

Typical Features

- ◆ Fixed input voltage, isolated & unregulated, output power 2W
- ◆ Efficiency up to 86%
- ◆ Mini SIP packing
- ◆ Isolation Voltage 3000VDC
- ◆ Ambient Temperature: -40°C~+105°C
- ◆ Plastic case, flame class UL94 V-0



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

Application Field

This series 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) Rated Voltage		Max. Capacitive Load	Ripple & Noise① (20MHz) Max/Typ	Efficiency (%) @full load/rated voltage	
		Rated	Range	Voltage (VDC)	Current (mA) MAX./Min.	Full load Typ.	No Load Typ.	uF	mVp-p	Min.	Typ.
-	FN2-05S3V3C3N	5	4.5 - 5.5	3.3	400/40	328	10	2400	150/80	77	80
CE	FN2-05S05C3N			5	400/40	456	8	2400	150/80	80	83
-	FN2-05S09C3N			9	222/22	450	8	1000	150/80	81	84
-	FN2-05S12C3N			12	167/17	445	10	560	150/80	82	85
-	FN2-05S15C3N			15	133/13	440	16	560	150/80	82	85
-	FN2-05S24C3N			24	83/8	435	18	220	150/100	82	85
CE, RoHS	FN2-05D05C3N			±5	±200/±20	456	10	1200	150/80	77	80
-	FN2-05D09C3N			±9	±111/±11	450	8	470	150/80	80	83
-	FN2-05D12C3N			±12	±83/±8	445	8	220	150/80	81	84
-	FN2-05D15C3N			±15	±67/±7	440	16	220	150/80	82	85
-	FN2-05D24C3N			±24	±42/±4	435	18	100	150/100	82	85
-	FN2-12S3V3C3N	12	10.8 - 13.2	3.3	400/40	130	8	2400	150/80	77	80
CE, CB, UL	FN2-12S05C3N			5	400/40	192	8	2400	150/80	80	83
-	FN2-12S09C3N			9	222/22	190	8	1000	150/80	80	83
CE, CB, UL	FN2-12S12C3N			12	167/17	188	8	560	150/80	83	86
ETL	FN2-12S15C3N			15	133/13	185	8	560	150/80	83	86
-	FN2-12S24C3N			24	83/8	180	10	220	150/100	82	85
-	FN2-12D05C3N			±5	±200/±20	192	8	1200	150/80	80	83

-	FN2-12D09C3N			±9	±111/±11	190	8	470	150/80	80	83
-	FN2-12D12C3N			±12	±83/±8	187	8	200	150/80	83	86
-	FN2-12D12V5C3N			±12.5	±80/±8	185	8	200	150/80	83	86
-	FN2-12D15C3N			±15	±67/±7	182	8	220	150/80	83	86
-	FN2-12D24C3N			±24	±42/±4	180	10	100	150/100	80	83
-	FN2-15S05C3N	15	13.5 - 16.5	5	400/40	155	8	2400	150/80	80	83
-	FN2-15S12C3N			12	167/17	150	8	560	150/80	80	83
-	FN2-15S15C3N			15	133/13	150	8	560	150/80	83	86
-	FN2-15S24C3N			24	83/8	145	8	220	150/100	83	86
-	FN2-15D05C3N			±5	±200/±20	155	8	1200	150/80	80	83
-	FN2-15D12C3N			±12	±83/±8	150	8	220	150/80	80	83
-	FN2-15D15C3N			±15	±67/±7	150	8	220	150/80	83	86
-	FN2-15D24C3N			±24	±42/±4	145	8	100	150/100	83	86
--	FN2-24S3V3C3N	24	21.6 - 26.4	3.3	400/40	68	8	2400	150/80	77	80
-	FN2-24S05C3N			5	400/40	96	8	2400	150/80	80	83
-	FN2-24S09C3N			9	222/22	94	8	1000	150/80	81	84
CE	FN2-24S12C3N			12	167/17	92	8	560	150/80	83	86
-	FN2-24S15C3N			15	133/13	90	8	560	150/80	83	86
-	FN2-24S24C3N			24	83/8	90	8	220	150/100	82	85
-	FN2-24D05C3N			±5	±200/±20	96	8	1200	150/80	80	83
-	FN2-24D09C3N			±9	±111/±11	94	8	470	150/80	81	84
-	FN2-24D12C3N			±12	±83/±8	92	8	220	150/80	83	86
-	FN2-24D15C3N			±15	±67/±7	90	8	220	150/80	83	86
-	FN2-24D24C3N			±24	±42/±4	90	8	100	150/100	82	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.)	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	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	3.3Vdc output	--	15	20	%
		Other output	--	10	15	
Line Regulation	Input Voltage Change $\pm 1\%$	3.3Vdc output	--	--	1.5	--
		Other output	--	--	1.2	
Temperature Drift Coefficient	100% Load		--	--	± 0.03	%/ $^{\circ}\text{C}$
Output Short Circuit Protection	Continuous, self-recovery					

