# VTW-60W Series

## 60W 4:1 Regulated Single & Dual output

MOTIEN TECHNOLOGY

## Features

- Wide 4:1 Input Range
- 1600VDC Isolation
- Efficiency up to 93%
- Extended 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


FC CE cULus CB

The VTW-60W series is a family of cost effective 60W single DC-DC converters. These converters combine copper package in a 2"x1" case with high performance features such as Active Clamp Technology, continuous short circuit protection with automatic restart and tight line / load regulation. Devices are encapsulated using flame retardant resin. Input voltages of 24 and 48 with output voltage of 5, 12, 15, ±12, ±15Vdc . High performance features include high efficiency operation up to 93% .

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

### OUTPUT SPECIFICATIONS

| | | |
|---|---|---|
| Output Voltage Accuracy | | ±1%, max. |
| Output Voltage Adjustability (Trim) | | ±10%, max. |
| Maximum Output Current | | See table |
| Line Regulation | | ±0.5%, max. |
| Load Regulation (0% to 100%) | | **Single:** ±0.5%, max.<br>**Dual:** ±1%, max. |
| Cross Regulation **(1)** | | **Dual:** ±5% |
| Ripple & Noise **(2)** | | 100mVpk-pk, max. |
| Over Voltage Protection (Zener diode clamp) | 5V output | 6.2V |
| | 12V output | 15V |
| | 15V output | 20V |
| Over Load Protection | | 140% of Iout, typ. |
| Short Circuit Protection | | Indefinite(hiccup) (Automatic Recovery) |
| Temperature Coefficient | | ±0.02%/°C |
| Capacitive Load **(3)** | | See table, max. |
| Transient Recovery Time **(4)** | | 250µs, typ. |
| Transient Response Deviation **(4)** | | ±3%, max. |

### INPUT SPECIFICATIONS

| | | |
|---|---|---|
| Input Voltage Range | | See table |
| Under Voltage Lockout | | |
| 24 Models | Module ON / OFF | 8.6Vdc / 7.9Vdc, typ. |
| 48 Models | Module ON / OFF | 17.8Vdc / 16Vdc, typ. |
| Start up Time (Nominal Vin and constant resistive load) | | 60mS, typ. |
| Input Filter | | Pi Type |
| Input Current (No-Load) | | See table, max. |
| Input Current (Full-Load) | | See table, typ. |
| Input Reflected Ripple Current **(5)** | | 20mApk-pk, typ. |

Remote On/Off (CTRL) **(6)**

ON: 3.0 ... 12Vdc or open circuit

OFF: 0 ... 1.2Vdc or Short circuit pin 2 and pin 3

OFF idle current: 5mA, typ.

### ENVIRONMENTAL SPECIFICATIONS

| | | |
|---|---|---|
| Operating Ambient Temperature | | -40°C ~ +100°C(See Derating Curve)<br>-40°C ~ +50°C(For 100% load) |
| Maximum Case Temperature | | 110°C |
| Thermal Impedance (Mounting at FR4 (5.9*2.75 inch) PCB | Without Heat-sink | 9.5°C/W, min. |
| | With Heat-sink | 8.5°C/W, min. |
| Storage Temperature | | -55°C ~ +125°C |
| Over Temperature Protection (Case) | | 115°C, typ. |
| Cooling**(7)** | | Nature Convection |

### GENERAL SPECIFICATIONS

| | |
|---|---|
| Efficiency | See table, typ. |
| I/O Isolation Voltage (60sec) | |
| Input / Output | 1600Vdc |
| Case / Input & Output | 1600Vdc |
| Isolation Resistance | 1GΩ, min. |
| Isolation Capacitance | 2200pF, typ. |
| Switching Frequency | 225kHz, typ. |
| Humidity | 95% rel H |
| Reliability Calculated MTBF ( MIL-HDBK-217 F ) | >210khrs |
| Safety Approvals | UL/cUL 60950-1, 62368-1<br>IEC/EN 60950-1, 62368-1 |

