

## QUARTER-BRICK DC-DC CONVERTERS

### 4:1 ULTRA WIDE INPUT RANGE UP TO 150 WATTS

#### RAILWAY APPLICATIONS

#### QB150 SERIES



#### FEATURES

- Railway System Applications
- 4:1 Ultra Wide Input Range
- No Minimum Load Required
- Low Standby Power Consumption
- High Efficiency (up to 90%)
- 2250Vdc Input to Output Basic Insulation
- Remote Control
- Compact 2.28" X 1.45" X 0.50" Quarter Brick Package
- Safety Meets UL60950-1, EN60950-1 & IEC60950-1
- CE Marked
- Compliant to RoHS II and Reach

#### SELECTION GUIDE All specifications are typical at nominal input, full load and 25°C, unless otherwise noted.

Input Voltage Range Vdc	Output Voltage Vdc	Output Current at Full Load A	Input Current at No Load mA	Efficiency %	Model Number	Maximum Capacitor Load µF
8.5 - 36	3.3	30	25	88	QB150-24S33	91000
8.5 - 36	5	24	25	89	QB150-24S5	48000
8.5 - 36	12	10	25	88	QB150-24S12	8300
8.5 - 36	15	8	25	89	QB150-24S15	5300
8.5 - 36	24	5	25	88	QB150-24S24	2100
8.5 - 36	30	4	25	89	QB150-24S30	1300
8.5 - 22	48	2.5	25	88	QB150-24S48	520
16.5 - 75	3.3	30	15	88	QB150-48S33	91000
16.5 - 75	5	24	15	89	QB150-48S5	48000
16.5 - 75	12	10	15	89	QB150-48S12	8300
16.5 - 75	15	8	15	90	QB150-48S15	5300
16.5 - 75	24	5	15	90	QB150-48S24	2100
16.5 - 75	30	4	15	90	QB150-48S30	1300
16.5 - 75	48	2.5	15	90	QB150-48S48	520
40 - 160	3.3	30	8	88	QB150-110S3P3	91000
40 - 160	5	24	8	89	QB150-110S05	48000
40 - 160	12	11	8	88	QB150-110S12	9170
40 - 160	15	8.6	8	89	QB150-110S15	5730
40 - 160	24	5.5	8	89	QB150-110S24	2290
40 - 160	30	4.4	8	89	QB150-110S30	1470
40 - 160	48	2.7	8	89	QB150-110S48	560

## QB150 SERIES

Input Specifications			Output Specifications		
Operating input voltage range, Vdc	8.5 Min., 24 Typ., 36 Max.	24Vin(nom)	Voltage accuracy, %	-1 Min., +1 Max.	
	16.5 Min., 48 Typ., 75 Max.	48Vin(nom)	Line regulation, %	-0.1 Min., +0.1 Max.	Low Line to High Line at Full Load
	40 Min., 110 Typ., 160 Max.	110Vin(nom)	Load regulation, %	-0.2 Min., +0.2 Max.	No Load to Full Load, 3.3 & 5Vout
Start up voltage, Vdc	9 Max.	24Vin(nom)	Voltage and adjustability, %	-0.1 Min., +0.1 Max.	No Load to Full Load, Others
	18 Max.	48Vin(nom)		Remote sense, %	-20 Min., +10 Max.
	43 Max.	110Vin(nom)	10 Max.		% of Vout(nom). If remote sense is not being used, sense pins should connect to the corresponding polarity OUTPUT pins.
Shutdown voltage, Vdc	7.3 Min., 8.1 Max.	24Vin(nom)	Ripple and noise, mVp-p		Measured by 20MHz bandwidth
	15.5 Min., 16.3 Max.	48Vin(nom)		75 Typ.	With a 22µF/25V X7R MLCC, 3.3Vout, 5Vout
	33 Min., 36 Max.	110Vin(nom)		100 Typ.	With a 22µF/25V X7R MLCC, 12Vout, 15Vout
Start up time, ms	75 Typ., 100 Max.	Constant resistive load, Power up	200 Typ.	With a 4.7µF/50V X7R MLCC, 24Vout, 30Vout	
	75 Typ., 100 Max.	Constant resistive load, Remote ON/OFF	300 Typ.	With a 2.2µF/100V X7R MLCC, 48Vout	
Input surge voltage, Vdc	50 Max.	1 second, max., 24Vin(nom)	Temperature coefficient, %/°C	-0.02 Min., +0.02 Max.	
	100 Max.	1 second, max., 48Vin(nom)	Transient response recovery time, µs	250 Typ.	25% load step change
	185 Max.	1 second, max., 110Vin(nom)	Over voltage protection, %	115 Min., 130 Max.	% of Vout(nom); Hiccup mode
Input filter <sup>(1)</sup>	Pi type		Over load protection, %	110 Min., 140 Max.	% of lout rated; Hiccup mode
Remote ON/OFF		Referenced to -INPUT pin	Short circuit protection	Continuous, automatics recovery	
	Short or 0 - 1.2Vdc	Negative logic, DC-DC ON			
	Open or 3 - 12Vdc	(Standard), DC-DC OFF			
	Open or 3 - 12Vdc	Positive logic, DC- DC ON			
	Short or 0 - 1.2Vdc	(Option), DC-DC OFF			
	-0.5 Min., 1 Max., mA	Input current of Ctrl pin			
	3 Typ., mA	Remote off input current			

