

VIIYONG

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**GUANGDONG VIIYONG ELECTRONIC
TECHNOLOGYCO., LTD.**

**High Capacitance Multi-layer Ceramic Chip Capacitor
Product Specification**

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**Mark: The product specification is only for reference of design and type selection,
not used as the basis for delivery.**

1. Scope:

The specifications are applicable to the high capacitance multi-layer ceramic chip capacitor (MLCC) as follows:

1.1 Application characteristics: general purpose;

1.2 Structural design classification: high capacity;

Chip Size: 0402、0603、0805、1206、1210;

Capacitance: 27nF~100μF

Voltage range: 4V~50V

1.3 Type of Dielectrics: X7R、X5R、X5S、X5T、Y5V;

2. Part Number System:

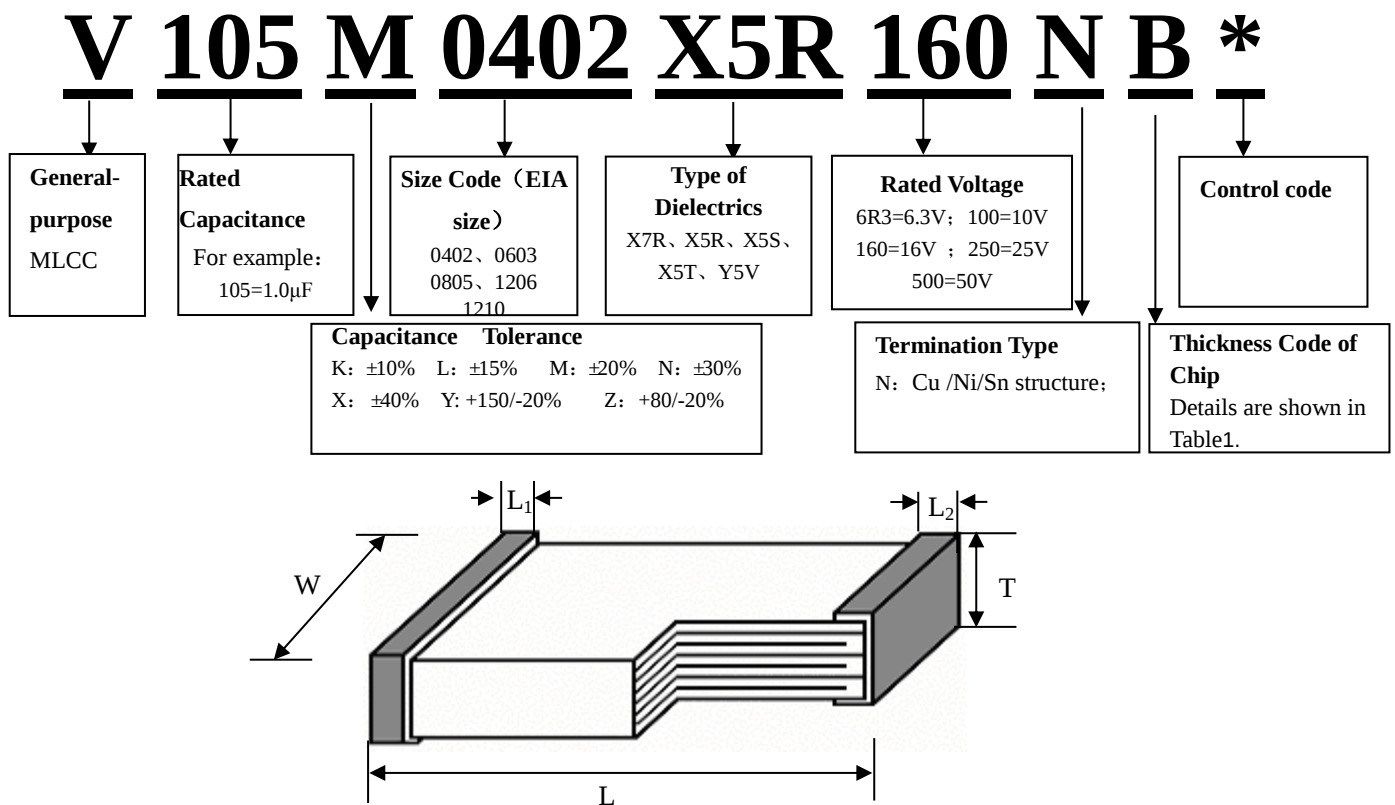


Figure 1 Configuration and Dimension of MLCC

Table 1 Size of MLCC (Unit: mm)

