

Typical Features

- ◆ Wide input voltage range (4:1)
- ◆ Efficiency up to 88% (Typ.)
- ◆ No-load power consumption 0.12W (Typ.)
- ◆ Continuous short circuit protection, self-recovery
- ◆ Input under voltage, output short circuit, over current, over voltage protections
- ◆ Isolation voltage 3000VDC
- ◆ Operating temperature from -40°C to +105°C
- ◆ Good EMC performance
- ◆ Standard pin-out alignment



EN62368-1

Application Field

PFD6-XXS&DXXE2(C)3 Series ---- DC-DC output power 6W modular converters with 4:1 wide voltage input range, 3000VDC isolation voltage, output short circuit, over-current and over-voltage protections, operating temperature from -40°C to +105°C, and the ON/OFF Control function. This series of products can be widely used in the fields of Industrial control, Instrumentation, Communications, Electric power and Internet of Things, etc. The additional EMC circuit diagram is recommended for the application with higher EMC requirement.

Typical Product List

Certificate	Part No.	Input Voltage		Output Voltage/Current (Vo/Io)		Input Current (mA) Typ. @Nominal Volt		Max Capacitive Load	Efficiency (%) @Full load, nominal volt.	
		Nom. (VDC)	Range (VDC)	Vo (VDC)	Io (mA)	Full load	No load	(uF)	Min	Typ
CE	PFD6-18S3V3E2(C)3	24	9~36	3.3	1500/0	267	5	2200	75	77
	PFD6-18S05E2(C)3			5	1200/0	301		2200	81	83
	PFD6-18S09E2(C)3			9	667/0	298		1000	82	84
	PFD6-18S12E2(C)3			12	500/0	294		680	83	85
	PFD6-18S15E2(C)3			15	400/0	291		680	84	86
	PFD6-18S24E2(C)3			24	250/0	291		680	84	86
	PFD6-18S25E2(C)3			25	240/0	294		680	84	86
CE	PFD6-18D05E2(C)3	24	9~36	±5	600/0	305	5	1000	83	85
	PFD6-18D09E2(C)3			±9	333/0	298		330	80	82
	PFD6-18D12E2(C)3			±12	250/0	294		330	82	84
	PFD6-18D15E2(C)3			±15	200/0	291		330	83	85
	PFD6-18D18E2(C)3			±18	167/0	291		220	84	86
	PFD6-18D24E2(C)3			±24	125/0	291		220	84	86

CE	PFD6-36S3V3E2(C)3	48	18~75	3.3	1500/0	129	4	2200	78	80
	PFD6-36S05E2(C)3			5	1200/0	149		2200	82	84
	PFD6-36S09E2(C)3			9	667/0	147		1000	83	85
	PFD6-36S12E2(C)3			12	500/0	144		680	85	87
	PFD6-36S15E2(C)3			15	400/0	142		680	86	88
	PFD6-36S24E2(C)3			24	250/0	144		680	85	87
CE	PFD6-36D05E2(C)3			±5	600/0	151		1000	81	83
	PFD6-36D09E2(C)3			±9	333/0	149		330	82	84
	PFD6-36D12E2(C)3			±12	250/0	144		330	85	87
	PFD6-36D15E2(C)3			±15	200/0	142		330	86	88
	PFD6-36D24E2(C)3			±24	125/0	145		220	84	86

Note:

1. The Part number letter C indicates the part with ON/OFF Control function, N indicates NO Control function.
2. The typical value of efficiency is tested at nominal input voltage and rated load.
3. The maximum capacitive load is the capacitance allowed to be used when the power supply starts at full load. The converter may not start if the capacitor exceeds this value.
4. The control chip could work at lower frequency at no load or low load to decrease the no load power and improve the efficiency.
5. Please contact Aipu sales for other output voltages requirement in this series but not listed in this table.

