WL-DCM2400 User Manual

Wavelabs

Wavelabs, Inc.,: RM705, 7FL, Jangmiro 42, Bundang-gu Sungnam-City, Gyeonggi-do, Rep of KOREA
Tel: +82.31.8017.7628 Fax: +82.31.8017.7629

© 2020 Wavelabs, Inc. All Rights Reserved

1. Overview

WL-DCM2400 provides safe RF wireless communication with Point-to-Point Topology.
WL-DCM2400 is an RF wireless communication module operating in the 2.4GHz ISM Band Frequency Hopping method and can apply to equipment using serial interface, and long distance communication is possible at high speed.
WL-DCM2400 can be configured according to the required type by AT command.
Applications are conveniently configured and can be applied in various fields.

1.1 Regulatory Information

SIMPLIFIED EU DECLARATION OF CONFIRMITY

The simplified EU declaration of conformity referred to in Article 10(9) shall be provided as follows:

Hereby, Wavelabs Co., Ltd. declares that the radio equipment type 2.4GHz wireless modem is in compliance with Directive 2014/53/EU.

Frequency Range	Output Power (Max.)
2400~2483.5 MHz	Below 20 dBm

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 : Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

 © 2020 Wavelabs, Inc. All Rights Reserved

RF Radiation Exposure Statement:

This equipment complies with RF radiation exposure limits set forth for an uncontrolled environment.

This equipment should be installed and operated with a minimum distance of 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

This device complies with Industry Canada license-exempt RSS standard(s). 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.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RSS-102 RF Exposure

Le dispositif doit être placé à une distance d'au moins 20 cm à partir de toutes les personnes au cours de son fonctionnement normal. Les antennes utilisées pour ce produit ne doivent pas être situés ou exploités conjointement avec une autre antenne ou transmetteur.

EXTERNAL ANTENNA MODEL SPECIFIC REQUIREMENTS

This radio transmitter IC: 27085-ICWLDCM2400 has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated.
Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio IC: 27085-ICWLDCM2400 a été approuvé par Innovation, Sciences et Développement
économique Canada pour fonctionner avec les types d'antenne énumérés ci dessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur

Antenna Name	Antenna Type	Antenna Gain (dBi)
TE-2406-CH05	Dipole	5.8
W5E-WO-01	Dipole	5.0

© 2020 Wavelabs, Inc. All Rights Reserved

1.2 Characteristics and functions

The main performance features of WL-DCM2400 are as follows.

- 2.4MHz ISM Band Frequency Hopping Operation(Max. 79ch)
- Maximum output power of 1W (+30dBm)

  ※ Output power level can be adjusted according to the standards of each country
- Link rate : Max. 250kbps
- Can be set by AT command
- UART / USB interface
- Call book function
- RSSI LED indication

1.3 WL-DCM2400 specification

Electrical / General

Supported Frequency:	2.405 ~ 2.480 GHz (CE) , 2.402 ~ 2.480 GHz (FCC)
Spreading Method:	Frequency Hopping(FHSS)
Output Power:	Up to 1W (adjustable)
Link Rate:	100 kbps, 250 kbps (adjustable)
Serial Baud Rate:	9600 ~ 230400 bps (adjustable)
Core Voltage:	+7 ~ +12 VDC
Power Consumption:	1.25A@+12V

Environmental

Operation Temperature : -25℃ to +85℃

Mechanical

Dimensions :	41mm X 75.5mm X 17mm
Weight :	Max. 100g (Without antenna)
Connectors :	Antenna : RSMA
	Data : USB (Micro 5Pin) / UART

 © 2020 Wavelabs, Inc. All Rights Reserved

2. Hardware Description

This document defines the standard and general characteristics applied to the WL-DCM2400 module.

WL-DCM2400 composes several interfaces as follows.

