

*Industry's Highest Efficiency DC/DC Converter
48V Input, 1.5V, 1.8V, 2.0V, 2.5V, 3.3V DC, 30A Output
or 5.0V DC, 20A Output*



*The open frame
Pisces is also available
in a heatsink-ready version
or complete with an optional heatsink.*

*The Pisces Series is the first high-efficiency quarter brick **CoolConverter™** in the Galaxy family of high-efficiency DC/DC converters.*

- Industry Standard Pinout and Footprint
- Highest Efficiency in the Industry, 92% at 3.3V, 15A; 90% at 3.3V, 30A
- No Heat Sink Required
- Very Low Common-mode Noise for a Commercial DC/DC Converter
- Two-stage Input Filter
- Constant Switching Frequency
- Remote Sense
- Open Frame Design
- Optional Low Profile Heatsink or Baseplate for Improved Thermal Performance
- Header with M3 Metal Inserts for Mechanical Connection to PCB
- Two Year Warranty

CONTROL FUNCTIONS

- Uses Patent Pending Power Supply Control and Architecture
- Microprocessor Controlled
- Primary-side Enable, Choice of Logic

PROTECTION FEATURES

- Over Temperature Protection
- Over Voltage Protection
- Over Current Protection
- Over/Under Input Voltage Protection

TYPICAL CHARACTERISTICS

- Output Setpoint Accuracy: $\pm 1\%$
- Load Regulation: $\pm 0.2\%$
- Line Regulation: $\pm 0.2\%$
- Regulation over Line, Load, and Temperature: $\pm 2\%$
- Low Output Ripple
- Output Trim

GENERAL SPECIFICATIONS

$V_{IN} = 48V_{DC}$, $T_A @ 25^{\circ}C$, 300 LFM Airflow, $V_{OUT} = 3.3V$, $I_{OUT} = \text{Full Load unless otherwise noted.}$

Available output power depends on ambient temperature and good thermal management. (See application graphs for limits.)

| Input Characteristics | | | | |
|--|------|-----|-----|--------------|
| Parameter | Min | Typ | Max | Units |
| Operating Input Voltage | 36 | 48 | 75 | V_{DC} |
| Input Current (Model Dependent) | | | 5 | A |
| Input Capacitance | | 4.5 | | μF |
| Input Hysteresis, Low Line | | 2 | | V_{DC} |
| Output Characteristics | | | | |
| Regulation Over Line, Load & Temperature | 98 | | 102 | $\% V_{NOM}$ |
| Voltage Ripple | | | 20 | mV RMS |
| Voltage Ripple, 20MHz BW | | | 150 | mV P-P |
| Current Range | 0 | | 30 | A |
| Current Limit Inception | 31 | | 37 | A |
| Short Circuit Current, Peak (see Note below) | | | 41 | A |
| Output Transient Response, 50% to 75% load change, 1A/ μ sec | | | 5 | $\% V_{OUT}$ |
| Settling Time to $\pm 1\%$ | | | 300 | μS |
| Turn-on Time to 98% Vnom | | | 35 | mS |
| Output Overshoot at Turn-on | | | 1 | $\% V_{OUT}$ |
| Trim Range | 90 | | 110 | $\% V_{OUT}$ |
| Overvoltage Protection, Latching | | 130 | | $\% V_{OUT}$ |
| Isolation | | | | |
| Isolation Test Voltage, Input/Output (Basic) | 2000 | | | V_{DC} |
| Isolation Resistance | 10 | | | M Ω |
| Features | | | | |
| Overtemperature Protection, Thermal Sensor, Latching* | | | 117 | $^{\circ}C$ |
| Input, Output Ripple Frequency, Fixed | | 200 | | kHz |

Notes: During short circuit, converter will shut down and attempt to restart once per second. The average current during this condition will be very low and the device can be safely left in this condition continuously. For specific output voltage specifications, see the corresponding detailed data sheet.

*PCB less than 130 $^{\circ}C$

General Specifications

| | |
|-----------------------|---------------------------------------|
| Operating Temperature | -40 $^{\circ}C$ to +100 $^{\circ}C$ |
| Storage Temperature | -55 $^{\circ}C$ to +125 $^{\circ}C$ |
| Relative Humidity | 10% to 95% RH, Non-condensing |
| Vibration | 2 to 9Hz, 3mm disp., 9 to 200Hz 1g |
| Material Flammability | UL V-0 |
| Weight | 35 grams |
| MTBF | BELLCORE TR-332 1,600,000 hours |

Approvals and Standards

UL and c-UL Recognized Component, TUV, UL1950, CSA 22.2 No. 950, IEC/EN 60950**

EMC Characteristics:

Designed to meet emission and immunity requirements per EN55022, CISPR 22, Class B, and CISPR 24.

