

CONTENT (MLCC)

E STANDARD NUMBER..... 3

STRUCTURE..... 4

ORDERING CODE..... 4

 MICROWAVE TYPE (F SERIES)..... 5

 TEST SPEC..... 9

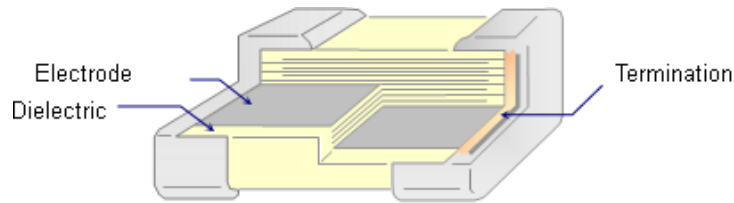
PACKAGE..... 11

OTHERS..... 15

E Standard Number

E3	1.0				2.2						4.7													
E6	1.0		1.5			2.2		3.3			4.7		6.8											
E12	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2												
E24	1.0	1.1	1.2	1.3	1.5	1.6	1.8	2.0	2.2	2.4	2.7	3.0	3.3	3.6	3.9	4.3	4.7	5.1	5.6	6.2	6.8	7.5	8.2	9.1

Structure



Ordering Code

C 0402 NPO 100 J F P F

PRODUCT CODE

C = MLCC

SIZE in mm (EIA CODE, in inch)

0402(01005)	0603(0201)	1005 (0402)	1608 (0603)	2012 (0805)
3216 (1206)	3225(1210)	4520 (1808)	4532 (1812)	

T. C.

NP0: $0 \pm 30\text{ppm}/^\circ\text{C}$	-55°C to +125°C		
X7R: $\pm 15\%$	-55°C to +125°C	X6S: $\pm 22\%$	-55°C to +105°C
X5R: $\pm 15\%$	-55°C to +85°C	Y5V: $+22\%/-82\%$	-30°C to +85°C

CAPACITANCE CODE

Expressed in pico-farads and identified by a three-digit number.
 First two digits represent significant figures.
 Last digit specifies the number of zeros.
 (Use 9 for 1.0 through 9.9pF ; Use 8 for 0.20 through 0.99pF)

Examples:

Code	Cap (pF)
478	0.47
229	2.2
101	100
102	1000

TOLERANCE CODE

A: $\pm 0.05\text{pF}$	B: $\pm 0.1\text{pF}$	C: $\pm 0.25\text{pF}$	D: $\pm 0.5\text{pF}$	F: $\pm 1\%$	G: $\pm 2\%$
J: $\pm 5\%$	K: $\pm 10\%$	M: $\pm 20\%$	Z: $+80/-20\%$		

VOLTAGE CODE

B: 4V	C: 6.3V	D: 10V	E: 16V	F: 25V	N: 35V	G: 50V	H: 100V
J: 200V	K: 250V	L: 500V	M: 630V	P: 1KV	Q: 2KV	R: 3KV	S: 4KV

PACKAGING CODE

T: Paper tape reel Ø180mm (7")	P: Embossed tape reel Ø180mm (7")
N: Paper tape reel Ø250mm (10")	D: Embossed tape reel Ø250mm (10")
A: Paper tape reel Ø330mm (13")	E: Embossed tape reel Ø330mm (13")
W: Special Packing	

Application Code

S: Standard Q: High Q/Low ESR F: Microwave A: Automotive infotainment with AEC-Q200

Microwave Type (F Series)

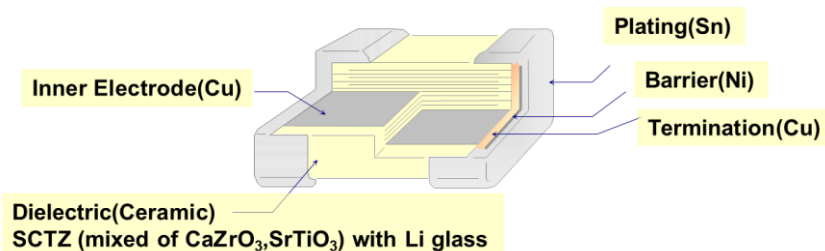
■ Feature

1. Ultra-stable
2. Tight tolerance available
3. Low ESR
4. Good frequency performance
5. No aging of capacitance
6. RoHS compliant
7. Halogen Free

■ Application

- LC and RC tuned circuit
- Filtering
- Timing
- PA Module, Wireless equipment, Smartphone

■ Structure



■ Part Number & Characteristic

- C0402NP0_F Series (EIA01005)

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Testing Freq	ESR (max.)	Q (min.)	Standard Packing
			Value	Unit			L/W	Thick.				
25V	C0402NP0208	1V, 1MHz	0.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	1,137	Embossed, 40Kpcs (W4P1)
	C0402NP0308	1V, 1MHz	0.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	758	
	C0402NP0408	1V, 1MHz	0.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	568	
	C0402NP0508	1V, 1MHz	0.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	455	
	C0402NP0608	1V, 1MHz	0.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	379	
	C0402NP0708	1V, 1MHz	0.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	325	
	C0402NP0808	1V, 1MHz	0.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	284	
	C0402NP0908	1V, 1MHz	0.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	253	
	C0402NP0109	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	227	
	C0402NP0119	1V, 1MHz	1.1	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	322	
	C0402NP0129	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	295	
	C0402NP0139	1V, 1MHz	1.3	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	272	
	C0402NP0159	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	236	
	C0402NP0169	1V, 1MHz	1.6	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	221	
	C0402NP0189	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	196	
	C0402NP0209	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	177	
	C0402NP0229	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	263	
	C0402NP0249	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	241	
	C0402NP0259	1V, 1MHz	2.5	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	231	
	C0402NP0279	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	214	
	C0402NP0309	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	193	
	C0402NP0339	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	175	
	C0402NP0369	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	161	
	C0402NP0399	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	148	
	C0402NP0439	1V, 1MHz	4.3	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	135	
	C0402NP0479	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	123	
	C0402NP0569	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	167	
	C0402NP0609	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	156	
	C0402NP0629	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	151	
	C0402NP0689	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	138	
C0402NP0709	1V, 1MHz	7.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	134		
C0402NP0759	1V, 1MHz	7.5	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	125		
C0402NP0829	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	114		
C0402NP0919	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	103		
C0402NP0100	1V, 1MHz	10	pF	±5%, ±2%	0.20	±0.02	±0.02	1GHz	170	94		

