MORNSUN®

VRA_LD-20WR2 & VRB_LD-20WR2 SERIES

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

Patent Protected **RoHS**

FEATURES

- Efficiency up to 90%
- 2:1 wide input voltage range
- Output over voltage,over current and Input under voltage protection,short circuit protection
- 1.5KVDC isolation
- Operating temperature range: -40°C ~ +85°C
- Six-sided metal shield
- Industry standard pinout
- Meet CISPR22/EN55022 CLASS A
- Meet EN60950
- A2S（chassis mounting）and A4S（DIN-Rail mounting）have the function of input reverse connection preventing

PART NUMBER SYSTEM

VRA1205LD-20WR2

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

APPLICATION

VRA_LD-20WR2 & VRB_LD-20WR2 series are applied to wide voltage range input situation such as data transmission device, battery power supply device, telecommunication device ,distributed power supply system, remote control system, industrial robot system etc.

SELECTION GUIDE

Approval	Model①	Input Voltage(VDC)		Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		Reflected Ripple Current (mA,typ.)	Max. Capacitive Load③ (μF)	Efficiency④ (%, typ.) @Max. Load
		Nominal (Range)	Max.②		Max.	Min.	@Max. Load	@No Load			
CE	VRA1205LD-20WR2	12 (9-18)	20	±5	±2000	±100	1938	30	30	4800	86
	VRA1212LD-20WR2			±12	±834	±42	1895	25		800	88
	VRA1215LD-20WR2			±15	±667	±33	1895	25		500	88
	VRA1224LD-20WR2			±24	±417	±21	1895	20		300	88
	VRB1203LD-20WR2			3.3	5000	250	1600	65		18700	86
	VRB1205LD-20WR2			5	4000	200	1872	60		9600	89
	VRB1212LD-20WR2			12	1667	84	1872	25		1600	89
	VRB1215LD-20WR2			15	1333	67	1872	25		1000	89
	VRB1224LD-20WR2			24	834	42	1853	30		470	90
	VRA2405LD-20WR2	24 (18-36)	40	±5	±2000	±100	969	25		4800	86
	VRA2412LD-20WR2			±12	±834	±42	948	20		800	88
	VRA2415LD-20WR2			±15	±667	±34	948	20		500	88
	VRA2424LD-20WR2			±24	±417	±21	948	20		300	88
	VRB2403LD-20WR2			3.3	5000	250	800	40		18700	86
	VRB2405LD-20WR2			5	4000	200	926	40		9600	90
	VRB2412LD-20WR2			12	1667	84	937	20		1600	89
	VRB2415LD-20WR2			15	1333	67	926	20		1000	90
	VRB2424LD-20WR2			24	834	42	916	20		470	90

CE	VRA4805LD-20WR2	48 (36-75)	80	±5	±2000	±100	484	20	30	4800	86
	VRA4812LD-20WR2			±12	±834	±42	474	15		800	88
	VRA4815LD-20WR2			±15	±667	±34	468	15		500	89
	VRA4824LD-20WR2			±24	±417	±21	468	15		300	89
	VRB4803LD-20WR2			3.3	5000	250	400	25		18700	86
	VRB4805LD-20WR2			5	4000	200	463	25		9600	90
	VRB4812LD-20WR2			12	1667	84	469	10		1600	89
	VRB4815LD-20WR2			15	1333	67	463	10		1000	90
	VRB4824LD-20WR2			24	834	42	468	10		470	89

Note: ①Series with suffix "H" are heat sink mounting; series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example VRB2405LD-20WHR2A2S is chassis mounting of with heat sink,VRB2405LD-20WR2A4S is DIN-Rail mounting of without heat sink;If the application has a higher requirement for heat dissipation, you can choose modules with heat sink;
②Absolute maximum rating without damage on the converter;
③For dual-output-converters the given value is for one output (for both outputs the same value);
④The efficiency of "A2S" and "A4S" is approx. 2% lower for the protection of inverse polarity.

INPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Input Surge 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	--	--	17.8	
	48VDC input	--	--	35.8	
Under Voltage Shutdown	12VDC input	7.5	--	--	
	24VDC input	16	--	--	
	48VDC input	32	--	--	
Start-up Time	Nominal input& constant resistance load	--	10	--	ms
Ctrl*	Models ON	Ctrl open or connect TTL high level (2.5-12VDC)			
	Models OFF	Ctrl connect GND or low level (0-1.2VDC)			
	Input current (Models OFF)	--	1	--	mA
Input Filter		Pi Filter			

Note: *The Ctrl control pin voltage is refer to GND.

