

## AM40EW-NZ

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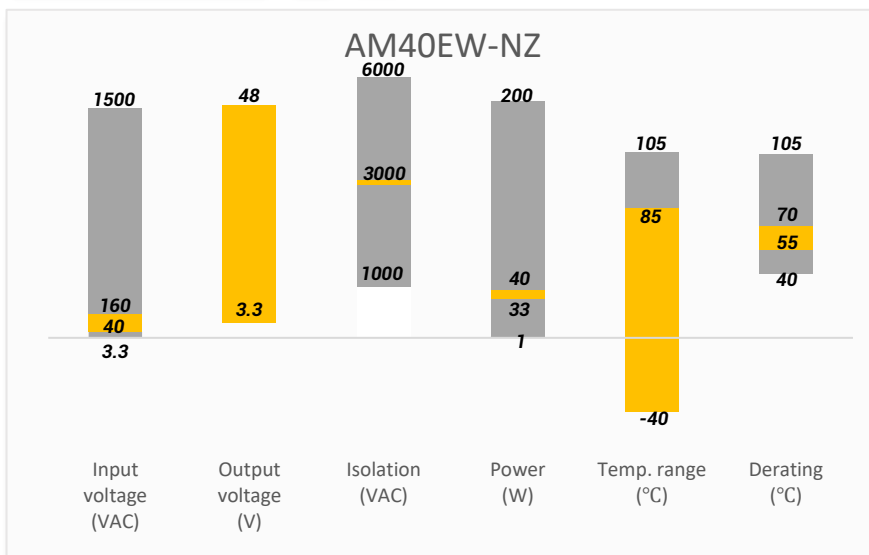
Encapsulated

This new series AM40EW-NZ provides a wide input voltage range of 40-160VDC required by input voltages of 72V, 96V, 110V in railway industry. Outputs and isolation voltage up to 3000VDC/1500VAC ensure them to meet the railway locomotive EN50155 standard requirements and EN62368 standard requirements. The converters also offer a wide operating temperature range of -40°C to +85°C. Protections for input UVP, OSC, OCP, OVP and OTP are also included. Housed in 2x1 inch package, this AM40EW-NZ series is available for packages with optional heat sink in PCB mount, chassis mount and DIN rail mount, which offers flexibility to the designer of the end-product and makes this series ideal for applications in railway monitoring, lighting equipment, information display and other railway vehicle-related equipment.

## Features

- Ultra-wide Input: 40 - 160VDC
- Operating Temp: -40 °C to +85 °C
- High isolation voltage: 3000VDC/1500VAC
- Low ripple & noise, 150mV(p-p), typ.
- Output short circuit, over-current, over-voltage, over temperature protection
- Regulated Output

## Summary



## Training

## Applications



Press Release

Coming Soon!

Product Training Video  
(click to open)

Application Notes



Power Grid



Industrial



Telecom



Instrumentation

## Models & Specifications

| Single Output       |                     |                      |                        |                        |                     |                              |                     |
|---------------------|---------------------|----------------------|------------------------|------------------------|---------------------|------------------------------|---------------------|
| Model               | Input Voltage (VDC) | Output Voltage (VDC) | Input Current max (mA) | Output Current max (A) | Isolation (VDC/VAC) | Maximum capacitive Load (μF) | Efficiency Typ. (%) |
| AM40EW-11003SH30-NZ | 110 (40 - 160)      | 3.3                  | 353                    | 10                     | 3000/1500           | 10000                        | 85                  |
| AM40EW-11005SH30-NZ | 110 (40 - 160)      | 5                    | 423                    | 8                      | 3000/1500           | 10000                        | 86                  |
| AM40EW-11012SH30-NZ | 110 (40 - 160)      | 12                   | 423                    | 3.33                   | 3000/1500           | 2700                         | 89                  |
| AM40EW-11015SH30-NZ | 110 (40 - 160)      | 15                   | 423                    | 2.67                   | 3000/1500           | 1680                         | 89                  |
| AM40EW-11024SH30-NZ | 110 (40 - 160)      | 24                   | 423                    | 1.67                   | 3000/1500           | 680                          | 87                  |
| AM40EW-11048SH30-NZ | 110 (40 - 160)      | 48                   | 423                    | 0.83                   | 3000/1500           | 470                          | 87                  |

Note: Use suffix "-K" for optional heat sink. Use suffix "ST" for chassis and suffix "STD" for DIN-Rail mounting (ex. AM40EW-11005SH30-NZ-K-STD is with the heatsink attached version. AM40EW-11005SH30-NZ-K-STD is DIN-Rail mounting version with the heatsink. AM40EW-11005SH30-NZ-ST is chassis mounting and AM40EW-11005SH30-NZ-STD is DIN-Rail mounting version.)

