# MB1500BRU

# 15W, 2"x 1" Case, Ultrawide 4:1 Input Range DC/DC Converters

## Key Features:

- 15W Output Power
- Ultrawide 4:1 Input Range
- -40°C to +85°C Temp
- 1500 VDC Isolation
- Efficiency to 90%
- Short Circuit Protection
- Over Current Protection
- Industry Standard Pin-Out

## Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

### Input

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage, See Note 3 | 24 VDC Input | 9 | 24 | 36 | VDC |
| | 48 VDC Input | 18 | 48 | 75 | |
| Impulse Voltage | 24 VDC Input | -0.7 | | 50 | VDC |
| | 48 VDC Input | -0.7 | | 100 | |
| Input Start Voltage | 24 VDC Input | | | 9 | VDC |
| | 48 VDC Input | | | 18 | |
| Input Under Voltage Protection | 24 VDC Input | 5.5 | 6.5 | | VDC |
| | 48 VDC Input | 12 | 15.5 | | |
| Reflected Ripple Current | Rated Input Voltage | | 30 | | mA |
| Input Filter | | | PI Filter | | |
| Start Time | | | 10 | | ms |

### Output

| Parameter | Conditions | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Output Voltage Accuracy | 5% - 100% Load | | | ±1.0 | ±3.0 | % |
| Line Regulation | Vin = Min. to Max. @ Full Load | | | ±0.2 | ±0.5 | % |
| Load Regulation | 5%-100% Load | | | ±0.5 | ±1.0 | % |
| Ripple & Noise, See Note 2 | 20 MHz bandwidth, 5%-100% load | | | 50 | 100 | mVp-p |
| Transient Recovery Time | 25% Load step change | | | 300 | 500 | µs |
| Transient Response Deviation | 25% Load step change | 3.3, 5, 5V Outputs | | ±3 | ±7 | % |
| | | Other Outputs | | ±3 | ±5 | |
| Temperature Coefficient | Full load | | | | ±0.02 | %/°C |
| Trim | | | | ±10 | | %Vo |
| Over Load Protection | | | 110 | 150 | | %Io |
| Output Short Circuit | Continuous, self-recovery | | | | | |

### General

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Isolation Voltage | 60 seconds, leakage current < 1 mA | 1500 | | | VDC |
| Isolation Resistance | 500 VDC | 1000 | | | MΩ |
| Isolation Capacitance | 100 KHz /0. 1V | | 2050 | | pF |
| Switching Frequency | PWM | | 300 | | kHz |

### Environmental

| Parameter | Conditions | Min. | Typ | Max. | Units |
|---|---|---|---|---|---|
| Operating Temperature Range | See Fig 1 | -40 | | +85 | °C |
| Storage Temperature Range | | -40 | | +105 | °C |
| Cooling | Free Air Convection | | | | |
| Humidity, See Note 7 | Non-Condensing | 5 | | 95 | %RH |

### Physical

| | |
|---|---|
| Case Size | 2.00 x 1.00 x 0.47 in (See mechanical diagrams on page 4) |
| Case Material | Aluminum Alloy, Black Anodized Coating |
| Weight | 0.99 oz (28g) (See mechanical diagrams on page 4) |

### Reliability Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| MTBF | MIL-HDBK-217F@25°C | 1000 | | | kHours |
| Lead Temperature | 1.5mm from case for 10 seconds | | | 300 | °C |


**MicroPower Direct**
46 Eastman Street
Unit 1
Easton, MA 02375
USA

T: (781) 344-8226
F: (781) 344-8481
E: sales@micropowerdirect.com
W: www.micropowerdirect.com

