

5. Pin Number and Function

Pin No.	Symbol	Function
1,2,3	Vin	Input
4	ON/OFF	Remote ON/OFF
5,6,7,8,9	GND	GND
10,11,12	Vout	Output
13	VAR	Output Voltage Adjust

6. Environmental Conditions

- 6.1 Operating Temperature Range $-10^{\circ}\text{C} \sim +80^{\circ}\text{C}$
6.2 Storage Temperature Range $-20^{\circ}\text{C} \sim +85^{\circ}\text{C}$
6.3 Operating Humidity Range 20% ~ 85% (No water condenses in any cases.)
6.4 Storage Humidity Range 10% ~ 90% (No water condenses in any cases.)

7. Absolute Maximum Rating

Item	Unit	Absolute Rating	Remarks
Minimum Input Voltage	V	0	
Maximum Input Voltage,	V	40	

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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8. Characteristics

8.1. Electrical Characteristics

8.1.1. Input Characteristics (Ta= 25°C)


Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
Input Voltage Range	Vin		17.0	24.0	40.0	V

8.1.2. Interface Characteristics (Ta= 25°C)

Item	Symbol	Condition	Value			Unit
			Min.	Typ.	Max.	
ON/OFF pin High Voltage	VIH	Vin=17.0~40.0V	2.5		-	V
ON/OFF pin Low Voltage	VIL		ON	-	-	

8.1.3. General Characteristics (Ta= 25°C)

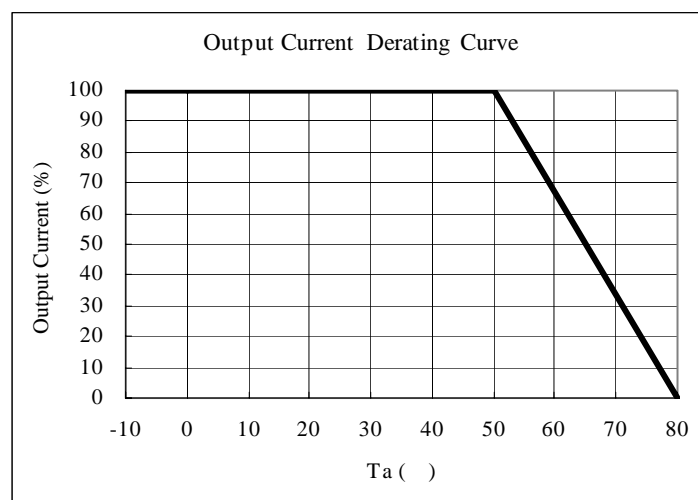
Item	Symbol	Condition	Value			Unit	
			Min.	Typ.	Max.		
Output Voltage	Vout	Vin=17.0~40.0V, Iout=0 ~ 6A	VAR=GND	11.64	12.00	12.36	V
			VAR=Open	4.85	5.00	5.15	
Output Current	Iout	Vin=17.0~40.0V, thermal derated	0	-	10.0	A	
Ripple Voltage	Vrpl	Vin=24V, Iout=6A, BW = 20MHz,	-	100	-	mV(pp)	
Efficiency	EFF	Vin =24V, Iout=10A, Vout=12V		97.3	-	%	
Protection Output Current	Iocp	Vin=17.0~40.0V	10.5	-	-	A	
Short Circuit Protection	SCP	If output is shorted to GND, DC-DC Converter shall be operated in a hiccup mode. After the short circuit event has cleared, the output is automatically brought back into regulation.					

 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 9. 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.

8.1.4. Thermal Derating

When using this product at (Ta : over 50°C), it is used by the following output current de-rating.


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8.2. Reliability

8.2.1. 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 8.1.).

8.2.2. Temperature Cycles

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

No damage in appearance and no deviation from electrical characteristics (section 8.1.).

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

8.2.3. 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 8.1.).

