



LINEAGE POWER<sup>®</sup>

QBVW033A0B Series Power Modules; DC-DC Converters

36-75V<sub>dc</sub> Input; 12V<sub>dc</sub> Output; 33A Output Current

## BARRACUDA SERIES Features



RoHS  
Compliant

- Compliant to RoHS EU Directive 2002/95/EC (-Z versions)
- High and flat efficiency profile – >95.5% at 12V<sub>dc</sub>, 30% load to 100% output
- Wide Input voltage range: 36-75V<sub>dc</sub>
- Delivers up to 33A<sub>dc</sub> output current
- Fully very tightly regulated output voltage
- Low output ripple and noise
- Industry standard, Quarter brick:  
58.4 mm x 36.8 mm x 11.7 mm  
(2.30 in x 1.45 in x 0.46 in)
- Constant switching frequency
- Positive Remote On/Off logic
- Output over current/voltage protection
- Over temperature protection
- Wide operating temperature range (-40°C to 85°C)
- UL\* 60950-1 Recognized, CSA<sup>†</sup> C22.2 No. 60950-1-03 Certified, and VDE<sup>‡</sup> 0805:2001-12 (EN60950-1) Licensed
- CE mark to 2006/96/EC directive<sup>§</sup>
- Meets the voltage and current requirements for ETSI 300-132-2 and complies with and licensed for Basic insulation rating per EN60950-1
- 2250 Vdc Isolation tested in compliance with IEEE 802.3<sup>††</sup> PoE standards
- ISO\*\* 9001 and ISO14001 certified manufacturing facilities

## Applications

- Distributed power architectures
- Intermediate bus voltage applications
- Servers and storage applications
- Networking equipment including Power over Ethernet (PoE)
- Fan assemblies and other systems requiring a tightly regulated output voltage

## Options

- Negative Remote On/Off logic (1=option code, factory preferred)
- Auto-restart after fault shutdown (4=option code, factory preferred)
- Base plate option (-H=option code)
- Passive Droop Load Sharing (-P=option code)

## Description

The QBVW033A0B series of dc-dc converters are a new generation of DC/DC power modules designed to support 12Vdc intermediate bus applications where multiple low voltages are subsequently generated using point of load (POL) converters, as well as other application requiring a tightly regulated output voltage. The QBVW033A0B series operate from an input voltage range of 36 to 75Vdc and provide up to 33A output current at output voltages of 12V<sub>dc</sub> in an industry standard quarter brick. The converter incorporates digital control, synchronous rectification technology, a fully regulated control topology, and innovative packaging techniques to achieve efficiency exceeding 96% at 12V output. This leads to lower power dissipations such that for many applications a heat sink is not required. Standard features include on/off control, output overcurrent and over voltage protection, over temperature protection, input under and over voltage lockout.

The output is fully isolated from the input, allowing versatile polarity configurations and grounding connections. Built-in filtering for both input and output minimizes the need for external filtering.

\* UL is a registered trademark of Underwriters Laboratories, Inc.

† CSA is a registered trademark of Canadian Standards Association.

‡ VDE is a trademark of Verband Deutscher Elektrotechniker e.V.

§ This product is intended for integration into end-user equipment. All of the required procedures of end-use equipment should be followed.

## Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only, functional operation of the device is not implied at these or any other conditions in excess of those given in the operations sections of the Data Sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Device	Symbol	Min	Max	Unit
Input Voltage*					
Continuous		V <sub>IN</sub>	-0.3	75	V <sub>dc</sub>
Operating transient ≤ 100mS				100	V <sub>dc</sub>
Operating Input transient slew rate, 50V <sub>IN</sub> to 75V <sub>IN</sub> (Output may exceed regulation limits, no protective shutdowns shall activate, C <sub>O</sub> =220μF to C <sub>O,max</sub> )		-	-	TBD	V/μs
Non- operating continuous		V <sub>IN</sub>	80	100	V <sub>dc</sub>
Operating Ambient Temperature (See Thermal Considerations section)	All	T <sub>A</sub>	-40	85	°C
Storage Temperature	All	T <sub>stg</sub>	-55	125	°C
I/O Isolation Voltage (100% factory Hi-Pot tested)	All	—	—	2250	V <sub>dc</sub>

\* Input over voltage protection will shutdown the output voltage when the input voltage exceeds threshold level.

## Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions.

Parameter	Device	Symbol	Min	Typ	Max	Unit
Operating Input Voltage		V <sub>IN</sub>	36	48	75	V <sub>dc</sub>
Maximum Input Current (V <sub>IN</sub> =0V to 75V, I <sub>O</sub> =I <sub>O,max</sub> )		I <sub>IN,max</sub>	-	-	12	A <sub>dc</sub>
Input No Load Current (V <sub>IN</sub> = V <sub>IN,nom</sub> , I <sub>O</sub> = 0, module enabled)	All	I <sub>IN,No load</sub>		80		mA
Input Stand-by Current (V <sub>IN</sub> = V <sub>IN,nom</sub> , module disabled)	All	I <sub>IN,stand-by</sub>			22	mA
External Input Capacitance	All		100	-	-	μF
Inrush Transient	All	I <sup>2</sup> t	-	-	1	A <sup>2</sup> s
Input Reflected Ripple Current, peak-to-peak (5Hz to 20MHz, 12μH source impedance; V <sub>IN</sub> = 48V, I <sub>O</sub> = I <sub>O,max</sub> ; see Figure 10)	All		-	24	-	mA <sub>p-p</sub>
Input Ripple Rejection (120Hz)	All		-	50	-	dB

**CAUTION: This power module is not internally fused. An input line fuse must always be used.**

This power module can be used in a wide variety of applications, ranging from simple standalone operation to an integrated part of sophisticated power architecture. To preserve maximum flexibility, internal fusing is not included, however, to achieve maximum safety and system protection, always use an input line fuse. The safety agencies require a fast-acting fuse with a maximum rating of 30 A in the ungrounded input lead of the power supply (see Safety Considerations section). Based on the information provided in this Data Sheet on inrush energy and maximum dc input current, the same type of fuse with a lower rating can be used. Refer to the fuse manufacturer's Data Sheet for further information.

