

AVE300-48S3V3

198 Watts

Half - Brick Converter

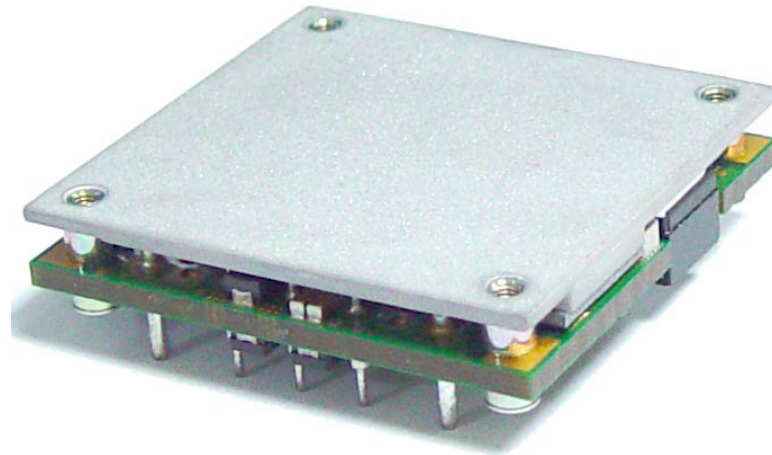
Total Power: 198 Watts
Input Voltage: 36 to 75 Vdc
of Outputs: Single

Special Features

- Delivering up to 60A output
- Ultra-high efficiency 92.5% typ. at full load
- 2:1 wide input range: 36V ~ 75V
- Improved thermal performance
- No minimum load requirement
- Basic isolation
- High power density
- Low output noise
- CNT function
- Remote output sense
- Trim function: 80% ~ 110%
- Input under voltage lockout
- Output over current protection
- Output over voltage protection
- Over temperature protection
- RoHS compliant
- Choice of positive logic or negative logic for CNT function
- Choice of with baseplate or without baseplate
- Pin Length Optional

Safety

EN/UL/CSA 60950
CE (LVD+RoHS)
UL + cUL
TUV-SUD



Product Descriptions

The AVE300-48S3V3 is a single output DC/DC converter with standard half-brick form factor and pin configuration. It delivers up to 60A output current with 3.3V output. Ultra-high 92.5% efficiency at full load and excellent thermal performance makes it an ideal choice for use in computing and telecommunication applications and can operate over an ambient temperature range of -40 °C ~ +85 °C.

Applications

Telecom/ Datacom

Model Numbers

Standard	Output Voltage	Structure	Remote ON/OFF logic	RoHS Status
AVE300-48S3V3-4	3.3Vdc	Open-frame	Negative	R6
AVE300-48S3V3B-4	3.3Vdc	Base plate	Negative	R6
AVE300-48S3V3P-4	3.3Vdc	Open-frame	Positive	R6
AVE300-48S3V3PB-4	3.3Vdc	Base plate	Positive	R6

Ordering information

AVE300	-	48	S	3V3	P	B	-	4
①		②	③	④	⑤	⑥		⑦

①	Model series	AVE: Ultra high efficiency half-brick series
②	Input voltage	48: 36V ~ 75V input range, rated input voltage 48V
③	Output number	S: single output
④	Rated output voltage	3V3: 3.3V output
⑤	Remote ON/OFF logic	CNT logic. Default: negative logic; P: positive logic
⑥	Base plate	B: with base plate; default: open-frame
⑦	Pin length	4: 4.80 mm ± 0.5 mm 6: 3.80 mm ± 0.5 mm 8: 2.80 mm + 0.5mm / -0.3 mm Default is 5.80 mm ± 0.5mm

Options

None

Electrical Specifications

Absolute Maximum Ratings

Stress in excess of those listed in the “Absolute Maximum Ratings” may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply’s reliability.

Table 1. Absolute Maximum Ratings:

Parameter	Model	Symbol	Min	Typ	Max	Unit
Input Voltage Operating -Continuous Non-operating -100mS	All	VI	0	-	80	Vdc
	All	VI,trans	0	-	100	Vdc
Maximum Output Power	All	P _{O,max}	-	-	198	W
Operating Ambient Temperature	All	T _a	-40	-	+85	°C
Operating Board Temperature without base plate ¹	All	T _c	105	110	120	°C
Operating Board Temperature with base plate ²	All	T _c	100	105	115	°C
Storage Temperature	All	T _{STG}	-55	-	+125	°C
Operating Humidity	All	-	-	-	95	%
Isolation Voltage ³ Input to output Input to output Input to Baseplate Output to Baseplate	Open frame modules		-	-	1500	Vdc
	Baseplate modules		-	-	1500	Vdc
	Baseplate modules		-	-	1500	Vdc
	Baseplate modules		-	-	500	Vdc

Note1 - Near temperature sensor Rt.

Note2 - Center of base plate.

Note3 - 1mA for 5 sec, slew rate of 1500V/10sec.

Input Specifications

Table 2. Input Specifications:

Parameter	Condition ¹	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC	All	$V_{IN,DC}$	36	48	75	Vdc
Turn-on Voltage Threshold	$I_O = I_{O,max}$	$V_{IN,ON}$	31	34	36	Vdc
Turn-off Voltage Threshold	$I_O = I_{O,max}$	$V_{IN,OFF}$	30	33	35	Vdc
Inrush transient	All	-	-	-	1	A ² s
Input Reflected-ripple Current ²	All	I_l	-	15	25	mAp-p
Supply voltage rejection (ac) ³	All	-	45	60	-	dB
Recommended Input Fuse ⁴	Fast blow external fuse recommended		-	-	10	A
Recommended External Input Capacitance	Low ESR capacitor recommended	C_{IN}	100	-	-	uF
Operating Efficiency	$T_A=25^{\circ}C$ $I_O = I_{O,max}$ $I_O = 50\%I_{O,max}$	η	90 91	92.5 93.5	- -	% %
Enable pin voltage:	Logic Low	All	-0.7	-	3.3	Vdc
	Logic High	All	3.5	-	12	Vdc
Enable pin current:	Logic Low	All	-	-	1.0	mA
	Logic High	All	-	-	-	uA

Note 1 - $T_A = 25^{\circ}C$, airflow rate = 400 LFM, $V_{in} = 48Vdc$, nominal V_{out} unless otherwise noted.

Note 2 - 5Hz to 20MHz: 12uH source impedance, $T_A=25^{\circ}C$.

Note 3 - test at 120Hz.

Note 4 - this power module is not internally fused. An input line fuse must always be used.

Output Specifications

Table 3. Output Specifications:

Parameter	Condition ¹	Symbol	Min	Typ	Max	Unit	
Output Voltage Setpoint	$I_O = I_{O,max}$	$V_{o,set}$	3.25	3.3	3.35	Vdc	
Output Line Regulation	$V_{IN,DC} = V_{IN,DC,min}$ to $V_{IN,DC,max}$	$\pm V_O$	-	-	5	mv	
Output Load Regulation	$I_O = I_{O,min}$ to $I_{O,max}$	$\pm V_O$	-	-	10	mv	
Output Temperature Regulation	All	$\%V_O$	-	-	0.02	$\%/^{\circ}C$	
Rated Output Current	All	I_O	0	-	60	A	
Output Over-current Protection ²	All	I_O	66	-	84	A	
External Load Capacitance ³	All	C_O	470	2200	10000	μF	
Output Ripple & Noise , pk-pk	See below Note 4	-	-	50	100	mVp-p	
Dynamic Response (all)	Peak Deviation:	25%~50%~25% 25% load change slew rate = 0.1A/us	$\pm V_O$	-	100	150	mV
	Settling Time (to $V_{o,nom}$):		T_s	-	200	500	μsec
	Peak Deviation	50%~100%~50% 50% load change slew rate = 0.1A/us	$\pm V_O$	-	-	200	mV
	Settling Time (to $V_{o,nom}$)		T_s	-	-	-	μsec
	Peak Deviation	10%~100%~10% 90% load change slew rate = 0.1A/us	$\pm V_O$	-	-	330	mV
	Settling Time (to $V_{o,nom}$)		T_s	-	-	-	μsec
Output Voltage Adjustment Range	-	$\%V_o$	80	-	110	%	
Output Over-voltage Protection (Static)	Hiccup	$V_{o,clamp}$	3.8	-	4.6	V	
Output Over-voltage Protection (Dynamic)	Hiccup	$V_{o,clamp}$	3.8	-	5.0	V	

Note 1 - $T_a = 25^{\circ}C$, airflow rate = 400 LFM, $V_{in} = 48Vdc$, nominal V_{out} unless otherwise noted.

