

Reference Specification

Type KJ
Safety Standard Certified Lead Type Disc Ceramic Capacitors for Automotive

Product specifications in this catalog are as of Aug. 2022, and are subject to change or obsolescence without notice.

Please consult the approval sheet before ordering. Please read rating and Cautions first.

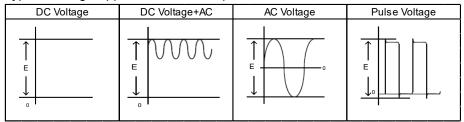
⚠ CAUTION

1. OPERATING VOLTAGE

- 1) Do not apply a voltage to a safety standard certified product that exceeds the rated voltage as called out in the specifications. Applied voltage between the terminals of a safety standard certified product shall be less than or equal to the rated voltage (+ 10%). When a safety standard certified product is used as a DC voltage product, the AC rated voltage value becomes the DC rated voltage value. (Example:AC250V (r.m.s.) rated product can be used as DC250V (+ 10%) rated product.) If both AC rated voltage and DC rated voltage are specified, apply the voltage lower than the respective rated voltage.
- 1-1) When a safety standard certified product is used in a circuit connected to a commercial power supply, ensure that the applied commercial power supply voltage including fluctuation should be less than 10% above its rated voltage.
- 1-2) When using a safety standard certified product as a DC rated product in circuits other than those connected to a commercial power supply.

When AC voltage is superimposed on DC voltage, the zero-to-peak voltage shall not exceed the rated DC voltage. When AC voltage or pulse voltage is applied, the peak-to-peak voltage shall not exceed the rated DC voltage.

Typical Voltage Applied to the DC Capacitor



(E: Maximum possible applied voltage.)

2) Abnormal voltages (surge voltage, static electricity, pulse voltage, etc.) shall not exceed the rated DC voltage.

2. OPERATING TEMPERATURE AND SELF-GENERATED HEAT

Keep the surface temperature of a capacitor below the upper limit of its rated operating temperature range. Be sure to take into account the heat generated by the capacitor itself.

When the capacitor is used in a high-frequency current, pulse current or the like, it may have the self-generated heat due to dielectric-loss. Applied voltage should be the load such as self-generated heat is within 20 °C on the condition of atmosphere temperature 25 °C. When measuring, use a thermocouple of small thermal capacity-K of ϕ 0.1mm and be in the condition where capacitor is not affected by radiant heat of other components and wind of surroundings. Excessive heat may lead to deterioration of the capacitor's characteristics and reliability. (Never attempt to perform measurement with the cooling fan running. Otherwise, accurate measurement cannot be ensured.)

3. TEST CONDITION FOR WITHSTANDING VOLTAGE

1) TEST EQUIPMENT

Test equipment for AC withstanding voltage should be used with the performance of the wave similar to 50/60 Hz sine wave.

If the distorted sine wave or over load exceeding the specified voltage value is applied, the defective may be caused.

2) VOLTAGE APPLIED METHOD

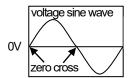
When the withstanding voltage is applied, capacitor's lead or terminal should be firmly connected to the out-put of the withstanding voltage test equipment, and then the voltage should be raised from near zero to the test voltage.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, test voltage should be applied with the *zero cross. At the end of the test time, the test voltage should be reduced to near zero, and then capacitor's lead or terminal should be taken off the out-put of the withstanding voltage test equipment.

If the test voltage without the raise from near zero voltage would be applied directly to capacitor, the surge voltage may arise, and therefore, the defective may be caused.

*ZERO CROSS is the point where voltage sine wave pass 0V.

- See the right figure -



4. FAIL-SAFE

When capacitor would be broken, failure may result in a short circuit. Be sure to provide an appropriate fail-safe function like a fuse on your product if failure would follow an electric shock, fire or fume.

5. VIBRATION AND IMPACT

Do not expose a capacitor or its leads to excessive shock or vibration during use. Excessive shock or vibration may cause to fatigue destruction of lead wires mounted on the circuit board. Please take measures to hold a capacitor on the circuit boards by adhesive, molding resin or coating and other. Please confirm there is no influence of holding measures on the product with an intended equipment.

6. SOLDERING

When soldering this product to a PCB/PWB, do not exceed the solder heat resistance specification of the capacitor. Subjecting this product to excessive heating could melt the internal junction solder and may result in thermal shocks that can crack the ceramic element.

When soldering capacitor with a soldering iron, it should be performed in following conditions.

Temperature of iron-tip: 400 °C max. Soldering iron wattage: 50W max. Soldering time: 3.5s max.

7. BONDING, RESIN MOLDING AND COATING

In case of bonding, molding or coating this product, verify that these processes do not affect the quality of capacitor by testing the performance of the bonded, molded or coated product in the intended equipment.

In case of the amount of applications, dryness / hardening conditions of adhesives and molding resins containing organic solvents (ethyl acetate, methyl ethyl ketone, toluene, etc.) are unsuitable, the outer coating resin of a capacitor is damaged by the organic solvents and it may result, worst case, in a short circuit.

The variation in thickness of adhesive, molding resin or coating may cause an outer coating resin cracking and/or ceramic element cracking of a capacitor in a temperature cycling.

8. TREATMENT AFTER BONDING, RESIN MOLDING AND COATING

When the outer coating is hot (over 100 °C) after soldering, it becomes soft and fragile. So please be careful not to give it mechanical stress.

Failure to follow the above cautions may result, worst case, in a short circuit and cause fuming or partial dispersion when the product is used.

9. OPERATING AND STORAGE ENVIRONMENT

The insulating coating of capacitors does not form a perfect seal; therefore, do not use or store capacitors in a corrosive atmosphere, especially where chloride gas, sulfide gas, acid, alkali, salt or the like is present. And avoid exposure to moisture. Before cleaning, bonding, or molding this product, verify that these processes do not affect product quality by testing the performance of a cleaned, bonded or molded product in the intended equipment. Store the capacitors where the temperature and relative humidity do not exceed -10 to 40 °C and 15 to 85%.

Use capacitors within 6 months after delivered. Check the solderability after 6 months or more.

10. LIMITATION OF APPLICATIONS

Please contact us before using our products for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property.

