

VRB_D-40W Series

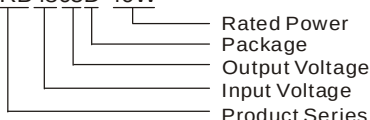
**40W, WIDE INPUT, ISOLATED & REGULATED
SINGLE OUTPUT DC-DC CONVERTER**



Patent Protection RoHS

PART NUMBER SYSTEM

VRB4805D-40W



PRODUCT FEATURES

- Efficiency up to 90%
- High power density
- 2:1 wide input range
- 1.5KVDC Isolation
- Over Current Protection
- Over Temperature Protection
- Short Circuit Protection
- Over Output Voltage Protection
- Under Input Voltage Protection
- Remote Voltage Compensate
- Operating temperature Range:
-40°C to +85°C
- Internal SMD Construction
- With heatsink
- MTBF>1,000,000 hours
- Industrial level specifications

APPLICATIONS

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

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*		Max.	Min.	@Max. Load	@No Load			
VRB1203D-40W	12 (9-18)	20	3.3	8000	800	2599	100	50	21000	84
VRB1205D-40W			5	8000	800	3796	106		13600	86
VRB1212D-40W			12	3300	330	3831	12		2360	86
VRB1215D-40W			15	2666	267	3790	11		1510	88
VRB1224D-40W			24	1670	167	3801	10		470	88
VRB2403D-40W	24 (18-36)	40	3.3	8000	800	1277	41	100	21000	87
VRB2405D-40W			5	8000	800	1877	66		13600	89
VRB2412D-40W			12	3300	330	1859	10		2360	89
VRB2415D-40W			15	2666	267	1860	13		1510	90
VRB2424D-40W			24	1670	167	1858	17		470	90
VRB4803D-40W	48 (36-75)	80	3.3	8000	800	636	39	200	21000	85
VRB4805D-40W			5	8000	800	931	38		13600	88
VRB4812D-40W			12	3300	330	922	8		2360	90
VRB4815D-40W			15	2666	267	920	8		1510	90
VRB4824D-40W			24	1670	167	942	8		470	89

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

2.Add suffix "H" for heatsink mounted, for example VRB4805D-40WH.

INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage(1sec. max.)	12VDC Input Models	-0.7	--	25	VDC
	24VDC Input Models	-0.7	--	50	
	48VDC Input Models	-0.7	--	100	

Under Voltage Shutdown	12VDC Input Models	--	--	9	VDC
	24VDC Input Models	--	--	18	
	48VDC Input Models	--	--	36	
Start-up Time	Nominal input& constant resistance load	--	5	--	ms
Ctrl*	Models ON	3.5 - 12VDC or open circuit			
	Models OFF	0-1.2VDC			
	Input current(Models OFF)	--	--	1	mA
Short Circuit Input Power		--	--	4.5	W
Input Filter		π Filter			
*The CTRL control pin voltage is refer to GND.					

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Power		4	--	40	W
Output Voltage Accuracy	Refer to recommended circuit	--	±1	--	%
Line Regulation	Full load, Input voltage from low to high	--	±0.2	--	
Load Regulation	10% to 100% load	--	±0.5	--	
Transient Recovery Time	25%~ 50%~25% load or	--	200	500	μs
Transient Response Deviation	50%~75%~50% load step change	--	±3	±5	%
Temperature Drift	100% full load	--	±0.02	--	%/°C
Ripple*	20MHz Bandwidth	--	40	75	mVp-p
Noise*		--	100	150	
Over Current Protection	Full input voltage	120-150%Po			
Over Voltage Protection		110-130%Vo			
Over Temp. Protection		--	115	--	°C
Trim	Nominal light load	--	±10%Vo	--	VDC
Sense	Remote Voltage compensation	--	10%Vo	--	
Short Circuit Protection	Full input voltage	Hiccup, Continuous, automatic recovery			
Note: *Ripple and noise tested by “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 and leakage current less than 1 mA	1500	--	--	VDC
Isolation Resistance	Test at 500VDC	1000	--	--	M Ω
Isolation Capacitance	Input/Output,100KHz/0.1V	--	2000	--	pF
Switching Frequency	Full load, nominal input	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours
Case Material		Aluminum Alloy			
Weight	Without heatsink	--	60	--	g
	With heatsink	--	85	--	

