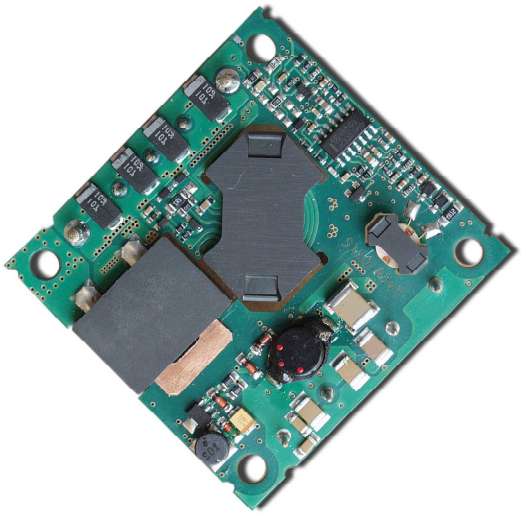
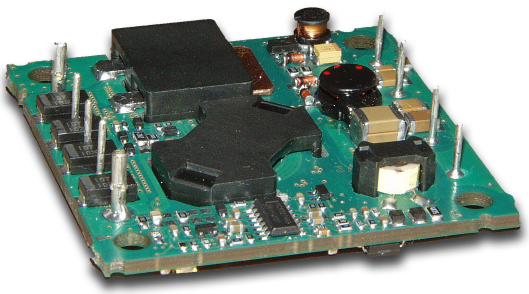
AH100W48V033V30AN

48V_{in} 30A_{out} 3.3V_{out} Isolated DC-DC Converter
High Efficiency, Half Brick

Features

- Very high efficiency: 90%@30A, 91.5%@20A
- Wide input voltage range (36 to 75Vdc)
- Low profile, industry standard footprint and pinout: 2.3" x 2.4" x 0.4" (58.4mm x 61.0mm x 10.2mm)
- Total weight: 63g. (2.22oz.)
- Remote ON/OFF
- Output voltage trim
- Remote sense
- Fixed Frequency (250 KHz)
- Under voltage lockout (UVLO) – auto recover
- Over voltage protection – auto recover
- Over current protection – auto recover
- Over temperature protection – auto recover
- Operating temperature -40/+100℃
- Input to Output Isolation at 2000Vdc,10MΩ
- CSA/US, CSA, TUV and KEMA Certified
- ISO 9001 Certified manufacturing processes





Product Highlights

- The AH Family of dc-dc converters is Ault's solution for next generation, cutting-edge board applications.
- Synchronous rectification uses MOSFET instead of Schottky diodes providing extreme reduction in heat generation, boosting efficiency, eliminating the need for a heat sink and increased reliability.
- Low profile (0.4"), open frame construction allows smaller card pitch and improves system ventilation.
- Fixed switching frequency provides predictable EMI characteristics.

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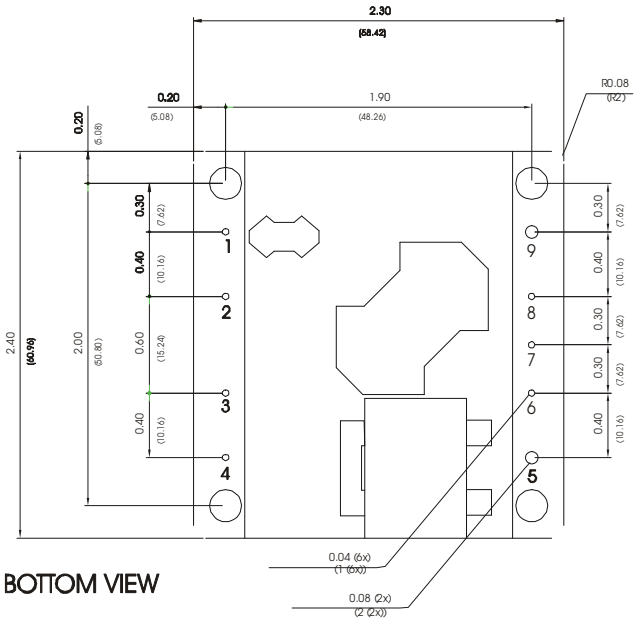
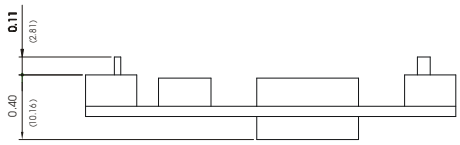
DIMENSIONS

DIMENSIONS ARE IN INCHES AND (MILLIMETERS)
TOLERANCE: x.xx in. ±0.02 in. (0.5 mm)
PINS 1-4, 6-8 are 0.04 in. (1.02 mm) dia.with 0.08 in. (2.03mm) dia. standoff shoulders

