

## WRB\_LT-3WR2 SERIES

### 3W, WIDE INPUT, ISOLATED & REGULATED SINGLE OUTPUT DC/DC CONVERTER



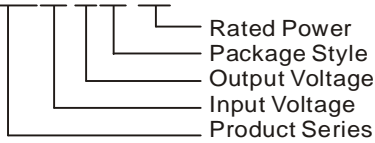
Patent Protected RoHS

#### FEATURES

- Ultra-small size, SMD package
- 2:1 wide input voltage range
- Operating temperature range: -40°C ~ +85°C
- 1.5KVDC isolation
- Short circuit protection (automatic recovery)
- High power density
- Meet UL94-V0

#### PART NUMBER SYSTEM

WRB2405LT-3WR2



#### APPLICATION

The WRB\_LT-3WR2 series are specially designed for applications where a wide range input voltage power supplies are isolated from the input power supply in a distributed power supply system on a circuit board.

- 1) These products apply to where: Input voltage ranges ≤ 2:1;
- 2) 1.5KV input and output isolation;
- 3) 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(μF)	Efficiency (%. typ.) @Max. Load
	Nominal (Range)	Max. ①		Max.	Min.	@Max. Load	@No Load			
WRB1205LT-3WR2	12 (9-18)	22	5	600	30	333	22	30	3300	75
WRB1212LT-3WR2			12	250	12	325			1800	77
WRB1215LT-3WR2			15	200	10	316			1000	79
WRB2405LT-3WR2	24 (18-36)	40	5	600	30	164	12	30	3300	76
WRB2412LT-3WR2			12	250	12	154			1800	81
WRB2415LT-3WR2			15	200	10	156			1000	80
WRB4805LT-3WR2	48 (36-75)	80	5	600	30	81	8	30	3300	77
WRB4812LT-3WR2			12	250	12	78			1800	80
WRB4815LT-3WR2			15	200	10	78			1000	80

Note:①. Absolute maximum rating without damage on the converter, but it isn't recommended.

#### INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1sec. max.)	12VDC input	-0.7	--	25	VDC
	24VDC input	-0.7	--	50	
	48VDC input	-0.7	--	100	
Start-up Voltage	12VDC input	4.5	8	9	VDC
	24VDC input	11	16	18	
	48VDC input	24	33	36	
Input Filter		Pi Filter			

#### OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	5% to 100% load	--	±1	±3	%
No-load Output Voltage Accuracy	Vo ≤ 5V	--	±1.5	±5	
	Vo > 5V	--	±1.5	±3	
Line Regulation	Full load, Input voltage from low to high	--	±0.2	±0.4	
Load Regulation	5% to 100% load	--	±0.2	±0.75	

Transient Recovery Time	25% load step change	--	0.5	1	ms
Transient Response Deviation		--	±2	±5	%
Temperature coefficient	100% load	--	±0.02	±0.03	%/°C
Ripple*	20MHz Bandwidth	--	20	35	mVp-p
Noise*		--	45	60	
Output Short Circuit Protection		Continuous, automatic recovery			
Note:* Ripple and noise tested with "parallel cable" method. See detailed operation instructions at <i>DC-DC Application Notes</i> .					

## COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Tested for 1 minute , leakage current less than 1 mA	1500	--	--	VDC
Isolation Resistance	Test at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input/Output,100KHz/0.1V	--	1	--	nF
Switching Frequency(PFM Mode)	100% load, nominal input voltage	--	350	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours
Case Material		Epoxy Resin (UL94-V0)			
Weight		--	5.2	--	g

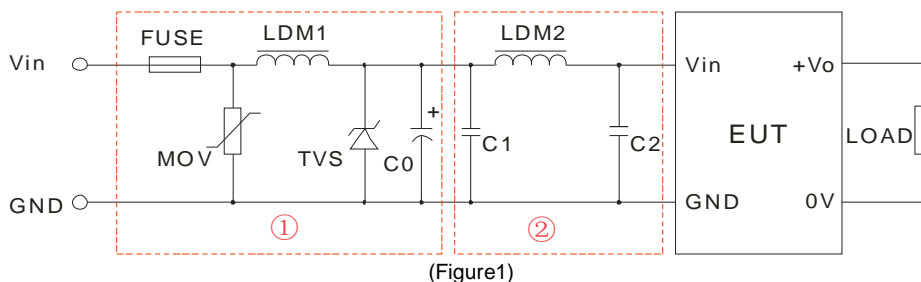
## ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	--	--	95	%
Operating Temperature	Power derating (above 85°C,see Figure 5)	-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 B (External Circuit Refer to Figure1-② or Figure 3)		
	RE	CISPR22/EN55022 CLASS B (External Circuit Refer to Figure1-② or Figure 3)		
EMS	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	perf. Criteria B (External Circuit Refer to Figure1-①)
			±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

