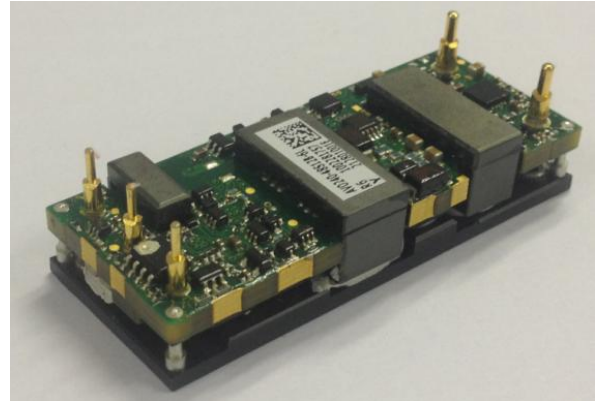


Description

The AVO240-48S12B-6L DC/DC converter is a next-generation industry standard eighth brick with optimized ultra high efficiency. This module can provide up to 20A output current at 12V output voltage, industry standard eighth brick 57.9mm × 22.9mm × 12.7mm (2.28" × 0.9" × 0.5"), which makes it an ideal choice for small space, telecom and datacom applications. The AVO240-48S12B-6L is standard eighth brick pin-out configuration, with baseplate option .it provide CNT ,remote control with OVP,OCP,OTP full protection method. This product can achieve ultra high efficiency of 94% at full load. For most applications, a heat sink is not required.



Mechanical Features

- Industry standard eighth brick
- Standard module with base plate
- Pin length option: 3.8mm,

Operational Features

- Up to 20A output current
- Ultra-high efficiency 94 % typ. at full load
- Wide input range: 41V ~ 75V
- Excellent thermal performance
- No minimum load requirement
- RoHS 6 compliant

Control Features

- Remote control function

Protection Features

- Input under voltage lockout
- Output over current protection
- Output over voltage protection
- Over temperature protection

Safety & EMC

- Meets safety standards UL 60950-1 2nd edition, IEC/EN 60950-1 2nd edition and GB4943.
- Approved by UL and TUV.
- Meets 2006/95/EEC and 93/68/EEC directives which facilitates CE marking in user's end product
- Meets conducted emission's requirements of EN55022 Class A with external filter.

Electrical Characteristics

Full operating ambient temperature range is -40°C to +85°C.

Specifications are subject to change without notice.

Parameter		Min.	Typ.	Max.	Unit	Notes & Conditions
Absolute max. ratings						
Input voltage	Non-operating	-	-	100	V	100ms
	Operating	-	-	80	V	Continuous
Operating temperature		-40	-	85	°C	-
Storage temperature		-55	-	125	°C	-
Voltage at remote ON/OFF pin		-0.7	-	5	V	-
Input characteristics						
Operating input voltage range		41	48	75	V	-
Input under-voltage lockout	Turn-on voltage threshold	31	-	36	V	-
	Turn-off voltage threshold	30	-	35	V	-
	Lockout voltage hysteresis	1	-	3	V	-
Max. input current		-	-	6.7	A	41V _{in} , full load
Inrush current transient rating		-	-	-	A ² s	Figure 13
Input reflected ripple current		-	45	-	mA	Through 12μH inductor; Figure 13
Recommended input fuse		-	-	15	A	Fast blow external fuse recommended; Figure 11
Recommended external input capacitance		220	-	-	μF	Low ESR capacitor recommended; Figure 11
Output characteristics						
Output voltage set point (standard option)*		11.6	11.9	12.2	V	48V _{in} , half load
Output voltage line regulation		-	0.1	0.3	%	-
			-	-	mV	-
Output voltage load regulation		-	0.1	0.5	%	-
			-	-	mV	-
Output voltage temperature regulation		-	-	0.02	%/°C	-
Total output voltage range*		11.2	11.9	12.5	V	Over sample, line, load,