## Model Selection Guide

| Model Number | Input | | | | Output | | Full Load Efficiency (%, Typ) | Reflected Ripple Current (mA, Typ) | Capacitive Load (μF, Max) (See Note 2) | Fuse Rating Slow-Blow (mA) (See Note 1) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Voltage (VDC) | | Current (mA) | | Voltage (VDC) | Current (mA, Max) | | | | |
| | Nominal | Range | Full-Load (Typ) | No-Load | | | | | | |
| MB1524S-03BRU | 24 | 9 - 36 | 639 | 30 | 3.3 | 4000 | 86 | 30 | 4700 | 4000 |
| MB1524S-05BRU | 24 | 9 - 36 | 710 | 30 | 5 | 3000 | 88 | 30 | 4700 | 4000 |
| MB1524S-09BRU | 24 | 9 - 36 | 702 | 10 | 9 | 1667 | 89 | 30 | 2200 | 4000 |
| MB1524S-12BRU | 24 | 9 - 36 | 702 | 10 | 12 | 1250 | 89 | 30 | 1000 | 4000 |
| MB1524S-15BRU | 24 | 9 - 36 | 702 | 10 | 15 | 1000 | 90 | 30 | 820 | 4000 |
| MB1524S-24BRU | 24 | 9 - 36 | 702 | 10 | 24 | 625 | 90 | 30 | 270 | 4000 |
| MB1524D-05BRU | 24 | 9 - 36 | 710 | 30 | ±5 | ±1500 | 86 | 30 | #2200 | 4000 |
| MB1524D-09BRU | 24 | 9 - 36 | 702 | 10 | ±9 | ±834 | 88 | 30 | #1000 | 4000 |
| MB1524D-12BRU | 24 | 9 - 36 | 702 | 10 | ±15 | ±625 | 88 | 30 | #470 | 4000 |
| MB1524D-15BRU | 24 | 9 - 36 | 702 | 10 | ±24 | ±500 | 88 | 30 | #330 | 4000 |
| MB1548S-03BRU | 48 | 18 - 75 | 319 | 15 | 3.3 | 4000 | 86 | 30 | 4700 | 2000 |
| MB1548S-05BRU | 48 | 18 - 75 | 355 | 15 | 5 | 3000 | 86 | 30 | 4700 | 2000 |
| MB1548S-09BRU | 48 | 18 - 75 | 351 | 4 | 9 | 1667 | 89 | 30 | 2200 | 2000 |
| MB1548S-12BRU | 48 | 18 - 75 | 351 | 4 | 12 | 1250 | 87 | 30 | 1000 | 2000 |
| MB1548S-15BRU | 48 | 18 - 75 | 351 | 4 | 15 | 1000 | 90 | 30 | 820 | 2000 |
| MB1548S-24BRU | 48 | 18 - 75 | 351 | 4 | 24 | 625 | 88 | 30 | 270 | 2000 |
| MB1548D-05BRU | 48 | 18 - 75 | 355 | 15 | ±5 | ±1500 | 86 | 30 | #2200 | 2000 |
| MB1548D-12BRU | 48 | 18 - 75 | 351 | 4 | ±12 | ±625 | 88 | 30 | #470 | 2000 |
| MB1548D-15BRU | 48 | 18 - 75 | 351 | 4 | ±15 | ±500 | 89 | 30 | #330 | 2000 |

**Notes:**

1. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection Guide.
2. All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 3. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.
3. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage.
4. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product.
5. The maximum capacitive load is tested within the input voltage range and under full load conditions.
6. Unless otherwise specified, all indicators in this manual are measured at Ta=25 °C, humidity<75% RH, nominal input voltage, and output rated load.
7. Product specifications are subject to change without prior notice.

For the heat sink option, add the suffix "**-H**" to the product model number (i.e. **MB1548S-15BRU-H**)

For the extended wiring package option, add the suffix "**-A2S**" to the product model number (i.e. **MB1548S-15BRU-A2S**)

For the extended rail package option, add the suffix "**-A4S**" to the product model number (i.e. **MB1548S-15BRU-A4S**)

