



AN1309: Bluetooth Low Energy Interoperability Testing Report

This document includes the results of the interoperability testing of Silicon Labs' ICs and Bluetooth Low Energy stack with Android and iOS smart phones.

The document also provides test setup details, test cases, and extension of the results based on the Bluetooth qualification of the smart phones.

KEY FEATURES

- Scan, connection, discovery, and GATT operations tested
- OTA (Over the Air) updates, Throughput and Security features also tested
- EFR32xG13, EFR32xG21 and EFR32xG22 tested
- Tested against mobile devices with both Android and iOS across various OS versions
- 2256 phones in extended list, 94 tested

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1. Test Setup

Tests were performed using Silicon Labs evaluation hardware. Each product that was tested was running functionally equivalent embedded test software. Interoperability against mobile phones running various versions of Android and iOS were tested corresponding to the test specifications listed below. The table below also provides the details of the software that was used to execute the testing. Silicon Labs developed custom applications based on the software mentioned below to execute the test cases.

Table 1.1. Setup Components

Setup Component	Version / Board
Bluetooth SDK (embedded)	3.0.2.0
EFR32 Connect	2.0.3
ERF32xG13	BRD4104A Rev A02
ERF32xG21	BRD4181A Rev A01
ERF32xG22	BRD4182A Rev B04

2. Test Environment

The overall test environment is described in the figure below.

- The Device under test (DUT) was placed about 1 m away from the mobile phone against which the tests were executed.
- The testing was conducted in a generic office environment with
 - The closest WiFi access point was about 5 m away.
 - About 15 other interferers in the 2.4 GHz spectrum were active during the testing and were randomly located in the 5m range.

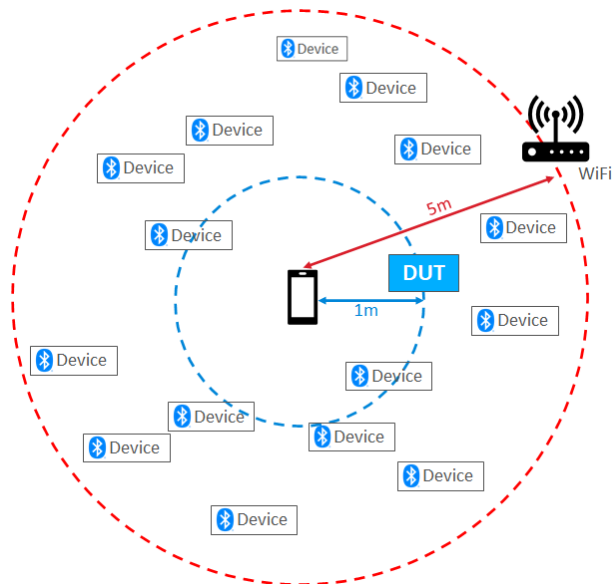


Figure 2.1. Test Environment

3. Test Case

The table below provides the details of the test cases. All of the test cases were executed using the setup described in section 2. [Test Environment](#) with multiple phones. The test cases are designed to test interoperability between the mobile phones and Bluetooth implementation of Silicon Labs only and not for other categories of testing. All of the below tests were run sequentially without breaks.

Table 3.1. Test Cases

Test ID	Test Type	Test Sub Type	Procedure
1	Bluetooth LE Scanning		Reset device, scan on phone. Pass if device is found by phone within 1000 ms from scanning start time. Maximum number of retries: 5
2	Bluetooth LE Connection		Attempt connection between phone as central and device as peripheral. Measure connection time from start to successful completion. Pass if the connection is established successfully within 1000 ms. Maximum number of retries: 5
3	Bluetooth LE Discovery		Pass if all GATT services from device under test are read by phone within 1200 ms.
4.1	GATT Operations	Read Only Length 1	<ul style="list-style-type: none"> Type = hex Length = 1 Read value = 0x55 Pass if expected value is read by phone.
4.2	GATT Operations	Read Only Length 255	<ul style="list-style-type: none"> Type = hex Length = 255 Properties = Read Value = 0-254 Pass if phone reads all 255 bytes match the value described above.
4.3	GATT Operations	Write Only Length 1	<ul style="list-style-type: none"> Type = hex Length = 1 Properties = Write Phone writes 1 byte to the characteristic with value 0. Pass if the operation does not generate an error on the phone.
4.4	GATT Operations	Write Only length 255	<ul style="list-style-type: none"> Type = hex Length = 255 Properties = Write Phone writes 255 bytes to the characteristic with value 0. Pass if the operation does not generate an error on the phone.
4.5	GATT Operations	Write Without Response Length 1	<ul style="list-style-type: none"> Type = hex Length = 1 Properties = Write Without Response Phone writes 1 byte to the characteristic with value 0. Pass if the operation does not generate an error on the phone.

Test ID	Test Type	Test Sub Type	Procedure
4.6	GATT Operations	Write Without Response Length 255	<ul style="list-style-type: none"> Type = hex Length = 255 Properties = Write Without Response <p>Phone writes 255 bytes to the characteristic with value 0.</p> <p>Pass if the operation does not generate an error on the phone.</p>
4.7	GATT Operations	Notify length 1	<ul style="list-style-type: none"> Type = hex Length = 1 Properties = Notify Value = 0x55 <p>Phone subscribes to notifications on the characteristic which shall trigger a one-shot 100 ms timer on the embedded firmware. Once the timer expires, the notification shall be sent with defined value.</p> <p>Pass if the subscription is done successfully, notification is received within 300 ms after subscribing, and the value is 0x55. Maximum number of retries: 5</p>
4.8	GATT Operations	Notify length MTU - 3	<ul style="list-style-type: none"> Type = hex Length = 255 Properties = Notify <p>Phone subscribes to indications on the characteristic which shall trigger a one-shot 100ms timer on the embedded firmware.</p> <p>Once the timer expires the indication shall be sent. The amount of bytes sent shall be MTU - 3 bytes (maximum supported by an indication) where the first byte value is 0 and the subsequent bytes will be previous one +1 (e.g., byte 0 value is 0, byte 1 value is 1,... and byte N value is N).</p> <p>Pass if the subscription is done successfully, indication is received within 300 ms after subscribing and the value matches as described above. Maximum number of retries: 5</p>
4.9	GATT Operations	Indicate Length 1	<ul style="list-style-type: none"> Type = hex Length = 1 Properties = Indicate Value = 0x55 <p>Phone subscribes to indications on the characteristic which shall trigger a one-shot 100 ms timer on the embedded firmware. Once the timer expires the indication shall be sent with defined value.</p> <p>Pass if the subscription is done successfully, indication is received within 300 ms after subscribing and the value is 0x55. Max Retries: 5 times</p>

Test ID	Test Type	Test Sub Type	Procedure
4.10	GATT Operations	Indicate length MTU - 3	<ul style="list-style-type: none"> Type = hex Length = 255 Properties = Indicate <p>Phone subscribes to indications on the characteristic which shall trigger a one-shot 100 ms timer on the embedded firmware.</p> <p>Once the timer expires the indication shall be sent. The amount of bytes sent shall be MTU - 3 bytes (maximum supported by an indication) where the first byte value is 0 and the subsequent bytes will be previous one +1 (e.g., byte 0 value is 0, byte 1 value is 1,... and byte N value is N).</p> <p>Pass if the subscription is done successfully, indication is received within 300 ms after subscribing and the value matches as described above.</p> <p>Maximum number of retries: 5</p>
5.1	Characteristic	Length 1	<ul style="list-style-type: none"> Type = hex Length = 1 Properties = Read, Write Value = 0x00 <p>Write 1 byte with value 0x55 then read value back.</p> <p>Pass if value read is 0x55.</p>
5.2	Characteristic	Length 255	<ul style="list-style-type: none"> Type = hex Length = 255 Properties = Read, Write Value = 0x00 on all bytes <p>Phone writes 255 bytes where the first byte value is 0 and the subsequent bytes will be previous one +1 (e.g., byte 0 value is 0, byte 1 value is 1,... and byte 254 value is 254). Read values back.</p> <p>Pass if all 255 bytes match the value described above.</p>
5.3	Characteristic	Length Variable 4	<ul style="list-style-type: none"> Type = hex Length = 4 Variable Length = True Properties = Read, Write Value = 0x00 (only 1 byte so that length is also 1) <p>Phone writes 1 byte with value 0x55 and read back.</p> <p>Pass if get only 1 byte with value 0x55.</p> <p>Phone writes 4 bytes with value 0x66 and read back.</p> <p>Pass if get 4 bytes with value 0x66.</p>

