DC/DC Converter

VRA_YMD-10WR3 & VRB_YMD-10WR3 Series

MORNSUN®

10W isolated DC-DC converter in DIP package
Wide input and regulated dual/single output

Patent Protection

CE Report EN62368-1

UKCA Report BS EN62368-1

RoHS

FEATURES

- Wide 2:1 input voltage range
- High efficiency up to 88%
- No load power consumption as low as 0.12W
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40℃ to +85℃
- Meets CISPR32/EN55032 CLASS A, without extra components
- Input reverse polarity protection available with chassis(A2S) or Din-Rail mounting(A4S) version
- Industry standard pin-out

VRA_YMD-10WR3 & VRB_YMD-10WR3 series are isolated 10W DC-DC converter products with a 2:1 input voltage range. They feature efficiencies up to 88%, 1500VDC input to output isolation, operating temperature of -40℃ to +85℃, input under-voltage protection, output short-circuit, over-current and over-voltage protection. They meet CLASS A CISPR32/EN55032 EMI standards(except 5VDC nominal input) without external components, optional packages are offered for chassis or DIN-rail mounting (A2S, A4S), adding additional input reverse polarity protection, which make them widely applied in applications such as industrial controls, electric power, instrumentation and communications.

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency④ (%) Min./Typ.	Capacitive Load⑤ (μF)Max.
		Nominal② (Range)	Max. ③	Voltage (VDC)	Current(mA) Max./Min.		
EN/BS EN	VRA0505YMD-10WR3	5 (4.5-9)	12	±5	±1000/0	76/78	1000
	VRA0512YMD-10WR3			±12	±417/0	81/83	470
	VRA0515YMD-10WR3			±15	±334/0	82/84	330
	VRA0524YMD-10WR3			±24	±209/0	81/83	100
--	VRB0503YMD-10WR3			3.3	2500/0	82/84	470
EN/BS EN	VRB0505YMD-10WR3			5	2000/0	83/85	470
	VRB0512YMD-10WR3			12	834/0	81/83	470
	VRB0515YMD-10WR3			15	667/0	82/84	330
	VRB0524YMD-10WR3			24	417/0	81/83	100
--	VRB1205YMD-10WR3	12 (9-18)	20	5	2000/0	79/81	2200
EN/BS EN	VRB2405YMD-10WR3	24 (18-36)	40	5	2000/0	80/82	2200
	VRB2412YMD-10WR3			12	833/0	85/87	470
	VRB2415YMD-10WR3			15	667/0	85/87	330
	VRB2424YMD-10WR3			24	416/0	86/88	100
--	VRB4803YMD-10WR3	48 (36-75)	80	3.3	2400/0	77/79	2200
	VRB4805(X)YMD-10WR3			5	2000/0	81/83	2200
	VRB4812(X⑥)YMD-10WR3			12	833/0	85/87	470
	VRB4815(X)YMD-10WR3			15	667/0	85/87	330
	VRB4824YMD-10WR3			24	416/0	86/88	100

Notes:
①Use "A2S" suffix for chassis mounting and "A4S" suffix for Din-Rail mounting;
②The A2S and A4S Model's start-up and minimum input voltages are increased by 0.5VDC due to the input reverse polarity protection circuit;
③Exceeding the maximum input voltage may cause permanent damage;
④Efficiency is measured at nominal input voltage and rated output load; efficiencies for A2S and A4S Model's is decreased by 2% due to the input reverse polarity protection circuit. The efficiencies of VRB1205YMD-10WR3 A2S and A4S Model's efficiency is decreased by 4%, and that of efficiencies VRA/B05xxYMD-10WR3 A2S and A4S Model's efficiency is decreased by 7% ;
⑤The specified maximum capacitive load value for Vo1 and Vo2 output is identical;
⑥ "X" means product without Ctrl pin.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no load)	5VDC nominal input series, nominal input voltage	3.3V output	--	1964/100	2012/150	mA
		5V output	--	2353/100	2410/150	
		Others	--	2500/10	2564/30	
	12VDC nominal input series, nominal input voltage		--	1004/5	1029/12	
	24VDC nominal input series, nominal input voltage		--	502/5	515/12	
	48VDC nominal input series, nominal input voltage	3.3V output	--	208/4	215/8	
		Others	--	251/4	258/8	
Reflected Ripple Current	5VDC / 12VDC nominal input series		--	50	--	
	24VDC nominal input series		--	40	--	
	48VDC nominal input series		--	30	--	
Surge Voltage (1sec. max.)	5VDC nominal input series		-0.7	--	16	VDC
	12VDC nominal input series		-0.7	--	25	
	24VDC nominal input series		-0.7	--	50	
	48VDC nominal input series		-0.7	--	100	
Start-up Voltage	5VDC nominal input series		--	--	4.5	
	12VDC nominal input series		--	--	9	
	24VDC nominal input series		--	--	18	
	48VDC nominal input series		--	--	36	
Input Under-voltage Protection	5VDC nominal input series		3	3.5	--	
	12VDC nominal input series		5.5	6.5	--	
	24VDC nominal input series		12	15.5	--	
	48VDC nominal input series		26	30	--	
Start-up Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl*	Module on		Ctrl pin open or pulled high TTL (3.5-12VDC)			
	Module off		Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off		--	6	10	mA

