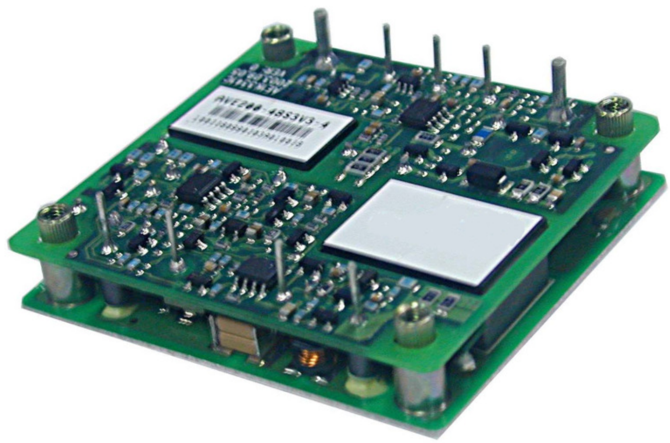
AVE200 Series

132 Watts

Half-brick Converter

Total Power: 132 Watts
Input Voltage: 36 to 75 Vdc
# of Outputs: Single



Special Features

- Delivers up to 40A output current
- Basic isolation
- Ultra-high efficiency
- Improved thermal performance: 40A at 70ºC at 1.5ms-1（300LFM）
- High power density
- Low output noise
- Industry standard pinout
- 2:1 wide input voltage of 36-75V
- CNT function
- Remote sense
- Trim function: +10%/-20%
- Input under-voltage lockout
- Output over-current protection
- Output over-voltage protection
- Over-temperature protection
- RoHS compliant

Safety

EN60950
CSA-C22.2 NO. 950-95
UL

Product Descriptions

The AVE200 series is a new open frame DC-DC converter for optimum efficiency and power density. The AVE200 series provide up to 40A output current in an industry standard Half Brick, which makes it an ideal choice for small space, high current and low voltage applications. The AVE200 series uses an industry standard Half Brick: 61.0mm X 57.9mm X 12.7mm (2.4”x2.28”x0.5”) and standard pinout configuration, provides CNT and trim functions. AVE200 series provide 3.3V@40A or 1.2V@40A single output, which is isolated from input. The series can achieve ultra high efficiency, for most applications a heat sink is required.

Applications

Telecom/ Datacom

ARTESYN EMBEDDED TECHNOLOGIES

Model Numbers

Standard	Input Voltage	Output Voltage	Output Current	Efficiency
AVE200-48S3V3	36-75Vdc	3.3Vdc	40	89%
AVE200-48S1V2	36-75Vdc	1.2Vdc	40	81%

Ordering information

AVE200	-	48	S	3V3	P	-	6
①		②	③	④	⑤		⑥

①	Model series	AVE200: Series name
②	Input voltage	48: 36V ~ 75V input range, rated input voltage 48V
③	Output number	S: single output
④	Rated output voltage	1V2: 1.2V output, 3V3: 3.3V output
⑤	Remote ON/OFF logic	Default: negative logic; P: positive logic
⑥	Pin length	-4---4.8 mm ± 0.5mm (0.189in. ± 0.02in.) -6---3.80mm ± 0.5mm(0.150in. ± 0.020in.) -8---2.80mm ± 0.5mm/-0.3mm(0.110in. ± 0.020in/-0.012in.) By default: 5.8mm ± 0.5mm (0.228in. ± 0.02in.)

Options

Choice of positive logic or negative logic for CNT function

Choice of short pins or long pins

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 Transient -100mS	 All All	$V_{IN,DC}$	 - -	 - -	 80 100	 Vdc Vdc
Maximum Output Power	AVE200-48S3V3 AVE200-48S1V2	$P_{O,max}$	- -	- -	132 48	W W
Isolation Voltage[1] Input to outputs	 All		 1500	 -	 -	 Vdc
Ambient Operating Temperature	All	T_A	-40	-	+70	^OC
Operating Board Temperature	All	T_C	-	-	+100	^OC
Storage Temperature	All	T_{STG}	-55	-	+125	^OC
Operating Humidity	All		-	-	95	%

Note 1 – 50 A for 5 sec, slew rate of 1500V/10sec

Input Specifications

Table 2. Input Specifications:

Parameter		Conditions[1]	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC		All	$V_{IN,DC}$	36	48	75	Vdc
Maximum Input Current	AVE200-48S3V3 AVE200-48S1V2	$V_{IN,DC}$ =0 to $V_{IN,DC,\ max}$ $I_O = I_{O,max}$	$I_{IN,max}$	- -	- -	6.2 2	A A
Recommended Input Fuse[2]	AVE200-48S3V3 AVE200-48S1V2	Fast blow external fuse recommended		- -	- -	10 5	A A
Input Reflected Ripple Current		5Hz to 20MHz: 12uH source impedance, TA = 25 °C.		-	-	20	mA
Supply Voltage Rejection (1KHz)		All		45	-	-	dB
Operating Efficiency	AVE200-48S3V3 AVE200-48S1V2	$V_{IN,DC} = V_{IN,DC,\ nom}$ $I_O = I_{O,max,}$ TA = 25°C	η	87 80	89 81	- -	% %

