

# PRODUCT SPECIFICATION

**PRODUCT: MULTILAYER CERAMIC CAPACITOR**

**TYPE: RADIAL-LEADED TYPE CAPACITOR**

**CUSTOMER:** \_\_\_\_\_

**DOC. NO.:** **D13-00-E-21**

**Ver.:** **21**

**APPROVED BY CUSTOMER**



**VENDOR :**

**WALSGIN TECHNOLOGY CORPORATION**

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TAO-YUAN, TAIWAN

**PAN OVERSEAS (GUANGZHOU) ELECTRONIC CO.,LTD.**  
NO.277, HONG MING ROAD, EASTERN SECTION,  
GUANG ZHOU ECONOMIC AND TECHNOLOGY  
DEVELOPMENT ZONE, CHINA

**MAKER : PAN OVERSEAS (GUANGZHOU) ELECTRONIC CO.,LTD.**

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Record of change

Date	Version	Description	page
2009.6.24	3	1. Add voltage code in Marking.	14
2009.8.17	4	1. Change PSA & POE logo to Walsin & POE logo.	all
2012/5/31	5	1. Review the capacitance range.	13~14
2012/11/20	6	1. Add “Table of contents”. 2. Review the body size W/H/T according to the chip size. 3. Review the contents of description. 4. Correct the size of P1 for type RD20.	3 4 11 13
2013/5/6	7	1. Review the Lead diameter $\phi$ from $0.55\pm0.05$ mm to $0.5+-0.05$ mm 2. Add “H1 max” to lead configuration and size form. 3. Review the Solderability temperature from $235\pm5^{\circ}\text{C}$ to $245\pm5^{\circ}\text{C}$ , Solderability time from $2\pm0.5$ s to $5\pm0.5$ s”	4,12,13 4 8
2014/8/8	8	1. Review the item 8 from “Storing condition and term” to be “Operating and storage environment” 2. Delete the 1206size for RD20 type. 3. Delete the 500V ~630V type of 0805 size. 4. Review the D.F. spec according to MLCC spec of Walsin.	11 4 14 6,8,9,10
2015/11/24	9	1. Review the Part number defining. 2. Add the 1812 size for the D.F. spec according to MLCC spec of Walsin. 3. Review the Packing quantity. 4. Add voltage code in Marking for 2000V&3000V.	4 6,8,9,10 14 15
2016/9/19	10	1. Review the Part number defining. 2. Review the Size code and capacitance (pF) available	4 15~17
2017/3/23	11	1. Delete the C Tolerance Code 2. Review the Packing specification	4 15
2017/7/7	12	1. Review the Part number defining 2. Complete Marking statement(Add 2-figure code Marking)	4 18
2017/11/8	13	1. Review the Part number defining ( add the 2220 size ) . 2. Review the D.F. spec according to MLCC spec of Walsin. 3. Add voltage code in Marking for 1500V & 2500V.	4 6,8,9,10 15
2018/12/19	14	1. Review the D.F. spec according to MLCC spec of Walsin. 2. Review the Size code and capacitance (pF) available	6,8,9,10 15~17
2020/10/29	15	1. Review the taping figure and specification	12~14
2021/3/26	16	1. Review the D.F. spec according to MLCC spec of Walsin. 2. Review the Size code and capacitance (pF) available	6~10 15~17
2021/9/9	17	1. Delete Walsin & POE logo.	1
2022/1/8	18	1. Add “Soldering Recommendation”	13
2022/4/21	19	1. Add “List of substances that affect the insulation strength of coating” in 7. Description.	12
2022/11/9	20	1. Due to the Y5V Dielectric EOL, delete Y5V Dielectric products.	4,5~10,19
2023/6/15	21	1. The 15th code “L” is changed from “Ag/Ni/Sn” to “Ag/Ni/Sn Halogen free”. 2. The 15th code “C” is changed from “Cu/Ni/Sn” to “Cu/Ni/Sn Halogen free”.	4

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**1. Scope:**

Its specification applies to Radial Series Ceramic Capacitor.

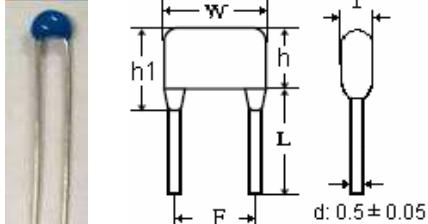
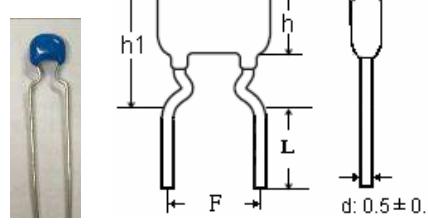
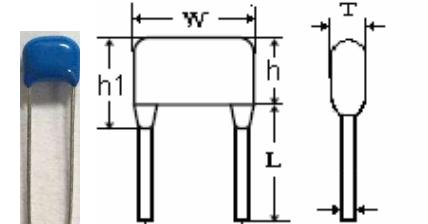
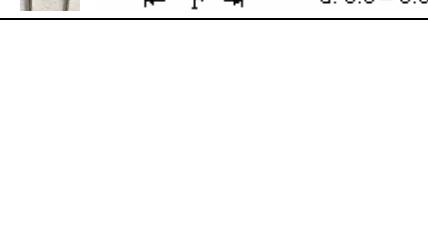
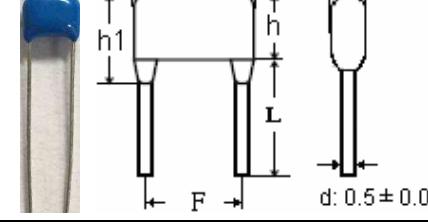
**2. Part number defining (SAP):**

RD21	B				102	K	500	B	5	C	07	B
Product Type	Dielectric Code				Capacitance Code	Tolerance Code	Rated Voltage	Packaging Code	Chip Size	Termination	Lead length	Lead length Tolerance
RD20	Code	T.C.	Operating Temperature	Capacitance Change( $\Delta$ °C)	100=10 pF	D=±0.5pF	500=50V	B=Bulk	5=0805	Code	Tapping: AN=Ammo	D=Tapping
RD21					102=1000 pF	J=±5 %	101=100V		6=1206	L	Ag/Ni/Sn	
RD30	N	NPO	-55 ~ +125 °C	0±30(PPM/°C)	103=10000 pF	K=±10 %	201=200V	A=Ammo	0=1210		Halogen free	
					1R5=1.5 pF	M=±20 %	251=250V		2=1812	A	Bulk (ex):	
					101=100 pF		501=500V		8=1808	C	3E=3.5 mm	
					472=4700 pF		631=630V		B=2220	H	05=5.0 mm	
	B	X7R	-55 ~ +125 °C	±15%	104=100000 pF		102=1000V				07=7.0 mm	C=Min
							202=2000V					
							302=3000V					

\* Remark about tolerance code:

