

Bluetooth Module
BLE60/BLE63 Datasheet

Amp'ed RF Technology, Inc.

BLE60/BLE63 Product Specification



13.5mm x 10.5mm x 2.6mm

Description

Amp'ed RF Technology presents the BLE60/BLE63 Smart Ready Bluetooth module supporting v4.2 Bluetooth Low Energy. Including an integrated internal antenna, the BLE60/BLE63 provides a complete ready-to-use RF platform. The BLE60/BLE63 is a surface mount PCB module, with pre-tested RF regulatory certifications improving time to market and reliability.

A ready to use AT command set enables instant BLE connectivity usage cases.

BLE60/BLE63 features

Bluetooth features

- Bluetooth v4.2 Smart Ready
- 1Mbps data throughput
- 128-bit encryption security

Hardware configuration

- Cortex-M0 microprocessor
- 128K bytes Flash memory
- 64Kbytes RAM memory
- 96Kbytes ROM memory
- Two UARTs
- Up to 8 general purpose I/Os
- 1 SPI

Embedded software

- BLE protocol stack
- AT command set

Additional documentation

- BLE Application Note

Table of Contents

1. Hardware Specifications	4
1.1. Recommended Operating Conditions.....	4
1.2. Absolute Maximum Ratings	4
1.3. Current Consumption.....	4
1.4. Selected RF Characteristics	5
1.5. I/O Operating Characteristics.....	5
1.6. Pin Assignment	6
1.7. Pin Placement Diagram (Top View).....	7
1.8. Layout Drawing	8
2. Module Block Diagram	9
3. Hardware Design.....	9
3.1. Module Reflow Installation	10
3.2. GPIO Interface	10
3.3. PCB Layout Guidelines	11
3.4. External LPO Input Circuit	11
3.5. Application Reference Design.....	13
4. Regulatory Compliance	14
4.1. Modular Approval, FCC and IC.....	15
4.2. FCC Label Instructions	15
4.3. CE Label Instructions	16
5. Ordering Information	16
6. Revision History.....	16

1. Hardware Specifications

General Conditions ($V_{IN}= 3.0V$ and $25^{\circ}C$)

1.1. Recommended Operating Conditions

Rating	Min	Typical	Max	Unit
Operating Temperature Range	-40	-	85	$^{\circ}C$
Supply Voltage V_{IN}	2.4	3.0	3.6	Volts
Signal Pin Voltage	-	$0.7V_{DDIO} \sim V_{DDIO}$	-	Volts
RF Frequency	2400	-	2483.5	MHz

1.2. Absolute Maximum Ratings

Rating	Min	Typical	Max	Unit
Storage temperature range	-55	-	+150	$^{\circ}C$
Supply voltage V_{IN}	-0.3	-	+5.0	Volts
I/O pin voltage V_{IO}	-0.3	-	+5.5	Volts
RF input power	-	-	0	dBm

1.3. Current Consumption

Modes (Typical PowerConsumption)	Avg	Unit
Deep sleep mode	6	μA
Sleep mode	8	μA
Idle mode	0.9	mA
Rx mode	13.6	mA
Tx mode	13.3	mA

1.4. Selected RF Characteristics

Parameters	Conditions	Typical	Unit
Antenna load		50	ohm
Radio Receiver			
Sensitivity level	BER < .001 with DH5	-92	dBm
Maximum usable level	BER < .001 with DH1	0	dBm
Input VSWR		2.5:1	
Radio Transmitter			
Maximum output power	50 Ω load	+4	dBm
Initial Carrier Frequency Tolerance		0	kHz
20 dB Bandwidth for modulated carrier		935	kHz

