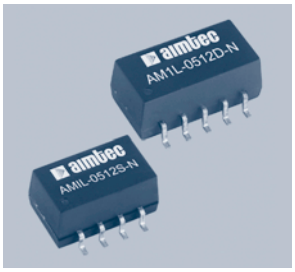
AM1L-N Series



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, ±3.3, ±5, ±9, ±12, ±15 & ±24VDC. 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	±10 %
Filter	Capacitor

Isolation Specifications:	
Rated voltage (60 sec)	1000 & 3000VDC
Resistance	> 1000MOhm
Capacitance	60pF, typ.

General Specifications:	
Efficiency	75% (typ)
Switching Frequency	100KHz, typ. 100% load

Physical Specifications		
Dimensions	single out	12.7x11.2x6.3 mm
	dual out	15.3x11.2x6.3 mm
	single & dual 3000VDC	15.2x11.2x6.25 mm
Weight		1.5 g
Case material		Plastic UL94-VO

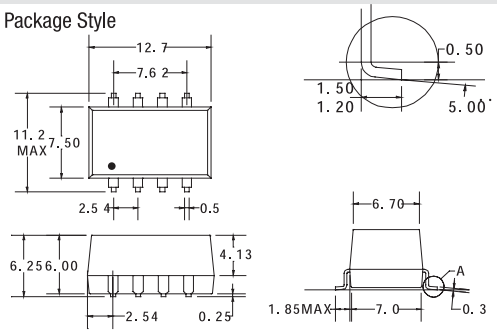
Output Specifications:	
Voltage accuracy	±5%, max.
Voltage balance (Dual Output)	±2%
Ripple & noise (at 20MHz BW)	150mVp-p, max.
Short circuit protection	1 sec.
Line voltage regulation	±1.2%/1% of Vin, max.
Load voltage regulation	10% max. (load 10...100%)
Temperature Coefficient	±0.03%/°C, max.

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

MTBF: > 980,000 hrs single, > 1,000,000 hrs dual (MIL-HDBK-217F, Ground Benign, t=+25°C)

Specifications are subject to change without notification

OUTLINE DIMENSIONS FOR SINGLE OUTPUT MODELS



All dimensions in mm. All pins on a 2.54 mm pitch. Tolerance: ±0.25mm

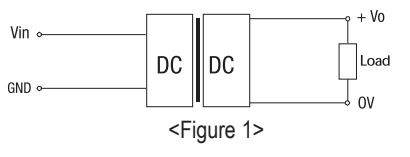
Pin	Single
1	-V Input
2	+V Input
4	-V Output
5	+V Output
3	N.C.
6	N.C.
7	N.C.
8	N.C.

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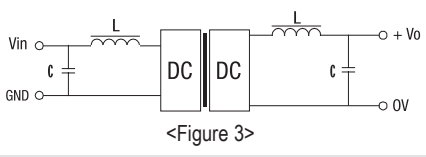
MODELS Single output

Models		Input Voltage	Ouput Voltage	Ouput 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

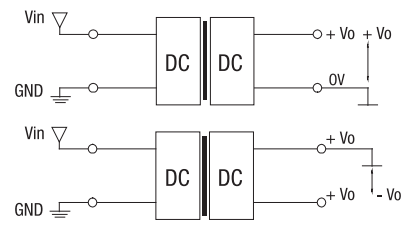
ISOLATED & UNREGULATED



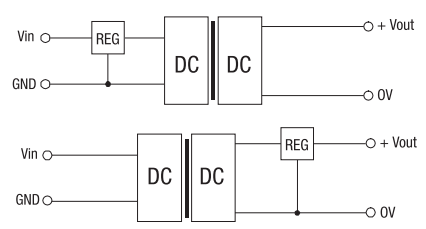
<Figure 1>



<Figure 3>



<Figure 2>



<Figure 4>

External Capacitor Table

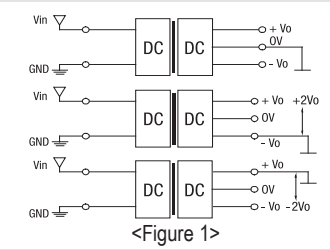
Vin	External Capacitor	Vout	External Capacitor
5VDC	4.7uF	5VDC	10uF
12VDC	2.2uF	9VDC	4.7uF
-	-	12VDC	2.2uF
-	-	15VDC	1uF

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

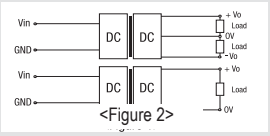
MODELS Dual output

Models		Input Voltage	Ouput Voltage	Ouput 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