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Testing Freq	ESR (max.)	Q (min.)	Standard Packing	
			Value	Unit			L/W	Thick.					
16V	C0402NP0208	EPF	1V, 1MHz	0.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	1,137	Embossed, 40Kpcs (W4P1)
	C0402NP0308	EPF	1V, 1MHz	0.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	758	
	C0402NP0408	EPF	1V, 1MHz	0.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	568	
	C0402NP0508	EPF	1V, 1MHz	0.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	455	
	C0402NP0608	EPF	1V, 1MHz	0.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	379	
	C0402NP0708	EPF	1V, 1MHz	0.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	325	
	C0402NP0808	EPF	1V, 1MHz	0.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	284	
	C0402NP0908	EPF	1V, 1MHz	0.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	253	
	C0402NP0109	EPF	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.20	±0.02	±0.02	1GHz	700	227	
	C0402NP0119	EPF	1V, 1MHz	1.1	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	322	
	C0402NP0129	EPF	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	295	
	C0402NP0139	EPF	1V, 1MHz	1.3	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	272	
	C0402NP0159	EPF	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	236	
	C0402NP0169	EPF	1V, 1MHz	1.6	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	221	
	C0402NP0189	EPF	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	196	
	C0402NP0209	EPF	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	450	177	
	C0402NP0229	EPF	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	263	
	C0402NP0249	EPF	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	241	
	C0402NP0259	EPF	1V, 1MHz	2.5	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	231	
	C0402NP0279	EPF	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	214	
	C0402NP0309	EPF	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	193	
	C0402NP0339	EPF	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	175	
C0402NP0369	EPF	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	161		
C0402NP0399	EPF	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	148		
C0402NP0439	EPF	1V, 1MHz	4.3	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	135		
C0402NP0479	EPF	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	275	123		
C0402NP0569	EPF	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	167		
C0402NP0609	EPF	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	156		
C0402NP0629	EPF	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	151		
C0402NP0689	EPF	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	138		
C0402NP0709	EPF	1V, 1MHz	7.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	134		
C0402NP0759	EPF	1V, 1MHz	7.5	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	125		
C0402NP0829	EPF	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	114		
C0402NP0919	EPF	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.20	±0.02	±0.02	1GHz	170	103		
C0402NP0100	EPF	1V, 1MHz	10	pF	±5%, ±2%	0.20	±0.02	±0.02	1GHz	170	94		
C0402NP0120	EPF	1V, 1MHz	12	pF	±5%, ±2%	0.20	±0.02	±0.02	1GHz	135	98		
C0402NP0150	EPF	1V, 1MHz	15	pF	±5%, ±2%	0.20	±0.02	±0.02	1GHz	135	79		
C0402NP0180	EPF	1V, 1MHz	18	pF	±5%, ±2%	0.20	±0.02	±0.02	1GHz	135	65		
C0402NP0200	EPF	1V, 1MHz	20	pF	±5%, ±2%	0.20	±0.02	±0.02	1GHz	135	59		
C0402NP0220	EPF	1V, 1MHz	22	pF	±5%, ±2%	0.20	±0.02	±0.02	1GHz	135	54		

● C0603NP0_F Series (EIA0201)

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Testing Freq	ESR (max.)	Q(1GHz) (min.)	Standard Packing	
			Value	Unit			L/W	Thick.					
50V	C0603NP0208	GTF	1V, 1MHz	0.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	2,274	Paper, 15Kpcs
	C0603NP0308	GTF	1V, 1MHz	0.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	1,516	
	C0603NP0408	GTF	1V, 1MHz	0.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	1,137	
	C0603NP0508	GTF	1V, 1MHz	0.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	909	
	C0603NP0608	GTF	1V, 1MHz	0.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	758	
	C0603NP0708	GTF	1V, 1MHz	0.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	650	
	C0603NP0808	GTF	1V, 1MHz	0.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	568	
	C0603NP0908	GTF	1V, 1MHz	0.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	505	
	C0603NP0109	GTF	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	455	
	C0603NP0119	GTF	1V, 1MHz	1.1	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	482	
	C0603NP0129	GTF	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	442	
	C0603NP0139	GTF	1V, 1MHz	1.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	408	
	C0603NP0159	GTF	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	354	
	C0603NP0169	GTF	1V, 1MHz	1.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	332	
	C0603NP0189	GTF	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	295	
	C0603NP0209	GTF	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	265	

□ Tolerance Code: A=±0.05 pF, B=±0.1pF, C=±0.25pF, D=±0.5pF, G=±2%, J=±5%; Special tolerance on the request.

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Testing Freq	ESR (max.)	Q(1GHz) (min.)	Standard Packing
			Value	Unit			L/W	Thick.				
50V	C0603NP0229 □GTF	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	362	Paper, 15Kpcs
	C0603NP0249 □GTF	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	332	
	C0603NP0259 □GTF	1V, 1MHz	2.5	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	318	
	C0603NP0279 □GTF	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	295	
	C0603NP0309 □GTF	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	265	
	C0603NP0339 □GTF	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	241	
	C0603NP0369 □GTF	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	221	
	C0603NP0399 □GTF	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	204	
	C0603NP0479 □GTF	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF,±0.05pF	0.30	±0.03	±0.03	1GHz	200	169	
	C0603NP0509 □GTF	1V, 1MHz	5.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	200	159	
	C0603NP0569 □GTF	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	189	
	C0603NP0609 □GTF	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	177	
	C0603NP0629 □GTF	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	171	
	C0603NP0689 □GTF	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	156	
	C0603NP0709 □GTF	1V, 1MHz	7.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	152	
	C0603NP0759 □GTF	1V, 1MHz	7.5	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	141	
	C0603NP0829 □GTF	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	129	
	C0603NP0919 □GTF	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	117	
	C0603NP100 □GTF	1V, 1MHz	10	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	150	106	
	C0603NP1020 □GTF	1V, 1MHz	12	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	53	
C0603NP1030 □GTF	1V, 1MHz	13	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	49		
C0603NP1050 □GTF	1V, 1MHz	15	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	42		
C0603NP1060 □GTF	1V, 1MHz	16	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	40		
C0603NP1080 □GTF	1V, 1MHz	18	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	35		
C0603NP0200 □GTF	1V, 1MHz	20	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	32		
25V	C0603NP0208 □FTF	1V, 1MHz	0.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	2,274	Paper, 15Kpcs
	C0603NP0308 □FTF	1V, 1MHz	0.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	1,516	
	C0603NP0408 □FTF	1V, 1MHz	0.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	1,137	
	C0603NP0508 □FTF	1V, 1MHz	0.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	909	
	C0603NP0608 □FTF	1V, 1MHz	0.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	758	
	C0603NP0708 □FTF	1V, 1MHz	0.70	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	650	
	C0603NP0758 □FTF	1V, 1MHz	0.75	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	606	
	C0603NP0808 □FTF	1V, 1MHz	0.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	568	
	C0603NP0908 □FTF	1V, 1MHz	0.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	505	
	C0603NP0109 □FTF	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	350	455	
	C0603NP0119 □FTF	1V, 1MHz	1.1	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	482	
	C0603NP0129 □FTF	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	442	
	C0603NP0139 □FTF	1V, 1MHz	1.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	408	
	C0603NP0159 □FTF	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	354	
	C0603NP0169 □FTF	1V, 1MHz	1.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	332	
	C0603NP0189 □FTF	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	295	
	C0603NP0209 □FTF	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	300	265	
	C0603NP0229 □FTF	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	362	
	C0603NP0249 □FTF	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	332	
	C0603NP0259 □FTF	1V, 1MHz	2.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	318	
	C0603NP0279 □FTF	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	295	
	C0603NP0309 □FTF	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	265	
	C0603NP0339 □FTF	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	241	
	C0603NP0369 □FTF	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	221	
	C0603NP0399 □FTF	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	204	
	C0603NP0479 □FTF	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	1GHz	200	169	
	C0603NP0509 □FTF	1V, 1MHz	5.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	200	159	
	C0603NP0569 □FTF	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	189	
	C0603NP0609 □FTF	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	177	
	C0603NP0629 □FTF	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	171	
	C0603NP0689 □FTF	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	156	
	C0603NP0709 □FTF	1V, 1MHz	7.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	152	
	C0603NP0759 □FTF	1V, 1MHz	7.5	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	141	
C0603NP0829 □FTF	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	129		
C0603NP0919 □FTF	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	1GHz	150	117		
C0603NP100 □FTF	1V, 1MHz	10	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	150	106		
C0603NP0120 □FTF	1V, 1MHz	12	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	53		
C0603NP0130 □FTF	1V, 1MHz	13	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	49		
C0603NP0150 □FTF	1V, 1MHz	15	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	42		
C0603NP0160 □FTF	1V, 1MHz	16	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	40		
C0603NP0180 □FTF	1V, 1MHz	18	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	35		
C0603NP0200 □FTF	1V, 1MHz	20	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	32		
C0603NP0220 □FTF	1V, 1MHz	22	pF	±5%, ±2%	0.30	±0.03	±0.03	1GHz	250	29		
C0603NP0240 □FTF	1V, 1MHz	24	pF	±5%, ±2%	0.30	±0.03	±0.03	500MHz	300	22		
C0603NP0270 □FTF	1V, 1MHz	27	pF	±5%, ±2%	0.30	±0.03	±0.03	500MHz	300	20		
C0603NP0330 □FTF	1V, 1MHz	33	pF	±5%, ±2%	0.30	±0.03	±0.03	500MHz	300	16		
6.3V	C0603NP0270 □CTF	1V, 1MHz	27	pF	±5%, ±2%	0.30	±0.03	±0.03	500MHz	300	20	Paper, 15Kpcs