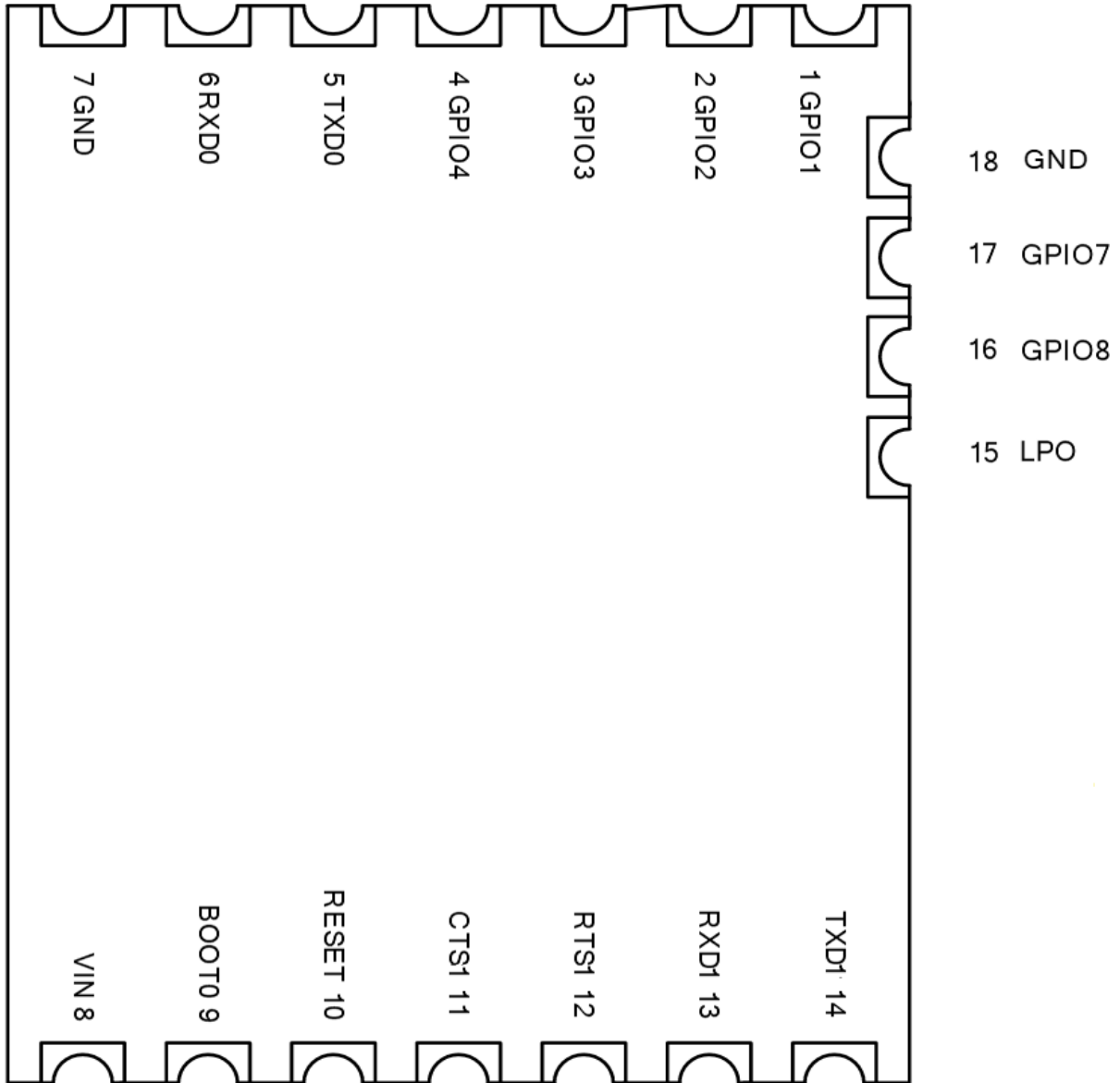
1.5. I/O Operating Characteristics

Symbol	Parameter	Min	Max	Unit	Conditions
V _{IL}	Low-Level Input Voltage	-	0.3 \times VCC	Volts	V _{IN} , 3.0V
V _{IH}	High-Level Input Voltage	0.7 \times VCC	-	Volts	V _{IN} , 3.0V
V _{OL}	Low-Level Output Voltage	-	0.1 \times VCC	Volts	V _{IN} , 3.0V
V _{OH}	High-Level Output Voltage	0.9 \times VCC	-	Volts	V _{IN} , 3.0V

