

LM812 Wi-Fi and Bluetooth® 4.2 Dual Mode USB Module

Host Controller Interface (HCI) via USB Interface

Revised

10/MAY/2023

Datasheet Version

1.4

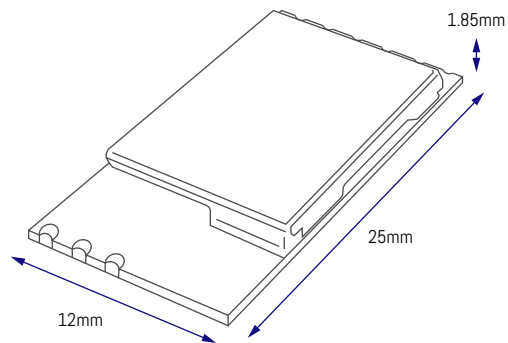
Ordering Options

See last page



Features

- Wi-Fi 4 (802.11 b/g/n/e/i)
- Bluetooth 4.2
(Backward compatible with Bluetooth 2.0, 2.1, 3.0, 4.0)
- 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 W-iFi / Bluetooth coexistence to enhance performance
- Supports Bluetooth adaptive power management



- 25mm x 12mm x 1.85mm
- Linux (Kernel 2.6.24 - 5.3), Android 10.x and Windows XP – 11 compatible
- See the website for this product's certifications. RoHS, REACH and WEEE compliant

Overview

The LM812 combination module offers coexistence for Bluetooth Dual Mode and Wi-Fi operations, allowing the host computer to wirelessly communicate with other Bluetooth and Wi-Fi 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 2.0, 2.1, 3.0, 4.0 and 4.2 standards.

Compatible with Linux (Kernel 5.3), Android 10.x and Windows XP – 11 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	<p>Wi-Fi:</p> <p>802.11 b/g/n/e/i</p> <p>Bluetooth:</p> <p>2.1+EDR/3.0/4.0/4.2 - BR/EDR and Low Energy</p>
Module Type	Host Controller Interface (HCI)
OS Compatibility	Linux (Kernel 2.6.24 - 5.3), Android 1.6 – 2.3, Android 4.0 – 10.x, Windows XP – 11
Security	<p>Wi-Fi:</p> <p>WPA, WPA-PSK, WPA2, WPA2 -PSK, WEP (64bit & 128bit), IEEE 802.11x, IEEE 802.11i</p> <p>Bluetooth:</p> <p>Simple Pairing</p>
Network Architecture	<p>Wi-Fi:</p> <p>Ad hoc mode (Peer-to-Peer) and Infrastructure mode Software AP; WiFi Direct</p> <p>Bluetooth:</p> <p>Pico Net; Scatter Net</p>
Chipset	Realtek
Antenna	Onboard Chip Antenna or IPEX Connector
Interfaces	USB 2.0
Tx Output Power	<p>Wi-Fi:</p> <p>17dBm – 802.11b@11Mbps</p> <p>15dBm – 802.11g@6Mbps</p> <p>14dBm – 802.11g@54Mbps</p> <p>13dBm – 802.11n@MCS0_HT20</p> <p>13dBm – 802.11n@MCS7_HT20</p> <p>13dBm – 802.11n@MCS0_HT40</p> <p>13dBm – 802.11n@MCS7_HT40</p> <p>Bluetooth:</p> <p>Maximum 10dBm</p>
Rx Sensitivity	<p>Wi-Fi:</p> <p>-82dBm – 802.11b@11Mbps</p> <p>-71dBm – 802.11g@54Mbps</p> <p>-67dBm – 802.11n@MCS7_HT20</p> <p>-64dBm - 802.11n@MCS7_HT40</p> <p>Bluetooth:</p> <p>-89dBm@1Mbps -90dBm@2Mbps -83dBm@3Mbps</p>



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General Specification (Continued)

