



CFM201S Series

Application Note V10 September 2016

AC-DC Switching Power Module CFM201S Series APPLICATION NOTE



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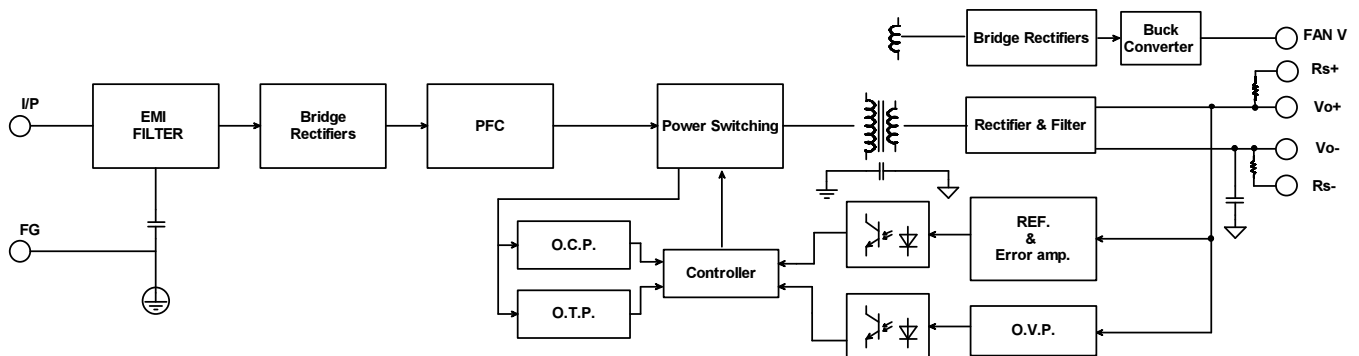
1. Introduction

This application note describes the features and functions of Cincon's CFM201S 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 CFM201S series power module is extremely reliable.

2. CFM201S Series Converter Features

- Universal Input 90 ~ 264Vac
- High Efficiency up to 92%
- Over Temperature Protection
- Remote Voltage Sense
- 3" X 5" Size Low Profile
- Active PFC Meets EN61000-3-2
- Conductive EMI Meets CISPR/FCC Class B

3 Electrical Block Diagram





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4. 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	-20		+80	°C
Storage Temperature		All	-20		+85	°C
Input/Output Isolation Voltage	1 minute	All	4242			Vdc
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			3	A
Leakage Current		All			3.5	mA
Inrush Current	Vin=240Vac, cold start at 25°C.	All			100	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.	CFM201S120	11.88	12	12.12	Vdc
		CFM201S240	23.76	24	24.24	
		CFM201S360	35.64	36	36.36	
		CFM201S480	47.52	48	48.48	
Operating Output Current Range		CFM201S120			16.67	A
		CFM201S240			8.34	
		CFM201S360			5.56	
		CFM201S480			4.17	
Holdup Time	Vin=115Vac	All		10		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	160	170	180	%
Over Voltage Protection		CFM201S120		13.2		Vdc
		CFM201S240		26.4		
		CFM201S360		39.6		
		CFM201S480		52.8		
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	CFM201S120			120	mVp-p
		CFM201S240			150	
		CFM201S360			150	
		CFM201S480			150	
Load Capacitance	1. Ambient temperature=25°C 2. Input voltage is 115VAC and 230VAC 3. Output is max. load	CFM201S120			16670	uF
		CFM201S240			8340	
		CFM201S360			5560	
		CFM201S480			4170	



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EFFICIENCY

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Efficiency	Output is Rated Load Ambient temperature=25°C	CFM201S120 CFM201S240 CFM201S360 CFM201S480		89 90 91 92		%

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			4242	Vdc
Input to Earth(Ground)	1 minute	All			2121	Vdc
Output to Earth(Ground)	1 minute	All			500	Vdc
Isolation Resistance		All	100			MΩ

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All	75		150	KHz
Output voltage adjustment	Pout=max. rated power	All	-5		+5	%

