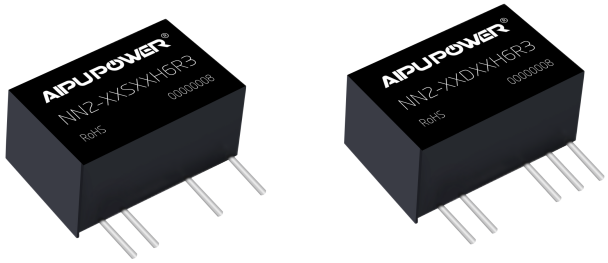
Typical Features

- ◆ Fixed input voltage, isolated & unregulated, output power 2W
- ◆ Efficiency up to 85% (Typ.)
- ◆ Mini SIP packaging
- ◆ Isolation Voltage 5000VAC/6000VDC
- ◆ Operating Temperature from -40℃ to +105℃
- ◆ Plastic case, flame class UL94 V-0



Test Condition: Unless otherwise specified, all parameter values had been tested at nominal input voltage, pure resistive rated load, and at room temperature 25°C.

Application Field

This series of products can be widely used in the fields of instrument, communication, pure digital circuit, general low frequency analog circuit, relay drive circuit, data exchange circuit, etc.

Typical Product List

Certificate	Part No.	Input Voltage Range (VDC)		Output Voltage/ Current (Vo/Io)		Input Current (mA) Typ. Nominal Volt.		Max. Capacitive Load	Ripple & Noise① (20MHz) (mVp-p)	Efficiency (%) @full load/nom. voltage	
		Nom.	Range	Vo (VDC)	Io(mA) Max/Min	Full load	No Load	(uF)	Max/Typ.	Min	Typ.
-	NN2-12S12H6R3	12	10.8 - 13.2	12	167/17	193	15	470	120/100	80	84
-	NN2-12S15H6R3			15	133/13	193	15	470	120/100	80	84
-	NN2-12D12H6R3			±12	±83/±8	192	15	220	120/100	80	84
-	NN2-12D15H6R3			±15	±67/±7	192	15	220	120/100	80	84
-	NN2-15S15H6R3	15	13.5 - 16.5	15	67/7	155	12	470	120/100	80	84
-	NN2-15D12H6R3			±12	±83/±8	155	15	220	120/100	80	84
-	NN2-24S12H6R3	24	21.6 - 26.4	12	167/17	98	8	470	120/100	81	85
-	NN2-24S15H6R3			15	133/13	98	8	470	120/100	81	85
-	NN2-24D09H6R3			±9	±111/±11	96	8	220	120/100	81	85
-	NN2-24D12H6R3			±12	±83/±8	96	8	220	120/100	81	85
-	NN2-24D15H6R3			±15	±67/±7	96	8	220	120/100	81	85

Note ①, The ripple and noise are tested by the twisted pair method.

Input Specifications

Item	Operating conditions	Min.	Typ.	Max.	Unit
Input inrush voltage (1Second.max.)	12Vdc Input	-0.7	--	18	VDC
	15Vdc Input	-0.7	--	21	
	24Vdc Input	-0.7	--	30	
Input Filter	Capacitor Filter				

Hot Plug	Unavailable

Output Specifications

Item	Operating conditions	Min.	Typ.	Max.	Unit
Output Power		0.2	--	2	W
Output Voltage Accuracy	Please refer to the output voltage deviation curve (Figure 1)				
Load Regulation	10% - 100% load	--	10	15	%
Line Voltage Regulation	Input Voltage Change ±1%	--	--	1.2	--
Temperature Drift Coefficient	100% Load	--	--	±0.03	%/°C
Short Circuit Protection	Continuous, self-recovery				

