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Application Specific

Improved technology has created the need for specialized market application specific electronic devices to meet higher requirement levels of performance. Applications operating with high voltages, high frequencies and high levels of electric current require specially designed capacitors to handle these increased performance demands.

Whether your requirements necessitate High Power, High Voltage or High Frequencies, Murata's application specific ceramic capacitors can meet your needs. This guide will assist you in determining the proper product series that best fits your requirements from the Murata family of application specific ceramic capacitors.



Why change to Murata and TTI?

In addition to the superior products listed below, Murata provides technical support to assist you with your designs, and production capabilities to meet your inventory requirements. TTI has samples to get you started, and the inventory and inventory management programs to keep your production line running once you're into production.

Together the Murata/TTI partnership offers you:

- Design support
- Technical Analysis Capability
- Quick turnaround on Application Specific Capacitor new product development
- Sample support and delivery
- Effective inventory management

In addition to superior products the Murata/TTI application specific capacitor partnership offers:

- Small quantity orders
- Custom leads or configurations
- Quick turnaround on samples or small production quantities
- A single source for standard and specialized capacitors
- Production capability/inventory to support growing production demands
- A superior source for all your ceramic application specific capacitor needs

High Frequency, High Q Capacitors—GQM, GJM, ERB

Murata is the only major supplier to offer copper electrode based high frequency capacitors. The GQM and GJM series provide the lowest ESR at higher frequencies, and are offered in standard EIA sizes, as small as 0201. For requirements greater than 200V and up to 500V the ERB series offers a high frequency, low ESR solution using a precious metal electrode. The family of GQM, GJM and ERB offers high frequency capacitors in miniature packages. These series are excellent for wireless applications, industry infrastructure and wireless handheld products.

High Power Capacitors—HPP, MA

The HPP series offers very High Q with the highest power offering in the industry. Custom lead configurations and high reliability screening are available. The MA offers high power, high current and very high resonant frequency in a small package size.

High Voltage Capacitors—DE, GRM, GR, GA

250V to 6.3kV voltage ratings are available. These lead-free capacitors come in several package configurations and sizes, and are safety rated (Y2/Y3). Safety rated at X1/Y2, the DE series caps use lead-free and halogen-free technology, and are the smallest leaded safety caps available in the market. ❖

Summary of Series

High Frequency Ceramic Capacitors

GQM	High Q capacitors are used from 500MHz to 10GHz for handheld and cellular applications. These capacitors are made with copper electrodes for very low ESRs and High Qs in GHz frequencies, sizes from 0603 to 1210.
GJM	High Q ultra small capacitors for high frequency applications, 500MHz to 10GHz . Made with copper electrodes for a cost effective solution for low ESR applications. EIA sizes 0201 to 0603.
ERB	High Q capacitors with Q and ESRs better than standard products. With low ESR in the 1MHz to 1GHz frequency range ERB (new global part number for GRM700 series) are precious metal electrodes based surface mount capacitors, available in voltages up to 500V.

