

SINPRO ENTERPRISE

**LM2455-ER/EU/EC SINPRO
Zb MANUAL
(For FCC/CE Certificate)**

(Revision 1.0)

1. LM2455-ER(or LM2455-EU or LM2455-EC) (GENERAL DESCRIPTION)

LM2455-ER(or LM2455-EU or LM2455-EC) is ZigBee RF module. This module includes RF Transceiver, RF circuit, 8051-compatible MCU and few external components such as resistors and capacitors. In addition, it is compliant to the specification of IEEE802.15.4 and ZigBee specifications. Zpulse, ZigBee 2006 stack library, provided by RadioPulse Inc is included in this module. LM2455-ER(or LM2455-EU or LM2455-EC) module supports data rate from 250Kbps to 1Mbps.

1.1. Block Diagram

As shown in [Figure 1], LM2455-ER(or LM2455-EU or LM2455-EC) includes the following features.

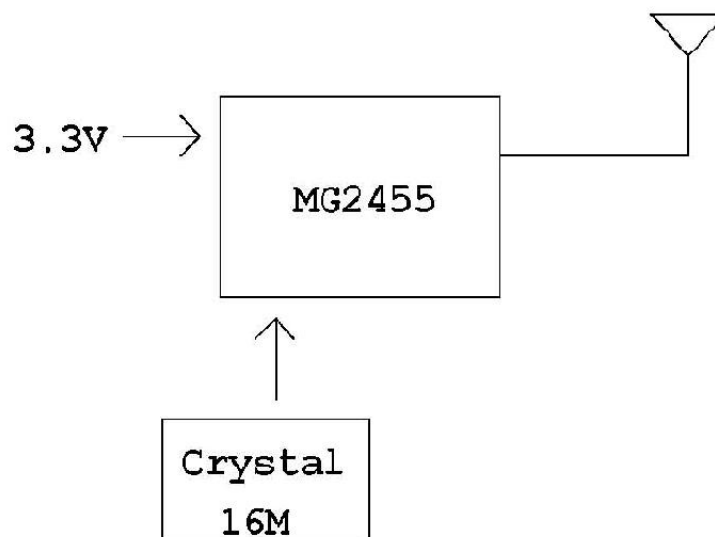


Figure 1.

