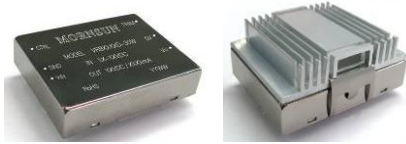


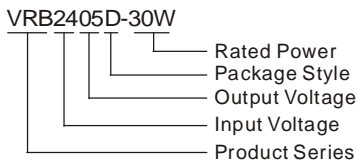
## VRB\_D-30W Series

### 30W, WIDE INPUT, ISOLATED & REGULATED SINGLE OUTPUT DC-DC CONVERTER



Patent Protection RoHS

#### PART NUMBER SYSTEM



#### PRODUCT FEATURES

- Efficiency up to 89%
- 2:1 Wide Input Range
- 1.5KVDC Isolation
- Over Voltage Protection
- Over Current Protection
- Output Short Circuit Protection
- Operating Temperature Range: -40°C ~ +85°C
- Internal SMD Construction
- Metal Shielding Package
- MTBF>1,000,000 hours
- Industry Standard Pinout

#### APPLICATIONS

The VRB\_D-30W series offer 30W of output, with 2:1 wide input voltage of 9-18, 18-36 and 36-75VDC and features 1500VDC isolation, short-circuit and over current protection. All models are particularly suited to tele-communications, industrial, test equipments power and other fields.

#### SELECTION GUIDE

Model Number	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-30W	12 (9-18)	20	3.3	6000	600	907	66	100	19500	85
VRB1205D-30W			5	6000	600	2839	68		10200	86
VRB1212D-30W			12	2500	250	2904	12		3240	86
VRB1215D-30W			15	2000	200	2865	13		1100	86
VRB1224D-30W			24	1250	125	2872	14		900	87
VRB2403D-30W	24 (18-36)	40	3.3	6000	600	924	29	50	19500	87
VRB2405D-30W			5	6000	600	1373	35		10200	88
VRB2409D-30W			9	3333	333	1447	9		6800	88
VRB2412D-30W			12	2500	250	1383	8		3300	89
VRB2415D-30W			15	2000	200	1404	9		1100	89
VRB2424D-30W			24	1250	125	1403	15		900	89
VRB4803D-30W	48 (36-75)	80	3.3	6000	600	464	16	25	19500	87
VRB4805D-30W			5	6000	600	688	26		10200	89
VRB4812D-30W			12	2500	250	706	10		3300	87
VRB4815D-30W			15	2000	200	703	11		1100	88
VRB4824D-30W			24	1250	125	709	12		900	87

Note: Add suffix "H" for heat sink mounted, for example VRB2405D-30WH.

#### 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	
Start-up Voltage	12VDC Input Models	--	--	9	
	24VDC Input Models	--	--	18	
	48VDC Input Models	--	--	36	
Under Voltage Shutdown	12VDC Input Models	--	--	9	
	24VDC Input Models	--	--	18	
	48VDC Input Models	--	--	36	

Start-up Time	Nominal input& constant resistance load	--	10	--	ms
Ctrl*	Models ON	3.5 -12VDC or open circuit			
	Models OFF	0-1.2VDC			
	Input current(Models OFF)	--	10	--	mA
Short Circuit Input Power		--	--	4.5	W
Input Filter		π Filter			

Note: \*The CTRL control pin voltage is referenced to GND.

## OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Output Power		3	--	30	W
Voltage accuracy	Refer to recommended circuit	--	±1	±3	%
Line Regulation	Full load, Input voltage from low to high	--	±0.2	±0.5	
Load Regulation	10% to 100% load	--	±0.5	±1	μs
Transient Recovery Time	25%~ 50%~25% load or	--	300	500	
Transient Response Deviation	50%~75%~50% load step change	--	±3	±5	%
Temperature Drift	100% full load	--	±0.02	--	%/°C
Ripple & Noise*	20MHz Bandwidth	--	75	150	mVp-p
Over voltage protection (light Load)	3.3V output	--	3.9	--	VDC
	5V output	--	6.2	--	
	9V output	--	10.8	--	
	12V output	--	15	--	
	15V output	--	18	--	
	24V output	--	30	--	
Trim	light Load	--	±10%Vo	--	
Over Current Protection	Full input voltage	120	130	150	%
Short Circuit Protection		Hiccup, Continuous, automatic recovery			

\* Ripple and noise tested by "parallel cable" method. See detailed operation instructions at Testing of Power Converter section, application notes.

