DC/DC Converter

URA1D_YMD-6WR3 & URB1D_YMD-6WR3 Series

MORNSUN®

6W isolated DC-DC converter

Ultra-wide input voltage and regulated dual/single output

Patent Protection

EN62368-1 BS EN62368-1 RoHS

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 86%
- I/O isolation test voltage: 2.25k VDC
- Operating ambient temperfuature range: -40℃ to +85℃
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Low ripfiple & noise
- Input reverse polarity protection available with chassis(A2S) or Din-Rail mounting (A4S) version
- Meets EN50155 railway standard
- Industry standard pin-out

URA1D_YMD-6WR3 & URB1D_YMD-6WR3 series are isolated 6W DC-DC converter products with 40-160VDC input voltage with efficiencies of up to 86%, input to output isolation is tested with 2250VDC and the converter safely operate ambient temperature of -40℃ to +85℃, input under-voltage protection, output short-circuit, over-current, over-voltage protection. They are widely used in railway vehicle applications using 72V, 96V and 110V battery voltages.

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	URA1D05YMD-6WR3	110 (40-160)	170	±5	±600/0	78/80	470
	URA1D12YMD-6WR3			±12	±250/0	82/84	100
	URA1D15YMD-6WR3			±15	±200/0	83/85	100
	URB1D05YMD-6WR3			5	1200/0	78/80	1000
	URB1D12YMD-6WR3			12	500/0	82/84	470
	URB1D15YMD-6WR3			15	400/0	83/85	220
	URB1D24YMD-6WR3			24	250/0	84/86	100

Note:

①Use "H" suffix for heat sink mounting, "A2S" suffix for chassis mounting and "A4S" suffix for Din-Rail mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;

②The minimum input voltage and starting voltage of A2S and A4S Model are 1VDC higher than those of DIP package due to input reverse polarity protection function;

③Exceeding the maximum input voltage may cause permanent damage;

④Efficiency is measure 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.

⑤The specified maximum capacitive load for Vo1 and Vo2 output is identical.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal input voltage	--	68/3	70/8	mA
Reflected Ripple Current	Nominal input voltage	--	25	--	
Surge Voltage (1sec. max.)		-0.7	--	180	VDC
Start-up Voltage		--	--	40	
Input Under-voltage Protection		28	33	--	
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 (3.5-12VDC)			
	Module off	Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off	--	3	8	mA
Note: *The Ctrl pin voltage is referenced to input GND.					

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy①	0%-100% load		--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load	Vo1	--	±0.2	±0.5	
		Vo2	--	±0.5	±1	
Load Regulation②	0%-100% load	URB1D_YMD-6WR3	--	±0.5	±1	
	5%-100% load	Vo1 of URA1D_YMD-6WR3		±0.5	±1	
		Vo2 of URA1D_YMD-6WR3		±0.5	±1.5	
Cross Regulation	Dual output, Vo1 load at 50%, Vo2 load at range of 25%-100%		--	--	±10	
Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
Transient Response Deviation		5V, ±5V output	--	±3	±8	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	±0.02	±0.03	%/℃
Ripple & Noise③	20MHz bandwidth, 5%-100% load		--	50	100	mVp-p
Over-voltage Protection	Input voltage range		110	--	160	%Vo
Over-current Protection			120	--	210	%Io
Short-circuit Protection			Continuous, self-recovery			

Note:
①Vo2 output voltage accuracy of ±5VDC output converter for 0%-5% load is ±5% max;
②URA1D_YMD-6WR3 load regulation for 0%-100% load is ±5%;
③Under 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.	2250	--	--	VDC
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.	1600	--	--	
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	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	
Storage Humidity	Non-condensing	5	--	95	%RH
Vibration		IEC61373 - Category 1, Grade B			
Switching Frequency *	PWM Mode	--	300	--	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(without heat sink)	25.40 x 25.40 x 11.70 mm
	Horizontal package(with heat sink)	25.40 x 25.40 x 16.20 mm
	A2S wiring package (without heat sink)	76.00 x 31.50 x 21.20 mm
	A2S wiring package(with heat sink)	76.00 x 31.50 x 25.20 mm
	A4S rail package(without heat sink)	76.00 x 31.50 x 25.80 mm
	A4S rail package(with heat sink)	76.00 x 31.50 x 29.80 mm

Weight	Without heat sink	Horizontal package/A2S wiring package/A4S rail package	12.5g/36.0g/56.0g (Typ.)
	With heat sink	Horizontal package/A2S wiring package/A4S rail package	17.0g/40.0g/59.0g (Typ.)
Cooling Methods	Free air convection		

