

# DHF060 Series | ITE & Medical Safety

## 60W/90W Peak

- 2.0" x 3.17" x 0.95" compact size
- Flexible installation for Class I/II
- 5,000 m operating altitude
- -40°C to 70°C convection cooling operation
- Up to 12,000uF loading start-up
- Level VI compliant eco-friendly design



GREEN POWER

## Description

The **DHF060 Series** is a 60W, open-frame, Level VI compliant power supply that is a compact 2.0" x 3.17" x 0.95" in size. In addition to being an eco-friendly design, the series has an expanded, -40°C to +70°C, operating temperature range and is rated to an operating altitude of 5,000 m. The series has a 90W peak-power rating making it ideal for motor-starting/in-rush currents for ITE and Medical equipment, including MOOP and 2xMOPP, applications.

## Specifications

### Input

|                     |  |
|---------------------|--|
| Input Voltage       | • 90 VAC to 264 VAC  |
| Input Frequency     | • 47 Hz to 63 Hz   |
| Inrush Current      | • 30/60A at 115/230 VAC, cold start, 25°C                        |
| Input Protection    | • Internal T3.15A / 250 VAC fuse in line                         |
| No Load Input Power | • < 0.5W (< 2W for "A" version)                                  |
| Input Current       | • 3A <sub>rms</sub> max/115 VAC, 1.5 A <sub>rms</sub> max/230VAC |

### Output

|                          |                                       |
|--------------------------|---------------------------------------|
| Output Voltage           | • See tables on page 2                |
| Initial Set Accuracy     | • See tables on page 2                |
| Minimum Load             | • No minimum load required            |
| Start Up Rise Time       | • 2 ms typical                        |
| Hold Up Time             | • 16 ms typical                       |
| Line Regulation          | • ±0.5% typical                       |
| Load Regulation          | • ±1.0% typical                       |
| Ripple & Noise           | • < 1% pk-pk typical, 20MHz Bandwidth |
| Over-voltage Protection  | • latch off                           |
| Over-load Protection     | • auto recovery                       |
| Short Circuit Protection | • auto recovery                       |

### Environmental

|                       |   |
|-----------------------|---|
| Operating Temperature | • -40°C to 70°C derating: 2.5% / °C > 50°C          |
| Cooling               | • 60W, free air convection<br>80W, 18CFM forced air |
| Operating Humidity    | • 5-95% RH, non-condensing                          |
| Storage Temperature   | • -40°C to +85°C                                    |
| Altitude              | • 0 to 5000 m                                       |

### General

|                      |   |
|----------------------|---|
| Efficiency           | • > 82% ("A" version: >80%) typical   |
| Energy Saving        | • Energy Star, Level V, std. (non "A" version)  |
| Isolation            | • 4000 VAC Input to Output, 2xMOPP<br>1500 VAC Input to Ground, 1xMOPP<br>1500 VDC Output to Ground, 1xMOPP |
| Isolation Resistance | • 50 MΩ   |
| Switching Frequency  | • 120 kHz typical   |
| MTBF                 | • >TBD kWhrs to MIL-HDBK-217F at 50°C   |

### EMC & Safety

|                      |  |
|----------------------|--|
| Safety Approvals:    | • UL/CSA/EN 60950-1, 2nd edition (ITE)<br>• ANSI/AMMI/CSA/EN 60601-1, 3rd edition<br>• CE Mark and CB report |
| Harmonic Currents    | • EN 61000-3-2 class A   |
| EMI                  | • EN 55022/CISPR 22 class B, EN 61000-3-3  |
| ESD Immunity         | • EN 61000-4-2, 6kV/contact, 8kV/air   |
| Radiated Immunity    | • EN 61000-4-3, 10V/m with 80% AM  |
| EFT Burst            | • EN 61000-4-4, 2kV  |
| Surge                | • EN 61000-4-5, 2kV/L-L, 4kV/L-G   |
| Conducted Immunity   | • EN 61000-4-6, 10V with 80% AM  |
| Magnetic Fields      | • E61000-4-8, 10A/m  |
| Dips & Interruptions | • EN 61000-4-11, 100% dips 10ms,<br>100% dips 20ms, 30% dips 500ms,<br>60% dips 200ms, 100% dips 5000ms      |

