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High Performance Electrical Double Layer Capacitor DMF Series

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 (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

- High power output and high energy: 5.5V
- Compact and slim: 21.0mm x 14.0mm x 3.2mm
- Wide operation temperature range from -40°C to +70°C
- Low ESR: 45mΩ
  - Stable ESR at lower temperatures
- ESR change @-30°C < twice the nominal ESR
- Low leakage current
  - Typical leakage less than 5μA@96hrs
- Long cycle life - exceeding 100k cycles

Benefits

- Leveling the high peak load up to hundreds of milli-seconds
  - Extend battery run time and cycle life by stable combination with EDLC
  - Enable the use of lower power battery or reduction of the number of series connections
  - Enable the use of high peak load applications without high power battery
- Quick Charge and Discharge of High Energy
  - Secure power line from large load change and power down
  - Secure battery power down at lower temperatures
  - Shorten the standby time
- Maintenance-free energy storage device with flexible charge

Applications

- Peak Power Assist
  - LED flash (DVC, DSC, smart phones), Smart meters (telecommunication system, valve operation, etc), e-paper applications
- Backup Applications
  - SSD (solid state drives), UPS, last gasp applications
- Energy Harvesting Systems
  - Micro and macro energy harvesting systems
- Battery Peak Load Leveling
  - Point of sale equipment, tablet PCs, audio, smart meters, GPS/GPRS tracking systems, fuel cells, primary cell equipment, power tools

Product Lineup

Series	Part Number	Rated Voltage (V)	Nominal Capacitance (mF) ( ): Tolerance	Typ. ESR @1kHz (mΩ) ( ): Max Value	Thickness (mm)
DMF	**DMF3Z5R5H474M3DTA0**	5.5 (Peak)/4.2 (Constant)	470 (±20%)	45 (55)	3.2 (typ.)

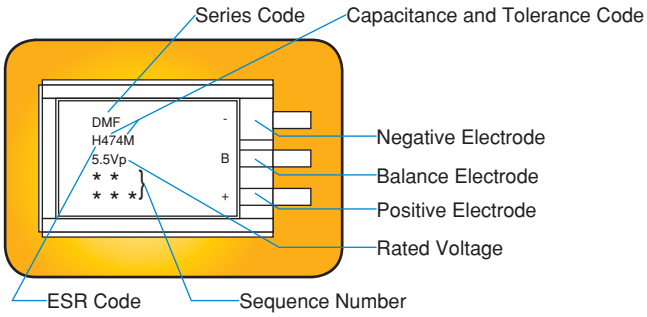
Operating Temperature

-40°C to 70°C

Storage Temperature

-40°C to 85°C

Marking



Part Number Description

(Part Number) **DMF** ❶ **3Z** ❷ **5R5** ❸ **H** ❹ **474** ❺ **M** ❻ **3D** ❼ **T** ❽ **A0** ❾

❶Series

Code	
DMF	High Peak Power Type

❷External Dimension (L×W×T)

Code	L (mm)	W (mm)	T (mm)
3Z	21.0±0.5	14.0±0.5	3.2 (typ.)

❸Rated Voltage

Expressed by three-digit alphanumerics.

Code	Rated Voltage
5R5	5.5V (Peak)/4.2V (Constant)

❹ESR

Code	ESR@1kHz
H	45mΩ

❺Nominal 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 zeros which follow the two numbers.

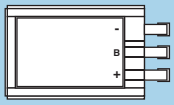
(e.g.)

