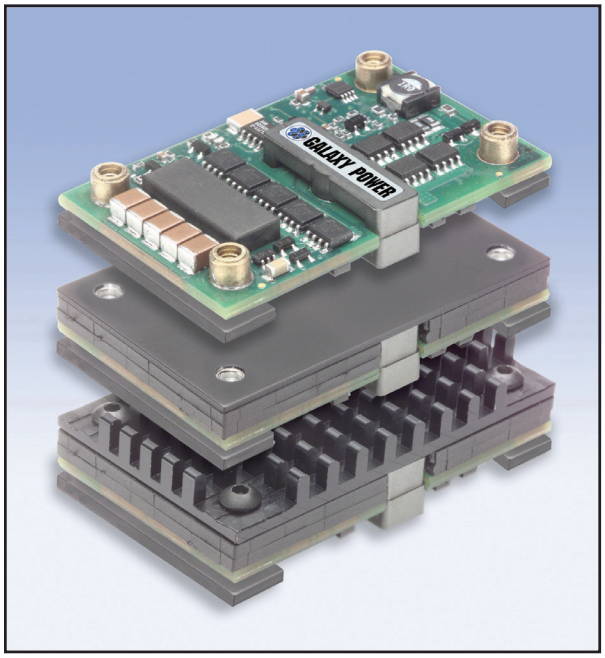
GALAXY POWER Incorporated

PISCES II SERIES

48V or 24V Input
1.0V, 1.2V, 1.5V, 1.8V, 2.0V, 2.5VDC, 60A Output
3.3V, 45A; 5.0V, 30A Output



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: ±1%**
- **Load Regulation: ±0.2%**
- **Line Regulation: ±0.2%**
- **Regulation over Line, Load, and Temperature: ±2%**
- **Low Output Ripple**
- **Output Trim**

ISO 9001 CERTIFIED ORGANISATION

URS UKAS QUALITY MANAGEMENT 043-A

GENERAL SPECIFICATIONS

V_{IN} = 48V_{DC}, T_A@25°C, 300 LFM Airflow, V_{OUT}=2.5V, I_{OUT} = 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/µsec			5	$\%V_{OUT}$
Settling Time to ±1%			200	µS
Turn-on Time to 98%Vnom			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			MΩ
Features				
Overtemperature Protection, Thermal Sensor, Latching*			110	°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°C*

General Specifications

Operating Temperature	-40°C to +100°C
Storage Temperature	-55°C to +125°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.

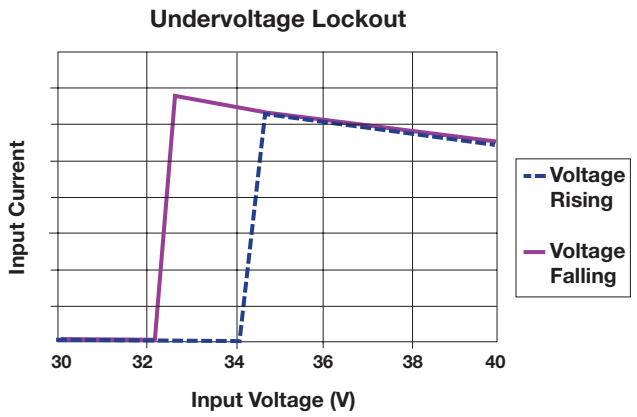
PROTECTION AND CONTROL

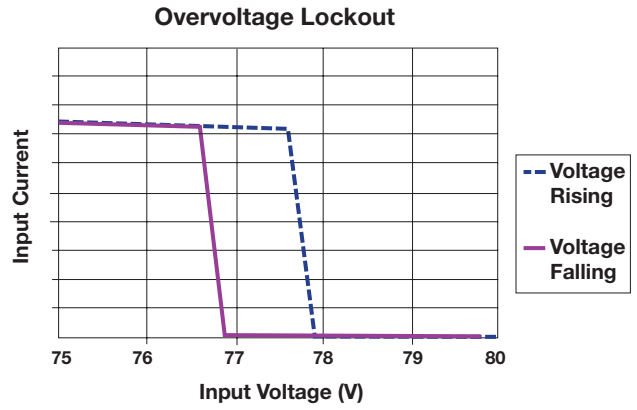
Valid Input Voltage Range:

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 100µA. 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 100kΩ to +5V.





