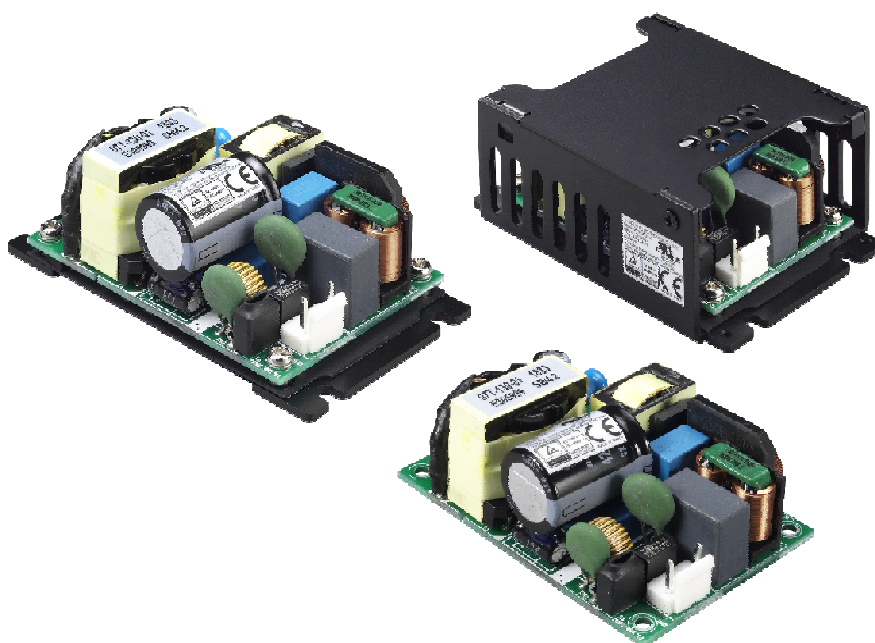




CFM130M Series

Application Note V11 March 2019

130W AC-DC Power Supply with PFC CFM130M Series APPLICATION NOTE



Approved By:

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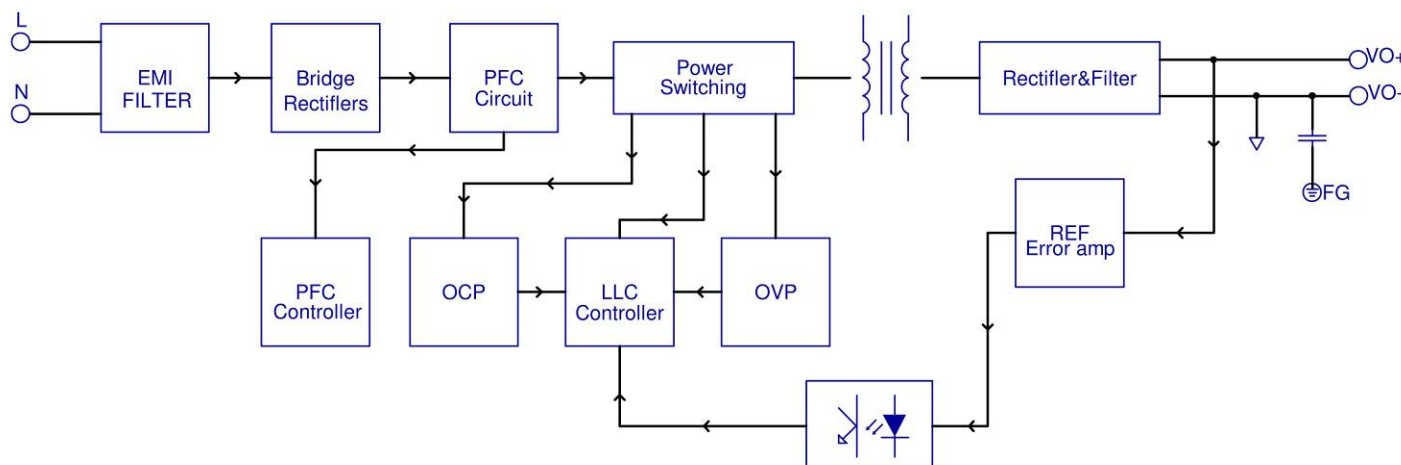
1. Introduction

This application note describes the features and functions of Cincon's CFM130M 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 CFM130M series power module is extremely reliable.