NPO: Cap<10pF: D tolerance / Cap $\geq$ 10pF: J, K, M, Z, X7R: K · M

**3. Lead configuration and size: (Unit: mm)**

Type Code	Chip size	Dimensions (Unit:mm)						Lead Configuration	
		Width (W)Max.	Height (Max.)		Thickness (T)Max.	Lead length (L)	Lead spacing(F)		
			h	h1			Taping	Bulk	
RD20	0805	5.0	4.5	6.0	3.5		2.5±0.8	2.54±1.0	 Detailed description: A diagram showing a cylindrical component with two leads. The lead length (L) is 3.5mm. The lead spacing (F) is 2.5mm. The lead diameter (d) is 0.5mm. The lead height (h) is 6.0mm, and the lead base height (h1) is 4.5mm.
RD21	0805	5.0	4.5	6.5	3.5	Refer to the item "2. SAP Part Number"	5.0±0.8	5.08±1.0	 Detailed description: A diagram showing a cylindrical component with two leads. The lead length (L) is 3.5mm. The lead spacing (F) is 5.0mm. The lead diameter (d) is 0.5mm. The lead height (h) is 6.5mm, and the lead base height (h1) is 4.5mm.
	1206	6.5	5.0	7.0	4.0				 Detailed description: A diagram showing a cylindrical component with two leads. The lead length (L) is 4.0mm. The lead spacing (F) is 5.0mm. The lead diameter (d) is 0.5mm. The lead height (h) is 7.0mm, and the lead base height (h1) is 5.0mm.
	1210 (Special size)	6.5	5.5	7.5	5.0				 Detailed description: A diagram showing a cylindrical component with two leads. The lead length (L) is 5.0mm. The lead spacing (F) is 5.0mm. The lead diameter (d) is 0.5mm. The lead height (h) is 7.5mm, and the lead base height (h1) is 5.5mm.
RD30	1808	8.0	6.0	7.5	5.5		5.0±0.8	5.08±1.0	 Detailed description: A diagram showing a cylindrical component with two leads. The lead length (L) is 5.5mm. The lead spacing (F) is 5.0mm. The lead diameter (d) is 0.5mm. The lead height (h) is 7.5mm, and the lead base height (h1) is 6.0mm.
	1812	8.0	6.5	8.0	5.5				 Detailed description: A diagram showing a cylindrical component with two leads. The lead length (L) is 5.5mm. The lead spacing (F) is 5.0mm. The lead diameter (d) is 0.5mm. The lead height (h) is 8.0mm, and the lead base height (h1) is 6.5mm.
	2220 *(Special size)	9.0	9.0	10.0	6.0				 Detailed description: A diagram showing a cylindrical component with two leads. The lead length (L) is 6.0mm. The lead spacing (F) is 5.0mm. The lead diameter (d) is 0.5mm. The lead height (h) is 10.0mm, and the lead base height (h1) is 9.0mm.

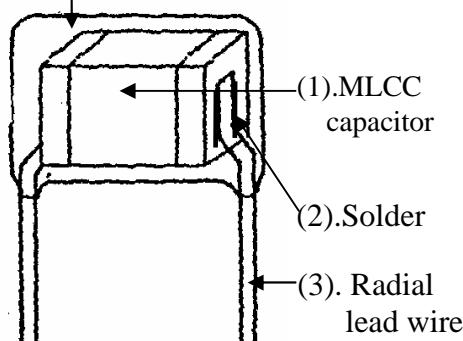
\* Lead diameter  $\Phi d$ : 0.5 +/-0.05mm

\* Special size : Customized

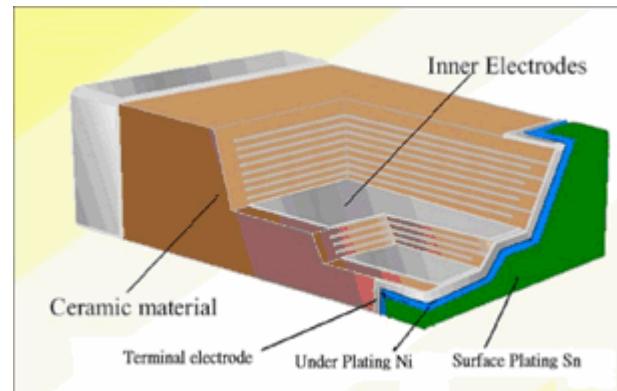
#### 4. Product structure:

##### Radial capacitor

(4) Epoxy coating



(1). MLCC capacitor



NO	Part name	Material
(1)	MLCC capacitor	Ceramic dielectric
		Internal Electrode Ag-Pd or Ni (BME)
		Terminal electrode Ag or Cu (BME) layer
		Under Plating Ni layer
		Surface Plating Sn layer
(2)	Solder	Tin-silver
(3)	Radial Lead Wire	Tinned CP wire
(4)	Coating	Epoxy resin(Blue)

#### 5. Specification and test method :

##### 5.1 Test conditions:

Tests shall, unless otherwise specified, be carried out at 15 to 35°C and RH 45 to 75%. If any doubt and argument has been encounter in judgement, the final test shall be done at 25±2°C, RH45 to 55% and 860~1060mbar. (Based on JIS standard)

##### 5.2 Handle procedure:

To avoid unexpected testing results from occurring, the tested capacitor must be kept at room temperature for at least 30 minutes and completely discharged.

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5.3 Performance:

No.	Item	Performance	Test or inspection method																														
(1)	Appearance structure size	No defects which may affect performance.	As section 3																														
(2)	Withstand Voltage	Withstand test voltage without Insulation breakdown or other damage.	DC Tested voltage shall be applied for 1~5sec. Charge/discharge current shall not exceed 50 mA . <table border="1" data-bbox="1031 516 1428 763"> <tr> <th>Rated Voltage</th><th>Tested Voltage</th></tr> <tr> <td>&lt;100V</td><td>250%</td></tr> <tr> <td>100V</td><td>300%</td></tr> <tr> <td>200~300V</td><td>200%</td></tr> <tr> <td>500~999V</td><td>150%</td></tr> <tr> <td>1000~3000V</td><td>120%</td></tr> </table>	Rated Voltage	Tested Voltage	<100V	250%	100V	300%	200~300V	200%	500~999V	150%	1000~3000V	120%																		
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(3)	Insulation resistance	NPO: 10G $\Omega$ Min or $R \cdot C \geq 500 \Omega \cdot F$ Whichever is smaller X7R: 10G $\Omega$ Min or $R \cdot C \geq 100 \Omega \cdot F$ (Whichever is smaller)	Insulation resistance shall be measured at $120 \pm 5$ seconds after rated voltage applied. <table border="1" data-bbox="1031 875 1428 988"> <tr> <th>Rated Voltage</th><th>Tested Voltage</th></tr> <tr> <td>&lt;500V</td><td>100%</td></tr> <tr> <td><math>\geq 500V</math></td><td>500V</td></tr> </table>	Rated Voltage	Tested Voltage	<500V	100%	$\geq 500V$	500V																								
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(4)	Capacitance	Within the specified tolerance.	Measuring frequency & voltage: NPO : $> 1000\text{pF}$ : 1KHz $\pm 10\%$ 1.0 $\pm 0.2$ Vrms $\leq 1000\text{pF}$ : 1MHz $\pm 10\%$ 1.0 $\pm 0.2$ Vrms																														
(5)	Q/D.F. (Dissipation Factor)	<table border="1" data-bbox="412 1145 999 1662"> <tr> <td rowspan="2">NPO</td> <td colspan="2">More than 30pF: <math>Q \geq 1000</math></td> </tr> <tr> <td colspan="2">Less than 30pF: <math>Q \geq 400+20C</math></td> </tr> <tr> <td rowspan="10">X7R</td> <td>Rated vol.</td> <td>DF <math>\leq</math></td> <td>Special chip size and capacitance</td> </tr> <tr> <td>&gt;1000V</td> <td><math>\leq 3\%</math></td> <td></td> </tr> <tr> <td rowspan="4"><math>\geq 100V</math></td> <td><math>\leq 2.5\%</math></td> <td></td> </tr> <tr> <td><math>\leq 3\%</math></td> <td>1206<math>\geq 0.47\mu\text{F}</math> 1812 &amp; 1808 &amp; 2220</td> </tr> <tr> <td><math>\leq 5\%</math></td> <td>0805<math>&gt;0.1\mu\text{F}</math>, 1206<math>&gt;1\mu\text{F}</math>, 1210<math>\geq 2.2\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>0805<math>&gt;0.22\mu\text{F}</math>; 1210<math>\geq 3.3\mu\text{F}</math></td> </tr> <tr> <td rowspan="4">50V</td> <td><math>\leq 2.5\%</math></td> <td></td> </tr> <tr> <td><math>\leq 3\%</math></td> <td>0805<math>\geq 0.18\mu\text{F}</math>, 1206<math>\geq 0.47\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 5\%</math></td> <td>1210<math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>0805<math>\geq 1\mu\text{F}</math>(0805/X7R<math>&gt;0.47\mu\text{F}</math>), 1206<math>\geq 2.2\mu\text{F}</math>, 1210<math>\geq 10\mu\text{F}</math></td> </tr> </table>	NPO	More than 30pF: $Q \geq 1000$		Less than 30pF: $Q \geq 400+20C$		X7R	Rated vol.	DF $\leq$	Special chip size and capacitance	>1000V	$\leq 3\%$		$\geq 100V$	$\leq 2.5\%$		$\leq 3\%$	1206 $\geq 0.47\mu\text{F}$ 1812 & 1808 & 2220	$\leq 5\%$	0805 $>0.1\mu\text{F}$ , 1206 $>1\mu\text{F}$ , 1210 $\geq 2.2\mu\text{F}$	$\leq 10\%$	0805 $>0.22\mu\text{F}$ ; 1210 $\geq 3.3\mu\text{F}$	50V	$\leq 2.5\%$		$\leq 3\%$	0805 $\geq 0.18\mu\text{F}$ , 1206 $\geq 0.47\mu\text{F}$	$\leq 5\%$	1210 $\geq 4.7\mu\text{F}$	$\leq 10\%$	0805 $\geq 1\mu\text{F}$ (0805/X7R $>0.47\mu\text{F}$ ), 1206 $\geq 2.2\mu\text{F}$ , 1210 $\geq 10\mu\text{F}$	X7R :  C $\leq 10\mu\text{F}$ 1.0 $\pm 0.2$ Vrms 1KHz $\pm 10\%$ C $> 10 \mu\text{F}$ 0.5 $\pm 0.2$ Vrms 120Hz $\pm 20\%$
NPO	More than 30pF: $Q \geq 1000$																																
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(6)	Terminal strength	Tensile strength: No breakdown	Loading weight 0.5 Kgs is applied for $10 \pm 1$ seconds																														
		Bending strength: No breakdown	Loading weight 0.25 Kgs is applied Bending back and forth 90 degrees twice																														

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(7)	Temperature Characteristic of Capacitance	Temperatures Coefficient			The temperature coefficient is determined using the capacitance measured at base temperature as a reference. Test the specimen in a range of maximum and minimum operation temperature that shown as left table. * Base Temp $25 \pm 2$ °C			
		T.C.	Operating Temperature	Capacitance Change( $\Delta C$ )				
		NPO	-55~+125°C	0±30(ppm/°C)				
				Step	Temperature(°C)			
		X7R	-55~+125°C	± 15%	1	Base Temp.(25°C)± 2 °C		
					2	Min. Operation Temp.± 2 °C		
					3	Base Temp.(25°C)± 2 °C		
					4	Max. Operation Temp.± 2 °C		
					5	Base Temp.(25°C)± 2 °C		
(8)	Soldering heat resistance	External appearance	No mechanical damage.		Lead wire or terminals shall be immersed (A) up to 2.0 mm from body (B) into the Molten solder of which temperature is $260+5 -0$ °C for $3 \pm 0.5$ sec. Then leave at standard test conditions for $24 \pm 2$ hours, then measured.			
		Cap. change ( $\Delta C/C$ )	NPO	$\pm 2.5\%$ or $\pm 0.25$ pF max. Whichever is larger				
		Q/D.F.		To meet initial standard value				
(9)	Solderability		To meet initial standard value		*Preconditioning : (only for Class 2): Perform a heat treatment at $150 +0/-10$ °C for one hour and then let sit for $48 \pm 4$ hours at room temperature.			
			To meet initial standard value					
(9)		Lead wire shall be soldered over 75% of the circumfluent direction			To comply with JIS-C-5102 8.4 , the soldering temperature is $245 \pm 5$ °C and dipping time is $5 \pm 0.5$ seconds. Flux: weight ratio of Rosin 25%			

