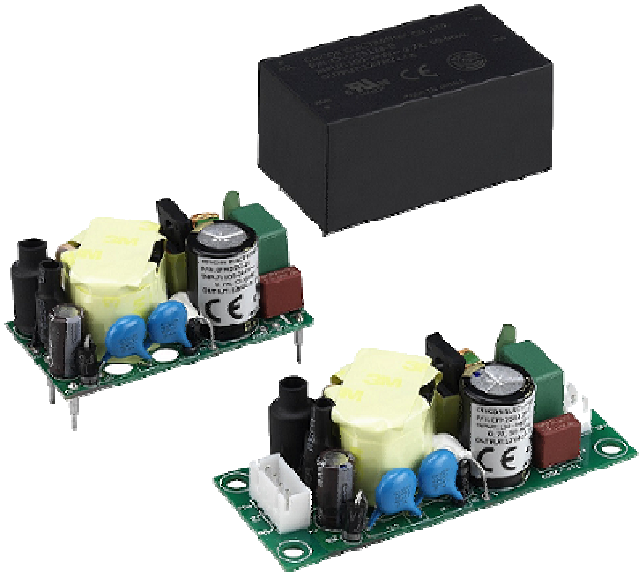
AC-DC Switching Power Module
CFM25S Series
APPLICATION NOTE



Approved By:

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Content

CFM25S Series

Application Note V16 June 2020

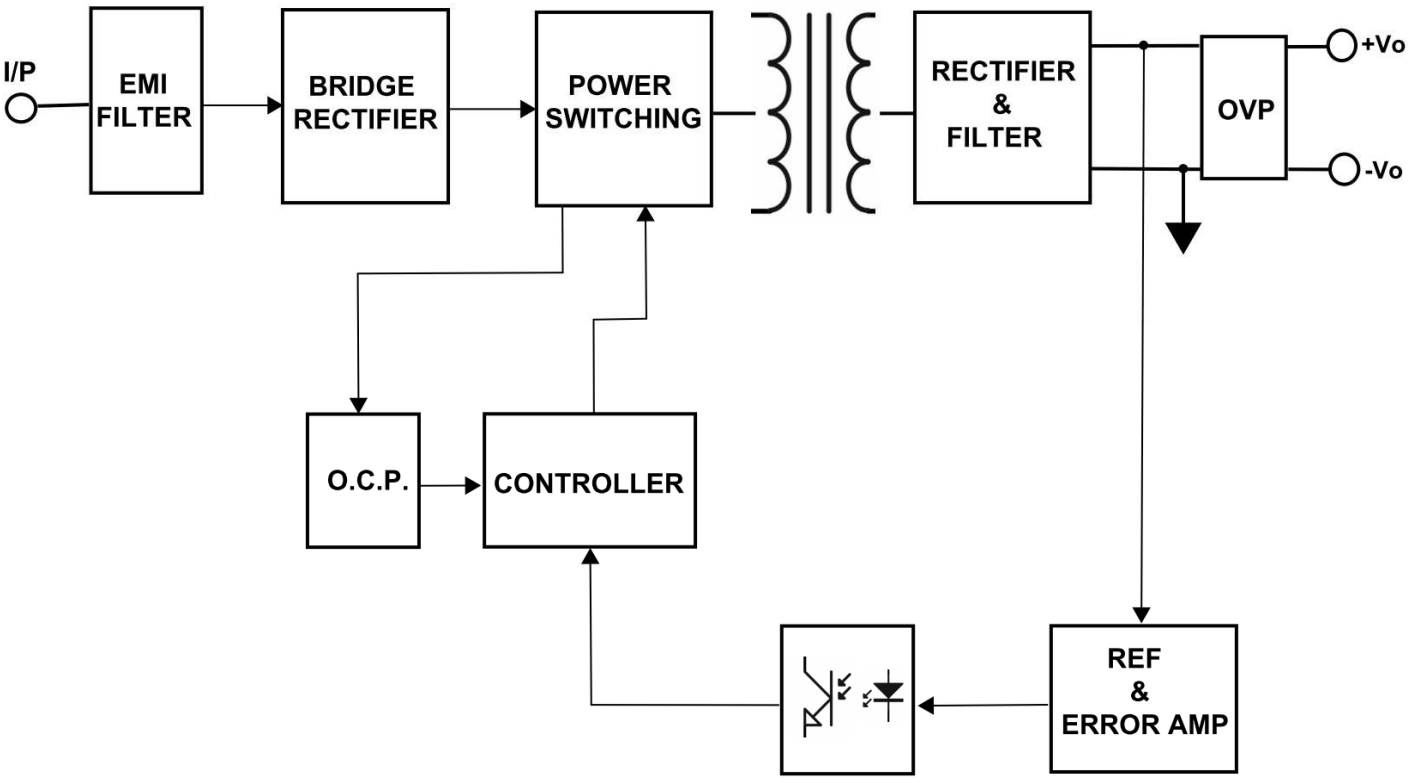
1. Introduction

This application note describes the features and functions of Cincon's CFM25S 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 CFM25S series power module is extremely reliable.

