QSB15048W series

XP Power

150W Baseplate cooled

DC-DC converters

The QSB15048W series have an ultra-wide 8:1 input voltage range of 9V to 75VDC providing a flexible single solution for nominal inputs of 12V, 24V & 48VDC, making these devices particularly suitable for mobile applications running from battery or vehicle supplies.

Baseplate or heatsink cooling allows operation over a wide temperature range from -40°C to +100°C. Standard features include both remote On/Off and remote sense. Protection features include input under-voltage lockout, overvoltage, short circuit and over load conditions while providing thermal shutdown in overtemperature conditions. Isolation voltage is 1.5kVDC and the output is tightly regulated to within ±0.2% for line changes and ±0.2% maximum under all load conditions.

Features

- Regulated single outputs 12V to 48VDC
- 8:1 input range 9V to 75VDC
- Baseplate cooled ½ brick package
- 1.5kVDC isolation
- Output trim ±10%
- Remote sense
- Remote On/Off
- -40°C to +100°C operating temperature
- 3 year warranty

Applications

Technology

Autonomous equipment

Industrial printing

Instrumentation

Process control

Robotics

Dimensions

61.0 x 57.9 x 12.7mm (2.4 x 2.28 x 0.5")

¼ brick package

Documentation

For further information click the link or scan the code

→ xppower.com

Models & ratings

Model number[3]	Input voltage	Output voltage	Output current	Input current[1]		Ripple & noise pk-pk[4]	Max. capacitive load	Efficiency
				No load	Full load			
QSB15048WS12	9-75VDC	12.0VDC	12.50A	60mA	4.53A	120mV	5000µF	89.0%
QSB15048WS15		15.0VDC	10.00A	60mA	4.50A	120mV	5000µF	90.0%
QSB15048WS24		24.0VDC	6.25A	60mA	4.66A	280mV	2000µF	89.5%
QSB15048WS28		28.0VDC	5.35A	60mA	4.62A	280mV	1500µF	90.0%
QSB15048WS48		48.0VDC	3.13A	60mA	4.64A	480mV	1000µF	90.0%

Notes:

1. Maximum input current is 20A at 9VDC full load
2. Measured at 2MHz bandwidth and 10µF tant/ µF ceramic capacitors on output (10µF electrolytic/1µF ceramic capacitors for 48VDC output)
3. Measured at 36VDC input and full load
4. Minimum capacitive load of 100µF required to maintain regulation
5. Add suffix -T for threaded baseplate fixing and suffix -N for negative logic control

Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Input voltage range	9		75	VDC	24VDC
Undervoltage lockout	On: >8.5 V	9.0	9.5	VDC	On
	Off: <7.5 V	8.0	8.5		Off
Lockout hysteresis		1.0		VDC	
Input surge		12	18	mA	When output is remotely turned off
Input current			1	A^2s	
Recommended input fuse		30		A	Fact acting type
Input reflected ripple current			50	mA pk-pk	Through 10µH inductor

Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Output voltage	12		48		See models and ratings table
Output trim	±10			%	See application notes (28Vout at 9-13 Vin Trim: +0/-10%
Initial set accuracy			±1.0	%	At full load and 36V input, 25°C
Minimum load	0			%	No minimum load required
Line regulation			±0.2	%	From minimum to maximum input at full load
Load regulation			±0.2	%	From 0% to full load for single/dual output
Transient response			±5.0	%	Maximum deviation, recovering to less than 1% in 500µs for 25% step load change. For 5V output, add 1000µF cap, for others add 100µF
Start up delay		100	150	ms	
Ripple and noise				mV pk-pk	See models and ratings table
Output voltage rise time		30	50	ms	
Short circuit protection	Continuous hiccup mode, with auto recovery				
Overload Protection	105	160	200	%	
Temperature coefficient			0.03	%/°C	
Max capacitive load	See models and ratings table				
Remote On/Off	Output is on if remote on/off (pin 2) is open or high (3.5-75 VDC) Output turns off if remote on/off (pin 2) is low (<1.2 VDC max)				
Overvoltage Protection	115		140	%	