Size	Length (L)	Width (W)	Width of Termination (L1, L2)	Thickness (T)	Thickness code
0402	1.00±0.05	0.50±0.05	0.10~0.35	0.50±0.05	B
	1.00 ^{+0.15} _{-0.05}	0.50 ^{+0.13} _{-0.05}	0.10~0.35	0.50 ^{+0.13} _{-0.05}	N
	1.00 ^{+0.15} _{-0.05}	0.50 ^{+0.15} _{-0.05}	0.10~0.35	0.50 ^{+0.15} _{-0.05}	6
	1.00 ^{+0.20} _{-0.05}	0.50 ^{+0.20} _{-0.05}	0.10~0.35	0.50 ^{+0.20} _{-0.05}	C
0603	1.60 ^{+0.20} _{-0.10}	0.80 ^{+0.20} _{-0.10}	0.15~0.60	0.45±0.05	S
	1.60±0.10	0.80±0.10	0.15~0.60	0.80±0.10	D
	1.60 ^{+0.20} ₋₀	0.80 ^{+0.15} _{-0.05}	0.15~0.60	0.80 ^{+0.15} _{-0.05}	E
	1.60 ^{+0.20} _{-0.10}	0.80 ^{+0.20} _{-0.10}	0.15~0.60	0.80 ^{+0.20} _{-0.10}	K
0805	1.60±0.25	0.80±0.25	0.20~0.60	0.80±0.25	4
	2.00±0.10	1.25±0.10	0.20~0.75	0.85±0.10	E
	2.00±0.20	1.25±0.20	0.20~0.75	0.85 ^{+0.15} _{-0.35}	Y
	2.00±0.15	1.25±0.15	0.20~0.75	1.25±0.15	5
1206	2.00 ^{+0.20} _{-0.30}	1.25 ^{+0.20} _{-0.30}	0.20~0.75	1.25 ^{+0.20} _{-0.30}	H
	3.20±0.15	1.60±0.15	0.25~0.75	0.85 ^{+0.15} _{-0.35}	Y
	3.20±0.20	1.60±0.20	0.25~0.75	1.15±0.20	O
	3.20±0.15	1.60±0.15	0.25~0.75	1.60±0.20	L
1210	3.20±0.20	2.50±0.20	0.25~0.75	1.60±0.20	L
	3.20±0.20	2.50±0.20	0.25~0.75	2.00±0.20	Q
	3.20±0.20	2.50±0.20	0.25~0.75	2.50±0.20	R

Table 2 Type of dielectrics

Type of Dielectrics	Operating Temperature Range	Temperature Coefficient or Characteristic
X7R	-55℃～+125℃	±15%
X5R	-55℃～+85℃	±15%
X5S	-55℃～+85℃	±22%
X5T	-55℃～+85℃	+22/-33%
Y5V	-30℃～+85℃	+22/-82%