## 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	--	--	MΩ
Isolation Capacitance	Input/Output,100KHz/0.1V	--	1000	--	pF
Switching Frequency	Full load, nominal input	--	300	--	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours
Case Material		Nickel- coated copper(Six-sided)			
Weight	Without heatsink	--	50	--	g
	With heatsink	--	70	--	

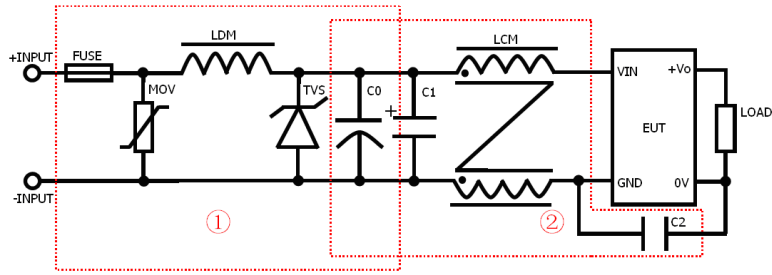
## ENVIRONMENTAL SPECIFICATIONS

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 Figure 1-②)			
EMS	ESD	IEC/EN61000-4-2 Contact ±4KV perf. Criteria B			
	EFT	IEC/EN61000-4-4 ±2KV perf. Criteria B (External Circuit Refer to Figure 1-①)			
	Surge	IEC/EN61000-4-5 ±2KV perf. Criteria B (External Circuit Refer to Figure 1-①)			

## EMC RECOMMENDED CIRCUIT



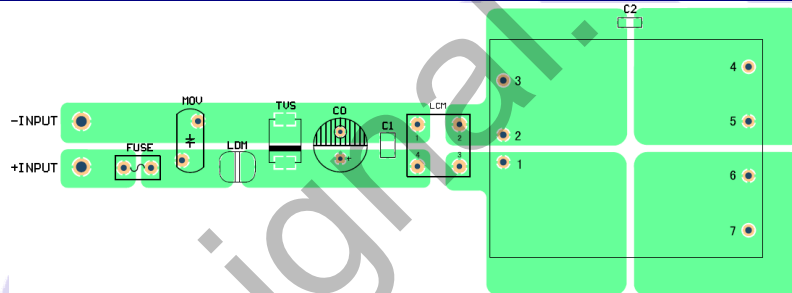
(Figure 1)

Recommended external circuit parameters:

Model		VRB12_D-30W	VRB24_D-30W	VRB48_D-30W
EMS	FUSE	Choose according to load		
	MOV	--	10D560K	10D101K
	LDM	--	56 $\mu$ H	56 $\mu$ H
	TVS	SMCJ28A	SMCJ48A	SMCJ90A
	C0	680 $\mu$ F/25V	120 $\mu$ F/50V	120 $\mu$ F/100V
EMI	C0	680 $\mu$ F/25V	120 $\mu$ F/50V	120 $\mu$ F/100V
	C1	4.7 $\mu$ F/50V 1210	4.7 $\mu$ F/50V 1210	--
	LCM	--	--	3.8mH
	C2	--	--	100pF/2KV 1206

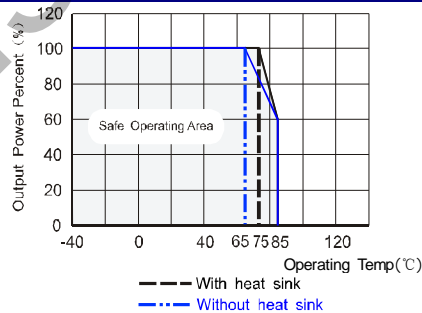
Note: 1. In Figure 1, part ① is EMS Recommended external circuit, part ② is EMI recommended external circuit. Choose according to requirements.  
2. If there is no recommended parameters, the model no require the external component.

