0.197
3.3	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.787	0.197
4.7	0.394	0.492	0.197	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.787	0.197
10	0.394	0.492	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.787	0.197
15	0.394	0.630	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.630	0.984	0.295
22	0.394	0.630	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.630	0.984	0.295
33	0.394	0.787	0.197	0.512	0.984	0.197	0.512	0.984	0.197	0.630	1.417	0.295
47	0.512	0.787	0.197	0.512	0.984	0.197	0.630	0.984	0.295	0.709	1.575	0.295
68	0.512	0.984	0.197	0.630	0.984	0.295	0.630	1.260	0.295	0.866	1.575	0.394
100	0.630	0.984	0.295	0.630	1.260	0.295	0.709	1.417	0.295			
150	0.630	1.260	0.295									
220	0.709	1.417	0.295									
330	0.709	1.575	0.295									



RL RADIAL SERIES

Technical Information: Dissipation Factor, ESR, Leakage Current and Ripple Current Details.

6.3 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	19.0
3.3	0.10	40.19	4.0	23.0
4.7	0.12	33.86	4.0	25.0
10	0.17	22.54	4.0	31.0
15	0.17	15.03	4.0	38.0
22	0.17	10.24	4.0	46.0
33	0.17	6.83	4.0	56.0
47	0.20	5.64	4.0	62.0
68	0.20	3.90	4.0	81.0
100	0.20	2.65	6.0	99.0
150	0.20	1.76	9.0	138.0
220	0.20	1.20	13.0	168.0
330	0.20	0.80	20.0	239.0
470	0.25	0.70	29.0	256.0
1000	0.25	0.33	63.0	473.0
1500	0.25	0.22	94.0	636.0
2200	0.28	0.16	138.0	783.0
3300	0.28	0.11	207.0	1047.0
4700	0.32	0.09	296.0	1264.0
6800	0.34	0.06	428.0	1829.0
10000	0.42	0.05	630.0	2140.0

10 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	19.0
3.3	0.10	40.19	4.0	23.0
4.7	0.12	33.86	4.0	25.0
10	0.17	22.54	4.0	31.0
15	0.17	15.03	4.0	38.0
22	0.17	10.24	4.0	46.0
33	0.17	6.83	4.0	56.0
47	0.20	5.64	4.0	62.0
68	0.20	3.90	6.0	81.0
100	0.20	2.65	10.0	113.0
150	0.20	1.76	15.0	138.0
220	0.20	1.20	22.0	195.0
330	0.20	0.80	33.0	239.0
470	0.20	0.70	47.0	321.0
1000	0.20	0.33	100.0	533.0
1500	0.20	0.22	150.0	778.0
2200	0.24	0.16	220.0	924.0
3300	0.26	0.11	330.0	1176.0
4700	0.28	0.09	470.0	1554.0
6800	0.32	0.06	680.0	1887.0
10000	0.38	0.05	1000.0	2366.0

16 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	19.0
3.3	0.10	40.19	4.0	23.0
4.7	0.12	33.86	4.0	25.0
10	0.17	22.54	4.0	31.0
15	0.17	15.03	4.0	38.0
22	0.17	10.24	4.0	46.0
33	0.17	6.83	5.0	61.0
47	0.17	4.79	7.0	73.0
68	0.17	3.31	10.0	88.0
100	0.17	2.25	16.0	122.0
150	0.17	1.50	24.0	175.0
220	0.17	1.02	35.0	212.0
330	0.17	0.68	52.0	292.0
470	0.17	0.47	75.0	396.0
1000	0.17	0.22	160.0	636.0
1500	0.19	0.16	240.0	876.0
2200	0.21	0.12	352.0	1069.0
3300	0.23	0.09	528.0	1251.0
4700	0.25	0.07	752.0	1776.0
6800	0.30	0.05	1088.0	2084.0

25 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	19.0
3.3	0.10	40.19	4.0	23.0
4.7	0.12	33.86	4.0	25.0
10	0.15	19.89	4.0	33.0
15	0.15	13.26	4.0	40.0
22	0.15	9.04	5.0	49.0
33	0.15	6.03	8.0	65.0
47	0.15	4.23	11.0	78.0
68	0.15	2.92	17.0	107.0
100	0.15	1.98	25.0	152.0
150	0.15	1.32	37.0	186.0
220	0.15	0.90	55.0	253.0
330	0.15	0.60	82.0	313.0
470	0.15	0.42	117.0	419.0
1000	0.15	0.19	250.0	804.0
1500	0.17	0.15	375.0	979.0
2200	0.19	0.11	550.0	1123.0
3300	0.21	0.08	825.0	1622.0
4700	0.23	0.06	1175.0	1984.0

35 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	19.0
3.3	0.10	40.19	4.0	23.0
4.7	0.12	33.86	4.0	25.0
10	0.12	15.91	4.0	37.0
15	0.12	10.61	5.0	45.0
22	0.12	7.23	7.0	59.0
33	0.12	4.82	11.0	83.0
47	0.12	3.38	16.0	100.0
68	0.12	2.34	23.0	140.0
100	0.12	1.59	35.0	170.0
150	0.12	1.06	52.0	233.0
220	0.12	0.72	77.0	320.0
330	0.12	0.48	115.0	392.0
470	0.12	0.33	164.0	519.0
1000	0.12	0.15	350.0	979.0
1500	0.14	0.12	525.0	1261.0
2200	0.16	0.09	770.0	1517.0
3300	0.18	0.07	1155.0	1870.0

50 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	19.0
3.3	0.10	40.19	4.0	23.0
4.7	0.10	28.22	4.0	27.0
10	0.10	13.26	5.0	40.0
15	0.10	8.84	7.0	54.0
22	0.10	6.02	11.0	75.0
33	0.10	4.01	16.0	92.0
47	0.10	2.82	23.0	127.0
68	0.10	1.95	34.0	153.0
100	0.10	1.32	50.0	209.0
150	0.10	0.88	75.0	289.0
220	0.10	0.60	110.0	351.0
330	0.10	0.40	165.0	471.0
470	0.10	0.28	235.0	662.0
1000	0.10	0.13	500.0	1212.0
1500	0.12	0.10	750.0	1486.0
2200	0.14	0.08	1100.0	1732.0



RL RADIAL SERIES

Technical Information: Dissipation Factor, ESR, Leakage Current and Ripple Current Details.