Test ID	Test Type	Test Sub Type	Procedure
5.4	Characteristic	Const Length 1	<ul style="list-style-type: none"> Type = hex Length = 1 Properties = Read, Write, Const Value = 0x55 <p>1: Phone reads 1 byte. Pass if the value is 0x55. 2: Phone writes value 0 Pass if ATT error code 0x03 "Write Not Permitted" is received.</p>
5.5	Characteristic	Const Length 255	<ul style="list-style-type: none"> Type = hex Length = 255 Properties = Read, Write, Const Value = The first byte value is 0 and the subsequent bytes will previous one +1 (e.g., byte 0 value is 0, byte 1 value is 1 ... and byte 254 value is 254) <p>1: Phone reads 255 byte. Pass if the value is as described above. 2: Phone writes value 0 to all bytes. Pass if ATT error code 0x03 "Write Not Permitted" is received</p>
5.6	Characteristic	User Len 1	<ul style="list-style-type: none"> Type = user Length = 1 Properties = Read, Write <p>Phone writes 1 byte with value 0x55 then reads value back. Pass if value read is 0x55.</p>
5.7	Characteristic	User Len 255	<ul style="list-style-type: none"> Type = user Length = 1 Properties = Read, Write <p>Phone writes 255 bytes where the first byte value is 0 and the subsequent bytes willprevious one +1 (e.g., byte 0 value is 0, byte 1 value is 1,... and byte 254 value is 254) Pass if value read is as described above.</p>
5.8	Characteristic	User Len Variable 4	<ul style="list-style-type: none"> Type = user Length = 4 Variable Length = True Properties = Read, Write <p>1: Phone writes 1 byte with value 0x55 and read back. Pass if get only 1 byte (so the length is 1) with value 0x55. 2: Phone writes 4 bytes with value 0x66 and read back. Pass if get 4 bytes (so the length is 4) with value 0x66.</p>

Test ID	Test Type	Test Sub Type	Procedure
6.1	OTA update	OTA update - Acknowledged write	<p>Mobile (OTA client) connects to target device with name "IOP Test"</p> <p>Mobile shows pop-up, user chooses application gbl file OR Mobile has inbuilt gbl file for updating.</p> <p>Mobile requests target device to reboot into DFU mode</p> <p>Mobile sends image to target boards with acknowledged data transfer (write)</p> <p>Upload is finished and connection closed, AppLoader on the device reboots back to normal mode</p> <p>Mobile scans and connect with target device</p> <p>Pass: there is no error in mobile side and connect to device with name "IOP Test Update" at the end which is the name in the new image.</p>
6.2	OTA update	OTA update - Unacknowledged write	<p>Mobile (OTA client) connects to target device with name "IOP Test Update"</p> <p>Mobile show pop-up, user chooses application gbl file OR Mobile has inbuilt gbl file for updating</p> <p>Mobile requests target device to reboot into DFU mode</p> <p>Mobile sends image to target boards with unacknowledged data transfer (write without response)</p> <p>Upload is finished and connection closed, AppLoader reboots back to normal mode</p> <p>Mobile scans and connect with target device</p> <p>Pass: there is no error in mobile side and connect to device with name "IOP Test" at the end.</p>
7	Throughput	Throughput - GATT Notification	<p>PHY bitrate: 1Mbps</p> <p>Connection interval request: 15 ms</p> <p>-</p> <p>Number of packets per connection interval for notification:</p> <p>Android - 6 packets.</p> <p>iOS - 4 packages [Max supported by iOS].</p> <p>The parameters are set as above and device sends the data to the mobile.- Mobile computes the throughput (Bytes/S).</p> <p>Pass if there is successful data transfer between the device and mobile.</p> <p>See section 4.3 Throughput Tests for more details.</p>

Test ID	Test Type	Test Sub Type	Procedure
8.1	Security and Encryption	Security - Pairing	<ul style="list-style-type: none">• Type = hex• Length = 1• Properties = Encrypted_Read• Value = 0x55 <p>Phone writes 1 byte to the characteristic with value 01</p> <p>Mobile changes secure mode on the device to be just works, disables bonding and disconnects with device.</p> <p>Mobile pairs with device in just works mode.</p> <p>Mobile reads a pre-set characteristic value (0x55) with encrypted read property</p> <p>Pass if there is no error and read value matches the pre-set value (0x55)</p>
8.2	Security and Encryption	Security - Authentication	<ul style="list-style-type: none">• Type = hex• Length = 1• Properties = Authenticated_Read• Value = 0x55 <p>Phone writes 1 byte to the characteristic with value 02</p> <p>Mobile changes secure mode on the device to authenticated and disconnect with device.</p> <p>Mobile pairs with device with authenticated mode by entering passkey as 123456.</p> <p>Mobile reads pre-set characteristic value (0x55) with authenticated read property.</p> <p>Pass if there is no error and read value matches the pre-set value (0x55) after pairing.</p>
8.3	Security and Encryption	Security - Bonding	<ul style="list-style-type: none">• Type = hex• Length = 1• Properties = Bonded_Read• Value = 0x55 <p>Phone writes 1 byte to the characteristic with value 03</p> <p>Mobile changes secure mode in firmware to bonded and disconnects with device.</p> <p>Mobile pairs with device with bonded mode by enter passkey is 123456.</p> <p>Mobile reads pre-set characteristic value (0x55) with bonded read property.</p> <p>Pass if there is no error and read value matches the pre-set value (0x55) after pairing.</p>

4. Test Results

4.1 Tested Phones

This section provides a list of phones and relevant information against which all the test cases mentioned in section 3. [Test Case](#) were executed.

4.1.1 Summary of Tested Phones

The table below gives a high-level view of the phones tested across iOS and Android platforms. It is to be noted that the choice of the version numbers has been made to provide a wide coverage. The earliest iOS version tested was 12.3 which was released in May 2019 and latest version is 14.4 which was released in January 2021. This included older devices like iPhone 5s which were released in 2013 upgraded to newer version of the OS. iPhone 11 pro was the latest of the iOS devices tested. Similarly, Android OS versions coverage ranged from 6.0 released in Oct 2015 to Android 10 released in Sep 2019 which at the time of testing was the latest of the generally available Android versions. The Android phones were sourced from various manufacturers across the world.

Table 4.1. Summary of Test Results

OS Platform	Number of Phones	Version Coverage
iOS	17	OS Version: 12.3, 12.4.8, 12.4.9, 13.3, 13.3.1, 13.4.1, 13.5.1, 13.6.1, 13.7, 14.2, 14.4
Android	77	OS Version: 6.0, 6.0.1, 7.0, 7.1.1, 7.1.2, 8.0.0, 8.1.0, 9, 10 API Level: 23, 24, 25, 26, 27, 28, 29

4.2 Details of Tested Phones

Notes:

1. Phone code is the code that is provided by the phone and extracted by using the specific APIs
2. For Android, the OS version is to be read as Android: <API_Level>_(<Android version>)
3. For a test to be qualified as “Pass”, the testing on all 3 SoC platforms have to pass.

Table 4.2. Tested Phones

SI No.	Device	Phone Code	OS Version	Test ID 1	Test ID 2	Test ID 3	Test ID 4.1-4.10	Test ID 5.1-5.8	Test ID 6.1-6.2	Test ID 7	Test ID 8.1-8.3
1	7 Pro	One-Plus_GM1925	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
2	8 Pro	OnePlus_IN2020	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
3	Asus nexus 7	Asus_Nexus_7	Android:23_(6.0.1)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
4	G6	LGE_LGM_G600L	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
5	Galaxy Tab A 8.0	Samsung_SM-T295	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
6	Google Pixel	Google_Pixel	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
7	Google Pixel 2	Google_Pixel_2	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
8	Google Pixel 2 XL	Google_Pixel_2_XL	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
9	Google Pixel 3	Google_Pixel_3	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
10	Google Pixel 3 XL	Google_Pixel_3_XL	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
11	Google Pixel XL	Google_Pixel_XL	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
12	Honor play	HUAWEI_COR_AL10	Android:27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
13	Huawei Enjoy 8	HUAWEI_DRA_AL00	Android:27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
14	Huawei Nova 3i	HUAWEI_INE-LX2	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
15	Huawei Nova Youth Edition	HUAWEI_WAS_AL00	Android:26_(8.0.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
16	Huawei P30 Lite	HUAWEI_MAR-LX2	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
17	Huawei Y7 Pro	HUAWEI_DUB_LX2	Android:27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
18	Huawei Y9 Prime	HUAWEI_STK-L22	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
19	LG G4	LGE_LG-H818	Android:23_(6.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
20	Mi 10 Pro	Xiaomi_Mi_10_Pro	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
21	Motorola Nexus 6	Motorola_Nexus_6	Android:25_(7.1.1)	Pass	Pass	Fail	Pass	Pass	Pass	Pass	Pass