General

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Efficiency		90			See models & ratings table
Isolation: input to output	1500			VDC	60s
Isolation: input to case	1500			VDC	60s
Isolation: output to case	1500			VDC	
Isolation resistance	10^7			Ω	
Isolation capacitance		3500		pF	Others
		2500			48V output
Switching frequency		200		kHz	
Power density			3.2 (54.0)	W/cm³ (W/in³)	
Mean time between failure		800		khrs	MIL-HDBK-217F, +25°C GB
Weight		109.0 (0.24)		g (lb)	
Solder Profile			260	°C	With iron 450°C 5s max 1.5mm from case 10s max
Case material	Plastic (DAP) with aluminum base plate. UL94V-0 rated.				
Potting Material	Epoxy UL94V-0				
Pin Material	Copper, nickel plated matte tin				

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & conditions
Operating base plate	-40		+100	°C	See derating curve
Storage temperature	-55		+105	°C	
Thermal protection		+105		°C	Non latching, recovery at 95°C center baseplate
Operating humitidy			95	%RH	Non-condensing
Altitude			2000	m	Storage to 12000m

EMC: emissions

Phenomenon	Standard	Test level	Notes & conditions
Conducted	EN55032	A	See application notes
Radiated	EN55032	A	

EMC: Immunity

Phenomenon	Standard	Test level	Criteria	Notes & conditions
ESD immunity	EN61000-4-2	±4kV/±8kV	A	Contact discharge/air discharge
Radiated	EN61000-4-3	3Vrms	A	
EFT/burst	EN61000-4-4	1kV	A	
Surges	EN61000-4-5	0.5kV	A	External TVS, SMCJ78A
Conducted	EN61000-4-6	3Vrms	A	
Magnetic fields	EN61000-4-8	3A/m	A	

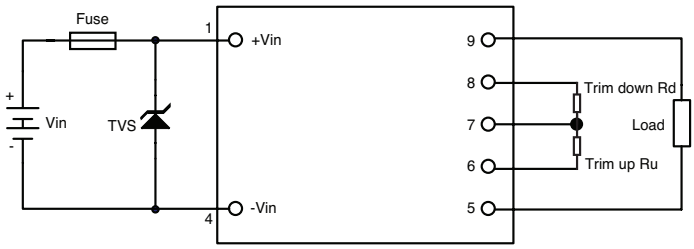
Safety approvals

Safety agency	Standard	Notes & conditions
UL	UL60950-1 & CAN/CSA C22.2 No.60950-1	ITE
EN	EN62368-1	Evaluated to EN62368-1
CE	Meets all applicable directives	
UKCA	Meets all applicable legislation	

Application notes

Input fusing and safety considerations

The QSB15048W series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 30A fast acting fuse. It is recommended that the circuit has a transient voltage suppressor diode (TVS) across the input terminals to protect the unit against surge or spike voltages and input reverse voltage (as shown). A suitable part would be SMCJ78A.



Output voltage sensing

The module will automatically trim the output voltage via the sense pins to the default values either locally or at the load. If not required, the sense pins should be connected locally as indicated in the example EMC circuit.

Output voltage adjustment

The Trim input permits the user to adjust the output voltage up or down 10%. This is accomplished by connecting an external resistor between the Trim pin and either the Vout (+) pin or the Vout(-) pin (COM pin).

To trim down

Connecting an external resistor (Rd) between the Trim pin and the Vout (+) (or Sense (+)) pin decreases the output voltage. The following equations determine the required external resistor value to obtain a percentage output voltage change of Δ%.

Vout = 12 & 15V

$$R_D = 20x \frac{(Vo_set - \triangle\% \times Vo_set - 1.24)}{\triangle\% \times Vo_set} - 100\ k\Omega$$

Vout = 24V

$$R_D = 20x \frac{(Vo_set - \triangle\% \times Vo_set - 2.5)}{\triangle\% \times Vo_set} - 100\ k\Omega$$

Vout = 28V

$$R_D = 23.7x \frac{(Vo_set - \triangle\% \times Vo_set - 2.5)}{\triangle\% \times Vo_set} - 150\ k\Omega$$

Vout = 48V

$$R_D = 30x \frac{(Vo_set - \triangle\% \times Vo_set - 2.5)}{\triangle\% \times Vo_set} - 200\ k\Omega$$

Where

$$Vout = Vo, set\ \triangle\% = \left(\frac{Vset - Vrequired}{Vo_set}\right) \times 100$$

To trim up

Connecting an external resistor (Ru) between the Trim pin and the Vout (-) (or Sense (-)) pin increases the output voltage. The following equations determine the required external resistor value to obtain a percentage output voltage change of Δ%.

