Features:

- Industry standard 1/4 brick package & footprint
- High power density: 31.8W/in^3
- High efficiency
- 2: 1 input voltage range
- Low output noise & ripple
- Remote sense
- Constant frequency
- Over-temperature protection: Auto-recovery
- Output over-voltage protection: locked
- Dual adjustable output voltage: +10%/-20%
- Output over-current/voltage protection
- EN60950-1 recognized

Options：

- Positive/Negative Remote on/off
- Sprayed conformal coating

Numbering Convention

QSR 06–48 D 12–L-G

① ② ③ ④ ⑤ ⑥ ⑦

NO	Features	Descriptions
①	Product Series	Industry standard 1/4 brick
②	Output Current	Total output current: 6A
③	Typical Input Voltage	Input Voltage: 48V
④	Number of Outputs	D – Dual Output
⑤	Typical Output Voltage	Output Voltage: 12V
⑥	Remote on/off Logic	L - Negative Logic
		H or Default - Positive Logic
⑦	Sprayed conformal coating	C - Sprayed Conformal coating
		Default: No sprayed Conformal coating

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1 Description

The QSR06-48D12(-L)G series power modules are open frame DC-DC converters in an industry 1/4 brick package and footprint, and can provide two outputs: +12V and -12V, with two-way load distribution. The rated output current of each output is 3.0A. All devices are surface mounted. The converters feature high power density, remote on/off, output voltage trim, over-temperature protection and over-current protection.

2 Technical Specifications(Unless otherwise stated, all specification are typical at nominal input voltage, full load, 25℃ and wind speed of 1m/S. Externally add a 220μF electrolytic capacitor to each output.)

Parameter		Test Condition	Min	Typ	Max	Unit
2.1 Absolute Maximum Ratings						
Input Voltage (Vi)		Non-operating, continuous	--	--	80	Vdc
Input Transient Voltage (Vit)		100ms	--	--	100	Vdc
Max Output Power (Pomax)		Allowable operating conditions	--	--	72	W
2.2 Input Specifications						
Typical Input Voltage (Vinom)		----	--	48	--	Vdc
Input Voltage Range ①		----	36	--	75	Vdc
Input Under-voltage Protection (Vishl)	Shutdown	Ionom	31	--	35	Vdc
	Recovery		32	--	36	Vdc
Maximum Input current (Iimax)		Vimin, Vonom,Ionom	--	--	2.273	A
No-load Input Current (Iio)		Vinom, Io＝0A	--	20	30	mA
Quiescent Input Current (Iiof)		Vinom, remote output shutdown	--	3	10	mA
Remote on/off (Positive Logic)	On	3.6V<Rem≤75V (referenced to grounding) or open circuits				
	Off	Rem<0.8V (referenced to grounding) or connected to -Vin				
Remote on/off (Negative Logic)	On	Rem<0.8V (referenced to grounding) or connected to -Vin				
	Off	3.6V<Rem≤75V (referenced to grounding) or open circuits				
2.3 **Output Specifications** ②						
Output voltage Set-point	Vo1nom	Vinom,Io1nom, Io2nom	11.88	12.00	12.12	Vdc
	Vo2nom		-12.12	-12.00	-11.88	
Unbalanced Load Regulation	Vo1	Vinom, Io1＝0.2A—3A Io2=(-3A)—(-0.2A)	11.40	12.00	12.60	Vdc
	Vo2		-12.60	-12.00	-11.40	
Typical Output Current	Io1nom	----	--	3.0	--	A
	Io2nom		--	-3.0	--	
Output Current Range	Io1	Po≤72W	0.2	--	3.0	A
	Io2		-3.0	--	-0.2	

