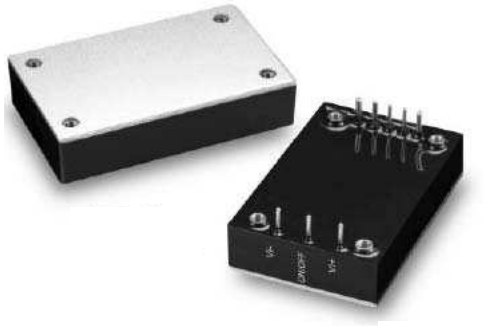
PART NUMBER: VQB75W **DESCRIPTION:** dc-dc converter

features

- 75W isolated output
- Efficiency to 87%
- 300 kHz switching frequency
- input under-voltage protection
- over-temperature protection
- over-current protection
- remote on/off
- industry standard quarter-brick package



RoHS

-MODEL

	input voltage nominal (V dc)	input voltage range (V dc)	output voltage (V dc)	output current [1] (A)	input current no load[2] (mA)	input current full load[2] (mA)	efficiency typ.[3] (%)
VQB75W-Q24-S3R3	24	9.0~36.0	3.3	12	50	2037	81
VQB75W-Q24-S5	24	9.0~36.0	5	12	50	2976	84
VQB75W-Q24-S12	24	9.0~36.0	12	6.25	50	3634	86
VQB75W-Q24-S15	24	9.0~36.0	15	5	50	3634	86
VQB75W-Q24-S24	24	9.0~36.0	24	3.12	50	3628	86
VQB75W-Q48-S3R3	48	18.0~75.0	3.3	12	30	1006	82
VQB75W-Q48-S5	48	18.0~75.0	5	12	30	1471	85
VQB75W-Q48-S12	48	18.0~75.0	12	6.25	30	1817	86
VQB75W-Q48-S15	48	18.0~75.0	15	5	30	1796	87
VQB75W-Q48-S24	48	18.0~75.0	24	3.12	30	1796	87

notes:
1. see output derating (page 3)
2. input currents are measured at nominal input voltage
3. efficiency is measured at nominal line, full load

INPUT

parameter	conditions/description	min	nom	max	units
input voltage range		9	24	36	V dc
		18	48	75	V dc
under voltage lockout	24 Vin power up		8.8		V dc
	24 Vin power down		8		V dc
	48 Vin power up		17		V dc
	48 Vin power down		16		V dc
remote on/off control[4]	section 3 in the application notes				
input filter	PI type				

notes:
4. add suffix "N" to the model number for negative logic on/off control

PART NUMBER: VQB75W **DESCRIPTION:** dc-dc converter

OUTPUT

parameter	conditions/description	min	nom	max	units
voltage accuracy				±1.5	%
transient response	75 ~ 100% step load change				
	recovery time			500	µ sec
	error band		±5		%Vout
external trim adj. range				±10	%
ripple & noise (20MHz BW)[5]	3.3V, 5V			40	mV RMS
				100	mV pk-pk
	12V& 15V			60	mV RMS
				150	mV pk-pk
	24V			100	mV RMS
				240	mV pk-pk
temperature coefficient			±0.03		%/°C
short circuit protection	continuous				
line regulation[6]				±0.2	%
load regulation[7]				±0.2	%
over voltage protection trip range, % Vo nom.		115		140	%
over current protection	% nominal output current	110		140	%

GENERAL SPECIFICATIONS

parameter	conditions/description	min	nom	max	units
switching frequency			300		KHz
operating ambient temp.[8]		-40		100	°C
storage temperature		-55		105	°C
thermal shutdown case temp.			105		°C
case material	aluminum base-plate, plastic case				

ISOLATION SPECIFICATIONS

parameter	conditions/description	min	nom	max	units
isolation voltage	input/output	1500			V dc
	input/case	1500			V dc
	output/case	1500			V dc
isolation resistance	tested at 500 V dc	100			MΩ

notes:
5. measured w/10 µF and 1 µF ceramic capacitors across output
6. measured from high line to low line at full load
7. measured from full load to zero load at nominal input
8. see output derating curve (page 3)

PART NUMBER: VQB75W **DESCRIPTION:** dc-dc converter

APPLICATION NOTES

1. OUTPUT DE-RATING

The operating case temperature range for VQB75W is -40 ~ +100°C. When operating the VQB75W series, proper derating or cooling is needed. The maximum case temperature under any operating condition should not exceed 100°C.

