

Multi-layer ceramic chip capacitors

MCH31 (3216 (1206) size, chip capacitor)

●Features

- 1) Miniature, high capacitance
- 2) Achieved high capacitance by thin and multi layer technology
- 3) Lead-free plating terminal
- 4) No polarity

●Quick Reference

The design and specifications are subject to change without prior notice. Please check the most recent technical specifications prior to placing orders or using the product. For more detail information regarding packaging style code, please check product designation.

●Thermal compensation

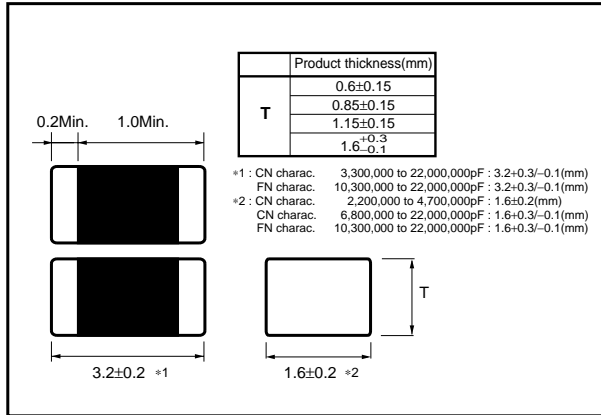
Part No.	Size code	Temperature characteristics		Operating temp. range (°C)	Rated voltage (V)	Capacitance (pF)	Capacitance tolerance	Thickness (mm)
		code	(ppm/°C)					
MCH31	3216 (1206)	A (AN)	0±30 (CG) (C0G)	-55 to +125	50	4,700 to 6,800 (E12 Series)	J(±5%)	0.6 ± 0.15
						8,200 to 10,000 (E12 Series)		0.85 ± 0.15
						15,000 to 22,000 (E12 Series)		1.15 ± 0.15
						33,000 (E12 Series)		1.6 ± 0.2

●High dielectric constant

Part No.	Size code	Temperature characteristics		Operating temp. range (°C)	Rated voltage (V)	Capacitance (pF)	Capacitance tolerance	Thickness (mm)		
		code	(ppm/°C)							
MCH31	3216 (1206)	CN	±10% (B)	-25 to +85	50	220 to 68,000 (E6 Series)	K(±10%)	0.6 ± 0.15		
						100,000 (E6 Series)		0.85 ± 0.15		
						150,000 to 330,000 (E6 Series)		1.15 ± 0.15		
					470,000 (E6 Series)	1.6 ^{+0.3} _{-0.1}				
					680,000 (E6 Series)	0.85 ± 0.15				
					220 to 68,000 (E6 Series)	0.6 ± 0.15				
			-55 to +125	50	100,000 (E6 Series)	0.85 ± 0.15				
					150,000 to 330,000 (E6 Series)	1.15 ± 0.15				
					470,000 (E6 Series)	1.6 ^{+0.3} _{-0.1}				
				25	680,000 (E6 Series)	0.85 ± 0.15				
					1,000,000 (E6 Series)	0.85 ± 0.15				
					1,500,000 to 4,700,000 (E6 Series)	1.6 ^{+0.3} _{-0.1}				
		-55 to +85	16	6,800,000 to 10,000,000 (E6 Series)	1.6 ^{+0.3} _{-0.1}					
				10	22,000,000 (E3 Series)	0.85 ± 0.15				
					1,000,000 (E3 Series)	0.85 ± 0.15				
			FN		+30% , -80% (F)	-25 to +85	50	2,200,000 (E3 Series)	Z(+80% , -20%)	1.15 ± 0.15
				4,700,000 (E3 Series)				1.15 ± 0.15		
				10,000,000 (E3 Series)				1.6 ^{+0.3} _{-0.1}		
		25		22,000,000 (E3 Series)			0.85 ± 0.15			
				47,000,000 (E3 Series)			0.85 ± 0.15			
				1,000,000 (E3 Series)			1.15 ± 0.15			
		-30 to +85	50	-30 to +85	25	4,700,000 (E3 Series)	Z(+80% , -20%)	1.15 ± 0.15		
						16		10,000,000 (E3 Series)		1.6 ^{+0.3} _{-0.1}
								10		22,000,000 (E3 Series)
6.3	47,000,000 (E3 Series)		0.85 ± 0.15							
	50		-30 to +85	25	4,700,000 (E3 Series)	Z(+80% , -20%)				1.15 ± 0.15
					16			10,000,000 (E3 Series)		1.6 ^{+0.3} _{-0.1}
10		22,000,000 (E3 Series)						0.85 ± 0.15		
	6.3	47,000,000 (E3 Series)	0.85 ± 0.15							