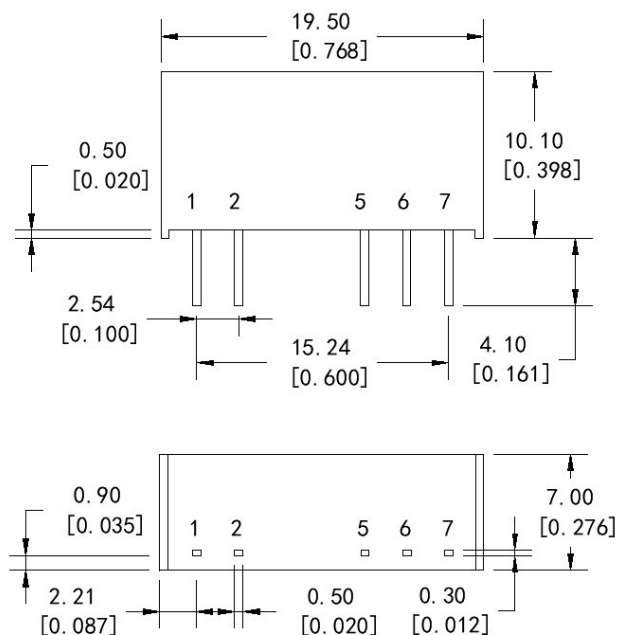
General Specifications

Item	Operating conditions		Min.	Typ.	Max.	Unit
Switching Frequency	Rated input voltage full load		--	260	--	KHz
Operating Temperature	Please refer to the temperature derating curve (Figure 2)		-40	--	105	$^{\circ}\text{C}$
Storage Temperature			-55	--	+125	
Case temperature rise	Operating at $T_a = 25^{\circ}\text{C}$		--	30 $^{\circ}$ K	--	
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 $<1\text{mA}$		3000	--	--	VDC
Insulation Resistance	Input-Output, @ 500Vdc		1000	--	--	M Ω
Isolation Capacitor	Input/Output, 100KHz/0.1V		--	20	--	pF
Vibration			10-150Hz, 5G, 30 Min. along X, Y and Z			
MTBF	MIL-HDBK-217F@25 $^{\circ}\text{C}$		3500	--	--	K hours
Case Material	Plastic in Black, flame class UL94 V-0					
Product Weight	2.5 g (Typ.)					
Cooling Method	Natural air					
Packing	Tube(525*18*10mm)		25PCS			
	Carton(542*110*155mm)		2000PCS (Total 80 Tubes)			
Unit Package Size	L x W x H		19.50 $\times$ 7.00 $\times$ 10.10 mm		0.768 $\times$ 0.276 $\times$ 0.398 inch	

EMC Performance

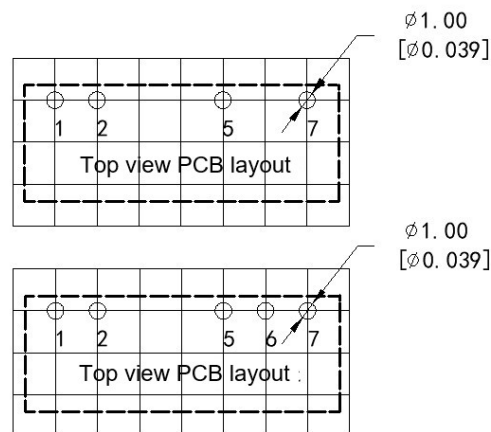
EMI	CE	CISPR32/EN55032, CLASS B (with EMC Recommended Circuit)
	RE	CISPR32/EN55032, CLASS B (with EMC Recommended Circuit)
EMS	ESD	IEC/EN61000-4-2 Air $\pm 8\text{kV}$, Contact $\pm 6\text{kV}$ perf.Criteria B