Vout = 12V & 15V

$$R_U = 20x \frac{\left(1.24 - \frac{0.46 \times 100}{100 + 4.3}\right)}{\triangle\% \times Vo_set} - \frac{4.3 \times 100}{100 + 4.3}\ k\Omega$$

Vout = 24V

$$R_U = 20x \frac{\left(2.5 - \frac{0.46 \times 100}{100 + 5.6}\right)}{\triangle\% \times Vo_set} - \frac{5.6 \times 100}{100 + 5.6}\ k\Omega$$

Vout = 28V

$$R_U = 23.7x \frac{\left(2.5 - \frac{0.46 \times 100}{100 + 5.6}\right)}{\triangle\% \times Vo_set} - \frac{5.6 \times 150}{150 + 5.6}\ k\Omega$$

Vout = 48V

$$R_U = 36x \frac{\left(2.5 - \frac{0.46 \times 200}{200 + 5.1}\right)}{\triangle\% \times Vo_set} - \frac{5.1 \times 200}{200 + 5.1}\ k\Omega$$

$$Vout = Vo_set\ \triangle\% = \left(\frac{Vrequired - Vo_set}{Vo_set}\right) \times 100$$

Output voltage adjustment examples

As an example, to trim-down the output voltage of 24V module (QS15048WS24) by 5% to 22.8 V, Rd resistor is calculated as follows: Δ%=5%

$$R_D = 20x \frac{(24 - 5\% \times 24 - 2.5)}{5\% \times 24} - 100\ k\Omega$$

$$R_D = 238.3\ k\Omega$$

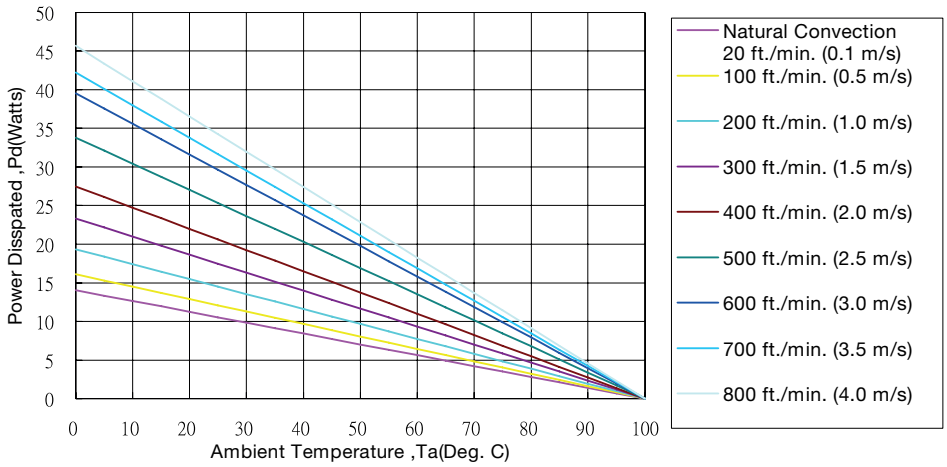
As an example, to trim-up the output voltage of 24V module (QS15048WS24) by 5% to 25.2 V, Ru resistor is calculated as follows: Δ%=5%

$$R_U = 20x \frac{(2.5 - \frac{0.46 \times 100}{100 + 5.6}}{5\% \times 24} - \frac{5.6 \times 100}{100 + 5.6}\ k\Omega$$

$$R_U = 29.1\ k\Omega$$

Application notes

Thermal resistance information



Air Flow Rate	Typical Rca
Natural Convection 20ft/min (0.1 m/s)	7.12°C/W
100 ft/min (0.5 m/s)	6.21°C/W
200 ft/min (1.0 m/s)	5.17°C/W
300 ft/min (1.5 m/s)	4.29°C/W
400 ft/min (2.0 m/s)	3.64°C/W
500 ft/min (2.5 m/s)	2.96°C/W
600 ft/min (2.5 m/s)	2.53°C/W
700 ft/min (2.5 m/s)	2.37°C/W
800 ft/min (2.5 m/s)	2.19°C/W

Airflow derating

Example (without heatsink)

To determine the minimum airflow necessary for a QS15048WS24 operating at an input voltage of 36 V, an output current of 6.25 A, and a maximum ambient temperature of 30°C:

Determine Power dissipation (Pd): Pd = Pi-Po = Po(1-η)/η,

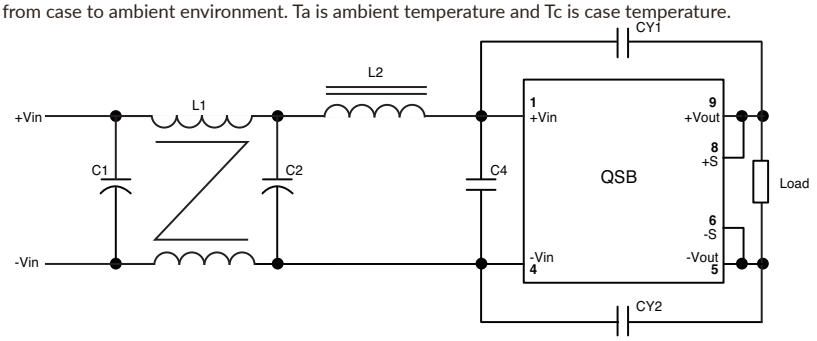
Pd =24V× 6.25 A×(1-0.895)/0.895=17.6Watts

Where Pi = Input power, Po = Output Power and η = Efficiency

Determine airflow from airflow derating graph using data points for Pd=19.5 W and Ta = 30 °C
Minimum airflow= 400 ft./min.

To check that the maximum case temp of 100 °C is not exceeded:
Maximum temperature rise is
ΔT = Pd × Rca=17.6×3.64=64°C.
Maximum case temperature is
Tc=Ta+ΔT=94°C <100°C.
Where: Rca is the thermal resistance from case to ambient environment. Ta is ambient temperature and Tc is case temperature.

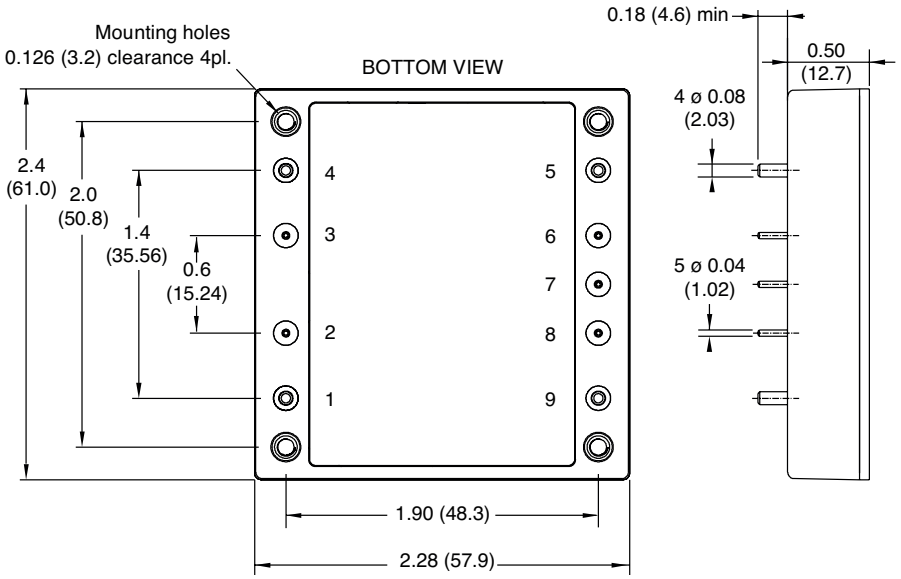
Conducted emissions



Model	C1	C2	CY1	CY2	L1	L2
QSB15048WS12	220μF/100V	220μF/100V	1500pF	1500pF	0.2mH	Short
QSB15048WS15	220μF/100V	220μF/100V	1500pF	1500pF	0.2mH	Short
QSB15048WS24	220μF/100V	220μF/100V	1500pF	1500pF	0.2mH	Short
QSB15048WS28	220μF/100V	220μF/100V	1500pF	1500pF	0.2mH	Short
QSB15048WS48	220μF/100V	220μF/100V	1500pF	1500pF	0.2mH	Short

Note: C1, C2 NICHICON PW series aluminum capacitors, CY1, CY2 are ceramic capacitors, L1 Core use SM CM20*12*10 Winding 5 turns (double wire).

Mechanical details



Pin connections	
Pin	**Function**
1	+Vin
2	Remote On/Off
3	Case
4	-Vin
5	-Vout
6	-Sense
7	Trim
8	+Sense
9	+Vout

Notes:

1. Dimensions are in mm (inches)
2. Tolerances: x.xx (x.x) = ±0.5 (±0.02). x.xxx (x.xx) = ±0.25 (±0.01)
3. Weight: 109g (0.24lbs) approx.