Ceramic capacitors

●External dimensions (Unit : mm)



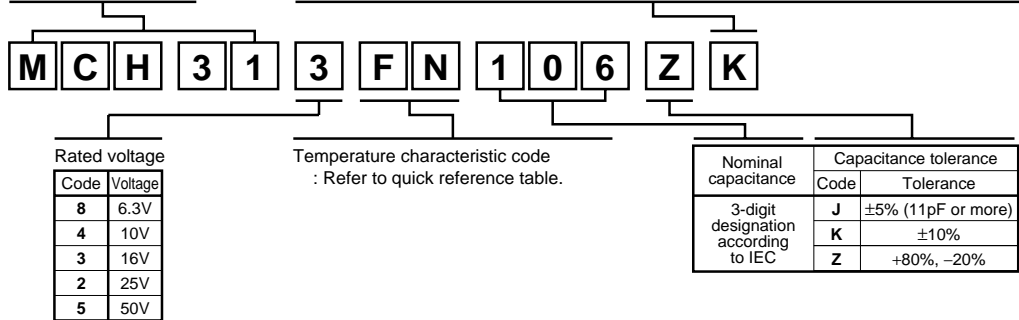
●Product designation

Code	Product thickness	Packing specification	Reel	Basic ordering unit (pcs.)
K	0.6mm	Paper tape (width 8mm, pitch 4mm)	φ180mm (7in.)	4,000
K	0.85mm	Paper tape (width 8mm, pitch 4mm)	φ180mm (7in.)	4,000
P	1.15mm	Plustic tape (width 8mm, pitch 4mm)	φ180mm (7in.)	2,000
P	1.60mm	Plustic tape (width 8mm, pitch 4mm)	φ180mm (7in.)	1,000

Reel (φ180mm) : compatible with EIAJ ET-7200A

Part No.

Packing Style



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•Performance and test method

