Product Specification

Bluetooth LE 5 Module
Model Name: AP-12SE

VERSION: 0.1

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1. INTRODUCTIONS AND SCOPE

AP-12SE is a Bluetooth low energy(BLE) and 2.4G private proprietary RF module. It uses Realtek Semiconductor controller RTL8762EMF, which is an ultra−low−power chipset.AP-12SE is designed for high−performance wearable, medical, industrial and consumer applications. The module integrates antenna and completed controller circuit, customer can easily apply it in product.

2. FEATURES

2.1 Bluetooth LE General

Bluetooth 5.2 Certified with LE 2Mbps Support

Build in Arm Cortex−M0+ Processor(Maximum 40MHz)

Bluetooth Transceiver

Transmitting Power: −20 to +7.5 dBm

RX Sensitivity -97dBm(BLE1M minimum)

Support Lower Voltage to 1.8V

104kByte SRAM and 8Mbit MCM flash

512kB Internal Flash Memory

Channel Selection #2

Support GAP, ATT/GATT, SMP, LCAP

Support AES128/192/256 Encrypt/ Decrypt Engine

Real Time Counter

Support LE Long Range

Additional Adv channel

Build in PCB Antenna

Support AT Command

Supports OTA

Support MESH

Max TX Power +7.5dBm

2.2 RF 2.4GHz General

Embedded GFSK RF Transceiver, Fully Compatible with Bluetooth Low Energy Wireless System

Frequency Band: 2348MHz~2530MHz, 1MHz step

Modulation: 1Mbps/2Mbps GFSK

Coding: Whitening, CRC

Configurable Packet Format

Role: Proprietary TX(PTX), Proprietary RX(PRX)

Modes: Oneshot/ Continuous PRX, Onshot/ Periodic/ GPIO Triggered PTX, Auto Acknowledge(ACK)

DMA Data Transfer

Power Spectrum Detection(PSD)

2.3 Peripheral Interface

Hardware Key Scan

Real Time Counters

4 wire SPI Master/ Slave

I2C x2

PWM x8

Timers x8

400Ksps, 12bits, 4channel AUXDAC

Embedded IR Transceiver

Embedded Proximity Sensor

3. MECHANICAL CHARACTERISTICS

3.1 Weight and Dimension

Weight: 0.8g

Dimension: 17.1mm x 11.15mm x 2.7(L x W x H, with metal cover)

3.2 Module Picture

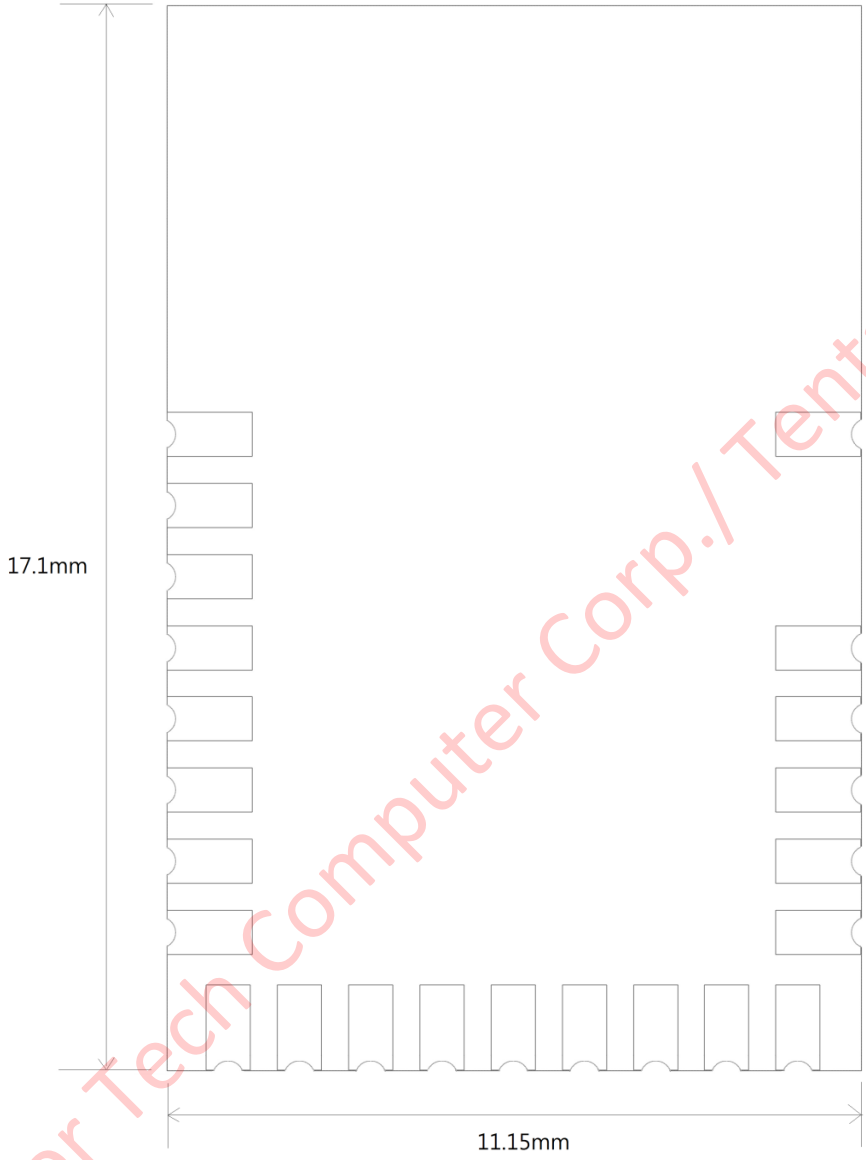
Reference picture below(without shielding cover):

