

15W isolated DC-DC converter  
Wide input and regulated single output



Patent Protection RoHS

## FEATURES

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

VRB2405XLD-15WR3 isolated 15W DC-DC products with a 2:1 input voltage range. They feature efficiencies of up to 90%, 1500VDC input to output isolation, operating ambient temperature range of -40°C to +85°C, input under-voltage protection, output short-circuit, over-voltage, over-current protection. They meet CLASS A of CISPR32/EN55032 EMI standards without external components, and they are widely used in applications such as data transmission device, battery power supplies, tele-communication device, distributed power supply system, hybrid module system, remote control system, industrial robot system fields.

## Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency <sup>②</sup> (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal (Range)	Max. <sup>①</sup>	Voltage (VDC)	Current (mA) Max./Min.		
--	VRB2405XLD-15WR3	24 (18-36)	40	5	3000/0	87/89	4700

Notes: ①Exceeding the maximum input voltage may cause permanent damage;  
②Efficiency is measured at nominal input voltage and rated output load.

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal input voltage	--	702/30	718/75	mA
Reflected Ripple Current		--	30	--	
Surge Voltage (1sec. max.)		-0.7	--	50	VDC
Start-up Voltage		--	--	18	
Input Under-voltage Protection		12	15.5	--	
Start-up Time	Nominal input voltage & constant resistance load	--	10	--	ms
Input Filter		Pi filter			
Hot Plug		Unavailable			

## 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	±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: The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information;  
Ripple & Noise at  $\leq 5\%$  load is 5%Vo. Max.

### 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	--	--	M $\Omega$
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	--	1050	--	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		10-55Hz, 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	50.80 x 25.40 x 11.80 mm
Weight	24g(Typ.)
Cooling method	Free air convection

### Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.3-② for recommended circuit)
	RE	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.3-② for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2	Contact $\pm 4$ kV perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A
	EFT	IEC/EN61000-4-4	$\pm 2$ kV (see Fig.3-① for recommended circuit) perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line $\pm 2$ kV (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

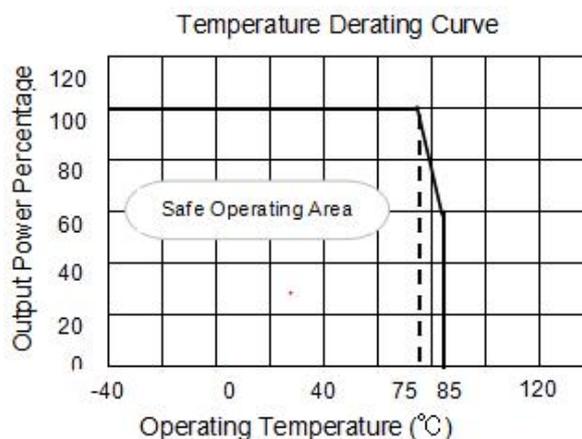
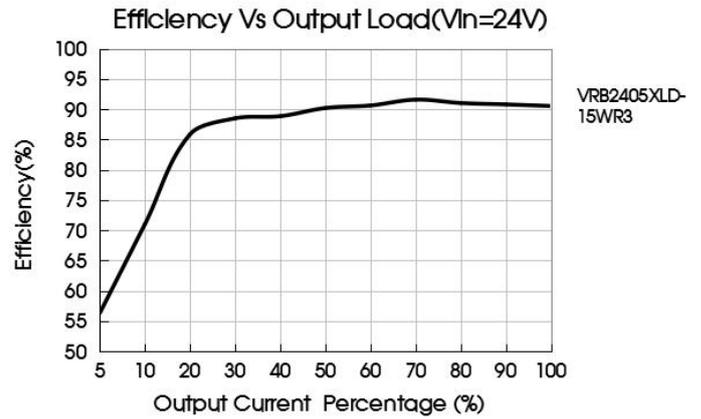
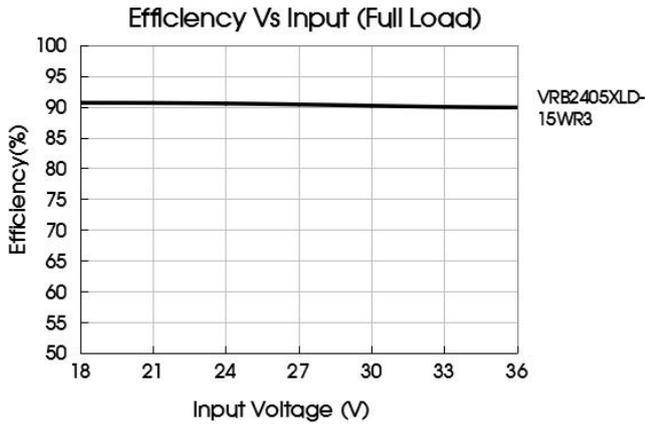