Parameter		Min.	Typ.	Max.	Unit	Notes & Conditions
						temperature & life
Output voltage ripple and noise		-	70	-	mVpp	
Output voltage ripple and noise		-	70	-	mVpp	Ta:25°C, Air velocity: 300LFM, Vin: 48V, Vonom, Ionom, 10u tantalum(ESR≤100 mΩ)// 1u ceramic capacitor, output≤12V)
Operating output current range		0	-	20	A	-
Output DC current-limit inception		21.5	-	43	A	Hiccup: auto-restart when over-current condition is removed
Output capacitance		100	1000	5000	μF	High frequency and low ESR is recommended
Dynamic characteristics						
Dynamic response	25% ~ 50% ~ 25% Io,max, 0.1A/μs	-	200	-	mV	Test condition: 25°C, nominal input voltage,
	Settling time	-	200	-	μs	Recovery to within 1% Vo,nom
Turn-on transient	Rise time	-	-	50	ms	
	Turn-on delay time	-	-	100	ms	-
	Output voltage overshoot	-	0	-	%Vo	-
Efficiency						
100% load		-	94	-	%	
50% load		-	94.3	-	%	
20% load		-	91	-	%	

Note*: At Vin = 36 V to 41Vo is the lower limit 10.5 V.

Electrical Characteristics (Continued)

Parameter	Min.	Typ.	Max.	Unit	Notes & Conditions	
Isolation characteristics						
Isolation voltage (conditions: 1mA for 60s, slew rate of 1500V/10s)	1500	-	-	V	Basic insulation, pollution degree 2, input to output	
Feature characteristics						
Switching frequency	-	150	-	kHz	-	
Remote ON/OFF control (positive logic)	Off-state voltage	-0.7	-	1.2	V	See Figure 12
	On-state voltage	3.5	-	5	V	
Remote ON/OFF control (negative logic)	Off-state voltage	3.5	-	5	V	
	On-State Voltage	-0.7	-	1.2	V	
Output over-voltage protection	13.5	-	18	V _{o,nom}	Hiccup: auto-restart when over-voltage condition is removed	
Over-temperature shutdown	110	130	135	°C	Auto recovery.	
Over-temperature hysteresis	-	-	-	°C	-	
Reliability characteristics						
Calculated MTBF (telcordia)	-	1.5	-	10 ⁶ h	Telcordia SR-332-2006; 80% load, 300LFM, 40°C T _a	

Electromagnetic compatibility requirements

Test Item	Regulations	Criteria	Notes & Conditions
Conducted Emission	EN 55022 DC input port, Class A Limits	/	See EMC test conditions
Immunity to Electrostatic Discharge	IEC/EN61000-4-2 Enclosure Port, Level 3	B	
Immunity to Electrical Fast Transient	IEC/EN61000-4-4 DC input port, Level 3	B	
Immunity to Surges	IEC/EN61000-4-5 DC input port Line to Ground(earth): 600V Line to Line: 600V	B	
Immunity to Continuous Conducted Interference	IEC/EN61000-4-6 DC input port, Level 2	A	
Immunity To Voltage Dips and short interruptions and voltage variations	EN 61000-4-29 DC input port	B	

Criterion A: Normal performance during and after test.

Criterion B: For EFT and surges, low-voltage protection or reset is not allowed. Temporary output voltage fluctuation ceases after disturbances ceases, and from which the EUT recovers its normal performance automatically. For Dips and ESD, output voltage fluctuation or reset is allowed during the test, but recovers to its normal performance automatically after the disturbance ceases.

Criterion C: Temporary loss of output, the correction of which requires operator intervention.

Criterion D: Loss of output which is not recoverable, owing to damage to hardware.

Qualification Testing

Parameter	Unit (pcs)	Test condition
Halt test	4 ~ 5	$T_{a,min}-10^{\circ}\text{C}$ to $T_{a,max}+10^{\circ}\text{C}$, 5°C step, $V_{in} = \text{min to max}$, 0 ~ 105% load
Vibration	3	Frequency range: 5Hz ~ 20Hz, 20Hz ~ 200Hz, A.S.D: $1.0\text{m}^2/\text{s}^3$, -3db/oct, axes of vibration: X/Y/Z Time: 30min/axis
Mechanical shock	3	30g, 6ms, 3axes, 6directions, 3time/direction
Thermal shock	3	-40°C to 100°C , unit temperature 20cycles
Thermal cycling	3	-40°C to 55°C , temperature change rate: $1^{\circ}\text{C}/\text{min}$, cycles: 2cycles
Humidity	3	40°C , 95%RH, 48h
Solder ability	15	IPC J-STD-002C-2007

