



CFM300 Series

Application Note V10 February 2016

AC-DC Switching Power Module CFM300M Series APPLICATION NOTE



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CFM300 Series

Application Note V10 February 2016

Content

1. INTRODUCTION	3
3. TECHNICAL SPECIFICATIONS	4
4. MAIN FEATURES AND FUNCTIONS	6
4.1 <i>Operating Temperature Range</i>	6
4.2 <i>Output Protection (Over Current Protection)</i>	6
5. EMC & SAFETY	6
6. APPLICATIONS	6
6.1 <i>Power De-Rating Curve</i>	6
6.2 <i>Test Set-Up</i>	6
6.3 <i>Output Ripple and Noise Measurement</i>	7
6.4 <i>Installation Instruction</i>	7
7. PART NUMBER	9
8. CFM300M SERIES MECHANICAL OUTLINE DIAGRAMS	9



CFM300 Series

Application Note V10 February 2016

1. Introduction

This application note describes the features and functions of Cincon's CFM300M series of open frame, switching AC-DC power module. These are highly efficient, reliable, compact, high power density, single output AC/DC power modules. The module is fully protected against short circuit and over-voltage conditions. Cincon's world class automated manufacturing methods, together with an extensive testing and qualification program, ensure that the CFM300M series power module is extremely reliable.

2. CFM300M Series Converter Features

- Universal Input Range 90~264Vac
- 3"x 5" Compact Size/CFM300M
- 250W with natural convection @ 220Vac/CFM300M
- 300W with natural convection @ 220Vac/CFM300MXXXC
- Meets EN55011 and EN55022 Class B
- Meets 2MOPP
- Active PFC Meets EN61000-3-2
- High Efficiency Up to 94% Typical
- High Power Density Up to 18W/Inch³/CFM300M
- Remote Voltage Sense
- PS On/Off Remote Control
- +5V Stand-by Output Power
- 12V fan output
- No load power consumption < 0.3W



CFM300 Series

Application Note V10 February 2016

3. Technical Specifications

(All specifications are typical at nominal input, full load at 25°C unless otherwise noted.)

ABSOLUTE MAXIMUM RATINGS						
PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input Voltage (Continuous)		All	90		264	Vac
Operating Temperature	See derating curve	All	-40		+80	°C
Storage Temperature		All	-40		+85	°C
Input/Output Isolation Voltage	1 minute	All	4000			Vac
INPUT CHARACTERISTICS						
PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Operating Voltage Range		All	100		240	Vac
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Load, Vin=100Vac	All			4	A
Leakage Current		All			300	uA
Inrush Current	Vin=240Vac, cold start at 25°C.	All			30	A
OUTPUT CHARACTERISTICS						
PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	Vin=Nominal Vin, Io=Io .max, Tc=25°C.	CFM300MS120/120C	11.4	12	12.6	Vdc
		CFM300MS240/240C	22.8	24	25.2	
		CFM300MS360/360C	34.2	36	37.8	
		CFM300MS480/480C	45.6	48	50.4	
Operating Output Current Range		CFM300MS120/120C			25	A
		CFM300MS240/240C			12.5	
		CFM300MS360/360C			8.34	
		CFM300MS480/480C			6.25	
Holdup Time	Vin=115Vac			16		ms
Output Voltage Regulation						
Load Regulation	10% load to full load	All			±1.0	%
Line Regulation	Vin=high line to low line	All			±0.5	%
Over Current Protection		All	130	150	180	%
Over Voltage Protection		CFM300MS120/120C		15		VDC
		CFM300MS240/240C		30		
		CFM300MS360/360C		43		
		CFM300MS480/480C		56		
Output Ripple and Noise	1. Add a 0.1uF ceramic capacitor and a 10uF aluminum electrolytic capacitor to output. 2. Oscilloscope is 20MHz band width. 3. Ambient temperature=25°C	CFM300MS120/120C			120	mVp-p
		CFM300MS240/240C			150	
		CFM300MS360/360C			150	
		CFM300MS480/480C			150	
Load Capacitance	1. Input voltage is 115VAC and 230VAC 2. Output is max. load	CFM300MS120/120C			25000	uF
		CFM300MS240/240C			12500	
		CFM300MS360/360C			5000	
		CFM300MS480/480C			3750	
Efficiency	1. Input voltage is 230VAC 2. Output is max. load	CFM300MS120/120C		92.5		%
		CFM300MS240/240C		93.5		
		CFM300MS360/360C		93.5		
		CFM300MS480/480C		94.0		