Note 1 - Ta = 25 °C, airflow rate = 400 LFM, Vin = 48Vdc, nominal Vout unless otherwise noted.
Note 2 - 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
Factory Set Voltage	AVE200-48S3V3 AVE200-48S1V2		V_O	3.25 1.18	3.3 1.2	3.35 1.22	Vdc
Output Voltage Line Regulation	AVE200-48S3V3 AVE200-48S1V2		V_O	- -	5 3	10 5	mV
Output Voltage Load Regulation	AVE200-48S3V3 AVE200-48S1V2		V_O	- -	10 5	20 10	mV
Output Voltage Temperature Regulation		All	V_O	-	-	0.02	%Vo/^{O}C
Output Voltage Adjustment Range		All	V_O	80	-	110	%Vo
Output Ripple, pk-pk	AVE200-48S3V3 AVE200-48S1V2	Across 1uF@10V, X7R ceramic capacitor & 2200uF@10V LOW ESR Aluminum capacitor	V_O	- -	- -	150 80	mV_{PK-PK}
Output Current		All	I_O	0	-	40	A
Output DC Current-limit Inception[2]		All	I_O	44	-	56	A
V_O Load Capacitance[3]		All	C_O	470	-	10000	uF
V_O Dynamic Response Peak Deviation	AVE200-48S3V3 AVE200-48S1V2	50%~75% or 50%~ 25% load change slew rate = 0.1A/us	$\pm V_O$	- -	- -	165 80	mV
V_O Dynamic Response Settling Time	AVE200-48S3V3 AVE200-48S1V2		T_s	- -	- -	300 300	uSec
V_O Dynamic Response Peak Deviation	AVE200-48S3V3 AVE200-48S1V2	50%~100% or 50%~ 0% load change slew rate = 0.1A/us	$\pm V_O$	- -	- -	200 120	mV
V_O Dynamic Response Settling Time	AVE200-48S3V3 AVE200-48S1V2		T_s	- -	- -	- -	uSec
V_O Dynamic Response Peak Deviation	AVE200-48S3V3 AVE200-48S1V2	10%~100% load change slew rate = 0.1A/us	$\pm V_O$	- -	- -	330 160	mV
V_O Dynamic Response Settling Time	AVE200-48S3V3 AVE200-48S1V2		T_s	- -	- -	- -	uSec
Turn-on Delay Time		$I_O = I_{max,}$ Vo within 1%	$T_{turn-on}$	-	-	20	mS

Note 1 - Ta = 25 ^{O}C, airflow rate = 400 LFM, Vin = 48Vdc, nominal Vout unless otherwise noted.
Note 2 - Hiccup: auto-restart when over-current condition is removed.
Note 3 - High frequency and low ESR is recommended.

Output Specifications

Table 3. Output Specifications, con't:

Parameter		Condition[1]	Symbol	Min	Typ	Max	Unit
Enable Pin Voltage	Logic Low	All		-0.7	-	1.2	V
	Logic High	All		3.5	-	12	V
Enable Pin Current	Logic Low	Leakage current, @10V		-	-	1.0	mA
	Logic High			-	-	-	uA
Output Over-voltage Protection[4]	AVE200-48S3V3 AVE200-48S1V2	All	V_O	3.75 1.4	- -	5.00 2.0	V
Under-voltage Lockout	Turn-on Point Turn-off Point	All All		31 30	- -	36 35	V
Isolation Resistance		All		10	-	-	MΩ
Switching Frequency	AVE200-48S3V3 AVE200-48S1V2	All	f_{SW}	- -	280 220	- -	KHz
MTBF		Io nom., 25 ^{O}C T_A		-	-	2	10^6 h
Vibration (Sine wave)		Vibration level: 3.5mm (2 ~ 9Hz), 10m/s^2 (9 ~ 200HZ),15m/s^2 (200 ~ 500HZ) Directions and time: 3 axis (X, Y, Z), 30 minutes each Sweep velocity: 1oct / min					
Shock (Half-sine wave)		Peak acceleration: 300m/s2 Duration time: 6ms Continuous shock 3 times at each of 6 directions (± X, ± Y, ± Z)					

Note 4 - Hiccup: auto-restart when over-voltage condition is removed.

AVO75B-36S3V3 Performance Curves

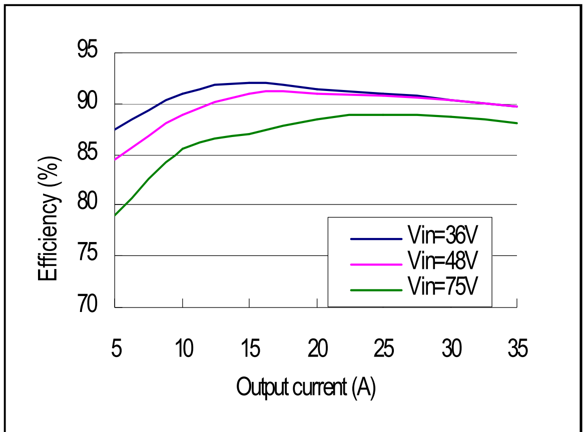


Figure 1: AVE200-48S3V3 Typical Efficiency

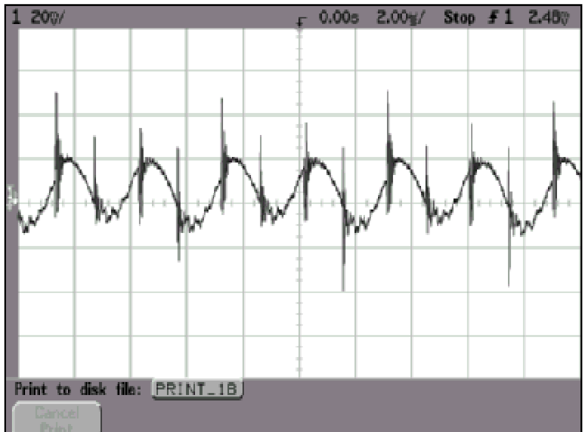


Figure 2: AVE200 series Ripple and Noise Measurement

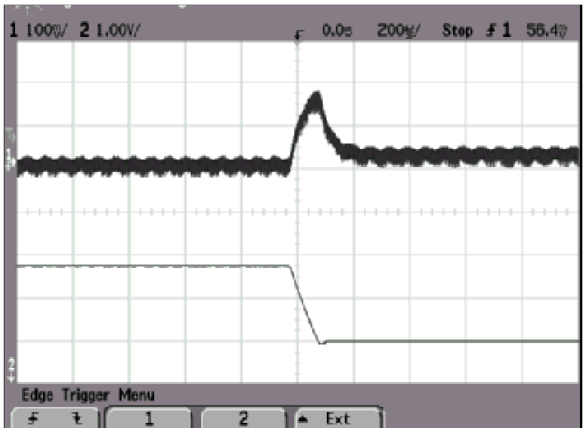


Figure 3: AVE200-48S3V3 Typical Transient Response to Step Decrease in Load from 50% to 25% of Full Load, Room Temperature 48Vdc Input

