6W Isolated DC to DC Converters
Single and Dual Output

6W isolated DC-DC converter in DIP package Ultra-wide input and regulated dual/single output

c UL us CE CB Patent Protection

Features

- Ultra-wide 4:1 input voltage range
- High efficiency up to 88%
- No-load power consumption as low as 0.12W
- I/O isolation test voltage 1.5K VDC
- Operating ambient temperature range: -40°C to +85°C
- Input under-voltage, output over-voltage, shortcircuit, over-current protection
- Meets CISPR32/EN55032 CLASS A, without extra components
- Industry standard pin-out
- UL60950, EN60950, IEC60950 approved
- Meets EN50155 railway standard
- Meets EN62368 standard

RoHS Compliant

These series of isolated 6W DC-DC converter products with an ultra-wide range of voltage input of 9-36VDC(24VDC input), 18-75VDC(48VDC input), input to output isolation is tested with 1500VDC, output over-voltage protection and output short-circuit protection. They meet CLASS A of CISPR32/EN55032 EMI standards without external components and they are widely used in fields such as industrial control, electric power, instruments, communication. and railway applications.

Selection Guide

Certification	Part Number	Input Voltage (VDC)		Output		Full Load Efficiency (%) Min./Typ.	Capacitive Load(μF)* Max.
		Nominal (Range)	Max.	Voltage (VDC)	Current (mA) Max./Min.		
UL/CE/CB	MPRA2405ZP-6W	24 (9 to 36)	40	±5	±600/0	81/83	680
	MPRA2412ZP-6W			±12	±250/0	85/87	330
	MPRA2415ZP-6W			±15	±200/0	86/88	220
	MPRA2424ZP-6W			±24	±125/0	85/87	100
	MPRB2403ZP-6W			3.3	1500/0	77/79	1800
	MPRB2405ZP-6W			5	1200/0	81/83	1000
	MPRB2409ZP-6W			9	667/0	82/84	1000
	MPRB2412ZP-6W			12	500/0	85/87	470
	MPRB2415ZP-6W			15	400/0	86/88	220
	MPRB2424ZP-6W			24	250/0	85/87	100
UL/CE/CB	MPRA4805ZP-6W	48 (18 to 75)	80	±5	±600/0	81/83	680
	MPRA4812ZP-6W			±12	±250/0	85/87	330
	MPRA4815ZP-6W			±15	±200/0	86/88	220
	MPRB4803ZP-6W			3.3	1500/0	78/80	1800
	MPRB4805ZP-6W			5	1200/0	82/84	1000
--	MPRB4809ZP-6W			9	667/0	83/85	680
UL/CE/CB	MPRB4812ZP-6W			12	500/0	85/87	470
	MPRB4815ZP-6W			15	400/0	86/88	220
	MPRB4824ZP-6W			24	250/0	85/87	100

Notes: 1. Exceeding the maximum input voltage may cause permanent damage;
2. Efficiency is measured at nominal input voltage and rated output load;
3. The specified maximum capacitive load for positive and negative output is identical.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC input	--	316/5	325/12	
	48VDC input	--	156/4	160/8	
Reflected Ripple Current		--	20	--	
Surge Voltage(1sec. max.)	24VDC input	-0.7	--	50	
	48VDC input	-0.7	--	100	
Start-up Voltage	24VDC input	--	--	9	
	48VDC input	--	--	18	
Input Under-voltage Protection	24VDC input	5.5	6.5	--	
	48VDC input	12	15.5	--	
Input Filter		Pi filter			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	Vo1		--	±1	±3	%
	Vo2					
Balance Of Output Voltage	Dual output, balanced load			±0.5	±1.5	
Linear Regulation	Input voltage variation from low to high at full load	Vo1		±0.2	±0.5	
		Vo2		±0.5	±1	
Load Regulation	5%-100% load	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			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*	20MHz bandwidth			--	85	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. Output voltage accuracy of ±5VDC/±9VDC output converter for 0%-5% load is ±5% max;
2. Load regulation for 0%-100% load is ±5%;
3. 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	-	1000	-	pF
Operating Temperature	Derating when operating temperature up to 71°C (see Fig. 1)	-40	-	+80	°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		IEC/EN61373 - Category 1, Grade B			
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	32mm × 20mm × 10.80mm
Weight	12g(Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A (without extra components)/ CLASS B (see Fig.3-2 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A (without extra components)/ 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 ±2KV (see Fig.3-1for 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

