

**SERIES:** AE40-UW | **DESCRIPTION:** DC-DC CONVERTER
**FEATURES**

- 40 watts
- high operating temp -40 to +70°C
- 4,000 Vac isolation
- UL 1741; EN 62109 approved
- board mounted
- input voltage range of 200~1,500 Vdc
- low ripple & noise
- OVP protection
- output short circuit protection

**MODEL**

|              | input<br>voltage<br>range<br>(Vdc) | output<br>voltage<br>(Vdc) | output<br>current |            | output<br>power<br>max<br>(W) | ripple<br>& noise <sup>1</sup><br>max<br>(mVp-p) | efficiency <sup>2</sup><br>typ<br>(%) |
|--------------|------------------------------------|----------------------------|-------------------|------------|-------------------------------|--------------------------------------------------|---------------------------------------|
|              |                                    |                            | min<br>(A)        | max<br>(A) |                               |                                                  |                                       |
| AE40-UW-S12* | 200~1500                           | 12                         | 0                 | 3.33       | 40                            | 300                                              | 76                                    |
| AE40-UW-S15  | 200~1500                           | 15                         | 0                 | 2.67       | 40                            | 300                                              | 78                                    |
| AE40-UW-S24* | 200~1500                           | 24                         | 0                 | 1.67       | 40                            | 300                                              | 80                                    |

Notes:

1. Measured at nominal input, 20 MHz bandwidth oscilloscope, with 10  $\mu$ F electrolytic and 1  $\mu$ F ceramic capacitors on the output.
2. Measured at 800 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.
4. \* Discontinued model.

**PART NUMBER KEY**
**AE40-UW - SXX**

Base Number

Output Voltage

## INPUT

| parameter               | conditions/description    | min | typ | max  | units |
|-------------------------|---------------------------|-----|-----|------|-------|
| operating input voltage |                           | 200 |     | 1500 | Vdc   |
| under voltage shutdown  | shut-down range           | 170 |     | 185  | Vdc   |
|                         | turn-on range             | 180 |     | 195  | Vdc   |
| current                 | at 200 Vdc                |     |     | 320  | mA    |
|                         | at 800 Vdc                |     |     | 80   | mA    |
|                         | at 1500 Vdc               |     |     | 42   | mA    |
| inrush current          | at 200 Vdc                |     | 30  |      | A     |
|                         | at 800 Vdc                |     | 80  |      | A     |
|                         | at 1500 Vdc               |     | 150 |      | A     |
| input fuse              | 4 A / 1500 Vdc (external) |     |     |      |       |

## OUTPUT

| parameter               | conditions/description                        | min | typ   | max   | units |
|-------------------------|-----------------------------------------------|-----|-------|-------|-------|
| maximum capacitive load | 12 Vdc output model                           |     |       | 3,000 | μF    |
|                         | 15 Vdc output model                           |     |       | 1,500 | μF    |
|                         | 24 Vdc output model                           |     |       | 680   | μF    |
| voltage accuracy        |                                               |     | ±2    |       | %     |
| line regulation         | from low line to high line, full load         |     | ±1    |       | %     |
| load regulation         | from 0% to full load                          |     | ±1    |       | %     |
| delay time              | from Vin = 0 V to 90% of rated output voltage |     |       | 2     | s     |
| switching frequency     |                                               |     | 65    |       | kHz   |
| temperature coefficient | at full load                                  |     | ±0.02 |       | %/°C  |

## PROTECTIONS

| parameter                | conditions/description         | min | typ | max | units |
|--------------------------|--------------------------------|-----|-----|-----|-------|
| over voltage protection  | 12 Vdc, 15 Vdc output models   |     |     | 20  | Vdc   |
|                          | 24 Vdc output model            |     |     | 30  | Vdc   |
| over current protection  | automatic recovery             | 120 |     | 320 | %     |
| 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        | CSA, EN 62109, UL 1741                                                              |         |     |     |       |
| 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, ± 2kV, class B (external circuit required, see Figure 2)           |         |     |     |       |
| surge                   | IEC/EN61000-4-5, line-line ± 1kV, class B (external circuit required, see Figure 2) |         |     |     |       |
| conducted immunity      | IEC/EN61000-4-6, 10 Vr.m.s, class A                                                 |         |     |     |       |
| magnetic field immunity | IEC/EN61000-4-8, 10 A/m, class A                                                    |         |     |     |       |
| MTBF                    | as per MIL-HDBK-217F, 25°C                                                          | 300,000 |     |     | hours |
| RoHS                    | yes                                                                                 |         |     |     |       |

