PRODUCT SPECIFICATION

PRODUCT: MULTILAYER CERAMIC CAPACITOR

TYPE: RADIAL-LEADED TYPE CAPACITOR

CUSTOMER: _____

DOC. NO.: D13-00-E-14

Ver.: 14

APPROVED BY CUSTOMER

VENDOR：

☐ **WALSIN TECHNOLOGY CORPORATION**

566-1, KAO SHI ROAD,YANG-MEI
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 φ from 0.55±0.05mm to 0.5+/-0.05mm 2. Add “H1 max” to lead configuration and size form. 3. Review the Solderability temperature from 235±5℃ to 245±5℃.,Solderability time from 2 ±0.5s to 5±0.5s”	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

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SPECIFICATION OF MULTI-LAYER RADIAL-LEADED TYPE CAPACITOR	D13-00-E-14	Ver: 14 Page: 4 / 18

1. Scope:

Its specification applies to Radial Series Ceramic Capacitor.

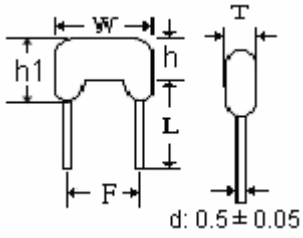
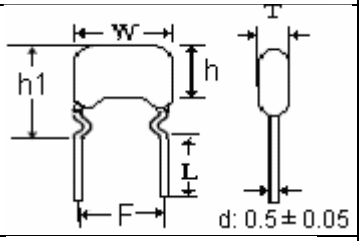
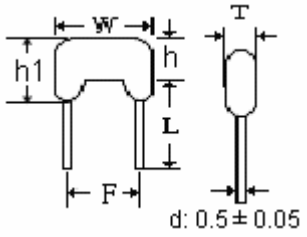
2. Part number defining (SAP):

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 RD21 RD30	Code	T.C.	Operating Temperature	Capacitance Change(△℃)	100=10 pF 102=1000 pF 103=10000 pF 1R5=1.5 pF 101=100 pF 472=4700 pF 104=100000 pF	D=±0.5pF J=±5 % K=±10 % M=±20 % Z=+80 % -20%	100=10V 250=25V 500=50V 101=100V 201=200V 251=250V 501=500V 631=630V 102=1000V 202=2000V 302=3000V	B=Bulk A=Ammo	5=0805 6=1206 0=1210 2=1812 8=1808 B=2220	L=Ag/Ni/Sn C=Cu/Ni/Sn A=Ag/Ni/Sn Halogen free H=Cu/Ni/Sn Halogen free	Tapping: AN=Ammo Bulk (ex): 07=7.0 mm	D=Tapping A=±0.5mm B=±1mm C=Min
	N	NPO	-55 ~ +125 ℃	0±30(PPM/℃)								
	B	X7R	-55 ~ +125 ℃	±15%								
	F	Y5V	-25~ +85℃	+30% ~ -80%								

*** Remark about tolerance code:**

NPO: Cap<10pF: D tolerance / Cap≧10pF: J, K, M, Z, X7R: K、M, Y5V: M、Z

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	Refer to the item “2. SAP Part Number”	2.5±0.8	2.54±1.0	 
RD21	0805	5.0	4.5	6.5	3.5		5.0±0.8	5.08±1.0	 
	1206	6.5	5.0	7.0	4.0				
	1210 (Special size)	6.5	5.5	7.5	5.0				
RD30	1808	8.0	6.0	7.5	5.5		5.0±0.8	5.08±1.0	 
	1812	8.0	6.5	8.0	5.5				
	2220 *(Special size)	9.0	9.0	10.0	6.0				

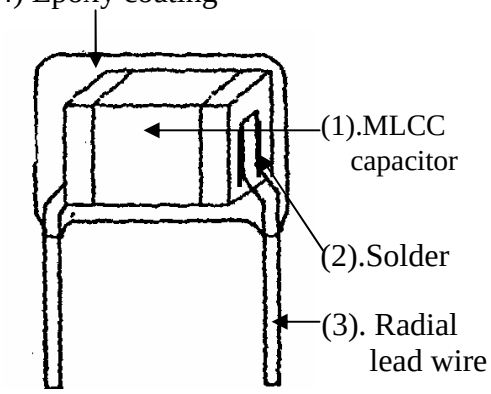
*** Lead diameter Φd: 0.5 +/-0.05mm**

*** Special size：Customized**

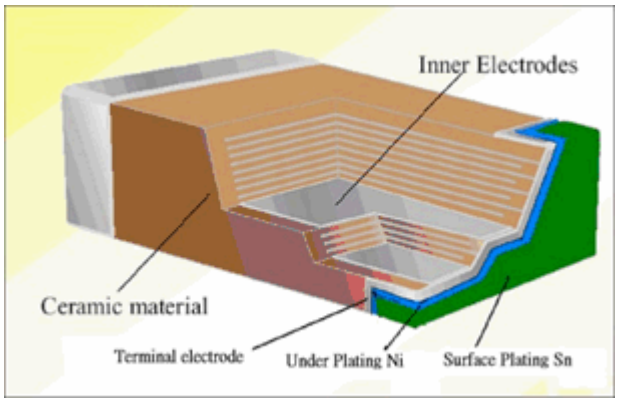
4. Product structure:

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	Tined 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℃ and RH 45 to 75%. If any doubt and argument has been encounter in judgement, the final test shall be done at 25±2℃, RH45 to 55% and 860～1060mbar. (Based on JIS standard)

5.2Handle 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.

5.3 Performance:

<table>
<tr><th>No.</th><th>Item</th><th>Performance</th><th>Test or inspection method</th></tr>
<tr><td>(1)</td><td>Appearance
structure size</td><td>No defects which may affect performance.</td><td>As section 3</td></tr>
<tr><td>(2)</td><td>Withstand
Voltage</td><td>Withstand test voltage without
Insulation breakdown or other damage.</td><td>DC Tested voltage shall be applied for 1～5sec. Charge/discharge current shall not exceed 50 mA .
<table>
<tr><th>Rated Voltage</th><th>Tested Voltage</th></tr>
<tr><td><100V</td><td>2.5Ra</td></tr>
<tr><td>100V</td><td>3.0Ra</td></tr>
<tr><td>200~300V</td><td>2.0 Ra</td></tr>
<tr><td>500~999V</td><td>1.5 Ra</td></tr>
<tr><td>1000~3000V</td><td>1.2 Ra</td></tr>
</table></td></tr>
<tr><td>(3)</td><td>Insulation
resistance</td><td>NPO:
10,000MΩ Min. or 500Ω*F Min
X7R、Y5V:
10GΩ Min or
R・C ≧ 500Ω・F
(Whichever is smaller)</td><td>Insulation resistance shall be measured at 120±5 seconds after rated voltage applied.
<table>
<tr><th>Rated Voltage</th><th>Tested Voltage</th></tr>
<tr><td><500V</td><td>1.0 Ra</td></tr>
<tr><td>≧500V</td><td>500V</td></tr>
</table></td></tr>
<tr><td>(4)</td><td>Capacitance</td><td>Within the specified tolerance.</td><td rowspan="2">Measuring frequency & voltage:
NPO：＞1000pF：
1KHz±10%
1.0±0.2 Vrms
≦1000pF：
1MHz±10%
1.0±0.2 Vrms
X7R、Y5V：
C ≦10uF
1.0±0.2 Vrms
1KHz±10%
C＞10 uF
0.5±0.2 Vrms
120Hz±20%</td></tr>
<tr><td>(5)</td><td>Dissipation
Factor</td><td>
<table>
<tr><td>NPO</td><td colspan="3">More than 30pF: Q≧1000
Less than 30pF: Q≧400+20C</td></tr>
<tr><td rowspan="11">X7R</td><td>Rated vol.</td><td>DF≦</td><td>Special chip size and capacitance</td></tr>
<tr><td>>1000V</td><td>≦3%</td><td></td></tr>
<tr><td rowspan="4">≧100V
≦1000V</td><td>≦2.5%</td><td></td></tr>
<tr><td>≦3%</td><td>1206≧0.47μF
1812 & 1808 & 2220</td></tr>
<tr><td>≦5%</td><td>0805＞0.1μF,1206>1μF,
1210≧2.2μF</td></tr>
<tr><td>≦10%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="4">50V</td><td>≦2.5%</td><td></td></tr>
<tr><td>≦3%</td><td>0805≧0.18μF, 1206≧0.47μF</td></tr>
<tr><td>≦5%</td><td>1210≧4.7μF</td></tr>
<tr><td>≦10%</td><td>0805≧1μF, 1206≧2.2μF,
1210≧10μF</td></tr>
<tr><td rowspan="11">Y5V</td><td>Rated vol.</td><td>DF≦</td><td>Special chip size and capacitance</td></tr>
<tr><td rowspan="3">≧50V</td><td>≦5%</td><td></td></tr>
<tr><td>≦7%</td><td>0805≧0.47μF, 1206≧4.7μF</td></tr>
<tr><td>≦12.5%</td><td>1210≧6.8μF</td></tr>
<tr><td rowspan="3">25V</td><td>≦5%</td><td></td></tr>
<tr><td>≦7%</td><td>0805≧0.33μF,
1206≧1μF, 1210≧4.7μF</td></tr>
<tr><td>≦9%</td><td>1206≧4.7μF, 1210≧22μF</td></tr>
<tr><td>16V
(C<1.0μF)</td><td>≦7%</td><td></td></tr>
<tr><td rowspan="2">16V
(C≧1.0μF)</td><td>≦9%</td><td></td></tr>
<tr><td>≦12.5%</td><td>0805≧3.3μF;1206≧10μF;
1210≧22μF; 1812≧47μF</td></tr>
<tr><td>10V</td><td>≦12.5%</td><td></td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th colspan="4">Performance</th><th>Test or inspection method</th></tr>
<tr><td rowspan="5">(6)</td><td rowspan="5">Temperature Characteristic of Capacitance</td><td colspan="4">Temperatures Coefficient</td><td rowspan="5">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±2℃
* Base Temp for Y5V: 20±2℃
<table><tr><th>Step</th><th>Temperature(℃)</th></tr><tr><td>1</td><td>Base Temp.(25℃)±2℃</td></tr><tr><td>2</td><td>Min. Operation Temp.±2℃</td></tr><tr><td>3</td><td>Base Temp.(25℃)±2℃</td></tr><tr><td>4</td><td>Max. Operation Temp.±2℃</td></tr><tr><td>5</td><td>Base Temp.(25℃)±2℃</td></tr></table></td></tr>
<tr><td>T.C.</td><td>Operating Temperature</td><td colspan="2">Capacitance Change(ΔC)</td></tr>
<tr><td>NPO</td><td>-55~+125℃</td><td colspan="2">0±30(ppm/℃)</td></tr>
<tr><td>X7R</td><td>-55~+125℃</td><td colspan="2">± 15%</td></tr>
<tr><td>Y5V</td><td>-25~+85℃</td><td colspan="2">+30%~−80%</td></tr>
<tr><td>(7)</td><td>Terminal strength</td><td colspan="4">Tensile strength:
No breakdown</td><td>Loading weight 0.5 Kgs is applied for 10±1 seconds</td></tr>
<tr><td></td><td></td><td colspan="4">Bending strength:
No breakdown</td><td>Loading weight 0.25 Kgs is applied
Bending back and forth 90 degrees twice</td></tr>
<tr><td rowspan="4">(8)</td><td rowspan="4">Soldering heat resistance</td><td>External appearance</td><td colspan="3">No mechanical damage.</td><td rowspan="4">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℃ for 3±0.5 sec. Then leave at standard test conditions for 24±2 hours, then measured.

