



Y5V Dielectrics

■ Features

- A monolithic structure ensures high reliability and mechanical strength.
- High capacitance density.
- A wide range of capacitance values in standard case size.
- Suitable for high speed SMT placement on PCBs.
- Ni barrier termination highly resistance to migration.
- Lead-free termination is in compliance with the requirement of green plan and ROHS.

■ Applications

- General electronic equipment.
- Communication equipment.
- Custom Application

■ Y5V Dielectric Characteristics

Capacitance Range	10nF to 100uF
Size (mm) (EIA inch)	0603 1005 1608 2012 3216 3225 (0201) (0402) (0603) (0805) (1206) (1210)
Test Voltage	1.0 ± 0.2Vrms (0.5±0.1Vrms for cap>10uF)
Test Frequency	1.0 ± 0.2KHz (120Hz±10% for cap>10uF)
Capacitance Tolerance	-20% to +80% (± 20% available on request)
Operating Temperature Range	-30°C to +85°C
Maximum Capacitance Change	-82% to + 22%
Rated Voltage	4, 6.3, 10, 16, 25 & 50 VDC
Dissipation Factor (DF)	Pls refer to DF table on page No. 6
Insulation Resistance (+25°C, RVDC)	10,000 MΩ min. or 500 Ω-F min., whichever is smaller
Insulation Resistance (+85°C, RVDC)	1,000 MΩ min. or 50 Ω-F min., whichever is smaller



Multi-Layer Ceramic Capacitor

C-S3-5-00

■ **Product Range and Thickness**

CLASS	Class II																													
TYPE	Standard																													
T.C.	Y5V																													
SIZE	0603				1005				1608				2012				3216				3225									
(EIA)	0201		0402				0603				0805				1206				1210											
RV	4V	6.3V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V			
10 n			B	B	B	B	B		D	D	D	D	C	C	C	C	C	E			E	E	E							
12 n			B	B	B	B	B		D	D	D	D	C	C	C	C	C	E			E	E	E							
15 n			B	B	B	B	B		D	D	D	D	C	C	C	C	C	E			E	E	E							
18 n			B	B	B	B	B		D	D	D	D	C	C	C	C	C	E			E	E	E							
22 n	A	A	B	B	B	B	B		D	D	D	D	C	C	C	C	C	E			E	E	E							
27 n			B	B	B	B	B		D	D	D	D	C	C	C	C	C	E			E	E	E							
33 n	A	A	B	B	B	B	B		D	D	D	D	C	C	C	C	C	E			E	E	E							
39 n			B	B	B	B			D	D	D	D	C	C	C	C	C	E			E	E	E							
47 n	A	A	B	B	B	B			D	D	D	D	C	C	C	C	C	E			E	E	E							
56 n			B	B	B				D	D	D	D	C	C	C	C	C	E			E	E	E							
68 n			B	B	B				D	D	D	D	C	C	C	C	C	E			E	E	E							
82 n			B	B	B				D	D	D	D	C	C	C	C	C	E			E	E	E							
100 n	A	A	B	B	B	B			D	D	D	D	C	C	C	C	C	E			E	E	E							
120 n			B	B					D	D	D		E	E	E	E	E				E	E	E							
150 n			B	B					D	D	D	D	E	E	E	E	E				E	E	E							
180 n			B	B					D	D	D		E	E	E	E	E				E	E	E							
220 n			B	B	B				D	D	D	D	E	E	E	E	E				E	E	E							
270 n									D	D	D		E	E	E	E					E	E	E							
330 n			B	B					D	D	D	D	E	E	E	E	G	E			E	E	E							
390 n									D	D			E	E	E	E	G				E	E	E							
470 n			B	B	B				D	D	D		E	E	E	E	G	E	G		E	E	E							
560 n									D	D			E	E	E	E	G				E	E	E							
680 n									D	D			E	E	E	E	G				E	E	E							
820 n									D	D			E	E	E	E	G				E	E	E							
1.0 u			B	B					D	D	D*		E	E	E	E	G	G			E	E	I	I			I			
1.2 u																														
1.5 u																														
1.8 u																														
2.2 u									D	D	D		E	E	E	G					E	E	G							
2.7 u																														
3.3 u																														
3.9 u																														
4.7 u									D				G	G	E	G					E	E	G				G			
5.6 u																														
6.8 u																														
8.2 u																														
10 u													E	G	E	G	G				G	G	G	L			G	L	L	N
12 u																														
15 u																														
18 u																														
22 u													G								G	L	G	L			N	N	N	
47 u																										N	N			
100 u																										P				