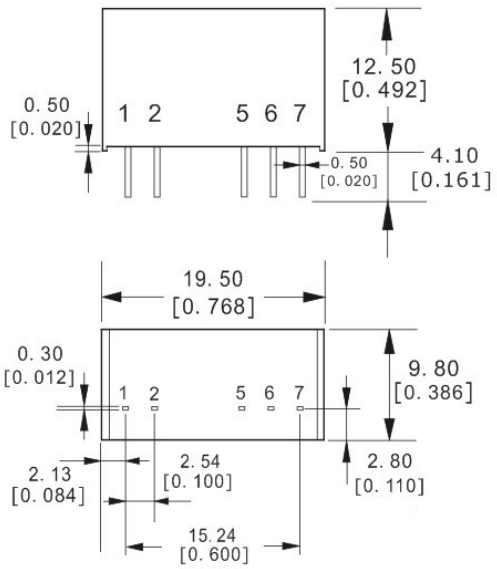
General Specifications

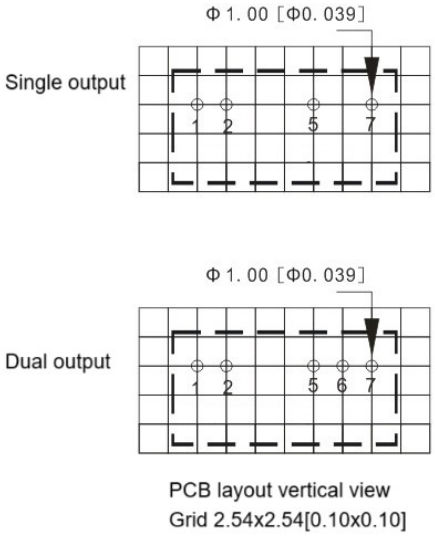
Item	Operating conditions	Min.	Typ.	Max.	Unit
Switching Frequency	Nominal input voltage, full load	--	240	--	KHz
Operating Temperature	Please refer to the temperature derating curve (Figure 2)	-40	--	+105	°C
Storage Temperature		-55	--	+125	
Case temperature rise	Operating at Ta =25℃	--	30°	--	
Pin Soldering Temperature	1.5mm from the case, 10S	--	--	300	
Relative humidity	No condensation	5	--	95	%RH
Isolation Voltage	Input-Output, test 1min, leakage current <1mA	6000	--	--	VDC
		5000	--	--	VAC
Insulation Resistance	Input-Output, @ 500VDC	1000	--	--	MΩ
Isolation Capacitor	Input/Output,100KHz/0.1V	--	6	--	pF
Vibration		10-150Hz, 5G, 30 Min. along X, Y and Z			
MTBF	MIL-HDBK-217F@25℃	3500	--	--	K hours
Transformer Clearance distance		5	--	--	mm
Transformer Creepage distance		5	--	--	
PCB CL & CR distances		5.5	--	--	
Case Material	Plastic in Black, flame class UL94 V-0				
Unit Weight	2.5 g (Typ.)				
Cooling Method	Natural air				
Packing	Tube size (525*18*10mm)	25PCS/Tube			
	Carton size (542*110*155mm)	2000PCS/Carton (Total 80 Tubes)			
Unit dimensions	L x W x H	19.50× 9.80 × 12.50 mm		0.768 × 0.386 × 0.492 inch	

EMC Performance

EMI	CE	EN60601-1-2/CISPR 11 GROUP1 CLASS B (with Recommended EMC circuit)
	RE	EN60601-1-2/CISPR 11 GROUP1 CLASS B (with Recommended EMC circuit)
EMS	ESD	EN60601-1-2（IEC/EN61000-4-2 Contact ±6KV perf.Criteria B）

Mechanical Dimensions





PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

Unit: mm[inch]
Pin diameter tolerance ±0.10[±0.004]
General tolerance ±0.50[±0.020]

Pin Function definition

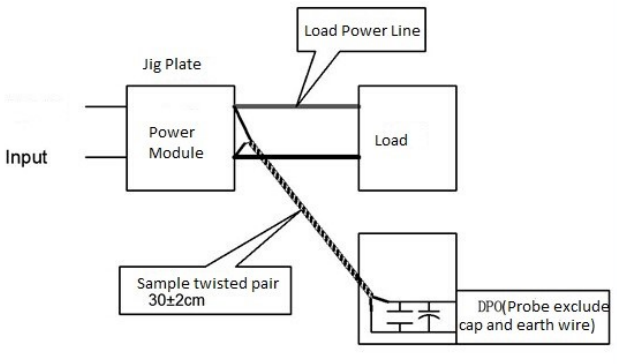
Pin No.	1	2	3, 4	5	6	7
Single(S)	+Vin	GND	No Pin	-Vo	No Pin	+Vo
Dual (D)	+Vin	GND	No Pin	-Vo	COM	+Vo

Note - Please take the pin definition on the product label as the right one if there is any difference between the data sheet and the one printed on the product label.

