

DESCRIPTIONS

30W, DC/DC Converter



Report Report
 UL 62368-1 EN 62368-1 BS EN 62368-1 IEC 62368-1

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 90% with full load
- High efficiency up to 82% with 5% load
- No-load power consumption as low as 0.14W
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short- circuit, over-voltage, over-current protection
- Operating ambient temperature range: -40°C to +80°C
- Meets CISPR32/EN55032 CLASS A without extra components
- Six-sided metal shielded package
- Input reverse polarity protection available with chassis(E2S) or Din-Rail mounting (D4S) version

APPLICATIONS

- Data transmission device
- Battery power supply device
- Telecommunication device
- Distributed power supply system
- Hybrid module system
- Remote control system
- Industrial robot
- Railway

Selection Guide

Certification	Part No. ^①	Input Voltage (VDC)		Output		Full Load Efficiency ^④ (%) Min./Typ.	Capacitive Load ^⑤ (μF)Max.
		Nominal ^② (Range)	Max. ^③	Voltage (VDC)	Current (mA) Max./Min.		
EN/BS EN	DWLD30-B2403	24 (9-36)	40	3.3	6000/0	83/85	10000
UL/EN/BS EN/IEC	DWLD30-B2405			5	6000/0	84/86	10000
EN/BS EN	DWLD30-B2409			9	3333/0	86/88	4700
UL/EN/BS EN/IEC	DWLD30-B2412			12	2500/0	88/90	2700

EN/BS EN	DWLD30-B2415			15	2000/0	88/90	1680
UL/EN/BS EN/IEC	DWLD30-B2424			24	1250/0	88/90	680
EN/BS EN	DWLD30-A2405	24 (9-36)	40	±5	±3000/0	84/86	2000
EN/BS EN	DWLD30-A2412			±12	±1250/0	87/89	1250
EN/BS EN	DWLD30-A2415			±15	±1000/0	87/89	680
EN/BS EN	DWLD30-A2424			±24	±625/0	87/89	470
EN/BS EN	DWLD30-B4803	48 (18-75)	80	3.3	6000/0	84/86	10000
EN/BS EN	DWLD30-B4805			5	6000/0	85/87	10000
UL/EN/BS EN/IEC	DWLD30-B4812			12	2500/0	86/88	2700
EN/BS EN	DWLD30-B4815			15	2000/0	87/89	1680
EN/BS EN	DWLD30-B4824			24	1250/0	85/87	680

Notes:

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;

②The minimum input voltage and starting voltage of E2S and D4S 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 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;

⑤The specified maximum capacitive load for positive and negative output is identical.

Specifications

Product Specifications	Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load / no-load)	24VDC nominal input series, nominal input voltage	3.3V output	--	971/60	mA
			5V output	--	1453/60	
			Others	--	1420/6	
		48VDC nominal input series, nominal input voltage	3.3V output	--	480/20	
			5V output	--	718/20	
			Others	--	710/5	
	Reflected Ripple Current	Nominal input voltage	--	40	--	VDC
	Surge Voltage (1sec. max.)	24VDC nominal input series	-0.7	--	50	
		48VDC nominal input series	-0.7	--	100	
	Start-up Voltage	24VDC nominal input series	--	--	9	
		48VDC nominal input series	--	--	18	
Input Specifications	Input Under-voltage Protection	24VDC nominal input series	5.5	6.5	--	VDC
		48VDC nominal input series	12.0	15.5	--	
	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		--	5	8	mA	
Output Specifications	Voltage Accuracy	5%-100% load		--	±1	±3	%	
		0%-5% load		--	±1	±5		
	Linear Regulation	Input voltage variation from low to high at full load	Vo1	--	±0.2	±0.5		
			Vo2	--	±0.5	±1		
	Load Regulation ^②	5%-100% load	Vo1	--	±0.5	±1		
			Vo2	--	±0.5	±1.5		
	Cross Regulation	Dual output, Vo1 load at 50%, Vo2 load at range of 10%-100%		--	--	±5		
	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/±5V output	--	±5	±8	%	
			Others	--	±3	±5		
	Temperature Coefficient	Full load		--	--	±0.03	%/°C	
	Ripple & Noise ^③	20MHz bandwidth, nominal input voltage, 100% load	Singe output	--	50	100	mVp-p	
			Dual output	--	50	150		
	Trim	Input voltage range			90	--	110	%Vo
	Over-voltage Protection				110	--	160	
	Over-current Protection				110	--	190	
Short-circuit Protection	Hiccup, continuous, self-recovery							
General Specifications	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/60sec		1000	--	--	MΩ	
	Isolation Capacitance	Input-output capacitance at 100kHz/0.1V		--	2000	--	pF	
	Operating Temperature	See Fig. 1, Fig. 2, Fig. 3 and Fig. 4		-40	--	+80	°C	