Power Consumption	See Page 6 for details
Range (in open space)	Wi-Fi: Up to 180m Bluetooth: Up to 10m
Data Transfer Rate	<p>Wi-Fi:</p> <p>802.11b: 11, 5.5, 2, 1 Mbps</p> <p>802.11g: 54, 48, 36, 24, 18, 12, 9, 6 Mbps</p> <p>802.11n: MCS0 to 7 for HT20MHz</p> <p>802.11n: MCS0 to 7 for HT40MHz</p> <p>Bluetooth:</p> <p>Basic rate: 1 Mbps</p> <p>Enhanced data rate: 2, 3 Mbps</p> <p>Low Energy: 1 Mbps</p>
Frequency	24GHz to 24835 GHz
Modulation Scheme	<p>Wi-Fi:</p> <p>802.11b: CCK, DQPSK, DBPSK</p> <p>802.11g: 64QAM, 16QAM, QPSK, BPSK</p> <p>802.11n: 64QAM, 16QAM, QPSK, BPSK</p> <p>Bluetooth:</p> <p>8DPSK, $\pi/4$ DQPSK, GFSKFSK</p>
Spread Spectrum	<p>Wi-Fi:</p> <p>IEEE 802.11b: DSSS (Direct Sequence Spread Spectrum)</p> <p>IEEE 802.11g/n: OFDM (Orthogonal Frequency Division Multiplexing)</p> <p>Bluetooth®:</p> <p>FHSS (Frequency Hopping Spread Spectrum)</p>
Operating Channels	<p>Wi-Fi (24GHz):</p> <p>11: (Ch. 1-11) – United States</p> <p>13: (Ch. 1-13) – Europe</p> <p>14: (Ch. 1-14) – Japan</p> <p>Bluetooth (24GHz):</p> <p>Ch. 0 to 78</p> <p>Ch. 0 to 39 (Bluetooth Low Energy)</p>



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Host Controller Interface (HCI) via USB Interface

General Specification (Continued)

Physical Characteristics

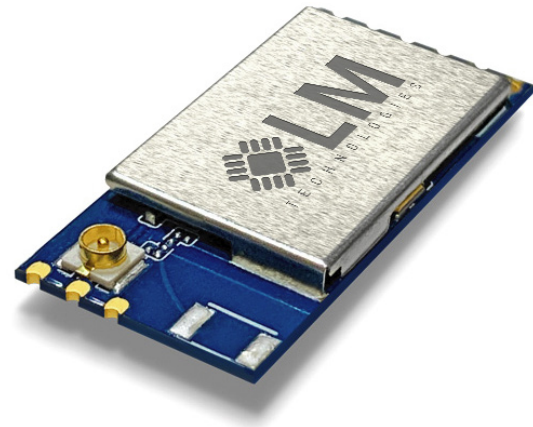
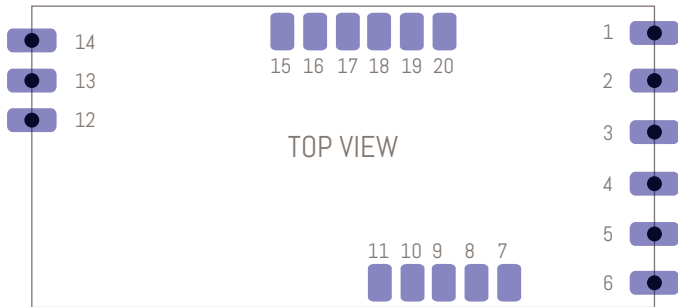
Operating Temperature	-20°C to +80°C ambient temperature 0 to 95 % (non-condensing)
Storage Temperature	-30°C to +85°C ambient temperature 0 to 95 % (non-condensing)
Dimensions (L x W x H)	25mm x 12mm x 1.85mm
Weight	1.10g +/- 0.25g tolerance
Certifications	See the website for this product's certifications.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



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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

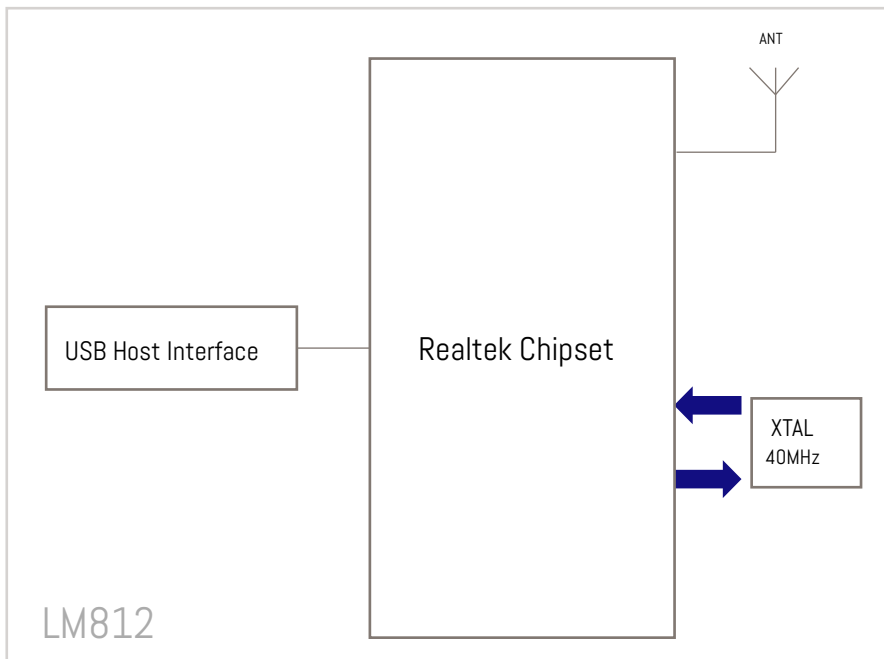
Description	Performance	
	Typical	Units
Off	10	uA
Unassociated idle	40	mA
Associated idle for 24GHz band	70	mA
Data transfer for 24GHz	103	mA