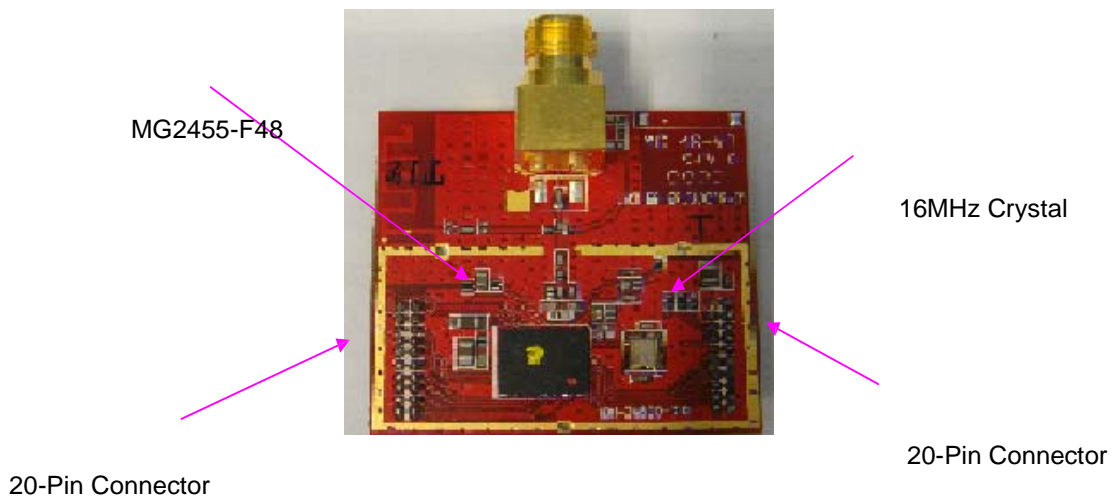


Figure 2. LM2455-ER

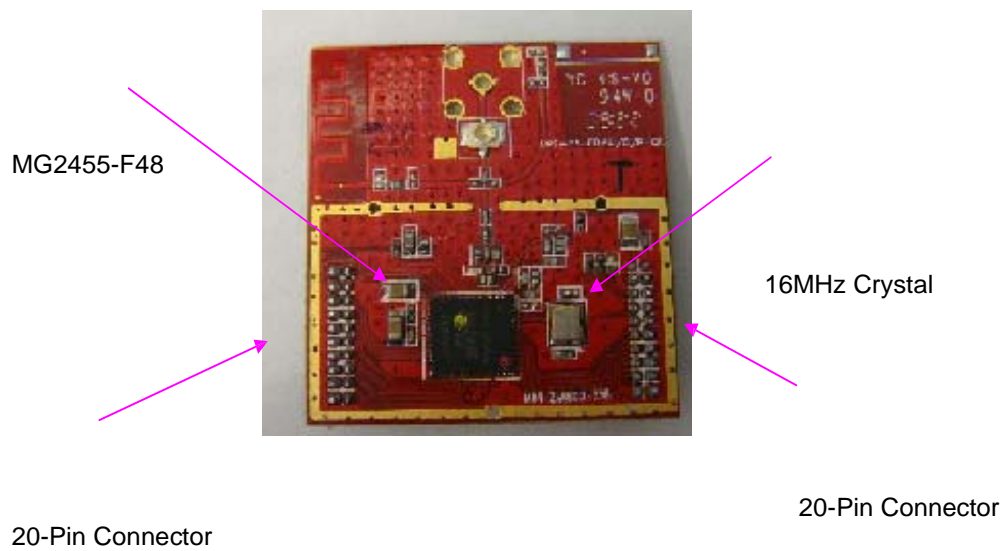


Figure 3. LM2455-EU

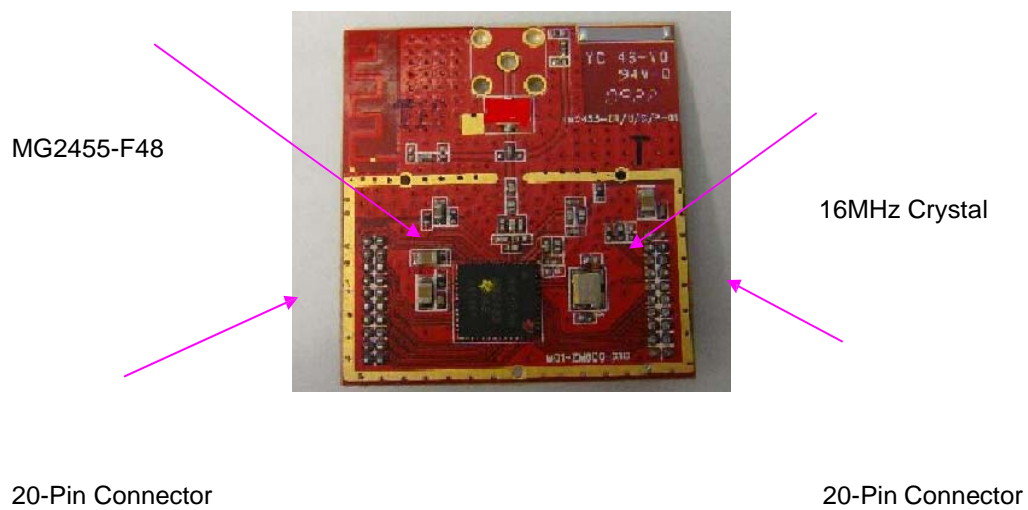


Figure 4. LM2455-EC

2. MG2455-F48 Components

2.1. Hardware Components

- LM2455-ER(or LM2455-EU or LM2455-EC) : 1 EA
- MG245X-EVB : 1 EA
- USB Cable : 1 EA
- 2dBi Pole Antenna : 1 EA

- ✓ LM2455-ER(or LM2455-EU or LM2455-EC): MG2455 Installed RF Module
- ✓ MG245X-EVB : PC Interface EVALUATION Board

