Product Requirement Document (PRD)

For

ZigBee Module (DVT)

LITEON code name: WZ401F

Version 0.12

Date: December 18th, 2012

Lite-On Technology

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Revision History

Version	Date	Author	Changes from Previous Version
0.01	8/08/2012	Stanley Wang	Initial Draft
0.02	8/20/2012	ThinkEco	Draft review
0.03	8/21/2012	ThinkEco	Added details, removed 4Mbit SPI serial flash
0.04	8/29/2012	ThinkEco	Updates to align with design choices
0.05	8/30/2012	ThinkEco	added logistics info, product names and SKU codes
0.06	9/10/2012	ThinkEco	Updated chapters 4,5,6
0.07	9/12/2012	Eddie.ZG.Chen	Change LITEON code name; Change RX sensitivity from -96dBm to -94dBm; Attach a correct picture in chapter 2.4 mechanical;
0.08 0.09	9/12/2012 9/18/2012	Thinkeco LITEON	IC certification as mandatory, updated label template Modify chapter 2.1
0.10	9/18/2012	Thinkeco	Assigned different PN to the device with or without on-board antenna
0.11	9/18/2012	LITEON	Renumbered 3.10 & 3.11 to 3.1 & 3.1, and 6.1~6.4 to 8.1~8.4; revised sec. 2.2.1 Appendix 5.2 to Appendix 8.2; revised sec. 2.2.2 Appendix 5.1 to Appendix 8.1
0.12	12/18/2012	LITEON	Add description for chapter 1; Add remark in section 2.2.1;

Contents

1. Purpose and Scope

The purpose of this document is to establish the product requirements for the standard range ZigBee module.

WZ401F-DVT has two SKUs, please see below description.
- ❖ Basic SKU:
  - ▪ Equips off-board antenna;
  - ▪ Be deployed on GTWY;
  - ▪ Be certified by FCC;
- ❖ RD SKU:
  - ▪ Equip Johansson 2450AT18A100 antenna,
  - ▪ For RD purpose;

2. Product Requirements

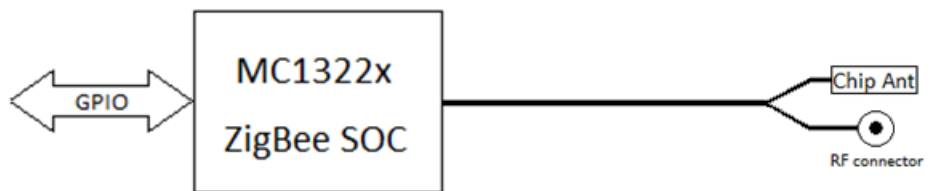## 2.1 Block Diagram

Fig. 1 WZ401F-DVT

The GPIO interface of the module is specified in Sec.2.3 below.

On-board chip antenna or off-board antenna can be selected when manufacture. If off-board antenna is used, chip antenna will not be mounted, and vice versa.

2.2 Requirements

2.2.1 RF Requirements (3.3V at 25°C)

- ❖ Transmit power will be configured through firmware to 3dBm (typical)

❖ Receiver sensitivity -94 dBm (typical at 1% PER for 20 byte packets) (for RD SKU)

     o *LITEON suggest RX sensitivity to be -94dBm, the reason as below:*

     o *-96dBm is the criterion for MC13224;*

     o *WZ401F (normal range) add a connector;*

     o *Trace is changed because we have to consider the shielding case;*

❖ Outdoor line of sight range 300m (1% PER for 20 byte packets) (for RD SKU)

❖ Ceramic antenna shall be matched for return loss better 10dB over 2.4…2.5(for RD SKU)

❖ LITEON shall characterize the module radiation pattern in the 3 orthogonal planes XY, XZ and YZ. (for RD SKU)

❖ See additional MC1322x RF specifications in Appendix 8.2

2.2.2   Reference crystal requirements
       * See MC1322x specification in Appendix 8.1

2.2.3   Regulatory Compliance
       * FCC Part 15.247 module certification
       * CE (Optional)
       * IC

2.2.4   Environmental
       * Operating Temperature: -40°C to +85°C
       * Humidity: 15% to 80% non-condensing
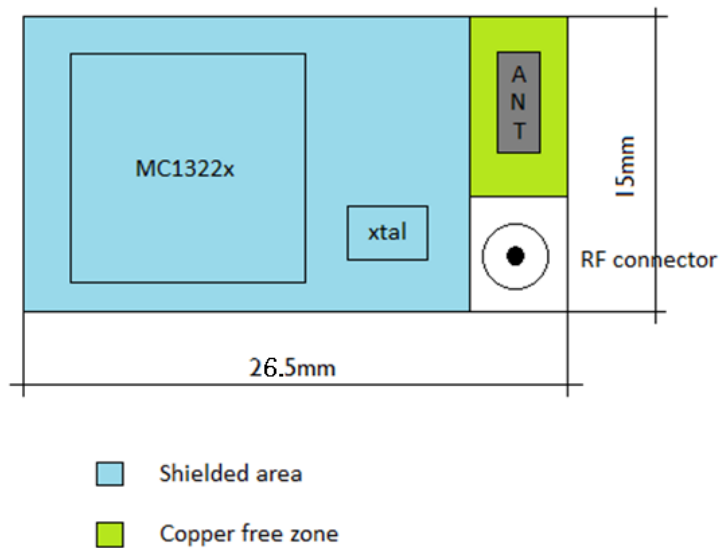   * RoHS
       * WEEE

2.3   External Connections

- UART1 (RTS, CTS, RX, TX)
- UART2 (RX, TX)
- I2C (SDA, SCL)
- SPI (SCK, MISO, MOSI, SS)
- TMR (TMR0, TMR1, TMR2, TMR3)
- KBI (KBI0, KBI1, …, KBI7)
- ADC2_VREFH, ADC2_VREFL

- RESETB
- Power (VCC, GND)
- JTAG (TDO, TDI, TCK, TMS, RTCK)
- ADC0, ADC4

With 4 connections for GND and 2 connections for VCC, this amounts to a total of 40~~2~~ external connections.