Note 2 - Hiccup: auto-restart when over-current condition is removed.

Note 3 - High frequency and low ESR is recommended.

Note 4 - $T_a = 25^{\circ}C$, Air velocity=300LFM, $V_{in}=48V$, $V_o=3.3V$, $I_O = I_{O,max}$, 10u tantalum($ESR \leq 100 m\Omega$) // 1 μ ceramic capacitors (Select 0 to 20MHz bandwidth on the oscilloscope).

Output Specifications

Table 3. Output Specifications, con't:

Parameter	Condition ¹	Symbol	Min	Typ	Max	Unit
Isolation Resistance	-		10	-	-	MΩ
Calculated MTBF	$V_{IN,DC} = 48Vdc,$ $I_o = I_{o,max},$ $T_a = 25^{\circ}C$		-	2,000,000	-	Hours
Turn-On Time	$I_o = I_{o,max}$	T_{rise}	-	-	20	msec
Output Voltage Overshoot	$I_o = I_{o,max},$ $T_a = 25^{\circ}C$	%V _O	-	-	5	%
Switching Frequency	-	f_{sw}	-	240	-	KHz

Note 1 - $T_a = 25^{\circ}C$, airflow rate = 400 LFM, $V_{in} = 48Vdc$, nominal V_{out} unless otherwise noted.

AVE300-48S3V3 Characteristic Curves

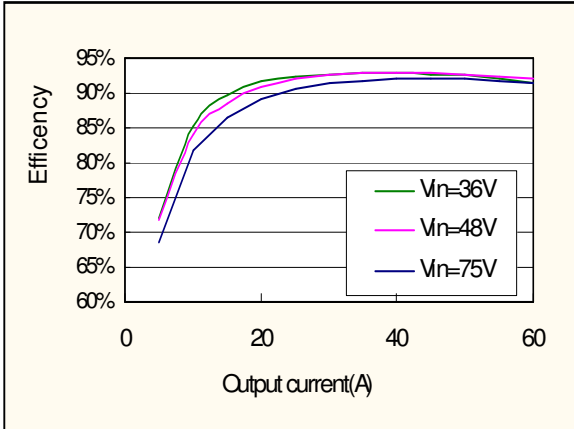


Figure 1: AVE300-48S3V3 Typical Efficiency
 $V_o=3.3V$.
 $T_a:25^{\circ}C$, Air velocity : 300LFM, Air direction: from Vin+ to Vin-.

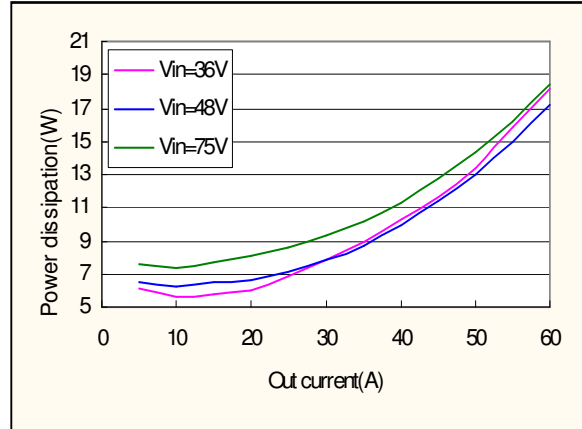


Figure 2: AVE300-48S3V3 Typical Power Dissipation Curve
 $V_o=3.3V$.
 $T_a:25^{\circ}C$, no wind, with baseplate.

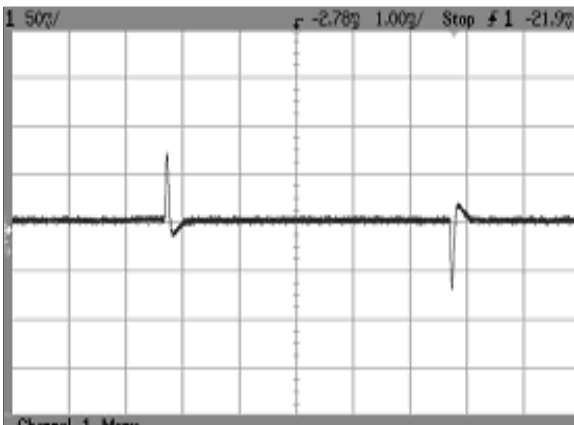


Figure 3: AVE300-48S3V3 Output Voltage Transient Response!
 $V_{in} = 48V_{dc}$, 25% $I_{o,nom}$ step from 50% $I_{o,nom}$, 0.1A/ μs
 Ch 1: V_o (50mV/div)

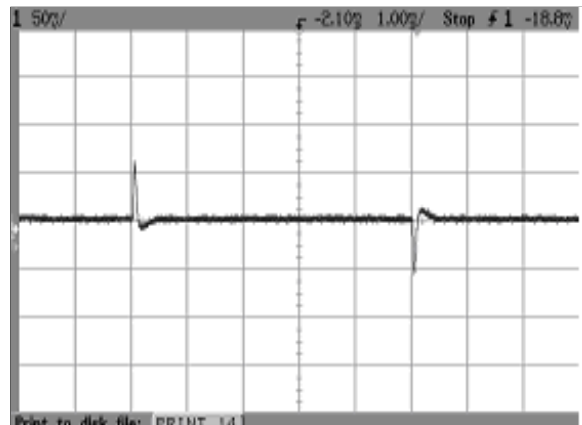


Figure 4: AVE300-48S3V3 Output Voltage Transient Response!
 $V_{in} = 48V_{dc}$, 50% $I_{o,nom}$ step from 75% $I_{o,nom}$, 0.1A/ μs
 Ch 1: V_o (50mV/div)

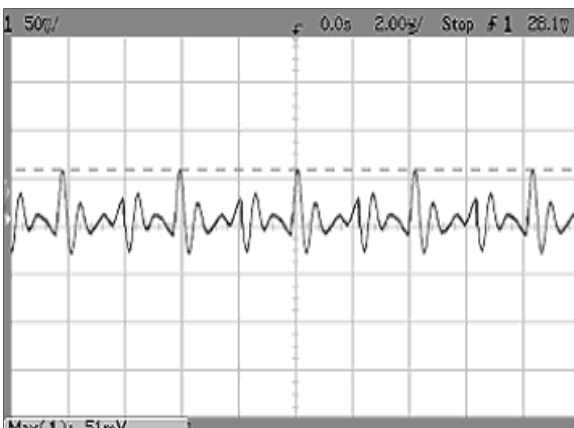


Figure 5: AVE300-48S3V3 Ripple and Noise Measurement!
 $V_{in} = 48V_{dc}$ $I_o = 60A$
 Ch 1: V_o (0.5V/div)

Note1 - Should use external capacitors 10 μ tantalum(ESR \leq 100 m Ω) // 1 μ ceramic capacitor.

AVE300-48S3V3 Performance Curves - Startup Characteristics

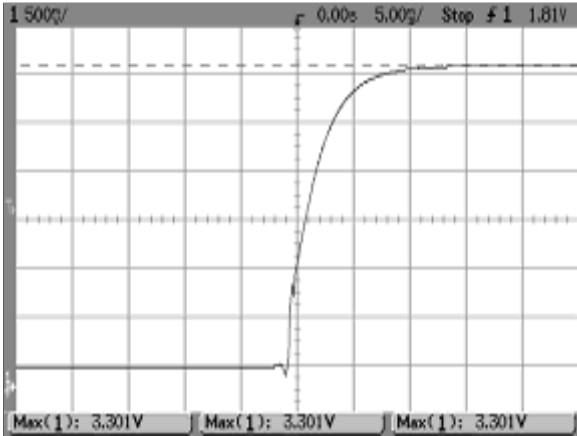


Figure 6: AVE300-48S3V3 Start-up from power on
Vin = 48Vdc Vo=3.3V Io =60A
Ch 1: Vo (0.5V/div)

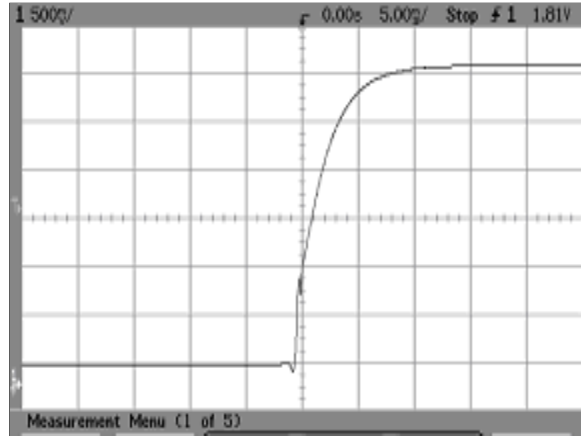


Figure 7: AVE300-48S3V3 Start-up from CNT on
Vin = 48Vdc Vo=3.3V Io = 60A
Ch 1: Vo (0.5V/div)

Protection Function Specification

Output Over-current Protection (OCP)

AVE300-48S3V3 DC/DC converter feature foldback current limiting as part of their Over-current Protection (OCP) circuits. When output current exceeds 110% to 140% of rated current, such as during a short circuit condition, the module will work on intermittent mode, also can tolerate short circuit conditions indefinitely. When the over-current condition is removed, the converter will automatically restart.