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Positive Voltage Accuracy		--	±1	±3	%
Negative Voltage Accuracy					
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, main output 50% load, Supplement output from 10% to 100% load	--	--	±5	
Transient Recovery Time	25% load step change	--	300	500	μs
Transient Response Deviation		--	±3	±5	%
Temperature Drift	Full load	--	±0.02	--	%/°C
Ripple & Noise*	20MHz bandwidth	--	70	100	mVp-p
Trim		--	±10%	--	VDC
Output Over Voltage Protection	3.3VDC output	--	3.9	--	
	5VDC output	--	6.2	--	
	12VDC output	--	15	--	
	15VDC output	--	18	--	
	24VDC output	--	30	--	
Over Current Protection	Input voltage range	--	150	--	%
Short Circuit Protection		Hiccup, Continuous, automatic recovery			

Note: * Ripple and noise tested by "parallel cable" method. See detailed operation instructions at *DC-DC application notes*.

COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-Output, Tested for 1 minute ,leakage current less than 1 mA	1500	--	--	VDC
Isolation Resistance	Input-Output, Test at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input/Output,100KHz/0.1V	--	1000	--	pF
Switching Frequency	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours
Safety approvals		EN60950			
Case Material		Aluminum Alloy			
Size	PCB mounting （Without heat sink）	50.80×25.40×11.80			mm
	PCB mounting （With heat sink）	50.80×25.40×16.30			
	A2S Chassis mounting（Without heat sink）	76.00×31.50×21.20			
	A2S Chassis mounting（With heat sink）	76.00×31.50×25.10			
	A4S DIN-Rail mounting（Without heat sink）	76.00×31.50×25.80			
	A4S DIN-Rail mounting（With heat sink）	76.00×31.50×29.70			
Weight	Without heat sink（Without heat sink）	--	28	--	g
	With heat sink（With heat sink）	--	36	--	
	A2S Chassis mounting（Without heat sink）	--	50	--	
	A2S Chassis mounting（With heat sink）	--	58	--	
	A4S DIN-Rail mounting（Without heat sink）	--	70	--	
	A4S DIN-Rail mounting（With heats ink）	--	78	--	

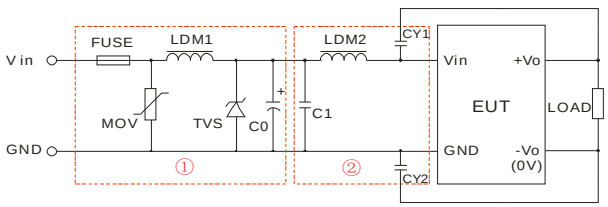
ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	See Temperature Derating Curve (Figure 3)	-40	--	85	℃
Storage Temperature		-55	--	125	
The Max. Case Temperature	Operating Temperature curve range	--	--	105	
Lead Temperature	1.5mm from case for 10 seconds	--	--	300	
Cooling		Free air convection			
Shake		10-55Hz, 10G, 30 Min. along X, Y and Z			

EMC SPECIFICATIONS

EMI	CE	CISPR22/EN55022 CLASS A（Without External Circuit）/ CLASS B（External Circuit Refer to Figure1-②）	
	RE	CISPR22/EN55022 CLASS A（Without External Circuit）/ CLASS B（External Circuit Refer to Figure1-②）	
EMS	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 (External Circuit Refer to Figure1-①)	perf. Criteria B
	Surge	IEC/EN61000-4-5 ±2KV (External Circuit Refer to Figure1-①)	perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s	perf. Criteria A
	Voltage dips, short and interruptions immunity	IEC/EN61000-4-29 0%-70%	perf. Criteria B