## EMC RECOMMENDED CIRCUIT PCB LAYOUT

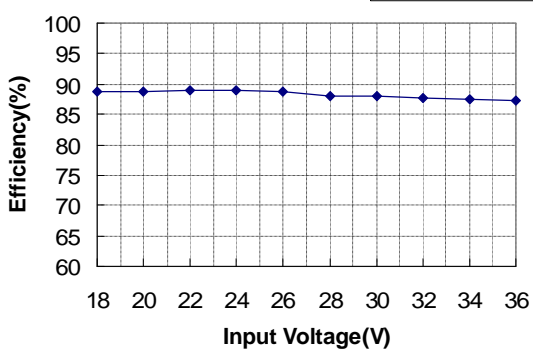


(Figure 2)

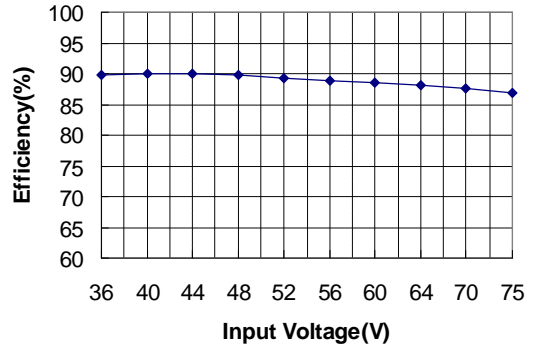
## PRODUCT TYPICAL CURVE

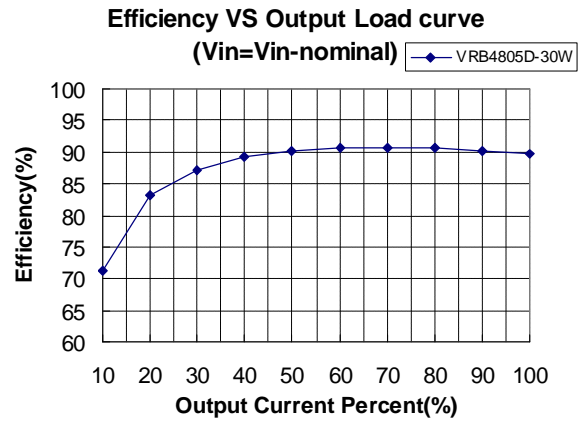
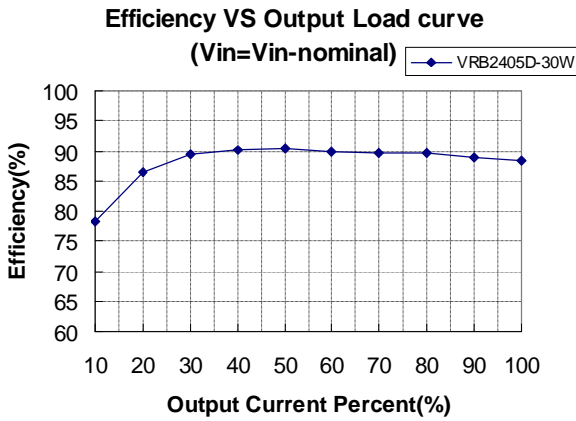


Efficiency VS Input Voltage curve  
(Full Load)



Efficiency VS Input Voltage curve  
(Full Load)





## OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

### MECHANICAL DIMENSIONS

**Bottom View Dimensions:**  
 Total width: 50.80±0.35 [2.000±0.014]  
 Pin 1-3 spacing: 10.16 [0.400]  
 Pin 4-7 spacing: 10.16 [0.400]  
 Total height: 40.60±0.35 [1.600±0.014]

