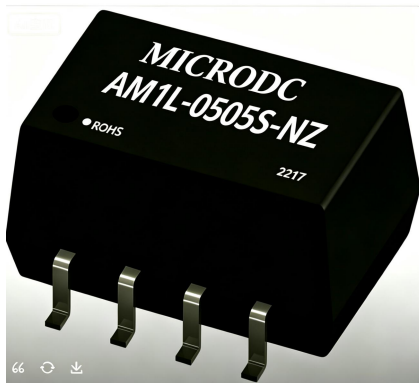




FEATURES

- ◆Footprint over pins 1.37cm²
- ◆Short Circuit Protection(automatic recovery)
- ◆I/O isolation voltage 1000VDC
- ◆Operating Temperature: -40℃ ~ +85℃
- ◆High efficiency up to 78%
- ◆Toroidal magnetics
- ◆Small SMD package with footprint
- ◆Power density 1.8W/cm³
- ◆Lead frame technology
- ◆Multi-layer ceramic capacitors

MODEL SELECTION

AM^①1L^②-05^③05^④S-NZ^⑤

- ①Product Series
- ②Input Voltage
- ③Output Voltage
- ④Fixed Input
- ⑤SMD Package
- ⑥Rated Power

APPLICATIONS

The AM1L-S-NZ series are miniature, 1W DC/DC converters with high isolation in a SMD package. With a new package design these converters are qualified for the higher temperatures requested by lead-free reflow solder processes. With the small footprint, these converters are the ideal solution for board level power distribution, mainly for applications in the industrial and telecom field. For automated SMD production lines the devices can be supplied in standard tape and reel package.



MICRODC RESERVES THE COPYRIGHT

Order code	Input		Output		Efficiency (% Typ.)	Isolation Capacitance pF
	Voltage(V DC)	Current (mA)	Voltage (VDC)	Current (mA)		
	Nominal	Rated Load				
AM1L-0303S-NZ	3.3	410	3.3	303	81	29
AM1L-0305S-NZ	3.3	390	5	200	83	30
AM1L-0309S-NZ	3.3	400	9	111	74	34
AM1L-0312S-NZ	3.3	400	12	83	76	40
AM1L-0315S-NZ	3.3	400	15	66	81	42
AM1L-0503S-NZ	5	270	3.3	303	85	31
AM1L-0505S-NZ	5	294	5	200	83	33
AM1L-0509S-NZ	5	267	9	111	85	38
AM1L-0512S-NZ	5	260	12	83	74	44
AM1L-0515S-NZ	5	256	15	66	78	43
AM1L-0524S-NZ	5	256	24	42	76	48
AM1L-1205S-NZ	12	124	5	200	80	50
AM1L-1209S-NZ	12	114	9	111	80	72
AM1L-1212S-NZ	12	113	12	83	85	89
AM1L-1215S-NZ	12	111	15	66	81	100
AM1L-2405S-NZ	24	62	5	200	80	50
AM1L-2412S-NZ	24	55	12	83	78	79
AM1L-2415S-NZ	24	55	15	66	76	79

1. Calculated using MIL-HDBK-217FN2 with nominal input voltage at full load.

All specifications typical at TA=25℃, nominal input voltage and rated output current unless otherwise specified.

Input Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation, 3.3V input	2.97	3.3	3.63	VDC
	Continuous operation, 5V input	4.5	5	5.5	VDC
	Continuous operation, 12V input	10.8	12	13.2	VDC
Start up time			30	47	mA p-p

Isolation Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation voltage	Flash tested for 1 second	1000			VDC
Resistance	Viso= 1000VDC	10			GΩ

Absolute Maximum Ratings

Parameter	Conditions
Lead temperature 1.5mm from case for 10 seconds	300℃
Internal power dissipation	600mW
Input voltage V _i , B03 types	5.5V
Input voltage V _{in} , B05 types	7V
Input voltage V _{in} , B12 types	15V

General Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	All output types		110		kHz

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power	TA=-40°C to 85°C	0.1		1.0	W
Voltage Set Point	See tolerance envelope				
Line regulation	High VIN to low VIN		1.0	1.2	%%
Load regulation ¹	10% load to rated load, 0303& 0503		10	14	%
	10% load to rated load, 0505& 1205		12.8	15	%
	10% load to rated load, 0506		9.2	10	%
	10% load to rated load, 0509 & 1209		8.3	9.0	%
	10% load to rated load, 0512& 1212		6.8	7.5	%
	10% load to rated load, 0515& 1215		6.3	7.0	%
Ripple & Noise	BW=DC to 20MHz, 3.3V output types, 0305 & 0505		40	60	mV p-p
	BW=DC to 20MHz, 3.3V output types, 0505 & 1205		62	85	mV p-p
	BW=DC to 20MHz, 0506		103	170	mV p-p
	BW=DC to 20MHz, 0509& 1209		49	75	mV p-p
	BW=DC to 20MHz, 0512& 1212		39	65	mV p-p
	BW=DC to 20MHz, 0515& 1215		38	76	mV p-p

Note:1、12V input types have typically 3% less load regulation change.

