Descriptions

40W isolated，DC/DC Converter

RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

Features

- Ultra-wide 4:1 input voltage range
- Reinforced isolation, I/O isolation test voltage 3.0KVDC/1.5KVAC
- Operating ambient temperature range: -40℃ to +85℃
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection, over-temperature protection
- Input reverse polarity protection available with chassis (E2S) or 35mm Din-Rail mounting (D4S) version
- Industry standard pin-out

Applications

- 72V, 96V and 110V battery voltages

Selection Guide

Certification	Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency④ (%) Min./Typ.	Max. Capacitive Load(μF)
		Nominal② (Range)	Max.③	Voltage (VDC)	Current(mA) Max./Min.		
EN/BS EN	DRWLD40-F1D03	110 (40-160)	170	3.3	10000/0	85/87	10000
	DRWLD40-F1D05			5	8000/0	86/88	10000
	DRWLD40-F1D12			12	3333/0	89/91	2700
	DRWLD40-F1D15			15	2667/0	89/91	1680
	DRWLD40-F1D24			24	1667/0	87/89	680
	DRWLD40-F1D48			48	833/0	87/89	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;

②Minimum input voltage and start-up voltage are increased by 1V for all models with E2S (wiring) and D4S (rail) suffixes because of the input reverse polarity function;

③Exceeding the maximum input voltage may cause permanent damage;

④Efficiency 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.

Specifications

Specifications	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load / no-load)	Nominal input voltage	3.3V output	--	345/5	353/15	mA
			Others	--	413/3	423/15	
	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	32	--	
	Start-up Time	Nominal input voltage & constant resistance load		--	20	--	ms
	Input Filter			Pi filter			
	Hot Plug			Unavailable			
	Ctrl①	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	10	mA
Output Specifications	Voltage Accuracy	0% -100% load		--	±1	±3	%
	Linear Regulation	Input voltage variation from low to high at full load		--	±0.4	±1	
	Load Regulation	0% -100% load		--	±0.5	±1	
	Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	μs
	Transient Response Deviation		3.3V/5V output	--	±5	±8	%
			Others	--	±3	±5	
	Temperature Coefficient	Nominal input voltage, full load		--	±0.02	±0.03	%/℃
	Ripple & Noise②	20MHz bandwidth, nominal input voltage, full load		--	150	200	mV p-p
	Trim			90	-	110	%Vo
	Over-voltage Protection	Input voltage range		110	--	160	
	Over-current Protection			110	--	190	%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.		3000	--	--	VDC
		Input-output Electric Strength Test for 1 minute with a leakage current of 5mA max.		1500	--	--	VAC
		Input/output-case 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		--	2200	3000	pF

	Operating Temperature	See Fig. 1		-40	--	+85	℃
	Storage Temperature			-55	--	+125	
	Over-temperature Protection			--	100	130	
	Storage Humidity	Non-condensing		5	--	95	%RH
	Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds		--	--	+300	℃
	Switching Frequency③	PWM mode		--	220	--	kHz
	Vibration			IEC61373 - Category 1, Grade B			
	MTBF	MIL-HDBK-217F@25℃		500	--	--	k hours
Mechanical Specifications	Case Material	Aluminum alloy					
	Dimensions	Without heat sink	Horizontal package	50.80 × 25.40 × 11.80 mm			
			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 × 16.50 mm			
			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	32.3g/56.3g/76.3g (Typ.)			
		With heat sink	Horizontal package/E2S chassis mounting/D4S Din-rail mounting	41.0g/65.0g/85.0g (Typ.)			
	Cooling Method	Free air convection					

Note:

①The Ctrl pin voltage is referenced to input GND.

②Ripple & Noise at < 5% load is 5%Vo max. The ” parallel cable” method is used for Ripple and Noise test.

③Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

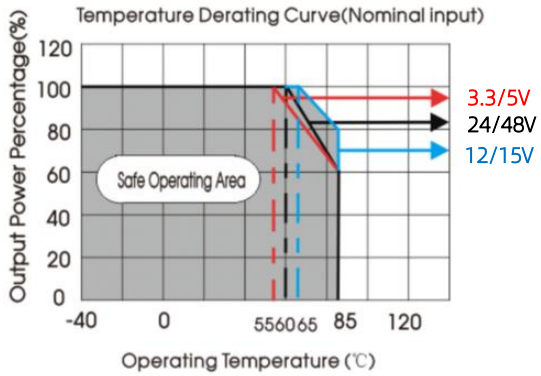
Electromagnetic compatibility (EMC) (EN62368)

Emissions	CE	CISPR32/EN55032	CLASS B(see Fig. 4-①/4-③ for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 4-①/4-③ for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	perf. Criteria A
	RS	IEC/EN61000-4-3	20V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	100kHz ±4KV (see Fig.4-②/4-④ for recommended circuit)	perf. Criteria A
	Surge	IEC/EN61000-4-5	line to line ±2KV (2Ω 18uF see Fig.4-②/4-④ for recommended circuit)	perf. Criteria A
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Electromagnetic Compatibility (EMC) (EN50155)

Emissions	CE	EN50121-3-2 150kHz-500kHz 99dBuV (see Fig. 4-①/4-③ for recommended circuit) EN55016-2-1 500kHz-30MHz 93dBuV	
	RE	EN50121-3-2 30MHz-230MHz 40dBuV/m at 10m (see Fig. 4-①/4-③ for recommended circuit) EN55016-2-1 230MHz-1GHz 47dBuV/m at 10m	
Immunity	ESD	EN50121-3-2 Contact ±6KV/Air ±8KV	perf. Criteria A
	RS	EN50121-3-2 20V/m	perf. Criteria A
	EFT	EN50121-3-2 ±2kV 5/50ns 5kHz (see Fig .4-②/4-④ for recommended circuit)	perf. Criteria A
	Surge	EN50121-3-2 line to line ±1KV（42Ω, 0.5μF） (see Fig .4-②/4-④ for recommended circuit)	perf. Criteria A
	CS	EN50121-3-2 0.15MHz-80MHz 10 Vr.m.s	perf. Criteria A

Typical Characteristic Curves



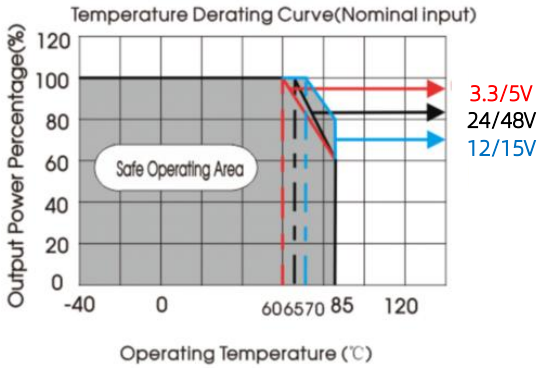


Fig. 1

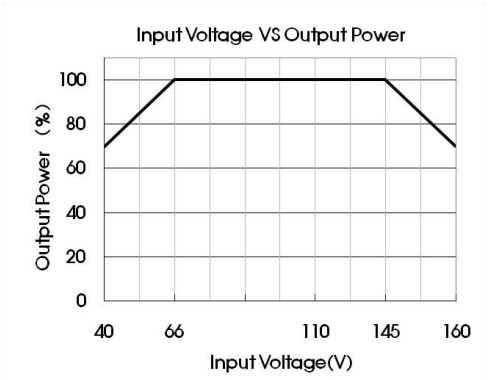
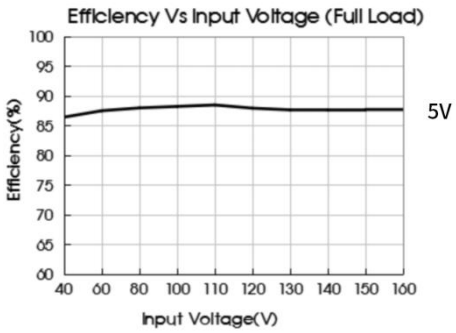
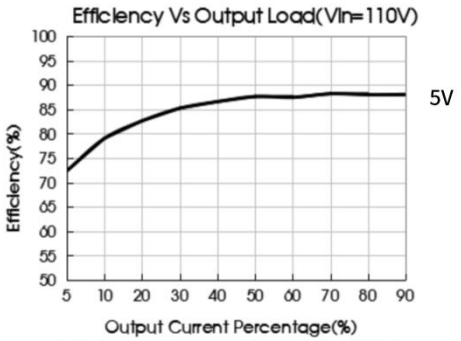
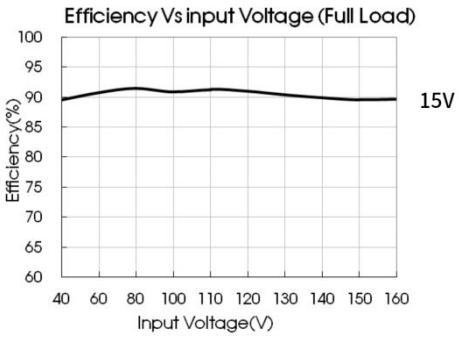


