

FEATURES

- 2250 Vdc Isolation
- Up to 50 Watts
- High Efficiency up to 93%
- 4:1 Wide Input Range
- Low Standby Power
- Six-Sided Continuous Shield
- Remote ON/OFF
- Over Voltage and Over Current Protection
- Short Circuit and Under Voltage Protection
- Over Temperature Protection
- Operating Altitude 5000 meter

APPLICATIONS

- Telecom
- Datacom
- Industrial Control
- Automation
- Measurement
- IPC

GENERAL DESCRIPTION

The VTW50Q series is a family of 50 Watt single and dual output DC-DC converters. These converters combine a six-side shielded nickel-coated copper package in a 1 x 1 x 0.4 compatible case with high performance features such as 2250 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 5, 12, 15, 24, ± 12 , ± 15 and ± 24 Vdc. Cooling is by free-air convention, or optional by heat sink.



PART NUMBER STRUCTUR

VTW50Q - 24	05	S	P	-HC	
Series Name	Input Voltage (VDC)	Output Voltage (VDC)	Output Quantity	Logical & pin Options	Assembly Options
	24: 9-36 48: 18-75	05: 5 12: 12 15: 15 24: 24 12: ±12 15: ±15 24: ±24	S: Single D: Dual	☐ : Negative logic P: Positive logic	☐ : None -HC1: Heatsink , H=0.3" -HC2: Heatsink , H=0.5" -HC3: Heatsink , H=0.8"

SELECTION GUIDE

Model No.	nominal Input Voltage Range [Vdc]	nominal Output Voltage [Vdc]	Output Current @Full Load [A]	Input Current @ No Load [mA]	Max. Capacitive Load [μF]	Efficiency typ. [%]
VTW50Q-2405S	24 (9~36)	5	10	15	14400	90
VTW50Q-2412S		12	4.2	15	2520	93
VTW50Q-2415S		15	3.33	15	1630	92
VTW50Q-2424S		24	2.1	15	630	90.5
VTW50Q-2412D		±12	±2.1	15	±1260	90.5
VTW50Q-2415D		±15	±1.68	15	±816	90.5
VTW50Q-2424D		±24	±1.05	15	±330	90.5
VTW50Q-4805S	48 (18~75)	5	10	15	14400	90
VTW50Q-4812S		12	4.2	15	2520	92
VTW50Q-4815S		15	3.33	15	1630	92.5
VTW50Q-4824S		24	2.1	15	630	90.5
VTW50Q-4812D		±12	±2.1	15	±1260	90.5
VTW50Q-4815D		±15	±1.68	15	±816	90.5
VTW50Q-4824D		±24	±1.05	15	±330	91

INPUT SPECIFICATIONS

Item	Conditions			Min.	Typ.	Max.	Unit	
Operating input voltage range	24 Vin (nom)			9	24	36	Vdc	
	48 Vin (nom)			18	48	75		
Start up voltage	24 Vin (nom)			-	-	9	Vdc	
	48 Vin (nom)			-	-	18		
Shutdown voltage	24 Vin (nom)			7.5	8	8.8	Vdc	
	48 Vin (nom)			15.5	16	17.5		
Start up time	Constant resistive load	Power up		-	30	60	ms	
		Remote ON/OFF						
Input surge voltage	1s, max.	24 Vin (nom)		-	-	50	Vdc	
		48 Vin (nom)		-	-	100		
Input filter	-			Pi type				
Remote ON/OFF	Referred to -Vin pin	Positive logic (Option)	DC-DC ON	Open or 3 ~ 12 Vdc				
			DC-DC OFF	Short or 0 ~ 1.2 Vdc				
		Negative logic (Standard)	DC-DC ON	Short or 0 ~ 1.2 Vdc				
			DC-DC OFF	Open or 3 ~ 12 Vdc				
		Input current of Ctrl pin			-0.5	-	+1.0	mA
		Remote off input current			-	3.0	-	mA

