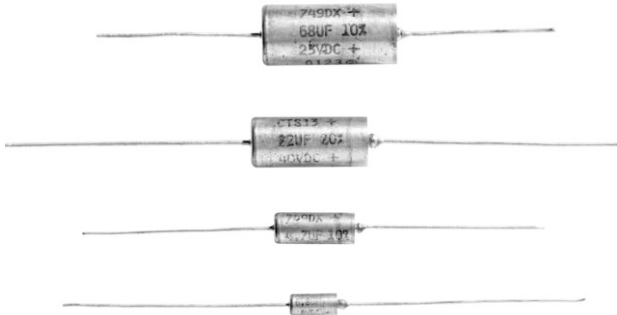


Hermetically Sealed, Axial-Lead to CECC Specifications


FEATURES

- Terminations: Tin/lead (SnPb), 100 % tin (RoHS compliant)
- Hermetically sealed metal case with plastic film insulation
- Extended capacitance range (type 749DX)
- High operational stability with both time and temperature
- Low leakage current
- Low dissipation factor
- Compliant to RoHS directive 2002/95/EC


RoHS*
COMPLIANT

APPLICATIONS

Performance and reliability has been proven in a wide range of applications such as: filtering, by-pass, coupling, energy storage, timing circuits.

PERFORMANCE CHARACTERISTICS
Operating Temperature:

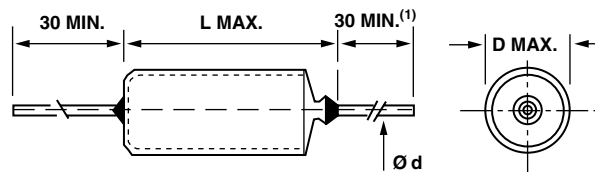
- 55 °C to + 85 °C (types CTS13)
- 55 °C to + 125 °C (types CTS1, 749DX)

SPECIFICATIONS

CECC	BS
30201-001	749DX 9073-N001 749DX
30201-002	CTS1
30201-005	CTS13
30201-029	749DX

ORDERING INFORMATION

CTS13 TYPE	105 CAPACITANCE	X0 CAPACITANCE TOLERANCE	040 DC VOLTAGE RATING AT + 85 °C	A CASE CODE	2 STYLE NUMBER	P PACKAGING	E3 ROHS COMPLIANT
Identifies the Basic Capacitor Design CTS1 = CECC 30201-002 CTS13 = CECC 30201-005 749DX = CECC 30201-001/029	Expressed in picofarads. First two digits are significant. Third digit is the number of zeros following.	X0 = ± 20 % X9 = ± 10 % X5 = ± 5 % (Special Order)	Expressed in volts. Where necessary, zeros precede the voltage rating to complete the 3 digit block 6R3 = 6.3 V	See Table Ratings and Case Codes.	0 = Bare Case 2 = Plastic-Film Insulation	See Taping and Packaging	E3 = 100 % tin termination (RoHS compliant) Blank = SnPb termination

DIMENSIONS in millimeters

⁽¹⁾ 23 mm MAX. FOR TAPED CAPACITORS

CASE CODE	BS D MAX.	NF D MAX.	L MAX.	+ 10 % Ø d - 0.05
A	3.6	3.8	10.2	0.5
B	4.9	5.1	15.0	0.5
C	7.5	7.7	20.5	0.6
D	9.1	9.3	24.0	0.6

* Pb containing terminations are not RoHS compliant, exemptions may apply

RATINGS AND CASE CODES - TYPE CTS1							
C _R μF	RATED VOLTAGE U _R (+ 85 °C)						
	6.3 V	10 V	16 V	25 V	40 V	50 V	63 V
	CATEGORY VOLTAGE U _C (+ 125 °C)						
	4 V	6.3 V	10 V	13 V	25 V	33 V	40 V
0.10							A
0.12							A
0.15							A
0.18							A
0.22							A
0.27						A	A
0.33						A	A
0.39						A	A
0.47					A	A	A
0.56					A	A	A
0.68					A	A	A
0.82					A	A	B
1.0					A	A	B
1.2					A	B	B
1.5				A	B	B	B
1.8			A		B	B	B
2.2			A		B	B	B
2.7			A		B	B	B
3.3			A		B	B	B
3.9		A			B	B	B
4.7		A			B	B	C
5.6	A				B	C	C
6.8	A				B	C	C
8.2				B	C	C	C
10				B	C	C	C
12			B		C	C	D
15			B		C	C	D
18			B		C	C	D
22			B		C	D	
27		B		C	D		
33		B		C	D		
39	B		C		D		
47	B		C		D		
56	B		C	D			
68			C	D			
82		C	D				
100		C	D				
120	C		D				
150	C		D				
180		D					
220		D					
270	D						
330	D						

Note

Preferred ratings are in bold characters. Non-preferred ratings are available only with a capacitance tolerance of ± 10 % or ± 5 % (special order).



RATINGS AND CASE CODES - TYPE CTS13								
C_R μF	RATED VOLTAGE U_R (+ 85 °C)							
	6.3 V	10 V	16 V	20 V	25V	40 V	50 V	63 V
0.10								A
0.12								A
0.15								A
0.18								A
0.22								A
0.27							A	A
0.33							A	A
0.39							A	A
0.47						A	A	A
0.56						A	A	A
0.68						A	A	A
0.82						A	A	B
1.0						A	A	B
1.2					A	A	B	B
1.5					A	B	B	B
1.8				A		B	B	B
2.2				A		B	B	B
2.7			A			B	B	B
3.3			A			B	B	B
3.9		A				B	B	B
4.7		A				B	B	C
5.6	A					B	C	C
6.8	A					B	C	C
8.2					B	C	C	C
10					B	C	C	C
12				B		C	C	D
15				B		C	C	D
18			B			C	C	D
22			B			C	D	
27		B			C	D		
33		B			C	D		
39	B			C		D		
47	B			C		D		
56	B		C		D			
68			C		D			
82		C		D				
100		C		D				
120	C		D					
150	C		D					
180		D						
220		D						
270	D							
330	D							

Note

Preferred ratings are in bold characters. Non-preferred ratings are available only with a capacitance tolerance of ± 10 % or ± 5 % (special order).