### PHYSICAL SPECIFICATIONS

| | |
|---|---|
| Case Material | Copper |
| Base Material | Non-conductive Black Plastic (UL94V-0 rated) |
| Pin Material | Φ1.0mm Brass Solder-coated |
| Potting Material | Epoxy (UL94V-0 rated) |
| Weight | 45.0g |
| Dimensions | 2.00"x1.00"x0.45" |

### ABSOLUTE SPECIFICATIONS (8)

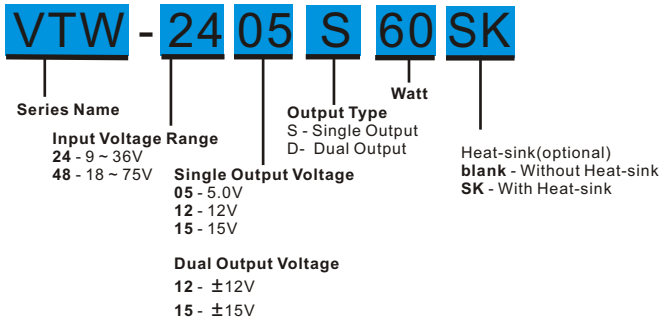
These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.

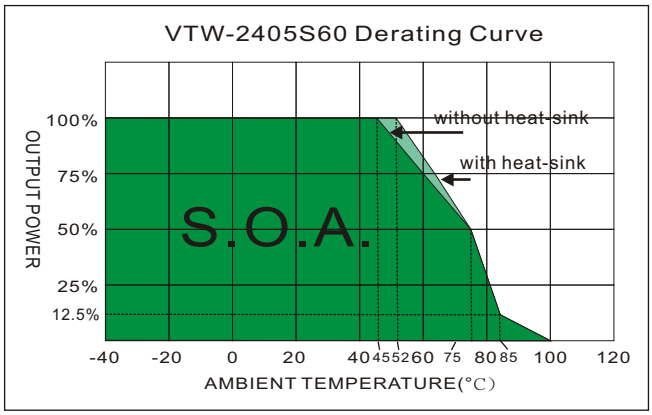
| | |
|---|---|
| Input Surge Voltage (100mS) | |
| 24 Models | 50Vdc, max. |
| 48 Models | 100Vdc, max. |
| Soldering Temperature (1.5mm from case 10sec max.) | 260°C, max. |

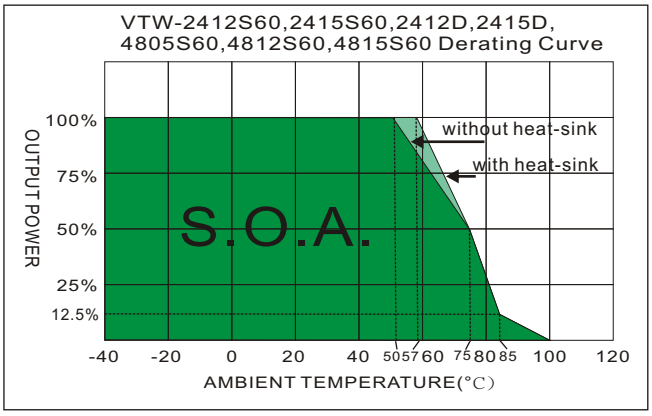
### EMC CHARACTERISTICS

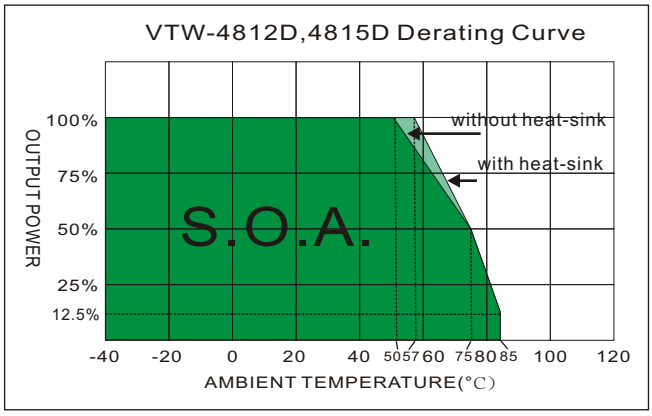
| | | |
|---|---|---|
| Radiated Emissions **(9)** | EN55032 | CLASS A |
| Conducted Emissions **(9)** | EN55032 | CLASS A |
| ESD | IEC61000-4-2 | Perf. Criteria A |
| RS | IEC61000-4-3 | Perf. Criteria A |
| EFT **(10)** | IEC61000-4-4 | Perf. Criteria A |
| Surge **(10)** | IEC61000-4-5 | Perf. Criteria A |
| CS | IEC61000-4-6 | Perf. Criteria A |
| PFMF | IEC61000-4-8 | Perf. Criteria A |