| Input Specification            |                                                                                                                   |          |         |          |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------|----------|---------|----------|
| Parameters                     | Conditions                                                                                                        | Typical  | Maximum | Units    |
| Voltage range                  | Nominal 110                                                                                                       | 40 – 160 |         | VDC      |
| Input under voltage lockout    | ON/OFF                                                                                                            | 40/32    |         | VDC      |
| Startup voltage                |                                                                                                                   | 40       |         | VDC      |
| Startup time                   | Nominal input and resistive load                                                                                  | 20       |         | ms       |
| Filter                         | Pi network                                                                                                        |          |         |          |
| Absolute maximum rating        | Duration 1s max.                                                                                                  |          | 180     | VDC      |
| Input reflected ripple current |                                                                                                                   | 25       |         | mA pk-pk |
| On/Off Control                 | ON – 3.5 to 12Vdc or open;<br>OFF – 0 to 1.2Vdc or Short circuit Pin 1 and Pin 2, idle current 2mA typ. 10mA max. |          |         |          |

| Isolation Specification |                             |         |         |       |
|-------------------------|-----------------------------|---------|---------|-------|
| Parameters              | Conditions                  | Typical | Maximum | Units |
| Tested I/O voltage      | 60 sec, leakage of 1mA max. | 3000    |         | VDC   |
|                         | 60 sec, leakage of 5mA max  | 1500    |         | VAC   |
| Resistance              | 500Vdc                      | >1000   |         | MOhm  |
| Capacitance             | 100KHz/0.1V                 | 2200    | 3000    | pF    |

| Output Specification         |                             |                |         |           |
|------------------------------|-----------------------------|----------------|---------|-----------|
| Parameters                   | Conditions                  | Typical        | Maximum | Units     |
| Voltage accuracy             | 0-100% load                 | ±1.0           | ±3.0    | %         |
| Line regulation              | Full load, main input range | ±0.4           | ±1.0    | %         |
| Load regulation              | 0-100% load                 | ±0.5           | ±1.0    | %         |
| Voltage adjustment           |                             |                | ±10     | %Vout     |
| Short circuit protection     | Continuous, Auto recovery   |                |         |           |
| Over current protection      |                             | 110~190        |         | % of Iout |
| Over voltage protection      |                             | 110~160        |         | % of Vout |
| Temperature coefficient      |                             | ±0.02          | ±0.03   | %/°C      |
| Ripple & Noise*              |                             | 150            | 200     | mV pk-pk  |
| Transient recovery time      | 25% load step change        | 300            | 500     | μs        |
| Transient response deviation | 25% load step change        | 3.3V/5V models | ±5      | %         |
|                              |                             | Others         | ±3      |           |

\* 20MHz bandwidth. The Ripple & Noise may reach 5% of Vout max. when the adding load below 5% of total load.

| General Specifications                                                                                                                                                        |                                                   |                                                   |         |       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------|---------|-------|
| Parameters                                                                                                                                                                    | Conditions                                        | Typical                                           | Maximum | Units |
| Switching frequency                                                                                                                                                           | Full load                                         | 220                                               |         | KHz   |
| Operating temperature                                                                                                                                                         | See derating graph                                | -40 to +85                                        |         | °C    |
| Storage temperature                                                                                                                                                           |                                                   | -55 to +125                                       |         | °C    |
| Over temperature protection                                                                                                                                                   | At case                                           | 100                                               | 130     | °C    |
| Lead temperature                                                                                                                                                              | 1.5mm from case 10 sec.                           |                                                   | 300     | °C    |
| Cooling                                                                                                                                                                       | Free air convection                               |                                                   |         |       |
| Humidity                                                                                                                                                                      | Non-condensing                                    | 95                                                |         | % RH  |
| Case material                                                                                                                                                                 | Aluminum                                          |                                                   |         |       |
| Weight                                                                                                                                                                        | PCB mountable models                              | 26                                                | g       |       |
|                                                                                                                                                                               | With optional -K heatsink models                  | 34                                                |         |       |
|                                                                                                                                                                               | With optional -ST mounting plate                  | 48                                                |         |       |
|                                                                                                                                                                               | With optional -STD mounting plate                 | 68                                                |         |       |
|                                                                                                                                                                               | With optional -K-ST mounting plate and heatsink   | 56                                                |         |       |
|                                                                                                                                                                               | With optional -K-STD mounting plate and heatsink  | 76                                                |         |       |
| Dimensions (L x W x H)                                                                                                                                                        | PCB mountable models                              | 2 x 1 x 0.47 inches (50.8 × 25.4 × 11.8 mm)       |         |       |
|                                                                                                                                                                               | With optional -K heatsink models                  | 2.02 x 1.03 x 0.65 inches (51.4 × 26.2 × 16.5 mm) |         |       |
|                                                                                                                                                                               | With optional -ST mounting plate                  | 2.99 x 1,24 x 0.83 inches (76 × 31.5 × 21.2 mm)   |         |       |
|                                                                                                                                                                               | With optional -STD mounting plate                 | 2.99 x 1,24 x 1.02 inches (76 × 31.5 × 25.8 mm)   |         |       |
|                                                                                                                                                                               | With optional -K-ST mounting plate and heatsink   | 2.99 x 1,24 x 1.00 inches (76 × 31.5 × 25.3 mm)   |         |       |
|                                                                                                                                                                               | With optional -K-STD mounting plate and heatsink  | 2.99 x 1,24 x 1.18 inches (76 × 31.5 × 29.9 mm)   |         |       |
| MTBF                                                                                                                                                                          | > 500 000 hrs (MIL-HDBK -217F, t=+25°C)/Full Load |                                                   |         |       |
| All specifications in this datasheet are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified. |                                                   |                                                   |         |       |

