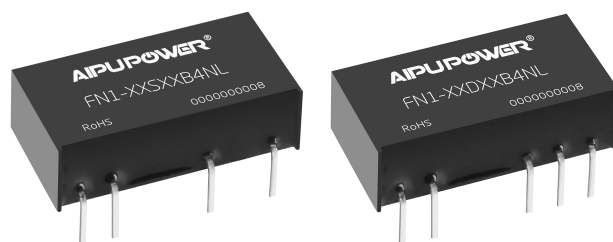


Typical Features

- ◆ Fixed input voltage, isolated & unregulated output 1W
- ◆ Efficiency up to 86% (Typ.)
- ◆ Mini size SIP package
- ◆ Isolation voltage 4000VDC
- ◆ Continuous short circuit protection, self-recovery
- ◆ Operating temperature from -40℃ to +105℃
- ◆ 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	Efficiency (%) @full load nominal volt.	
		Nominal (VDC)	Range (VDC)	Vo (VDC)	Io(mA) Max/Min	Full Load	No Load	(uF)	Min	Typ.
-	FN1-3V3S3V3B4NL	3.3	2.97 - 3.63	3.3	303/30	370	8	2400	74	78
-	FN1-3V3S05B4NL			5	200/20	358	8	2400	79	83
-	FN1-3V3S12B4NL			12	84/9	340	10	560	81	85
-	FN1-3V3S15B4NL			15	67/7	345	20	560	79	83
-	FN1-3V3S24B4NL			24	42/4	360	20	220	79	83
-	FN1-05S3V3B4NL	5	4.5 - 5.5	3.3	303/30	250	8	2400	76	80
-	FN1-05S05B4NL			5	200/20	225	8	2400	81	85
-	FN1-05S07B4NL			7.2	139/14	225	8	1200	81	85
-	FN1-05S09B4NL			9	111/12	227	10	1000	81	85
-	FN1-05S12B4NL			12	84/9	220	10	560	81	85
-	FN1-05S15B4NL			15	67/7	220	18	560	81	85
-	FN1-05S24B4NL			24	42/4	266	18	220	80	84
-	FN1-05D3V3B4NL			±3.3	±152/±15	250	8	1200	74	78
-	FN1-05D05B4NL			±5	±100/±10	225	8	1200	79	83
-	FN1-05D09B4NL			±9	±56/±6	227	10	470	81	85
-	FN1-05D12B4NL			±12	±42/±5	220	10	220	81	85
-	FN1-05D15B4NL			±15	±34/±4	220	18	220	81	85
-	FN1-05D24B4NL			±24	±21/±2	266	18	100	79	83
-	FN1-09S09B4NL	9	8.1	9	111/12	128	10	1000	80	84
-	FN1-09S12B4NL		-	12	84/9	120	10	560	81	85
-	FN1-09S15B4NL		9.9	15	67/7	120	10	560	81	85

-	FN1-12S3V3B4NL	12	10.8 - 13.2	3.3	303/30	98	10	2400	80	82
-	FN1-12S05B4NL			5	200/20	96	10	2400	84	86
-	FN1-12S09B4NL			9	111/12	92	10	1000	84	86
-	FN1-12S12B4NL			12	84/9	90	10	560	84	86
-	FN1-12S15B4NL			15	67/7	90	10	560	84	86
-	FN1-12S24B4NL			24	42/4	92	10	220	83	85
-	FN1-12D3V3B4NL			±3.3	±152/±15	98	10	1200	79	83
-	FN1-12D05B4NL			±5	±100/±10	96	10	1200	80	82
-	FN1-12D09B4NL			±9	±56/±6	92	10	470	84	86
-	FN1-12D12B4NL			±12	±42/±5	90	10	220	84	86
-	FN1-12D15B4NL			±15	±34/±4	90	10	220	84	86
-	FN1-12D24B4NL			±24	±21/±2	92	10	100	84	86
-	FN1-15S05B4NL	15	13.5 - 16.5	5	200/20	78	10	2400	79	83
-	FN1-15S12B4NL			12	84/9	76	10	1000	80	82
-	FN1-15S15B4NL			15	67/7	76	10	560	84	86
-	FN1-15D05B4NL			±5	±100/±10	78	10	1200	84	86
-	FN1-15D09B4NL			±9	±56/±6	76	10	1200	84	86
-	FN1-15D12B4NL			±12	±42/±5	76	10	470	84	86
-	FN1-15D15B4NL			±15	±34/±4	78	10	220	79	83
-	FN1-24S3V3B4NL	24	21.6 - 26.4	3.3	303/30	48	8	2400	79	83
-	FN1-24S05B4NL			5	200/20	47	8	2400	80	82
-	FN1-24S09B4NL			9	111/12	48	8	1000	84	86
-	FN1-24S12B4NL			12	84/9	48	8	560	84	86
-	FN1-24S15B4NL			15	67/7	48	8	560	84	86
-	FN1-24S24B4NL			24	42/4	49	8	220	84	86
-	FN1-24D05B4NL			±5	±100/±10	48	8	1200	79	83
-	FN1-24D09B4NL			±9	±56/±6	47	8	470	80	82
-	FN1-24D12B4NL			±12	±42/±5	48	8	220	84	86
-	FN1-24D15B4NL			±15	±34/±4	48	8	220	84	86
-	FN1-24D24B4NL			±24	±21/±2	48	8	100	84	86

