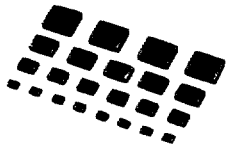
SURFACE MOUNT MONOLITHIC CHIP CAPACITORS HIGH DIELECTRIC CONSTANT TYPE

murata
Innovator in Electronics

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
See below and following pages.

3-digit code appears as necessary to indicate special thickness requirements. Please consult your local sales office for details.

TEMPERATURE CHARACTERISTICS
X5R
X7R
Y5V

CAPACITANCE VALUE
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.

CAPACITANCE TOLERANCE
X7R/X5R:
K = ±10%
M = ±20%
Non-standard
J = ±5%
Y5V: Z = $^{+80}_{-20}$%

VOLTAGE
Identified by a three-digit number.

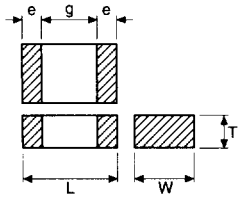
MARKING
A = Unmarked

PACKAGING

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.

CHIP DIMENSIONS



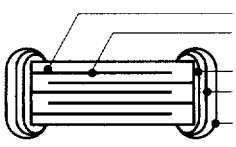
Dimensions: mm	Size	EIA Code	L Length	W Width	T Thickness	e (min.) Termination	g (min.) Insulation
	GRM36	0402	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05	0.15 ~ 0.3	0.4
	GRM39*	0603	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.2 ~ 0.5	0.5
	GRM40	0805	2.0 ± 0.1	1.25 ± 0.1	0.6 ± 0.1 0.85 ± 0.1 1.25 ± 0.1	0.2 ~ 0.7	0.7
	GRM42-6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

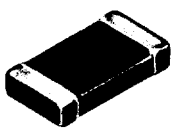
CHIP TERMINATION DIAGRAMS

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

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Innovator in Electronics

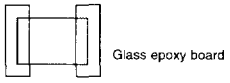
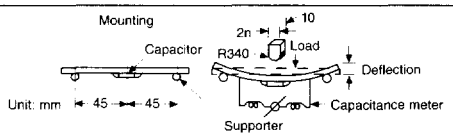
GRM36/39/40/42-6/42-2/43-2/44-1 Series

GENERAL/ELECTRICAL

Capacitance Change with Temperature:	X5R: ±15% ΔCX −55°C to +85°C X7R: ±15% ΔCX −55°C to +125°C Y5V: $^{+22\%}_{-82\%}$ ΔCX −30°C to +85°C
Capacitance & D.F. (Frequency & Voltage)	X5R, X7R: 1kHz ±100Hz @ 1.0 ±.2Vrms Y5V: 1kHz ±100Hz @ 1.0 ±.2Vrms
Dissipation Factor (D.F.)	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%

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)
Dielectric Strength (Flash)	250% of rated voltage for 5 seconds with series resistor limiting charge current to 50mA max.; 200% for 500V
Typ. Aging (per Decade)	X5R/X7R 3% Y5V 7%