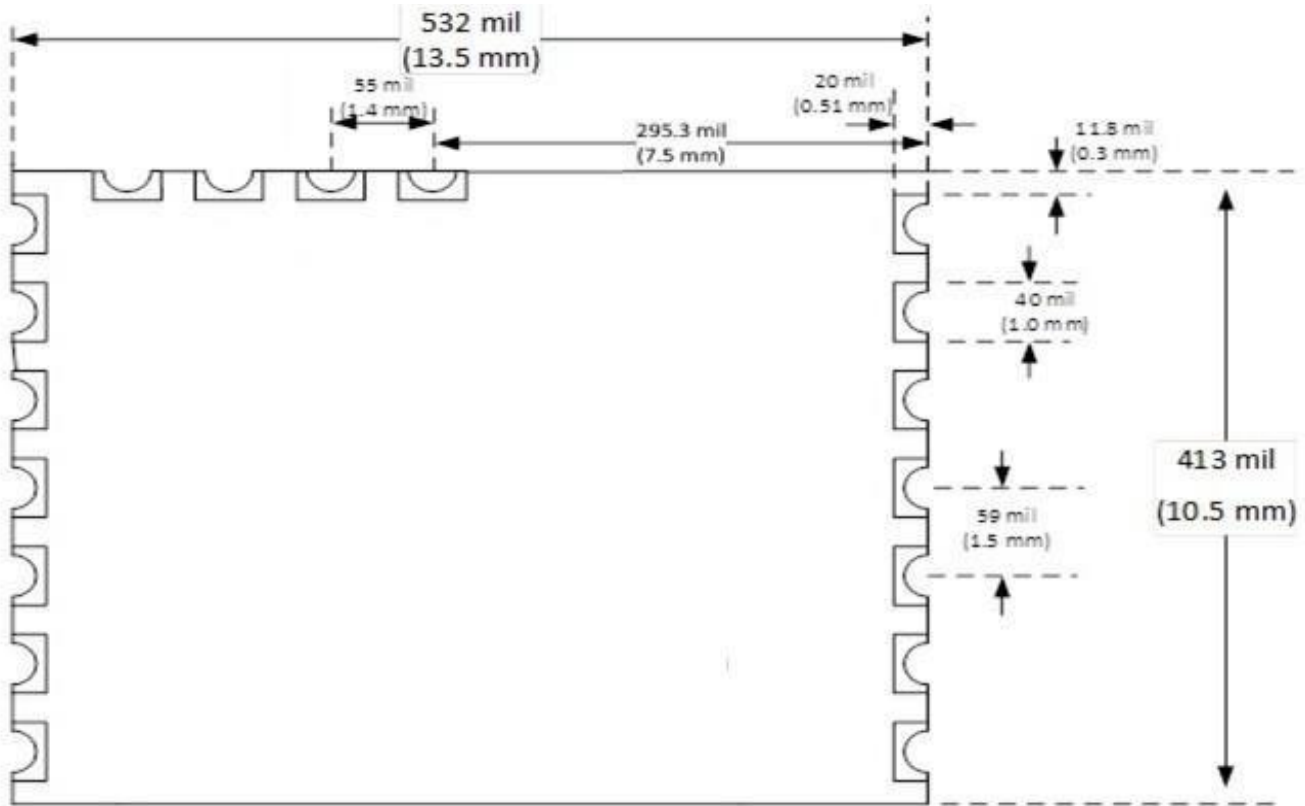
1.6. Pin Assignment

Name	Type	Pin #	Description
UART Interface			
RXD1	I	13	Receive data/ SPI_MISO
TXD1	O	14	Transmit data/SPI_MOSI
RTS1	O	12	Request to send (active low)/SPI_CLK
CTS1	I	11	Clear to send (active low)/SPI_CS
Power and Ground			
VIN		8	VIN
GND		7	GND
GND		18	GND
Reset			
RESETN	I	10	Reset input
LPO			
LPO	I	15	Low power clock input Connect an external source when using PN: BLE60. Be left floating with PN: BLE60_LP
Fast boot			
Fast boot	I	9	Fast boot enable
GPIO			
GPIO1		1	GPIO1/SWCLK/ADC_IN3
GPIO2		2	GPIO2/SWDIO/ADC_IN2
GPIO3		3	GPIO3/PWM output 0
GPIO4		4	GPIO4/CLK output 0
TXD0		5	TXD0/GPIO5
RXD0		6	RXD0/GPIO6
GPIO7		16	GPIO7/SDA
GPIO8		17	GPIO8/SCL/ PWM output 1

