

VTW-60W Series



60W 4:1 Regulated Single & Dual output

Features

- Wide 4:1 Input Range
- 1600VDC Isolation
- Efficiency up to 93%
- Operating Temperature Range -40 ~ 100°C max.
- Adjustable Output Voltage
- Remote ON/OFF Control (CTRL)
- Continuous Short Circuit Protection
- Over Current Protection
- Over Voltage Protection
- Over Temperature Protection
- Soft Start
- No minimum load required



PART NUMBER STRUCTURE

VT **W** - **24** **05** **S** **60** **SK**
(1) (2) (3) (4) (5) (6) (7)

(1) Series

(2) Wide Input Range
W - 4 : 1

(3) Input Voltage Range

24 - 9-36 V

48 - 18-75 V

(4) Output Voltage

05 - 5.0 V

12 - 12 V

15 - 15 V

(5) Output Type

S - Single Output

D - Dual Output

(6) Watt

(7) Heat-sink (Optional)

Blank - Without Heat-sink

SK - With Heat-sink

ALL SPECIFICATIONS ARE TYPICAL AT 25°C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED

Model Number	Input Voltage Range (VDC)	Input Current		Output Voltage (VDC)	Output Current		Efficiency @FL (% , typ.)	Capacitive Load @FL (μF, max.)
		No-Load (mA, max.)	Full Load (mA, typ.)		Min. load (mA)	Full load (mA)		
VTW-2405S60	9-36	25	2688	5	0	12000	93	30000
VTW-2412S60	9-36	25	2688	12	0	5000	93	5850
VTW-2415S60	9-36	25	2674	15	0	4000	93.5	3900
VTW-4805S60	18-75	25	1337	5	0	12000	93.5	30000
VTW-4812S60	18-75	25	1337	12	0	5000	93.5	5850
VTW-4815S60	18-75	25	1337	15	0	4000	93.5	3900
VTW-2412D60	9-36	40	2747	±12	0	±2500	91	±3900
VTW-2415D60	9-36	50	2717	±15	0	±2000	92	±2400
VTW-4812D60	18-75	40	1366	±12	0	±2500	91.5	±3900
VTW-4815D60	18-75	50	1359	±15	0	±2000	92	±2400

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INPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range	24V Input		9	24	36	VDC
	48V Input		18	48	75	
Under Voltage Protection	24V Input	Module ON		8.6		VDC
		Module OFF		7.9		
	48V Input	Module ON		17.8		
		Module OFF		16		
Input Filter	Pi Type					
Input Reflected Ripple Current (1)				20		mApk-pk
Start up Time	Nominal Vin and constant resistive load			60		ms
Remote ON/OFF Control (2)	Module ON (Open Circuit)		3.0		12	VDC
	Module OFF (Short circuit pin 2 and pin 3)		0		1.2	
	OFF idle current			5.0		mA
Recommended input fuse (slow blow)	24V Input		10			A
	48V Input		6			
Note :						
1. Measured with a simulated source inductance of 1.0 μ H and a source capacitor Cin (22 μ F, ESR<1.0 Ω at 100kHz).						
2. The remote ON/OFF control pin is referenced to -Vin (pin2).						

OUTPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy			-1.0		+1.0	%
Output Voltage Adjustability (Trim)			-10		+10	%
Line Regulation			-0.5		+0.5	%
Load Regulation	From 0% to 100% Load	Single Output	-0.5		+0.5	%
		Dual Output	-1.0		+1.0	
Cross Regulation	Asymmetrical Load 25% / 100% for Dual Output		-5		+5	%
Ripple & Noise (1)	20MHz bandwidth				100	mVpk-pk
Over Voltage Protection (Zener diode clamp)	5V Output			6.2		VDC
	12V Output			15		
	15V Output			20		
Over Current Protection				140		% of FL
Short Circuit Protection	Indefinite (hiccup) (Automatic Recovery)					
Temperature Coefficient			-0.02		+0.02	%/ $^{\circ}$ C
Maximum Capacitive Load	Minimum Vin and constant resistive load		See Table			
Transient Recovery Time	Nominal Vin and 25% load step change			250		μ s
Transient Response Deviation	(75%-50%-25% of Io)		-3		+3	%
Note :						
1. Measured with a 1.0 μ F MLCC.						

ABSOLUTE MAXIMUM RATINGS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Input Surge Voltage (100 ms)	24V Input				50	VDC
	48V Input				100	
Soldering Temperature	1.5mm from case 10sec max.				260	$^{\circ}$ C
Note : These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.						