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig.3 or Fig.4-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig.3 or Fig.4-② for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6kV/Air ±8kV	perf. Criteria B
	RS	IEC/EN61000-4-3	20V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±4kV(see Fig.3 or Fig.4-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2kV (2Ω, 18μF see Fig.3 for recommended circuit) line to ground ±4kV (12Ω, 9μF see Fig.3 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Electromagnetic Compatibility (EMC) (EN50155)

Emissions	CE	EN50121-3-2	150kHz-500kHz 99dBμV 500kHz-30MHz 93dBμV	
	RE	EN50121-3-2	30MHz-230MHz 40dBμV/m at 10m 230MHz-1GHz 47dBμV/m at 10m	
Immunity	ESD	EN50121-3-2	Contact ±6kV/Air ±8kV	perf. Criteria B
	RS	EN50121-3-2	20V/m	perf. Criteria A
	EFT	EN50121-3-2	±2kV 5/50ns 5kHz	perf. Criteria A
	Surge	EN50121-3-2	line to line ±1kV (42Ω, 0.5μF) line to ground ±2kV (42Ω, 0.5μF)	perf. Criteria B
	CS	EN50121-3-2	0.15MHz-80MHz 10Vr.m.s	perf. Criteria A

Note: All the tests are measured under the conditions of input capacitor 100μF/200V or FC-C01D.

Typical Characteristic Curves

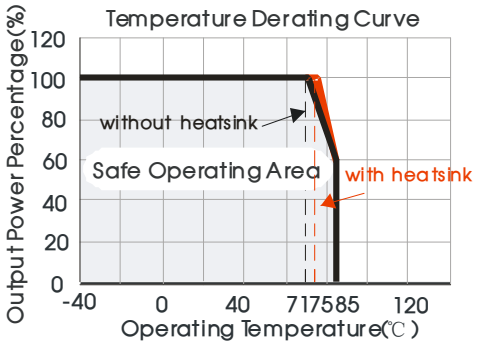
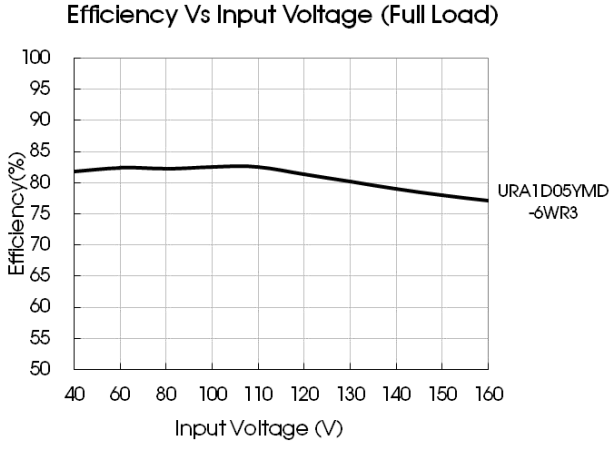
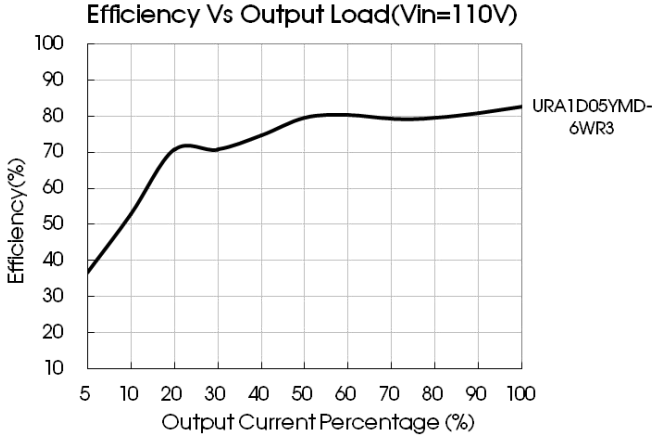
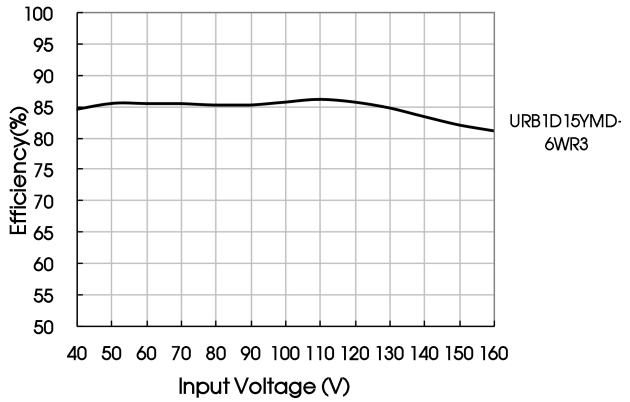