CFM300 Series

Application Note V10 February 2016

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Power Good(PG)	1. Input voltage is 90VAC~264VAC 2. Output is max. load 3. The TTL goes high after power set up	All	50		250	ms
Power Fail(PG)	1. Input voltage is 90VAC~264VAC 2. Output is max. load 3. The TTL goes low before Vo below 90% rated value	All	5		20	ms

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			4000	Vac
Input to Earth(Ground)	1 minute	All			1500	Vac
Output to Earth(Ground)	1 minute	All			500	Vac
Isolation Resistance		All	100			MΩ

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All		70		KHz
Output Voltage adjustment	Pout=max. rated power	All	-5		+5	%

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
MTBF	Io=100%; Ta=25℃ per MIL-HDBK-217F	All	100K			hours
Weight		CFM300MXXX CFM300MXXXC		410 515		g



CFM300 Series

Application Note V10 February 2016

4. Main Features and Functions

4.1 Operating Temperature Range

The highly efficient design of Cincon's CFM300M series power modules has resulted in their ability to operate within ambient temperature environments from -40°C to 80°C . Due consideration must be given to the de-rating curves when ascertaining the maximum power that can be drawn from the module. The maximum power which can be drawn is influenced by a number of factors, such as

- Input voltage range
- Permissible Output load (per derating curve)
- Effective heat sinks

4.2 Output Protection (Over Current Protection)

The power modules provide full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit will operate normally once the fault condition is removed. The power module will go to hiccup mode if the output current is set from 130% to 180% of rated current.

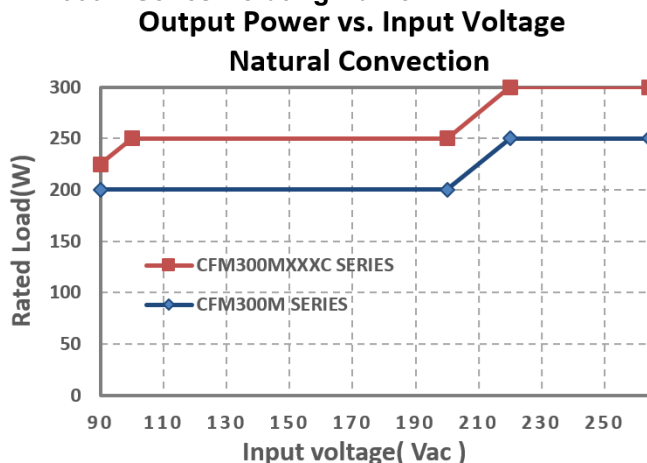
5. EMC & Safety

- CB IEC 60950-1
- TUV EN 60950-1
- UL/cUL UL60601-1
- CE EN 55022 Class B, EN55024
- FCC Part 15 for a Class B, CISPR 22

