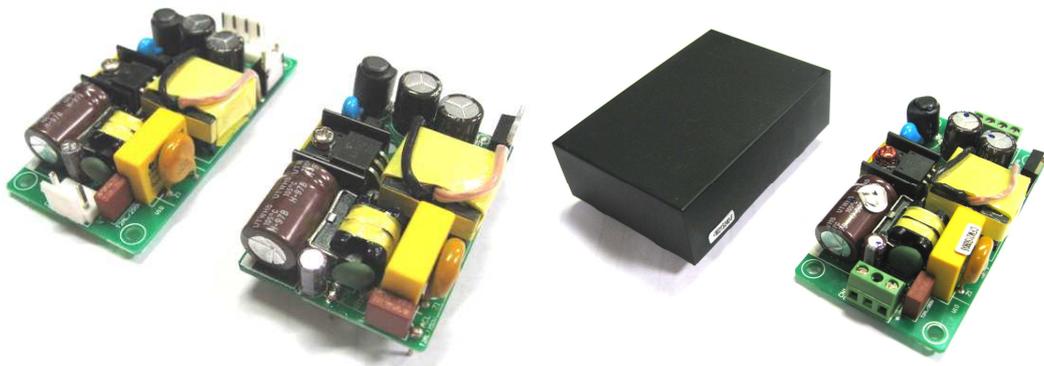




CFM21 Series

Application Note V11 January 2021

AC-DC Switching Power Module CFM21 Series APPLICATION NOTE



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1. Introduction

This application note describes the features and functions of Cincon's CFM21 series of 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 CFM21 series power module is extremely reliable.

2. CFM21 Series Features

- Universal Input Range 90~264VAC
- Miniature Size Low Profile 0.8"
- Industry-Standard Pin Out
- Efficiency to 85%
- Option for On-Board, Connector, Screw Terminal or Encapsulated type
- Continuous Short Circuit Protection
- Over Voltage Protection
- No Load Input Power < 0.3W
- Leakage Current < 0.1mA
- IEC/EN/UL 60601-1 Medical Safety Approved



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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		All	90		264	Vac
			120		370	Vdc
Operating Temperature	See derating curve	All	-25		+60	°C
Storage Temperature		All	-40		+85	°C
Input/Output Isolation Voltage	1 minute	All	5656			Vdc

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Operating Voltage Range		All	90		240	Vac
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Load, Vin=100Vac	All			0.5	A
Leakage Current		All			0.1	mA
Inrush Current	Vin=240Vac, cold start at 25°C.	All			40	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.	CFM21S033	3.26	3.3	3.33	Vdc
		CFM21S050	4.95	5.0	5.05	
		CFM21S090	8.91	9.0	9.09	
		CFM21S120	11.88	12.0	12.12	
		CFM21S150	14.85	15.0	15.15	
		CFM21S240	23.76	24.0	24.24	
Operating Output Current Range		CFM21S033			4	A
		CFM21S050			4	
		CFM21S090			2.3	
		CFM21S120			1.7	
		CFM21S150			1.4	
		CFM21S240			0.9	
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 Voltage Protection	uses a TVS component to clamp output voltage	CFM21S033		6.8		VDC
		CFM21S050		6.8		
		CFM21S090		11		
		CFM21S120		15		
		CFM21S150		18		
		CFM21S240		30		



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PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
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	CFM21S033			50	mVp-p
		CFM21S050			50	
		CFM21S090			90	
		CFM21S120			120	
		CFM21S150			150	
		CFM21S240			240	
Load Capacitance	1. Ambient temperature=25°C 2. Input voltage is 115VAC and 230VAC 3. Output is max. load	CFM21S033			4000	uF
		CFM21S050			4000	
		CFM21S090			2300	
		CFM21S120			1700	
		CFM21S150			1400	
		CFM21S240			900	
Efficiency	Output is Rated Load Ambient temperature=25°C	CFM21S033		75		%
		CFM21S050		80		
		CFM21S090		81		
		CFM21S120		83		
		CFM21S150		84		
		CFM21S240		85		

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All	5656			Vdc
Isolation Resistance		All	1000			MΩ