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Parameter		Test Condition	Min	Typ	Max	Unit
Line Regulation (Vov)		Vimin-Vimax Io1nom, Io2nom	--	--	±0.5	%Vo1
			--	--	±0.5	%Vo2
Load Regulation (Vol)		0-100%Io1nom/Io2nom	--	--	±0.5	%Vo1
		| |Io1|-|Io2| | < 0.05A	--	--	±0.5	%Vo2
Output Voltage Trim (Voadj)		Io≤Ionom,Po≤72W ③	18	--	26	Vdc
Output Over-voltage Protection	Vo1	Po<Pomax	14.6	--	16.6	Vdc
	Vo2		-16.6	--	-14.6	Vdc
Output Over-current Protection	Protection Mode	Vinom | |Io1|-|Io2| | < 0.05A	Hiccup, Auto-recovery			
	Threshold		3.3	--	4.2	A
Output Short-circuit Protection	Protection Mode	Hiccup, Auto-recovery				
Dynamic Load Response	Peak Deviation	25%-50%-25%Ionom 50%-75%-50%Ionom ΔIo/Δt=2.5A/μS,Vinom ④	--	--	±5	%Vo
	Settling Time		--	--	200	μs
Output Ripple & Noise	Vrp1	Vinmin-Vinmax, Ionom, 20MHz ⑤	--	--	150	mV
	Vrp2		--	--	150	mV
External Output Capacitance (Co)		Vo1,Vo2	220	--	6800	μF
Turn-on/off Peak Deviation		Vo1,Vo2	--	--	±10	%Vo
2.4 Safety Specifications						
Isolation voltage	Input to output	Leak Current≤1mA, 1min	1500	--	--	Vdc
Isolation Resistance (RISO)		----	10	--	--	MΩ
Safety Certificate		EN60950-1Certified				
2.5 Reliability						
Vibration Test(sine)		ΔIo/Δt=: 10~55Hz Amplitude: 0.35mm Acceleration: 10m/s^2 Cycle: X,Y,Z 30min each axis	After being tested, no damage to the converter and its components, the appearance, output voltage and output ripple and noise (p-p) meet the data sheet requirements.			
Impact Test (half-sine)		Peak Acceleration: 300m/s^2 Duration: 6ms 6 times for three perpendicular directions	After being tested, no damage to the converter and its components, the appearance, output voltage and output ripple and noise (p-p) meet the data sheet requirements.			
MTBF		2×10^6 h Bellcore TR-332				
2.6 Environmental Specifications						
Relative Humidity		(40±2) ℃, No dew	--	--	90	%RH

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Parameter		Test Condition	Min	Typ	Max	Unit
Cooling		⑥	Forced-air cooling or heat sink			
Operating Temperature	Baseplate Temperature (Tc)	⑥	-40	--	+100	℃
	Ambient Temperature (Ta)		-40	--	+85	℃
Over-temperature Protection ⑦		----	When baseplate temp. is at 100℃ to 125℃, output is off; output recovers automatically when the temp. is lower than the threshold by 5℃to10℃.			
Storage Temperature (Tst)		Non-operating conditions	-55	--	+125	℃
2.7 General Specifications						
Switching Frequency		----	--	300	--	k Hz
Temperature Coefficient (Tcoeff)		----	--	--	±0.02	%/℃
Efficiency (η)		Vinom,Ionom	88	90	--	%
Weight		----	--	35	--	g
RoHS		RoHs (2002/95/EC) Directive				

Note:

① Input voltage up to 80Vdc for long time or reverse polarity may cause the module damaged;

② Special instructions: tested at Ta=25℃, |Io1|=|Io2|=0.5|Ionom|;

③ Trim the two outputs together; Output Voltage Range (+/-Vout): 18～26V; Output Voltage =20V when trim resistor is about 35kΩ;

④ Two loads step at the same time: add Dynamic Load to +12V and -12V (Pin 4 and Pin 7);

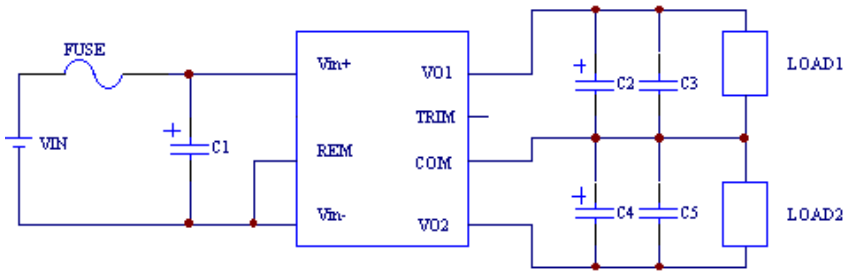
⑤ Connect a 220μF electrolytic capacitor (ESR<120mΩ) and a 1μF monolithic capacitor between Vo1(pin 7)/Vo2(pin 4) and COM(pin 5) respectively;

⑥ See the thermal derating curve;

⑦ Auto-recovery, see Figure 6 for reference.

3 Basic Application Circuit and Considerations

3.1 Typical Application



C1: 100V/33μF, low ESR capacitor; C2,C4: 220μF electrolytic capacitor ; C3,C5: 1μF monolithic capacitor.
AS for high EMI requirements or requirements of relevant certifications, add appropriate common/differential-mode filter circuits to input and output.