- 1. Aircraft equipment
- 2. Aerospace equipment
- 3. Undersea equipment
- 4. Power plant control equipment
- 5. Medical equipment
- 6. Transportation equipment (vehicles, trains, ships, etc.)
- 7. Traffic signal equipment
- 8. Disaster prevention / crime prevention equipment
- 9. Data-processing equipment exerting influence on public
- 10. Application of similar complexity and/or reliability requirements to the applications listed in the above.

NOTICE

1. CLEANING (ULTRASONIC CLEANING)

To perform ultrasonic cleaning, observe the following conditions.

Rinse bath capacity: Output of 20 watts per liter or less.

Rinsing time: 5 min maximum.

Do not vibrate the PCB/PWB directly.

Excessive ultrasonic cleaning may lead to fatigue destruction of the lead wires.

2. CAPACITANCE CHANGE OF CAPACITORS

· Class 1 capacitors

Capacitance might change a little depending on a surrounding temperature or an applied voltage. Please contact us if you use for the strict time constant circuit.

· Class 2 and 3 capacitors

Class 2 and 3 capacitors like temperature characteristic B, E and F have an aging characteristic, whereby the capacitor continually decreases its capacitance slightly if the capacitor leaves for a long time. Moreover, capacitance might change greatly depending on a surrounding temperature or an applied voltage. So, it is not likely to be able to use for the time constant circuit.

Please contact us if you need a detail information.

3. PERFORMANCE CHECK BY EQUIPMENT

Before using a capacitor, check that there is no problem in the equipment's performance and the specifications.

Generally speaking, CLASS 2 ceramic capacitors have voltage dependence characteristics and temperature dependence characteristics in capacitance. So, the capacitance value may change depending on the operating condition in an equipment. Therefore, be sure to confirm the apparatus performance of receiving influence in a capacitance value change of a capacitor, such as leakage current and noise suppression characteristic.

Moreover, check the surge-proof ability of a capacitor in the equipment, if needed, because the surge voltage may exceed specific value by the inductance of the circuit.

\triangle NOTE

- 1.Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
- 2. You are requested not to use our product deviating from this specification.

1. Application

This specification is applied to Safety Standard Certified Lead Type Disc Ceramic Capacitors Type KJ which can be used for the battery charger for Electric Vehicles and Plug-in Hybrid.

Type KJ is Safety Standard Certified capacitors of Class X1,Y2, and in accordance with AEC-Q200 requirements.

Approval standard and certified number

	Standard number	*Certified number	AC Rated voltage V(r.m.s.)
UL/cUL	UL60384-14/CSA E60384-14	E37921	V4.440
ENEC (VDE)	EN60384-14 IEC60384-14	40031217	X1:440 Y2:300

^{*}Above Certified number may be changed on account of the revision of standards and the renewal of certification.

2. Rating

2-1. Operating temperature range

-40 ~ +125°C

2-2. Rated Voltage

X1:AC440V(r.m.s.) Y2:AC300V(r.m.s.) DC1kV

2-3. Part number configuration

ex.) DE6 E3 KJ 472 M A3 B
Series Temperature Certified Capacitance Capacitance Lead Package Individual
Characteristics Type Tolerance Style Specification

Series

DE6 denotes class X1,Y2.

• Temperature Characteristics

Code	Temperature Characteristics
B3	В
E3	E

Please confirm detailed specification on [Specification and test methods].

• Certified Type

This denotes safety certified type name Type KJ.

Capacitance

The first two digits denote significant figures; the last digit denotes the multiplier of 10 in pF. ex.) In case of 472.

$$47 \times 10^2 = 4700 pF$$

• Capacitance Tolerance

Please refer to [Part number list].

• Lead Style

Code	Lead Style
A*	Vertical crimp long type
B*	Vertical crimp short type
N*	Vertical crimp taping type

* Please refer to [Part number list].

Solder coated copper wire is applied for termination.

Package

Code	Package
В	Bulk type
Α	Ammo pack taping type

• Individual Specification

Murata's control code

Please refer to Part number list .

Note) Murata part numbers might be changed depending on Lead Style or any other changes. Therefore, please specify only the Certified Type (KJ) and capacitance of products in the parts list when it is required for applying safety standard of electric equipment.

3. Marking

Capacitance : 3 digit system

Capacitance tolerance : Code
Certified type : KJ
Rated voltage mark : 300~
Class code : X1Y2

Manufacturing year : Letter code(The last digit of A.D. year.)

Manufacturing month : Code

* From January to September: "1" to "9",

October: "O", November: "N", December: "D"

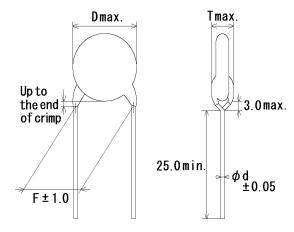
Company name code : (M15 (Made in Thailand)

(Example)

472M KJ 300~ X1Y2 2D (15

4. Part number list

·Vertical crimp long type
(Lead Style: A*)

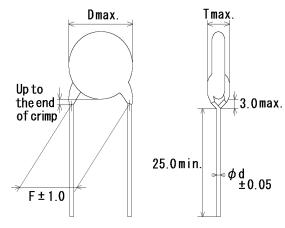


Note) The mark '*' of Lead Style differ from lead spacing(F) and lead diameter(d).

Please see the following list about details.

Τ.Ο	Сар. Сар.		Overtone on Deat Name have	Manada Dari Namahan	Dir	nensi	on (m	m)	Lead	atv.
T.C.	(pF)	toİ.	Customer Part Number	Murata Part Number		Т	F	d	Style	qty. (pcs)
В	100	±10%		DE6B3KJ101KA3BE01J	6.0	5.0	7.5	0.6	A3	250
В	150	$\pm 10\%$		DE6B3KJ151KA3BE01J	8.0	5.0	7.5	0.6	A3	250
В	220	±10%		DE6B3KJ221KA3BE01J	6.0	6.0	7.5	0.6	A3	250
В	330	$\pm 10\%$		DE6B3KJ331KA3BE01J	7.0	6.0	7.5	0.6	A3	250
В	470	$\pm 10\%$		DE6B3KJ471KA3BE01J	8.0	6.0	7.5	0.6	A3	250
В	680	$\pm 10\%$		DE6B3KJ681KA3BE01J	9.0	6.0	7.5	0.6	A3	250
Е	1000	$\pm 20\%$		DE6E3KJ102MA3B	7.0	7.0	7.5	0.6	A3	250
Е	1500	$\pm 20\%$		DE6E3KJ152MA3B	8.0	7.0	7.5	0.6	A3	250
Е	2200	$\pm 20\%$		DE6E3KJ222MA3B	9.0	7.0	7.5	0.6	A3	250
Е	3300	±20%		DE6E3KJ332MA3B	10.0	7.0	7.5	0.6	A3	250
Е	4700	±20%		DE6E3KJ472MA3B	12.0	7.0	7.5	0.6	A3	200