Electromagnetic Compatibility (EMC) (EN50155)			
Emissions	CE	EN50121-3-2 150kHz-500kHz 99dBμV (see Fig.3-2 for recommended circuit) EN55016-2-1 500kHz-30MHz 93dBμV (see Fig.3-2 for recommended circuit)	
	RE	EN50121-3-2 30MHz-230MHz 40dBμV/m at 10m (see Fig.3-2 for recommended circuit) EN55016-2-1 230MHz-1GHz 47dBμV/m at 10m (see Fig.3-2 for recommended circuit)	
Immunity	ESD	EN50121-3-2 Contact ±6KV/Air ±8KV	Perf. Criteria A
	RS	EN50121-3-2 20V/m	Perf. Criteria A
	EFT	EN50121-3-2 ±2kV 5/50ns 5kHz (see Fig.3-1 for recommended circuit)	Perf. Criteria A
	Surge	EN50121-3-2 line to line ±1KV (42Ω, 0.5μF) (see Fig.3-1 for recommended circuit)	Perf. Criteria A
	CS	EN50121-3-2 0.15MHz-80MHz 10V r.m.s	Perf. Criteria A

Typical Characteristic Curves

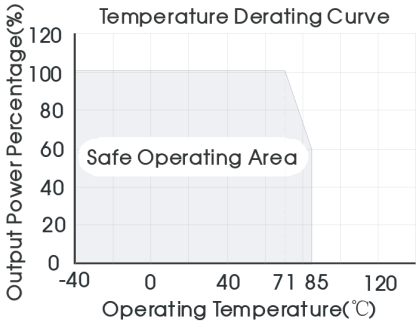
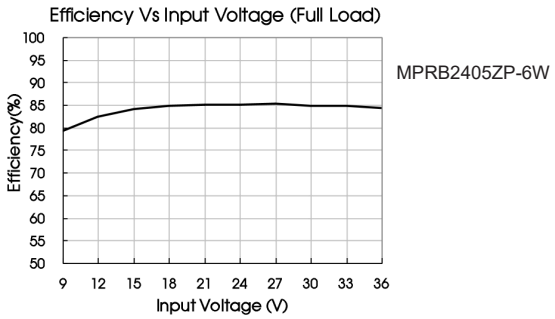
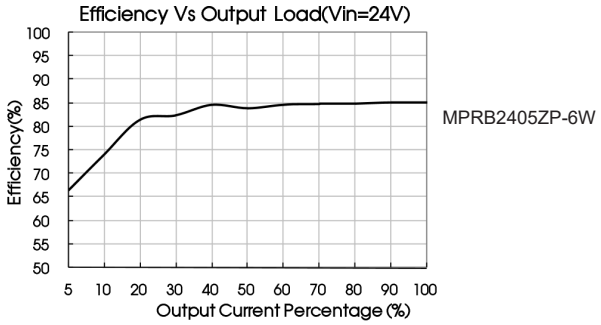
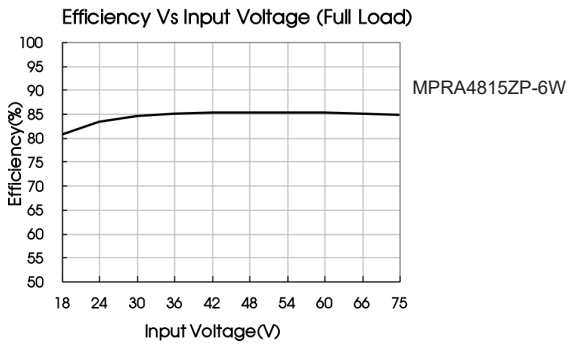
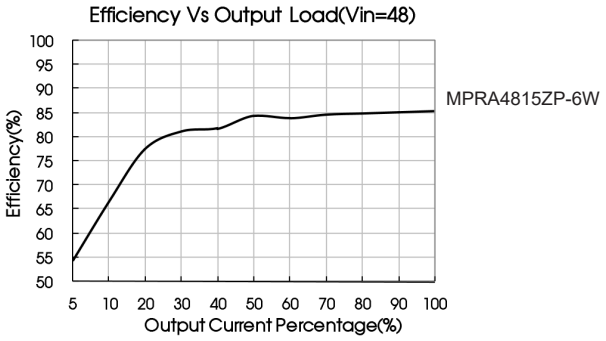


Fig. 1









Design Reference

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 Cin and Cout 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.

