



MINMAX[®]

AAF-03 Series

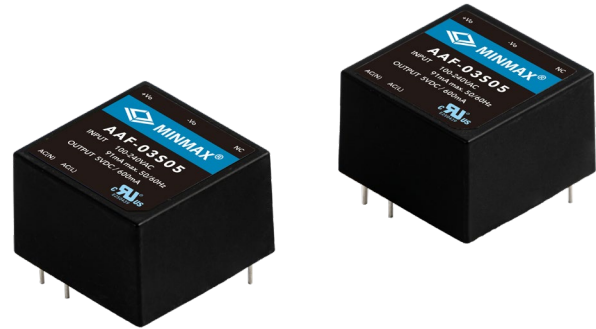
Electric Characteristic Note

AAF-03 Series EC Note

AC-DC Power Module 3W

Features

- ▶ Ultra Compact Size 1.0" x 1.0" x 0.64"
- ▶ Fully Encapsulated Plastic Case for PCB Mounting
- ▶ Universal Input 85-264VAC
- ▶ I/O Isolation 3000VAC with Reinforced Insulation
- ▶ Operating Ambient Temp. Range -25°C to +70°C
- ▶ No Min. Load Requirement
- ▶ Overload/Voltage and Short Circuit Protection
- ▶ EMI Emission EN 55032/14-1 Class B Approved
- ▶ EMS Immunity EN 61000-4-2,3,4,5,6,8,11 Approved
- ▶ Eco Design, Low No Load Power Consumption < 150mW
- ▶ UL/cUL/IEC/EN 62368-1(60950-1), TUV/IEC/EN 60335-1 Safety Approval & CE Marking



Applications

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

Product Overview

The AAF-03 Series from MINMAX is a range of ultra-small, fully encapsulated 3 Watt AC-DC power supply modules. They are designed for easy PCB mounting with solder pins. The modules feature EMI emission EN 55032/14-1 Class B approved. EMC immunity complies with EN 61000-6-1. The low stand-by power consumption complies with European ErP Directive 2009/125/EC. This series comply with international standard pinout and input voltage range of 85-264VAC for worldwide markets. The AAF-03 series provide a better solution for space critical applications in consumer appliances and instrumentation and communication equipment.

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Model Selection Guide

Model Number	Output Voltage VDC	Output Current		Input Current @Max. Load mA(typ.)	Max. capacitive Load μF	Efficiency (typ.) @Max. Load %
		Max. mA	Peak ₍₁₎ mA			
		AAF-03S03	3.3	900	1170	62
AAF-03S05	5	600	780	61	820	72
AAF-03S09	9	333	430	57	470	77
AAF-03S12	12	250	320	56	330	78
AAF-03S15	15	200	260	56	270	78
AAF-03S24	24	125	160	56	180	78

Input Specifications

Parameter	Conditions / Model	Min.	Typ.	Max.	Unit
Input Voltage Range	All Models	85	---	264	VAC
Input Frequency Range		47	---	63	Hz
Input Voltage Range		120	---	370	VDC
No-Load Power Consumption		---	---	150	mW
Inrush Current (Cold Start at 25°C)	115VAC	---	---	15	A
	230VAC	---	---	25	A

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	---	±2.0	%Vnom.
Line Regulation	Vin=Min. to Max. @Full Load	---	---	±1.0	%
Load Regulation	Io=0% to 100%	---	---	±1.0	%
Ripple & Noise	0-20 MHz Bandwidth	---	---	70	mV _{P-P}
Minimum Load	No minimum Load Requirement				
Over Voltage Protection	Zener Diode Clamp	---	125	---	% of Vo
Temperature Coefficient		---	---	±0.05	%/°C
Overshoot		---	---	5	%Vout
Over Load Protection	Foldback, auto-recovery	135	150	---	%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	60 Seconds	3000	---	---	VAC
I/O Isolation Resistance	500 VDC	100	---	---	MΩ
Switching Frequency		---	65	---	kHz
Hold-up Time	115VAC, Full Load	---	8	---	ms
MTBF (calculated)	MIL-HDBK-217F@25°C, Ground Benign	1,200,000			Hours
Safety Approvals	UL/cUL 60950-1 recognition (UL certificate), IEC/EN 60950-1 (CB-report)				
	UL/cUL 62368-1 recognition (UL certificate), IEC/EN 62368-1 (CB-report)				
	IEC/EN 60335-1 recognition (CB-report, TUV certificate)				

