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BTBE1A Module Spec.   V1.5

1.General Description and Specification

1.1 General Description

This product is a SMT Bluetooth Module used BlueCore CSR8670 BGA. Its a perfect consumer audio solution for wireless applications, such as wireless soundbars, wireless stereo speakers and headphones. Its slim and light so the designers can have better flexibilities for the product size.

This module complies with Bluetooth specification version 4.1. It can support HSP,HFP,A2DP,AVRCP,PBAP,MAP,SPP profiles. Radio includes integrated balun, and integrates an ultra-low-power DSP and application processor with embedded flash memory, a high-performance stereo codec, a power management subsystem, LED and LCD drivers inputs in a SOC IC. The dual-core architecture with flash memory enables manufactures to easily differentiate their products with new features without extending development cycles.

General Features:

- Class 1, Class 2, Class 3 support
- Bluetooth Specification V4.1
- 16M internal flash memory
- Support Firmware Upgrade
- USB 2.0, UART,I^2C,SPI interface and up to 29 PIOs
- Multi-Configurable I2S, PCM and SPDIF Interface
- SBC,MP3,AAC and AAC+, Faststream codec
- aptX,5-band EQ,3D stereo separation and DRC
- Stereo ambient noise cancellation
- Integrated Battery Charger
- 3 Hardware LED controllers (for RGB) and LCD driver
- Built in 16-bit Stereo Codec- 96dB SNR for DAC
- Support for 802.11 Co-existence
- Green (RoHS Compliant)

1.2 Device Details

Radio

- On-chip balun (50Ω impedance in TX and RX modes)
- Built-in BPF and PCB Antenna

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■ No external trimming is required in production

■ BIST minimize production test time

■ Bluetooth V4.1 specification fully qualified software

Transmitter

■ 10dBm RF transmit power with level control from on-chip 6-bit DAC over a dynamic range >30dB

■ Class 1, Class 2 and Class 3 support without the need for an external power amplifier or TX/RX switch

Receiver

■ Receiver sensitivity of -80dBm

■ Integrated channel filters

■ Digital demodulator for improved sensitivity and co-channel rejection

■ Real-time digitised RSSI available to application

■ Fast AGC for enhanced dynamic range

■ Channel classification for AFH

Baseband and Software

■ 16Mbit internal flash

■ Integrated 26M Crystal

■ Memory protection unit supporting accelerated VM

■ 56KB internal RAM, enables full-speed data transfer, mixed voice/data and full piconet support

■ Logic for forward error correction, header error control, access code correlation, CRC, demodulation, encryption bit stream generation, whitening and transmit pulse shaping

■ Transcoders for A-law, μ-law and linear voice via PCM and A-law, μ-law and CVSD voice over air

Physical Interfaces

■ UART interface with programmable baud rate up to 4Mbps

■ USB 2.0 interface with full speed

■ Master and slave bit-serialiser (I^2C and SPI)

■ Up to 29 PIOs, i.e. 14 general purpose PIOs and unused digital interfaces are available as PIOs

■ SPI debug and programming interface with read access disable locking

■ PCM, I^2S and SPDIF interfaces

■ Dual/quad external serial flash memory interface

■ 3 LED drivers (includes RGB) with PWM flasher on sleep clock

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Kalimba DSP

■ Enhanced Kalimba DSP coprocessor, 80MIPS, 24-bit fixed point core

■ 2 single-cycle MACs; 24 x 24-bit multiply and 56-bit accumulator

■ 32-bit instruction word, dual 24-bit data memory

■ 32-bit instruction word, dual 24-bit data memory

■ 12K x 32-bit program RAM including 1K instruction cache for executing out of internal flash

■ 32K x 24-bit + 32K x 24-bit 2-bank data RAM

Audio

■ Audio codec with 2 high-quality dedicated ADCs

■ 2 microphone bias generators and up to 2 analogue microphone inputs

■ Up to 6 digital microphone (MEMS) inputs

■ G.722 compatible, includes improved digital FIR filter path for stop-band attenuation required for G.722 compliance

