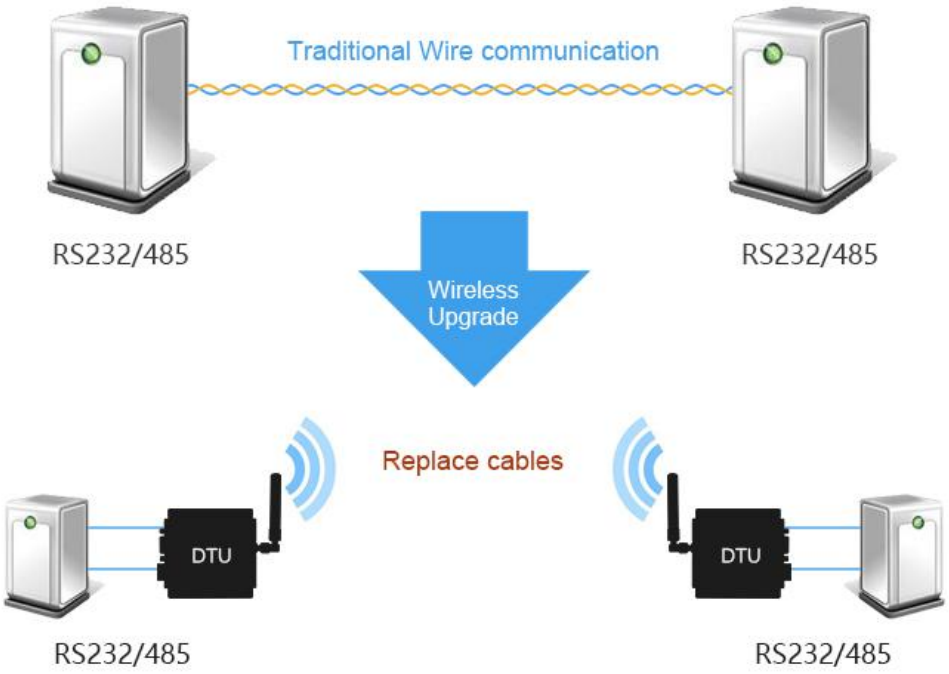
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# E61-DTU-5W Datasheet v1.0

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# 1. Introduction

## 1.1 Feature




E61-DTU-5W is a high-speed data transfer unit (DTU) with RS232/RS485 interface, 10V~36V, operating at 425~450.5MHz (Default: 433MHz). Transparent transmission is available.

The package length is unlimited when module works in Continuous mode, which perfectly realizes continuous transmission for baud rate of 57600/38400/19200/9600, etc. In fixed-length transmission, air data rate, FEC, password etc. are configurable. Transmit data with configured air data rate in the most efficient way, which realizes low-latency and high-response. The high-speed feature of module is suitable for polling sampling, handshake response communication, and supporting Modbus protocol.

The data of the module transmitted on the air features randomness. And with the rigorous encryption & decryption, data interception becomes pointless. 65536 configurable addresses for user to define, which only allows the module with matched password to receive the data successfully.

| No. | Feature | Description |
|---|---|---|
| 1 | Continuous transmission | In this mode the data transmitting length is unlimited:<br>Perfectly realize continuous transmission for baud rate of 57600/38400/19200/9600/4800/2400/1200. |
| 2 | Fixed-length transmission | Air data rate, FEC and Encryption are configurable by users;<br>Transmitting data to the receiver in present air data rate with a most effective way to realize low delay and high respond. |
| 3 | Encryption | Module has 65536 ciphers reserved for user to define, only when the cipher is matched can the module receive data. |
| 4 | Modbus | 433M high rate and low latency,<br>suitable for polling sampling, handshaking response communication, and supporting Modbus protocol. |
| 5 | Broadcast | Set the address as 0xFFFF:<br>All data transmission of modules in the same channel can be monitored.<br>Data transmitted can be received by modules in the same channel to broadcast and monitor. |
| 6 | FEC | FEC (Forward Error Correction ) algorithm. It has high coding with efficiency & good correction performance. In a sudden interference, it can correct the interfered data packets proactively, so that the reliability & transmission range are improved proactively. Without FEC, those data packets can only be dropped. |
| 7 | Watchdog | With a built-in watchdog and precise time configuration, once an exception occurs , the DTU will restart within 0.107 second and continue to work on previous parameter settings. |

