THERMAL－
CONSIDERATIONS

COSEL

Conduction cooling of GMA300F series

Ver 1.1
2019.4.3

Conduction cooling of the GMA300F

Applications manual

For GMA300F

1. Introduction

1.1 Suggestion for conduction cooling

With the GMA300F, it is possible to increase the output power with conduction cooling of the power semiconductors which are mounted on the bottom PCB.

2. Derating conditions

2.1 Measuring condition in conduction cooling

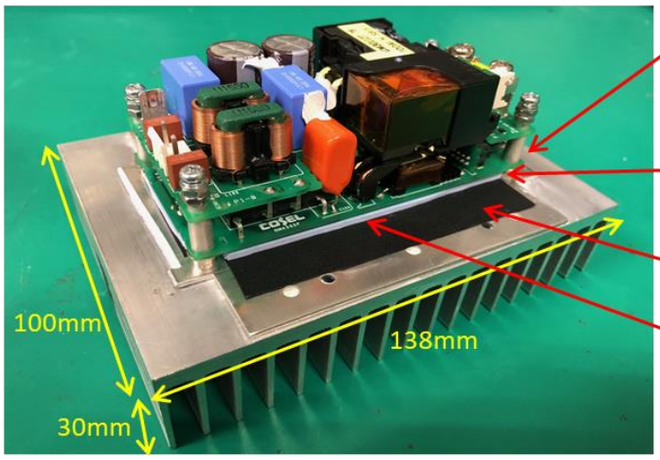

Fig2.1 Measured condition in conduction cooling

Aluminum heatsink
30F138(W=138mm,H=30mm,L=100mm
Marusan Electronics or equal
The heat resistance is shown in Fig 2.2.

Clearance/Creepage: 4.0mm
The bottom of PCB needs 4.0mm or more for the isolation.

Basic insulation sheet
LEXAN FR700 t=0.43mm ※1 or equal

Thermally conductive spacer
FSL200BS t=2.0mm (DENKA) or equal
If the thickness is **less** than 2mm, TR501 cannot contact enough.

*1. In case of the distance at the bottom of PCB is 8mm or less, basic insulation sheet is required for satisfying safety isolation between internal components and the heatsink.

2.2 Heat dissipation condition

The followings are the example of component which is used for conduction cooling.

Table 2.1 Thermal spacer FSL200BS parameter

No.	Content	value
1	Item	FSL-SB
2	Manufacture	DENKA
3	Feature	Great flexibility
4	Thermal conductivity [W/mK]	3
5	Hardness [AsckeC]	8
6	Relative permittivity	7.2

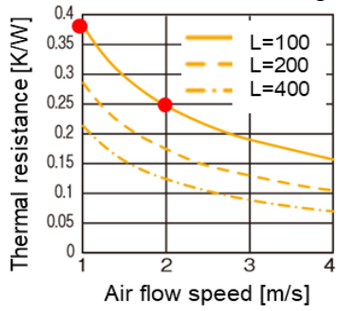

Fig 2.2 Aluminum heatsink 30F138 Thermal resistance graph

The followings are checkpoints of ambient temperature and air flow speed at the forced air cooling condition.

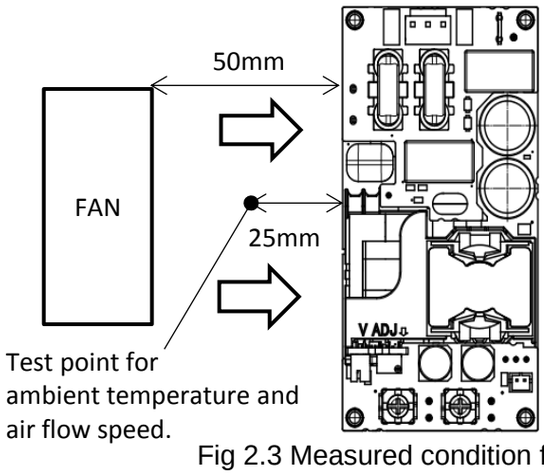

Fig 2.3 Measured condition for forced air cooling.

