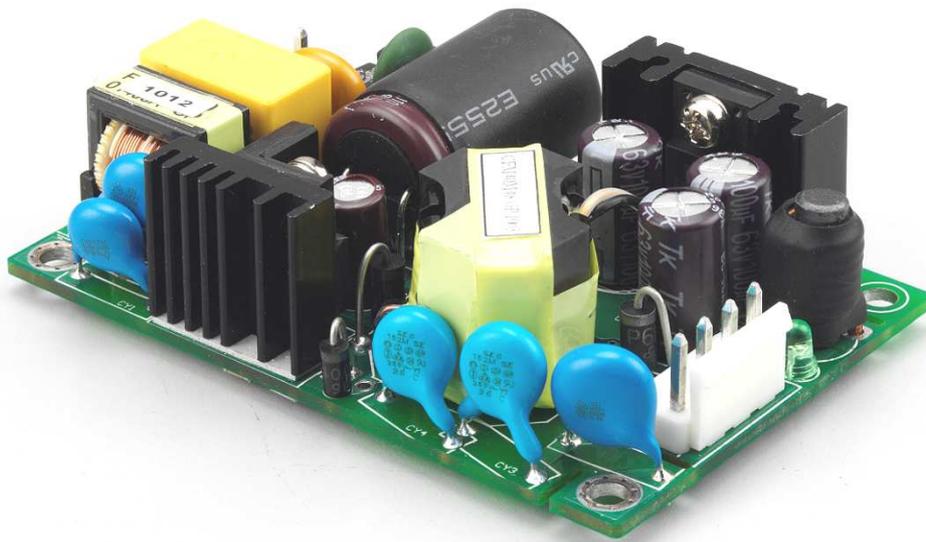




# CFM40M Series

## Application Note V12 June 2020

### AC-DC Switching Power Module CFM40M Series APPLICATION NOTE



Approved By:

Department	Approved By	Checked By	Written By
Research and Development Department	Enoch	Calvin	Moya
		Ovid	
Quality Assurance Department	Ryan	Benny	



# CFM40M Series

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### 1. Introduction

This application note describes the features and functions of Cincon's CFM40M series of open frame, Isolated AC-DC Converters. These are highly efficient, reliable and compact, high power density, single output AC/DC converters. The modules are fully protected against short circuit conditions. Cincon's world class automated manufacturing methods, together with an extensive testing and qualification program; ensure that all CFM40M series converters are extremely reliable.

### 2. CFM40M Series Features

- Universal Input Range 90~264VAC
- Efficiency to 88% Typical
- Continuous Short Circuit Protection
- No Load Power Consumption<0.3W
- 2"X3" Size
- Meets 2 MOPP
- Medical and ITE Approved
- Meets IEC/EN60335-1
- Meets EN55011 and EN55032 Class B

### 3. General Description

A block diagram of the CFM40M series converter is shown in Figure 1. Extremely high efficiency power conversion is achieved through the use of synchronous rectification and drive techniques. Essentially, the powerful CFM40M series topology is based on flyback converter. The control loop is optimized for unconditional stability, fast transient response and a very tight line and load regulation.

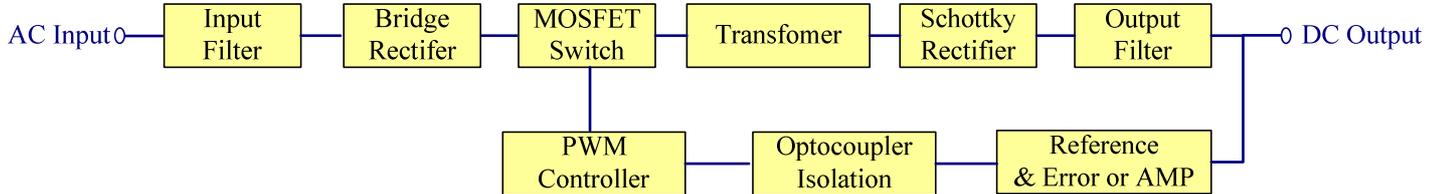


Figure1. Electrical Block Diagram



# CFM40M Series

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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	3 seconds	All	4000			Vac

