

FEATURES

1. Wide 2:1 input voltage range
2. High efficiency up to 88%
3. No-load power consumption as low as 0.09W
4. I/O isolation test voltage 1.5k VDC
5. Operating ambient temperature range: -40°C to +85°C
6. +85°C
7. Meets CISPR32/EN55032 CLASS A, without extra components (except for 5VDC input)
8. Input under-voltage protection, output short-circuit, over-current, over-voltage protection
9. Industry standard pin-out



3 years
Warranty

Selection Guide

Part No.	Input Voltage (VDC)		Output		Full Load Efficiency [®] (%) Min./Typ.	Capacitive Load [®] (μF)Max.
	Nominal (Range)	Max. ^①	Voltage(VDC)	Current (mA) Max./Min.		
MFA0505ZP-6WR3	5 (4.5-9)	12	±5	±600/0	76/78	1000
MFA0512ZP-6WR3			±12	±250/0	82/84	470
MFA0515ZP-6WR3			±15	±200/0	82/84	220
MFA0524ZP-6WR3			±24	±125/0	82/84	100
MFB0505ZP-6WR3			5	1200/0	76/78	1000
MFB0512ZP-6WR3			12	500/0	82/84	470
MFB0515ZP-6WR3			15	400/0	82/84	220
MFB0524ZP-6WR3			24	250/0	82/84	100
MFA1205ZP-6WR3	12 (9-18)	20	±5	±600/0	78/80	680
MFA1212ZP-6WR3			±12	±250/0	82/84	330
MFA1215ZP-6WR3			±15	±200/0	83/85	220
MFA1224ZP-6WR3			±24	±125/0	82/84	100
MFB1203ZP-6WR3			3.3	1500/0	73/75	1800
MFB1205ZP-6WR3			5	1200/0	78/80	1000
MFB1212ZP-6WR3			12	500/0	82/84	470
MFB1215ZP-6WR3			15	400/0	83/85	220
MFB1224ZP-6WR3	24	250/0	83/85	100		
MFA2405ZP-6WR3	24 (18-36)	40	±5	±600/0	81/83	680
MFA2412ZP-6WR3			±12	±250/0	84/86	330
MFA2415ZP-6WR3			±15	±200/0	85/87	220
MFA2424ZP-6WR3			±24	±125/0	83/85	100
MFB2403ZP-6WR3			3.3	1500/0	76/78	1800
MFB2405ZP-6WR3			5	1200/0	80/82	1000
MFB2412ZP-6WR3			12	500/0	83/85	470
MFB2415ZP-6WR3			15	400/0	84/86	220
MFB2424ZP-6WR3	24	250/0	84/86	100		
MFA4805ZP-6WR3	48 (36-75)	80	±5	±600/0	81/83	680
MFA4812ZP-6WR3			±12	±250/0	85/87	330
MFA4815ZP-6WR3			±15	±200/0	83/85	220
MFA4824ZP-6WR3			±24	±125/0	83/85	100

MFB4803ZP-6WR3	48 (36-75)	80	3.3	1500/0	77/79	1800
MFB4805ZP-6WR3			5	1200/0	81/83	1000
MFB4812ZP-6WR3			12	500/0	85/87	470
MFB4815ZP-6WR3			15	400/0	86/88	220
MFB4824ZP-6WR3			24	250/0	85/87	100

Notes:

- 1 Exceeding the maximum input voltage may cause permanent damage;
- 2 Efficiency is measured In nominal input voltage and rated output load;
- 3 The specified maximum capacitive load for Vo1 and Vo2 output is identical.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	5VDC input	5V / ±5V output	--	1539/10	1579/30	mA
		Others	--	1429/10	1464/30	
	12VDC input	3.3V output	--	550/7	566/25	
		Others	--	607/7	641/25	
	24VDC input	3.3V output	--	265/7	272/25	
		Others	--	296/7	313/25	
	48VDC input	3.3V output	--	131/7	134/25	
		Others	--	147/7	155/25	
Reflected Ripple Current	5VDC input		--	50	--	
	Others		--	20	--	
Surge Voltage (1sec. max.)	5VDC input		-0.7	--	16	VDC
	12VDC input		-0.7	--	25	
	24VDC input		-0.7	--	50	
	48VDC input		-0.7	--	100	
Start-up Voltage	5VDC input		--	--	4.5	VDC
	12VDC input		--	--	9	
	24VDC input		--	--	18	
	48VDC input		--	--	36	
Input Under-voltage Protection	5VDC input		3	3.5	--	
	12VDC input		5.5	6.5	--	
	24VDC input		13	15	--	
	48VDC input		26	30	--	
Input Filter			Pi filter			
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	5VDC input, 0%-100% load ①	Vo1	--	±1	±2	
		Vo2	--	±1	±3	
	Others	Vo1	--	±1	±3	
		Vo2	--	±1	±3	
Linear Regulation	Input voltage variation from low to high at full load	Vo1	--	±0.2	±0.5	%
		Vo2	--	±0.5	±1	
Load Regulation	5VDC input, 0%-100% load	Vo1	--	--	±1	
		Vo2	--	--	±1.5	
	other input, 5%-100% load ②	Vo1	--	±0.5	±1	
		Vo2	--	±0.5	±1.5	
Cross Regulation	Dual output, Vo1 load at 50%, Vo2 load at range of 10%-100%		--	--	±5	

Transient Recovery Time	25% load step change, Nominal input voltage		–	300	500	μs
Transient Response Deviation		3.3V/5V/±5V output	–	±5	±8	%
		Others	–	±3	±5	
Temperature Coefficient	Full load		–	–	±0.03	%/°C
Ripple & Noise ^③	20MHz bandwidth, 5%-100% load		–	–	100	mVp-p
Over-voltage Protection	Input voltage range		110	–	160	%Vo
Over-current Protection			110	140	190	%Io
Short-circuit Protection			Continuous, self-recovery			

Note: ① At 0%~5% load, the Max. output voltage accuracy of ±5VDC output converter is ±5%;
 ② load regulation for 0%-100% load is ±5%;
 ③ Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	–	–	VDC
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	–	–	
Insulation Resistance	Input-output resistance at 500VDC	1000	–	–	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	–	1000	–	pF
Operating Temperature	See Fig. 1	-40	–	85	°C
Storage Temperature		-55	–	+125	
Storage Humidity	Non-condensing	5	–	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	–	–	300	°C
Vibration		10-150Hz, 5G, 30 Min. along X, Y and Z			
Switching Frequency *	PWM mode	–	300	–	kHz
MTBF	MIL-HDBK-217F@25°C	1000	–	–	k hours

Note: * Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Mechanical Specifications

Case Material	Aluminum alloy
Dimensions	32.00 × 20.00 × 10.80mm
Weight	12.0g(Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	5VDC input	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
		Others	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.4-② for recommended circuit)	
Emissions	RE	5VDC input	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
		Others	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.4-② for recommended circuit)	
Immunity	ESD		IEC/EN61000-4-2	Contact ±4kV	perf. Criteria B
		RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	5VDC input	IEC/EN61000-4-4	±2kV (see Fig.3-① for recommended circuit)	perf. Criteria B
		Others	IEC/EN61000-4-4	±2kV (see Fig.4-① for recommended circuit)	perf. Criteria B
	Surge	5VDC input	IEC/EN61000-4-5	line to line ±2kV (see Fig.3-① for recommended circuit)	perf. Criteria B
		Others	IEC/EN61000-4-5	line to line ±2kV (see Fig.4-① for recommended circuit)	perf. Criteria B
CS		IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A	

