Typical Features

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

UL62368-1

EN62368-1

IEC62368-1

Application Field

FN1-XXSXXAN Series *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.*

Selection Guide

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	(μF)	Min (%)	Typ. (%)
CE	FN1-3V3S3V3AN	3.3	2.97 - 3.63	3.3	303/30	370	8	2400	74	76
CE	FN1-3V3S05AN			5	200/20	358	8	2400	81	83
CE	FN1-3V3S12AN			12	83/9	340	10	560	83	85
CE	FN1-3V3S15AN			15	67/7	345	20	560	81	83
CE	FN1-3V3S24AN			24	42/5	360	25	220	81	83
CE	FN1-05S3V3AN	5	4.5 - 5.5	3.3	303/30	250	8	2400	78	80
CE/UL	FN1-05S05AN			5	200/20	225	8	2400	83	85
CE	FN1-05S09AN			9	111/12	227	10	1000	83	85
CE	FN1-05S12AN			12	83/9	220	10	560	83	85
CE	FN1-05S15AN			15	67/7	220	15	560	83	85
CE	FN1-05S24AN			24	42/5	266	18	220	82	84
-	FN1-09S09AN	9	8.1 - 9.9	9	111/12	128	10	560	82	84
CE	FN1-12S3V3AN	12	10.8 - 13.2	3.3	303/30	98	10	2400	75	77
UL/CB	FN1-12S05AN			5	200/20	96	10	2400	84	86
-	FN1-12S06AN			6	167/17	96	10	2400	84	86
CE	FN1-12S09AN	12	10.8 - 13.2	9	111/12	92	10	1000	84	86
UL/CE/CB/TSCA	FN1-12S12AN			12	83/9	90	10	560	84	86
CE	FN1-12S15AN			15	67/7	90	10	560	84	86

CE	FN1-12S24AN			24	42/5	92	10	220	83	85
CE	FN1-15S05AN	15	13.5 - 16.5	5	200/20	78	10	2400	83	85
-	FN1-15S09AN			9	111/12	78	10	1000	83	85
CE	FN1-15S12AN			12	83/9	76	10	1000	84	86
CE	FN1-15S15AN			15	67/7	76	10	560	83	85
CE	FN1-15S24AN			24	42/5	75	10	470	83	85
-	FN1-18S18AN	18	16.2 - 19.8	18	56/6	70	10	470	83	85
CE	FN1-24S3V3AN	24	21.6 - 26.4	3.3	303/30	52	8	2400	75	77
CE	FN1-24S05AN			5	200/20	47	8	2400	82	84
CE	FN1-24S09AN			9	111/12	48	8	1000	83	85
CE	FN1-24S12AN			12	83/9	48	8	560	84	86
CE	FN1-24S15AN			15	67/7	48	8	560	83	85
CE	FN1-24S24AN			24	42/5	49	8	220	83	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

Items	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	
	18Vdc Input	-0.7	-	25	
	24Vdc Input	-0.7	-	30	
Input filter	Capacitor Filter				
Hot plug	N/A				

Output Specifications

Items	Test Condition		Min.	Typ.	Max.	Unit
Output voltage accuracy	Please refer to the Output Voltage Deviation Curve (Figure 1)					
Load regulation	10%-100% load	3.3Vdc output	-	15	20	%
		Others	-	10	15	
Line voltage regulation	Input voltage change ±1%	3.3Vdc output	-	-	1.5	
		Others	-	-	1.2	
Temperature drift coefficient			-	-	±0.03	%/°C
Ripple & Noise	0%-100% load, 20MHz	24Vdc output	-	50	100	mVp-p

	bandwidth	Others		30	75	mVp-p
Output power			0.1	-	1	W
Short circuit protection	Continuous, self-recovery					
Note: The Ripple & Noise is tested by the Twisted Pair Method, please refer to the following test instruction.						

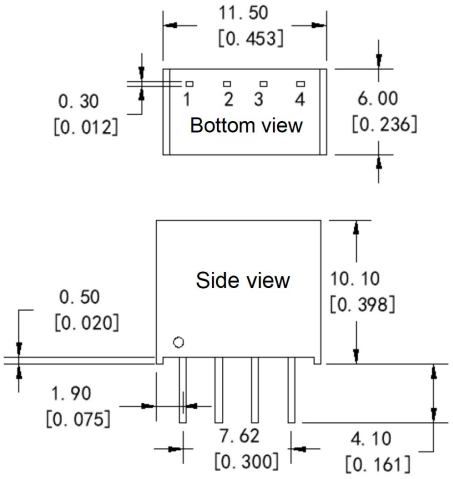
General Specifications

Items	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	℃
Storage temperature	-	-55	-	+125	℃
Case temperature rise	Within the operating derating range	-	25°	-	℃
Pin soldering temperature	1.5mm from the case, soldering time 10S	-	-	300	℃
Relative humidity	No condensing	5	-	95	%RH
Isolation voltage	I/P-O/P, test 1 minute, leakage current <1mA	1500	-	-	VDC
Insulation resistance	I/P-O/P, @ 500VDC	1000	-	-	MΩ
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℃	3500	-	-	K hours
Case material	Plastic in Black, flame class UL94-V0				
Unit weight	1.4g (Typ.)				
Cooling method	Natural air				
Packing	Tube size (525x18x10mm)	43PCS			
	Carton size (542x110x155mm)	3440PCS (Total 80 Tubes)			
Unit dimensions	L x W x H	11.50× 6.00 × 10.10mm	0.453 × 0.236 × 0.398inch		