### 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	A
No Load Input Power		All			0.3	W
Leakage Current		All			0.1	mA
Inrush Current	Vin=240Vac, cold start at 25°C.	All			60	A

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	Vin=100Vac or 240Vac, Io=Io.max, Tc=25°C.	CFM40M033	3.267	3.3	3.33	Vdc
		CFM40M050	4.95	5	5.05	
		CFM40M090	8.91	9	9.09	
		CFM40M120	11.88	12	12.12	
		CFM40M150	14.85	15	15.15	
		CFM40M240	23.76	24	24.24	
		CFM40M300	29.7	30	30.3	
		CFM40M360	35.64	36	36.36	
Operating Output Current Range		CFM40M033			6	A
		CFM40M050			6	
		CFM40M090			4.45	
		CFM40M120			3.34	
		CFM40M150			2.67	
		CFM40M240			1.67	
		CFM40M300			1.33	
		CFM40M360			1.11	
CFM40M480			0.834			
Holdup Time	Vin=115Vac	All		10		ms
Output Voltage Regulation						
Load Regulation	10% load to full load	All			±1.0	%
Line Regulation	Vin=240Vac to 100Vac	All			±0.5	%



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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	CFM40M033			50	mVp-p
		CFM40M050			50	
		CFM40M090			90	
		CFM40M120			120	
		CFM40M150			150	
		CFM40M240			240	
		CFM40M300			300	
		CFM40M480			480	
Load Capacitance	Vin=Nominal Vin at Full load	CFM40M033			6000	uF
		CFM40M050			6000	
		CFM40M090			4400	
		CFM40M120			3400	
		CFM40M150			2600	
		CFM40M240			1600	
		CFM40M300			1300	
		CFM40M480			840	
Output Current Limit	Output Voltage=90% Nominal Output Voltage	All	130	140	170	%
Output Voltage Protection TVS Clamp		All	120	130	140	%
Turn-On Transient						
Start Up Time from Input	Vin=115Vac	All			1	s

### Efficiency

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
100% Load	Vin=230Vac	CFM40M033		76		%
		CFM40M050		80		
		CFM40M090		84		
		CFM40M120		86		
		CFM40M150		87		
		CFM40M240		88		
		CFM40M300		88		
		CFM40M480		88		

### ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			4000	Vac
Input to Earth(Ground)	1 minute	All			1500	Vac
Output to Earth(Ground)	1 minute	All			1500	Vac
Isolation Resistance		All	100			MΩ

### FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Switching Frequency		All		65		KHz



# CFM40M Series

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### GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
MTBF	Io=100%; Ta=25°C per MIL-HDBK-217F	All	200			k hours
Weight		All		90		g
EMI	EN55032, EN55011, FCC PART15 &18 meets Class B					
Radio-frequency field strength immunity	IEC61000-4-3:2010					
Electrical Fast Transient	IEC61000-4-4:2012 ±2kV					
Surge	IEC61000-4-5:2014 Line to Line ±1kV, Line to Earth ±2kV					
Conducted disturbances, induced by RF fields	IEC61000-4-6:2013					
Power frequency magnetic field	IEC61000-4-8:2009					
Voltage dips	IEC61000-4-11:2004					
Voltage interruptions	IEC61000-4-11:2004					



# CFM40M Series

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### 5. Main Features and Functions

#### 5.1 Operating Temperature Range

Cincon's CFM40M series converters highly efficient converter design has resulted in its ability to operate ambient temperature environment (-20°C to 70°C). Due consideration must be given to the de-rating curves when ascertaining maximum power that can be drawn from the converter. The maximum power drawn is influenced by a number of factors, such as:

- Input voltage range
- Output Current
- These can effective heat sinks for the converter

#### 5.2 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.

#### 5.3 Over Voltage Protection

All different voltage models have a TVS component to clamp output voltage, when output voltage greater than breakdown voltage.

