



AYM-60 Series

AC-DC Power Module 60W, Industrial & Medical Safety

Features

- ▶ Fully Encapsulated Plastic Case for PCB, Chassis and DIN-Rail Mounting Version
- ▶ Universal Input 85~264VAC, 47~440Hz
- ▶ I/O Isolation 4000VAC with Reinforced Insulation
- ▶ Operating Ambient Temp. Range -40°C to +80°C
- ▶ Overload/Voltage and Short Circuit Protection
- ▶ EMI Emission EN 55011/32 Class B Approved
- ▶ EMC Immunity EN 61000-4-2,3,4,5,6,8,11 Approved
- ▶ Medical EMC Standard with 4th Edition of EMI EN 55011 & EMS EN 60601-1-2 Approved
- ▶ Medical Safety with 2xMOPP per 3rd Edition of IEC/EN 60601-1 & ANSI/AAMI ES 60601-1 Approved
- ▶ UL508 Safety Approval Specifically for Industrial Application
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE Marking

Electric Characteristic Note



Applications

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

Product Overview

The new MINMAX AYM-60 series is a range of fully encapsulated AC-DC power modules. These high performance products feature an extended operating temperature range of -40°C to +80°C. Universal input voltage 85-264VAC and UL/IEC/EN safety approvals including medical safety and UL 508 listing qualify these power supplies modules for applications in products with worldwide markets. EMI Emission EN 55011/32 Class B Approved. The AYM-60 series power modules provide a perfect solution for many space critical applications in commercial, medical and industrial electronic equipment.

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Model Selection Guide						
Model Number	Output Voltage	Output Current	Input Current		Max. capacitive Load	Efficiency (typ.)
			115VAC, 60Hz	230VAC, 50Hz		
	VDC	Max. mA	@Max. Load mA(typ.)		μF	@Max. Load, 115VAC %
AYM-60S051	5.1	10000	880	528	8000	84
AYM-60S12	12	5000	1000	600	3900	87
AYM-60S15	15	4000	1000	600	3300	87
AYM-60S24	24	2500	1000	600	1500	87
AYM-60S48	48	1250	988	593	680	88

Input Specifications						
Parameter	Conditions / Model		Min.	Typ.	Max.	Unit
AC Voltage Input Range	All Models		85	---	264	VAC
Input Frequency Range			47	---	440	Hz
DC Voltage Input Range			120	---	370	VDC
No-Load Power Consumption			---	---	0.5	W
Inrush Current (Cold Start at 25°C)			115VAC	---	---	30
	230VAC	---	---	60	A	

Output Specifications						
Parameter	Conditions / Model		Min.	Typ.	Max.	Unit
Output Voltage Setting Accuracy			---	±1.0	±2.0	%Vnom.
Line Regulation	Vin=Min. to Max. @Full Load		---	±0.2	±1.0	%
Load Regulation	Io=0% to 100%		---	±0.5	±1.0	%
Minimum Load	No minimum Load Requirement					
Ripple & Noise ₍₃₎	0-20 MHz Bandwidth	5.1VDC Output Models	---	2.0	3.0	%V _{PP} of Vo
		Other Output Models	---	1.0	1.5	%V _{PP} of Vo
Over Voltage Protection	Zener diode clamp		---	120	---	% of Vo
Temperature Coefficient			---	±0.02	---	%/°C
Overshoot			---	---	5	%
Over Load Protection	85VAC, Hiccup Mode, auto-recovery (long term overload condition may cause damage)		105	---	---	%Inom.
Short Circuit Protection	Hiccup mode, Automatic Recovery					