Output Over-Voltage Protection (OVP)

The output over-voltage protection consists of circuitry that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the over voltage protection threshold, then the module will work on hiccup mode. When the over-voltage condition is removed, the converter will automatically restart. The protection mechanism is such that the unit can continue in this condition until the fault is cleared.

Over-Temperature Protection (OTP)

These modules feature an over-temperature protection circuit to safeguard against thermal damage. The module will work in intermittent mode when the maximum device reference temperature is exceeded. When the over-temperature condition is removed, the converter will automatically restart.

Input Reverse Voltage Protection

Under installation and cabling conditions where reverse polarity across the input may occur, reverse polarity protection is recommended. Protection can easily be provided as shown in Figure 8. In both cases the diode used is rated for 15A/100V. Placing the diode across the inputs rather than in-line with the input offers an advantage in that the diode only conducts in a reverse polarity condition, which increases circuit efficiency and thermal performance.

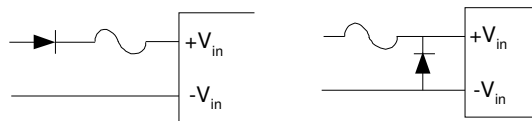


Figure 8 Reverse polarity protection circuit

Input Fusing

The AVE300-48S3V3 power module has no internal fuse. An external fuse must always be used to meet international safety requirements, a 250 Volt rated fuse should be used. If one of the input lines is connected to chassis ground, then the fuse must be placed in the other input line.

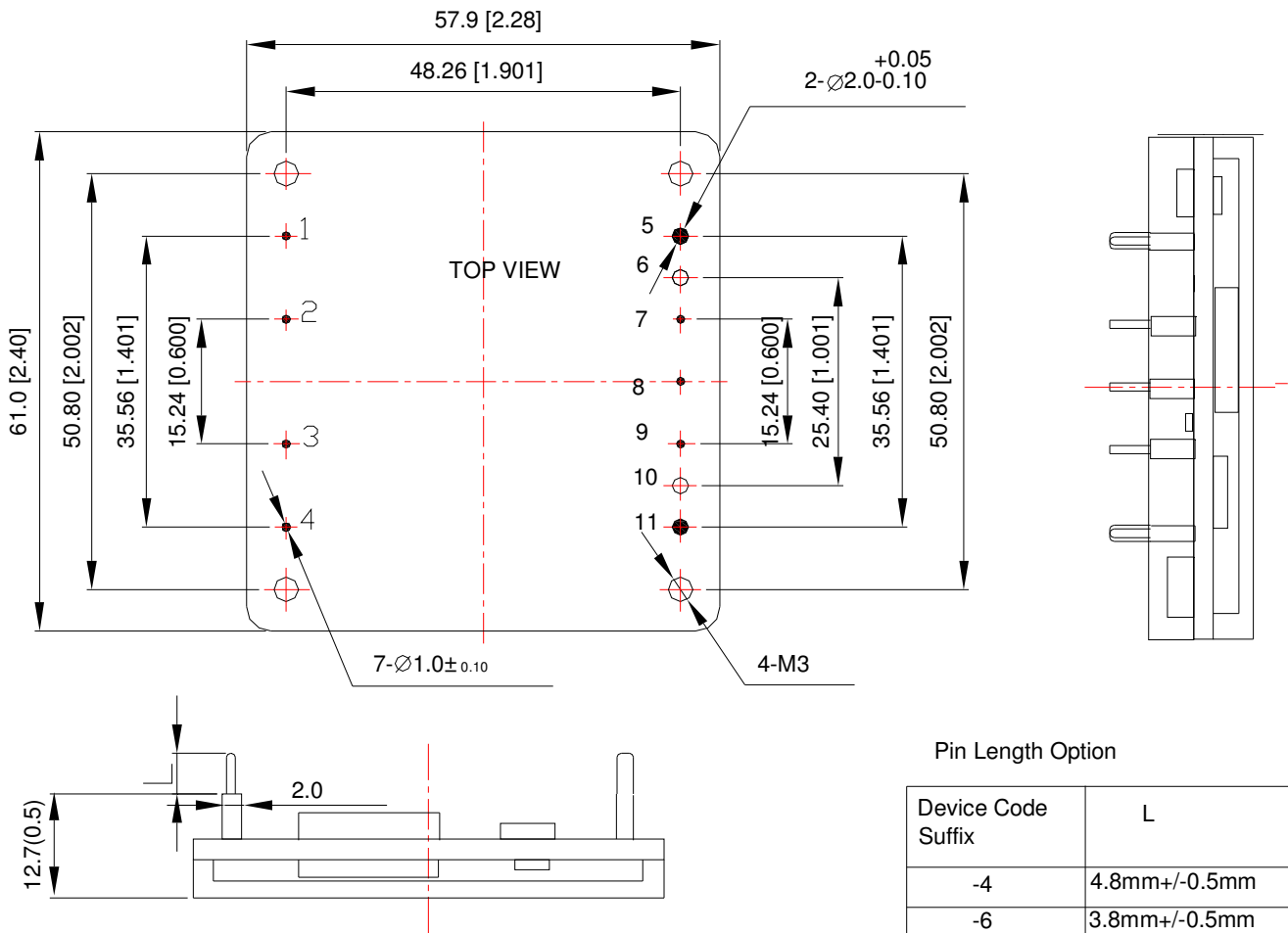
Standard safety agency regulations require input fusing. Recommended fuse rating is 10A for the AVE300-48S3V3.

Note: the fuse is fast blow type.

