CHIPS–
GRM Series

COG AND TEMPERATURE COMPENSATING

FEATURES

- Miniature size
- No Polarity
- Nickel Barrier Termination Standard – highly resistant to metal migration
- Uniform dimensions and configuration
- Flow and Reflow Solderable
- Minimum series inductance
- Tape and Reel Packaging
- Wide selection of capacitance values and voltages
- Largest production capacity and volumn in the world

PART NUMBERING SYSTEM

GRM 40 --- COG 101 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
COG
P2H
R2H
S2H
T2H
U2J
SL

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. For fractional values below 10pF, the letter "R" is used as the decimal point and the last digit becomes significant.

CAPACITANCE TOLERANCE
(10pF or less)
B=±.1pF
C=±.25pF
D=±.5pF
F=±1pF for 10pF only
(over 10pF)
F=±1%
G=±2%
J=±5%
K=±10%

VOLTAGE
Identified by a three-digit number.

MARKING
A=Unmarked
B=EIA Marking
C=Non-standard
Contact Factory.

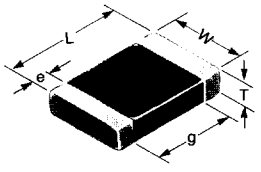
PACKAGING

Reel Diameter/ Tape Material	Code
7" Paper Tape	D
7" Plastic Tape	L
13" Paper Tape	J
13" Plastic Tape	K
Bulk	B

See pages 24-25 for additional marking and packaging information T/R per EIA-481-1

CHIP DIMENSIONS

DIMENSIONS: in (mm)

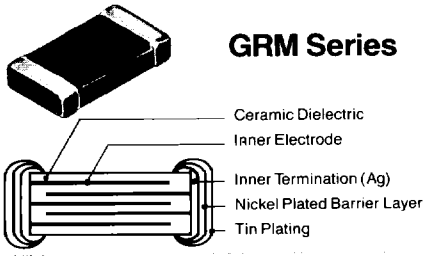


Size	EIA Code	L Length	W Width	T Thickness	g (Min.) Insulation	e Termination
GRM39	0603	.060 ± .006 (1.6 ± 0.15)	.030 ± .006 (0.80 ± 0.15)	Note 1: Thickness varies with capacitance value. See capacitance charts on following pages for thickness.	.020 (0.5)	.014 ± .006 (0.35 ± 0.15)
GRM40	0805	.080 ± .006 (2.0 ± 0.15)	.050 ± .006 (1.25 ± 0.15)		.030 (0.75)	.020 ± .010 (0.5 ± 0.25)
GRM42-6	1206	.125 ± .006 (3.2 ± 0.15)	.063 ± .006 (1.6 ± 0.15)		.040 (1.0)	.020 ± .010 (0.5 ± 0.25)
GRM42-2	1210	.125 ± .006 (3.2 ± 0.15)	.100 ± .006 (2.5 ± 0.15)		.040 (1.0)	.020 ± .010 (0.5 ± 0.25)
GRM43-2	1812	.180 ± .012 (4.6 ± 0.3)	.125 ± .008 (3.2 ± 0.2)		.080 (2.0)	.025 ± .015 (0.63 ± 0.38)
GRM43-4	1825	.180 ± .012 (4.6 ± 0.3)	.250 ± .016 (6.35 ± 0.4)		.080 (2.0)	.025 ± 0.15 (0.63 ± 0.38)
GRM44-1	2220*	.220 ± .012 (5.6 ± 0.3)	.200+.010-.025 (5.1+0.25-0.5)		.080 (2.0)	.025 ± .015 (0.63 ± 0.38)
GRM44	2225*	.220 ± .012 (5.6 ± 0.3)	.250 ± .016 (6.35 ± 0.4)		.080 (2.0)	.025 ± .015 (0.63 ± 0.38)

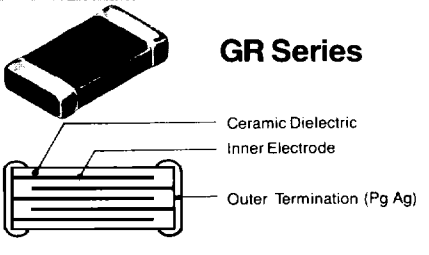
*Non EIA–Standard Size

CHIP TERMINATION DIAGRAMS

Nickel Barrier Layer (Standard)



Palladium Silver



Note: Other Terminations Available Upon Request. Please Contact Local Sales Office.