2. CFM25S Series Features

- 25W Isolated Output
- Universal Input 90~264VAC
- High Efficiency Up to 87%
- Meets EN55032 Class B and CISRP/FCC Class B
- Meets IEC/EN60335-1, IEC61558-1
- Approved IEC/EN/UL62368
- Continuous Short Circuit Protection
- Over Voltage Protection
- Peak Load (2 Times of Rated Current)
- No Load Input Power < 0.1W
- 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		All	90		264	Vac
			120		370	Vdc
Operating Temperature	See derating curve	All	-30		70	^{0}C
Storage Temperature		All	-30		85	^{0}C
Input/Output Isolation Voltage	1 minute	All	3000			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			0.7	A
Leakage Current		All			0.25	mA
Inrush Current	Vin=240Vac, cold start at 25℃.	All			60	A
OUTPUT CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	Vin=Nominal Vin, Io=Io.max, Tc=25℃.	CFM25S050	4.9	5	5.1	Vdc
		CFM25S120	11.88	12	12.12	
		CFM25S150	14.85	15	15.15	
		CFM25S240	23.76	24	24.24	
		CFM25S360	35.64	36	36.36	
		CFM25S480	47.52	48	48.48	
Operating Output Current Range		CFM25S050			4	A
		CFM25S120			2.1	
		CFM25S150			1.67	
		CFM25S240			1.05	
		CFM25S360			0.7	
		CFM25S480			0.52	
Holdup Time	Vin=115Vac	All		8		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	%

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Over Voltage Protection	uses a TVS component to clamp output voltage	CFM25S050	6.45	6.8	7.44	VDC
		CFM25S120	14.3	15	16.2	
		CFM25S150	17.1	18	18.9	
		CFM25S240	28.5	30	31.5	
		CFM25S360	40.9	43	45.6	
		CFM25S480	53.2	56	59.2	
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℃	CFM25S050			50	mVp-p
		CFM25S120			120	
		CFM25S150			150	
		CFM25S240			240	
		CFM25S360			360	
		CFM25S480			480	
Load Capacitance	1. Ambient temperature=25℃ 2. Input voltage is 115VAC and 230VAC 3. Output is max. load	CFM25S050			81000	uF
		CFM25S120			40900	
		CFM25S150			19800	
		CFM25S240			6600	
		CFM25S360			4000	
		CFM25S480			2170	
Efficiency	Output is rated load Ambient temperature=25℃ @ Input voltage is 230VAC	CFM25S050		81		%
		CFM25S120		84		
		CFM25S150		85		
		CFM25S240		86		
		CFM25S360		87		
		CFM25S480		87		

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	500			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
Weight		CFM25SXXX CFM25SXXX-E CFM25SXXX-T		38 75 40		g
Safety	Class II,IEC/EN/UL60950-1, IEC/EN/UL62368-1					
EMC Emission	EN55032 Class B ,EN61000-3-2:2014,EN61000-3-3:2013, EN61000-6-3:2012, EN61000-6-4:2011, 47 CFR FCC Part 15 Subpart B, Oct.2014					Class B
Conducted Disturbance	EN55032,EN61000-6-3:2012,Class B, 47 CFR FCC Part 15 Subpart B					Class B
Radiated Disturbance	EN55032,EN61000-6-3:2012,Class B, 47 CFR FCC Part 15 Subpart B					Class B
Harmonic Current Emissions	EN61000-3-2:2014					
Voltage Fluctuations & Flicker	EN61000-3-3:2013					
EMC Immunity	EN55024, EN61204-3:2000, EN61000-6-1:2007, EN61000-6-2:2005					
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008, Air Discharge:±8KV, Contact Discharge:±4KV					Criterion A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2010					Criterion A
Electrical Fast Transient (EFT)	IEC 61000-4-4:2012, ±0.5kv, ±1kv, ±2kv					Criterion A
Surge	IEC 61000-4-5:2014, L-N: ±0.5kv, ±1kv,					Criterion A
Conducted Disturbances, Induced by RF Fields	IEC 61000-4-6:2013					Criterion A
Power Frequency Magnetic Field	IEC 61000-4-8:2009					Criterion A
Voltage Dips	IEC 61000-4-11:2004, Dip: 30% Reduction, Dip >95% Reduction					Criterion A
Voltage Interruptions	IEC 61000-4-11:2004, >95% Reduction					Criterion B

