MORNSUN®

VRB_LD-30WR2 SERIES

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

Patent Protected RoHS

FEATURES

- Efficiency up to 89%
- 2:1 wide input voltage range
- 1.5KVDC isolation
- Operating temperature range: -40°C ~ +85°C
- Output over current protection, output over voltage protection, input under voltage protection and output short circuit protection(automatic recovery)
- Six-sided metal shield, Industry standard pinout
- Inverse polarity protection for A2S（chassis mounting）and A4S（DIN-Rail mounting）
- Meet EN60950 and UL60950

PART NUMBER SYSTEM

VRB2405LD-30WR2

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

APPLICATION

The VRB_LD-30WR2 series offer 30W of output, with 2:1 wide input voltage of 18-36VDC, 36-75VDC and features 1500VDC isolation, over current and short-circuit protection etc, as well as six-sided metal shielding. It offers good EMC performance,meet EN60950 and UL60950 standards.All models are particularly suited to industrial control, electric power, instrumentation, tele-communications etc.

SELECTION GUIDE

Approval	Model Number①	Input Voltage (VDC)		Output Voltage (VDC)	Output Current (mA)		Input Current (mA)(typ.)		reflection ripple Current (mA,typ.)	Max. Capacitor Load (max,μF)	Efficiency ③ (%, typ.) @ Max.load
		Nominal (Range)	Max.②		Max.	Min.	@Max. load	@ No load			
CE	VRB2403LD-30WR2	24 (18-36)	40	3.3	6000	600	948	120	48	6800	87
	VRB2405LD-30WR2			5	6000	600	1420	120	73	6800	88
	VRB2409LD-30WR2			9	3333	333	1420	20	72	680	88
UL/CE	VRB2412LD-30WR2			12	2500	250	1420	20	72	680	88
CE	VRB2415LD-30WR2			15	2000	200	1404	20	72	680	89
	VRB2424LD-30WR2			24	1250	125	1404	20	72	470	89
CE	VRB4803LD-30WR2	48 (36-75)	80	3.3	6000	600	474	80	25	6800	87
	VRB4805LD-30WR2			5	6000	600	710	80	36.5	6800	88
	VRB4812LD-30WR2			12	2500	250	702	20	36	680	89
	VRB4815LD-30WR2			15	2000	200	702	20	36	680	89
	VRB4824LD-30WR2			24	1250	125	710	20	36	470	88

Note: ① Series with suffix "H" are heat sink mounting, for example VRB2405LD-30WHR2. series with suffix "A2S" are chassis mounting, with suffix "A4S" are DIN-Rail mounting, for example VRB2405LD-30WR2A2S is chassis mounting, VRB2405LD-30WR2A4S is DIN-Rail mounting. 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, but it isn't recommended.

③The 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.)	24VDC Input Models	-0.7	--	50	VDC
	48VDC Input Models	-0.7	--	100	
Start-up Voltage	24VDC Input Models	--	17.8	18	
	48VDC Input Models	--	35.8	36	

Under Voltage Shutdown	24VDC Input Models	16	--	--	VDC
	48VDC Input Models	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 at shutdown	--	1	--	mA
Input Filter		Pi Filter			
*The Ctrl control pin voltage is refer to GND.					

OUTPUT SPECIFICATIONS

Item	Test conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy			--	±1	±3	%
Line Voltage Regulation	Input voltage from low to high at 100% load		--	±0.2	±0.5	
Load Regulation	From 10% to 100% load Nominal input		--	±0.5	±1	
Transient Recovery Time	25% load step change		--	300	500	μs
Transient Response Deviation			--	±3	±5	%
Temperature Drift	100% load		--	±0.02	--	%/°C
Ripple & Noise *	20MHz bandwidth		--	50	120	mVp-p
Output Voltage Range (Trim)			--	±10%Vo	--	VDC
Over Voltage Protection	Full input voltage	3.3VDC output	--	3.96	--	
		5VDC output	--	6	--	
		9VDC output	--	10.8	--	
		12VDC output	--	15	--	
		15VDC output	--	18	--	
		24VDC output	--	28	--	
Over Current Protection	Full input voltage		120	130	150	%
Short Circuit Protection			Hiccup, 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	--	2000	--	pF
Switching Frequency	PWM mode	--	300	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours
Safety approvals	VRB2412LD-30WR2	UL60950, EN60950			
	Others	EN60950			
Case Material		Aluminum Alloy			
Size	PCB mounting（Without heat sink）	50.8x25.4x11.8			mm
	PCB mounting（With heat sink）	50.8x25.4x16.3			
	A2S chassis mounting（Without heat sink）	76.0x31.5x21.2			
	A4S DIN-Rail mounting（Without heat sink）	76.0x31.5x25.8			
	A2S chassis mounting（With heat sink）	76.0x31.5x25.1			
	A4S DIN-Rail mounting（With heat sink）	76.0x31.5x29.7			
Weight	PCB mounting（Without heat sink）	--	22	--	g
	PCB mounting（With heat sink）	--	35	--	
	A2S chassis mounting（Without heat sink）	--	44	--	
	A4S DIN-Rail mounting（Without heat sink）	--	64	--	
	A2S chassis mounting（With heat sink）	--	57	--	
	A4S DIN-Rail mounting（With heat sink）	--	77	--	