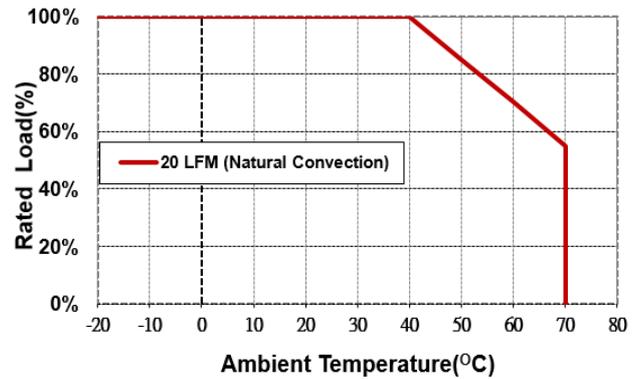
### 6. Safety

- IEC60601-1;2005
- EN60601-1;2006
- UL ANSI/AAMEI ES60601-1:2005
- IEC60950-1
- EN60950-1
- UL60950-1

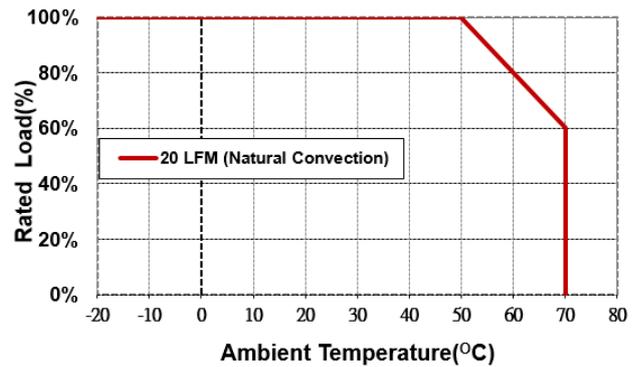
### 7. Applications

#### 7.1 Power De-Rating Curve

CFM40M050



CFM40M033, 090, 120, 240, 300, 360, 480

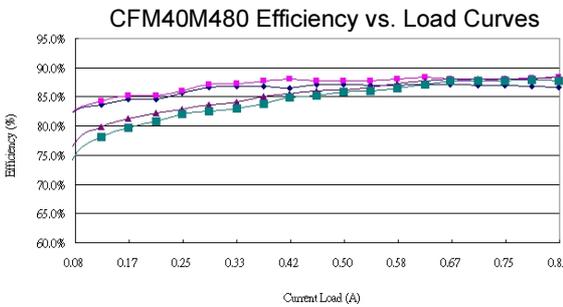
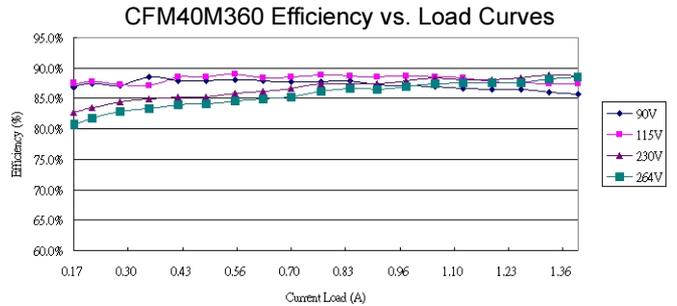
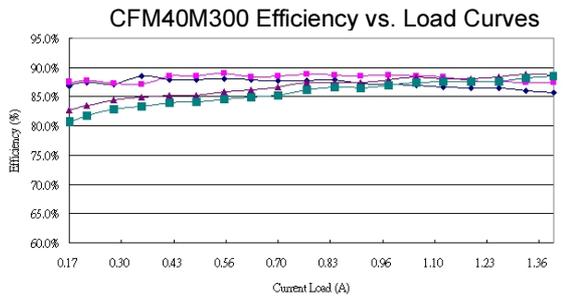
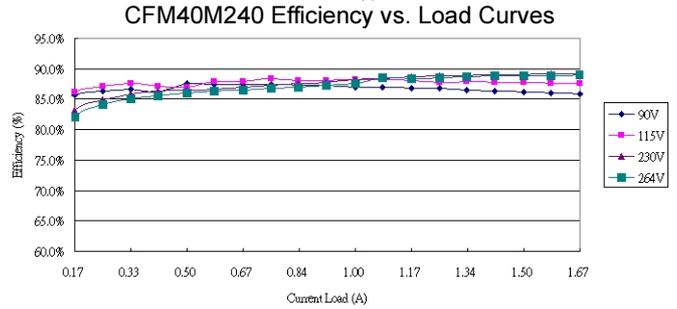
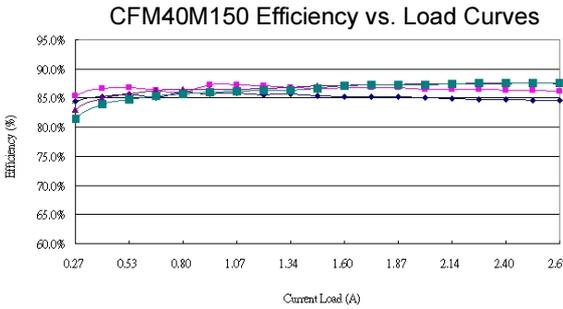
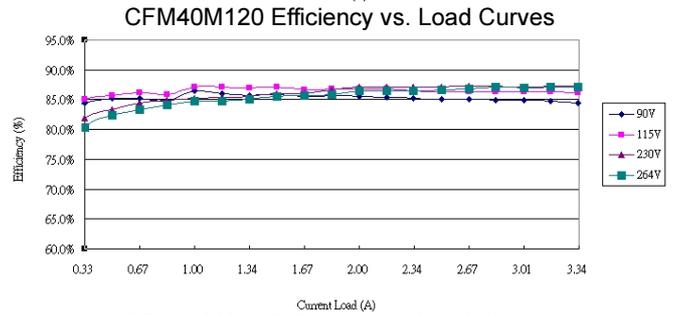
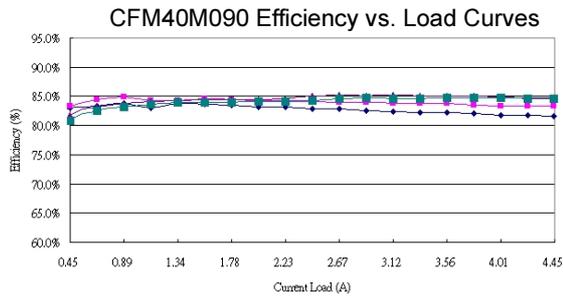
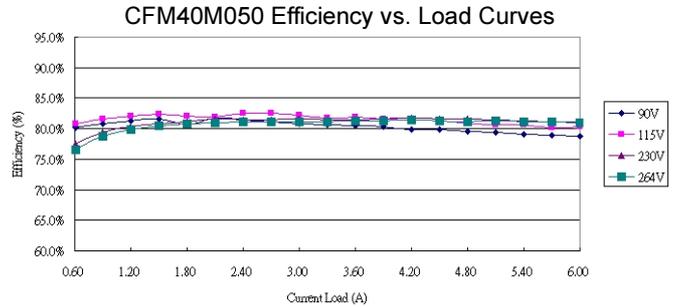
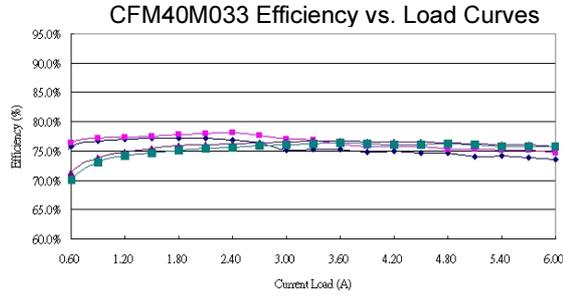




# CFM40M Series

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### 7.2 Efficiency vs. Load Curves





# CFM40M Series

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### 7.3 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown in Figure 2. When testing the Cincon's CFM40M 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<sub>FL</sub> is the output voltage at full load
- V<sub>NL</sub> 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<sub>HL</sub> is the output voltage of maximum input voltage at full load.
- V<sub>LL</sub> is the output voltage of minimum input voltage at full load.