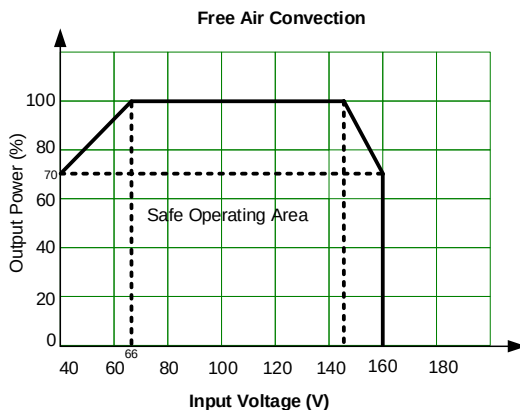
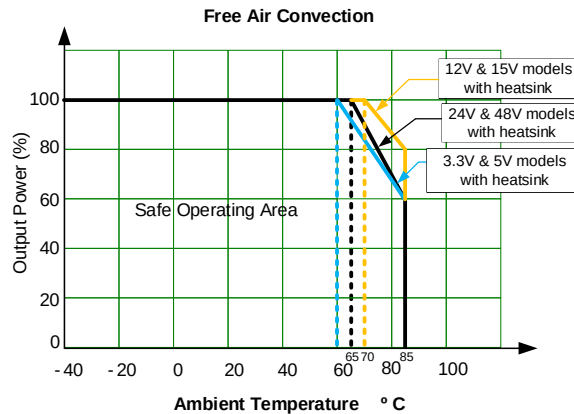
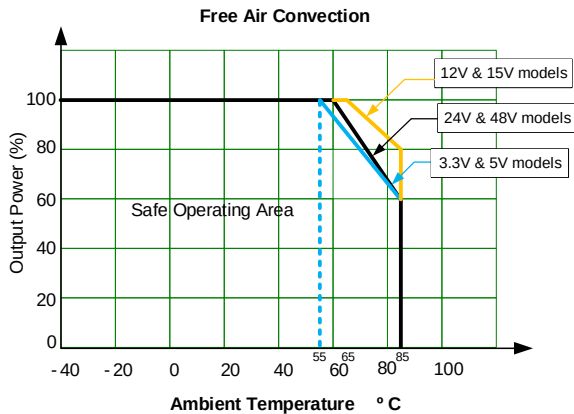
All specifications in this datasheet are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified.

## Safety Specifications

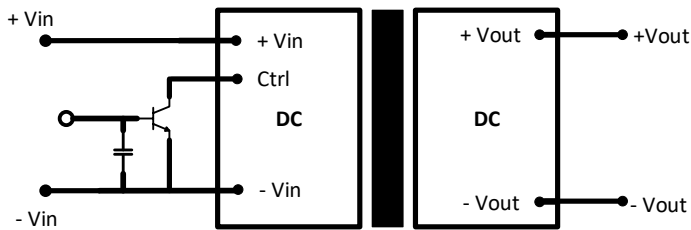
### Parameters

|           |                                              |    |                                                                                                                                                                            |
|-----------|----------------------------------------------|----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standards | Information technology Equipment             |    | Design to meet IEC/EN/UL62368-1                                                                                                                                            |
|           | Electronic equipment in railway applications |    | Design to meet EN50155                                                                                                                                                     |
|           | EMI - Conducted and Radiated Emission        | CE | CISPR32/EN55032, Class B with the recommended EMC circuit<br>EN50121-3-2 with the recommended EMC circuit<br>99dBuV from 0.15-0.5MHz<br>93dBuV from 0.5-30MHz              |
|           |                                              | RE | CISPR32/EN55032, Class B with the recommended EMC circuit<br>EN50121-3-2, with the recommended EMC circuit<br>40dBuV from 30-230MHz at 10m<br>47dBuV from 0.23-1GHz at 10m |
|           | Electrostatic Discharge Immunity             |    | IEC/EN61000-4-2, Contact $\pm 6\text{KV}$ / Air $\pm 8\text{KV}$ , Criteria A<br>EN50121-3-2, Contact $\pm 6\text{KV}$ / Air $\pm 8\text{KV}$ , Criteria A                 |
|           | RF, Electromagnetic Field Immunity           |    | IEC/EN61000-4-3, 20V/m, Criteria A<br>EN50121-3-2, 20V/m, Criteria A                                                                                                       |
|           | Electrical Fast Transient/Burst Immunity**   |    | IEC/EN61000-4-4, $\pm 4\text{KV}$ with recommended EMC circuit, Criteria A<br>EN50121-3-2, $\pm 2\text{KV}$ with recommended EMC circuit, Criteria A                       |
|           | Surge Immunity**                             |    | IEC/EN61000-4-5, $\pm 2\text{KV}$ with recommended EMC circuit, Criteria A<br>EN50121-3-2, L-L $\pm 1\text{KV}$ with recommended EMC circuit, Criteria A                   |
|           | RF, Conducted Disturbance Immunity           |    | IEC/EN61000-4-6, 10Vr.m.s, Criteria A<br>EN50121-3-2, 10Vr.m.s @ 0.15~80MHz, Criteria A                                                                                    |

