

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°C to +85°C
4. Input under-voltage protection, output short circuit, over-current, over-voltage protection
5. Low output Ripple & Noise
6. CLSPR32/EN55032 CLASS A EMI compliant without external components
7. Input Reverse Polarity Protection available with Chassis (A2S) or 35mm DIN-Rail mounting (A4S) version
8. Industry standard pin-out



**3 years
Warranty**

Selection Guide

Part No. ②	Input Voltage (VDC)		Output		Full Load Efficiency④(%) Typ.	Capacitive Load(μF) Max.
	Nominal (Range)	Max.③	Voltage (VDC)	Current(mA) Max./Min.		
ATB1D03LMD-20WR3	110 (40-160)	170	3.3	5000/0	82	10000
ATB1D05LMD-20WR3			5	4000/0	84	10000
ATB1D12LMD-20WR3			12	1667/0	85	1600
ATB1D15LMD-20WR3			15	1333/0	86	1000
ATB1D24LMD-20WR3			24	833/0	86	470

Note:

② 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;

③ Absolute maximum stress rating without damage (not recommended);

④ 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)	ATB1D_LMD-20WR3 series, Nominal input voltage	3.3V output	–	183/10	188/20
		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	
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 *	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	25% load step change, nominal input voltage	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	
Over-voltage Protection	Input voltage range	110	–	--	%Vo
Over-current Protection		120	–	--	%Io
Short-circuit Protection		Continuous, self-recovery			

Note: *Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes 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	–	–	
	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 Temperature	Soldering spot is 1.5mm away from case for 10 seconds	–	–	300	°C
Switching Frequency *	PWM mode	–	300	–	kHz
Shock & Vibration test		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.

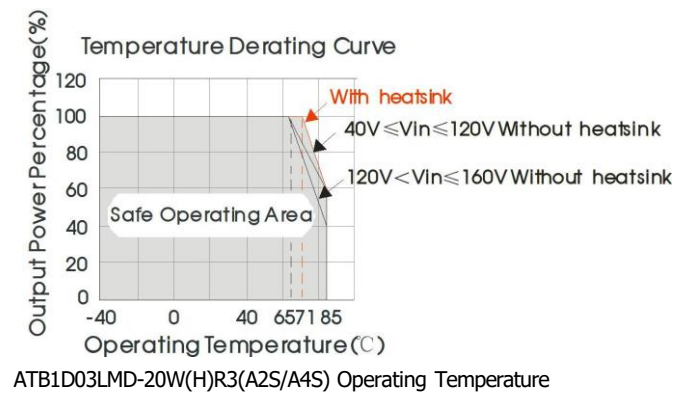
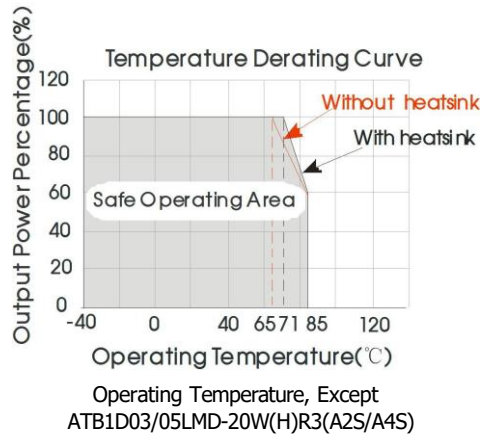
Mechanical Specifications