Mechanical Specifications

Mechanical Outlines – Base plate Module

AVE300-48S3V3B



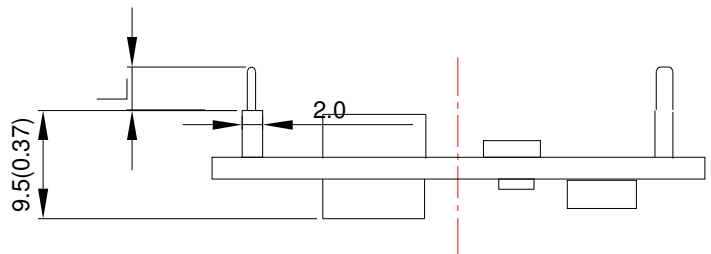
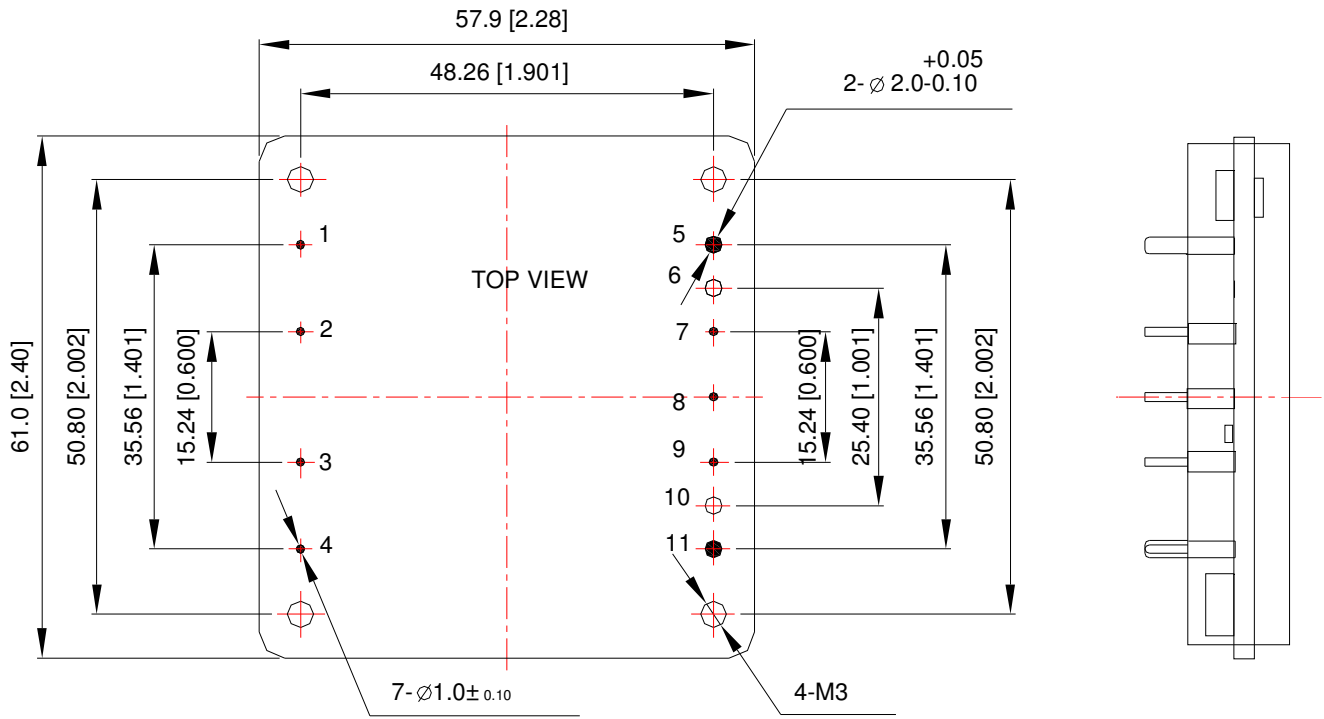
TOLERANCES: X.Xmm= \pm 0.5mm
 X.XXmm= \pm 0.25mm

Notes: Un-dimensioned components are for visual reference only.

Figure 9 Mechanical Outlines with base plate

Mechanical Outlines – Open-Frame Module

AVE300-48S3V3



TOLERANCES: X.Xmm=+/-0.5mm
 X.XXmm=+/-0.25mm

Pin Length Option

Device Code Suffix	L
-4	4.8mm+/-0.5mm
-6	3.8mm+/-0.5mm
-8	2.8mm+0.5/-0.3mm
NONE	5.8mm+/-0.5mm

Notes: Un-dimensioned components are for visual reference only.

Figure 10 Mechanical Outlines without base plate

Pin Designations

Pin No	Name	Function
1	+Vin	Positive input voltage
2	CNT	Remote control
3	NC	No pin function
4	-Vin	Negative input voltage
5	+Vout	Positive output voltage
6	NC	No pin function
7	+Sense	Positive remote sense
8	Trim	Output voltage trim
9	-Sense	Negative remote sense
10	NC	No pin function
11	-Vout	Negative output voltage

Environmental Specifications

EMC Test Conditions

For conditions where EMI is a concern, a different input filter can be used. Figure 11 shows a filter designed to reduce EMI effects. AVE300-48S3V3 can meet EN55022 CLASS A with the EMI reduction filter.

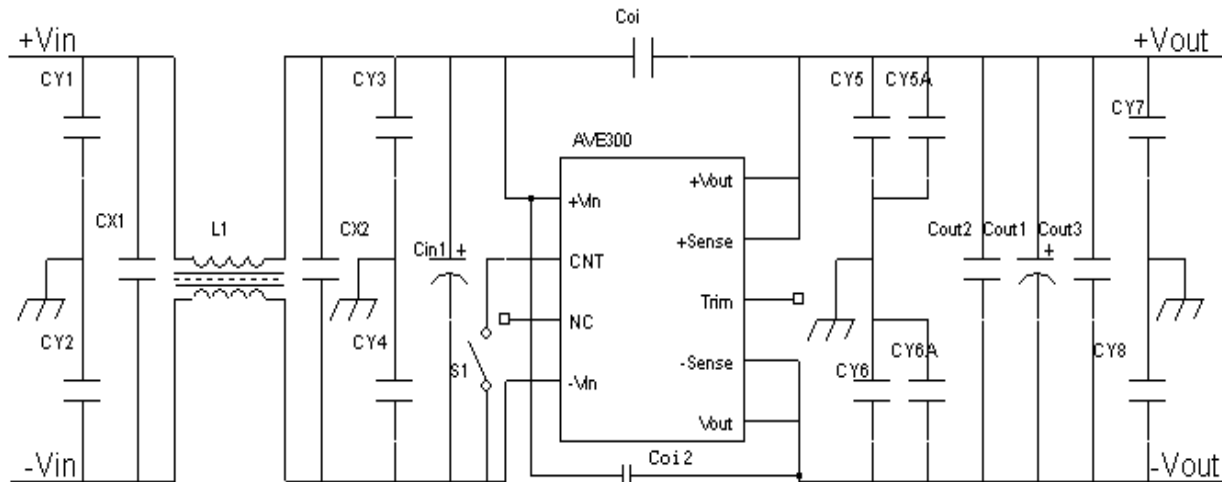


Figure 11 EMI reduction filter

Recommended values:

Component	Value / Rating	Type
Cin1	100 μ F	Aluminum Electrolytic
CX1	0.47 μ F	Metal film or ceramic high frequency capacitor
L1	7mH	Mn-Zn Common mode Core ϕ 20
CY1, CY2	0.22 μ /275V	Safety Y capacitor
CY3, CY4	-	-
CY5, CY6	0.033 μ	Metal film or ceramic high frequency capacitor
CY5A, CY6A	4700pF	Metal film or ceramic high frequency capacitor
Cout1	2200 μ F/16V	Aluminum Electrolytic
Cout2	1 μ F/63V	Metal film capacitor
Cout3	1 μ F/50V/SC1206	Chip Capacitor
Coi	1000pF	Metal film capacitor

Safety Consideration

To comply with the published safety standards, the following must be observed when using the converter.

The converter is intended for use as a component part of other equipment. When installing the power supply and marking input and output connecting, the relevant safety standards e.g. UL 60950-1; IEC 60950-1/VDE 0805; EN 60950-1; CAN/CSA-22.2NO. 60950-1-03 must be complied with, especially the requirements for creepage distances, clearances and distance through insulation between primary and earth or primary and secondary.

The output power taken from the converter must not exceed the rating given on the converter. The converter is not intended to be repaired by service personnel in case of failure or component defect (the converter can be thrown away).

The maximum ambient temperature around the converter must not exceed 55 °C.

Note - The converter has no in-line fuse. For safe operation, an external fast acting UL listed fuse or UL recognized fuse rated 10A, 250V, fuse must be employed as input line fuse before installation.

For the Converter without heatsink

An external air forced cooling (CFM: 80.2, Speed: 1 m/s, Distance from unit: 25cm) shall be used for the converter operation with full load (3.3V@60A) and the ambient temperature up to 45 °C; the external air forced cooling is 1.0m/s (CFM: 80.2, Distance from unit: 25cm) when the converter operates with 3.3V@52A load and the ambient temperature up to 55 °C.

For the converter with heatsink

An external air forced cooling (CFM: 80.2, Speed: 1 m/s, Distance from unit: 25cm) shall be used for the converter operation with full load (3.3V@60A) and the ambient temperature up to 52 °C; the external air forced cooling is 1.0m/s (CFM: 80.2, Distance from the converter: 25cm) when the converter operates with 3.3V@57A loaded and the ambient temperature up to 55 °C.

The output power may exceed the Hazardous Energy Level –240VA, operator can't touch the output when the converter operates.

Operating Temperature

The AVE300-48S3V3 series power supplies will start and operate within stated specifications at an ambient temperature from -40 °C to 85 °C under all load conditions. The storage temperature is -55 °C to 125 °C.

Technologies

AVE300-48S3V3 modules have ultra-high efficiency at full load. With less heat dissipation and temperature-resistant components such as ceramic capacitors, these modules exhibit good behavior during pro-longed exposure to high temperatures. Maintaining the operating board temperature within the specified range help keep internal component temperatures within their specifications which in turn help keep MTBF from falling below the specified rating. Proper cooling of the power modules is also necessary for reliable and consistent operation.

