AEH08U48 Series

400 Watts

Half Brick DC-DC

Total Power: 400 Watts
Input Voltage: 38-60 Vdc
# of Outputs: Single

Special Features

- High power converter
- High efficiency (94% Typical)
- Industry standard package Half Brick 2.30"x2.40"x0.50"
- High capacitive load limit on start-up
- Industry standard features: Input UVLO, Output Enable, Output Trim, differential Remote sense, OCP,OVP,OTP
- Basic isolation
- EU directive 2002/95/EC Compliant for RoHS (RoHS 6)

Safety

UL, cUL 60950-1
TUV EN60950-1

Product Descriptions

The AEH08U48 series DC-DC converter is Emerson's latest addition to its Half brick standard products offering. It operates from an input range of 38 to 60 Vdc and provides a fully regulated 53Vdc output delivering up to 7.55A at a rated continuous output power of up to 400W with conversion efficiency up to 94%.

This converter comes with industry standard features such as Input UVLO, Output Enable, Output Trim, Differential Remote Sense, OCP, OVP and OTP. It also has an integrated baseplate for direct coupling to cooling heatsink surface.

The AEH08U48 DC-DC converter meets all major safety standards (UL, cUL and TUV).

EMERSON
Network Power

Model Numbers

Model	Input Voltage Range	Output Voltage	Maximum Load
AEH08U48	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48-6	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48N	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48N-6	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48-L	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48-6L	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48N-L	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48N-6L	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48N-6ML	38 – 60 Vdc	53 Vdc	7.55A
AEH08U48N-6AL	38 – 60 Vdc	53 Vdc	7.55A

Options

Suffix	Option
N	Negative Logic Enable
Without N	Positive Logic Enable
L	RoHS 6
Without L	RoHS 5
M	Modified
Without M	Standard
6	3.7mm Pin Length
Without 6	5.0mm Pin Length
A	Non-threaded hole for M2.5 screws
Without A	Threaded hole for M3.0 screws

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: DC continuous operation	All models	V_I	38	-	60	Vdc
Maximum Output Power	All models	$P_{O,max}$	-	-	400	W
Isolation Resistance Input to GND	All models		50	-	-	Mohm
Isolation Voltage Input to Output	All models		-	-	2400	Vdc
Operating Temperature						
Long-Term	All models	T_A	-5	-	+55	ºC
Short-Term	All models	T_A	-5	-	+70	ºC
Storage Temperature	All models	T_{STG}	-55	-	+125	ºC
Humidity (non-condensing)						
Operating	All models		10	-	90	%
Non-operating	All models		10	-	90	%
Altitude						
Operating	All models		-500	-	10,000	feet
Non-operating	All models		-500	-	30,000	feet

Input Specifications

Table 2. Input Specifications:

Parameter	Conditions	Symbol	Min	Nom	Max	Unit
Operating Input Voltage, DC		V_I	38	-	60	Vdc
Transient Input Voltage (Voltage transient at 10μS)			- -	- -	80	Vdc
Maximum Input Current ($I_O = I_{O,max}$)	V_{IDC} = 38Vdc	$I_{I,max}$	- -	- -	11.8	A
Inrush Current			-	-	0.7	A^2Sec
Input Ripple Current			-	-	150	mA_{RMS}
No Load Input Current	V_{IDC} = 38Vdc V_{IDC} = 60Vdc	I_{I,no_load}	- -	- -	180 120	mA
No Load Input Power	V_{IDC} = 60Vdc	P_{I,no_load}	-	-	5.5	W
Input Capacitance			80	-	-	μF

Output Specifications

Table 3. Output Specifications:

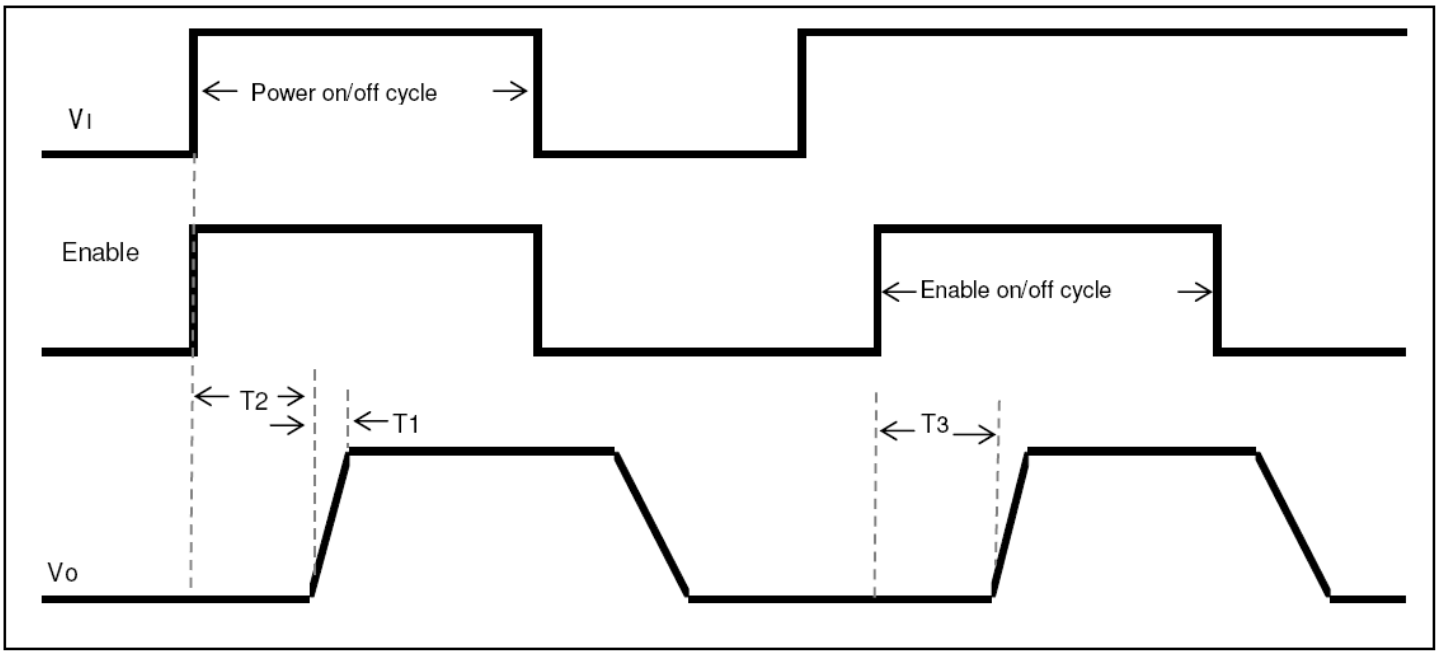
Parameter	Condition	Symbol	Min	Nom	Max	Unit
Output Voltage Set-Point		V_O	51.5	53.0	54.5	Vdc
Output Current		I_O	-	-	7.55	A
Line Regulation			-	-	0.2	$\%V_O$
Load Regulation			-	-	100	mV
Output Ripple, pk-pk	40Vdc ≤ V_I ≤ 52Vdc Measure with a 0.1 μ F ceramic capacitor in parallel with 2x 100 μ F electrolytic capacitor, 0 to 20MHz bandwidth, see application note for set up		-	-	150	mVp-p
Load Transient Response Peak Deviation Settling Time	25-50% and 50-75% load step, slew rate = 1A/μs	 $\pm\%V_O$ T_s	 - -	 - -	 1500 250	 mVp-p μSec
Turn-on Overshoot	No load with nominal output cap.		-	-	0	$\%V_O$
Output Voltage Adjustment Range		V_O	-5	-	+5	$\%V_O$
Output Power		P_O	-	400	-	W
Efficiency	I_I = 7.55A V_I = 48Vdc	η	93.0	-	-	%
Output Capacitance			160	200	240	μF
Output Rise Time	10 to 90% of V_O		5	-	100	mSec
Switching Frequency		f_{SW}	350	400	450	KHz

System Timing Specifications

Table 4. System Timing Specifications:

Label	Parameter	Min	Typ	Max	Unit
T1	Output Rise Time (from 10% to 90% V_O nominal)	5	-	100	mSec
T2	Turn on delay (from V_I ON to 10% of V_O nominal)	5	-	50	mSec
T3	Turn on delay (from Enable go High (AEH08U48) to 10% of V_O nominal)	5	-	50	mSec

Table 2. System Timing diagram (positive logic Enable):