Input Specifications

Item	Operating conditions	Min	Typ.	Max	Unit
Standby power consumption	Full input voltage range	/	0.12	/	W
Max input current	Full input voltage range	/	/	0.9	A
Input inrush voltage (1sec.max)	Nominal 24Vdc Input	-0.7	/	50	VDC
	Nominal 48Vdc Input	-0.7	/	100	
Start-up voltage	Nominal 24Vdc Input	/	/	9	
	Nominal 48Vdc Input	/	/	18	
Input under-voltage protection	Nominal 24Vdc Input	5.5	6.5	/	
	Nominal 48Vdc Input	12	15	/	
Reflected ripple current	Nominal input voltage	/	20	/	mA
Hot-plug	/	NA			
Input filter	/	π filter			
ON/OFF Control (Ctrl)	Turn ON the converter	Ctrl does no connection or connects to the high voltage level (3.5-12VDC)			
	Turn OFF the converter	Ctrl connects to -Vin or the low voltage level (0-1.2VDC)			
	Input current for switching OFF	/	3	/	mA

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

Output Specifications

Item	Operating conditions		Min	Typ.	Max	Unit
Output voltage accuracy	5% ~ 100% load		/	±1	±3	%
	0% ~ 5% load	Single output	/	±1	±3	
		Dual output	/	±2	±5	
Output voltage balance	Dual outputs, balanced load		/	±0.5	±1.5	
Voltage regulation	Full voltage range, full load	Positive output	/	±0.2	±0.5	
		Negative output	/	±0.5	±1	
Load regulation	5% - 100% load	Positive output	/	±0.5	±1	
		Negative output	/	±0.5	±1.5	
Ripple & Noise	0% - 100% load, 20MHz bandwidth		/	50	100	mVp-p
Dynamic response deviation	25% rated load step, nominal input voltage		/	±3	±5	%
Dynamic response time	25% rated load step, full input voltage range		/	250	500	μs
Temperature drift coefficient	/		/	/	±0.03	%/°C
Turn-on delay time	Nominal input voltage		/	10	/	mS
Over voltage protection	Full input voltage range		110	160	200	%Vo
Over current protection			110	150	260	%Io
Output overshoot			/	/	10	%Vo
Short circuit protection			Continuous, Self-recovery			

Note: The Ripple & Noise is tested by the twisted pair method (please refer to the following test instruction).

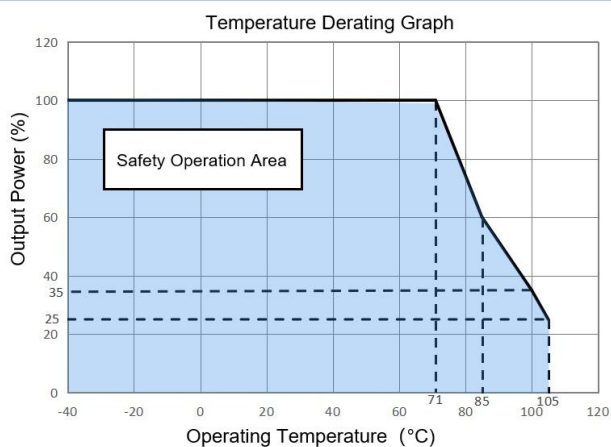
General Specifications

Item	Operating conditions		Min	Typ.	Max	Unit
Switching frequency	Operating Mode (PWM)		/	300	/	KHz
Operating temperature	Refer to Temperature Derating Graph		-40	/	+105	°C
Storage temperature	/		-55	/	+125	
Pin soldering temperature	1.5mm from the case, 10S		/	/	300	
Relative humidity	No condensing		5	/	95	%RH
Isolation voltage	Input to output, test 1min, leakage current <1mA		3000	/	/	VDC
Insulation resistance	Input to output @ 500VDC		1000	/	/	MΩ
Isolation capacitance	Input to output, 100KHz/0.1V		/	1000	/	pF
MTBF	MIL-HDBK-217F@25°C		1000	/	/	K hours
Cooling method	Nature air					
Vibration	10-150Hz, 5G, 0.75mm, along X, Y and Z					
Case material	Plastic in black, flame class UL94-V0					
Weight/Dimensions	Part No.	Weight (Typ.)	Dimensions L x W x H			
	PFD6-XXS&DXXE2(C)3	12g	31.60×20.30×10.20 mm	1.244×0.799×0.402 inch		