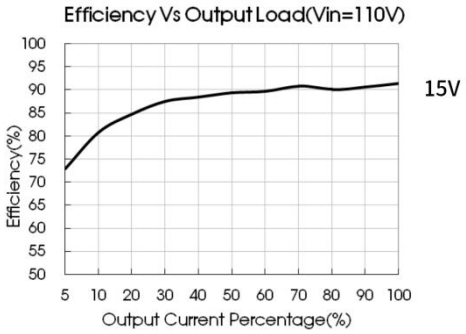
Fig. 2

Note:Fig.2 Input voltage VS output power derating curve for reference only, when opearting, as long as the case temperature does not exceed 100 ℃, the product can be used under any conditions within the input voltage and output load range.









Design Reference

1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 3.

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 max. capacitive load value of the product.

Fig. 3

Vout(VDC)	Fuse	Cin	Cout
3.3, 5	2A, slow blow	100μF	470μF
12, 15			220μF
24, 48			100μF

2. EMC compliance circuit

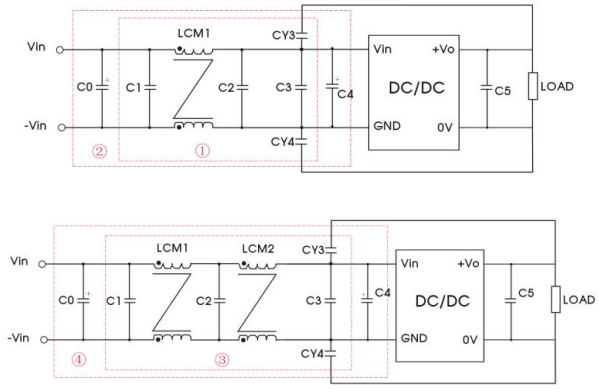


Fig. 4

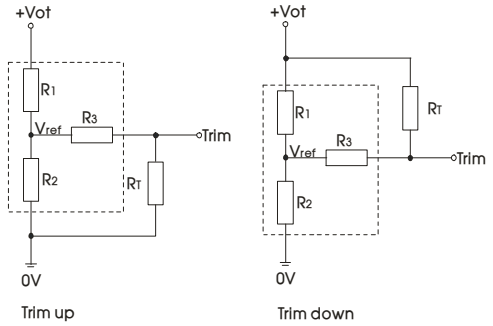
Fig.4 List of components:	
C0, C4	100μF/200V
C1, C2	2.2μF/250V
C3	Refer to the Cin in Fig.3
LCM1	10mH
LCM2	2.2mH
CY3, CY4	2200pF/400VAC
C5	Refer to the Cout in Fig.3

Notes:

1. For 3.3VDC, 5VDC, 12VDC, 15VDC, 24VDC output EMC tests we use Part ② in Fig. 4 for immunity and part ① for emissions test.