5. Main Features and Functions

5.1 Operating Temperature Range

The highly efficient design of Cincon's CFM25S series power modules has resulted in their ability to operate within ambient temperature environments from -30^{0}C to 70^{0}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:

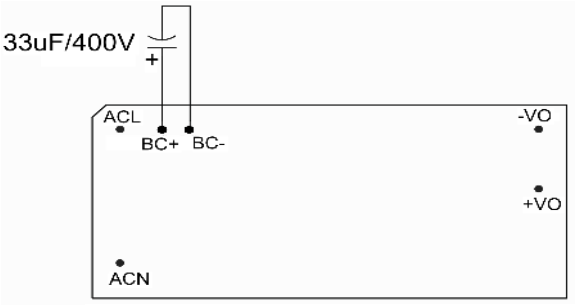
- Input voltage range
- Permissible Output load (per derating curve)

5.2 Output Protection

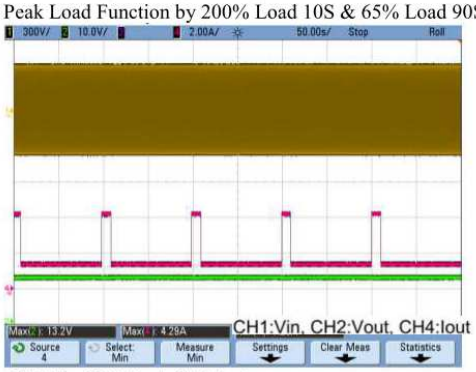
The power modules provide full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit will operate normally once the fault condition is removed.

5.3 Peak Load Function

CFM25SXXX PL and CFM25SXXX-E PL has a very powerful peak load function which can provide twice the rated power. However, the duration of the peak load should be less than 10 seconds, with a maximum 10% duty cycle and must externally add a 33uF/ 400V capacitor to BC+ & BC-, but this is not needed when input is @ 220Vac.



Vin=90Vac&115Vav&230Vac&264Vac
Peak Load Function by 200% Load 10S & 65% Load 90S.



CH1:Vin, CH2:Vout, CH4:Iout
Average Power:19.78W
add external 33u / 400V capacitor to BC+& BC-.

Vin=230Vac&264Vac
Peak Load Function by 200% Load 10S & 65% Load 90S

CH1:Vin, CH2:Vout, CH4:Iout
Average Power:19.78W

6. EMC & Safety

■ Emission and Immunity

EN55032 Class B, EN61000-3-2:2014, EN61000-3-3:2013, EN61000-6-3:2012, EN61000-6-4:2011, 47 CFR FCC Part 15 Subpart B (Class B), Oct.2014,
EN55024, EN61204-3:2000, EN61000-6-1:2007, EN61000-6-2:2005

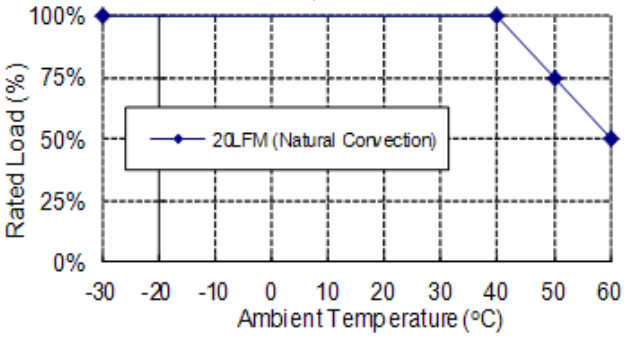
■ Safety

Class II, IEC/EN/UL60950-1, IEC/EN/UL62368-1

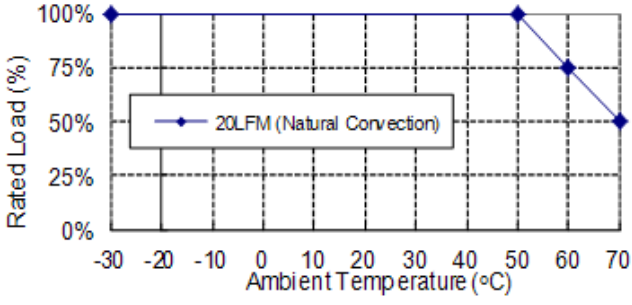
7. Applications

7.1 Power De-Rating Curve

CFM25S050, CFM25S050-T



CFM25S120, CFM25S150, CFM25S240, CFM25S360, CFM25S480, CFM25S120-T, CFM25S150-T, CFM25S240-T, CFM25S360-T , CFM25S480-T, CFM25SXXX-E



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 CFM25S 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.

