

QSB Series



- 4:1 Input Range
- Industry Standard Packages
- -40 °C to +100 °C Operating Temperature
- High Power Density
- Base Plate Cooled
- Remote On/Off & Remote Sense
- 3 Year Warranty

Specification

Input

Input Voltage Range	• See tables
Input Current	• See tables
Input Reverse Voltage Protection	• None
Input Filter	• Pi network
Undervoltage Lockout	• 24 Vin: power up 8.8 V, down 8.0 V for 9-36 V, 24 Vin: power up 9.2 V, down 9.2 V for 10-36 V, 48 Vin: power up 17.0 V, down 16.0 V
Input Surge	• 24 Vin: 50 VDC for 100 ms 48 Vin: 100 VDC for 100 ms

Output

Output Voltage Trim	• See application notes
Initial Set Accuracy	• $\pm 1.5\%$ max
Line Regulation	• $\pm 0.2\%$ max measured from high line to low line
Load Regulation	• $\pm 0.2\%$ max measured from 0-100% load
Transient Response	• 5% max deviation, recovery to within 1% in 500 μ s, 25% step load change
Ripple & Noise	• 3.3 & 5 V models: 100 mV pk-pk 12 & 15 V models: 150 mV pk-pk 24 V models: 240 mV max pk-pk 20 MHz bandwidth, see note 3
Overvoltage Protection	• 115-140%
Short Circuit Protection	• Continuous
Temperature Coefficient	• $\pm 0.03\%/^{\circ}\text{C}$
Current Limit	• 110-140% nominal output for 75 & 150 W 110-160% nominal output for 100 W 110-150% nominal output for 200 W
Remote On/Off	• See note 1 & 2
Thermal Shutdown	• Case temperature $>105^{\circ}\text{C}$

General

Efficiency	• See tables
Isolation Voltage	• 1500 VDC Input to Output 1500 VDC Input to Case 1500 VDC Output to Case
Isolation Resistance	• $10^7 \Omega$
Isolation Capacitance	• 100 pF typical
Switching Frequency	• QSB75: 300 kHz typical QSB100, QSB150 & QSB200: 250 kHz typical
MTBF	• QSB75 & QSB100: 730 kHrs QSB150 & QSB200: 1 MHrs typical to MIL-HDBK-217 at 25 °C, GB

Environmental

Operating Base Plate Temperature	• -40 °C to +100 °C, see derating curve
Storage Temperature	• -55 °C to +105 °C
Operating Humidity	• Up to 90% non condensing
Cooling	• Base plate cooled

EMC & Safety

Emissions	• EN55022, level A conducted with external components
ESD Immunity	• EN61000-4-2, level 2 Perf Criteria B
Radiated Immunity	• EN61000-4-3, 3 V/m Perf Criteria A
EFT/Burst Surge	• EN61000-4-4, Level 1, Perf Criteria A EN61000-4-5, Level 1, Perf Criteria A
Conducted Immunity	• EN61000-4-6, 3 V rms Perf Criteria A
Safety Approvals	• QSB150 & QSB200: UL60950-1