■ Enhanced side-tone gain control

■ Supported sample rates of 8, 11.025, 16, 22.05, 32, 44.1,48 and 96kHz (DAC only)

Auxiliary Features

■ On-chip regulators:

3.3V USB pad supply linear regulator, Low-voltage linear regulator for internal digital supply with 0.80V to 1.25V output, Low-voltage linear regulator for internal analogue supply with 1.35V output

■ On-chip high-efficiency switch-mode regulator:

1.8V and1.35V outputs from battery supply

■ Power-on-reset cell detects low supply voltage

■ Power management includes digital shutdown and wake-up commands with an integrated low-power oscillator for ultra-low power Park/Sniff/Hold mode

■ Built-in Lithium ion / Lithium polymer battery charger with optional external mode

■ Crystal oscillator with built-in digital trimming

■ Clock request output to control external clock

■ Auxiliary ADC and DAC available to applications

1.3 Specification

Brand name	⊛YAMAHA
Model No.	BTBE1A
Chipset	CSR8670
Specification Version	Bluetooth V4.1

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Power Class	Class2
Frequency Band	2.402~2.480GHz
Max. TX Power	-6~+4dBm
RX Sensitivity	-80dBm@0.1%BER
Hopping	1600hops/sec, 1MHz channel space
Channel No.	79
Data Rate	1 Mbps for Basic Rate using GFSK
	2 Mbps for Enhanced Data Rate using π/4-DQPSK
	3 Mbps for Enhanced Data Rate using 8DPSK
Modulation Type	GFSK, π/4-DQPSK,8DPSK
Crystal	26MHz
Distance	>10m(Class2 without obstacle)
Flash Size	16M
Operation Temperature	-10 ~ +45 ℃
Dimension	27.5mm(L)x 20 mm(W) x 0.8mm(H)

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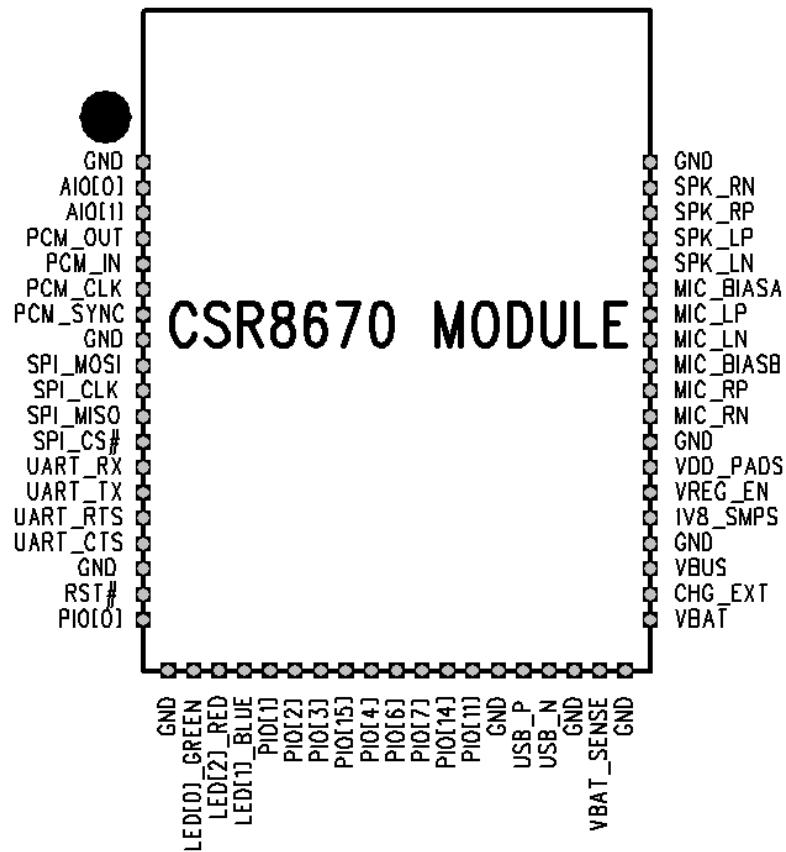## 2.Package Information