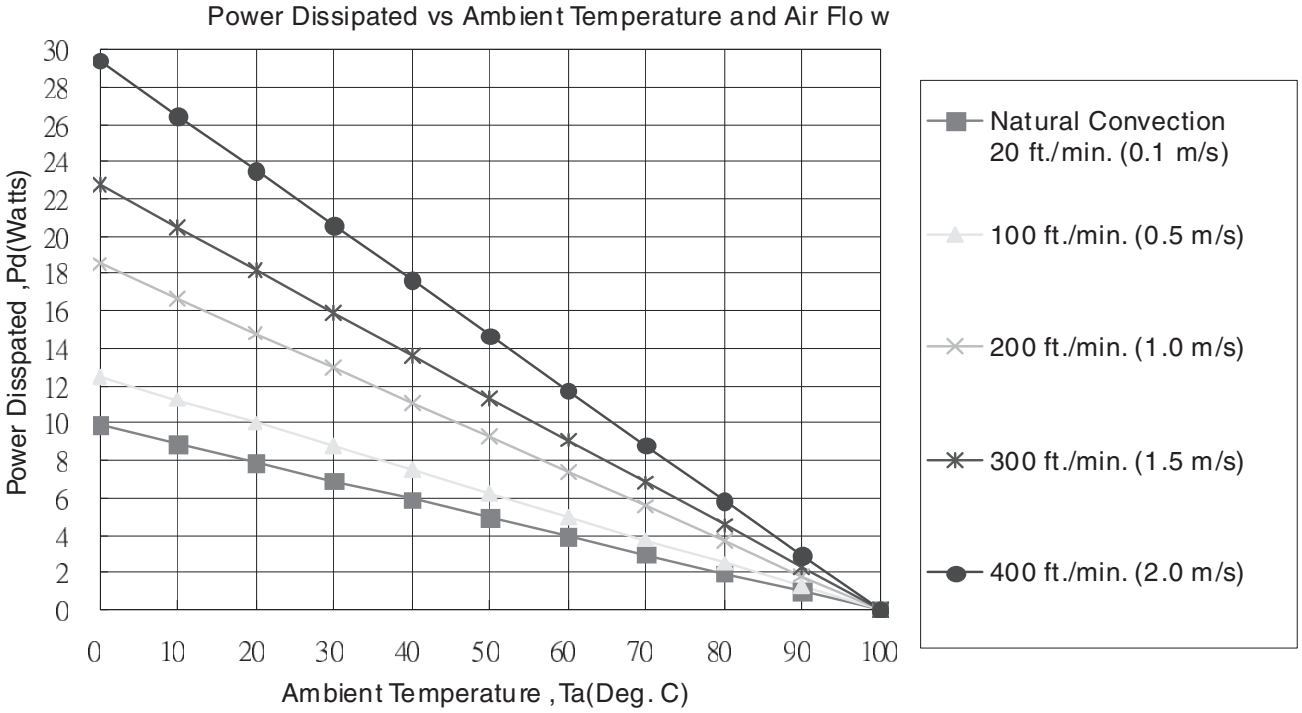


FIGURE 1. OUTPUT DERATING (FORCED CONVECTION WITH NO HEAT SINK)

Example:

What is the minimum airflow necessary for a VQB75W-Q48-S5 operating at nominal line, an output current of 20 A, and a maximum ambient temperature of 40°C?