8.2.4. Mechanical Shock

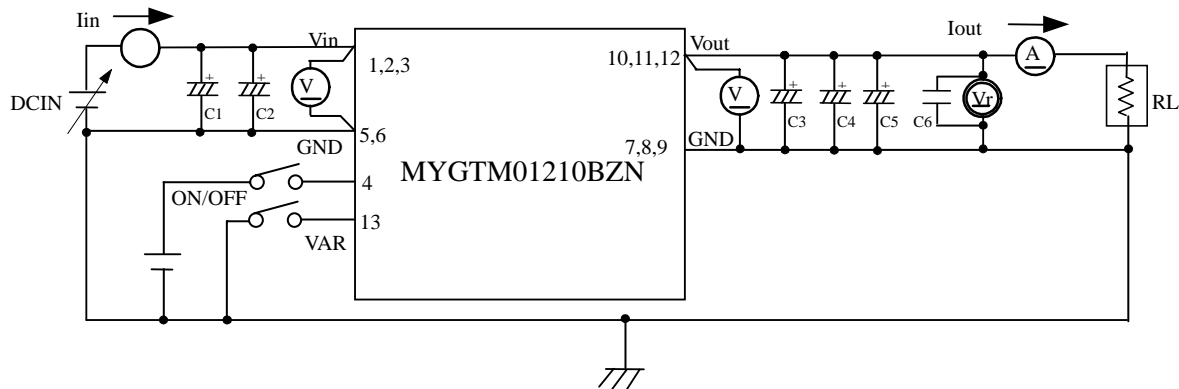
20G, 1 time for each X, Y, Z directions.

No damage in appearance and no deviation from electrical characteristics (section 8.1.).

9. Test Circuit

In the following test circuit, the initial values under item 8.1.. should be met.

9.1. General Measure Circuit



C1,C2 : 1000 μ F/50V Low Impedance Aluminum Electrolytic Capacitor (ZL series : Rubycon)

C3,C4,C5 : 1000 μ F/16V Low Impedance Aluminum Electrolytic Capacitor (EKZE160ETD102MJ20S

NIPPON CHEMI-CON)

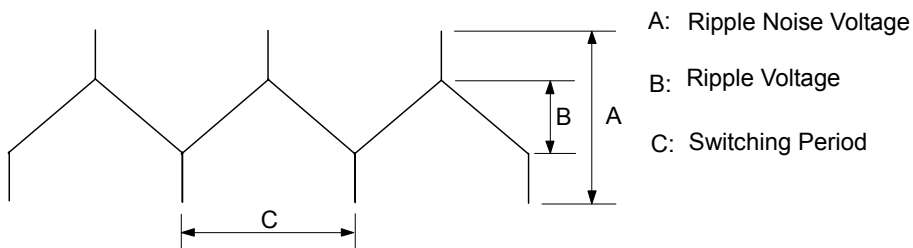
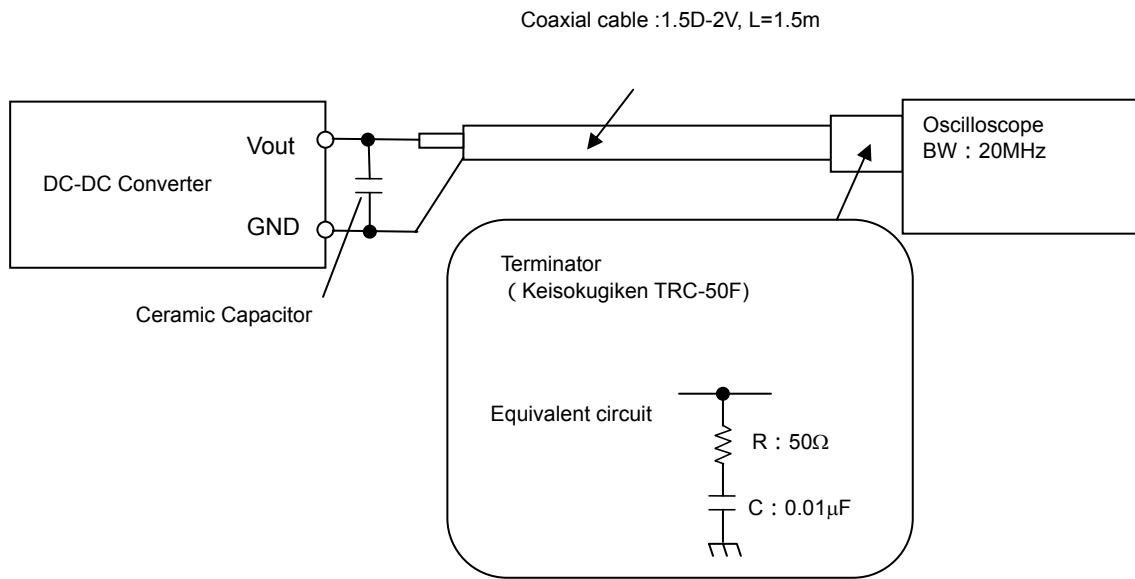
C6 : 0.1 μ F