EMC RECOMMENDED CIRCUIT



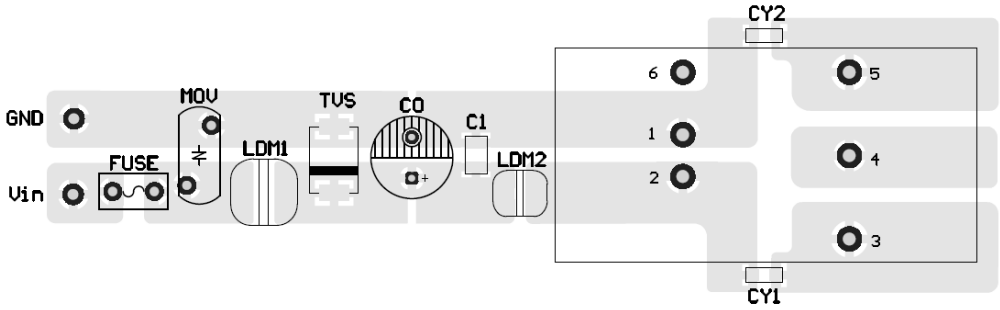
(Figure1)

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

Recommended external circuit parameters:

Model	Vin:12V	Vin:24V	Vin:48V
FUSE	Choose according to practical input current		
MOV	--	S14K35	S14K60
LDM1	--	56μH	
TVS	SMCJ28A	SMCJ48A	SMCJ90A
C0	680μF/25V	330μF/50V	330μF/100V
C1	1μF /50V	1μF /50V	1μF /100V
LDM2	4.7μH		
CY1、CY2	1nF/2KV		

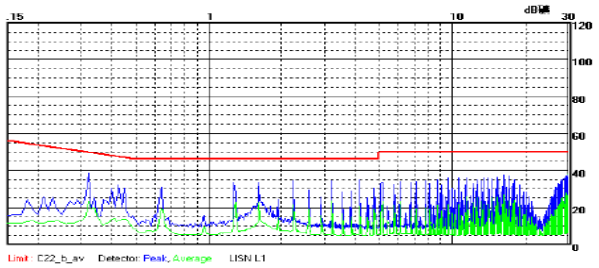
EMC RECOMMENDED CIRCUIT PCB LAYOUT



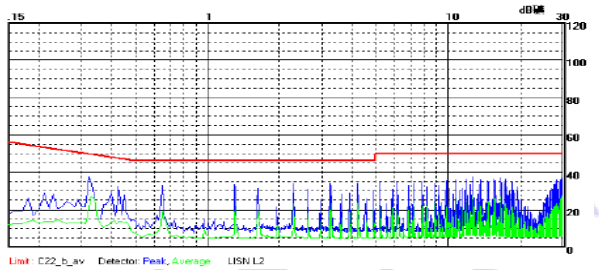
(Figure 2)

Note: The pad space between input and output (CY1/CY2) must ≥2mm.

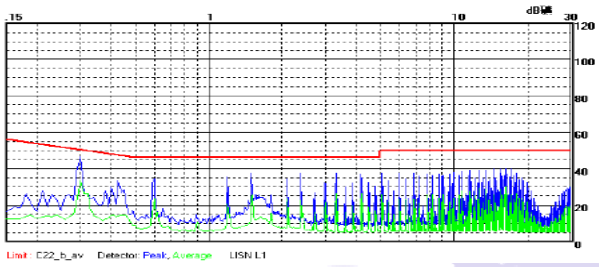
EMC TEST WAVEFORM(CLASS B APPLY CIRCUIT)



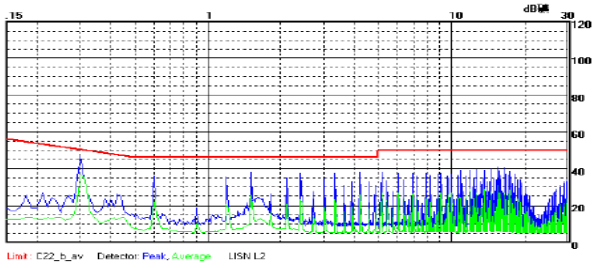
VRA2405LD-20WR2 CE (Positive line)



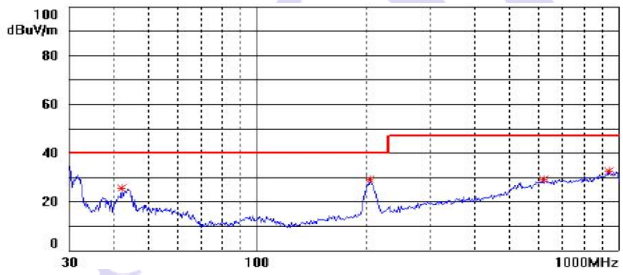
VRA2405LD-20WR2 CE (Negative line)