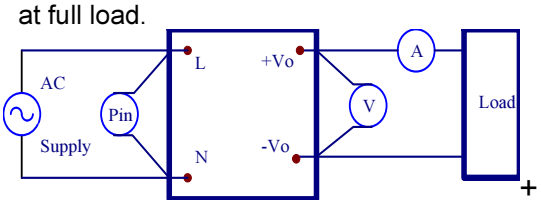


Figure 1. CFM25S Series Test Setup

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.

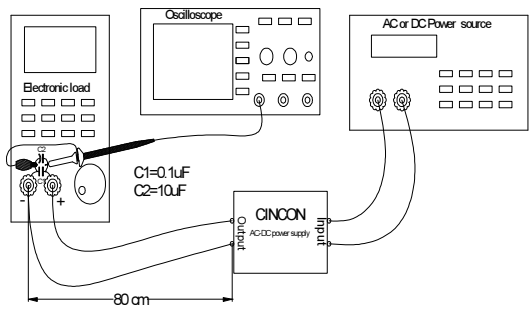
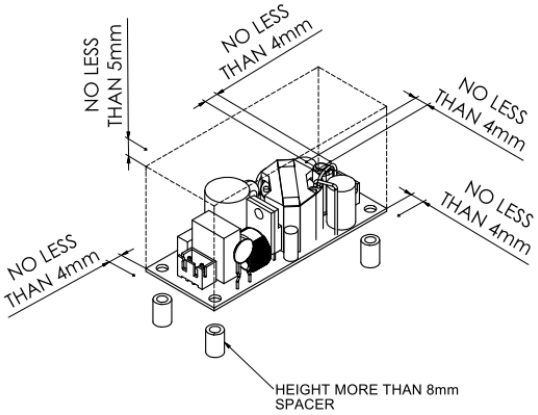


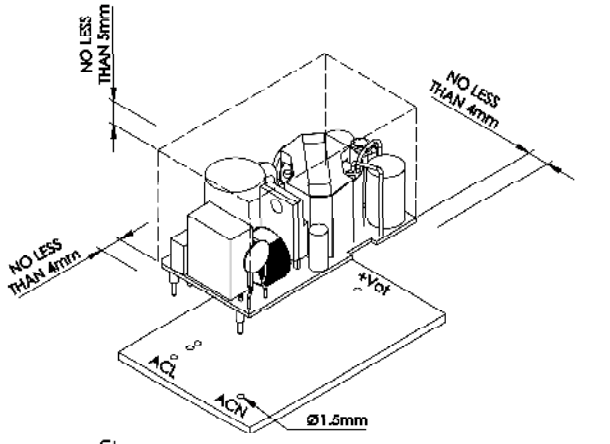
Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

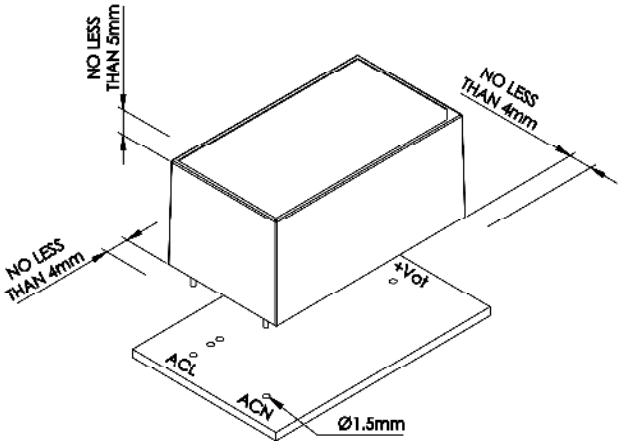
7.4 Installation Instruction

The CFM25SXXX-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 CFM25SXXX and CFM25SXXX-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.

