

DC-DC CONVERTER AER50-W

RAILWAY CONVERTER.

FOR PCB MOUNTING



HIGHLIGHTS

- + Output Power up to 50 Watts
- + Efficiency up to 89 %
- + Ultra Wide Input Range
- + Wide Temperature Range
- + RoHS compliance
- + According to EN50155
- + Remote On/Off

INPUT

Input Voltage Nominal 24, 36, 48, 72, 96, 110 VDC

OUTPUT

Output Voltage 5, 12, 24 and 48 VDC

Initial Set Accuracy < 1 %*

Minimum Load No minimum load

Short Circuit Continuous short circuit proof

Line Regulation < 0,2 %, see note 1 page 3

Load Regulation < 0,2 %, see note 2 page 3

Ripple & Noise 40 mV RMS, 100mV pk-pk, 20 MHz bandwidth**

Start Time 30 ms typ.

Max. Output Capacitance See table page 2

Temperature Coefficient < 0.02 %/°C

FEATURES

Remote On/Off See notes 4 & 5 page 3

Sense +/- Remote sense to compensate for lead drops of the output line up to 10 %

Trim -20 %, +10 % adjustable output voltage (with an external resistor)

Max. Operating Altitude 5000 m

PROTECTION

Over Temperature Protection (OTP) Shut down at typ. 110°C baseplate temp. with about 15°C hysteresis and auto recovery

Over Voltage Protection (OVP) 115-140 % $V_{out, nom}$

Over Current Protection (OCP) 110 % - 220 % $I_{out, nom}$

GENERAL

Product Standard EN 50155

Isolation Input to Output 3000 VDC

Input to case 2500 VDC

Output to case 500 VAC

Isolation Resistance > 100 M Ω Input to Output

Isolation Capacitance typ. 1nF Input to Output

Switching Frequency Typ. 240 kHz

Lead Temperature 260°C (1,5 mm from case for 10 sec.)

Dimensions [mm] 57.9 x 36.8 x 12.7

Weight 61,5 g

MTBF 780.000h acc. to MIL-HDBK-217F (GB,25°)

Fire & Smoke EN 45545-2

ENVIRONMENTAL

Operating Case Temp. -40°C to +100°C

Storage Temperature -55°C to +125°C

Vibration / Shock / Bump MIL-STD-810F / EN61373

EMC & SAFETY

EMC Standard EN 50121-3-2

Conducted Emissions EN 55011, Class A, with external input filter***

ESD Immunity EN 61000-4-2 Air \pm 8 kV, Contact \pm 6 kV, Criteria A

Burst EN 61000-4-4 \pm 2 kV, Criteria A****

Surge EN 61000-4-5 line to line \pm 2 kV, Criteria A****

Line to earth \pm 4 kV, Criteria A

Conducted Immunity EN 61000-4-6 10 V, Criteria A

Radiated Immunity EN 61000-4-3 20 V/m, Criteria A

Safety UL60950-1 2nd (basic insulation)

* For $T_{amb} = 25^\circ\text{C}$, $V_{in, nom}$, $I_{out, nom}$

** See note 3 page 3

*** In built-in condition our devices may show different EMC properties

**** With external capacitor and suppressor diode

TECHNICAL DATA

For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$, unless otherwise specified.

SPECIFICATION Input 14 - 160 VDC (24, 36, 48, 72, 96, 110 Vin nom)

TYPE	Unit	AER50-W05			AER50-W12			AER50-W24			AER50-W48		
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
ORDER NUMBER		11 75 12 0051 8			11 75 12 0121 1			11 75 12 0241 9			11 75 12 0481 7		
CHARACTERISTIC	Unit	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max
INPUT													
Input Voltage Operating	V	14...160											
Max. Input Surge Voltage (100 ms max.)	V	200											
Under Voltage Turn-on	V	13,2...14											
Under Voltage Turn-off	V	11,8...12,6											
Input Current @ Full Load 72 V	mA		530			810			810			810	
Input Current @ No Load (typical)	mA	5			5			5			8		
Standby Input Current (typical)	mA	3											
OUTPUT													
Output Voltage	V	5			12			24			48		
Output Current	A			6			4,2			2,1			1,05
Output Power	W			30			50,4			50,4			50,4
Max. Capacitive Load	μF			10000			6800			3300			680
Efficiency @ Full Load 72V	%		83			87			89			88	
Efficiency @ Full Load 110V	%		81			86			87			85	
Output Current Limit Inception*	%	110	180	220	110	180	220	110	180	220	110	180	220
Transient Response 75% / 100% Load Step, Recovery Time < 250 μs	%	$\pm 5\%$											

