DC-DC Converter Application Manual

MPDTY411S/MPDTY412S

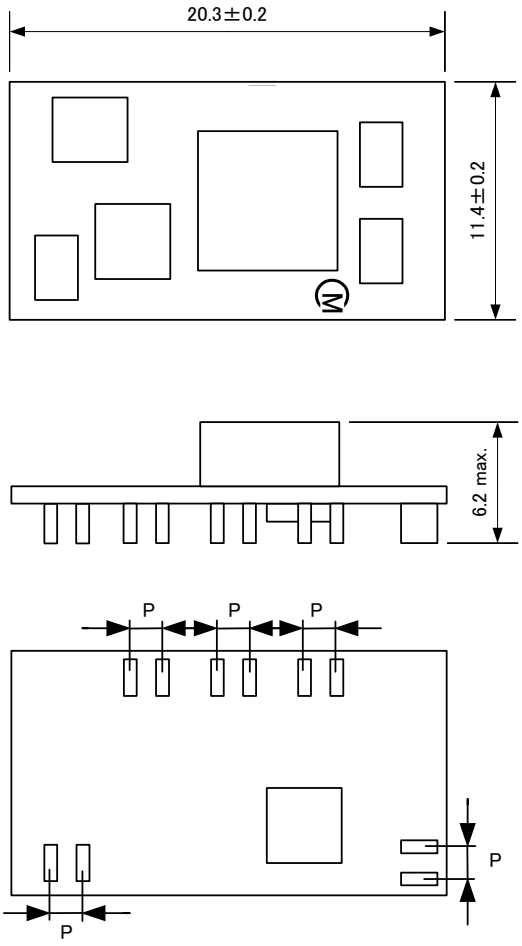
Features

- These are the Low Voltage/High current non-insulated type DC-DC Converter.
- Low profile ; 6.2mmMAX.
- Output voltage is adjustable by using single external resistance.
- (0.8-3.3V : MPDTY411S 0.8-2.5V : MPDTY412S)
- ON/OFF function is built in.
- Short circuit protection & over temperature protection is built in.

1. Product line up

Input Voltage	
5.0V type	3.3V type
MPDTY411S	MPDTY412S

2. Appearance, Dimensions



P=1.5 ±0.2mm

【Unit：mm】

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3. Pin Number and Function

Pin No.	Symbol	Function
1	Vin	Input Voltage
2	Vin	Input Voltage
3	GND	GND
4	GND	GND
5	TRIM	Output Voltage Adjustment
6	TRIM	Output Voltage Adjustment
7	Vout	output Voltage
8	Vout	output Voltage
9	ON/OFF	Remote ON/OFF
10	ON/OFF	Remote ON/OFF

4. Electrical Characteristics(Ta=25°C)

Item	Symbol	Condition	Model Number	Value Min.	Value Typ.	Value Max.	Unit
Input Voltage	Vin		MPDTY411S	4.5	5.0	5.5	V
			MPDTY412S	3.0	3.3	3.6	
UVLO Threshold	UVLO		MPDTY411S	-	4.0	-	V
			MPDTY412S	-	2.7	-	
Output Voltage Adjustable Range	Vout		MPDTY411S	0.8	-	3.63	V
			MPDTY412S	0.8	-	2.5	
Output Voltage Accuracy	Vout-0.8	Vin =4.5～5.5V, Iout= 0～7A TRIM = Open	MPDTY411S	0.776	0.80	0.824	V
	Vout-3.3	Vin =4.5～5.5V, Iout= 0～7A TRIM = 5460Ω		3.201	3.30	3.399	
	Vout-0.8	Vin =3.0～3.6V, Iout= 0～7A TRIM = Open	MPDTY411S	0.776	0.80	0.824	
	Vout-3.3	Vin =3.0～3.6V, Iout= 0～7A TRIM = 10429Ω		2.425	2.50	2.575	
Output Current	Iout		All	0	-	7	A
Ripple Noise Voltage	Vripl	Vin=5.0V, Vou=3.3V, Iout=7A,BW=20MHz	MPDTY411S	-	20	50	mV(p_p)
			MPDTY412S	-	15	50	
Efficiency	EFF	Vin =5.0V, Vout=3.3V, Iout= 7A	MPDTY411S	89	94	-	%
		Vin =5.0V, Vout=2.5V, Iout= 7A	MPDTY412S	88	93	-	
Operating Frequency	Frq		All	-	600	-	kHz
ON/OFF pin High Voltage	VIH	If ON/OFF pin is connected to Vin,the DC-DC Converter shall be “OFF”.	OFF	Vin	0.3	Vin	Vin
ON/OFF pin Low Voltage	VIL	If ON/OFF pin is pulled down to GNDor is opened, the DC-DC Convertershall be “ON”.	ON	0	-	0.3	V
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.					
Over Temperature Protection	OTP	If OTP event is occurred, DC-DC Converter shall be shut down. After theOTP event has cleared, the output isautomatically brought back into regulation.		-	115	-	°C
Additional Output Capacitor	Cout	When input voltage is ideal voltage source		47	-	1000	μF
Output Delay	Td	Output voltage 0-10% (remote on)		0.1	-	8	msec
Output Rise Time	Tr	Output voltage 10-90%		1	-	10	msec

