

# High Performance Electrical Double Layer Capacitor



**muRata** *Innovator  
in Electronics*

Murata  
Manufacturing Co., Ltd.

# High Performance Electrical Double Layer Capacitor

To meet consumer demand for mobile devices with greater efficiency and functionality, Murata began focusing its R&D efforts on Electrical Double Layer Capacitors (EDLC) in 2008, at which time we made a strategic decision to license leading-edge supercapacitor technology from CAP-XX, an Australia-based firm. Working from this collaborative basis, Murata has enhanced the design and manufacturer of these high power (low ESR) EDLCs in a compact, slim package, and we continue our research efforts to develop even better and higher performing products.



Electrical Double Layer Capacitors (EDLC), often referred to as supercapacitors, are energy storage devices with high power density characteristics that are up to 1,000 times greater than what is typically found in conventional capacitor technology. Murata's EDLC combines these advanced characteristics in a small and slim module. Optimization of electrochemical systems, including the electrode structure, enables flexible charging and discharging from high to low output over a range of temperatures. By supporting momentary peak load, the components also level battery load and can drive high-output functions that are difficult for batteries alone.

## Features and Benefits

- Small and slim: 20.5mm×18.5mm×1.5mm
  - Suitable for portable devices
- High power (High rated voltage and low ESR)
  - Higher allowable current than any battery or conventional EDLC
- High energy (High rated voltage and high capacitance)
  - Flexible discharge 500μAh-2As
- Wide operation temperature range from -30°C to +70°C
- Low ESR at lower temperatures
  - High power peak assist at low temperatures
- Long cycle life-exceeding 100k cycles
  - Maintenance free energy device with flexible charge/discharge profiles
- High peak pulse output
  - Can be used for load leveling

## Applications



- Peak Power Assist  
 LED flash, Motors, E-Paper, Cellular phones, PA assist, Audio
- Backup  
 Solid state drives, UPS
- Energy Harvesting  
 Micro and macro energy harvesting
- Battery Load Assist  
 Point of sales equipment, Smart Meters, Tablet PC, Fuel cells

## Product Lineup

Series	Part Number	Rated Voltage (V)	ESR @1kHz (mΩ) (: Max.)	Capacitance (mF) (: Tolerance)	T (mm)	Construction	Applications
DME	DME2D2R7F704M2BTA0	Peak 2.7V/Constant 2.1V	30 (35)	700 (±20%)	1.3±0.2	Single cell	LED flash GSM/GPRS Peak assist
	DME2U5R5L354M3BTA0	Peak 5.5V/Constant 4.2V	60 (70)	350 (±20%)	2.8±0.3	Double cell	
DMD	DMD2E2R1F704M2BTA0	2.1V	30 (35)	700 (±20%)	1.4±0.2	Single cell	SSD Backup
	DMD2W4R2L354M3BTA0	4.2V	60 (70)	350 (±20%)	3.0±0.3	Double cell	

