FEATURES

1. Ultra-wide 4:1 input voltage range
2. Reinforced I/O isolation test voltage 2.25k VDC
3. Operating ambient temperature range -40℃ to +85℃
4. Input under-voltage protection, output short circuit, over-current, over–voltage protection
5. Low output ripple & noise
6. Designed to meet IEC60950/UL60950 safety standards
7. Input Reverse Polarity Protection available with Chassis (A2S) or 35mm DIN-Rail mounting (A4S) version
8. Industry standard pin-out
9. Suitingelectronicequipmentandrailwayvehicleapplicationsusing72V, 96Vand110Vbateryvoltages.

RoHS CE 3 years Warranty

Selection Guide

Part No.①	Input Voltage (VDC)		Output		Full Load Efficiency③(%) Typ.	Max. Capacitive Load(μF)
	Nominal (Range)	Max.②	Voltage (VDC)	Current(mA) Max./Min.		
ATB1D03LD-20WR3	110 (40-160)	170	3.3	5000/0	82	10000
ATB1D05LD-20WR3			5	4000/0	85	10000
ATB1D12LD-20WR3			12	1667/0	86	1600
ATB1D15LD-20WR3			15	1333/0	86	1000
ATB1D24LD-20WR3			24	833/0	87	470

Note:
① Use "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;
② Absolute maximum stress rating without damage (not recommended);
③ Efficiency is measured 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.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal input voltage	3.3V output	–	183/10	188/20	mA
		5V output	–	214/10	219/20	
		Others	–	212/3	217/8	
Reflected Ripple Current	Nominal input voltage		–	25	–	
Surge Voltage (1sec. max.)			-0.7	–	180	VDC
Start-up Voltage	100% load		–	–	40	
Shut-down Voltage			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		–	2	7	mA

Note: *The Ctrl pin voltage is referenced to input GND.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
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		3.3V/5V output	–	±3	±8	%
		Others	–	±3	±5	
Temperature Coefficient	Full load		–	±0.02	±0.03	%/°C
Ripple & Noise *	20MHz bandwidth, 5% -100% load		–	50	100	mV p-p
Trim			90	–	110	%Vo
Over-voltage Protection	Input voltage range		110	–	--	
Over-current Protection			120	–	--	%Io
Short-circuit Protection			Continuous, self-recovery			

Note: *Ripple & Noise at < 5% load is 5%Vo max. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Note 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	–	2200	–	pF
Operating Temperature	See Fig. 1	-40	–	+85	°C
Storage Temperature		-55	–	+125	
Storage Humidity	Non-condensing	5	–	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	–	–	300	°C
Switching Frequency*	PWM mode	–	300	–	KHz
Vibration		IEC61373 - Category 1, Grade B			
MTBF	MIL-HDBK-217F@25°C	1000	–	–	K hours

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

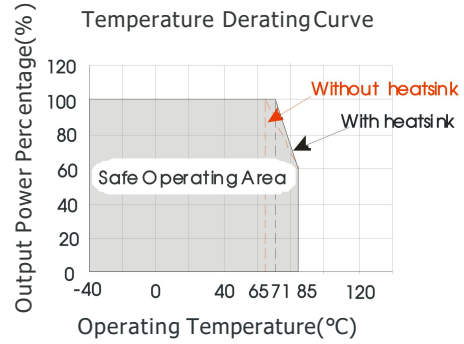
Mechanical Specifications

Case Material	Aluminum alloy		
Dimensions	Without heat sink	Horizontal package	50.80 ×25.40 ×11.80mm
		A2S chassis mounting	76.00 ×31.50 ×21.20mm
		A4S Din-rail mounting	76.00 ×31.50 ×25.80mm
	With heat sink	Horizontal package	51.40 ×26.20 ×16.50mm
		A2S chassis mounting	76.00 ×31.50 ×25.30mm
		A4S Din-rail mounting	76.00 ×31.50 ×29.90mm
Weight	Without heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	41.0g/48.0g/68.0g(Typ.)
	With heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	49.0g/56.0g/76.0g(Typ.)
Cooling Method	Free air convection		

