

DC-DC Converter Specification

MPDTH12040WAS/H

1. Application

This specification applies to DC-DC Converter for telecommunication / data-communication equipment, MPDTH12040WAS/WAH.

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

2. Customer Reference

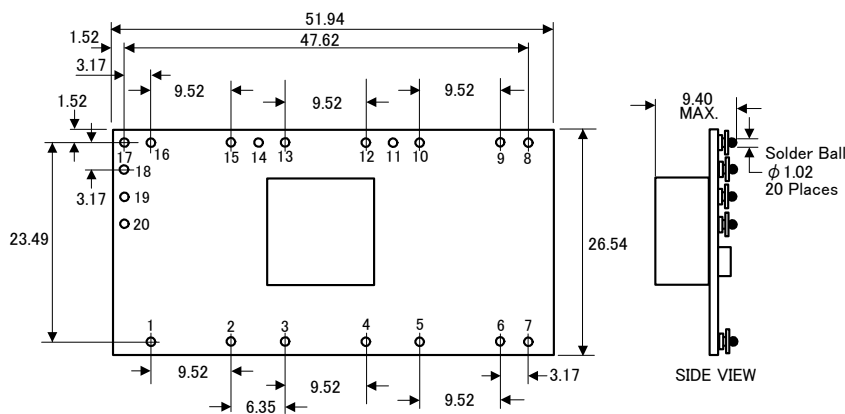
Customer Spec. Number
Customer Part Number

3. Murata Part Number

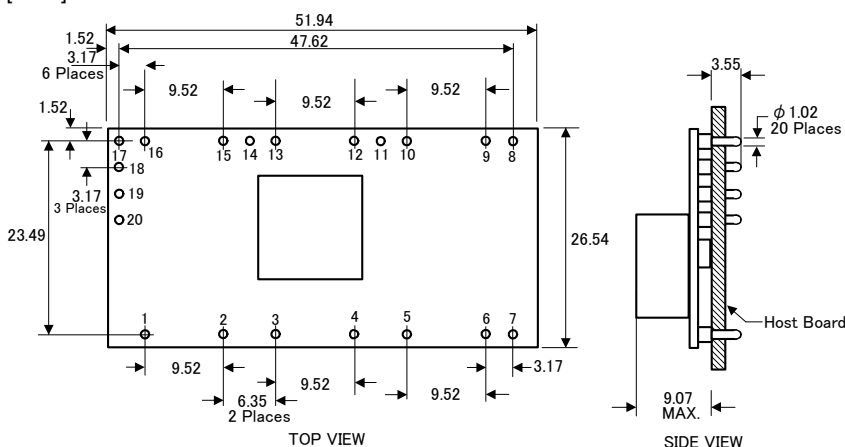
MPDTH12040WAS / MPDTH12040WAH

4. Appearance, Dimensions

[WAS]



[WAH]



Marking

(1) MFG ID

(2) Part No. ---WAS → PRH

---WAH → PRF

(3) Lot No. ①②③

① Production factory Mark

② Production Year

③ Production Month (1,2,3,...9,O,N,D)

unit : mm

Tolerance : 0.25mm

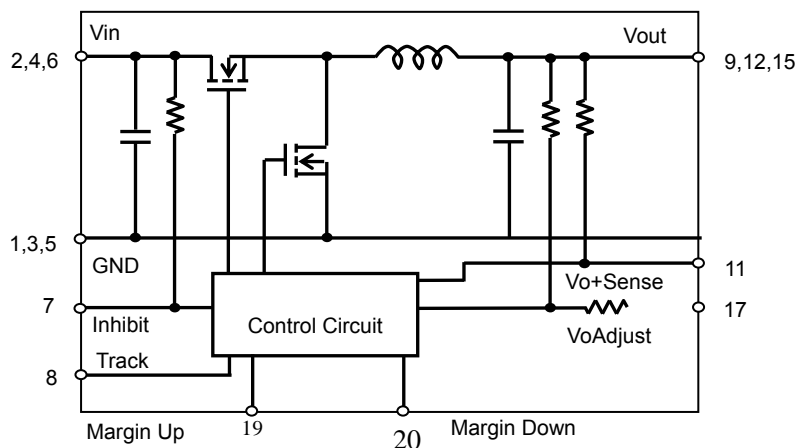
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5. Pin Number and Function