**Side View Dimensions:**  
 Total height: 11.20 [0.441]  
 Base width: 4.10 [0.161]

Pin	Function
1	Vin
2	GND
3	Ctrl
4	Trim
5	0V
6	+Vo
7	No Pin

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

### RECOMMENDED FOOTPRINT(TOP VIEW)

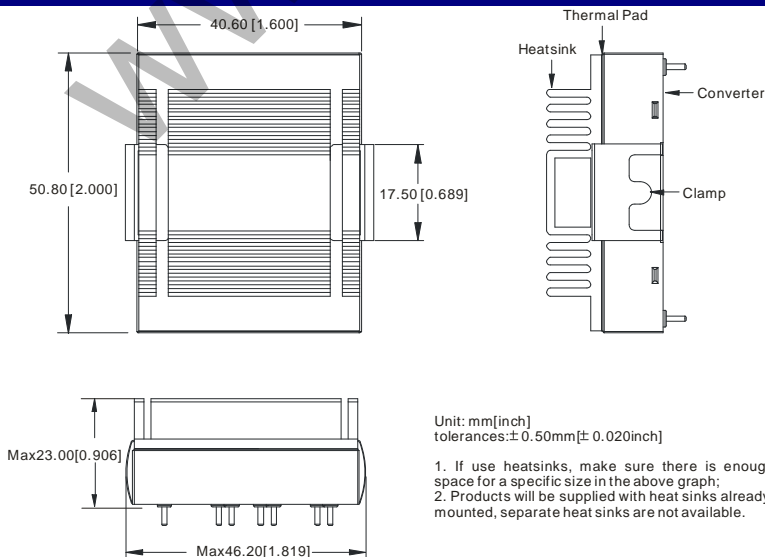
**Footprint Dimensions:**  
 Total width: 52.07±0.05 [2.050±0.003]  
 Total height: 15.24 [0.600]

### TUBE OUTLINE DIMENSIONS (WITHOUT HEATSINK)

**Tube Dimensions:**  
 Length: 54.30 [2.138]  
 Height: 20.00 [0.787]

Note:  
 Unit: mm[inch]  
 General tolerances: ± 0.50mm[± 0.020inch]  
 L=220mm[8.661inch] pcs/tube: 7  
 Short tube inner package dimensions: L\*W\*H= 255\*170\*80mm  
 Short tube outer package dimensions: L\*W\*H= 375\*280\*270mm

## HEATSINK ASSEMBLY & PACKAGE DIAGRAM

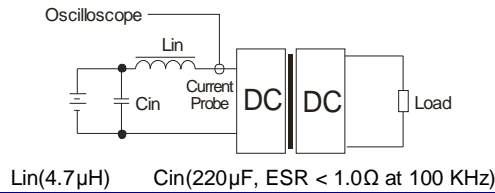


Inner packaging box dimensions:  
 L\*W\*H=355\*192\*93mm  
 Packaging quantity:20pcs  
 Outer packaging carton dimensions:  
 L\*W\*H=405\*380\*305mm  
 Packaging quantity:120pcs

## TEST CONFIGURATIONS

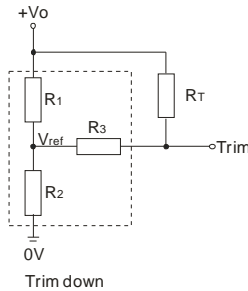
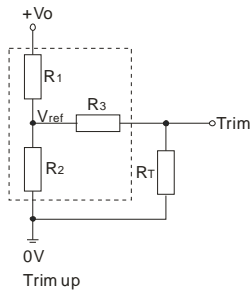
### Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor  $L_{in}$  and Capacitor  $C_{in}$  to simulate source impedance.



## 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  $R_1$ ,  $R_2$ ,  $R_3$ , and  $V_{ref}$  refer to the following table.  $R_T$ : Resistance of Trim     $a$ : User-defined parameter, no actual meanings  
 $V_o'$ : The trim up/down voltage

Resistance \ $V_o$	3.3(VDC)	5(VDC)	9(VDC)	12(VDC)	15(VDC)	24(VDC)
$R_1(K\Omega)$	4.801	2.883	7.5	10.971	14.497	24.872
$R_2(K\Omega)$	2.863	2.864	2.864	2.864	2.864	2.863
$R_3(K\Omega)$	15	10	15	17.8	17.8	20
$V_{ref}(V)$	1.24	2.5	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, or use our company's products with a lower rated output power.

### 2) Recommended circuit

All the VRB\_D-30W 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 a 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	$C_{out}(\mu F)$	$C_{in}(\mu F)$ (12V,24V,48V input)
Output Voltage		
3.3V,5V	220	100
12V,15V	100	
24V	47	

### 3) Cannot use in parallel and hot swap

Note:

- The load shouldn't be less than 10%, otherwise ripple will increase dramatically. Operation under minimum load will not damage the converter; However, they may not meet all specification listed.
- Max. Capacitive Load tested at input voltage range and full load.
- All specifications measured at  $T_a=25^\circ C$ , humidity<75%, nominal input voltage and rated output load unless otherwise specified.
- In this datasheet, all the test methods of indications are based on our corporate standards.
- All characteristics are for listed model only, non-standard models may perform differently, please contact our technical person for more detail.
- Contact us for your specific requirement.
- Specifications subject to change without prior notice.

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