



LM812 WiFi and Bluetooth® 4.2 Dual Mode USB Module

Host Controller Interface (HCI) via USB Interface

Revised

15/MAR/2021

Datasheet Version

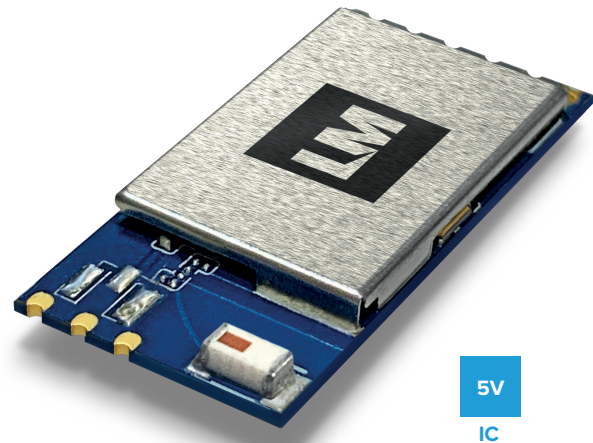
1.2

Ordering Options

See last page



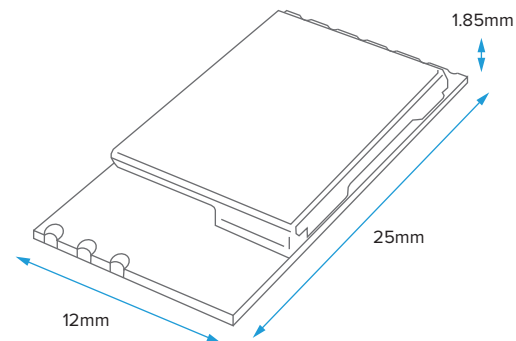
3.3V
IPEX



5V
IC

Features

- WiFi 802.11 b/g/n/e/i
- Bluetooth® v4.2
(Backward compatible with Bluetooth® v2.0, v2.1, v3.0, v4.0)
- WPA, WPA-PSK, WPA2, WPA2 -PSK and WEP (64bit & 128bit) encryption schemes
- Full speed Bluetooth® Piconet and Scatternet
- 5V IC Antenna or 3.3V IPEX Connector module options
- USB 2.0
- Supports sophisticated WiFi / Bluetooth® coexistence to enhance performance
- Supports Bluetooth® adaptive power management



- 25mm x 12mm x 1.85mm
- Linux (Kernel v2.6.24 - v5.1), Android 9.x and Windows XP – 10 compatible
- See our website for this products certifications. RoHS, REACH and WEEE compliant.

Overview

The LM812 combination module offers coexistence for Bluetooth® (Dual Mode) and WiFi operations, allowing the host computer to wirelessly communicate with other Bluetooth® and WiFi enabled devices. This cost-effective module saves valuable PCB space within your product.

The LM812 module supports IEEE 802.11b/g/n/e/i and Bluetooth® v2.0, v2.1, v3.0, v4.0 and v4.2 standards.

Compatible with Linux (Kernel v5.1), Android 9.x and Windows XP – 10 platforms.

The LM812 module also offers low power consumption and an intelligent coexistence mechanism, ideal for communicating with many wireless devices such as tablets, smart phones and laptops.





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General Specification

Wireless Standard	WiFi: 802.11 b/g/n/e/i Bluetooth®: v2.1+EDR/v3.0/v4.0/v4.2
Module Type	Host Controller Interface (HCI)
OS Compatibility	Linux (Kernel v2.6.24 - v5.1), Android 1.6 – 2.3, Android 4.0 – 9.x, Windows XP – 10
Security	WiFi: WPA, WPA-PSK, WPA2, WPA2 -PSK, WEP (64bit & 128bit) ,IEEE 802.11x, ,IEEE 802.11i Bluetooth®: Simple Paring
Network Architecture	WiFi: Ad hoc mode (Peer-to-Peer) and Infrastructure mode Software AP; WiFi Direct Bluetooth®: Pico Net; Scatter Net
Chipset	Realtek
Antenna	Onboard Chip Antenna or IPEX Connector
Interfaces	USB 2.0
Tx Output Power	WiFi: 17dBm – 802.11b@11Mbps 15dBm – 802.11g@6Mbps 14dBm – 802.11g@54Mbps 13dBm – 802.11n@MCS0_HT20 13dBm – 802.11n@MCS7_HT20 13dBm – 802.11n@MCS0_HT40 13dBm – 802.11n@MCS7_HT40 Bluetooth®: Maximum 10dBm
Rx Sensitivity	WiFi: -82dBm – 802.11b@11Mbps -71dBm – 802.11g@54Mbps -67dBm – 802.11n@MCS7_HT20 -64dBm - 802.11n@MCS7_HT40 Bluetooth®: -89dBm@1Mbps -90dBm@2Mbps -83dBm@3Mbps



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Host Controller Interface (HCI) via USB Interface

General Specification (Continued)

