



1. Product Overview

The YW6045_Vxx_BT Bluetooth module is a high-integration audio Bluetooth solution based on the JL7016C chip, compliant with Bluetooth 5.4 standards. It supports dual-mode operation (BLE/BR/EDR) and integrates multiple functions including Bluetooth audio transmission, data communication, USB/TF card audio decoding, and TF card reader.

The module features a stamp-hole encapsulation design, facilitating soldering and integration into diverse applications. This significantly reduces customer development complexity and shortens design cycles, making it an ideal choice for Bluetooth speaker systems, smart home solutions, and similar applications.

II. Main Characteristics

1. Bluetooth functionality

Complies with Bluetooth 5.4

Supports BLE data transmission

Supports HID Profile

support GATT

Supports classic Bluetooth protocols: A2DP, AVRCP, HFP, SPP, and HID

2. Audio Processing

16-bit stereo audio DAC output

12-bit precision stereo audio ADC with built-in microphone amplifier circuit

Supports I²S digital audio output

Supports external audio input

3. Interface resources

Three-way high-speed UART interface

USB 2.0 Full Speed OTG interface (compatible with USB drives, card readers, and USB sound cards)

SDIO interface, supports SD/MMC card read/write

Rich GPIO resources

4. Radio Frequency Characteristics

Built-in 2.4G PCB antenna

III. Application Fields



Bluetooth speaker/audio device
 Smart Home Control System
 vehicle audio system
 Wearable devices
 industrial data transmission terminal
 IoT devices

IV. Module Structure

4.1 Module Block Diagram

<https://media/image2.png>

4.2 Dimensions and Pinout Diagram

<https://media/image3.png>

<https://media/image4.png>

5. Module Hardware Specifications

5.1 PMU Characteristics

Table 3-2

Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VBAT	Voltage Input	2.2	3.7	4.4	V	
VPWR	Charger supply Voltage	4.5	5.0	5.5	V	
Operating mode						
IOVDD	Voltage output	2.0	3.0	3.4	V	VBAT=4.2V,10mA loading
	Loading current	1	1	120	mA	IOVDD=3V@VBAT=3.3V
DCVDD	Voltage output	1.0	1.25	1.4	V	IOVDD=3.0V,10mA loading
	Loading current	1	1	100	mA	DCVDD=1.25V@IOVDD=3.0v On LDO mode
VLVD	Voltage input	1.8	2.5	2.5	V	Low-Voltage Detection for IOVDD
Low Power mode						
IOVDD	Loading current	1	1	10	mA	IOVDD=3V@VBAT=4.2V



5.2 IO Input/Output Electrical Logical Characteristics

Table 3-4

GPIO input characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VIL	Low-Level Input Voltage	-0.3	1	0.3*IOVDD	V	IOVDD=3.0V
VH	High-Level Input Voltage	0.7*IOVDD	1	IOVDD+0.3	V	IOVDD=3.0V
High Voltage Resistant IO input characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
V	Low-Level Input Voltage	-0.3	1	0.3*IOVDD	V	IOVDD=3.0V
VH	High-Level Input Voltage	0.7*IOVDD	1	+5V	V	IOVDD=3.0V
GPIO&High Voltage Resistant IO output characteristics						
Symbol	Parameter	Min	Typ	Max	Unit	Test Conditions
VoL	Low-Level Output Voltage	1	1	0.1*IOVDD	V	IOVDD=3.0V
VoH	High-Level Output Voltage	0.9*IOVDD	1	1	V	IOVDD=3.0V

5.3 Internal Resistor Characteristics

Table 3-5

Port	Drive Current(mA)		Internal Pull-Up Resistor	Internal Pull-Down Resistor	Comment
PA PC2~PC5 PG PE5,PE6	HD,HD0=0,1	8	10K	10K	1.PB1,PG4 default pull up 2.USBDM&USBDP default pull down 3.Internal pull-up/pull-down resistance accuracy±20%
	HD,HD0=1,0	26			
	HD,HD0=1,1	46			
PB1~PB7 PPO(VPWR)	8		10K	10K	
USBDP	4		1.5K	15K	



USBDM		180K	15K	
-------	--	------	-----	--

5.4 Audio DAC Characteristics

DAC MODE H2

Table 3-6

Parameter	Mode	Min	Typ	Max	Unit	Test Conditions
Frequency Response		20	1	20K	Hz	1KHz/OdB 10k ohm loading With A-Weighted Filter
Output Swing	Differential		1.7		Vrms	
	Single-ended		860	¹	mVrms	
THD+N	Differential		-70	¹	dB	
	Single-ended	₁	-70	¹	dB	
S/N	Differential	₁	105	¹	dB	
	Single-ended	₁	99	¹	dB	
Dynamic Range	Differential	₁	105	¹	dB	1KHz/-60dB 10k ohm loading With A-Weighted Filter
	Single-ended	₁	98	¹	dB	
Noise Floor	Differential	₂	10	₂	uVrms	A-Weighted Filter
	Single-ended	₁	10	¹	uVrms	

5.5 Audio ADC Characteristics

Table 3-7

Parameter	Min	Typ	Max	Unit	Test Conditions
Dynamic Range		94		dB	Fsample=44.1kHz,Gain=0dB Fin=1KHz 590mVrms
S/N	₂	95	₁	dB	Fsample=44.1kHz,Gain=0dB Fin=1KHz 590mVrms
THD+N	₁	-75	₁	dB	
S/N	₁	76	₁	dB	Fsample=44.1kHz,Gain=18dB