2. For 48VDC voltage EMC tests we use Part ④ in Fig. 4 for immunity and part ③ for emissions test.

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

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

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

RT = Trim Resistor value;

a = self-defined parameter;

Vo' = desired output voltage

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.801	2.87	10	1.24
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
48	55.28	3.0	20	2.5

4. Reflected Ripple Current testing circuit

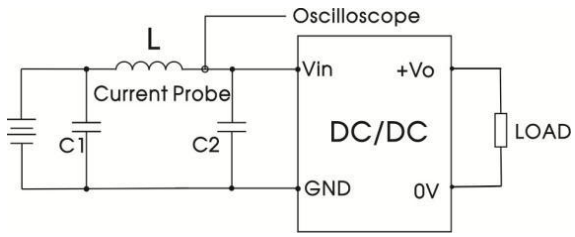
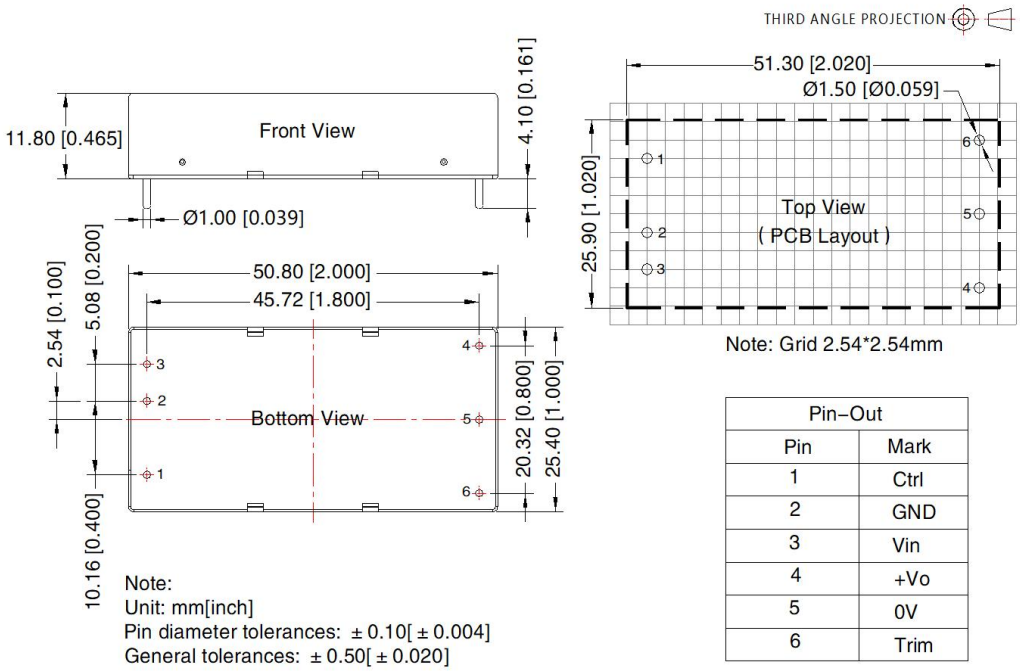