General Specifications						
Parameter	Conditions		Min.	Typ.	Max.	Unit
I/O Isolation Voltage	Reinforced Insulation, Rated For 60 Seconds		4000	---	---	VAC
Leakage Current			---	80	---	μA
I/O Isolation Resistance	500 VDC		1000	---	---	MΩ
Switching Frequency			---	65	---	kHz
Hold-up Time	115VAC, 60Hz		---	20	---	ms
	230VAC, 50Hz		---	80	---	ms
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign		125,000			Hours
Safety Standards	UL/cUL 60950-1, CSA C22.2 No 60950-1					
	ANSI/AAMI ES60601-1, CAN/CSA-C22.2 No. 60601-1					
	IEC/EN 60950-1, IEC/EN 60601-1 3 rd Edition 2xMOPP					
	UL508, CSA C22.2 No.107.1-01					
Safety Approvals	UL/cUL 60950-1 recognition (UL certificate), IEC/EN 60950-1 (CB-report), UL/cUL 508 listed certificate					
	UL/cUL 62368-1 recognition (UL certificate), IEC/EN 62368-1 (CB-report)					
	ANSI/AAMI ES60601-1 2xMOPP recognition (UL certificate), IEC/EN 60601-1 3 rd Edition (CB-report)					

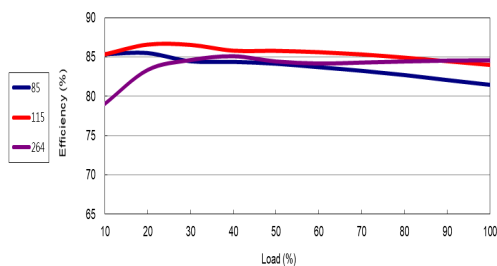
EMC Specifications					
Parameter	Standards & Level			Performance	
EMI	Conduction	EN 55011, EN 55032, EN 61000-6-4,		Without external components Class B	
	Radiation	EN 61000-6-3			
EMS	EN 60601-1-2 4 th , EN 55024, EN 61000-6-2, EN 61000-6-1				
	ESD	EN 61000-4-2 Air ± 15kV, Contact ± 8kV			A
	Radiated 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 & Interruptions	EN 61000-4-11	0% of 230VAC	0.5 cycle	A
			0% of 230VAC	1 cycle	A
70% of 230VAC			25/30 cycle	A	
0% of 230VAC			250/300 cycle	B	

Environmental Specifications				
Parameter	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range		-40	+80	°C
Power Derating	Above +60°C	2.3		W / °C
Storage Temperature Range		-40	+95	°C
Humidity (non condensing)		---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)		---	260	°C

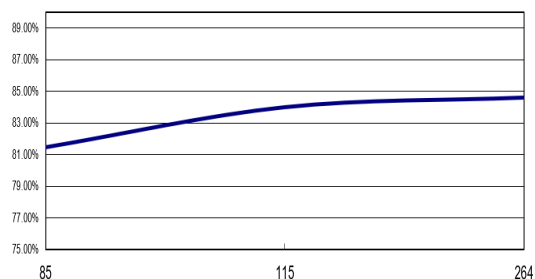
Notes	
1	This product is not designed for use in critical life support systems, equipment used in hazardous environment, nuclear control systems or other such applications which necessitate specific safety and regulatory standards other the ones listed in this datasheet.
2	Specifications typical at Ta=+25°C, resistive load, 115VAC, 60Hz input voltage, after warm-up time rated output current unless otherwise noted.
3	Ripple & Noise of PCB mounting type measured with a 0.1µF/50V MLCC and a 1µF/50V Aluminum electrolytic.
4	Safety approvals cover frequency 47-63 Hz.
5	We recommend to protect the converter by a slow blow fuse in the input supply line.
6	Other input and output voltage may be available, please contact MINMAX.
7	Specifications are subject to change without notice.

Characteristic Curves

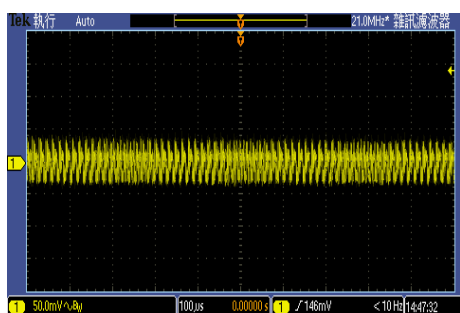
All test conditions are at 25°C The figures are identical for AYM-60S051