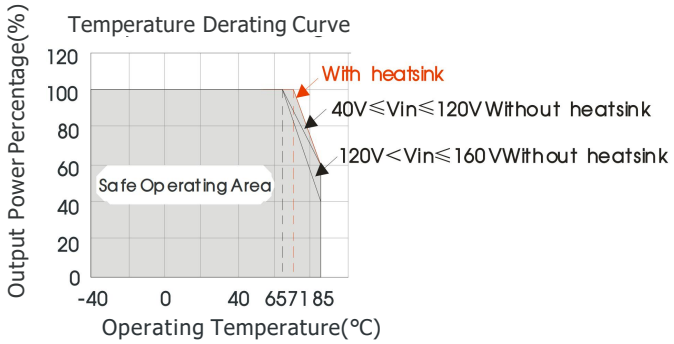
EMC Specifications

Emissions	CE	CISPR32/EN55032	CLASS A (without external components)/CLASS B (see Fig. 3-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A (without external components)/CLASS B (see Fig. 3-② 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.3 or Fig.4-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2KV (2Ω0.5uF see Fig.3 for recommended circuit) line to ground ±4KV (12Ω0.5uF see Fig.3 for recommended circuit)	perf. Criteria B
		EN50121-3-2	line to line ±1KV (42Ω 0.5uF see Fig.4-① for recommended circuit) line to ground ±2KV (42Ω0.5uF see Fig.4-①for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

