

# REALTEK

## RTL8762AG-CG

### BLUETOOTH LOW ENERGY SOC

### DATASHEET

(CONFIDENTIAL: Development Partners Only)

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**USING THIS DOCUMENT**

This document is intended for the software engineer’s reference and provides detailed programming information.

Though every effort has been made to ensure that this document is current and accurate, more information may have become available subsequent to the production of this guide.

**REVISION HISTORY**

Revision	Release Date	Summary
1.0	2015/06/15	First release.

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## 1. General Description

The RTL8762AG is an ultra-low power system on chip solution for Bluetooth low energy applications. The RTL8762AG combines the excellent performance of a leading RF transceiver with ARM Cortex M0, 256KB eflash, 80KB RAM, and rich powerful supporting features and peripherals. The RTL8762AG embeds IR transceiver, hardware keyscan, and Quad-decoder on a single IC. The RTL8762AG comes with QFN32 package.

## 2. Features

### General

- Ultra low power consumption with intelligent PMU
- Support the Bluetooth 4.2 core specification
- Integrate MCU to execute Bluetooth protocol stack
- Support fully multiple Low Energy states
- Support LE L2CAP Connection Oriented Channel Support
- Support LE low duty directed advertising
- Support LE data length extension feature
- Support OTA (Over-the-Air) programming mechanism for firmware upgrade
- Support internal 32KHz OSC or external 32KHz clock input for low power mode
- Support GAP, ATT/GATT, SMP, L2CAP
- Generic Applications for GAP Central, Peripheral, Observer and Broadcaster Roles

### Platform

- ARM Cortex-M0 (Maximum 52MHz)
- 256KB embedded flash
- 80KB RAM
- 2KB e-fuse
- Support AES128/192/256 encrypt/decrypt engine

### Bluetooth Transceiver

- Fast AGC control to improve receiving dynamic range
- Support Bluetooth Low Energy PHY

### Peripheral Interfaces

- Flexible General Purpose IOs (15GPIOs with 32QFN)
- Three configurable LED pins
- Hardware Keyscan and Quad-decoder
- Embed IR transceiver
- Embed 8-CH 12-bit Sigma-Delta ADC
- Real-time counters (RTC)
- Support 3wire/2wire SPI
- Support Low power comparator
- Timer x 8
- I2C x 2
- PWM x 4
- Support 40MHz XTAL

