

apm8762m Bluetooth 4.2 Low Energy IOT Module

DESCRIPTION

The apm8762m module is a low energy and high integrated Bluetooth 4.2 module, which is in size of 17.5 x 12.5 mm based on RTK RTL8762AG solution.

The apm8762m module runs both Application and BLE protocol Stack, that combines the excellent performance of a leading RF transceiver with a low-power ARM® Cortex™-M0, 256KB eFlash, 80KB RAM, and rich powerful supporting features and peripherals.

The apm8762m module can widely be applied in short range wireless communication and performs as core component in remote controller, Beacon, Home automation, wearable devices with powerful peripherals.

GENERAL FEATURES

- Small footprint: 12.5×17.5×2.3 mm max
- Bluetooth LE v4.2 listed single-mode module
 - QDID : [72183](#)
 - Declaration ID : [D040900](#)
- Ultra low power consumption with intelligent PMU
- Integrated MCU to execute Bluetooth protocol stack
- Supports multiple level Low Energy states
- Supports LE L2CAP Connection Oriented Channel Support
- Supports LE low duty directed advertising
- Supports LE data length extension feature
- Supports OTA (Over-the-Air) programming mechanism for firmware upgrade
- Supports internal 32KHz OSC for low power mode
- Supports GAP, ATT/GATT, SMP, L2CAP
- Generic Applications for GAP Central, Peripheral, Observer and Broadcaster Roles
- RoHS compliant

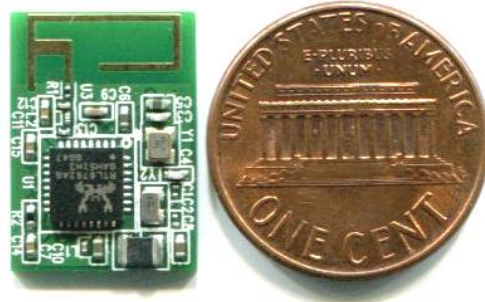
PERIPHERAL INTERFACES

- Maximum 16 GPIO pins
- Three configurable LED pins
- Real-Time Counters (RTC)
- Supports generic 4-wire SPI master/slave
- Timers x 8
- I2C x 2
- PWM x 4
- UART x 3

APPLICATIONS

- TV remote controller
- LE HID
- Home automation
- Key Fob
- Beacon
- Wearable device

APPEARANCE



REVISION HISTORY

Date	Release	Author	Description
2017/10/03	0.1	Pol	Initial release
2017/10/24	0.2	Pol	Update module appearance
2017/12/28	0.3	Pol	Update module weight in section 3
2018/7/30	1.0	Pol	Update certification in section 5
2018/10/2	1.1	Pol	Update recommended mounting pad in section 4-1