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 voltage regulation	Input voltage change $\pm 1\%$	3.3V output	--	--	1.5	%
		Others	--	--	1.2	
Temperature drift coefficient			--	--	± 0.03	%/ $^{\circ}\text{C}$
Ripple & Noise	5%-100% load, 20MHz bandwidth	Others	--	30	75	mVp-p
		24V output	--	50	100	
Short circuit protection	Continuous, self-recovery					

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

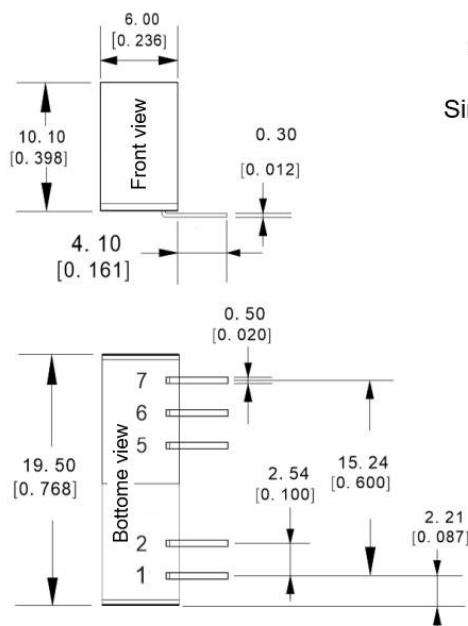
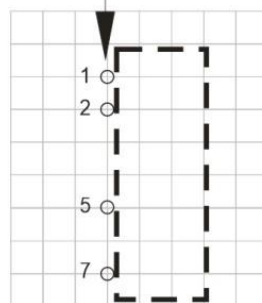
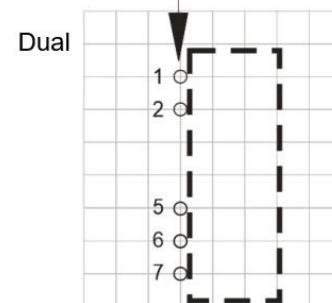
General Specifications

Item	Test Condition		Min.	Typ.	Max.	Unit
Switching frequency	Nominal input voltage, full load		--	260	--	KHz
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 operation derating range		--	30 $^{\circ}$	--	$^{\circ}\text{C}$
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 $< 1\text{mA}$	4000	--	--	VDC
Insulation resistance	I/P-O/P	@ 500VDC	1000	--	--	M Ω
Isolation capacitance	I/P-O/P	100KHz/0.1V	--	20	--	pF
MTBF	MIL-HDBK-217F@25 $^{\circ}\text{C}$		3500	--	--	K hours
Vibration	10-150Hz, 5G, 30 Min. along X, Y and Z					
Case material	Plastic in Black, flame class UL94-V0					
Unit weight	2.1g (Typ.)					
Cooling method	Natural air					
Packing	Tube size (525x22x15mm)		25PCS/Tube			
	Carton size (542x110x155mm)		1800PCS/Carton (Total 72 Tubes)			
Unit dimensions	L x W x H		19.50 $\times$ 6.00 $\times$ 10.10 mm		0.768 $\times$ 0.236 $\times$ 0.398 inch	