## ENVIRONMENTAL

| parameter             | conditions/description | min | typ | max  | units |
|-----------------------|------------------------|-----|-----|------|-------|
| operating temperature | see derating curves    | -40 |     | 70   | °C    |
| storage temperature   |                        | -40 |     | 85   | °C    |
| storage humidity      | non-condensing         |     |     | 95   | %     |
| altitude              | see derating curves    |     |     | 5000 | 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    | 125.00 x 75.00 x 40.00 [4.921 x 2.953 x 1.575 inch] |     |     |     | mm    |
| case material | black flame-retardant heat-proof plastic (UL94V-0)  |     |     |     |       |
| weight        |                                                     |     | 410 |     | g     |

## MECHANICAL DRAWING

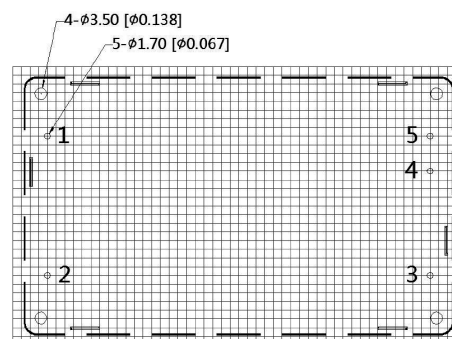
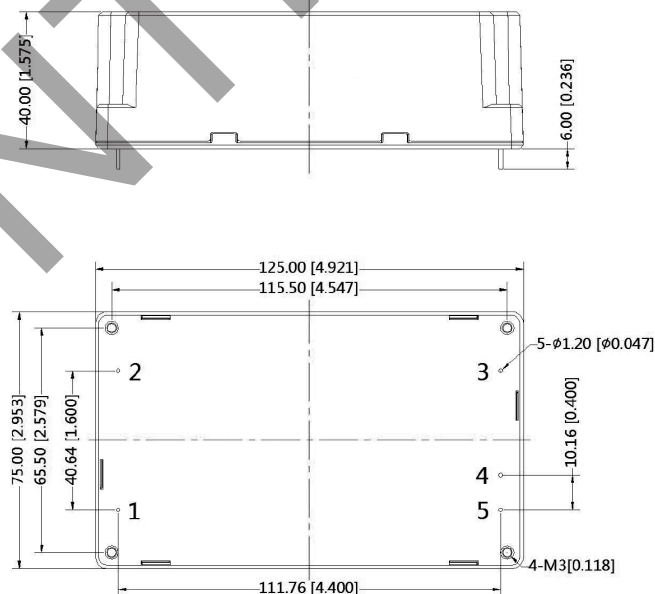
units: mm [inch]

tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]pin diameter tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]pin height tolerance:  $\pm 1.50$  [ $\pm 0.059$ ]

In high vibration environments, this series should be mounted with screws.  
tightening torque: max 0.4 N\*m