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.

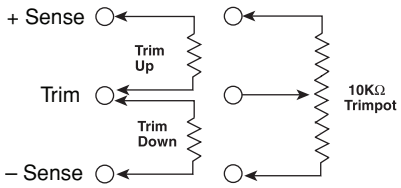
Remote Sense:

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 Vout, whichever is greater.

Safety:

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

External Output Trimming

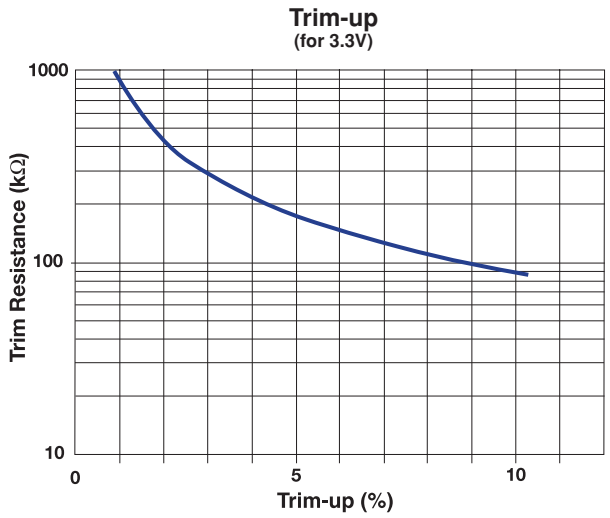


Trim:

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:

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

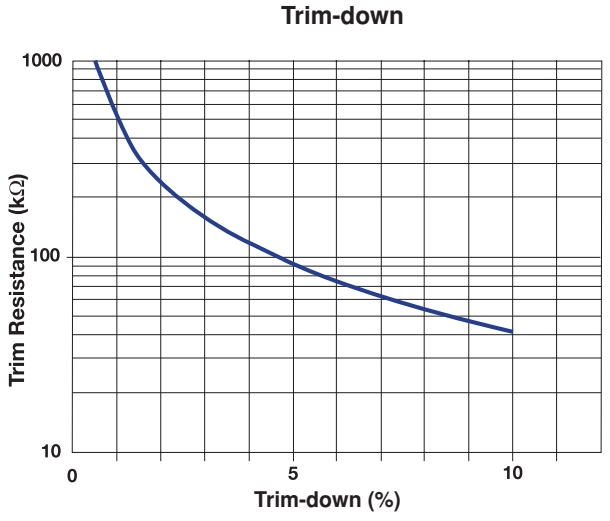


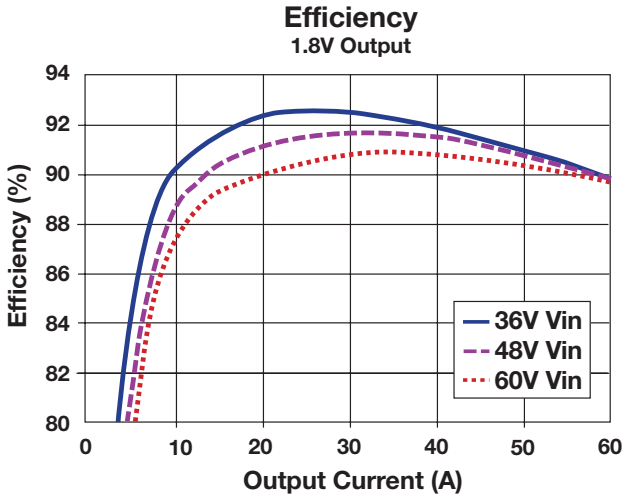
Trim-up for less than 1.5V:

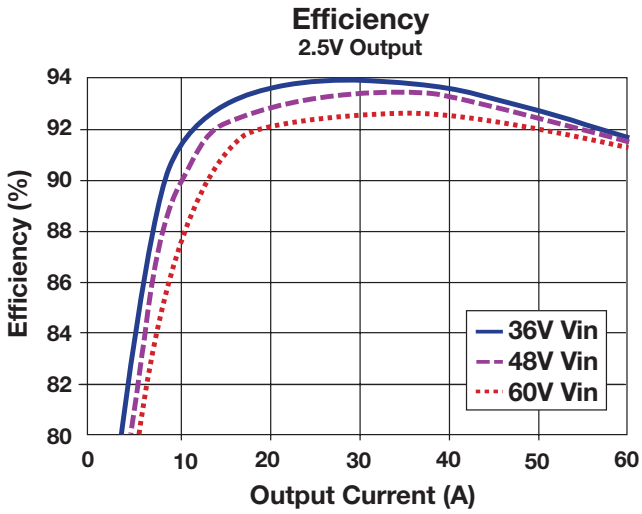
$$R_{TRIM\text{-}UP} = \left\{ \frac{Vo\,(100+\Delta\%)}{0.62\Delta\%} - \frac{(100+2\Delta\%)}{\Delta\%} \right\} 5.11k\Omega$$

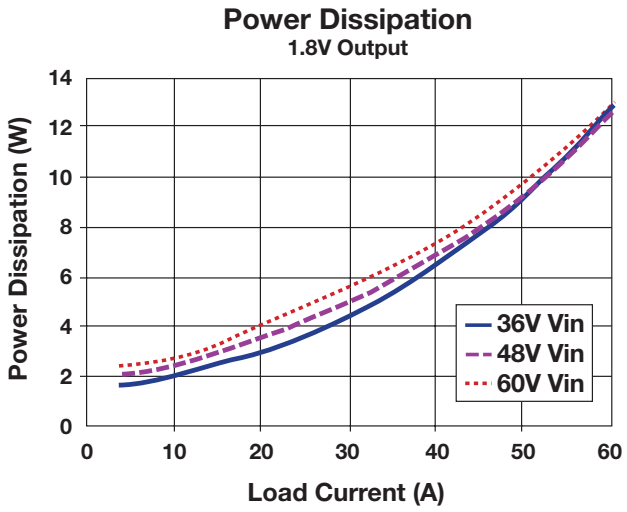
Trim-down for all voltages:

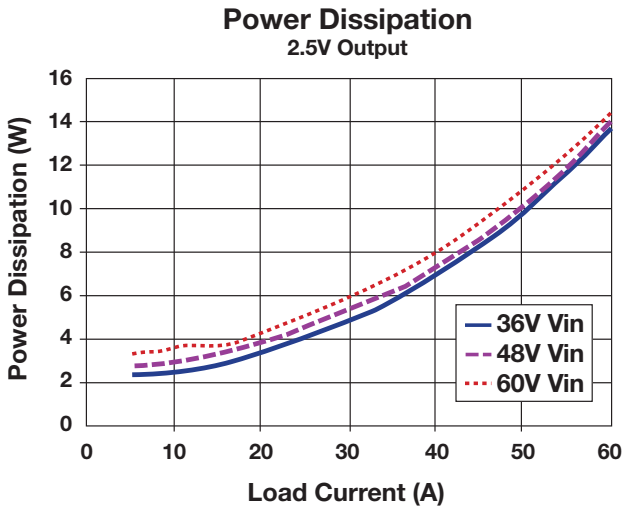
$$R_{TRIM\text{-}DOWN} = \left\{ \frac{100}{\Delta\%} - 2 \right\} 5.11k\Omega$$

