

# SURFACE MOUNT MONOLITHIC CHIP CAPACITORS

## COG AND TEMPERATURE COMPENSATING TYPES



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

SURFACE MOUNT MONOLITHIC CHIP CAPACITORS



#### 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	TEMPERATURE CHARACTERISTICS	CAPACITANCE VALUE	CAPACITANCE TOLERANCE	VOLTAGE	MARKING	PACKAGING																
3-digit code appears as necessary to indicate special thickness requirements. Please consult your local sales office for details.	COG COH P2H R2H S2H T2H U2J SL	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. For fractional values below 10pF, the letter "R" is used as the decimal point and the last digit becomes significant.	* = Standard ≤ 5pf: B = ±.1pf *C = ±.25pf >5pf to ≤10pf: B = ±.1pf C = ±.25pf *D = ±.5pf >10pf: K = ±10% *J = ±5% G = ±2% F = ±1%	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 115 - 118 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	0.2 ~ 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 ± 0.3	2.5 ± 0.2	1.6 ± 0.2	0.3 min.	1.0
					1.15 ± 0.1		
					1.35 ± 0.15		
1.8 ± 0.2							
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

## COG AND TEMPERATURE COMPENSATING TYPES – SPECIFICATION

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



### GENERAL

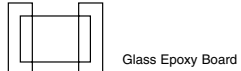
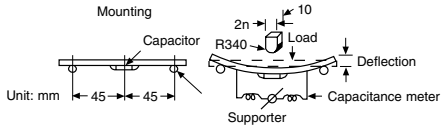
Temperature Coefficient	Temperature Range
COG = 0 ± 30 ppm*	-55° to +125°C
COH = 0 ± 60 ppm	-55° to +125°C
P2H = N150 ± 60 ppm	-55° to +85°C
R2H = N220 ± 60 ppm	-55° to +85°C
S2H = N330 ± 60 ppm	-55° to +85°C
T2H = N470 ± 60 ppm	-55° to +85°C
U2J = N750 ± 120 ppm	-55° to +85°C
SL = N1000 to P350	-55° to +85°C

\*TC Tolerance for COG  
Refer to EIA-RS198E for other limitations

### ELECTRICAL

TEST	
Capacitance & Q (Frequency & Voltage):	≤1000pF 1MHz ± 100Hz @ 1.0 ± .2 Vrms >1000pF 1kHz ± 100Hz @ 1.0 ± .2 Vrms
Q Limits	≤30pF: 400 + (20xC (pF)) >30pF: 1000 minimum
Insulation Resistance (I.R.)	100,000 megohms or 1000 megohms – mfd (whichever is less) with rated voltage applied for 2 minutes max with 50mA limiting current
Dielectric Strength (Flash)	250% of rated voltage for 5 seconds with series resistor limiting charging current to 50mA max.; 200% for 500V
Aging	Negligible

### MECHANICAL

TEST	TEST METHOD	POST TEST LIMITS
Terminal Adhesion	 Glass Epoxy Board	≤0603 1.0 lbs. ≥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	Contact factory for test limits

### ENVIRONMENTAL

TEST	TEST METHOD	POST TEST LIMITS
Thermal Shock (Air to Air)	MIL-STD-202, Method 107, Condition A Post thermal Shock measurement shall be taken after 24 hours stabilization.	Appearance: No visual damage ΔC: = ±2.0% or ±0.5pF (whichever is greater) Q: >30pF = 1,000 min., ≤ 30pF = 400 + [20 x C(pF)] I.R.: = 100,000MΩ min. or 1,000MΩ•μF (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 24 ± 2 hours at room temperature, then measure.	Appearance: No defects Capacitance: Within ±5% or ±0.5pF (whichever is greater) Q/D.F.: 30pF and over: Q≥350; 10pf to 30pf: Q≥275+5/2C 10pf and below: Q≥200±10C I.R.: 1,000MΩ or 50MΩ F (whichever is less) C: Nominal Capacitance (pF)
Humidity Load	Apply the rated voltage at 40 ± 2°C and 90 to 95% humidity for 500 ± 12 hours. Remove and let sit for 24 ± 2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.	Appearance: No defects Capacitance: Within ±7.5% or ±0.75pF (whichever is greater) Q/D.F.: 30pF and over: Q≥200; 30pf and below: Q≥100±10/3C I.R.: 500MΩ or 25MΩ F (whichever is less) C: Nominal Capacitance (pF)
Life Test	Apply 200% of rated voltage for 1000 ± 12 hours at maximum operating temperature; 150% for 500V. Upon completion of above test wait 24 hours prior to performing post testing.	Appearance: No defects Capacitance: ±3% or ±.3pF (whichever is greater) Q: >30pF = 500 min., ≤30pF = 200 + [10 x C(pF)] I.R.: 1,000MΩ or 50MΩ F (whichever is less) Flash: 250% rated voltage

