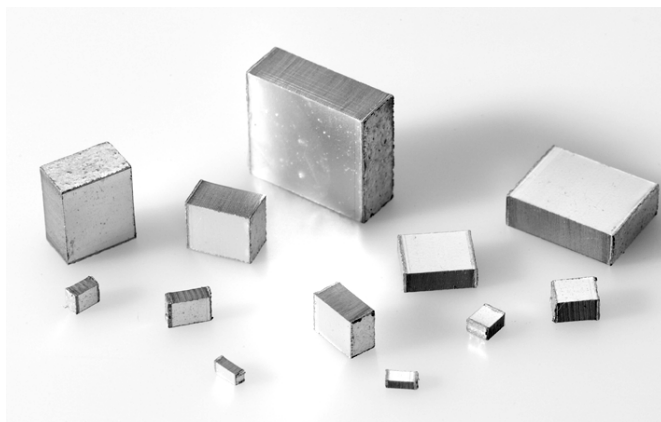


Multilayer Film Chip Capacitors



APPLICATIONS

General purpose, low voltage applications where miniaturization and surface mount capability are critical parameters:

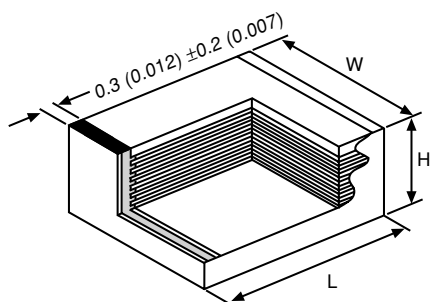
Such as -

- Telecommunications : Switching systems
Modems
Telephone sets
Cellular
- Automotive: Airbag
Fuel injection
- Industrial : Switch mode power supplies
Power converter module

FEATURES

- Multilayer metallized polymer surface mount chips
- Use of high temperature metallized polymer film makes the MKT1802 capacitor suitable for infrared or vapor phase reflow solder processes.
- The self-healing property of metallized film technology provides a safe open circuit failure mode and excellent reliability.
- Open construction provides larger capacitance values in smaller size for a given voltage
- EIA standard chip sizes
- Excellent thermal shock resistance.
- Low dissipation factor, ESR and ESL.
- No piezoelectric effect.
- Nonpolar construction.
- Tape and reel packaging
- Tape and Reel packaging supplied in hermetically sealed bags.

GENERAL CHARACTERISTICS	
Capacitance Range (E6 Series)	.001 μ F to 4.7 μ F
Tolerance on Capacitance	$\pm 5\%$
DC Rated Voltage Range Vr	25VDC, 63VDC, 100VDC, 250VDC
Temperature Range	- 55°C to + 125°C with Voltage derating of 1.25%/°C from 105°C to 125°C
Insulation Resistance Minimum	For C $\leq$ 0.33 μ F ; IR > 1000 M Ω at 20°C for 1 min. charge at 10VDC for Vr < 100VDC and 100VDC for Vr $\geq$ 100VDC For C > 0.33 μ F ; IR • C > 400 sec at 20°C for 1 min. charge at 10VDC for Vr < 100VDC and 100VDC for Vr $\geq$ 100VDC
Climatic Catagory	55/125/56
Surge Voltage	1.4Vr 2s
Dissipation Factor	<10 x 10 ⁻³ @ 1kHz
Soldering Methods	IR or vapor phase reflow (MKT1802 is not suitable for wave soldering)

**EIA SIZES AND DIMENSIONS**

SIZE	1206	1210	1812	2220	2824	4030	5040	6054
L								
mm	3.2 ± 0.3	3.2 ± 0.3	4.5 ± 0.5	5.7 ± 0.5	7.1 ± 0.5	10.2 ± 0.6	12.7 ± 0.6	15.2 ± 0.6
inch	0.126 ± 0.012	0.126 ± 0.012	0.177 ± 0.020	0.224 ± 0.020	0.280 ± 0.020	0.401 ± 0.024	0.500 ± 0.024	0.598 ± 0.024
W								
mm	1.6 ± 0.3	2.5 ± 0.3	3.2 ± 0.5	5.0 ± 0.5	6.1 ± 0.5	7.6 ± 0.8	10.2 ± 0.8	13.7 ± 0.8
inch	0.063 ± 0.012	0.098 ± 0.012	0.126 ± 0.020	0.197 ± 0.020	0.240 ± 0.020	0.299 ± 0.031	0.401 ± 0.031	0.539 ± 0.031

MOUNTING AND SOLDERING RECOMMENDATIONS

For infrared and vapor phase reflow soldering, the temperature profile below shows allowable time temperature combination. These capacitors are NOT suitable for wave soldering.