Power Consumption	Average: TBA Peak: TBA
Range (in open space)	WiFi: Up to 180m Bluetooth®: Up to 10m
Data Transfer Rate	WiFi: 802.11b: 11, 5.5, 2, 1 Mbps 802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps 802.11n: MCS0 to 7 for HT20MHz 802.11n: MCS0 to 7 for HT40MHz Bluetooth®: Basic rate: 1Mbps Enhanced data rate: 2, 3 Mbps Low Energy: 1Mbps
Frequency	2.4GHz to 2.4835 GHz
Modulation Scheme	WiFi: 802.11b: CCK, DQPSK, DBPSK 802.11g: 64QAM, 16QAM, QPSK, BPSK 802.11n: 64QAM, 16QAM, QPSK, BPSK Bluetooth®: 8DPSK, $\pi/4$ DQPSK, GFSKFSK
Spread Spectrum	WiFi: IEEE 802.11b: DSSS (Direct Sequence Spread Spectrum) IEEE 802.11g/n: OFDM (Orthogonal Frequency Division Multiplexing) Bluetooth®: FHSS (Frequency Hopping Spread Spectrum)
Operating Channels	WiFi (2.4GHz): 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan Bluetooth® (2.4GHz): Ch. 0 to 78



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Host Controller Interface (HCI) via USB Interface

General Specification (Continued)

Physical Characteristics

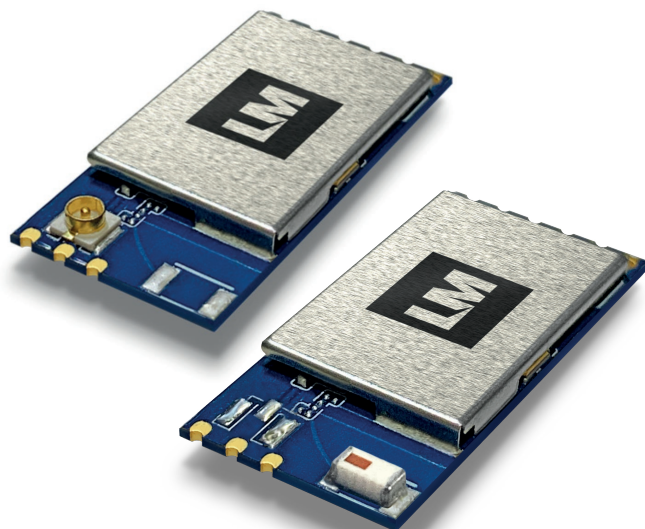
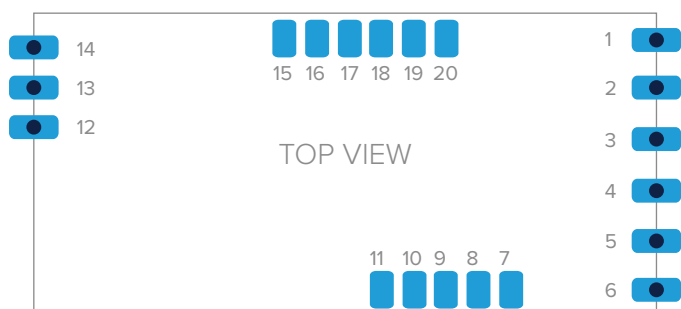
Operating Temperature	-20°C to +80°C ambient temperature 0 to 95 % (non-condensing)
Storage Temperature	-30°C to +85°C ambient temperature 0 to 95 % (non-condensing)
Dimensions (L x W x H)	25mm x 12mm x 1.85mm
Weight	1.10g +/- 0.25g tolerance
Certifications	See our website for this products certifications.
Compliance	RoHS, REACH and WEEE



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Host Controller Interface (HCI) via USB Interface

Pin Outs



Pin Assignments

Pin Signal Type Description

1	HOST_WAKE_BT	Input	Shared with GPIO 13.
2	VDD	Power	Supply DC 3.3V for LM812 (IPEX Connector Module) / Supply DC 5V for LM812 (IC Antenna Module).
3	HSDM	I/O	USB D- signal
4	HSDP	I/O	USB D+ signal.
5	GND	-	Ground.
6	BT_WAKE_HOST	Output	Shared with GPIO 14. Bluetooth® device wake up host.
7	NC	-	Do not connect to ground (IC pin GPIO3).
8	NC	-	Do not connect to ground (IC pin GPIO2).
9	NC	-	Do not connect to ground (IC pin GPIO1).
10	NC	-	Do not connect to ground (IC pin GPIO0).
11	EXT_XIN	-	No connection, leave floating.
12	GND	-	Ground.
13	ANT	RF	WiFi / Bluetooth® RF port (if you are NOT using the IPEX connector).
14	GND	-	Ground.
15	WL_WAKE_HST	Output	WLAN device wake up host (IC pin GPIO8).
16	WL_WAKE_WL	Input	Host wake up WLAN device (IC pin BT_GPIO14).
17	NC	-	No Connection. Do not connect to ground.
18	BT_DIS#	Input	Bluetooth disable. Default pull high, external pull low disable BT.
19	WL_DIS#	Input	WLAN disable. Default pull high, external pull low disable WLAN.
20	3DD_SEL	-	No Connection. Do not connect to ground (IC pin GPIO6).

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Host Controller Interface (HCI) via USB Interface

DC Power Input

Module	Min	Typical	Max	Unit
DC 5V (IC Antenna)	4.75	5	5.25	V
DC 3.3V (IPEX Connector)	3.135	3.3	3.465	V

Important Warning

Do **NOT** use the wrong voltage on your module.