Recommended cooling fan

No.	Air flow speed	Part number	Mfr.
1	2m/s	9A0612H401	SANYO Denki
2	1m/s	9A0412M7D03	SANYO Denki

2.3 Mounting Methods

(A) to (E) mountings are shown in Fig 2.4.

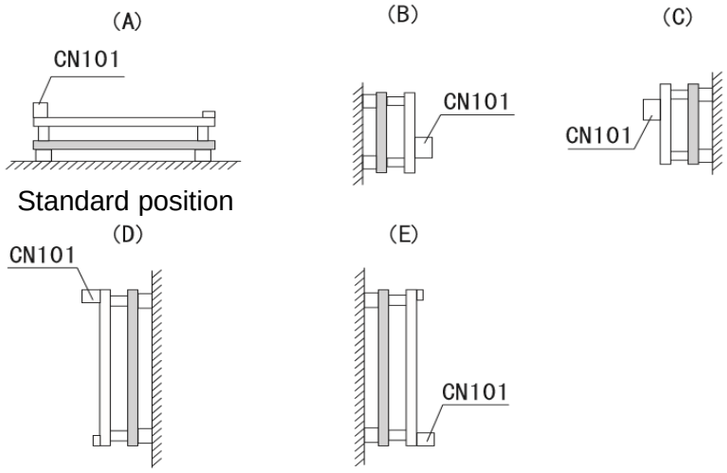

Fig 2.4 Mounting method

2.4 Derating curve for conduction cooling

The derating curve comparison between conduction cooling and convection cooling (A) mounting is shown in Fig 2.5.

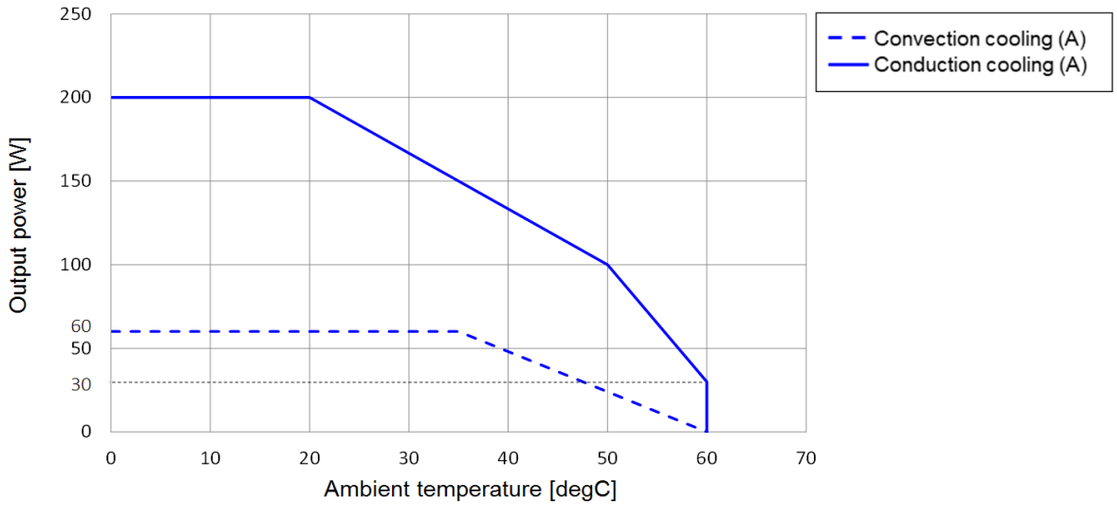

Fig 2.5 Conduction cooling at (A) mounting

This is reference data according Cosel test conditions.
When using the -R3 option, (5VAUX and 12VAUX) the load must be less than 0.1A on each.

The derating curve comparison between conduction cooling and convection cooling (B) mounting is shown in Fig 2.6.

