

### FEATURES

1. Wide 2:1 input voltage range
2. High efficiency up to 90%
3. No-load power consumption as low as 0.12W
4. I/O isolation test voltage 1.5k VDC
5. Input under-voltage protection, output short-circuit, over-current, over-voltage protection
6. Operating ambient temperature range: -40°C to +85°C
7. Meets CISPR32/EN55032 CLASS A, without extra components



3 years  
Warranty

### Selection Guide

Part No.	Input Voltage (VDC)		Output		Full Load Efficiency(%) Min./Typ.	Capacitive Load (µF)Max.
	Nominal (Range)	Max.	Voltage (VDC)	Current (mA) Max./Min.		
MFB2403LD-15WR3	24 (18-36)	40	3.3	4000/0	87/89	4700
MFB2405LD-15WR3			5	3000/0	87/89	4700
MFB2412LD-15WR3			12	1250/0	87/89	1000
MFB2415LD-15WR3			15	1000/0	87/89	820
MFB2424LD-15WR3			24	625/0	88/90	270
MFB4803LD-15WR3	48 (36-75)	80	3.3	4000/0	81/83	4700
MFB4805LD-15WR3			5	3000/0	86/88	4700
MFB4812LD-15WR3			12	1250/0	86/88	1000
MFB4815LD-15WR3			15	1000/0	87/89	820
MFB4824LD-15WR3			24	625/0	87/89	270

### Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC input	3.3V/5V output	--	702/30	718/75	mA
		Others	--	702/5	718/10	
	48VDC input	3.3V/5V output	--	355/20	363/30	
		Others	--	351/5	363/10	
Reflected Ripple Current	24VDC input		--	30	--	
	48VDC input		--	30	--	
Surge Voltage (1sec. max.)	24VDC input		-0.7	--	50	VDC
	48VDC input		-0.7	--	100	
Start-up Voltage	24VDC input		--	--	18	VDC
	48VDC input		--	--	36	
Under-voltage protection	24VDC input		12	15.5	--	
	48VDC input		26	30	--	

Start-up Time	Nominal input voltage & constant resistance load	--	10	--	ms
Input Filter	Pi filter				
Ctrl *	Module on	Ctrl pin open or pulled high (3.5-12VDC)			
	Module off	Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off	--	4	7	mA
Hot Plug	Unavailable				
Note: *The Ctrl pin voltage is referenced to input GND.					

### Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Voltage Accuracy	0% -100% load	--	±1	±3	%	
Linear Regulation	Input voltage variation from low to high at full load	--	±0.2	±0.5		
Load Regulation	Nominal input voltage	--	±0.5	±1		
Transient Recovery Time	25% load step change, Nominal input voltage	--	300	500	µs	
Transient Response Deviation		3.3V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load	--	--	±0.03	%/°C	
Ripple & Noise*	20MHz bandwidth, 5% -100% load	--	50	100	mVp-p	
Trim	Input voltage range	90	--	110	%Vo	
Over-voltage Protection		110	--	160		
Over-current Protection		110	--	190	%Io	
Short-circuit Protection		Hiccup, continuous, self-recovery				
Note: *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	
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ	
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	MFB2424LD-15W(H)R3	--	2050	--	pF
		MFB4824LD-15W(H)R3	--	1050	--	
		Others	--	1050	--	
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		10-55Hz, 2G, 30 Min. along X, Y and Z				
Switching Frequency *	PWM mode	--	270	--	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	Horizontal package (without heat sink)		50.80 × 25.40 × 11.80 mm
	Horizontal package (with heat sink)		51.40 × 26.20 × 16.50 mm
Weight	without heat sink	Horizontal package	26.0g (Typ.)
	with heat sink	Horizontal package	34.0g (Typ.)
Cooling Method	Free air convection		

### Electromagnetic Compatibility (EMC)

Emissions	CE	Others	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.3-② for recommended circuit)
		3.3V output	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)
	RE	Others	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.3-② for recommended circuit)
		3.3V output	CISPR32/EN55032	CLASS B (see Fig.3-② 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		IEC/EN61000-4-4	±2kV (see Fig.3-① for recommended circuit) perf. Criteria B
	Surge		IEC/EN61000-4-5	line to line ±2kV (see Fig.3-① for recommended circuit) perf. Criteria B
	CS		IEC/EN61000-4-6	3 Vr.m.s perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity		IEC/EN61000-4-29	0%, 70% perf. Criteria B