Characteristic Curves

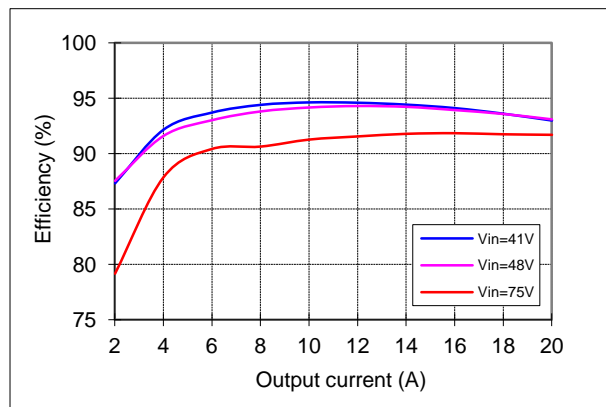


Figure 1 Efficiency vs. output current, $T_a=25^{\circ}\text{C}$, $V_o=12\text{V}$, Air velocity=400LFM

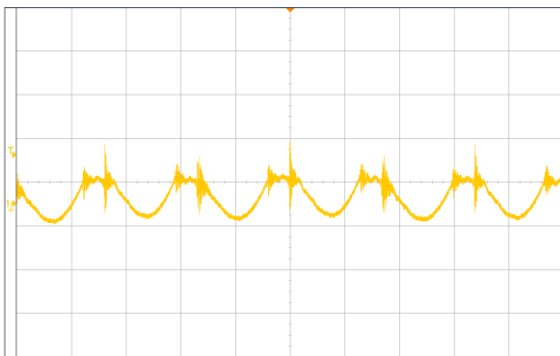


Figure 2 Output ripple & noise (2 $\mu\text{s}/\text{div}$, 20mV/div), see Figure 15 for test configuration

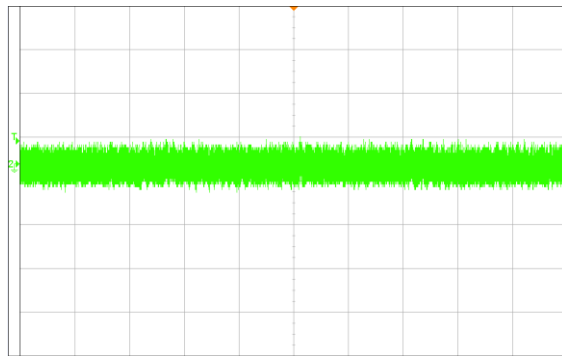


Figure 3 Input reflected ripple current (2ms/div, 20mA/div), see Figure 15 for test configuration

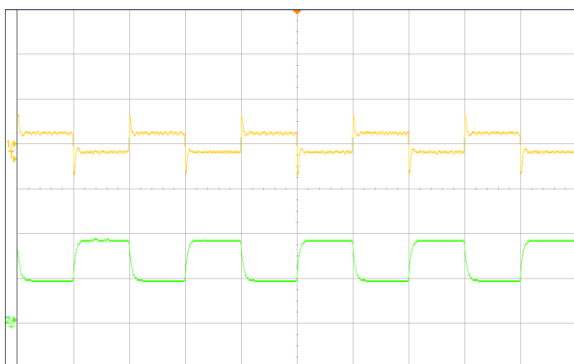


Figure 4 Dynamic response for 25% load step (25% ~ 50% ~ 25%) and 0.1A/ μs slew rate, (2ms/div), see Figure 10 for test configuration; CH1-output voltage (50mV/div); CH2-output current (5A/div)

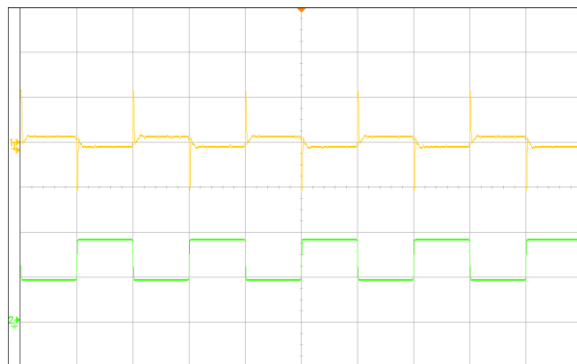


Figure 5 Dynamic response for 25% load step (25% ~ 50% ~ 25%) and 1A/ μs slew rate, (2ms/div), see Figure 10 for test configuration; CH1-output voltage (100mV/div); CH2-output current (5A/div)