Table 3 Rated Voltage and Rated Capacitance

Size	Rate voltage /U _R	Capacitance				Thickness code
		X7R	X5R	X5S/X5T	Y5V	
0402	50V	27nF～100nF	82nF～470nF	100nF～470nF	100nF～470nF	C
	35V	—	82nF～470nF 1.0μF/2.2μF	100nF～470nF	100nF～470nF	C
	25V	—	120nF～820nF	—	150nF～680nF	N
		—	1.0μF	1.0μF	1.0μF	B
		—	2.2μF	2.2μF	2.2μF	C
		—	2.2μF	—	—	N
	16V	—	—	—	—	B
		220nF	270nF～2.2μF	—	330nF～2.2μF	N
		—	1.0μF	1.0μF～2.2μF	1.0μF	B
		—	4.7μF	—	4.7μF	C
	10V	—	4.7μF	—	4.7μF	6
		220nF	270nF～820nF	—	330nF～680nF	N
		—	1.0μF～2.2μF	1.0μF	1.0μF～2.2μF	B
		—	2.7μF～4.7μF	—	2.7μF～4.7μF	6
		—	4.7μF～10μF	—	4.7μF～10μF	C
	6.3V	220nF	270nF～820nF	—	330nF～680nF	N
		—	1.0μF～2.2μF	1.0μF～2.2μF	1.0μF～2.2μF	B
		—	2.7μF～4.7μF	2.7μF～4.7μF	2.7μF～4.7μF	6
		—	4.7μF～10μF	4.7μF～10μF	4.7μF～10μF	C
	4V	—	10μF～22μF	—	10μF～22μF	C
0603	50V	120nF～1.0μF	1.0μF	—	1.0μF	D
		—	2.2μF	—	2.2μF	K
	35V	—	1.0μF	—	1.0μF	D
		—	2.2μF～4.7μF	—	—	K
	25V	—	1.0μF～2.2μF	—	1.0μF～2.2μF	S
		470nF～1.0μF	270nF～3.9μF	0.47μF～1.0μF	330nF～3.3μF	D
		—	4.7μF～10μF	—	4.7μF～10μF	K
	16V	—	1.0μF～2.2μF	—	1.0μF～2.2μF	S
		470nF～1.0μF	560nF～4.7μF	—	680nF～3.3μF	D
		—	4.7μF	—	4.7μF	E
		—	6.8μF～10μF	—	6.8μF～10μF	K
	10V	—	4.7μF	—	4.7μF	S
		—	1.0μF～4.7μF/10μF	2.2μF～4.7μF	1.0μF～4.7μF	D
		—	10μF	—	10μF	E
		—	4.7μF～10μF	—	5.6μF～10μF	K
	6.3V	—	22μF	—	—	4
		—	2.2μF～6.8μF	2.2μF～6.8μF	2.2μF～6.8μF	D
		—	10μF	10μF	10μF	E
		—	8.2μF～47μF	8.2μF～22μF	8.2μF～22μF	K
	4V	—	10μF～47μF	—	10μF～47μF	K
0805	50V	—	1.0μF～2.2μF	—	1.0μF～2.2μF	Y
		1.0μF	1.0μF～4.7μF	—	1.0μF～4.7μF	H
	35V	—	1.0μF～2.2μF	—	1.0μF～2.2μF	Y
		—	1.0μF～4.7μF	—	1.0μF～4.7μF	H
	25V	—	1.0μF～10μF	—	1.0μF～10μF	Y
		—	22μF	—	—	5
		1.0μF	1.0μF～22μF	—	1.0μF～22μF	H
	16V	—	2.2μF～10μF	—	2.2μF～10μF	Y
		—	2.2μF～22μF	—	2.2μF～22μF	H
	10V	—	2.2μF～22μF	—	2.2μF～22μF	Y
		—	2.2μF～47μF	—	2.2μF～47μF	H
	6.3V	—	2.2μF～22μF	2.2μF～22μF	2.2μF～22μF	Y
		—	47μF	—	47μF	E
		—	2.2μF～47μF/100μF	2.2μF～47μF	2.2μF～47μF	H
	4V	—	22μF～47μF	—	22μF～47μF	Y
		—	47μF	—	47μF	H

Size	Rate voltage /U _R	Capacitance				Thicknes s code
		X7R	X5R	X5S/X5T	Y5V	
1206	50V	—	1.0μF~4.7μF	—	1.0μF~4.7μF	Y
		—	10μF	—	10μF	L
	35V	—	2.2μF/4.7μF	—	2.2μF/4.7μF	Y
		—	4.7μF~22μF	—	4.7μF~22μF	L
	16V	—	4.7μF~22μF	—	4.7μF~22μF	Y
		—	4.7μF~22μF	—	4.7μF~22μF	L
	10V	—	22μF	—	10μF/22μF	O
		—	22μF~47μF	—	22μF~47μF	L
1210	25V	—	22μF~47μF	—	22μF~47μF	O
		—	22μF~100μF	—	22μF~100μF	L
	16V	—	10μF	—	10μF	L
		—	10μF	—	10μF	Q
		—	4.7μF~22μF	—	4.7μF~22μF	L
	10V	—	4.7μF~22μF	—	4.7μF~22μF	Q
		—	4.7μF~22μF	—	4.7μF~22μF	R
		—	10μF	—	10μF	Q

Note: 1) E6 series are adopted for Y5V, and E12 series are adopted for X7R, X5R and X5S.

2) for products of the same size, material and capacity, the U_R can be covered from high to low.