63 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	19.0
3.3	0.10	40.19	4.0	23.0
4.7	0.10	28.22	4.0	30.0
10	0.10	13.26	6.0	44.0
15	0.10	8.84	9.0	62.0
22	0.10	6.02	13.0	75.0
33	0.10	4.01	20.0	107.0
47	0.10	2.82	29.0	127.0
68	0.10	1.95	42.0	172.0
100	0.10	1.32	63.0	236.0
150	0.10	0.88	94.0	289.0
220	0.10	0.60	138.0	285.0
330	0.10	0.40	207.0	554.0
470	0.10	0.28	296.0	717.0
1000	0.10	0.13	630.0	1303.0
1500	0.12	0.10	945.0	1587.0

80 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	60.28	4.0	20.0
3.3	0.10	40.19	4.0	25.0
4.7	0.10	28.22	4.0	30.0
10	0.10	13.26	6.0	50.0
15	0.10	8.84	12.0	62.0
22	0.10	6.02	17.0	87.0
33	0.10	4.01	26.0	107.0
47	0.10	2.82	37.0	143.0
68	0.10	1.95	54.0	194.0
100	0.10	1.32	80.0	259.0
150	0.10	0.88	120.0	342.0
220	0.10	0.60	76.0	452.0
330	0.10	0.40	264.0	644.0
470	0.10	0.28	376.0	888.0
1000	0.10	0.13	800.0	1467.0
1500	0.12	0.10	1200.0	1700.0

100 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	8.0
1.0	0.10	132.62	4.0	12.0
2.2	0.10	120.56	4.0	20.0
3.3	0.10	80.37	4.0	25.0
4.7	0.10	28.22	4.7	30.0
10	0.10	13.26	10.0	50.0
15	0.10	8.84	15.0	72.0
22	0.10	6.02	22.0	87.0
33	0.10	4.01	33.0	120.0
47	0.10	2.82	47.0	161.0
68	0.10	1.95	68.0	213.0
100	0.10	1.32	100.0	279.0
150	0.10	0.88	150.0	373.0
220	0.10	0.60	220.0	525.0
330	0.10	0.40	330.0	743.0
470	0.10	0.28	470.0	888.0

160 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
1.0	0.20	265.25	103.0	16.0
2.2	0.20	120.56	103.0	19.0
3.3	0.20	80.37	105.0	23.0
4.7	0.20	56.44	107.0	28.0
10	0.20	26.52	116.0	47.0
15	0.20	17.68	124.0	64.0
22	0.20	12.04	135.0	85.0
33	0.20	8.02	152.0	123.0
47	0.20	5.64	175.0	159.0
68	0.20	3.90	208.0	206.0
100	0.20	2.66	260.0	267.0
150	0.20	1.76	340.0	378.0
220	0.20	1.76	352.0	378.0
330	0.20	1.76	528.0	378.0

250 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
1.0	0.20	265.25	102.0	16.0
2.2	0.20	120.56	105.0	19.0
3.3	0.20	80.37	108.0	23.0
4.7	0.20	56.44	111.0	32.0
10	0.20	26.52	125.0	57.0
15	0.20	17.68	137.0	70.0
22	0.20	12.04	155.0	101.0
33	0.20	8.02	182.0	133.0
47	0.20	5.64	217.0	184.0
68	0.20	3.90	270.0	238.0
100	0.20	2.66	350.0	324.0

350 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
1.0	0.20	265.25	103.0	16.0
2.2	0.20	120.56	107.0	19.0
3.3	0.20	80.37	111.0	26.0
4.7	0.20	56.44	116.0	36.0
10	0.20	26.52	135.0	62.0
15	0.20	17.68	152.0	83.0
22	0.20	12.04	177.0	109.0
33	0.20	8.02	215.0	154.0
47	0.20	5.64	264.0	197.0
68	0.20	3.90	338.0	267.0
100	0.20	2.66	450.0	351.0

450 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
1.0	0.25	331.56	104.0	16.0
2.2	0.25	150.71	109.0	19.0
3.3	0.25	100.47	114.0	27.0
4.7	0.25	70.54	121.0	35.0
10	0.25	33.15	145.0	60.0
15	0.25	22.10	167.0	80.0
22	0.25	15.07	199.0	104.0
33	0.25	10.04	248.0	148.0
47	0.25	7.05	311.0	189.0
68	0.25	4.87	406.0	259.0



RADIAL ELECTROLECTICS

RLS RADIAL SERIES

INTRODUCTION

RLS Series Radial Lead Aluminum Electrolytic capacitors cover a wide range of values, voltages and temperatures. These capacitors are suitable for industrial and commercial designs requiring continuous duty applications. These capacitors are suitable for applications in switching power supplies, measuring instruments and automotive electronics.

FEATURES

- High temperature rating up to 105 °C.
- Wide value and Voltage range.
- Special encapsulation with safety vent.
- Reduced case dimensions for use in thickly populated boards.

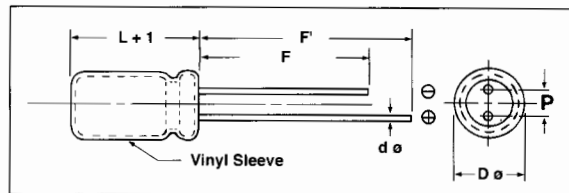
GENERAL SPECIFICATIONS

Temperature range: -40 to 105 °C for voltage ratings up to 100 V DC -25 to 105 °C for voltage ratings above 100 V DC. **Capacitance tolerance:** ±10%(k) and ±20%(M), Other tolerances on request. **Leakage current:** <0.01CV or 4.0µA whichever is greater, when measured after 1 minute of application of rated voltage at 20 °C for rated voltage up to 100 V DC. <0.01CV + 100µA, when measured after 1 minute of application of rated voltage at 20 °C for rated voltage above 100 V DC. **Dissipation factor:** 0.10 to 0.44 at 120 Hz and 20 °C. Please refer to the ratings table for the details corresponding to the actual capacitance and voltage.

LOAD LIFE TEST DETAILS

Capacitors shall withstand 100% DC rated voltage applied at 105 °C for 1000 hours. After the test:

1. Capacitance change shall remain within ±20% of the initial value.
2. Dissipation Factor shall be within 2.0 times the original limits.
3. The leakage current shall remain within the original specified limits.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.



