

## FEATURES AND APPLICATIONS

- 4:1 Input Range
- High Efficiency up to 88%
- Six-Sided Shield
- 2 x 2 x 0.4 inches
- Over Voltage Protection
- Over Current Protection
- UL60950-1 certified
- RoHS ✓



## GENERAL DESCRIPTION

The VTW40 series is a family of 40 Watt single, dual and triple output DC-DC converters. These converters combine a six-side shielded nickel-coated copper package in a 2" x 2" x 0.4" compatible case (50.8 x 50.8 x 10.2 mm) with high performance features such as 1500 Vdc input/output isolation voltage, continuous short circuit protection with automatic restart and tight line and load regulation. Models operate from a 4:1 input bus voltage of 24 and 48 Vdc offering output voltage levels of 3.3, 5, 12, 15,  $\pm 12$  and  $\pm 15$  Vdc. Cooling is by free-air convection, or optional by heat sink.

### 4:1 Input – single and dual Output

Model Number	Input Voltage [Vdc]	Output Voltage [Vdc]	Output Current min. Load [mA]	Output Current Full Load [mA]	Output Ripple & Noise [mVpp]	Inp. Current no Load [mA] 24/48	Input Current Full Load [mA] 24/48	Efficiency [%] 24/48	max. Cap. Load [ $\mu$ F]
VTW40-xx3R3S	24 48	3.3	0	10000	50	80/60	1677/838	86/86	25750
VTW40-xx05S		5.0	0	8000	50	100/65	2008/992	87/88	13600
VTW40-xx12S		12.0	50	3333	75	50/30	2008/1004	87/87	23600
VTW40-xx15S		15.0	50	2666	75	50/30	2008/1004	87/87	1510
VTW40-xx12D		$\pm 12.0$	$\pm 65$	$\pm 1667$	120	60/30	2032/1016	86/86	$\pm 1200$
VTW40-xx15D		$\pm 15.0$	$\pm 50$	$\pm 1333$	150	70/30	2032/1016	86/86	$\pm 750$

xx ... nominal Input voltage:

VTW40-Series: 24 (9 – 36 Vdc)  
48 (18 – 75 Vdc)

Options:

Suffix -HS Heat Sink + Clamps  
Suffix -HC Heat Sink only (no Clamps)  
Suffix N Remote ON/OFF Opiton, Negative Logic

### ELECTRICAL SPECIFICATIONS

Specifications typical at +25°C, nominal input voltage, rated output current unless otherwise specified.

#### Input Specifications

4:1 Input Voltage Range	24V: 9 to 36 Vdc 48V: 18 to 75 Vdc
Input Filter	Pi Type
Input Surge Voltage	24V: 50V dc, 100mS, max. 48V: 100 Vdc, 100mS, max.
Input reflected ripple current	20 mA <sub>pp</sub>
Start up time	20 mS, max.
Start up voltage	24V/48V: 9 / 18 Vdc
Shutdown voltage	24V/48V: 8 / 16 Vdc

#### Output Specifications

Output Power	40 Watts, max.
Output Voltage Accuracy	±1%
Min. Load for specified regulation	see table
The output requires minimum loading to maintain specified regulation. Operation in no-load condition will not damage these devices; however they may not meet all listed specifications.	
External trim adjustment range	±10% (single/dual output only)
Remote Sense Node:	
If remote sense is not being used, +Sense should be connected to +OUTPUT, and -SENSE to -Output!	
Ripple and Noise (20 MHz BW)	see table
Line Voltage Regulation	±0.2% (min. load to full load)
Load Voltage Regulation	±0.5% (single) ±1% (dual)
(Min. Load to HL at full load) Load regulation for dual output: Min. load to 100% load balanced on all outputs.	
Temperature Coefficient	±0.02%/°C, max.
Short Circuit Protection	Continuous (Hiccup)
Over Voltage Protection	3.3 Vout: 3.9 Vdc 5 Vout: 6.2 Vdc 12 Vout: 15 Vdc 15 Vout: 18 Vdc ±12 Vout: ±15 Vdc ±15 Vout: ±18 Vdc
(Zener diode clamp)	
Over load protection (% to FL at nom. input)	150%, max
Transient response recovery time	250 µsec (25% load step change)