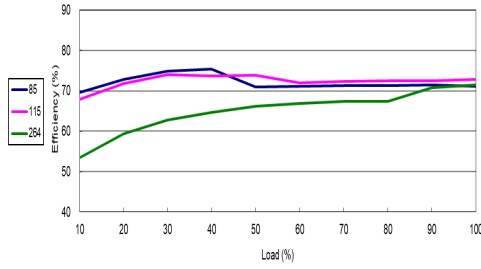
EMC Specifications				
Parameter	Standards & Level			Performance
EMI	Conduction	EN 55014-1, EN 55032	Without external components	Class B
	Radiation			
EMS	EN 55014-2, EN 55024			
	ESD	EN 61000-4-2 Air \pm 8kV, Contact \pm 4kV		A
	Radiated immunity	EN 61000-4-3 10V/m		A
	Fast transient	EN 61000-4-4 \pm 2kV		A
	Surge	EN 61000-4-5 \pm 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	Conditions	Min.	Max.	Unit
Operating Ambient Temperature Range		-25	+70	°C
Storage Temperature Range		-40	+85	°C
Power Derating	+60°C to +70°C	0.15		W / °C
Humidity (non condensing)		---	95	% rel. H
Lead Temperature (1.5mm from case for 10Sec.)		---	260	°C

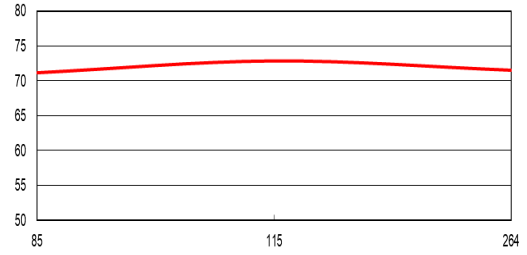
Notes
1 Peak load lasting <30s with a maximum duty cycle of 10%, average output power not to exceed maximum power.
2 All specifications typical at Ta=+25°C, resistive load, 115VAC, 60Hz input voltage and after warm-up time rated output current unless otherwise noted.
3 We recommend to protect the converter by a slow blow fuse in the input supply line.
4 Other input and output voltage may be available, please contact MINMAX.
5 Specifications are subject to change without notice.

Characteristic Curves

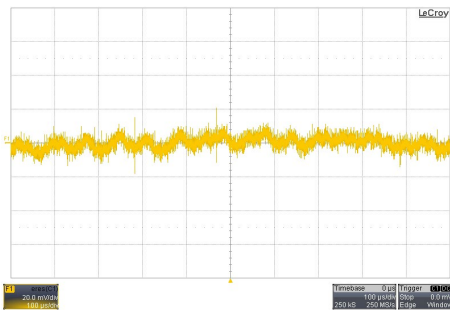
All test conditions are at 25°C The figures are identical for AAF-03S03



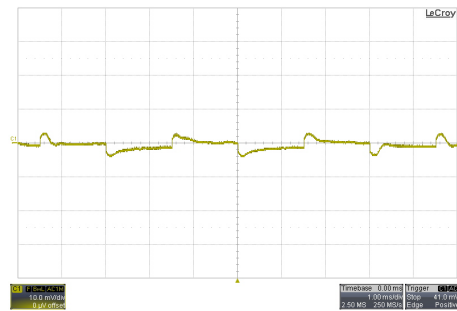
Efficiency Versus Output Current



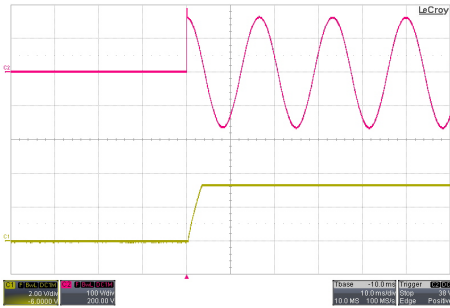
Efficiency Versus Input Voltage Full Load