OPEN-FRAME VERSION

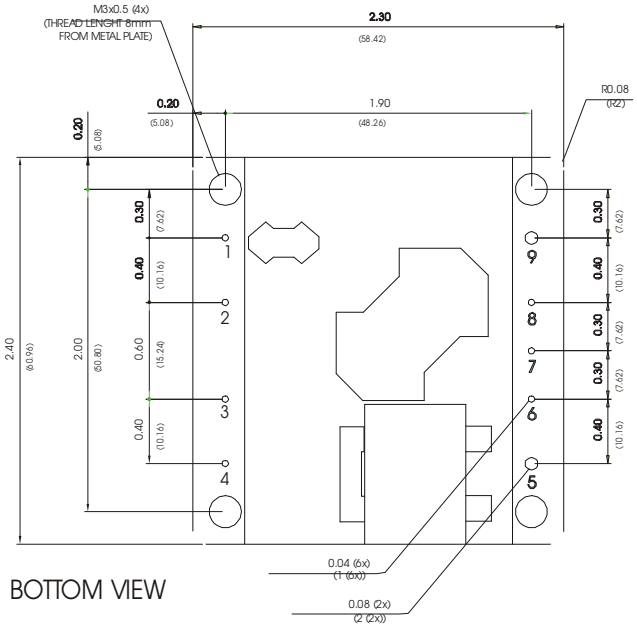


BOTTOM VIEW

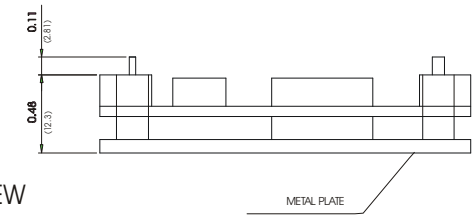


SIDE VIEW

METAL-PLATE VERSION



BOTTOM VIEW



SIDE VIEW

PIN CONNECTIONS	
PIN NO.	FUNCTION
1	- Vin
2	NO PIN
3	Remote ON/OFF
4	+ Vin
5	+ Vout
6	+ Sense
7	Trim
8	- Sense
9	- Vout

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Specifications

(Typical values are at nominal input line, full load, airflow 300 LFM, 25℃ ambient temperature unless otherwise specified)

Input characteristics	Notes & Conditions	Min	Typ	Max	Units
Operating Input Voltage Range	Note 1	36	48	75	V
Input Surge Voltage	T< 10µs			100	V
Input Under-Voltage Lockout					
Turn-On Voltage Threshold		35.0	35.2	35.4	V
Turn-Off Voltage Threshold		31.7	31.9	32.1	V
Lockout Hysteresis Voltage		3.3	3.3	3.3	V
Maximum Input Current (I_{INmax})	V_{IN}=36V; Full Load			3.5	A
No-load Input Current			50	60	mA
Off Converter Input Current			4	6	mA
Inrush Current Transient Rating			0.03		A^2s
Input Reflected-Ripple Current	RMS; see figures 6,7		5	7	mA

Output Characteristics	Notes & Conditions	Min	Typ	Max	Units
Output Voltage Set Point	50 % Load	3.28	3.30	3.32	V
Output Voltage Regulation					
Over Load			± 3	± 5	mV
Over Line			± 3	± 5	mV
Over Temperature			± 15	± 30	mV
Total Output Voltage Range		3.25		3.35	V
Output Voltage Ripple and Noise	20 MHz bandwidth				
Peak to Peak	Full load, 2x10µF		70		mV
RMS	ceramic; see fig. 6, 8		25		mV
Operating Output Current Range		0	-	30	A
Output DC Current Limit Inception	Output Voltage 10% low	31	34	39	A
Output DC Current Limit Shutdown Voltage	See figure 5		2.3		V
Admissible Output Capacitance	Full load, resistive	0		50000	µF

Dynamic Characteristics	Notes & Conditions	Min	Typ	Max	Units
Output Voltage Current Transient	470µF load cap. 1A/µs; see figure 3				
Positive Step Change in I_{OUT}	50% to 75% load		100		mV
Negative Step Change in I_{OUT}	75% to 50% load		100		mV
Settling Time to 1%			200		µs
Turn On Transient	See figures 1, 2				
Overshoot			0		mV
Turn On Time	Full load		15	20	ms
Output Voltage Overshoot	10mF load capacitance, Iout= 0A		3		%

Efficiency	Notes & Conditions	Min	Typ	Max	Units
Load 100%	Vin=50V	89	90		%
Load 67%	Vin=50V	91	91.5		%
Load 33%	Vin=50V	91	91.5		%