DC power for 3.3V

Description	Performance	
	Typical	Units
Off	16	uA
Unassociated idle	90	mA
Associated idle for 24GHz band	141	mA
Data transfer for 24GHz	168	mA

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

Module Block Diagram



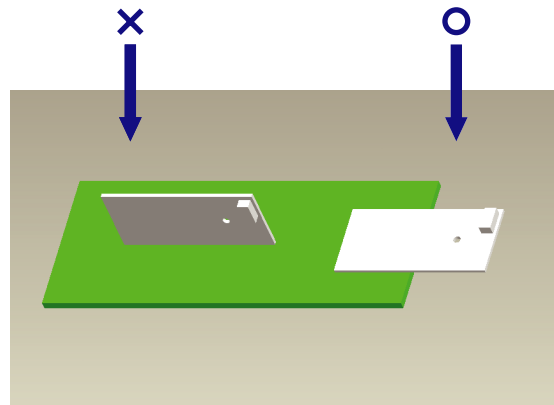
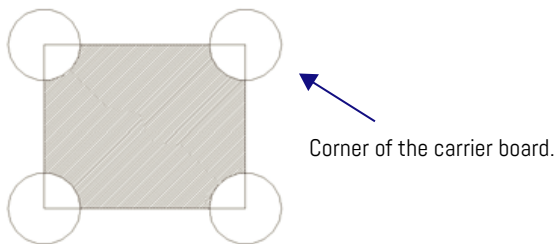
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Host Controller Interface (HCI) via USB Interface

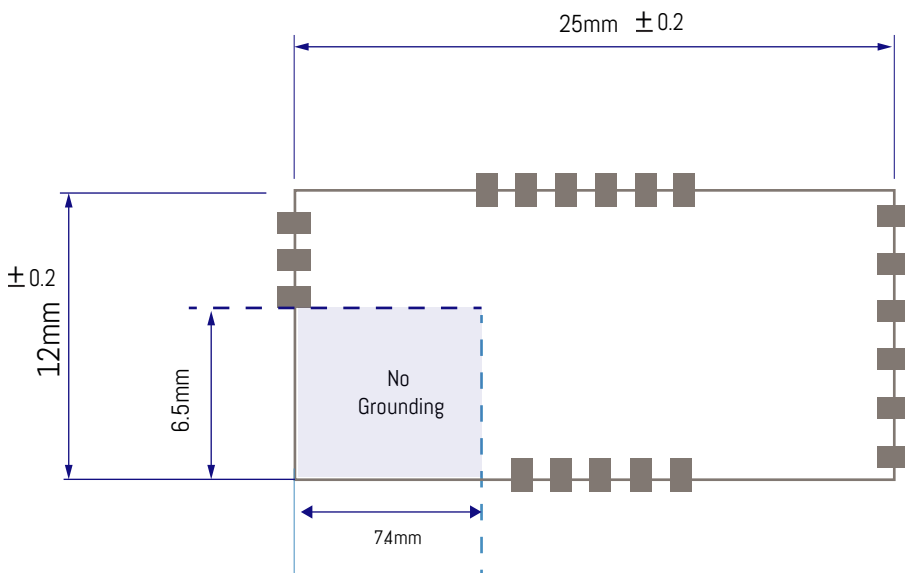
Module Placement Notes

In order to improve performance, please do not place any metal shielding in the surrounding area of module and place the module as close to the corner of the carrier board as possible.

Due to the antenna field pattern the module should be placed horizontally with the carrier board.