Fig.5

Fig.5 Parameter description:	
C1	220uF, ESR<1.0Ωat 100KHz
L	4.7uH
C2	4.7uF/250V

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

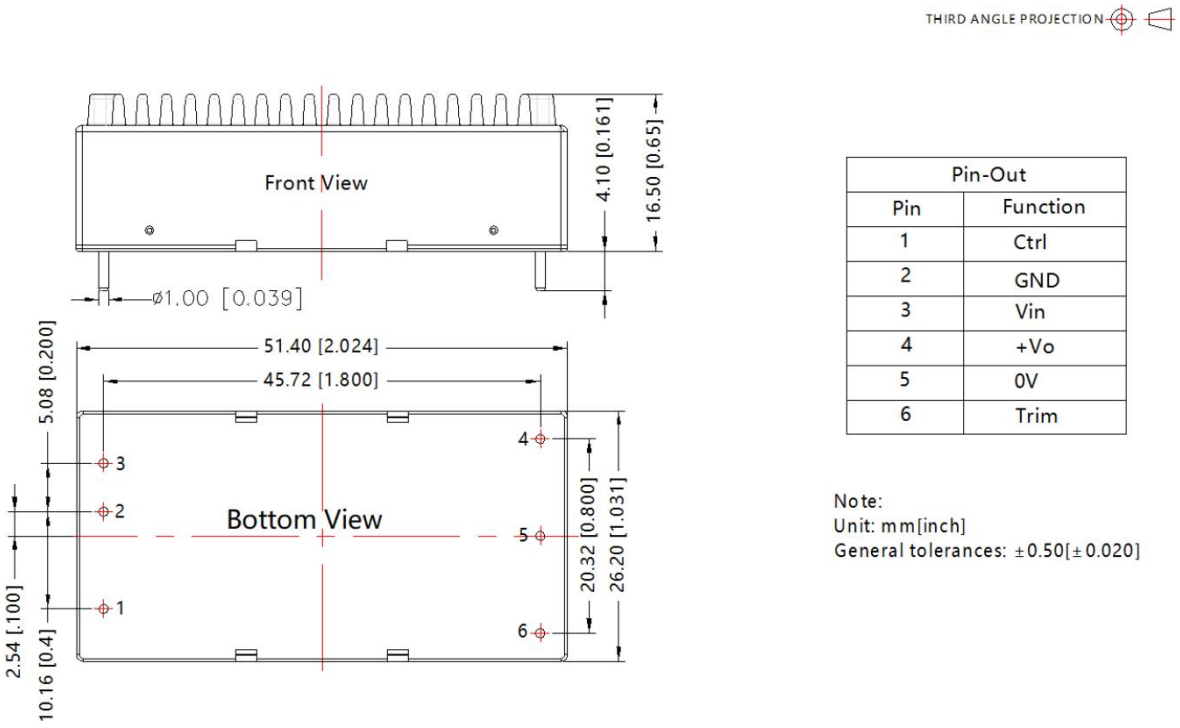
Horizontal Package (without heat sink) Dimensions and Recommended Layout



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

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

Horizontal Package (with heat sink) Dimensions and Recommended Layout

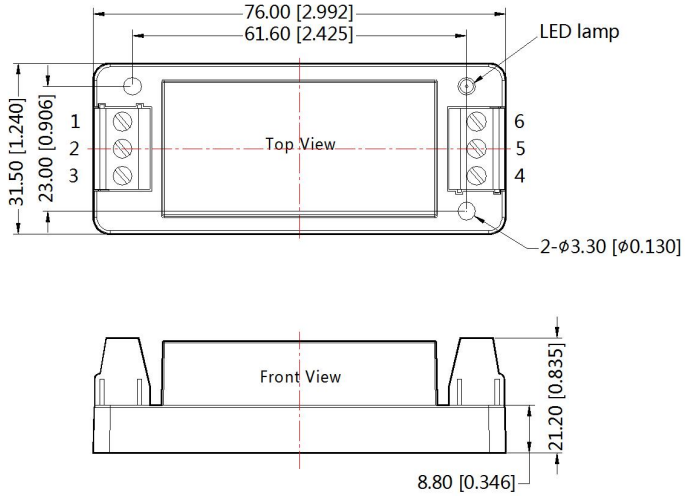


Pin-Out	
Pin	Function
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

Note:
Unit: mm[inch]
General tolerances: ±0.50[±0.020]

