Version 1.1
July, 2012

DRI-0007

Zigbee Module

User Manual

Dongbu Robot

RF Transceiver

- Single-chip 2.4GHz RF Transceiver
- Low Power Consumption
- No External T/R Switch or Filter needed
- On-chip VCO, LNA, and PA
- Programmable Output Power up to +10dBm
- Direct Sequence Spread Spectrum
- O-QPSK Modulation
- Scalable Data Rate including 250Kbps specified in IEEE802.15.4: 31.25Kbps ~ 1Mbps
- RSSI Measurement
- Compliant to IEEE802.15.4

Hardwired MAC

- Two 256-byte circular FIFOs
- FIFO management
- AES Encryption/Decryption Engine(128 bit)
- CRC-16 Computation and Check

8051-Compatible MCU

- 8051 Compatible (single cycle execution)
- 64KB Embedded Flash Memory
- 6KB Data Memory
- 128-byte CPU dedicated Memory
- 1KB Boot ROM
- Dual DPTR Support
- I2S/PCM Interface with two 256-byte FIFOs
- μ-law/a-law/ADPCM Voice Encoder/Decoder
- Two High-Speed UARTs with Two 16-byte FIFOs(up to 1Mbps)
- Two Timer/Counters
- 5 PWM channels
- Watchdog Timer
- Sleep Timer using the 32kHz RC-OSC clock
- Quadrature Signal Decoder
- 22 General Purpose I/Os for MG2470-F48
- Internal 32kHz RC oscillator for Sleep Timer
- 16 MHz High Speed RC oscillator for the fast start-up from reset & power-down mode
- On-chip Power-on-Reset and Brown-out detector
- 4-channel 12-bit ADC(ENOB > 10-bit)
- SPI Master/Slave Interface with two 16-byte FIFOs
- I2C Master/Slave with 16-byte FIFO
- Programmable IR(Infra-Red) Modulator
- ISP (In System Programming)
- External clock output function(500KHz, 1/2/4/8/16/32 MHz selectable)

Clock Inputs

- 32MHz Crystal for System Clock is included.

Power

- 1.8V(Core)/2.0~3.6V(I/O) Operation
- Power Management Scheme with Deep Sleep Mode
- Separate On-chip Regulators for Analog and Digital Circuitry.
- Power Supply Range for Internal Regulator(2.0V(Min) ~ 3.6V(Max))

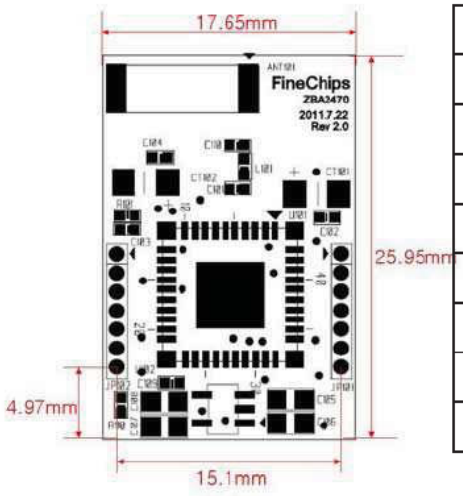
Package

- 44-pin LGA Package (9mm x 9mm)

Applications

- Home automation and security
- Automatic Meter Reading
- Factory automation and motor control
- Replacement for legacy wired UART
- Voice application
- Energy management
- Remote entry with acknowledgement
- Low power Telemetry
- Health-care equipments
- PC peripherals
- Toys

JP102	
No	Pin Assignment
1	P3.2/INT0
2	VDD3.3(LDO_OUT)
3	nRESET
4	P1.1/UTX1
5	P1.0/URX1
6	ISP
7	GND