ENVIRONMENTAL SPECIFICATIONS

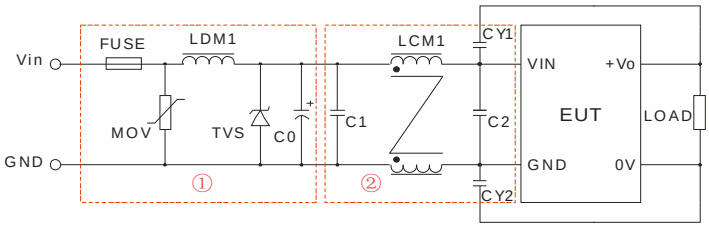
Item	Test conditions	Min.	Typ.	Max.	Unit
Storage Humidity	Non condensing	5	--	95	%
Operating Temperature	See Temperature Derating Curve（see Figure 3）	-40	--	85	°C
Storage Temperature		-55	--	125	

The Max. Case Temperature	Operating Temperature curve range	--	--	105	°C
Soldering 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	3Vr.m.s	perf. Criteria A
	Voltage dips, short and interruptions immunity	IEC/EN61000-4-29	0%-70%	perf. Criteria B

EMC RECOMMENDED CIRCUIT



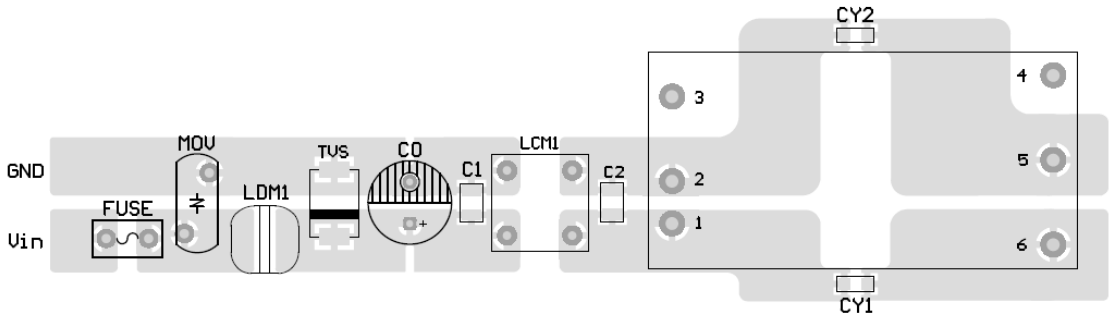
(Figure 1)

Note: 1. In Figure 1, part① is EMS recommended external circuit, part② is EMI recommended external circuit. Choose according to requirements.
2. FL2D-30-102 is the EMC auxiliary component of our company.

Recommended external circuit parameters:

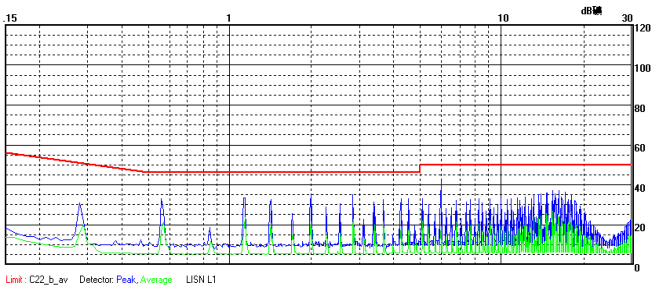
Model	VRB24_LD-30WR2	VRB48_LD-30WR2
FUSE	Choose according to practical input current	
MOV	S14K35	S14K60
LDM1	56μH	56μH
TVS	SMCJ48A	SMCJ90A
C0	330μF/50V	330μF/100V
C1,C2	4.7uF/50V	2.2uF/100V
LCM1	1mH (FL2D-30-102)	
CY1,CY2	1nF/2KV	1nF/2KV