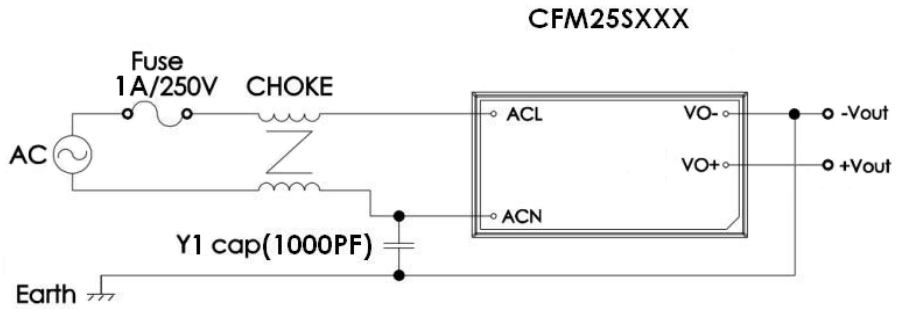




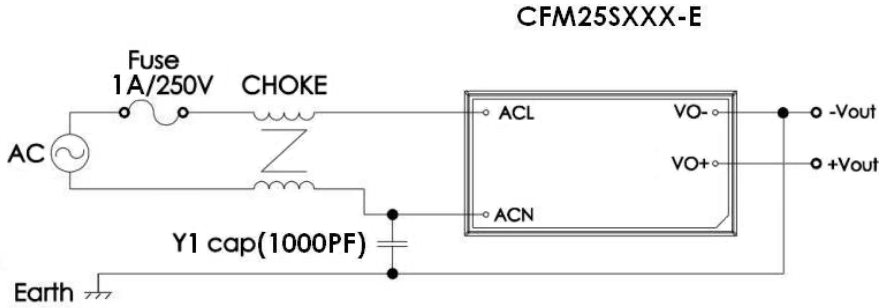
7.5 Class I EMI Solution

The CFM25S series need additional inductance and YCap to meet EN55032 CLASS B when test condition is Class I.If customers use in Class II systems, please ignore this section.

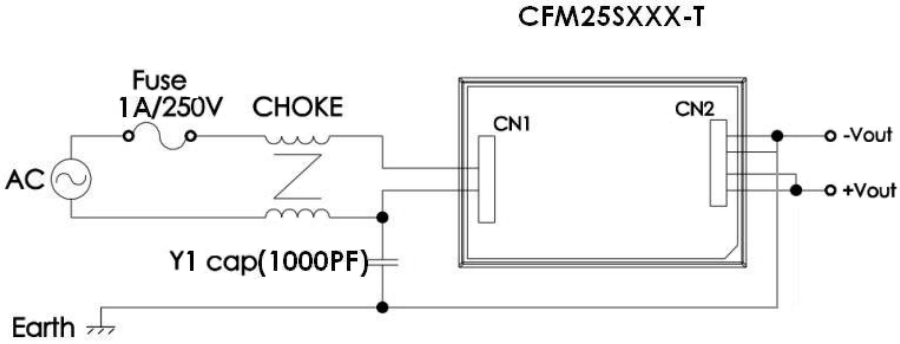
CFM25SXXX



CFM25SXXX-E



CFM25SXXX-T



Additional Inductance related parameters:

Specification	Inductance	Duplex Winding /turns	Manufacturers
UU9.8 R12K	10mH	2-UEW φ0.27*85Ts	SEND POWER

Additional Safety YCap related parameters:

Subclass	WITHSTANDVOLTAGE	Capacitance	Manufacturers
Y1 CAP	250V(min)	1000pF(typ.)	TDK