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

NC=no connection

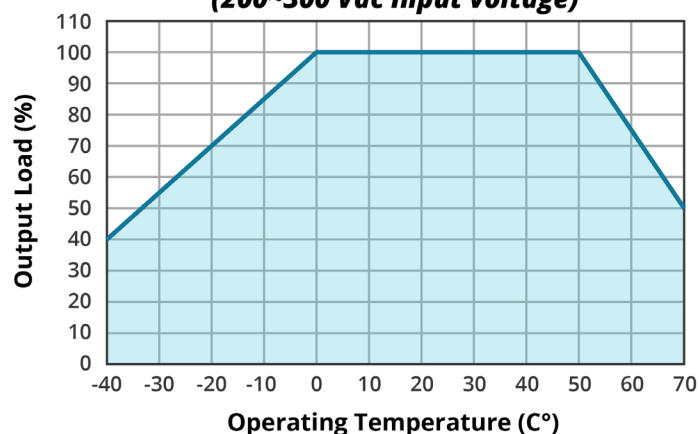


Note : Grid 2.54\*2.54mm

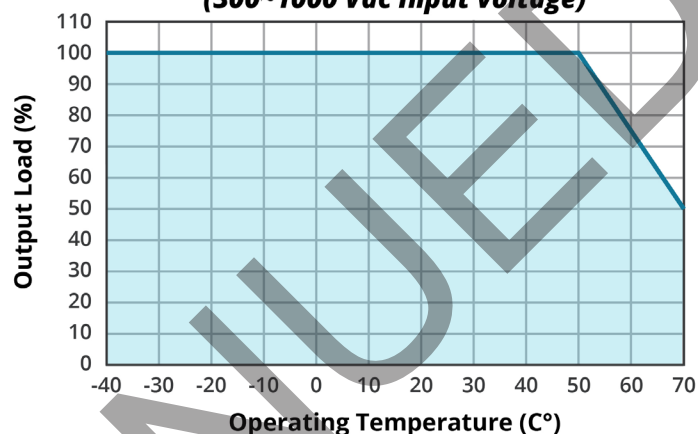
Recommended PCB Layout  
Top View

## DERATING CURVES

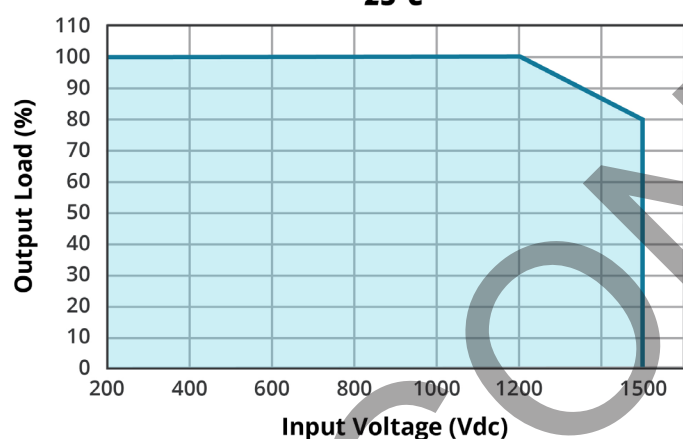
**TEMPERATURE DERATING CURVE**  
(200~300 Vdc Input voltage)



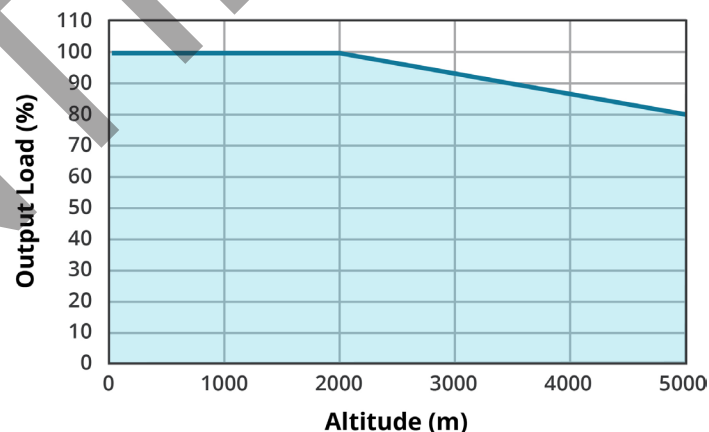
**TEMPERATURE DERATING CURVE**  
(300~1000 Vdc Input voltage)