DIMENSIONS AND TOLERANCES

"d" - 0.5 mm (0.020") for case dia 5.0 mm (0.2")

"d" - 0.6 mm (0.024") for case dia 6.3mm to 13.0 mm (0.25 to 0.51")

"d" - 0.8 mm (0.030") for case dia 16.0 mm (0.63") and above

Cathode lead length "F" - 15.0mm (0.6") min. Anode lead length "F" - 20.0mm (0.79") min. Tolerance on lead spacing "s" - 0.5 (0.20")

SHELF LIFE TEST DETAILS:

The capacitors shall be stored at 85 °C for 500 hours without application of voltage. When tested after 500 hours:

1. Capacitance change shall remain within ±20% the original specified limits.
2. Dissipation Factor shall be within 2.0 times the original limits.
3. The leakage current shall remain within 200% of the initial value.
4. There shall be no remarkable change in the appearance and the marking shall remain legible.

Case Dimensions in Millimeters 6.3V • 10V • 16V • 25V

RATED VOLT SURGE VOLT CAPACITANCE in µF	6.3 V DC 8.0 V DC			10 V DC 13 V DC			16 V DC 20 V DC			25 V DC 32 V DC		
	DIMENSIONS IN MM			DIMENSIONS IN MM			DIMENSIONS IN MM			DIMENSIONS IN MM		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
1.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
2.2	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
3.3	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
4.7	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
6.8	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
10	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
15	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
22	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
33	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
47	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
68	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5
100	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5
150	8.0	11.5	3.5	8.0	11.5	3.5	8.0	11.5	3.5	8.0	11.5	3.5
220	8.0	11.5	3.5	8.0	11.5	3.5	10.0	12.5	5.0	10.0	16.0	5.0
330	10.0	12.5	5.0	10.0	12.5	5.0	10.0	16.0	5.0	10.0	20.0	5.0
470	10.0	12.5	5.0	10.0	16.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0
680	10.0	16.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0
1000	10.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5
1500	13.0	25.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5	16.0	31.5	7.5
2200	13.0	25.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5	16.0	35.5	7.5
3300	16.0	25.0	7.5	16.0	31.5	7.5	16.0	35.5	7.5	18.0	40.0	7.5
4700	16.0	31.5	7.5	16.0	35.5	7.5	18.0	35.5	7.5			
6800	16.0	35.5	7.5	18.0	40.0	7.5						
10000	18.0	40.0	7.5									

Case Dimensions in Millimeters 35V • 50V • 63V • 80V

RATED VOLT SURGE VOLT CAPACITANCE in µF	35 V DC 44 V DC			50 V DC 63 V DC			63 V DC 79 V DC			80 V DC 100 V DC		
	DIMENSIONS			DIMENSIONS			DIMENSIONS			DIMENSIONS		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
1.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
2.2	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
3.3	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0	5.0	11.0	2.0
4.7	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5	5.0	11.0	2.0
6.8	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5	6.3	11.0	2.5
10	5.0	11.0	2.0	5.0	11.0	2.0	6.3	11.0	2.5	6.3	11.0	2.5
15	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5	6.3	11.0	2.5
22	6.3	11.0	2.5	6.3	11.0	2.5	8.0	11.5	3.5	8.0	11.5	3.5
33	6.3	11.0	2.5	8.0	11.5	3.5	8.0	11.5	3.5	10.0	16.0	5.0
47	6.3	11.0	2.5	8.0	11.5	3.5	10.0	12.5	5.0	10.0	16.0	5.0
68	8.0	11.5	3.5	10.0	12.5	5.0	10.0	16.0	5.0	10.0	20.0	5.0
100	10.0	12.5	5.0	10.0	16.0	5.0	10.0	20.0	5.0	10.0	20.0	5.0
150	10.0	16.0	5.0	10.0	20.0	5.0	13.0	20.0	5.0	13.0	20.0	5.0
220	10.0	20.0	5.0	13.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0
330	10.0	20.0	5.0	13.0	20.0	5.0	13.0	25.0	5.0	16.0	31.5	7.5
470	13.0	25.0	5.0	16.0	25.0	7.5	16.0	25.0	7.5	16.0	35.5	7.5
680	16.0	25.0	5.0	16.0	25.0	7.5	16.0	31.0	7.5	18.0	35.5	7.5
1000	16.0	25.0	7.5	16.0	31.5	7.5	18.0	35.5	7.5			
1500	16.0	35.5	7.5	18.0	40.0	7.5						
2200	18.0	35.5	7.5									



RLS RADIAL SERIES

Case Dimensions
in Millimeters
100V • 160V • 250V

RATED VOLT SURGE VOLT CAPACITANCE in μ F	100 V DC 125 V DC			160 V DC 200 V DC			250 V DC 300 V DC		
	DIMENSIONS			DIMENSIONS			DIMENSIONS		
	D	L	S	D	L	S	D	L	S
0.47	5.0	11.0	2.0						
1.0	5.0	11.0	2.0	6.3	11.0	2.5	6.3	11.0	2.5
2.2	5.0	11.0	2.0	8.0	11.5	3.5	8.0	16.0	3.5
3.3	5.0	11.0	2.0	8.0	11.5	3.5	8.0	16.0	3.5
4.7	5.0	11.0	2.0	8.0	14.0	3.5	10.0	16.0	5.0
6.8	8.0	11.5	3.5	8.0	14.0	3.5	10.0	16.0	5.0
10	8.0	11.5	3.5	10.0	16.0	5.0	13.0	20.0	5.0
15	8.0	11.5	3.5	10.0	20.0	5.0	13.0	20.0	5.0
22	10.0	12.5	5.0	13.0	20.0	5.0	13.0	25.0	5.0
33	10.0	16.0	5.0	13.0	25.0	5.0	16.0	25.0	7.5
47	10.0	20.0	5.0	16.0	25.0	7.5	16.0	31.5	7.5
68	10.0	20.0	5.0	16.0	31.5	7.5	16.0	35.5	7.5
100	13.0	20.0	5.0	16.0	35.5	7.5	18.0	40.0	7.5
150	13.0	20.0	5.0						
220	16.0	25.0	7.5						
330	16.0	31.5	7.5						
470	18.0	35.5	7.5						