2. CFM130M Series Features

- Universal Input 80~264Vac
- 2"x 3" Open Frame Compact Size
- 100W with Natural Convection
- 130W with Fan-Cooled
- No Load Input Power Consumption<150mW
- Active PFC Function
- High Efficiency up to 94%
- Continuous Short Circuit Protection
- Meets 2 MOPP IEC/EN60335-1
- EMI Safety Meets Class I & Class II
- Operating Altitude 5000m

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)	See derating curve	All	80		264	Vac
Operating Temperature	See derating curve	All	-30		+70	°C
Storage Temperature		All	-40		+85	°C
Input/Output Isolation Voltage	1 minute	All	4000			Vac
Operating 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			1.8	A
Leakage Current (Earth)		All		260	300	uA
Leakage Current (Touch)		All		75	100	uA
Under Voltage Protection		All	55	62	70	V

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	Vin=Nominal Vin, Io=Io .max, Tc=25°C.	CFM130M120/-B/-C	11.76	12	12.24	Vdc
		CFM130M240/-B/-C	23.52	24	24.48	
		CFM130M360/-B/-C	35.28	36	36.72	
		CFM130M480/-B/-C	47.04	48	48.96	
Operating Output Current Range		CFM130M120/-B/-C			10.8	A
		CFM130M240/-B/-C			5.4	
		CFM130M360/-B/-C			3.6	
		CFM130M480/-B/-C			2.7	
Holdup Time	Vin=115Vac	All	20			ms

Output Voltage Regulation

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Load Regulation	20% load to full load	All			±1.0	%
Line Regulation	Vin=high line to low line	All			±0.5	%
Over Current Protection		All	150	170	190	%
Over Voltage Protection		CFM130M120/-B/-C		13.5		VDC
		CFM130M240/-B/-C		30		
		CFM130M360/-B/-C		42		
		CFM130M480/-B/-C		54		
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	CFM130M120/-B/-C			120	mVp-p
		CFM130M240/-B/-C			150	
		CFM130M360/-B/-C			360	
		CFM130M480/-B/-C			480	



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PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Load Capacitance	1. Input voltage is 115VAC and 230VAC 2. Output is max. load	CFM130M120/-B/-C CFM130M240/-B/-C CFM130M360/-B/-C CFM130M480/-B/-C			8400 4200 2720 2040	uF
Efficiency	1. Input voltage is 230VAC 2. Output is max. load	CFM130M120/-B/-C CFM130M240/-B/-C CFM130M360/-B/-C CFM130M480/-B/-C		93 93 94 94		%

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute (without dielectric breakdown)	All			4000	Vac
Input to Earth(Ground)	1 minute (without dielectric breakdown)	All			1500	Vac
Output to Earth(Ground)	1 minute (without dielectric breakdown)	All			500	Vac
Isolation Resistance		All	100			MΩ

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All		105		KHz

GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
MTBF	Io=100%; Ta=25°C per MIL-HDBK-217F	All	400			K hours
Weight		CFM130MXXX CFM130MXXX-B CFM130MXXX-C		135 170 218		g
Safety	Class I & Class II, IEC60601-1, EN60601-1, ANSI/AAMI ES60601-1				Ed 3.1	
EMC Emission	EN55011, Class B, IEC61000-3-2:2014, IEC61000-3-3:2013, FCC CFR 47 Part 18 Subpart C, Oct. 2015				Ed 4.0	
Conducted disturbance	EN55011, FCC CFR 47 Part 18				Class B	
Radiated disturbance	EN55011, FCC CFR 47 Part 18 Class I,(Class II see Section 7.5)				Class B	
Harmonic current emissions	IEC 61000-3-2:2014				Class A, Class D	
Voltage fluctuations & flicker	IEC 61000-3-3:2013				Criteria A	
EMC Immunity	IEC61000-4-2, 3, 4, 5, 6, 8, 11					
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2010				Criteria A	
Electrical fast transient (EFT)	IEC 61000-4-4:2012, ±2kv				Criteria A	
Surge	IEC 61000-4-5:2014, L-N: ±1kv, L-PE, N-PE: ±2kv				Criteria A	
Conducted disturbances, induced by RF fields	IEC 61000-4-6:2013				Criteria A	
Power frequency magnetic field	IEC 61000-4-8:2009				Criteria A	
Voltage dips	IEC 61000-4-11:2004, Dip: 30% 500ms, Dip: 60% 100ms, Dip >95% 10ms				Criteria A	
Voltage interruptions	IEC 61000-4-11:2004, >95% 5000ms				Criteria B	
Voltage interruptions	IEC 61000-4-11:2004, >95% 5000ms					