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



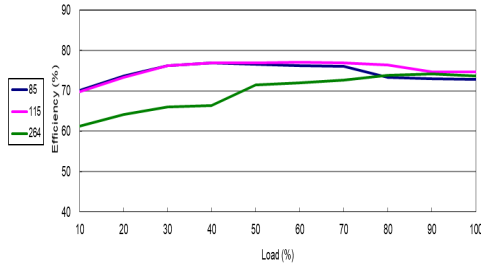
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



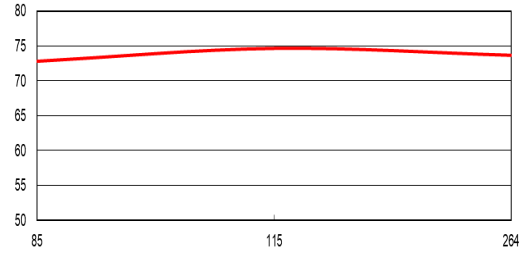
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

Characteristic Curves

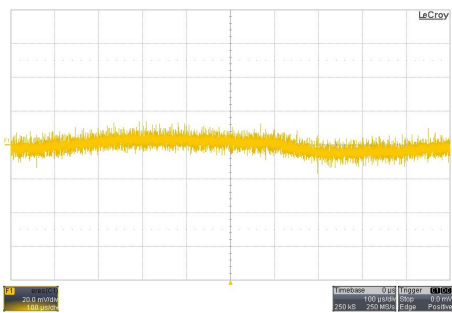
All test conditions are at 25°C The figures are identical for AAF-03S05



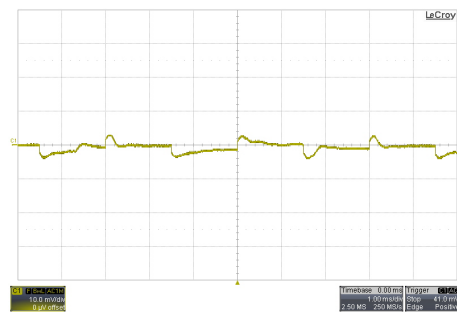
Efficiency Versus Output Current



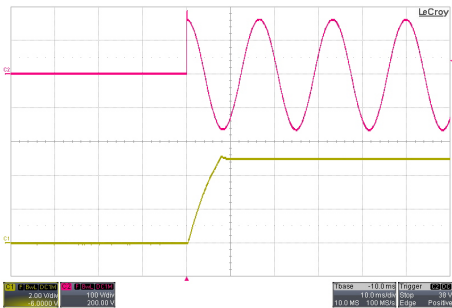
Efficiency Versus Input Voltage Full Load



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



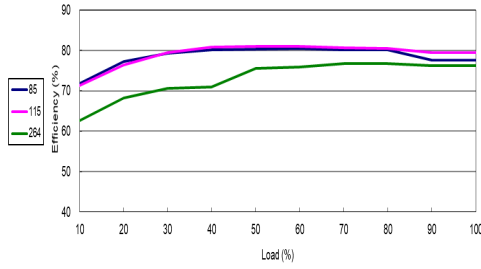
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



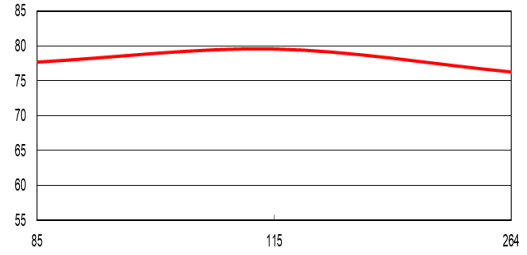
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