OUTPUT SPECIFICATIONS

Item	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy	-		-1.0	-	+1.0	%
Line regulation	Low Line to high line @ full load	Single	-0.2	-	+0.2	%
		Dual	-0.5	-	+0.5	
Load regulation	No load to full load	Single	-0.2	-	+0.2	%
		Dual	-1.0	-	+1.0	
	10% load to 90% load	Single	-0.1	-	+0.1	%
		Dual	-0.8	-	+0.8	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0	-	5.0	%
Voltage adjustability	Single output	15 & 24 Vout	-10	-	+20	%
		others	-10	-	+10	
Ripple and noise (Measured by 20MHz bandwidth)	with a 22 μ F/25V X7R MLCC	single: 5 Vout	-	75	-	mVp-p
	with a 22 μ F/25V X7R MLCC	single: 12 & 15 Vout	-	100	-	
	with a 4.7 μ F/50V X7R MLCC	single: 24 Vout	-	150	-	
	with a 10 μ F/25V X7R MLCC (for each output)	dual: 12 & 15 Vout	-	100	-	
	with a 4.7 μ F/50V X7R MLCC (for each output)	dual: 24 Vout	-	150	-	
Temperature coefficient	-		-0.02	-	+0.02	%/°C
Transient response recovery time	25% load step change		-	250	-	μ s
Over voltage protection	-	5 Vout	-	6.5	-	Vdc
	-	12 Vout	-	15	-	
	-	15 Vout	-	20	-	
	-	24 Vout	-	30	-	
Over load protection	% of lout rated; Hiccup mode		-	150	-	%
Short circuit protection	-		continuous, automatics recovery			

GENERAL SPECIFICATIONS

Item	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output	2250	-	-	Vdc
		Input(Output) to case	1600	-	-	
Isolation resistance	500 Vdc		1			GΩ
Isolation capacitance	-		-	-	2000	pF
Switching frequency	-	Dual 24 Vout	255	300	345	kHz
		others	230	270	310	kHz
Safety standards	(designed to meet)		IEC / UL / EN62368-1			
Case material	-		copper			
Base material	-		FR4 PCB			
Potting material	-		Silicone (UL94 V-0)			
Weight	Module stand alone		23.3g (0.82oz)			
MTBF	MIL-HDBK-217F, Full load		9.995 x 10 ⁵ hrs			

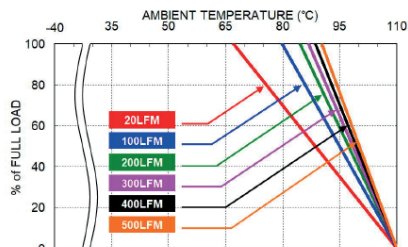
EMC SPECIFICATIONS

Item	Conditions		Level
EMI	EN55032	with external components	Class A, Class B
EMS	EN55035		-
ESD	EN61000-4-2	Air ±8kV and Contact ±6kV	Perf. Criteria A
Radiated Immunity	EN61000-4-3	20 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	±2 kV	Perf. Criteria A
		24 Vin: With 2 pcs. of aluminium electrolytic capacitor (Nippon chemi-con KY series, 470 µF/50V) and a TVS (SMD-J58A, 58V, 3000 Watt peak pulse power) in parallel 48 Vin: With 2 pcs. of aluminium electrolytic capacitor (Nippon chemi-con KY series, 220 µF/100V) and a TVS (SMD-J120A, 120V, 3000 Watt peak pulse power) in parallel	
Surge	EN61000-4-5	±2kV	Perf. Criteria A
		24 Vin: With 2 pcs. of aluminium electrolytic capacitor (Nippon chemi-con KY series, 470 µF/50V) and a TVS (SMD-J58A, 58V, 3000 Watt peak pulse power) in parallel 48 Vin: With 2 pcs. of aluminium electrolytic capacitor (Nippon chemi-con KY series, 220 µF/100V) and a TVS (SMD-J120A, 120V, 3000 Watt peak pulse power) in parallel	
Conducted immunity	EN61000-4-6	10 Vrms	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second	Perf. Criteria A

