Descriptions

20W isolated，DC/DC Converter





RoHS

CE Report
EN62368-1

UKCA Report
BS EN62368-1

Features

- Ultra-wide 4:1 input voltage range
- Reinforced I/O isolation test voltage 2.25k VDC
- Operating ambient temperature range -40℃ to +85℃
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- Low output Ripple & Noise
- CLSPR32/EN55032 CLASS A EMI compliant without external components
- Input Reverse Polarity Protection available with Chassis (E2S) or 35mm DIN-Rail mounting (D4S) version
- Industry standard pin-out

Applications

- Railway equipment with 72V, 96V and 110V input voltages

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency(%)③ Min./Typ.	Capacitive Load(μF) Max.
		Nominal (Range)	Max.②	Voltage (VDC)	Current(mA) Max./Min.		
EN/BS EN	DRWLMD20-B1D03	110 (40-160)	170	3.3	5000/0	80/82	10000
	DRWLMD20-B1D05			5	4000/0	82/84	10000
	DRWLMD20-B1D12			12	1667/0	83/85	1600
	DRWLMD20-B1D15			15	1333/0	84/86	1000
	DRWLMD20-B1D24			24	833/0	84/86	470

Note:
①Use "H" suffix for heat sink mounting, "E2S" suffix for chassis mounting and "D4S" suffix for DIN-Rail mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
②Absolute maximum stress rating without damage (not recommended);
③Efficiency is measured at nominal input voltage and rated output load; efficiencies for E2S and D4S Model's is decreased by 2% due to the input reverse polarity protection circuit;
④Product images are for reference only; the actual product shall prevail.

Specifications

Product Specifications	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load / no-load)	20W series, Nominal input voltage	3.3V output	--	183/10	188/20	mA
			5V output	--	217/10	222/20	
			Others	--	214/3	219/8	
	Reflected Ripple Current	Nominal input voltage		--	25	--	
	Surge Voltage (1sec. max.)			-0.7	--	180	VDC
	Start-up Voltage	100% load		--	--	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 ①	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		--	2	7	mA
Output Specifications	Voltage Accuracy	0%-100% load		--	±1	±3	%
	Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
	Load Regulation	0%-100% load		--	±0.5	±1	
	Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
	Transient Response Deviation	25% load step change, nominal input voltage	3.3V/5V output	--	±3	±8	%
			Others	--	±3	±5	
	Temperature Coefficient	Full load		--	±0.02	±0.03	%/℃
	Ripple & Noise ②	20MHz bandwidth, 5%-100% load		--	50	100	mV p-p
	Trim	Input voltage range		90	--	110	%Vo
	Over-voltage Protection			110	--	160	
	Over-current Protection			120	--	210	%Io
	Short-circuit Protection			Continuous, self-recovery			
General Specifications	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		--	2200	--	pF
	Operating Temperature	See Fig. 1		-40	--	+85	℃
	Storage Temperature			-55	--	+125	

	Storage Humidity	Non-condensing		5	--	95	%RH
	Pin Soldering Resistance Temperature③	Soldering spot is 1.5mm away from the case, 10 seconds max.		--	--	+300	℃
		Wave soldering, maximum 10 seconds		255	260	265	
	Switching Frequency④	PWM mode		--	300	--	kHz
	Shock & Vibration test			IEC61373 - Category 1, Grade B			
	MTBF	MIL-HDBK-217F@25℃		1000	--	--	k hours
Mechanical Specifications	Case Material	Aluminum alloy					
	Dimensions	Without heat sink	Horizontal package	50.80 × 25.40 × 11.80mm			
			E2S chassis mounting	76.00 × 31.50 × 21.20 mm			
			D4S Din-rail mounting	76.00 × 31.50 × 25.80 mm			
		With heat sink	Horizontal package	51.40 × 26.20 × 16.50mm			
			E2S chassis mounting	76.00 × 31.50 × 25.30 mm			
			D4S Din-rail mounting	76.00 × 31.50 × 29.90 mm			
	Weight	Without heat sink	Horizontal package/E2S chassis mounting/D4S Din-rail mounting	26.0g/48.0g/68.0g(Typ.)			
		With heat sink	Horizontal package/E2S chassis mounting/D4S Din-rail mounting	34.0g/56.0g/76.0g(Typ.)			
	Cooling Method	Free air convection					