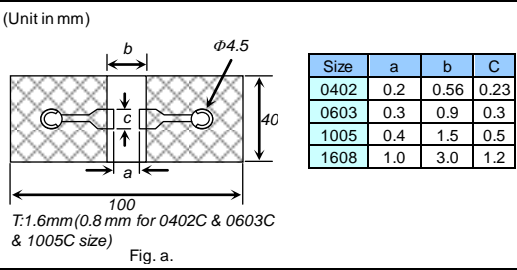
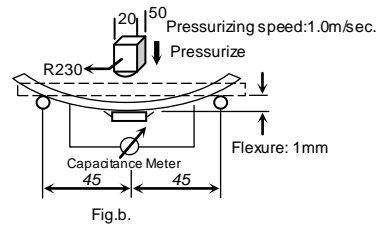
MLCC High Frequency Application

● C1005NP0_F Series (EIA0402)

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Testing Freq	ESR (max.)	Q(1GHz) (min.)	Standard Packing	
			Value	Unit			L/W	Thick.					
50V	C1005NP0208	GTF	1V, 1MHz	0.20	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	Paper, 10Kpcs
	C1005NP0308	GTF	1V, 1MHz	0.30	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0408	GTF	1V, 1MHz	0.40	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0508	GTF	1V, 1MHz	0.50	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0608	GTF	1V, 1MHz	0.60	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0708	GTF	1V, 1MHz	0.70	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0808	GTF	1V, 1MHz	0.80	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0908	GTF	1V, 1MHz	0.90	pF	±0.25pF,±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0109	GTF	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	350	455	
	C1005NP0129	GTF	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	442	
	C1005NP0159	GTF	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	354	
	C1005NP0189	GTF	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	295	
	C1005NP0209	GTF	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF,±0.05pF	0.50	±0.05	±0.05	1GHz	300	265	
	C1005NP0229	GTF	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	241	
	C1005NP0249	GTF	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	221	
	C1005NP0279	GTF	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	196	
	C1005NP0309	GTF	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	177	
	C1005NP0339	GTF	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	161	
	C1005NP0369	GTF	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	147	
	C1005NP0399	GTF	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	136	
	C1005NP0479	GTF	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	113	
	C1005NP0509	GTF	1V, 1MHz	5.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	300	106	
	C1005NP0569	GTF	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	250	114	
	C1005NP0609	GTF	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	250	106	
	C1005NP0629	GTF	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	250	103	
	C1005NP0689	GTF	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	250	94	
	C1005NP0829	GTF	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	250	78	
	C1005NP0909	GTF	1V, 1MHz	9.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	250	71	
	C1005NP0919	GTF	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	1GHz	250	70	
	C1005NP0100	GTF	1V, 1MHz	10	pF	±5%, ±2%, ±1%	0.50	±0.05	±0.05	1GHz	250	64	
	C1005NP0120	GTF	1V, 1MHz	12	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	53	
	C1005NP0150	GTF	1V, 1MHz	15	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	42	
	C1005NP0180	GTF	1V, 1MHz	18	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	35	
C1005NP0200	GTF	1V, 1MHz	20	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	32		
C1005NP0220	GTF	1V, 1MHz	22	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	29		
C1005NP0270	GTF	1V, 1MHz	27	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	24		
C1005NP0330	GTF	1V, 1MHz	33	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	19		
C1005NP0390	GTF	1V, 1MHz	39	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	16		
C1005NP0470	GTF	1V, 1MHz	47	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	14		
C1005NP0560	GTF	1V, 1MHz	56	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	11		
25V	C1005NP0680	FTF	1V, 1MHz	68	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	9	Paper, 10Kpcs
	C1005NP0820	FTF	1V, 1MHz	82	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	8	
	C1005NP0101	FTF	1V, 1MHz	100	pF	±5%, ±2%	0.50	±0.05	±0.05	1GHz	250	6	

□ Tolerance Code: A=±0.05 pF, B=±0.1pF, C=±0.25pF ,D=±0.5pF, G=±2%, J=±5%; Special tolerance on the request.

● Test Spec.

Item	Specification	Test Method																				
1	Operating Temperature Range NP0: -55 to 125 °C	---																				
2	Rated Voltage Shown in the table of "Part Number & Characteristic"	The rated voltage is defined as the maximum voltage, which may be applied continuously to the capacitor.																				
3	Appearance No defects or abnormalities.	Visual inspection																				
4	Dimensions Within the specified dimension.	Using calipers or Microscope.																				
5	Dielectric Strength (Flash) No defects or abnormalities.	No failure shall be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds. The charge and discharge current is less than 50mA.																				
6	Insulation Resistance (I.R.) I.R. $\geq 10G\Omega$	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max, and within 1 minute of charging.																				
7	Capacitance Within the specified tolerance	The capacitance /Q shall be measured at 25°C at the frequency and voltage shown in the tables.																				
8	Quality Factor (Q) 30pF min.: $Q \geq 1000$ 30pF max.: $Q \geq 400+20C$ C: Nominal Capacitance (pF)	<table border="1"> <tr> <td>Frequency</td> <td>1.0±0.2MHz</td> </tr> <tr> <td>Voltage</td> <td>1.0±0.2Vrms</td> </tr> </table>	Frequency	1.0±0.2MHz	Voltage	1.0±0.2Vrms																
Frequency	1.0±0.2MHz																					
Voltage	1.0±0.2Vrms																					
9	Capacitance Temperature Characteristics Capacitance change within 0±30ppm/°C under operating temperature range.	The capacitance value at 25°C and 85°C shall be measured and calculated from the formula given below. $T.C. = (C_{85} - C_{25}) / C_{25} * \Delta T * 10^6 (PPM/°C)$																				
10	Termination Strength No removal of the terminations or marking defect.	Apply a parallel force of 5N to a PCB mounted sample for 10±1sec. *2N for 0603 (EIA 0201).																				
11	Deflection (Bending Strength) No cracking or marking defects shall occur at 1mm deflection. Capacitance change: NP0: within ±5% or ± 0.5pF. (whichever is larger)	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig.a using a SAC305(Sn96.5Ag3.0Cu0.5) solder. Then apply a force in the direction shown in Fig.b. The soldering shall be done with the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.																				
	(Unit in mm)  <table border="1"> <thead> <tr> <th>Size</th> <th>a</th> <th>b</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>0402</td> <td>0.2</td> <td>0.56</td> <td>0.23</td> </tr> <tr> <td>0603</td> <td>0.3</td> <td>0.9</td> <td>0.3</td> </tr> <tr> <td>1005</td> <td>0.4</td> <td>1.5</td> <td>0.5</td> </tr> <tr> <td>1608</td> <td>1.0</td> <td>3.0</td> <td>1.2</td> </tr> </tbody> </table> T: 1.6mm (0.8mm for 0402C & 0603C & 1005C size) Fig. a.	Size	a	b	C	0402	0.2	0.56	0.23	0603	0.3	0.9	0.3	1005	0.4	1.5	0.5	1608	1.0	3.0	1.2	 Fig. b.
Size	a	b	C																			
0402	0.2	0.56	0.23																			
0603	0.3	0.9	0.3																			
1005	0.4	1.5	0.5																			
1608	1.0	3.0	1.2																			
12	Solderability of Termination 90% of the terminations are to be soldered evenly and continuously. C0402 Series: 75% of the terminations are to be soldered evenly and continuously.	Immerse the test capacitor into a methanol solution containing rosin for 3 to 5 seconds, preheat it 150 to 180°C for 2 to 3 minutes and immerse it into SAC305(Sn96.5Ag3.0Cu0.5) solder of 245 ± 5°C for 3±1seconds.																				
13	Resistance to Soldering Heat	Appearance No marking defects	Immerse the capacitor in a SAC305(Sn96.5Ag3.0Cu0.5) solder solution at 270±5°C for 10±1 seconds. Let sit at room temperature for 24±2 hours, then measure. *C0402 Series is not suitable for this testing																			
		Cap. Change NP0 within ±2.5% or ±0.25pF (whichever is larger)																				
		Q Initial spec.																				
		I.R. Initial spec.																				