Fig. 1



## 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.



Fig. 2

$C_{in}$	$C_{out}$
100 $\mu$ F/50V	470 $\mu$ F/16V

### 2. EMC compliance circuit

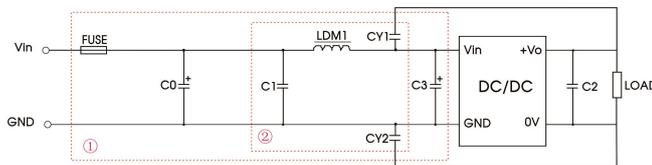


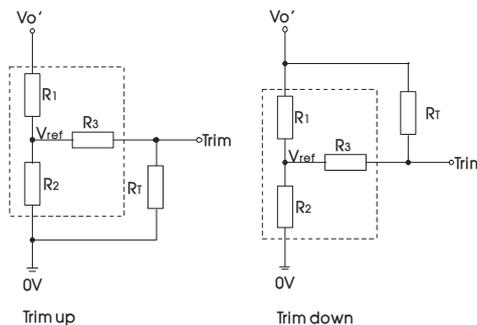
Fig. 3

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	$V_{in}$ :24VDC
FUSE	Choose according to actual input current
C0/C3	330 $\mu$ F/50V
C1	1 $\mu$ F/50V
C2	Refer to the $C_{out}$ in Fig.2
LDM1	4.7 $\mu$ H/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:

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

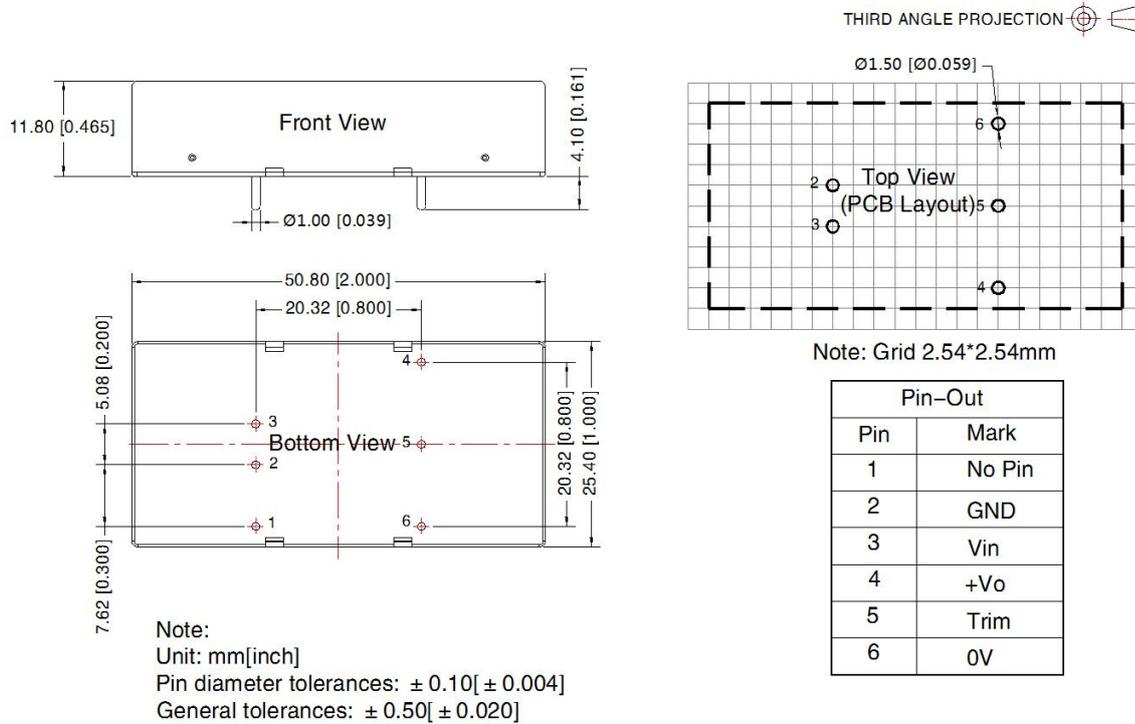
$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

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

$V_{out}$ (VDC)	R1(k $\Omega$ )	R2(k $\Omega$ )	R3(k $\Omega$ )	$V_{ref}$ (V)
5	2.883	2.87	10	2.5

4. The products do not support parallel connection of their output
5. For additional information please refer to DC-DC converter application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout



- Note:
1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging number: 58200035;
  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  $T_a=25^{\circ}\text{C}$ , 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. We can provide product customization service, please contact our technicians directly for specific information;
  6. Products are related to laws and regulations: see "Features" and "EMC";
  7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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