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GENERAL SPECIFICATIONS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output, and rated for 60sec	1600			VDC
	Case-I/O, and rated for 60sec	1600			
Isolation Resistance	Input-output	1000			MΩ
Isolation Capacitance	Input-output		2200		pF
Switching Frequency			225		kHz
MTBF	MIL-HDBK-217 F @ 25°C	210			k hours
Safety Approval	IEC / EN / UL 62368-1	DK-66166-UL, E252573			
Environmental compliance		RoHS			

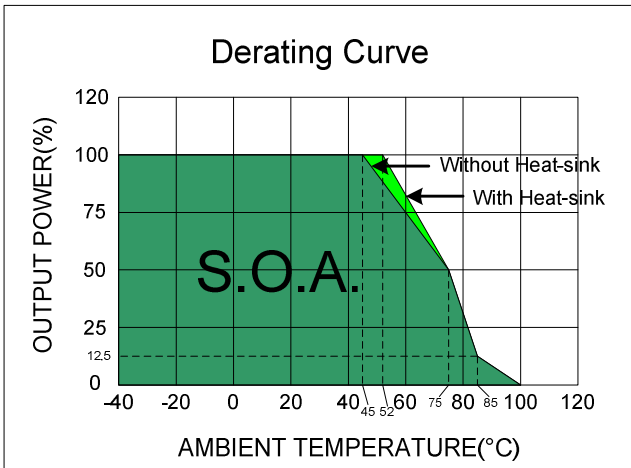
ENVIRONMENT SPECIFICATIONS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Ambient Temperature	See the Derating Curve	-40		100	°C
Maximum Case Temperature				110	°C
Thermal Impedance (Mounting at FR4 (5.9*2.75 inch) PCB)	Without Heat-sink	9.5			°C/W
	With Heat-sink	8.5			
Over Temperature Protection	Case Temperature		115		°C
Storage Humidity				95	% rel. H
Storage Temperature		-55		125	°C
Cooling	Natural Convection	30-65 LFM			

EMC SPECIFICATIONS			
Parameter	Standard	Condition	Criterion
Conducted Emissions	EN55032	with external components	A
Radiated Emissions	EN55032	with external components	A
ESD	IEC 61000-4-2	Air: ± 8kV Contact: ± 6kV	A
RS	IEC 61000-4-3	20V/m	A
EFT	IEC 61000-4-4	±2kV with external components	A
Surge	IEC 61000-4-5	±2kV with external components	A
CS	IEC 61000-4-6	10Vrms	A
PFMF	IEC 61000-4-8	100A/m	A

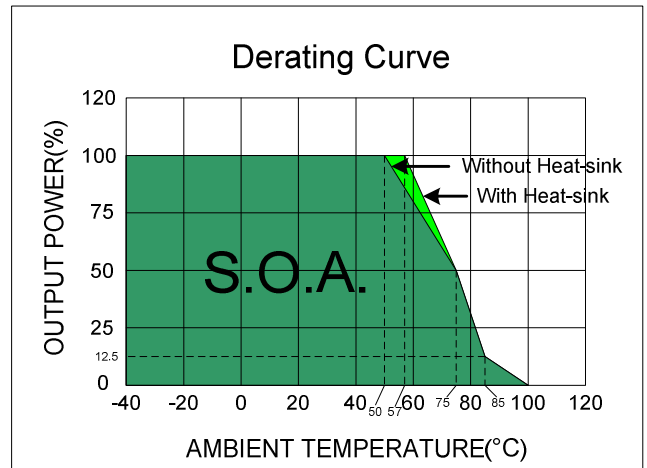
PHYSICAL SPECIFICATIONS	
Parameter	Value
Case Material	Copper
Base Material	Nonconductive Black Plastic (UL94V-0 rated)
Pin Material	Ø1.0mm Brass Solder-coated
Potting Material	Epoxy (UL94V-0 rated)
Weight	45.0 g, typ. (Without Heat-sink)
	56.3 g, typ. (With Heat-sink)
Dimensions	2.00" x 1.00" x 0.45" (Without Heat-sink)
	2.00" x 1.00" x 0.69" (With Heat-sink)

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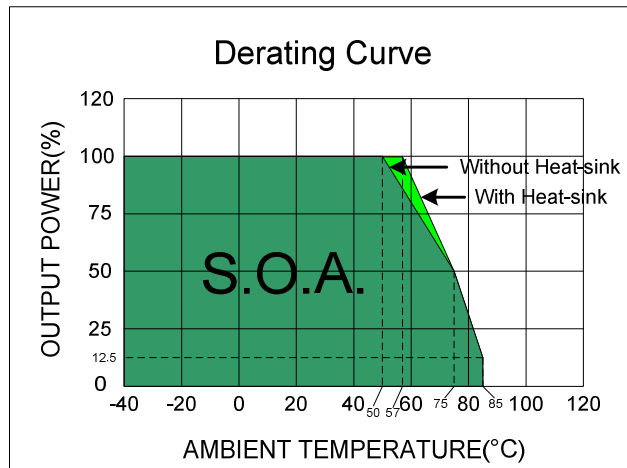
ELECTRICAL CHARACTERISTIC CURVES



