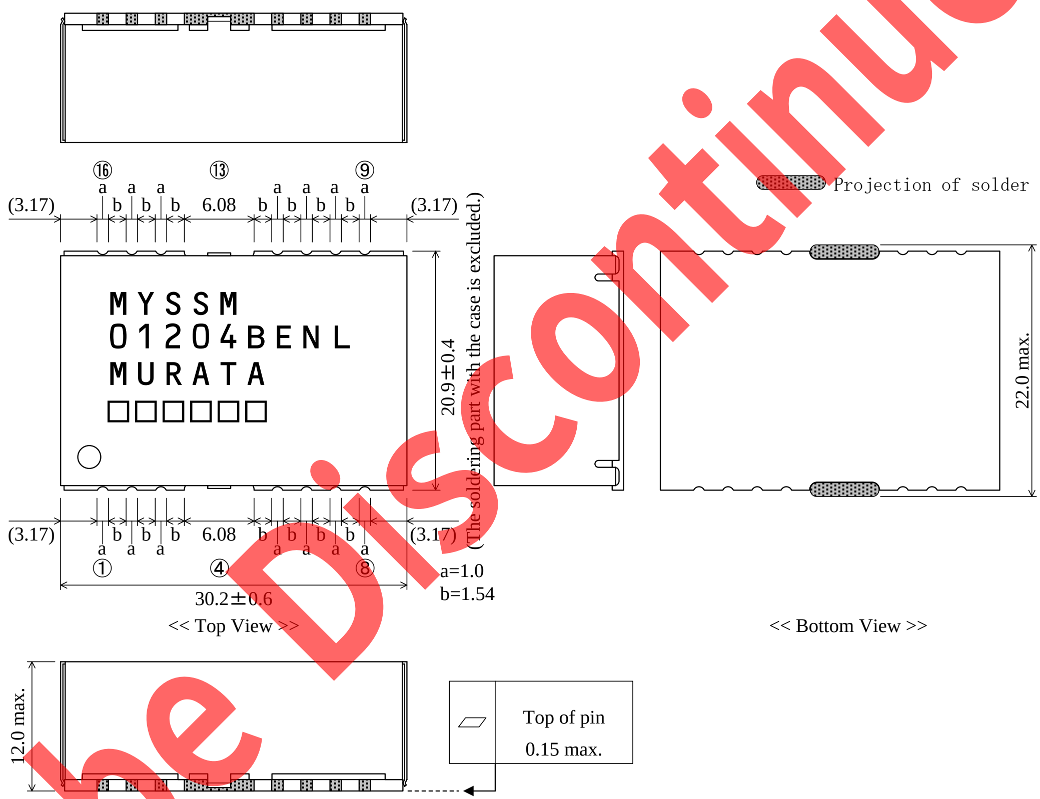
DC-DC Converter DATA Sheet

MYSSM01204BENL

1. Features
- Wide input voltage range. (17V~40V)
- Single Output Voltage/High Current(Iout=4.0A) and Surface Mount Type of Non-insulated DC-DC Converter.
- Ultra small size and low profile.
- High Efficiency product.
- Wide adjustable output voltage by connecting external resistors.(5.0 to 12.0V)
- On/Off function and short circuit protection is built in.

2. Appearance, Dimensions



【Unit: mm】

Tolerance ±0.3mm
Toleranc is not accumulated.

Marking

(1)Manufacturer Parts Number	MYSSM01204BENL
(2) Manufacturer ID	MURATA
(3) Lot No.	□□□□□□
(4)Pin No.1 Side Marking	○

Note:

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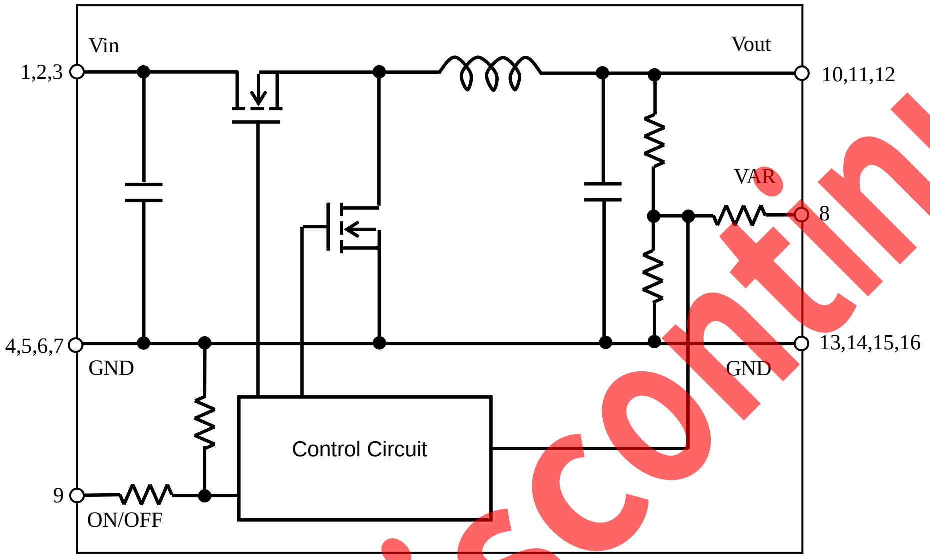
2016.7.12

Pin Number and Function

Pin No.	Symbol	Function
1,2,3	Vin	Input
4,5,6,7,13,14,15.16	GND	GND
8	VAR	Output voltage adjustment
9	ON/OFF	Remote ON/OFF
10,11,12	Vout	Output

3. Block Diagram



4. Environmental Conditions

4 .1. Operating Temperature Range -10 °C ~ +70 °C
4 .2. Storage Temperature Range -20 °C ~ +85 °C
4 .3. Operating Humidity Range 10% ~ 85%(No water condenses in any cases.)
4 .4. Storage Humidity Range 5% ~ 90%(No water condenses in any cases.)

5. Absolute Maximum Rating

Item	Unit	Absolute Rating	Remarks
Maximum Input Voltage	V	50	
ON/OFF	V	Vin	

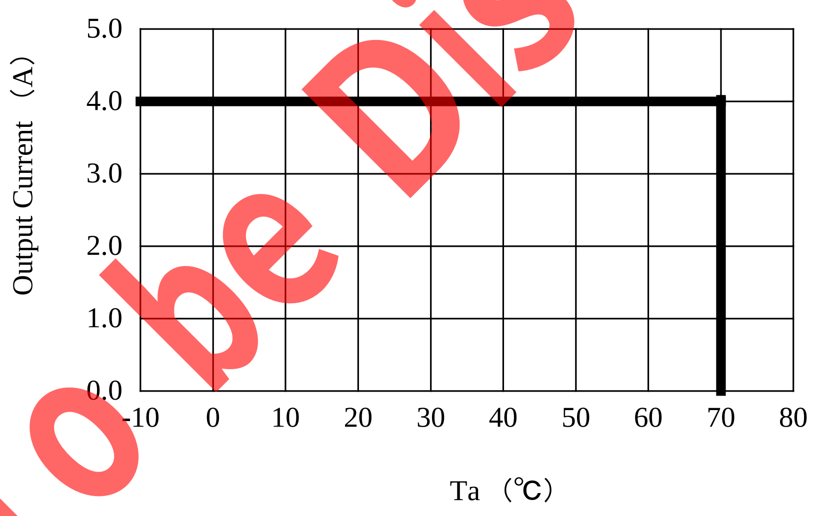
※No voltage, no matter how instantaneous, shall be applied beyond the absolute maximum voltage rating to this product. If you apply any voltage over this limit the product characteristics will deteriorate or the product itself will be destroyed. Even though it may continue operating for a while after 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.

6. Characteristics

6.1. Electrical Characteristics (Ta=25 °C)

Item	Symbol	Condition		Value Min.	Value Typ.	Value Max.	Unit
Input Voltage	Vin			+17.0	+24.0	+40.0	V
Output Voltage	Vout	Vin=17.0~40.0V Iout=0~4.0A	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		0	-	4.0	A
Ripple Voltage	Vrip	Vin =24.0V, Iout=4.0A BW=20MHz		-	180	-	mV(p-p)
Efficiency	EFF	Vin =24.0V, Iout=4.0A		-	96	-	%
ON/OFF Voltage	VON/OFF	Vin=17.0~40.0V	OFF	2.5	-	Vin	V
			ON	-	-	0.5	
			ON	Open			
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.					

6. 2. Output Current Derating



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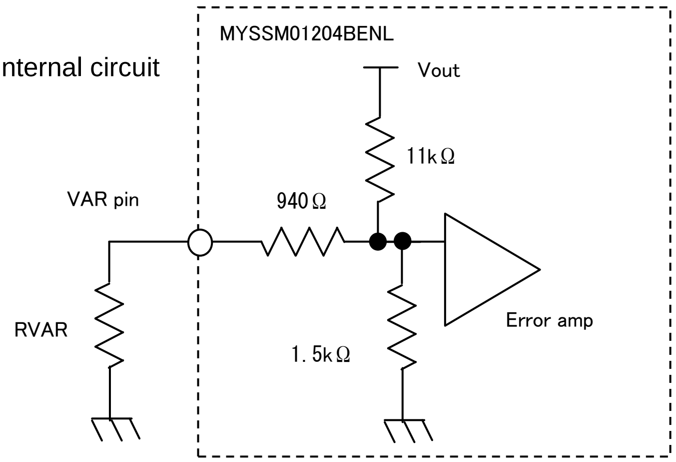
7. Operation in information

7.1. Output Voltage Adjustment

The output voltage can be adjusted ranging by connecting resistors between VAR-pin(8pin) to GND-pin.
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.