SI No.	Device	Phone Code	OS Version	Test ID 1	Test ID 2	Test ID 3	Test ID 4.1-4.10	Test ID 5.1-5.8	Test ID 6.1-6.2	Test ID 7	Test ID 8.1-8.3
22	Nexus 5	LGE_Nexus_5	Android: 23_(6.0.1)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
23	Oppo A1k	OPPO_CPH1923	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
24	Oppo A5s	OPPO_CPH1912	Android: 27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
25	Oppo A7	OppO_CPH1905	Android: 27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
26	Oppo F11 Pro	OPPO_CPH1969	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
27	Oppo Reno	OPPO_CPH1917	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
28	P40 Pro	HUA-WEI_ELS_NX9	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
29	Redmi 4X	Xiaomi_Redmi_4X	Android: 25_(7.1.2)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
30	Redmi 5A	Xiaomi_Redmi_5A	Android: 25_(7.1.2)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
31	Redmi 5plus	Xiaomi_Redmi_5_Plus	Android: 27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
32	Redmi 6Pro	Xiaomi_Redmi_6_Pro	Android: 27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
33	Redmi 7	Xiaomi_Redmi_7	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
34	Redmi K20 pro (New)	Xiaomi_Redmi_K20_Pro_Premium_Edition	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
35	Redmi K30 Pro	Xiaomi_Redmi_K30_Pro	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
36	Redmi Note 8 (New)	Xiaomi_Redmi_Note_8	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
37	Redmi note5	Xiaomi_Redmi_Note_5	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
38	S20 Ultra	Samsung_SM-G988B	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
39	Samsung A10	Samsung_SM-A105G	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
40	Samsung A10s	Samsung_SM-A107F	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
41	Samsung A30	Samsung_SM-A305F	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
42	Samsung A51	SM-A515F	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
43	Samsung A6 Plus	Samsung_SM-A605G	Android: 26_(8.0.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
44	Samsung A7 (2017)	Samsung_SM-A750GN	Android: 26_(8.0.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
45	Samsung A70	Samsung_SM-A705F	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

SI No.	Device	Phone Code	OS Version	Test ID 1	Test ID 2	Test ID 3	Test ID 4.1-4.10	Test ID 5.1-5.8	Test ID 6.1-6.2	Test ID 7	Test ID 8.1-8.3
46	Samsung A80	Samsung_SM-A805F	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
47	Samsung A9	Samsung_SM-A920F	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
48	Samsung J5(2016)	Samsung_SM-J510FN	Android:25_(7.1.1)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
49	Samsung J7 (2016)	Samsung_SM-J710F	Android:23_(6.0.1)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
50	Samsung M20	Samsung_SM-M205G	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
51	Samsung Note 8	Samsung_SM-N950F	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
52	Samsung Note 9	Samsung_SM-N960F	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
53	Samsung S10 Plus	Samsung_SM-G975F	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
54	Samsung S7	Samsung_SM-G930F	Android:26_(8.0.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
55	Samsung S7 Edge	Samsung_SM-G935F	Android:26_(8.0.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
56	Samsung S8	Samsung_SM-G950F	Android:26_(8.0.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
57	Samsung S8 Plus	Samsung_SM-G955F	Android:26_(8.0.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
58	V20	LGE_VS995	Android:24_(7.0)	Pass	Fail	Pass	Pass	Pass	Pass	Pass	Pass
59	V30	LGE_LG-H931	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
60	Xiao Mi 9	Xiaomi_MI_9	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
61	Xiao Mi 9T	Xiaomi_MI_9T	Android:29_(10)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
62	Xiao Mi A2 LITE	Xiao-mi_MI_A2_Lite	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
63	Xiaomi 6	Xiaomi_MI_6	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
64	Xiaomi 6X	Xiaomi_MI_6X	Android:27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
65	Xiaomi 8	Xiaomi_MI_8	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
66	Xiaomi 9 Pro (New)	Xiao-mi_MI9_Pro_5G	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
67	Xiaomi 9SE	Xiaomi_MI_9_SE	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
68	Xiaomi max2	Xiao-mi_MI_MAX_2	Android:25_(7.1.1)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
69	Xiaomi max3	Xiao-mi_MI_MAX_3	Android:27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
70	Xiaomi Mi 8 Lite	Xiaomi_MI_8_Lite	Android:27_(8.1.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
71	Xiaomi Mi A2	Xiaomi_MI_A2	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

SI No.	Device	Phone Code	OS Version	Test ID 1	Test ID 2	Test ID 3	Test ID 4.1-4.10	Test ID 5.1-5.8	Test ID 6.1-6.2	Test ID 7	Test ID 8.1-8.3
72	Xiaomi Mi A3	Xiaomi_Mi_A3	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
73	Xiaomi MIX 3	Xiao-mi_Mi_MIX_3_5G	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
74	Xiaomi MIX2S	Xiaomi_MIX_2S	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
75	Xiaomi Note 4	Xiaomi_Red-mi_Note_4	Android:23_(6.0)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
76	Xiaomi Redmi 7A	Xiaomi_Red-mi_7A	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
77	Xiaomi Redmi Note 7	Xiaomi_Red-mi_Note_7	Android:28_(9)	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
78	iPhone 8 Plus	iPhone 8 Plus	iOS 14.2	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
79	iPhone 5S	iPhone 5S	iOS 12.4.9	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
80	iPhone 6	iPhone 6	iOS 12.4.8	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
81	iPhone X	iPhone X	IOS 13.6.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
82	iPhone 7 Plus	iPhone 7 Plus	iOS 14.4	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
83	iPhone Xs	iPhone Xs	IOS 13.5.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
84	iPhone 8	iPhone 8	iOS 14.2	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
85	iPhone 6 Plus	iPhone 6 Plus	iOS 12.4.8	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
86	iPhone 7	iPhone 7	iOS 13.3	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
87	iPhone 6s	iPhone 6S	iOS 13.7	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
88	iPhone SE	iPhone SE (2nd generation)	iOS 13.5.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
89	11 Pro	iPhone 11 Pro	iOS 14.2	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
90	iPad Mini 5	iPad mini (5th generation)	iOS 13.4.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
91	iPad 2019	iPad (7th generation)	iOS 13.4.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
92	iPad Air 3	iPad Air(3rd generation)	iOS 13.3.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
93	iPad Pro 11 2020	iPAD 11 Pro	iOS 13.5.1	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
94	iPhone Xs Max	iPhone XS Max	iOS 12.3	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

4.3 Throughput Tests

The tables below represent the throughput test results across various SoC platforms that were tested. Note that the throughput depends on various factors that are dependent on the phone including the below key ones.

1. Bluetooth version number – v4.0 and 4.1 support lower PUD size (27 bytes) vs 4.2 and above (251 bytes)
2. Packets per connection interval – The max supported by iOS is 4 and that by Android is 6
3. Radio performance.

