GAPTEC® GREEN TECHNOLOGY

20DAW4_1.5 Series

20W - Single Output - Wide Input - Isolated & Regulated DC-DC Converter

DC-DC Converter 20 Watt

- Efficiency up to 90%
- 4:1 wide input voltage range
- Short circuit protection (SCP)
- Output over voltage protection
- Output over current protection
- Industry standard pinout
- 1.5kVDC isolation
- Operating temperature range: -40°C ~ +85°C
- Six-sided metal shield
- Meet UL60950 and EN60950
- Meet CISPR22/EN55022 CLASS A
- PCB mounting, chassis mounting, DIN-rail mounting

The 20DAW4 series offers 20W of output, with 4:1 ultra wide input voltage of 9-36VDC, 18-75VDC, and features 1500VDC isolation, over current, over voltage and short-circuit protection, as well as six sided metal shielding.

All models are applied to wide voltage range input situation such as data transmission device, battery power supply device, telecommunication device ,distributed power supply system, remote control system, industrial robot system

UL-60950-1 (E347551)

Common specifications

Short circuit protection:	Hiccup, continuous, automatic recovery
Cooling:	Free air convection
Operation temperature range:	-40°C~+85°C
Storage temperature range:	-55°C~+125°C
Lead temperature:	300°C MAX, 1.5mm from case for 10 sec
Storage humidity range:	5% MIN, 95% MAX
Switching frequency (PWM mode):	300kHz TYP
Vibration:	10-55Hz, 10G, 30 Min. along X, Y and Z
Case material:	Aluminium alloy
MTBF (MIL-HDBK-217F@25°C):	1000 K hours MIN
Weight:	Horizontal: 28g (36g with heatsink) Chassis: 50g (70g with heatsink) DIN-rail: 70g (78g with heatsink)
Dimension:	Horizontal: 50.8*25.4*11.8mm (50.8*25.4*16.3mm with heatsink) Chassis: 76*31.5*21.2 mm (76*31.5*25.1 mm with heatsink) DIN-rail: 76*31.5*25.8 mm (76*31.5*29.7 mm with heatsink)

Input specifications

Item	Test condition	Min	Typ	Max	Units
Input current (full load/no load)	• 24VDC input				
	- 3.3V/5V output		969/60	993/45	mA
	- others		947/15	969/10	mA
	• 48VDC input				
	- 3.3V/5V output		485/35	496/50	mA
	- others		473/10	485/20	mA
Reflected ripple current			30		mA
Input impulse voltage (1 sec. max)	• 24VDC input	-0.7		50	VDC
	• 48VDC input	-0.7		100	VDC
Input filter	Pi				
Starting time	Nominal input & constant resistance load		10		ms
Ctrl [1]	• Module switch: ON	Ctrl suspended or connected to TTL high level (2.5-12VDC)			
	• Module switch: OFF	Ctrl pin connected to GND or low level (0-1.2VDC)			
	• Input current (Models OFF)		1		mA
Hot plug	Unavailable				

1. The CTRL control pin voltage is relative to input pin GND.

Isolation specifications

Item	Test condition	Min	Typ	Max	Units
Isolation voltage	Tested for 1 minute and leakage current less than 1 mA	1500			VDC
Isolation resistance	Test at 500VDC	1000			MΩ
Isolation capacitance	100KHz/0.1V				
	• 24VDC output		2000		pF
	• others		1000		pF

Example:
20DAW4_2415S1.5
20 = 20Watt; D = DIP; A = series; W4 = wide input (4:1) 18-36Vin; 15Vout; S = Single output; 1.5 = 1500VDC isolation

Note:

1. Recommend to use module with more than 5% load, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product;
3. The recommended unbalance degree of the dual output module load is ≤±5%; if the degree exceeds ±5%, than the product performance cannot be guaranteed to comply with all parameters in the datasheet. Please contact our technicians directly for specific information;
4. The maximum capacitive load offered were tested at nominal input voltage and full load;
5. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta = 25°C, humidity <75% with nominal input voltage and rated output load;
6. All index testing methods in this datasheet are based on our Company's corporate standards;
7. The performance parameters of the product models listed in this manual are as above, but some parameters of non-standard model products may exceed the requirements mentioned above. Please contact our technicians directly for specific information;
8. We can provide product customization service;
9. Specifications are subject to change without prior notice.