### Application

- TV Remote Controller
- LE HID
- Beacon
- Home Automation

- Key Fob
- Wristband
- Wearable Device

**Package**

- 32-pin 5mmx5mm QFN

### 3. Block Diagram

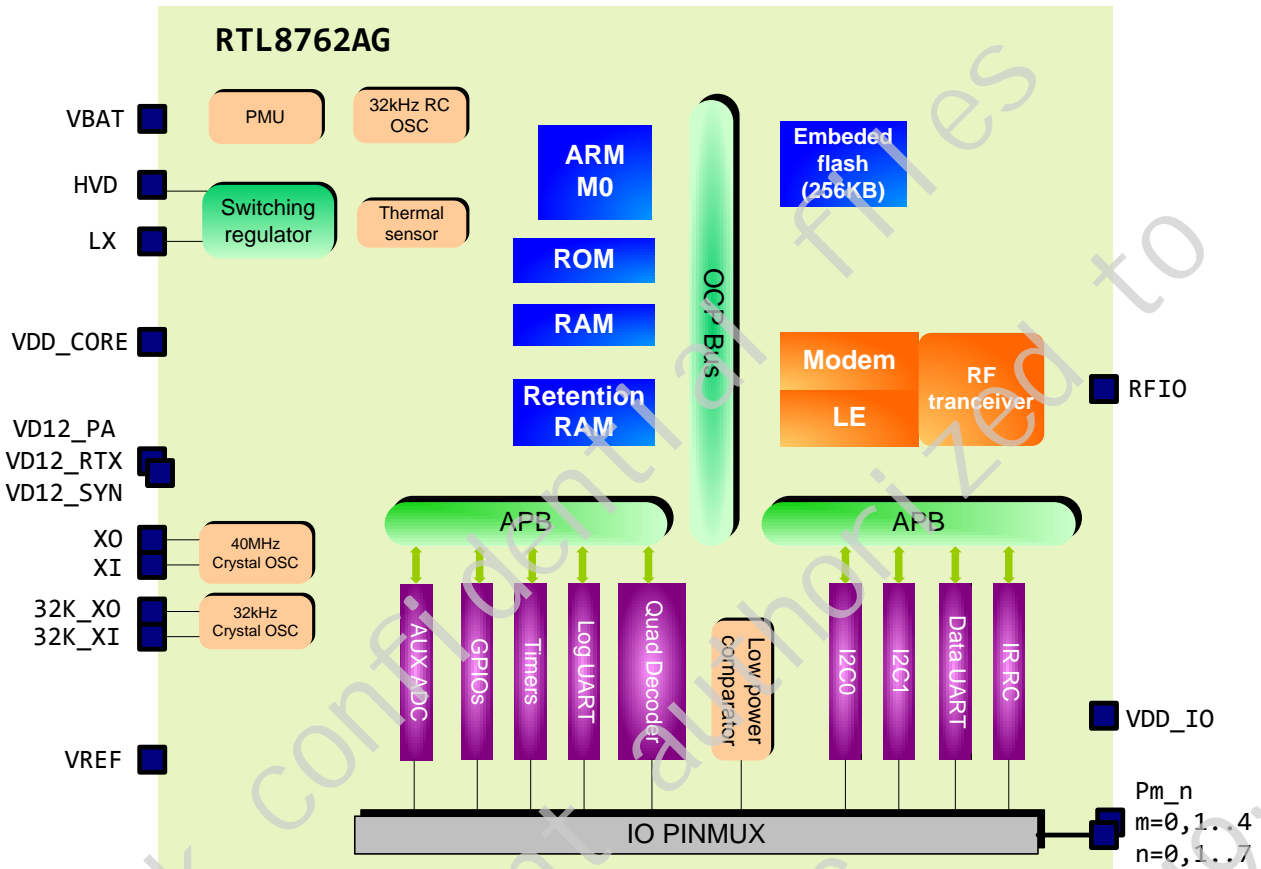


Figure 1. Block Diagram.