Temperature Characteristics

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types	-40		85	°C
Storage		-55		125	°C
Case temperature rise above ambient	0305, 0309, 0315		25		°C
	0303, 0312, 0503, 0505, 0509, 0512C, 0515		30		°C
	0505, 1205		43		°C
	1209, 1212, 1215		40		°C
Cooling	Free air convection				

Technical notes

ISOLATION VOLTAGE

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Professional Power Module AM1L-S-NZ series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 second.

A question commonly asked is, "What is the continuous voltage that can be applied across the part in normal operation?"

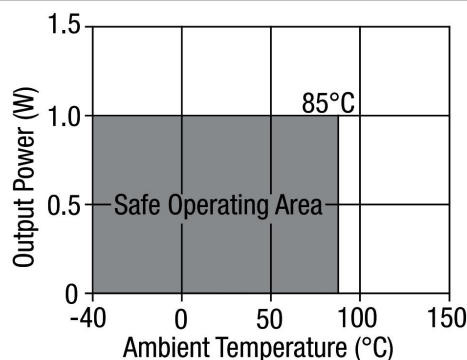
For a part holding no specific agency approvals, such as the AM1L-S-NZ series, both input and output should normally be maintained within SELV limits i.e. less than 42.4V peak, or 60VDC. The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with several hundred volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

REPEATED HIGH-VOLTAGE ISOLATION TESTING

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. The AM1L-S-NZ series has toroidal isolation transformers, with no additional insulation between primary and secondary windings of enameled wire. While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation. Any material, including this enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

This consideration equally applies to agency recognized parts rated for better than functional isolation where the wire enamel insulation is always supplemented by a further insulation system of physical spacing or barriers.

Temperature derating graph



Application Notes

Minimum load

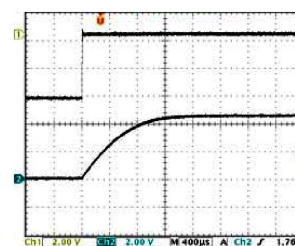
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

Capacitive loading and start up

Typical start up times for this series, with a typical input voltage rise time of 2.2 μ s and output capacitance of 10 μ F, are shown in the table below. The product series will start into a capacitance of 47 μ F with an increased start time, however, the maximum recommended output capacitance is 10 μ F.

Start-up time		Start-up time	
μ s		μ s	
AM1L-030 3S-NZ	437	AM1L-0509S-NZ	3146
AM1L-030 5S-NZ	1359	AM1L-0512S-NZ	4960
AM1L-030 9S-NZ	3435	AM1L-0515S-NZ	7740
AM1L-031 2S-NZ	6590	AM1L-1205S-NZ	895
AM1L-031 5S-NZ	7625	AM1L-1209S-NZ	2150
AM1L-050 3S-NZ	533	AM1L-1212S-NZ	3640
AM1L-050 5S-NZ	1368		

Typical Start-Up Wave Form

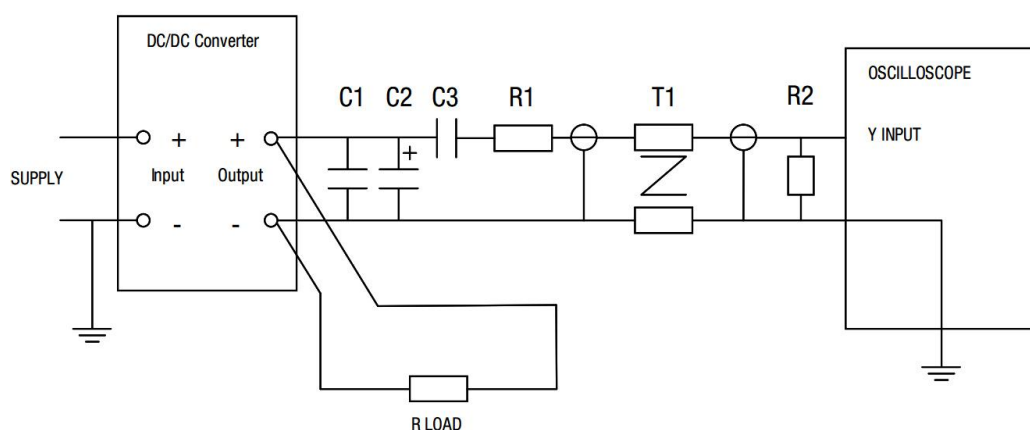


Ripple & Noise Characterization Method

Ripple and noise measurements are performed with the following test configuration.