High Q RF Power Capacitors

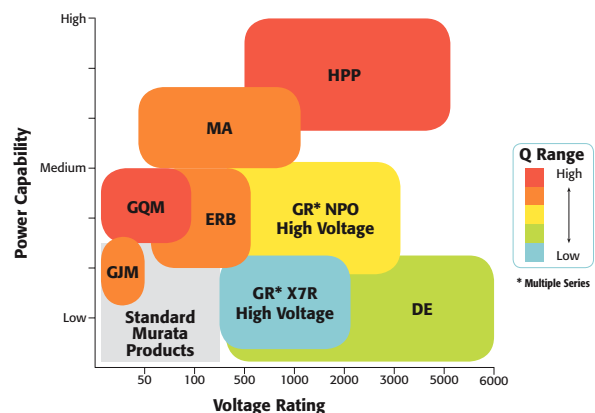
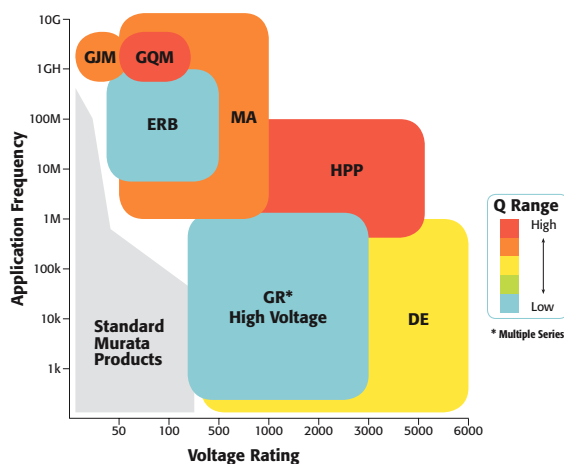
HPP*	High Q capacitors designed to handle very high RF currents at frequencies from 500KHz to 300MHz and rated voltage from 1000 to 5400 VDC. Leaded and SMD forms, EIA sizes 2622 to large 4642.
MA	High Q precious metal electrode capacitors for use in the 500KHz to 25GHz ranges. They come in SMD and leaded forms. Cubic capacitors in sizes from 0505 to 1111.

High Voltage Capacitors

GRM, GR4, GA3	Capacitors that have operating voltages from 250 to 3000V. Safety Capacitors with X & Y UL ratings.
DE*	Leaded high voltage capacitors. Lead capacitors for high voltage and safety rated applications, 250V to 6.3kV.

* Multiple Series

Visual Representations of Series



Application Guide

	High Power				High Frequency			High Voltage								
	HPP1	HPPC	MA 1, 5	MA 2, 6	GQM	GJM	ERB	DE 1, 2	DEB	DEH	DEA	DES	DEC	GRM	GR4	GA3
Power Supply																
Cellphone Battery Charger								◆		◆				◆		◆
DC/DC Converter														◆		◆
HF Power Supply	◆	◆	◆	◆			◆									
HV Power Supply	◆	◆	◆	◆				◆	◆	◆	◆	◆	◆	◆	◆	◆
Power Station Equipment							◆							◆		
Power Supply for Air Conditioner, Washing Machine								◆		◆			◆			
Power Supply for PC, Printer, Copier								◆	◆	◆	◆	◆		◆		
Power Supply for VCR, DVD Player								◆	◆	◆	◆	◆		◆		
SM Power Supply			◆	◆				◆	◆	◆	◆	◆	◆			
Switching Power Supply			◆	◆				◆	◆	◆	◆	◆		◆	◆	◆
Switching Power Supply-AC														◆		◆
Telecom																
Base Station Power amps			◆	◆	◆		◆									
Bluetooth Modules						◆										
Broadcasting Equipment	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
Cell Phones					◆	◆										
Modem																
DAA Modem								◆	◆					◆	◆	◆
xDSL Modem								◆						◆		◆
LAN, Router, HUB, Switches								◆	◆						◆	
PA Modules					◆	◆	◆									
RF Power Amplifiers		◆		◆			◆									
Network																
Set Top box								◆	◆	◆				◆	◆	◆
Tuners, Mixers, Filters, Oscillators			◆	◆												

Notes:

1. Please Contact the Murata Sales office or Marketing staff for any special requirements outside our standard specifications (i.e. testing & outgoing inspection).
2. Murata products should not be used or sold for the development, production, stockpiling or utilization of any conventional weapons or mass-destructive weapons (such as: nuclear, chemical, biological or missile weapons).
3. Please contact a Murata sales representative or product engineer before using our products for the applications listed below, which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property. a) aircraft equipment b) aerospace equipment c) undersea equipment d) power plant equipment e) life sustaining medical equipment.