## 1.2 Basic usage

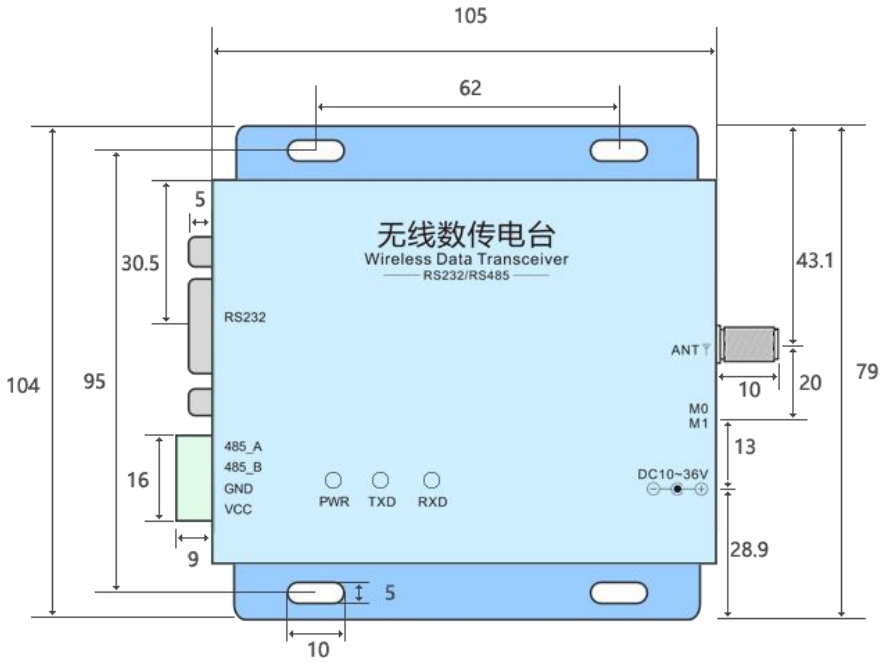
| No. | Usage | Description |
|---|---|---|
| 1 | Continuous transmission | Modules work on mode 0, and set "Continuous transmission " ;<br>air data rate will be matched automatically. Suitable for huge data transmission continuously(transparent transmission).<br>I.e.: A send 1000 bytes FF 00...FF 00 to B(HEX), then B receives 1000 bytes FF 00...FF 00 accordingly. |
| 2 | Fixed-length transmission | Modules work on mode 0, and set "fixed-length transmission" ;<br>Suitable for the transparent transmission of small data(within dozens of bytes). Users can set air data rate, FEC, password etc to realize low-latency and high-response. Note：77 bytes at most per package in this mode.<br>i.e.: A send 5 bytes 01 02 03 04 05 to B(HEX), then B receive 5 bytes 01 02 03 04 05 accordingly. |

## 1.3 Electrical parameter

| No. | Item | Parameter details | Description |
|---|---|---|---|
| 1 | Size | 124 * 104 *25.5mm | - |
| 2 | Weight | 135g | Average weight |
| 3 | Frequency band | Default: 433MHz | 425~450.5MHz<br>channel:256, 433±5MHz(recommended) |
| 4 | Process | SMT, lead-free | Ensure the consistency and reliability of mass production |
| 5 | Connector | RS485：1 * 4 * 3.81 mm<br>RS232：DB9 | Screwing<br>Standard DB9, hole |
| 6 | Supply voltage | 10 ~ 36V DC | Note: the voltage higher than 36V is forbidden |
| 7 | Communication level | RS232/RS485 | Available for RS232 and RS485 |
| 8 | Operation range | Continuous transmission:10000m | Test condition: clear and open area&37dBm, antenna gain: 5dBi，height: 2m,<br>baud rate: 9600 |
| | | Fixed-length transmission:15000m | Test condition: clear and open area&37dBm, antenna gain: 5dBi，height: 2m,<br>air data rate: 1.2kbps |
| 9 | Transmitting power | Maximum 37dBm | 5W |
| 10 | Receiving sensitivity | -126dBm@1.2kbps | Sensitivity has nothing to do with baud rate or timing |
| 11 | Air data rate | Continuous transmission: baud rate will be matched automatically. | |
| | | Fixed-length transmission : 8 option level( 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 50, 70kbps ) | |
| 12 | Standby current | 36mA | Mode 3(the supply voltage is 12V) |
| 13 | Transmitting current | 988mA@37dBm | ≥2A (recommended) (the supply voltage is 12V) |
| 14 | Receiving current | 41mA | average |
| 15 | Communication interface | RS232/RS485 | 8N1, 8E1, 8O1，<br>Eight kinds of baud rate, from 1200 to 115200 bps (default: 9600) |
| 16 | Driving mode | RS232/RS485 | Can be configured to push-pull/high pull, open-drain |
| 17 | Transmitting length | Continuous transmission: unlimited(≤57600) | |
| | | Fixed-length transmission:256 bytes buffer, 77 bytes per package | |
| 18 | Receiving length | Continuous transmission: unlimited | |
| | | Fixed-length transmission:256 bytes buffer | |
| 19 | Address | 65536 configurable address, 0xFF FF is for broadcasting | |
| 20 | Password | 65536 transmitting password(cipher text) | |
| 21 | Antenna type | SMA-K | External thread hole, 50 Ω characteristic impedance |
| 22 | Operating temperature | -40 ~ +85℃ | - |
| 23 | Operation Humidity | 10% ~ 90% | Relative humidity, no condensation |
| 24 | Storage temperature | -40 ~ +125℃ | - |

