Amp'ed RF
Wireless Technology

Fast Track Your Wireless Project
自由无线 放飞梦想

BT30 Datasheet

Amp'ed RF Technology, Co. Ltd

BT30 Product Specification

10.4 mm x 13.5 mm x 2.0 mm

Description

Amp'ed RF Tech presents our BT30 HCI module, supporting Bluetooth specification v3.0. The BT30 is a low cost Bluetooth module for higher volume customers, and is intended to help customers shorten product development cycles and reduce cost. We offer a full upper layer stack Amp'ed UP, which may be added to a customer's host processor, and combined with the BT30, for a complete Bluetooth solution.

Features

Bluetooth features

- FCC & Bluetooth licensed radio (Pending)
- Surface mount type 10.4 X 13.5 X 2.0 mm
- Bluetooth v3.0, ST Ericsson STLC2690
- 10 dBm Tx power (typical), class 1 radio
- High sensitivity -88 (typical)
- Range up to 40 m LOS
- Bluetooth data rate up to 2178Kbps asymmetric
- 128-bit encryption security
- Multipoint capability up to 7 slaves
- Co-existence with IEEE 802.11 (AWMA, AFH)

Hardware features

- Serial interfaces: UART, PCM/I2S, SDIO
- Deep sleep power, only 20 µA
- Integrated deep sleep crystal
- Internal crystal oscillator (26 MHz)
- RoHS conformance

Embedded software

- Includes Bluetooth protocol up to HCI interface
- Amp'ed Up Stack and Bluetooth Profiles available for host processor

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Table of Contents

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1 Software Architecture

1.1 Lower Layer Stack

- Full Bluetooth v3.0 enhanced data rate (EDR)
- Device power modes: active, sleep and deep sleep
- Wake on Bluetooth feature optimized power consumption of host CPU
- Authentication and encryption
- Encryption key length from 8 to 128 bits
- Persistent FLASH memory for BD Address and user parameter storage
- ACL (Asynchronous Connection Less) packet types: DM1, DH1, DM3, DH3, DM5, DH5, 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5, AUX1
- SCO and eSCO (Synchronous Connection Oriented) packet support.
- Point to multipoint and scatternet support: 3 master and 7 slave links allowed (10 active links simultaneously)
- Sniff, and hold modes: fully supported to maximum allowed intervals
- Master slave switch, supported during connection and post connection
- Dedicated Inquiry Access Code, for improved inquiry scan performance
- Dynamic packet selection, channel quality driven data rate to optimize link performance
- Bluetooth test modes per Bluetooth v3.0 specification
- 802.11b/g/n co-existence: AFH, AWMA
- Vendor specific HCI commands to support device configuration and certification test modes

1.2 HCI Interface

- Bluetooth v3.0 specification compliant
- HCI UART transport layer (H4)

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2 Hardware Specifications

General Conditions (V_{IN}= 3.0V and 25°C)

2.1 Recommended Operating Conditions

Rating	Min	Typical	Max	Unit
Operating Temperature Range	-40	-	85	°C
Supply Voltage V_{IN}	1.8	2.1	3.6	Volts
Signal Pin Voltage	-	2.1	-	Volts
RF Frequency	2400	-	2483.5	MHz

2.2 Current Consumption

Modes (Typical Power Consumption)	Avg	Unit
Complete Power Down	3.0	µA
Deep Sleep mode	18.0	µA
Functional Sleep mode	1.1	mA
HW Inquiry Scan in a Deep Sleep	220.0	µA
HW Page Scan in a Deep Sleep	220.0	µA
HW Inquiry and Page scan in a Deep Sleep	400.0	µA
ACL data 172.8K Baud (Master)	19.2	mA
ACL data 172.8K Baud (Slave)	22.2	mA
Connection, no data traffic, master	2.8	mA
Connection, no data traffic, slave	4.8	mA
Connection, 375ms sniff, slave	105.0	µA
Connection, audio: HV3, master, not sniffed	8.4	mA
Connection, audio: HV3, slave, sniffed	8.2	mA
Connection, audio:eSCO (64kbps, Tsco=6), master	8.2	mA
Connection, audio:eSCO (64kbps, Tsco=6), slave	8.7	mA
Connection, audio:eSCO (64kbps, Tsco=18), master	4.2	mA
Connection, audio:eSCO (64kbps, Tsco=18), slave	4.8	mA

Selected RF Characteristics

Parameters	Conditions	Typical	Unit
Antenna load		50	ohm
Radio Receiver			
Sensitivity level	BER < .001 with DH5	-88	dBm
Maximum usable level	BER < .001 with DH1	+9	dBm
Input VSWR		2.5:1	
Radio Transmitter			
Maximum output power	50 Ω load	+10	dBm
Initial Carrier Frequency Tolerance		0	kHz
20 dB Bandwidth for modulated carrier		932	kHz