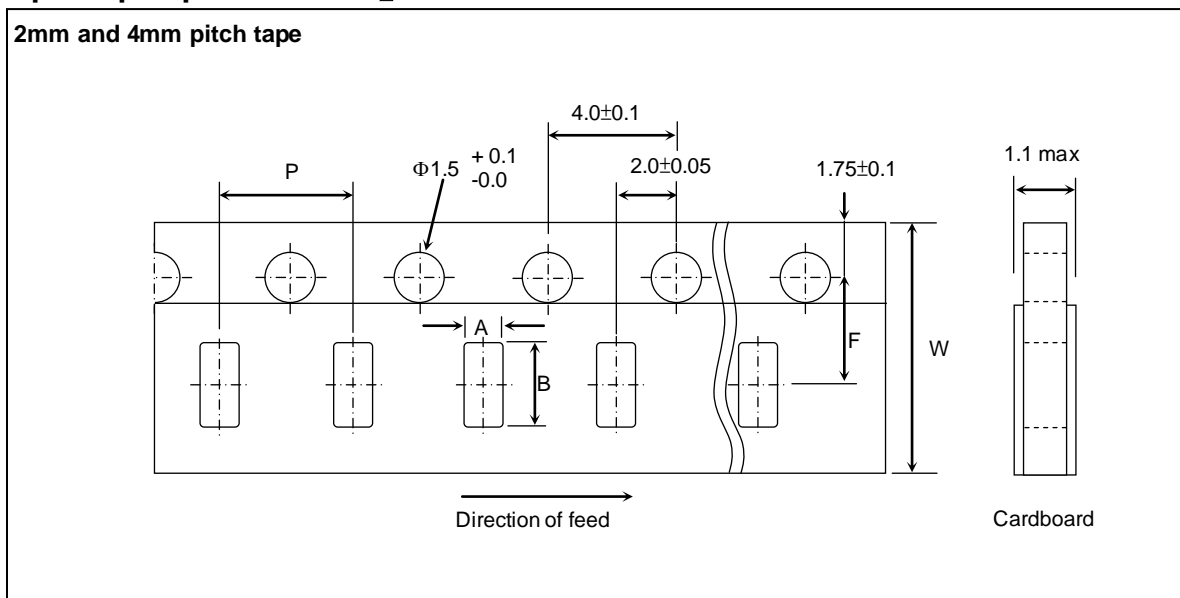
	Item	Specification	Test Method
14	Temperature cycle (Thermal shock)	Appearance	Solder the capacitor to supporting jig (glass epoxy board) and perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2hrs at room temperature, then measure. Step 1: Minimum operating temperature 30±3min Step 2: Room temperature 2~3 min Step 3: Maximum operating temperature 30±3min Step 4: Room temperature 2~3min
		Cap. Change	
		Q	
		I.R.	
15	Humidity load	Appearance	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge / discharge current is less than 50mA.
		Cap. Change	
		Q	
		I.R.	
16	High temperature load life test	Appearance	Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ± 3°C . Let sit for 24± 2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Cap. Change	
		Q	
		I.R.	
17	ESR & Q	Shown in the table of "Part Number & Characteristic"	Testing frequency is shown in the table of "Part Number & Characteristic"

Package

- Tape and reel packaging**

Tape and reel packaging is currently the most promising system for high-speed production. A typical 180mm (7 inch) diameter reel contains 1,500 to 15,000 capacitors, 250mm (10 inch) contains 10,000 capacitors, and 330mm (13 inch) contains 10,000 to 50,000 capacitors. Three standard sizes are available in taped and reeled package either with paper carrier tapes or embossed tapes.

【Paper tape specifications】

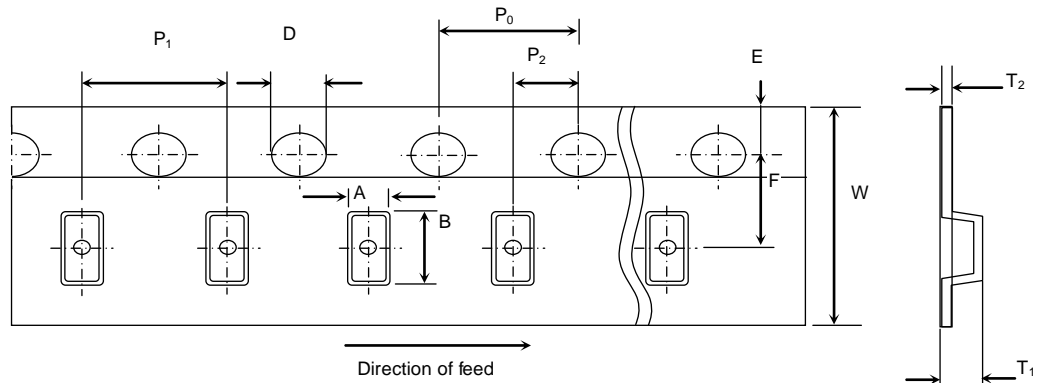


SYMBOL	PRODUCT SIZE CODE												UNIT
	0402(01005)		0603(0201)		1005(0402) (±0.05 mm)		1005(0402) (±0.10 mm)		1005(0402) (±0.15 mm)		1005(0402) (±0.20 mm)		
	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	
A	0.23	± 0.02	0.38	± 0.04	0.65	± 0.10	0.70	± 0.10	0.72	± 0.10	0.80	± 0.10	mm
B	0.43	± 0.02	0.68	± 0.04	1.15	± 0.10	1.19	± 0.10	1.25	± 0.10	1.35	± 0.10	mm
F	3.5	± 0.05	3.5	± 0.05	3.5	± 0.05	3.5	± 0.05	3.5	± 0.05	3.5	± 0.05	mm
P	2	± 0.05	2	± 0.10	2	± 0.10	2	± 0.10	2	± 0.10	2	± 0.10	mm
W	8	± 0.20	8	± 0.20	8	± 0.20	8	± 0.20	8	± 0.20	8	± 0.20	mm