VTW-2405S60



**VTW-2412S60,2415S60,2412D60,2415D60
VTW-4805S60,4812S60,4815S60**

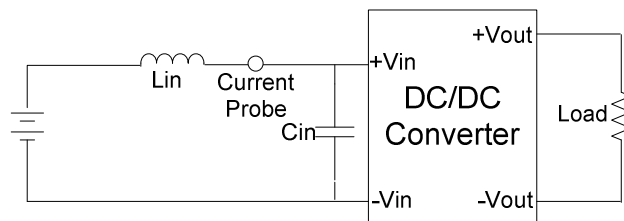


VTW-4812D60 , 4815D60

TEST CONFIGURATIONS

Input Reflected Ripple Current Test Step

Input reflected ripple current is measured with a source inductor L_{in} (1.0 μ H) and a source capacitor C_{in} (22 μ F, ESR<1.0 Ω at 100kHz) at nominal input and full load.



DESIGN & FEATURE CONFIGURATIONS

Over Current Protection

The module includes an internal over current protection circuit, which will endure current limiting for an unlimited duration during output over load condition. If the output current exceeds the OCP set point, the module will shut down automatically (hiccup). The module will try to restart after shut down. If the over load condition still exists, the module will shut down again.

Over Voltage Protection

The module includes an internal output over voltage protection circuit, which monitors the voltage on the output terminals. If this voltage exceeds the over voltage set point, the module will activate the control loop of internal circuit to clamp the output voltage.

Over Temperature Protection Test

The over temperature protection consists of circuitry that provides protection from thermal damage. If the temperature exceeds the over temperature threshold the module will shut down. The module will try to restart after shut down, if the over temperature condition still exists during restart, the module will shut down again. This restart trial will continue until the temperature is within specification.

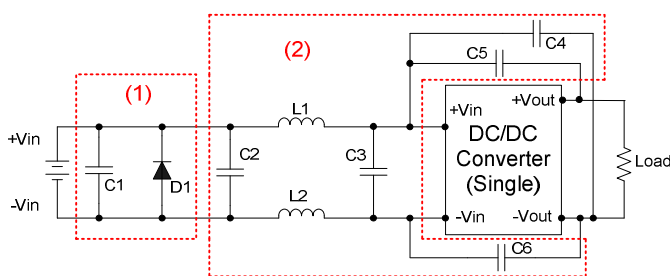
Remote Module ON / OFF

Positive logic turns on the module during high logic and off during low logic. Remote module ON/OFF can be controlled by an external switch between the CTRL terminal and -Vin terminal. For positive logic if the remote feature is not used, please leave the CTRL pin floating.

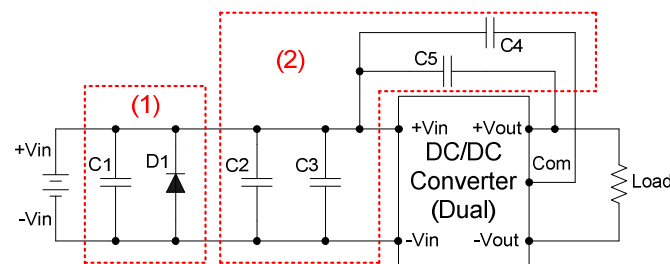
DESIGN & FEATURE CONFIGURATIONS

EMC Filter

The part (1) Circuit is used to meet Surge & EFT test, and the part (2) Circuit is used to meet EMI test.