Note:
①The Ctrl pin voltage is referenced to input GND;
②Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "parallel cable" method is used for Ripple and Noise test;
③The pin soldering temperature tolerance is not the actual temperature set by the soldering iron but the temperature required for proper solder joints. The actual temperature set by the customer should be determined comprehensively based on factors such as PCB thickness, copper coverage, soldering iron power, and soldering iron tip selection;
④Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Electromagnetic compatibility (EMC) (EN62368)

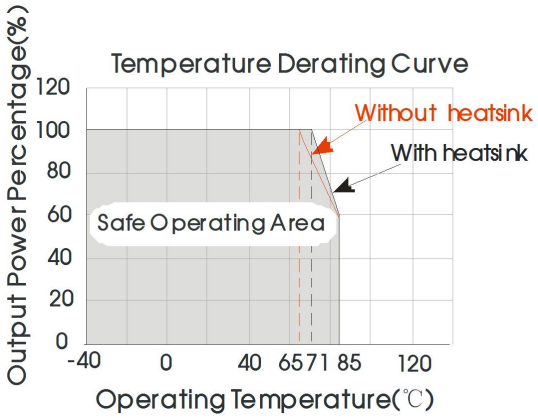
Emissions	CE	CISPR32/EN55032	CLASS A(see Fig.3 for recommended circuit)/ CLASS B(see Fig.5-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A(without external components)/ CLASS B (see Fig.5-② for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6kV/Air ±8kV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±4kV (see Fig.4 or Fig.5-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2kV (2Ω 18uF see Fig.4 for recommended circuit) line to ground ±4kV (12Ω 9uF see Fig.4 for recommended circuit)	perf. Criteria B
		EN50121-3-2	line to line ±1kV (42Ω 0.5uF see Fig.5-① for recommended circuit) line to ground ±2kV (42Ω 0.5uF see Fig.5-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Electromagnetic Compatibility (EMC) (EN50155)

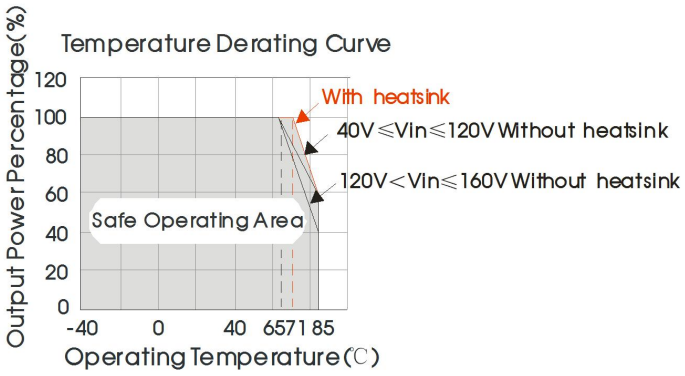
Emissions	CE	EN50121-3-2 EN55016-2-1	150kHz-500kHz 99dBuV 500kHz-30MHz 93dBuV	
	RE	EN50121-3-2 EN55016-2-1	30MHz-230MHz 40dBuV/m at 10m 230MHz-1GHz 47dBuV/m at 10m	
Immunity	ESD	EN50121-3-2	Contact ±6kV/Air ±8kV	perf. Criteria B
	RS	EN50121-3-2	20V/m	perf. Criteria A
	EFT	EN50121-3-2	±2kV 5/50ns 5kHz	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 10 Vr.m.s	perf. Criteria A

Note: All the tests are measured under the conditions of inputs capacitor 100uF/200V or EFP1DX3 filter (the recommended circuit please see Fig.3 or see Fig.4).