AEH08U48 Performance Curves

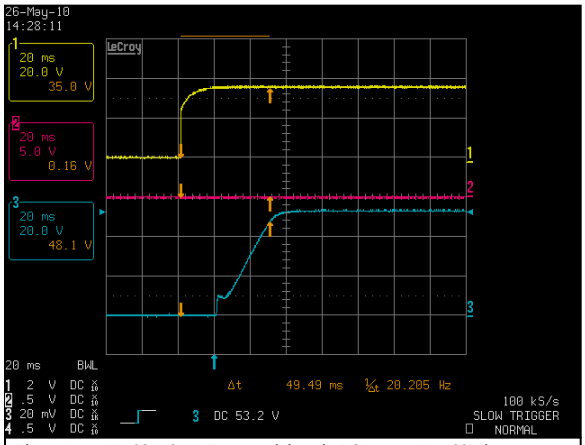


Figure 1: AEH08U48N-L Turn-on delay via DC Input – V_I = 38Vdc

Ch 1: V_I Ch 2: Enable Ch3: V_O

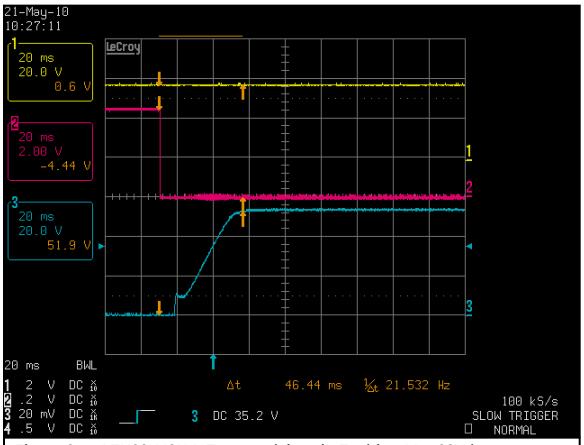


Figure 2: AEH08U48N-L Turn-on delay via Enable – V_I = 38Vdc

Ch 1: V_I Ch 2: Enable Ch3: V_O

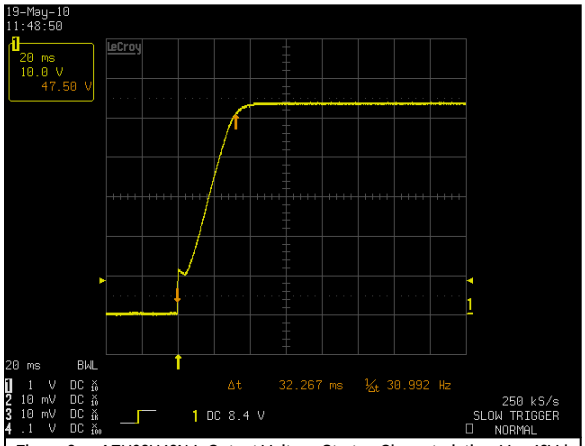


Figure 3: AEH08U48N-L Output Voltage Startup Characteristic – V_I = 48Vdc
I_O = 0A

Ch 1: V_O

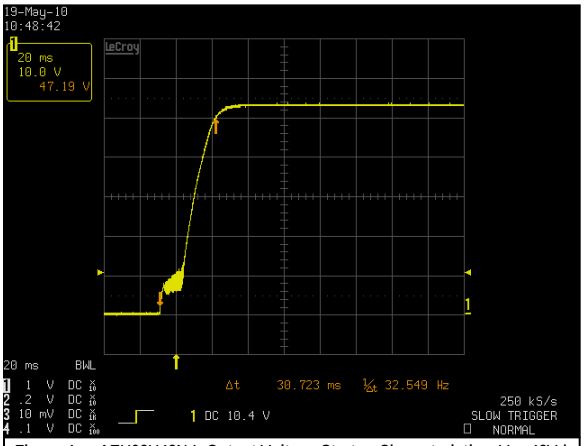


Figure 4: AEH08U48N-L Output Voltage Startup Characteristic – V_I = 48Vdc
I_O = 7.55A

Ch 1: V_O

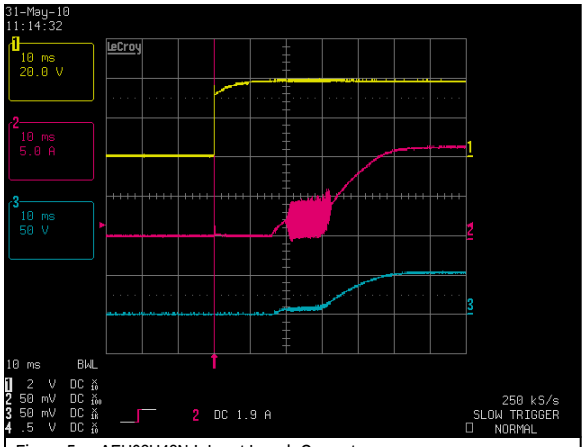


Figure 5: AEH08U48N-L Input Inrush Current
V_I = 38Vdc I_O = 7.55A
Ch 1: V_I Ch 2: I_I Ch 3: Vo

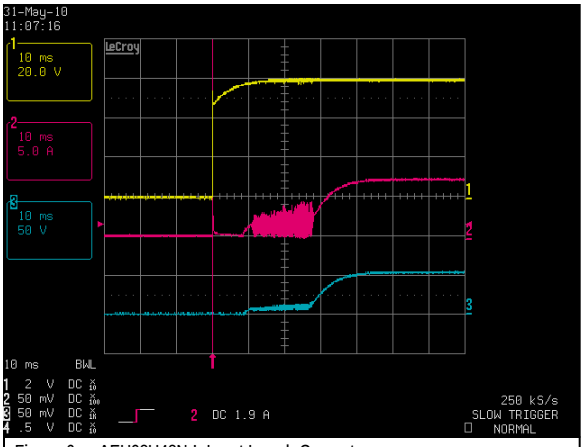


Figure 6: AEH08U48N-L Input Inrush Current
V_I = 60Vdc I_O = 7.55A
Ch 1: V_I Ch 2: I_I Ch 3: Vo

