QSC150 Series

DC-DC Converter

XP Power

150 Watts

- Wide 4:1 Input Range
- Single Output
- Industry Standard 1/4 Brick
- -40 °C to +105 °C Operation
- 2250 VDC Isolation
- Output Trim ±10%
- Remote On/Off
- 3 Year Warranty

Dimensions:

QSC150:
2.28 x 1.45 x 0.5" (57.9 x 36.8 x 12.7 mm)

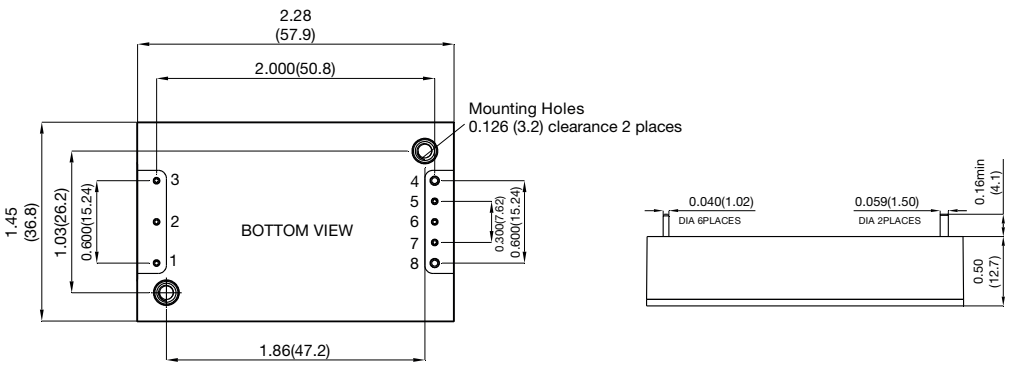
Models & Ratings

Input Voltage	Output Voltage	Output Current	Input Current[1]		Ripple & noise[2]	Efficiency[3]	Max. capacitive load	Model Number
			No Load	Full Load				
9-36 V	5 V	30.0 A	10 mA	18.1 A	100 mV	92.0%	30000 µF	QSC15024S05
	12 V	12.5 A	10 mA	18.1 A	150 mV	92.0%	12500 µF	QSC15024S12
	24 V	6.3 A	10 mA	18.3 A	280 mV	91.0%	6300 µF	QSC15024S24
	28 V	5.4 A	10 mA	18.2 A	280 mV	91.5%	5400 µF	QSC15024S28
	48 V	3.2 A	10 mA	18.1 A	480 mV	92.0%	1000 µF	QSC15024S48
18-75 V	5 V	30.0 A	8 mA	9.1 A	100 mV	92.0%	30000 µF	QSC15048S05
	12 V	12.5 A	8 mA	9.2 A	150 mV	91.0%	12500 µF	QSC15048S12
	24 V	6.3 A	8 mA	9.2 A	280 mV	90.5%	6300 µF	QSC15048S24
	28 V	5.4 A	8 mA	9.2 A	280 mV	90.5%	5400 µF	QSC15048S28
	48 V	3.2 A	8 mA	9.1 A	480 mV	91.5%	1000 µF	QSC15048S48

Notes

1. At lowest input voltage.
2. Measured at 20MHz bandwidth and 10uF tant/1uF ceramic capacitors on output (10uF electrolytic/1uF ceramic capacitors for 48V output).
3. Measured at nominal input.

Mechanical Details



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

Notes

1. All dimensions are in inches (mm)
2. Weight: 0.15 lbs (68 g) approx.
3. Tolerance: x.xx = ±0.02 (x.x = ±0.5)
   x.xxx = ±0.01 (x.xx = ±0.25)

Input

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Input Voltage Range	9		36	VDC	24 V nominal
	18		75		48 V nominal
Input Current		20/10		A	QSC15024 at 9 V / QSC15048 at 18V
Input Surge			50/100	VDC for 100 ms	QSC15024 / QSC15048
Undervoltage Lockout	>8.0/16.5	8.5/17.0	8.8/17.5	VDC	On: 24 V/48 V
	<7.7/15.5	8.0/16.0	8.3/16.5		Off: 24 V/48 V
Lockout Hysteresis		0.6/0.9		VDC	24 V/48 V
Idle Current		5	10	mA	When output is remotely turned off
Inrush Current			0.1	A^2s	As per ETS300 132-2
Recommended Input Fuse		30/15		A	Time delay fuse - 24 V/48 V
Input Reflected Ripple Current		30		mA pk-pk	Through 12 µH inductor