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2.3 Absolute Maximum Ratings

Rating	Min	Typical	Max	Unit
Storage temperature range	-55	-	+150	°C
Supply voltage V_{IN}	-0.3	-	+5.0	Volts
I/O pin voltage V_{IO}	-0.3	-	+2.5	Volts
RF input power	-	-	-5	dBm

2.4 Pin Assignment

Name	Type	Pin #	Description
UART Interface			
CTS	O	11	Clear to send (active low)
RTS	I	12	Request to send (active low)
RXD	I	13	Receive data
TXD	O	14	Transmit data
PCM Interface			
PCM_CLK	I	9	PCM Clock
PCM_SYNC	I	2	PCM Synchronization
PCM_A	I	15	PCM Data
PCM_B	I	16	PCM Data
Co-Existence Interface			
IO5	I	4	Co-Exist IEEE 802.11 b/g/n
IO6	I	5	Co-Exist IEEE 802.11 b/g/n
IO7	I	6	Co-Exist IEEE 802.11 b/g/n
Controller pins			
RESETN	I	10	Reset input (active low for 5 ms);
BT_wakeup	I	1	BT Wake up input
Host_Wakeup	O	3	Host Wake up output
Power and Ground			
V_{in}		8	V_{in}
GND		7	GND

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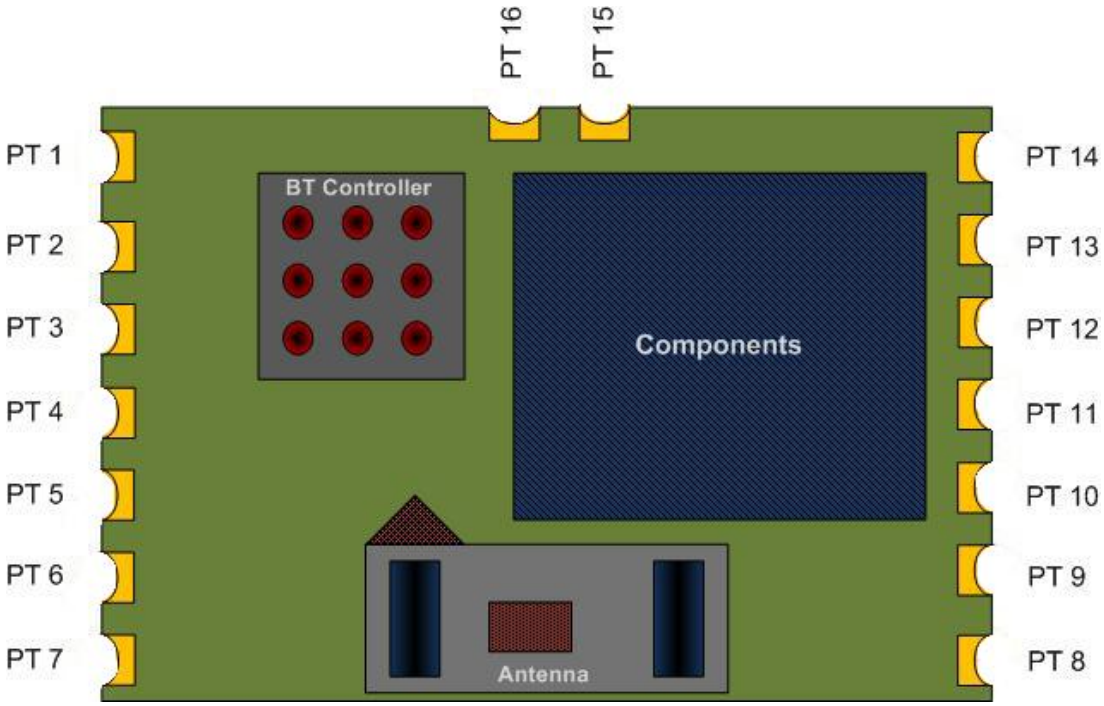
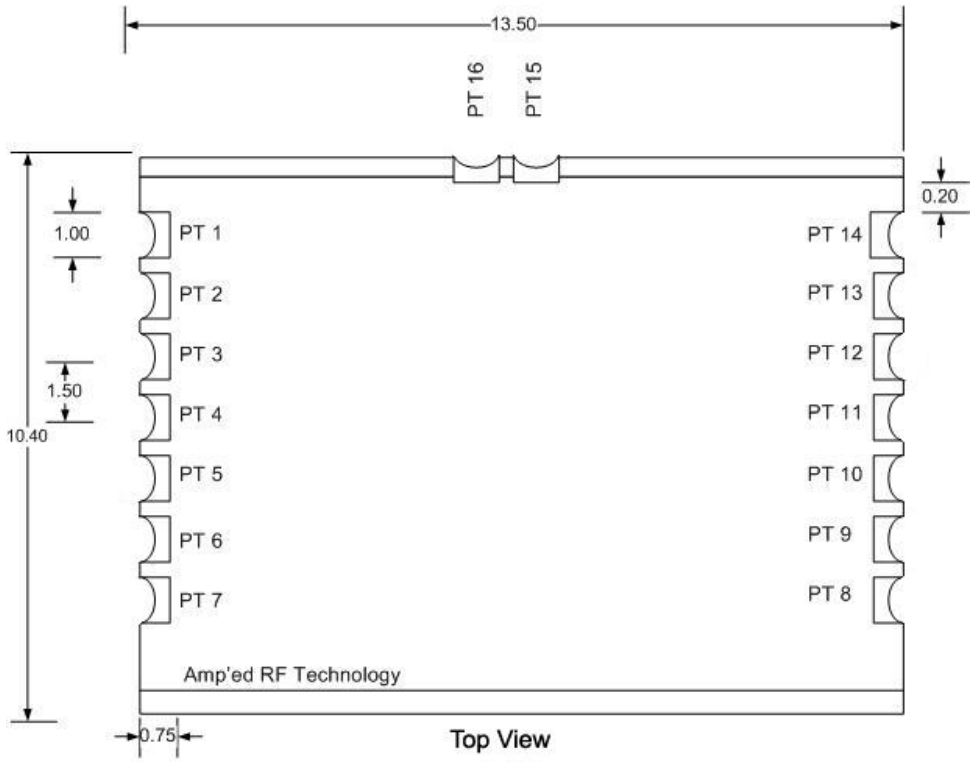
2.5 Pin Placement Diagram (Top View)