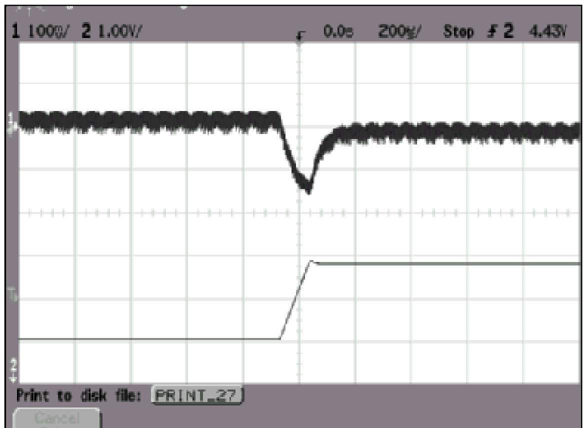


Figure 4: AVE200-48S3V3.Typical Transient Response to Step Increase in Load from 50% to 75% of Full Load, Room Temperature, 48Vdc Input

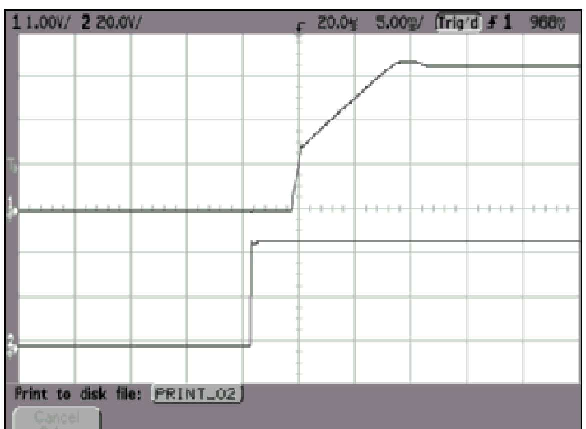


Figure 5: AVE200-48S3V3 Typical Start-up from Power On

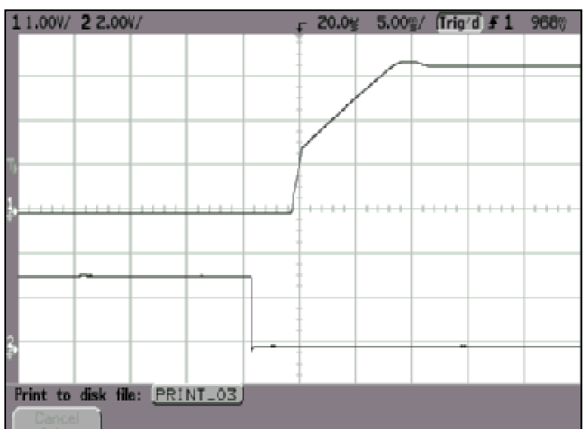


Figure 6: AVE200-48S3V3 Typical Start-up from CNT On

AVO75B-36S1V2 Performance Curves

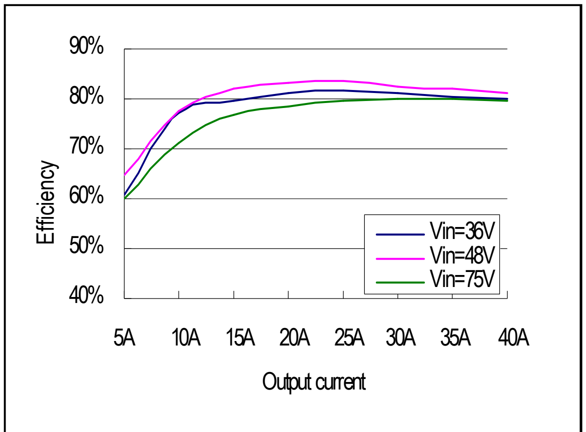


Figure 7: AVE200-48S1V2 Typical Efficiency

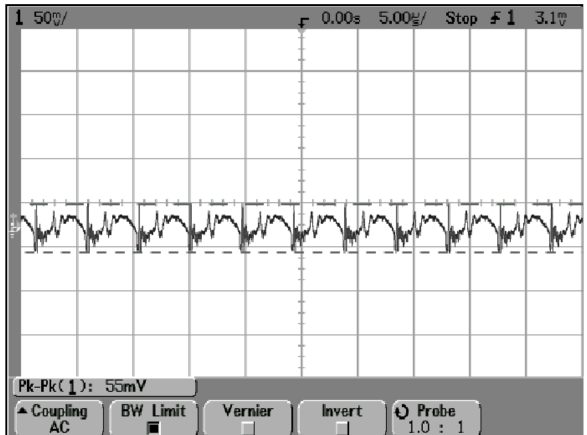


Figure 8: AVO75B-36S1V2 Ripple and Noise Measurement

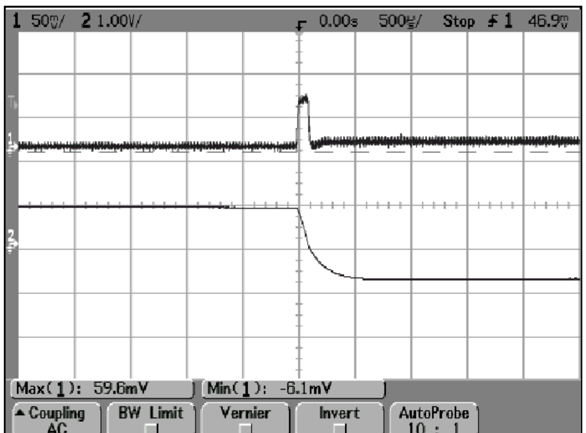


Figure 9: AVE200-48S1V2 Typical Transient Response to Step Decrease in Load from 50% to 25% of Full Load, Room Temperature 48Vdc Input

