

FEATURES

- ▶ Ultra Compact Size 2.99x2.13x1.10 "
- ▶ Fully Encapsulated Plastic Case for PCB, Chassis and DIN-Rail Mounting Version
- ▶ Universal Input 85-264VAC, 90-370VDC, 47-440Hz
- ▶ I/O Isolation 3000VAC with Reinforced Insulation
- ▶ No Min. Load Requirement & Low no-load power consumption
- ▶ Operating Ambient Temp. Range -40°C to +70°C
- ▶ Overload/Voltage and Short Circuit Protection
- ▶ EMI Emission EN55014-1/55032 Class B Approved
- ▶ EMC Immunity EN61000-4-2,3,4,5,6,8,11 Approved
- ▶ Safety Approval to UL/cUL/IEC/EN 62368-1, IEC/EN 60335-1 & CE Marking



PRODUCT OVERVIEW

The MINMAX AMF-60 series is a new generation of fully encapsulated AC-DC power supply modules with ultra-compact size for higher power density and space saving.

The product features universal AC input 85-264VAC and wider DC input 90-370VDC, regulated output voltages 5.1,12,15,24,48VDC ; I/O Isolation 3000VAC with Reinforced Insulation ; EMI emission EN55014-1/32 Class B and EMS immunity EN 61000-4 standards approved ; no min. load requirement and low no-load power consumption; abnormal protection mechanism with output overload, short circuit and overvoltage protections.

The AMF-60 series equips with PCB, Chassis and DIN-Rail Mounting Version for flexible installation and comply with UL/IEC/EN 62368-1 & IEC/EN 60335-1 for safety usage. It provides a cost effective solution especially for space critical applications in industrial and household electronic equipment.

Model Selection Guide

Model Number	Output Voltage	Output Power	Output Current	Input Current	Max. capacitive Load	Efficiency (typ.)
				115VAC, 60Hz		(typ.)
	VDC	W	Max. A	@Max. Load mA(typ.)	μF	@Max. Load %
AMF-60S051	5.1	51	10	961	12000	87
AMF-60S12	12	60	5	1127	2200	89
AMF-60S15	15	60	4	1127	1500	89
AMF-60S24	24	60	2.5	1127	1000	89
AMF-60S48	48	60	1.25	1127	220	89

Input Specifications

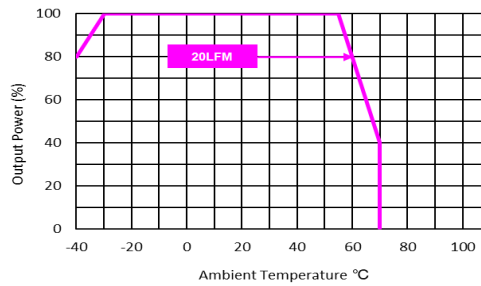
Parameter	Conditions / Model		Min.	Typ.	Max.	Unit
AC Input Voltage Range	All Models		85	---	264	VAC
AC Input Frequency Range			47	---	440	Hz
DC Input Voltage Range			90	---	370	VDC
No-Load Power Consumption	115VAC	PCB Mounting	---	---	100	mW
	230VAC		---	---	200	mW
	115VAC	Chassis Mounting	---	---	150	mW
	230VAC		---	---	250	mW
Inrush Current	115VAC	Cold Start at 25°C	---	---	45	A
	230VAC		---	---	90	A

Output Specifications						
Parameter	Conditions / Model	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy		---	±1.0	±2.0	%	
Line Regulation	Vin=Min. to Max. @Full Load	---	---	±0.5	%	
Load Regulation	Io=0% to 100%	---	---	±1.0	%	
Ripple & Noise	0-20 MHz Bandwidth	5.1VDC Output Model	---	---	1.8	%V _{PP} of Vo
		Other Output Models	---	---	1.0	%V _{PP} of Vo
Minimum Load	No minimum Load Requirement					
Over Voltage Protection	Zener diode clamp	---	125	---	% of Vo	
Temperature Coefficient		---	±0.01	±0.02	%/°C	
Overshoot		---	---	5	% Vout	
Over Load Protection	auto-recovery	110	---	---	%I _{nom} .	
	(long term overload condition may cause damage)					
Short Circuit Protection	Hiccup mode, Automatic Recovery					

General Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
I/O Isolation Voltage	Input to Output, 60 Seconds	3000	---	---	VAC
I/O Isolation Resistance	500 VDC	10	---	---	GΩ
Switching Frequency		---	65	---	kHz
Start-up Time		---	---	1	s
Hold-up Time	115VAC, 60Hz	10	---	---	ms
	230VAC, 50Hz	20	---	---	ms
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	355,000	---	---	Hours
Safety Approvals	UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report)				
	IEC/EN 60335-1, 61558-1, 61558-2-16 recognition(CB-report)				

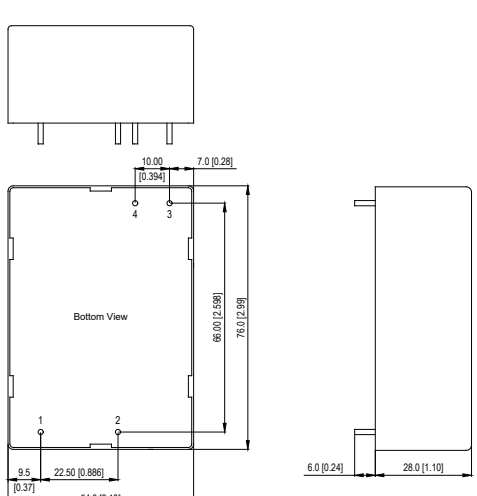
EMC Specifications				
Parameter	Standards & Level			Performance
General	Compliance with EN 61204-3 Switch mode power supplies			
EMI	Conduction	EN55014-1, EN 55032	Without external components	Class B
	Radiation			
EMS	EN 55014-2, EN 55035			
	ESD	Direct discharge	Indirect discharge HCP & VCP	
		EN61000-4-2 air ± 8kV	Contact ± 6kV	
	Radiated immunity	EN 61000-4-3 10V/m		
	Fast transient	EN 61000-4-4 ±2kV		
	Surge	EN 61000-4-5 ±1kV		
	Conducted immunity	EN 61000-4-6 10Vrms		
	PFMF	EN 61000-4-8 30A/m		
	Dips	EN 61000-4-11 30% 10ms		
Interruptions	EN 61000-4-11 >95% 5000ms			

Environmental Specifications					
Parameter	Min.	Typ.	Max.	Unit	
Operating Ambient Temperature Range (See Power Derating Curve)	-40	---	+70	°C	
Storage Temperature Range	-40	---	+85	°C	
Humidity (non condensing)	---	---	95	% rel. H	
Lead Temperature (1.5mm from case for 10Sec.)	---	---	260	°C	

Power Derating Curve

Notes

- 1 All Specifications typical at Ta=+25°C, resistive load, 115VAC, 60Hz input voltage and after warm-up time rated output current unless otherwise noted.
- 2 We recommend to protect the converter by a slow blow fuse in the input supply line.
- 3 Other input and output voltage may be available, please contact MINMAX.
- 4 Specifications are subject to change without notice
- 5 The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system.

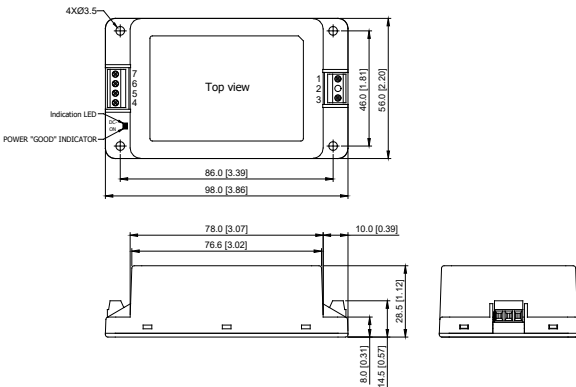
Package Specifications PCB Mounting

Mechanical Dimensions		Pin Connections																
		<table border="1"> <thead> <tr> <th>Pin</th> <th>Function</th> <th>Diameter mm (inches)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>AC(L) – AC Line</td> <td>∅ 1.5 [0.06]</td> </tr> <tr> <td>2</td> <td>AC(N) – AC Neutral</td> <td>∅ 1.5 [0.06]</td> </tr> <tr> <td>3</td> <td>-Vout</td> <td>∅ 1.5 [0.06]</td> </tr> <tr> <td>4</td> <td>+Vout</td> <td>∅ 1.5 [0.06]</td> </tr> </tbody> </table>		Pin	Function	Diameter mm (inches)	1	AC(L) – AC Line	∅ 1.5 [0.06]	2	AC(N) – AC Neutral	∅ 1.5 [0.06]	3	-Vout	∅ 1.5 [0.06]	4	+Vout	∅ 1.5 [0.06]
Pin	Function	Diameter mm (inches)																
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3	-Vout	∅ 1.5 [0.06]																
4	+Vout	∅ 1.5 [0.06]																
<p>▶ All dimensions in mm (inches)</p> <p>▶ Tolerance: ±0.5 (±0.02)</p> <p>▶ Pin pitch tolerance: ±0.25 (0.01)</p> <p>▶ Pin diameter tolerance: X.X±0.1 (X.XX±0.004)</p>																		

