

The open-frame Pisces II is available with an optional heat-spreading baseplate or low profile heatsink for use in extremely demanding applications.

The Pisces II Series is the industry's first 60A quarter brick in Galaxy Power's CoolConverter™ line of high-efficiency DC/DC converters.

- Industry Standard Pinout and Footprint
- Typical Efficiency:
93% at 2.5V, 30A; 91% at 2.5V, 60A
- Very Low Dissipation
- No Heat Sink Required
- Low Profile, 0.38"
- Very Low Common-mode Noise for a Commercial DC/DC Converter
- Two-stage Input Filter
- Constant Switching Frequency
- Remote Sense, Wide Trim Range
- Single Board Design, Very Low Parts Count
- Optional Baseplate or Low Profile Heatsink for Improved Thermal Performance
- Header with M3 Metal Inserts for Mechanical Connection to PCB
- Two Year Warranty

CONTROL FUNCTIONS

- Patented 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

ISO 9001 CERTIFIED ORGANISATION



GENERAL SPECIFICATIONS

$V_{IN} = 48V_{DC}$, $T_A@25^{\circ}C$, 300 LFM Airflow, $V_{OUT}=2.5V$, $I_{OUT} = \text{Full Load unless otherwise noted.}$

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

| Input Characteristics | | (24V Input in [brackets]) | | |
|------------------------------------------------------------------|---------|---------------------------|---------|-------------|
| Parameter | Min | Typ | Max | Units |
| Operating Input Voltage | 36 [18] | 48 [24] | 75 [36] | V_{DC} |
| Input Current (Model Dependent) | | | 6 [10] | A |
| Input Capacitance | | 4 [9] | | μF |
| Input Hysteresis, Low Line | | 2 [1] | | V_{DC} |
| Output Characteristics | | | | |
| Regulation Over Line, Load & Temperature | 98 | | 102 | $\%V_{NOM}$ |
| Voltage Ripple | | | 25 | mV RMS |
| Voltage Ripple, 20MHz BW | | | 85 | mV P-P |
| Current Range | 0 | | 60 | A |
| Current Limit Inception | 103 | | 140 | $\%I_{OUT}$ |
| Short Circuit Current, Peak (see Note below) | | | 90 | A |
| Output Transient Response, 50% to 75% load change, 1A/ μ sec | | | 5 | $\%V_{OUT}$ |
| Settling Time to $\pm 1\%$ | | | 200 | μS |
| Turn-on Time to 98% V_{nom} | | | 35 | mS |
| Output Overshoot at Turn-on | | 0 | | $\%V_{OUT}$ |
| Trim Range | 70 | | 110 | $\%V_{OUT}$ |
| Overvoltage Protection, Latching | | 130 | | $\%V_{OUT}$ |
| Isolation | | | | |
| Isolation Test Voltage, Input/Output (Basic) | 2250 | | | V_{DC} |
| Isolation Test Voltage, Input/Case | 2000 | | | V_{DC} |
| Isolation Test Voltage, Output/Case | 500 | | | V_{DC} |
| Isolation Resistance | 10 | | | $M\Omega$ |
| Features | | | | |
| Overtemperature Protection, Thermal Sensor, Latching* | | | 110 | $^{\circ}C$ |
| Switching Frequency, Fixed | | 250 | | 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 Telcordia (Bellcore) | 1.6 Million Hours |

Approvals and Standards

| |
|---------------------------------------------------------------------------------------------------------------------------|
| UL and c-UL Recognized Component, TUV, UL60950, 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:

- Patented 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 from balanced winding design.

PROTECTION AND CONTROL

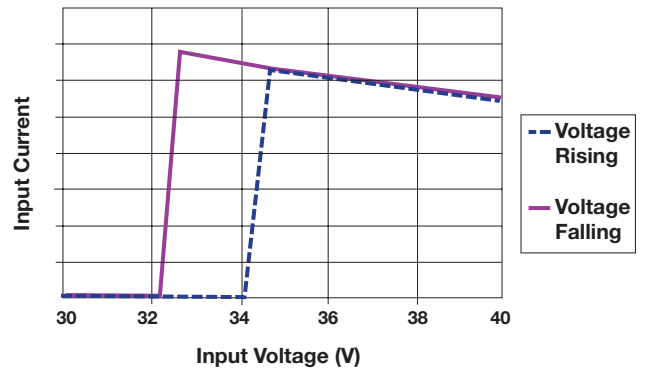
Valid Input Voltage Range:

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.

