LIBRE
WIRELESS TECHNOLOGIES

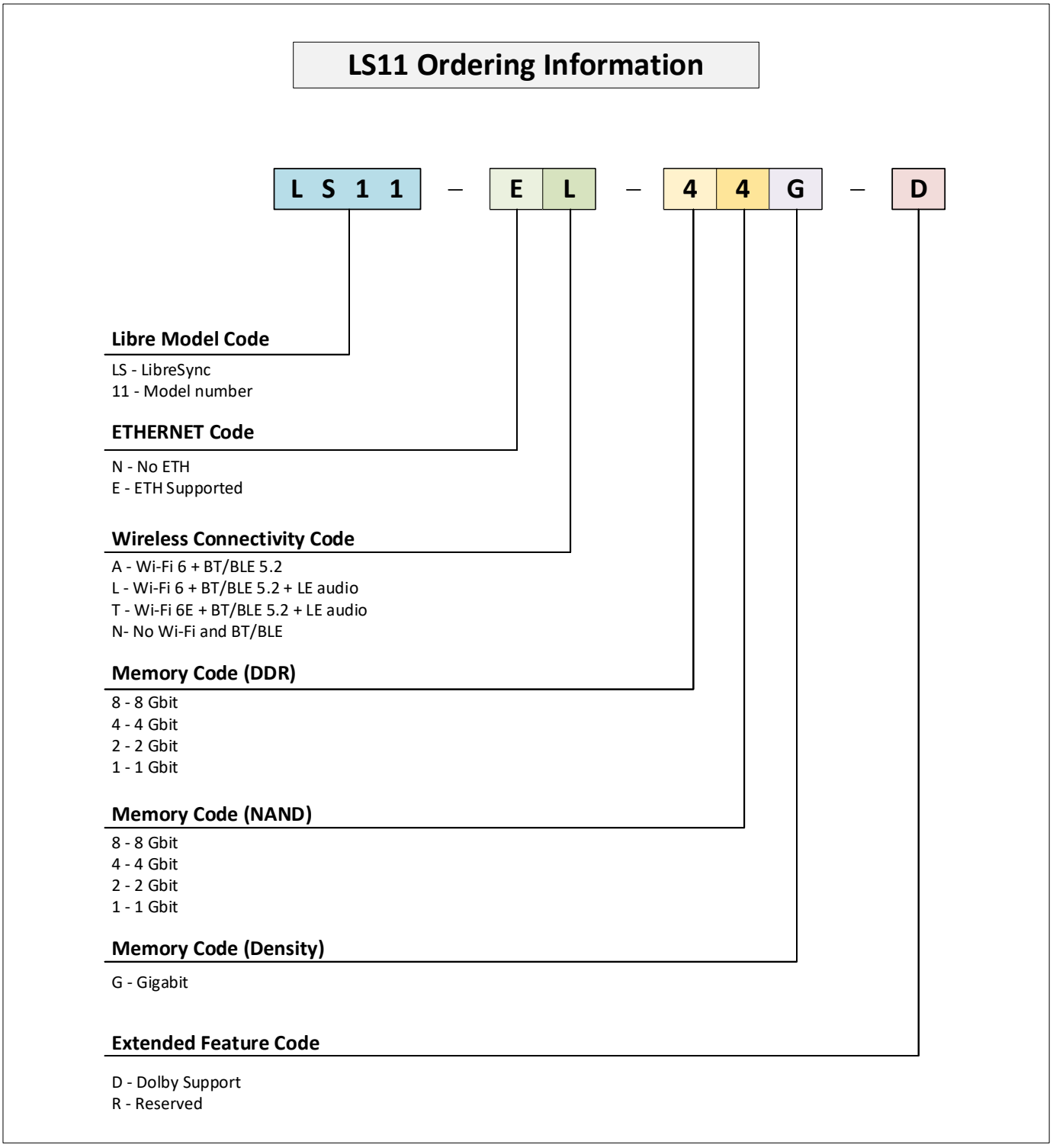
LIBRE SYNC

LS11
High Performance Wireless Media Module

Data Sheet

Rev: 1.5

LS11 Module Ordering Information



Sl. No	Part Number	Ethernet Support	Wireless Connectivity	Memory Density Flash / DDR	Extended Features
1	LS11-EA-44G-R	Yes	Wi-Fi 6, BT/BLE 5.2	512MB / 512MB	Dolby Not supported
2	LS11-NA-44G-R	No	Wi-Fi 6, BT/BLE 5.2	512MB / 512MB	Dolby Not supported
3	LS11-EA-88G-R	Yes	Wi-Fi 6, BT/BLE 5.2	1GB / 1GB	Dolby Not supported
4	LS11-NA-88G-R	No	Wi-Fi 6, BT/BLE 5.2	1GB / 1GB	Dolby Not supported
5	LS11-EA-22G-R	Yes	Wi-Fi 6, BT/BLE 5.2	256MB / 256MB	Dolby Not supported
6	LS11-NA-22G-R	No	Wi-Fi 6, BT/BLE 5.2	256MB / 256MB	Dolby Not supported
7	LS11-EN-44G-R	Yes	No	512MB / 512MB	Dolby Not supported
8	LS11-EN-88G-R	Yes	No	1GB / 1GB	Dolby Not supported
9	LS11-EN-22G-R	Yes	No	256MB / 256MB	Dolby Not supported

- The LS11 module with different memory configuration is available based on the request.
- Dolby feature can be implemented based on the customer requirement.

