

SURFACE MOUNT MONOLITHIC CHIP CAPACITORS

HIGH DIELECTRIC CONSTANT TYPE

GRM36/39/40/42-6/42-2/43-2/44-1 Series



FEATURES

- Miniature size
- No Polarity
- Nickel Barrier Termination Standard – highly resistant to metal migration
- Uniform dimensions and configuration
- Suitable for reflow soldering
- GRM39, 40 and 42-6 suitable for wave soldering
- Minimum series inductance
- Tape and Reel Packaging
- Bulk Case Packaging available for GRM40 and smaller
- Wide selection of capacitance values and voltages
- Largest production capacity and volume in the world

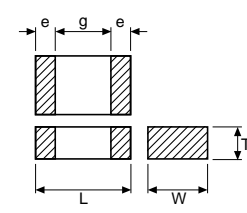
PART NUMBERING SYSTEM

CAPACITOR TYPE AND SIZE	3-digit code appears as necessary to indicate special thickness requirements. Please consult your local sales office for details.	TEMPERATURE CHARACTERISTICS	CAPACITANCE VALUE	CAPACITANCE TOLERANCE	VOLTAGE	MARKING	PACKAGING																
GRM40	---	X7R	103	K	050	A	D																
See below and following pages.		X5R X7R Y5V	Expressed in picofarads and identified by a three-digit number. First two digits represent significant figures. Last digit specifies the number of zeros to follow.	X7R/X5R: K = ±10% M = ±20% Non-standard J = ±5% Y5V: Z = ±80%	Identified by a three-digit number.	A = Unmarked	<table border="1"> <thead> <tr> <th>Reel Diameter/ Tape Material</th> <th>Code</th> </tr> </thead> <tbody> <tr><td>7" Paper Tape</td><td>D</td></tr> <tr><td>7" Plastic Tape</td><td>L</td></tr> <tr><td>13" Paper Tape</td><td>J</td></tr> <tr><td>13" Plastic Tape</td><td>K</td></tr> <tr><td>Bulk</td><td>B</td></tr> <tr><td>Bulk Cassette</td><td>C</td></tr> <tr><td>7" Paper 2mm pitch</td><td>Q</td></tr> </tbody> </table>	Reel Diameter/ Tape Material	Code	7" Paper Tape	D	7" Plastic Tape	L	13" Paper Tape	J	13" Plastic Tape	K	Bulk	B	Bulk Cassette	C	7" Paper 2mm pitch	Q
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							See pages 33-36 for labeling and packaging information.																

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CHIP DIMENSIONS

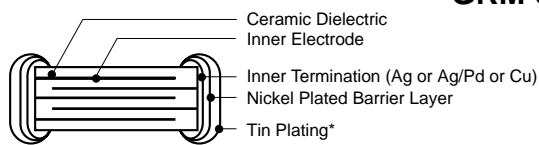
Dimensions: mm	Size	EIA Code	L Length	W Width	T Thickness	e (min.) Termination	g (min.) Insulation
	GRM36	0402	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05	0.15 ~ 0.3	0.4
	GRM39*	0603	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.2 ~ 0.5	0.5
	GRM40	0805	2.0 ± 0.1	1.25 ± 0.1	0.6 ± 0.1	0.2 ~ 0.7	0.7
					0.85 ± 0.1		
					1.25 ± 0.1		
	GRM42-6	1206	3.2 ± 0.15	1.6 ± 0.15	0.85 ± 0.1	0.3 ~ 0.8	1.5
					1.15 ± 0.1		
	GRM42-2	1210	3.2 ± 0.2	1.6 ± 0.2	1.6 ± 0.2	0.3 min.	1.0
					1.15 ± 0.1		
					1.35 ± 0.15		
	GRM43-2	1812	3.2 ± 0.3	2.5 ± 0.2	1.8 ± 0.2	2.0 max.	0.3 min.
					2.5 ± 0.2		
GRM44-1	2220	4.5 ± 0.4	3.2 ± 0.3	2.0 max.	0.3 min.	2.0	
		5.7 ± 0.4	5.0 ± 0.4	2.0 max.	0.3 min.	2.0	

*Bulk case packaging is L = 1.6 ± 0.07, W, T = 0.8 ± 0.07.