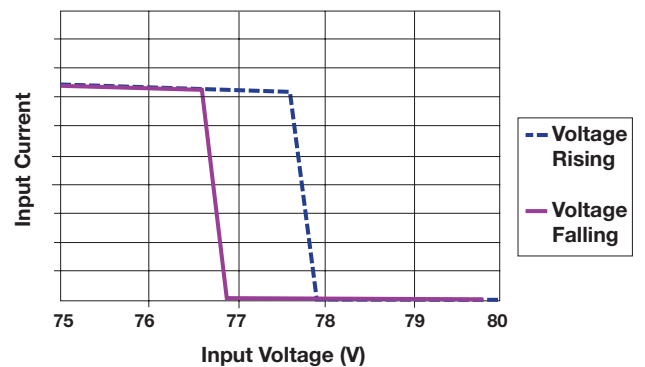
ON/OFF Logic Option:

The ON/OFF control logic can be either Negative (standard) or Positive to enable the converter. For Negative logic, bring the ON/OFF pin to less than 1.0V with respect to the -INPUT pin to enable the converter. The pull-down must be able to sink 100 μ A. For Positive logic, bring the ON/OFF pin to greater than 4.0V with respect to the -INPUT pin and be limited to less than 10V. To request the Positive logic version, add the suffix (P) to the standard part number. The ON/OFF pin has a built-in pull up resistor of approximately 100k Ω to +5V.

Undervoltage Lockout



Overvoltage Lockout



APPLICATION NOTES

Output Over Voltage Protection:

The output voltage is constantly monitored by the microprocessor with a redundant secondary-side measurement circuit that both shuts down the duty cycle and triggers the microprocessor to shut down. 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.

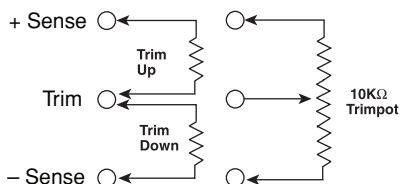
Remote Sense:

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.

External Output Trimming

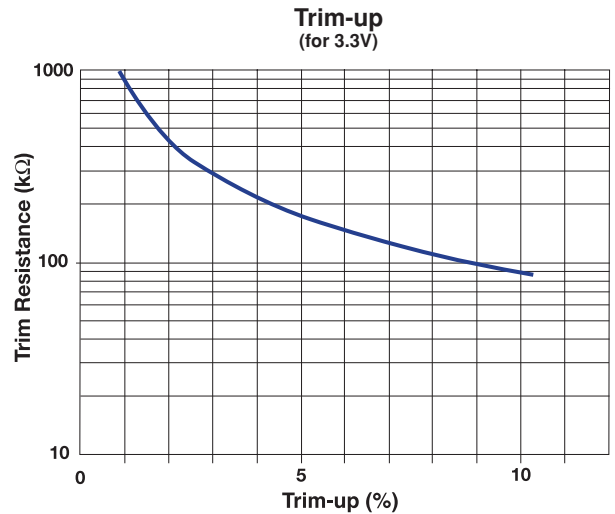


Trim:

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. The Trim-down equation applies to all Voltages.

