ShenZhen Linkiing Technology Co,.LTD

LK8353

Bluetooth 5.2 BLE Module

DATASHEET V1.0

Version update notes:

Version	Date	Update content	
V1.0	2021-5-13	First release	Dylan

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1. Introduction:

Key feature:

The LK8355 highlighted features are listed below.

- Low Power Wireless System-on-Chip
- High Performance 32-bit 80 MHz ARM Cortex®-M33 with DSP instruction and floating-point unit for efficient signal processing
- Up to 1024 kB flash program memory
- Up to 96 kB RAM data memory
- 2.4 GHz radio operation
- TX power up to 20 dBm
- Low Energy Consumption
- 8.8 mA RX current at 2.4 GHz (1 Mbps GFSK)
- 9.3 mA TX current @ 0 dBm output power at 2.4 GHz
- 33.8 mA TX current @ 10 dBm output power at 2.4 GHz
- 50.9 µA/MHz in Active Mode (EM0)
- 5.0 µA EM2 DeepSleep current

(96 kB RAM retention and RTC running from LFXO)

- 4.5 µA EM2 DeepSleep current

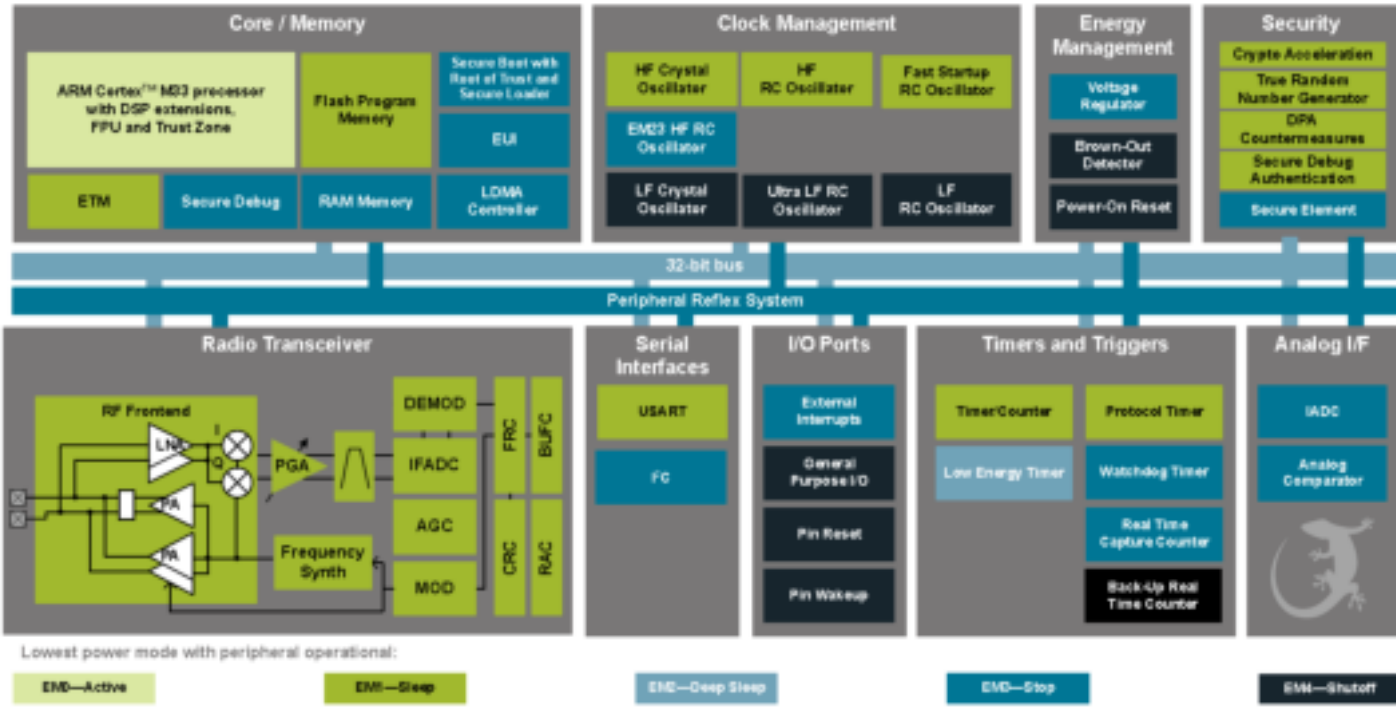
(16 kB RAM retention and RTC running from LFRCO)