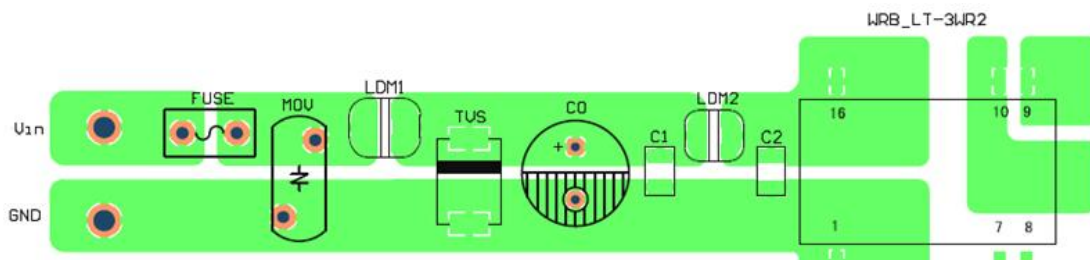


Recommended external circuit parameters:

Model	Vin:12V	Vin:24V	Vin:48V
FUSE	Choose according to practical input current		
MOV	--	10D560	10D101
LDM1	--	56μH	
TVS	SMCJ28A	SMCJ48A	SMCJ90A
C0	680μF/25V	120μF/50V	120μF/100V
LDM2	12μH		
C1	4.7uF/50V		4.7uF/100V
C2	4.7uF/50V		4.7uF/100V

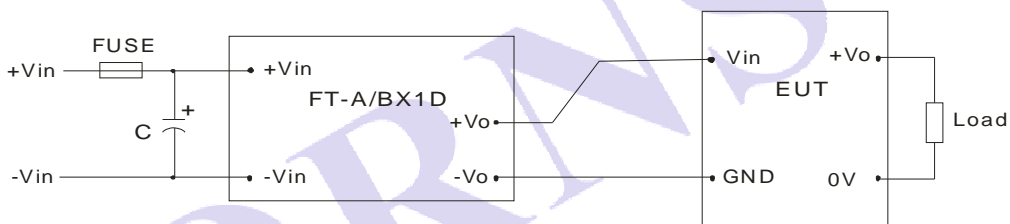
Note: 1. In Figure 1, part① is EMS Recommended external circuit, part② is EMI recommended external circuit. Choose according to requirements;  
2. If there is no recommended parameters, the model no require the external component.

## EMC RECOMMENDED CIRCUIT PCB LAYOUT



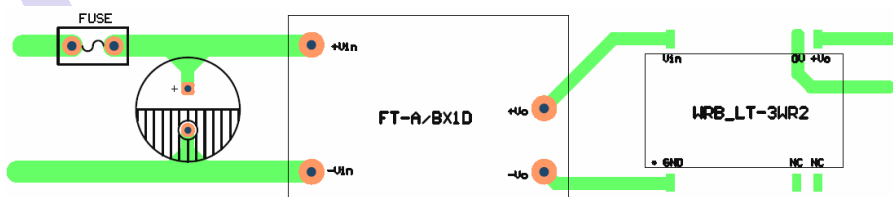
(Figure 2)

## EMC MODULE APPLICATION CIRCUIT



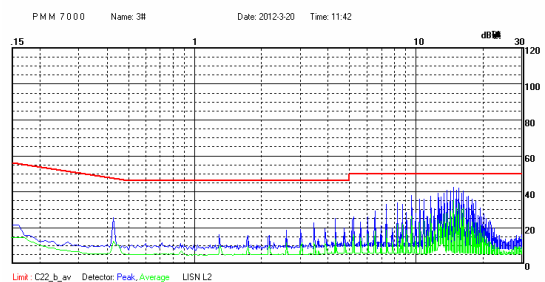
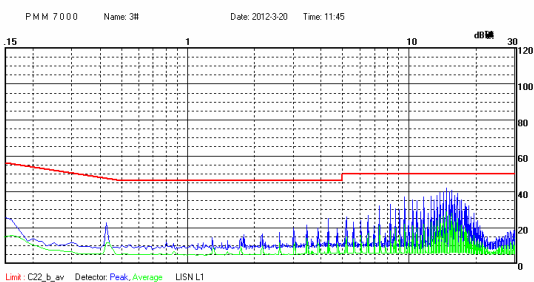
Nominal Input Voltage<48V, C≥330uF/50V  
Nominal Input Voltage=48V, C≥330uF/100V  
FT-A/BX1D is MORNSUN's EFT suppresser  
(Figure 3)

