

CONTENT (MLCC)

E STANDARD NUMBER..... 3

STRUCTURE 4

ORDERING CODE 4

 HIGH Q & LOW ESR TYPE (Q SERIES)..... 5

 TEST SPEC. 9

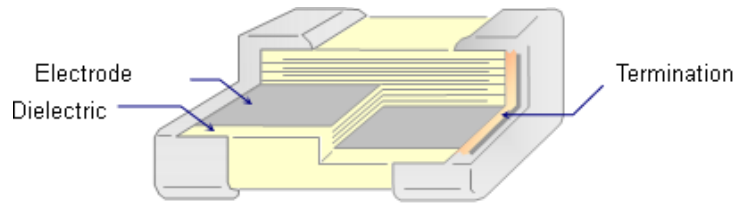
PACKAGE 11

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 1005 NP0 101 J G T Q

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 with AEC-Q200

High Q & Low ESR Type (Q Series)

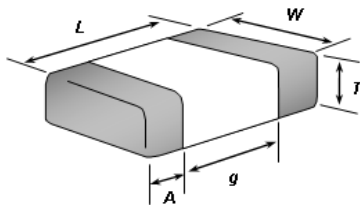
■ **Feature**

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

■ **Application**

1. LC and RC tuned circuit
2. Filtering
3. Timing

■ **Standard External Dimensions**



TYPE (EIA Size)	Dimension (mm)				
	L (Length)	W (Width)	T (Max.)	g (Min)	A (Min/Max)
C0603 (0201)	0.6±0.03	0.3±0.03	0.33	0.15	0.10/0.20
C1005 (0402)	1.0 ± 0.05	0.5 ± 0.05	0.55	0.30	0.15 / 0.35
C1608 (0603)	1.6 ± 0.10	0.8 ± 0.10	0.90	0.50	0.25 / 0.65
C2012 (0805)	2.0 ± 0.15	1.25 ± 0.15	1.45	0.70	0.25 / 0.75

■ **Part Number & Characteristic**

● C0603NP0_Q Series (EIA0201)

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Q(1GHz) (min.)	Standard Packing
			Value	Unit			L/W	Thick.		
50V	C0603NP0108BGTQ	1V, 1MHz	0.10	pF	±0.1pF	0.30	±0.03	±0.03	350	Paper, 15Kpcs
	C0603NP0208□GTQ	1V, 1MHz	0.20	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0308□GTQ	1V, 1MHz	0.30	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0408□GTQ	1V, 1MHz	0.40	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0508□GTQ	1V, 1MHz	0.50	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0608□GTQ	1V, 1MHz	0.60	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0708□GTQ	1V, 1MHz	0.70	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0758□GTQ	1V, 1MHz	0.75	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0808□GTQ	1V, 1MHz	0.80	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0908□GTQ	1V, 1MHz	0.90	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0109□GTQ	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0119□GTQ	1V, 1MHz	1.1	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0129□GTQ	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0139□GTQ	1V, 1MHz	1.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0159□GTQ	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0169□GTQ	1V, 1MHz	1.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0189□GTQ	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0209□GTQ	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0229□GTQ	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0249□GTQ	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0259□GTQ	1V, 1MHz	2.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0279□GTQ	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0309□GTQ	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
	C0603NP0339□GTQ	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
C0603NP0369□GTQ	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200		
C0603NP0399□GTQ	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200		
C0603NP0439□GTQ	1V, 1MHz	4.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200		
C0603NP0479□GTQ	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200		