AEH08U48 Performance Curves

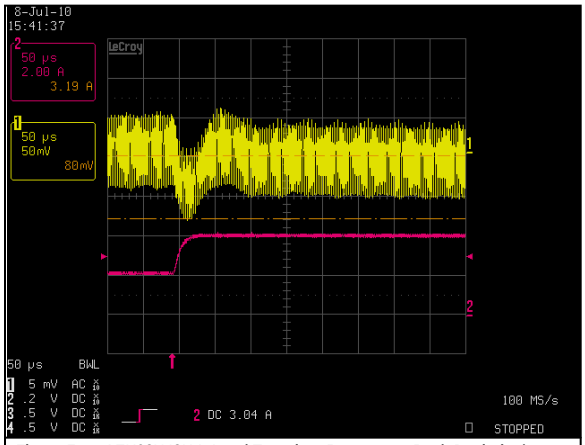


Figure 7: AEH08U48N-L Load Transient Response –Peak Deviation)
25% to 50% load change , Vin = 48VDC (Low to High)
Ch 1: Vo Ch 2: Io

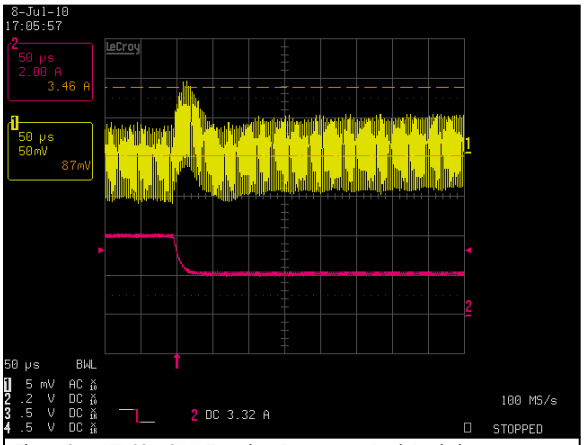


Figure 8: AEH08U48N-L Transient Response – Peak Deviation
50% to 25% load change, Vin = 48VDC (High to Low)
Ch 1: Vo Ch 2: Io

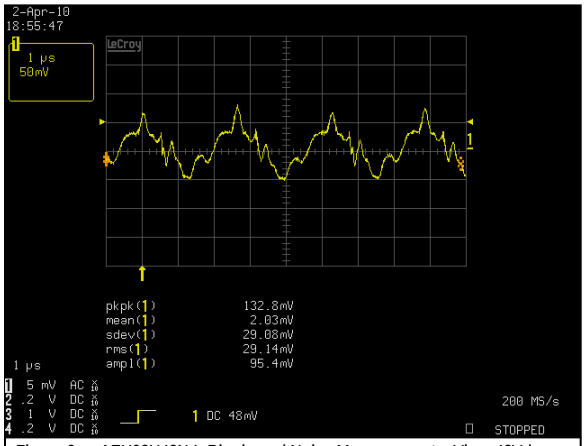


Figure 9: AEH08U48N-L Ripple and Noise Measurement – Vin = 48Vdc
Full Load: Io = 7.55A,
Ch 1: Vo

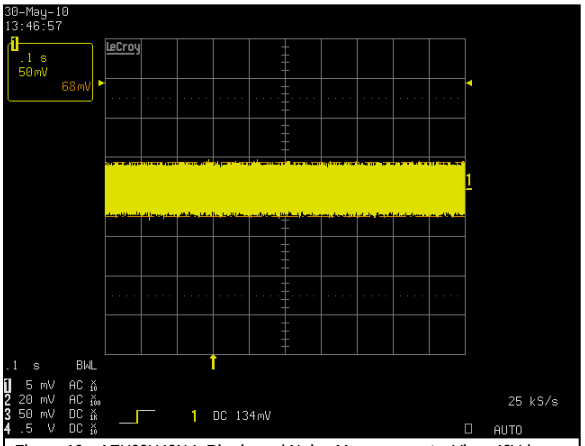


Figure 10: AEH08U48N-L Ripple and Noise Measurement – Vin = 48Vdc
Full Load: Io = 7.55A,
Ch 1: Vo