Note: *The Ctrl pin voltage is referenced to input GND, VRB_XYMD-10WR3 series without Ctrl pin.

Output Specifications

Item	Operating Conditions			Min.	Typ.	Max.	Unit
Voltage Accuracy	0%-100% load	5VDC input, 3.3VDC output		--	±1	±3	%
		5VDC input, other output	Positive output	--	±1	±2	
			Negative output	--	±1	±3	
		Others		--	±1	±3	
Linear Regulation	Input voltage variation from low to high at full load	5VDC input	Singe output	--	--	±0.5	
			Dual output	--	--	±1	
		Others		--	±0.2	±0.5	
Load Regulation①	0%-100% load	5VDC input, 3.3VDC output		--	--	±2	
		5VDC input, other output	Singe output	--	--	±1	
			Dual output	--	--	±1.5	
		24VDC input		--	±0.5	±1	
	5%-100% load	12VDC/48VDC input		--	±0.5	±1	
		VRB0503YMD-10WR3		--	--	±1	
Cross Regulation	Input voltage range, 25%-100% load			--	--	±5	
Transient Recovery Time	25% load step change, nominal input voltage			--	300	500	μs

Transient Response Deviation	25% load step change, nominal input voltage	±5V output, VRB4803YMD-10WR3, VRB4805YMD-10WR3, VRB0503YMD-10WR3	--	±5	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise②	20MHz bandwidth, 5%-100% load		--	40	100	mV p-p
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			110	140	190	%Io
Short-circuit Protection			Continuous, self-recovery			

Note: ① Load regulation for 0% -100% for 12VDC/48VDC nominal input series parts to ±5%;
②Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	1000	--	pF
Operating Temperature	See Fig. 1	-40	--	+85	℃
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	℃
Vibration		10-150Hz, 5G, 90 Min. along X, Y and Z			
Switching Frequency *	PWM mode	--	350	--	kHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours

Note: *Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Mechanical Specifications

Case Material	Aluminum alloy		
Dimensions	Horizontal package		25.40 x 25.40 x 11.70 mm
	A2S chassis mounting		76.00 x 31.50 x 21.20 mm
	A4S DIN-rail mounting		76.00 x 31.50 x 25.80 mm
Weight	VRB0505YMD-10WR3, VRB0503YMD-10WR3	Horizontal package/A2S wiring package/A4S rail package	15.0g /38.5g /58.5g (Typ.)
	Others		12.5g /36.0g /56.0g(Typ.)
Cooling Method	Free air convection		

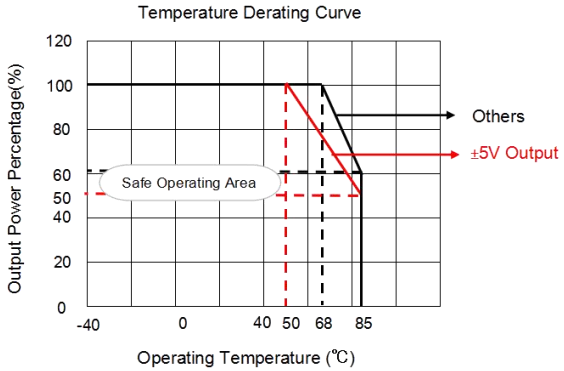
Electromagnetic Compatibility (EMC)

