



**THE DATASHEET OF  
MA0603CG221J500**



# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

**MERITEK**

### FEATURE

- A wide selection of sized is available (0201 to 2225)
- High capacitance in given case size
- Capacitor with lead-free termination (pure Tin)
- RoHS and HALOGEN compliant.
- Application: DC to DC converter. General digital circuit. Power supply bypass capacitors. Consumer electronics. telecommunication



### PART NUMBERING SYSTEM

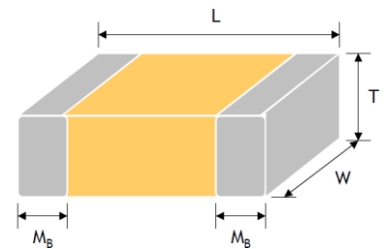
MA 1812 XR 102 C 250  
 (1) (2) (3) (4) (5) (6)



No	Item	Code	Description	Series Reference
(1)	Meritek Series	MA	Multilayer Ceramic Chip Capacitors	Low voltage type, ≤ 50Vdc
(2)	Size	1812	1812 inch (4532 mm)	See dimension table for available size below
(3)	Dielectric	XR	XR: X7R	CG: C0G(NP0), XF: X5R, YV: Y5V
(4)	Capacitance	102	102: 10x10 <sup>2</sup> pF = 1000pF	103: 10x10 <sup>3</sup> pF, 4R7: 4.7pF
(5)	Tolerance	C	C: ±0.50 pF	See capacitor tolerance ref. table below
(6)	Rated Voltage	250	250: 25x10 <sup>0</sup> VDC=25VDC	4R0: 4VDC, 6R3:6.3VDC, 500:50VDC

### DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Thickness	M <sub>B</sub> min (mm)
			T (mm) code	
0201 (0603)	0.60±0.05	0.30±0.05	See Thickness Specification Reference Table below	0.15±0.05
0402 (1005)	1.00±0.15/-1.0	0.50±0.15/-1.0		0.25±0.05/-0.10
0603 (1608)	1.60±0.20	0.80±0.15		0.40±0.15
0805 (2012)	2.10±0.20	1.25±0.20		0.50±0.20
1206 (3216)	3.30±0.30	1.60±0.30/-0.10		0.60±0.20
1210 (3225)	3.30±0.40	2.50±0.30		0.75±0.35
1808 (4520)	4.60±0.50	2.00±0.20		0.75±0.35
1812 (4532)	4.60±0.50	3.20±0.30		0.75±0.35
1825 (4563)	4.60±0.50	6.30±0.40		0.75±0.35
2220 (5750)	5.70±0.50	5.00±0.40		0.85±0.35
2225 (5763)	5.70±0.50	6.30±0.40	0.85±0.35	



### CAPACITANCE TOLERANCE REFERENCE

Code	Description	Code	Description	Code	Description	Code	Description
A	±0.05 pF	G	±2 %	L	0%~10%	Z	-20%~80%
B	±0.10 pF	H	±3 %	M	±20 %	X	+10% ~ +20%
C	±0.25 pF	I	-10%~0%	N	-5%~10%	-	-
D	±0.50 pF	J	±5 %	P	±0.02 pF	-	-
F	±1 %	K	±10 %	Q	±0.03 pF	-	-

# Multilayer Ceramic Chip Capacitors

## Voltage $\leq$ 50VDC

MA Series

**MERITEK**

### THICKNESS SPECIFICATION REFERENCE

Code	Thickness (mm)	Code	Thickness (mm)	Code	Thickness (mm)
A	0.60 $\pm$ 0.10	I	1.25 $\pm$ 0.20	Q	0.50 + 0.02/-0.05
B	0.8 + 0.15/-0.10	J	1.15 $\pm$ 0.15	R	3.10 $\pm$ 0.30
C	1.25 $\pm$ 0.10	K	0.50 $\pm$ 0.20	S	0.80 $\pm$ 0.07
D	1.40 $\pm$ 0.15	L	0.30 $\pm$ 0.03	T	0.85 $\pm$ 0.10
E	1.60 $\pm$ 0.20	M	0.95 $\pm$ 0.10	U	0.50 $\pm$ 0.10
F	2.00 $\pm$ 0.20	N	0.50 $\pm$ 0.05	V	0.20 $\pm$ 0.02
G	2.50 $\pm$ 0.30	O	3.50 $\pm$ 0.20	X	0.80 $\pm$ 0.10
H	2.80 $\pm$ 0.30	P	1.60 +0.3/-0.10	Z	0.25 $\pm$ 0.03

### ELECTRICAL CHARACTERISTICS

Properties	Characteristics			
<b>Dielectric</b>	C0G(NP0)	X7R	X5R	Y5V
<b>Chip Size</b>	0201, 0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0201, 0402, 0603, 0805, 1206, 1210, 1808, 1812, 1825, 2220, 2225	0201, 0402, 0603	0402, 0603, 0805, 1206, 1210, 1812
<b>Rated Voltage</b>	10V, 16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V	4V, 6.3V, 10V, 16V, 25V, 50V	6.3V, 10V, 16V, 25V, 50V
<b>Capacitance Range</b>	0.1pF ~ 390nF	100pF ~ 820nF	100pF ~ 820nF	10nF ~ 680nF
<b>Capacitance Tolerance</b>	See Capacitance Tolerance Reference Table Above			
<b>Dissipation Factor</b>	Cap<30pF: Q $\geq$ 400+20C Cap $\geq$ 30pF: Q $\geq$ 1000	See Dissipation Factor (Reliability)		
<b>Insulation Resistance</b>	$\geq$ 10G $\Omega$ or R•C $\geq$ 500 $\Omega$ -F Whichever is smaller	$\geq$ 10G $\Omega$ or R•C $\geq$ 100 $\Omega$ -F Whichever is smaller		
<b>Operation Temperature</b>	-55 ~ +125°C		-55 ~ +85°C	-25 ~ +85°C
<b>Temperature Coefficient</b>	$\pm$ 30ppm/ $^{\circ}$ C	$\pm$ 15%		+30/-80%
<b>Termination</b>	Cu (or Ag)/Ni/Sn (lead-free termination)			

Notes:

1. Measured at the condition of 30~70% related humidity.
2. C0G(NP0): Apply 1.0 $\pm$ 0.2Vrms, 1.0MHz $\pm$ 10% for Cap $\leq$ 1000pF and 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10% for Cap $>$ 1000pF, 25°C at ambient temperature
3. X7R: Apply 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10%, at 25°C ambient temperature.
4. Y5V: Apply 1.0 $\pm$ 0.2Vrms, 1.0kHz $\pm$ 10%, at 20°C ambient temperature.

# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series



### CAPACITANCE RANGE - C0G (NP0) Dielectric (0201~1206)

Dimension		0201			0402				0603				0805				1206			
Cap(pF)	code	10V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V
0.1	0R1	L	L	L	N	N	N	N												
0.2	0R2	L	L	L	N	N	N	N												
0.3	0R3	L	L	L	N	N	N	N												
0.4	0R4	L	L	L	N	N	N	N												
0.5	0R5	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A				
1	1R0	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A				X
1.2	1R2	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
1.5	1R5	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
1.8	1R8	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
2.2	2R2	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
2.7	2R7	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
3.3	3R3	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
3.9	3R9	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
4.7	4R7	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
5.6	5R6	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
6.8	6R8	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
8.2	8R2	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
10	100	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
12	120	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
15	150	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
18	180	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
22	220	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
27	270	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
33	330	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
39	390	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
47	470	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
56	560	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
68	680	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
82	820	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
100	101	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
120	121	L	L	L	N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
150	151				N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
180	181				N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
220	221				N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
270	271		L		N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
330	331		L		N	N	N	N	S	S	S	S	A	A	A	A	X	X	X	X
390	391		L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
470	471		L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
560	561		L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
680	681				N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
820	821				N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
1000	102				N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X
1200	122								B	B	B	B	X	X	X	X	X	X	X	X
1500	152								B	B	B	B	X	X	X	X	X	X	X	X
1800	182								B	B	B	B	X	X	X	X	X	X	X	X
2200	222								B	B	B	B	X	X	X	X	X	X	X	X
2700	272								B	B	B	B	C	C	C	C	X	X	X	X
3300	332								B	B	B	B	C	C	C	C	X	X	X	X
3900	392								B	B	B	B	C	C	C	C	X	X	X	X
4700	472								B	B	B	B	C	C	C	C	X	X	X	X
5600	562								B	B	B	B	C	C	C	C	X	X	X	X
6800	682								B	B	B	B	C	C	C	C	M	M	M	M
8200	822								B	B	B	B	C	C	C	C	C	C	C	C
10000	103								B	B	B	B	C	C	C	C	C	C	C	C
12000	123												T	T	T	T	T	T	T	T
15000	153												T	T	T	T	T	T	T	T
18000	183												C	C	C	C	T	T	T	T
22000	223												C	C	C	C	T	T	T	T
27000	273																T	T	T	T
33000	333																T	T	T	T
39000	393																J	J	J	J
47000	473																J	J	J	J
56000	563																J	J	J	J
68000	683																E	E	E	E
82000	823																E	E	E	E
100000	104																E	E	E	E

# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

**MERITEK**

### CAPACITANCE RANGE - C0G (NP0) Dielectric (1210~2225)

Dimension		1210				1808	1812				1825	2220	2225
Cap(pF)	code	10V	16V	25V	50V	50V	10V	16V	25V	50V	50V	50V	50V
2.2	2R2					C							
2.7	2R7					C							
3.3	3R3					C							
3.9	3R9					C							
4.7	4R7					C							
5.6	5R6					C							
6.8	6R8					C							
8.2	8R2					C							
10	100	M	M	M	M	C	C	C	C	C	E	E	E
12	120	M	M	M	M	C	C	C	C	C	E	E	E
15	150	M	M	M	M	C	C	C	C	C	E	E	E
18	180	M	M	M	M	C	C	C	C	C	E	E	E
22	22	M	M	M	M	C	C	C	C	C	E	E	E
27	27	M	M	M	M	C	C	C	C	C	E	E	E
33	33	M	M	M	M	C	C	C	C	C	E	E	E
39	39	M	M	M	M	C	C	C	C	C	E	E	E
47	47	M	M	M	M	C	C	C	C	C	E	E	E
56	56	M	M	M	M	C	C	C	C	C	E	E	E
68	68	M	M	M	M	C	C	C	C	C	E	E	E
82	82	M	M	M	M	C	C	C	C	C	E	E	E
100	100	M	M	M	M	C	C	C	C	C	E	E	E
120	120	M	M	M	M	C	C	C	C	C	E	E	E
150	150	M	M	M	M	C	C	C	C	C	E	E	E
180	180	M	M	M	M	C	C	C	C	C	E	E	E
220	220	M	M	M	M	C	C	C	C	C	E	E	E
270	270	M	M	M	M	C	C	C	C	C	E	E	E
330	330	M	M	M	M	C	C	C	C	C	E	E	E
390	390	M	M	M	M	C	C	C	C	C	E	E	E
470	470	M	M	M	M	C	C	C	C	C	E	E	E
560	560	M	M	M	M	C	C	C	C	C	E	E	E
680	681	M	M	M	M	C	C	C	C	C	E	E	E
820	821	M	M	M	M	C	C	C	C	C	E	E	E
1000	102	M	M	M	M	C	C	C	C	C	E	E	E
1200	122	M	M	M	M	C	C	C	C	C	E	E	E
1500	152	M	M	M	M	C	C	C	C	C	E	E	E
1800	182	M	M	M	M	C	C	C	C	C	E	E	E
2200	222	M	M	M	M	C	C	C	C	C	E	E	E
2700	272	M	M	M	M	C	C	C	C	C	E	E	E
3300	332	M	M	M	M	C	C	C	C	C	E	E	E
3900	392	M	M	M	M	C	C	C	C	C	E	E	E
4700	472	M	M	M	C	C	C	C	C	C	E	E	E
5600	562	M	M	M	C	C	C	C	C	C	E	E	E
6800	682	M	M	M	E	C	C	C	C	C	E	E	E
8200	822	M	M	M	E	C	C	C	C	C	E	E	E
10000	103	M	M	M	E	C	C	C	C	C	E	E	E
12000	123	C	C	C	E	E	C	C	C	C	E	E	E
15000	153	C	C	C	E	E	C	C	C	C	E	E	E
18000	183				F	F	C	C	C	C	E	E	E
22000	223				F	F	C	C	C	C	E	E	E
27000	273				G	F	C	C	C	C	E	E	E
33000	333				G		C	C	C	C	E	E	E
39000	393				G					F	E	E	E
47000	473				G					F	E	E	E
56000	563									G	E	E	E
68000	683									G	E	F	E
82000	823									G	F	G	F
100000	104									G	G	G	F
120000	124										G	G	G
150000	154											G	G
180000	184											G	G
220000	224												G
270000	274												G

# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

**MERITEK**

### CAPACITANCE RANGE - X7R Dielectric (0201~1206)

Dimension		0201				0402				0603				0805				1206				
Cap(pF)	Code	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	
100	101	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X					X
120	121	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X					X
150	151	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
180	181	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
220	221	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
270	271	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
330	331	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
390	391	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
470	471	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
560	561	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
680	681	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
820	821	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
1000	102	L	L	L	L	N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
1200	122	L	L	L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
1500	152	L	L	L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
1800	182	L	L			N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
2200	222	L	L			N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
2700	272	L	L			N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
3300	332	L	L	L		N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
3900	392	L	L			N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
4700	472	L	L			N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
5600	562	L				N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
6800	682	L				N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
8200	822	L				N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
10000	103	L	L			N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
12000	123					N	N	N		S	S	S	S	X	X	X	X	X	X	X	X	X
15000	153					N	N	N		S	S	S	S	X	X	X	X	X	X	X	X	X
18000	183					N	N	N		S	S	S	S	X	X	X	X	X	X	X	X	X
22000	223					N	N	N	N	S	S	S	S	X	X	X	X	X	X	X	X	X
27000	273					N	N	N		S	S	S	S	X	X	X	X	X	X	X	X	X
33000	333					N	N	N	N	S	S	S	B	X	X	X	X	X	X	X	X	X
39000	393					N	N	N		S	S	S	B	X	X	X	X	X	X	X	X	X
47000	473					N	N	N	N	S	S	S	B	X	X	X	X	X	X	X	X	X
56000	563					N	N	N	N	S	S	S	B	X	X	X	X	X	X	X	X	X
68000	683					N	N		N	S	S	S	B	X	X	X	X	X	X	X	X	X
82000	823					N	N			S	S	S	B	X	X	X	X	X	X	X	X	X
100000	104					N	N	N	N	S	S	S	B	X	X	X	X	X	X	X	X	X
120000	124									S	S	B		X	X	X	C	X	X	X	X	X
150000	154									S	S	B		C	C	C	C	M	M	M	M	M
180000	184									S	S	B		C	C	C	C	M	M	M	M	M
220000	224					N	N	N		S	S	B	B	C	C	C	C	M	M	M	M	M
270000	274									B	B	B		C	C	C	I	M	M	M	C	C
330000	334									B	B	B		C	C	C	I	M	M	M	C	C
390000	394									B	B	B		C	C	C	I	M	M	J	P	P
470000	474					N				B	B	B	B	C	C	C	I	J	J	J	P	P
560000	564									B	B			C	C	C		J	J	J	P	P
680000	684									B	B			C	C	C		J	J	J	P	P
820000	824									B	B			C	C	C		J	J	J	P	P

# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

**MERITEK**

### CAPACITANCE RANGE - X7R Dielectric (1210~2225)

Dimension		1210				1808	1812				1825	2220	2225
Cap(pF)	Code	10V	16V	25V	50V	50V	10V	16V	25V	50V	50V	50V	50V
100	101												
120	121												
150	151					C							
180	181					C							
220	221				M	C							
270	271				M	C				C			
330	331				M	C				C			
390	391				M	C				C			
470	471				M	C				C			
560	561				M	C				C			
680	681				M	C				C			
820	821				M	C				C			
1000	102	M	M	M	M	C	C	C	C	C	F	F	F
1200	122	M	M	M	M	C	C	C	C	C	F	F	F
1500	152	M	M	M	M	C	C	C	C	C	F	F	F
1800	182	M	M	M	M	C	C	C	C	C	F	F	F
2200	222	M	M	M	M	C	C	C	C	C	F	F	F
2700	272	M	M	M	M	C	C	C	C	C	F	F	F
3300	332	M	M	M	M	C	C	C	C	C	F	F	F
3900	392	M	M	M	M	C	C	C	C	C	F	F	F
4700	472	M	M	M	M	C	C	C	C	C	F	F	F
5600	562	M	M	M	M	E	C	C	C	C	F	F	F
6800	682	M	M	M	M	E	C	C	C	C	F	F	F
8200	822	M	M	M	M	E	C	C	C	C	F	F	F
10000	103	M	M	M	M	E	C	C	C	C	F	F	F
12000	123	M	M	M	M	E	C	C	C	C	F	F	F
15000	153	M	M	M	M	E	C	C	C	C	F	F	F
18000	183	M	M	M	M	E	C	C	C	C	F	F	F
22000	223	M	M	M	M	E	C	C	C	C	F	F	F
27000	273	M	M	M	M	E	C	C	C	C	F	F	F
33000	333	M	M	M	M	E	C	C	C	C	F	F	F
39000	393	M	M	M	M	E	C	C	C	C	F	F	F
47000	473	M	M	M	M	E	C	C	C	C	F	F	F
56000	563	M	M	M	M	E	C	C	C	C	F	F	F
68000	683	M	M	M	M	E	C	C	C	C	F	F	F
82000	823	M	M	M	M	E	C	C	C	C	F	F	F
100000	104	M	M	M	M	E	C	C	C	C	F	F	F
120000	124	M	M	M	M	E	C	C	C	C	F	F	F
150000	154	M	M	M	M	E	C	C	C	C	F	F	F
180000	184	M	M	M	M	E	C	C	C	C	F	F	F
220000	224	M	M	M	M	E	C	C	C	C	F	F	F
270000	274	M	M	M	M	F	C	C	C	C	F	F	F
330000	334	M	M	M	C	F	C	C	C	C	F	F	F
390000	394	M	M	M	C	F	C	C	C	C	F	F	F
470000	474	M	M	M	C	F	C	C	C	C	F	F	F
560000	564	C	C	C	C	F	C	C	C	C	F	F	F
680000	684	C	C	C	C	F	C	C	C	C	F	F	F
820000	824	C	C	C	C	F	C	C	C	C	F	F	F

# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

**MERITEK**

### CAPACITANCE RANGE - X5R Dielectric (0201~0603)

Dimension		0201					0402					0603				
Cap (nF)	Code	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
0.10	101			L	L	L										
0.12	121			L	L	L										
0.15	151			L	L	L										
0.18	181			L	L	L										
0.22	221			L	L	L										
0.27	271			L	L	L										
0.33	331			L	L	L										
0.47	471			L	L	L										
0.56	561			L	L	L										
0.68	681			L	L	L										
0.82	821			L	L	L										
1.0	102		L	L	L	L										
1.5	152		L	L												
2.2	222		L	L												
3.3	332		L	L												
4.7	472		L	L												
6.8	682		L													
10	103	L	L	L	L											
27	273	L	L						N							
33	333	L	L						N							
39	393	L	L						N							
47	473	L	L						N							
56	563	L	L					N	N							
68	683	L	L					N	N							
82	823	L	L				N	N	N							
100	104	L	L	L	L		N	N	N	N	N			S		
150	154						N	N	N	N						
220	224	L	L				N	N	N	N	N		B	B	B	B
270	274							N					B	B	B	
330	334						N	N				B	B	B	B	
390	394											B	B	B		
470	474	L					N	N	K	K	K	B	B	B	B	B
680	684						N	N				B	B	B	B	
820	824											B	B	B		

### CAPACITANCE RANGE - Y5V Dielectric (0402~1812)

Dimension		0402				0603					0805				1206				1210				1812				
Cap (nF)	Code	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	
10	103	N	N	N	N		S	S	S	S	A	A	A	A	X	X	X	X									
15	153	N	N	N	N		S	S	S	S	A	A	A	A	X	X	X	X									
22	223	N	N	N	N		S	S	S	S	A	A	A	A	X	X	X	X									
33	333	N	N	N	N		S	S	S	S	A	A	A	A	X	X	X	X									
47	473	N	N	N			S	S	S	S	A	A	A	A	X	X	X	X									
68	683	N	N	N			S	S	S	S	A	A	A	A	X	X	X	X									
100	104	N	N	N			S	S	S	S	A	A	A	A	X	X	X	X	M	M	M	M	C	C	C	C	
150	154	N	N				S	S	S	S	A	A	A	A	X	X	X	X	M	M	M	M	C	C	C	C	
220	224	N	N			S	S	S	S	S	A	A	A	A	X	X	X	X	M	M	M	M	C	C	C	C	
330	334	N	N			S	S	S	S	B	X	X	X	X	X	X	X	X	M	M	M	M	C	C	C	C	
470	474	N	N			S	S	S	B	B	X	X	X	X/C	X	X	X	X	M	M	M	M	C	C	C	C	
680	684	N				S	S	B	B		X	X	C	C	X	X	X	X	M	M	M	M	C	C	C	C	

# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

MERITEK

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

Item	Test Condition	Requirements																																																						
Visual and Dimensions	- - -	<ul style="list-style-type: none"> <li>No remarkable defect.</li> <li>Dimensions to confirm to individual specification sheet.</li> </ul>																																																						
Capacitance	Class I: NP0 Cap≤1000pF 1.0±0.2Vrms, 1MHz±10% Cap>1000pF 1.0±0.2Vrms, 1kHz±10% Class II: X7R, X7E, X5R, Y5V Cap≤10μF, 1.0±0.2Vrms, 1kHz±10% Cap>10μF, 0.5±0.2Vrms, 120Hz±20%  Test condition: 0.5±0.2Vrms, 1kHz±10% X7R: 0603≧225(10V), 0805=106(6.3V&10V) X5R: 01R5≧103, 0201≧224 (6.3V), 0402≧475 (6.3V), 0402≧225(10V), 0603=106 (6.3V), 0603≧475(10V)	<ul style="list-style-type: none"> <li>Shall not exceed the limits given in the detailed spec.</li> <li>NP0: Cap≥30pF, Q≥1000; Cap&lt;30pF, Q≥400+20C</li> <li>7R, X5R:</li> </ul> <table border="1"> <thead> <tr> <th>Rated Vol. (V)</th> <th>X7R D.F.≤</th> <th>X5R D.F.≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥50</td> <td rowspan="3">2.5%</td> <td rowspan="3">2.5%</td> <td>≤3.0%</td> <td>0201(50V); 0603≧0.047μF; 0805≧0.18μF; 1206≧0.47μF</td> </tr> <tr> <td>≤5.0%</td> <td>1210≧4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0603≧1μF; 0805≧1μF; 1206≧4.7μF; 1210≧10μF</td> </tr> <tr> <td>35</td> <td>3.5%</td> <td>3.5%</td> <td>≤10%</td> <td>0805≧2.2μF; 1210≧10μF</td> </tr> <tr> <td rowspan="3">25</td> <td rowspan="3">3.5%</td> <td rowspan="3">3.5%</td> <td>≤5.0%</td> <td>0201≧0.01μF; 0805≧1μF; 1210≧10μF</td> </tr> <tr> <td>≤7.0%</td> <td>0603≧0.33μF; 1206≧4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≧0.10μF; 0603≧0.47μF; 0805≧2.2μF; 1206≧6.8μF; 1210≧22μF</td> </tr> <tr> <td rowspan="2">16</td> <td rowspan="2">3.5%</td> <td rowspan="2">3.5%</td> <td>≤5.0%</td> <td>0201≧0.01μF; 0402≧0.033μF; 0805≧0.68μF; 1206≧2.2μF; 1210≧4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≧0.47μF; 0603≧0.68μF; 0805≧2.2μF; 1206≧4.7μF; 1210≧22μF</td> </tr> <tr> <td rowspan="2">10</td> <td rowspan="2">5.0%</td> <td rowspan="2">5.0%</td> <td>≤10%</td> <td>0402≧0.33μF; 0603≧0.33μF; 08052.2μF; 1206≧2.2μF; 1210≧22μF</td> </tr> <tr> <td>≤15%</td> <td>0201≧0.1μF; 0402≧1μF</td> </tr> <tr> <td rowspan="2">6.3</td> <td rowspan="2">10%</td> <td rowspan="2">10%</td> <td>≤15%</td> <td>0201≧0.1μF; 0402≧1μF; 0603≧10μF; 0805≧4.7μF; 1206≧47μF; 1210≧100μF</td> </tr> <tr> <td>≤20%</td> <td>0402≧2.2μF</td> </tr> <tr> <td>4</td> <td>15%</td> <td>15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated Vol. (V)	X7R D.F.≤	X5R D.F.≤	Exception of D.F. ≤		≥50	2.5%	2.5%	≤3.0%	0201(50V); 0603≧0.047μF; 0805≧0.18μF; 1206≧0.47μF	≤5.0%	1210≧4.7μF	≤10%	0603≧1μF; 0805≧1μF; 1206≧4.7μF; 1210≧10μF	35	3.5%	3.5%	≤10%	0805≧2.2μF; 1210≧10μF	25	3.5%	3.5%	≤5.0%	0201≧0.01μF; 0805≧1μF; 1210≧10μF	≤7.0%	0603≧0.33μF; 1206≧4.7μF	≤10%	0402≧0.10μF; 0603≧0.47μF; 0805≧2.2μF; 1206≧6.8μF; 1210≧22μF	16	3.5%	3.5%	≤5.0%	0201≧0.01μF; 0402≧0.033μF; 0805≧0.68μF; 1206≧2.2μF; 1210≧4.7μF	≤10%	0402≧0.47μF; 0603≧0.68μF; 0805≧2.2μF; 1206≧4.7μF; 1210≧22μF	10	5.0%	5.0%	≤10%	0402≧0.33μF; 0603≧0.33μF; 08052.2μF; 1206≧2.2μF; 1210≧22μF	≤15%	0201≧0.1μF; 0402≧1μF	6.3	10%	10%	≤15%	0201≧0.1μF; 0402≧1μF; 0603≧10μF; 0805≧4.7μF; 1206≧47μF; 1210≧100μF	≤20%	0402≧2.2μF	4	15%	15%	---	---
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10	5.0%	5.0%	≤10%	0402≧0.33μF; 0603≧0.33μF; 08052.2μF; 1206≧2.2μF; 1210≧22μF																																																				
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6.3	10%	10%	≤15%	0201≧0.1μF; 0402≧1μF; 0603≧10μF; 0805≧4.7μF; 1206≧47μF; 1210≧100μF																																																				
			≤20%	0402≧2.2μF																																																				
4	15%	15%	---	---																																																				
Q/ D.F. (Dissipation Factor)		<ul style="list-style-type: none"> <li>Y5V:</li> </ul> <table border="1"> <thead> <tr> <th>Rated Vol. (V)</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥50</td> <td>5.0%</td> <td>≤7.0%</td> <td>0603≧0.1μF; 0805≧0.47μF; 1206≧4.7μF</td> </tr> <tr> <td>35</td> <td>7.0</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">25</td> <td rowspan="2">5.0%</td> <td>7.0%</td> <td>0402≧0.047μF; 0603≧0.1μF; 0805≧0.33μF; 1206≧1μF; 1210≧4.7μF</td> </tr> <tr> <td>9.0%</td> <td>0402≧0.068μF; 0603≧0.47μF; 1206≧4.7μF; 1210≧22μF</td> </tr> <tr> <td rowspan="2">16 (C&lt;1.0 μF)</td> <td rowspan="2">7.0%</td> <td>9.0%</td> <td>0402≧0.068μF; 0603≧0.68μF</td> </tr> <tr> <td>12.5%</td> <td>0402≧0.22μF</td> </tr> <tr> <td rowspan="2">16 (C&lt;1.0 μF)</td> <td rowspan="2">9.0%</td> <td>12.5%</td> <td>0603≧2.2μF; 0805≧3.3μF; 1206≧10μF; 1210≧22μF; 1812≧47μF</td> </tr> <tr> <td>20%</td> <td>0402≧0.47μF</td> </tr> <tr> <td>6.3</td> <td>20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated Vol. (V)	D.F.≤	Exception of D.F. ≤		≥50	5.0%	≤7.0%	0603≧0.1μF; 0805≧0.47μF; 1206≧4.7μF	35	7.0	---	---	25	5.0%	7.0%	0402≧0.047μF; 0603≧0.1μF; 0805≧0.33μF; 1206≧1μF; 1210≧4.7μF	9.0%	0402≧0.068μF; 0603≧0.47μF; 1206≧4.7μF; 1210≧22μF	16 (C<1.0 μF)	7.0%	9.0%	0402≧0.068μF; 0603≧0.68μF	12.5%	0402≧0.22μF	16 (C<1.0 μF)	9.0%	12.5%	0603≧2.2μF; 0805≧3.3μF; 1206≧10μF; 1210≧22μF; 1812≧47μF	20%	0402≧0.47μF	6.3	20%	---	---																				
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		20%	0402≧0.47μF																																																					
6.3	20%	---	---																																																					
Temperature Coefficient	With no electrical load.																																																							
	T.C.	Operation Temp.	T.C.	Capacitance Change																																																				
	COG(NP0)	-55~125°C at 25°C	COG(NP0)	Within ±30ppm/°C																																																				
	X7R	-55~125°C at 25°C	X7R	Within ±15%																																																				
	X5R	-55~85°C at 25°C	X5R	Within ±15%																																																				
	Y5V	-25~85°C at 20°C	Y5V	Within +30%/-80%																																																				