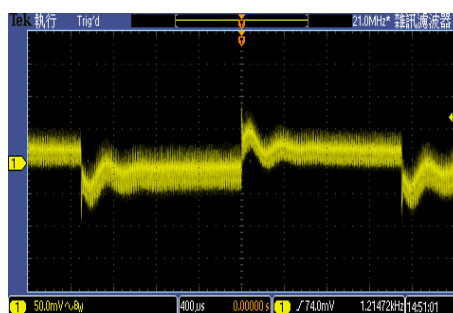
Efficiency Versus Output Current



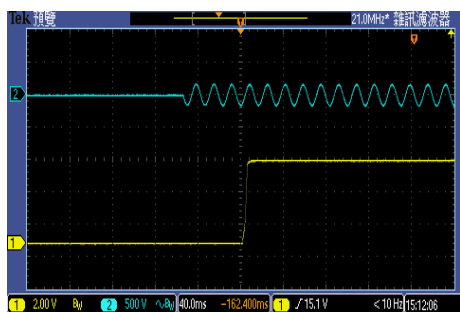
Efficiency Versus Input Voltage
Full Load



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



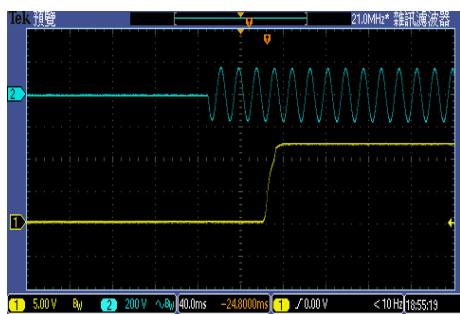
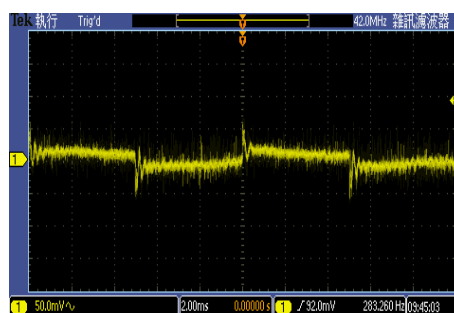
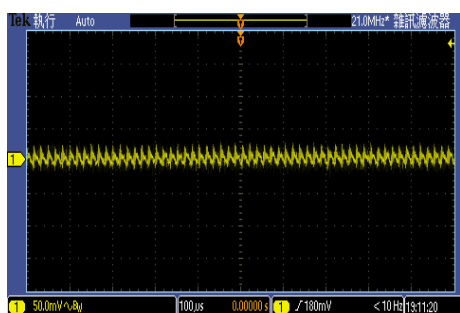
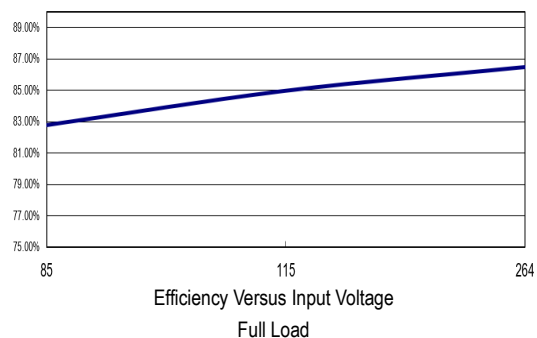
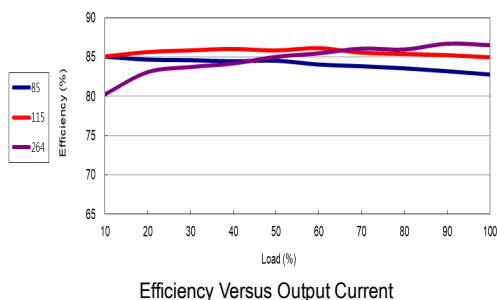
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