RATINGS AND CASE CODES - TYPE 749DX									
C_R μF	RATED VOLTAGE U_R (+ 85 °C)								
	6.3 V	10 V	16 V	20 V	25 V	35 V	40 V	50 V	63 V
	CATEGORY VOLTAGE U_C (+ 125 °C)								
	4 V	6.3 V	10 V	13 V	16 V	23 V	25 V	33 V	40 V
0.068									
0.10						A	A		A
0.12						A	A		A
0.15						A	A		A
0.18						A	A		A
0.22						A	A		A
0.27						A	A		A
0.33						A	A		A
0.39						A	A		A
0.47						A	A		A
0.56						A	A		A
0.68						A	A		A
0.82						A	A	A	B
1.0						A	A	A	B
1.2					A	B	B	B	B
1.5					A	B	B	B	B
1.8				A		B	B	B	B
2.2				A		B	B	B	B
2.7			A			B	B	B	B
3.3			A			B	B	B	B
3.9		A				B	B	B	B
4.7		A				B	B	B	C
5.6	A					B	B	C	C
6.8	A					B	B	C	C
8.2					B	C	C	C	C
10					B	C	C	C	C
12				B		C	C	C	D
15				B		C	C	C	D
18			B			C	C	C	D
22			B			C	C	D	
27		B			C	D	D		
33		B			C	D	D		
39		B		C		D	D		
47	B			C		D			
56	B		C		D	D			
68			C		D				
82		C		D					
100		C		D					
120		C	D						
150	C		D						
180	C	D							
220		D							
270	D								
330	D								

Note
Preferred ratings are in bold characters. Non-preferred ratings are available only with a capacitance tolerance of $\pm 10\%$ or $\pm 5\%$ (special order).



STANDARD/EXTENDED RATINGS - CTS1						
CAPACITANCE C _R (μF)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μA)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)	
6.3 VDC AT + 85 °C, 4 VDC AT 125 °C						
5.6	A	CTS1565(1)6R3A(2)(3)	1.0	6	10	
6.8	A	CTS1685(1)6R3A(2)(3)	1.0	6	10	
39	B	CTS1396(1)6R3B(2)(3)	2.3	6	5	
47	B	CTS1476(1)6R3B(2)(3)	2.8	6	5	
56	B	CTS1566(1)6R3B(2)(3)	3.4	6	5	
120	C	CTS1127(1)6R3C(2)(3)	7.2	6	2	
150	C	CTS1157(1)6R3C(2)(3)	9.0	6	2	
270	D	CTS1277(1)6R3D(2)(3)	16.2	6	1	
330	D	CTS1337(1)6R3D(2)(3)	19.8	8	1	
10 VDC AT + 85 °C, 6.3 VDC AT 125 °C						
3.9	A	CTS1395(1)010A(2)(3)	1.0	6	10	
4.7	A	CTS1475(1)010A(2)(3)	1.0	6	10	
27	B	CTS1276(1)010B(2)(3)	2.7	6	5	
33	B	CTS1336(1)010B(2)(3)	3.3	6	5	
82	C	CTS1826(1)010C(2)(3)	8.2	6	2	
100	C	CTS1107(1)010C(2)(3)	10.0	6	2	
180	D	CTS1187(1)010D(2)(3)	18.0	6	1	
220	D	CTS1227(1)010D(2)(3)	22.0	8	1	
16 VDC AT + 85 °C, 10 VDC AT + 125 °C						
1.8	A	CTS1185(1)016A(2)(3)	1.0	6	10	
2.2	A	CTS1225(1)016A(2)(3)	1.0	6	10	
2.7	A	CTS1275(1)016A(2)(3)	1.0	6	10	
3.3	A	CTS1335(1)016A(2)(3)	1.0	6	10	
12	B	CTS1126(1)016B(2)(3)	1.9	6	5	
15	B	CTS1156(1)016B(2)(3)	2.4	6	5	
18	B	CTS1186(1)016B(2)(3)	2.9	6	5	
22	B	CTS1226(1)016B(2)(3)	3.5	6	5	
39	C	CTS1396(1)016C(2)(3)	6.2	6	2	
47	C	CTS1476(1)016C(2)(3)	7.5	6	2	
56	C	CTS1566(1)016C(2)(3)	9.0	6	2	
68	C	CTS1686(1)016C(2)(3)	10.9	6	2	
82	D	CTS1826(1)016D(2)(3)	13.1	6	1	
100	D	CTS1107(1)016D(2)(3)	16.0	6	1	
120	D	CTS1127(1)016D(2)(3)	19.2	8	1	
150	D	CTS1157(1)016D(2)(3)	24.0	8	1	
25 VDC AT + 85 °C, 16 VDC AT + 125 °C						
1.5	A	CTS1155(1)025A(2)(3)	1.0	6	10	
8.2	B	CTS1825(1)025B(2)(3)	2.1	6	5	
10	B	CTS1106(1)025B(2)(3)	2.5	6	5	
27	C	CTS1276(1)025C(2)(3)	6.8	6	2	
33	C	CTS1336(1)025C(2)(3)	8.3	6	2	
56	D	CTS1566(1)025D(2)(3)	14.0	6	1	
68	D	CTS1686(1)025D(2)(3)	17.0	6	1	
40 VDC AT + 85 °C, 25 VDC AT + 125 °C						
0.47	A	CTS1474(1)040A(2)(3)	1.0	6	10	
0.56	A	CTS1564(1)040A(2)(3)	1.0	6	10	
0.68	A	CTS1684(1)040A(2)(3)	1.0	6	10	
0.82	A	CTS1824(1)040A(2)(3)	1.0	6	10	
1.0	A	CTS1105(1)040A(2)(3)	1.0	6	10	

STANDARD/EXTENDED RATINGS - CTS1					
CAPACITANCE C_R (μ F)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μ A)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)
40 VDC AT + 85 °C, 25 VDC AT + 125 °C					
1.2	A	CTS1125(1)040A(2)(3)	1.0	6	10
1.5	B	CTS1155(1)040B(2)(3)	1.0	6	5
1.8	B	CTS1185(1)040B(2)(3)	1.0	6	5
2.2	B	CTS1225(1)040B(2)(3)	1.0	6	5
2.7	B	CTS1275(1)040B(2)(3)	1.1	6	5
3.3	B	CTS1335(1)040B(2)(3)	1.3	6	5
3.9	B	CTS1395(1)040B(2)(3)	1.6	6	5
4.7	B	CTS1475(1)040B(2)(3)	1.9	6	5
5.6	B	CTS1565(1)040B(2)(3)	2.2	6	5
6.8	B	CTS1685(1)040B(2)(3)	2.7	6	5
8.2	C	CTS1825(1)040C(2)(3)	3.3	6	2
10	C	CTS1106(1)040C(2)(3)	4.0	6	2
12	C	CTS1126(1)040C(2)(3)	4.8	6	2
15	C	CTS1156(1)040C(2)(3)	6.0	6	2
18	C	CTS1186(1)040C(2)(3)	7.2	6	2
22	C	CTS1226(1)040C(2)(3)	8.8	6	2
27	D	CTS1276(1)040D(2)(3)	10.8	6	1
33	D	CTS1336(1)040D(2)(3)	13.2	6	1
39	D	CTS1396(1)040D(2)(3)	15.6	6	1
47	D	CTS1476(1)040D(2)(3)	18.8	6	1
50 VDC AT + 85 °C, 33 VDC AT + 125 °C					
0.27	A	CTS1274(1)050A(2)(3)	1.0	6	10
0.33	A	CTS1334(1)050A(2)(3)	1.0	6	10
0.39	A	CTS1394(1)050A(2)(3)	1.0	6	10
0.47	A	CTS1474(1)050A(2)(3)	1.0	6	10
0.56	A	CTS1564(1)050A(2)(3)	1.0	6	10
0.68	A	CTS1684(1)050A(2)(3)	1.0	6	10
0.82	A	CTS1824(1)050A(2)(3)	1.0	6	10
1.0	A	CTS1105(1)050A(2)(3)	1.0	6	10
1.2	B	CTS1125(1)050B(2)(3)	1.0	6	5
1.5	B	CTS1155(1)050B(2)(3)	1.0	6	5
1.8	B	CTS1185(1)050B(2)(3)	1.0	6	5
2.2	B	CTS1225(1)050B(2)(3)	1.1	6	5
2.7	B	CTS1275(1)050B(2)(3)	1.4	6	5
3.3	B	CTS1335(1)050B(2)(3)	1.7	6	5
3.9	B	CTS1395(1)050B(2)(3)	2.0	6	5
4.7	B	CTS1475(1)050B(2)(3)	2.4	6	5
5.6	C	CTS1565(1)050C(2)(3)	2.8	6	2
6.8	C	CTS1685(1)050C(2)(3)	3.4	6	2
8.2	C	CTS1825(1)050C(2)(3)	4.1	6	2
10	C	CTS1106(1)050C(2)(3)	5.0	6	2
12	C	CTS1126(1)050C(2)(3)	6.0	6	2
15	C	CTS1156(1)050C(2)(3)	7.5	6	2
18	C	CTS1186(1)050C(2)(3)	9.0	6	2
22	D	CTS1226(1)050D(2)(3)	11.0	6	1