### Electrical Specifications (continued)

Parameter	Device	Symbol	Min	Typ	Max	Unit
Output Voltage Set-point (V <sub>IN</sub> =V <sub>IN,nom</sub> , I <sub>O</sub> =TBDA, T <sub>A</sub> =25°C)	All	V <sub>O,set</sub>	TBD	12.00	TBD	V <sub>dc</sub>
Output Voltage (Over all operating input voltage, resistive load, and temperature conditions until end of life)		V <sub>O</sub>	TBD	—	12.36	% V <sub>O,set</sub>
Output Regulation						
Line (V <sub>IN</sub> =TBDV to V <sub>IN,max</sub> )	All		—	—	0.2	% V <sub>O,set</sub>
Load (I <sub>O</sub> =I <sub>O,min</sub> to I <sub>O,max</sub> )	All w/o -P		—	—	0.2	% V <sub>O,set</sub>
Load (I <sub>O</sub> =I <sub>O,min</sub> to I <sub>O,max</sub> ), Intentional Droop	-P Option			1.0		V <sub>dc</sub>
Temperature (T <sub>A</sub> = -40°C to +85°C)	All		—	—	1.0	% V <sub>O,set</sub>
Output Ripple and Noise on nominal output (V <sub>IN</sub> =V <sub>IN,nom</sub> and I <sub>O</sub> =I <sub>O,min</sub> to I <sub>O,max</sub> )						
RMS (5Hz to 20MHz bandwidth)	All		—	70	—	mV <sub>rms</sub>
Peak-to-Peak (5Hz to 20MHz bandwidth)	All		—	200	—	mV <sub>pk-pk</sub>
External Output Capacitance	All	C <sub>O,max</sub>	0	—	10,000	μF
Output Current	All	I <sub>O</sub>	0		33	A <sub>dc</sub>
Output Current Limit Inception	All	I <sub>O,lim</sub>	—	40	—	A <sub>dc</sub>
Efficiency V <sub>IN</sub> =V <sub>IN,nom</sub> , T <sub>A</sub> =25°C I <sub>O</sub> =100% I <sub>O,max</sub> , V <sub>O</sub> = V <sub>O,set</sub> I <sub>O</sub> =40% I <sub>O,max</sub> to 75% I <sub>O,max</sub> , V <sub>O</sub> = V <sub>O,set</sub>	All	η		95.5 96.0		%
Switching Frequency		f <sub>sw</sub>		150		kHz
Dynamic Load Response dI <sub>O</sub> /dt=1A/10μs; V <sub>IN</sub> =V <sub>IN,nom</sub> ; T <sub>A</sub> =25°C; (Tested with a 1.0μF ceramic, a 10μF tantalum, and 470μF capacitor and across the load.)						
Load Change from I <sub>O</sub> = 50% to 75% of I <sub>O,max</sub> : Peak Deviation Settling Time (V <sub>O</sub> <10% peak deviation)	All	V <sub>pk</sub> t <sub>s</sub>	— —	300 700	— —	mV <sub>pk</sub> μs
Load Change from I <sub>O</sub> = 75% to 50% of I <sub>O,max</sub> : Peak Deviation Settling Time (V <sub>O</sub> <10% peak deviation)		V <sub>pk</sub> t <sub>s</sub>	— —	300 700	— —	mV <sub>pk</sub> μs

### Isolation Specifications

Parameter	Symbol	Min	Typ	Max	Unit
Isolation Capacitance	C <sub>iso</sub>	—	1000	—	pF
Isolation Resistance	R <sub>iso</sub>	10	—	—	MΩ

### General Specifications

Parameter	Device	Typ	Unit
Calculated Reliability Based upon Telcordia SR-332 Issue 2: Method I, Case 1, (I <sub>O</sub> =80%I <sub>O,max</sub> , T <sub>A</sub> =40°C, Airflow = 200 lfm), 90% confidence	MTBF	All	TBD
	FIT	All	TBD
Weight – Open Frame		—	47.4 (1.67)
Weight – with Base plate option		—	66.4 (2.34)

## Feature Specifications

Unless otherwise indicated, specifications apply over all operating input voltage, resistive load, and temperature conditions. See Feature Descriptions for additional information.

Parameter	Device	Symbol	Min	Typ	Max	Unit
Remote On/Off Signal Interface (V <sub>IN</sub> =V <sub>IN,min</sub> to V <sub>IN,max</sub> , Signal referenced to V <sub>IN</sub> -terminal) Negative Logic: device code suffix "1" Logic Low = module On, Logic High = module Off Positive Logic: No device code suffix required Logic Low = module Off, Logic High = module On Logic Low Specification On/Off Thresholds:						
Remote On/Off Current – Logic Low (V <sub>in</sub> =100V)	All	I <sub>on/off</sub>	280	—	310	μA
Logic Low Voltage	All	V <sub>on/off</sub>	-0.3	—	0.8	V <sub>dc</sub>
Logic High Voltage – (Typ = Open Collector)	All	V <sub>on/off</sub>	2.0	—	14.5	V <sub>dc</sub>
Logic High maximum allowable leakage current (V <sub>on/off</sub> = 2.0V)	All	I <sub>on/off</sub>	—	—	10	μA
Maximum voltage allowed on On/Off pin	All	V <sub>on/off</sub>	—	—	14.5	V <sub>dc</sub>
Turn-On Delay and Rise Times (I <sub>o</sub> =I <sub>o,max</sub> )						
T <sub>delay</sub> = Time until V <sub>O</sub> = 10% of V <sub>O,set</sub> from either application of V <sub>in</sub> with Remote On/Off set to On or operation of Remote On/Off from Off to On with V <sub>in</sub> already applied for at least one second.	All	T <sub>delay, Enable with V<sub>in</sub></sub>	—	—	150	ms
	All	T <sub>delay, Enable with on/off</sub>	—	—	10	ms
T <sub>rise</sub> = Time for V <sub>O</sub> to rise from 10% of V <sub>O,set</sub> to 90% of V <sub>O,set</sub> , I <sub>o</sub> must be < 50% I <sub>o,max</sub> .		T <sub>rise</sub>	—	—	15	ms
Overtemperature Protection (See Feature Descriptions)						
All		T <sub>ref</sub>	—	TBD	—	°C
Input Undervoltage Lockout						
Turn-on Threshold (Default)			34	35	36	V <sub>dc</sub>
Turn-off Threshold (Default)			32	33	34	V <sub>dc</sub>
Input Overvoltage Lockout						
Turn-off Threshold (Default)			—	81	—	V <sub>dc</sub>
Turn-on Threshold (Default)			76	79	—	V <sub>dc</sub>

### Characteristic Curves, 12V<sub>dc</sub> Output

The following figures provide typical characteristics for the QBVW033A0B (12V, 33A) at 25°C. The figures are identical for either positive or negative Remote On/Off logic.