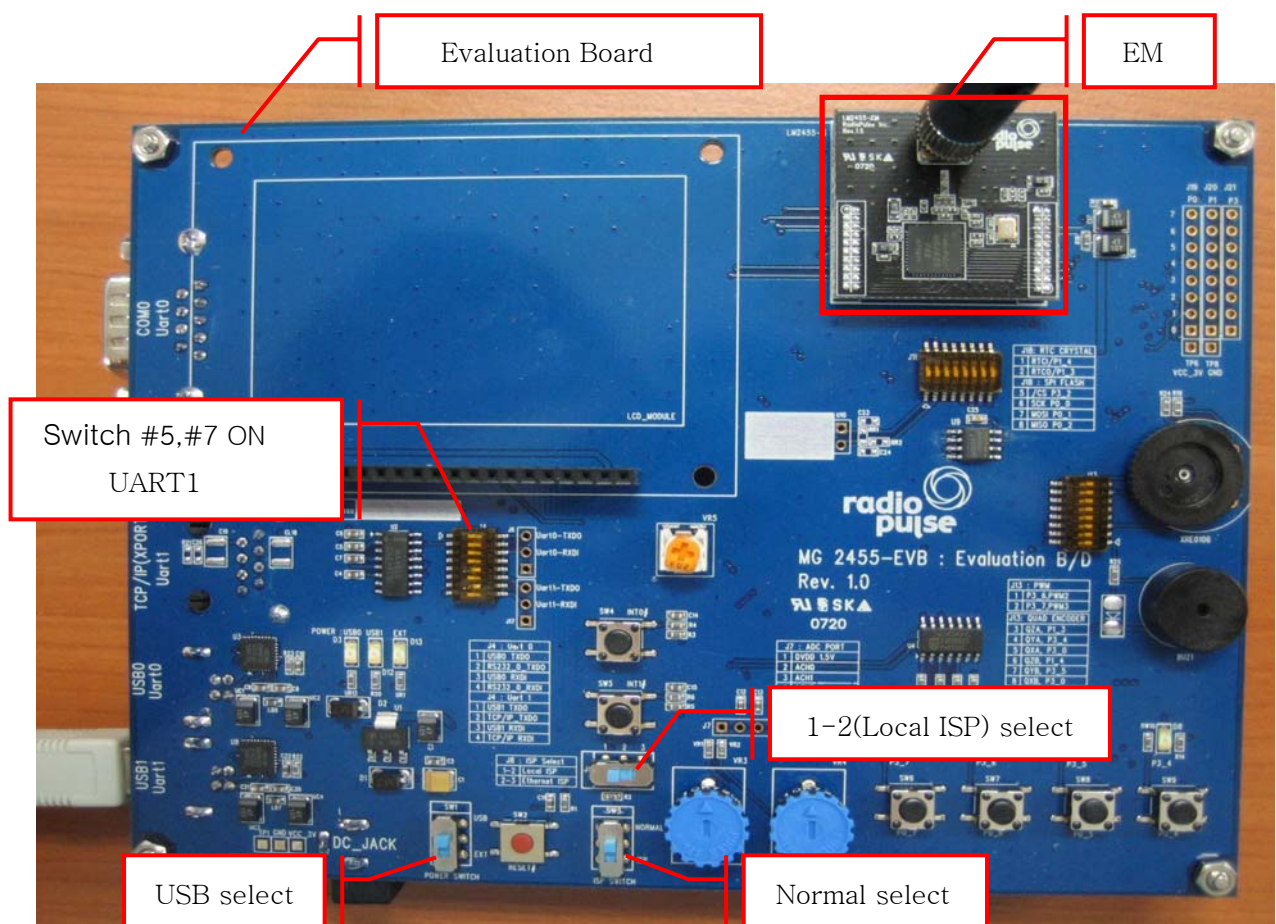
2.2. HARDWARE

2.2.1. Hardware Setting and Binding for Test

Two pcs each of Evaluation Board and Evaluation Module provided by RadioPulse are needed.(transmit, receive)

* EVB: Evaluation Board(EVB), EM: Evaluation Module(EM)

Figure5. Basic Hardware Setting (Transmit/Receive)



[Figure 5. MG245X- EVB]

3. Operation

- 1) After you stick LM2455-ER in MG245X -EVB , connect MG245X-EVB to your PC using the USB cable as shown below figure.



