

1mW ZigBee Module

HT-MDL-Z-EM-2400-001-A-V3.0.0

Product Manual V1.0.0



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Version Control

Date	Version	Notes
2009.09.30	1.0.0	1st Issue of Preliminary Manual

* Holley reserves the right to make changes to the product specification at anytime without notice.

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1. Introduction

Holley 1mW ZigBee Module (HT-MDL-Z-EM-2400-001-A-V3.0.0) is a type of surface mounted module that enable users to implement ZigBee/IEEE 802.15.4 compliant solution which satisfies the needs of low-cost, low-power wireless sensor networks. The module is easy-to-use, save board space and provide reliable delivery of data between devices.

Holley 1mW ZigBee Module (HT-MDL-Z-EM-2400-001-A-V3.0.0) operates within the ISM 2.4GHz frequency band. The module's default configuration supports a wide range of data system applications. The module uses Ember's EM250 wireless microcontroller to provide a comprehensive solution.

1.1 Product Features

- State-of-art EM250 chip adopted
- Stable and reliable Ember protocol stack embedded
- Easy to implement ZigBee technology integration for hardware equipment manufacturers
- Wide communication range and high network reliability

2. Specifications

Table 2-01: Specifications of 1mW ZigBee Module (HT-MDL-Z-EM-2400-001-A-V3.0.0) (PRELIMINARY)

Specifications	
Maximum Transmit Range	250m (line of sight)
Maximum Transmit Power Output	4dBm
RF Data Rate	250kbps
Serial Interface Data Rate (software selectable)	1200-115200 bps
Receiver Sensitivity (1% packet error rate)	-95dBm
Supply Voltage	2.7~3.6V DC
Operating Current (Transmit)	35mA
Operating Current (Receive)	35mA
Power-down Current	0.6µA
Operating Frequency Band	ISM 2.405~2.480 GHz
Operating Temperature	-40 to 85°C
Antenna Interface	Edge mounted MMCX
Interface Features	17 GPIO ports; 4 interrupt ports; 2 serial ports, UART/SPI/I2C supported; 4*12 bits A/D conversion
Supported Network Topologies	Point-to-point, Point-to-multipoint, Peer-to-peer & Mesh
Number of Channels (software selectable)	16 Direct Sequence Channels
Dimensions	36.3 x 22.9 mm

3. Pin Configurations

3.1 Pin Signals

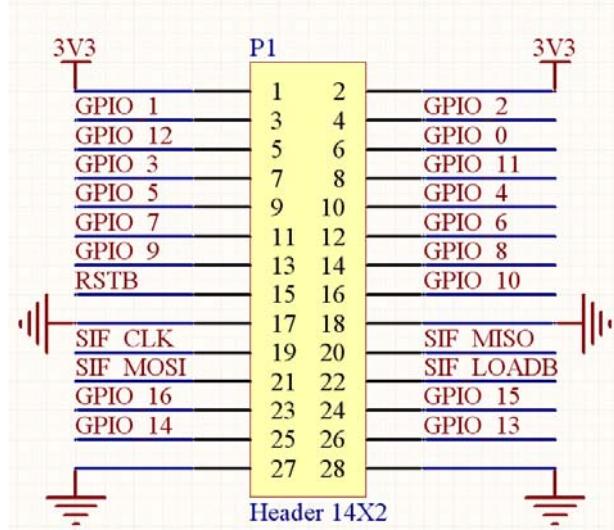


Figure 3-01: Pin Signals

3.2 Pin Assignment

Table 3-01: Pin Assignment

Module Pin	Signal	Corresponding EM250 Pin	Pin Description
1	VDD	-	DC3.3V supply
2	VDD	-	DC3.3V supply
3	GPIO1	22	Digital I/O SPI master data in of Serial Controller SC2 SPI slave data out of Serial Controller SC2 I2C data of Serial Controller SC2 Capture Input A of Timer 2
4	GPIO2	24	Digital I/O SPI master clock of Serial Controller SC2 SPI slave clock of Serial Controller SC2 I2C clock of Serial Controller SC2 Capture Input B of Timer 2
5	GPIO12	20	Digital I/O UART RTS handshake of Serial Controller SC1 Capture Input B for Timer 2
6	GPIO0	21	Digital I/O SPI master data out of Serial Controller SC2 SPI slave data in of Serial Controller SC2 Capture Input A of Timer 1