** An external fuse shall be used to comply with the requirements.

CoolConverter™

Galaxy's proprietary **CoolConverter™** provides:

- Patent Pending single-stage power conversion architecture, control, and magnetic design allow unprecedented power density and efficiency in an isolated power supply.
- An advanced microcontroller reduces parts count while adding features, performance, and flexibility in the design.
- Low common-mode noise as a result of lower capacitance in the transformer compared to planar magnetics and metal baseplate designs.
- Higher reliability than planar transformer designs that can suffer from via fatigue from thermal cycling, and metal baseplate designs with board to board interconnects that are subject to mechanical stress on electrical connections.

PROTECTION AND CONTROL

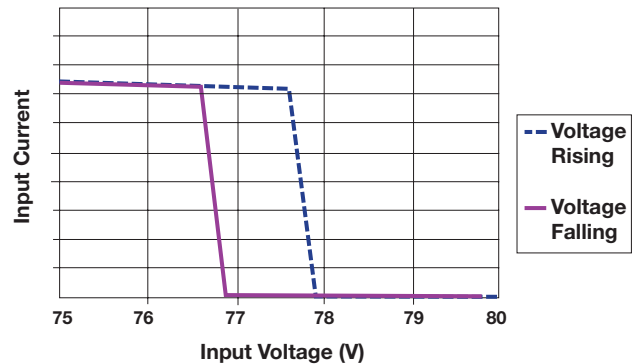
Valid Input Voltage Range:

The converter measures the input voltage and will not allow operation outside of the input voltage specification. As shown by the graphs, hysteresis is added to both the high and low voltage to prevent the converter from turning on and off repeatedly when the voltage is held near either voltage extreme. At low line this assures the maximum input current is not exceeded; at high line this assures the semiconductor devices in the converter are not damaged by excessive voltage stress.

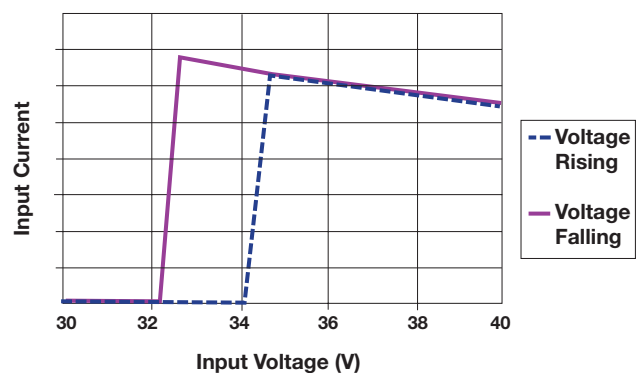
ON/OFF Logic Option:

The ON/OFF control logic can be either Negative (standard) or Positive to enable the converter. For Negative logic, the ON/OFF pin is brought below 1.0 V with respect to the -INPUT pin to enable the converter. The pull down must be able to sink 100 microamps. For Positive logic, the ON/OFF pin is brought to greater than 4.0 V with respect to the -INPUT pin and must be able to source more than 100 μ A and be limited to less than 10 V. To request the Positive logic version, add the suffix (P) to the standard part number. The positive version has a built-in pull up resistor of approximately 100 k Ω .

Overvoltage Lockout



Undervoltage Lockout



APPLICATION NOTES

Output Over Voltage Protection:

The output voltage is constantly monitored by the microprocessor and a redundant secondary-side crowbar circuit that is set to a higher trip point than the microprocessor protection. If the output voltage exceeds the over-voltage specification, the microprocessor will latch the converter off. To turn the converter on requires either cycling the ON/OFF pin or power to the converter. This advanced feature prevents the converter from damaging the load if there is a converter failure or application error. If non-latching is required, consult factory.

Thermal Shutdown:

The printed circuit board temperature is measured using a semiconductor sensor. If the maximum rated temperature is exceeded, the converter is latched off. To re-enable the converter requires cycling the ON/OFF pin or power to the converter. If non-latching is required, consult factory.