3.3V IPEX connector products must only use 3.3V

5V IC Antenna products must only use 5V

Power Consumption

DC power for 5V

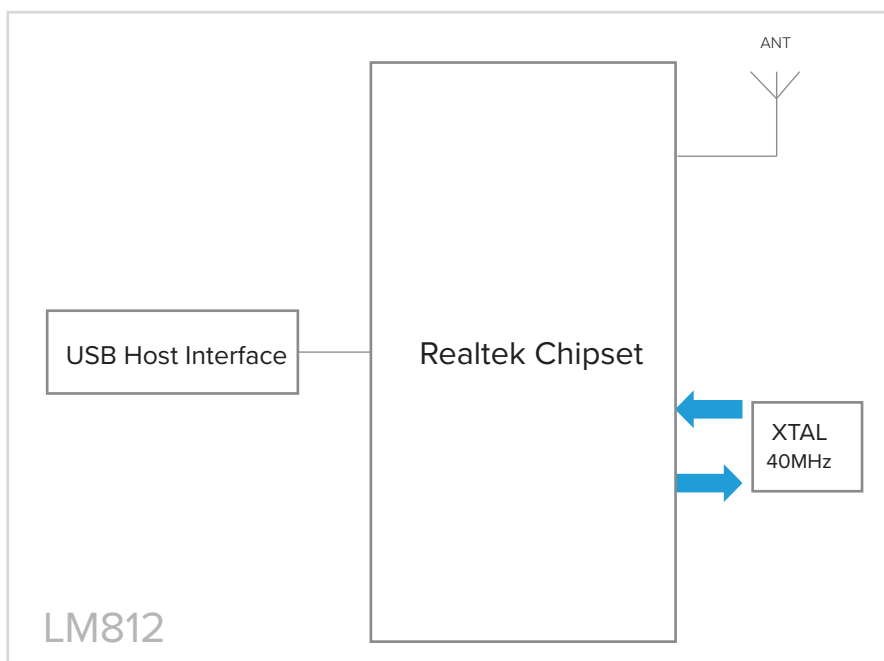
Description	Performance	
	Typical	Units
Off	10	uA
Unassociated idle	40	mA
Associated idle for 2.4GHz band	70	mA
Data transfer for 2.4GHz	103	mA

DC power for 3.3V

Description	Performance	
	Typical	Units
Off	16	uA
Unassociated idle	90	mA
Associated idle for 2.4GHz band	141	mA
Data transfer for 2.4GHz	168	mA

NB: Data transfer test using the Linux driver: Linux_v4.3.6_1184.20140714

Module Block Diagram



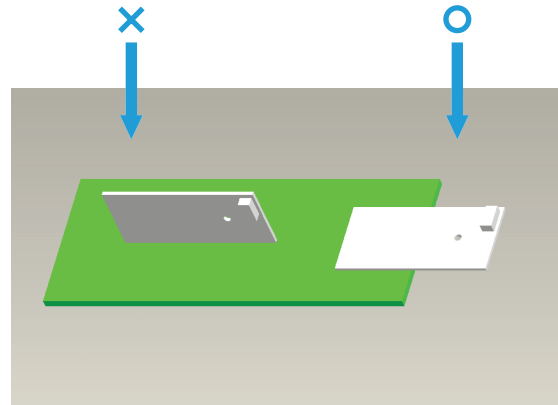
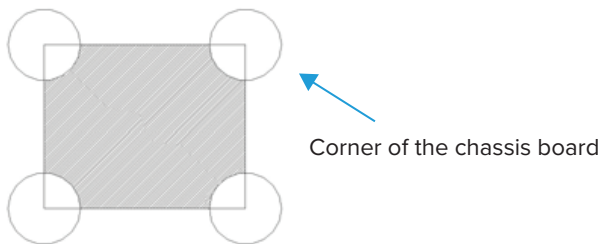
LM812 WiFi and Bluetooth® 4.2 Dual Mode USB Module

Host Controller Interface (HCI) via USB Interface

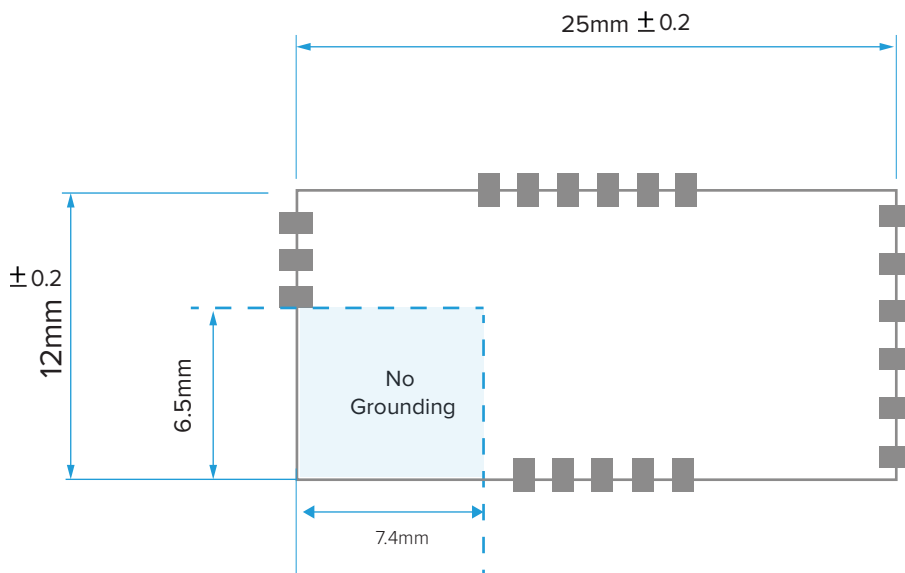
Module Placement Notes

In order to get a better performance please don't put any metal shielding in the surrounding area of module and try to leave the module placed in the corner of chassis board as close as possible.

