MORNSUN®

VRA_D-20W & VRB_D-20W Series

20W, WIDE INPUT, ISOLATED & REGULATED SINGLE&DUAL OUTPUT DC-DC CONVERTER

Patent Protection **RoHS**

PART NUMBER SYSTEM

VRA2405D-20W

- Rated Power
- Package Style
- Output Voltage
- Input Voltage
- Product Series

PRODUCT FEATURES

- Efficiency up to 87%
- 2:1 wide input range
- 1.5KV Isolation
- Over Voltage protection
- Over Current protection
- Output Short Circuit Protection
- Operating Temperature Range: -40°C ~ +85°C
- Internal SMD construction
- Metal Shielding Package
- Industry Standard Pinout
- MTBF>1,000,000 hours

APPLICATIONS

The VRA_D-20W & VRB_D-20W series offer 20W of output, with 2:1 wide input voltage range of 9-18, 18-36 and 36-75VDC, and features 1500VDC isolation, over current, over voltage and short circuit protection. All models are particularly suited to tele-communications, industrial, test equipments power etc.

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			
VRA1205D-20W	12 (9-18)	20	±5	±2000	±200	1990	19	10	3400	80
VRA1212D-20W			±12	±833	±83	1919	29		680	82
VRA1215D-20W			±15	±666	±67	1917	36		450	82
VRA1224D-20W			±24	±416	82	1905	31		300	82
VRB1203D-20W			3.3	5400	540	1750	66		7500	86
VRB1205D-20W			5	4000	400	1983	23		4000	79
VRB1212D-20W			12	1666	167	1914	12		1500	81
VRB1215D-20W			15	1333	133	1939	23		500	82
VRB1224D-20W			24	833	83	1922	52		500	83
VRA2405D-20W	24 (18-36)	40	±5	±2000	±200	990	19	20	3400	81
VRA2412D-20W			±12	±833	±83	939	24		680	86
VRA2415D-20W			±15	±666	±67	937	24		450	86
VRA2424D-20W			±24	±416	84	960	28		300	84
VRB2403D-20W			3.3	5400	540	825	41		13000	86
VRB2405D-20W			5	4000	400	1036	45		6800	81
VRB2409D-20W			9	2222	222	957	31		4700	85
VRB2412D-20W			12	1666	167	969	29		2200	83
VRB2415D-20W			15	1333	133	958	24		755	85
VRB2418D-20W			18	1111	111	955	37		680	86
VRB2424D-20W			24	833	85	950	29		500	85
VRA4805D-20W	48 (36-75)	80	±5	±2000	±200	487	16	10	3400	81
VRA4812D-20W			±12	±833	±83	478	19		680	86
VRA4815D-20W			±15	±666	±67	487	19		450	86
VRA4824D-20W			±24	±416	84	459	10		300	84
VRB4803D-20W			3.3	5400	540	419	13		13000	87
VRB4805D-20W			5	4000	400	497	21		6800	81
VRB48C6D-20W			6.2	3225	323	498	17		6800	83
VRB4812D-20W			12	1666	167	476	10		2200	84
VRB4815D-20W			15	1333	133	482	13		755	84
VRB4824D-20W			24	833	86	476	16		500	86

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

INTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (1000 ms)	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	--	8.8	9	
	24VDC Input Models	--	17.8	18	
	48VDC Input Models	--	35	36	
Start-up Time	Nominal input& constant resistance load	--	20	--	ms
Ctrl*	Models ON	3.5 - 40VDC or open circuit			
	Models OFF	0-1.2VDC			
Short Circuit Input Power		--	--	3.5	W
Input Filter		LC Filter			

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

OUTPUT SPECIFICATIONS

Item	Test Conditions		Min.	Typ.	Max.	Unit
Output Power			2	--	20	W
Positive voltage accuracy	Refer to recommended circuit		--	±1	±3	%
Negative voltage accuracy			--	±3	±5	
Output Voltage Balance	Dual Output, Balanced Loads		--	±0.5	±1	
Line Regulation	Full load, Input voltage from low to high		--	±0.2	±0.5	
Load Regulation	10% to 100% load		--	±0.5	±1	
Cross Regulation	Dual output		--	--	±5	
Transient Recovery Time	25%~ 50%~25% load or 50%~75%~50% load step change		--	200	500	μs
Transient Response Deviation			±2	±3	±5	%
Temperature Drift	100% full load		--	±0.02	--	%/°C
Ripple & Noise*	20MHz Bandwidth		50	75	150	mVp-p
Over Current Protection	Full input voltage	Others	120	150	--	%
		24VDC output	120	140	--	
Over voltage protection (half of rate load)	3.3V output		3.63	--	4.29	VDC
	5V output		5.5	--	6.5	
	6.2V output		6.82	--	8	
	9V output		9.9	--	11.7	
	12V output		13.2	--	15.6	
	15V output		16.5	--	19.5	
	18V output		19.8	--	23.4	
	24V output		26.4	--	31.2	
Short Circuit Protection**	VRB1224D-20W		--	--	30	s
	Others		Continuous, automatic recovery			