Case Dimensions
in Inches
6.3V • 10V • 16V • 25V

RATED VOLT SURGE VOLT CAPACITANCE in μ F	6.3 V DC 8.0 V DC			10 V DC 13 V DC			16 V DC 20 V DC			25 V DC 32 V DC		
	DIMENSIONS IN MM			DIMENSIONS IN MM			DIMENSIONS IN MM			DIMENSIONS IN MM		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
1.0	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
2.2	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
3.3	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
4.7	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
6.8	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
10	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
15	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
22	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
33	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
47	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
68	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098
100	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098
150	0.315	0.453	0.138	0.315	0.453	0.138	0.315	0.453	0.138	0.394	0.492	0.197
220	0.315	0.453	0.138	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.630	0.197
330	0.394	0.492	0.197	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.787	0.197
470	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.787	0.197	0.512	0.787	0.197
680	0.394	0.630	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197
1000	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197	0.630	0.984	0.295
1500	0.512	0.984	0.197	0.512	0.984	0.197	0.630	0.984	0.295	0.630	1.240	0.295
2200	0.512	0.984	0.197	0.512	0.984	0.197	0.630	0.984	0.295	0.630	1.398	0.295
3300	0.630	0.984	0.295	0.630	1.240	0.295	0.630	1.398	0.295	0.709	1.575	0.295
4700	0.630	1.240	0.295	0.630	1.398	0.295	0.709	1.398	0.295			
6800	0.630	1.398	0.295	0.709	1.575	0.295						
10000	0.709	1.575	0.295									

Case Dimensions
in Inches
35V • 50V • 63V • 80V

RATED VOLT SURGE VOLT CAPACITANCE in μ F	35 V DC 44 V DC			50 V DC 63 V DC			63 V DC 79 V DC			80 V DC 100 V DC		
	DIMENSIONS			DIMENSIONS			DIMENSIONS			DIMENSIONS		
	D	L	S	D	L	S	D	L	S	D	L	S
0.47	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
1.0	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
2.2	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
3.3	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079	0.197	0.433	0.079
4.7	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098	0.197	0.433	0.079
6.8	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098	0.248	0.433	0.098
10	0.197	0.433	0.079	0.197	0.433	0.079	0.248	0.433	0.098	0.248	0.433	0.098
15	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098	0.248	0.433	0.098
22	0.248	0.433	0.098	0.248	0.433	0.098	0.315	0.453	0.138	0.315	0.453	0.138
33	0.248	0.433	0.098	0.315	0.453	0.138	0.315	0.453	0.138	0.394	0.630	0.197
47	0.248	0.433	0.098	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.630	0.197
68	0.315	0.453	0.138	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.787	0.197
100	0.394	0.492	0.197	0.394	0.630	0.197	0.394	0.787	0.197	0.394	0.787	0.197
150	0.394	0.630	0.197	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.787	0.197
220	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197
330	0.394	0.787	0.197	0.512	0.787	0.197	0.512	0.984	0.197	0.630	1.240	0.295
470	0.512	0.984	0.197	0.630	0.984	0.295	0.630	0.984	0.295	0.630	1.398	0.295
680	0.630	0.984	0.197	0.630	0.984	0.295	0.630	0.984	0.295	0.709	1.398	0.295
1000	0.630	0.984	0.295	0.630	1.240	0.295	0.709	1.398	0.295			
1500	0.630	1.398	0.295	0.709	1.575	0.295						
2200	0.709	1.398	0.295									

Case Dimensions
in Inches
100V • 160V • 250V

RATED VOLT SURGE VOLT CAPACITANCE in μ F	100 V DC 125 V DC			160 V DC 200 V DC			250 V DC 300 V DC		
	DIMENSIONS			DIMENSIONS			DIMENSIONS		
	D	L	S	D	L	S	D	L	S
0.47	0.197	0.433	0.079						
1.0	0.197	0.433	0.079	0.248	0.433	0.098	0.248	0.433	0.098
2.2	0.197	0.433	0.079	0.315	0.453	0.138	0.315	0.630	0.138
3.3	0.197	0.433	0.079	0.315	0.453	0.138	0.315	0.630	0.138
4.7	0.197	0.433	0.079	0.315	0.551	0.138	0.394	0.630	0.197
6.8	0.315	0.453	0.138	0.315	0.551	0.138	0.394	0.630	0.197
10	0.315	0.453	0.138	0.394	0.630	0.197	0.512	0.787	0.197
15	0.315	0.453	0.138	0.394	0.787	0.197	0.512	0.787	0.197
22	0.394	0.492	0.197	0.512	0.787	0.197	0.512	0.984	0.197
33	0.394	0.630	0.197	0.512	0.984	0.197	0.630	0.984	0.295
47	0.394	0.787	0.197	0.630	0.984	0.295	0.630	1.240	0.295
68	0.394	0.787	0.197	0.630	1.240	0.295	0.630	1.398	0.295
100	0.512	0.787	0.197	0.630	1.398	0.295	0.709	1.575	0.295
150	0.512	0.787	0.197						
220	0.630	0.984	0.295						
330	0.630	1.240	0.295						
470	0.709	1.398	0.295						



RLS RADIAL SERIES

Technical Information: Dissipation Factor, ESR, Leakage Current and Ripple Current Details.

6.3 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	15.0
3.3	0.10	40.19	4.0	19.0
4.7	0.12	32.86	4.0	23.0
6.8	0.17	33.15	4.0	21.0
10	0.17	22.54	4.0	25.0
15	0.17	15.03	4.0	31.0
22	0.17	10.24	4.0	38.0
33	0.17	6.83	4.0	46.0
47	0.20	5.64	4.0	51.0
68	0.20	3.90	4.0	67.0
100	0.20	2.65	6.0	82.0
150	0.20	1.76	9.0	114.0
220	0.20	1.20	13.0	150.0
330	0.20	0.80	20.0	200.0
470	0.25	0.70	29.0	239.0
680	0.25	0.48	42.0	288.0
1000	0.25	0.33	63.0	393.0
1500	0.25	0.22	94.0	530.0
2200	0.28	0.16	138.0	733.0
3300	0.28	0.11	207.0	953.0
4700	0.32	0.09	296.0	1215.0
6800	0.34	0.06	428.0	1602.0
10000	0.42	0.06	630.0	2300.0