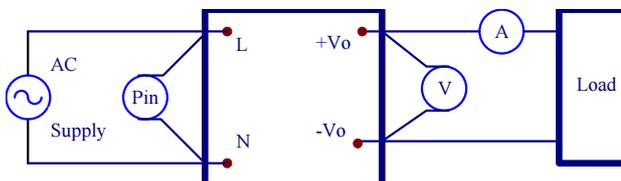
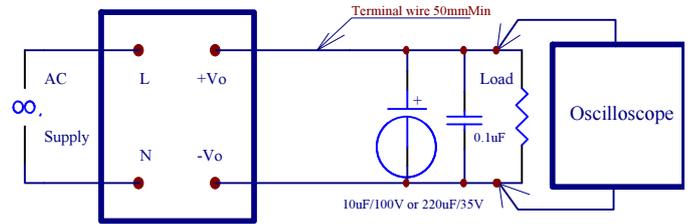


Figure 2. CFM40M Series Test Setup

### 7.4 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 3. Measured method:

Add a terminal wire is 50mm MIN that the output end needs to connect the sub length of line of one end.



CFM100 Series

Figure 3. Output Voltage Ripple and Noise Measurement Set-Up

### 7.5 Output Capacitance

Cincon's CFM40M series converters provide unconditional stability with or without external capacitors. Cincon's converters are designed to work with load capacitance up-to 1000F per amp.

### 7.6 EMI

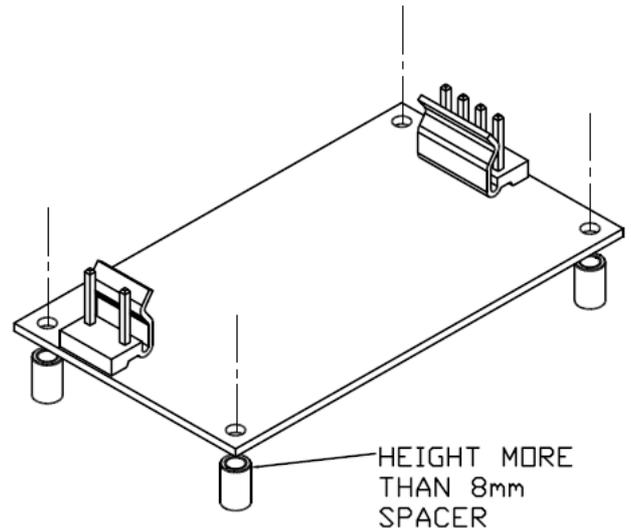
■ Conductive EMI meets CISPR/FCC Class B

### 8. Installation Instruction

Please use the mounting hold as:

CFM40M series: 4 holds of  $\phi$  3.17

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

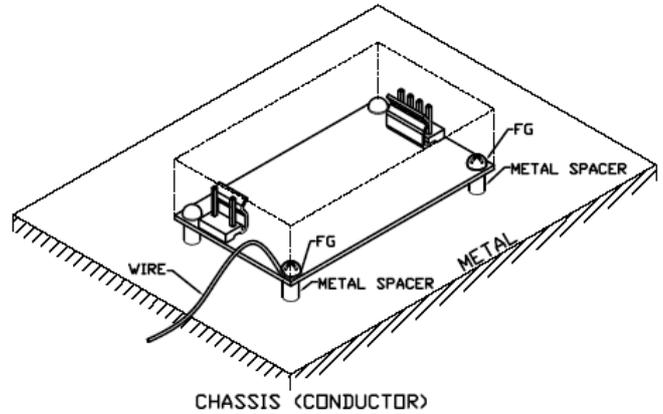
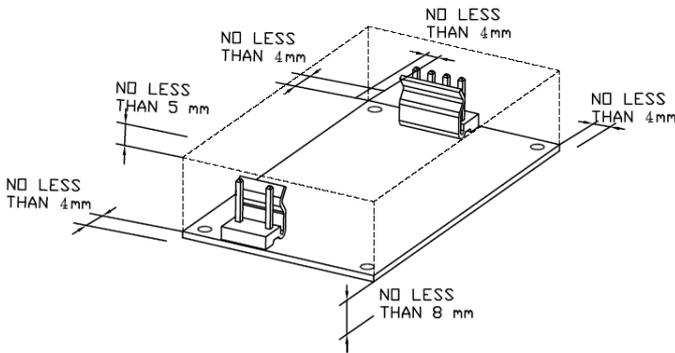


Please reserve 4mm space from the surfaces and the sides of PCB, especially from the solder surface, 8mm space is necessary. If the space is not enough, the specification of insulation and withstand will not be satisfied.



# CFM40M Series

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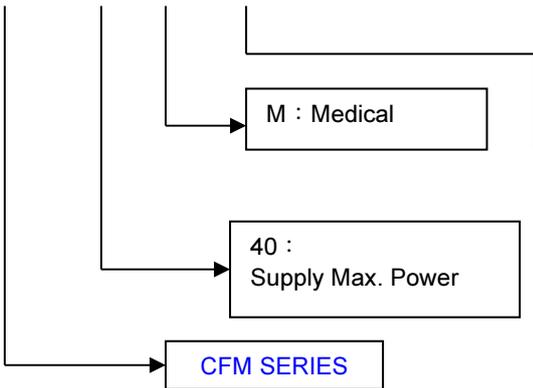


FG should be connected to the earth terminal of the apparatus. If not, the conducted noise and output noise will increase.

### 9. Part Number

**CFM XX M XXX - X**

None: Open Frame PCB Mount  
P: PCB Mount Type



- 033 : Output Voltage 3.3 VDC
- 050 : Output Voltage 5.0 VDC
- 090 : Output Voltage 9.0 VDC
- 120 : Output Voltage 12 VDC
- 150 : Output Voltage 15 VDC
- 240 : Output Voltage 24 VDC
- 300 : Output Voltage 30 VDC
- 360 : Output Voltage 36 VDC
- 480 : Output Voltage 48 VDC



# CFM40M Series

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### 10. CFM40M Series Mechanical Outline Diagrams