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All		100		KHz

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
MTBF	Io=100%; Ta=25°C per MIL-HDBK-217F	All		700		K hours
Weight		CFM21SXX		50		g
		CFM21SXX-T		55		
		CFM21SXX-S		55		
		CFM21SXX-E		105		
Safety	Class II, IEC60601-1/ ANSI/AAMI ES 60601-1					Ed.3.0
	EN60601-1 Medical					Ed.3.1
EMC Emission	EN55011 Class B, EN60601-1-2:2015, EN61000-3-2:2014, EN6100-3-3:2013, IEC61000-4-2, IEC61000-4-3, IEC61000-4-4, IEC61000-4-5, IEC61000-4-6, IEC61000-4-8, IEC61000-4-11					Ed.4.0
Conducted disturbance	EN55011, EN61000-6-3:2012, Class B,					
Radiated disturbance	EN55011, EN61000-6-3:2012, Class B,					
Harmonic current emissions	EN61000-3-2:2014					



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GENERAL SPECIFICATIONS

Voltage fluctuations & flicker	EN61000-3-3:2013
EMC Immunity	EN55024, EN61204-3:2000, EN61000-6-1:2007,
Electrostatic discharge (ESD)	IEC 61000-4-2:2008, Air discharge:±15kV,Contact discharge:±8kV
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2010
Electrical fast transient (EFT)	IEC 61000-4-4:2012, ±0.5kv, ±1kV, ±2kV
Surge	IEC 61000-4-5:2014, L-N: ±0.5kV, ±1kV,
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, Dip: 30% 10ms, Dip: 60% 100ms, Dip >95% 5000ms
Voltage interruptions	IEC 61000-4-11:2004, >95% 5000ms



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4. Main Features and Functions

4.1 Operating Temperature Range

The highly efficient design of Cincon's CFM21 series power modules has resulted in their ability to operate within ambient temperature environments from -25°C to 60°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

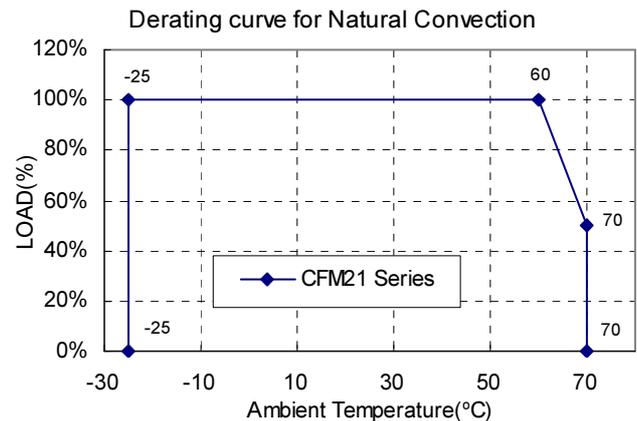
The power modules provide full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit will operate normally once the fault condition is removed. The power module will go to hiccup mode if the output current is set from 120% to 200% of rated current.

5. EMC & Safety

- CE Directive 2004/108/EC, 93/42/EEC
- Emissions
EN60601-1/EN61204-3/EN55022/CISPR Class B,
EN55024
- Safety Approvals
UL60601-1, IEC60601-1, EN60601-1

6. Applications

6.1 Power De-Rating Curve



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 CFM21 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:

- Vo is output voltage
- Io is output current
- Pin 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.

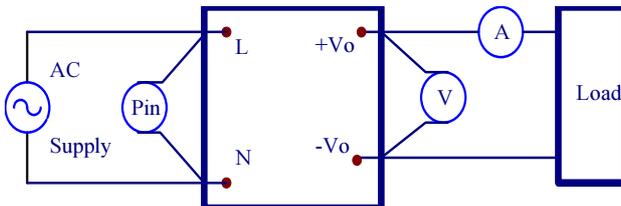


Figure 1. CFM21 Series Test Setup

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

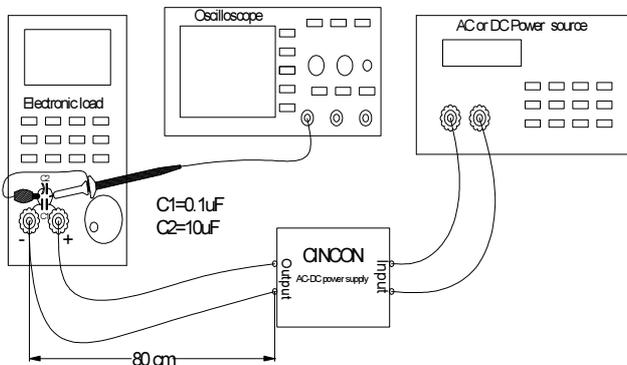
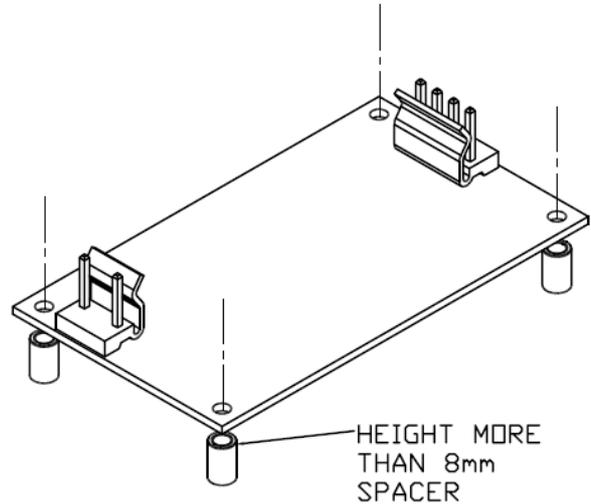


