

**CHIP MONOLITHIC CERAMIC CAPACITOR**  
**GMD155R71E393KA11\_ (0402, X7R, 39000pF, 25Vdc)**  
 \_: packaging code

**Reference Sheet**

**1.Scope**

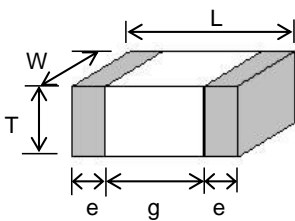
This product specification is applied to Chip Monolithic Ceramic Capacitor for Bonding used for General Electronic equipment.

**2.MURATA Part NO. System**

(Ex.)

GMD	15	5	R7	1E	393	K	A11	D
	(1)L/W Dimensions	(2)T Dimensions	(3)Temperature Characteristics	(4)DC Rated Voltage	(5)Nominal Capacitance	(6)Capacitance Tolerance	(7)Murata's Control Code	(8)Packaging Code

**3. Type & Dimensions**



(Unit:mm)

(1)-1 L	(1)-2 W	(2) T	e	g
1.0±0.05	0.5±0.05	0.5±0.05	0.15 to 0.35	0.3 min.

**4.Rated value**

(3) Temperature Characteristics (Public STD Code):X7R(EIA)		(4) DC Rated Voltage	(5) Nominal Capacitance	(6) Capacitance Tolerance	Specifications and Test Methods (Operation Temp. Range)
Temp. coeff or Cap. Change	Temp. Range (Ref.Temp.)				
-15 to 15 %	-55 to 125 °C (25 °C)	25 Vdc	39000 pF	±10 %	-55 to 125 °C

**5.Package**

mark	(8) Packaging	Packaging Unit
D	φ180mm Reel PAPER	10000 pcs./Reel
J	φ330mm Reel PAPER	50000 pcs./Reel
B	Bulk Bag	1000 pcs./Bag

Product specifications in this catalog are as of Aug.2,2012,and are subject to change or obsolescence without notice.  
 Please consult the approval sheet before ordering.  
 Please read rating and !Cautions first.

