



USER MANUAL FOR INTEGRATORS

This document is meant as user manual for integrators of this module WL18MODGB into their host products.

It is provided along the product when for sale.

Device Overview

Features

• General

- Integrates RF, Power Amplifiers (PAs), Clock, • **Bluetooth and Bluetooth LE (WL18xxMOD RF Switches, Filters, Passives, and Power Only)**
- Management – Bluetooth 4.1 Compliance and CSA2 Support
- Quick Hardware Design With TI Module – Host Controller Interface (HCI) Transport for Collateral and Reference Designs Bluetooth Over UART
- Operating Temperature: –20°C to 70°C – Dedicated Audio Processor Support of SBC
- Small Form Factor: 13.3 × 13.4 × 2 mm Encoding + A2DP
- Dual-Mode Bluetooth and Bluetooth LE
- 100-Pin MOC Package
- TI's Bluetooth- and Bluetooth LE-Certified Stack
- FCC, IC, ETSI/CE, and TELEC Certified

• Wi-Fi • Key Benefits

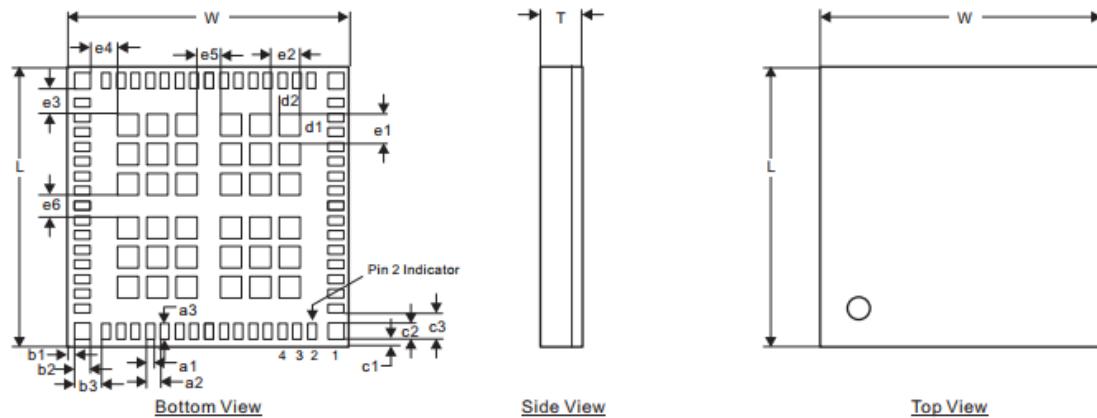
- WLAN Baseband Processor and RF Transceiver – Reduces Design Overhead
- Support of IEEE Std 802.11a, 802.11b, 802.11g, – Differentiated Use-Cases by Configuring WiLink and 802.11n 8 Simultaneously in Two Roles (STA and AP) to
- 20- and 40-MHz SISO and 20-MHz 2 × 2 MIMO Connect Directly With Other Wi-Fi Devices on at 2.4 GHz for High Throughput: 80 Mbps Different RF Channel (Wi-Fi Networks) (TCP), 100 Mbps (UDP) – Best-in-Class Wi-Fi With High-Performance
- 2.4-GHz MRC Support for Extended Range Audio and Video Streaming Reference
- Fully Calibrated: Production Calibration Not Applications With Up to 1.4X the Range Versus Required One Antenna
- 4-Bit SDIO Host Interface Support – Different Provisioning Methods for In-Home Devices Connectivity to Wi-Fi in One Step
- Wi-Fi Direct Concurrent Operation (Multichannel, Multirole) – Lowest Wi-Fi Power Consumption in Connected Idle (< 800 µA)
- Configurable Wake on WLAN Filters to Only Wake up the System
- Wi-Fi-Bluetooth Single Antenna Coexistence

Applications

- Internet of Things (IoT) • Industrial and Home Automation
- Multimedia • Smart Gateway and Metering
- Home Electronics • Video Conferencing
- Home Appliances and White Goods • Video Camera and Security

