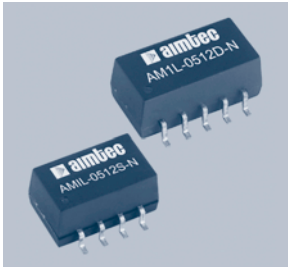


# AM1L-N Series



## 1 watt dc-dc converters

- SMD PACKAGE
- LOW RIPPLE & NOISE
- HIGH EFFICIENCY UP TO 75%
- UL94-VO PACKAGE
- INPUT/OUTPUT ISOLATION: 1000 & 3000VDC
- OPERATING TEMPERATURE: -40°C ... +85°C
- PIN-COMPATIBLE WITH MULTIPLE MANUFACTURERS

## GENERAL DESCRIPTION

Our AM1L-N series is a family of cost effective 1W single and dual output DC-DC converters. These converters combines a miniature SMD package with 1000 & 3000VDC input/output isolation voltage.

Ninety six models operate from input voltages of 3.3, 5, 12 & 24VDC with producing output voltage levels of 3.3, 5, 9, 12, 15, 24,  $\pm 3.3$ ,  $\pm 5$ ,  $\pm 9$ ,  $\pm 12$ ,  $\pm 15$  &  $\pm 24$ VDC. Full SMD-design and a 100% production test of parameters ensures a high reliability in this product.

## ELECTRICAL SPECIFICATIONS

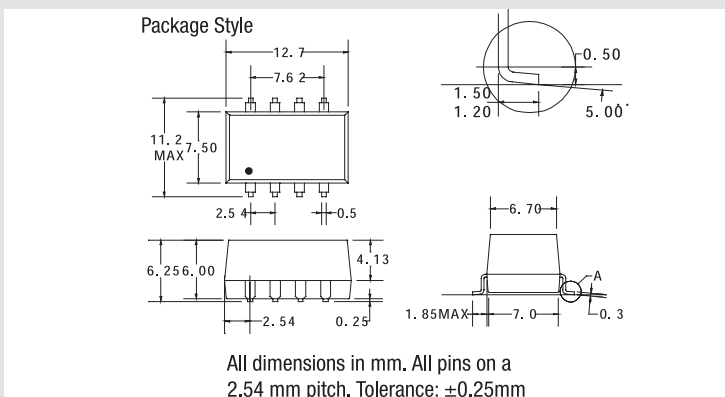
Specifications typical at +25°C, nominal input voltage, rated output current unless otherwise specified

| Input Specifications:            |   | Output Specifications:               |                                      |
|----------------------------------|---|--------------------------------------|--------------------------------------|
| Voltage range                    | $\pm 10\%$                              | Voltage accuracy                     | $\pm 5\%$ , max.                     |
| Filter                           | Capacitor                               | Voltage balance (Dual Output)        | $\pm 2\%$                            |
| <b>Isolation Specifications:</b> |   | Ripple & noise (at 20MHz BW)         | 150mVp-p, max.                       |
| Rated voltage (60 sec)           | 1000 & 3000VDC                          | Short circuit protection             | 1 sec.                               |
| Resistance                       | > 1000M $\Omega$                        | Line voltage regulation              | $\pm 1.2\%/1\%$ of $V_{in}$ , max.   |
| Capacitance                      | 60pF, typ.                              | Load voltage regulation              | 10% max.<br>(load 10...100%)         |
| <b>General Specifications:</b>   |   | Temperature Coefficient              | $\pm 0.03\%/^{\circ}\text{C}$ , max. |
| Efficiency                       | 75% (typ)                               | <b>Environmental Specifications:</b> |                                      |
| Switching Frequency              | 100KHz, typ. 100% load                  | Operating temperature (ambient)      | -40°C ... +85°C                      |
| <b>Physical Specifications</b>   |   | Storage temperature                  | -55°C ... +125°C                     |
| Dimensions                       | single out 12.7x11.2x6.3 mm             | Case temperature                     | +95°C, max.                          |
|                                  | dual out 15.3x11.2x6.3 mm               | Derating                             | None required                        |
|                                  | single & dual 3000VDC 15.2x11.2x6.25 mm | Humidity (non-condensing)            | Up to 90%                            |
| Weight                           | 1.5 g                                   | Cooling                              | Free-air Convection                  |
| Case material                    | Plastic UL94-VO                         |                                      |                                      |