NOTE 1 : Absolute max. input voltage 80V

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AH100W–48V–3.3V High Efficiency DC-DC Converter

Isolation Characteristics	Notes & Conditions	Min	Typ	Max	Units
Isolation Voltage input to output	Basic isolation	2000			V_{DC}
Isolation Voltage Input to plate	Basic isolation	2000			V_{DC}
Isolation Capacitance			5500		pF
Isolation Resistance		10			MΩ

Feature Characteristics		Min.	Typ.	Max	Units
Switching frequency			250		kHz
ON/OFF Control					
Off-State Voltage		2.7		15	V
On-State Voltage		0		0.8	V
Output Voltage Trim Range		-20		+10	%
Output Over-Voltage Protection				130	%
Over-Temperature shutdown	PCB Hot Spot		125		℃

General Characteristics	Notes & Conditions	Min	Typ	Max	Units
Operating Range Temperature	Maximum Rating	-40		+100	℃
Storage Temperature	Maximum Rating	-50		+120	℃
Relative Humidity	Non condensing	5		95	%
Calculated MTBF	Bellcore Issue 4 RDF93 HRD Issue 5	1,965,099 hours			

Safety and Regulatory
TUV and KEMA certified for compliance to EN06950 requirements CSA 22.2 No. 950-95(US and Canada) certified with basic insulation for compliance to UL 1950. Note : An external input fuse must always be used for compliance to listed safety requirements.
CE compliant per 72/23/EEC (Low voltage directive) and 93/68/EEC to facilitate CE Mark at system level.
Material flammability rating, UL94V-0
NEBS compliant

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Performance Curves

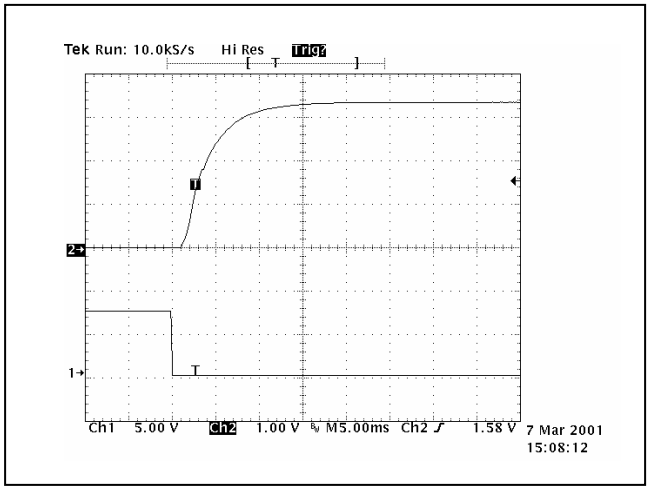

Figure 1. Turn-on transient at full rated current (resistive load)
Upper Trace: Vout (1V/div)
Lower Trace: Remote Enable signal (5V/div)

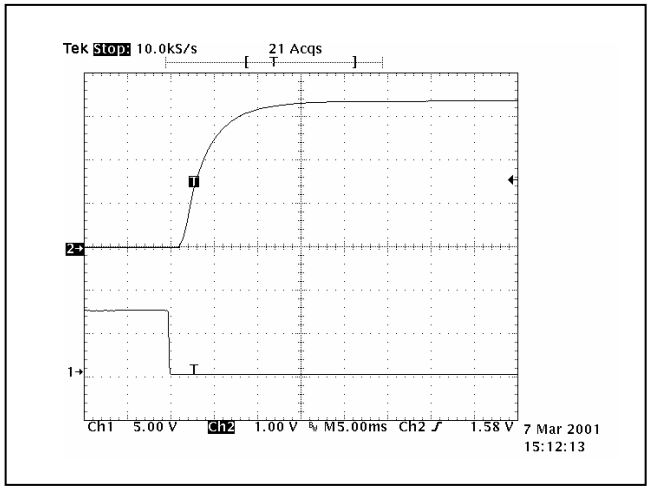

Figure 2. Turn-on transient at zero load.
Upper Trace: Vout (1V/div)
Lower Trace: Remote Enable signal (5V/div)

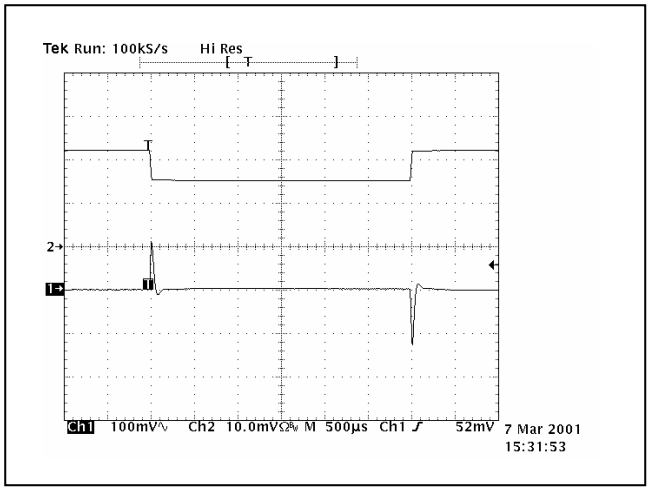

Figure 3. Output Voltage response (100mV/div) to a step- change in load current (50% - 75% - 50% of Imax:dI/dt=1A/µs Load capacitance: 470µF, 30mOhm ESR tantalum capacitor and 1µF ceramic capacitor.