Mechanical Packaging and Orderable Information

Module Mechanical Outline



TI Module Mechanical Outline

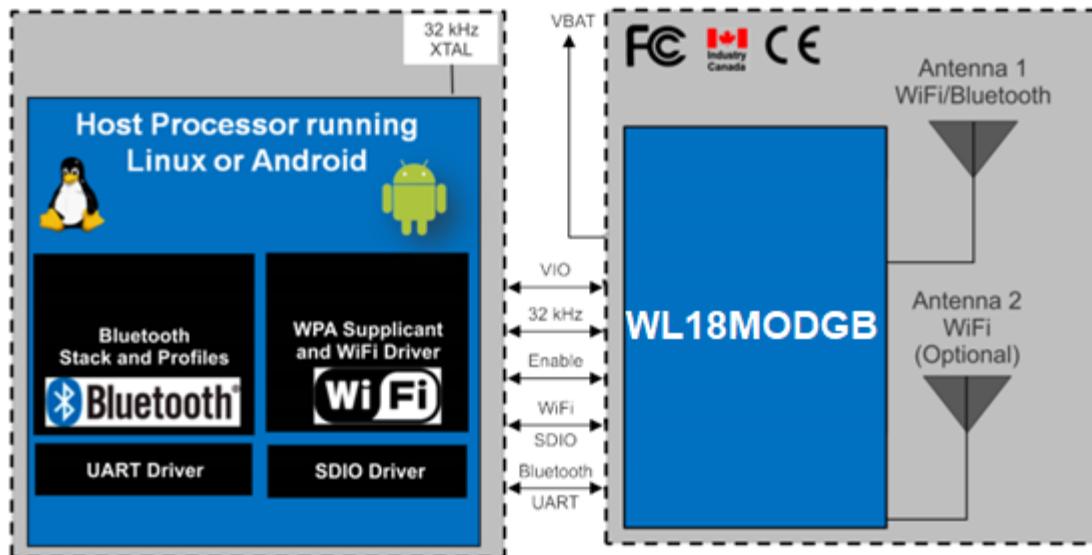
NOTE

The TI module weighs 0.684 g (± 0.005 g).

MARKING	MIN (mm)	NOM (mm)	MAX (mm)	MARKING	MIN (mm)	NOM (mm)	MAX (mm)
L (body size)	13.20	13.30	13.40	c2	0.65	0.75	0.85
W (body size)	13.30	13.40	13.50	c3	1.15	1.25	1.35
T (thickness)	1.90	2.00	d1	0.90	1.00	1.10	
a1	0.30	0.40	0.50	d2	0.90	1.00	1.10
a2	0.60	0.70	0.80	e1	1.30	1.40	1.50
a3	0.65	0.75	0.85	e2	1.30	1.40	1.50
b1	0.20	0.30	0.40	e3	1.15	1.25	1.35
b2	0.65	0.75	0.85	e4	1.20	1.30	1.40
b3	1.20	1.30	1.40	e5	1.00	1.10	1.20
c1	0.20	0.30	0.40	e6	1.00	1.10	1.20

Detailed Description

The WiLink 8 module is a self-contained connectivity solution based on WiLink 8 connectivity. As the eighth-generation connectivity combo chip from TI, the WiLink 8 module is based on proven technology.



WLAN Performance Parameters

WLAN ⁽¹⁾	SPECIFICATION (TYP)	CONDITIONS
Maximum TX power	17.3 dBm	1 Mbps DSSS
Minimum sensitivity	-96.3 dBm	1 Mbps DSSS
Sleep current	160 µA	Leakage, firmware retained
Connected IDLE	750 µA	No traffic IDLE connect
RX search	54 mA	Search (SISO20)
RX current (SISO20)	65 mA	MCS7, 2.4 GHz
TX current (SISO20)	238 mA	MCS7, 2.4 GHz, +11.2 dBm
Maximum peak current consumption during calibration ⁽²⁾	850 mA	

(1) System design power scheme must comply with both peak and average TX bursts.

