DC-DC Converter
FK1-XXXXXE3 Series

Typical Features

- ◆ Wide input voltage range (2:1),Output Power 1W
- ◆ Transfer Efficiency up to 86%
- ◆ With remote shutdown function
- ◆ Continuous Short Circuit protection, Self-recovery
- ◆ No overshoot when switching on and off
- ◆ Isolation Voltage 3000 VDC
- ◆ Operating Temperature: -40°C~+85°C
- ◆ Plastic case, meets UL94-V0 requirements

Test conditions: Unless otherwise specified, all parameters are tested at nominal input voltage, pure resistive rated load and 25℃ room temperature.

Application Field

Widely used in instrumentation, communications, pure digital circuits, general low-frequency analog circuits, relay drive circuits, data exchange circuits and other fields.

Typical Product List

Part no.	Input Voltage Range (VDC)		Output Voltage/Current (Vo/Io)		Input Current (mA) (Nominal Voltage)		Max. Capacitive Load	Ripple & Noise Max	Efficiency (%)output full load, I/P nominal voltage	
	Nominal	Range	Voltage (VDC)	Current (mA) Max/Min	Full load typ.	No Load typ.	uF	mVp-p	Min.	Typ.
FK1-05S05E3	5	4.5 - 9	5	200	264	24	3000	100	74	76
FK1-05S12E3			12	83	270	32	680	100	72	74
FK1-05S15E3			15	67	288	66	1000	100	67	69
FK1-12S3V3E3	12	9 - 18	3.3	303	115	15	2200	100	73	75
FK1-12S05E3			5	200	105	12	2200	100	78	80
FK1-12S12E3			12	83	102	16	1000	100	80	82
FK1-12S15E3			15	67	104	15	470	100	78	80
FK1-24S3V3E3	24	18 - 36	3.3	303	57	10	2200	100	74	76
FK1-24S05E3			5	200	52	10	2200	100	79	81
FK1-24S12E3			12	83	52	10	680	100	78	80
FK1-24S15E3			15	67	49	10	1000	100	84	86
FK1-24S24E3			24	42	56	10	680	100	76	78
FK1-48S05E3	48	36 - 75	5	200	28	5	2200	100	76	78
FK1-48S12E3			12	83	25	5	680	100	80	82
FK1-48S15E3			15	67	25	5	470	100	80	82
FK1-05D05E3	5	4.5 - 9	±5	±100	268	26	1000	100	72	74

FK1-05D12E3			±12	±42	271	40	680	100	72	74
FK1-05D15E3			±15	±33	280	49	470	100	69	71
FK1-12D05E3	12	9 - 18	±5	±100	108	14	1000	100	75	77
FK1-12D12E3			±12	±42	106	20	680	100	78	80
FK1-12D15E3			±15	±33	103	20	470	100	78	80
FK1-24D05E3	24	18 - 36	±5	±100	55	10	1000	100	75	77
FK1-24D12E3			±12	±42	52	10	470	100	78	80
FK1-24D15E3			±15	±33	50	10	470	100	82	84
FK1-48D05E3	48	36 - 75	±5	±100	26	5	1000	100	78	80
FK1-48D12E3			±12	±42	27	5	680	100	79	81
FK1-48D15E3			±15	±34	25	5	330	100	80	82

1. "*" indicates a model under development;
2. In order to ensure that the module can work efficiently and reliably, its minimum output load cannot be less than 10% of the rated load when in use. If the power you need is indeed small, please connect a resistor in parallel at the output end. The recommended resistance value is equivalent to 10% of the rated power.
3. The capacitive load of the positive and negative outputs is the same.

Input Specification

Item	Working Condition	Min.	Typ.	Max.	Unit
Maximum input surge voltage (1 second)	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	
Standby power	0.3W (Max.)				
Input Filter	capacitor filter				

Output Specification

Positive output voltage accuracy Accuracy	Full voltage full load	+Vo	≤±2.0%
Negative output voltage accuracy		-Vo	≤±3.0%
No-load output voltage accuracy		Vo	Main Road：≤±3.0% Auxiliary Road：≤±5.0%
Voltage Regulation	Nominal load, full voltage range	Vo	Main Road：≤±0.2% Auxiliary Road：≤±0.5%