Pin No.	Symbol	Function
1	GND	GND
2	Vin	Input
3	GND	GND
4	Vin	Input
5	GND	GND
6	Vin	Input
7	Inhibit	Remote ON/OFF
8	UVLOProg	UVLO
9	Vout	Output
10	GND	GND
11	Vo+Sense	Vout +sense
12	Vout	Output
13	GND	GND
14	Vo-Sense	Vout -sense
15	Vout	Output
16	GND	GND
17	VoAdjust	Vout control
18	Track	Tracking signal input
19	Margin Up	Margin up signal input
20	Margin Down	Margin down signal input

6. Block Diagram



7. Ambient Condition

- 7.1 Operating Temperature Range -40 to +85 °C
- 7.2 Storage Temperature Range -40 to +125 °C

8. Absolute Rating

- 8.1 Track Pin Input Voltage Range -0.3V to Vin+0.3V

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8. Characteristics

8.1 Electrical Characteristics (Ta=25 °C)

Item	Symbol	Condition	Value			Unit	
			Min.	Typ.	Max.		
Output Current	Io	60°C, 200 LFM airflow	0	-	50 (*1)	A	
Input Voltage Range	Vin	Over Io range	8	-	14	V	
Set-point Voltage Tolerance	Vo tol		-	-	±2 (*2)	%Vo	
Temperature Variation	ΔRegtemp	Ta=-40°C to 85°C	-	±0.5	-	%Vo	
Line Regulation	ΔRegline	Over Vin range	-	±5	-	mV	
Load Regulation	ΔRegload	Over Io range	-	±5	-	mV	
Total Output Variation	ΔRegtot	Includes set-point, line, load, Ta= -40°C to 85°C	-	-	±3 (*2)	%Vo	
Output Adjust Range	ΔVadj		0.8	-	5.5 (*3)	V	
Efficiency	η	Vin=12V Io=35A	Rset=205Ω Vo=5.0V	-	96	-	%
			Rset=1.5kΩ Vo=3.3V	-	95	-	
			Rset=3.01kΩ Vo=2.5V	-	93	-	
			Rset=4.99kΩ Vo=2.0V	-	92	-	
			Rset=6.34kΩ Vo=1.8V	-	91	-	
			Rset=9.76kΩ Vo=1.5V	-	90	-	
			Rset=18.2kΩ Vo=1.2V	-	88	-	
			Rset=38.3kΩ Vo=1.0V	-	86	-	
		Rset=open cct.Vo=0.8V	-	82	-		
Ripple Voltage	Vr	BW=20MHz, Co=10 μF ceramic	-	15 (*4)	-	mVpp	
Short Circuit Protection	Io trip	Reset, followed by auto-recovery	-	95	-	A	
Transient Response	ttr	1A/us load step, 50 to 100% Iomax, Co=660 μF	-	70	-	μsec	
	ΔVtr		-	150	-	mV	
Margin Up/Down Adjust	ΔVomargin	Pin to GND	-	±5	-	%	
Margin Input Current	IIL margin	Pin to GND	-	-8	-	μA	
Track Input Current	IIL track	Pin to GND	-		-0.10	mA	
Track Slew Rate Capability	dVtrack/dt	Vtrack-Vo < 50mV, Vtrack<Vo(nom)	-	-	1	V/ms	
UVLO Undervoltage lockout	UVLOr	Pin 8 open	Vin=increasing	-	7.5	-	V
	—		Hysteresis	-	1	-	V
Input High Voltage	VIH	Referenced to GND	This pin should left open to operate (*5)			V	
Input Low Voltage	VIL	Referenced to GND	-0.2	-	0.5	V	
Input Low Current	IIL inhibit	Pin to GND	-	-0.5	-	mA	
Input Standby Current	Iin inh	Inhibit to GND	-	35	-	mA	
Switching Frequency	Frq	Over Vin and Io ranges	-	1.05	-	MHz	
External Input Capacitor	Cin		560 (*6)	1000		μF	
External Output Capacitor	Cout	non-ceramic (ESR>2mΩ)	660 (*7)		14000	μF	
		ceramic	-	-	400		
MTBF	MTBF	Per Bellcore TR-332, 50% stress, Ta=40°C, ground benign	2.5	-	-	10 ⁶ Hrs	

(*1) See SOA curves or consult factory for appropriate derating.

