V-INFINITY
a division of CUI INC

date 05/2009

PART NUMBER: VHB75

DESCRIPTION: dc-dc converter

features

- 37.5W-75W isolated output
- Efficiency to 85%
- 300KHz switching frequency
- 2:1 input range
- Regulated outputs
- Continuous short circuit protection
- Industry standard half-brick package
- Five-sided metal case
- Safety approvals



E222736

MODEL	Input Voltage	Output Voltage	Output Current	Input Current No Load	Input Current Full Load	Efficiency
VHB75-D12-S2R5	9-18 VDC	2.5VDC	15A	50mA	4110mA	76%
vHB75-D12-S3R3	9-18 VDC	3.3VDC	15A	50mA	5290mA	78%
VHB75-D12-S5	9-18 VDC	5VDC	15A	50mA	7715mA	81%
VHB75-D12-S12	9-18 VDC	12VDC	6.25A	50mA	7440mA	84%
VHB75-D12-S15	9-18 VDC	15VDC	5A	50mA	7440mA	84%
VHB75-D12-S24	9-18 VDC	24VDC	3.13A	50mA	7440mA	84%
VHB75-D24-S2R5	18-36 VDC	2.5VDC	15A	50mA	2029mA	77%
VHB75-D24-S3R3	18-36 VDC	3.3VDC	15A	50mA	2610mA	79%
VHB75-D24-S5	18-36 VDC	5VDC	15A	50mA	3810mA	82%
VHB75-D24-S12	18-36 VDC	12VDC	6.25A	50mA	3675mA	85%
VHB75-D24-S15	18-36 VDC	15VDC	5A	50mA	3675mA	85%
VHB75-D24-S24	18-36 VDC	24VDC	3.13A	50mA	3640mA	86%
VHB75-D48-S2R5	36-75 VDC	2.5VDC	15A	50mA	1015mA	77%
VHB75-D48-S3R3	36-75 VDC	3.3VDC	15A	50mA	1305mA	79%
VHB75-D48-S5	36-75 VDC	5VDC	15A	50mA	1883mA	83%
vHB75-D48-S12	36-75 VDC	12VDC	6.25A	50mA	1838mA	85%
VHB75-D48-S15	36-75 VDC	15VDC	5A	50mA	1838mA	86%
VHB75-D48-S24	36-75 VDC	24VDC	3.13A	50mA	1820mA	86%

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INPUT

Input Voltage Range		12V:	9-18V
		24V:	18-36V
		48V:	36-75V
Under Voltage Lockout		12 Vin:	power up 8.8V
			power down 8V
		24Vin:	power up 17V
			power down 16V
		48Vin:	power down 34V
			power down 32.5V
ON/OFF Control			see notes 3&4
Input Filter			PI Type

OUTPUT

Voltage Accuracy		±1% max.
Transient Response: 25% Step Load Change		<500µ sec.
External Trim Adj. Range		±10%
Ripple & Noise	2.5V, 3.3V, 5V	20 mV RMS., max
20MHz BW		75 mV p-p., max
	12V & 15V	30 mV RMS., max
		100 mV p-p., max
	24V	100 mV RMS., max
		240 mV p-p, max
Temperature Coefficient		±0.03%/°C
Short Circuit Protection	Continuous	
Safety		approved to UL1950 (E222736)
Line Regulation[1]		±0.2% max
Load Regulation[2]		±0.2% max
Over Voltage Protection trip Range, % Vo nom.		115-140%
Current Limit		110-150% Nominal Output

GENERAL SPECIFICATIONS

Efficiency			see table
Isolation Voltage	Input/Output		1500VDC min.
	Input/Case		1500VDC min.
	Output/Case		1500VDC min.
Isolation Resistance			10^7Ohm min.
Switching Frequency		12-24Vin	400kHz, Typ.
		48Vin	300kHz, Typ
Operating Case Temperature			-40°C ~ +100°C
Storage Temperature			-55°C ~ +105°C
Thermal Shutdown, Case Temp.			100°C Typ.
Dimensions			2.28x2.40x0.50 inches
			(57.9x61.0x12.7mm)
Case Material			aluminum

NOTES:

1. Measured from high line to low line
2. Measured from full load to zero load
3. On/Off Control: Positive logic default. Referenced to -Vin. Open collector.
   Module ON...open circuit
   Module OFF...<0.8Vdc
4. For negative logic On/Off control, add suffix "N" to the model number

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APPLICATION NOTES

1. OUTPUT DE-RATING

The operating case temperature range of the VHB75 series is -40°C to +100°C. When operating the VHB75, proper derating or cooling is needed. Following is the derating curve of VHB75 without heat sink.