(2) Peak current VBAT can hit 850 mA during device calibration.

- At wakeup, the WiLink 8 module performs the entire calibration sequence at the center of the 2.4-GHz band.
- Once a link is established, calibration is performed periodically (every 5 minutes) on the specific channel tuned.
- The maximum VBAT value is based on peak calibration consumption with a 30% margin.

Bluetooth Performance Parameters

BLUETOOTH	SPECIFICATION (TYP)	CONDITIONS
Maximum TX power	11.7 dBm	GFSK
Minimum sensitivity	-92.2 dBm	GFSK
Sniff	178 µA	1 attempt, 1.28 s (+4 dBm)
Page or inquiry	253 µA	1.28-s interrupt, 11.25-ms scan window (+4 dBm)
A2DP	7.5 mA	MP3 high quality 192 kbps (+4 dBm)



WLAN Features

The device supports the following WLAN features:

- Integrated 2.4-GHz power amplifiers (PAs) for a complete WLAN solution
- Baseband processor: IEEE Std 802.11b/g and IEEE Std 802.11n data rates with 20- or 40-MHz SISO and 20-MHz MIMO
- Fully calibrated system (production calibration not required)
- Medium access controller (MAC)
- Embedded ARM® central processing unit (CPU)
- Hardware-based encryption-decryption using 64-, 128-, and 256-bit WEP, TKIP, or AES keys
- Requirements for Wi-Fi-protected access (WPA and WPA2.0) and IEEE Std 802.11i (includes hardware-accelerated Advanced Encryption Standard [AES])
- New advanced coexistence scheme with *Bluetooth* and *Bluetooth* LE wireless technology
- 2.4-GHz radio
- Internal LNA and PA
- IEEE Std 802.11b, 802.11g, and 802.11n
- 4-bit SDIO host interface, including high speed (HS) and V3 modes

Bluetooth Features

The device supports the following *Bluetooth* features:

- *Bluetooth* 4.1 as well as CSA2
- Concurrent operation and built-in coexisting and prioritization handling of *Bluetooth* and *Bluetooth* LE wireless technology, audio processing, and WLAN
- Dedicated audio processor supporting on-chip SBC encoding + A2DP
- Assisted A2DP (A3DP): SBC encoding implemented internally
- Assisted WB-speech (AWBS): modified SBC codec implemented internally