Output

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Output Voltage	5		48	VDC	See Models and Ratings table
Output Trim	±10			%	
Initial Set Accuracy			±1	%	At full load and nominal input
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
Transient Response			±5.0	%	Maximum deviation, recovering to less than 1% in 250 µs for 25% step load change.
Start Up Time		30		ms	
Output Voltage Rise Time		30		ms	
Ripple & Noise				mV pk-pk	See models and ratings table
Overload Protection	110	125	160	%	
Short Circuit Protection					Continuous hiccup mode, with auto recovery
Maximum Capacitive Load					See Models and Ratings table
Temperature Coefficient			0.02	%/°C	
Overvoltage Protection	115		140	%	
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)				

General

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Efficiency		92		%	See Models and Ratings table
Isolation: Input to Output	2250			VDC	60 s
Isolation: Input and output to Case	2250			VDC	60 s
Switching Frequency		285/300		kHz	48S12 model / All other models
Isolation Resistance	10^9			Ω	
Isolation Capacitance		1500		pF	
Power Density			90.7	W/in^3	
Mean Time Between Failure		309/667		kHrs	S05/S48, MIL-HDBK-217F, +25 °C GB
Weight		0.15 (68.0)		lb (g)	

Environmental

Characteristic	Minimum	Typical	Maximum	Units	Notes & Conditions
Operating Base Plate Temperature	-40		+105	°C	
Storage Temperature	-55		+125	°C	
Thermal Protection		+110		°C	
Operating Altitude			3000	m	
Humidity			95	%RH	Non-condensing
Cooling					Base plate cooled

