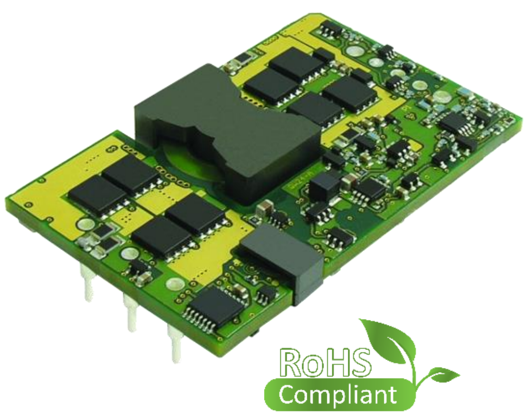
QW24T25033

Quarter-Brick DC-DC Converter

The **QW** Series provides outstanding thermal performance in high temperature environments. This performance is accomplished through the use of patented/patent-pending circuits, packaging, and processing techniques to achieve ultra-high efficiency, excellent thermal management, and a low-body profile.

The low-body profile and the preclusion of heat sinks minimize impedance to system airflow, thus enhancing cooling for both upstream and downstream devices. The use of 100% automation for assembly, coupled with advanced electronic circuits and thermal design, results in a product with extremely high reliability.

The **QW-Series** is an excellent choice in applications where multiple input voltage options are required. The designer can use a single QW converter to cover 24Vin through 48Vin input ranges, eliminating the need to specify multiple circuit packs to handle each input range. This is particularly useful in wireless base station applications where the power plants tend to vary and could provide nominal 24 or 48 V input. Besides operating from a 18-60 V input, the QW-Series converters provide outputs that can be trimmed from –20% to +10% of the nominal output voltage, thus providing outstanding design flexibility.



Key Features & Benefits

- RoHS lead-free solder and lead-solder-exempted products are available
- Wide input range: 18 to 60 VDC
- Delivers up to 25 A
- Industry-standard quarter-brick pinout
- On-board input differential LC-filter
- Start-up into pre-biased load
- No minimum load required
- Dimensions: 1.45” x 2.30” x 0.482” (36.83 mm x 58.42 mm x 12.24 mm)
- Weight: 1.3 oz (37 g)
- Meets Basic Insulation requirements
- Withstands 80 V input transient for 100 ms
- Fixed frequency operation
- Remote output sense
- Negative ON/OFF logic
- Output voltage trim range: –20%/+10% with industry-standard trim equations
- High reliability: MTBF approx. 10.7 million hours, calculated per Telcordia TR-332, Method I Case 1
- Approved to the following Safety Standards: UL/CSA60950-1, EN60950-1, and IEC60950-1
- Designed to meet Class B conducted emissions per FCC and EN55022 when used with external filter
- All materials meet UL94, V-0 flammability rating

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1. ELECTRICAL SPECIFICATIONS

All specifications apply over specified input voltage, output load and temperature range, unless otherwise noted.

PARAMETER	CONDITIONS / DESCRIPTION	MIN	TYP	MAX	UNITS
Absolute Maximum Ratings					
Input Voltage	Continuous	0		60	VDC
Operating Ambient Temperature		-40		85	°C
Storage Temperature		-55		125	°C
Isolation Characteristics					
I/O Isolation		2000			VDC
Isolation Capacitance			2.7		nF
Isolation Resistance		10			MΩ
Feature Characteristics					
Switching Frequency			200		kHz
Output Voltage Trim Range[1]	Industry-std. equations	-20		+10	%
Remote Sense Compensation[1]	Percent of VOUT(nom)			+10	%
Output Overvoltage Protection	Non-latching	117	122	127	%
Over-temperature Shutdown (PCB)	Non-latching, at Thermal Ref. Points		130		°C
Auto-Restart Period	Applies to all protection features		200		ms
Turn-On Time (Rise Time)	Full Load (resistive)		2.5		ms
Turn-On Time (Rise Time)	20,000µF plus Full Load (resistive)		5		ms
Turn-On Delay Time	Turn-On by Enable		1		ms
ON/OFF Control (Negative Logic)					
Converter Off (logic high)		2.4		20	VDC
Converter On (logic low)		-20		0.8	VDC
Input Characteristics					
Operating Input Voltage Range		18	36	60	VDC
Input Under voltage Lockout	Non-latching				
Turn-on Threshold		16	17	18	VDC
Turn-off Threshold		13	15	16.5	VDC
Input Voltage Transient	100 ms			80	VDC
Maximum Input Current	18 VDC in, 3.3 VDC Out @ 25A			5.2	ADC
Input Standby Current	converter disabled, 25 °C ambient		3		mADC
Input No Load Current (0 load on the output)	converter enabled, 25 °C ambient		60		mADC
Minimum Input Capacitance (external)	ESR < 0.7 Ω [2]	100			µF
Inrush Transient				0.1	A2s
Input Reflected-Ripple Current	25 MHz bandwidth, 25 °C ambient		10		mAPK-PK
Input Voltage Ripple Rejection	120 Hz, 25 °C ambient		65		dB

