

SURFACE MOUNT MONOLITHIC CHIP CAPACITORS HIGH DIELECTRIC CONSTANT TYPE



SURFACE MOUNT
MONOLITHIC CHIP
CAPACITORS

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

GRM40 - - - X7R 103 K 050 A D

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																		
		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% +80% -20% Y5V: Z =	Identified by a three-digit number.	A = Unmarked																			
							<table border="1"> <tr> <th>Reel Diameter/ Tape Material</th> <th>Code</th> </tr> <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> <tr> <td colspan="2">See pages 33-36 for labeling and packaging information.</td> </tr> </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	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

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

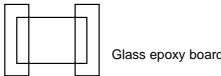
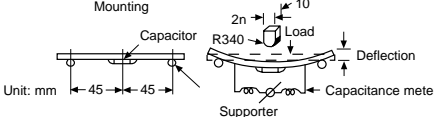
SURFACE MOUNT MONOLITHIC CHIP CAPACITORS HIGH DIELECTRIC CONSTANT TYPE- SPECIFICATION

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	 Glass epoxy board	<0603 1.0 lbs. \geq 0805 2.2 lbs. No evidence of termination peeling
Deflection	 Unit: mm	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)																											
		<table border="1"> <thead> <tr> <th></th> <th>Char.</th> <th>25V min.</th> <th>16V</th> <th>10V</th> <th>6.3V</th> </tr> </thead> <tbody> <tr> <td rowspan="4">Q/D.F.</td> <td>X5R</td> <td>0.05 max.</td> <td>0.05 max.</td> <td>0.05 max.</td> <td>0.075 max.</td> </tr> <tr> <td>X7R</td> <td>0.05 max.</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Z5U</td> <td>0.05 max.</td> <td>—</td> <td>—</td> <td>—</td> </tr> <tr> <td>Y5V</td> <td>0.075 max.</td> <td>0.1 max. (C<1.0μF) 0.125 max. (C\geq1.0μF)</td> <td>0.15 max.</td> <td>0.15 max.</td> </tr> </tbody> </table>		Char.	25V min.	16V	10V	6.3V	Q/D.F.	X5R	0.05 max.	0.05 max.	0.05 max.	0.075 max.	X7R	0.05 max.	—	—	—	Z5U	0.05 max.	—	—	—	Y5V	0.075 max.	0.1 max. (C<1.0 μF) 0.125 max. (C \geq 1.0 μF)	0.15 max.	0.15 max.
	Char.	25V min.	16V	10V	6.3V																								
Q/D.F.	X5R	0.05 max.	0.05 max.	0.05 max.	0.075 max.																								
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	Y5V	0.075 max.	0.1 max. (C<1.0 μF) 0.125 max. (C \geq 1.0 μF)	0.15 max.	0.15 max.																								
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

Type (EIA Code)	GRM36* (0402)										GRM39 (0603)										GRM40 (0805)															
	X5R		X7R			Y5V					X7R		Y5V					X7R					Y5V													
Char.	10	16	10	16	25	50	10	16	25	50	10	16	25	50	100	200	10	16	25	50	100	10	16	25	50	100	200	16	25	50	100					
Cap. (pF)	Volt.																																			
220																																				
270																																				
330																																				
390																																				
470																																				
560																																				
680																																				
820																																				
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10000000																																				