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

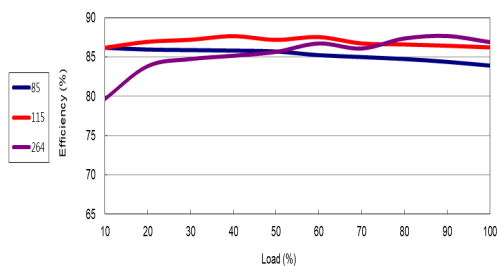
Characteristic Curves

All test conditions are at 25°C. The figures are identical for AYM-60S12

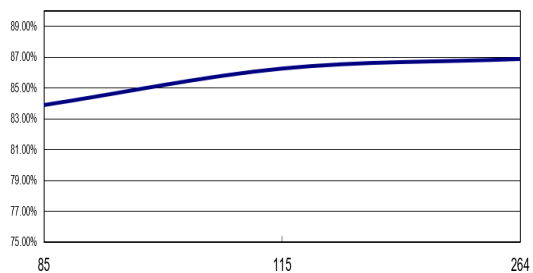


Characteristic Curves

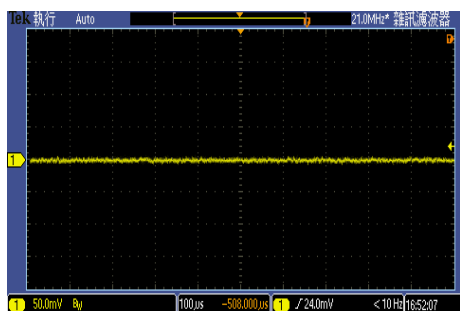
All test conditions are at 25°C The figures are identical for AYM-60S15



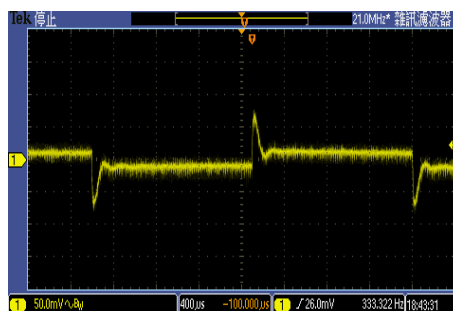
Efficiency Versus Output Current



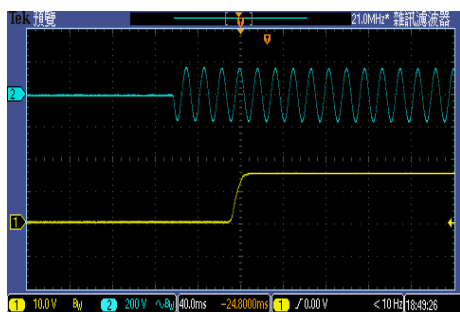
Efficiency Versus Input Voltage Full Load



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



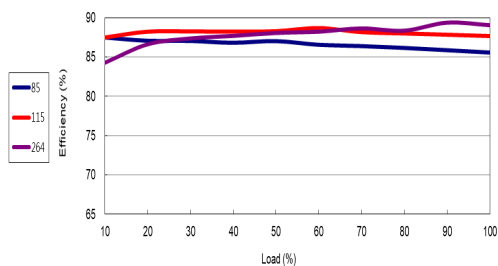
Transient Response to Dynamic Load Change from 100% to 75% of Full Load; $V_{in}=V_{in\ nom}$



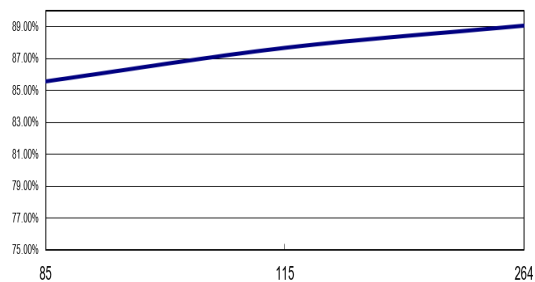
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

Characteristic Curves

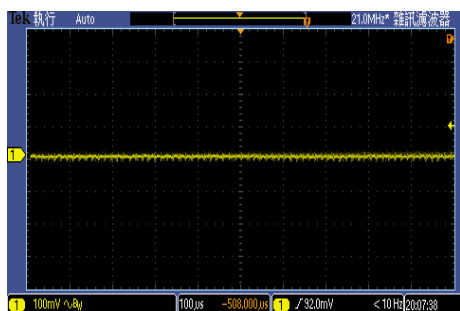
All test conditions are at 25°C The figures are identical for AYM-60S24