2.6 Layout Drawing, BT30

Size: 10.4 mm x 13.5 mm x 2.0 mm (height)



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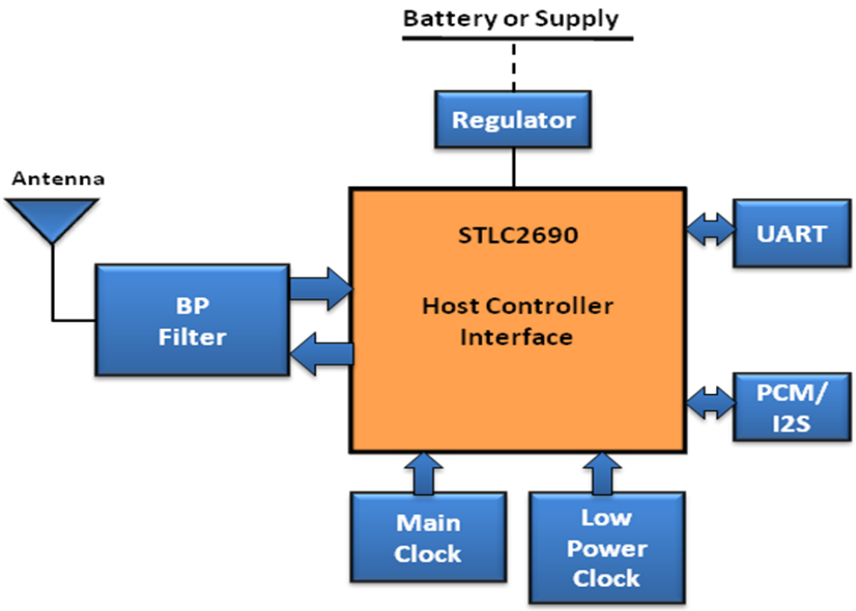
3 Hardware Block Diagram



4 Hardware Design

- 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 6.5 mm in all directions.
- Traces should not be routed underneath the module.

4.1 Module Reflow Installation

The BT30 is a surface mount Bluetooth module supplied on a 16 pin, 4-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.

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5 Startup Sequence

Just after chip reset, the Host has to download patches and/or configuration settings. This needs to be done using the following HCI Command sequence (before any other HCI communication takes place[3]):

- ST_Read_Revision_Information (or Read_Local_Version_Information)
  Optional, up to the Host to decide if needed
- ST_Write_File_Block to download patches file. Mandatory
- ST_Write_File_Block to download static configuration settings file. Mandatory
- ST_Write_File_Block to download dynamic configuration settings file
  Optional, up to the Host to decide if needed
- Hci_Reset. Mandatory

After the Hci_Reset command, all patches and settings are applied.