8. CFM25S Series Mechanical Outline Diagrams

8.1. Mechanical Outline Diagrams

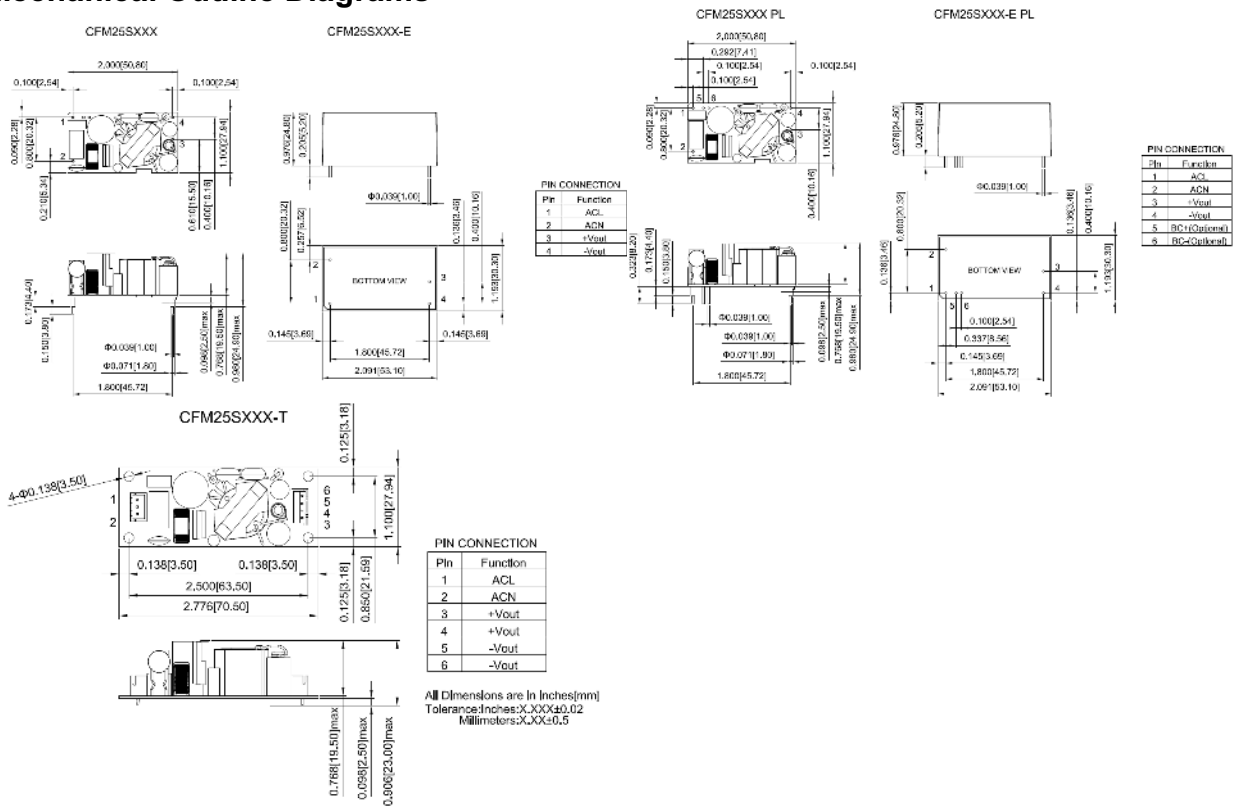
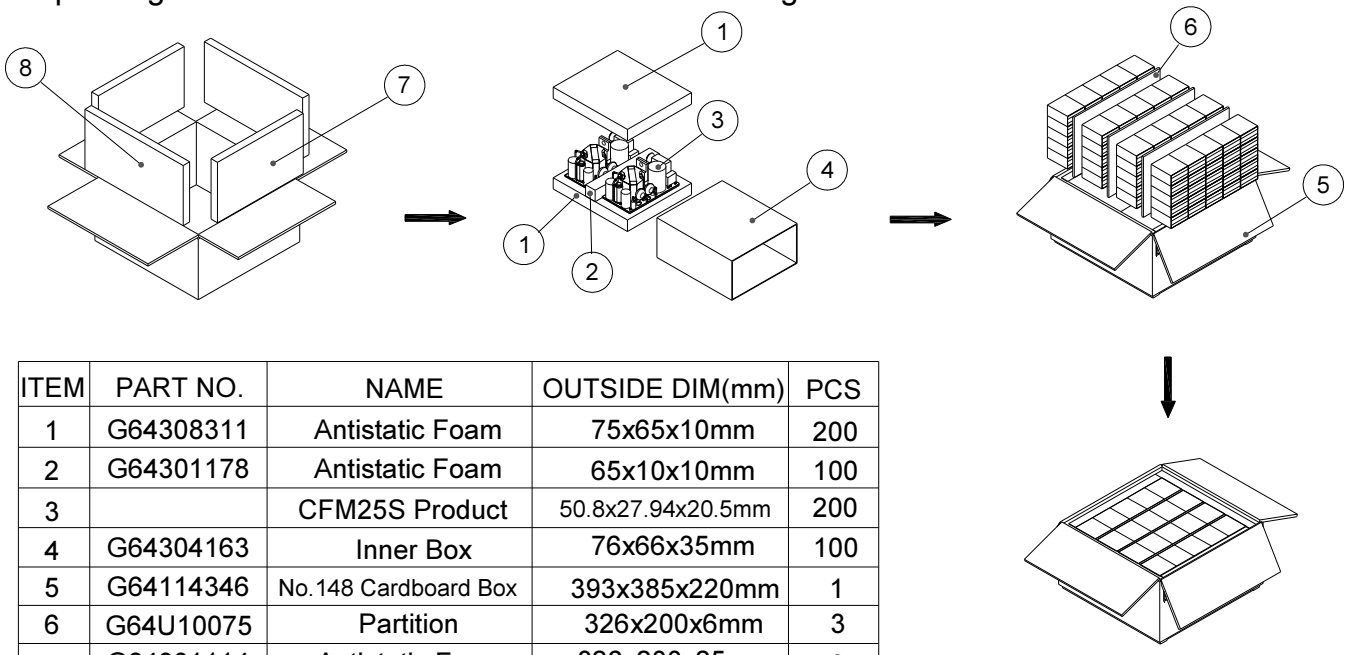