## 4. Pin Assignments

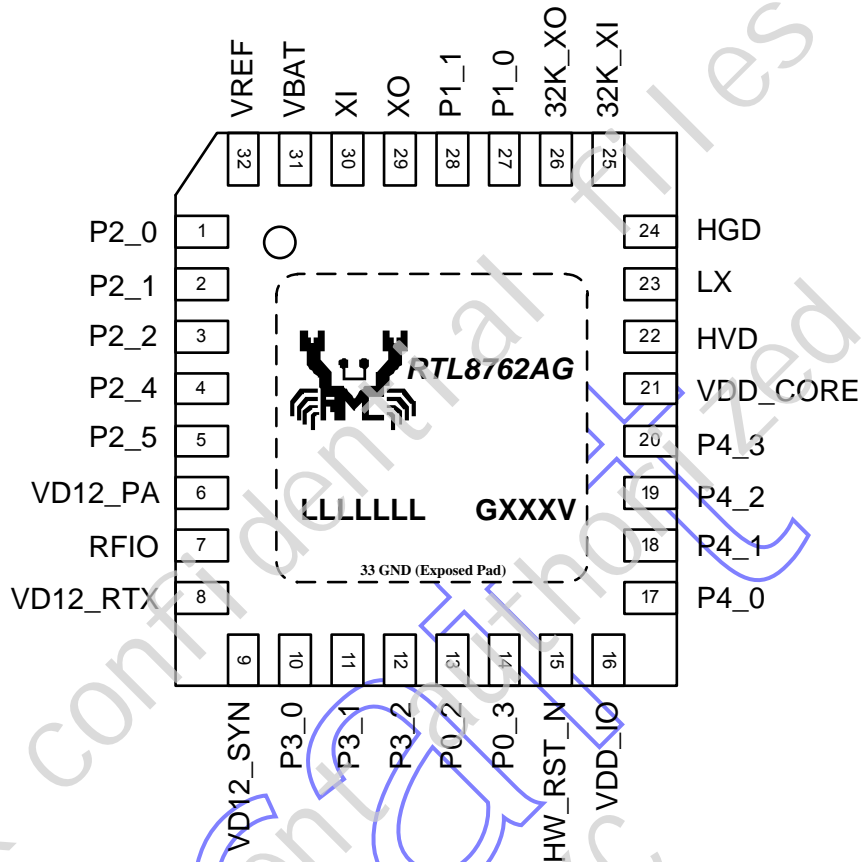


Figure 2. Pin Assignments

### 4.1. Package Identification

Green package is indicated by the 'G' in GXXXXV (Figure 2).

## 5. Pin Descriptions

The following signal type codes are used in the tables:

I: Input

O: Output

P: Power

### 5.1. RF Interface

**Table 1. RF Interface**

Symbol	Type	Pin No	Description
RFIO	IO	7	BT TRX signal

### 5.2. XTAL and System Interface

**Table 2. XTAL Interface**

Symbol	Type	Pin No	Description
32K_XI	I	25	32k crystal input or external 32k clock input
32K_XO	O	26	32k crystal output
XI	I	30	40MHz crystal input or external 40MHz clock input
XO	O	29	40MHz crystal output
HW_RST_N	I	15	Hardware reset pin, low active

### 5.3. General Purpose IOs

**Table 3. General Purpose IOs**

Symbol	Type	Pin No	Description
P2_0	IO	1	General purpose IO
P2_1	IO	2	General purpose IO
P2_2	IO	3	General purpose IO
P2_4	IO	4	General purpose IO, I2C_SDA0 (default)
P2_5	IO	5	General purpose IO, I2C_SCL0(default)
P3_0	IO	10	General purpose IO
P3_1	IO	11	General purpose IO, UART_RX(default)
P3_2	IO	12	General purpose IO
P0_2	IO	13	General purpose IO, 20mA driving capability
P0_3	IO	14	General purpose IO, 20mA driving capability
P4_0	IO	17	General purpose IO, SPI0_CLK(default)
P4_1	IO	18	General purpose IO, SPI0_MISO(default)
P4_2	IO	19	General purpose IO, SPI0_MOSI(default)
P4_3	IO	20	General purpose IO, SPI0_CS_N(default)

Symbol	Type	Pin No	Description
P1_0	IO	27	General purpose IO, SWDIO(default)
P1_1	IO	28	General purpose IO, SWDCLK(default)

## 5.4. Power Pins

**Table 4. Power Pins**

Symbol	Type	Pin No	Description
VREF	P	32	ADC reference voltage (decouple)
VD12_PA	P	6	supply 1.2V power for PA
VD12_RTX	P	8	supply 1.2V power for RF transceiver
VD12_SYN	P	9	supply 1.2V power for synthesizer
VDD_IO	P	16	supply 1.8V~3.3V power for digital IO PADS
VDD_CORE	P	21	supply 1.2V power for digital core
HVD	P	22	supply 2.6~3.3V power for Switching regulator input
LX	P	23	Switching regulator output
HGD	P	24	Ground for switching regulator
VBAT	P	31	Battery voltage input

## 6. Electrical and Thermal Characteristics

### 6.1. Temperature Limit Ratings

**Table 5. Temperature Limit Ratings**

Parameter	Minimum	Maximum	Units
Storage Temperature	-55	+125	°C
Ambient Operating Temperature	0	+70	°C
Junction Temperature	0	+125	°C

### 6.2. Power Supply DC Characteristics

**Table 6. Power Supply DC Characteristics**

Symbol	Parameter	Minimum	Typical	Maximum	Units
VBAT	Single power source of whole chip	1.8	3	3.6	V
VDD_CORE VD12_PA VD12_RTX VD12_SYN	1.2V Core and RFAFE Supply Voltage	1.10	1.2	1.32	V
VDD_IO <sup>Note</sup>	Power for digital IO PADS	1.8	-	3.6	V
HVD	Power for switching regulator	1.8	-	3.6	V