EMC Performance

Item		Test Standards	Performance/Class
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	Contact $\pm 6\text{kV}$, Air $\pm 8\text{kV}$ perf. Criteria B

Mechanical Dimensions

Single $\Phi 1.00 [\Phi 0.039]$ Dual $\Phi 1.00 [\Phi 0.039]$ PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

Unit: mm[inch]

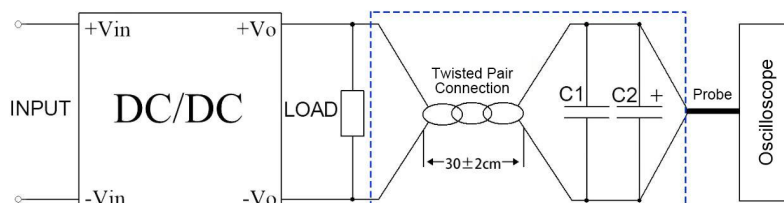
Pin section tolerance: $\pm 0.10[\pm 0.004]$ General tolerance: $\pm 0.50[\pm 0.020]$

Pin-out Function Description

Pin No.	1	2	3	4	5	6	7
Single (S)	+Vin	GND	No Pin	No Pin	-Vo	No Pin	+Vo
Dual (D)	+Vin	GND	No Pin	No Pin	-Vo	COM	+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 & 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 30cm $\pm$ 2 cm) should be connected in parallel with the load. The test can start after the input power on.
3. It is recommended to connect a $\geq 5\%$ load or a high frequency low impedance electrolytic capacitor ($\geq 100\mu\text{F}$) load to the output to avoid the output ripple increasing.

Product Characteristics Graphs

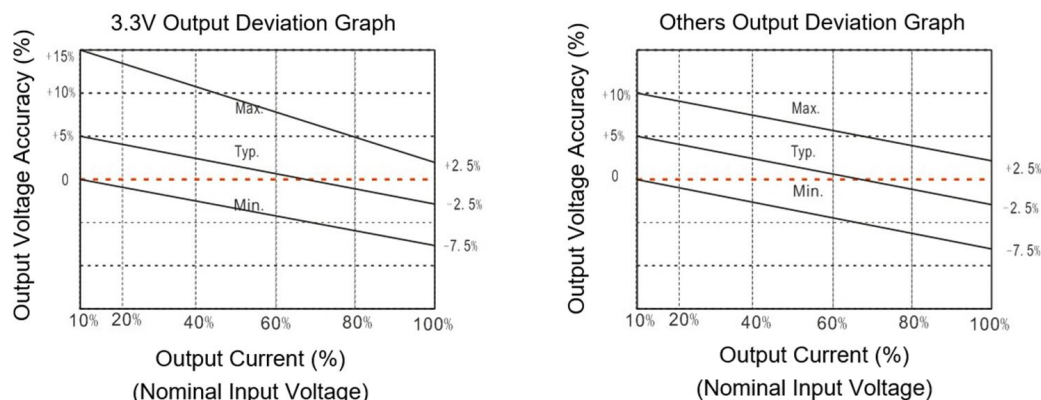


Figure 1

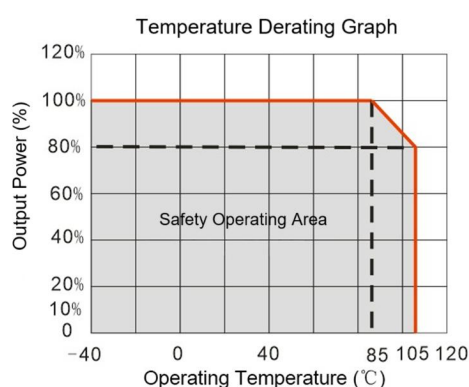


Figure 2

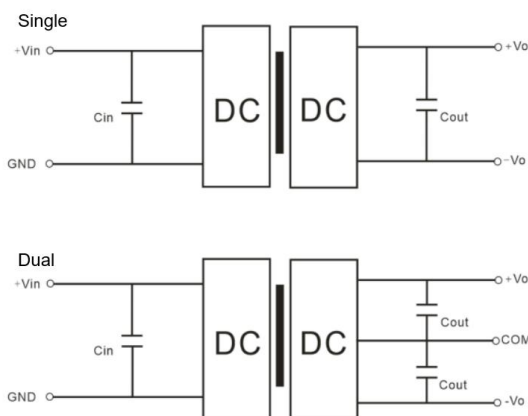
Recommended Circuits for Application

1. Requirement for the output load

- a. To ensure the converter operates 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