- Non-standard capacitance or thickness is available on request
- The thickness might be changed due to technology improvement.

Typical Tolerance

Thickness (mm)		Thickness (mm)		Thickness (mm)		Thickness (mm)		Thickness (mm)	
Code	Class	Code	Class	Code	Class	Code	Class	Code	Class
A	0.30+/-0.03	M	0.70+/-0.15	I	0.95+/-0.15	H	1.50+/-0.20	N	2.00+/-0.20
B	0.50+/-0.05	D	0.80+/-0.10	F	1.15+/-0.20	P	2.50+/-0.20	R	3.20+/-0.20
C	0.60+/-0.15	E	0.85+/-0.15	G	1.25+/-0.20	L	1.60+/-0.20		

Special Tolerance

Thickness (mm)		Thickness (mm)		Thickness (mm)		Thickness (mm)		Thickness (mm)	
Code	Class	Code	Class	Code	Class	Code	Class	Code	Class
G	1.25 -0.20/+0.30	L	1.60 -0.20/+0.30	N	2.00+/-0.30	P	2.50+/-0.30	R	3.20+/-0.30

For Cap ≥ 1µF, Tolerance of dimensions will be enlarged.



■ Taping Amount

Thickness			Amount per reel					
			180 mm (7")		250 mm (10")		330 mm (13")	
Code	Spec	Size(EIA)	Paper	Embossed	Paper	Embossed	Paper	Embossed
A	0.30+/-0.03	0603 (0201)	15K					
B	0.50+/-0.05	1005 (0402)	10K				50K	
C	0.60+/-0.15	2012 (0805)	4K		10K		15K	
		3216 (1206)	4K		10K		15K	
D	0.80+/-0.10	1608 (0603)	4K		10K		15K	
D*	0.80+0.15/ -0.10	1608 (0603)	4K		10K		15K	
E	0.85+/-0.15	2012 (0805)	4K		10K		15K	
		3216 (1206)	4K		10K		15K	
		3225 (1210)		3K				10K
I	0.95+/-0.15	4532 (1812)		1K				
		2012 (0805)		3K				
F	1.15+/-0.20	3216 (1206)		3K				10K
		4520 (1808)		3K				
G	1.25 +/-0.20	2012 (0805)		2K/3K				10K
		3216 (1206)		3K				10K
		3225 (1210)		3K				
		4520 (1808)		3K				
G	1.25+0.3/-0.2	4532 (1812)		1K				
		2012 (0805)		2K/3K				10K
		3216 (1206)		3K				10K
H	1.50+/-0.20	3225 (1210)		2K				
		4520 (1808)		2K				
		4532 (1812)		1K				
L	1.60+/-0.20	3216 (1206)		2K				
		3225 (1210)		2K				
		4520 (1808)		2K				
L	1.60+0.30/-0.20	4532 (1812)		1K				
		3216 (1206)		2K				
		3225 (1210)		2K				
N	2.00+/-0.20	4520 (1808)		2K				
		4532 (1812)		1K				
		3216 (1206)		2K/3K				
		3225 (1210)		2K				
N	2.00+/-0.30	4520 (1808)		1K				
N	2.00+/-0.30	4532 (1812)		1K				
N	2.00+/-0.30	3225 (1210)		2K				
P	2.50+/-0.20	3225 (1210)		500pcs/1K				
P	2.50+/-0.30	3225 (1210)		500pcs/1K				
R	3.20+/-0.20			500pcs				
R	3.20+/-0.30			500pcs				

*: For some products, the thickness spec can be 0.8+0.15/-0.1mm.