6. Applications

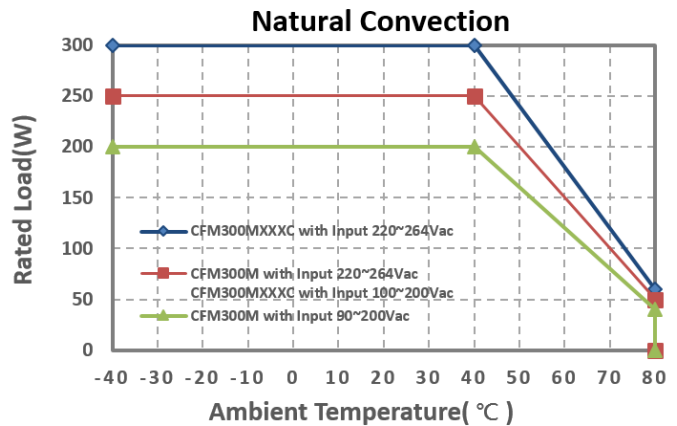
6.1 Power De-Rating Curve

CFM300M Series Derating Curve

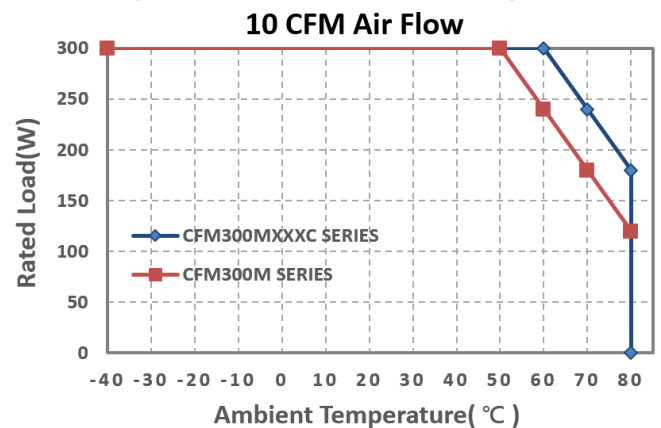


CFM300MXXXC Series Derating Curve

Output Power vs. Ambient Temperature



Output Power vs. Ambient Temperature



6.2 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown in Figure 1. When testing the Cincon's CFM300M series under any transient conditions, please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate the

- Efficiency
- Load regulation and line regulation.

The value of efficiency is defined as:

$$\eta = \frac{V_o \times I_o}{P_{in}} \times 100\%$$

Where:

V_o is output voltage
 I_o is output current
 P_{in} is input power

The value of load regulation is defined as:

$$\text{Load reg.} = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

V_{FL} is the output voltage at full load
 V_{NL} is the output voltage at 10% load

The value of line regulation is defined as:



CFM300 Series

Application Note V10 February 2016

$$\text{Line reg.} = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where:

V_{HL} is the output voltage of maximum input voltage at full load.

V_{LL} is the output voltage of minimum input voltage at full load.

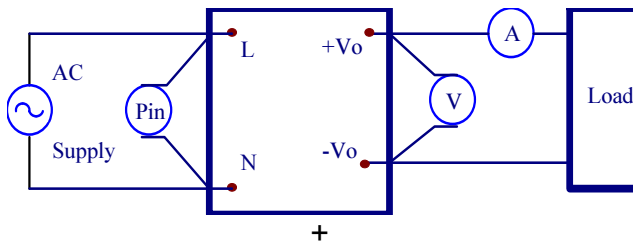


Figure 1. CFM300M Series Test Setup

6.3 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 2. Measured method:

Add a 0.1 μF ceramic capacitor and a 10 μF electrolytic capacitor to output at 20 MHz Band Width.