Typical Characteristic Curves

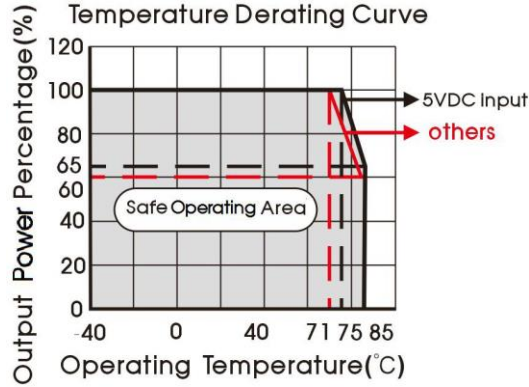
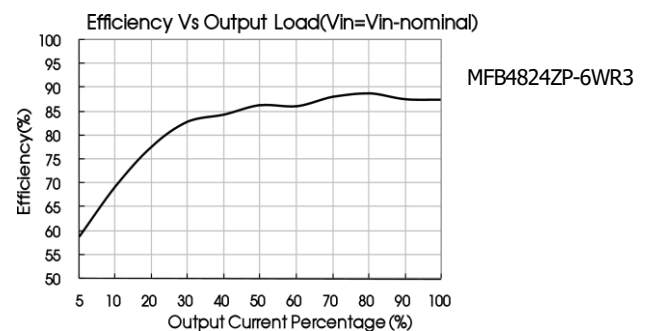
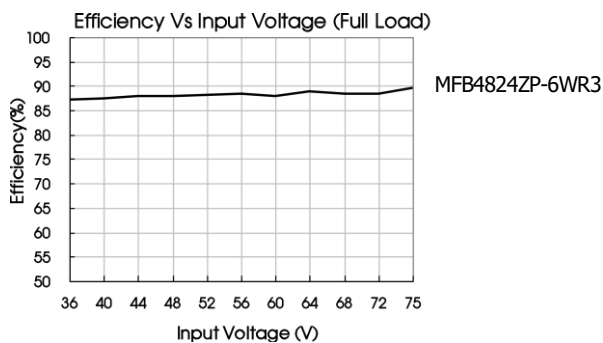
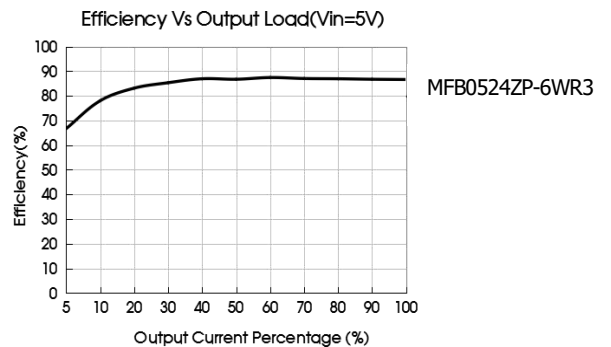
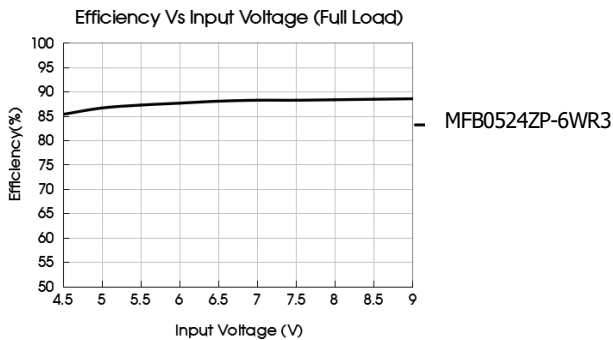
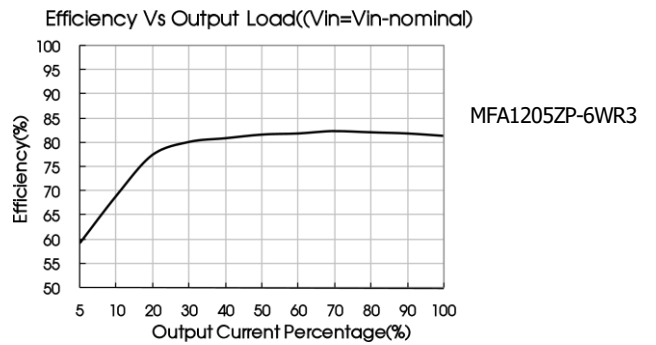
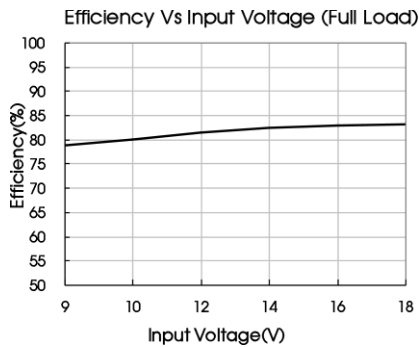
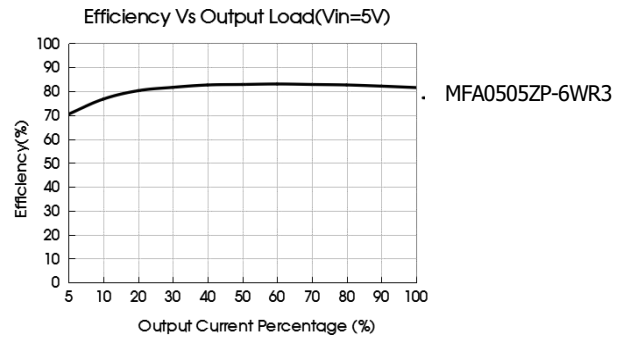
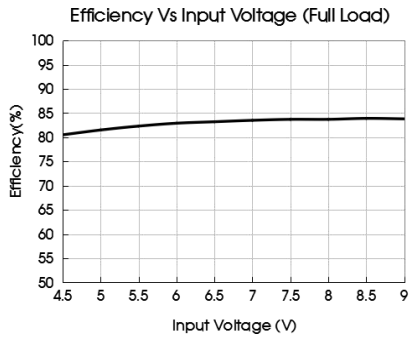