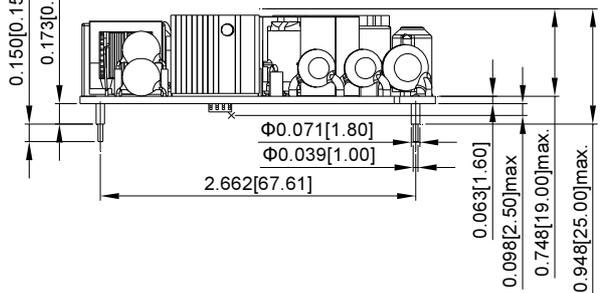
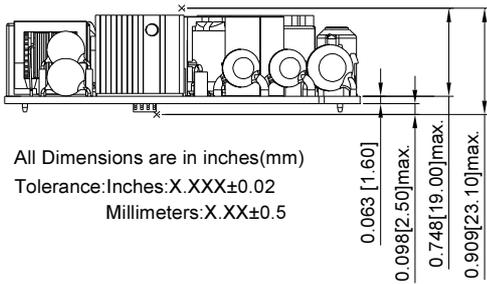
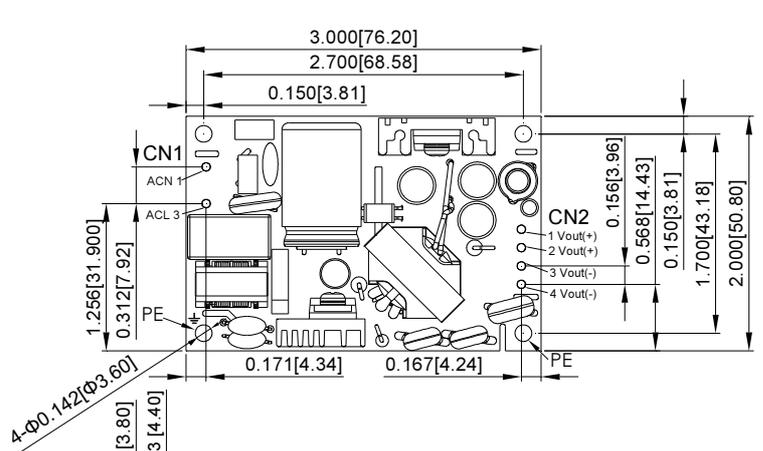
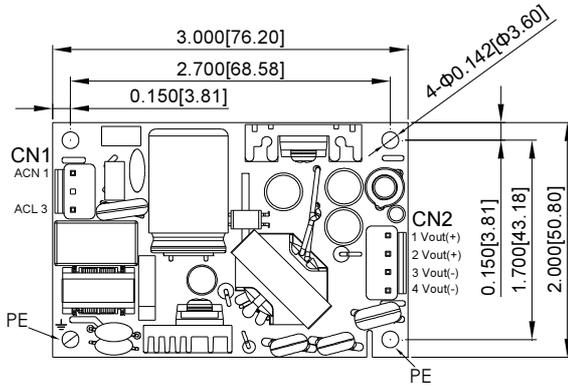
#### 10.1. Mechanical Outline Diagrams

Annotations :

For all models, height does not exceed 23.1mm max.

CFM40MXXX

CFM40MXXX-P



All Dimensions are in inches(mm)  
Tolerance: Inches: X.XXX±0.02  
Millimeters: X.XX±0.5

CFM40MXXX-C

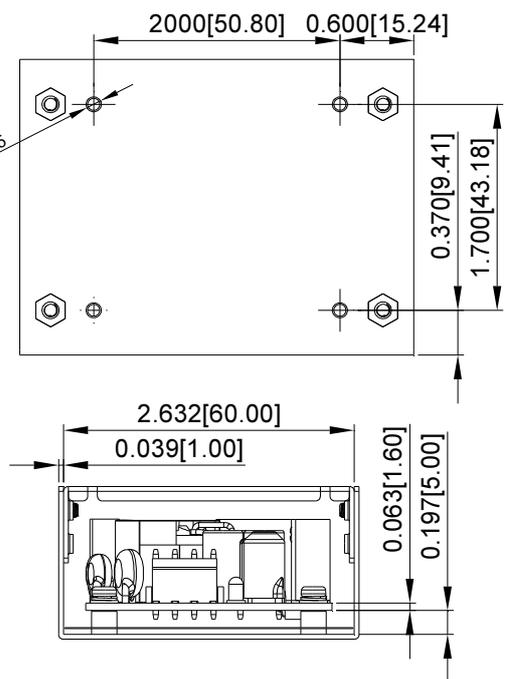
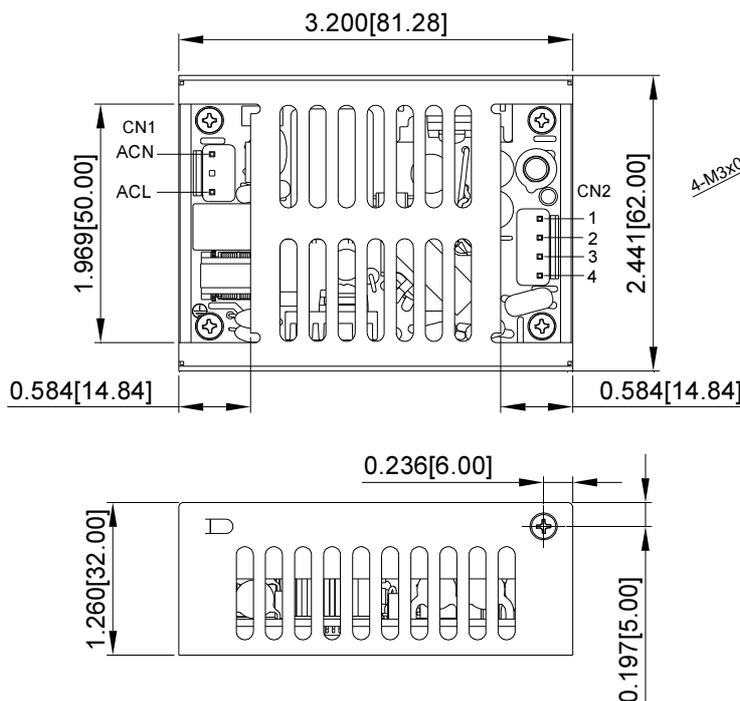