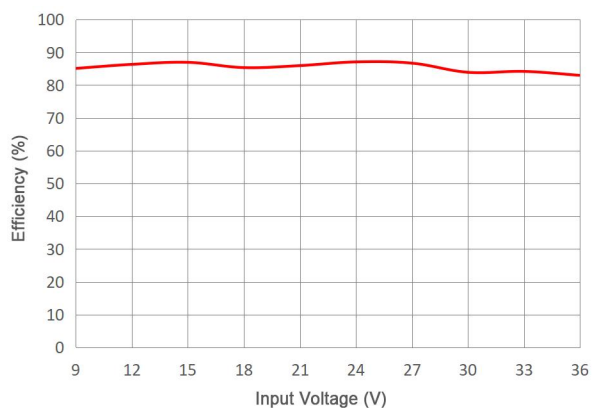
EMC Performance

Total Items		Sub items	Test standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032	CLASS B (with the Recommended EMC Circuit)
		RE	CISPR32/EN55032	CLASS B (with the Recommended EMC Circuit)
	EMS	CS	IEC/EN61000-4-6	3Vr.m.s Perf.Criteria A
		RS	IEC/EN61000-4-3	10V/m Perf.Criteria A
		ESD	IEC/EN61000-4-2	Contact ±4KV Perf.Criteria B
		Surge	IEC/EN61000-4-5	±2KV (with the Recommended EMC Circuit) Perf.Criteria B
		EFT	IEC/EN61000-4-4	±2KV (with the Recommended EMC Circuit) Perf.Criteria B

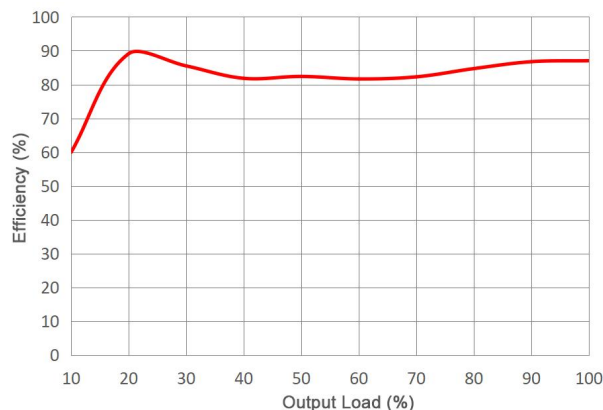
Temperature Derating & Efficiency Graphs



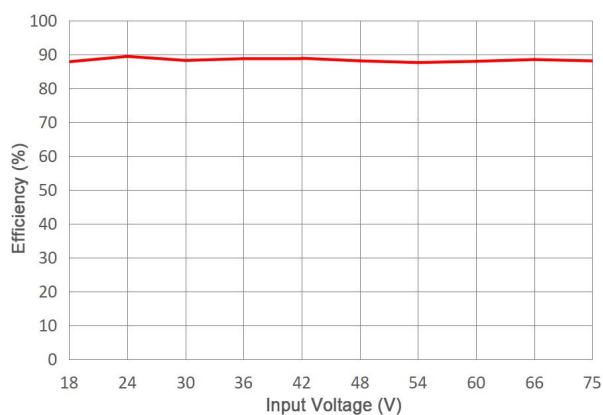
Efficiency VS Input Voltage (PFD6-18D15E2C3)



