

## Typical Features

- ◆ Fixed input voltage, isolated & unregulated, output 1W
- ◆ Efficiency up to 86% (Typ.)
- ◆ Mini size SIP package
- ◆ Isolation voltage 1500VDC
- ◆ Operating temperature from -40°C to +105°C
- ◆ Plastic Case, flame class UL94-V0



## 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		Output Voltage/Current (Vo/Io)		Input Current (mA) Typ. @nominal volt.		Max. Capacitive Load (uF)	Efficiency @full load, nominal volt.	
		Nominal (VDC)	Range (VDC)	Vo (VDC)	Io(mA) Max/Min	Full Load	No Load		Min (%)	Typ. (%)
-	FN1-3V3S3V3AMR3	3.3	2.97 - 3.63	3.3	303/30	370	8	2400	73	76
-	FN1-3V3S05AMR3			5	200/20	358	8	2400	80	83
-	FN1-3V3S12AMR3			12	84/9	340	10	560	82	85
-	FN1-3V3S15AMR3			15	67/7	345	15	560	80	83
-	FN1-05S3V3AMR3	5	4.5 - 5.5	3.3	303/30	250	5	2400	77	80
-	FN1-05S05AMR3			5	200/20	225	5	2400	82	85
-	FN1-05S09AMR3			9	111/12	227	10	1000	82	85
-	FN1-05S12AMR3			12	84/9	220	12	560	82	85
-	FN1-05S15AMR3			15	67/7	225	15	560	82	85
-	FN1-09S09AMR3	9	8.1-9.9	9	111/12	128	10	1000	81	84
-	FN1-12S3V3AMR3	12	10.8 - 13.2	3.3	303/30	98	10	2400	79	82
-	FN1-12S05AMR3			5	200/20	96	10	2400	83	86
-	FN1-12S09AMR3			9	111/12	92	10	1000	83	86
-	FN1-12S12AMR3			12	84/9	90	10	560	83	86
-	FN1-12S15AMR3			15	67/7	90	10	560	83	86
-	FN1-15S3V3AMR3	15	13.5 - 16.5	3.3	303/30	78	10	2400	79	82
-	FN1-15S05AMR3			5	200/20	76	10	1000	83	86
-	FN1-15S12AMR3			12	111/12	78	10	2400	82	85
-	FN1-15S15AMR3			15	84/9	76	10	1000	82	85
-	FN1-24S3V3AMR3	24	21.6 - 26.4	3.3	303/30	48	8	2400	79	82
-	FN1-24S05AMR3			5	200/20	47	8	2400	81	84
-	FN1-24S09AMR3			9	111/12	48	8	1000	82	85
-	FN1-24S12AMR3			12	84/9	48	8	560	83	86
-	FN1-24S15AMR3			15	67/7	48	8	560	82	85

Note 1: The maximum capacitive load is the capacitance allowed to be used when the power supply starts up at full load. The converter may not start if the capacitor exceeds this value.

Note 2: The efficiency is tested at the nominal input voltage and the rated load.

Note 3: Please contact Aipu sales for other output voltages requirements of this series but not listed in this table.

### Input Specifications

Item	Test Condition	Min.	Typ.	Max.	Unit	
Input inrush voltage (1Sec max.)	3.3Vdc Input	-0.7	-	7	VDC	
	5Vdc Input	-0.7	-	9		
	9Vdc Input	-0.7	-	12		
	12Vdc Input	-0.7	-	18		
	15Vdc Input	-0.7	-	21		
	24Vdc Input	-0.7	-	30		
Input filter	Capacitor Filter					
Hot plug	Unavailable					

### Output Specifications

Item	Test Condition	Min.	Typ.	Max.	Unit
Output power		0.1	-	1	W
Output voltage accuracy	Please refer to the Output Voltage Deviation Graph (Figure 1)				
Load regulation	10%-100% load	3.3V output	-	15	20
		Others	-	10	15
Line regulation	Input voltage change $\pm 1\%$	3.3V output	-	-	1.5
		Others	-	-	1.2
Temperature drift coefficient		-	-	$\pm 0.03$	$^{\circ}\text{C}$
Ripple & Noise	5%-100% load, 20MHz bandwidth	-	50	100	mVp-p
Short circuit protection	Continuous, self-recovery				

Note: The Ripple & Noise is tested by the Twisted Pair Method, please refer to the following test instruction.