In case of hand soldering, the temperature of the soldering iron should not be above 250°C. Special care must be taken to avoid touching the body with the iron tip.

PHASE	TEMPERATURE (°C)	TIME (s)
Preheating	160 to 180°C max.	180s max.
Soldering	180 to 235°C max.	30s max.

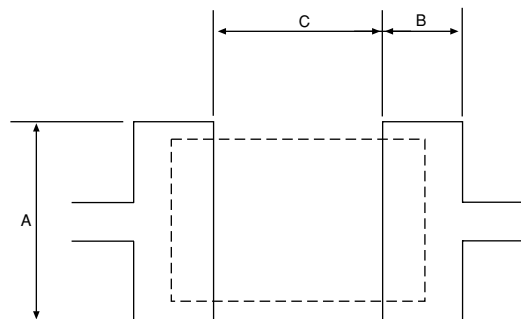
Solder Paste Thickness

For optimum solderability, the recommended soldering paste thickness is as follows:-

CHIP SIZE	SOLDER PASTE THICKNESS
1206 / 1210 / 1812 / 2220 / 2824	150 to 200µm
4030 / 5040 / 6054	200 to 300µm

Board Cleaning Recommendations

To clean the flux from the PC board assembly, use a suitable solvent such as Isopropylalcohol, or deionized water wash. Solvents such as Toluene, Xylene and Trichloroethylene should be avoided.

SOLDER PAD DIMENSIONS

CASE SIZE	DIMENSIONS					
	A		B		C	
	mm	inch	mm	inch	mm	inch
1206	1.3	0.051	1.3	0.051	2.4	0.090
1210	2.0	0.079	1.3	0.051	2.4	0.090
1812	3.0	0.118	1.5	0.059	3.5	0.140
2220	5.0	0.197	1.9	0.075	4.5	0.180
2824	6.0	0.236	2.5	0.098	5.7	0.220
4030	7.5	0.295	3.0	0.118	8.0	0.310
5040	11.2	0.441	3.5	0.138	10.3	0.410
6054	14.6	0.575	3.6	0.142	12.6	0.500



CAPACITANCE AND VOLTAGE RANGE						
25V (105°C) / 16VAC (105°C) - 5% CAPACITANCE TOLERANCE						
VISHAY PART NUMBER	CAPACITANCE VALUE μF	EIA SIZE	H DIMENSION MAX.		REEL SIZE inch	QUANTITY pcs/reel
			mm	inches		
MKT 1802-210/024	.001μF	1206	1.1	0.043	7	3900
MKT 1802-215/024	.0015μF	1206	1.1	0.043	7	3900
MKT 1802-222/024	.0022μF	1206	1.1	0.043	7	3900
MKT 1802-233/024	.0033μF	1206	1.1	0.043	7	3900
MKT 1802-247/024	.0047μF	1206	1.1	0.043	7	3900
MKT 1802-268/024	.0068μF	1206	1.1	0.043	7	3900
MKT 1802-310/024	.01μF	1206	1.3	0.051	7	3400
MKT 1802-315/024	.015μF	1206	1.3	0.051	7	3400
MKT 1802-322/024	.022μF	1206	1.3	0.051	7	3400
MKT 1802-333/024	.033μF	1210	2.2	0.087	7	2000
MKT 1802-347/024	.047μF	1210	1.8	0.071	7	2500
MKT 1802-368/024	.068μF	1210	2.2	0.087	7	2000
MKT 1802-410/024	.1μF	1210	2.2	0.087	7	2000
63V (105°C) / 40VAC (105°C) - 5% CAPACITANCE TOLERANCE						
MKT 1802-210/064	.001μF	1812	1.5	0.059	7	1500
MKT 1802-215/064	.0015μF	1812	1.5	0.059	7	1500
MKT 1802-222/064	.0022μF	1812	1.5	0.059	7	1500
MKT 1802-233/064	.0033μF	1812	1.5	0.059	7	1500
MKT 1802-247/064	.0047μF	1812	1.5	0.059	7	1500
MKT 1802-268/064	.0068μF	1812	1.5	0.059	7	1500
MKT 1802-310/064	.01μF	1812	1.5	0.059	7	1500
MKT 1802-315/064	.015μF	1812	1.5	0.059	7	1500
MKT 1802-322/064	.022μF	1812	1.5	0.059	7	1500
MKT 1802-333/064	.033μF	1812	1.5	0.059	7	1500
MKT 1802-347/064	.047μF	1812	2.0	0.079	7	1200
MKT 1802-368/064	.068μF	1812	2.0	0.079	7	1200
MKT 1802-410/064	.1μF	1812	2.0	0.079	7	1200
MKT 1802-415/064	.15μF	1812	2.5	0.098	7	900
MKT 1802-422/064	.22μF	1812	3.0	0.118	7	700
MKT 1802-433/064-C	.33μF	2220	3.4	0.134	13	2800
MKT 1802-447/064-C	.47μF	2220	4.0	0.157	13	2300
MKT 1802-468/064-C	.68μF	2220	4.5	0.177	13	1900
MKT 1802-510/064-C	1μF	2824	5.0	0.197	13	1100
MKT 1802-515/064-C	1.5μF	5040	4.6	0.181	13	700
MKT 1802-522/064-C	2.2μF	5040	5.5	0.217	13	700
MKT 1802-533/064-C	3.3μF	6054	5.7	0.224	13	400
MKT 1802-547/064-C	4.7μF	6054	6.0	0.236	13	400