CHIP TERMINATION DIAGRAMS

Nickel Barrier Layer (Standard)

GRM Series



*Size 0402 – Solder Plated



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All products on this page are available as standard through authorized Murata Electronics Distributors.

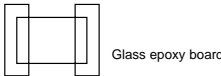
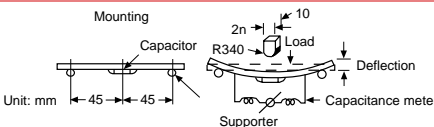
SURFACE MOUNT MONOLITHIC CHIP CAPACITORS HIGH DIELECTRIC CONSTANT TYPE- SPECIFICATION

GRM36/39/40/42-6/42-2/43-2/44-1 Series

GENERAL/ELECTRICAL

Capacitance Change with Temperature:	X5R: $\pm 15\%$ Δ CX -55°C to $+85^{\circ}\text{C}$ X7R: $\pm 15\%$ Δ CX -55°C to $+125^{\circ}\text{C}$ Y5V: $^{+22}_{-82}\%$ Δ CX -30°C to $+85^{\circ}\text{C}$	Insulation Resistance (I.R.)	X5R/X7R 100,000 megohms or 1000 megohms-mfd (whichever is less) Y5V 10,000 megohms or 500 megohms-mfd (whichever is less)																				
Capacitance & D.F. (Frequency & Voltage)	X5R, X7R: 1kHz $\pm 100\text{Hz}$ @ 1.0 $\pm 2\text{Vrms}$ Y5V: 1kHz $\pm 100\text{Hz}$ @ 1.0 $\pm 2\text{Vrms}$	Dielectric Strength (Flash)	250% of rated voltage for 5 seconds with series resistor limiting charge current to 50mA max.; 200% for 500V																				
Dissipation Factor (D.F.)	<table border="1"> <tr> <td></td> <td>Min. 25V</td> <td>16V</td> <td>10V</td> <td>6.3V</td> </tr> <tr> <td>X5R</td> <td>2.5%</td> <td>3.5%</td> <td>3.5%</td> <td>5%</td> </tr> <tr> <td>X7R</td> <td>2.5%</td> <td>3.5%</td> <td>3.5%</td> <td>5%</td> </tr> <tr> <td>Y5V</td> <td>5.0%</td> <td>9.0%</td> <td>12.5%</td> <td>12.5%</td> </tr> </table>		Min. 25V	16V	10V	6.3V	X5R	2.5%	3.5%	3.5%	5%	X7R	2.5%	3.5%	3.5%	5%	Y5V	5.0%	9.0%	12.5%	12.5%	Typ. Aging (per Decade)	X5R/X7R 3% Y5V 7%
	Min. 25V	16V	10V	6.3V																			
X5R	2.5%	3.5%	3.5%	5%																			
X7R	2.5%	3.5%	3.5%	5%																			
Y5V	5.0%	9.0%	12.5%	12.5%																			

MECHANICAL

TEST	TEST METHOD	POST TEST LIMITS
Terminal Adhesion		<0603 1.0 lbs. \geq 0805 2.2 lbs. No evidence of termination peeling
Deflection		1 mm deflection (Glass epoxy board) No mechanical damage Cap., DF, IR meet initial limits
Solderability	MIL-STD-202 Method 208F	Meets Requirement For specific details contact factory