·Vertical crimp long type
(Lead Style: A*)

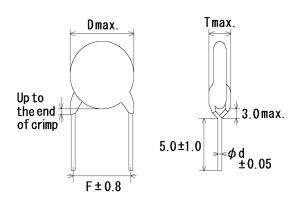


Note) The mark '*' of Lead Style differ from lead spacing(F) and lead diameter(d).

Please see the following list about details.

Τ.Ο	Cap. Cap.		Cap. Cap. Customer Part Number		Dir	nensi	Lead	Pack		
T.C.	(pF)	toİ.	Customer Part Number	Customer Part Number Murata Part Number I		Т	F	d	Style	qty. (pcs)
В	100	±10%		DE6B3KJ101KA4BE01J	6.0	5.0	10.0	0.6	A4	250
В	150	$\pm 10\%$		DE6B3KJ151KA4BE01J	8.0	5.0	10.0	0.6	A4	250
В	220	$\pm 10\%$		DE6B3KJ221KA4BE01J	6.0	6.0	10.0	0.6	A4	250
В	330	$\pm 10\%$		DE6B3KJ331KA4BE01J	7.0	6.0	10.0	0.6	A4	250
В	470	$\pm 10\%$		DE6B3KJ471KA4BE01J	8.0	6.0	10.0	0.6	A4	250
В	680	$\pm 10\%$		DE6B3KJ681KA4BE01J	9.0	6.0	10.0	0.6	A4	250
Е	1000	±20%		DE6E3KJ102MA4B	7.0	7.0	10.0	0.6	A4	250
Е	1500	±20%		DE6E3KJ152MA4B	8.0	7.0	10.0	0.6	A4	250
Е	2200	±20%		DE6E3KJ222MA4B	9.0	7.0	10.0	0.6	A4	250
Е	3300	±20%		DE6E3KJ332MA4B	10.0	7.0	10.0	0.6	A4	250
Е	4700	$\pm 20\%$		DE6E3KJ472MA4B	12.0	7.0	10.0	0.6	A4	200

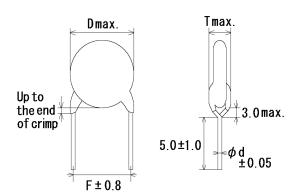
·Vertical crimp short type
(Lead Style:B*)



Note) The mark '*' of Lead Style differ from lead spacing(F) and lead diameter(d).
Please see the following list about details.

Τ.Ο	Cap.	Cap. Cap. Customer Part Number		Manada Dari Namahan	Dir	nensi	Lead	Pack		
T.C.	(pF)	toİ.	Customer Part Number	Murata Part Number -		Т	F	d	Style	qty. (pcs)
В	100	±10%		DE6B3KJ101KB3BE01J	6.0	5.0	7.5	0.6	В3	500
В	150	$\pm 10\%$		DE6B3KJ151KB3BE01J	8.0	5.0	7.5	0.6	В3	500
В	220	±10%		DE6B3KJ221KB3BE01J	6.0	6.0	7.5	0.6	В3	500
В	330	$\pm 10\%$		DE6B3KJ331KB3BE01J	7.0	6.0	7.5	0.6	В3	500
В	470	$\pm 10\%$		DE6B3KJ471KB3BE01J	8.0	6.0	7.5	0.6	В3	500
В	680	$\pm 10\%$		DE6B3KJ681KB3BE01J	9.0	6.0	7.5	0.6	В3	500
Е	1000	$\pm 20\%$		DE6E3KJ102MB3B	7.0	7.0	7.5	0.6	В3	500
Е	1500	$\pm 20\%$		DE6E3KJ152MB3B	8.0	7.0	7.5	0.6	В3	500
Е	2200	$\pm 20\%$		DE6E3KJ222MB3B	9.0	7.0	7.5	0.6	В3	500
Е	3300	±20%		DE6E3KJ332MB3B	10.0	7.0	7.5	0.6	В3	500
Е	4700	±20%		DE6E3KJ472MB3B	12.0	7.0	7.5	0.6	В3	250

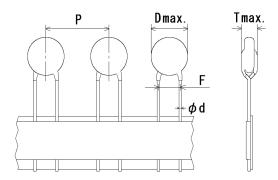
·Vertical crimp short type
(Lead Style:B*)



Note) The mark '*' of Lead Style differ from lead spacing(F) and lead diameter(d).
Please see the following list about details.

Τ.Ο	Сар.	Сар.	Overtone on Deat Name have	Number Murata Part Number –		nensi	m)	Lead	Pack	
T.C.	(pF)	toİ.	Customer Part Number			Т	F	d	Style	qty. (pcs)
В	100	±10%		DE6B3KJ101KB4BE01J	6.0	5.0	10.0	0.6	В4	500
В	150	$\pm 10\%$		DE6B3KJ151KB4BE01J	8.0	5.0	10.0	0.6	B4	500
В	220	$\pm 10\%$		DE6B3KJ221KB4BE01J	6.0	6.0	10.0	0.6	B4	500
В	330	±10%		DE6B3KJ331KB4BE01J	7.0	6.0	10.0	0.6	B4	500
В	470	$\pm 10\%$		DE6B3KJ471KB4BE01J	8.0	6.0	10.0	0.6	B4	500
В	680	±10%		DE6B3KJ681KB4BE01J	9.0	6.0	10.0	0.6	B4	500
Е	1000	±20%		DE6E3KJ102MB4B	7.0	7.0	10.0	0.6	B4	500
Е	1500	±20%		DE6E3KJ152MB4B	8.0	7.0	10.0	0.6	B4	500
Е	2200	±20%		DE6E3KJ222MB4B	9.0	7.0	10.0	0.6	B4	500
Е	3300	±20%		DE6E3KJ332MB4B	10.0	7.0	10.0	0.6	B4	500
Е	4700	±20%		DE6E3KJ472MB4B	12.0	7.0	10.0	0.6	B4	250

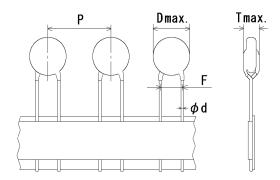
·Vartical crimp taping type (Lead Style:N*)



Note) The mark '*' of Lead Style differ from lead spacing(F) and lead diameter(d) and pitch of component(P).
Please see the following list or taping specification about details.