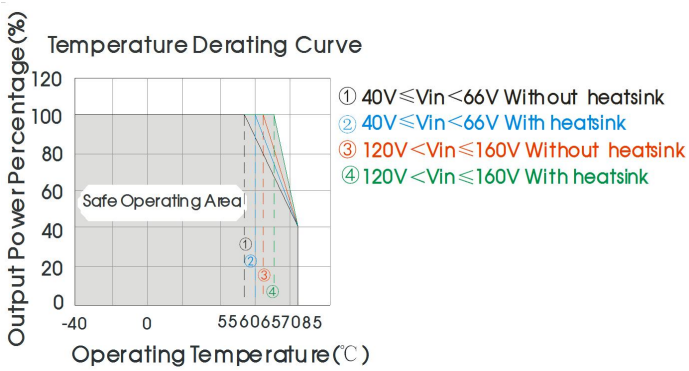
Characteristic Curve

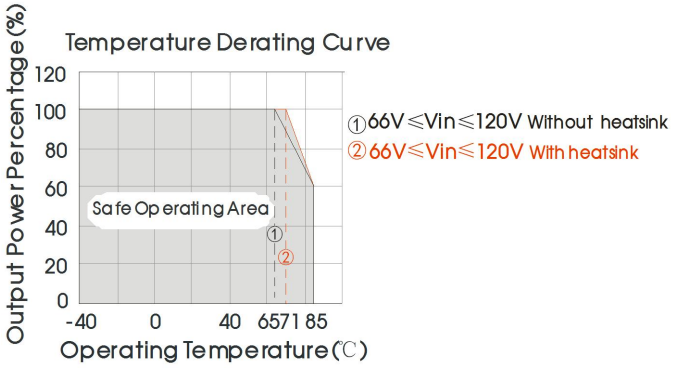


Except 3.3/5VDC output



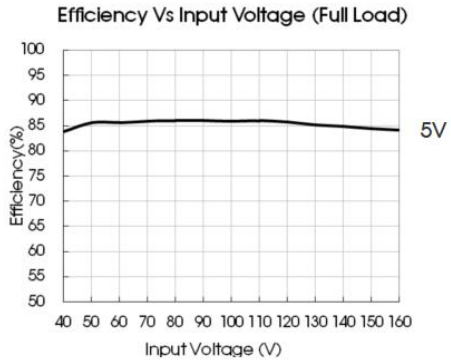
3.3VDC output

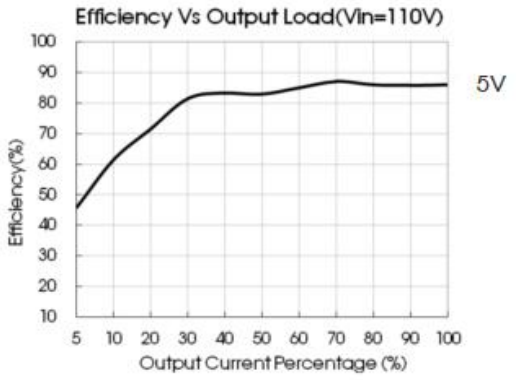


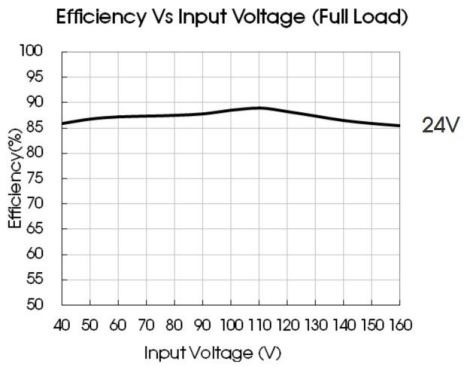


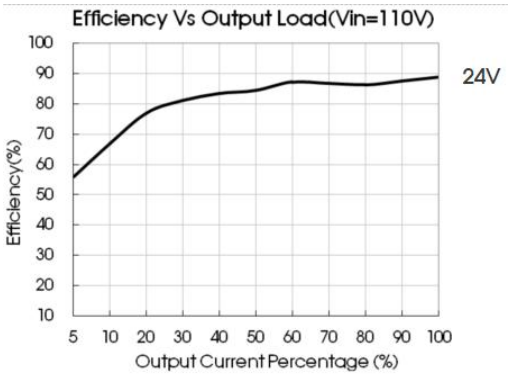
5VDC output

Fig. 1









Design Reference

1. Typical application

①All the DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

②Input 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 max. capacitive load value of the product.



Fig. 2

Vout(VDC)	Fuse	Cin	Cout
3.3/5	2A, slow blow	10μF - 47μF/250V	470μF/16V
12/15			220μF/25V
24			100μF/50V

2. EMC compliance circuit



Fig. 3

Fig. 3 List of components:

Cin	27uF -100μF/250V
Cout	Refer to the Cout in Fig.2

Notes: Fig. 3 Cin please use the 250V withstand voltage of the capacitor.

