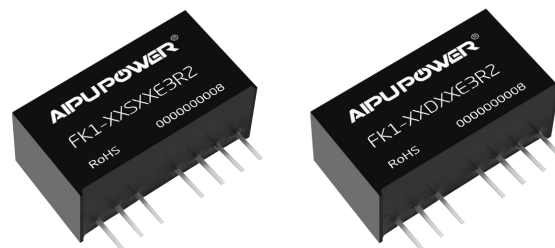


Typical Features

- ◆ Wide input voltage range (2:1), output power 1W
- ◆ Efficiency up to 80% (Typ.)
- ◆ With ON/OFF Control function
- ◆ Continuous short circuit protection, self-recovery
- ◆ Isolation voltage 3000VDC
- ◆ Operating temperature from -40℃ to +85℃
- ◆ 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)	Full Load	No Load		Min	Typ.
-	FK1-05S3V3E3R2	5	4.5 - 9	3.3	303	294	53	2200	66	68
-	FK1-05S05E3R2			5	200	278	38	2200	70	72
-	FK1-05S09E3R2			9	111	270	54	1000	72	74
-	FK1-05S12E3R2			12	83	262	39	1000	74	76
-	FK1-05S15E3R2			15	67	268	50	680	73	75
-	FK1-05S24E3R2			24	42	276	67	330	71	73
-	FK1-05D3V3E3R2			±3.3	±151	294	47	±470	66	68
-	FK1-05D05E3R2			±5	±100	278	47	±470	70	72
-	FK1-05D12E3R2			±12	±42	262	41	±220	74	76
-	FK1-05D15E3R2			±15	±33	268	51	±150	73	75
-	FK1-05D24E3R2			±24	±21	276	67	±100	71	73
-	FK1-12S3V3E3R2	12	9 - 18	3.3	303	113	15	2200	72	74
-	FK1-12S05E3R2			5	200	108	15	2200	75	77
-	FK1-12S12E3R2			12	83	106	18	1000	76	78
-	FK1-12S15E3R2			15	67	105	25	680	78	80
-	FK1-12S24E3R2			24	42	111	29	330	74	76
-	FK1-12D3V3E3R2			±3.3	±151	113	12	±470	72	74
-	FK1-12D05E3R2			±5	±100	108	12	±470	75	77
-	FK1-12D12E3R2			±12	±42	106	17	±220	76	78
-	FK1-12D15E3R2			±15	±33	105	22	±150	78	80
-	FK1-12D24E3R2			±24	±21	111	22	±100	74	76

-	FK1-24S3V3E3R2	24	18 - 36	3.3	303	56	12	2200	72	74
-	FK1-24S05E3R2			5	200	54	10	2200	75	77
-	FK1-24S12E3R2			12	83	53	10	1000	76	78
-	FK1-24S15E3R2			15	67	54	10	680	76	78
-	FK1-24S24E3R2			24	42	55	11	330	75	77
-	FK1-24D3V3E3R2			±3.3	±151	56	10	±470	72	74
-	FK1-24D05E3R2			±5	±100	54	10	±470	75	77
-	FK1-24D12E3R2			±12	±42	53	11	±220	76	78
-	FK1-24D15E3R2			±15	±33	54	12	±150	76	78
-	FK1-24D24E3R2			±24	±21	55	12	±100	75	77
-	*FK1-48S3V3E3R2	48	36 - 75	3.3	303	29	7	2200	70	72
-	*FK1-48S05E3R2			5	200	28	7	2200	73	75
-	*FK1-48S12E3R2			12	83	26	8	1000	78	80
-	*FK1-48S15E3R2			15	67	27	8	680	77	79
-	*FK1-48S24E3R2			24	42	28	8	330	74	76
-	*FK1-48D3V3E3R2			±3.3	±151	29	7	±470	70	72
-	*FK1-48D05E3R2			±5	±100	28	7	±470	73	75
-	*FK1-48D12E3R2			±12	±42	26	8	±220	78	80
-	*FK1-48D15E3R2			±15	±33	27	8	±150	77	79
-	*FK1-48D24E3R2			±24	±21	28	8	±100	74	76

Note 1: The * marked parts have been developed in process.

Note 2: 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 3: The efficiency is tested at the nominal input voltage and the rated load.

