

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 VT60 series is a family of 60 Watt single 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 24 and 48 Vdc offering output voltage levels of 3.3, 5, 12, 15 and 24 Vdc. Cooling is by free-air convection, or optional by heat sink.

2:1 Input – Single Output - Standard Types

Type Number	Input Voltage [Vdc]	Output Voltage [Vdc]	Output Current [A]	Input Current no Load [mA] 24/48	Input Current Full Load [mA] 24/48	Output Ripple & Noise [mVpp]	Efficiency [%]	max. Cap. Load [µF]
VT60-xx3R3S	24 48	3.3	14	100/80	2260/1130	75	89	36000
VT60-xx05S		5.0	12	130/90	2940/1450	75	90	20400
VT60-xx12S		12.0	5	50/30	2910/1450	100	90	3550
VT60-xx15S		15.0	4	50/30	2910/1450	100	90	2300
VT60-xx24S		24.0	2.5	50/30	2940/1470	200	89	885

xx ... nominal Input voltage:

VT60-Series: 24 (18 – 36 Vdc)
48 (36 – 75 Vdc)

Options:

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

ELECTRICAL SPECIFICATIONS

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

Input Specifications

2:1 Input Voltage Range	24V: 18 to 36 Vdc 48V: 36 to 75 Vdc
Input Filter	Pi Type
Input Surge Voltage	24V: 50 Vdc, 100 mS, max. 48V: 100 Vdc, 100 mS, max.
Input reflected ripple current	20 mApp
Start up time	20 mS, max.
Start up voltage	24V: 17 Vdc 48V: 34 Vdc
Shutdown voltage	24V: 15 Vdc 48V: 32 Vdc

Output Specifications

Output Power	60 Watts, max.
Output Voltage Accuracy	±1%
Min. Load for specified regulation	0%
External trim adjustment range	24 Vout: +20% to -10% others: ±10%

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% (LL to HL at full load)
Load Voltage Regulation	±0.5% (No load to full load)
Temperature Coefficient	±0.02%/°C, max.
Short Circuit Protection	Continuous (Hiccup)
Over Voltage Protection	3.3 Vout: 3.7 to 5.4 Vdc 5 Vout: 5.6 to 7.0 Vdc 12 Vout: 13.8 to 17.5 Vdc 15 Vout: 16.8 to 20.5 Vdc 24 Vout: 30.0 to 33.0 Vdc
Over load protection	150%, max (% to FL at nom. input)
Transient response recovery time	250 µsec (25% load step change)

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.
Case Grounding:	Connect case to -INPUT with decoupling Y Cap
Approvals	UL60950-1 certified (E352836) IEC/EN60950-1 (designed to meet)

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 -1.0 mA
Remote off input current	4 mA

Environmental Specification

Operating Temperature	-40°C to +110°C (with Derating) (Heat sink available – see Page 4)
Max. Case Temperature	+115°C
Storage Temperature	-55°C to +125°C
Over Temp. Protection	+120°C
Cooling	Free-air Convection
Thermal Impedance	10.5°C/W Nature convection 8.4°C/W Heat sink
MTBF Bellcore TR-NWT-000332:	1.093 x 10 ⁶ Hrs (Case1, 50% Stress, 40°C)
MIL-HDBK-217F:	1.096 x 10 ⁶ Hrs (Notice2 @25°C, FL, Ground, Benign, controlled environment)
Thermal Shock	MIL-STD-810F
Vibration	MIL-STD-810F
Relative Humidity	5% to 95% RH