Considering antenna field pattern it is better to put the module in horizontal way with the chassis board.



PCB Footprint

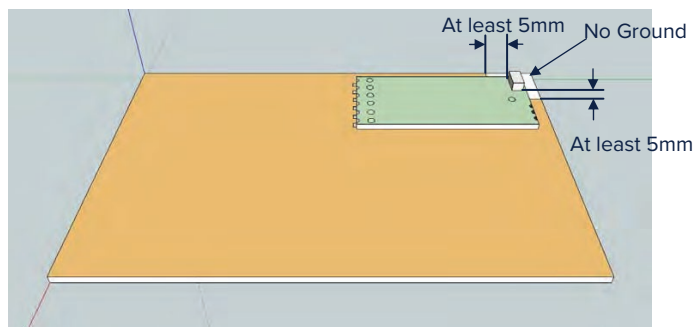


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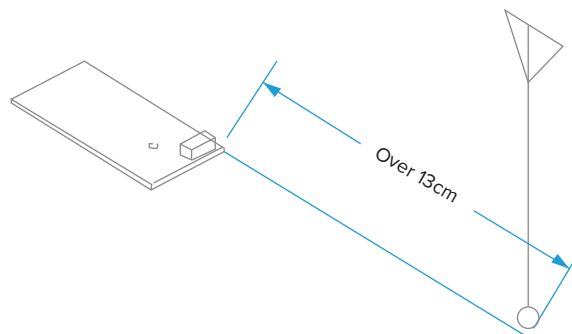
Host Controller Interface (HCI) via USB Interface

Chip Antenna

The antenna area in the module should protrude outside the Ground at least 5mm

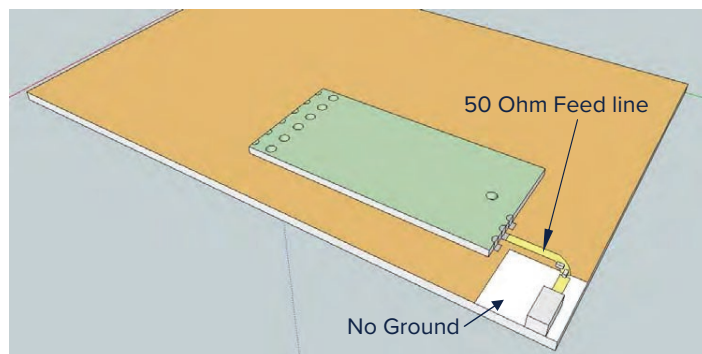
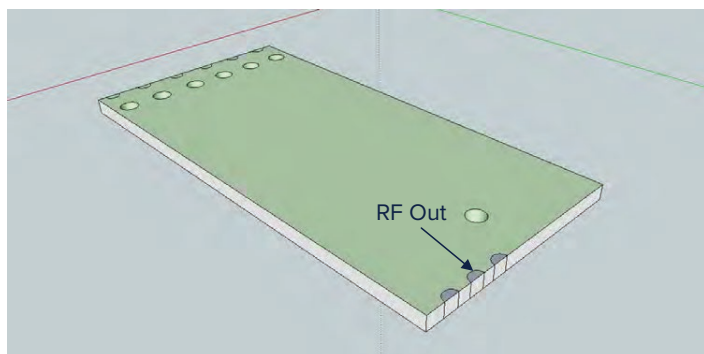


Keep the distance at least 13cm long with WLAN or another antenna of the same frequency band, to avoid the interference or deteriorate the performance.

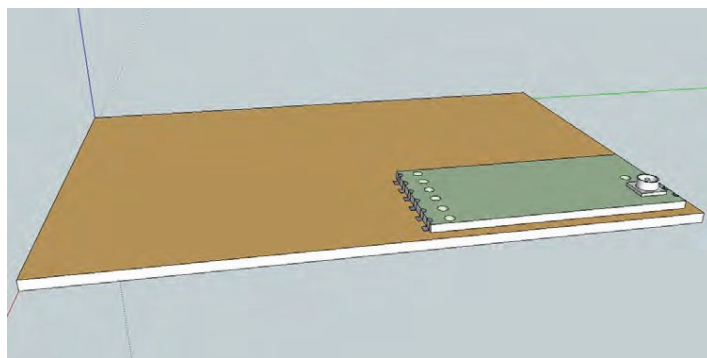


RF Out

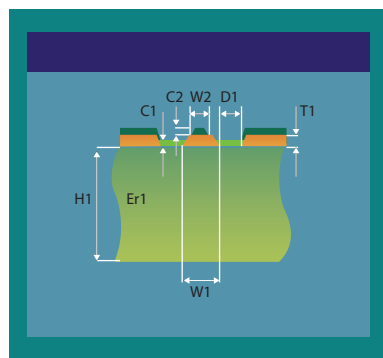
This RF out pin needs the input impedance of 50 Ohm



RF Connector



50 Ohm Feed Line



H1	20 - 60 mil
Er1	4.2
W1	20 mil
W2	20 mil
D1	5 mil
C1	0.7 mil
C2	0.7 mil
T1	1.4 mil (1 oz)
Impedance	51 - 53 Ohm

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PCB Drying Conditions

Please refer below to the conditions for drying before the solder reflow processes. (Extracted from IPC/JEDEC J-STD-033B.1)

1. If the system PCBA is double side design please reflow the side without this module first.
2. Don't let the solder machine temperature over 250 °C or follow solder paste vender's recommended temperature.
3. The Ramp-up temperature speed is 1~4 °C per second, the Ramp-down temperature speed is 1~4 °C per second.
4. This temperature reflow chart is for reference only, it depends on the manufacturing machine's characters requirement.