20DAW4_1.5 Series

20W - Single Output - Wide Input - Isolated & Regulated
DC-DC Converter

Output specifications					
Item	Test condition	Min	Typ	Max	Units
Output voltage accuracy	Positive and negative accuracy		±1	±3	%
Balance of output voltage	Dual output, balanced load		±0.5	±1	%
Line regulation	Full load, input voltage from low to high		±0.2	±0.5	%
Load regulation	5% to 100% load		±0.5	±1	%
Cross regulation	Dual output, main circuit 50% load, auxiliary circuit 10% to 100% load			±5	%
Transient recovery time	25% load step change		300	500	µs
Transient response deviation	25% load step change		±3	±5	%
Temperature drift	100% full load		±0.02		%/°C
Ripple & Noise*	20MHz Bandwidth		70	100	mVp-p
Trim			±10%Vo		VDC
Over Voltage Protection	• 3.3V output • 5V output • 9V output • 12V output • 15V output • 24V output		3.9 6.2 10.8 15 18 30		VDC VDC VDC VDC VDC VDC
Over current protection	Input voltage range		160		%

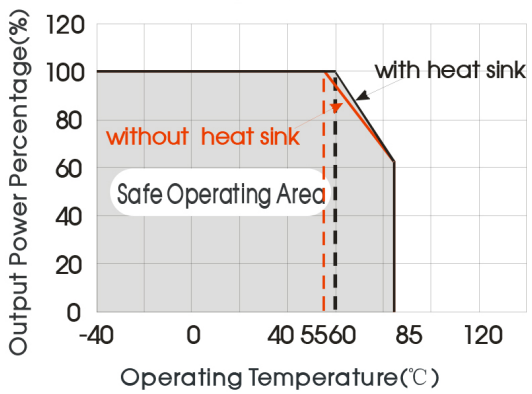
* Ripple & noise are measured by "parallel cable" method, please see DC-DC Converter Application Notes for specific operation.

EMC specifications				
EMI	CE	CISPR22/EN55022 CLASS A (Bare component) CLASS B (External Circuit Refer to EMC recommended circuit,②)		
EMI	RE	CISPR22/EN55022 CLASS A (Bare component) CLASS B (External Circuit Refer to recommended circuit,②)		
EMS	ESD	IEC/EN61000-4-2 perf. Criteria B	Contact ±4KV	
EMS	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
EMS	EFT	IEC/EN61000-4-4 (External Circuit Refer to recommended circuit,①)	±2KV	perf. Criteria B
EMS	Surge	IEC/EN61000-4-5 (External Circuit Refer to recommended circuit,①)	±2KV	perf. Criteria B
EMS	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
EMS	Voltage dips, short and interruptions immunity	IEC/EN61000-4-29	0%-70%	perf. Criteria B

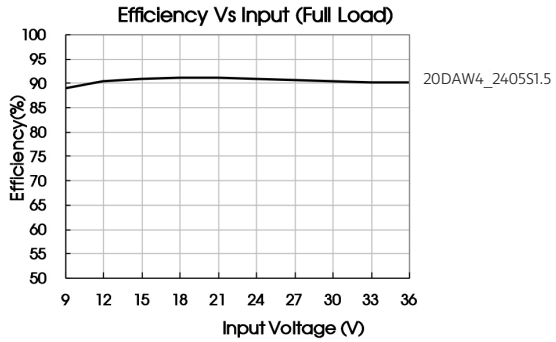
Part Number	Input Voltage [VDC] Nominal	Range	Max[1]	Output Voltage [VDC]	Output Current [mA, Max]	Efficiency [%, Typ.]	Capacitive load[2] [µF, Max]
20DAW4_2403S1.5	24	9-36	40	3.3	5000	86	18700
20DAW4_2405S1.5	24	9-36	40	5	4000	90	9600
20DAW4_2409S1.5	24	9-36	40	9	2222	88	4700
20DAW4_2412S1.5	24	9-36	40	12	1667	89	1600
20DAW4_2415S1.5	24	9-36	40	15	1333	90	1000
20DAW4_2424S1.5	24	9-36	40	24	834	90	500
20DAW4_4803S1.5	48	18-75	80	3.3	5000	86	18700
20DAW4_4805S1.5	48	18-75	80	5	4000	88	9600
20DAW4_4812S1.5	48	18-75	80	12	1667	89	1600
20DAW4_4815S1.5	48	18-75	80	15	1333	90	1000
20DAW4_4824S1.5	48	18-75	80	24	834	90	500
20DAW4_2405D1.5	24	9-36	40	±5	±2000	86	4800
20DAW4_2412D1.5	24	9-36	40	±12	±834	88	800
20DAW4_2415D1.5	24	9-36	40	±15	±667	88	625
20DAW4_4805D1.5	48	18-75	80	±5	±2000	86	4800
20DAW4_4812D1.5	48	18-75	80	±12	±834	88	800
20DAW4_4815D1.5	48	18-75	80	±15	±667	89	625