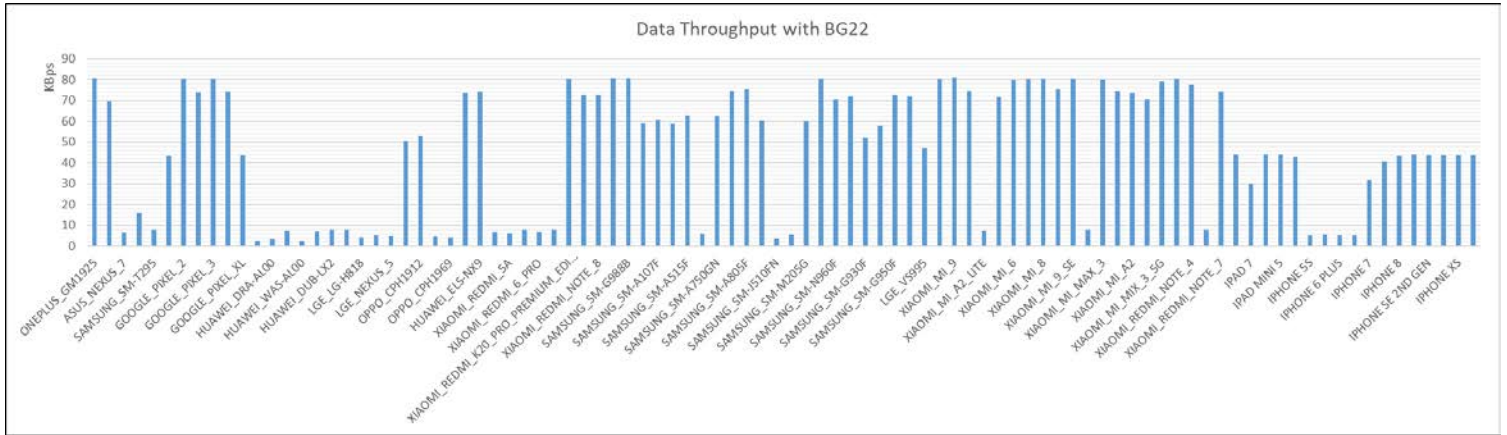


Figure 4.1. Data Throughput on BG22

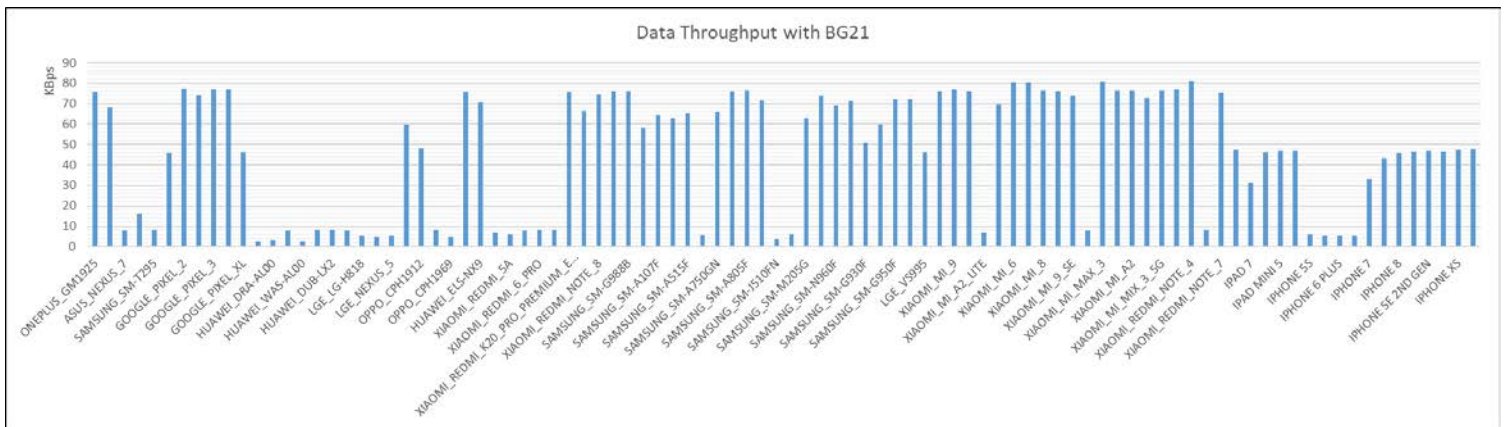


Figure 4.2. Data Throughput on BG21

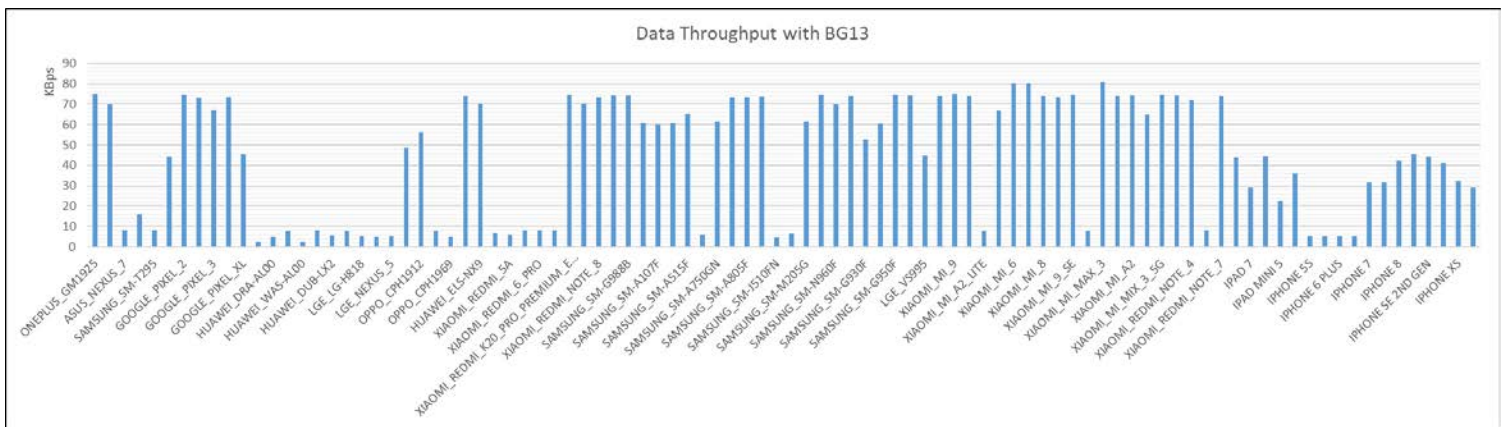


Figure 4.3. Data Throughput on BG13

4.4 Extended Set of Phones

While the testing was done on a limited set of phones, the results can be extended to infer wider interoperability considering the overall system architecture and the Bluetooth qualification process.

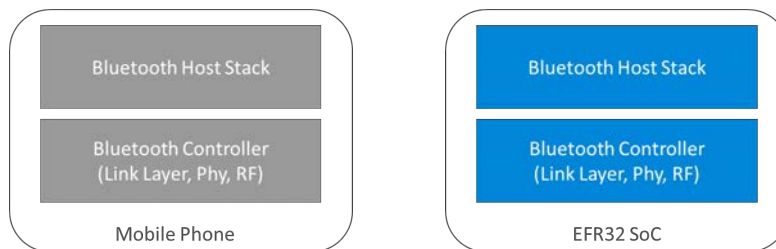


Figure 4.4. High Level Architecture of the System

The figure above provides a high-level architecture of the different components used in the testing on the mobile phones and on the EFR32 SoCs.

When testing with different mobile phones the components which vary across the phones are the Bluetooth Controller and Bluetooth Host Stack on the mobile phones. The Bluetooth qualification process states that “If an organization produces more than one product that incorporates the same Bluetooth design, those additional products can be listed within the same qualification at no additional cost” [1.]. This is utilized by several companies to qualify different models of the mobile phones using the same qualification ID when the Bluetooth design is the same. With reference to the figure above, Bluetooth design refers to the combination of Controller and Host Stack.

Combining the architecture and qualification process, it can be inferred with high level of confidence that mobile phones which share the same qualification ID of the phones against which testing is done will exhibit the same behavior and hence the same level of interoperability.

The table below provides a list of 2,256 devices arranged by the qualification ID that they share with one of the phones that has been tested with.

Table 4.3. Extended Phone List

Phone code	OS version	Qualification Reference	Models with Shared Qualification
OnePlus_GM1925	Android_SDK:_28_(9)	128467 - End Product	OnePlus 7 Pro, GM1915 OnePlus 7 Pro, GM1913 OnePlus 7 Pro, GM1917 OnePlus 7 Pro 5G, GM1920 OnePlus 7 Pro 5G, GM1925 OnePlus 7 Pro, GM1911 OnePlus 7 Pro, GM1910 OnePlus 7, GM1900 OnePlus 7, GM1903 OnePlus 7, GM1901
OnePlus_IN2020	Android_SDK:_29_(10)	144662 - End Product	Smart Phone, IN2017 OnePlus 8 5G UW, IN2019 OnePlus 8, IN2015 OnePlus 8, IN2013 OnePlus 8, IN2010 OnePlus 8, IN2011 OnePlus 8 Pro, IN2020 OnePlus 8 Pro, IN2021 OnePlus 8 Pro, IN2023 OnePlus 8 Pro, IN2025
Asus_Nexus_7	An-droid_SDK:_23_(6.0.1)	None	

Phone code	OS version	Qualification Reference	Models with Shared Qualification
LGE_LGM_G600L	Android_SDK:_28_(9)	92094 - End Product	LG Mobile Phone, LGM-G600L LG Mobile Phone, LGM-G600K LG Mobile Phone, LGM-G600S LG Mobile Phone, LGM-G600LR LG Mobile Phone, LGM-G600SR LG Mobile Phone, LGM-G600KR LG Mobile Phone, LGM-G600LP LG Mobile Phone, LGM-G600SP LG Mobile Phone, LGM-G600KP
Samsung_SM-T295	Android_SDK:_28_(9)	134106 - End Product	Galaxy Tab A, SM-T295 Galaxy Tab A, SM-T295N Galaxy Tab A, SM-T297 Galaxy Tab A, SM-T295C Galaxy Tab A, SM-T290
Google_Pixel	Android_SDK:_28_(9)	85767 - End Product	Pixel, Pixel Pixel XL, Pixel XL
Google_Pixel_2	Android_SDK:_29_(10)	98278 - End Product	Pixel 2, G011A
Google_Pixel_2_XL	Android_SDK:_28_(9)	98638 - End Product	LG Mobile Phone, G011C
Google_Pixel_3	Android_SDK:_29_(10)	111802 - Controller Subsystem 115459 - Host Subsystem	Pixel 3, G013A Pixel 3, G013B Pixel 3 XL, G013C Pixel 3 XL, G013D
Google_Pixel_3_XL	Android_SDK:_29_(10)	122387 - Profile Subsystem 111802 - Controller Subsystem 115459 - Host Subsystem	Pixel 3a XL, G020A G020B G020C G020D Pixel 3a, G020E G020F G020G G020H
Google_Pixel_XL	Android_SDK:_29_(10)	85767 - End Product	Pixel, Pixel Pixel XL, Pixel XL

Phone code	OS version	Qualification Reference	Models with Shared Qualification
			COL-AL10, COL-AL10 COL-AL00, COL-AL00 COL-TL10, COL-TL10 COL-TL00, COL-TL00 COL-L29, COL-L29 Smart Phone,Honor, COR-TL00 Smart Phone,Honor, COR-AL00 Smart Phone,Honor, COR-AL10 Smart Phone,Honor, COR-L29 Smart Phone, HUAWEI, PAR-AL00 Smart Phone, HUAWEI, PAR-TL00 Smart Phone, HUAWEI, PAR-LX1 Smart Phone, HUAWEI, PAR-LX9 Smart Phone, HUAWEI, PAR-LX1M Smart Phone, HUAWEI, PAR-TL20 Smart Phone, HUAWEI, INE-AL00 Smart Phone, HUAWEI, INE-TL00 Smart Phone, HUAWEI, SNE-AL00 Smart Phone, HUAWEI, INE-LX1 Smart Phone, HUAWEI, INE-LX2 Smart Phone, HUAWEI, SNE-LX1 Smart Phone, HUAWEI, SNE-LX2 Smart Phone, HUAWEI, SNE-LX3 Smart Phone, HUAWEI, JKM-LX1 Smart Phone, HUAWEI, JKM-LX2 Smart Phone, HUAWEI, JKM-LX3 Smart Phone, HUAWEI, JKM-TL00 Smart Phone, HUAWEI, JKM-AL00 Smart Phone, HUAWEI, JKM-AL00a Smart Phone, HUAWEI, JKM-AL00b Smart Phone, HONOR, JSN-AL00 Smart Phone, HONOR, JSN-AL00a Smart Phone, HONOR, JSN-TL00 Smart Phone, HONOR, JSN-L21 Smart Phone, HONOR, JSN-L22 Smart Phone, HONOR, JSN-L42 Smart Phone, HONOR, JSN-L23 Smart Phone, HUAWEI, INE-LX2r Smart Phone, HUAWEI, INE-LX1r