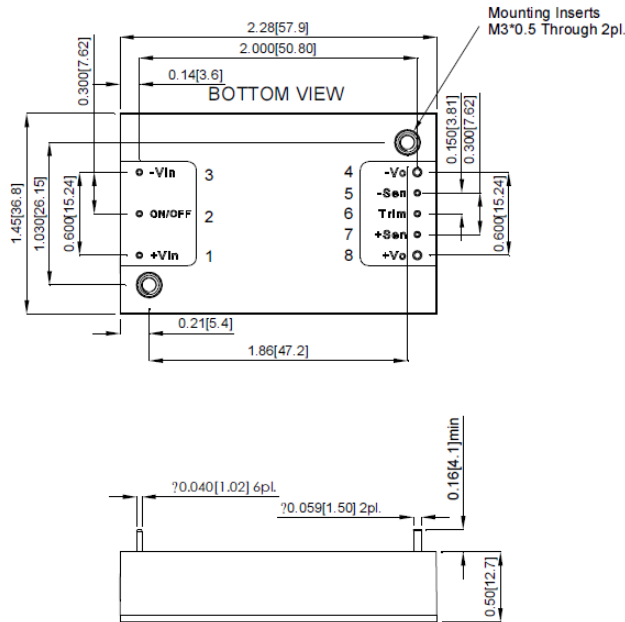
* Hiccup mode, auto recovery

TECHNICAL DATA

For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$, unless otherwise specified.

MECHANICAL DETAILS

1. Dimensions are in inches [mm].
2. Tolerance: Inches: X.XX \pm 0.02, X.XXX \pm 0.010
Millimeters: X.X \pm 0.5, X.XX \pm 0.25



Case Material: Plastic, DAP
Baseplate Material: Aluminium
Potting Material: UL 94V-0
Pin Material: Base: Copper
Plating: Nickel with Matte Tin
Weight: 61.5 g

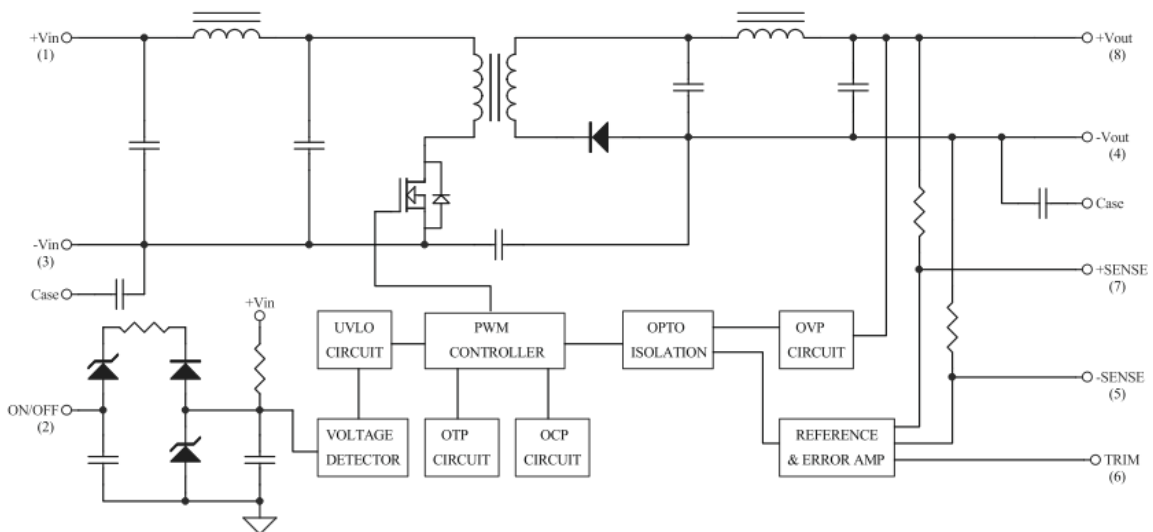
PINNING

Pin	Function
1	+V _{in}
2	Remote On/Off
3	-V _{in}
4	-V _{out}
5	- Sense
6	Trim
7	+ Sense
8	+V _{out}

