



CFM150M Series

Application Note V10 August 2020

AC-DC Switching Power Module CFM150M Series APPLICATION NOTE



Approved By:

Department	Approved By	Checked By	Written By
Research and Development Department	Enoch	Yang	Horard
		Ovid	
Quality Assurance Department	Ryan	Benny	



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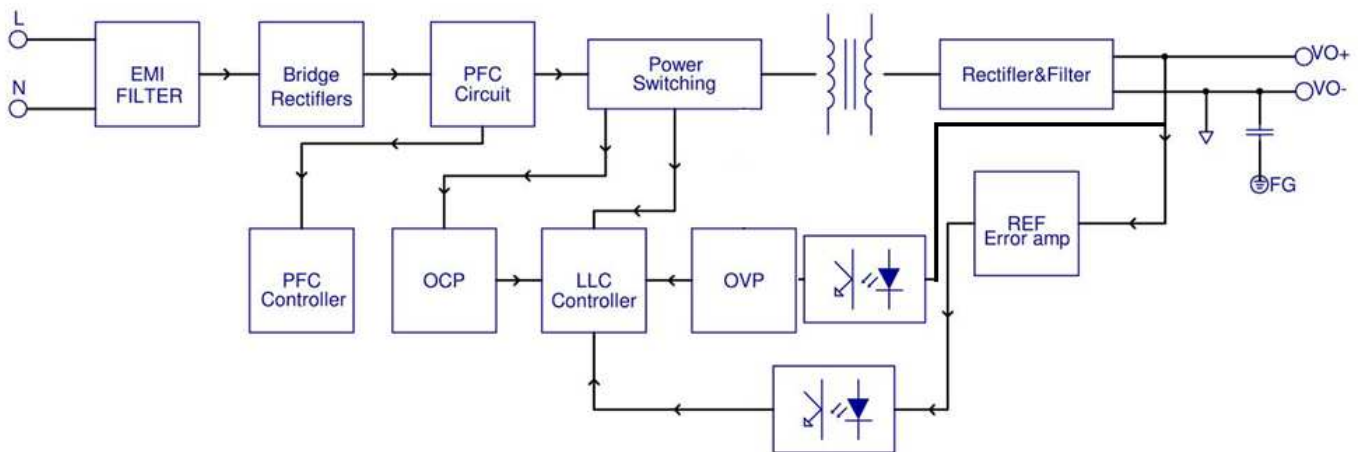
1. Introduction

This application note describes the features and functions of Cincon's CFM150M 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 CFM150M series power module is extremely reliable.

2. CFM150M Series Features

- Universal Input Range 90 ~ 264VAC
- Medical and ITE Safeties
- 3"x 5" Compact Size
- Less than 1 U high : 1.05"
- Industry Standard Pin Out
- Active PFC Meets EN61000-3-2
- High Efficiency up to 93%
- Meets CISPR/FCC Class B
- Remote Voltage Sense
- Over Voltage Protection
- Continuous Short Circuit Protection
- No load Power Consumption <0.5W

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		All	90		264	Vac
			120		370	Vdc
Operating Temperature	See derating curve	All	-20		+70	°C
Storage Temperature		All	-20		+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	100		240	Vac
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Load, Vin=100Vac	All			2	A
Leakage Current		All			300	uA
Inrush Current	Vin=240Vac, cold start at 25°C.	All			110	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.	CFM150M120	11.4	12	12.6	Vdc
		CFM150M240	22.8	24	25.2	
		CFM150M360	34.2	36	37.8	
		CFM150M480	45.6	48	50.4	
Operating Output Current Range		CFM150M120			12.5	A
		CFM150M240			6.25	
		CFM150M360			4.17	
		CFM150M480			3.13	
Holdup Time	Vin=115Vac	All		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 Voltage Protection	uses a TVS component to clamp output voltage	CFM150M120			16.9	Vdc
		CFM150M240			32.4	
		CFM150M360			48.6	
		CFM150M480			64.8	
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	CFM150M120			120	mVp-p
		CFM150M240			240	
		CFM150M360			360	
		CFM150M480			480	