Thermal Considerations – Open-frame module

Measuring the board temperature of the module is shown in Figure 12 (with base plate) and Figure 13 (without base plate) can verify the proper cooling.

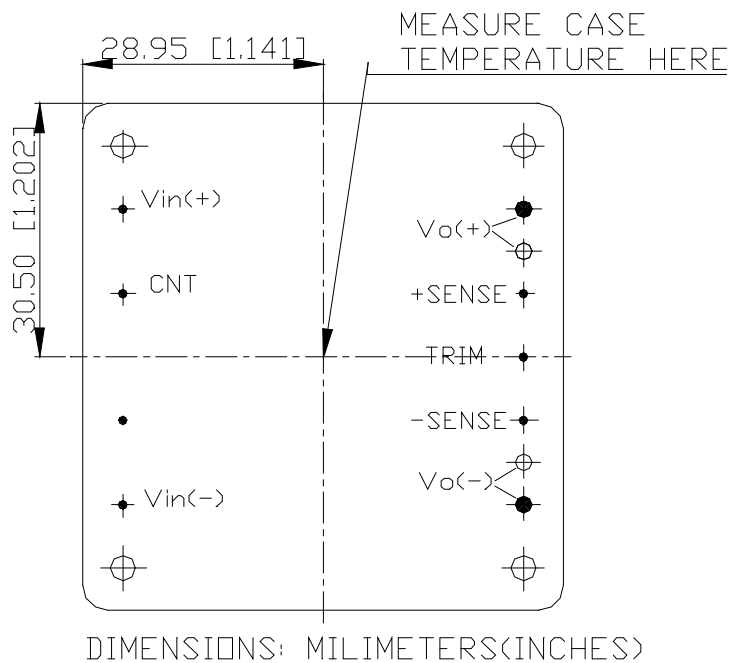
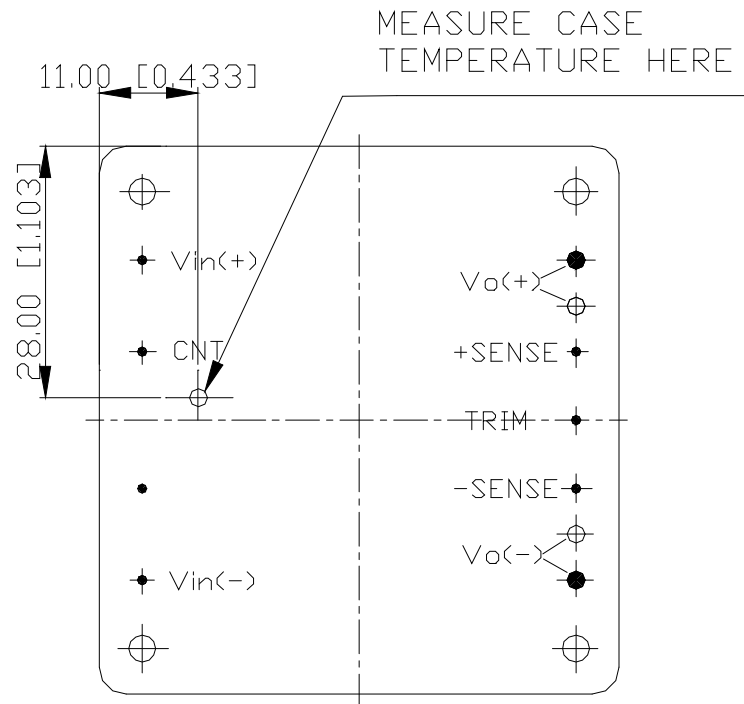


Figure 12 Temperature measurement location(with base plate)



Dimensions: millimeters(inches)

Figure 13 Temperature measurement location(without base plate)

The module should work under 85 °C ambient for the reliability of operation and the board temperature must not exceed 105 °C(without base plate) or 100 °C(with base plate) while operating in the final system configuration. The measurement can be made with a surface probe after the module has reached thermal equilibrium. No heatsink is mounted, make the measurement as close as possible to the indicated position. It makes the assumption that the final system configuration exists and can be used for a test environment. Note that the board temperature of module must always be checked in the final system configuration to verify proper operational due to the variation in test conditions. Thermal management acts to transfer the heat dissipated by the module to the surrounding environment. The amount of power dissipated by the module as heat (P_D) is got by the equation below:

$$P_D = P_I - P_O$$

Where P_I is input power; P_O is output power; P_D is dissipated power.

Also, module efficiency (η) is defined as the following equation:

$$\eta = P_O / P_I$$

If eliminating the input power term, from two above equations can yield the equation below:

$$P_D = P_O (1 - \eta) / \eta$$

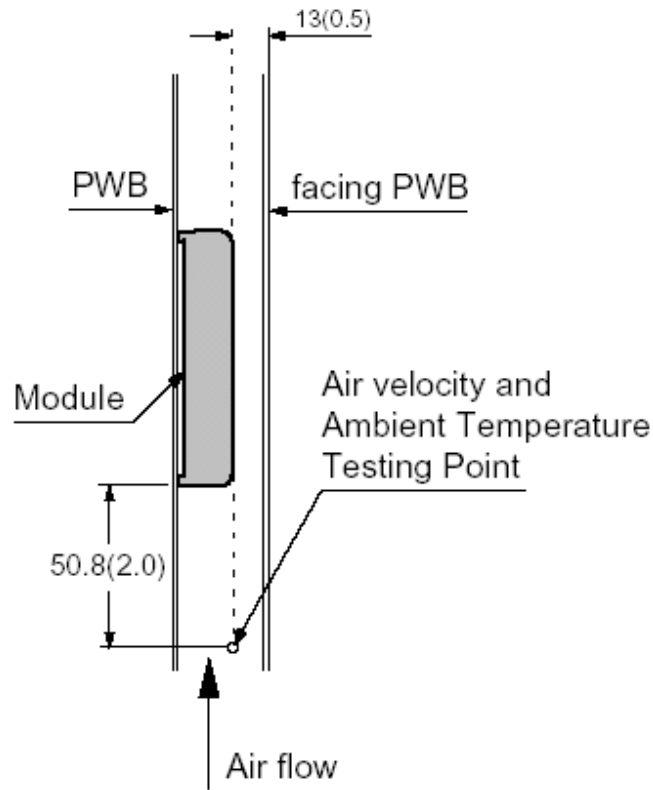
The module power dissipation then can be calculated through the equation.

Because each power module output voltage has a different power dissipation curve, a plot of power dissipation versus output current over three different line voltages is given in the following figures.

Module Derating

Experiment Setup

From the experimental set up shown in Figure 14, the derating curves as Figure 15 and Figure 16 can be drawn. Note that the Printed Wiring Board (PWB) and the module must be mounted vertically. The Passage has a rectangular cross-section. The clearance between the facing PWB and the top of the module is kept 13 mm (0.5 in.) constantly.



Dimensions: millimeters (inches).

Figure 14 Experiment setup

Convection Without Heatsinks

Increasing the airflow over the module can enhance heat transfer. Figure 15 and figure 16 shows the change of the module output current with the change of ambient temperature. In the test, the airflow was created with externally adjustable fans. The appropriate airflow for a given operating condition can be determined through this figure.

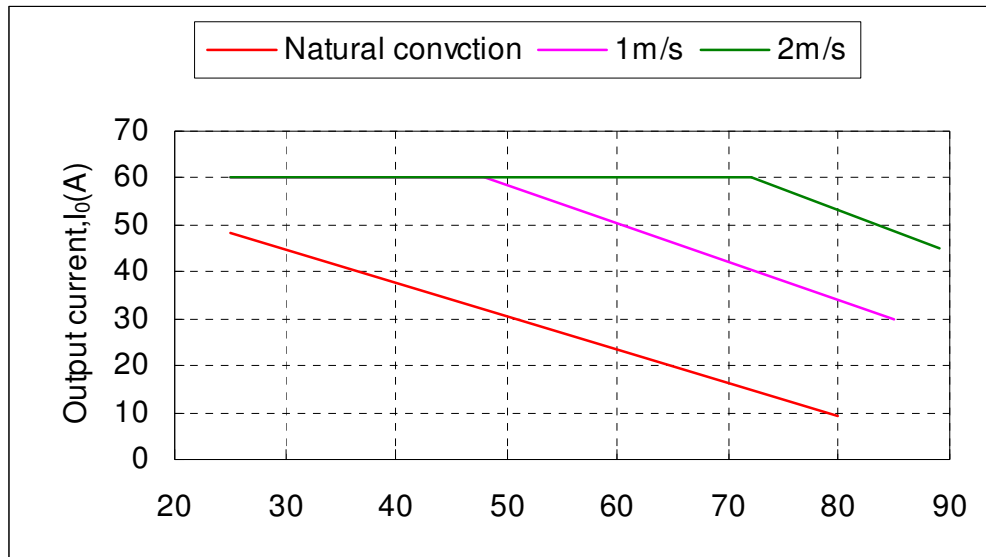


Figure 15 Forced convection power derating without base plate
 Airflow direction from Vin(+) to Vin(-); Vin=48V.