Output Characteristics					
Output Voltage Set Point (no load)		3.267	3.300	3.333	VDC
Output Regulation					
Over Line			±10	±20	mV
Over Load			±10	±20	mV
Output Voltage Range	Over line, load and temperature [3]	3.250		3.350	VDC
Output Ripple and Noise – 20 MHz bandwidth			30	60	mVPK-PK
External Load Capacitance	Plus Full Load (resistive)			20,000	µF
Output Current Range		0		25	ADC
Current Limit Inception	Non-latching	110		140	%Iomax
Peak Short-Circuit Current	Non-latching, Short = 10 mΩ			50	A
RMS Short-Circuit Current	Non-latching, 25°C ambient		5		Arms
Dynamic Response					
Load Change 75%-100%-75%, di/dt = 0.1A/µs	Co = 1 µF ceramic + 10µF tantalum		50	100	mV
di/dt = 1 A/µs	Co = 1 µF ceramic + 10µF tantalum		165	300	mV
Settling Time to 1%			50		µs
Efficiency					
100% Load	Vin = 36VDC, 25°C ambient		92.5		%
50% Load	Vin = 36VDC, 25°C ambient		92		%
Environmental and Mechanical					
Ambient Temperature Range		-40		85	°C
Storage Temperature (Ts)		-55		125	°C
Weight			1.3 [37]		oz [g]
Operating Vibration (sinusoidal)	Frequency Range	5		500	Hz
	Magnitude	0.5			G
	Sweep Rate	1			oct/min
	Repetitions in each axis (Min-Max-Min Sweep)	2			sweeps
Non-Operating Shock (half sine)	Acceleration	50			G
	Duration	11			ms
	Number of shocks in each axis	10			
MTBF	Calculated Per Telcordia Technologies SR-332		10.7		MHrs
Lead Plating			100% Matte Tin		
Moisture Sensitivity Level per JEDEC J-STD-020C	QW24T25033-xyz0		2		
	QW24T25033-xyz0G		3		

1) Vout can be increased up to 10% via the sense leads or up to 10% via the trim function. However, the total output voltage trim from all sources should not exceed 10% of VOUT(nom), in order to ensure specified operation of overvoltage protection circuitry.
2) Not required when used with low impedance inputs.
3) Operating ambient temperature range of -40 °C to 85 °C for converter.

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2. OPERATIONS

2.1 INPUT AND OUTPUT IMPEDANCE

These power converters have been designed to be stable with no external capacitors when used in low inductance input and output circuits.
In many applications, the inductance associated with the distribution from the power source to the input of the converter can affect the stability of the converter. The addition of a 100 µF electrolytic capacitor with an ESR < 0.7 Ω across the input helps to ensure stability of the converter. In many applications, the user has to use decoupling capacitance at the load. The power converter will exhibit stable operation with external load capacitance up to 20,000 µF on 3.3 V output.
Additionally, see the EMC section of this data sheet for discussion of other external components which may be required for control of conducted emissions.

2.2 ON/OFF (Pin 2)

The ON/OFF pin is used to turn the power converter on or off remotely via a system signal. Negative logic, is referenced to Vin(-). A typical connection is shown in Fig. 1.

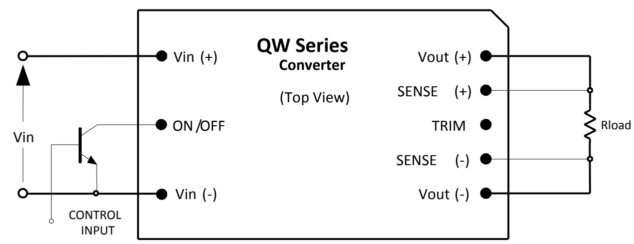

Figure 1. Circuit configuration for ON/OFF function.

The negative logic version turns on when the pin is at a logic low and turns off when the pin is at a logic high. The ON/OFF pin can be hardwired directly to Vin(-) to enable automatic power-up of the converter without the need of an external control signal.
The ON/OFF pin is internally pulled up to 5 V through a resistor. A properly debounced mechanical switch, open-collector transistor, or FET can be used to drive the input of the ON/OFF pin. The device must be capable of sinking up to 0.2 mA at a low level voltage of ≤ 0.8 V. An external voltage source (±20 V maximum) may be connected directly to the ON/OFF input, in which case it must be capable of sourcing or sinking up to 1 mA depending on the signal polarity. See the Startup Information section for system timing waveforms associated with use of the ON/OFF pin.

2.3 REMOTE SENSE (PINS 5 AND 7)

The remote sense feature of the converter compensates for voltage drops occurring between the output pins of the converter and the load. The SENSE(-) (Pin 5) and SENSE(+) (Pin 7) pins should be connected at the load or at the point where regulation is required (see Fig. 2).

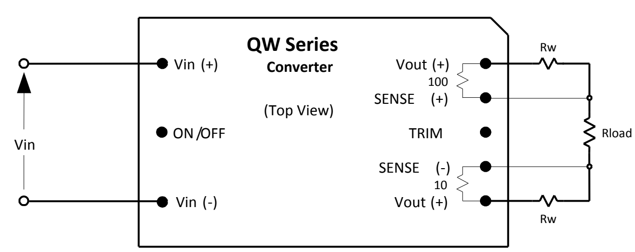

Figure 2. Remote sense circuit configuration

<u>CAUTION</u>

If remote sensing is not utilized, the SENSE(-) pin must be connected to the Vout(-) pin (Pin 4), and the SENSE(+) pin must be connected to the Vout(+) pin (Pin 8) to ensure the converter will regulate at the specified output voltage. If these connections are not made, the converter will deliver an output voltage that is slightly higher than the specified data sheet value.

Because the sense leads carry minimal current, large traces on the end-user board are not required. However, sense traces should be run side-by-side and located close to a ground plane to minimize system noise and ensure optimum performance. The converter's output overvoltage protection (OVP) senses the voltage across Vout(+) and Vout(-), and not across the sense lines, so the resistance (and resulting voltage drop) between the output pins of the converter and the load should be minimized to prevent unwanted triggering of the OVP.
When utilizing the remote sense feature, care must be taken not to exceed the maximum allowable output power capability of the converter, which is equal to the product of the nominal output voltage and the allowable output current for the given conditions.
When using remote sense, the output voltage at the converter can be increased by as much as 10% above the nominal rating in order to maintain the required voltage across the load. Therefore, the designer must, if necessary, decrease the maximum current (originally obtained from the derating curves) by the same percentage to ensure the converter's actual output power remains at or below the maximum allowable output power.