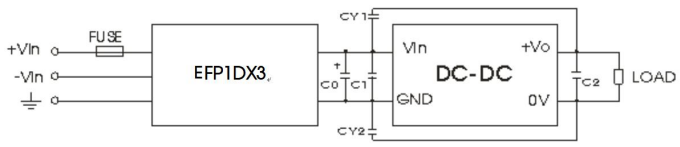


Fig. 4

Fig. 4 List of components:

FUSE	Choose according to actual input current
FP1DX3	EMC filter, Vin: 40V-160V; P: 30W
C0	100μF/200V
C1	Refer to the Cin in Fig.2
C2	Refer to the Cout in Fig.2
CY1, CY2	1000pF/400VAC

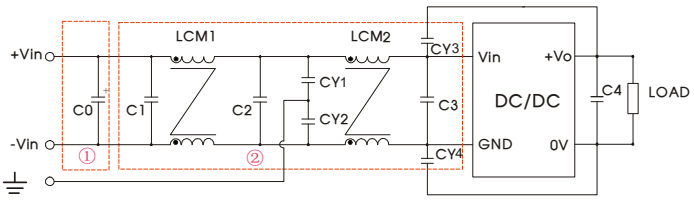


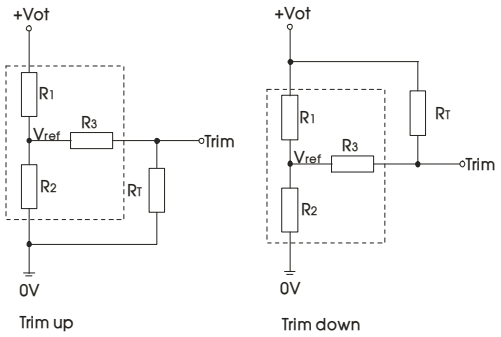
Fig. 5

Notes: Part ① in the Fig. 5 is used for EMS test and part ② for EMI test

Fig. 5 List of components:

Model	20W
C0	100μF/200V
C1, C2	0.22μF/250V
C3	Refer to the Cin in Fig.2
LCM1	2.2mH
LCM2	0.53mH (material: TN150P-RH12.7*12.7*7.9)
CY1, CY2, CY3, CY4	1000pF/400VAC
C4	Refer to the Cout in Fig.2

3. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

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

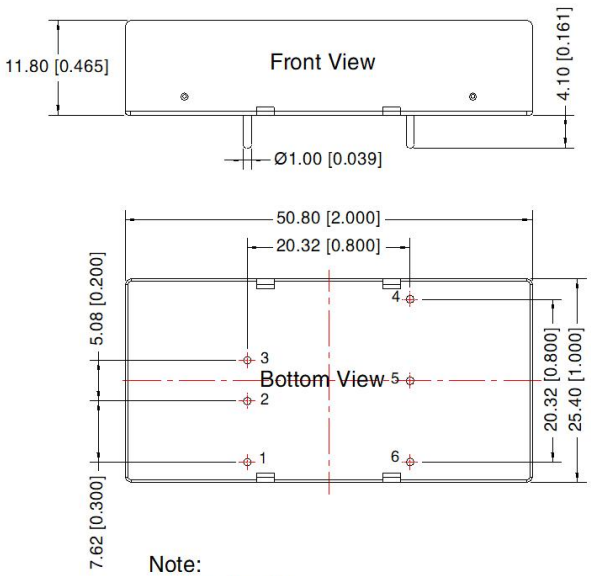
$$down:\ R_T=\frac{aR_1}{R_1-a}-R_3 \qquad a=\frac{Vo'-Vref}{Vref}\cdot R_2$$

R_T = Trim Resistor value;
a = self-defined parameter
Vo'= desired output voltage

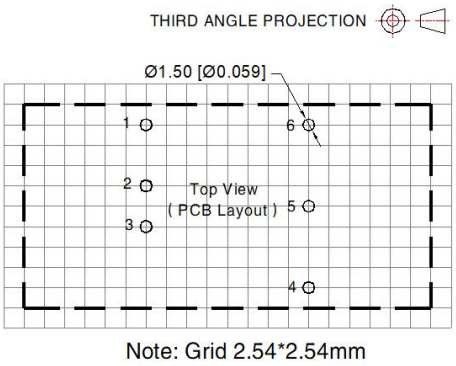
Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	4.772	2.87	10	1.25
5	2.883	2.87	10	2.5
12	11.000	2.87	15	2.5
15	14.384	2.87	15	2.5
24	24.872	2.87	17.8	2.5