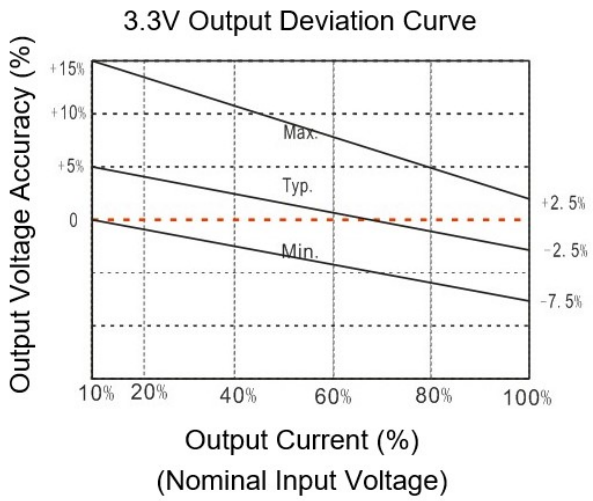
Ripple & Noise Test Instructions (Twisted Pair Method, 20MHz Bandwidth)

1) The Ripple & noise test need 12# twisted pair cables, an oscilloscope which bandwidth should be set to 20MHz, 0.1uF polypropylene capacitor and 10uF high-frequency low-resistance electrolytic capacitor are connected in parallel with the probes (100M bandwidth). The oscilloscope should be set at the Sample Mode.

2) The test diagram is shown on the right. The converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the location is as close as possible to the output pins or terminals. The test can be started after input power on.



Product Performance Curves



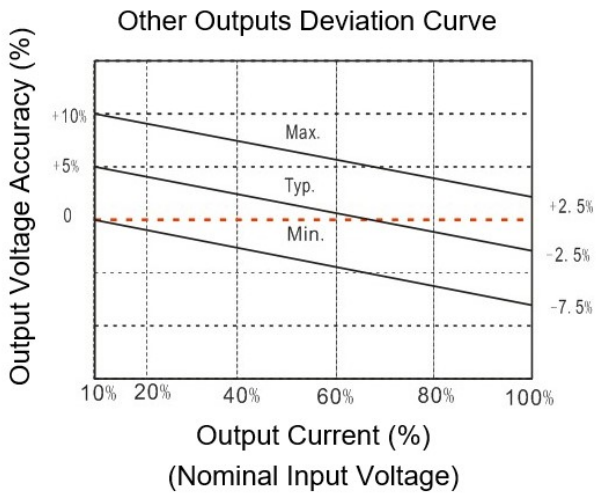


Figure 1

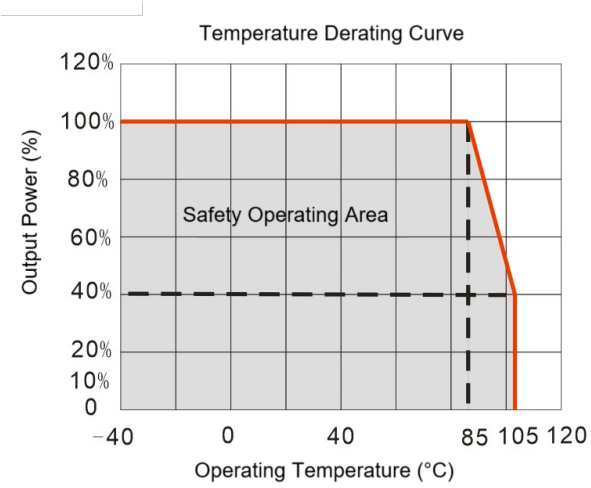


Figure 2

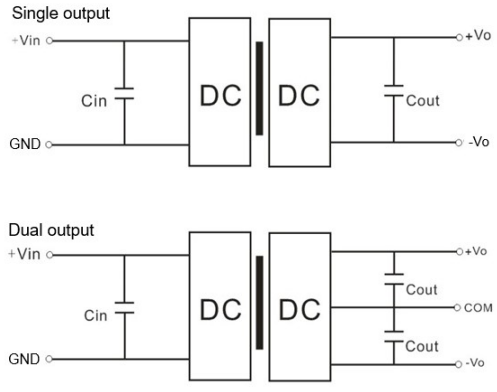
Recommended Circuits for Application

1. Requirement for Output load

The maximum capacitive load was tested at the rated full load. The converter may not start or be damaged if the output capacitors exceed this value.