EMC RECOMMENDED CIRCUIT PCB LAYOUT

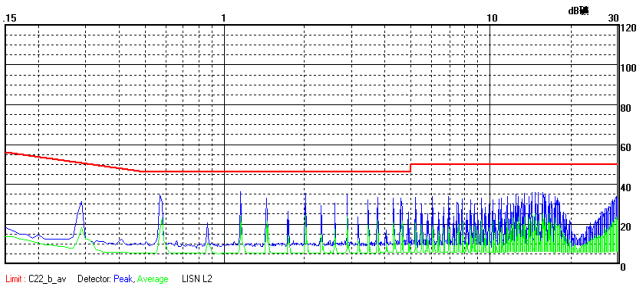


(Figure 2)

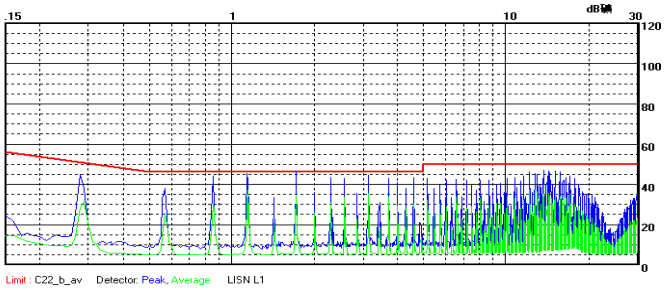
EMI TEST WAVEFORM (CLASS B APPLICATION CIRCUIT)