Figure 3. CFM25S series Mechanical Outline Diagram

8.2. Packing Information

The packing information for CFM25S SERIES is showing as follows:

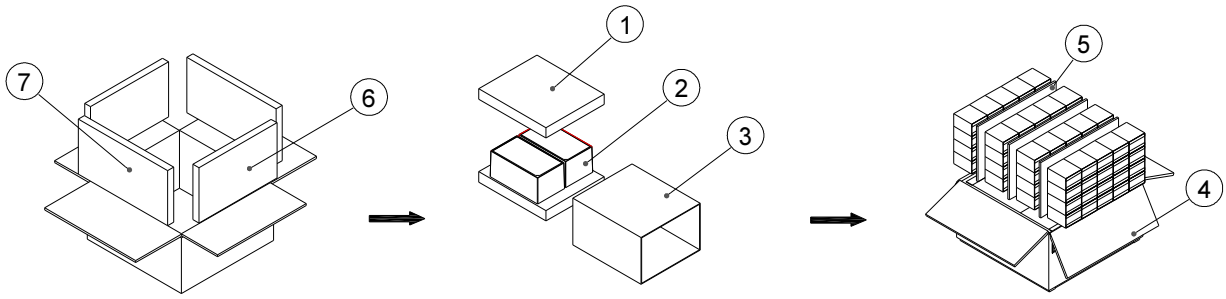


ITEM	PART NO.	NAME	OUTSIDE DIM(mm)	PCS
1	G64308311	Antistatic Foam	75x65x10mm	200
2	G64301178	Antistatic Foam	65x10x10mm	100
3		CFM25S Product	50.8x27.94x20.5mm	200
4	G64304163	Inner Box	76x66x35mm	100
5	G64114346	No.148 Cardboard Box	393x385x220mm	1
6	G64U10075	Partition	326x200x6mm	3
7	G64301114	Antistatic Foam	326x200x25mm	2
8	G64301113	Antistatic Foam	373x200x25mm	2

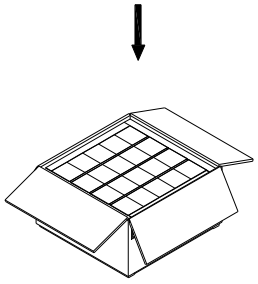
Each Box Packaging 200 PCS Products
Net weight Ref. 8 Kg
Gross weight Ref. 9.5 Kg

CFM25S 200Pcs a box, including the total weight of package material about 9.5Kg

The packing information for CFM25S-E SERIES is showing as follows:



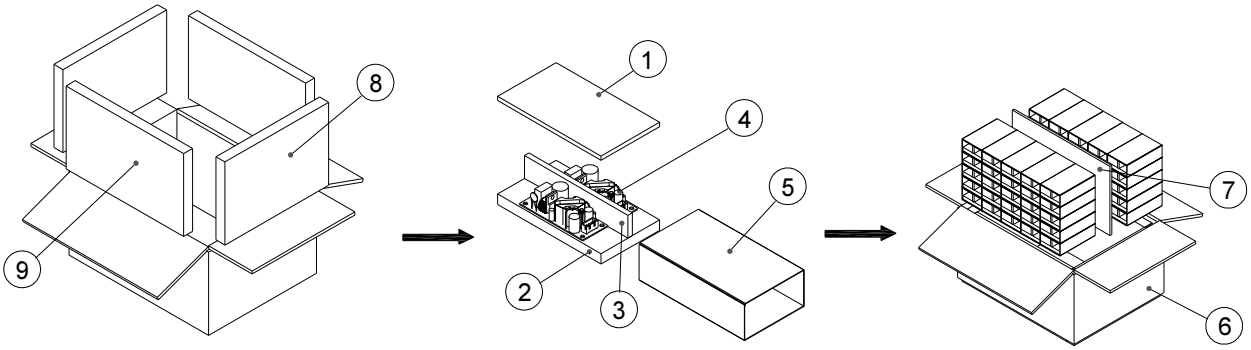
ITEM	PART NO.	NAME	OUTSIDE DIM(mm)	PCS
1	G64308311	Antistatic Foam	75x65x10mm	160
2		CFM25S-E Product	53.1x30.3x24.8mm	160
3	G64304175	Inner Box	76x66x45mm	80
4	G64114346	No.148 Cardboard Box	393x385x220mm	1
5	G64U10075	Partition	326x200x6mm	3
6	G64301114	Antistatic Foam	326x200x25mm	2
7	G64301113	Antistatic Foam	373x200x25mm	2



