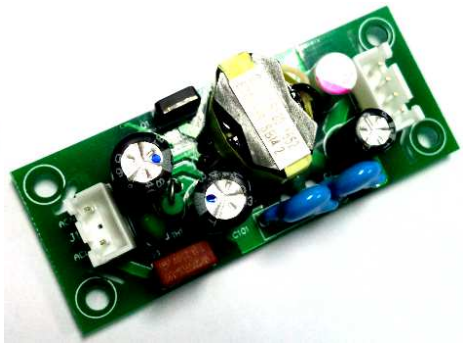
AC-DC Switching Power Module
CFM12S Series
APPLICATION NOTE





Approved By:

Department	Approved By	Checked By	Written By
Research and Development Department	Enoch	Yang Ovid	Su Shih Hang
Quality Assurance Department	David	Benny	

Content

CFM12S Series

Application Note V10 December 2017

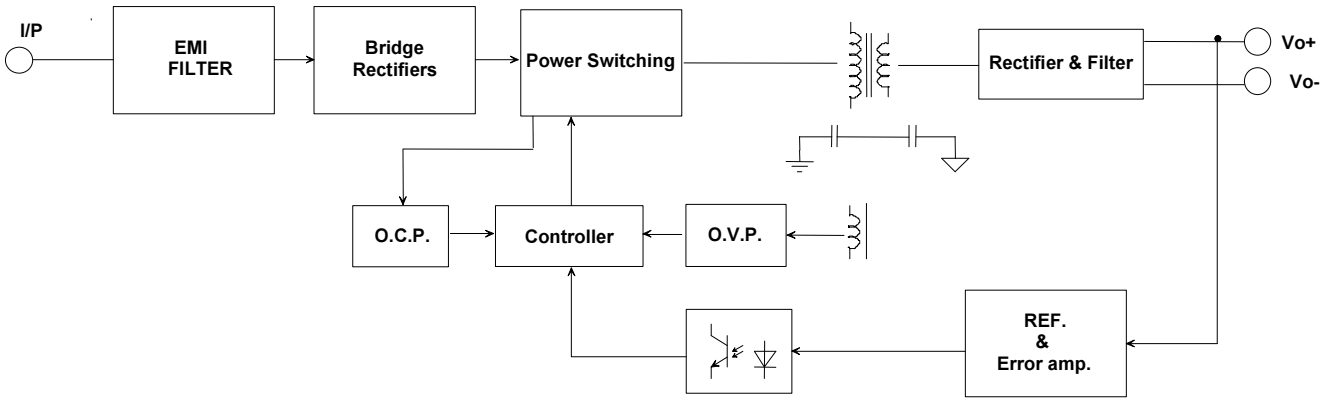
1. Introduction

This application note describes the features and functions of Cincon's CFM12S 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 CFM12S series power module is extremely reliable.

2. CFM12S Series Converter Features

- 12W Isolated Output
- High Efficiency Up to 84%
- Meets EN55032 Class B and CIRSS/FCC Class B
- Meets IEC62368-1,UL62368-1,
- Meets EN60335-1
- Continuous Short Circuit Protection
- Over Voltage Protection
- No Load Input Power < 75mW
- CLASS II

3. Electrical Block Diagram



4. Technical Specifications

(All specifications are typical at nominal input, full load at 25℃ 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	-30		70	^{0}C
Storage Temperature		All	-40		85	^{0}C
Input/Output Isolation Voltage	1 minute	All	3000			Vac
Altitude		All			5000	m
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			0.4	A
Leakage Current		All			0.25	mA
Inrush Current	Vin=240Vac, cold start at 25℃.	All			50	A
OUTPUT CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	Vin=Nominal Vin, Io=Io.max, Tc=25℃.	CFM12S050 CFM12S090 CFM12S120 CFM12S150 CFM12S240	4.9 8.82 11.76 14.7 23.52	5 9 12 15 24	5.1 9.18 12.24 15.3 24.48	Vdc
Operating Output Current Range		CFM12S050 CFM12S090 CFM12S120 CFM12S150 CFM12S240			2 1.34 1.0 0.8 0.5	A
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			±1.0	%
Over Voltage Protection		CFM12S050 CFM12S090 CFM12S120 CFM12S150 CFM12S240			6.3 12.6 15.8 18.9 31.5	Vdc
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℃	CFM12S050 CFM12S090 CFM12S120 CFM12S150 CFM12S240			100 100 120 150 240	mVp-p