### Typical Characteristic Curves

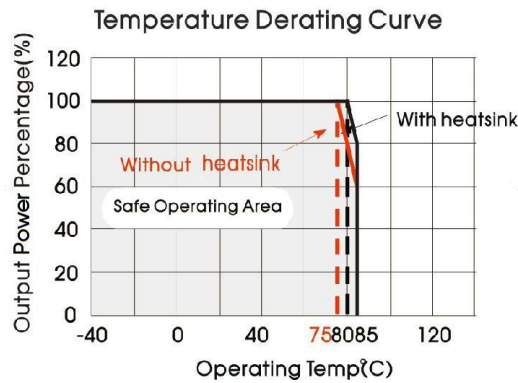
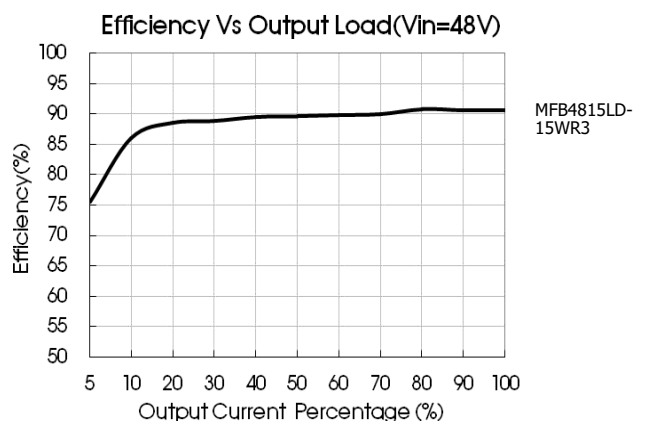
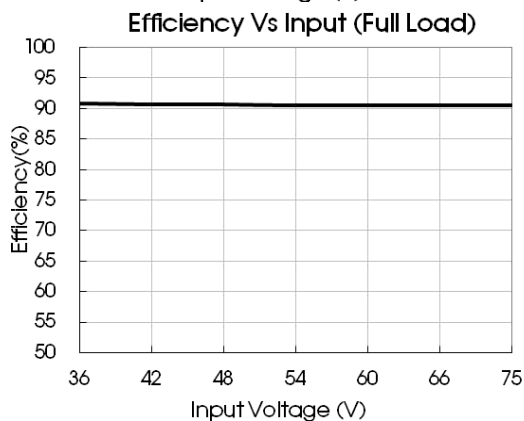
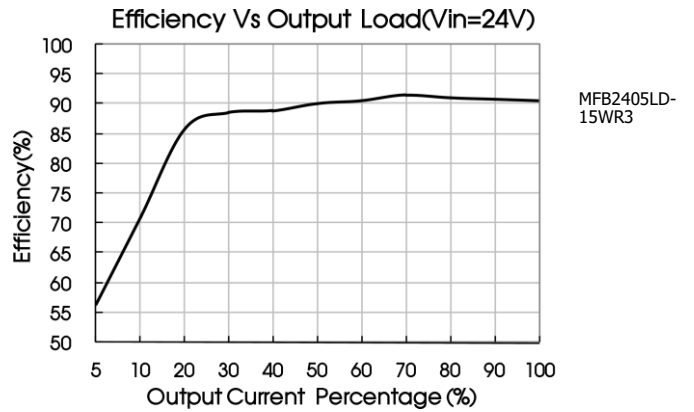
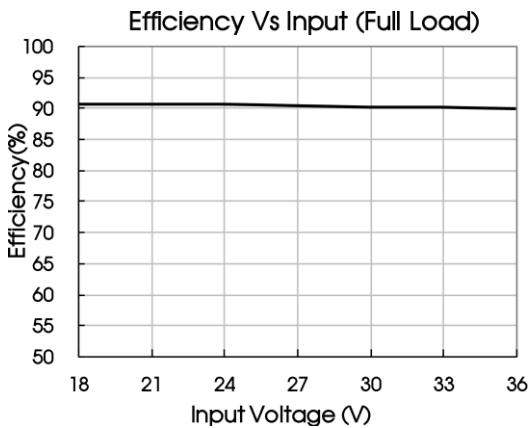


Fig. 1

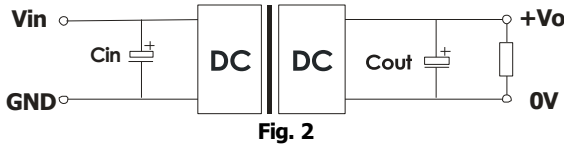


### Design Reference

#### 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.



Vout (VDC)	Cout (μF)	Cin (μF)
3.3/5	470	100
12/15	220	
24	100	

#### 2. EMC compliance circuit

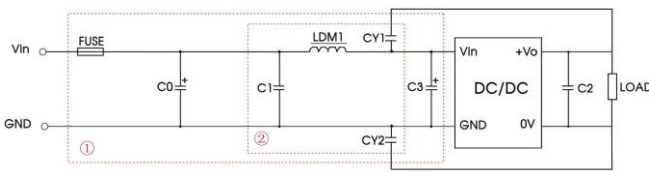


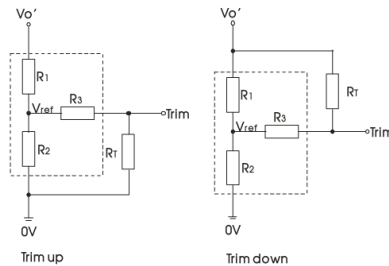
Fig. 3

Note: 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: 24VDC	Vin: 48VDC
FUSE	Choose according to actual input current	
C0/C3	330μF/50V	330μF/100V
C1	1μF/50V	4.7μF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7μH/2.2A	
CY1/CY2	1nF/2kV	

