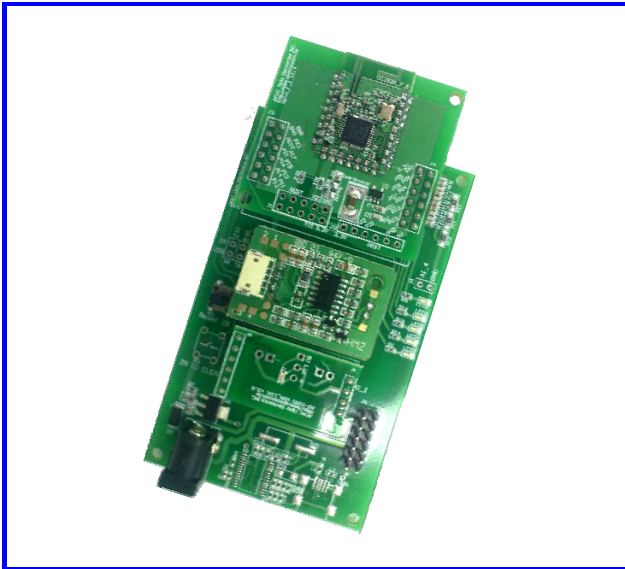


AO-1505-THM ZigBee Temperature and Humidity Sensor



Features

- Reliable wireless transceiver module.
- Compatible with Peer to Peer, Star, Tree, or Mesh network configurations.
- AO-1501 with on board PCB ANT with 150M range (LOS).
- AO-1501A with external Antenna.
- -97dBm sensitivity at the receiver.
- The sensor module is linear DC output

Applications

- Wireless sensor network (WSN).
- RF remote control for temperature and humidity detection.
- Home and building automation.
- Industrial control and surveillance.

Description

AO-1505-TMH ZigBee temperature and humidity sensor, which uses the latest TI CC2530 ZigBee chip, is designed for smart home and smart building applications. This sensor integrated high efficiency RF transceiver module, temperature/humidity module, and other functional elements to control with various peripheral devices. The sensor and integrated circuit to provide a linear DC voltage for 1-60°C TEMP and 0-100%RH to enable easy user application

Ordering Information

PART NUMBER	INPUT/OUTPUT	SIGNAL DETECT	VOLTAGE	TEMPERATURE
AO-1505-TMH	DC 5V/DC 3.3V	TTL	3.3V	-30°C to 80°C

Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Storage Temperature	T_S	-40	85	°C	
Supply Voltage	V_{CC}	-0.3	7	V	
Input Voltage	V_{IN}	2	5	V	
Operating Current	I_{OP}	---	40	mA	
Input RF level	RF_L	---	10	dBm	



AO-1505-THM

ZigBee Temperature and Humidity Sensor

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNITS	NOTE
Operating ambient temperature range	T_A	-30	80	°C	
Supply Voltage	V_{cc}	1.8	5.5	V	
Storage Temperature Condition	T_C	10	40	°C	
Storage Humidity Condition[1]	H_C	---	90	RH	or Less

[1] Do not store humidity sensors long period of time in an 70°C ambient, due to some occasion of degradation on sensor housing case.

ZigBee Module Electrical Characteristics

PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNITS	NOTE
I_{core} Core current consumption	PM0 DC Current	---	5.0	8.9	mA	
	PM1 DC Current	---	0.2	0.3	mA	
	PM2 DC Current	---	0.3	1	uA	
	32-MHz XOSC running, radio in RX mode at -100-dBm input power, no peripherals active, CPU idle	---	24.1	29.6	mA	
	32-MHz XOSC running, radio in TX mode, 4.5-dBm output power, no peripherals active, CPU idle	---	35.4	39.6	mA	
Peripheral Current Consumption						
ADC	When converting	---	1.2	---	mA	
Flash	Erase	---	1	---	mA	
	Burst write peak current	---	6	---	mA	
Radio Part						
RF frequency range	Programmable in 1-MHz steps, 5 MHz between channels	2394	---	2507	MHz	
Radio baud rate	As defined by [1]	---	250	---	kbps	
Radio chip rate	As defined by [1]	---	2	---	MChip/s	
Wireless Distance		---	---	150	m	
Communication Interface Part						
UART Baud Rate		4800	9600	115200	bps	

[1] AO-1503 reference design is suitable for systems targeting compliance with EN 300 328, EN 300 440, FCC CFR47 Part 15



AO-1505-THM

ZigBee Temperature and Humidity Sensor

and ARIB STD-T-66.

