

DC-DC Converter Specification

MPDTY201S

1 . Application

This specification applies to DC-DC Converter for telecommunication equipment / data-communication equipment, MPDTY201S.

For any other application, please contact us before using this product.

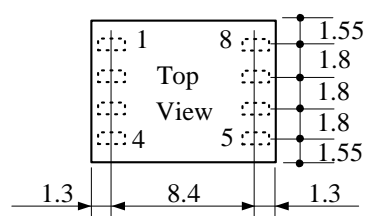
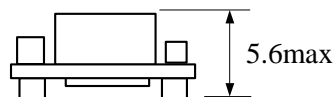
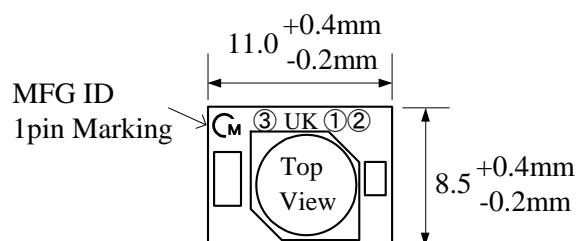
2 . Customer Reference

Customer Spec. Number
Customer Part Number

3 . Murata Part Number

MPDTY201S


4 . Appearance, Dimensions



unit: mm

Tolerance : 0.2mm

Marking

(1) MFG ID / Pin No.1 marking 

(2) Parts No. UK

(3) Lot No. ①②③

① Production factory Mark

② Production Year

③ Production Month (1,2,3 ,9,O,N,D)

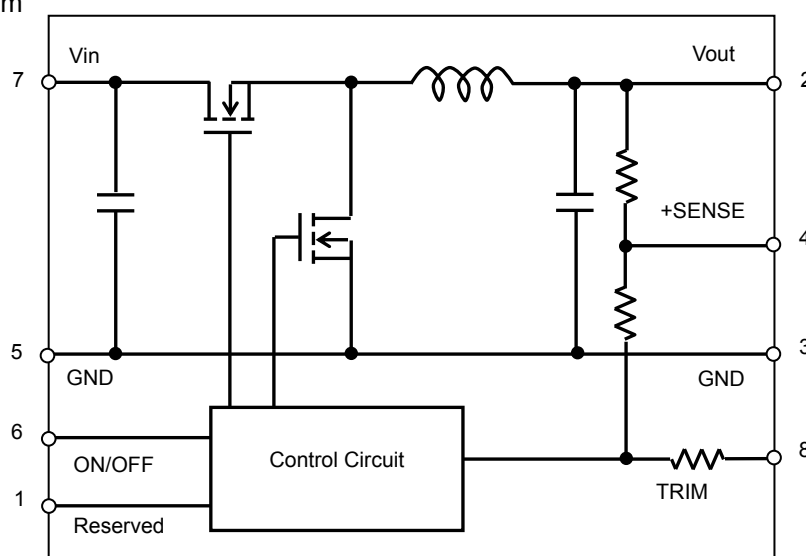
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5. Pin Number and Function

Pin No.	Symbol	Function
1	Reserved	N.C. Please leave this pin open.
2	Vout	Output
3	GND	GND
4	+SENSE	Vout sense input
5	GND	GND
6	ON/OFF	Remote ON/OFF
7	Vin	Input
8	TRIM	Vout adjust control

6. Block Diagram



7. Environmental Conditions

- 7.1 Operating Temperature Range -40 to +85 °C
(Temperature gradient $\leq 10^{\circ}\text{C}/\text{H}$)
- 7.2 Storage Temperature Range -40 to +85 °C
(Temperature gradient $\leq 25^{\circ}\text{C}/\text{H}$)
- 7.3 Operating Humidity Range 20% to 85% (No condensation)
- 7.4 Storage Humidity Range 10% to 90% (No condensation)
- 7.5 Maximum Wet Bulb 39°C

8. Absolute Maximum Rating

Item	Unit	Absolute Rating	Remarks
Minimum Input Voltage	V	0	
Maximum Input Voltage	V	5.5	
ON/OFF Pin Input Voltage Range	V	Vin	

*No voltage, no matter how instantaneous, shall be applied beyond the absolute maximum voltage rating to this product. If you apply any voltage over this limit the product characteristics will deteriorate or the product itself will be destroyed. Even though it may continue operating for a while after the over-voltage event, its life will likely be shortened significantly. Reliability and life of the module may degrade similarly if the maximum operating voltage rating is continuously exceeded. This product is designed to operate within the maximum operating voltage rating specification.