2.4 OUTPUT VOLTAGE ADJUST /TRIM (PIN 6)

The output voltage can be adjusted up 10% or down 20% relative to the rated output voltage by the addition of an externally connected resistor.
The TRIM pin should be left open if trimming is not being used. To minimize noise pickup, a 0.1 μF capacitor is connected internally between the TRIM and SENSE(-) pins.
To increase the output voltage, refer to Fig. 3. A trim resistor, $R_{T\text{-}INCR}$, should be connected between the TRIM (Pin 6) and SENSE(+) (Pin 7), with a value of:

$$R_{T-INCR} = \frac{5.11(100+\Delta)V_{O-NOM} - 626}{1.225\Delta} - 10.22 \ \text{[k}\Omega\text{]}$$

where,
$R_{T\text{-}INCR}$ = Required value of trim-up resistor kΩ]
$V_{O\text{-}NOM}$ = Nominal value of output voltage [V]

$$\Delta = \left| \frac{(V_{O\text{-}REQ} - V_{O\text{-}NOM})}{V_{O\text{-}NOM}} \right| X\ 100 \ \text{[k}\Omega\text{]}$$

Vo-REQ = Desired (trimmed) output voltage [V].

When trimming up, care must be taken not to exceed the converter's maximum allowable output power. See the previous section for a complete discussion of this requirement.

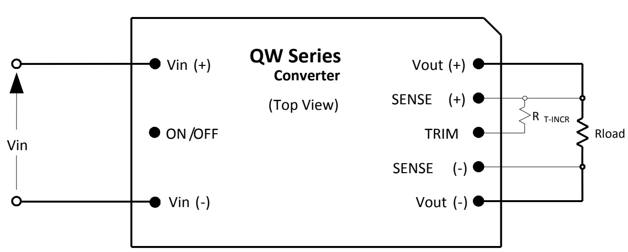

Figure 3. Configuration for increasing output voltage.

To decrease the output voltage (Fig. 4), a trim resistor, $R_{T\text{-}DECR}$, should be connected between the TRIM (Pin 6) and SENSE(-) (Pin 5), with a value of:

$$R_{T-DECR} = \frac{511}{|\Delta|} - 10.22 \text{ [k}\Omega\text{]}$$

where,
$R_{T\text{-}DECR}$ Required value of trim-down resistor [kΩ]
and Δ is as defined above.

Note:
The above equations for calculation of trim resistor values match those typically used in conventional industry-standard quarter-bricks.

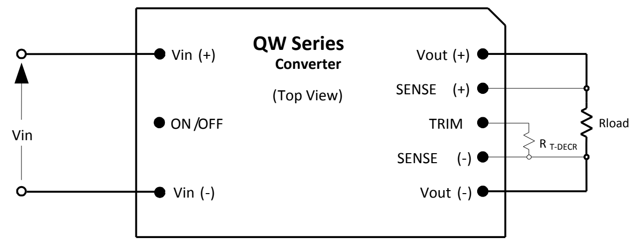

Figure 4. Configuration for decreasing output voltage.

Trimming/sensing beyond 110% of the rated output voltage is not an acceptable design practice, as this condition could cause unwanted triggering of the output overvoltage protection (OVP) circuit. The designer should ensure that the difference between the voltages across the converter's output pins and its sense pins does not exceed 10% of VOUT(nom), or:

$$[V_{OUT}(+) - V_{OUT}(-)] - [V_{SENSE}(+) - V_{SENSE}(-)] \leq V_{O\text{ - }NOM} \times 10\% \text{ [V]}$$

This equation is applicable for any condition of output sensing and/or output trim.

3. PROTECTION FEATURES

3.1 INPUT UNDERVOLTAGE LOCKOUT

Input under voltage lockout is standard with this converter. The converter will shut down when the input voltage drops below a pre-determined voltage.
The input voltage must be typically 17 V for the converter to turn on. Once the converter has been turned on, it will shut off when the input voltage drops typically below 15 V. This feature is beneficial in preventing deep discharging of batteries used in telecom applications.

3.2 OUTPUT OVERCURRENT PROTECTION (OCP)

The converter is protected against overcurrent or short circuit conditions. Upon sensing an overcurrent condition, the converter will switch to constant current operation and thereby begin to reduce output voltage. When the output voltage drops below 60% of the nominal value of output voltage, the converter will shut down.
Once the converter has shut down, it will attempt to restart nominally every 200 ms with a typical 3% duty cycle. The attempted restart will continue indefinitely until the overload or short circuit conditions are removed or the output voltage rises above 60% of its nominal value.
Once the output current is brought back into its specified range, the converter automatically exits the hiccup mode and continues normal operation.

3.3 OUTPUT OVERVOLTAGE PROTECTION (OVP)

The converter will shut down if the output voltage across Vout(+) (Pin 8) and Vout(-) (Pin 4) exceeds the threshold of the OVP circuitry. The OVP circuitry contains its own reference, independent of the output voltage regulation loop. Once the converter has shut down, it will attempt to restart every 200 ms until the OVP condition is removed.

3.4 OVERTEMPERATURE PROTECTION (OTP)

The converter will shut down under an overtemperature condition to protect itself from overheating caused by operation outside the thermal derating curves, or operation in abnormal conditions such as system fan failure. After the converter has cooled to a safe operating temperature, it will automatically restart.

3.5 SAFETY REQUIREMENTS

The converters meet North American and International safety regulatory requirements per UL/CSA60950-1, EN60950-1 and IEC60950-1. Basic Insulation is provided between input and output.
To comply with safety agencies' requirements, an input line fuse must be used external to the converter. A 10 A fuse is recommended for use with this product.

3.6 ELECTROMAGNETIC COMPATIBILITY (EMC)

EMC requirements must be met at the end-product system level, as no specific standards dedicated to EMC characteristics of board mounted component dc-dc converters exist. However, Power Bel Solutions tests its converters to several system level standards, primary of which is the more stringent EN55022, Information technology equipment - Radio disturbance characteristics-Limits and methods of measurement.
An effective internal LC differential filter significantly reduces input reflected ripple current, and improves EMC.