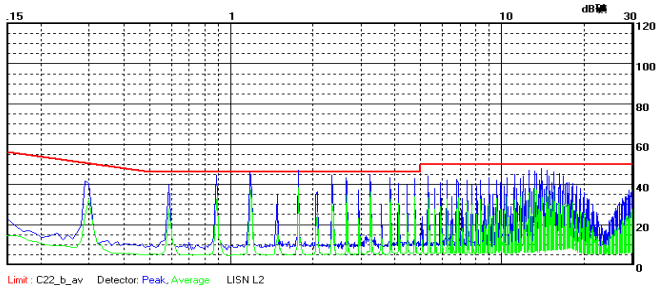
VRB2405LD-30WR2 CE（Positive line）



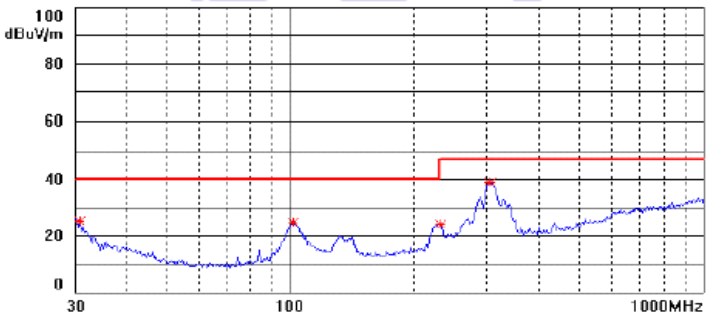
VRB2405LD-30WR2 CE（Negative line）



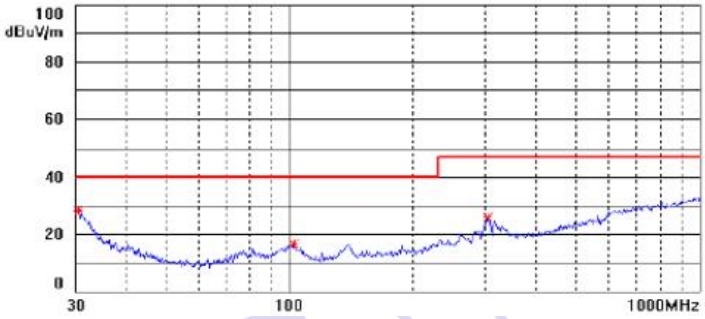
VRB4815LD-30WR2 CE（Positive line）



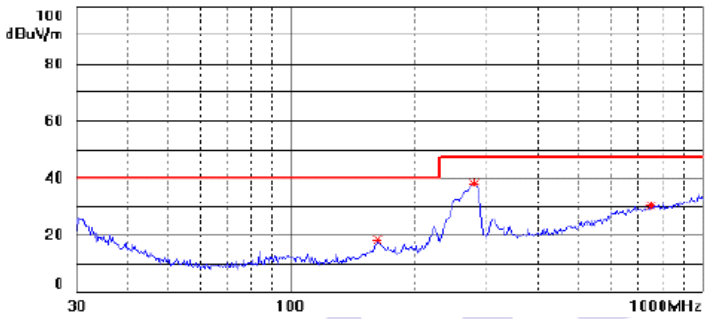
VRB4815LD-30WR2 CE（Negative line）



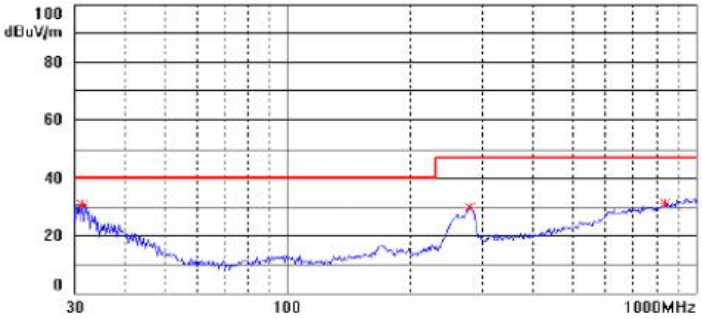
VRB2405LD-30WR2 RE（Horizontal）



VRB2405LD-30WR2 RE（Vertical）



VRB4815LD-30WR2 RE（Horizontal）

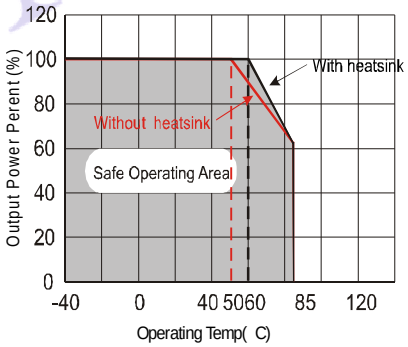


VRB4815LD-30WR2 RE（Vertical）

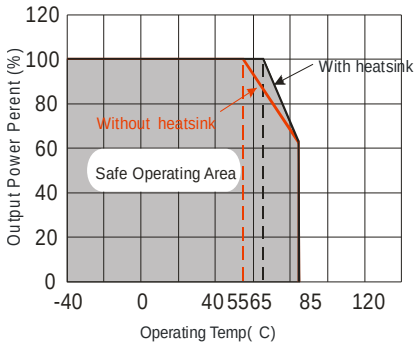
PRODUCT TYPICAL PERFORMANCE CURVE

Temperature derating curve

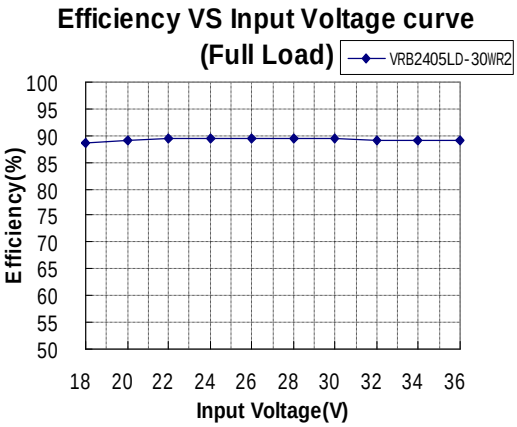
(Output Voltage≤5V)

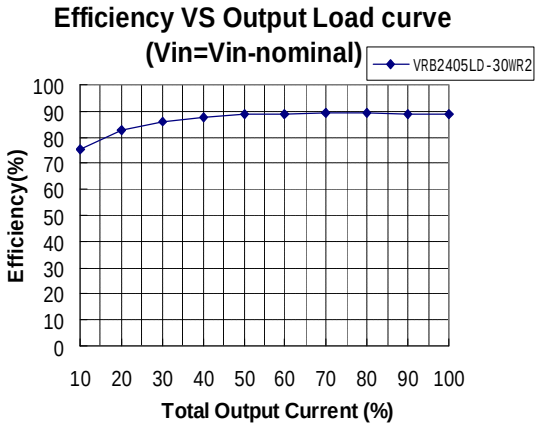


(Output Voltage＞5V)