Type of Packing:

Reel Packaging (standard carrier tape disc packaging), every disc smallest package are shown in Table 4.

Table 4 Packing type

Chip Size	0402		0603				0805			1206			1210		
Disc size	7"	13"	7"	7"	13"	7"	7"	7"	7"	7"	7"	7"	7"	7"	7"
QTY(Kpcs)	10	50	4	4	15	3	4	2	3	4	3	2	2	1	0.5
Tape type	Paper	Paper	Paper	Plastic	Paper	Plastic	Paper	Plastic	Plastic	Paper	Plastic	Plastic	Plastic	Plastic	Plastic
Thicknesscode	B/N	B/N	D/K	K	D/K	D/K	Y	H	H	Y	O	L	L	Q/R	Q/R

First packaging: Each multi-disc material is packed into a box.

The second packaging: the first packaged packaging box is loaded into the paper packaging box, and the remaining space in the box is filled with light auxiliary materials.

The above packaging forms can also be packaged according to user needs.

3. Technical specifications and test methods:

3.1 Visual Inspection:

3.1.1 Requirement: no obvious defects on ceramic body and termination.

3.1.2 Test Method: Microscope 10×

3.2 Size:

3.2.1 Requirement: Configuration and dimension of MLCC are shown in Figure 1 and Table 1.

3.2.2 Test Method: Measuring by gages which precision is not less than 0.01 mm .

3.3 Operating Environment:

X7R	Temperature: -55℃ ~ +125℃ ; Relative humidity: ≤95% (25℃)	Atmosphere: 86 KPa ~ 106KPa
X5R、X5S、X5T	Temperature: -55℃ ~ +85℃ ; Relative humidity: ≤95% (25℃)	Atmosphere: 86 KPa ~ 106KPa
Y5V	Temperature: -30℃ ~ +85℃ ; Relative humidity: ≤95% (25℃)	Atmosphere: 86 KPa ~ 106KPa

3.4 Electrical Parameters and Test Methods:

Table 6 Specifications and Test Methods of MLCC Electrical Parameter

No.	Item	Specification	Test Method
1	Capacitance (C)	Within the specified tolerance	Temperature: 18~28℃ ; Humidity: ≤RH 80%;
2	Tangent of Loss Angle/ (tgδ)	X7R、X5R、X5S、X5T: $U_R \geq 25V$ $tg\delta \leq 1000 \times 10^{-4}$ $U_R = 16V$ $tg\delta \leq 1250 \times 10^{-4}$ $U_R \leq 10V$ $tg\delta \leq 1500 \times 10^{-4}$ Y5V: $U_R \geq 25V$ $tg\delta \leq 1000 \times 10^{-4}$ $U_R = 16V$ $tg\delta \leq 1500 \times 10^{-4}$ $U_R \leq 10V$ $tg\delta \leq 1800 \times 10^{-4}$	Test Frequency: X7R、X5R、Y5V: $100pF < C \leq 10\mu F$, $f = 1KHz \pm 10\%$; $C > 10\mu F$, $f = 100$ or $120Hz$; Test Voltage: $100pF < C \leq 10\mu F$: $U_R > 6.3V$ $1.0 \pm 0.2V_{rms}$; $U_R \leq 6.3V$ $0.5 \pm 0.2V_{rms}$; $C > 10\mu F$: $0.5 \pm 0.2V_{rms}$
3	Insulation Resistances/ (Ri)	$Ri \times C \geq 100s$	Temperature: 18~28℃ ; Humidity: ≤RH 80%; Apply rated voltage within $60 \pm 5S$
4	Withstandi ng voltage (WV)	No breakdown or flashover during test	$2.5 \times U_R$ $t = 1$ minute Charge/discharge current not exceeds 50mA.

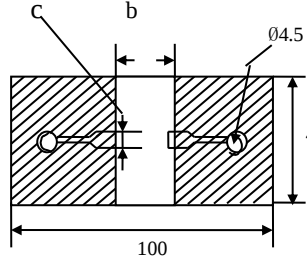
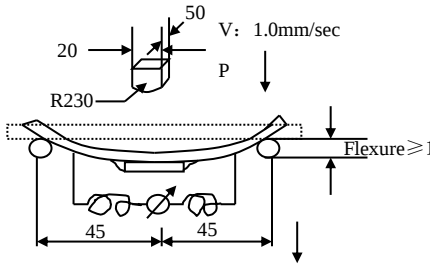
Note: Capacitance test instructions of Class 2 ceramic capacitors

When the capacitor initial capacitance is lower than its tolerance value, the test sample need to be heated for 60 ± 5 minutes at 150 ± 10 °C. Recover it, let sit at room temperature for 24 ± 2 hrs, and then test the capacitance.