PCB Footprint

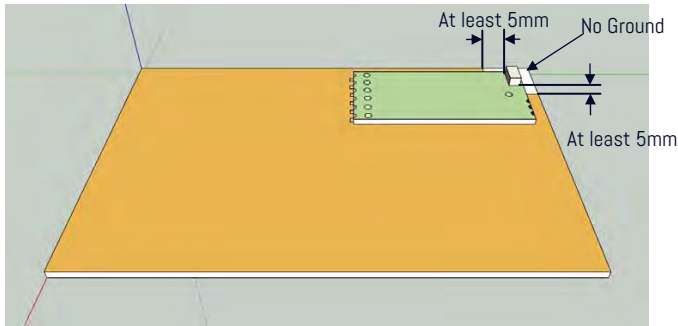


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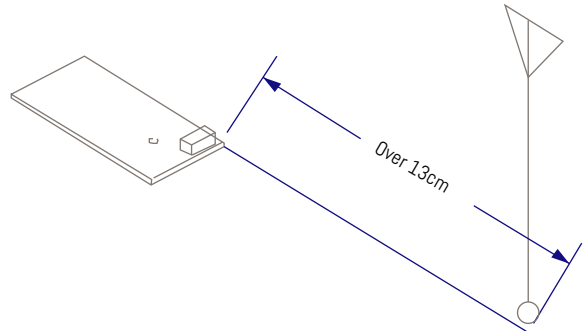
Host Controller Interface (HCI) via USB Interface

Chip Antenna

The antenna area of the module should protrude outside the ground at least 5mm.

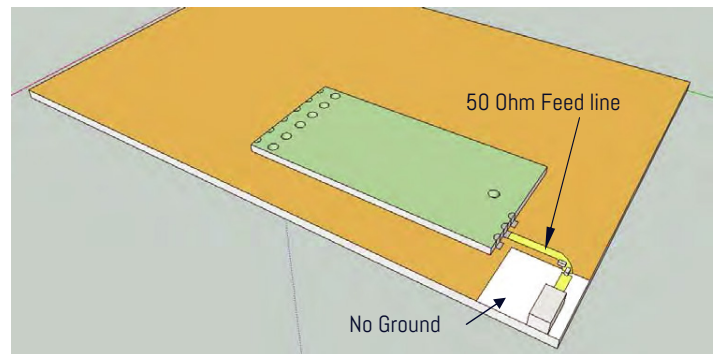
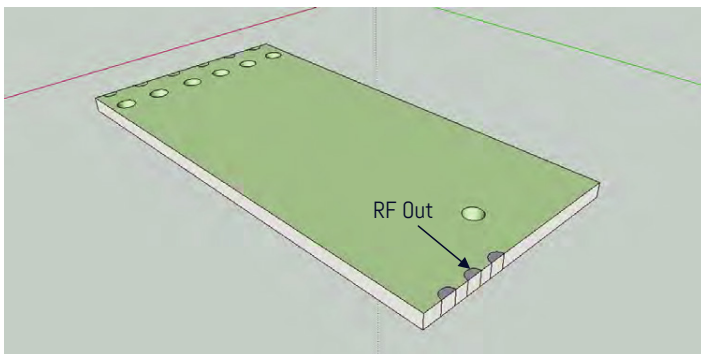


Keep the distance at least 13cm apart with the WLAN or another antenna of the same frequency band, to avoid interference or performance deterioration .

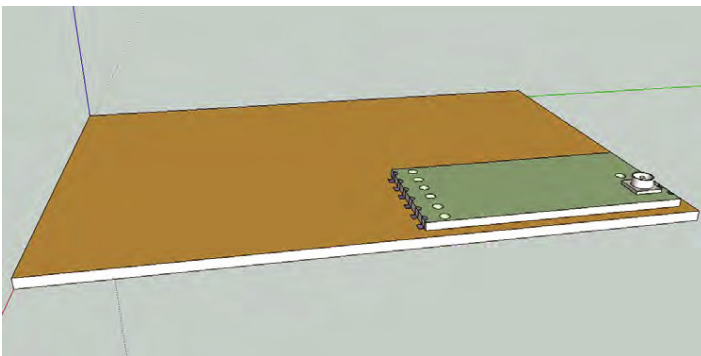


RF Out

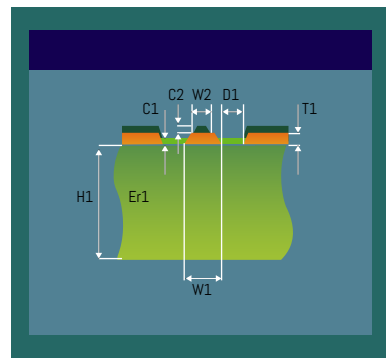
This RF out pin needs an input impedance of 50 Ohm.