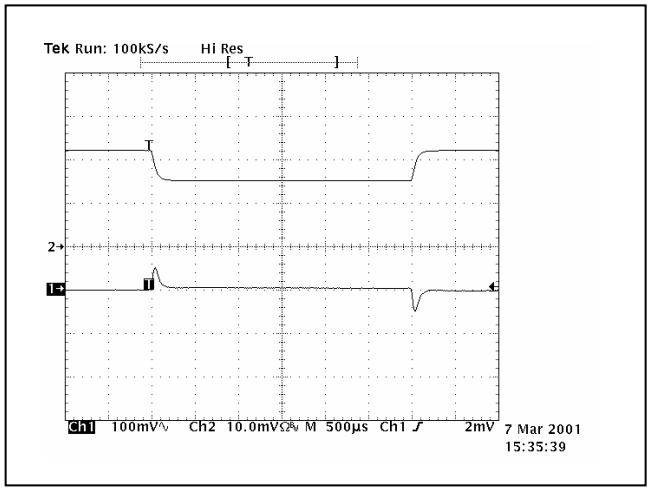

Figure 4. Output Voltage response (100mV/div) to a step- change in load current (50% - 75% - 50% of Imax:dI/dt=0.1A/µs). Load capacitance: 10µF, 100mOhm ESR tantalum capacitor and 1µF ceramic capacitor.

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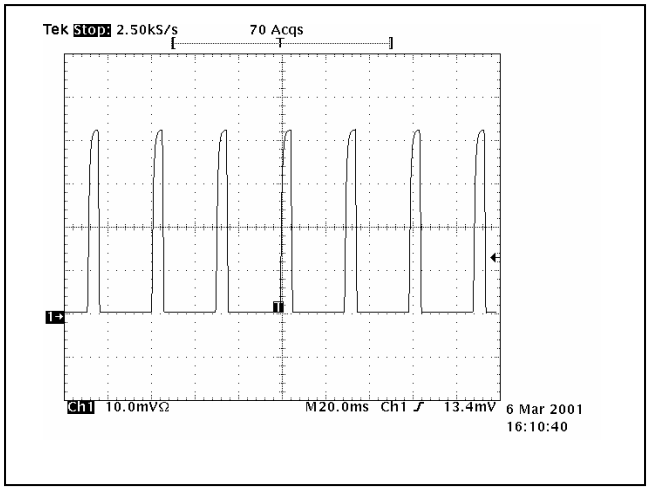

Figure 5. Load current (10A/div) vs time when converter attempts to turn on into 10mOhm short circuit.

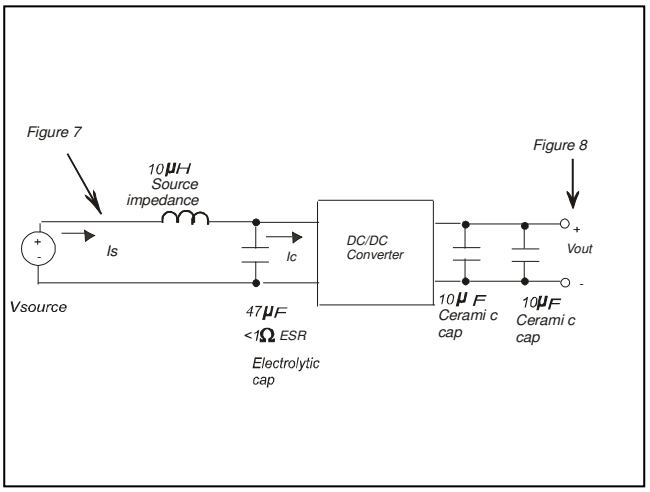

Figure 6. Test set-up diagram showing measurement point for Input Reflected Ripple Current and Output Voltage Ripple.