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Load Capacitance	1. Ambient temperature=25℃ 2. Input voltage is 115VAC and 230VAC 3. Output is max. load	CFM12S050 CFM12S090 CFM12S120 CFM12S150 CFM12S240			2000 1340 1000 800 500	uF
Efficiency	Average Efficiency measured at 25%,50%,75%,100% load and input voltage is 115Vac / 230Vac.	CFM12S050 CFM12S090 CFM12S120 CFM12S150 CFM12S240	79 83.26 83.26 83.26 83.26			%
ISOLATION CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			3000	Vac
Isolation Resistance		All	100			MΩ
FEATURE CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Switching Frequency		All		65		KHz
GENERAL SPECIFICATIONS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
MTBF	Io=100%; Ta=25℃ per MIL-HDBK-217F	All	450			K hours
Humidity	Nom-condensing	All			93	% RH
Shock	Mests MIL-STD-810F Table 516.5,TABLE 516.5-1 10ms, each axis 3 times(+-X、Y、Z axis)	All		75		g
Vibration	Mests MIL-STD-810F Table 514.5C-VIII,15~2000Hz, X、Y、Z axis,1 hr(each axis),. toal 3 hrs.	All		4		g

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Weight		CFM12SXXX CFM12SXXX-E CFM12SXXX-T		16 40 17		g
Safety	Class II, IEC62368-1, UL62368-1, IEC60950-1, UL60950-1					
EMC Emission	EN55032 Class B, EN61000-3-2, EN6100-3-3, EN61000-6-3, EN61000-6-4. 47 CFR FCC Part 15 Subpart B (Class B)					
Conducted disturbance	EN55032 2015, EN6100-6-3 2007+A1: 2011+AC: 2012, Class B, 47 CFR FCC Part 15 Subpart B (Class B)					
Radiated disturbance	EN55032 2015, EN6100-6-3 2007+A1: 2011+AC: 2012, Class B, 47 CFR FCC Part 15 Subpart B (Class B)					
Harmonic current emissions	EN6100-3-2:2014					
Voltage fluctuations & flicker	EN6100-3-3:2013					
EMC Immunity	EN55024 2010+A1:2015, EN61204-3:2000, EN61000-6-1:2007, EN61000-6-2:2005					
Electrostatic discharge (ESD)	IEC 61000-4-2:2008					
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2010					
Electrical fast transient (EFT)	IEC 61000-4-4:2012					
Surge	IEC 61000-4-5:2014					
Conducted disturbances, induced by RF fields	IEC 61000-4-6:2013					
Power frequency magnetic field	IEC 61000-4-8:2009					
Voltage dips	IEC 61000-4-11:2004					
Voltage interruptions	IEC 61000-4-11:2004					

5. Main Features and Functions

5.1 Operating Temperature Range

The highly efficient design of Cincon's CFM12S series power modules has resulted in their ability to operate within ambient temperature environments from -30°C to 70°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)

5.2 Output 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.

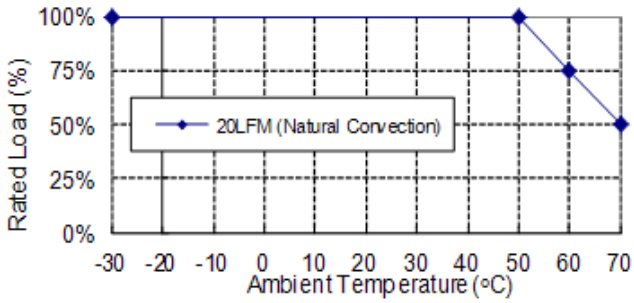
6. EMC & Safety

■ Emission and Immunity
EN55032 Class B, EN55024, EN61204-3,
EN61000-3-2, EN6100-3-3,
EN61000-6-1, 2, 3, 4
47 CFR FCC Part 15 Subpart B (Class B)

■ Safety
Class II, IEC62368-1, UL62368-1, IEC60950-1, 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 CFM12S 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:

Where:

Vo is output voltage

Io is output current

Pin is input power

The value of load regulation is defined as:

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:

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

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.