General Specifications	Storage Temperature	General Specifications	-55	--	+125	°C
	Storage Humidity	Non-condensing	5	--	95	%RH
	Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	°C
	Vibration		IEC/EN61373 - Category 1, Grade B			
	Switching	PWM mode	--	300	--	kHz

	Frequency ^④					
	MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours
Mechanical Specifications	Case Material	Aluminum alloy				
	Dimensions	Horizontal package (without heat sink)			50.80 × 25.40 × 11.80 mm	
		Horizontal package (with heat sink)			51.40 × 26.20 × 16.50 mm	
		E2S chassis mounting (without heat sink)			76.00 × 31.50 × 21.20 mm	
		E2S chassis mounting (with heat sink)			76.00 × 31.50 × 25.30 mm	
		D4S Din-rail mounting (without heat sink)			76.00 × 31.50 × 25.80 mm	
		D4S Din-rail mounting (with heat sink)			76.00 × 31.50 × 29.90 mm	
	Weight	Without heat sink	Horizontal package/E2S chassis mounting/D4S Din-rail mounting		27.8g/52.0g/72.0g(Typ.)	
		With heat sink	Horizontal package/E2S chassis mounting/D4S Din-rail mounting		37.0g/60.0g/80.0g(Typ.)	
	Cooling Method	Free air convection				

Note:

①The Ctrl pin voltage is referenced to input GND.

②Load regulation for 0%-100% load is ±5%;

③The “parallel cable” method is used for ripple and noise test;

④Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Electromagnetic Compatibility (EMC)

Emissions	CE	Single output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.6-② for recommended circuit)	
		Dual output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.7-② for recommended circuit)	
	RE	Single output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.6-② for recommended circuit)	
		Dual output	CISPR32/EN55032	CLASS A (without external components)/ CLASS B (see Fig.7-② for recommended circuit)	
Immunity	ESD		IEC/EN61000-4-2	Contact ±4kV	perf. Criteria B
	RS		IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	Single output	IEC/EN61000-4-4	±2kV (see Fig.6-① for recommended circuit)	perf. Criteria B
		Dual output	IEC/EN61000-4-4	±2kV (see Fig.7-① for recommended circuit)	perf. Criteria B
	Surge	Single output	IEC/EN61000-4-5	line to line ±2kV (see Fig.6-① for recommended circuit)	perf. Criteria B
		Dual output	IEC/EN61000-4-5	line to line ±2kV (see Fig.7-① for recommended circuit)	perf. Criteria B
	CS	Single output	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
		Dual output	IEC/EN61000-4-6	10Vr.m.s	perf. Criteria A

Electromagnetic Compatibility (EMC) (EN50155)

Emissions	CE	Single output	EN50121-3-2	150kHz-500kHz	99dBμV (see Fig.6-② for recommended circuit)		
			EN55016-2-1	500kHz-30MHz	93dBμV (see Fig.6-② for recommended circuit)		
		Dual output	EN50121-3-2	150kHz-500kHz	99dBμV (see Fig.7-② for recommended circuit)		
			EN55016-2-1	500kHz-30MHz	93dBμV (see Fig.7-② for recommended circuit)		
	RE	Single output	EN50121-3-2	30MHz-230MHz	40dBμV/m at 10m (see Fig.6-② for recommended circuit)		
			EN55016-2-1	230MHz-1GHz	47dBμV/m at 10m (see Fig.6-② for recommended circuit)		
Dual output		EN50121-3-2	30MHz-230MHz	40dBμV/m at 10m (see Fig.7-② for recommended circuit)			
		EN55016-2-1	230MHz-1GHz	47dBμV/m at 10m (see Fig.7-② for recommended circuit)			
Immunity	ESD		EN50121-3-2	Contact ±6kV/Air ±8kV		perf. Criteria A	
	RS		EN50121-3-2	20V/m		perf. Criteria A	
	EFT	Single output	EN50121-3-2	±2kV 5/50ns 5kHz	(see Fig.6-① for recommended circuit)		perf. Criteria A
		Dual output	EN50121-3-2	±2kV 5/50ns 5kHz	(see Fig.7-① for recommended circuit)		perf. Criteria A
	Surge	Single output	EN50121-3-2	line to line ±1kV (42Ω, 0.5μF) (see Fig.6-① for recommended circuit)		perf. Criteria A	
		Dual output	EN50121-3-2	line to line ±1kV (42Ω, 0.5μF) (see Fig.7-① for recommended circuit)		perf. Criteria A	
	CS	Single output	EN50121-3-2	0.15MHz-80MHz	10V r.m.s		perf. Criteria A
		Dual output	EN50121-3-2	0.15MHz-80MHz	10V r.m.s		perf. Criteria A