- High Receiver Performance
- -97.5 dBm sensitivity @ 1 Mbit/s GFSK
- -94.4 dBm sensitivity @ 2 Mbit/s GFSK
- -104.9 dBm sensitivity @ 125 kbps GFSK
- Supported Modulation Format
- GFSK
- Protocol Support
- Wide selection of MCU peripherals
- 12-bit 1 Msps SAR Analog to Digital Converter (ADC)
- 2 × Analog Comparator (ACMP)
- Up to 20 General Purpose I/O pins with output state reten-tion and asynchronous interrupts
- 8 Channel DMA Controller
- 12 Channel Peripheral Reflex System (PRS)
- 2 × 16-bit Timer/Counter
- 3 Compare/Capture/PWM channels
- 1 × 32-bit Timer/Counter
- 3 Compare/Capture/PWM channels
- 32-bit Real Time Counter
- 24-bit Low Energy Timer for waveform generation
- 2 × Watchdog Timer
- 3 × Universal Synchronous/Asynchronous Receiver/Trans-mitter (UART/SPI/SmartCard(ISO 7816)/IrDA/I2S)
- 2 × I2C interface with SMBus support
- Wide Operating Range
- 1.71 to 3.8 V single power supply
- -40 to 125 °C ambient
- Security
- Secure Boot with Root of Trust and Secure Loader (RTSL)
- Hardware Cryptographic Acceleration with DPA counter-measures for AES128/256, SHA-1, SHA-2 (up to 256-bit), ECC (up to 256-bit), ECDSA, ECDH and J-Pake
- True Random Number Generator (TRNG) compliant with NIST SP800-90 and AIS-31
- ARM® TrustZone®
- Secure Debug with lock/unlock
- ARM® TrustZone®
- Secure Debug with lock/unlock

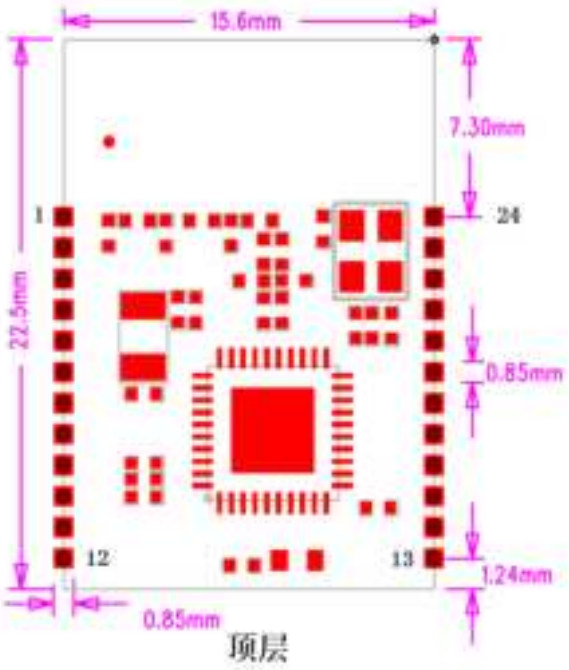
Wireless applications include:

- Lighting
- Connected Home
- Gateways and Digital Assistants
- Building Automation and Security

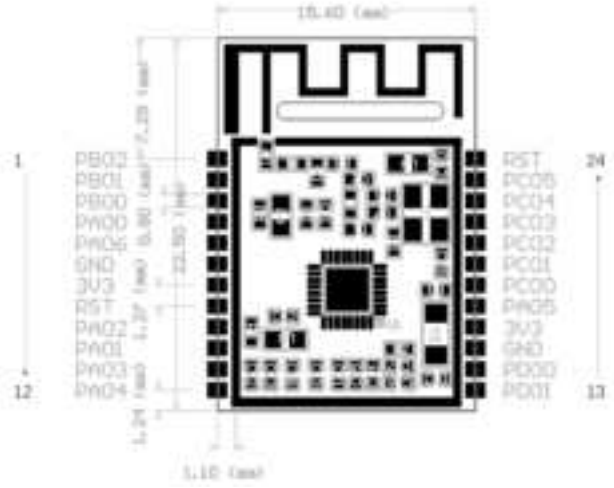
Architecture :