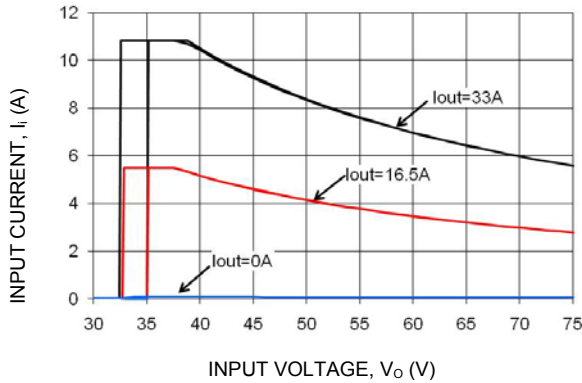


Figure 1. Typical Input Characteristic at Room Temperature.

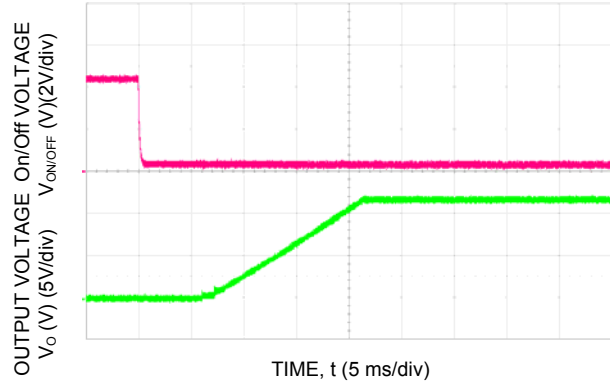


Figure 4. Typical Start-Up Using Remote On/Off with Vin applied, negative logic version shown.

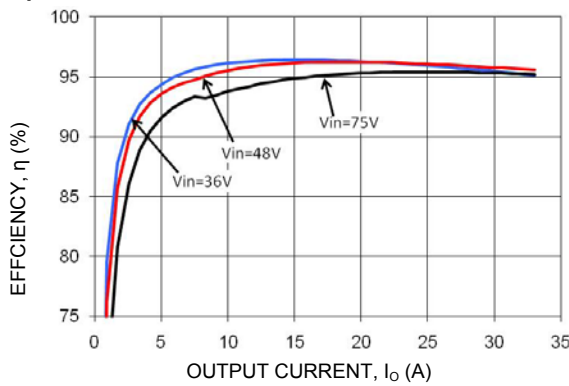


Figure 2. Typical Converter Efficiency Vs. Output current at Room Temperature and 48 Vdc Input.

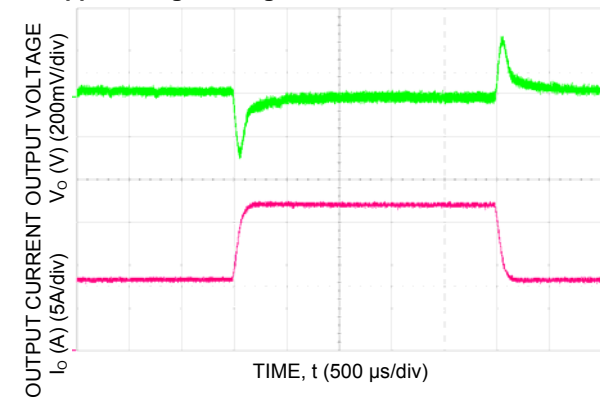


Figure 5. Typical Transient Response to 0.1A/μs Step Change in Load from 25% to 50% to 25% of Full Load at Room Temperature, Co=470μF and 48 Vdc Input.

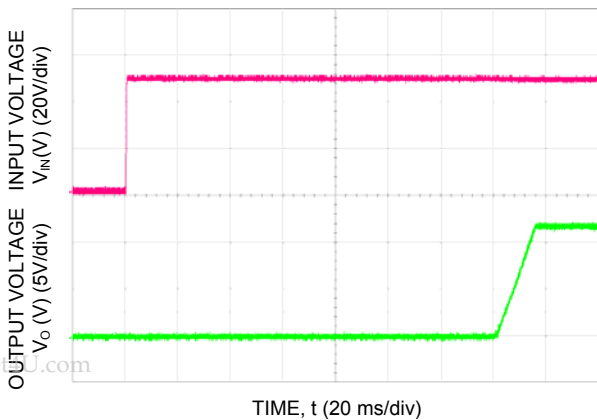


Figure 3. Typical Start-Up Using Vin with Remote On/Off enabled, negative logic version shown.

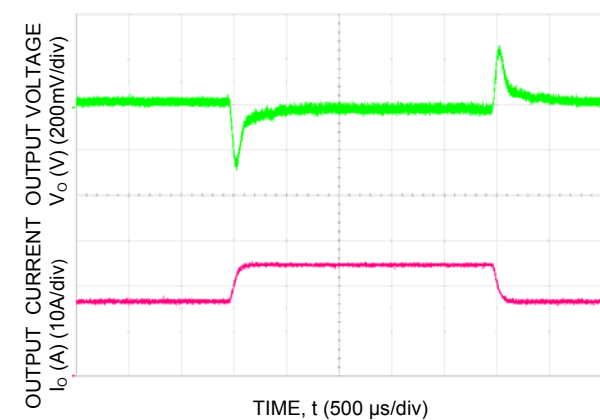


Figure 6. Typical Transient Response to 0.1A/μs Step Change in Load from 50% to 75% to 50% of Full Load at Room Temperature, Co=470μF and 48 Vdc Input.

Characteristic Curves, 12V<sub>dc</sub> Output (continued)

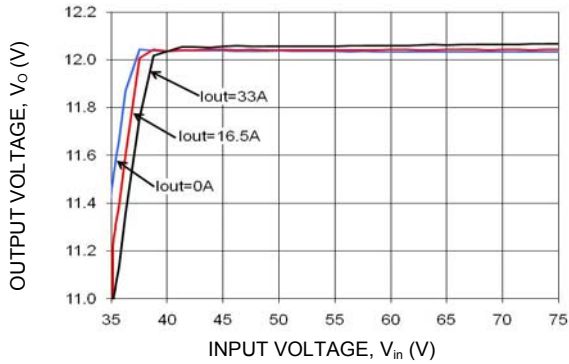


Figure 7. Typical Output Voltage regulation vs. Input Voltage at Room Temperature.