Please make sure to place C1~C5 nearby input and output terminal of DC-DC converter.

⚠ Note:

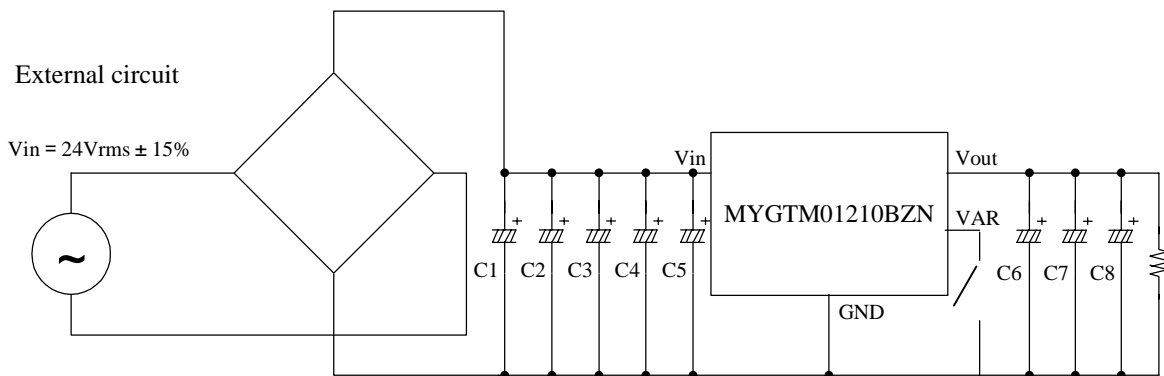
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9.2. Ripple Noise Measurement Circuit



9.3. Input/Output Aluminum Electrolytic Capacitor for full-wave rectifier(Reference)

* When input is AC24V±15% 50Hz or 60Hz full-wave rectifier, please refer following external circuit.



C1,C2,C3 : 1000μF/50V Low Impedance Aluminum Electrolytic Capacitor (EKZE500EC3102ML25S NIPPON CHEMI-CON)
 C4,C5 : 1000μF/16V Low Impedance Aluminum Electrolytic Capacitor (EKZE160ETD102MJ20S NIPPON CHEMI-CON)
 C6,C7,C8 : 1000μF/16V Low Impedance Aluminum Electrolytic Capacitor (EKZE160ETD102MJ20S NIPPON CHEMI-CON)

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10. Packaging specification

10.1. Packing form

These are packed in a tray.(See Fig.1)

10.2. The number of products in pack specification from.

35pcs/tray

If the products have fraction, may not follow this specification.

10.3. Packaging Form

10.3.1. Case of reuseable box is used.

These trayies packed products are packaging for Fig.2.

10.3.2. Case of reuseable box is not used

These trayies packed products are packaging for Fig.3.