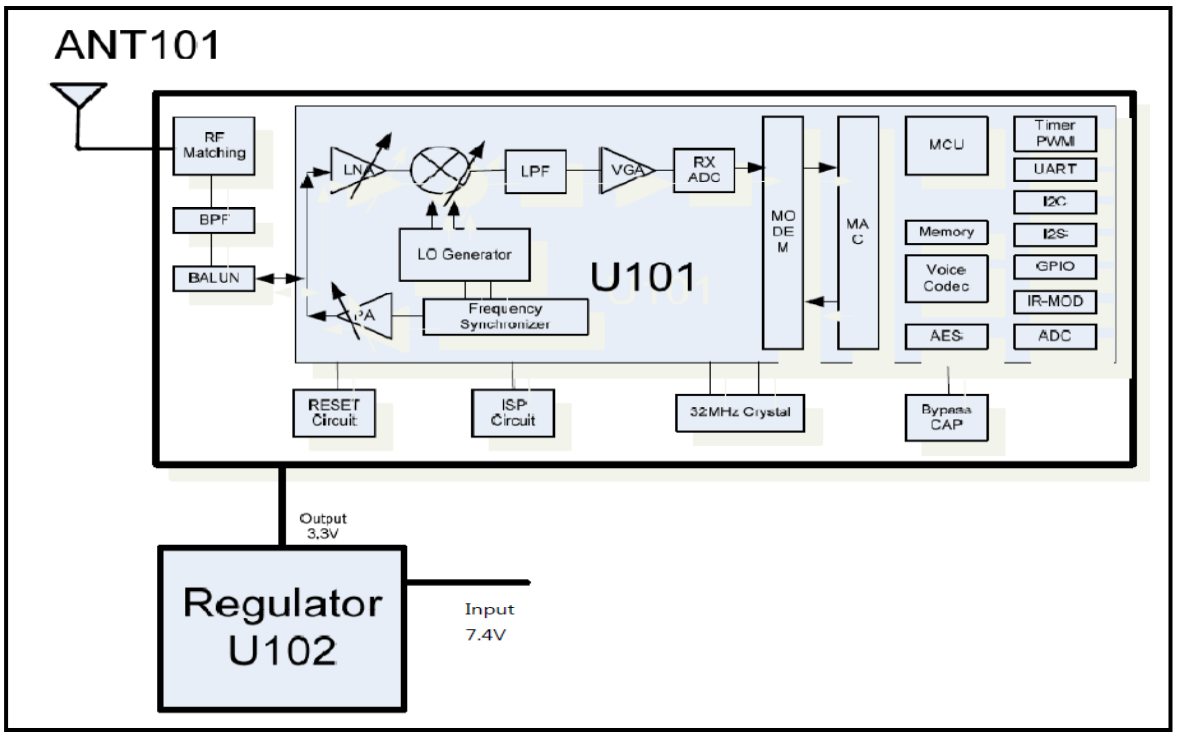


JP101	
No	Pin Assignment
1	P1.6/I2CCLK
2	P1.7/I2CSDA
3	nRESET
4	P3.1/UTX0
5	P3.0/URX0
6	VDD5(LDO_IN)
7	GND