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance (mm)		Q(1GHz) (min.)	Standard Packing
			Value	Unit			L/W	Thick.		
50V	C0603NP0509 □ GTQ	1V, 1MHz	5.0	pF	±0.5pF, ±0.25pF	0.30	±0.03	±0.03	180	Paper, 15Kpcs
	C0603NP0519 □ GTQ	1V, 1MHz	5.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0569 □ GTQ	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0609 □ GTQ	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0629 □ GTQ	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0689 □ GTQ	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0709 □ GTQ	1V, 1MHz	7.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120	
	C0603NP0759 □ GTQ	1V, 1MHz	7.5	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120	
	C0603NP0829 □ GTQ	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120	
	C0603NP0909 □ GTQ	1V, 1MHz	9.0	pF	±0.5pF	0.30	±0.03	±0.03	120	
	C0603NP0919 □ GTQ	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120	
	C0603NP0100 □ GTQ	1V, 1MHz	10	pF	±5%, ±2%	0.30	±0.03	±0.03	120	
	C0603NP0120 □ GTQ	1V, 1MHz	12	pF	±5%, ±2%	0.30	±0.03	±0.03	90	
	C0603NP0150 □ GTQ	1V, 1MHz	15	pF	±5%, ±2%	0.30	±0.03	±0.03	70	
C0603NP0180 □ GTQ	1V, 1MHz	18	pF	±5%, ±2%	0.30	±0.03	±0.03	60		
25V	C0603NP0208 □ FTQ	1V, 1MHz	0.20	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	Paper, 15Kpcs
	C0603NP0308 □ FTQ	1V, 1MHz	0.30	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0408 □ FTQ	1V, 1MHz	0.40	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0508 □ FTQ	1V, 1MHz	0.50	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0608 □ FTQ	1V, 1MHz	0.60	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0708 □ FTQ	1V, 1MHz	0.70	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0758 □ FTQ	1V, 1MHz	0.75	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0808 □ FTQ	1V, 1MHz	0.80	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0908 □ FTQ	1V, 1MHz	0.90	pF	±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0109 □ FTQ	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	350	
	C0603NP0119 □ FTQ	1V, 1MHz	1.1	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0129 □ FTQ	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0139 □ FTQ	1V, 1MHz	1.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0159 □ FTQ	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0169 □ FTQ	1V, 1MHz	1.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0189 □ FTQ	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	300	
	C0603NP0209 □ FTQ	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0229 □ FTQ	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0249 □ FTQ	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0259 □ FTQ	1V, 1MHz	2.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0279 □ FTQ	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	250	
	C0603NP0309 □ FTQ	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
	C0603NP0339 □ FTQ	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
	C0603NP0369 □ FTQ	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
	C0603NP0399 □ FTQ	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
	C0603NP0439 □ FTQ	1V, 1MHz	4.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
	C0603NP0479 □ FTQ	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.30	±0.03	±0.03	200	
	C0603NP0509 □ FTQ	1V, 1MHz	5.0	pF	±0.5pF, ±0.25pF	0.30	±0.03	±0.03	180	
	C0603NP0519 □ FTQ	1V, 1MHz	5.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0569 □ FTQ	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0609 □ FTQ	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0629 □ FTQ	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0689 □ FTQ	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	180	
	C0603NP0709 □ FTQ	1V, 1MHz	7.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120	
	C0603NP0759 □ FTQ	1V, 1MHz	7.5	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120	
	C0603NP0829 □ FTQ	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120	
C0603NP0909 □ FTQ	1V, 1MHz	9.0	pF	±0.5pF	0.30	±0.03	±0.03	120		
C0603NP0919 □ FTQ	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120		
C0603NP0959 □ FTQ	1V, 1MHz	9.5	pF	±0.5pF, ±0.25pF, ±0.1pF	0.30	±0.03	±0.03	120		
C0603NP0100 □ FTQ	1V, 1MHz	10	pF	±5%, ±2%	0.30	±0.03	±0.03	120		
C0603NP0120 □ FTQ	1V, 1MHz	12	pF	±5%, ±2%	0.30	±0.03	±0.03	90		
C0603NP0150 □ FTQ	1V, 1MHz	15	pF	±5%, ±2%	0.30	±0.03	±0.03	70		
C0603NP0180 □ FTQ	1V, 1MHz	18	pF	±5%, ±2%	0.30	±0.03	±0.03	60		

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

● C1005NP0_Q Series (EIA0402)

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance (mm)		Q(1GHz) (min.)	Standard Packing
			Value	Unit			L/W	Thick.		
50V	C1005NP0108□GTQ	1V, 1MHz	0.10	pF	±0.1pF	0.50	±0.05	±0.05	300	Paper, 10Kpcs
	C1005NP0208□GTQ	1V, 1MHz	0.20	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0308□GTQ	1V, 1MHz	0.30	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0408□GTQ	1V, 1MHz	0.40	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0508□GTQ	1V, 1MHz	0.50	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0608□GTQ	1V, 1MHz	0.60	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0708□GTQ	1V, 1MHz	0.70	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0758□GTQ	1V, 1MHz	0.75	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	350	
	C1005NP0808□GTQ	1V, 1MHz	0.80	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	350	
	C1005NP0908□GTQ	1V, 1MHz	0.90	pF	±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0109□GTQ	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0119□GTQ	1V, 1MHz	1.1	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	300	
	C1005NP0129□GTQ	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	250	
	C1005NP0139□GTQ	1V, 1MHz	1.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	250	
	C1005NP0159□GTQ	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	250	
	C1005NP0189□GTQ	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	250	
	C1005NP0209□GTQ	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	200	
	C1005NP0229□GTQ	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	200	
	C1005NP0249□GTQ	1V, 1MHz	2.4	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	200	
	C1005NP0279□GTQ	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	200	
	C1005NP0299□GTQ	1V, 1MHz	2.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	200	
	C1005NP0309□GTQ	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	200	
	C1005NP0339□GTQ	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	200	
	C1005NP0369□GTQ	1V, 1MHz	3.6	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	180	
	C1005NP0399□GTQ	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	180	
	C1005NP0409□GTQ	1V, 1MHz	4.0	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	180	
	C1005NP0479□GTQ	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF, ±0.05pF	0.50	±0.05	±0.05	180	
	C1005NP0509□GTQ	1V, 1MHz	5.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	150	
	C1005NP0519□GTQ	1V, 1MHz	5.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	150	
	C1005NP0569□GTQ	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	150	
	C1005NP0609□GTQ	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	150	
	C1005NP0629□GTQ	1V, 1MHz	6.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	150	
	C1005NP0689□GTQ	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	150	
C1005NP0709□GTQ	1V, 1MHz	7.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	100		
C1005NP0809□GTQ	1V, 1MHz	8.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	100		
C1005NP0829□GTQ	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	100		
C1005NP0909□GTQ	1V, 1MHz	9.0	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	100		
C1005NP0919□GTQ	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF, ±0.1pF	0.50	±0.05	±0.05	100		
C1005NP0100□GTQ	1V, 1MHz	10	pF	±5%, ±2%	0.50	±0.05	±0.05	80		
C1005NP0120□GTQ	1V, 1MHz	12	pF	±5%, ±2%	0.50	±0.05	±0.05	60		
C1005NP0150□GTQ	1V, 1MHz	15	pF	±5%, ±2%, ±1%	0.50	±0.05	±0.05	40		
C1005NP0180□GTQ	1V, 1MHz	18	pF	±5%, ±2%	0.50	±0.05	±0.05	30		
C1005NP0220□GTQ	1V, 1MHz	22	pF	±5%, ±2%	0.50	±0.05	±0.05	20		