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1. Document Information

1.1. Document Revision History

Revision	Date	Description of change	Author
1.5	October 09, 2023	General Update	Chandravel
1.4	September 27, 2023	Updated Power Consumption	Balakumar
1.3	April 19, 2023	Updated Block Diagram and Pin descriptions	Chandravel & Shahim Ahmed
1.2	December 05, 2022	Updated Block Diagram, WLAN Features, Mechanical Dimensions, images and Pin Details	Chandravel
1.1	August 23, 2022	Final Draft	Chandravel

2. Introduction

Libre Wireless - LS11 is an advanced high-performance media/audio streaming module for smart audio and smart home appliances. It comes with powerful Quad Core Coretex-A53 CPU running at 1.5GHz with Neon and Crypto extensions and unified L2 cache. LS11 module incorporates Wi-Fi-6 (2.4GHz/5GHz) BT-5.2 (BT/BLE) combo chip with USB OTG.

3. Module Feature Summary

Key Features

- Quad Core ARM Cortex-A53 CPU up to 1.5GHz.
- Advanced Trust Zone Security System.
- ARM Cortex-M3 MCU in Always-On (AO) Domain.
- LCD display support over SPI: 240x320
- Up to 4 DMIC support.
- 2D Bit BLT engine.
- 10/100 Ethernet support with internal PHY Chip.
- Inbuild IR, TX and RX.
- GC4A, AirPlay, Home-kit, Spotify-Connect, DLNA DMP/DMR/DMS, etc.
- Hi-Rez Audio 384kHz x 32 Bits x 8 Channel.
- Support for SPDIF digital audio input and output
- Support Dolby/DTS
- LPCM, MP3, AAC/AAC+, AC3, OGG Vorbis, HE-AAC, WMA decode capability.
- Lossless audio decodes like FLAC, APE and DSD Support.
- Supports WMV9, AVS, GC4A.
- Libre in-built code protection and security.

- 1DES/3DES/AES/CSS/CPRM/DTCP crypto protection
- 2 - I2S interface. One dedicated I2S1 and one more I2S2 is muxed with SPI2.

> **Note:** In LS11, SPI2 and I2S2 are mutually exclusive. I2S2 is available only when SPI2 output is disabled and vice versa.

- LS11 module can be configured as I2S-Master mode/I2S-Slave mode.
- DSD over PCM
- 1x USB 2.0 OTG (For Firmware update, USB Media Playback, USB Tethering)
- 2x UART (Debug communication, Host communication)
- 1x I2C, 2x SPI (one muxed with I2S), GPIOs
- Wi-Fi 6 2x2 802.11a/b/g/n/ac/ax with Dual Band
- Bluetooth 5.2 BT/BLE
- Wi-Fi/BT concurrent coexistence
- Standard RAM/Flash configuration includes 512MB/512MB. Custom memory configuration supported on request.

4. LibreSync Features

LibreSync modules have extensive software features for connected media streaming and control applications. These include system level control and interface features as well as networking features.

Please refer to the full “Master Feature List” for details of supported features.

Platform features can vary based on module configuration/derivatives and commercial engagement details.

