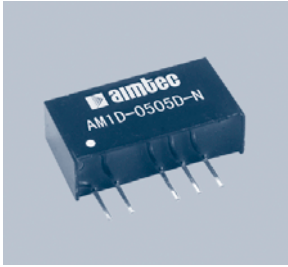


# AM1D-N Series



## 1 watt dc-dc converters

- 7PIN SIP PACKAGE
- LOW RIPPLE & NOISE
- HIGH EFFICIENCY UP TO 81%
- UL94-VO PACKAGE
- INPUT/OUTPUT ISOLATION: 1000, 3000 & 6000VDC
- OPERATING TEMPERATURE: -40°C ... +85°C
- PIN-COMPATIBLE WITH MULTIPLE MANUFACTURERS

## GENERAL DESCRIPTION

Our AM1D-N series is a family of cost effective 1W single, dual output isolated DC-DC converters. These converters achieve low cost and ultra-miniature SIP7 pin size without compromising performance and reliability.

Seventy two models operate from input voltages of 5, 12 & 24VDC; producing output voltage levels of 5, 9, 12, 15,  $\pm 5$ ,  $\pm 9$ ,  $\pm 12$ ,  $\pm 15$ 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:

|               |            |
|---------------|------------|
| Voltage range | $\pm 10\%$ |
| Filter        | Capacitor  |

### Isolation Specifications:

|                        |                        |
|------------------------|------------------------|
| Rated voltage (60 sec) | 1000, 3000 & 6000VDC   |
| Resistance             | $> 1000\text{M}\Omega$ |
| Capacitance            | 60pF, typ.             |

### Output Specifications:

|                               |                                      |
|-------------------------------|--------------------------------------|
| Voltage balance (dual output) | $\pm 1\%$                            |
| Voltage accuracy              | $\pm 5\%$ , max.                     |
| Ripple & noise (at 20MHz BW)  | 75mVp-p, typ.                        |
| Short circuit protection      | 1 sec.                               |
| Line voltage regulation       | $\pm 1.2\%$ / $1.0\%$ of $V_{in}$    |
| Load voltage regulation       | 10% max.<br>load=10~100%             |
| Temperature coefficient       | $\pm 0.03\%/^{\circ}\text{C}$ , max. |

### General Specifications:

|                     |                        |
|---------------------|------------------------|
| Efficiency          | 72% to 81%             |
| Switching frequency | 150KHz, typ. 100% load |

### Environmental Specifications:

|                                 |                     |
|---------------------------------|---------------------|
| Operating temperature (ambient) | -40°C ... +85°C     |
| Storage temperature             | -55°C ... +125°C    |
| Case Temperature                | +95°C, max.         |
| Derating                        | None required       |
| Humidity (non-condensing)       | Up to 90%           |
| Cooling                         | Free-air Convection |

### Physical Specifications:

|                             |                                            |
|-----------------------------|--------------------------------------------|
| Dimensions (1000 & 3000VDC) | 19.50x6.00x10.00mm<br>0.76x0.24x0.39inches |
| Dimensions (6000VDC)        | 19.50x9.8x12.5mm<br>0.76x0.39x0.49inches   |
| Weight                      | 2g                                         |
| Case material               | Plastic UL94-VO                            |

MTBF:  $> 1,100,000$  hrs (MIL-HDBK-217F, Ground Benign,  $t=+25^{\circ}\text{C}$ )

Specifications are subject to change without notification

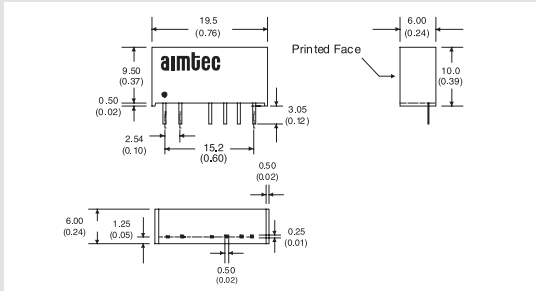
## PIN CONNECTIONS

| Pin | 1000VDC   |           | 3000, 6000VDC |           |
|-----|-----------|-----------|---------------|-----------|
|     | Single    | Dual      | Single        | Dual      |
| 1   | +V Input  | +V Input  | +V Input      | +V Input  |
| 2   | -V Input  | -V Input  | -V Input      | -V Input  |
| 4   | -V Output | -V Output | Omitted       | Omitted   |
| 5   | Omitted   | Common    | -V Output     | -V Output |
| 6   | +V Output | +V Output | Omitted       | Common    |
| 7   | Omitted   | Omitted   | +V Output     | +V Output |