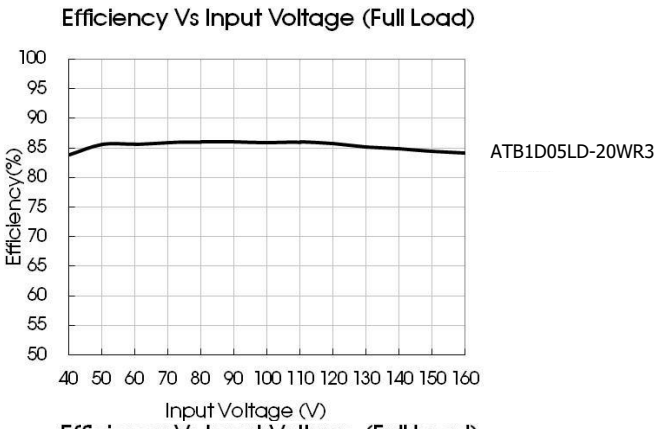
Typical Characteristic Curves

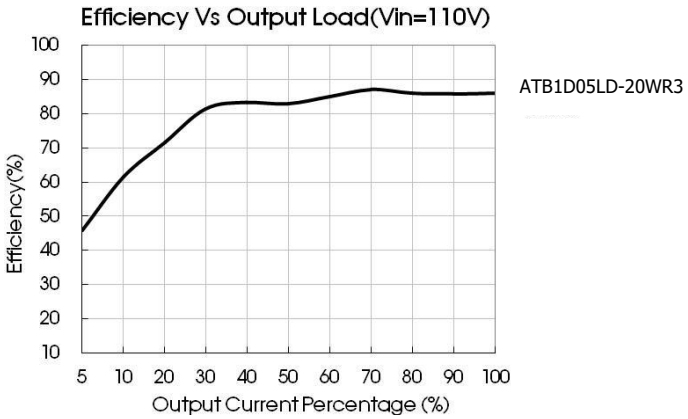


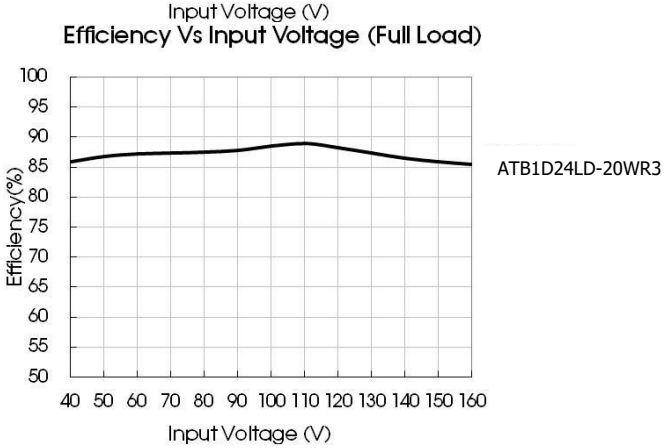
Operating Temperature, Except ATB1D12/15/24LD-20W(H)R3(A2S/A4S)

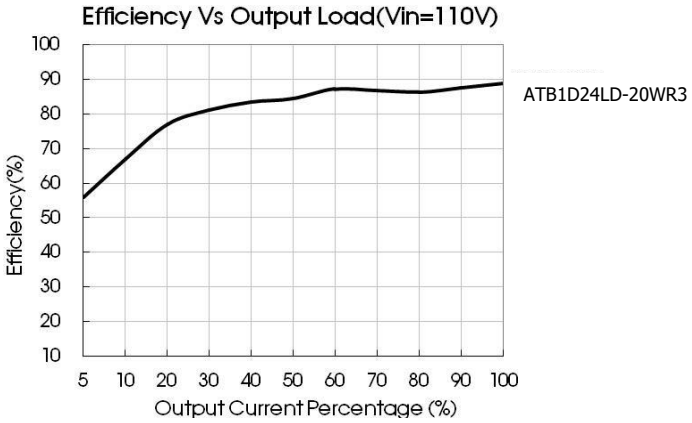


ATB1D03LD-20W(H)R3(A2S/A4S) Operating Temperature









Design Reference

1. Typical application

All 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 max. capacitive load value of the product.

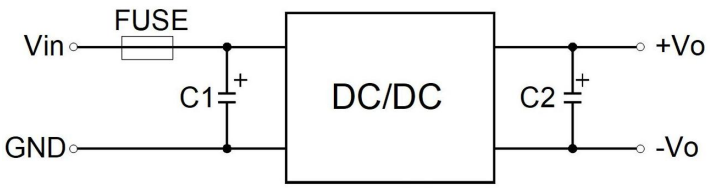


Fig. 2

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

2. EMC compliance circuit

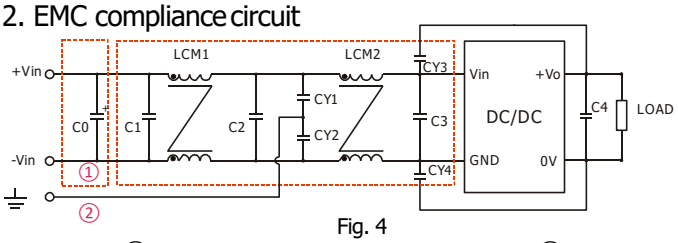


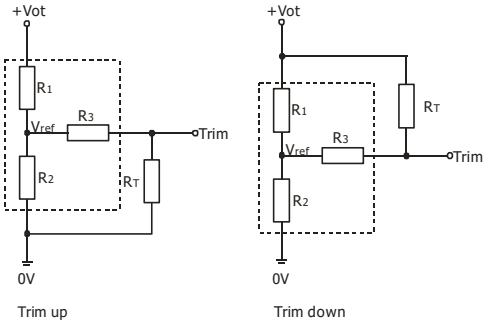
Fig. 4

Notes: Part ①in the Fig. 4 is used for EMS test and part ②for EMI test

Fig.4 List of components:

Output voltage	3.3V	5V	12V	15V	24V
C0	100μF/200V				
C1、C2	0.22μF/250V				
C3	47μF/200V				
LCM1、LCM2	15mH (UU common mode inductance)				
CY1、CY2、CY3、CY4	1000pF/400VAC				
C4	470μF/16V		220μF/25V		100μF/35V