Fig. 1

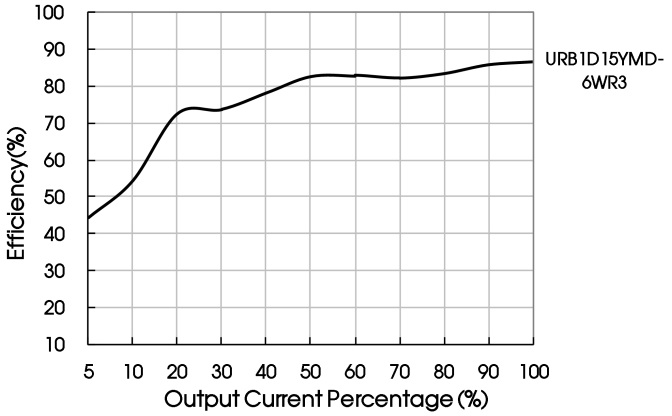




Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load(Vin=110V)



Design Reference

1. Typical application

All the 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.

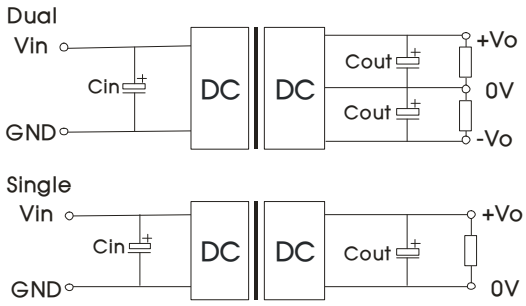


Fig. 2

Cin	Vo(VDC)	Cout
10μF/250V -47μF/250V	±5/5	10μF/16V
	±12/12/±15/15	10μF/25V
	24	10μF/50V

2. EMC compliance circuit

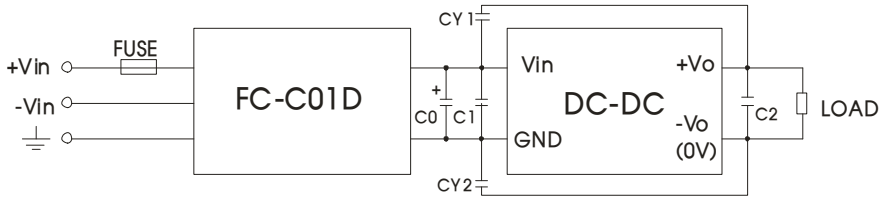


Fig. 3

Fig. 3 Parameter description:

FUSE	Choose according to actual input current
FC-C01D	FC-CX1D is the EMC auxiliary component of our company. Input voltage range: 40V-160V
C0	100μF/200V
C1	Refer to the Cin in Fig.2
C2	Refer to the Cout in Fig.2
CY1/CY2	1nF/3kV

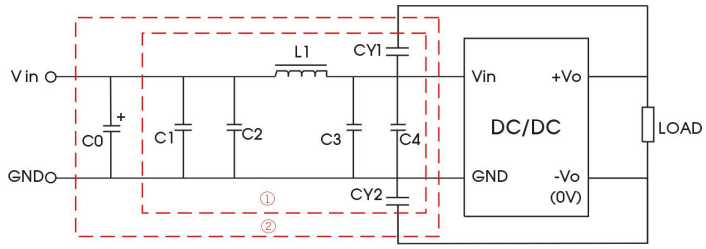


Fig. 4

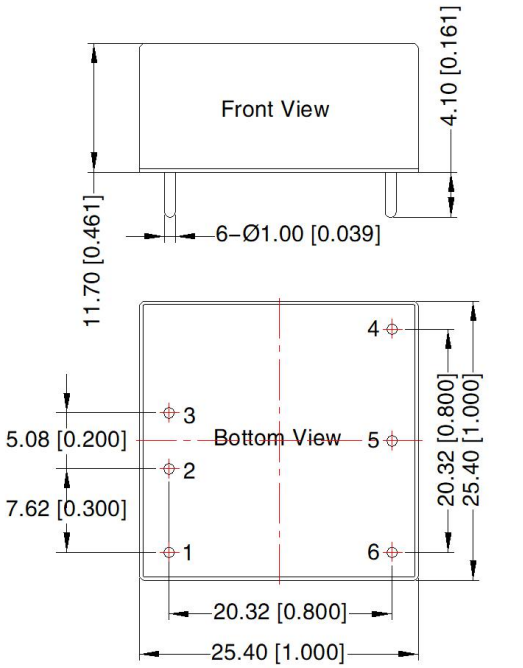
Fig. 4 Parameter description:

C0	100μF/200V
C1/C2/C3/C4	0.22μF/250V
L1	68μH
CY1/CY2	1nF/3kV

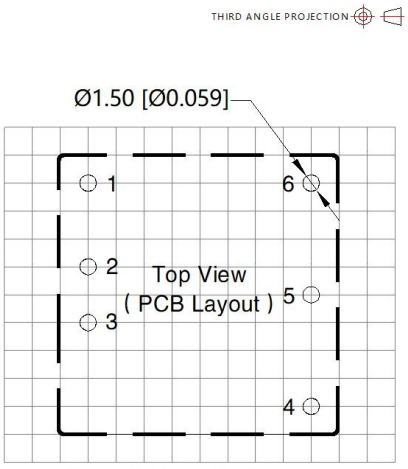
3. The products do not support parallel connection of their output

4. For additional information about Mornsun EMC Filter products please refer to www.mornsun-power.com to download the Selection Guide of EMC Filter

Horizontal Package (without heat sink) Dimensions and Recommended Layout



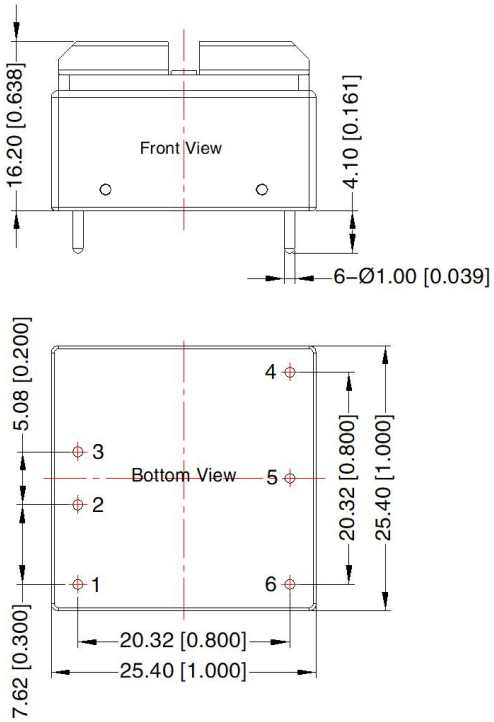
Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
PIN1/2/3/4/5/6: ϕ1.0mm
General tolerances: ±0.50[±0.020]



Note: Grid 2.54*2.54mm

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

Horizontal Package (with heat sink) Dimensions

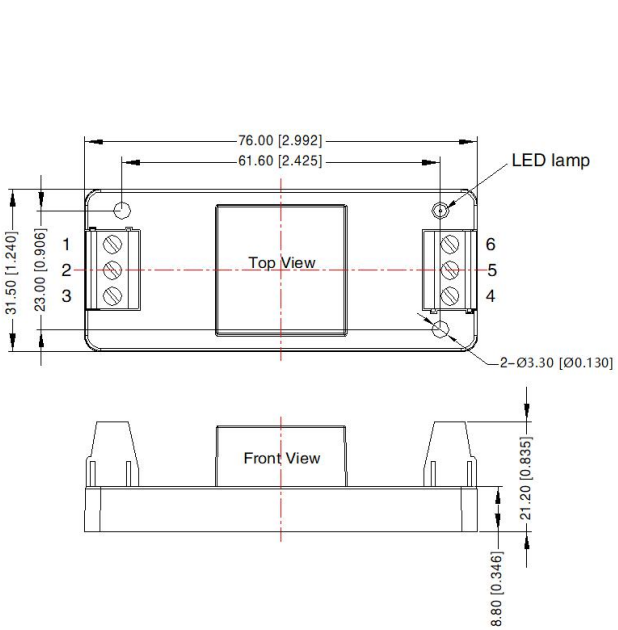


Note: Grid 2.54*2.54mm

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

Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
PIN1/2/3/4/5/6: ϕ 1.0mm
General tolerances: ± 0.50[± 0.020]