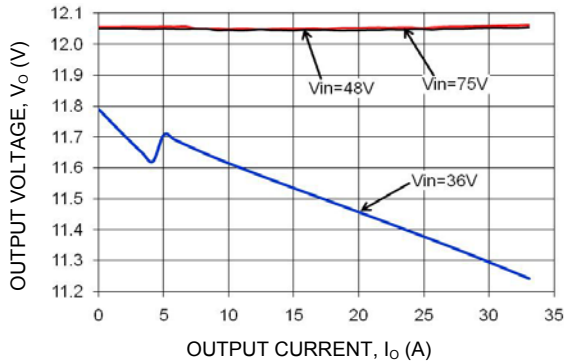


Figure 8. Typical Output Voltage Regulation vs. Output Current at Room Temperature.

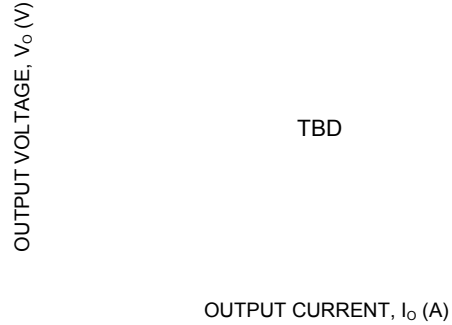


Figure 9. Typical Output Voltage Regulation vs. Output Current at Room Temperature for the -P Option.

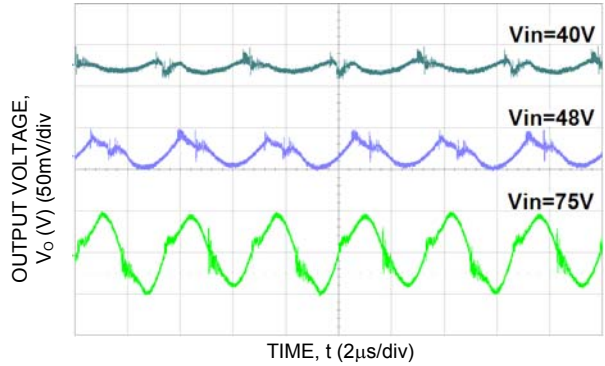
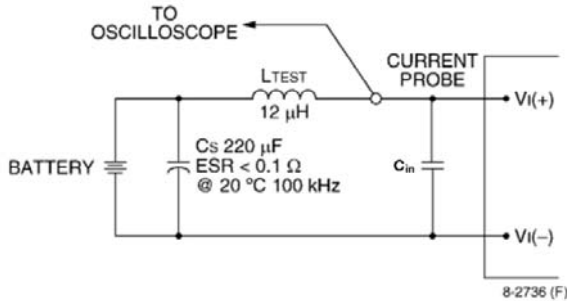


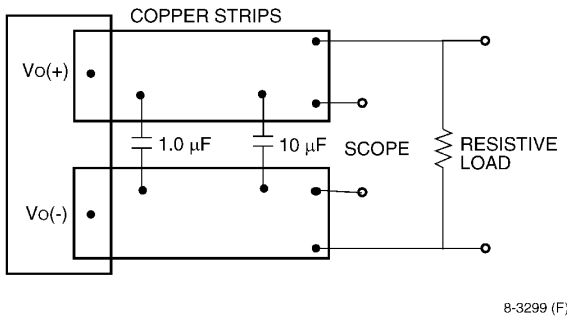
Figure 10. Typical Output Ripple and Noise at Room Temperature, 48 Vdc Input and  $I_o = I_{o,max}$ .

## Test Configurations



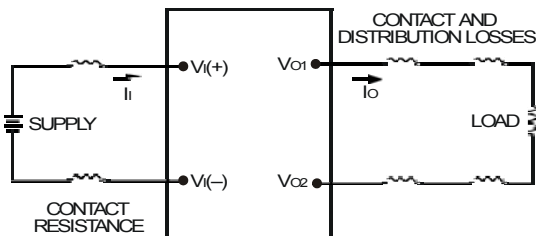
Note: Measure input reflected-ripple current with a simulated source inductance (LTEST) of 12 µH. Capacitor CS offsets possible battery impedance. Measure current as shown above.

**Figure 11. Input Reflected Ripple Current Test Setup.**



Note: Use a 1.0 µF ceramic capacitor and a 10 µF aluminum or tantalum capacitor. Scope measurement should be made using a BNC socket. Position the load between 51 mm and 76 mm (2 in. and 3 in.) from the module.

**Figure 12. Output Ripple and Noise Test Setup.**



Note: All measurements are taken at the module terminals. When socketing, place Kelvin connections at module terminals to avoid measurement errors due to socket contact resistance.

$$\eta = \left( \frac{[V_{O(+)} - V_{O(-)}]I_{O}}{[V_{I(+)} - V_{I(-)}]I_{I}} \right) \times 100 \%$$

**Figure 13. Output Voltage and Efficiency Test Setup.**

## Design Considerations

### Input Source Impedance

The power module should be connected to a low ac-impedance source. Highly inductive source impedance can affect the stability of the power module. For the test configuration in Figure 11, a 100µF electrolytic capacitor, C<sub>in</sub>, (ESR<0.7Ω at 100kHz), mounted close to the power module helps ensure the stability of the unit.

### Safety Considerations

For safety-agency approval of the system in which the power module is used, the power module must be installed in compliance with the spacing and separation requirements of the end-use safety agency standard, i.e., UL60950-1, CSA C22.2 No. 60950-1, and VDEEN60950-1.

If the input source is non-SELV (ELV or a hazardous voltage greater than 60 Vdc and less than or equal to 75Vdc), for the module's output to be considered as meeting the requirements for safety extra-low voltage (SELV), all of the following must be true:

- The input source is to be provided with reinforced insulation from any other hazardous voltages, including the ac mains.
- One V<sub>IN</sub> pin and one V<sub>OUT</sub> pin are to be grounded, or both the input and output pins are to be kept floating.
- The input pins of the module are not operator accessible.
- Another SELV reliability test is conducted on the whole system (combination of supply source and subject module), as required by the safety agencies, to verify that under a single fault, hazardous voltages do not appear at the module's output.

**Note:** Do not ground either of the input pins of the module without grounding one of the output pins. This may allow a non-SELV voltage to appear between the output pins and ground.

The power module has safety extra-low voltage (SELV) outputs when all inputs are SELV.

The input to these units is to be provided with a maximum 30 A fast-acting (or time-delay) fuse in the ungrounded input lead.

The optional heat-plate is considered floating mid-point from a spacing perspective between input and output.



## Feature Descriptions

### Overcurrent Protection

To provide protection in a fault output overload condition, the module is equipped with internal current-limiting circuitry and can endure current limiting continuously. If the overcurrent condition causes the output voltage to fall below 8.0V, the module will shut down and remain latched off. The overcurrent latch is reset by either cycling the input power or by toggling the on/off pin for one second. If the output overload condition still exists when the module restarts, it will shut down again. This operation will continue indefinitely until the overcurrent condition is corrected.