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No.	Item	Performance			Test or inspection method
(10)	Humidity (Steady state)	External appearance	No mechanical damage.		
		Cap. change ( $\Delta C/C$ )	NPO: $\pm 5\%$ or $\pm 0.5 \text{ pF}_{\text{max}}$ . (Whichever is larger) X7R: $\pm 12.5\%$		
		Q / D.F.:  NPO: $C \geq 30 \text{ pF}$ : $Q \geq 350$ , $10 \text{ pF} \leq C < 30 \text{ pF}$ : $Q \geq 275 + 2.5C$ $C < 10 \text{ pF}$ : $Q \geq 200 + 10C$ PS: C: Nominal Capacitance (pF)			Humidity (Steady state): At temperature $40 \pm 2 \text{ }^{\circ}\text{C}$ and humidity 90 to 95%RH for $500 + 24 - 0$ hours. Leave the capacitors in ambient condition for the following time before measurement. Class 1 : $24 \pm 2$ hours. Class 2 : $48 \pm 4$ hours. * Charge / discharge current shall not exceed 50 mA. * Preconditioning : (only for Class 2): Apply the rated DC voltage for 1hour at $150 \pm 5 \text{ }^{\circ}\text{C}$ . Remove and let sit for $48 \pm 4$ hours at room temperature. Perform initial measurement.
		Rated vol.	$DF \leq$	Special chip size and capacitance	
	X7R	$\geq 100 \text{ V}$	$\leq 3\%$		
			$\leq 6\%$	$1206 \geq 0.47 \mu\text{F}$ $1812 \& 1808 \& 2220$	
			$\leq 7.5\%$	$0805 > 0.1 \mu\text{F}, 1206 > 1 \mu\text{F},$ $1210 \geq 2.2 \mu\text{F}$	
			$\leq 20\%$	$0805 > 0.22 \mu\text{F}; 1210 \geq 3.3 \mu\text{F}$	
	50V	$50 \text{ V}$	$\leq 3\%$		
			$\leq 6\%$	$0805 \geq 0.18 \mu\text{F}, 1206 \geq 0.47 \mu\text{F}$	
			$\leq 10\%$	$1210 \geq 4.7 \mu\text{F}$	
			$\leq 20\%$	$0805 \geq 1 \mu\text{F} (0805/X7R > 0.47 \mu\text{F}), 1206 \geq 2.2 \mu\text{F},$ $1210 \geq 10 \mu\text{F}$	
	I.R.		$1 \text{ G}\Omega$ min. or $50 \Omega * \text{F}$ (Whichever is smaller)		

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No.	Item	Performance			Test or inspection method																							
(11)	Humidity load	External appearance	No mechanical damage.																									
		Cap. change ( $\Delta C/C$ )	NPO: $\pm 5\%$ or $\pm 0.5 \mu F$ max. (Whichever is larger) X7R: $\pm 12.5\%$																									
		Q / D.F.:  NPO: $C \geq 30 \mu F: Q \geq 350$ , $10 \mu F \leq C < 30 \mu F: Q \geq 275 + 2.5C$ $C < 10 \mu F: Q \geq 200 + 10C$ PS: C: Nominal Capacitance (pF)																										
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		I.R.	$500M \Omega$ min. or $25 \Omega * F$ (Whichever is smaller)																									
(12)	Temperature cycle	External appearance	No mechanical damage.																									
		Cap. change ( $\Delta C/C$ )	NPO: $\pm 2.5\%$ or $\pm 0.25 \mu F$ max. ( Whichever is larger) X7R: $\pm 7.5\%$																									
		Q / D.F.	To meet initial standard value																									
		I.R.	$10000M \Omega$ min. or $500 \Omega * F$ (Whichever is smaller)																									
		<p>The capacitor shall be subject 5 cycles according to four heat treatments listed in the following table.</p> <p>Then Leave the capacitors in ambient condition for the following time before measurement.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Duration (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. Operation Temp. <math>\pm 3</math></td> <td><math>30 \pm 3</math></td> </tr> <tr> <td>2</td> <td>Room Temp. (25°C)</td> <td><math>2 \sim 3</math></td> </tr> <tr> <td>3</td> <td>Max. Operation Temp. <math>\pm 3</math></td> <td><math>30 \pm 2</math></td> </tr> <tr> <td>4</td> <td>Room Temp. (25°C)</td> <td><math>2 \sim 3</math></td> </tr> </tbody> </table> <p>*Preconditioning : (only for Class 2):</p> <p>Perform a heat treatment at <math>150 +0-10°C</math> for one hour and then let sit for <math>48 \pm 4</math> hours at room temperature.</p>				Step	Temperature (°C)	Duration (min.)	1	Min. Operation Temp. $\pm 3$	$30 \pm 3$	2	Room Temp. (25°C)	$2 \sim 3$	3	Max. Operation Temp. $\pm 3$	$30 \pm 2$	4	Room Temp. (25°C)	$2 \sim 3$								
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No.	Item	Performance		Test or inspection method																						
(13)	Temperature Load	External appearance	No mechanical damage.	<table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Tested Voltage</th> </tr> </thead> <tbody> <tr> <td>&lt; 500V</td> <td>2.0Ra</td> </tr> <tr> <td>500V</td> <td>1.5Ra</td> </tr> <tr> <td>≥ 630V</td> <td>1.2Ra</td> </tr> <tr> <td>≥ 1000V</td> <td>1.2Ra</td> </tr> </tbody> </table>	Rated Voltage	Tested Voltage	< 500V	2.0Ra	500V	1.5Ra	≥ 630V	1.2Ra	≥ 1000V	1.2Ra												
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		Q / D.F.:		PS: The test voltage is 150% of rated voltage for below range.																						
		NPO: $C \geq 30\text{pF}$ : $Q \geq 350$ , $10\text{pF} \leq C < 30\text{pF}$ : $Q \geq 275 + 2.5C$ $C < 10\text{pF}$ : $Q \geq 200 + 10C$ PS: C: Nominal Capacitance (pF)		<table border="1"> <thead> <tr> <th>Size</th> <th>Rated voltage</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td>0805</td> <td>50V(X7R)</td> <td><math>C \geq 2.2\mu\text{F}</math></td> </tr> <tr> <td></td> <td>100V(X7R)</td> <td><math>C \geq 0.47\mu\text{F}</math></td> </tr> <tr> <td>1206</td> <td>100V(X7R)</td> <td><math>C \geq 1.0\mu\text{F}</math></td> </tr> </tbody> </table>	Size	Rated voltage	Capacitance	0805	50V(X7R)	$C \geq 2.2\mu\text{F}$		100V(X7R)	$C \geq 0.47\mu\text{F}$	1206	100V(X7R)	$C \geq 1.0\mu\text{F}$										
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X7R	Rated vol.	$DF \leq$		Special chip size and capacitance																						
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				Class I: $24 \pm 2$ hours Class II: $48 \pm 4$ hours																						
				* Charge / discharge current shall not exceed 50 mA. * Preconditioning : (only for Class 2): Apply 200% of the rated DC voltage for 1 hour at the maximum operating temperature $\pm 3^\circ\text{C}$ . Remove and let sit for $48 \pm 4$ hours at room temperature. Perform initial measurement.																						
	I.R.	1000MΩ or $50\Omega * F$ (Whichever is smaller)																								

## 6. 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 are present. Also 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 5 to 40 degrees centigrade and 20 to 70%. Use capacitors within 6 months after delivery.

## 7. Description:

Radial-Leaded, Epoxy-Dipped Multilayer ceramic capacitors are built by superior moisture and shock resistant Epoxy coating, can be supplied in both bulk or tape package for automatic insertion in printed circuit board. But must to avoid effect of external force when the capacitors are used automatic insertion because the inner chips are very weak and easy broken.

Our RD series capacitors have wide application in computer, data Processor, telecom communication, industrial control, and instrumentation equipment, etc.