Characteristic Curve

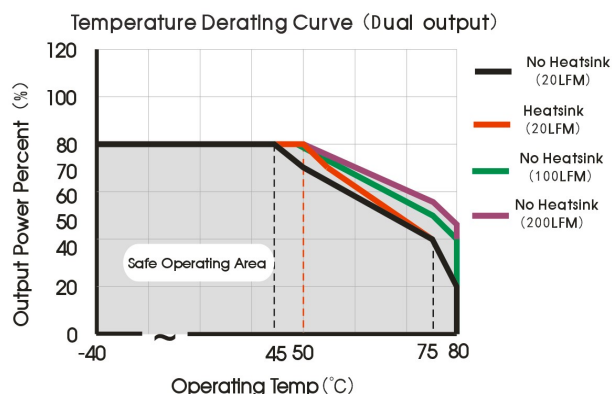


Fig. 1

Applicable models: DWLD30-A2405 (9-18V input voltage),
DWLD30-A2424 (9-18V input voltage),

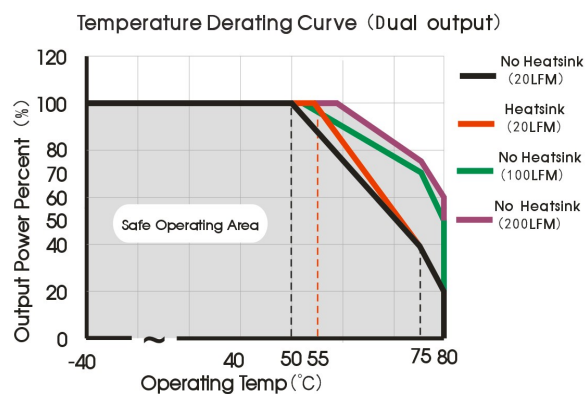


Fig. 2

Applicable models: DWLD30-A2405 (18-36V input voltage),
DWLD30-A2424 (18-36V input voltage),
DWLD30-A2412, DWLD30-A2415