Control Options:

As the behavior of the circuit is determined by firmware in the microcontroller, specific customer requirements such as

- non-latching thermal protection
- custom valid input voltage range
- controlled delay from initiating an ON/OFF signal for power sequencing

can be accomplished with no change to hardware.

The standard behavior was chosen based on system design experience but we understand that customers often have their own requirements.

Please consult Galaxy Power for your special needs.

Remote Sense:

The output voltage is regulated at the point where the sense pins connect to the power output pins. Total sense compensation should not exceed 0.4V or 10% of V_{out} , whichever is greater.

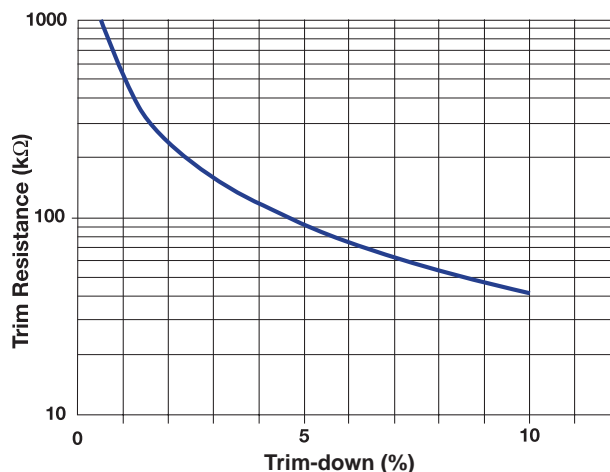
Safety:

An external input fuse must always be used to meet these safety requirements.

Trim:

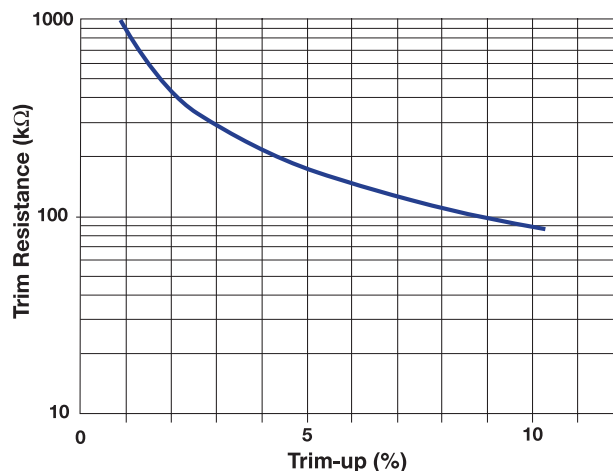
To trim the output voltage higher, connect the required trim resistor from the Trim pin to the +Sense pin. To trim the output voltage lower, connect the required trim resistor from the Trim pin to the -Sense pin. See diagram below.

Trim-down



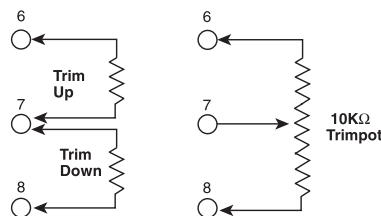
$$R_{\text{TRIM-DOWN}} = \left\{ \frac{100}{\Delta\%} - 2 \right\} \dots 5.11\text{k}\Omega$$

Trim-up (for 3.3V)