*Preconditioning：
(only for Class 2):
Perform a heat treatment at 150 +0/-10℃ for one hour and then let sit for 48 ± 4 hours at room temperature.</td></tr>
<tr><td>Cap. change (ΔC/C)</td><td>NPO</td><td>±2.5% or ± 0.25 pF max. Whichever is larger</td><td></td></tr>
<tr><td></td><td>X7R</td><td>±7.5%</td><td></td></tr>
<tr><td></td><td>Y5V</td><td>±20%</td><td></td></tr>
<tr><td>D.F.</td><td colspan="3">To meet initial standard value</td></tr>
<tr><td>I.R.</td><td colspan="3">To meet initial standard value</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th colspan="2">Performance</th><th>Test or inspection method</th></tr>
<tr><td>(9)</td><td>Solderability</td><td colspan="2">Lead wire shall be soldered over 75% of the circumfluent direction
.</td><td>To comply with JIS-C-5102 8.4 , the soldering temperature is 245±5℃ and dipping time is 5±0.5 seconds.
Flux: weight ratio of Rosin 25%</td></tr>
<tr><td rowspan="5">(10)</td><td rowspan="5">Humidity
(Steady state)</td><td>External appearance</td><td>No mechanical damage.</td><td rowspan="5">Humidity (Steady state):
At temperature 40±2 ℃ 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±2 hours.
Class 2：48±4 hours.
* Charge / discharge current shall. not exceed 50 mA.
* Preconditioning：
(only for Class 2):
Apply the rated DC voltage for 1hour at 150 ±5℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.</td></tr>
<tr><td>Cap. change
(ΔC/C)</td><td>NPO: ± 5% or ±0.5 pFmax.
(Whichever is larger)
X7R: ±12.5%
Y5V: ±30%</td></tr>
<tr><td colspan="2">D.F.:
NPO:
C≧30pF: D.F. ≦ $\frac{1}{350}$
10pF≦C＜30pF: D.F. ≦ $\frac{1}{275+2.5*C}$
C＜10pF: D.F. ≦ $\frac{1}{200+10*C}$
PS: C: Nominal Capacitance (pF)
<table>
<tr><td rowspan="5">X7R</td><td rowspan="4">≧100V</td><td>DF≦</td><td>Special chip size and capacitance</td></tr>
<tr><td>≦3%</td><td></td></tr>
<tr><td>≦6%</td><td>1206≧0.47uF
1812 & 1808 & 2220</td></tr>
<tr><td>≦7.5%</td><td>0805＞0.1μF,1206>1μF,
1210≧2.2μF</td></tr>
<tr><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td rowspan="4">50V</td><td>≦3%</td><td></td></tr>
<tr><td>≦6%</td><td>0805≧0.18μF, 1206≧0.47μF</td></tr>
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<tr><td>≦20%</td><td>0805≧1μF, 1206≧2.2μF,
1210≧10μF</td></tr>
<tr><td rowspan="9">Y5V</td><td rowspan="2">Rated vol.</td><td>DF≦</td><td>Special chip size and capacitance</td></tr>
<tr><td>≦7.5%</td><td></td></tr>
<tr><td>≧50V</td><td>≦10%</td><td>0805≧0.47μF, 1206≧4.7μF</td></tr>
<tr><td></td><td>≦20%</td><td>1210≧6.8μF</td></tr>
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<tr><td>≦10%</td><td>0805≧0.33μF,
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<tr><td rowspan="2">16V
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<tr><td>≦20%</td><td>0805≧3.3μF;1206≧10μF;
1210≧22μF; 1812≧47μF;</td></tr>
<tr><td>10V</td><td>≦20%</td><td></td></tr>
</table></td></tr>
<tr><td>I.R.</td><td>1GΩ min. or 50Ω*F
(Whichever is smaller)</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th colspan="2">Performance</th><th>Test or inspection method</th></tr>
<tr><td rowspan="4">(11)</td><td rowspan="4">Humidity load</td><td>External appearance</td><td>No mechanical damage.</td><td rowspan="4">Humidity load:
(apply for the product with rated voltage 500V-Max):
Apply the rated voltage at temperature 40±2 ℃ 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±2 hours.
Class 2：48±4 hours.
* Charge / discharge current shall. not exceed 50 mA.
* Preconditioning：(only for Class 2):
Apply the rated DC voltage for 1hour at 150 ±5℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.</td></tr>
<tr><td>Cap. change
(ΔC/C)</td><td>NPO: ± 5% or
±0.5 pFmax.
(Whichever is larger)
X7R: ±12.5%
Y5V: ±30%</td></tr>
<tr><td colspan="2">D.F.:

NPO:
C≧30pF: D.F. ≦ $\frac{1}{350}$
10pF≦C＜30pF: D.F. ≦ $\frac{1}{275+2.5*C}$
C＜10pF: D.F. ≦ $\frac{1}{200+10*C}$
PS: C: Nominal Capacitance (pF)
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<tr><td rowspan="4">≧100V</td><td>≦3%</td><td></td></tr>
<tr><td>≦6%</td><td>1206≧0.47uF
1812 & 1808 & 2220</td></tr>
<tr><td>≦7.5%</td><td>0805＞0.1μF,1206>1μF</td></tr>
<tr><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
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<tr><td>≦20%</td><td>0805≧1μF, 1206≧2.2μF,
1210≧10μF</td></tr>
<tr><td rowspan="11">Y5V</td><td>Rated vol.</td><td>DF≦</td><td>Special chip size and capacitance</td></tr>
<tr><td rowspan="3">≧50V</td><td>≦7.5%</td><td></td></tr>
<tr><td>≦10%</td><td>0805≧0.47μF, 1206≧4.7μF</td></tr>
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<tr><td>16V
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<tr><td rowspan="2">16V
(C≧1.0μF)</td><td>≦12.5%</td><td></td></tr>
<tr><td>≦20%</td><td>0805≧3.3μF;1206≧10μF;
1210≧22μF; 1812≧47μF;</td></tr>
<tr><td>10V</td><td>≦20%</td><td></td></tr>
</table></td></tr>
<tr><td>I.R.</td><td>500MΩ min. or 25Ω*F
(Whichever is smaller)</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th>Performance</th><th>Test or inspection method</th></tr>
<tr><td>(12)</td><td>Temperature Load</td><td>
<table>
<tr><td>External appearance</td><td>No mechanical damage.</td></tr>
<tr><td>Cap. change
(ΔC/C)</td><td>NPO: ±3% or ±0.3pFmax.
(Whichever is larger)
X7R: ≥ 10V, ±12.5%

Y5V: ≥ 10V, ±30%</td></tr>
</table>
D.F.:

NPO:
C≧30pF: D.F. ≦ $\frac{1}{350}$
10pF≦C＜30pF: D.F. ≦ $\frac{1}{275+2.5*C}$
C＜10pF: D.F. ≦ $\frac{1}{200+10*C}$
PS: C: Nominal Capacitance (pF)
<table>
<tr><td rowspan="9">X7R</td><td>Rated vol.</td><td>DF≦</td><td>Special chip size and capacitance</td></tr>
<tr><td rowspan="3">≧100V</td><td>≦3%</td><td></td></tr>
<tr><td>≦6%</td><td>1206≧0.47uF
1812 & 1808 & 2220</td></tr>
<tr><td>≦7.5%</td><td>0805＞0.1μF,1206>1μF</td></tr>
<tr><td rowspan="4">50V</td><td>≦20%</td><td>0805＞0.22μF;1210≧3.3μF</td></tr>
<tr><td>≦3%</td><td></td></tr>
<tr><td>≦6%</td><td>0805≧0.18μF, 1206≧0.47μF</td></tr>
<tr><td>≦10%</td><td>1210≧4.7μF</td></tr>
<tr><td>≦20%</td><td>0805≧1μF, 1206≧2.2μF,
1210≧10μF</td></tr>
<tr><td rowspan="11">Y5V</td><td>Rated vol.</td><td>DF≦</td><td>Special chip size and capacitance</td></tr>
<tr><td rowspan="3">≧50V</td><td>≦7.5%</td><td></td></tr>
<tr><td>≦10%</td><td>0805≧0.47μF, 1206≧4.7μF</td></tr>
<tr><td>≦20%</td><td>1210≧6.8μF</td></tr>
<tr><td rowspan="3">25V</td><td>≦7.5%</td><td></td></tr>
<tr><td>≦10%</td><td>0805≧0.33μF,
1206≧1μF, 1210≧4.7μF</td></tr>
<tr><td>≦15%</td><td>1206≧4.7μF, 1210≧22μF</td></tr>
<tr><td>16V
(C<1.0μF)</td><td>≦10%</td><td></td></tr>
<tr><td rowspan="2">16V
(C≧1.0μF)</td><td>≦12.5%</td><td></td></tr>
<tr><td>≦20%</td><td>0805≧3.3μF;1206≧10μF;
1210≧22μF; 1812≧47μF;</td></tr>
<tr><td>10V</td><td>≦20%</td><td></td></tr>
</table>
<table>
<tr><td>I.R.</td><td>1000MΩ or 50Ω*F
(Whichever is smaller)</td></tr>
</table>
</td><td>
<table>
<tr><th>Rated Voltage</th><th>Tested Voltage</th></tr>
<tr><td>＜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>
</table>
PS: The test voltage is 150% of rated voltage for below range.
<table>
<tr><th>Size</th><th>Rated voltage</th><th>Capacitance</th></tr>
<tr><td>0805</td><td>50V(X7R)</td><td>C≧2.2uF</td></tr>
<tr><td></td><td>100V(X7R)</td><td>C≧0.47uF</td></tr>
<tr><td></td><td>16V(Y5V)</td><td>C≧0.47uF</td></tr>
<tr><td>1206</td><td>100V(X7R)</td><td>C≧1.0uF</td></tr>
</table>
at maximum operating temperature ±2℃ for 1000＋48/－0 hours.
Leave the capacitors in ambient condition for the following time before measurement.
Class I: 24±2 hours
Class II: 48±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 ± 3℃.
Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.
</td></tr>
</table>

<table>
<tr><th>No.</th><th>Item</th><th colspan="2">Performance</th><th>Test or inspection method</th></tr>
<tr><td rowspan="4">(13)</td><td rowspan="4">Temperature cycle</td><td>External appearance</td><td>No mechanical damage.</td><td rowspan="2">The capacitor shall be subject 5 cycles according to four heat treatments listed in the following table.
Then Leave the capacitors in ambient condition for the following time before measurement.
Class I: 24±2 hours
Class II: 48±4 hours</td></tr>
<tr><td>Cap. change (ΔC/C)</td><td>NPO: ±2.5% or ±0.25pFmax.
(Whichever is larger)
X7R: ±7.5%
Y5V: ±20%</td></tr>
<tr><td>D.F.</td><td>To meet initial standard value</td><td><table><tr><th>Step</th><th>Temperature (℃)</th><th>Duration (min.)</th></tr><tr><td>1</td><td>Min. Operation Temp.±3</td><td>30±3</td></tr><tr><td>2</td><td>Room Temp. (25℃)</td><td>2 ~ 3</td></tr><tr><td>3</td><td>Max. Operation Temp.±3</td><td>30±2</td></tr><tr><td>4</td><td>Room Temp. (25℃)</td><td>2 ~ 3</td></tr></table></td></tr>
<tr><td>I.R.</td><td>10000MΩ min. or 500Ω*F
(Whichever is smaller)</td><td>*Preconditioning：(only for Class 2):
Perform a heat treatment at 150 +0-10℃ for one hour and then let sit for 48±4 hours at room</td></tr>
</table>

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.