Trim-up for 1.5V and above:

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

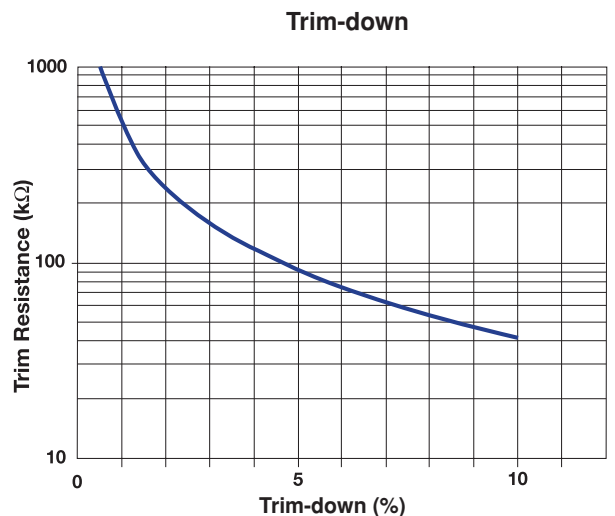


Trim-up for less than 1.5V:

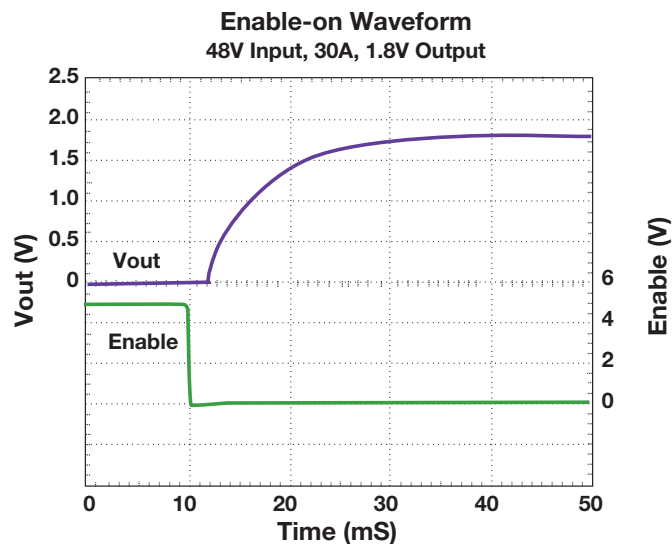
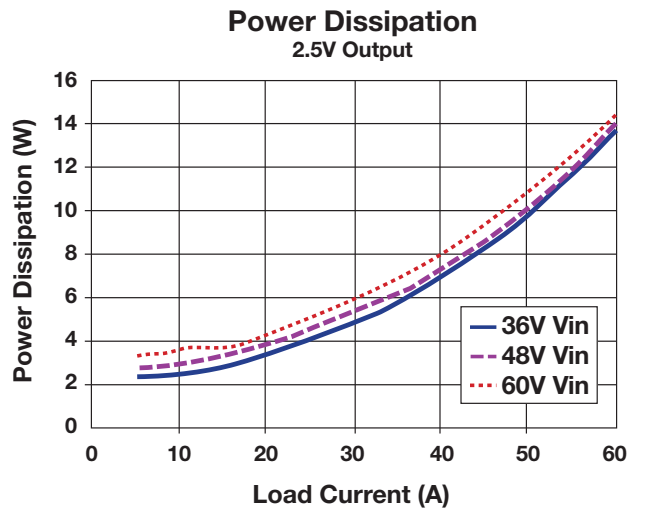
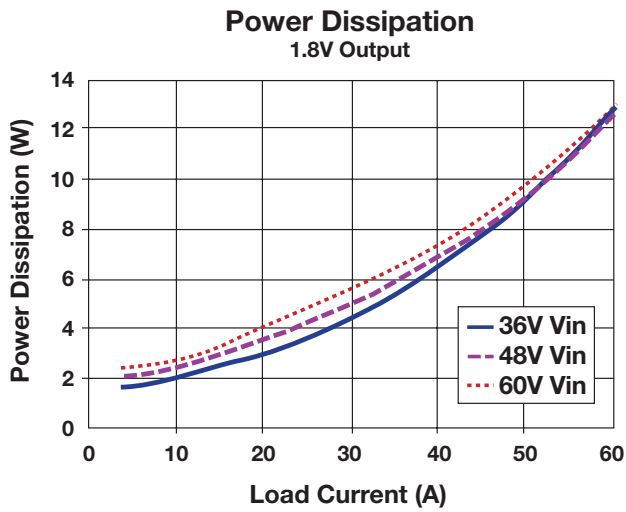
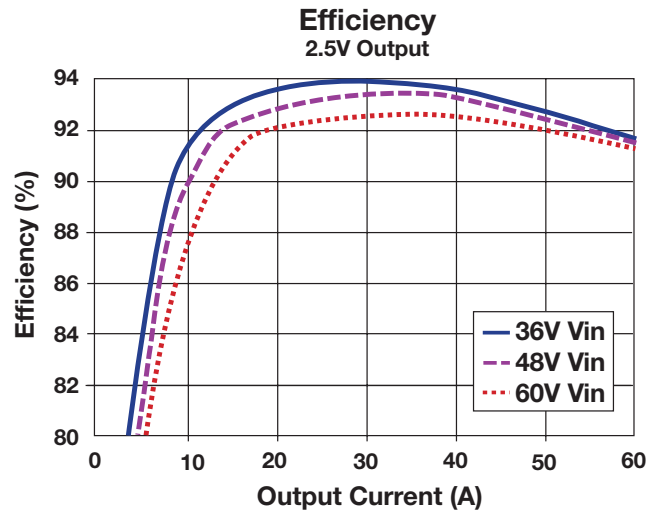
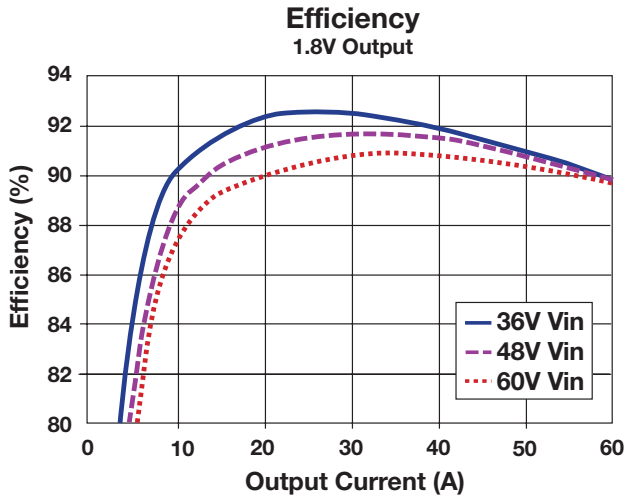
$$R_{\text{TRIM-UP}} = \left\{ \frac{V_o (100+\Delta\%)}{0.62\Delta\%} - \frac{(100+2\Delta\%)}{\Delta\%} \right\} 5.11\text{k}\Omega$$