# 2. Functional description

## 2.1 Pin definition

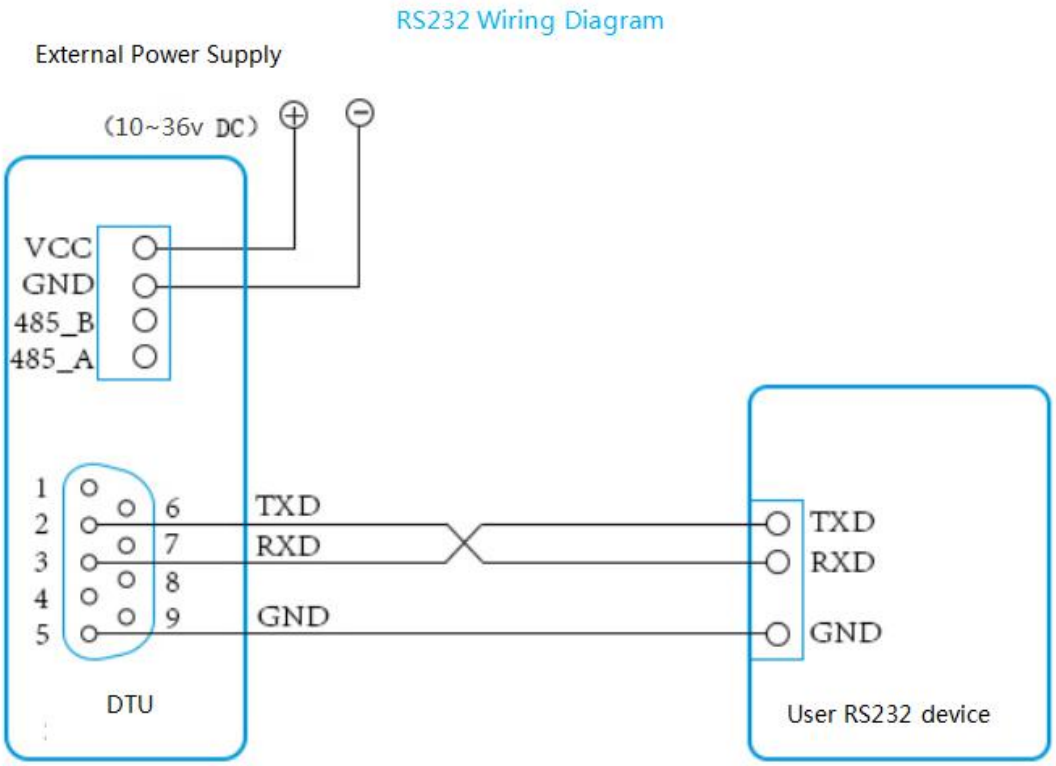



Unit : mm

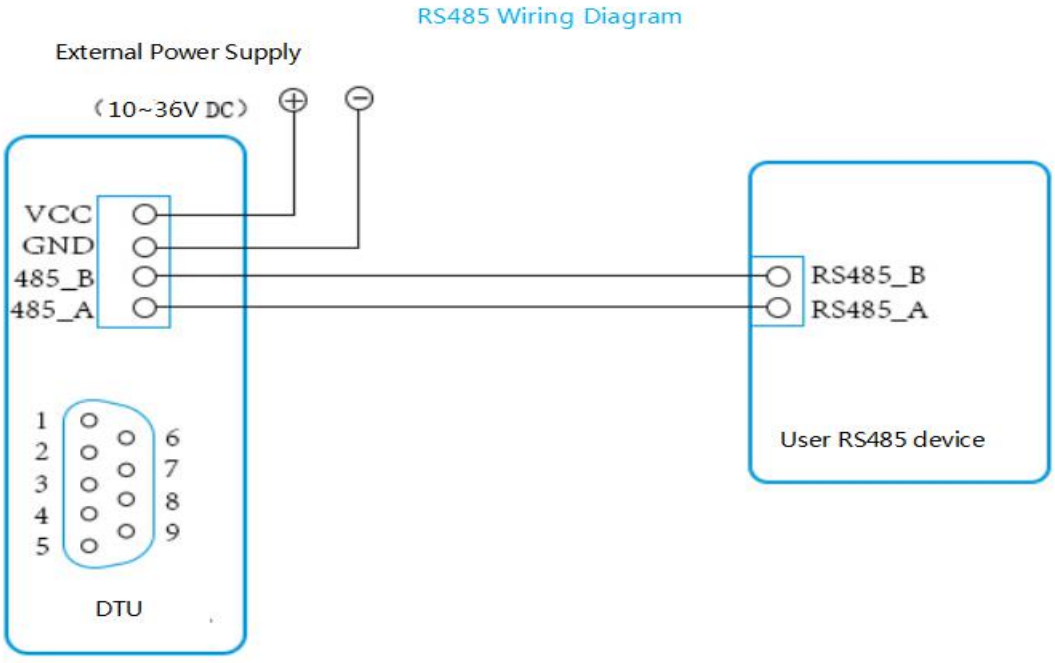
| No. | Pin item | Application |
|---|---|---|
| 1 | RS232 | Standard DB9, hole |
| 2 | 485_A | Connect to end A of other RS485 devices |
| 3 | 485_B | Connect to end B of other RS485 devices |
| 4 | GND | Ground |
| 5 | VCC | Power supply，default: 10~36V（5V version can be customized） |
| 6 | DC10~36V | DC power connector( 5.5*2.5 )for DC10~36V( 5V version can be customized ) |
| 7 | ANT | Antenna（SMA-K : External thread hole, 50Ω characteristic impedance） |
| 8 | PWR | Power indicator |
| 9 | TXD | Transmitting indicator |
| 10 | RXD | Receiving indicator |
| 11 | M0 | Dip switch (control operating mode) |
| 12 | M1 | Dip switch (control operating mode) |

## 2.2 Connection type

- **RS232 Connection**




- **RS485 Connection**



# 3. Operating mode




| | Mode | M1 | M0 | Description |
|---|---|---|---|---|
| M0 | Normal Mode | On | On | Open UART and RF , transparent transmission is on |
| M1 | Remained Mode | On | Off | UART and module are closed |
| M2 | Command Mode | Off | On | Parameter setting |
| M3 | Sleep Mode | Off | Off | UART and module are closed |

# 4. Instruction format

In sleep mode ( mode 3 : M1=Off, M0=Off ) , it supports below instructions on list. Only support 9600 and 8N1 format when setting.

| No. | Instruction format | Illustration |
|---|---|---|