Physical Characteristics

Case Size	: 76.0x54.0x28.0mm (2.99x2.13x1.10 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Copper Alloy
Weight	: 169g

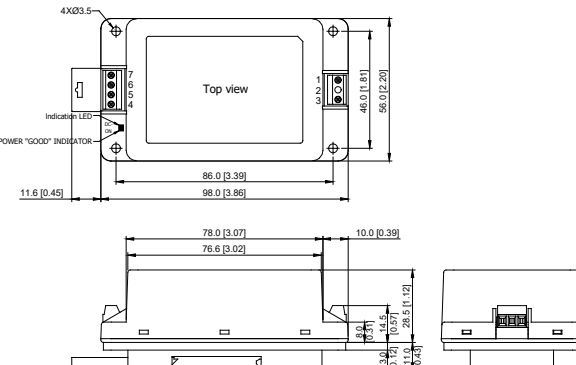
Package Specifications Chassis Mounting with screw terminal (order code suffix C)

Mechanical Dimensions		Pin Connections	
 <p>Note: Screw type Terminal: Wires 1.5mm² max. Recommended Terminal Screw tightening torque: 0.2Nm (1.7lb.in.) max.</p>		Pin	Function
		1	AC(L) – AC Line
		2	No Pin
		3	AC(N) – AC Neutral
		4	-Vout
		5	-Vout
		6	+Vout
		7	+Vout
		▶ All dimensions in mm (inches)	▶ Tolerance: ±0.5 (±0.02)

Physical Characteristics

Case Size	: 98.0x56.0x28.5mm (3.86x2.20x1.12 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 172g

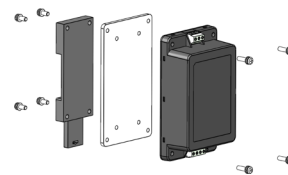
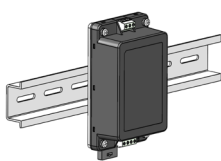
Package Specifications for screw terminal with DIN Rail Mounting (order code suffix AC-DIN-01)

Mechanical Dimensions	
	

Physical Characteristics

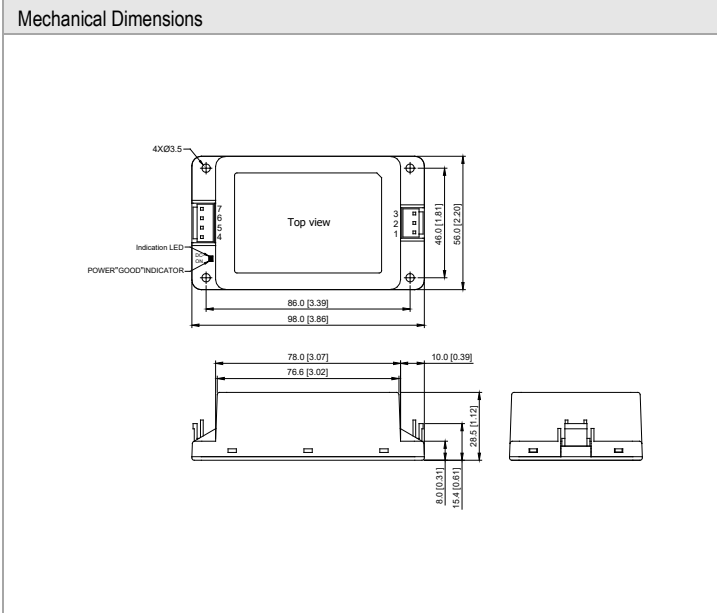
Case Size	: 98.0x56.0x28.5mm (3.86x2.20x1.12 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 226g

Screw terminal with DIN Rail Mounting



Note:
Recommended tightening torque: 0.35Nm (3.1lb.in.) max.