2.1 Pin-out Diagram

Figure 1: BTBE1A Module Pin-out(Top View)

2.2 Terminal Functions

Pin Name	Pin Number	Description
GND	1	Ground
AIO[0]	2	Analogue programmable input / output line
AIO[1]	3	
PCM_OUT	4	Synchronous data output Alternative function PIO[18]
PCM_IN	5	Synchronous data input Alternative function PIO[17]
PCM_CLK	6	Synchronous data clock Alternative function PIO[20]
PCM_SYNC	7	Synchronous data sync Alternative function PIO[19].
GND	8	Ground

SPI_MOSI	9	SPI data input
SPI_CLK	10	SPI clock
SPI_MISO	11	SPI data output
SPI_CS#	12	Chip select for SPI, active low
UART_RX	13	UART data input
UART_TX	14	UART data output
UART_RTS	15	UART request to send, active low Alternative function PIO[16]
UART_CTS	16	UART clear to send, active low
GND	17	Ground
RST#	18	Reset if low. Input debounced so must be low for >5ms to cause a reset
PIO[0]	19	Programmable input / output line
GND	20	Ground
LED[0]_GREEN	21	LED driver
LED[2]_RED	22	
LED[1]_BLUE	23	
PIO[1]	24	Programmable input / output line
PIO[2]	25	
PIO[3]	26	
PIO[15]	27	
PIO[4]	28	
PIO[6]	29	
PIO[7]	30	
PIO[14]	31	
PIO[11]	32	
GND	33	Ground
USB_P	34	USB data plus with selectable internal 1.5k Ω pull-up resistor
USB_N	35	USB data minus
GND	36	Ground
VBAT_SENSE	37	Battery charger sense input
GND	38	Ground
VBAT	39	Battery positive terminal
CHG_EXT	40	External battery charger control
VBUS	41	Battery charger input
GND	42	Ground

|		
1V8_SMPS	43	1.8V output
VREG_EN	44	Regulator enable input
VDD_PADS	45	1.7V to 3.6V positive supply input
GND	46	Ground
MIC_RN	47	Microphone input negative, right
MIC_RP	48	Microphone input positive, right
MIC_BIASB	49	Microphone bias B
MIC_LN	50	Microphone input negative, left
MIC_LP	51	Microphone input positive, left
MIC_BIASA	52	Microphone bias A
SPK_LN	53	Speaker output negative, left
SPK_LP	54	Speaker output positive, left
SPK_RP	55	Speaker output positive, right
SPK_RN	56	Speaker output negative, right
GND	57	Ground