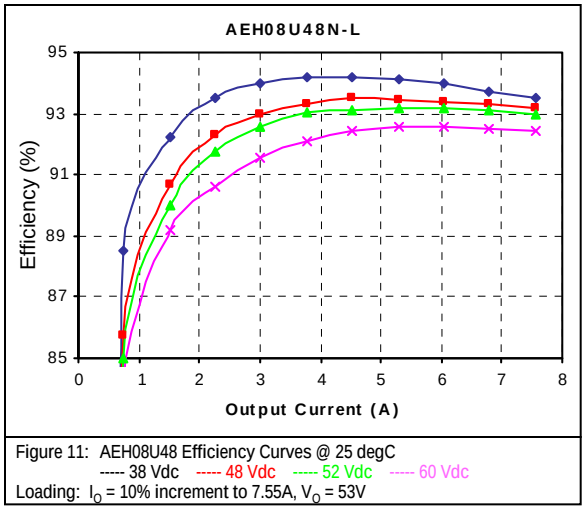


Figure 11: AEH08U48 Efficiency Curves @ 25 degC
----- 38 Vdc ----- 48 Vdc ----- 52 Vdc ----- 60 Vdc
Loading: I_O = 10% increment to 7.55A, V_O = 53V

Protection Function Specification

Over Voltage / Under Voltage Protection (OVP / UVP)

OVP

Parameter	Min	Nom	Max	Unit
V_I Input Overvoltage	70	76	85	Vdc
V_O Output Overvoltage	57.0	-	60.0	Vdc

UVP

Parameter	Min	Nom	Max	Unit
Turn-on Input under voltage	35.5	36.5	37.5	Vdc
Turn-off Input under voltage	34.0	35.0	36.0	Vdc

Over Current / Over Temperature Protection (OCP / OTP)