### STORAGE LIFE

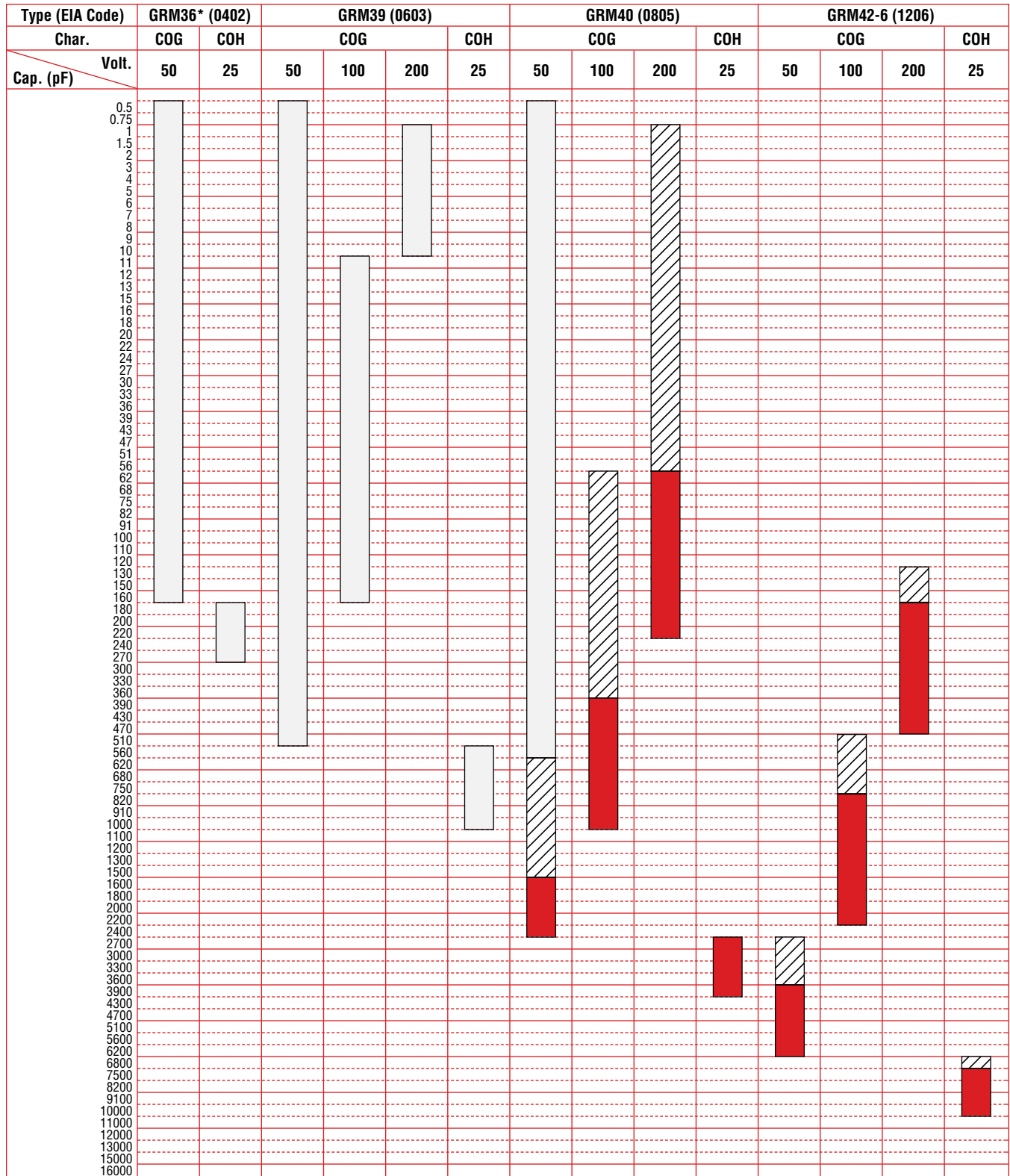
Chip component terminations should generally be protected from moisture. In addition, they should also be protected from materials containing chlorine, sulfur compounds or any harmful gases that could cause degradation of the solder.