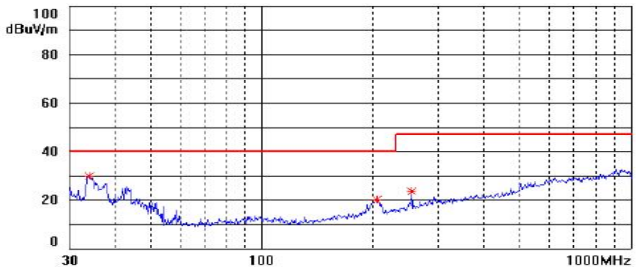
VRA4815LD-20WR2 CE (Positive line)



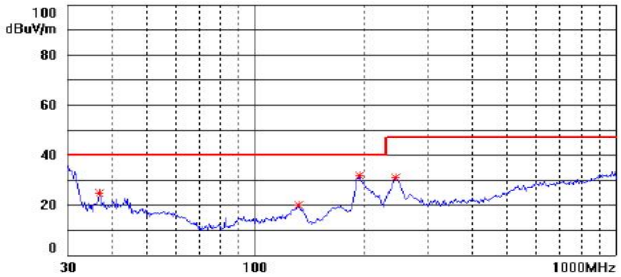
VRA4815LD-20WR2 CE (Negative line)



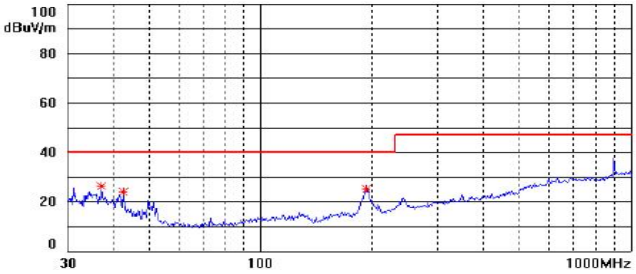
VRA2405LD-20WR2 RE(Horizontal)



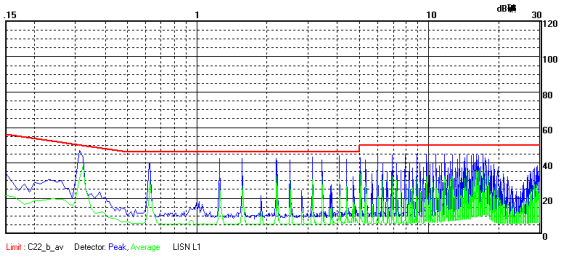
VRA2405LD-20WR2 RE(Vertical)



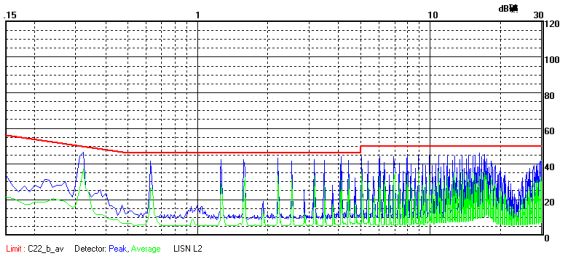
VRA4815LD-20WR2 RE(Horizontal)



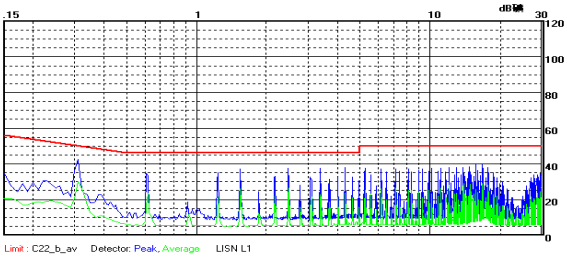
VRA4815LD-20WR2 RE(Vertical)



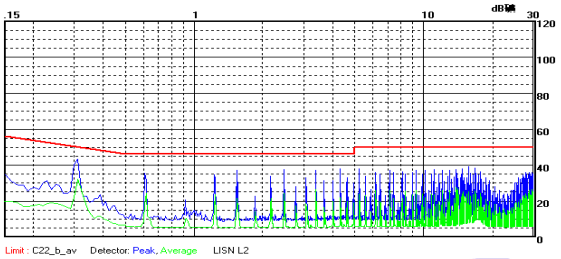
VRB2405LD-20WR2 CE (Positive line)