2. Typical application circuit

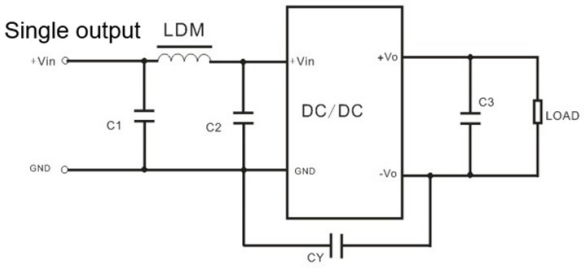
To ensure effectively decrease the input and output ripple and noise, a capacitor filter can be connected at the input and output, the application circuit is shown in the figure below. The suitable filter capacitors should be chosen as the recommended capacitive load values in Table 1. The converter could not start if the capacitance is too big.



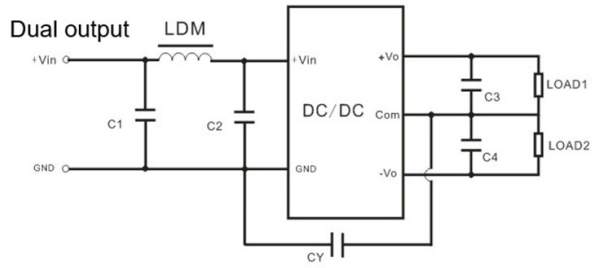
Recommended Capacitive Load Value Table (Table 1)

Vin (Vdc)	Cin	Single Vout (Vdc)	Cout (μF)	Dual Vout (Vdc)	Cout (μF)
5	10μF/16V	3.3	10μF/16V	±3.3	4.7μF/16V
12	2.2μF/25V	5	10μF/16V	±5	4.7μF/16V
15	2.2μF/25V	9	2.2μF/25V	±9	2.2μF/25V
24	1μF/50V	12	2.2μF/25V	±12	1μF/25V
--	--	15	1μF/25V	±15	1μF/16V
--	--	24	1μF/50V	±24	0.47μF/50V

3. Recommended EMC Circuit



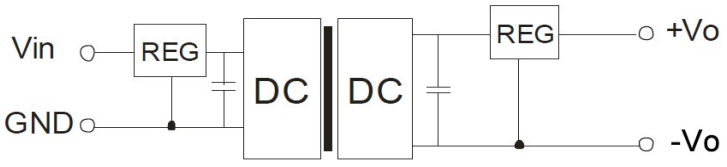
Input voltage		5VDC	12/15/24VDC
EMI	C1/C2	4.7μF/16V	4.7μF/50V
	CY	270 pF	270 pF
	C3	Refer to Cout in Table 1	
	LDM	6.8μH	6.8μH



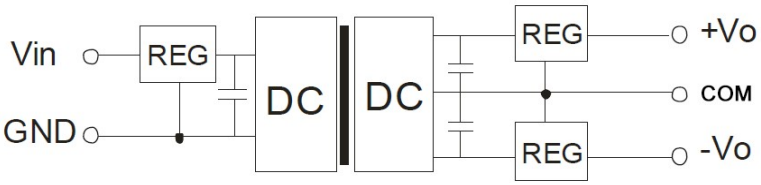
Input voltage		5VDC	12/15/24VDC
EMI	C1/C2	4.7μF/16V	4.7μF/50V
	CY	270 pF	270 pF
	C3/C4	Refer to Cout in Table 1	
	LDM	6.8μH	6.8μH

4. Output voltage regulation and overvoltage protection

The simple solution to achieve the output regulated voltage, over voltage and over current protections is to connect a linear regulator with overheat protection at input or output, and a capacitor filter connected in parallel as below circuit. Filter capacitive value recommended see table 1, Linear regulator should be chosen according to the actual voltage & current for operating. Or Aipu NW series products are recommended instead.



Single output



Dual output

Application Notice

1.This series of converters should not be used in parallel, and they do not support hot-plugging.

2.The product performance in this datasheet cannot be guaranteed if it works at a lower load than the minimum load condition.

3. All values or indicators in this datasheet had been tested based on Aipupower test specifications.

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