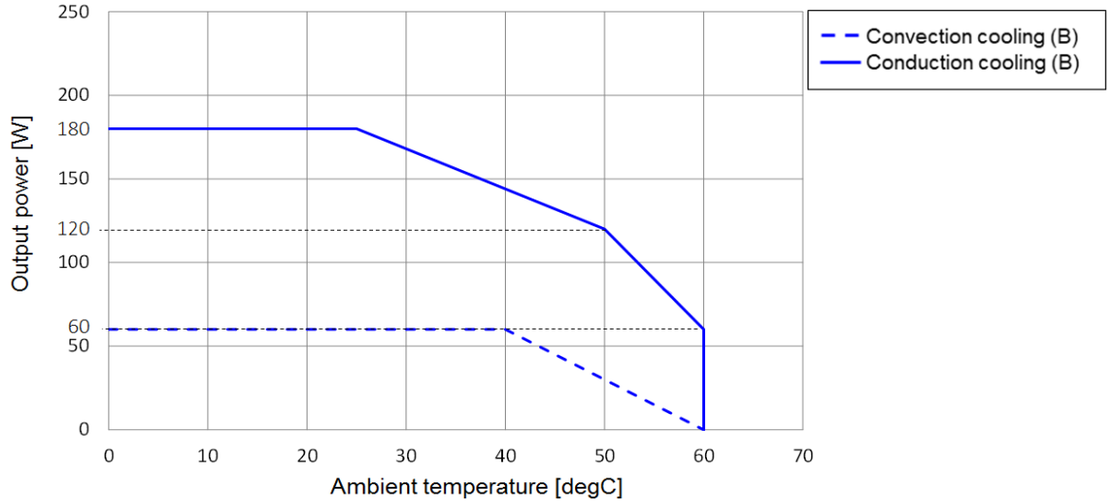

Fig 2.6 Conduction cooling at (B) mounting

This is reference data according Cosel test conditions.
When using the -R3 option, (5VAUX and 12VAUX) the load must be less than 0.1A on each

The derating curve comparison wbetween conduction cooling and convection cooling (C) mounting is shown in Fig 2.7.

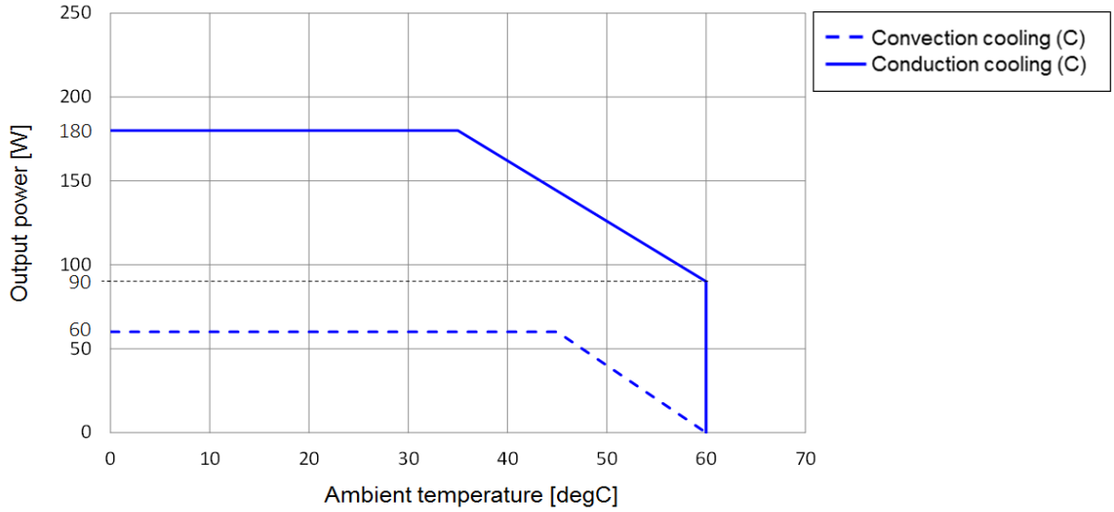

Fig 2.7 Conduction cooling at (C) mounting

This is reference data according Cosel test conditions.
When using the -R3 option, (5VAUX and 12VAUX) the load must be less than 0.1A on each

The derating curve comparison between conduction cooling and convection cooling (D) mounting is shown in Fig 2.8.