Internal circuit



RVAR=6.6／(Vout－5.0)－0.943(kΩ)

＜RVAR calculation example＞

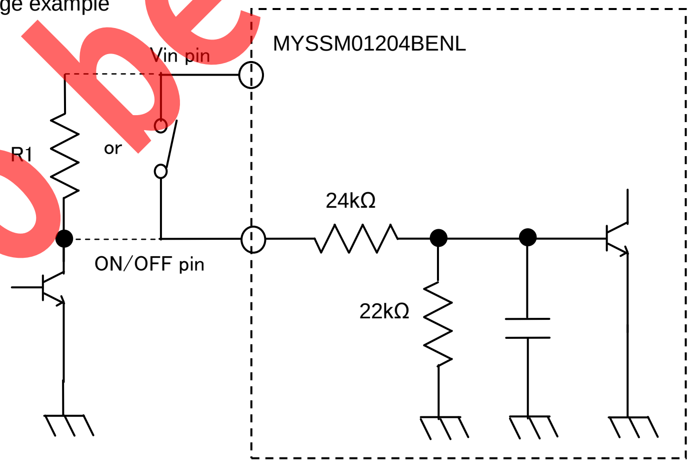
Vout [V]	Calculated RVAR[Ω]	RVAR example
12.0	0	0Ω
5.0	∞	Open

7.2. ON/OFF control

ON/OFF function
The DC-DC Converter can be inactive by using ON/OFF function.

ON/OFF control method
When ON/OFF-pin(9pin) is connected to Vin ・・・ Output Voltage=OFF
When ON/OFF-pin(9pin) is connected to GND or Open ・・・ Output Voltage=ON

Usage example



※ R1=10kΩ ～ 100kΩ

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8. Reliability

8.1. 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 6.1.).

8.2. Temperature Cycles
Repeat cycle 5 times. Leave 2 hours at room temp.
No damage in appearance and no deviation from electrical characteristics (section 6.1.).

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

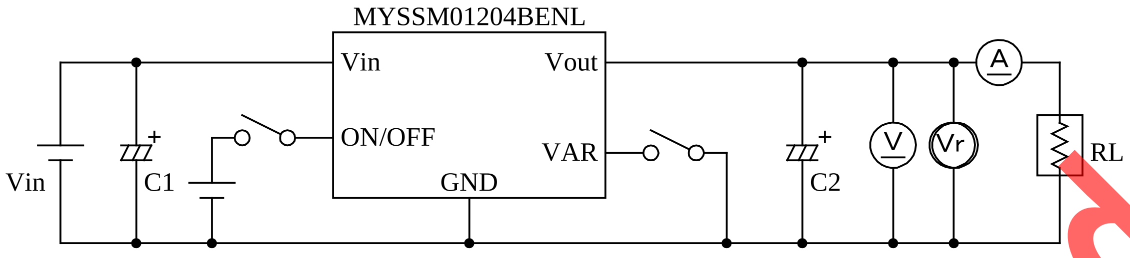
8.3. Vibration
10 to 55Hz, 1.5mm amplitude (1minute cycle), 1 hour for each of X, Y, Z directions.
No damage in appearance and no deviation from electrical characteristics (section 6.1.).

8.4. Mechanical Shock
20G, 1 time for each X, Y, Z directions.
No damage in appearance and no deviation from electrical characteristics (section 6.1.).

9. Test Circuit

In the following test circuit, the initial values under item 6.1. should be met.

9.1. General Measure Circuit

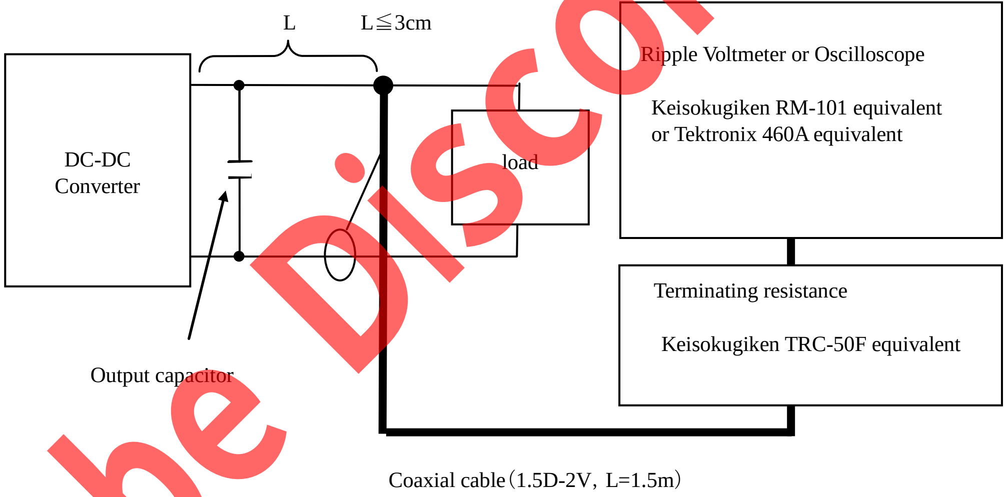


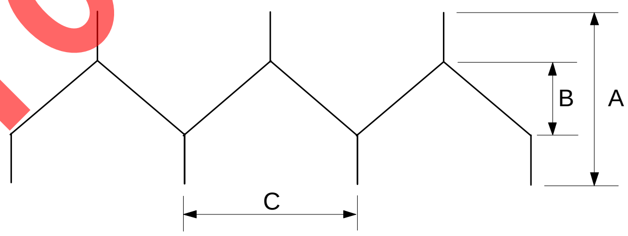
C1 : Conductive Polymer Aluminum Solid Electrolytic Capacitor 100μF/50V
(PCG1C821MCL1GS ϕ 10×L12.7 : nichicon)

C2 : Conductive Polymer Aluminum Solid Electrolytic Capacitor 820μF/16V
(PCG1C102MNL1GS ϕ 10×L12.7 : nichicon)

OR
Aluminum Solid Electrolytic Capacitor 1000μF/16V
(UCL1C102MNL1GS ϕ 10×L13.5 : nichicon)

9.2. Ripple Voltage Measurement Circuit





A : Output Ripple Noise

B : Output Ripple Voltage

C : Switching cycle

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 form
32pcs./tray
If the products have fraction,may not follow this specification.

10.3. Packaging Form
These trays packed products are packaging in a corrugated box altemately.

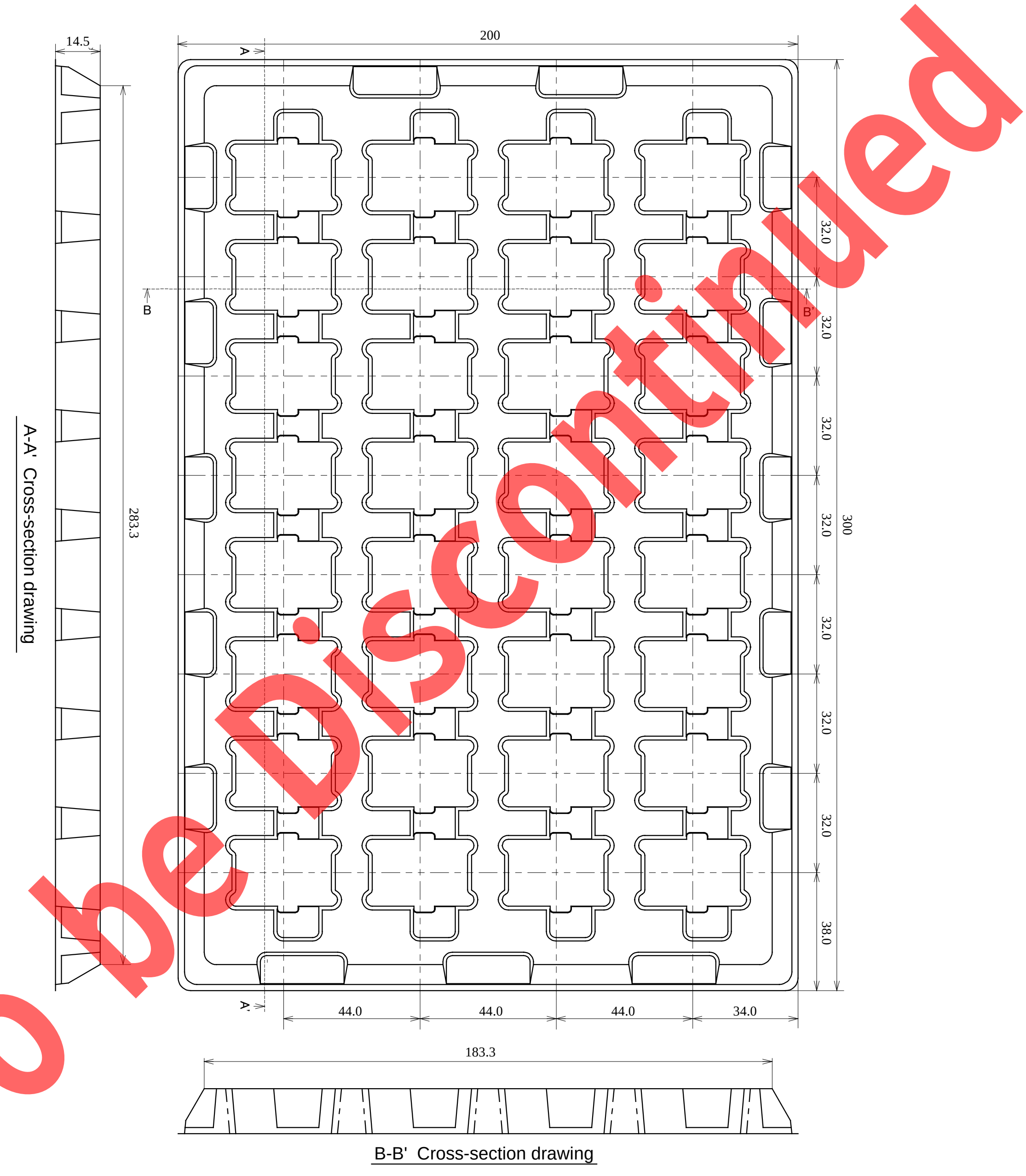
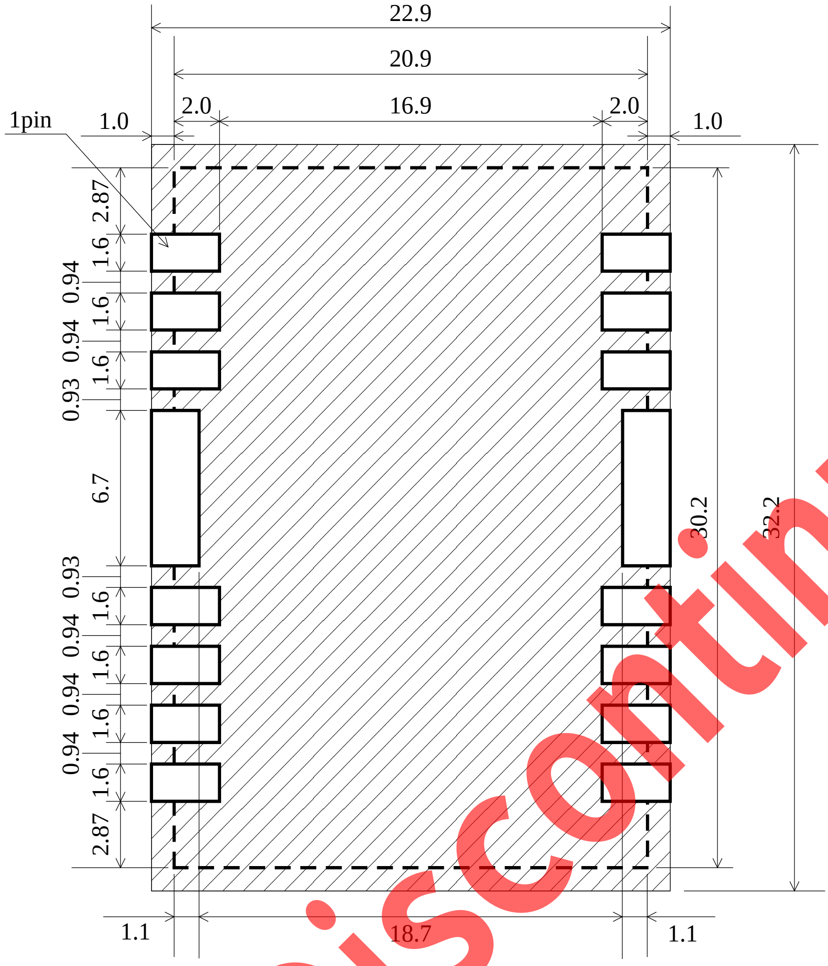