No.	Items	Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)													
1	Appearance and dimensions	No marked defects shall be allowed for appearance. Dimensions shall be as specified the clause 4.	As per 4.4 of JIS C 5101-1. As per 4.5 of JIS C 5101-10 Using a Magnifier.													
2	Withstanding voltage	No dielectrical breakdown or other damage shall be allowed.	As per 4.6 of JIS C 5101-1. As per 4.6.4 of JIS C 5101-10 Voltage shall be applied as per Table1. <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Table 1</caption> <thead> <tr> <th>Charac- teristic</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>A, AN</td> <td>300% Rated voltage</td> </tr> <tr> <td>CN</td> <td rowspan="2">250% Rated voltage</td> </tr> <tr> <td>FN</td> </tr> </tbody> </table> Voltage shall be applied for 1 to 5s with 50mA charging and discharging current.	Charac- teristic	Voltage	A, AN	300% Rated voltage	CN	250% Rated voltage	FN						
Charac- teristic	Voltage															
A, AN	300% Rated voltage															
CN	250% Rated voltage															
FN																
3	Insulation resistance	Not less than 10000MΩ or 500MΩ · μF, whichever is less. (For products with rated voltage less than 16V, it is not less than 10000MΩ or 100MΩ · μF, whichever is less.)	As per 4.5 of JIS C 5101-1. As per 4.6.3 of JIS C 5101-10 Measurements shall be made after 60+/-5s period of the rated voltage applied.													
4	Capacitance	Capacitance shall be within specified tolerance range.	As per 4.7 of JIS C 5101-1. As per 4.6.1 of JIS C 5101-10 Measurements shall be made under the conditions specified in Table 2. <table border="1" style="margin-left: auto; margin-right: auto;"> <caption>Table 2</caption> <thead> <tr> <th>Charac- teristic</th> <th colspan="2">Frequency · Voltage</th> </tr> </thead> <tbody> <tr> <td rowspan="2">A, AN</td> <td>≤ 1000pF</td> <td>> 1000pF</td> </tr> <tr> <td>1+/-0.1MHz 1+/-0.1Vrms.</td> <td>1+/-0.1kHz 1+/-0.1Vrms.</td> </tr> <tr> <td rowspan="2">CN</td> <td>≤ 10μF</td> <td>> 10μF</td> </tr> <tr> <td>1+/-0.1KHz 1+/-0.1Vrms.</td> <td>120+/-24Hz 0.5+/-0.2Vrms.</td> </tr> </tbody> </table>	Charac- teristic	Frequency · Voltage		A, AN	≤ 1000pF	> 1000pF	1+/-0.1MHz 1+/-0.1Vrms.	1+/-0.1kHz 1+/-0.1Vrms.	CN	≤ 10μF	> 10μF	1+/-0.1KHz 1+/-0.1Vrms.	120+/-24Hz 0.5+/-0.2Vrms.
Charac- teristic	Frequency · Voltage															
A, AN	≤ 1000pF	> 1000pF														
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5	Dielectric loss tangent	<table border="1" style="width: 100%;"> <tbody> <tr> <td style="width: 10%;">A, A N</td> <td style="width: 80%;">tan δ ≤ 0.1%</td> </tr> <tr> <td>C N</td> <td>Rated voltage ≥ 25V tan δ ≤ 3.0% Rated voltage=16,10V tan δ ≤ 5.0% Rated voltage=6.3V tan δ ≤ 10.0%</td> </tr> <tr> <td>F N</td> <td>Rated voltage=50V tan δ ≤ 5.0% Rated voltage=25V tan δ ≤ 7.5% Rated voltage=16V tan δ ≤ 10.0% Rated voltage=10V,6.3V tan δ ≤ 12.5%</td> </tr> </tbody> </table>	A, A N	tan δ ≤ 0.1%	C N	Rated voltage ≥ 25V tan δ ≤ 3.0% Rated voltage=16,10V tan δ ≤ 5.0% Rated voltage=6.3V tan δ ≤ 10.0%	F N	Rated voltage=50V tan δ ≤ 5.0% Rated voltage=25V tan δ ≤ 7.5% Rated voltage=16V tan δ ≤ 10.0% Rated voltage=10V,6.3V tan δ ≤ 12.5%	As per 4.8 of JIS C 5101-1. As per 4.6.2 of JIS C 5101-10 Measurements shall be made under the conditions specified in Table 2.							
A, A N	tan δ ≤ 0.1%															
C N	Rated voltage ≥ 25V tan δ ≤ 3.0% Rated voltage=16,10V tan δ ≤ 5.0% Rated voltage=6.3V tan δ ≤ 10.0%															
F N	Rated voltage=50V tan δ ≤ 5.0% Rated voltage=25V tan δ ≤ 7.5% Rated voltage=16V tan δ ≤ 10.0% Rated voltage=10V,6.3V tan δ ≤ 12.5%															