A factory configured auto-restart option (with overcurrent and overvoltage auto-restart managed as a group) is also available. An auto-restart feature continually attempts to restore the operation until fault condition is cleared.

### Remote On/Off

The module contains a standard on/off control circuit reference to the V<sub>IN</sub>(-) terminal. Two factory configured remote on/off logic options are available. Positive logic remote on/off turns the module on during a logic-high voltage on the ON/OFF pin, and off during a logic low. Negative logic remote on/off turns the module off during a logic high, and on during a logic low. Negative logic, device code suffix "1," is the factory-preferred configuration. The On/Off circuit is powered from an internal bias supply, derived from the input voltage terminals. To turn the power module on and off, the user must supply a switch to control the voltage between the On/Off terminal and the V<sub>IN</sub>(-) terminal (V<sub>on/off</sub>). The switch can be an open collector or equivalent (see Figure 14). A logic low is V<sub>on/off</sub> = -0.3V to 0.8V. The typical I<sub>on/off</sub> during a logic low (V<sub>in</sub>=48V, On/Off Terminal=0.3V) is 147μA. The switch should maintain a logic-low voltage while sinking 310μA. During a logic high, the maximum V<sub>on/off</sub> generated by the power module is 8.2V. The maximum allowable leakage current of the switch at V<sub>on/off</sub> = 2.0V is 10μA. If using an external voltage source, the maximum voltage V<sub>on/off</sub> on the pin is 14.5V with respect to the V<sub>IN</sub>(-) terminal.

If not using the remote on/off feature, perform one of the following to turn the unit on:

For negative logic, short ON/OFF pin to V<sub>IN</sub>(-).

For positive logic: leave ON/OFF pin open.

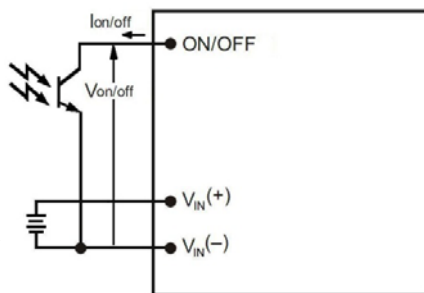


Figure 14. Remote On/Off Implementation.

### Output Overvoltage Protection

The module contains circuitry to detect and respond to output overvoltage conditions. If the overvoltage condition causes the output voltage to rise above the limit in the Specifications Table, the module will shut down and remain latched off. The overvoltage latch is reset by either cycling the input power, or by toggling the on/off pin for one second. If the output overvoltage condition still exists when the module restarts, it will shut down again. This operation will continue indefinitely until the overvoltage condition is corrected.

A factory configured auto-restart option (with overcurrent and overvoltage auto-restart managed as a group) is also available. An auto-restart feature continually attempts to restore the operation until fault condition is cleared.

### Overtemperature Protection

These modules feature an overtemperature protection circuit to safeguard against thermal damage. The circuit shuts down and latches off the module when the maximum device reference temperature is exceeded. The module can be restarted by cycling the dc input power for at least one second or by toggling the remote on/off signal for at least one second.

### Input Under/Over voltage Lockout

At input voltages above or below the input under/over voltage lockout limits, module operation is disabled. The module will begin to operate when the input voltage level changes to within the under and overvoltage lockout limits.

### Load Sharing

For higher power requirements, the QBVW033A0B power module offers an optional feature for parallel operation (-P Option code). This feature provides a precise forced output voltage load regulation droop characteristic. The output set point and droop slope are factory calibrated to insure optimum matching of multiple modules' load regulation characteristics. To implement load sharing, the following requirements should be followed:

- The V<sub>out</sub>(+) and V<sub>out</sub>(-) planes of all parallel modules must be connected together with output traces from each module as short as possible to common power planes.
- These modules contain means to block reverse current flow upon start-up, when output voltage is present from other parallel modules, eliminating the requirement for external output ORing devices. However, output ORing devices should be used, if fault tolerance is desired in parallel applications. It is essential to use the modules Remote On/Off pin to control module startup; and not allow the module to startup upon application of V<sub>in</sub>. One parallel module must start at least 15ms (may be reduced TBD) sooner than the remaining parallel modules to insure that the pre-bias detection operates correctly.



## Feature Descriptions (continued)

### Thermal Considerations

The power modules operate in a variety of thermal environments and sufficient cooling should be provided to help ensure reliable operation.

Thermal considerations include ambient temperature, airflow, module power dissipation, and the need for increased reliability. A reduction in the operating temperature of the module will result in an increase in reliability. The thermal data presented here is based on physical measurements taken in a wind tunnel.

Heat-dissipating components are mounted on the top side of the module. Heat is removed by conduction, convection and radiation to the surrounding environment. Proper cooling can be verified by measuring the thermal reference temperature (TH<sub>x</sub>). Peak temperature (TH<sub>x</sub>) occurs at the position indicated in Figure 15 and 16. For reliable operation this temperature should not exceed the listed temperature threshold.

TBD

Figure 15. Location of the thermal reference temperature TH.

TBD

Figure 16. Location of the thermal reference temperature TH<sub>3</sub> for Base plate module.

The output power of the module should not exceed the rated power for the module as listed in the Ordering Information table.

Although the maximum TH<sub>x</sub> temperature of the power modules is TBD °C, you can limit this temperature to a lower value for extremely high reliability.

Please refer to the Application Note "Thermal Characterization Process For Open-Frame Board-Mounted Power Modules" for a detailed discussion of thermal aspects including maximum device temperatures.

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### Heat Transfer via Convection

Increased airflow over the module enhances the heat transfer via convection. The thermal derating of figure 17-21 shows the maximum output current that can be delivered by each module in the indicated orientation without exceeding the maximum TH<sub>x</sub> temperature versus local ambient temperature (T<sub>A</sub>) for several air flow conditions.

The use of Figures 16 is shown in the following example:

#### Example

What is the minimum airflow necessary for a QBVW033A0B operating at V<sub>I</sub> = 48 V, an output current of 20A, and a maximum ambient temperature of 60 °C in transverse orientation.

Solution:

Given: V<sub>in</sub> = 48V, I<sub>O</sub> = 20A, T<sub>A</sub> = 60 °C

Determine required airflow velocity (Use Figure 17):

Velocity = 0.5m/s (100 LFM) or greater.