● C1608NP0_Q Series (EIA0603)

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Q(1GHz) (min.)	Standard Packing
			Value	Unit			L/W	Thick.		
250V	C1608NP0308□KTQ	1V, 1MHz	0.30	pF	±0.1pF, ±0.05pF	0.80	±0.10	±0.10	250	Paper, 4Kpcs
	C1608NP0508□KTQ	1V, 1MHz	0.50	pF	±0.1pF, ±0.05pF	0.80	±0.10	±0.10	250	
	C1608NP0758□KTQ	1V, 1MHz	0.75	pF	±0.1pF, ±0.05pF	0.80	±0.10	±0.10	250	
	C1608NP0109□KTQ	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	250	
	C1608NP0129□KTQ	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	200	
	C1608NP0159□KTQ	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	200	
	C1608NP0189□KTQ	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	200	
	C1608NP0209□KTQ	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	150	
	C1608NP0229□KTQ	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	150	
	C1608NP0279□KTQ	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	150	
	C1608NP0309□KTQ	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0339□KTQ	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0399□KTQ	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0479□KTQ	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0569□KTQ	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	80	
	C1608NP0609□KTQ	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	80	
	C1608NP0689□KTQ	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	80	
	C1608NP0829□KTQ	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	70	
	C1608NP0919□KTQ	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	70	
	C1608NP0100□KTQ	1V, 1MHz	10	pF	±5%	0.80	±0.10	±0.10	70	
C1608NP0120□KTQ	1V, 1MHz	12	pF	±5%	0.80	±0.10	±0.10	40		
C1608NP0150□KTQ	1V, 1MHz	15	pF	±5%	0.80	±0.10	±0.10	35		
C1608NP0180□KTQ	1V, 1MHz	18	pF	±5%	0.80	±0.10	±0.10	30		
C1608NP0220□KTQ	1V, 1MHz	22	pF	±5%	0.80	±0.10	±0.10	25		
50V	C1608NP0228□GTQ	1V, 1MHz	0.22	pF	±0.1pF, ±0.05pF	0.80	±0.10	±0.10	250	Paper, 4Kpcs
	C1608NP0308□GTQ	1V, 1MHz	0.30	pF	±0.1pF, ±0.05pF	0.80	±0.10	±0.10	250	
	C1608NP0508□GTQ	1V, 1MHz	0.50	pF	±0.1pF, ±0.05pF	0.80	±0.10	±0.10	250	
	C1608NP0758□GTQ	1V, 1MHz	0.75	pF	±0.1pF, ±0.05pF	0.80	±0.10	±0.10	250	
	C1608NP0109□GTQ	1V, 1MHz	1.0	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	250	
	C1608NP0129□GTQ	1V, 1MHz	1.2	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	200	
	C1608NP0159□GTQ	1V, 1MHz	1.5	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	200	
	C1608NP0189□GTQ	1V, 1MHz	1.8	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	200	
	C1608NP0209□GTQ	1V, 1MHz	2.0	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	150	
	C1608NP0229□GTQ	1V, 1MHz	2.2	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	150	
	C1608NP0279□GTQ	1V, 1MHz	2.7	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	150	
	C1608NP0309□GTQ	1V, 1MHz	3.0	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0339□GTQ	1V, 1MHz	3.3	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0399□GTQ	1V, 1MHz	3.9	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0479□GTQ	1V, 1MHz	4.7	pF	±0.25pF, ±0.1pF	0.80	±0.10	±0.10	100	
	C1608NP0569□GTQ	1V, 1MHz	5.6	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	80	
	C1608NP0609□GTQ	1V, 1MHz	6.0	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	80	
	C1608NP0689□GTQ	1V, 1MHz	6.8	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	80	
	C1608NP0829□GTQ	1V, 1MHz	8.2	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	70	
	C1608NP0919□GTQ	1V, 1MHz	9.1	pF	±0.5pF, ±0.25pF	0.80	±0.10	±0.10	70	
C1608NP0100□GTQ	1V, 1MHz	10	pF	±5%	0.80	±0.10	±0.10	70		
C1608NP0120□GTQ	1V, 1MHz	12	pF	±5%	0.80	±0.10	±0.10	40		
C1608NP0150□GTQ	1V, 1MHz	15	pF	±5%	0.80	±0.10	±0.10	35		
C1608NP0180□GTQ	1V, 1MHz	18	pF	±5%	0.80	±0.10	±0.10	30		
C1608NP0220□GTQ	1V, 1MHz	22	pF	±5%	0.80	±0.10	±0.10	25		

● C2012NP0_Q Series (EIA0805)

RV	DARFON P/N	Measuring Condition	Capacitance		Available Tolerance	Thick. (mm)	Tolerance(mm)		Q(1GHz) (min.)	Standard Packing
			Value	Unit			L/W	Thick.		
250V	C2012NP0150□KTQ	1V, 1MHz	15	pF	±5%	1.25	±0.15	±0.15	53	Embossed, 3kpcs

□ 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"																				
3	Appearance	No defects or abnormalities.																				
4	Dimensions	Within the specified dimension.																				
5	Dielectric Strength (Flash)	No defects or abnormalities.																				
6	Insulation Resistance (I.R.)	I.R. $\geq 10G\Omega$																				
7	Capacitance	Within the specified tolerance																				
8	Quality Factor (Q)	30pF min.: $Q \geq 1000$ 30pF max.: $Q \geq 400+20C$ C: Nominal Capacitance (pF)																				
9	Capacitance Temperature Characteristics	Capacitance change within $0 \pm 30ppm/^\circ C$ under operating temperature range.																				
10	Termination Strength	No removal of the terminations or marking defect.																				
11	Deflection (Bending Strength)	No cracking or marking defects shall occur at 1mm deflection. Capacitance change: NP0: within $\pm 5\%$ or $\pm 0.5pF$. (whichever is larger)																				
	<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> <p>Fig. a.</p>	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	<p>Fig. b.</p>
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.																				
13	Resistance to Soldering Heat	Immerse the 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 $245 \pm 5^\circ C$ for 3 ± 1 seconds.																				
	Appearance	No marking defects																				
	Cap. Change	NP0 within $\pm 2.5\%$ or $\pm 0.25pF$ (whichever is larger)																				
	Q	Initial spec.																				
	I.R.	Initial spec.																				