SYMBOL	PRODUCT SIZE CODE (EIA)								UNIT
	1608 (0603) (±0.15 mm)		1608 (0603) (±0.20 mm)		2012 (0805)		3216 (1206)		
	Size	Tol.	Size	Tol.	Size	Tol.	Size	Tol.	
A	1.0	±0.2	1.1	±0.2	1.5	±0.2	1.9	±0.2	mm
B	1.8	±0.2	1.9	±0.2	2.3	±0.2	3.6	±0.2	mm
F	3.5	±0.05	3.5	±0.05	3.5	±0.05	3.5	±0.05	mm
P	4	±0.1	4	±0.1	4	±0.1	4	±0.1	mm
W	8	±0.2	8	±0.2	8	±0.2	8	±0.2	mm

【 Embossed tape specifications 】

1mm and 4mm and 8mm pitch tape

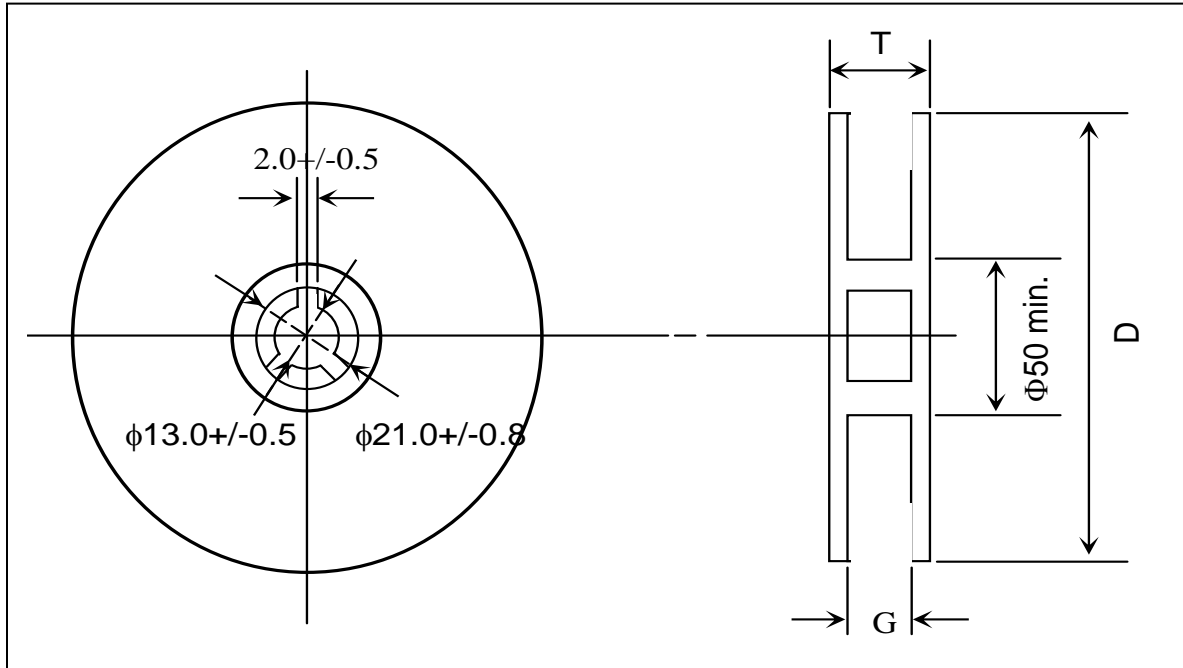


For $W=8\text{mm}$: $T_1=2.5\text{mm max.}$

For $W=12\text{mm}$: $T_1=4.5\text{mm}$

DIMENSION (mm)	PRODUCT SIZE CODE						
	1mm tape	4 mm tape				8 mm tape	
	0402 (01005)	1608 (0603)	2012 (0805)	3216 (1206)	3225 (1210)	4520 (1808)	4532 (1812)
P_1	1 ± 0.02	4 ± 0.1	4 ± 0.1	4 ± 0.1	4 ± 0.1	8 ± 0.1	8 ± 0.1
P_0	2 ± 0.04	4 ± 0.1	4 ± 0.1	4 ± 0.1	4 ± 0.1	4 ± 0.1	4 ± 0.1
P_2	1 ± 0.02	2 ± 0.05	2 ± 0.05	2 ± 0.05	2 ± 0.05	2 ± 0.05	2 ± 0.05
A	0.23 ± 0.02	1.2 ± 0.2	1.45 ± 0.2	1.9 ± 0.2	2.8 ± 0.2	2.3 ± 0.2	3.6 ± 0.2
B	0.43 ± 0.02	2.0 ± 0.2	2.3 ± 0.2	3.5 ± 0.2	3.6 ± 0.2	4.9 ± 0.2	4.9 ± 0.2
W	4 ± 0.05	8 ± 0.3	8 ± 0.2	8 ± 0.2	8 ± 0.2	12 ± 0.2	12 ± 0.2
E	0.9 ± 0.05	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.1
F	1.8 ± 0.02	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	3.5 ± 0.05	5.5 ± 0.05	5.5 ± 0.05
D	0.8 ± 0.04	1.5 (+0.1/-0.0)	1.5 (+0.1/-0.0)	1.5 (+0.1/-0.0)	1.5 (+0.1/-0.0)	1.5 (+0.1/-0.0)	1.5 (+0.1/-0.0)
T_1	0.5 max	1.4 max.	2.5 max.	2.5 max.	2.5 max.	4.5	4.5
T_2	0.15-0.40	0.25 ± 0.1	0.305 ± 0.1	0.30 ± 0.1	0.30 ± 0.1	0.30 ± 0.1	0.30 ± 0.1

【 Reel specifications】



TAPE WIDTH (mm)	G (mm)	T max. (mm)	D (mm)
4	5.0 ± 1.5	8.0	180
8	10.0 ± 1.5	14.5	180
8	10.0 ± 1.5	14.5	250
8	10.0 ± 1.5	14.5	330
12	14.0 ± 1.5	18.5	180

【 Thickness and Packing Amount 】

Thickness			Amount per reel			
Code	Spec.(mm)	Size (EIA)	180 mm (7")		330 mm (13")	
			Paper	Embossed	Paper	Embossed
Z	0.20	0402 (01005)	20K	40K ^{#1}		
A	0.30	0603 (0201)	15K		50K	
		1005 (0402)	15K		50K	
B	0.50	1005 (0402)	10K		50K	
Q	0.45	1005 (0402)	10K		50K	
		1608 (0603)	4K		15K	
C	0.60	2012 (0805)	4K		15K	
		3216 (1206)	4K		15K	
D	0.80	1608 (0603)	4K	4K	15K	
E	0.85	2012 (0805)	4K		15K	
		3216 (1206)	4K		15K	
		3225 (1210)		3K		10K
I	0.95	4532 (1812)		1K		
		2012 (0805)		3K		
F	1.15	3216 (1206)		3K		10K
		4520 (1808)		3K		
G	1.25	2012 (0805)		2K/3K		10K
		3216 (1206)		3K		10K
		3225 (1210)		3K		
		4520 (1808)		2K/3K		
		4532 (1812)		1K		
		3225 (1210)		3K		
L	1.60	3216 (1206)		2K		
		3225 (1210)		2K		
		4520 (1808)		2K		
		4532 (1812)		1K		
N	2.00	3216 (1206)		2K/3K		
		3225 (1210)		2K		
		4520 (1808)		1K		
		4532 (1812)		1K		
P	2.50	3225 (1210)		500pcs/1K		