RF Transmitter Electrical Characteristics

$V_{IN} = 3.0\text{ V to }3.6\text{ V}$, $T_C = -40\text{ }^\circ\text{C to }85\text{ }^\circ\text{C}$, $f_c = 2394\text{ MHz to }2507\text{ MHz}$

PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNITS	NOTE
Nominal output power	Delivered to a single-ended 50- Ω load through a balun using maximum-recommended output-power setting requires minimum -3 dBm	0	4.5	8	dBm	
Programmable output power 32 dB range	When converting	---	32	---	dB	
Optimum load impedance			69 + j29		Ω	

RF Receiver Electrical Characteristics

$V_{IN} = 3.0\text{ V to }3.6\text{ V}$, $T_C = -40\text{ }^\circ\text{C to }85\text{ }^\circ\text{C}$, $f_c = 2394\text{ MHz to }2507\text{ MHz}$

PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNITS	NOTE
Receiver sensitivity	PER = 1%	---	-97	-92	dBm	
Saturation (maximum input level)	PER = 1%	---	---	10	dBm	
Frequency error tolerance	requires minimum 80 ppm		± 150		ppm	
Symbol rate error tolerance	requires minimum 80 ppm		± 1000		ppm	

Debug Interface Characteristics

TA = -40°C to 85°C, VDD = 2 V to 3.6 V, unless otherwise noted.

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP.	MAX	UNITS	NOTE
Debug clock frequency	fclk_dbg		---	---	12	MHz	(see Figure 1)
Allowed high pulse on clock	t1		35	---	---	ns	(see Figure 1)
Allowed low pulse on clock	t2		35	---	---	ns	(see Figure 1)
EXT_RESET_N low to first falling edge on debug clock	t3		167	---	---	ns	(see Figure 2)
Falling edge on clock to EXT_RESET_N high	t4		83	---	---	ns	(see Figure 2)
EXT_RESET_N high to first debug command	t5		83	---	---	ns	(see Figure 2)
Debug data setup	t6		2	---	---	ns	(see Figure 3)
Debug data hold	t7		4	---	---	ns	(see Figure 3)
Clock-to-data delay	t8	Load = 10 pF	---	---	30	ns	(see Figure 3)

