

**SERIES:** AE10-EW | **DESCRIPTION:** DC-DC CONVERTER

**FEATURES**

- 10 watts
- high operating temp -40 to +70°C
- 4,000 Vac isolation
- extra wide input voltage 10:1
- input voltage up to 1 kVdc
- OVP protection
- output short circuit protection
- board mounted
- EN 62109 approved

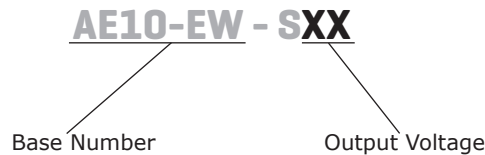


**MODEL**

| MODEL       | input voltage range (Vdc) | output voltage (Vdc) | output current |         | output power max (W) | ripple & noise <sup>1</sup> max (mVp-p) | efficiency <sup>2</sup> typ (%) |
|-------------|---------------------------|----------------------|----------------|---------|----------------------|---|---------------------------------|
|             |                           |                      | min (A)        | max (A) |                      |   |                                 |
| AE10-EW-S5  | 100~1000                  | 5                    | 0              | 2.00    | 10                   | 200                                     | 72                              |
| AE10-EW-S9  | 100~1000                  | 9                    | 0              | 1.11    | 10                   | 200                                     | 76                              |
| AE10-EW-S24 | 100~1000                  | 24                   | 0              | 0.42    | 10                   | 200                                     | 80                              |

Notes: 1. Measured at nominal input, 20 MHz bandwidth oscilloscope, with 10 µF electrolytic and 1 µF ceramic capacitors on the output.  
 2. Measured at 200 Vdc input voltage, full load.  
 3. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

**PART NUMBER KEY**



**INPUT**

| parameter               | conditions/description    | min | typ | max  | units |
|-------------------------|---------------------------|-----|-----|------|-------|
| operating input voltage |                           | 100 |     | 1000 | Vdc   |
| current                 | at 200 Vdc                |     |     | 75   | mA    |
|                         | at 600 Vdc                |     |     | 25   | mA    |
|                         | at 1000 Vdc               |     |     | 16   | mA    |
| inrush current          | at 200 Vdc                |     | 7   |      | A     |
|                         | at 600 Vdc                |     | 20  |      | A     |
|                         | at 1000 Vdc               |     | 30  |      | A     |
| input fuse              | 1 A / 1000 Vdc (external) |     |     |      |       |

**OUTPUT**

| parameter               | conditions/description                        | min | typ   | max   | units |
|-------------------------|---|-----|-------|-------|-------|
| maximum capacitive load | 5 Vdc output model                            |     |       | 6,000 | μF    |
|                         | 9 Vdc output model                            |     |       | 4,000 | μF    |
|                         | 24 Vdc output model                           |     |       | 470   | μF    |
| voltage accuracy        |   |     | ±1    | ±2    | %     |
| line regulation         | from low line to high line, full load         |     | ±0.5  | ±1    | %     |
| load regulation         | from 0% to full load                          |     | ±0.5  | ±1    | %     |
| delay time              | from Vin = 0 V to 90% of rated output voltage |     |       | 1     | s     |
| switching frequency     |   |     |       | 75    | kHz   |
| temperature coefficient | at full load                                  |     | ±0.02 |       | %/°C  |

**PROTECTIONS**

| parameter                | conditions/description         | min | typ | max | units |
|--------------------------|--------------------------------|-----|-----|-----|-------|
| over voltage protection  | 5 Vdc output model             |     |     | 7.5 | Vdc   |
|                          | 9 Vdc output model             |     |     | 12  | Vdc   |
|                          | 24 Vdc output model            |     |     | 28  | Vdc   |
| over current protection  | automatic recovery             | 110 |     |     | %     |
| short circuit protection | continuous, automatic recovery |     |     |     |       |