Fig. 1



Design Reference

1. Typical application

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

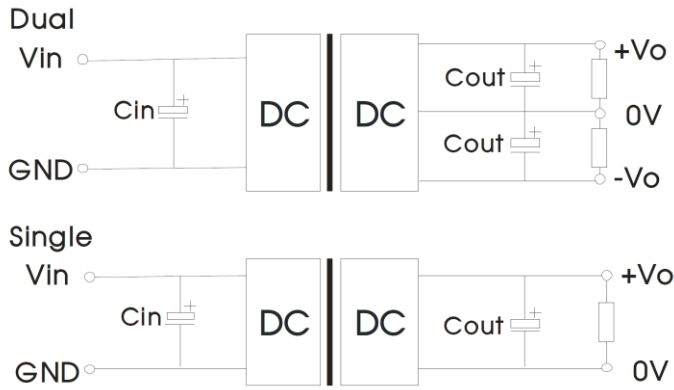


Fig. 2

Vin(VDC)	Vout(VDC)	Cin	Cout
5	5/±5	100µF/16V	10µF/16V
	12/15/±12/±15		10µF/25V
	24/±24		10µF/50V
12	3.3/5/±5	100µF35V	10µF/16V
	12/15/±12/±15		10µF/25V
	24/±24		10µF/50V
24	3.3/5/±5	100µF/50V	10µF/16V
	12/15/±12/±15		10µF/25V
	24/±24		10µF/50V
48	3.3/5/±5	10µF - 47µF/100V	10µF/16V
	12/15/±12/±15		10µF/25V
	24/±24		10µF/50V

2. EMC compliance circuit

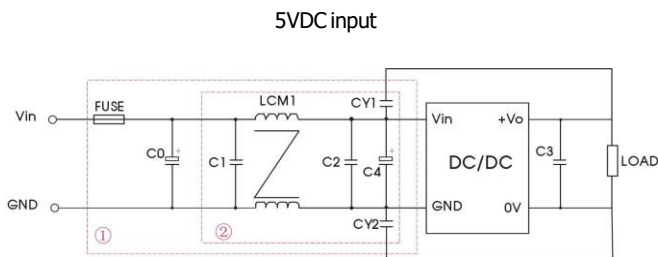


Fig. 3

Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

Parameter description:

Model	Vin: 5VDC
FUSE	Select fuse value according to actual input current
C0	2200µF/35V
C1/C2	4.7µF/50V
C3	Refer to the Cout in Fig.2
C4	100µF/35V
LCM1	2.2mH, recommended to use 2200*2µH 3Amax
CY1/CY2	2.2nF/2kV