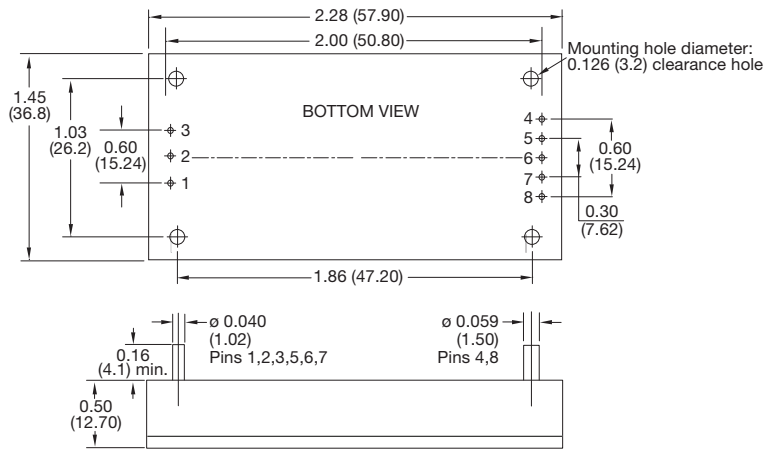
Models and Ratings

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
9-36 VDC	3.3 V	12.00 A	50 mA	2.04 A	81%	QSB7524S3V3
	5.0 V	12.00 A	50 mA	2.98 A	84%	QSB7524S05
	12.0 V	6.25 A	50 mA	3.64 A	86%	QSB7524S12
	15.0 V	5.00 A	50 mA	3.64 A	86%	QSB7524S15
	24.0 V	3.12 A	50 mA	3.63 A	86%	QSB7524S24
18-75 VDC	3.3 V	12.00 A	30 mA	1.01 A	82%	QSB7548S3V3
	5.0 V	12.00 A	30 mA	1.47 A	85%	QSB7548S05
	12.0 V	6.25 A	30 mA	1.82 A	86%	QSB7548S12
	15.0 V	5.00 A	30 mA	1.80 A	87%	QSB7548S15
	24.0 V	3.12 A	30 mA	1.80 A	87%	QSB7548S24
18-75 VDC	3.3 V	30.00 A	60 mA	2.35 A	88%	QSB10048S3V3
	5.0 V	20.00 A	60 mA	2.37 A	88%	QSB10048S05
	12.0 V	8.30 A	30 mA	2.36 A	88%	QSB10048S12
	15.0 V	6.70 A	30 mA	2.38 A	88%	QSB10048S15
	24.0 V	4.17 A	30 mA	2.39 A	88%	QSB10048S24

Notes

1. Logic compatibility: Ref to -ve input. Module On = open circuit. Module Off = -0.8 VDC.
2. Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.
3. Ripple & noise is measured with a 10 μF tantalum capacitor and 0.1 μF ceramic capacitor across output.
4. Input current specified at 24 V for 9-36 VDC and 48 V for 18-75 VDC models.

Mechanical Details

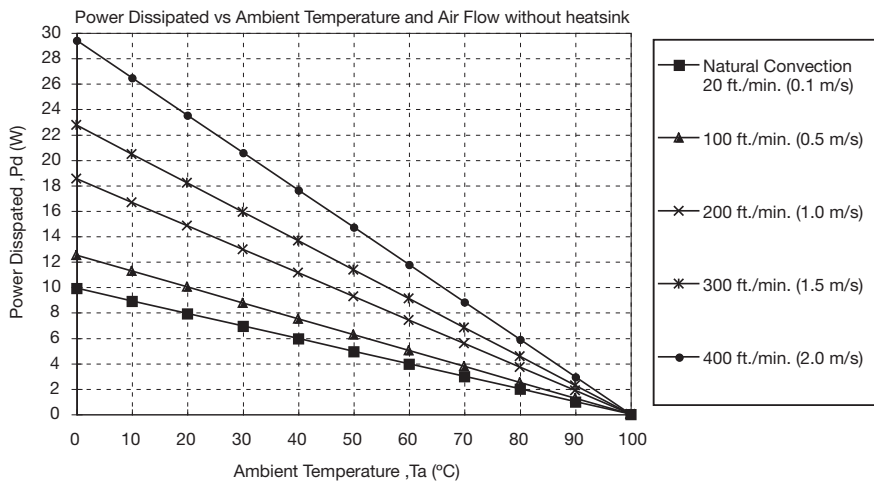


PIN CONNECTIONS	
Pin	Function
1	+Vin
2	Remote On/Off
3	-Vin
4	-Vout
5	-Sense
6	Trim
7	+Sense
8	+Vout

Weight: 0.22 lbs (100 g) approx
 Dimensions are in inches (mm)
 Tolerances: X.XX = ± 0.02 (X.X = ± 0.5)
 X.XXX = ± 0.01 (X.XX = ± 0.25)