NOTES

1. Measured from high line to low line.
2. Measured from full load to zero load.
3. Output ripple and noise measured with 22 μ F aluminum solid capacitor and 1 μ F ceramic capacitor across output.
4. Logic compatibility
Module on: open collector ref to -Input >3.5 VDC to 160 VDC or open circuit
Module off: 0 to <1.2 VDC
5. Suffix "N" to the model number with negative logic remote on/off
Module on: 0 to <1.2 VDC
Module off: >4.0 VDC to 160 VDC or open circuit
6. Suffix "C" to the model number with clear mounting insert (3.2 mm DIA.)
7. An external input capacitor 68 μ F for all models are recommended to reduce input ripple voltage.
8. For information about EN50155 and RIA12, refer to application note.

BLOCK DIAGRAM



DESCRIPTION OF FEATURES

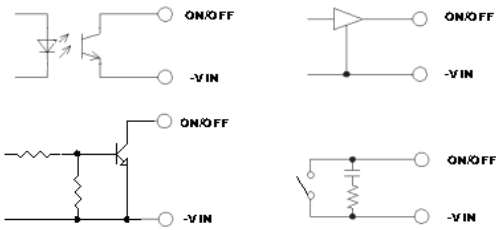
For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$ unless otherwise specified.

REMOTE ON/OFF

The AER50-W series allows the user to switch the module on and off electronically with the remote on/off feature. All models are available in "positive logic" and "negative logic" (optional) versions. The converter turns on if the remote on/off pin is high (>3.5Vdc to 160Vdc or open circuit). Setting the pin low (0 to <1.2Vdc) will turn the converter off. The signal level of the remote on/off input is defined with respect to ground. If not using the remote on/off pin, leave the pin open (converter will be on). Models with part number suffix "N" are the "negative logic" remote on/off version. The unit turns off if the remote on/off pin is high (>4.0Vdc to 160Vdc or open circuit). The converter turns on if the on/off pin input is low (0 to <1.2Vdc). Note that the converter is off by default.

Logic State (Pin 2)	Negative Logic	Positive Logic
Logic Low – Switch Closed	Module on	Module off
Logic High – Switch Open	Module off	Module on

The converter remote On/Off circuit built-in on input side. The ground pin of input side Remote On/Off circuit is -VIN pin. Connection examples see below.

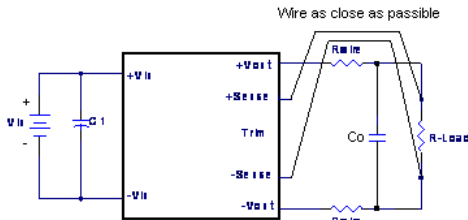


OUTPUT REMOTE SENSING

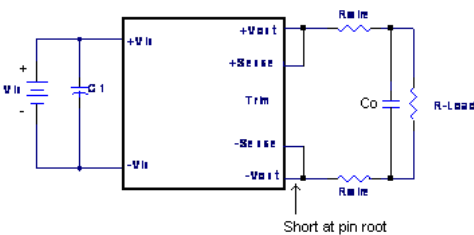
The AER50-W series converter has the capability to remotely sense both lines of its output. This feature moves the effective output voltage regulation point from the output of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the AER50-W12 series in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load. The remote-sense voltage range is:

$$[(+V_{out}) - (-V_{out})] - [(+Sense) - (-Sense)] \leq 10\% \text{ of } V_{o_nominal}$$

When remote sense is in use, the sense should be connected by twisted-pair wire or shield wire. If the sensing patterns short, heavy current flows and the pattern may be damaged. Output voltage might become unstable because of impedance of wiring and load condition when length of wire is exceeding 400mm. This is shown in the schematic below.