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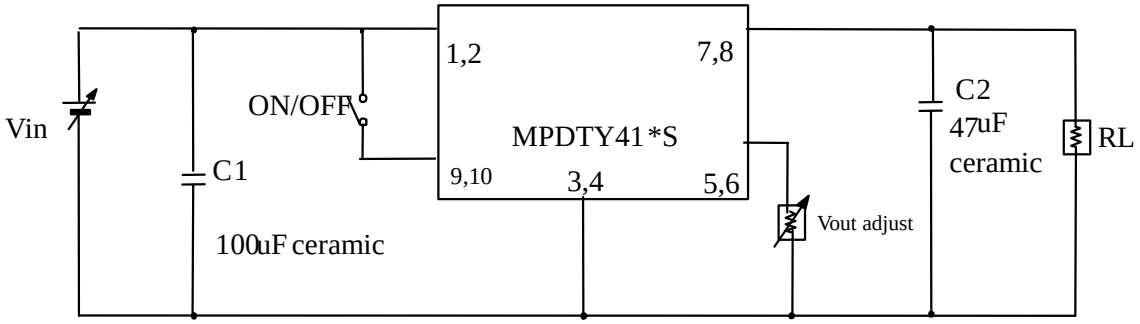
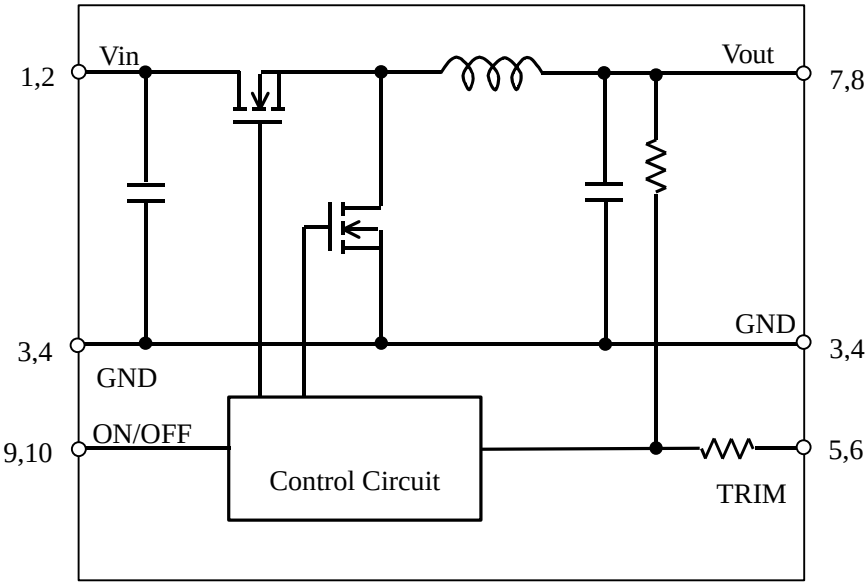
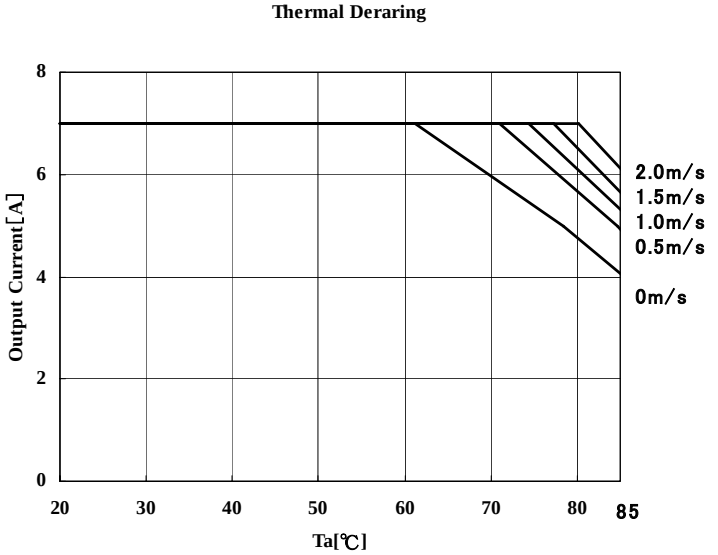
5. Test Circuit



6. Block Diagram



7. Output Current Derating
When using this product at the ambient air temperature of 60℃ more, it is used by the following temperature derating.



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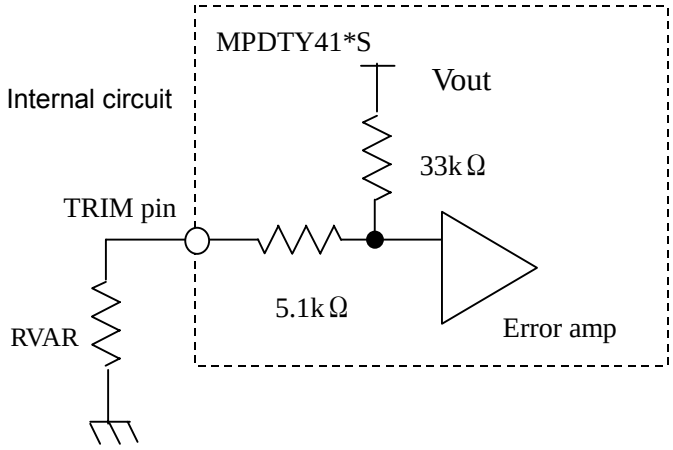
8. Output Voltage Adjustment
The output voltage can be adjusted ranging from 0.8V to 3.63V(MPDTY411S), from 0.8V to 2.5V (MPDTY412S) by connecting resistors between TRIM-pin(5pin、6pin) to GND-pin(3pin、4pin).
The following equation gives the required external-resistor value to adjust the output voltage to Voadj.
It is strictly recommended to evaluate the characteristics of DC-DC Converter at your board conditions.



$$RVAR = \frac{26400}{Voadj[V] - 0.8[V]} - 5100 \quad [\Omega]$$

＜RVAR calculation example＞

Voadj [V]	Calculated RVAR[Ω]	RVAR example
3.63	4229	3.9kΩ+330Ω
3.3	5460	5.1kΩ＋360Ω
2.5	10429.4	10 kΩ＋430Ω
2.0	16900	16kΩ＋910Ω
1.8	21300	18kΩ＋3.3kΩ
1.5	32614.3	27kΩ＋5.6kΩ
1.2	60900	51kΩ+10kΩ
1.0	126900	120kΩ＋6.8kΩ
0.8	∞	Open

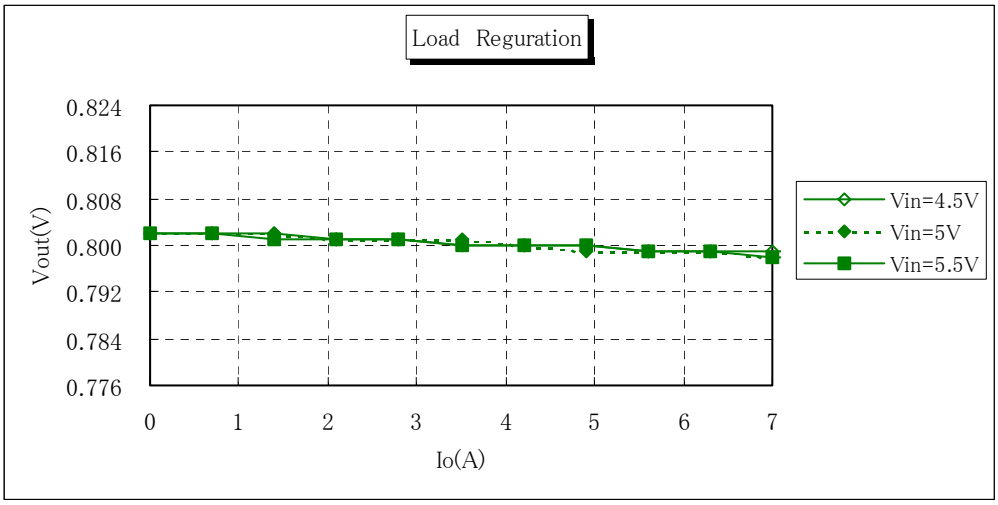
9. ON/OFF control
ON/OFF function
The DC-DC Converter can be inactive by using ON/OFF function.
This function is effective when the sequence of a power supply system is constituted.
And it can be used for power-saving control.