Bake @ 125 °C

Exceeding floor Life by
> 72h

9 hours

Exceeding floor Life by
≤ 72h

7 hours

Bake @ 90 °C

Exceeding floor Life by
> 72h

33 hours

Exceeding floor Life by
≤ 72h

23 hours

Bake @ 40 °C

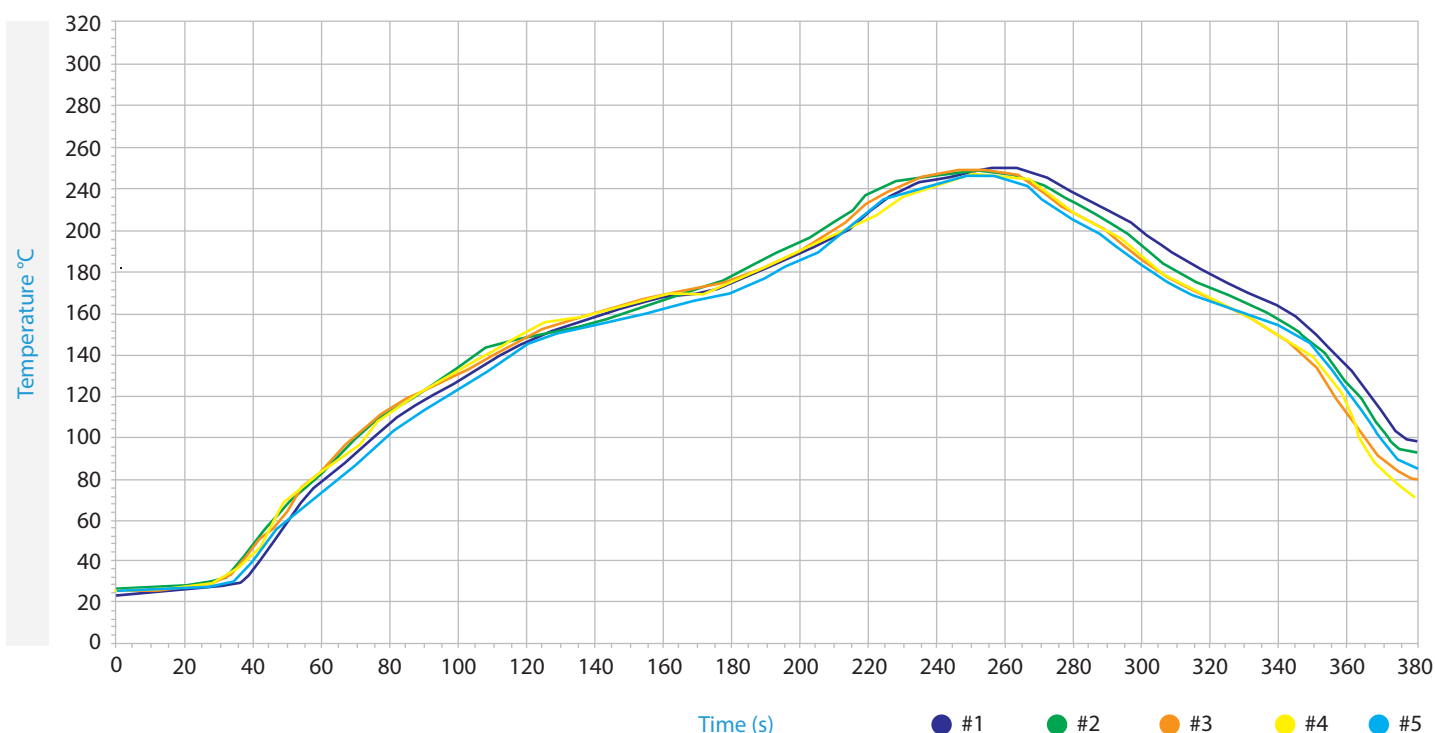
Exceeding floor Life by
> 72h

13 days

Exceeding floor Life by
≤ 72h

9 days

Soldering Reflow Chart



Name	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8
Max	180.0	180.0	170.0	170.0	180.0	210.0	260.0	245.0
Min	180.0	180.0	170.0	170.0	180.0	210.0	260.0	245.0
Length	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