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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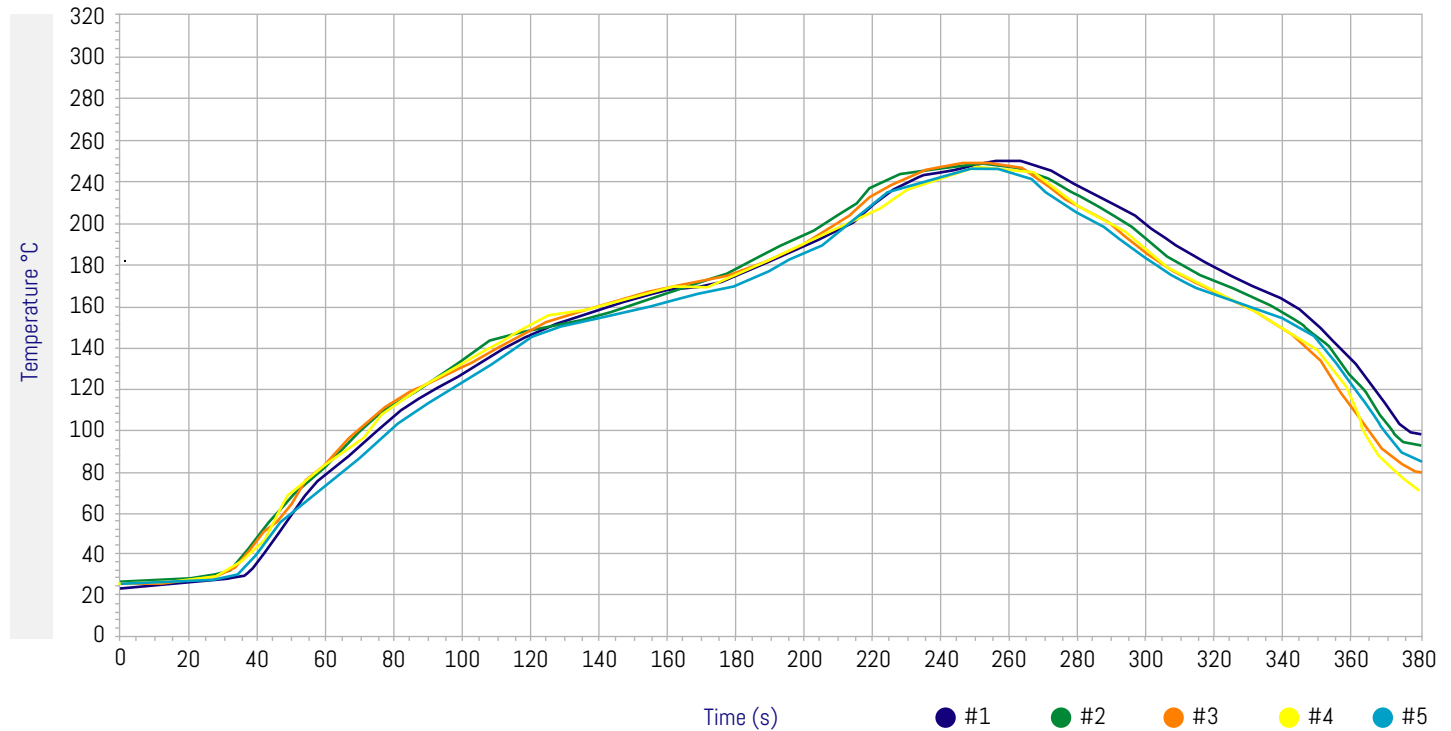
PCB Drying Conditions

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

1. If the carrier board PCBA is double sided, please reflow the side without this module first.
2. Do not let the solder machine temperature exceed 250 °C or follow the solder paste vendor'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 manufacturer's equipment requirements.

Bake @ 125 °C		Bake @ 90 °C		Bake @ 40 °C	
Exceeding floor Life by > 72h	Exceeding floor Life by ≤ 72h	Exceeding floor Life by > 72h	Exceeding floor Life by ≤ 72h	Exceeding floor Life by > 72h	Exceeding floor Life by ≤ 72h
9 hours	7 hours	33 hours	23 hours	13 days	9 days