Note 4: 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.)	4.5 - 9V input	-0.7	-	16	VDC
	9 - 18V input	-0.7	-	25	
	18 - 36V input	-0.7	-	50	
	36 - 75V input	-0.7	-	100	
Start-up voltage	4.5 - 9V input	3.5	4	4.5	VDC
	9 - 18V input	4.5	8	9	
	18 - 36V input	11	16	18	
	36 - 75V input	24	33	36	
Start-up current	4.5 - 9V input	500	-	-	mA
	9 - 18V input	250	-	-	
	18 - 36V input	120	-	-	
	36 - 75V input	60	-	-	
Standby power consumption	0.5W Max.				

Input filter	Capacitor filtering	
Hot plug	Unavailable	
ON/OFF Control (Ctrl)	Turn ON the converter	Ctrl terminal No connection or connected to high impedance
	Turn OFF the converter	Ctrl terminal connected to high level (VS input GND), current through Ctrl 5-10mA

Output Specifications

Item	Test Condition		Min.	Typ.	Max.	Unit
Output power			0	-	1	W
Positive output voltage accuracy	Full input voltage range	10%-100% load	-	-	±2	%
		0-10% load	-	-	±3	
Negative output voltage accuracy		10%-100% load	-	-	±3	%
		0-10% load	-	-	±5	
Line voltage regulation	100% load	Positive output	-	-	±0.2	%
		Negative output	-	-	±0.5	
Load regulation	10% - 100% load	Positive output	-	-	±0.5	%
		Negative output	-	-	±3	
Cross regulation	Dual output, +Vo 50% load, -Vo 25%-100% load		-	-	±5	%
Transient response deviation	25% load step change		-	±3	±5	%
Transient recovery time			-	300	500	uS
Temperature drift coefficient	100% load		-	-	±0.03	%/°C
Ripple & Noise	0%-100% load, 20MHz bandwidth	±12V, ±15V, ±24V output	-	100	150	mVp-p
		Others	-	50	100	
Over current protection	Full input voltage range		150	-	300	%Io
Short circuit protection	Continuous protection, self-recovery					

Note 1: Dual output loads imbalance: ±5%

Note 2: The Ripple & Noise is tested by the Twisted Pair Method, please refer to the following test instruction.

General Specifications

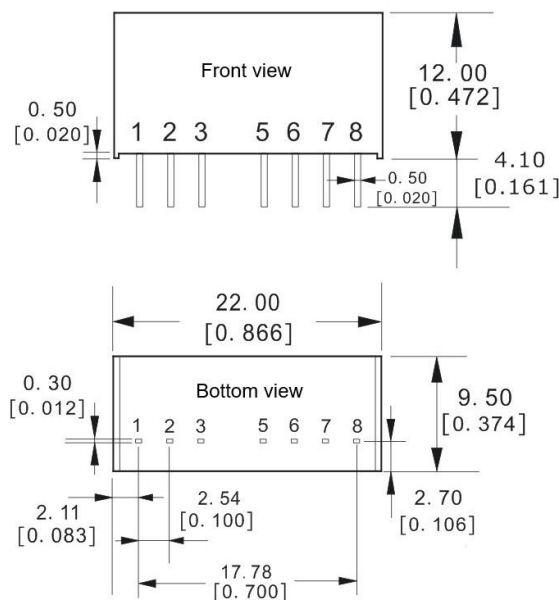
Item	Test Condition		Min.	Typ.	Max.	Unit
Switching frequency	Nominal input voltage, full load		-	330	-	KHz
Operating temperature	Refer to the Temperature Derating Graph		-40	-	+85	°C
Storage temperature			-55	-	+125	°C
Case temperature rise	Ta=25°C		-	30°	-	°K
Pin soldering temperature	1.5mm from the case, soldering time 10S		-	-	300	°C
Relative humidity	No condensing		5	-	95	%RH
Isolation voltage	I/P-O/P	Test 1 minute, leakage current <1mA	3000	-	-	VDC
Insulation resistance	I/P-O/P	@ 500VDC	1000	-	-	MΩ
Isolation capacitance	I/P-O/P	100KHz/0.1V	-	50	-	pF
MTBF	MIL-HDBK-217F@25°C		1000	-	-	K hours
Vibration	10-150Hz, 5G, 30 Min. along X, Y and Z					