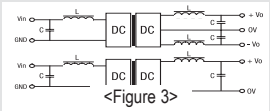
ISOLATED & UNREGULATED



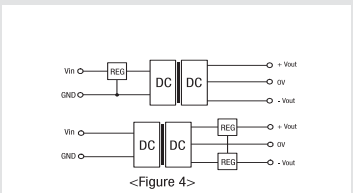
<Figure 1>



<Figure 2>

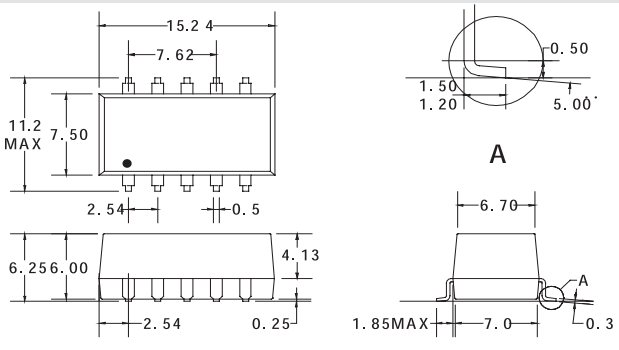


<Figure 3>



<Figure 4>

OUTLINE DIMENSIONS FOR DUAL OUTPUT MODELS



All dimensions in mm. All pins on a 2.54mm pitch.
Tolerance: ±0.25mm

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.

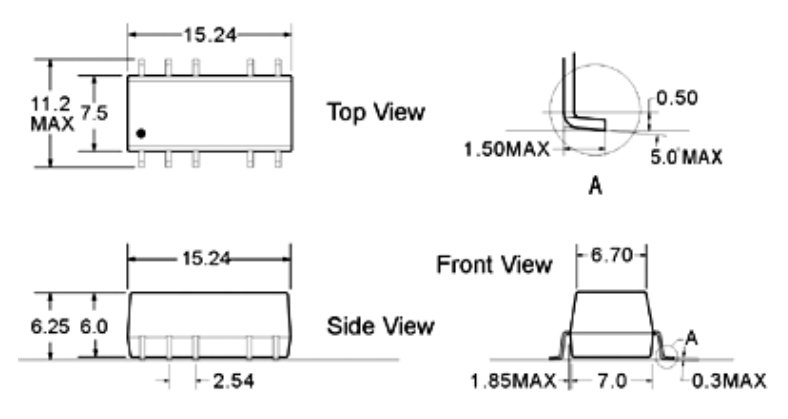
External Capacitor Table

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.

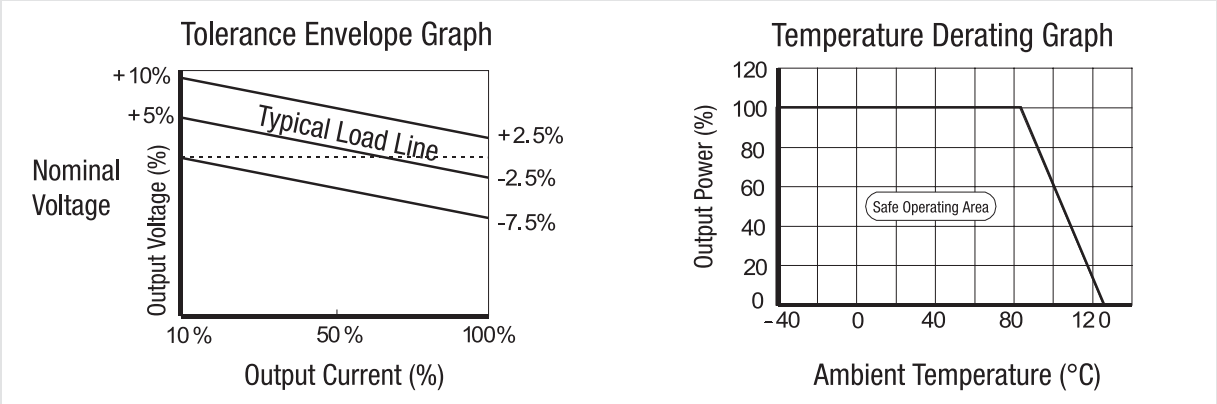
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OUTLINE DIMENSIONS FOR SINGLE & DUAL OUTPUT MODELS (3000VDC)



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 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 productís reliability will be greatly reduced.

Input Polarity Protection
Under normal conditions, this productís input circuit has no protection against polarity inversion; the solution is to connect a diode in series at the input.