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9. Characteristics

9.1 Electrical Characteristics (Ta=25°C)

9.1.1 Input Characteristics

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Input Voltage Range	Vin		3.0	3.3	5.5	V
Rising UVLO Threshold	UVLOr	Vin increasing	2.42	2.55	2.7	V
Falling UVLO Threshold	UVLOf	Vin decreasing	2.4	2.5	2.6	V

9.1.2 Interface Characteristics

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
ON/OFF pin High Voltage	VIH		2.0	Vin	-	V
ON/OFF pin Low Voltage	VIL		-	0	0.8	V

9.1.3 Weight

Item	Value			単位 Unit
	Min.	Typ.	Max.	
Weight		0.76		g

9.1.4 Output Characteristics

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Output Voltage Adjustable Range	Vout	Vin=4.5V-5.5V	0.8	-	2.5	V
		Vin=3.0V-4.5V	0.8	-	1.8	
Output Voltage Tolerance	Vo tol	Over Vin, temperature range Rset=0.5% tolerance Io=5mA-3A	-3	-	+3	%Vo
Output Current	Iout	See the thermal derating curve in section 9.1.5	0	-	3	A
Ripple Voltage	Vrpl	Vin =5V, Iout=3A BW=20MHz, Cout=1μF				mV(p-p)
		Vout=2.5V	-	20	50	
		Vout=0.8V	-	20	50	
Efficiency	EFF	Vin =5V, Vout=2.5V, Iout=3A	-	87	-	%
Operating Frequency	Frq		-	1000	-	kHz
Short Circuit Protection	SCP	Latch-up mode after a mask time: Tlatch.After correction of the abnormal condition, the DC-DC Converter will restart by re-inputting Vin or toggling On/Off pin.	-	6	-	A
Timer Latch Mask Time	Tlatch		0.5	1	2	msec
External Output Capacitor	Cout	When input voltage is ideal voltage source	0	-	300	μF
Rising Overshoot	Vover		-	0	+5	%
Output Rise Time	Tr	Output voltage 0-90% (remote on)	2.5	5	10	msec

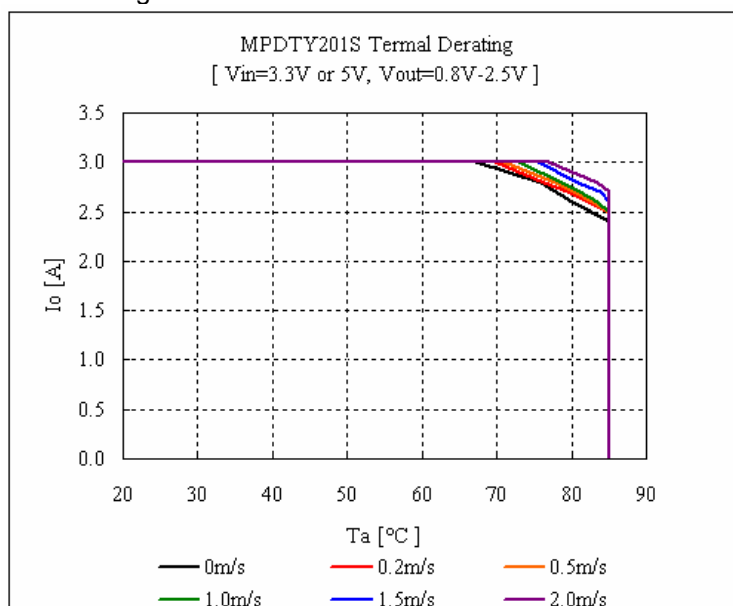
⚠ Caution

The above electrical characteristics are guaranteed with the condition that the impedance of the input voltage source is sufficiently low as shown in section 10. Connecting an input inductance or using an input power supply with output inductance may cause an unstable operation of this device. Please check the proper operation of this device with the peripheral circuits on your system.