2.3 Package Dimensions
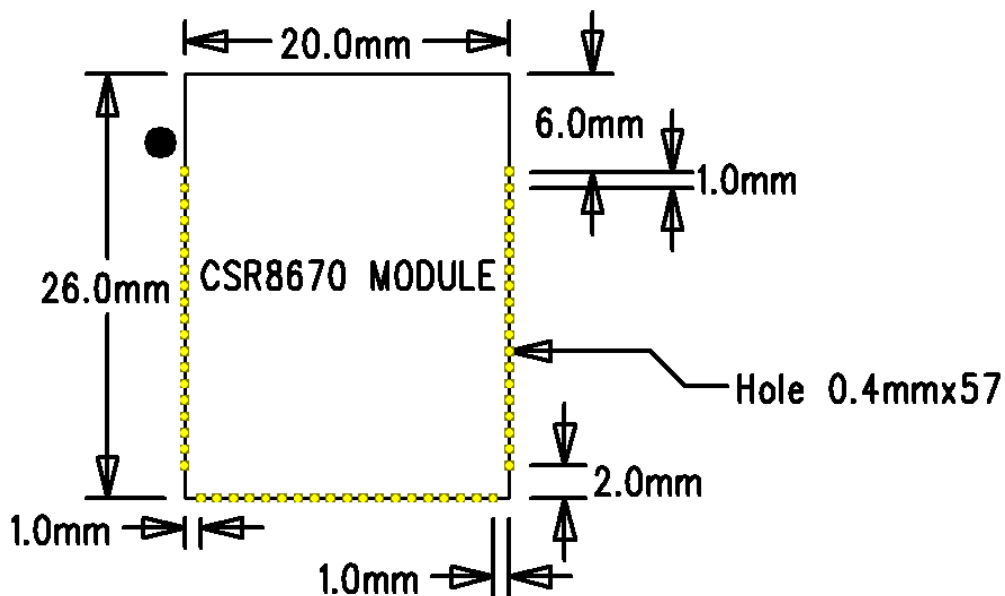
Figure 2: BTBE1A Module package Dimensions

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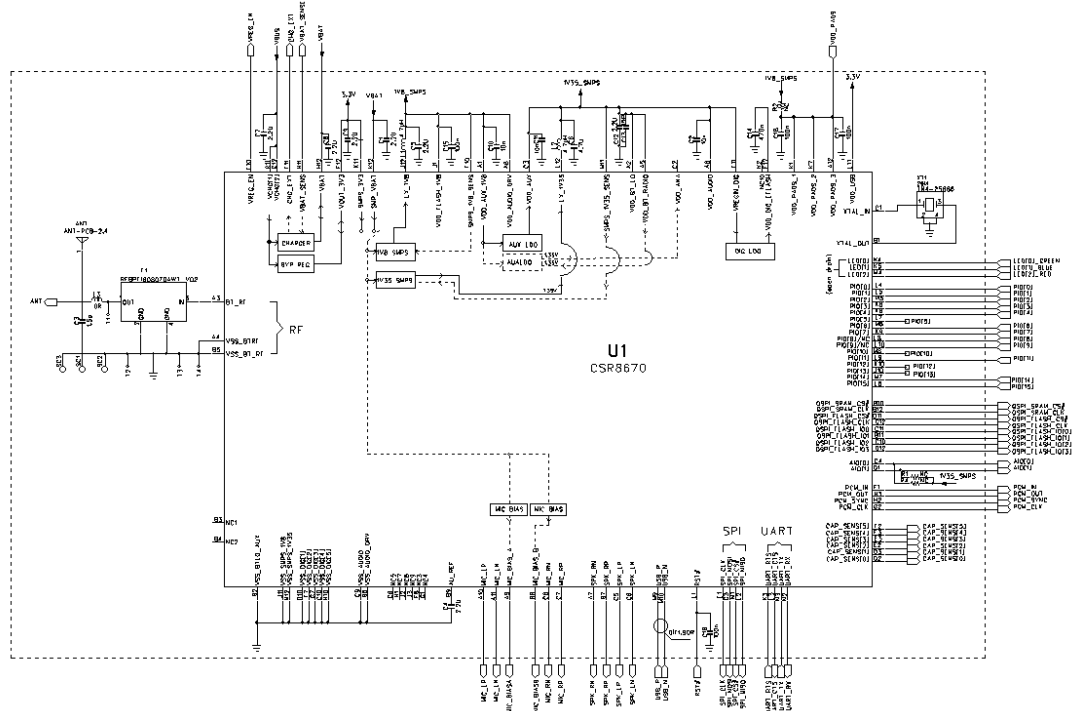## 3.Hardware Description