Mechanical Dimensions



Unit dimensions

Single output



Dual output

Note:
Unit: mm[inch]
Grid: 2.54x2.54[0.10x0.10]
Pin section tolerance: ± 0.10 [0.004]
General tolerance: ± 0.50 [0.020]

Recommended PCB layout

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

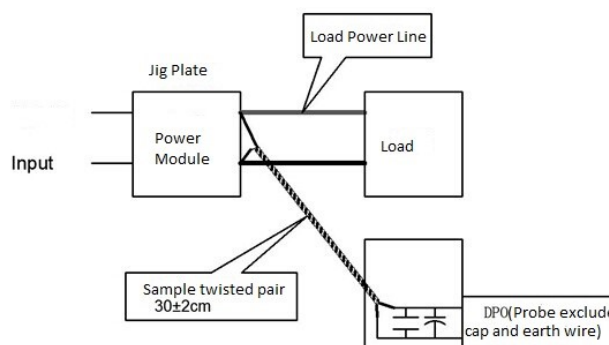
Note: Please take the pin definition on the product label as the right one if there is any difference between the data sheet and the one printed on the product label.

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

Test Method:

1) 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 output ripple noise 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 $\pm$ 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 Curve

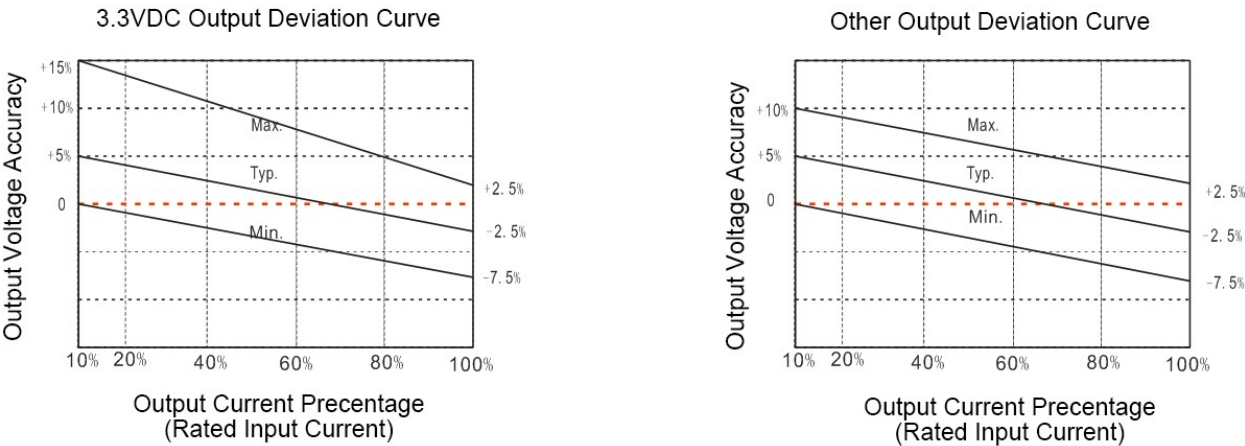


Figure 1

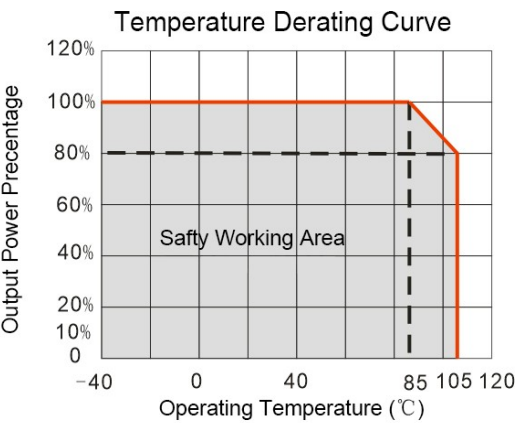


Figure 2

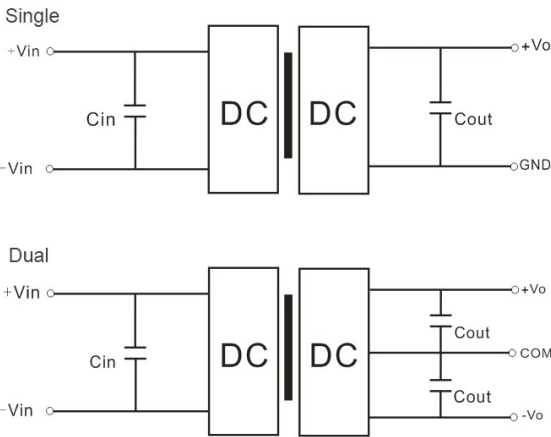
Recommended Circuits for Application

1. Requirement for Output load

The maximum capacitive load of the product was tested at the Rated full load. The converter may not start or be damaged if the capacitor exceeds this value.

2. Recommended circuit

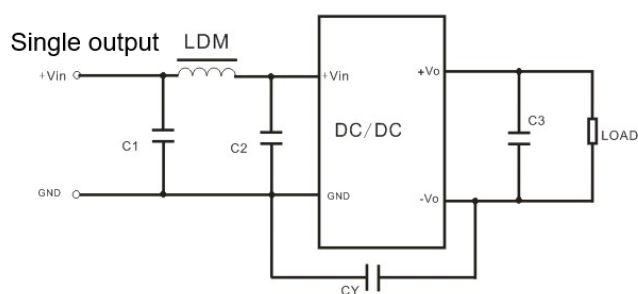