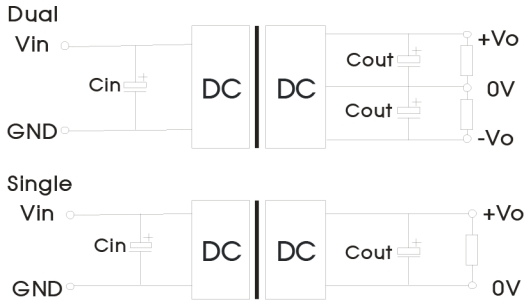
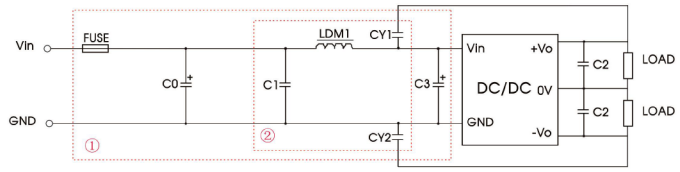


Fig. 2

Vin(VDC)	Cin	Vo(VDC)	Cout
24	100μF/50V	3.3/5/9/±5/±9	10μF/16V
		12/15/±12/±15	10μF/25V
		24/±24	10μF/50V
48	10μF/100V~47μF/100V	3.3/5/9/±5	10μF/16V
		12/15/±12/±15	10μF/25V
		24	10μF/50V

EMC compliance circuit

Dual output:



Single output:

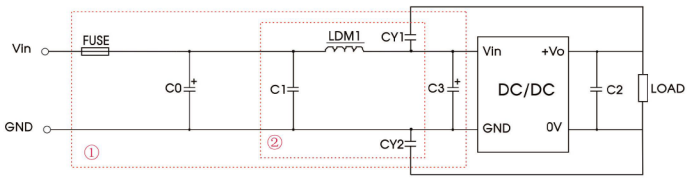


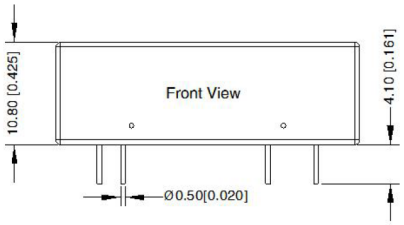
Fig. 3

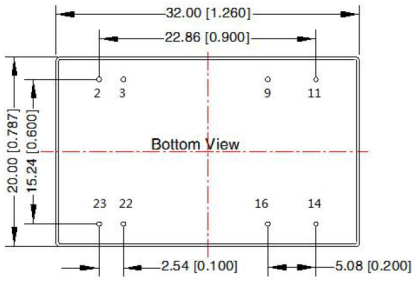
Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

Parameter description:

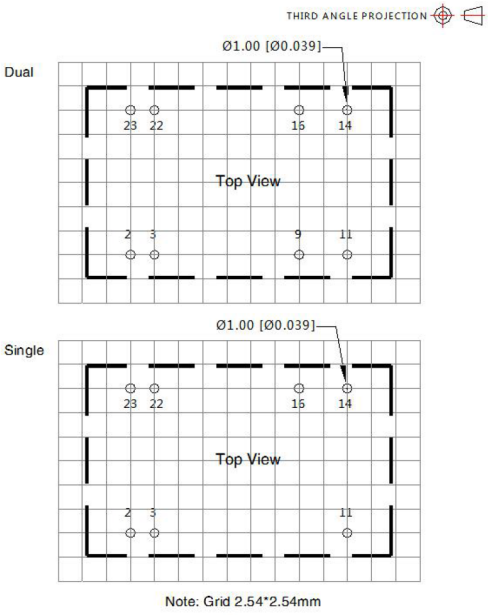
Model	Vin:24VDC	Vin:48VDC
FUSE	Choose according to actual input current	
C0/C3	330μF/50V	330μF/100V
C1	1μF/50V	1μF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7μH	
CY1/CY2	1nF/2KV	

Dimensions and Recommended Layout





Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 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

NC: Pin to be isolated from circuit

Notes:

1. It is recommended that the load imbalance of the dual output is ≤±5%. If it exceeds ±5%, the performance of the product cannot be guaranteed to meet as datasheet marked. For details, please contact our technical staff;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on company corporate standards;
5. The performance indexes of the product models listed in this datasheet are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technicians for specific information;
6. We can provide product customization service;
8. Products are related to laws and regulations: see “Features” and “EMC”;
9. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.