

NEW

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 | | |
| | | | | Max. | @Max. Load | |
| | VDC | W | A | mA(typ.) | μF | % |
| 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 | %VPP of Vo |
| | | Other Output Models | --- | --- | 1.0 | %VPP 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

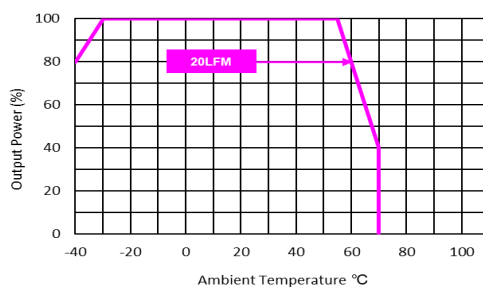
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------------------------|---|---------|------|------|-------|
| I/O Isolation Voltage | Input to Output, 60 Seconds | 3000 | --- | --- | VAC |
| I/O Isolation Resistance | 500 VDC | 10 | --- | --- | GΩ |
| Switching Frequency | | --- | 65 | --- | 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

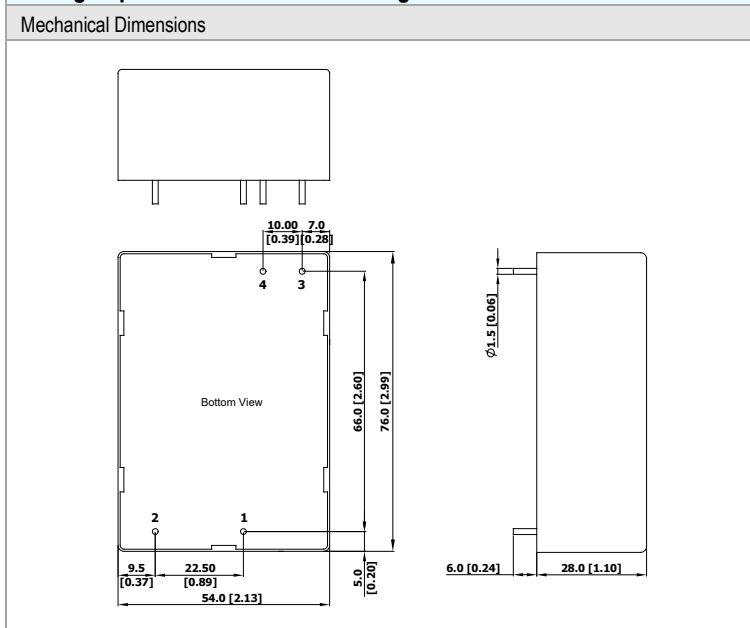
| Parameter | | Standards & Level | | Performance |
|-----------|--------------------------------|---|------------------------------|-------------|
| General | | Compliance with EN 61204-3 Switch mode power supplies | | |
| EMI | Conduction | EN55014-1, EN 55032 | Without external components | Class B |
| | Radiation | | | |
| EMS | EN 55014-2, EN 55024, EN 55035 | | | |
| | ESD | Direct discharge | Indirect discharge HCP & VCP | A |
| | | EN61000-4-2 air ± 8kV, Contact ± 6kV 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 | --- | +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 $T_a = +25^{\circ}\text{C}$, 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