To ensure effectively decrease the input and output ripple and noise, a capacitor filter can be connected at the input and output, the application circuit is shown in the figure below. The suitable filter capacitors should be chosen as the recommended capacitive load values in Table 1. The converter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



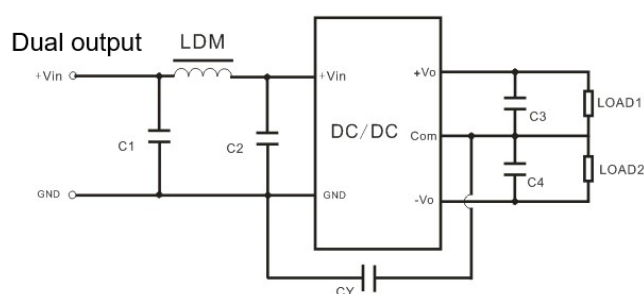
Recommended Capacitive Load Value Table (Table 1)

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

3. Recommended EMC Circuit



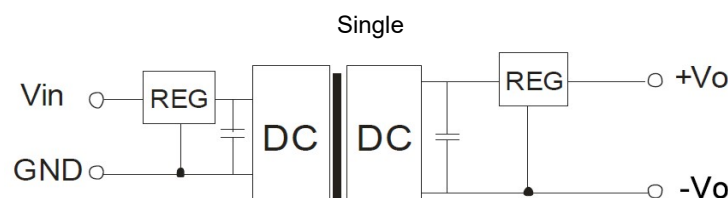
Input voltage		5VDC	12/15/24VDC
EMI	C1/C2	4.7 μ F/16V	4.7 μ F/50V
	CY	270pF/4kV	270pF/4kV
	C3	Refer to Cout in Table 1	
	LDM	6.8 μ H	6.8 μ H



Input voltage		5VDC	12/15/24VDC
EMI	C1/C2	4.7 μ F/16V	4.7 μ F/50V
	CY	270pF/4kVdc	270pF/4kVdc
	C3/C4	Refer to Cout in Table 1	
	LDM	6.8 μ H	6.8 μ H

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(Page 5), Linear regulator should be chosen according to the actual voltage & current for operating. Or Aipu NW series products are recommended instead.



Note:

- 1.This product cannot be used in parallel, and it does not support hot-plugging.
- 2.The product performance in this manual cannot be guaranteed if it works at a lower load than the minimum load condition.
3. All values or indicators in this manual had been tested based on Aipupower test specifications.

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