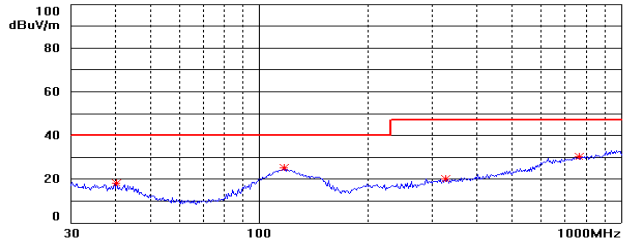
VRB2405LD-20WR2 CE (Negative line)



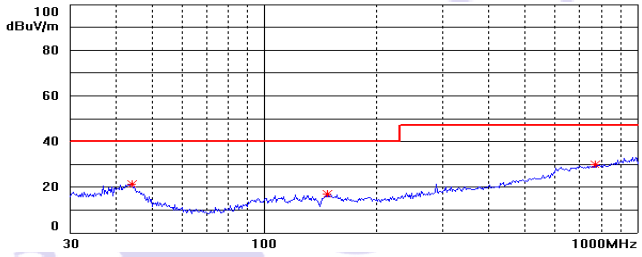
VRB4815LD-20WR2 CE (Positive line)



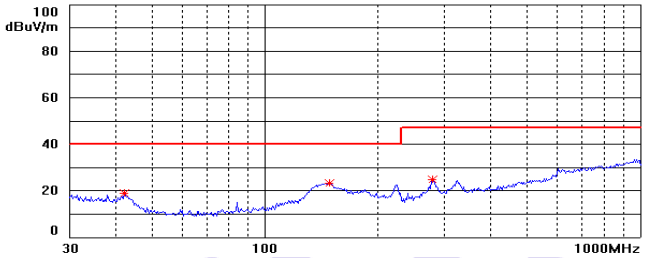
VRB4815LD-20WR2 CE (Negative line)



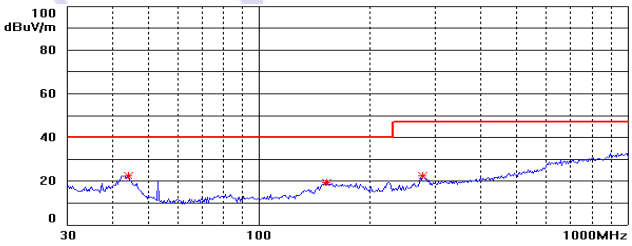
VRB2405LD-20WR2 RE(Horizontal)



VRB2405LD-20WR2 RE(Vertical)

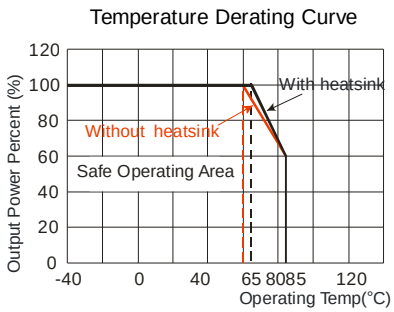


VRB4815LD-20WR2 RE(Horizontal)

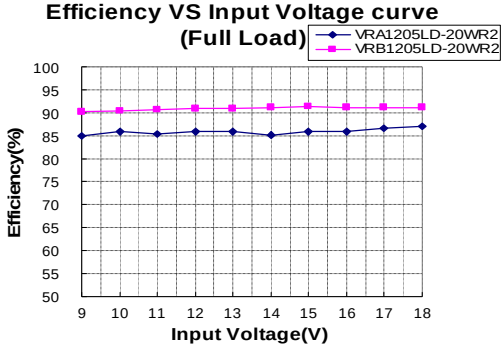


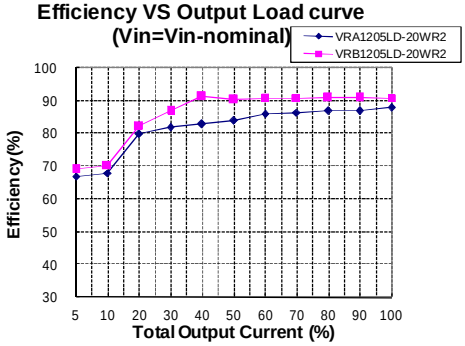
VRB4815LD-20WR2 RE(Vertical)