| 1 | C0+working parameter | C0 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes (in total) must be sent in succession. (Save the parameters when power- down) |
| 2 | C1+C1+C1 | Three C1 are sent in hexadecimal format. The DTU returns the saved parameters and they must be sent in succession. |
| 3 | C2+working parameter | C2 + 5 bytes working parameters are sent in hexadecimal format. 6 bytes(in total) must be sent in succession. (Do not save the parameters when power- down). |
| 4 | C3+C3+C3 | Three C3 are sent in hexadecimal format. The DTU returns the version information and they must be sent in succession. |
| 5 | C4+C4+C4 | Three C4 are sent in hexadecimal format. The DTU will reset for one time and they must be sent in succession. |

## 4.1 Default parameter

| | Default parameter values：C0 00 00 18 50 50 | | | | | | |
|---|---|---|---|---|---|---|---|
| Model | Frequency | Address | Channel | Air data rate | Baud rate | Parity | Transmitting power |
| E61-DTU-5W | 433MHz | 0x0000 | 0x50 | Continuous transmission | 9600 | 8N1 | 37dBm |

## 4.2 Parameter setting instruction

The difference between C0 command and C2 command is that C0 command will write parameters into the internal flash memory and can be saved when power down, while C2 command cannot be saved when power down, because C2 command is temporarily mend instruction.C2 is recommended for the occasion that need to change the operating parameters frequently, such as C2 00 00 18 50 50.