## Temperature Derating

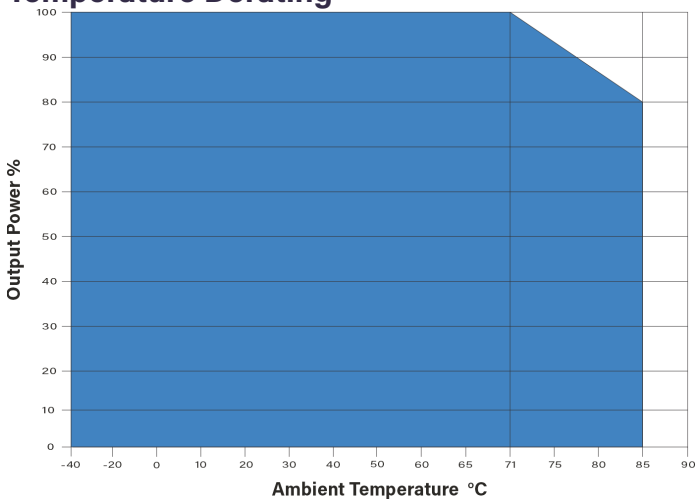



**Fig. 1**

## Typical Application Circuit

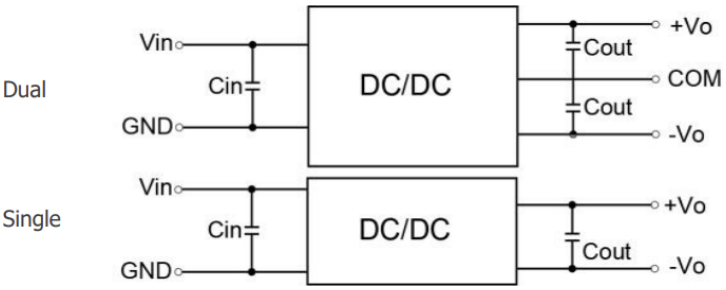



Fig. 2

| Recommended Component Parameters | | |
|---|---|---|
| VOUT (VDC) | COUT (uF) | CIN (uF) |
| 3.3/5/12/15 | 100 | 100 |
| 24 | 47 | 100 |

## EMI Recommended Circuit

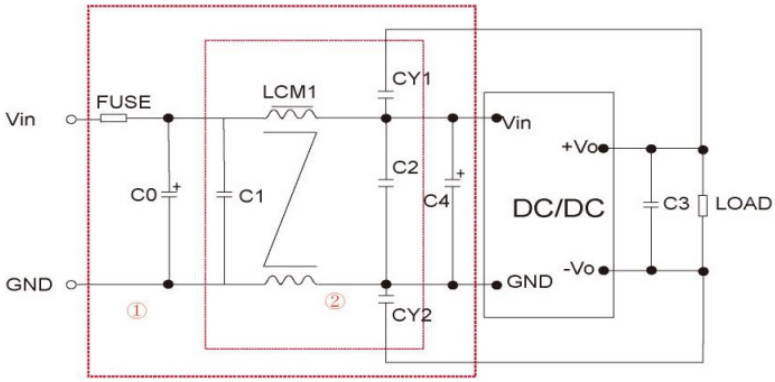



Fig. 3

| EMI Recommended Component Parameters | | |
|---|---|---|
| Vin(VDC) | 24VDC | 48VDC |
| FUSE | Choose according to actual input current | |
| C0, C4 | 330uF/50V | 330uF/100V |
| C1. C2 | 4.7uF/50V | 4.7uF/100V |
| C3 | Refer to the Cout in Fig. 2 | |
| LCM1 | 1mH | |
| CY1/CY2 | 1nF/2KV | |

**Note:** Part 1 of Figure 3 is used for EMS testing; Part 2 is used for EMI filtering and can be selected according to requirements.

## Trim Resistor Connections

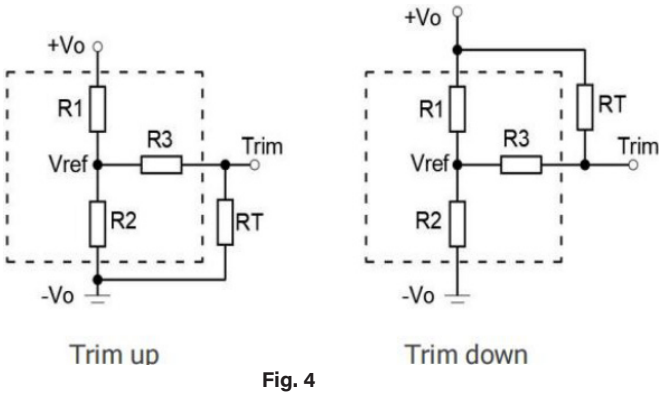



Fig. 4

| Trim Recommended Component Parameters | | | | |
|---|---|---|---|---|
| Vout (V) | R1 (KΩ) | R2 (KΩ) | R3 (KΩ) | Vref (V) |
| 3.3 | 10 | 6.064 | 13.62 | 1.24 |
| 5 | 2.4 | 2.34 | 13.62 | 2.5 |
| 9 | 12 | 4.6 | 17.4 | 2.5 |
| 12 | 8.2 | 2.15 | 17.4 | 2.5 |
| 15 | 12 | 2.39 | 21.02 | 2.5 |
| 24 | 10 | 1.16 | 10.71 | 2.5 |