Thermal Resistance Information

Derating Curve



Air Flow Rate	Typical R_{ca}
Natural Convection 20 ft./min (0.1 m/s)	10.1 °C/W
100 ft./min (0.5 m/s)	8.0 °C/W
200 ft./min (1.0 m/s)	5.4 °C/W
300 ft./min (1.5 m/s)	4.4 °C/W
400 ft./min (2.0 m/s)	3.4 °C/W

R_{ca} = Thermal resistance from case to ambient



Models & Ratings

Input Voltage	Output Voltage	Output Current	Input Current ⁽⁴⁾		Efficiency	Model Number ⁽²⁾
			No Load	Full Load		
9-36 V	3.3 V	30.00 A	200 mA	4.75 A	85%	QSB15024S3V3
	5.0 V	30.00 A	200 mA	7.00 A	87%	QSB15024S05
	12.0 V	12.50 A	100 mA	6.95 A	88%	QSB15024S12
	15.0 V	10.00 A	100 mA	6.95 A	88%	QSB15024S15
18-75 V	24.0 V	6.50 A	100 mA	7.00 A	88%	QSB15024S24
	3.3 V	30.00 A	100 mA	4.75 A	87%	QSB15048S3V3
	5.0 V	30.00 A	100 mA	7.00 A	89%	QSB15048S05
	12.0 V	12.50 A	50 mA	6.95 A	90%	QSB15048S12
10-36 VDC	15.0 V	10.00 A	50 mA	6.95 A	90%	QSB15048S15
	24.0 V	6.50 A	50 mA	7.00 A	89%	QSB15048S24
	3.3 V	50.00 A	150 mA	7.90 A	87%	QSB20024S3V3
	5.0 V	40.00 A	150 mA	9.58 A	87%	QSB20024S05
18-75 VDC	12.0 V	16.70 A	100 mA	9.71 A	86%	QSB20024S12
	15.0 V	13.30 A	100 mA	9.67 A	86%	QSB20024S15
	24.0 V	8.30 A	100 mA	9.54 A	87%	QSB20024S24
	3.3 V	40.00 A	80 mA	3.13 A	88%	QSB20048S3V3
18-75 VDC	5.0 V	40.00 A	80 mA	4.69 A	89%	QSB20048S05
	12.0 V	16.70 A	60 mA	4.74 A	88%	QSB20048S12
	15.0 V	13.30 A	60 mA	4.72 A	88%	QSB20048S15
	24.0 V	8.30 A	60 mA	7.72 A	88%	QSB20048S24

Notes

1. Logic compatibility: Ref to -ve input. Module On = open circuit. Module Off = <0.8 VDC.
2. Add suffix 'N' to the model number to receive the unit with negative logic Remote On/Off.
3. Ripple & noise is measured with a 10 μ F tantalum capacitor and 0.1 μ F ceramic capacitor across output.
4. Input current specified at 24 V for 10-36 VDC models and 48 V for 18-75 VDC models.

Mechanical Details

BOTTOM VIEW

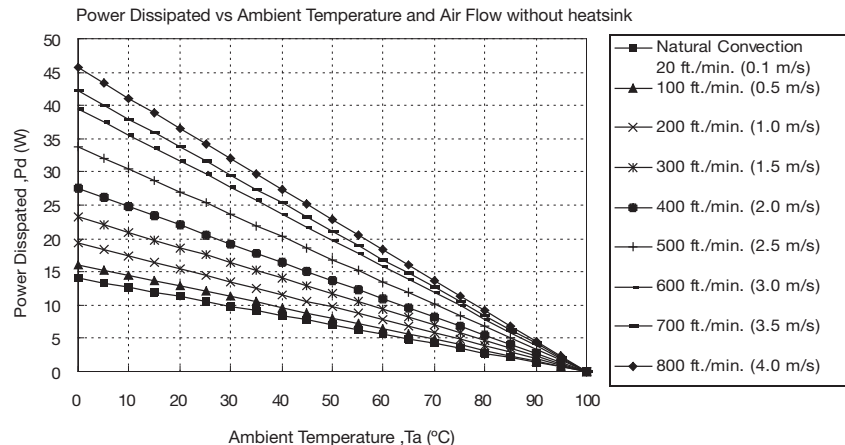
SIDE VIEW

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

Weight: 0.22 lbs (100 g) approx
 Dimensions are in inches (mm)
 Tolerances: X.XX = ± 0.02 (X.X = ± 0.5)
 X.XXX = ± 0.01 (X.XX = ± 0.25)