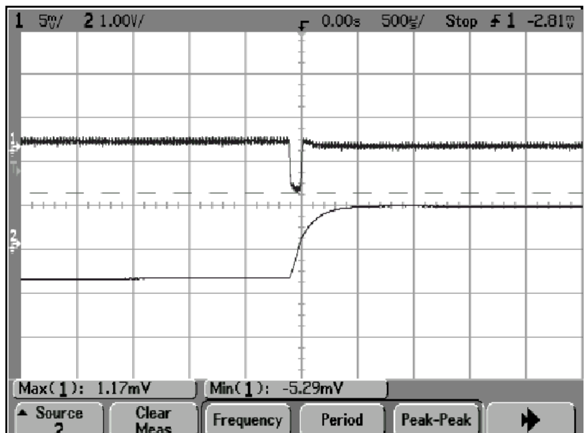


Figure 10: AVE200-48S1V2.Typical Transient Response to Step Increase in Load from 50% to 75% of Full Load, Room Temperature, 48Vdc Input

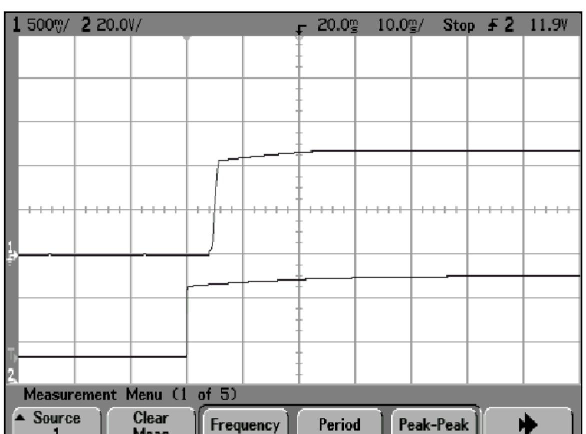


Figure 11: AVE200-48S1V2 Typical Start-up from Power On

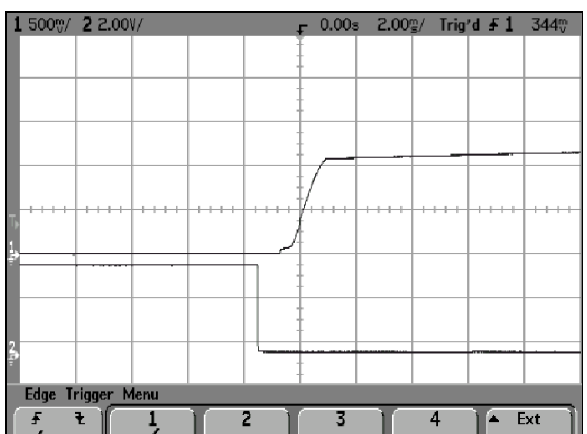
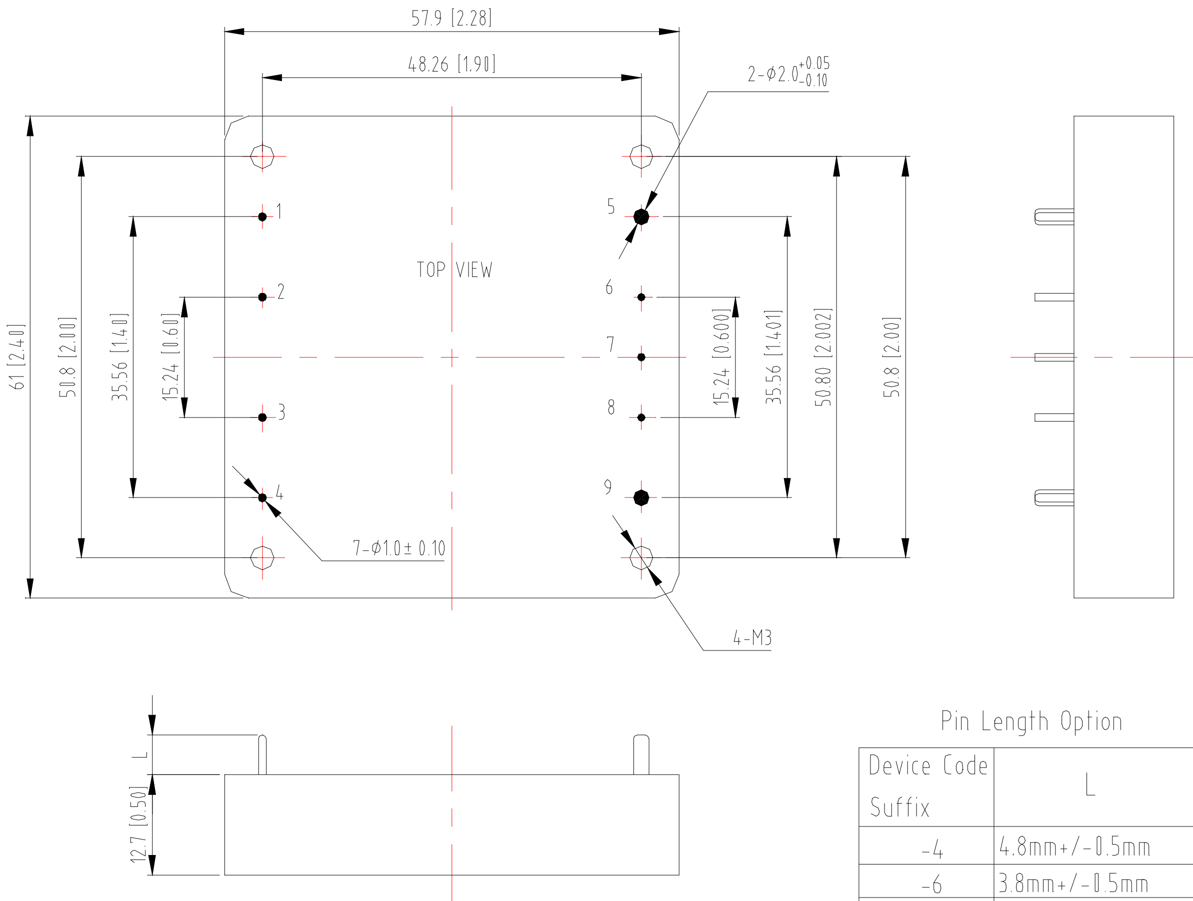


Figure 12: AVE200-48S1V2 Typical Start-up from CNT On

Mechanical Specifications

Mechanical Outlines

AVE200 series



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.

