

# 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**

Ceramic Dielectric  
Inner Electrode  
Inner Termination (Ag or Ag/Pd or Cu)  
Nickel Plated Barrier Layer  
Tin Plating\*

\*Size 0402 – Solder Plated

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

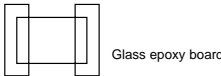
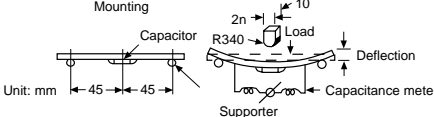
# SURFACE MOUNT MONOLITHIC CHIP CAPACITORS HIGH DIELECTRIC CONSTANT TYPE- SPECIFICATION

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

## GENERAL/ELECTRICAL

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

## MECHANICAL

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

## ENVIRONMENTAL

<b>TEST</b>	<b>TEST METHOD</b>	<b>POST TEST LIMITS</b>
<b>Thermal Shock (Air to Air)</b>	MIL-STD-202, Method 107, Condition A Prior to starting Thermal Shock test, capacitors shall be heat treated (deaged) for one (1) hour at $150^{\circ}\text{C}$ . 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 $\Delta$ C: X5R/X7R = $\pm 12.5\%$ Y5V = $\pm 30.0\%$ D.F.: X5R/X7R = 2.5% max. @ $25^{\circ}\text{C}$ , (3.5% max. @ $25^{\circ}\text{C}$ for 16V & 10V Series) (7.5% max. @ $25^{\circ}\text{C}$ for 6.3V Series) Y5V = 5.0% max. @ $25^{\circ}\text{C}$ , (9.0% max. @ $25^{\circ}\text{C}$ for 16V Series) (15% max. @ $25^{\circ}\text{C}$ for 10V & 6.3V Series) I.R.: X5R/X7R = 100,000M $\Omega$ min. of 1,000M $\Omega$ • $\mu\text{F}$ (whichever is less) Y5V = 10,000 $\Omega$ or 500M $\Omega$ • $\mu\text{F}$ min. (whichever is less)
<b>Humidity, Steady State</b>	Maintain the capacitor at $40 \pm 2^{\circ}\text{C}$ and 90 to 95% humidity for $500 \pm 12$ hours. Remove and let sit for $48 \pm 4$ 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 $\Omega$ or 50 $\Omega$ F (whichever is less)
<b>Humidity Load</b>	Apply the rated voltage at $40 \pm 2^{\circ}\text{C}$ and 90 to 95% humidity for $500 \pm 12$ hours. Remove and let sit for $48 \pm 4$ 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 $48 \pm 4$ 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)
<b>Life Test</b>	Apply 200% of rated voltage for $1000 \pm 12$ 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 $\pm 12.5\%$ $\Delta$ CX, Z5U/Y5V $\pm 30\%$ $\Delta$ CX D.F.: X5R/X7R = 3.0% max. @ $25^{\circ}\text{C}$ , (5% max. @ $25^{\circ}\text{C}$ for 16V & 10V Series) (7.5% max. @ $25^{\circ}\text{C}$ for 6.3V Series) Y5V = 7.5% max. @ $25^{\circ}\text{C}$ , (10% max. @ $25^{\circ}\text{C}$ for 16V Series) (15% max. @ $25^{\circ}\text{C}$ for 10V & 6.3V Series) I.R.: X5R/X7R 1,000M $\Omega$ or 50M $\Omega$ -mfd. (whichever is less) Y5V 1,000M $\Omega$ or 50M $\Omega$ -mfd. (whichever is less) Flash: 250% rated voltage