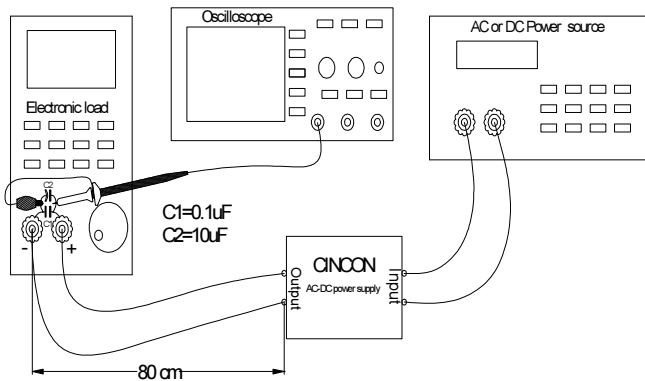
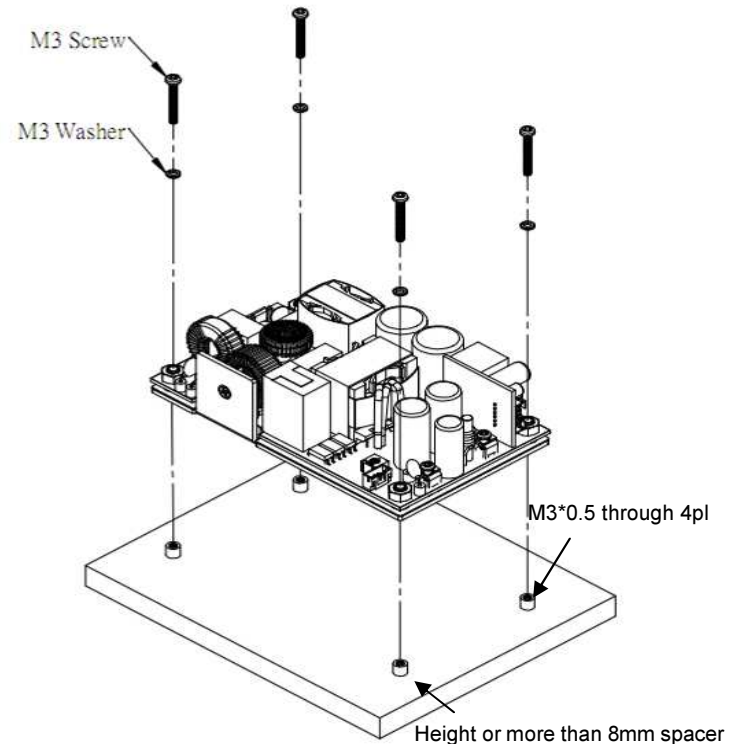


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

6.4 Installation Instruction

The CFM300M series has four 4mm diameter mounting holes. There are three type installations for CFM300M. Please use the mounting holes as follows:

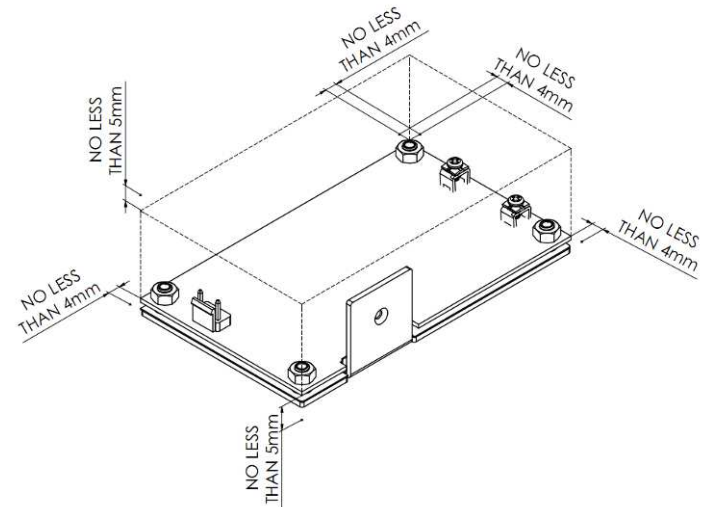
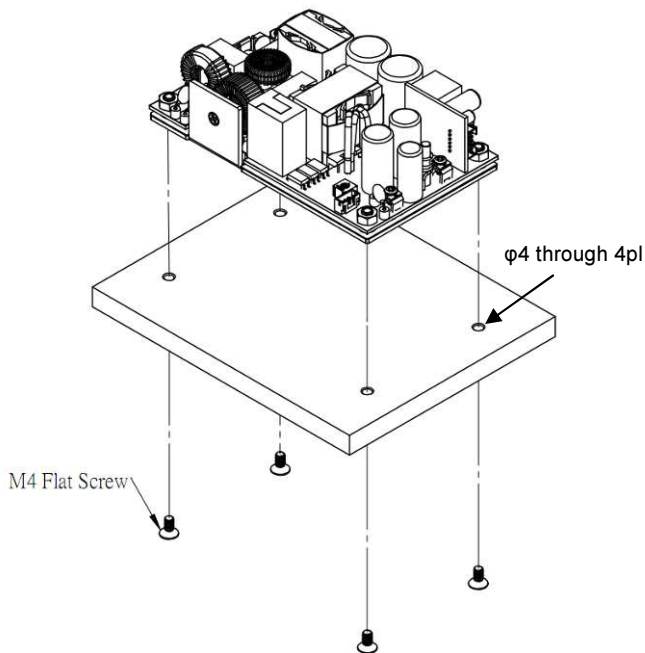
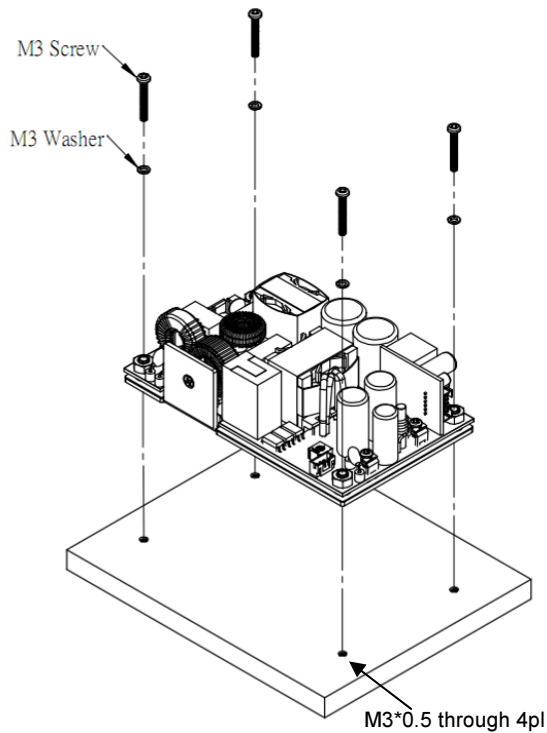
Insert the spacer (4mm diameter max.) of 8mm height or more to mount the unit. The vibration specification applies when the unit is mounted on 8mm spacers



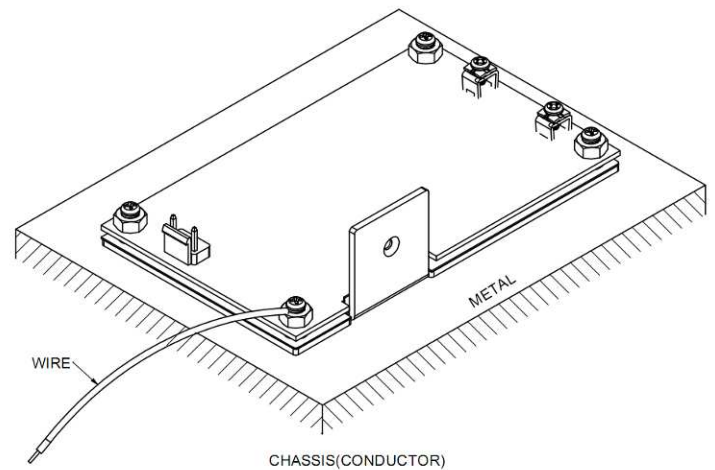


CFM300 Series

Application Note V10 February 2016



FG should be connected to the earth (ground) terminal of the apparatus. If not, the conducted noise and output noise will increase.



Please allow 4mm side clearance from the components and all side of the PCB. Allow 5mm clearance above the highest parts on the PCB. Be especially careful to allow 8mm between the solder side of the PCB and the mounting surface. If the clearances are not sufficient, the specifications for isolation and withstand will not be valid.