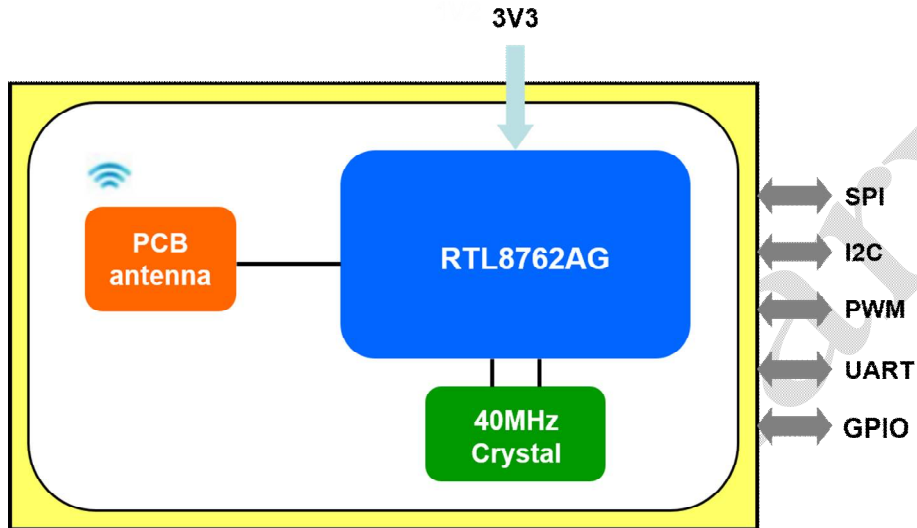
Preliminary

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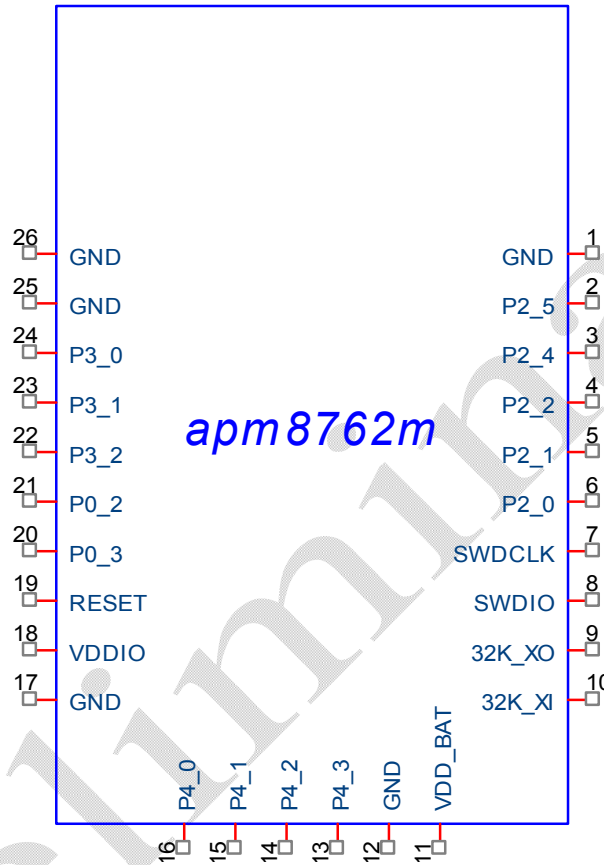
1 Hardware Specification

1-1 Block Diagram



1-2 Pinout

1-2-1 Pin Assignment



1-2-2 Pin Description

* I/O: Input/Output, I: Input, O: Output, A: Analog, P: Power, G: GND

#	Name	I/O	Description
1	GND	G	Module ground
2	P2_5	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down. AUXADC input 5.
3	P2_4	I/O	General purpose IO 8mA driving capability.

#	Name	I/O	Description
			With wakeup function. With internal pull-up and pull-down. AUXADC input 4.
4	P2_2	I/O	General purpose IO 8mA driving capability. With internal pull-up and pull-down. AUXADC input 2.
5	P2_1	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down. AUXADC input 1.
6	P2_0	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down. AUXADC input 0.
7	SWDCLK/P1_1	I/O	General purpose IO 8mA driving capability. With internal pull-up and pull-down. SWDCLK(default).
8	SWDIO/P1_0	I/O	General purpose IO 8mA driving capability. With internal pull-up and pull-down. SWDIO(default).
9	32K_XO	O	32k crystal output
10	32K_XI	I	32k crystal input
11	VDD_BAT	P	Battery voltage input
12	GND	G	Module ground
13	P4_3	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down. Low power comparator input.
14	P4_2	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down.
15	P4_1	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down.

#	Name	I/O	Description
16	P4_0	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down.
17	GND	G	Module ground
18	VDDIO	P	Supply 1.8V~3.3V for digital IO PADS (Note :VDDIO should be less than VDD_BAT)
19	RESET	I/O	Hardware reset pin; low active
20	P0_3	I/O	LOG_UART TX. Erase eFlash trigger. Power on trap; pull-up to erase eFlash content when powered on. (default PAD internal pull-down). Note: This pin is only for internal used, not a General purpose IO. In normal case, this pin should connect a resistor to ground. Do not connect any other component.
21	P0_2	I/O	General purpose IO 20mA driving capability. With wakeup function. With internal pull-up and pull-down.
22	P3_2	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down.
23	P3_1	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down. HCI_UART_RX(default).
24	P3_0	I/O	General purpose IO 8mA driving capability. With wakeup function. With internal pull-up and pull-down. HCI_UART_TX(default).
25	GND	G	Module ground
26	GND	G	Module ground