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PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Load Capacitance	1. Ambient temperature=25°C 2. Input voltage is 115VAC and 230VAC 3. Output is max. load	CFM150M120			12620	uF
		CFM150M240			6600	
		CFM150M360			4340	
		CFM150M480			3190	
Efficiency	Output is Rated Load Ambient temperature=25°C	CFM150M120		90		%
		CFM150M240		92		
		CFM150M360		92		
		CFM150M480		93		

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			5656	Vdc
Input to Earth (Ground)	1 minute	All			2121	Vdc
Output to Earth (Ground)	1 minute	All			2121	Vdc
Isolation Resistance		All	100			MΩ

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All		90		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°C per MIL-HDBK-217F	CFM150M120	100			K hours
		CFM150M240	100			
		CFM150M360	100			
		CFM150M480	100			
Weight		All		270		g



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GENERAL SPECIFICATIONS

Safety	Class I, IEC60601-1, EN60601-1, ANSI/AAMI ES60601-1	Medical Ed. 3.1
	EN 60950-1, IEC 60950-1, UL60950-1	
EMC Emission	EN55011 Class B, EN 61000-3-2, EN 61000-3-3, FCC CFR 47 Part 15	Medical Ed. 4.0
	EN55032 Class B, EN 61000-3-2, EN 61000-3-3, EN 61000-6-1, EN 61000-6-3 EN 61204-3, FCC CFR 47 Part 15	
Conducted Disturbance	EN55011, EN55032, FCC CFR 47 Part 15 Class B	
Radiated Disturbance	EN55011, EN55032, FCC CFR 47 Part 15 Class B	
Harmonic Current Emissions	IEC 61000-3-2:2014	
Voltage Fluctuations & Flicker	IEC 61000-3-3:2013	
EMC Immunity	IEC 61000-4-2, 3, 4, 5, 6, 8, 11	
Radio-Frequency	IEC 61000-4-3:2010	
Continuous Radiated Disturbance		
Electrical fast transient (EFT)	IEC 61000-4-4:2012, $\pm 2\text{kv}$	
Surge	IEC 61000-4-5:2014, L-N: $\pm 1\text{kv}$, L-PE, N-PE: $\pm 2\text{kv}$	
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	



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5. Main Features and Functions

5.1 Operating Temperature Range

The highly efficient design of Cincon's CFM150M series power modules has resulted in their ability to operate within ambient temperature environments from -20°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 Voltage Adjustment

The Output voltage on all models is in the range from +5% to -5% but can't exceed the watt value of the products.

5.3 Over Current Protection

All different voltage models have a 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 operates normally once the fault condition is removed. The power module will supply up to 150% of rated current. In the event of an over current converter will go into a hiccup mode protection.

6. EMC & Safety

■ Emission and Immunity

Medical(Ed. 4.0):

EN55011, EN55032 Class B, IEC61000-3-2
 EC61000-3-3, FCC CFR 47 Part 15, IEC61000-4-2
 IEC61000-4-3, IEC61000-4-4, IEC61000-4-5
 IEC61000-4-6, IEC61000-4-8, IEC61000-4-11

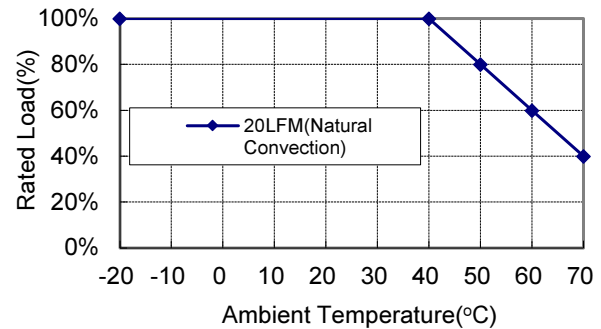
■ Safety

Medical(Ed. 3.1):

Class I, IEC/EN 60601-1, ANSI/AAMI ES60601-1
 I.T.E:
 IEC/EN/UL 60950-1

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 CFM150M 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:

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

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:

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

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.