										•	
T.C.	Сар.	Сар.	Cap. Customer Bort Number Munich		Dimension (mm)					Lead	Pack
1.0.	(pF)	tol.	Customer Part Number	r Part Number Murata Part Number		Т	F	d	Р	Style	qty. (pcs)
В	100	±10%		DE6B3KJ101KN3AE01J	6.0	5.0	7.5	0.6	15.0	N3	700
В	150	$\pm 10\%$		DE6B3KJ151KN3AE01J	8.0	5.0	7.5	0.6	15.0	N3	700
В	220	±10%		DE6B3KJ221KN3AE01J	6.0	6.0	7.5	0.6	15.0	N3	700
В	330	±10%		DE6B3KJ331KN3AE01J	7.0	6.0	7.5	0.6	15.0	N3	700
В	470	±10%		DE6B3KJ471KN3AE01J	8.0	6.0	7.5	0.6	15.0	N3	700
В	680	±10%		DE6B3KJ681KN3AE01J	9.0	6.0	7.5	0.6	15.0	N3	700
Е	1000	±20%		DE6E3KJ102MN3A	7.0	7.0	7.5	0.6	15.0	N3	700
Е	1500	±20%		DE6E3KJ152MN3A	8.0	7.0	7.5	0.6	15.0	N3	700
Е	2200	±20%		DE6E3KJ222MN3A	9.0	7.0	7.5	0.6	15.0	N3	700
Е	3300	±20%		DE6E3KJ332MN3A	10.0	7.0	7.5	0.6	15.0	N3	700
Е	4700	±20%		DE6E3KJ472MN3A	12.0	7.0	7.5	0.6	15.0	N3	700

·Vartical crimp taping type (Lead Style:N*)



Note) The mark '*' of Lead Style differ from lead spacing(F) and lead diameter(d) and pitch of component(P).
Please see the following list or taping specification about details.

			•								
T.C.	Сар.	Сар.	Customer Part Number	Murata Part Number	Dimension (mm)					Lead	Pack
1.0.	(pF)	tol.	Customer Part Number	wurata Fait Number		T	F	d	Р	Style	qty. (pcs)
В	100	±10%		DE6B3KJ101KN4AE01J	6.0	5.0	10.0	0.6	25.4	N4	400
В	150	$\pm 10\%$		DE6B3KJ151KN4AE01J	8.0	5.0	10.0	0.6	25.4	N4	400
В	220	$\pm 10\%$		DE6B3KJ221KN4AE01J	6.0	6.0	10.0	0.6	25.4	N4	400
В	330	±10%		DE6B3KJ331KN4AE01J	7.0	6.0	10.0	0.6	25.4	N4	400
В	470	$\pm 10\%$		DE6B3KJ471KN4AE01J	8.0	6.0	10.0	0.6	25.4	N4	400
В	680	$\pm 10\%$		DE6B3KJ681KN4AE01J	9.0	6.0	10.0	0.6	25.4	N4	400
Е	1000	±20%		DE6E3KJ102MN4A	7.0	7.0	10.0	0.6	25.4	N4	400
Е	1500	±20%		DE6E3KJ152MN4A	8.0	7.0	10.0	0.6	25.4	N4	400
Е	2200	$\pm 20\%$		DE6E3KJ222MN4A	9.0	7.0	10.0	0.6	25.4	N4	400
Е	3300	±20%		DE6E3KJ332MN4A	10.0	7.0	10.0	0.6	25.4	N4	400
Е	4700	$\pm 20\%$		DE6E3KJ472MN4A	12.0	7.0	10.0	0.6	25.4	N4	400

5. Spe	ecification and test r	methods									
No.		em		ecification				est method			
1	Appearance and	dimensions	No marked defect on appearance form. Please refer to [Part number list] on dimensions.			The capacitor should be inspected by naked eyes for visible evidence of defect. Dimensions should be measured with slide calipers.					
2	Marking		To be easily le	egible.		The capaci	tor should	be inspec	ted by na	ked eyes.	
3	Capacitance		Within specific	ed tolerance.		The capacit	tance sho	uld be me	asured at		
4	Dissipation Facto	r (D.F.)	2.5% max.			The dissipa	ition facto	r should b	e measure	ed at 20°C	
5	Insulation Resista	ance (I.R.)	10000MΩ mir	ì.		The insulation with DC500 The voltage through a re	ion resista ±50V with should b	ance shoul nin 60±5 s e applied	d be mea of chargir	ng.	
6	Dielectric strength	Between lead wires	No failure.			The capacit AC2600V(r. the lead wir	.m.s.)<50/res for 60	/60Hz> is : s.	applied be	etween	
		Body insulation	No failure.			First, the terminals of the capacitor shoul connected together. Then, a metal foil should be closely wrapped around the body of the capacitor to the distance of about 3 to 4mm			About 3 to 4 mm Metal balls tto a 1mm 0Hz> is ad wires		
7	Temperature char	racteristic	Char. B: With Char. E: With (Temp. range			The capacit each step s			should be	e made at	
				Step	1	2	3	4	5	1	
				Temp.(°C)	20±2		20±2	85±2	20±2	1	
			before initial r	nt ould be stored at neasurements.		C for 1 h, the	en placed	at *room o	condition f		
8	Solderability		Lead wire should be sold with uniform coating on the direction over 3/4 of the circumferential direction.			H63 Eute	eam agin dipped in nen into mof immersiot of lead older: ee Solder(ectic Sold	g, the lead to a ethat nolten sold ion is up to wires. Sn-3Ag-0. er 235±5°	d wire of a not solution ler for 5+0 about 1.5 .5Cu) 245	a capacitor on of 25% /-0.5 sec. 5 to 2.0mm	