### General Specifications

Isolation voltage, Vdc	1 minute (Basic insulation)	Input to Output	2250 Min.		
	1 minute (Basic insulation)	Input (Output) to Base-Plate	2250 Min.		
Isolation resistance, GΩ	500Vdc		1 Min.		
Isolation capacitance, pF					1500 Max.
Switching frequency, kHz			270 Min.	300 Typ.	330 Max.

### Environmental Specifications

Operating case temperature, °C		-40 Min.		+110 Max.
Over temperature protection, °C			+110 Typ.	
Storage temperature range, °C		-55 Min.		+125 Max.
Thermal impedance <sup>(2)</sup> , °C/W	Vertical direction by natural convection (20LFM)			
	Without Heat-sink		9 Typ.	
	Mount on 2U iron base-plate		2.8 Typ.	
	With 0.24" Height Heat-sink		7.1 Typ.	
	With 0.5" Hight Heat-sink		5.5 Typ.	
Thermal shock		EN61373, MIL-STD-810F		
Vibration		EN61373, MIL-STD-810F		
Relative humidity		5% to 95% RH		

## QB150 SERIES

### Physical Specifications

Design meet safety standard	IEC60950-1, UL60950-1, EN60950-1, EN50155, CE
Case material	Aluminum base-plate with plastic case
Potting material	Silicone (UL94-V0)
Dimensions	2.28 x 1.45 x 0.50 Inch (57.9 x 36.8 x 12.7 mm)
Weight	64g (2.26oz)
MTBF	9.742 x 10 <sup>5</sup> hrs, BELLCORE TR-NWT-000332 Case 1: 50% Stress, Ta= 40°C 8.573 x 10 <sup>4</sup> hrs, MIL-HDBK-217F Ta=25°C, Full load (G/B, controlled environment)

### EMC Specifications

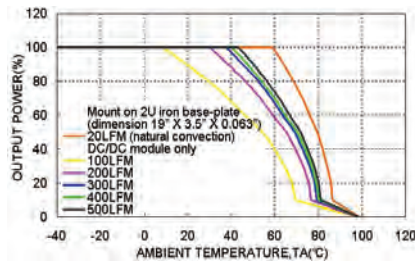
Specifications	Conditions	Level
EMI <sup>(3)</sup>	EN55011, EN55022	Class B
ESD	EN61000-4-2 Air ±8kV and Contact ±6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3 20V/m	Perf. Criteria A
Fast transient <sup>(4)</sup>	EN61000-4-4 ±2kV	Perf. Criteria A
Surge <sup>(4)</sup>	EN61000-4-5 EN55024:±2kV, EN50155:±2kV	Perf. Criteria A
Conducted immunity	EN61000-4-6 10 Vr.m.s	Perf. Criteria A

#### Note:

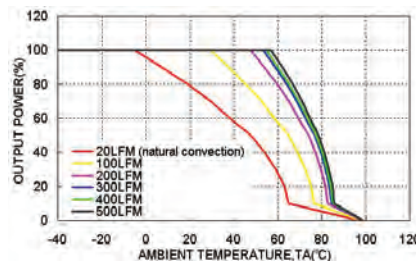
- Input source impedance: The power modules will operate as specifications without external components, assuming that the source voltage has a very low impedance and reasonable input voltage regulation. Highly inductive source impedances can affect the stability of the power module. Since real-world voltage source has finite impedance, performance can be improved by adding external filter capacitor. The QB150-24SXXW and QB150-48SXXW recommended Nippon Chemi-con Ruby-con KY series, 100µF/100V. The QB150-110SXXW recommended Ruby-con BXF series, 39µF/200V.
- The heat-sink is optional and P/N: 7G-0029A-F , 7G-0030A-F , 7G-0031A-F , 7G-0032A-F. Please refer to heat-sink selection guide.
- The QB150W series standard module meets EMI Class A or Class B only with external components. For more detail information, please contact Polytron Devices.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The QB150-24SXXW and QB150-48SXXW recommended 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220µF/100V) to connect in parallel. The QB150-110SXXW recommended 3 pcs of aluminum electrolytic capacitor (Ruby-con BXF series, 100µF/250V) to connect in parallel.
- BASE-PLATE GROUNDING: When connect two screw bolts to shield plane, the EMI could be reduced.