**INPUT VOLTAGE DERATING CURVE**  
25°C

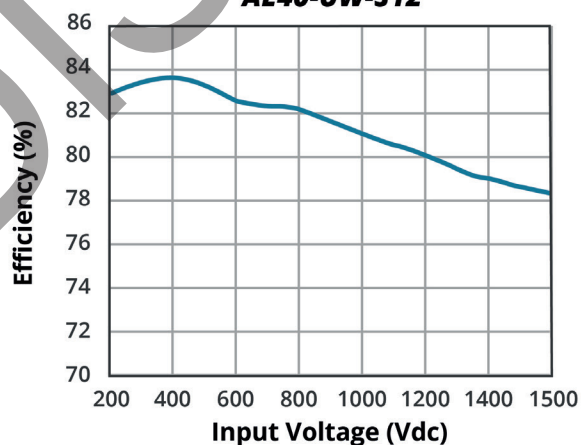


**ALTITUDE DERATING CURVE**

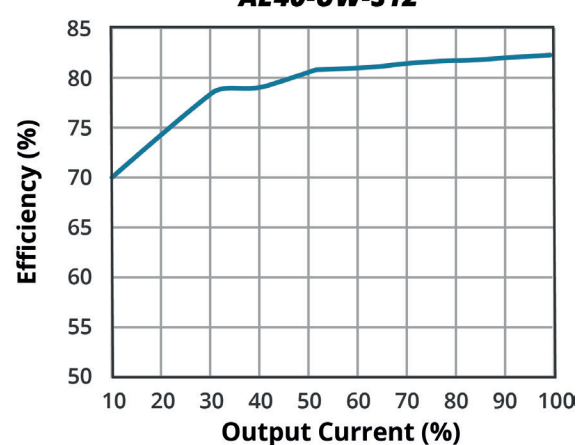


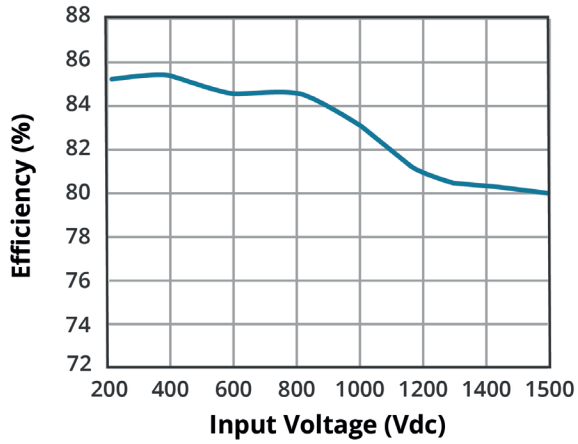
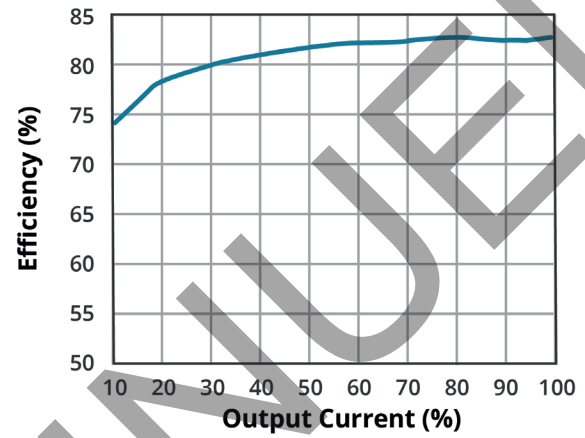
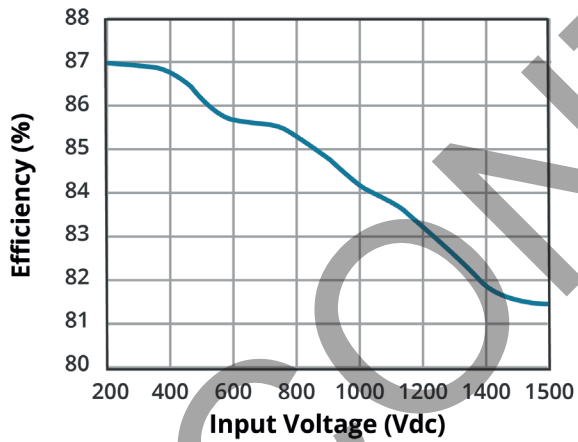
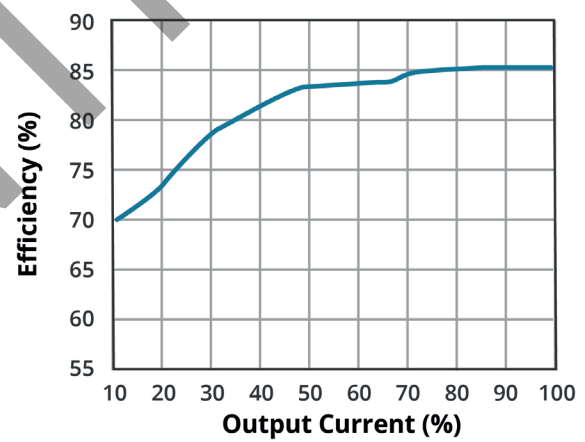
## EFFICIENCY CURVES