Pin Designations

Pin No	Name	**Function**
1	Vin+	Positive input voltage
2	CNT	Remote control
3	CASE	
4	Vin-	Negative input voltage
5	Vo+	Positive output voltage
6	+SENSE	Positive remote sense
7	Trim	Output voltage trim
8	-SENSE	Negative remote sense
9	Vo-	Negative output voltage

Environmental Specifications

Safety Certifications

The AVE200 series power supply is intended for inclusion in other equipment and the installer must ensure that it is in compliance with all the requirements of the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

Table 4. Safety Certifications for AVE200 series power supply system

Document	File #	Description
UL1950		US Requirements
CSA C22.2 No. 950-95		Canada Requirements
EN60950		European Requirements

Operating Temperature

The AVE200 series power supplies will start and operate within stated specifications at an ambient temperature from -40 ^{O}C to 70 ^{O}C under all load conditions. The storage temperature is -55 ^{O}C to 125 ^{O}C.

Thermal Considerations

AVE200 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.

Measuring the board temperature of the module as the method shown in Figure 13 can verify the proper cooling.

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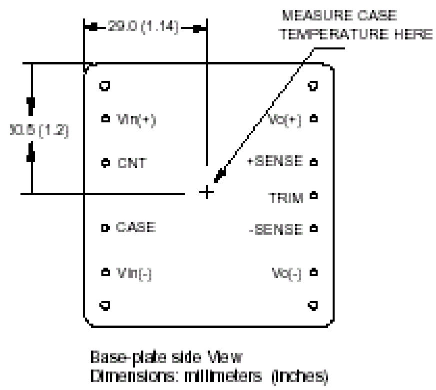

Figure 13 Temperature test point

The module should work under 70 ^{O}C ambient for the reliability of operation and the board temperature must not exceed 100 ^{O}C while operating in the final system configuration. The measurement can be made with a surface probe after the module has reached thermal equilibrium. No heat sink 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 (PD) is got by the equation below:

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PD = PI - PO

Where: PI is input power; PO is output power; PD is dissipated power.

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

η = PO / PI

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

PD = PO (1-η) / η

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

Each power module output voltage has a different power dissipation curve, the following figures show the typical power dissipation curves of AVE200 series.

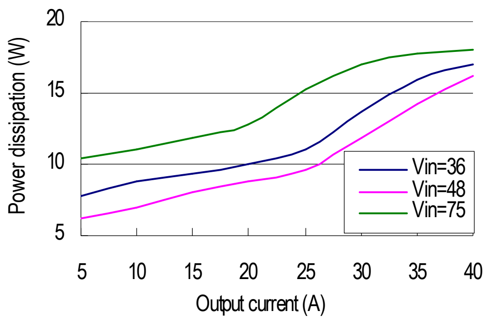


Figure 14 Typical power dissipation
AVE200-48S3V3

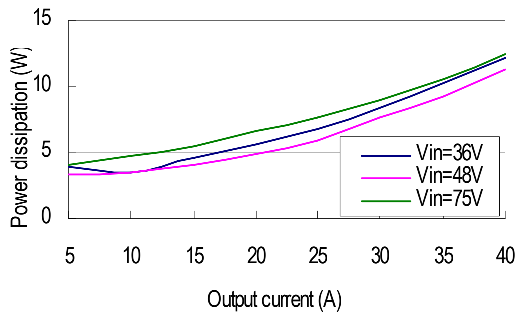


Figure 15 Typical power dissipation
AVE200-48S1V2

Module Derating

Experiment Setup

From the experimental set up shown in Figure 16, the derating curves as Figures 17 & 18 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.

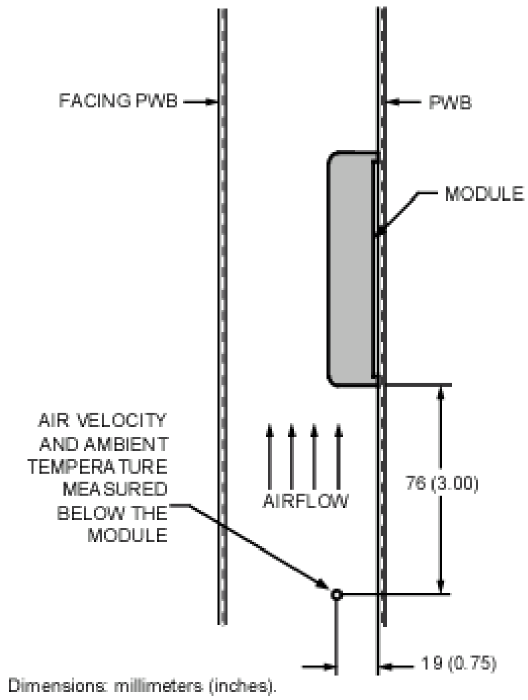


Figure 16 Experiment setup

Convection Without Heat Sinks

Heat transfer can be enhanced by increasing the airflow over the module. Figures 17 and 18 show 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 these figures.

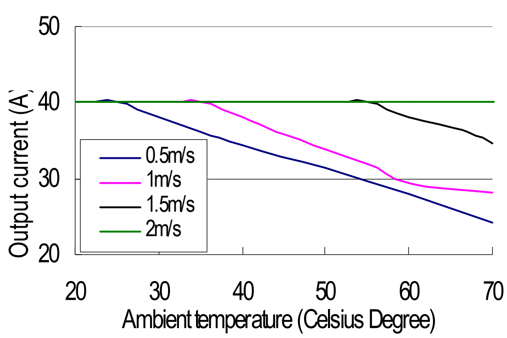


Figure 17 Forced convection power derating without heat sink of AVE200-48S3V3

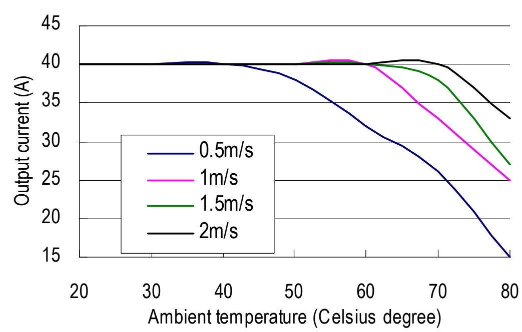


Figure 18 Forced convection power derating without heat sink of AVE200-48S1V2

Heat Sink Configuration

Several standard heat sinks available for the AVE200 series are shown in Figure19 to 21.