Note: 1.Dual output models unbalanced load: ±5%.
2.*Ripple and noise tested by “parallel cable” method. See detailed operation instructions at Testing of Power Converter section, application notes.
3.**The short circuit time of VRB1224D-20W model is no more than 30s, due to short-circuit in different ways.

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	500	--	--	MΩ
Isolation Capacitance	Input/Output,100KHz/0.1V	--	1000	--	pF
Switching Frequency	Full load, nominal input	--	300	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours
Case Material		Aluminous alloy			
Weight		--	39	--	g

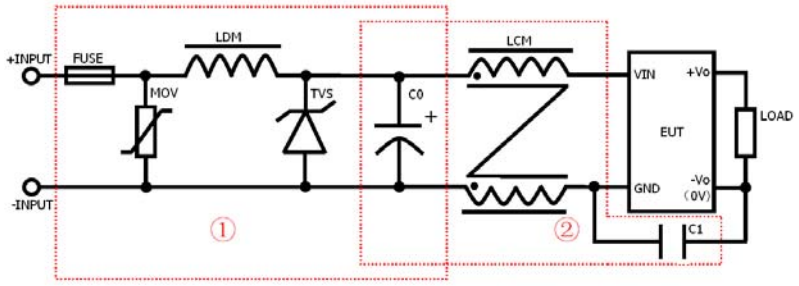
ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	Power derating (above 55℃)	-40	--	85	℃
Storage Temperature		-55	--	105	
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 ±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



(Figure1)

VRA_D-20W recommended external circuit parameters:

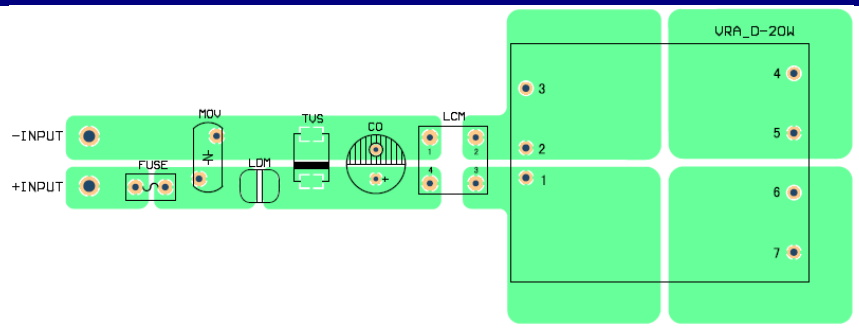
Model		VRA12_D-20W	VRA24_D-20W	VRA48_D-20W
EMS	FUSE	Choose according to load		
	MOV	--	10D560K	10D101K
	LDM	--	56μH	56μH
	TVS	SMCJ28A	SMCJ48A	SMCJ90A
	C0	680μF/25V	120μF/50V	120μF/100V
EMI	C0	680μF/25V	120μF/50V	120μF/100V
	LCM	3.8mH	1.27mH	1.27mH

VRB_D-20W recommended external circuit parameters:

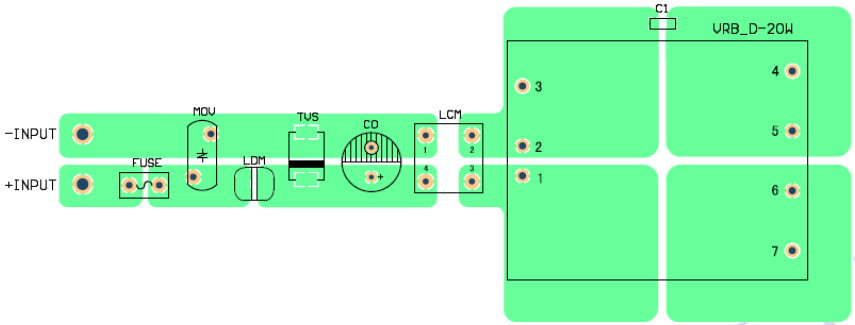
Model		VRB12_D-20W	VRB24_D-20W	VRB48_D-20W
EMS	FUSE	Choose according to load		
	MOV	--	10D560K	10D101K
	LDM	--	56μH	56μH
	TVS	SMCJ28A	SMCJ48A	SMCJ90A
	C0	680μF/25V	120μF/50V	120μF/100V
EMI	C0	680μF/25V	120μF/50V	120μF/100V
	LCM	3.8mH	3.8mH	3.8mH
	C1	100pF/2KV 1206	--	--

