HIGH DIELECTRIC CONSTANT TYPE

PART NUMBERING SYSTEM

GRM 40 --- 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
★X7R
★Z5U
★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: ★K=±10%
★M=±20%
Z5U: ★M=±20%
★Z+80, –20%
Y5V: ★Z+80, –20%

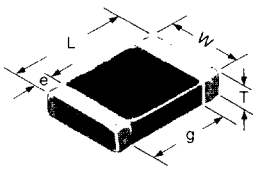
VOLTAGE
Identified by a three-digit number.

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 27-29 for additional marking and packaging information T/R per EIA-481-1	
Bulk Cassette	C
7″ Paper 2mm Pitch	Q

CHIP DIMENSIONS

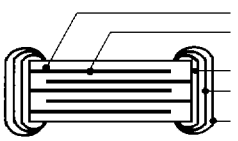
DIMENSIONS: in. (mm)	Size	EIA Code	L Length	W Width	T Thickness	g (Min.) Insulation	e Termination
	★GRM 36	0402	.040±.002 (1.0±0.05)	.020±.002 (0.5±0.05)	.020±.002 (0.5±0.05)	.012 (0.3)	.004 (0.1)
	★GRM 39	0603	.060±.006 (1.6±0.15)	.030±.006 (0.80±0.15)	Note 1: Thickness varies with capacitance value. See capacitance charts on following pages for thickness.	.020 (0.5)	.014±.006 (0.35±0.15)
	★GRM 40	0805	.080±.006 (2.0±0.15)	.050±.006 (1.25±0.15)		.030 (0.75)	.020±.010 (0.5±0.25)
	★GRM 42-6	1206	.125±.006 (3.2±0.15)	.063±.006 (1.6±0.15)		.040 (1.0)	.020±.010 (0.5±0.25)
	★GRM 42-2	1210	.125±.006 (3.2±0.15)	.100±.006 (2.5±0.15)		.040 (1.0)	.020±.010 (0.5±0.25)
	★GRM 43-2	1812	.180±.012 (4.6±0.3)	.125±.008 (3.2±0.2)		.080 (2.0)	.025±.015 (0.63±0.38)
	★GRM 43-4	1825	.180±.012 (4.6±0.3)	.250±.016 (6.35±0.4)		.080 (2.0)	.025±0.15 (0.63±0.38)
	★GRM 44-1	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)
	★GRM 44	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)

GRM Series





★Available as standard through authorized Murata Electronics Distributors.

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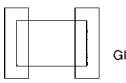
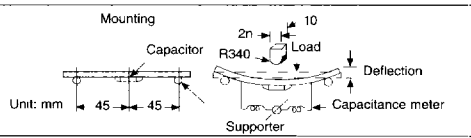
HIGH DIELECTRIC CONSTANT TYPE

GENERAL/ELECTRICAL

Capacitance Change with Temperature:	X7R : ±15% ΔCX −55°C to +125°C Z5U : $^{+22}_{-56}$% ΔCX +10°C to +85°C Y5V : $^{+22}_{-82}$% ΔCX −30°C to +85°C		
Capacitance & D.F. (Frequency & Voltage)	X7R : 1KHz ±100Hz @ 1.0 ±.2Vrms Z5U : 1KHz ±100Hz @ .5 ±.1Vrms Y5V : 1KHz ±100Hz @ 1.0 ±.2Vrms		
Dissipation Factor (D.F.)		25 to 100V	16V
	X7R	2.5%	3.5%
	Z5U	3.0%	(25V 5%)
	Y5V	5.0%	9.0%

Insulation Resistance (I.R.)	X7R 100,000 megohms or 1000 megohms-mfd (whichever is less) Z5U/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.
Typ. Aging (per Decade)	X7R 3% Z5U 5% 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		2 mm deflection (paper phenol board) 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 : X7R=±12.5% Z5U=±20.0% Y5V=±30.0% D.F. : X7R=2.5% max. @ 25°C, (3.5% max. @ 25°C for 16V Series) Z5U=3.0% max. @ 25°C, (5.0% max. @ 25°C for 25V Series) Y5V=5.0% max. @ 25°C, (9.0% max. @ 25°C for 16V Series) I.R. : X7R=100,000MΩ min. of 1,000MΩ•μF (whichever is less) Z5U/Y5V=10,000Ω or 500MΩ•μF min. (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 .5Vrms for 250 ± 12 hours at 85°C and 85% relative humidity **See Note 1**	Appearance: No defects Capacitance: X7R ± 12.5% ΔCX, Z5U/Y5V ±30% ΔCX D.F. : X7R=3.0% max. @ 25°C, (5% max. @ 25°C for 16V Series) Z5U=3.5% max. @ 25°C, (7% max. @ 25°C for 16V Series) Y5V=7.5% max. @ 25°C, (10% max. @ 25°C for 16V Series) I.R. : X7R 10,000MΩ or 100MΩ-mfd. (whichever is less) Z5U/Y5V 1,000MΩ or 50MΩ-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: X7R ± 12.5% ΔCX, Z5U/Y5V ±30% ΔCX D.F. : X7R=3.0% max. @ 25°C, (5% max. @ 25°C for 16V Series) Z5U=3.5% max. @ 25°C, (7% max. @ 25°C for 16V Series) Y5V=7.5% max. @ 25°C, (10% max. @ 25°C for 16V Series) I.R. : X7R 1,000MΩ or 50MΩ-mfd. (whichever is less) Z5U/Y5V 1,000MΩ or 50MΩ-mfd. (whichever is less) Flash : 250% rated voltage