The heat sinks mounted to the top surface of the module with screws torqued to 0.56 N-m (5 in.-Ib). A thermally conductive dry pad or thermal grease is placed between the case and the heat sink to minimize contact resistance (typically 0.1 ^{O}C /W to 0.3 ^{O}C /W) and temperature differential.

Nomenclature for heat sink configurations is as follows:

WDxyyy40

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

yyy = heat sink height (in 100ths of inch)

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

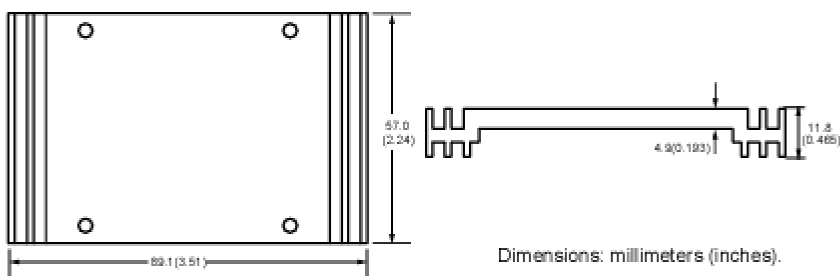


Figure 19 Non-standard heatsink

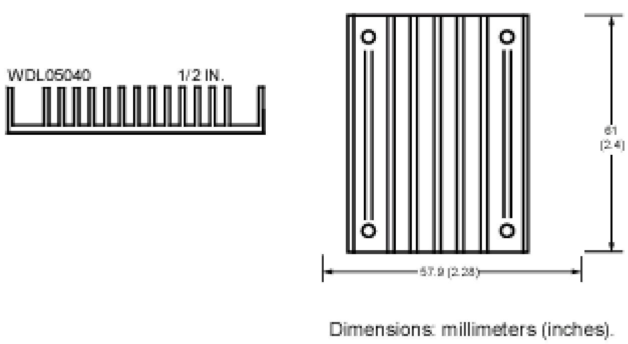


Figure 20 Longitudinal fins heat sink

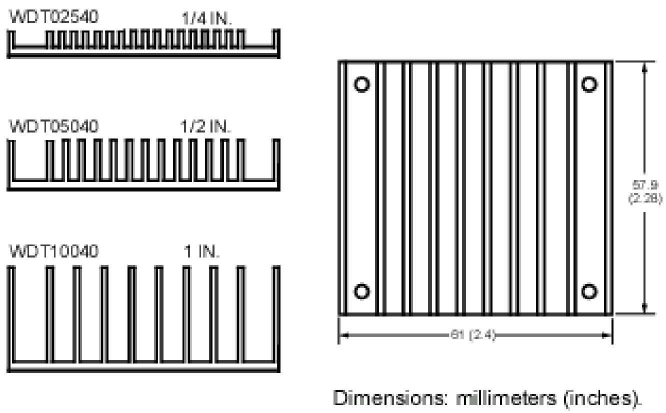


Figure 21 Transverse fins heat sink

Heat Sink Mounting

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

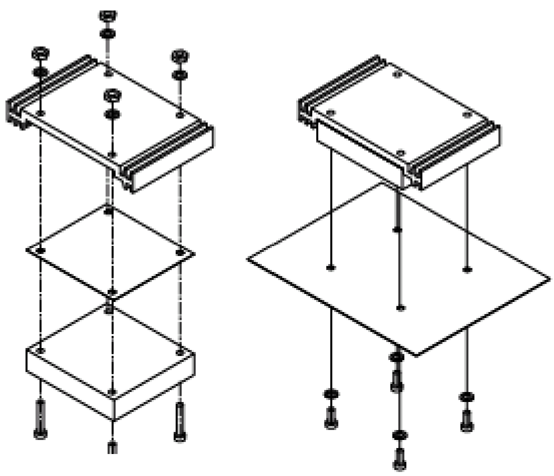


Figure 22 Heat sink mounting

Natural Convection with Heat Sink

The power derating for a module with the heat sink in natural convection is shown in Figures 23 and 24. In this test, natural convection generates airflow about 0.05m/s to 0.1m/s (10ft/min to 20ft/min). Figure 23 and 24 can be used for heat-sink selection in natural convection environment.

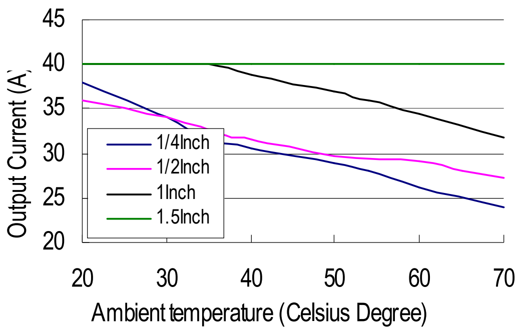


Figure 23 Heat sink power derating curves, natural convection, AVE200-48S3V3

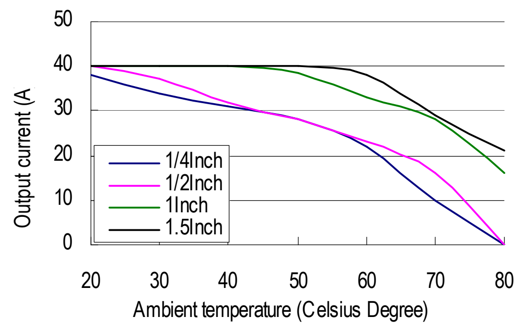


Figure 24 Heat sink power derating curves, natural convection, AVE200-48S1V2

Application Notes

Typical Application

Below is the typical application of the AVE200 series series power supply.