E2S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

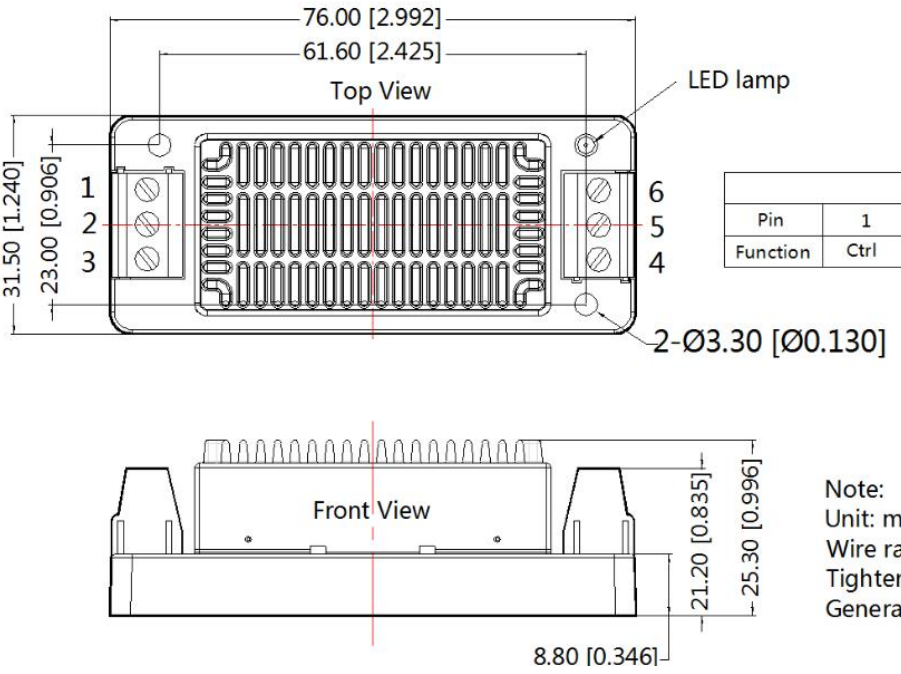


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim

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

E2S (with heat sink) Dimensions

THIRD ANGLE PROJECTION

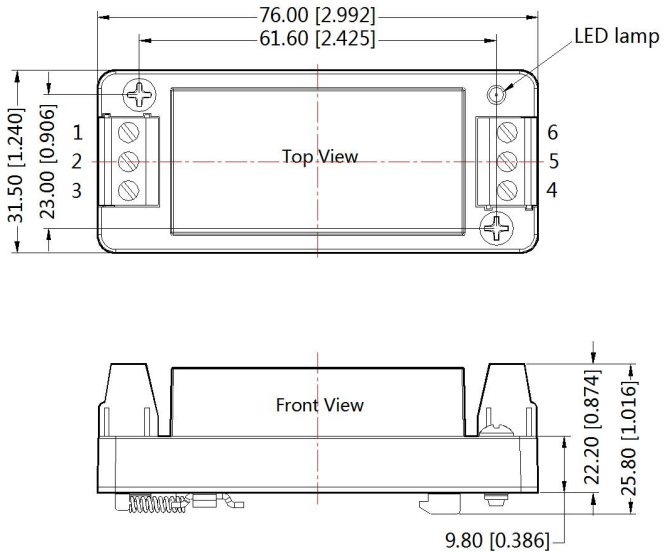


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim

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

D4S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

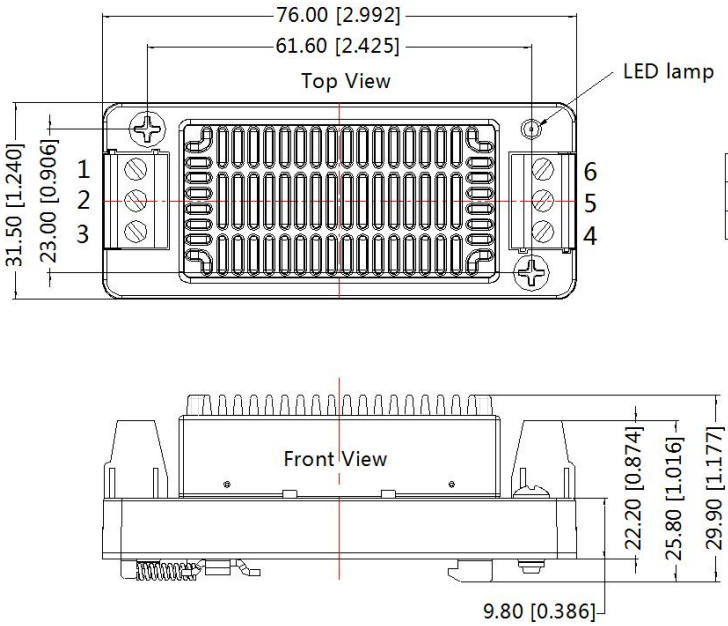


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim

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]

D4S (with heat sink) Dimensions

THIRD ANGLE PROJECTION



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

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.