* "room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

Appearance Non-preheat) Appearance Appea	No.	Iten	n	Specification	Test method
Change Change		Resistance to			As shown in figure, the lead wires should be
Dielectric Strength				Within ± 10%	•
Delectric Strength Per Item 6 Per Item 6 Per Item 6				1000M Ω min.	
Pre-treatment Capacitor should be stored at 125:3°C for 1 h, then placed at 1700 condition for 24:2 h before initial measurements.			Dielectric	Per Item 6	insulating
Pre-treatment Capacitor should be stored at 125+3°C for 1 h, then placed at 1700m condition for 24-2 h before install measurements.			Strength		10 2.0mm
Capacitor should be stored at 125:3° C for 1 h, then placed at "room condition for 24½ h before initial measurements.					
then placed at 'room condition for 24±2 h before initial measurementsPost-treatment Capacitars should be stored for 1 to 2 h at 'room condition. Resistance to Soldering Heat (On-preheat) (On-preheat) Resistance to Soldering Heat (On-preheat) In Capacitars with a solder of 260+0/-5°C up to 1,5 to 2,0 mm from the root of terminal for 7,4+0/-5°C up to 1,5 to 2,0 mm from the root of terminal f					•Pre-treatment
Initial measurements					Capacitor should be stored at 125±3°C for 1 h,
Post-treatment Capacitors should be stored for 1 to 2 h at "room condition. First the capacitor should be stored at 120+0/-5°C for 60-0/-5°C apacitors should be stored at 120+0/-5°C for 60-0/-5°C apacitors should be stored at 120+0/-5°C for 60-0/-5°C in 20-15 to 2.0 mm from the root of terminal for 7-50-0/-1 s. Then, as in figure, the lead wires should be immersed solder of 260+0/-5°C up to 1.5 to 2.0 mm from the root of terminal for 7-50-0/-1 s. Then, as in figure, the lead wires should be stored at 125:3°C for 1 h, then placed at 1					•
Resistance to Soldering Heat (On-preheat) Appearance No marked defect. First the capacitor should be stored at 120+0/-5°C for 60+0/-5°.					
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Dielectric strength Per item 6 Per it		(On-preneat)		1000MO min	
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Pre-treatment : Capacitin should be stored at 1255:3°C for 1 h, then placed at 1255:3°C for 1 h,					Thermal Capacitor
Pre-treatment : Capacitor should be stored at 125±3°C for 1 h, then placed at *"room condition. Pre-treatment : Capacitor should be stored for 1 to 2 th at "room condition for 24±2 h before initial measurements. Post-treatment : Capacitor should be stored for 1 to 2 th at "room condition. Appearance					
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Post-treatment: Capacitor should be stored for 1 to 2 h at **room condition. Post-treatment: Capacitor should be stored for 1 to 2 h at **room condition. Post-treatment: Capacitor should be stored for 1 to 2 h at **room condition. Post-treatment: Capacitor should be stored for 1 to 2 h at *room condition. Post-treatment: Capacitor should be firmly soldered to the supporting lead wire, 1.5mm in total amplitude, with about 20 minutes rate of vibration change from 10Hz to 200Hz and back to 10Hz. This motion should be applied for 12 times in each 3 mutually perpendicular directions (total of 36 times). The acceleration is 5g max. Post-treatment: Capacitor and gum up the body to the supporting lead wire, 1.5mm in total amplitude, with about 20 minutes rate of vibration change from 10Hz to 200Hz and back to 10Hz. This motion should be applied for 12 times in each 3 mutually perpendicular directions (total of 36 times). The acceleration is 5g max. Solder the capacitor and gum up the body to the supporting lead wire, 1.5mm in total amplitude, with about 20 minutes rate of vibration change from 10Hz to 200Hz and back to 10Hz. This motion should be applied for 12 times in each 3 mutually perpendicular areas to and from 5g max. Solder the capacitor and gum up the body to the test jig (glass epoxy board) by resin(adhesive). I.R.					
Post-treatment : Capacitor should be stored for 1 to 2 h at *froom condition. 2 h at *froom condition.					
Appearance No marked defect.					
Vibration Appearance No marked defect.					
D.F. 2.5% max. resin(adhesive)	11	Vibration			Solder the capacitor and gum up the body to the
The capacitor should be firmly soldered to the supporting lead wire, 1.5mm in total amplitude, with about 20 minutes rate of vibration change from 10Hz to 2000Hz and back to 10Hz. This motion should be applied for 12 times in each 3 mutually perpendicular directions (total of 36 times). The acceleration is 5g max. Appearance No marked defect. Capacitance Within the specified tolerance. D.F. 5.0% max. Solder the capacitor and gum up the body to the test jig (glass epoxy board) by resin(adhesive). Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s. Humidity (Under steady state) Appearance No marked defect. Capacitance Char. B: Within ±10% Char. E: Within ±15% D.F. 5.0% max. Appearance No marked defect. Set the capacitor for 1000±12 h at 85±3°C in 80 to 85% relative humidity. Pre-treatment Capacitor should be stored at 125±3°C for 1 h, then placed at "room condition for 24±2 h before initial measurements. Post-treatment Capacitor should be stored for 1 to 2 h at "room condition.					test jig (glass epoxy board) by resin(adhesive).
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This motion should be applied for 12 times in each 3 mutually perpendicular directions (total of 36 times). The acceleration is 5g max. Appearance No marked defect. Capacitance Within the specified tolerance. D.F. I.R. 10000M Ω min. Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s. Set the capacitor for 1000±12 h at 85±3°C in 80 to 85% relative humidity. (Under steady state) D.F. Solder the capacitor and gum up the body to the test jig (glass epoxy board) by resin(adhesive). Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s. Set the capacitor for 1000±12 h at 85±3°C in 80 to 85% relative humidity. Pre-treatment Capacitor should be stored at 125±3°C for 1 h, then placed at *room condition for 24±2 h before initial measurements. Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.					
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Mechanical Shock (Compliant with AEC-Q200) Appearance No marked defect.					
Shock (Compliant with AEC-Q200) Capacitance D.F. 5.0% max.					
Compliant with AEC-Q200 D.F. 5.0% max. Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s.	12		- ' '		
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Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s. Appearance No marked defect. Capacitance Char. B: Within ±10% change Char. E: Within ±15% D.F. 5.0% max. I.R. 3000MΩ min. Dielectric strength Three shocks in each direction should be applied along 3 mutually perpendicular axes to and from of the test specimen (18 shocks). The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s. Set the capacitor for 1000±12 h at 85±3°C in 80 to 85% relative humidity. *Pre-treatment Capacitor should be stored at 125±3°C for 1 h, then placed at *room condition for 24±2 h before initial measurements. *Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.			1.5	40000140	
13Humidity (Under steady state)Appearance Char. E: Within ±15%No marked defect. O.F.Set the capacitor for 1000±12 h at 85±3°C in 80 to 85% relative humidity.18I.R. (I.R. Dielectric strength)3000MΩ min. (Dielectric strength)+Pre-treatment (Capacitor should be stored for 1 to 2 h at *room condition.			I.K.	10000M Ω min.	
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The specified test pulse should be Half-sine and should have a duration :0.5ms, peak value:100g and velocity change: 4.7m/s. Humidity (Under steady state) Appearance No marked defect. Capacitance Char. B : Within ±10% Char. E : Within ±15% D.F. 5.0% max. Pre-treatment Capacitor should be stored at 125±3°C for 1 h, then placed at *room condition for 24±2 h before initial measurements. Post-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment Capacitor should be stored for 1 to 2 h at *room condition. Prost-treatment					
Appearance No marked defect. Set the capacitor for 1000±12 h at 85±3°C in 80 to (Under steady state) Capacitance change Char. B : Within ±10% change Char. E : Within ±15% D.F. 5.0% max. Pre-treatment Capacitor should be stored at 125±3°C for 1 h, then placed at *room condition for 24±2 h before initial measurements.					The specified test pulse should be Half-sine and
Humidity (Under steady state) Appearance No marked defect. Capacitance change Char. B : Within ±10% Char. E : Within ±15%					
Capacitance change Char. B : Within ±10% Char. E : Within ±15%	13	Humidity	Appearance	No marked defect	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					
Capacitor should be stored at 125±3°C for 1 h, then placed at *room condition for 24±2 h before initial measurements. Per item 6 Per item 6 Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.		state)	change	Char. E: Within ±15%	·
I.R. 3000MΩ min. then placed at *room condition for 24±2 h before initial measurements. Dielectric strength Per item 6 •Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.			D.F.	5.0% max.	
Dielectric strength Per item 6 Per item 6 -Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.			IR	3000MO min	
strength •Post-treatment Capacitor should be stored for 1 to 2 h at *room condition.					
condition.					
	* "roor	n condition" Temper	ature: 15 to 35°C	. Relative humidity: 45 to 75% Atmo	
	. 551			,	,