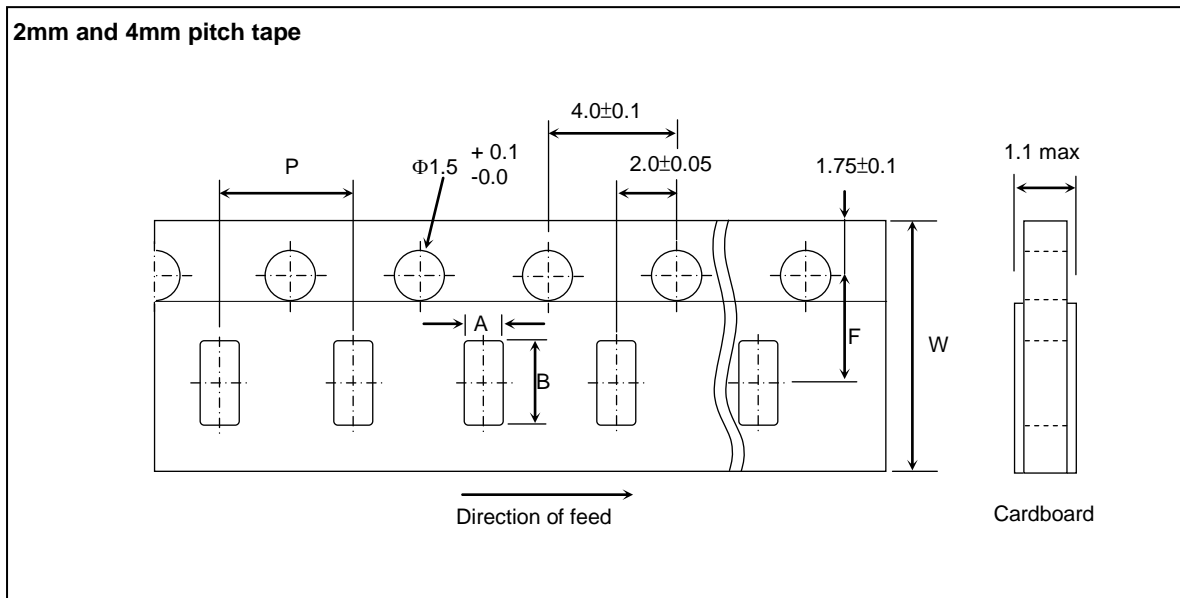
	Item	Specification	Test Method
14	Temperature cycle (Thermal shock)	Appearance	Solder the capacitor to supporting jig (glass epoxy board) and perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2hrs at room temperature, then measure. Step 1: Minimum 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】

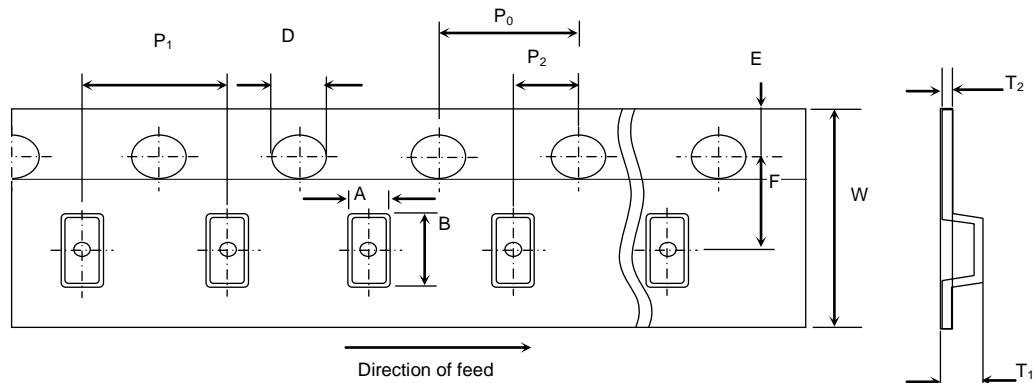


SYMBOL	PRODUCT SIZE CODE												UNIT
	0402(01005)		0603(0201)		1005(0402) (±0.05 mm)		1005(0402) (±0.10 mm)		1005(0402) (±0.15 mm)		1005(0402) (±0.20 mm)		
	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	SIZE	TOL.	
A	0.23	±0.02	0.38	±0.04	0.65	±0.10	0.70	±0.10	0.72	±0.10	0.80	±0.10	mm
B	0.43	±0.02	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