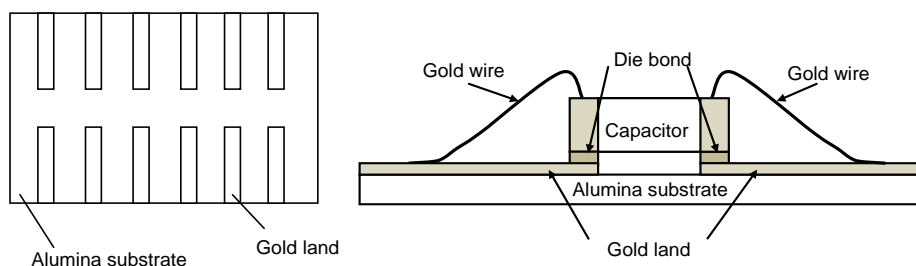
■ SPECIFICATIONS AND TEST METHODS

No	Item		Specification	Test Method																						
1	Operating Temperature Range		B1, B3 : -25°C to +85°C R1, R7 : -55°C to +125°C	Reference Temperature : 20°C (R7 :25°C)																						
2	Rated Voltage		See the previous pages.	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, should be maintained within the rated voltage range.																						
3	Appearance		No defects or abnormalities.	Visual inspection.																						
4	Dimension		Within the specified dimensions.	Using calipers.																						
5	Dielectric Strength		No defects or abnormalities.	No failure should be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA.																						
6	Insulation Resistance		$C \leq 0.047\mu F$ : More than 10000MΩ $C > 0.047\mu F$ : More than 500Ω · F C: Nominal Capacitance	The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 20°C/25°C and 75%RH max. and within 2 minutes of charging, provided the charge/discharge current is less than 50mA.																						
7	Capacitance		Within the specified tolerance.	The capacitance/D.F. should be measured at 20°C/25°C at the frequency and voltage shown in the table.																						
8	Dissipation Factor (D.F.)		B1,B3,R1,R7 W.V. : 25Vmin: 0.025 max. W.V. : 16/10V: 0.035 max.	<table border="1"> <tr> <td>Frequency</td> <td>1±0.1kHz</td> </tr> <tr> <td>Voltage</td> <td>1±0.2Vrms</td> </tr> </table>	Frequency	1±0.1kHz	Voltage	1±0.2Vrms																		
Frequency	1±0.1kHz																									
Voltage	1±0.2Vrms																									
9	Capacitance Temperature Characteristics	No bias	B1, B3 : Within ±10% (-25 to +85°C) R1,R7 : Within ±15% (-55 to +125°C)	<p>The capacitance change should be measured after 5 min. at each specified temp. stage.</p> <p>The ranges of capacitance change compared with Reference Temperature value over the temperature ranges shown in the table should be within the specified ranges. *</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> <th>Applying Voltage(V)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>20±2/25±2</td> <td rowspan="4">No bias</td> </tr> <tr> <td>2</td> <td>-55±3(for R1, R7) / -25±3(for B1, B3)</td> </tr> <tr> <td>3</td> <td>20±2/25±2</td> </tr> <tr> <td>4</td> <td>125±3(for R1, R7) / 85±3(for B1, B3)</td> </tr> <tr> <td>5</td> <td>20±2/25±2</td> <td rowspan="3">50% of the rated voltage</td> </tr> <tr> <td>6</td> <td>-55±3(for R1) / -25±3(for B1)</td> </tr> <tr> <td>7</td> <td>20±2</td> </tr> <tr> <td>8</td> <td>125±3(for R1) / 85±3(for B1)</td> <td></td> </tr> </tbody> </table> <p>* Initial measurement for high dielectric constant type Perform a heat treatment at 150 ±0/-10°C for one hour and then set for 24±2 hours at room temperature. Perform the initial measurement.</p>	Step	Temperature(°C)	Applying Voltage(V)	1	20±2/25±2	No bias	2	-55±3(for R1, R7) / -25±3(for B1, B3)	3	20±2/25±2	4	125±3(for R1, R7) / 85±3(for B1, B3)	5	20±2/25±2	50% of the rated voltage	6	-55±3(for R1) / -25±3(for B1)	7	20±2	8	125±3(for R1) / 85±3(for B1)	
		Step	Temperature(°C)		Applying Voltage(V)																					
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	50% of the Rated Voltage	B1 : Within +10/-30% R1 : Within +15/-40%																								
10	Mechanical Strength	Bond Strength	Pull force : 0.03N min.	MIL-STD-883 Method 2011 Conition D Mount the capacitor on a gold metallized alumina substrate with Au-Sn(80/20) and bond a 25μ m(0.001 inch) gold wire to the capacitor terminal using an ultrasonic ball bond. Then, pull wire.																						
		Die Shear Strength	Die Shear force : 2N min.	MIL-STD-883 Method 2019 Mount the capacitor on a gold matallized alumina substrate with Au-Sn(80/20). Apply the force parallel to the substrate.																						
11	Vibration Resistance	Appearance	No defects or abnormalities.	Ramp frequency from 10 to 55Hz then return to 10Hz all within 1 minite. Amplitude : 1.5 mm(0.06 inch) max. total excursion. Apply thie motion for a period of 2 hours in each of 3 muturally perpendicular directions (total 6 hours).																						
		Capacitance	Within the specified tolerance.																							
		D.F.	B1,B3,R1,R7 W.V. : 25Vmin: 0.025 max. W.V. : 16/10V: 0.035 max.																							