(Epoxy coated: Flame resistance for UL94 V-0 Approved)

### ※ List of substances that affect the insulation strength of coating:

#### Epoxy resin solvent

Category	Model		
Ketone	Acetone	Butanone	Cyclohexanone
Esters	Ethyl acetate	Dibutyl phthalate	
Chlorinated hydrocarbons	Dichloromethane		

#### Epoxy resin thinner

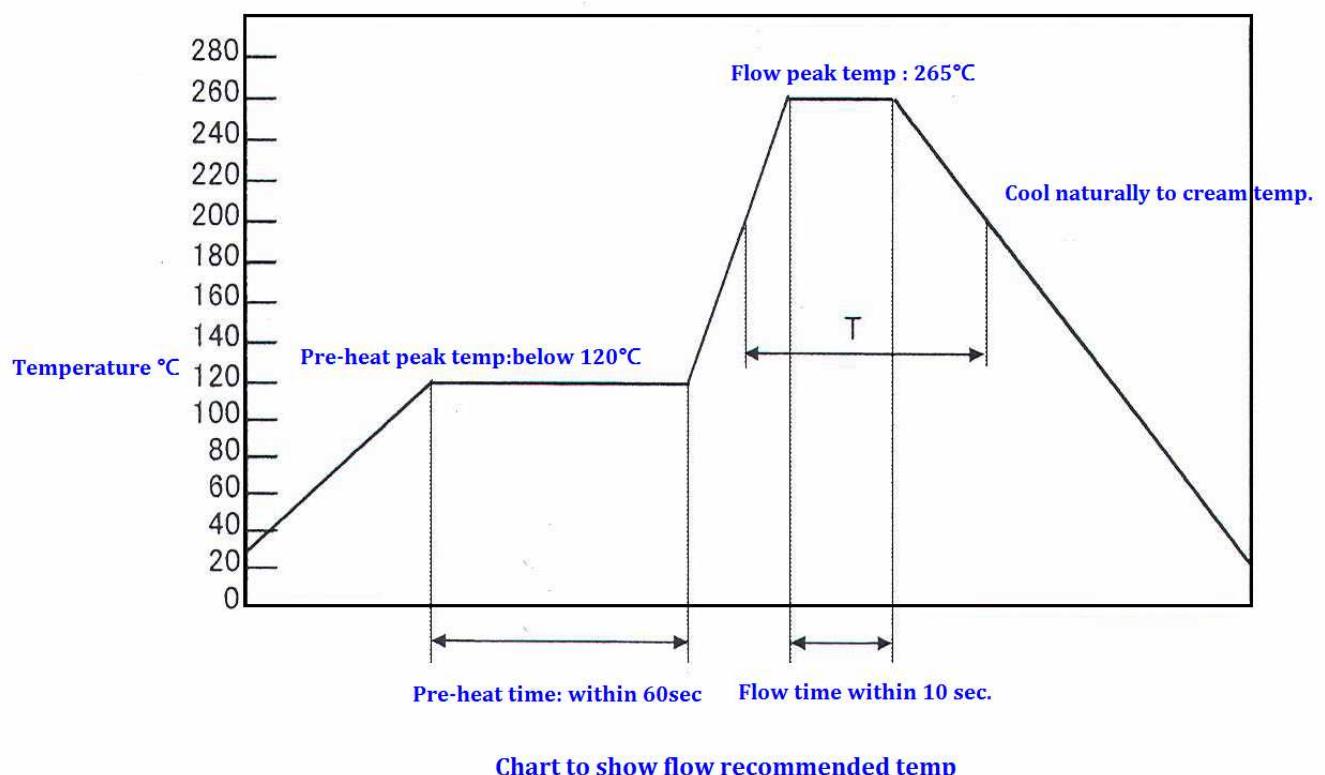
Category	Model	
Reactive diluentactivated thinner	HK-66 (Alkyl glycidyl ether)	
	501 (Butyl glycidyl ether)	
	690 (Phenyl Glycidyl Ether )	
	AGE (C12-14Aliphatic Polyalcohol Glycidyl Ether)	
	692 (Benzyl Glycidyl Ether)	
	D-678 ( Neopentyl glycol diglycidyl ether )	
	622 (1,4-Butanediol diglycidyl ether)	
	669 (Ethylene glycol diglycidyl ether)	
	X-632 (Polypropylene glycol diglycidyl ether)	
	X-652 (1,6-Hexadiol diglycidyl ether)	
Two functional groups	D-691Epoxypropane o-methylphenyl ether	
	Anhydrous ethanol	Toluene
	Ethyl acetate	Dimethylbenzene
	Dimethyl formamide	Butyl acetate
	Acetone	Styrene
Non-activated thinner	Polyol	Benzyl alcohol

**Note: The above substances should not contact the coating of the product body, otherwise it will affect the insulation strength of the product**

## 8. Soldering Recommendation:

### 8.1 Wave Soldering Profile:

- Temperature conditions of the flow is recommended as shown in the chart
- Must implement the pre-heat
- Maximum peak flow temperature is recommended 265°C
- Time “ T ” implement in the chart recommended within 20 sec. if temperature exceed 200°C
- Take care with the flow solder not to touch the capacitor body directly at mounting



### 8.2 Recommended Reworking Conditions with Soldering Iron :

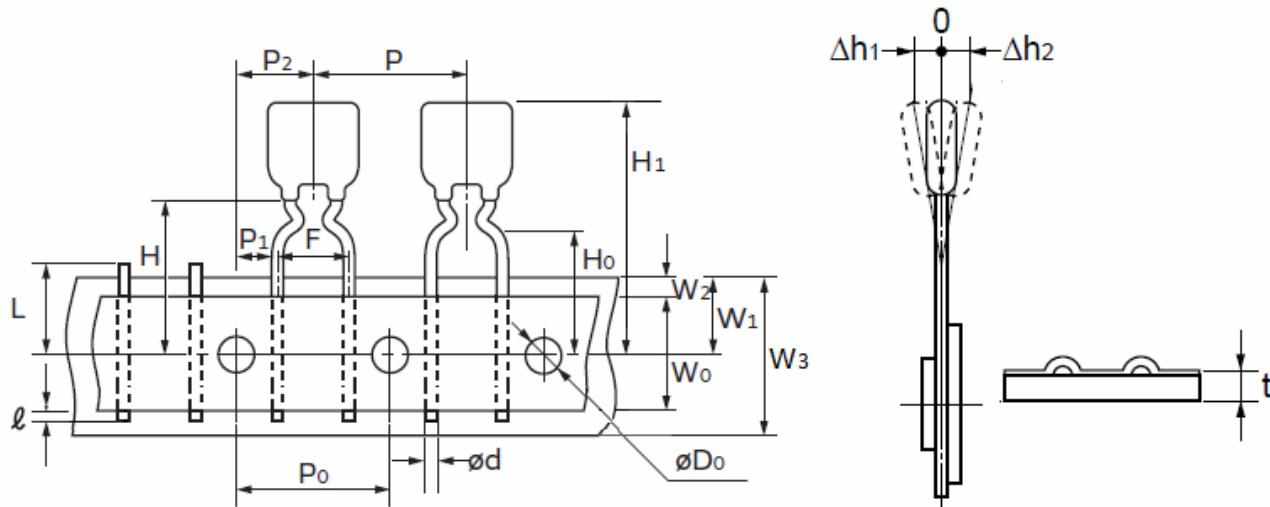
- Temperature of iron-tip: 400 degrees C. max.
- Soldering iron wattage: 50W max.
- Soldering time: 3.5 sec. max.
- Distance from coating body: 2 mm (min.)

