



MINMAX[®]

AMF-07 Series

Electric Characteristic Note

AMF-07 Series EC Note

AC-DC POWER MODULE 7W

Features

- ▶ Ultra Compact Size 1.52x1.00x0.66"
- ▶ Fully Encapsulated Plastic Case for PCB and Chassis 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 +80°C
- ▶ Overload/Voltage and Short Circuit Protection
- ▶ EMI Emission EN55014-1/55032 Class B Approved
- ▶ EMS 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



Applications

- ▶ Distributed power architectures
- ▶ Workstations
- ▶ Computer equipment
- ▶ Communications equipment

Product Overview

The MINMAX AMF-07 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 5,12,15,24,48VDC ; 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-07 series equips with PCB and Chassis 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.

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Model Selection Guide						
Model Number	Output Voltage	Output Power	Output Current	Input Current	Max. capacitive Load	Efficiency (typ.)
				115VAC, 60Hz		(typ.)
	VDC	W	mA	@Max. Load	μF	@Max. Load
AMF-07S05	5	7	1400	146	1500	80
AMF-07S12	12	7.02	585	141	270	84
AMF-07S15	15	7.01	467	139	180	84
AMF-07S24	24	7.01	292	138	120	85
AMF-07S48	48	7.01	146	138	33	84

Input Specifications						
Parameter	Conditions		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		---	---	150	mW
	230VAC		---	---	300	mW
Inrush Current	115VAC	Cold Start at 25°C	---	---	15	A
	230VAC		---	---	30	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	5VDC 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	---	---	%Inom.
	(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			---	125	---	kHz
Start-up Time			---	---	2	s
Hold-up Time	115VAC, 60Hz		10	---	---	ms
	230VAC, 50Hz		20	---	---	ms
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign		499,890	---	---	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)					

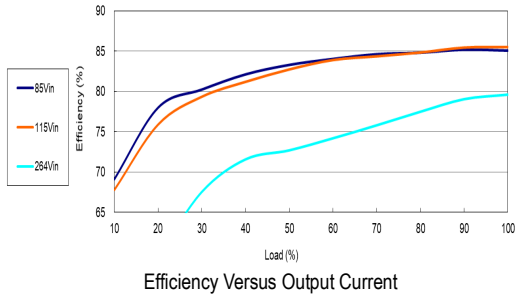
EMC Specifications					
Parameter	Standards & Level			Performance	
General	Compliance with EN 61204-3 Switch mode power supplies				
EMI	Conduction	EN55014-1, EN 55032	Without external components	Class B	
	Radiation				
EMS	EN 55014-2, EN 55035				
	ESD	Direct discharge	Indirect discharge HCP & VCP	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

Environmental Specifications					
Parameter	Min.	Typ.	Max.	Unit	
Operating Ambient Temperature Range (See Power Derating Curve)	-40	---	+80	°C	
Storage Temperature Range	-40	---	+85	°C	
Humidity (non condensing)	---	---	95	% rel. H	
Lead Temperature (1.5mm from case for 10Sec.)	---	---	260	°C	

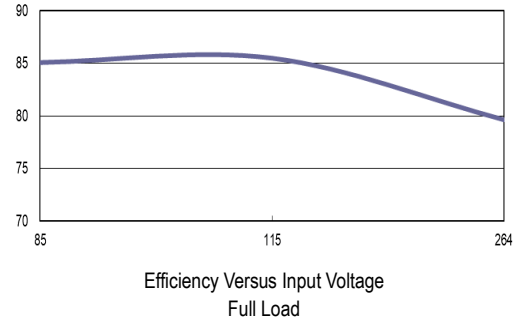
Notes	
1	All Specifications typical at Ta=+25°C, resistive load, 115VAC, 60Hz input voltage and after warm-up time rated output current unless otherwise noted.
2	We recommend to protect the converter by a slow blow fuse in the input supply line.
3	Other input and output voltage may be available, please contact MINMAX.
4	The continuous operation on DC input voltage of 80VDC to 370VDC is available after start-up at 90VDC.
5	Specifications are subject to change without notice
6	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.