MTBF: > 980,000 hrs single, > 1,000,000 hrs dual (MIL-HDBK-217F, Ground Benign,  $t=+25^{\circ}\text{C}$ )

Specifications are subject to change without notification

## OUTLINE DIMENSIONS FOR SINGLE OUTPUT MODELS



| Pin | Single    |
|-----|-----------|
| 1   | -V Input  |
| 2   | +V Input  |
| 4   | -V Output |
| 5   | +V Output |
| 3   | N.C.      |
| 6   | N.C.      |
| 7   | N.C.      |
| 8   | N.C.      |

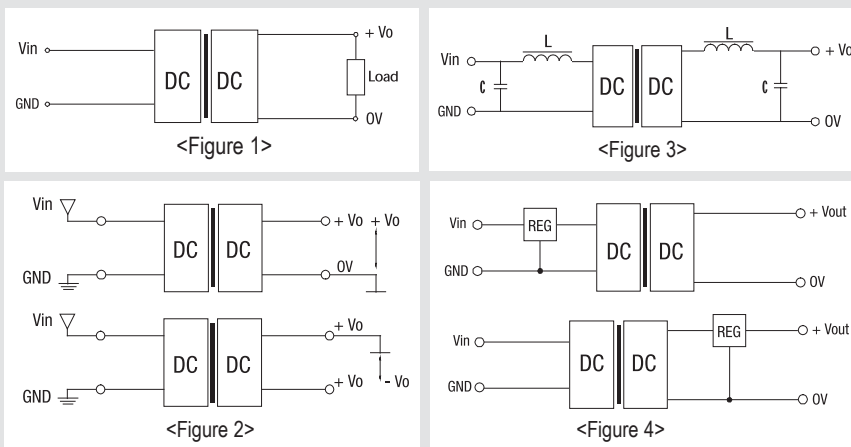
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# AM1L-N Series

## MODELS Single output

| Models            |                   | Input Voltage | Output Voltage | Output Current max. |
|-------------------|-------------------|---------------|----------------|---------------------|
| Isolation 1000VDC | Isolation 3000VDC |               |                |                     |
| AM1L-0303S-N      | AM1L-0303SH30-N   | 3.3V±10%      | 3.3VDC         | 304mA               |
| AM1L-0305S-N      | AM1L-0305SH30-N   |               | 5VDC           | 200mA               |
| AM1L-0309S-N      | AM1L-0309SH30-N   |               | 9VDC           | 111mA               |
| AM1L-0312S-N      | AM1L-0312SH30-N   |               | 12VDC          | 84mA                |
| AM1L-0315S-N      | AM1L-0315SH30-N   |               | 15VDC          | 67mA                |
| AM1L-0324S-N      | AM1L-0324SH30-N   |               | 24VDC          | 40mA                |
| AM1L-0503S-N      | AM1L-0503SH30-N   | 5V±10%        | 3.3VDC         | 304mA               |
| AM1L-0505S-N      | AM1L-0505SH30-N   |               | 5VDC           | 200mA               |
| AM1L-0509S-N      | AM1L-0509SH30-N   |               | 9VDC           | 111mA               |
| AM1L-0512S-N      | AM1L-0512SH30-N   |               | 12VDC          | 84mA                |
| AM1L-0515S-N      | AM1L-0515SH30-N   |               | 15VDC          | 67mA                |
| AM1L-0524S-N      | AM1L-0524SH30-N   |               | 24VDC          | 40mA                |
| AM1L-1203S-N      | AM1L-1203SH30-N   | 12V±10%       | 3.3VDC         | 304mA               |
| AM1L-1205S-N      | AM1L-1205SH30-N   |               | 5VDC           | 200mA               |
| AM1L-1209S-N      | AM1L-1209SH30-N   |               | 9VDC           | 111mA               |
| AM1L-1212S-N      | AM1L-1212SH30-N   |               | 12VDC          | 84mA                |
| AM1L-1215S-N      | AM1L-1215SH30-N   |               | 15VDC          | 67mA                |
| AM1L-1224S-N      | AM1L-1224SH30-N   |               | 24VDC          | 40mA                |
| AM1L-2403S-N      | AM1L-2403SH30-N   | 24V±10%       | 3.3VDC         | 304mA               |
| AM1L-2405S-N      | AM1L-2405SH30-N   |               | 5VDC           | 200mA               |
| AM1L-2409S-N      | AM1L-2409SH30-N   |               | 9VDC           | 111mA               |
| AM1L-2412S-N      | AM1L-2412SH30-N   |               | 12VDC          | 84mA                |
| AM1L-2415S-N      | AM1L-2415SH30-N   |               | 15VDC          | 67mA                |
| AM1L-2424S-N      | AM1L-2424SH30-N   |               | 24VDC          | 40mA                |