Emissions	CE	5VDC nominal input	CISPR32/EN55032 CLASS B (see Fig.5-② for recommended circuit)	
		12VDC nominal input	CISPR32/EN55032 CLASS A (without extra components.)/ CLASS B (see Fig.4-② for recommended circuit)	
		24VDC nominal input	CISPR32/EN55032 CLASS A (without extra components.)/ CLASS B (see Fig.3-② for recommended circuit)	
		48VDC nominal input	CISPR32/EN55032 CLASS B (see Fig.3-② for recommended circuit)	
	RE	5VDC nominal input	CISPR32/EN55032 CLASS B (see Fig.5-② for recommended circuit)	
		12VDC nominal input	CISPR32/EN55032 CLASS A(without extra components.)/CLASS B(see Fig.4-② for recommended circuit)	
		24VDC nominal input	CISPR32/EN55032 CLASS A(without extra components.)/CLASS B(see Fig.3-② for recommended circuit)	
		48VDC nominal input	CISPR32/EN55032 CLASS B (see Fig.3-② for recommended circuit)	
Immunity	ESD	5VDC nominal input	IEC/EN61000-4-2 Contact ±6kV	perf. Criteria B
		Others	IEC/EN61000-4-2 Contact ±4kV	perf. Criteria B

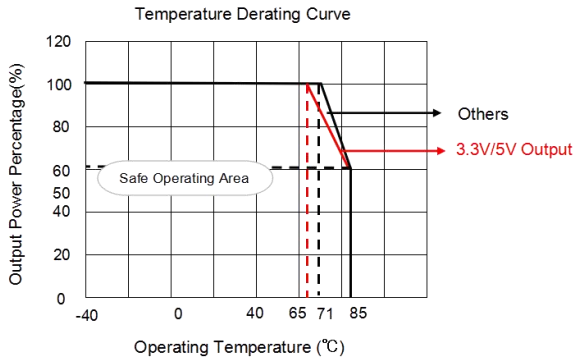
Immunity	RS		IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	Others	IEC/EN61000-4-4	±2kV (see Fig.3-① for recommended circuit)	perf. Criteria B
		5VDC nominal input	IEC/EN61000-4-4	±2kV (see Fig.5-① for recommended circuit)	perf. Criteria B
		12VDC nominal input	IEC/EN61000-4-4	±2kV (see Fig.4-① for recommended circuit)	perf. Criteria B
	Surge	Others	IEC/EN61000-4-5	line to line ±2kV (see Fig.3-①for recommended circuit)	perf. Criteria B
		5VDC nominal input	IEC/EN61000-4-5	line to line ±2kV (see Fig.5-①for recommended circuit)	perf. Criteria B
		12VDC nominal input	IEC/EN61000-4-5	line to line ±2kV (see Fig.4-①for recommended circuit)	perf. Criteria B
	CS		IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A

