

FEATURES AND APPLICATIONS

- 2:1 and 4:1 Input Range
- High Efficiency up to 87%
- 2" x 1.6" Package
- Low Ripple & Noise
- UL60950-1 certified
- RoHS ✓



GENERAL DESCRIPTION

The VT20 and VTW20 series is a family of 20 Watt single, dual and triple output DC-DC converters. These converters combine five side shielded nickel-coated copper package in a compatible case (2" x 1.6") 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 or a 4:1 input bus voltage of 12, 24 and 48 Vdc offering output voltage levels of 3.3, 5, 12, 15, ± 5 , ± 12 , ± 15 , 3.3/ ± 12 , 3.3/ ± 15 , 5/ ± 12 and 5/ ± 15 Vdc. Cooling is by free-air convection.

2:1 Input – Single, Dual and Triple Outputs

Type Number	Input Voltage [Vdc]	Output Voltage [Vdc]	Output Current Min. load [mA]	Output Current Full load [mA]	Input Current Full load [mA] 12/24/48	Output Ripple & Noise [mVpp]	Efficiency [%] 12/24/48	max. Cap. Load [μ F]
VT20-xx3R3S	12 24 48	3.3	280	4000	1507/733/4367	75	77/79/79	13000
VT20-xx05S		5.0	280	4000	2193/1082/543	75	80/81/82	6800
VT20-xx12S		12.0	134	1670	2110/1018/509	75	83/86/86	2200
VT20-xx15S		15.0	106	1330	2083/1018/506	75	84/86/86	755
VT20-xx05D		± 5.0	± 140	± 2000	2136/1028/514	100	82/85/85	± 3400
VT20-xx12D		± 12.0	± 67	± 833	2110/1016/502	100	83/86/87	± 680
VT20-xx15D		± 15.0	± 53	± 667	2110/1015/502	100	83/86/87	± 450
VT20-xx3R312T		3.3/ ± 12.0	300/ ± 30	3000/ ± 300	1900/914/457	50/ ± 120	79/82/82	4700/ ± 220
VT20-xx3R315T		3.3/ ± 15.0	300/ ± 25	3000/ ± 250	1933/967/464	50/ ± 150	79/79/82	4700/ ± 220
VT20-xx0512T		5.0/ ± 12.0	200/ ± 30	2000/ ± 300	1885/907/448	50/ ± 120	80/83/84	4700/ ± 220
VT20-xx0515T		5.0/ ± 15.0	200/ ± 25	2000/ ± 250	1919/922/456	50/ ± 150	80/83/84	4700/ ± 220

4:1 Input – Single and Dual Outputs

Type Number	Input Voltage [Vdc]	Output Voltage [Vdc]	Output Current Min. load [mA]	Output Current Full load [mA]	Input Current Full load [mA] 24/48	Output Ripple & Noise [mVpp]	Efficiency [%] 24/48	max. Cap. Load [μ F]
VTW20-xx3R3S	24 48	3.3	280	4000	764/377	75	76/77	13000
VTW20-xx05S		5.0	280	4000	1111/548	75	79/80	6800
VTW20-xx12S		12.0	134	1670	1082/536	75	81/82	2200
VTW20-xx15S		15.0	106	1330	1082/532	75	81/82	755
VTW20-xx05D		± 5.0	± 140	± 2000	1111/541	100	79/81	± 3400
VTW20-xx12D		± 12.0	± 67	± 833	1068/527	100	82/83	± 680
VTW20-xx15D		± 15.0	± 53	± 667	1068/527	100	82/83	± 450

xx ... nominal Input voltage:

VT20-Series:	12	(9 – 18 Vdc)
	24	(18 – 36 Vdc)
	48	(36 – 75 Vdc)
VTW20-Series:	24	(9 – 36 Vdc)
	48	(18 – 75 Vdc)

Options:

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

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ELECTRICAL SPECIFICATIONS

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

Input Specifications

Input Voltage Range	
2:1 input (VT20-Series)	4:1 input (VTW20-Series)
12V: 9 to 18 Vdc	24V: 9 to 36 Vdc
24V: 18 to 36 Vdc	48V: 18 to 75 Vdc
48V: 36 to 75 Vdc	
Input Filter	Pi 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	25 mApp
Start Up time (nom. input, const. res. load)	20 mS