Top Side

Bottom Side

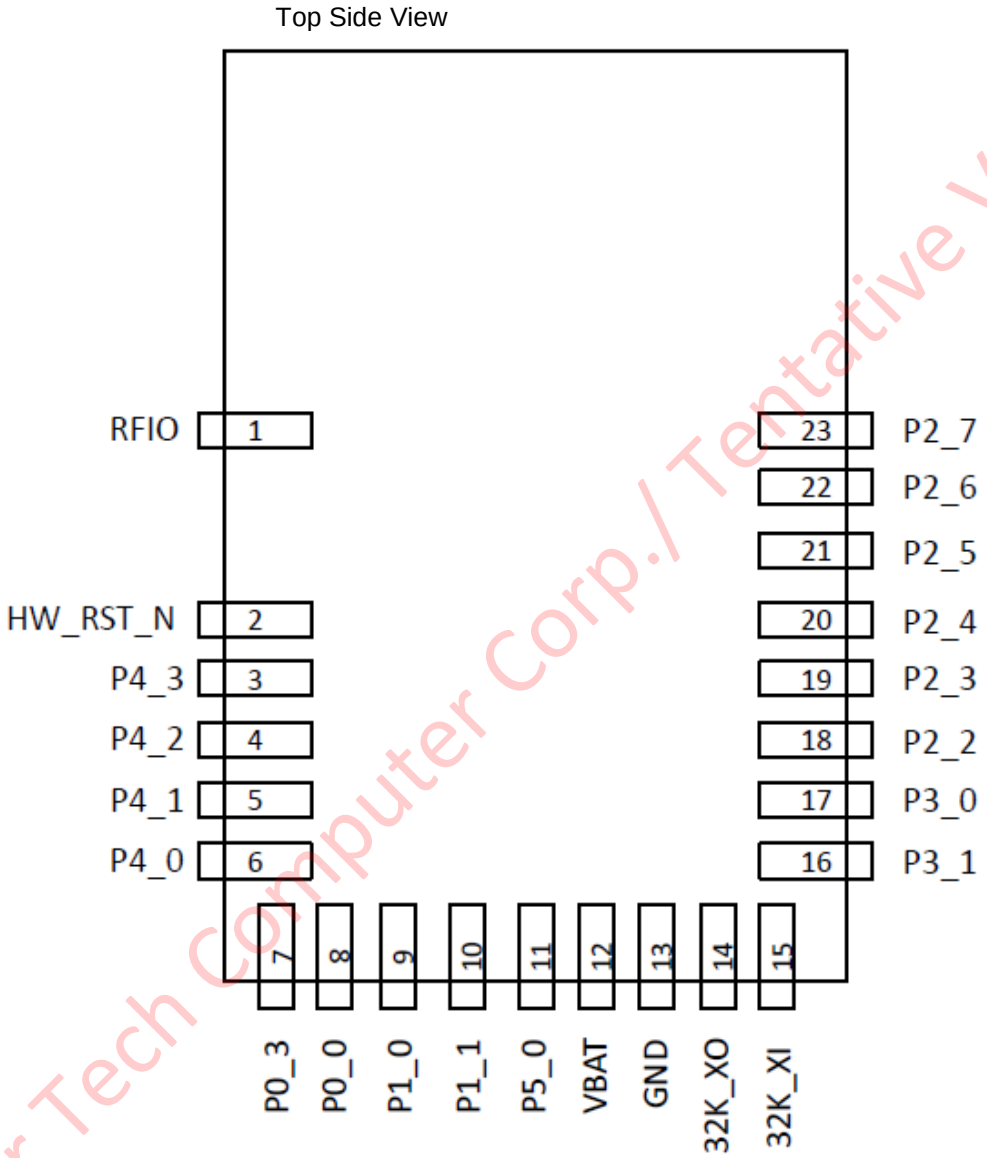
4. EXTERNAL DIMENSION

4.1 Outline Dimension of PCBA (Unit: mm)



5. PIN ASSIGNMENT AND DESCRIPTION

5.1 Pin Assignment



5.2 Pin Descriptions

Pin	Symbol	I/O	ADC	Pull	Description
1	RFIO	--	--	--	BT RX/BT TX interface
2	HW_RST_N	I	--	--	Hardware reset pin; low active
3	P4_3	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
4	P4_2	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
5	P4_1	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
6	P4_0	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
7	P0_3	IO	--	--	LOG_UART TX Power on trap: Pull-up for normal operation Pull-down to bypass executing program code in flash (PAD internal pull-up by default)
8	P0_0	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
9	P1_0	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
10	P1_1	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
11	P5_0	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down
12	VBAT	P	--	--	Battery voltage input DC1.8V~3.6V
13	GND				Ground
14	32K_XO	A/IO	--	--	32k crystal output or external 32k clock output(optional)
15	32K_XI	A/IO	--	--	32k crystal input or external 32k clock

					input(optional)
16	P3_1	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down HCI_UART_RX
17	P3_0	IO	--	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down HCI_UART_TX