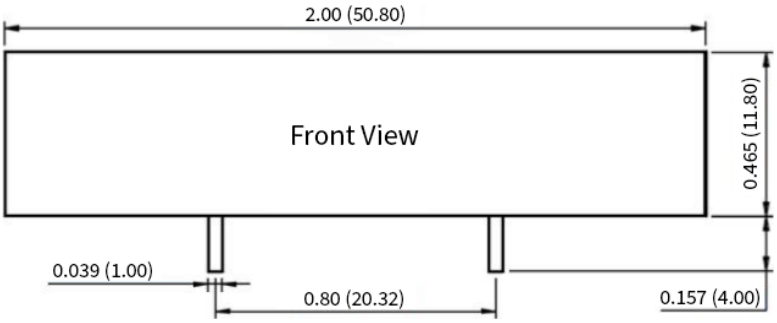
Up: $Rt=\frac{nR2}{R2-n}-R3$ $n=\frac{Vref}{Vo-Vref}*R1$

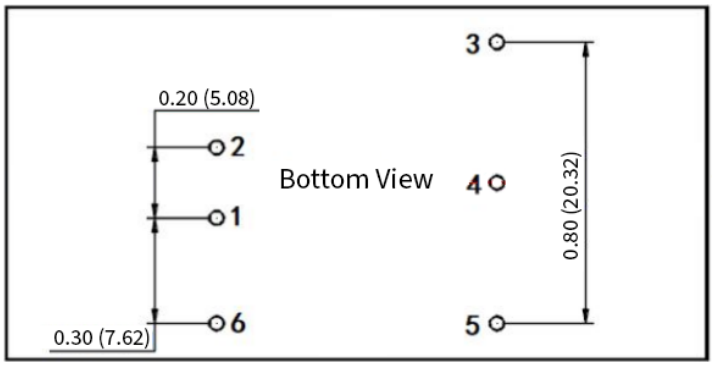
Down: $Rt=\frac{nR1}{R1-n}-R3$ $n=\frac{Vo-Vref}{Vref}*R2$

### EMI Characteristics

| Parameter | Standard | Criteria | Level |
|---|---|---|---|
| Radiated Emissions | CISPR32/EN 55032 | | Class A |
| | CISPR32/EN 55032 | | Class B (See Fig. 3 - 2) |
| Conducted Emissions | CISPR32/EN 55032 | | Class A |
| | CISPR32/EN 55032 | | Class B (See Fig. 3 - 2) |
| ESD | IEC/EN 61000-4-2 | B | ±4 kV Contact |
| RS | IEC/EN 61000-4-3 | A | 10V/m |
| EFT | IEC/EN 61000-4-4 | B | ±2 kV (Recommended circuit Fig. 3 - 1) |
| Input Voltage Surge | IEC/EN61000-4-5 | B | ±2 kV line to line (Recommended circuit Fig. 3 - 1) |
| CS | IEC/EN 61000-4-6 | A | 3 Vr.m.s |