Note 1: Upon completion of either above test wait 48 hours prior to performing post testing.
Note 2: Upon completion of above test wait 48 hours prior to performing post testing.

HIGH DIELECTRIC CONSTANT TYPE X7R

MURATA DESIGNATION	GRM 36			GRM 39					GRM 40					GRM 42-6					GRM 42-2				
EIA TYPE DESIGNATION	0402			0603					0805					1206					1210				
WVDC	16	25	50	16	25	50	100	200	16	25	50	100	200	16	25	50	100	200	16	25	50	100	200
CAPACITANCE (pF) 100			220			220	220	220			220	220	220			220	220	220					
1000		4700	4200		3900					2200													1500
	8200	7200																					
(μF) .01	.01			.012					.015						.022					.022		.027	
.1														.1					.12		.068		.048
1.0																							

Note: Capacitance values = EIA 12 Step = 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82. For values not listed, contact your local Murata Electronics Sales Office. (*For .1 T Max. = 1.4 mm)

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 : 0.5 ± 0.05	1000	10000	N/A	N/A	N/A
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

HIGH DIELECTRIC CONSTANT TYPE X7R

MURATA DESIGNATION	GRM 43-2					GRM 43-4			GRM 44-1				GRM 44		
EIA TYPE DESIGNATION	1812					1825			2220				2225		
WVDC	16	25	50	100	200	50	100	200	25	50	100	200	50	100	200
CAPACITANCE (pF) 100															
1000															
(μF) .01			.01	.012	.01	.047	.033	.022		.056	.056	.022	.082	.056	.033
.1	.39	.1							.47						
1.0						1.2							1.5		

Note: Capacitance values = EIA 12 Step = 10, 12, 15, 18, 22, 27, 33, 39, 47, 56, 68, 82. For values not listed, contact your local Murata Electronics 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
[redacted] T : 1.25 $^{+0}_{-0.2}$	1000	N/A	1000	N/A	5000
[redacted] T : 1.5 $^{+0}_{-0.2}$	1000	N/A	1000	N/A	5000
[redacted] T : 2.0 $^{+0}_{-0.2}$	1000	N/A	1000	N/A	4000

HIGH DIELECTRIC CONSTANT TYPE Z5U

MURATA 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) 1000									3300			6800
(μF) .01			N/A	.022							.022	
.1										.1		
1.0												

Note: Capacitance values = EIA 6 Step = 10, 15, 22, 33, 47, 68. For values not listed, contact your local Murata Electronics Sales Office.