**SAFETY AND COMPLIANCE**

| parameter           | conditions/description  | min     | typ | max | units |
|---------------------|---|---------|-----|-----|-------|
| isolation voltage   | input to output for 1 minute  | 4,000   |     |     | Vac   |
| safety approvals    | EN 62109  |         |     |     |       |
| conducted emissions | CISPR22/EN55022, class A (external circuit required, see Figure 2)        |         |     |     |       |
| radiated emissions  | CISPR22/EN55022, class A (external circuit required, see Figure 2)        |         |     |     |       |
| ESD                 | IEC/EN61000-4-2, contact ± 6kV/air ± 8kV, class B                         |         |     |     |       |
| radiated immunity   | IEC/EN61000-4-3, 10V/m, class A   |         |     |     |       |
| EFT/burst           | IEC/EN61000-4-4, ± 4kV, class B (external circuit required, see Figure 2) |         |     |     |       |
| surge               | IEC/EN61000-4-5, ± 2kV, class B (external circuit required, see Figure 2) |         |     |     |       |
| conducted immunity  | IEC/EN61000-4-6, 10 Vr.m.s, class A                                       |         |     |     |       |
| MTBF                | as per MIL-HDBK-217F, 25°C  | 300,000 |     |     | hours |
| RoHS                | 2011/65/EU  |         |     |     |       |

## ENVIRONMENTAL

| parameter             | conditions/description | min | typ | max  | units |
|-----------------------|------------------------|-----|-----|------|-------|
| operating temperature | see derating curves    | -40 |     | 70   | °C    |
| storage temperature   |                        | -40 |     | 105  | °C    |
| storage humidity      | non-condensing         |     |     | 95   | %     |
| altitude              |                        |     |     | 2000 | m     |

## SOLDERABILITY

| parameter      | conditions/description | min | typ | max | units |
|----------------|------------------------|-----|-----|-----|-------|
| hand soldering | for 3~5 seconds        | 350 | 360 | 370 | °C    |
| wave soldering | for 5~10 seconds       | 255 | 260 | 265 | °C    |

## MECHANICAL

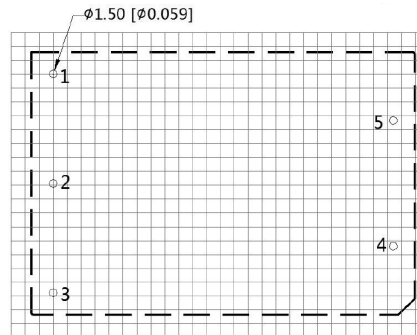
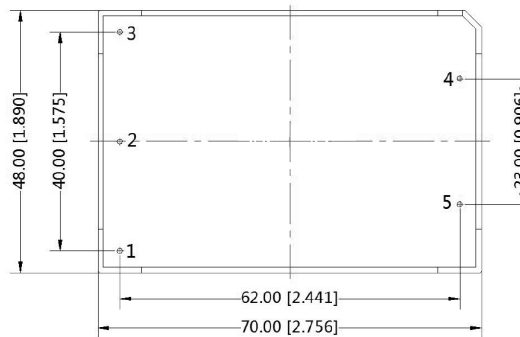
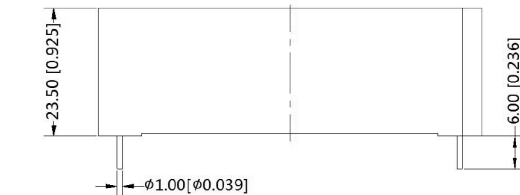
| parameter     | conditions/description                             | min | typ | max | units |
|---------------|--|-----|-----|-----|-------|
| dimensions    | 70.00 x 48.00 x 23.50 [2.756 x 1.890 x 0.925 inch] |     |     |     | mm    |
| case material | black flame-retardant heat-proof plastic (UL94V-0) |     |     |     |       |
| weight        |  |     | 95  |     | g     |

## MECHANICAL DRAWING

units: mm [inch]  
 tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]  
 pin diameter tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]

| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | Function |
| 1               | NC       |
| 2               | -Vin     |
| 3               | +Vin     |
| 4               | +Vout    |
| 5               | -Vout    |

