

DC-DC Converter
FK3-XXXXXE3
Series

◆ Plastic case, flame class UL94-V0

Application Field

Typical Product List

Certificate	Part No.			(Vo/Io)		@nominal volt.		Load	nominal volt.	
		Nominal (VDC)	Range (VDC)	Vo (VDC)	Io (mA)	Full Load	No Load	(uF)	Min	Typ.
-	FK3-05S3V3E3R2	5	4.5 - 9	3.3	758	735	53	2200	66	68
-	FK3-05S05E3R2			5	600	801	38	2200	73	75
-	FK3-05S09E3R2			9	333	769	54	1000	72	74
-	FK3-05S12E3R2			12	250	763	39	1000	77	79
-	FK3-05S15E3R2			15	200	829	50	680	74	76
-	FK3-05S24E3R2			24	125	769	67	330	74	76
-	FK3-05D3V3E3R2			±3.3	±379	735	47	±470	66	68
-	FK3-05D05E3R2			±5	±300	811	47	±470	72	74
-	FK3-05D12E3R2			±12	±125	807	41	±220	72	74
-	FK3-05D15E3R2			±15	±100	876	51	±150	74	76
-	FK3-05D24E3R2			±24	±62.5	876	67	±100	74	76
-	FK3-12S3V3E3R2	12	9 - 18	3.3	758	275	15	2200	70	72
-	FK3-12S05E3R2			5	600	316	15	2200	77	79
-	FK3-12S12E3R2			12	250	306	18	1000	80	82
-	FK3-12S15E3R2			15	200	314	25	680	80	82
-	FK3-12S24E3R2			24	125	313	29	330	79	81
-	FK3-12D3V3E3R2			±3.3	±379	282	12	±470	72	74
-	FK3-12D05E3R2			±5	±300	316	12	±470	77	79
-	FK3-12D12E3R2			±12	±125	302	17	±220	81	83
-	FK3-12D15E3R2			±15	±100	313	22	±150	78	80
-	FK3-12D24E3R2			±24	±62.5	313	22	±100	78	80
-	FK3-24S3V3E3R2			3.3	758	140	12	2200	72	74
-	FK3-24S05E3R2			5	600	157	10	2200	76	78

-	FK3-24S09E3R2	24	18 - 36	9	333	156	10	1000	78	80
-	FK3-24S12E3R2			12	250	152	10	1000	81	83
-	FK3-24S15E3R2			15	200	148	10	680	84	86
-	FK3-24S24E3R2			24	125	146	11	330	84	86
-	FK3-24D3V3E3R2			±3.3	±379	141	10	±470	72	74
-	FK3-24D05E3R2			±5	±300	156	10	±470	78	80
-	FK3-24D09E3R2			±9	±167	156	10	±220	78	80
-	FK3-24D12E3R2			±12	±125	141	11	±220	83	85
-	FK3-24D15E3R2			±15	±100	144	12	±150	84	86
-	FK3-24D24E3R2			±24	±62.5	144	12	±100	84	86
-	*FK3-48S3V3E3R2	48	36 - 75	3.3	758	73	7	2200	70	72
-	*FK3-48S05E3R2			5	600	77	7	2200	80	82
-	*FK3-48S12E3R2			12	250	74	8	1000	84	86
-	*FK3-48S15E3R2			15	200	78	8	680	82	84
-	*FK3-48S24E3R2			24	125	74	8	330	84	86
-	*FK3-48D3V3E3R2			±3.3	±379	70	7	±470	72	74
-	*FK3-48D05E3R2			±5	±300	82	7	±470	77	79
-	*FK3-48D12E3R2			±12	±125	78	8	±220	80	82
-	*FK3-48D15E3R2			±15	±100	78	8	±150	80	82
-	*FK3-48D24E3R2			±24	±62.5	78	8	±100	80	82

Note 1: The max capacitive load is the capacitance allowed when the power supply starts up at full load. The converter may not start if the output 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.

Note 4: The * marked parts have been developed in process.