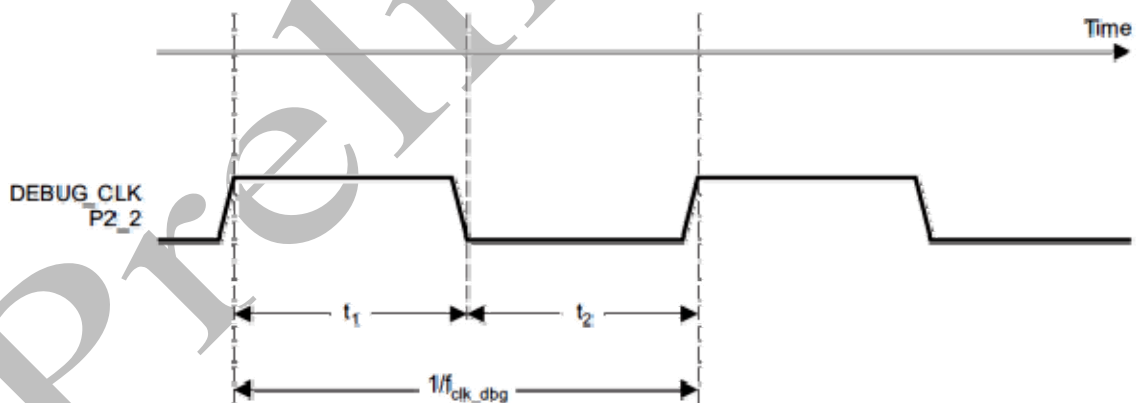


Figure 1 Debug Clock – Basic Timing

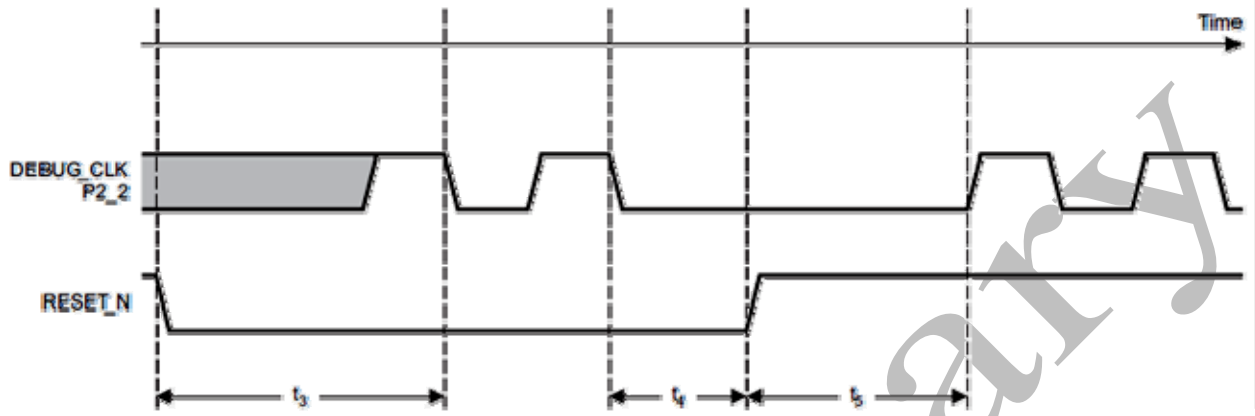


Figure 2 Data Setup and Hold Timing

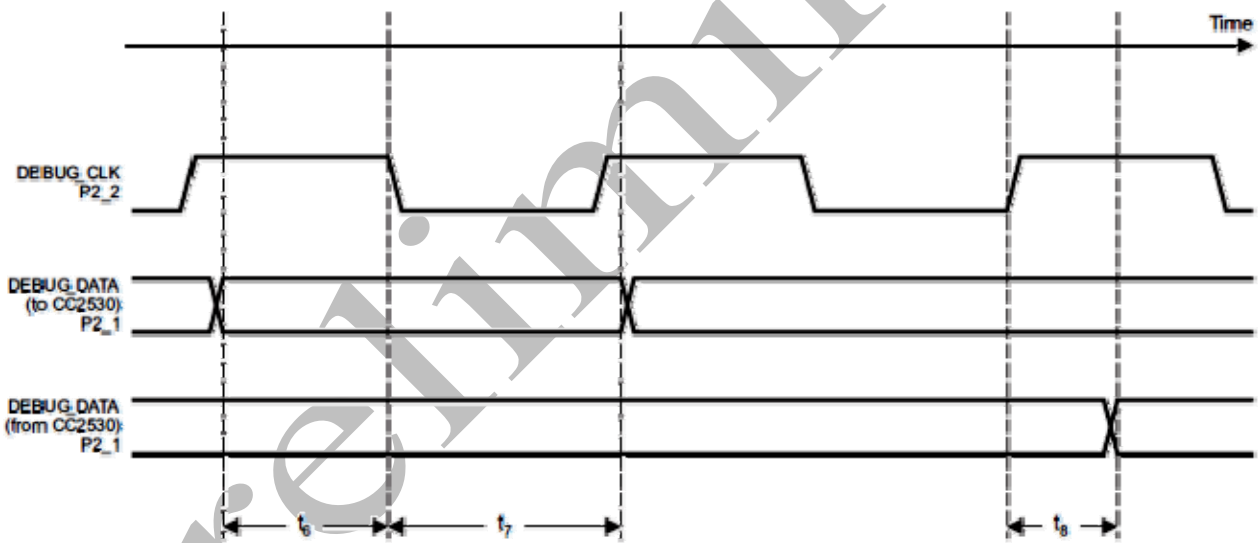


Figure 3 Debug Enable Timing



AO-1505-THM

ZigBee Temperature and Humidity Sensor

Sensor Module Characteristics

The sensor is the module with the 0~3.5V voltage output for humidity and temperature output 50KΩ(at 25 °C,)