3.1. SOFTWARE

3.1.1. PC Terminal Program

PC Terminal Program is used for test controlling and monitoring.

A terminal program called 'Tera-Term Pro' is introduced in this section.

(This program is a freeware.)

****NOTE: Tera-term Pro supports COM1, COM2, COM3, and COM4 only.**

(When revising initial file, it's possible up to COM16.)

After Tera-Term Pro installation, follow the procedure below. a.

Set hardware(EM, EVB)

- b. Connect pc and EVB with USB cable.
- c. Start Tera-Term Pro and open COM port.

**Menu bar -> Setup -> Serial port -> Serial port setup Dialogue box
-> Set Port , Baud rate, Data, Parity, Stop and Flow control -> OK**

Port: Corresponding COM port(About MS Windows OS, Refer to port item of device manager.)

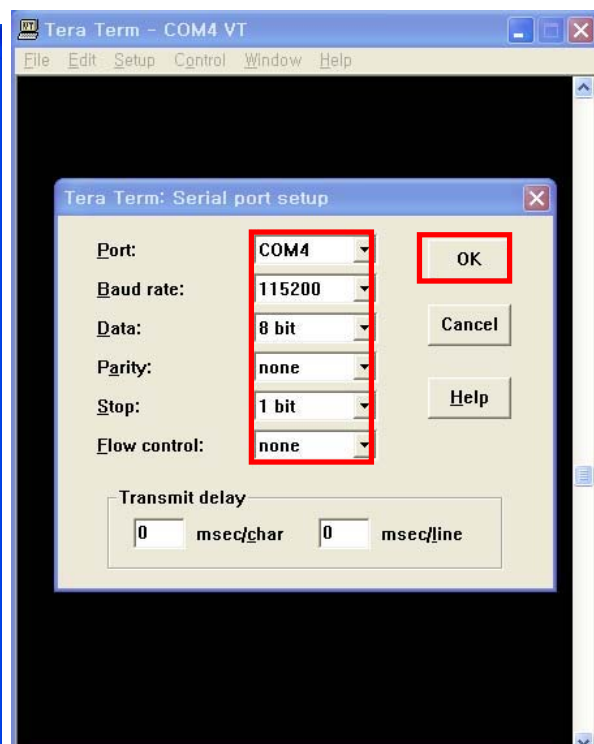
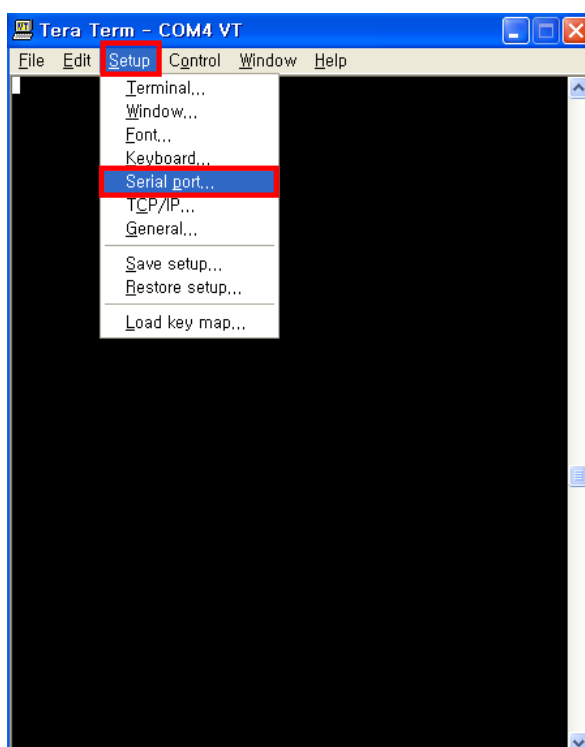
Baud rate: 115200

Data: 8 bit

Parity: none

Stop: 1bit

Flow control: none



3.2. How to Use Test Program

3.2.1. Information

In test program, Tx and Rx use same firmware. Tx and Rx are classified by inputting 0/1 in PC terminal program.

The firmware is **MG245X-MTP_V17.H00**, **MG245X-MTP_V17.H01**. For download information, refer to **Device Programmer User's Guide**.