SPECIFICATIONS
GRM SERIES

COG AND TEMPERATURE COMPENSATING

GENERAL

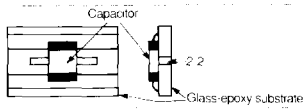
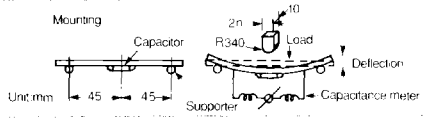
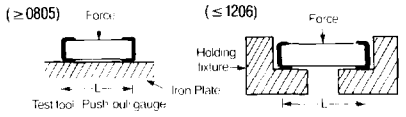
Temperature Coefficient	Temperature Range
COG = 0 ± 30 ppm*	−55° to +125°C
P2H = N150 ± 60 ppm	−55° to +85°C
R2H = N220 ± 60 ppm	−55° to +85°C
S2H = N330 ± 60 ppm	−55° to +85°C
T2H = N470 ± 60 ppm	−55° to +85°C
U2J = N750 ± 120 ppm	−55° to +85°C
SL = N1000 to P350	−55° to +85°C

***TC Tolerance for COG**
0.5 to 2.0pf = ±250ppm(K)
2.1 to 3.9pf = ±120ppm(J)
4.0 to 9.9pf = ± 60ppm(H)
10 or over = ± 30ppm(G)
Refer to EIA-RS198 for other limitations

ELECTRICAL

TEST	
Capacitance & Q (Frequency & Voltage):	≤1000pF 1 KHz ± 100Hz @ 1.0 ± .2 Vrms >1000pF 1MHz ± 100 KHz @ 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.
Aging	Negligible

MECHANICAL

TEST	TEST METHOD	POST TEST LIMITS
Terminal Adhesion		<0603 1.0 lbs. ≥0805 2.2 lbs. No evidence of termination peeling
Deflection		2 mm deflection (paper phenol board) 1mm deflection (Glass epoxy board) No mechanical damage Cap., DF, IR meet initial limits
Break Strength	 Stress is applied at rate of 150mm/minute	Thickness (mm) / F minimum (lbs) 0.7, 0.8 — 1.8 1.0 — 6.6 ≤1.25 — 12.0
Solderability	MIL-STD-202 Method 208F	Solder coverage GRM Type

	Under Room temperature		Under high temperature	Under high humidity
Initial	6 months	12 months	85 C 100 hrs	40 C, 90-95%RH 100hrs.
95-100%	95-100%	95%	90-95%	95%

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 24 hours prior to taking initial measurements. 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 × C(pF)] I.R.: = 100,000MΩ min. or 1,000MΩ•μF (whichever is less)
Humidity	**RATED VOLTAGE**: Apply rated voltage for 500 ±12 hours at 85°C and 85% relative humidity. **See Note 1** **LOW VOLTAGE**: Apply .5 Vrms for 250 ±12 hours at 85°C and 85% relative humidity. **See Note 1**	Appearance: No defects Capacitance: ±3% or ±.3pF (whichever is less) Q :>30pF = 500 min., ≤30pF = 200 + [10 x C(pF)] I.R.: 10,000 megohms or 100 megohm-mfd. (whichever is less) Flash: 250% rated voltage
Life Test	Apply 200% of rated voltage for 1000 ± 12 hours at maximum operating temperature **See Note 2**	Appearance: No defects Capacitance: ±3% or ±.3pF (whichever is greater) Q : >30pF = 500 min., ≤30pF = 200 + [10 x C(pF)] I.R.: 10,000 megohms or 100 megohm-mfd. (whichever is less) Flash: 250% rated voltage

Note 1: Upon completion of either above test wait 24 hours prior to performing post testing.
Note 2: Upon completion of above test wait 24 hours prior to performing post testing.