Fig.1

11. Mounting Condition

11.1. PCB Land Pattern Recommendation



Area prohibits wirings other than land.

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.

11.2. Recommendable Condition of Soldering

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

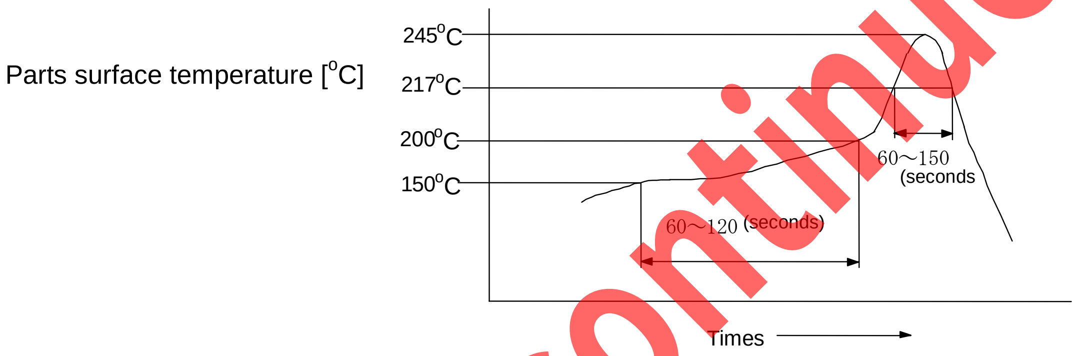
Method : Full convection reflow soldering

Reflow Soldering Profile

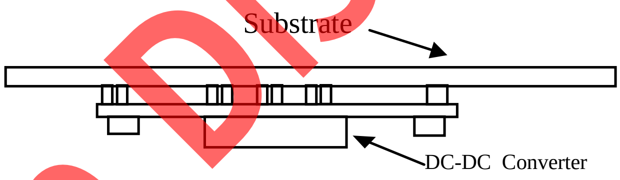
JEDEC IPC/JEDEC J-STD-020D
Table 5-2 Classification Reflow Profile
Pb-Free Assembly Large Body

Profile details

Soldering temperature	:	245 °C +0/-5 °C
Soldering time	:	30seconds, 240 to 245 °C
Heating time	:	60 to 150 seconds, over217 °C
Preheating time	:	60 to 120 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 vibrate for the products on reflow.
Please need to take care temperature control because mounted parts may come off if the product are left under the high temperature.
Do not reflow DC-DC converter as follows, because DC-DC converter may fall down from a substrate during reflowin



12. Characteristics Data

12.1.Static Electrical Characeyeristics

Vin=17V～40V, Vout=5.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=Open)

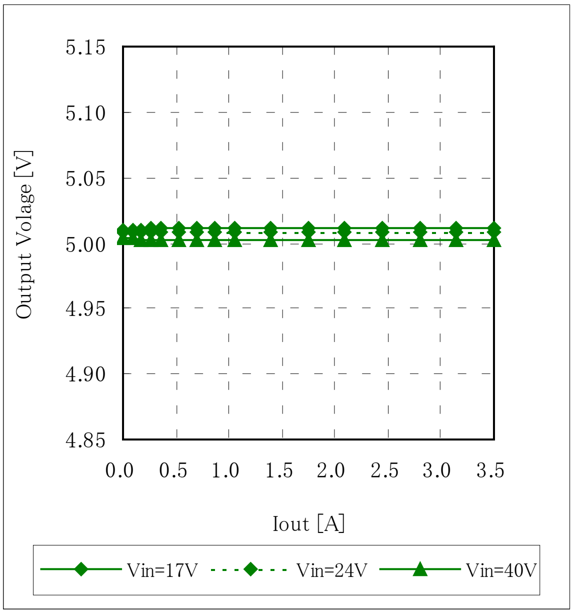


Fig.12-1-1. Output Voltage vs. Output Current

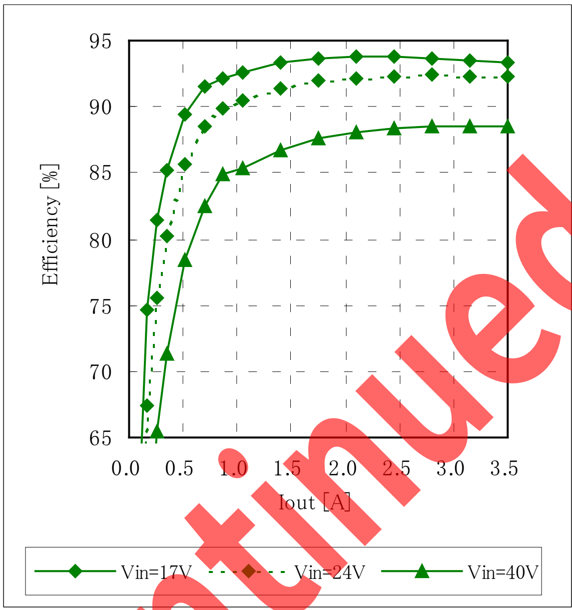


Fig.12-1-2. Efficiency vs. Output Current

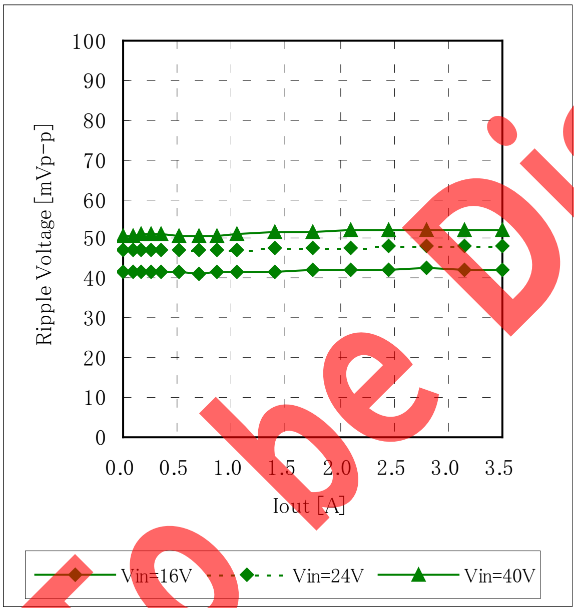


Fig.12-1-3. Ripple Voltage vs. Output Current

Vin=17V～40V, Vout=12.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=GND)

