AN214873

Bluetooth Low-Energy RF Testing Using BlueTool™

Associated Part Family: CYW20734

This document contains detailed information on using BlueTool to perform RF testing on Bluetooth Low Energy (BLE) devices.

1 About This Document

1.1 Purpose and Audience

This document shows the sequence of how CYW20734 audio packets are formated and then sent to the host. It provides details to understand the CYW20734 Bluetooth® Low Energy (BLE) audio protocol. More specifically, it is intended for hardware, design, application, and OEM engineers who is trying to implement the protocol on the host side (i.e., a TV or Set-Top Box) for a CYW20734 Bluetooth remote that supports audio.

1.2 Cypress Part Numbering Scheme

Cypress is converting the acquired IoT part numbers from Broadcom to the Cypress part numbering scheme. Due to this conversion, there is no change in form, fit, or function as a result of offering the device with Cypress part number marking. The table provides Cypress ordering part number that matches an existing IoT part number.

Table 1. Mapping Table for Part Number between Broadcom and Cypress

Broadcom Part Number	Cypress Part Number
BCM20734	CYW20734

1.3 Acronyms and Abbreviations

In most cases, acronyms and abbreviations are defined on first use. For a more complete list of acronyms and other terms used in Cypress documents, go to: http://www.cypress.com/glossary.

2 IoT Resources

Cypress provides a wealth of data at http://www.cypress.com/internet-things-iot to help you to select the right IoT device for your design, and quickly and effectively integrate the device into your design. Cypress provides customer access to a wide range of information, including technical documentation, schematic diagrams, product bill of materials, PCB layout information, and software updates. Customers can acquire technical documentation and software from the Cypress Support Community website (http://community.cypress.com/).

3 General Overview

The Cypress CYW20734 is a Bluetooth 4.1-compliant, stand-alone baseband processor with an integrated 2.4 GHz transceiver. It is the optimal solution for applications in wireless input devices including game controllers, remote, keyboards, and joysticks. Built-in firmware adheres to the Bluetooth Low Energy (BLE) profile and the BLE Human Interface Device (HID) profile.

This document shows the sequence of how CYW20734 audio packets are formated and then sent to the host.