ENVIRONMENTAL

TEST	TEST METHOD	POST TEST LIMITS
Thermal Shock (Air to Air)	MIL-STD-202, Method 107, Condition A Prior to starting Thermal Shock test, capacitors shall be heat treated (deaged) for one (1) hour at 150°C . Allow capacitors to stabilize at room temperature for 48 hours prior to taking initial measurements. Post thermal Shock measurement shall be taken after 48 hours stabilization.	Appearance: No visual damage Δ C: X5R/X7R = $\pm 12.5\%$ Y5V = $\pm 30.0\%$ D.F.: X5R/X7R = 2.5% max. @ 25°C , (3.5% max. @ 25°C for 16V & 10V Series) (7.5% max. @ 25°C for 6.3V Series) Y5V = 5.0% max. @ 25°C , (9.0% max. @ 25°C for 16V Series) (15% max. @ 25°C for 10V & 6.3V Series) I.R.: X5R/X7R = 100,000M Ω min. of 1,000M Ω • μF (whichever is less) Y5V = 10,000 Ω or 500M Ω • μF min. (whichever is less)
Humidity, Steady State	Maintain the capacitor at $40 \pm 2^{\circ}\text{C}$ and 90 to 95% humidity for 500 ± 12 hours. Remove and let sit for 48 ± 4 hours at room temperature, then measure.	Appearance: No defects Capacitance: X5R, X7R within $\pm 12.5\%$; Z5U, Y5V within $\pm 30\%$ Q/D.F.: See chart below. I.R.: 1,000M Ω or 50 Ω F (whichever is less)
Humidity Load	Apply the rated voltage at $40 \pm 2^{\circ}\text{C}$ 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. • Initial measurement for Y5V/10V max. Apply the rated DC voltage for 1 hour at $40 \pm 20^{\circ}\text{C}$. Remove and let sit for 48 ± 4 hours at room temperature. Perform initial measurement.	Appearance: No defects Capacitance: X5R, X7R within $\pm 12.5\%$; Z5U within $\pm 30\%$; Y5V within $+30/-40\%$ (10Vmax), within $\pm 30\%$ (others)
Life Test	Apply 200% of rated voltage for 1000 ± 12 hours at maximum operating temperature; 150% for 500V Upon completion of above test wait 48 hours prior to performing post testing.	Appearance: No defects Capacitance: X5R/X7R $\pm 12.5\%$ Δ CX, Z5U/Y5V $\pm 30\%$ Δ CX D.F.: X5R/X7R = 3.0% max. @ 25°C , (5% max. @ 25°C for 16V & 10V Series) (7.5% max. @ 25°C for 6.3V Series) Y5V = 7.5% max. @ 25°C , (10% max. @ 25°C for 16V Series) (15% max. @ 25°C for 10V & 6.3V Series) I.R.: X5R/X7R 1,000M Ω or 50M Ω -mfd. (whichever is less) Y5V 1,000M Ω or 50M Ω -mfd. (whichever is less) Flash: 250% rated voltage