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9.15 Thermal Derating



The above derating limits apply to this product soldered directly to 101.6*180mm*1.6mm PCB (double-sided, with 70um copper). Any adjacent parts of high temperature may cause overheating. For reliable operation, please ensure that the IC temperature of this product is maintained below 120°C and the inductor temperature is below 119°C.

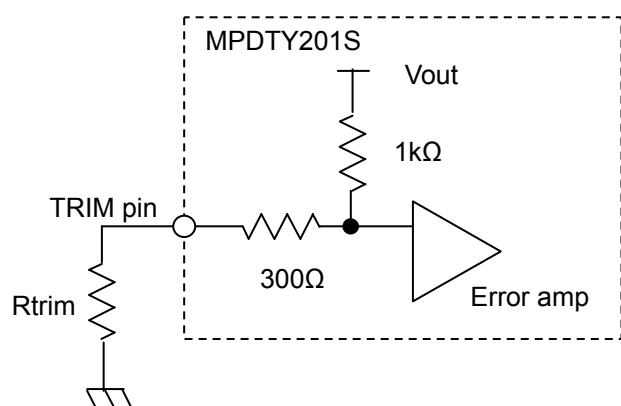
9.2 Pin Description

9.2.1 Trimming (Adjusting) the Output Voltage

The output voltage can be adjusted from 0.8V to 1.8V by connecting a resistor between TRIM-pin(8Pin) to GND-pin(Pin 3 is recommended for accurate Vout setting).

The following equation gives the required external-resistance value to adjust the output voltage to the required Vout.

Internal circuit



$$R_{trim} = \frac{800}{V_{out} - 0.8} - 300 \quad [\Omega]$$

[Rtrim calculation example]

Vout [V]	Calculated Rtrim[Ω]	Applied Rtrim (example) [Ω]
2.5	170.6	160+10
1.8	500	470+30
1.5	842.9	820+22
1.2	1700	1.5k+200
1.0	3700	36k+100
0.8	∞	Open

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9.2.2 ON/OFF function

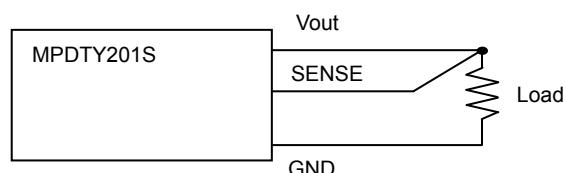
By using ON/OFF function, the operation of this product can be disabled without disconnection of input voltage. Sequence of a power supply system and power-saving control can be easily achieved using this function.

< ON/OFF control usage >

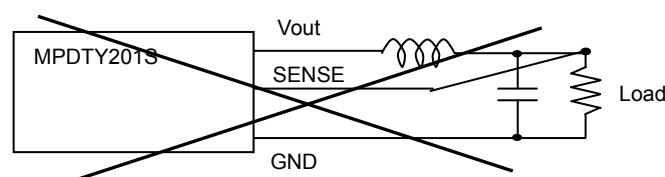
When ON/OFF-pins(6pin) is connected to Vin Output Voltage =ON
 When ON/OFF-pins(6pin) are connected to GND Output Voltage=OFF

9.2.3 Output voltage sensing

By connecting SENSE-pin to the load, output voltage drop in wiring shall be compensated.



Please do NOT connect SENSE-pin to the output of LC filter that is set to the Vout line. When using this way, this product will not operate properly.



< Caution >

Please connect SENSE-pin to Vout-pin nearby the product, if sense function is not used.

9.3 Reliability

9.3.1 Humidity

According to JIS-C-0022.

40±2°C, 90 to 95%RH, 100 hours. Leave for 4 hours at room temperature.