## PART NUMBER STRUCTURE




# MODEL SELECTION GUIDE

| MODEL NUMBER | INPUT Voltage Range (Vdc) | INPUT Current No-Load (mA, max.) | INPUT Current Full Load (mA, typ.) | OUTPUT Voltage (Vdc) | OUTPUT Current Min. load (mA) | OUTPUT Current Full load (mA) | EFFICIENCY @FL (%, typ.) | Capacitor Load @FL (μF, max.) |
|---|---|---|---|---|---|---|---|---|
| VTW-2405S60 | 9-36, 24V Nominal | 25 | 2703 | 5 | 0 | 12000 | 92.5 | 30000 |
| VTW-2412S60 | 9-36, 24V Nominal | 25 | 2703 | 12 | 0 | 5000 | 92.5 | 5850 |
| VTW-2415S60 | 9-36, 24V Nominal | 25 | 2688 | 15 | 0 | 4000 | 93 | 3900 |
| VTW-4805S60 | 18-75, 48V Nominal | 25 | 1344 | 5 | 0 | 12000 | 93 | 30000 |
| VTW-4812S60 | 18-75, 48V Nominal | 25 | 1351 | 12 | 0 | 5000 | 92.5 | 5850 |
| VTW-4815S60 | 18-75, 48V Nominal | 25 | 1344 | 15 | 0 | 4000 | 93 | 3900 |
| VTW-2412D60 | 9-36, 24V Nominal | 40 | 2747 | ±12 | 0 | ±2500 | 91 | ±3900 |
| VTW-2415D60 | 9-36, 24V Nominal | 50 | 2747 | ±15 | 0 | ±2000 | 91 | ±2400 |
| VTW-4812D60 | 18-75, 48V Nominal | 40 | 1373 | ±12 | 0 | ±2500 | 91 | ±3900 |
| VTW-4815D60 | 18-75, 48V Nominal | 50 | 1373 | ±15 | 0 | ±2000 | 91 | ±2400 |

## NOTE

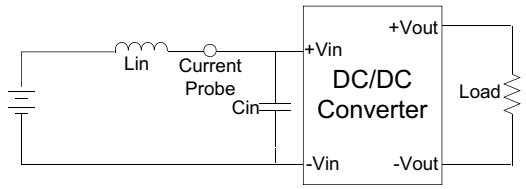
1. Dual: One load is 25% to 100% load, the other load is 100% load, the output voltage variable rate is within ±5%.
2. Measured with 20MHz bandwidth and 1.0μF ceramic capacitor.
3. Tested by minimal Vin and constant resistive load.
4. Tested by normal Vin and 25% load step change ( 75%-50%-25% of Io ).
5. Measured with a simulated source inductance of 1μH and a source capacitor Cin(22μF, ESR<1.0Ω at 100KHz).
6. The remote on/off control pin is referenced to -Vin(pin2).
7. "Nature Convection" is usually about 30-65 LFM but is not equal to still air (0 LFM).
8. Exceeding the absolute ratings of the unit could cause damage. It is not allowed for continuous operating.
9. The VTW-60W series can meet EN55032 Class A with an external filter in parallel with the input pins.
10. An external filter capacitor is required if the module has to meet EN61000-4-4,EN61000-4-5.
    The VTW-24XXX60 recommended an aluminum electrolytic capacitor ( Nippon chemi-con KY series, 330μF/100V) and a TVS (SMDJ58A,58V,3000Watt peak pulse power) to connect in parallel.
    The VTW-48XXX60 recommended an aluminum electrolytic capacitor ( Nippon chemi-con KY series,330μF/100V) and A TVS (SMDJ120A,120V,3000Watt peak pulse power) to connect in parallel.