Characteristic Curves

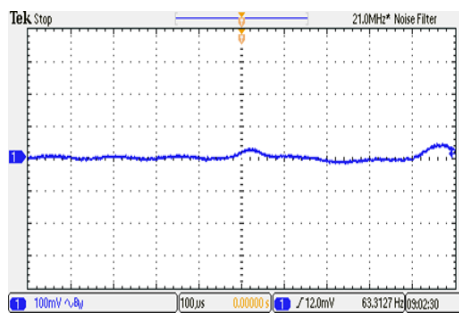
All test conditions are at 25°C The figures are identical for AMF-07S05



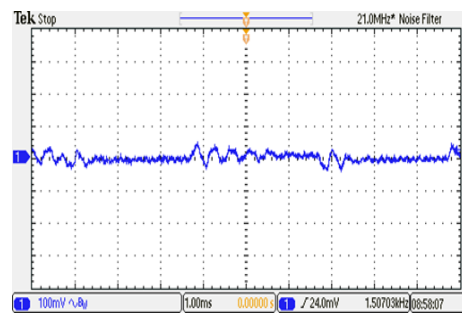
Efficiency Versus Output Current



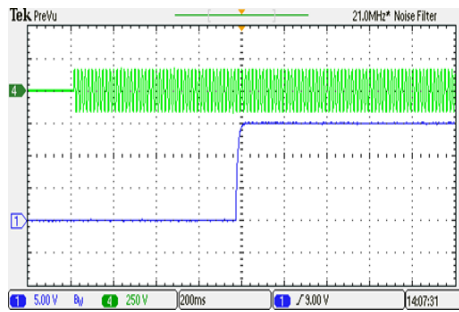
Efficiency Versus Input Voltage Full Load



Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



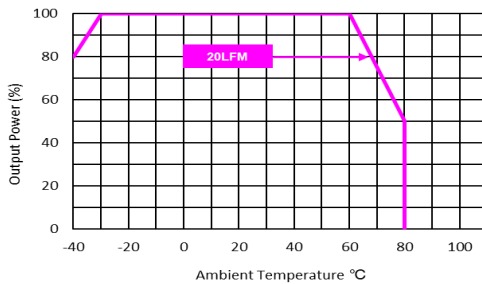
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load; $V_{in}=V_{in\ nom}$



Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



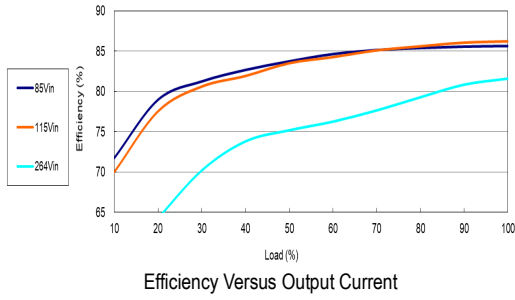
Typical Input Hold-up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



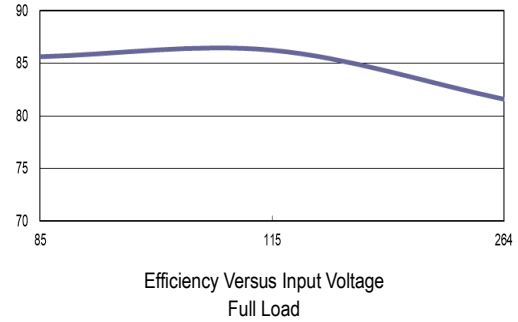
Derating Output Current Versus Ambient Temperature
 $V_{in}=V_{in\ nom}$

Characteristic Curves

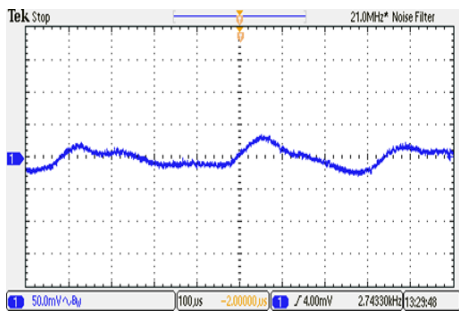
All test conditions are at 25°C The figures are identical for AMF-07S12



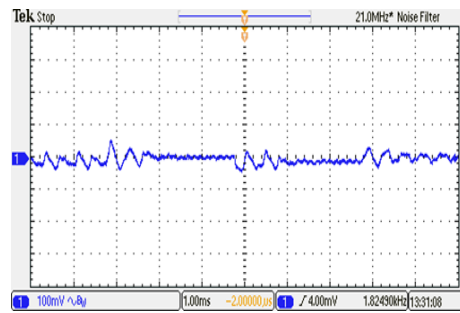
Efficiency Versus Output Current



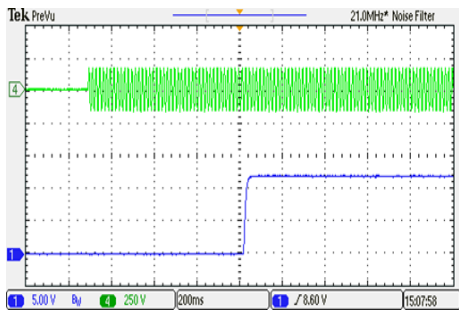
Efficiency Versus Input Voltage Full Load