Characteristic Curves

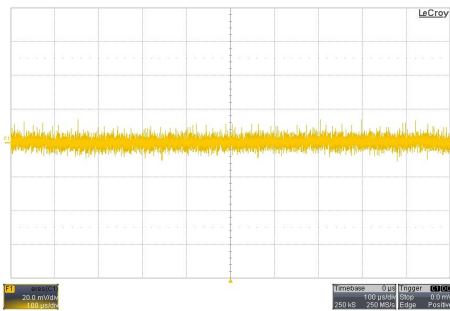
All test conditions are at 25°C The figures are identical for AAF-03S09



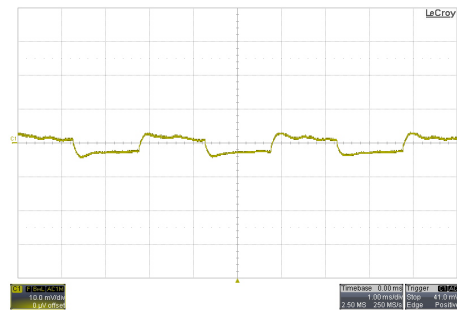
Efficiency Versus Output Current



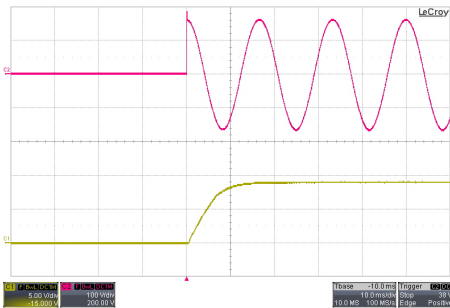
Efficiency Versus Input Voltage Full Load



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



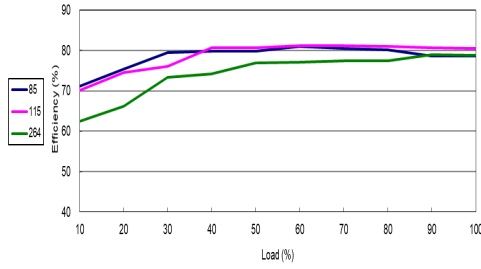
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



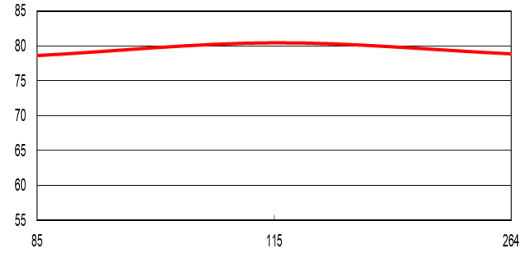
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

Characteristic Curves

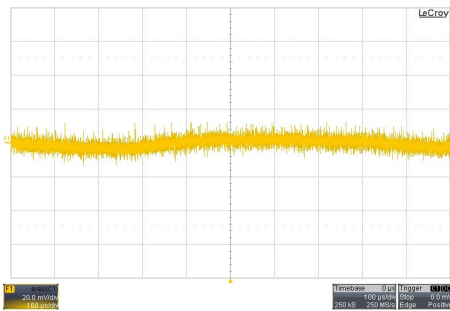
All test conditions are at 25°C The figures are identical for AAF-03S12



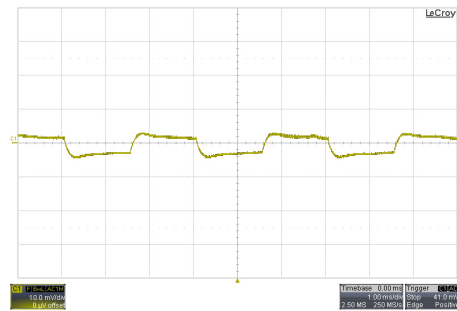
Efficiency Versus Output Current



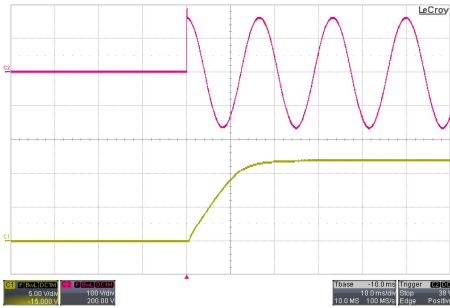
Efficiency Versus Input Voltage Full Load