The models listed above is just for standard type. If you need the special specification product, please contact our service member by telephone presented in shortform cover or e-mail to : sales@motien.com.tw

## TEST CONFIGURATIONS

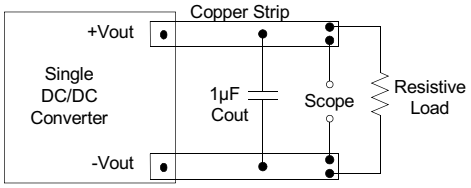
### Input Reflected Ripple Current Test Step

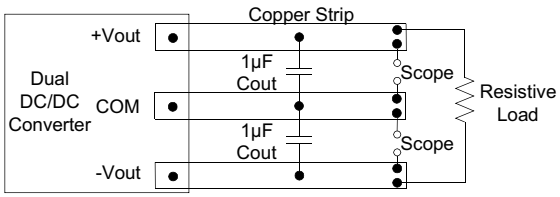
Input reflected ripple current is measured with a source inductor Lin(1μH) and a source capacitor Cin(22μF, ESR<1.0Ω at 100KHz) at nominal input and full load.




### Output Ripple & Noise Measurement Test

Use a capacitor Cout(1.0μF) measurement.
The Scope measurement bandwidth is 0-20MHz.




## 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 Temperature Protection

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.

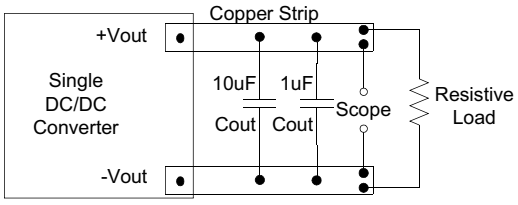
The module will try to restart after shut down, If the over temperature condition still exists during restart, the module will shut down again. This restart trial will continue until the temperature is within specification.

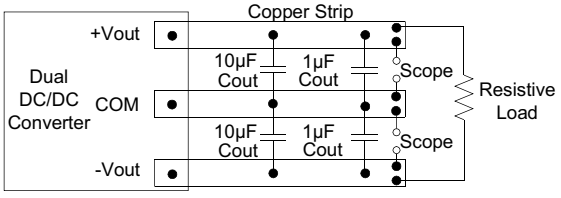
### Over Voltage Protection

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.

### Output Ripple & Noise Reduction

To reduce ripple and noise, it is recommended to use a 1μF ceramic disk capacitor and a 10μF ceramic disk capacitor to at the output.



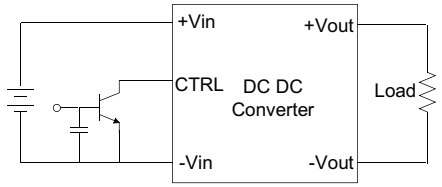

### CTRL Module ON / OFF

Positive logic turns on the module during high logic and off during low logic.

Ctrl module on/off can be controlled by an external switch between the ctrl terminal and -Vin terminal.

The switch can be an open collector or open drain.

For positive logic if the ctrl feature is not used, please leave the ctrl pin floating.

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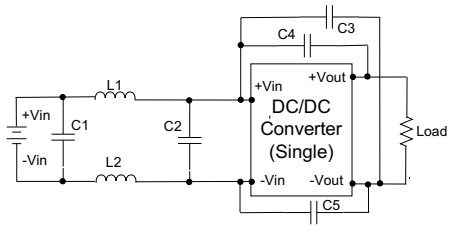
## DESIGN & FEATURE CONFIGURATIONS

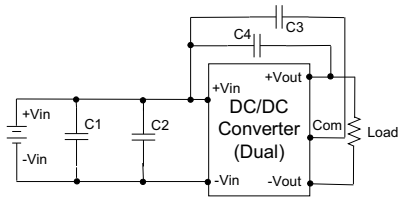
### EMI Filter

Input filter components (C1~C5,L1/L2) are used to help meet conducted emissions.

These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.