C1	1 μ F X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC/DC converter
C2	10 μ F tantalum capacitor, voltage rating to be a minimum of 1.5 times the output voltage of the DC/DC converter with an ESR of less than 100m Ω at 100 kHz
C3	100nF multilayer ceramic capacitor, general purpose
R1	450 Ω resistor, carbon film, $\pm$ 1% tolerance
R2	50 Ω BNC termination
T1	3T of the coax cable through a ferrite toroid
RLOAD	Resistive load to the maximum power rating of the DC/DC converter. Connections should be made via twisted wires
Measured values are multiplied by 10 to obtain the specified values.	

Differential Mode Noise Test Schematic



Application Notes

Output Ripple Reduction

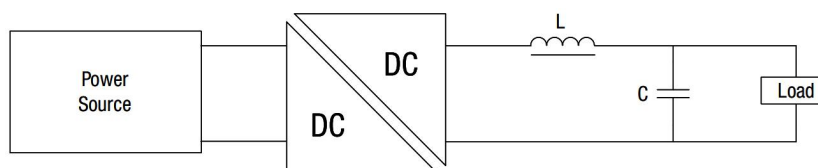
By using the values of inductance and capacitance stated, the output ripple at the rated load is lowered to 5mV p-p max.

Component selection

Capacitor: It is required that the ESR (Equivalent Series Resistance) should be as low as possible, ceramic types are recommended.

The voltage rating should be at least twice (except for 15V output), the rated output voltage of the DC/DC converter.

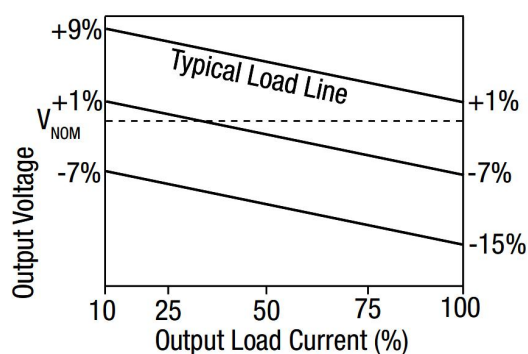
Inductor: The rated current of the inductor should not be less than that of the output of the DC/DC converter. At the rated current, the DC resistance of the inductor should be such that the voltage drop across the inductor is <2% of the rated voltage of the DC/DC converter. The SRF (Self Resonant Frequency) should be >20MHz.



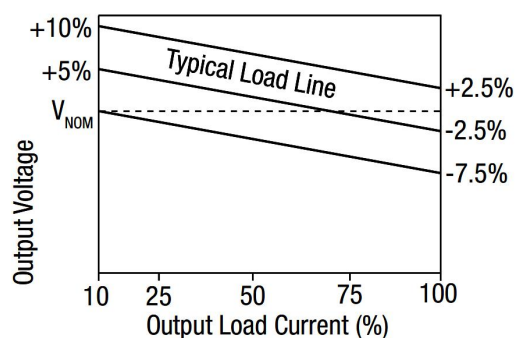
	Inductor			Capacitor
	L, μ H	SMD	Through Hole	C, μ F
AM1L-0303S-NZ	10	82103C	11R103C	4.7
AM1L-0305S-NZ	47	82473C	11R103C	4.7
AM1L-0309S-NZ	22	82223C	11R223C	2.2
AM1L-0312S-NZ	10	82103C	11R103C	1
AM1L-0315S-NZ	47	82473C	11R473C	1
AM1L-0503S-NZ	10	82103C	11R103C	4.7
AM1L-0505S-NZ	47	82473C	11R473C	4.7
AM1L-0509S-NZ	22	82223C	11R223C	2.2
AM1L-0512S-NZ	47	82473C	11R473C	1
AM1L-0515S-NZ	47	82473C	11R473C	1
AM1L-1205S-NZ	47	82473C	11R473C	4.7
AM1L-1209S-NZ	22	82223C	11R223C	2.2
AM1L-1212S-NZ	47	82473C	11R473C	1
AM1L-1215S-NZ	47	82473C	11R473C	1

Tolerance Envelopes

Tolerance Envelope - 3.3V output types.



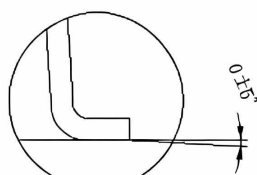
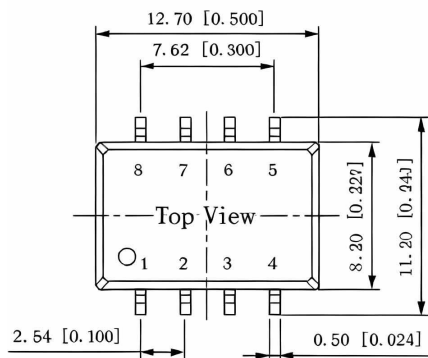
All other types.