**EFFICIENCY VS INPUT VOLTAGE**  
AE40-UW-S12



**EFFICIENCY VS OUTPUT LOAD**  
AE40-UW-S12



**EFFICIENCY CURVES (CONTINUED)****EFFICIENCY VS INPUT VOLTAGE  
AE40-UW-S15****EFFICIENCY VS OUTPUT LOAD  
AE40-UW-S15****EFFICIENCY VS INPUT VOLTAGE  
AE40-UW-S24****EFFICIENCY VS OUTPUT LOAD  
AE40-UW-S24**

## APPLICATION CIRCUIT

Figure 1

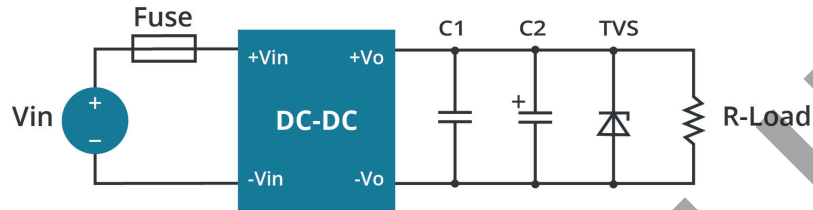


Table 1

| Vout (Vdc) | Fuse           | C1 (μF) | C2 (μF) | TVS     |
|------------|----------------|---------|---------|---------|
| 12         | 4 A / 1500 Vdc | 1       | 120     | SMBJ20A |
| 15         | 4 A / 1500 Vdc | 1       | 120     | SMBJ20A |
| 24         | 4 A / 1500 Vdc | 1       | 68      | SMBJ30A |

## EMC RECOMMENDED CIRCUIT

Figure 2

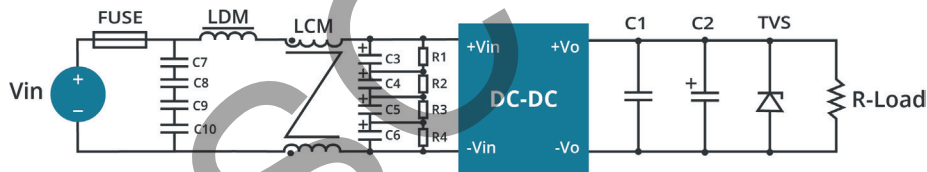


Table 2

| Recommended External Circuit Components |               |
|-----------------------------------------|---------------|
| FUSE                                    | 4 A/1500 Vdc  |
| C7, C8, C9, C10                         | 104K/275 Vac  |
| C3, C4, C5, C6                          | 47 μF/450 Vdc |
| R1, R2, R3, R4                          | 1 MΩ/2 W      |
| LDM                                     | 330 μH/1 A    |
| LCM                                     | 7 mH/1 A      |

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

| rev. | description                                                    | date       |
|------|----------------------------------------------------------------|------------|
| 1.0  | initial release                                                | 09/13/2017 |
| 1.01 | updated datasheet                                              | 03/05/2018 |
| 1.02 | added UL safety approval                                       | 02/26/2019 |
| 1.03 | changed external input fuse recommendation                     | 07/24/2019 |
| 1.04 | company logo updated                                           | 04/12/2021 |
| 1.05 | derating curves, efficiency curves and circuit figures updated | 08/31/2021 |
| 1.06 | discontinued models AE40-UW-S12 & AE40-UW-S12                  | 11/11/2022 |

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



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