10 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	15.0
3.3	0.10	40.19	4.0	19.0
4.7	0.12	32.86	4.0	21.0
6.8	0.17	33.15	4.0	23.0
10	0.17	22.54	4.0	25.0
15	0.17	15.03	4.0	31.0
22	0.17	10.24	4.0	38.0
33	0.17	6.83	4.0	46.0
47	0.20	5.64	4.0	56.0
68	0.20	3.90	6.0	67.0
100	0.20	2.65	10.0	93.0
150	0.20	1.76	15.0	114.0
220	0.20	1.20	22.0	177.0
330	0.20	0.80	33.0	223.0
470	0.20	0.56	47.0	267.0
680	0.20	0.39	68.0	361.0
1000	0.20	0.26	100.0	488.0
1500	0.20	0.17	150.0	650.0
2200	0.24	0.14	220.0	783.0
3300	0.26	0.10	330.0	1077.0
4700	0.28	0.07	470.0	1483.0
6800	0.32	0.06	680.0	1712.0
10000				

16 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	15.0
3.3	0.10	40.19	4.0	19.0
4.7	0.12	32.86	4.0	21.0
6.8	0.17	33.15	4.0	23.0
10	0.17	22.54	4.0	25.0
15	0.17	15.03	4.0	31.0
22	0.17	10.24	4.0	38.0
33	0.17	6.83	5.0	51.0
47	0.17	4.79	7.0	61.0
68	0.17	3.31	10.0	73.0
100	0.17	2.25	16.0	101.0
150	0.17	1.50	24.0	146.0
220	0.17	1.02	35.0	177.0
330	0.17	0.68	52.0	242.0
470	0.17	0.47	75.0	329.0
680	0.17	0.33	108.0	433.0
1000	0.17	0.22	160.0	572.0
1500	0.19	0.16	240.0	733.0
2200	0.21	0.12	352.0	912.0
3300	0.23	0.09	528.0	1215.0
4700	0.25	0.07	752.0	1585.0

25 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	15.0
3.3	0.10	40.19	4.0	19.0
4.7	0.12	32.86	4.0	22.0
6.8	0.15	29.25	4.0	23.0
10	0.15	19.89	4.0	27.0
15	0.15	13.26	4.0	33.0
22	0.15	9.04	5.0	44.0
33	0.15	6.03	8.0	54.0
47	0.15	4.23	11.0	73.0
68	0.15	2.92	17.0	88.0
100	0.15	1.98	25.0	127.0
150	0.15	1.32	37.0	174.0
220	0.15	0.90	55.0	210.0
330	0.15	0.60	82.0	291.0
470	0.15	0.42	117.0	384.0
680	0.15	0.29	170.0	498.0
1000	0.15	0.19	250.0	672.0
1500	0.17	0.15	375.0	816.0
2200	0.19	0.11	550.0	1099.0
3300	0.21	0.08	825.0	1483.0

35 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	15.0
3.3	0.10	40.19	4.0	19.0
4.7	0.12	33.86	4.0	23.0
6.8	0.12	24.40	4.0	25.0
10	0.12	15.91	4.0	30.0
15	0.12	10.61	5.0	41.0
22	0.12	7.23	7.0	49.0
33	0.12	4.82	11.0	69.0
47	0.12	3.38	16.0	82.0
68	0.12	2.34	23.0	116.0
100	0.12	1.59	35.0	158.0
150	0.12	1.06	52.0	194.0
220	0.12	0.72	77.0	266.0
330	0.12	0.48	115.0	359.0
470	0.12	0.33	164.0	467.0
680	0.12	0.23	238.0	611.0
1000	0.12	0.15	350.0	816.0
1500	0.14	0.12	525.0	1052.0
2200	0.16	0.09	770.0	1398.0

50 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	15.0
3.3	0.10	40.19	4.0	19.0
4.7	0.10	28.22	4.0	23.0
6.8	0.10	19.50	4.0	27.0
10	0.10	13.26	5.0	33.0
15	0.10	8.84	7.0	45.0
22	0.10	6.02	11.0	61.0
33	0.10	4.01	16.0	75.0
47	0.10	2.82	23.0	106.0
68	0.10	1.95	34.0	128.0
100	0.10	1.32	50.0	174.0
150	0.10	0.88	75.0	240.0
220	0.10	0.60	110.0	321.0
330	0.10	0.40	165.0	424.0
470	0.10	0.28	235.0	554.0
680	0.10	0.19	340.0	725.0
1000	0.10	0.13	500.0	1011.0
1500	0.12	0.10	750.0	1326.0



RLS RADIAL SERIES

Technical Information: Dissipation Factor, ESR, Leakage Current and Ripple Current Details.

63 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	15.0
3.3	0.10	40.19	4.0	19.0
4.7	0.10	28.22	4.0	25.0
6.8	0.10	19.50	4.0	30.0
10	0.10	13.26	6.0	36.0
15	0.10	8.84	9.0	51.0
22	0.10	6.02	13.0	61.0
33	0.10	4.01	20.0	89.0
47	0.10	2.82	29.0	117.0
68	0.10	1.95	42.0	143.0
100	0.10	1.32	63.0	196.0
150	0.10	0.88	94.0	265.0
220	0.10	0.60	138.0	346.0
330	0.10	0.40	207.0	463.0
470	0.10	0.28	296.0	597.0
680	0.10	0.19	428.0	836.0
1000	0.10	0.13	630.0	1163.0

80 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	17.0
3.3	0.10	40.19	4.0	21.0
4.7	0.10	28.22	4.0	25.0
6.8	0.10	19.50	5.0	30.0
10	0.10	13.26	8.0	41.0
15	0.10	8.84	12.0	55.0
22	0.10	6.02	17.0	72.0
33	0.10	4.01	26.0	97.0
47	0.10	2.82	37.0	119.0
68	0.10	1.95	54.0	161.0
100	0.10	1.32	80.0	216.0
150	0.10	0.88	120.0	312.0
220	0.10	0.60	176.0	408.0
330	0.10	0.40	264.0	538.0
470	0.10	0.28	376.0	741.0
680	0.10	0.19	544.0	962.0

100 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
0.47	0.10	282.18	4.0	7.0
1.0	0.10	132.62	4.0	10.0
2.2	0.10	60.28	4.0	17.0
3.3	0.10	40.19	4.0	21.0
4.7	0.10	28.22	4.7	25.0
6.8	0.10	19.50	6.0	34.0
10	0.10	13.26	10.0	45.0
15	0.10	8.84	15.0	60.0
22	0.10	6.02	22.0	81.0
33	0.10	4.01	33.0	99.0
47	0.10	2.82	47.0	134.0
68	0.10	1.95	68.0	178.0
100	0.10	1.32	100.0	255.0
150	0.10	0.88	150.0	337.0
220	0.10	0.60	220.0	439.0
330	0.10	0.40	330.0	620.0
470	0.10	0.28	470.0	792.0