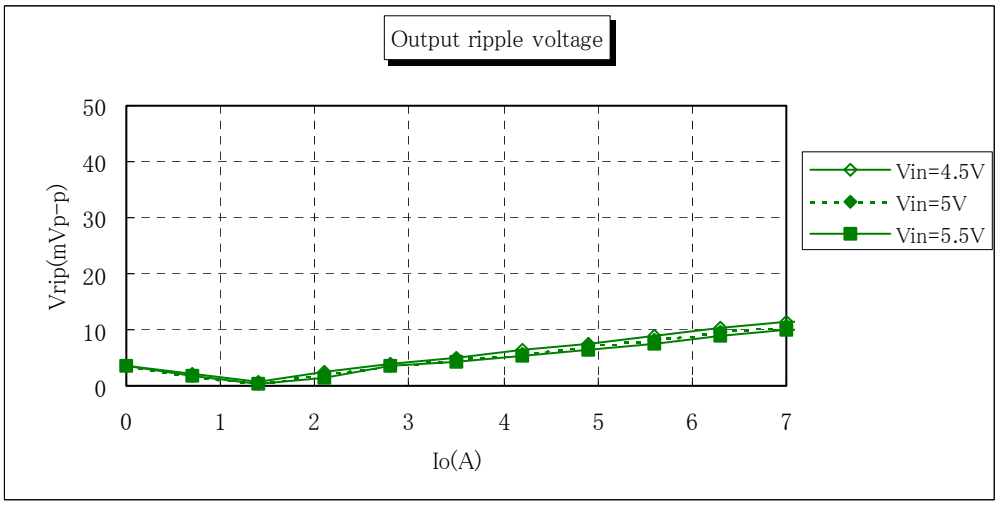
In case of not using ON/OFF function
In case of not using ON/OFF function, please left open ON/OFF-pin(9,10pin).

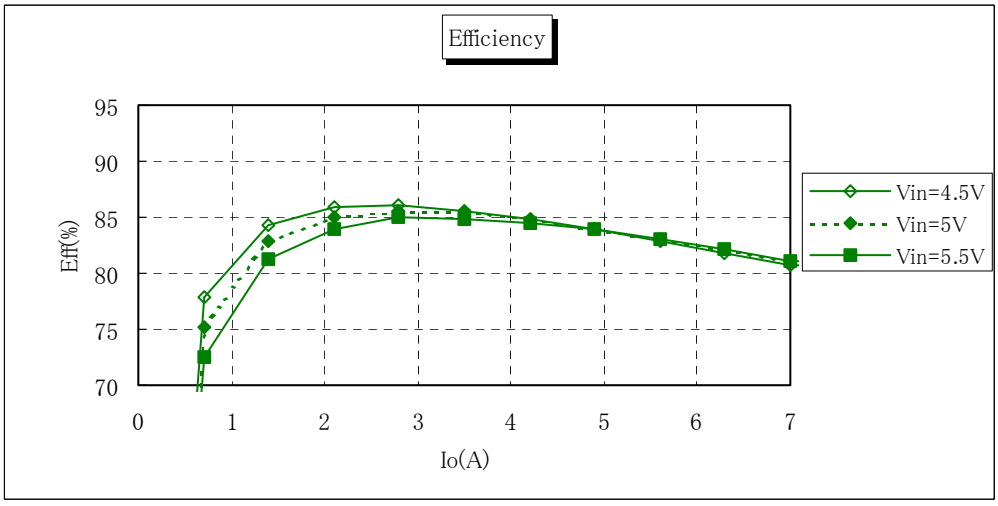
ON/OFF control method
Between ON/OFF-pin(9,10pin) and Vin-pin(1,2pin)
Open……Output Voltage=ON
Short……Output Voltage=OFF

10. Characteristics Data

10.1 MPDTY411S (Vout=0.8V)







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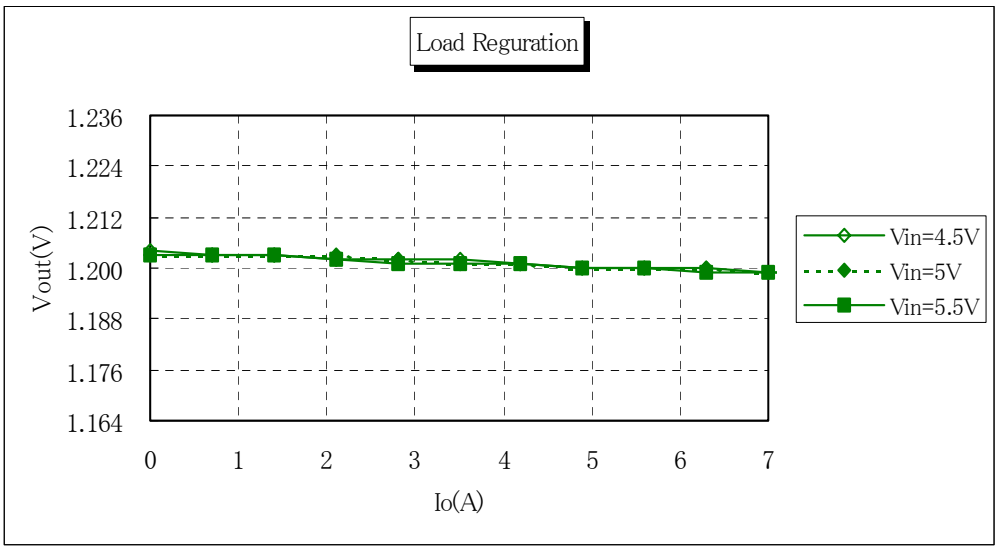
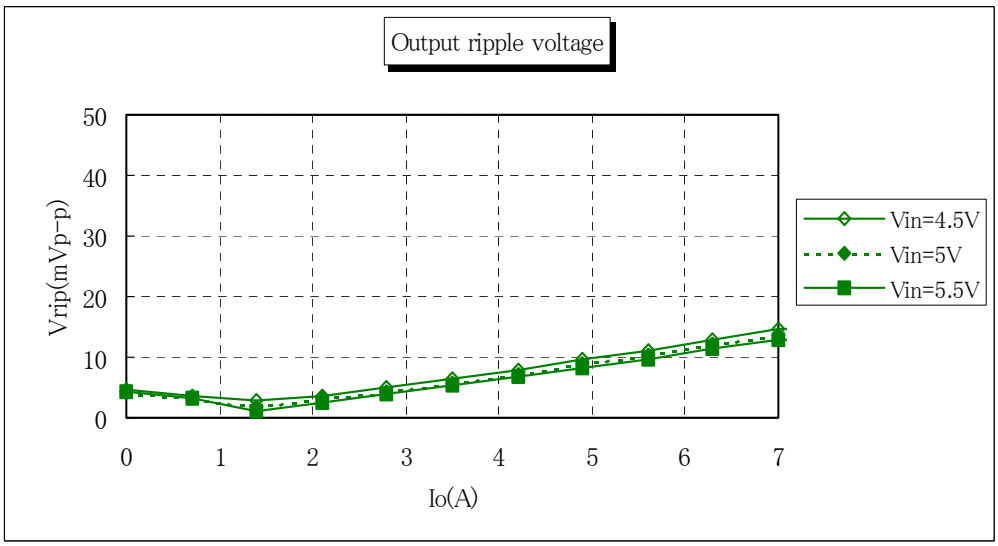
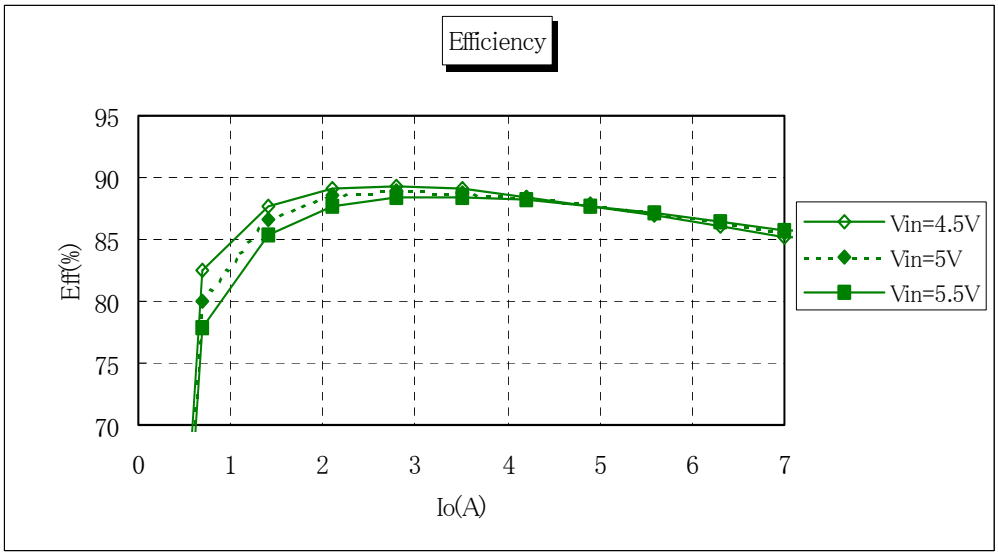
10.2 MPDTY411S (Vout=1.2V)







