

## 0.25 watt dc-dc converters

- SMD PACKAGE
- UL94-VO PACKAGE
- LOW RIPPLE & NOISE
- EFFICIENCY UP TO 68%
- INPUT/OUTPUT ISOLATIONS OF 1000 & 3000VDC
- OPERATING TEMPERATURE: -40°C ... +85°C
- UNREGULATED
- PIN-COMPATIBLE WITH MULTIPLE MANUFACTURERS

### GENERAL DESCRIPTION

Our AM1/4L-N series is a family of cost effective 1/4W single and dual output DC/DC converters. These converters combine a miniature SMD package and high performance features such as a 1000 & 3000VDC input/output isolation voltages, continuous short circuit protection and a tight line / load regulation.

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

### ELECTRICAL SPECIFICATIONS

All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

#### Input Specifications:

Voltage range	$\pm 10\%$
Filter	Capacitor

#### Isolation Specifications:

Rated voltage (60 sec)	1000 & 3000VDC
Resistance	> 1000M $\Omega$
Capacitance	60pF, typ.

#### 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 95%
Cooling	Free-air Convection

#### General Specifications:

Efficiency	68%, typ.
Switching frequency (Single)	100KHz, typ., 100% load
Switching frequency (Dual)	150KHz, typ., 100% load

#### Output Specifications:

Voltage accuracy	$\pm 5\%$ , max.
Voltage balance (Dual Output)	$\pm 2\%$
Ripple & Noise (at 20MHz BW)	75m Vp-p, typ.
Short circuit protection	1 sec.
Line voltage regulation	$\pm 1.2\%$ max. for 1% of $V_{in}$
Load voltage regulation	10% typ., (10...100% load)
Temperature coefficient	$\pm 0.03\%/^{\circ}\text{C}$ , max.

#### Physical Specifications:

Dimensions (Single)	12.70x11.20x6.30mm
Dimensions (Dual)	15.30x11.20x6.30mm
Dimensions (S&D@3000VDC)	15.20x11.20x6.00mm
Weight	1.5g
Case material	UL94-VO Plastic

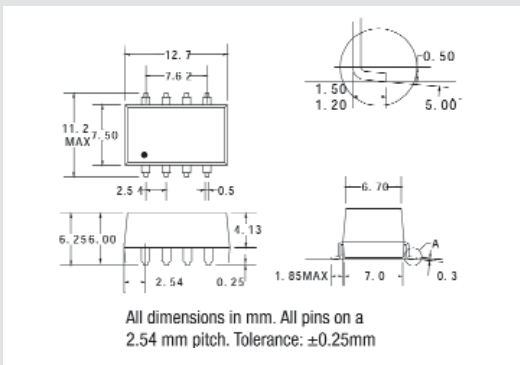
MTBF: > 3,500,000 hrs (MIL-HDBK-217F, Ground Benign,  $t=+25^{\circ}\text{C}$ )