COG

MURATA ERIE DESIGNATION	GRM 39			GRM 40			GRM 42-6			GRM 42-2		
EIA TYPE DESIGNATION	0603			0805			1206			1210		
WVDC	50	100	200	50	100	200	50	100	200	50	100	200
CAPACITANCE (pF) (NOTE)												
1.0												
10			10									
100		160		330	390	56	750		150			240
560												
1000				2400								
(μF) .01												
.1												

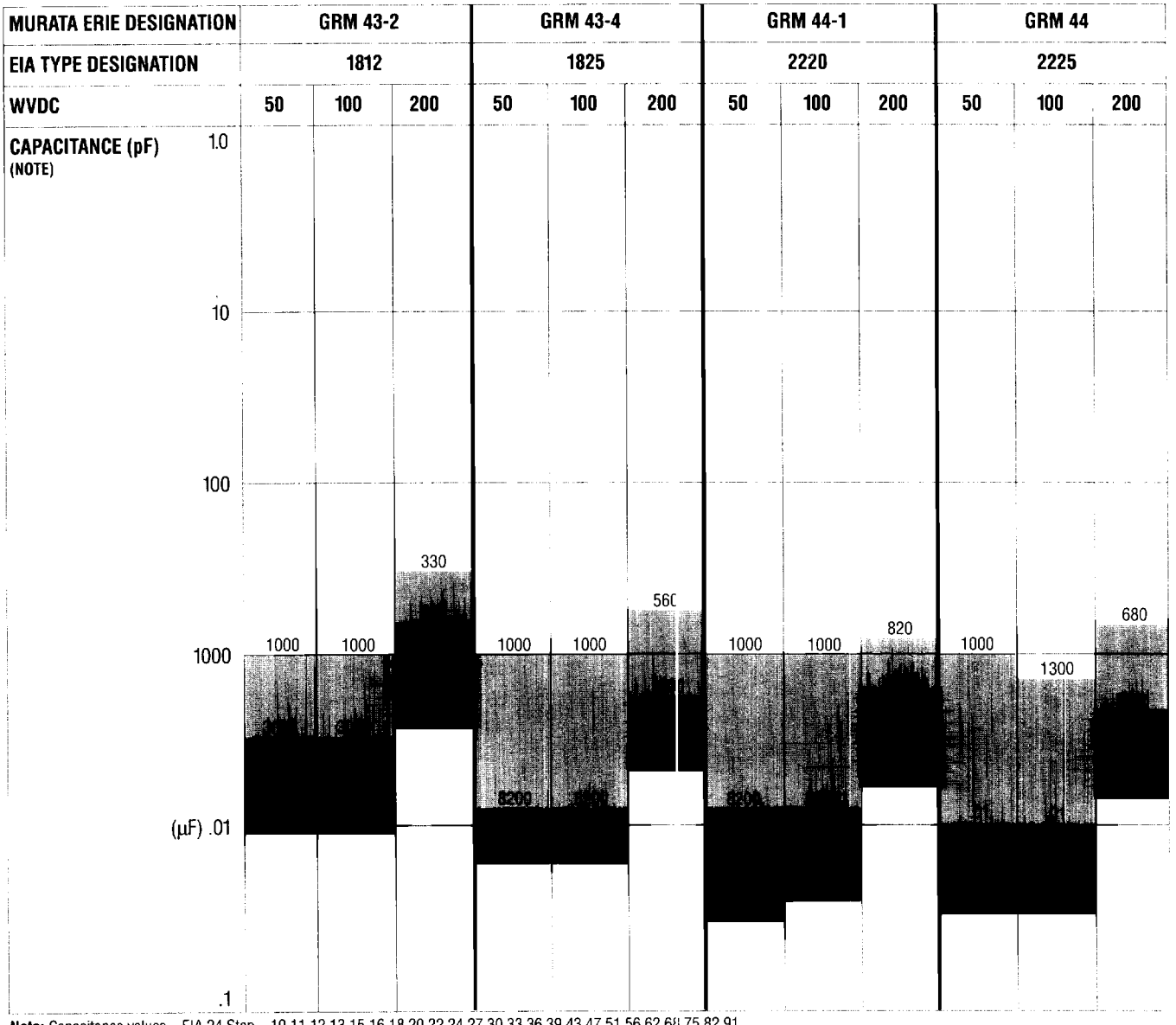
Note: Capacitance values = EIA 24 Step = 10,11,12,13,15,16,18,20,22,24,27,30,33,36,39,43,47,51,56,62,68,75,82,91
For values under 1.0pF and other values not listed, contact your local Murata Erie Sales Office