1-3 Pin Configurable Function Table

Pin Name	SDK Index	GPIO Number	Bootcode default	Wakeup Function	Dedicate Pin(cannot be freely switched with pin mux)	Reset default	Power-on latch	Driver current (mA)
P0_2	2	DW_2		1		Pull down		20
P0_3	3	DW_3	LOG_UART_TX	x		Pull down	BP_EFLASH 1:Erase APP code	20
P1_0	8	DW_8	SWDIO	x		Pull up		8
P1_1	9	DW_9	SWDCLK	x		Pull up		8
P2_0	16	DW_16		1	ADC(channel 0)	Pull down		8
P2_1	17	DW_17		1	ADC(channel 1)	Pull down		8
P2_2	18	DW_18		x	ADC(channel 2)	Pull down		8
P2_4	20	DW_20	SDA	1	ADC(channel 4) differential0	Pull down		8
P2_5	21	DW_21	SCL	1	ADC(channel 5) differential0	Pull down		8
P3_0	24	DW_24	HCI_UART_TX	1		Pull down		8
P3_1	25	DW_25	HCI_UART_RX	1		Pull down		8
P3_2	26	DW_26		1		Pull down		8
P4_0	32	DW_32	SPI0_CLK	1		Pull down		8
P4_1	33	DW_33	SPI0_MISO	1		Pull down		8
P4_2	34	DW_34	SPI0_MOSI	1		Pull down		8
P4_3	35	DW_35	SPI0_CS _n	1	Low power comparator	Pull down		8

1-4 Electrical Specification

1-4-1 Absolute Maximum Rating

Symbol	Description	Min.	Max.	Units
T _{ST}	Storage temperature	-40	+85	°C
VDD_BAT	Main supply voltage	-0.3	+3.6	V
VDDIO	Supply power for digital IO PADS	-0.3	+3.6	V

1-4-2 Recommended Operating Conditions

Symbol	Description	Min.	Typ.	Max.	Units
T _{OP}	Operating temperature	0	+25	+70	°C
VDD_BAT	Main supply voltage	+1.8	+3.3	+3.6	V
VDDIO	Supply power for digital IO PADS	+1.8	+3.3	+3.6	V

2 RF Specification

2-1 Operating frequency

Features	Description
Frequency band	2.402 GHz - 2.480 GHz
Number of channels	40 channels

2-1-1 Transmitter and Receiver RF Specification

Conditions: VDD_BAT=VDDIO=+3.3V, T_{OP}=+25°C

Parameter		Min	Typ	Max	Bluetooth Spec.	Unit
Low Energy - Transmitter Test						
Maximum RF transmit power		-	0	-	Class2: -6 to +4	dBm
Modulation Characteristic	Modulation index: Δf_{1avg}	225	246.3	275	$225 \leq \Delta f_{1avg} \leq 275$	kHz
	Modulation index: Δf_{2avg}	185	236.9	-	≥ 185	kHz
	Modulation index: $\Delta f_{2avg} / \Delta f_{1avg}$	0.8	0.96	-	≥ 0.8	NA
Carrier Frequency Offset and Drift	Average Frequency Offset	-	-16	-	± 150	kHz
	Drift Rate	-	7.4	-	± 20	kHz/50us
	Avg Drift	-	8	-	≤ 50	kHz
	Max Drift	-	9	50	≤ 50	kHz
Low Energy - Receiver Test						
Receiver sensitivity		-	-92	-70	≤ -70	dBm
Receiver sensitivity - Frame Error Rate		-	0	30.8	≤ 30.8	%
PER Report Integrity - Frame Error Rate		50	50	65.4	$50.0 \leq PER \leq 65.4$	%

2-2 Current Consumption

2-2-1 Low Power Mode

Power Mode	Always on Registers	32k RCOSC/XTAL	Retention SRAM	CPU	Wakeup Method	Current Consumption (VDD_BAT=3.3V)
Power down	ON	OFF	OFF	OFF	Wakeup by GPIO	200 nA
Deep LPS	ON	ON	Retention	OFF	Wakeup by GPIO, timer	1.1 uA