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Humidity	Non-condensing	All			93	% RH
Shock/Vibration	Meets EN61373,MIL-STD-810F					
MTBF	Io=100%; Ta=25℃ per MIL-HDBK-217F	All		120		K Hours
Weight	Open frame versions	All		400		g
	Covered frame versions	All		500		
Safety	Class I, IEC60950-1, EN60950-1, UL60950-1					
EMC Emission	EN 55022, EN61000-3-2, EN61000-3-3, FCC CFR 47 Part 15 Subpart B					
Conducted disturbance at main terminal	EN55022 Class B, FCC CFR 47 Part 15 Subpart B					
Radiated disturbance	EN55022 Class B, FCC CFR 47 Part 15 Subpart B					
Harmonic current emissions	EN61000-3-2/2014,Class A					
Voltage fluctuations & flicker	EN 61000-3-3/2013					
EMC Immunity	IEC61000-4-2,3,4,5,6,8,11					
Electrostatic discharge (ESD)	IEC 61000-4-2:2008,±2kv, ±4kv, ±8kv,Criteria B					
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2010,Criteria A					
Electrical fast transient (EFT)	IEC 61000-4-4:2012,±0.5kv, ±1kv, ,Criteria B					
Surge	IEC 61000-4-5:2005,L-N: ±0.5kv, ±1kv,L-PE,N-PE: ±0.5kv, ±1kv, ±2kv, Criteria B					
Radio-frequency, Continuous conducted disturbances	IEC 61000-4-6:208, ,Criteria A					
Power frequency magnetic field	IEC 61000-4-8:2009, ,Criteria A					
Voltage dips	IEC 61000-4-11:2004,Dip : 30% reduction ,Criteria C ,Dip >95% reduction ,Criteria B,					
Voltage interruptions	IEC 61000-4-11:2004 ,Criteria C ,					



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5. Main Features and Functions

5.1 Operating Temperature Range

The highly efficient design of Cincon's CFM201S series power modules has resulted in their ability to operate within ambient temperature environments from -20°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

5.2 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 160% to 180% of rated current.

● Over voltage protection

All different voltage models have a full continuous over voltage protection. The power module will supply up to 110% of rated voltage. In the event of an over voltage converter will go into a hiccup model protection.

6. EMC & Safety

■ Emission and Immunity

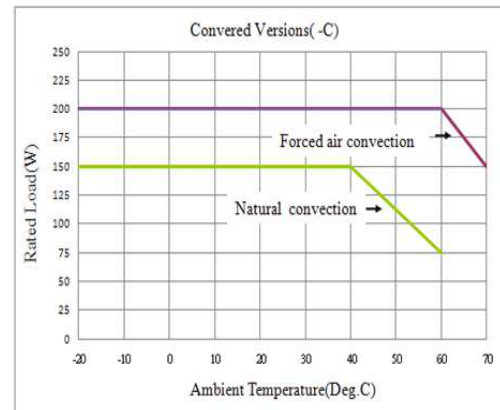
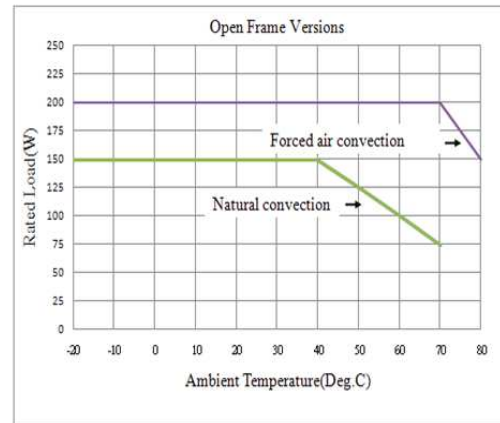
EN 55022, EN61000-3-2, EN61000-3-3, FCC CFR 47 Part 15 Subpart B, IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11

■ Safety

Class I, IEC60950-1, EN60950-1, UL60950-1

7. Applications

7.1 Power De-Rating Curve



7.2 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 CFM201S 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



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The value of line regulation is defined as:

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

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.