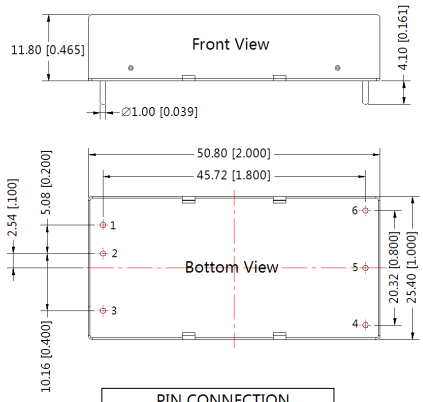
(Figure 3)





PCB MOUNTING(WITHOUT HEATSINK) OUTLINE DIMENSIONS,RECOMMENDED FOOTPRINT

MECHANICAL DIMENSIONS

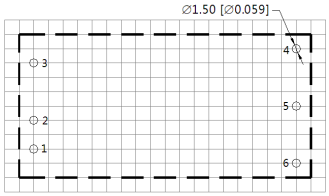


PIN CONNECTION	
Pin	Function
1	Vin
2	GND
3	Ctrl
4	Trim
5	0V
6	+Vo

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

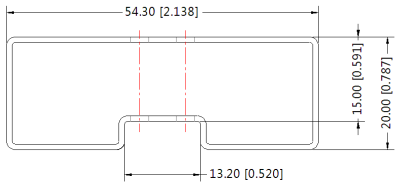
THIRD ANGLE PROJECTION

RECOMMENDED FOOTPRINT DETAILS



Note : Grid 2.54*2.54mm

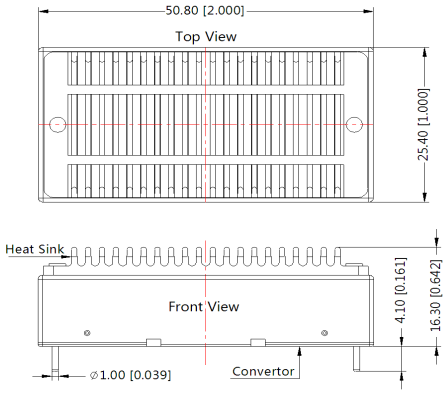
TUBE PACKAGING DIMENSIONS (WITHOUT HEATSINK)



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 (WITH HEATSINK)OUTLINE DIMENSIONS

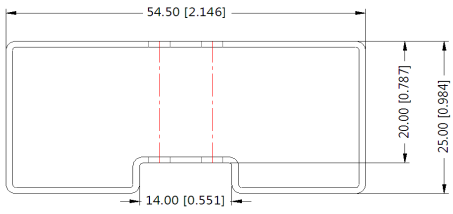
MECHANICAL DIMENSIONS(WITH HEATSINK)



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)

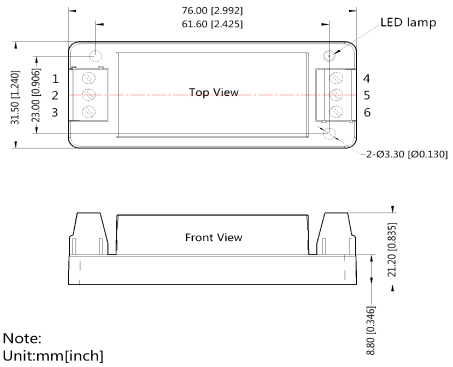


Note:
Unit :mm[inch]
General tolerances: ±0.50[±0.020]
L=220[8.661] Tube Quantity: 7pcs
Inner carton(S): L*W*H=255*170*80
Outer carton(S): L*W*H=375*280*270, 6 inner cartons(S)

VRB_LD-30WR2A2S CHASSIS MOUNTING OUTLINE DIMENSIONS

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

MECHANICAL DIMENSIONS



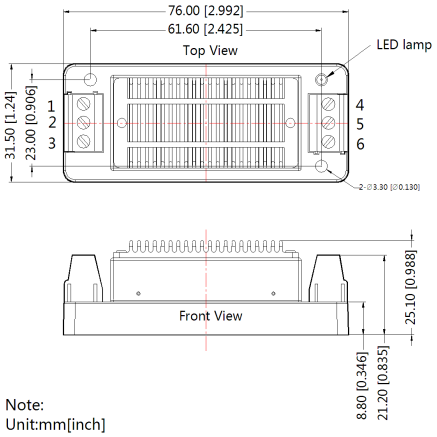
Note:
Unit:mm[inch]
Wire range：24~12 AWG
If use heat sink,the product height is 25.70[1.012]
General tolerances:±0.5mm[±0.02inch]

THIRD ANGLE PROJECTION

VRB_LD-30WHR2A2S CHASSIS MOUNTING OUTLINE DIMENSIONS

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

MECHANICAL DIMENSIONS(WITH HEATSINK)