MECHANICAL

TEST	TEST METHOD	POST TEST LIMITS
Terminal Adhesion		<0603 1.0 lbs. ≥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 ΔC: X5R/X7R = ±12.5% Y5V = ±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 = 100,000MΩ min. of 1,000MΩ•μF (whichever is less) Y5V = 10,000Ω or 500MΩ•μF min. (whichever is less)
Humidity, Steady State	Maintain the capacitor 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.	Appearance: No defects Capacitance: X5R, X7R within ±12.5%; Z5U, Y5V within ±30% Q/D.F.: See chart below. I.R.: 1,000MΩ or 50Ω F (whichever is less)
Humidity Load	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. • Initial measurement for Y5V/10V max. Apply the rated DC voltage for 1 hour at 40 ± 20°C. Remove and let sit for 48 ± 4 hours at room temperature. Perform initial measurement.	Appearance: No defects Capacitance: X5R, X7R within ±12.5%; Z5U within ±30%; Y5V within +30/-40% (10Vmax), within ±30% (others) Q/D.F.: Char. / 25V min. / 16V / 10V / 6.3V X5R X7R: 0.05 max. / 0.05 max. / 0.05 max. / 0.075 max. Z5U: 0.05 max. / — / — / — Y5V: 0.075 max. / 0.1 max. (C<1.0μF) 0.125 max. (C≥1.0μF) / 0.15 max. / 0.15 max. I.R.: 500MΩ or 25Ω F (whichever is less) Dielectric Strength: No failure
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 ± 12.5% ΔCX, Z5U/Y5V ±30% ΔCX 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 1,000MΩ or 50MΩ-mfd. (whichever is less) Y5V 1,000MΩ or 50MΩ-mfd. (whichever is less) Flash: 250% rated voltage

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

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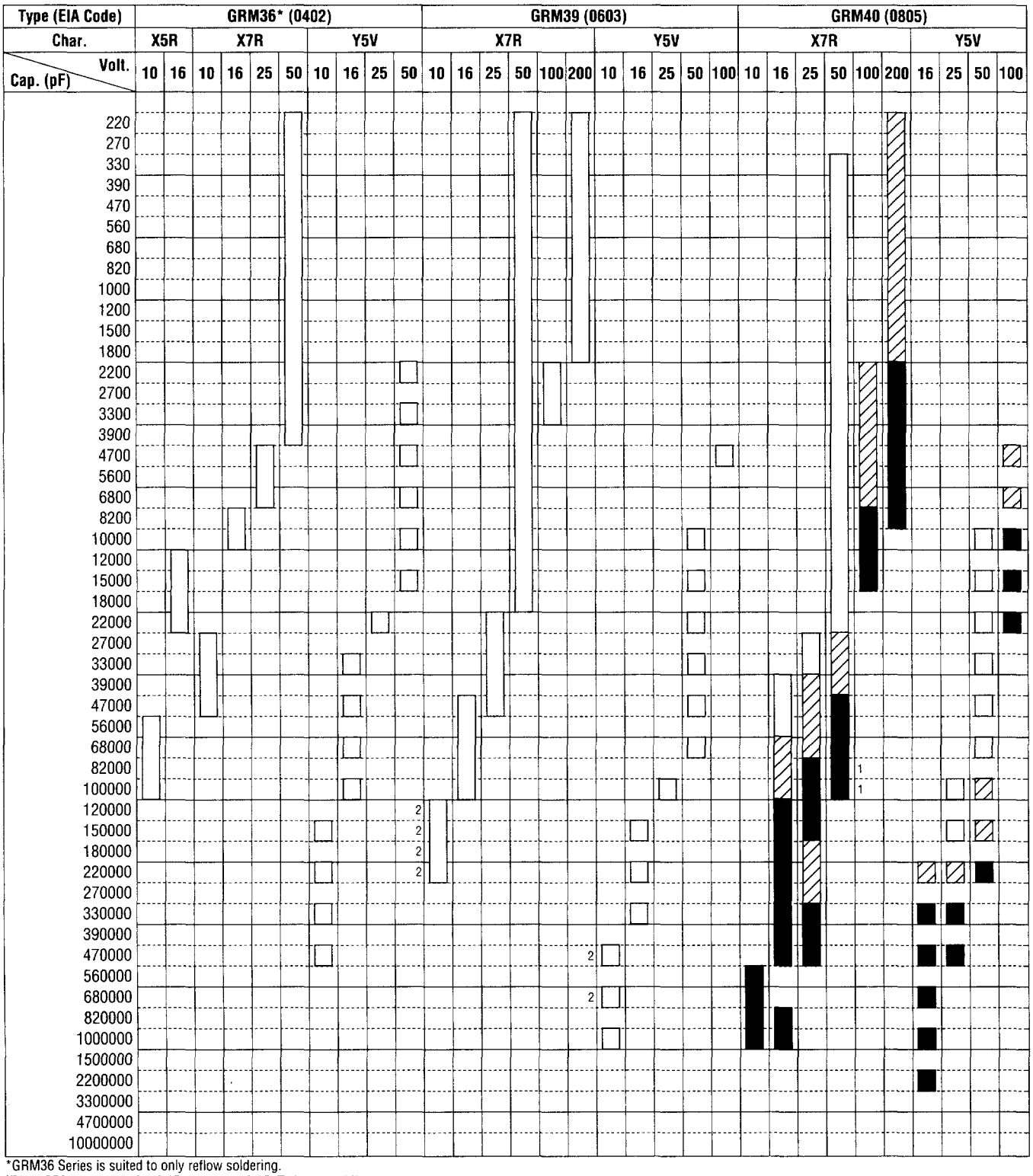
GRM36/39/40 Series