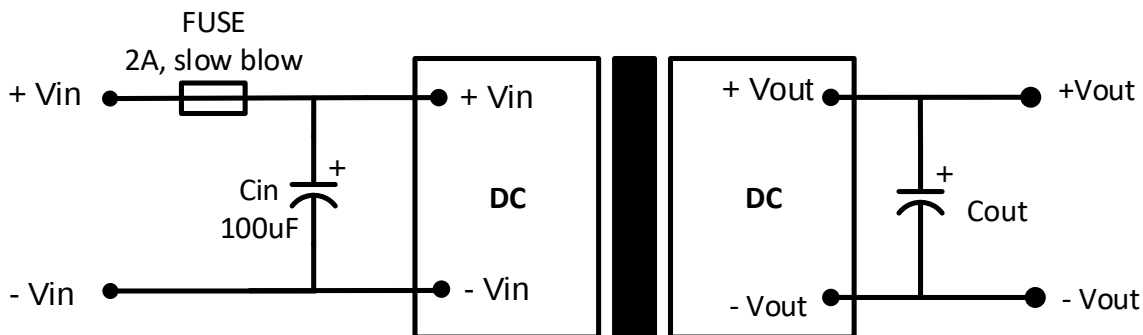
## Derating



## On/Off Control Application Circuit

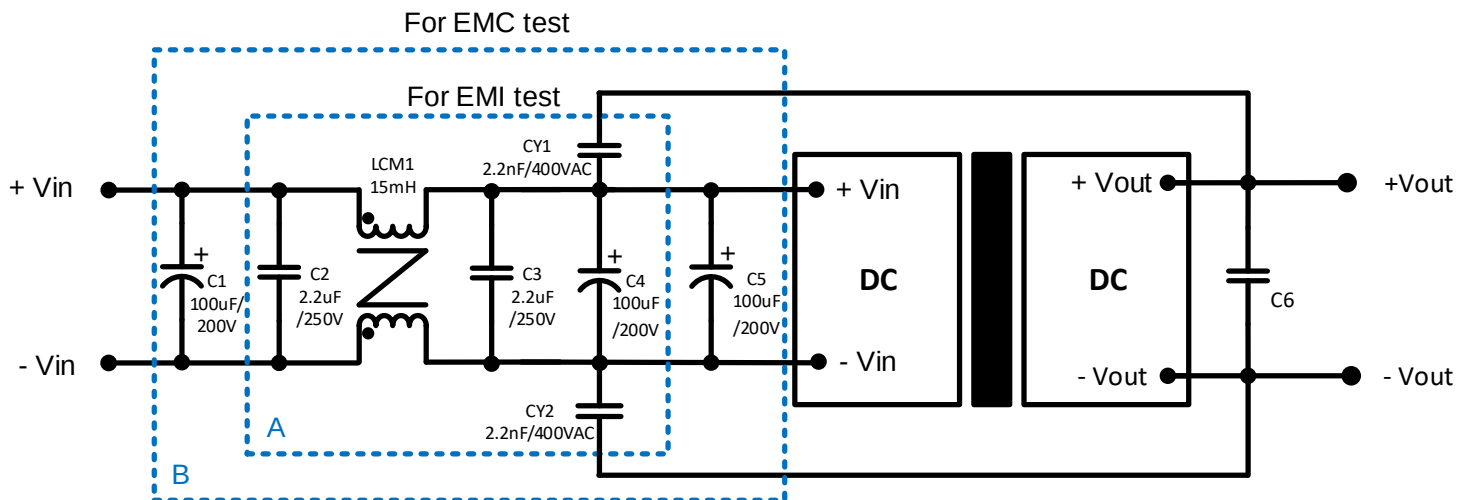


## Typical Application Circuit



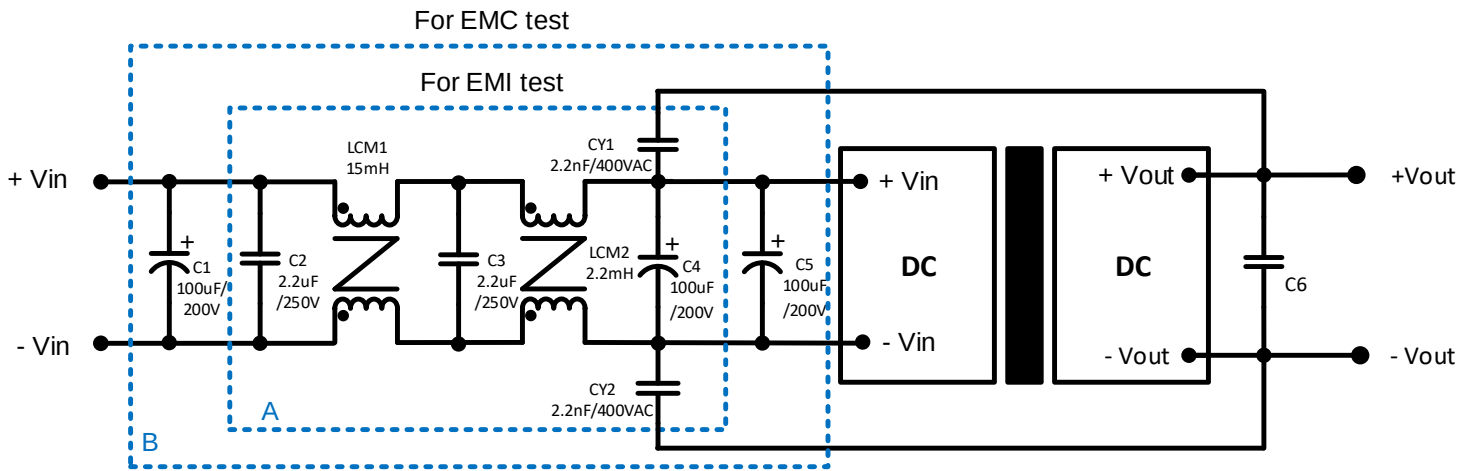
## EMC recommended Circuit

For 3.3V, 5V, 12V, 15V, 24V output models



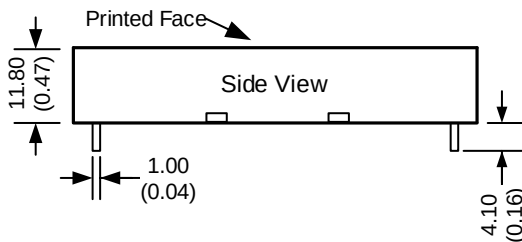
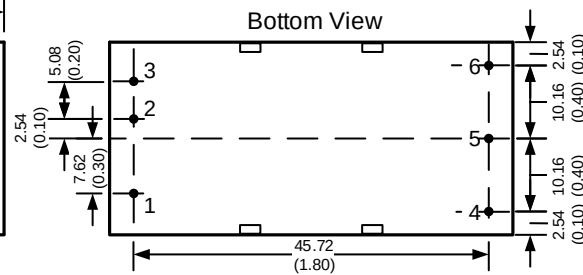