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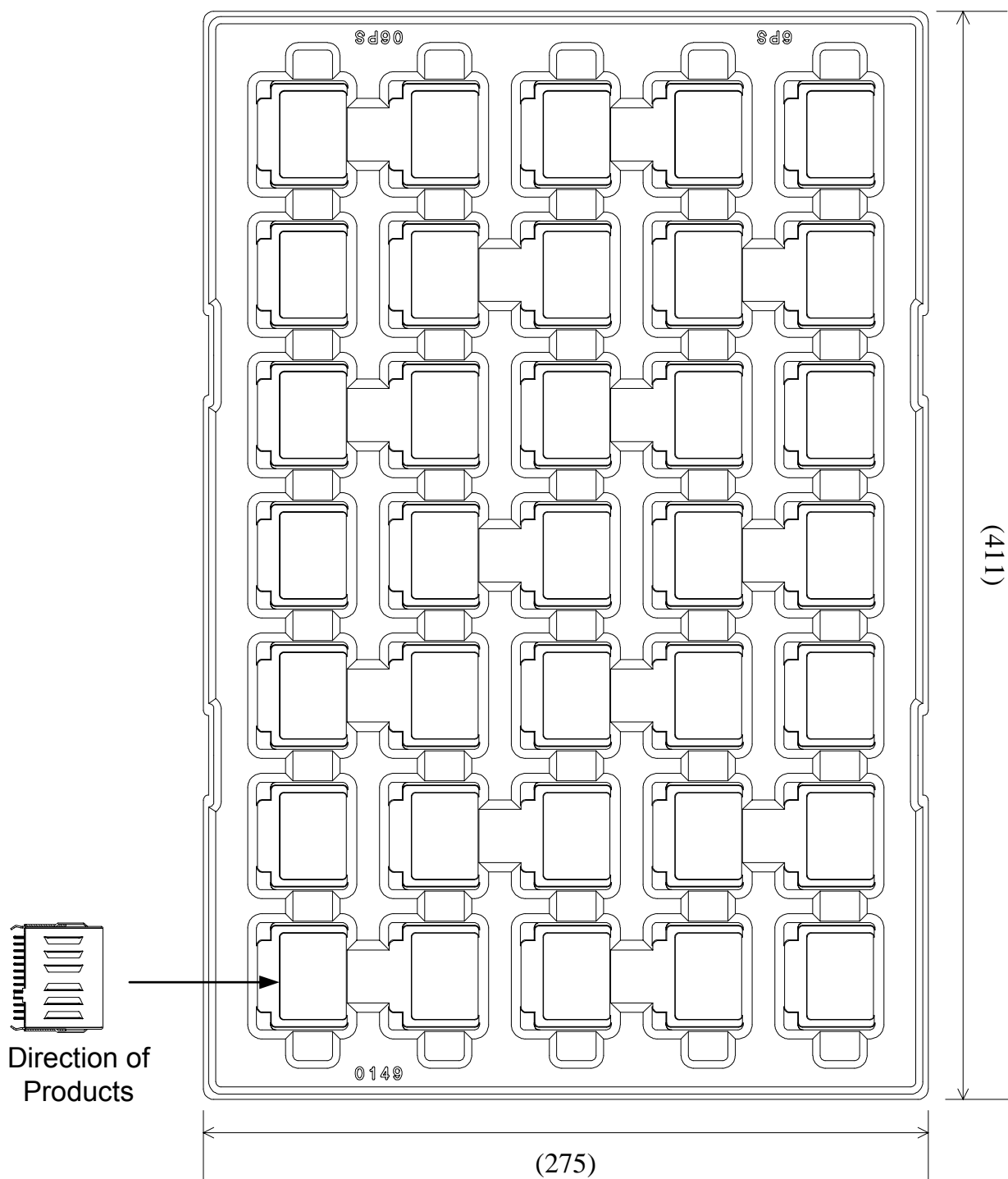


Fig.1

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As in Figure 2, six trays are packed up in the outside packing box .(Number of packed traies is 5 and Empty traies is 1)
 When there is a fraction, packing up the empty tray. (Number of all traies is allways 6.)
 Then, traies pile up alternately.