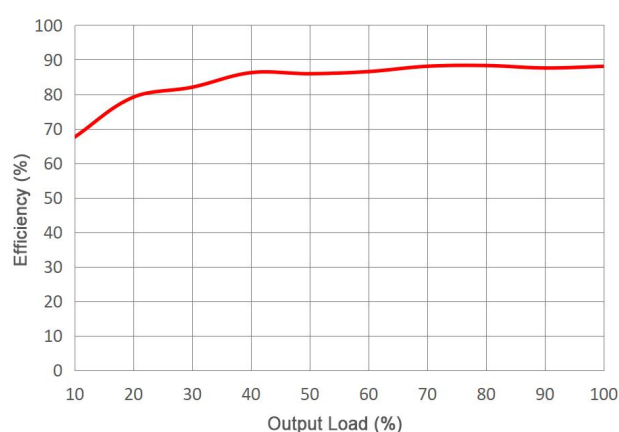
Efficiency VS Output Load (PFD6-18D15E2C3)



Efficiency VS Input Voltage (PFD6-36S12E2C3)



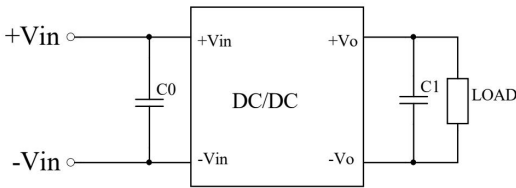
Efficiency VS Output Load (PFD6-36S12E2C3)



Recommend Circuits Diagrams for Application

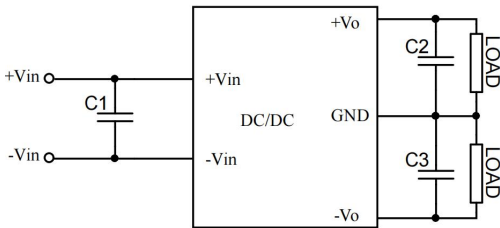
1. DC-DC test circuit diagrams

Single output



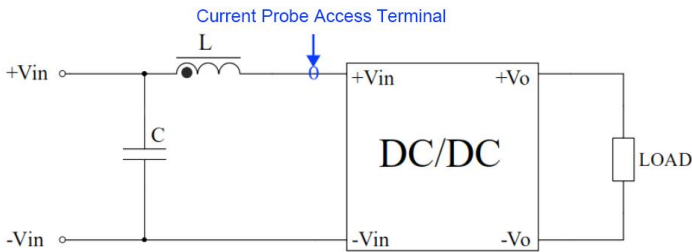
Single output	
Components	Parameters
C0	100uF/100V
C1	10uF/50V

Dual outputs



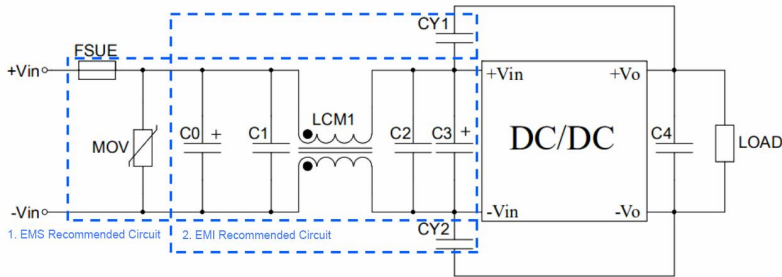
Dual outputs	
Components	Parameters
C1	100uF/100V
C2, C3	10uF/50V

2. Input reflected ripple current test circuit diagram



Components	Parameters
C	220uF/100V
L	4.7uH

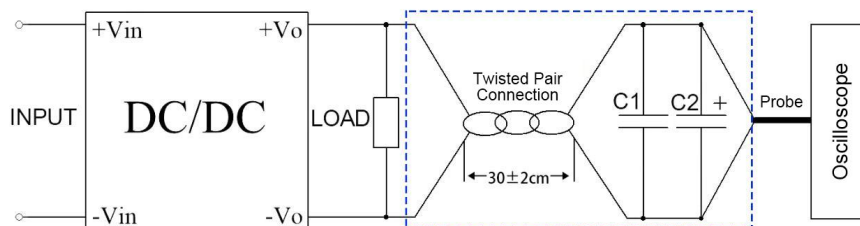
3. Recommended EMC circuit diagram



Components	Vin 24VDC	Vin 48VDC
FUSE	TBD by the customer	
MOV	10D470K	10D101K
C0, C3	330uF/50V	100uF/100V
C1, C2, C4	10uF/50V	10uF/100V
LCM1	10mH	
CY1, CY2	1nF/3KV	