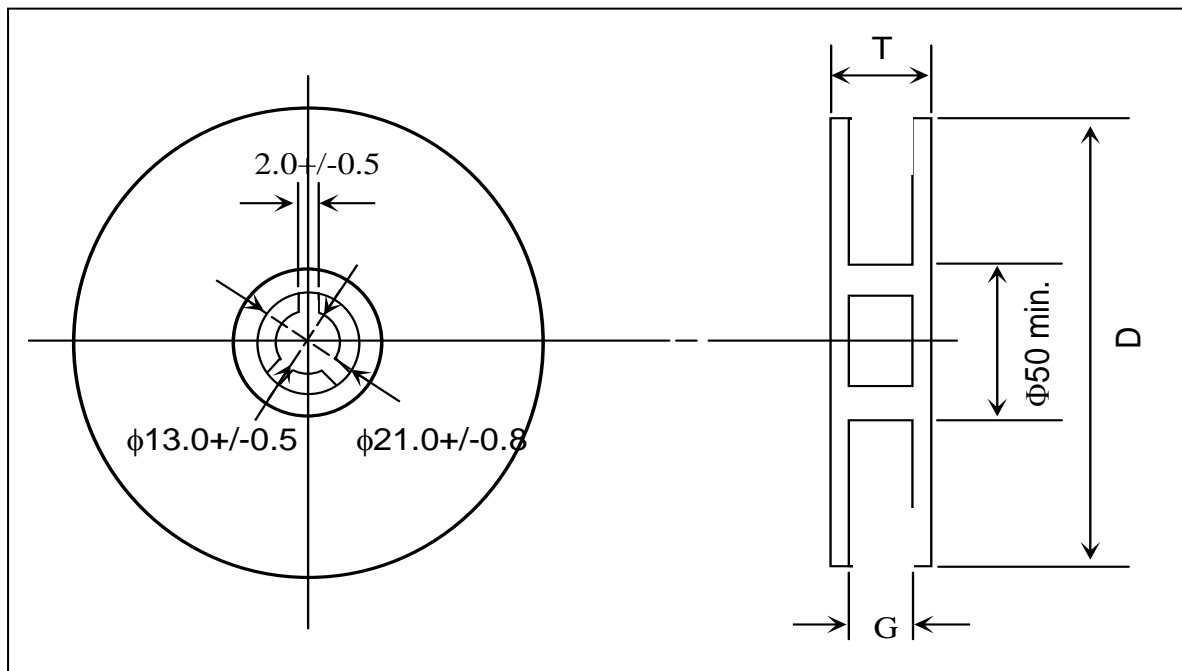


For W= 8mm: T₁=2.5mm max.

For W= 12mm: T₁= 4.5mm

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

MLCC

【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		
		4520 (1808)		3K		10K
H	1.25	3216 (1206)		3K		10K
		2012 (0805)		2K/3K		10K
		3216 (1206)		3K		10K
		3225 (1210)		3K		
		4520 (1808)		2K/3K		
		4532 (1812)		1K		
L	1.60	3225 (1210)		3K		
		3216 (1206)		2K		
		3225 (1210)		2K		
		4520 (1808)		2K		
N	2.00	4532 (1812)		1K		
		3216 (1206)		2K/3K		
		3225 (1210)		2K		
		4520 (1808)		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】

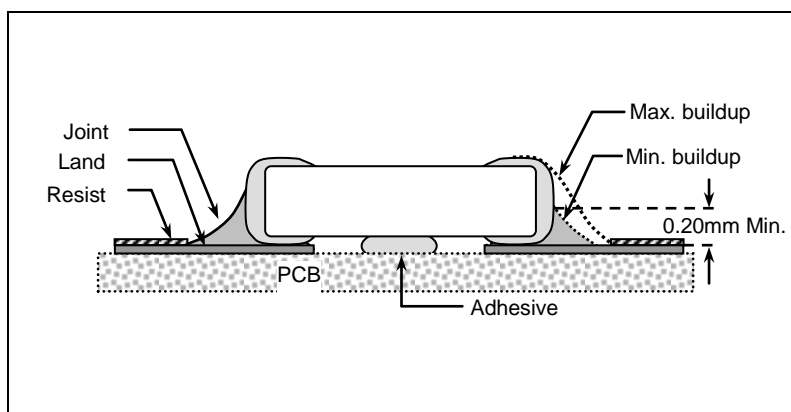
1. An excessive amount of flux or too rapid temperature rise can cause solvent burst, solder can generate a large quantity of gas. The gas can spread small solder particles to cause solder balling effect or bridging problem.
2. Flux containing too high of a percentage of halide may cause corrosion of 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】

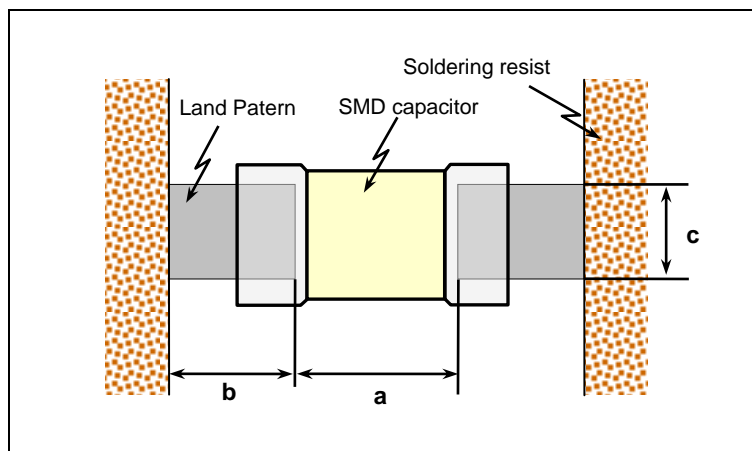
Too much solder amount may increase solder stress and cause crack risk. Insufficient solder amount may reduce adhesive strength and cause parts falling off PCB. When soldering, confirm that the solder is placed over 0.2mm of the surface of the terminations.