Physical Characteristics

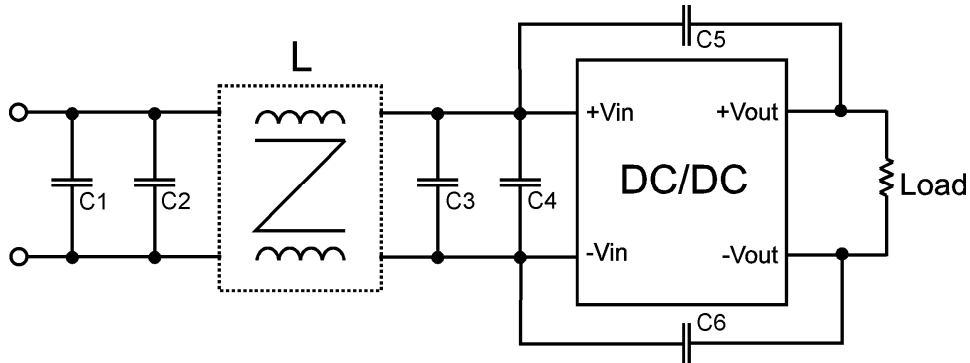
Dimensions	50.8 x 50.8 x 10.2 mm 2.0 x 2.0 x 0.4 inches
Case Material	Nickel-Coated Copper
Base Material	FR4 PCB
Potting Material	Epoxy (UL94-V0)
Weight	60 g

EMC Characteristics

EMI	EN55022	Class A
	With an external capacitor parallel to the input pins. Recommended 24 Vin: 6.8 µF / 50 V 1812MLCC 48 Vin: 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 A (±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!

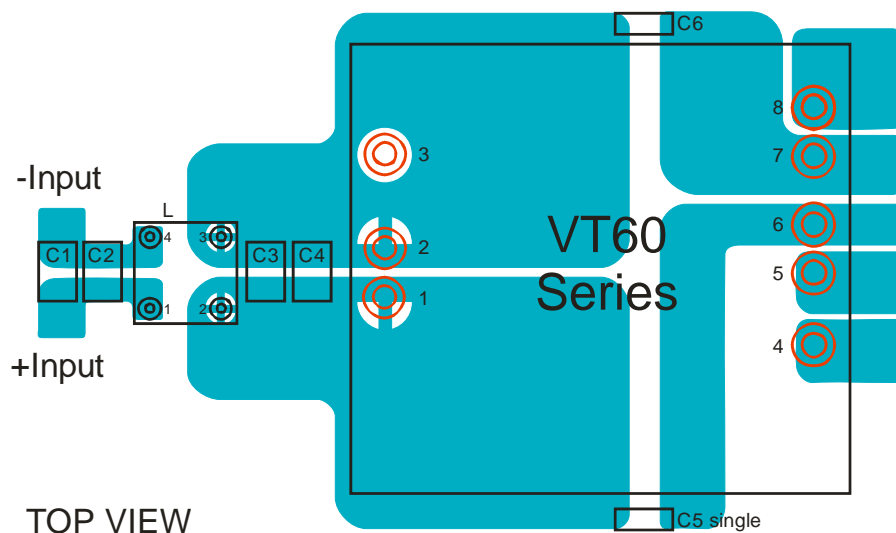
Recommended Filter for EN55022 Class B Compliance



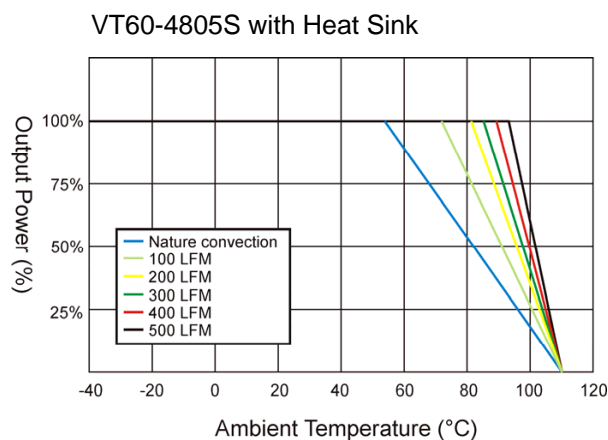
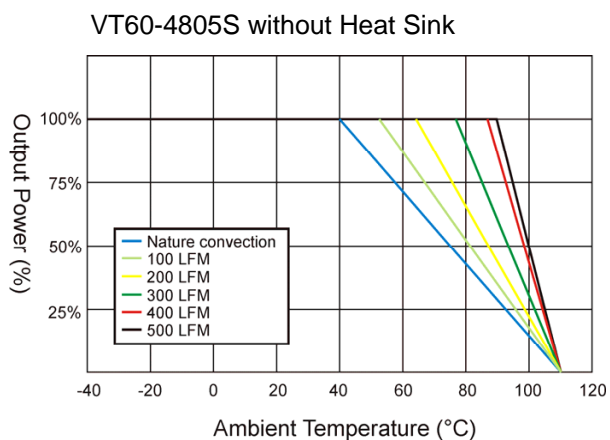
Recommended Components as follows:

	C1	C2	C3	C4	C5 & C6	L
VT60-24xxx	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
VT60-48xxx	2.2 μ F / 100V 1812 MLCC	2.2 μ F / 100V 1812 MLCC	2.2 μ F / 100V 1812 MLCC	N/A	1000 pF / 2kV 1812 MLCC	830 μ H Common Choke PMT-053

Recommended EN55022 Class B Filter Circuit Layout:



Derating

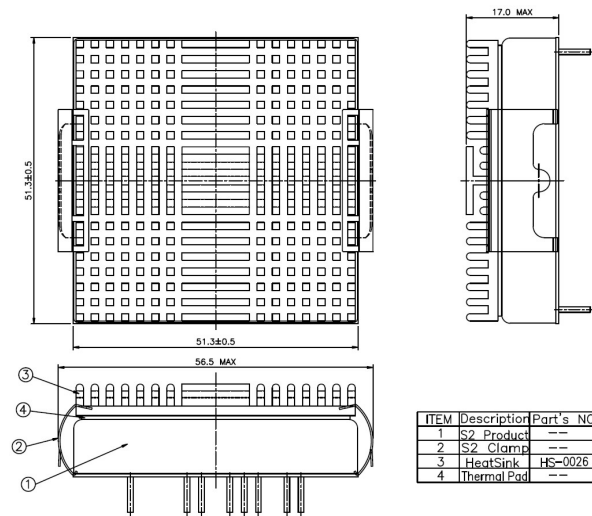
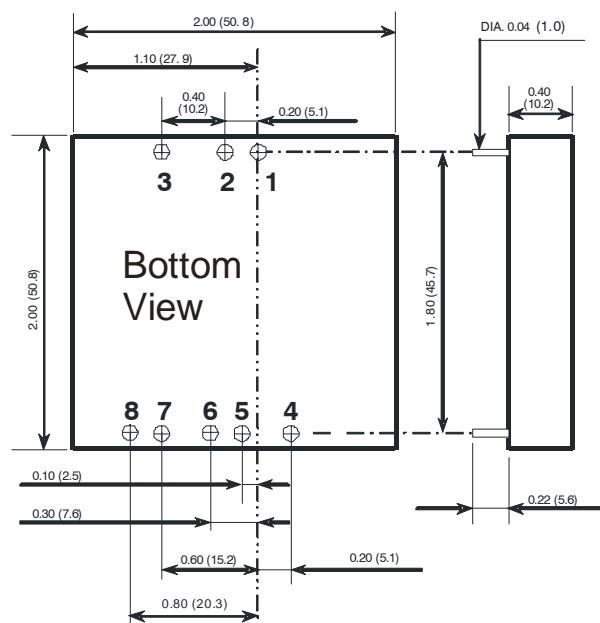
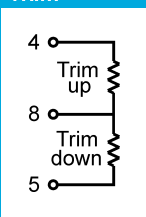


PIN Connections

Standard PIN Connections

Pin	Single Output
1	+V Input
2	-V Input
3	Ctrl
4	-V Sense
5	+V Sense
6	+V Output
7	-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 VT60 with Heat Sink add following Suffix to the Part Number:

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

Example: VTW60-4805S-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.