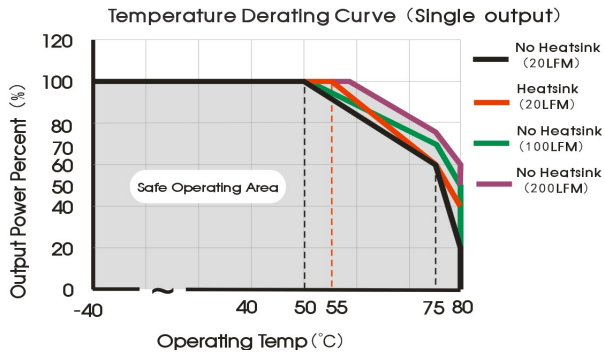


Fig. 3

Applicable models: DWLD30-B2403、DWLD30-B2405、
DWLD30-B4803、DWLD30-B4805

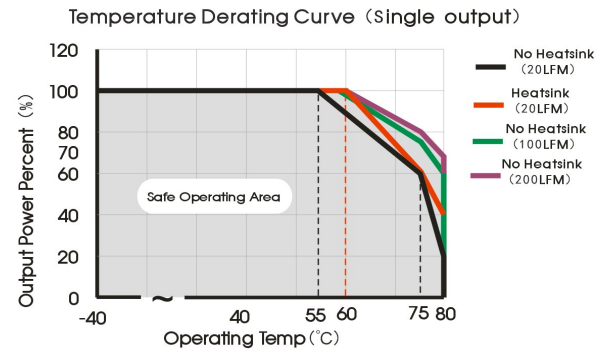
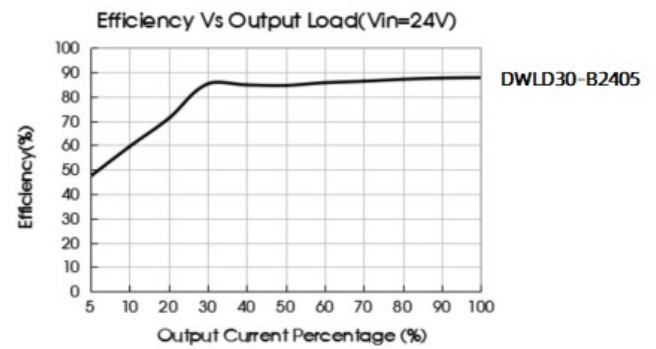
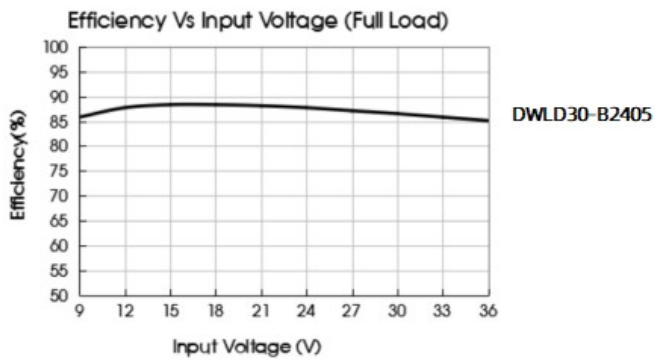


Fig. 4

Applicable models: DWLD30-B2409、DWLD30-B2412、
DWLD30-B2415、DWLD30-B2424、
DWLD30-B4812、DWLD30-B4815、
DWLD30-B4824



Design Reference

1. Typical application

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 5.

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} 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.

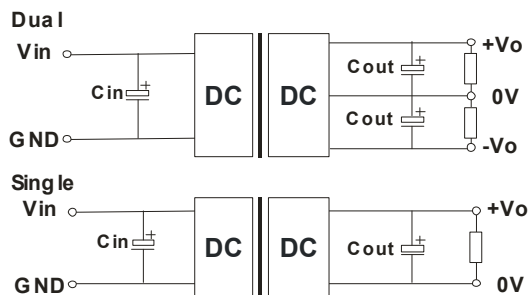


Fig. 5

Single output voltage (VDC)	Cout (μF)	Cin (μF)	Dual output voltage (VDC)	Cout (μF)	Cin (μF)
3.3/5/9	220	100	±5/±12/±15	220	100
12/15/24	100		±24	100	

2. EMC compliance circuit

Single output:

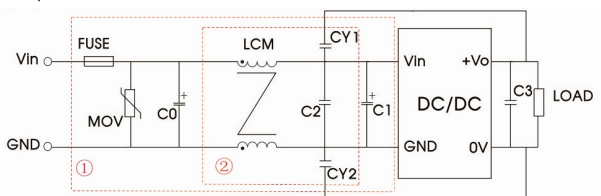


Fig. 6

Notes: We use Part ① in Fig. 6 for immunity and part ② for emissions test.
Selecting based on needs.

Dual output:

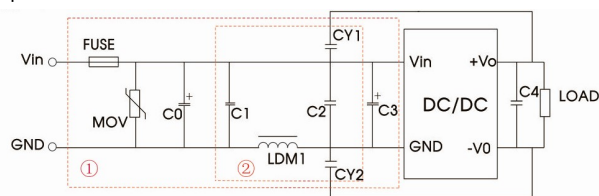


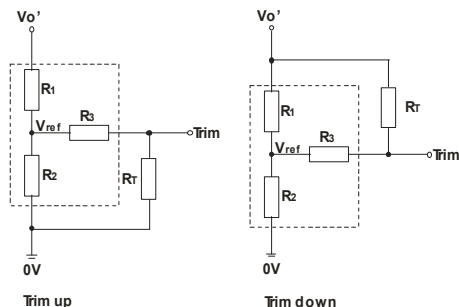
Fig. 7

Notes: We use Part ① in Fig. 7 for immunity and part ② for emissions test.
Selecting based on needs.