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5. Main Features and Functions

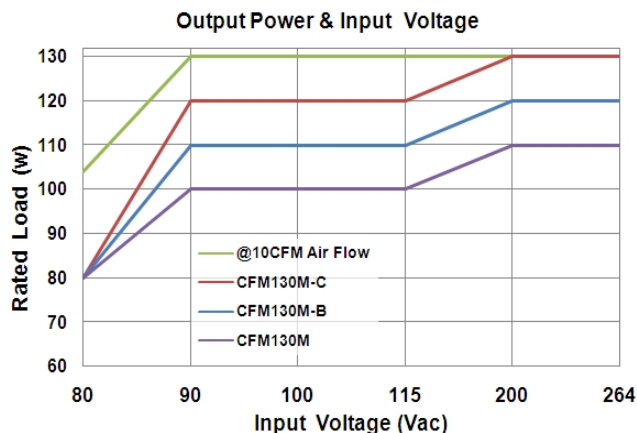
5.1 Operating Temperature Range

The highly efficient design of Cincon's CFM130M 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)
- 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 150% to 190% of rated current.



6. EMC & Safety

■ Emission and Immunity (Ed. 4.0)

EN55011 Class B, IEC61000-3-2)

EC61000-3-3, FCC Part 18 Class B, IEC61000-4-2

IEC61000-4-3, IEC61000-4-4, IEC61000-4-5

IEC61000-4-6, IEC61000-4-8, IEC61000-4-11

■ Safety (Ed. 3.1)

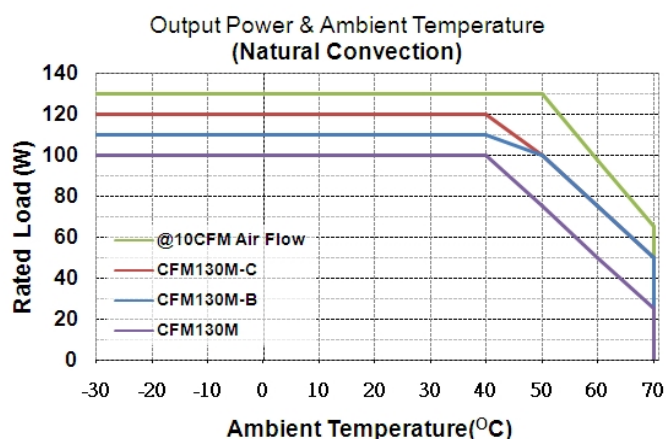
Class I, Class II, IEC60601-1, EN60601-1

UL ANSI/AAMI ES60601-1

7. Applications

7.1 Power De-Rating Curve

CFM130M Series Derating Curve





CFM130M Series

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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 CFM130M 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:

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

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.

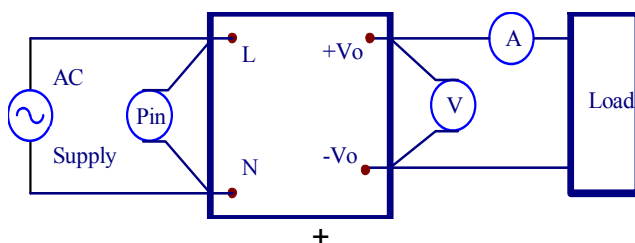


Figure 1. CFM130M Series Test Setup

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 $C2=0.1\mu F$ ceramic capacitor and a $C1=10\mu F$ electrolytic capacitor to output at 20 MHz Band Width.