### 8.3 Reflow-Soldering : Lead Ceramic Cap. should not be soldered by reflow-soldering.

## 9. Taping Figure and Specification:

### 9. 1 RD21 Type Taping Figure and Specification

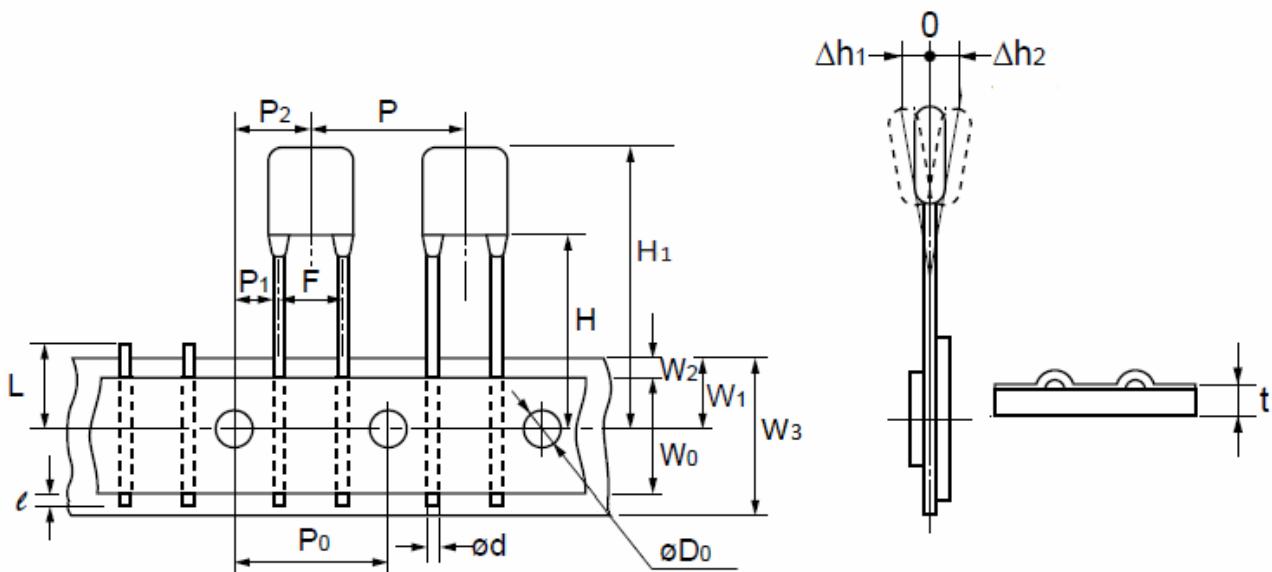
(Unit: mm)



Description	Symbol	Dimension	Remarks
Pitch of component	P	$12.7 \pm 1.0$	
Feed hold pitch	P0	$12.7 \pm 0.3$	Cumulative pitch error : $\pm 1.0 \text{ Mm}/20 \text{ pitches}$
Feed hold center to lead	P1	$3.85 \pm 0.7$	
Feed hold center to component center	P2	$6.35 \pm 1.3$	
Lead diameter	d	$0.5 \pm 0.05$	
Lead to lead spacing	F	$5.0 \pm 0.8$	To lead tip within tolerance
Component alignment, F-R	$\Delta h$	2.0 max	The alignment from the center of the lead $Is \pm 1.0\text{mm}$
Adhesive tape width	W0	8.0 min.	
Hole position	W1	$9.0 \pm 0.5$	
Adhesive tape position	W2	3.0 max	
Tape width	W3	$18.0+1.0/-0.5$	
Height of bottom body from tape center	H	$18.0+2.0/-0$	$H+12.5\text{mm} \leq H1$
Length from the terminal of the lead wire to the edge of adhesive tape	l	3.0 max	Or the end of lead wire may be inside the hole-down tape.
Portion to cut in case of defect	L	11.0 max	
Lead-wire clinch height	H0	$16.0 \pm 0.5$	$6.5 \leq H0-W1$
Component height	H1	32.25 max.	
Feed hole diameter	D0	$4.0 \pm 0.2$	
Tape thickness	t	$0.6 \pm 0.3$	

## 9. 2 RD20 Type Taping Figure and Specification

(Unit: mm)



Unit: mm

Description	Symbol	Dimension	Remarks
Pitch of component	P	$12.7 \pm 1.0$	
Feed hold pitch	P0	$12.7 \pm 0.3$	Cumulative pitch error : $\pm 1.0 \text{ Mm}/20 \text{ pitches}$
Feed hold center to lead	P1	$5.1 \pm 0.7$	
Feed hold center to component center	P2	$6.35 \pm 1.3$	
Lead diameter	d	$0.5 \pm 0.05$	
Lead to lead spacing	F	$2.5 \pm 0.8$	To lead tip within tolerance
Component alignment, F-R	$\Delta h$	2.0 max	The alignment from the center of the lead $Is \pm 1.0\text{mm}$
Adhesive tape width	W0	8.0 min.	
Hole position	W1	$9.0 \pm 0.5$	
Adhesive tape position	W2	3.0 max	
Tape width	W3	$18.0 +1.0/-0.5$	
Lead-wire clinch height from bottom of capacitor to the hold center	H	$18.0 \pm 0.5$	
Length from the terminal of the lead wire to the edge of adhesive tape	l	3.0 max	Or the end of lead wire may be inside the hole-down tape.
Portion to cut in case of defect	L	11.0 max	
Component height	H1	32.25 max	
Feed hole diameter	D0	$4.0 \pm 0.2$	
Tape thickness	t	$0.6 \pm 0.3$	