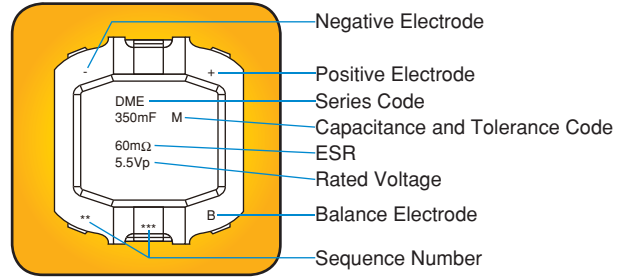
## Operating Temperature

-30°C to 70°C

## Storage Temperature

-30°C to 85°C

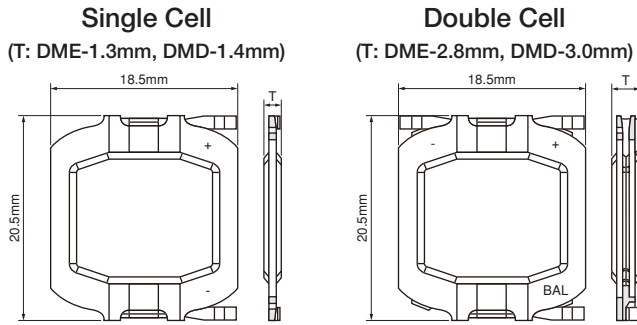
## Marking



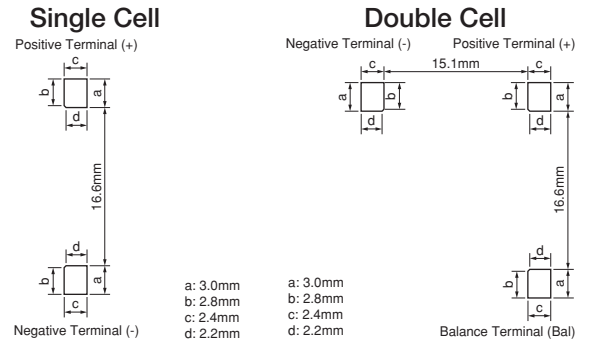
## Performance and Validation Method

Item	Validation Method	Specification																					
Operating Temperature	—	-30°C to 70°C																					
Nominal Capacitance	<p>&lt;Discharge Method&gt;                      1. Charge capacitor for 30min. at rated peak voltage.                      2. Then discharge.</p> <p>V1: 80% of rated peak voltage                      V2: 40% of rated peak voltage                      T1: Time with voltage V1                      T2: Time with voltage V2                      Discharge current: 100mA</p> $C = \frac{I \times (T_2 - T_1)}{V_1 - V_2}$	Please refer to Lineup list.																					
ESR	<p>&lt;Impedance Method&gt;                      Measured at AC1kHz.                      Current: 10mA-200mA</p>	Please refer to Lineup list.																					
Leakage Current @96hrs	Current value 96hrs after applying rated voltage	Less than or equal to 10μA at 96hrs.																					
Temperature Characteristics	ESR: -30°C to 70°C	<p>Temperature characteristics</p> <table border="1"> <thead> <tr> <th></th> <th>ESR@1kHz</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td>70°C</td> <td>±10%</td> <td>±10%</td> </tr> <tr> <td>40°C</td> <td>±10%</td> <td>±10%</td> </tr> <tr> <td>25°C</td> <td>—</td> <td>—</td> </tr> <tr> <td>0°C</td> <td>+20% or less</td> <td>±10%</td> </tr> <tr> <td>-20°C</td> <td>+50% or less</td> <td>±10%</td> </tr> <tr> <td>-30°C</td> <td>+80% or less</td> <td>±10%</td> </tr> </tbody> </table>		ESR@1kHz	Capacitance	70°C	±10%	±10%	40°C	±10%	±10%	25°C	—	—	0°C	+20% or less	±10%	-20°C	+50% or less	±10%	-30°C	+80% or less	±10%
	ESR@1kHz	Capacitance																					
70°C	±10%	±10%																					
40°C	±10%	±10%																					
25°C	—	—																					
0°C	+20% or less	±10%																					
-20°C	+50% or less	±10%																					
-30°C	+80% or less	±10%																					
Charge-Discharge Cycle Test	<p>Charge Voltage: Maximum voltage                      Charge: 1A                      Discharge: 5A33msec.                      Test Temperature: 40°C±2°C                      Cycle Number: 50,000 times</p>	<p>Capacitance Change:                      · Under 120% of initial value                      ESR Change (@1kHz):                      · Under 130% of initial value</p>																					
High Temperature Loading-1	<p>70°C+2°C/-0°C                      1000hrs+24hrs/-0hrs                      Applying rated voltage</p>	<p>ESR @1kHz: Under 130% of initial value                      Capacitance Change: Over 80% of initial value</p>																					
High Temperature Loading-2 (DME Series)	<p>70°C+2°C/-0°C                      500hrs+24hrs/-0hrs,                      Applying peak voltage</p>	<p>ESR @1kHz: Under 150% of initial value                      Capacitance Change: Over 70% of initial value</p>																					

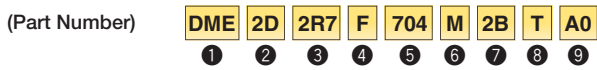
## Dimensions



## Land Pattern Design



## Part Number Description



### ① Series

Code	
DMD	Standard Type
DME	High Peak Power Type

### ② External Dimension (L×W×T)

Code	L (mm)	W (mm)	T (mm)
2D	20.5±0.5	18.5±0.5	1.3±0.2
2E	20.5±0.5	18.5±0.5	1.4±0.2
2U	20.5±0.5	18.5±0.5	2.8±0.3
2W	20.5±0.5	18.5±0.5	3.0±0.3

### ③ Rated Voltage

Expressed by three-digit alphanumerics.

