20mW Short-range ZigBee Module

HT-MDL-Z-EM-2400-021-X

Product Manual V1.0.0

Holley Group Co., Ltd.
NO.8 Liansheng Road, Xianlin, Hangzhou 310023, P.R.China
Tel: 86 571 88471702
Fax: 86 571 28116981
www.holley.cn

Version Control

Date	Version	Notes
2008.06.23	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 20mW Short-range ZigBee Module (HT-MDL-Z-EM-2400-021-X) 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 20mW Short-range ZigBee Module (HT-MDL-Z-EM-2400-021-X) 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 20mW Short-range ZigBee Module (PRELIMINARY)

Specifications	
Maximum Transmit Range	1km (line of sight)
Maximum Transmit Power Output	13±0.5 dBm
RF Data Rate	250kbps
Serial Interface Data Rate (software selectable)	1200-115200 bps
Receiver Sensitivity (1% packet error rate)	-101dBm
Supply Voltage	3.3V
Operating Current (Transmit)	80mA
Operating Current (Receive)	42mA
Power-down Current	0.82μA
Operating Frequency Band	ISM 2.4GHz
Operating Temperature	-40 to 85℃
Antenna Interface	MMCX jack (connected to the MMCX plug of antenna cable)
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)	15 Direct Sequence Channels

3. Pin Configurations

3.1 Pin Signals

There're two options of interface available for customers:

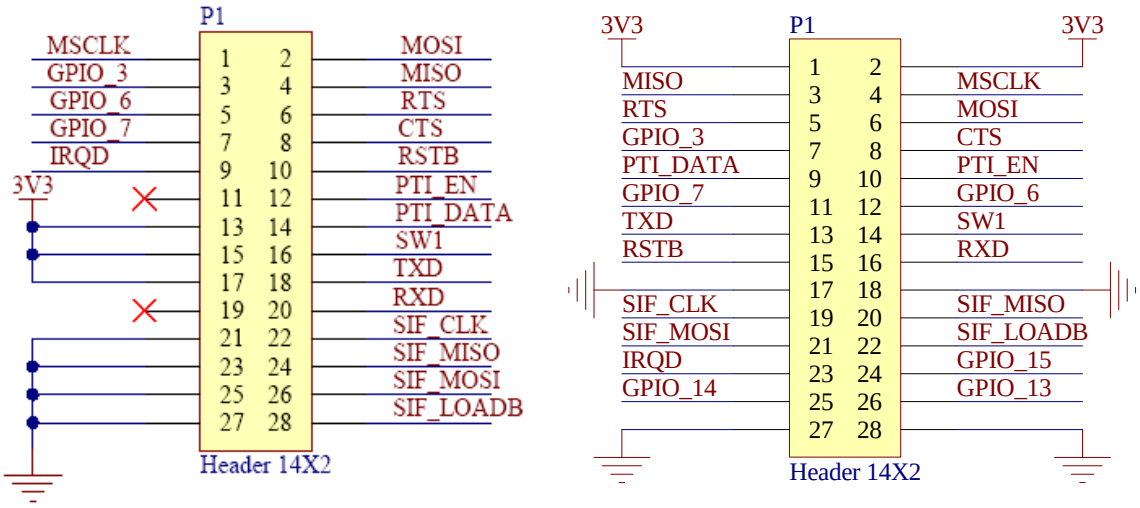

Figure 3-01: Pin Signals

3.2 Pin Assignment

Table 3-01: Pin Assignment

Signal	Corresponding EM250 Pin	Pin Description
MSCLK	24	GPIO2; SPI Clock of SC2; I^2C Clock of SC2
MOSI	21	GPIO0; SPI Master output slave input of SC2
GPIO_3	25	GPIO3; SPI slave select of SC2
MISO	22	GPIO1; SPI Master input slave output of SC2 I^2C data of SC2
GPIO_6	29	GPIO6; ADC input 2
RTS	20	GPIO12; UART RTS handshake of SC1
GPIO_7	30	GPIO7; ADC input 3