No damage in appearance and no deviation from electrical characteristics (section 9.1).

9.3.2 Temperature Cycles

Repeat cycle 5 times. Leave 2 hours at room temp.

No damage in appearance and no deviation from electrical characteristics (section 9.1).

Step	Condition	Time
1	-40°C±3°C	30 minutes
2	Room Temp.	5-10 minutes
3	+85°C±2°C	30 minutes
4	Room Temp.	5-10 minutes

9.3.3 Vibration

10 to 55Hz, 1.5mm amplitude (1minute cycle), 1 hour for each of X, Y, Z directions.

No damage in appearance and no deviation from electrical characteristics (section 9.1).

9.3.4 Mechanical Shock

20G, 1 time for each X, Y, Z directions.

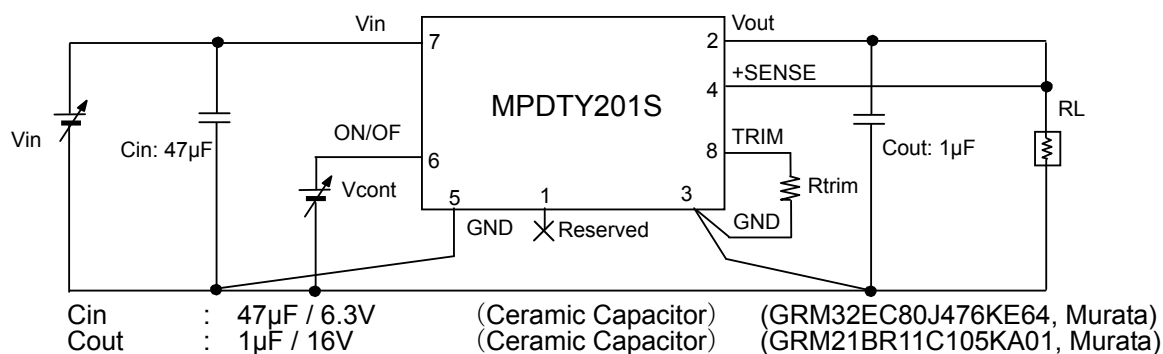
No damage in appearance and no deviation from electrical characteristics (section 9.1).

⚠ Note:

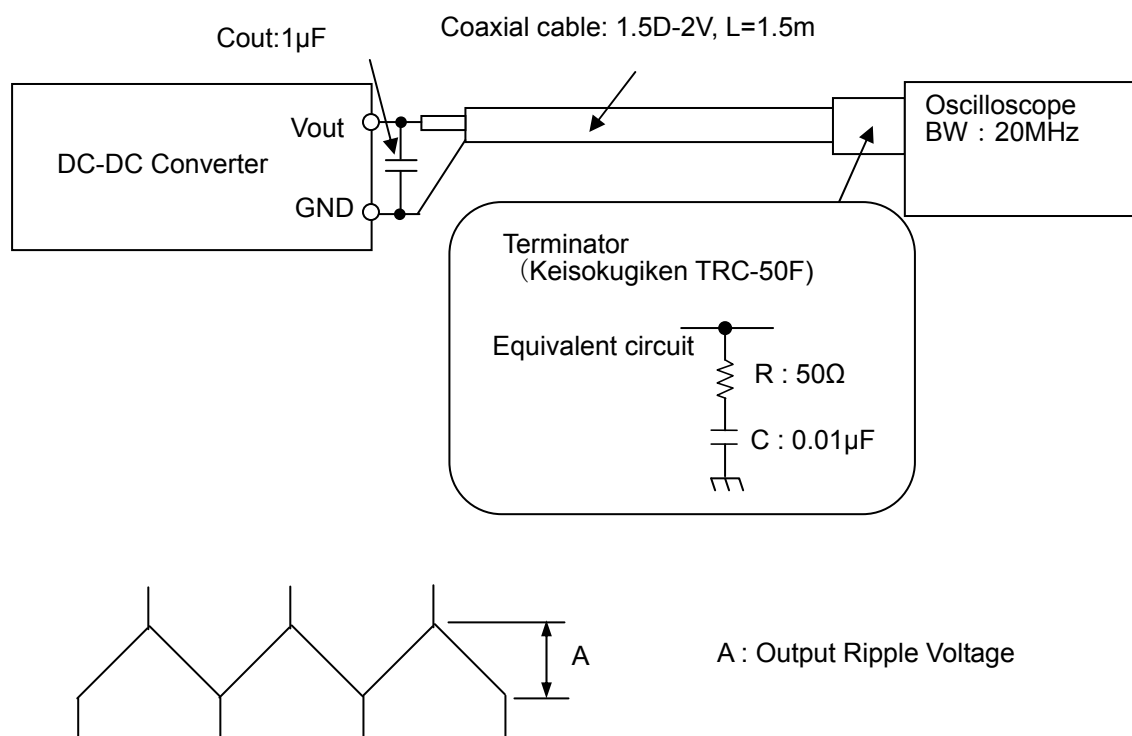
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10. Test Circuit