Note: 1. In Figure 1,part①is EMS Recommended external circuit, part②is 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

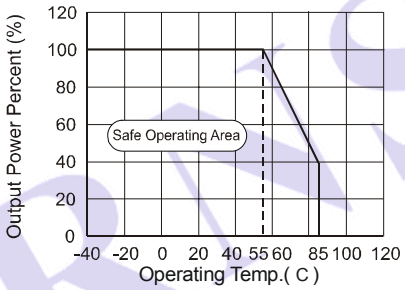


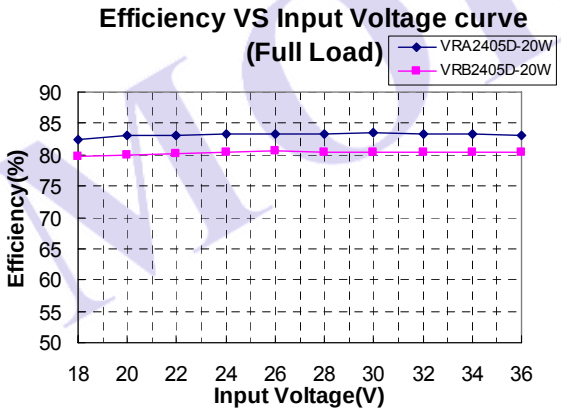
(Figure 2) VRA_D-20W Series

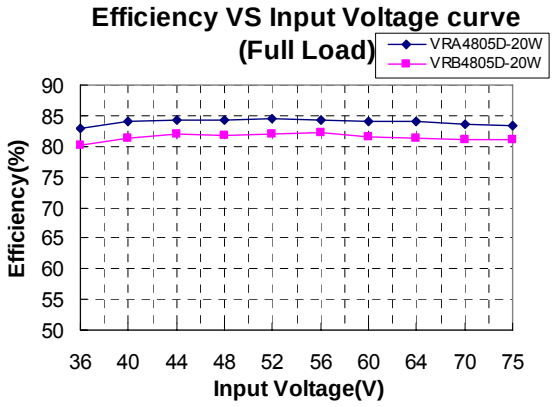


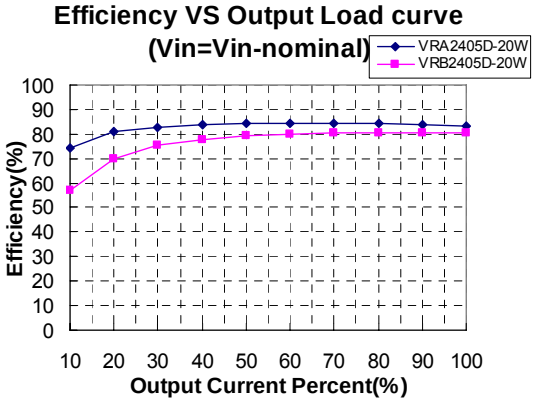
(Figure 3) VRB_D-20W Series

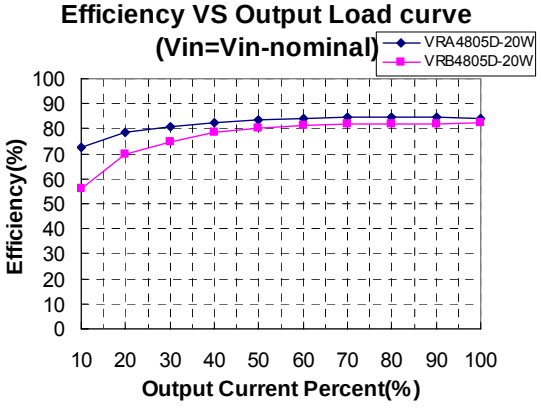
PRODUCT TYPICAL CURVE





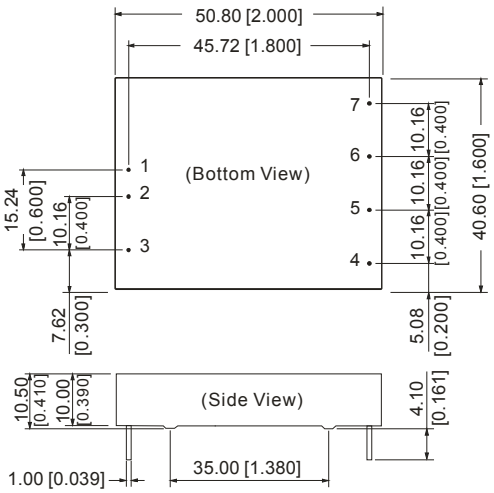






OUTLINE DIMENSIONS、RECOMMENDED FOOTPRINT & PACKAGING

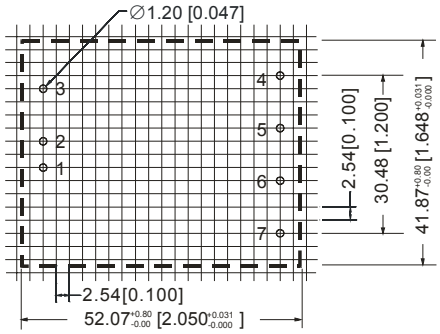
MECHANICAL DIMENSIONS



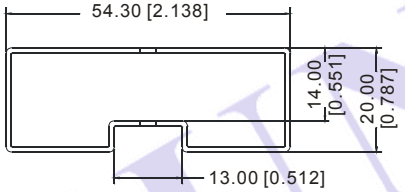
FOOTPRINT DETAILS		
Pin	Single	Dual
1	Vin	Vin
2	GND	GND
3	Ctrl	Ctrl
4	Trim	Trim
5	0V	-Vo
6	+Vo	0V
7	No Pin	+Vo

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

RECOMMENDED FOOTPRINT(TOP VIEW)



TUBE OUTLINE DIMENSIONS

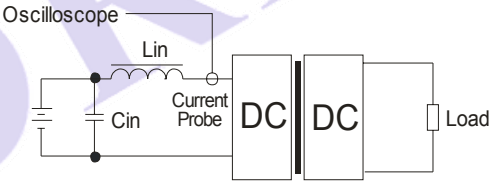


Note:
Unit :mm[inch]
General tolerances: ± 0.50mm[± 0.020inch]
L=220mm[8.661inch] pcs/tube: 4
Short tube inner package dimensions: L*W*H= 255*170*80mm
Short tube outer package dimensions: L*W*H= 375*280*270mm

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

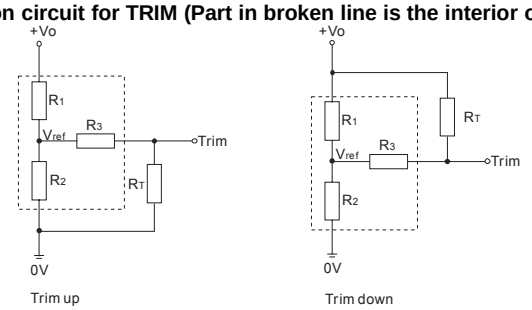
Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



Lin(4.7μH) Cin(220μF, ESR < 1.0Ω at 100 KHz)