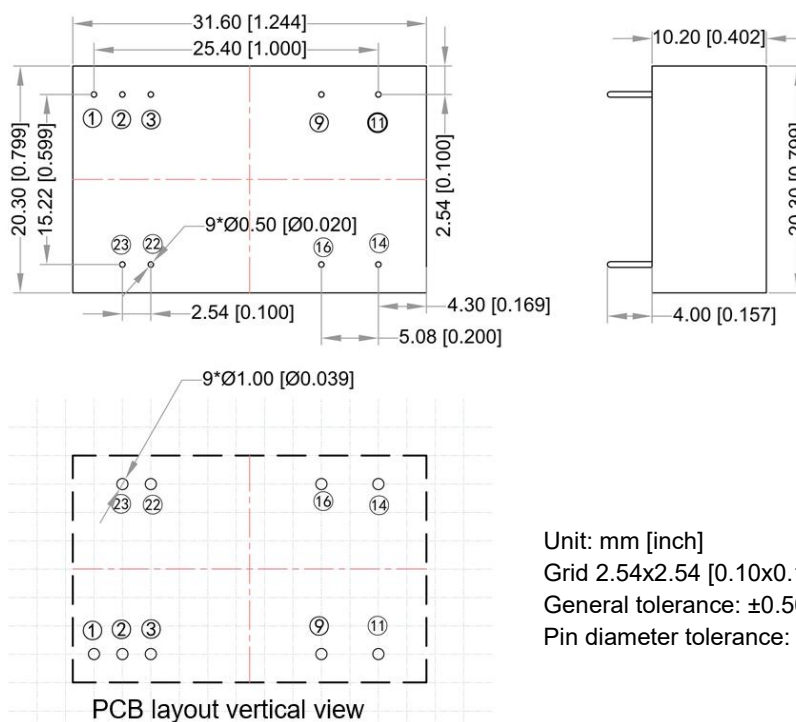
Note: Part 1 in the circuit is for EMS test, part 2 for EMI filtering, both can be adjusted according to the actual situation.

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-resistance electrolytic capacitor are connected in parallel with the probes and one side of the twisted pair.
2. The power supply output connects to the load by the cables. The other side of the twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the polarity of the output and the oscilloscope probe should not be reversed. The test can be start after input power on.
3. The maximum capacitive load is tested at full load (pure resistance load).
4. It is recommended that the load imbalance of Dual outputs should be less than ±5% deviation.

Mechanical Dimensions



Pin-out Function Description

Pin No.	1	2, 3	22, 23	14	16	9	11
PFD6-XXSXXE2C3	Ctrl	-Vin	+Vin	+Vo	GND	No Pin	No Connection
PFD6-XXSXXE2N3	No Pin	-Vin	+Vin	+Vo	GND	No Pin	No Connection
PFD6-XXDXXE2C3	Ctrl	-Vin	+Vin	+Vo	GND	GND	-Vo
PFD6-XXDXXE2N3	No Pin	-Vin	+Vin	+Vo	GND	GND	-Vo

Application notice

- 1.The products should be used according to the specifications on this datasheet, otherwise it could be permanently damaged.
2. The product performance on this datasheet cannot be guaranteed if it works at a lower load than the minimum load defined.
3. The product performance on this datasheet cannot be guaranteed if it works at over-load condition.
4. Unless otherwise specified, all values or indicators on this datasheet are tested at Ta=25°C, humidity<75%RH, nominal input voltage and rated load (pure resistance load).
5. All values or indicators on this datasheet had been tested based on Aipupower test specifications.
- 6.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.
7. Aipupower can provide customization service.

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