## ISOLATED & UNREGULATED



### External Capacitor Table

| Vin   | External Capacitor | Vout  | External Capacitor |
|-------|--------------------|-------|--------------------|
| 5VDC  | 4.7uF              | 5VDC  | 10uF               |
| 12VDC | 2.2uF              | 9VDC  | 4.7uF              |
| -     | -                  | 12VDC | 2.2uF              |
| -     | -                  | 15VDC | 1uF                |

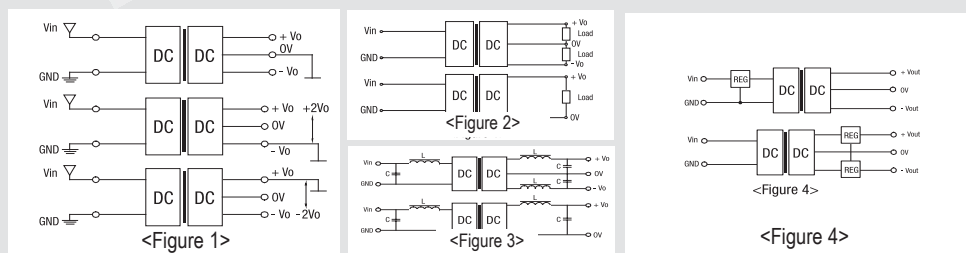
Note: The selected voltage withstand of the capacitor is generally 1.5~2 times of the nominal voltage.