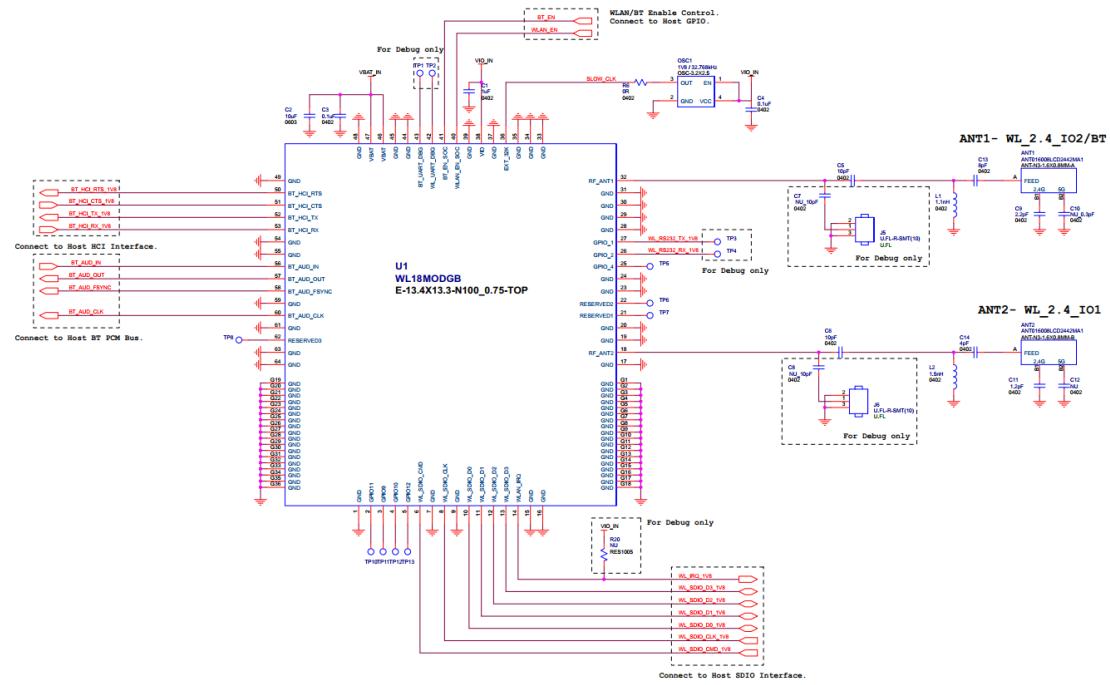
Bluetooth LE Features

The device supports the following *Bluetooth* LE features:

- *Bluetooth* 4.0 LE dual-mode standard
- All roles and role combinations, mandatory as well as optional
- Up to 10 LE connections
- Independent LE buffering allowing many multiple connections with no affect on BR-EDR performance

Application Information

Typical Application – WL18MODGB Reference Design



Design Recommendations

This section describes the layout recommendations for the WL18MODGB module, RF trace, and antenna.

ITEM	DESCRIPTION
Thermal	
1	The proximity of ground vias must be close to the pad.
2	Signal traces must not be run underneath the module on the layer where the module is mounted.
3	Have a complete ground pour in layer 2 for thermal dissipation.
4	Have a solid ground plane and ground vias under the module for stable system and thermal dissipation.
5	Increase the ground pour in the first layer and have all of the traces from the first layer on the inner layers, if possible.
6	Signal traces can be run on a third layer under the solid ground layer, which is below the module mounting layer.
RF Trace and Antenna Routing	
7	The RF trace antenna feed must be as short as possible beyond the ground reference. At this point, the trace starts to radiate.
8	The RF trace bends must be gradual with an approximate maximum bend of 45 degrees with trace mitered. RF traces must not