6 Startup behavior

RESET

This pin is always an input pin, active low, with a PD during reset. This signal MUST be active during power supplies initialization and, when all power supplies are stable, it must remain active low for at least 2 cycles of the slow clock in order to insure good reset functionality.

HOST_WAKEUP/SPI_INT

During reset, this signal is an input with internal pull-down. After reset this signal is becoming an output Low signal irrespective of the interface used.

The pull-down/pull-up/no-pull option is selected by the parameters HOST_WAKEUP in IO Pulls Settings on applet ST Static Settings3 of NanoTailor (the pull-down is disabled in the default static file).

In order to ensure proper behavior of the device at start-up, there should be no external pull-up on this line, such as to make sure that as long as the signal is in input mode, it is seen as a logical zero.

UART and SPI interface

UART_CTS is an input with PU, UART_RXD is an input with PU, UART_TXD toggles from input PU to output High and UART_RTS toggles from input PU to output Low 70ms after reset, enabling UART communication if needed.

BT_WAKEUP

BT_WAKEUP is used as a Wake-Up / Deep Sleep signal from the Host to the Bluetooth Controller, SPI_INT as a wake-up signal from the Bluetooth Controller to the Host.

Entering Deep Sleep mode can only be initiated by the Host that forces the BT_WAKEUP signal to ‘0’. Note that it is not allowed to force this signal before the end of a WRITE operation from the Host to the Bluetooth device, this in order to allow the Bluetooth Controller to decode the message send by the Host Based on its internal state, the Bluetooth Controller can decide to go or not in Deep Sleep mode.

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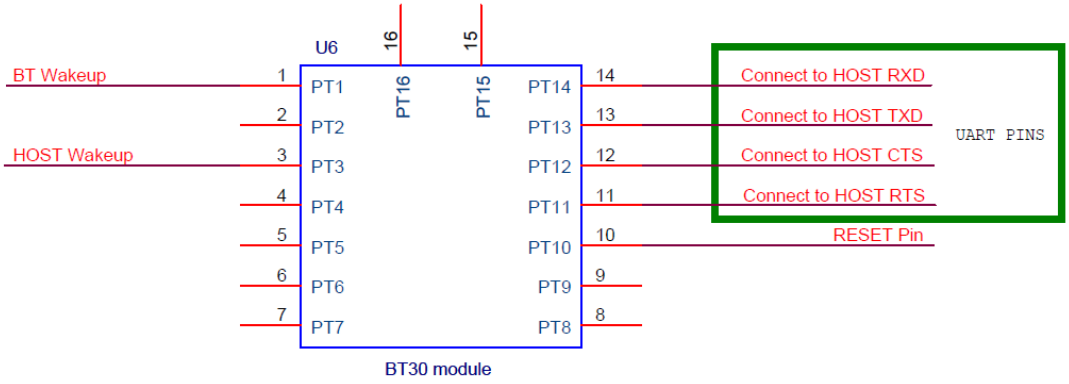
If data communication is needed with autonomous wake-up, there are two possibilities (selection is done by a parameter setting) after the clock request:

- Bluetooth Controller requests traffic by asserting HOST_WAKEUP high. Host asserts BT_WAKEUP high when it is ready for communication. Bluetooth Controller puts UART_RTS low to start traffic exchange. In this scenario, the Bluetooth Controller enables the UART interface only when BT_WAKEUP is asserted high.

- Bluetooth Controller requests traffic by asserting HOST_WAKEUP high. At the same time Bluetooth Controller puts UART_RTS low to start traffic exchange. In this scenario, the Bluetooth Controller enables the UART interface at the same time it tells the Host to wakeup. Communication is handled by flow control, but there may be a power penalty in case the Host takes long time to start the interface at his side. Note that BT_WAKEUP is not used in that scenario.

7 Connection Diagram



8 FCC Regulatory Compliance

This module has been tested and found to comply with the FCC Part15 and IC RSS-210 rules. These limits are designed to provide reasonable protection against harmful interference in approved installations. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications or changes to this equipment not expressly approved by Amp'ed RF Technology may void the user's authority to operate this equipment.

8.1 Modular Approval, FCC and IC

FCC ID: X3ZBTMOD3
IC: 8828A-MOD3

In accordance with FCC Part 15, the BT30 is listed above as a Limited Modular Transmitter device.

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8.2 FCC Label Instructions

The outside of final products that contain a BT30 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: X3ZBTMOD3

IC: 8828A-MOD3

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

Ordering Information

Part Name	Description
BT30	Standard version

9 Revision History

Data	Revision	Description
14-March-2011	1	Q1 in 2011

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