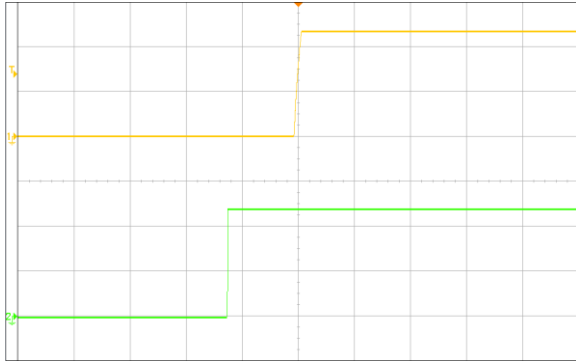


Figure 6 Output voltage startup by power on, (50ms/div), see Figure 10 for test configuration; CH1-output voltage (5V/div); CH2-input voltage (20V/div)

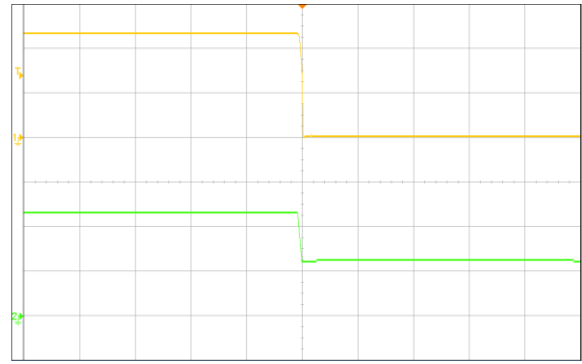


Figure 7 Output voltage shut down by power off, (10ms/div), see Figure 10 for test configuration; CH1-input voltage (20V/div); CH2-output voltage (5V/div)

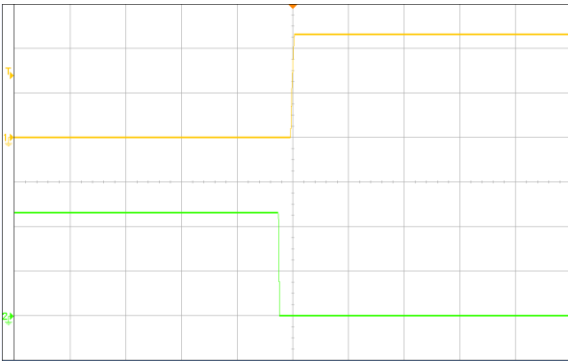


Figure 8 Output voltage startup by remote ON, (100ms/div) ,see Figure 11 for test configuration; CH1-output voltage (5V/div); CH2-remote ON (2V/div)

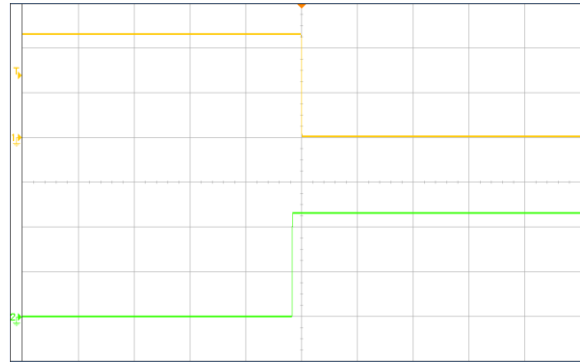


Figure 9 Output voltage shutdown by remote OFF, (100ms/div) ,see Figure 11 for test configuration; CH1-output voltage (5V/div); CH2-remote OFF voltage (2V/div)