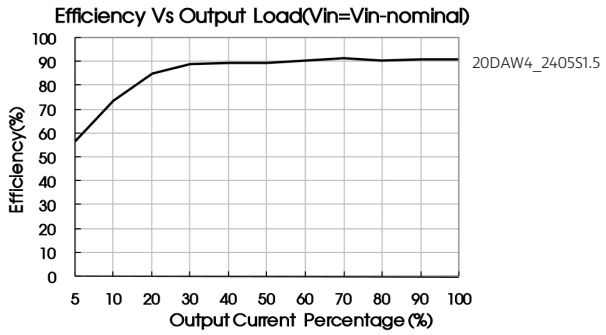
1. Absolute maximum rating without damage on the converter, but it isn't recommended
2. For each output
3. Series with suffix - HS are heat-sink mounting
   Series with suffix - CM are with chassis mounting
   Series with suffix - CMHS are with chassis mounting + heat-sink
   Series with suffix - DR are with Din-Rail mounting
   Series with suffix - DRHS are with Din-Rail mounting + heat-sink

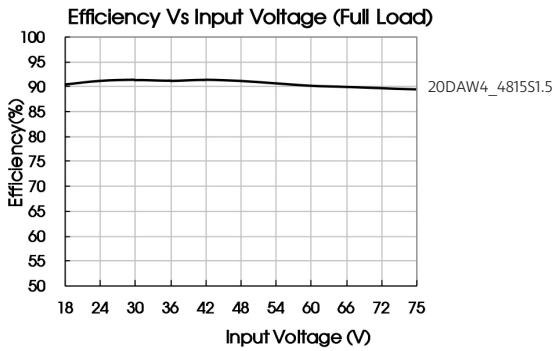
Temperature derating

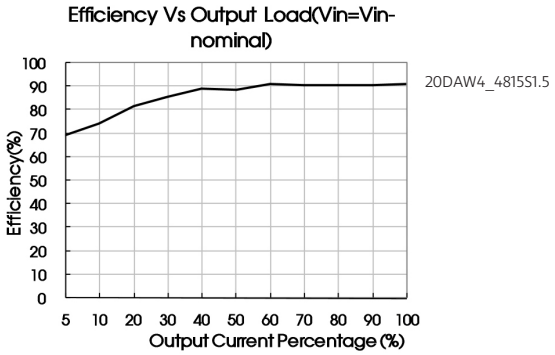


Efficiency curves









Typical application

All the 20DAW4_1.5 Series are tested according to the recommended circuit (see Fig. 1) before delivery.
If a further decrease of the input and output ripple is required, properly increase the input & output of additional capacitors Cin and Cout or select capacitors of low equivalent impedance, and ensure the capacitance should be lower than the max. capacitive load of the product.

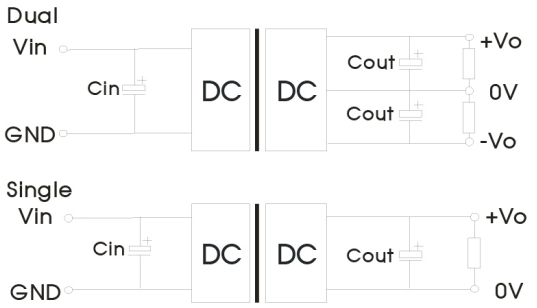


Figure 1

External capacitor table

Single Vout (VDC)	Cout (µF)	Cin (µF)	Dual Vout (VDC)	Cout (µF)	Cin (µF)
3.3/5	470	100	±5	220	100
9/12/15	220	100	±12/±15	100	100
24	100	100	-	-	100