Using the following test circuit, the initial values under section 9.1 shall be met.



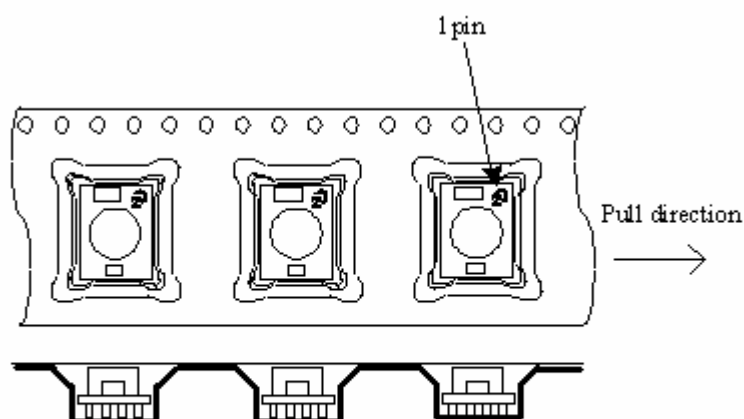
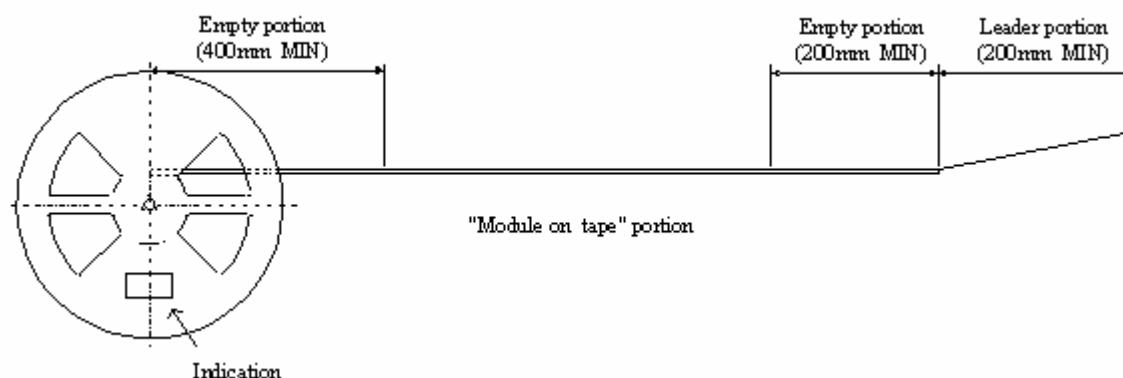
Ripple Measurement Circuit



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11.3 Taping Specification



The module is oriented with coil on top and pins on the bottom sides.

11.4 Note

1. The adhesive strength of the protective tape must be within 0.1-1N.
2. Each reel contains 500pcs.
3. No vacant pocket in "Module on tape" section.
4. The reel is labeled with customer part number, Murata part number and quantity.
5. The color of reel is not specified.