# Multilayer Ceramic Chip Capacitors

## Voltage $\leq$ 50VDC

MA Series

**MERITEK**

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS

Item	Test Condition	Requirements															
Insulation Resistance	To apply rated voltage for max. 120 sec.	10G $\Omega$ or RxC $\geq$ 500 $\Omega$ -F whichever is smaller. Class II (X7R, X5R, Y5V)															
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Solderability	<ul style="list-style-type: none"> <li>Solder temperature: 235<math>\pm</math>5<math>^{\circ}</math>C for (1206~1210)</li> <li>Solder temperature: 245<math>\pm</math>5<math>^{\circ}</math>C for (1808~2225)</li> <li>Dipping time: 2<math>\pm</math>0.5 sec.</li> </ul>	<ul style="list-style-type: none"> <li>75% min. coverage of all metalized area.</li> </ul>															
Dielectric Strength	<ul style="list-style-type: none"> <li>To apply voltage (<math>\leq</math>50V) 250%.</li> <li>Duration: 1 to 5 sec.</li> <li>Charge and discharge current less than 50mA.</li> </ul>	<ul style="list-style-type: none"> <li>No evidence of damage or flashover during test.</li> </ul>															
Resistance to Soldering Heat	<ul style="list-style-type: none"> <li>Solder temperature: 260<math>\pm</math>5<math>^{\circ}</math>C</li> <li>Dipping time: 10<math>\pm</math>1 sec</li> <li>Preheating: 120 to 150<math>^{\circ}</math>C for 1 minute before immerse the capacitor in a eutectic solder.</li> <li>Before initial measurement (Class II only): Perform 150+0/-10<math>^{\circ}</math>C for 1 hr. and then set for 48<math>\pm</math>4 hrs. at room temp.</li> <li>Measurement to be made after keeping at room temp. for 24<math>\pm</math>2 hrs (Class I) or 48<math>\pm</math>4 hrs (Class II).</li> </ul>	<ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change: NP0: within <math>\pm</math>2.5% or <math>\pm</math>0.25pF whichever is larger. X7R, X5R: within <math>\pm</math>7.5% Y5V: within <math>\pm</math>20%</li> <li>25% max. leaching on each edge.</li> </ul>															
Temperature Cycle	<ul style="list-style-type: none"> <li>Conduct the five cycles according to the temperatures and time.</li> </ul> <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (<math>^{\circ}</math>C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30<math>\pm</math>3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. Operating temp. +3/-0</td> <td>30<math>\pm</math>3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Before initial measurement (Class II only): Perform 150+0/-10<math>^{\circ}</math>C for 1 hr and then set for 48<math>\pm</math>4 hrs at room temp.</li> <li>Measurement to be made after keeping at room temp. for 24<math>\pm</math>2 hrs (Class I) or 48<math>\pm</math>4 hrs (Class II).</li> </ul>	Step	Temp. ( $^{\circ}$ C)	Time (min.)	1	Min. operating temp. +0/-3	30 $\pm$ 3	2	Room temp.	2~3	3	Max. Operating temp. +3/-0	30 $\pm$ 3	4	Room temp.	2~3	<ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change: NP0: within <math>\pm</math>2.5% or <math>\pm</math>0.25pF whichever is larger. X7R, X5R: within <math>\pm</math>7.5% Y5V: within <math>\pm</math>20%</li> <li>25% max. leaching on each edge.</li> <li>Q/D.F. <math>\leq</math> initial requirement</li> <li>I.R. <math>\geq</math> 0.25<math>\times</math>initial requirements.</li> </ul>
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# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

MERITEK

### RELIABILITY TEST CONDITIONS AND REQUIREMENTS (CONTINUED)

Item	Test Condition	Requirements																																												
Humidity (Damp Heat) Steady State	<ul style="list-style-type: none"> <li>Test temp.: 40±2°C</li> <li>Humidity: 90~95% RH</li> <li>Test time: 500+24/-0hrs.</li> <li>To apply voltage :rated voltage</li> <li>Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II).</li> </ul>	<ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change: NPO: within ±5% or 0.5pF whichever is larger X7R, X7E, X5R: ≥10V**, within ±12.5%; 6.3V within ±25%; TT series &amp; C≥ 1uF, within ±25% **10V:0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%</li> <li>Q/D.F. value: NPO: More than 30pF, Q≥350, 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C</li> <li>X7R, X5R:</li> </ul> <table border="1"> <thead> <tr> <th>Rated Vol. (V)</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥50</td> <td rowspan="3">3.0%</td> <td>6.0%</td> <td>0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>10%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>20%</td> <td>0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>35</td> <td>5.0%</td> <td>20%</td> <td>0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201≥0.01μF; 0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>14%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>15%</td> <td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF</td> </tr> <tr> <td rowspan="2">16</td> <td rowspan="2">5.0%</td> <td>10%</td> <td>0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>15%</td> <td>0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td rowspan="2">10</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>20%</td> <td>0201≥0.1μF; 0402≥1μF</td> </tr> <tr> <td>6.3</td> <td>15.0%</td> <td>30%</td> <td>0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>4</td> <td>20.0%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated Vol. (V)	D.F. ≤	Exception of D.F. ≤		≥50	3.0%	6.0%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	10%	1210≥4.7μF	20%	0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	35	5.0%	20%	0805≥2.2μF; 1210≥10μF	25	5.0%	10%	0201≥0.01μF; 0805≥1μF; 1210≥10μF	14%	0603≥0.33μF; 1206≥4.7μF	15%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF	16	5.0%	10%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF	15%	0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	10	7.5%	15%	0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	20%	0201≥0.1μF; 0402≥1μF	6.3	15.0%	30%	0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	4	20.0%	---	---
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# Multilayer Ceramic Chip Capacitors