STANDARD/EXTENDED RATINGS - CTS1					
CAPACITANCE C_R (μF)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μA)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)
63 VDC AT + 85 °C, 40 VDC AT + 125 °C					
0.10	A	CTS1104(1)063A(2)(3)	1.0	6	10
0.12	A	CTS1124(1)063A(2)(3)	1.0	6	10
0.15	A	CTS1154(1)063A(2)(3)	1.0	6	10
0.18	A	CTS1184(1)063A(2)(3)	1.0	6	10
0.22	A	CTS1224(1)063A(2)(3)	1.0	6	10
0.27	A	CTS1274(1)063A(2)(3)	1.0	6	10
0.33	A	CTS1334(1)063A(2)(3)	1.0	6	10
0.39	A	CTS1394(1)063A(2)(3)	1.0	6	10
0.47	A	CTS1474(1)063A(2)(3)	1.0	6	10
0.56	A	CTS1564(1)063A(2)(3)	1.0	6	10
0.68	A	CTS1684(1)063A(2)(3)	1.0	6	10
0.82	B	CTS1824(1)063B(2)(3)	1.0	6	5
1.0	B	CTS1105(1)063B(2)(3)	1.0	6	5
1.2	B	CTS1125(1)063B(2)(3)	1.0	6	5
1.5	B	CTS1155(1)063B(2)(3)	1.0	6	5
1.8	B	CTS1185(1)063B(2)(3)	1.1	6	5
2.2	B	CTS1225(1)063B(2)(3)	1.4	6	5
2.7	B	CTS1275(1)063B(2)(3)	1.7	6	5
3.3	B	CTS1335(1)063B(2)(3)	2.1	6	5
3.9	B	CTS1395(1)063B(2)(3)	2.5	6	5
4.7	C	CTS1475(1)063C(2)(3)	3.0	6	2
5.6	C	CTS1565(1)063C(2)(3)	3.5	6	2
6.8	C	CTS1685(1)063C(2)(3)	4.3	6	2
8.2	C	CTS1825(1)063C(2)(3)	5.2	6	2
10	C	CTS1106(1)063C(2)(3)	6.3	6	2
12	D	CTS1126(1)063D(2)(3)	7.6	6	1
15	D	CTS1156(1)063D(2)(3)	9.5	6	1
18	D	CTS1186(1)063D(2)(3)	11.3	6	1

Notes

- (1) Capacitance Tolerance Code: X5, X9, X0
- (2) Style number - 0 or 2
- (3) Packaging Code

STANDARD/EXTENDED RATINGS - CTS13						
CAPACITANCE C_R (μ F)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μ A)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)	
6.3 VDC AT + 85 °C						
5.6	A	CTS13565(1)6R3A(2)(3)	1.0	6	10	
6.8	A	CTS13685(1)6R3A(2)(3)	1.0	6	10	
39	B	CTS13396(1)6R3B(2)(3)	2.3	6	5	
47	B	CTS13476(1)6R3B(2)(3)	2.8	6	5	
56	B	CTS13566(1)6R3B(2)(3)	3.4	6	5	
120	C	CTS13127(1)6R3C(2)(3)	7.2	6	2	
150	C	CTS13157(1)6R3C(2)(3)	9.0	6	2	
270	D	CTS13277(1)6R3D(2)(3)	16.2	6	1	
330	D	CTS13337(1)6R3D(2)(3)	19.8	8	1	
10 VDC AT + 85 °C						
3.9	A	CTS13395(1)010A(2)(3)	1.0	6	10	
4.7	A	CTS13475(1)010A(2)(3)	1.0	6	10	
27	B	CTS13276(1)010B(2)(3)	2.7	6	5	
33	B	CTS13336(1)010B(2)(3)	3.3	6	5	
82	C	CTS13826(1)010C(2)(3)	8.2	6	2	
100	C	CTS13107(1)010C(2)(3)	10.0	6	2	
180	D	CTS13187(1)010D(2)(3)	18.0	6	1	
220	D	CTS13227(1)010D(2)(3)	22.0	8	1	
16 VDC AT + 85 °C						
2.7	A	CTS13275(1)016A(2)(3)	1.0	6	10	
3.3	A	CTS13335(1)016A(2)(3)	1.0	6	10	
18	B	CTS13186(1)016B(2)(3)	2.9	6	5	
22	B	CTS13226(1)016B(2)(3)	3.5	6	5	
56	C	CTS13566(1)016C(2)(3)	9.0	6	2	
68	C	CTS13686(1)016C(2)(3)	10.9	6	2	
120	D	CTS13127(1)016D(2)(3)	19.2	8	1	
150	D	CTS13157(1)016D(2)(3)	24.0	8	1	
20 VDC AT + 85 °C						
1.8	A	CTS13185(1)020A(2)(3)	1.0	6	10	
2.2	A	CTS13225(1)020A(2)(3)	1.0	6	10	
12	B	CTS13126(1)020B(2)(3)	2.4	6	5	
15	B	CTS13156(1)020B(2)(3)	3.0	6	5	
39	C	CTS13396(1)020C(2)(3)	7.8	6	2	
47	C	CTS13476(1)020C(2)(3)	9.4	6	2	
82	D	CTS13826(1)020D(2)(3)	16.4	6	1	
100	D	CTS13107(1)020D(2)(3)	20.0	8	1	
25 VDC AT + 85 °C						
1.2	A	CTS13125(1)025A(2)(3)	1.0	6	10	
1.5	A	CTS13155(1)025A(2)(3)	1.0	6	10	
8.2	B	CTS13825(1)025B(2)(3)	2.1	6	5	
10	B	CTS13106(1)025B(2)(3)	2.5	6	5	
27	C	CTS13276(1)025C(2)(3)	6.8	6	2	
33	C	CTS13336(1)025C(2)(3)	8.3	6	2	
56	D	CTS13566(1)025D(2)(3)	14.0	6	1	
68	D	CTS13686(1)025D(2)(3)	17.0	6	1	



