40W,wide input isolated & regulated single output DC/DC converter

Patent Protection RoHS

FEATURES

- Wide range of input voltage (2:1)
- Efficiency up to 90%
- High power density
- Isolation voltage :1500VDC
- Operating temperature range: -40℃ to +85℃
- Remote voltage compensate
- Over-temperature protection, output over-voltage, over-current and short circuit protection

The VRB_D-40W series are particularly suited to data transfer equipments, battery operated equipments, tele-communication equipments, distributing power system, mix analog/digital system, remote control system, industrial robot system and other wide input voltage application fields.

Selection Guide

Part No.①	Input Voltage (VDC)		Output		Efficiency (%,Typ.) @ Full Load	Max. Capacitive Load(μF)
	Nominal (Range)	Max.②	Output Voltage (VDC)	Output Current (mA)(Max./Min.)		
VRB1203D-40W	12 (9-18)	20	3.3	8000/800	84	21000
VRB1205D-40W			5	8000/800	86	13600
VRB1212D-40W			12	3300/330	86	2360
VRB1215D-40W			15	2666/267	88	1510
VRB1224D-40W			24	1670/167	88	470
VRB2403D-40W	24 (18-36)	40	3.3	8000/800	87	21000
VRB2405D-40W			5	8000/800	89	13600
VRB2412D-40W			12	3300/330	89	2360
VRB2415D-40W			15	2666/267	90	1510
VRB2424D-40W			24	1670/167	90	470
VRB4803D-40W	48 (36-75)	80	3.3	8000/800	85	21000
VRB4805D-40W			5	8000/800	88	13600
VRB4812D-40W			12	3300/330	90	2360
VRB4815D-40W			15	2666/267	90	1510
VRB4824D-40W			24	1670/167	89	470

Notes:
① Add suffix "H" for heat sink mounted, for example VRB4805D-40WH.
② Input voltage can't exceed this value, or will cause the permanent damage.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	12VDC input	3.3VDC、5VDC output	--	3796/106	--	mA
		others		3790/11		
	24VDC input	3.3VDC、5VDC output	--	1877/66	--	
		others		1860/13		
	48VDC input	3.3VDC、5VDC output	--	931/38	--	
		others		920/8		
Reflected Ripple Current	12VDC input		--	50	--	
	24VDC input		--	100	--	
	48VDC input		--	200	--	
Input impulse Voltage (1sec. max.)	12VDC input		-0.7	--	25	VDC
	24VDC input		-0.7	--	50	
	48VDC input		-0.7	--	100	
Start-up voltage	12VDC input		--	--	9	

	24VDC input	--	--	18	
	48VDC input	--	--	36	
Starting Time	Nominal input& constant resistance load	--	5	--	ms
Short Circuit Input Power		--	--	4.5	W
Input Filter		Pi filter			
Ctrl*	Module switch on	3.5 - 12VDC or open circuit			
	Module switch off	0-1.2VDC or short Circuit			
	Input current when switched off	--	--	1	mA
Note: *the voltage of Ctrl pin is relative to input pin GND.					

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Power		4	--	40	W
Output Voltage Accuracy		--	±1	--	%
Line Regulation	Full load, the input voltage is from low voltage to high voltage	--	±0.2	--	
Load Regulation	10%-100% load	--	±0.5	--	
Transient Recovery Time	25% load step change	--	200	500	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift Coefficient	Full load	--	±0.02	--	%/℃
Ripple & Noise*	20MHz bandwidth	--	100	400	mV p-p
Output Voltage Regulation (Trim)	Nominal light load	--	±10%Vo	--	VDC
Remote output voltage compensate (Sense)	To compensate for the voltage of remote load	--	10%Vo	--	
Output Over-current Protection	Input voltage range	120-150%Po			
Output Over-voltage Protection		110-130%Vo			
Output over-temperature Protection		--	115	--	℃
Output Short circuit Protection		continuous, self-recovery			
Note:*Ripple and noise tested with "parallel cable" method, please see *DC-DC Converter Application Notes* for specific operation methods.					