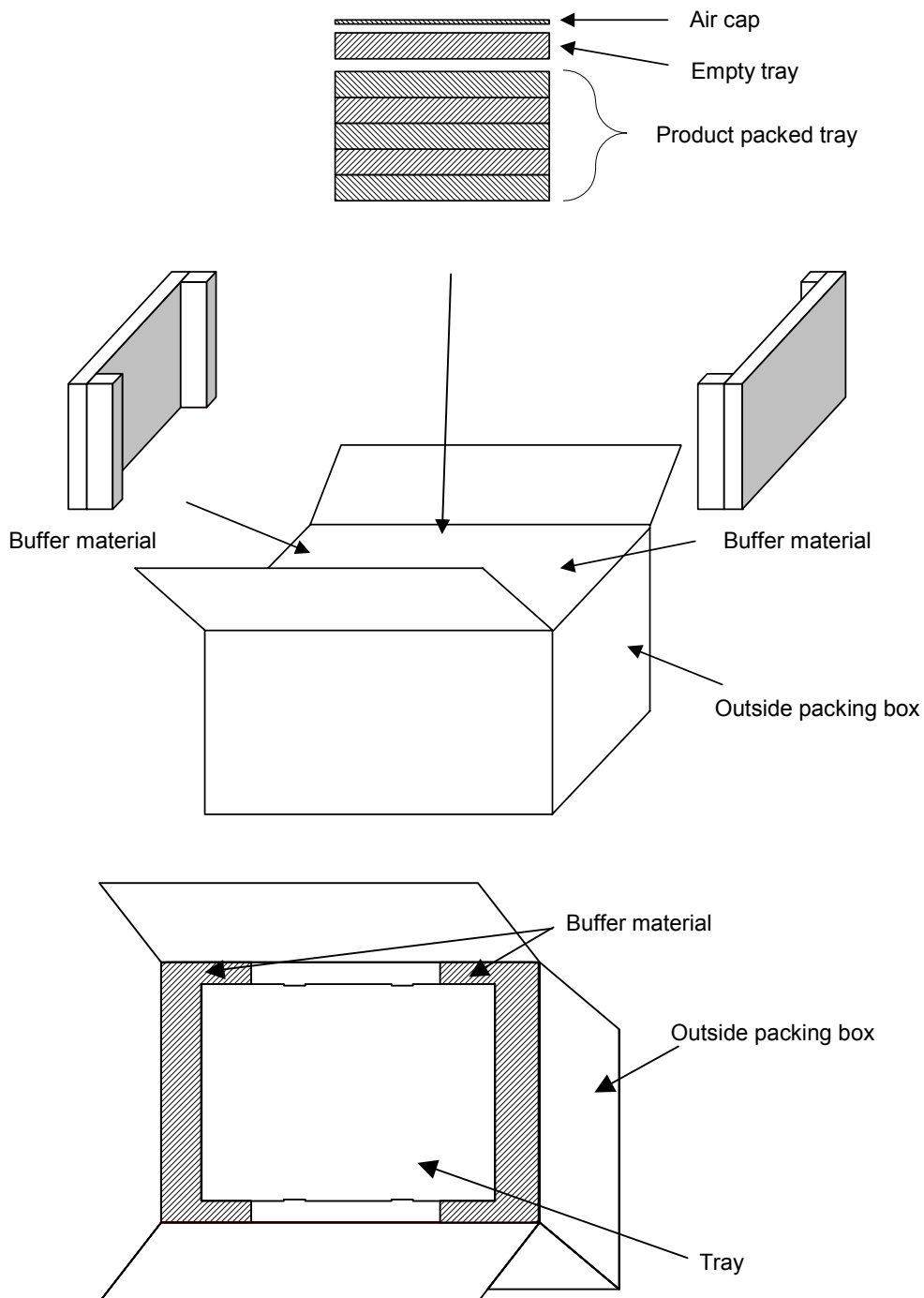