7	GPIO3	25	Digital I/O SPI slave select of Serial Controller SC2 Capture Input B of Timer 1
8	GPIO11	19	Digital I/O UART CTS handshake of Serial Controller SC1 SPI master clock of Serial Controller SC1 Capture Input A of Timer 2
9	GPIO5	27	Digital I/O ADC Input 1 Data signal of Packet Trace Interface PTI
10	GPIO4	26	Digital I/O ADC Input 0 Frame signal of Packet Trace Interface PTI
11	GPIO7	30	Digital I/O ADC Input 3 External regulator open collector output
12	GPIO6	29	Digital I/O ADC Input 2 External clock input of Timer 2 External enable mask of Timer 1
13	GPIO9	32	Digital I/O UART transmit data of Serial Controller SC1 SPI master data out of Serial Controller SC1 I2C data of Serial Controller SC1 Capture Input A of Timer 1
14	GPIO8	31	Digital I/O ADC reference output External clock input of Timer 1 External enable mask of Timer 2 External interrupt source A
15	RSTB	13	Active low chip reset (internal pull-up)
16	GPIO10	33	Digital I/O UART receive data of Serial Controller SC1 SPI master data in of Serial Controller SC1 I2C clock of Serial Controller SC1 Capture Input B of Timer 2
17	GND	-	Ground
18	GND	-	Ground
19	SIF_CLK	34	Serial interface, clock (internal pull-down)
20	SIF_MISO	35	Serial interface, master in/slave out
21	SIF_MOSI	36	Serial interface, master out/slave in
22	SIF_LOADB	37	Serial interface, load strobe (open-collector with internal pull-up)

23	GPIO16	40	Digital I/O Waveform Output B of Timer 1 Capture Input B of Timer 2 External interrupt source D
24	GPIO15	41	Digital I/O Waveform Output A of Timer 1 Capture Input A of Timer 2 External interrupt source C
25	GPIO14	42	Digital I/O Waveform Output B of Timer 2 Capture Input B of Timer 1 External interrupt source B
26	GPIO13	43	Digital I/O Waveform Output A of Timer 2 Capture Input A of Timer 1
27	GND	-	Ground
28	GND	-	Ground

3.3 Mounting Considerations

The Holley ZigBee module is designed to mount into a 28-pin receptacle and therefore does not require any soldering when mounting it to a board. The development kits contain the RS232 interface board which uses one 28-pin receptacle to receive module.