Code	Nominal Capacitance
474	47×10^{4}μF=470mF

❻Capacitance Tolerance

Code	Tolerance
M	±20%

❼External Terminal

Code	Terminal Specification
3D	3 Terminals (+/-/Balance) 

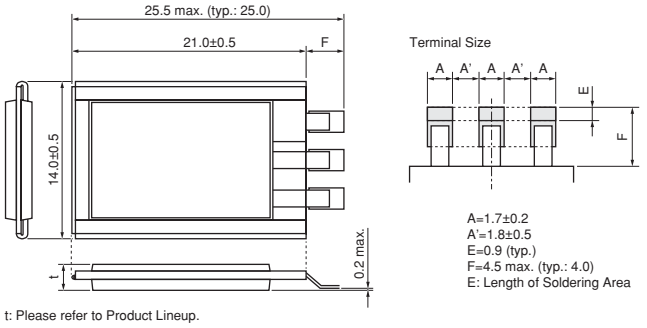
❽Packing Code

Code	Packing Specification
T	Tray Type, 50pcs/Tray

❾Inhouse Specification Code

Expressed by two-digit alphanumerics.

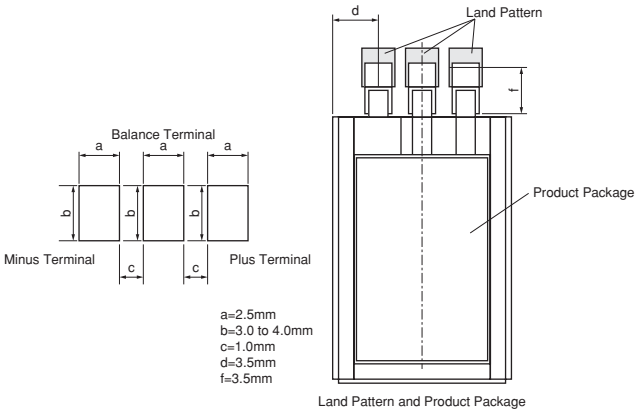
Dimensions



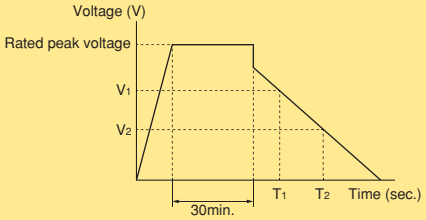
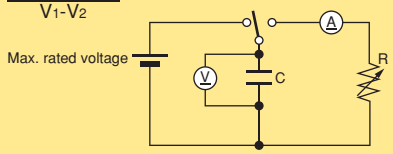
t: Please refer to Product Lineup.

(in mm)