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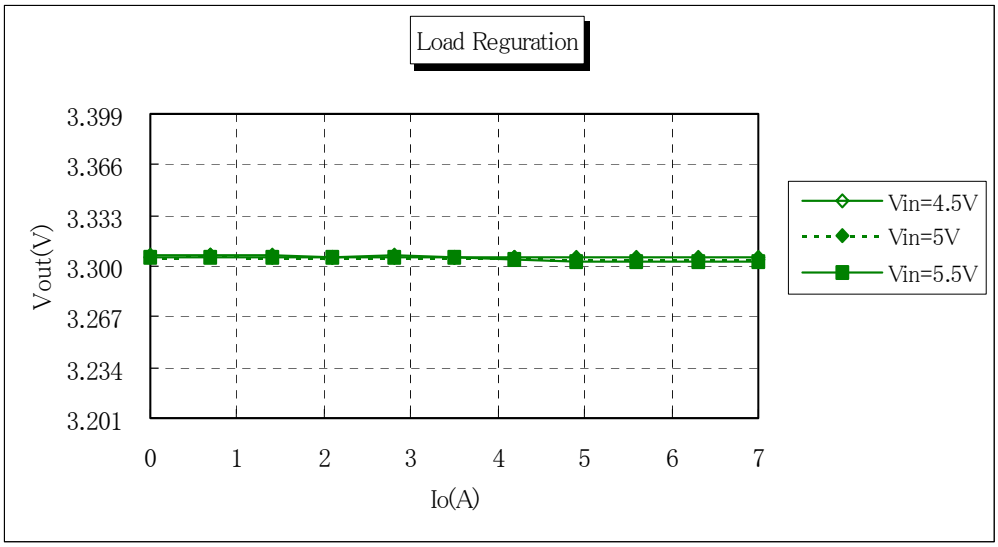
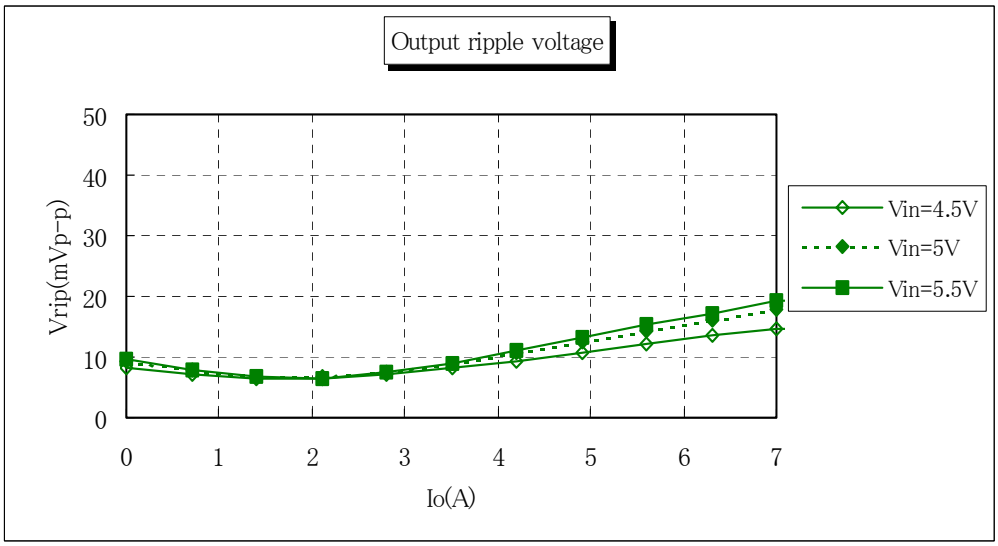
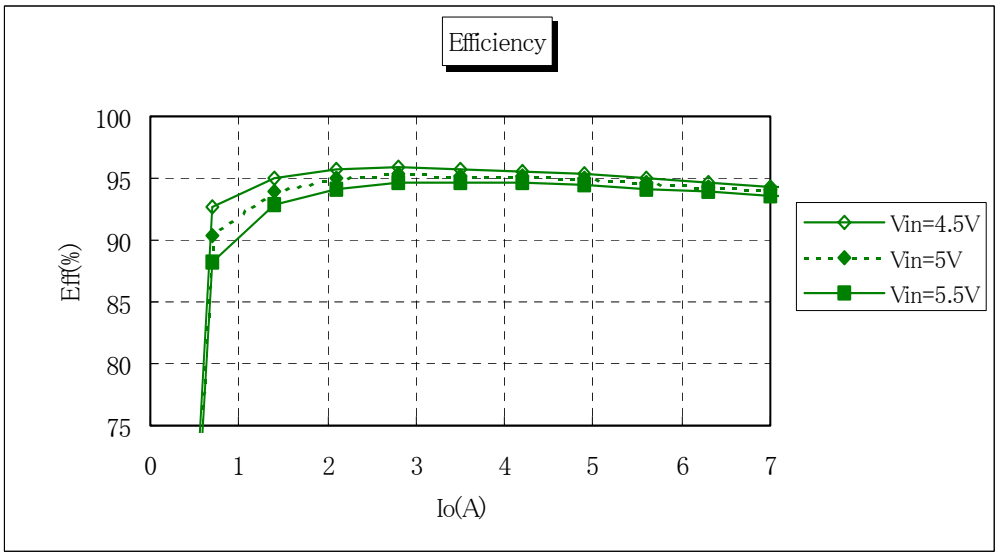
10.3 MPDTY411S (Vout=3.3V)