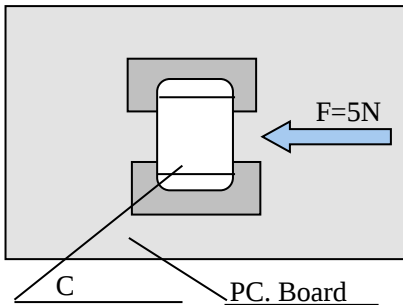
3.5 Environment Test Specifications and Methods:

Without specific note, the “test method” in Table 7 is based on GB/T 21041/21042 IDT IEC60384-21/22 .

Table 7 Environment Test Specifications and Methods

No.	Item	Specification	Test Method
1	Temperature Coefficient of Capacitance (α_c) or Temperature Characteristics	X7R、X5R: $\Delta C/C \leq \pm 15\%$ X5S: $\Delta C/C \leq \pm 22\%$ X5T: $-33\% \leq \Delta C/C \leq +22\%$ Y5V: $-82\% \leq \Delta C/C \leq +22\%$ Y5V: $-82\% \leq \Delta C/C \leq +22\%$	Preconditioning for 1hr at 150℃ followed by 24hrs, The ranges of capacitance change compared with the temperature ranges (θ_1 , 25℃, θ_2) shall be within the specified ranges. X5R、X5S、X5T: $\theta_1 = -55^\circ\text{C}$, $\theta_2 = 85^\circ\text{C}$ Y5V: $\theta_1 = -30^\circ\text{C}$, $\theta_2 = 85^\circ\text{C}$ X7R: $\theta_1 = -55^\circ\text{C}$, $\theta_2 = 125^\circ\text{C}$
2	Resistance to Soldering Heat	Visual: No visible damage and terminations uncovered shall be less than 25%. Capacitance Change: X7R、X5R、X5S: $\Delta C/C \leq \pm 15\%$; X5T、Y5V: $\Delta C/C \leq \pm 30\%$ tgδ and Ri: meet the initial specification in Table 6.	Special preconditioning for 1hr at 150℃ followed by 24±1hrs; Preheat the capacitor at 110 to 140℃ for 30-60s. Immerse the capacitor in an eutectic solder solution at 260±5℃ for 10±1 seconds. The depth of immersion is 10mm. Recover it, let sit at room temperature for 24±2hrs, then observe appearance and measure electrical characteristics.
3	Solderability	75% min. coverage of both terminal electrodes is soldered evenly and continuously.	Immerse the test capacitor into a methanol solution containing rosin for 3 to 5 seconds, preheat it at 80 to 140℃ for 30s to 60s and immerse it into molten solder of 235±5℃ for 2±0.2 seconds. The depth of immersion is 10mm.
4	Bond Strength of Termination	Visual: No visible damage. Capacitance Change: X7R、X5R、X5S: $\Delta C/C \leq \pm 10\%$; X5T、Y5V: $\Delta C/C \leq \pm 30\%$	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig. a. Apply a force in the direction shown in Fig. b. Bending 1mm at a speed of 1mm/sec and hold for 5±1secs, then measure the capacitance.  Fig.a  Capacitance meter Fig. b

(Unit: mm)