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

DRWLMD20-B1Dxx (without heat sink) Dimensions and Recommended Layout



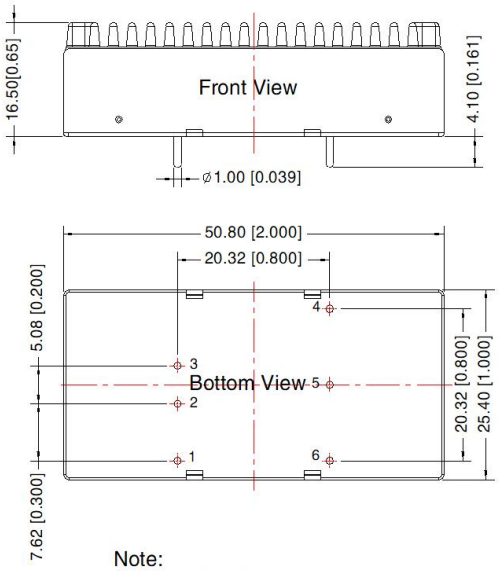
Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]



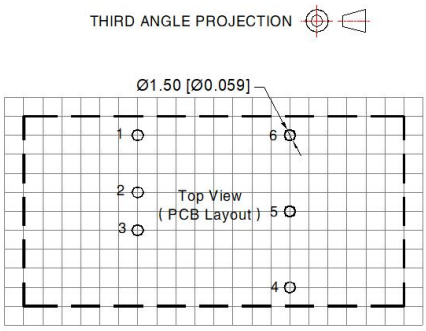
Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
1	Ctrl
2	GND
3	Vin
4	+Vo
5	Trim
6	0V

DRWLMD20-B1DxxH Horizontal Package (with heat sink) Dimensions



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

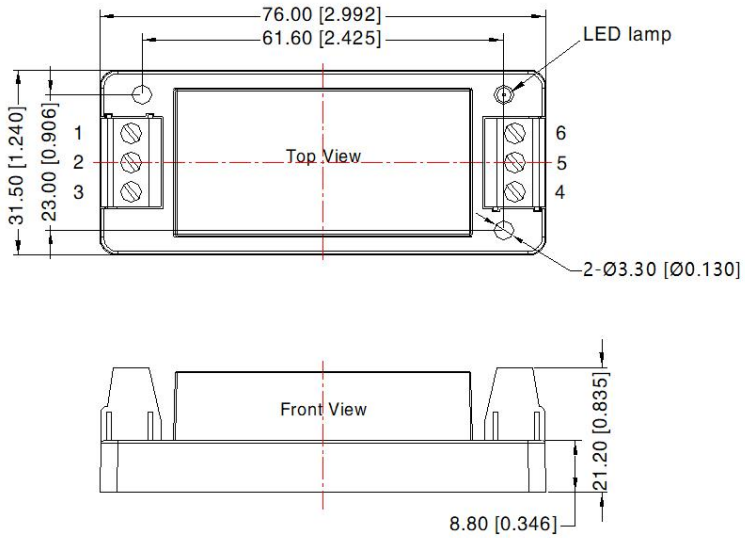


Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
1	Ctrl
2	GND
3	Vin
4	+Vo
5	Trim
6	0V