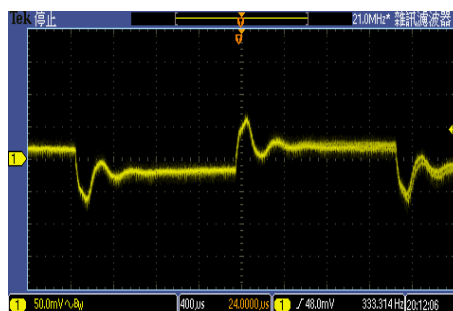
Efficiency Versus Output Current



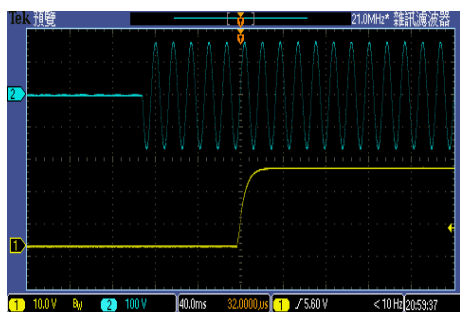
Efficiency Versus Input Voltage
Full Load



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



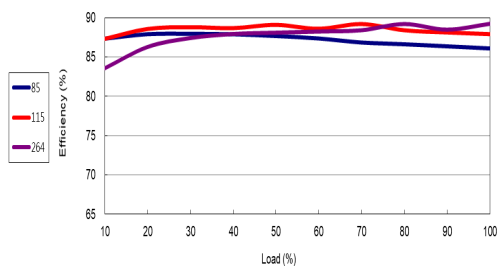
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



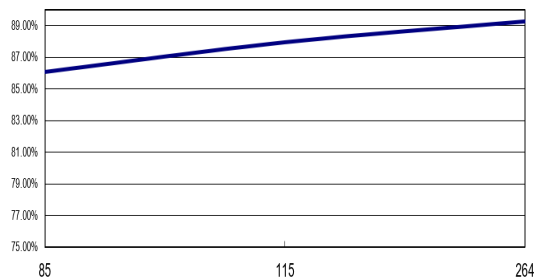
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

Characteristic Curves

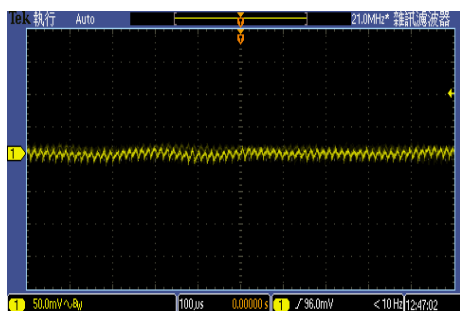
All test conditions are at 25°C The figures are identical for AYM-60S48



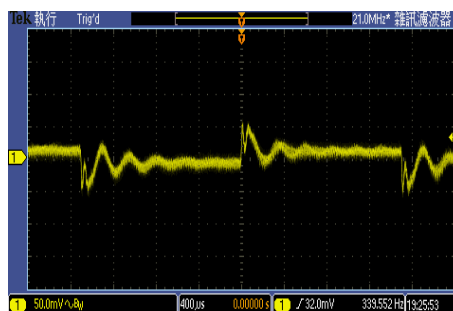
Efficiency Versus Output Current



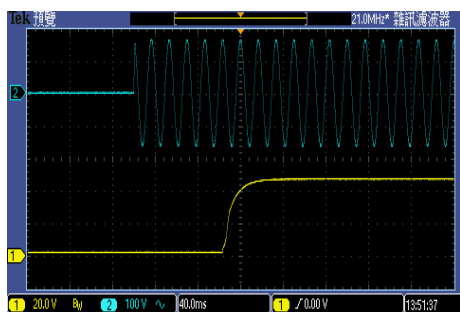
Efficiency Versus Input Voltage Full Load



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

Package Specifications PCB Mounting

Mechanical Dimensions

The drawing shows a rectangular PCB mounting package. The bottom view shows a width of 67.5 mm [2.66] and a height of 88.9 mm [3.50]. The distance between the two mounting holes is 25.4 mm [1.00]. The mounting holes are spaced 17.75 mm [0.70] from the top edge and 17.00 mm [0.67] from each other. The distance from the bottom edge to the center of the mounting holes is 36.45 mm [1.44]. The side view shows a height of 6.0 mm [0.24] and a width of 34.2 mm [1.35]. A tolerance of ±0.04 mm is indicated for the height.