Phone code	OS version	Qualification Reference	Models with Shared Qualification
HUAWEI_DRA_AL00	An-droid_SDK:_27_(8.1.0)	101927 - Host Subsystem 67572 - Controller Subsystem 96540 - Profile Subsystem 104712 - Profile Subsystem	DRA-LX2, DRA-LX2 DRA-TL00, DRA-TL00 DRA-AL00, DRA-AL00 DUA-AL00, DUA-AL00 DUA-TL00, DUA-TL00 DRA-L01, DRA-L01 DRA-L21, DRA-L21 DRA-LX3, DRA-LX3 DUA-L22, DUA-L22 DUA-LX3, DUA-LX3 BG2-W09, BG2-W09 Smart Phone, HUAWEI, DRA-LX5 Smart Phone, HONOR, DUA-L32 HUAWEI/HONOR Smart Phone, DUA-LX5

Phone code	OS version	Qualification Reference	Models with Shared Qualification
			COL-AL10, COL-AL10 COL-AL00, COL-AL00 COL-TL10, COL-TL10 COL-TL00, COL-TL00 COL-L29, COL-L29 Smart Phone,Honor, COR-TL00 Smart Phone,Honor, COR-AL00 Smart Phone,Honor, COR-AL10 Smart Phone,Honor, COR-L29 Smart Phone, HUAWEI, PAR-AL00 Smart Phone, HUAWEI, PAR-TL00 Smart Phone, HUAWEI, PAR-LX1 Smart Phone, HUAWEI, PAR-LX9 Smart Phone, HUAWEI, PAR-LX1M Smart Phone, HUAWEI, PAR-TL20 Smart Phone, HUAWEI, INE-AL00 Smart Phone, HUAWEI, INE-TL00 Smart Phone, HUAWEI, SNE-AL00 Smart Phone, HUAWEI, INE-LX1 Smart Phone, HUAWEI, INE-LX2 Smart Phone, HUAWEI, SNE-LX1 Smart Phone, HUAWEI, SNE-LX2 Smart Phone, HUAWEI, SNE-LX3 Smart Phone, HUAWEI, JKM-LX1 Smart Phone, HUAWEI, JKM-LX2 Smart Phone, HUAWEI, JKM-LX3 Smart Phone, HUAWEI, JKM-TL00 Smart Phone, HUAWEI, JKM-AL00 Smart Phone, HUAWEI, JKM-AL00a Smart Phone, HUAWEI, JKM-AL00b Smart Phone, HONOR, JSN-AL00 Smart Phone, HONOR, JSN-AL00a Smart Phone, HONOR, JSN-TL00 Smart Phone, HONOR, JSN-L21 Smart Phone, HONOR, JSN-L22 Smart Phone, HONOR, JSN-L42 Smart Phone, HONOR, JSN-L23 Smart Phone, HUAWEI, INE-LX2r Smart Phone, HUAWEI, INE-LX1r

Phone code	OS version	Qualification Reference	Models with Shared Qualification
HUAWEI_WAS_AL00	An-droid_SDK:_26_(8.0.0)	80373 - End Product	, HUAWEI VNS-L31 , HUAWEI VNS-L21 , HUAWEI VNS-L22 , HUAWEI VNS-L23 , HUAWEI VNS-L53 , NEM-AL10 , NEM-TL00 , NEM-TL00H , NEM-UL10 , HUAWEI NMO-L21 , NMO-L21 , HUAWEI NMO-L31 , NMO-L31 , NEM-L21 , NEM-L51 , HUAWEI NMO-L22 , NMO-L22 , NEM-L22 , HUAWEI NMO-L23 , NMO-L23 BTV-DL09, BTV-DL09 BTV-W09, BTV-W09 BLL-L21, BLL-L21 BLL-L22, BLL-L22 BLL-L23, BLL-L23 BLN-AL10, BLN-AL10 BLN-L21, BLN-L21 BLN-L22, BLN-L22 BLN-L24, BLN-L24 BLN-TL00, BLN-TL00 BLN-TL10, BLN-TL10 VEN-L22, VEN-L22 d-01J, d-01J BLN-AL20, BLN-AL20 PRA-LX1, PRA-LX1 PRA-LA1, PRA-LA1 PRA-LX2, PRA-LX2 PRA-LX3, PRA-LX3 PRA-AL00, PRA-AL00 PRA-AL00X, PRA-AL00X PRA-TL10, PRA-TL10 WAS-L03T, WAS-L03T WAS-LX1, WAS-LX1 WAS-LX1A, WAS-LX1A WAS-LX2, WAS-LX2 WAS-LX2J, WAS-LX2J WAS-LX3, WAS-LX3 WAS-AL00, WAS-AL00 WAS-TL10, WAS-TL10 BLN-AL30, BLN-AL30 BLN-AL40, BLN-AL40 608HW, 608HW BND-AL10, BND-AL10 BND-TL10, BND-TL10 BND-L21, BND-L21 BND-L24, BND-L24 BND-AL00, BND-AL00 BND-L31, BND-L31 BND-L34, BND-L34

Phone code	OS version	Qualification Reference	Models with Shared Qualification
			COL-AL10, COL-AL10 COL-AL00, COL-AL00 COL-TL10, COL-TL10 COL-TL00, COL-TL00 COL-L29, COL-L29 Smart Phone,Honor, COR-TL00 Smart Phone,Honor, COR-AL00 Smart Phone,Honor, COR-AL10 Smart Phone,Honor, COR-L29 Smart Phone, HUAWEI, PAR-AL00 Smart Phone, HUAWEI, PAR-TL00 Smart Phone, HUAWEI, PAR-LX1 Smart Phone, HUAWEI, PAR-LX9 Smart Phone, HUAWEI, PAR-LX1M Smart Phone, HUAWEI, PAR-TL20 Smart Phone, HUAWEI, INE-AL00 Smart Phone, HUAWEI, INE-TL00 Smart Phone, HUAWEI, SNE-AL00 Smart Phone, HUAWEI, INE-LX1 Smart Phone, HUAWEI, INE-LX2 Smart Phone, HUAWEI, SNE-LX1 Smart Phone, HUAWEI, SNE-LX2 Smart Phone, HUAWEI, SNE-LX3 Smart Phone, HUAWEI, JKM-LX1 Smart Phone, HUAWEI, JKM-LX2 Smart Phone, HUAWEI, JKM-LX3 Smart Phone, HUAWEI, JKM-TL00 Smart Phone, HUAWEI, JKM-AL00 Smart Phone, HUAWEI, JKM-AL00a Smart Phone, HUAWEI, JKM-AL00b Smart Phone, HONOR, JSN-AL00 Smart Phone, HONOR, JSN-AL00a Smart Phone, HONOR, JSN-TL00 Smart Phone, HONOR, JSN-L21 Smart Phone, HONOR, JSN-L22 Smart Phone, HONOR, JSN-L42 Smart Phone, HONOR, JSN-L23 Smart Phone, HUAWEI, INE-LX2r Smart Phone, HUAWEI, INE-LX1r

Phone code	OS version	Qualification Reference	Models with Shared Qualification
			LDN-L01, LDN-L01 LDN-L21, LDN-L21 LDN-LX2, LDN-LX2 LDN-LX3, LDN-LX3 LDN-TL10, LDN-TL10 LND-AL30, LND-AL30 LND-AL40, LND-AL40 LND-L29, LND-L29 LND-TL30, LND-TL30 LND-AL50, LND-AL50 LND-TL40, LND-TL40 LDN-AL10, LDN-AL10 LND-TL50, LND-TL50 LDN-AL00, LDN-AL00 LDN-AL20, LDN-AL20 LDN-TL00, LDN-TL00 LDN-TL20, LDN-TL20 AUM-AL20, AUM-AL20 AUM-AL00, AUM-AL00 AUM-TL00, AUM-TL00 AUM-TL20, AUM-TL20 ATU-AL10, ATU-AL10 ATU-TL10, ATU-TL10 ATU-L11, ATU-L11 ATU-L21, ATU-L21 ATU-L31, ATU-L31 ATU-L22, ATU-L22 ATU-L42, ATU-L42 ATU-LX3, ATU-LX3 AUM-L29, AUM-L29 AUM-L41, AUM-L41 AUM-L33, AUM-L33 Smart Phone, HONOR, BKK-AL10 Smart Phone, HONOR, BKK-AL00 Smart Phone, HONOR, BKK-TL00 Smart Phone, HONOR, BKK-L21 Smart Phone, HUAWEI, DUB-AL00 Smart Phone, HUAWEI, DUB-AL20 Smart Phone, HUAWEI, DUB-TL00 Smart Phone, HUAWEI, DUB-TL20 Smart Phone, HUAWEI, DUB-LX1 Smart Phone, HUAWEI, DUB-LX2 Smart Phone, HUAWEI, DUB-LX3 Smart Phone, HONOR, BKK-LX2 Smart Phone, HUAWEI, DUB-TL00a Smart Phone, HUAWEI, DUB-AL00a Smart Phone, HONOR, BKK-AL20 Smart Phone, HUAWEI, DUB-AL10a Smart Phone, HUAWEI, DUB-