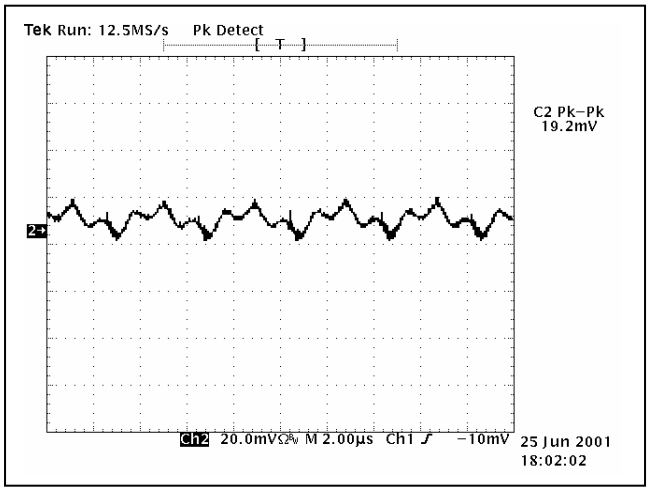

Figure 7. Input reflected ripple current at nominal input voltage and rated load current (see Fig.6)

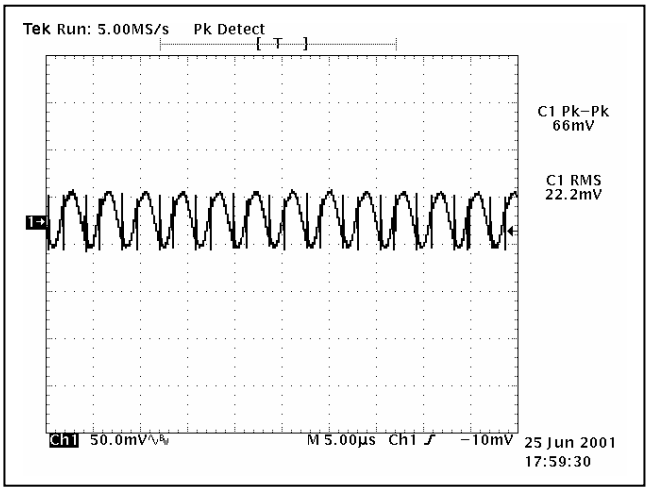

Figure 8. Output voltage ripple at nominal input voltage and rated load current. Load cap: 20µF ceramic capacitor
** see note below (see Fig.6)

**Output ripple measure: care must be taken to insert the output capacitors in the output current paths.
The measurements is taken with the following output capacitors:
-2x AVX PN CM316X5R106K006AT
-2x Murata PN GRM31CR60J106KC01L
-2x Taiyo Yuden PN JMK316B106KL

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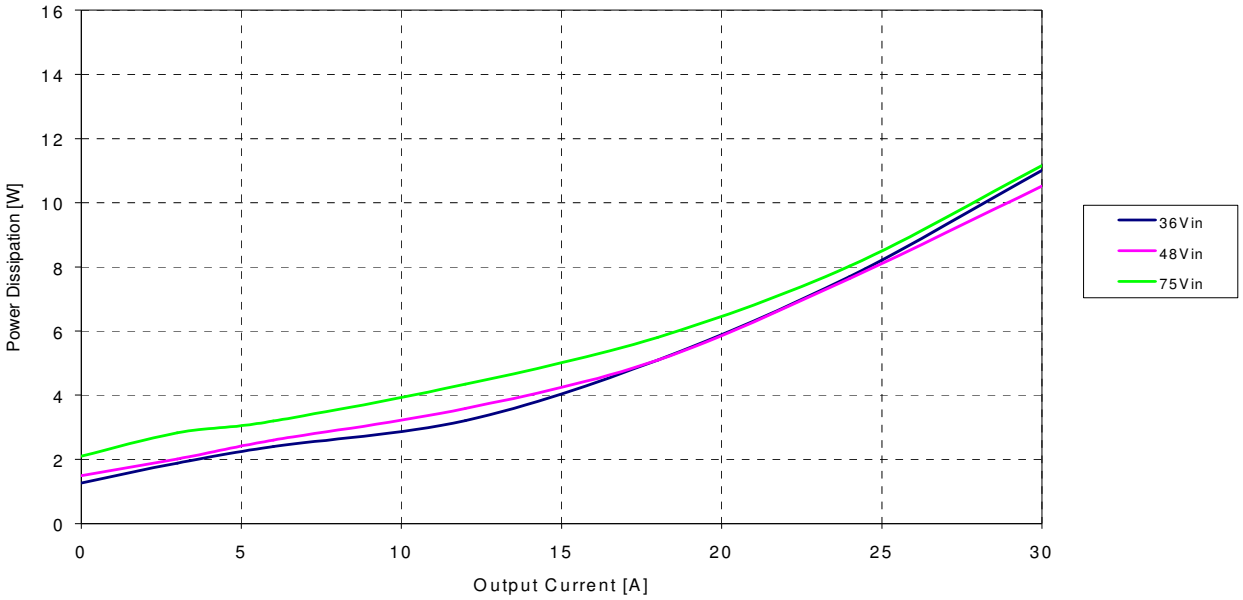

Figure 9. Efficiency vs. load current for minimum, nominal and maximum input voltages.