*GRM36 Series is suited to only reflow soldering.
[1]Type: GRM40-034 (L: 2 ± 0.15, W: 1.25 ± 0.15, T: 1.25 ± 0.15)
[2]Only 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	[3]φ330mm reel is available on request. [4]Bulk case packaging is T = 0.8 ± 0.07.				

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

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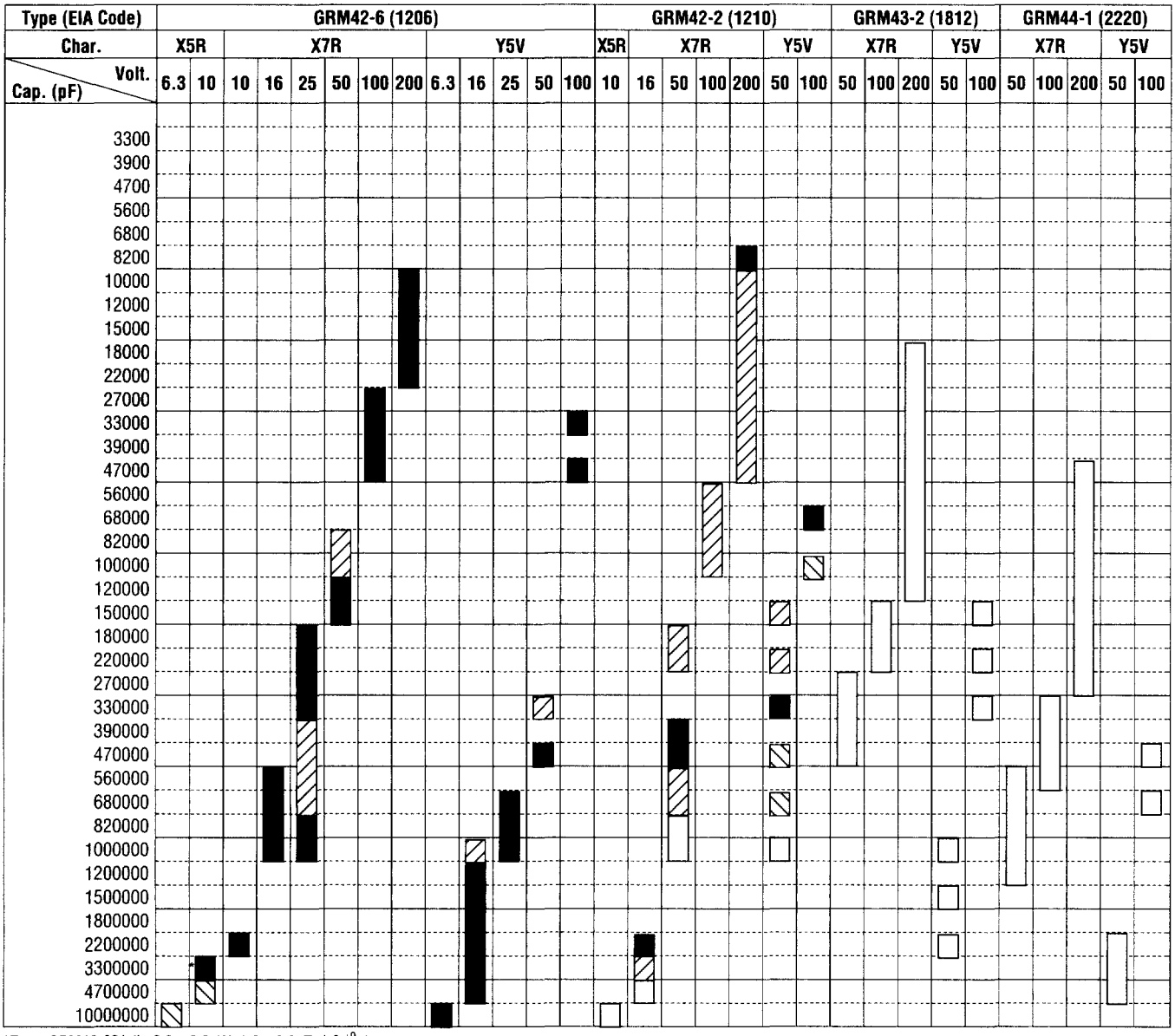
GRM42-6/42-2/43-2/44-1 Series