5. Block Diagram

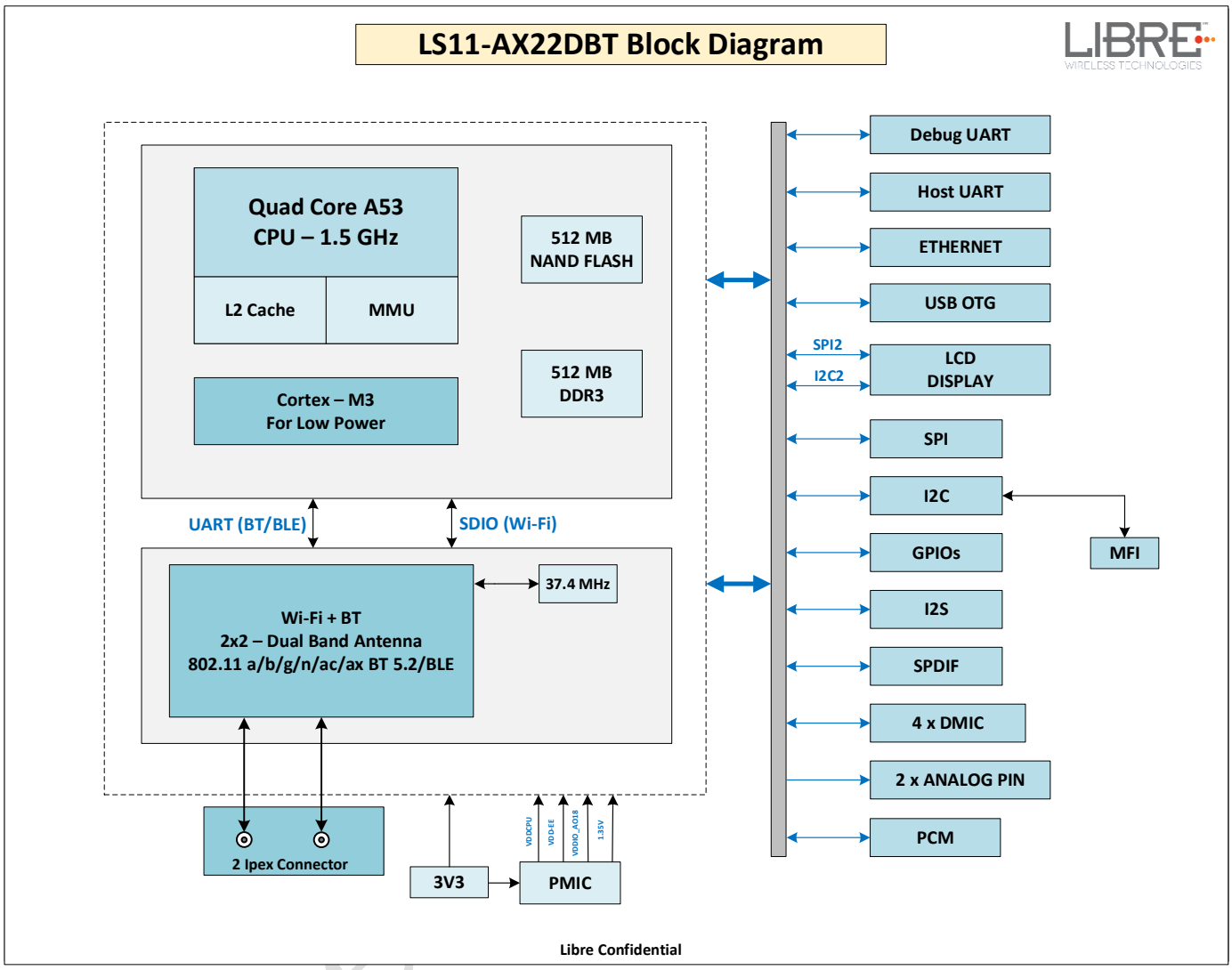


Figure 5-1: LS11 Module Block Diagram

6. Specifications

6.1. General Specifications

Parameter	Description / Values
Model	LS11 Module
Product Name	Network Media Module
Standard	• Wi-Fi – IEEE 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac, 802.11ax standards. • BT – v2.1+EDR, BT-5.2 BT/BLE
Frequency Band	2.4/5.0 GHz
Input Voltage	3.3 V ± 5 %, 20-30 mVpk-pk
USB_VBUS	4.8-5.2V, 50 mVpk-pk
Operating Temperature	-5˚C to + 70˚C
Dimensions	65 mm x 40 mm x 7 mm (L x W x H) ± 0.2mm

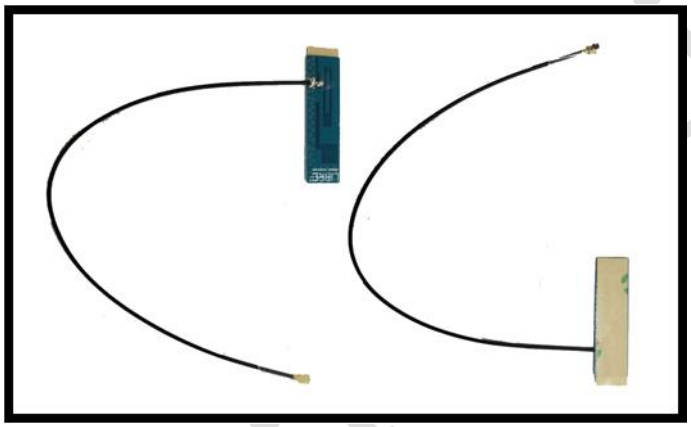
6.2. Wi-Fi Specifications

Parameter	Description / Values
Standard	2x2, Wi-Fi-6 (Dual band, 802.11 a/b/g/n/ac/ax)
Operating Band Support	• Dual Band • 2.4GHz: 2.412 ~ 2.483 GHz • 5.0 GHz: 5.180GHz ~ 5.825GHz
Network Architecture	• Infrastructure Mode • Concurrent STA/AP and STA/STA
Security	WPA, WPA-PSK, WPA2(personal), WPA2-PSK, WPS, IEEE 802.1x, IEEE 802.11i and WPA3(personal).