5	Adhesion	Visual: No visible damage.	When Soldering the capacitor on a P. C. board, apply a pushing force of 5N for 10±1secs. 															
6	Vibration	Visual: No visible damage.	Sample shall be mounted on a suitable substrate. Amplitude: 1.5mm Frequencies: 10 Hz~55Hz, and Harmonic vibration of uniform changes, 1 minutes sweep cycle. Repeat this for 2hrs each in 3 perpendicular directions X, Y, Z, total 6hrs.(Related STD: IEC 68-2-6 test Fc)															
		Capacitance Change: X7R、X5R、X5S: $\Delta C/C \leq \pm 15\%$; X5T、Y5V: $\Delta C/C \leq \pm 20\%$																
		Tgδ and Ri: meet the initial specification in Table 6.																
7	Rapid change of temperature	Visual: No visible damage.	Special preconditioning for 1hr at 150℃ followed by 24hrs.Fix the capacitor to the supporting jig. Expose the capacitors in the condition step 1 through 4 and perform 10 cycles. <table><tr><td>Step</td><td>temperature (℃)</td><td>time</td></tr><tr><td>1</td><td>θ_A</td><td>30 min</td></tr><tr><td>2</td><td>25</td><td>2~5 min.</td></tr><tr><td>3</td><td>θ_B</td><td>30 min</td></tr><tr><td>4</td><td>25</td><td>2~5 min.</td></tr></table> X7R:θ_A =-55℃, θ_B =125℃; X5R、X5S、X5T: θ_A =-55℃, θ_B =85℃; Y5V:θ_A =-30℃, θ_B =85℃; Recover it, let sit at room temperature for 24±2hrs, then observe appearance and measure electrical characteristics.	Step	temperature (℃)	time	1	θ _A	30 min	2	25	2~5 min.	3	θ _B	30 min	4	25	2~5 min.
		Step		temperature (℃)	time													
		1		θ _A	30 min													
2	25	2~5 min.																
3	θ _B	30 min																
4	25	2~5 min.																
Capacitance Change: X7R、X5R、X5S: $\Delta C/C \leq \pm 15\%$; X5T、Y5V: $\Delta C/C \leq \pm 20\%$																		
Tgδ and Ri: meet the initial specification in Table 6.																		
8	Damp Heat (Steady State)	Visual: No visible damage.	Special preconditioning for 1hr at 150℃ followed by 24hr Test Temperature: 60℃ ±2℃; Humidity: RH 90~95%; Duration:500h; Recover it, let sit at room temperature for 24±2hrs, then observe appearance and measure electrical characteristics.															
		Capacitance Change: X7R、X5R、X5S: $\Delta C/C \leq \pm 12.5\%$; X5T、Y5V: $\Delta C/C \leq \pm 30\%$																
		tgδ: tgδ≤2×the initial specification in Table 6.																
		Ri: Ri≥1000MΩ or Ri×C≥50s (U_R≥25V) , which is smaller; Ri≥1000MΩ or Ri×C≥10s (U_R≤16V) , which is smaller.																

9	Damp heat with load	Visual: No visible damage.	Special preconditioning for 1hr at 150℃. Remove and set for 24hours at room temperature. Perform initial measurement. Test Temperature: 60±2℃; Humidity: RH 90~95%; Test Voltage: 1.0×U _R ; Duration: 500h; Charge/discharge current not exceeds 50mA. Recover it, let sit at room temperature for 24±2hrs, then observe appearance and measure electrical characteristics. (X5R≥100nF Special preconditioning for 1hr at 150℃ followed by 24±4hrs).
		Capacitance Change: X7R: ΔC/C≤±12.5%; X5R、X5T、X5S: ΔC/C≤±15%; Y5V: ΔC/C≤±30%	
		tgδ: tgδ≤2×the initial specification in Table 6.	
		Ri: Ri≥500MΩ or Ri×C≥25s, which is smaller.	
10	Endurance	Visual: No visible damage.	Test Temperature: 125℃ (X7R) or 85℃ (X5R、X5S、X5T、Y5V) Duration: 1000h Test Voltage: 1.5×U _R The following specifications follow:1.0×U _R 0402 Cp≥1.0μF U _R ≥6.3V 0603 Cp≥1.0μF U _R ≥16V Cp>10μF U _R ≥6.3V 0805 Cp≥10μF U _R ≥6.3V 1206 Cp≥10μF U _R ≥6.3V Recover it, let sit at room temperature for 24±2hrs, then observe appearance and measure electrical characteristics. (X5R≥100nF Special preconditioning for 1hr at 150℃ followed by 24±4hrs).
		Capacitance Change: X7R、X5R、X5S: ΔC/C≤±15%; X5T、Y5V: ΔC/C≤±30%	
		tgδ: tgδ≤2×the initial specification in Table 6.	
		Ri: Ri≥1000MΩ or Ri×C≥50s (U _R ≥25V), which is smaller. Ri≥1000MΩ or Ri×C≥10s (U _R ≤16V), which is smaller.	