Size :

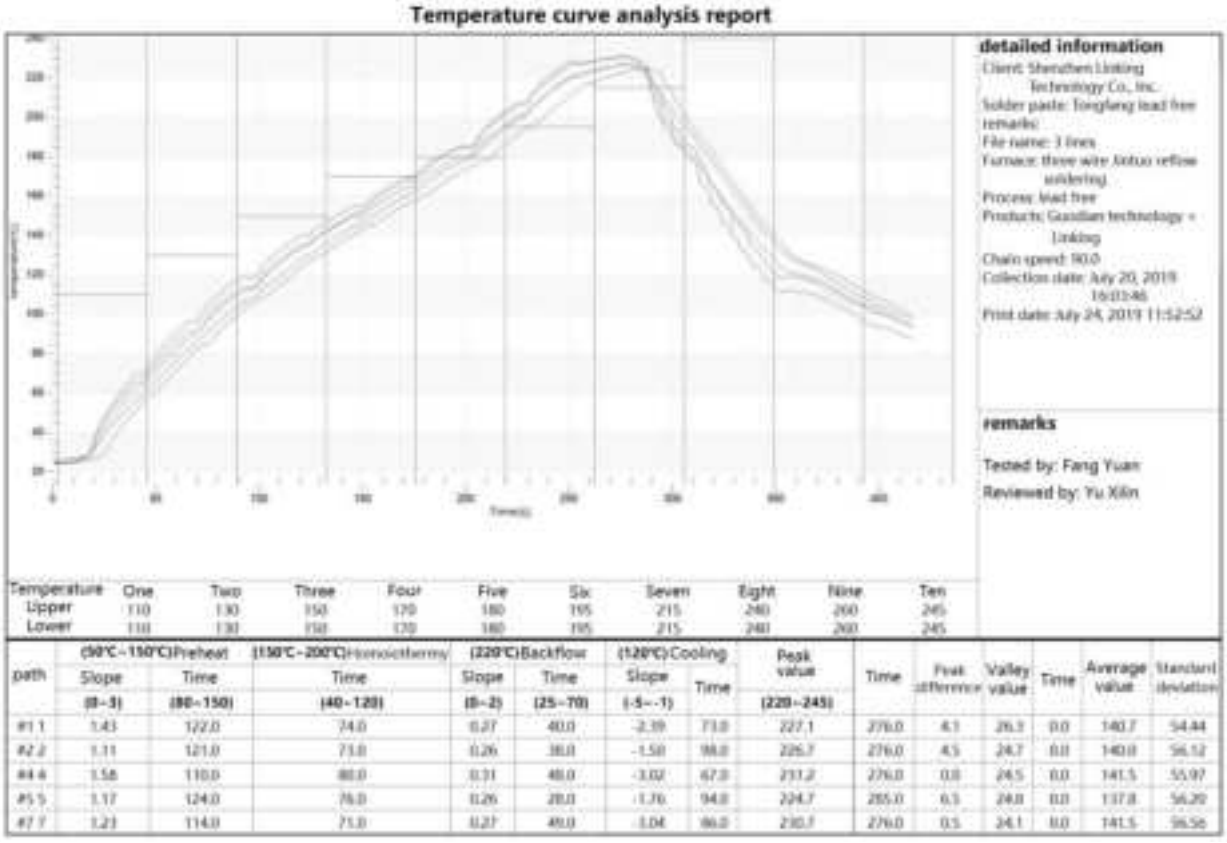

15.6mm
7.30mm
22.5mm
1
24
0.85mm
12
13
1.24mm
0.85mm
顶层

PIN :


1
12
24
13
PB03
PB01
PB00
PW00
PW06
GND
3V3
RST
PW02
PW01
PW03
PW04
RST
PC05
PC04
PC03
PC02
PC01
PC00
PW05
3V3
GND
PC10
PC11