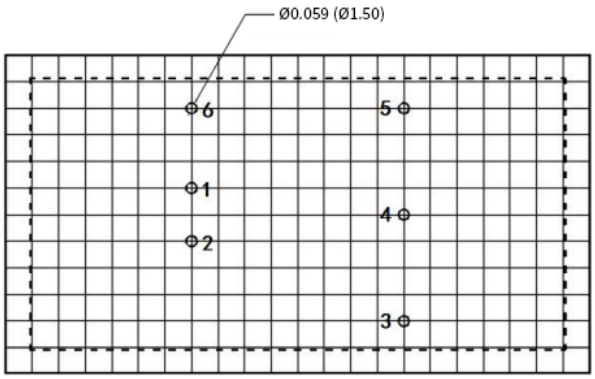
## Mechanical Dimensions




**Note:**
Unit: inches(mm)
Pin section tolerances: ±0.004 (±0.10)
General tolerances: ±0.020 (±0.50)

**PCB Layout**



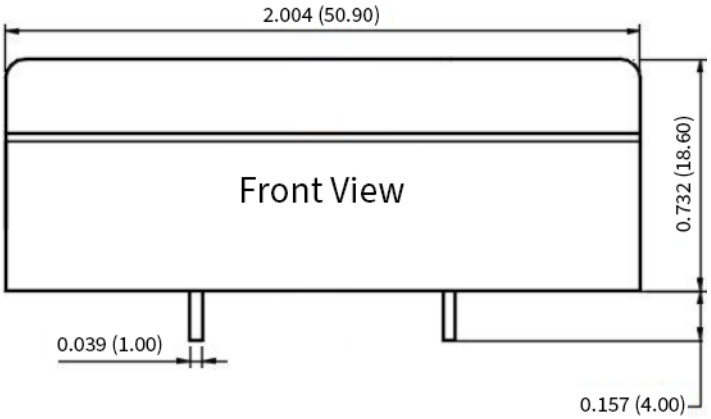

The grid distance is 2.54 x 2.54 mm

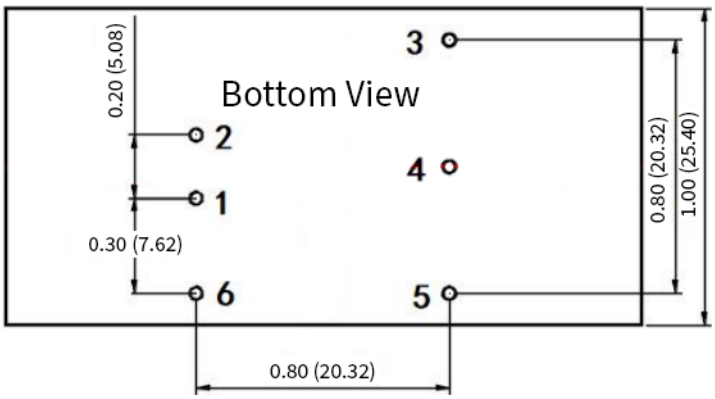
| Pin | Single | Dual |
|---|---|---|
| 1 | GND | GND |
| 2 | Vin | Vin |
| 3 | +Vo | +Vo |
| 4 | Trim | Com |
| 5 | -Vo | -Vo |
| 6 | CTRL | CTRL |

**Control Pin Conditions**

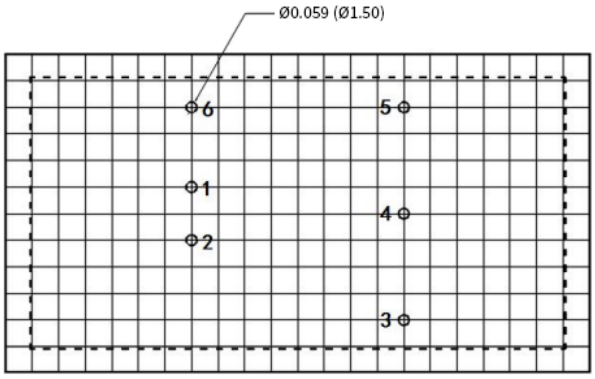
| Item | Operating Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Ctrl | Turn off module | Connected GND or (0-1.2V) | | | |
| | Turn on module | Not Connected or (3.5-12V) | | | |
| | Input current when off | -- | 5 | 8 | mA |