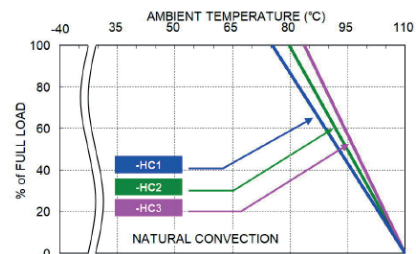
ENVIRONMENTAL SPECIFICATIONS

Item	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	with derating, standard type	- 40	-	+110	°C
Maximum case temperature	-	-	-	+110	°C
Over temperature protection	-	-	+116	-	°C
Storage temperature range	-	- 55	-	+125	°C
Operating altitude	-	-	-	5000	m
Thermal impedance	without Heat-sink	-	9.8	-	°C/W
	with Heat-sink option -HC1	-	7.9	-	
	with Heat-sink option -HC2	-	6.9	-	
	with Heat-sink option -HC3	-	6.0	-	
Thermal shock	-	MIL-STD-810F			
Shock	-	MIL-STD-810F			
Vibration	-	MIL-STD-810F			
Relative humidity	-	5% to 95% RH			

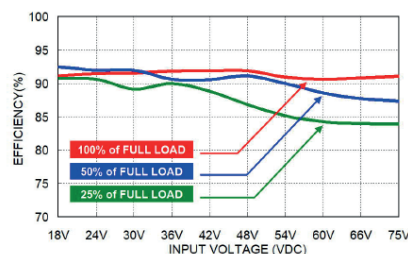
CHARACTERISTIC CURVE



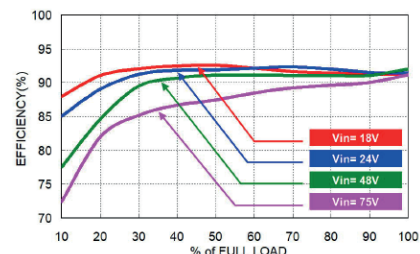
VTW50Q-4812S Derating Curve



VTW50Q-4812S Derating Curve with Heat-sink

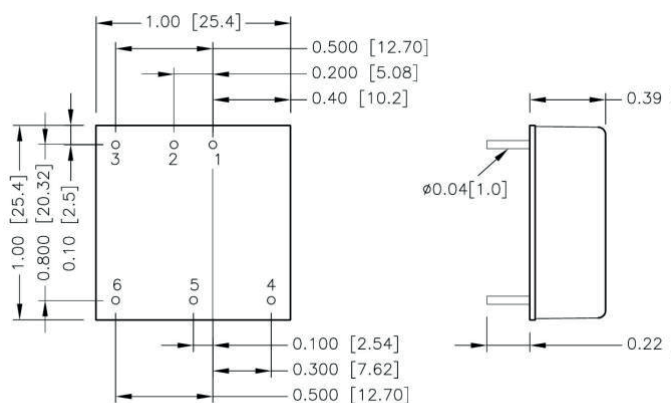


VTW50Q-4812S Efficiency vs. Input Voltage



VTW50Q-4812S Efficiency vs. Load

MECHANICAL DRAWING



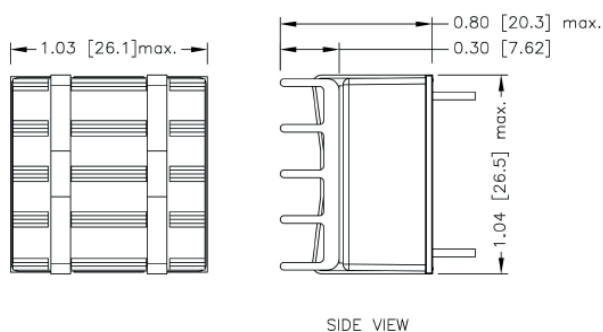
ROTTOM VIFW

PIN CONNECTION

PIN	Single	Dual
1	+ Vin	+ Vin
2	- Vin	- Vin
3	Ctrl	Ctrl
4	+ Vout	+ Vout
5	Trim	Com
6	- Vout	- Vout

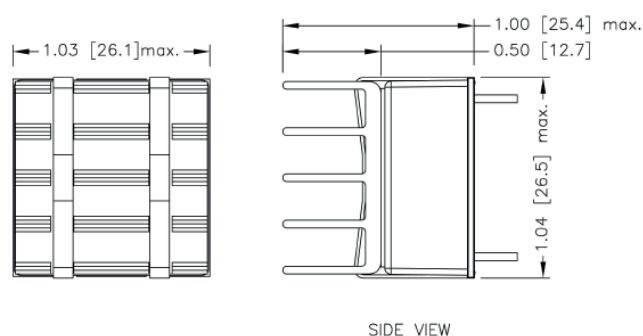
- All dimensions in inch [mm]
Tolerance: $x.xx \pm 0.02$ [$x.x \pm 0.5$]
 $x.xxx \pm 0.01$ [$x.x \pm 0.25$]
- Pin pitch tolerance ± 0.01 [± 0.25]
- Pin dimension tolerance ± 0.004 [± 0.10]