Solder Reflowing 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

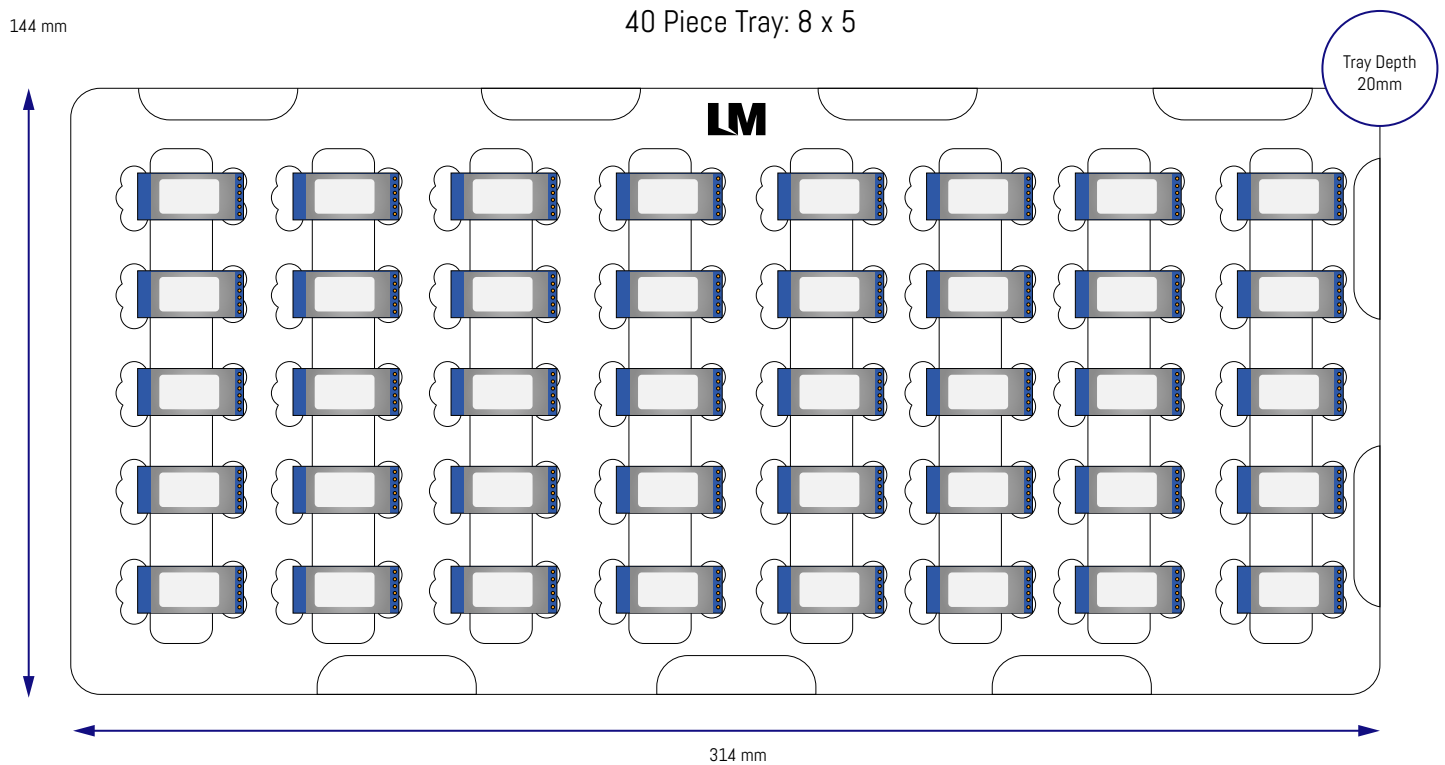
Probe	Liquidus Line		Maximum / Minimum		Slope	
	Rising 110.00-190.00	Above 230.0	Max	Min	Positive	Negative
#1	119.00	47.50	245.50	27.30	2.56	-1.69
#2	116.50	49.00	247.10	27.70	2.69	-1.60
#3	116.00	46.50	245.80	29.30	2.04	-1.57
#4	117.00	46.50	244.90	29.20	2.60	-1.31
#5	119.50	50.00	248.10	29.60	2.44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

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Host Controller Interface (HCI) via USB Interface