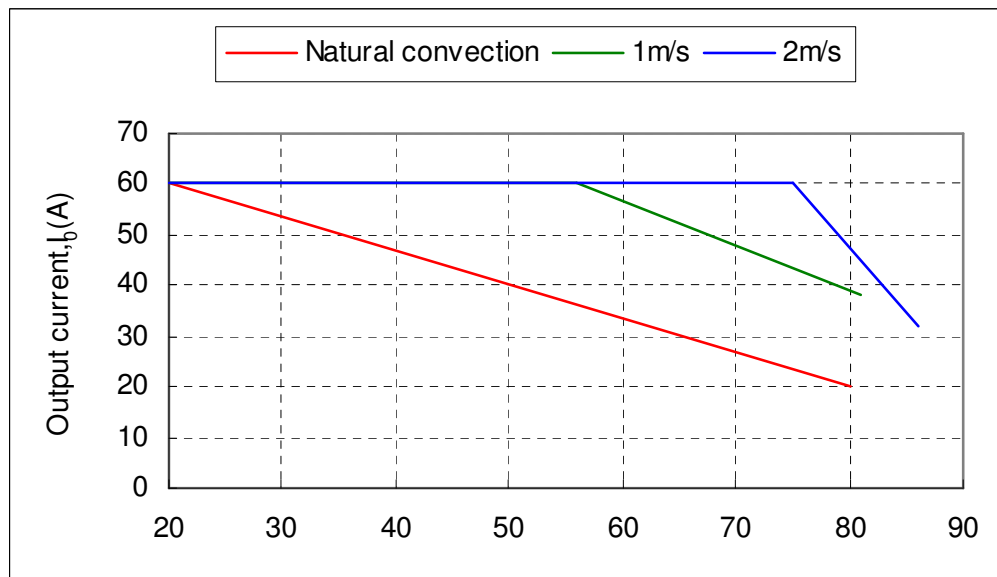


Figure 16 Forced convection power derating with base plate
 Airflow direction from Vin(+) to Vin(-); Vin=48V.

Heatsink Configuration

Several standard heatsinks available for the AVE300-48S3V3 are shown in Figure 17 to 19.

The heatsinks mounted to the top surface of the module with screws torqued to 0.56 N-m (5 in.-lb). A thermally conductive dry pad or thermal grease is placed between the case and the heatsink to minimize contact resistance (typically 0.1 °C /W to 0.3 °C/W) and temperature differential.

Nomenclature for heatsink configurations is as follows:

WDxyy40

x = fin orientation: longitudinal (L) or transverse (T)

yyy = heatsink height (in 100ths of inch)

For example, WDT5040 is a heatsink that is transverse mounted for a 61 mm x 57.9 mm (2.4in. x 2.28in.) module with a heatsink height of 0.5 in.

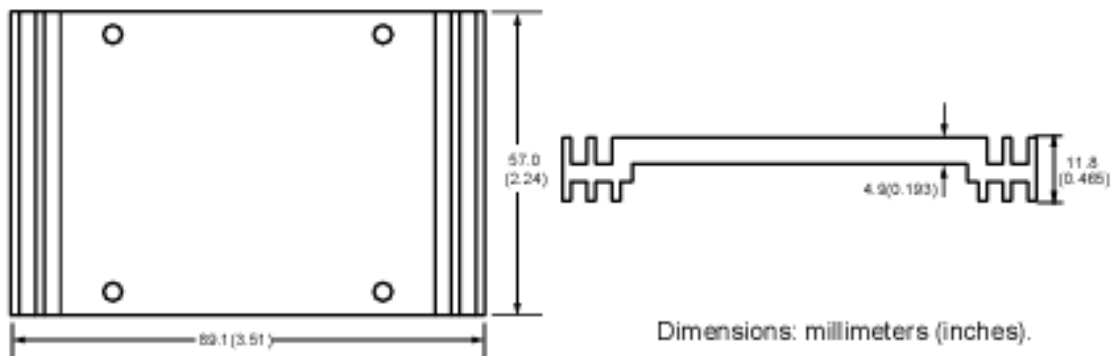


Figure 17 Non-standard heatsink

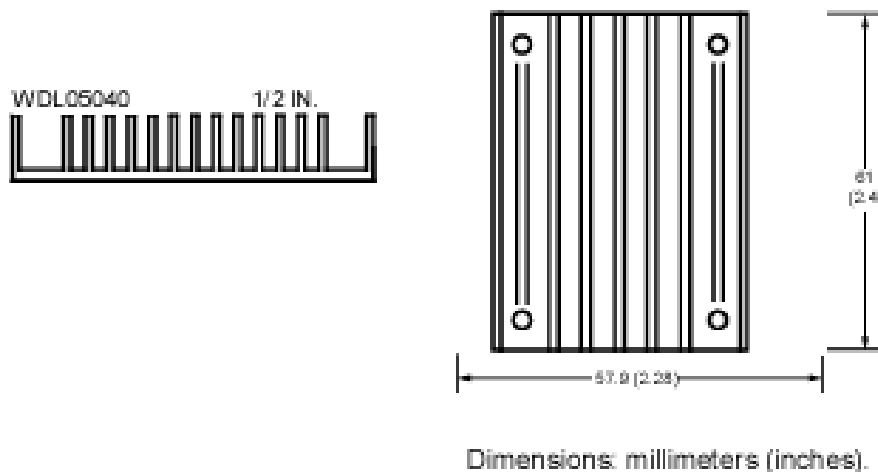
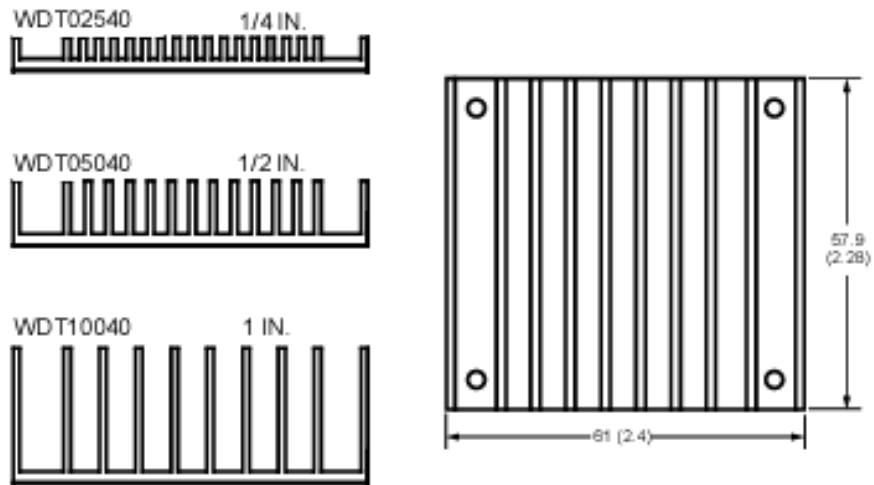


Figure 18 Longitudinal fins heatsink



Dimensions: millimeters (inches).

Figure 19 Transverse fins heatsink

Heatsink Mounting

A crucial part of the thermal design strategy is the thermal interface between the base plate of the module and the heatsink. Inadequate measures taken will quickly negate any other attempts to control the base plate temperature. For example, using a conventional dry insulator can result in a case-heatsink thermal impedance of $>0.5^{\circ}\text{C}/\text{W}$, while use one of the recommended interface methods (using silicon grease or thermal pads) can result in a case-heatsink thermal impedance around $0.1^{\circ}\text{C}/\text{W}$. The heatsink mounting is shown in Figure 20 below.