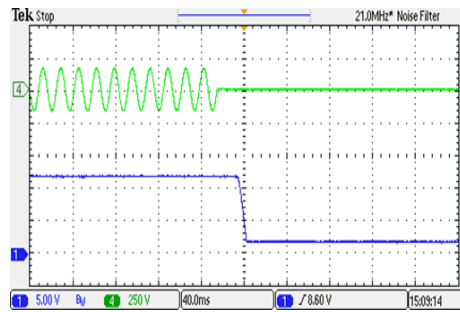
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



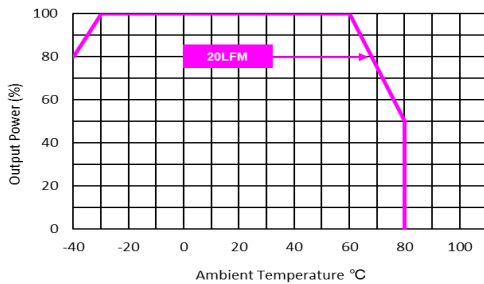
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



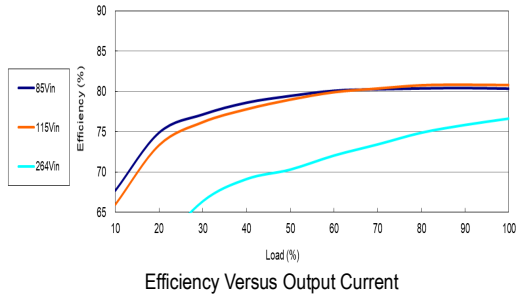
Typical Input Hold-up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



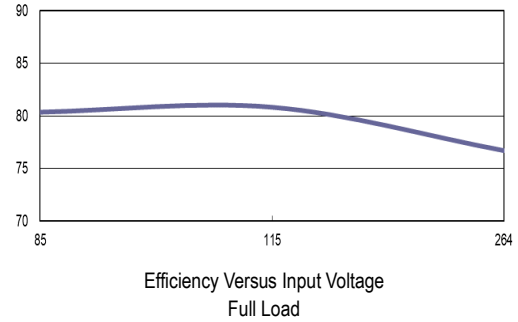
Derating Output Current Versus Ambient Temperature
 $V_{in}=V_{in\ nom}$

Characteristic Curves

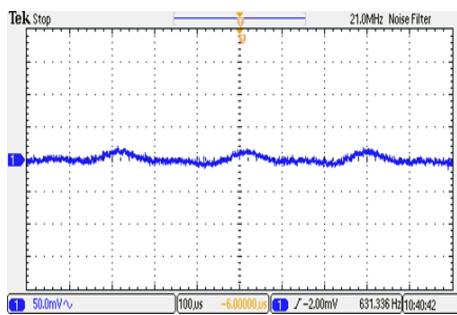
All test conditions are at 25°C The figures are identical for AMF-07S15



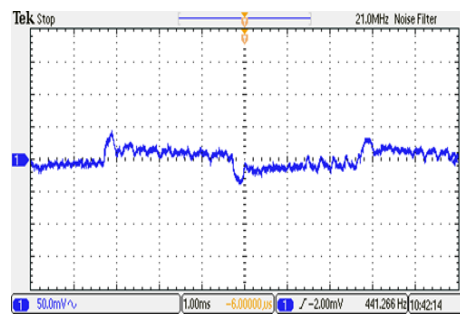
Efficiency Versus Output Current



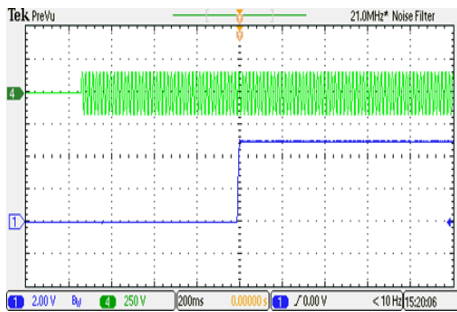
Efficiency Versus Input Voltage Full Load



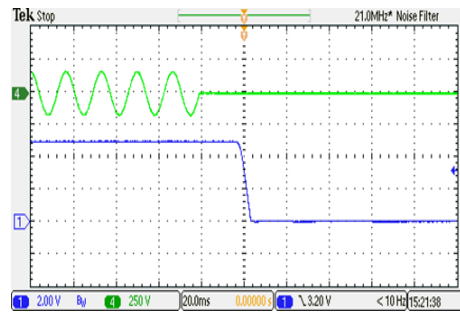
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