#1: 4mm width 1mm pitch Embossed Taping

【 Packing Rule 】

EIA SIZE	Tape	Reel Size	Reels/Box	Boxes/ Carton
01005	Emboss	7"	8	12
01005	Paper	7"	5	12
0201	Paper	7"	5	12
0402	Paper	7"	5	12
0603	Paper/Emboss	7"	5	12
0805	Paper/Emboss	7"	5	12
1206	Paper/Emboss	7"	5	12
1210	Emboss	7"	5	12
1808	Emboss	7"	5	12
1812	Emboss	7"	5	12

Others

【Storage】

1. The chip capacitors shall be packaged in carrier tapes or bulk cases.
2. Keep storage place temperatures from +5°C to +35°C, humidity from 45 to 70% RH.
3. The storage atmosphere must be free of gas containing sulfur and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminations will oxidize and solderability will be affected.
4. The solderability is assured for 12 months from our final inspection date if the above storage condition is followed.

【Circuit Design】

1. Once application and assembly environments have been checked, the capacitor may be used in conformance with the rating and performance, which are provided in both the catalog and the specifications. Exceeding the specifications listed may result in inferior performance. It may also cause a short, open, smoking, or flaming to occur, etc.
2. Please use the capacitors in conformance with the operating temperature provided in both the catalog and the specifications. Be especially cautious not to exceed the maximum temperature. In the situation the maximum temperature set forth in both the catalog and specifications is exceeded, the capacitor's insulation resistance may deteriorate, power may suddenly surge and short-circuit may occur. The loss of capacitance will occur, and may self-heat due to equivalent series resistance when alternating electric current is passed through. As this effect becomes critical in high frequency circuits, please exercise with caution. When using the capacitor in a (self-heating) circuit, please make sure the surface of the capacitor remains under the maximum temperature for usage. Also, please make certain temperature rise remain below 20°C.
3. Please keep voltage under the rated voltage, which is applied to the capacitor. Also, please make certain the peak voltage remains below the rated voltage when AC voltage is super-imposed to the DC voltage. In the situation where AC or pulse voltage is employed, ensure average peak voltage does not exceed the rated voltage. Exceeding the rated voltage provided in both catalog and specifications may lead to defective withstanding voltage or, in worse case situations, may cause the capacitor to burn out.
4. It's is a common phenomenon of high-dielectric products to have a deteriorated amount of static electricity due to the application of DC voltage.

【Handling】

Chip capacitors should be handled with care to avoid contamination or damage. The use of vacuum pick-up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

【Flux】

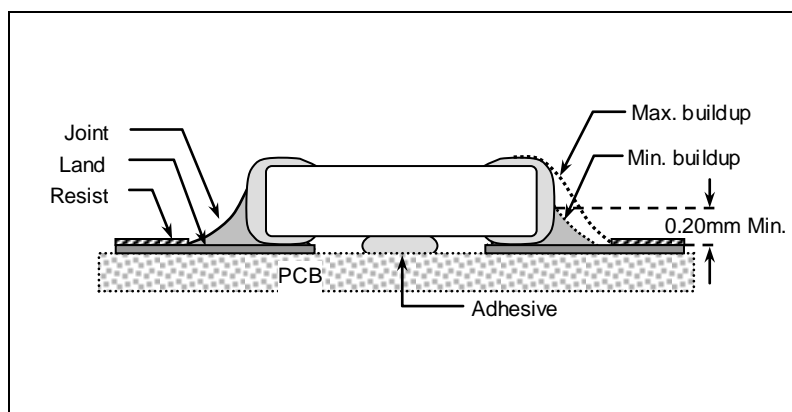
1. An excessive amount of flux or too rapid temperature rise can cause solvent burst, solder can generate a large quantity of gas. The gas can spread small solder particles to cause solder balling effect or bridging problem.
2. Flux containing too high of a percentage of halide may cause corrosion of termination unless sufficient cleaning is applied.
3. Use rosin-type flux. Highly acidic flux (halide content less than 0.2wt%) is not recommended.
4. The water soluble flux causes deteriorated insulation resistance between outer terminations unless sufficiently cleaned.

【Component Spacing】

For wave soldering components, the spacing must be sufficient far apart to prevent bridging or shadowing. This is not so important for reflow process but enough space for rework should be considered. The suggested spacing for reflow soldering and wave soldering is 0.5mm and 1.0mm, respectively.

【Solder Fillet】

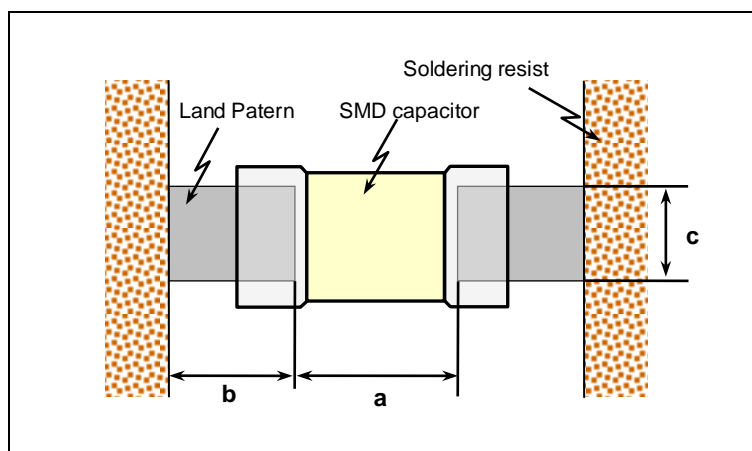
Too much solder amount may increase solder stress and cause crack risk. Insufficient solder amount may reduce adhesive strength and cause parts falling off PCB. When soldering, confirm that the solder is placed over 0.2mm of the surface of the terminations.



【Recommended Land Pattern Dimensions】

When mounting the capacitor to substrate, it's important to consider that the amount of solder (size of fillet) used has a direct effect upon the capacitor once it's mounted.

1. The greater the amount of solder, the greater the stress to the elements, as this may cause the substrate to break or crack.
2. In the situation where two or more devices are mounted onto a common land, separate the device into exclusive pads by using soldering resist.
3. Land width equal to or less than component. It is permissible to reduce land width to 80% of component width.