Case material	Plastic in Black, flame class UL94-V0		
Unit weight	4.5g (Typ.)		
Cooling method	Natural air		
Packing	Tube size (525x12.5x20mm)	22PCS/Tube	
	Carton size (542x110x155mm)	1232PCS/Carton (Total 56 Tubes)	
Unit dimensions	L x W x H	22.00× 9.50 × 12.00 mm	0.866 × 0.374 × 0.472 inch

EMC Performance

Item		Test Standard	Performance/Class
EMI	CE	CISPR32/EN55032	Class B (with the recommended EMC circuit part ②)
	RE	CISPR32/EN55032	Class B (with the recommended EMC circuit part ②)
EMS	ESD	IEC/EN61000-4-2	Contact ±4kV perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A
	EFT	IEC/EN61000-4-4	±2kV perf. Criteria B (with the recommended EMC circuit part ①)
	Surge	IEC/EN61000-4-5	Line to line ±2kV perf. Criteria B (with the recommended EMC circuit part ①)
	CS	IEC/EN61000-4-6	3 Vr.m.s perf. Criteria A
	Voltage dips & short interruptions	IEC/EN61000-4-29	0%, 70% perf. Criteria B

Mechanical Dimensions



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

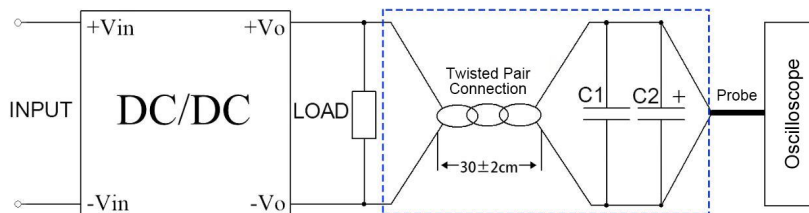
Pin-out Function Description

Pin No.	1	2	3	4	5	6	7	8
Single (S)	GND	+Vin	Ctrl	NP	NC	+Vo	-Vo	CS
Dual (D)	GND	+Vin	Ctrl	NP	NC	+Vo	0V	-Vo

Note 1: NC means No Connection, NP means No Pin, CS refers to the following application instruction.

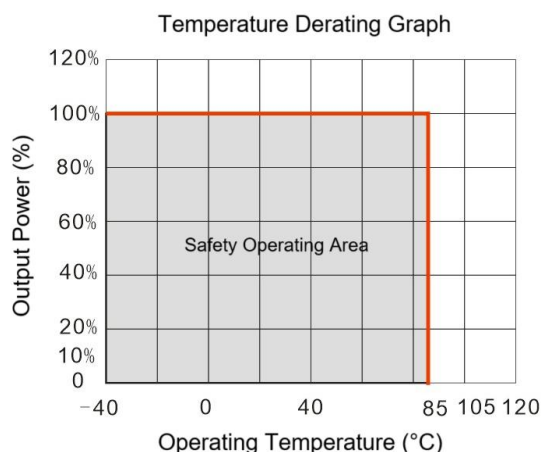
Note 2: Please take the pin definition on the product label as the right one if it is different than the data sheet description.

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±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 ≥5% load or a high frequency low impedance electrolytic capacitor (≥100uF) load to the output to avoid the output ripple increasing.

Product Characteristics Graph



Recommended Circuits for Application

1. CS Terminal

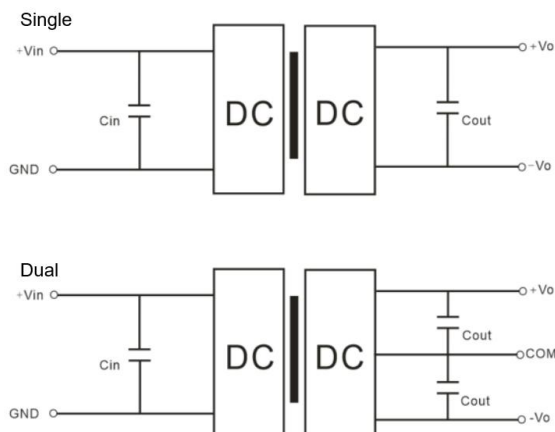
This terminal has connected with the converter internal main filtering capacitor (positive). It is recommended to use a low ESR capacitor ($\leq 47\mu\text{F}$) between CS and Pin 7 (negative) to improve the output Ripple and Noise performance.