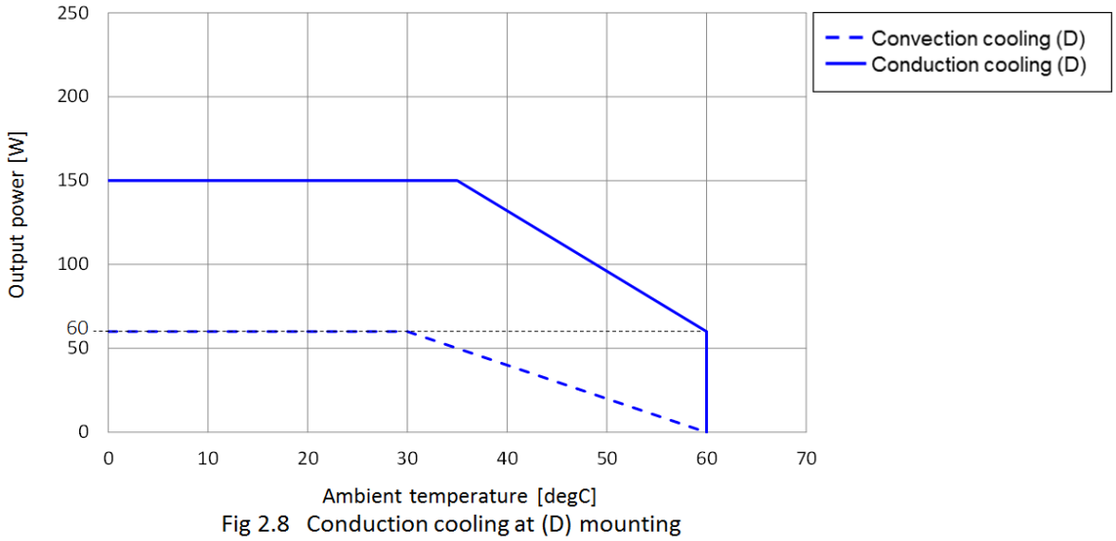

Fig 2.8 Conduction cooling at (D) mounting

This is reference data according Cosel test conditions.
When using the -R3 option, (5VAUX and 12VAUX) the load must be less than 0.1A on each

The derating curve comparison wbetween conduction cooling and convection cooling (E) mounting is shown in Fig 2.9.

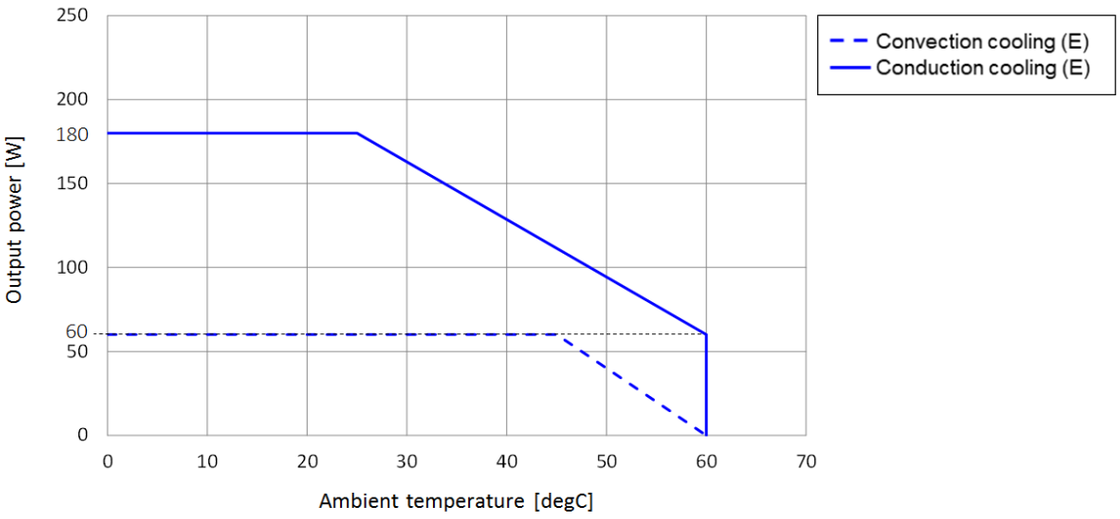

Fig 2.9 Conduction cooling at (E) mounting

This is reference data according Cosel test conditions.
When using the -R3 option, (5VAUX and 12VAUX) the load must be less than 0.1A on each

2.5 Derating curve with combination cooling

The derating curve comparison using forced air (1m/s: 1CFM) with and without conduction cooling is shown in Fig 2.10.