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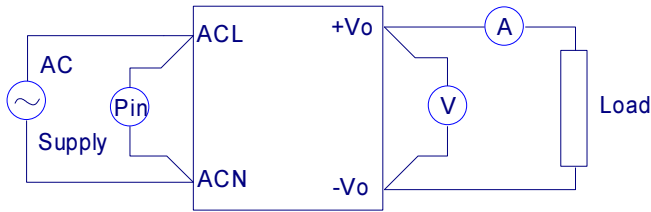


Figure 1. CFM150M Series Test Setup

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

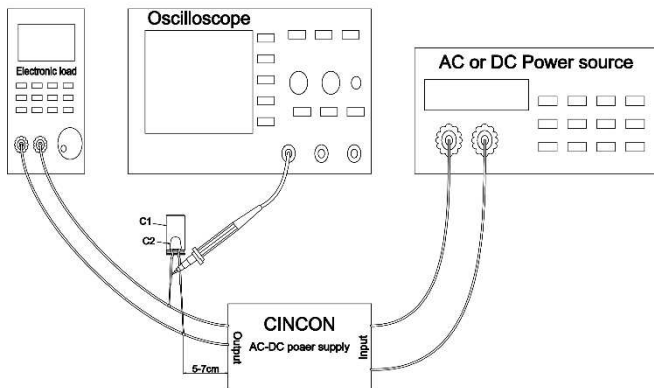


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

7.4 Remote Sense

The CFM150M series has the capability to remotely sense both lines of its output. This feature moves the effective output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the CFM150M series.

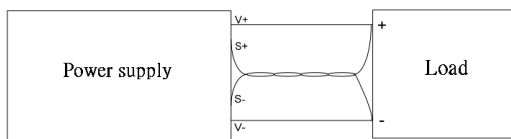


Figure 3

7.4 Installation Instruction

Please use the mounting hold as:

CFM150M: 4 holds of $\varnothing 3.2$

And insert the spacer (Max $\varphi 6$) of height over 8mm to lift the unit. The vibration spec. is the value take when the unit is raised by 8mm spacers.

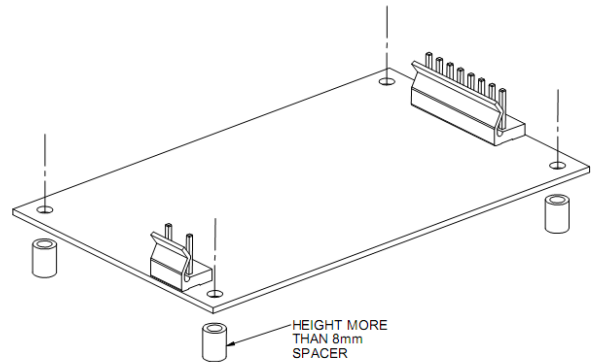


Figure 4

Please reserve 4mm space from the surfaces and the sides of PCB, especially from the solder surface, 8mm space is necessary. If the space is not enough, the specification of insulation and withstand will not be satisfied.

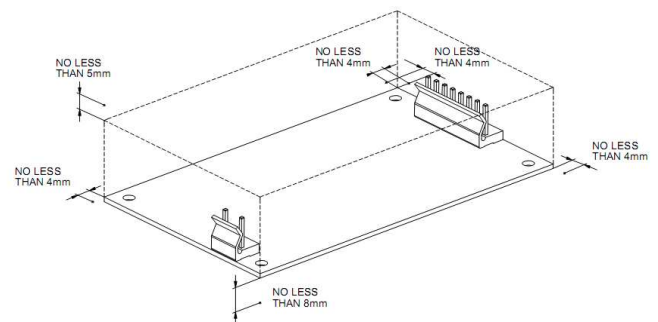


Figure 5

PE should be connected to the earth terminal of the apparatus. If not, the conducted noise and output noise will increase.