STANDARD/EXTENDED RATINGS - CTS13						
CAPACITANCE C_R (μF)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μA)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)	
40 VDC AT + 85 °C						
0.47	A	CTS13474(1)040A(2)(3)	1.0	6	10	10
0.56	A	CTS13564(1)040A(2)(3)	1.0	6	10	10
0.68	A	CTS13684(1)040A(2)(3)	1.0	6	10	10
0.82	A	CTS13824(1)040A(2)(3)	1.0	6	10	10
1.0	A	CTS13105(1)040A(2)(3)	1.0	6	10	10
1.2	A	CTS13125(1)040A(2)(3)	1.0	6	10	10
1.5	B	CTS13155(1)040B(2)(3)	1.0	6	5	5
1.8	B	CTS13185(1)040B(2)(3)	1.0	6	5	5
2.2	B	CTS13225(1)040B(2)(3)	1.0	6	5	5
2.7	B	CTS13275(1)040B(2)(3)	1.1	6	5	5
3.3	B	CTS13335(1)040B(2)(3)	1.3	6	5	5
3.9	B	CTS13395(1)040B(2)(3)	1.6	6	5	5
4.7	B	CTS13475(1)040B(2)(3)	1.9	6	5	5
5.6	B	CTS13565(1)040B(2)(3)	2.2	6	5	5
6.8	B	CTS13685(1)040B(2)(3)	2.7	6	5	5
8.2	C	CTS13825(1)040C(2)(3)	3.3	6	2	2
10	C	CTS13106(1)040C(2)(3)	4.0	6	2	2
12	C	CTS13126(1)040C(2)(3)	4.8	6	2	2
15	C	CTS13156(1)040C(2)(3)	6.0	6	2	2
18	C	CTS13186(1)040C(2)(3)	7.2	6	2	2
22	C	CTS13226(1)040C(2)(3)	8.8	6	2	2
27	D	CTS13276(1)040D(2)(3)	10.8	6	1	1
33	D	CTS13336(1)040D(2)(3)	13.2	6	1	1
39	D	CTS13396(1)040D(2)(3)	15.6	6	1	1
47	D	CTS13476(1)040D(2)(3)	18.8	6	1	1
50 VDC AT + 85 °C						
0.27	A	CTS13274(1)050A(2)(3)	1.0	6	10	10
0.33	A	CTS13334(1)050A(2)(3)	1.0	6	10	10
0.39	A	CTS13394(1)050A(2)(3)	1.0	6	10	10
0.47	A	CTS13474(1)050A(2)(3)	1.0	6	10	10
0.56	A	CTS13564(1)050A(2)(3)	1.0	6	10	10
0.68	A	CTS13684(1)050A(2)(3)	1.0	6	10	10
0.82	A	CTS13824(1)050A(2)(3)	1.0	6	10	10
1.0	A	CTS13105(1)050A(2)(3)	1.0	6	10	10
1.2	B	CTS13125(1)050B(2)(3)	1.0	6	5	5
1.5	B	CTS13155(1)050B(2)(3)	1.0	6	5	5
1.8	B	CTS13185(1)050B(2)(3)	1.0	6	5	5
2.2	B	CTS13225(1)050B(2)(3)	1.1	6	5	5
2.7	B	CTS13275(1)050B(2)(3)	1.4	6	5	5
3.3	B	CTS13335(1)050B(2)(3)	1.7	6	5	5
3.9	B	CTS13395(1)050B(2)(3)	2.0	6	5	5
4.7	B	CTS13475(1)050B(2)(3)	2.4	6	5	5
5.6	C	CTS13565(1)050C(2)(3)	2.8	6	2	2
6.8	C	CTS13685(1)050C(2)(3)	3.4	6	2	2
8.2	C	CTS13825(1)050C(2)(3)	4.1	6	2	2
10	C	CTS13106(1)050C(2)(3)	5.0	6	2	2
12	C	CTS13126(1)050C(2)(3)	6.0	6	2	2
15	C	CTS13156(1)050C(2)(3)	7.5	6	2	2
18	C	CTS13186(1)050C(2)(3)	9.0	6	2	2
22	D	CTS13226(1)050D(2)(3)	11.0	6	1	1

STANDARD/EXTENDED RATINGS - CTS13						
CAPACITANCE C_R (μ F)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μ A)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)	
63 VDC AT + 85 °C						
0.1	A	CTS13104(1)063A(2)(3)	1.0	6	10	
0.12	A	CTS13124(1)063A(2)(3)	1.0	6	10	
0.15	A	CTS13154(1)063A(2)(3)	1.0	6	10	
0.18	A	CTS13184(1)063A(2)(3)	1.0	6	10	
0.22	A	CTS13224(1)063A(2)(3)	1.0	6	10	
0.27	A	CTS13274(1)063A(2)(3)	1.0	6	10	
0.33	A	CTS13334(1)063A(2)(3)	1.0	6	10	
0.39	A	CTS13394(1)063A(2)(3)	1.0	6	10	
0.47	A	CTS13474(1)063A(2)(3)	1.0	6	10	
0.56	A	CTS13564(1)063A(2)(3)	1.0	6	10	
0.68	A	CTS13684(1)063A(2)(3)	1.0	6	10	
0.82	B	CTS13824(1)063B(2)(3)	1.0	6	5	
1.0	B	CTS13105(1)063B(2)(3)	1.0	6	5	
1.2	B	CTS13125(1)063B(2)(3)	1.0	6	5	
1.5	B	CTS13155(1)063B(2)(3)	1.0	6	5	
1.8	B	CTS13185(1)063B(2)(3)	1.1	6	5	
2.2	B	CTS13225(1)063B(2)(3)	1.4	6	5	
2.7	B	CTS13275(1)063B(2)(3)	1.7	6	5	
3.3	B	CTS13335(1)063B(2)(3)	2.1	6	5	
3.9	B	CTS13395(1)063B(2)(3)	2.5	6	5	
4.7	C	CTS13475(1)063C(2)(3)	3.0	6	2	
5.6	C	CTS13565(1)063C(2)(3)	3.5	6	2	
6.8	C	CTS13685(1)063C(2)(3)	4.3	6	2	
8.2	C	CTS13825(1)063C(2)(3)	5.2	6	2	
10	C	CTS13106(1)063C(2)(3)	6.3	6	2	
12	D	CTS13126(1)063D(2)(3)	7.6	6	1	
15	D	CTS13156(1)063D(2)(3)	9.5	6	1	
18	D	CTS13186(1)063D(2)(3)	11.3	6	1	