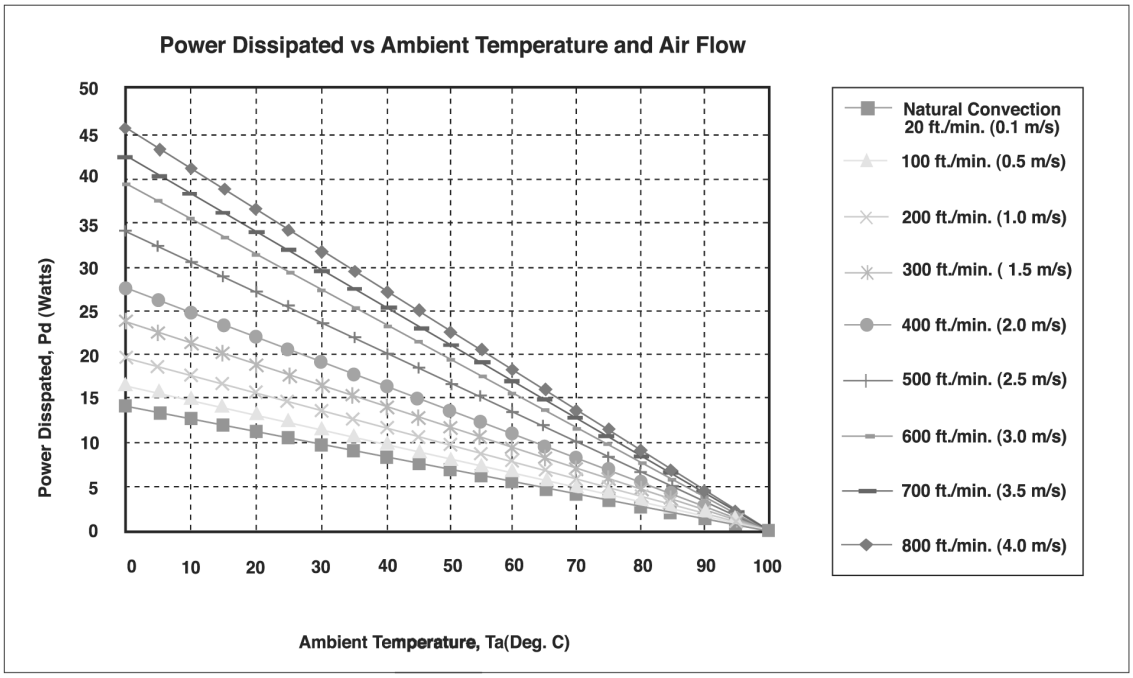


FIGURE 1. OUTPUT DERATING (FORCED CONVECTION WITH NO HEAT SINK)

Where:

The power dissapation (Pd) is

$$Pd = Pi - Po = Po\,(1-\eta)/\eta$$

The thermal resistances are listed below.

Chart of Thermal Resistance vs Air Flow:

AIR FLOW RATE	TYPICAL Rca
Natural Convection 20ft./min. (0.1m/s)	7.12 °C/W
100 ft./min. (0.5m/s)	6.21 °C/W
200 ft./min. (1.0m/s)	5.17 °C/W
300 ft./min. (1.5m/s)	4.29 °C/W
400 ft./min. (2.0m/s)	3.64 °C/W
500 ft./min. (2.5m/s)	2.96 °C/W
600 ft./min. (3.0m/s)	2.53 °C/W
700 ft./min. (3.5m/s)	2.37 °C/W
800 ft./min. (4.0m/s)	2.19 °C/W

The temperature rise (ΔT):

$$\Delta T = Pd * Rca$$

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2. OUTPUT TRIMMING (OPTIONAL)

The output voltages are preset to nominal values as indicated by the models table at the factory. If desired, the output voltage may optionally be trimmed to a different value (+/- 10%) with external resistors and/or potentiometer as shown below.

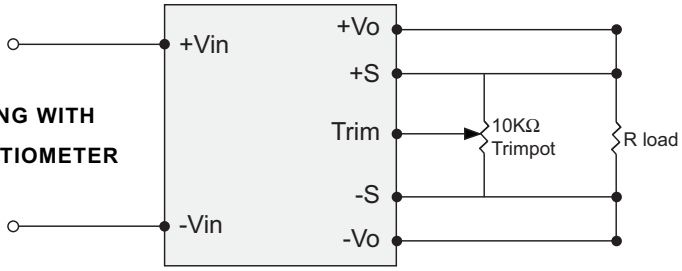


FIGURE 2. TRIMMING WITH EXTERNAL POTENTIOMETER

To trim the output voltage with fixed resistors, the output voltage can be calculated as follows.