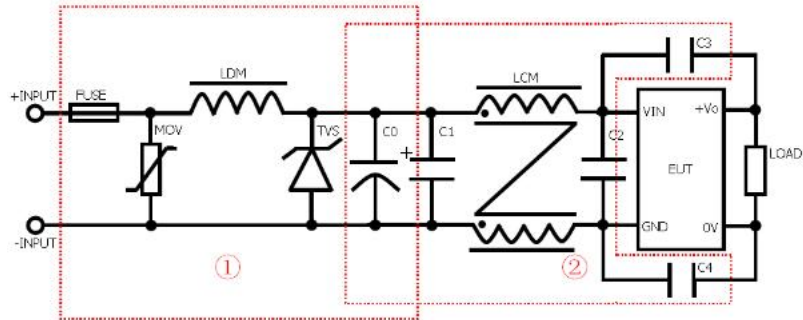
ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	See Temperature Derating Curve	-40	--	85	°C
Storage Temperature		-55	--	125	
Temp. rise allowed at full load	Operating Temperature curve range	--	--	105	
Soldering Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			

EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022 CLASS A (External Circuit Refer to Figure1-②)
EMS	ESD	IEC/EN61000-4-2 Contact $\pm 4\text{KV}$ perf. Criteria B
	EFT	IEC/EN61000-4-4 $\pm 2\text{KV}$ perf. Criteria B (External Circuit Refer to Figure 1-①)
	Surge	IEC/EN61000-4-5 $\pm 2\text{KV}$ perf. Criteria B (External Circuit Refer to Figure 1-①)

EMC RECOMMENDED CIRCUIT



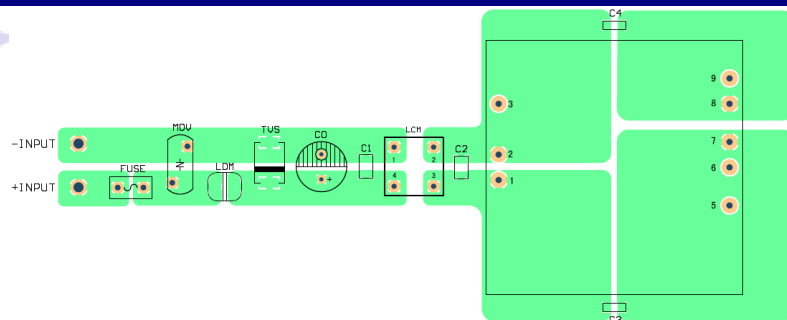
(Figure1)

Recommended external circuit parameters:

Model		VRB12_D-40W	VRB24_D-40W	VRB48_D-40W
EMS	FUSE	Choose according to load		
	MOV	--	S10K35	S10K75
	LDM1	--	82 μH CD53	82 μH CD53
	TVS	SMCJ28A	SMCJ48A	SMCJ100A
	C0	680 μF /25V	120 μF /50V	120 μF /100V
EMI	C0	680 μF /25V	--	120 μF /100V
	C1	--	4.7 μF /50V 1210	--
	LCM	--	--	3.8mH
	C2	--	4.7 μF /50V 1210	--
	C3	--	1000pF/2KV 1206	--
	C4	100pF/2KV 1206	1000pF/2KV 1206	--

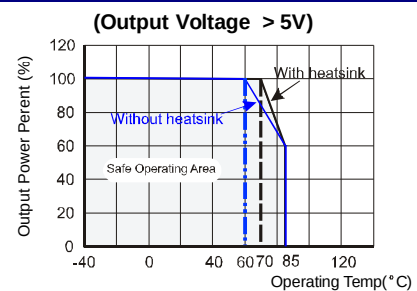
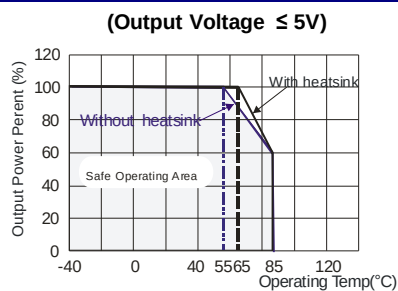
Note: 1. In Figure 1, part ① is EMS Recommended external circuit, part ② is EMI recommended external circuit. Choose according to requirements.
2. If there is no recommended parameters, the model no require the external component.