- Input DC voltage : +7 ~ +12 VDC
- Power LED indication: Red
- RSSI LED indication: Blue
- TX Data LED indication: Red
- RX Data LED indication: Green
- RS232 / UART Data Interface
- Antenna (SMA)
- USB Port (Serial to USB (Micro 5Pin))
- I/O Pins (JST Connector 6Pin (VCC / Config / UART / GND))

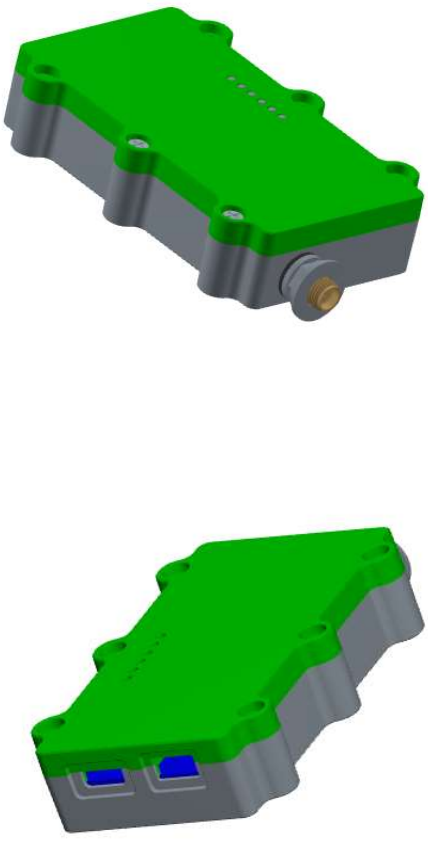

Fig 1. WL-DCM240

© 2020 Wavelabs, Inc. All Rights Reserved

2.1 WL-DCM2400 Drawings

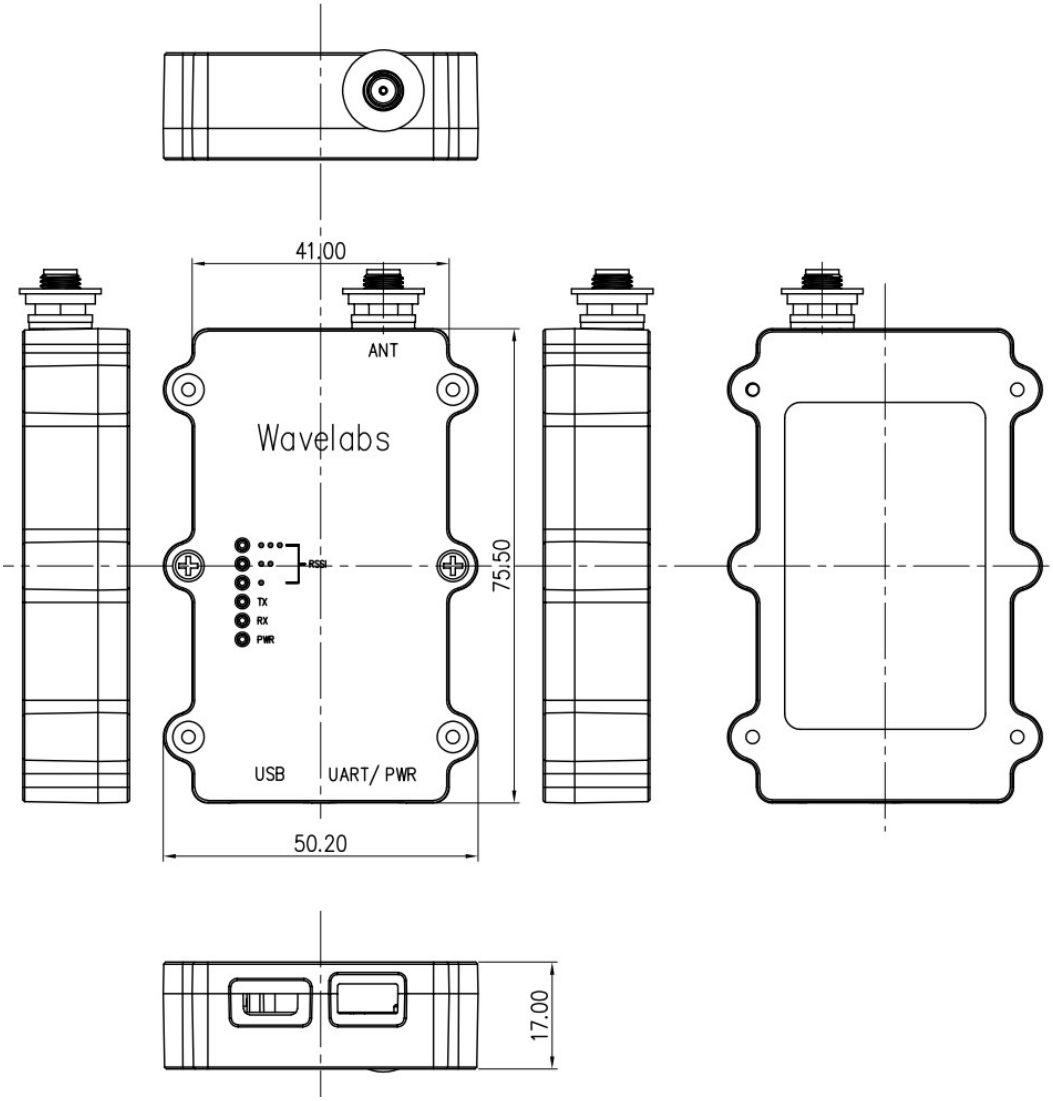

Fig 2. Drawings

© 2020 Wavelabs, Inc. All Rights Reserved

2.2 WL-DCM2400 Connectors & LED indication

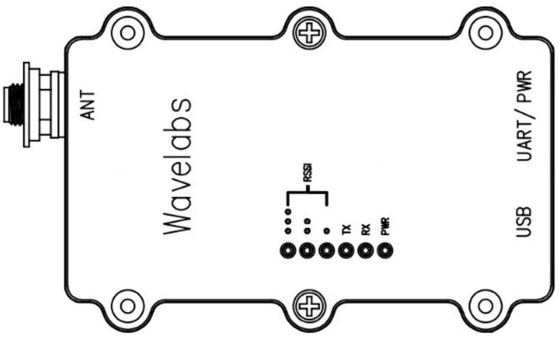

Fig 3. LED indication

- PWR (Red)

  Red LED turns on when WL-DCM2400 input voltage (+7 ~ +12 VDC) is applied.

- TX LED (Red)

  TX red LED is ready and TX red LED blinks repeatedly to indicate data transmission status.

- RX LED (Green)

  RX green LED is ready and RX green LED blinks repeatedly to indicate data reception status.

- Indication of received signal strength (Blue) : RSSI

  As the received signal strength increases, 1 to 3 blue LED lights increase.

MODE	Unit Type	LED status			
		PWR	TX	RX	RSSI
COMMAND	ALL	ON	OFF	OFF	OFF
DATA	RX	ON	Blinking : Transmission state	ON : Ready state Blinking : Reception state	LED lights up according to signal strength
	TX	ON	ON : Ready state Blinking : Transmission state	Blinking : Reception State	LED lights up according to signal strength