Code	Rated Voltage
2R7	DC2.7V (peak)/DC2.1V (constant)
2R1	DC2.1V
5R5	DC5.5V (peak)/DC4.2V (constant)
4R2	DC4.2V

### ④ ESR

Code	ESR@1kHz
F	30mΩ
L	60mΩ

### ⑤ Nominal Capacitance

Expressed by three-digit numeric code. The unit is micro-farad(μF). The first and second figures are significant digits, and the third figure expresses the number of zero which follow the two numbers.

Ex.)

Code	Nominal Capacitance
704	70×10 <sup>4</sup> μF=700mF
354	35×10 <sup>4</sup> μF=350mF

### ⑥ Capacitance Tolerance

Code	Tolerance
M	±20%

### ⑦ External Terminal

Code	Terminal Specification
2B	Standard type 2 terminals (+/-) 
3B	Standard type 3 terminals (+/-/Balance) 

### ⑧ Packing Code

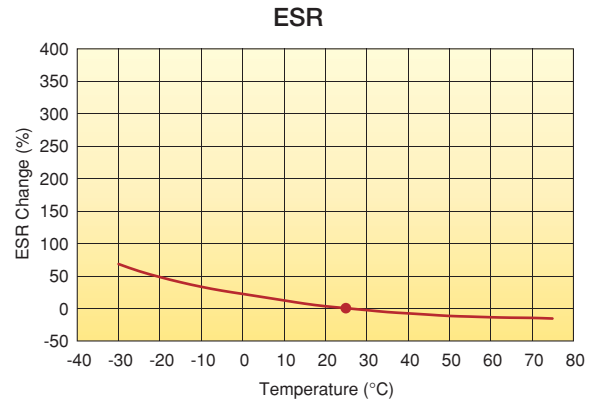
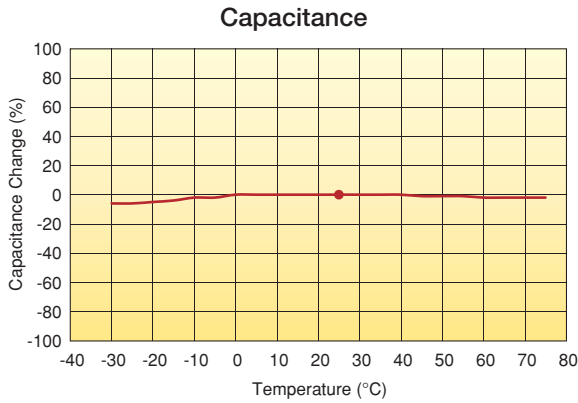
Code	Packing Specification
T	Tray type, 50pcs/Tray

### ⑨ Inhouse Specification Code

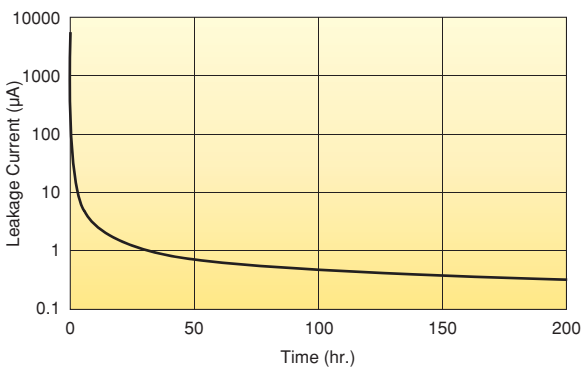
Expressed by two-digit alphanumerics.