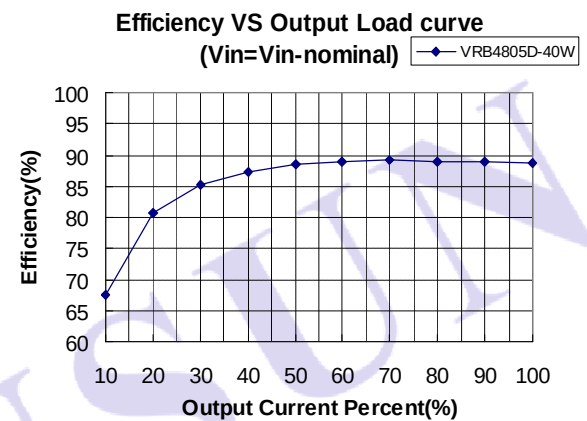
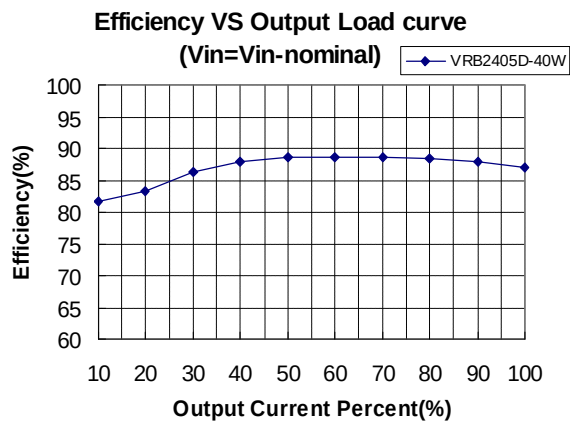
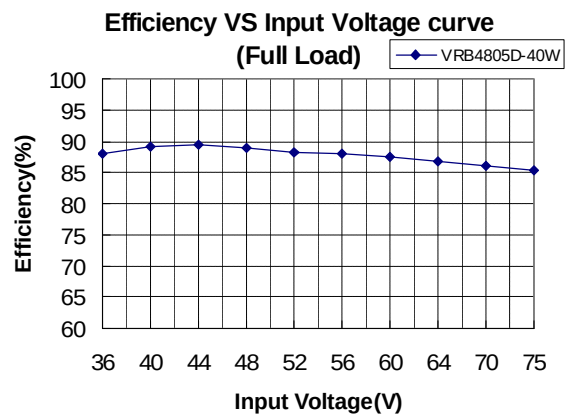
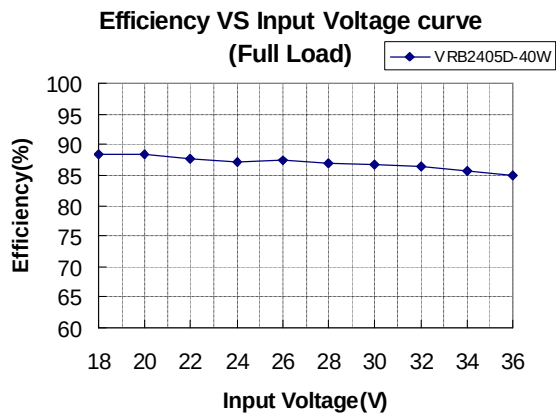
EMC RECOMMENDED CIRCUIT PCB LAYOUT



(Figure 2) VRB_D-40W Series

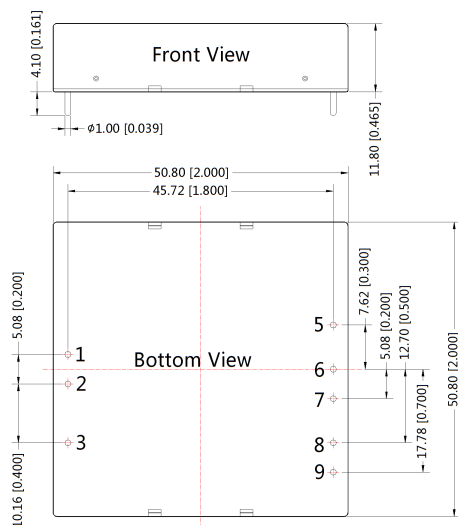
PRODUCT TYPICAL CURVE





OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

MECHANICAL DIMENSIONS

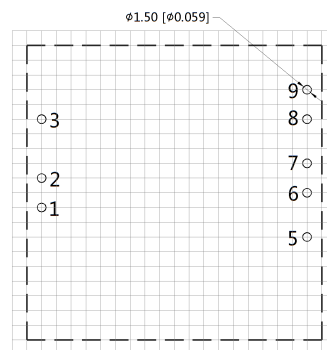


PIN CONNECTION	
Pin	Function
1	Vin
2	GND
3	Ctrl
5	Sense-
6	Sense+
7	+Vo
8	0V
9	Trim

Note:
Unit :mm[inch]
Pin diameter tolerances :±0.10[±0.004]
Pin height tolerances :±0.50[±0.020]
General tolerances :±0.30[±0.012]

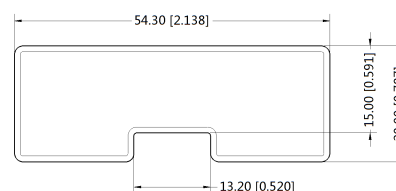
THIRD ANGLE
PROJECTION

RECOMMENDED FOOTPRINT DETAILS



Note : Grid 2.54*2.54mm

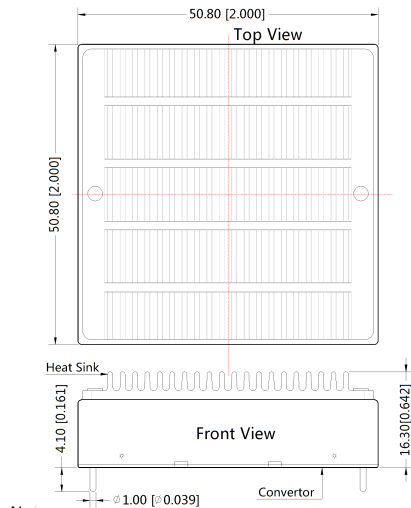
TUBE PACKAGING DIMENSIONS



Note:
Unit :mm[inch]
General tolerances :±0.50[±0.020]
L=230[9.055] Tube Quantity:7 pcs
Inner carton(S): L*W*H=255*170*80
Outer carton(S): L*W*H=375*280*270, 6 inner cartons(S)