Table 1

EMC solution-recommended circuit

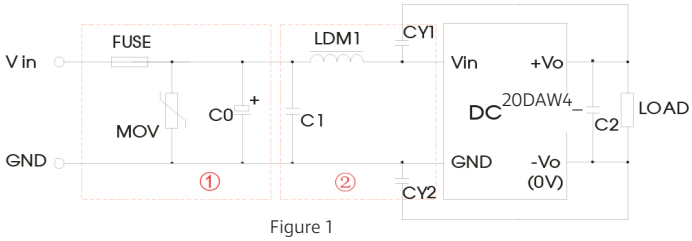
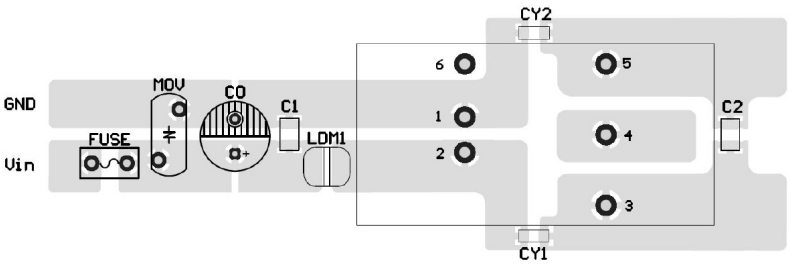


Figure 1

Note:
Part ① is used for EMS test and part ② for EMI filtering; selected based on needs.

Recommended external circuit parameters	Vin: 24V	Vin: 48V
FUSE	Choose according to actual input current	
MOV	S14K35	S14K60
C0	330µF/50V	330µF/100V
C1	1µF/50V	1µF/100V
C2	Refer to the Cout in Typical application	
LDM1	4.7µH	
CY1, CY2	1nF/2KV	

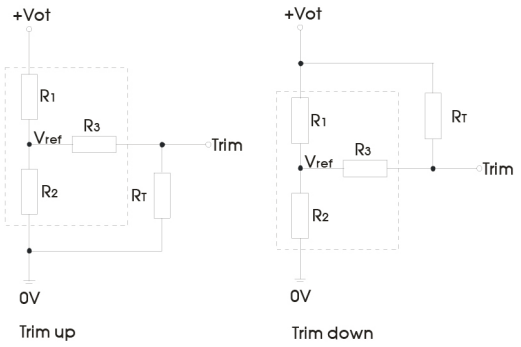
EMC recommended circuit PCB layout



Note:
The min. distance of the bonding pads between input & output isolation capacitors (CY1/CY2) shall be ≥ 2mm.

Trim application & trim resistance

Application circuit for TRIM
(Part in broken line is the interior of models)



Applied circuits of Trim (Part in broken line is the interior of models)

Formula for resistance of Trim

$$\text{up:}\quad R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

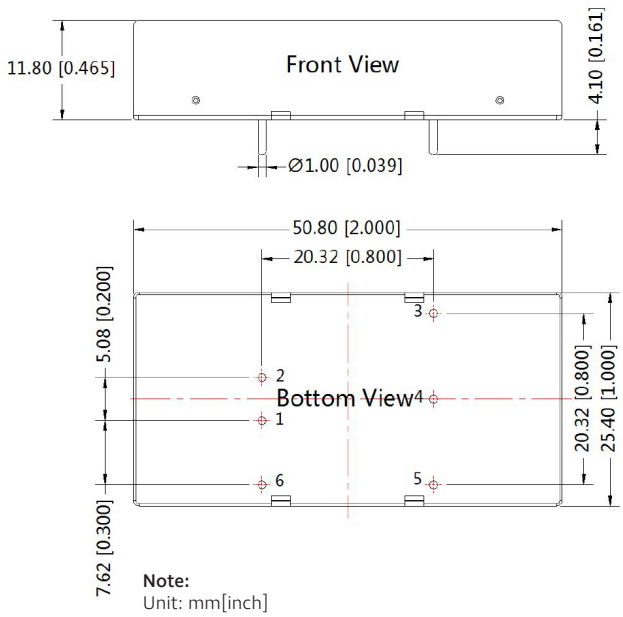
$$\text{down:}\quad R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

Note:
Value for R1, R2, R3, and Vref refer to the following table.
R_T: Resistance of Trim
a: User-defined parameter, no actual meanings
Vo': The trim up/down voltage

Vout (V)	R1 (KΩ)	R2 (KΩ)	R3 (KΩ)	Vref (V)
3.3	4.801	2.863	15	1.24
5	2.883	2.864	10	2.5
9	7.500	2.864	15	2.5
12	10.971	2.864	17.8	2.5
15	14.497	2.864	17.8	2.5
24	24.872	2.863	20	2.5

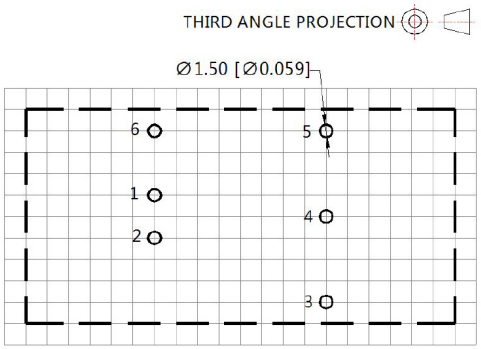
It is not allowed to connect modules output in parallel to enlarge the powe.