PARAMETER	TEST CONDITIONS	MIN	TYP.	MAX	UNITS	NOTE
Input Voltage		---	---	5.0	V	
Humidity Output Voltage		0.0	---	3.5	V	
Temperature Output		---	50	---	KΩ	at 25°C
Terminal Connector (4Pin)						Pitch=1.5 mm
Accuracy		---	±5%	---	RH	
Output Range		10%	---	90%	RH	

Sensor Module Reliability Test

ITEM	METHOD	REQUIREMENT
Impact test	To drop Module 3time at random on to a hard wooden plate from 1meter above high.	No breakage, nor cracks. Should be electrically normal , Δ%RH < ±5%RH
Vibration test	Vibration test in X-Y-Z axis for 30min. under 10-55Hz frequency, 1.5mm (10-55-10Hz) amplitude.	No breakage, nor cracks. Should be electrically normal , Δ%RH < ±5%RH
Heat resistance	1000 hours@ 70°C	Δ%RH < ±5%RH
Cool resistance	1000 hours@ -30°C	Δ%RH < ±5%RH
Humidity resistance	1000 hours@ 60°C/ 90%RH.	Δ%RH < ±5%RH
Temperature cycle test	Repeat 100 cycles , Each cycle: 30 minutes@-30°C/30 inutes@85°C	Δ%RH < ±5%RH
Loading test	Room Temperature / Humidity , Input +5V for 1000hours.	Δ%RH < ±5%RH



AO-1505-THM ZigBee Temperature and Humidity Sensor

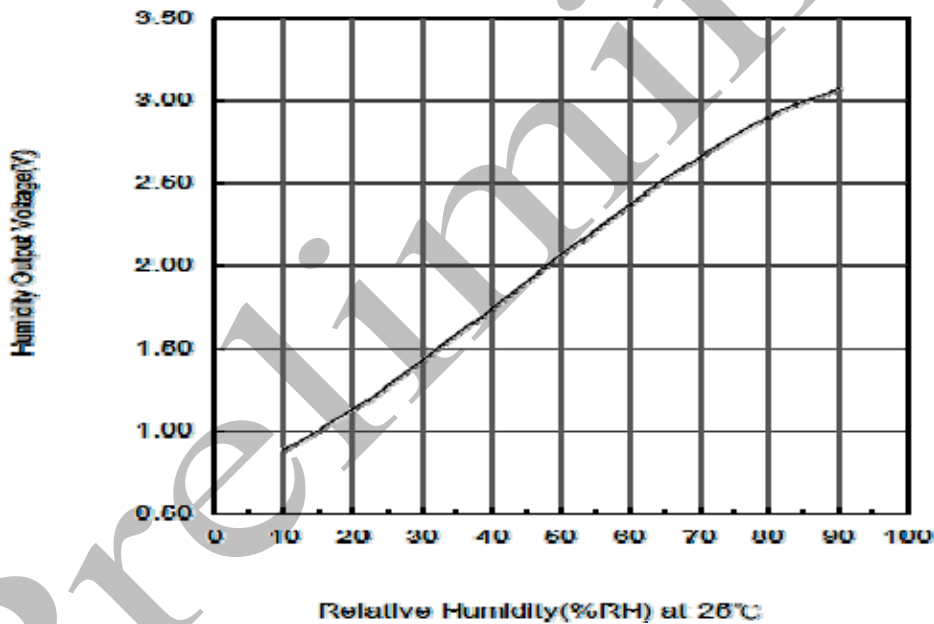
Temperature Output

- Using thermistor 503 $R(25^{\circ}\text{C})=50\text{K}\Omega\pm 1\%$,
- Signal(Reference): $B(25/85)=3950\text{K}\pm 1\%$
- Range:

Temperature($^{\circ}\text{C}$)	0	10	20	25	30	40	50	60
Resistance($\text{K}\Omega$)	160.56	98.714	62.328	50.0	40.356	26.756	18.138	12.554

Humidity Output

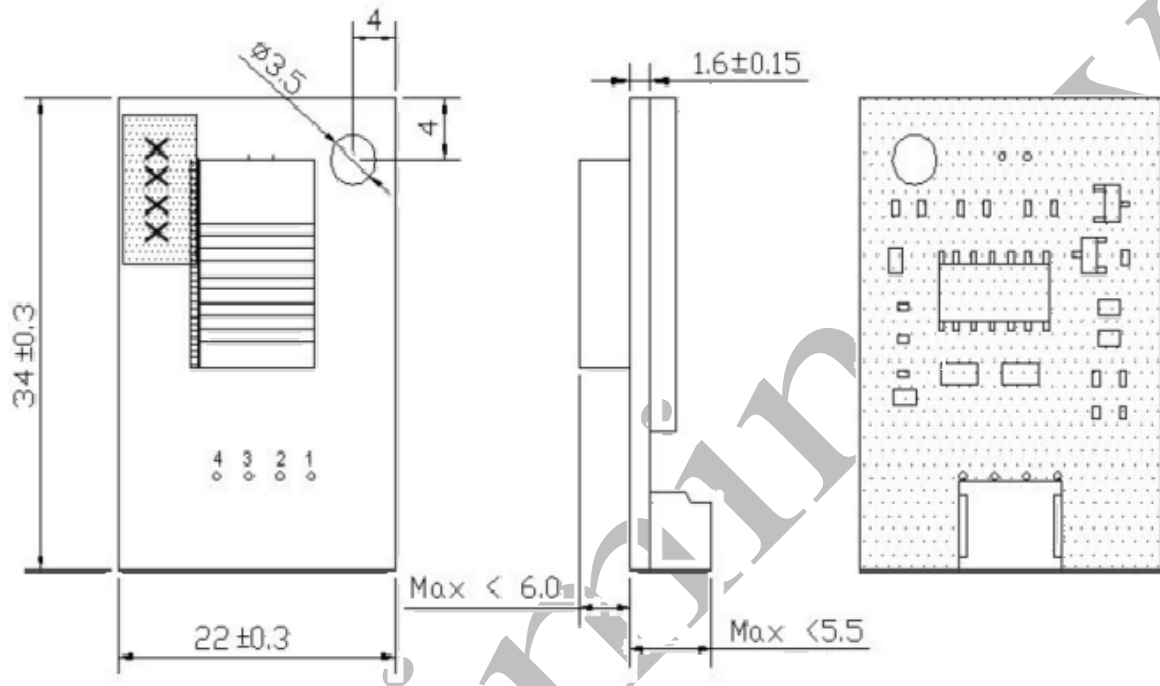
- 0~3.3V at 25°C , $V_{in}=5.00\text{VDC}$
- Signal(Reference) : Output Impedance approx: $5\text{K}\Omega$
- Humidity Output 0~3.5V characteristics



- Range:

Humidity(%RH)	10	20	30	40	50	60	70	80	90
Output Voltage(V)	0.88	1.13	1.42	1.74	2.06	2.37	2.66	2.90	3.07