160 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
1.0	0.20	72.42	101.0	32.0
2.2	0.20	72.42	103.0	47.0
3.3	0.20	48.25	105.0	55.0
4.7	0.20	33.88	107.0	55.0
10	0.20	23.42	110.0	72.0
6.8	0.20	15.95	116.0	89.0
15	0.20	10.62	124.0	132.0
22	0.20	7.24	135.0	175.0
33	0.20	4.83	152.0	220.0
47	0.20	3.39	175.0	295.0
68	0.20	2.34	208.0	400.0
100	0.20	1.59	260.0	505.0

250 V

CAPACITANCE in μF	MAXIMUM DISSIPATION FACTOR	MAXIMUM ESR OHMS	MAXIMUM LEAKAGE CURRENT μA	MAXIMUM RIPPLE CURRENT mA
1.0	0.20	72.42	102.0	16.0
2.2	0.20	72.42	105.0	32.0
3.3	0.20	48.25	108.0	47.0
4.7	0.20	33.88	111.0	55.0
6.8	0.20	23.42	117.0	78.0
10	0.20	15.95	125.0	100.0
15	0.20	10.62	137.0	145.0
22	0.20	7.24	155.0	180.0
33	0.20	4.83	182.0	235.0
47	0.20	3.39	217.0	363.0
68	0.20	2.34	270.0	440.0
100	0.20	1.59	350.0	550.0



CARBON FILM RESISTORS

ORDERING INFORMATION

Example = Carbon Film, 1/4 Watt, 220K Ohm, 5% Tolerance Tape & Reel Resistor.



Series _____
 Series Code: CF¼, CF½, CF½

Resistance (1st, 2nd, 3rd Band) _____

Resistance Color Code

Color Code	1st Band	2nd Band	3rd Band Multiplier
Black	0	0	1
Brown	1	1	10
Red	2	2	100
Orange	3	3	1,000
Yellow	4	4	10,000
Green	5	5	100,000
Blue	6	6	1,000,000
Violet	7	7	10,000,000
Gray	8	8	100,000,000
White	9	9	1,000,000,000
Gold			0.1

Tolerance (4th Band) _____

Resistance Tolerance Code:

Resistance Tolerance	± 2%	± 5%
Tolerance Code	G	J
Color Code	Red	Gold

Packaging Spec Code _____

Code	Packaging Type
T	Tape and Reel
A	Ammo Pack

E 24 Series Resistance Decade Values

1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0
3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1



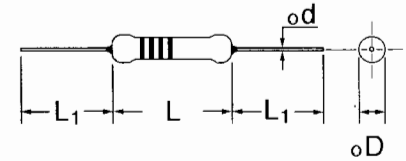
CF 1/8, CF 1/4, CF 1/2, RESISTORS SERIES

INTRODUCTION

The CF $\frac{1}{8}$, CF $\frac{1}{4}$, CF $\frac{1}{2}$ series resistors are the most popular type of film resistors ideal for general purpose applications. High grade ceramic rods, welded cap construction and special coating techniques ensure high quality and reliability. Products meet and/or exceed EIA RS 196A, JIS- C- 6402 and IEC - 115

The CF $\frac{1}{8}$, CF $\frac{1}{4}$, CF $\frac{1}{2}$ series are specially designed for industrial applications.

These resistors are supplied in individually boxed Tape and Reel packaging as per EIA standards.



FEATURES

- Excellent long term stability.
- Available in bulk, tape & reel or ammo pack.
- Available in 5% tolerance.
- Epoxy coating and marking resistant to all generally used cleaning solvents.
- Uniform body size ensures compatibility with High speed automatic handling machines.

SPECIFICATIONS

RESISTANCE RANGE: 1 Ohms to 10 M Ohms in E 24 Series. **RATED POWER:** 1/4 Watts at 70 °C with derating above 70 °C.

RATED VOLTAGE: $\sqrt{1/4 \times \text{Nominal Resistance}}$. **MAXIMUM VOLTAGE:** 250 V DC. **MAXIMUM OVERLOAD VOLTAGE:** 500 V DC

TEMPERATURE RANGE: -55°C to +155°C with derating above 70°C. **TOLERANCE:** $\pm 5\%$.

LOAD LIFE:

The component will be subjected 1000 hours testing at rated voltage and 70° C, with duty cycles of 1.5 hours "on" and 0.5 hours "off". After the test the Resistance change will remain within $\pm 3\%$ of the initial value for values below 1.0 M Ohms and $\pm 5\%$ for values above 1.0 M ohms.

DAMP HEAT TEST:

The component will be subjected to 95% RH. at 40°C for 1000 hours with duty cycles of 1.5 hours "on" and 0.5 hours "off". After the test the Resistance change will remain within $\pm 3\%$ of the initial value for values below 100 K Ohms and $\pm 5\%$ for values above 100 K Ohms.

DIMENSIONS

BODY				LEAD WIRE			
DIAMETER		LENGTH		DIAMETER		LENGTH	
Inch	mm	Inch	mm	Inch	mm	Inch	mm
0.098 max	2.5 max	0.265 max	6.7 max	0.024 ± 0.001	0.6 ± 0.03	1.10 ± 0.04	28.0 ± 1.0

Performance Characteristics

ELECTRICAL

1.1 RESISTANCE TEMPERATURE COEFFICIENT

This value calculated with the following relation shall remain within the values indicated.

$$\frac{R - R_0}{R_0 (t - t_0)} \times 10^6 \text{ (PPM/}^\circ\text{C)}$$

R_0 - Resistance value at reference temperature of 25°C

R - Resistance value at test temperature of 105°C

Resistance Range in Ohms	upto 100	above 100 to +36K	above 36K to 510K	above 510K to 1M	above 1M to 4.7M
RTC value in PPM/°C	± 350	0 to -350	0 to -650	0 to -850	0 to -1200

1.2 VOLTAGE COEFFICIENT

This value calculated with the following relation shall remain within ± 50 PPM/ V max.

$$\frac{R - r}{0.9 r E} \times 10^6 \text{ (PPM/}^\circ\text{C)}$$

R - Resistance value at rated continuous working voltage

r - Resistance value at 0.1 times rated continuous working voltage

E - Rated continuous working voltage

1.3 DIELECTRIC WITHSTANDING VOLTAGE

Resistors shall withstand a AC rms potential of 500 V for one minute when clamped in a trough of 90° metallic V Block without any flash over or break down.