## Voltage ≤ 50VDC

MA Series

MERITEK

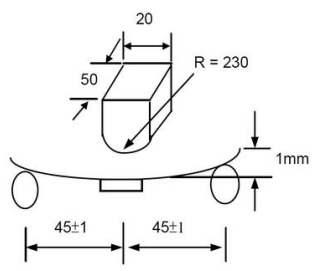
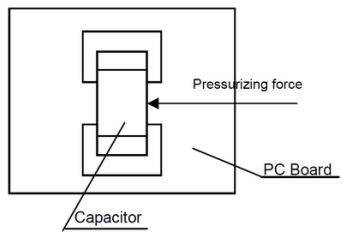
### RELIABILITY TEST CONDITIONS AND REQUIREMENTS (CONTINUED)

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Humidity (Damp Heat) Load	<ul style="list-style-type: none"> <li>Test temp.: 40±2°C</li> <li>Humidity: 90~95% RH</li> <li>Test time: 500+24/-0hrs.</li> <li>To apply voltage :rated voltage</li> <li>Measurement to be made after keeping at room temp. for 24±2 hrs (Class I) or 48±4 hrs (Class II).</li> </ul>	<ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change: NPO: within ±7.5% or 0.75pF whichever is larger X7R, X7E, X5R: ≥10V**, within ±12.5%; 6.3V within ±25%; TT series &amp; C<sub>z</sub> ≥ 1μF, within ±25% **10V:0603 ≥ 4.7μF; 0402 ≥ 1μF; 0201 ≥ 0.1μF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/-40%</li> <li>Q/D.F. value: NPO: More than 30pF, Q≥200, 10pF≤C≤30pF, Q≥100+10/3C</li> <li>X7R, X5R:</li> </ul> <table border="1"> <thead> <tr> <th>Rated Vol. (V)</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥50</td> <td rowspan="3">3.0%</td> <td>6.0%</td> <td>0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>10%</td> <td>1210≥4.7μF</td> </tr> <tr> <td>20%</td> <td>0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>35</td> <td>5.0%</td> <td>20%</td> <td>0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25</td> <td rowspan="3">5.0%</td> <td>10%</td> <td>0201≥0.01μF; 0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>14%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>15%</td> <td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF</td> </tr> <tr> <td rowspan="2">16</td> <td rowspan="2">5.0%</td> <td>10%</td> <td>0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>15%</td> <td>0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td rowspan="2">10</td> <td rowspan="2">7.5%</td> <td>15%</td> <td>0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>20%</td> <td>0201≥0.1μF; 0402≥1μF</td> </tr> <tr> <td>6.3</td> <td>15.0%</td> <td>30%</td> <td>0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>4</td> <td>20.0%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated Vol. (V)	D.F. ≤	Exception of D.F. ≤		≥50	3.0%	6.0%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	10%	1210≥4.7μF	20%	0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	35	5.0%	20%	0805≥2.2μF; 1210≥10μF	25	5.0%	10%	0201≥0.01μF; 0805≥1μF; 1210≥10μF	14%	0603≥0.33μF; 1206≥4.7μF	15%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF	16	5.0%	10%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF	15%	0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	10	7.5%	15%	0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	20%	0201≥0.1μF; 0402≥1μF	6.3	15.0%	30%	0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	4	20.0%	---	---
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**RELIABILITY TEST CONDITIONS AND REQUIREMENTS (CONTINUED)**

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<b>High Temperature Load (Endurance)</b>	<ul style="list-style-type: none"> <li>Test temp.: NP0, X7R/X7E: 125±3°C X5R, Y5V: 85±3°C</li> <li>Test time: 1000+24/-0 hrs.</li> <li>To apply voltage: 1. 6.3V or C ≥ 10μF or TT series: 150% of rated voltage.</li> <li>2. 10V ≤ Ur &lt; 500V: 200% of rated voltage.</li> <li>3. 500V: 150% of rated voltage.</li> <li>4. Ur ≥ 630V: 120% of rated voltage.</li> <li>5. 100% of rated voltage for below range:</li> </ul> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated Vol. (V)</th> <th>Capacitance Range</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R</td> <td>6.3, 10</td> <td>C ≥ 0.1μF</td> </tr> <tr> <td>0402</td> <td>X5R</td> <td>6.3, 10</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td>0603</td> <td>X5R</td> <td>6.3, 10</td> <td>C ≥ 4.7μF</td> </tr> <tr> <td>0805</td> <td>X5R</td> <td>6.3</td> <td>C ≥ 22μF</td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R</td> <td>6.3</td> <td>C ≥ 47μF</td> </tr> <tr> <td>NP0</td> <td>3000</td> <td>C ≥ 1.5pF</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>6. 150% of rated voltage for below range:</li> </ul> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated Vol. (V)</th> <th>Capacitance Range</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R</td> <td>10, 16, 25</td> <td>C ≥ 0.22μF</td> </tr> <tr> <td>Y5V</td> <td>16</td> <td>C ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R</td> <td>10, 16</td> <td>C ≥ 1.0μF</td> </tr> <tr> <td>Y5V</td> <td>16</td> <td>C ≥ 2.2μF</td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R</td> <td>10</td> <td>C ≥ 4.7μF</td> </tr> <tr> <td>Y5V</td> <td>16</td> <td>C ≥ 4.7pF</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Measurement to be made after keeping at room temp. for 24±2 hrs. 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0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	10%	1210 ≥ 4.7μF	20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35	5.0%	20%	0805 ≥ 2.2μF; 1210 ≥ 10μF	25	5.0%	10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	16	5.0%	10%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	15%	0402 ≥ 0.47μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10	7.5%	15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	20%	0201 ≥ 0.1μF; 0402 ≥ 1μF	6.3	15.0%	30%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4	20.0%	---	---	Rated Vol. (V)	D.F. ≤	Exception of D.F. ≤		≥50	7.5%	10%	0603 ≥ 0.1μF; 0805 ≥ 0.47μF; 1206 ≥ 4.7μF	35	10%	---	---	25	7.5%	10%	0402 ≥ 0.047μF; 0603 ≥ 0.1μF; 0805 ≥ 0.33μF; 1206 ≥ 1μF; 1210 ≥ 4.7μF	15%	0402 ≥ 0.068μF; 0603 ≥ 0.47μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	16 (C < 1.0μF)	10%	12.5%	0402 ≥ 0.068μF; 0603 ≥ 0.68μF	20%	0402 ≥ 0.22μF	16 (C < 1.0μF)	12.5%	20%	0603 ≥ 2.2μF; 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**RELIABILITY TEST CONDITIONS AND REQUIREMENTS (CONTINUED)**