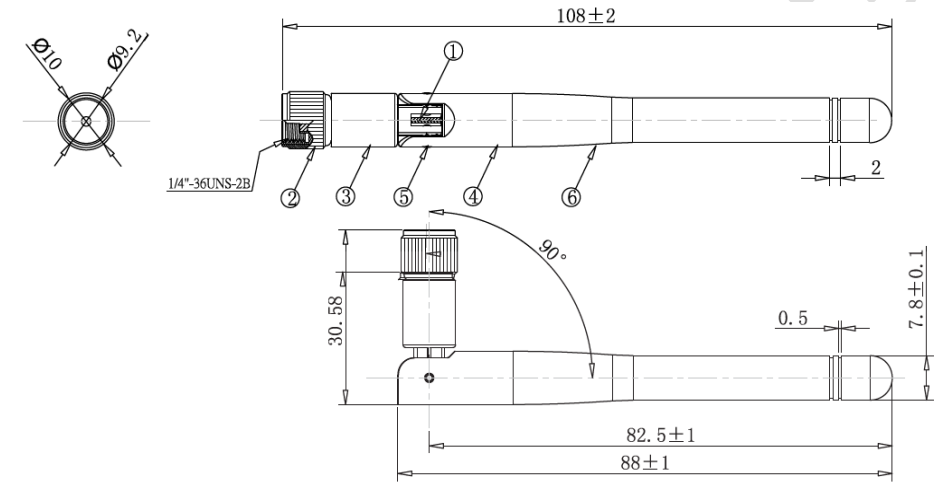
6.3. Bluetooth Specifications

Parameter	Description / Values
Standard	V2.1+EDR, V3.0+HS, BT-5.2 BT/BLE
Audio CODEC Support	SBC, AAC and LC3
Profile Support	A2DP 1.3.2 and AVRCP 1.6.2
Coexistence Support	Intelligent AFH (Advanced Frequency Hopping) – Channel Assessment WLAN/Bluetooth Coexistence (BCA) Protocol Support
Operation Channel	0 to 78 for BDR/EDR 0 to 39 for BLE
Frequency Range	2.4 GHz (2402 -2480 MHz)
Security	AES-128 and AES-256 Encryption

6.4. Antenna Specification

Antenna Module	LSANT-1C-180
Antenna Gain	≤ 3.5dBi
Manufacturer of Antenna	Golden Smart International Co., Ltd
Antenna Images	

6.5. Rubber Antenna Specification

Antenna Model	RC1WFI0886A
Antenna Gain	≤ 2.0 dBi
Manufacturer of Antenna	Suzhou Point Positive Electronic Technology Co., Ltd
Antenna Image	

SPECIFICATION
1.Frequency Range: 2.4--5.8Ghz
2.Impendance:50Ω
3.VSWR：≤2.0
4.Polanization:Vertical
5.Radlation:Omni
6.Gain: 2dBi

NO	PARTNAME	DESCRIPTION	Q'TY	Part P/NO
⑥	Connettor	SM3033 Reverse	1PCS	
⑤	Antenna Cover	L153mm*□13.0mm TPEE Black	1PCS	
④	Rivet	L5.1mm*□2.4mm POM Black	2PCS	
③	Antenna Base	L28.2*□13.0mm PBT Black	1PCS	
②	Antenna Base	L29.4*□13.0mm PC Black	1PCS	
①	Cable	RG-178 Cable 50Ω	1PCS	

7. Mechanical, Connectors and Interfaces

7.1. Physical Module

Physical module dimensions are 65mm x 40mm x 7mm (L x W x H) ± 0.2mm (LS11).