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

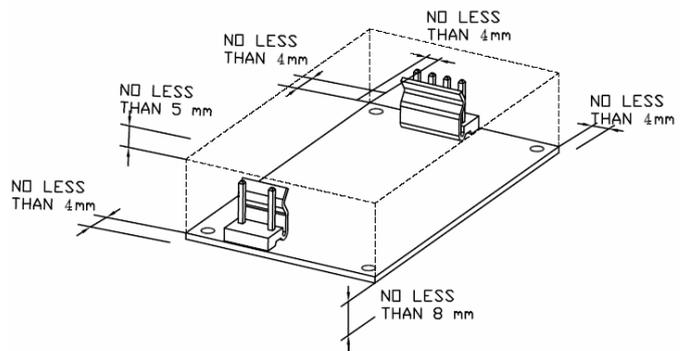
6.4 Installation Instruction

The CFM21 series has four 3.81mm 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.





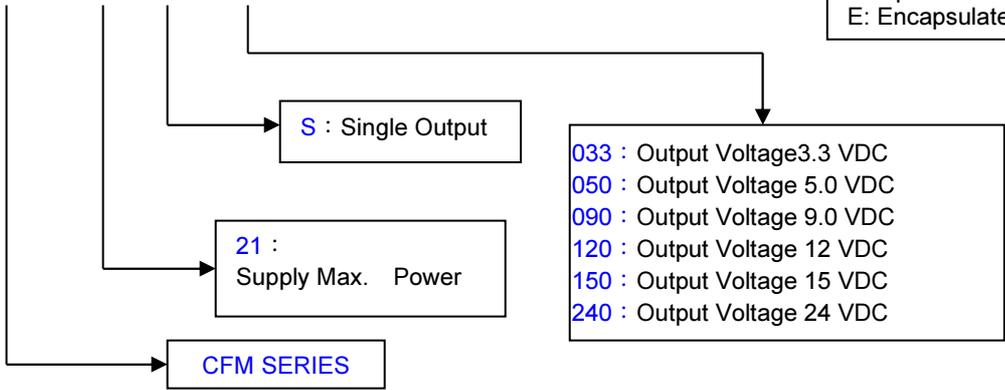
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7. Part Number

CFM XX S XXX-X

None: Open Frame PCB Mount
 T: Open Frame Chassis Mount
 S: Open Frame Screw Terminal
 E: Encapsulated