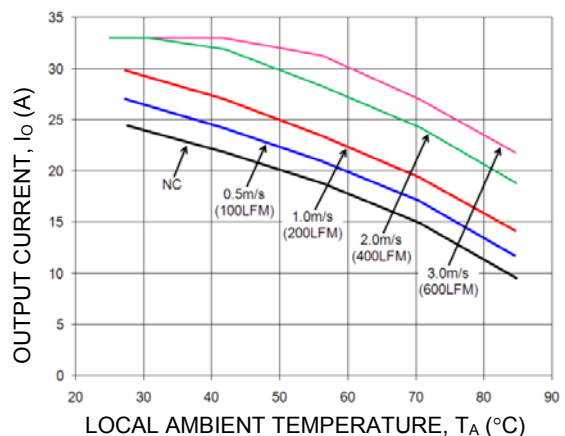


Figure 17. Output Current Derating for the Open Frame QBVW033A0B in the Transverse Orientation; Airflow Direction from Vin(+) to Vin(-); Vin = 48V.

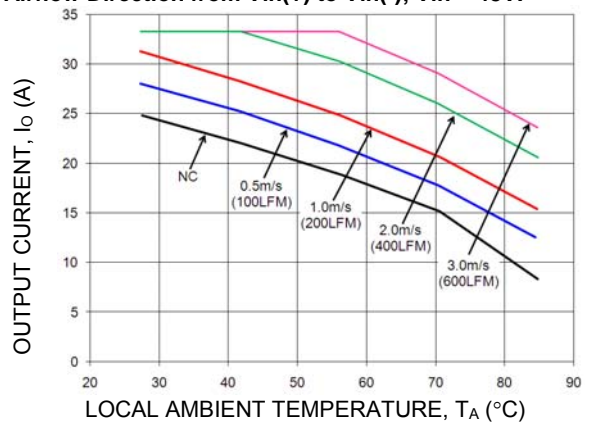


Figure 18. Output Current Derating for the Base plate QBVW033A0B-H in the Transverse Orientation; Airflow Direction from Vin(+) to Vin(-); Vin = 48V.

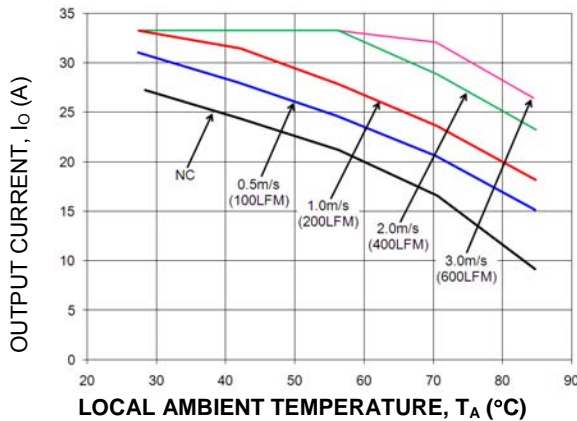


Figure 19. Output Current Derating for the Base plate QBVW033A0B-H with 0.25" heatsink in the Transverse Orientation; Airflow Direction from Vin(+) to Vin(-); Vin = 48V.

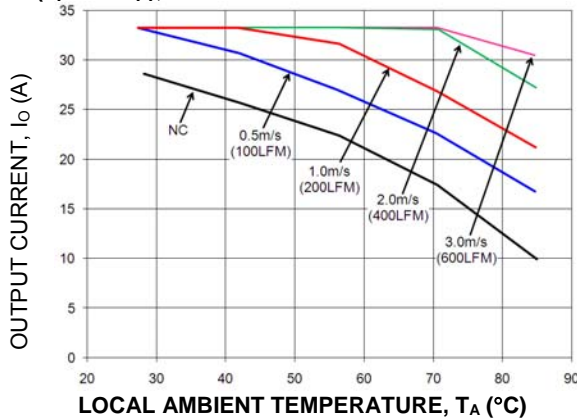


Figure 20. Output Current Derating for the Base plate QBVW033A0B-H with 0.5" heatsink in the Transverse Orientation; Airflow Direction from Vin(+) to Vin(-); Vin = 48V.

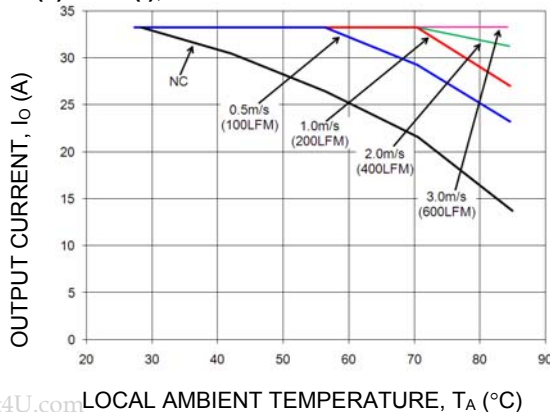


Figure 21. Output Current Derating for the Base plate QBVW033A0B-H with 1.0" heatsink in the Transverse Orientation; Airflow Direction from Vin(+) to Vin(-); Vin = 48V.

## Layout Considerations

The QBVW033 power module series are low profile in order to be used in fine pitch system card architectures. As such, component clearance between the bottom of the power module and the mounting board is limited. Avoid placing copper areas on the outer layer directly underneath the power module. Also avoid placing via interconnects underneath the power module.

For additional layout guide-lines, refer to FLTR100V10 Data Sheet.

## Through-Hole Lead-Free Soldering Information

The RoHS-compliant, Z version, through-hole products use the SAC (Sn/Ag/Cu) Pb-free solder and RoHS-compliant components. The module is designed to be processed through single or dual wave soldering machines. The pins have a RoHS-compliant, pure tin finish that is compatible with both Pb and Pb-free wave soldering processes. A maximum preheat rate of 3°C/s is suggested. The wave preheat process should be such that the temperature of the power module board is kept below 210°C. For Pb solder, the recommended pot temperature is 260°C, while the Pb-free solder pot is 270°C max.

## Reflow Lead-Free Soldering Information

The RoHS-compliant through-hole products can be processed with TBD paste-through-hole Pb or Pb-free reflow process.

Process details TB

If additional information is needed, please consult with your Lineage Power representative for more details.

## Post Solder Cleaning and Drying Considerations

Post solder cleaning is usually the final circuit-board assembly process prior to electrical board testing. The result of inadequate cleaning and drying can affect both the reliability of a power module and the testability of the finished circuit-board assembly. For guidance on appropriate soldering, cleaning and drying procedures, refer to Lineage Power *Board Mounted Power Modules: Soldering and Cleaning Application Note* (AP01-056EPS).