18	P2_2	IO	ADC2	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down AUXADC input 2
19	P2_3	IO	ADC3	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down AUXADC input 3
20	P2_4	IO	ADC4	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down AUXADC input 4
21	P2_5	IO	ADC5	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down AUXADC input 5
22	P2_6	IO	ADC6	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down AUXADC input 6
23	P2_7	IO	ADC7	U/D	General purpose IO 8mA driving capacity with wakeup function with internal strong/ weak pull-up and pull-down AUXADC input 7

Legend:
Type: A = analog; D = digital; I = input; O = output; P = power
Pull(U/D) : U = pull up; D = pull down

6. ELECTRICAL CHARACTERISTICS

6.1 Voltage Specification

Symbol: VBAT
Power supply voltage range: 1.8~3.6V

6.2 Temperature Specification

Functional temperature range: -40°C ~ 105°C
Storage temperature range: -55°C~125°C

6.3 AUXDAC Characteristics

Resolution 12bits
DNL (Single-ended mode) +/-1.5 LSB
DNL (Differential mode) +/-3 LSB
INL (Single-ended mode) +/-1 LSB
INL (Differential mode) +/-2 LSB
Maximum input voltage: VBAT
Input Impedance(bypass mode): 1Mohm
Input Impedance(resister divider mode 1/4): 500kohm

6.4 Radio Characteristics

Frequency range 2402MHz~2480MHz
RX sensitivity -97dBm (PER <= 30.8%)
RX maximum input level -1dBm (PER <= 30.8%)
TX maximum output power 8dBm