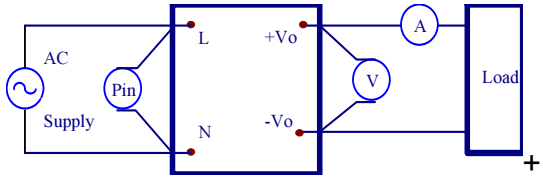


Figure 1. CFM12S Series Test Setup

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

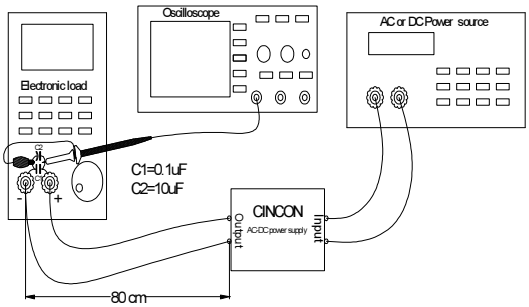
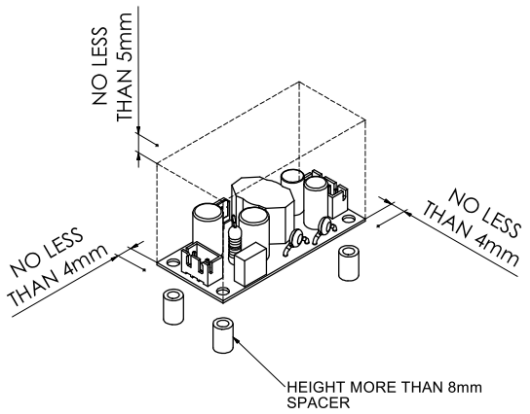


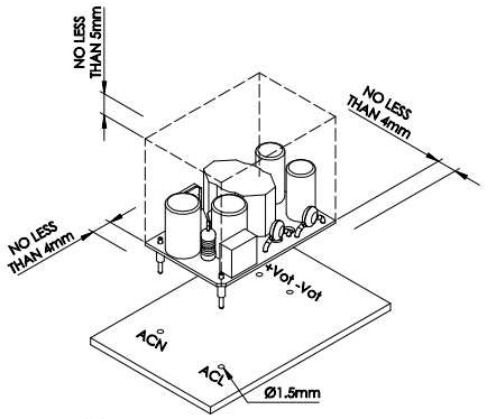
Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

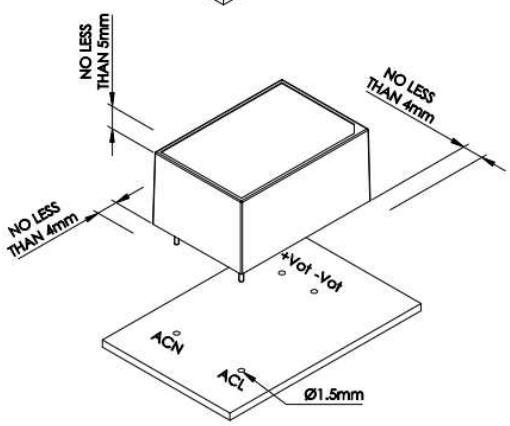
7.4 Installation Instruction

The CFM12SXXX-T has four 3.5mm diameter mounting holes. 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. 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.