### General Specifications

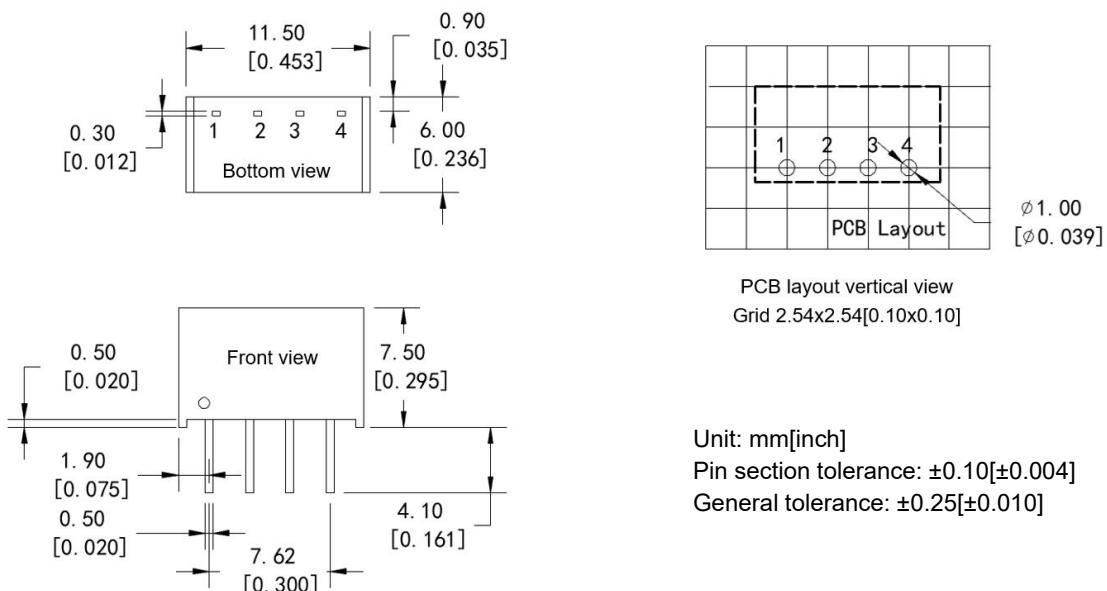
Item	Test Condition	Min.	Typ.	Max.	Unit
Switching frequency	Nominal input voltage, full load	5VDC input	-	320	-
		Others	-	240	-
Operating temperature	Refer to the Temperature Derating Graph (Figure 2)	-40	-	+105	$^{\circ}\text{C}$
Storage temperature		-55	-	+125	$^{\circ}\text{C}$
Case temperature rise	Within the operating derating range	-	30°	-	$^{\circ}\text{C}$
Pin soldering temperature	1.5mm from the case, soldering time 10S	-	-	300	$^{\circ}\text{C}$
Relative humidity	No condensing	5	-	95	%RH
Isolation voltage	I/P-O/P, test 1 minute, leakage current <1mA	1500	-	-	VDC
	I/P-O/P, test 1 second, leakage current <1mA	3000	-	-	VDC