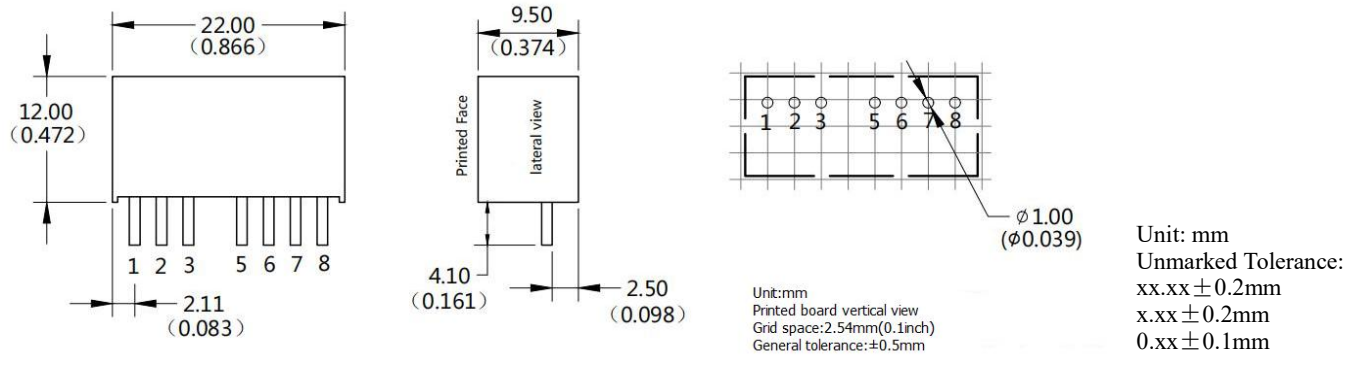
Load regulation	10% ~ 100% nominal load	Vo	Main Road：≤±0.5% Auxiliary Road：≤±0.75%
Cross regulation	Dual output, main output 50% load, auxiliary output 10% to 100% load		≤±5.0%
Ripple & Noise*	Nominal load, nominal voltage, Twisted Pair Test Method,		≤100mVp-p (20MHz Bandwidth)
Temperature drift coefficient	100% full load		±0.03%/℃
Dynamic Response	25% of nominal load step	△Vo/△t	≤±5.0%/0.5ms(Typ.)
Output short circuit protection	Continuous, self-recovery		

Note: 1. Dual output module load imbalance: ±5%;
2. * Ripple & noise test uses twisted pair method, see design and application circuit reference for details.

General Specification

Switching Frequency	Typical	250KHz (Typ.)
Operating Temperature	Refer to Temperature Derating Curve	-40℃ ~ +85℃
Storage Temperature	-	-55℃ ~ +125℃
Max Case Temperature	Within Temperature Derating Curve	+105℃
Relative Humidity	No condensing	5%~95%
Case Material		Black flame-retardant and heat-resistant plastic
Pin resistance soldering temperature	The distance between the soldering point and the shell is 1.5mm, 10 seconds	300℃ MAX
Isolation Voltage	Input to Output	3000Vdc ≤ 0.5mA / 1min
MTBF	MIL-HDBK-217F@25℃	2X10^{5}Hrs
Product Weight	--	4.5g（Typ.）
Packing Method	Single-tube （225*20.5*12.5mm）	9PCS
	Single box （245*155*85mm）	432PCS（Total 48 tubes）

Packing Dimension



Packing Code	L x W x H	
E	22X 9.5X12 mm	0.866X0.374X0.472inch

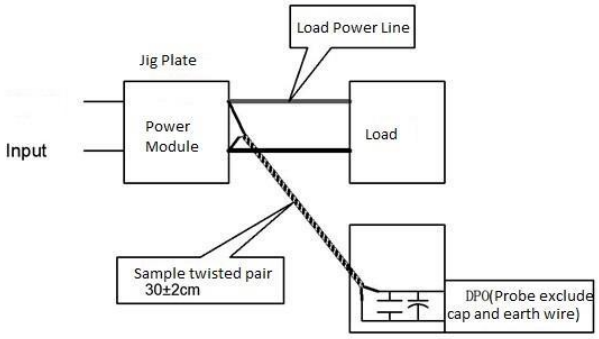
Pin out Specifications

Single	1	2	3	4	5	6	7	8
	GND	+Vin	Ctrl	NP	NC	+Vo	0V	CS
Dual	1	2	3	4	5	6	7	8
	GND	+Vin	Ctrl	NP	NC	+Vo	0V	-Vo

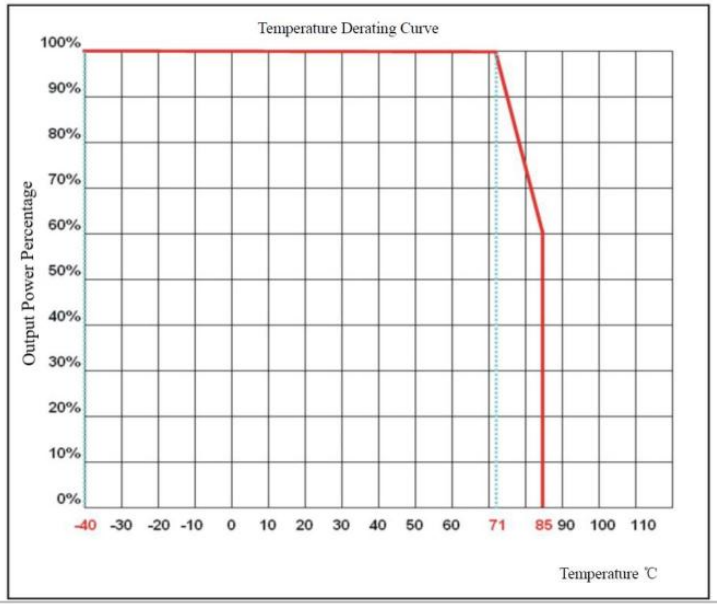
Note: If the pin definitions of the power module are inconsistent with those in the selection manual, the markings on the actual label shall prevail.