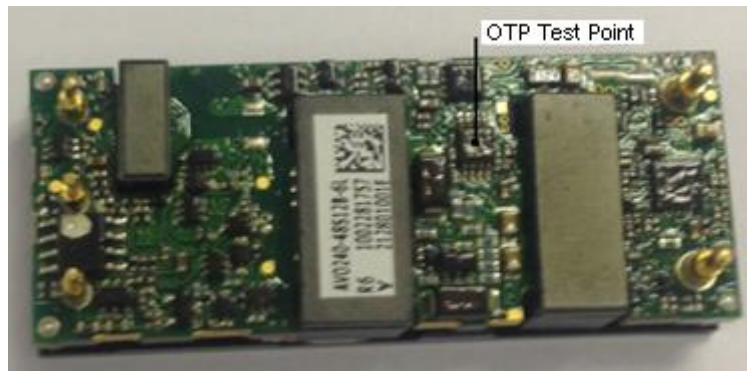


Figure 10 OTP test point

Typical Application

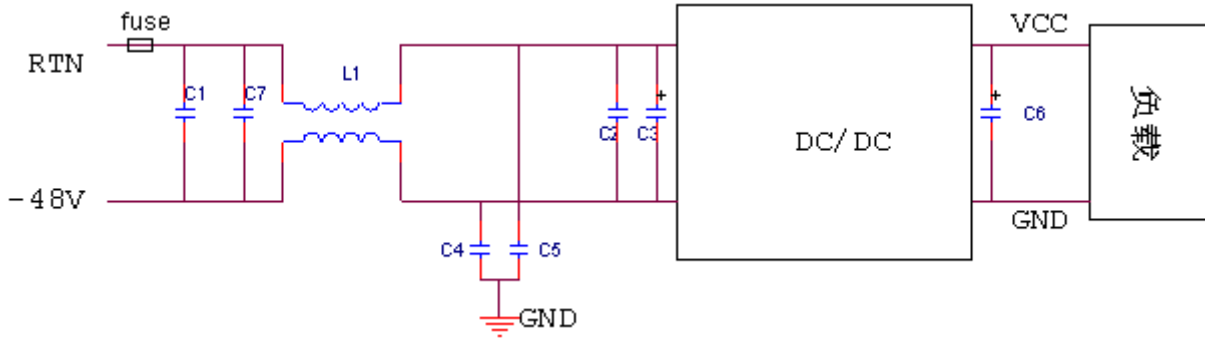


Figure 11 Typical application

Recommended input fuse:Littel fuse 0314015.P 15A

C1 C7:SMDceramic-100V-2.2uF-X7R-1210

C2 : SMDceramic-100V-100nF-±10%-X7R-1206

C3: 100µF/100V electrolytic capacitor, High frequency and low ESR

C6:1000µF/25V electrolytic capacitor, High frequency and low ESR

C4 C5: SMD ceramic-0.1U/1000V/X7R- 2220

L1: 809uH-±25%-9.7A-R5K-28*26*12.7mm

Remote ON/OFF

Either positive or negative remote ON/OFF logic is available in AVO240-48S12. The logic is CMOS and TTL compatible.

The voltage between pin Remote ON/OFF and pin Vin- must not exceed the range listed in table “Feature characteristics” to ensure proper operation. The external Remote ON/OFF circuit is highly recommended as shown in figure 11.