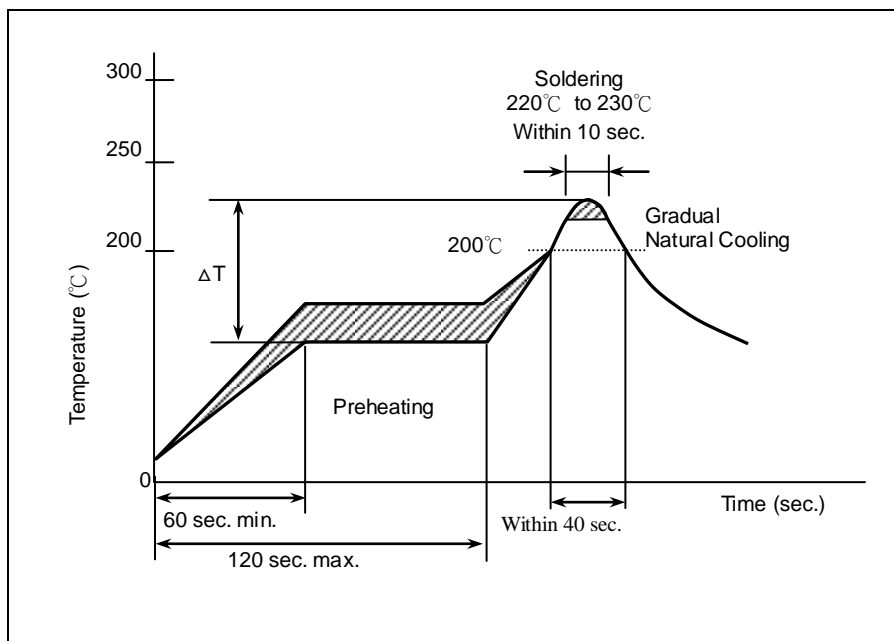
Size mm (EIA)	L x W (mm) (Dimension tolerance)	a (mm)	b (mm)	c (mm)
0402 (01005)	0.4*0.2	0.16 to 0.20	0.12 to 0.18	0.20 to 0.23
0603 (0201)	0.6*0.3	0.15 to 0.35	0.2 to 0.3	0.25 to 0.3
1005 (0402)	1.0*0.5 (within±0.10)	0.3 to 0.5	0.35 to 0.45	0.4 to 0.5
	1.0*0.5 (±0.15 or ±0.20)	0.4 to 0.6	0.4 to 0.5	0.5 to 0.6
1608 (0603)	1.6*0.8 (within±0.10)	0.7 to 1.0	0.6 to 0.8	0.7 to 0.8
	1.6*0.8 (±0.15 or ±0.20)	0.8 to 1.1	0.7 to 0.9	0.8 to 0.9
2012 (0805)	2.0*1.25	1.0 to 1.3	0.7 to 0.9	1.0 to 1.2
3216 (1206)	3.2*1.6	2.1 to 2.5	1.0 to 1.2	1.3 to 1.6
3225 (1210)	3.2*2.5	2.1 to 2.5	1.0 to 1.2	2.0 to 2.5
4520 (1808)	4.5*2.0	3.2 to 3.8	1.2 to 1.4	1.7 to 2.0
4532 (1812)	4.5*3.2	3.2 to 3.8	1.2 to 1.4	2.7 to 3.2

【Resin Mold】

If a large amount of resin is used for molding the chip, cracks may occur due to contraction stress during curing. To avoid such cracks, use a low shrinkage resin. The insulation resistance of the chip will degrade due to moisture absorption. Use a low moisture absorption resin. Check carefully that the resin does not generate a decomposition gas or reaction gas during the curing process or during normal storage. Such gases may crack the chip capacitor or damage the device itself.

【Soldering Profile for SMT Process with SnPb Solder Paste】

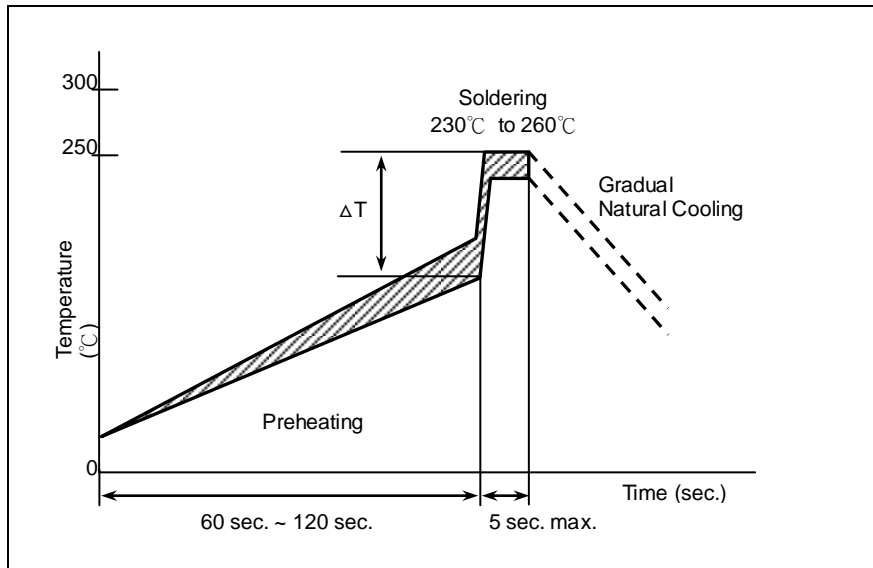
Reflow Soldering



The difference between solder and chip surface should be controlled as following table. The rate of preheat should not exceed 4°C/sec and a target of 2°C/sec is preferred.

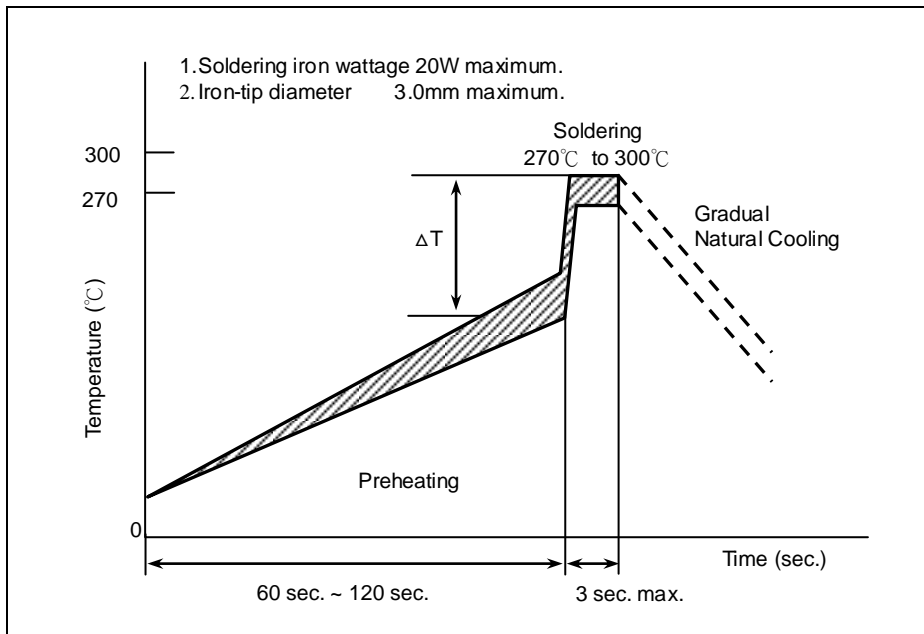
Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 150^\circ\text{C}$	$\Delta T \leq 130^\circ\text{C}$