4. Packaging, Shipment and storage:

4.1 Packing:

4.1.1Type of packing:

Reel Packaging (standard carrier tape disc packaging), single disc smallest package are shown in Table 4.

4.1.2 Carrier Tape size:

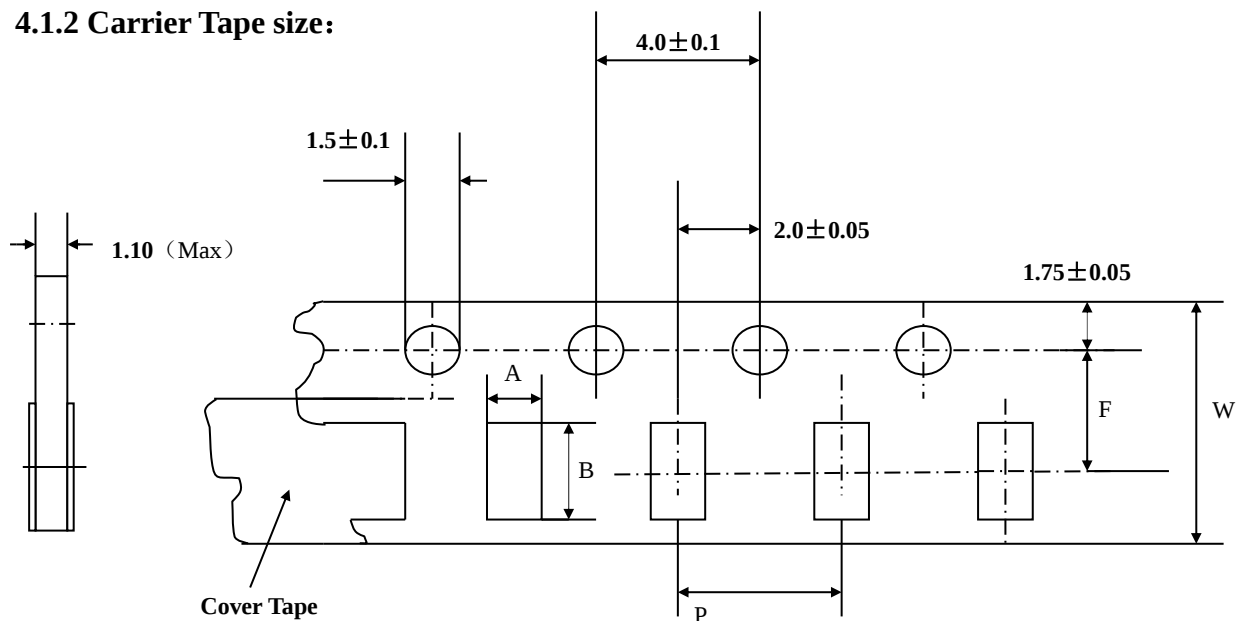


Figure 2 Carrier

Table 8 Carrier size

Mark	Size of product				
	0402	0603	0805	1206	1210
	Size (Unit: mm)				
A (Width of the square hole)	0.70±0.10	1.00±0.20	1.60±0.20	2.00±0.20	3.00±0.20
B (Length of the square hole)	1.20±0.10	1.80±0.20	2.40±0.20	3.60±0.20	3.60±0.20
F (Center distance between positioning hole and square hole)	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05
P (Square hole spacing)	2.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
W (Width of carrier)	8.00±0.20	8.00±0.20	8.00±0.20	8.00±0.20	8.00±0.20