Typical Characteristic Curves

5VDC input series, except 3.3VDC output



Others



5VDC input series, 3.3VDC output

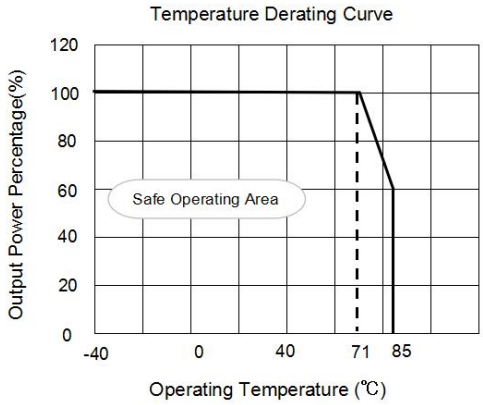
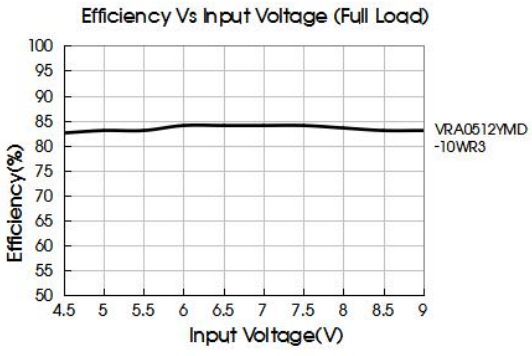
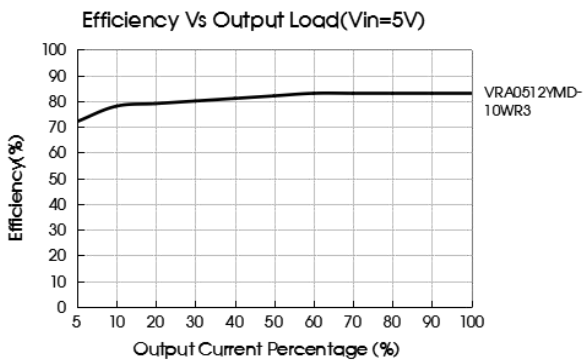
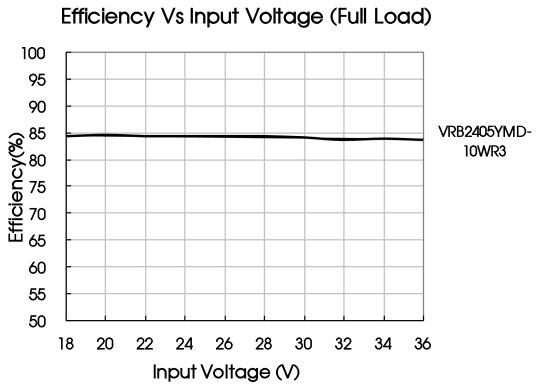
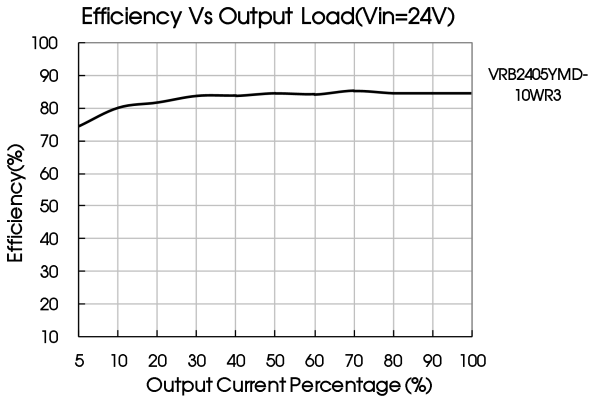


Fig. 1









Design Reference

1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.
Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

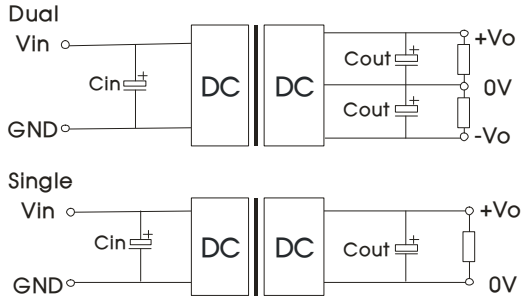


Fig. 2

Vin(VDC)	Cin	Cout
5	100μF/16V	Vo(3.3/5/±5): 10μF/16V Vo(12/±12/15/±15V): 10μF/25V Vo(24/±24V): 10μF/50V
12	100μF/25V	
24	100μF/50V	
48	100μF/100V	

2. EMC compliance circuit

24VDC/48VDC nominal input series

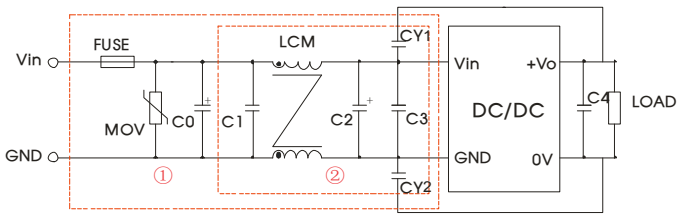


Fig. 3
Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

Parameter description:

Model	Vin: 24VDC	Vin: 48VDC
FUSE	Select fuse value according to actual input current	
MOV	S20K30	S14K60
C0	680μF/50V	680uF/100V
C1	1μF/50V	1uF/100V
C2	330μF/50V	330μF/100V
C3	4.7μF/50V	4.7uF/100V
C4	Refer to the Cout in Fig.2	
LCM	4.7mH, recommended to use MORNSUN FL2D-30-472	
CY1, CY2	1nF/2kV	