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3.7 STARTUP INFORMATION (USING NEGATIVE ON/OFF)

Scenario #1: Initial Startup From Bulk Supply
ON/OFF function enabled, converter started via application of V_{IN}. See Figure 5.

Time	Comments
t_0	ON/OFF pin is ON; system front-end power is toggled on, V_{IN} to converter begins to rise.
t_1	V_{IN} crosses Under-Voltage Lockout protection circuit threshold; converter enabled.
t_2	Converter begins to respond to turn-on command (converter turn-on delay).
t_3	Converter V_{OUT} reaches 100% of nominal value

For this example, the total converter startup time (t_3- t_1) is typically 3.5 ms.

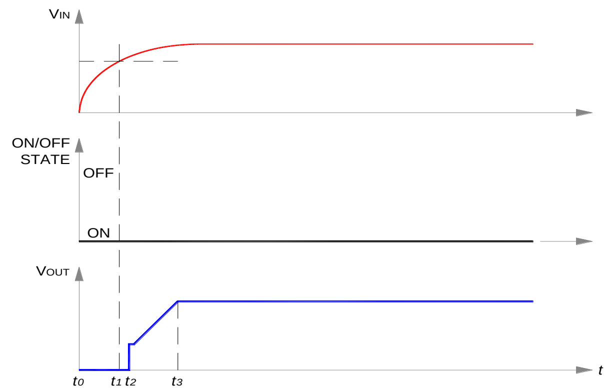


Figure 5. Start-up scenario #1.

Scenario #2: Initial Startup Using ON/OFF Pin
With V_{IN} previously powered, converter started via ON/OFF pin. See Figure 6.

Time	Comments
t_0	V_{INPUT} at nominal value.
t_1	Arbitrary time when ON/OFF pin is enabled (converter enabled).
t_2	End of converter turn-on delay.
t_3	Converter V_{OUT} reaches 100% of nominal value.

For this example, the total converter startup time (t_3- t_1) is typically 3.5 ms.

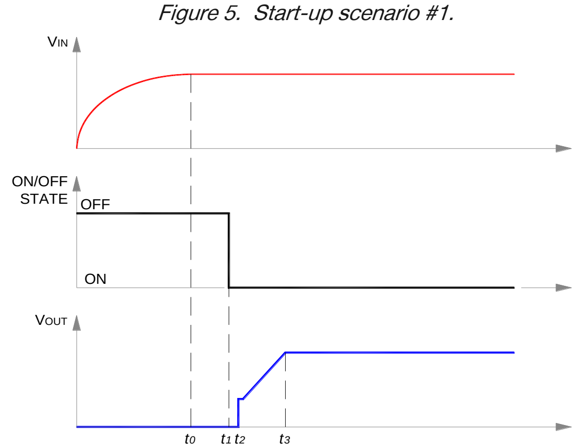


Figure 6. Startup scenario #2.

Scenario #3: Turn-off and Restart Using ON/OFF Pin
With V_{IN} previously powered, converter is disabled and then enabled via ON/OFF pin. See Figure 7.

Time	Comments
t_0	V_{IN} and V_{OUT} are at nominal values; ON/OFF pin ON.
t_1	ON/OFF pin arbitrarily disabled; converter output falls to zero; turn-on inhibit delay period (200 ms typical) is initiated, and ON/OFF pin action is internally inhibited.
t_2	ON/OFF pin is externally re-enabled. **If (t_2- t_1) ≤ 200 ms**, external action of ON/OFF pin is locked out by startup inhibit timer. **If (t_2- t_1) > 200 ms**, ON/OFF pin action is internally enabled.
t_3	Turn-on inhibit delay period ends. If ON/OFF pin is ON, converter begins turn-on; if off, converter awaits ON/OFF pin ON signal; see Figure 6.
t_4	End of converter turn-on delay.
t_5	Converter V_{OUT} reaches 100% of nominal value.

For the condition, **(t_2- t_1) ≤ 200 ms**, the total converter startup time (t_5- t_2) is typically 203.5 ms. For **(t_2- t_1) > 200 ms**, startup will be typically 3.5 ms after release of ON/OFF pin.

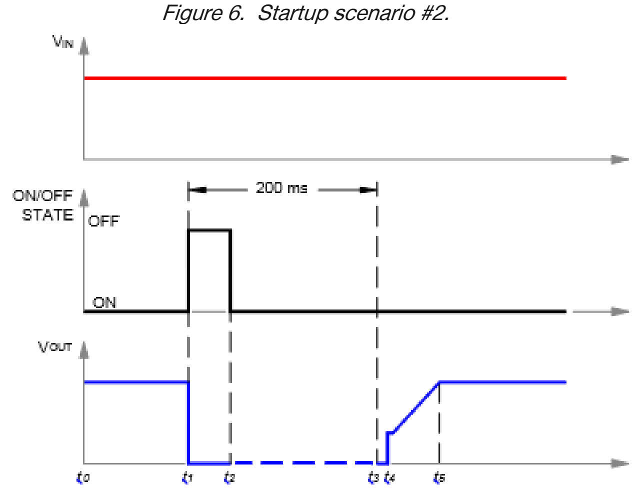


Figure 7. Startup scenario #3.

4. CHARACTERIZATION

4.1 GENERAL INFORMATION

The converter has been characterized for many operational aspects, to include thermal derating (maximum load current as a function of ambient temperature and airflow) for vertical and horizontal mountings, efficiency, startup and shutdown parameters, output ripple and noise, transient response to load step-change, overload, and short circuit.
The following pages contain specific plots or waveforms associated with the converter. Additional comments for specific data are provided below.