NC=no connection

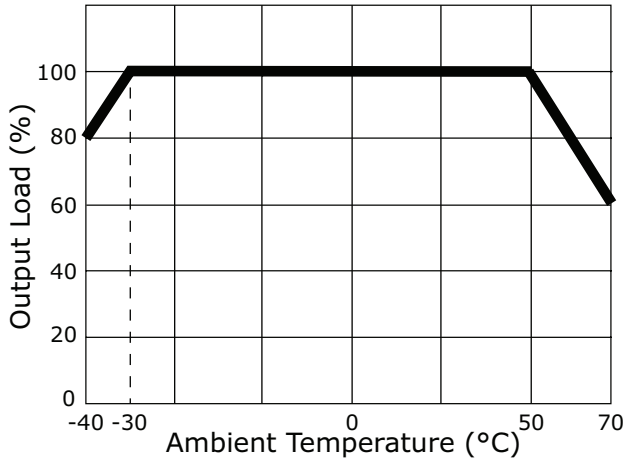


Note: Grid 2.54\*2.54mm

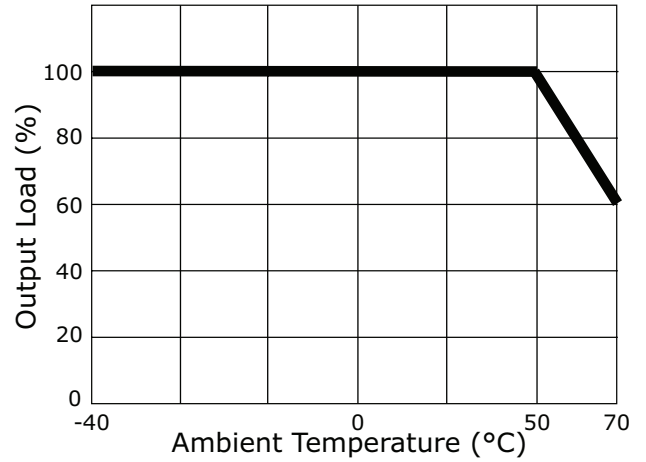
Recommended PCB Layout  
 Top View

## DERATING CURVES

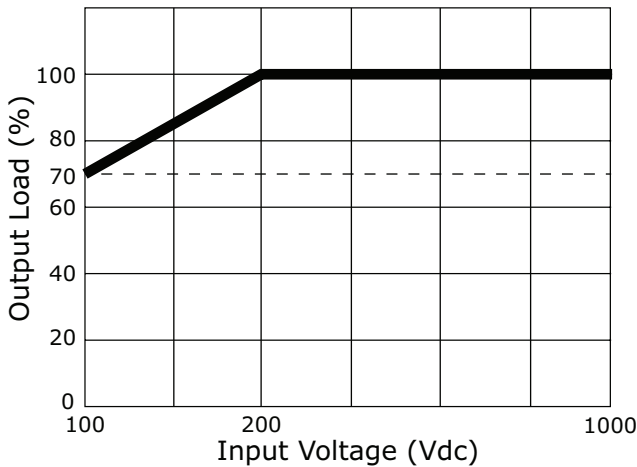
Temperature Derating Curve  
(100~150 Vdc input voltage)



Temperature Derating Curve  
(150~1000 Vdc input voltage)

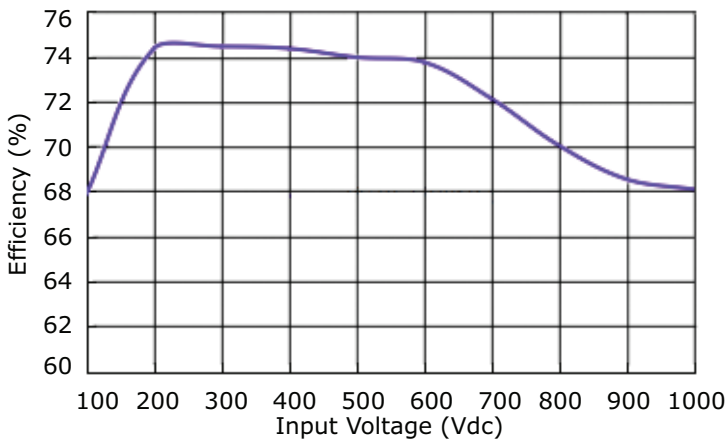


Load vs. Input Voltage Derating Curve  
(at 25°C)