Trim-down for all voltages:

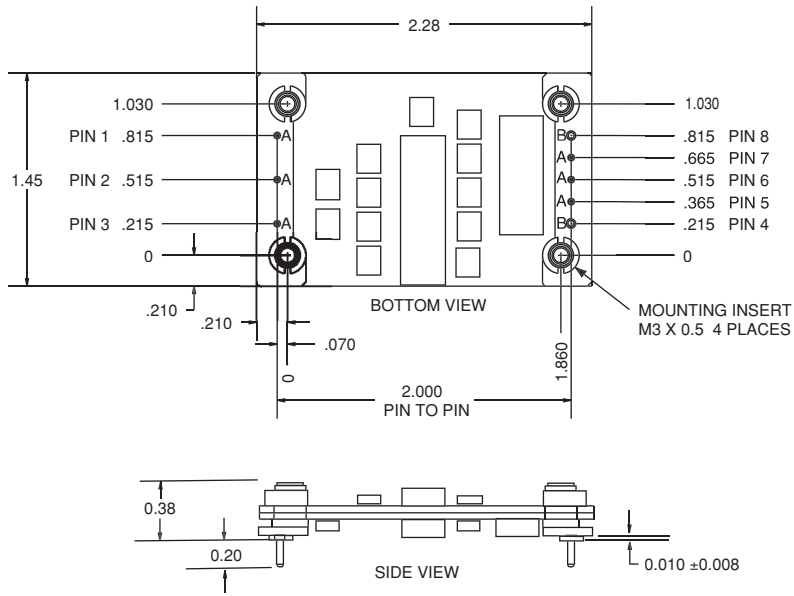
$$R_{\text{TRIM-DOWN}} = \left\{ \frac{100}{\Delta\%} - 2 \right\} 5.11\text{k}\Omega$$