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

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

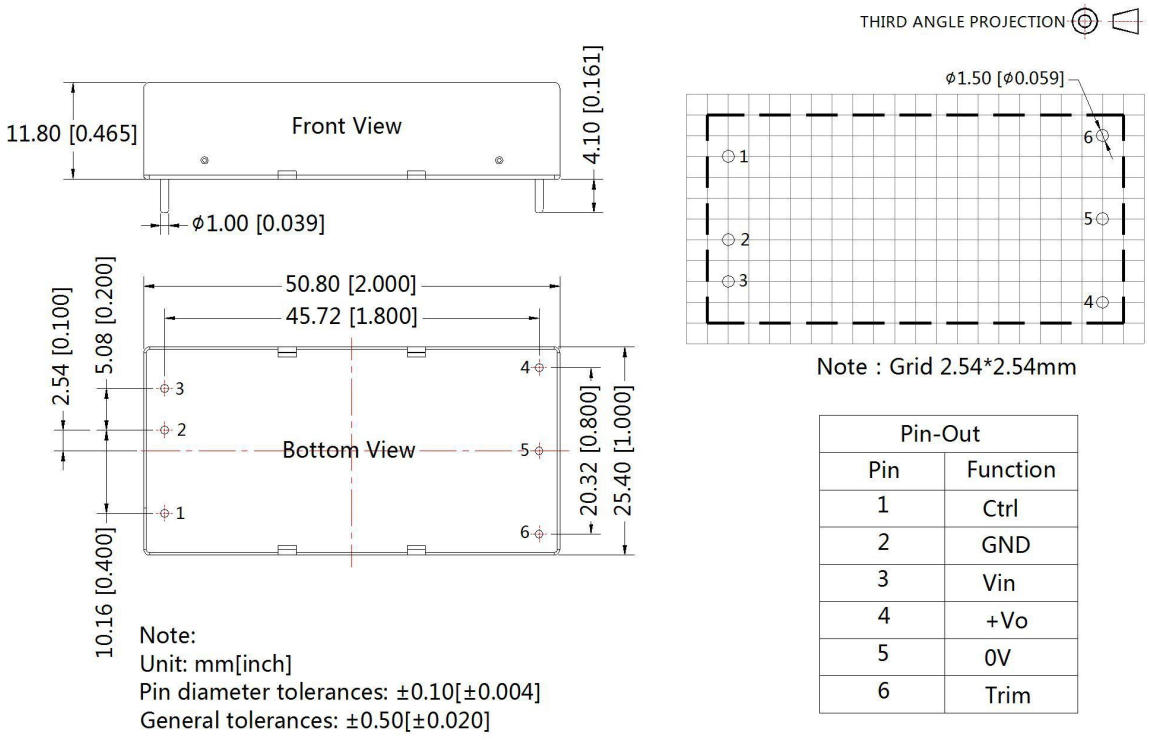
$$down:\ R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vo' - Vref}{Vref} \cdot R_2$$

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	4.801	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