Input Specifications

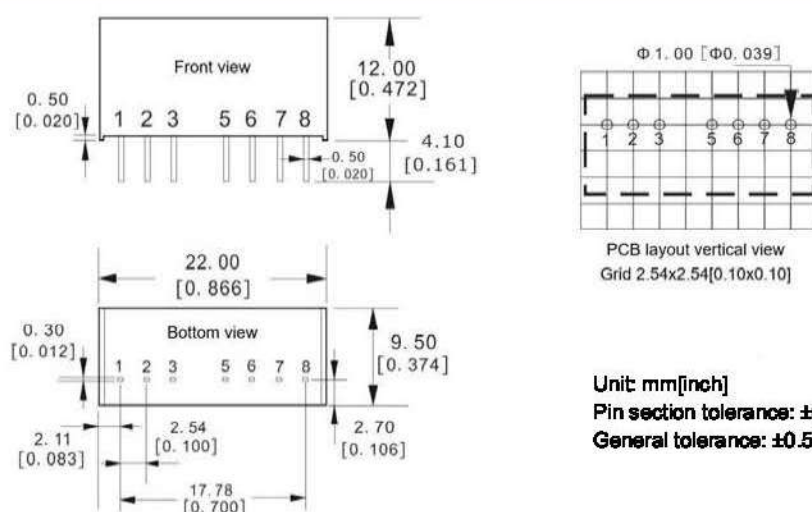
Item	Test Condition	Min.	Typ.	Max.	Unit
Input inrush voltage (1Sec max.)	4.5-9V input	-0.7	-	16	VDC
	9-18V input	-0.7	-	25	VDC
	18-36V input	-0.7	-	50	VDC
	36-75V input	-0.7	-	100	VDC
Start-up voltage	4.5-9V input	3.5	4	4.5	VDC
	9-18V input	4.5	8	9	VDC
	18-36V input	11	16	18	VDC
	36-75V input	24	33	36	VDC
Start-up current	4.5-9V input	1.5	-	-	A
	9-18V input	0.8	-	-	A
	18-36V input	0.4	-	-	A
	36-75V input	0.2	-	-	A
No load power consumption	0.5W Max.				
Input filter	Capacitor filter				
Hot plug	Unavailable				

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)
	RE	CISPR32/EN55032	Class B (with the Recommended EMC circuit)
EMS	ESD	IEC/EN61000-4-2	Contact ±4kV perf. Criteria B

Mechanical Dimensions



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

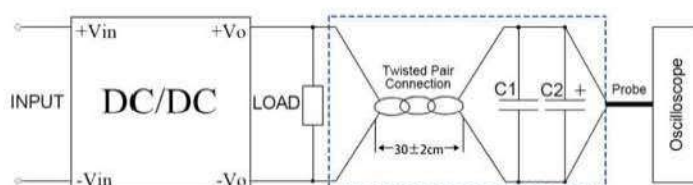
Pin-out Function Description

Pin No.	1	2	3	4	5	6	7	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.

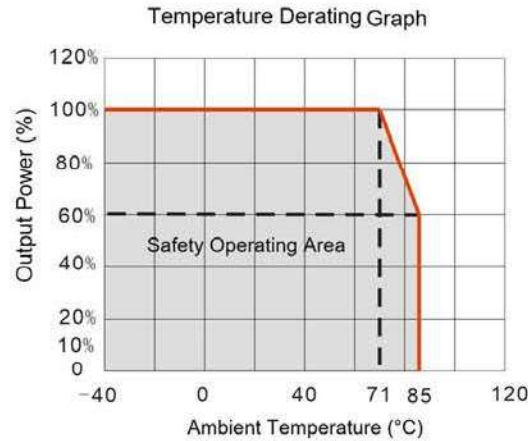
Ripple & Noise Test Instruction (Twisted Pair Method, 20MHZ bandwidth)



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 use a ≥5% load or a high-frequency low impedance electrolytic capacitor (≥100μF) load at the output to avoid the output ripple increasing.