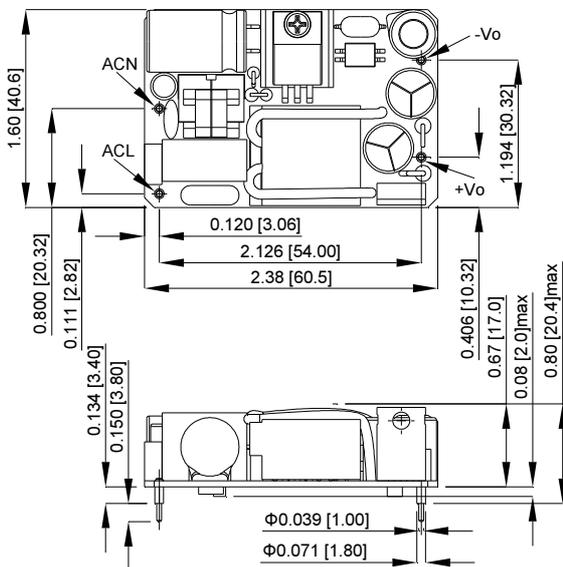


8. CFM21 Series Mechanical Outline Diagrams

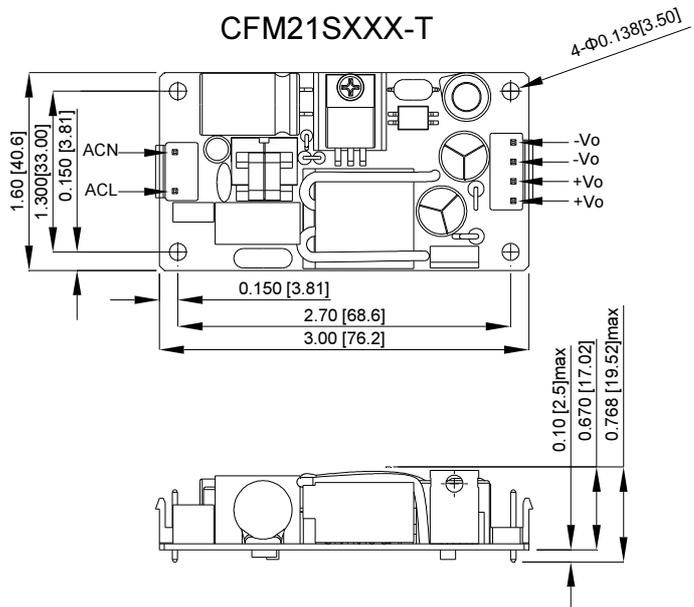
Annotations :

For all models, height does not exceed 34mm max.

CFM21SXXX



CFM21SXXX-T





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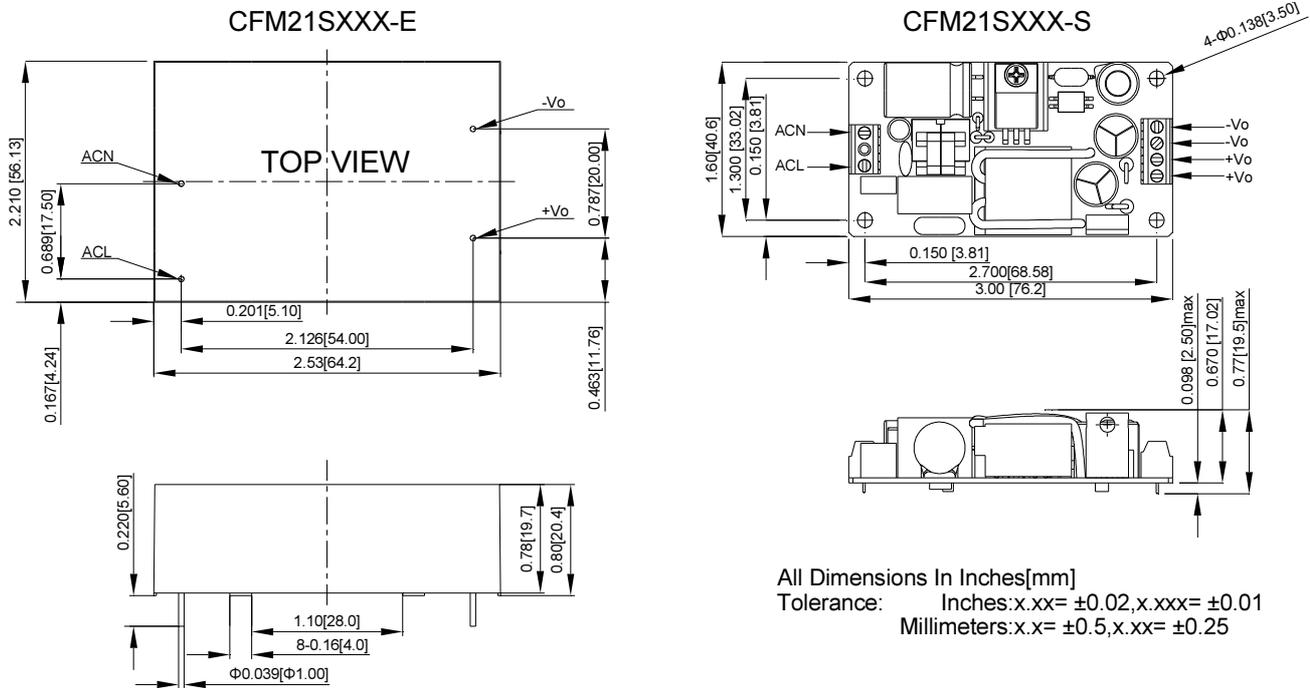


Figure 3. CFM21 series Mechanical Outline Diagram

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