## Electrical Characteristics

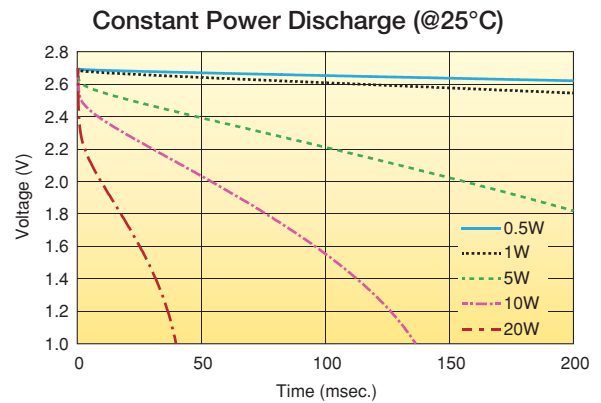
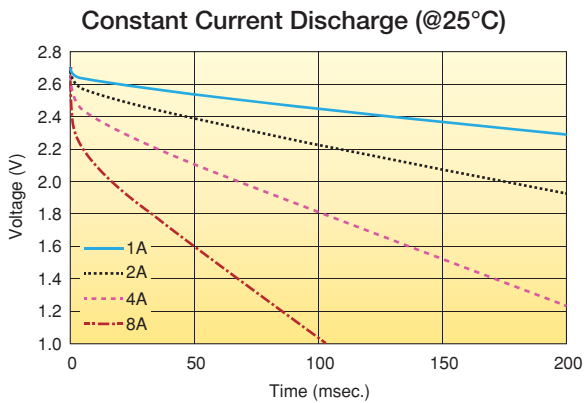
### Capacitance and ESR Temperature Characteristics (DME/DMD)



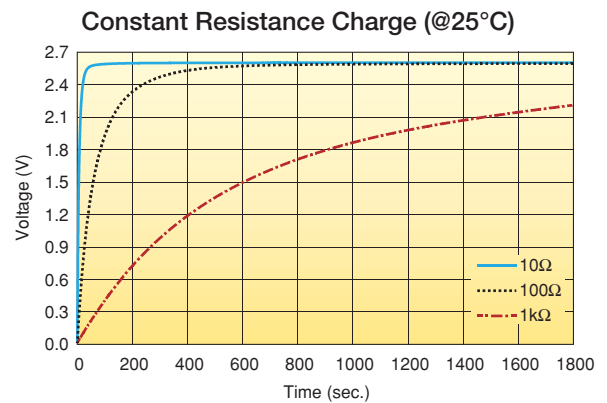
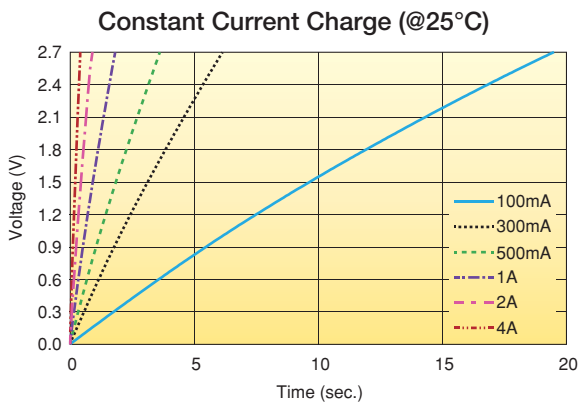
### Leakage Current @25°C (DME2D2R7F704M2BTA0)



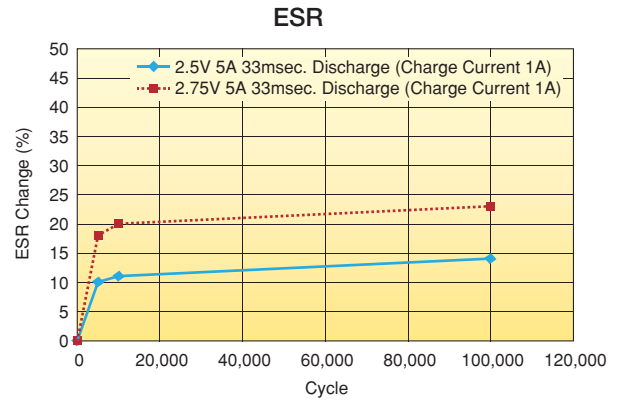
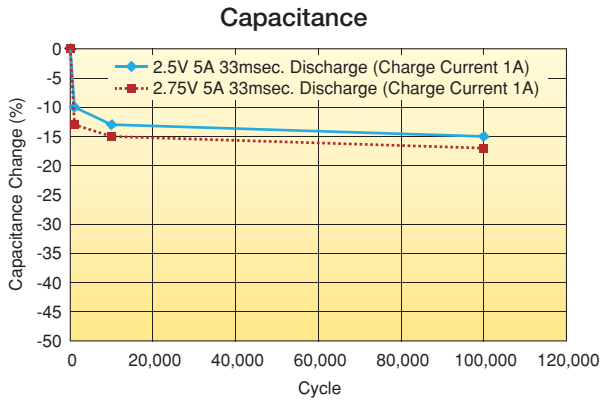
### Discharge Characteristics (DME2D2R7F704M2BTA0)