Ceramic capacitors

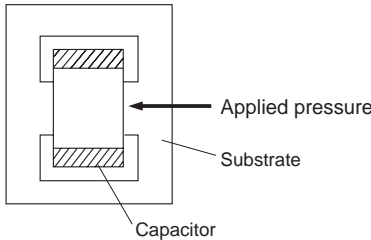
No.	Items	Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)	
6	Temperature characteristic	A, A N	0+/-30ppm / °C (-55°C to +125°C)	
		C N	X7R R	+/-15% (-55°C to +125°C)
			B	+/-10% (-25°C to +85°C)
		F N	X5R	+/-15% (-55°C to +85°C)
7	Solderability	More than 3/4 of each end termination shall be covered with new solder.	As per 4.15.2 of JIS C 5101-1. As per 4.11 of JIS C 5101-10 The solder specified in JIS Z 3282 H63A shall be used. Ans the flux containing 25% rosin and ethanol solution shall be used. The specimens shall be immersed into the solder at 235+/-5°C for 2+/-0.5s So that both end terminations are completely under solder.	
8	Resistance to soldering heat	Appearance	Without mechanical damage.	
		Change rate from initial value	A, A N	Within +/-2.5%
			C N	Within +/-7.5%
			F N	Within +/-20%
		Dielectric loss tangent	Within specified initial value.	
		Insulation resistance	Within specified initial value.	
Withstanding voltage	No defects shall be allowed.			
9	End termination adherence	Without peeling or sign of peeling shall be allowed on the end terminations.	As per 4.13 of JIS C 5101-1. As per 4.8 of JIS C 5101-10 A 5N weight for 10+/-1s shall be applied to the soldered specimens as shown by the arrow mark in the below sketch. 	

Table3

Charac-teristic	Time
A, AN	24+/-2 h
CN, FN	48+/-4 h

Ceramic capacitors

No.	Items		Performance		Test Method (As per JIS C 5101-1, JIS C 5101-10)																					
10	Bending strength	Appearance	Without mechanical damage.		As per 4.35 of JIS C 5101-1. As per 4.9 of JIS C 5101-10 Glass epoxy board with soldered specimens shall be bent till 1mm by 1.0mm/s.																					
11	Vibration	Appearance	Without mechanical damage.		As per 4.17 of JIS C 5101-1. The specimens shall be soldered on the specified test jig. Initial measurements shall be made after the thermal pre-conditioning specified in Remarks(1). Final measurements shall be made after the specimens have been left at room temperature as per Table3. [Condition] Directions : 2h each X, Y and Z directions Total : 6h Frequency range : 10 to 55 to 10Hz(1min) Applitude : 1.5mm (shall not exceed acceleration 196m/s ²) Table3 <table border="1"> <thead> <tr> <th>Charac-teristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>A, AN</td> <td>24+/-2 h</td> </tr> <tr> <td>CN, FN</td> <td>48+/-4 h</td> </tr> </tbody> </table>	Charac-teristic	Time	A, AN	24+/-2 h	CN, FN	48+/-4 h															
		Charac-teristic	Time																							
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Change rate from initial value	A, A N	Capacitance shall be within specified tolerance range.																								
	C N	Within +/-7.5%																								
	F N	Within +/-20%																								
	Dielectric loss tangent	Within specified initial value.																								
12	Temperature cycling	Appearance	Without mechanical damage.		As per 4.16 of JIS C 5101-1 As per 4.12 of JIS C 5101-10 The specimens shall be soldered on the test jig shown in Remarks. Temperature cycle : 100cycles Initial measurements prior to test shall be performed after the thermal per-conditioning specified in Remarks (1). Final measurements shall be made after the specimens have been left at room temperature as per Table3. Test condition <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min operating temp.</td> <td>30+/-3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>≤ 3</td> </tr> <tr> <td>3</td> <td>Max operating temp.</td> <td>30+/-3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>≤ 3</td> </tr> </tbody> </table> Table3 <table border="1"> <thead> <tr> <th>Charac-teristic</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>A, AN</td> <td>24+/-2 h</td> </tr> <tr> <td>CN, FN</td> <td>48+/-4 h</td> </tr> </tbody> </table>	Step	Temp. (°C)	Time (min)	1	Min operating temp.	30+/-3	2	Room temp.	≤ 3	3	Max operating temp.	30+/-3	4	Room temp.	≤ 3	Charac-teristic	Time	A, AN	24+/-2 h	CN, FN	48+/-4 h
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	F N	Within +/-20%																								
	Dielectric loss tangent	Within specified initial value.																								
	Insulation resistance	Within specified initial value.																								
	Withstanding voltage	No defects shall be allowed.																								