#### Remote ON/OFF Control

Control Voltage referenced to negative (-) input	
Positive logic (Standard)	ON-Control: 3 - 12 V or open OFF-Control: 0 - 1.2 V or short
Negative logic (Option N)	ON-Control: 0 - 1.2 V or short OFF-Control: 3 - 12 V or open
Input current of remote control pin	-0.5 mA to -0.5 mA
Remote off state input current	10 mA (24V input) 5 mA (48V input)

#### General Specifications

Efficiency	see table
Switching Frequency	300 kHz ±10%
Isolation Voltage	Input to Output: 1500 Vdc, min. (1 minute) Input to Case: 1500 Vdc, min. (1 minute)
Isolation Resistance	10 <sup>9</sup> Ohms, min.
Isolation capacitance	1500 pF, max.
Case Grounding:	Connect case to -INPUT with decoupling Y Cap
Approvals	UL60950-1 certified (E352836) IEC/EN60950-1 (designed to meet)

#### Environmental Specification

Operating Temperature	-40°C to +50°C (without derating) +50°C to +105°C (with derating) (Heatsink available – see Page 4)
Max. Case Temperature	+105°C
Storage Temperature	-55°C to +125°C
Over Temp. Protection	+110°C
Cooling	Free-air Convection
Thermal Impedance	9.2°C/W Nature convection 7.6°C/W Heat sink with 20 LFM
MTBF	MIL-HDBK-217F: 1.511 x 10 <sup>6</sup> Hrs (Notice2 @25°C, FL, Ground, Benign, controlled environment) Bellcore TR-NWT-000332: 1.105 x 10 <sup>6</sup> Hrs (Case1, 50% Stress, 40°C)
Thermal Shock	MIL-STD-810F
Vibration	MIL-STD-810F
Relative Humidity	5% to 95% RH

#### Physical Characteristics

Dimensions	50.8 x 50.8 x 10.2 mm 2.0 x 2.0 x 0.4 inches
Case Material	Nickel-Coated Copper
Base Material	FR4 PCB
Potting Material	Epoxy (UL94-V0)
Weight	60 g

#### EMC Characteristics

EMI	EN55022	Class A
With an external capacitor parallel to the input pins. Recommended 24Vin: N/A 48Vin: 2 pcs of 2.2 µF / 100 V 1812MLCC		
ESD	EN61000-4-2	Perf. Criteria A (Air ±8 kV; Contact ±6 kV)
Radiated Im.	EN61000-4-3	Perf. Criteria A (10 V/m)
F. Transients.	EN61000-4-4	Perf. Criteria B (±2 kV)
Surge	EN61000-4-5	Perf. Criteria A (±1 kV)
An external filter capacitor is required if the module has to meet EN61000-4-4 and EN61000-4-5. Recommended: 220 µF / 100 V, low ERS		
Conducted I.	EN61000-4-6	Perf. Criteria A (10 Vrms)

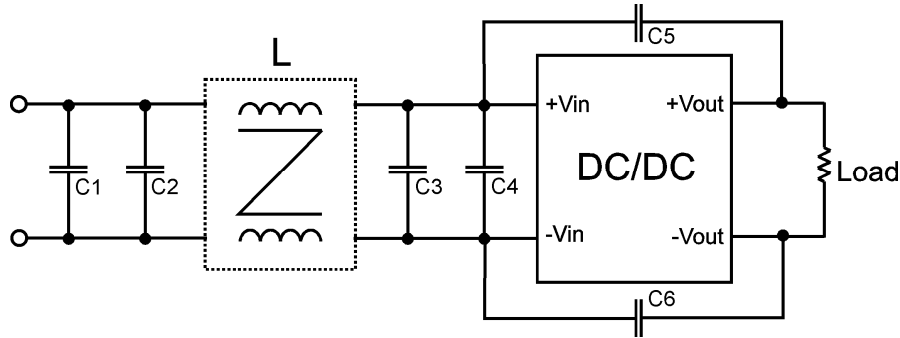
**CAUTION:** This power module is not internally fused. An input line fuse must always be used!