4.2 TEST CONDITIONS

All data presented were taken with the converter soldered to a test board, specifically a 0.060" thick printed wiring board (PWB) with four layers. The top and bottom layers were not metalized. The two inner layers, comprised of two-ounce copper, were used to provide traces for connectivity to the converter.
The lack of metalization on the outer layers as well as the limited thermal connection ensured that heat transfer from the converter to the PWB was minimized. This provides a worst-case but consistent scenario for thermal derating purposes.
All measurements requiring airflow were made in the vertical and horizontal wind tunnel using Infrared (IR) thermography and thermocouples for thermometry.
Ensuring components on the converter do not exceed their ratings is important to maintaining high reliability. If one anticipates operating the converter at or close to the maximum loads specified in the derating curves, it is prudent to check actual operating temperatures in the application. Thermographic imaging is preferable; if this capability is not available, then thermocouples may be used. The use of AWG #40 gauge thermocouples is recommended to ensure measurement accuracy. Careful routing of the thermocouple leads will further minimize measurement error. Refer to Fig. 8 for the optimum measuring thermocouple location.

4.3 THERMAL DERATING

Load current vs. ambient temperature and airflow rates are given in Fig. 9 and Fig. 10 for vertical converter mounting. Ambient temperature was varied between 25 °C and 85 °C, with airflow rates from 30 to 500 LFM (0.15 to 2.5 m/s).
For each set of conditions, the maximum load current was defined as the lowest of:

(i) The output current at which temperature of thermocouples (Figure 8) does not exceed 125 °C or
(ii) The nominal rating of the converter (25 A).

During normal operation, derating curves with maximum temperature of 125 °C should not be exceeded. Temperature at the thermocouple location shown in Fig. 8 should not exceed 125 °C in order to operate inside the derating curves.

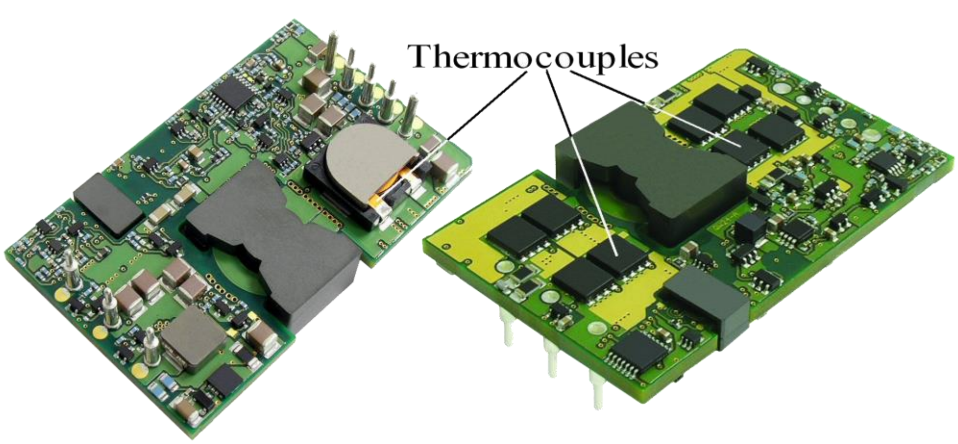


Figure 8. Location of the thermocouple for thermal testing.

4.4 EFFICIENCY

Fig. 11 shows the efficiency vs. load current plot for ambient temperature of 25 ºC, airflow rate of 300 LFM (1.5 m/s) with vertical mounting and input voltages of 18 V, 36 V and 60 V. Also, a plot of efficiency vs. load current, as a function of ambient temperature with Vin = 36 V, airflow rate of 200 LFM (1 m/s) with vertical mounting is shown in Fig. 12.

4.5 POWER DISSIPATION

Fig. 13 shows the power dissipation vs. load current plot for Ta = 25 ºC, airflow rate of 300 LFM (1.5 m/s) with vertical mounting and input voltages of 18 V, 36 V and 60 V. Also, a plot of power dissipation vs. load current, as a function of ambient temperature with Vin = 36 V, airflow rate of 200 LFM (1 m/s) with vertical mounting is shown in Fig. 14.

4.6 START-UP

Output voltage waveforms, during the turn-on transient using the ON/OFF pin for full rated load currents (resistive load) are shown without and with external load capacitance in Figs. 15-16, respectively.

4.7 RIPPLE AND NOISE

Fig. 18 show the output voltage ripple waveform, measured at full rated load current with a 10 µF tantalum and 1 µF ceramic capacitor across the output. Note that all output voltage waveforms are measured across a 1 µF ceramic capacitor.
The input reflected ripple current waveforms are obtained using the test setup shown in Fig 19. The corresponding waveforms are shown in Figs. 20-21.

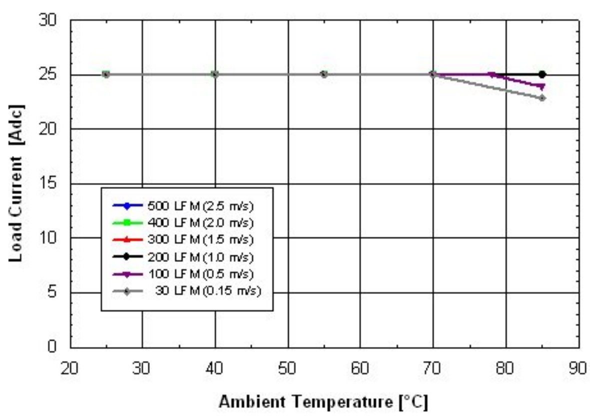


Figure 9. Available load current vs. ambient air temperature and airflow rates for converter with G height pins mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 125 ºC, Vin = 24 V.