Pin Connections

Pin	Function
1	AC (N)
2	AC (L)
4	+Vout
6	-Vout

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ±1.0 (±0.04)
- ▶ Pin pitch tolerance: ±0.25 (±0.01)
- ▶ Pin diameter \varnothing 1.0 ±0.1 (0.04±0.004)

Physical Characteristics

Case Size	: 88.9x67.5x34.2mm (3.50x2.66x1.35 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Copper Alloy with Tin Plate Over Nickel Subplate
Weight	: 360g

Package Specifications Chassis Mounting (order code suffix C)

Mechanical Dimensions

The drawing shows a rectangular chassis mounting package. The top view shows a width of 100.0 mm [3.94] and a height of 67.8 mm [2.67]. The distance between the two rows of pins is 50.0 mm [1.97]. The distance from the top edge to the center of the top row of pins is 17.75 mm [0.70]. The distance from the bottom edge to the center of the bottom row of pins is 17.00 mm [0.67]. The side view shows a height of 38.0 mm [1.50] and a width of 90.0 mm [3.54]. The distance from the top edge to the center of the top row of pins is 11.0 mm [0.43]. The distance from the bottom edge to the center of the bottom row of pins is 16.8 mm [0.66]. The distance between the two rows of pins is 5.00 mm [0.20]. The distance from the top edge to the center of the top row of pins is 17.75 mm [0.70]. The distance from the bottom edge to the center of the bottom row of pins is 17.00 mm [0.67]. The distance between the two rows of pins is 17.75 mm [0.70]. The distance from the top edge to the center of the top row of pins is 17.75 mm [0.70]. The distance from the bottom edge to the center of the bottom row of pins is 17.00 mm [0.67]. The distance between the two rows of pins is 17.75 mm [0.70].

Connections

Pin	Function
1	AC (N)
2	AC (L)
3	NC
4	+Vout
5	NC
6	-Vout
7	NC

NC: No Connection

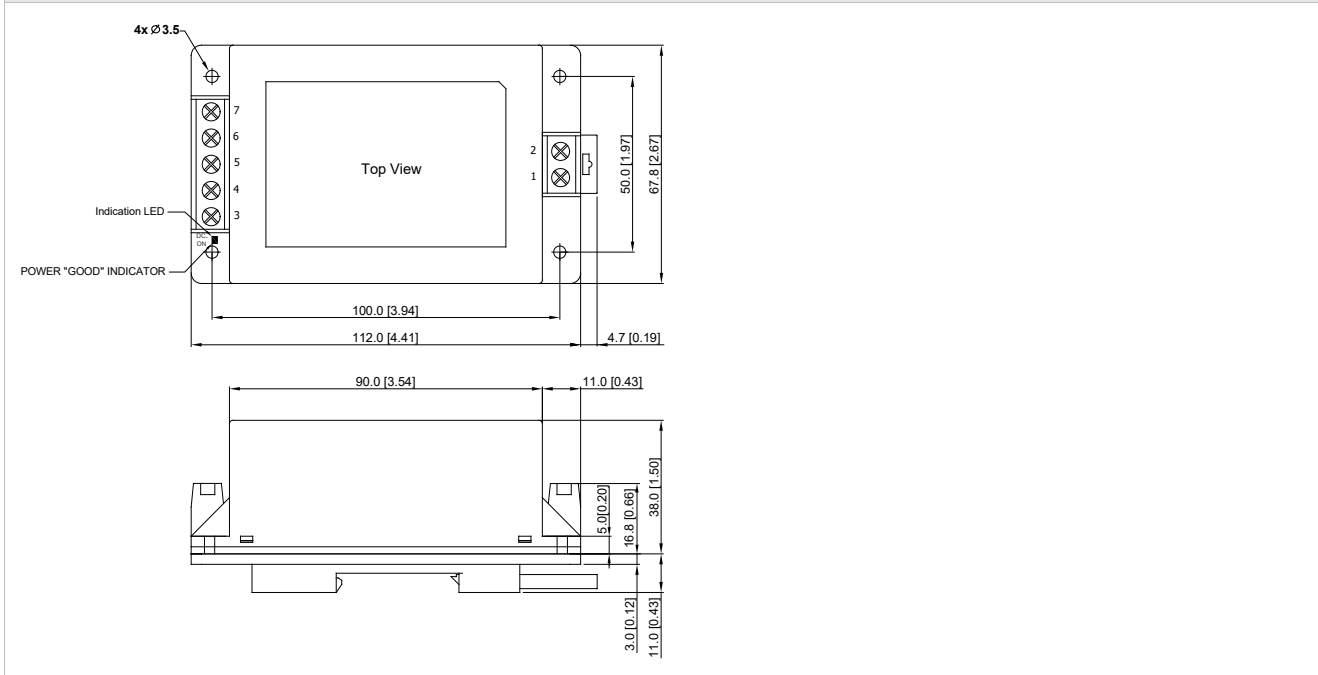
- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ±1.0 (±0.04)