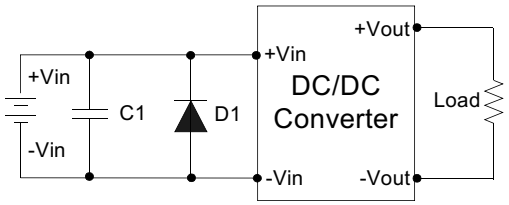

| Single | C1 | L1/L2 | C2 | C3 | C4 | C5 |
|---|---|---|---|---|---|---|
| VTW-24XXSXX | 1812,4.7μF, 50V | 12μH | 1812,4.7μF, 50V | 1206,470pF, 2KV | 1206,1000pF, 2KV | 1206,1000pF, 2KV |
| VTW-48XXSXX | 1812,1.5μF, 100V | 12μH | 1812,1.5μF, 100V | 1206,470pF, 2KV | 1206,1000pF, 2KV | 1206,1000pF, 2KV |




| Dual | C1 | C2 | C3 | C4 |
|---|---|---|---|---|
| VTW-24XXDXX | 1812,4.7μF, 50V | 1812,4.7μF, 50V | 1206,220pF, 2KV | 1206,1500pF, 2KV |
| VTW-48XXDXX | 1812,1.5μF, 100V | 1812,1.5μF, 100V | 1206,220pF, 2KV | 1206,1500pF, 2KV |

### EFT & SURGE Filter

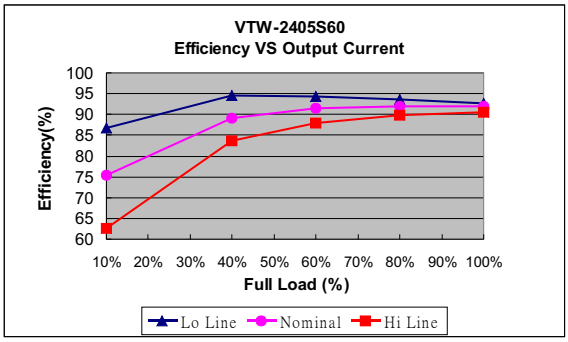
Input components (C1,D1) are used to help meet surge test requirement for the module.