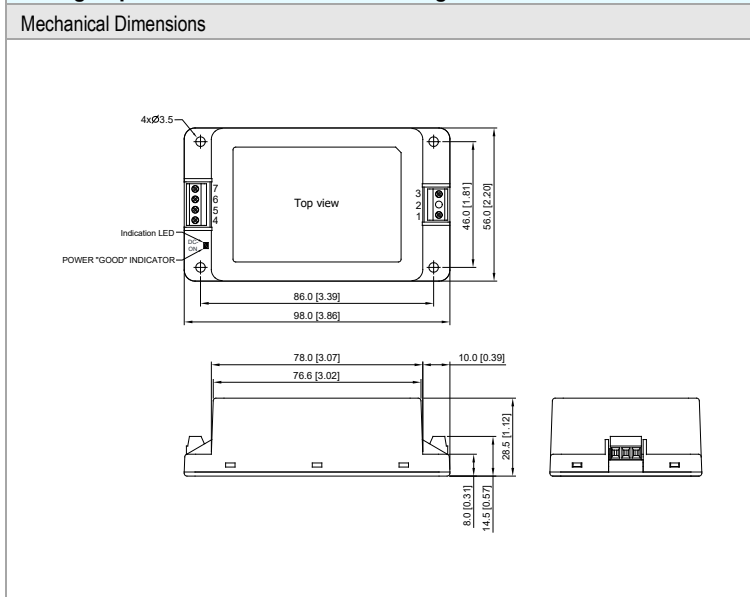
Package Specifications PCB Mounting


| Pin Connections | |
|-----------------|--------------------|
| Pin | Function |
| 1 | AC(N) – AC Neutral |
| 2 | AC(L) – AC Line |
| 3 | -Vout |
| 4 | +Vout |

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ± 0.5 (± 0.02)
- ▶ Pin pitch tolerance: ± 0.25 (0.01)
- ▶ Pin diameter $\varnothing 1.5 \pm 0.1$ (0.06 ± 0.004)

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 with Tin Plate Over Nickel Subplate |
| Weight | : 169g |

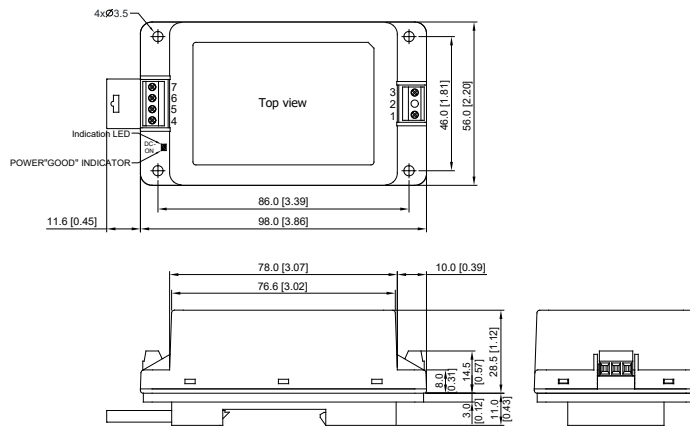
Package Specifications Chassis Mounting


| 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 |

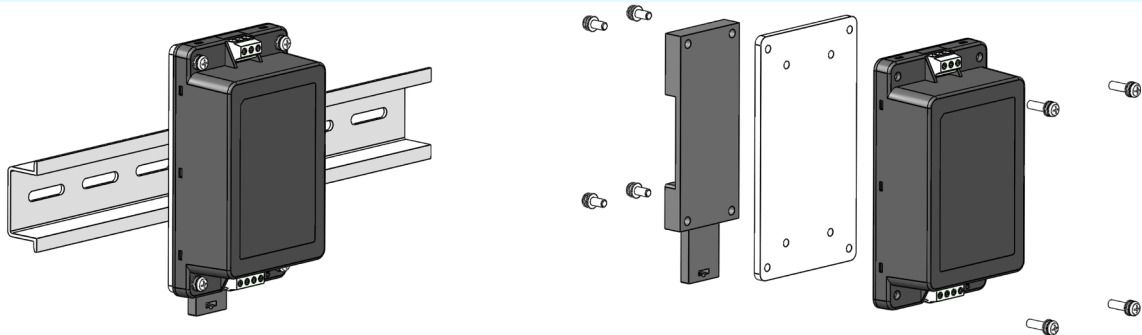
- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ± 0.5 (± 0.02)

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 with DIN Rail Mounting Bracket (order code 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 |

DIN-Rail Mounting Kit

Order Code Table

| PCB Mounting | Chassis Mounting | With DIN Rail Mounting by two Order Code | |
|--------------|------------------|--|-----------|
| AMF-60S051 | AMF-60S051C | AMF-60S051C | AC-DIN-01 |
| AMF-60S12 | AMF-60S12C | AMF-60S12C | AC-DIN-01 |
| AMF-60S15 | AMF-60S15C | AMF-60S15C | AC-DIN-01 |
| AMF-60S24 | AMF-60S24C | AMF-60S24C | AC-DIN-01 |
| AMF-60S48 | AMF-60S48C | AMF-60S48C | AC-DIN-01 |