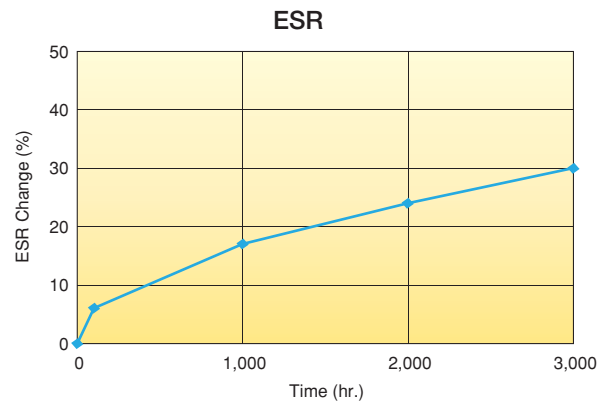
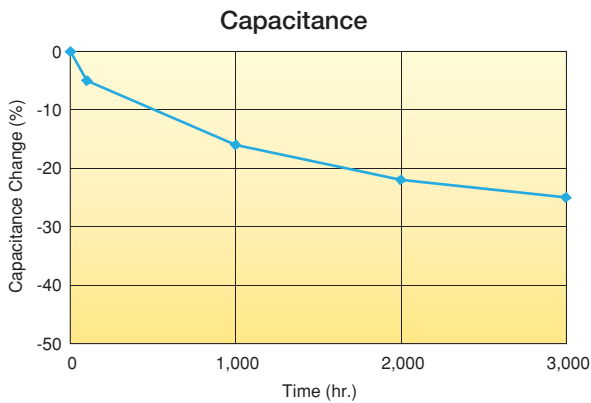
### Charge Characteristics (DME2D2R7F704M2BTA0)



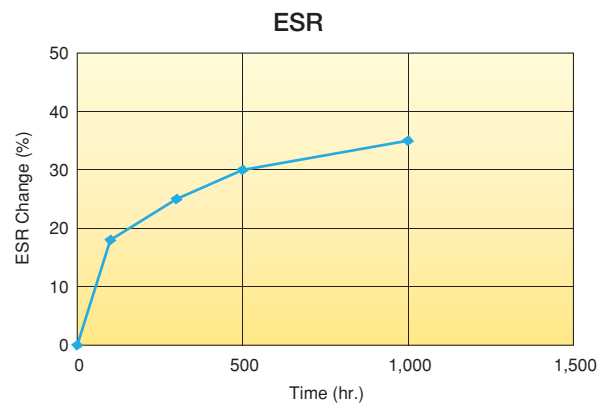
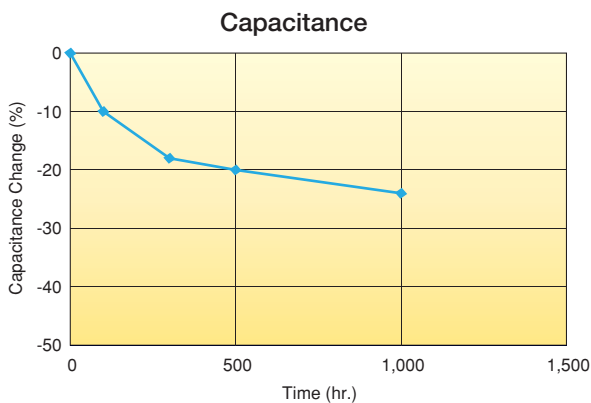
■ Charge-Discharge Cycle (@40°C) (DME)



■ High Temperature Loading DC  
 ● High Temperature Loading-1 (DME/DMD)  
 Test Condition 2.1V@70°C



● High Temperature Loading-2 (DME)  
 Test Condition: 2.75V@70°C



## Caution before Use

### ■ Caution

- This device must be used within rated voltage. Over voltage may cause electrolyte leakage or swelling.
- This device has polarity. Please do not reverse polarity when in use.  
Reverse polarity may damage electrolyte or the electrode inside.  
Please verify the orientation of the capacitor before use in accordance with the markings of polarity on the products.
- If a capacitor body contacts with other part or circuit, it may cause leakage failure.
- This device cannot be used under any acidic or alkaline environment.
- This device uses a relatively low vapor pressure liquid electrolyte. At high altitudes (with low external pressure), internal resistance or other performance may decrease. If you would like to use this product at high altitude, please consult a Murata representative first.
- The double cell product (DME5.5V, DMD4.2V) has two individual cells connected electrically in series. Please ensure that peak voltage is less than 2.75V per cell and less than 2.1V per cell for constant load. Murata strongly recommends the use of active balancing control circuits or balance resistors at the very least. For further details, Please contact your local Murata representative.
- When connecting two or more capacitors in series, voltage load may vary between capacitors. This could lead to excessive voltage on any capacitor. In these cases, please consult a Murata representative beforehand.