Notes

- (1) Capacitance Tolerance Code: X5, X9, X0
- (2) Style number - 0 or 2
- (3) Packaging Code



STANDARD/EXTENDED RATINGS - 749DX						
CAPACITANCE C_R (μF)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μA)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)	
6.3 VDC AT + 85 °C, 4 VDC AT 125 °C						
5.6	A	749DX565(1)6R3A(2)(3)	1.0	6	10	
6.8	A	749DX685(1)6R3A(2)(3)	1.0	6	10	
47	B	749DX476(1)6R3B(2)(3)	2.8	6	5	
56	B	749DX566(1)6R3B(2)(3)	3.4	6	5	
150	C	749DX157(1)6R3C(2)(3)	9.0	8	2	
180	C	749DX187(1)6R3C(2)(3)	10.8	8	2	
270	D	749DX277(1)6R3D(2)(3)	16.2	8	1	
330	D	749DX337(1)6R3D(2)(3)	19.8	8	1	
10 VDC AT + 85 °C, 6.3 VDC AT 125 °C						
3.9	A	749DX395(1)010A(2)(3)	1.0	6	10	
4.7	A	749DX475(1)010A(2)(3)	1.0	6	10	
27	B	749DX276(1)010B(2)(3)	2.7	6	5	
33	B	749DX336(1)010B(2)(3)	3.3	6	5	
39	B	749DX396(1)010B(2)(3)	3.9	6	5	
82	C	749DX826(1)010C(2)(3)	8.2	6	2	
100	C	749DX107(1)010C(2)(3)	10.0	6	2	
120	C	749DX127(1)010C(2)(3)	12.0	8	2	
180	D	749DX187(1)010D(2)(3)	18.0	8	1	
220	D	749DX227(1)010D(2)(3)	22.0	8	1	
16 VDC AT + 85 °C, 10 VDC AT + 125 °C						
2.7	A	749DX275(1)016A(2)(3)	1.0	6	10	
3.3	A	749DX335(1)016A(2)(3)	1.0	6	10	
18	B	749DX186(1)016B(2)(3)	2.9	6	5	
22	B	749DX226(1)016B(2)(3)	3.5	6	5	
56	C	749DX566(1)016C(2)(3)	9.0	6	2	
68	C	749DX686(1)016C(2)(3)	10.9	6	2	
120	D	749DX127(1)016D(2)(3)	19.2	8	1	
150	D	749DX157(1)016D(2)(3)	24.0	8	1	
20 VDC AT + 85 °C, 13 VDC AT + 125 °C						
1.8	A	749DX185(1)020A(2)(3)	1.0	6	10	
2.2	A	749DX225(1)020A(2)(3)	1.0	6	10	
12	B	749DX126(1)020B(2)(3)	2.4	6	5	
15	B	749DX156(1)020B(2)(3)	3.0	6	5	
39	C	749DX396(1)020C(2)(3)	7.8	6	2	
47	C	749DX476(1)020C(2)(3)	9.4	6	2	
82	D	749DX826(1)020D(2)(3)	16.4	6	1	
100	D	749DX107(1)020D(2)(3)	20.0	6	1	
25 VDC AT + 85 °C, 16 VDC AT + 125 °C						
1.2	A	749DX125(1)025A(2)(3)	1.0	6	10	
1.5	A	749DX155(1)025A(2)(3)	1.0	6	10	
8.2	B	749DX825(1)025B(2)(3)	2.1	6	5	
10	B	749DX106(1)025B(2)(3)	2.5	6	5	
27	C	749DX276(1)025C(2)(3)	6.8	6	2	
33	C	749DX336(1)025C(2)(3)	8.3	6	2	
56	D	749DX566(1)025D(2)(3)	14.0	6	1	
68	D	749DX686(1)025D(2)(3)	17.0	6	1	



STANDARD/EXTENDED RATINGS - 749DX						
CAPACITANCE C_R (μ F)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μ A)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)	
35 VDC AT + 85 °C, 23 VDC AT + 125 °C						
0.1	A	749DX104(1)035A(2)(3)	1.0	6	10	
0.12	A	749DX124(1)035A(2)(3)	1.0	6	10	
0.15	A	749DX154(1)035A(2)(3)	1.0	6	10	
0.18	A	749DX184(1)035A(2)(3)	1.0	6	10	
0.22	A	749DX224(1)035A(2)(3)	1.0	6	10	
0.27	A	749DX274(1)035A(2)(3)	1.0	6	10	
0.33	A	749DX334(1)035A(2)(3)	1.0	6	10	
0.39	A	749DX394(1)035A(2)(3)	1.0	6	10	
0.47	A	749DX474(1)035A(2)(3)	1.0	6	10	
0.56	A	749DX564(1)035A(2)(3)	1.0	6	10	
0.68	A	749DX684(1)035A(2)(3)	1.0	6	10	
0.82	A	749DX824(1)035A(2)(3)	1.0	6	10	
1	A	749DX105(1)035A(2)(3)	1.0	6	10	
1.2	B	749DX125(1)035B(2)(3)	1.0	6	5	
1.5	B	749DX155(1)035B(2)(3)	1.0	6	5	
1.8	B	749DX185(1)035B(2)(3)	1.0	6	5	
2.2	B	749DX225(1)035B(2)(3)	1.0	6	5	
2.7	B	749DX275(1)035B(2)(3)	1.0	6	5	
3.3	B	749DX335(1)035B(2)(3)	1.2	6	5	
3.9	B	749DX395(1)035B(2)(3)	1.4	6	5	
4.7	B	749DX475(1)035B(2)(3)	1.6	6	5	
5.6	B	749DX565(1)035B(2)(3)	2.0	6	5	
6.8	B	749DX685(1)035B(2)(3)	2.4	6	5	
8.2	C	749DX825(1)035C(2)(3)	2.9	6	2	
10	C	749DX106(1)035C(2)(3)	3.5	6	2	
12	C	749DX126(1)035C(2)(3)	4.2	6	2	
15	C	749DX156(1)035C(2)(3)	5.3	6	2	
18	C	749DX186(1)035C(2)(3)	6.3	6	2	
22	C	749DX226(1)035C(2)(3)	7.7	6	2	
27	D	749DX276(1)035D(2)(3)	9.5	6	1	
33	D	749DX336(1)035D(2)(3)	11.6	6	1	
39	D	749DX396(1)035D(2)(3)	13.7	6	1	
47	D	749DX476(1)035D(2)(3)	16.5	6	1	
56	D	749DX566(1)035D(2)(3)	19.6	6	1	
40 VDC AT + 85 °C, 25 VDC AT + 125 °C						
0.1	A	749DX104(1)040A(2)(3)	1.0	6	10	
0.12	A	749DX124(1)040A(2)(3)	1.0	6	10	
0.15	A	749DX154(1)040A(2)(3)	1.0	6	10	
0.18	A	749DX184(1)040A(2)(3)	1.0	6	10	
0.22	A	749DX224(1)040A(2)(3)	1.0	6	10	
0.27	A	749DX274(1)040A(2)(3)	1.0	6	10	
0.33	A	749DX334(1)040A(2)(3)	1.0	6	10	
0.39	A	749DX394(1)040A(2)(3)	1.0	6	10	
0.47	A	749DX474(1)040A(2)(3)	1.0	6	10	
0.56	A	749DX564(1)040A(2)(3)	1.0	6	10	
0.68	A	749DX684(1)040A(2)(3)	1.0	6	10	
0.82	A	749DX824(1)040A(2)(3)	1.0	6	10	
1.0	A	749DX105(1)040A(2)(3)	1.0	6	10	
1.2	B	749DX125(1)040B(2)(3)	1.0	6	5	