URA1D_YMD-6WR3A2S & URB1D_YMD-6WR3A2S (without heat sink) Dimensions

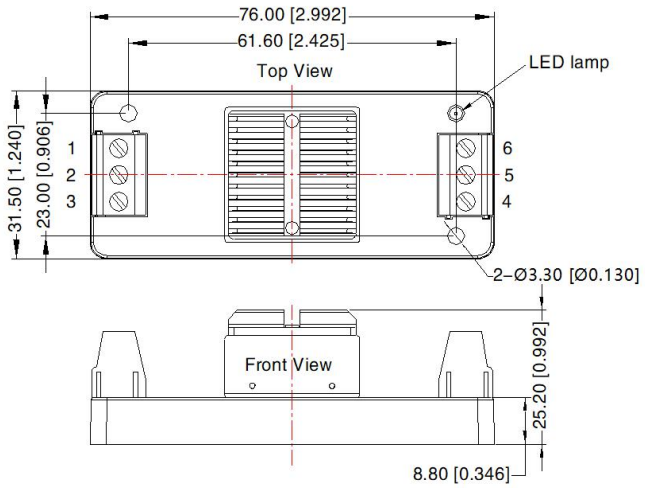


Pin–Out						
Pin	1	2	3	4	5	6
Single	NC	GND	Vin	+Vo	NC	0V
Dual	Ctrl	GND	Vin	+Vo	0V	–Vo

Note:
Unit: mm[inch]
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ± 0.50[± 0.020]

URA1D_YMD-6WHR3A2S & URB1D_YMD-6WHR3A2S (with heat sink) Dimensions

THIRD ANGLE PROJECTION

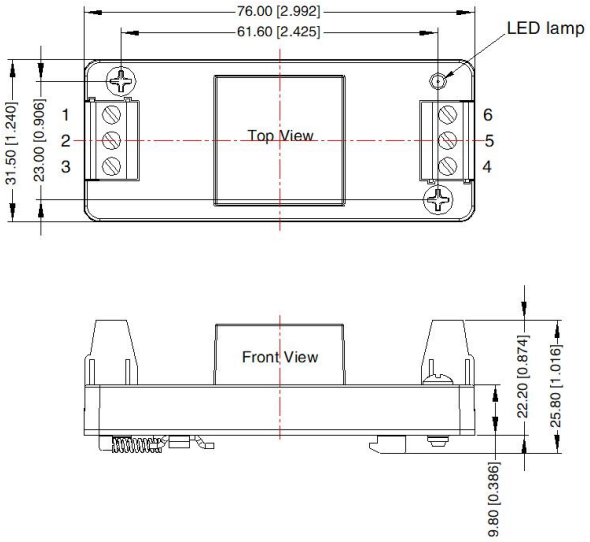


Pin–Out						
Pin	1	2	3	4	5	6
Single	NC	GND	Vin	+Vo	NC	0V
Dual	Ctrl	GND	Vin	+Vo	0V	–Vo

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

URA1D_YMD-6WR3A4S & URB1D_YMD-6WR3A4S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

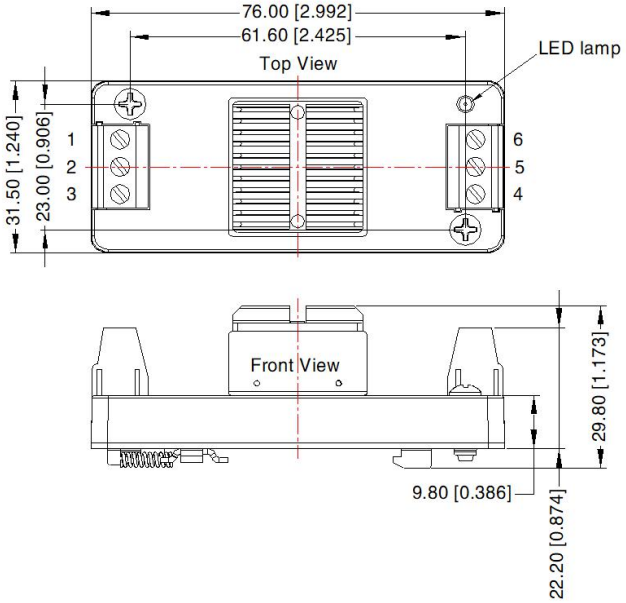


Pin–Out						
Pin	1	2	3	4	5	6
Single	NC	GND	Vin	+Vo	NC	0V
Dual	Ctrl	GND	Vin	+Vo	0V	–Vo

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]

URA1D_YMD-6WHR3A4S & URB1D_YMD-6WHR3A4S(with heat sink) Dimensions

THIRD ANGLE PROJECTION



Pin–Out						
Pin	1	2	3	4	5	6
Single	NC	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. The Packaging bag number of Horizontal package: 58210003(without heat sink), 58200048(with heat sink), A2S/ A4S package number: 58220022;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. 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;
4. Other product application information, please see DC-DC（railway power supply）Converter Application Notes for specific operation methods--2016 Edition;
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.

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