Ceramic capacitors

No.	Items	Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)						
13	Humidity (Steady)	Appearance	Without mechanical damage.	As per 4.22 of JIS C 5101-1 JIS C 5101-10 Test temperature : 60+/-2°C Relative humidity : 90 to 95% Test time : 500 +24/-0 h Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2). Final measurements have been left at room temperature as per Table3.					
		Change rate from initial value	A, A N		Within +/-5.0%				
			C N		Rated voltaeg 25V,16V,10V	Within +/-12.5%			
					Rated voltaeg 6.3V	Within +/-25.0%			
			F N		Within +/-30%				
		Dielectric tangent	A, A N		$\tan \delta \leq 0.3\%$				
			C N		Less than 200% of initial spec.				
F N	Less than 150% of initial spec.								
Insulation resistance	Not less than 1000MΩ or 50MΩ · μF, whichever is less. (For products with rated voltage less than 16V, it is not less than 1000MΩ or 10MΩ · μF, whichever is less.)								
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Charac-teristic	Time								
A, AN	24+/-2 h								
CN, FN	48+/-4 h								
14	Humidity life test	Appearance	Without mechanical damage.	As per 4.22 of JIS C 5101-1 As per 4.14 of JIS C 5101-10 Test temperature : 60+/-2°C Relative humidity : 90 to 95% Voltage : Rated voltage Test time : 500 +24/-0 h Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2). Final measurements shall be made after the specimens have been left at room temperature as per Table3.					
		Change rate from initial value	A, A N		Within +/-7.5%				
			C N		Rated voltaeg 25V,16V,10V	Within +/-12.5%			
					Rated voltaeg 6.3V	Within +/-25.0%			
			F N		Within +/-30%				
		Dielectric loss tangent	A, A N		$\tan \delta \leq 0.5\%$				
			C N		Less than 200% of initial spec.				
F N	Less than 150% of initial spec.								
Insulation resistance	Not less than 500MΩ or 25MΩ · μF, whichever is less. (For products with rated voltage less than 16V, it is not less than 500mΩ or 5MΩ · μF, whichever is less.)								
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Charac-teristic	Time								
A, AN	24+/-2 h								
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Ceramic capacitors

No.	Items	Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)																			
15	Heat life test	Appearance	Without mechanical damage.																			
		Change rate from initial value	A, A N	Within +/-3.0%																		
			C N	Rated voltage 25V,16V,10V	Within +/-15%																	
				Rated voltage 6.3V	Within +/-25%																	
			F N	Within +/-30%																		
		Dielectric loss tangent	A, A N	$\tan \delta \leq 0.5\%$																		
			C N	Less than 200% of initial spec.																		
			F N	Less than 150% of initial spec.																		
		Insulation resistance	Not less than 1000MΩ or 50MΩ · μF, whichever is less. (For products with rated voltage less than 16V, it is not less than 1000mΩ or 10MΩ · μF, whichever is less.)																			
					As per 4.23 of JIS C 5101-1. As per 4.15 of JIS C 5101-10																	
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A, AN	24+/-2 h																					
CN, FN	48+/-4 h																					

[Remarks]

Pre-conditioning

If specified in test method of as per 3(Performance and test method), capacitors of CN, FN characteristics shall be pre-conditioned as follows.

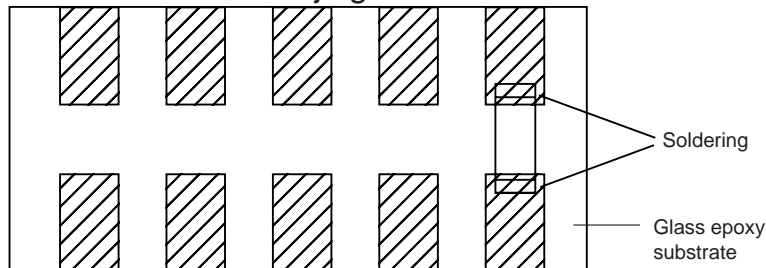
(1) Thermal pre-conditioning

Prior to initial measurements, specimens shall be conditioned at a temperature of 150 0/-10°C for a period of 1hr., and shall be allowed to stabilize at room temperature for 48+/-4h