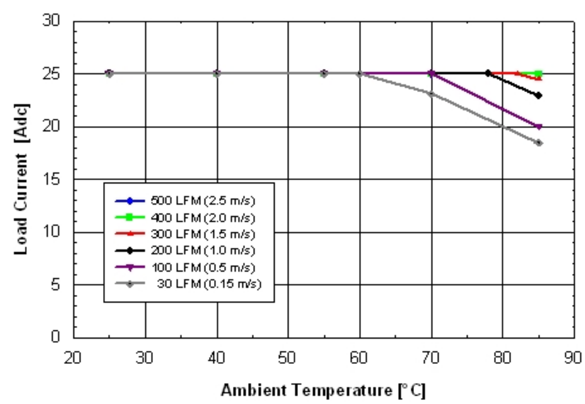


Figure 10. Available load current vs. ambient air temperature and airflow rates for converter with G height pins mounted vertically with air flowing from pin 1 to pin 3, MOSFET temperature ≤ 125 ºC , Vin = 48 V.

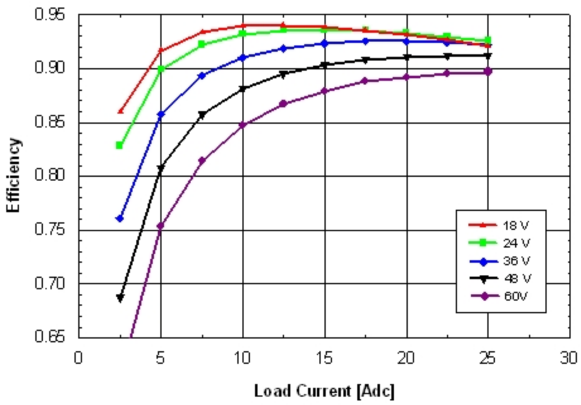


Figure 11. Efficiency vs. load current and input voltage for converter mounted vertically with air flowing from pin 1 to pin 3 at a rate of 300 LFM (1.5 m/s) and Ta = 25 °C.

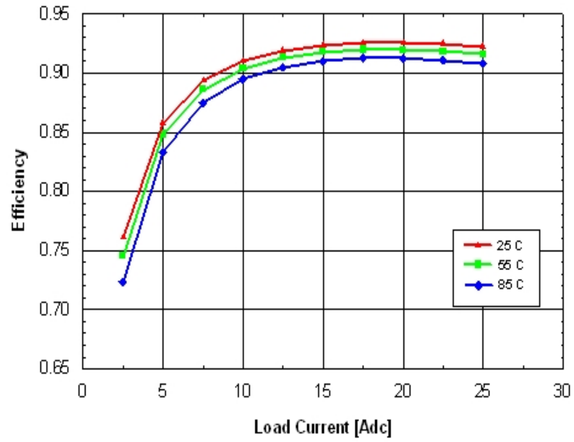


Figure 12. Efficiency vs. load current and ambient temperature for converter mounted vertically with Vin = 36 V and air flowing from pin 1 to pin 3 at a rate of 200 LFM (1.0 m/s).

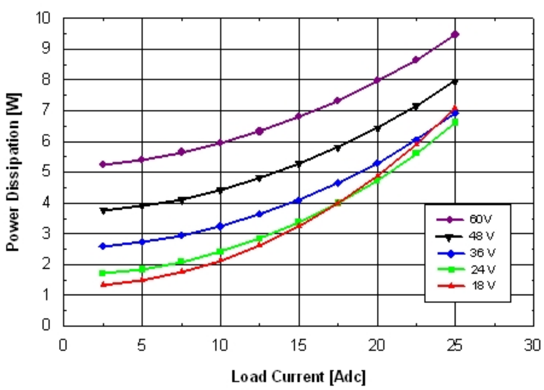


Figure 13. Power dissipation vs. load current and input voltage for converter mounted vertically with air flowing from pin 1 to pin 3 at a rate of 300 LFM (1.5 m/s) and Ta = 25 °C.

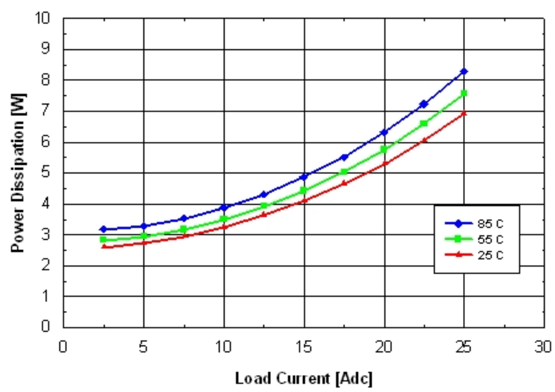


Figure 14. Power dissipation vs. load current and ambient temperature for converter mounted vertically with Vin = 36 V and air flowing from pin 1 to pin 3 at a rate of 200 LFM (1.0 m/s).

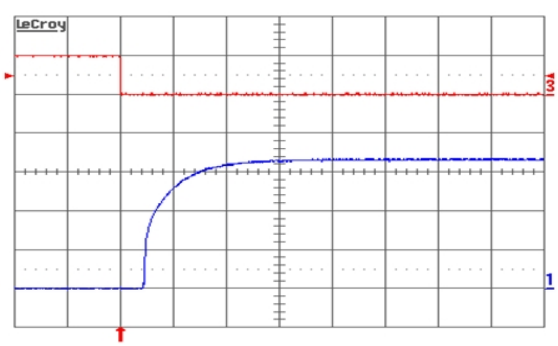


Figure 15. Turn-on transient at full rated load current (resistive) with no output capacitor at Vin = 36 V, triggered via ON/OFF pin. Top trace: ON/OFF signal (5 V/div.). Bottom trace: output voltage (1 V/div.). Time scale: 2 ms/div.