HEAT SINK OPTION „HC1“



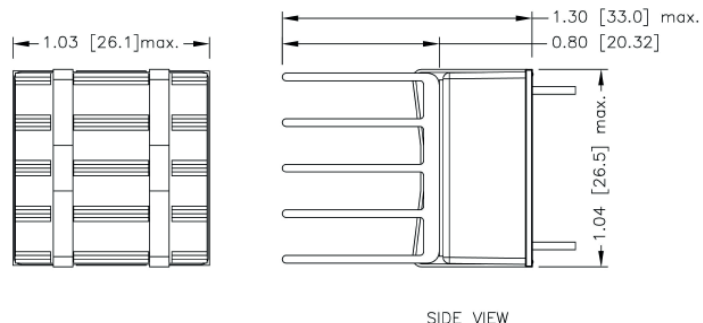
SIDE VIEW

HEAT SINK OPTION „HC2“



SIDE VIEW

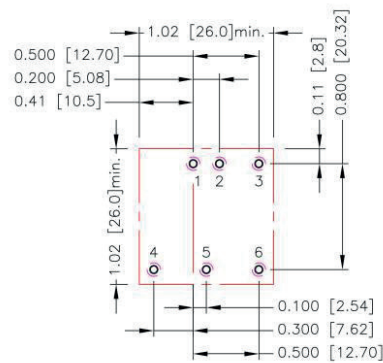
HEAT SINK OPTION „HC3“



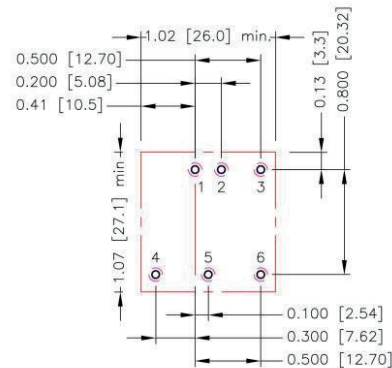
SIDE VIEW

RECOMMENDED PAD LAYOUT

Standard



-HC1, -HC2, -HC3



All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 1.2.3.4.5.6: diameter 0.051[1.30]
 Top view pad 1.2.3.4.5.6: diameter 0.064[1.63]
 Bottom view pad 1.2.3.4.5.6: diameter 0.102[2.60]

FUSE CONSIDERATION

This power modules is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below:

Model	Fuse Rating [A]	Fuse Type
24 Vin-Models	10	Fast-Acting
48 Vin-Models	5	Slow-Blow

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

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

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. Proper cooling can be verified by measuring the middle point on top of the module. The temperature at this location should not exceed „Maximum case temperature“

When operating, adequate cooling must be provided to maintain the test point temperature at or below „Maximum case temperature.“ You can limit this Temperature to a lower value for extremely high reliability.

Thermal test condition with vertical direction by natural convection (20LFM).

OUTPUT VOLTAGE ADJUSTMENT

Output voltage set point adjustment allows the user to increase or decrease the output voltage of the module. This is accomplished by connecting an external resistor between the Trim pin and either the +Vout or -Vout pins. With an external resistor between the Trim and -Vout pin, the output voltage increases. With an external resistor between the Trim and +Vout pin, the output voltage decreases. The external Trim resistor needs to be at least 1/16 W of rated power.

Trim Up Equation

$$R_U = \left[\frac{G \times L}{(V_{o,up} - L - K)} - H \right] \Omega$$

Trim Down Equation

$$R_D = \left[\frac{(V_{o,down} - L) \times G}{(V_o - V_{o,down})} - H \right] \Omega$$

Trim constants

Model	G	H	K	L
VTW50Q-xx05S	5110	2050	2.5	2.5
VTW50Q-xx12S	10000	5110	9.5	2.5
VTW50Q-xx15S	10000	5110	12.5	2.5
VTW50Q-xx24S	56000	13000	21.5	2.5

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.