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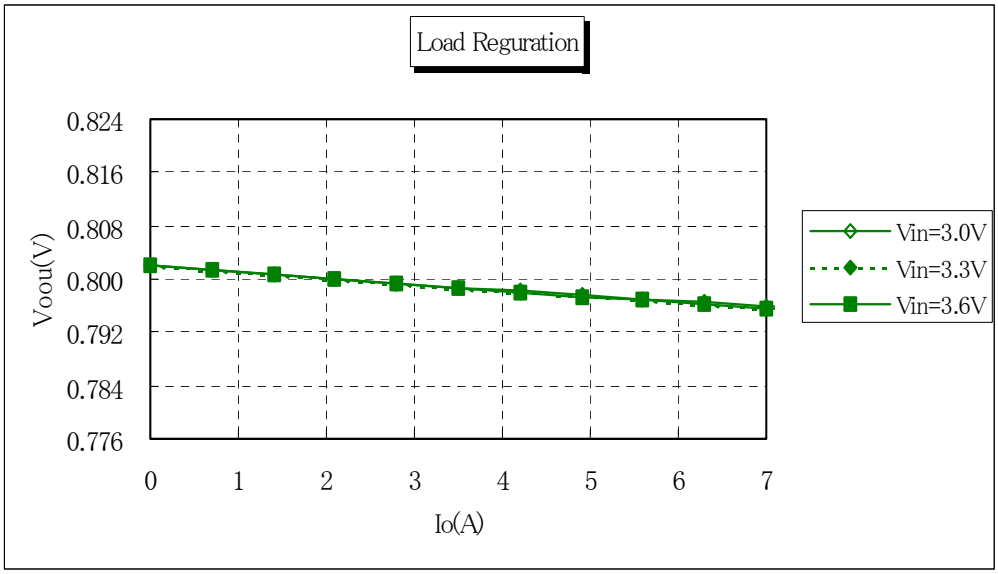
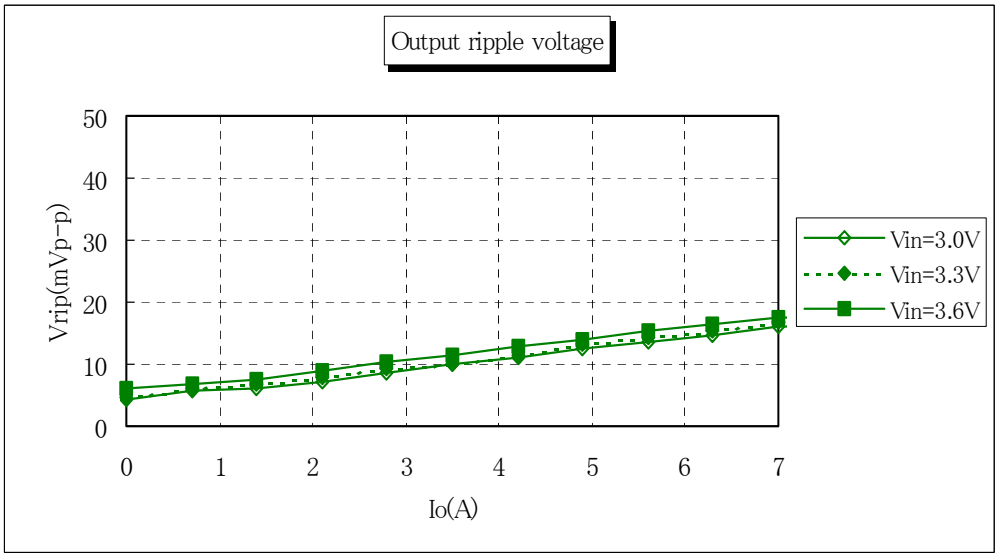
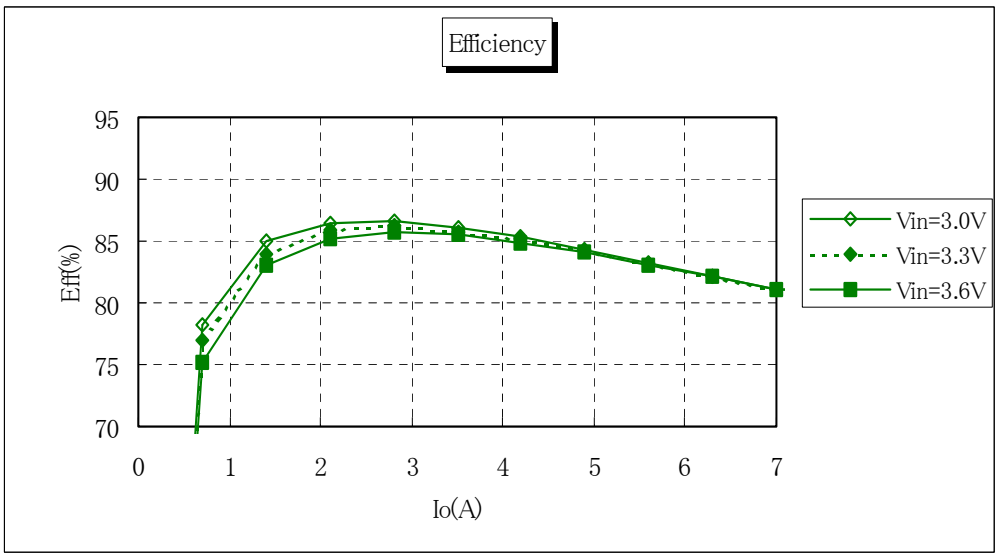
10.4 MPDTY412S (Vout=0.8V)