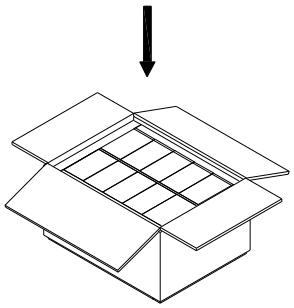
Each Box Packaging 160 PCS Products
Net weight Ref. 12.8 Kg
Gross weight Ref. 14 Kg

CFM25S-E 160Pcs a box, including the total weight of package material about 14Kg

The packing information for CFM25S-T SERIES is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM	PCS
1	G64308313	Antistatic Foam	115x65x5.5mm	50
2	G64308312	Antistatic Foam	115x65x10mm	50
3	G64301182	Antistatic Foam	115x5x22mm	50
4		CFM25S-T Product	70.5x27.94x20.5mm	100
5	G64304165	Inner Box	115x65x35mm	50
6	G64114347	No.149 Cardboard Box	388x300x220mm	1
7	G64U10075	Partition	326x200x6mm	1
8	G64301115	Antistatic Foam	288x200x25mm	2
9	G64301114	Antistatic Foam	326x200x25mm	2

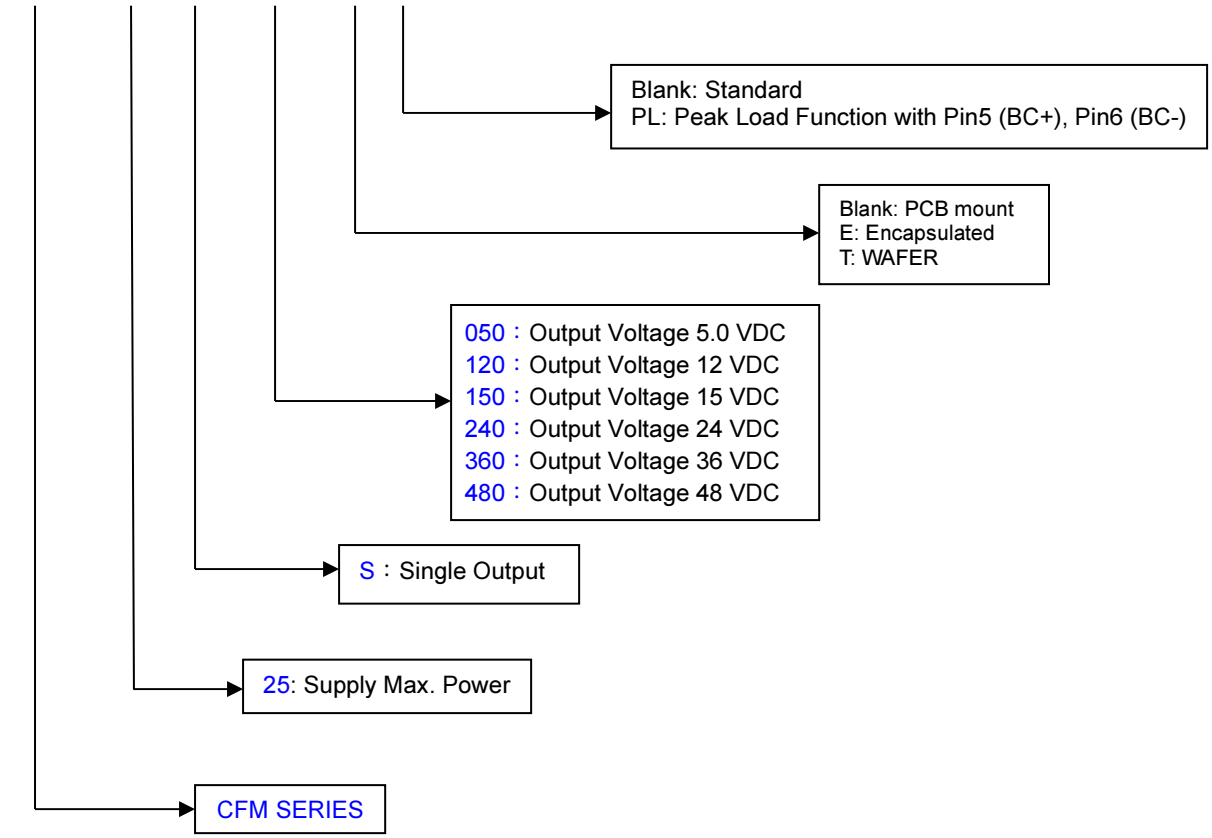


Each Box Packaging 100 PCS Products
Net weight Ref. 4.1 Kg
Gross weight Ref. 5.3 Kg

CFM25S-T 100Pcs a box, including the total weight of package material about 5.3Kg

9. Part Number

CFM XX S XXX-X YZ



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