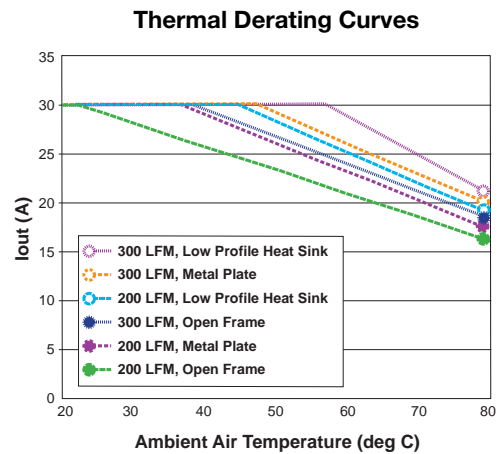
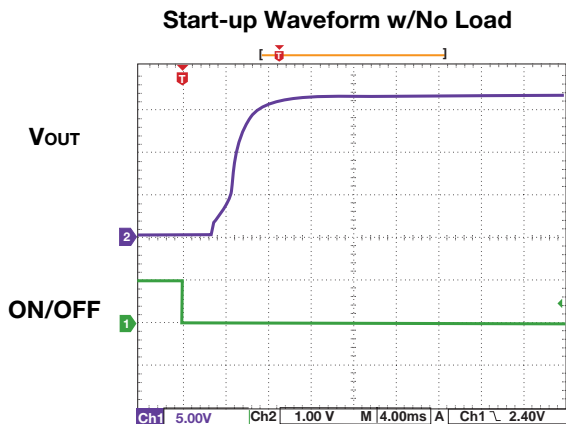
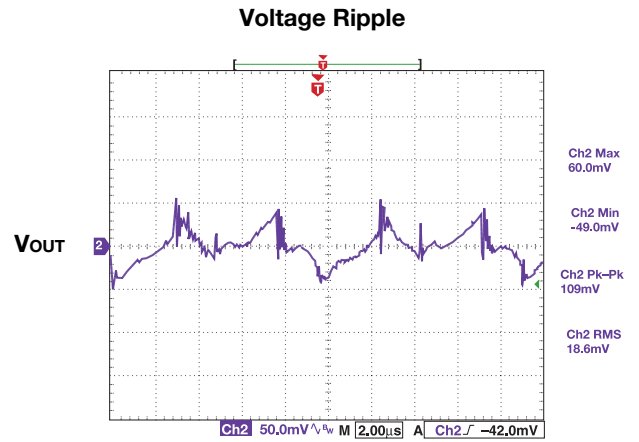
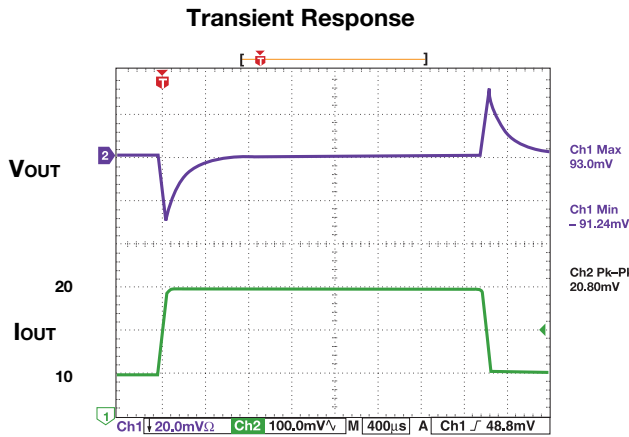
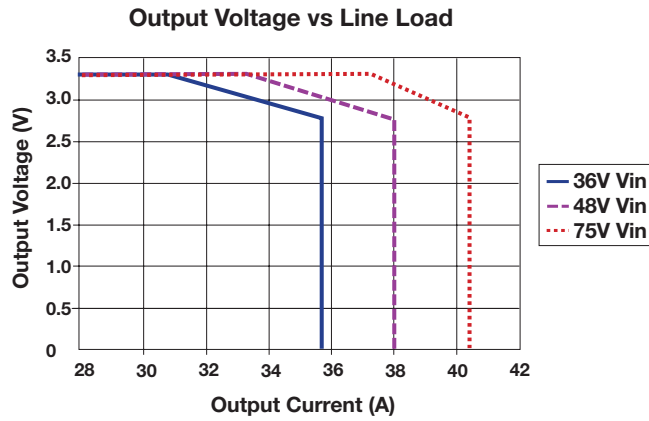
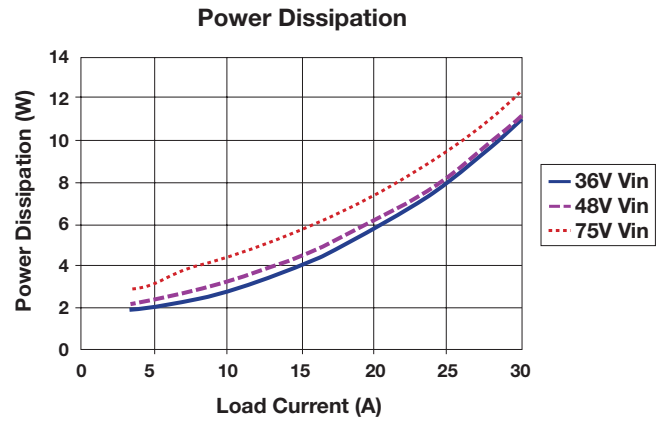
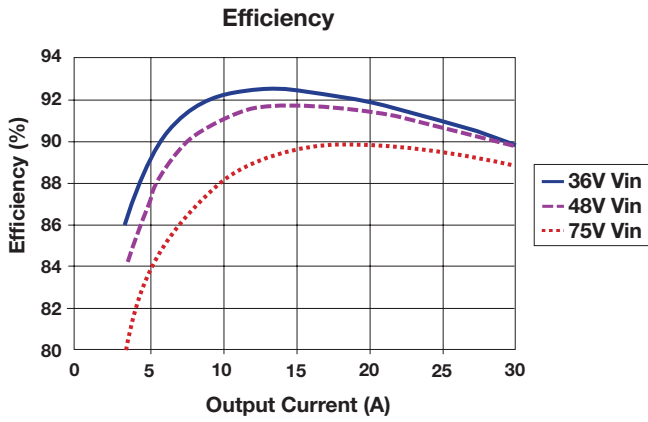


