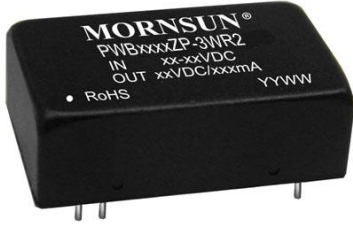


## PWB\_ZP- 3WR2 Series

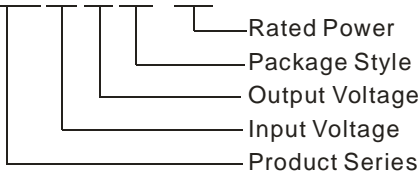
### 3W,4:1 WIDE INPUT, ISOLATED & REGULATED SINGLE OUTPUT, DC-DC CONVERTER



Patent Protection RoHS

### PART NUMBER SYSTEM

PWB2405ZP-3WR2



### FEATURES

- 4:1 wide input voltage range
- DIP Package
- Efficiency up to 83%
- 1.5KVDC isolation
- Short Circuit Protection(automatic recovery)
- Operating Temperature Range: -40°C ~ +85°C
- Meet CISPR22/EN55022 CLASS A

### APPLICATION

The PWB\_ZP-3WR2 Series are specially designed for applications where a wide range input voltage power supplies are unregulated from the input power supply in a distributed power supply system on a circuit board.

These products apply to where:

- 1) Input voltage range  $\leq 4:1$ ;
- 2) 1.5KVDC input and output isolation;
- 3) Output regulated and low ripple noise is required.

### SELECTION GUIDE

Model	Input Voltage(VDC)		Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(Typ.)		Reflected Ripple Current (mA,Typ.)	Max. Capacitive Load( $\mu$ F)	Efficiency (%. Typ.) @Max. Load
	Nominal (Range)	Max ①		Max.	Min.	@Max. Load	@No Load			
PWB2403ZP-3WR2	24 (9-36)	40	3.3	909	45	167	10	30	2700	75
PWB2405ZP-3WR2			5	600	30	156			2200	80
PWB2409ZP-3WR2			9	333	17	156			1000	80
PWB2412ZP-3WR2			12	250	13	154			680	81
PWB2415ZP-3WR2			15	200	10	152			680	82
PWB2424ZP-3WR2			24	125	6	152			470	82
PWB4803ZP-3WR2	48 (18-75)	80	3.3	909	45	82	8	30	2700	76
PWB4805ZP-3WR2			5	600	30	79			2200	79
PWB4809ZP-3WR2			9	333	17	77			1000	81
PWB4812ZP-3WR2			12	250	13	76			680	82
PWB4815ZP-3WR2			15	200	10	75			680	83

Note:①.Input voltage can't exceed this value, or will cause the permanent damage.

### INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec. max.)	24VDC input	-0.7	--	50	VDC
	48VDC input	-0.7	--	100	
Start-up Voltage	24VDC input	4.5	7	9	
	48VDC input	11	16	18	
Input Filter		$\pi$ Filter			

### OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	5% to 100% load	--	$\pm 1$	$\pm 3$	%
No load output Voltage Accuracy	Input voltage range	--	$\pm 1.5$	$\pm 5$	
Line Regulation	Full load, Input voltage from low to high	--	$\pm 0.2$	$\pm 0.5$	
Load Regulation	5% to 100% load	--	$\pm 0.2$	$\pm 1$	

Transient Recovery Time	25% load step change	--	0.5	3	ms
Transient Response Deviation		--	±2	±5	%
Temperature Drift	100% load	--	±0.02	±0.03	%/°C
Ripple*	20MHz Bandwidth	--	30	45	mVp-p
Noise*		--	35	85	
Output Power Protection	Input voltage range	120	--	--	%
Output Short Circuit Protection		Continuous, automatic recovery			

Note: \* Ripple and noise tested by "parallel cable" method. See detailed operation instructions at Testing of Power Converter section, application notes.

## COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-Output, Tested for 1 minute and leakage current less than 1 mA	1500	--	--	VDC
Isolation Resistance	Input-Output, Test at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-Output, 100KHz/0.1V	--	120	--	pF
Switching Frequency(PFM mode)	100% load, stand Input voltage	--	250	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours
Case Material		Aluminum Alloy			
Weight		--	14	--	g

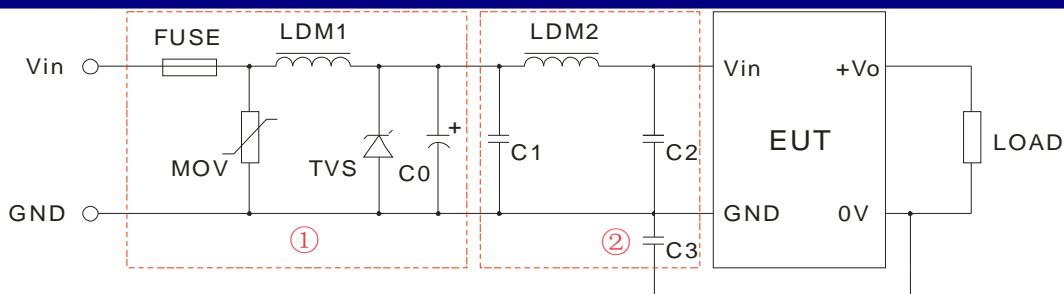
## ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	--	--	95	%
Operating Temperature	Power derating (above 71°C)	-40	--	85	°C
Storage Temperature		-55	--	125	
Temp. rise at full load	Ta=25°C	--	25	--	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			

## EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022	CLASS A(Without External Circuit)/ CLASS B( External Circuit Refer to Figure1-② or Figure 3)		
	RE	CISPR22/EN55022	CLASS A(Without External Circuit)/ CLASS B( External Circuit Refer to Figure1-② or Figure 3)		
EMS	ESD	IEC/EN61000-4-2	Contact ±4KV/ Air ±8KV	perf. Criteria B	
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A	
	EFT	IEC/EN61000-4-4	±2KV	perf. Criteria B ( External Circuit Refer to Figure1-①)	
		IEC/EN61000-4-4	±4KV	perf. Criteria B ( External Circuit Refer to Figure 3)	
	Surge	IEC/EN61000-4-5	±2KV	perf. Criteria B ( External Circuit Refer to Figure1-① or Figure 3)	
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A	
	Voltage dips, short and interruptions immunity	IEC/EN61000-4-29	0%-70%	perf. Criteria B	

## EMC RECOMMENDED CIRCUIT



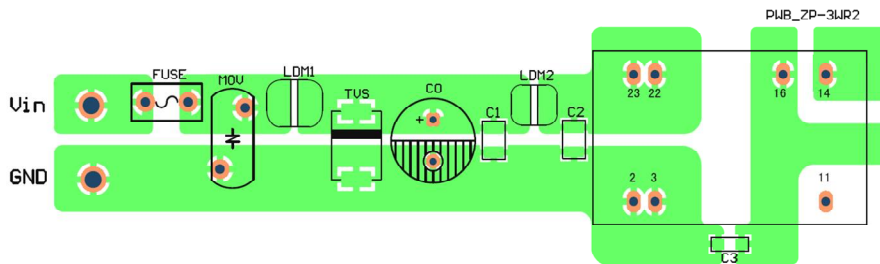
(Figure1)

Recommended external circuit parameters:

Model	Vin:24V	Vin:48V
FUSE	Choose according to practical input current	
MOV	10D560K	10D101K
LDM1	56μH	
TVS	SMCJ48A	SMCJ90A
C0	120μF/50V	120μF/100V
C1	4.7μF/50V	4.7μF/100V
LDM2	12μH	
C2	4.7μF/50V	4.7μF/100V
C3	1nF/2KV	

Note: 1. In Figure 1, part① is EMS Recommended external circuit, part② is EMI recommended external circuit. Choose according to requirements.  
 2. If there is no recommended parameters, the model no require the external component.

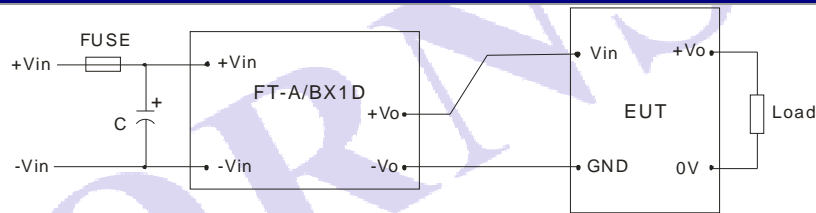
### EMC RECOMMENDED CIRCUIT PCB LAYOUT



(Figure 2)

Note: The space between input and output GND (C3) must  $\geq 2\text{mm}$ .