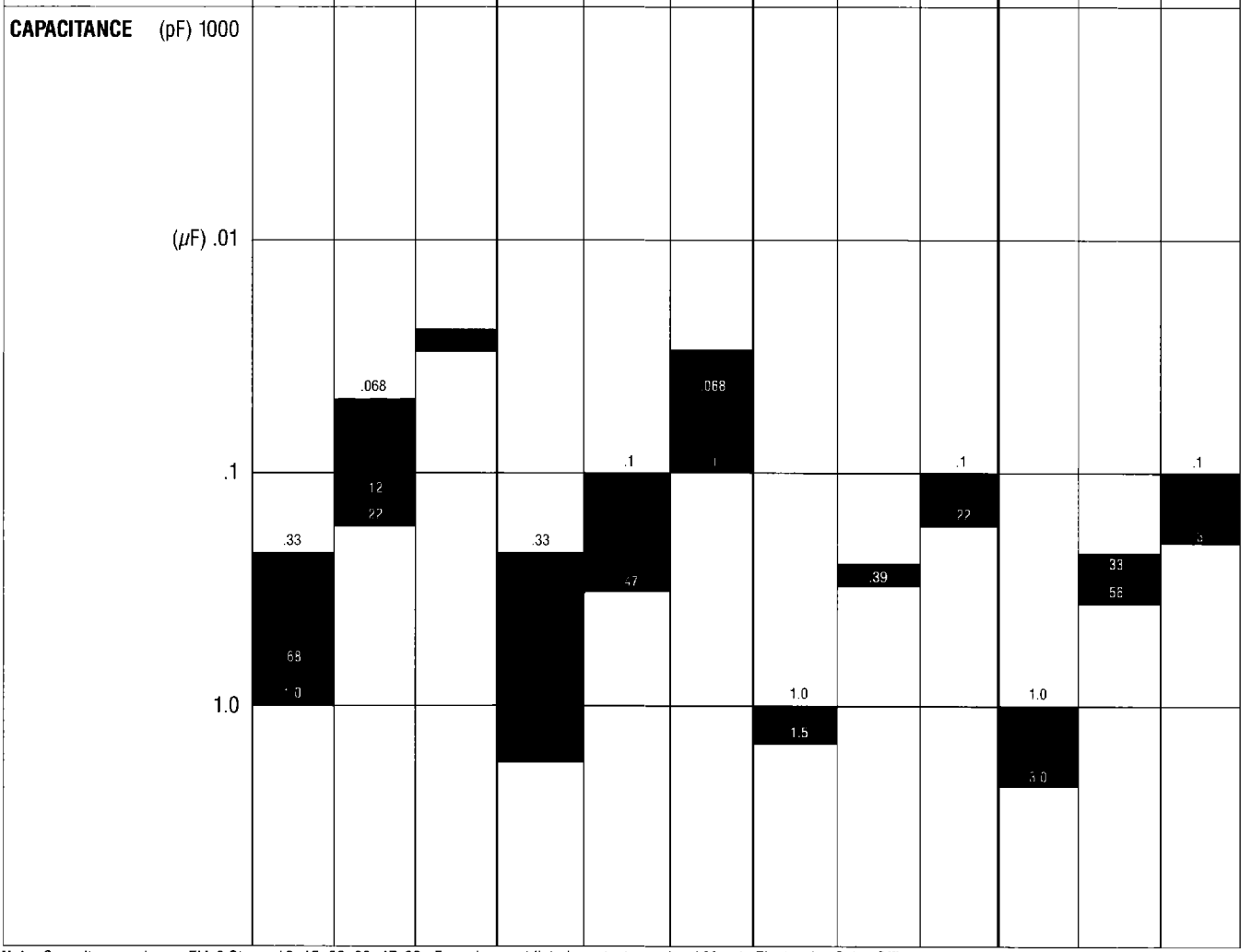
STANDARD THICKNESS/PACKAGING SPECIFICATIONS

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

HIGH DIELECTRIC CONSTANT TYPE Z5U

MURATA DESIGNATION	GRM 43-2			GRM 43-4			GRM 44-1			GRM 44		
EIA TYPE DESIGNATION	1812			1825			2220			2225		
WVDC	50	100	200	50	100	200	50	100	200	50	100	200



Note: Capacitance values = EIA 6 Step = 10, 15, 22, 33, 47, 68. For values not listed, contact your local Murata Electronics 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 : $1.25^{+0}_{-0.2}$	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

HIGH DIELECTRIC CONSTANT TYPE Y5V

MURATA DESIGNATION	GRM 36			GRM 39				GRM 40				GRM 42-6				GRM 42-2			
EIA TYPE DESIGNATION	0402			0603				0805				1206				1210			
WVDC	16	25	50	16	25	50	100	16	25	50	100	16	25	50	100	16	25	50	100
CAPACITANCE (pF) 1000							1200		2200	2200									
(μF) .01	.033 .047	.022	.015	.033				.1				.15	.068			.68	1.0		.047
.1																			
1.0																			

Note: Capacitance values = EIA 6 Step = 10, 15, 22, 33, 47, 68. For values not listed, contact your local Murata Electronics 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 : 0.5 ± 0.5	1000	10000	N/A	N/A	N/A
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

*GRM40 T = 1.25 ± .15

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HIGH DIELECTRIC CONSTANT TYPE Y5V

MURATA DESIGNATION	GRM 43-2				GRM 43-4		GRM 44-1			GRM 44		
EIA TYPE DESIGNATION	1812				1825		2220			2225		
WVDC	16	25	50	100	50	100	25	50	100	25	50	100
CAPACITANCE (pF) 1000												
(μF) .01												
.1				.15 .27	.22	.1 .33 .47			.33 .68			.47 .82
1.0					.5		1.0 2.2	1.0 1.5 2.2			1.0 4.4	

Note: Capacitance values = EIA 6 Step = 10, 15, 22, 33, 47, 68. For values not listed, contact your local Murata Electronics 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 : 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