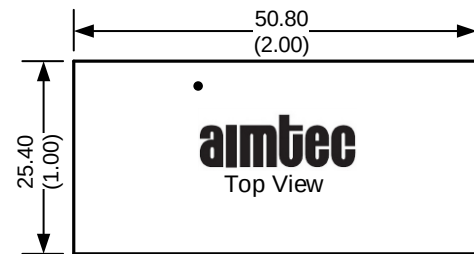
Notes: Part A for EMI filtering and Part B is used for EMC test.

For 48V output model



Notes: Part A for EMI filtering and Part B is used for EMC test.

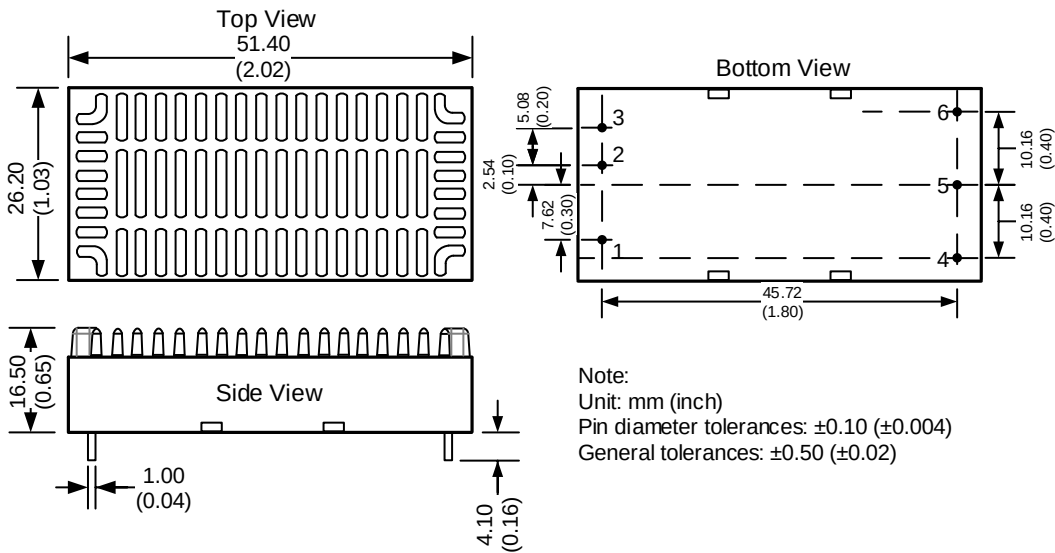
## Dimensions



Note:  
Unit: mm (inch)  
Pin diameter tolerances:  $\pm 0.10$  ( $\pm 0.004$ )  
General tolerances:  $\pm 0.50$  ( $\pm 0.02$ )