Specification

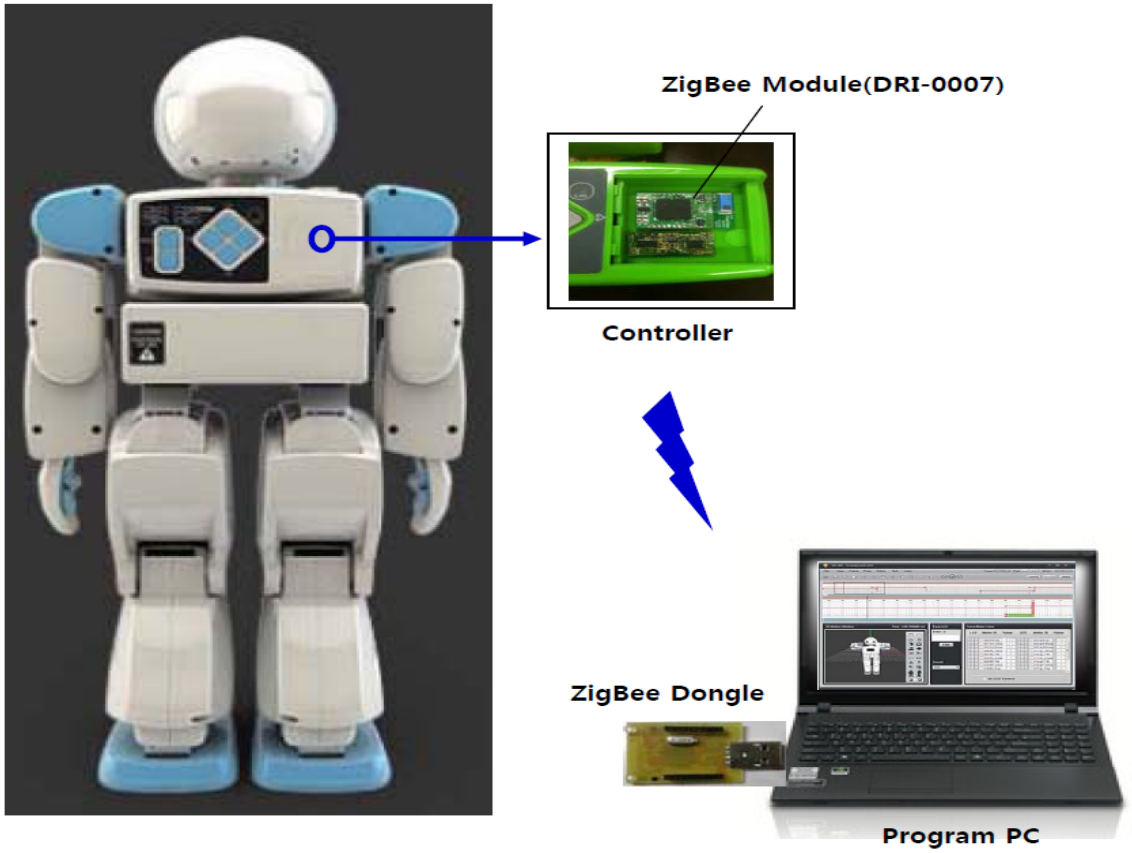
Model Number	DRI-0007
CPU	RP-S2470(RF System In Package)
Operating Voltage Tolerance Range	4.5V ~ 9V
Serial Speed	115,200 bps
Storage Temperature	-40~85℃
Operating Temperature	-30~75℃
Input Voltage(VDD3.3)	2.7~3.6V
Input Voltage(VDD5)	4.5~9V
Current Consumption(TX, Max Power)	45mA
Current Consumption(RX)	26mA
Max TX Power	9.3dBm
Data Rate	250kbps
Frequency Range	2.4~2.4835 GHz

Block Diagram & Operational description



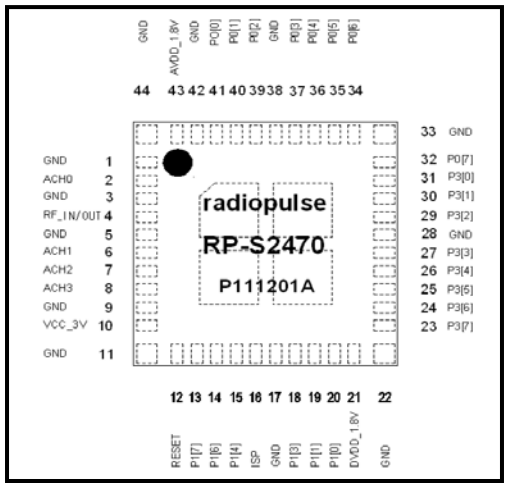
Dongbu Robot's DRI-0007 is a compact ZigBee module designed to provide easy ZigBee data communication application for communication devices without ZigBee functionality.
By integrating the module into communication devices, it enables the communication device to be used with ZigBee devices within a range of 10m~20m distance.
M5G integrates all the functions needed to replace existing data connection wirelessly and has been designed such that it is possible to control and monitor the functions externally via serial (UART) communication thereby enabling ZigBee functionality to be implemented into devices in a short period of time.
DRI-0007 is small type module that UART to RF converter.
DRI-0007 is compatible with IEEE 802.2.15.4.
It operates in 2400 to 2483.5 MHz band and use Direct sequence spread spectrum method.
The using channel number is 16CH and Channel space is 5MHz.
The data rate is 250Kbps.