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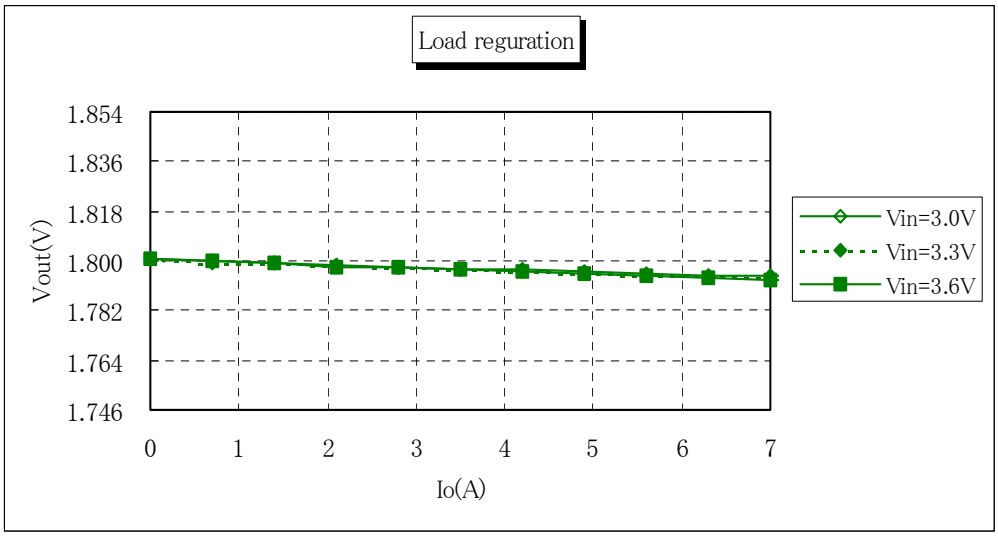
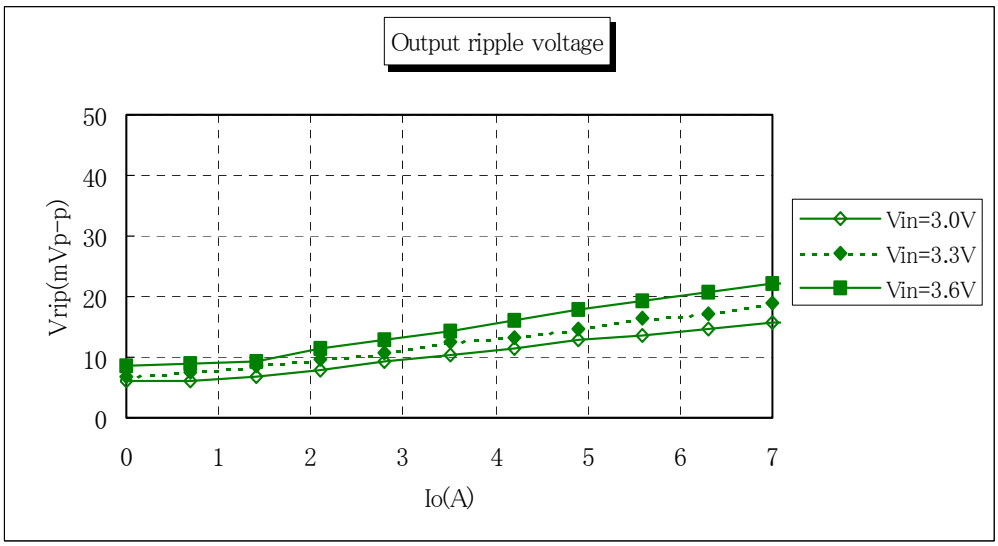
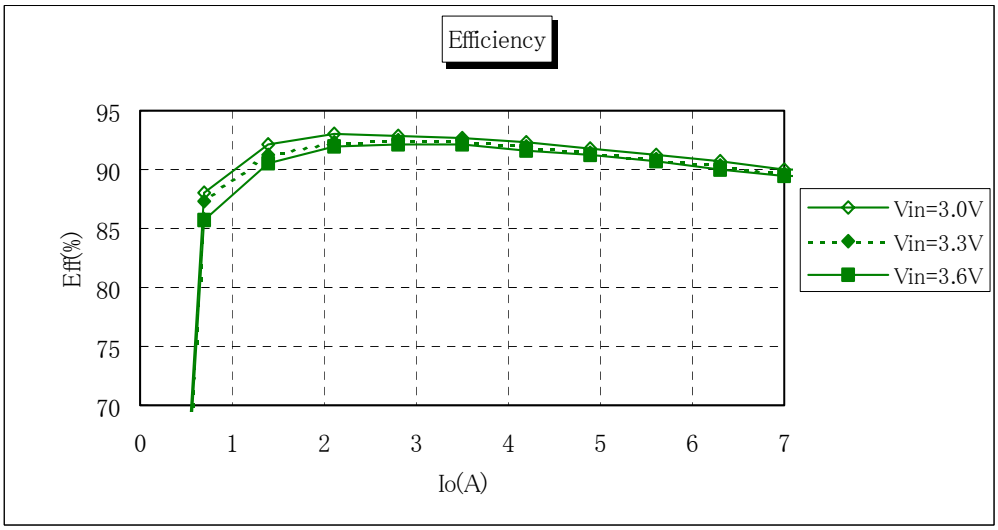
10.5 MPDTY412S (Vout=1.8V)







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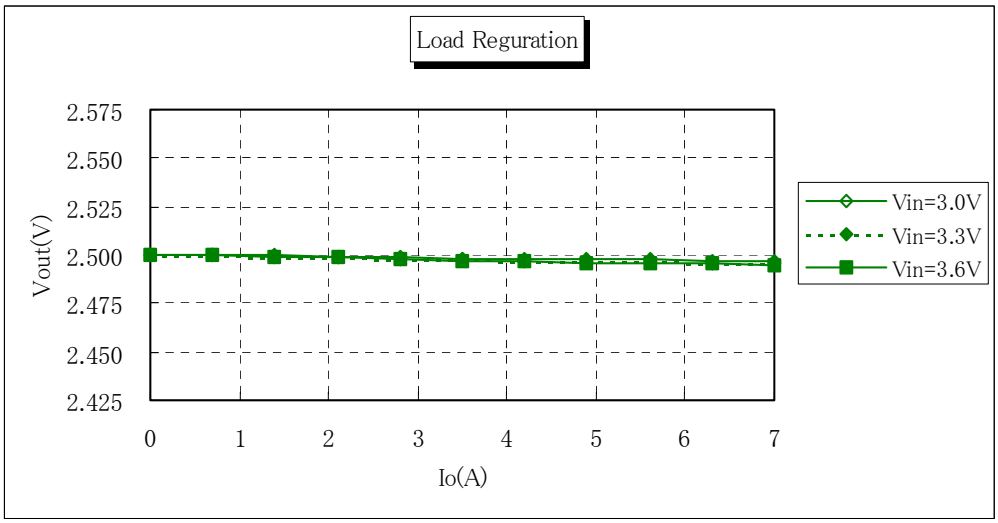
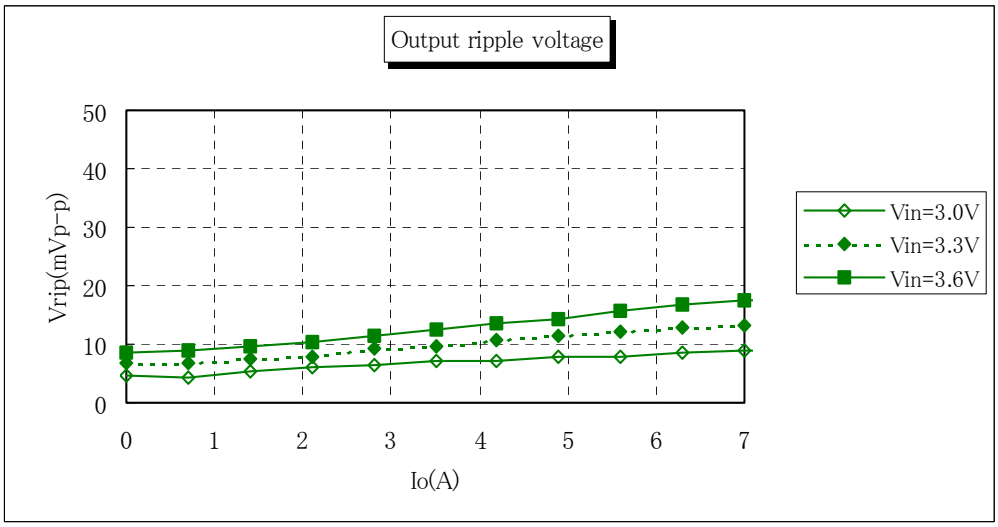
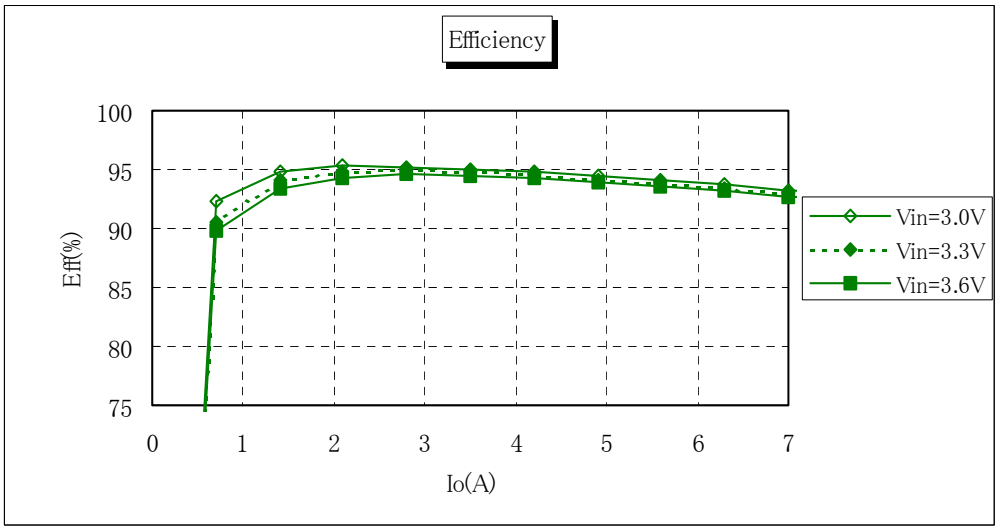
10.6 MPDTY412S (Vout=2.5V)