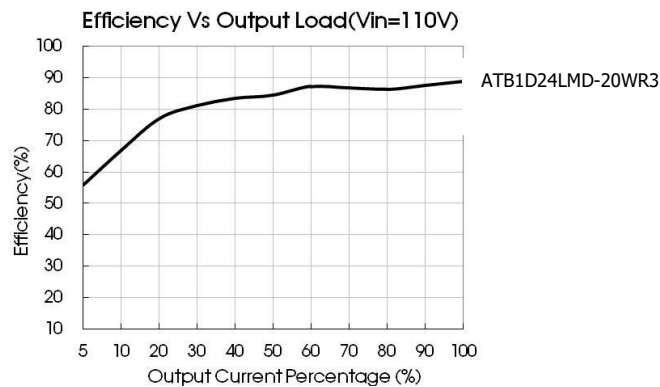
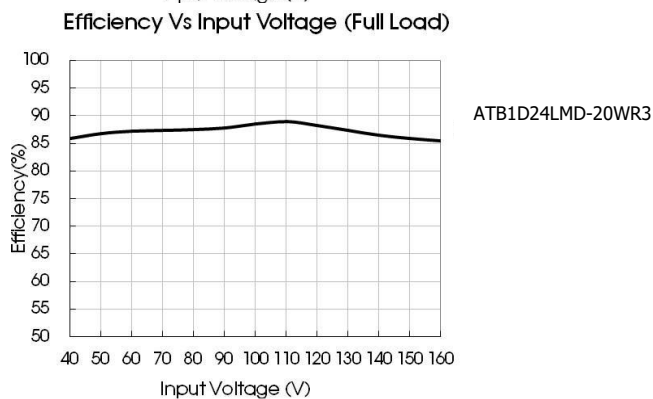
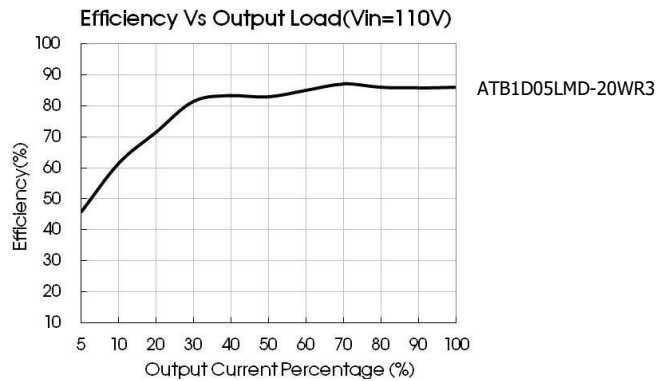
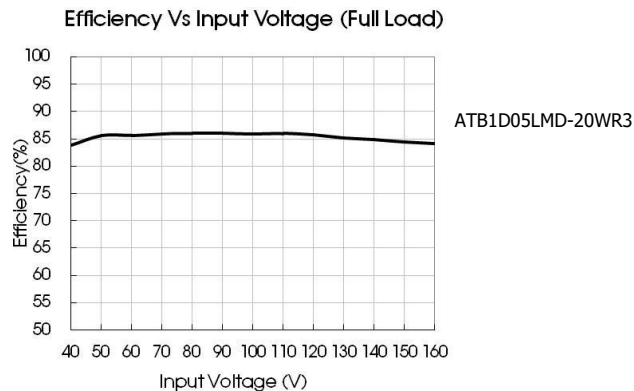
Case Material	Aluminum alloy		
Dimensions	Without heat sink	Horizontal package	50.80 × 25.40 × 11.80mm
		A2S chassis mounting	76.00 × 31.50 × 21.20 mm
		A4S Din-rail mounting	76.00 × 31.50 × 25.80 mm
Dimensions	With heat sink	Horizontal package	51.40 × 26.20 × 16.50mm
		A2S chassis mounting	76.00 × 31.50 × 25.30 mm
		A4S Din-rail mounting	76.00 × 31.50 × 29.90 mm
Weight	Without heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	
	With heat sink	Horizontal package/A2S chassis mounting/A4S Din-rail mounting	
Cooling Method	Free air convection		

EMC Specifications

Emissions	CE	CISPR32/EN55032	CLASS A(see Fig.3 for recommended circuit)/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.4 or Fig.3-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2kV (2Ω 18uF see Fig.3 for recommended circuit) line to ground ±4kV (12Ω 9uF see Fig.3 for recommended circuit)	perf. Criteria B
		EN50121-3-2	line to line ±1kV (42Ω 0.5uF see Fig.3-① for recommended circuit) line to ground ±2kV (42Ω 0.5uF see Fig.3-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf. Criteria A

Typical Characteristic Curve





Design Reference

1. Typical application

All the 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 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 max. capacitive load value of the product.