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output, with the test time of 1 minute and the leak current lower than 1mA	1500	--	--	VDC
Isolation Resistance	Input-output, isolation voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	2000	--	pF
Operating Temperature	see Fig. 1	-40	--	85	℃
Storage Temperature		-55	--	125	
Storage Humidity	Non-condensing	5	--	95	%RH
Max. Operating Temperature for casing	Within the operating temperature curve	--	--	105	℃
Pin Welding Resistance Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	300	
Switching Frequency	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours

Physical Specifications

Casing Material	Aluminum alloy	
Package Dimensions	Horizontal package(without heat sink)	50.80*50.80*11.80 mm
	Horizontal package(with heat sink)	50.80*50.80*16.30 mm
Weight	Horizontal package(without heat sink)/ Horizontal package(with heat sink)	60.00g/85.00g(Typ.)
Cooling Method	Free air convection	

EMC Specifications

EMI	Conducted disturbance	CISPR22/EN55022	CLASS A (see Fig.3-② for recommended circuit)	
EMS	Electrostatic discharge	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	EFT	IEC/EN61000-4-4	±2KV (see Fig.3-① for recommended circuit)	perf. Criteria B
	Surge immunity	IEC/EN61000-4-5	±2KV (see Fig.3-①for recommended circuit)	perf. Criteria B

Product Characteristic Curve

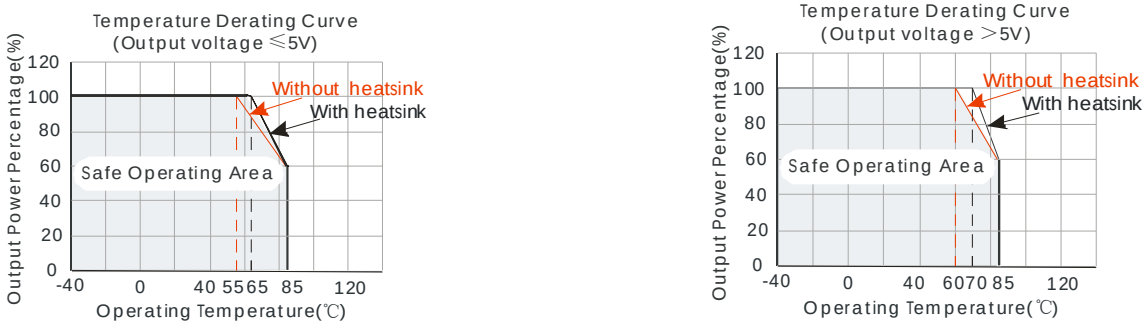
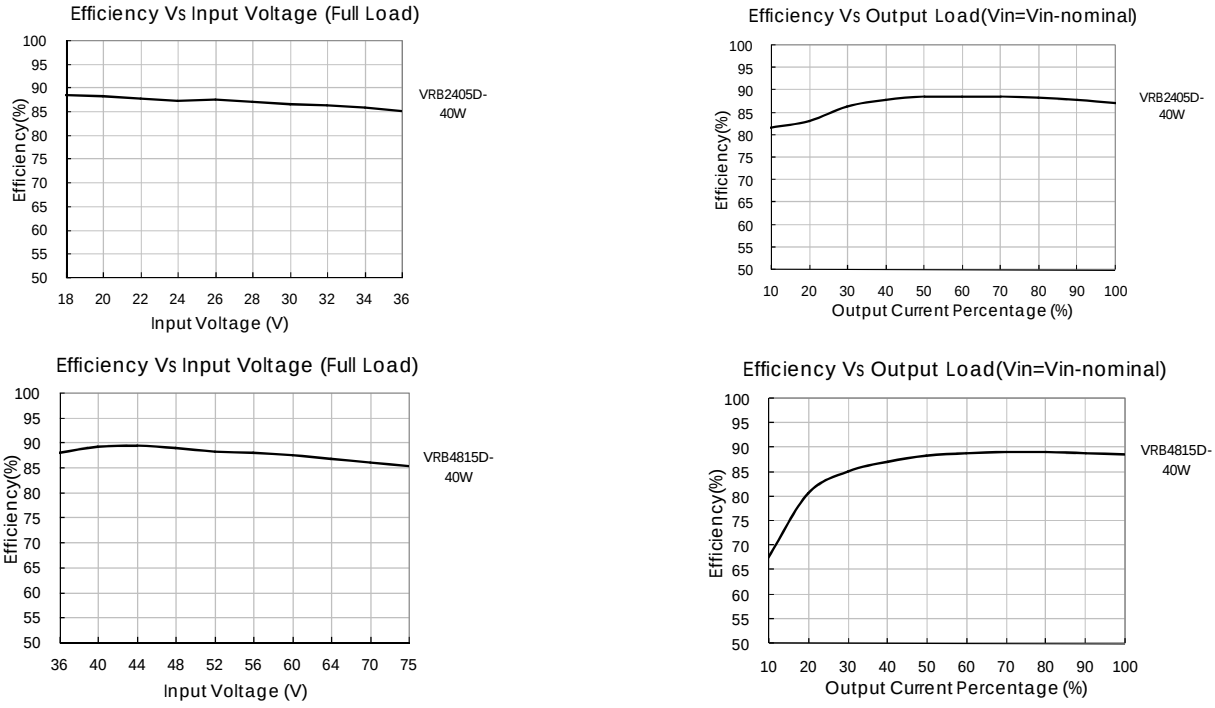


Fig. 1



Design Reference

1. Typical application

All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 2) before delivery.