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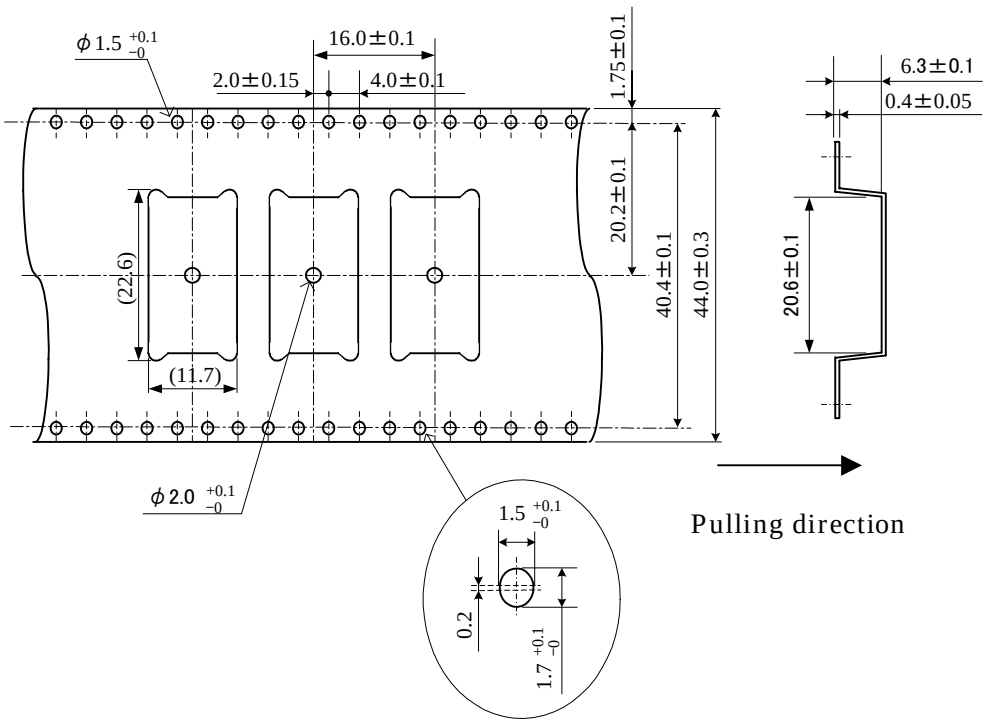
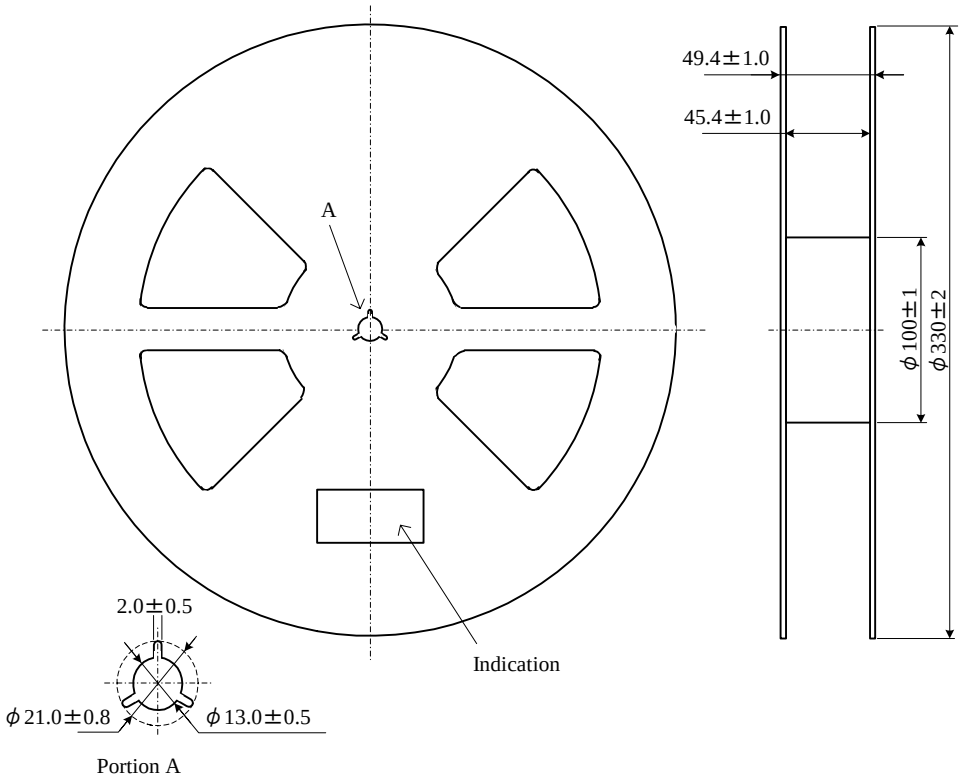
11. Packaging Specification