## EMC MODULE RECOMMENDED CIRCUIT PCB LAYOUT



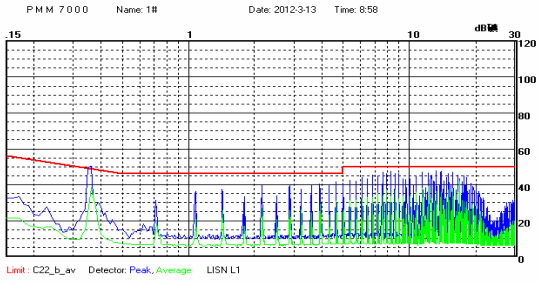
(Figure 4)

## EMI TEST WAVEFORM (NOMINAL AND FULL LOAD)

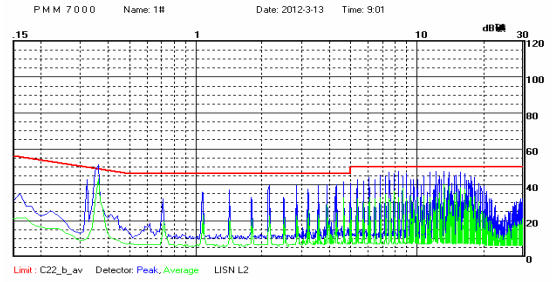


WRB2405LT-3WR2 With External Circuit Power+ (Class B)

WRB2405LT-3WR2 With External Circuit Power- (Class B)



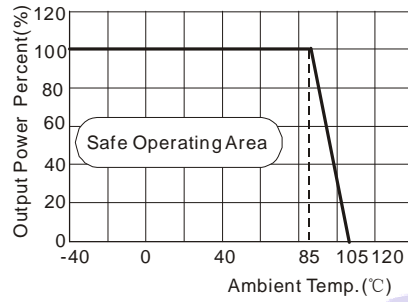
WRB4815LT-3WR2 With External Circuit Power+ (Class B)



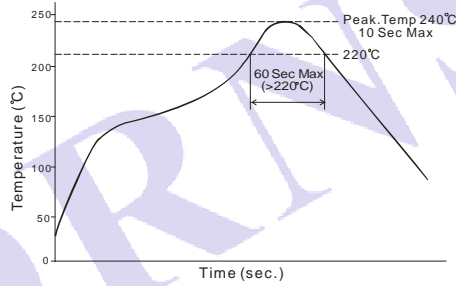
WRB4815LT-3WR2 With External Circuit Power- (Class B)

**PRODUCT TYPICAL PERFORMANCE CURVE**

Temperature Derating Graph

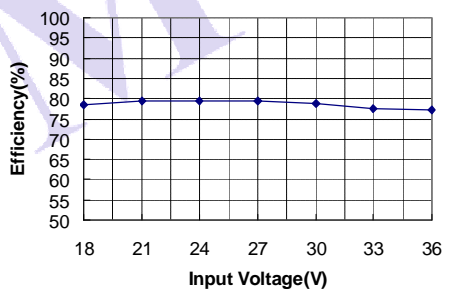


(Figure 5)

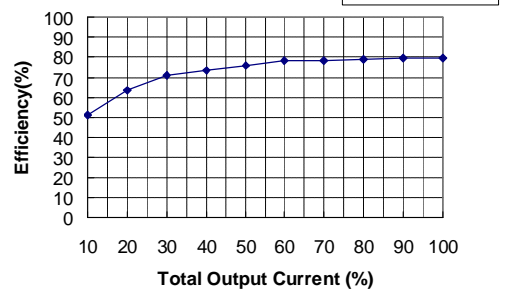


Remark: The curve applies only to the hot air reflow soldering

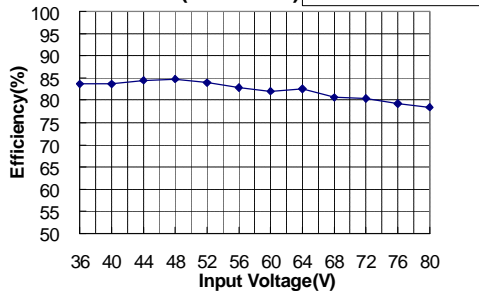
Efficiency VS Input Voltage curve (Full Load)