2. Requirement for the output load

- a. To ensure efficient and reliable operation of this converter, it is recommended that the minimum load should not be lower than 5% of the rated load. If the required power is indeed low, please connect a resistor equivalent to 5% of the rated load at the output. For products with dual outputs, try to avoid significant load imbalance to guarantee the output voltage accuracy.
- b. The maximum capacitive load is measured under full-load conditions. The capacitive load must be less than the maximum value during operation, or else the converter could not start-up or be potentially damaged. If the converter could be used under no-load conditions, the capacitive load at the output should be minimized as much as possible, or a resistor equivalent to 5% of the rated load should be used at the output. Otherwise, output voltage instability or deviation from the specified accuracy range may occur.

3. Typical application circuits

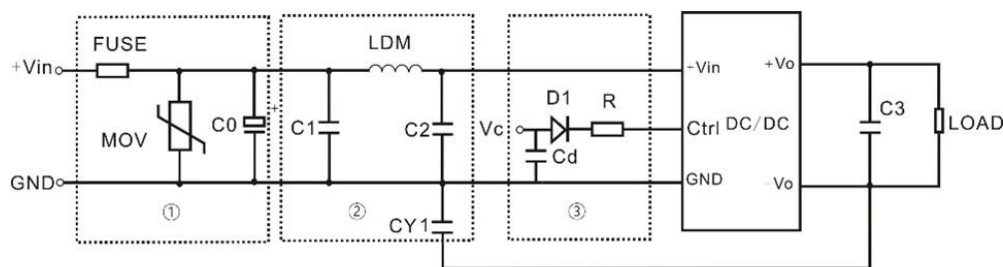
To ensure effectively decrease the input and output ripple and noise, a capacitor filtering net can be used at the input and output, the application circuits are shown below. Suitable filtering capacitors should be chosen as the recommended capacitive load values in Table 1. The converter could not start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



Recommended Capacitive Load Values (Table 1)

Vin (Vdc)	Cin	Single Vout (Vdc)	Cout	Dual Vout (Vdc)	Cout
5	10uF/16V	3.3	10uF/16V	±3.3	4.7uF/16V
12	2.2uF/50V	5	10uF/16V	±5	4.7uF/16V
24	2.2uF/50V	9	2.2uF/25V	±9	2.2uF/25V
48	1uF/100V	12	2.2uF/25V	±12	1uF/50V
-	-	15	1uF/50V	±15	1uF/50V
-	-	24	1uF/50V	±24	0.47uF/50V

4. Recommended EMC circuit diagram



Note: The part ① circuit is for EMS test, part ② for EMI filtering, part ③ for ON/OFF control, all can be adjusted according to the actual situation.

	5V/12V input	24V input	48V input
FUSE	TBD by the actual input current		
MOV	14D330K	14D470K	14D101K
C0	1000uF/25V	330uF/50V	330uF/100V
C1, C2	4.7uF/50V	4.7uF/50V	4.7uF/100V
LDM	12uH		
C3	Refer to the recommended Table 1		
CY1	1nF/3KV		
D1	Anti-reverse diode, RB160M, 1A/60V		
Cd	100nF/100V		
R	Current-limiting resistor of Ctrl, see below calculating formula		

5. ON/OFF Control (Ctrl Terminal)

The converter starts with normal output when the Ctrl terminal is no connection or connected with high impedance, it can turn OFF when the Ctrl terminal is connected to high voltage level (VS input GND).

Note: The current value 5-10mA through the Ctrl can be available, the converter could be broken if the current is over the Maximum limit (for example 20mA). Below is the calculating formula for R:

$$R = \frac{V_c - V_d - 0.7}{I_c} - 330$$

V_c is the input voltage of Ctrl, V_d is the forward voltage drop of D1, 0.7V is the Triode voltage drop, 330Ω is the converter internal resistance of Ctrl terminal, I_c is the working current of Ctrl.

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 Ta=25℃, 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>