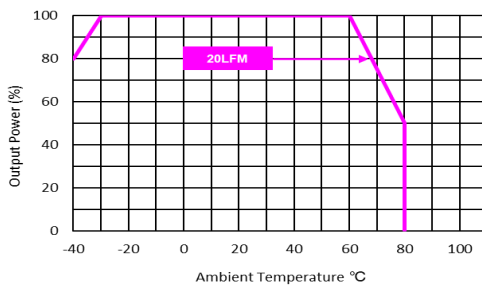
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



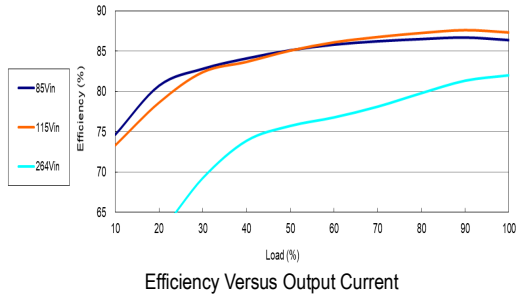
Typical Input Hold-up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



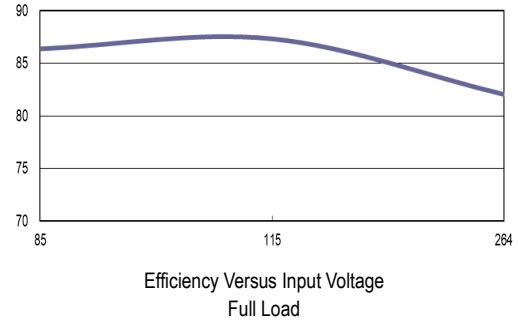
Derating Output Current Versus Ambient Temperature
 $V_{in}=V_{in\ nom}$

Characteristic Curves

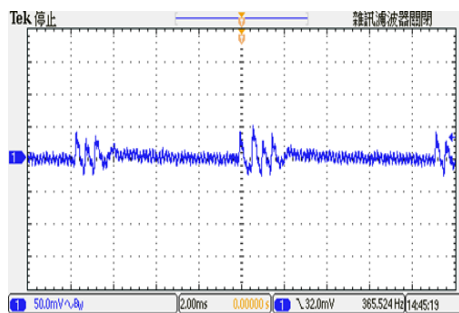
All test conditions are at 25°C The figures are identical for AMF-07S24



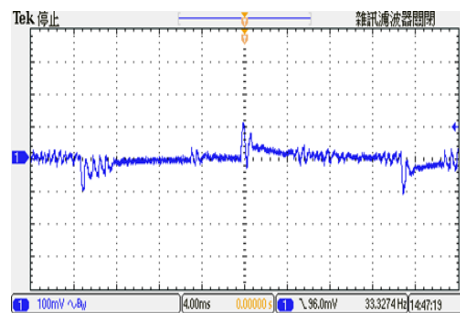
Efficiency Versus Output Current



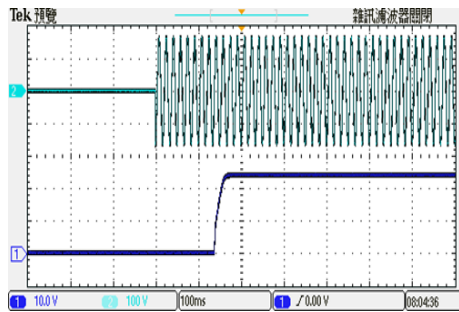
Efficiency Versus Input Voltage Full Load



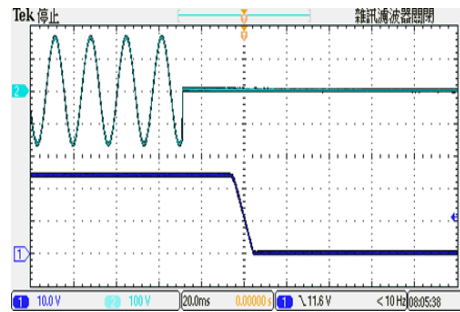
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



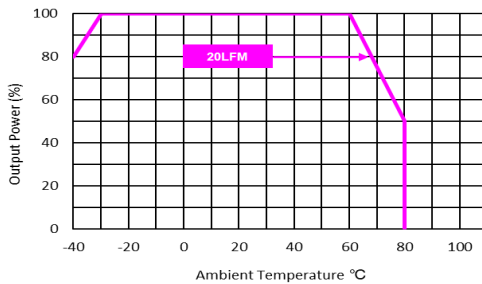
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load; $V_{in}=V_{in\ nom}$



Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



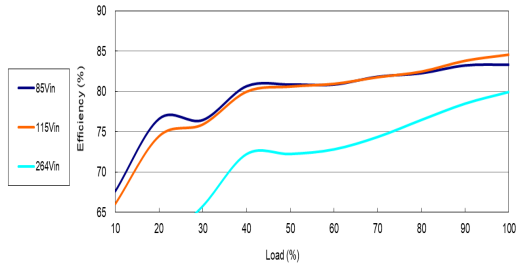
Typical Input Hold-up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



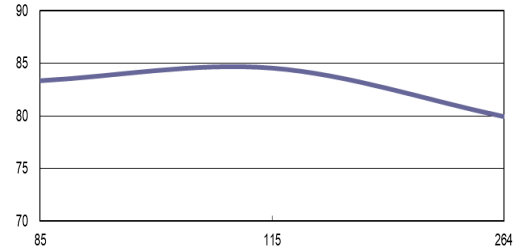
Derating Output Current Versus Ambient Temperature
 $V_{in}=V_{in\ nom}$

Characteristic Curves

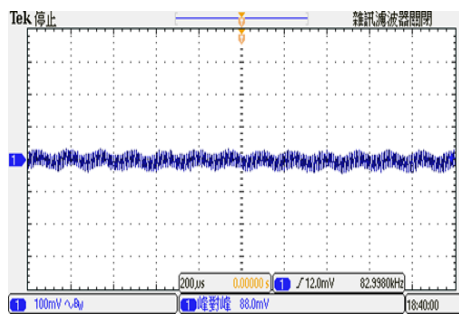
All test conditions are at 25°C The figures are identical for AMF-07S48



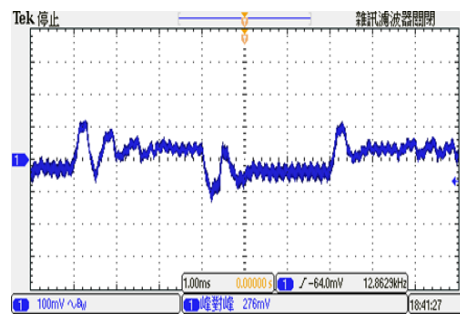
Efficiency Versus Output Current



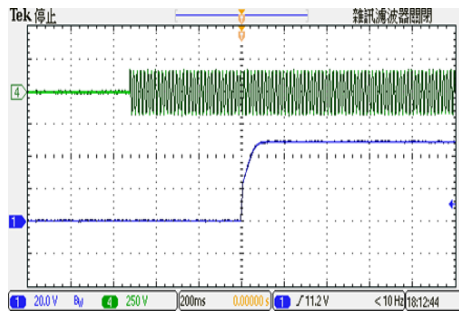
Efficiency Versus Input Voltage Full Load



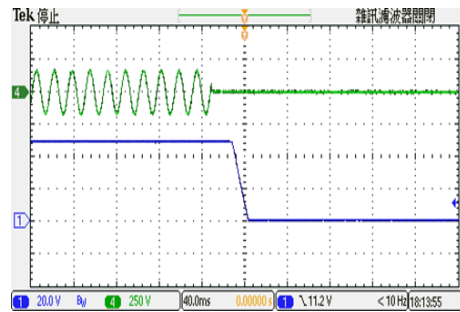
Typical Output Ripple and Noise
 $V_{in}=V_{in\ nom}$; Full Load



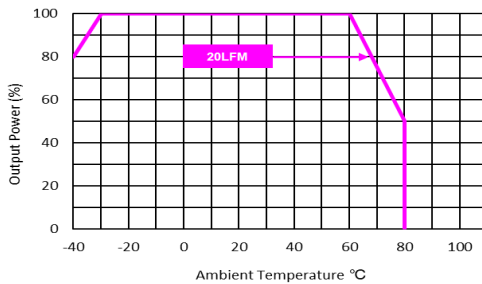
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load; $V_{in}=V_{in\ nom}$