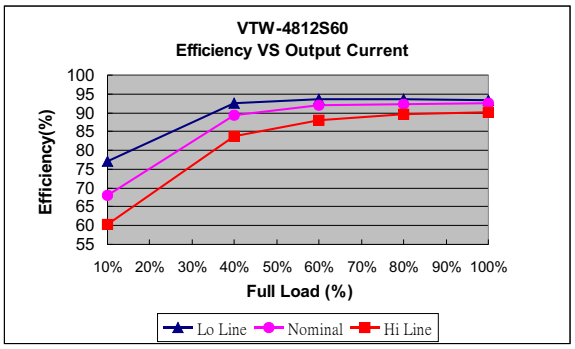


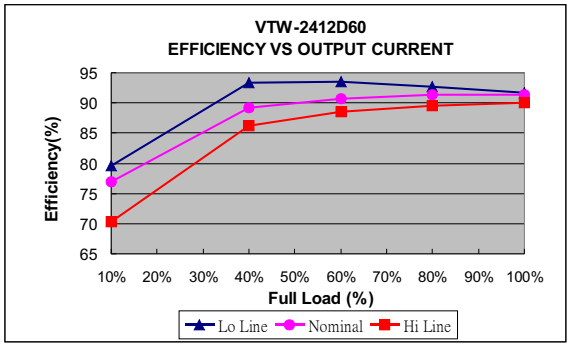

| | C1 | D1 |
|---|---|---|
| VTW-24XXX60 | 330μF,100V | TVS,58V,3kW |
| VTW-48XXX60 | 330μF,100V | TVS,120V,3kW |

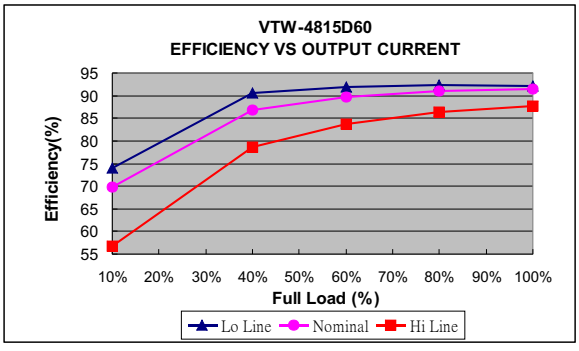
D1:Transient Voltage Suppression Diodes

## ELECTRICAL CHARACTERISTIC CURVES

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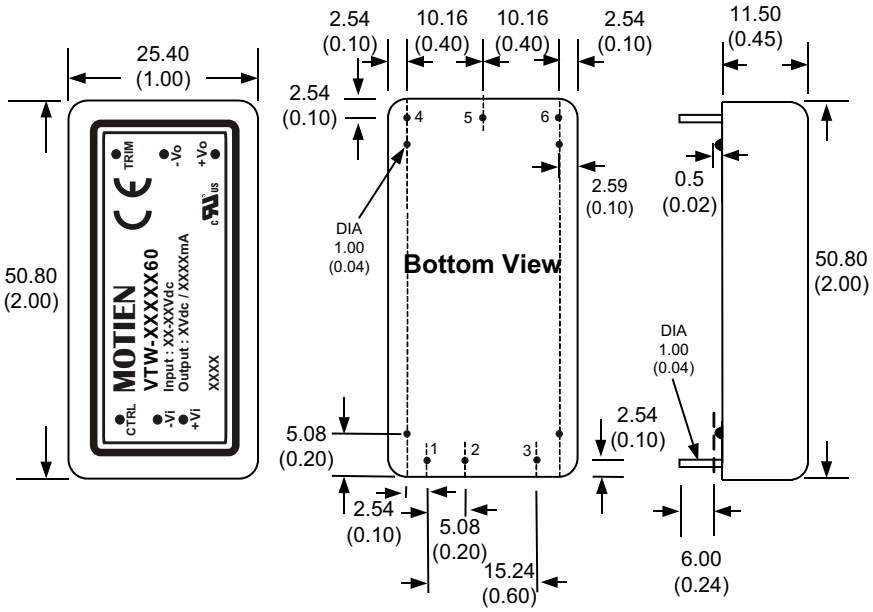
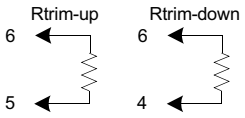
## MECHANICAL SPECIFICATIONS




| 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**

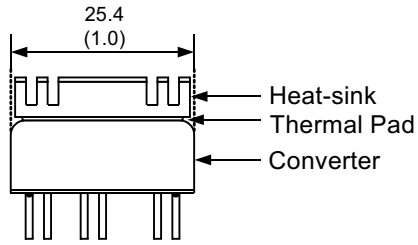
Output can be externally trimmed by using the method as below. (single output models only )




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 )

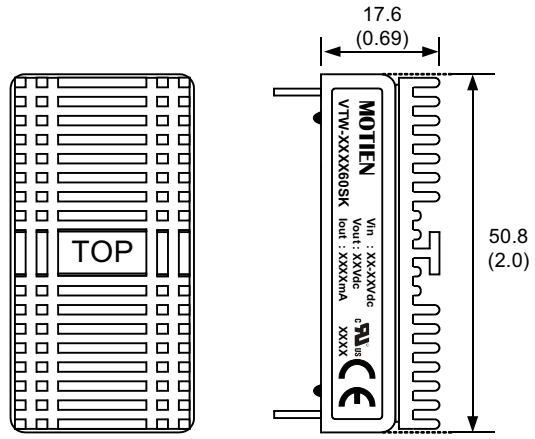
## With Heat-sink




Order code: VTW-XXXXX60SK(contain: heat-sink, thermal pad)
Material: Aluminum
Finish: Anodic treatment (black)
Weight: 11g (0.39oz) (without converter)

Note:

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




MOTIEN ISO 9001 . ISO 14001 . IECQ QC080000
No. 9, Keji 2nd Rd., Tainan Technology Industrial Park, Tainan City 70955, Taiwan
Tel: 886-6-384 2366 (Rep.) Fax: 886-6-384 2399
Website : www.motien.com.tw Email : sales@motien.com.tw

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