	High Power				High Frequency			High Voltage								
	HPP1	HPPC	MA 1, 5	MA 2, 6	GQM	GJM	ERB	DE 1, 2	DEB	DEH	DEA	DES	DEC	GRM	GR4	GA3
Wireless																
Remote Keyless Entry					◆	◆	◆									
Wireless Handhelds					◆	◆	◆									
Wireless LAN					◆	◆										
Wireless Systems					◆	◆	◆									
Military & Aerospace																
Avionics	◆	◆						◆	◆	◆	◆	◆	◆			
Radar Systems	◆	◆	◆	◆			◆									
Medical																
.5 to 1.5 Tesla MRI & NMI Tuning Coils		◆	◆	◆												
1 to 3 Tesla MRI Gradient Coils & Magnetic Rings	◆	◆														
CT-Scanner	◆	◆						◆	◆	◆	◆	◆	◆			
Medical MRI	◆	◆	◆	◆				◆	◆	◆	◆	◆	◆	◆		
NMR Probes		◆	◆	◆												
X-Ray Generator								◆	◆	◆	◆	◆	◆	◆	◆	◆
Semiconductor																
RF Tuning Networks	◆	◆		◆												
RF Power Supplies	◆	◆		◆												
Semiconductor Manufacturing	◆	◆	◆	◆				◆	◆	◆	◆	◆	◆	◆		
Security																
Handheld Scanners		◆	◆		◆		◆								◆	
Intruder Detection Systems					◆		◆								◆	
Luggage Scanners	◆	◆		◆												
Metal/Explosives Detector	◆	◆						◆	◆	◆	◆	◆	◆			
Other																
LCD Back Light inverter										◆	◆				◆	
LCD Manufacturing Equipment															◆	◆
Electric Ballast for CFL										◆					◆	◆
Electric Ballast for Fluorescent Lamp								◆		◆	◆	◆	◆	◆		
Measurement Equipment			◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆
PDP Panel															◆	

GRM•GR4•GA3

Surface Mount High Voltage
& Safety Rated Capacitors



Features

- 250V, 630V, 1kV, 2kV, and 3.15kV voltage ratings
- Meets special Hi-Voltage needs
- Base metal & lead-free technology
- GA3 is safety rated (Y2/Y3)

Part Numbers

- Contact TTI, Inc. for part number information and options.

Specifications

Series	GRM						GR4		GA3 (GD)	GA3 (GF)	GA3 (GB)
Case Size	0603, 0805, 1206, 1210, 1812, 2220	1206, 1210, 1812, 2220	1206, 1210, 1812, 2220	1206, 1210, 1812	1808	1808, 1812	1808, 1812, 2220	1206, 1210, 1812	1808, 1812, 2211, 2220		2220
Voltage	250V	630V	1kV	2kV	3.15kV		2kV	250V*	250VAC Y3	250VAC Y2	250VAC X2
Dielectric	X7R			SL	COG	SL	X7R		X7R		
Temp. Range	-55 to 125°C			-55 to 85°C	-55 to 125°C	-55 to 85°C	-55 to 125°C				
Cap. Range	220pF to 1µF	100pF to .22µF	47pF to .1µF	10pF to 220pF	5pF to 22pF	27pF to 100pF	100pF to .01µF	.1µF to 1µF	100pF to 4,700pF	100pF to 4,700pF	.01µF to .033µF

* Tip & Ring

Application Selection Guide

Series		GRM	GR4	GA3
Modem	DAA Modem	◆	◆	◆
	xDSL Modem	◆		◆
Network	Set Top Box	◆	◆	◆
	LAN, Router, HUB, Switch, etc.		◆	
Flat Panel Display	LCD Back Light Inverter	◆		
	PDP Panel	◆		
Power Supply	Switching Power Supply, AC Adapter	◆		◆
	DC/DC Converter	◆		
	Battery Charger for Cellphone	◆		◆
Lighting	Electric Ballast for Fluorescent Lamp	◆		
	Electric Ballast for CFL	◆		◆

Features

- 250V to 6.3kV voltage ratings
- Lead-free & halogen-free technology
- Safety rated (X & Y) available
- Smallest safety caps in the market



Kits Available

- DE-KIT-SAFETY-KXKH

Part Numbers

- Contact TTI, Inc. for part number information and options.