Appendix A: Mechanical Drawings

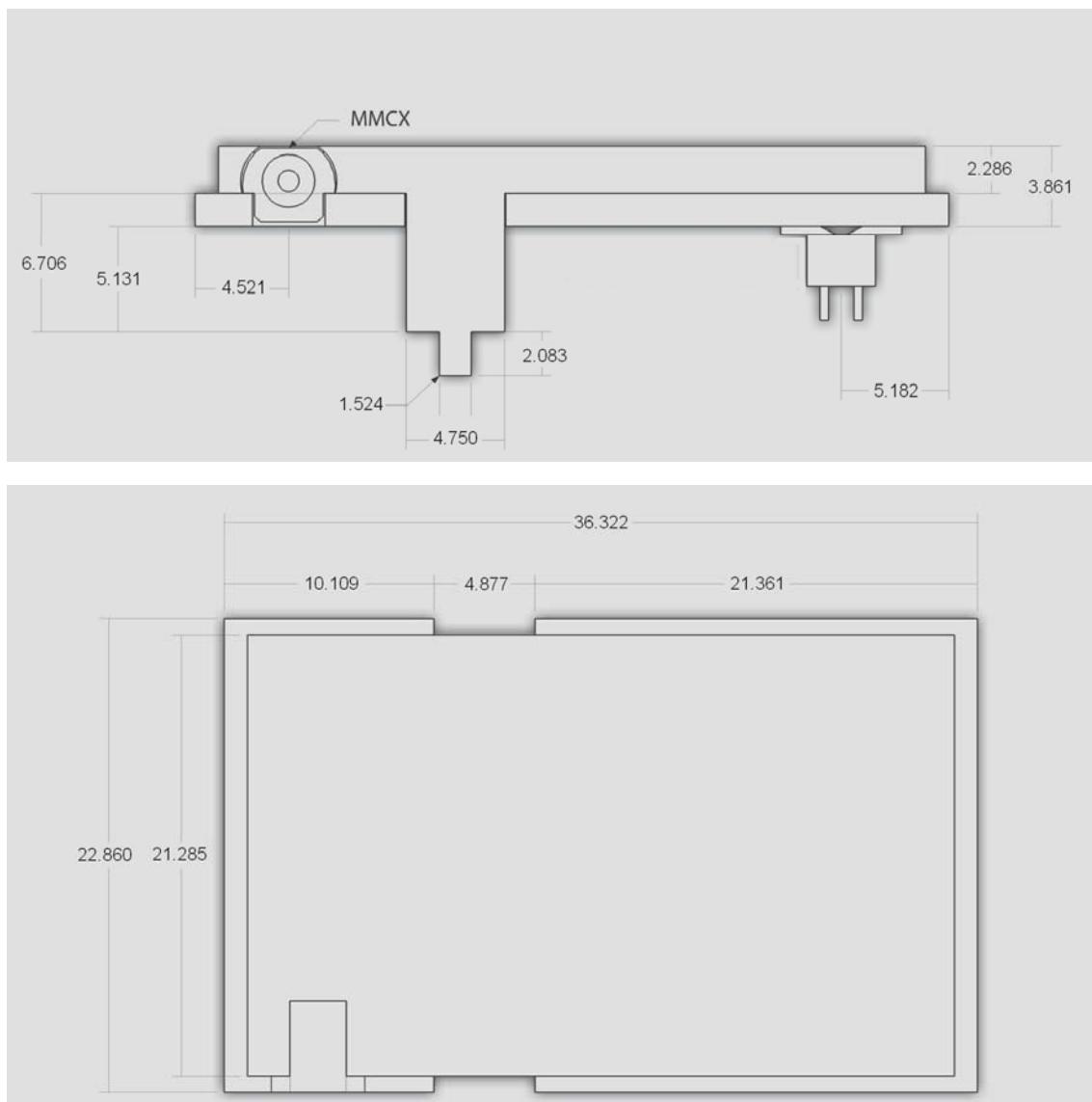


Figure A-01: 1mW ZigBee Module