4 Sending Audio Data to the Host

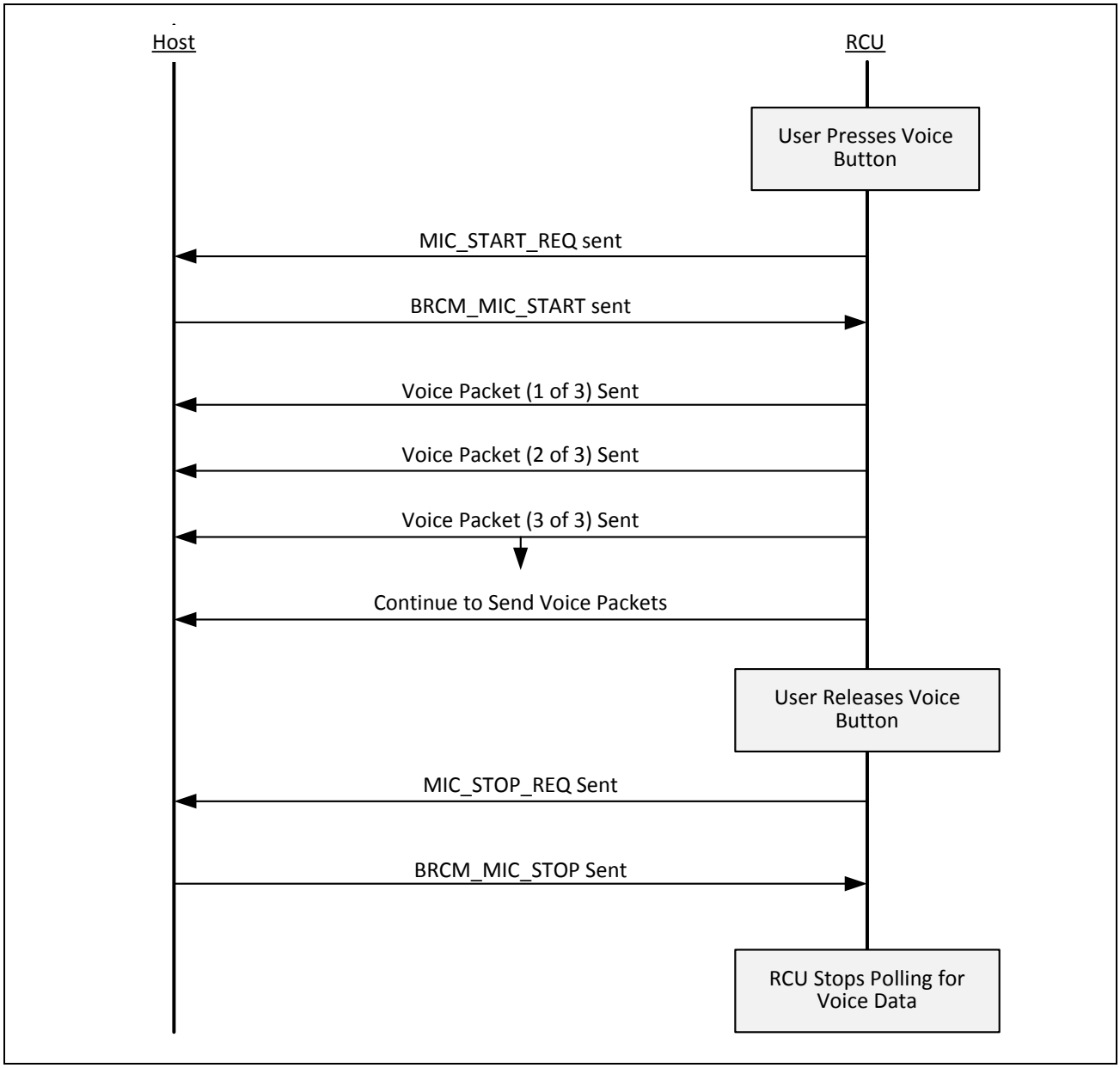
When the CYW20734 wants to send audio data to the host, it sends a Mic Start request packet. When the host receives this packet, it prepares to receive the audio and sends a Mic Start packet. When the CYW20734 receives the Mic Start packet, it encodes the audio data and continuously sends audio data to the host. When the CYW20734 is finished sending audio data, it sends a Mic Stop request packet. When host receives this packet, it sends a Mic Stop packet. When the CYW20734 receives the Mic Stop packet, it stops sending audio.

Here is a more detailed description of the sequence:

1. When audio needs to be transmitted, remote will send a audio start packet (11 bytes).
   a. Here is an example:
      0c 00 01 00 00 00 00 00 00 00 00
2. Host will send a 7-byte packet.
   a. Here is an example:
      02 00 01 00 00 00 00
      i. This is a feature report for Attribute Handle 0x79, which is a feature report.
      ii. The handle assigns 0xF8 as the report ID for this Attribute Handle.
      iii. 0x02 is BRCM_MIC_START.
3. Remote will retrieve data from microphone and encode the data into 60-byte blocks. The 60-byte blocks will be sent over three 20-byte packets until audio has stopped.
   a. Here is an example of 3 packets:
      01 08 AD 00 00 37 65 54 34 33 7D DD AD 5F 77 6B 57 DD DA D5
      F7 76 B5 7D DD AD 5F 77 6B 57 5D DA D5 A9 74 B9 29 A5 92 09
      59 6B A1 71 DD 90 B4 55 51 32 21 0A 94 77 33 12 9A DC D4 00
4. When the remote is finished sending audio, it sends audio stop packets (11 bytes)
   a. Here is an example:
      0D 00 01 00 00 00 00 00 00 00 00
5. Host will send a 7-byte packet.
   a. Here is an example:
      03 00 01 00 00 00 00
      i. 0x03 is BRCM_MIC_STOP

Figure 1 is a sequence chart of the CYW20734 sending voice data to a host.

Figure 1. CYW20734 Sending Voice Data to the Host



5 CYW20734 LE Audio Packet Formats

The following tables list the CYW20734 LE audio packet formats.