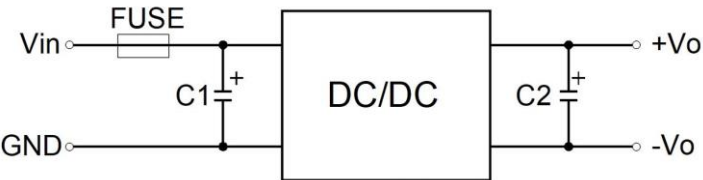


Fig. 2

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

2. EMC compliance circuit

Fig. 5 List of components:

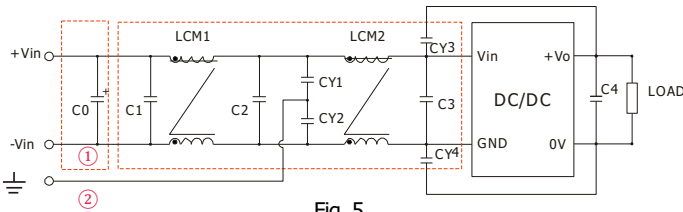
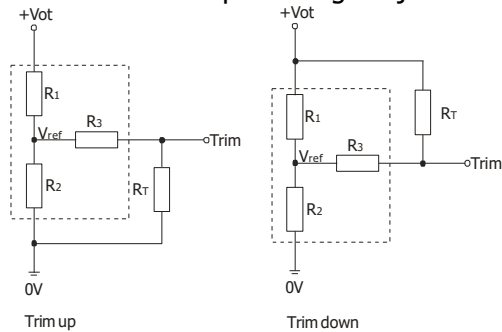


Fig. 5

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

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)



Calculating Trim resistor values:

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

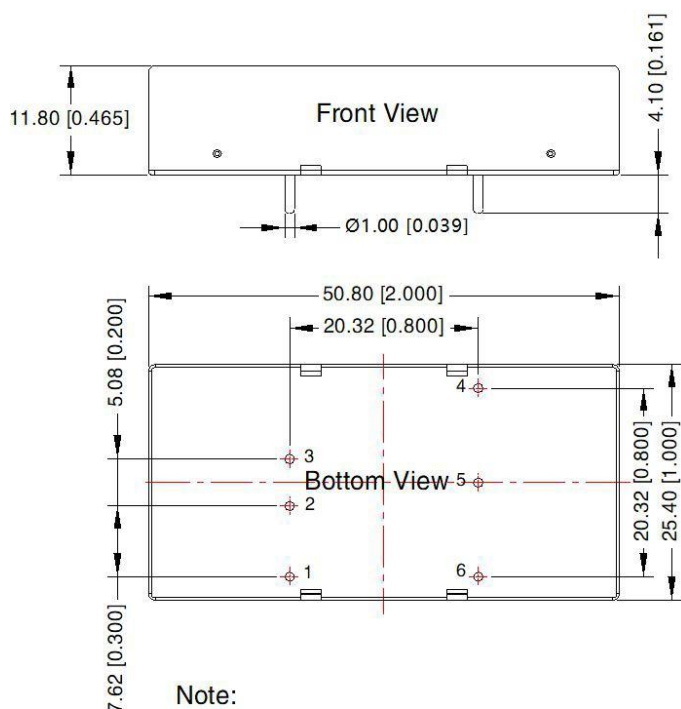
R_T = Trim Resistor value;
 a = self-defined parameter
 V_o' = desired output voltage

TRIM resistor connection (dashed line shows internal resistor network)

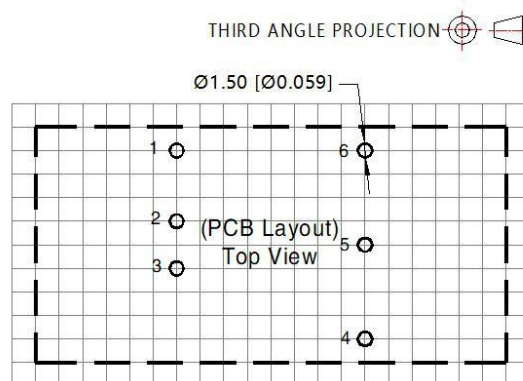
Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	10	6.064	13.622	1.24
5	2.4	2.344	13.622	2.5
12	8.2	2.153	17.346	2.5
15	12	2.388	21.016	2.5
24	10	1.158	10.714	2.5