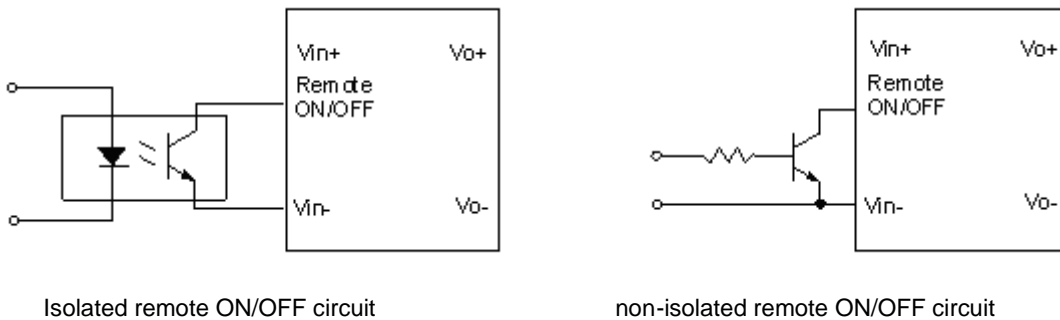


Figure 12 external Remote ON/OFF circuit

Input Ripple & Inrush Current And Output Ripple & Noise Test Configuration

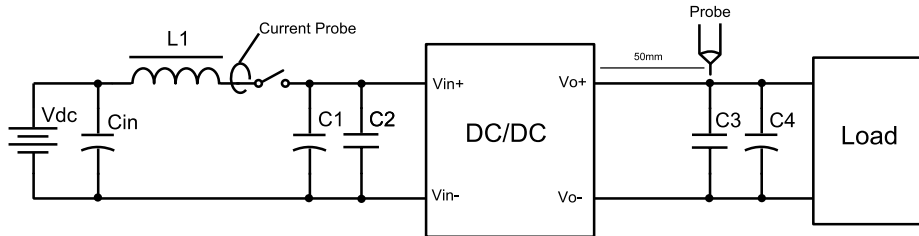


Figure 13 Input ripple & inrush current, ripple & noise test configuration

Vdc: DC power supply

L1: 12 μ H

Cin: 220 μ F/100V typical

C1: 220 μ F/100V electrolytic capacitor, High frequency and low ESR

C2 C3: SMDceramic-100V-1000nF-X7R-1210

C4:1000 μ F/25V electrolytic capacitor, High frequency and low ESR

Note: Using a coaxial cable with series 50 Ω resistor and 0.68 μ F ceramic capacitor or a ground ring of probe to test output ripple & noise is recommended.

EMC test conditions

See Figure10.

Thermal Considerations

The converter is designed to operate in different thermal environments and sufficient cooling must be provided. Proper cooling can be verified by measuring the temperature at the test points. The temperature at these points should not exceed the max values in Table 1.

For a typical application, forced airflow direction is from Vin- to Vin+, figure 15 shows the derating of output current vs. ambient air temperature at different air velocity.

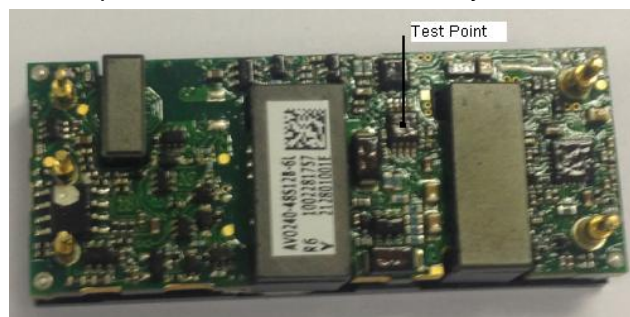


Figure 14 Test point

Table 1 Temperature test point

Test Point	Temperature limit
TEST POINT	125

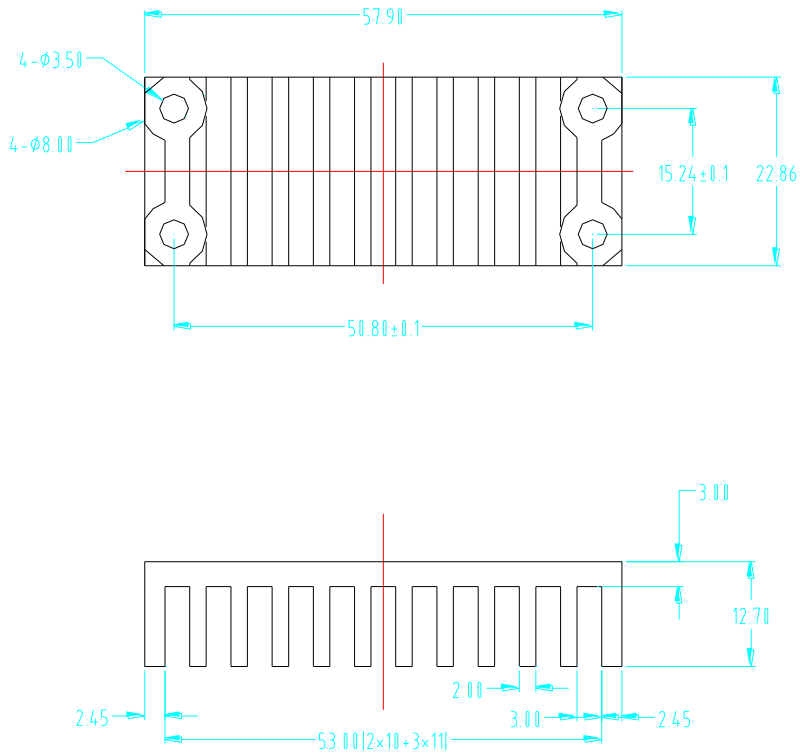


Figure 15 Heatsink

Figure 17 shows the derating output current vs ambient air temperature at different air velocity .The typical test condition is shown in Figure 18.