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

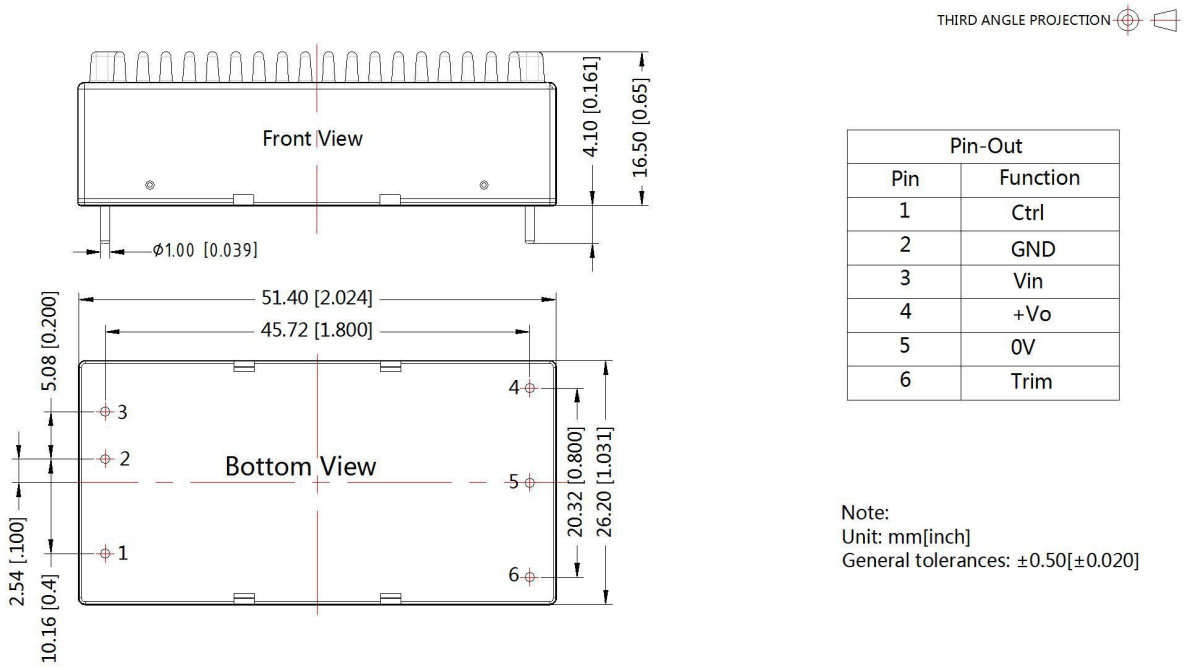
Horizontal Package (without heat sink) Dimensions and Recommended Layout