*Specifications are subject to change without notification.*

## MODELS Single Output

@ 1000VDC	@ 3000VDC	Input Voltage	Output Voltage	Max. Output Current
AM1/4L-0303S-N	AM1/4L-0303SH30-N	3.3V±10%	3.3VDC	75mA
AM1/4L-0305S-N	AM1/4L-0305SH30-N		5VDC	50mA
AM1/4L-0309S-N	AM1/4L-0309SH30-N		9VDC	27mA
AM1/4L-0312S-N	AM1/4L-0312SH30-N		12VDC	20mA
AM1/4L-0315S-N	AM1/4L-0315SH30-N		15VDC	16mA
AM1/4L-0324S-N	AM1/4L-0324SH30-N		24VDC	10mA
AM1/4L-0503S-N	AM1/4L-0503SH30-N	5V±10%	3.3VDC	75mA
AM1/4L-0505S-N	AM1/4L-0505SH30-N		5VDC	50mA
AM1/4L-0509S-N	AM1/4L-0509SH30-N		9VDC	27mA
AM1/4L-0512S-N	AM1/4L-0512SH30-N		12VDC	20mA
AM1/4L-0515S-N	AM1/4L-0515SH30-N		15VDC	16mA
AM1/4L-0524S-N	AM1/4L-0524SH30-N		24VDC	10mA
AM1/4L-1203S-N	AM1/4L-1203SH30-N	12V±10%	3.3VDC	75mA
AM1/4L-1205S-N	AM1/4L-1205SH30-N		5VDC	50mA
AM1/4L-1209S-N	AM1/4L-1209SH30-N		9VDC	27mA
AM1/4L-1212S-N	AM1/4L-1212SH30-N		12VDC	20mA
AM1/4L-1215S-N	AM1/4L-1215SH30-N		15VDC	16mA
AM1/4L-1224S-N	AM1/4L-1224SH30-N		24VDC	10mA
AM1/4L-2403S-N	AM1/4L-2403SH30-N	24V±10%	3.3VDC	75mA
AM1/4L-2405S-N	AM1/4L-2405SH30-N		5VDC	50mA
AM1/4L-2409S-N	AM1/4L-2409SH30-N		9VDC	27mA
AM1/4L-2412S-N	AM1/4L-2412SH30-N		12VDC	20mA
AM1/4L-2415S-N	AM1/4L-2415SH30-N		15VDC	16mA
AM1/4L-2424S-N	AM1/4L-2424SH30-N		24VDC	10mA

## OUTLINE DIMENSIONS & PIN CONNECTIONS - SINGLE @ 1000VDC



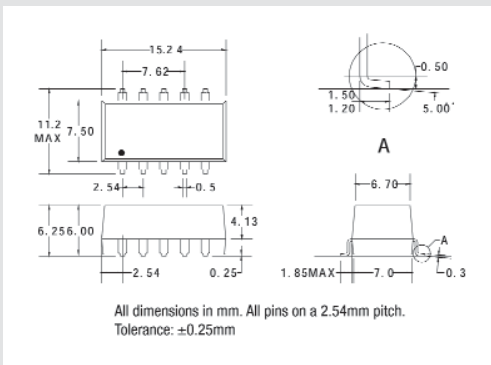
Pin	Single Output
1	-V Input
2	+V Input
3	N.C.
4	-V Output
5	+V Output
6	N.C.
7	N.C.
8	N.C.