Specifications

Series	DEA	DEH		DES	DEC			DEB		
Rated Voltage	1kV to 3.15kV	250V to 3.15kV	DC500	500V and 1kV	6.3kV			1kV to 3.15kV	1kV and 2kV	
Dielectric	U2J	Y5R	Y5S	Y5T	U2J	Y5P	Y5U	Y5P	Y5U	Y5V
Temp. Range	-55 to 85°C	-25 to 125°C			-55 to 85°C					
Capacitance Range	10pF to 560pF	150pF to 10,000pF	330pF to 4700pF	100pF to 4700pF	22pF to 150pF	100pF to 1,000pF	1,000pF to 2,200pF	100pF to 6,800pF	1,000pF to 10,000pF	

Specifications

Series	DE1 KX		DE2 KH			DE2 KY			
Rated Voltage	250VAC X1/Y1		250VAC X1/Y2			250VAC X1/Y2			
Dielectric	Y5P	Y5U	Y5P	Y5U	Y5V	U2J	Y5P	Y5U	
Temp. Range	-25 to 85°C					-55 to 85°C		-25 to 85°C	
Capacitance Range	100pF to 680pF	1,000pF to 4,700pF	100pF to 680pF	1,000pF to 4,700pF	10,000pF	10pF to 68pF	100pF to 680pF	1,000pF to 4,700pF	

Application Selection Guide

	Series	DE1, 2	DEB	DEH	DEA	DES	DEC
Modem	DAA Modem	◆	◆				
	xDSL Modem	◆					
Network	Set Top Box	◆	◆	◆			
	LAN, Router, HUB, etc.	◆	◆				
Flat Panel Display	LCD Back Light Inverter			◆	◆		◆
Power Supply	Switching Power Supply	◆	◆	◆	◆	◆	
	Power Supply for Air Conditioner, Washing Machine	◆		◆			◆
	Battery Charger for Cellphone	◆		◆			
AV Equipment	Color Television, Power Supply for VCR, DVD Player	◆		◆			
OA Equipment	CRT Display, Power Supply for PC, Printer, Copier	◆	◆	◆	◆	◆	
Lighting	Electric Ballast for Fluorescent Lamp	◆		◆	◆	◆	

Specifications

Series	GQM	GJM
Case Size	0603, 0805, 1210	0201, 0402, 0603
Voltage Rating	50 & 100V	25, 50, & 100V
ESR	Ultra Low	Very Low
Electrodes	Cu	Cu
	Special Construction	Standard
Dielectric	COG 0 ±30 ppm/°C	
Frequency Range	500MHz to 10GHz	
Key Points	High Performance	Smallest Package, Mid-Range Performance
Applications	Bluetooth Modules, Base Stations, Cell phones, remote keyless entry, GPS for automotive, Satellite Radio, and TV	Miniature High Frequency Handhelds, Wireless Modems, WLAN, remote keyless entry, Wireless PDAs, Cell Phones



Features

- World's first copper electrode based high frequency capacitor
- Copper (Cu) for much lower ESR at higher (GHz) frequencies
- GQM is the "Gold Medal Performer," lowest ESR in the industry (0603, 0805, & 1210)
- GJM very low ESR at best price, and smallest package (0201, 0402, & 0603)
- Tight tolerances as low as ± 0.05pF

Application Selection Guide

Product Series		GQM	GJM
Communication Equipment	Base Station	◆	
	Bluetooth Modules		◆
	PA Modules	◆	
	Cell Phones	◆	◆
Wireless	Wireless Handhelds	◆	◆
	Remote Keyless Entry	◆	◆
	Wireless LAN	◆	◆

Kits Available

- (0201, 0402) GJM-KIT-B
- (0603) GQM18-KIT-B
- (0805) GQM21-KIT-B
- (1210) GQM32-KIT-B

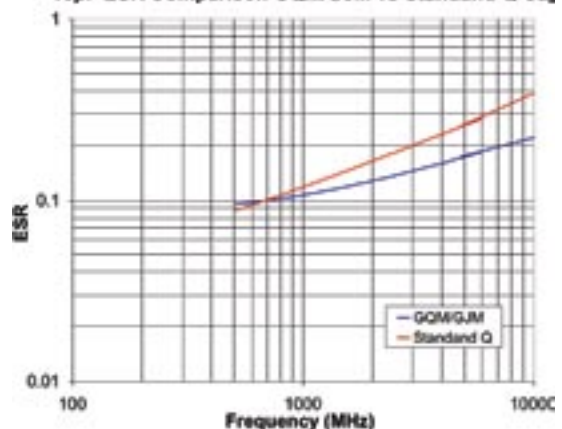
Part Numbers

- Contact TTI, Inc. for part number information and options.