*Type: GRM42-631 (L: 3.2 ± 0.2, W: 1.6 ± 0.2, T: 1.3 $^{+0}_{-0.2}$)

THICKNESS AND PACKAGING TYPES/QUANTITY

Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./ϕ178mm reel)[1]
GRM42-6	▨: 0.85 ± 0.1	1000	4000
	■: 1.15 ± 0.1	1000	3000
	▨: 1.6 ± 0.2	1000	2000
GRM42-2	■: 1.15 ± 0.1	1000	3000
	□: 1.35 ± 0.15	1000	2000

Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./ϕ178mm reel)[1]
GRM42-2	▨: 1.8 ± 0.2	1000	1000
	□: 2.5 ± 0.2	1000	1000
GRM43-2	□: 2.0 max.	1000	1000
GRM44-1	□: 2.0 max.	1000	1000

[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

Capacitors > Monolithic Ceramic Capacitors > for Flow/Reflow Soldering

Specification

Part Number	GRM39X5R105K6.3
Length L	1.60mm ±0.10mm
Width W	0.80mm ±0.10mm
Thickness T	0.80mm ±0.10mm
Electrod e	0.20 to 0.50mm
Electrode Gap g	0.50mm min.
TC Code	X5R
Capacitance Change	±15%
TC Change Correction	
Temperature Range	-55 to 85°C
Capacitance	1.0µF ±10%
Rated Voltage	6.3Vdc
Soldering Method	FLW / RFLW
Recomended Parts	
EIA	0603

Minimum Quantity

180mm Paper Tape	4000
180mm Plastic Tape	
330mm Paper Tape	10000
330mm Plastic Tape	
Bulk Case	
Bulk(Bag)	1000
Flat Pack	
335Reel	
Magazine	
Box	

Details

- Appearance
- Dimensions
- Feature & Applctn
- Cap.-Temp.Char.
- Cap.Chng.-Aging
- Impdnc.-Freq.Char.
- Notice (storage and operation condition)
- Notice (rating)
- Notice (soldering and mounting)
- Notice (handling)
- Notice (other)
- Specifications
- Packaging
- Information for Data
- Sample Kit

Product specifications in this catalog are as of Fed. '00, and are subject to change or obsolescence