# AM1L-N Series

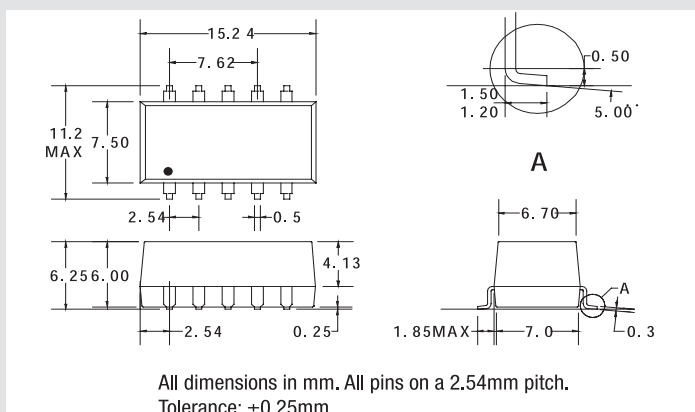
## MODELS Dual output

| Models            |                   | Input Voltage | Output Voltage | Output Current max. |
|-------------------|-------------------|---------------|----------------|---------------------|
| Isolation 1000VDC | Isolation 3000VDC |               |                |                     |
| AM1L-0303D-N      | AM1L-0303DH30-N   | 3.3V±10%      | ±3.3VDC        | ±152mA              |
| AM1L-0305D-N      | AM1L-0305DH30-N   |               | ±5VDC          | ±100mA              |
| AM1L-0309D-N      | AM1L-0309DH30-N   |               | ±9VDC          | ±56mA               |
| AM1L-0312D-N      | AM1L-0312DH30-N   |               | ±12VDC         | ±42mA               |
| AM1L-0315D-N      | AM1L-0315DH30-N   |               | ±15VDC         | ±33mA               |
| AM1L-0324D-N      | AM1L-0324DH30-N   |               | ±24VDC         | ±20mA               |
| AM1L-0503D-N      | AM1L-0503DH30-N   | 5V±10%        | ±3.3VDC        | ±152mA              |
| AM1L-0505D-N      | AM1L-0505DH30-N   |               | ±5VDC          | ±100mA              |
| AM1L-0509D-N      | AM1L-0509DH30-N   |               | ±9VDC          | ±56mA               |
| AM1L-0512D-N      | AM1L-0512DH30-N   |               | ±12VDC         | ±42mA               |
| AM1L-0515D-N      | AM1L-0515DH30-N   |               | ±15VDC         | ±33mA               |
| AM1L-0524D-N      | AM1L-0524DH30-N   |               | ±24VDC         | ±20mA               |
| AM1L-1203D-N      | AM1L-1203DH30-N   | 12V±10%       | ±3.3VDC        | ±152mA              |
| AM1L-1205D-N      | AM1L-1205DH30-N   |               | ±5VDC          | ±100mA              |
| AM1L-1209D-N      | AM1L-1209DH30-N   |               | ±9VDC          | ±56mA               |
| AM1L-1212D-N      | AM1L-1212DH30-N   |               | ±12VDC         | ±42mA               |
| AM1L-1215D-N      | AM1L-1215DH30-N   |               | ±15VDC         | ±33mA               |
| AM1L-1224D-N      | AM1L-1224DH30-N   |               | ±24VDC         | ±20mA               |
| AM1L-2403D-N      | AM1L-2403DH30-N   | 24V±10%       | ±3.3VDC        | ±152mA              |
| AM1L-2405D-N      | AM1L-2405DH30-N   |               | ±5VDC          | ±100mA              |
| AM1L-2409D-N      | AM1L-2409DH30-N   |               | ±9VDC          | ±56mA               |
| AM1L-2412D-N      | AM1L-2412DH30-N   |               | ±12VDC         | ±42mA               |
| AM1L-2415D-N      | AM1L-2415DH30-N   |               | ±15VDC         | ±33mA               |
| AM1L-2424D-N      | AM1L-2424DH30-N   |               | ±24VDC         | ±20mA               |

## ISOLATED & UNREGULATED



## OUTLINE DIMENSIONS FOR DUAL OUTPUT MODELS



| Pin | Dual      |
|-----|-----------|
| 1   | -V Input  |
| 2   | +V Input  |
| 3   | N.C.      |
| 4   | Common    |
| 5   | -V Output |
| 6   | N.C.      |
| 7   | +V Output |
| 8   | N.C.      |
| 9   | N.C.      |
| 10  | N.C.      |

## External Capacitor Table

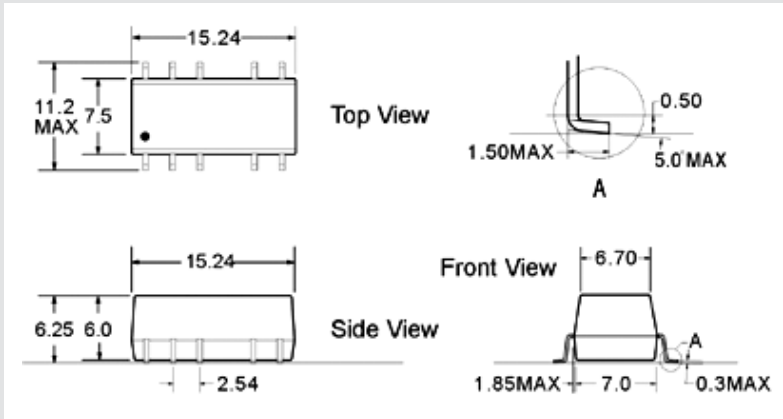
| Vin   | External Capacitor | Vout  | External Capacitor |
|-------|--------------------|-------|--------------------|
| 5VDC  | 4.7uF              | 5VDC  | 4.7uF              |
| 12VDC | 2.2uF              | 9VDC  | 2.2uF              |
| -     | -                  | 12VDC | 1uF                |
| -     | -                  | 15VDC | 0.47uF             |

Note: The selected voltage withstand of the capacitor is generally 1.5-2 times of the nominal voltage.