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No.	Item	1	Specification	Test method
14	Humidity loading	Appearance	No marked defect.	Apply the rated voltage for 1000±12 h at 85±3°C in
	, ,	Capacitance	Char. B: Within ±10%	80 to 85% relative humidity.
		change	Char. E: Within ±15%	
		D.F.	5.0% max.	•Pre-treatment
				Capacitor should be stored at 125±3°C for 1 h,
				then placed at *room condition for 24±2 h before initial measurements.
		I.R.	3000M $Ω$ min.	Post-treatment
				Capacitor should be stored for 1 to 2 h at *room
				condition.
15	Life	Dielectric	No marked defect.	Impulse voltage
		strength		Each individual capacitor should be subjected to
		Capacitance	Within ± 20%	a 5kV impulses for three times. Then the capacitors are applied to life test.
		change I.R.	3000MΩ min.	
		Dielectric	Per item 6	Front time (T1) = 1.7 μ s=1.67T 90 Time to half-value (T2) = 50 μ s
		strength	Feritem 0	50 - 11110 to Hall-Value (12) = 50 \(\mu \) 3
		Strongth		0 0 0
				0 T t
				Τ2
				The capacitors are placed in a circulating air oven
				for a period of 1000 h.
				The air in the oven is maintained at a temperature
				of 125+2/-0°C, and relative humidity of 50% max
				Throughout the test, the capacitors are subjected to a AC510V(r.m.s.)<50/60Hz> alternating voltage
				of mains frequency, except that once each hour
				the voltage is increased to AC1000V(r.m.s.) for
				0.1 s.
				•Pre-treatment
				Capacitor should be stored at 125±3°C for 1 h,
				then placed at *room condition for 24±2 h before initial measurements.
				Post-treatment
				Capacitor should be stored for 1 to 2 h at *room
				condition.
16	Flame test		The capacitor flame discontinue	The capacitor should be subjected to applied
			as follows.	flame for 15 s. and then removed for 15 s until 5
				cycles are completed.
			Cycle Time	Capacitor
			1 to 4 30 s max.	Flame
			5 60 s max.	
				:
				Gas Burner
17	Debugtness of	Topoilo	Lood wire chould not out off	(in mm)
17	Robustness of terminations	Tensile	Lead wire should not cut off. Capacitor should not be broken.	As shown in the figure at right, fix the body of the capacitor and apply
	terminations		Capacitor should not be broken.	a tensile weight gradually to each
				lead wire in the radial direction of the
				capacitor up to 10N, and keep it
			1	for 10±1 s.
		Bending		Each lead wire should be subjected to 5N of
				weight and bent 90° at the point of egress, in one
				direction, then returned to its original position, and
				bent 90° in the opposite direction at the rate of one bend in 2 to 3 s.
* "roo	m condition" Tempera	ature: 15 to 35°C	Relative humidity: 45 to 75%, Atmos	
1001	in condition Tempera	ature. 15 to 55 C	, Relative numbers, 45 to 75%, Atmos	splienc pressure, oo to Tookra