All 1812 case size values in 7 inch reels are available on request in a 13 inch reel option; to order add suffix -C to standard part number.

QUANTITIES PER 1812 REEL

7 inch Reel13 inch Reel7 inch Reel13 inch Reel

1,500

5,800

900

3,600

1,200

4,500

700

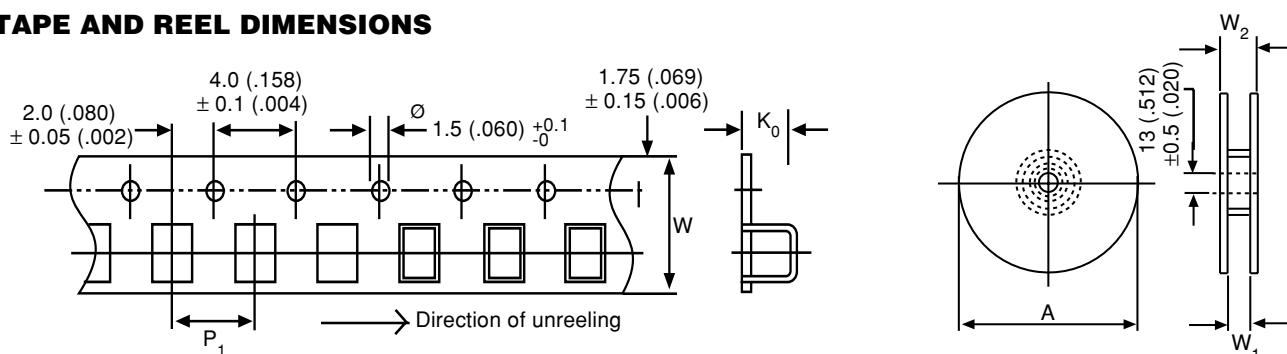
3,000

CAPACITANCE AND VOLTAGE RANGE						
100V (105°C) / 63VAC (105°C) - 5% CAPACITANCE TOLERANCE						
VISHAY PART NUMBER	CAPACITANCE VALUE μF	EIA SIZE	H DIMENSION MAX.		REEL SIZE inch	QUANTITY pcs/reel
			mm	inches		
MKT 1802-210/014	.001μF	1812	1.5	0.059	7	1500
MKT 1802-215/014	.0015μF	1812	1.5	0.059	7	1500
MKT 1802-222/014	.0022μF	1812	1.5	0.059	7	1500
MKT 1802-233/014	.0033μF	1812	1.5	0.059	7	1500
MKT 1802-247/014	.0047μF	1812	1.5	0.059	7	1500
MKT 1802-268/014	.0068μF	1812	1.5	0.059	7	1500
MKT 1802-310/014	.01μF	1812	1.5	0.059	7	1500
MKT 1802-315/014	.015μF	1812	1.5	0.059	7	1500
MKT 1802-322/014	.022μF	1812	1.5	0.059	7	1500
MKT 1802-333/014	.033μF	1812	1.5	0.059	7	1500
MKT 1802-347/014	.047μF	1812	2.0	0.079	7	1200
MKT 1802-368/014	.068μF	1812	3.0	0.118	7	700
MKT 1802-410/014	.1μF	1812	3.0	0.118	7	700
MKT 1802-415/014-C	.15μF	2220	3.0	0.118	13	2800
MKT 1802-422/014-C	.22μF	2220	4.5	0.177	13	1900
MKT 1802-433/014-C	.33μF	2220	4.5	0.177	13	1900
MKT 1802-447/014-C	.47μF	2824	3.5	0.138	13	1600
MKT 1802-468/014-C	.68μF	2824	5.1	0.201	13	1000
MKT 1802-510/014-C	1μF	4030	4.8	0.189	13	1100