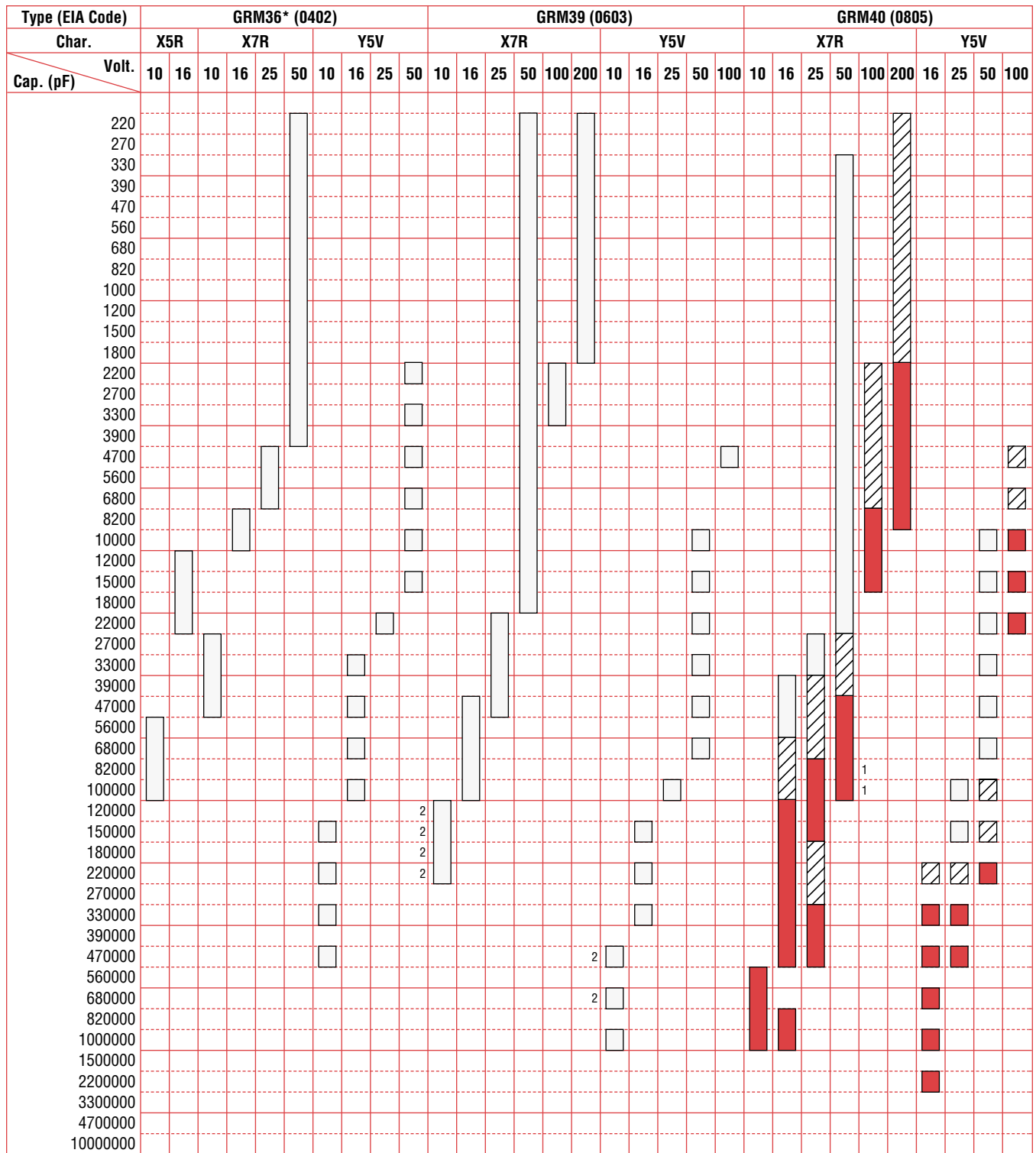
SURFACE MOUNT MONOLITHIC CHIP CAPACITORS

HIGH DIELECTRIC CONSTANT X5R/X7R/Y5V TYPES



GRM36/39/40 Series

SURFACE MOUNT
MONOLITHIC CHIP
CAPACITORS



*GRM36 Series is suited to only reflow soldering.
¹Type: GRM40-034 (L: 2 ± 0.15 , W: 1.25 ± 0.15 , T: 1.25 ± 0.15)
²Only for taping