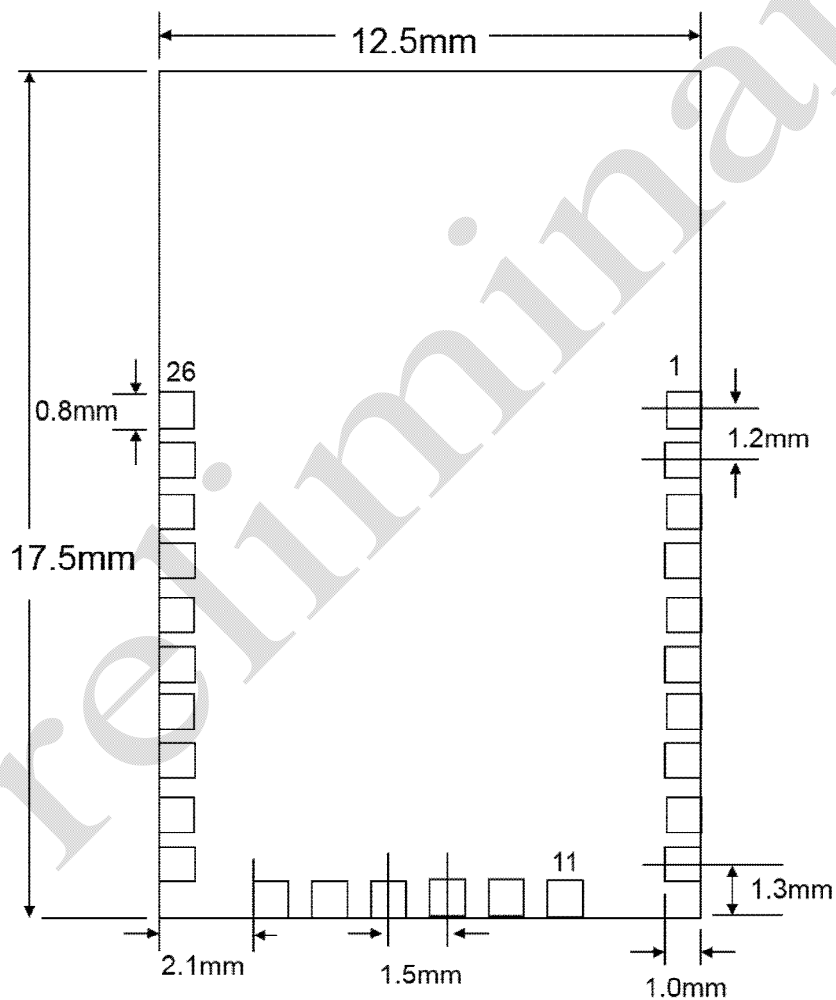
2-2-2 Active Mode

Power Mode	Current Consumption (VDD_BAT=3.3V)
Active RX mode	8.9 mA
Active TX mode (TX power: 0dBm)	7.4 mA

3 Mechanical Specification

Dimension	12.5×17.5×2.3 mm (max. height)
Pinout	26
Weight	0.6854g
Antenna	PCB Antenna

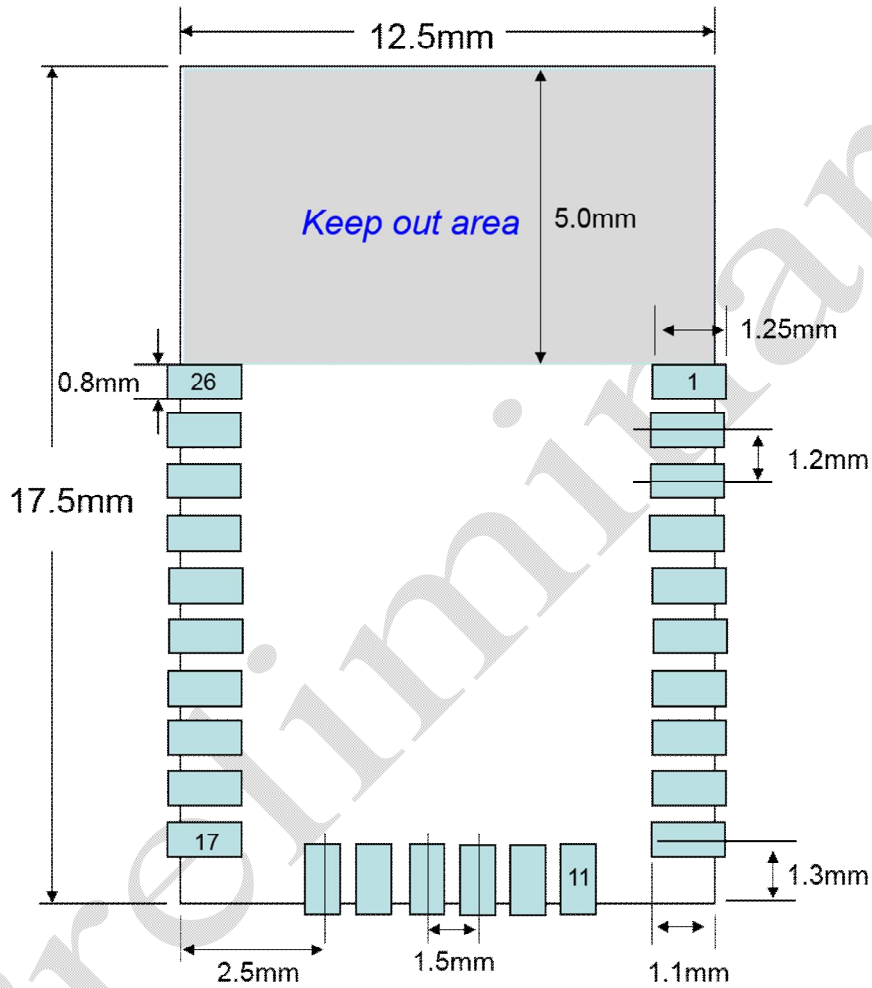
3-1 Package Outline



4 Assembly Guideline

4-1 Recommended Mounting Pad Design (Top View)

The following figure illustrates the recommended mounting pad design for apm8762m.