Test program is divided into **Automatic Test** and **Single Test** in general.

Automatic Test can test several items centered on MCU Peripheral at a time.

Single Test tests the single item in case equipment is needed or test time is uncertain.

*Reference: Test Program's default setting – Channel: No 22, Output: Maximum(10dBm)

Detailed test process is as follows;

3.2.1.1 Automatic Test Practice

After connecting PC and Evaluation Board, follow the process below.

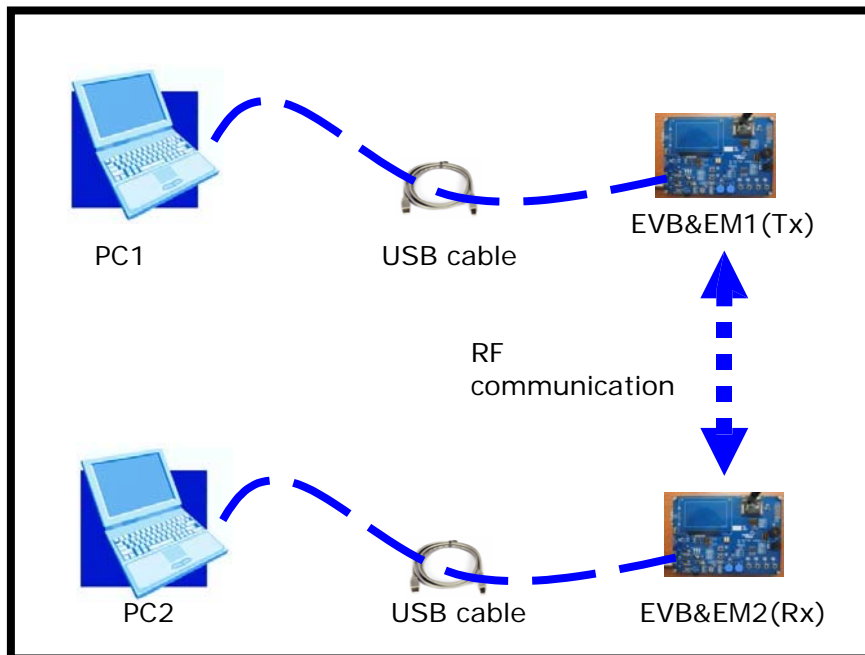
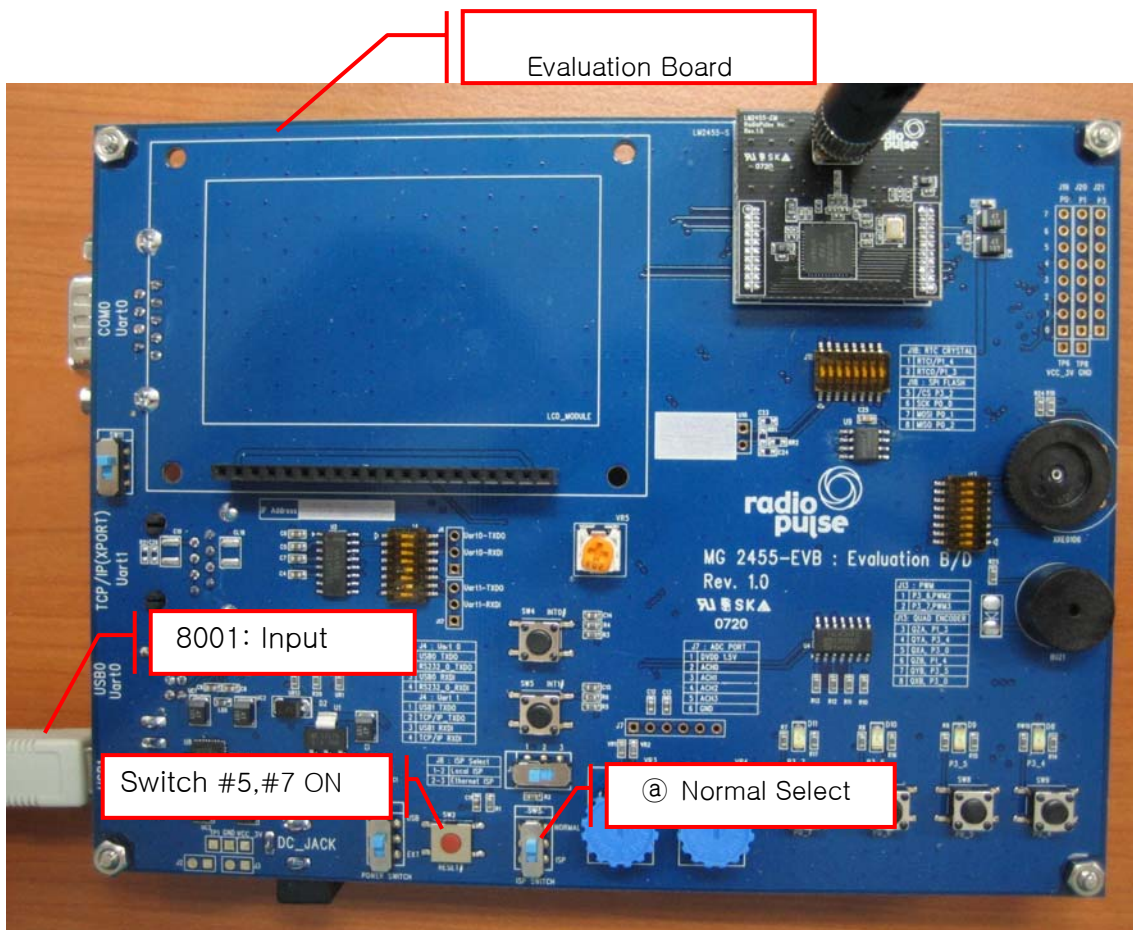