Item	Test Condition	Requirements								
<p><b>Resistance to Flexure of Substrate</b></p>	<ul style="list-style-type: none"> <li>The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm.</li> </ul> 	<ul style="list-style-type: none"> <li>No remarkable damage.</li> </ul> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="background-color: #d9e1f2;">Dielectric</th> <th style="background-color: #d9e1f2;">Cap Change</th> </tr> </thead> <tbody> <tr> <td>Class I (NP0)</td> <td>within ±3.0% or ±0.3pF whichever is larger</td> </tr> <tr> <td>Class II (X7R)</td> <td>within ±12.5%</td> </tr> <tr> <td>Class II (Y5V)</td> <td>within ±30%</td> </tr> </tbody> </table> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>	Dielectric	Cap Change	Class I (NP0)	within ±3.0% or ±0.3pF whichever is larger	Class II (X7R)	within ±12.5%	Class II (Y5V)	within ±30%
Dielectric	Cap Change									
Class I (NP0)	within ±3.0% or ±0.3pF whichever is larger									
Class II (X7R)	within ±12.5%									
Class II (Y5V)	within ±30%									
<p><b>Adhesive Strength of Termination</b></p>	<ul style="list-style-type: none"> <li>Capacitors mounted on a substrate. A force of 5N(≤0603) or 10N(&gt; 0603) applied perpendicular to the place of substrate and parallel the line joining the center of terminations for 10±1 second.</li> </ul>  <ul style="list-style-type: none"> <li>Pressurizing force: 0201 :2N / 0402 &amp; 0603 : 5N&gt;0603 : 10N</li> <li>Test time: 10±1 sec.</li> </ul>	<ul style="list-style-type: none"> <li>No remarkable damage or removal of the terminations.</li> </ul>								
<p><b>Vibration Resistance</b></p>	<ul style="list-style-type: none"> <li>Vibration frequency: 10~55 Hz/min.</li> <li>Total amplitude: 1.5mm</li> <li>Test time: 6 hrs. (Two hrs. each in three mutually perpendicular directions.)</li> </ul>	<ul style="list-style-type: none"> <li>No remarkable damage.</li> <li>Cap change and Q/D.F.: To meet initial spec.</li> </ul>								

# Multilayer Ceramic Chip Capacitors

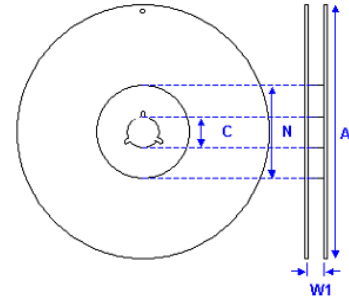
## Voltage ≤ 50VDC

MA Series

MERITEK

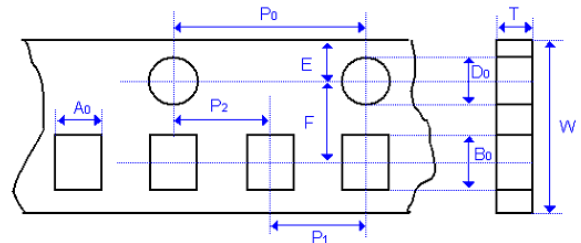
### PACKAGE DIMENSION

Size	0201, 0402, 0603, 0805, 1206, 1210			1812, 1825, 2220, 2225
Reel Size	7"	10"	13"	7"
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W1	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0	12.4+2.0/-0
A	178.0±0.10	250.0±1.0	330.0±0.10	178.0±0.10
N	65.0±1.0	100.0±1.0	100.0±1.0	60.5±1.0

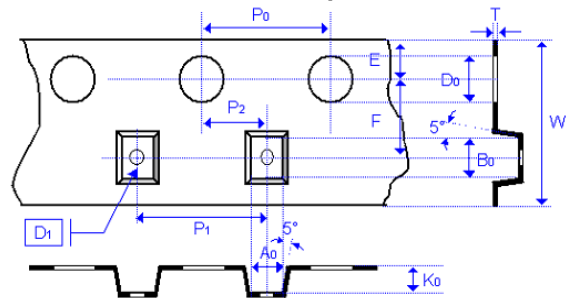


Size	0201	0402	0603	
Chip Size	0.30 ±0.03	0.50 ±0.05	0.80 ±0.07	0.80±0.15 /-0.10
A <sub>0</sub>	0.38±0.05	0.62±0.05	1.00+0.05 /-0.10	1.02+0.05 /-0.10
B <sub>0</sub>	0.68±0.05	1.12±0.05	1.80±0.10	1.80±0.10
T	0.42±0.05	0.60±0.05	0.95±0.05	0.97±0.05
K <sub>0</sub>	-	-	-	-
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP <sub>0</sub>	40.00±0.10	40.00±0.20	40.0±0.20	40.00±0.20
P <sub>1</sub>	2.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.1/-0
D <sub>1</sub>	-	-	-	-
E	1.75±0.05	1.75±0.05	1.75±0.10	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05

#### Paper Tape:



#### Plastic Tape:



Size	0805		1206		1210		1808		
Chip Size	0.80 ±0.10	1.25 ±0.10	0.80 ±0.10	0.95±0.10 / 1.25±0.10	1.60±0.20 / 1.60+0.3/-0.1	0.95±0.10 / 1.25±0.10 / 1.60±0.20 / 2.00±0.20	2.50±0.30	1.25±0.10 / 1.40±0.15 / 1.60±0.20	2.00±0.20
A <sub>0</sub>	1.50±0.10	<1.65	2.00±0.10	<2.00	<2.00	<3.05	<3.10	<2.50	<2.50
B <sub>0</sub>	2.30±0.10	<2.40	3.50±0.10	<3.60	<3.70	<3.80	<4.00	<5.30	<5.30
T	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.25±0.05	0.25±0.05
K <sub>0</sub>	-	<2.50	-	<2.50	<2.50	<2.50	<3.50	<2.50	<2.50
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	12.0±0.20	12.0±0.20
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.100	4.00±0.10	4.00±0.10	4.00±0.10
10xP <sub>0</sub>	40.00±0.20	40.00±0.20	40.0±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.0±0.20	40.0±0.20	40.0±0.20
P <sub>1</sub>	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.55±0.05	1.50±0.1/-0	1.50±0.05	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0	1.50±0.1/-0
D <sub>1</sub>	-	1.00±0.10	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10	1.50±0.10	1.50±0.10
E	1.75±0.05	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	5.50±0.05	5.50±0.05

# Multilayer Ceramic Chip Capacitors

## Voltage $\leq$ 50VDC

MA Series

**MERITEK**

### PACKAGE DIMENSION (CONTINUED)

Size	1812		1825		2220		2225	
Chip Size	1.25±0.10 1.60±0.20 2.00±0.20	2.50 ±0.30	1.60±0.20 2.00±0.20	2.50 ±0.30	1.40±0.15 1.60±0.20 2.00±0.20	2.50 ±0.30	1.60±0.20 2.00±0.20	2.50 ±0.30
A <sub>0</sub>	<3.90	<3.90	<6.80	<6.80	<5.80	<5.80	<6.80	<6.80
B <sub>0</sub>	<5.30	<5.30	<5.30	<5.30	<6.50	<6.50	<6.50	<6.50
T	0.25±0.05	0.25±0.05	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10	0.30±0.10
K <sub>0</sub>	<3.0	<2.50	<3.10	<2.50	<3.10	<2.50	<3.10	<3.10
W	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20	12.0±0.20
P <sub>0</sub>	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP <sub>0</sub>	40.0±0.20	40.00±0.2	40.00±0.2	40.00±0.2	40.0±0.20	40.0±0.20	40.0±0.20	40.0±0.20
P <sub>1</sub>	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P <sub>2</sub>	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D <sub>0</sub>	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0	1.50 +0.10/-0
D <sub>1</sub>	1.50±0.10	1.50+/-0.1	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10	1.50±0.10
E	1.75±0.10	1.75+/-0.1	1.75±0.1	1.75±0.10	1.75±0.1	1.75±0.10	1.75±0.10	1.75±0.10
F	5.50±0.05	5.50+/- 0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05