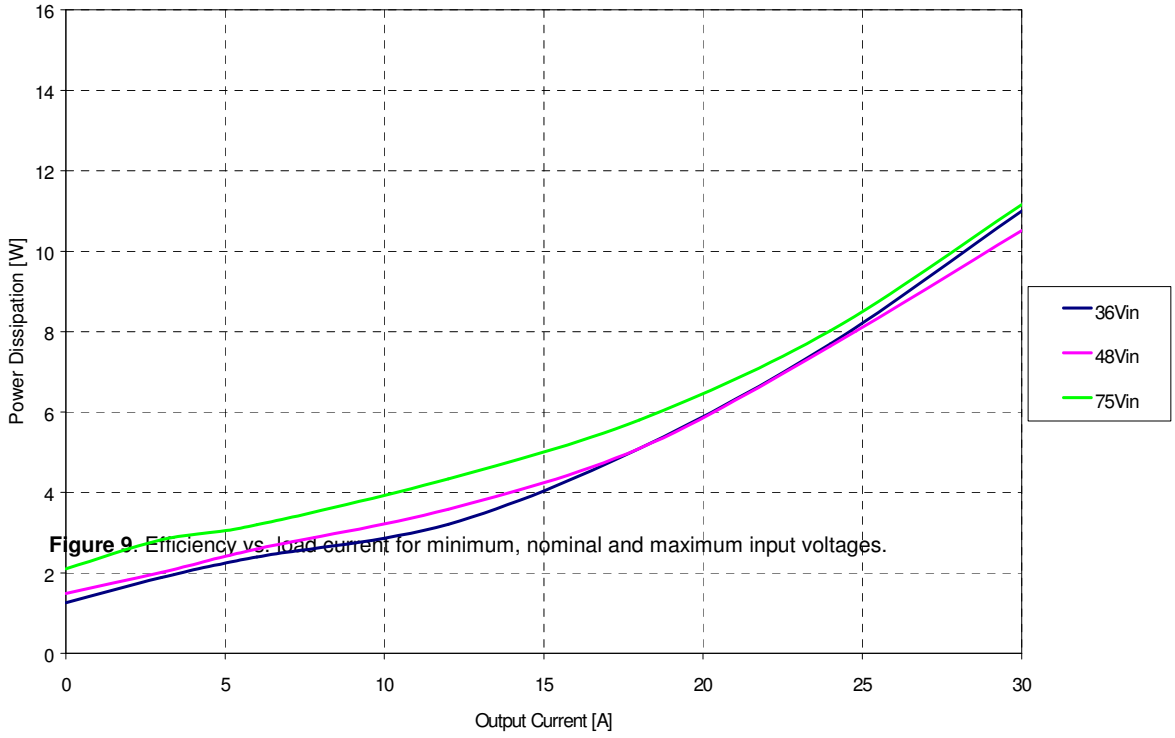

Figure 10. Power dissipation vs. load current for minimum, nominal and maximum input voltage.

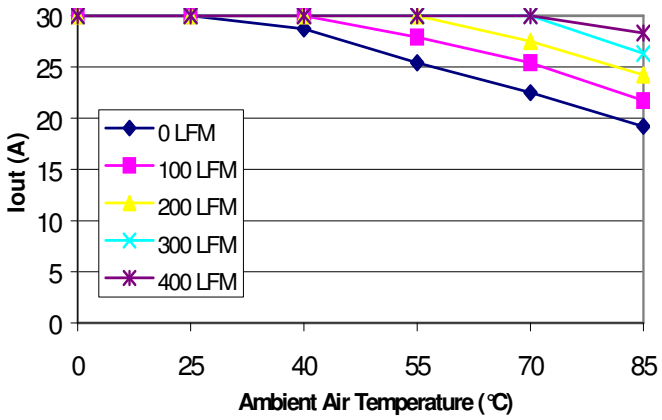

Figure 11: Maximum output power derating curves vs. ambient air temperature for airflow rates of 0 LFM through 400 LFM with air flowing from **input to output** and nominal input voltage.