(*2) The set-point voltage tolerance is affected by the tolerance and stability of Rset. The stated limit is unconditionally met if Rset has a tolerance of 1% with 100ppm/°C or better temperature stability.

(*3) When the set-point voltage is adjusted higher than 3.6V, a 10-V minimum input voltage is recommended.

(*4) The peak to peak output ripple voltage is measured with an external 10μF ceramic capacitor.

(*5) This control pin has an internal pull-up. If it is left open-circuit the module will operate when input power is applied.

(*6) The external input capacitor must be rated at or above 300mA rms of ripple current.

(*7) A minimum value of output capacitance is required for proper operation. Adding additional capacitance at the load will further improve transient response.

⚠ **Note:**

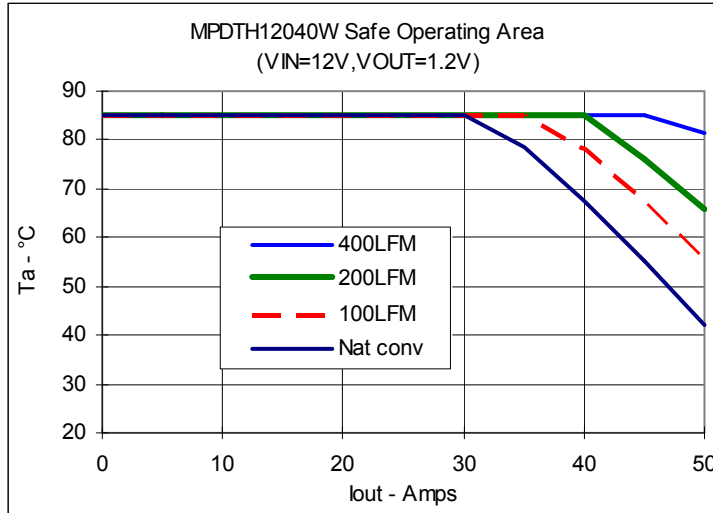
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⚠ Caution

The above electrical characteristics are guaranteed in the condition that the impedance of the input voltage source is sufficiently low as shown in clause 11.

Connecting an input inductance or using an input power supply with output inductance may cause an unstable operation of this product. Please check the proper operation of this product with the peripheral circuits on your product.

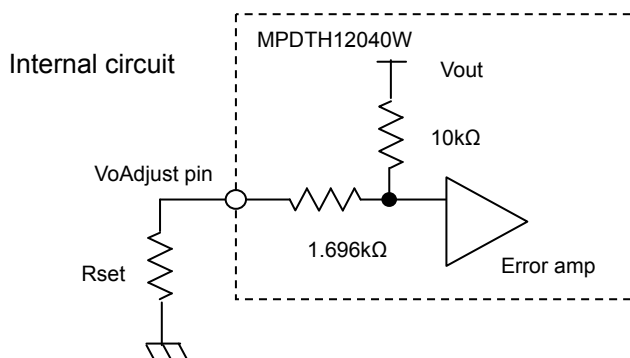
8.2 Thermal Derating



The above SOA represents the condition at which internal components are at or below the manufacturer's maximum operating temperatures. Derating limits apply to modules soldered directly to 4 inch×4inch, 4-layer PCB with 1 oz. copper. For more reliable operation, appropriate derating is desirable.

9. Adjusting the Output Voltage

The output voltage can be adjusted ranging from 0.8V to 5.5V by connecting resistors between VoAdjust-pin (17pin) to GND-pin. The resistor's tolerance should be 1%, with 100ppm/degC(or better). The following equation gives the required external-resistor value to adjust the output voltage to Vout.