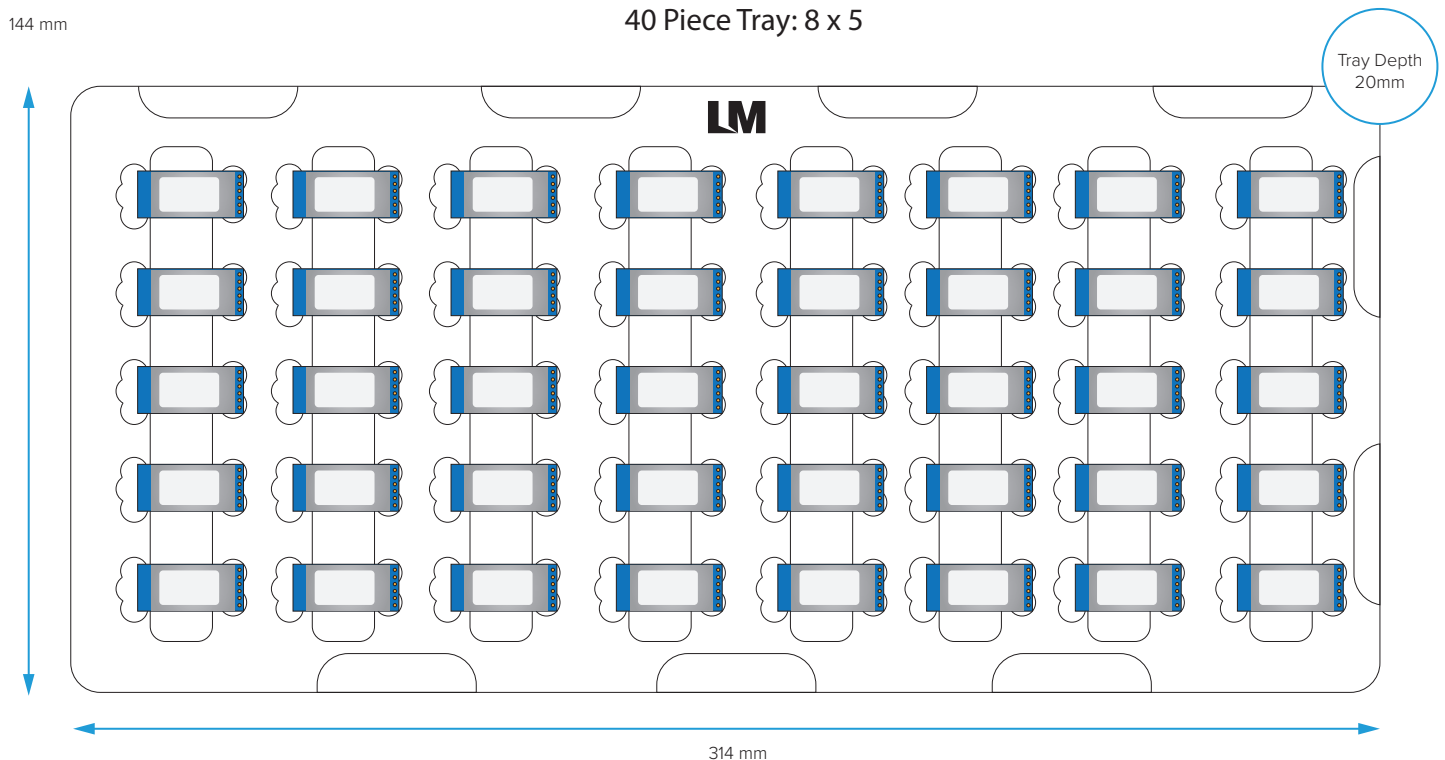
Probe	Liquidus Line		Maximum / Minimum		Slope	
	Rising 110.00-190.00	Above 230.0	Max	Min	Positive	Negative
#1	119.00	47.50	245.50	27.30	2.56	-1.69
#2	116.50	49.00	247.10	27.70	2.69	-1.60
#3	116.00	46.50	245.80	29.30	2.04	-1.57
#4	117.00	46.50	244.90	29.20	2.60	-1.31
#5	119.50	50.00	248.10	29.60	2.44	-1.64

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Tray Packaging

Tray Dimensions



Quantities

- 40 modules per Tray
- 3 Trays per Inner Box
- 120 modules per Inner Box
- 8 Inner Boxes per Outer Carton
- 960 modules per Outer Carton

Notes

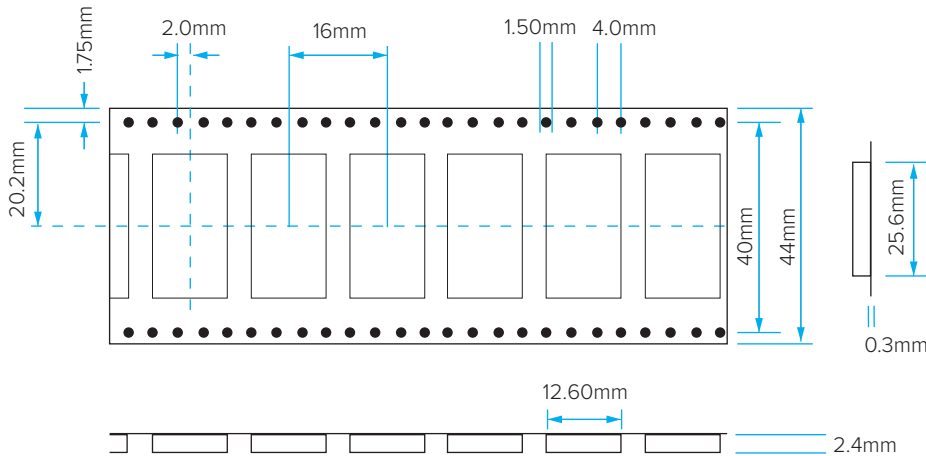
- Anti-Static PS Tray, Black.
- Material Thickness: 1mm
- Height of Tray: 20mm
- Carton Dimensions (L x W x H):
340mm x 290mm x 385mm