12. Production factory

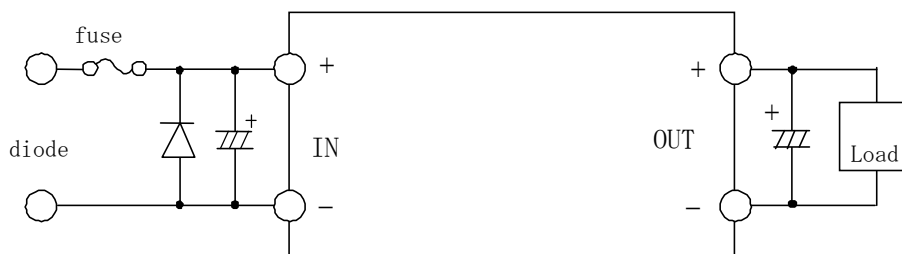
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13. ⚠ Caution

1. Be sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure of our product.
2. This DC-DC Converter has no inrush protect circuit. If any inrush current is applied to this product (ex. using mechanical switch), it may be damaged by surge voltage.
3. Please connect the input terminal by right polarity. If you connect opposite polarity, it may break the DC-DC Converter. In the case of destruction of the DC-DC Converter inside, over input current may flow. Please add diode and fuse as following to protect them.



※ Please select diode and fuse after confirming the operation.

4. Limitation of Application

Please contact us 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.

- 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 reliability requirements to the applications listed in the above.

14. Notice

14. 1. Soldering

14. 1. 1 Flux

Please solder the products with Rosin Flux which contains of 0.2wt% or less chlorine.

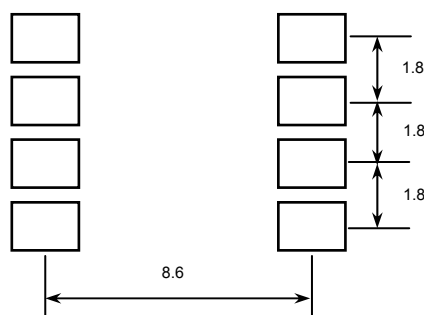
Please do not use high activity acid flux and water soluble flux because they may erode metal or glass portion of the products and may cause defective or low quality products.

14. 1. 2 Solder

Please use the solder H60, H63 (in JIS Z 3282) or the equivalent type.

Please use the same type solder as stated above when you use solder paste.

14. 1. 3 Recommendable Solder Land Pattern



Unit: mm

Recommended land size 2.4mm × 1.4mm

There are wiring coppers or through-hole via at the bottom side of the DC-DC Converter. When you design your PCBs, please be careful not to short the circuit of the DC-DC Converter or PCBs.

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14. 1. 4 Recommendable Condition of Soldering

This product is RoHS compatible. The following profile is recommended for the reflow of this product using Pb-free solder paste (Sn-Ag-Cu).