Output Specifications

Output Power	20 Watts, max.
Output Voltage Accuracy	±1.0% (Single and Dual Types)
	±1.0% (Triple - Main Output)
	±5.0% (Triple - Auxiliary Output)
Output Voltage Trim	±10% (Single and Dual Output)
	The Output Voltage could be trimmed by using external Components (see Page 4)
Min. Load for specified regulation	see table
Ripple and Noise (20 MHz BW)	see table
Line Voltage Regulation	Single: ±0.2% (LL to HL at full load)
	Dual: ±0.5% (LL to HL at full load)
	Triple – Main Output: ±1.0% (LL to HL at full load)
	Triple – Auxiliary Output: ±5.0% (LL to HL at full load)
Load Voltage Regulation	Single: ±0.5% (Min. load to full load)
	Dual: ±3.0% (Min. load to full load)
	Triple – Main Output: ±2.0% (Min. load to full load)
	Triple – Auxiliary Output: ±5.0% (Min. load to full load)
Cross Regulation (Dual)	Dual: ±5.0% (Asym. load 25%/100% FL)
	Triple – Main Output: ±2.0% (Asym. load 25%/100% FL)
	Triple – Auxiliary Output: ±5.0% (Asym. load 25%/100% FL)
Temperature Coefficient	±0.02%/°C, max.
Over Load Protection	150% (of FL at nominal input)
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
Transient response recovery time	
	Single, Dual: 250 µsec (25% load step change)
	Triple – Main Output: 500 µsec (25% load step change)

General Specifications

Efficiency	see table
Switching Frequency	300 kHz, ±10%
Isolation Voltage	1500 Vdc, min. (1 minute)
Isolation Resistance	10 ⁹ Ohms, min.
Isolation Capacitance	300 pF, max.
Approvals	UL60950-1 certified (E352836)
	IEC/EN60950-1 (designed to meet)

Remote ON/OFF Control

Control Voltage referenced to negative (-) input	
Positive Logic	ON-Control: 3.5 to 12 V or open
	OFF-Control: 0 to 1.2 V or short
Input current of remote control pin	-0.5 mA to +1.0 mA, max.
Remote off input current	20 mA

Environmental Specification

Operating Temperature	-40°C to +85°C with Derating
Storage Temperature	-55°C to +105°C
Max. Case Temperature	+100°C
Thermal Impedance	10°C/Watt (Natural Convection)
	8.24°C/Watt (with Heat Sink)
Cooling	Free-air Convection
MTBF	MIL-HDBK-217F: 7.650 x 10 ⁵ Hrs *
	Bellcore TR-NWT-000332: 1.928 x 10 ⁶ Hrs **
	* Notice2 @25°C, FL, Ground, Benign, controlled environment
	** 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 40.6 x 10.2 mm
	2.00 x 1.60 x 0.40 inches
Case Material	Nickel-coated copper
Base Material	Non-conductive black plastic
Potting Material	Epoxy (UL94-V0)
Weight	48 g

EMC Characteristics

EMI	EN55022	Class A
	With an external capacitor parallel to the input pins: see EMI Filter on Page 3	
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)
	An external filter capacitor is required if the module has to meet EN61000-4-4 and EN61000-4-5. Recommended: 220 µF/100 V, ESR 48 mΩ	
Conducted I.	EN61000-4-6 Perf. Criteria A	(10 Vrms)

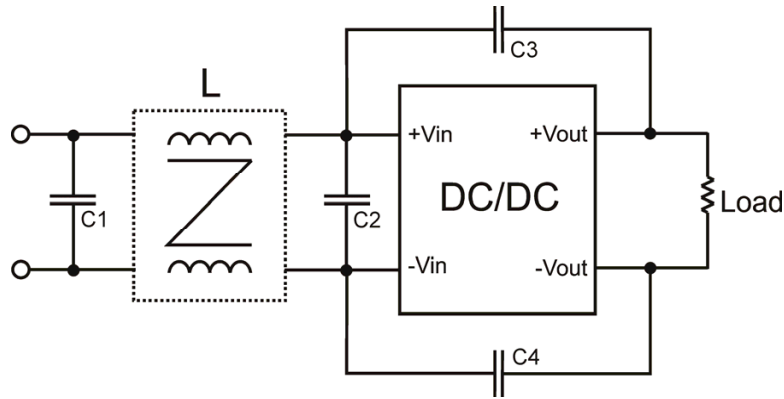
CAUTION: This power module is not internally fused. An input line fuse must always be used!

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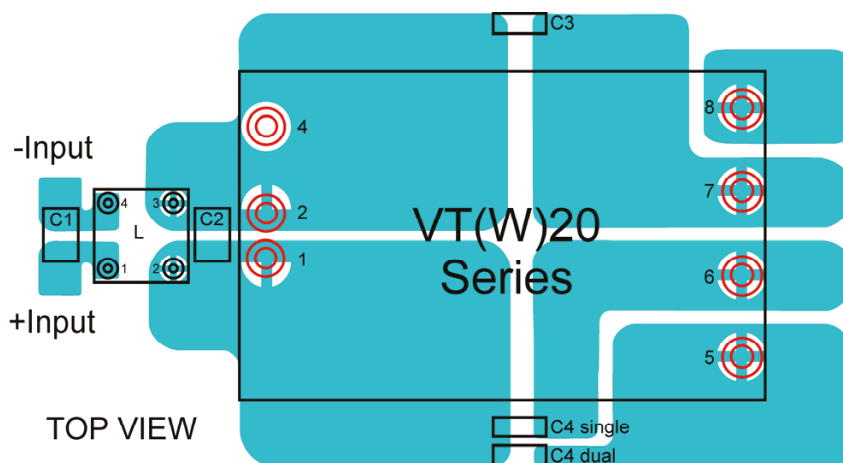
Recommended Filter for EN55022 Class A or Class B Compliance