Land Pattern Design

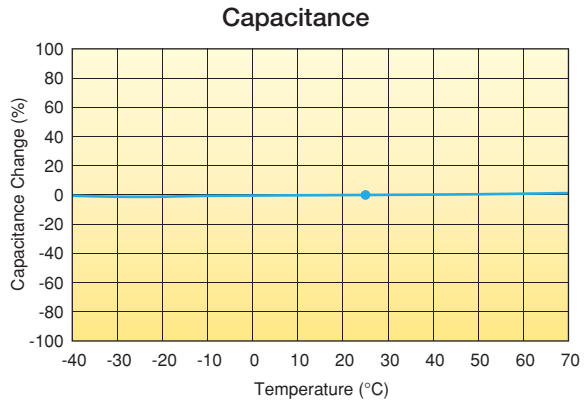


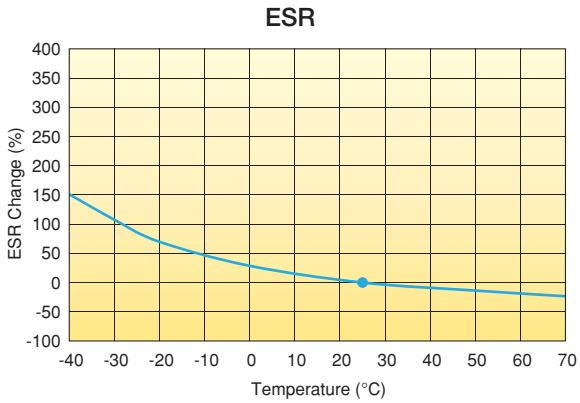
Performance and Validation Method

Item	Validation Method	Specification
Operating Temperature	—	-40°C to 70°C
Nominal Capacitance	<Discharge Method> 1. Charge capacitor for 30min. at rated peak voltage 5.5V. 2. Then discharge.  V_1: 80% of rated peak voltage V_2: 40% of rated peak voltage T_1: Time with voltage V_1 T_2: Time with voltage V_2 Discharge current: 100mA $C = \frac{I \times (T_2 - T_1)}{V_1 - V_2}$  	Please refer to Product Lineup.
ESR	<Impedance Method> Measured at AC1kHz. Current: 10mA-200mA	Please refer to Product Lineup.
Leakage Current @96hrs	Measured in 96hrs after applying rated voltage.	Less than or equal to 5μA at 96hrs.
Temperature Characteristics	ESR: -40°C to 70°C	Temperature Characteristics ESR@1kHz / Capacitance 70°C: Less than std value / ±10% 40°C: Less than std value / ±10% 25°C: Standard value / Standard value 0°C: +40% max. / ±10% -20°C: +80% max. / ±10% -30°C: +130% max. / ±10% -40°C: +200% max. / ±10%
Charge-Discharge Cycle Test	Charge Voltage: 5.5V Charge: 0.5A Discharge: 5A 67msec. Test Temperature: 70°C±2°C Cycle Number: 10,000 times	Capacitance Change: · Over 70% of initial value ESR Change (@1kHz): · Under 170% of initial value
High Temperature Loading	Charge Voltage: 4.2V Test Temperature: 70°C+0°C/-3°C Duration: 1000hrs+24hrs/-0hrs	Capacitance Change: · Over 70% of initial value ESR Change (@1kHz): · Under 140% of initial value

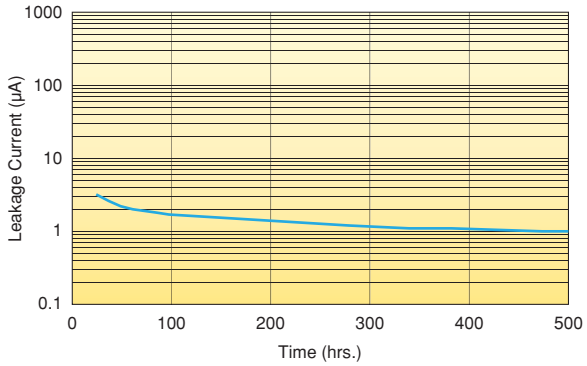
Electrical Characteristics

■ Capacitance and ESR Temperature Characteristics (V.S. 25°C)