(2) Voltage pre-conditioning

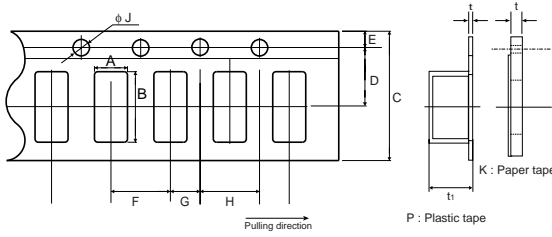
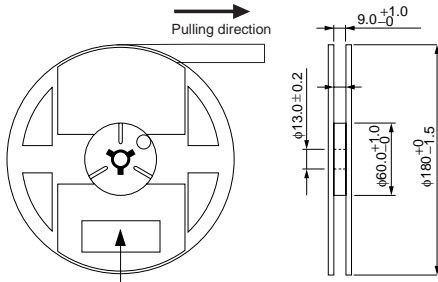
Prior to initial measurements, voltage specified as a test condition shall be applied to specimens for a period of 1hr., and the specimens shall be allowed to stabilize at room temperature for 48+/-4h

< Test jig >



Ceramic capacitors

●Packaging specifications

Taping dimensions	Reel dimensions																																									
 <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Symbol</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</th> <th>H</th> <th>J</th> <th>t</th> <th>t</th> <th>t1</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Paper</td> <td>Plastic</td> <td></td> </tr> </thead> <tbody> <tr> <td>Dimensions</td> <td>8.0 +/-0.3</td> <td>3.5 +/-0.05</td> <td>1.75 +/-0.1</td> <td>4.0 +/-0.1</td> <td>2.0 +/-0.05</td> <td>4.0 +/-0.1</td> <td>φ1.5 +0.1/-0</td> <td>1.1 MAX.</td> <td>0.3 MAX.</td> <td>2.5 MAX.</td> </tr> </tbody> </table> <p style="text-align: center;">(Unit : mm)</p> <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th>Style</th> <th>Symbol</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>MCH31</td> <td></td> <td>1.9+/-0.2</td> <td>3.5+/-0.2</td> </tr> </tbody> </table> <p style="text-align: center;">(Unit : mm)</p>	Symbol	C	D	E	F	G	H	J	t	t	t1									Paper	Plastic		Dimensions	8.0 +/-0.3	3.5 +/-0.05	1.75 +/-0.1	4.0 +/-0.1	2.0 +/-0.05	4.0 +/-0.1	φ1.5 +0.1/-0	1.1 MAX.	0.3 MAX.	2.5 MAX.	Style	Symbol	A	B	MCH31		1.9+/-0.2	3.5+/-0.2	 <p style="text-align: center;">As per EIAJ ET-7200A</p> <p style="text-align: right;">(Unit : mm)</p>
Symbol	C	D	E	F	G	H	J	t	t	t1																																
								Paper	Plastic																																	
Dimensions	8.0 +/-0.3	3.5 +/-0.05	1.75 +/-0.1	4.0 +/-0.1	2.0 +/-0.05	4.0 +/-0.1	φ1.5 +0.1/-0	1.1 MAX.	0.3 MAX.	2.5 MAX.																																
Style	Symbol	A	B																																							
MCH31		1.9+/-0.2	3.5+/-0.2																																							

(1) The quantity for one reel is as bellows.

Kind of reel	Series	Paper tape		Plastic tape	
		Quantity	Symbol	Quantity	Symbol
φ180 reel	MCH31	4,000 pcs.	K	2,000 pcs.	P

(2) When the tape is pulled out towards the operator with the cover tape facing upward, the feeding holes shall be found on the right portion of the tape.

(3) Specification of beginning and ending of the tape are as follows.

- Ending(reel's center) : Approx. Over 160mm (no chips)
- Beginning(reel's round) : Approx. Over 160mm (no chips)
- : Approx. 240mm (cover tape only)

(4) No juncture of tape shall be allowed.