Ripple& Noise Test:（Twisted Pair Test Method 20MHz bandwidth）

1.12# twisted pair to connect, Oscilloscope bandwidth set as 20MHz, 100M bandwidth probe, terminated with 0.1uF polypropylene capacitor and 10uF high frequency low resistance electrolytic capacitor in parallel, oscilloscope set as Sample pattern.
2. Output Ripple& Noise Test Method:
Input terminal connect to power supply, output terminal connect to electronic load through jig plate, Use 30cm±2 cm sampling line, Power line selected from corresponding diameter wire with insulation according to the flow of output current.



Product characteristic curve



Design reference application

①CS terminal

This terminal provides a connection point for connecting the main filter capacitor inside the output end of the DC/DC converter (connected to the positive electrode of the capacitor). By connecting a low ESR capacitor between this terminal and the 7th pin terminal (connected to the negative electrode of the capacitor), the output ripple and noise can be further improved (generally CS≤ 47uF).

②Output load requirements

a. In order to ensure that the power module can work efficiently and reliably, it is recommended that its minimum load should not be less than 10% of the rated resistive load; if the power you need is indeed small, please connect a resistor equivalent to 10% of the rated load in parallel at the output end. If using a product with positive and negative outputs, try not to have a large imbalance in the load of the two channels, otherwise the original output voltage accuracy cannot be guaranteed.

b. The maximum capacitive load of the product is obtained from the nominal full load test; if it needs to be used under no-load conditions, the capacitive load at the output end must be reduced as much as possible or a resistor equivalent to 10% of the rated load must be connected in parallel at the output end, otherwise the output voltage may be unstable or even exceed the original output voltage accuracy range.

③Recommended circuit

DC/DC test circuit: If you need to further reduce the input and output ripple, the capacitance of the external capacitor can be appropriately increased, but the maximum capacitance of the filter capacitor must be less than the maximum capacitive load, otherwise it will easily cause difficulty in starting the power module.

General recommendation: Ci: 100uF (5V&12V) / 10uF (24V&48V)

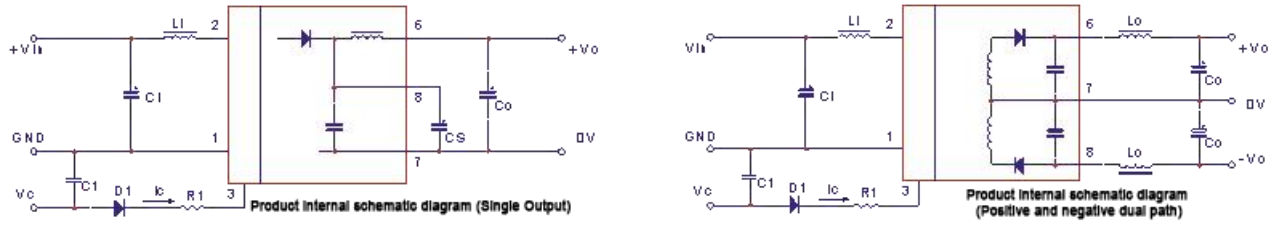
Li: 4.7uH～120uH

CS: 10uF～22uF

Co: 100uF (Typ.)

Lo: 2.2uH～10uH

C1: 47nF/100V



Single Output　　Positive and negative dual output

Picture 13

④CTRL terminal

When it is suspended or high impedance, the module outputs normally; when it is connected to a high level (relative to the input ground), the module is shut down.

Note: The current flowing into this pin should be 5-10mA. If the current exceeds its maximum value (generally 20mA), it will cause permanent damage to the module. The R value can be calculated according to the following formula:

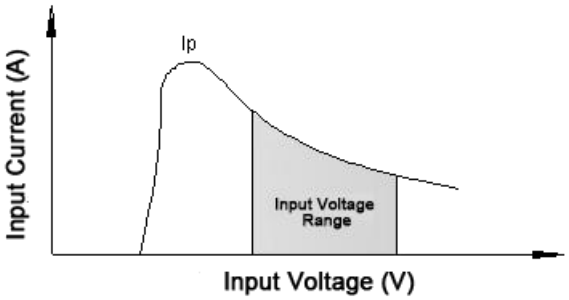
$$R = \frac{Vc - Vd - 0.7}{Ic} - 330$$ (see Picture 13)

Where Vc is the input voltage of the Ctrl pin, Vd is the forward voltage drop of D1, 0.7V and 330Ω are the voltage drop of the module transistor and the internal connection resistance of the control pin input terminal respectively, and Ic is the current flowing into the control terminal.

⑤ Input current

When using an unstable power supply, please ensure that the output voltage fluctuation range and ripple voltage of the power supply do not exceed the module's own specifications. The output current of the input power supply must be sufficient to cope with the instantaneous startup current Ip of the DC/DC module (see the figure below).

General: $Ip \leq 1.4 * Iin_{max}$



Note:

1. This product cannot be used in parallel and does not support hot swapping;
2. All indicator test methods in this article are based on our company's corporate standards;
3. Product specifications are subject to change without prior notice.