■Specifications and Test Methods

No.	Item		Specification: Temperature Compensating Type	Specification: High Dielectric Type	Test Method
1	Operating Temperature		−55 to +125℃	X5R : −55 to +85℃ X7R : −55 to +125℃ Z5U : +10 to +85℃ Y5V : −30 to +85℃	
2	Rated Voltage		See the previous page.		The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V^{P-P} or V^{O-P}, whichever is larger, shall be maintained within the rated voltage range.
3	Appearance		No defects or abnormalities.		Visual inspection.
4	Dimensions		Within the specified dimensions.		Using calipers on micrometer.
5	Dielectric Strength		No defects or abnormalities.		No failure shall be observed when *300% of the rated voltage (C0Δ to U2J and SL) or *250% of the rated voltage (X5R, X7R, Z5U and Y5V) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V
6	Insulation Resistance		More than 10,000MΩ or 500Ω · F (Whichever is smaller)		The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25℃ and 75%RH max. and within 2 minutes of charging.
7	Capacitance		Within the specified tolerance.		The capacitance/Q/D.F. shall be measured at 25℃ at the frequency and voltage shown in the table.
8	Q/ Dissipation Factor (D.F.)		30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[X5R,X7R] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V : 6.3V 0.05max.(C<3.3μF) 0.1max.(C≧3.3μF) [Z5U] W.V. : 25Vmin. : 0.025max. [Y5V] W.V. : 25Vmin. : 0.05max.(C<10μF) : 0.09max.(C≧1.0μF) W.V. : 16V : 0.07max.(C<1.0μF) : 0.09max.(C≧1.0μF) W.V. : 10Vmax. : 0.125max.	
9	Capacitance Temperature Characteristics	Capacitance Change	Within the specified tolerance. (Table A)	X5R : Within±15% (−55 to +85℃) X7R : Within±15% (−55 to +125℃) Z5U : Within +22/−56% (+10 to +85℃) Y5V : Within +22/−82% (−30 to +85℃)	The capacitance change shall be measured after 5 Min. at each specified temperature stage. (1) Temperature Compensating Type The temperature coefficient is determined using the Capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5 (C0Δ : +25℃ to +125℃ : other temp. coeffs. : +25℃ to +85℃) the capacitance shall be within the specified tolerance for the temperature coefficient and capacitance change as Table A. The capacitance drift is caluculated by dividing the differences between the maximum and minimum measured values in the step 1,3 and 5 by the cap value in step 3.
		Temperature Coefficient	Within the specified tolerance. (Table A)	—	
		Capacitance Drift	Within ±0.2% or ±0.05pF (Whichever is larger.) *Not apply to SL/25V	—	(2) High Dielectric Constant Type The ranges of capacitance change compared with the above 25℃ value over the temperature ranges shown in the table shall be within the specified ranges.

Item \ Char.	Frequency	Voltage
C0Δ toU2J,SL (1000pF and below)	1±0.1MHz	0.5 to 5Vrms
C0Δ toU2J,SL (more than 1000pF)	1±0.1kHz	1±0.2Vrms
X5R,X7R,Y5V (10μF and below)	1±0.1kHz	1±0.2Vrms
X5R,X7R,Y5V (more than 10μF)	120±24Hz	0.5±0.1Vrms
Z5U	1±0.1kHz	0.5±0.05Vrms

Step	Temperature(℃)
1	25±2
2	−55±3 (for CΔ to U2J/SL/X5R/X7R) −30±3 (for Y5V) 10±3 (for Z5U)
3	25±2
4	125±3 (for CΔ/X7R) 85±3 (for other TC)
5	25±2

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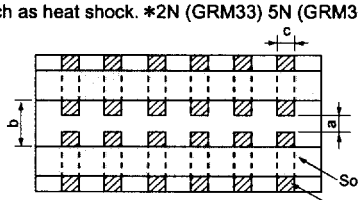
<table>
<tr><th rowspan="2">No.</th><th rowspan="2" colspan="2">Item</th><th colspan="2">Specification</th><th rowspan="2">Test Method</th></tr>
<tr><th>Temperature Compensating Type</th><th>High Dielectric Type</th></tr>
<tr><td>10</td><td colspan="2">Adhesive Strength of Termination</td><td colspan="2">No removal of the terminations or other defect shall occur.</td><td>Solder the capacitor to the test jig (glass epoxy board) shown in Fig.1 using a eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1sec. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and gree of defects such as heat shock. *2N (GRM33) 5N (GRM36,GRM39)
 