Figure6. Hardware setting for Automatic Test



- Set **ISP switch** to **Normal mode**.(EVB operating)
- Press **RESET** button.(EVB operating)
 –Press RESET button when it's stick to certain test mode or simple mistake occurs.
- When a message as below is shown in program window of PC terminal, set same Mode with DUT after press **0(zero)** for Station(Rx).
 For DUT(Device Under Test), Select a status of testing subject.

When testing subject is MG2455 module, (Refer to figure below.)

- ⌘ **Receive module(Rx on Figure3): 0 Input ⌘ 3 Input**
- ⌘ **Transmit module(Tx on Figure3): 3 Input. (DUT: Module for test)**

⌘ Transmit/Receive setting is needed for Automatic Test RF Tx-Rx testing item.

- d. When testing item is selected, **Device Information and Help Message** are shown. There are several test items in Help Message. When a user press '0', testing item selected basically is processed automatically. (Refer to Automatic Test.)

Figure7. Start Program

```
COM8:115200baud - Tera Term VT
File Edit Setup Control Window Help
RadioPulse MG245x Pan-Test Program !
Input Test Type !

[0]: MG245x Station for Ack Request
[1]: MG2455 Chip Test
[2]: MG2450 Chip Test
[3]: MG2455 Module Test
[4]: MG2450 Module Test
[5]: MG2455 Power Amp. 13dBm Module Test
[6]: MG2455 Power Amp. 20dBm Module Test
[9]: MG245x EVB Test
: 0

MG245x-STATION for Ack Request, RadioPulse Inc.
VERSION = 01.7a
REG_VERSION = 01.52

MG245X Initializing .... ==> OK

=== My Device Information ===
DevMode : 0x00
DataRate : 0
PowerLevel : 0x00

Channel : 22
PanID : 0xcafe
DstAddr : 0x0bee
MyAddr : 0x1bee
=====

RadioPulse MG245x Pan-Test Program !
Input Test Type !

[1]: MG2455 Chip Test
[2]: MG2450 Chip Test
[3]: MG2455 Module Test
[4]: MG2450 Module Test
[5]: MG2455 Power Amp. 13dBm Module Test
[6]: MG2455 Power Amp. 20dBm Module Test
[9]: MG245x EVB Test
: 3
==> Ready to run !!!

=== HELP ===
[0] : Auto Test Execution
[1] : Auto Test Item Selection
[2] : User Specific(Rx Count)
[7] : WDT RESET
[8] : SPI-MASTER
[9] : SPI-SLAVE
```


COM11:115200baud - Tera Term VT

Tx DUT

File Edit Setup Control Window Help

Press RESET

RadioPulse MG245x Pan-Test Program !
Input Test Type !