【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.



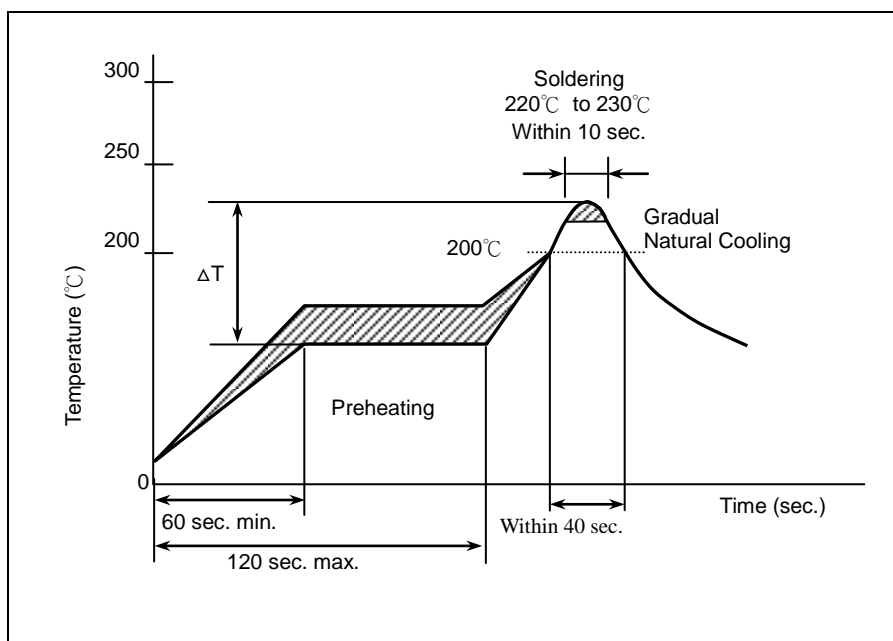
Size mm (EIA)	L x W (mm) (Dimension tolerance)	a (mm)	b (mm)	c (mm)
0402 (01005)	0.4*0.2	0.16 to 0.20	0.12 to 0.18	0.20 to 0.23
0603 (0201)	0.6*0.3	0.15 to 0.35	0.2 to 0.3	0.25 to 0.3
1005 (0402)	1.0*0.5 (within±0.10)	0.3 to 0.5	0.35 to 0.45	0.4 to 0.5
	1.0*0.5 (±0.15 or ±0.20)	0.4 to 0.6	0.4 to 0.5	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】

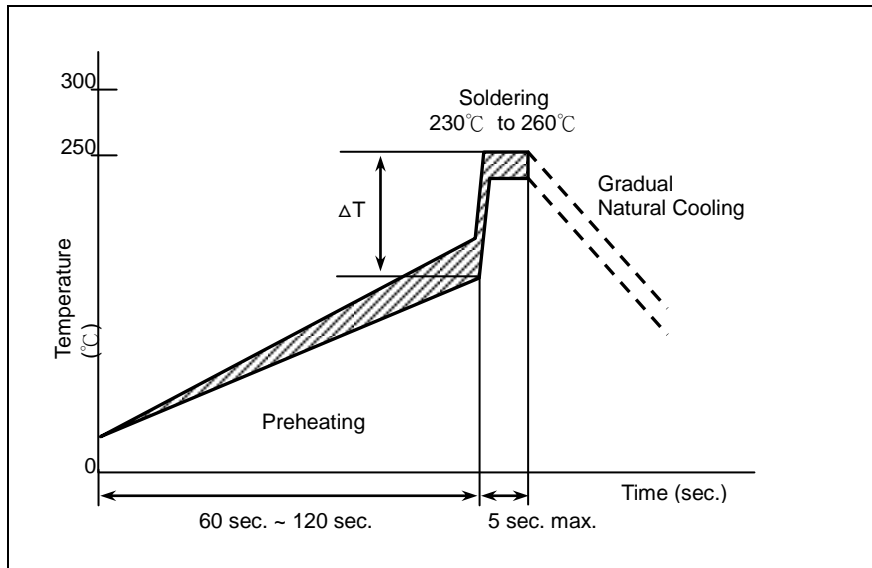
Reflow Soldering



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.

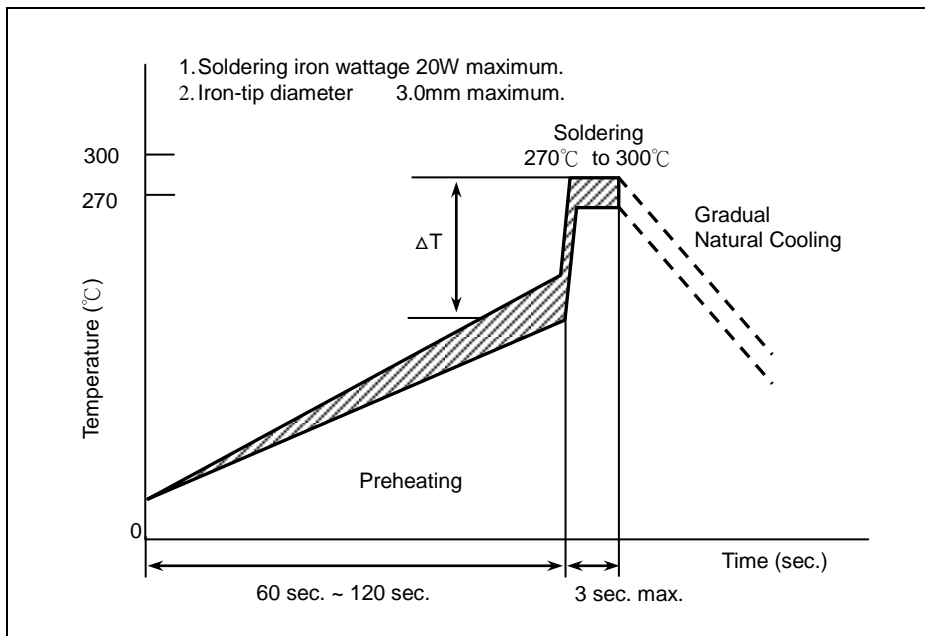
Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 150^\circ\text{C}$	$\Delta T \leq 130^\circ\text{C}$