Table 1. LED operation

© 2020 Wavelabs, Inc. All Rights Reserved

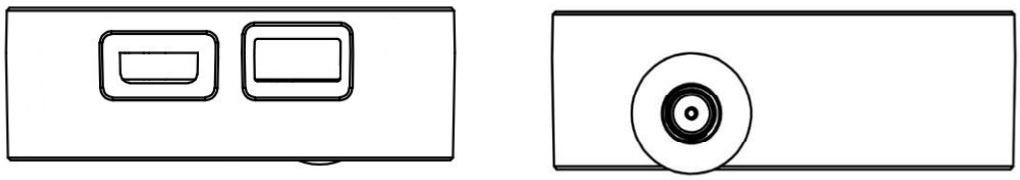

Fig 4. Connector & USB

- USB

  When connected to a PC, a USB port provided for user convenience through a serial to USB port . (Micro 5 Pin to USB)

- JST Connector (6 Pin)

  Input DC volatage

  : +7 ~ +12 VDC

  Config (COMMAND)

  : Using for firmware download

  UART (DATA)

  : UART communication between devices

Pin No.	Signal	
1	VCC	
2	Config	
3	UART	RX
4		TX
5		GND
6	GND	

Table 2. JST Connector Pin

- ANT

  SMA Connector

 © 2020 Wavelabs, Inc. All Rights Reserved

3. RF module command

RF module can be controlled by AT command, and it is composed in the form of "AT+<Command>[Enter]"

: [Enter] means newline character, CR(0x0D) + LF(0x0A) character

3.1 Enter command mode

- Check whether to enter "Command Mode" for 5 seconds after powering on the RF module.

  (When entering "command mode" command is not input, "RF transmit/receive mode" is automatically switched)

- RF module setting can be checked and changed after entering "command mode"

- When changing the RF module setting, the changed setting value is applied only after flash saving is completed. (If Flash cannot be saved, the setting change will not be applied)

- After "command mode" is finished, "RF transmission/reception mode (=RF Mode)" is automatically switched.