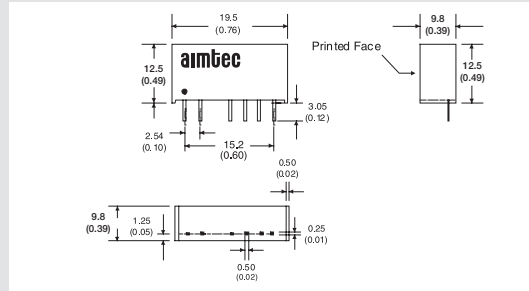
# AM1D-N Series

## OUTLINE DIMENSIONS

### 1000 & 3000VDC



### 6000VDC



## MODELS

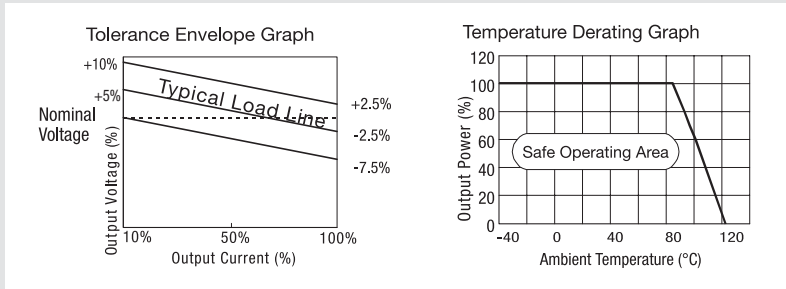
### Single output

| Models            |                   |                   | Input Voltage | Output Voltage | Output Current max. |
|-------------------|-------------------|-------------------|---------------|----------------|---------------------|
| Isolation 1000VDC | Isolation 3000VDC | Isolation 6000VDC |               |                |                     |
| AM1D-0505S-N      | AM1D-0505SH30-N   | AM1D-0505SH60-N   | 5V±10%        | 5VDC           | 200mA               |
| AM1D-0509S-N      | AM1D-0509SH30-N   | AM1D-0509SH60-N   |               | 9VDC           | 110mA               |
| AM1D-0512S-N      | AM1D-0512SH30-N   | AM1D-0512SH60-N   |               | 12VDC          | 83mA                |
| AM1D-0515S-N      | AM1D-0515SH30-N   | AM1D-0515SH60-N   |               | 15VDC          | 70mA                |
| AM1D-1205S-N      | AM1D-1205SH30-N   | AM1D-1205SH60-N   | 12V±10%       | 5VDC           | 200mA               |
| AM1D-1209S-N      | AM1D-1209SH30-N   | AM1D-1209SH60-N   |               | 9VDC           | 110mA               |
| AM1D-1212S-N      | AM1D-1212SH30-N   | AM1D-1212SH60-N   |               | 12VDC          | 83mA                |
| AM1D-1215S-N      | AM1D-1215SH30-N   | AM1D-1215SH60-N   |               | 15VDC          | 70mA                |
| AM1D-2405S-N      | AM1D-2405SH30-N   | AM1D-2405SH60-N   | 24V±10%       | 5VDC           | 200mA               |
| AM1D-2409S-N      | AM1D-2409SH30-N   | AM1D-2409SH60-N   |               | 9VDC           | 110mA               |
| AM1D-2412S-N      | AM1D-2412SH30-N   | AM1D-2412SH60-N   |               | 12VDC          | 83mA                |
| AM1D-2415S-N      | AM1D-2415SH30-N   | AM1D-2415SH60-N   |               | 15VDC          | 70mA                |