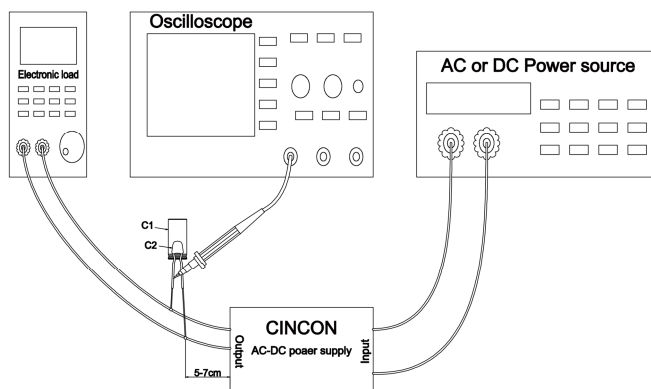
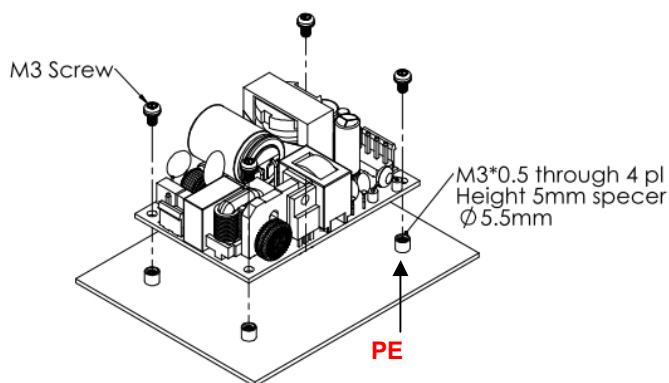


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

7.4 Installation Instruction

The CFM130M series has four 3.2mm diameter mounting holes. There are three type installations for CFM130M. Please use the mounting holes as follows: Insert the spacer (5.5mm diameter max.) of 5mm height or more to mount the unit.



CFM130MXXX Installation Diagram

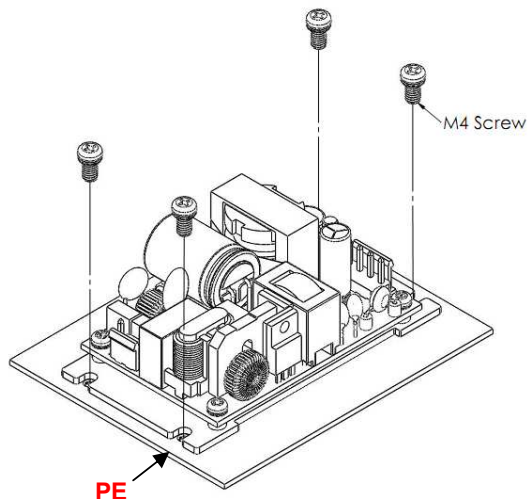
Note: M3 screw head and washer diameter shall not exceed 5.5mm.



CFM130M Series

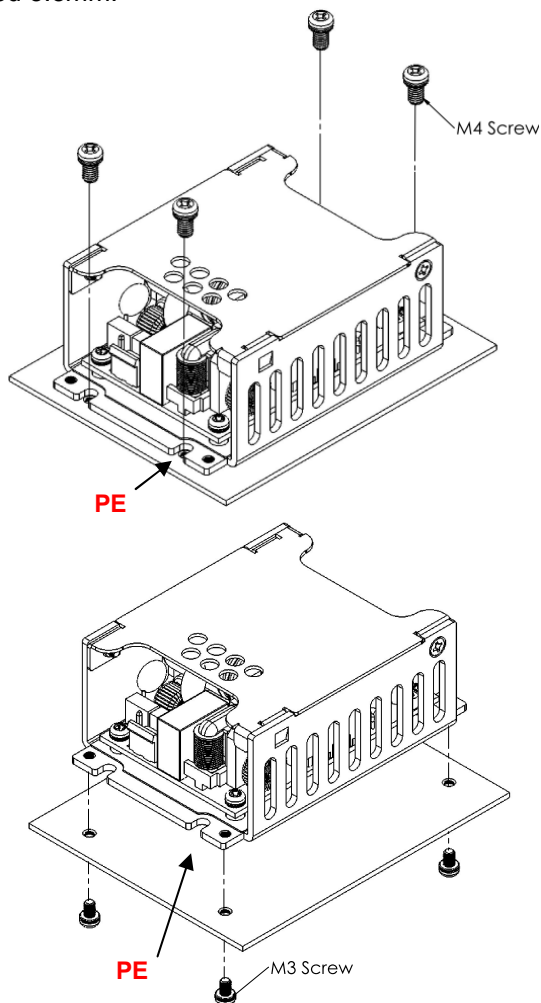
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The CFM130M series provide the baseplate cooling for customer to increasing heat dissipation. Please refer to the following figure for installation.