## EMC Considerations

TBD

### Mechanical Outline for QBVW033A0B Through-hole Module

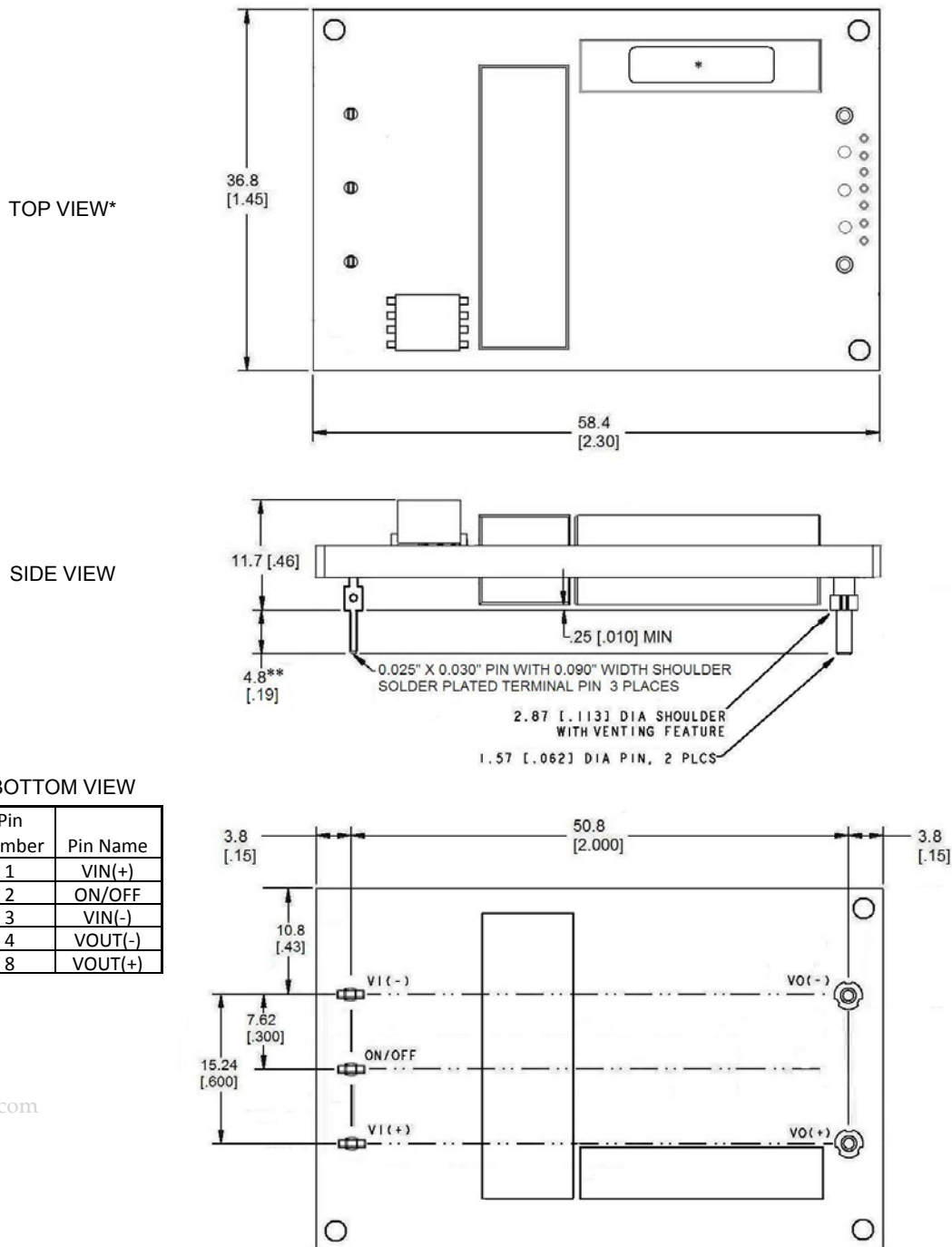
Dimensions are in millimeters and [inches].

Tolerances: x.x mm ± 0.5 mm [x.xx in. ± 0.02 in.] (Unless otherwise indicated)

x.xx mm ± 0.25 mm [x.xxx in ± 0.010 in.]

\*Top side label includes Lineage Power name, product designation, and data code.

\*\* Standard pin tail length. Optional pin tail lengths shown in Table 2, Device Options.



**Mechanical Outline for QBVW033A0B-H (Base plate) Through-hole Module**

Dimensions are in millimeters and [inches].

Tolerances: x.x mm ± 0.5 mm [x.xx in. ± 0.02 in.] (Unless otherwise indicated)

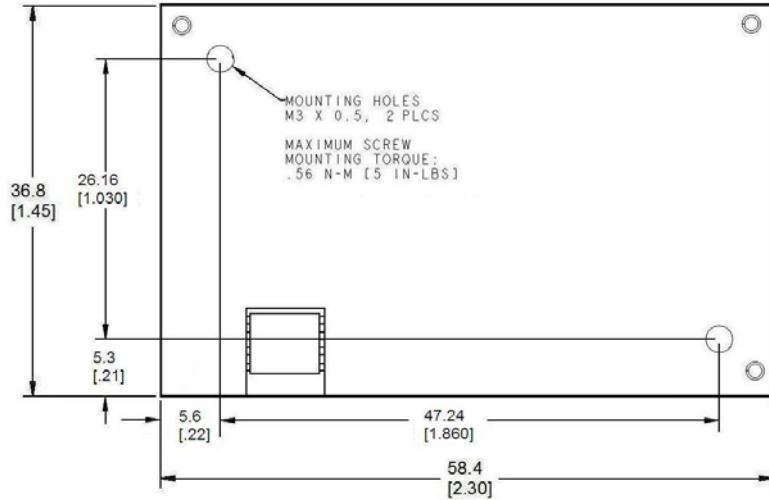
x.xx mm ± 0.25 mm [x.xxx in ± 0.010 in.]

\*Side label includes product designation, and data code.

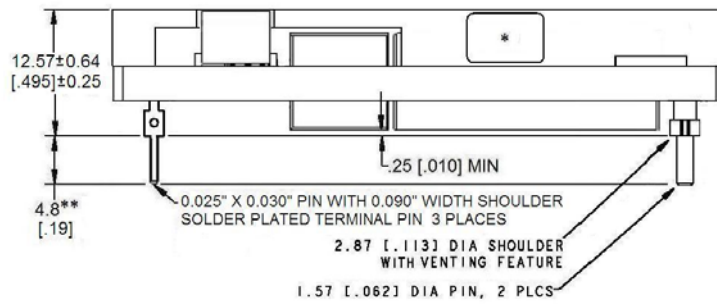
\*\* Standard pin tail length. Optional pin tail lengths shown in Table 2, Device Options.