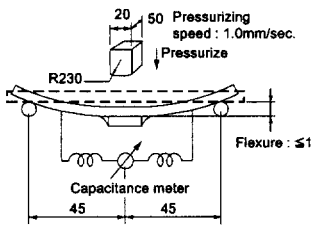
Fig.1
<table>
<tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr>
<tr><td>GRM33</td><td>0.3</td><td>0.9</td><td>0.3</td></tr>
<tr><td>GRM36</td><td>0.4</td><td>1.5</td><td>0.5</td></tr>
<tr><td>GRM39</td><td>1.0</td><td>3.0</td><td>1.2</td></tr>
<tr><td>GRM40</td><td>1.2</td><td>4.0</td><td>1.65</td></tr>
<tr><td>GRM42-6</td><td>2.2</td><td>5.0</td><td>2.0</td></tr>
<tr><td>GRM42-2</td><td>2.2</td><td>5.0</td><td>2.9</td></tr>
<tr><td>GRM43-2</td><td>3.5</td><td>7.0</td><td>3.7</td></tr>
<tr><td>GRM44-1</td><td>4.5</td><td>8.0</td><td>5.6</td></tr>
</table>
(in mm)</td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Vibration Resistance</td><td>Appearance</td><td colspan="2">No defects or abnormalities.</td><td rowspan="3">Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor shall be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours).</td></tr>
<tr><td>Capacitance</td><td colspan="2">Within the specified tolerance.</td></tr>
<tr><td>Q/D.F.</td><td>30pFmin. : Q≧1000
30pFmax. : Q≧400+20C
C : Nominal Capacitance (pF)</td><td>[X5R,X7R]
W.V. : 25Vmin. : 0.025max.
W.V. : 16/10V : 0.035max.
W.V. : 6.3V :
0.05max. (C<3.3μF)
0.1max. (C≧3.3μF)
[Z5U]
W.V. : 25Vmin. : 0.025max.
[Y5V]
W.V. : 25Vmin.
: 0.05max. (C<1.0μF)
: 0.09max. (C≧1.0μF)
W.V. : 16V
: 0.07max. (C<1.0μF)
: 0.09max. (C≧1.0μF)
W.V. : 10Vmax.:0.125max.</td></tr>
<tr><td>12</td><td colspan="2">Deflection</td><td colspan="2">No crack or marked defect shall occur.
 

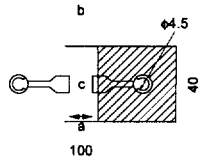
Fig.3</td><td>Solder the capacitor on the test jig (glass epoxy board) shown in Fig.2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.
 

Fig.2 t : 1.6mm (GRM33/36 : 0.8mm)
<table>
<tr><th>Type</th><th>a</th><th>b</th><th>c</th></tr>
<tr><td>GRM33</td><td>0.3</td><td>0.9</td><td>0.3</td></tr>
<tr><td>GRM36</td><td>0.4</td><td>1.5</td><td>0.5</td></tr>
<tr><td>GRM39</td><td>1.0</td><td>3.0</td><td>1.2</td></tr>
<tr><td>GRM40</td><td>1.2</td><td>4.0</td><td>1.65</td></tr>
<tr><td>GRM42-6</td><td>2.2</td><td>5.0</td><td>2.0</td></tr>
<tr><td>GRM42-2</td><td>2.2</td><td>5.0</td><td>2.9</td></tr>
<tr><td>GRM43-2</td><td>3.5</td><td>7.0</td><td>3.7</td></tr>
<tr><td>GRM44-1</td><td>4.5</td><td>8.0</td><td>5.6</td></tr>
</table>
(in mm)</td></tr>
</table>