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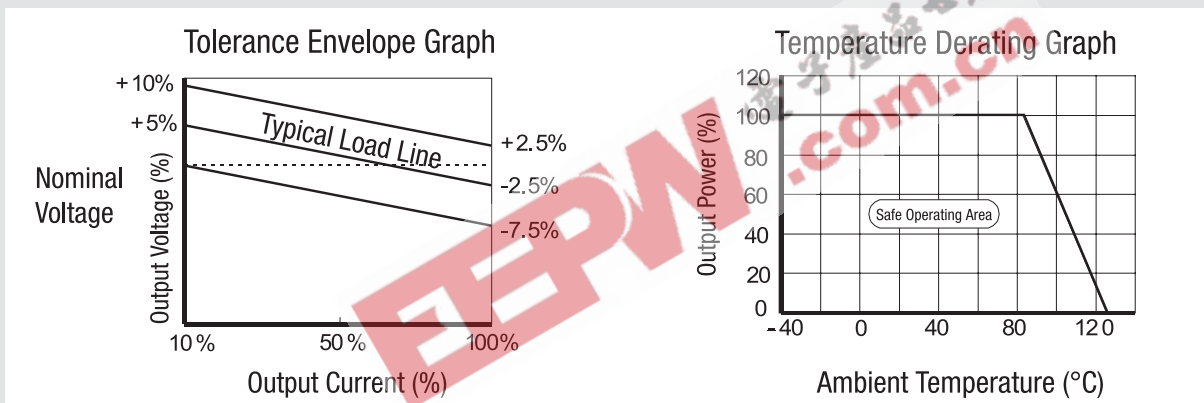
# AM1L-N Series

## OUTLINE DIMENSIONS FOR SINGLE & DUAL OUTPUT MODELS (3000VDC)



| Pin | 3000VDC   |           |
|-----|-----------|-----------|
|     | Single    | Dual      |
| 1   | GND       | GND       |
| 2   | +V Input  | +V Input  |
| 3   | N.C.      | N.C.      |
| 4   | Omitted   | Omitted   |
| 5   | Common    | Common    |
| 6   | N.C.      | -V Output |
| 7   | N.C.      | N.C.      |
| 8   | +V Output | +V Output |
| 9   | Omitted   | Omitted   |
| 10  | N.C.      | N.C.      |
| 11  | N.C.      | N.C.      |
| 12  | N.C.      | N.C.      |

## TYPICAL CHARACTERISTICS



## APPLICATION NOTE

### General Application

In regular circuits, our company's DC/DC converters may be used directly without any peripheral components (see Figure 2). The basic input/output isolation may be used to provide a group of simple isolated polar output power supplies or to generate power supply lines of different voltages.

### Voltage And Polarity Inversion

A key performance of this DC/DC converter is high electric isolation capability. Thus, only one DC/DC converter may allow for several potential differences in the layout of circuit board. If necessary, you may connect the output end of the positive to input ground, then the negative output end will generate a negative voltage (see Figure 3).

### Filtering

In some circuits which are sensitive to noise and ripple, a filtering capacitor may be added to the DC/DC output end and input end to reduce the noise and ripple. However, the capacitance of the output filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output provided the safe and reliable operation is ensured, the greatest capacitance of its filtering capacitor sees the External Capacitor Table. To get an extremely low ripple, a "LC" filter network may be connected to the input and output ends of the DC/DC converter, which may produce a more significant filtering effect. It should also be noted that the inductance and the frequency of the "LC" filter network should be staggered with the DC/DC frequency to avoid mutual interference (see Figure 3).

### Requirement On Output Load

To ensure this module can operate efficiently and reliably, a minimum load is specified for this kind of DC/DC converter in addition to a maximum load (namely full load). During operation, make sure the specified range of input voltage is not exceeded, the minimum output load is not less than 10% of the full load, and that this product should never be operated under no load!!! If the actual output power is very small, please connect a resistor with proper resistance at the output end in parallel to increase the load.

### Overload Protection

Under normal operating conditions, the output circuit of these products has no protection against over-current and short-circuits. The simplest method is to connect a self-recovery fuse in series at the input end or add a circuit breaker to the circuits.

### Output Voltage Regulation and Over-voltage Protection Circuit

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear voltage stabilizer with overheat protection that is connected to the input or output end in series (see Figure 4).

### Product Reliability

The MTBF is the mean time between failures under full load. If the actual load is less than 20% of the rated load or greater than the rated load, then this product's reliability will be greatly reduced.

### Input Polarity Protection

Under normal conditions, this product's input circuit has no protection against polarity inversion; the solution is to connect a diode in series at the input.