7.1.1. Module Manufacturer

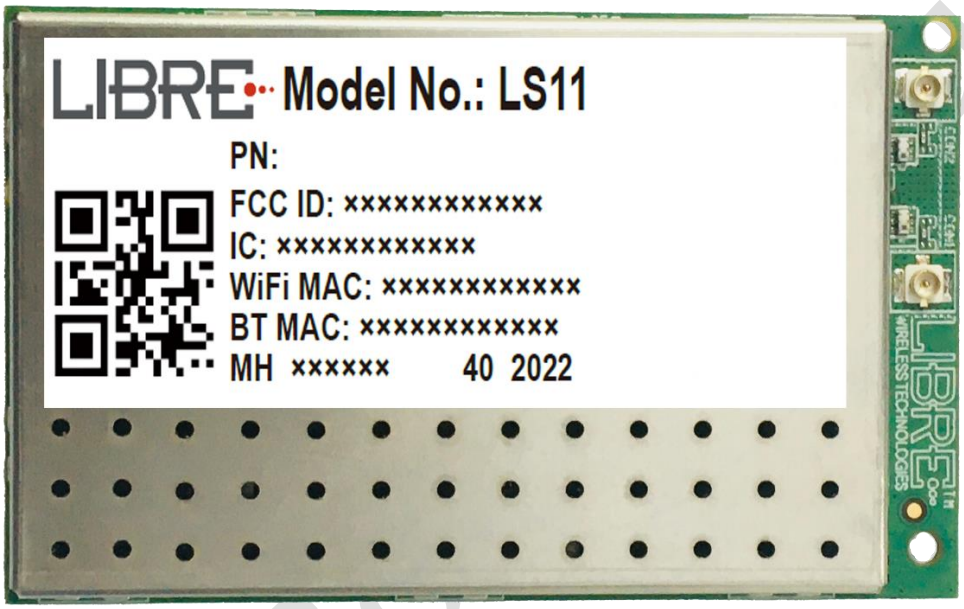


Figure 7.1-1: LS11 Module Top View

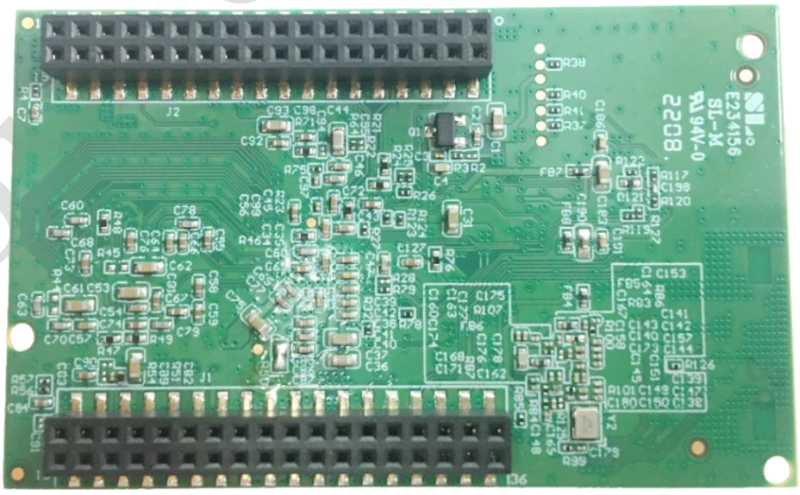


Figure 7.1-2: LS11 Module Bottom View

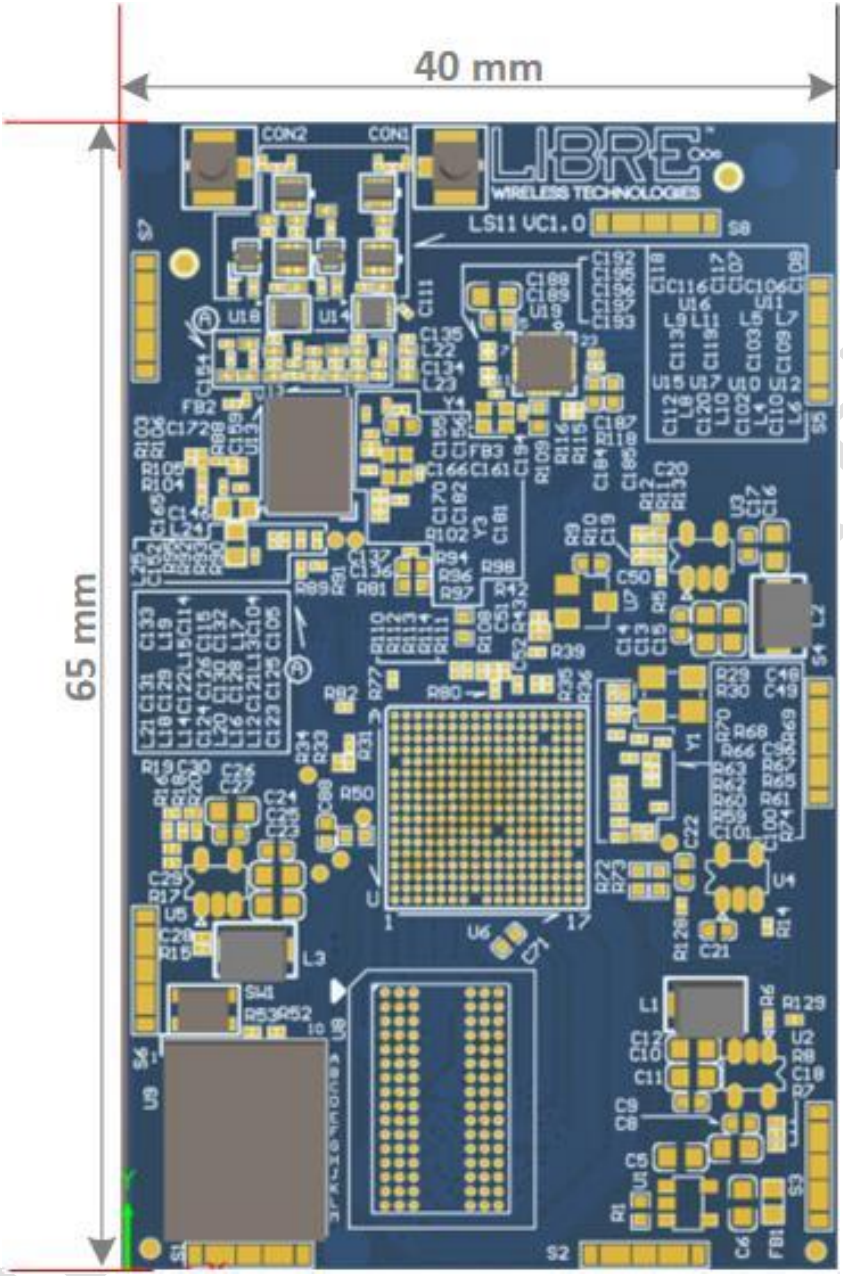