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



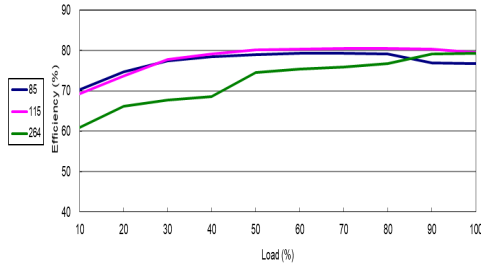
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



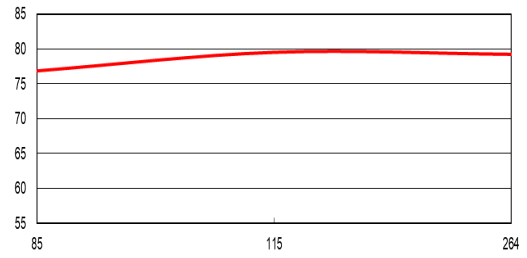
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

Characteristic Curves

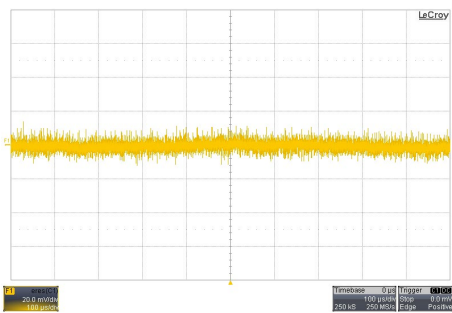
All test conditions are at 25°C The figures are identical for AAF-03S15



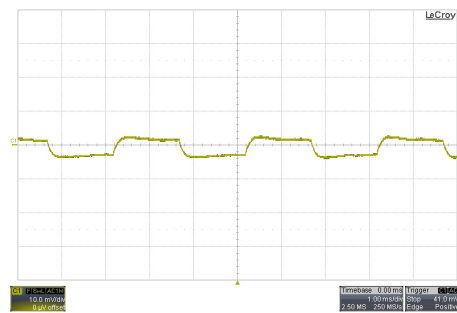
Efficiency Versus Output Current



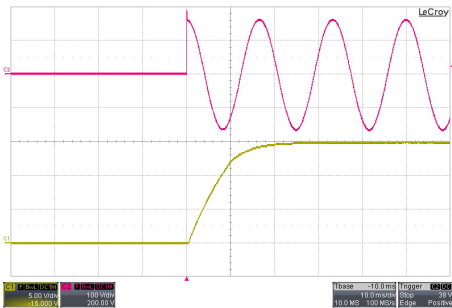
Efficiency Versus Input Voltage Full Load



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



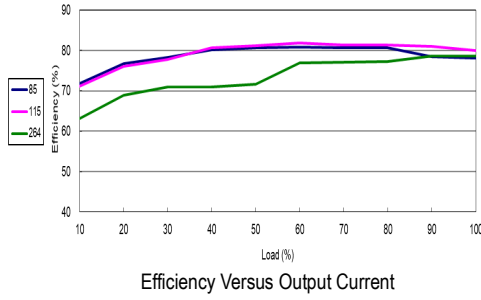
Transient Response to Dynamic Load Change
from 100% to 75% of Full Load ; $V_{in}=V_{in\ nom}$



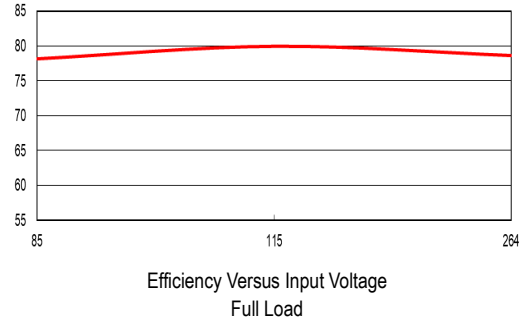
Typical Input Start-Up and Output Rise Characteristic
 $V_{in}=V_{in\ nom}$; Full Load