■ SPECIFICATIONS AND TEST METHODS

No	Item	Specification	Test Method																	
12	Temperature Cycle	The measured and observed characteristics should satisfy the specifications in the following table.	The capacitor should be set for 24±2 hours at room temperature after one hour heat of treatment at 150 +0/-10°C, then perform the five cycles according to the four heat treatments measure for the initial measurement. Fix the capacitor to the supporting jig in the same manner and under the same conditions as (11) and conduct the five cycles according to the temperatures and time shown in the following table. Set for 24±2 hours at room temperature, then measure. <table border="1" style="margin-top: 10px;"> <thead> <tr> <th>Step</th> <th>Temp.(°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">1</td> <td>Min. Operating Temp.+0/-3</td> <td rowspan="2">30±3</td> </tr> <tr> <td>Room Temp</td> </tr> <tr> <td rowspan="2">3</td> <td>Max. Operating Temp.+3/-0</td> <td rowspan="2">30±3</td> </tr> <tr> <td>Room Temp</td> </tr> <tr> <td>2</td> <td>Room Temp</td> <td>2 to 3</td> </tr> <tr> <td>4</td> <td>Room Temp</td> <td>2 to 3</td> </tr> </tbody> </table>	Step	Temp.(°C)	Time (min.)	1	Min. Operating Temp.+0/-3	30±3	Room Temp	3	Max. Operating Temp.+3/-0	30±3	Room Temp	2	Room Temp	2 to 3	4	Room Temp	2 to 3
	Step	Temp.(°C)		Time (min.)																
	1	Min. Operating Temp.+0/-3		30±3																
		Room Temp																		
	3	Max. Operating Temp.+3/-0		30±3																
Room Temp																				
2	Room Temp	2 to 3																		
4	Room Temp	2 to 3																		
Appearance	No defects or abnormalities.																			
Capacitance Change	B1, B3, R1, R7 : Within ±7.5%																			
D.F.	B1, B3, R1, R7 W.V. : 25Vmin: 0.025 max. W.V. : 16/10V: 0.035 max.																			
I.R.	More than 10,000MΩ or 500Ω ·F (Whichever is smaller)																			
Dielectric Strength	No defects.																			
13	Humidity (Steady State)	The measured and observed characteristics should satisfy the specifications in the following table.	Set the capacitor at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours at room temperature, then measure.																	
	Appearance	No defects or abnormalities.																		
	Capacitance Change	B1, B3, R1, R7 : Within ±12.5%																		
	D.F.	B1,B3, R1, R7 : 0.05 max.																		
	I.R.	More than 1,000MΩ or 50Ω ·F (Whichever is smaller)																		
14	Humidity	The measured and observed characteristics should satisfy the specifications in the following table.	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and set for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.																	
	Appearance	No defects or abnormalities.																		
	Capacitance Change	B1, B3, R1, R7 : Within ±12.5%																		
	D.F.	B1, B3, R1, R7 : 0.05 max.																		
	I.R.	More than 500MΩ or 25Ω ·F (Whichever is smaller)																		
15	High Temperature Load	The measured and observed characteristics should satisfy the specifications in the following table.	Apply 200% of the rated voltage at the maximum operating temperature±3°C for 1000±12 hours. Set for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.  ·Initial measurement Apply 200% of the rated DC voltage at the maximum operating temperature ±3°C for one hour. Remove and set for 24±2 hours at room temperature.																	
	Appearance	No defects or abnormalities.																		
	Capacitance Change	B1, B3, R1, R7 : Within ±12.5%																		
	D.F.	B1, B3, R1, R7: 0.05 max.																		
	I.R.	More than 1,000MΩ or 50Ω ·F (Whichever is smaller)																		

Mounting for testing : The capacitors should be mounted on the substrate as shown below using die bonding and wire bonding when tests No.11 to 15 are performed.



There are two type of packaging for chip monolithic ceramic capacitor.  
Please specify the packaging code.