Contents in below table are the introduction of input status of M1 & M0 and their corresponding mode:

| No. | Item | Description | Remark |
|---|---|---|---|
| 0 | HEAD | Fix 0xC0 or 0xC2, it means this frame data is control command | ● Must be 0xC0 or 0xC2<br>C0: Save the parameters when power- down<br>C2: Do not save the parameters when power-down |
| 1 | ADDH | High address byte of module<br>( the default 00H ) | 00H-FFH<br>● Address is defined by ADDH and ADDL to form a 16 bit.<br>● When ADDH=FFH, ADDL=FFH, the module has the broadcasting function:<br>1. As the transceiver, module can transmit data to all modules in different address.<br>2. As the receiver, module can monitor data packets in different address. |
| 2 | ADDL | Low address byte of module<br>( the default 00H ) | ● 00H-FFH |
| 3 | SPED | Rate parameter , including UART baud rate and air data rate<br>7 , 6 UART parity bit<br>00 : 8N1 ( default )<br>01 : 8O1<br>10 : 8E1<br>11 : 8N1 ( equal to 00 )<br>----------<br>5 , 4 , 3 TTL UART baud rate ( bps )<br>000 : 1200bps<br>001 : 2400bps<br>010 : 4800bps | ● UART mode can be different between communication parties<br>----------<br>● In Continuous Mode, the baud rate must be same for both communication parties. The higher the baud rate the shorter the transmission distance. |

| | | | |
|---|---|---|---|
| | | 011：9600bps（default）<br>100：19200bps<br>101：38400bps<br>110：57600bps<br>111：115200bps<br><br>----------<br>2，1，0 Air data rate（bps）<br>000：1.2Kbps<br>001：2.4Kbps<br>010：4.8Kbps<br>011：9.6Kbps<br>100：19.2Kbps<br>101：38.4Kbps<br>110：50Kbps<br>111：70Kbps | ● In Constant Length Mode, UART baud rate can be different between communication parties. The UART baud rate has nothing to do with wireless transmission parameters & won’t affect the wireless transmit / receive features.<br>----------<br>● In Continuous Mode, the setting is unavailable. The air data rate will match automatically according to UART baud rate.<br>● In Constant Length Mode, The air data rate must keep the same for both communication parties. the lower the air data rate, the longer the transmitting distance, better anti-interference performance and longer transmitting time. |
| 4 | CHAN | Communication frequency（425M + CHAN * 0.1M<br>(default 50H：433MHz） | ● 00H-FFH, for 425-450.5MHz. |
| 5 | OPTION | 7， FEC switch<br>1：turn on FEC<br>0：turn off FEC（default）<br><br>----------<br>6 IO drive mode(the default 1)<br>1：TXD and AUX push-pull outputs, RXD pull-up inputs<br>0：TXD, AUX open-collector outputs, RXD open-collector inputs<br><br>----------<br>5，4，3 Transmission mode:<br>(for receiver it is monitoring gap time, for transceiver it is gap time for continuously transmitting preamble code）<br>000: Constant Length<br>001: Reserved, like 0<br>010: Continuous Mode (default) | ● When FEC turns on, the data transmitting time will be extended while greatly improved the probability of successful sending and receiving data. User can enable this function if your application do not need low-latency transaction.<br>----------<br>● This bit is used to the module internal pull-up resistor. It also increases the level’s adaptability in case of open drain. But in some cases, it may need external 4-10KΩ pull-up resistor.<br><br>----------<br>● See more details in related chapters. |

| | | | |
|---|---|---|---|
| | | 011: Reserved, like 0<br>100: Reserved, like 0<br>101: Reserved, like 0<br>110: Reserved, like 0<br>111: Reserved, like 0<br><br>---<br>2 , Whether to enable cipher<br>1 : Enable<br>0 :Not enable( Default )<br><br>---<br>1, 0 transmission power (approximation)<br>00 : 37dBm ( Default )<br>01 : 37dBm<br>10 : 37dBm<br>11 : 37dBm | ---<br>● Defined by users and the encryption must be the same for both parties.<br>● The switch must keep the same for both parties.<br>---<br>● The external power must make sure the ability of current output more than 2A and ensure the power supply ripple within 100mV.<br>● Low power transmission is not recommended due to its low power supply efficiency. |