## H Heat Sink Option




**PCB Layout**

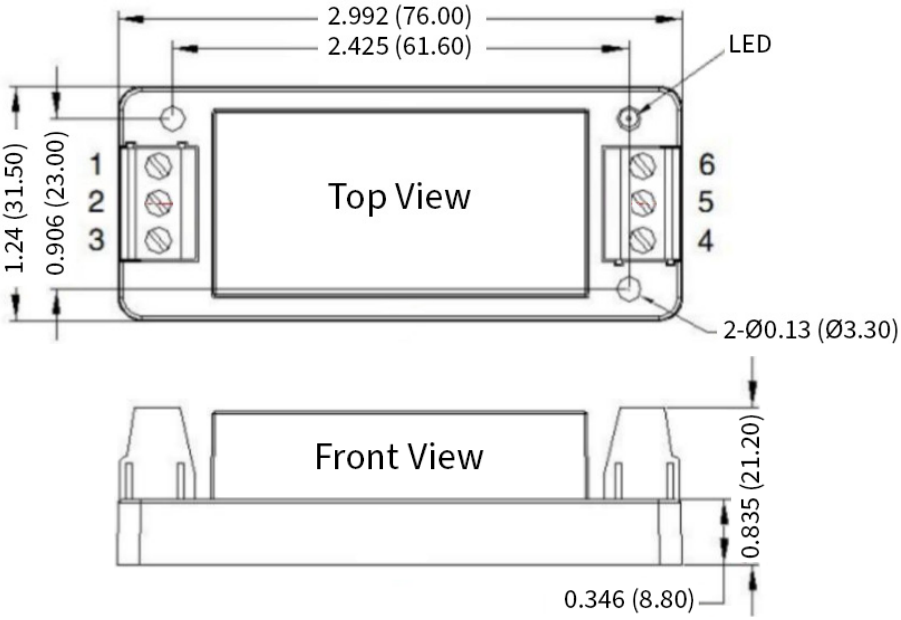



The grid distance is 2.54 x 2.54 mm

| Pin | Single | Dual |
|---|---|---|
| 1 | GND | GND |
| 2 | Vin | Vin |
| 3 | +Vo | +Vo |
| 4 | Trim | Com |
| 5 | -Vo | -Vo |
| 6 | CTRL | CTRL |

**Note:**
Unit: inches(mm)
Pin section tolerances: ±0.004 (±0.10)
General tolerances: ±0.020 (±0.50)

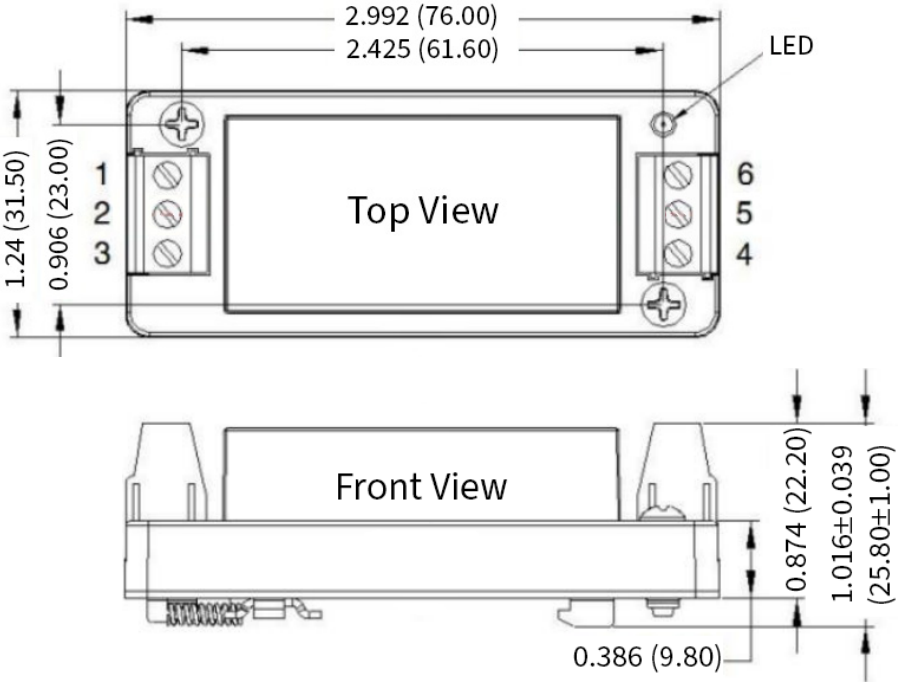
## A2S Extended Wiring Option




| Pin | Single | Dual |
|---|---|---|
| 1 | CTRL | CTRL |
| 2 | GND | GND |
| 3 | Vin | Vin |
| 4 | +Vo | +Vo |
| 5 | Trim | Com |
| 6 | -Vo | -Vo |

**Note:**
Unit: inches(mm)
Wire range: 24-12 AWG
Tightening torque: 0.4N ▪ m (max)
General tolerances: ±0.039 (±1.00)

## A4S Extended Rail Option




| Pin | Single | Dual |
|---|---|---|
| 1 | CTRL | CTRL |
| 2 | GND | GND |
| 3 | Vin | Vin |
| 4 | +Vo | +Vo |
| 5 | Trim | Com |
| 6 | -Vo | -Vo |

**Note:**
Unit: inches(mm)
Mounting rail: TS35
Wire range: 24-12 AWG
Tightening torque: 0.4N ▪ m (max)
General tolerances: ±0.039 (±1.00)