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3.2 Instruction for Use & Attentions

(1) Positive logic: Output will be on when Rem is at High Level or keeps Open Circuit; Output will be off when Rem is at Low Level (reference to –Vin) or connected to -Vin.

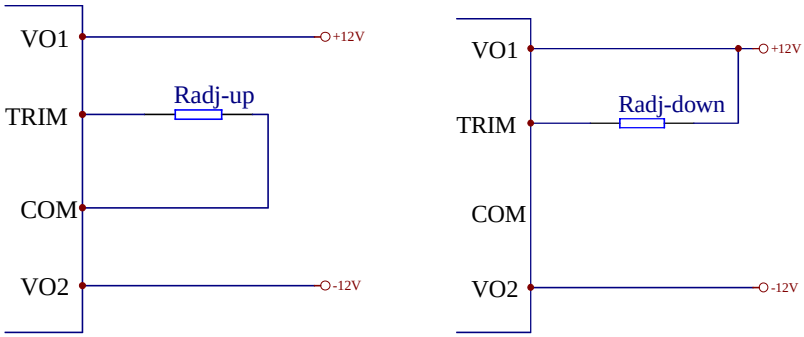
Negative logic: Output will be off when Rem is at High Level or keeps Open Circuit; Output will be on when Rem is at Low Level or connected to -Vin.

(2) Input Voltage up to 80Vdc for long time or reverse input polarity would cause the module damaged;

(3) When using output voltage trim, see "4. Output Voltage Adjustment (trim)" for reference; or keep TRIM open circuit.

4 Output Voltage Trim

4.1 Output Voltage Trim Circuit



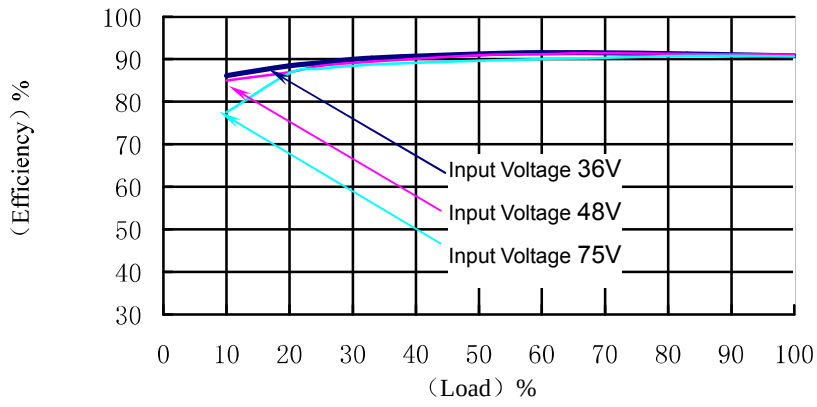
4.2 Output Adjustment Equations

Trim up: $R_{adj-up}(K\Omega) = \frac{1086 - 35.7Vo}{Vo - Ve} - 5.11$

Trim down $R_{adj-down}(K\Omega) = \frac{317.35}{Ve - Vo} - 40.81$

Where Vo: expected voltage, and Ve: nominal output voltage (24V for this module).

5 Characteristic Curves (Ta＝＋25℃)



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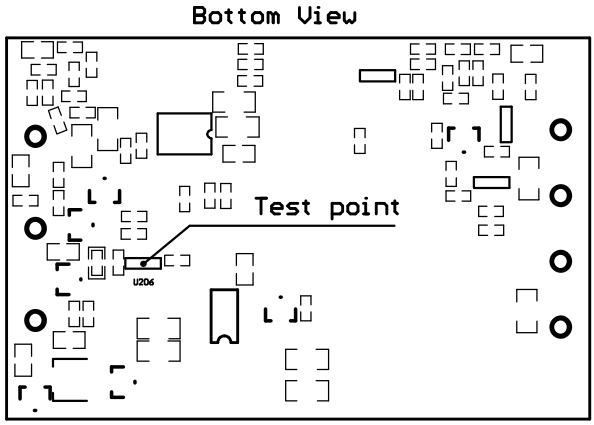
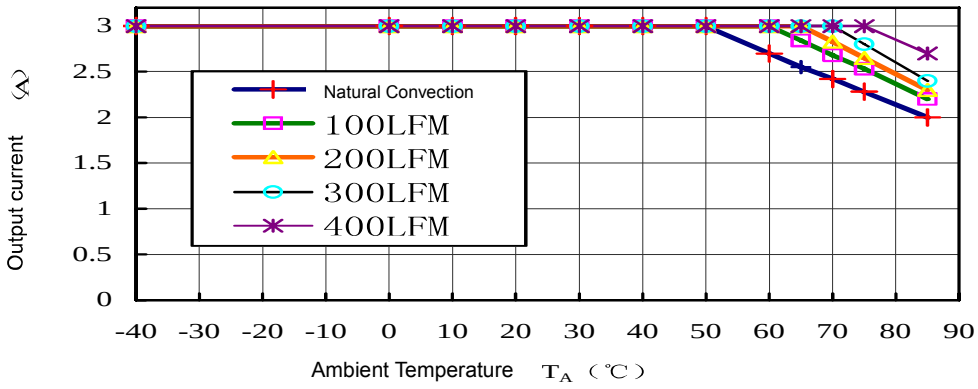
6 Temperature Test Point