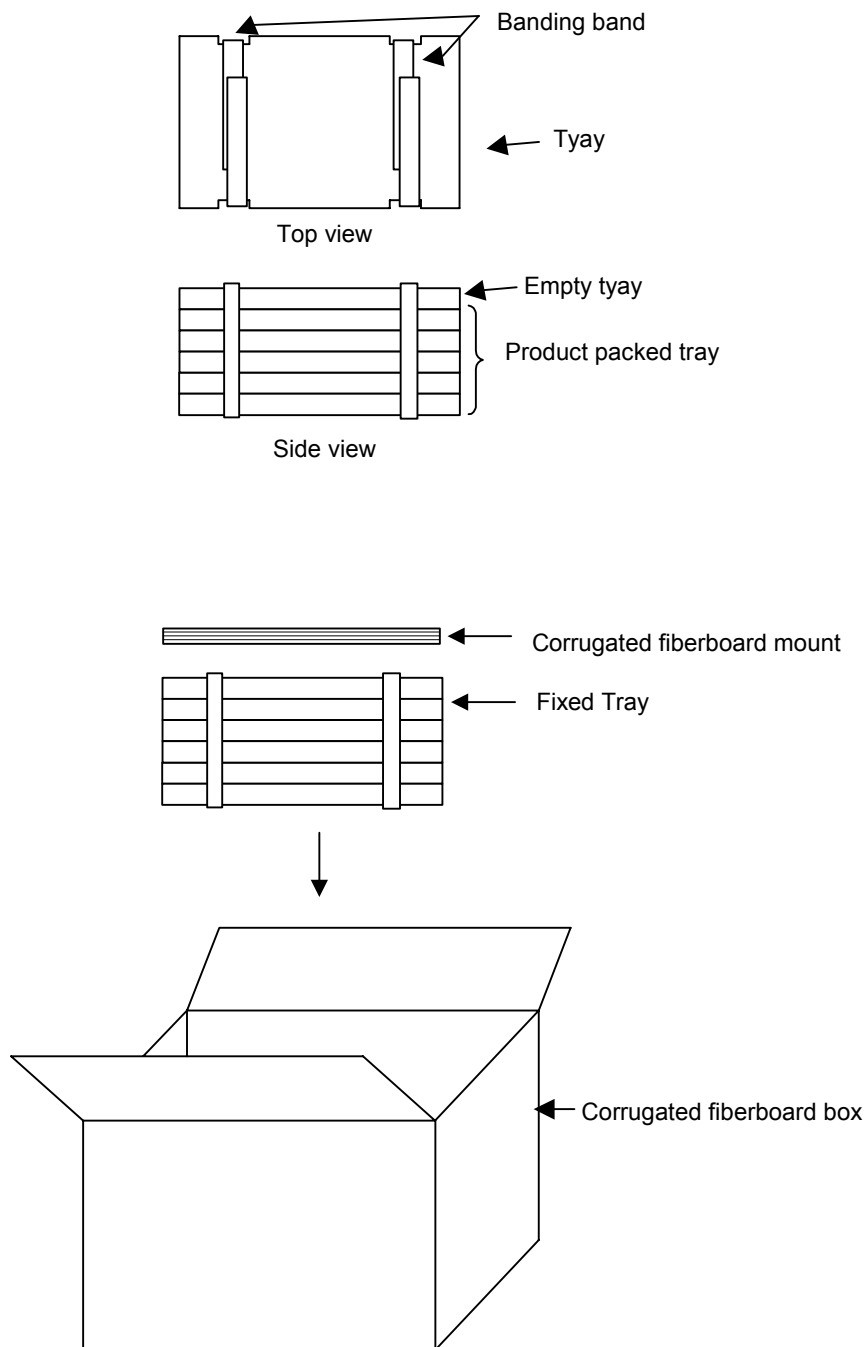