■ **Y5V Specifications**

No.	Item	Specification	Test Method																					
1	Operating Temperature Range	-30°C to 85°C	-																					
2	Rated Voltage	4V,6.3VDC, 10VDC, 16VDC, 25VDC & 50VDC	The rated voltage is defined as the maximum voltage, which may be applied continuously to the capacitor.																					
3	Appearance	No defects or abnormalities.	Visual inspection																					
4	Dimensions	Within the specified dimension.	Using calipers																					
5	Dielectric Strength (Flash)	No defects or abnormalities.	No failure shall be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, the charge and discharge current is less than 50mA.																					
6	Insulation Resistance (I.R.)	Rated Voltage: <500V To apply rated voltage.	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max, and within 1 minute of charging.																					
		Rated Voltage: ≥500V To apply 500V.		I.R. ≥10G or R ₁ C _R ≥ 500Ω-F (whichever is smaller)																				
7	Capacitance	Within the specified tolerance at 1,000 hours	The capacitance/D.F. shall be measured at 25°C at frequency 1.0±0.2KHz and voltage 1.0±0.2Vrms. *For cap>10uF, measuring frequency 120±10% Hz and voltage 0.5±0.1Vrms.																					
8	Dissipation Factor (D.F.)	See Y5V DF table on page 6.																						
9	Capacitance Temperature Characteristics	Capacitance change within the specified tolerance -82% to +22%. Reference temperature 25°C.	The ranges of capacitance change compared with 25°C value over the temperature ranges should be within the specified ranges.																					
10	Termination Strength	No removal of the terminations or marking defect.	Apply a parallel force of 5N to a PCB mounted sample for 10±1sec.																					
11	Deflection (Bending Strength)	Appearance: No cracking or marking defects. Capacitance change within ±20%.	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig. a. using a eutectic solder then let sit for 48±4 hours. Then apply a force in the direction shown in Fig. b. The soldering shall be done with the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.																					
		<p>(Unit in mm)</p> <p>Fig. a.</p> <table border="1"> <thead> <tr> <th>Size</th> <th>a</th> <th>b</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>1005</td> <td>0.4</td> <td>1.5</td> <td>0.5</td> </tr> <tr> <td>1608</td> <td>1.0</td> <td>3.0</td> <td>1.2</td> </tr> <tr> <td>2012</td> <td>1.2</td> <td>4.0</td> <td>1.65</td> </tr> <tr> <td>3216</td> <td>2.2</td> <td>5.0</td> <td>2.0</td> </tr> <tr> <td>3225</td> <td>2.2</td> <td>5.0</td> <td>2.9</td> </tr> </tbody> </table>		Size	a	b	C	1005	0.4	1.5	0.5	1608	1.0	3.0	1.2	2012	1.2	4.0	1.65	3216	2.2	5.0	2.0	3225
Size	a	b	C																					
1005	0.4	1.5	0.5																					
1608	1.0	3.0	1.2																					
2012	1.2	4.0	1.65																					
3216	2.2	5.0	2.0																					
3225	2.2	5.0	2.9																					
		<p>Fig. b.</p>																						
12	Solderability of Termination	90% of the terminations is to be soldered evenly and continuously.	Immerse the test capacitor into a methanol solution containing rosin for 3 to 5 seconds, preheat it 150 to 180°C for 2 to 3 minutes and immerse it into molten solder of 230 ± 5°C for 5±1seconds.																					
13	Resistance to Soldering Heat	Appearance	Preheat the capacitor at 120 to 150°C* for 1 minute. Immerse the capacitor in an eutectic solder solution at 270±5°C for 10±1 seconds. Let sit at room temperature for 48±4 hours, then measure. * Preheat 150 to 200°C for size ≥3216. Initial measurement : perform a heat treatment at 150+0/-10°C for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.																					
		Cap. Change																						
		D.F.																						
		I.R.																						
		No marking defects																						
		Within ±20%																						
		To satisfy the specified initial value																						
		I.R. ≥ 10,000MΩ or R ₁ C _R ≥ 500Ω-F. (whichever is smaller)																						



Continued from previous page.