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

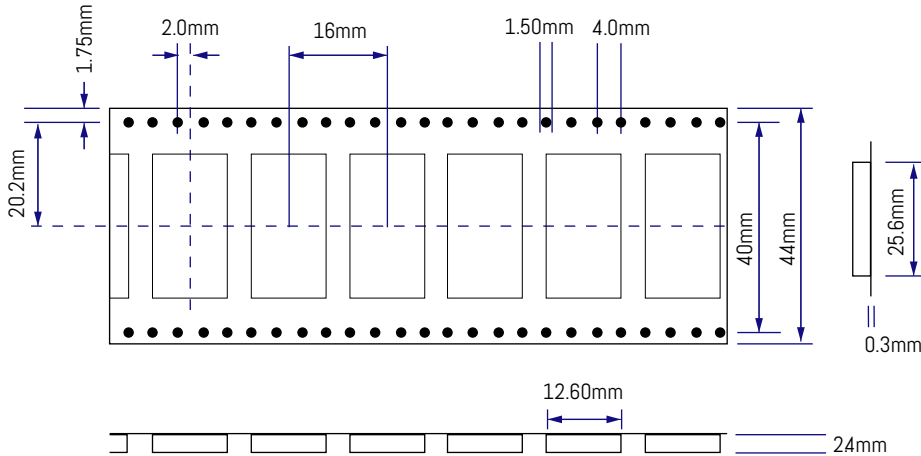
- Anti-Static PS Tray, Black
- Material Thickness: 1mm
- Height of Tray: 20mm
- Carton Dimensions (L x W x H):
340mm x 290mm x 385mm

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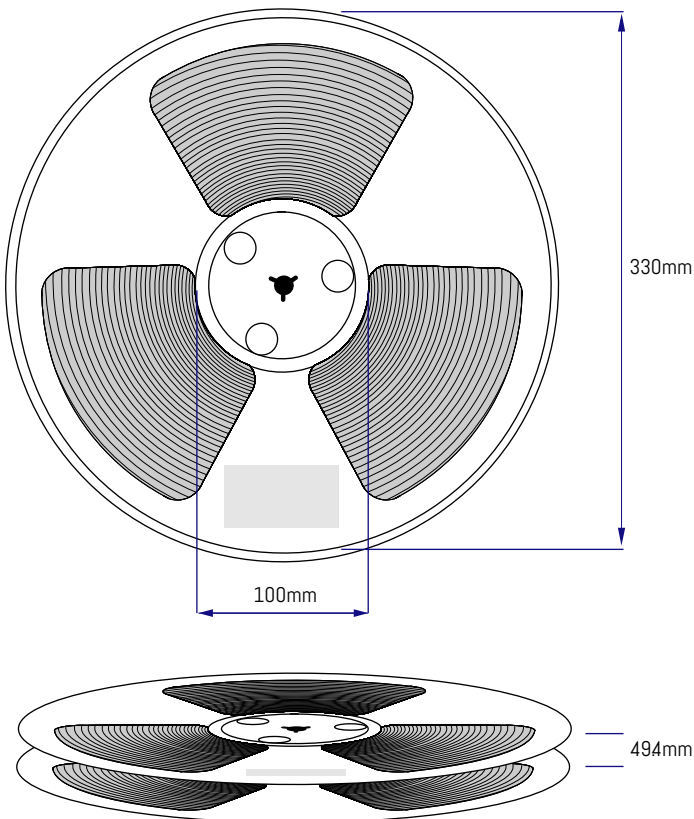
Host Controller Interface (HCI) via USB Interface

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

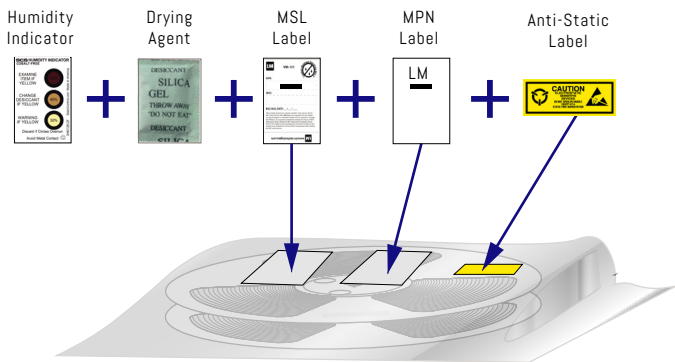
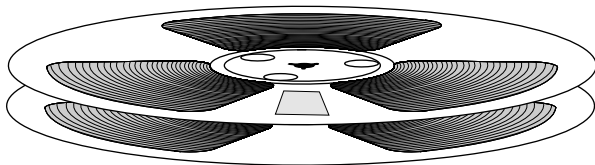
Packaging for Tape & Reel / Tray

The Tape & Reel / Tray are inserted into an anti-static vacuum bag with a Humidity Indicator Card and Drying Agent.