Outline Drawing

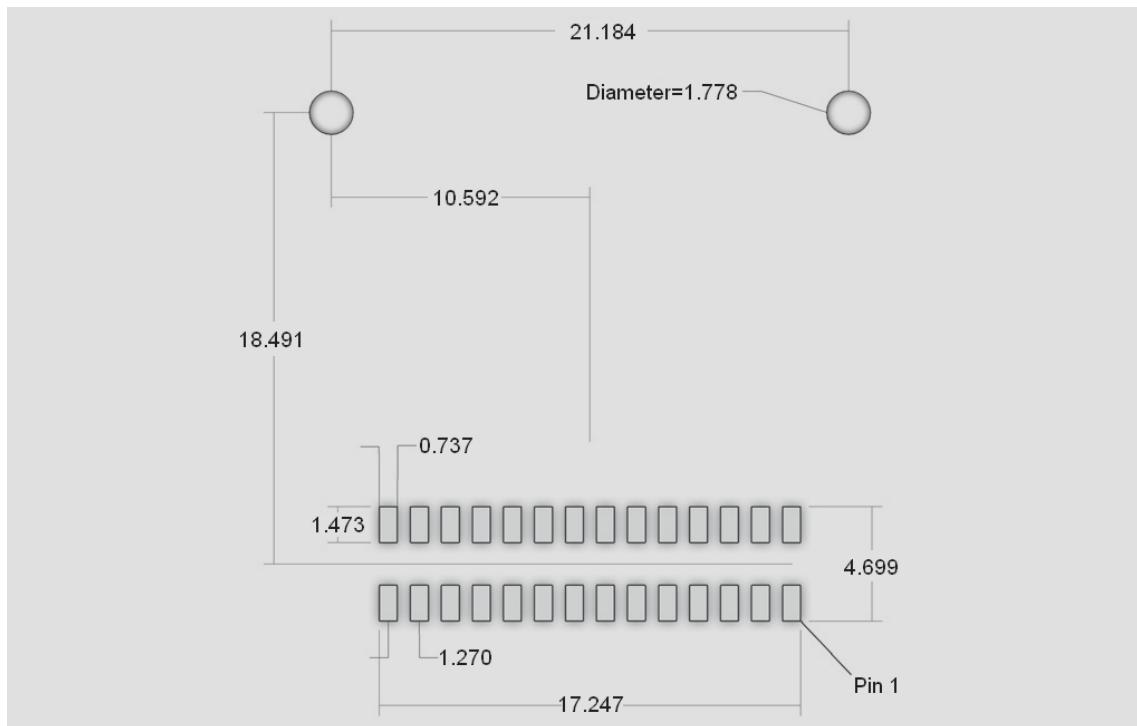
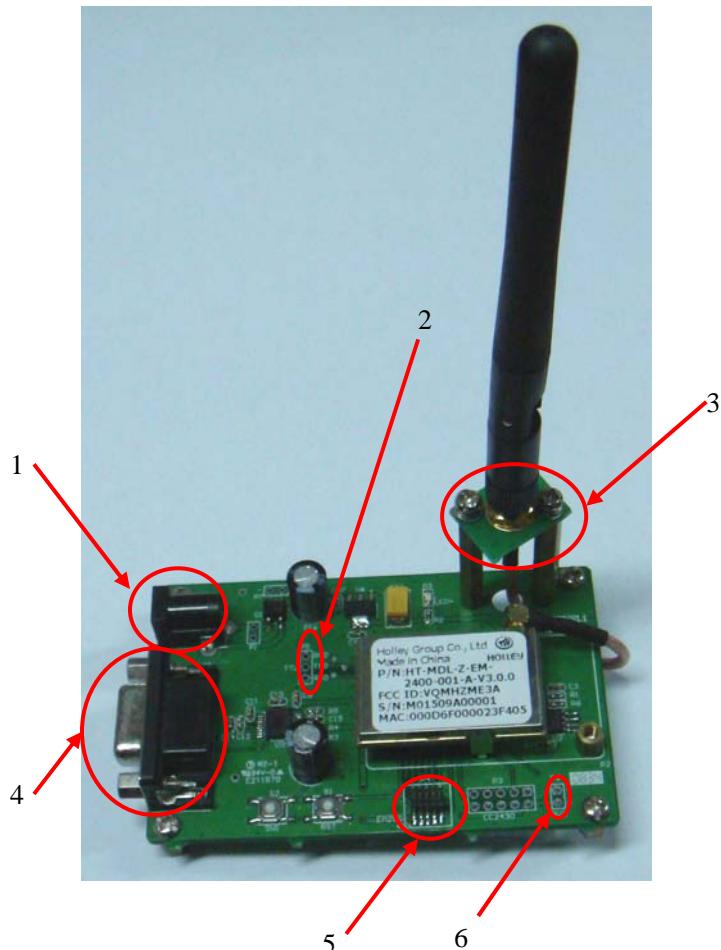