Method : Full convection reflow soldering

Reflow Soldering Profile

JEDEC IPC/JEDEC J-STD-020C

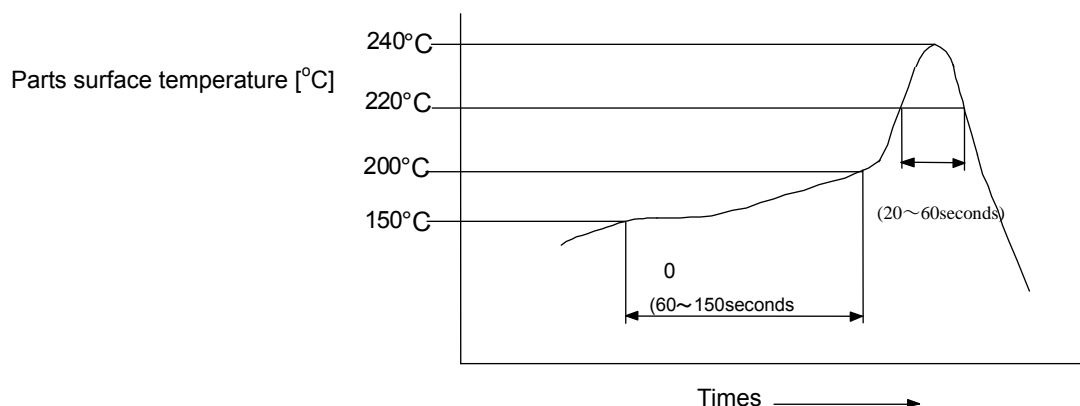
Table 5-2 Classification Reflow Profile

Pb-Free Assembly Large Body

Profile details

Reflow Soldering Profile

Method : Full convection reflow soldering
 Soldering temperature : 245°C +0/-5°C (Parts surface temperature)
 Soldering time : 20 to 60 seconds max. (Over 220°C)
 Preheating : 60 to 150 seconds (150-200°C)
 Time : 1 time



* Elimination of any additional vibration applied to this product during reflow is highly recommended. Careful regulation of temperature is recommended to avoid the separation of mounted components from this product during reflow.

14.2. Cleaning

14. 2. 1 Please clean the products to remove flux from them using the dipping, and vapor methods in isopropyl alcohol for up to 5 minutes. Please inform us if you are to use aqueous or semi-aqueous cleaning or another methods. Do not use ultrasonic cleaning as semiconductor devices on the products, may be damaged by resonance.

14. 2. 2 After cleaning, please dry the products thoroughly. If you touch the products that have not been dried enough, you must take care because the products markings may thin or blur. Do not measure electrical characteristics, until the products are completely dry.

14. 2. 3 If you use no-clean flux and do not clean our products, you must confirm the reliability of the products fully in advance.

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14. 3 Storage

14. 3. 1 Please store the product in a room where the temperature/humidity is stable and direct sunlight does not enter. Use the products within 6 months after delivery.

Please avoid dampness and heat or locations where temperatures may vary widely to avoid possible water condensation on the product. Exposure to such environments may degrade the performance and/or the reliability of the product.

If the product must be stored for a longer time than 1 year it is recommended that solderability be tested regularly to confirm material degradation has not occurred.

14. 3. 2 Please do not store this product in places such as :

A dusty place, a place exposed directly to sea breeze, or in an atmosphere containing corrosive gas (Cl₂, NH₃, SO₂, NO_x and so on).

14. 4 Operational Environment and Operational Conditions

14. 4. 1 Operational Environment

This product is not water-, chemical- or corrosion-proof.

In order to prevent leakage of electricity and abnormal temperature rise of the product, do not operate under the following environmental conditions:

- (1) An atmosphere containing corrosive gas (Cl₂, NH₃, SO₂, NO_x and so on)
- (2) A high-dust environment
- (3) Under the exposure of direct sunlight
- (4) A location where the likelihood of exposure to water or water condensation exists.
- (5) A location exposed to ocean air
- (6) Any locations similar to the above

14. 4. 2 Operational Conditions

Please use this product within specified values (power supply, temperature, input, output and load condition, and so on). If the product is exposed to conditions outside of the specified values reliability of the product may be adversely effected.

14. 4. 3 Note prior to use

Diminished reliability and/ or failure may result if the product is exposed to a high-level static charge, over-rated voltage or reverse voltage. Please avoid the following conditions be avoided prior to use of the product:

- (1) Supply of power outside of rated values (see section 8)
- (2) Supply of reverse power or inadequate connection of a 0 V(DC) line
- (3) Electrostatic discharge from production line and/ or operator
- (4) Electrification of the product from electrostatic induction
- (5) Excessive mechanical shock

14. 5 Transportation

Murata recommends that when transporting this product, it be packed so as to avoid damage by mechanical vibration or exposure to adverse conditions such as ocean air, high humidity. It is additionally recommended that appropriate instructions and guidelines be communicated to carriers to prevent exposure to these same conditions.

15. Note

1. Murata recommends that customers ensure that the evaluation and testing of these devices are completed with this product actually assembled on their product.
2. All the items and parameters in this product specification have been prescribed on the premise that Murata's product is used for the purpose, under the condition and in the environment mutually agreed upon.

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