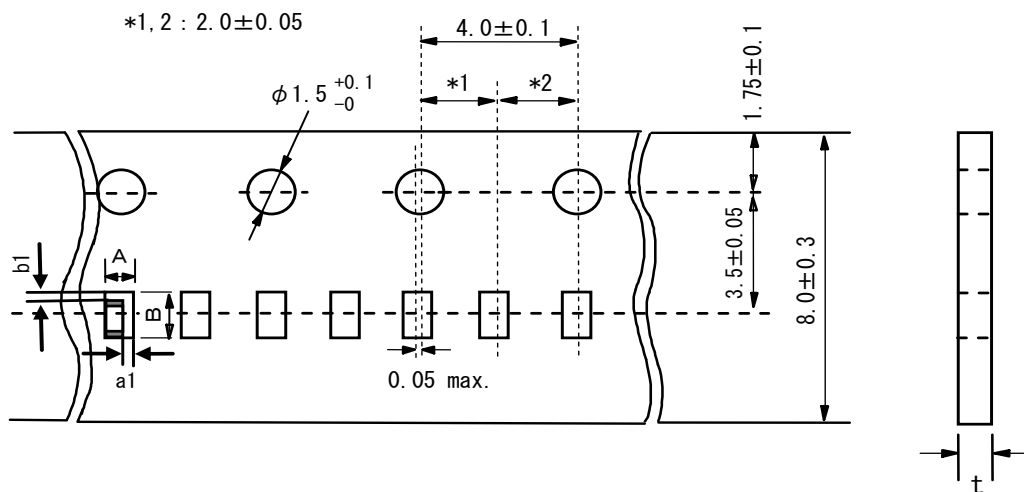
1. Bulk Packaging(Packaging Code=B):In a bag.  
Minimum Quantity : 1000(pcs./bag)

2. Tape Carrier Packaging(Packaging Code:D/E/J/F)  
2.1 Minimum Quantity(pcs./reel)

Type	φ180mm reel	φ330mm reel
	Paper Tape	Paper Tape
	Code:D/E	Code:J/ F
GMD03	15000	50000
GMD15	10000	50000

2.2 Dimensions of Tape  
(1) GMD03/15

(in mm)



Code	GMD03	GMD15
A *3	0.37	0.65
B *3	0.67	1.15
a1,b1 *3		0.15
t	0.5 max.	0.8 max.

\*3 Nominal value

Fig.1 Package Chips

(in mm)