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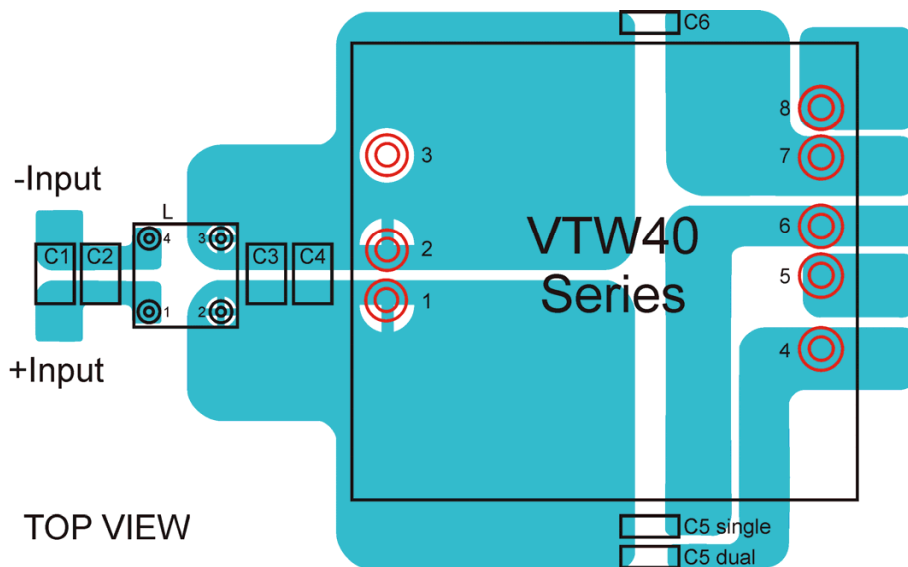
### Recommended Filter for EN55022 Class B Compliance



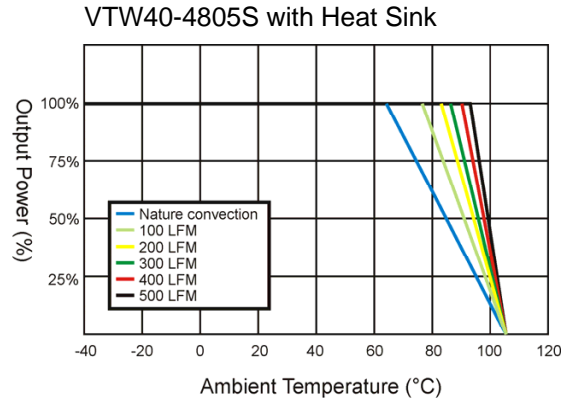
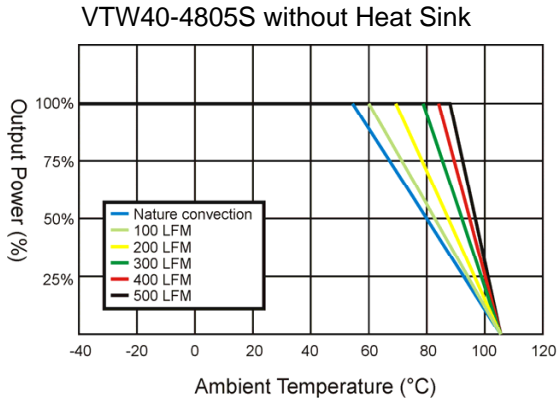
Recommended Components as follows:

	C1	C2	C3	C4	C5 & C6	L
VTW40-24xxx	4.7 $\mu$ F / 50V 1812 MLCC	N/A	4.7 $\mu$ F / 50V 1812 MLCC	N/A	1000 pF / 2kV 1812 MLCC	450 $\mu$ H Common Choke PMT-048
VTW40-48xxx	2.2 $\mu$ F / 100V 1812 MLCC	2.2 $\mu$ F / 100V 1812 MLCC	2.2 $\mu$ F / 100V 1812 MLCC	2.2 $\mu$ F / 100V 1812 MLCC	1000 pF / 2kV 1812 MLCC	830 $\mu$ H Common Choke PMT-053

Recommended EN55022 Class B Filter Circuit Layout:

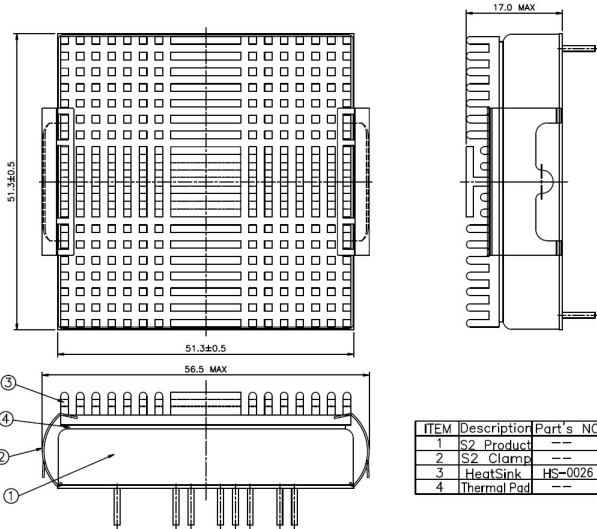
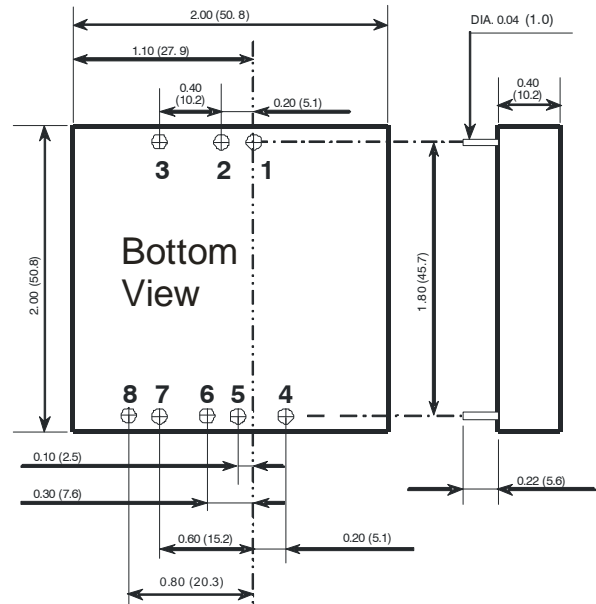
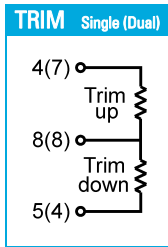


## Derating



## PIN Connections

Standard PIN Connections		
Pin	Single Output	Dual Output
1	+V Input	+V Input
2	-V Input	-V Input
3	Ctrl	Ctrl
4	-V Sense	+V Output
5	+V Sense	Common
6	+V Output	Common
7	-V Output	-V Output
8	Trim	Trim



ITEM	Description	Part's NO.	Q'ty
1	S2 Product	---	1
2	S2 Clamp	---	2
3	HeatSink	HS-0026	1
4	Thermal Pad	---	1

## Heat Sink

To order VTW40 with Heat Sink add following Suffix to the Part Number:

- HS ... Heat Sink only
- HC ... Heat Sink + Clamps (Recommended)

Example: VTW40-4805S-HC

Notes: All dimensions in millimeters (inches). Tolerance  $\pm 0.25\text{mm}$  (0.01).

Specifications can be changed without prior notice. Products are not intended for and must not be used in life support systems, human implantation, nuclear facilities or systems or any other application where product failure or malfunction of the component could lead to loss of life or catastrophic property damage.