MKT 1802-515/014-C	1.5μF	5040	4.6	0.181	13	900
MKT 1802-522/014-C	2.2μF	5040	5.5	0.217	13	700
MKT 1802-533/014-C	3.3μF	6054	5.7	0.224	13	400
MKT 1802-547/014-C	4.7μF	6054	7.0	0.276	13	300
250V (105°C) / 160VAC (105°C) - 5% CAPACITANCE TOLERANCE						
MKT 1802-210/254	.001μF	1812	1.5	0.059	7	1500
MKT 1802-215/254	.0015μF	1812	1.5	0.059	7	1500
MKT 1802-222/254	.0022μF	1812	1.5	0.059	7	1500
MKT 1802-233/254	.0033μF	1812	1.5	0.059	7	1500
MKT 1802-247/254	.0047μF	1812	1.5	0.059	7	1500
MKT 1802-268/254	.0068μF	1812	1.5	0.059	7	1500
MKT 1802-310/254	.01μF	1812	1.5	0.059	7	1500
MKT 1802-315/254	.015μF	1812	2.5	0.098	7	900
MKT 1802-322/254-C	.022μF	2220	2.0	0.079	13	4400
MKT 1802-333/254-C	.033μF	2220	2.0	0.079	13	4400
MKT 1802-347/254-C	.047μF	2220	3.0	0.118	13	2800
MKT 1802-368/254-C	.068μF	2220	4.0	0.157	13	2300
MKT 1802-410/254-C	.1μF	2824	3.6	0.142	13	1600
MKT 1802-415/254-C	.15μF	2824	5.1	0.201	13	1100
MKT 1802-422/254-C	.22μF	4030	3.8	0.150	13	1400
MKT 1802-433/254-C	.33μF	4030	5.8	0.228	13	900
MKT 1802-447/254-C	.47μF	5040	4.6	0.181	13	900
MKT 1802-468/254-C	.68μF	6054	4.4	0.173	13	600
MKT 1802-510/254-C	1μF	6054	5.7	0.224	13	400

All 1812 case size values in 7 inch reels are available on request in a 13 inch reel option; to order add suffix -C to standard part number.

QUANTITIES PER 1812 REEL	7 inch Reel	13 inch Reel	7 inch Reel	13 inch Reel
	1,500	5,800	900	3,600
	1,200	4,500	700	3,000