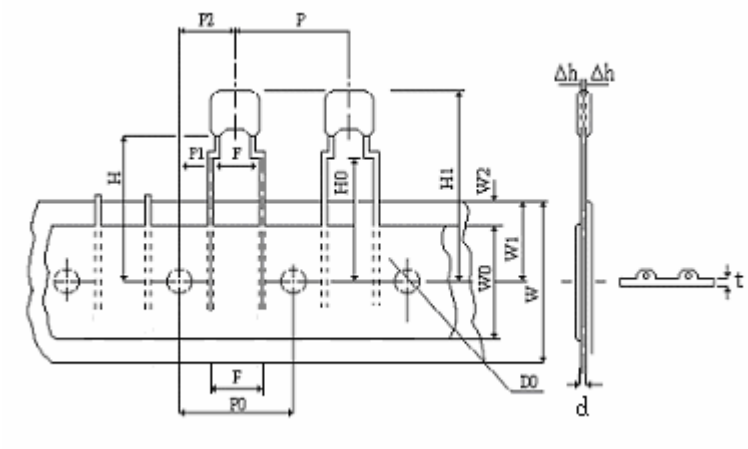
Our RD series capacitors have wide application in computer, data Processor, telecom communication, industrial control, and instrumentation equipment, etc.

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

8. Taping Figure and Specification:

8. 1 RD21 Type Taping Figure and Specification

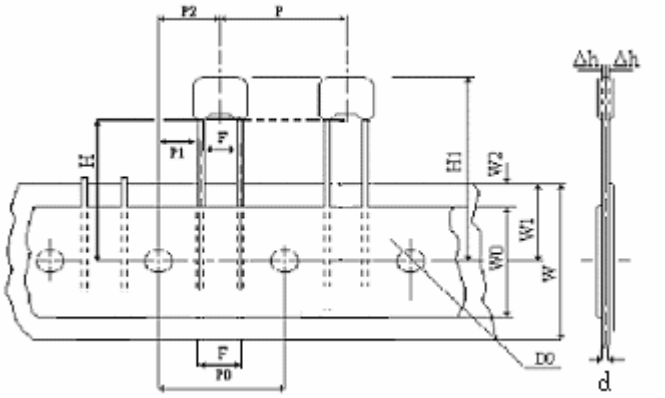
(Unit: mm)



Description	Symbol	Dimension	Remarks
Pitch Of Component	P	12.7±1.0	
Feed Hold Pitch	P0	12.7±0.3	Cumulative Pitch Error： ±1.0 Mm/20 Pitches
Feed Hold Center to Lead	P1	3.85±0.7	
Feed Hold Center to Component Center	P2	6.35±1.3	
Lead diameter	d	0.5±0.05	
Lead To Lead Spacing	F	5.0 ±0.8	To Lead Tip Within Tolerance
Component Alignment, F-R	Δh	2.0 Max	The Alignment From The Center Of The Lead Is±1.0mm
Tape Width	W	18.0+1.0/-0.5	
Adhesive Tape Width	W0	11.0 Min.	
Hole Position	W1	9.0±0.5	
Adhesive Tape Position	W2	3.0 max.	
Height Of Bottom Body From Tape Center	H	18.0+2.0/-0	H+12.5mm≤H1
Lead-Wire Clinch Height	H0	16.0±0.5	6.5≤H0-W1
Component Height	H1	32.25 Max.	
Feed Hole Diameter	D0	4.0±0.2	
Tape Thickness	t	0.6±0.3	

8. 2 RD20 Type Taping Figure and Specification

(Unit: mm)