Mechanical dimensions



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

Recommended footprint

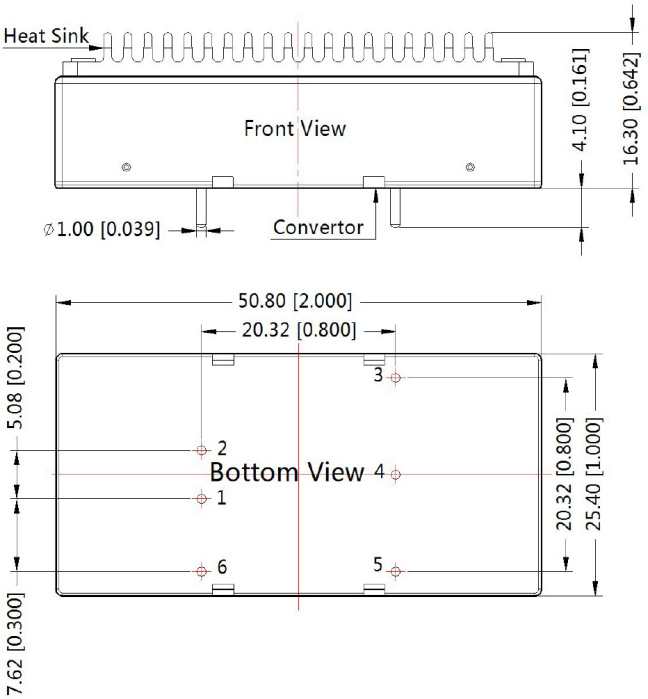


Note : Grid 2.54*2.54mm

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

Mechanical dimensions with heatsink (-HS)

THIRD ANGLE PROJECTION

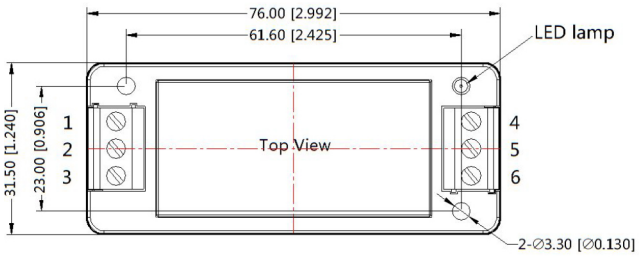


Pin-Out		
Pin	Single	Dual
1	GND	GND
2	Vin	Vin
3	+Vo	+Vo
4	Trim	0V
5	0V	-Vo
6	Ctrl	Ctrl

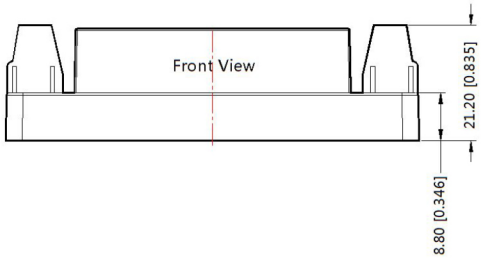
Note:
Unit :mm[inch]
General tolerances:±0.50[±0.020]
If use heatsinks,make sure there is enough space for a special size in ther above graph

Chassis mounting (-CM)

THIRD ANGLE PROJECTION

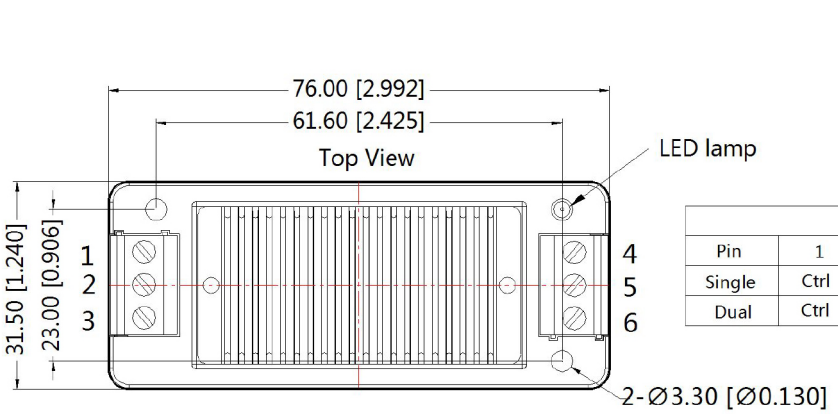


Pin-Out						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	-Vo	0V	+Vo
Single	Ctrl	GND	Vin	0V	Trim	+Vo