Phone code	OS version	Qualification Reference	Models with Shared Qualification
LGE_LG-H818	Android_SDK:_23_(6.0)	66928 - End Product	LG-PFM LG-VS986 LG-F500L LG-F500S LG-F500K LGLS991 LG-US991 LG-H818 LG-PFM_Subset LG-H815P LG-H815AR LG-H815TR LG-H815L LG-H815K LG-H818N LG-H818P LG-H815 LG-VS986W LG-AS986 LG-AS991 LG-H819 LG-H815T LG-VS986B LG-VS986LD LG-VS986LE LG-H815PX
Xiaomi_Mi_10_Pro	Android_SDK:_29_(10)	146349 - End Product	Mi 10, M2001J2G Mi 10, M2001J2E Mi 10, M2001J2C Mi 10, M2001J2I Mi 10 Pro, M2001J1E Mi 10 Pro, M2001J1C Mi 10 Pro, M2001J1G Mi 10 Ultra, M2007J1SC
OPPO_CPH1923	Android_SDK:_28_(9)	Not Available to Silicon Labs	
OPPO_CPH1912	An- droid_SDK:_27_(8.1.0)	128457 - End Product	OPPO Mobile Phone, CPH1920 AX5s, CPH1920 A5s, CPH1910 A5s, CPH1909 A5s, CPH1912 A7n, PCDT00 A7n, PCDM00 A9, PCAT10 A9, PCAM10 A9x, PCET00 A9x, PCEM00 F11, CPH1911 F11, CPH1913 F11, CPH1915 F11, CPH1916
OppO_CPH1905	An- droid_SDK:_27_(8.1.0)	119078 - End Product	OPPO Mobile Phone, CPH1903 A7, CPH1901 AX7 A7, CPH1903 A7, PBFT00 A7, PBFM00 A7, CPH1905
OPPO_CPH1987	Android_SDK:_28_(9)	Not Available to Silicon Labs	

Phone code	OS version	Qualification Reference	Models with Shared Qualification
OPPO_CPH1917	Android_SDK:_29_(10)	128024 - End Product	OPPO Mobile Phone , CPH1917 Reno, PCAM00 Reno, CPH1917 Reno, PCAT00 K3, PCGM00 K3, CPH1955 K3, PCGT00
HUAWEI_ELS_NX9	Android_SDK:_29_(10)	138868 - Host Subsystem 137431 - Controller Subsystem 140076 - Profile Subsystem	https://launchstudio.bluetooth.com/ListingDetails/96444
Xiaomi_Redmi_5_Plus	Android_SDK:_27_(8.1.0)	107188 - Controller Subsystem 86918 - Host Subsystem	Xiaomi Redmi 5 Plus, MEG7 Xiaomi Redmi 5 Plus, MEE7 Xiaomi Redmi 5 Plus, MET7
Xiaomi_Redmi_6_Pro	Android_SDK:_27_(8.1.0)	112808 - End Product	Redmi Note 5, M1803E7SG Redmi Note 5, M1803E7SH Redmi Note 6 Pro, M1806E7TH Redmi Note 6 Pro, M1806E7TG
Xiaomi_Redmi_7	Android_SDK:_28_(9)	127108 - End Product	Xiaomi Redmi 7, M1810F6LG Xiaomi Redmi 7, M1810F6LH Xiaomi Redmi 7, M1810F6G
Xiaomi_Redmi_K20_Pro_Premium_Edition	Android_SDK:_29_(10)	134727 - Controller Subsystem 114535 - Host Subsystem	MI 9T Pro, M1903F11G
Xiaomi_Redmi_K30_Pro	Android_SDK:_29_(10)	147004 - End Product	POCO F2 Pro, M2004J11G Redmi K30 Pro 5G, M2001J11E Redmi K30 Pro 5G/Redmi K30 Pro 5G Zoom Edition, M2001J11I Redmi K30 Pro 5G, M2001J11C
Xiaomi_Redmi_Note_8	Android_SDK:_28_(9)	137555 - End Product	Redmi Note8, M1908C3JG Redmi Note8, M1908C3JH
Xiaomi_Redmi_Note_5	Android_SDK:_28_(9)	112808 - End Product	Redmi Note 5, M1803E7SG Redmi Note 5, M1803E7SH Redmi Note 6 Pro, M1806E7TH Redmi Note 6 Pro, M1806E7TG
Samsung_SM-G988B	Android_SDK:_29_(10)	158725 - End Product 156360 - Profile Subsystem 156361 - Profile Subsystem 156364 - Profile Subsystem 156367 - Profile Subsystem 156366 - Profile Subsystem 156362 - Profile Subsystem 156363 - Profile Subsystem	Galaxy S20 Ultra 5G, SM-G988B_DS
Samsung_SM-A105G	Android_SDK:_29_(10)	126589 - Host Subsystem 100088 - Controller Subsystem 124964 - Profile Subsystem	Galaxy A10, SM-A105F Galaxy A10, SM-A105F_DS Galaxy A10, SM-A105M_DS Galaxy A10, SM-A105G_DS Galaxy A10, SM-A105G Galaxy A10, SM-A105M Galaxy A10, SM-A105N Galaxy A10, SM-A105FN_DS

Phone code	OS version	Qualification Reference	Models with Shared Qualification
Samsung_SM-A107F	Android_SDK:_28_(9)	135247 - End Product	Galaxy A10s, SM-A107F_DS Galaxy A10s, SM-A107M_DS Galaxy A10s, SM-A107F Galaxy A10s, SM-A107M Galaxy M01s, SM-M017F_DS
Samsung_SM-A305F	Android_SDK:_28_(9)	123890 - Host Subsystem 100088 - Controller Subsystem 124964 - Profile Subsystem	Galaxy-A30, SM-A305F Galaxy-A30, SM-A305G Galaxy-A30, SM-A305GN Galaxy-A30, SM-A305N Galaxy-A30, SM-A305F_DS Galaxy-A30, SM-A305FN_DS Galaxy-A30, SM-A305GN_DS Galaxy-A30, SM-A305GT_DS Galaxy-A30, SM-A305G_DS Galaxy-A30, SM-A305FN Galaxy-A30, SM-A305YN
Samsung_SM-A505F	Android_SDK:_28_(9)	123895 - End Product 124964 - Profile Subsystem	Galaxy-A50 , SM-A505FN Galaxy-A50, SM-A505GT_DS Galaxy-A50, SM-A505GN_DS Galaxy-A50, SM-A505G_DS Galaxy-A50, SM-A505FN_DS Galaxy-A50, SM-A505FM_DS Galaxy-A50, SM-A505F_DS Galaxy-A50, SM-A505G Galaxy-A50, SM-A505X Galaxy-A50, SM-A505GN Galaxy-A50, SM-A505F Galaxy-A50, SM-A505U Galaxy-A50, SM-A505FN Galaxy-A50, SM-A505YN Galaxy-A50, SM-A505W Galaxy-A50, SM-A505N Galaxy-A50, SM-S506DL Galaxy-A50, SM-A505U1
SM-A515F	Android_SDK:_29_(10)	141913 - End Product 141230 - Profile Subsystem 141221 - Profile Subsystem 124964 - Profile Subsystem 141223 - Profile Subsystem 141224 - Profile Subsystem 141225 - Profile Subsystem 141226 - Profile Subsystem 141234 - Profile Subsystem 141232 - Profile Subsystem 141233 - Profile Subsystem	Galaxy-A51, SM-A515F_N Galaxy-A51, SM-A515F Galaxy-A51, SM-A515F_DS Galaxy-A51, SM-A515F_DSM Galaxy-A51, SM-A515F_DSN Galaxy-A51, SM-A515F_DST Galaxy-A51, SM-A515X