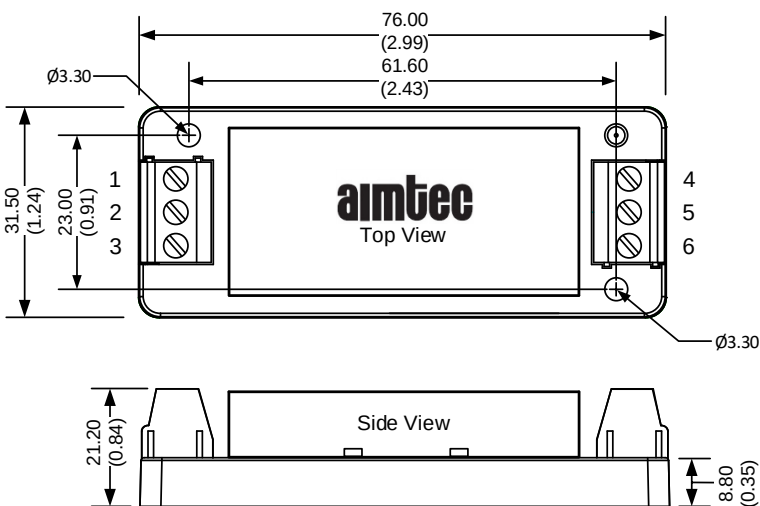
| Pin Output Specifications |             |
|---------------------------|-------------|
| Pin                       | Single      |
| 1                         | On/Off Ctrl |
| 2                         | -V Input    |
| 3                         | +V Input    |
| 4                         | +V Output   |
| 5                         | -V Output   |
| 6                         | Trim        |

## Dimensions with -K option



| Pin Output Specifications |             |
|---------------------------|-------------|
| Pin                       | Single      |
| 1                         | On/Off Ctrl |
| 2                         | -V Input    |
| 3                         | +V Input    |
| 4                         | +V Output   |
| 5                         | -V Output   |
| 6                         | Trim        |

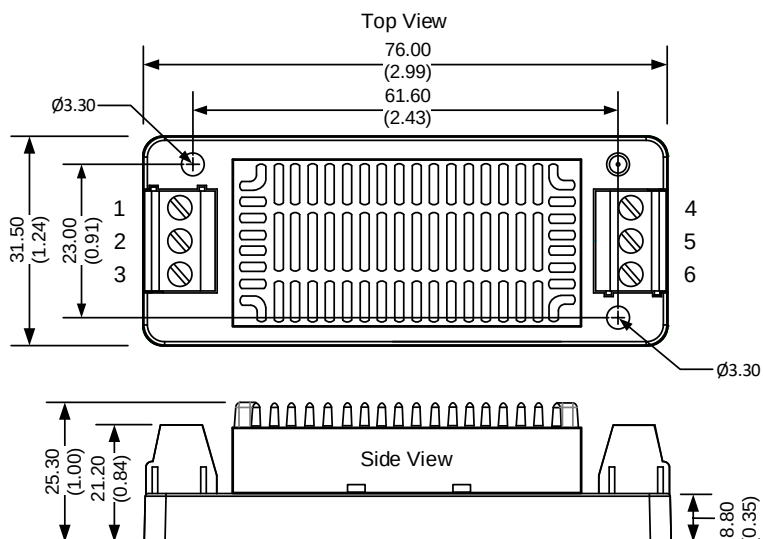
## Dimensions with -ST option



| Pin Output Specifications |             |
|---------------------------|-------------|
| Pin                       | Single      |
| 1                         | On/Off Ctrl |
| 2                         | -V Input    |
| 3                         | +V Input    |
| 4                         | Trim        |
| 5                         | -V Output   |
| 6                         | +V Output   |

Note:  
Unit: mm (inch)  
Wire range: 24-12 AWG  
Tightening torque: Max 0.4 N\*m  
General tolerances:  $\pm 0.50$  ( $\pm 0.02$ )

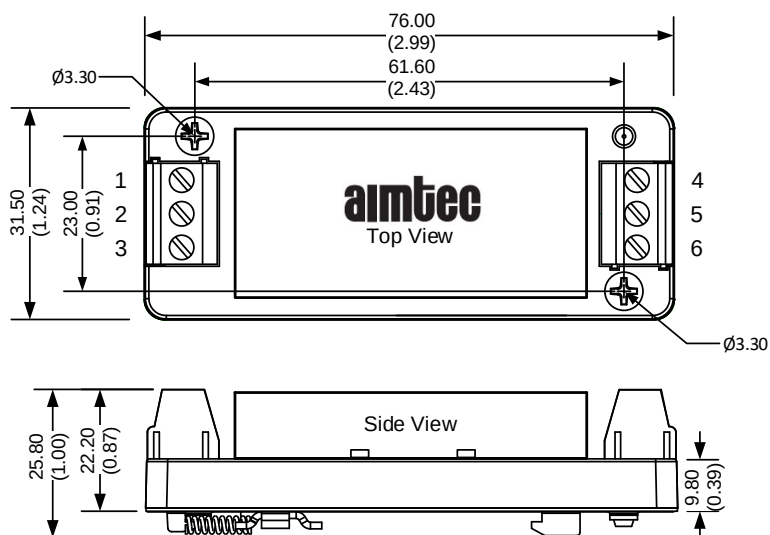
## Dimensions with -K-ST option



Note:  
Unit: mm (inch)  
Wire range: 24-12 AWG  
Tightening torque: Max 0.4 N\*m  
General tolerances:  $\pm 1.00$  ( $\pm 0.04$ )

| Pin Output Specifications |             |
|---------------------------|-------------|
| Pin                       | Single      |
| 1                         | On/Off Ctrl |
| 2                         | -V Input    |
| 3                         | +V Input    |
| 4                         | Trim        |
| 5                         | -V Output   |
| 6                         | +V Output   |