2.4   Mechanical

This figure illustrates the intended component layout and scale. The module needs to be suitable for pick and place assembly.

3. Software

➢ ThinkEco will be responsible for all software development and support.

➢ Thinkeco will provide LITEON

❖ Manufacturing testing and loading program

❖ Manufacturing testing procedure

➢ Preliminary testing procedure reported in the document *Simplified Test ZigBee Modules v0.02 09-10-2012.pdf*

4. Manufacturing Testing Process

> ➢ Conduct module tests

> ➢ Collect and keep all logs for passed and failed units

> ➢ Retest those failed units.

> ➢ Send Thinkeco log files of passed or failed units for the first time, and log files of those unit failed at the first time but passed at the 2nd time

> ➢ Wait for Thinkeco's log review and feedback

> ➢ Receive Thinkeco's approval to deliver the units to gateway production line.

5. Preproduction run

> ➢ ThinkEco to receive and approve the detailed WI and quality process (by October 2012)

> ➢ LITEON will do production trial run to validate process and allow ThinkEco to sign off (by November 2012)

6. Packaging

> ➢ Labeling: Each product will be labeled based on Thinkeco specification

1) EVT units

```
Thinkeco Inc.
model TE7010
SN: XXXXXXXX
MAC:AAAAAAAAAAAAAAAA
ENGINEERING SAMPLE
```

2) Production units TE7010 with on-board antenna

```
Thinkeco Inc.          www.thinkeco.com
Modlet IQ
model: TE7010          FC
SN: 00000000           FCC ID: Y38TE7010
MAC:                   IC: 9407A-TE7010
AAAAAAAAAAAAAAAA       made in China
```

3) Production units TE7010 with off-board antenna

```
Thinkeco Inc.        www.thinkeco.com
Modlet IQ
model: TE7010-OB    FCC  [FC]  [QR code]
SN: 00000000        FCC ID: Y38TE7010
MAC:                IC: 9407A-TE7010
AAAAAAAAAAAAAAAA    made in China
```

➢ Delivery packaging:

      ❖ Each product will be stocked and delivered inside an ESD bag

      ❖ Shipping box: TBD

➢ E-file: Each shipment will be anticipated by the E-file reporting all the tracking information requested by Thinkeco. The e-file will be sent via email.

7. Appendix

8.1 Crystal Spec

See included file *ZigBee Module - Excerpt MC1322x Data Sheet - Crystal Spec.pdf*

8.2 RF Electrical Characteristics

See included file *ZigBee Module - Excerpt MC1322x Data Sheet - RF Electrical Characteristics.pdf*

8.3 RF Electrical Interface See

See included file *ZigBee Module - Excerpt MC1322x Reference Manual - RF Interface.pdf*

8.4 Documentation

MC1322x Data Sheet included in *MC1322x.pdf*

MC1322x Reference Manual included in *MC1322xRM.pdf*

8. FCC statement & Labels

Class B: (Section 15.105)

FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE STATEMENT
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.

CAUTION: (Section 15.21)

Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment.

Labeling requirements

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.

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to 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. End-users and installers must be provide with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: Y38TE7010" and "Contains IC: 9407A-TE7010

This radio transmitter FCC ID: Y38TE7010" has been approved by FCC to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	JOHANSON	2450AT18A100	Chip Antenna	0.5dBi for 2.4 GHz
2.	MAGLAYERS	PCA-5015-2G4C2-A1	PCB Antenna	2.69dBi for 2.4 GHz

This radio transmitter IC: 9407A-TE7010 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	JOHANSON	2450AT18A100	Chip Antenna	0.5dBi for 2.4 GHz
2.	MAGLAYERS	PCA-5015-2G4C2-A1	PCB Antenna	2.69dBi for 2.4 GHz

Canada, Industry Canada (IC) Notices
This Class B digital apparatus complies with Canadian ICES-003 and RSS-210.
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.

Radio Frequency (RF) Exposure Information
The radiated output power of the Wireless Device is below the Industry Canada (IC) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the IC RF Exposure limits under mobile exposure conditions. (antennas are greater than 20cm from a person's body).

Canada, avis d'Industry Canada (IC)
Cet appareil numérique de classe B est conforme aux normes canadiennes ICES-003 et RSS-210. Son fonctionnement est soumis aux deux conditions suivantes : (1) cet appareil ne doit pas causer d'interférence et (2) cet appareil doit accepter toute interférence, notamment les interférences qui peuvent affecter son fonctionnement.

Informations concernant l'exposition aux fréquences radio (RF)
La puissance de sortie émise par l'appareil de sans fil est inférieure à la limite d'exposition aux fréquences radio d'Industry Canada (IC). Utilisez l'appareil de sans fil de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles (les antennes se situent à moins de 20 cm du corps d'une personne).

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.