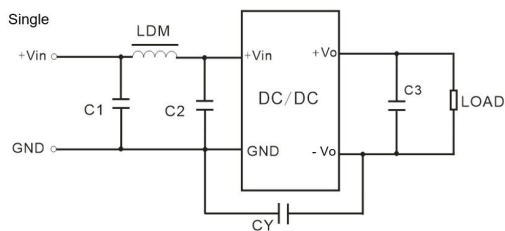
To ensure effectively decrease the input and output ripple and noise, a capacitor filtering net can be used at the input and output, the application circuits diagrams are shown below. Suitable filter capacitors should be chosen as the recommended capacitive load values in Table 1. The converter could not start if the capacitance is too big.



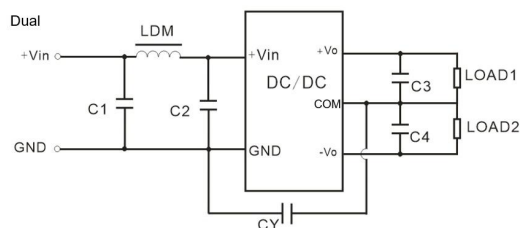
Recommended Capacitive Load Values (Table 1)

Vin (Vdc)	Cin	Single Vout (Vdc)	Cout	Dual Vout (Vdc)	Cout
3.3	10uF/16V	3.3	10uF/16V	±3.3	4.7uF/16V
5	10uF/16V	5	10uF/16V	±5	4.7uF/16V
9	4.7uF/16V	9	2.2uF/25V	±9	2.2uF/25V
12	2.2uF/25V	12	2.2uF/25V	±12	1uF/50V
15	2.2uF/25V	15	2.2uF/25V	±15	1uF/50V
24	1uF/50V	24	1uF/50V	±24	470nF/50V

3. Recommended EMC circuit diagram



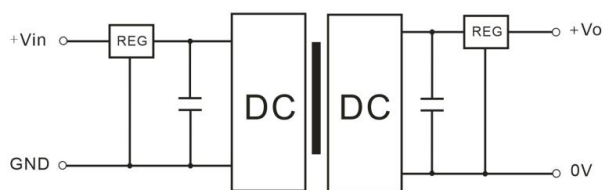
Input Volt. (single)		3.3/5Vdc	9/12/15/24Vdc
EMI	C1/C2	4.7uF/16V	4.7uF/50V
	CY	270pF/4KVdc	270pF/4KVdc
	C3	Refer to Cout value in Table 1	
	LDM	6.8uH	6.8uH



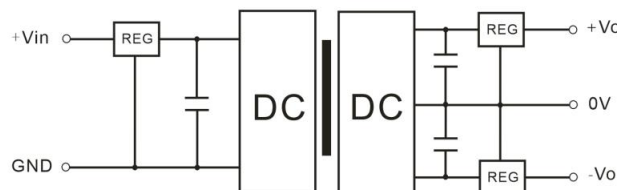
Input Volt. (dual)		3.3/5Vdc	9/12/15/24Vdc
EMI	C1/C2	4.7uF/16V	4.7uF/50V
	CY	270pF/4KVdc	270pF/4KVdc
	C3/C4	Refer to Cout value in Table 1	
	LDM	6.8uH	6.8uH

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 filter connected in parallel as below circuits diagrams. 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 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.

Guangzhou Aipu Electron Technology Co., Ltd

Address: Building 4, HEDY Park, No.63, Punan Road, Huangpu Dist, Guangzhou, China.

Tel: 86-20-84206763 Fax: 86-20-84206762 HOTLINE: 400-889-8821

E-mail: sales@aipu-elec.com Website: <https://www.aipupower.com>