(5) The share strength of tape shall be more than 5N at the break down strength.

(6) The peel strength of the cover tape shall be 0.1 to 0.7(N) when the cover tape are peeled 0 to 15° degree from the surface.

(7) The number of missing components shall not exceed 0.1% of the total number of components (marked number) or one whichever is the larger, and no consecutive missing exceeding two is allowed.

(8) The reels made from resin shall be used, as per EIAJ ET-7200A.

●Marking

No marking shall be performed on the chip.

Trademark, parts number, quantity, lot No. , and country of origin shall be labeled on each reel.

●Numbering system for LOT No.

Example

<u>04</u>	<u>01</u>	<u>A0001</u>	<u>F</u>
(1)	(2)	(3)	(4)

- (1) The end of the Christian Era <two digits> of production finish.
- (2) Week in completing part of production finish.
- (3) Manufacture continuity number.
- (4) The symbol of manufacturing plant.

Ceramic capacitors

●Label expression

The Figure below is label expression

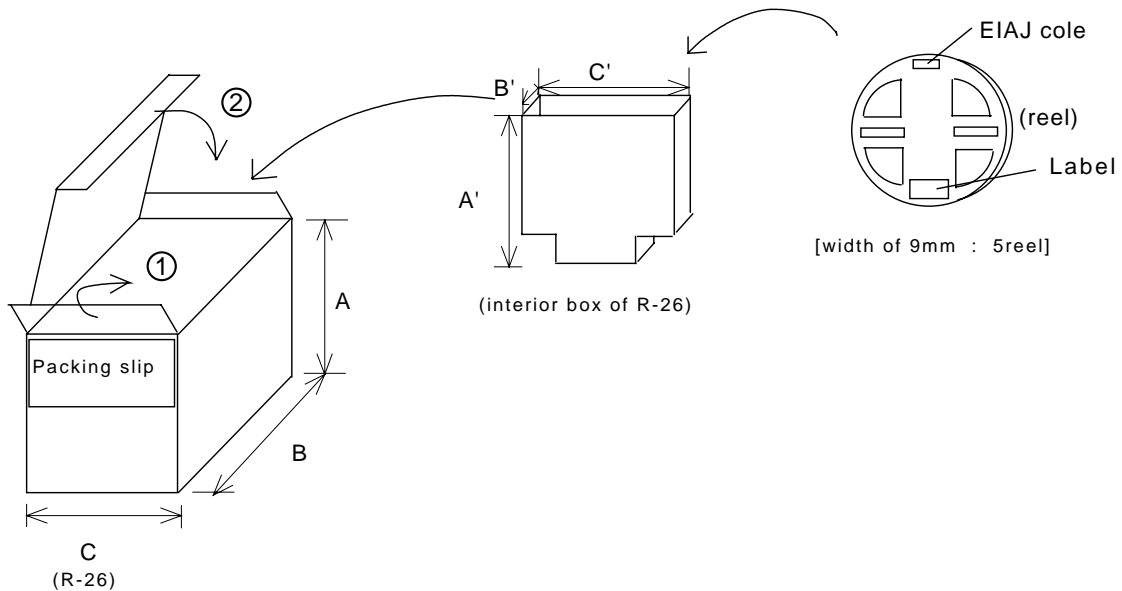
< Label Example > Part Number : MCH315A103JK



- ① Part Number
- ② Division cord
- ③ Quantity
- ④ Lot No.
- ⑤ The Country of origin
- ⑥ Inspector
- ⑦ QR code
- ⑧ Trademark

●Packing method

1) ϕ 180mm Reel



Ceramic capacitors

< Packaging unit >

Symbol	K
Quantity of reel in interior box	5
Quantity of reel in box of R-26	20

Dimensions	Packaging	
	R-26	interior box of R-26
A (A')	195	185
B (B')	255	60
C (C')	190	185

(Unit : mm)

< Appearance >

Carton

< Accumulation >

You must do accumulation by ten boxes

< Packaging slip >

1. Customer
2. Parts number
3. Quantity
4. Box quantity
5. Trade mark

Notes

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