OCP

Current Limit protection (non-latching), limits apply at room ambient only

Parameter	Min	Nom	Max	Unit
I_O Current Limit	8.50	-	11.5	A

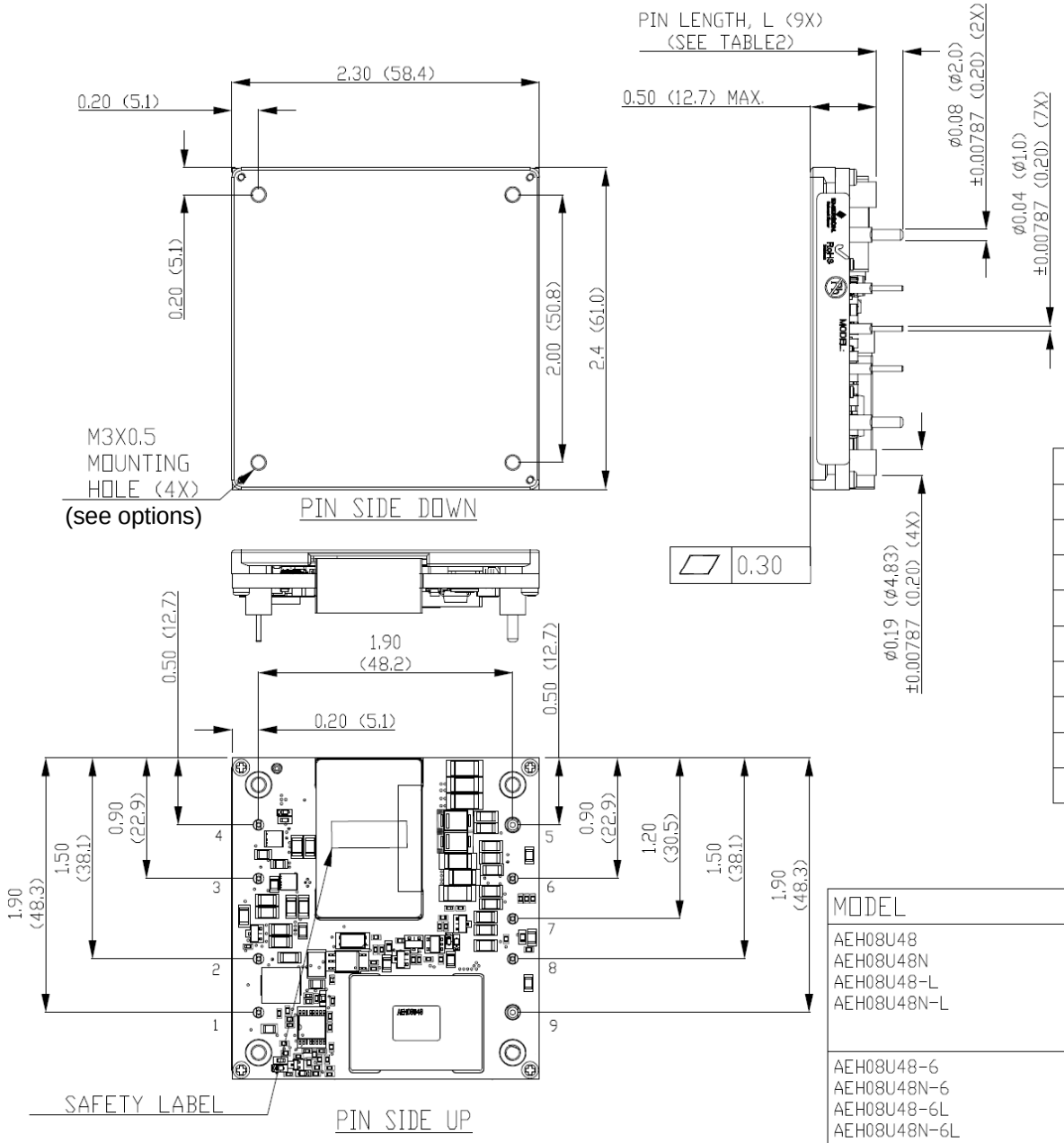
OTP

Over Temperature (non-latching), baseplate temperature

Parameter	Min	Nom	Max	Unit
Over - temperature	110	-	130	° C

Mechanical Specifications

Mechanical Outlines



PIN#	FUNCTION
1	Vin (+)
2	ENABLE
3	CASE
4	Vin (-)
5	Vout (-)
6	SENSE (-)
7	TRIM
8	SENSE (+)
9	Vout (+)

TABLE1

MODEL	PIN DIM. "L"
AEH08U48 AEH08U48N AEH08U48-L AEH08U48N-L	0.197±0.0197 (5.0±0.5)
AEH08U48-6 AEH08U48N-6 AEH08U48-6L AEH08U48N-6L AEH08U48N-6ML	0.145±0.00787 (3.68±0.2)

TABLE2

MECH. OUTLINE DIMENSIONS ARE IN INCHES (mm.)

TOLERANCES:
WHOLE NO.
±0.05 (0.13)
DECIMAL
.X ± 0.02 (0.50)
.XX ± 0.02 (0.50)

ANGLE
± 2°

Mounting Hole Options	
-6AL	M2.5 clearance hole, non-threaded
Default	M3.0 x 0.5 threaded

Weight

The AEH08U48 series weight is 0.25 lbs. (113 grams) maximum.

Safety Certifications

The AEH08U48 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 5. Safety Certifications for AEH08U48 series power supply system

Document	Description
cUL	US and Canada Requirements
UL	US Requirements
EN60950	European Requirements
TUV AGENCY	German Requirements
CB Certificate and Report	(All CENELEC Countries)

Operating Temperature

Parameter	Min	Nom	Max	Unit
Long-Term (Note1)*	-5	-	55	ºC
Short-Term (Note2)*	-5	-	70	ºC
Air Flow Velocity	200			LFM

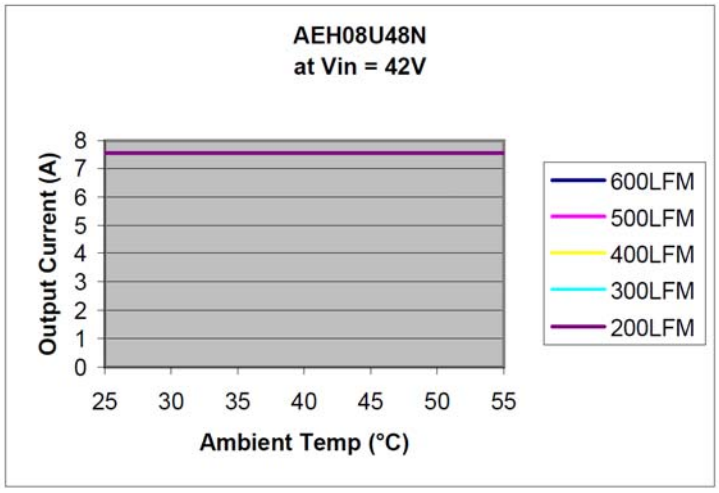
* Note: 1) Unit's component temperatures will not exceed Emerson derating guidelines.
2) Unit's component temperatures can exceed Emerson derating guidelines, but will not exceed component max temperature ratings, will not activate the OTP, and will not compromise long-term reliability.

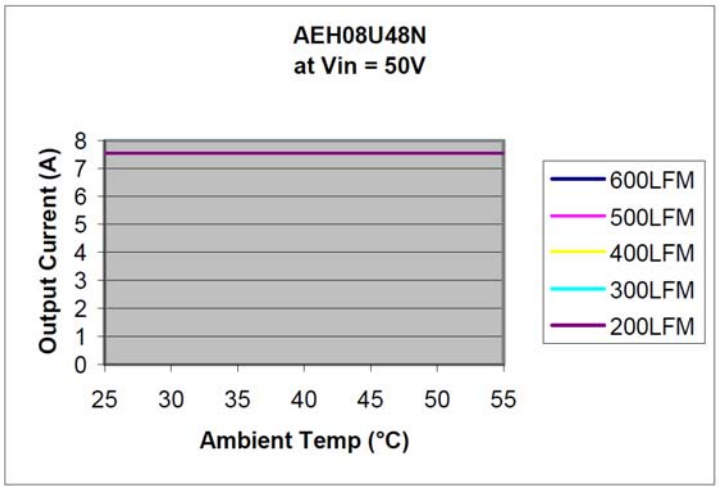
Forced Air Cooling

The AEH08U48 series power supply will require minimum 200LFM force air cooling to operate properly.