Typical Input Start-up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

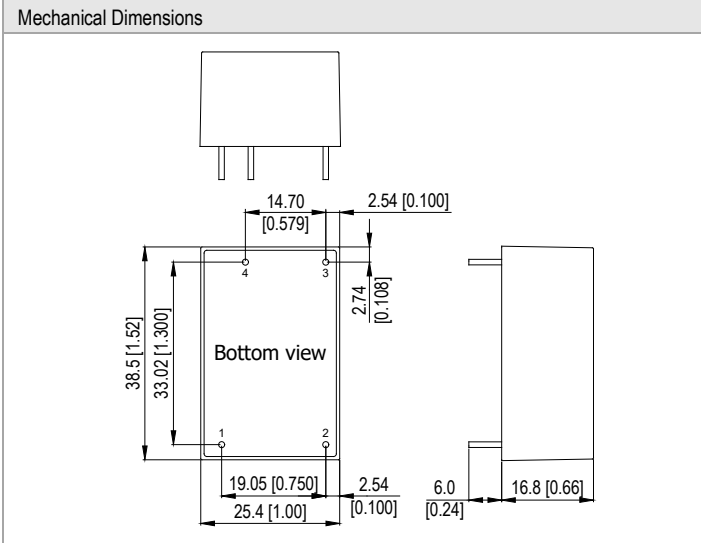


Typical Input Hold-up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load



Derating Output Current Versus Ambient Temperature
 $V_{in}=V_{in\ nom}$

Package Specifications PCB Mounting



Pin Connections

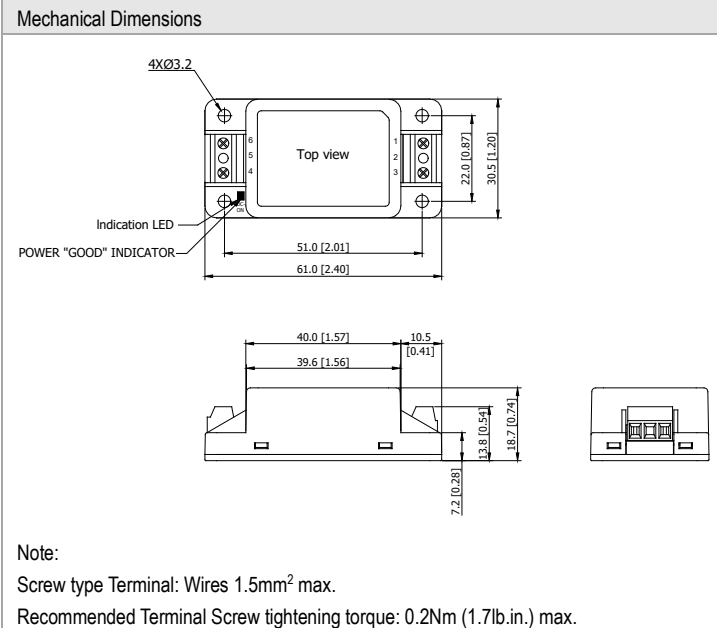
Pin	Function	Diameter mm (inches)
1	AC(N)	∅ 1.0 [0.04]
2	AC(L)	∅ 1.0 [0.04]
3	-Vout	∅ 1.0 [0.04]
4	+Vout	∅ 1.0 [0.04]

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ±0.5 (±0.02)
- ▶ Pin pitch tolerance: ±0.25 (±0.01)
- ▶ Pin diameter tolerance: X.X±0.1 (X.XX±0.004)

Physical Characteristics

Case Size	: 38.5x25.4x16.8mm (1.52x1.00x0.66 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Copper Alloy
Weight	: 29g

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



Pin Connections

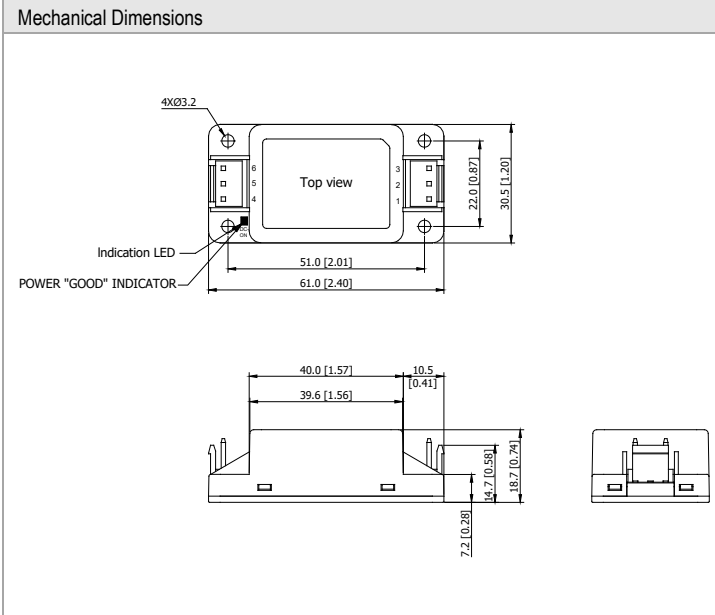
Pin	Function
1	AC(N)
2	No Pin
3	AC(L)
4	-Vout
5	No Pin
6	+Vout

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

Physical Characteristics

Case Size	: 61.0x30.5x18.7mm (2.40x1.20x0.74 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 34g