THICKNESS AND PACKAGING TYPES/QUANTITY

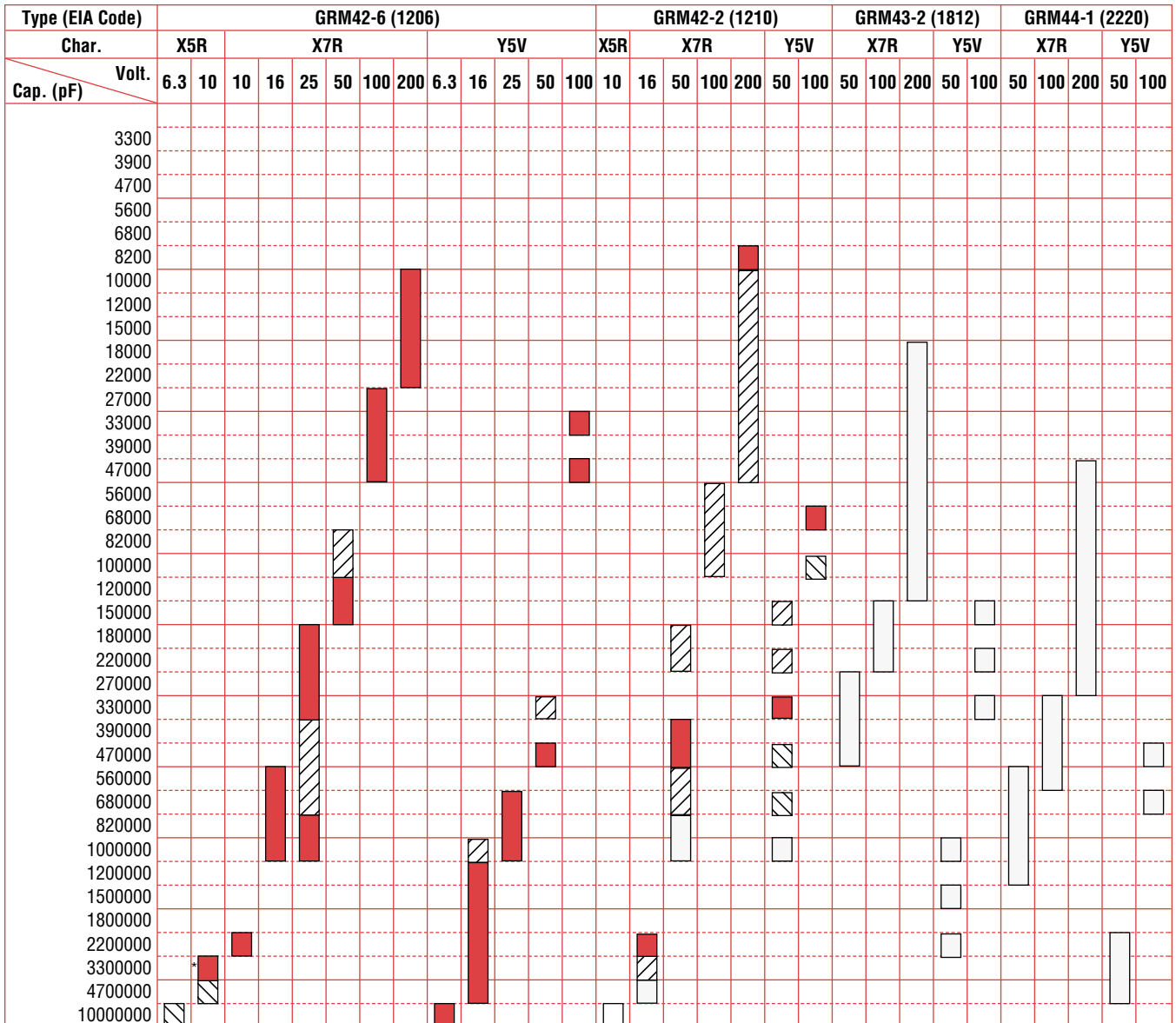
Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) ³	Bulk Case (pcs./case)	Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) ³	Bulk Case (pcs./case)
GRM36	: 0.5 ± 0.05	1000	10000	50000	GRM40	: 0.85 ± 0.1	1000	4000	—
GRM39	: 0.8 ± 0.14	1000	4000	15000		: 1.25 ± 0.1	1000	3000	5000
GRM40	: 0.6 ± 0.1	1000	4000	10000					

³φ330mm reel is available on request. ⁴Bulk case packaging is T = 0.8 ± 0.07 .

SURFACE MOUNT MONOLITHIC CHIP CAPACITORS HIGH DIELECTRIC CONSTANT X5R/X7R/Y5V TYPES



GRM42-6/42-2/43-2/44-1 Series



*Type: GRM42-631 (L: 3.2 ± 0.2, W: 1.6 ± 0.2, T: 1.3 ±_{0.2})

THICKNESS AND PACKAGING TYPES/QUANTITY

Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) ¹	Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) ¹
GRM42-6	▨: 0.85 ± 0.1	1000	4000	GRM42-2	▨: 1.8 ± 0.2	1000	1000
	■: 1.15 ± 0.1	1000	3000		□: 2.5 ± 0.2	1000	1000
	▨: 1.6 ± 0.2	1000	2000	GRM43-2	□: 2.0 max.	1000	1000
GRM42-2	■: 1.15 ± 0.1	1000	3000	GRM44-1	□: 2.0 max.	1000	1000
	□: 1.35 ± 0.15	1000	2000	¹φ330mm reel is available on request.			

Note: Capacitance Values = EIA 12 step: X7R = 10,12,15,18,22,27,33,39,47,56,68,82
6 step: Y5V = 10,15,22,33,47,68. For other values contact your local Murata Sales Office