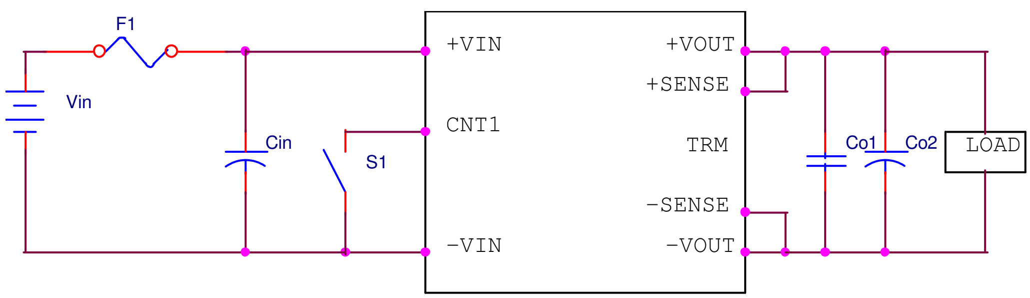


Figure 25 Typical application

F1: Fuse*: Use external fuse (fast blow type) for each unit.

For 3.3V output: 10A (Pout=132W)

For 1.2V output: 5A (Pout=48W)

Cin: Recommended input capacitor

100µF/100V high frequency low ESR electrolytic type capacitor .

Co1: Recommended 1µF /10V ceramic capacitor

Co2: Recommended output capacitor

Recommended 2200µF/10V high frequency low ESR electrolytic type capacitor.

If Ta<-5 °C, use 220µF tantalum capacitor parallel with a 2200µF/ 10V high frequency low ESR electrolytic capacitor.

Note: The AVE200 modules cannot be used in parallel mode directly!

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≤L≤1.2V

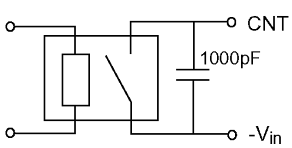
H--- means “High Voltage”, 3.5V≤H≤12V

ON--- means “Module is on”, OFF--- means “Module is off”

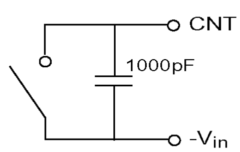
Open--- means “CNT pin is left open “

Note: When CNT is left open, VCNT may reach 18V.

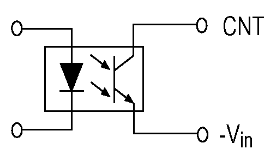
The following figures shows a few simple CNT circuits.



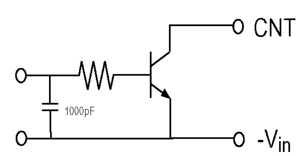
Relay CNT



Simple CNT



Isolated CNT



Transistor CNT

Remote Sense

The AVE200 series 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 the AVE200 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%Vo, 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 26, 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 +Vo, and -Sense with -Vo. Although the output voltage can be increased by both the remote sense and by tine 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.

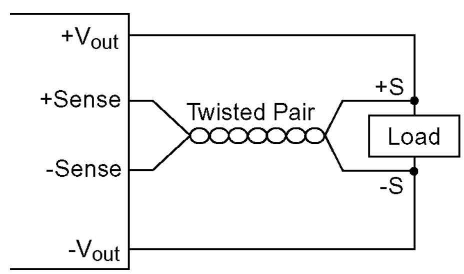


Figure 26 Sense connection

Trim

The +Vo output voltage of the AVE200 series 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 up 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 27).

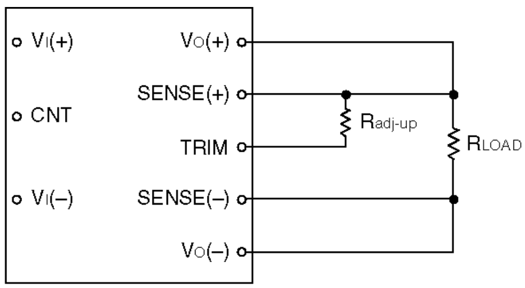


Figure 27 Trim up circuit

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

For 3.3V:

$$R_{adj-up} = \frac{V_o \times (100 + \Delta\%)}{1.26 \times \Delta\%} - \frac{100 + 2 \times \Delta\%}{\Delta\%} (K\Omega)$$

For 1.2V:

$$Radj - up = \frac{2461 + 72.87 \times Vo \times (100 + \Delta\%)}{20.52 \times Vo \times (100 + \Delta\%) - 2461} (K\Omega)$$

Note**:** here is the trim range: -20 ~ +10.

Trim down

With an external resistor between the TRIM and -SENSE pins, the output voltage set point decreases (see Figure 28).

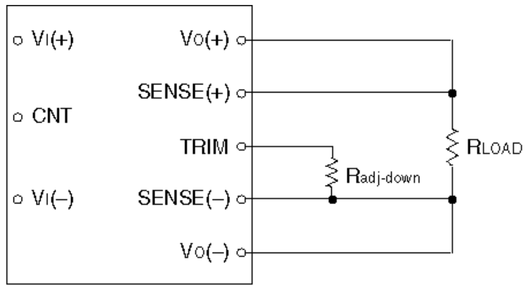


Figure 28 Trim down circuit

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

For 3.3V:

$$R_{adj-down} = \frac{100}{\Delta\%} - 2(K\Omega)$$

For 1.2V:

$$Radj - down = \frac{2461 - 113.92 \times Vo \times (100 - \Delta\%)}{20.52 \times Vo \times (100 - \Delta\%) - 2461}(K\Omega)$$

Note: here is the trim range: -20 ~ +10.

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.

Output Over-current Protection

AVE200 series DC/DC converters 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

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 intermittent 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

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

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. Tp 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 29. The recommended value for the output capacitor C1 is 2200μF.

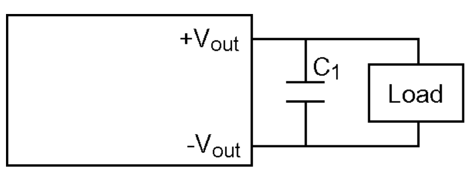


Figure 29 Output ripple filter

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 1F ceramic capacitor C3 in parallel generally as shown in Figure 30.