If it is required to further reduce input and output ripple, properly increase the input & output of additional capacitors Cin and Cout or select capacitors of low equivalent impedance provided that the capacitance is no larger than the max. capacitive load of the product.

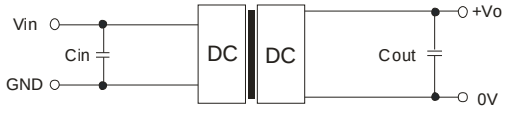


Fig. 2

Vout(VDC)	Cin(μF)	Cout(μF)
3.3, 5	100	220
12, 15		100
24		47

2. EMC solution-recommended circuit

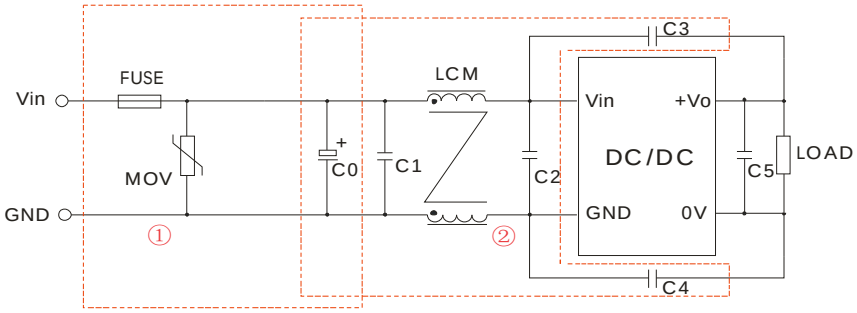


Fig. 3

Notes: Part ① in the Fig. 3 is used for EMS test and part ② for EMI filtering; selected based on needs.

Parameter description

Model		VRB12_D-40W	VRB24_D-40W	VRB48_D-40W
EMS	FUSE	Choose according to load		
	MOV	--	S14K35	S14K60
	C0	680μF/25V	330μF/50V	330μF/100V
EMI	C0	680μF/25V	330μF/50V	330μF/100V
	C1	--	4.7μF/50V	--
	LCM	--	--	3.3mH
	C2	--	4.7μF/50V	--
	C3	--	1nF/2KV	--
	C4	100pF/2KV	1nF/2KV	--

Note: It is not needed to add the component in the peripheral circuit when parameter with the symbol of "--"

EMC solution-recommended circuit PCB layout

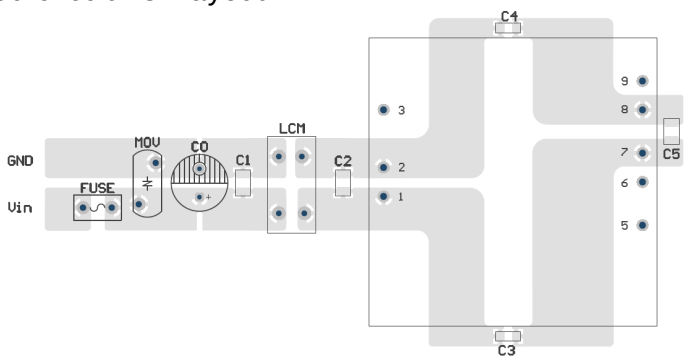
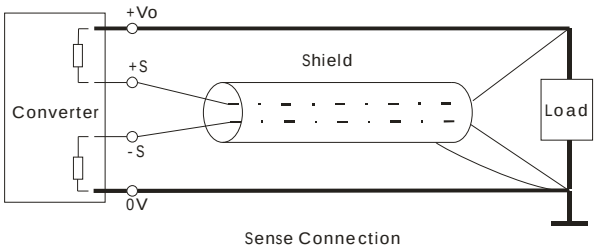


Fig. 4

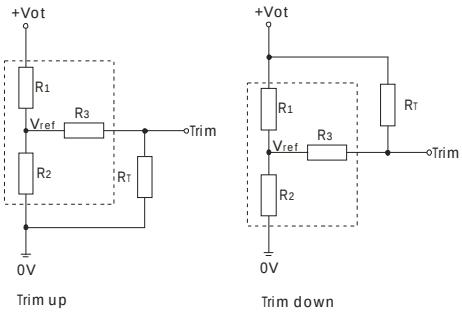
Note: the min. distance of the bonding pads between input & output isolation capacitors (CY1/CY2) shall be ≥ 2mm.