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

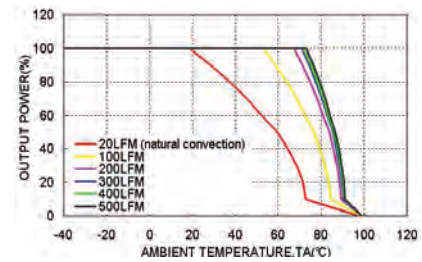
### Characteristic Curve



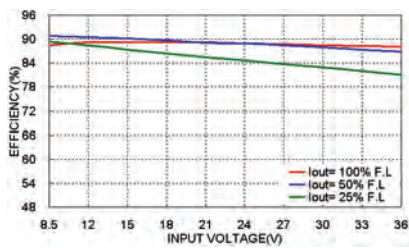
QB150-24S05 Derating Curve



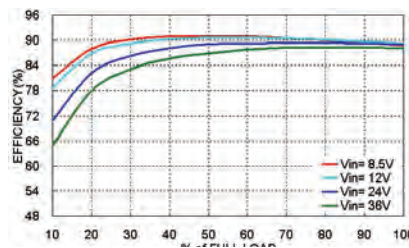
QB150-24S05 Derating Curve  
With 0.24" Height Heat-sink



QB150-24S05 Derating Curve  
With 0.5" Height Heat-sink



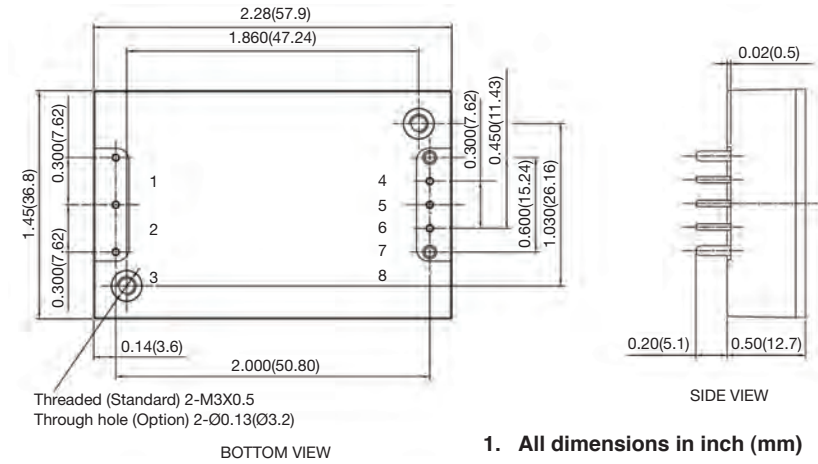
QB150-24S05 Efficiency vs. Input Voltage



QB150-24S05 Efficiency vs. Output Load

**QB150 SERIES**

**Mechanical Drawing**



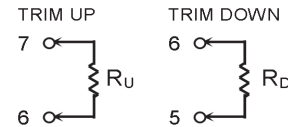
1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5) x.xxx±0.01 (x.xx±0.25)
3. Pin pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)

**PIN CONNECTION**

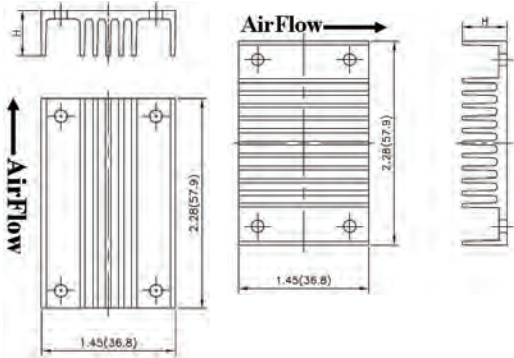
PIN	DEFINE	DIAMETER
1	-Input	0.04 Inch
2	Ctrl	0.04 Inch
3	+Input	0.04 Inch
4	-Output	0.06 Inch
5	-Sense	0.04 Inch
6	Trim	0.04 Inch
7	+Sense	0.04 Inch
8	+Output	0.06 Inch

**EXTERNAL OUTPUT TRIMMING**

Output can be externally trimmed by using the method shown below.



**Heat-sink Type Options**



1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)

$$R_U = \left( \frac{5.11V_{OUT}(100 + \Delta\%)}{1.225\Delta\%} - \frac{(511 + 10.22\Delta\%)}{\Delta\%} \right) k\Omega$$

$$R_D = \left( \frac{511}{\Delta\%} - 10.22 \right) k\Omega$$