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No.	Item		Specification: Temperature Compensating Type	Specification: High Dielectric Type	Test Method
13	Solderability of Termination		75% of the terminations is to be soldered evenly and continuously.		Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight propotion). Preheat at 80 to 120℃ for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5℃.
14	Resistance to Soldering Heat		The measured and observed characteristics shall satisfy the specifications in the following table.		Preheat the capacitor at 120 to 150℃ for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5℃ for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type), then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150 +0 -10℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement. *Preheating for GRM42-2/43-2/44-1 Step 1: 100℃ to 120℃, 1 min. Step 2: 170℃ to 200℃, 1 min.
		Appearance	No marking defects.		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	X5R,X7R : Within ±7.5% Z5U,Y5V : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C:Nominal Capacitance (pF)	[X5R,X7R] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [Z5U] W.V. : 25Vmin. : 0.025max. [Y5V] W.V. : 25Vmin. : 0.05max. (C<1.0μF) : 0.09max. (C≧1.0μF) W.V.:16V : 0.07max. (C<1.0μF) : 0.09max. (C≧1.0μF) W.V. : 10Vmax. : 0.125max.	
		I.R.	More than 10,000MΩ or 500Ω•F (Whichever is smaller)		
		Dielectric Strength	No failure		
15	Temperature Cycle		The measured and observed characteristics shall safisfy the specifications in the following table.		Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hour (high dielectric constant type) at room temperature, then measure. Step 1: Temp. (℃) Min. Operating Temp.+0/−3, Time(min.) 30±3 Step 2: Room Temp., 2 to 3 Step 3: Max. Operating Temp.+3/−0, 30±3 Step 4: Room Temp., 2 to 3 •Initial measurement for high dielectric constant type Perform a heat treatment at 150 +0 -10℃ for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement.
		Appearance	No marking defects.		
		Capacitance Change	Within ±2.5% or ±0.25pF (Whichever is larger)	X5R,X7R : Within ±7.5% Z5U,Y5V : Within ±20%	
		Q/D.F.	30pFmin. : Q≧1000 30pFmax. : Q≧400+20C C : Nominal Capacitance (pF)	[X5R,X7R] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V:0.035max. W.V. : 6.3V 0.05max. (C<3.3μF) 0.1max. (C≧3.3μF) [Z5U] W.V. : 2.5Vmin. : 0.025max. [Y5V] W.V. : 25Vmin. : 0.05max. (C<1.0μF) : 0.09max. (C≧1.0μF) W.V. : 16V : 0.07max. (C<1.0μF) : 0.09max. (C≧1.0μF) W.V. : 10Vmax. : 0.125max.	
		I.R.	More than 10,000MΩ or 500Ω•F (Whichever is smaller)		
		Dielectric Strength	No failure		