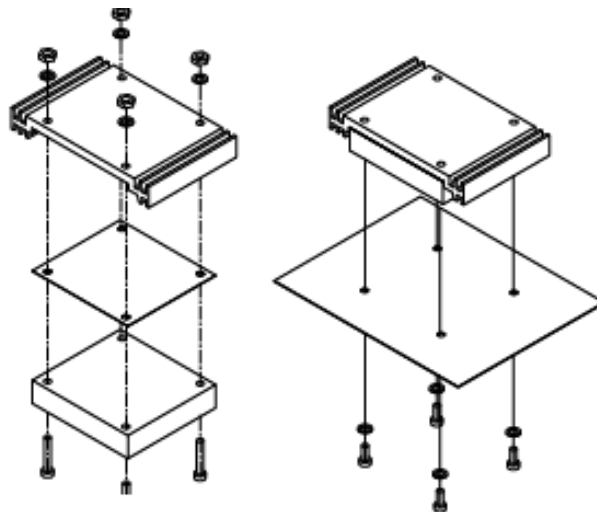


Figure 20 Heatsink mounting

Feature Description

CNT Function

Two CNT logic options are available. The CNT logic, CNT voltage and the module working state are as the following table.

	L	H	OPEN
N	ON	OFF	OFF
P	OFF	ON	ON

N--- means "Negative Logic"

P--- means "Positive Logic"

L--- means "Low Voltage", $-0.7V \leq L \leq 3.3V$

H--- means "High Voltage", $3.5V \leq H \leq 12V$

ON--- means "Module is on", OFF--- means "Module is off"

Open--- means "CNT pin is left open"

Note: when CNT is left open, V_{CNT} may reach 6V.

Figure 21 shows a few simple CNT circuits.

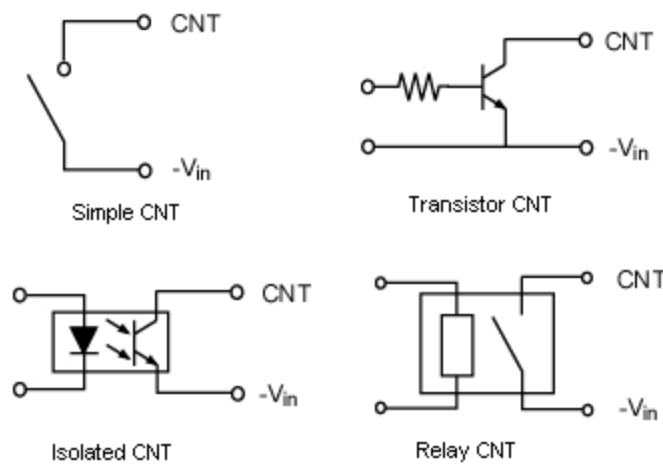


Figure 21 CNT circuits

Remote Sense

AVE300-48S3V3 converter can remotely sense both lines of its output which moves the effective output voltage regulation point from the output terminals of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of AVE300-48S3V3 in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load.

When the converter is supporting loads far away, or is used with undersized cabling, significant voltage drop can occur at the load. The best defense against such drops is to locate the load close to the converter and to ensure adequately sized cabling is used. When this is not possible, the converter can compensate for a drop of up to 10% V_o , through use of the sense leads.

When used, the + Sense and - Sense leads should be connected from the converter to the point of load as shown in Figure 22, using twisted pair wire, or parallel pattern to reduce noise effect. The converter will then regulate its output voltage at the point where the leads are connected. Care should be taken not to reverse the sense leads. If reversed, the converter will trigger OVP protection and turn off. When not used, the +Sense lead must be connected with + V_o , and -Sense with - V_o . Although the output voltage can be increased by both the remote sense and trim, the maximum increase for the output voltage is not the sum of both.

The maximum increase is the larger of either the remote sense or the trim.

Note that at elevated output voltages the maximum power rating of the module remains the same, and the output current capability will decrease correspondingly.

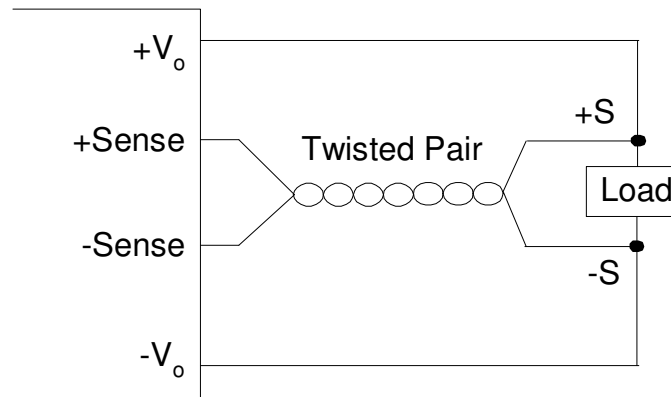


Figure 22 Sense connection

Trim Characteristics

The +Vo output voltage of AVE300-48S3V3 can be trimmed using the trim pin provided. Applying a resistor to the trim pin through a voltage divider from the output will cause the +Vo output to increase by up to 10% or decrease by down to -20%. Trimming up by more than 10% of the nominal output may activate the OVP circuit or damage the converter. Trimming down more than -20% can cause the converter to regulate improperly. If the trim pin is not needed, it should be left open.

Trim up

With an external resistor connected between the TRIM and +SENSE pins, the output voltage set point increases (see Figure 23 below).

The following equation determines the required external-resistor value to obtain a percentage output voltage change of %.

$$R_{\text{adj-up}} = \frac{V_o(100+y)}{1.225y} - \frac{(100+2y)}{y}$$

Note: y is the adjusting percentage of the voltage. $0 < y < 10$. R_{adj-up} is in kΩ.

Trim down

With an external resistor between the TRIM and -SENSE pins, the output voltage set point decreases (see Figure 24 below).

The following equation determines the required external-resistor value to obtain a percentage output voltage change of %.

$$R_{\text{adj-down}} = \frac{100}{y} - 2$$

Note: y is the adjusting percentage of the voltage. $0 < y < 10$. R_{adj-down} is in kΩ.

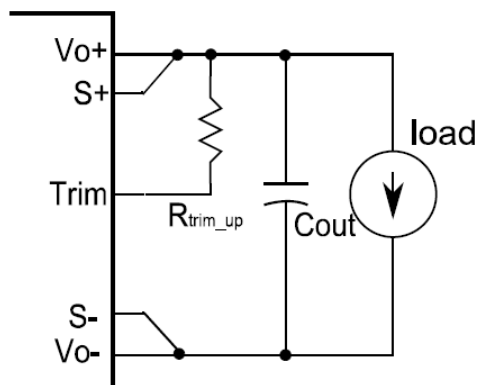


Figure 23 Trim up circuit

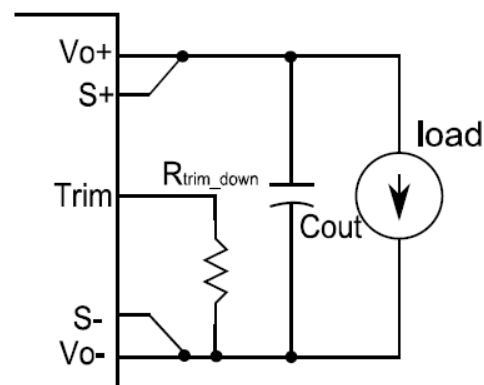


Figure 24 Trim down circuit

Although the output voltage can be increased by both the remote sense and by the trim, the maximum increase for the output voltage is not the sum of both. The maximum increase is the larger of either the remote sense or the trim.

Note that at elevated output voltages the maximum power rating of the module remains the same, and the output current capability will decrease correspondingly.

Minimum Load Requirements

There is no minimum load requirement for the AVE300-48S3V3 module.

Parameter	Device	Symbol	Typ	Unit
Minimum Load	3.3V	I_{MIN}	0	A

Output Capacitance

High output current transient rate of change (high di/dt) loads may require high values of output capacitance to supply the instantaneous energy requirement to the load. To minimize the output voltage transient drop during this transient, low Equivalent Series Resistance (ESR) capacitors may be required, since a high ESR will produce a correspondingly higher voltage drop during the current transient.

When the load is sensitive to ripple and noise, an output filter can be added to minimize the effects. A simple output filter to reduce output ripple and noise can be made by connecting a capacitor C1 across the output as shown in Figure 25. The recommended value for the output capacitor C1 is 2200µF.