12VDC nominal input series

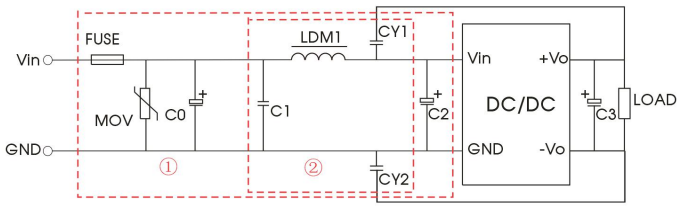


Fig. 4

Notes: For EMC tests we use Part ① in Fig. 4 for immunity and part ② for emissions test. Selecting based on needs.

Parameter description:

Model	Vin: 12VDC
FUSE	Select fuse value according to actual input current
MOV	S20K30
C0, C2	330μF/50V
C1	1μF/50V
C3	Refer to the Cout in Fig.2
LDM1	4.7μH
CY1, CY2	1nF/2kV

5VDC nominal input series

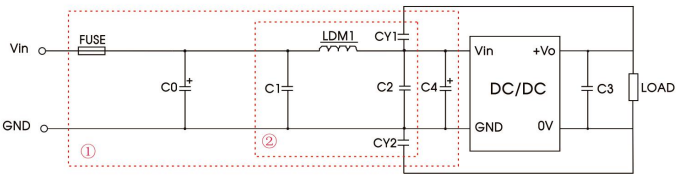


Fig. 5

Notes: For EMC tests we use Part ① in Fig. 5 for immunity and part ② for emissions test. Selecting based on needs.

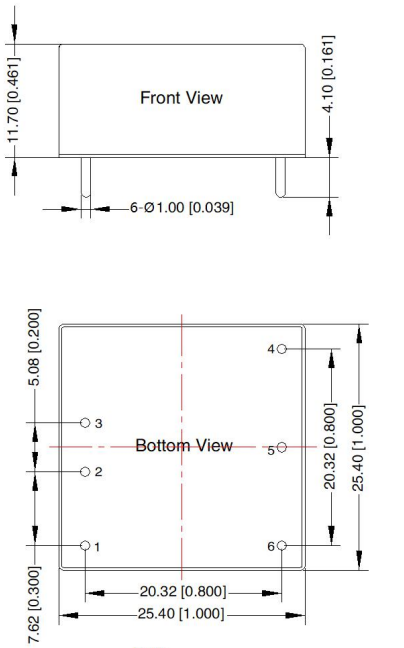
Parameter description:

Model	Vin: 5VDC
FUSE	Select fuse value according to actual input current
C0	2200μF/35V
C1, C2	4.7μF/50V
C3	Refer to the Cout in Fig.2
C4	1000μF/35V
LDM1	4.7μH
CY1, CY2	1nF/2kV

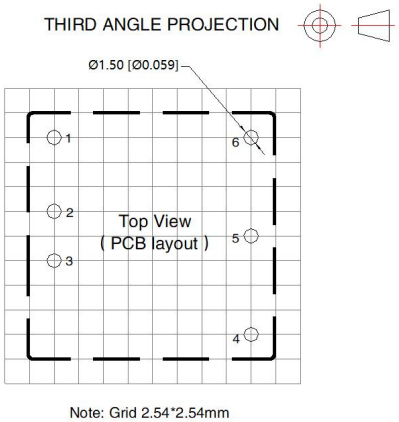
3. The products do not support parallel connection of their output.

4. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

VRA(B)_YMD-10WR3 Dimensions and Recommended Layout

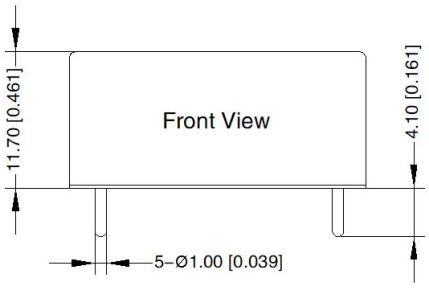


Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
PIN1/2/3/4/5/6: ϕ1.0mm

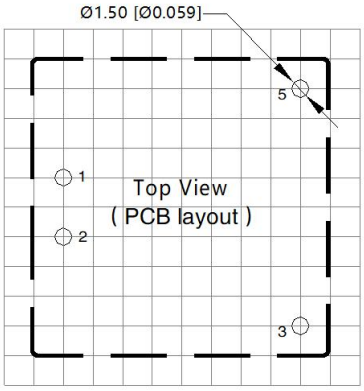


Pin-Out		
Pin	Single	Dual
1	Ctrl	Ctrl
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	No Pin	0V
6	0V	-Vo