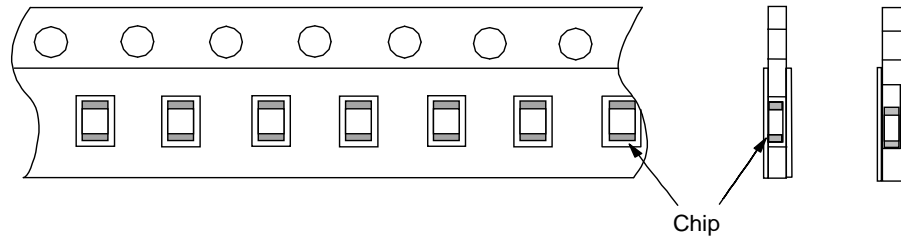


Fig.2 Dimensions of Reel

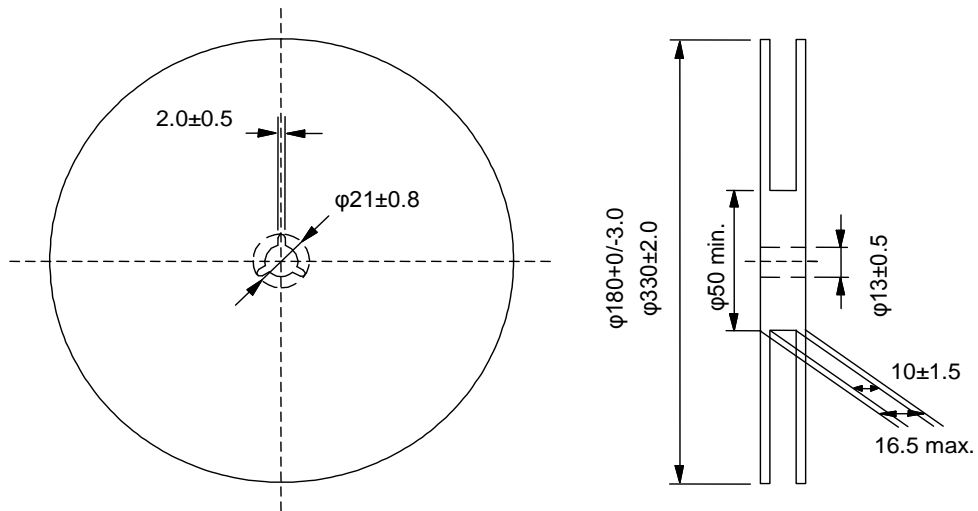
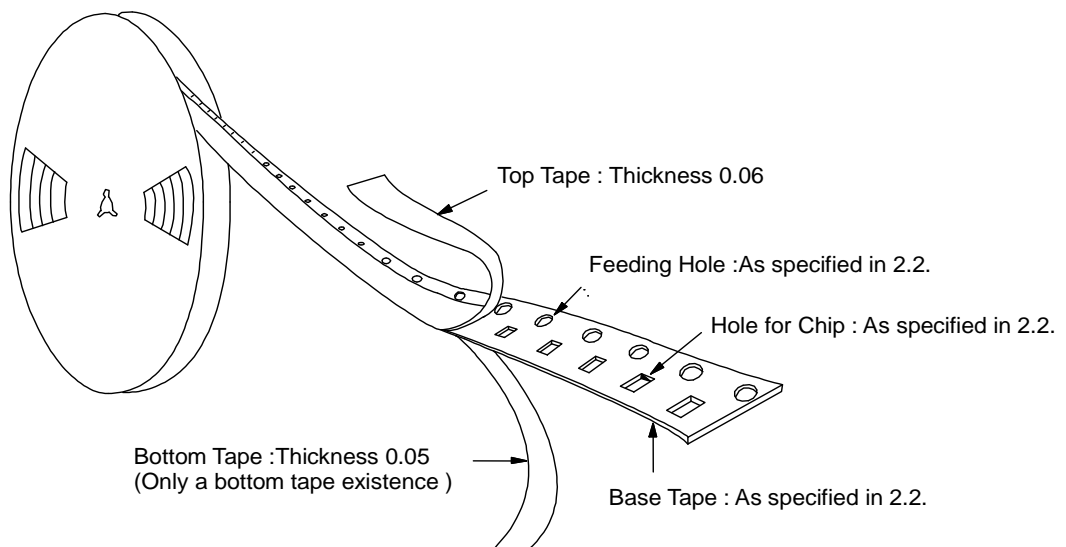
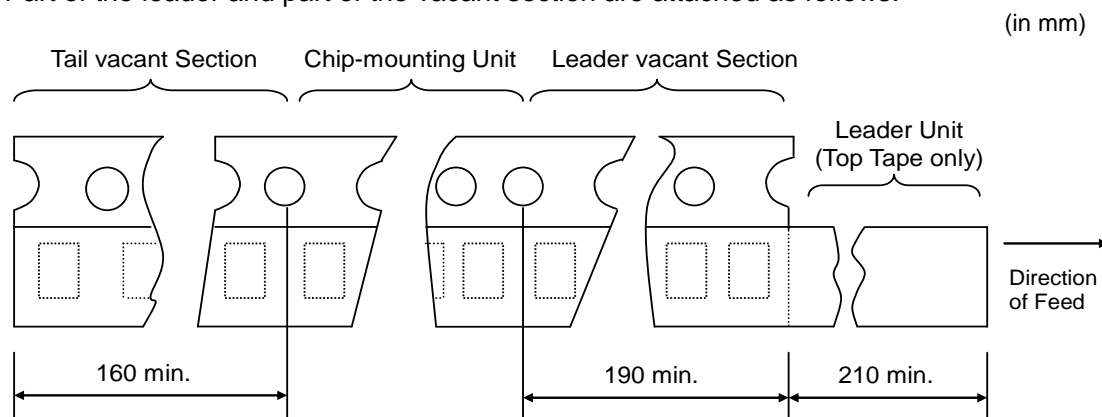


Fig.3 Taping Diagram



2.3 Tapes for capacitors are wound clockwise shown in Fig.3.  
(The sprocket holes are to the right as the tape is pulled toward the user.)