$$R_{set} = 10k\Omega \frac{0.8V}{V_{out} - 0.8V} - 1.696k\Omega$$

Rset calculation example

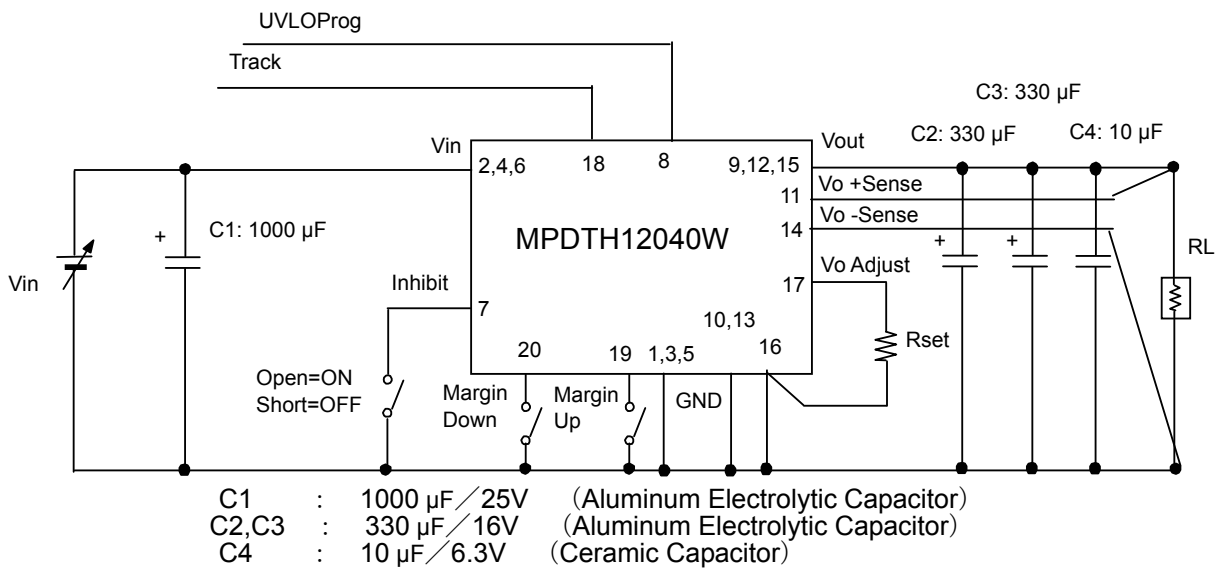
Vout [V]	Calculated Rset[kΩ]	Rset example
5	0.209	200Ω+10Ω
3.3	1.50	1.5kΩ
2.5	3.01	2kΩ+1kΩ
2	4.97	3.9kΩ+1.1kΩ
1.8	6.30	5.1kΩ+1.2kΩ
1.5	9.73	8.2kΩ+1.5kΩ
1.2	18.3	15kΩ+3.3kΩ
1	38.3	36kΩ+2.2kΩ
0.8	∞	Open

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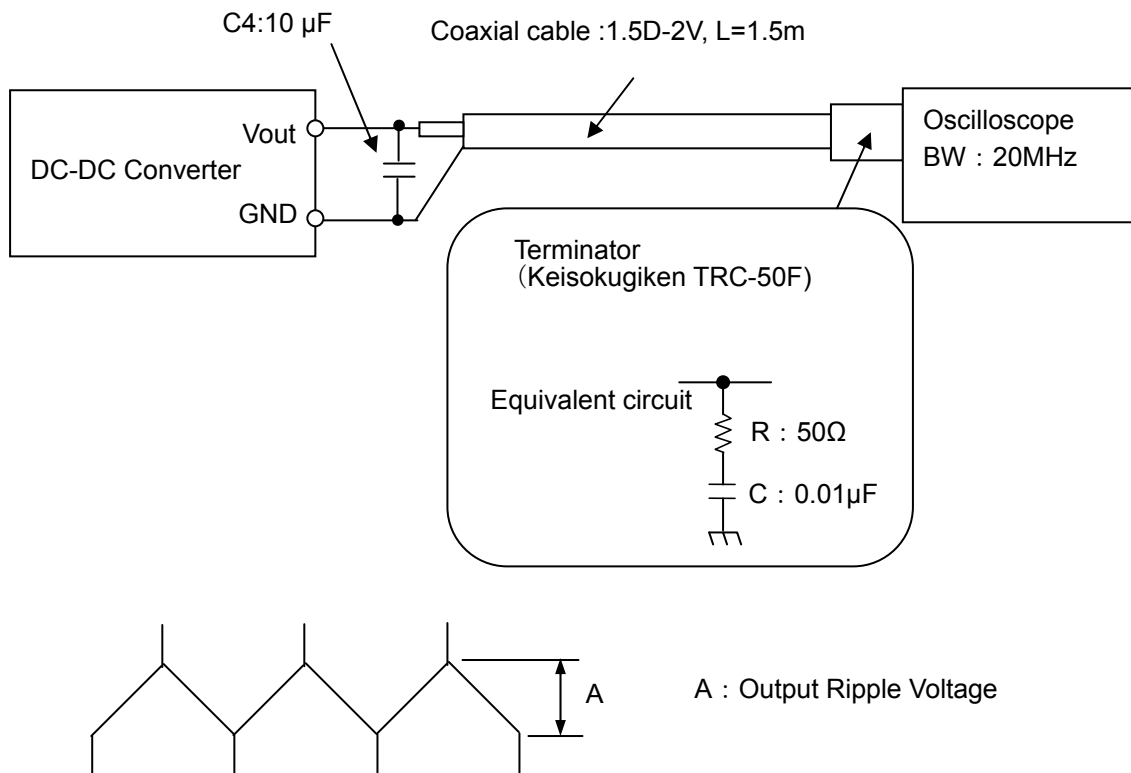
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11. Test Circuit