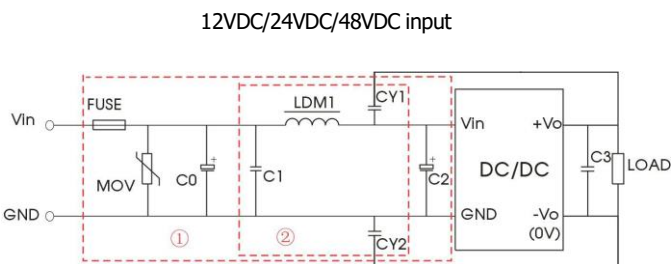


Fig. 4

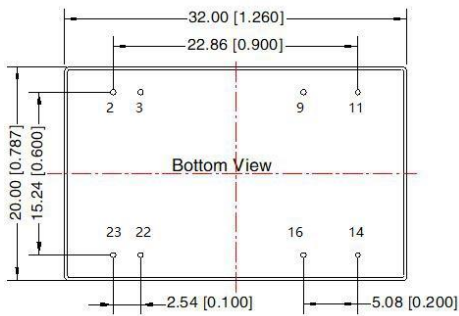
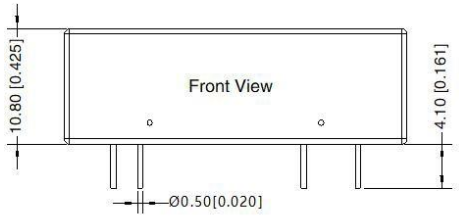
Notes: For EMC tests we use Part ① in Fig. 4 for immunity and part ② for emissions test. Selecting based on needs.

Parameter description:

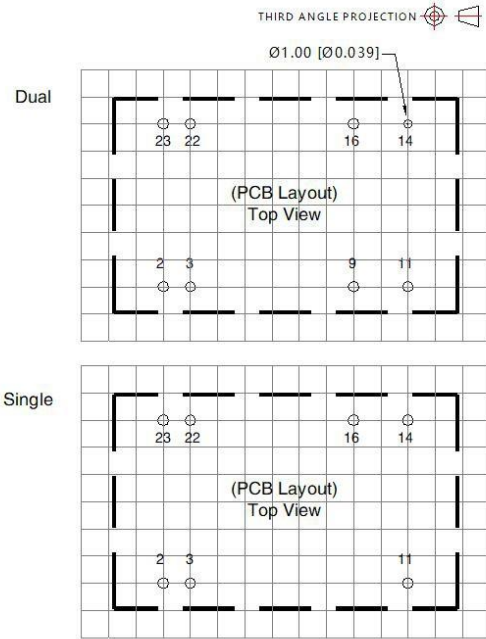
Model	Vin: 12VDC	Vin: 24VDC	Vin: 48VDC
FUSE	Select fuse value according to actual input current		
MOV	S14K20	S20K30	S14K60
C0	1000µF/35V	1000µF/50V	680µF/100V
C2	100µF/35V	100µF/50V	100µF/100V
C1	1µF/50V		1µF/100V
C3	Refer to the Cout in Fig.2		
LDM1	4.7µH		
CY1, CY2	1nF/2kV		

3. The products do not support parallel connection of their output

Dimensions and Recommended Layout



Note:
 Unit: mm[inch]
 Pin diameter tolerances: $\pm 0.10 [\pm 0.004]$
 General tolerances: $\pm 0.50 [\pm 0.020]$



Note: Grid 2.54*2.54mm

Pin-Out		
Pin	Single	Dual
2,3	GND	GND
9*	No Pin	0V
11	NC	-Vo
14	+Vo	+Vo
16	0V	0V
22,23	Vin	Vin

* Note: 5V input product without 9th pin
 NC: Pin to be isolated from circuit

Notes & Instructions

1. If the product works under the minimum required load, it cannot guarantee that the performance of the product complies with all the performance indicators in this manual;
2. The maximum capacitive load is tested under the input voltage range and full load condition;
3. Unless otherwise stated, all indexes in this manual are measured at Ta=25°C, humidity <75%RH, nominal input voltage and rated output load;
4. All index testing methods in this manual are based on the enterprise standards of the company;
5. Our company can provide product customization, specific needs can directly contact our technical staff;