Wave Soldering



Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 150^\circ\text{C}$	-

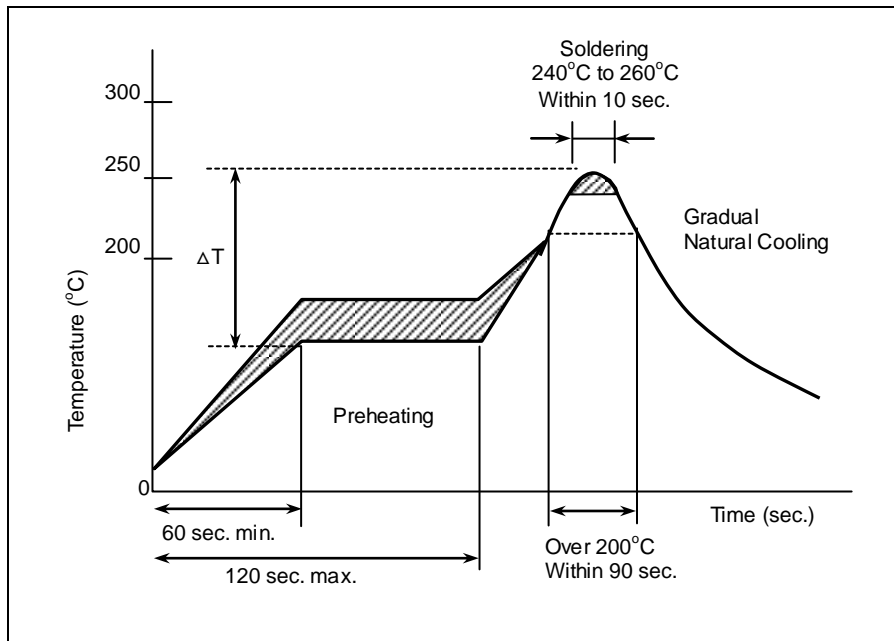
Soldering Iron



Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 190^\circ\text{C}$	$\Delta T \leq 130^\circ\text{C}$

【Soldering】

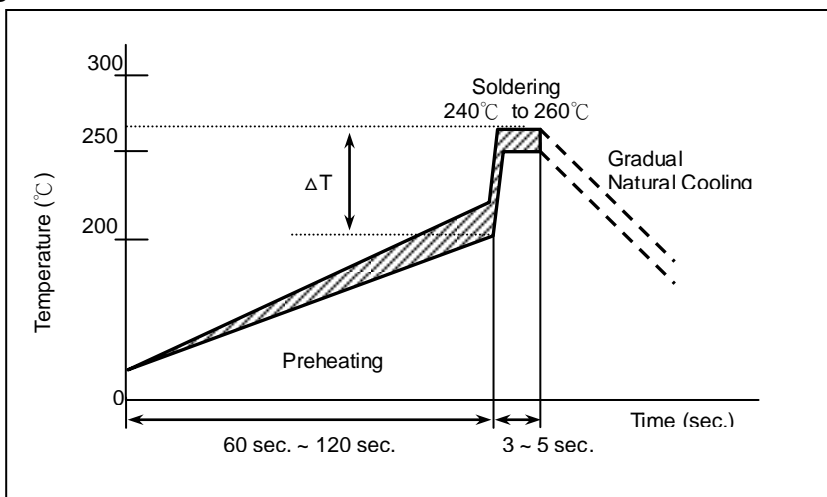
Reflow Soldering for Lead free Termination



The difference between solder and chip surface should be controlled as following table. The rate of preheat should not exceed 4°C/sec and a target of 2°C/sec is preferred.

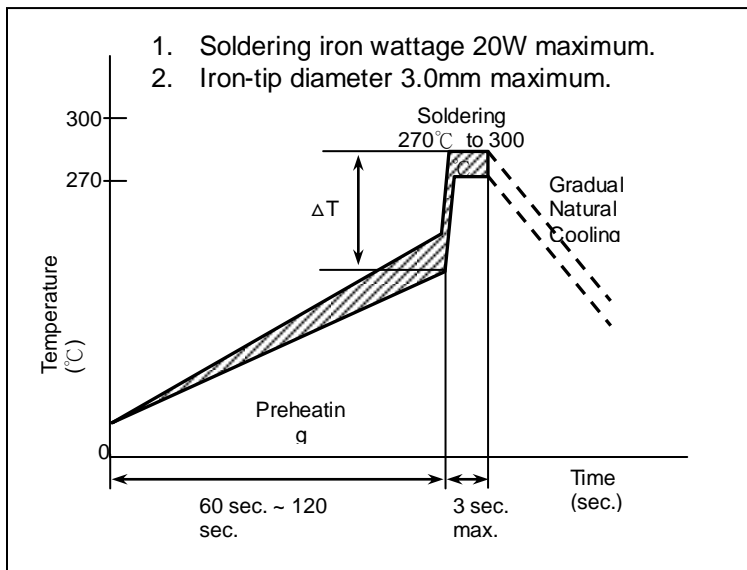
Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 150^\circ\text{C}$	$\Delta T \leq 130^\circ\text{C}$

Flow Soldering for Lead free Termination



Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 150^\circ\text{C}$	-

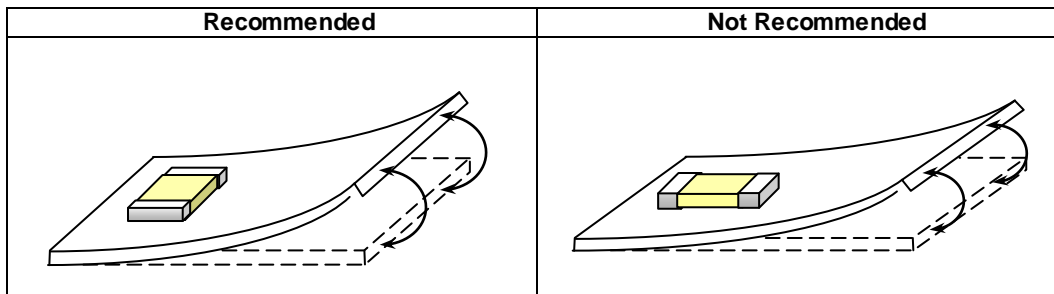
Soldering Iron



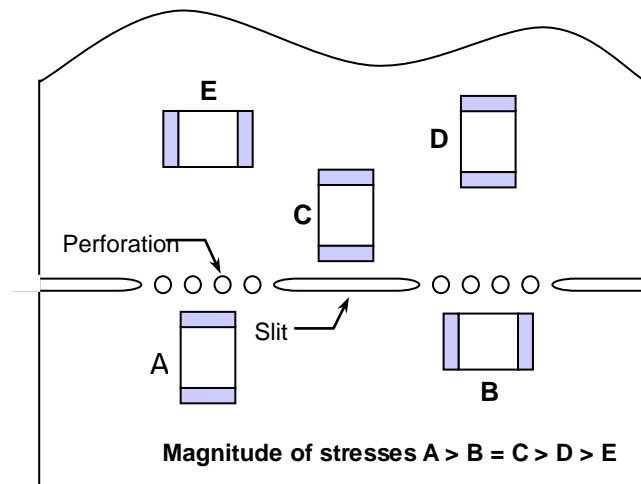
Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 190^{\circ}\text{C}$	$\Delta T \leq 130^{\circ}\text{C}$

【Chip Layout and Breaking PCB】

- To layout the SMD capacitors for reducing bend stress from board deflection of PCB. The following are examples of Hood and bad layout.



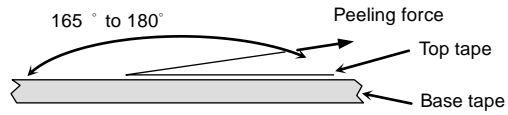
- When breaking PCB, the layout should be noted that the mechanical stresses are depending on the position of capacitors. The following example shows recommendation for better design.



【Peeling Off Force】

Peeling off force: 0.1N to 1.0 N* in the direction shown as below.

The peeling speed: 300±10 mm/min



1. The taped tape on reel is wound clockwise. The sprocket holes are to the right as the tape is pulled toward the user.
2. There are minimum 150 mm as the leader and minimum 40 mm empty tape as the tail is attached to the end of the tape.