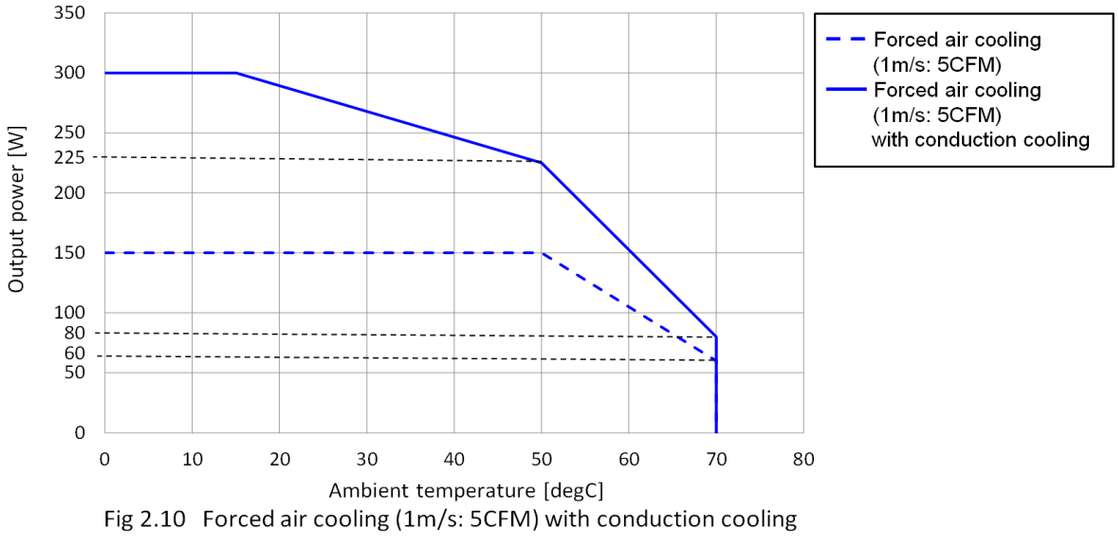

Fig 2.10 Forced air cooling (1m/s: 5CFM) with conduction cooling

This is reference data according Cosel test conditions.
When using the -R3 option, (5VAUX and 12VAUX) the load must be less than 0.75A on each.

The derating curve comparison with forced air condition (2m/s: 10CFM) with and without conduction cooling is shown in Fig 2.11.

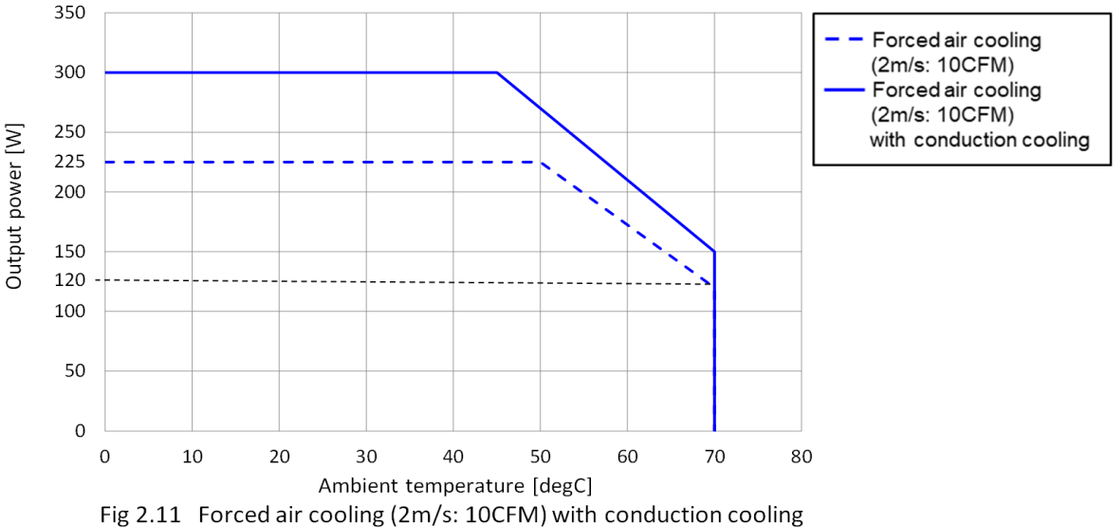

Fig 2.11 Forced air cooling (2m/s: 10CFM) with conduction cooling

This is reference data according Cosel test conditions.