CFM130MXXX-B installation diagram

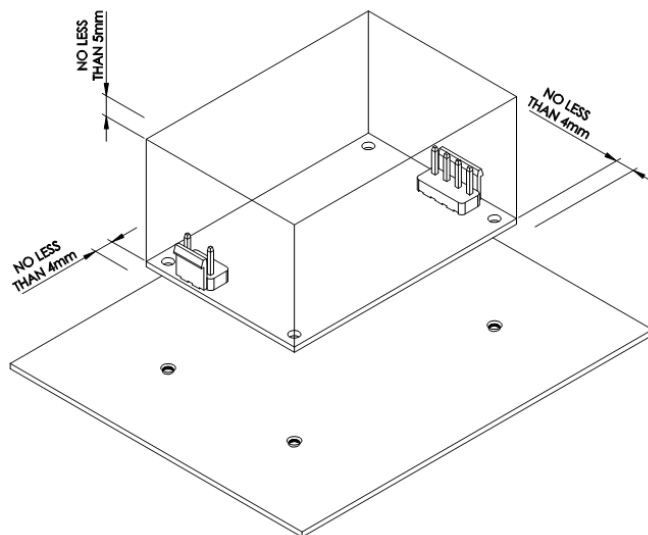
Note: M4 screw head and washer diameter shall not exceed 5.5mm.



CFM130MXXX-C installation diagram

Note: M3&M4 screw head and washer diameter shall not exceed 5.5mm

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 5mm 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.

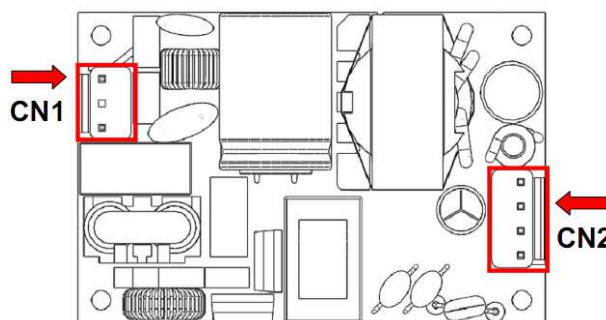


FG should be connected to the earth (ground) terminal of the apparatus. If not the conducted noise and output noise will increase.

7.5 EMI Test

The CFM130M series Conductive EMI meets EN55011 Class B when test condition is Class I & Class II. Radiation meet EN55011 Class B when test condition is Class I. Radiation meet EN55011 Class A when test condition is Class II.

7.6 Mating Connectors



AC Input (CN1)	Wafer: TAIWAN KING PIN TERMINAL
DC Output (CN2)	PVHI series or equivalent.
	Housing: JST VHR series or equivalent.