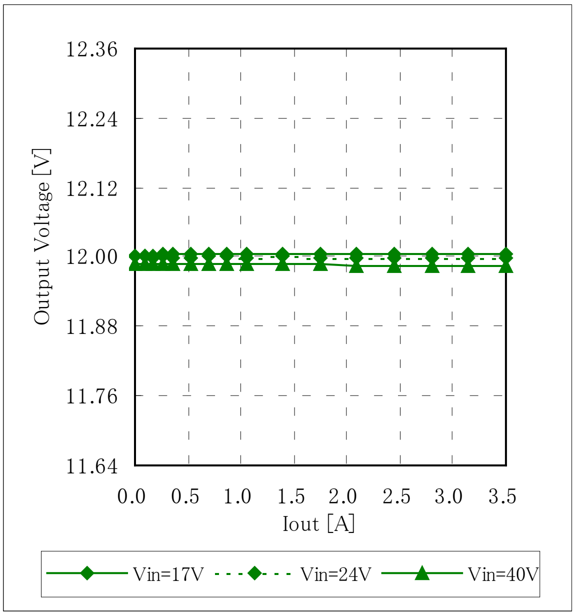


Fig.12-1-4. Output Voltage vs. Output Current

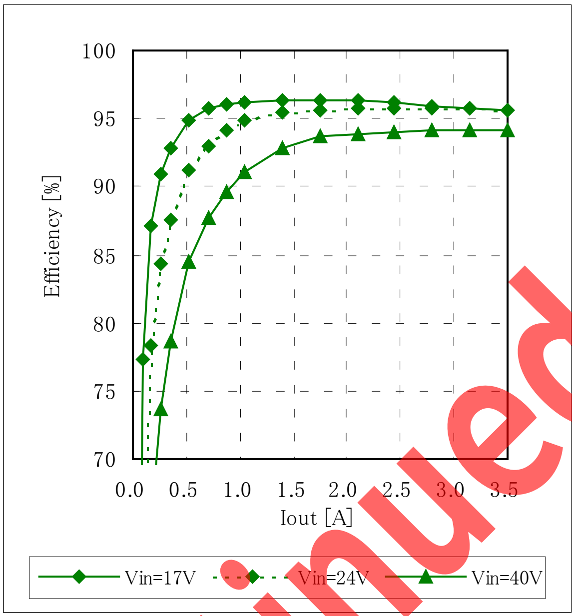


Fig.12-1-5. Efficiency vs. Output Current

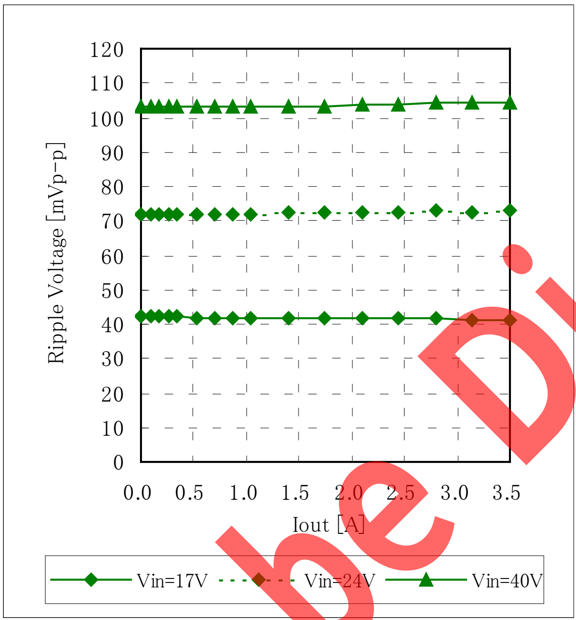


Fig.12-1-6. Ripple Voltage vs. Output Current

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12.2.Dynamic Electrical Characyeristics

Vin=17V, Vout=5.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=Open)

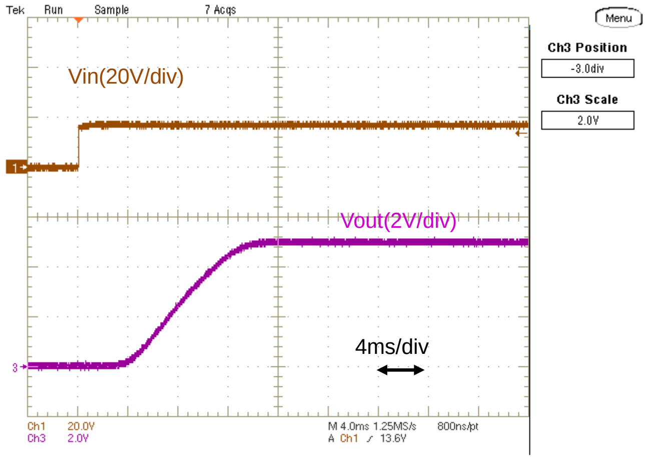

Fig.12-2-1. Start-up Waveform (Io=0A)

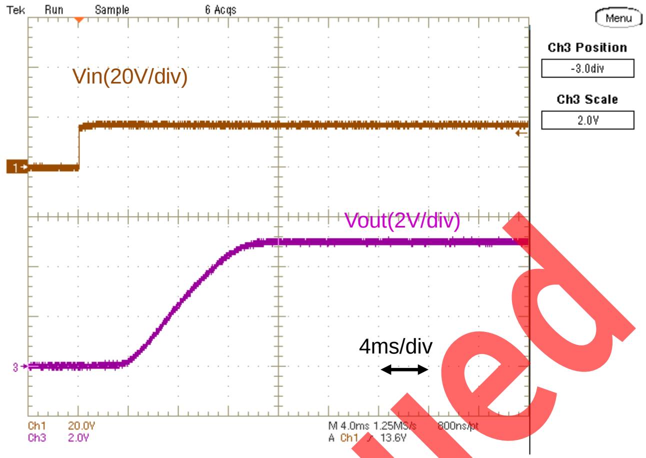

Fig.12-2-2. Start-up Waveform (Io=3.5A)

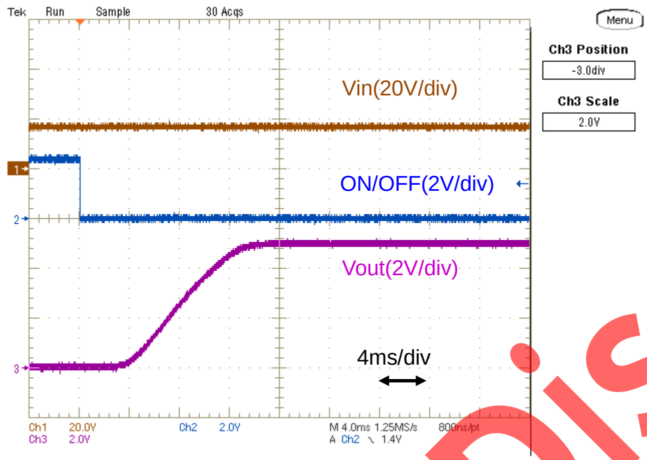

Fig.12-2-3. Start-up Waveform (Io=0A)

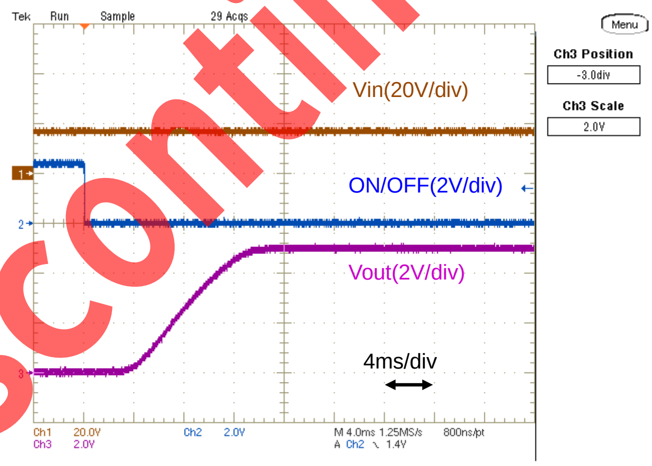

Fig.12-2-4. Start-up Waveform (Io=3.5A)

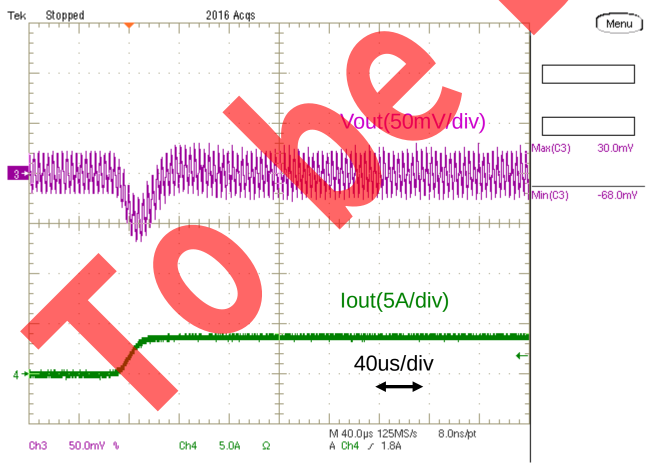

Fig.12-2-5. Load Transient Response
(Io= 0 → 3.5A)

