

FEATURES AND APPLICATIONS

- 2:1 Input Range
- High Efficiency up to 90%
- Six-Sided Shield
- 2 x 2 x 0.4 inches
- Over Voltage Protection
- Over Current Protection
- UL60950-1 certified
- RoHS ✓



GENERAL DESCRIPTION

The VT40 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 2:1 input bus voltage of 12, 24 and 48Vdc offering output voltage levels of 1.5, 1.8, 2.5, 3.3, 5, 12, 15, ±12, ±15, 3.3/5, 3.3&±12, 3.3&±15, 5&±12 and 5&±15 Vdc. Cooling is by free-air convention, or optional by heat sink.

2:1 Input - single, dual and triple 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] 12/24/48	Input Current Full Load [mA] 12/24/48	Efficiency [%] 12/24/48	max. Cap. Load [µF]
VT40-xx1R5S	12 24 48	1.5	0	8000	50	110/40/25	1250/649/321	84/81/82	45000
VT40-xx1R8S		1.8	0	8000	50	110/40/25	1538/759/375	82/83/84	37700
VT40-xx2R5S		2.5	0	8000	50	110/40/25	2083/1016/508	84/86/86	27000
VT40-xx3R3S		3.3	0	8000	50	175/60/35	2683/1325/655	86/87/88	21000
VT40-xx05S		5.0	0	8000	50	225/80/40	4065/1961/969	86/89/90	13600
VT40-xx12S		12.0	0	3333	75	255/70/50	4065/2048/1000	86/88/89	2300
VT40-xx15S		15.0	0	2666	75	310/85/50	4015/1985/992	87/89/89	1500
VT40-xx12D		±12.0	±144	±1800	120	30/20/15	4444/2169/1084	85/87/87	±1200
VT40-xx15D		±15.0	±112	±1400	150	35/20/15	4321/2108/1054	85/87/87	±750
VT40-xx3R305D		3.3/5.0	0	4000/4000	100	325/80/45	3416/1689/823	85/86/88	11000/6800
VT40-xx3R312T		3.3/±12	600/±40	6000/±400	50/75	215/65/35	3063/1512/747	84/85/86	13000/±400
VT40-xx3R315T		3.3/±15	600/±30	6000/±300	50/75	230/65/35	3000/1481/732	84/85/86	13000/±110
VT40-xx0512T		5.0/±12	600/±40	6000/±400	50/75	280/60/30	4024/1989/982	86/87/88	6800/±330
VT40-xx0515T		5.0/±15	600/±30	6000/±300	50/75	255/75/40	3963/1958/967	86/87/88	6800/±110

xx ... nominal Input voltage:

VT40-Series: 12 (9 – 18 Vdc)
24 (18 – 36 Vdc)
48 (36 – 75 Vdc)

Options:

Suffix -HS Heat Sink + Clamps
Suffix -HC Heat Sink only (no Clamps)

ELECTRICAL SPECIFICATIONS

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

Input Specifications

2:1 Input Voltage Range	12V: 9 to 18 Vdc 24V: 18 to 36 Vdc 48V: 36 to 75 Vdc
Input Filter	L-C Type
Input Surge Voltage	12V: 36 Vdc, 100 mS, max. 24V: 50 Vdc, 100 mS, max. 48V: 100 Vdc, 100 mS, max.
Input reflected ripple current	40 mApp
Start up time	25 mS, max.
Start up voltage	12V/24V/48V: 9 / 17.8 / 36 Vdc
Shutdown voltage	12V/24V/48V: 8 / 16 / 34 Vdc

Output Specifications

Output Power	40 Watts, max.
Output Voltage Accuracy	±1% (single/dual/triple main) ±5% (triple aux)
Min. Load for specified regulation	see table <small>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.</small>
External trim adjustment range	±10% (single/dual output only)
Remote Sense Node:	<small>If remote sense is not being used, +Sense should be connected to +OUTPUT, and -SENSE to -Output!</small>
Ripple and Noise (20 MHz BW)	see table <small>Measured with a 0.1µF/50V MLCC</small>
Line Voltage Regulation	±0.5% (single/dual) (single/dual: min. load to full load) ±1% (triple main) (triple: 10% to 100% load) ±5% (triple aux)
Load Voltage Regulation	±0.5% (single) (single: LL to HL at full load) ±1% (dual) (dual: asymmetric load 25/100% of FL) ±2% (triple main) (triple: main 100%, aux 25-100% of FL) ±5% (triple aux)
Temperature Coefficient	±0.02%/°C, max.
Short Circuit Protection	Continuous (Hiccup)
Over Voltage Protection	1.5-3.3 Vout: 3.9 Vdc (Zener diode clamp) 5 Vout: 6.2 Vdc 12 Vout: 15 Vdc 15 Vout: 18 Vdc
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	ON-Control: 3.5-12 V or open OFF-Control: 0-1.2 V or short
Input current of remote control pin	-0.5 mA to -0.5 mA
Remote off input current	2.5 mA