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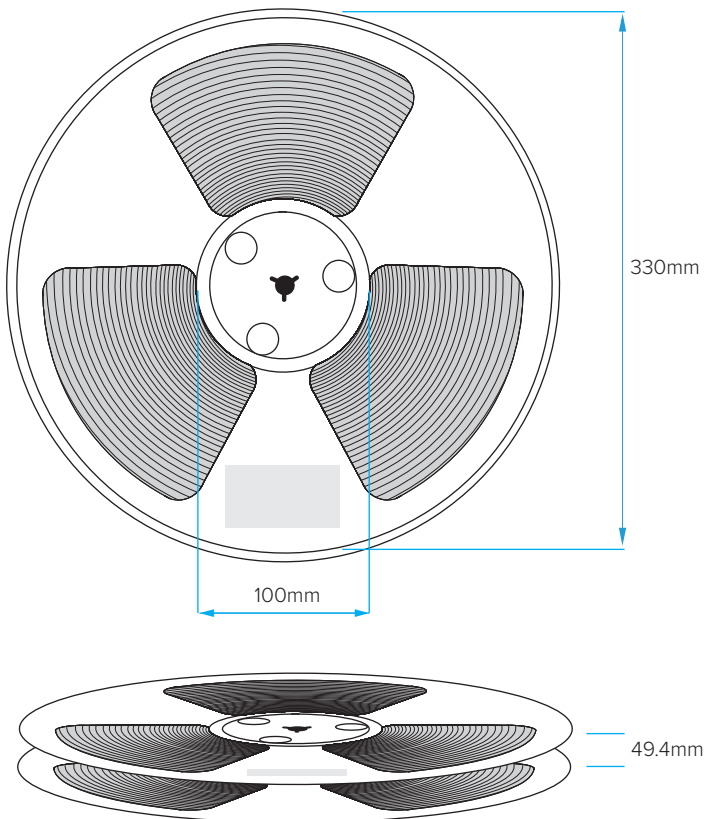
Host Controller Interface (HCI) via USB Interface

Tape and Reel Packaging

Tape Dimensions



Reel Dimensions



Quantities

- 1500 modules per Tape & Reel
- 1 Tape & Reel per Inner Box
- 5 Inner Boxes per Outer Carton
- 7500 modules per Outer Carton

Notes

- Inner Box Dimensions (L x W x H):
360mm x 360mm x 60mm
- Outer Carton Dimensions (L x W x H):
395mm x 360mm x 305mm

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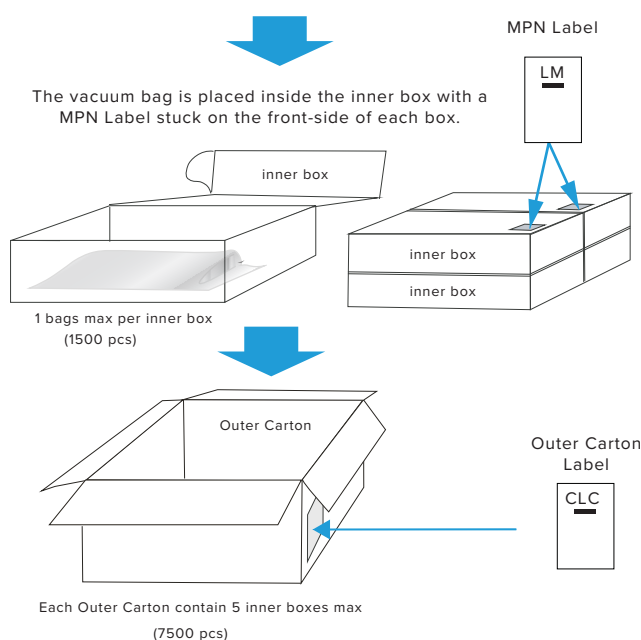
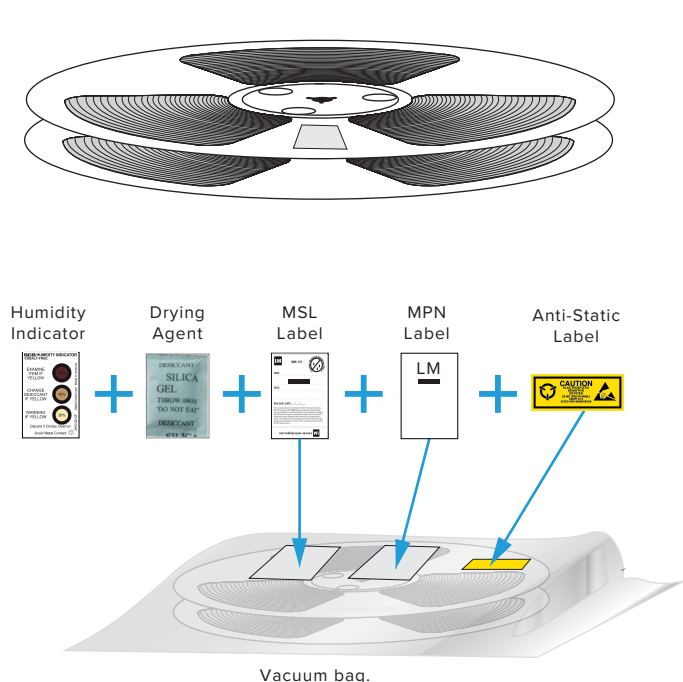
Host Controller Interface (HCI) via USB Interface

Packaging for Tape & Reel / Tray

The Tape & Reel / Tray are inserted into an anti-static vacuum bag with a Humidity Indicator Card and Drying Agent. On the outside of the vacuum bag are MSL (Moisture Sensitivity Levels), MPN and an Anti-Static Labels.