In the following test circuit, the initial values under item 9 should be met.



Ripple Noise Measurement Circuit



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12 . Packaging Information

12. 1 Tray Dimensions

DC-DC converters are put in the trays. (See Fig.1)

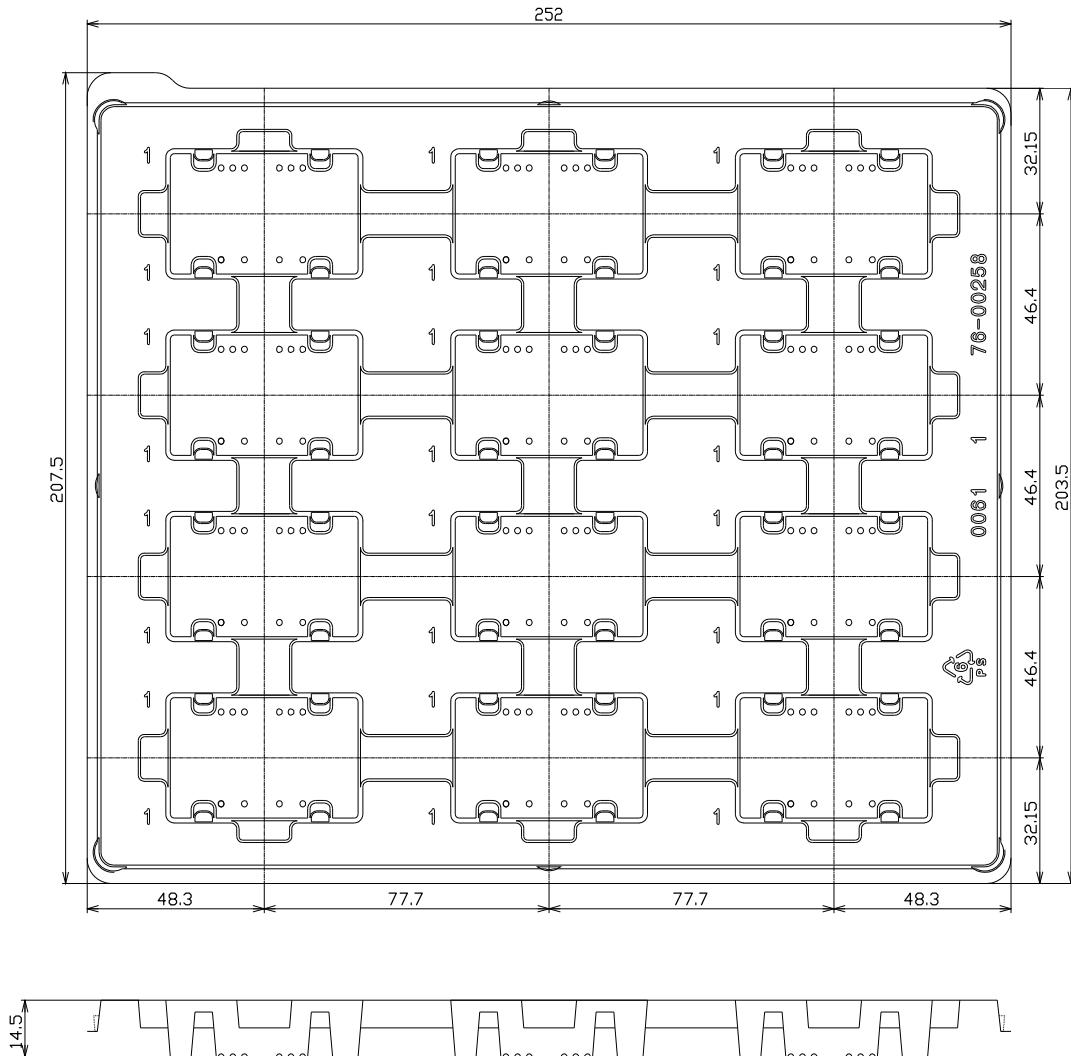


Fig.1

12. 2 Maximum Pieces per a Tray

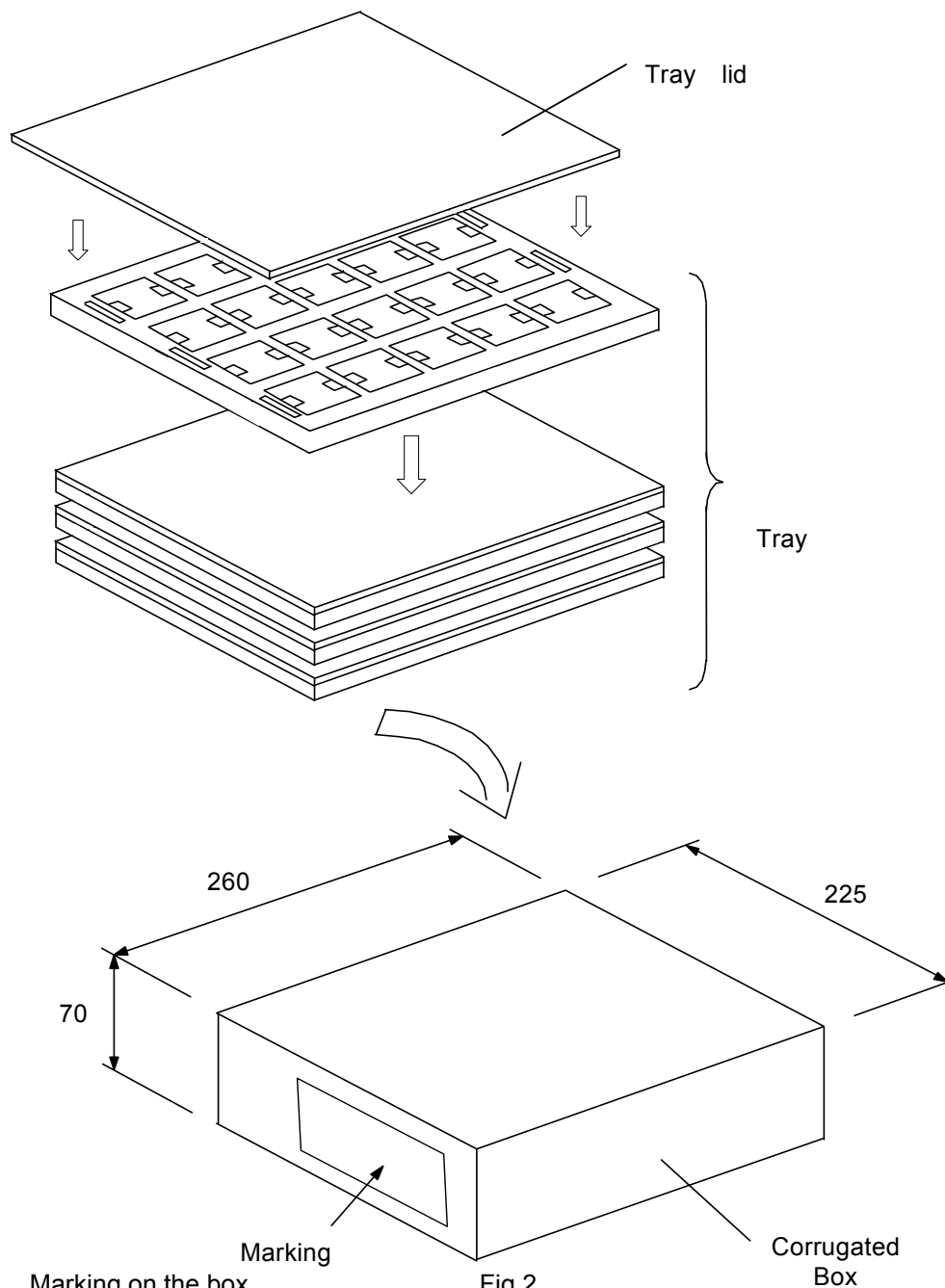
12pcs/tray
(except when less than 12)