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No.	Item		Specification		Test Method
			Temperature Compensating Type	High Dielectric Type	
16	Humidity Steady State		The measured and observed characteristics shall satisfy the specifications in the following table.		Sit the capacitor at 40±2℃ and 90 to 95% humiduty for 500±12 hours. Remove and letsit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure.
		Appearance	No marking defects.		
		Capacitance Change	Within ±5% or ±0.5pF (Whichever is larger)	X5R,X7R : Within ±12.5% Z5U,Y5V : Within ±30%	
		Q/D.F.	30pF and over:Q≧350 10pF and over 30pF and below : Q≧275+5C/2 10pF and below : Q≧200+10C C : Nominal Capacitance (pF)	[X5R,X7R] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [Z5U] W.V. : 25Vmin.:0.05max. [Y5V] W.V. : 25Vmin. : 0.075max. (C<1.0μF) : 0.0125max.(C≧1.0μF) W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≧1.0μF) W.V. : 10Vmax. : 0.15max.	
		I.R.	More than 1,000MΩ or 50Ω•F(Whichever is smaller)		
		Dielectric Strength	No failure		
17	Humidity Load		The measured and observed characteristics shall satisfy the specifications in the following table.		Apply the rated voltage at 40±2℃ and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 Hours (high dielectric constant type) at room temperature, then muasure.The charge/discharge current is less than 50mA. •Initial measurement for Y5V/10Vmax. Apply the rated DC voltage for 1 hour at 40±2℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement.
		Appearance	No marking defects.		
		Capacitance Change	Within ±7.5% or ±0.75pF (Whichever is larger)	X5R,X7R : Within ±12.5% Z5U : Within ±30% Y5V : Within ±30% [W.V. : 10Vmax.] Y5V : Within +30/−40%	
		Q/D.F.	30pF and over : Q≧200 30pF and below : Q≧100±10C/3 C : Nominal Capacitance (pF)	[X5R,X7R] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [Z5U] W.V. : 25Vmin. : 0.05max. [Y5V] W.V. : 25Vmin. : 0.075max. (C<10μF) : 0.0125max. (C≧1.0μF) W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≧1.0μF) W.V. : 10Vmax. : 0.15max.	
		I.R.	More than 500MΩ or 25Ω•F(Whichever is smaller)		
		Dielectric Strength	No failure		

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No.	Item		Specification		Test Method
			Temperature Compensating Type	High Dielectric Type	
18	High Temperature Load		The measured and observed characteristics shall satisfy the specifications in the following table.		Apply 200% of the rated voltage for 1000±12 hours at the maximun operating temperature ±3℃. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximun operating temperature ±3℃. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. *150% for 500V
		Appearance	No marking defects.		
		Capacitance Change	Within ±3% or ±0.3pF (Whichever is larger)	X5R,X7R : Within ±12.5% Z5U : Within ±30% Y5V : Within ±30% (Cap<1.0μF) Y5V : Within +30/−40%(Cap≧1.0μF)	
		Q/D.F.	30pF and over : Q≧350 10pF and over 30pF and below : Q≧275±5C/2 10pF and below : Q≧200±10C C : Nominal Capacitance (pF)	[X5R,X7R] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≧3.3μF) [Z5U] W.V. : 25Vmin. : 0.05max [Y5V] W.V. : 25Vmin. : 0.075max. (C<1.0μF) : 0.0125max.(C≧1.0μF) W.V. : 16V : 0.1max. (C<1.0μF) : 0.125max. (C≧1.0μF) W.V. : 10Vmax. : 0.15max.	
		I.R.	More than 1,000MΩ or 50Ω•F(Whichever is smaller)		
		Dielectric Strength	No failure		
19	Notice		When mounting capacitor of 500V rated voltage, perform the epoxy resin coating(min.1.0mm thickness)		

Table A

Char.	Nominal Values (ppm/℃)*	Capacitance Change from 25℃ (%)					
		−55		−30		−10	
		Max.	Min.	Max.	Min.	Max.	Min.
C0G	0± 30	0.58	−0.24	0.40	−0.17	0.25	−0.11
C0H	0± 60	0.87	−0.48	0.59	−0.33	0.38	−0.21
P2H	−150± 60	2.33	0.72	1.61	0.50	1.02	0.32
R2H	−220± 60	3.02	1.28	2.08	0.88	1.32	0.56
S2H	−330± 60	4.09	2.16	2.81	1.49	1.79	0.95
T2H	−470± 60	5.46	3.28	3.75	2.26	2.39	1.44
U2J	−750±120	8.78	5.04	6.04	3.47	3.84	2.21
SL	+350 to −1000	−	−	−	−	−	−

*Nominal values denote the temperature coefficient within a range of 25℃ to 125℃ (for CoΔ)/85℃ (for other TC).