Signal	Corresponding EM250 Pin	Pin Description
CTS	19	GPIO11; UART CTS handshake of SC1; SPI Clock of SC1
IRQD	40	GPIO16; External interrupt source D
RSTB	13	Active low chip reset (internal pull-up)
NC	-	-
PTI_EN	26	GPIO4; ADC input 0; Frame signal of Packet Trace Interface
VDD	-	DC3.3V supply
PTI_DATA	27	GPIO5; ADC input 1; Data signal of Packet Trace Interface PTI
VDD	-	DC3.3V supply
GPIO_8	31	GPIO8; ADC reference output; External interrupt source A
VDD	-	DC3.3V supply
TXD	32	GPIO9; UART TXD of SC1; SPI Master output of SC1; I^2C data of SC1
NC	-	-
RXD	33	GPIO10; UART RXD of SC1; SPI Master input of SC1; I^2C Clock of SC1
GND	-	Ground
SIF_CLK	34	Serial interface, clock (internal pull-down)
GND	-	Ground
SIF_MISO	35	Serial interface, master in/slave out
GND	-	Ground
SIF_MOSI	36	Serial interface, master out/slave in
GND	-	Ground
SIF_LOADB	37	Serial interface, load strobe (open-collector with internal pull-up)

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

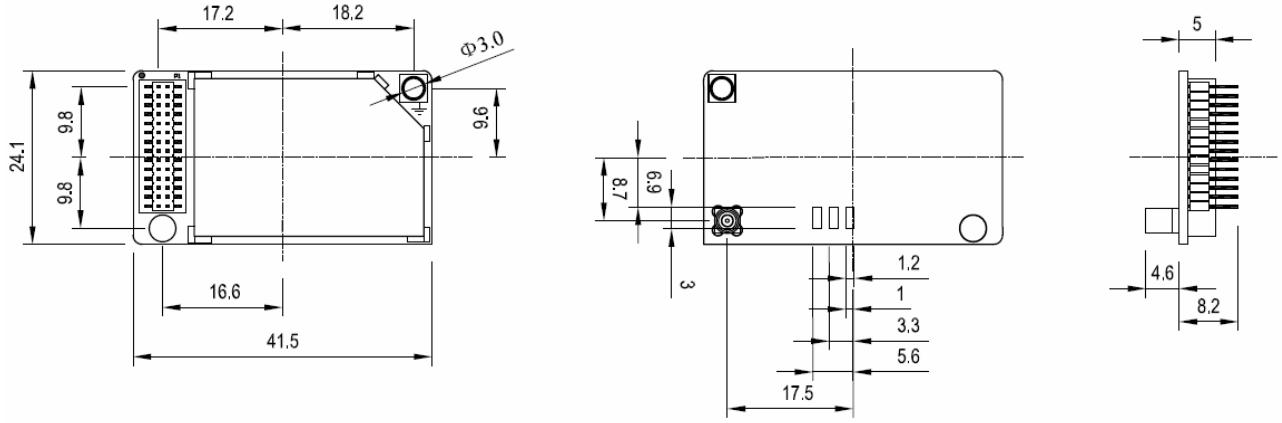

Figure A-01: 20mW Short-range ZigBee Module Outline Drawing

Appendix B: Accessories

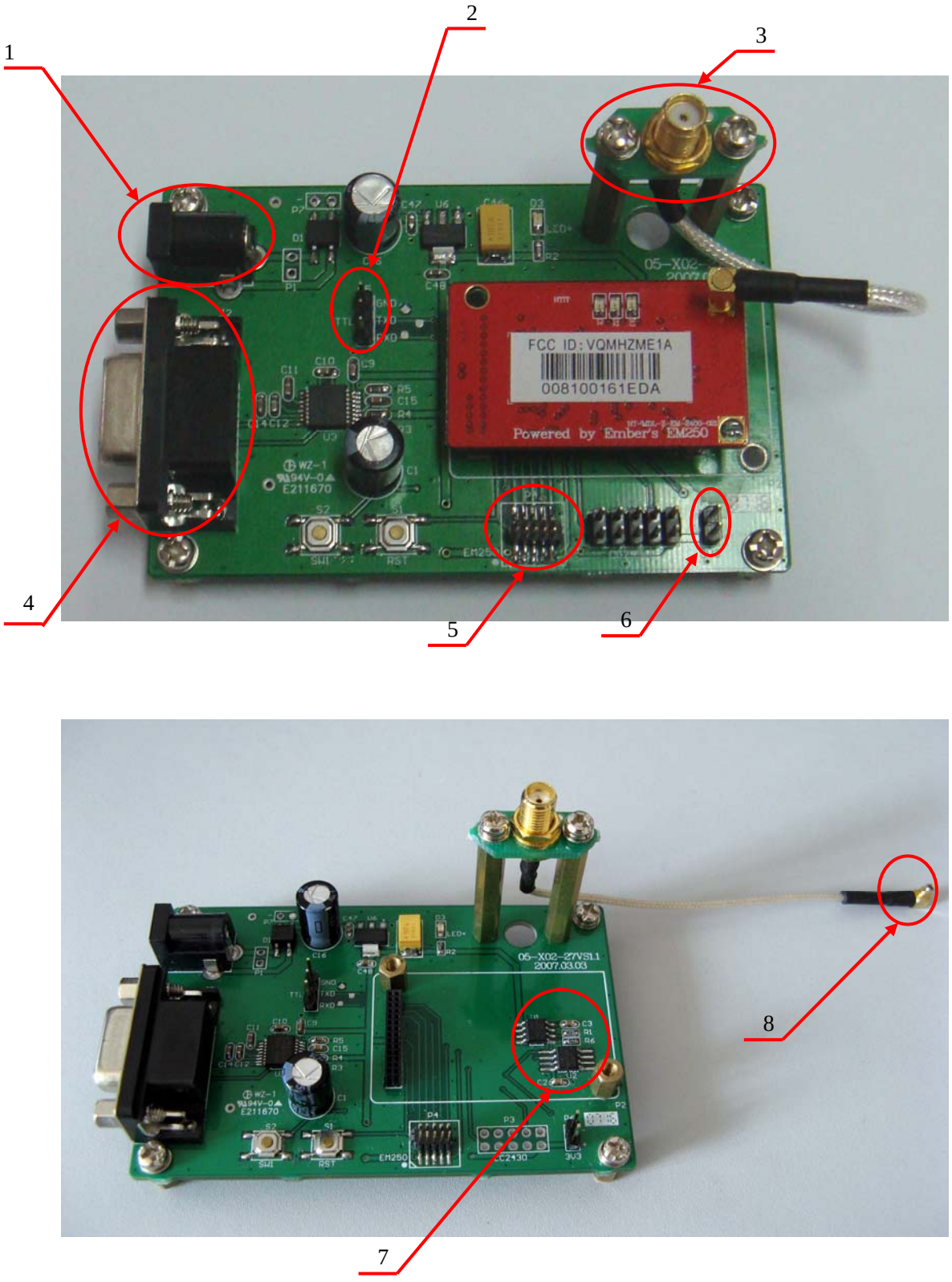

Figure B-01(a) (b): Holley ZigBee Module Carry Board

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 E^2PROM are connected to EM250's SC2 I^2C 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-2400-021-X module

> **Contains FCC ID: VQMHZME1A**
> 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-2400-021-X module, the external antennas have been tested and approved which are specified in *Approved Antenna List*. The HT-MDL-Z-EM-2400-021-X 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-2400-021-X module has been tested and approved for use with the antennas listed in the table below.

Table C-01: Approved Antenna List

Part Number	Manufacturer	Description	Gain (dBi)	Min. Separation (cm)
ANT-FW-2400-1.3-B	Off the shelf	Omni, with SMA-J connector,* frequency range 2.4-2.5 GHz	2.1	20

* Two kinds of antenna cables are used: one is 11cm long, and the other is 15cm long. Both cables have two connectors: one is MMCX plug connected to the module, and the other is SMA jack connected to the antenna.

Appendix D: Ordering Information

Table D-01: Part Numbers: HT-MDL-Z-EM-2400-021-X

HT	-MDL	-Z	-EM	-2400	-021	-X
Company name	Module Product	ZigBee Compatible	RF Chip Provider (Ember)	Radio Frequency (2400MHz)	Output Power (13±0.5 dBm)	Antenna Interface *

* -A: with MMCX straight jack
-B: with MMCX right angle jack

Appendix E: Contact Details

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