No.	Item	l	Specification	Test method
18	Active flammability		The cheese-cloth should not be on fire.	The capacitors should be individually wrapped in at least one, but not more than two, complete layers of cheese-cloth. The capacitor should be subjected to 20 discharges. The interval between successive discharges should be 5 s. The UAc should be maintained for 2min after the last discharge.
				C1,2 : $1\mu F \pm 10\%$, C3 : $0.033\mu F \pm 5\%$ $10kV$ L1 to L4 : $1.5mH \pm 20\%$ $16A$ Rod core choke R : $100\Omega \pm 2\%$, Ct : $3\mu F \pm 5\%$ $10kV$ UAc : UR $\pm 5\%$ UR : Rated working voltage Cx : Capacitor under test F : Fuse, Rated $10A$ Ut : Voltage applied to Ct
				5kV time
19	Passive flammability		The burning time should not be exceeded the time 30 s. The tissue paper should not ignite.	The capacitor under test should be held in the flame in the position which best promotes burning. Time of exposure to flame is for 30 s. Length of flame: 12±1mm Gas burner: Length 35mm min. Inside Dia. 0.5±0.1mm Outside Dia. 0.9mm max. Gas: Butane gas Purity 95% min.
				About 8mm Gas burner About 10mm thick board Capacitor Capacitor Tissue
20	Temperature	Appearance	No marked defect.	The capacitor should be subjected to
	Cycle (Compliant with	Capacitance	Char. B: Within ±10%	1000 temperature cycles.
	AEC-Q200)	change D.F.	Char. E : Within ±20% 5.0% max.	Step Temperature(°C) Time(min.) 1 -55+0/-3 30
		I.R.	3000MΩ min.	2 Room temp. 3
		Dielectric	Per Item 6.	3 +125+3/-0 30
		strength		4 Room temp. 3 •Pre-treatment Capacitor should be stored at 125±3°C for 1 h, the placed at *room condition for 24±2 h. •Post-treatment Capacitor should be stored for 24±2 h at *room condition.
21	High Temperature Exposure (Storage) (Compliant with AEC-Q200)	Capacitance	Within ± 20%	Sit the capacitor for 1,000±12 h at 150±3°C.
		change D.F.	5.0% max.	•Pre-treatment
		I.R.	1000MΩ min.	Capacitor should be stored at 125±3°C for 1 h, thei placed at *room condition for 24±2 h. •Post-treatment Capacitor should be stored for 24±2 h at *room condition.
* "rooı	m condition" Tempera	ture: 15 to 35°C	, Relative humidity: 45 to 75%, Atmosp	

No.	Item	1	Specification	Test method
22	Thermal Shock	Appearance	No marked defect except	The capacitor should be subjected to 300 cycles.
	(Compliant with AEC-Q200)	''	color change of outer coating.	Step Temperature(°C) Time(min.)
		Capacitance change	Char. B : Within ±10% Char. E : Within ±20%	1 -55+0/-3 30
		D.F.	5.0% max.	2 125+3/0 30
		I.R.	3000M Ω min.	 Pre-treatment Capacitor should be stored at 125±3°C for 1 h, then placed at *room condition for 24±2 h. Post-treatment Capacitor should be stored for 24±2 h at *room condition.
23	Resistance to Solvents (Compliant with AEC-Q200)	Appearance Capacitance change D.F. I.R.	No marked defect. Char. B : Within $\pm 10\%$ Char. E : Within $\pm 20\%$ 5.0% max. $3000M\Omega$ min.	Per MIL-STD-202 Method 215 Solvent 1 : 1 part (by volume) of isopropyl alcohol 3 parts (by volume) of mineral spirits Solvent 2 : Terpene defluxer Solvent 3 : 42 parts (by volume) of water 1 part (by volume) of propylene glycol monomethyl ether 1 part (by volume) of monoethanolomine
24	Biased Humidity (Compliant with AEC-Q200)	Appearance Capacitance change D.F. I.R.	No marked defect. Char. B : Within $\pm 10\%$ Char. E : Within $\pm 15\%$ 5.0% max. $3000 \text{M}\Omega$ min.	Apply DC1.3+0.2/-0 V (add 100k Ω resistor) at 85±3°C and 80 to 85% humidity for 1,000±12 h. The charge/discharge current is less than 50mA •Pre-treatment Capacitor should be stored at 125±3°C for 1 h, then placed at *room condition for 24±2 h. •Post-treatment Capacitor should be stored for 24±2 h at *room condition.
25	Moisture Resistance (Compliant with AEC-Q200)	Appearance Capacitance change D.F. I.R.	No marked defect. Char. B : Within $\pm 10\%$ Char. E : Within $\pm 20\%$ 5.0% max. $3000 \text{M}\Omega$ min.	Apply the 24 h heat(25 to 65°C) and humidity(80 to 98%) treatment shown below, 10 consecutive times. Temperature Humidity 90-98% 90-98% 90-98% 90-98% 90-98% 90-98% 90-98% 90-98% Humidity 90-98% 90-98% 90-98% Humidity 90-98% 90-98% 90-98% Humidity 90-98% 90-98% 90-98% 90-98% Humidity 90-98% 90-98% Humidity 90-98% 90-98% 90-98% Humidity 90-98% 90-98% Humidity 90-98% 90-98% Humidity 90-98% 90-98% Humidity 90-98% Humidity 90-98% 90-98% Humidity 90-98% Humidity 90-98% 90-98% Humidity 90-98% Humidity 90-98% 90-98% Humidity 9

* "room condition" Temperature: 15 to 35°C, Relative humidity: 45 to 75%, Atmospheric pressure: 86 to 106kPa

6.Packing specification

•Bulk type (Package : B)

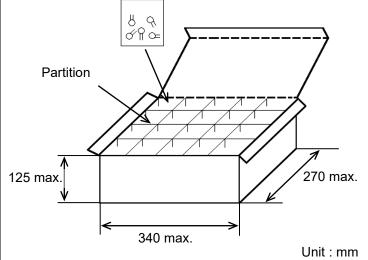
*1 The number of packing = Packing quantity \times n

The size of packing case and packing way

Polyethylene bag

*1 : Please refer to [Part number list].

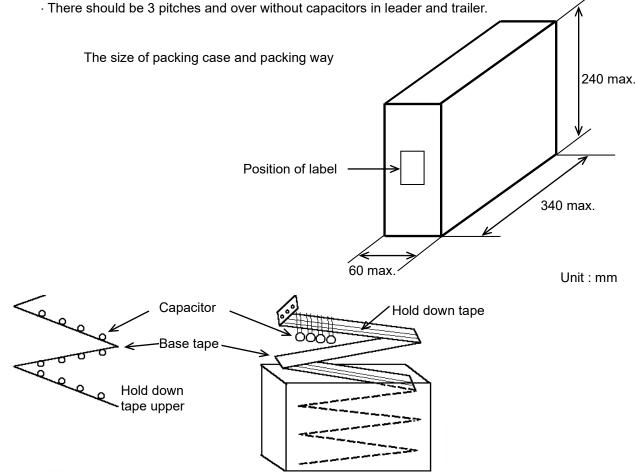
*2 : Standard n = 20 (bag)



Note)

The outer package and the number of outer packing be changed by the order getting amount.