THD+N	1	-73	1	dB	Fin=1KHz 75mVrms
-------	---	-----	---	----	------------------

5.6 BT Characteristics

5.6.1 Transmitter

Basic Rate

Basic Rate

Table 3-8

Table 3-8

Parameter		Min	Typ	Max	Unit	Test Conditions
RF Transmit Power			7.0		dBm	25°C, Power Supply VBAT=3.7V 2441MHz 4 Layer Board
RF Power Control Range			18.2		dB	
20dB Bandwidth			950		KHz	
In-band spurious Emissions (BQB Test Mode RF_Tx Power=5dBm)	F=F0±1MHz		-22		dBm	
	F=F0±2MHz		-51		dBm	
	F=F0±3MHz		-55		dBm	
	F=F0+/->3MHz		-55		dBm	

Enhanced Data Rate

Table 3-9

Parameter		Min	Typ	Max	Unit	Test Conditions
Relative Power			-2.5		dB	25°C Power Supply VBAT=3.7V 2441MHz 4 Layer Board
π/4 DQPSK Modulation Accuracy	DEVM RMS		6		%	
	DEVM 99%		11		%	
	DEVM Peak		16		%	
In-band spurious Emissions (BQB Test Mode RF_Tx Power=5dBm)	F=F0±1MHz		-4		dBm	
	F=F0±2MHz		-34		dBm	
	F=F0±3MHz		-43		dBm	
	F=F0+/->3MHz		-48		dBm	

5.6.2 Receiver



Basic Rate

Table 3-10

Parameter		Min	Typ	Max	Unit	Test Conditions
Sensitivity			-92		dBm	25°C Power Supply VBAT=3.7V 2441MHz DH5 4 Layer Board
Co-channel Interference Rejection			10		dB	
Adjacent Channel selectivity C/I	+1MHz		-4		dB	
	-1MHz		-3		dB	
	+2MHz		-39		dB	
	-2MHz		-33		dB	
	+3MHz		-45		dB	
	-3MHz		-28		dB	

5.6 Bluetooth RF Characteristics

transmitter (base rate)

Transmit power: +7dBm (typical)
Power control range: 18.2dB
20dB bandwidth: 950kHz

Receiver (Basic Rate)

Reception sensitivity: -92dBm
Same-channel interference suppression: 10dB
Adjacent channel selectivity: $\pm 1\text{MHz}$: -4/-3dB, $\pm 2\text{MHz}$: -39/-33dB

VI. Product Selection



model	explain	Appearance diagram
YW6045_VXX_BT	General version, no shield	
YW6045_VXX_BT_1	Version with metal shield	

2. PCB Layout

Audio traces should be kept away from digital and RF traces.
Copper plating and routing are prohibited in the antenna area.
The crystal oscillator should be placed close to the chip.

10. Version History

date	edition	explain
2025.12.24	V1.0	Initial version release



FCC Certification

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

The YW6045-01_BT-YW is a BT+BLE module. It is within U.S. FCC part 15.247 standard.

2.3 Specific operational use conditions

Operation Frequency: 2402-2480MHz for BT and BLE

Modulation Type: GFSK, $\pi/4$ -DQPSK, 8-DPSK for BT, GFSK for BLE

2.4 Limited module procedures

Not applicable; Single Modular Approval Request

2.5 Trace antenna designs

It communicates with its antenna, which is PCB Antenna

2.6 RF exposure considerations

This equipment complies with FCC RF exposure guidelines and can be installed/operated without minimum distance restrictions: use only the supplied antenna.

2.7 Antennas

It communicates with its antenna, which is PCB Antenna

Antenna Designation: BT/BLE: PCB Antenna Gain: -6.14 dBi

2.8 Label and compliance information

The final end product must be label in a visible area. The Host must Contains FCC ID: 2BTX6-YW6045-01

2.9 Information on test modes and additional testing requirements

Data transfer module demo board can control the EUT work in RF test mode at specified test channel.

2.10 Additional testing, Part 15 Subpart B disclaimer

The module without unintentional-radiator digital circuit, so the module does not required an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B

2.11 OEM integration instructions:

This device is intended only for OEM integrators under the following conditions: The transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the external antenna(s) that has been originally tested and certified with this module. As long as the conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

2.12 Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot 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 obtaining a separate FCC authorization.

ATTENTION

This device is intended only for OEM integrators under the following conditions:

- 1) Product can be installed/operated without minimum distance restrictions, and
- 2) This device and its antenna(s) must not be co-located with any other transmitters except in accordance with

FCC multi-transmitter product procedures. Referring to the multi-transmitter policy, multiple transmitter(s) and module(s) can be operated simultaneously without C2PC.

- 3) For all products market in US, OEM has to limit the operating frequency by supplied firmware programming tool.



OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

USERS MANUAL OF THE END PRODUCT:

In the user manual of the end product, the end user has to be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

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. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter. NOTE: 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.

This equipment complies with FCC RF exposure guidelines and can be installed/operated without minimum distance restrictions: use only the supplied antenna. FCC ID: 2BTX6-YW6045-01