Characteristic Curves

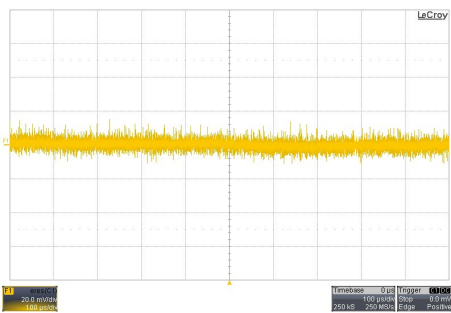
All test conditions are at 25°C. The figures are identical for AAF-03S24



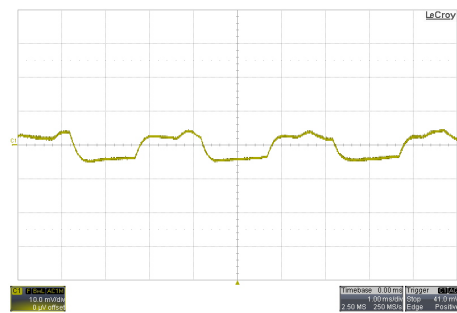
Efficiency Versus Output Current



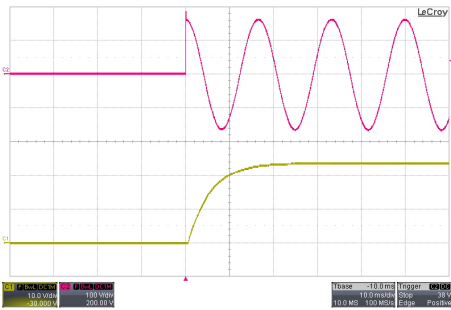
Efficiency Versus Input Voltage Full Load



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

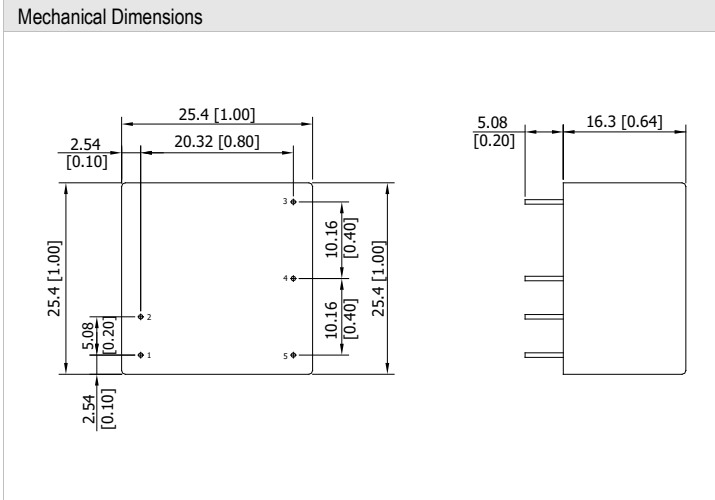


Transient Response to Dynamic Load Change
from 100% to 75% of Full Load; $V_{in}=V_{in\ nom}$



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

Package Specifications



Pin Connections

Pin	Function	Diameter mm (inches)
1	AC (N)	∅ 0.6 [0.02]
2	AC (L)	∅ 0.6 [0.02]
3	NC	∅ 0.6 [0.02]
4	-Vout	∅ 0.6 [0.02]
5	+Vout	∅ 0.6 [0.02]