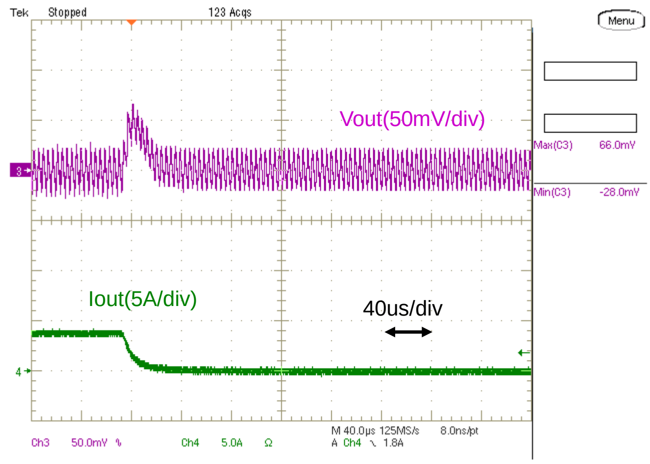

Fig.12-2-6. Load Transient Response
(Io= 3.5A → 0)

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Vin=24V, Vout=5.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=Open)

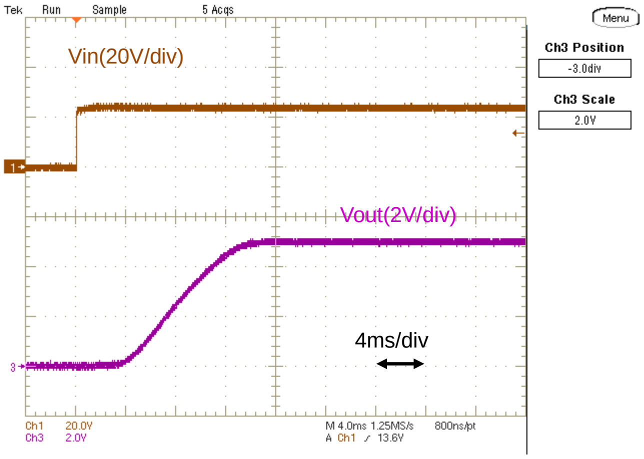

Fig.12-2-7. Start-up Waveform (Io=0A)

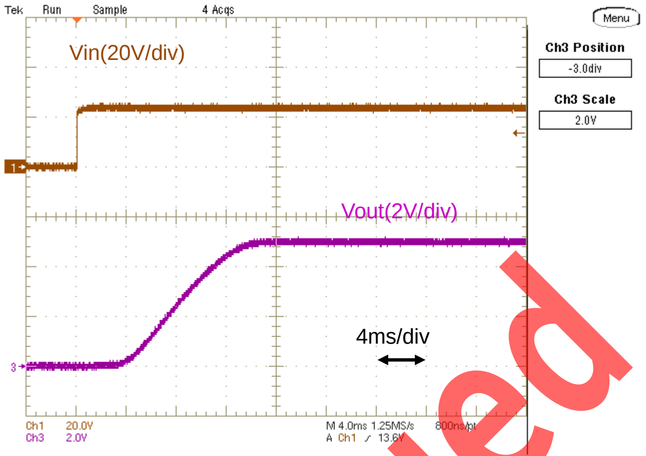

Fig.12-2-8. Start-up Waveform (Io=3.5A)

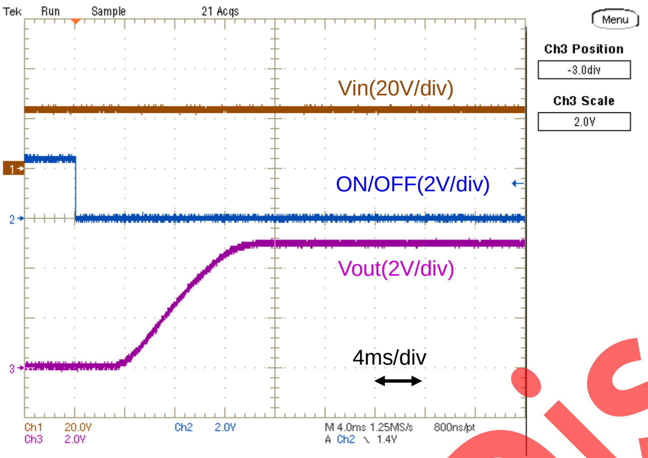

Fig.12-2-9. Start-up Waveform (Io=0A)

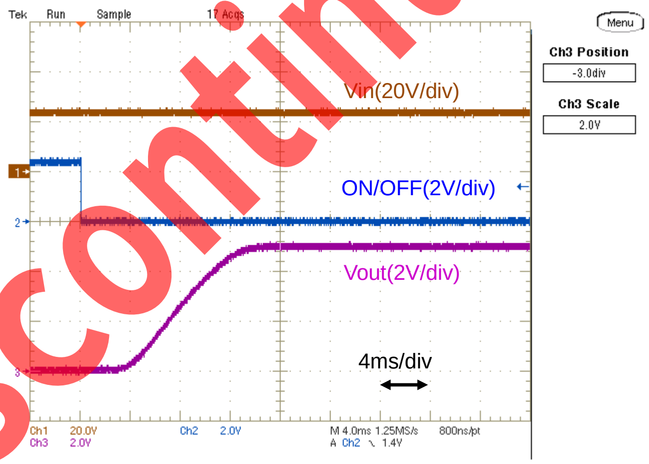

Fig.12-2-10. Start-up Waveform (Io=3.5A)

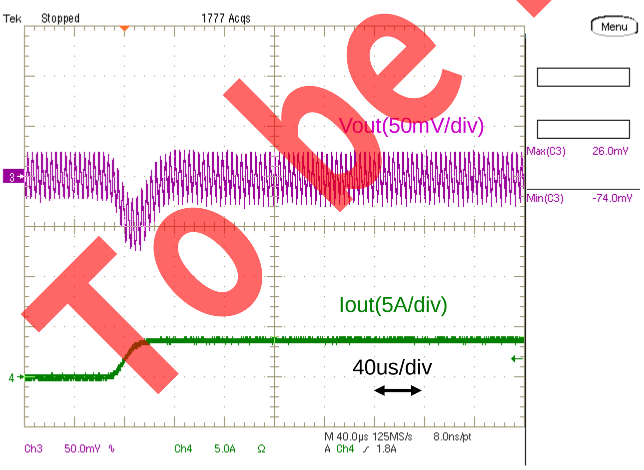

Fig.12-2-11. Load Transient Response
(Io= 0 → 3.5A)

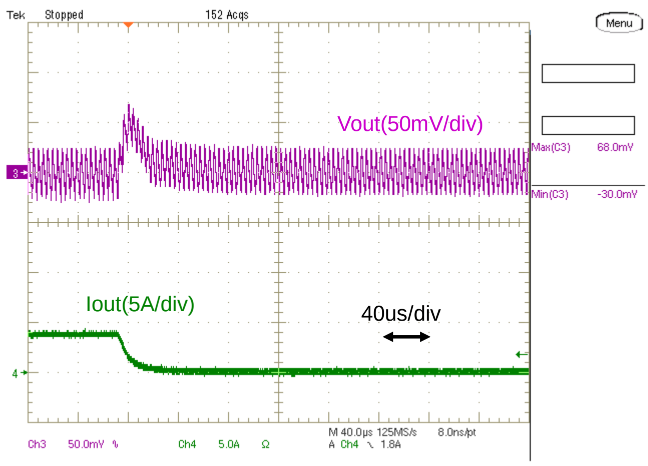

Fig.12-2-12. Load Transient Response
(Io= 3.5A → 0)

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Vin=40V, Vout=5.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=Open)

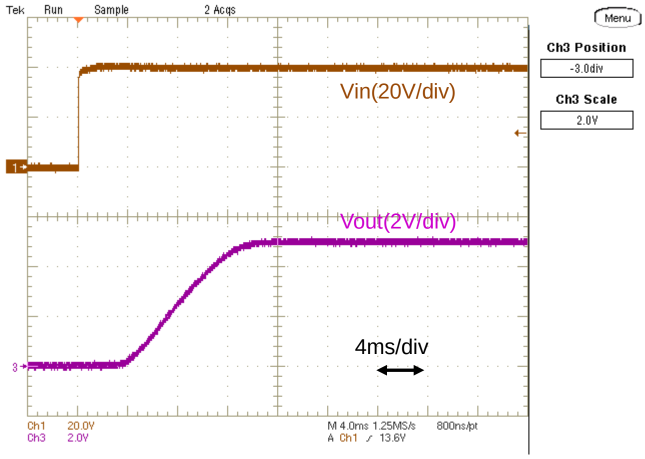

Fig.12-2-13. Start-up Waveform (Io=0A)

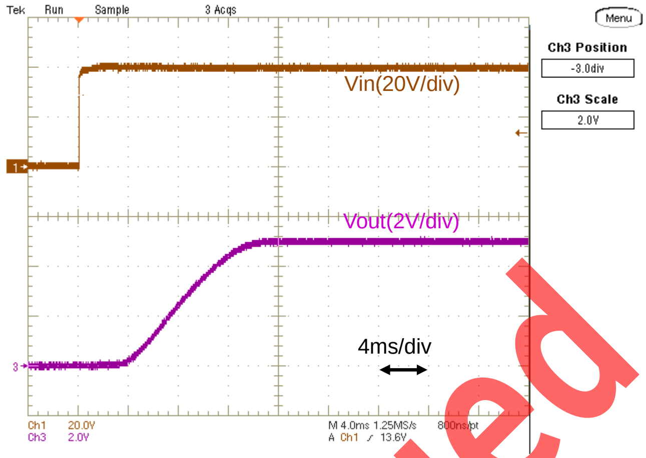

Fig.12-2-14. Start-up Waveform (Io=3.5A)