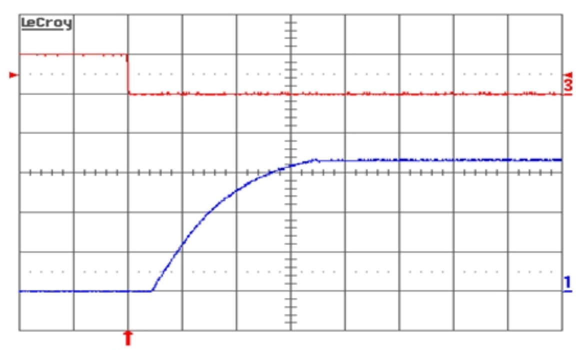


Figure 16. Turn-on transient at full rated load current (resistive) plus 20,000 µF at Vin = 36 V, triggered via ON/OFF pin. Top trace: ON/OFF signal (5 V/div.). Bottom trace: output voltage (1 V/div.). Time scale: 2 ms/div.

QW24T25033

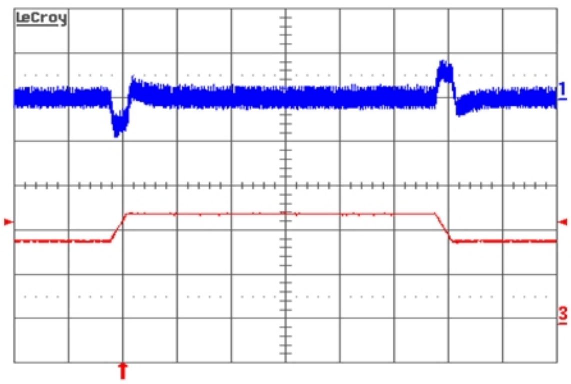


Figure 17. Output voltage response to load current step-change (18.75 A – 25 A – 18.75 A) at Vin = 36 V. Top trace: output voltage (50 mV/div.). Bottom trace: load current (10 A/div.). Current slew rate: 0.1 A/µs. Co = 1 µF ceramic + 10 µF tantalum. Time scale: 0.2 ms/div.

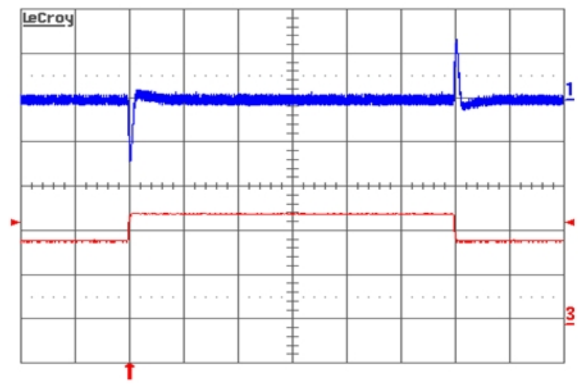


Figure 18. Output voltage response to load current step-change (18.75 A – 25 A – 18.75 A) at Vin = 36 V. Top trace: output voltage (100 mV/div.). Bottom trace: load current (10 A/div.). Current slew rate: 1 A/µs. Co = 1 µF ceramic + 10 µF tantalum. Time scale: 0.2 ms/div.

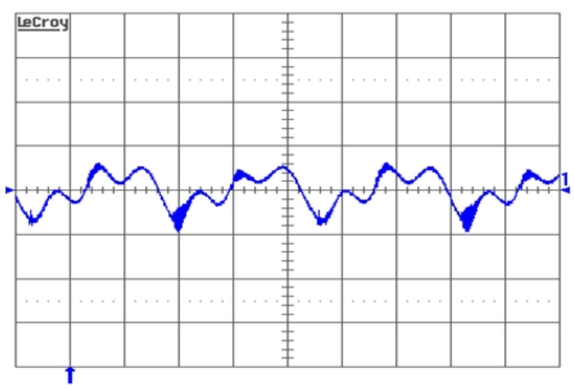


Figure 19. Output voltage ripple (20 mV/div.) at full rated load current into a resistive load with Co = 10 µF tantalum + 1 µF ceramic and Vin = 36 V. Time scale: 1 µs/div.

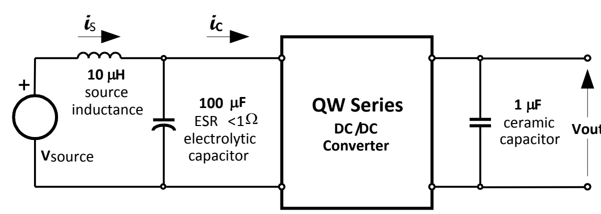


Figure 20. Test setup for measuring input reflected ripple currents, i_c and i_s.

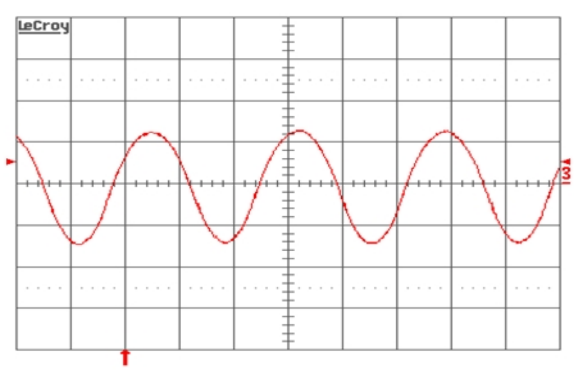


Figure 21. Input reflected ripple current, i_c (100 mA/div.), measured at input terminals at full rated load current and Vin = 36 V. Refer to Fig. 20 for test setup. Time scale: 1 µs/div.

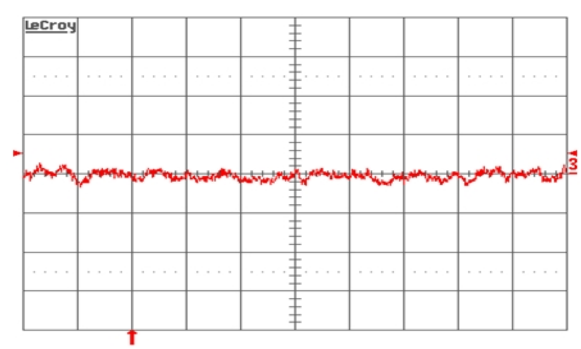


Figure 22. Input reflected ripple current, i_s (10 mA/div.), measured through 10 µH at the source at full rated load current and Vin = 36 V. Refer to Fig. 20 for test setup. Time scale: 1 µs/div.