4.1.3 Disc Size:

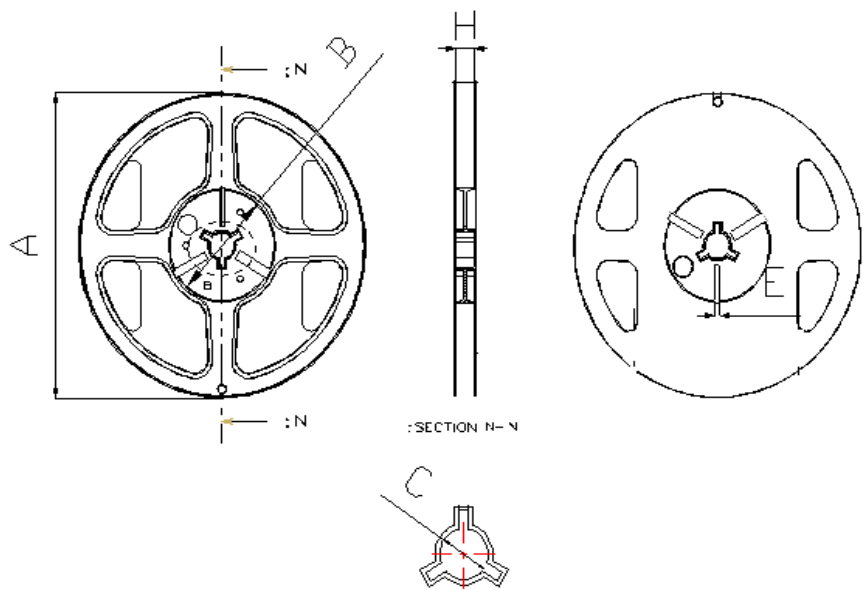
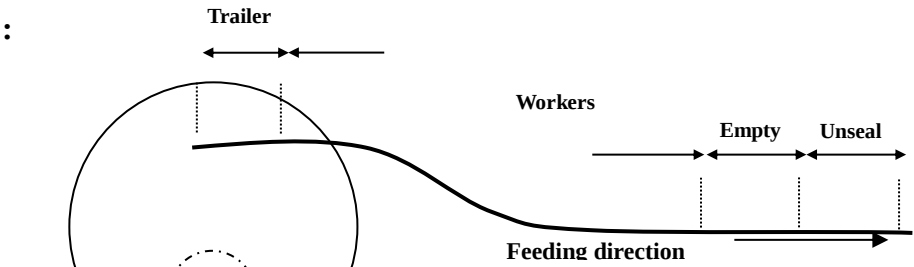


Figure 3 disc

Table 9 Disc Size

Disc Size	A/mm	B/mm	C/mm	E/mm	H/mm
7"	Φ178±2.0	Φ60±2.0	Φ13±1.0	4±1.0	9.5±1.0
13"	Φ330±2.0	Φ100±2.0	Φ13±1.0	3±1.0	10±1.0

4.1.4 Carrier Tape Specifications:



Packing	The minimum length of the reserved spaces		
Carrier tape	Trailer	Empty	Unseal
	60 mm	200mm	160 mm

4.1.5 Performance of Carrier Taping:

4.1.5.1 Strength of Carrier Tape and Top Cover Tape:

a. Carrier Tape

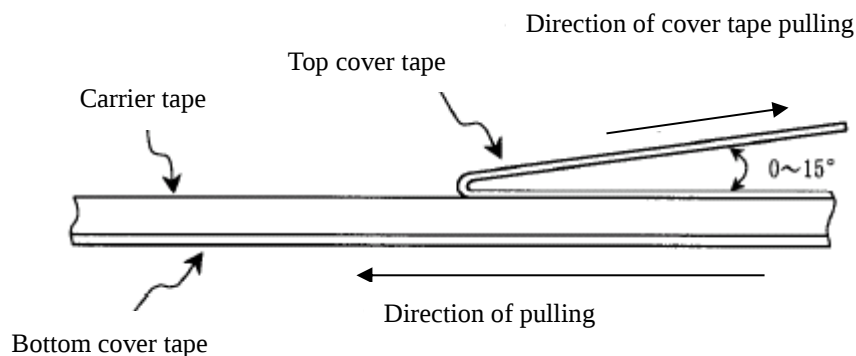
When a tensile force 1.02kgf is applied in the direction to unreel the tape, the tape shall withstand this force.

b. Top cover Tape

When a tensile force 1.02kgf is applied to the tape, the tape shall withstand this force.

4.1.5.2 Peeling Strength of Top Cover Tape:

Unless otherwise specified, the peeling strength of top cover tape shall be within 10.2 to 71.4 gf when the top cover tape is pulled at a speed of 300mm/min with the angle of 0 to 15° (see the following figure).



4.2 Shipment:

It must not be got rain, snow, and must avoid erosion of acid and alkali during the course of shipment.

4.3 Storage:

Period of Store:

12 months, otherwise, its solderability must be inspected again.

Condition of Store:

Temperature: Below 35°C

Humidity: Below RH70%