PRODUCT TYPICAL CURVE

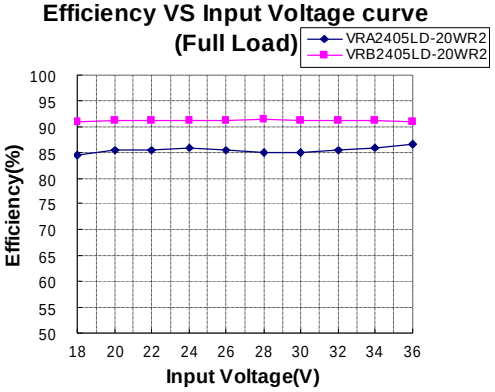


(Figure 3)

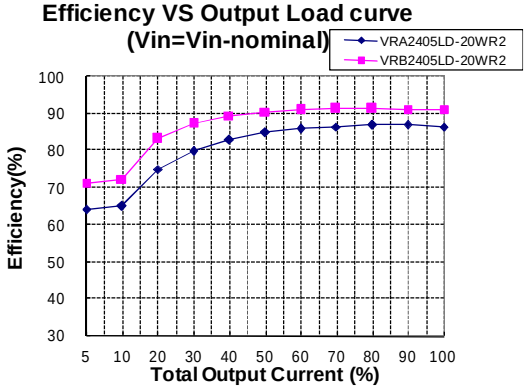




Efficiency VS Input Voltage curve (Full Load)

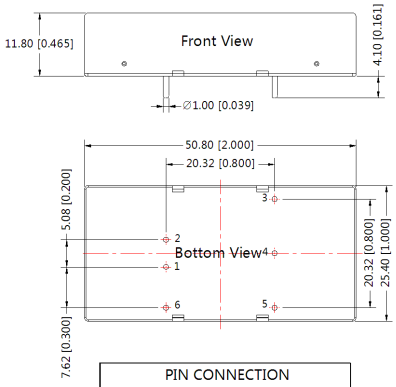


Efficiency VS Output Load curve (Vin=Vin-nominal)



PCB MOUNTING OUTLINE DIMENSIONS, RECOMMENDED FOOTPRINT(WITHOUT HEATSINK)

MECHANICAL DIMENSIONS

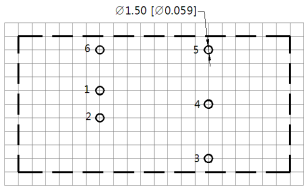


PIN CONNECTION		
Pin	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	Trim	0V
5	0V	-Vo
6	Ctrl	Ctrl

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

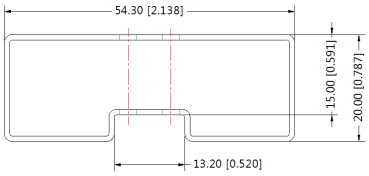
THIRD ANGLE PROJECTION

RECOMMENDED FOOTPRINT DETAILS



Note : Grid 2.54*2.54mm

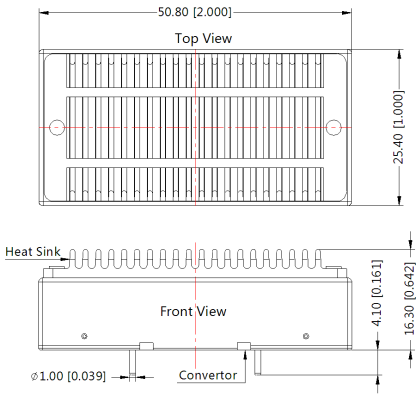
TUBE PACKAGING DIMENSIONS (WITHOUT HEATSINK)



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)

PCB MOUNTING OUTLINE DIMENSIONS (WITH HEATSINK)

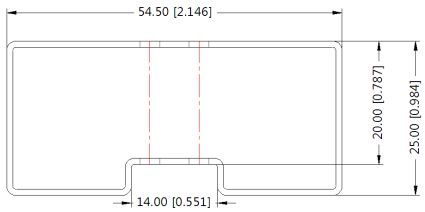
MECHANICAL DIMENSIONS(WITH HEATSINK)



Note:
Unit :mm[inch]
General tolerances:±0.30[±0.012]
If use heatsinks,make sure there is enough space for a special size in ther above graph