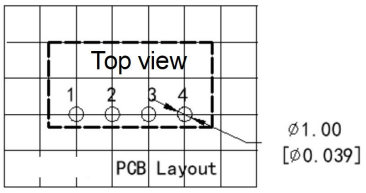
EMC Performance

Items		Test Standard	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	Air±8kV, Contact±6kV Perf.Criteria B

Mechanical Dimensions



Mechanical Outline Drawing



PCB layout vertical view
Grid 2.54×2.54 [0.10×0.10]

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

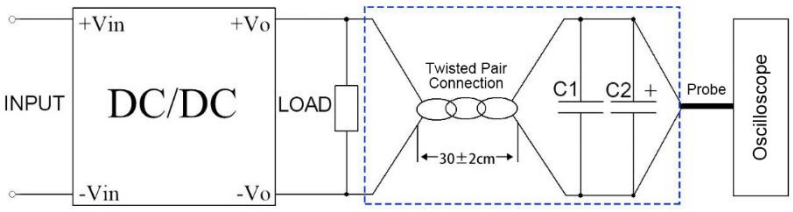
Recommended PCB Layout

Pin-out Function Description

Pin No.	1	2	3	4
Single(S)	GND	+Vin	-Vo	+Vo
Description	Input Negative	Input Positive	Output Negative	Output Positive

Note: In case of any discrepancy between the pin definitions in this datasheet and the product label, the marking on the actual product shall prevail.

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



1、 Ripple noise is measured using a #12 twisted pair cable. Set the oscilloscope bandwidth to 20MHz with 100M bandwidth. Remove the probe cap and ground clip. Connect C1 (0.1μF polypropylene capacitor) and C2 (10μF high-frequency low-ESR electrolytic capacitor) in parallel at the probe end. Use the Sample mode for oscilloscope sampling.

2. Output Ripple Noise Test Diagram: Connect the power supply input to the input power source. The power supply output connects to the electronic load via the fixture board. For testing, use a 30cm±2cm sampling lead to directly sample from the power supply output port. Select insulated wires with appropriate wire gauges based on the output current.

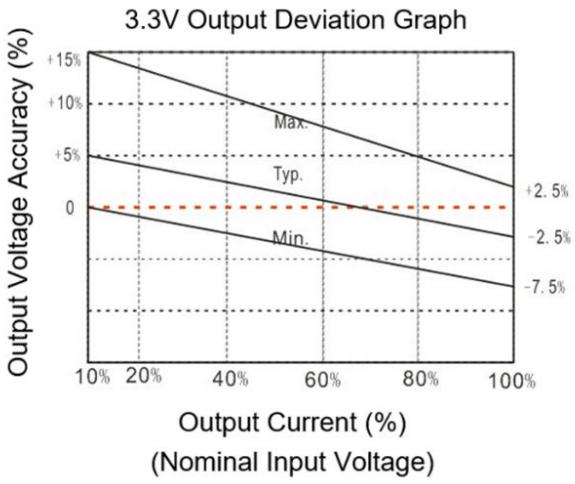
Application Reference:

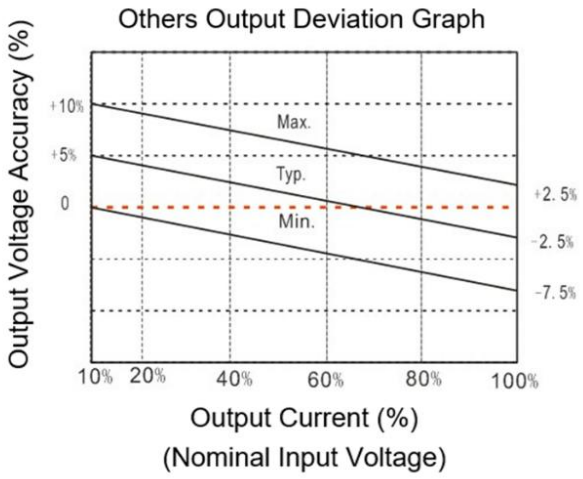
1. Max. Capacitive Load values are obtained under pure resistive full-load Test Conditions;

2. Minimum 10% load or connection of a high-frequency, low-ESR electrolytic capacitor (≥100μF) is recommended to prevent increased output voltage ripple and noise;

3. Our company offers complete power supply solutions or product customization. Due to space limitations, please contact our relevant personnel for any other inquiries.