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8. Part Number

CFM 130 M XXX - X

Blank: WAFER
B: Base Cooling
C: with Cover

M: Medical

130:
Supply Max. Power

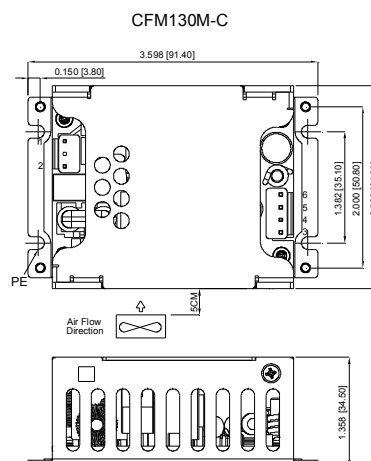
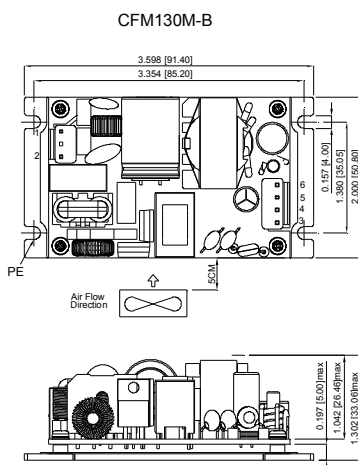
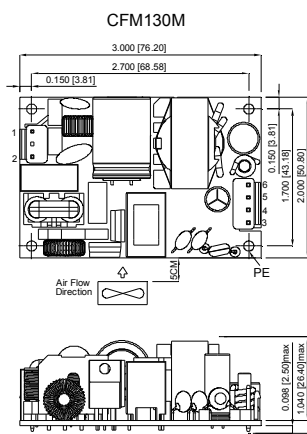
CFM SERIES

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

9. CFM130M Series Mechanical Outline Diagrams

9.1. Mechanical Outline Diagrams

All Dimensions in Inches(mm)
Tolerance Inches:x.xxx= ± 0.02
Millimeters: x.xx = ± 0.5



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

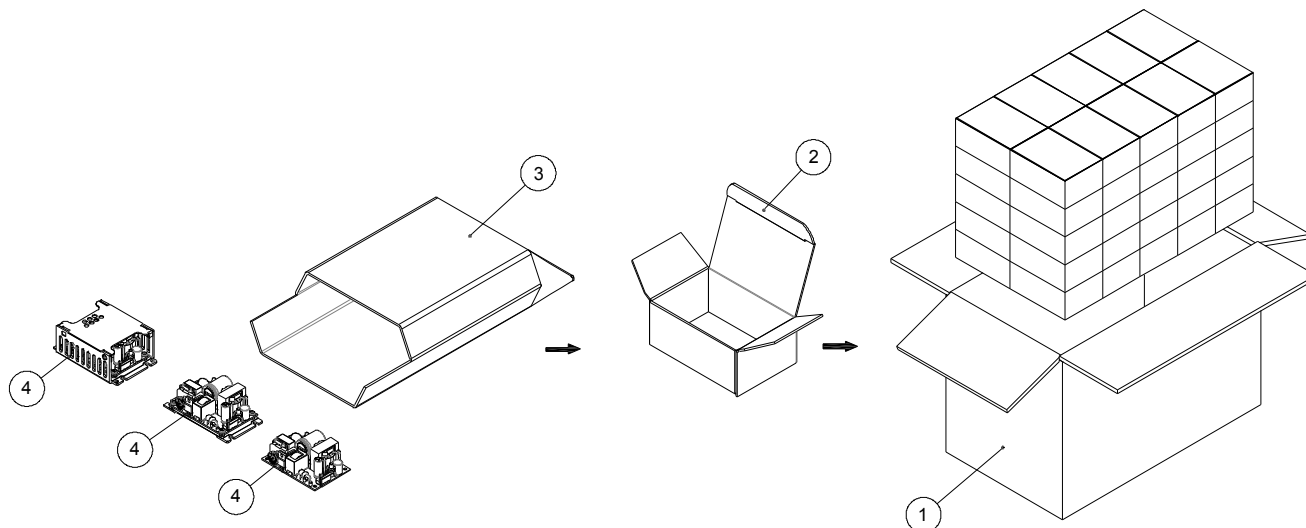


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9.2. Packing Information

The packing information for CFM130M series is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM(mm)	PCS
1	G64112341	No.159 Cardboard Box	454.5*266.6*312.1mm	1
2	G64214315	White inner Box	12.5*8.6*5.5cm	50
3	G64F00006	Anti-Static Bag	155*185*65mm	50
4	-	CFM130MXXX or CFM130MXXX-B or CFM130MXXX-C Product		50

Each Box Packaging 50PCS Products

CFM130MXXX
Gross weight Ref. 9.3 Kg
Net weight Ref. 6.8 Kg

CFM130MXXX-B
Gross weight Ref. 11 Kg
Net weight Ref. 8.5 Kg

CFM130MXXX-C
Gross weight Ref. 12.5 Kg
Net weight Ref. 10.9 Kg

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