MORNSUN®

6W isolated DC-DC converter in SIP package
Wide Input and regulated single output

CE Patent Protection RoHS 3 years Warranty

FEATURES

- Wide 2:1 input voltage range
- High efficiency up to 87%
- No-load power consumption as low as 0.12W
- I/O isolation test voltage 1.6K VDC
- Input under-voltage protection, output short circuit, over-current protection
- Operating ambient temperature range: -40℃ ~ +105℃
- Industry standard pin-out
- EN62368 approved

VRB_S-6WR3 series of isolated 6W DC-DC products with a 2:1 input voltage range. They feature efficiencies of up to 87%, 1600VDC input to output isolation, operating ambient temperature range of -40℃ ~ +105℃, input under-voltage protection, output over-current, short circuit protection and they are widely used in applications such as medical care, industrial control, electric power, instruments and communication fields.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency② Min./Typ.	Max. Capacitive Load (μF)
		Nominal (Range)	Max.①	Voltage (VDC)	Current (mA) (Max./Min.)		
CE	VRB1203S-6WR3	12 (9-18)	20	3.3	1350/0	74/76	1800
	VRB1205S-6WR3			5	1200/0	78/80	1000
	VRB1209S-6WR3			9	667/0	80/82	470
	VRB1212S-6WR3			12	500/0	82/84	470
	VRB1215S-6WR3			15	400/0	82/84	220
	VRB1224S-6WR3			24	250/0	82/84	100
	VRB2403S-6WR3	24 (18-36)	40	3.3	1350/0	76/78	1800
	VRB2405S-6WR3			5	1200/0	80/82	1000
	VRB2409S-6WR3			9	667/0	82/84	470
	VRB2412S-6WR3			12	500/0	84/86	470
	VRB2415S-6WR3			15	400/0	85/87	220
	VRB2424S-6WR3			24	250/0	83/85	100

Notes:
① Exceeding the maximum input voltage may cause permanent damage;
② Efficiency 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)	12VDC nominal input series, nominal input voltage	3.3V output	--	489/12	502/18	mA
		Others	--	625/12	641/18	
	24VDC nominal input series, nominal input voltage	3.3V output	--	238/5	245/12	
		5V output	--	305/5	313/12	
		Others	--	305/10	313/16	
Reflected Ripple Current			--	50	--	
Surge Voltage (1sec. max.)	12VDC nominal input voltage		-0.7	--	25	VDC
	24VDC nominal input voltage		-0.7	--	50	
Start-up Voltage	12VDC nominal input voltage		--	--	9	
	24VDC nominal input voltage		--	--	18	
Input Under-voltage Protection	12VDC nominal input voltage		5.5	6.5	--	VDC
	24VDC nominal input voltage		12	15.5	--	
Input Filter			Capacitance Filter			

Hot Plug		Unavailable			
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	--	6	10	mA
Note: *The Ctrl pin voltage is referenced to input GND.					

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy①	5%-100% load		--	±1	±2	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.5	±1	
Load Regulation②	5%-100% load		--	±0.5	±1.5	
Transient Recovery Time	25% load step change		--	300	500	μs
Transient Response Deviation		3.3V, 5V output	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise③	20MHz bandwidth, 5%-100% load		--	50	100	mV p-p
Over-current Protection	Input voltage range		110	160	230	%Io
Short-circuit Protection			Continuous, self-recovery			

Note:
①At 0%-5% load, the Max. output voltage accuracy is ±3%;
②Load regulation for 0%-100% load is ±3%;
③Ripple & Noise at ≤ 5% load is no more than 150mV. 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.	1600	--	--	VDC
Insulation Resistance	Input-output insulation at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V	--	1000	--	pF
Operating Temperature	see Fig. 1	-40	--	+105	℃
Storage Humidity	Without condensation	5	--	95	%RH
Storage Temperature		-55	--	+125	℃
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	
Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency *	PWM mode	--	500	--	KHz
MTBF	MIL-HDBK-217F@25℃	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	Black plastic; flame-retardant and heat-resistant (UL94-V0)
Dimensions	22.00 x 9.50 x 12.00 mm
Weight	4.9g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
	RE	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