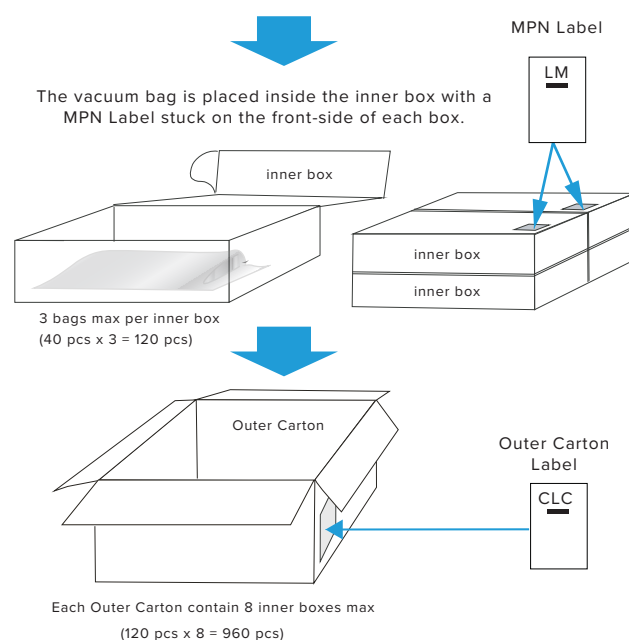
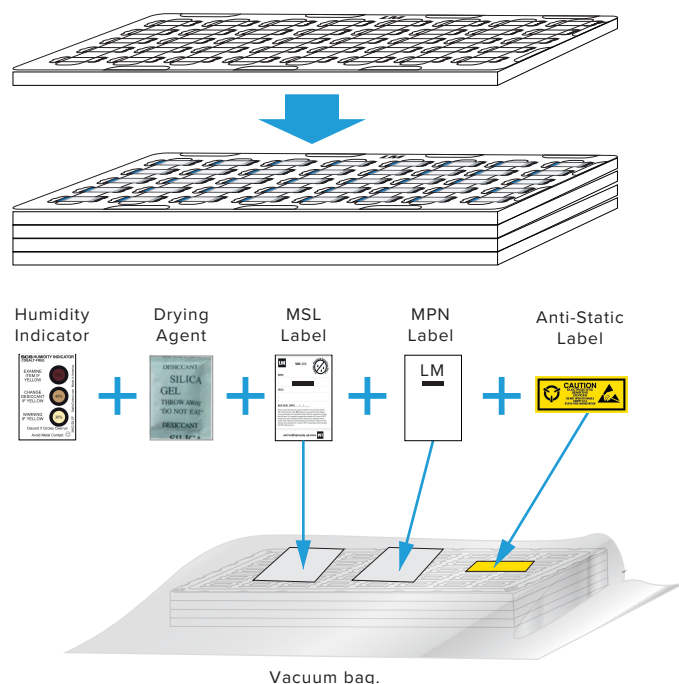
Tape & Reel

Reels are placed within a vacuum bag.



Tray

Trays are stacked with an empty tray on the top and placed within a vacuum bag.





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Host Controller Interface (HCI) via USB Interface

Datasheet Version Notes

v1.0	5 MAR 2021	Initial datasheet release.
v1.1	8 MAR 2021	Power Consumption and Packing information added.
v.1.2	15 MAR 2021	Pin Out 3 and 4 Description error amended. D- D+



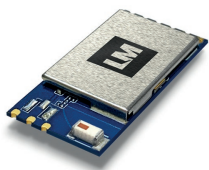
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Ordering Options

RF Country Bands

Our default radio region is ETSI. Unless specified otherwise when ordering, units will be shipped using the ETSI radio bands.



5V
IC

Ordering Code

812-8121-000

812-8121-001

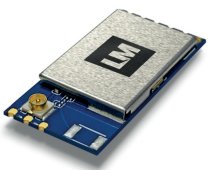
812-8121-002

5V Module with IC Antenna

MOD SMT HCI 802.11n BT4.2 -20c 5v IC ANT D-Type SP

MOD SMT HCI 802.11n BT4.2 -20c 5v IC ANT D-Type TRAY

MOD SMT HCI 802.11n BT4.2 -20c 5v IC ANT D-Type T&R



3.3V
IPEX

Ordering Code

812-8120-000

812-8120-001

812-8120-002

3.3V Module with IPEX Connector

MOD SMT HCI 802.11n BT4.2 -20c 3.3V IPEX SP

MOD SMT HCI 802.11n BT4.2 -20c 3.3V IPEX TRAY

MOD SMT HCI 802.11n BT4.2 -20c 3.3V IPEX T&R

● Product User Guides, Manuals and Configuration Software can be downloaded via our website - <http://www.lm-technologies.com/downloads>