**For example: The meaning of No.3 "SPED" byte**

| The binary bit of the byte | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|---|---|
| The specific value (configured by user) | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Meaning | UART parity bit 8N1 | | UART baud rate is 9600 | | | Air date rate is 1.2k | | |
| Corresponding hexadecimal | 1 | | | | 8 | | | |

## 4.3 Reading operating parameters

| Instruction format | Description |
|---|---|
| C1+C1+C1 | In sleep mode ,<br>User gives the module instruction (HEX format): C1 C1 C1,<br>Module returns the present configuration parameters.<br>For example, C0 00 00 18 50 50. |

## 4.4 Reading version number

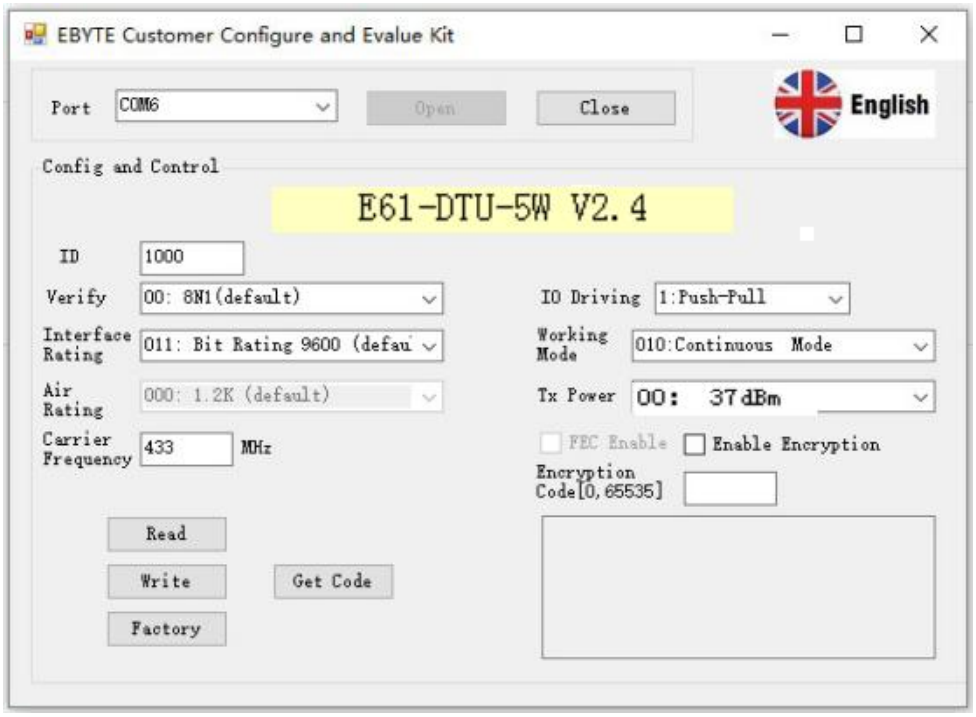
| Instruction format | Description |
|---|---|
| C3+C3+C3 | In sleep mode,<br>User gives the module instruction (HEX format): C3 C3 C3,<br>Module returns its present version number, for example C3 61 xx yy.<br>61 here means the module model (E61 series); xx is the version number and yy refers to the other module features. |

### 4.5 Reset instruction

| Instruction format | Description |
|---|---|
| C4+C4+C4 | In sleep mode,<br>User gives the module instruction (HEX format): C4 C4 C4, the module resets for one time.<br>During the reset process, the module will conduct self-check, AUX outputs low level. After reset completing, the AUX outputs high level, then the module starts to work regularly which the working mode can be switched or be given another instruction. |

## 5. Parameter setting

| | |
|---|---|
| Configure the DTU to commend mode.<br>Switch the dip switch to M2 (as shown in the picture) |  |



# 6. Customization

★Please contact us for customization.

★Ebyte has established profound cooperation with various well-known enterprises.

# 7. About us




Chengdu Ebyte Electronic Technology Co., Ltd. (Ebyte) is specialized in wireless solutions and products.

◆We research and develop various products with diversified firmware;

◆Our catalogue covers WiFi, Bluetooth, Zigbee, PKE, wireless data transceivers & etc.;

◆With about one hundred staffs, we have won tens of thousands customers and sold millions of products;

◆Our products are being applied in over 30 countries and regions globally;

◆We have obtained ISO9001 QMS and ISO14001 EMS certifications;

◆We have obtained various of patents and software copyrights, and have acquired FCC, CE, RoHs & etc.