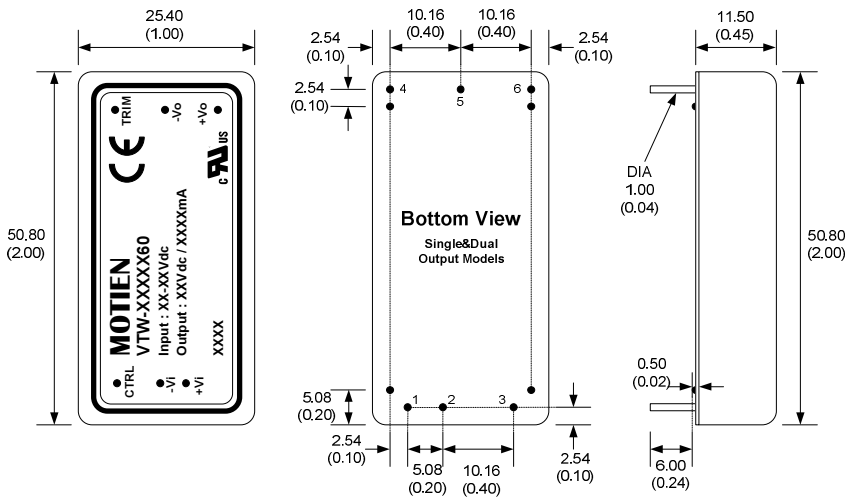
Single	C1	D1	C2 · C3	L1 · L2	C4	C5 · C6
VTW-24XXS60	NIPPON Chemi-con	SMDJ58A	MLCC 4.7µF, 50V	12µH	MLCC 470pF, 2kV	MLCC 1000pF, 2kV
VTW-48XXS60	KY series 330µF, 100V	SMDJ120A	MLCC 1.5µF, 100V			



Dual	C1	D1	C2 · C3	C4	C5
VTW-24XXD60	NIPPON Chemi-con	SMDJ58A	MLCC 4.7µF, 50V	MLCC 220pF, 2kV	MLCC 1500pF, 2kV
VTW-48XXD60	KY series 330µF, 100V	SMDJ120A	MLCC 1.5µF, 100V		

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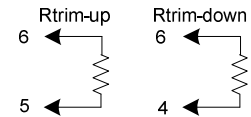
MECHANICAL SPECIFICATIONS



PIN CONNECTIONS		
PIN NUMBER	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	+Vout	+Vout
5	-Vout	COM
6	Trim	-Vout

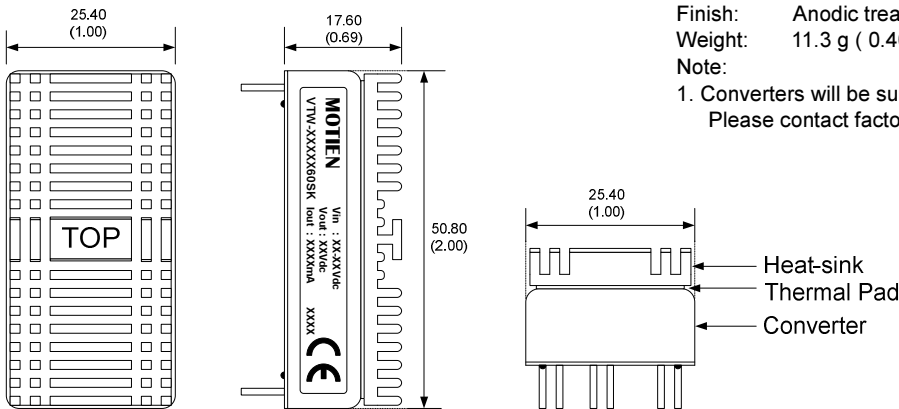
EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method as below. (single output models only)



- Notes : All dimensions are typical in millimeters (inches).
1. Pin diameter: 1.0±0.05 (0.04±0.002)
 2. Pin pitch and length tolerance: ±0.35 (±0.014)
 3. Case tolerance: ±0.5 (±0.02)
 4. Stand-off tolerance: ±0.1 (±0.004)

With Heat-sink



Order code: VTW-XXXXX60SK (contain: heat-sink, thermal pad)

Material: Aluminum

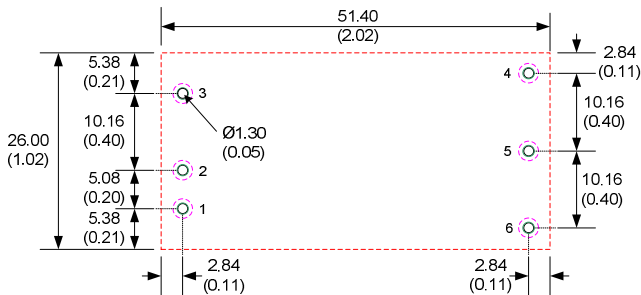
Finish: Anodic treatment (black)

Weight: 11.3 g (0.40 oz) (without converter)

Note:

1. Converters will be supplied with heat-sinks already mounted. Please contact factory for quotation.

RECOMMENDED FOOTPRINT DETAILS



- Notes : 1. All dimensions are typical in millimeters (inches).
- Through hole (black) 1~6: Ø1.3 (0.051)
 - Top view pad (green) 1~6: Ø1.5 (0.059)
 - Bottom view pad (pink) 1~6: Ø2.6 (0.098)