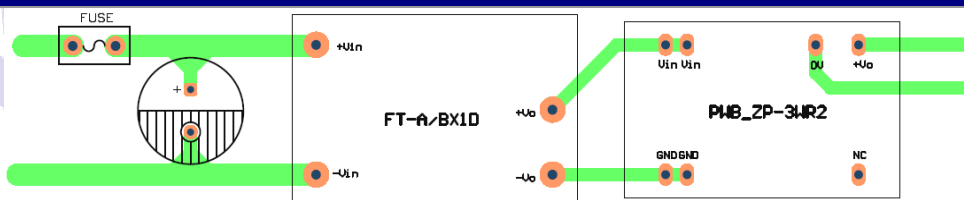
### EMC MODULE RECOMMENDED CIRCUIT



Nominal Input Voltage=24V,  $C \geq 330\mu\text{F}/50\text{V}$   
 Nominal Input Voltage =48V,  $C \geq 330\mu\text{F}/100\text{V}$   
 FT-A/BX1D is MORNSUN's EFT suppresser

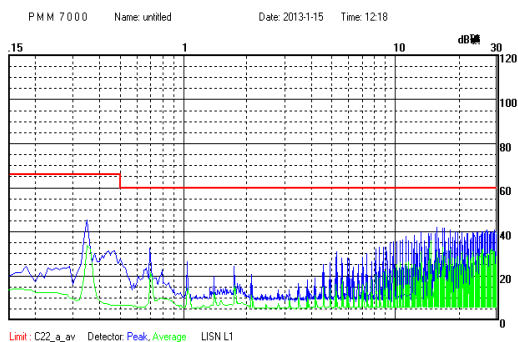
(Figure 3)

### EMC MODULE RECOMMENDED CIRCUIT PCB LAYOUT

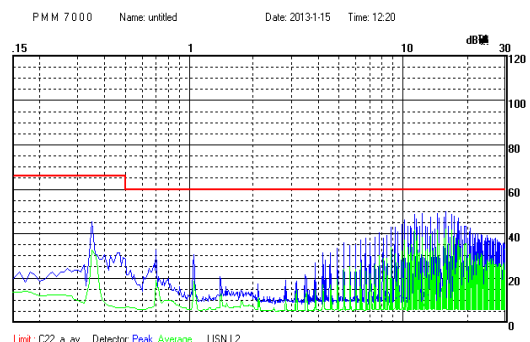


(Figure 4)

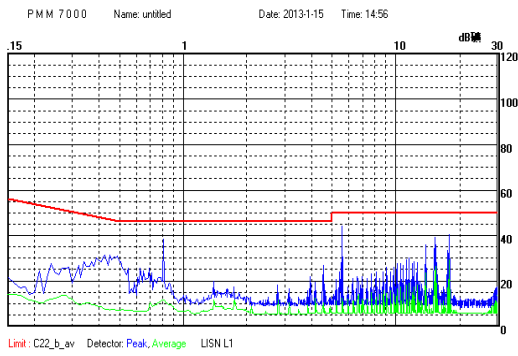
### EMI TEST WAVEFORM (NOMINAL AND FULL LOAD)



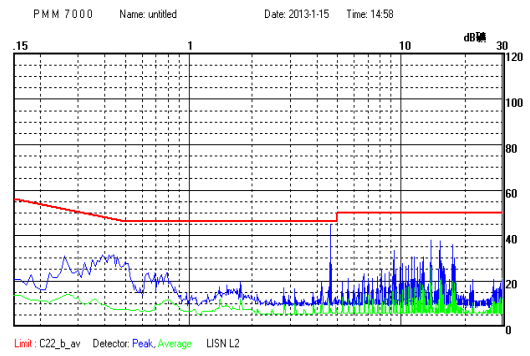
PWB2405ZP-3WR2 Without External Circuit Power+ (Class A)



PWB2405ZP-3WR2 Without External Circuit Power- (Class A)



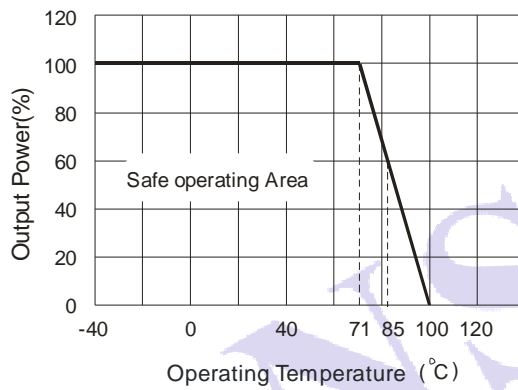
PWB2405ZP-3WR2 With External Circuit Power+ (Class B)