Insulation resistance	I/P-O/P, @ 500VDC		1000	-	-	M Ω
Isolation capacitance	I/P-O/P, 100KHz/0.1V		-	20	-	pF
Vibration	10-150Hz, 5G, 30 Min. along X, Y and Z					
MTBF	MIL-HDBK-217F@25°C		3500	-	-	K hours
Case material	Plastic in Black, flame class UL94-V0					
Unit weight	1.0g (Typ.)					
Cooling method	Natural air					
Packing	Tube size (525x18x10mm)		43PCS/Tube			
	Carton size (542x110x155mm)		3440PCS/Carton (Total 80 Tubes)			
Unit dimensions	L x W x H		11.50× 6.00 × 7.50 mm		0.453 × 0.236 × 0.295 inch	

### EMC Performance

Item		Standard	Performance
EMI	CE	CISPR32/EN55032	CLASS B (with the Recommended EMC circuit)
	RE	CISPR32/EN55032	CLASS B (with the Recommended EMC circuit)
EMS	ESD	IEC/EN61000-4-2	Air ±8kV, Contact ±6kV perf. Criteria B

### Mechanical Dimensions

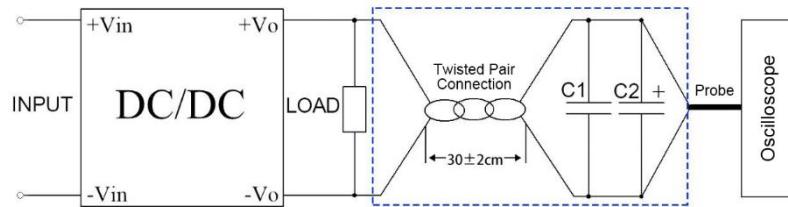


### Pin-out Function Description

Pin No.	1	2	3	4		
Single (S)	GND	+Vin	-Vo	+Vo		

Note: Please take the pin definition on the product label as the right one if it is different than the data sheet description.

## Ripple &amp; Noise Test Instruction (Twisted Pair Method, 20MHZ bandwidth)



1. The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which should be set at the Sample Mode, bandwidth 20MHz. 100M bandwidth probe with cap and ground removed. C1(0.1uF) polypropylene capacitor and C2(10uF) high frequency low impedance electrolytic capacitor are connected in parallel with the probes and one side of the twisted pair.
2. Refer to the test diagram, 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 other side of the twisted pair (length  $30\text{cm}\pm 2\text{ cm}$ ) should be connected in parallel with the load. The test can start after the input power on.
3. It is recommended to use a  $\geq 10\%$  load or a high frequency low impedance electrolytic capacitor ( $\geq 100\mu\text{F}$ ) load at the output to avoid the output ripple increasing.