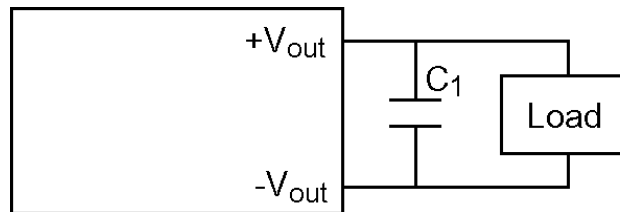


Figure 25 Output ripple filter

Extra care should be taken when long leads or traces are used to provide power to the load. Long lead lengths increase the chance for noise to appear on the lines. Under these conditions C2 can be added across the load, with a 1µF ceramic capacitor C2 in parallel generally as shown in Figure 26.

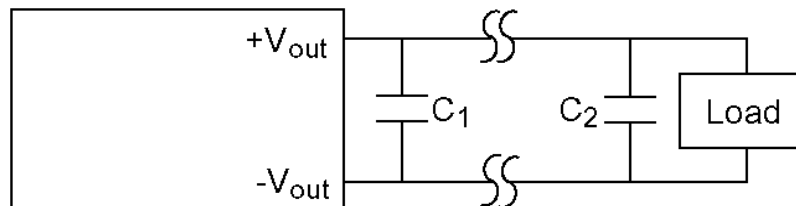


Figure 26 Output ripple filter for a distant load

Decoupling

The converter does not always create noise on the power distribution system. High-speed analog or digital loads with dynamic power demands can cause noise to cross the power inductor back onto the input lines. Noise can be reduced by decoupling the load. In most cases, connecting a 10 μ F ceramic capacitor in parallel with a 0.1 μ F ceramic capacitor across the load will decouple it. The capacitors should be connected as close to the load as possible.

Ground Loops

Ground loops occur when different circuits are given multiple paths to common or earth ground, as shown in Figure 27. Multiple ground points can slightly different potential and cause current flow through the circuit from one point to another. This can result in additional noise in all the circuits. To eliminate the problem, circuits should be designed with a single ground connection as shown in Figure 28.

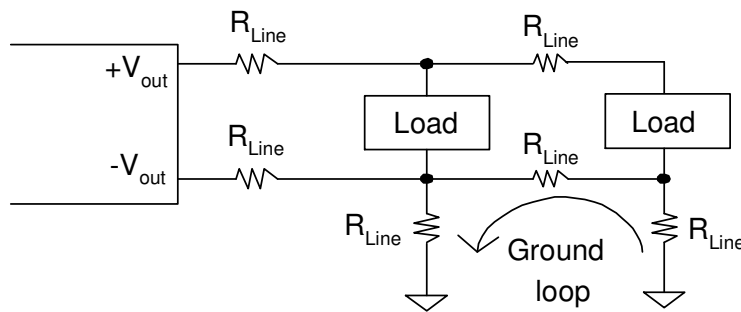


Figure 27 Ground loops

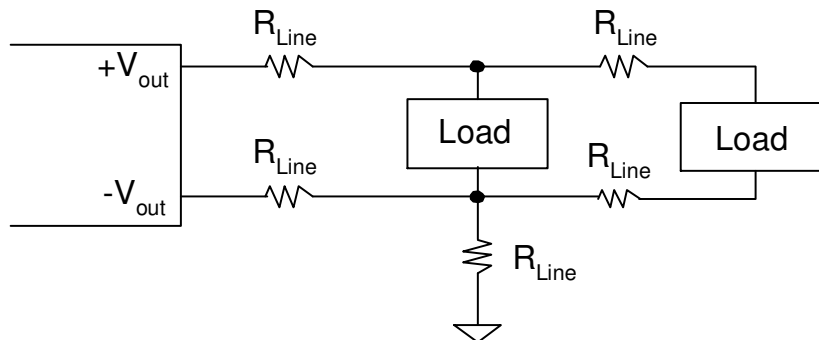


Figure 28 Single point ground

Application Notes

Typical Application

Below is the typical application of the AVE300-48S3V3 series power supply.

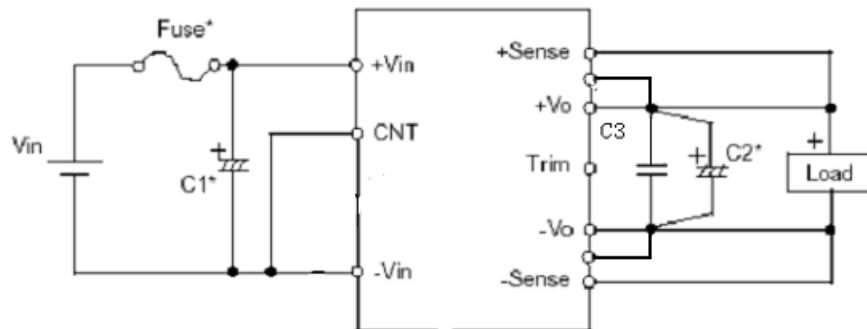


Figure 29 Typical application

F1: Fuse*: Use external fuse (fast blow type) for each unit. For 3.3V output: 5A ($P_{out}=198W$)

C1: Recommended input capacitor $C1 \geq 100\mu F/100V$ electrolytic or ceramic type capacitor.

C2: Recommended $-5^{\circ}C \sim 100^{\circ}C$ uses: $2,200\mu F/10V$ (electrolytic capacitor)

$-40^{\circ}C \sim -5^{\circ}C$: For this temperature range, use $2,200\mu F/50V$ electrolytic capacitor and $220\mu F/10V$ tantalum capacitor.

C3: Recommended $1\mu F/10V$

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

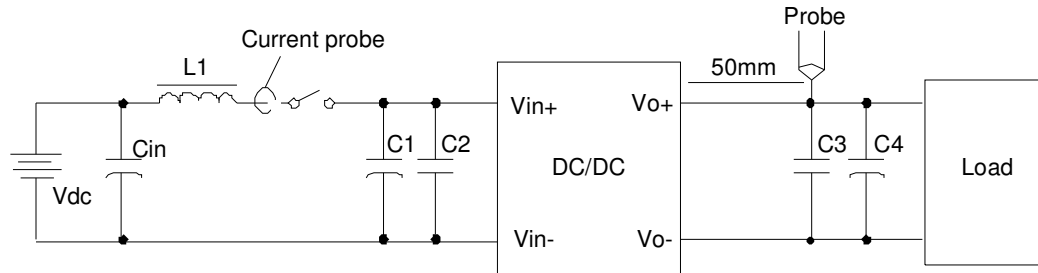


Figure 30 Input ripple & inrush current output ripple & noise test configuration

Vdc: DC power supply input

L1: 12uH

Cin: 220uF/100V typical

C1: SMD ceramic-100V-100nF-±10%-X7R-1206

C2: 100µF/100V electrolytic capacitor, high frequency and low ESR

C3: SMD ceramic-10V-1µF-±10%-X7R-1206

C4: 10µF/10V electrolytic capacitor, high frequency and low ESR

Note - Using a coaxial cable with series 50ohm resistor and 0.68uF ceramic capacitor or a ground ring of probe to test output ripple & noise is recommended.

Weight

The AVE300-48S3V3 series weight is 72g typical without base plate, or 103g typical with base plate.

Installation

Although AVE300-48S3V3 converters can be mounted in any orientation, free air-flowing must be taken. Normally power components are always put at the end of the airflow path or have the separate airflow paths. This can keep other system equipment cooler and increase component life spans.

Soldering

AVE300-48S3V3 converter is compatible with standard wave soldering techniques. When wave soldering, the converter pins should be preheated for 20-30 seconds at 110 °C, and wave soldered at 260 °C for less than 10 seconds. When hand soldering, the iron temperature should be maintained at 425 °C and applied to the converter pins for less than 5 seconds. Longer exposure can cause internal damage to the converter. Cleaning can be performed with cleaning solvent IPA or with water.

Assembly

The maximum length of the screw driven into the heat-sink is 3.3mm.

Hazardous Substances Announcement (RoHS of China R6)

Parts	Hazardous Substances					
	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
AVE300-48S3V3	x	x	x	x	x	x

x: 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

√: 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

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1. Solders (including high-temperature solder in parts) contain plumbum.
2. Glass of electric parts contains plumbum.
3. Copper alloy of pins contains plumbum

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