Typical Characteristic Curves

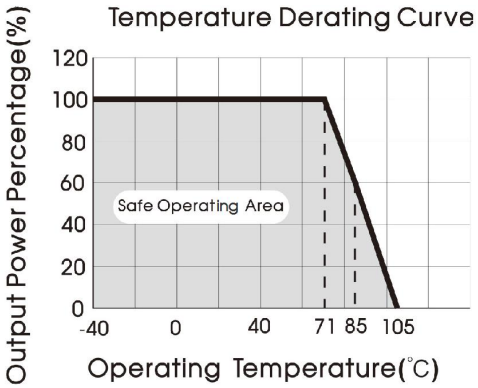
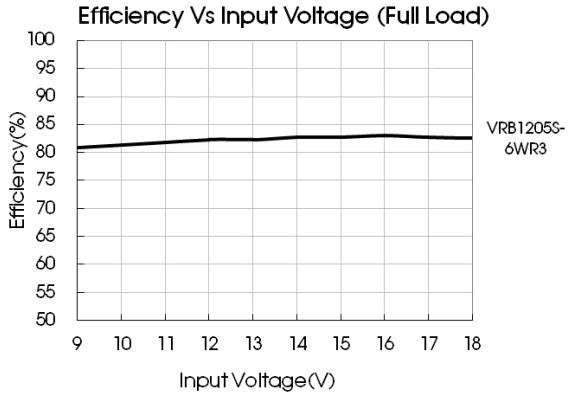
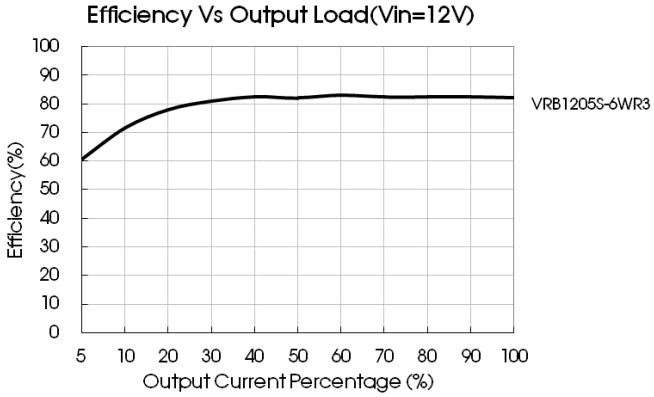
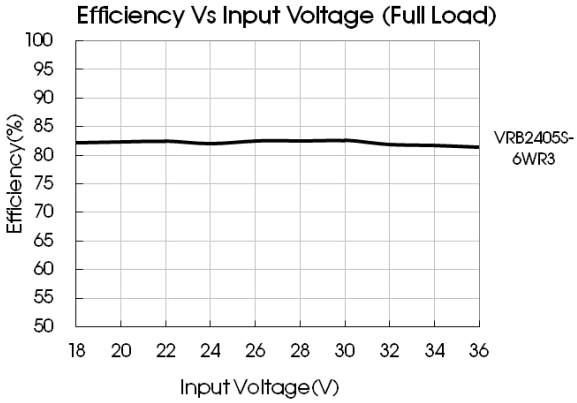
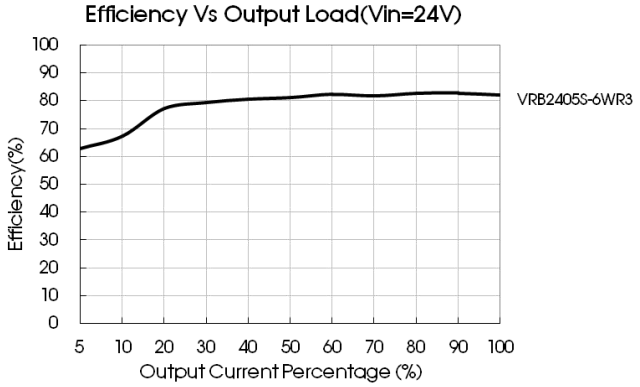


Fig. 1









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 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

Cin(uF)	Cout(uF)
100	22

2. EMC compliance circuit

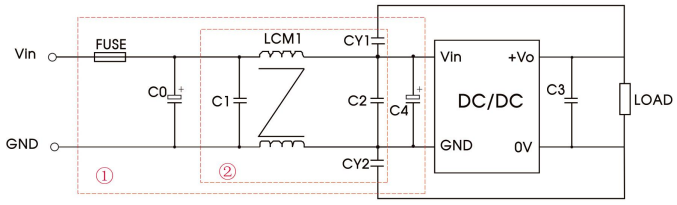


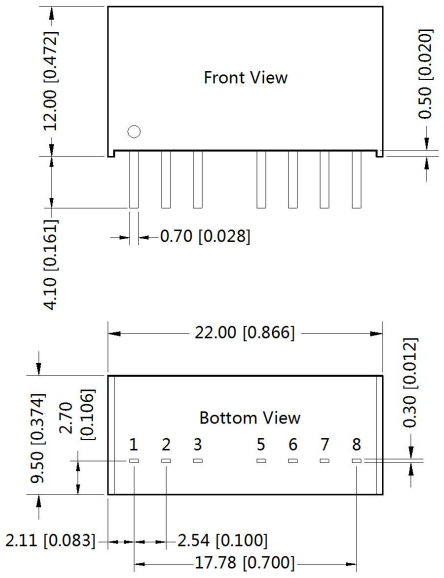
Fig. 3
Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs

Fig. 3 Parameter description

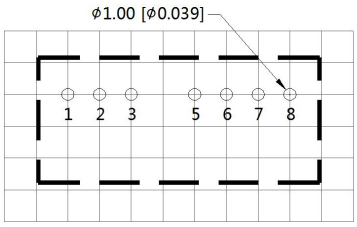
Model	Vin:12V	Vin:24V
FUSE	Choose according to actual input current	
C0, C4	330μF/35V	330μF/50V
C1, C2	10μF/50V	
C3	22μF/50V	
LCM1	1.4-1.7mH（TN150P-RH12.7*12.7*7.9）	
CY1, CY2	1nF/400VAC	

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]



Note : Grid 2.54*2.54mm

Pin-Out	
Pin	Function
1	GND
2	Vin
3	Ctrl
5	NC
6	+Vo
7	0V
8	NC

NC: Pin to be isolated from circuitry

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. packaging number: 58210004;
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℃, 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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