11.1 Emboss Tape Dimensions



11.2 Reel Dimension



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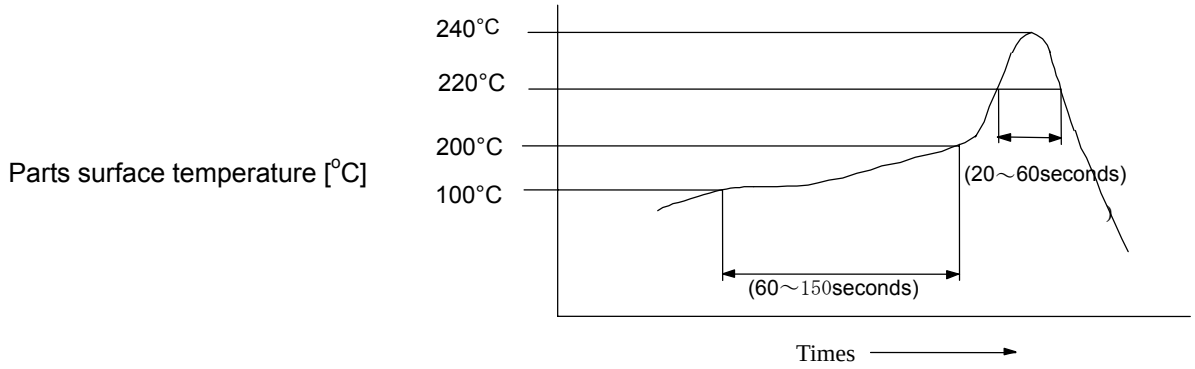
12. Recommended Soldering Conditions

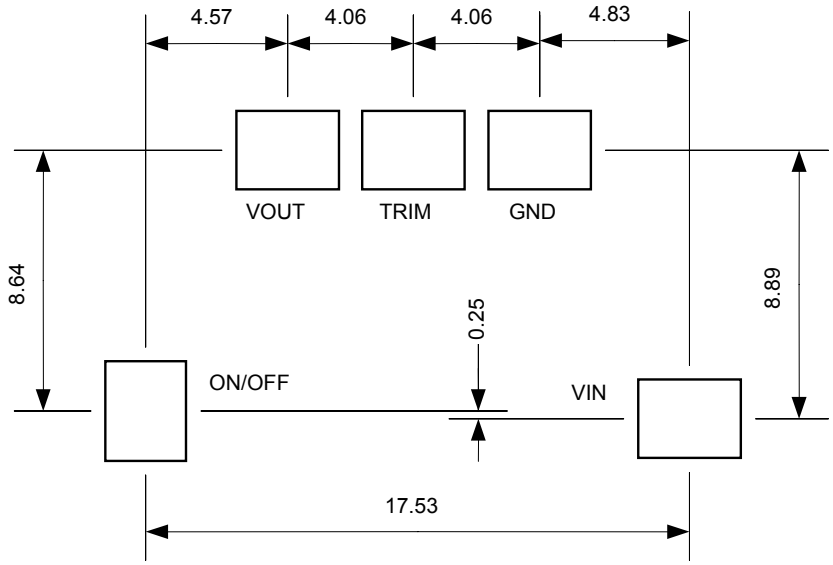
Reflow Soldering

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.

13. Recommendable Solder Land Pattern



Reccommmendable 3.3mm × 2.2mm

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⚠ Notice

1. Input / output capacitor

When an inductance or a switch devise is connected to the input line, or when you use a power supply with output inductance as the input voltage source, the input voltage of the DC-DC Converter will be fluctuated.
By this input voltage fluctuation, the transient load response of the DC-DC Converter may be deteriorated or abnormal oscillation may occur. So please confirm normal operation on each application.
Please use external input capacitor in order to decrease inductance of input line.
In case you use external output capacitor in order to improve transient load response, please use input capacitor to prevent abnormal oscillation. When you use external capacitors, following capacitors are recommendable.

※Input capacitor C1 : Please use capacitors more than 100μF of low impedance in high frequency range.
Output capacitor C2 : Please use capacitors less than 1000μF

2. Wiring of input / output capacitor

In the case of input / output capacitor connection, in order to reduce electrical noise , please design PCBs with consideration of the following item.

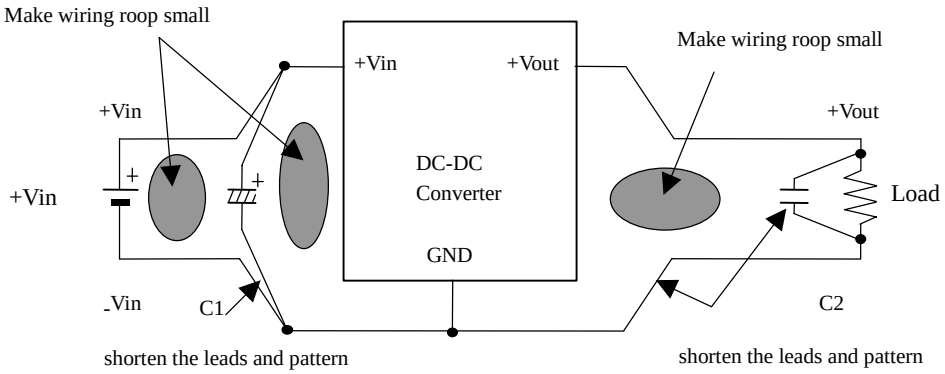
①Please be sure to check normal operation on your system.

②Please use low impedance capacitors with good high frequency characteristic.

③Please shorten those leads of each capacitor as much as possible, and make sure the lead inductance low.

④Both input-side and output side, please make the wiring loop between plus and minus as small as possible. The influence of leakage inductance can be reduced.

⑤Please design the print pattern of the main circuit as wide and short as possible.

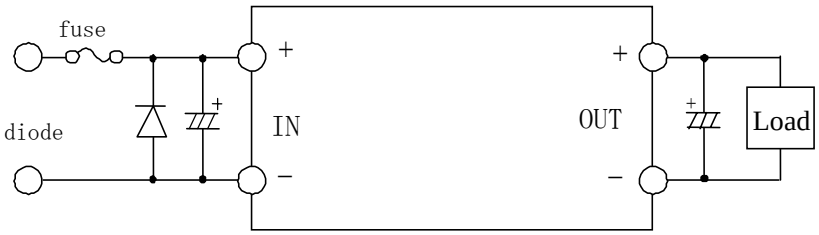


3. This product could not be operated parallel or series.

4. Please do not use a connector or a socket for connection with your board of this product. Electrical performance may be deteriorated the influence of contact resistance. Please be sure to mount this product with solder.

5. 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.

6. Please connect the input terminal with proper polarity. If you connect wrong polarity, the DC-DC Converter may be broken. In the case of the DC-DC Converter is damaged, abnormal input current may flow in, and abnormal overheat of the DC-DC Converter, or some damage of your products may occur. Please use a diode and a fuse to as following figure.



※Please select diode and fuse after confirming the operation.

⚠ Note

1. Please contact our main sales office or nearby sales office 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 or this products for any other applications that described in the above.

   ①Aircraft equipment
   ②Aerospace equipment
   ③Undersea equipment
   ④Power plant control equipment
   ⑤Medical equipment
   ⑥Transportation equipment (vehicles, trains, ships, etc.)
   ⑦Traffic signal equipment
   ⑧Disaster prevention /crime prevention equipment
   ⑨Data-processing equipment
   ⑩Application of similar complexity and/or reliability requirements to the applications listed in the above.

2. This catalog is indicated in Apl. 2006. About the written contents, since changing without a preliminary announcement for improvement and supply are sometimes stopped, please confirm in case of ordering. If the written contents are unknown, please ask to our main sales office or nearby sales office.