PIN	Name	Function	Pin of chip	chip's Pin name
1	GPIO	GPIO	14	B02
2	GPIO	GPIO	15	B01
3	GPIO	GPIO	16	B00
4	GPIO	GPIO	17	A00
5	GPIO	GPIO	23	A06
6	GND	GND	-	GND
7	VCC	VCC		3.3V
8	RST	Reset		RST
9	GPIO	GPIO	19	A02
10	GPIO	GPIO	18	A01
11	GPIO	GPIO	20	A03
12	GPIO	GPIO	21	A04
13	GPIO	GPIO	31	D01
14	GPIO	GPIO	32	D00
15	GND	GND		GND
16	VCC	VCC		3.3V
17	GPIO	GPIO	22	A05
18	GPIO	GPIO	1	C00
19	GPIO	GPIO	2	C01
20	GPIO	GPIO	3	C02
21	GPIO	GPIO	4	C03
22	GPIO	GPIO	5	C04
23	GPIO	GPIO	6	C05
24	RST	Reset		RST

Secondary flows welding temperature control diagram:



Temperature	One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten
Upper	110	130	150	170	180	195	215	240	260	245
Lower	110	130	150	170	180	195	215	240	260	245

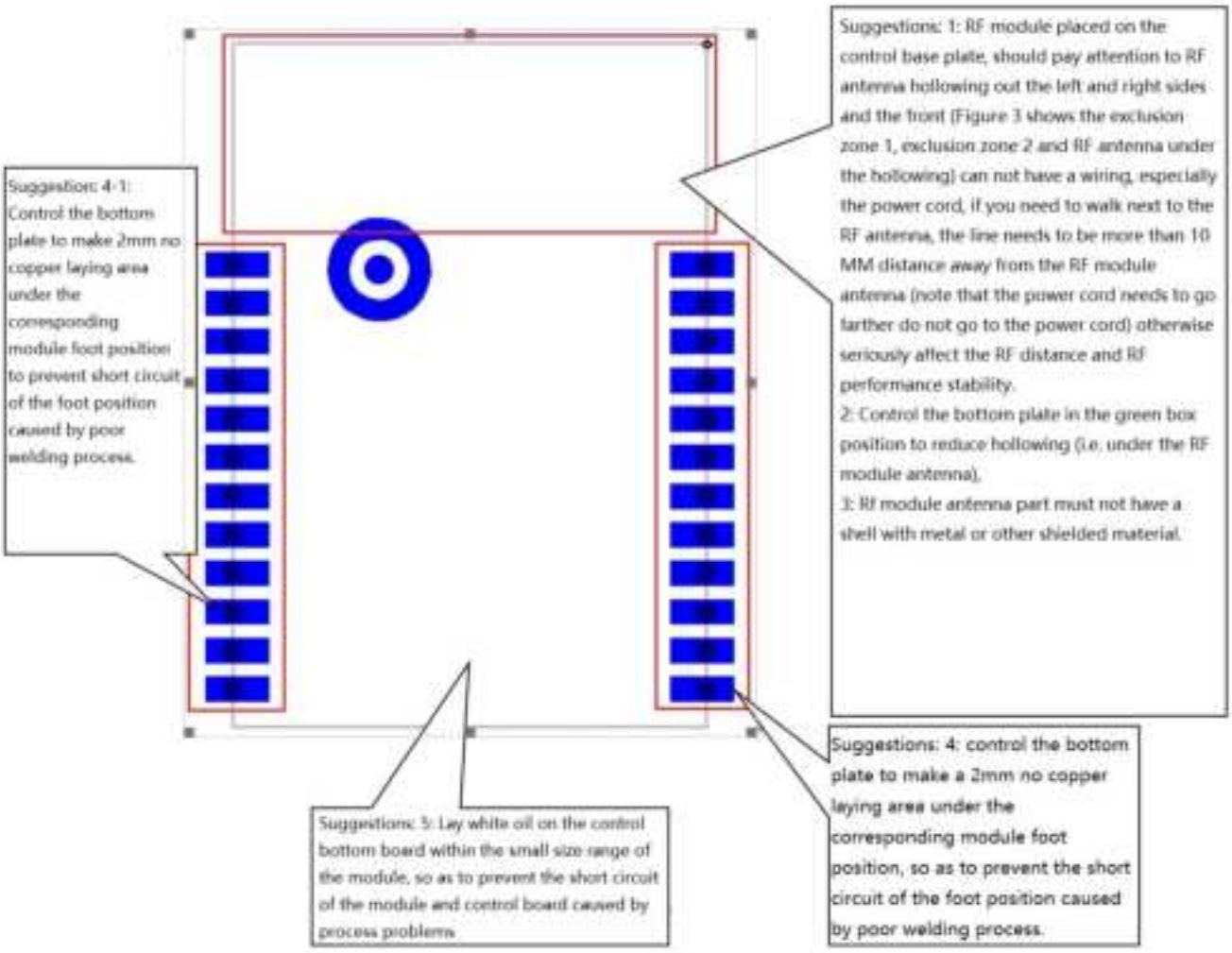
path	(50℃~150℃)Preheat		(150℃~200℃)Homeothermy	(220℃)Backflow		(120℃)Cooling		Peak value	Time	Peak difference	Valley value	Time	Average value	Standard deviation
	Slope	Time	Time	Slope	Time	Slope	Time							
	(0~3)	(80~150)	(40~120)	(0~2)	(25~70)	(-5~-1)		(220~245)						
#1 1	1.43	122.0	74.0	0.27	40.0	-2.39	73.0	227.1	276.0	4.1	26.3	0.0	140.7	54.44
#2 2	1.11	121.0	73.0	0.26	38.0	-1.50	98.0	226.7	276.0	4.5	24.7	0.0	140.0	56.12
#4 4	1.58	110.0	80.0	0.31	48.0	-3.02	67.0	231.2	276.0	0.0	24.5	0.0	141.5	55.97
#5 5	1.17	124.0	76.0	0.26	28.0	-1.76	94.0	224.7	285.0	6.5	24.0	0.0	137.8	56.20
#7 7	1.23	114.0	71.0	0.27	49.0	-1.04	86.0	230.7	276.0	0.5	24.1	0.0	141.5	56.56