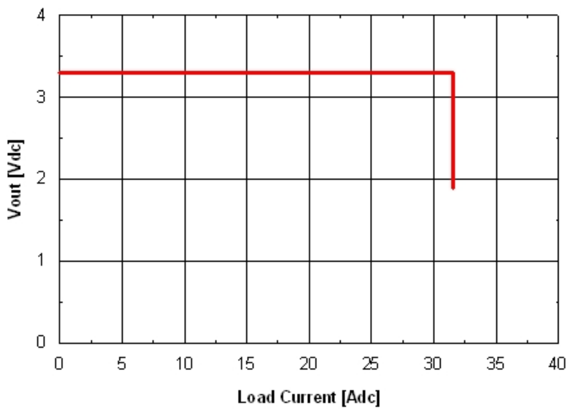


Figure 23. Output voltage vs. load current showing typical current limit threshold and converter shutdown point. Input voltage has almost no effect on current limit characteristic.

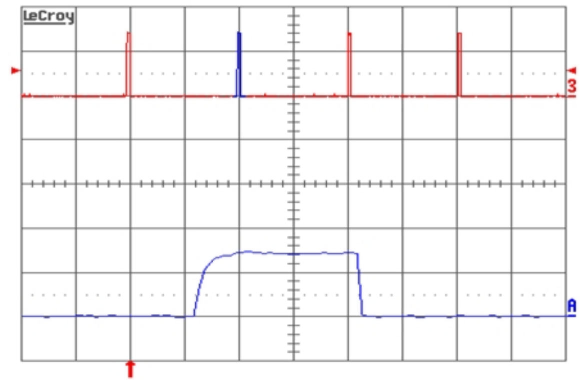
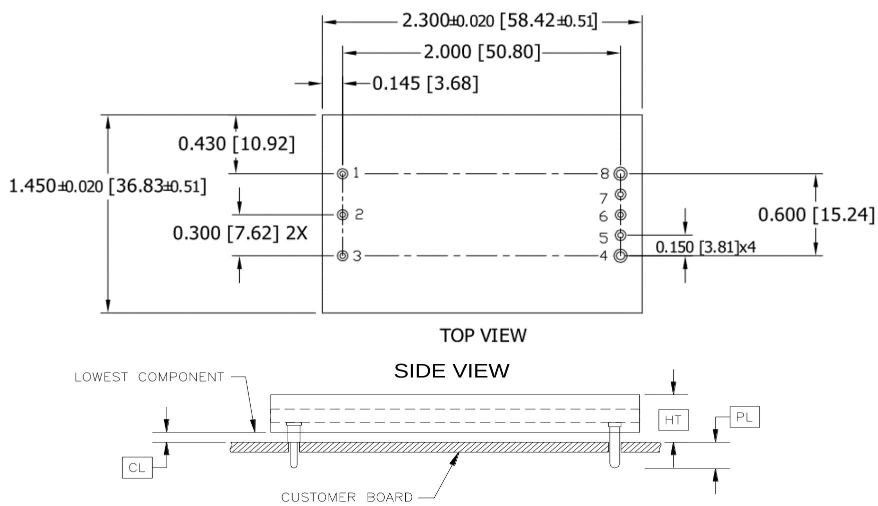


Figure 24. Load current (top trace, 20 A/div., 100 ms/div.) into a 10 mΩ short circuit during restart, at Vin = 36 V. Bottom trace (20 A/div., 2 ms/div.) is an expansion of the on-time portion of the top trace.

5. MECHANICAL PARAMETERS



PAD/PIN CONNECTIONS	
Pad/Pin #	**Function**
1	Vin (+)
2	ON/OFF
3	Vin (-)
4	Vout (-)
5	SENSE (-)
6	TRIM
7	SENSE (+)
8	Vout (+)

Height Option	HT (Maximum Height) +0.000 [+0.00] -0.038 [-0.97]	CL (Minimum Clearance) +0.016 [+0.41] -0.000 [-0.00]
G	0.482 [12.24]	0.035 [0.89]

Pin Option	PL (Pin Length) ±0.005 [±0.13]
A	0.188 [4.78]
B	0.145 [3.68]

- All dimensions are in inches [mm]
- Pins 1-3 and 5-7 are Ø 0.040" [1.02] with Ø 0.078" [1.98] shoulder
- Pins 4 and 8 are Ø 0.062" [1.57] without shoulder
- Pin Material & Finish: Brass Alloy 360 with Matte Tin over Nickel
- Converter Weight: 1.3 oz [37 g]

QW24T25033

6. ORDERING INFORMATION

Product Series	Input Voltage	Mounting Scheme	Rated Load Current	Output Voltage		ON/OFF Logic	Maximum Height [HT]	Pin Length [PL]	Special Features	RoHS
QW	24	T	25	033	-	N	G	B	0	
Quarter-Brick Format Wide Input Range	18-60 V	Through Hole	25 A	033 ⇒ 3.3 V		N ⇒ Negative	G ⇒ 0.482”	A ⇒ 0.188” B ⇒ 0.145”	0 ⇒ STD	No Suffix ⇒ RoHS lead-solder-exemption compliant G ⇒ RoHS compliant for all six substances

The example above describes P/N QW24T25033-NGB0: 18-60 V input, through-hole mounting, 25 A @ 3.3 V output, negative ON/OFF logic, a maximum height of 0.482”, a through the board pin length of 0.145”, and Eutectic Tin/Lead solder. Please consult factory for the complete list of available options

For more information on these products consult: tech.support@psbel.com