Parameter description:

Model	Vin:24VDC	Vin:48VDC
FUSE	Choose according to actual input current	
MOV	S20K30	S14K60
C0	680μF/50V	330μF/100V
C1	330μF/50V	330μF/100V
C2	4.7μF/50V	2.2μF/100V
C3	Refer to the Cout in Fig.5	
LCM	1mH	
CY1/CY2	1nF/2kV	
Model	Vin:24VDC	Vin:48VDC
FUSE	Choose according to actual input current	
MOV	S20K30	S14K60
C0	680μF/50V	330μF/100V
C1/C2	2.2μF/50V	2.2μF/100V
C3	330μF/50V	330μF/100V
C4	Refer to the Cout in Fig.5	
LDM1	3.3μH	
CY1/CY2	2.2nF/400VAC Safety Y Capacitor	

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\begin{aligned} \text{up: } R_T &= \frac{a R_2}{R_2 - a} - R_3 & a &= \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{a R_1}{R_1 - a} - R_3 & a &= \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_T = Trim Resistor value

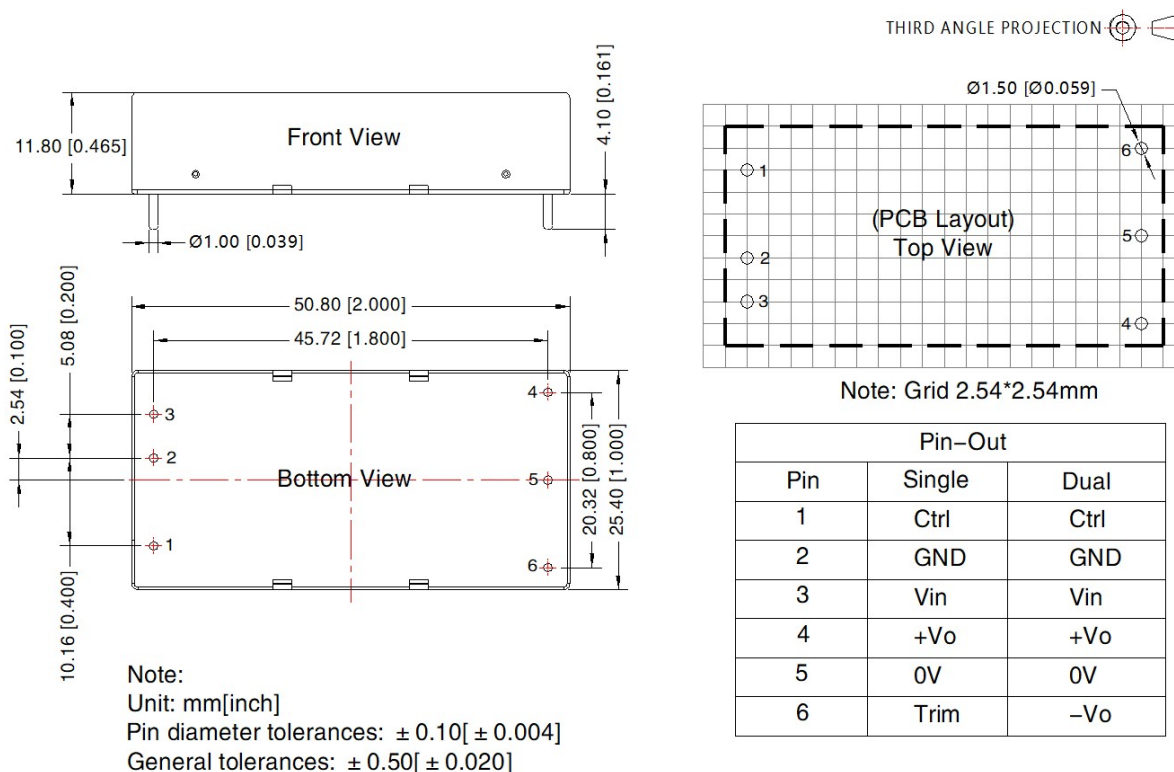
a = self-defined parameter

$V_{o'}$ = desired output voltage

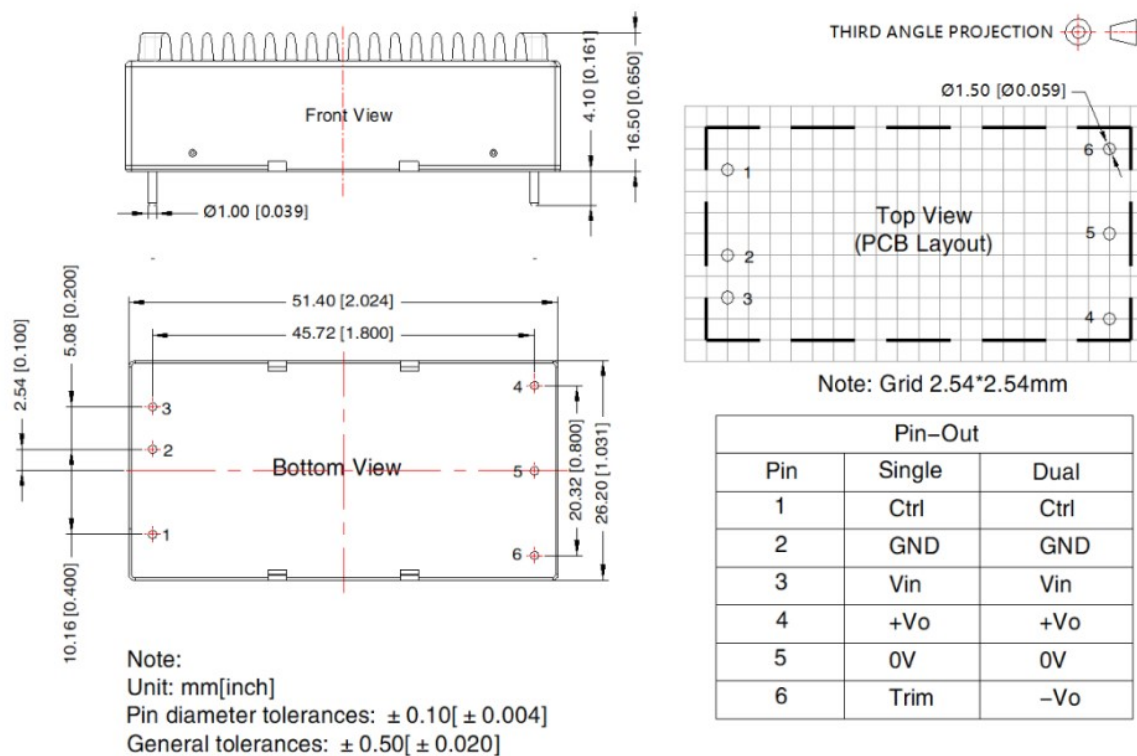
Vout(VDC)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	4.801	2.87	12.4	1.24
5	2.883	2.87	10	2.5
9	7.500	2.87	15	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