12. 3 Packaging Form

Trays with products are lidded and packed in a corrugated box. (See Fig.2)

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Marking on the box
 MURATA Parts Number
 Quantity
 Inspection No.

Fig.2

Corrugated
 Box

13. Production factory

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

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15. 1. 3 Recommended Soldering Conditions

- Reflow Soldering

This product is RoHS compatible. The following profile is recommended for the reflow of the SMD product (WAS) 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

Soldering temperature	: 245 °C +0/-5 °C
Soldering time	: 20 to 40 seconds, 240 to 245 °C
Heating time	: 60 to 150 seconds, over 217 °C
Preheating time	: 60 to 180 seconds, 150 to 200 °C
Programming rate	: 3 °C / sec. Max., 217 to 245 °C
Descending rate	: 6 °C / sec. Max.
Total soldering time	: 8 minutes Max., 25 to 245 °C
Times	: 1time

Do not add vibration to this product during reflow.

Please carefully regulate temperature control as mounted parts may come off from this product if left under the high temperature for an extended time.

15. 2 Cleaning

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

15. 3 Storage

15. 3. 1 This product should be treated as MSL2 product when it is reflowed according to the recommended soldering condition, which is described at 15.1.3. .

At below 30 °C 60%R.H., this product can be stored 1 year without baking.

If stored over 1 year, please bake this product before soldering.

The recommendable baking condition is at 125±5 °C /24hour.

If baked in a tray of in a tape, 60±5 °C /168hour is recommended.

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.

15. 3. 2 Please do not store this product in the conditons 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).

15. 4 Operational Environment and Operational Conditions

15. 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 this product, do not use this product in the following conditions:

- (1) in an atmosphere containing corrosive gas (Cl₂, NH₃, SO₂, NOX and so on)
- (2) in a dusty place
- (3) in a place exposed to direct sunlight
- (4) in such a place where water splashes or in such a humid place where water condenses
- (5) in a place exposed to sea breeze
- (6) in any other places similar to the above

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15. 4. 2 Operational Conditions

Please use this product within specified values (power supply, temperature, input, output and load condition, and so on). As the input voltage may drop due to line impedance, please make sure that the input voltage is within the specified values.

If not used within the specified values, defectiveness and deterioration of this product may be caused. Even if this product can endure the condition for short time, it may cause degradation of reliability.

15. 4. 3 Note prior to use

Defectiveness and reliability degradation may be caused if high static electricity, over rated voltage or reverse voltage are applied to this product. Please be sure to avoid the followings:

- (1) over rating power supply, reverse power supply or inadequate connection of 0 V(DC)line
- (2) electrostatic discharge from production line and/or operator
- (3) electrified product from electrostatic induction

Please avoid an excessive mechanical shock.

If this product is dropped on the floor, etc., a crack to the core of inductors and monolithic ceramic capacitors may occur.

Please handle with care to avoid a strong shock to this product.

15. 5 Transportation

When transporting this product, please pack it in order to avoid damage by mechanical vibration or mechanical shock, and please give instructions and set guidelines to the carriers to prevent rough handling. When transporting this product overseas (in particular, by sea), bad environment of transportation may be expected, therefore please pack this product considering mechanical strength, vibration-resistance and humidity-resistance.

The packaging designed for domestic sales may not suitable for overseas transportation.

Please contact us if this product with domestic packing is transported overseas.

16. 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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