Figure A-02: 1mW ZigBee Module Footprint

Appendix B: Accessories



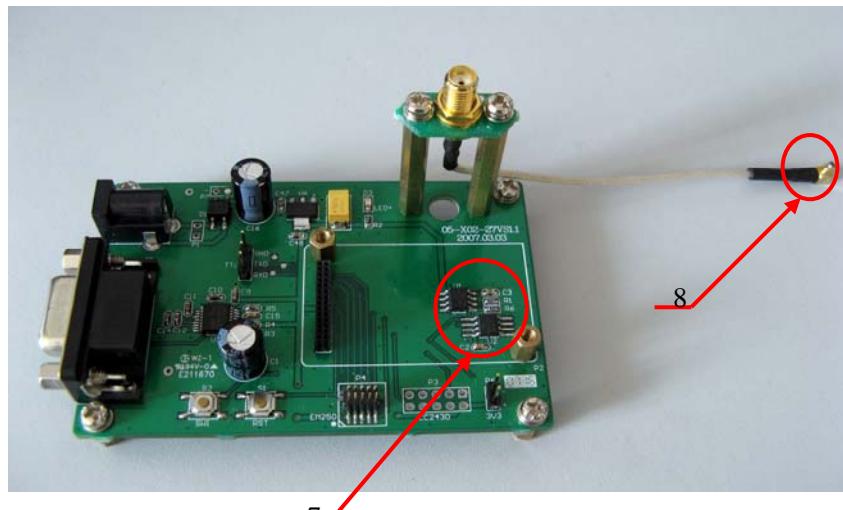


Figure B-01(a) (b) (c): Holley ZigBee Module Carry Board

1. Power supply, require DC9.0V.
2. UART TTL interface, connected to EM250's SC1 UART mode.
3. SMA antenna connector.
4. RS232 connect, DB9 female mode. This interface is derived from item 2 above, through a MAX3221 chip.
5. EM250's system SIF interface. This interface is necessary in downloading program and debugging (with Ember's Insight Adaptor).
6. DC3.3V power output/input port. If the board is powered by item 1, then this port provides a DC3.3V output. Or, the board could be powered by DC3.3V directly via this port.
7. Two 64Kbytes EPROM chips make up a total space of 128Kbytes, for sake of module's remote upgrade. The E²PROM are connected to EM250's SC2 I²C mode.
8. MMCX connector to the module.

Appendix C: Agency Certifications

FCC Certification

This equipment complies with Part 15 of the FCC rules and regulations.

To fulfill FCC Certification requirements, an OEM manufacturer must comply with the following regulations:

1. The modular transmitter must be labeled with its own FCC ID number, and, if the FCC ID 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:

Example of label required for OEM product containing

HT-MDL-Z-EM-2400-001-A-V3.0.0 module

Contains FCC ID: VQMHZME3A

The enclosed 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.

Any similar wording that expresses the same meaning may be used.

2. To be used with the HT-MDL-Z-EM-2400-001-A-V3.0.0 module, the external antennas have been tested and approved which are specified in *Approved Antenna List*. The HT-MDL-Z-EM-2400-001-A-V3.0.0 module may be integrated with other custom design antennas which OEM installer must authorize following the FCC 15.21 requirements.

WARNING: The Original Equipment Manufacturer (OEM) must ensure that the OEM modular transmitter must be labeled with its own FCC ID number. This includes a clearly visible label on the outside of the final product enclosure that displays the contents shown below. If the FCC ID is not visible when the equipment is installed inside another device, then the outside of the device into which the equipment is installed must also display a label referring to the enclosed equipment.

IMPORTANT: This equipment 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 (FCC 15.19).

The internal/external antenna(s) used for this mobile transmitter must provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter.

IMPORTANT: Modifications not expressly approved by this company could void the user's authority to operate this equipment (FCC section 15.21).

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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.

Approved Antenna List

HT-MDL-Z-EM-2400-001-A-V3.0.0 module has been tested and approved for use with the antennas listed in the table below. These two kinds of antennas comply with the requirements of FCC Part 15.203.

Table C-01: Approved Antenna List

Part Number	Manufacturer	Description	Gain (dBi)
HT-ANT-2400-2B	Off the shelf	Omni, with MMCX connector, frequency range 2.4-2.5 GHz	2.1
HT-ANT-2400-2E	Off the shelf	Omni, with MMCX connector, frequency range 2.4-2.5 GHz	1.8

Appendix D: Ordering Information

Table D-01: Part Numbers: HT-MDL-Z-EM-2400-001-A-V3.0.0

HT	-MDL	-Z	-EM	-2400	-001	-A	-V3.0.0
Company name	Module Product	ZigBee Compatible	RF Chip Provider (Ember)	Radio Frequency (2400MHz)	Output Power (0~4 dBm)	Antenna Interface	Hardware Version

Appendix E: Contact Details

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