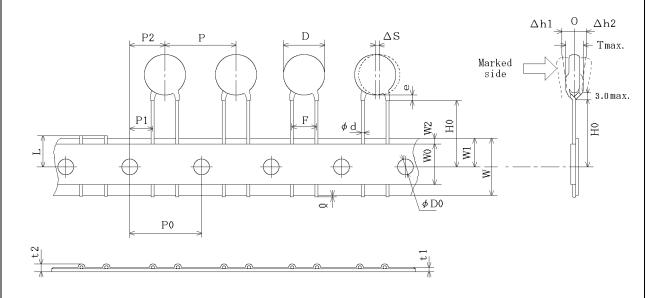
- •Ammo pack taping type (Package : A)
 - · The tape with capacitors is packed zigzag into a case.
 - \cdot When body of the capacitor is piled on other body under it.



7. Taping specification

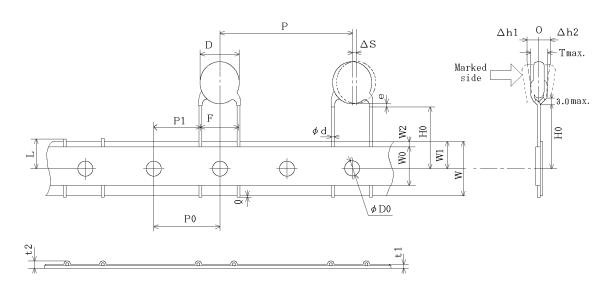
7-1. Dimension of capacitors on tape

Vertical crimp taping type < Lead Style : N3 > Pitch of component 15.0mm / Lead spacing 7.5mm



Item	Code	Dimensions	Remarks
Pitch of component	Р	15.0±2.0	
Pitch of sprocket hole	P0	15.0±0.3	
Lead spacing	F	7.5±1.0	
Length from hole center to component center Length from hole center to lead		7.5±1.5	Deviation of progress direction
		3.75±1.0	
Body diameter	D	Please refer to [Part number list].
Deviation along tape, left or right	ΔS	0±2.0	They include deviation by lead bend .
Carrier tape width	W	18.0±0.5	
Position of sprocket hole	W1	9.0±0.5	Deviation of tape width direction
Lead distance between reference and bottom planes	Н0	18.0± ^{2.0}	
Protrusion length	Q	+0.5~-1.0	
Diameter of sprocket hole	φ D 0	4.0±0.1	
Lead diameter	φd	0.60±0.05	
Total tape thickness	t1	0.6±0.3	
Total thickness, tape and lead wire	t2	1.5 max.	They include hold down tape thickness.
Deviation across tape, front	Δh1 Δh2	2.0 max.	
Deviation across tape, rear			
Portion to cut in case of defect	L	11.0± ⁰ _{1.0}	
Hold down tape width	W0	11.5 min.	
Hold down tape position	W2	1.5±1.5	
Coating extension on lead	е	Up to the end of	crimp
Body thickness	Т	Please refer to [Part number list].	

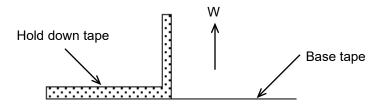
Vertical crimp taping type < Lead Style : N4 > Pitch of component 25.4mm / Lead spacing 10.0mm



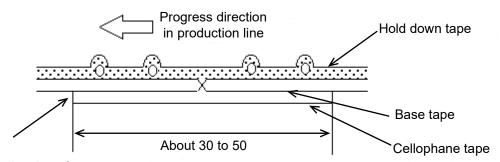
Item	Code	Dimensions	Remarks
Pitch of component		25.4±2.0	
Pitch of sprocket hole		12.7±0.3	
Lead spacing	F	10.0±1.0	
Length from hole center to lead	P1	7.7±1.5	
Body diameter	D	Please refer to [Part number list].	
Deviation along tape, left or right		0±2.0	They include deviation by lead bend .
Carrier tape width	W	18.0±0.5	
Position of sprocket hole	W1	9.0±0.5	Deviation of tape width direction
Lead distance between reference and bottom planes	Н0	18.0± ₀ ^{2.0}	
Protrusion length	Q	+0.5~-1.0	
Diameter of sprocket hole	φD0	4.0±0.1	
Lead diameter	φd	0.60±0.05	
Total tape thickness	t1	0.6±0.3	
Total thickness, tape and lead wire	t2	1.5 max.	They include hold down tape thickness.
Deviation across tape, front	∆h1	2.0 max.	
Deviation across tape, rear	∆h2		
Portion to cut in case of defect	L	11.0± _{1.0}	
Hold down tape width	W0	11.5 min.	
Hold down tape position	W2	1.5±1.5	
Coating extension on lead	е	Up to the end of crimp	
Body thickness	Т	Please refer to [Part number list].	

7-2. Splicing way of tape

1) Adhesive force of tape is over 3N at test condition as below.



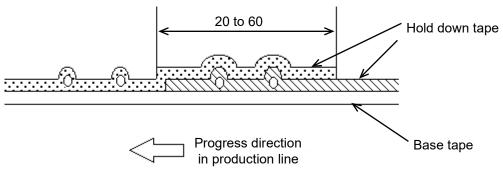
- 2) Splicing of tape
 - a) When base tape is spliced
 - •Base tape should be spliced by cellophane tape. (Total tape thickness should be less than 1.05mm.)



No lifting for the direction of progressing

Unit: mm

- b) When hold down tape is spliced
 - •Hold down tape should be spliced with overlapping. (Total tape thickness should be less than 1.05mm.)



- c) When both tape are spliced
 - •Base tape and hold down tape should be spliced with splicing tape.
- 3) Missing components
 - •There should be no consecutive missing of more than three components.
 - •The number of missing components should be not more than 0.5% of total components that should be present in a Ammo pack.