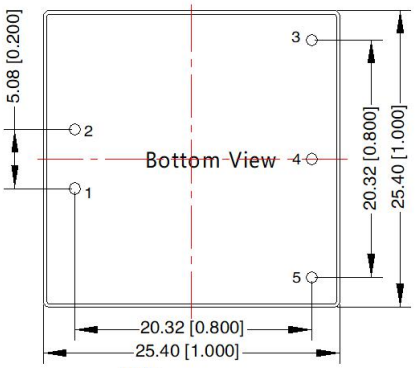
VRB_XYMD-10WR3 Dimensions and Recommended Layout



THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

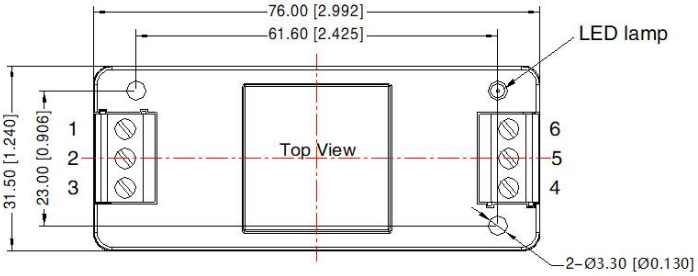


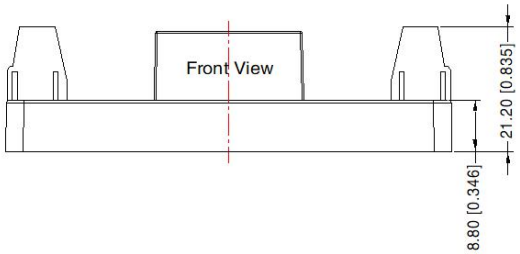
Pin-Out	
Pin	Mark
1	GND
2	Vin
3	+Vo
4	No Pin
5	0V

Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
PIN1/2/3/4/5: ϕ 1.0mm
General tolerances: ± 0.50[± 0.020]

VRA_YMD-10WR3A2S & VRB_YMD-10WR3A2S Dimensions

THIRD ANGLE PROJECTION



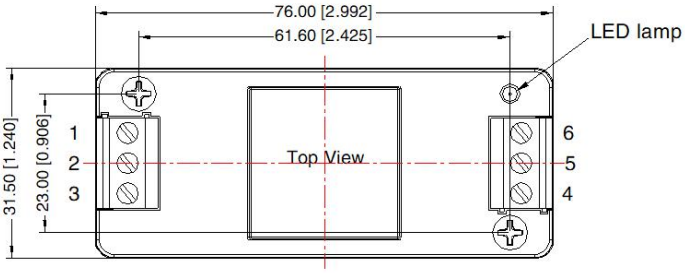


Pin-Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	NC	0V
Dual	Ctrl	GND	Vin	+Vo	0V	-Vo

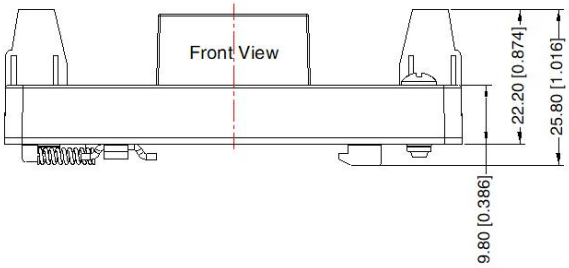
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N ▪ m
General tolerances: ± 1.00[± 0.039]

VRA_YMD-10WR3A4S & VRB_YMD-10WR3A4S Dimensions

THIRD ANGLE PROJECTION



Pin–Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	NC	0V
Dual	Ctrl	GND	Vin	+Vo	0V	–Vo



Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N ▪ m
General tolerances: ± 1.00[± 0.039]

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210003 (DIP); 58220022(A2S/A4S package);
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Mornsun Guangzhou Science & Technology Co., Ltd.
Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com