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



Pin Connections	
Pin	Function
1	AC(L)
2	No Pin
3	AC(N)
4	No Pin
5	-Vout
6	+Vout

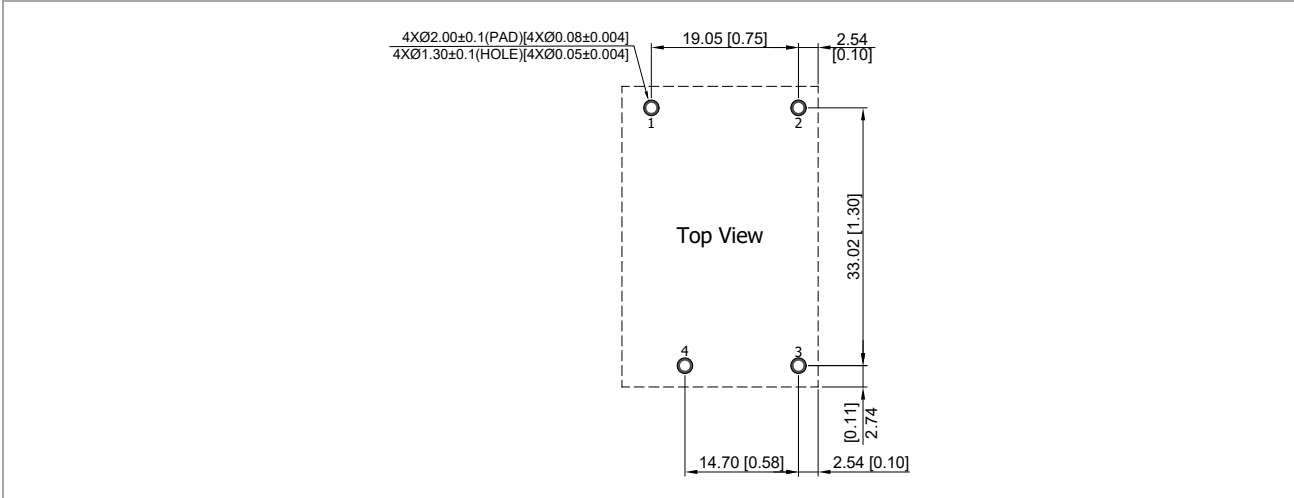
Input (pin 1, pin 3): JST Connector
 mates with JST crimp contacts: SVH-41T-P1.1
 terminal housing: VAR-2
 Output (pin 5, pin 6): JST Connector
 mates with JST crimp contacts: SVH-41T-P1.1
 terminal housing: VHR-3

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

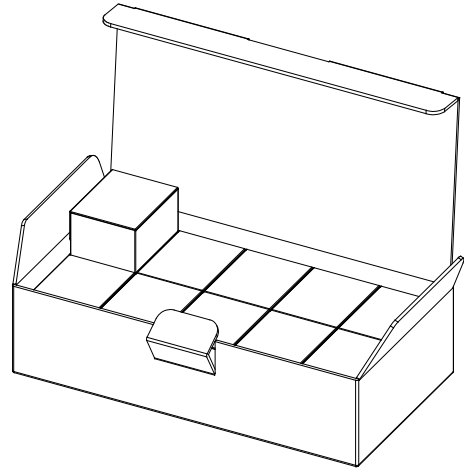
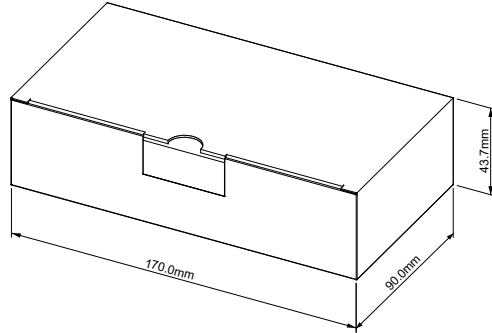
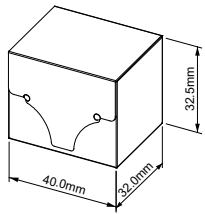
Physical Characteristics

Case Size	: 61.0x30.5x18.7mm (2.40x1.20x0.74 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 34g