### Warranty

|                         |   |
|-------------------------|---|
| Manufacturer's Warranty | • 10 years. Call Tri-Mag or go to <a href="http://www.Tri-Mag.com">www.Tri-Mag.com</a> for details. |
|-------------------------|---|

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## Output Specifications

| Model No.               | Output Rail | Load |       |      |      | Initial Accuracy | Step Efficiency |            |            | Avg. Eff.  |
|-------------------------|-------------|------|-------|------|------|------------------|-----------------|------------|------------|------------|
|                         |             | Min  | Rated | Max  | Peak |                  | @20% Load       | @50% Load  | @100% Load |            |
| DHF060-7<br>DHF060-7A   | +12V        | 0A   | 5A    | 6A   | 8A   | +11.9V~+12.1V    | 88%<br>83%      | 89%<br>87% | 86%<br>85% | 87%<br>85% |
| DHF060-8<br>DHF060-8A   | +15V        | 0A   | 4A    | 4.8A | 6.1A | +14.9V~+15.1V    | 88%<br>83%      | 89%<br>87% | 86%<br>85% | 86%<br>80% |
| DHF060-9<br>DHF060-9A   | +24V        | 0A   | 2.5A  | 3A   | 4A   | +23.8V~+24.2V    | 88%<br>83%      | 89%<br>87% | 86%<br>85% | 86%<br>80% |
| DHF060-14<br>DHF060-14A | +48V        | 0A   | 1.3A  | 1.5A | 2A   | +47.6V~+48.4V    | 88%<br>83%      | 89%<br>87% | 86%<br>85% | 86%<br>80% |

### Notes

- Output Load:**  
Convection cooling: 60W, forced-air cooling: 72W max
- Peak Load Duration:**  
96W peak rating for durations up to 5 secs. Ideal for motor-starting/in-rush conditions.
- Engineering Specification:**  
Contact Tri-Mag for full engineering specification for the specific part number used in your design application.
- Standby Power Consumption with System:**  
This is required by ENERGY STAR in U.S. and ErP regulation in Europe for appliances such as computers and displays. The latest requirement is measured input power to be less than 0.5W with system.
- Audible Noise:**  
For the DHF030-x energy saving series, achieving level VI (<0.3W) standby power consumption is accomplished through burst mode operation of the controller. The burst operation frequency is dependent on load conditions and is approx. 114Hz, within the audible frequency range.
- Step Efficiency and Average Efficiency:**  
Test conditions in step efficiency are referred to 3.2.2 IPS (Internal Power Supply) of the ENERGY STAR program requirements for computers. ENERGY STAR required for efficiency @ 20%, 50%, 100% load is 82%, 85%, 86%; average efficiency is the average of step efficiency.
- Model Ordering Table:**

| Safety/Application | w/o Audible Noise | Energy Saving |
|--------------------|-------------------|---------------|
| ITE & Medical      | DHF060-xA         | DHF060-x      |

## Mechanical Specifications

### Notes

- Mechanical drawing dimensions shown in mm. Tolerance:  $\pm 0.4$ mm.
- Size: 50.8 x 80.5 x 24.0 Max. (mm)  
2.0 x 3.17 x 0.95 Max. (inches)  
Net weight: 114 g approx./unit
- Connectors: AC input: JST B2P3-VH or equivalent  
DC output: JST B4P-VH or equivalent
- Output Pin assignment:

| TB2 Pin No. | 1         | 2         | 3   | 4   |
|-------------|-----------|-----------|-----|-----|
| Connection  | $V_{out}$ | $V_{out}$ | GND | GND |

- RoHS compliant