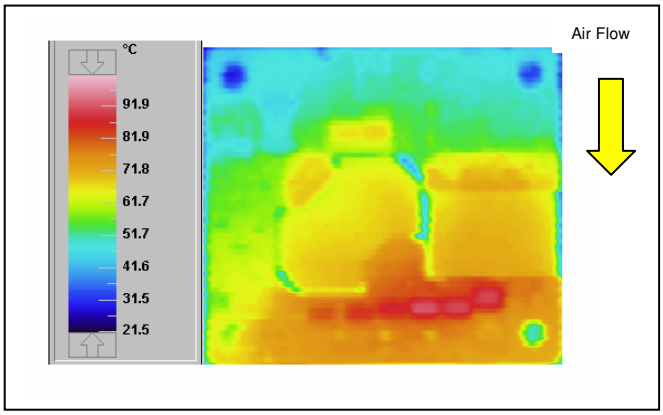

Figure 12: Thermal plot of converter at 30 amp load current with 25°C air flowing at the rate of 0 LFM. Converter in vertical position with air flowing from **input to output.**

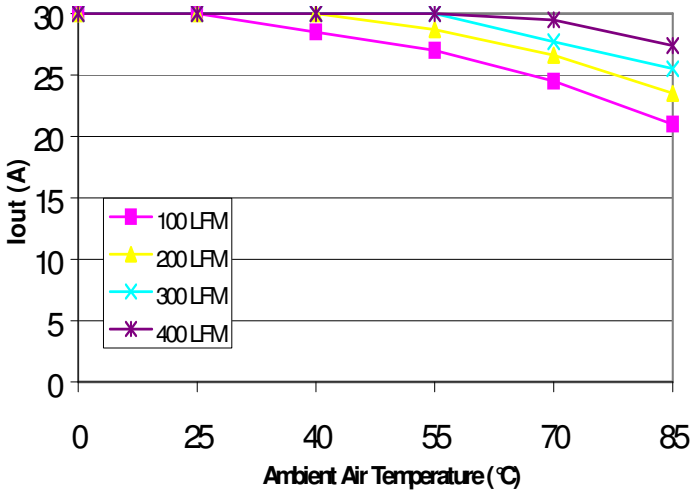

Figure 13: Maximum output power derating curves vs. ambient air temperature for airflow rates of 100 LFM through 400 LFM with air flowing from **output to input** and nominal input voltage.

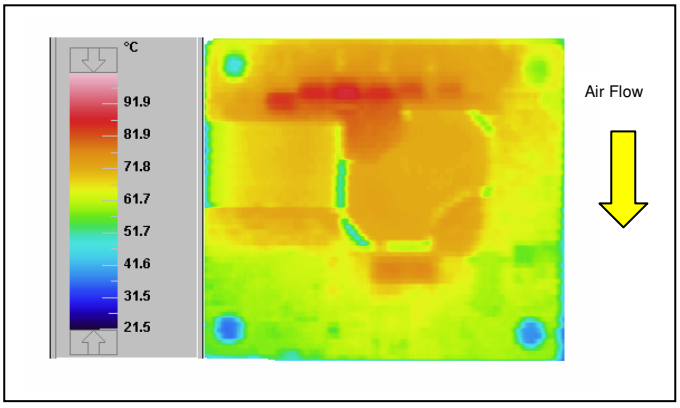

Figure 14: Thermal plot of converter at 30 amp load current with 40°C air flowing at the rate of 300 LFM. Converter in vertical position with air flowing from **output to input**.

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Features and Pins description

REMOTE ON-OFF CONTROL

The default logic is negative, where the Remote On/Off (pin 3) input is referenced to -Vin (pin 1). The Remote On/Off signal must be lower than 0.8V to enable the output voltage, and higher than 2.7V to disable the output voltage. Positive logic is an available option, add "–P" to the end of the ordering code.

TRIM

The output voltage can be trimmed by means of an external resistor connected between Trim (pin 6) and +Sense (pin 6) or -Sense (pin 8). The selection of the resistor follows the industry standard trim equation.

An external resistor connected between Trim and –Sense pins will decrease the output voltage. For a decrease of Δ% of the nominal output voltage, calculate the value of the external resistor using the following equation:

$$\mathbf{R_{trim\text{-}down}} = \left(\frac{100\%}{\Delta}\right) - 2k\Omega, \quad \text{where} \quad \Delta = \left(\frac{V_{nominal} - V_{target}}{V_{nominal}}\right) \times 100\%$$