Derating Curves

Both the ambient operating temperature and the method of cooling will limit the maximum power available from the AEH08U48 series power supply.





Storage and Shipping Temperature / Humidity

The AEH08U48 series power supplies can be stored or shipped at temperatures between –55 ° C to +125 ° C and relative humidity from 10% to 90% non-condensing.

Altitude

The AEH08U48 series will operate within specifications at altitudes between -500 to 10,000 feet.

Humidity

The AEH08U48 series will operate within specifications when subjected to a relative humidity from 10% to 90% non-condensing.

Power and Signal Pins

These pins provide power and signal interface to the AEH08U48 series module.

Pin 1	- Vin (+)	– Input Voltage Positive
Pin 2	- ENABLE	– ON / OFF Control
Pin 3	- CASE	– Connection to Baseplate
Pin 4	- Vin (-)	– Input Voltage Return
Pin 5	- Vout (-)	– Output Voltage Return
Pin 6	- SENSE (-)	– Remote Sense Return
Pin 7	- TRIM	– Output Voltage Trim
Pin 8	- SENSE (+)	– Remote Sense Positive
Pin 9	- Vout (+)	– Output Voltage Positive

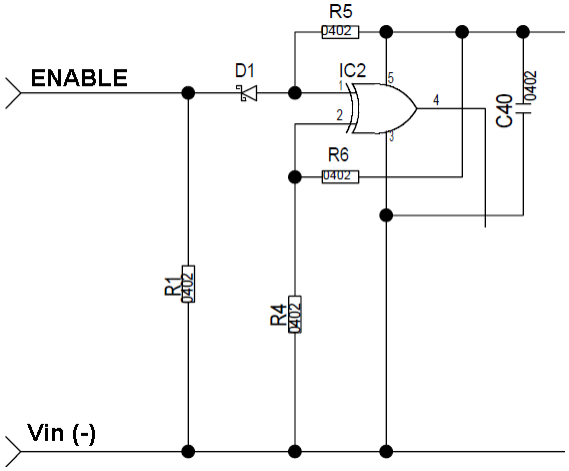
Vin (+), Vin (-) – (Pin 1 and Pin 4)

These pins are the Input Voltage Positive and Input Voltage Return pins of the module.

ENABLE – (Pin 2)

ENABLE pin allows the user to turn ON and OFF the output of the AEH08U48 series modules. The ENABLE signal is referenced to the Vin (-) pin.

- For positive ENABLE logic (AEH08U48) - unit turns ON (ENABLE = high or open) or OFF (ENABLE = low or short)
- For negative ENABLE logic (AEH08U48N) - unit turns ON (ENABLE = low or short) or OFF (ENABLE = high or open)



CASE – (Pin 3)

CASE pin is connected internally to the baseplate of the AEH08U48 series modules, it can be used to connect the baseplate to an EMI ground such as chassis ground or Vin (-) for shielding purpose.

Vout (+), Vout (-) – (Pin 9 and Pin 5)

These pins are the Output Voltage Positive and Output Voltage Return pins of the module.

SENSE (+), SENSE (-) – (Pin 8 and Pin 6)

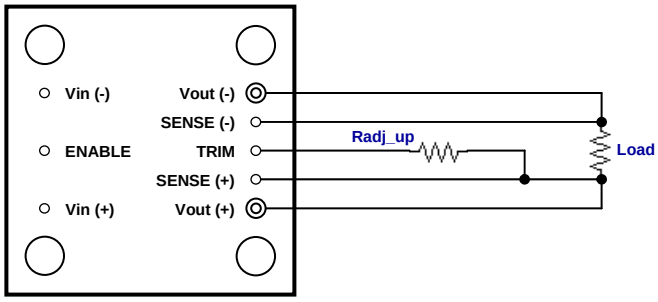
The AEH08U483 is equipped with a Remote Sensing capability that will compensate for voltage drop between the output pins of the module and the sensed voltage point (load). This feature is implemented by connecting the SENSE (+) (pin 9) and the SENSE (-) (pin 5)) to the positive and return rails of the output, respectively, at a location that is near to the load. Care should be taken in the routing of the sense lines as any noise sources or additional filtering components introduced into the output voltage rail may affect the stability of the power supply. The AEH08U48 series will operate appropriately without the sense lines connected; however it is recommended that the sense lines be connected directly to the output pins if remote sensing is not required.

TRIM – (Pin 7)

Output voltage adjustment is accomplished by connecting an external resistor between the TRIM pin and either the Sense (+) or Sense (-) pin.