Safety Approvals

Agency	Standard	Notes & Conditions
UL	cUL60950-1	ITE

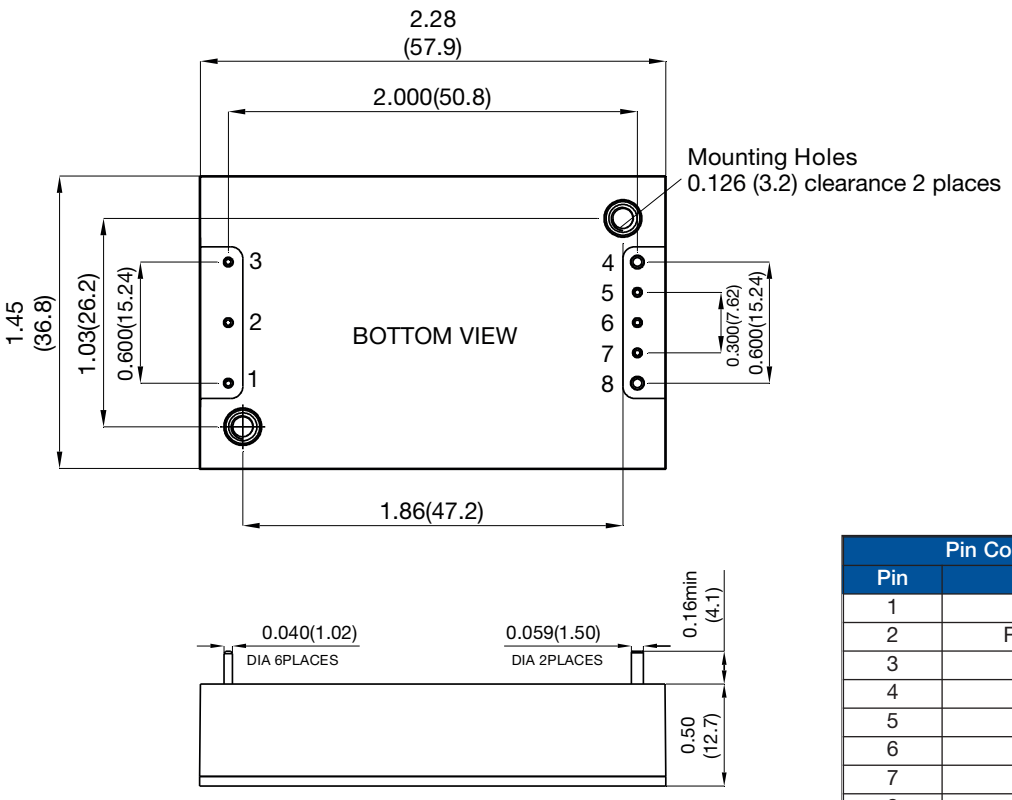
EMC: Emissions

Phenomenon	Standard	Test Level	Notes & Conditions
Conducted	EN55032	Class A	See Application Notes
Radiated	EN55032	Class A	

EMC: Immunity

Phenomenon	Standard	Test Level	Criteria	Notes & Conditions
ESD Immunity	EN61000-4-2	±6 kV/±8 kV	A	Contact Discharge/Air Discharge
Radiated Immunity	EN61000-4-3	20 V/m	A	
EFT/Burst	EN61000-4-4	1 kV	A	With 470 µF/100 V electrolytic on input
Surge	EN61000-4-5	2 kV	A	External TVS, SMCJ78A and 470 µF/100 V on input
Conducted Immunity	EN61000-4-6	10 V rms	A	
Magnetic Fields	EN61000-4-8	3 A/m	A	

Mechanical Details



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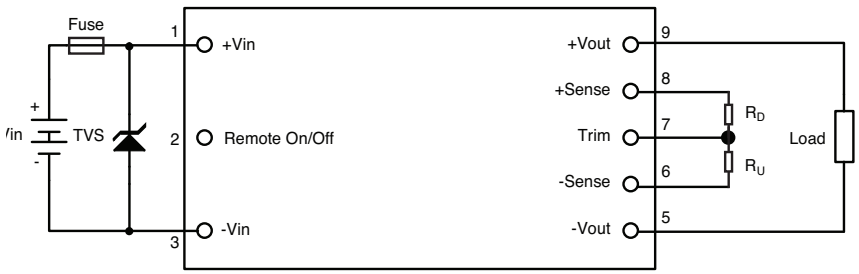
Notes

1. All dimensions are in inches (mm)
2. Weight: 0.15 lbs (68 g) approx.
3. Tolerance: x.xx = ±0.02 (x.x = ±0.5)
   x.xxx = ±0.01 (x.xx = ±0.25)

Application Notes

Input Fusing and Safety Considerations

The QSC150 series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 30 A time delay fuse for nominal 24 V and 15 A time delay fuse for nominal 48 V. 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 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 +Sense pin or the -Sense pin.

To Trim Down

Connecting an external resistor (R_D) between the Trim pin and the Vout (+) (or +Sense) pin decreases the output voltage. The following table can be used to determine the required external resistor (R_D) value to obtain a percentage output voltage change of $\Delta\%$.

	RD (kΩ)				
Trim Down %	5 V	12 V	24 V	28 V	48 V
1%	110.400	660.30	1671.00	1984.00	3106.00
2%	52.380	300.10	775.80	905.50	1400.00
3%	33.050	180.00	477.20	545.80	831.50
4%	23.380	120.00	327.90	365.90	547.10
5%	17.580	83.99	238.30	258.00	376.50
6%	13.710	59.97	178.60	186.00	262.80
7%	10.950	42.82	136.00	134.60	181.50
8%	8.880	29.95	104.00	96.10	120.60
9%	7.269	19.95	79.07	66.12	73.17
10%	5.980	11.94	59.17	42.14	32.25

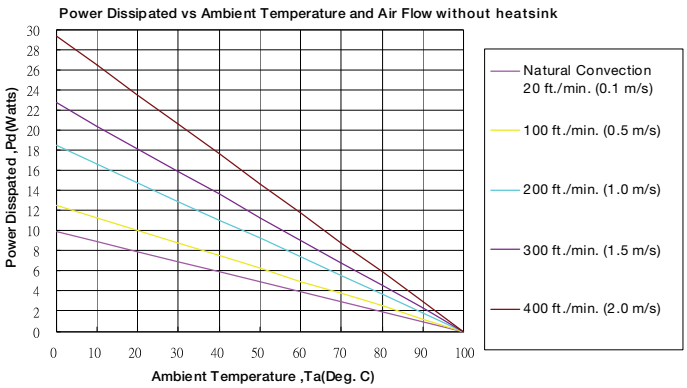
To Trim Up

Connecting an external resistor (R_U) between the Trim pin and the Vout (-) (or -Sense) pin increases the output voltage. The following table can be used to determine the required external resistor (R_U) value to obtain a percentage output voltage change of $\Delta\%$.