Phone code	OS version	Qualification Reference	Models with Shared Qualification
Samsung_SM-A605G	Android_SDK:_26_(8.0.0)	110962 - End Product	Galaxy-A6-Plus , SM-A605FN Galaxy-A6-Plus , SM-A605FN_DS Galaxy-A6-Plus, SM-A605F_DS Galaxy-A6-Plus, SM-A605G_DS Galaxy-A6-Plus, SM-A605GN_DS Galaxy-A6-Plus, SM-A6050 Galaxy-A6-Plus, SM-A6058 Galaxy-A6-Plus, SM-A605G Galaxy-A6-Plus, SM-A605F Galaxy-A6-Plus, SM-A605GN Galaxy-A6-Plus, SM-A605X Galaxy-A6-Plus, SM-A605XC Galaxy-A6-Plus, SM-A605FN Galaxy-A6-Plus , SM-A605K
Samsung_SM-A750GN	Android_SDK:_26_(8.0.0)	117674 - Host Subsystem 100088 - Controller Subsystem	Galaxy A7 2018, SM-A750FN Galaxy A7 2018, SM-A750N Galaxy-A7-2018, SM-A750F_DS Galaxy-A7-2018, SM-A750FN_DS Galaxy-A7-2018, SM-A750G_DS Galaxy-A7-2018, SM-A750GN_DS Galaxy-A7-2018, SM-A750GN Galaxy-A7-2018, SM-A750G Galaxy-A7-2018, SM-A750F Galaxy-A7-2018, SM-A750X
Samsung_SM-A705F	Android_SDK:_28_(9)	126131 - End Product 124964 - Profile Subsystem	Galaxy-A70 , SM-A705FN Galaxy-A70, SM-A705GM Galaxy-A70, SM-A705FN_DSM Galaxy-A70, SM-A705X Galaxy-A70, SM-A7050 Galaxy-A70, SM-A705FN_DS Galaxy-A70, SM-A705XC Galaxy-A70, SM-A705W Galaxy-A70, SM-A705MN Galaxy-A70, SM-A705F Galaxy-A70, SM-A705F_DS Galaxy-A70, SM-A705MN_DS Galaxy-A70, SM-A705GM_DS Galaxy-A70, SM-A705YN
Samsung_SM-A805F	Android_SDK:_28_(9)	129305 - End Product 124964 - Profile Subsystem	Samsung Mobile Phone, SM-A805F Galaxy A80, SM-A805F_DS Galaxy A80, SM-A805F Galaxy A80, SM-A805F_DSM Galaxy A80, SM-A805N Galaxy A80, SM-A805X Galaxy A80, SM-A805XC Galaxy A80, SM-A8050
Samsung_SM-A920F	Android_SDK:_29_(10)	124417 - End Product 124964 - Profile Subsystem	Galaxy A9 2018, SM-A920F Galaxy A9 2018, SM-A920N Galaxy A9 2018, SM-A920F_DS
Samsung_SM-J510FN	Android_SDK:_25_(7.1.1)	100952 - End Product	SM-J510FN, SM-J510FN SM-J510H_DS, SM-J510H_DS Galaxy-J5, SM-J510H_DS Galaxy-J5, SM-J510FN

Phone code	OS version	Qualification Reference	Models with Shared Qualification
Samsung_SM-J710F	Android_SDK:_23_(6.0.1)	100611 - End Product	SM-J710FN, SM-J710FN SM-J710MN, SM-J710MN SM-J710F_DS, SM-J710F_DS SM-J710F, SM-J710F SM-J710FQ, SM-J710FQ SM-J710FN_DS, SM-J710FN_DS SM-J710GN, SM-J710GN SM-J710K, SM-J710K
Samsung_SM-M205G	Android_SDK:_28_(9)	121921 - Host Subsystem 100088 - Controller Subsystem	Galaxy-M20, SM-M205F Galaxy-M20, SM-M205F_DS Galaxy-M20, SM-M205FN_DS Galaxy-M20, SM-M205G_DS Galaxy-M20, SM-M205M_DS Galaxy-M20, SM-M205M
Samsung_SM-N950F	Android_SDK:_28_(9)	124394 - End Product 124964 - Profile Subsystem	Galaxy Note 8, SM-N950F
Samsung_SM-N960F	Android_SDK:_29_(10)	123909 - Profile Subsystem 116457 - End Product	Samsung Mobile Phone , SM-N960F
Samsung_SM-G975F	Android_SDK:_29_(10)	121766 - End Product	Samsung Mobile Phone , SM-G405F_DS Samsung Mobile Phone, SM-G405X Samsung Mobile Phone, SM-G405F Samsung Mobile Phone, SM-G405XN Samsung Mobile Phone, SM-G405N Galaxy S10+, SM-G975X Galaxy S10+, SM-G975F_DS Galaxy S10+, SM-G975F Galaxy S10+, SM-G975XN Galaxy S10+, SM-G975N
SM-G970F	Android_SDK:_29_(10)	122960 - End Product	Samsung Mobile Phone, SM-G400F Samsung Mobile Phone, SM-G400N Samsung Mobile Phone, SM-G400XN Samsung Mobile Phone, SM-G400X Samsung Mobile Phone, SM-G400F_DS Galaxy S10e, SM-G970N Galaxy S10e, SM-G970F Galaxy S10e, SM-G970XN Galaxy S10e, SM-G970X Galaxy S10e, SM-G970F_DS
Samsung_SM-G930F	Android_SDK:_26_(8.0.0)	110193 - End Product	Samsung Galaxy S7, SM-G930F Samsung Galaxy S7, SM-G930L Samsung Galaxy S7, SM-G930S Samsung Galaxy S7, SM-G930K Samsung Galaxy S7, SM-G930W8

Phone code	OS version	Qualification Reference	Models with Shared Qualification
Samsung_SM-G935F	Android_SDK:_26_(8.0.0)	110511 - End Product	Galaxy S7 Edge, SM-G935F Galaxy S7 Edge, SM-G935K Galaxy S7 Edge, SM-G935L Galaxy S7 Edge, SM-G935S Galaxy S7 Edge, SM-G935W8
Samsung_SM-G950F	Android_SDK:_26_(8.0.0)	123982 - End Product	Galaxy S8, SM-G950F
Samsung_SM-G955F	Android_SDK:_26_(8.0.0)	124224 - End Product	Galaxy S8+, SM-G955F
LGE_VS995	Android_SDK:_24_(7.0)	85177 - End Product	LG-VS995, LG-VS995 LG-H910, LG-H910 LG-LS997, LG-LS997 LG-H990T, LG-H990T LG-H910PR, LG-H910PR LG-H915, LG-H915 LG-US996, LG-US996 LG-H918, LG-H918 LG-VS995S, LG-VS995S LG V20, LG-H910
LGE_LG-H931	Android_SDK:_28_(9)	96522 - End Product	LG-VS996, LG-VS996 LG-AS998, LG-AS998 LG-US998, LG-US998 LG-H931, LG-H931 LG-LS998, LG-LS998 LG-H933, LG-H933 LGM-V300L, LGM-V300L LGM-V300S, LGM-V300S LGM-V300K, LGM-V300K LG-H930, LG-H930 LG-H930DS, LG-H930DS LG-H930K, LG-H930K LG-H930G, LG-H930G LG-H932, LG-H932 LG-H932PR, LG-H932PR LG-H930D, LG-H930D LG V30, LG-H931
Xiaomi_MI_9	Android_SDK:_28_(9)	123912 - End Product	XiaoMi MI 9, M1902F1G
Xiaomi_Mi_9T	Android_SDK:_29_(10)	130653 - Controller Subsystem 114535 - Host Subsystem	MI 9T, M1903F10G
Xiaomi_Mi_A2_Lite	Android_SDK:_27_(8.1.0)	116717 - End Product	Xiaomi MI A2 LITE, M1805D1SG
Xiaomi_MI_6	Android_SDK:_28_(9)	98293 - End Product	Xiaomi Mi 6, MCE16 Xiaomi Mi 6, MCT1 Xiaomi MIX 2, MDE5 Xiaomi MIX 2, MDT5 Xiaomi Note 3, MCE8 Xiaomi Note 3, MCT8
Xiaomi_MI_6X	Android_SDK:_27_(8.1.0)	116110 - End Product	Xiaomi MI A2, M1804D2SG
Xiaomi_MI_8	Android_SDK:_28_(9)	115812 - End Product	MI MIX2S, M1803D5XA MI 8, M1803E1A POCOPHONE F1, M1805E10A

Phone code	OS version	Qualification Reference	Models with Shared Qualification
Xiaomi_Mi9_Pro_5G	Android_SDK:_28_(9)	146631 - End Product	Redmi Note 9S, M2003J6A1G Redmi Note 9S, M2003J6A1R Redmi Note 9 Pro, M2003J6A1I Redmi Note 9 Pro Max, M2003J6B1I Redmi Note 9 Pro, M2003J6B2G POCO M2 Pro, M2003J6CI
Xiaomi_MI_9_SE	Android_SDK:_28_(9)	127288 - Controller Subsystem 114535 - Host Sybssystem	MI 9 SE, M1903F2G
Xiaomi_MI_MAX_3	Android_SDK:_27_(8.1.0)	116759 - End Product	MI MAX3, M1804E4A MI 8 Lite, M1808D2TG
Xiaomi_MI_8_Lite	Android_SDK:_27_(8.1.0)	116759 - End Product	MI MAX3, M1804E4A MI 8 Lite, M1808D2TG
Xiaomi_MI_A2	Android_SDK:_28_(9)	116110 - End Product	Xiaomi MI A2, M1804D2SG
Xiaomi_MI_A3	Android_SDK:_29_(10)	136133 - End Product	Xiaomi Mi A3, M1906F9SH
Xiaomi_MI_MIX_3_5G	Android_SDK:_28_(9)	121613 - End Product	Xiaomi MIX3, M1810E5A
Xiaomi_MIX_2S	Android_SDK:_28_(9)	115812 - End Product	MI MIX2S, M1803D5XA MI 8, M1803E1A POCOPHONE F1, M1805E10A
Xiaomi_Redmi_7A	Android_SDK:_28_(9)	134589 - End Product	Xiaomi Redmi 7A, M1903C3EG Xiaomi Redmi 7A, M1903C3EH
Redmi Note 7	Android_SDK:_29_(10)	123919 - End Product	Redmi Note7, M1901F7G Redmi Note7, M1901F7H
iPhone 8 Plus	iOS 14.2	99179 - Host Subsystem 96809 - Controller Subsystem 62504 - Profile Subsystem	iPhone 8, A1863 Apple TV 4K, A1842 iPhone 8, A1905 iPhone 8, A1906 iPhone 8 Plus, A1864 iPhone X, A1865 iPhone 8 Plus, A1897 iPhone X, A1901 iPhone 8 Plus, A1898 iPhone X, A1902 iPhone 8, A1907 iPhone 8 Plus, A1899 iPhone X, A1903 HomePod, A1639
iPhone 5S	iOS 12.4.8	Not Available to Silicon Labs	0
iPhone 6	iOS 12.4.8	48083 - Profile Subsystem 59997 - Controller Subsystem 53915 - Host Subsystem	A1586, A1549, A1589