SPECIM



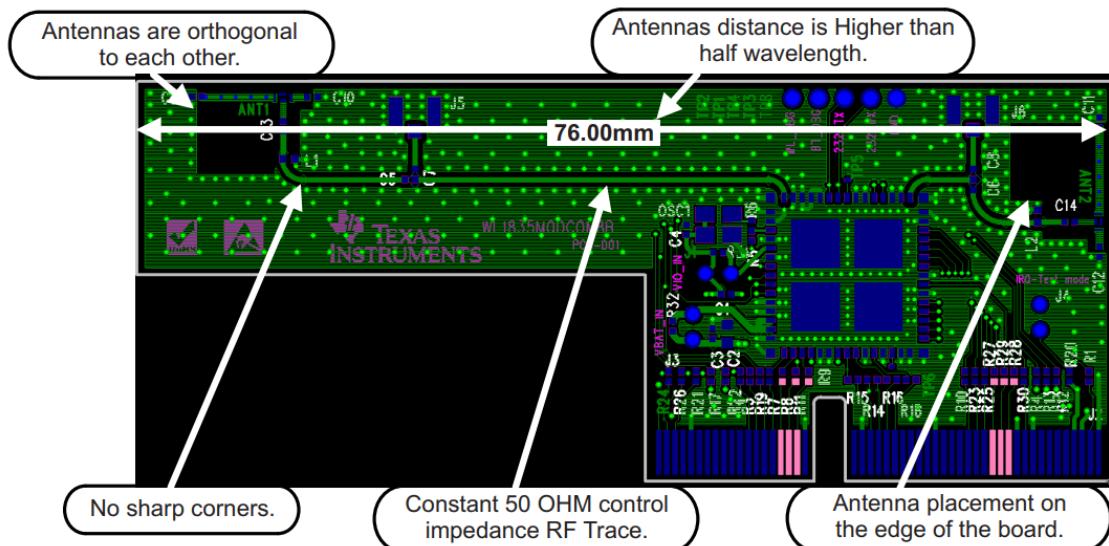
SPECTRAL IMAGING

	have sharp corners.
9	RF traces must have via stitching on the ground plane beside the RF trace on both sides.
10	RF traces must have constant impedance (microstrip transmission line).
11	For best results, the RF trace ground layer must be the ground layer immediately below the RF trace. The ground layer must be solid.
12	There must be no traces or ground under the antenna section.
13	RF traces must be as short as possible. The antenna, RF traces, and modules must be on the edge of the PCB product. The proximity of the antenna to the enclosure and the enclosure material must also be considered.
Supply and Interface	
14	The power trace for VBAT must be at least 40-mil wide.
15	The 1.8-V trace must be at least 18-mil wide.
16	Make VBAT traces as wide as possible to ensure reduced inductance and trace resistance.
17	If possible, shield VBAT traces with ground above, below, and beside the traces.
18	SDIO signals traces (CLK, CMD, D0, D1, D2, and D3) must be routed in parallel to each other and as short as possible (less than 12 cm). In addition, every trace length must be the same as the others. There should be enough space between traces – greater than 1.5 times the trace width or ground – to ensure signal quality, especially for the SDIO_CLK trace. Remember to keep these traces away from the other digital or analog signal traces. TI recommends adding ground shielding around these buses.
19	SDIO and digital clock signals are a source of noise. Keep the traces of these signals as short as possible. If possible, maintain a clearance around them.

RF Trace and Antenna Layout Recommendations

NOTE

For reuse of the regulatory certification, a trace of 1-dB attenuation is required on the final application board.



Follow these RF trace routing recommendations:

- RF traces must have $50\text{-}\Omega$ impedance.
- RF traces must not have sharp corners.
- RF traces must have via stitching on the ground plane beside the RF trace on both sides.
- RF traces must be as short as possible. The antenna, RF traces, and module must be on the edge of the PCB product in consideration of the product enclosure material and proximity.



Regulatory Information

USA

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

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Class B device notice

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.

RF exposure safety

The WL18MODGB, FCC ID: 2ALJ9-WL18SBMOD is a radio transmitter and receiver.

It is designed not to exceed the emission limits for exposure to radio frequency (RF) energy set by the Federal Communications Commission.

The antenna must 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.

Labelling Requirements for the Host Device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains FCC ID: 2ALJ9-WL18SBMOD



Canada

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

Les changements ou modifications non expressément approuvés par la partie responsable de la conformité pourraient annuler l'autorisation de l'utilisateur d'utiliser l'équipement.

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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF exposure safety

The WL18MODGB, IC: 23244-WL18SBMOD is a radio transmitter and receiver.

It is designed not to exceed the emission limits for exposure to radio frequency (RF) energy set by the ISED.

The antenna must 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.

Le WL18MODGB, IC: 23244-WL18SBMOD est un émetteur et un récepteur radio.

Il est conçu pour ne pas dépasser les limites d'émission pour l'exposition à l'énergie radiofréquence (RF) établie par l'ISDE.

L'antenne doit être installé de façon à garder une distance minimale de 20 cm entre la source de rayonnements et votre corps.

L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

CAN ICES-3 (B)/NMB-3(B)

This Class B digital apparatus complies with Canadian ICES-003

Cet appareil numérique de classe B est conforme à la norme Canadienne ICES-003



Labelling Requirements for the Host Device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

Contains IC: 23244-WL18SBMOD

L'équipement hôte doit être correctement étiqueté pour identifier les modules dans l'équipement. L'étiquette de certification du module doit être clairement visible en tout temps lorsqu'il est installé dans l'hôte, l'équipement hôte doit être étiqueté pour afficher l'IC du module, précédé des mots "Contient le module émetteur", ou le mot "Contient", ou un libellé similaire exprimant la même signification, comme suit:

Contains IC: 23244-WL18SBMOD