	RU (kΩ)				
Trim Up %	5 V	12 V	24 V	28 V	48 V
1%	112.700	153.20	165.70	168.30	148.60
2%	54.700	74.30	79.36	81.16	71.81
3%	35.370	47.99	50.58	52.12	46.21
4%	25.700	34.83	36.19	37.60	33.40
5%	19.900	26.94	27.56	28.86	25.72
6%	16.030	21.68	21.80	23.08	20.60
7%	13.270	17.92	17.69	18.93	16.94
8%	11.200	15.10	14.61	15.82	14.20
9%	9.589	12.91	12.21	13.40	12.07
10%	8.300	11.15	10.29	11.47	10.36

Thermal Resistance Information

Airflow Derating Graph – Without Heatsink



Air Flow Rate	Typical Rca
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

Example (Without Heatsink)

To determine the minimum airflow necessary for a QS15048S12 operating at an input voltage of 48 V, an output current of 12.5 A, and a maximum ambient temperature of 40°C:

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

Pd =12 V× 12.5 A×(1-0.9)/0.9 =16.67 Watts

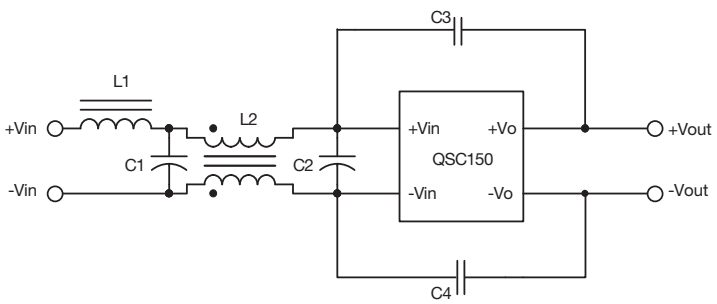
Where Pi = Input power, Po = Output Power and η = Efficiency

Determine airflow from airflow derating graph using data points for Pd=16.67 W and Ta = 40 °C

Minimum airflow= 400 ft./min.

To check that the maximum case temp of 105 °C is not exceeded:
Maximum temperature rise is
ΔT = Pd × Rca =16.67×3.4 =56.65°C.
Maximum case temperature is
Tc=Ta+ΔT=96.68°C <105°C.
Where: Rca is the thermal resistance from case to ambient environment. Ta is ambient temperature and Tc is case temperature.

Conducted Emissions



Model Number	C1	C2	C3	C4	L1	L2
QSC15024S05	470 µF/50 V	470 µF/50 V	2200 pF	2200 pF	Short	0.5mH
QSC15024S12	470 µF/50 V	470 µF/50 V	2200 pF	2200 pF	Short	0.5mH
QSC15024S24	470 µF/50 V	470 µF/50 V	2200 pF	2200 pF	Short	0.5mH
QSC15024S28	470 µF/50 V	470 µF/50 V	2200 pF	2200 pF	Short	0.5mH
QSC15024S48	470 µF/50 V	470 µF/50 V	4700 pF	4700 pF	Short	0.5mH
QSC15048S05	220 µF/100 V	220 µF/100 V	2200 pF	2200 pF	Short	0.5mH
QSC15048S12	220 µF/100 V	220 µF/100 V	2200 pF	2200 pF	Short	0.5mH
QSC15048S24	220 µF/100 V	220 µF/100 V	2200 pF	2200 pF	Short	0.5mH
QSC15048S28	220 µF/100 V	220 µF/100 V	2200 pF	2200 pF	Short	0.5mH
QSC15048S48	220 µF/100 V	220 µF/100 V	4700 pF	4700 pF	Short	0.5mH

Note: C1, C2 are NIPPON CHEMI-CON KY series aluminum capacitors, C3, C4 are ceramic capacitors.