STANDARD/EXTENDED RATINGS - 749DX					
CAPACITANCE C_R (μF)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μA)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)
40 VDC AT + 85 °C, 25 VDC AT + 125 °C					
1.5	B	749DX155(1)040B(2)(3)	1.0	6	5
1.8	B	749DX185(1)040B(2)(3)	1.0	6	5
2.2	B	749DX225(1)040B(2)(3)	1.0	6	5
2.7	B	749DX275(1)040B(2)(3)	1.1	6	5
3.3	B	749DX335(1)040B(2)(3)	1.3	6	5
3.9	B	749DX395(1)040B(2)(3)	1.6	6	5
4.7	B	749DX475(1)040B(2)(3)	1.9	6	5
5.6	B	749DX565(1)040B(2)(3)	2.2	6	5
6.8	B	749DX685(1)040B(2)(3)	2.7	6	5
8.2	C	749DX825(1)040C(2)(3)	3.3	6	2
10	C	749DX106(1)040C(2)(3)	4.0	6	2
12	C	749DX126(1)040C(2)(3)	4.8	6	2
15	C	749DX156(1)040C(2)(3)	6.0	6	2
18	C	749DX186(1)040C(2)(3)	7.2	6	2
22	C	749DX226(1)040C(2)(3)	8.8	6	2
27	D	749DX276(1)040D(2)(3)	10.8	6	1
33	D	749DX336(1)040D(2)(3)	13.2	6	1
39	D	749DX396(1)040D(2)(3)	15.6	6	1
50 VDC AT + 85 °C, 33 VDC AT + 125 °C					
0.82	A	749DX824(1)050A(2)(3)	1.0	6	10
1	A	749DX105(1)050A(2)(3)	1.0	6	10
1.2	B	749DX125(1)050B(2)(3)	1.0	6	5
1.5	B	749DX155(1)050B(2)(3)	1.0	6	5
1.8	B	749DX185(1)050B(2)(3)	1.0	6	5
2.2	B	749DX225(1)050B(2)(3)	1.1	6	5
2.7	B	749DX275(1)050B(2)(3)	1.4	6	5
3.3	B	749DX335(1)050B(2)(3)	1.7	6	5
3.9	B	749DX395(1)050B(2)(3)	2.0	6	5
4.7	B	749DX475(1)050B(2)(3)	2.4	6	5
5.6	C	749DX565(1)050C(2)(3)	2.8	6	2
6.8	C	749DX685(1)050C(2)(3)	3.4	6	2
8.2	C	749DX825(1)050C(2)(3)	4.1	6	2
10	C	749DX106(1)050C(2)(3)	5.0	6	2
12	C	749DX126(1)050C(2)(3)	6.0	6	2
15	C	749DX156(1)050C(2)(3)	7.5	6	2
18	C	749DX186(1)050C(2)(3)	9.0	6	2
22	D	749DX226(1)050D(2)(3)	11.0	6	1
63 VDC AT + 85 °C, 40 VDC AT + 125 °C					
0.1	A	749DX104(1)063A(2)(3)	1.0	6	10
0.12	A	749DX124(1)063A(2)(3)	1.0	6	10
0.15	A	749DX154(1)063A(2)(3)	1.0	6	10
0.18	A	749DX184(1)063A(2)(3)	1.0	6	10
0.22	A	749DX224(1)063A(2)(3)	1.0	6	10
0.27	A	749DX274(1)063A(2)(3)	1.0	6	10
0.33	A	749DX334(1)063A(2)(3)	1.0	6	10
0.39	A	749DX394(1)063A(2)(3)	1.0	6	10
0.47	A	749DX474(1)063A(2)(3)	1.0	6	10
0.56	A	749DX564(1)063A(2)(3)	1.0	6	10
0.68	A	749DX684(1)063A(2)(3)	1.0	6	10



STANDARD/EXTENDED RATINGS - 749DX					
CAPACITANCE C_R (μ F)	CASE CODE	PART NUMBER	MAX. DC LEAKAGE AT + 25 °C (μ A)	MAX. DF AT + 25 °C 120 Hz, (%)	MAX. IMPEDANCE AT + 25 °C 100 kHz (Ω)
63 VDC AT + 85 °C, 40 VDC AT + 125 °C					
0.82	B	749DX824(1)063B(2)(3)	1.0	6	5
1	B	749DX105(1)063B(2)(3)	1.0	6	5
1.2	B	749DX125(1)063B(2)(3)	1.0	6	5
1.5	B	749DX155(1)063B(2)(3)	1.0	6	5
1.8	B	749DX185(1)063B(2)(3)	1.1	6	5
2.2	B	749DX225(1)063B(2)(3)	1.4	6	5
2.7	B	749DX275(1)063B(2)(3)	1.7	6	5
3.3	B	749DX335(1)063B(2)(3)	2.1	6	5
3.9	B	749DX395(1)063B(2)(3)	2.5	6	5
4.7	C	749DX475(1)063C(2)(3)	3.0	6	2
5.6	C	749DX565(1)063C(2)(3)	3.5	6	2
6.8	C	749DX685(1)063C(2)(3)	4.3	6	2
8.2	C	749DX825(1)063C(2)(3)	5.2	6	2
10	C	749DX106(1)063C(2)(3)	6.3	6	2
12	D	749DX126(1)063D(2)(3)	7.6	6	1
15	D	749DX156(1)063D(2)(3)	9.5	6	1
18	D	749DX186(1)063D(2)(3)	11.3	6	1