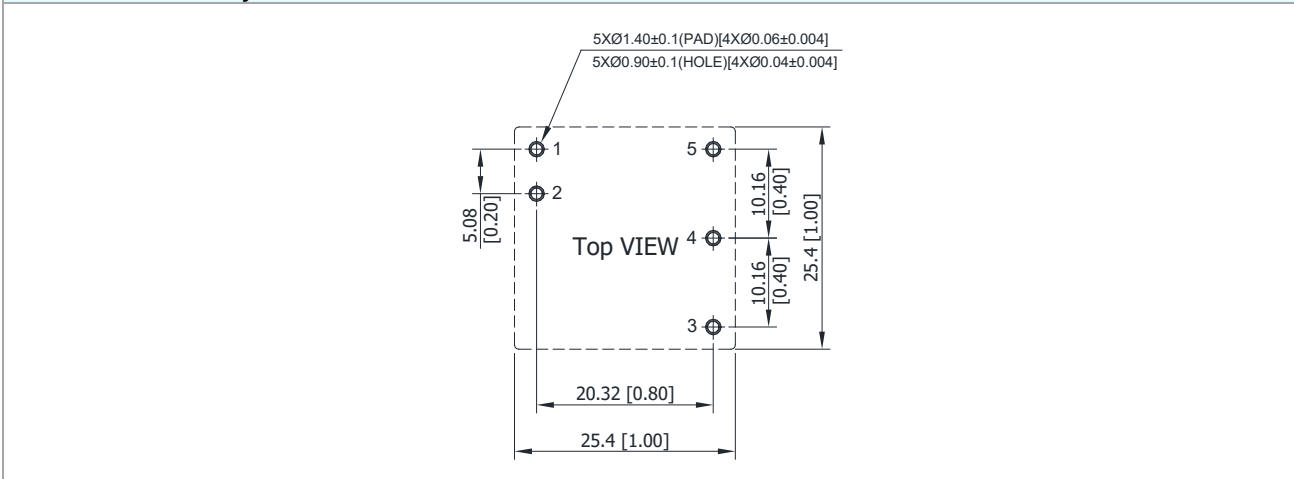
NC: No Connection

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

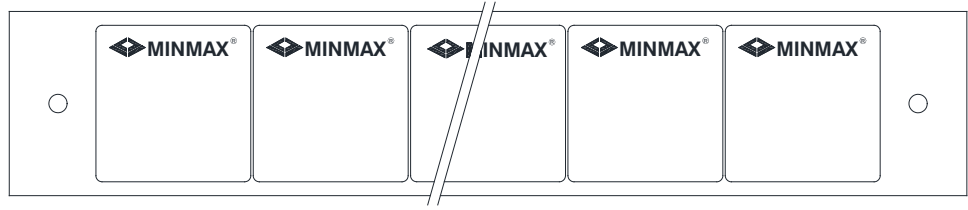
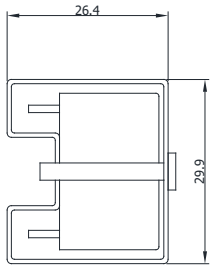
Physical Characteristics

Case Size	: 25.4x25.4x16.3mm (1.0x1.0x0.64 inches)
Case Material	: Plastic resin (flammability to UL 94V-0 rated)
Pin Material	: Copper Alloy
Weight	: 17.4g

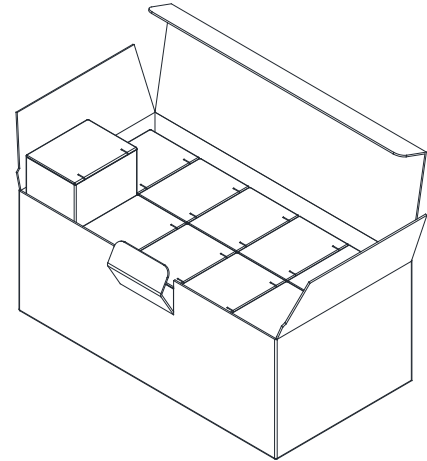
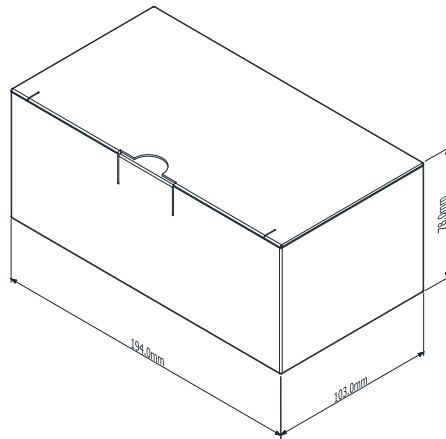
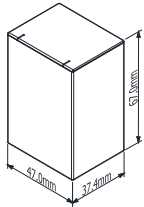
Recommended Pad Layout