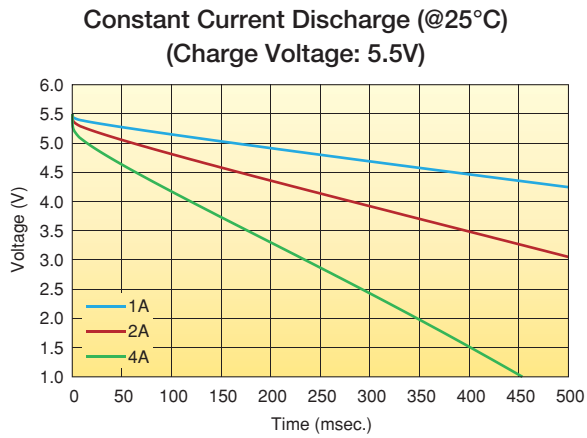


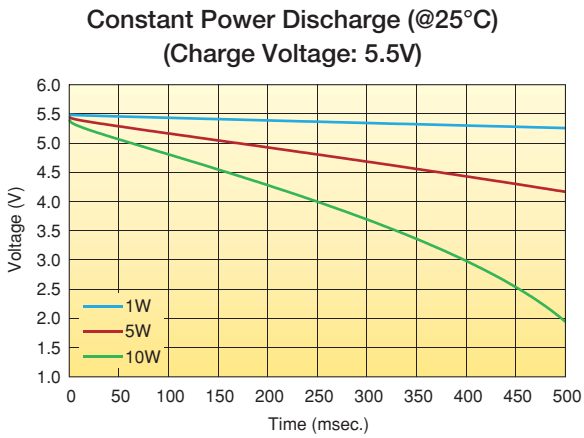


■ Leakage Current

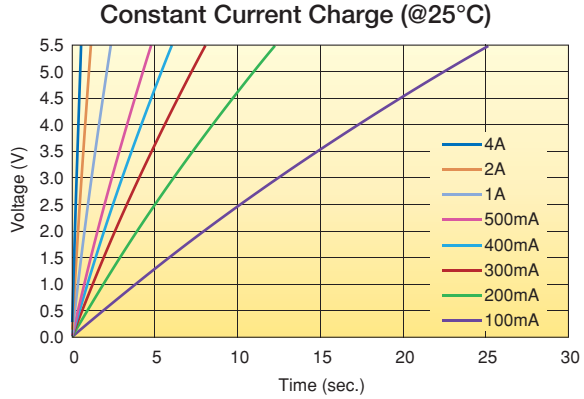


■ Discharge Characteristic



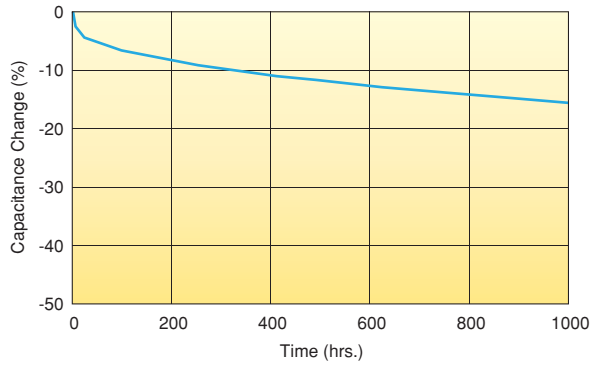


■ Charge Characteristic

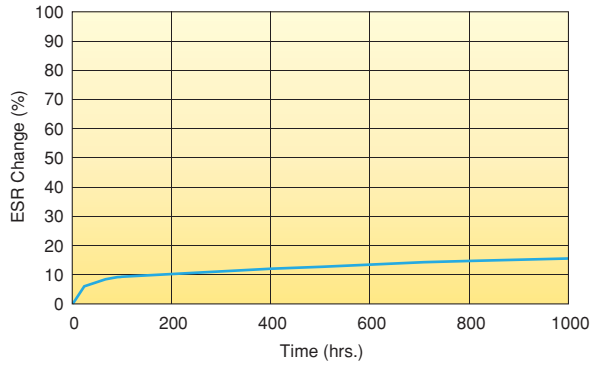


■ High Temperature Loading (Test Condition: Loading Voltage 4.2V@70°C)

Capacitance

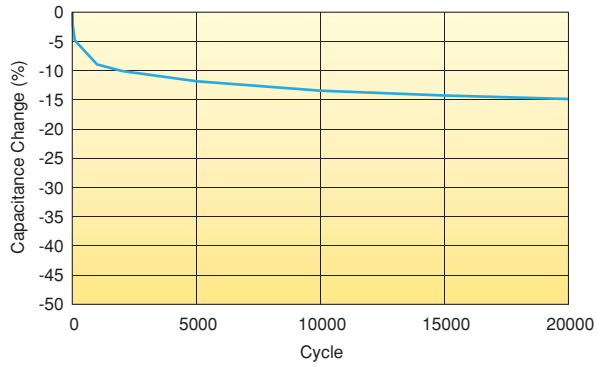


ESR

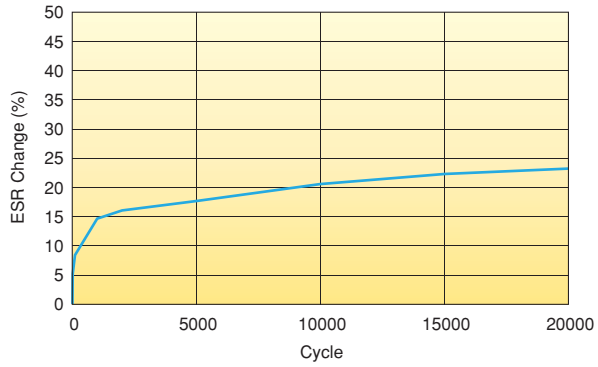


■ Charge-Discharge Cycle Characteristic (@70°C)

Capacitance



ESR



Caution before Use

■Caution

<1> Voltage
- This device must be used within rated voltage. Over voltage may cause electrolyte leakage or swelling.
- DMF series product 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. For further details, 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.