Figure 7.1-3: LS11 Top View - Mechanical Dimension 1

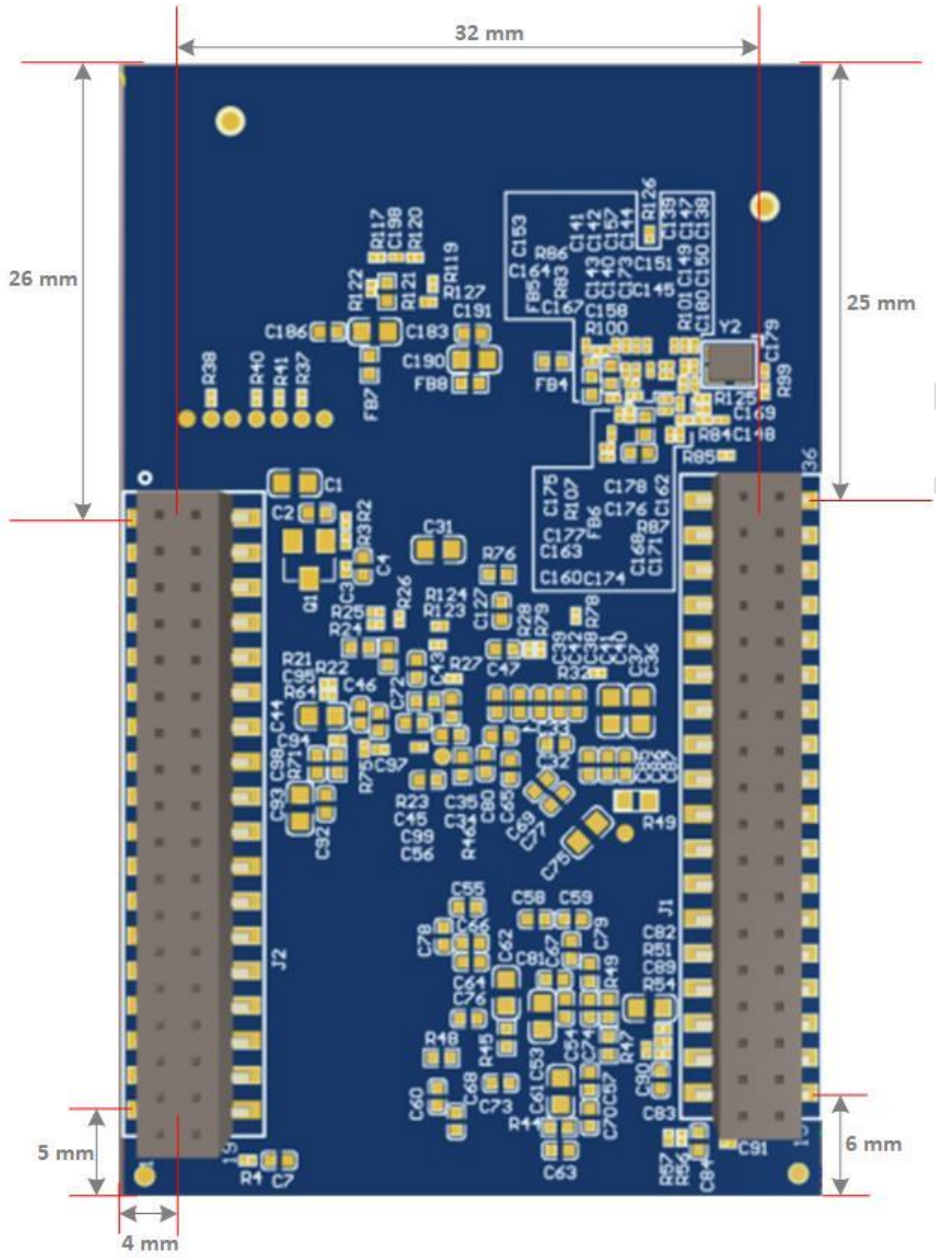


Figure 7.1-4: LS11 Bottom View - Mechanical Dimension 2

> **Note:** The module dimension is measured in millimeters (mm).