Packaging Information



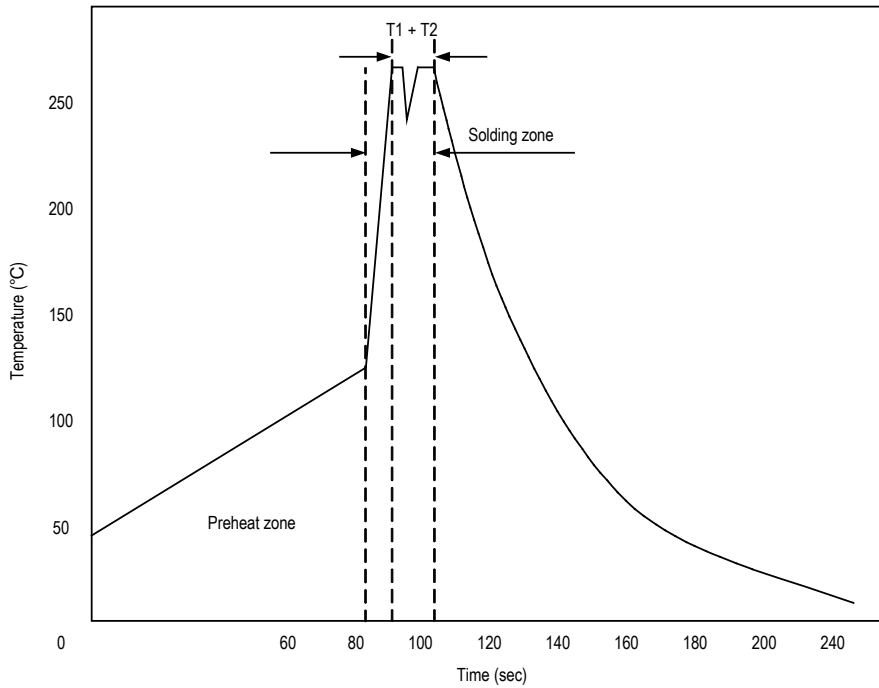
Unit: mm
10 PCS per Tube



Unit: mm
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																								
<u>AAF</u>	-	<u>03</u>	<u>S</u>																					
		<table border="1"> <tr> <th>Output Power</th> </tr> <tr> <td>3 Watt</td> </tr> </table>	Output Power	3 Watt	<table border="1"> <tr> <th>Output Quantity</th> </tr> <tr> <td>S: Single</td> </tr> </table>	Output Quantity	S: Single																	
Output Power																								
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			<table border="1"> <tr> <th colspan="3">Output Voltage</th> </tr> <tr> <td>03:</td> <td>3.3</td> <td>VDC</td> </tr> <tr> <td>05:</td> <td>5</td> <td>VDC</td> </tr> <tr> <td>09:</td> <td>9</td> <td>VDC</td> </tr> <tr> <td>12:</td> <td>12</td> <td>VDC</td> </tr> <tr> <td>15:</td> <td>15</td> <td>VDC</td> </tr> <tr> <td>24:</td> <td>24</td> <td>VDC</td> </tr> </table>	Output Voltage			03:	3.3	VDC	05:	5	VDC	09:	9	VDC	12:	12	VDC	15:	15	VDC	24:	24	VDC
Output Voltage																								
03:	3.3	VDC																						
05:	5	VDC																						
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12:	12	VDC																						
15:	15	VDC																						
24:	24	VDC																						

MTBF and Reliability		
The MTBF of AAF-03 series of AC-DC Power Module has been calculated using MIL-HDBK 217F NOTICE2, Operating Temperature 25°C, Ground Benign.		
Model	MTBF	Unit
AAF-03S03	1,200,000	Hours
AAF-03S05		
AAF-03S09		
AAF-03S12		
AAF-03S15		
AAF-03S24		