Product Characteristics Graph



Recommended Circuits for Application

1. CS Terminal

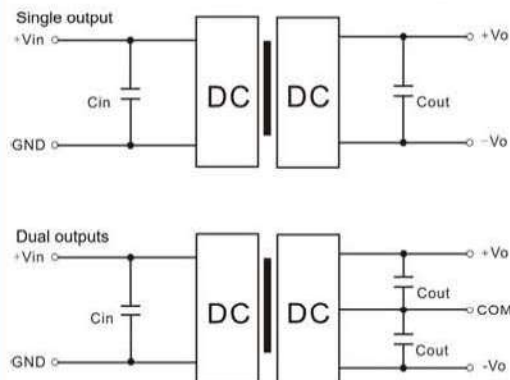
This terminal has connected with the converter internal main filter capacitor (positive). It is recommended to use a low ESR capacitor ($\leq 47\mu\text{F}$) between CS and Pin 7 (negative) to improve the output Ripple and Noise performance.

2. Requirement for the output load

- To ensure the converter operating efficiently and reliably, its minimum load should not be less than 5% of the rated load. Dual output loads should be balanced in $\pm 5\%$ or else the output voltage accuracy could be out of the range.
- The maximum capacitive load is tested at the full load. The converter may not start or be damaged at the capacitive over-load. It is recommended to use a resistor (equal to 5% load) at the output or decrease the output capacitive load when the converter will work with no load, or else the output voltage will be unstable or out of the voltage accuracy range.

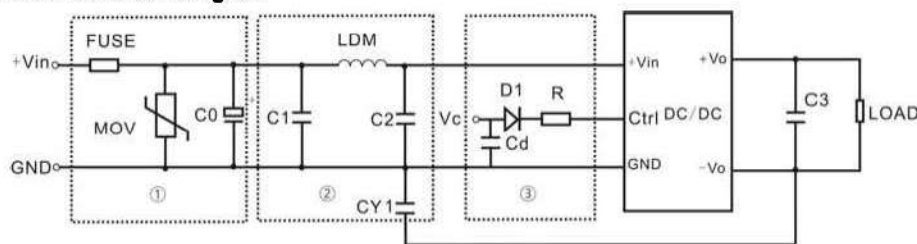
3. Typical application circuits

To ensure effectively decrease the input and output ripple and noise, a capacitor filter net can be connected 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 may 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	10μF/16V	3.3	10μF/16V	±3.3	4.7μF/16V
12	2.2μF/50V	5	10μF/16V	±5	4.7μF/16V
24	2.2μF/50V	9	2.2μF/25V	±9	2.2μF/25V
48	1μF/100V	12	2.2μF/25V	±12	1μF/50V
-	-	15	1μF/50V	±15	1μF/50V
-	-	24	1μF/50V	±24	0.47μF/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.

Vin	5V/12V	24V	48V
FUSE	TBD by the actual input current		
MOV	14D330K	14D470K	14D101K
C0	680uF/25V	330uF/50V	220uF/100V
C1, C2	4.7uF/50V	4.7uF/50V	4.7uF/100V
LDM	12uH		
C3	Refer to the Recommended Capacitive Load Values (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

The converter starts with normal output when the Ctrl terminal is no connection or connected with high impedance, it will be turn OFF when the Ctrl terminal is connected to high voltage level (VS 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:

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

Vc is the input voltage of Ctrl, Vd is the forward voltage drop of D1, 0.7V is the Triode voltage drop, 330Ω is the internal resistance of the Ctrl, Ic 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 the 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.

ON/OFF control (Ctrl)	Turn ON the converter	Ctrl no connection or connected to high impedance
	Turn OFF the converter	Ctrl connected to high voltage level, current 5-10mA

Note: The voltage of Ctrl is relative to the input GND.

Output Specifications

Item	Test Condition		Min.	Typ.	Max.	Unit
Output power			0.15	-	3	W
Positive output voltage accuracy	Full input voltage range	10%-100% load	-	-	±2	%
		0%-10% load	-	-	±3	%
Negative output voltage accuracy	Full input voltage range	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 with 50% load, -Vo with 25%-100% load		-	-	±5	%
Transient response deviation	25% load change step		-	±3	±5	%
Transient recovery time			-	300	500	μS
Temperature drift coefficient	100% load		-	-	±0.03	%/°C
Ripple & Noise	5%-100% load, 20MHz bandwidth	±12, ±15, ±24 output	-	100	150	mVp-p
		Others	-	50	100	
Over current protection	Full input voltage range		150	-	300	%Io
Short circuit protection	Continuous, 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°	-	°C
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	-	120	-	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.)					