Trim-Up

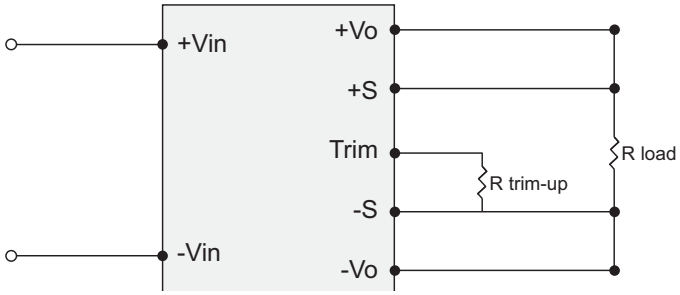


FIGURE 3: TRIM-UP VOLTAGE SETUP

The value of $R_{trim\text{-}up}$ is defined as:

$$R_{trim\text{-}up} = \frac{R1 - R2 \times (Vo - Vo,nom)}{Vo - Vo,nom} (\text{K}\Omega)$$

Where: $R_{trim\text{-}up}$ is the external resistor in $K\Omega$. $V_{o,nom}$ is the nominal output voltage. V_o is the desired output voltage. R_1 and R_2 are internal to the unit and are defined in Table 1. For example, to trim-up the output voltage of 5.0V module (VHB75-Q48-S5) by 8% to 5.4V, $R_{trim\text{-}up}$ is calculated as follows:

$$Vo - Vo,nom = 5.4 - 5.0 = 0.4 \text{ V}$$

$$R1 = 5.8 \text{ K}\Omega$$

$$R2 = 8.25 \text{ K}\Omega$$

$$R_{trim\text{-}up} = \frac{5.8 - 8.25 \times 0.4}{0.4} = 6.25 (\text{K}\Omega)$$

Table 1

Output Voltage(V)	R1(KΩ)	R2(KΩ)
2.5V	2.877	8.25
3.3V	3.168	7.2
5V	5.8	8.25
12V	19.656	13.304
15V	25.474	14.76
24V	42.215	16.923

Trim-Down

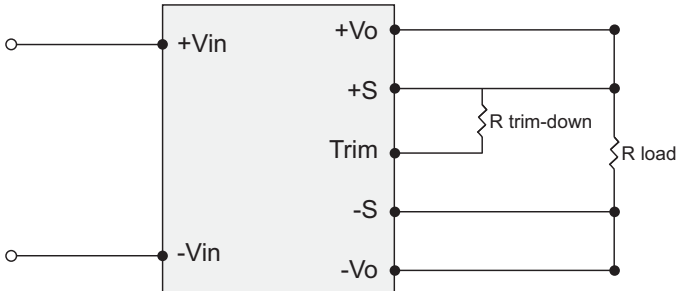


FIGURE 4: TRIM-DOWN VOLTAGE SETUP

The value of $R_{trim\text{-}down}$ is defined as:

$$R_{trim\text{-}down} = \frac{R1 - R2 \times (Vo,nom - Vo)}{Vo,nom - Vo} (\text{K}\Omega)$$

Where: $R_{trim\text{-}down}$ is the external resistor in $K\Omega$. $V_{o,nom}$ is the nominal output voltage. V_o is the desired output voltage. R_1 and R_2 are internal to the unit and are defined in Table 2. For example, to trim-up the output voltage of 5.0V module (VHB75-Q48-S5) by 8% to 4.6V, $R_{trim\text{-}down}$ is calculated as follows:

$$Vo,nom - Vo = 5.0 - 4.6 = 0.4 \text{ V}$$

$$R1 = 5.8 \text{ K}\Omega$$

$$R2 = 10.57 \text{ K}\Omega$$

$$R_{trim\text{-}down} = \frac{5.8 - 10.57 \times 0.4}{0.4} = 3.93 (\text{K}\Omega)$$

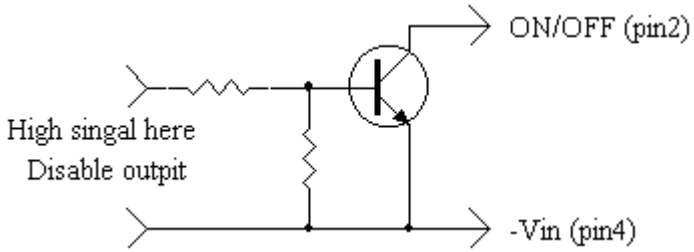
Table 2

Output Voltage(V)	R1(KΩ)	R2(KΩ)
2.5V	2.923	10.57
3.3V	6.18	15
5V	5.8	10.57
12V	86.45	60.1
15V	150	94
24V	430	130

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Remote On/Off Control

The VHB75 series allows the user to switch the module on and off electronically with the remote on/off feature. Logic control defaults to “positive” logic. The diagram shows the recommentded curcuits for positive logic. The “negative logic” option is also available.