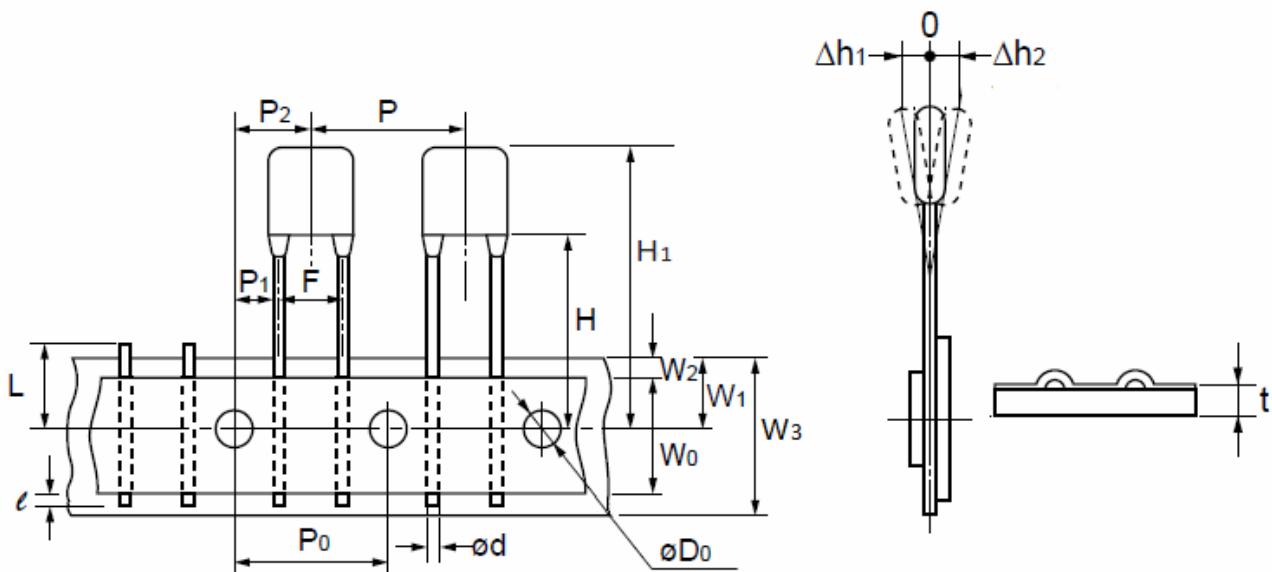
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9. 3 RD30 Type Taping Figure and Specification

(Unit: mm)



Unit: mm

Description	Symbol	Dimension	Remarks
Pitch of component	P	$12.7 \pm 1.0$	
Feed hold pitch	P0	$12.7 \pm 0.3$	Cumulative pitch error : $\pm 1.0 \text{ Mm}/20 \text{ pitches}$
Feed hold center to lead	P1	$3.85 \pm 0.7$	
Feed hold center to component center	P2	$6.35 \pm 1.3$	
Lead diameter	d	$0.5 \pm 0.05$	
Lead to lead spacing	F	$5.0 \pm 0.8$	To lead tip within tolerance
Component alignment, F-R	$\Delta h$	2.0 max	The alignment from the center of the lead is $\pm 1.0 \text{ mm}$
Adhesive tape width	W0	8.0 min.	
Hole position	W1	$9.0 \pm 0.5$	
Adhesive tape position	W2	3.0 max	
Tape width	W3	$18.0 \pm 1.0/-0.5$	
Lead-wire clinch height from bottom of capacitor to the hold center	H	$18.0 \pm 0.5$	
Length from the terminal of the lead wire to the edge of adhesive tape	l	3.0 max	Or the end of lead wire may be inside the hole-down tape.
Portion to cut in case of defect	L	11.0 max	
Component height	H1	32.25 max	
Feed hole diameter	D0	$4.0 \pm 0.2$	
Tape thickness	t	$0.6 \pm 0.3$	

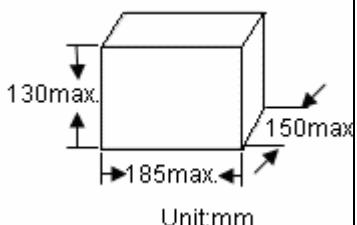
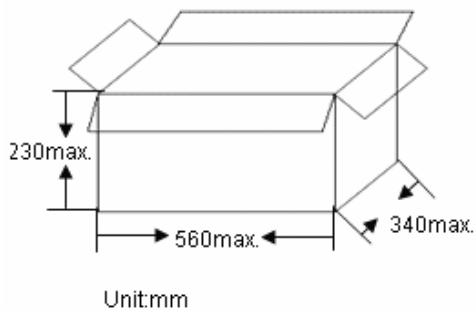
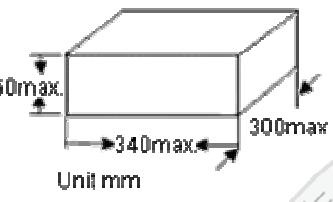
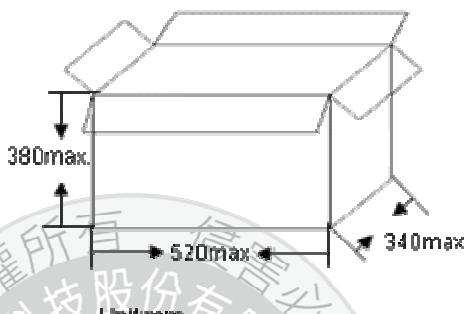
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**10. Packing specification :**

10.1 Packing size:

Type	Box	Carton
Bulk	 <p>130max. 185max. 150max. Unit:mm</p>	 <p>230max. 560max. 340max. Unit:mm</p>
Ammo taping	 <p>60max. 340max. 300max. Unit:mm</p>	 <p>380max. 520max. 340max. Unit:mm</p>

10.2 Packing quantity:

Chipsize	Taping type		Bulk type
	Quantity per reel	Quantity per box	Quantity per bag
0805	2,000	2,000	1,000
1206,1210,1808,1812	1,500	1,500	1,000

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11. Size code and capacitance (pF) available :