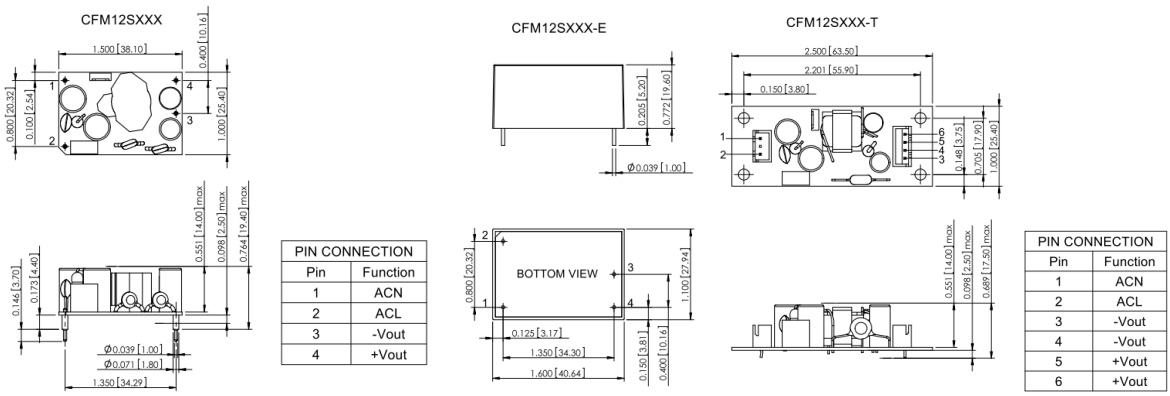
The CFM12SXXX and CFM12SXXX-E mounting holes are 1.5mm. Please allow 4mm side clearance from the components and all side of the PCB and CASE. Allow 5mm clearance above the highest parts on the PCB and CASE.





8. CFM12S Series Mechanical Outline Diagrams

All Dimensions In Inches[mm]
Tolerance Inches:x.xxx= ± 0.02
Millimeters: x.xx = ± 0.5



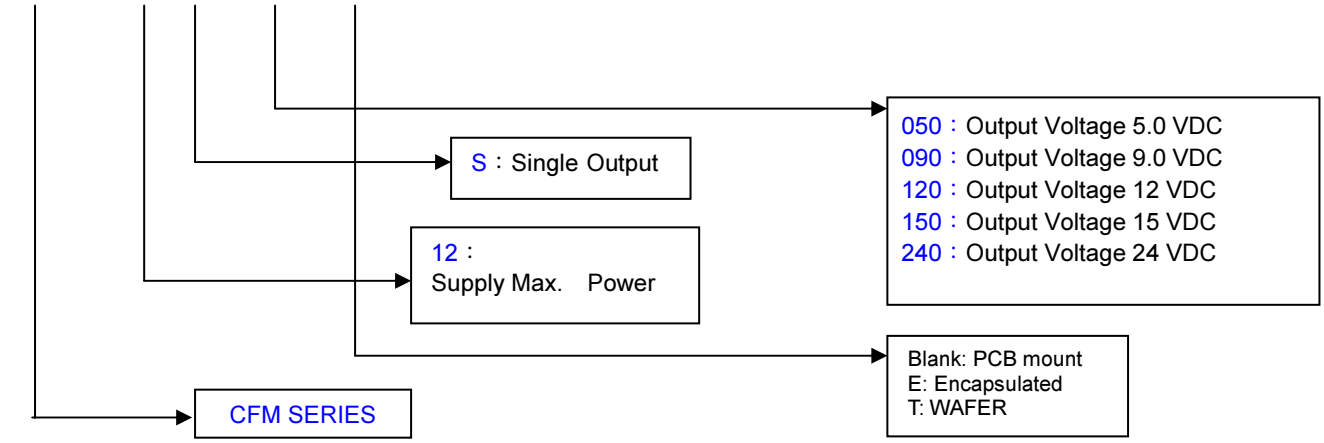
PIN CONNECTION	
Pin	Function
1	ACN
2	ACL
3	-Vout
4	+Vout

PIN CONNECTION	
Pin	Function
1	ACN
2	ACL
3	-Vout
4	-Vout
5	+Vout
6	+Vout

Figure 3. CFM12S series Mechanical Outline Diagram

9. Part Number

CFM XX S XXX-X



CINCON ELECTRONICS CO., LTD.

Headquarters:

14F, No.306, Sec.4, Hsin Yi Rd.
Taipei, Taiwan
Tel: 886-2-27086210
Fax: 886-2-27029852
E-mail: support@cincon.com.tw
Web Site: http://www.cincon.com

Factory:

No. 8-1, Fu Kung Rd.
Fu Hsing Industrial Park
Fu Hsing Hsiang,
Chang Hua Hsien, Taiwan
Tel: 886-4-7690261
Fax: 886-4-7698031

Cincon North America:

1655 Mesa Verde Ave. Ste 180
Ventura, CA 93003
Tel: 805-639-3350
Fax: 805-639-4101
E-mail: info@cincon.com