Package Specifications Chassis Mounting with JST connection (order code suffix CD)



Pin Connections

Pin	Function
1	AC(N) – AC Neutral
2	No Pin
3	AC(L) – AC Line
4	-Vout
5	-Vout
6	+Vout
7	+Vout

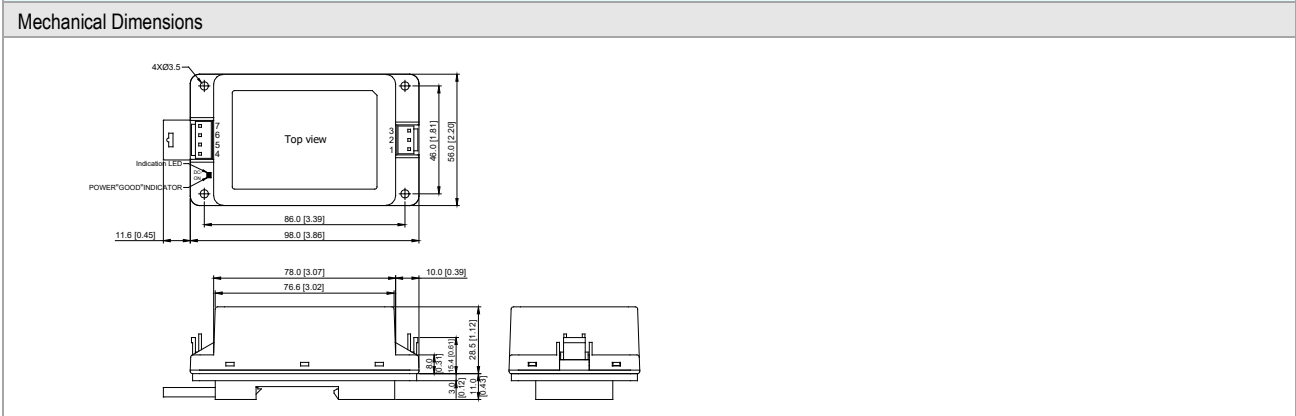
Input (pin 1, pin 3): JST Connector
mates with JST crimp contacts: SVH-41T-P1.1
terminal housing: VAR-2
Output (pin 4, pin 5, pin 6, pin 7): JST Connector
mates with JST crimp contacts: SVH-41T-P1.1
terminal housing: VHR-4

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ± 0.5 (± 0.02)

Physical Characteristics

Case Size : 98.0x56.0x28.5mm (3.86x2.20x1.12 inches)
Case Material : Plastic resin (flammability to UL 94V-0 rated)
Weight : 172g

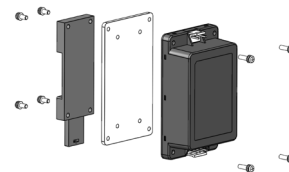
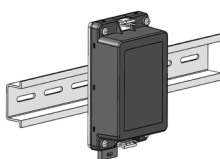
Package Specifications for JST connection with DIN Rail Mounting (order code suffix AC-DIN-01)



Physical Characteristics

Case Size : 98.0x56.0x28.5mm (3.86x2.20x1.12 inches)
Case Material : Plastic resin (flammability to UL 94V-0 rated)
Weight : 226g

JST connection with DIN Rail Mounting



Note:

Recommended tightening torque: 0.35Nm (3.1lb.in.) max.

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Order Code Table					
PCB Mounting	Chassis Mounting with screw terminal		Chassis Mounting with JST connection		DIN Rail Kit
	Power module only	Power module with Din Rail Kit	Power module only	Power module with Din Rail Kit	
AMF-60S051	AMF-60S051C	AMF-60S051C-AC-DIN-01	AMF-60S051CD	AMF-60S051CD-AC-DIN-01	AC-DIN-01
AMF-60S12	AMF-60S12C	AMF-60S12C-AC-DIN-01	AMF-60S12CD	AMF-60S12CD-AC-DIN-01	AC-DIN-01
AMF-60S15	AMF-60S15C	AMF-60S15C-AC-DIN-01	AMF-60S15CD	AMF-60S15CD-AC-DIN-01	AC-DIN-01
AMF-60S24	AMF-60S24C	AMF-60S24C-AC-DIN-01	AMF-60S24CD	AMF-60S24CD-AC-DIN-01	AC-DIN-01
AMF-60S48	AMF-60S48C	AMF-60S48C-AC-DIN-01	AMF-60S48CD	AMF-60S48CD-AC-DIN-01	AC-DIN-01