STANDARD THICKNESS/PACKAGING SPECIFICATIONS

Dimensions (mm)		Bulk	Tape			
		Pcs/bag (typical)	Pcs/7 inch (178 mm) reel		Pcs/13 inch (330 mm) reel	
		Plastic	Paper	Embossed	Paper	Embossed
	T : $0.7^{+0}_{-0.2}$	1000	4000	4000	10000	10000
	T : 0.8 ±0.1	1000	4000	N/A	10000	N/A
	T : $1.0^{+0}_{-0.2}$	1000	4000	3000	10000	10000
	T : $1.25^{+0}_{-0.2}$*	1000	N/A	3000	N/A	10000
	T : $1.5^{+0}_{-0.2}$	1000	N/A	2000	N/A	8000

*GRM 40 T = 1.25 ± .1

COG



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		Plastic	Paper	Embossed	Paper	Embossed
	T : 1.25 $^{+0}_{-0.2}$	1000	N/A	1000	N/A	5000
	T : 1.5 $^{+0}_{-0.2}$	1000	N/A	1000	N/A	5000
	T : 2.0 $^{+0}_{-0.2}$	1000	N/A	1000	N/A	4000

TEMPERATURE COMPENSATING

MURATA ERIE DESIGNATION	GRM 39												GRM 40											
EIA TYPE DESIGNATION	0603												0805											
CHARACTERISTIC	P2H		R2H		S2H		T2H		U2H		SL		P2H		R2H		S2H		T2H		U2J		SL	
WVDC	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100	50	100
CAPACITANCE (pF) (NOTE)	160	120	160	150	220	120	390	39	750	430	750	430	160		180		240		130	30	750	750	750	750