Cross Reference

Series	GQM			GJM		
Sizes	0603	0805	1210	0201	0402	0603
ATC 650	◆	◆			◆	◆
AVX Accu-F	◆	◆				
AVX Accu-P	◆	◆	◆		◆	
AVX "U"	◆	◆	◆		◆	◆
Johanson "S"	◆			◆	◆	◆
Johanson "C"	◆	◆	◆		◆	◆
Johanson "L"				◆		
Vishay "Q"	◆	◆	◆		◆	◆
Vishay HPC					◆	

10pF ESR Comparison GQM/GJM vs Standard Q Cap





Features

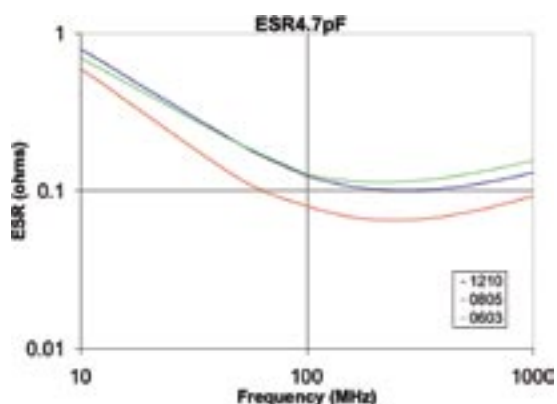
- ▶ Low ESR precious metal electrode (0603, 0805, & 1210)
- ▶ High voltage capability—up to 500V
- ▶ Tight tolerances as low as $\pm .05\text{pF}$

Kits Available

- ▶ (0603) ERB18-KIT-X
- ▶ (0805) ERB21-KIT-X
- ▶ (1210) ERB32-KIT-X

Part Numbers

- ▶ Contact TTI, Inc. for part number information and options.



Specifications

	ERB
Case Size	0603, 0805, 1210
Voltage Rating	50, 100, 200, & 500V
ESR	Low
Electrodes	Precious metal
	Standard
Dielectric	COG $0 \pm 30 \text{ ppm}/^\circ\text{C}$
Frequency Range	1MHz to 1GHz
Key Points	Low ESR High Voltage
Applications	Wireless communication devices for household applications, Wireless security systems, High frequency radios

Application Selection Guide

Industry	Application	ERB
Communication Equipment	Base Station Power Amps	◆
	RF Amplifiers	◆
	PA Modules	◆
Wireless	Wireless Handhelds	◆
	Remote Keyless Entry	◆
Security	Intruder Detection Systems	◆

Cross Reference

Series	ERB		
	0603	0805	1210
Case Size			
ATC 600	◆	◆	
ATC 650		◆	◆
AVX "U"	◆	◆	◆
Johanson "C"	◆	◆	◆
Vishay "Q"	◆	◆	◆

Specifications

HPP Series	HPPC	HPP1
Case Size	2622	4642
Voltage Rating	1, 1.5, 2.5kV	2.5, 3.6, 5.4kV
Capacitance Range	1pF to 1,200pF	1pF to 1,200pF
ESR	Very Low	
Temperature Range	-55 to 125°C	
Dielectric	P90 (COG soon)	
Power Rating	Very High Power	
Frequency Range	500KHz to 300MHz	
Key Points	Very High Q with the Highest Power in the Industry. Custom Lead Configurations Available.	
Applications	High Power RF Amplifiers for MRI, NMR, CT Scanners, and RF Semiconductor Power Supplies	



Features:

- High power, high performance
- Improved version of our proven UFP & UY capacitors
- P90 dielectric available now (COG available soon)
- Two sizes: 2622 & 4642
- Chip & leaded forms
- 1pF to 1,200pF
- Low ESR & High Q
- Up to 20 amps RMS

Kits Available

- KIT-HPPC-A
- KIT-HPP1-A

Part Numbers

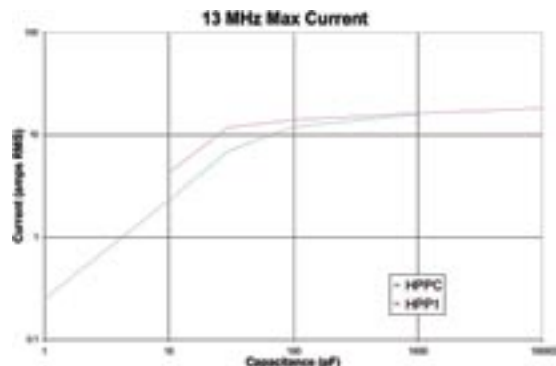
- Contact TTI, Inc. for part number information and options.

Application Selection Guide

Product Series		HPPC	HPP1
Communication Equipment	RF Power Amplifiers	◆	
Semiconductor Processing	RF Tuning Networks	◆	◆
	RF Power Supplies	◆	◆
Security	Luggage Scanners	◆	◆
Medical Imaging	.5 to 1.5 Tesla MRI & NMR Tuning coils	◆	
	1 to 3 Tesla MRI Gradient Coils & Magnetic Rings	◆	◆

Cross Reference

Murata	HPPC	HPP1
ATC	100C	100E
AVX	2325 A7G	3739 A7G
Dielectric Labs	C22	C40
Johanson Tech	T32	T44





Features

- Cubic capacitors for very high resonant frequencies
- High Q P90 & COG dielectrics
- Two sizes: 0505 & 1111
- Chip & leaded forms
- Low ESR & High Q
- Up to 5 amps RMS

Kits Available

- (P90 0505) KIT-MA19-A
- (P90 1111) KIT-MA29-A
- (COG 0505) KIT-MA59-A
- (COG 1111) KIT-MA69-A

Part Numbers

- Contact TTI, Inc. for part number information and options.

Specifications

MA Series	1, 5	2, 6
Case Size	0505	1111
Voltage Rating	50, 150V	50, 100, 200, 300, 500V
Capacitance Range	.1pF to 1,000pF	.1pF to 5,600pF
ESR	Very Low	
Temperature Range	-55 to 125°C	
Dielectric	P90 & COG	
	1(P90), 5(COG)	2(P90), 6(COG)
Power Rating	High Power	
Frequency Range	500KHz to 25GHz	
Key Points	Small High Power and Current Capability, High Resonant Frequency, Non-Magnetic and Custom Lead Configurations Available	
Applications	High Power RF and Microwave Amplifiers, Low Noise Amplifiers Filters, Oscillators, Mixers, Timing and Delay Lines, Tuning for MRI Coils	

Cross Reference

Murata	MA1	MA2	MA5	MA6
ATC	100A	100B	700A	700B
AVX	AQ11/12	AQ13/14	AQ11/12	AQ13/14
Dielectric Labs	C11	C17	C11	C17
Johanson Tech			R11	S41

Application Selection Guide

Product Series		MA1, 5	MA2, 6	Other Products		
Communication Equipment	Base Station power amps	◆	◆	Directional Couplers & Baluns, Filters: Dielectric & LC; VCO; Connector	Inductors (LQW, LQP, LQG)	Pots & Trimmers
	Tuners, Mixers filters oscillators	◆	◆			
	RF Power Amplifiers		◆			
Semiconductor Processing	RF Tuning Networks		◆		Inductors (LQW, LQP, LQG)	Pots & Trimmers
	RF Power Supplies		◆		Common Mode Choke (DLW/DLP) Chip Ferrite Bead (BLM), EMI filter (NF)	Pots & Trimmers; Thermistor (PRG, NCP)
Medical Imaging	.5 to 1.5 Tesla MRI & NMI Tuning coils	◆	◆			