HEATSINK ASSEMBLY & PACKAGE DIAGRAM

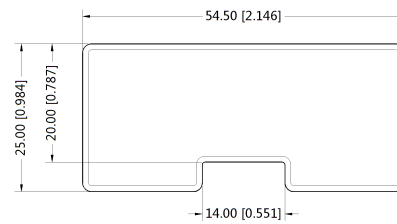
MECHANICAL DIMENSIONS (WITH HEATSINK)



Note:
Unit :mm[inch]
General tolerances:±0.30[±0.012]
If use heat sinks, make sure there is enough space for a specific size in the above graph.

THIRD ANGLE PROJECTION

TUBE PACKAGING DIMENSIONS (WITH HEATSINK)

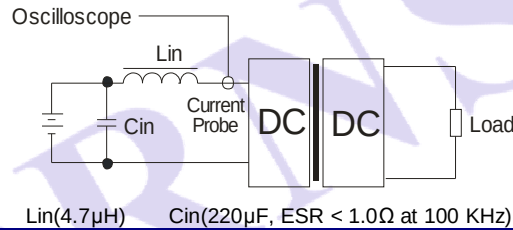


Note:
Unit :mm[inch]
General tolerances :±0.50[±0.020]
L=220mm[8.661 inch] Tube Quantity:4 PCS
Inner carton(S):L*W*H=255*170*80
Outer carton(S):L*W*H=375*280*270,6 inner cartons(S)

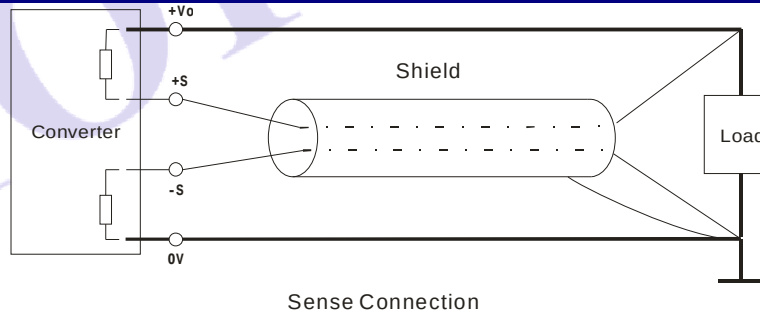
TEST CONFIGURATIONS

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.

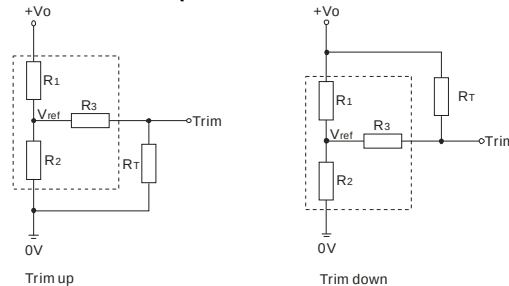


SENSE USE (REMOTE VOLTAGE COMPENSATION)



TRIM APPLICATION & TRIM RESISTANCE

Application circuit for TRIM (Part in broken line is the interior of models)



Formula for resistance of Trim

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \quad a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \quad a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

Note: Value for R1, R2, R3, and Vref refer to the following table.

R_T: Resistance of Trim

a: User-defined parameter, no actual meanings.

Vo': The trim up/down voltage

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

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 10% of the full load**. 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.

2) Recommended circuit

All the VRB_D-40W series have been tested according to the following recommended testing circuit before leaving factory. This series should be tested under load. Never be tested under no load (see Figure 3).

If you want to further decrease the output ripple, you can increase capacitance properly or choose capacitors with low ESR. However, the capacitance can't exceed the maximum capacitor load in the list (Table 1).



(Figure 3)

EXTERNAL CAPACITOR TABLE (TABLE 1)

Capacitance Output Voltage	Cout(μF)	Cin(μF)(12V,24V, 48V input)
3.3V、5V	220	100
12V、15V	100	
24V	47	

3) Cannot use in parallel and hot swap

Note:

1. Operation under minimum load will not damage the converter; However, they may not meet all specification listed.
2. Max. Capacitive Load tested at input voltage range and full load.
3. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on our corporate standards.
5. All characteristics are for listed model only, 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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