1.7. Pin Placement Diagram (Top View)

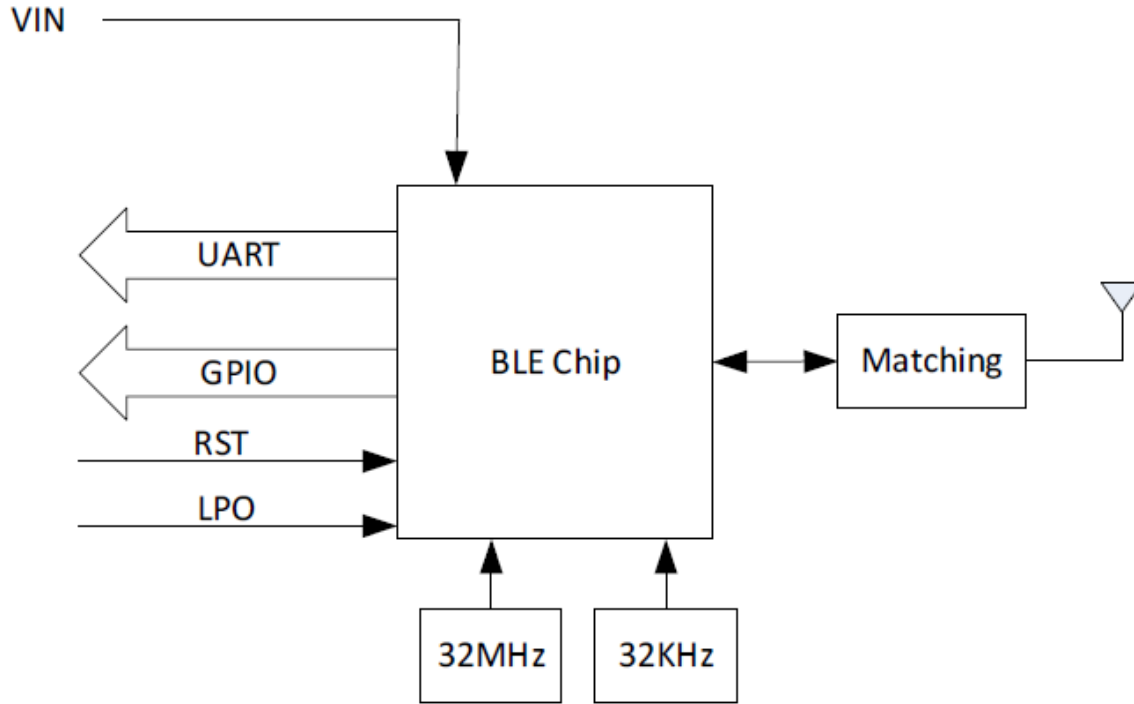


1.8. Layout Drawing



13.5 mm x 10.5 mm x 2.6 mm (+/- 0.2mm, heighttolerance))

2. Module Block Diagram



An external source may optionally supply the slow clock to the LPO pin when using PN: BLE60/BLE63. This clock is already supplied on the module with PN: BLE60/BLE63_LP, and no additional circuitry is needed.

3. Hardware Design

Notes

- All unused pins should be left floating; do not ground.
- All GND pins must be well grounded.
- The area around the antenna should be free of any ground planes, power planes, trace routings, or metal for at least 5 mm in all directions.
- Traces should not be routed underneath the module.
- The BLE60s/BLE63s must be reprogrammed via UART0.

3.1. Module Reflow Installation

The BLE60/BLE63 is a surface mount Bluetooth module supplied on an 18 pin, 6-layer PCB. The final assembly recommended reflow profiles are:

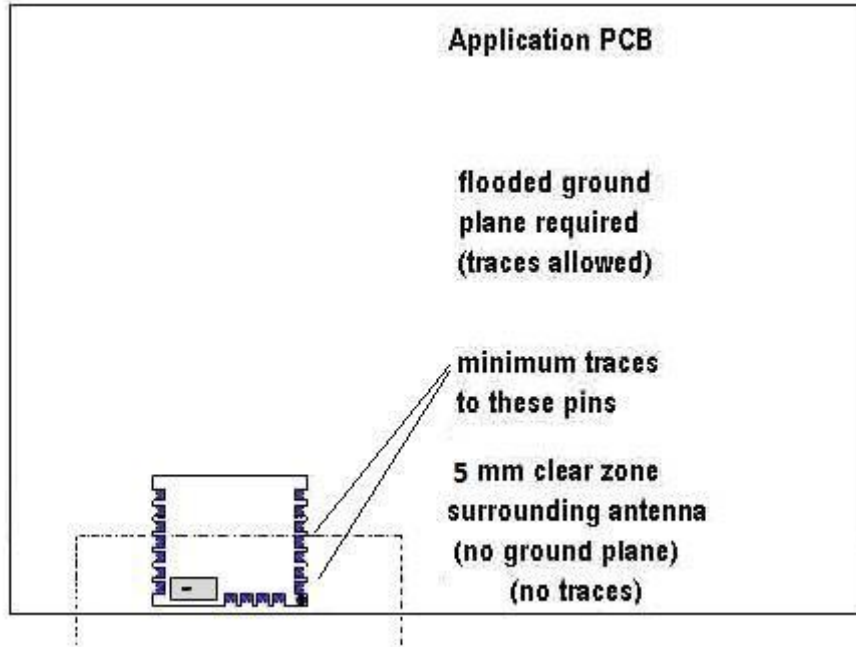
For RoHS/Pb-free applications, Sn96.5/Ag3.0/Cu0.5 solder is recommended.