*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

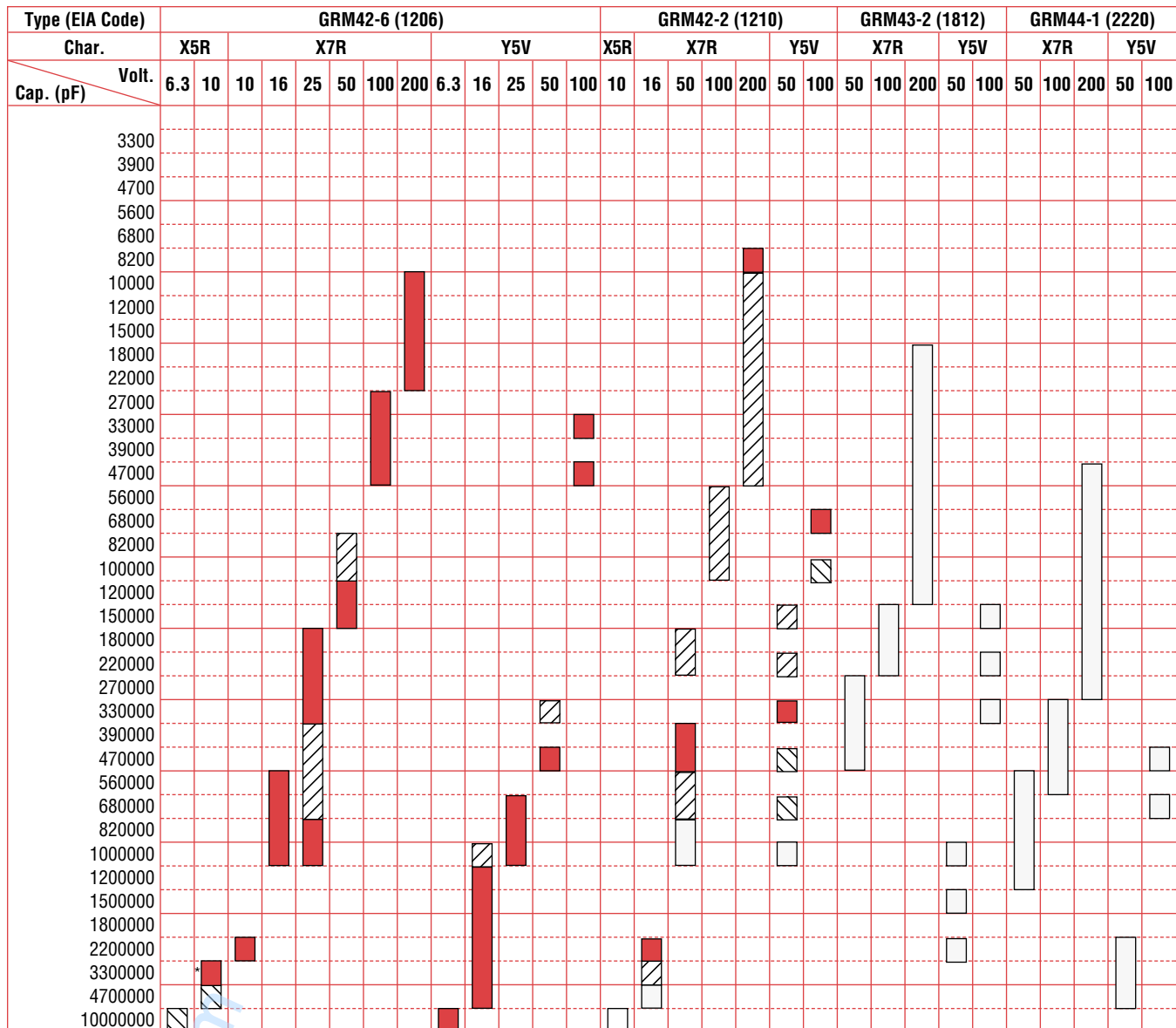
Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) ³	Bulk Case (pcs./case)	Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) ³	Bulk Case (pcs./case)
GRM36	: 0.5 ± 0.05	1000	10000	50000	GRM40	: 0.85 ± 0.1	1000	4000	—
GRM39	: 0.8 ± 0.1 ⁴	1000	4000	15000		: 1.25 ± 0.1	1000	3000	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		GRM43-2	: 2.5 ± 0.2	1000	1000
	: 1.6 ± 0.2	1000	2000			GRM44-1	: 2.0 max.	1000
GRM42-2	: 1.15 ± 0.1	1000	3000	GRM44-1	: 2.0 max.		1000	1000
	: 1.35 ± 0.15	1000	2000		¹ φ330mm 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