#### 3. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

#### Calculating Trim resistor values:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \quad a = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

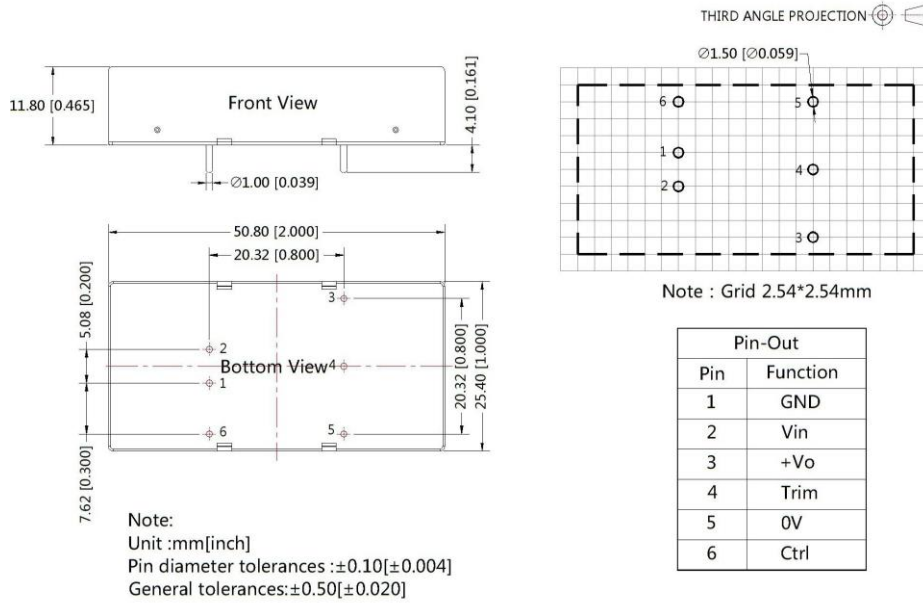
$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \quad a = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

- $R_T$  is Trim resistance
- $a$  is a self-defined parameter, with no real meaning.

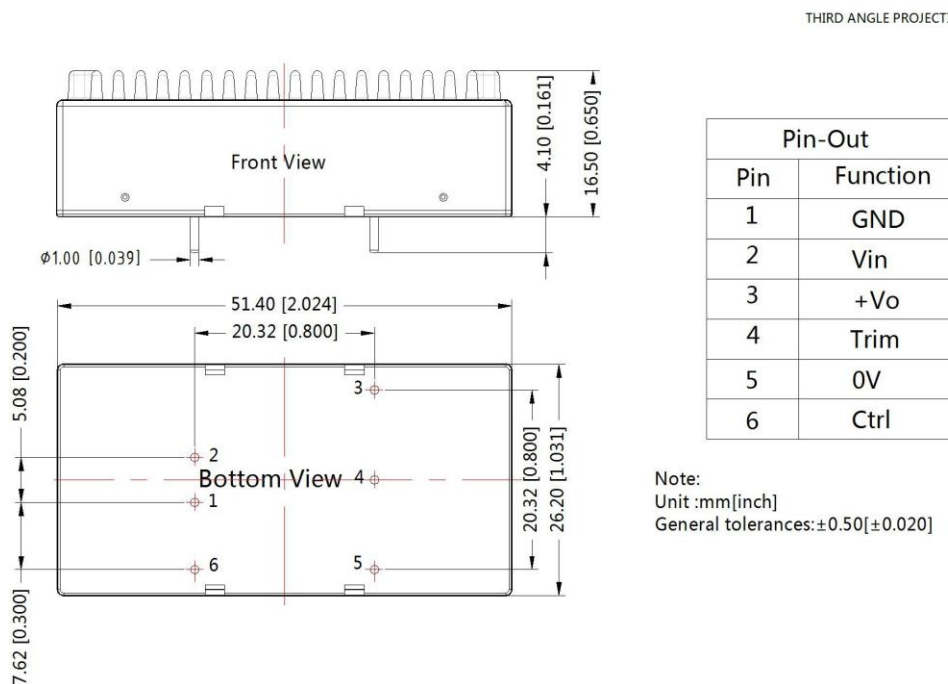
Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	4.775	2.87	12.4	1.25
5	2.883	2.87	10	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

#### 4. The products do not support parallel connection of their output

### Horizontal Package (without heat sink) Dimensions and Recommended Layout



### Horizontal Package (with heat sink) Dimensions



**Note:**

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;