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

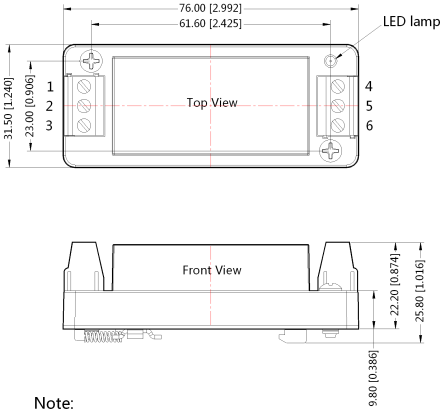
THIRD ANGLE PROJECTION

VRB_LD-30WR2A4S DIN-RAIL MOUNTING OUTLINE DIMENSIONS

DIN-rail modules are fitting to TS35 rails

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

MECHANICAL DIMENSIONS



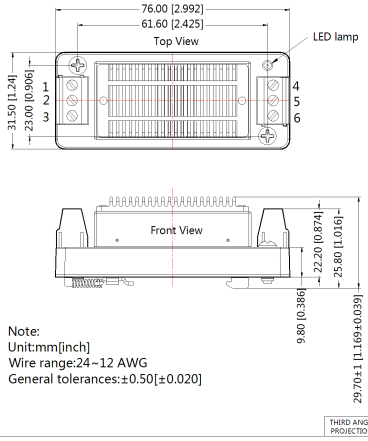
Note:
Unit:mm[inch]
Wire range：24~12 AWG
General tolerances:±0.50[±0.020]

THIRD ANGLE PROJECTION

VRB_LD-30WHR2A4S DIN-RAIL MOUNTING OUTLINE DIMENSIONS

DIN-rail modules are fitting to TS35 rails

MECHANICAL DIMENSIONS(WITH HEATSINK)



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

PACKAGE DIAGRAM

Special Package Series（A2S/A4S）

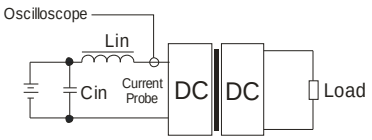
PACKAGE DIAGRAM

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

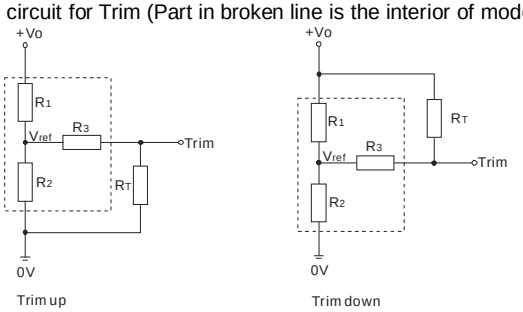
Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.



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: 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)

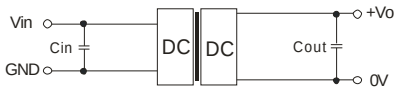
Parameter \ Vo	3.3(VDC)	5(VDC)	9(VDC)	12(VDC)	15(VDC)	24(VDC)
R1(KΩ)	4.801	2.883	7.5	10.971	14.497	24.872
R2(KΩ)	2.863	2.864	2.864	2.864	2.864	2.863
R3(KΩ)	12	10	15	15	15	20
Vref(V)	1.24	2.5	2.5	2.5	2.5	2.5

DESIGN CONSIDERATIONS

1）Recommended circuit

All the VRB_LD-30WR2 Series have been tested according to the following recommended test circuit before leaving the factory (see Figure 4).

If you want to further decrease the input/output ripple, you can increase a capacitance-values properly or choose capacitors with low ESR, but th total capacitance of the filter capacitor must not exceed the Max. Capacitive Load.



(Figure 4)

EXTERNAL CAPACITOR TABLE (TABLE 2)

Output Voltage \ Capacitance	Cout(μF)	Cin(μF)
3.3V,5V	220	100
9V,12V,15V	100	
24V	47	

2）It 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 10%, otherwise ripple maybe increased dramatically, If the product operates under min. load, it may not be guaranteed to meet all specifications listed. Operation under minimum load will not damage the converter.
2. Max. Capacitive Load is 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 test methods are based on our corporate standards.
5. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more details.
6. Please contact our technical support for any specific requirement.
7. Specifications of this product are subject to changes 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

E-mail: info@mornsun.cn

Http://www.mornsun-power.com