PISCES II OPERATION



PACKAGE DETAIL



Pin Configuration —Bottom View

| Pin | Function | Pin Dia. (in.) |
|-----|----------|----------------|
| 1 | - Input | 0.040 |
| 2 | On/Off | 0.040 |
| 3 | + Input | 0.040 |
| 4 | + Output | 0.060 |
| 5 | + Sense | 0.040 |
| 6 | Trim | 0.040 |
| 7 | - Sense | 0.040 |
| 8 | - Output | 0.060 |

- Notes:**
- Mechanical tolerances
 x.xxx in. = ±0.005 in.
 x.xx in. = ±0.01 in.
 - Pin material: brass with tin/lead plating over nickel
 - Workmanship: Meets or exceeds IPC-A-610B Class II
 - "A" = 0.040" dia. pins
 - "B" = 0.060" dia. pins

ORDERING INFORMATION

| Standard Model Number | Output Voltage | Max Current | Typical Efficiency | |
|----------------------------------------|----------------|-------------|--------------------|-----------|
| | | | Half Load | Full Load |
| 48V Input Models (Designated W) | | | | |
| G2PW5V030* | 5.0V | 30A | 93% | 91% |
| G2PW3V345* | 3.3V | 45A | 93% | 92% |
| G2PW2V560* | 2.5V | 60A | 93% | 91% |
| G2PW2V060* | 2.0V | 60A | 92% | 91% |
| G2PW1V860* | 1.8V | 60A | 91% | 90% |
| G2PW1V560* | 1.5V | 60A | 90% | 88% |
| G2PW1V260* | 1.2V | 60A | 88% | 86% |
| G2PW1V060* | 1.0V | 60A | TBD | |

| Standard Model Number | Output Voltage | Max Current | Typical Efficiency | |
|----------------------------------------|----------------|-------------|--------------------|-----------|
| | | | Half Load | Full Load |
| 24V Input Models (Designated C) | | | | |
| G2PC5V030* | 5.0V | 30A | 92% | 90% |
| G2PC3V345* | 3.3V | 45A | 92% | 91% |
| G2PC2V560* | 2.5V | 60A | 92% | 90% |
| G2PC2V060* | 2.0V | 60A | 91% | 90% |
| G2PC1V860* | 1.8V | 60A | 90% | 89% |
| G2PC1V560* | 1.5V | 60A | 89% | 87% |
| G2PC1V260* | 1.2V | 60A | 87% | 85% |
| G2PC1V060* | 1.0V | 60A | TBD | |

Ordering Information

Example Part No.:

G2PW1V860MRT

48V input

1.8V @ 60A output

Negative Logic

0.145" pin length

Heatsink-ready Plate

Tuned Module**

Options Code: (All options shown)

G2PW 3V345 P S R T 00X

Part Number (from chart above)

Options:

Positive Logic Version

Optional Pin Lengths

E = 0.18"

M = 0.145"

S = 0.12"

Heatsink-ready

Tuned Model

Heatsink

001 = 0.25"

002 = 0.50"

003 = 1.00"

004 = 0.13"

005 = 0.70"

* Options:

P = Positive Logic Version; High = On

E = 0.18" pins (± 0.01 ")

M = 0.145" Pins (± 0.01 ")

S = 0.12" Pins (± 0.01 ")

R = Heatsink Ready

T = Tuned model**

Pisces II Heatsink Part Numbers

| Part Number | Height† | Typical Thermal Performance | |
|-------------|---------|---------------------------------------|----------------------------------------|
| | | Natural Convection Power Dissipation* | Forced Convection Thermal Resistance** |
| 001 | 0.25" | 5W | 5.8°C/W |
| 002 | 0.50" | 7W | 3.2°C/W |
| 003 | 1.00" | 11W | 2.0°C/W |
| 004 | 0.13" | TBD | TBD |
| 005 | 0.70" | TBD | TBD |

**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 5600μF with an impedance magnitude of less than 0.005Ω at 15kHz. It offers a minimum 3X improvement in the peak response compared to a standard unit. Consult Factory.

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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