Physical Characteristics

Case Size	: 112.0x67.8x38.0mm (4.41x2.67x1.50 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 380g

Package Specifications with DIN Rail Mounting Bracket

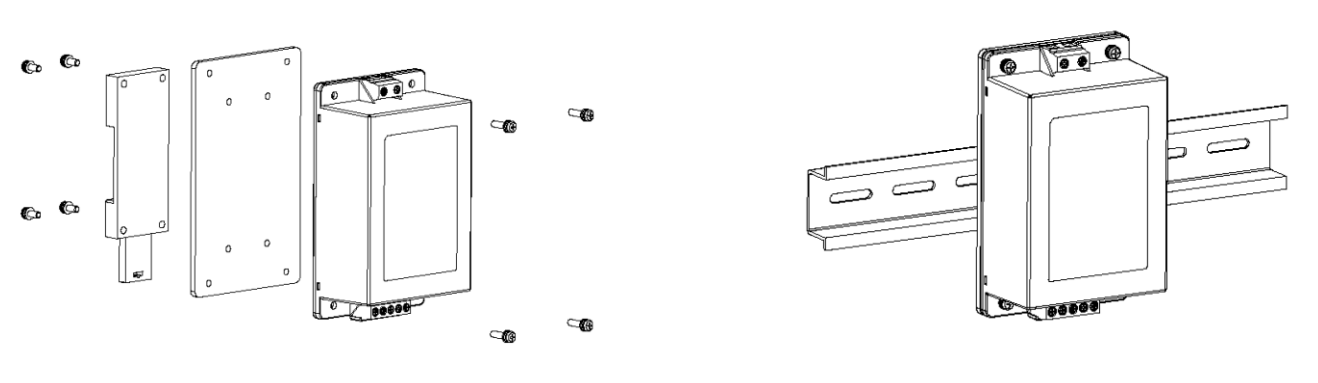
Mechanical Dimensions

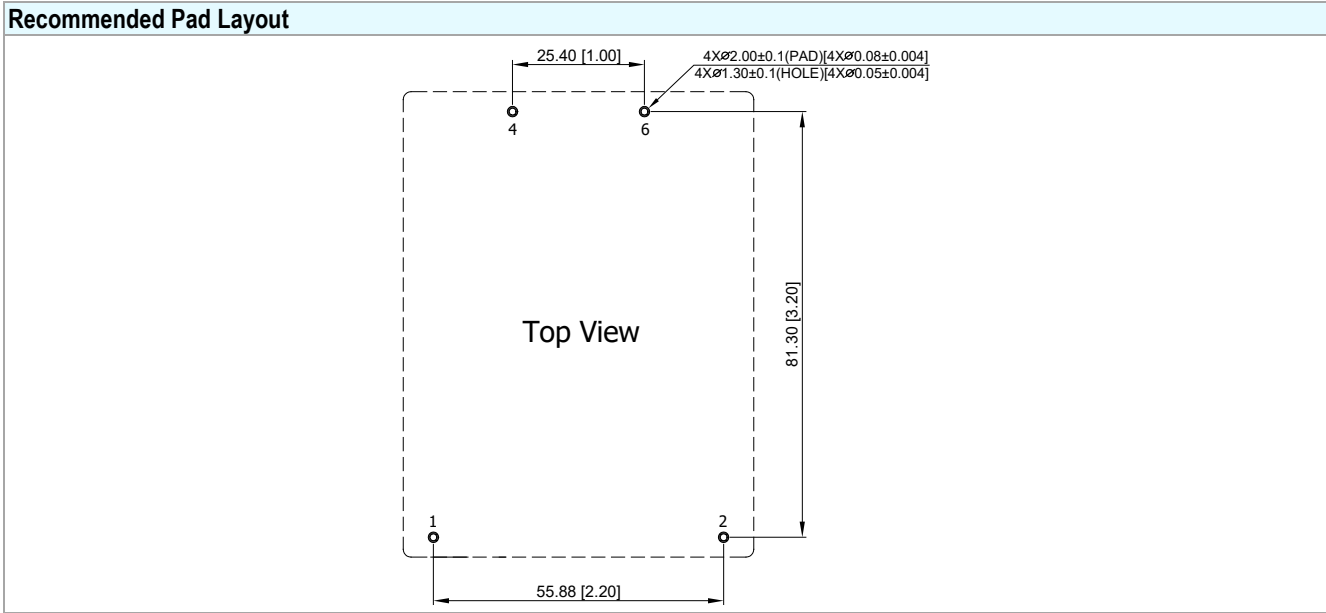


Physical Characteristics

Case Size	: 112.0x67.8x38.0mm (4.41x2.67x1.50 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Weight	: 433g

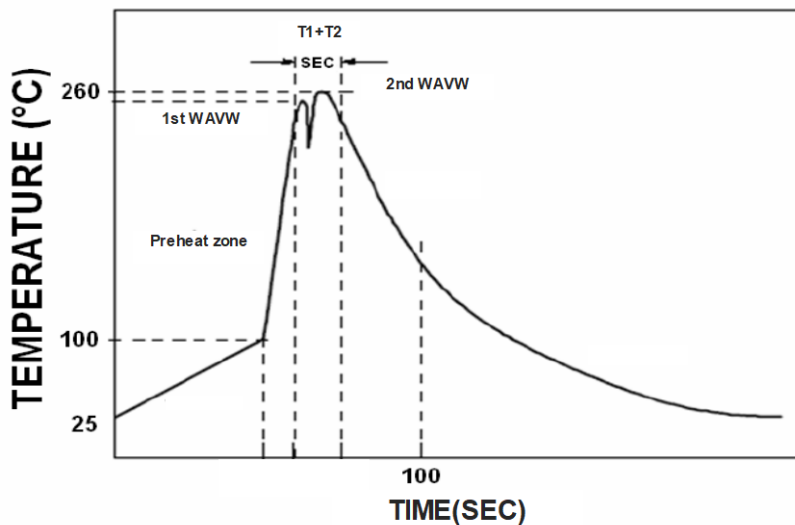
DIN-Rail Mounting Bracket (Order Code for Kit : AC-DIN-02)





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

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

AYM-60S051

Max. Output Power
60Watts

Output Voltage
S051 : 5.1 VDC
S12 : 12 VDC
S15 : 15 VDC
S24 : 24 VDC
S48 : 48 VDC

MTBF and Reliability

The MTBF of AYM-60 series of AC-DC Power Module has been calculated using MIL-HDBK 217F NOTICE2, Operating Temperature 25°C, Ground Benign.

Model	MTBF	Unit
AYM-60S051	817,940	Hours
AYM-60S12	768,665	
AYM-60S15	754,820	
AYM-60S24	815,988	
AYM-60S48	805,421	
AYM-60S051C	800,146	
AYM-60S12C	766,976	
AYM-60S15C	753,191	
AYM-60S24C	806,949	
AYM-60S48C	797,127	