DRWLMD20-B1DxxE2S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

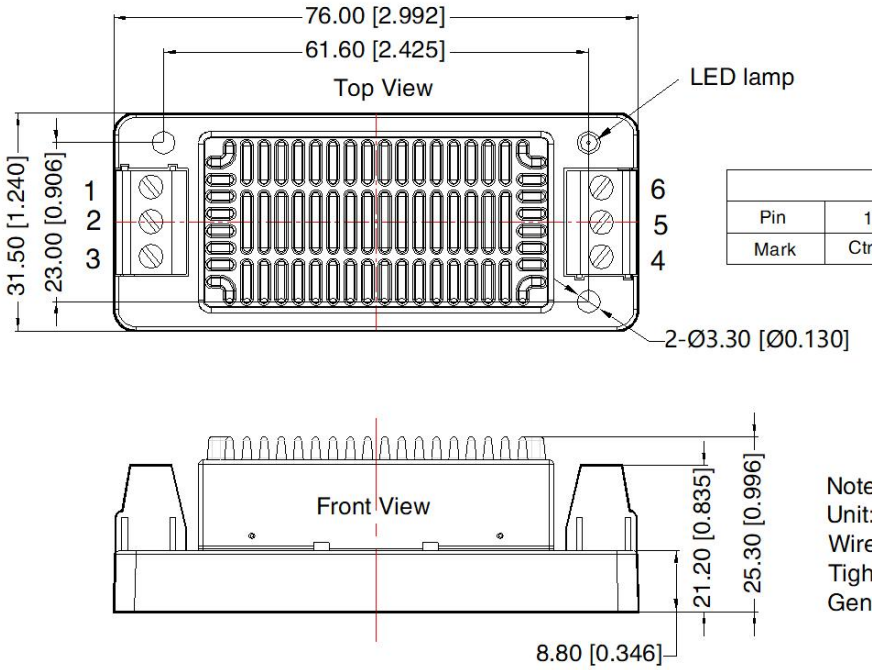


Pin–Out						
Pin	1	2	3	4	5	6
Mark	Ctrl	GND	Vin	+Vo	Trim	0V

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

DRWLMD20-B1DxxHE2S (with heat sink) Dimensions

THIRD ANGLE PROJECTION

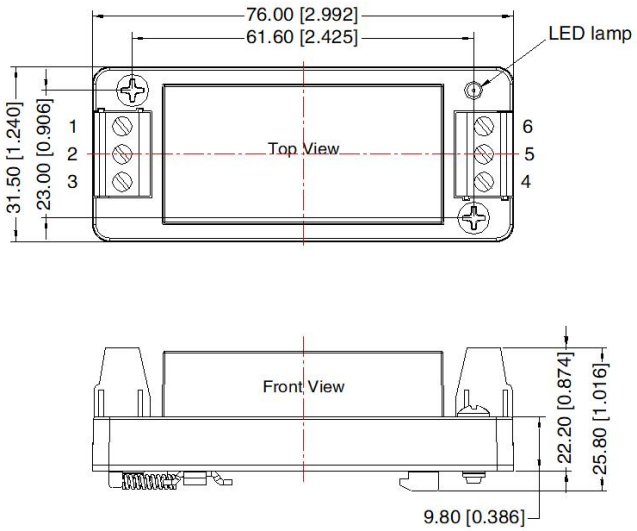


Pin–Out						
Pin	1	2	3	4	5	6
Mark	Ctrl	GND	Vin	+Vo	Trim	0V

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

DRWLMD20-B1DxxD4S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

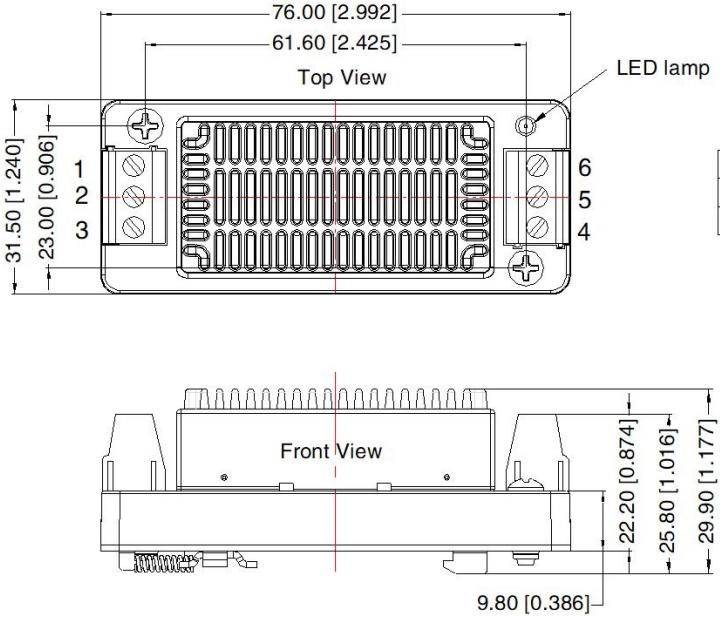


Pin–Out						
Pin	1	2	3	4	5	6
Mark	Ctrl	GND	Vin	+Vo	Trim	0V

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]

DRWLMD20-B1DxxHD4S (with heat sink) Dimensions

THIRD ANGLE PROJECTION



Pin–Out						
Pin	1	2	3	4	5	6
Mark	Ctrl	GND	Vin	+Vo	Trim	0V

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. The maximum capacitive load offered were tested at input voltage range and full load;
2. 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;
3. All index testing methods in this datasheet are based on company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.
7. The image certification marks are for reference only; please refer to the selection table for actual specifications. Certification is based on the physical mark or packaging label.