1.4 INSULATION RESISTANCE

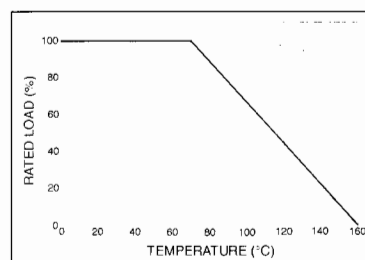
The components shall have an insulation resistance of 1000 M Ohms min. when clamped in the through of 90° metallic V Block and measured at 100 V DC.

1.5 SHORT TERM OVERLOAD

Permanent resistance change after the application of a potential of 2.5 times rated continuous working voltage for 5 ± 0.5 seconds shall be within $\pm (1\% + 0.05 \text{ Ohms})$ Max. without any arching or burning.

1.6 POWER DISSIPATION

FIGURE 1.6



POWER DISSIPATION DERATING CURVE

The component has a power dissipation rating of 0.25 Watts at 25°C. For operations above 70°C the power dissipation capability has to be derated as shown in FIG. 1.6 at left.

MECHANICAL

2.1 TERMINAL STRENGTH

The resistors shall withstand a 0.5 Kg load when held by one terminal and applied to the other terminal in the direction of the longitudinal axis, without any breakdown or mechanical damage.

2.2 TWIST TEST

When leads are bent through 90° at a point 6.35 mm from the body of resistor and rotate through 360° about the original axis of the bent leads in alternating direction for a total 5 rotations.

2.3 SOLDERABILITY

When tested as per MIL - STD - 202D method 208, at test temperature of 230 $\pm 5^\circ\text{C}$ and immersion time of 5 ± 0.5 seconds a minimum coverage of 95 % will be achieved.

2.4 RESISTANCE TO SOLDERING HEAT

Resistance change when leads are immersed to 3.2 to 4.8 mm from resistor body in 350°C $\pm 10^\circ\text{C}$ solder bath for 3 ± 0.5 seconds, to be within 1% +0.05 Ohms with no evidence of mechanical damage.

ENVIRONMENTAL

3.1 MOISTURE RESISTANCE

Resistance change after 1000 hours of operation at rated voltage, 40 $\pm 2^\circ\text{C}$ and 90 to 95% relative humidity for duty cycles of 1.5 hours "on" and "0.5" hours off will be $\pm 3\%$ for values below 100 K Ohms and $\pm 5\%$ for values above 100 K Ohms.



CF 1/8, CF 1/4, CF 1/2, WATT RESISTORS SERIES

INTRODUCTION

The CF $\frac{1}{8}$, CF $\frac{1}{4}$, CF $\frac{1}{2}$ series resistors are the most popular type of film resistors ideal for general purpose applications. High grade ceramic rods, welded cap construction and special coating techniques ensure high quality and reliability. Products meet and/or exceed EIA RS 196A, JIS-C-6402 and IEC-115.

The CF $\frac{1}{8}$, CF $\frac{1}{4}$, CF $\frac{1}{2}$ series are specially designed for industrial applications.

Those resistors are supplied in individually boxed Tape and Reel packaging as per EIA standards.

FEATURES:

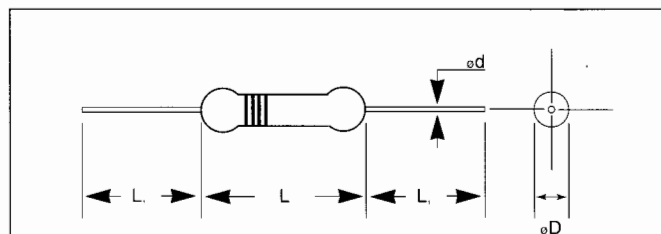
- Excellent long term stability.
- Available in bulk, tape & reel or ammo pack.
- Available in 5% tolerance.
- Uniform body size ensures compatibility with High speed automatic handling machines.
- Epoxy coating and marking resistant to all generally used cleaning solvents.

LOAD LIFE

The component will be subjected 1000 hours testing at rated voltage and 70°C, with duty cycles of 1.5 hours "on" and 0.5 hours "off". After the test the Resistance change will remain within $\pm 3\%$ of the initial value for values below 1.0M ohms and $\pm 5\%$ for values above 1.0M ohms.

DAMP HEAT TEST

The component will be subjected 95% RH, at 40°C for 1000 hours with duty cycles of 1.5 hours "on" and 0.5 hours "off". After the test the Resistance change will remain within $\pm 3\%$ of the initial value for values below 100K ohms and $\pm 5\%$ for values above 100K ohms.



DIMENSIONS

BODY				LEAD WIRE			
DIAMETER		LENGTH		DIAMETER		LENGTH	
inch	mm	inch	mm	inch	mm	inch	mm
0.098 max	2.5 max	0.285 max	6.7 max	0.024 \pm .001	0.010.03	1.10 \pm .04	28.0 \pm 1.0

SPECIFICATIONS

RESISTANCE RANGE: 1 ohms to 10M ohms in E 24 Series.

RATED POWER: 1/4 Watts at 70°C with derating above 70°C

RATED VOLTAGE: $\sqrt{1/4 \times \text{Nominal Resistance}}$

MAXIMUM VOLTAGE: 250 V DC

MAXIMUM OVERLOAD VOLTAGE: 500 V DC

TEMPERATURE: -55°C to +155°C with derating above 70°C $\pm 5\%$



CR THICK FILM CHIP RESISTOR SERIES

INTRODUCTION

The most popular type of chip resistor developed for surface mount technology. Ideal for general purpose applications. Unique construction and special termination techniques ensure high quality and reliability. Extremely compact size for miniaturization.

FEATURES

- Excellent Long Term stability
- Available in Bulk and Tape & Reel packing.
- Available in Tolerances of $\pm 5\%$ ($\pm 1\%$ On Request)
- Uniform body size ensures compatibility with High Speed automatic handling machines
- Compatible with flow and re-flow soldering methods

SPECIFICATIONS

Resistance Range: 10 Ohms to 1.0 M Ohms in E 24 Series. (Please also see Power Ratings Table.)

Rated Power: 1/16 to 1/4W. (Please also see Power Ratings Table.)

Rated Voltage: $\sqrt{\text{Rated Power} \times \text{Nominal Resistance}}$.