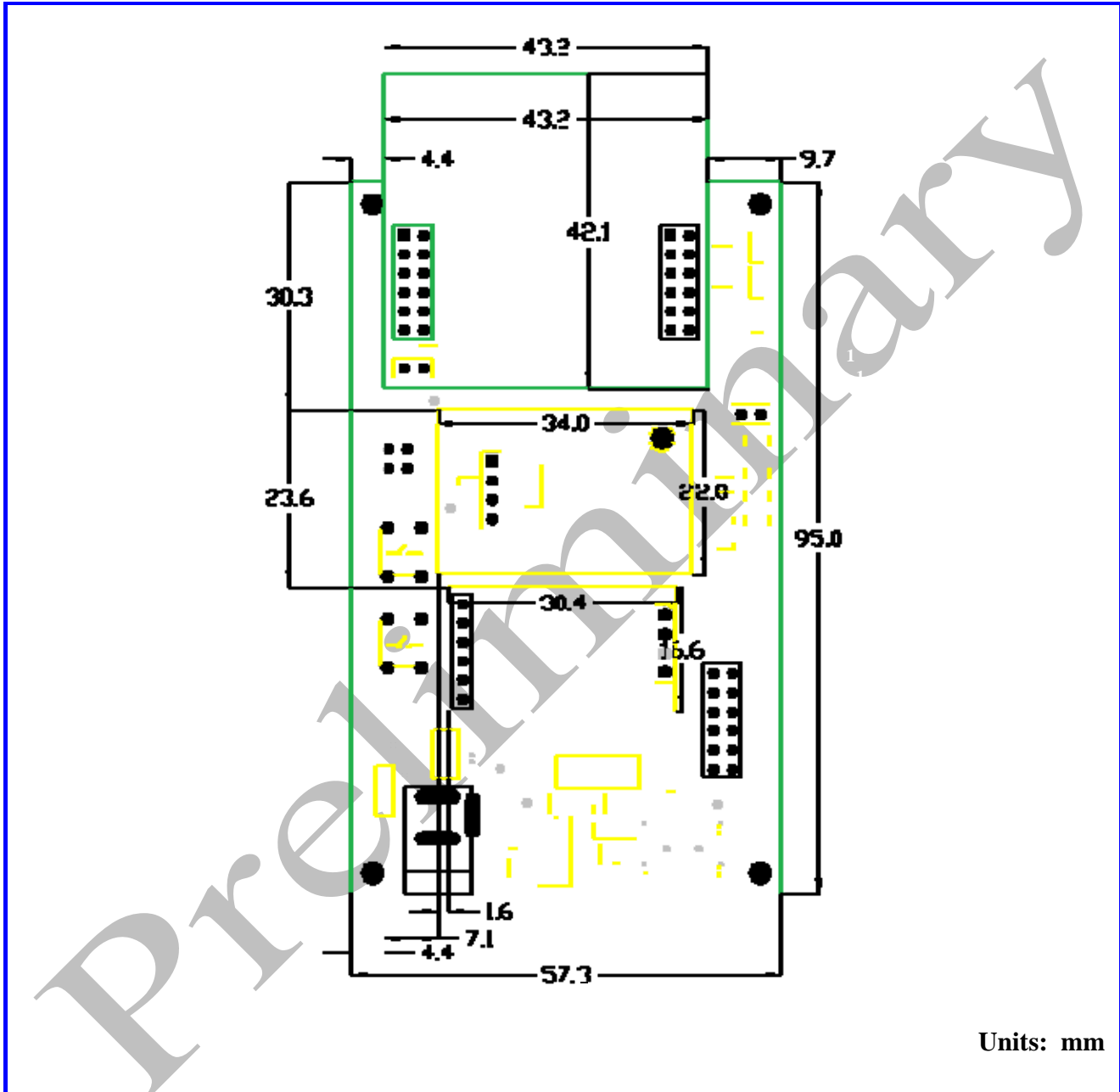
Sensor module Dimensions and Terminals



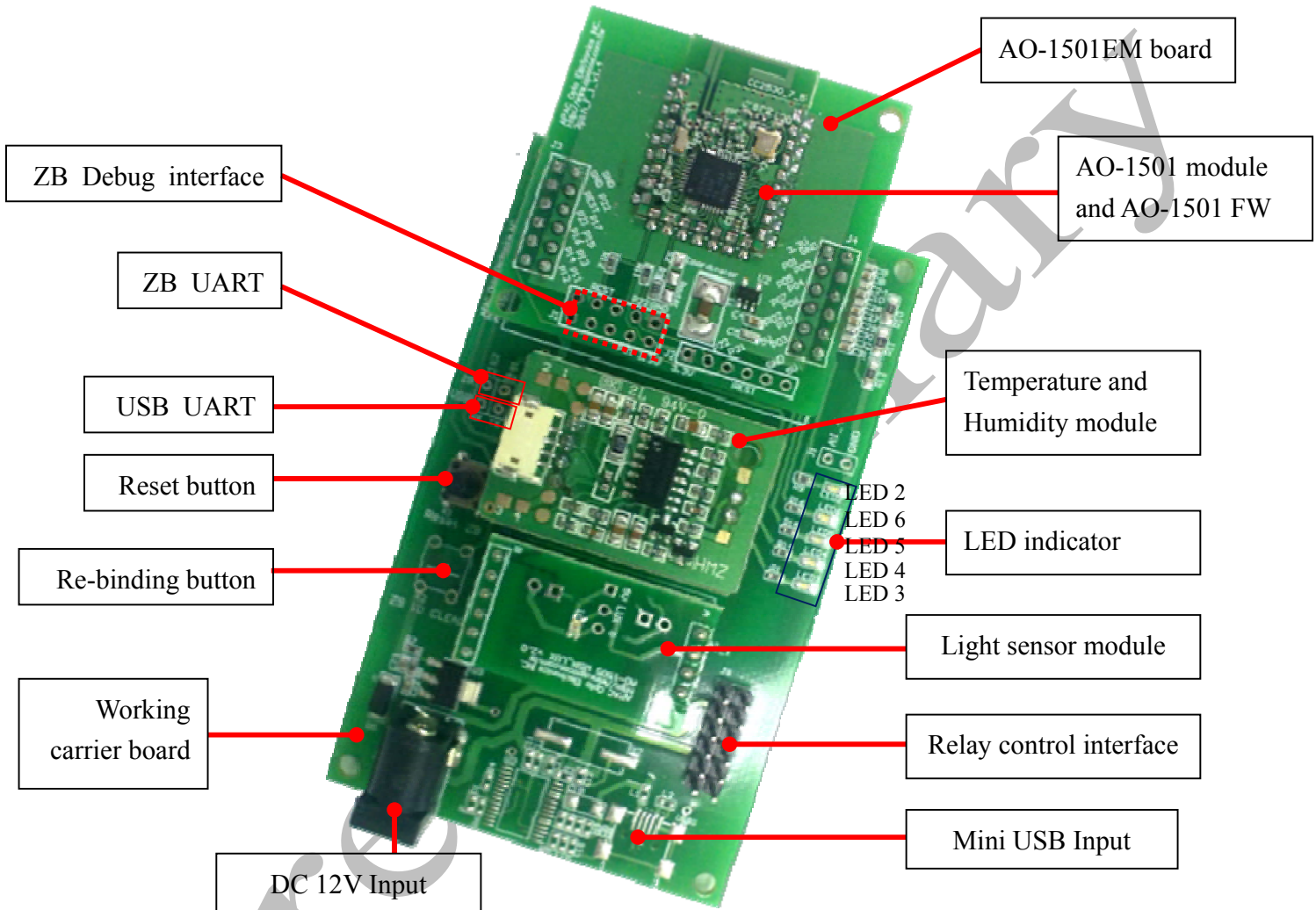
Units: mm

Terminal	Description
Pin 1	Power source 5V DC
Pin 2	Humidity Output
Pin 3	GND
Pin 4	Temperature output 50K Ω (at 25 $^{\circ}$ C)

Sensor board Dimensions



Sensor Board Peripherals:

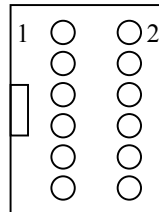


LED Indicator

Description

LED 2	ZigBee Network ready: LED ON
LED 6	Output 4 (1: LED ON; 0: LED OFF)
LED 5	Output 3 (1: LED ON; 0: LED OFF)
LED 4	Output 2 (1: LED ON; 0: LED OFF)
LED 3	Output 1 (1: LED ON; 0: LED OFF)

Relay Control Interface



PIN Terminals	Description
PIN 1	Relay +V _{CC}
PIN 2	Relay +V _{CC}
PIN 3	Relay +V _{CC}
PIN 4	Relay +V _{CC}
PIN 5	GND
PIN 6	IO_1 (output control)
PIN 7	GND
PIN 8	IO_2 (output control)
PIN 9	GND
PIN 10	IO_3 (output control)
PIN 11	GND
PIN 12	IO_4 (output control)