7.2. Media Connector Specification

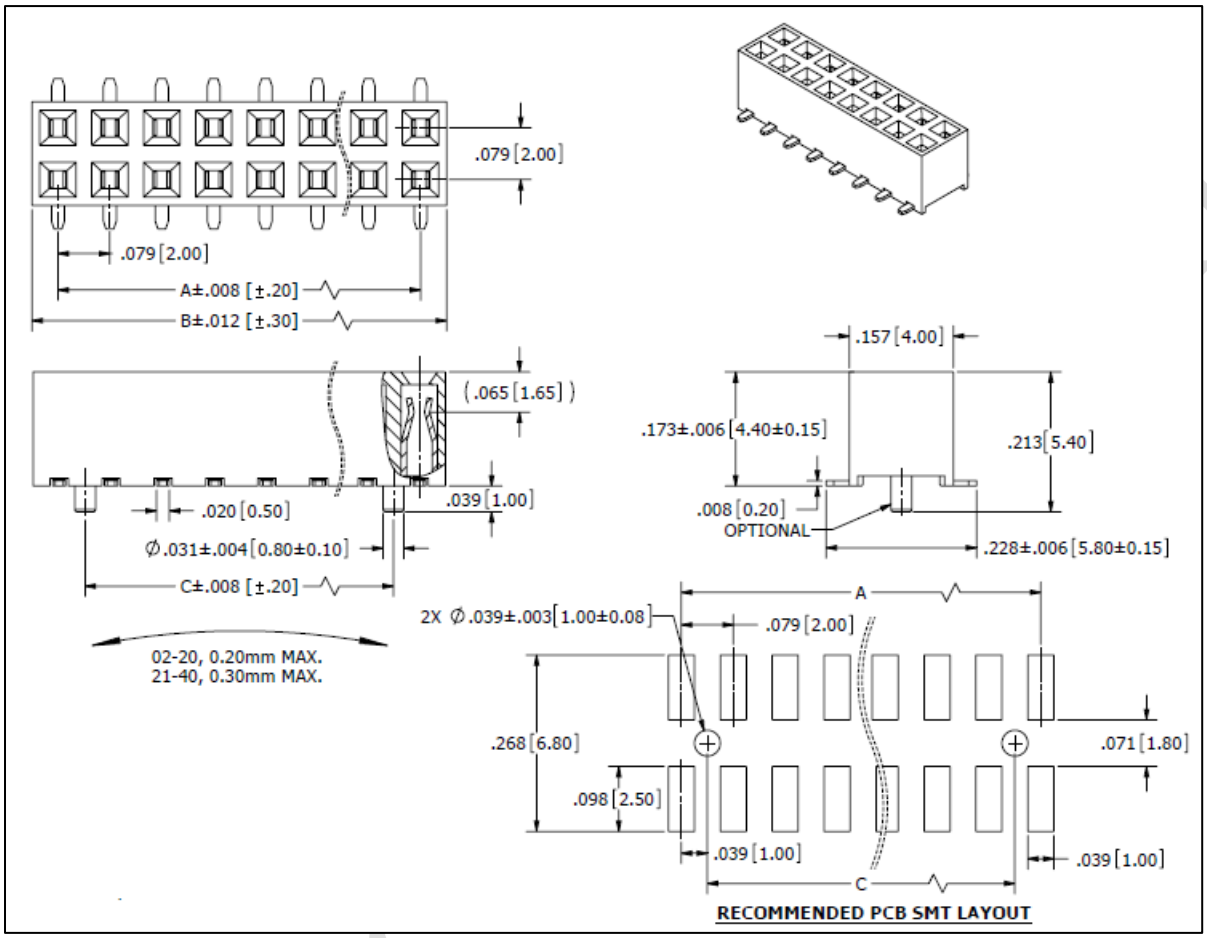


Figure 7.2-1: Media Connector

7.3. Pin Descriptions

7.3.1. Connector

Connector J1		
Pin No.	**Signal Name**	**Functionality**
1	MDI_RN	MEDIUM DEPENDENT INTERFACE RX NEGATIVE
2	MDI_RP	MEDIUM DEPENDENT INTERFACE RX POSITIVE
3	MDI_TN	MEDIUM DEPENDENT INTERFACE TX NEGATIVE
4	MDI_TP	MEDIUM DEPENDENT INTERFACE TX POSITIVE
5	GND	GROUND
6	PCM_CLK	BT PCM BIT CLOCK
7	PCM_IN	BT PCM RXD
8	PCM_OUT	BT PCM TXD
9	PCM_SYNC	BT PCM LRCLK
10	GND	GROUND
11	UART1_RTS	UART1_RTS/GPIOZ_7
12	UART1_CTS	UART1_CTS/GPIOZ_6
13	NC	NC
14	PHY_LED0_AD0	Link/ Status LED
15	CHELSEA_RST/IR_IN	GPIOAO_6/IR_IN
16	BUTTON1	GPIOAO_3
17	CHELSEA_IRQ/IR_OUT	GPIOAO_7/IROUT
18	GND	GROUND

Connector J1		
Pin No.	**Signal Name**	**Functionality**
19	GND	GROUND
20	SPI0_SS0_A	SPI0 CHIP SELECT/GPIOZ_3
21	SPI0_MISO_A	SPI0 MISO/GPIOZ_2
22	SPI0_MOSI_A	SPI0 MOSI/GPIOZ_1
23	SPI0_CLK_A	SPI0 CLOCK/GPIOZ_0
24	GND	GROUND
25	I2C_AO_SDA	I2C0 DATA
26	I2C_AO_SCL	I2C0 CLOCK
27	GND	GROUND
28	LS11_MCLKB	AUDIO O/P MASTER CLOCK
29	LS11_BCLK	AUDIO O/P BIT CLOCK
30	LS11_LRCLK	AUDIO O/P LR CLOCK
31	LS11_I2S_RXD	I2S1_RXD
32	LS11_I2S_TXD	I2S1_TXD
33	CPU_RESET	RESET PIN
34	HOST_UART_RX	HOST UART Communication
35	HOST_UART_TX	HOST UART Communication
36	GND	GROUND

Connector J2		
Pin No.	**Signal Name**	**Functionality**
1	GND	GROUND
2	USB_OTG_ID	USB OTG IDENTIFICATION
3	LEDB	GPIOX_11
4	LEDG	GPIOA_16
5	LEDR	GPIOA_15
6	BUTTON3	GPIOAO_5
7	GND	GROUND
8	DEBUG_UART_TX	DEBUG UART Communication
9	DEBUG_UART_RX	DEBUG UART Communication
10	GND	GROUND
11	USB_DP	USB DATA PLUS
12	USB_DM	USB DATA MINUS
13	GND	GROUND
14	USB_VBUS	USB POWER. 5V SHOULD COME FROM EXTERNAL IF IT IS IN DEVICE MODE.
15	GND	GROUND
16	GND	GROUND
17	3.3V	POWER RAIL
18	3.3V	POWER RAIL

Connector J2		
Pin No.	**Signal Name**	**Functionality**
19	GND	GROUND
20	SARADC_CH0	ANALOG INPUT CHANNEL
21	GND	GROUND
22	BUTTON2	GPIOAO_4
23	DM1_DATA	MIC 1 DATA
24	DM0_DATA	MIC 0 DATA
25	DMIC_CLK	MIC CLOCK
26	GND	GROUND
27	SPDIF_OUT	SPDIF OUTPUT
28	SPDIF_IN	SPDIF INPUT
29	GND	GROUND
30	SPI1_SS0_B/I2S_RX	SPI1 CS/I2S2 RX/GPIOA_5
31	SPI1_CLK_B/I2S_TX	SPI1 CLOCK/I2S2 TX/GPIOA_4
32	SPI1_MISO_B/I2S_LRCLK	SPI1 MISO/I2S LRCLK/GPIOA_3
33	SPI1_MOSI_B/I2S_BCLK	SPI1 MOSI/I2S BCLK/GPIOA_2
34	LCD_RESET	LCD RESET/GPIOA_0
35	SARADC_CH1	ANALOG INPUT CHANNEL
36	NC	No Connection