6.5 GPIO Characteristics

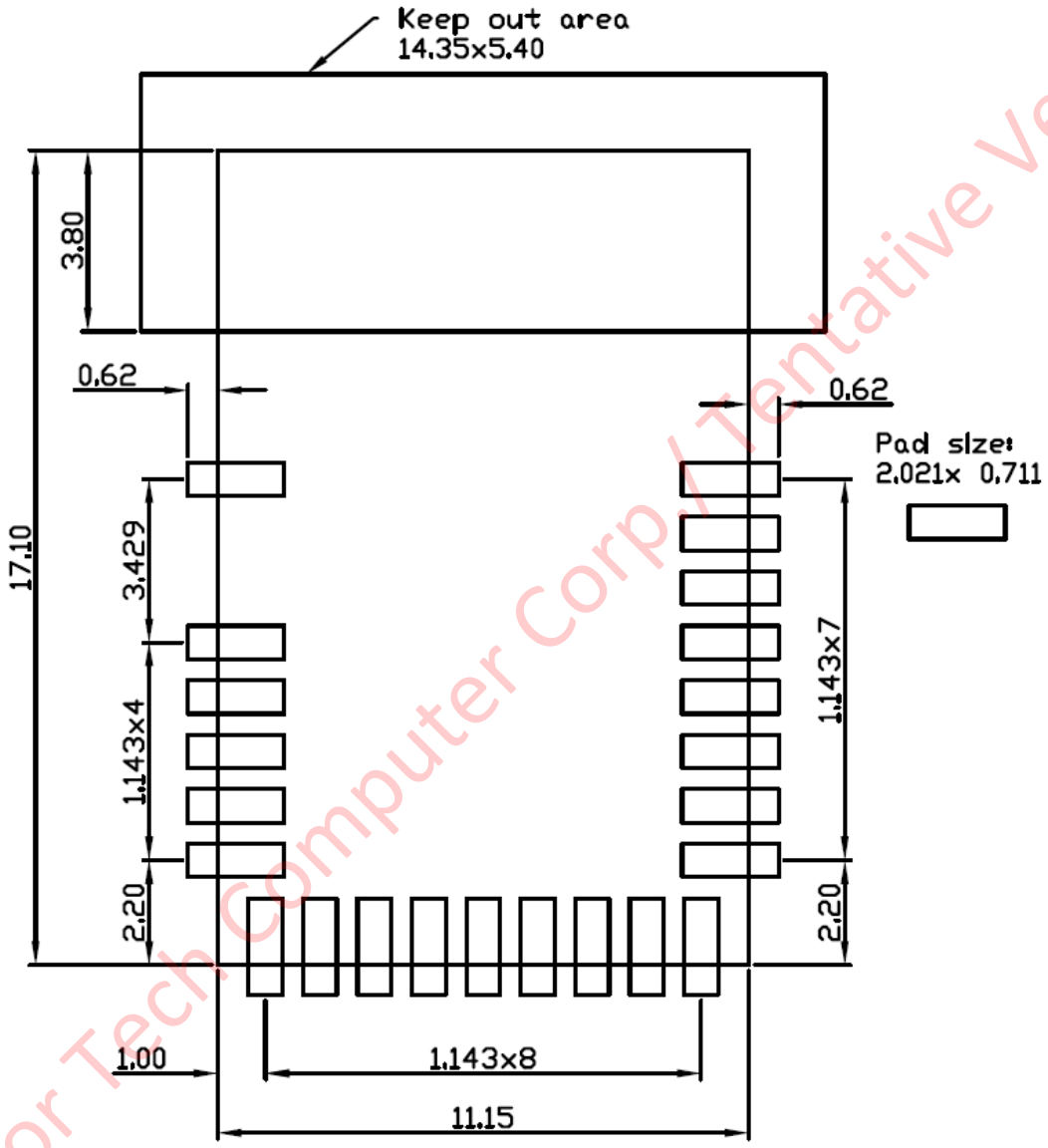
Input/ Output functions
Independent interrupts
3 interrupt trigger conditions(level/ edge/ dual-edge)
Hardware interrupt de-bounce

Parameter	Condition	Min	Typical	Max
Input high voltage	Vbat = 3.3V	2	3.3	3.6
Input low voltage	Vbat = 3.3V	--	0	0.9
Output high voltage	Vbat = 3.3V	2.97	--	3.3
Output low voltage	Vbat = 3.3V	0	--	0.33
Input high voltage	Vbat = 2.8V	1.8	2.8	3.1
Input low voltage	Vbat = 2.8V	--	0	0.8
Output high voltage	Vbat = 2.8V	2.5	--	--
Output low voltage	Vbat = 2.8V	0	--	2.8
Pull high and pull low resister(KOhm)	Vbat = 3.3V Strong pull/ weal pull	--	10/100	--

	V_{bat} = 1.8V Strong pull/ weal pull	--	20/200	--
	V_{bat} = 3.3 Strong pull/ weal pull V	--	5/50	--
	V_{bat} = 1.8 Strong pull/ weal pull V	--	2.5/25	--
Input high current(uA)	PAD configured as input mode	--	--	0.1
Input low current(uA)	PAD configured as input mode	--	--	0.1

6. FOOTPRINT AND RF LAYOUT SUGGESTION

Make sure no ground pad is in the keep out area. If PCB is multi layer, there should be no ground pad in each layer inside keep out area



Unit : mm

7. SHIPPING PACKAGE

Packed by tray, 80pcs modules per tray(T.B.D)
MOQ 1200pcs
MPQ 80pcs
Carton and labels (T.B.D)