### Dual output

| Models            |                   |                   | Input Voltage | Output Voltage | Output Current max. |
|-------------------|-------------------|-------------------|---------------|----------------|---------------------|
| Isolation 1000VDC | Isolation 3000VDC | Isolation 6000VDC |               |                |                     |
| AM1D-0505D-N      | AM1D-0505DH30-N   | AM1D-0505DH60-N   | 5V±10%        | ±5VDC          | ±100mA              |
| AM1D-0509D-N      | AM1D-0509DH30-N   | AM1D-0509DH60-N   |               | ±9VDC          | ±55mA               |
| AM1D-0512D-N      | AM1D-0512DH30-N   | AM1D-0512DH60-N   |               | ±12VDC         | ±42mA               |
| AM1D-0515D-N      | AM1D-0515DH30-N   | AM1D-0515DH60-N   |               | ±15VDC         | ±35mA               |
| AM1D-1205D-N      | AM1D-1205DH30-N   | AM1D-1205DH60-N   | 12V±10%       | ±5VDC          | ±100mA              |
| AM1D-1209D-N      | AM1D-1209DH30-N   | AM1D-1209DH60-N   |               | ±9VDC          | ±55mA               |
| AM1D-1212D-N      | AM1D-1212DH30-N   | AM1D-1212DH60-N   |               | ±12VDC         | ±42mA               |
| AM1D-1215D-N      | AM1D-1215DH30-N   | AM1D-1215DH60-N   |               | ±15VDC         | ±35mA               |
| AM1D-2405D-N      | AM1D-2405DH30-N   | AM1D-2405DH60-N   | 24V±10%       | ±5VDC          | ±100mA              |
| AM1D-2409D-N      | AM1D-2409DH30-N   | AM1D-2409DH60-N   |               | ±9VDC          | ±55mA               |
| AM1D-2412D-N      | AM1D-2412DH30-N   | AM1D-2412DH60-N   |               | ±12VDC         | ±42mA               |
| AM1D-2415D-N      | AM1D-2415DH30-N   | AM1D-2415DH60-N   |               | ±15VDC         | ±35mA               |

## TYPICAL CHARACTERISTICS



## APPLICATION NOTE

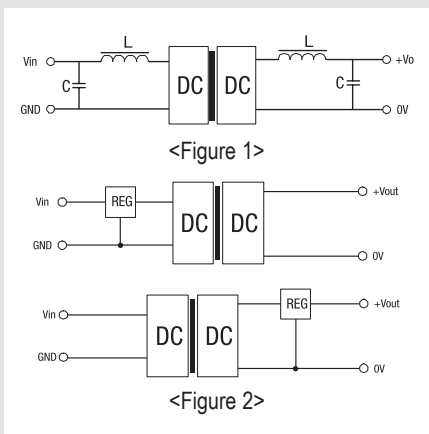
### Filtering

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 filter capacitor sees the external capacitor table. To get an extremely low ripple, an "LC" filtering 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" filtering network should be staggered with the dc/dc frequency to avoid mutual interference (see figure 1).

### 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.

### For single output



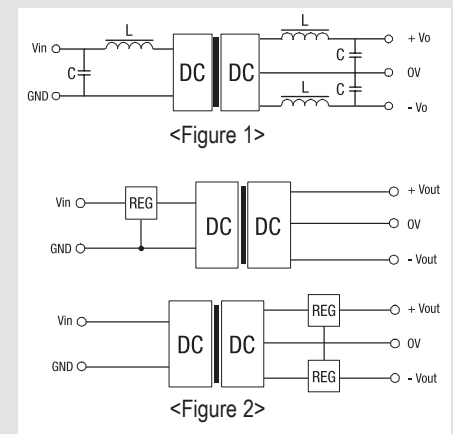
### Overload Protection

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 circuit.

### 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 regulator with overheat protection that is connected to the input or output end in series (see Figure 2).

### For dual output



### External Capacitor Table for Single Output

| Vin   | External Capacitor | Vout  | External Capacitor |
|-------|--------------------|-------|--------------------|
| 5VDC  | 4.7uF              | 5VDC  | 10uF               |
| 12VDC | 2.2uF              | 9VDC  | 4.7uF              |
| 24VDC | 1uF                | 12VDC | 2.2uF              |
| -     | -                  | 15VDC | 1uF                |

### External Capacitor Table for Dual Output

| Vin   | External Capacitor | Vout  | External Capacitor |
|-------|--------------------|-------|--------------------|
| 5VDC  | 4.7uF              | 5VDC  | 4.7uF              |
| 12VDC | 2.2uF              | 9VDC  | 2.2uF              |
| 24VDC | 1uF                | 12VDC | 1uF                |
| -     | -                  | 15VDC | 0.47uF             |