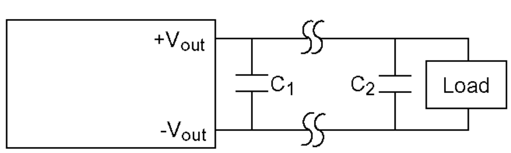


Figure 30 Output ripple filter for a distant load

Decoupling

Noise on the power distribution system is not always created by the converter. 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 10uF tantalum or ceramic capacitor in parallel with a 0.1F 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 31. 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 32.

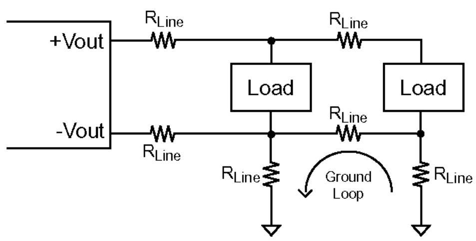


Figure 31 round loops

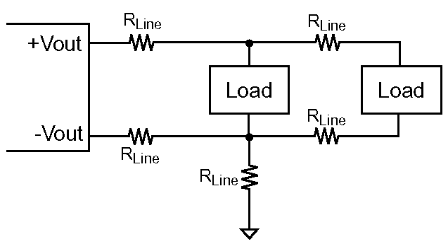


Figure 32 Single point ground

Fusing

The AVE200 power modules have 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, the fuse must be placed in the other input line.

Standard safety agency regulations require input fusing. Recommended fuse ratings for the AVE200 Series are shown as following list.

For 3.3V output: 10A (Pout=132W)
For 1.2V output: 5A (Pout=48W)

Note: The fuse is fast blow type.

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 33. In both cases the diode used is rated for 10A/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.

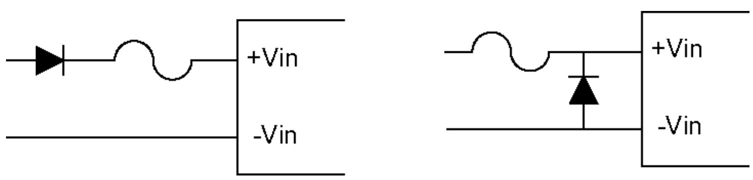


Figure 33 Reverse polarity protection circuit

EMC

For conditions where EMI is a concern, a different input filter can be used. Figure 34 shows a filter designed to reduce EMI effects. AVE200 series can meet EN55022 CLASS A with Figure 34.

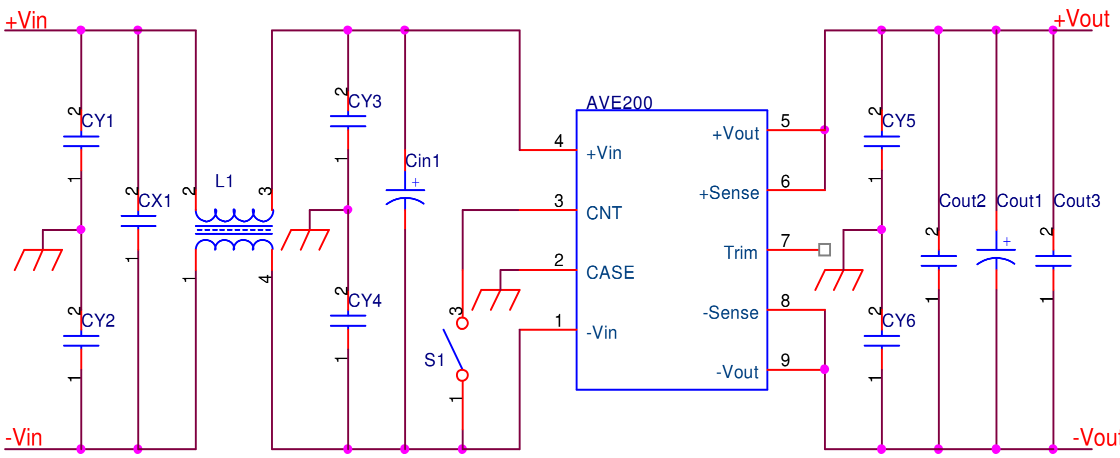


Figure 34 EMI reduction filter

Recommended values:

CX1	2.2uF/100V
CY1,CY2	1000P/2KV
CY3,CY4	0.1uF/100V
Cin1	100uF/100V
CY5,CY6	4700P/2KV
Cout1	2200uF/10V
Cout2	0.1uF/50V
Cout3	0.01uF/50V
L1	3.6mH

Safety Consideration

For safety-agency approval of the system in which the power module is used, the power module must be installed in compliance with the spacing and separation requirements of the end-use safety agency standard, i.e., UL1950, CSA C22.2 No. 950-95, and EN60950. The AVE200 series input-to-output isolation is a basic insulation. The DC/DC power module should be installed in end-use equipment, in compliance with the requirements of the ultimate application, and is intended to be supplied by an isolated secondary circuit. When the supply to the DC/DC power module meets all the requirements for SELV (<60Vdc), the output is considered to remain within SELV limits (level 3). If connected to a 60Vdc power system, double or reinforced insulation must be provided in the power supply that isolates the input from any hazardous voltages, including the ac mains. One input pin and one output pin are to be grounded or both the input and output pins are to be kept floating. Single fault testing in the power supply must be performed in combination with the DC/DC power module to demonstrate that the output meets the requirement for SELV. The input pins of the module are not operator accessible.

Note: Do not ground either of the input pins of the module without grounding one of the output pins. This may allow a non-SELV voltage to appear between the output pin and ground.

Installation

Although AVE200 series converters can be mounted in any orientation, free air-flowing is always necessary. Normally, power components are located at the end of the airflow path or have separate airflow paths so as to keep other system equipment cooler and increase component life spans.

Soldering

AVE200 series converters are 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.

Weight

The AVE200 series weight is 80g maximum.

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