The control signals and data in the ZigBee Chipset are modulated and processed and then pass the PA in it. They will be transmitted from ANT through the Balun filter to another ZigBee device.
The RF signal from other ZigBee devices is received via ANT. And they go through Balun filter into the chip. They are magnified by internal LNA in the chip.
The power settings and crystal trim are stored in internal Flash Memory.
The product is powered by DC +7.4V nominal and has an Inverted F PCB antenna in it.



The ZigBee module(DRI-0007) is installed Controller inside case.
Robot-motion come into action wireless data communication through ZigBee module and ZigBee dongle.
The ZigBee module and dongle is duplex transceiver and is cotrolled by program PC.
The function of program PC have robot' state reading and checking.
Also through wireless communication, come into action robot-motion and motor driving.

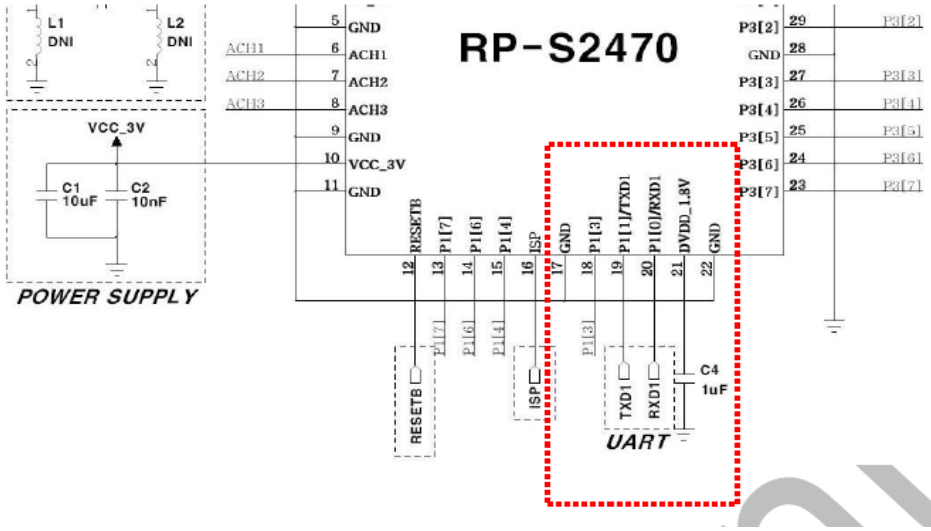
ZigBee Chipset(RP-S2470) Pin Description