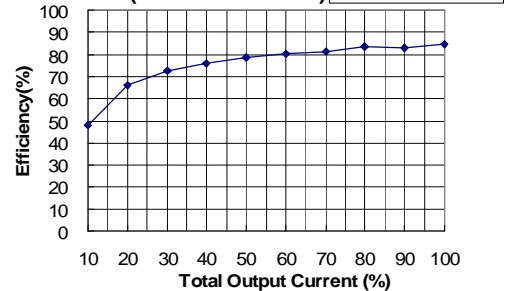
Efficiency VS Output Load curve (Vin=Vin-nominal)



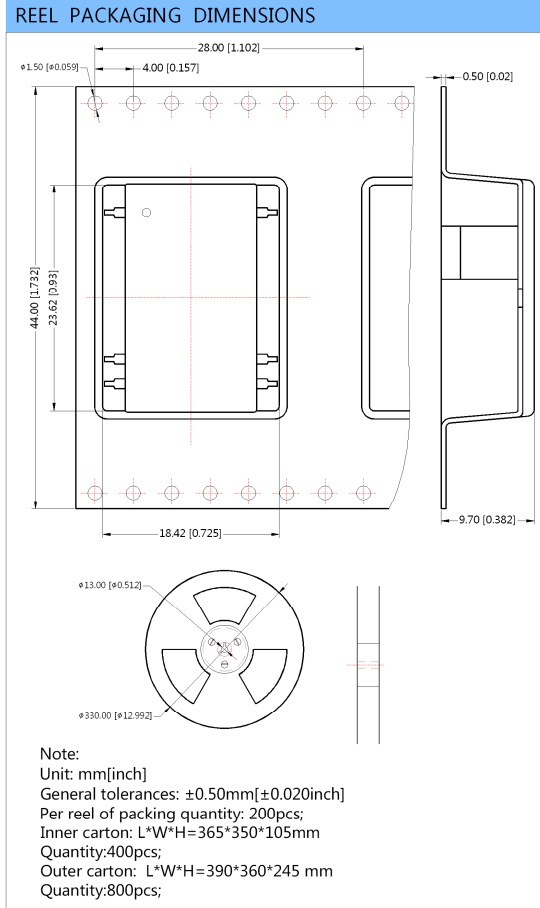
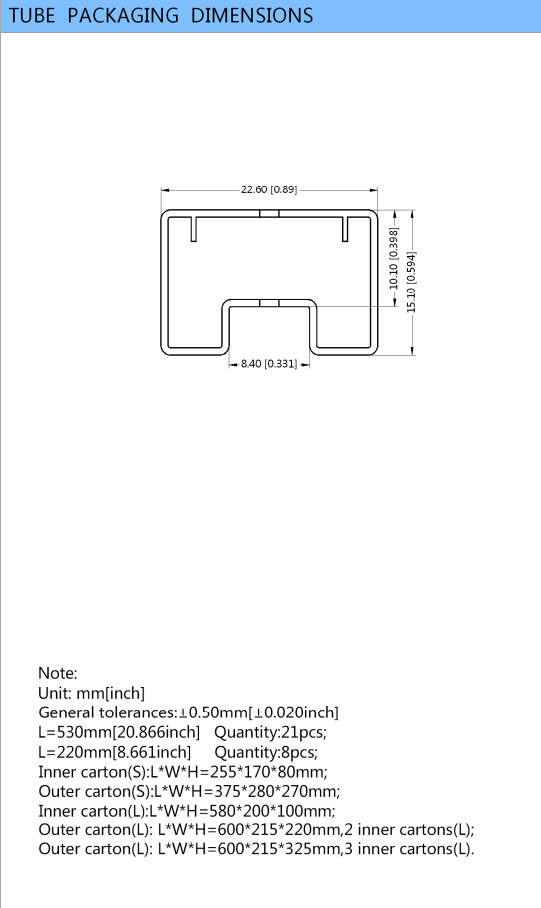
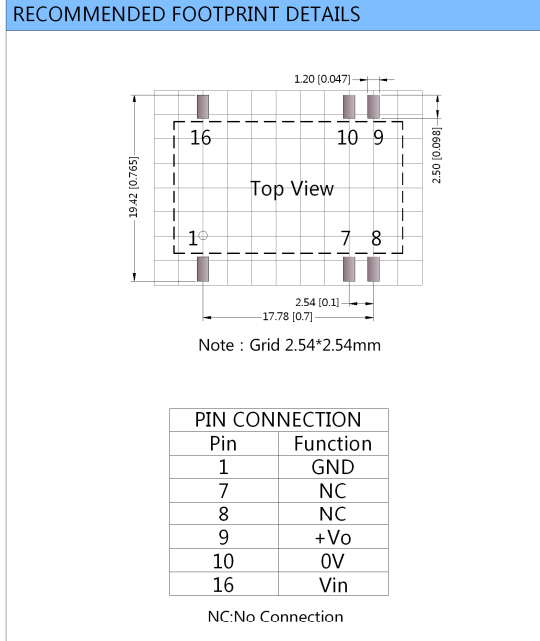
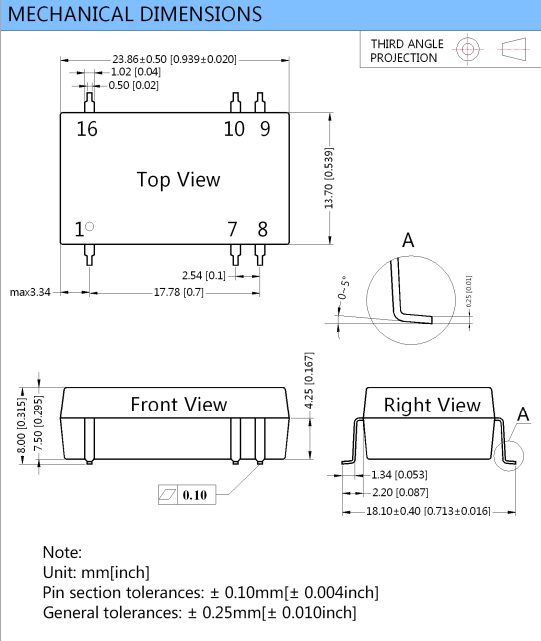
Efficiency VS Input Voltage curve (Full Load)