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

Horizontal Package (without heat sink) Dimensions and Recommended Layout



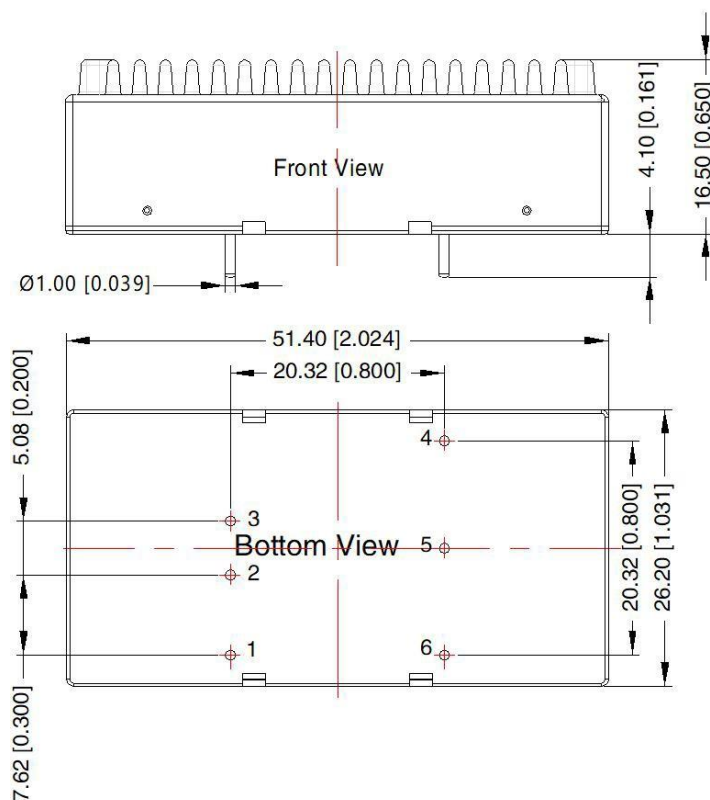
Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10 [± 0.004]
General tolerances: ± 0.50 [± 0.020]



Note: Grid 2.54*2.54mm

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

Horizontal Package (with heatsink) Dimensions

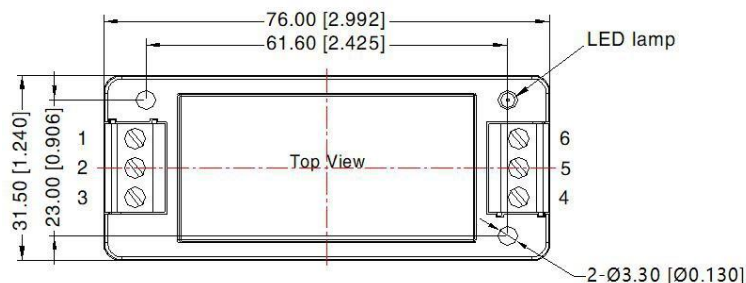


Note:
Unit: mm[inch]
General tolerances: ± 0.50 [± 0.020]

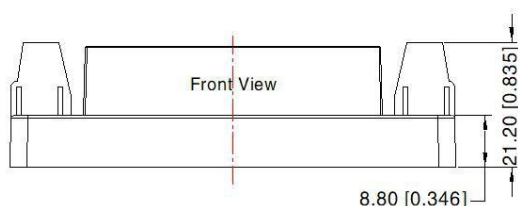
Pin-Out	
Pin	Mark
1	Ctrl
2	GND
3	Vin
4	+Vo
5	Trim
6	0V

ATB1D_LMD-20WR3A2S (without heatsink) Dimensions

THIRD ANGLE PROJECTION



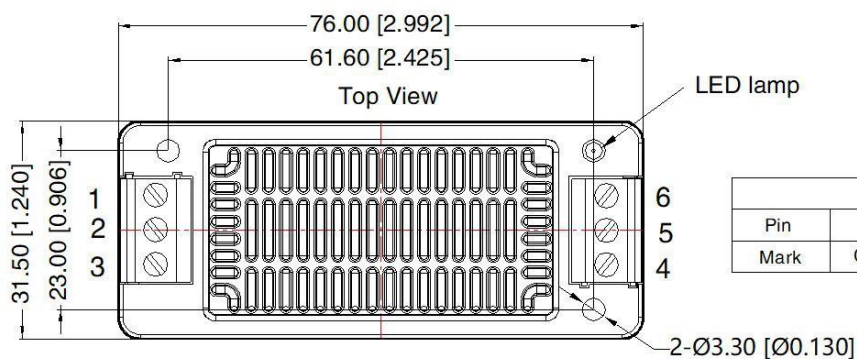
Pin-Out						
Pin	1	2	3	4	5	6
Mark	Ctrl	GND	Vin	+Vo	Trim	0V