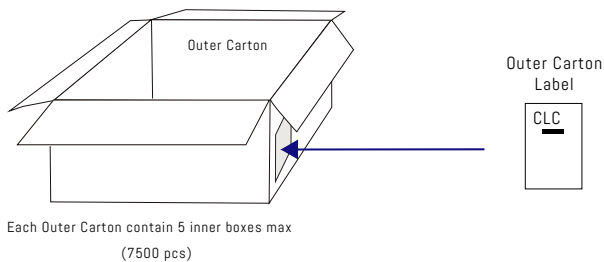
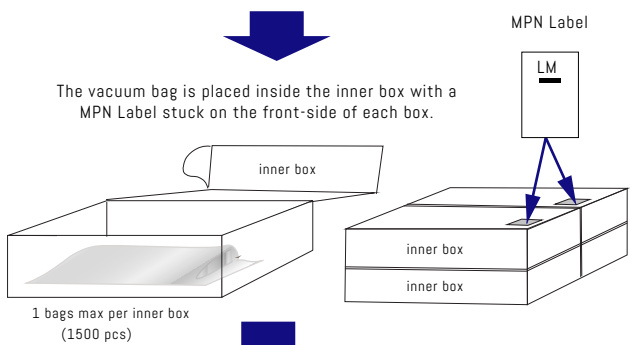
On the outside of the vacuum bag are MSL (Moisture Sensitivity Levels), MPN and Anti-Static Labels.

Tape & Reel

Reels are placed within a vacuum bag.

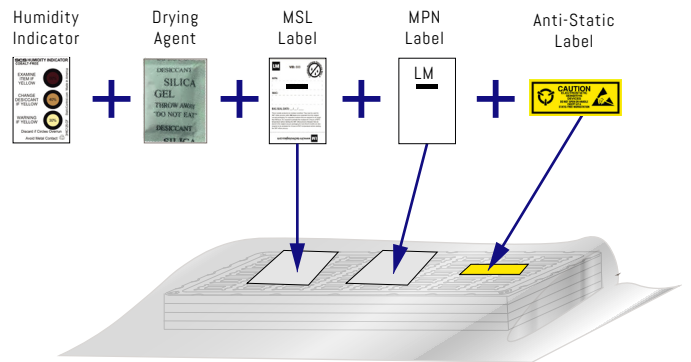
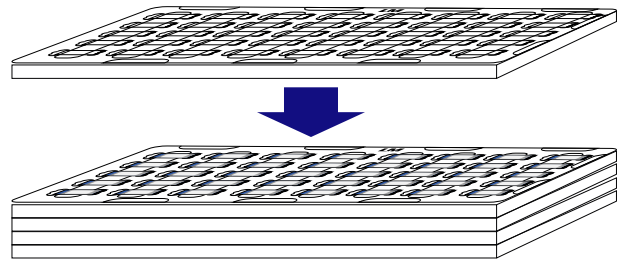


Vacuum bag.

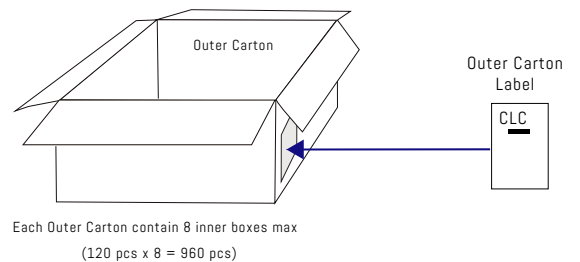
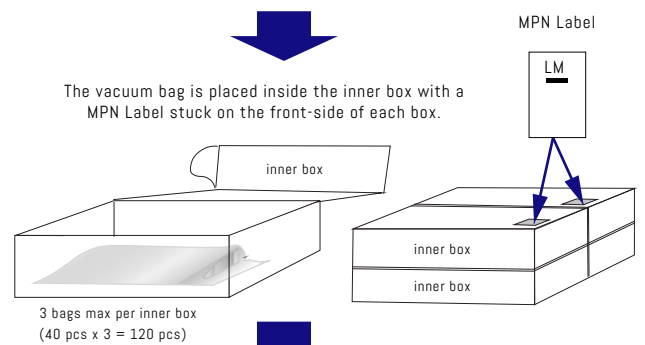


Tray

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



Vacuum bag.



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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+
V1.3	10 MAY 2023	Branding update and footprint dimension adjustments. Revised ordering codes. Updated OS version support.



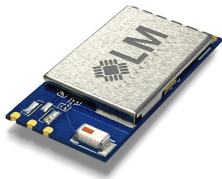
LM812 Wi-Fi and Bluetooth® 4.2 Dual Mode USB Module

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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

812-8120

812-8121

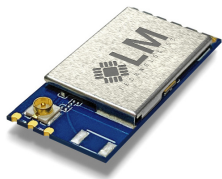
812-8122

5V Module with IC Antenna

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

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

812-8123

812-8124

812-8125

3.3V Module with IPEX Connector

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

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

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