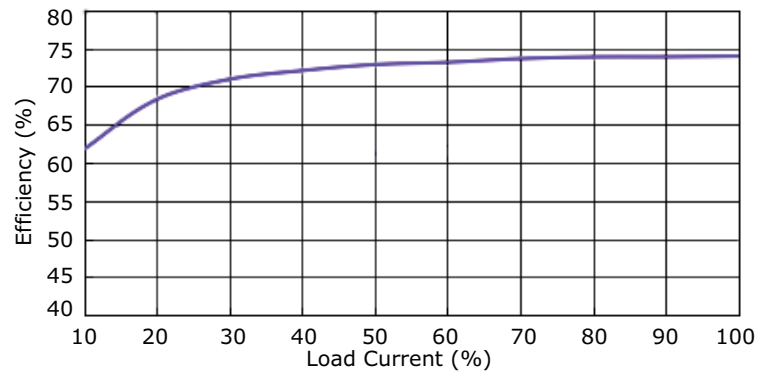


## EFFICIENCY CURVES

AE10-EW-S5 Efficiency Curve  
Efficiency vs. Input Voltage

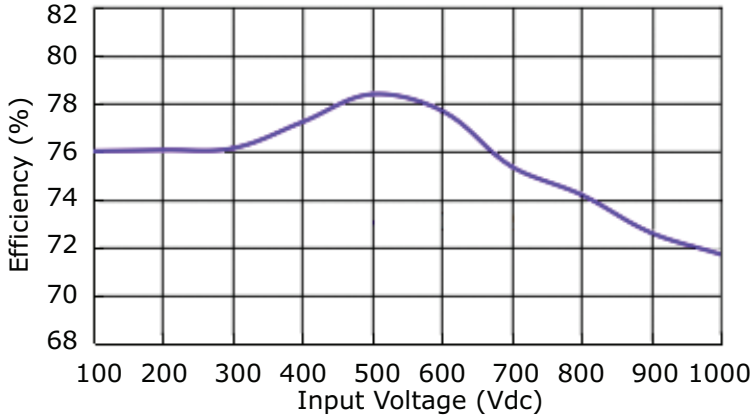


AE10-EW-S5 Efficiency Curve  
Efficiency vs. Load Current

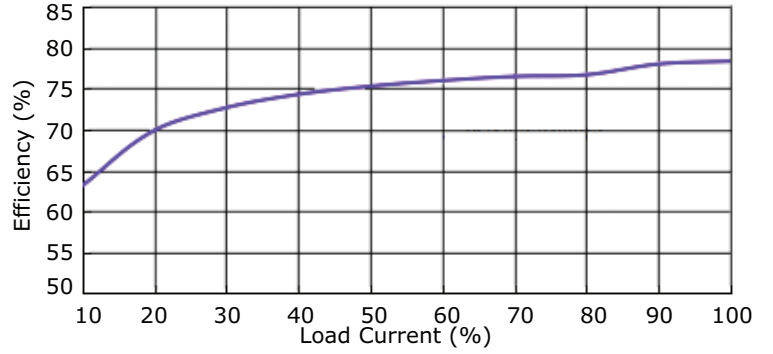


## EFFICIENCY CURVES (CONTINUED)

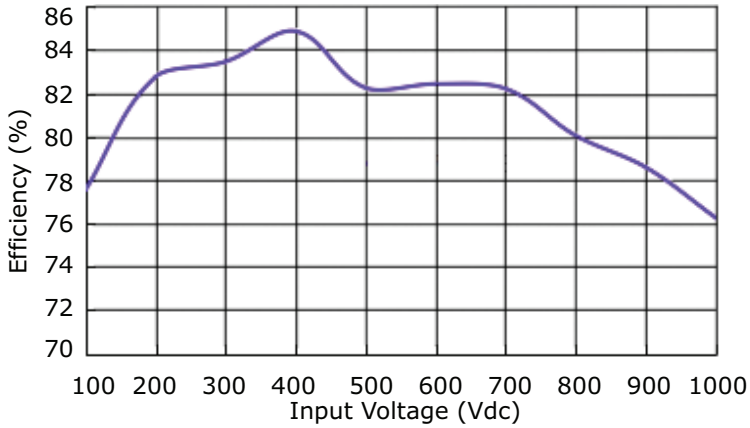
AE10-EW-S9 Efficiency Curve  
Efficiency vs. Input Voltage