## Dimensions with -STD option

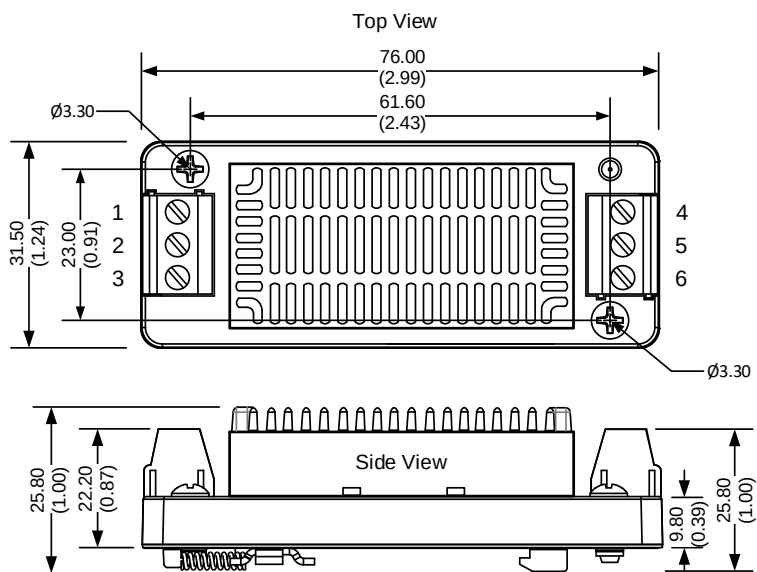


Note:  
Unit: mm (inch)  
Mounting rail: TS35  
Wire range: 24-12 AWG  
Tightening torque: Max 0.4 N\*m  
General tolerances:  $\pm 1.00$  ( $\pm 0.04$ )

| Pin Output Specifications |             |
|---------------------------|-------------|
| Pin                       | Single      |
| 1                         | On/Off Ctrl |
| 2                         | -V Input    |
| 3                         | +V Input    |
| 4                         | Trim        |
| 5                         | -V Output   |
| 6                         | +V Output   |



## Dimensions with -K-STD option



Note:  
Unit: mm (inch)  
Mounting rail: TS35  
Wire range: 24-12 AWG  
Tightening torque: Max 0.4 N\*m  
General tolerances:  $\pm 1.00$  ( $\pm 0.04$ )

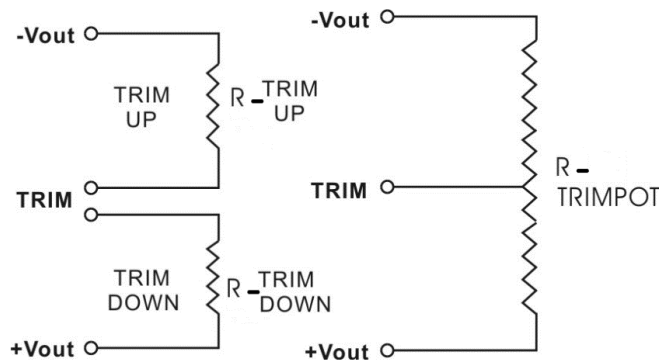
| Pin Output Specifications |             |
|---------------------------|-------------|
| Pin                       | Single      |
| 1                         | On/Off Ctrl |
| 2                         | -V Input    |
| 3                         | +V Input    |
| 4                         | Trim        |
| 5                         | -V Output   |
| 6                         | +V Output   |

## Trimming

Output voltage can be externally trimmed by utilizing the methods as shown below

### Fixed Resistor

### Variable Potentiometer



Leave open if not used.

#### AM40EW-11003SH30-NZ

| Trim down %  | 1       | 2       | 3      | 4     | 5      | 6      | 7      | 8      | 9      | 10     |
|--------------|---------|---------|--------|-------|--------|--------|--------|--------|--------|--------|
| Vout (VDC)   | 3.267   | 3.234   | 3.201  | 3.168 | 3.135  | 3.102  | 3.069  | 3.036  | 3.003  | 2.97   |
| Rt down (KΩ) | 195.744 | 109.218 | 73.096 | 53.27 | 40.741 | 32.108 | 25.797 | 20.983 | 17.19  | 14.124 |
| Trim up %    | 1       | 2       | 3      | 4     | 5      | 6      | 7      | 8      | 9      | 10     |
| Vout (VDC)   | 3.333   | 3.366   | 3.399  | 3.432 | 3.465  | 3.498  | 3.531  | 3.564  | 3.597  | 3.63   |
| Rt up (KΩ)   | 308.349 | 105.149 | 60.286 | 40.58 | 29.504 | 22.407 | 17.472 | 13.842 | 11.058 | 8.857  |

#### AM40EW-11005SH30-NZ

| Trim down %  | 1       | 2      | 3      | 4      | 5      | 6      | 7      | 8     | 9     | 10    |
|--------------|---------|--------|--------|--------|--------|--------|--------|-------|-------|-------|
| Vout (VDC)   | 4.95    | 4.9    | 4.85   | 4.8    | 4.75   | 4.7    | 4.65   | 4.6   | 4.55  | 4.5   |
| Rt down (KΩ) | 105.181 | 52.154 | 31.997 | 21.378 | 14.823 | 10.373 | 7.155  | 4.719 | 2.811 | 1.277 |
| Trim up %    | 1       | 2      | 3      | 4      | 5      | 6      | 7      | 8     | 9     | 10    |
| Vout (VDC)   | 5.05    | 5.1    | 5.15   | 5.2    | 5.25   | 5.3    | 5.35   | 5.4   | 5.45  | 5.5   |
| Rt up (KΩ)   | 176.356 | 71.279 | 41.974 | 28.2   | 20.198 | 14.967 | 11.281 | 8.544 | 6.43  | 4.749 |