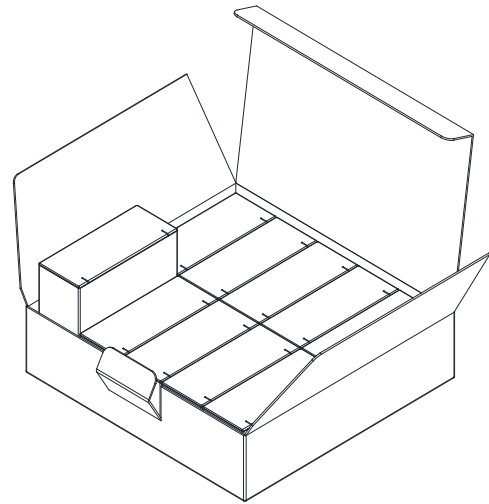
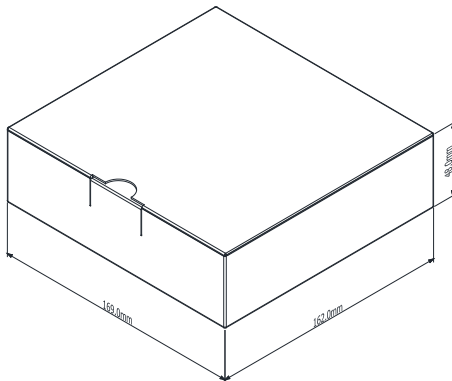
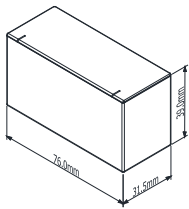
Recommended Pad Layout



Packaging Information



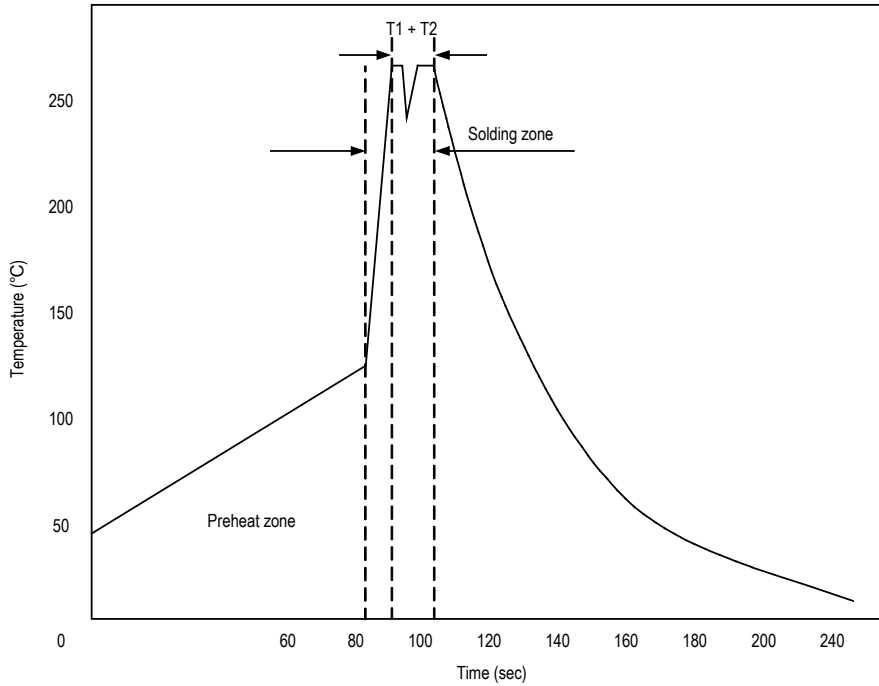
Unit: mm
AMF-07 PCB Mounting 10 PCS per Box



Unit: mm
AMF-07 Chassis Mounting 10 PCS per Box

Wave Soldering Considerations

Lead free wave solder profile



Zone	Reference Parameter
Preheat	Rise temp. speed : 3°C/sec max.
zone	Preheat temp. : 100~130°C
Actual	Peak temp. : 250~260°C
heating	Peak time(T1+T2) : 4~6 sec

Hand Welding Parameter

Reference Solder: Sn-Ag-Cu : Sn-Cu : Sn-Ag

Hand Welding: Soldering iron : Power 60W

Welding Time: 2~4 sec

Temp.: 380~400°C

Part Number Structure					
AMF	-	07	S	05	C
		Output Power 7 Watt	Output Quantity S: Single	Output Voltage 05: 5 VDC 12: 12 VDC 15: 15 VDC 24: 24 VDC 48: 48 VDC	Package Type N/A: PCB Mounting C: Chassis Mounting with screw terminal CD: Chassis Mounting with JST connection

MTBF and Reliability		
The MTBF of AMF-07 series of AC-DC Power Module has been calculated using MIL-HDBK 217F NOTICE2, Operating Temperature 25°C, Ground Benign.		
Model	MTBF	Unit
AMF-07S05	499,890	Hours
AMF-07S12	603,652	
AMF-07S15	620,445	
AMF-07S24	648,900	
AMF-07S48	619,979	
AMF-07S05C	492,021	
AMF-07S12C	592,764	
AMF-07S15C	602,624	
AMF-07S24C	602,912	
AMF-07S48C	608,857	
AMF-07S05CD	492,021	
AMF-07S12CD	592,764	
AMF-07S15CD	602,624	
AMF-07S24CD	602,912	
AMF-07S48CD	608,857	