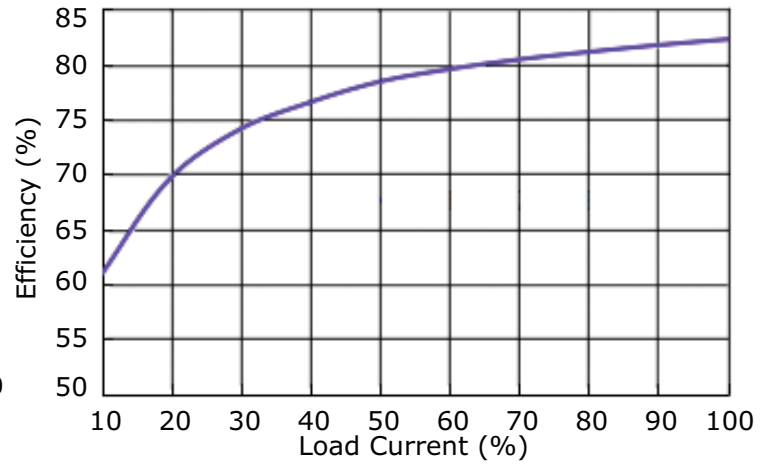
AE10-EW-S9 Efficiency Curve  
Efficiency vs. Load Current



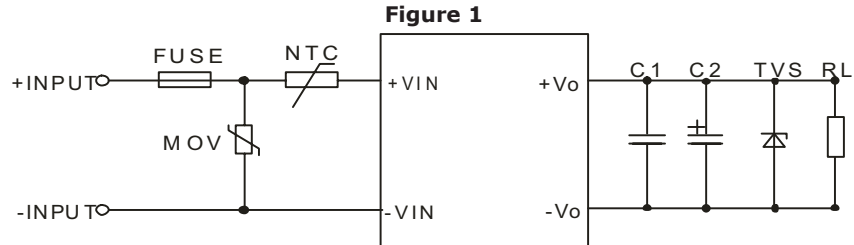
AE10-EW-S24 Efficiency Curve  
Efficiency vs. Input Voltage



AE10-EW-S24 Efficiency Curve  
Efficiency vs. Load Current



## APPLICATION CIRCUIT

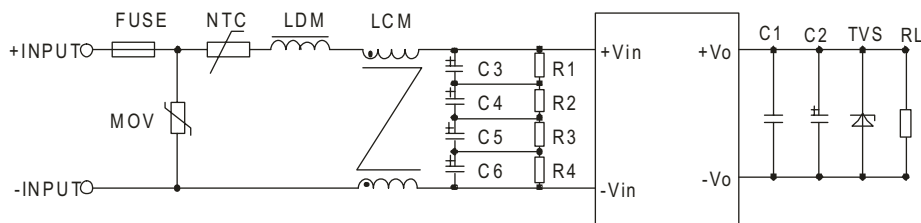


**Table 1**

| Vout (Vdc) | Fuse           | MOV     | NTC    | C1 (μF) | C2 (μF) | TVS      |
|------------|----------------|---------|--------|---------|---------|----------|
| 5          | 1 A / 1000 Vdc | S14K880 | 10D-11 | 1       | 220     | SMBJ7.0A |
| 9          | 1 A / 1000 Vdc | S14K880 | 10D-11 | 1       | 120     | SMBJ12A  |
| 24         | 1 A / 1000 Vdc | S14K880 | 10D-11 | 1       | 68      | SMBJ33A  |

## EMC RECOMMENDED CIRCUIT

**Figure 2**



**Table 2**

| Recommended External Circuit Components |               |
|---|---------------|
| FUSE                                    | 1 A/1000 Vdc  |
| MOV                                     | S14K880       |
| C3, C4, C5, C6                          | 47 μF/400 Vdc |
| R1, R2, R3, R4                          | 1 MΩ/2 W      |
| NTC                                     | 10D-11        |
| LDM                                     | 4.7 mH/0.38 A |
| LCM                                     | 10 mH         |

Note: See also Table 1.

- Notes:
1. C1 is a ceramic capacitor used to filter high frequency noise.
  2. C2 is electrolytic and is recommended to be high frequency and low resistance. For capacitance and current of the capacitor, refer to the datasheet provided by the manufacturer. Capacitance withstand voltage derating should be 80% or above.

## REVISION HISTORY

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| <b>rev.</b> | <b>description</b> | <b>date</b> |
|-------------|--------------------|-------------|
| 1.0         | initial release    | 09/13/2017  |

The revision history provided is for informational purposes only and is believed to be accurate.



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