4-2 Baking condition recommendation before IR reflow

Baking condition for apm8762m module:

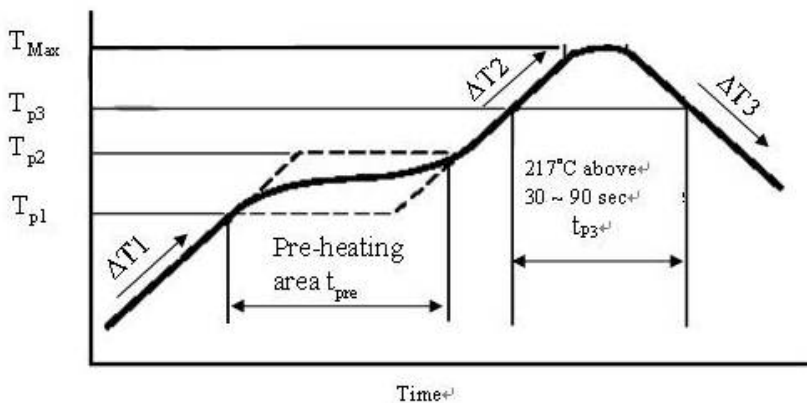
- I: 125°C/4hrs baking is necessary for apm8762m module before SMT process. After baking treatment the modules can be stored in the environment under 30°C and 60% RH for 48 hrs. If the storage time is over 48hrs, the modules need to be re-baked using the same condition again.
- II: In the event that the sealed bag is damaged on receipt of the modules, the baking condition should be changed to 125°C/24 hrs.

4-3 Recommendation for Reflow Profile

The solder profile depends on various parameters necessitating a set up for each application. The data here is given only for guidance on solder re-flow.

Maximum reflow temperature is 250°C

Preheat ramp-up rate	125°C to 180°C 1 to 3°C/ sec.
Peak temperature	250°C, Max.
Temperature maintained above 217°C	30 ~ 90 sec.
Cooling ramp-down rate	<2~4°C/ sec.
Maximum number of reflow cycles	≤3




Typical Lead-Free Re-flow Solder Profile

Heating/Cooling Speed			Pre-Heating		Heating	
$\Delta T1$	$\Delta T2$	$\Delta T3$	$T_{p1}-T_{p2}$	t_{pre}	T_{Max}	t_{p3}
1 to 3°C / sec	1 to 3°C / sec	< 2°C / sec	125 ~ 180°C	30 ~ 90 sec.	250°C max.	30 ~ 90 sec.

5 Bluetooth Certification

The apm8762m module has been certified as an End Product and has a QDID of 72183.

																		
Project Details																		
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Project Name	apm8762m Bluetooth 4.2 Low Energy IOT Module																	
Product Type	End Product																	
TCRL Version:	TCRL 2017-2																	
Referenced Qualified Design(s)																		
Previously Qualified Design Used in this Qualification(s)	72183																	
Listing Date	2018-07-23																	
Declaration ID	D040900																	
Product Listing(s)	<table border="1"> <thead> <tr> <th>Name</th> <th>Website</th> <th>Category</th> <th>Publish Date</th> <th>Model Number</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>apm8762m Bluetooth 4.2 Low Energy IOT Module</td> <td>http://www.apmcomm.com</td> <td>Unique Products</td> <td>7/23/2018 12:00:00 AM</td> <td>apm8762m</td> <td>apm8762m Bluetooth 4.2 LE Single Mode Module with GATT-based Profiles</td> </tr> </tbody> </table>						Name	Website	Category	Publish Date	Model Number	Description	apm8762m Bluetooth 4.2 Low Energy IOT Module	http://www.apmcomm.com	Unique Products	7/23/2018 12:00:00 AM	apm8762m	apm8762m Bluetooth 4.2 LE Single Mode Module with GATT-based Profiles
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Member Company	apm Communication, Inc.																	

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