2.4 Part of the leader and part of the vacant section are attached as follows.



2.5 Accumulate pitch : 10 of sprocket holes pitch =  $40 \pm 0.3\text{mm}$

2.6 Chip in the tape is enclosed by top tape and bottom tape as shown in Fig.1.

2.7 The top tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.

2.8 There are no jointing for top tape and bottom tape.

2.9 There are no fuzz in the cavity.

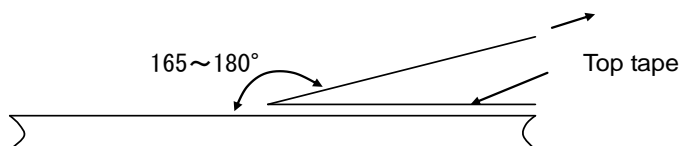
2.10 Break down force of top tape : 5N min.

Break down force of bottom tape : 5N min. (Only a bottom tape existence )

2.11 Reel is made by resin and appeaser and dimension is shown in Fig 2.

There are possibly to change the material and dimension due to some impairment.

2.12 Peeling off force : 0.1 to 0.6N in the direction as shown below.



2.13 Label that show the customer part number, our part number, our company name, inspection number and quantity, will be put in outside of reel.

## ■ Limitation of use

Please contact our sales representatives or product engineers before using our products for the applications listed below which require of our products for other applications than specified in this product.

- ① Aircraft equipment
- ② Aerospace equipment
- ③ Undersea equipment
- ④ Power plant control equipment
- ⑤ Medical equipment
- ⑥ Transportation equipment (vehicles, trains, ships, etc.)
- ⑦ Traffic signal equipment
- ⑧ Disaster prevention / crime prevention equipment
- ⑨ Data-processing equipment
- ⑩ Application of similar complexity and/or requirements to the applications listed in the above

## ■ Storage and Operation conditions

The performance of chip monolithic ceramic capacitors may be affected by the storage conditions.

- ① Storage environment must be at an ambient temperature of 5-40°C. And an ambient humidity of 20-70% RH. Use chip within 6 months. If 6 months or more have elapsed, check bondability before use.
- ② Insulation Resistance should be deteriorated on specific condition of high humidity or incorrosion gas such as hydrogen sulfide, sulfurous acid gas, chlorine.
- ③ Do not directly touch capacitors with hands.

## ■ Die Bonding of capacitors

• Use the following materials

Braze alloy :

Au-Sn (80/20) 300 to 320°C in N<sub>2</sub> atmosphere

• Mounting

- ① Control the temperature of the substrate so that it matches the temperature of the braze alloy.
- ② Place braze alloy on substrate and place the capacitor on the alloy. Hold the capacitor and gently apply the load. Be sure to complete the operation in 1 minute.

## ■ Wire Bonding

• Wire

Gold wire : 25μ m (0.001 inch) diameter

• Bonding

- ① Thermocompression, ultrasonic ball bonding.
- ② Required stage temperature : 150 to 200°C.
- ② Required wedge of capillary weight : 0.2N to 0.5N.
- ③ Bond the capacitor and base substrate or other devices with gold wire.

## ■ Others

(1) Resin Coating

When selecting resin materials, select those with low contraction.

(2) Circuit Design

GMD Series capacitors in this catalog are not safety recognized products.

## ■ Remarks

The above notices are for standard applications and conditions. Contact us when the products are used in special mounting conditions.

Select optimum conditions for operation as they determine the reliability of the product after assembly.

## NOTE

1. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
2. You are requested not to use our product deviating from this product specification.
3. We consider it not appropriate to include any terms and conditions with regard to the business transaction in the product specifications, drawings or other technical documents. Therefore, if your technical documents as above include such terms and conditions such as warranty clause, product liability clause, or intellectual property infringement liability clause, they will be deemed to be invalid.