Phone code	OS version	Qualification Reference	Models with Shared Qualification
iPhone X	iOS 13.6.1	99179 - Host Subsystem 96809 - Controller Subsystem 62504 - Profile Subsystem	iPhone 8, A1863 Apple TV 4K, A1842 iPhone 8, A1905 iPhone 8, A1906 iPhone 8 Plus, A1864 iPhone X, A1865 iPhone 8 Plus, A1897 iPhone X, A1901 iPhone 8 Plus, A1898 iPhone X, A1902 iPhone 8, A1907 iPhone 8 Plus, A1899 iPhone X, A1903 HomePod, A1639
iPhone 7 Plus	iOS 14.2	64104 - Host Subsystem 62504 - Profile Subsystem 86656 - Controller Subsystem	iPhone 7 Plus, A1661 iPhone 7 Plus, A1785 iPhone 7 Plus, A1786 iPhone 7 Plus, A1784
iPhone Xs	iOS 13.5.1	115456 - Controller Subsystem 102170 - Profile Subsystem 99179 - Host Subsystem	iPhone, A1921 A2101 A2102 A2104 A2103 iPhone XR, A1984 A2105 A2106 A2108 A2107 iPhone Xs, A1920 A2097 A2098 A2100 A2099 iPhone Xs Max, A1921 A2101 A2102 A2104 A2103 iPad Pro 11", A1980 A2013 A1934 A1979 iPad Pro 12.9", A1876 A2014 A1895 A1893 iPad mini, A2133 A2126 A2124 A2125 iPad, A2152 A2153 A2123 A2154 iPad mini 5, A2133 A2126 A2124 A2125 iPad Air (3rd generation), A2152 A2153 A2123 A2154
iPhone 8	iOS 13.5.1	99179 - Host Subsystem 96809 - Controller Subsystem 62504 - Profile Subsystem	iPhone 8, A1863 Apple TV 4K, A1842 iPhone 8, A1905 iPhone 8, A1906 iPhone 8 Plus, A1864 iPhone X, A1865 iPhone 8 Plus, A1897 iPhone X, A1901 iPhone 8 Plus, A1898 iPhone X, A1902 iPhone 8, A1907 iPhone 8 Plus, A1899 iPhone X, A1903 HomePod, A1639
iPhone 6 Plus	iOS 12.4.8	Not Available to Silicon Labs	
iPhone 7	iOS 13.3	64104 - Host Subsystem 62504 - Profile Subsystem 86655 - Controller Subsystem	iPhone 7, A1660 iPhone 7, A1779 iPhone 7, A1780 iPhone 7, A1778
iPhone 6S	iOS 13.6.1	Not Available to Silicon Labs	

Phone code	OS version	Qualification Reference	Models with Shared Qualification
iPhone SE (2nd generation)	iOS 13.5.1	Not Available to Silicon Labs	
iPhone 11 Pro	iOS 14.2	136497 - Controller Subsystem 137333 - Profile Subsystem 137332 - Host Subsystem	iPhone 11 Pro, A2160 iPhone 11 Pro Max, A2161 iPhone 11 Pro, A2217 iPhone 11 Pro, A2215 iPhone 11 Pro, A2216 iPhone 11 Pro Max, A2218 iPhone 11 Pro Max, A2220 iPhone 11 Pro Max, A2219 iPhone 11, A2111 iPhone 11, A2221 iPhone 11, A2223 iPhone 11, A2222 iPad Pro 12.9-inch, A2232 iPad Pro 12.9-inch, A2069 iPad Pro 12.9-inch, A2233 iPad Pro 12.9-inch, A2229 iPad Pro 11-inch, A2068 iPad Pro 11-inch, A2230 iPad Pro 11-inch, A2231 iPad Pro 11-inch, A2228
iPad mini (5th generation)	iOS 13.4.1	115456 - Controller Subsystem 102170 - Profile Subsystem 99179 - Host Subsystem	iPhone, A1921 A2101 A2102 A2104 A2103 iPhone XR, A1984 A2105 A2106 A2108 A2107 iPhone Xs, A1920 A2097 A2098 A2100 A2099 iPhone Xs Max, A1921 A2101 A2102 A2104 A2103 iPad Pro 11", A1980 A2013 A1934 A1979 iPad Pro 12.9", A1876 A2014 A1895 A1893 iPad mini, A2133 A2126 A2124 A2125 iPad, A2152 A2153 A2123 A2154 iPad mini 5, A2133 A2126 A2124 A2125 iPad Air (3rd generation), A2152 A2153 A2123 A2154
iPad (7th generation)	iOS 13.4.1	Not Available to Silicon Labs	
iPad Air(3rd generation)	iOS 13.3.1	Not Available to Silicon Labs	

Phone code	OS version	Qualification Reference	Models with Shared Qualification
iPAD 11 Pro	iOS 13.5.1	137333 (Profile Subsystem) 137332 (Host Subsystem)	iPhone 11 Pro, A2160 iPhone 11 Pro Max, A2161 iPhone 11 Pro, A2217 iPhone 11 Pro, A2215 iPhone 11 Pro, A2216 iPhone 11 Pro Max, A2218 iPhone 11 Pro Max, A2220 iPhone 11 Pro Max, A2219 iPhone 11, A2111 iPhone 11, A2221 iPhone 11, A2223 iPhone 11, A2222 iPad Pro 12.9-inch, A2232 iPad Pro 12.9-inch, A2069 iPad Pro 12.9-inch, A2233 iPad Pro 12.9-inch, A2229 iPad Pro 11-inch, A2068 iPad Pro 11-inch, A2230 iPad Pro 11-inch, A2231 iPad Pro 11-inch, A2228
iPhone XS Max	iOS 12.3	115456 - Controller Subsystem 102170 - Profile Subsystem 99179 - Host Subsystem	iPhone, A1921 A2101 A2102 A2104 A2103 iPhone XR, A1984 A2105 A2106 A2108 A2107 iPhone Xs, A1920 A2097 A2098 A2100 A2099 iPhone Xs Max, A1921 A2101 A2102 A2104 A2103 iPad Pro 11", A1980 A2013 A1934 A1979 iPad Pro 12.9", A1876 A2014 A1895 A1893 iPad mini, A2133 A2126 A2124 A2125 iPad, A2152 A2153 A2123 A2154 iPad mini 5, A2133 A2126 A2124 A2125 iPad Air (3rd generation), A2152 A2153 A2123 A2154
Motorola_Nexus_6	Android_SDK:_25_(7.1.1)	Not available to Silicon Labs	
Xiaomi_Redmi_4X	Android_SDK:_25_(7.1.2)	73778 - Host Subsystem 100220 - Controller Subsystem	Xiaomi Redmi 4X, MAG138 Xiaomi Redmi 4X, MAI132 Xiaomi Redmi 4X, MAE136 Xiaomi Redmi 4X, MAT136
Xiaomi_Redmi_5A	Android_SDK:_25_(7.1.2)	86918 - Host Subsystem 100220 - Controller Subsystem	Redmi 5A, MCG3B Redmi 5A, MCI3B Redmi 5A, MCT3B Redmi 5A, MCE3B
Xiaomi_MI_MAX_2	Android_SDK:_25_(7.1.1)	86918 - Host Subsystem 98200 - Profile Subsystem 98201 - Controller Subsystem	Xiaomi Mi MAX2, MDE40 Xiaomi Mi MAX2, MDI40 Xiaomi Mi MAX2, MDT4 Xiaomi Mi 5X, MDE2 Xiaomi Mi 5X, MDT2 Xiaomi Mi A1, MDG2 Xiaomi Mi A1, MDI2
Xiaomi_Redmi_Note_4	Android_SDK:_23_(6.0)	Not available to Silicon Labs	

5. References

<https://www.bluetooth.com/develop-with-bluetooth/qualification-listing/>

6. Revision History

Revision 0.1

July, 2021

- Initial version

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