To adjust V_O to a higher value, an external resistor Radj_up should be connected between the TRIM pin and the SENSE (+) pin. Use the following equation to determine the required Radj_up resistor:

$$\text{Radj\_up} = \left[\frac{V_O\,(100 + \Delta\%)}{1.225\ \Delta\%} - \frac{100}{\Delta\%} - 2 \right] \text{K}\Omega$$

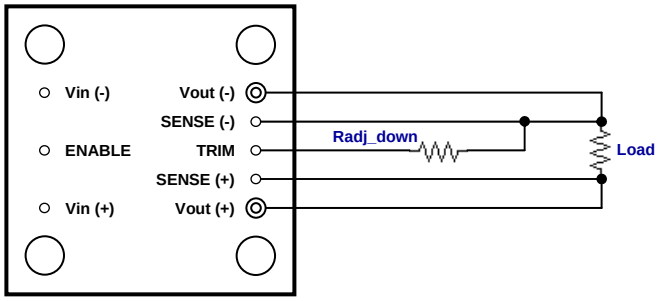


Where: Radj_up - in kΩ

Δ% - percent change in output voltage

To adjust V_O to a lower value, an external resistor Radj_down should be connected between the TRIM pin and the SENSE (-) pin. Use the following equation to determine the required Radj_down resistor:

$$\text{Radj\_down} = \left[\frac{100}{\Delta\%} - 2 \right] \text{K}\Omega$$



Where: Radj_down - in kΩ

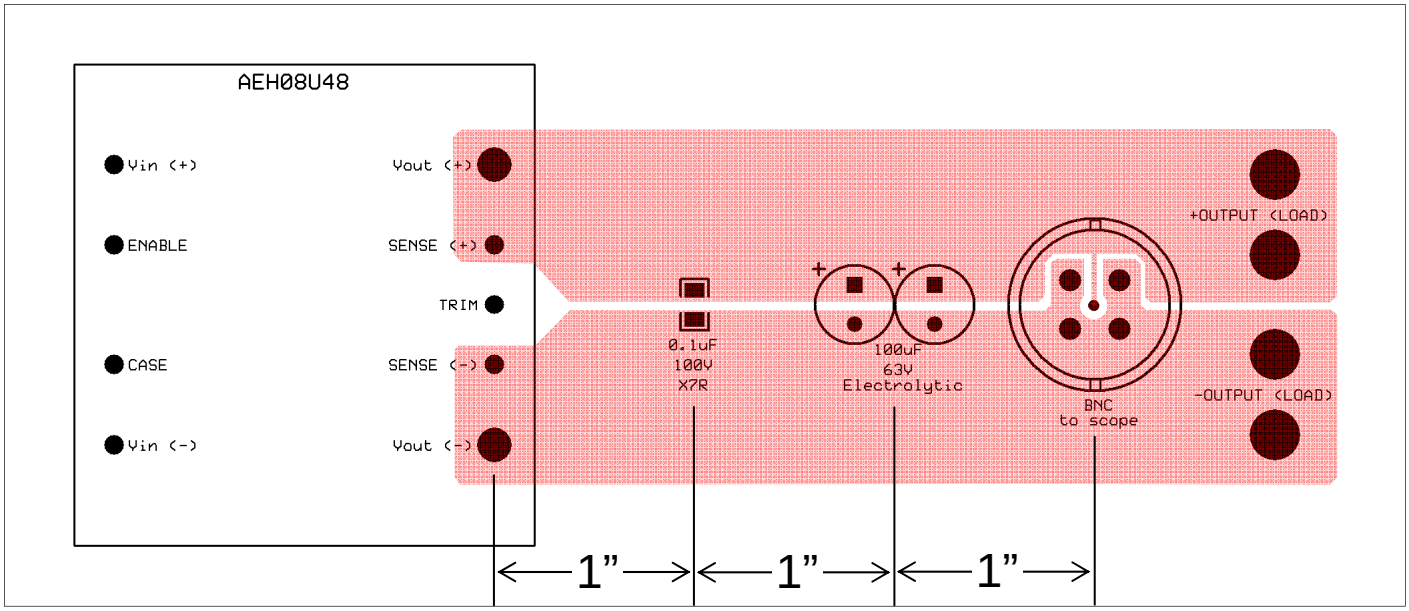
Δ% - percent change in output voltage

Output Ripple and Noise Measurement

Use a 0.1µF @100V X7R ceramic capacitor (connected 1” away from the output terminals of the Device Under Test (DUT)) and 2x 100µF @ 63V electrolytic capacitor (2” away from the output terminals of the DUT).

Recommended components – 100µF, NIC COMPONENTS P/N NACE101M63V10X10.5TR13 or TECATE GROUP P/N MXM-063/101M10X10).

Scope measurement should be made using a BNC socket, positioned 3 inches away from output terminals of the converter.



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