4.4 Precautions for the use of Bluetooth modules

（1） Bluetooth use environment, wireless signal applications are greatly affected by the surrounding environment, such as trees, metals and other obstacles will have a certain absorption of wireless signal, so that in practical applications, the distance of data transmission is affected by a certain degree.

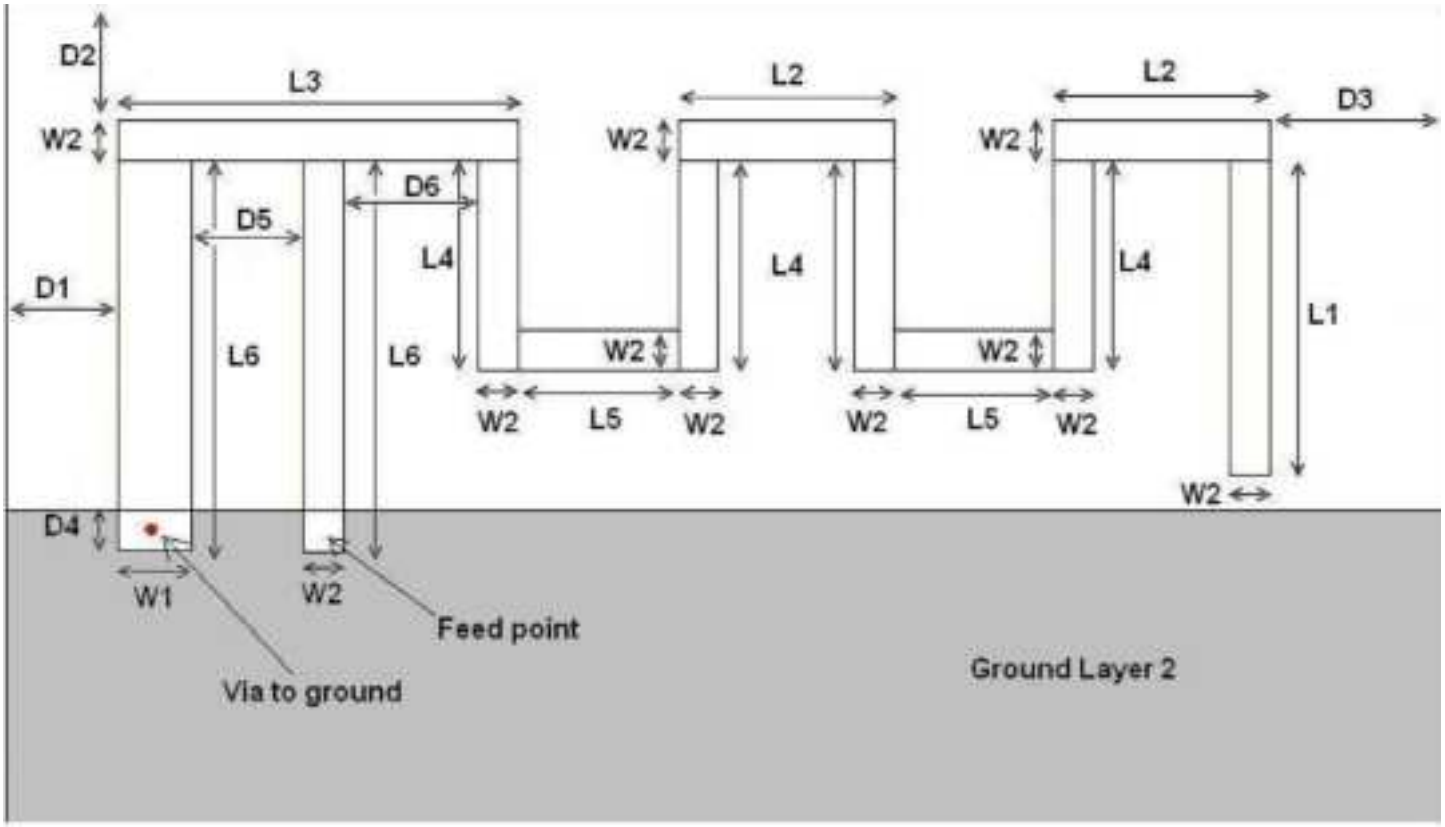
（2） Because the Bluetooth module should be equipped with the existing system, placed in the shell, because the metal housing on the radio frequency signal is shielded. Therefore, it is not recommended to install in a metal housing.

（3） PCB cloth board: Bluetooth module antenna part, because the metal will weaken the function of the antenna, in the module cloth board, the module antenna (the left and right side of the antenna and front end) under the strictly prohibited laying and wiring, if you can hollow out better.