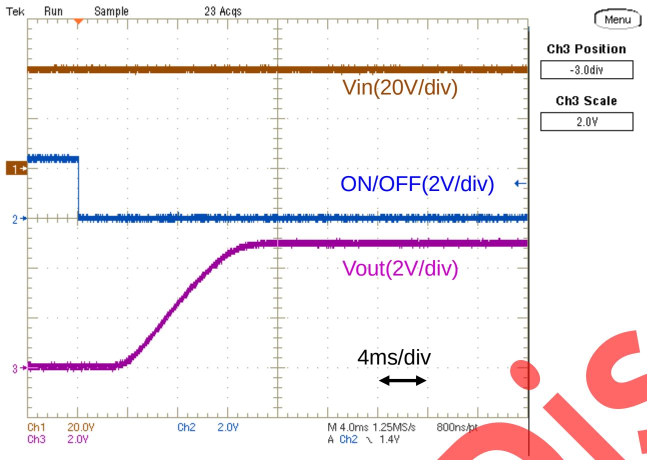

Fig.12-2-15. Start-up Waveform (Io=0A)

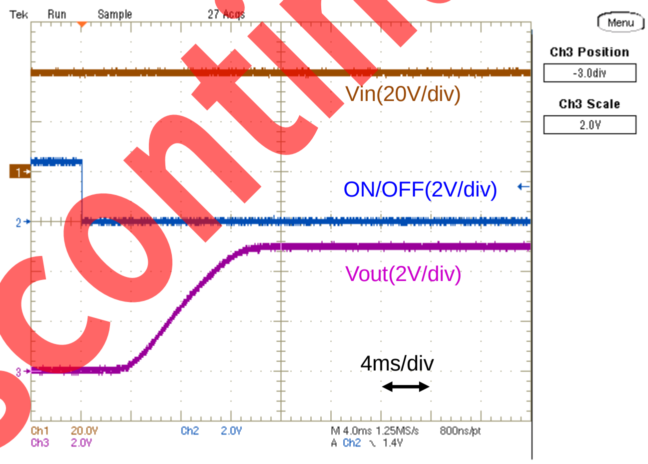

Fig.12-2-16. Start-up Waveform (Io=3.5A)

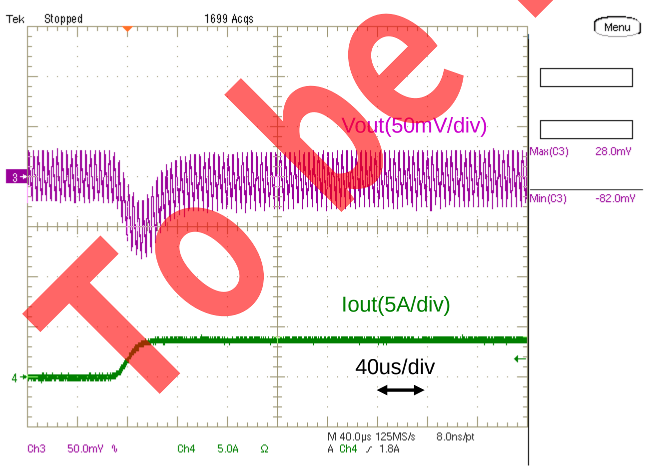

Fig.12-2-17. Load Transient Response
(Io= 0 → 3.5A)

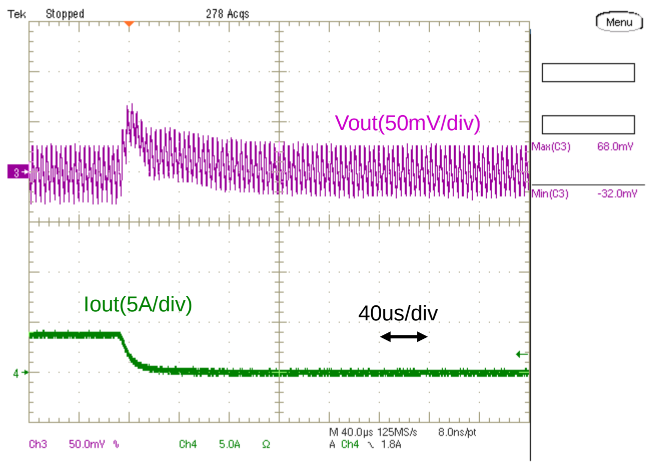

Fig.12-2-18. Load Transient Response
(Io= 3.5A → 0)

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Vin=17V, Vout=12.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=GND)

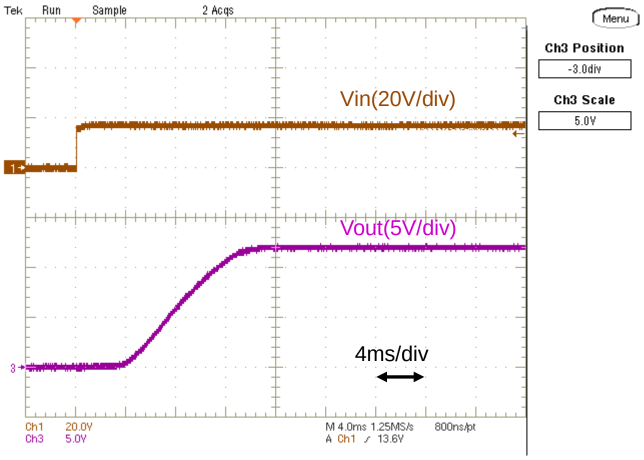

Fig.12-2-19. Start-up Waveform (Io=0A)

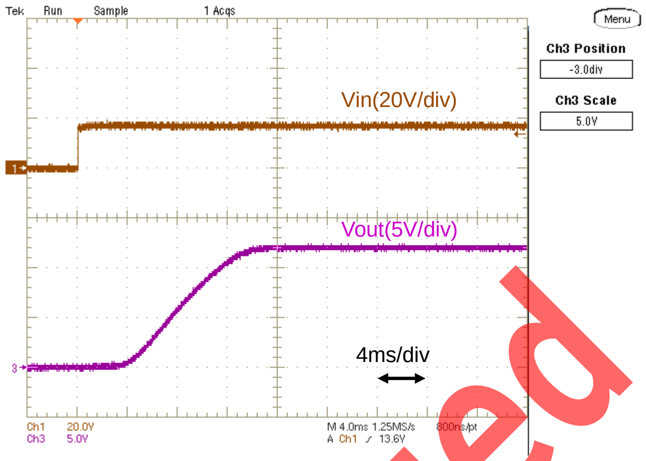

Fig.12-2-20. Start-up Waveform (Io=3.5A)

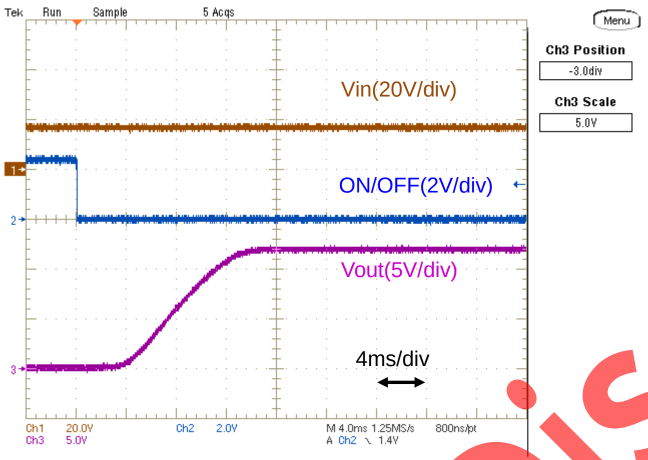

Fig.12-2-21. Start-up Waveform (Io=0A)

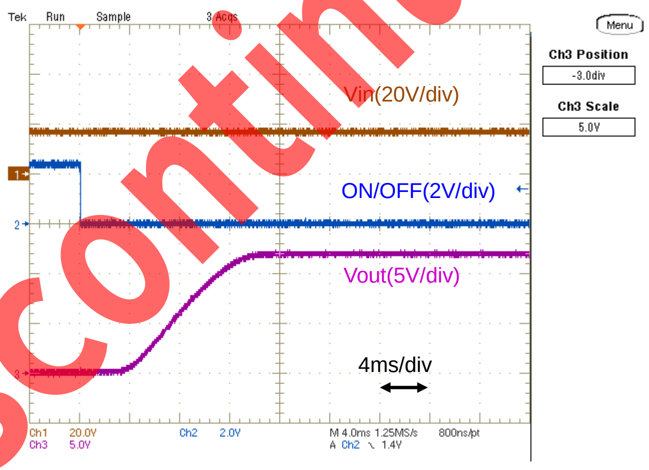

Fig.12-2-22. Start-up Waveform (Io=3.5A)

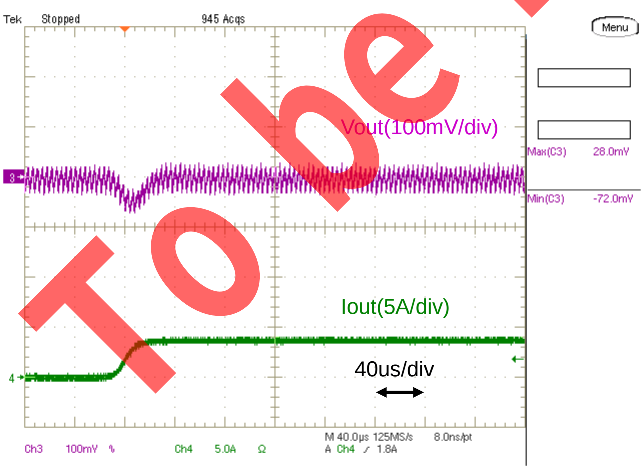

Fig.12-2-23. Load Transient Response
(Io= 0 → 3.5A)