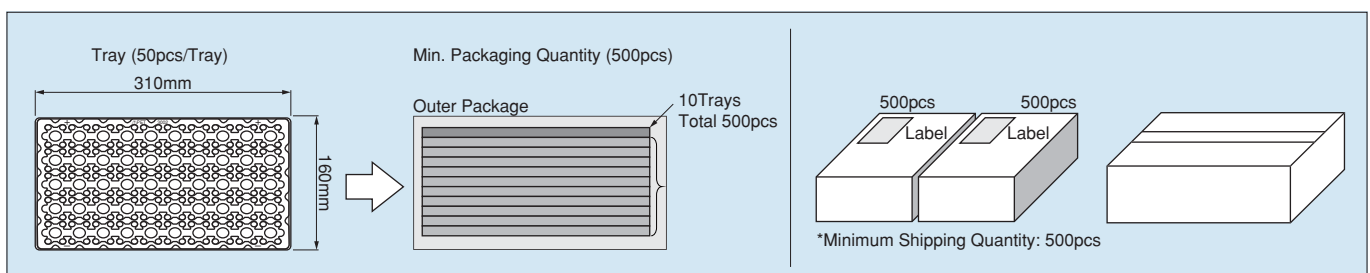
### ■ Caution for Soldering and Assembling ⚠

- (1) These parts should not be soldered using re-flow or flow profiles. Please use connection methods that prevent exposure to temperatures beyond the maximum allowable range. These may include hand soldering, ultrasonic welding, etc.
- (2) Please do not apply excessive force to the capacitor during insertion as well as after soldering. The excessive force may result in damage to electrode terminals and/or degradation of electrical performance.
- (3) Hand Soldering  
Please solder under following conditions.  
Soldering iron temperature at 350°C±10°C  
Solder iron wattage: 70W or less  
Soldering time: 3.0±1/-0sec.  
Allowable soldering frequencies: 3times/device. \* Please allow at least for 15sec. between successive soldering.  
Please do not touch laminate package directly with the solder iron.
- (4) Please do not wash the device after soldering.

### ■ Storage Conditions

- Storage condition without opening outer package  
30°C 60%RH for 1year (Before opening outer package)  
\* Remark: This product cannot be baked.
- Storage conditions after opening outer package
  - (1) Term of warranty of this device is 3months after sealed package is opened.
  - (2) Storage environment  
Please adhere to the following conditions in sealed package.  
Temperature: 5 to 35°C and  
Humidity: no more than 70%RH. No condensation.  
Avoid any acidic or alkaline environment.  
Avoid excessive external force while in storage.
  - (3) Please keep device in sealed plastic package before use.
  - (4) Please do not apply any heat treatment before use.

## Packaging



⚠Note:

- Export Control  
<For customers outside Japan>  
No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.  
<For customers in Japan>  
For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.
- Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.
  - Aircraft equipment
  - Aerospace equipment
  - Undersea equipment
  - Power plant equipment
  - Medical equipment
  - Transportation equipment (vehicles, trains, ships, etc.)
  - Traffic signal equipment
  - Disaster prevention / crime prevention equipment
  - Data-processing equipment
  - Application of similar complexity and/or reliability requirements to the applications listed above
- Product specifications in this catalog are as of January 2012. They are subject to change or our products in it may be discontinued without advance notice.  
Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.
- Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.
- This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.
- Please note that unless otherwise specified, we shall assume no responsibility whatsoever for any conflict or dispute that may occur in connection with the effect of our and/or a third party's intellectual property rights and other related rights in consideration of your use of our products and/or information described or contained in our catalogs. In this connection, no representation shall be made to the effect that any third parties are authorized to use the rights mentioned above under licenses without our consent.
- No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.

 **Murata Manufacturing Co., Ltd.**

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