14	Temperature Cycle (Thermal Shock)	Appearance	No marking defects	Solder the capacitor to supporting jig (glass epoxy board) and perform the five cycles according to the four heat treatments listed in the following table. Let sit for 48±4hrs at room temperature, then measure. Step 1: Minimum operating temperature 30±3min Step 2: Room temperature 2~3 min Step 3: Maximum operating temperature 30±3min Step 4: Room temperature 2~3min Initial measurement : perform a heat treatment at 150+0/-10°C for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.
		Cap. Change	Within ±20%	
		D.F.	To satisfy the specified initial value	
		I.R.	More than 10,000MΩ or $R_1C_R > 500\Omega\text{-F}$ (whichever is smaller)	
15	Humidity Load	Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 48±4 hours at room temperature, then measure. The charge/discharge current is less than 50mA. Pre-treatment: Apply the rated DC voltage for 1 hr at 40±2°C and 90 to 95% humidity. Remove and let sit for 48±4 hours, then perform the initial measurement.
		Cap. Change	Within ±30%	
		D.F.	150% max. of initial value	
		I.R.	More than 500MΩ or $R_1C_R \geq 25\Omega\text{-F}$. (whichever is smaller)	
		Dielectric Strength	No failure	
16	High Temperature Load (Life Test)	Appearance	No marking defects	Apply *200% of the rated voltage for 500±12 hours at the maximum operating temperature ± 3°C. Let sit for 48±4 hours at room temperature, then measure. The charge/discharge current is less than 50mA. Pre-treatment: Apply 200% of the rated voltage for 1 hr at maximum operating temperature ±3°C. Remove and let sit for 48±4 hours, then perform the initial measurement. *some of the parts are applicable in rated voltage *1.5. please refer to table 1
		Cap. Change	Within ±30%	
		D.F.	150% max. of initial value	
		I.R.	More than 1 GΩ or $R_1C_R \geq 50\Omega\text{-F}$. (whichever is smaller)	

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■ **Y5V DF (tan δ) Table**

T.C	Rated Voltage	Size	Capacitance	D.F. Max.
Y5V	4V	0603	ALL	16%
		1005	ALL	20%
	6.3V	0603	ALL	16%
		1005	$\leq 220n$	12.5%
			$>220n$	16%
		1608/3225	ALL	12.5%
		2012/3216	ALL	16%
	10V	1005/1608/3225	ALL	12.5%
		2012	$< 10u$	12.5%
			10u	30%
		3216	$\leq 4.7u$	12.5%
			$4.7u < C_p < 22u$	16%
			22u	30%
	16V	1005	ALL	9%
		1608	$\leq 100n$	7.0%
			$100n < C_p \leq 220n$	9.0%
			$> 220n$	12.5%
		2012	ALL	9.0%
		3216/3225	$\leq 2.2u$	9.0%
			$> 2.2u$	12.5%
	3225	$4.7u \leq C_p \leq 22u$	12.5%	
	25V/50V	1005	$< 100n$	7.0%
		1608	$< 100n$	5.0%
			100n	7.0%
			$> 100n$	9.0%
		2012	$< 330n$	5.0%
			330n	7.0%
			$> 330n$	9.0%
		3216/3225	$< 1u$	5.0%
			1u	7.0%
$> 1u$			9.0%	

■ **Table 1**

TC	Product Range
Y5V	1005 (EIA 0402): C > 0.47 uF
	1608 (EIA 0603): C > 1.0 uF
	2012 (EIA 0805): C > 4.7 uF
	3216 (EIA 1206): C > 10 uF
	3225 (EIA 1210): C > 22 uF