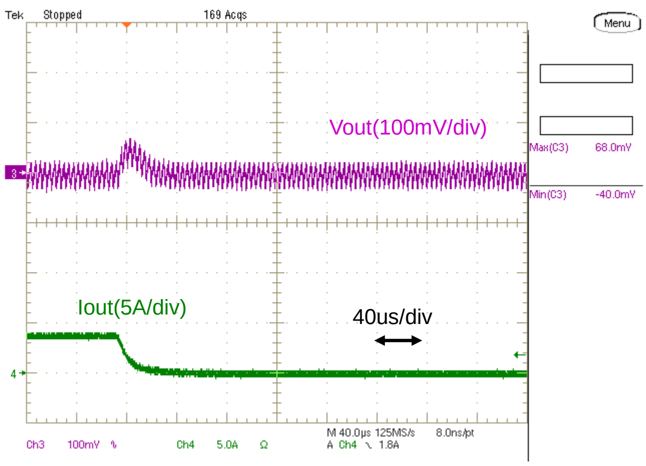

Fig.12-2-24. Load Transient Response
(Io= 3.5A → 0)

Vin=24V, Vout=12.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=GND)

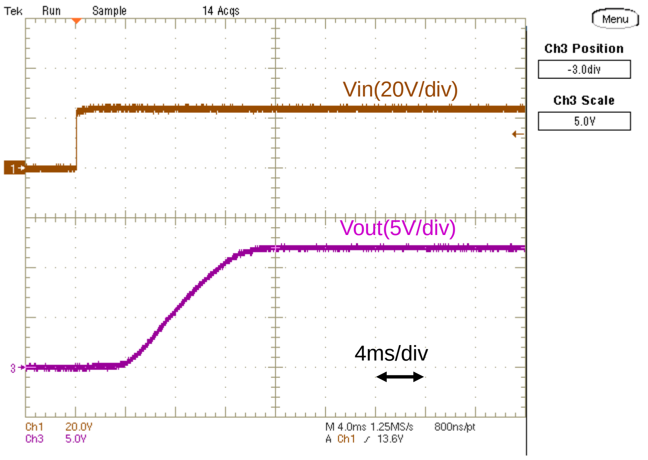

Fig.12-2-25. Start-up Waveform (Io=0A)

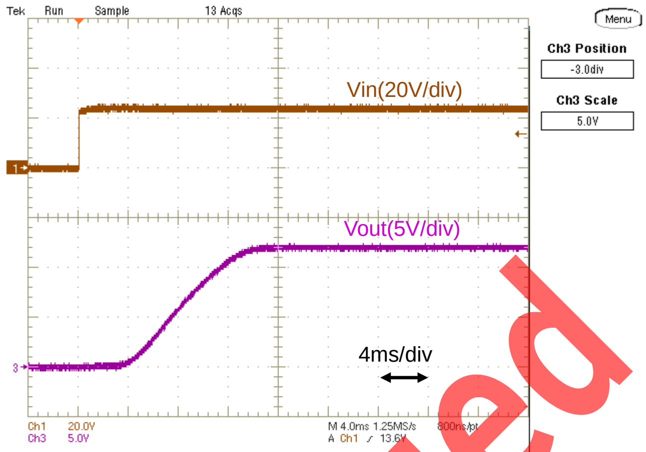

Fig.12-2-26. Start-up Waveform (Io=3.5A)

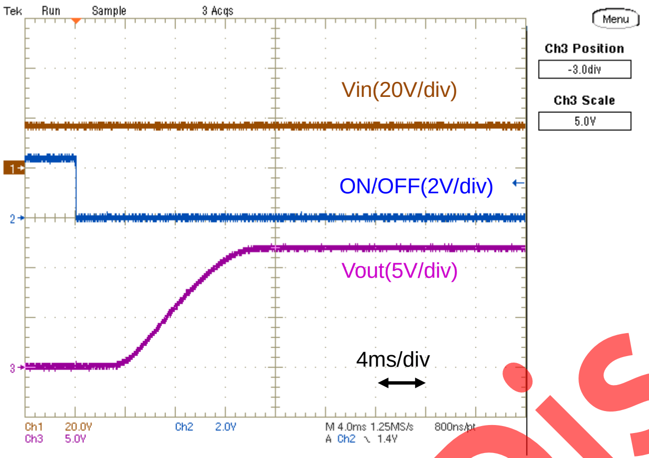

Fig.12-2-27. Start-up Waveform (Io=0A)

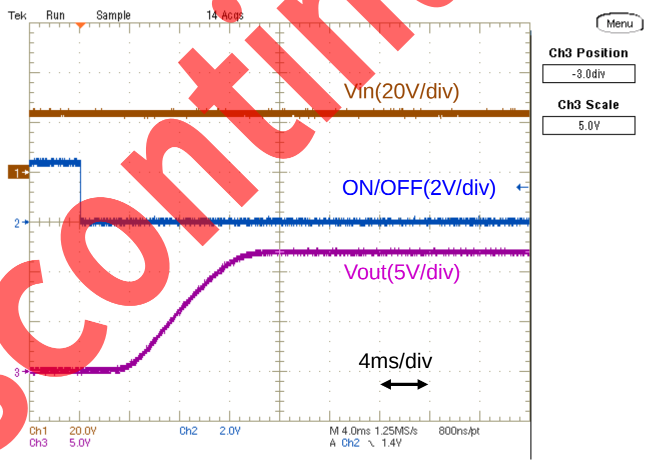

Fig.12-2-28. Start-up Waveform (Io=3.5A)

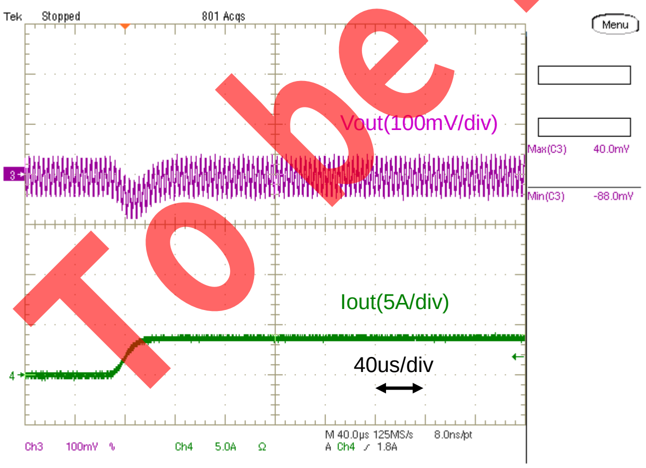

Fig.12-2-29. Load Transient Response
(Io= 0 → 3.5A)

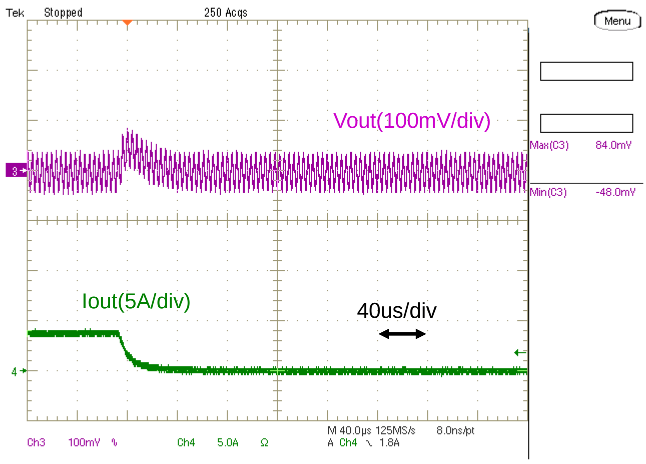

Fig.12-2-30. Load Transient Response
(Io= 3.5A → 0)

⚠ **Note:**

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2. This datasheet has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

Vin=40V, Vout=12.0V
(Ta=25℃, Cin 50CE220KX×5, Cout= 16CE330KX×4, RVAR=GND)

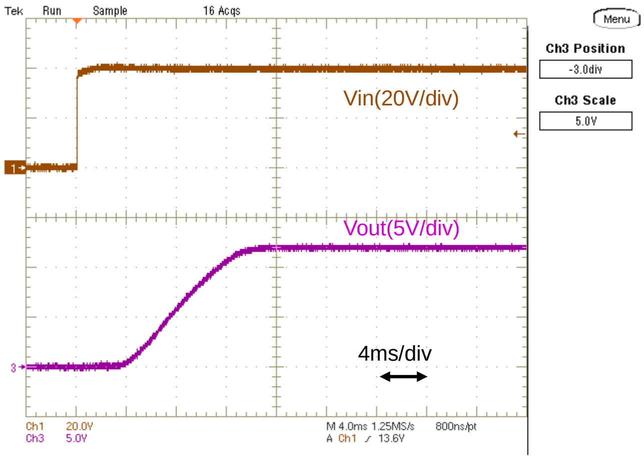

Fig.12-2-31. Start-up Waveform (Io=0A)

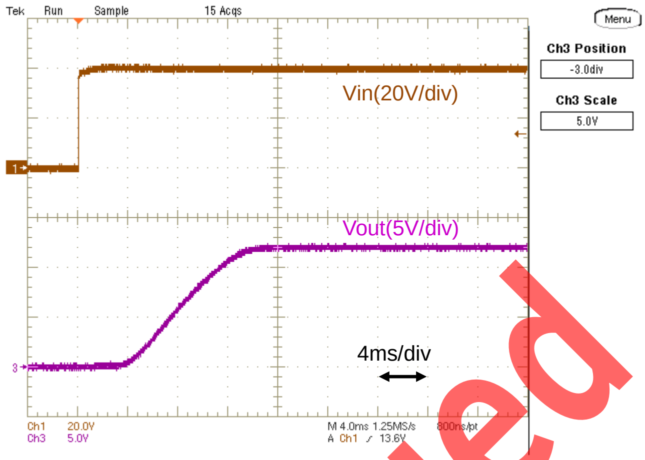

Fig.12-2-32. Start-up Waveform (Io=3.5A)