Product Characteristics Graphs





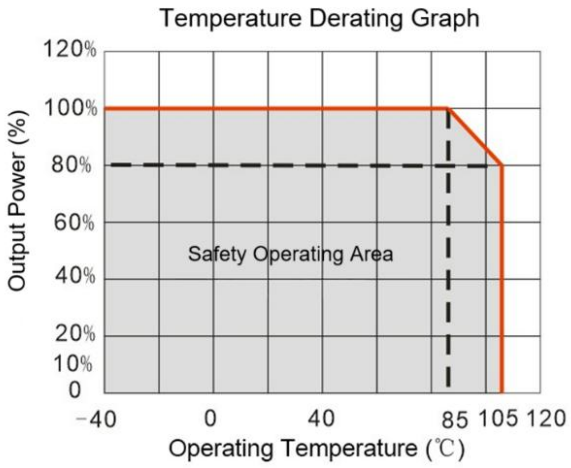


Figure 2

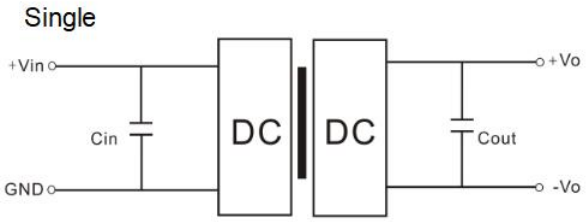
Recommended Circuits for Application

➢ **Output Load Requirements**

a. To ensure efficient and reliable operation of this power module, the minimum load should not fall below 10% of the rated resistive load. If your actual power requirement is significantly lower, connect a resistor equivalent to 10% of the rated load in parallel at the output terminal.

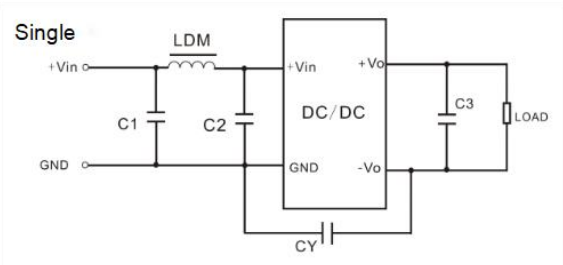
b. The Max. Capacitive Load is determined by nominal full-load testing. Do not exceed the Max. Capacitive Load at the output terminals during use, as this may cause startup difficulties and potentially damage the product.

➢ **Recommended Circuit** To effectively reduce input/output ripple and noise, connect a Capacitor Filter to the input and output terminals. Refer to the chart in below



Recommended Capacitive Load Values (Table 1)			
Vin(Vdc)	Cin	Vout(Vdc)	Cout
3.3	10μF/16V	3.3	10μF/16V
5	10μF/16V	5	10μF/16V
9	4.7μF/16V	9	2.2μF/25V
12	2.2μF/25V	12	2.2μF/25V
15	2.2μF/25V	15	2.2μF/25V
18	2.2μF25V	18	2.2μF/25V
24	1μF/50V	24	1μF/50V

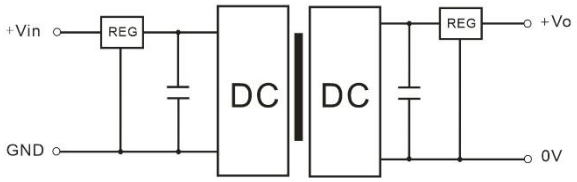
➢ **Recommended EMC circuit diagram**



Input Voltage (Single)		3.3/5Vdc	12/15/18/24Vdc
EMI	C1/C2	4.7μF/16V	4.7μF/50V
	CY	270pF/2KVdc	270pF/2KVdc
	C3	Refer to Cout value in Table 1	
	LDM	6.8μH	6.8μH

➢ **Output Regulation and Over-voltage Protection Circuit**

The simplest method for output regulation, over-voltage, and over-current protection is to connect a linear regulator with built-in thermal protection in series with the input or output, accompanied by a capacitive filter network (see diagram below). For recommended filter capacitor values, please refer to Table 1. Select a linear regulator appropriate for your specific voltage and current requirements, or choose our FW Series products.



Application Notice

1. This product cannot be used in parallel and does not support Hot Plug;
2. The product must be used within its specified parameters; otherwise, permanent damage may occur.
3. When operating below the minimum required load, product performance cannot be guaranteed to meet all Performance Specifications outlined in this manual;
4. If the product operates beyond its load range, compliance with all Performance Specifications in this manual cannot be guaranteed;
5. Unless otherwise specified, all data above is measured at Ta=25°C, humidity <75%, Nominal Input Voltage, and rated output load (resistive load);
6. All testing methods for the above specifications comply with our company's standards;
7. The Performance Specifications listed above apply to the product models specified in this manual. Non-standard models may exceed certain requirements; please contact our technical personnel directly for specific details.
8. Customized products are available upon request.

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