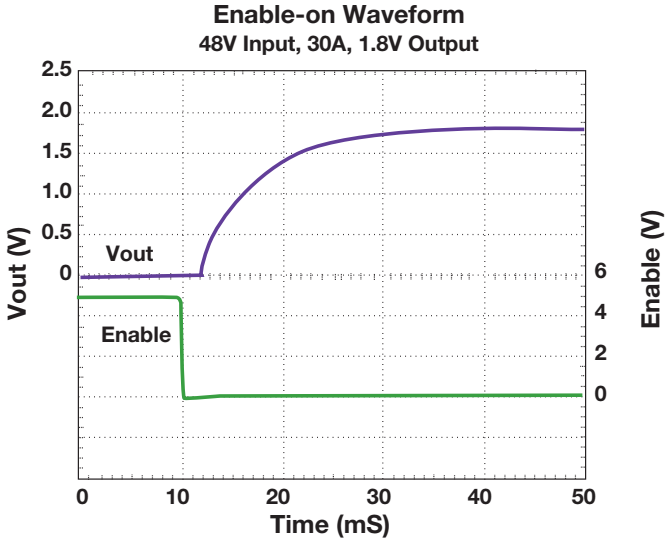



Efficiency
1.8V Output
Efficiency (%)
94
92
90
88
86
84
82
80
0
10
20
30
40
50
60
Output Current (A)
36V Vin
48V Vin
60V Vin

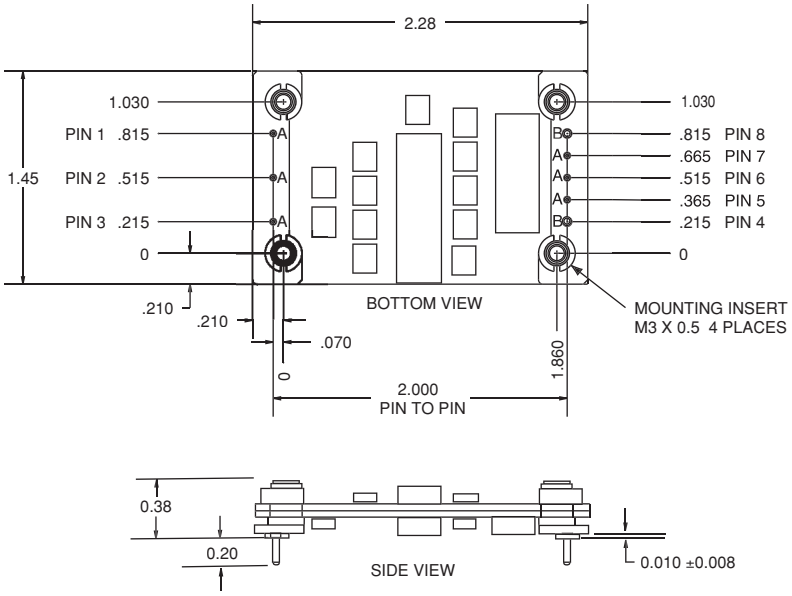

Efficiency
2.5V Output
Efficiency (%)
94
92
90
88
86
84
82
80
0
10
20
30
40
50
60
Output Current (A)
36V Vin
48V Vin
60V Vin


Power Dissipation
1.8V Output
Power Dissipation (W)
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
Load Current (A)
36V Vin
48V Vin
60V Vin


Power Dissipation
2.5V Output
Power Dissipation (W)
16
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
Load Current (A)
36V Vin
48V Vin
60V Vin


Enable-on Waveform
48V Input, 30A, 1.8V Output
Vout (V)
2.5
2.0
1.5
1.0
0.5
0
Vout
Enable
6
4
2
0
Enable (V)
0
10
20
30
40
50
Time (mS)

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:

1. Mechanical tolerances
   x.xxx in. = ±0.005 in.
   x.xx in. = ±0.01 in.
2. Pin material: brass with tin/lead plating over nickel
3. Workmanship: Meets or exceeds IPC-A-610B Class II
4. "A" = 0.040" dia. pins
5. "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	

** Options:*
P = Positive Logic Version; High = On
E = 0.18" poins (±0.01")
M = 0.145" Pins (±0.01")
S = 0.12" Pins (±0.01")
R = Heatsink Ready
*T = Tuned model***

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"

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.

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