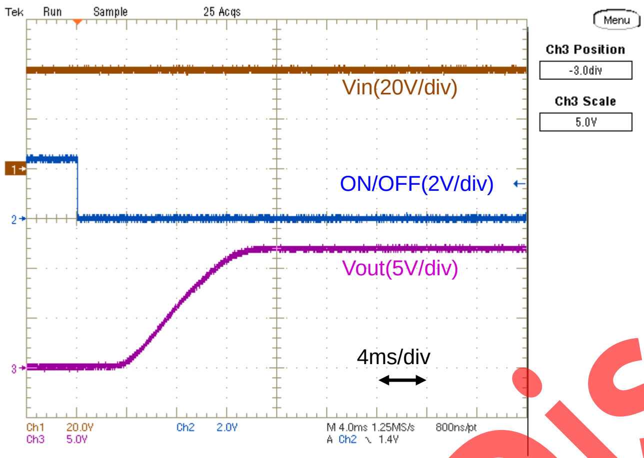

Fig.12-2-33. Start-up Waveform (Io=0A)

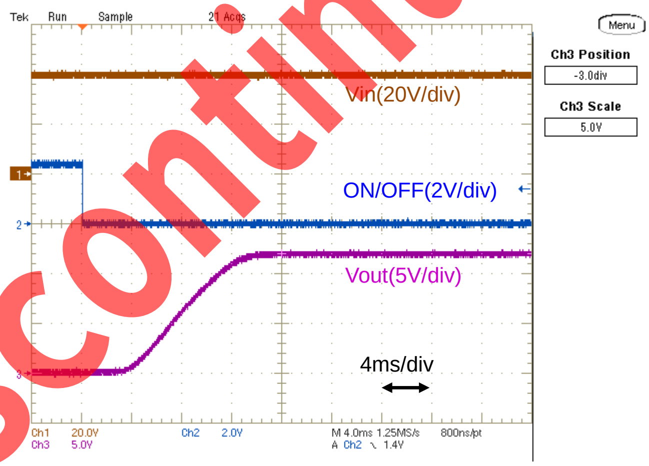

Fig.12-2-34. Start-up Waveform (Io=3.5A)

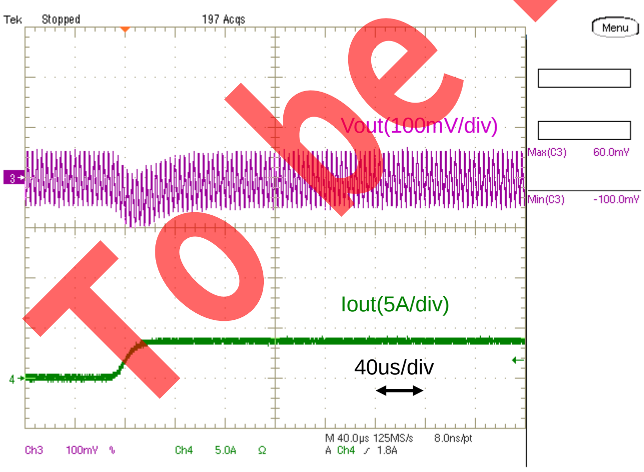

Fig.12-2-35. Load Transient Response
(Io= 0 → 3.5A)

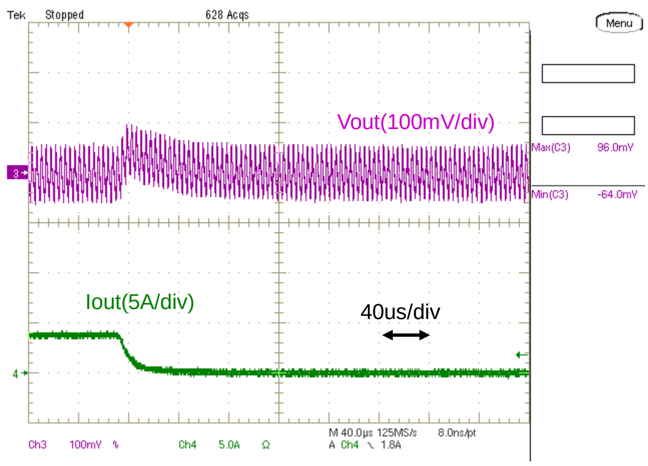

Fig.12-2-36. Load Transient Response
(Io= 3.5A → 0)

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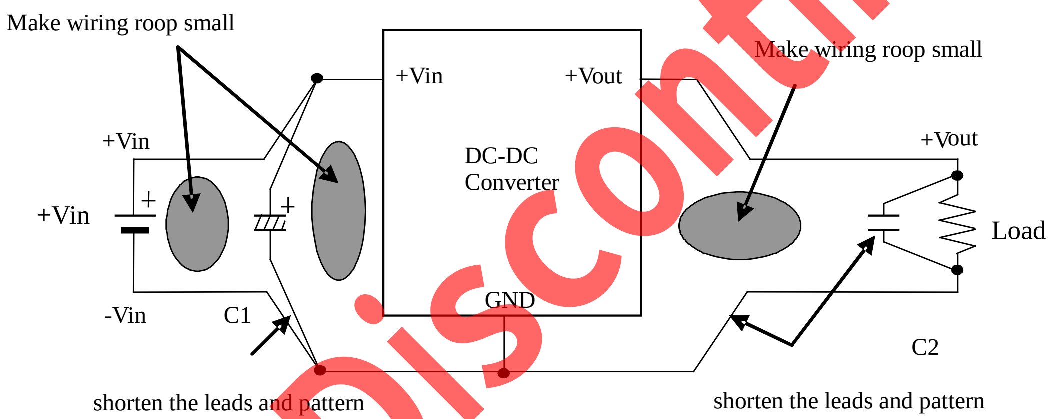
13. Notice

13.1. 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.

13.2. 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.

13.3. Input / Output capacitor
When a inductance or a switch devise are 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.

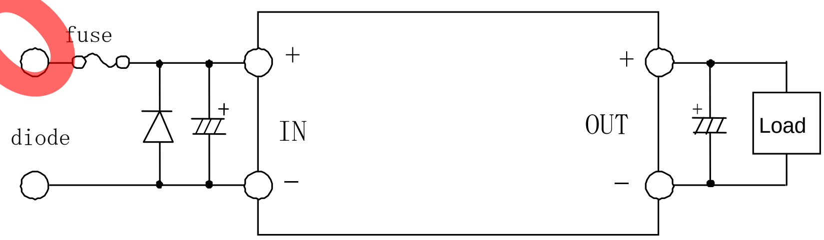
13. 4. Wiring of input / output capacitor
In the case of input / output capacitor connection, in order to reduce electrical noise, please design PCBs with consideration of the following item.
①.Please be sure to check normal operation on your system.
②.Please use low impedance capacitors with good high frequency characteristic.
③.Please shorten those leads of each capacitor as much as possible, and make sure the lead Inductance low.
④.Both 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.
⑤.Please design the print pattern of the main circuit as wide and short as possible.



13.5. This product should not be operated in parallel or in series.

13.6. Inrush current protection is not a feature of this product.
Please be careful that surge voltage caused by wiring indcutance etc. may make the product damage when input voltage is applied suddenly to the product.

13.7. 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:

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2. This datasheet has only typical specifications because there is no space for detailed specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

13. 8. Cleaning

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

13. 9. Storage

13.9.1. 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℃,60%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.

13.9.2. 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 (Cl_2,NH_3,SO_2,NOX and so on).

13.10 Operational Environment and Operational Conditions

13.10.1 Operational Environment

The products are not waterproof, chemical-proof or rust-proof.
In order to prevent leakage of electricity and abnormal temperature increase of the products, do not use the products under the following circumstances:

(1) in an atmosphere containing corrosive gas (Cl_2, NH_3, SO_2, 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 (1)through (5).

13.10.2 Operational Conditions

Please use the products within specified values (power supply, temperature, input, output and load condition, and so on). Input voltage drop for line impedance, so please make sure that input voltage is included in specified values.
If you use the products over the specified values, it may break the products, reduce the quality, and even if the products can endure the condition for short time, it may cause degradation of the reliability.
Also please take care that the external voltage over output voltage of DC-DC Converter does not applies to output of this DC-DC Converter.

13.10.3 Note prior to use

If you apply high static electricity, over rated voltage or reverse voltage to the products, it may cause defects in the products or degrade the reliability.
Please avoid the following items:

(1) over rating power supply, reverse power supply or not-enough connection of 0 V(DC) line.
(2) electrostatic discharge by production line and/or operator.
(3) electrified product by electrostatic induction.

Do not give an excessive mechanical shock..
If you drop the products on the floor, etc., it may occur a crack to the core of inductors and monolithic ceramic capacitors.
Do not give a strong shock such as a drop in handling.

13.11. Transportation

If you transport the products, please pack them so that the package will not be damaged by mechanical vibration or mechanical shock, and please educate and guide a carrier to prevent rough handling.

If you transport the products to overseas (in particular, by sea), it is expected that the transportation environment will be the worst, so please pack the products, in the package designed on the consideration of mechanical strength, vibration-resistant and humidity-resistant. The package of the products which Murata sells in Japan, may not resist over seas transport.

Please consult us if you are to use the Murata package of the products sold in Japan for transport to overseas.

⚠ 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.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.

3. If you have any concerned materials other than RoHS directive, please contact us.

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