Overload Voltage: Please refer to Rated Voltage Table.

Temperature Coefficient: ± 250 ppm per $^{\circ}\text{C}$.

Temperature Range: -55°C to $+125^{\circ}\text{C}$ with derating above 70°C

Tolerance: $\pm 5\%$ ($\pm 1\%$ On request.).

Load Life:

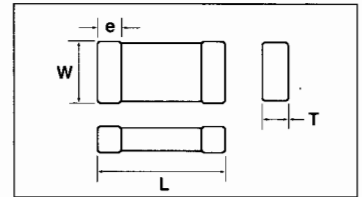
The component will be subjected to 1000 hours of testing at rated voltage and 70°C , with duty cycles of 1.5 hours "on" and 0.5 hours "off". After the test the Resistance change will remain within $\pm 3\%$ of the initial value + 0.1 Ohm for values above 1 M Ohm and 5% for values less than 1 M Ohm.

Resistance to Soldering Heat:

The component can be subjected to a soldering temperature of 270°C for 10 seconds. After the test the Resistance change will remain within $\pm 3\% + 0.1$ Ohms.

Tolerance on Dimensions:

"L" and "W": $\pm 0.25\text{mm}(0.01")$



Case Dimensions Table

Case Code	Dimension in MM (Inches)			
	L	W	T max	e
0603	1.6 (0.063")	0.8 (0.032")	0.45 (0.018")	0.30 (0.012")
0805	2.03 (0.080")	1.27 (0.050")	0.45 (0.018")	0.40 (0.016")
1206	3.18 (0.125")	1.60 (0.063")	0.55 (0.022")	0.75 (0.030")

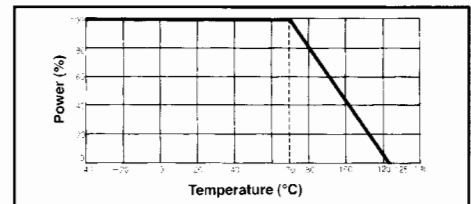
Power Ratings Table

Series	CR 10	CR 21	CR 32	CR 32
Case Size	0603	0805	1206	1206
Power Rating @ 70°C	1/16W (0.063)	1/10W (0.10)	1/8W (0.125)	1/4W (0.25)
Resistance Range (F Tol.)	10 Ω - 1 M Ω	10 Ω - 1 M Ω	10 Ω - 1 M Ω	10 Ω - 1 M Ω
Resistance Range (K Tol.)	2.2 Ω - 3.3 M Ω	2.2 Ω - 10 M Ω	2.2 Ω - 10 M Ω	10 Ω - 1 M Ω

Rated Voltage Table

Series	CR 10	CR 21	CR 32	CR 32
Working Voltage (Max.)	50V	100V	200V	200V
Overload Voltage (Max.)	100V	200V	400V	400V

Power Derating Curve



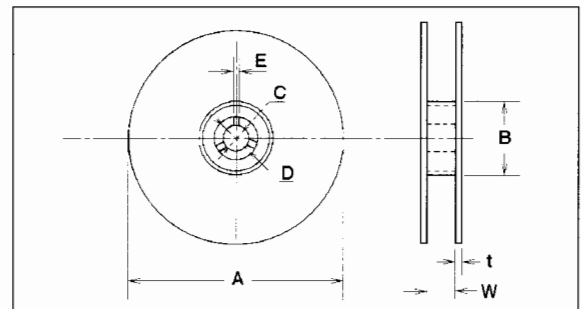
Tape, Reel and Packing Specifications

Reel Dimensions in Millimeters

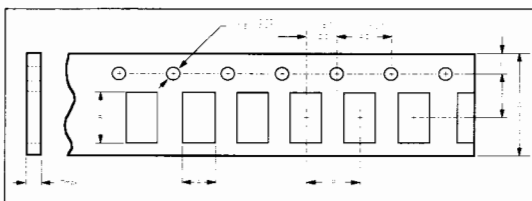
A	B	C	D	E	W	t
$\phi 178 \pm 2.0$	$\phi 50$ min.	13.0 ± 0.5	21.0 ± 0.8	2.0 ± 0.8	8.8/12.8 ± 1.5	2.0 ± 0.5
$\phi 330 \pm 2.0$	$\phi 100$ min.	13.0 ± 0.5	21.0 ± 0.8	2.0 ± 0.8	8.8/12.8 ± 1.5	2.0 ± 0.6

Reel Dimensions in Inches

A	B	C	D	E	W	t
$\phi 7 \pm 0.08$	$\phi 2.0$ min.	5.0 ± 0.02	8.83 ± 0.03	0.08 ± 0.3	0.35/0.50 ± 0.06	0.08 ± 0.02
$\phi 13 \pm 0.08$	$\phi 4.0$ min.	5.0 ± 0.3	8.83 ± 0.03	0.08 ± 0.3	0.35/0.50 ± 0.06	0.08 ± 0.02

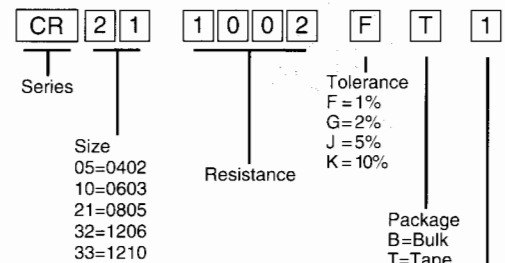


Carrier Tape Dimensions



SIZE CODE	A	B	W	F	E	P	Tmax
	± 0.2 mm or $\pm 0.008"$	± 0.2 mm or $\pm 0.008"$	± 0.3 mm or $\pm 0.012"$	± 0.1 mm or $\pm 0.004"$	± 0.1 mm or $\pm 0.004"$	± 0.1 mm or $\pm 0.004"$	
0603	1.1 (0.043")	1.9mm (0.075")	8.0mm (0.315")	3.5mm (0.138")	1.75mm (0.069")	4mm (0.157")	0.85mm (0.033")
0805	1.6 (0.063")	2.3mm (0.090")	8.0mm (0.315")	3.5mm (0.138")	1.75mm (0.069")	4mm (0.157")	0.85mm (0.033")
1206	1.8 (0.070")	3.45mm (0.136")	8.0mm (0.315")	3.5mm (0.138")	1.75mm (0.069")	4mm (0.157")	0.85mm (0.033")

PART NUMBERING



1=Pager Tape
2=Plastic Tape