#### AM40EW-11012SH30-NZ

| Trim down %  | 1       | 2       | 3       | 4       | 5       | 6       | 7      | 8      | 9      | 10     |
|--------------|---------|---------|---------|---------|---------|---------|--------|--------|--------|--------|
| Vout (VDC)   | 11.88   | 11.76   | 11.64   | 11.52   | 11.4    | 11.28   | 11.16  | 11.04  | 10.92  | 10.8   |
| Rt down (KΩ) | 496.092 | 301.452 | 212.527 | 161.585 | 128.573 | 105.442 | 88.332 | 75.164 | 64.716 | 56.223 |
| Trim up %    | 1       | 2       | 3       | 4       | 5       | 6       | 7      | 8      | 9      | 10     |
| Vout (VDC)   | 12.12   | 12.24   | 12.36   | 12.48   | 12.6    | 12.72   | 12.84  | 12.96  | 13.08  | 13.2   |
| Rt up (KΩ)   | 706.435 | 158.92  | 83.879  | 54.075  | 38.077  | 28.095  | 21.274 | 16.317 | 12.552 | 9.595  |

#### AM40EW-11015SH30-NZ

| Trim down %  | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10    |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-------|
| Vout (VDC)   | 14.85   | 14.7    | 14.55   | 14.4    | 14.25   | 14.1    | 13.95   | 13.8    | 13.65   | 13.5  |
| Rt down (KΩ) | 974.008 | 517.39  | 346.387 | 256.863 | 201.789 | 164.487 | 137.551 | 117.187 | 101.251 | 88.44 |
| Trim up %    | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10    |
| Vout (VDC)   | 15.15   | 15.3    | 15.45   | 15.6    | 15.75   | 15.9    | 16.05   | 16.2    | 16.35   | 16.5  |
| Rt up (KΩ)   | 283.713 | 117.996 | 70.541  | 48.045  | 34.918  | 26.315  | 20.242  | 15.725  | 12.235  | 9.456 |

#### AM40EW-11024SH30-NZ

| Trim down %  | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10     |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|
| Vout (VDC)   | 23.76   | 23.52   | 23.28   | 23.04   | 22.8    | 22.56   | 22.32   | 22.08   | 21.84   | 21.6   |
| Rt down (KΩ) | 1286.2  | 792.123 | 565.867 | 436.104 | 351.954 | 292.963 | 249.315 | 215.714 | 189.047 | 167.37 |
| Trim up %    | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10     |
| Vout (VDC)   | 24.24   | 24.48   | 24.72   | 24.96   | 25.2    | 25.44   | 25.68   | 25.92   | 26.16   | 26.4   |
| Rt up (KΩ)   | 816.889 | 179.914 | 94.338  | 60.464  | 42.307  | 30.988  | 23.257  | 17.64   | 13.376  | 10.027 |

AM40EW-11048SH30-NZ

| Trim down %  | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10      |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Vout (VDC)   | 47.52   | 47.04   | 46.56   | 46.08   | 45.6    | 45.12   | 44.64   | 44.16   | 43.68   | 43.2    |
| Rt down (KΩ) | 2357.74 | 1592.78 | 1193.77 | 948.808 | 783.113 | 663.569 | 573.251 | 502.609 | 445.845 | 399.235 |
| Trim up %    | 1       | 2       | 3       | 4       | 5       | 6       | 7       | 8       | 9       | 10      |
| Vout (VDC)   | 48.6    | 48.96   | 49.44   | 49.92   | 50.4    | 50.88   | 51.36   | 51.84   | 52.32   | 52.8    |
| Rt up (KΩ)   | 4126    | 331.356 | 138.244 | 82.118  | 55.382  | 39.741  | 29.475  | 22.22   | 16.821  | 12.646  |

**NOTE:** **1.** Datasheets are updated as needed and as such, specifications are subject to change without notice. Once printed or downloaded, datasheets are no longer controlled by Aimtec; refer to [www.aimtec.com](http://www.aimtec.com) for the most current product specifications. **2.** Product labels shown, including safety agency certifications on labels, may vary based on the date manufactured. **3.** Mechanical drawings and specifications are for reference only. **4.** All specifications are measured at an ambient temperature of 25°C, humidity<75%, nominal input voltage and at rated output load unless otherwise specified. **5.** Aimtec may not have conducted destructive testing or chemical analysis on all internal components and chemicals at the time of publishing this document. CAS numbers and other limited information are considered proprietary and may not be available for release. **6.** This product is not designed for use in critical life support systems, equipment used in hazardous environments, nuclear control systems or other such applications which necessitate specific safety and regulatory standards other the ones listed in this datasheet. **7.** Warranty is in accordance with Aimtec's standard Terms of Sale available at [www.aimtec.com](http://www.aimtec.com).