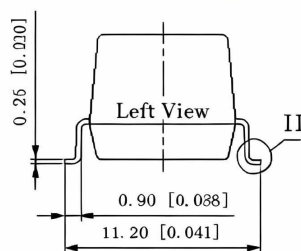
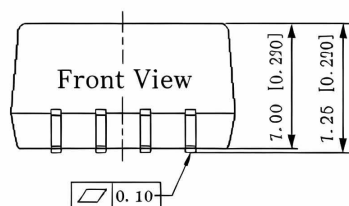
The voltage tolerance envelope shows typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading.

OUTLINE DIMENSIONS & FOOTPRINT DETAILS

MECHANICAL DIMENSIONS



II
10:1



Note:

Note:

Units: mm[inch]

Terminal section tolerance: $\pm 0.10 [\pm 0.004]$

Terminal section tolerance: $\pm 0.10 [\pm 0.004]$

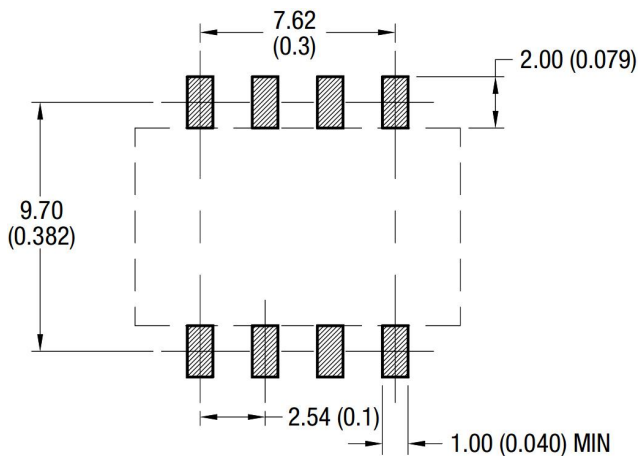
Unspecified tolerance: $\pm 0.50 [\pm 0.020]$

FOOTPRINT DETAILS

Pin	Single
1	-Vin
2	+Vin
3	NC
4	-Vout
5	+Vout
6	NC
7	NC
8	NC

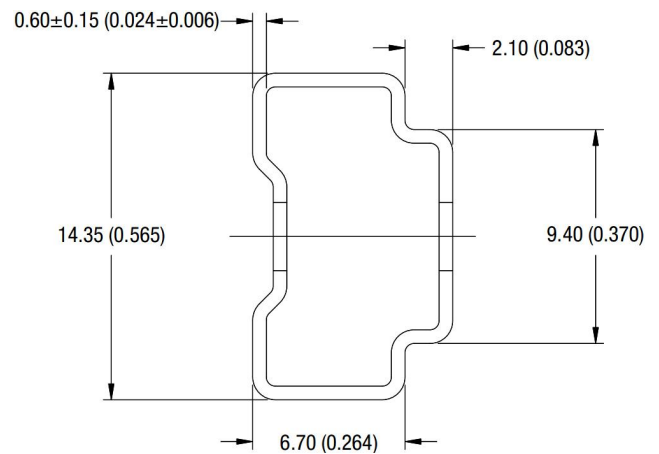
NC - Not available for electrical connection.

SOLDER PAD DIMENSION



Dimensions in [mm], () = Inch
Pin pitch tolerances: ± 0.13 (± 0.005)
Other tolerances: ± 0.25 (± 0.01)

TUBE OUTLINE DIMENSIONS



Unless otherwise stated all dimensions in mm ± 0.5 (inches ± 0.02).
Tube length : 475 ± 2.0 (18.70 ± 0.07). Tube Quantity : 35

Specifications can be changed any time without notice.

No parallel connection or plug and play.

Note:

1. The load shouldn't be less than 10%, otherwise ripple will increase dramatically.
2. Operation under 10% load will not damage the converter; However, they may not meet all specification listed.
3. All specifications measured at $T_a = 25^\circ\text{C}$, humidity $< 75\%$, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on corporate standards.
5. Only typical models listed, other models may be different, please contact our technical person for more details.



RoHS COMPLIANT INFORMATION

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300°C for 10 seconds. The pin termination finish on the SIP package type is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The DIP types are Matte Tin over Nickel Preplate. Both types in this series are backward compatible with Sn/Pb soldering systems.



REACH COMPLIANT INFORMATION

This series has proven that this product does not contain harmful chemicals, it also has harmful chemical substances through the registration, inspection and approval.