\*\*\*Bottom label includes Lineage Power name, product designation, and data code

TOP VIEW

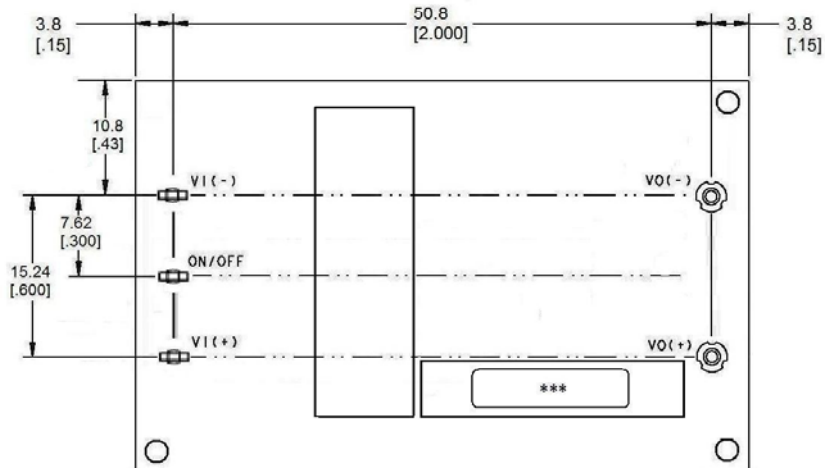


SIDE VIEW\*



BOTTOM VIEW\*\*\*

Pin Number	Pin Name
1	VIN(+)
2	ON/OFF
3	VIN(-)
4	VOUT(-)
8	VOUT(+)



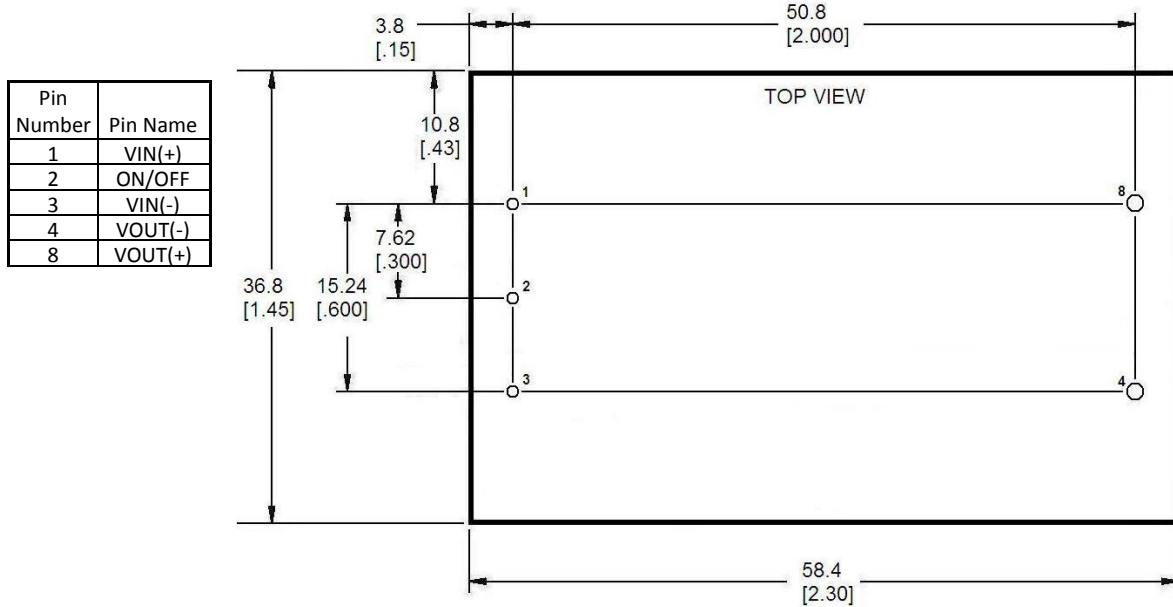
### Recommended Pad Layouts

Dimensions are in millimeters and (inches).

Tolerances: x.x mm ± 0.5 mm ( x.xx in. ± 0.02 in.) [unless otherwise indicated]

x.xx mm ± 0.25 mm ( x.xxx in ± 0.010 in.)

### Through-Hole Modules



## Ordering Information

Please contact your Lineage Power Sales Representative for pricing, availability and optional features.

**Table 1. Device Codes**

Product codes	Input Voltage	Output Voltage	Output Current	Efficiency	Connector Type	Comcodes
QBVW033A0B41Z	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109165247
QBVW033A0B541Z	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109165263
QBVW033A0B641Z	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109165692
QBVW033A0B41-HZ	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109165255
QBVW033A0B641-HZ	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109165701
QBVW033A0B541-PZ	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109167086
QBVW033A0B1-PHZ	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109167094
QBVW033A0B41-PHZ	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109167103
QBVW033A0B61-PHZ	48V (36-75Vdc)	12V	33A	95.5%	Through hole	CC109167111

**Table 2. Device Options**

	Characteristic	Character and Position	Definition
Ratings	Form Factor	Q	Q = Quarter Brick
	Family Designator	BV	BV = BARRACUDA Series, without PMBus and Sense/Trim pins
	Input Voltage	W	W = Wide Range, 36V-75V
	Output Current	033A0	033A0 = 033.0 Amps Maximum Output Current
	Output Voltage	B	B = 12.0V nominal
Options	Pin Length	8 6 5	Omit = Default Pin Length shown in Mechanical Outline Figures 8 = Pin Length: 2.79 mm ± 0.25mm , (0.110 in. ± 0.010 in.) 6 = Pin Length: 3.68 mm ± 0.25mm , (0.145 in. ± 0.010 in.) 5 = Pin Length: 6.35 mm ± 0.25mm , (0.250 in. ± 0.010 in.)
	Action following Protective Shutdown	4	Omit = Latching Mode 4 = Auto-restart following shutdown (Overcurrent/Overvoltage)
	On/Off Logic	1	Omit = Positive Logic 1 = Negative Logic
	Load Sharing	P	Omit = Very Tight Load Regulation P = Forced Droop Load Regulation for use in parallel applications
	Mechanical Features	H	Omit = Standard Open Frame Module H = Heat plate, for use with heat sinks or cold-walls
	Customer Specific	XY	XY = Customer Specific Modified Code, Omit for Standard Code
	RoHS	Z	Z = RoHS 6/6 Compliant, Lead free



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