Mode switching	Input string	Remark
RF Module Initial → CMD Mode	AT+SET1[Enter]	In "RF transmission / reception mode", can not enter "command mode"
CMD Mode → RF Mode	AT+SET0[Enter]	

Table 3. Entering/exiting command mode

3.2 Configuration Command

- Basic commands

명령어	설명
AT+I	Display module information
AT+F	Module frequency band setting
AT+C	Calling up default settings related to module control
AT+S	Save module current settings flash memory
AT+V	Module current setting output

Table 4. Command table

 © 2020 Wavelabs, Inc. All Rights Reserved

3.2.1 AT+I

Function	Module information output	
Example	TX	AT+I<Index>[Enter]
Example	RX	<Information>[Enter]
Parameter	<Index>	0 : Product Name 1 : Firmware Version 2 : Module MAC Address
Remark		

Table 5. AT+I description

3.2.2 AT+F

Function	Module frequency band setting	
Example	TX	AT+F<Space>**<Fstart>**<Space>**<Fstop>** <Space>**<Spacing>**<Space>**<Count>**[Enter]
Example	RX	OK
Parameter	<Fstart>	Communication frequency start value, unit : MHz **(Default : 2405.0, Min : 2402.0)**
	<Fstop>	Communication frequency start value, unit : MHz **(Default : 2480.0, Max : 2480.0)**
	<Spacing>	Communication frequency interval, unit : MHz **(Default : 5.0, Min : 1.0 / Max : 5.0)**
	<Count>	Frequency hopping number, unit : ea **(Default : 16, Min : 1 / Max : 79)**
Remark	Separation of parameters is determined by spaces (=space, 0x20) For <Spacing> and <Count> items, Min & Max values are automatically changed according to the value. → Spacing = (1.0) / Count = (Min : 1, Max : 79) → Spacing = (5.0) / Count = (Min : 1, Max : 16) Ex : (<Fstart>) + (<Spacing>*<Count>) <= (<Fstop>)	

Table 6. AT+F description

3.2.3 AT+C

Function	Calling up default settings related to module control	
Example	TX	AT+C<Index>[Enter]
Example	RX	OK [Enter]
Parameter	<Index>	0 : Master (Transmit Mode) 1 : Slave (Receive Mode)
Remark	Set to the default setting of the selected <Index> mode	

Table 7. AT+C description

 © 2020 Wavelabs, Inc. All Rights Reserved

3.2.4 AT+S

Function	Saving the module current setting to the flash memory	
Example	TX	AT+S[Enter]
Example	RX	OK[Enter]
Parameter		
Remark	After changing the settings in "command mode", go to "RF transmission/reception mode" without saving, previously changed values are not applied when switching	

Table 8. AT+S description

3.2.5 AT+V

Function	Module current setting output	
Example	TX	AT+V[Enter]
Example	RX	<Information>[Enter]
Parameter		
Remark	The previously saved Flash value and the current changed value are separated and output.	

Table 9. AT+V description

4. Installation

There are several factors to consider when preparing to deploy a wireless network, and several factors are described below in no specific order.

4.1 Network Topology

WL-DCM2400 operates in 2.4GHz ISM band and supports Point to Point Topology.

4.2 Throughput

WL-DCM2400 supports up to 250kbps asynchronous transmission speed

4.3 Distance

Physical distance between products is affected by required antenna performance and height

4.4 Terrain

Along with distance, terrain should take into account antenna performance considerations. The term "line of sight" (LOS) means being able to see one location from another location, which is the minimum requirement for a radio signal path. That is, the LOS should be secured to minimize the effect on the RF communication link.

 © 2020 Wavelabs, Inc. All Rights Reserved

4.5 Power requirements

WL-DCM2400 uses DC input voltage +7 ~ +12 VDC.

(If the supply voltage/current does not meet the requirements, normal operation may not be possible or the product may be damaged)

5. User description

5.1 POWER SUPPLY

The module supply power is +7 ~ +12V, and the user should consider the current capacity when applying power.

5.2 UART PORT

It processes transmission/reception data by connecting it to the UART Port of the connecting device.

5.3 USB PORT

USB PORT is an added function for user convenience, and it is directly connected to the PC without using a separate conversion device.

5.4 LED status indication

LED status indication is as follows.

Item	Description	LED Color	Number of LEDs
RSSI	Received signal strength indication	Blue	3 EA
TX	RF data transmission status indication	Red	1 EA
RX	RF data reception status display	Green	1 EA
POWER	Module power status indication	Red	1 EA

* In Command Mode, only the power LED is on.

 © 2020 Wavelabs, Inc. All Rights Reserved