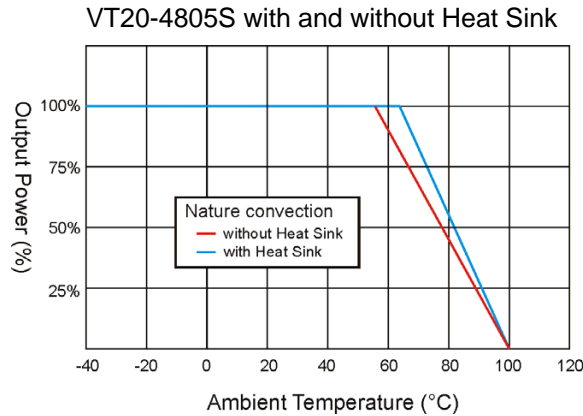
Recommended Components as follows:

	Class A Compliance		Class B Compliance			
	C2	C1, C3, C4, L	C1	C2	C3, C4	L
VT20-12xxx	6.8 μ F / 50V 1812 MLCC	-	4.7 μ F / 50V 1812 MLCC	-	1000 pF / 2kV MLCC	450 μ H Common Choke PMT-048
VT20-24xxx	-	-	4.7 μ F / 50V 1812 MLCC	-	1000 pF / 2kV MLCC	450 μ H Common Choke PMT-048
VT20-48xxx	2.2 μ F / 100V 1812 MLCC	-	2.2 μ F / 100V 1812 MLCC	2.2 μ F / 100V 1812 MLCC	1000 pF / 2kV MLCC	450 μ H Common Choke PMT-048

Recommended EN55022 Class A or Class B Filter Circuit Layout:

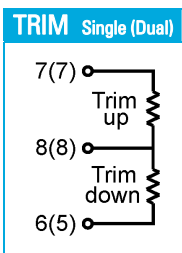


Derating

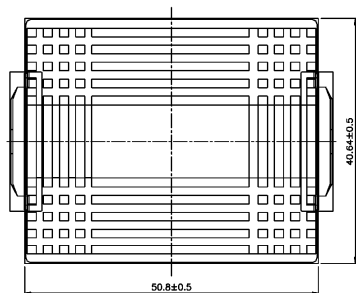


PIN Connections

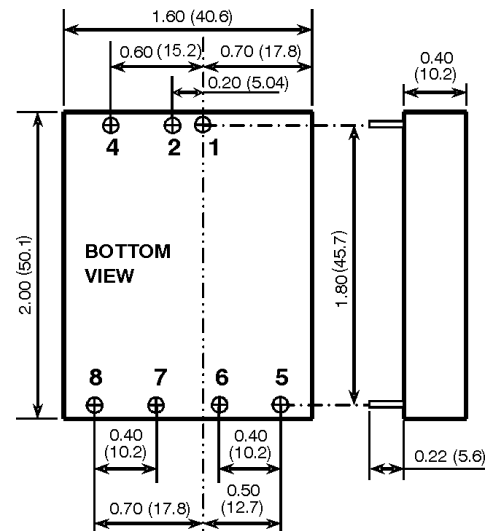
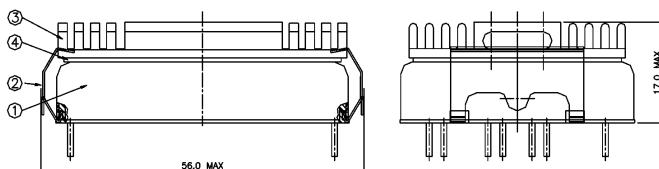
Standard PIN Connections			
Pin	Single	Dual	Triple
1	+V Input	+V Input	+V Input
2	-V Input	-V Input	-V Input
4	Ctrl	Ctrl	Ctrl
5	NP	+V Output	+ Auxiliary
6	+V Output	Common	+3.3V / +5V
7	-V Output	-V Output	Common
8	TRIM	TRIM	- Auxiliary



NP ... No Pin



ITEM	Description	Part's NO.	Q'ty
1	F2 Productor	--	1
2	F2 Clamper	HS-CL02	2
3	HeatSink	HS-0011A	1
4	Thermal Pad	5T-S0091	1



Heat Sink

To order the VT20/VTW20-Series assembled with heat sink, add following suffix to the part number:

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

e.g. VTW20-2405S-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.