Thermal Resistance Information

Derating Curve



Air Flow Rate	Typical R _{ca}
Natural Convection 20 ft./min (0.1 ms)	7.12 °C/W
100 ft./min (0.5 ms)	6.21 °C/W
200 ft./min (1.0 ms)	5.17 °C/W
300 ft./min (1.5 ms)	4.29 °C/W
400 ft./min (2.0 ms)	3.64 °C/W
500 ft./min (2.5 ms)	2.96 °C/W
600 ft./min (3.0 ms)	2.53 °C/W
700 ft./min (3.5 ms)	2.37 °C/W
800 ft./min (4.0 ms)	2.19 °C/W

R_{ca} = Thermal resistance from case to ambient

Output Voltage Trim - QSB75 & QSB150 Series

Voltage trim up

Connect trim resistor Rtrim between Trim pin and -Sense pin.

$$R \text{ trim up} = \left(\frac{R1 \left(Vr - Vf \left(\frac{R2}{R2 + R3} \right) \right)}{Vdes - Vnom} \right) - \frac{R2 \times R3}{R2 + R3} \text{ (k}\Omega\text{)}$$

Voltage trim down

Connect trim resistor Rtrim between Trim pin and +Sense pin

$$R \text{ trim down} = \frac{R1 \times (Vdes - Vr)}{Vnom - Vdes} R2 \text{ (k}\Omega\text{)}$$

Where: R trim up is the external resistor in kΩ. Vnom is the nominal output voltage. Vdes is the desired output voltage. R1, R2, R3 and Vr are internal to the unit and are defined in the table below.

Where: R trim down is the external resistor in kΩ Vnom is the nominal output voltage. Vdes is the desired output voltage. R1, R2, R3 and Vr are internal to the unit and are defined in the below table.

Output Voltage (V)	R1 (kΩ)	R2 (kΩ)	R3 (kΩ)	Vr (V)	Vf (V)
3.3 V	3.00	12.0	4.3	1.24	0.46
5.0 V	2.32	3.3	0.0	2.5	0.0
12.0 V	9.10	51.0	5.1	2.5	0.46
15.0 V	12.0	56.0	8.25	2.5	0.46
24.0 V	20.0	100.0	7.5	2.5	0.46

Output Voltage Trim - QSB100 & QSB200 Series

Voltage trim up

Voltage trim up, Connect trim resistor Rtrim between Trim pin and +Sense pin.

$$R \text{ trim down} = \left(\frac{511}{\Delta\%} - 10.22 \right) \text{ k}\Omega$$

Where:

$$\Delta\% = \left(\frac{Vnom - Vdes}{Vnom} \right) \times 100$$

Voltage trim down

Connect trim resistor Rtrim between Trim pin and -Sense pin

$$R \text{ trim up} = \left(\frac{5.11 Vnom (100 + \Delta\%)}{1.225 \times \Delta\%} - \frac{511}{\Delta\%} - 10.22 \right) \text{ k}\Omega$$

Where:

$$\Delta\% = \left(\frac{Vnom - Vdes}{Vnom} \right) \times 100$$

Remote Sense

The +Sense and -Sense pins should be connected to the load when it is required to compensate for load lead voltage drop. Up to 10% of nominal output voltage can be compensated for but this depends on the amount of output trim used. The total output adjustment resulting from output trim and remote sense is 10%. The remote sense pins should be connected locally to +Vout and -Vout if sensing is not required.

Remote On/Off

For standard models, applying a logic low (<1.8 VDC) to the Remote On/Off pin will inhibit the output. Applying a logic high (>3.5 VDC) or leaving the pin open will enable the output. A negative logic option (-N) works in reverse. Applying a logic high will inhibit the output. Applying a logic low or shorting the Remote On/Off pin to -Vin will enable the output