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



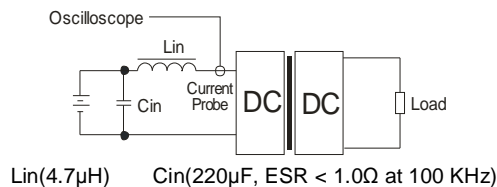
# OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGE DIAGRAM



## 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 the 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 may 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 WRB\_LT-3WR2 series have been tested according to the following recommended test circuit before leaving the factory (See Figure 6).

If you want to further decrease the input/output ripple, you can increase a capacitance-values 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. Provided the safe and reliable operation is ensured, the greatest capacitance of its filter capacitor must be less than the Max. Capacitive Load.

General: Cin: 12V 100 $\mu$ F  
24V&48V 10 $\mu$ F~47 $\mu$ F  
Cout: 10 $\mu$ F/100mA

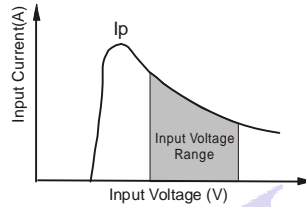


(Figure 6)

### 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 7).

General: Vin: 12V Ip = 640mA  
24V Ip = 320mA  
48V Ip = 160mA



(Figure 7)

**4) It is not recommended to increase the output power capability by connecting two or more converters in parallel. The product is not hot-swappable**

Note:

1. Min. load shouldn't be less than 5%, otherwise ripple may be increased dramatically. If the product operates under min. load, it may not be guaranteed to meet all specifications listed. Operation under minimum load will not damage the converter.
2. Max. Capacitive Load is tested at input voltage range and full load.
3. All specifications measured at  $T_a=25^{\circ}\text{C}$ , humidity < 75%, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all test methods are based on our corporate standards.
5. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more details.
6. Please contact our technical support for any specific requirement.
7. Specifications of this product are subject to changes without prior notice.

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