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## MODELS Dual Output

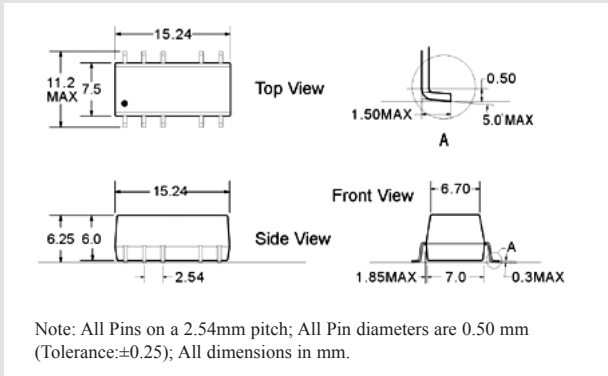
@ 1000VDC	@ 3000VDC	Input Voltage	Output Voltage	Max. Output Current
AM1/4L-0303D-N	AM1/4L-0303DH30-N	3.3V±10%	±3.3VDC	±38mA
AM1/4L-0305D-N	AM1/4L-0305DH30-N		±5VDC	±25mA
AM1/4L-0309D-N	AM1/4L-0309DH30-N		±9VDC	±14mA
AM1/4L-0312D-N	AM1/4L-0312DH30-N		±12VDC	±11mA
AM1/4L-0315D-N	AM1/4L-0315DH30-N		±15VDC	±9mA
AM1/4L-0324D-N	AM1/4L-0324DH30-N		±24VDC	±5mA
AM1/4L-0503D-N	AM1/4L-0503DH30-N	5V±10%	±3.3VDC	±38mA
AM1/4L-0505D-N	AM1/4L-0505DH30-N		±5VDC	±25mA
AM1/4L-0509D-N	AM1/4L-0509DH30-N		±9VDC	±14mA
AM1/4L-0512D-N	AM1/4L-0512DH30-N		±12VDC	±11mA
AM1/4L-0515D-N	AM1/4L-0515DH30-N		±15VDC	±9mA
AM1/4L-0524D-N	AM1/4L-0524DH30-N		±24VDC	±5mA
AM1/4L-1203D-N	AM1/4L-1203DH30-N	12V±10%	±3.3VDC	±38mA
AM1/4L-1205D-N	AM1/4L-1205DH30-N		±5VDC	±25mA
AM1/4L-1209D-N	AM1/4L-1209DH30-N		±9VDC	±14mA
AM1/4L-1212D-N	AM1/4L-1212DH30-N		±12VDC	±11mA
AM1/4L-1215D-N	AM1/4L-1215DH30-N		±15VDC	±9mA
AM1/4L-1224D-N	AM1/4L-1224DH30-N		±24VDC	±5mA
AM1/4L-2403D-N	AM1/4L-2403DH30-N	24V±10%	±3.3VDC	±38mA
AM1/4L-2405D-N	AM1/4L-2405DH30-N		±5VDC	±25mA
AM1/4L-2409D-N	AM1/4L-2409DH30-N		±9VDC	±14mA
AM1/4L-2412D-N	AM1/4L-2412DH30-N		±12VDC	±11mA
AM1/4L-2415D-N	AM1/4L-2415DH30-N		±15VDC	±9mA
AM1/4L-2424D-N	AM1/4L-2424DH30-N		±24VDC	±5mA

## OUTLINE DIMENSIONS & PIN CONNECTIONS - DUAL @ 1000VDC



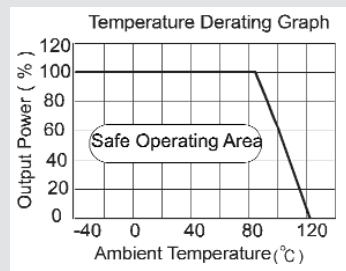
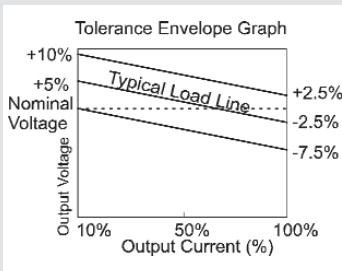
Pin	Dual Output
1	-V Input
2	+V Input
3	N.C.
4	Common
5	-V Output
6	N.C.
7	+V Output
8	N.C.
9	N.C.
10	N.C.

## OUTLINE DIMENSIONS & PIN CONNECTIONS FOR SINGLE & DUAL @ 3000VDC



Pin	Single	Dual
1	-V Input	-V Input
2	+V Input	+V Input
3	N.C.	N.C.
5	-V Output	Common
6	N.C.	-V Output
7	N.C.	N.C.
8	+V Output	+V Output
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 1).

### 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).

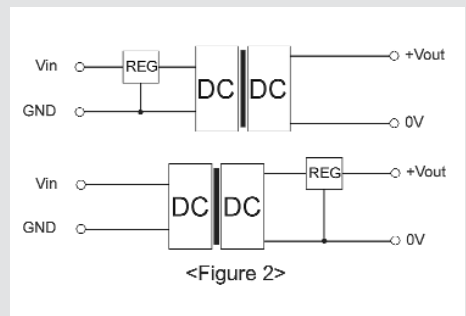
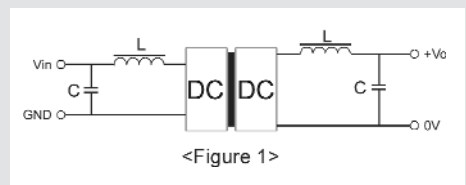
### Product Reliability

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.

## SINGLE OUTPUT MODELS



## DUAL OUTPUT MODELS