<2> Polarity
- This device has polarity. Please do not reverse polarity when in use. Reverse polarity may damage the electrolyte or electrode inside. Please verify the orientation of the capacitor before use in accordance with the markings of polarity on the products.

<3> Use Environment
- 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.

<4> Resin Coating
If coating/molding the device with resin, there is a risk that some resins may erode metal, or cure-stress of resin may distort terminal or package shape. So please pay careful attention in selecting resin. Prior to use, please make the reliability evaluation with the device mounted in your application set.

<5> Disassembly
This device uses a volatile organic electrolyte. Please do not disassemble it.

<6> Disposal
This device should be disposed of as industrial waste in accordance with local laws and regulations. Never throw this device into fire.

<7> Response to IATA Dangerous Goods Regulations
According to the 54th Edition of IATA Dangerous Goods Regulations effective from January 1, 2013, Electrical Double-Layer Capacitors (ELDCs) with an energy storage capacity greater than 0.3Wh are treated as dangerous goods and introduced as UN3499 in Class 9. However, the energy storage capacity of each of Murata's EDLCs is not greater than 0.3Wh. Therefore, Murata's EDLCs are not covered by this regulation.

■Caution for Soldering and Assembling⚠

(1) Reflow and flow soldering cannot be used because a capacitor body temperature will rise beyond the maximum allowable temperature. Please use other mounting methods. These may include hand soldering, connector mounting, 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: 3 times/terminal.
Please do not touch laminate package directly with the solder iron.

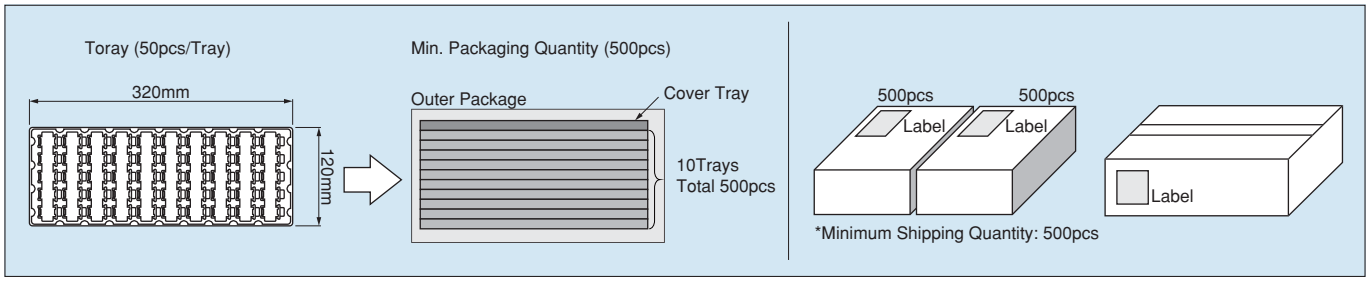
(4) Please do not wash the device after soldering.

■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 3 months after sealed package is opened.
(2) Storage environment
Please adhere to the following conditions in sealed package.
Temperature: 5 to 35°C
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:

1. 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.
2. 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.
   ① Aircraft equipment ② Aerospace equipment
   ③ Undersea equipment ④ Power plant 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 reliability requirements to the applications listed above
3. Product specifications in this catalog are as of September 2013. 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.
4. Please read rating and ⚠CAUTION (for storage, operating, rating, soldering, mounting and handling) in this catalog to prevent smoking and/or burning, etc.
5. This catalog has only typical specifications.Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.
6. 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.
7. No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.

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