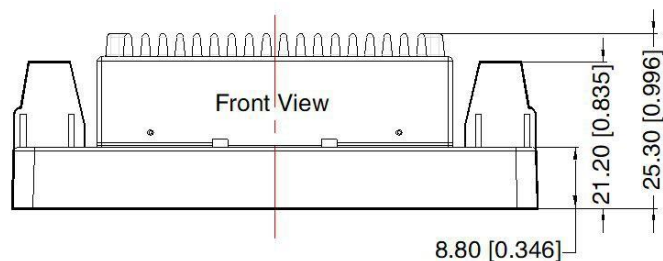
Note:
 Unit: mm[inch]
 Wire range: 24–12 AWG
 Tightening torque: Max 0.4 N·m
 General tolerances: $\pm 1.00 [\pm 0.039]$

ATB1D_LMD-20WHR3A2S (with heatsink) Dimensions

THIRD ANGLE PROJECTION



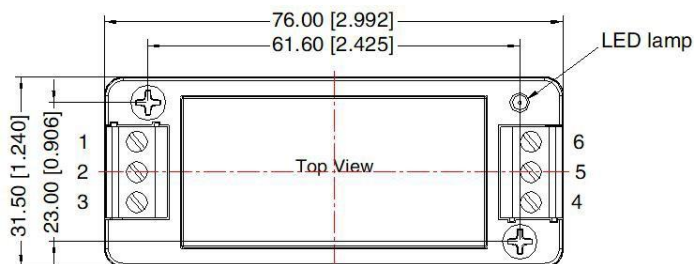
Pin-Out						
Pin	1	2	3	4	5	6
Mark	Ctrl	GND	Vin	+Vo	Trim	0V



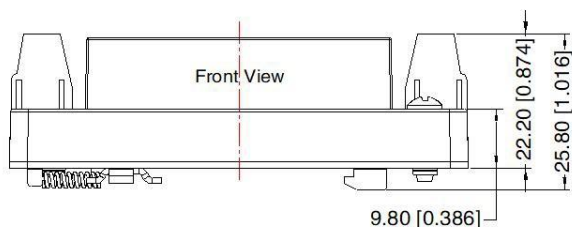
Note:
 Unit: mm[inch]
 Wire range: 24–12 AWG
 Tightening torque: Max 0.4 N·m
 General tolerances: $\pm 1.00 [\pm 0.039]$

ATB1D_LMD-20WR3A4S (without heatsink) Dimensions

THIRD ANGLE PROJECTION



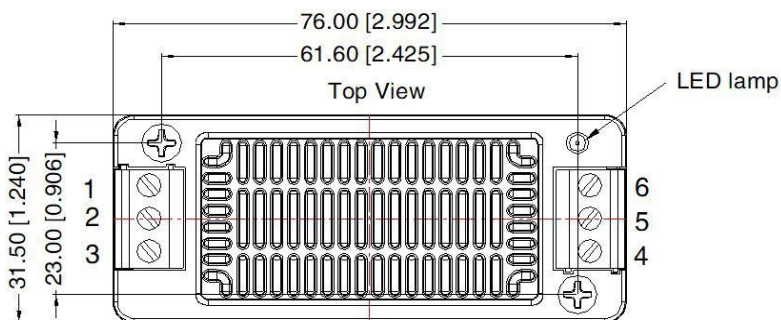
Pin-Out						
Pin	1	2	3	4	5	6
Mark	Ctrl	GND	Vin	+Vo	Trim	0V



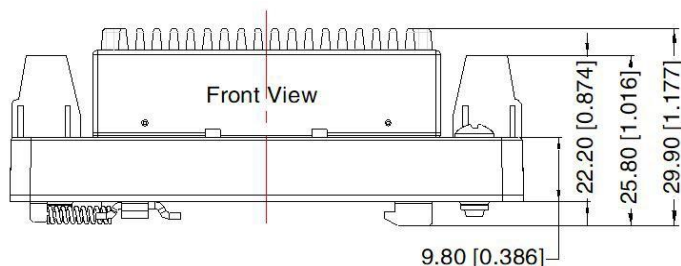
Note:
 Unit: mm[inch]
 Mounting rail: TS35
 Wire range: 24-1
 Tightening torque: Max 0.4 N·m
 General tolerances: $\pm 1.00 [\pm 0.039]$

ATB1D_LMD-20WHR3A4S (with heatsink) 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: $\pm 1.00 [\pm 0.039]$

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 $T_a=25^{\circ}\text{C}$, humidity $<75\%\text{RH}$, 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;