Fig.2

⚠ **Note:**

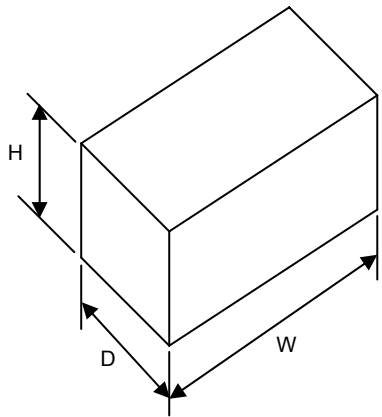
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As in Figure 2, six trays fixed by banding band are packed up in the corrugated fiberboard box.
 (Number of packed trays is 5 and Empty trays is 1.)
 When there is a fraction, fixed the empty trays by banding band. (Number of all trays is always 6.)
 Then, trays piles up alternately.



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Item	Specification
Packaging form typical classification	Box
Dimensions of packaging form (typ.) 	Case of reuseable box is used. $W = 538 \text{ (mm)}$ $D = 368 \text{ (mm)}$ $H = 284 \text{ (mm)}$ Case of reuseable box is not used $W = 432 \text{ (mm)}$ $D = 296 \text{ (mm)}$ $H = 264 \text{ (mm)}$
The number of products in packaging form	175(p c s)
Mass of one product	45(g) Typ.
Remark If the products have fraction, may not follow this specification. On the Packing case, the following is indicated. Murata Parts No. Quantity Stamp No.	

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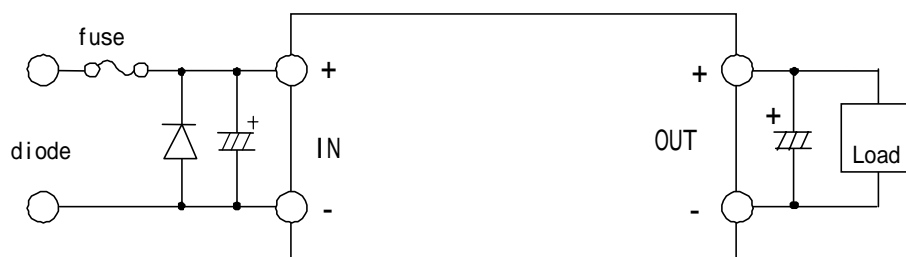
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11. Production factory

Komatsu Murata Mfg.Co., Ltd.
 Kanazu Murata Mfg. Co., Ltd.
 Wakura Murata Mfg. Co., Ltd.

12.  Caution

1. Be sure to provide an appropriate fail-safe function on your product to prevent secondary damage that may be caused due to abnormal functional or failure of this product.
2. Inrush current protection is not a feature of this product.
3. Please connect the input terminals with the correct polarity. If an error in polarity connection is made this product may be damaged. If this product is damaged internally, an elevated input current may flow, and so this product may exhibit an abnormal temperature rise, or your product may be damaged. Please add a diode and fuse per the following diagram to protect them.



Please select diode and fuse after confirming the operation of your product.

4. Limitation of Application

Please contact us before using this product 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.

Aircraft equipment
 Aerospace equipment
 Undersea equipment
 Power plant control equipment
 Medical equipment
 Transportation equipment (vehicles, trains, ships, etc.)
 Traffic signal equipment
 Disaster prevention /crime prevention equipment
 Any other application of similar complexity and/or reliability requirements to the applications listed above.

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13.1.3. Soldering Conditions Recommendation

Please solder under the following condition.

- Flow soldering Preheating : 120±10°C 60 ~ 120 seconds
- Soldering : 255±5°C
- Time within : 10 seconds
- Condition of iron soldering : under 380°C, 4 seconds at maximum

(Only iron less than 30W should be used.)

13. 2. Cleaning

Please use no-cleaning type flux and do not wash this product.

13.3. Storage

13.3.1. Please store the products in room where the temperature/humidity is stable and direct sunlight cannot come in, and use the products within 6 months after delivery.

Please avoid damp and heat or such places where the temperature greatly changes, as water may condense on this product, and the quality of characteristics may be reduced, and/or be the solderability may be degraded.

If this product needs to be stored for a long time (more than 1 year), this product may be degraded in solderability and/or corroded. Please test the solderability of this product regularly.

Baking before reflow process is unnecessary to store the products under 30%RH or less up to 6 months.

In case the storage condition is over above mentioned, if these are unpacked condition, please bake them at 125 ± 5 /24hour. If these are packed in a tape, please bake them before soldering at 60 ± 5 /168hour.

13.3.2. 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,NOX and so on).

13. 4. Operational Environment and Operational Conditions

13.4.1. 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, NOX 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

13.4.2. 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.

13.4.3. 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

13.5. 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.

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14.  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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