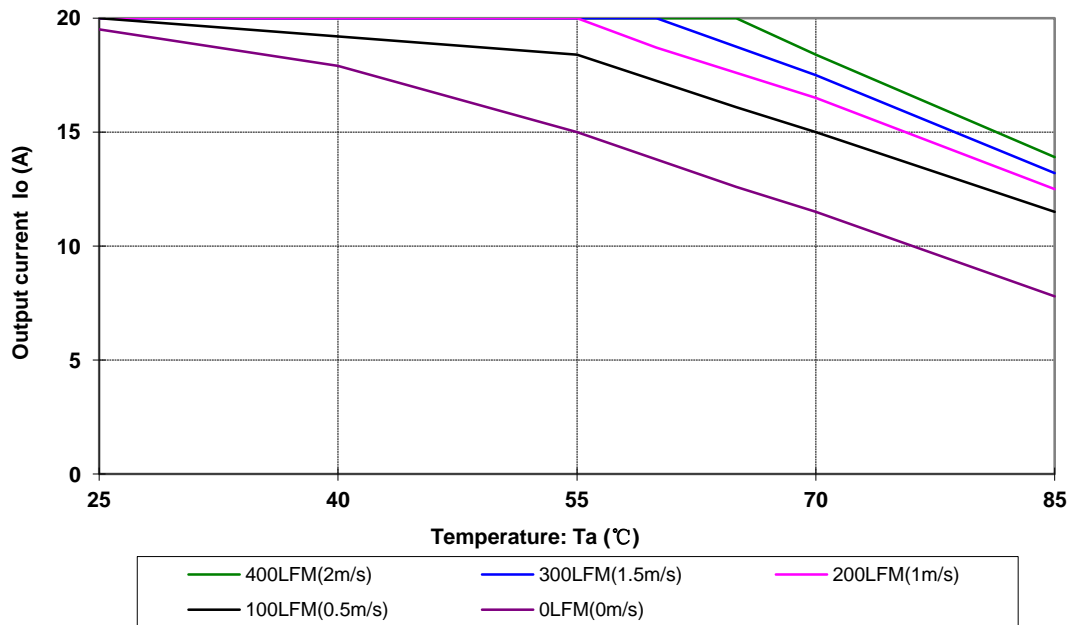
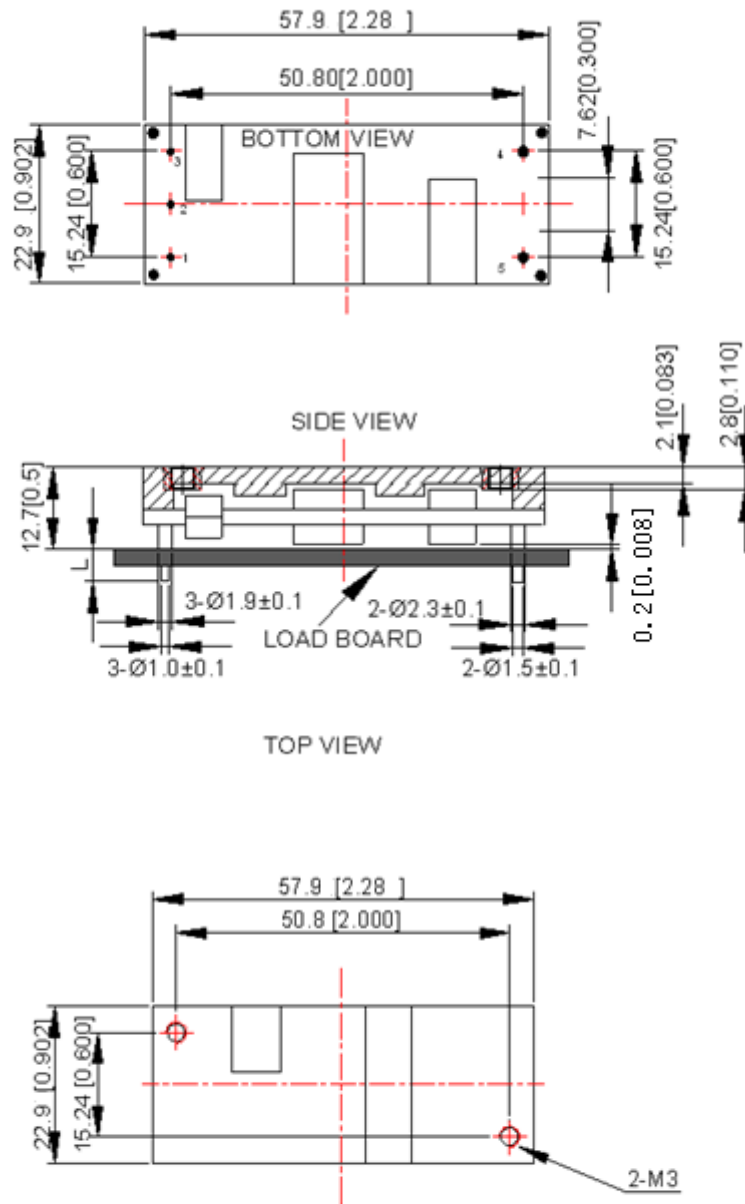