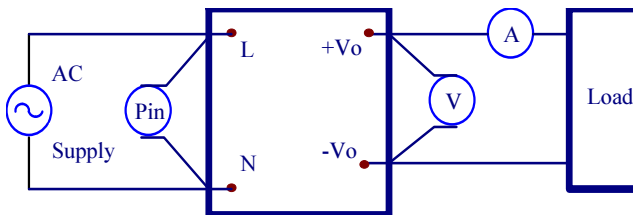


Figure 1. CFM201S Series Test Setup

7.3 Output Ripple and Noise Measurement

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

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

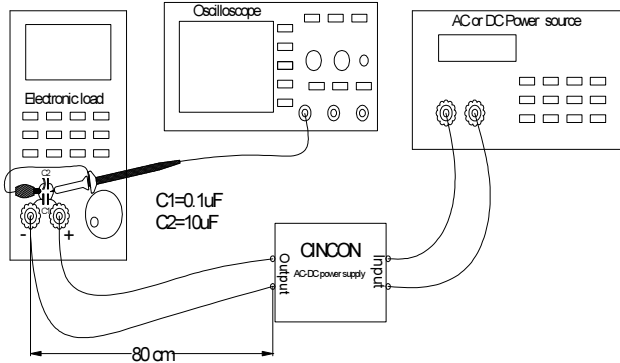


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

7.4 Installation Instruction

The CFM201SS series has four 3.17mm diameter mounting holes is shown in Figure 3. Please use the mounting holes as follows:

Insert the spacer (6mm diameter max.) of 8mm height or more to mount the unit. The vibration specification applies when the unit is mounted on 8mm spacers

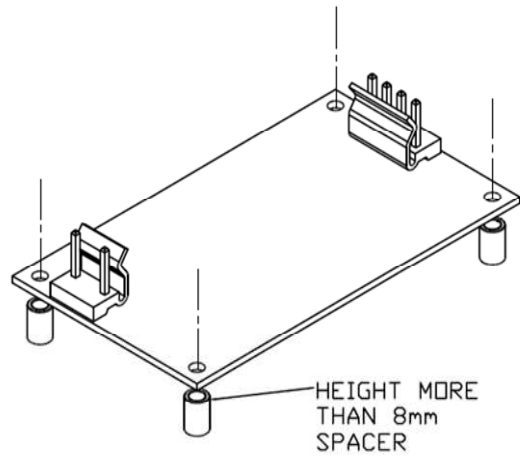


Figure 3

Please allow 4mm side clearance from the components and all side of the PCB is shown in Figure 4. Allow 5mm clearance above the highest parts on the PCB. Be especially careful to allow 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.

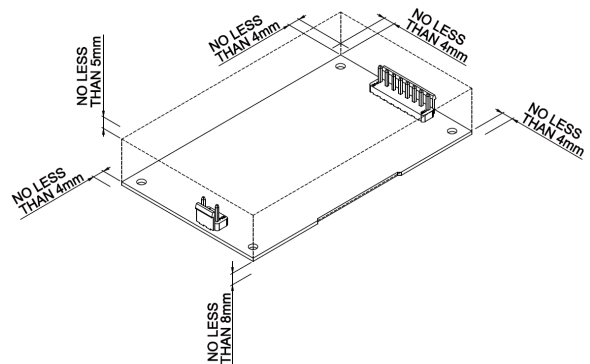


Figure 4

PE should be connected to the earth (ground) terminal of the apparatus is shown in Figure 5. If not, the conducted noise and output noise will increase.

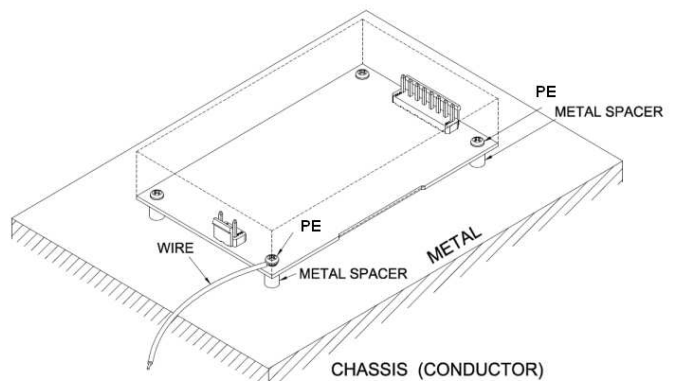


Figure 5



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8. Part Number

CFM XX S XXX-X

None:
Open Frame PCB Mount
-C:
Covered versions

S : Single Output

201 :
Supply Max. Power

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120 : Output Voltage 12.0 VDC
240 : Output Voltage 24.0 VDC
360 : Output Voltage 36.0 VDC
480 : Output Voltage 48.0 VDC