## Product Characteristics Graphs

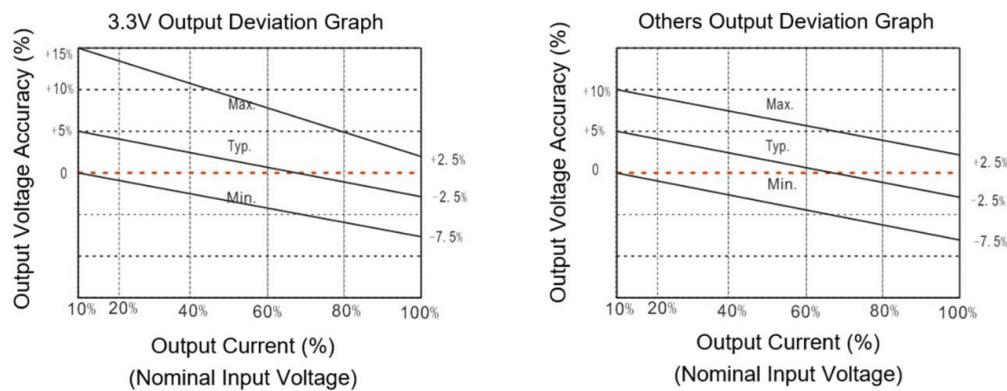


Figure 1

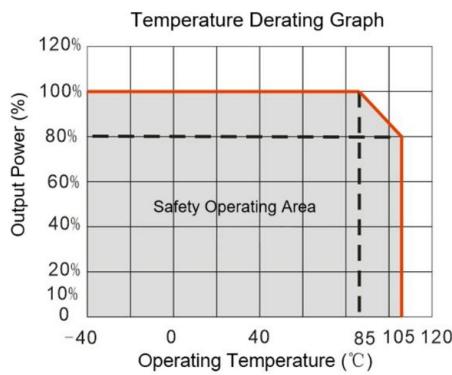


Figure 2

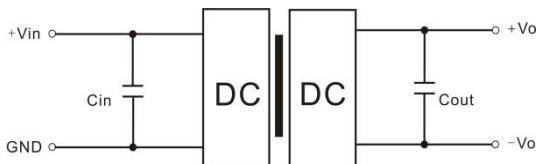
## Recommended Circuits for Application

## 1. Output load requirements

- a. To ensure the converter operating efficiently and reliably, its minimum load should not be less than 10% of the rated load. It is recommended to connect a resistor in parallel to the output when the real load is less than 10% (the sum of the power consumed should be bigger than or equal to 10% of the rated power).
- b. The maximum capacitive load is tested at the full load. The converter may not start or be damaged at the capacitive over-load.

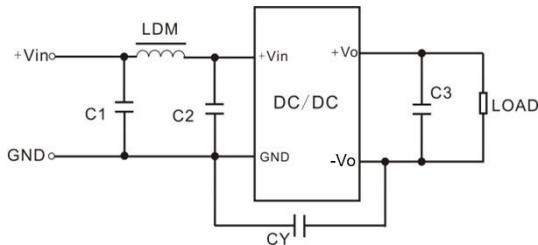
## 2. Typical application circuits

To ensure effectively decrease the input and output ripple and noise, a capacitor filtering net can be used at the input and output, the application circuit is shown below. 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 Values (Table 1)			
Vin (Vdc)	Cin	Vout (Vdc)	Cout
3.3	10uF/16V	3.3	10uF/16V
5, 9	4.7uF/16V	5	10uF/16V
12	2.2uF/25V	9	4.7uF/16V
15	2.2uF/50V	12	2.2uF/25V
24	1uF/50V	15	2.2uF/25V

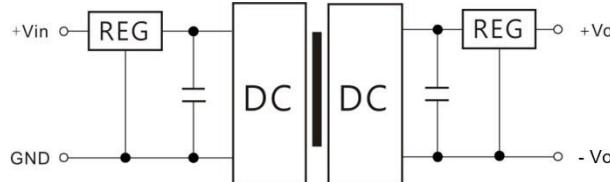
## 3. Recommended EMC circuit diagram



Input Voltage		3.3/5/9Vdc	12/15/24Vdc
EMI	C1/C2	4.7uF/16V	4.7uF/50V
	CY	270pF/3KVdc	270pF/3KVdc
	C3	Refer to Cout value in Table 1	
	LDM	6.8uH	6.8uH

## 4. Output voltage regulation and overvoltage protection

The simple solution to achieve the output regulated voltage, over voltage and over current protections is to use a linear regulator with overheat protection at input or output, and a capacitor filtering net used in parallel as below circuit. Filter capacitive values 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.



## Application Notice

1. This series of products cannot be used in parallel, and do not support hot-plug.
2. The product should be used according to the specifications, otherwise it could be permanently damaged.
3. The product performance cannot be guaranteed if it works at a lower load than the minimum load defined.
4. The product performance cannot be guaranteed if it works under over-load condition.
5. Unless otherwise specified, all values or indicators on this datasheet are tested at  $T_a=25^{\circ}\text{C}$ , humidity <75%RH, nominal input voltage and rated load (pure resistance load).
6. All values or indicators on this datasheet have been tested based on Aipupower test specifications.
7. The specifications are specially for the parts listed on this datasheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.
8. Aipupower can provide customization service.

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