Figure 16 Output power derating, 48V_{in}, air flowing across the converter from Vin- and Vin+

Mechanical Diagram



UNIT: mm[inch] BOTTOM VIEW: pin on upside
 TOLERANCE: X.Xmm \pm 0.5mm[X.X in. \pm 0.02in.]
 X.XXmm \pm 0.25mm[X.XX in. \pm 0.01in.]

Figure 17 Mechanical diagram

Pin length option

Device code suffix	L
-4	4.8mm±0.2mm
-6	3.8mm±0.2mm
-8	2.8mm±0.2mm
None	5.8mm±0.2mm

Pin Designations

Pin NO.	Name	Function
1	V_{in+}	Positive input voltage
2	Remote ON/OFF	Remote control
3	V_{in-}	Negative input voltage
4	V_{o-}	Negative output voltage
5	V_{o+}	Positive output voltage

Soldering

AVO240-48S12B-6L, AVO240-48S12PB-6L

The product is intended for standard manual or wave soldering.

When wave soldering is used, the temperature on pins is specified to maximum 260°C for maximum 7s.

When soldering by hand, the iron temperature should be maintained at 300°C ~ 380°C and applied to the converter pins for less than 10s. Longer exposure can cause internal damage to the converter.

Cleaning of solder joint can be performed with cleaning solvent IPA or similitive.

Ordering Information

AVO240	-	48	S	12	P	B	-	6	L
①		②	③	④	⑤	⑥		⑦	⑧

①	Model series	AVO: series name , 240:output power 240W
②	Input voltage	48: 41V ~ 75V input range, rated input voltage 48V
③	Output number	S: single output
④	Rated output voltage	12:12V output
⑤	Remote ON/OFF logic	Default: negative; P: positive logic
⑥	Base plate	Default:without the baseplate,B:with baseplate
⑦	Pin length	6: 3.8mm
⑧	RoHS status	L: RoHS, R6; Y: RoHS, R5

Model number	Description
AVO240-48S12-6L	4.8mm pin lenth;negative on/off logic; open frame,R6 compliant
AVO240-48S12P-6L	4.8mm pin lenth;positive on/off logic; open frame, R6 compliant
AVO240-48S12B-6L	4.8mm pin lenth;negative on/off logic;with base plate; R6 compliant, see AVO240-48S12B-6L TRN
AVO240-48S12PB-6L	4.8mm pin lenth;positive on/off logiec; with base plate; R6 compliant, see AVO240-48S12B-6L TRN

Hazardous Substances Announcement (RoHS Of China)

Parts	Hardarzous Substances					
	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
AVO240-48S12 B-6L	○	○	○	○	○	○
<p>○: Means the content of the hazardous substances in all the average quality materials of the part is within the limits specified in SJ/T-11363-2006</p> <p>√: Means the content of the hazardous substances in at least one of the average quality materials of the part is outside the limits specified in SJ/T11363-2006</p>						
<p>Emerson Network Power Co., Ltd. has been committed to the design and manufacturing of environment-friendly products. It will reduce and eventually eliminate the hazardous substances in the products through unremitting efforts in research. However, limited by the current technical level, the following parts still contain hazardous substances due to the lack of reliable substitute or mature solution:</p> <ol style="list-style-type: none"> 1. Solders (including high-temperature solder in parts) contain plumbum. 2. Glass of electric parts contains plumbum. 3. Copper alloy of pins contains plumbum 						