3. Important points when using conduction cooling

3.1 The maximum temperature at the measurement points

The output power derating may vary depending on the size and ventilation of the enclosure. These components listed in table 3.1 must not be exceeded the maximum temperature shown under any condition.

Table 3.1 Maximum temperature

Location	Component	symbol No.	Maximum temperature [℃]						
			Conduction cooling					Combination cooling (Conduction and Forced air)	
			A	B	C	D	E	1m/s (5CFM)	2m/s (10CFM)
①	Line filter coil	L101	95	90	85	85	80	100	80
②	Smooth capacitor	C114	80	85	85	85	85	85	85
③	Main transformer	T201	100	100	105	105	105	110	110
④	Output capacitor	C516	85	85	85	85	90	85	90
⑤	Switching transistor	TR102	110	110	110	110	110	110	110
⑥	Output transistor	TR501	110	110	110	110	110	110	110
⑦	Sub transformer	T301	90	90	95	95	95	90	95

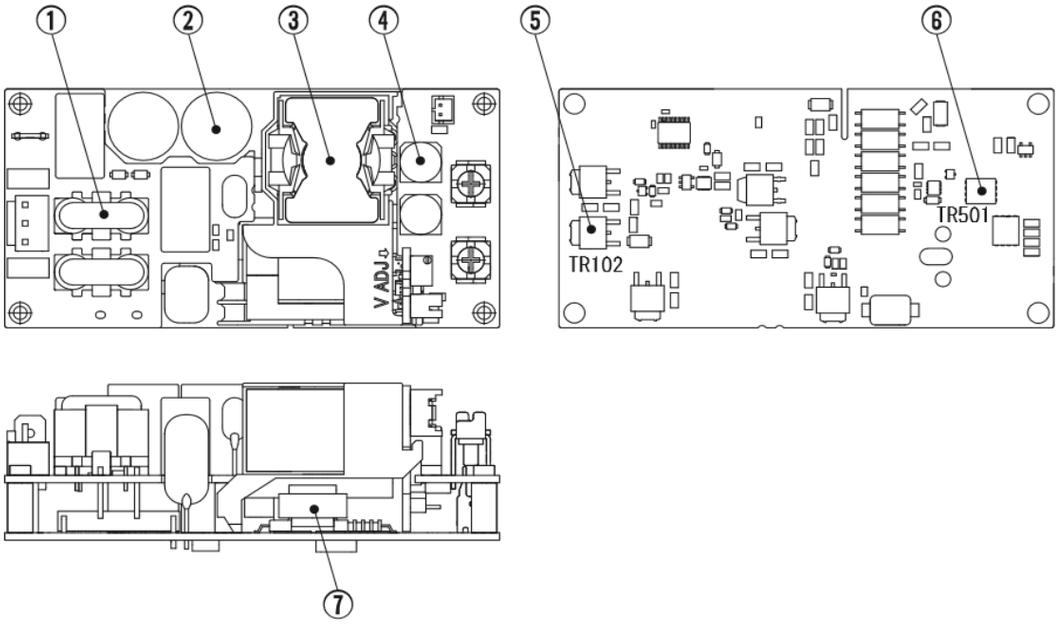

Fig. 3.1 Temperature measurement points

3.2 EMS level when using conduction cooling

There is possibility that EMS level will be weak because the thermal sheet causes capacitance between GMA lower PCB and heatsink. The EMS levels when using conduction cooling (example fig 2.1) is shown in table 3.2.

Table 3.2 EMS level at fig 2.1 conduction cooling

No.	Test item	EMS level	Note
1	Static electricity immunity	Level3、Criteria:A	
2	Electrical fast transient burst immunity	Level3、Criteria:A	
3	Surge immunity	Level3、Criteria:A	
4	Line noise immunity	1.0kV、Criteria:A	

EMS level when using the GMA with conduction cooling might change depending on the conduction cooling method and the wiring condition. Therefore, please evaluate your system under this condition.

End