GPIO Details

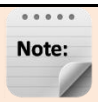
Interface	Signal Name	Availability/Usage
SPI	SPI0_SS0	YES
	SPI0_SCLK	
	SPI0_MOSI	
	SPI0_MISO	
	SPI1_SS0	I2S2 AND SPI1 are mutually exclusive
	SPI1_SCLK	
	SPI1_MOSI	
	SPI1_MISO	
UART	UART0_TX	Host UART
	UART0_RX	
	UART1_RX	Debug UART
	UART1_TX	
I2C interface	I2C0_SCL	Yes ACP and CODEC
	I2C0_SDA	

8. Power Consumption

GCast Configuration

Build version is eng.C4A110012

Parameter	Idle	Active Mode	Network Standby Mode
I (mA)	163	170	166
V (V)	3.3	3.3	3.3
P (mW)	538	561	548



Power numbers may vary based on features.
Power numbers are calculated theoretically.

9. Environmental

9.1. Storage Conditions

The calculated shelf life in a sealed bag is 12 months if stored between 0°C and 70˚C at less than 90% relative humidity (RH).

After the bag is opened, devices that are subjected to solder reflow or other high temperature processes must be handled in the following manner:

Mounted within 168 hours in factory conditions, i.e., <30°C at 60% RH.

Storage humidity needs to be maintained at <10%RH.

10. Disclaimer

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FCC regulatory conformance

FCC ID: 2ADBM-LS11

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.
(2) This device must accept any interference received, including interference that may cause undesired operation.
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

NOTE: Unauthorized changes will result in loss of device operating privileges.

RF Exposure

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

IC regulatory conformance

IC: 20276-LS11

This device complies with CAN ICES-003 (B)/NMB-003(B).This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(s). Operation is subject to the following two conditions:

(1) This device may not cause interference.
(2) This device must accept any interference, including interference that may cause undesired operation of the device.
Cet appareil est conforme à la norme CAN ICES-003 (B)/NMB-003 (B).
Cet appareil contient des émetteurs / récepteurs exempt (s) de licence qui sont conformes aux RSS exemptes de licence d'Innovation, Sciences et Développement économique Canada. Son fonctionnement est soumis aux deux conditions suivantes:

(1) Cet appareil ne doit pas provoquer d'interférences.
(2) Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

RF Exposure
This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
Cet équipement est conforme aux limites d'exposition aux rayonnements de la IC établies pour unenvironnement non contrôé. Cet équipement doit être installé et fonctionner à au moins 20cm de distance d'un radiateur ou de votre corps.

ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

OEM must certify the final end product to comply with unintentional radiators (FCC Sections 07 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: 2ADBM-LS11". Additionally, the following statement should be included on the label and in the final product's user manual: "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 interferences, and

(2) this device must accept any interference received, including interference that may cause undesired operation."

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end-use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY.

Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user

IC labeling requirement for the final end product:

The final end product must be labeled in a visible area with the following “Contains IC: 20276-LS11”

The Host Marketing Name (HMN) must be indicated at any location on the exterior of the host product or product packaging or product literature, which shall be available with the host product or online.

Unauthorized modifications could void the user's authority to operate the equipment.

This radio transmitter [lC: 20276-LS11] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Frequency range	Manufacturer	Peak gain	Impedance	Antenna type
2400-2483.5MHz	Golden Smart International Co., Ltd	3.5dBi	50Ω	PCB Antenna
2400-2483.5MHz	Suzhou Point Positive Electronic Technology Co., Ltd	2.6651 dBi	50Ω	Rod Antenna
2400-2483.5MHz	Golden Smart International Co., Ltd	2.3dBi	50Ω	FPC Antenna
5150 to 5250 MHz 5250 to 5350 MHz 5470 to 5725 MHz 5725 to 5850 MHz	Golden Smart International Co., Ltd	5.9 dBi	50Ω	PCB Antenna
5150 to 5250 MHz 5250 to 5350 MHz 5470 to 5725 MHz 5725 to 5850 MHz	Suzhou Point Positive Electronic Technology Co., Ltd	2.73919 dBi	50Ω	Rod Antenna
5150 to 5250 MHz 5250 to 5350 MHz 5470 to 5725 MHz 5725 to 5850 MHz	Golden Smart International Co., Ltd	2.4 dBi	50Ω	FPC Antenna

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3
Explanation: This module meets the requirements of FCC part 15C(15.247). part 15E(15.407)

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.
Explanation: The module has the trace antenna designs, and the antenna use a permanently attached antenna which is unique, The designed antenna meets the hardware module's requirements via the connection between Reverse polarity SMA connector and module.

2.4 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions. A limited module manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.
This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.
Explanation: The module is not a limited module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects:
layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.
a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency,

the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
d) Appropriate parts by manufacturer and specifications;
e) Test procedures for design verification; and
f) Production test procedures for ensuring compliance.
The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.
Explanation: Yes, The module with trace antenna designs, and this manual has been shown the layout of trace design, antenna, connectors, and isolation requirements.

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).
Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: 2ADBM-LS11.

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type")).
For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.
Explanation: The module has the trace antenna designs, and the antenna use a permanently attached antenna which is unique, The designed antenna meets the hardware module's requirements via the connection between Reverse polarity SMA connector and module.

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.
Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2ADBM-LS11"

2.9 Information on test modes and additional testing requirements5

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.
The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.
Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.
Explanation: Top band can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.
Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.