THIRD ANGLE PROJECTION

TUBE PACKAGING DIMENSIONS (WITH HEATSINK)

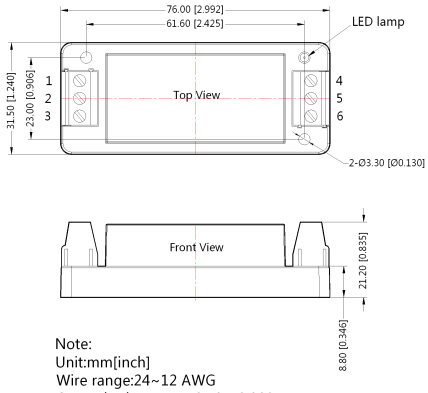


Note:
Unit :mm[inch]
General tolerances: ± 0.50[± 0.020]
L=220[8.661] Tube Quantity: 7pcs
Inner carton(S): L*W*H=255*170*80
Outer carton(S): L*W*H=375*280*270, 6 inner cartons(S)

VRA_LD-20WR2A2S& VRB_LD-20WR2A2S CHASSIS MOUNTING OUTLINE DIMENSIONS

Footprint Details						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	-Vo	0V	+Vo
Single	Ctrl	GND	Vin	0V	Trim	+Vo

MECHANICAL DIMENSIONS



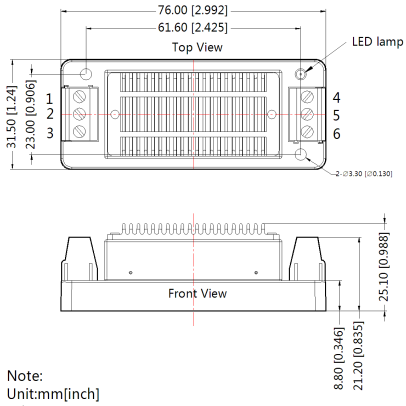
Note:
Unit:mm[inch]
Wire range:24~12 AWG
General tolerances:±0.50[±0.020]

THIRD ANGLE PROJECTION

VRA_LD-20WHR2A2S & VRB_LD-20WHR2A2S CHASSIS MOUNTING OUTLINE DIMENSIONS

Footprint Details						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	-Vo	0V	+Vo
Single	Ctrl	GND	in	0V	Trim	+Vo

MECHANICAL DIMENSIONS(WITH HEATSINK)



Note:
Unit:mm[inch]
Wire range:24~12 AWG
General tolerances:±0.50[±0.020]

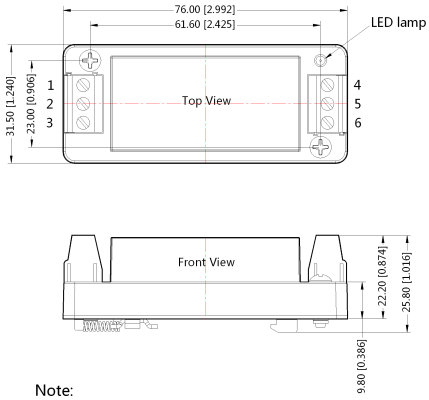
THIRD ANGLE PROJECTION

VRA_LD-20WR2A4S& VRB_LD-20WR2A4S DIN-RAIL MOUNTING OUTLINE DIMENSIONS

It is hanged on the TS35 rail

Footprint Details						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	-Vo	0V	+Vo
Single	Ctrl	GND	Vin	0V	Trim	+Vo

MECHANICAL DIMENSIONS



Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

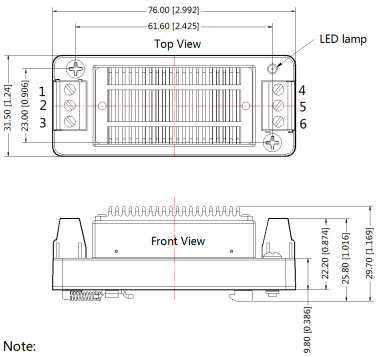
THIRD ANGLE PROJECTION

VRA_LD-20WHR2A4S & VRB_LD-20WHR2A4S DIN-RAIL MOUNTING OUTLINE DIMENSIONS

DIN-rail modules are fitting to TS35 rails

Footprint Details						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	-Vo	0V	+Vo
Single	Ctrl	GND	Vin	0V	Trim	+Vo