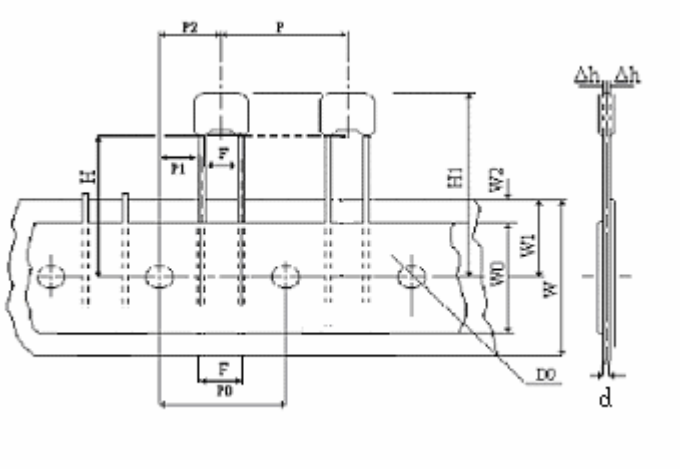


Unit: mm

Description	Symbol	Dimension	Remarks
Pitch Of Component	P	12.7±1.0	
Feed Hold Pitch	P0	12.7±0.3	Cumulative Pitch Error： ±1.0 Mm/20 Pitches
Feed Hold Center to Lead	P1	5.1±0.7	
Feed Hold Center to Component Center	P2	6.35±1.3	
Lead diameter	d	0.5±0.05	
Lead To Lead Spacing	F	2.5 ±0.8	To Lead Tip Within Tolerance
Component Alignment, F-R	Δh	2.0 Max	The Alignment From The Center Of The Lead Is±1.0mm
Tape Width	W	18.0+1.0/-0.5	
Adhesive Tape Width	W0	11.0 Min.	
Hole Position	W1	9.0±0.5	
Adhesive Tape Position	W2	3.0 max.	
Lead-Wire Clinch Height from bottom of capacitor to the hold center	H	18.0±0.5	
Component Height	H1	32.25 Max.	
Feed Hole Diameter	D0	4.0±0.2	
Tape Thickness	t	0.6±0.3	

8. 3 RD30 Type Taping Figure and Specification

(Unit: mm)

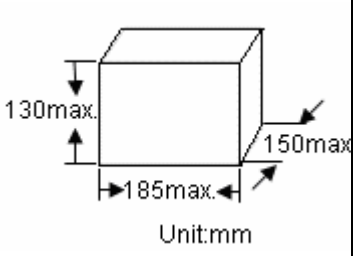
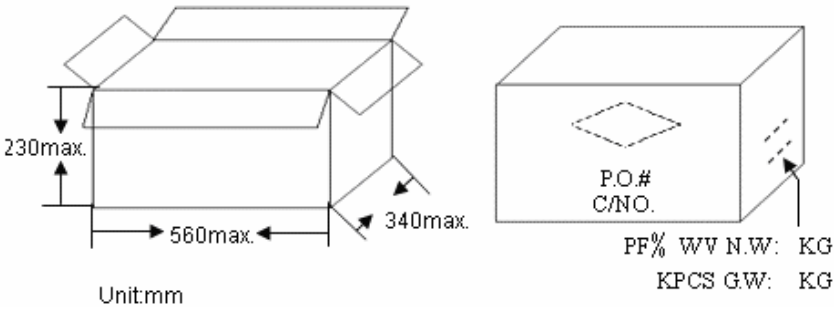
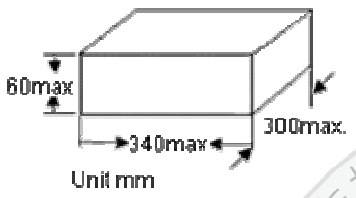
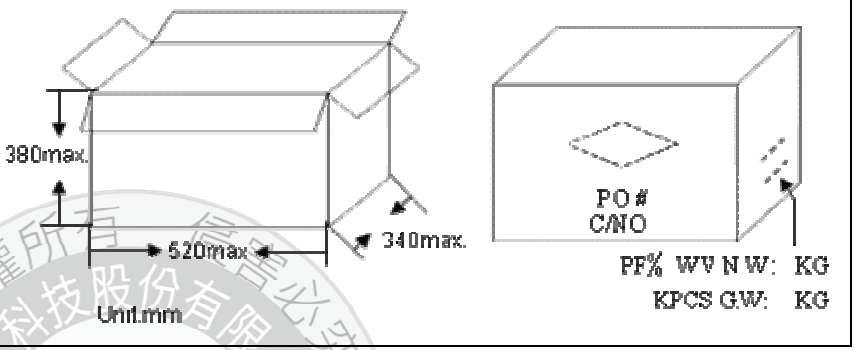


Unit: mm

Description	Symbol	Dimension	Remarks
Pitch Of Component	P	12.7±1.0	
Feed Hold Pitch	P0	12.7±0.3	Cumulative Pitch Error： ±1.0 Mm/20 Pitches
Feed Hold Center to Lead	P1	3.85±0.7	
Feed Hold Center to Component Center	P2	6.35±1.3	
Lead diameter	d	0.5±0.05	
Lead To Lead Spacing	F	5.0 ±0.8	To Lead Tip Within Tolerance
Component Alignment, F-R	Δh	2.0 Max	The Alignment From The Center Of The Lead Is±1.0mm
Tape Width	W	18.0+1.0/-0.5	
Adhesive Tape Width	W0	11.0 Min.	
Hole Position	W1	9.0±0.5	
Adhesive Tape Position	W2	3.0 max.	
Lead-Wire Clinch Height from bottom of capacitor to the hold center	H	18.0±0.5	
Component Height	H1	32.25 Max.	
Feed Hole Diameter	D0	4.0±0.2	
Tape Thickness	t	0.6±0.3	