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

Horizontal Package (without heat sink) Dimensions Recommended Layout

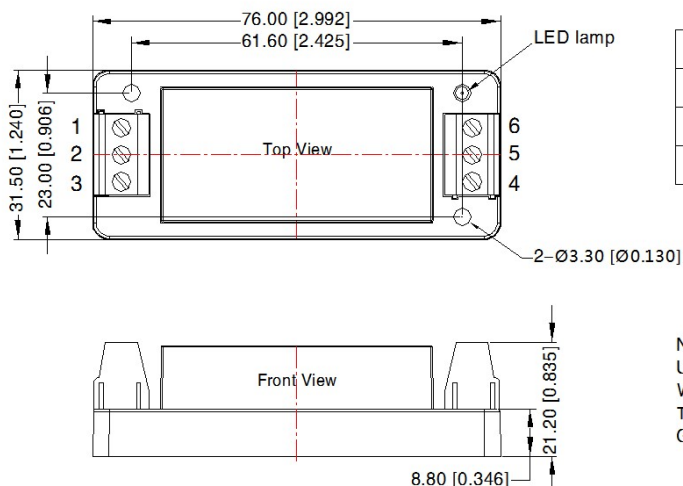


Horizontal Package (with heat sink) Dimensions



E2S (without heat sink) Dimensions

THIRD ANGLE PROJECTION

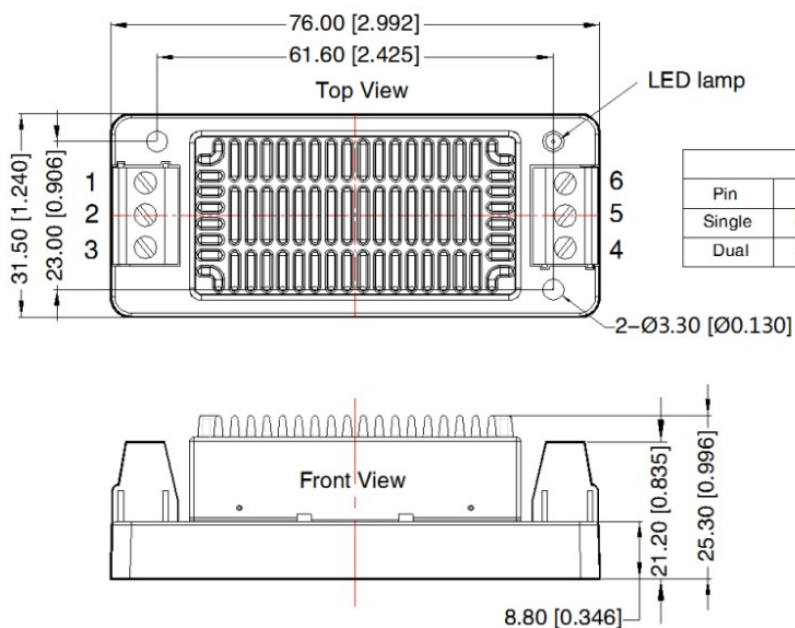


Pin-Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	0V	Trim
Dual	Ctrl	GND	Vin	+Vo	0V	-Vo

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

E2S (with heat sink) Dimensions

THIRD ANGLE PROJECTION

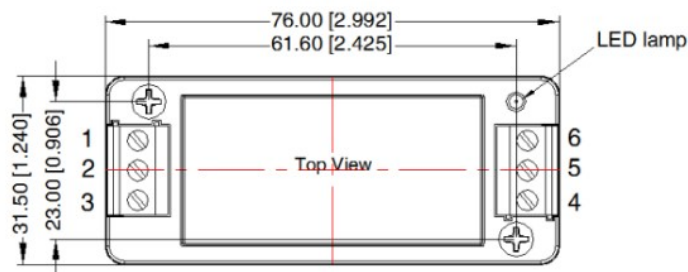


Pin-Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	0V	Trim
Dual	Ctrl	GND	Vin	+Vo	0V	-Vo

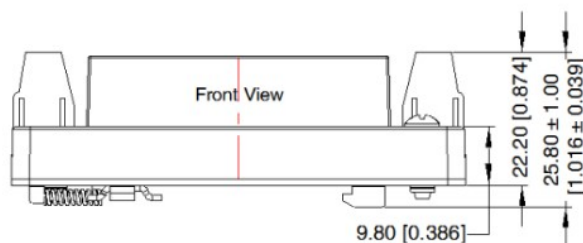
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N · m
General tolerances: $\pm 1.00[\pm 0.039]$

D4S (without heat sink) Dimensions

THIRD ANGLE PROJECTION



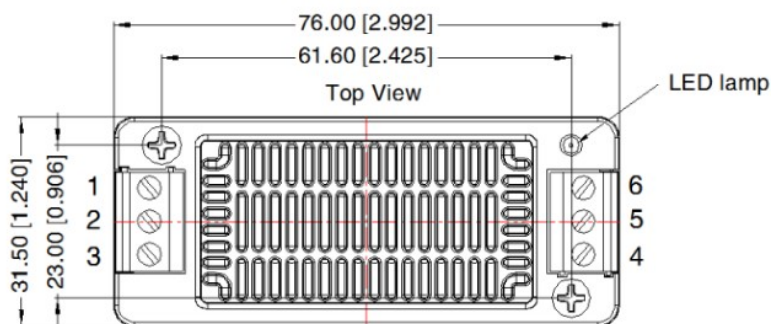
Pin-Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	0V	Trim
Dual	Ctrl	GND	Vin	+Vo	0V	-Vo



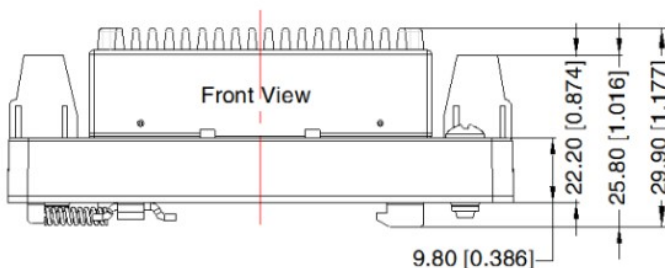
Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N · m
General tolerances: ± 1.00[± 0.039]

D4S (with heat sink) Dimensions

THIRD ANGLE PROJECTION



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

Notes:

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 $T_a=25^{\circ}\text{C}$, 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.