Terminal	NAME	Interface	I/O	Description
1	GND	Ground	-	GROUND
2	ACH0	Analog	I	ADC CH0 Input
3	GND	Ground	-	GROUND
4	RF_IN/OUT	RF	I/O	RF input/output signal to LNA / from PA in receive / TX mode
5	GND	Ground	-	GROUND
6	ACH1	Analog	I	ADC CH1 Input
7	ACH2	Analog	I	ADC CH2 Input
8	ACH3	Analog	I	ADC CH3 Input
9	GND	Ground	-	GROUND
10	VCC_3V	Power	I	2.0V to 3.6V Digital power supply connection
11	GND	Ground	-	GROUND
12	RESETB	Digital	I	Active Low RESET
13	P1[7]	Digital	I/O	Port P1.7 GPIO / I2C_SDA
14	P1[6]	Digital	I/O	Port P1.6 / I2C_SCL
15	P1[4]	Digital	I/O	Port P1.4 / QUADZB / EXT_RTC_CLK / PTC_GATE4
16	ISP		I	Active High In System-Programming Input
17	GND	Ground	-	GROUND
18	P1[3]	Digital	I/O	Port P1.3 / QUADZA / PTC_GATE3 / IR_TX.CLK_OUT
19	P1[1]	Digital	I/O	Port P1.1 / TXD1
20	P1[0]	Digital	I/O	Port P1.0 / RXD1
21	DVDD_1.8V	Power	O	1.8V Digital power supply connection
22	GND	Ground	-	GROUND
23	P3[7]	Digital	I/O	Port P3.7 / CTS1 / SPICSN
24	P3[6]	Digital	I/O	Port P3.6 / RTS1 / SPICLK
25	P3[5]	Digital	I/O	Port P3.5 / CTS0 / QUADYB / SPIDO / T1
26	P3[4]	Digital	I/O	Port P3.4 / RTS0 / QUADYA / SPIDI / T0
27	P3[3]	Digital	I/O	Port P3.3 / INT1 (active low)
28	GNG	Ground	-	GROUND
29	P3[2]	Digital	I/O	Port P3.2 / INT0 (active low)
30	P3[1]	Digital	I/O	Port P3.1 / TXD0 / QUADXB
31	P3[0]	Digital	I/O	Port P3.0 / RXD0 / QUADXA
32	P0[7]	Digital	I/O	Port P0.7 / I2STX_MCLK / PTC_GATE2
33	GND	Ground	-	GROUND
34	P0[6]	Digital	I/O	Port P0.6 / I2STX_BCLK / PTC_GATE1
35	P0[5]	Digital	I/O	Port P0.5 / I2STX_LRCLK / PTC_GATE0
36	P0[4]	Digital	I/O	Port P0.4 / I2STX_DO / PWM4, 16mA drive capability
37	P0[3]	Digital	I/O	Port P0.3 / I2SRX_MCLK / PWM3, 16mA drive capability
38	GND	Ground	-	GROUND
39	P0[2]	Digital	I/O	Port P0.2 / I2SRX_BCLK / PWM2, 16mA drive capability
40	P0[1]	Digital	I/O	Port P0.1 / I2SRX_LRCLK / PWM1, 16mA drive capability
41	P0[0]	Digital	I/O	Port P0.0 / I2SRX_DI / PWM0, 16mA drive capability
42	GND	Ground	-	GROUND
43	AVDD_1.8V	Power	O	1.8V RF / Analog power supply connection
44	GND	Ground	-	GROUND

UART Interface

P1.0 and P1.1 are UART interface.
If another UART is needed, use P3.0(UART_RXD0) and P3.1(UART_TXD0).



Reliability

Test Item	Test Condition
Temperature Drift	25 -> 0 -> 30 -> 50 -> 75°C, 2hrs/step
High Temperature Storage	85°C@120hrs
Low Temperature Storage	-40°C@120hrs
High Humidity Storage	80°C/85%RH@120hrs
Thermal Shock	-40°C@1hrs <- > 85°C@1hrs, (50cycles)
Pressure Cooker Test	121°C/100%RH, 2kf/cm2@12hrs
Reflow Test	Step1 : 150 ~ 170°C, 70 ~ 175sec Step2 : 230+/-5°C
Electrostatic Discharge (ESD)	See nested tables below

Test Model	Test Stress		
	Reference	Polarity	Level
H.B.M	VDD VSS PTOP	1(Pos/Neg)	2000V

Test Model	Test Stress		
	Reference	Polarity	Level
MM	VDD VS PTOP	1(Po /Ne)	150V

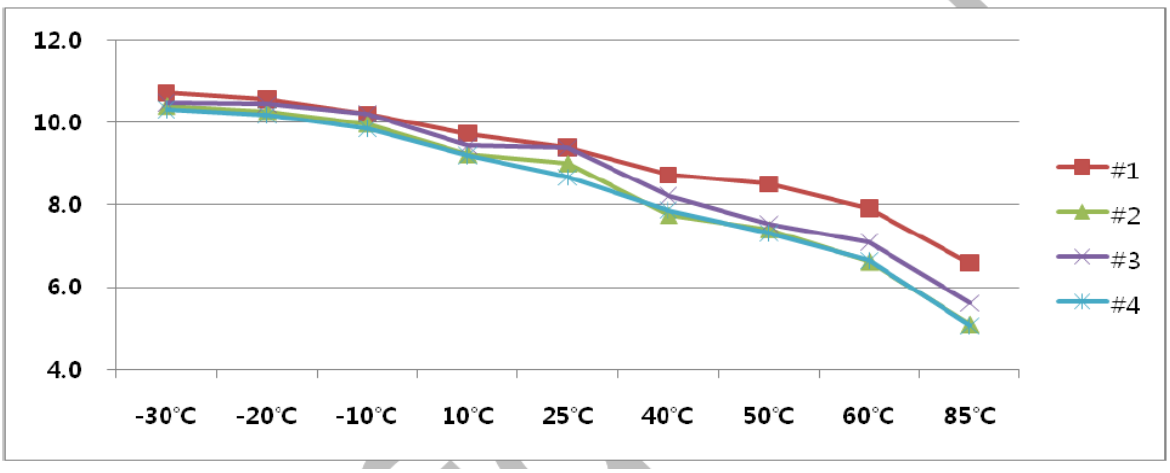
Test Model	Test Stress		
	Reference	Polarity	Level
C.D.M	Field Induced Charge	3(Pos/Neg)	500V