[0]: MG245x Station for Ack Request
[1]: MG2455 Chip Test
[2]: MG2450 Chip Test
[3]: MG2455 Module Test
[4]: MG2450 Module Test
[5]: MG2455 Power Amp. 13dBm Module Test
[6]: MG2455 Power Amp. 20dBm Module Test
[9]: MG245x EVB Test
: 3

MG245X-MTP, RadioPulse Inc.
MTP_VERSION = 01.7a
REG_VERSION = 01.52

MG245X Initializing ==> OK

=== My Device Information ===
DevMode : 0x01
DataRate : 0
PowerLevel : 0x00

Channel : 22
PanID : 0xcafe
DstAddr : 0x1bee
MyAddr : 0x0bee
=====

3 : Input

==> Ready to run !!!

=== HELP ===
[0] : Auto Test Execution
[2] : User Specific(Rx Count)
[8] : SPI-MASTER
[C] : Channel Change
[E] : Energy Detection
[I] : Select Item(PER, RF Power, RSSI, Rx Packet)
[P] : PowerDown
[T] : Transmit
[M] : TEST_TXOUT : Modulation with IFS
[B] : TEST_TXOUT : Back To Normal Mode
[W] : PWM
[1] : Auto Test Item Selection
[7] : WDT RESET
[9] : SPI-SLAVE
[D] : DataRate Change
[H] : HELP MESSAGE!
[S] : SAES
[N] : TEST_TXOUT : Modulation without IFS
[U] : TEST_TXOUT : Unmodulated Carrier
[V] : VERSION
[Z] : Register Value Change

Device Information

Help

COM11:115200baud - Tera Term VT

File Edit Setup Control Window Help

=== HELP ===

[0] : Auto Test Execution	[1] : Auto Test Item Selection
[2] : User Specific(Rx Count)	[7] : WDT RESET
[8] : SPI-MASTER	[9] : SPI-SLAVE
[C] : Channel Change	[D] : DataRate Change
[E] : Energy Detection	[H] : HELP MESSAGE!
[I] : Select Item(PER, RF Power, RSSI, Rx Packet)	
[P] : PowerDown	[S] : SAES
[T] : Transmit	[N] : TEST_TXOUT : Modulation without IFS
[M] : TEST_TXOUT : Modulation with IFS	[U] : TEST_TXOUT : Unmodulated Carrier
[B] : TEST_TXOUT : Back To Normal Mode	[V] : VERSION
[W] : PWM	[Z] : Register Value Change

[0] RF Tx-Rx => OK

[0] EXT INT => OK

[0] UART0 => OK

[0] UART1 => OK

[0] TIMER0 => OK

[0] TIMER1 => OK

[0] TIMER2 => OK

[0] TIMER3 => OK

[0] GPIO => OK

[0] ADC0 => OK

[0] ADC1 => OK

[0] ADC2 => OK

[0] ADC3 => OK

[S] POWER DOWN START =>

[0] POWER DOWN => OK

[S] IDLE_MODE START =>

[0] IDLE_MODE => OK

[0] DATA MEMORY => OK

[0] PLL LOCK => OK

[S] WATCHDOGTIMER START =>

RadioPulse MG245x Pan-Test Program !

Input Test Type !

[0]: MG245x Station for Ack Request

[1]: MG2455 Chip Test

[2]: MG2450 Chip Test

[3]: MG2455 Module Test

[4]: MG2450 Module Test

[5]: MG2455 Power Amp. 13dBm Module Test

[6]: MG2455 Power Amp. 20dBm Module Test

[9]: MG245x EVB Test

:

Tx DUT

Automatic Test result
when ' 0 ' input

System reset with
WATCHDOG-TIMER test

Federal Communication 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 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.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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.

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

IMPORTANT NOTE:

This module is intended for OEM integrator. The OEM integrator is still responsible for the FCC compliance requirement of the end product, which integrates this module.

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

USERS MANUAL OF THE END PRODUCT:

The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: XBJLM2455ER-EU-EC ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.