11.1 NPO Dielectric

Dielectric Size Voltage (VDC)	NPO																														
	0805				1206						1210						1808				1812										
	50	100	200	250	50	100	200	250	500	630	1000	50	100	200	250	500	630	1000	500	630	1000	2000	3000	500	630	1000	2000	3000			
Capacitance	1.0pF (010)	B	B	B	B																										
	1.2pF (1R2)	B	B	B	B	B	B	B	B	B	B																				
	1.5pF (1R5)	B	B	B	B	B	B	B	B	B	B																				
	1.8pF (1R8)	B	B	B	B	B	B	B	B	B	B																				
	2.2pF (2R2)	B	B	B	B	B	B	B	B	B	B																				
	2.7pF (2R7)	B	B	B	B	B	B	B	B	B	B																				
	3.3pF (3R3)	B	B	B	B	B	B	B	B	B	B																				
	3.9pF (3R9)	B	B	B	B	B	B	B	B	B	B																				
	4.7pF (4R7)	B	B	B	B	B	B	B	B	B	B																				
	5.6pF (5R6)	B	B	B	B	B	B	B	B	B	B																				
	6.8pF (6R8)	B	B	B	B	B	B	B	B	B	B																				
	8.2pF (8R2)	B	B	B	B	B	B	B	B	B	B																				
	10pF (100)	B	B	B	B	B	B	B	B	B	B																				
	12pF (120)	B	B	B	B	B	B	B	B	B	B																				
	15pF (150)	B	B	B	B	B	B	B	B	B	B																				
	18pF (180)	B	B	B	B	B	B	B	B	B	B																				
	22pF (220)	B	B	B	B	B	B	B	B	B	B																				
	27pF (270)	B	B	B	B	B	B	B	B	B	B																				
	33pF (330)	B	B	B	B	B	B	B	B	B	B																				
	39pF (390)	B	B	B	B	B	B	B	B	B	B																				
	47pF (470)	B	B	B	B	B	B	B	B	B	B																				
	56pF (560)	B	B	B	B	B	B	B	B	B	B																				
	68pF (680)	B	B	B	B	B	B	B	B	B	B																				
	82pF (820)	B	B	B	B	B	B	B	B	B	B																				
	100pF (101)	B	B	B	B	B	B	B	B	B	B																				
	120pF (121)	B	B	B	B	B	B	B	B	B	B																				
	150pF (151)	B	B	B	B	B	B	B	B	B	B																				
	180pF (181)	B	B	B	B	B	B	B	B	B	B																				
	220pF (221)	B	B	B	B	B	B	B	B	B	B																				
	270pF (271)	B	B	B	B	B	B	B	B	B	B																				
	330pF (331)	B	B	B	B	B	B	B	B	B	B																				
	390pF (391)	B	B	B	B	B	B	B	B	B	B																				
	470pF (471)	B	B	B	B	B	B	B	B	B	B																				
	560pF (561)	B	B	B	B	B	B	B	B	B	B																				
	680pF (681)	B	B	B	B	B	B	B	B	B	B																				
	820pF (821)	B	B	B	B	B	B	B	B	B	B																				
	1000pF (102)	B	B	B	B	B	B	B	B	B	B																				
	1200pF (122)	B	B	B	B	B	B	B	B	B	B																				
	1500pF (152)	B	B	B	B	B	B	B	B	B	B																				
	1800pF (182)	B	B	B	B	B	B	B	B	B	B																				
	2200pF (222)	B	B	B	B	B	B	B	B	B	B																				
	2700pF (272)	B	B	B	B	B	B	B	B	B	B																				
	3300pF (332)	B	B	B	B	B	B	B	B	B	B																				
	3900pF (392)	B	B	B	B	B	B	B	B	B	B																				
	4700pF (472)	B	B	B	B	B	B	B	B	B	B																				
	5600pF (562)	B	B			B	B	B	B	B	B																				
	6800pF (682)	B	B			B	B	B	B	B	B																				
	8200pF (822)	B	B			B	B	B	B	B	B																				
	0.010uF (103)	B	B			B	B	B	B	B	B																				
	0.012uF (123)	B	B			B	B																								
	0.015uF (153)	B	B			B	B																								
	0.018uF (183)	B	B			B	B																								
	0.022uF (223)	B	B			B	B																								
	0.027uF (273)					B																									
	0.033uF (333)					B																									
	0.039uF (393)					B																									
	0.047uF (473)					B																									
	0.056uF (563)					B																									
	0.068uF (683)					B																									
	0.082uF (823)					B																									
	0.1uF (104)					B																									

SPECIFICATION OF MULTI-LAYER RADIAL-LEADED TYPE CAPACITOR

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11.2 X7R Dielectric

Capacitance	Dielectric	Size	X7R																		1808					
			0805				1206						1210						1808				1812			
			50	100	200	250	50	100	200	250	500	630	1000	50	100	200	250	500	630	1000	500	630	1000	2000	3000	
	100pF (101)		B	B	B	B		B	B	B	B	B														
	120pF (121)		B	B	B	B			B				B													
	150pF (151)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B			
	180pF (181)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B			
	220pF (221)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B			
	270pF (271)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B		B	B
	330pF (331)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B		B	B
	390pF (391)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B		B	B
	470pF (471)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B		B	B
	560pF (561)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B		B	B
	680pF (681)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B		B	B
	820pF (821)		B	B	B	B	B	B	B	B	B	B							B	B	B	B	B		B	B
	1000pF (102)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	1200pF (122)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	1500pF (152)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	1800pF (182)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	2200pF (222)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	2700pF (272)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	3300pF (332)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	3900pF (392)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	4700pF (472)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	5600pF (562)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	6800pF (682)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	8200pF (822)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.01uF (103)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.012uF (123)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.015uF (153)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.018uF (183)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.022uF (223)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.027uF (273)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.033uF (333)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.039uF (393)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.047uF (473)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.056uF (563)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.068uF (683)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.082uF (823)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.1uF (104)		B	B	B	B	B	B	B	B	B	B		B	B	B	B	B	B	B	B	B	B	B	B	
	0.12uF (124)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.15uF (154)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.18uF (184)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.22uF (224)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.27uF (274)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.33uF (334)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.39uF (394)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.47uF (474)		B	B			B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.56uF (564)		B				B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.68uF (684)		B				B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	0.82uF (824)						B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	1.0uF (105)		B				B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	1.5uF (155)						B						B	B	B	B	B	B	B	B	B	B	B	B	B	
	2.2uF (225)		B				B	B	B	B			B	B	B	B	B	B	B	B	B	B	B	B	B	
	3.3uF (335)						B						B	B	B	B	B	B	B	B	B	B	B	B	B	
	4.7uF (475)						B						B	B	B	B	B	B	B	B	B	B	B	B	B	
	10.0uF (106)						B						B													

★ The letter in cell is expressed the symbol of product terminations. B: (Cu/Ni/Sn)

★ RD30 type can use Mlcc size 1808 and 1812, RD21 type can use Mlcc size 0805 and 1206, but RD20 type can only use Mlcc size 0805.

SPECIFICATION OF MULTI-LAYER RADIAL-LEADED TYPE CAPACITOR

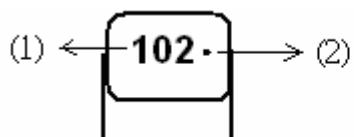
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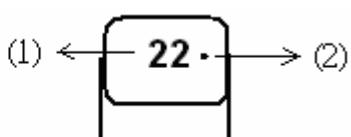
**12. Marking:**

Rated voltage (VDC)	10	16	25	50	100	200	250	500	630	1000	1500	2000	2500	3000
3-figure code Marking	102	102	102	102	102	102	102	102	102	102	102	102	102	102
2-figure code Marking	22	22	22	22	22	22	22	22	22	22	22	22	22	22

3-figure code Marking



2-figure code Marking



(1) Rated capacitance:

Two significant digits followed by no. of zeros. And R is in place of decimal point.

ex.: 0R5=0.5pF 1R0=1.0pF 102=10x10<sub>2</sub>=1000pF 104=10x10<sub>4</sub>=100nF

(2) Halogen and Pb free: There is a “•” beside the capacitance code when the coating resin is

Halogen and Pb free Epoxy.