RF Inspection Specification

ITEM	UNIT	MIN	TYP	MAX	
Frequency Tolerance	kHz	-40		+40	AT 25°C
Maximum TX Output power	dBm		10.4		AT -30°C
			9		AT 25°C
			7		AT 60°C
			5.5		AT 85°C
TX EVM	%			20	AT -30~85°C

Thermal Characteristics Radio

ITEM		#1	#2	#3	#4
TX OUTPUT POWER (dBm)	-30°C	10.7	10.4	10.5	10.3
	-20°C	10.6	10.3	10.4	10.2
	-10°C	10.2	10.0	10.2	9.9
	10°C	9.7	9.2	9.4	9.2
	25°C	9.4	9.0	9.3	8.7
	40°C	8.7	7.8	8.2	7.9
	50°C	8.5	7.4	7.5	7.3
	60°C, 80%	7.9	6.6	7.1	6.6
	85°C, 90%	6.6	5.1	5.6	5.1



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.

FCC Compliance information

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.

FCC Radiation Exposure Statement:

This equipment complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body.This transmitter must not be co-located or operating 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.

20cm minimum distance has to be able to be maintained between the antenna and the users for the host this module is integrated into. Under such configuration, the FCC radiation exposure limits set forth for an population/uncontrolled environment can be satisfied.

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:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. 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,

Label and manual requirements for the End Product

For an end product using the DRI-0007 there must be a label containing, at least, the following information. FCC ID certification number for model : DRI-0007
This device contains FCC ID : QXNDRI-0007
The label must be affixed on an exterior surface of the end product such that it will be visible upon inspection in
compliance with the modular approval guidelines developed by the FCC Where the DRI-0007 will be installed in final products larger than 8cm × 10cm following statements has to be placed ONTO the device .
"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."

Assure compliance

The use of the modular transmitter is only approved to be used inside Dongbu Robot Co.,Ltd. equipment. We assure the compliance of the end product when it is assembled inside Dongbu Robot Co.,Ltd. equipment.

Caution

Modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment**.**

Antenna

This device shall only be used with the tested antenna that is integral CHIP antenna.

RF exposure compliance

Module rf radiation exposure is compliant and does not use any other antenna. But will only use the chip antenna. Must be operated with a minimum distance of 20cm between the works.

Warranty & Service

‣ Warranty and Repair service

- Dongbu Robot Co., Ltd.. warrants to the original consumer or other end user that this product,DRI-0007, is free from defects in materials and workmanship for a period of 1 year from the date of purchase.

※ Note Warranty/non-warranty repair fees do not include any shipping charges.

‣ The damages(defaults) prescribed below are NOT to be covered by warranty.

- User's misuse of part/component.
- Product's inspection requirement.
- Adding certain functions or extension of system.
- Fault by User's misuse against the product's manual.

CONTACT INFORMATION
Manufacturer Address : #235, Singal-ri, Jiksan-eup, Seobuk-gu, Cheonan-si, Chungcheongnam-do, Korea To locate in-country Dongbu Robot Co., Ltd., distributors of the Zigbee Module please refer to the Dongbu Robot Co., Ltd. Website http://www. www. dongbu.com These distributor(s) represent local contacts for this product.

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