Solution:

Given: Vin=48 V dc, Vo=5 V dc, Io=12 A

Determine Power dissipation (Pd):

Pd=Pi-Po=Po(1-η)/η

Pd=5×12×(1-0.85)/0.85=10.59 W

Determine airflow:

Given: Pd=10.59 W and Ta=40°C

Check above Power de-rating curve:

minimum airflow= 200 ft./min.

AIR FLOW RATE	TYPICAL R_{ca}
Natural Convection 20ft./min. (0.1m/s)	10.1 ℃/W
100 ft./min. (0.5m/s)	8.0 ℃/W
200 ft./min. (1.0m/s)	5.4 ℃/W
300 ft./min. (1.5m/s)	4.4 ℃/W
400 ft./min. (2.0m/s)	3.4 ℃/W

Chart of Thermal Resistance vs Air Flow

Verifying:

The maximum temp. rise ΔT = Pd × Rca=10.59×5.4=57.19°C. The maximum case temperature Tc=Ta+ΔT=97.19°C<100°C

Where:

The Rca is thermal resistance from case to ambience.The Ta is ambient temperature and the Tc is case temperature.

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.

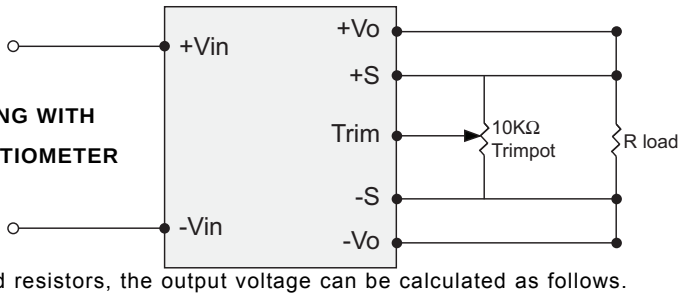


FIGURE 2. TRIMMING WITH EXTERNAL POTENTIOMETER

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

Trim-Up

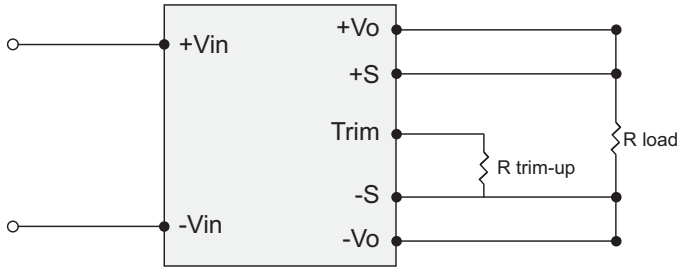


FIGURE 3: TRIM-UP VOLTAGE SETUP

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

$$R_{trim\text{-}up} = \left(\frac{R_1\left(V_r - V_f\left(\frac{R_2}{R_2+R_3}\right)\right)}{Vo - V_{o,nom}}\right) - \frac{R_2 R_3}{R_2+R_3} \ (\mathrm{K\Omega})$$

Where: $R_{trim\text{-}up}$ is the external resistor in KΩ. Vo,nom is the nominal output voltage. Vo is the desired output voltage. R1, R2, R3, Vf and Vr are internal to the unit and are defined in Table 1.

For example, to trim-up the output voltage of 12.0 V module (VHB50W-Q48-S12) by 5% to 12.6 V, $R_{trim\text{-}up}$ is calculated as follows:

Vo – Vo,nom = 12.6 – 12 = 0.6V

R1 = 9.1 KΩ , R2 = 51 KΩ , R3 = 5.1KΩ , Vr= 2.5 V , Vf=0.46 V

$$R_{trim\text{-}up} = \frac{18.944}{0.6} - 4.636 = 26.94\ (\mathrm{K\Omega})$$

Trim-Down

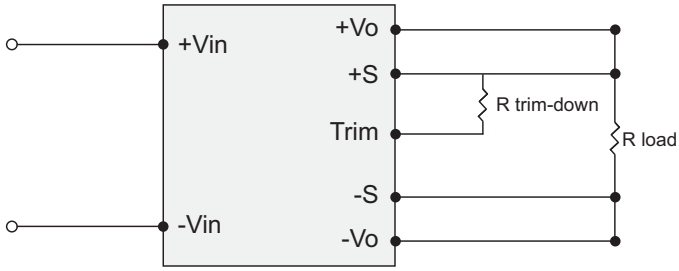


FIGURE 4: TRIM-DOWN VOLTAGE SETUP

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

$$R_{trim\text{-}down} = \frac{R_1 \times (V_o - V_r)}{V_{o,nom} - V_o} - R_2 \ (\mathrm{K\Omega})$$

Where: $R_{trim\text{-}down}$ is the external resistor in KΩ. Vo,nom is the nominal output voltage. Vo is the desired output voltage. R1, R2, R3, Vf and Vr are internal to the unit and are defined in Table 1.

For example, to trim-down the output voltage of 12.0 V module (VHB50W-Q48-S12) by 5% to 11.4 V, $R_{trim\text{-}down}$ is calculated as follows:

Vo,nom – Vo = 12 – 11.4 = 0.6 V

R1 = 9.1 KΩ , R2 = 51 KΩ , Vr= 2.5 V

$$R_{trim\text{-}down} = \frac{9.1 \times (11.4 - 2.5)}{0.6} - 51 = 83.98\ (\mathrm{K\Omega})$$

Table 1

Output Voltage (V)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	Vr (V)	Vf (V)
3.3 V	3.0	12	4.3	1.24	0.46
5 V	2.32	3.3	0	2.5	0
12 V	9.1	51	5.1	2.5	0.46
15 V	12	56	8.25	2.5	0.46
24 V	20	100	7.5	2.5	0.46

PART NUMBER: VQB75W **DESCRIPTION:** dc-dc converter

3. REMOTE OUTPUT ON/OFF CONTROL

The converter output can be enabled or disabled through the On/Off pin. The control logic is shown in this table. A common control circuit is shown below.

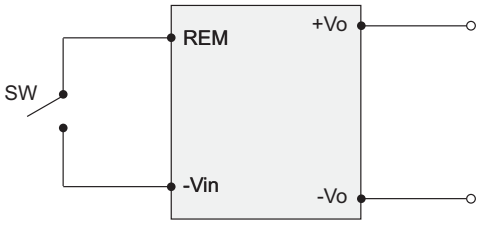


FIGURE 5. REMOTE ON/OFF CONTROL

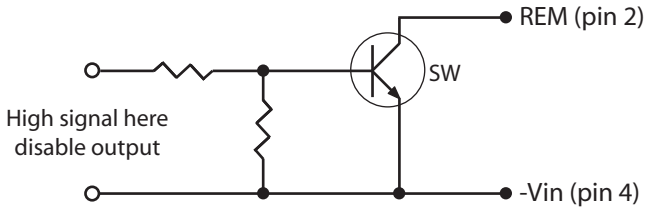


FIGURE 6. REMOTE ON/OFF CONTROL WITH TRANSISTOR SWITCH

Logic Table	Negative logic	Positive logic
SW Closed (V_{REM} <1.8 V)	Output on	Output off
SW Open (V_{REM} >3.5 ~ 75 V dc)	Output off	Output on

4. OUTPUT NOISE MEASUREMENT SCHEMATIC

For proper output ripple and noise measurement, connect a 10µF tantalum and a 1µF ceramic capacitor across the output. Set the scope bandwidth to 20MHz. Probe directly off of one of the capacitors, using a small ground clip to minimize measurement error.