MECHANICAL DIMENSIONS



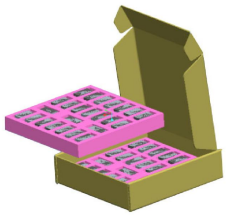
Note:
Unit:mm[inch]
Wire range:24~12 AWG
General tolerances:±0.50[±0.020]

THIRD ANGLE PROJECTION

PACKAGE DIAGRAM

Special Package Series（A2S/A4S）

PACKAGE DIAGRAM

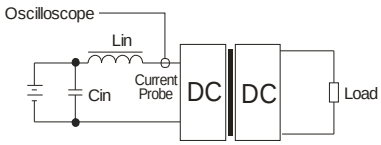


Note:
Unit:mm[inch]
General tolerances:±0.5[±0.02]
Inner carton dimensions L*W*H=365*350*105
Packaging quantity : 48 PCS
Outer carton dimensions: L*W*H=390*360*245
Packaging quantity : 96 PCS

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

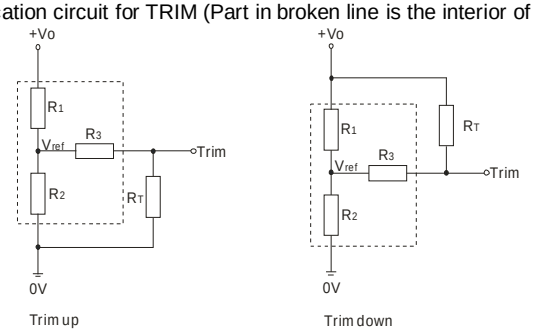
Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



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: Leave open if not used. Value for R1, R2, R3, and V_{ref} refer to the above (table 1). R_T: Resistance of Trim. a: User-defined parameter, no actual meanings. Vo': The trim up/down voltage.

(Table 1)

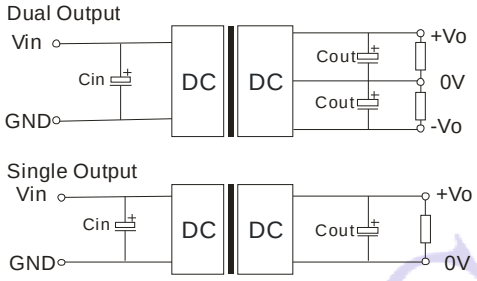
Vo / Parameter	3.3(VDC)	5(VDC)	12(VDC)	15(VDC)	24 (VDC)
R1(KΩ)	4.801	2.883	10.971	14.497	24.872
R2(KΩ)	2.863	2.864	2.864	2.864	2.863
R3(KΩ)	15	10	17.8	17.8	20
Vref(V)	1.24	2.5	2.5	2.5	2.5

DESIGN CONSIDERATIONS

①Recommended circuit

All the VRA_LD-20WR2 & VRB_LD-20WR2 Series have been tested according to the following recommended testing circuit before leaving factory (see Figure 3).

If you want to further decrease the input/output ripple, you can increase a capacitance properly or choose capacitors with low ESR, but the greatest capacitance of its filter capacitor must less than the Max. Capacitive Load. The recommended capacitance of its filter capacitor sees (Table 2).



(Figure 3)

EXTERNAL CAPACITOR TABLE (Table 2)

Single Vout (VDC)	Cout (μF)	Cin (μF)	Dual Vout (VDC)	Cout# (μF)	Cin (μF)
3.3/5	470	100	±5	220	100
12/15	220		±12/±15	100	
24	100		±24	47	

Note: # For each output.

②It is not recommended to increase the output power capability by connecting two or more converters in parallel.The product is not hot-swappable

Note:

1.Min. load shouldn't be less than 5%, otherwise ripple maybe increased dramatically, If the product operates under min. load, it may not be guaranteed to meet all specification listed. Operation under minimum load will not damage the converter.

2.Recommended Dual output models unbalanced load:≤±5%, If the product operates >±5%, it may not be guaranteed to meet all specification Listed, please contact our technical person for more detail.

3.Max. Capacitive Load is tested at nominal input voltage and full load.

4.All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.

5.In this datasheet, all the test methods of indications are based on our corporate standards.

6.All characteristics are for listed model, non-standard models may perform differently, please contact our technical person for more detail.

7.Contact us for your specific requirement.

8.Specifications of this product are subject to changes without prior notice.

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