Wave Soldering



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

Soldering Iron

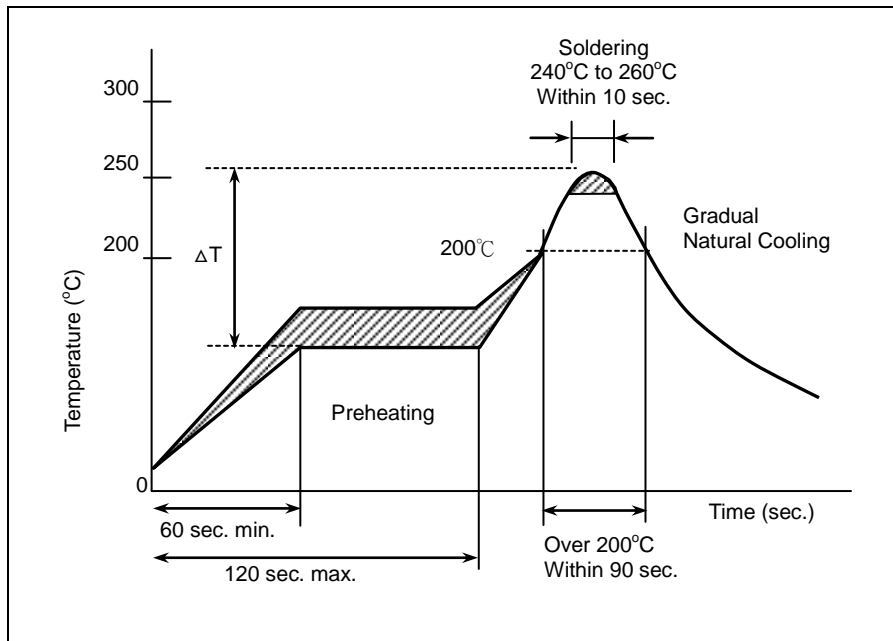


Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 190^\circ\text{C}$	$\Delta T \leq 130^\circ\text{C}$

MLCC

[Soldering]

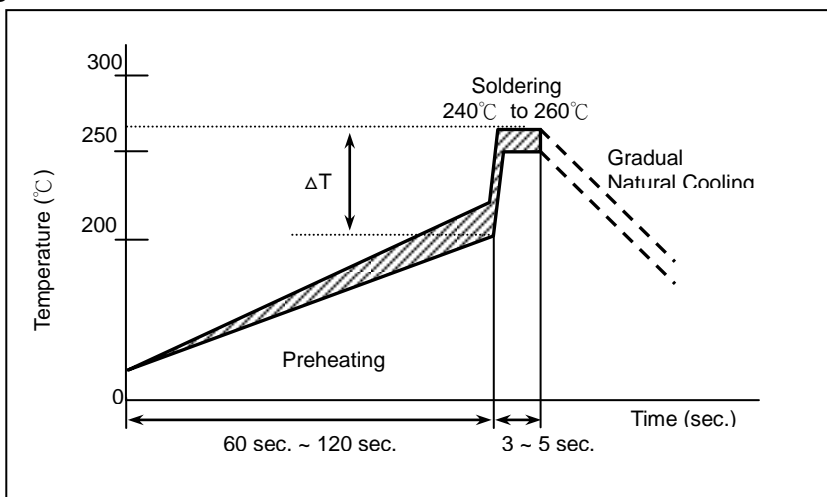
Reflow Soldering for Lead free Termination



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.

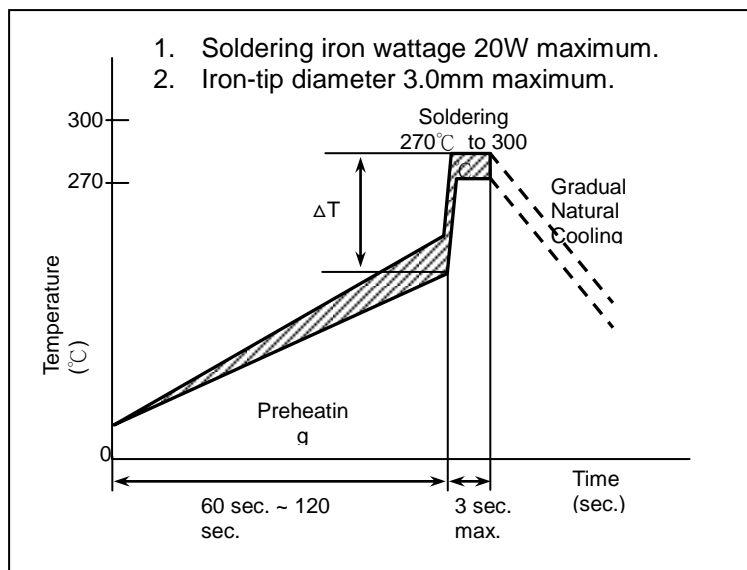
Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 150^\circ\text{C}$	$\Delta T \leq 130^\circ\text{C}$