7 Thermal Derating Curve



Derating Curve at Vin＝48.0V

Note: Natural cooling - wind speed at 0.05m/S to 0.1m/S.

Test conditions:

1) The module shall be soldered on a 2.0mm standard 4-layer test board, of which the middle two layers are two-ounce copper foils.
2) A certain gap is required between the module and test board. Keep the test board perpendicular to the horizontal direction and the long edge parallel with the horizontal plane.
3) Put the module into a thermal test box, and test the module using infrared thermal imaging equipment and thermocouple test equipment.
4) When the module reaches thermal equilibrium state, the components on the module can meet thermal derating requirements.

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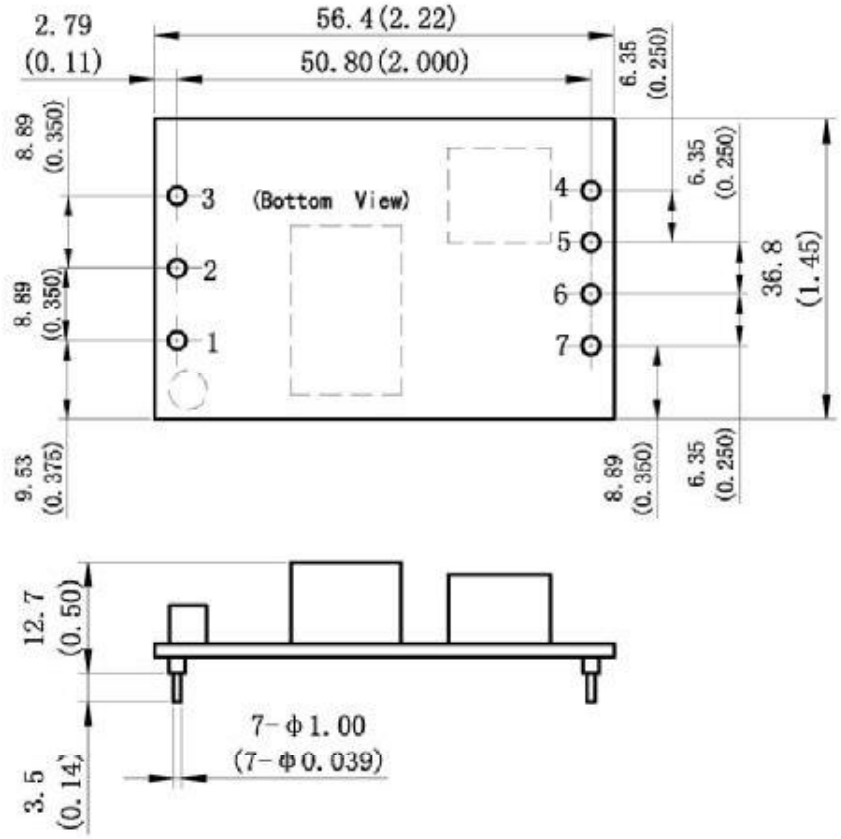
8 Dimensions and Pin definition

8.1 Dimensions



Unit: mm (inch) Tolerance: .X±0.5(.XX±0.02); .XX±0.13(.XXX±0.005)

8.2 Pin Definition:

No	1	2	3	4	5	6	7
Symbol	+Vin	Rem	-Vin	Vo2	COM	Trim	Vo1
Definition	Positive Input	Remote on/off	Negative Input	−12V Vo2	Common Terminal	Output Trim	+12V Vo1

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