Note: VDD\_IO ≤ VBAT

### 6.3. Digital IO Pin DC Characteristics

**Table 7. 3.3V IO Pin DC Characteristics**

Symbol	Parameter	Minimum	Normal	Maximum	Units
V <sub>IH</sub>	Input high voltage	2.0	3.3	3.6	V
V <sub>IL</sub>	Input low voltage	-	0	0.9	V
V <sub>OH</sub>	Output high voltage	2.97	-	3.3	V
V <sub>OL</sub>	Output low voltage	0	-	0.33	V

**Table 8. 2.8V IO Pin DC Characteristics**

Symbol	Parameter	Minimum	Normal	Maximum	Units
V <sub>IH</sub>	Input high voltage	1.8	2.8	3.1	V
V <sub>IL</sub>	Input low voltage	-	0	0.8	V
V <sub>OH</sub>	Output high voltage	2.5	-	3.1	V
V <sub>OL</sub>	Output low voltage	0	-	0.28	V

## 6.4. Power Consumption

### 6.4.1. Low Power Mode

**Table 9. Low Power Mode**

Power mode	Always on registers	32k RCOSC/XTAL	Retention SRAM	CPU	Wakeup method	Current consumption (VBAT=3V)
Power down	ON	OFF	OFF	OFF	Wakeup by GPIO	TBD
Hibernate	ON	ON	OFF	OFF	Wakeup by GPIO or RTC	TBD
Deep LPS	ON	ON	Retention	OFF	Wakeup by GPIO, timer	TBD

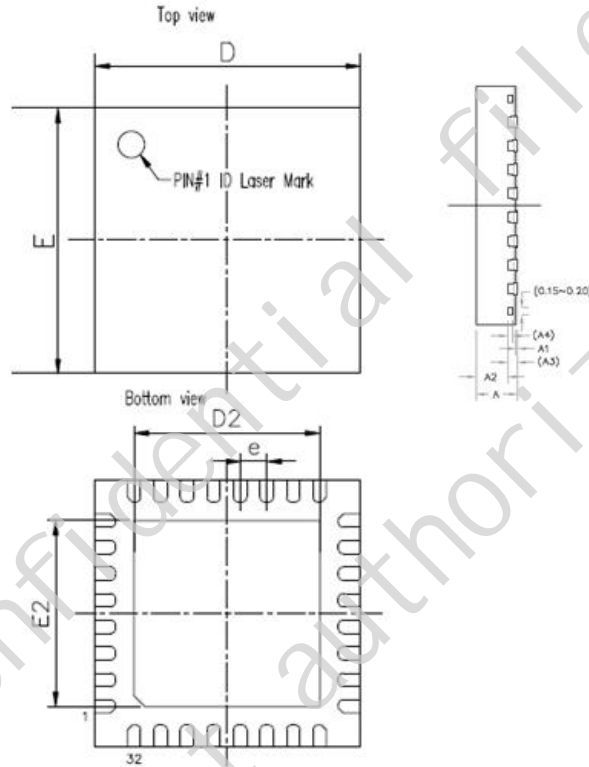
### 6.4.2. Active Mode

**Table 10. Active Mode**

Power Mode	Current Consumption (VBAT=3V)
Active RX mode	TBD
Active TX mode	TBD

## 7. Mechanical Dimensions

Plastic Quad Flat No Lead Package 32 Leads 5x5mm<sup>2</sup> Outline



## 7.1. Mechanical Dimensions Notes

Symbol	Dimension in mm			Dimension in inch		
	Min	Nom	Max	Min	Nom	Max
A	0.80	0.85	0.90	0.031	0.033	0.035
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.20 REF			0.008 REF		
A4	0.10 REF			0.004 REF		
b	0.18	0.25	0.30	0.007	0.010	0.012
D/E	5.00 BSC			0.020 BSC		
D2/E2	3.25	3.50	3.75	0.128	0.138	0.148
e	0.50 BSC			0.020 BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020

Note 1: CONTROLLING DIMENSION: MILLIMETER (mm).

Note 2: REFERENCE DOCUMENT: JEDEC MO-220.

## 8. Ordering Information

Table 11. Ordering Information

Part Number	Package	Status
RTL8762AG-CG	QFN-32, 'Green' Package	MP

Note: See page 5 for package identification.

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