Figure 3. CFM40M series Mechanical Outline Diagram

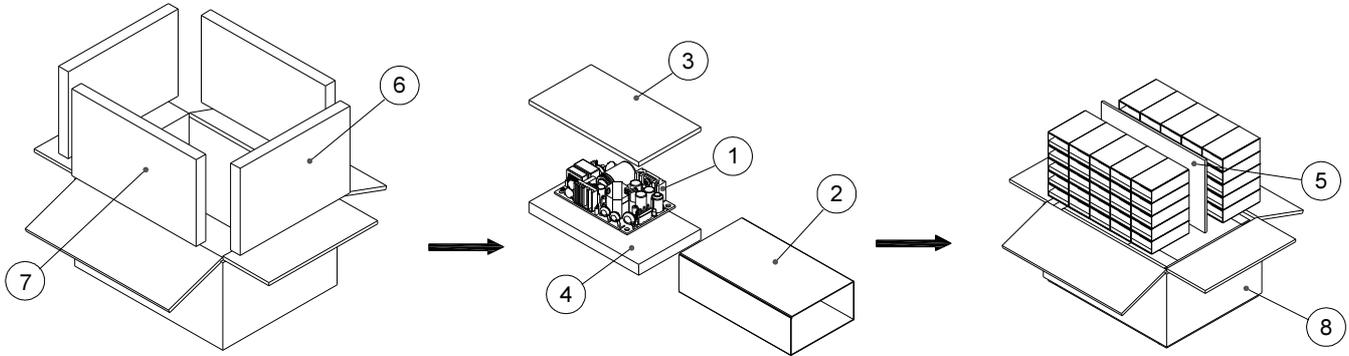


# CFM40M Series

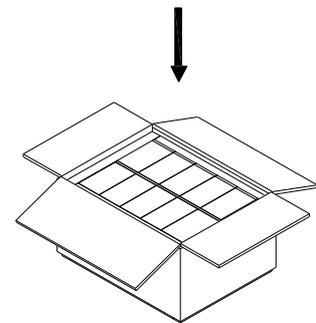
## Application Note V12 June 2020

### 10.2. Packing Information

The packing information for CFM40M SERIES is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM	PCS
1		CFM40MXXX Product	76.2x50.8x23.1mm	50
2	G64304165	Inner Box	115x65x35mm	50
3	G64308313	Antistatic Foam	115x65x5.5mm	50
4	G64308312	Antistatic Foam	115x65x10mm	50
5	G64U10075	Partition	326x200x6mm	1
6	G64301115	Antistatic Foam	288x200x25mm	2
7	G64301114	Antistatic Foam	326x200x25mm	2
8	G64114347	No.149 Cardboard Box	388x300x220mm	1



Each Box Packaging 50 PCS Products  
 Net weight Ref. 4.5 Kg  
 Gross weight Ref. 5.5 Kg

CFM40M 5PCS a box, including the total weight of package material about 5.5Kg

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