TRIM APPLICATION & TRIM RESISTANCE

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



Formula for resistance of Trim

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

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

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)	6.2(VDC)	9(VDC)	12(VDC)	15(VDC)	18(VDC)	24(VDC)
R1(KΩ)	4.801	2.883	4.303	7.5	10.971	14.497	17.902	24.872
R2(KΩ)	2.863	2.864	2.864	2.864	2.864	2.864	2.864	2.863
R3(KΩ)	15	10	10	15	17.8	17.8	20	20
Vref(V)	1.24	2.5	2.5	2.5	2.5	2.5	2.5	2.5

DESIGN CONSIDERATIONS

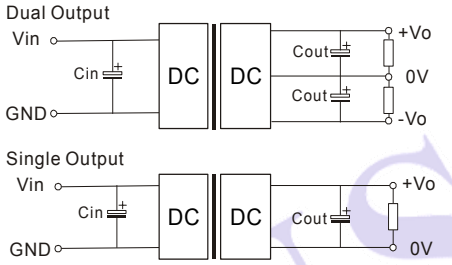
1) Requirement on output load

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 VRA_D-20W&VRB_D-20W 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 4).

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 4)

EXTERNAL CAPACITOR TABLE (TABLE 1)

Output Voltage / Capacitance		Cout(μF)	Cin(μF) (12V,24V, 48V input)
Single	3.3V,5V,6.2V	470	100
	9V,12V,15V,18V	220	
	24V	100	
Dual	±5V	220	
	±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.

MORNSUN Science & Technology Co.,Ltd.
Address: No. 5, Kehui St. 1, Kehui development center, Science Ave., Guangzhou Science City, Luogang district, Guangzhou,P.R.China.
Tel: 86-20-38601850
Fax:86-20-38601272
Http://www.mornsun-power.com