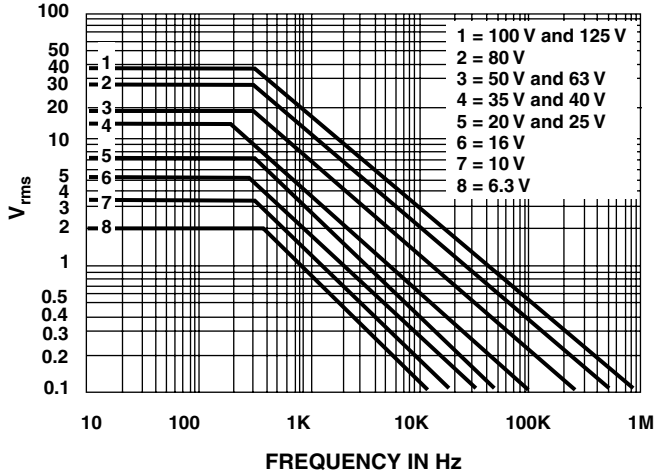
Notes

- (1) Capacitance Tolerance Code: X5, X9, X0
- (2) Style number - 0 or 2
- (3) Packaging Code

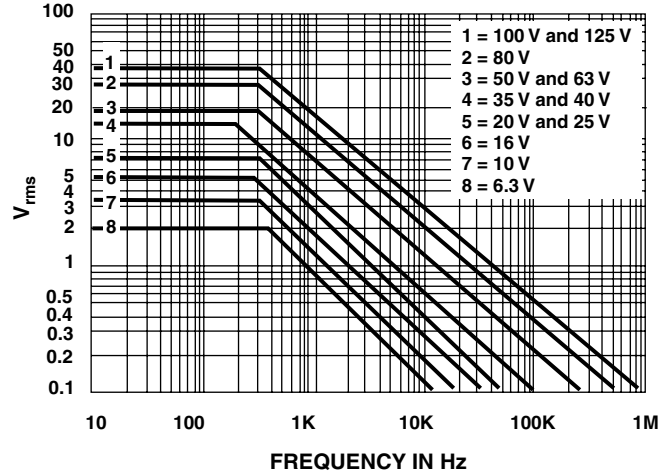


TYPICAL CURVES RIPPLE VOLTAGE AT + 25 °C

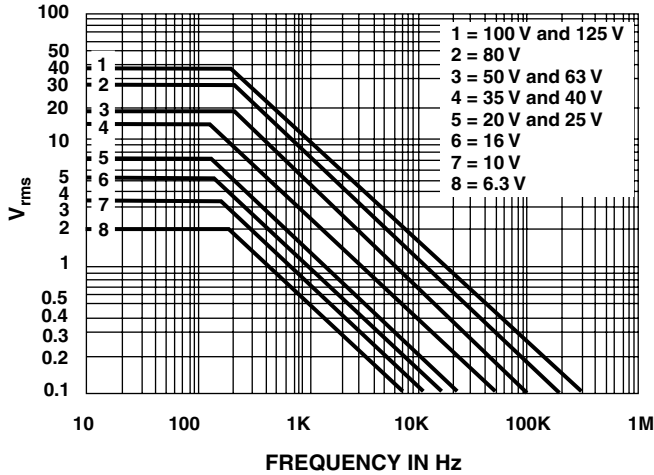
CASE "A" CAPACITORS



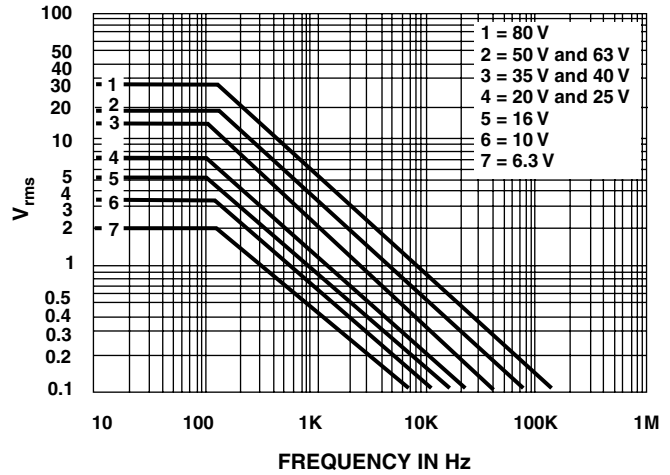
CASE "B" CAPACITORS



CASE "C" CAPACITORS



CASE "D" CAPACITORS



PERFORMANCE CHARACTERISTICS

1. Operating temperature:

- 55 °C to + 85 °C with rated DC voltage U_R applied,
+ 85 °C to + 125 °C with linear voltage derating
to category voltage U_C (only for types CTS1, 749DX).

2. Capacitance and tolerance:

Capacitance measured at 100 Hz and + 25 °C shall be within the specified tolerance limits of the nominal rating. Capacitance measurement shall be made by means of a polarized capacitance bridge. The polarizing voltage shall be of 2.2 V. The maximum voltage applied during measurements shall be 1.0 V_{rms} at 100 Hz and + 25 °C.

3. Reverse voltage:

These capacitors are capable of withstanding peak voltage in the reverse direction equal to: 15 % of the rated DC voltage at + 25 °C, 5 % of the rated DC voltage at + 85 °C.

4. Surge voltage:

Table 1

PRODUCT TYPE	SURGE VOLTAGE AT + 85 °C	SURGE VOLTAGE AT + 125 °C
CTS13	1.30 U_R	-
749DX/CTS1	1.30 U_R	1.30 U_C

Capacitors shall withstand the surge voltage applied in series with a 1000 W resistor, at the rate of 1.5 min on, 5.5 min off, for 1000 successive test cycles at + 85 °C or at + 125 °C. After test, dissipation factor and leakage current shall meet the initial requirements at + 25 °C (see below), capacitance change shall not exceed ± 10 % of initial value at + 25 °C.

5. Leakage current:

Rated voltage U_R shall be applied to capacitors during five minutes with a resistor of 1000 Ω in series with each capacitor, before making DC leakage current measurements. The leakage current shall not exceed the following limits:

Table 2

TEMPERATURE	CTS1/CTS13/749DX
+ 25 °C	0.01 $C_R \times U_R$ or 1 μA whichever is greater
+ 85 °C	0.1 $C_R \times U_R$ or 10 μA whichever is greater
+ 125 °C	0.125 $C_R \times U_R$ or 12.5 μA whichever is greater

6. Dissipation factor:

The dissipation factor, when measured at 100 Hz, shall not exceed the values below:

Table 3

TEMP.	CTS1/CTS13		749DX	
	$C_R U_R \leq 1900$	$C_R U_R > 1900$	$C_R \leq 100$	$C_R > 100$
- 55 °C	9 %	11 %	8 %	10 %
+ 25 °C	6 %	8 %	6 %	8 %
+ 85 °C	9 %	11 %	-	-
+ 125 °C (1)	12 %	14 %	10 %	11 %

Note (1) Not applicable for CTS13

7. Stability at low and high temperature:

Capacitance change with temperature shall not exceed the limits of the following table, leakage current and dissipation factor shall be within the limits specified in Tables 2 and 3.