- All chip components, including tape and reel, should be kept in an area where the temperature is between 5°C and 40°C and where the humidity is 20% to 70%.
- The chip components should be used within six months.
- The solderability of the chip components should be rechecked in the event that they are not used in six months.
- Peel strength and shelf life of tape are guaranteed for 1 year when stored under afore said conditions.

# SURFACE MOUNT MONOLITHIC CHIP CAPACITORS

## COG/COH TYPE – 25V/50V/100V/200V

### GRM36/39/40/42-6 Series



Note: Capacitance values = EIA 24 Step = 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91 \*GRM36 is suited to only reflow soldering.

### THICKNESS AND PACKAGING TYPES/QUANTITY

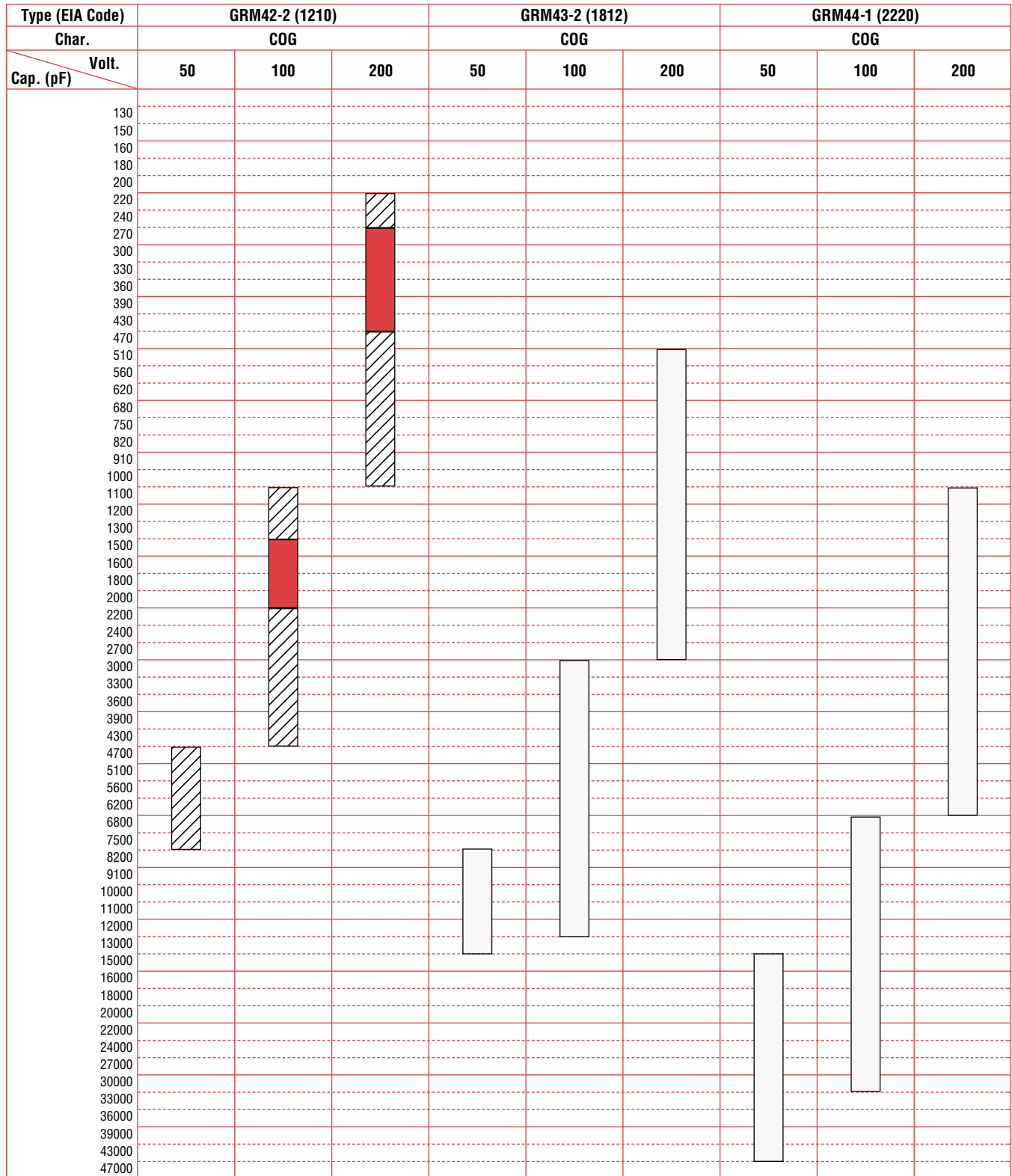
Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) <sup>1</sup>	Bulk Case (pcs./case)	Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) <sup>1</sup>	Bulk Case (pcs./case)
GRM36	█: 0.5 ± 0.05	1000	10000	50000	GRM42-6	▨: 0.85 ± 0.1	1000	4000	—
GRM39	█: 0.8 ± 0.1 <sup>2</sup>	1000	4000	15000		█: 1.15 ± 0.1	1000	3000	—
GRM40	█: 0.6 ± 0.1	1000	4000	10000					
	▨: 0.85 ± 0.1	1000	4000	—					
	█: 1.25 ± 0.1	1000	3000	5000					