### REEL DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper Tape (pcs)		Plastic Tape (pcs)	
		7" reel	13" reel	7" reel	13" reel
0201(0603)	0.30±0.05	15K	70K	-	-
0402 (1005)	0.50±0.05	10K	50K	-	-
0603 (1608)	0.80±0.07	4K	15K	-	-
	0.80±0.15	4k	15K	-	-
0805 (2012)	0.60±0.10	4K	15K	-	-
	0.80±0.10	4K	15K	-	-
	0.95±0.10	-	-	3K	10K
	1.25±0.10	-	-	3K	-
1206 (3216)	0.80±0.10	4K	15K	-	-
	0.95±0.10	-	-	3K	10K
	1.25±0.10	-	-	3K	10K
	1.60±0.20	-	-	2K	-
1210 (3225)	0.95±0.10	-	-	3K	10K
	1.25±0.10	-	-	3K	10K
	1.60±0.20	-	-	2K	-
	2.00±0.20	-	-	1K	-
	2.50±0.30	-	-	1K	-
1808 (4520)	1.25±0.10	-	-	2K	-
	1.60±0.20	-	-	2K	-
	2.00±0.20	-	-	1K	-
1812 (4532)	1.25±0.10	-	-	1k	-
	1.60±0.20	-	-	1K	-
	2.00±0.20	-	-	1K	-
	2.50±0.30	-	-	0.5K	-
1825 (4563)	1.60±0.20	-	-	1K	-
	2.00±0.20	-	-	1K	-
	2.50±0.30	-	-	0.5K	-
2220 (5750)	1.60±0.20	-	-	1K	-
	2.00±0.20	-	-	1K	-
	2.50±0.30	-	-	0.5K	-
2225 (5763)	2.00±0.20	-	-	1K	-
	2.50±0.30	-	-	0.5K	-

**APPLICATION NOTES**

**STORAGE**

- To prevent the damage of solderability of terminations, the following storage conditions are recommended:  
 Indoors under 5°C~ 40°C and 20% ~ 70% RH.  
 No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.
- Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 6 months and checked the solderability before use.

**HANDLING**

- Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

**PREHEAT**

- In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 4°C per second. and the final preheat temperature should be within 100°C of the soldering temperature for small chips such as 0805,1206, within 50°C of the soldering temperature for bigger chips such as 1210, 1808, 1812, 1825, 2211, 2220 and 2225, etc.

**SOLDERING**

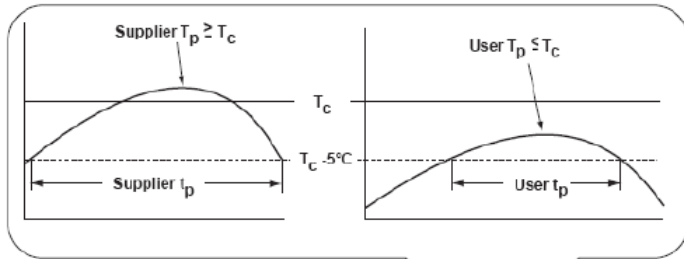
- Use midly activated rosin RA and RMA fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.
- Hand soldering with temperature-controlled iron not exceeding 30 watts and diameter of tip less than 1.2 mm is recommended, tip of iron should not contact the ceramic body directly, and the temperature of iron should be set to not more than 260°C.
- For bigger chips such as 1210, 1808, 1812, 2211, 2220 and 2225, etc. wave soldering and hand soldering are no recommended.
- Refer IPC/JEDEC J-STD-020D Method recommended soldering profiles:  
 Reflow not sooner than 15 minutes and not longer than 4 hrs after removal from the temperature/humidity chamber, subject the sample to 3 cycle of the appropriate reflow conditions as the table description below.

Profile Feature		Pb-Free Assembly
Preheat/Soak	Temperature MIN (T <sub>smin</sub> )	150°C
	Temperature MAX. (T <sub>sMAX</sub> )	200°C
	Time(t <sub>s</sub> ) from (T <sub>smin</sub> to T <sub>smax</sub> )	60~120 seconds
Ramp-up rate (T <sub>L</sub> to T <sub>P</sub> )		3°C/second max.
Liquidous Temperature (T <sub>L</sub> ) Time(T <sub>L</sub> ) maintained above T <sub>L</sub>		217°C 60~150 seconds
Peek package body temperature(T <sub>P</sub> )		For user T <sub>p</sub> must not exceed the classification temp 260°C For supplier T <sub>p</sub> must equal or exceed the classification temp 260°C
Time(T <sub>P</sub> )* within 5°C of the specified classification temperature(T <sub>C</sub> )		30 seconds
Ramp-down rate (T <sub>P</sub> to T <sub>L</sub> )		6°C/second MAX.
Time 25°C to peak temperature 260°C		8 minutes MAX.

- Lead-free: Soldering temperature = 235 to 260°C, depending on product.
- Maximum temperature = Minimum temperature (235°C) + ΔT+ Tolerance for oven process and measurement (5 ~ 7°C)
- Time at peak temperature = 10sec, Dwell above 217°C = 90sec, Ramping rate = 3°C/sec (heating) and 6°C/sec (heating).

**APPLICATION NOTES (CONTINUED)**

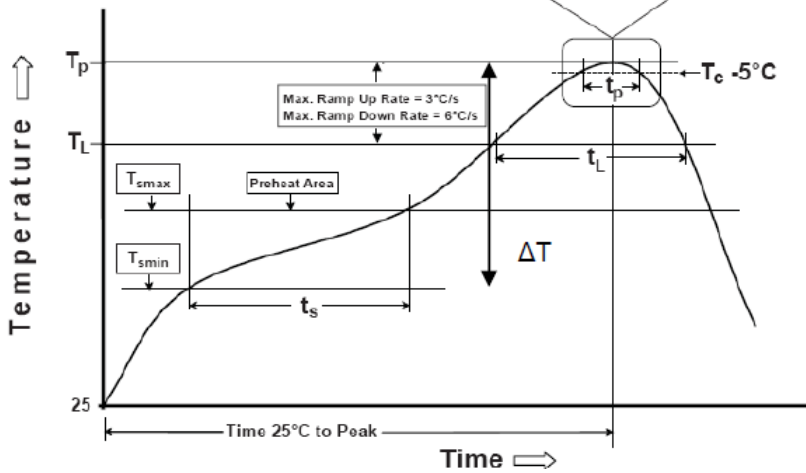
**CLASSIFICATION REFLOW PROFILES**



Chip Size	ΔT
0805, 1206	100°C
1210, 1808, 1812, 1825, 2211, 2220, 2225	50°C

Soldering	Solder Temp. (T <sub>c</sub> )	Soldering Time (t <sub>p</sub> )
Reflow	235~260°C	< 15sec.

**Note:**  
 For example: T<sub>c</sub> is 260°C and time t<sub>p</sub> is 15sec.  
 For user: The peak temperature must not exceed 260°C. The time above 255°C must not exceed 15 seconds.



**COOLING**

- After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint. A cooling rate not exceeding 4 per second should °C be used when forced cooling is necessary.

**CLEANING**

- All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.

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