9. CFM201S Series Mechanical Outline Diagrams

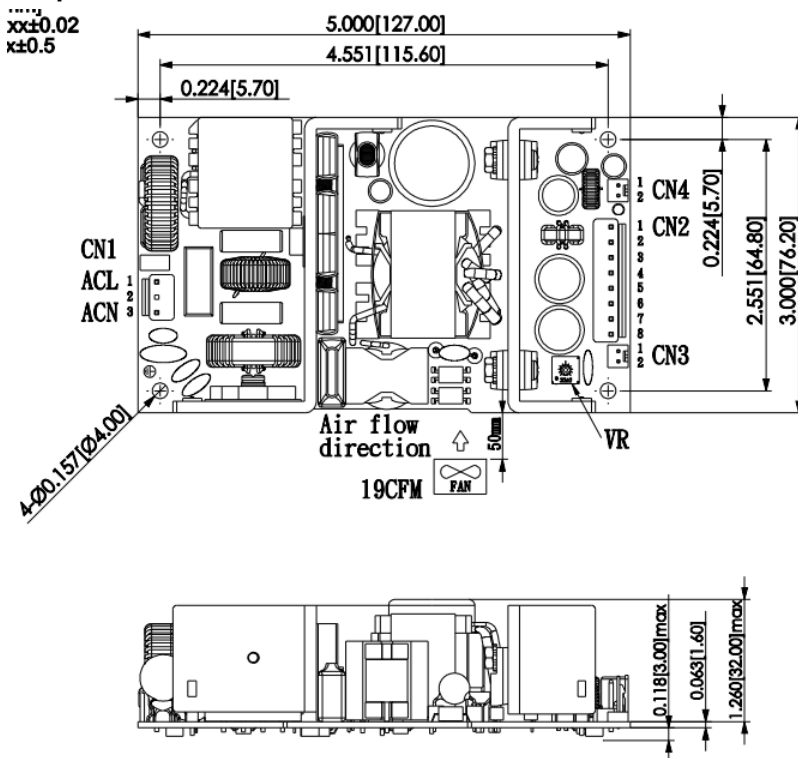
Annotations :

Dimensions are in millimeters

Tolerance: x.x ±0.5mm, unless otherwise noted

For all models, height does not exceed 38mm max

Open frame versions:



CN1:
PIN CONNECTION

Pin	Function
1	ACL
2	-
3	ACN

CN2:
PIN CONNECTION

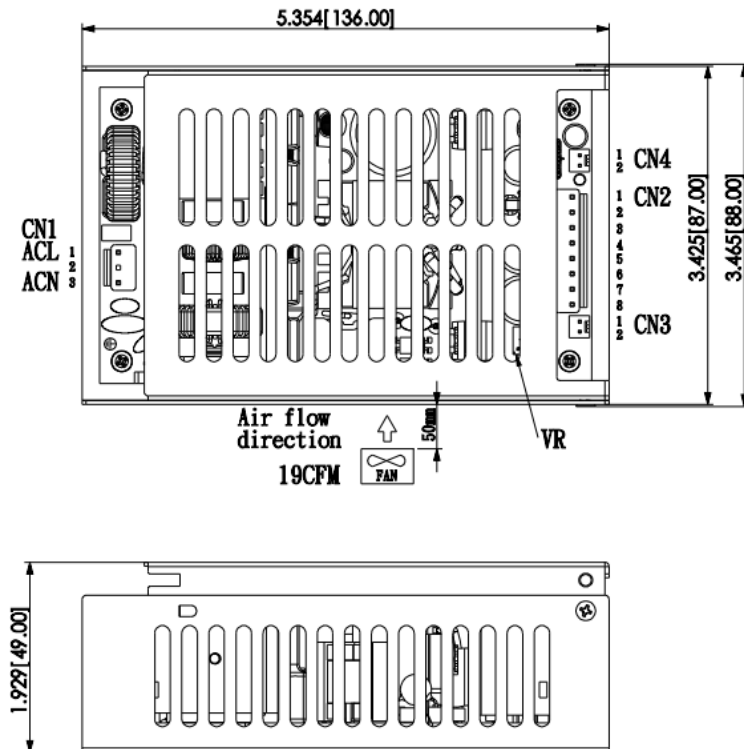
Pin	Function	Pin	Function
1	Vout(+)	5	Vout(-)
2	Vout(+)	6	Vout(-)
3	Vout(+)	7	Vout(-)
4	Vout(+)	8	Vout(-)



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Covered versions(-C):



CN3:
PIN CONNECTION

Pin	Function
1	Rs+
2	Rs-

CN4:
PIN CONNECTION

Pin	Function
1	FAN V+
2	FAN V-

Figure 6. CFM201S series Mechanical Outline Diagram

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