<sup>1</sup>φ330mm reel is available on request. <sup>2</sup>Bulk case packaging is T = 0.8 ± 0.07.

# SURFACE MOUNT MONOLITHIC CHIP CAPACITORS

## COG TYPE - 50V/100V/200V

### GRM42-2/43-2/44-1 Series



Note: Capacitance values = EIA 24 Step = 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91

#### THICKNESS AND PACKAGING TYPES/QUANTITY

Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel)*
GRM42-2	□: 1.35 ± 0.15	1000	2000
GRM43-2	□: 2.0 max.	1000	1000
GRM44-1	□: 2.0 max.	1000	1000

\*φ330mm reel is available on request.

# SURFACE MOUNT MONOLITHIC CHIP CAPACITORS



## TEMPERATURE COMPENSATING TYPE – 25V/50V

### GRM36/39 Series

Type (EIA Code)	GRM36* (0402)		GRM39 (0603)						
Char.	SL		SL		P2H	R2H	S2H	T2H	U2J
Cap. (pF) \ Volt.	25	50	25	50	50	50	50	50	50
0.5									
0.75									
1									
1.5									
2									
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Note: Capacitance values = EIA 24 Step = 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91 \*GRM36 is suited to only reflow soldering.

#### THICKNESS AND PACKAGING TYPES/QUANTITY

Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel) <sup>1</sup>	Bulk Case (pcs./case)
GRM36	 : 0.5 ± 0.05	1000	10000	50000
GRM39	 : 0.8 ± 0.1 <sup>2</sup>	1000	4000	15000