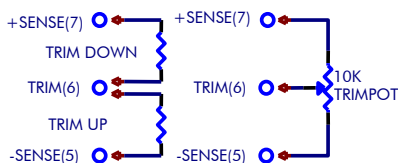


If the remote sense feature is not to be used, the sense pins should be connected locally. The +Sense pin should be connected to the +Vout pin at the module and the -Sense pin should be connected to the -Vout pin at the module. Wire between +Sense and +Vout and between -Sense and -Vout as short as possible. Loop wiring should be avoided. The converter might become unstable by noise coming from poor wiring. This is shown in the schematic below.



OUTPUT TRIMMING

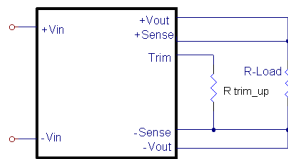
Output may be externally trimmed (-20% to +10%) with a fixed resistor or an external trim pot as shown (optional). Model specific formulas for calculating trim resistors are available upon request as a separate document.



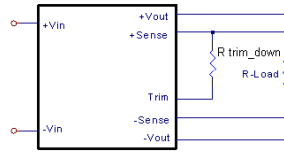
DESCRIPTION OF FEATURES

For $T_{amb} = 25^{\circ}\text{C}$, $V_{in\ nom}$, $I_{out\ nom}$ unless otherwise specified.

In order to trim the voltage up or down, one needs to connect the trim resistor either between the trim pin and -Sense for trim-up or between trim pin and +Sense for trim-down. The output voltage trim range is -20% to +10%. This is shown:



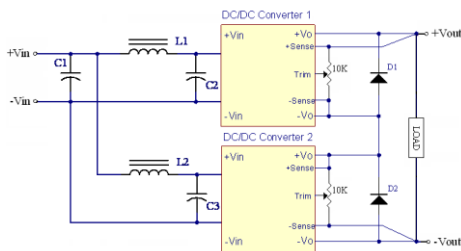
Trim-up Voltage Setup



Trim-down Voltage Setup

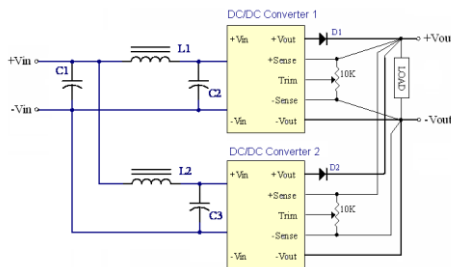
SERIES OPERATION

Series operation is possible by connecting the outputs two or more units. Connection is shown in below. The output current in series connection should be lower than the lowest rate current in each power module.



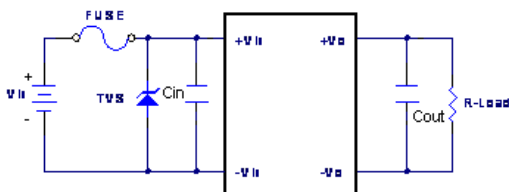
PARALLEL/REDUNDAND OPERATING

The AER50-W series parallel operation is not possible. Parallel for redundancy operation is possible by connecting the units as shown in the schematic below. The current of each converter become unbalance by a slight difference of the output voltage. Make sure that the output voltage of units of equal value and the output current from each power supply does not exceed the rate current. Suggest use an external potentiometer to adjust output voltage from each power supply.



INPUT FUSING AND SAFETY CONSIDERATIONS

The AER50-W series converters have no internal fuse. In order to achieve maximum safety and system protection, always use an input line fuse. We recommended a 6A fast acting fuse for all models. It is recommended that the circuit have a transient voltage suppressor diode (TVS) across the input terminal to protect the unit against surge or spike voltage and input reverse voltage (as shown).



The external TVS is required if AER50-W series has to meet EN61000-4-4, EN61000-4-5. The AER50-W series recommended a TVS (Littelfuse 1.5KE180A) to connect parallel.