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

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

Horizontal Package (with heat sink) Dimensions

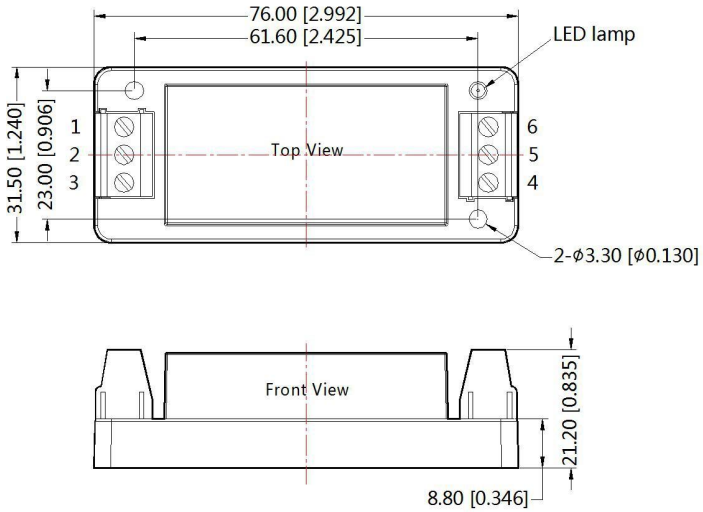


Pin-Out	
Pin	Function
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

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

ATB1D_LD-20WR3A2S (without heatsink) Dimensions

THIRD ANGLE PROJECTION

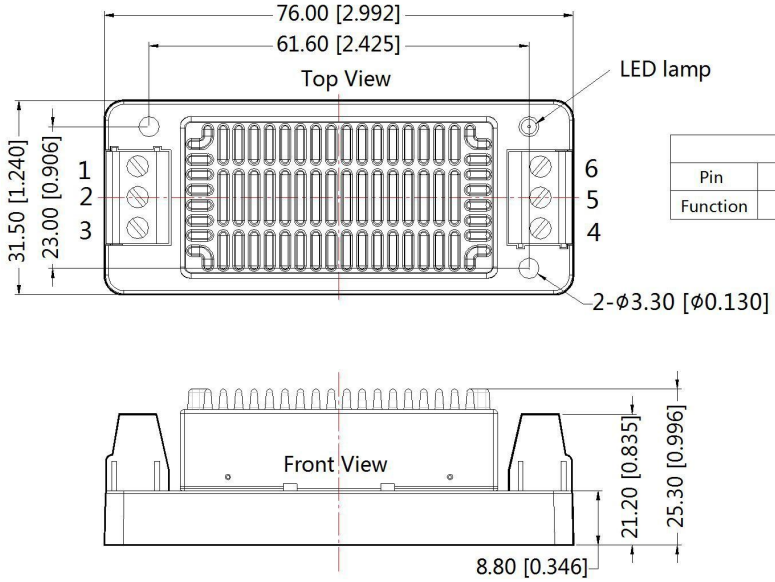


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim

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

ATB1D_LD-20WHR3A2S (with heatsink) Dimensions

THIRD ANGLE PROJECTION

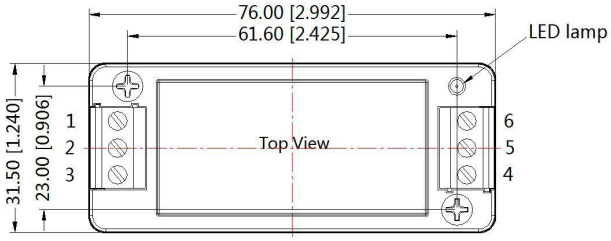


Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim

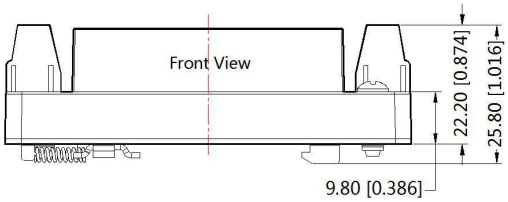
Note:
Unit: mm[inch]
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.039]

ATB1D_LD-20WR3A4S (without heatsink) Dimensions

THIRD ANGLE PROJECTION



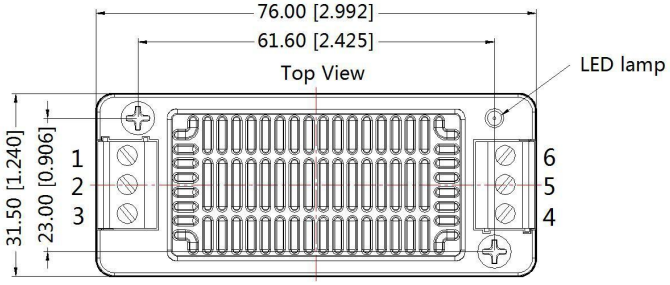
Pin-Out						
Pin	1	2	3	4	5	6
Function	Ctrl	GND	Vin	+Vo	0V	Trim



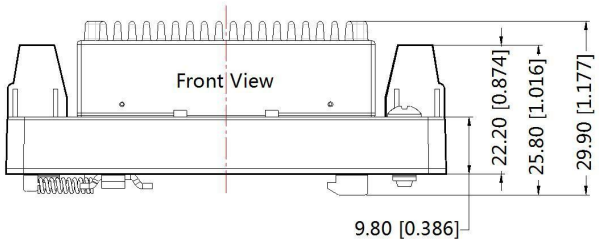
Note:
Unit: mm[inch]
Mounting rail: TS35
Wire range: 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ±1.00[±0.039]

ATB1D_LD-20WHR3A4S (with heatsink) 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. If the product works under the minimum required load, it cannot guarantee that the performance of the product complies with all the performance indicators in this manual;
2. The maximum capacitive load is tested under the input voltage range and full load condition;
3. Unless otherwise stated, all indexes in this manual are measured at Ta=25℃, humidity <75%RH, nominal input voltage and rated output load;
4. All index testing methods in this manual are based on the enterprise standards of the company;
5. Our company can provide product customization, specific needs can directly contact our technical staff;