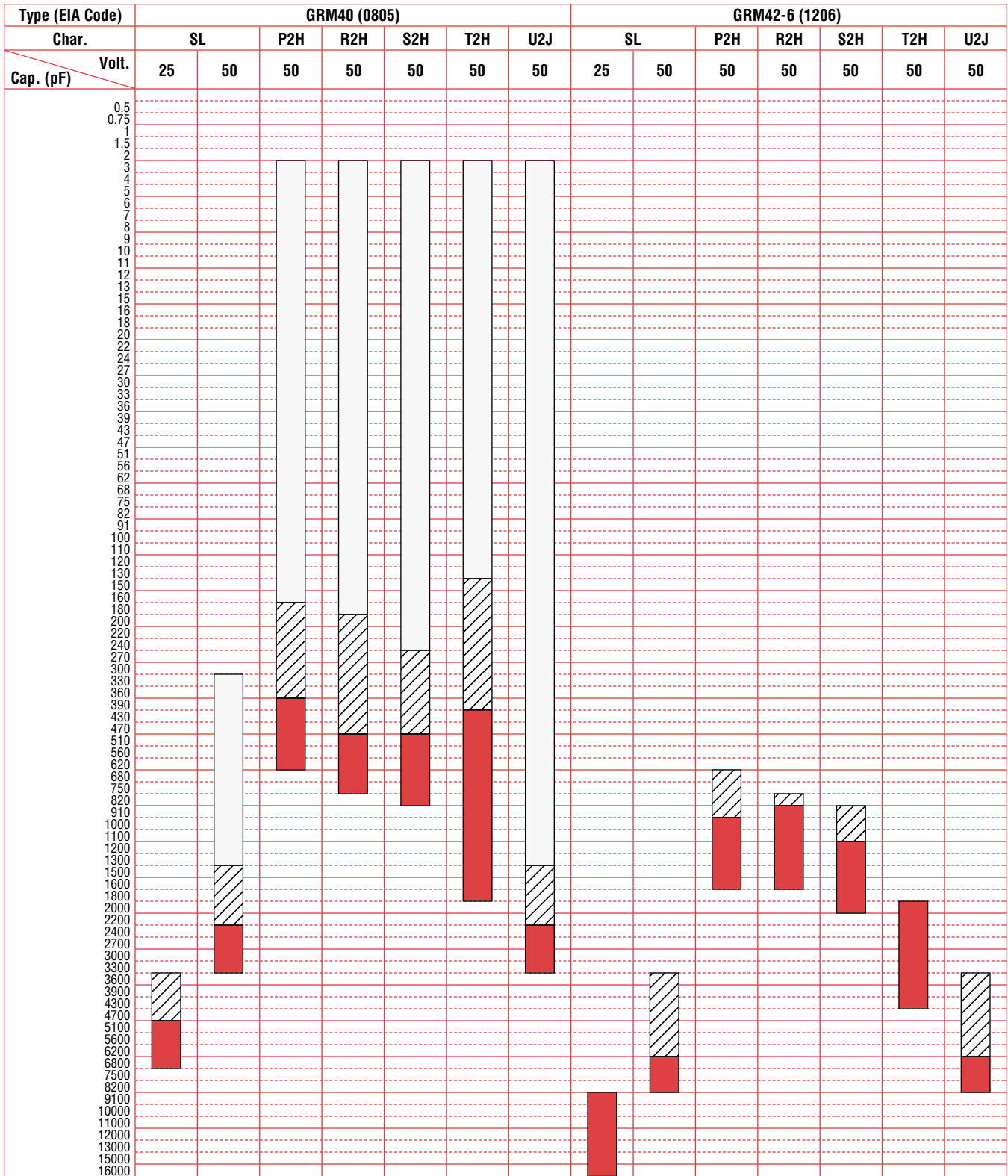
<sup>1</sup>φ330mm reel is available on request. <sup>2</sup>Bulk case packaging is T = 0.8 ± 0.07.

# SURFACE MOUNT MONOLITHIC CHIP CAPACITORS

## TEMPERATURE COMPENSATING TYPE - 25V/50V



### GRM40/42-6 Series



Note: Capacitance values = EIA 24 Step = 10, 11, 12, 13, 15, 16, 18, 20, 22, 24, 27, 30, 33, 36, 39, 43, 47, 51, 56, 62, 68, 75, 82, 91

#### THICKNESS AND PACKAGING TYPES/QUANTITY

Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel)*	Bulk Case (pcs./case)	Type	Thickness: T (mm)	Bulk (pcs./bag)	Taping (pcs./φ178mm reel)*	Bulk Case (pcs./case)
GRM40	□: 0.6 ± 0.1	1000	4000	10000	GRM42-6	▨: 0.85 ± 0.1	1000	4000	—
	▨: 0.85 ± 0.1	1000	4000	—		■: 1.15 ± 0.1	1000	3000	—
	■: 1.25 ± 0.1	1000	3000	5000		*φ330mm reel is available on request.			

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