TAPE AND REEL DIMENSIONS



TAPE AND REEL CHARACTERISTICS AND PACKAGING QUANTITIES													
CASE SIZE	TAPE QTY/REEL	TAPE DIMENSIONS						REEL DIMENSIONS					
		W ±0.3		P ₁ ±0.1		K ₀		A ±2		W ₁ +2, -0		W ₂ max.	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
1206	3900	8.0	0.315	4.0	0.157	1.2	0.047	180	7.09	8.4	0.331	14.4	0.567
	3400	8.0	0.315	4.0	0.157	1.4	0.055	180	7.09	8.4	0.331	14.4	0.567
1210	2500	8.0	0.315	4.0	0.157	1.9	0.075	180	7.09	8.4	0.331	14.4	0.567
	2000	8.0	0.315	4.0	0.157	2.3	0.091	180	7.09	8.4	0.331	14.4	0.567
1812	1500	12.0	0.472	8.0	0.315	1.6	0.063	180	7.09	12.4	0.488	18.4	0.724
	1200	12.0	0.472	8.0	0.315	2.1	0.083	180	7.09	12.4	0.488	18.4	0.724
	900	12.0	0.472	8.0	0.315	2.6	0.102	180	7.09	12.4	0.488	18.4	0.724
	700	12.0	0.472	8.0	0.315	3.1	0.122	180	7.09	12.4	0.488	18.4	0.724
1812	5800	12.0	0.472	8.0	0.315	1.6	0.063	330	12.99	12.4	0.488	18.4	0.724
	4500	12.0	0.472	8.0	0.315	2.1	0.083	330	12.99	12.4	0.488	18.4	0.724
	3600	12.0	0.472	8.0	0.315	2.6	0.102	330	12.99	12.4	0.488	18.4	0.724
	3000	12.0	0.472	8.0	0.315	3.1	0.122	330	12.99	12.4	0.488	18.4	0.724
2220	4400	12.0	0.472	8.0	0.315	2.1	0.083	330	12.99	12.4	0.488	18.4	0.724
	4300	12.0	0.472	8.0	0.315	2.2	0.087	330	12.99	12.4	0.488	18.4	0.724
	3000	12.0	0.472	8.0	0.315	3.1	0.122	330	12.99	12.4	0.488	18.4	0.724
	2800	12.0	0.472	8.0	0.315	3.5	0.138	330	12.99	12.4	0.488	18.4	0.724
	2300	12.0	0.472	8.0	0.315	4.1	0.161	330	12.99	12.4	0.488	18.4	0.724
	1900	16.0	0.630	8.0	0.315	4.6	0.181	330	12.99	16.4	0.646	22.4	0.882
2824	1600	24.0	0.945	12.0	0.472	3.7	0.146	330	12.99	24.4	0.961	30.4	1.197
	1100	16.0	0.630	12.0	0.472	5.2	0.205	330	12.99	16.4	0.646	22.4	0.882
	1000	16.0	0.630	12.0	0.472	5.5	0.217	330	12.99	16.4	0.646	22.4	0.882
4030	1400	24.0	0.945	12.0	0.472	3.9	0.154	330	12.99	24.4	0.961	30.4	1.197
	1100	16.0	0.630	12.0	0.472	4.9	0.193	330	12.99	16.4	0.646	22.4	0.882
	900	24.0	0.945	12.0	0.472	6.2	0.244	330	12.99	24.4	0.961	30.4	1.197
5040	1100	24.0	0.945	16.0	0.630	4.0	0.157	330	12.99	24.4	0.961	30.4	1.197
	900	24.0	0.945	16.0	0.630	4.7	0.185	330	12.99	24.4	0.961	30.4	1.197
	700	24.0	0.945	16.0	0.630	5.7	0.224	330	12.99	24.4	0.961	30.4	1.197
6054	600	24.0	0.945	24.0	0.945	4.5	0.177	330	12.99	24.4	0.961	30.4	1.197
	400	24.0	0.945	24.0	0.945	6.3	0.248	330	12.99	24.4	0.961	30.4	1.197
	300	24.0	0.945	24.0	0.945	7.6	0.299	330	12.99	24.4	0.961	30.4	1.197

TAPE AND REEL CHARACTERISTICS IN ACCORDANCE WITH IEC 286 AND EIA 481

Materials Used:

Carrier tape

Antistatic Material.