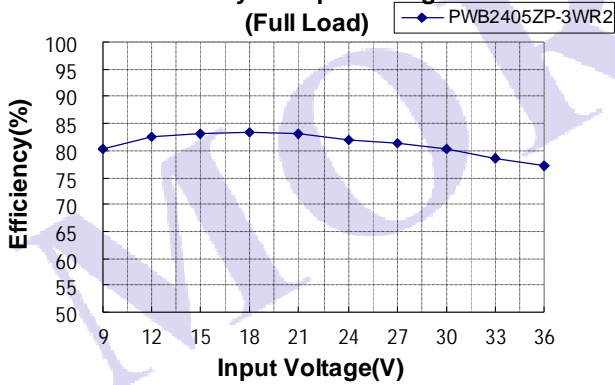
PWB2405ZP-3WR2 With External Circuit Power- (Class B)

**PRODUCT TYPICAL CURVE**

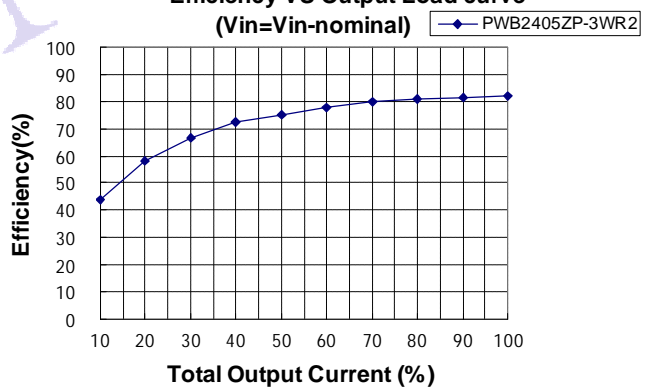
Temperature Derating Graph



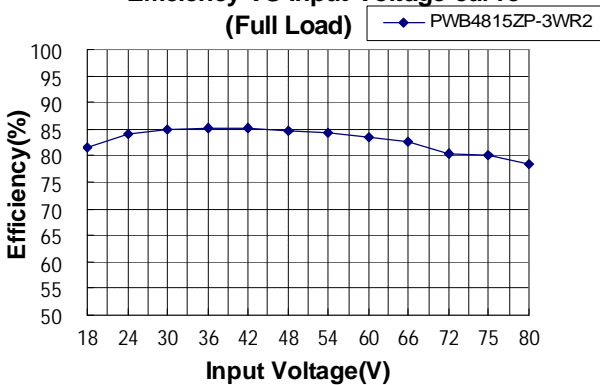
Efficiency VS Input Voltage curve (Full Load)



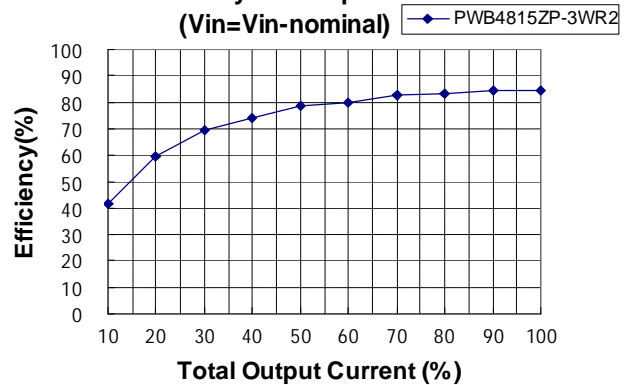
Efficiency VS Output Load curve (Vin=Vin-nominal)



Efficiency VS Input Voltage curve (Full Load)

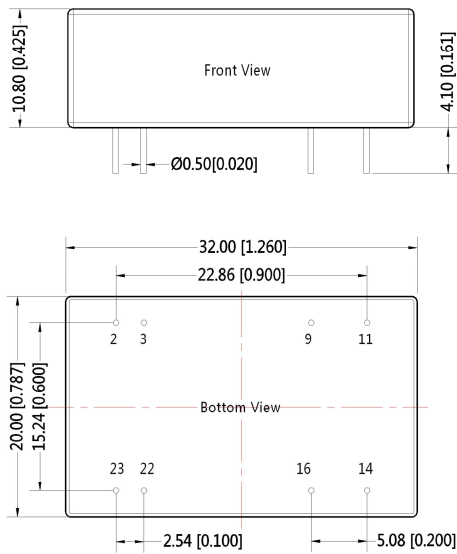


Efficiency VS Output Load curve (Vin=Vin-nominal)



# OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

## MECHANICAL DIMENSIONS

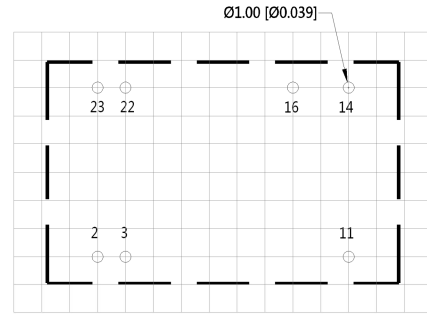


PIN CONNECTION	
Pin	Function
2,3	GND
9	No Pin
11	NC
14	+V0
16	0V
22, 23	Vin

NC: No Connection

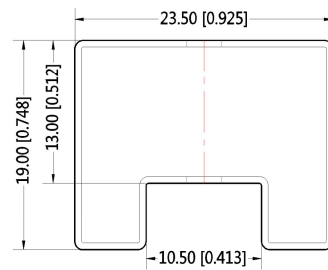
Note:  
 Unit :mm[inch]  
 Pin diameter tolerances :±0.1mm[±0.004inch]  
 General tolerances:±0.25mm[±0.01inch]

## RECOMMENDED FOOTPRINT DETAILS



Note:Grid 2.54\*2.54mm

## TUBE PACKAGING DIMENSIONS

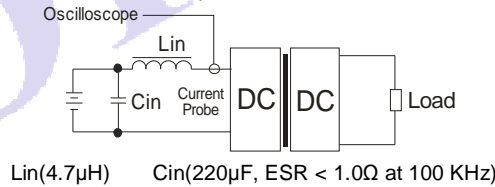


Note:  
 Unit :mm[inch]  
 General tolerances :±0.5mm[±0.020inch]  
 L=530mm[20.866 inch] Tube Quantity: 15PCs  
 L=220mm[8.661 inch] Tube Quantity: 6PCs  
 Inner carton(S): L\*W\*H=255\*170\*80 mm;  
 Outer carton(S): L\*W\*H=375\*280\*270mm, 6 inner cartons(S);  
 Inner carton(L): L\*W\*H=580\*200\*100mm;  
 Outer carton(L): L\*W\*H=600\*215\*220mm, 2 inner cartons(L);  
 Outer carton(L): L\*W\*H=600\*215\*325mm, 3 inner cartons(L);

## TEST CONFIGURATIONS

### Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor  $L_{in}$  and Capacitor  $C_{in}$  to simulate source impedance.



## DESIGN CONSIDERATIONS

### 1) Requirement on output load

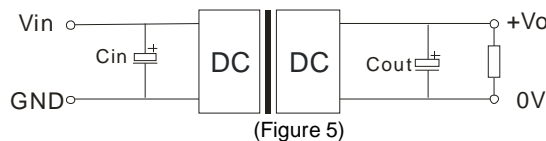
To ensure this module can operate efficiently and reliably, during operation, the minimum output load could not be less than 5% of the full load. otherwise ripple maybe increase dramatically. If the actual output power is very small, please connect a resistor with proper resistance at the output end in parallel to increase the load, suppose to use the resistance of 5% rated power, or use our company's products with a lower rated output power.

### 2) Recommended circuit

All the PWB\_ZP-3WR2 Series have been tested according to the following recommended testing circuit before leaving factory (see Figure 5).

If you want to further decrease the input/output ripple, you can increase a capacitance properly or choose capacitors with low ESR. However, the capacitance of the output filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. The safe and reliable operation is ensured, the greatest capacitance of its filter capacitor must be less than the Max. Capacitive Load.

General:  $C_{in}$ : 10µF~47µF  
 $C_{out}$ : 10µF/100mA

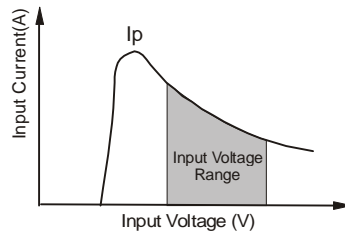


(Figure 5)

### 3) Input current

When it is used in unregulated power supply, be sure that the fluctuating range of the power supply and the rippled voltage do not exceed the module standard. Input current of power supply should afford the flash startup current of this kind of DC/DC module (Figure 6).

General:  $V_{in}$ :24V  $I_p$  =640mA  
 $V_{in}$ :48V  $I_p$  =320mA



(Figure 6)

#### 4) Cannot use in parallel and hot swap

Note:

1. Min. load shouldn't be less than 5%, otherwise ripple maybe increase dramatically. Operation under minimum load will not damage the converter, however, they may not meet all specification listed.
2. All specifications measured at  $T_a=25^{\circ}\text{C}$ , humidity<75%, nominal input voltage and rated output load unless otherwise specified.
3. Max. Capacitive Load tested at input voltage range and full load.
4. In this datasheet, all the test methods of indications are based on our corporate standards.
5. All characteristics are for listed model, non-standard models may perform differently, please contact our technical person for more detail.
6. Contact us for your specific requirement.
7. Specifications subject to change without prior notice.

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