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 ⁹ Ohms, min.
Isolation capacitance	1500 pF, max.
Approvals	UL60950-1 certified (E352836) IEC/EN60950-1 (designed to meet)

Environmental Specification

Operating Temperature	-40°C to +85°C (with derating) (Heatsink available – see Page 4)
Max. Case Temperature	+100°C
Storage Temperature	-55°C to +105°C
Over Temp. Protection	+115°C
Cooling	Free-air Convection
Thermal Impedance	9.2°C/W Nature convection 7.6°C/W Heat sink with 20 LFM 2.8°C/W Heat sink with 500 LFM
MTBF	MIL-HDBK-217F: 3.585 x 10 ⁶ Hrs (Notice2 @25°C, FL, Ground, Benign, controlled environment) Bellcore TR-NWT-000332: 1.398 x 10 ⁶ Hrs (Case1, 50% Stress, 40°C)
Thermal Shock	MIL-STD-810F
Vibration	MIL-STD-810F
Relative Humidity	5% to 95% RH

Physical Characteristics

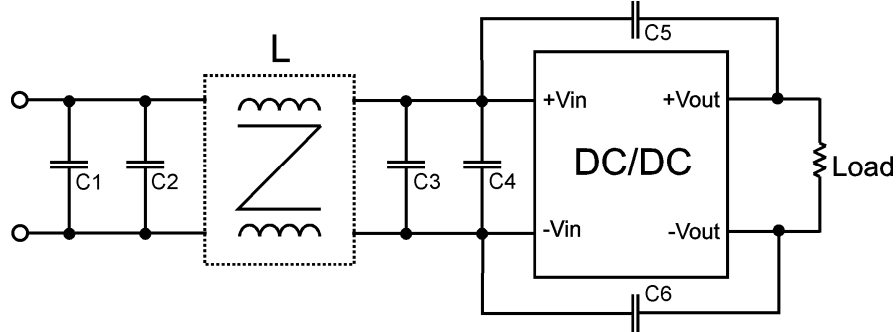
Dimensions	50.8 x 50.8 x 10.2 mm 2.0 x 2.0 x 0.4 inches
Case Material	Nickel-Coated Copper
Base Material	FR4 PCB
Potting Material	Epoxy (UL94-V0)
Weight	60 g

EMC Characteristics

EMI	EN55022	Class A
<small>With an external capacitor parallel to the input pins.</small>		
<small>Recommended 12Vin: 6.8µF/50V 1812MLCC 24Vin: 6.8µF/50V 1812MLCC 48Vin: 2.2µF/100V 1812MLCC</small>		
ESD	EN61000-4-2	Perf. Criteria B (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 B (±1 kV)
<small>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</small>		
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!

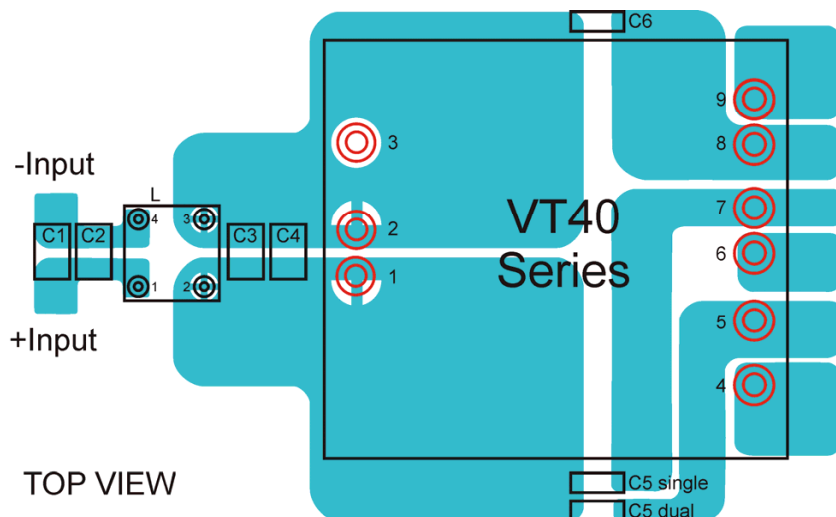
Recommended Filter for EN55022 Class B Compliance



Recommended Components as follows:

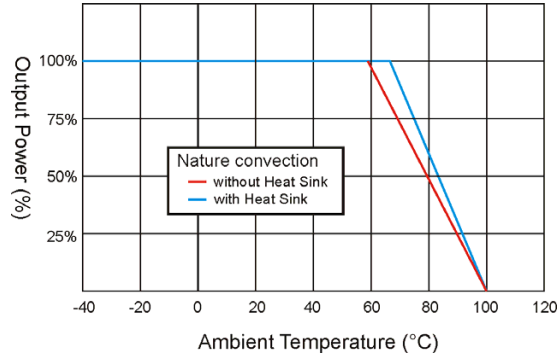
	C1	C2	C3	C4	C5 & C6	L
VT40-12xxx	4.7 μ F / 50V 1812 MLCC	N/A	4.7 μ F / 50V 1812 MLCC	N/A	1000 pF / 2kV 1812 MLCC	450 μ H Common Choke PMT-048
VT40-24xxx	6.8 μ F / 50V 1812 MLCC	N/A	6.8 μ F / 50V 1812 MLCC	N/A	1000 pF / 2kV 1812 MLCC	450 μ H Common Choke PMT-048
VT40-48xxx	2.2 μ F / 100V 1812 MLCC	2.2 μ F / 100V 1812 MLCC	2.2 μ F / 100V 1812 MLCC	2.2 μ F / 100V 1812 MLCC	1000 pF / 2kV 1812 MLCC	830 μ H Common Choke PMT-053

Recommended EN55022 Class B Filter Circuit Layout:



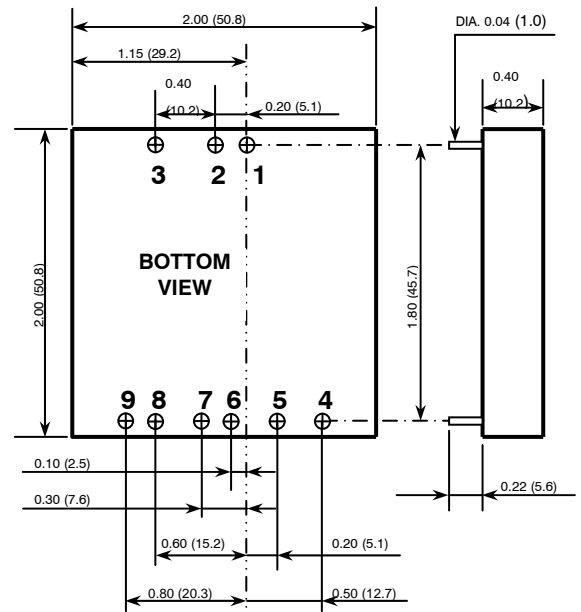
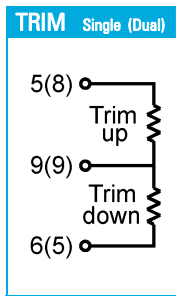
Derating

VT40-4805S with and without Heat Sink

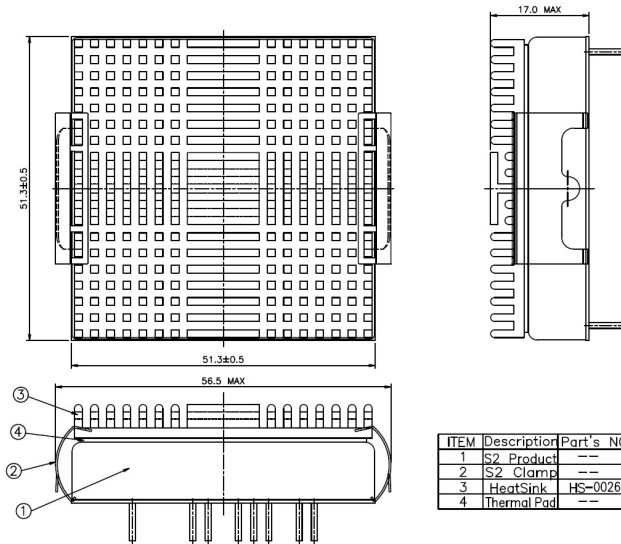


PIN Connections

Standard PIN Connections			
Pin	Single Output	Dual Output VT40-xxxxD / VT40-xx3R305D	Triple Output
1	+V Input	+V Input	+V Input
2	-V Input	-V Input	-V Input
3	Ctrl	Ctrl	Ctrl
4	NC	Omitted / 3.3V	+AUX
5	-V Sense	+V Output / 3.3V RTN (COM)	Common
6	+V Sense	Common / NC	-AUX
7	+V Output	Common / NC	+V Output
8	-V Output	-V Output / 5V	-V Output
9	Trim	Trim / 5V RTN (COM)	NC



NC...not connected



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 VT40 with Heat Sink add following Suffix to the Part Number:

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

Example: VT40-4805S-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.