Table 2. BLE Audio Packet Format

Packet Name	Attribute Handler	Packet Size	Packet Type	Report ID
Remote Audio Control Packet	0x75	11	Input	0xf8
Remote Audio Voice Packet	0x71	20	Input	0xf7
Host Control Packet	0x79	11	Feature	0xf8

Table 3. Remote Audio Control Packet

Bytes	Packet Name	Description			
Byte 0	Report ID	f8			
Byte 1	Format	mic_start_req = 0xc	mic_start_req = 0xd		
Byte 2	Channel	Not Used			
Byte 3	RSVD	audio_mode	0 = None	1 = send msg	2 = Send PCM
Byte 4	Data Cnt[0]	Not Used			
Byte 5	Data Cnt[1]	Not Used			
Byte 6	Data Buffer[0]	Not Used			
Byte 7	Data Buffer[1]	Not Used			
Byte 8	Data Buffer[2]	Not Used			
Byte 9	Data Buffer[3]	Not Used			
Byte 10	Data Buffer[4]	Not Used			
Byte 11	Data Buffer[5]	Not Used			

Table 4. Remote Audio Voice Packet (1 of 3)

Bytes	Packet Name	Description			
Byte 0	1	–	–	–	–
Byte 1	Header	0x8	0x38	0xc8	0xf8
Bytes 2–19	Audio Data	–	–	–	–

Table 5. Remote Audio Voice Packet (2 of 3)

Bytes	Packet Name	Description			
Bytes 0–19	Audio Data	–			

Table 6. Remote Audio Voice Packet (3 of 3)

Byte	Packet Name	Description			
Bytes 0–18	Audio Data	–			
Byte 19	Padding	–			

Table 7. Host Audio Control Packet

Byte	Packet Name	Description	
Byte 0	Report ID	0xf8	–
Byte 1	Format	0x2 = Mic Start	0x3 = Mic Stop
Byte 2	Channel	Not Used	–
Byte 3	RSVD	Not Used	–
Byte 4	Data Cnt[0]	Not Used	–

Table 7. Host Audio Control Packet (Cont.)

Byte	Packet Name	Description	
Byte 5	Data Cnt[1]	Not Used	–
Byte 6	Data Buffer[0]	Not Used	–
Byte 7	Data Buffer[1]	Not Used	–
Byte 8	Data Buffer[2]	Not Used	–
Byte 9	Data Buffer[3]	Not Used	–
Byte 10	Data Buffer[4]	Not Used	–
Byte 11	Data Buffer[5]	Not Used	–

6 FAQs

Below is a list of commonly asked questions:

1. What is the audio report format?

a. The audio will be compressed into three 20-byte packets.

b. Byte 0 = Report ID

c. Byte 1 = Header

d. Byte 2 – 59 = Compressed Audio Data

e. Byte 59 = 0 (Padding)

f. Here is an example of the 3 packets sent over the air:

i.01 08 AD 00 00 37 65 54 34 33 7D DD AD 5F 77 6B 57 DD DA D5

ii.F7 76 B5 7D DD AD 5F 77 6B 57 5D DA D5 A9 74 B9 29 A5 92 09

iii.59 6B A1 71 DD 90 B4 55 51 32 21 0A 94 77 33 12 9A DC D4 00

2. Is compression used?

Yes, SBC. The audio data is compressed from x bytes to 60 bytes and sent over three 20-byte packets.

3. What is the compression rate?

4 to 1 with default encode parameters.

4. What is the rate at which the audio packets are sent?

7.5 ms with a sampling frequency of 16 kHz, a sample size of 16 bits, and a mono channel.

Document History Page

Document Title: AN214873 - Bluetooth Low-Energy RF Testing Using BlueTool™ Document Number: 002-14873				
Rev.	**ECN No.**	**Orig. of Change**	**Submission Date**	**Description of Change**
**	-	-	04/11/2016	Initial release
*A	5450806	UTSV	09/27/2016	Updated to Cypress template Added Cypress part numbering scheme
*B	5834940	BENV	07/27/2017	Updated logo and copyright

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