$$R_{\text{TRIM-UP}} = \left\{ \frac{V_o (100+\Delta\%)}{1.225\Delta\%} - \frac{(100+2\Delta\%)}{\Delta\%} \right\} \dots 5.11\text{k}\Omega$$

External Output Trimming



GHPW3V3-30 OPERATION



ORDERING INFORMATION

| Standard Model Number | Output Voltage | Max Current | Efficiency | |
|--|----------------|-------------|------------|-----------|
| | | | Half Load | Full Load |
| 48V Input Models (Designated W) | | | | |
| GHPW5V020* | 5.0V | 20A | 91% | 90% |
| GHPW3V330* | 3.3V | 30A | 92% | 90% |
| GHPW2V530* | 2.5V | 30A | 90% | 87% |
| GHPW2V030* | 2.0V | 30A | 89% | 85% |
| GHPW1V830* | 1.8V | 30A | 88% | 84% |
| GHPW1V530* | 1.5V | 30A | 86% | 82% |

| Standard Model Number | Output Voltage | Max Current | Efficiency | |
|--|----------------|-------------|------------|-----------|
| | | | Half Load | Full Load |
| 24V Input Models (Designated C) | | | | |
| GHPC5V020* | 5.0V | 20A | 90% | 88% |
| GHPC3V330* | 3.3V | 30A | 91% | 89% |
| GHPC2V530* | 2.5V | 30A | 89% | 86% |
| GHPC2V030* | 2.0V | 30A | 88% | 84% |
| GHPC1V830* | 1.8V | 30A | 87% | 83% |
| GHPC1V530* | 1.5V | 30A | 85% | 81% |

*** Options:**

P = Positive Logic Version; High = On

M = 0.145" Pins (± 0.01 ")

S = 0.12" Pins (± 0.01 ")

R = Heatsink Ready (incl. Plate + Case Ground Pin),

or with heatsink:

= Case Ground Pin + Heatsink (contact factory)

T = Tuned model**

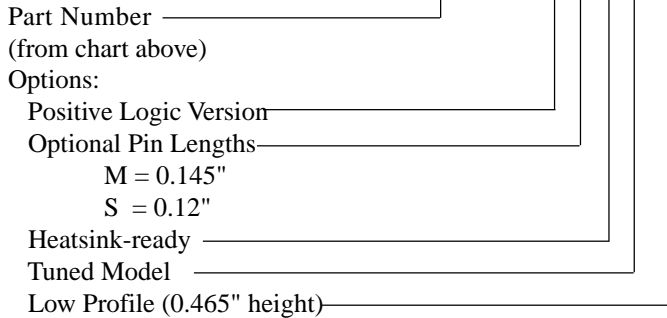
L = Low Profile (0.465" height)

Heatsinks optional, consult factory.

Example:

(All options shown)

GHPW 3V330 P S R T L



****T (Tuned Model) Option**

Designed for higher di/dt and ΔI applications, the transient response has been modified to take advantage of the capacitance on the customer's PCB. This unit requires a minimum load capacitance of 5600 μ F with an impedance magnitude of less than 0.005 Ω at 15kHz. It offers a minimum 3X improvement in the peak response compared to a standard unit.

Galaxy Power Inc. warrants to the original purchaser that the products conform to this data sheet and are free from material and workmanship defects for a period of two (2) years from the date of manufacture, if this product is used within specified conditions. Galaxy Power Inc. reserves the right to make changes to the product(s) or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such products or information. For additional details on this limited warranty consult the factory.



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