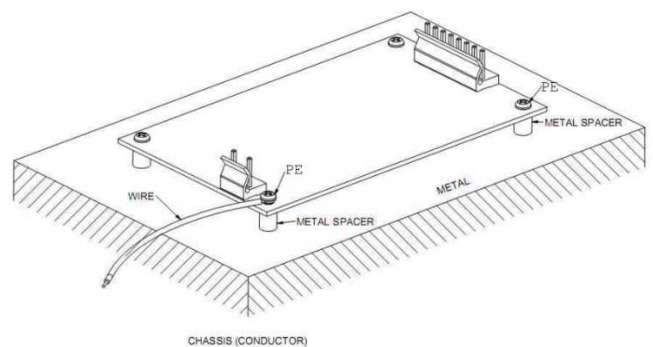


Figure 6

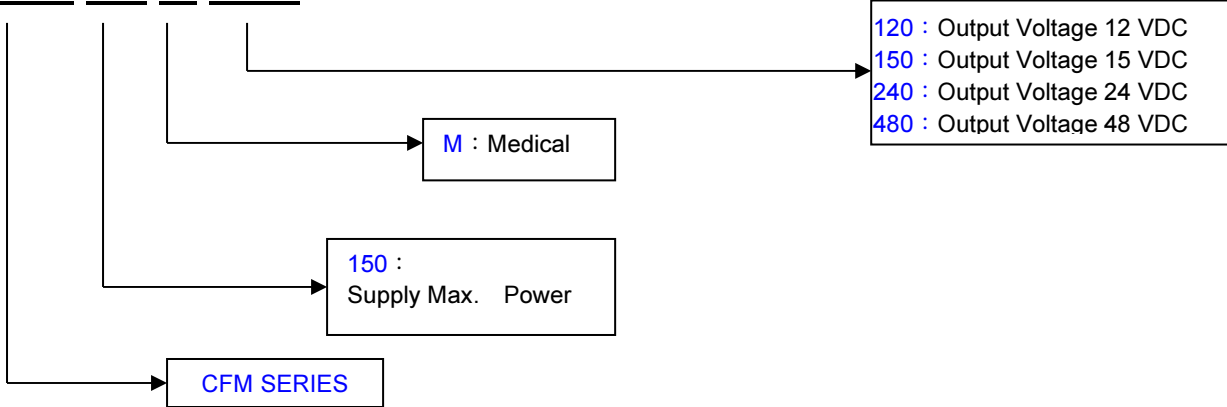


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8. Part Number

CFM XX M XXX



9. CFM150M Series Mechanical Outline Diagrams

9.1. Mechanical Outline Diagrams

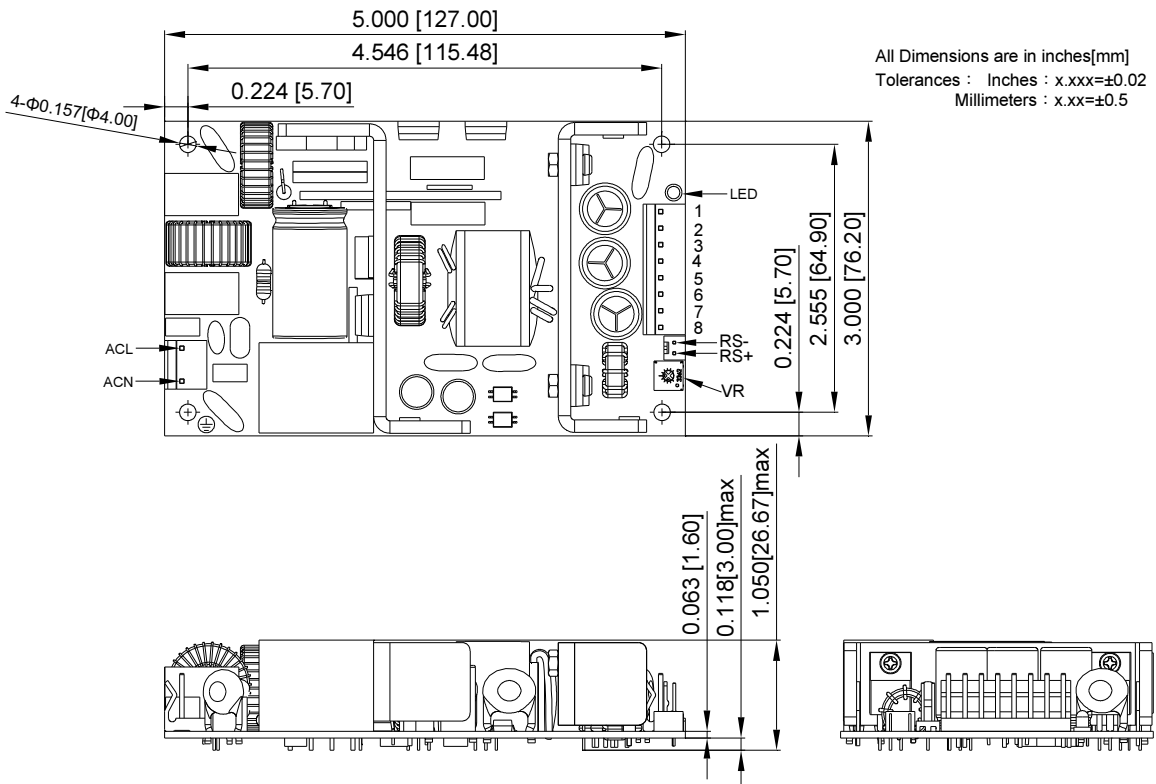


Figure 7. CFM150M series Mechanical Outline Diagram

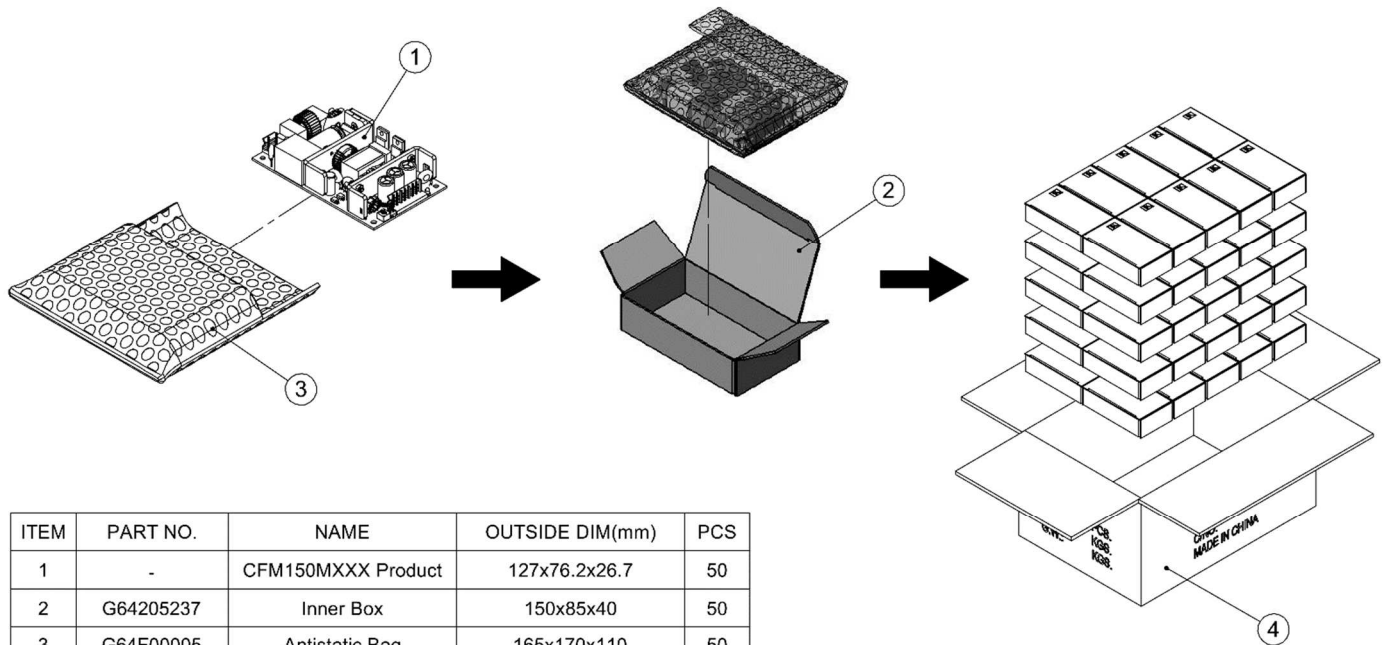


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9.2. Packing Information

The packing information for CFM150MXXX series is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM(mm)	PCS
1	-	CFM150MXXX Product	127x76.2x26.7	50
2	G64205237	Inner Box	150x85x40	50
3	G64F00005	Antistatic Bag	165x170x110	50
4	G64112340	No. 67 Cardboard Box	454.5x318.2x230.3	1

Each Box Packaging 50 PCS Products
Gross weight Ref. 16 Kg

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>

CINCON ELECTRONICS CO., LTD.

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