Table 4

TEMPERATURE	CTS1/CTS13/749DX
- 55 °C	- 10 %
+ 85 °C	+ 12 %
+ 125 °C (2)	+ 15 %

Note (2) Not applicable for CTS13

8. Impedance:

The impedance measured at 100 kHz and 25 °C shall not exceed the following values:

Table 5

CASE CODE	Z (Ω) (3)
A	10
B	5
C	2
D	1

Note (3) Not applicable for $C_R \leq 0.68 \mu F$

9. Life test:

After 2000 h at + 85 °C with rated DC voltage applied, or after 2000 h at + 125 °C with category DC voltage applied (for types CTS1, 749DX only) capacitors shall meet the requirements in table 6.

Table 6

PRODUCT TYPE	CAPACITANCE CHANGE	DISSIPATION FACTOR	DC LEAKAGE CURRENT
CTS1 CTS13 749DX	Within ± 10 % of initial value at + 25 °C	Within initial requirement at + 25 °C	Within 125 % of initial requirements at + 25 °C



PERFORMANCE CHARACTERISTICS

(Continued)

10. Humidity test:

After 56 days (1350 h) at + 40 °C, 90 % to 95 % of relative humidity (per IEC 68-2-3) with no voltage applied, capacitors shall meet the requirements in table 7 below.

Table 7

CAPACITANCE CHANGE	Within ± 3 % of initial value
DC LEAKAGE CURRENT	Within initial requirement at + 25 °C - Table 2
DISSIPATION FACTOR	Within initial requirement at + 25 °C - Table 3

Table 8

CAPACITANCE CHANGE	Within ± 5 % of initial value at + 25 °C
DC LEAKAGE CURRENT	Within initial requirement at + 25 °C - Table 2
DISSIPATION FACTOR	Within initial requirement at + 25 °C - Table 3

Typical values of charge-discharge current (per above test conditions).

RATED VOLTAGE U_R (V)	CHARGE-DISCHARGE CURRENT (A)
6.3	13
10	20
16	32
25	50
40	80
50	100
63	126

12. Insulation test:

For capacitors with insulating sleeves, a DC voltage of 100 V shall be applied for one minute between the case of the capacitor and a metal “V” block in intimate contact with the insulating sleeve. The insulating resistance measured in these conditions shall be at least 100 MΩ.

13. Lead pull test:

Leads shall withstand the following test (IEC 68-2-2): Tensile stress of 5N (cases A and B) or 10N (cases C and D) for 10 s in any direction

One bend in each direction
Two cosecutive rotations of 180°

GUIDE TO APPLICATION

1. A-C Ripple current:

The maximum allowable ripple current shall be determined from the formula:

$$I_{rms} = \sqrt{\frac{P}{R_{ESR}}}$$

where,

P = Power Dissipation in W at + 25 °C as given below
R_{ESR} = The capacitor Equivalent Series resistance at the specified frequency.

2. A-C Ripple voltage:

The maximum allowable ripple voltage shall be determined from the formula:

$$V_{rms} = \sqrt{\frac{P}{R_{ESR}}} \times Z$$

where,

Z = The capacitor Impedance at the specified frequency.

The calculations are summarized on the graphs page 59 giving the maximum available ripple voltage as a function of frequency.

However, the sum of the peak AC voltage plus the DC voltage shall not exceed the rated DC voltage at + 85 °C of the capacitor. The sum of the negative peak AC voltage plus the DC voltage shall not allow a voltage reversal exceeding 15 % of the rated DC voltage.

3. AC Ripple current or voltage derating factor:

If these capacitors are to be operated at temperatures above + 25 °C, the permissible rms ripple current or voltage shall be calculated using the derating factors in the table below:

TEMPERATURE	DERATING FACTOR
+ 25 °C	1.0
+ 55 °C	0.8
+ 85 °C	0.6
+ 125 °C	0.4

4. Power dissipation:

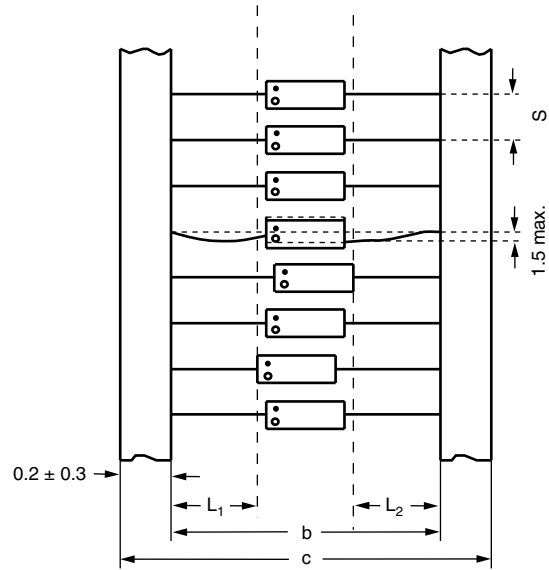
Power dissipation will be affected by the heat sinking capability of the mounting surface. Non-sinusoidal ripple current may produce heating effects which differ from those shown in the following table. It is important that the equivalent I_{rms} value be established when calculating permissible operating levels.

CASE CODE	POWER DISSIPATION AT + 25 °C (W)
A	0.115
B	0.145
C	0.185
D	0.225

TAPE AND REEL PACKING

MEETS IEC 286-1

$L_1 - L_2 = 1.5 \text{ mm max.}$
 S = component spacing (cumulative tolerance on 20 units = 4 mm)
 b = tape spacing
 c = overall length



DIMENSIONS in millimeters

CASE SIZE	REEL AND AMMO S	REEL PACK					AMMO PACK			BULK
		OPTION P		OPTION R		QTY PER REEL	OPTION G		QTY PER BOX	QTY PER PACK
		b	c MAX.	b	c MAX.		b	c MAX.		
A	5.0 ± 0.3	63 ± 2	78	53 ± 2	68	1000	53 ± 2	68	500	100
B	5.0 ± 0.3	63 ± 2	78	53 ± 2	68	1000	53 ± 2	68	500	75
C	10.0 ± 0.3	63 ± 2	78	63 ± 2	78	500	53 ± 2	68	250	50
D	10.0 ± 0.3	63 ± 2	78	63 ± 2	78	500	53 ± 2	68	250	25
PACKAGING CODE		P		R			G			B

MARKING

Capacitors shall be marked with SPRAGUE and/or the registered trademark 2 at vendor's option; the type number; rated capacitance and tolerance (with a letter code, if different from $\pm 20\%$, $K = \pm 10\%$; $J = \pm 5\%$); rated DC voltage at $+ 85^\circ\text{C}$ and the date code of manufacture.

Capacitors shall be marked on one end with a "plus" sign (+) to identify the positive terminal.



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