- Maximum peak temperature of 230° - 240°C (below 250°C).
- Maximum rise and fall slope after liquidous of < 2°C/second.
- Maximum rise and fall slope after liquidous of < 3°C/second.
- Maximum time at liquidous of 40 – 80 seconds.

3.2. GPIO Interface

All GPIOs are capable of sinking and sourcing 6mA of I/O current.

3.3. PCB Layout Guidelines



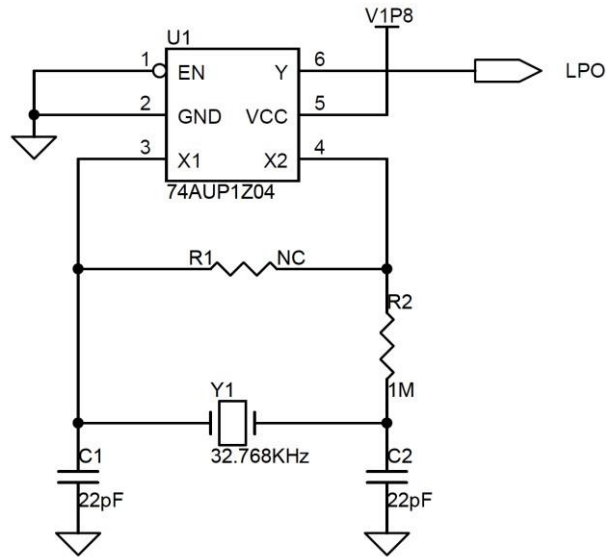
3.4. External LPO Input Circuit

An external source may optionally supply the slow clock to the LPO pin when using PN: BLE60/BLE63. This clock is already supplied on the module with PN: BLE60/BLE63_LP, and no additional circuitry is needed. The source must be a digital signal in the range of 0.1V to Vcc. The accuracy of the slow clock frequency must be 32.768 KHz ±100 ppm.

3.4.1. Low power circuit requirements

Module part number	Low power usage	External LPO circuit required
BLE60/BLE63	No	Not required
BLE60/BLE63	Yes	Required
BLE60/BLE63_LP	Yes or no	Not required

3.4.2. External LPO circuit example



External LPO Reference Circuit

(A) If using a permanently affixed label, the modular transmitter must be labeled with its own FCC identification number, and, if the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: X3ZBLEMOD1” or “Contains FCC ID: X3ZBLEMOD1.”

(B) If the modular transmitter uses an electronic display of the FCC identification number, the information must be readily accessible and visible on the modular transmitter or on the device in which it is installed. If the module is installed inside another device, then the outside of the device into which the module is installed must display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains FCC certified transmitter module(s).”

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Industry Canada statement:

Label of the end product:

The final product must be labeled in a visible area with the following "Contains transmitter module IC: 8828A-BLE1" This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) L'appareil ne doit pas produire de brouillage;

(2) L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

4.1. Modular Approval, FCC and IC

FCC ID: X3ZBLEMOD1

IC: 8828A-BLE1

In accordance with FCC Part 15, the BLE60/BLE63 is listed above as a Modular Transmitter device.

4.2. FCC Label Instructions

The outside of final products that contain a BLE60/BLE63 device must display a label referring to the enclosed module. This exterior label can use wording such as the following:

Contains Transmitter Module

FCC ID: X3ZBLEMOD1

IC: 8828A-BLE1

Any similar wording that expresses the same meaning may be used.

4.3. CE Label Instructions

TBD

4.4. Bluetooth Certification

Bluetooth QDID:

5. Ordering Information

Part Name	Description
BLE60	BLE module, no LPO
BLE60_LP	BLE module, with LPO
BLE63	Audio BLE module

6. Revision History

Date	Revision	Description
28, Dec 2018	1.0	Initial version
10, Jan, 2019	1.1	Added application referencedesign
27, Mar, 2019	1.2	Updated pinout chart
30, Apr, 2019	1.3	FCC and IC certifications