9. Packing specification：

9.1 Packing size:

Type	Box	Carton
Bulk		
Ammo taping		

9.2 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

10. Size code and capacitance (pF) available：

10.1 NPO Dielectric

Dielectric		NPO																										
Size		0805				1206							1210							1808					1812				
Voltage (VDC)		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																						
	1.5pF (1R5)	B	B	B	B	B	B	B	B	B	B	B																	
	1.8pF (1R8)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	2.2pF (2R2)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	2.7pF (2R7)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	3.3pF (3R3)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	3.9pF (3R9)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	4.7pF (4R7)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	5.6pF (5R6)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	6.8pF (6R8)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	8.2pF (8R2)	B	B	B	B	B	B	B	B	B	B	B								B	B	B	B	B					
	10pF (100)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	12pF (120)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	15pF (150)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	18pF (180)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	22pF (220)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	27pF (270)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	33pF (330)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	39pF (390)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	47pF (470)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	56pF (560)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	68pF (680)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	82pF (820)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	100pF (101)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	120pF (121)	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
	150pF (151)	B	B	B	B	B	B	B	B	B	B	B	B	B	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	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	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	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	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	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	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	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	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	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			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			
	2200pF (222)	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			
	3300pF (332)	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			
	4700pF (472)	B	B			B	B	B	B				B	B	B	B										B	B			
	5600pF (562)	B	B			B	B						B	B	B	B										B	B			
	6800pF (682)	B	B			B	B						B	B	B	B										B	B			
	8200pF (822)	B				B	B						B	B	B	B										B	B			
	0.010uF (103)	B				B	B						B	B	B	B														
	0.012uF (123)	B				B	B						B	B																
	0.015uF (153)	B				B	B						B	B																
	0.018uF (183)	B				B	B						B	B																
	0.022uF (223)	B				B	B						B	B																
	0.027uF (273)					B							B	B																
	0.033uF (333)					B	B						B	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																								

☆ **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.**

10.2 X7R Dielectric

Dielectric		X7R																										
Size		0805				1206							1210							1808					1812				
Voltage (VDC)		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	100pF (101)	B	B	B	B																								
	120pF (121)	B	B	B	B																								
	150pF (151)	B	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	B					
	220pF (221)	B	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	B	
	330pF (331)	B	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	B	
	470pF (471)	B	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	B	
	680pF (681)	B	B	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	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	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	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	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	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		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		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		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		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		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		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		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	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	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	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	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	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	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	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	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	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	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		
	0.082uF (823)	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		
	0.12uF (124)	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			
	0.18uF (184)	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			
	0.27uF (274)	B				B	B						B	B	B	B									B	B			
	0.33uF (334)	B				B	B						B	B	B	B									B	B			
	0.39uF (394)	B				B	B						B	B	B	B									B	B			
	0.47uF (474)	B	B			B	B						B	B	B	B									B	B			
	0.56uF (564)					B	B						B	B	B	B													
	0.68uF (684)					B	B						B	B	B	B													
	0.82uF (824)					B	B						B	B															
	1.0uF (105)	B				B	B						B	B															
	1.5uF (155)												B	B															
	2.2uF (225)	B				B	B						B	B															
	4.7uF (475)					B							B																
	10uF (106)												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.**

10.3 Y5V Dielectric

Dielectric		Y5V																						
Size		0805							1206							1210							1812			
Voltage (VDC)		10	16	25	50	100	200	250	10	16	25	50	100	200	250	10	16	25	50	100	200	250	50	100	200	250
Capacitance	0.01uF (103)	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
	0.022uF (223)	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
	0.047uF (473)	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
	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	B
	0.15uF (154)	B	B	B	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
	0.33uF (334)	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
	0.68uF (684)	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		
	1.5uF (155)	B	B						B	B	B					B	B	B					B			
	2.2uF (225)	B	B						B	B	B					B	B	B	B				B			
	3.3uF (335)	B	B						B	B	B					B	B	B					B			
	4.7uF (475)	B	B						B	B	B					B	B	B	B				B			
	6.8uF (685)	B							B	B						B	B	B					B			
	10uF (106)	B							B	B						B	B	B								
	22uF (226)								B																	

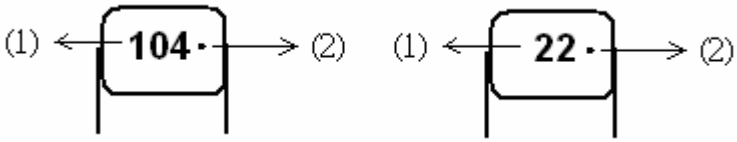
☆ **The letter in cell is expressed the symbol of product terminations. B: (Cu/Ni/Sn)**

☆ **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.**

11. Marking:

Rated voltage (VDC)	10	16	25	50	100	200	250	500	630	1000	1500	2000	2500	3000
3-figure code Marking	104	104	104	104	104	104	104	104	104	104	104	104	104	104
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　104=10x10$_4$ =100nF

(2) Halogen and Pb free: There is a "•" beside the capacitance code when the coating resin is Halogen and Pb free Epoxy.

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