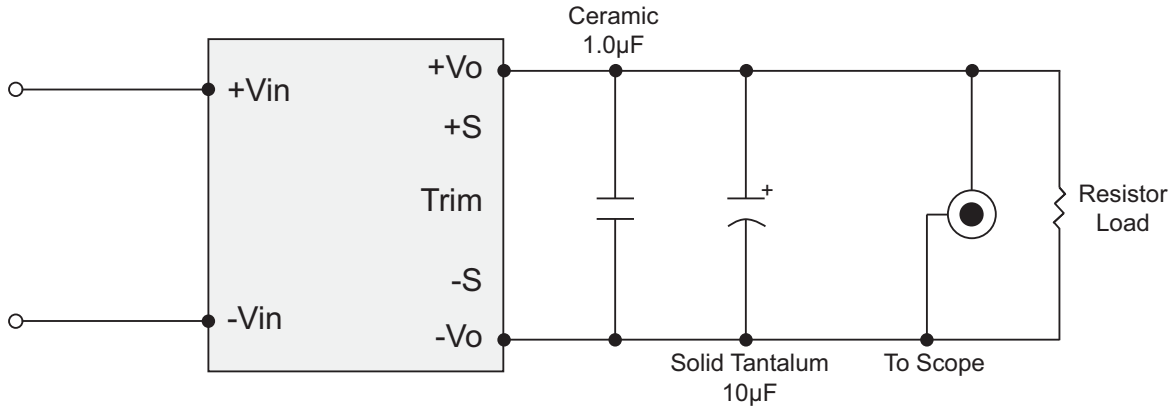
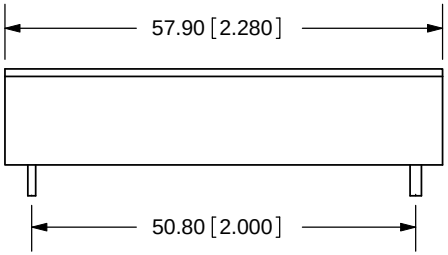
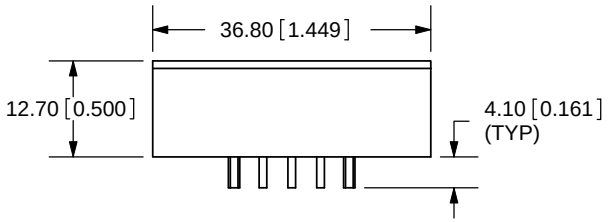
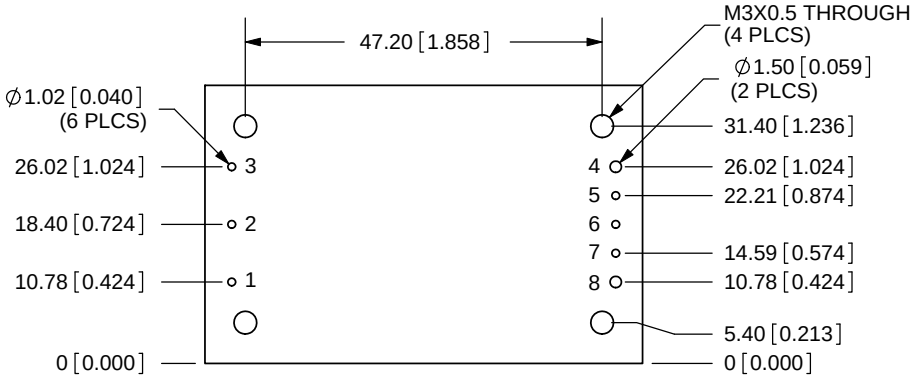


FIGURE 7. OUTPUT NOISE MEASUREMENT CIRCUIT

REV.	DESCRIPTION	DATE
A	NEW DRAWING	12/30/2008







TOLERANCE:
X.X ±0.5mm
X.XX ±0.25mm

RoHS

PIN CONNECTION	
Pin	Function
1	+Vin
2	ON/OFF
3	-Vin
4	-Vout
5	-Sense
6	Trim
7	+Sense
8	+Vout

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Fax: 503-612-2383
Website: www.cui.com

TITLE: DC-DC CONVERTER		REV: A
PART NO. VQB75W	UNITS: MM [INCHES]	
DRAWN BY: JMS	APPROVED BY:	SCALE: 1:1

PC FILE NAME: VQB75W