CFM300 Series

Application Note V10 February 2016

7. Part Number

CFM 300 M XXX C

C : With Case

M : Medical

300 :
Supply Max. Power

CFM SERIES

120 : Output Voltage 12 VDC
240 : Output Voltage 24 VDC
360 : Output Voltage 36 VDC
480 : Output Voltage 48 VDC

8. CFM300M Series Mechanical Outline Diagrams

All Dimensions In Inches(mm)
Tolerance Inches:x.xxx $\pm$ 0.02
Millimeters:x.xx $\pm$ 0.5

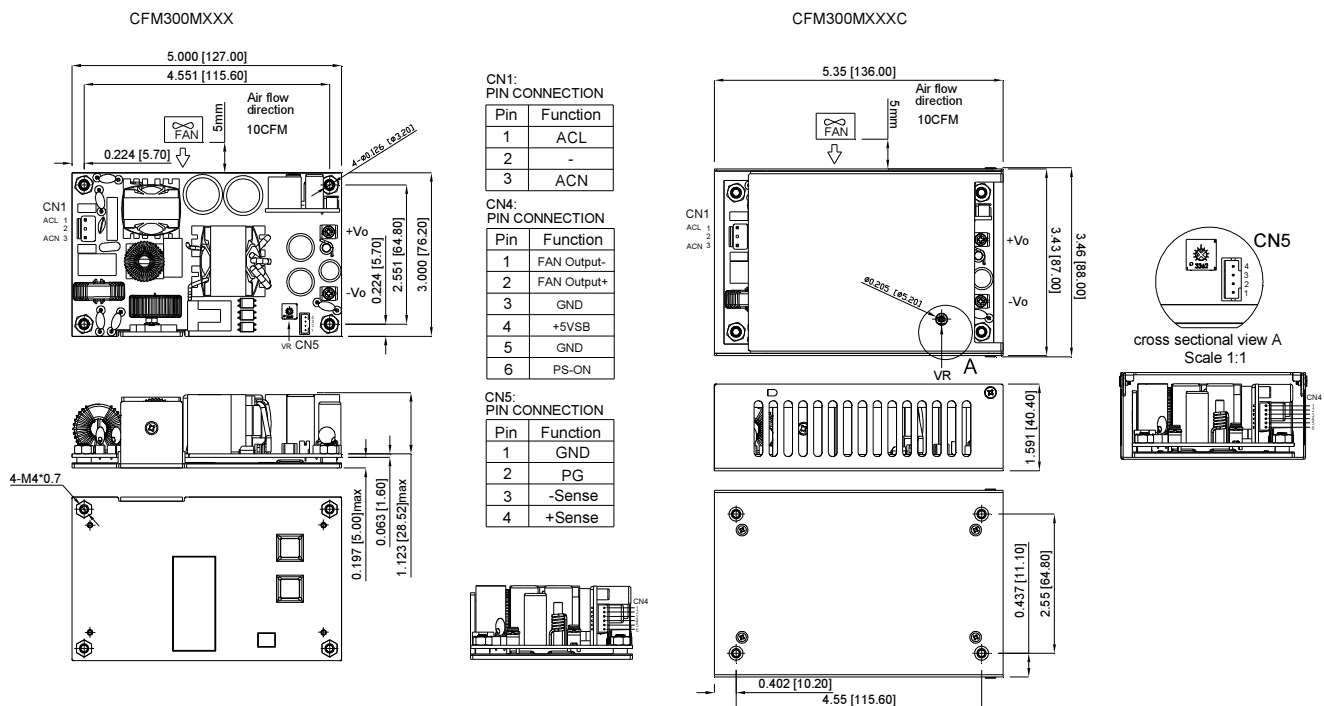


Figure 3. CFM300M series Mechanical Outline Diagram

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