3.1 Reference Schematic

Figure 3: BTBE1A Module Reference Schematic

3.2 Mounting condition

To achieve better RF performance, the area around antenna in red color as below is the minimum safe area which should be kept away from copper and any other metal. And it is recommended to lay the antenna at the edge of the mother board while mounting the Module.
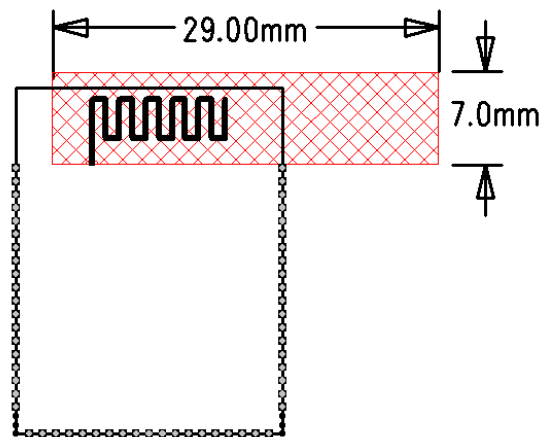

Figure 4: BTBE1A Module mounting condition

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3.3 Reset

This Module is reset from several sources: RST# pin, power-on reset, USB charger attach reset, UART break character and software configured watchdog timer.

The RST# pin is an active low reset and is internally filtered using the internal low frequency clock oscillator. Keep RST# for low period >5ms is recommended.

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4. ELECTRICAL CHARACTERISTIC

4.1 Absolute Maximum Ratings

Rating	Min.	Max.	Unit
Storage temperature	-40	105	° C
Supply Voltage			
VBAT	-0.4	4.4	V
VBUS	-0.4	5.75	V
VBAT_SENSE	-0.4	5.75	V

4.2 Recommended Operating Conditions

Rating	Min.	Typ.	Max.	Unit
Operating temperature range	-10	25	45	° C
Supply Voltage				
VBAT	2.80	3.70	4.25	V
VBUS	4.75	5.00	5.75	V
VBAT_SENSE	0	3.70	4.25	V

4.3 RF Characteristics (Class 2)

4.3.1 Transmitter output power

Freq.	Average power	Limit	Unit
2402MHz	-1		
2441MHz	0	-6~+4	dbm
2480MHz	1		

4.3.2 Receiver Sensitivity @0.1% BER

Freq.	Average sensitivity	Limit	Unit
2402MHz	-84		
2441MHz	-85	<=-70	dbm
2480MHz	-86		

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5. Green Products and RoHS Compliance

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6.Caution for user

FCC Statement

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 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.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This End equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and

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obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following:
"Contains FCC ID:UZZBTBE1A".

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

Canada Statement

This device complies with Industry Canada's licence-exempt RSSs.. 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.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Caution Exposure:

This device meets the exemption from the routine evaluation limits in section 2.5 of RSS102 and users can obtain Canadian information on RF exposure and compliance.
Le dispositif répond à l'exemption des limites d'évaluation de routine dans la section 2.5 de RSS102 et les utilisateurs peuvent obtenir des renseignements canadiens sur l'exposition aux RF et le respect.

The final end product must be labelled in a visible area with the following:

The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the Industry Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows: Contains transmitter module IC: 7633A-BTBE1A
Le produit final doit être étiqueté dans une zone visible de ce qui suit:

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L'étiquette d'un module de certification Industrie Canada doit être clairement visible en tout temps lorsqu'il est installé dans le dispositif hôte, sinon le dispositif hôte doit être étiqueté pour afficher le numéro de certification Industrie Canada du module, précédée de la mention "Contient le module émetteur", ou le mot "Contient" ou un libellé similaire exprimant le même sens, comme suit:
Contient le module émetteur IC: 7633A-BTBE1A

This End equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.

Cet équipement devrait être installé et actionné avec une distance minimum de 20 centimètres entre le radiateur et votre corps.

The end user manual shall include all required regulatory information/warning as show in this manual.

以下內容僅適用於台灣版本：

本產品符合低功率電波輻射性電機管理辦法：

第十二條 經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條 低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

本模組於取得認證后將依認規定於模本體標示審驗合格標籤，并要求平台廠商於平台上標示：

内含發射器模組：
(((（ xxxxxxxxxxxxxxx