Flow Soldering for Lead free Termination



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

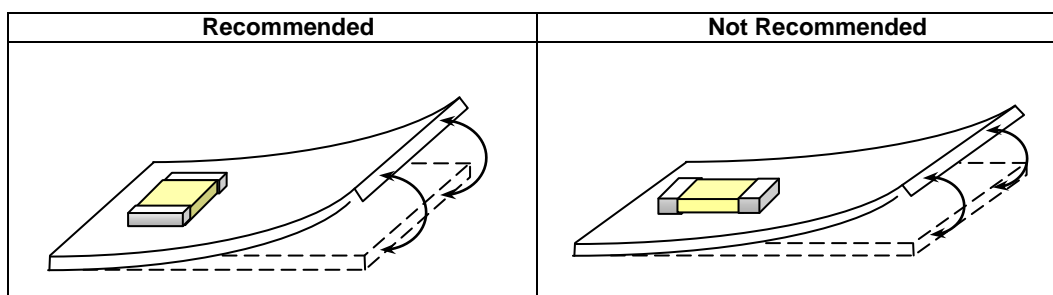
Soldering Iron



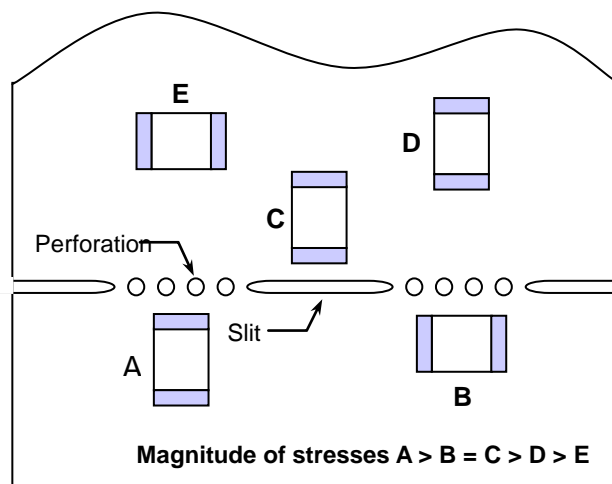
Chip Size	3216 and smaller	3225 and above
Preheating	$\Delta T \leq 190^{\circ}\text{C}$	$\Delta T \leq 130^{\circ}\text{C}$

【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.



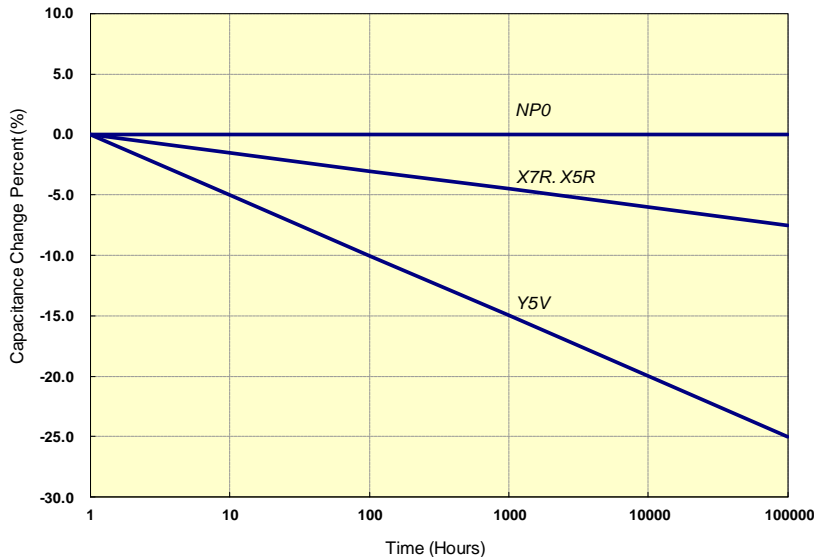
- When breaking PCB, the layout should be noted that the mechanical stresses are depending on the position of capacitors. The following example shows recommendation for better design.



【Aging Rate】

The capacitance and dissipation factor of class 2 capacitors decreases with time. It is known as 'aging' that follows a logarithmic law and expressed in terms of an aging constant. Aging is caused by a gradual re-alignment of the crystalline structure of the ceramic. The aging constant is defined as the percentage loss of capacitance at a 'time decade'. The law of capacitance aging is expressed as following equation:

Typical Curve of Aging Rate of Different Dielectric Material



$$C_{t_2} = C_{t_1} \times (1 - k \times \log_{10}(t_2/t_1))$$

C_{t_1} : Capacitance after t_1 hours of start aging.

C_{t_2} : Capacitance after t_2 hours of start aging.

k : aging constant (capacitance decrease per decade)

t_1, t_2 : time in hours from start of aging.

A typical curve of aging rate is shown in following figure.

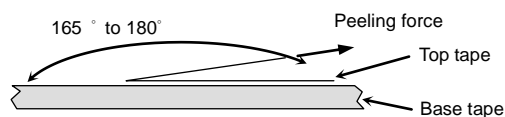
When heating the capacitors above Curie temperature ($130^{\circ}\text{C} \sim 150^{\circ}\text{C}$) the capacitance can be re-new. So capacitance of class 2 capacitors will be complete de-aged by soldering process; subsequently a new aging process begins.

Because of aging, it is specified an age for measurement to meet the prescribed tolerance for class 2 capacitors. Normally, 1000 hours ($t_2=1000$ hrs) is defined.

【Peeling Off Force】

Peeling off force: 0.1N to 1.0N^* 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.