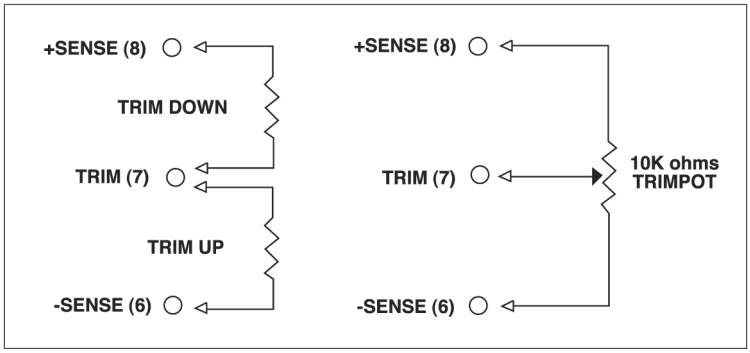


Logic table

Logic State(pin2)	Negative logic	Positive logic
Logic Low-Switch Closed	Module on	Module off
Logic High-Switch Open	Module off	Module on

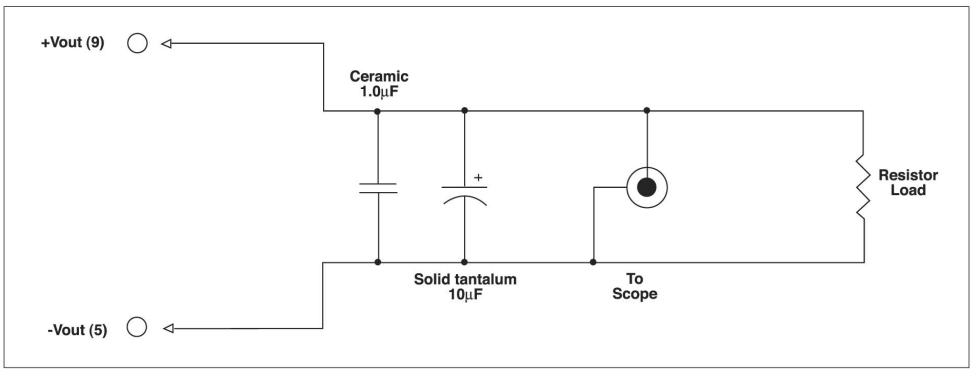
External Output Trimming

Output may optionally be trimmed (±10%) with external fixed resistors or an external trimpot as shown.



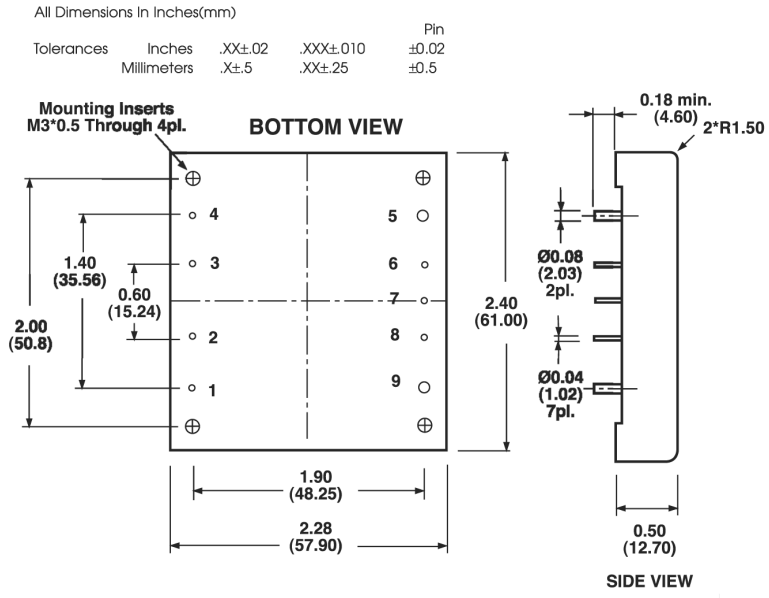
Output Noise

The output noise is measured with a 10uF tantalum capacitor and a 1.0uF ceramic capacitor across the output.



Output Noise Test Circuit schematic

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PIN CONNECTION

Pin	Function
1.	+Vin
2.	ON/OFF
3.	CASE
4.	-Vin
5.	-Vout
6.	-Sense
7.	Trim
8.	+Sense
9.	+Vout