Cover tape

Polyester

Reel

Recyclable Material

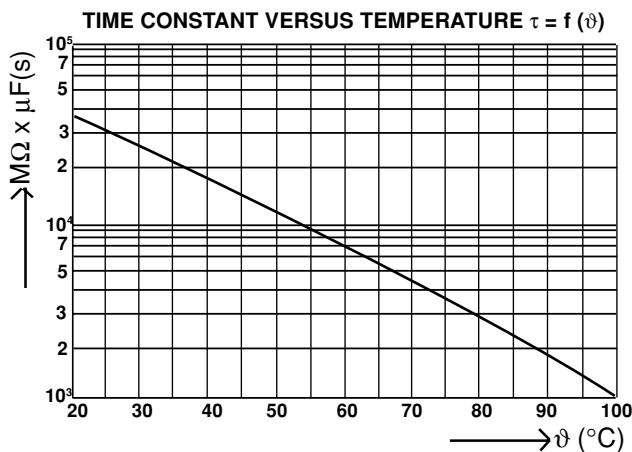
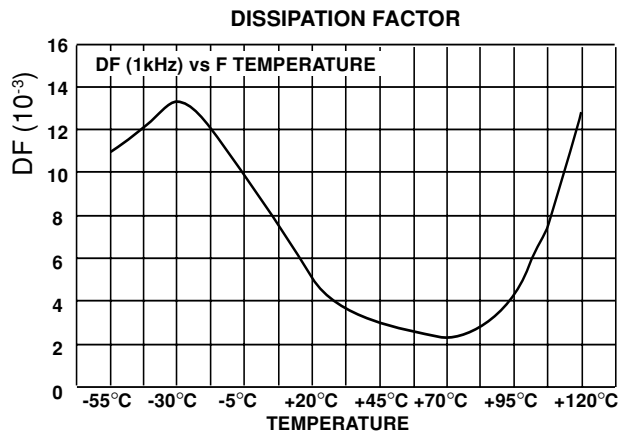
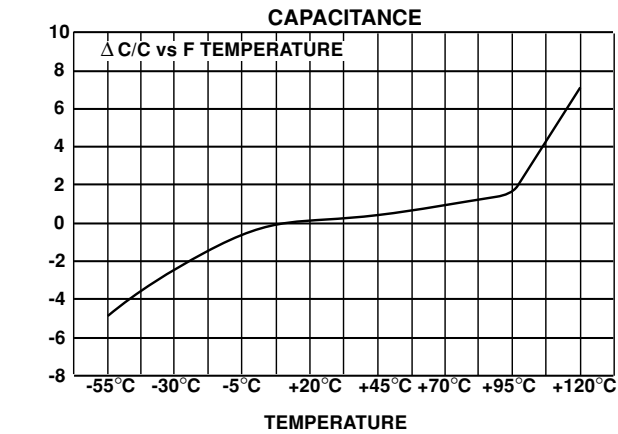
Reel Packaging: Reels are packed in hermetically sealed plastic bags.

Note: Once the bag is open, the capacitors must be kept in a dry atmosphere of 25° ± 5°C and RH ≤ 60% until ready for soldering.

PERFORMANCE AND TEST CONDITIONS		
TEST	CONDITIONS	PERFORMANCE
Capacitance C	Measurement frequency 1KHz 20°C	Within tolerance of the rated value
Dissipation Factor DF	Measurement frequency 1KHz 20°C	$< 10 \times 10^{-3}$
Insulation Resistance IR	Voltage applied: 10V - for $V_r < 100V$ 100V - for $V_r \geq 100V$	IR > 1000 MΩ for $C \leq 0.33\mu F$ IR x C > 400 sec. for $C > 0.33\mu F$
Dielectric Strength for 1 mm between terminals	Surge Voltage = 1.4V _r applied	No direct breakdown
Mounting	Board = 1.6mm (0.063 inch) thick epoxy glass laminated or alumina substrate	C = within $\pm 2\%$ of initial value DF = $\leq 10 \times 10^{-3}$ at 1KHz IR = within initial limit
Adhesion	Force of 5N applied for 10 secs.	No visible damage
Board Bending Test	Bending of 1mm (0.039 inch) for 90mm (3.543 inch) length	C = within $\pm 2\%$ of initial value No visible damage
Thermal Shock	500 cycles -55 /+105°C	C = within $\pm 5\%$ of initial value ESR = no more than 3 times initial value IR = not less than 50% of the initial limit
Damp Heat Steady State	40°C 93% RH/no voltage /56 days	C = within $\pm 7\%$ of initial value $\Delta DF = < 5 \times 10^{-3}$ at 1KHz IR = not less than 50% of the initial limit
Accelerated Damp Heat (Load Humidity)	85°C 85% RH 1.5V- 500 H	C = within $\pm 7\%$ of initial value $\Delta DF = \leq 7 \times 10^{-3}$ at 1KHz IR = not less than 50% of the initial limit
Life Test	85°C/1.25V _r / 1,000 Hours	C = within $\pm 8\%$ of initial value $\Delta DF = < 5 \times 10^{-3}$ at 1KHz IR = not less than 50% of the initial limit
Life Test	105°C / V _r /1,000 Hours 125°C / V _r /1,000 Hours 140°C / 0.5 V _r /1,000 Hours	C = within $\pm 7\%$ of initial value $\Delta DF = < 5 \times 10^{-3}$ at 1 KHz IR = not less than 50% of the initial limit
Charge/Discharge	10,000 cycles/V _r	C = within $\pm 5\%$ of initial value $\Delta DF = < 5 \times 10^{-3}$ at 1KHz IR = not less than 50% of the initial limit

• Reference Standard is CECC 32201 (see detailed tests above)

ELECTRICAL CHARACTERISTICS



FREQUENCY CHARACTERISTICS