1.0 / 10 / 100 / 1000 / (μF) .01

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
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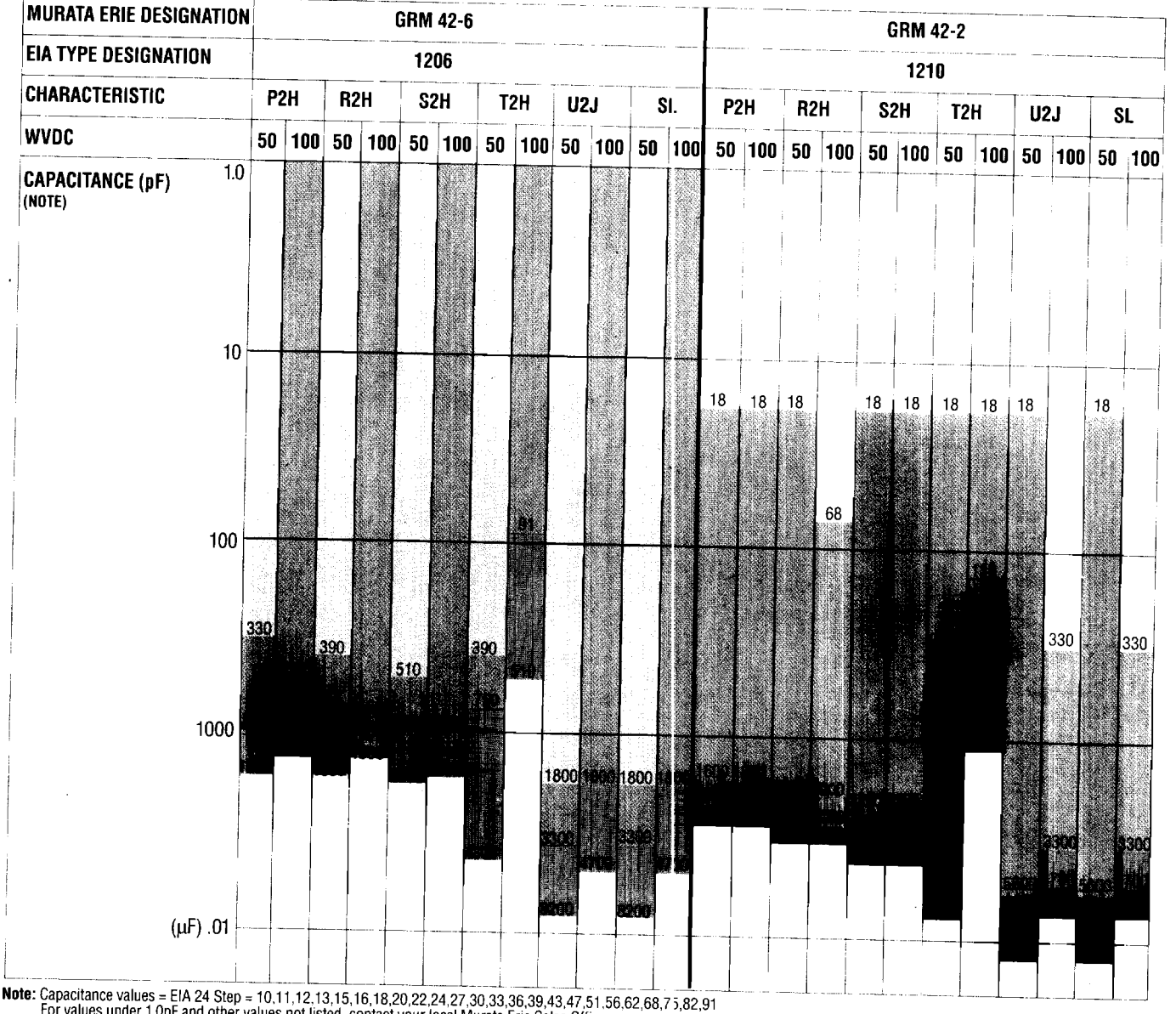
	T : 0.8 ± 0.1	1000	4000	N/A	10000	N/A
	T : $1.0^{+0}_{-0.2}$	1000	4000	3000	10000	10000
	T : $1.25^{+0}_{-0.2}$*	1000	N/A	3000	N/A	10000
	T : $1.5^{+0}_{-0.2}$	1000	N/A	2000	N/A	8000

*GRM 40 T = 1.25 ± .1

TEMPERATURE COMPENSATING



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	T : 0.7 $^{+0}_{-0.2}$	1000	4000	4000	10000	10000
	T : 0.8 ±0.1	1000	4000	4000	10000	10000
	T : 1.0 $^{+0}_{-0.2}$	1000	4000	3000	10000	10000
	T : 1.25 $^{+0}_{-0.2}$	1000	N/A	3000	N/A	10000
	T : 1.5 $^{+0}_{-0.2}$	1000	N/A	2000	N/A	8000