3. Sense use (remote voltage compensation)



Sense Connection

4. Application of Trim and calculation of Trim resistance



Applied circuits of Trim (Part in broken line is the interior of models)

Calculation formula of Trim resistance:

up: $R_T = \frac{aR_2}{R_2-a} - R_3$ $\quad a = \frac{Vref}{Vo'-Vref} \cdot R_1$

down: $R_T = \frac{aR_1}{R_1-a} - R_3$ $\quad a = \frac{Vo'-Vref}{Vref} \cdot R_2$

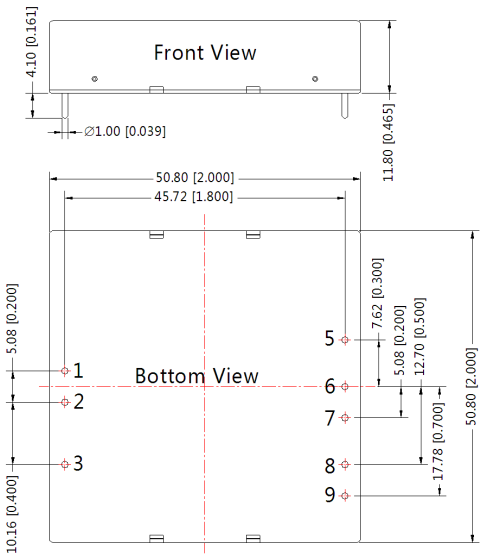
R_T is Trim resistance
a is a self-defined parameter, with no real meaning.
Vo' is the trim up/down voltage

Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.80	2.86	15	1.24
5	2.88	2.86	10	2.5
12	10.97	2.86	17.8	2.5
15	14.50	2.86	17.8	2.5
24	24.87	2.86	20	2.5

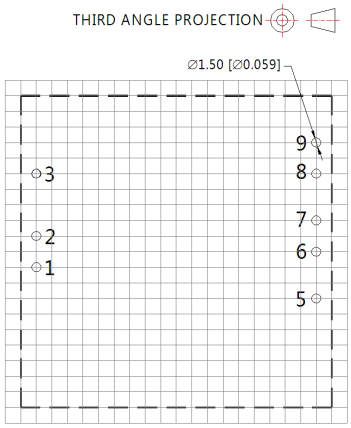
5. The product does not support output in parallel with power per liter or hot-plug use

6. For more information please find the application notes on www.mornsun-power.com

Dimensions and Recommended Layout (Horizontal package without heat sink)



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

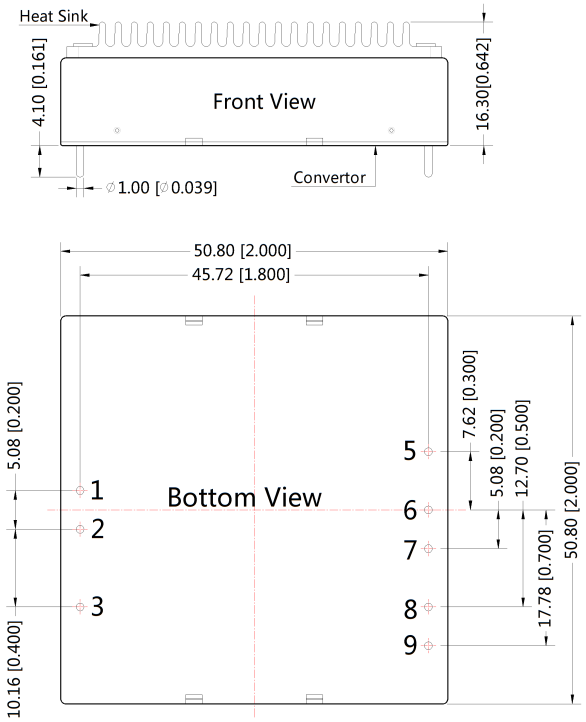


Note : Grid 2.54*2.54mm

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

Horizontal Package Dimensions (Horizontal package with heat sink)

THIRD ANGLE PROJECTION



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

Note:
Unit :mm[inch]
General tolerances:±0.50[±0.020]
If use heat sinks, make sure there is enough space for a specific size in the above graph.

Notes:

1. Packing Information please refer to 'Product Packing Information'. The Packing bag number of Horizontal package :58200023(without heat sink), 58200049(with heat sink);
2. Recommended used in more than 10% load, if the load is lower than10%, then the ripple index of the product may exceed the specification, but does not affect the reliability of the product;
3. The max. capacitive load should be tested within the input nominal voltage and under full load conditions;
4. Unless otherwise specified, data in this datasheet should be tested under the conditions of Ta=25℃, humidity<75% when inputting nominal voltage and outputting rated load;
5. All index testing methods in this datasheet are based on our Company's corporate standards;
6. 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;
7. We can provide product customization service;
8. Specifications of this product are subject to changes without prior notice.

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