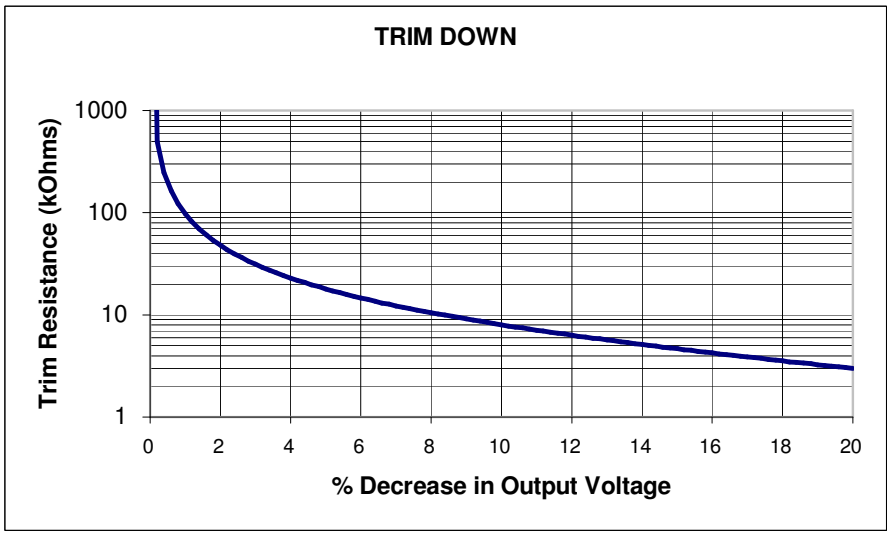

Figure A

An external resistor connected between Trim and +Sense pins will increase the output voltage. For an increase of Δ% of the nominal output voltage, calculate the value of the external resistor using the following equation:

$$\mathbf{R_{trim\text{-}up}} = \frac{\left(\frac{V_{nom}}{V_{ref}} - 2\right) \bullet V_{tar} + V_{nom}}{V_{tar} - V_{nom}} k\Omega,$$

where V_{nom} = Nominal Voltage, V_{tar} = Target Voltage, V_{ref} =1.225 V

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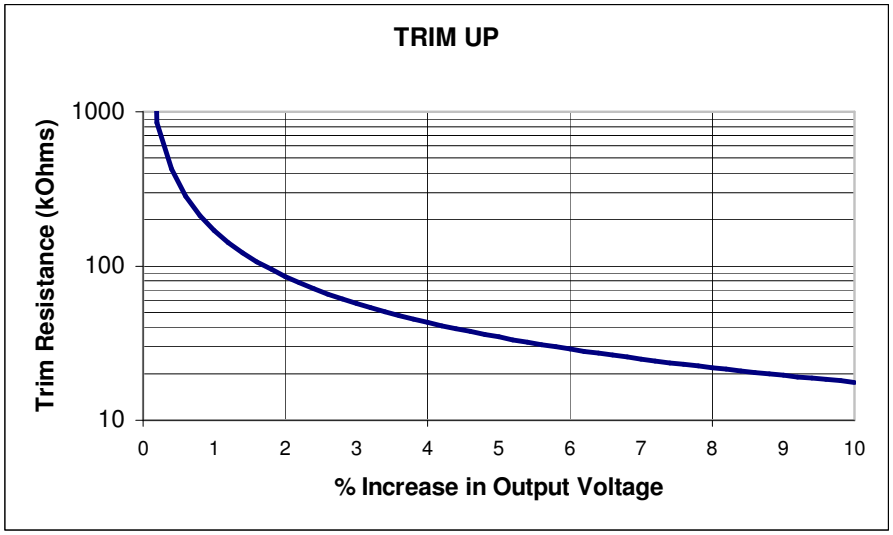

Figure B

SENSE (+ or -)

The +Sense or –Sense pins must be connected to the load or output pins of the converter. To ensure tight regulation at the system critical load, then the remote sense pins should be connected to the system critical load. Reference applicable section of data sheet for maximum voltage compensation.

Ensure sufficient margin to the over voltage threshold, review applicable sections of the data sheet and system loading: output over-voltage protection –Vs- system transient load condition(s).

THERMAL CONSIDERATIONS

The converter has internal thermal protection preventing hot spots on PCB from exceeding 120℃ (248 ℉), reference Figures 12 and 14. Margin to the temperature protection limit should be verified in the application. During an abnormal condition that induces an increase in the converter temperature, the converter output voltage will fold back when the over temperature protection threshold is reached. The converter will auto-recover when the fault condition is corrected and time allowed for the converter to cool down.

OVERCURRENT PROTECTION

The overcurrent limit inception is typically 110% of the rated output current. When the overcurrent limit inception is exceeded the output voltage will decrease proportional to the increase in the load current. Further increase in the load current will cause the output voltage to trip the under voltage protection threshold and enter fault protection, or hiccup reference Figure 5. The converter will enter fault protection typically at 125% of rated output current. When the fault is removed the converter will auto recover.

Ordering code

AH100W48V033V30AN

Option code **-P** for Positive Logic, example **AH100W48V033V30AN-P**
-PL for Cold Plate, example **AH100W48V033V30AN-PL**

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