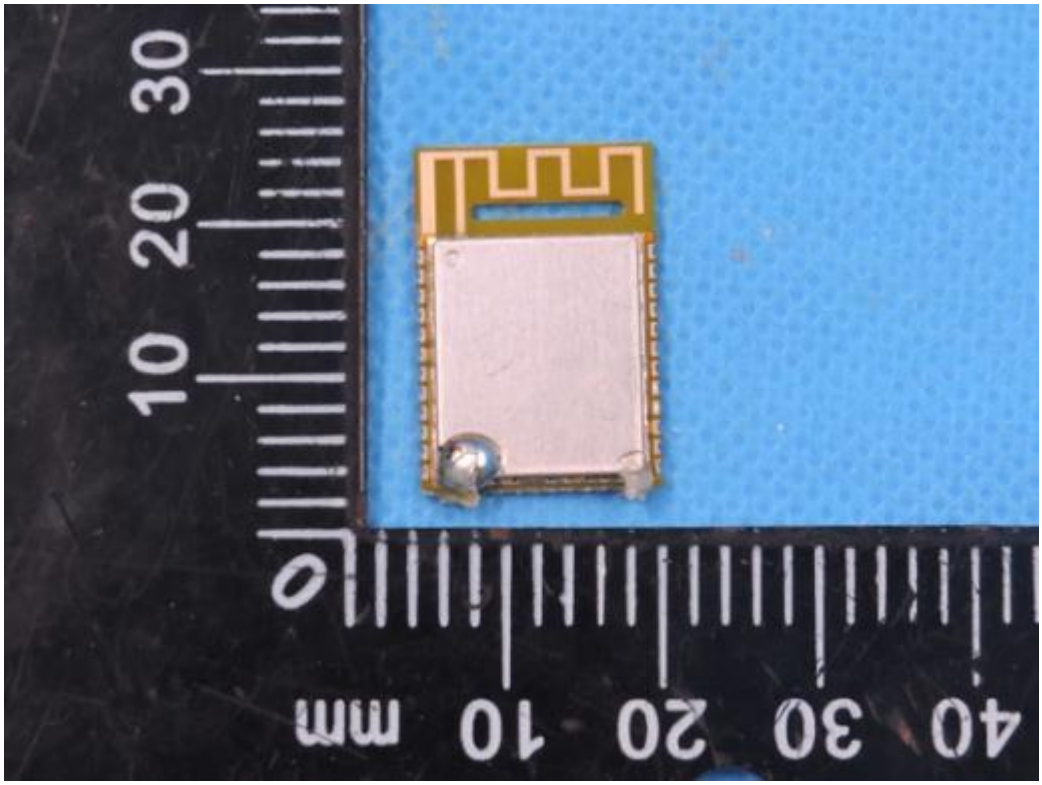
Antenna

Antenna Size :



Label

Stickers: 10mm*10mm



Model: LK8353

FCC ID: 2A8JX-LK8353

IC: 20034-LK8353

FCC Statement

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

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.

FCC Radiation Exposure Statement

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

“Contains Transmitter Module FCC ID: 2A8JX-LK8353 Or Contains FCC ID: 2A8JX-LK8353”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with Single modular approval should perform the test of radiated emissionand spurious emission according to FCC part 15C : 15.247

and 15.209 requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 requirement, then the host can be sold legally.

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.

IC Statement

Radiation Exposure Statement

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

If the ISED identification number is not visible when the module is installed inside another device,

then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following:

“Contains Transmitter Module IC: 20034-LK8353 Or Contains IC: 20034-LK8353”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. This device complies with Industry Canada’s licence-exempt RSSs. Operation is subject to the

following two conditions:

(1) This device may not cause interference; and

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

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

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with Single modular approval should perform the test of radiated emission and spurious emission according to RSS-247 requirement, Only if the test result comply with RSS-247 requirement， then the host can be sold legally.

Cet appareil est conforme aux CNR exemptes de licence d'Industrie Canada . Son fonctionnement est soumis aux deux conditions suivantes :

(1) Ce dispositif ne peut causer d'interférences ; et

(2) Ce dispositif doit accepter toute interférence , y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

Déclaration d'exposition aux radiations

Ce module est conforme aux limites d'exposition aux rayonnements RF IC définies pour un environnement non contrôlé.

environnement. Cet émetteur ne doit pas être co-localisé ou fonctionner en conjonction avec tout autre antenne ou émetteur. Ce module doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et le corps de l'utilisateur.

OEM INTEGRATION INSTRUCTIONS:

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

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 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.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

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/IC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID/IC 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. In such cases, please involve a FCC/IC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC/IC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following:

"Contains FCC ID: 2A8JX-LK8353, IC: IC: 20034-LK8353".

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

2.2 List of applicable FCC/IC rules
List the FCC/IC 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/ICES-003) 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)/RSS-247.

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 EUT has a PCB Antenna, and the antenna use a permanently attached antenna which is not replaceable.

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/IC (new application).
Explanation: This module complies with FCC/IC 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/IC statement, "Contains FCC ID: 2A8JX-LK8353, IC: 20034-LK8353".

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 EUT has a PCB Antenna, and the antenna use a permanently attached antenna which is unique.

2.8 Label and compliance information
Grantees are responsible for the continued compliance of their modules to the FCC/IC 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: 2A8JX-LK8353, IC: 20034-LK8353"."

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/IC 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/ICES-003 disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC/IC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC/IC 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/ICES-003 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/ICES-003 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/ICES-003. The host shoule be evaluated by the FCC Subpart B/ICES-003.