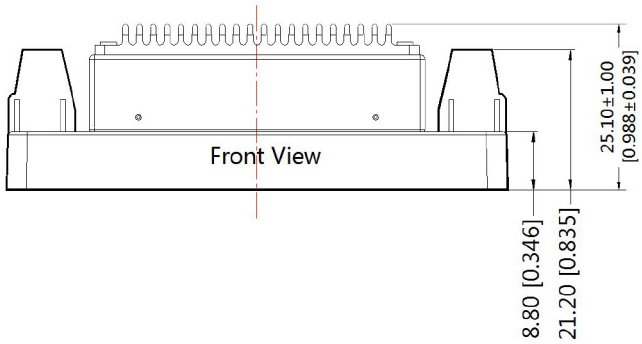


Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

Chassis mounting with heatsink (-CMHS)

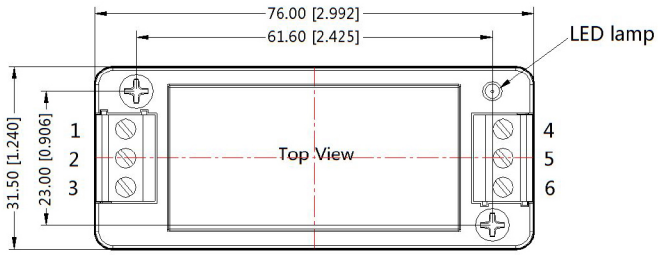


Pin-Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	Vin	0V	Trim	+Vo
Dual	Ctrl	GND	Vin	-Vo	0V	+Vo

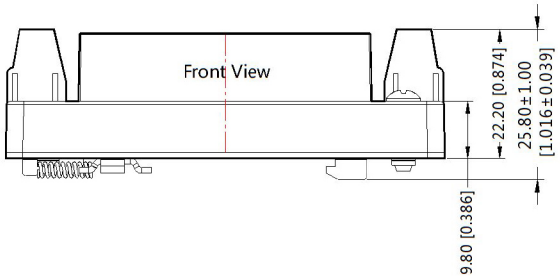


Note:
Unit:mm[inch]
Wire range:24~12 AWG
General tolerances:±0.50[±0.020]

DIN rail mounting (-DR)

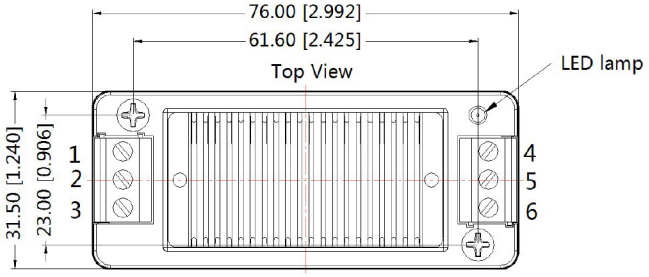


Pin-Out						
Pin	1	2	3	4	5	6
Dual	Ctrl	GND	Vin	-Vo	0V	+Vo
Single	Ctrl	GND	Vin	0V	Trim	+Vo

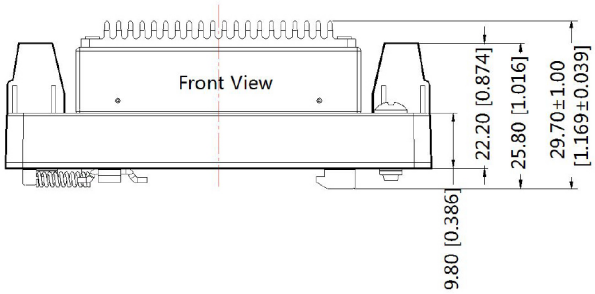


Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

DIN rail mounting with heatsink (-DRHS)



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



Note:
Unit:mm[inch]
Wire range:24~12 AWG
General tolerances:±0.50[±0.020]