

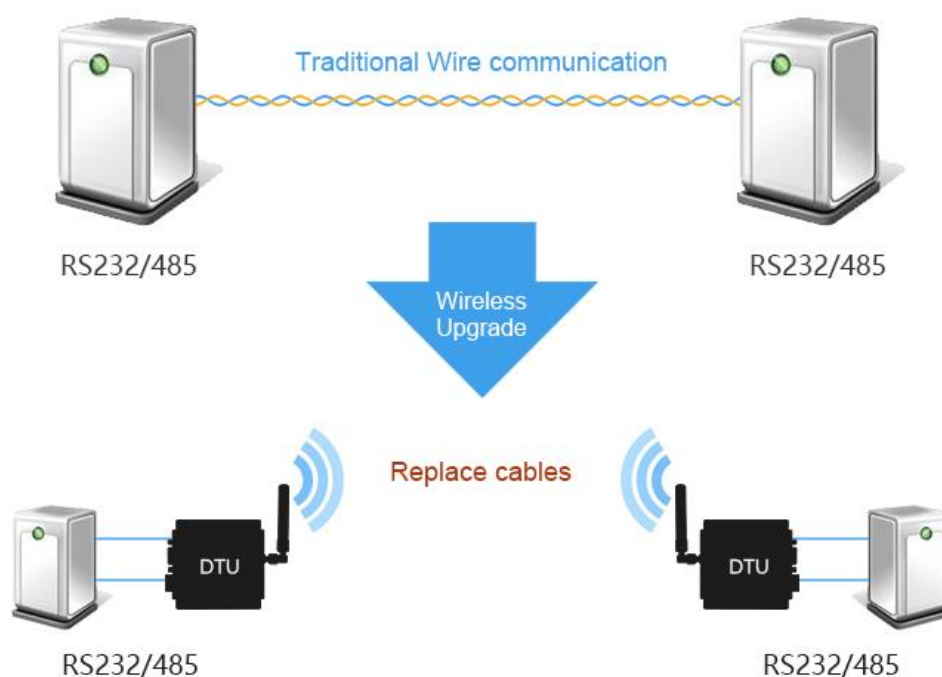


**成都亿佰特电子科技有限公司**  
Chengdu Ebyte Electronic Technology Co.,Ltd.

## E51-DTU-5W Datasheet v1.0

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## 1. Introduction



E51-DTU-5W is a 230MHz data transceiver unit (DTU) with RS232/RS485 interfaces and 10V ~ 36V voltage supply, it operates at 225~237.6MHz (default: 230MHz), Transparent transmission is available

It features FEC ( Forward Error Correction ) algorithm, which ensures its high coding efficiency & good correction performance. In the case of sudden interference, it can correct the interfered data packets proactively, so that the reliability & transmission range are improved correspondingly. But without FEC, those data packets can only be dropped.

The DTU has the function of data encryption & compression. The data transmitted over the air features randomness. And with the rigorous encryption & decryption, data interception becomes pointless. The function of data compression can decrease the transmission time & probability of being interfered, while improving the reliability & transmission efficiency.

## 2. Feature

No.	Feature	Description
1	Narrow band transmission	It features concentrated power density, long operating range, high anti-interference ability, under same power, the operating range is longer.
2	Ultra low power consumption	It supports WOR to reduce overall power consumption: In power-saving mode(M2), it can regulate overall power consumption by setting receiving response delay; The maximum receiving response delay can be configured as 2000ms.
3	Fixed transmission	Master can transmit data to other DTUs which work in different channels or addresses, easy for networking and repeater, etc. For example: DTU A transmits AA BB CC to DTU B (address: 0x00 01, channel: 0x80), HEX format is 00 01 80 AA BB CC (00 01 refers to the address of DTU B, 80 refers to the channel of DTU B), then DTU B receives AA BB CC (only DTU B).
4	Broadcast transmission	Set the DTU address as 0xFFFF, then the DTU can communicate with other DTUs in the same channel.
5	FEC	It features FEC (Forward Error Correction ) algorithm. It has high coding 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.
6	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 the previous parameter settings.

## 3. E51 Series

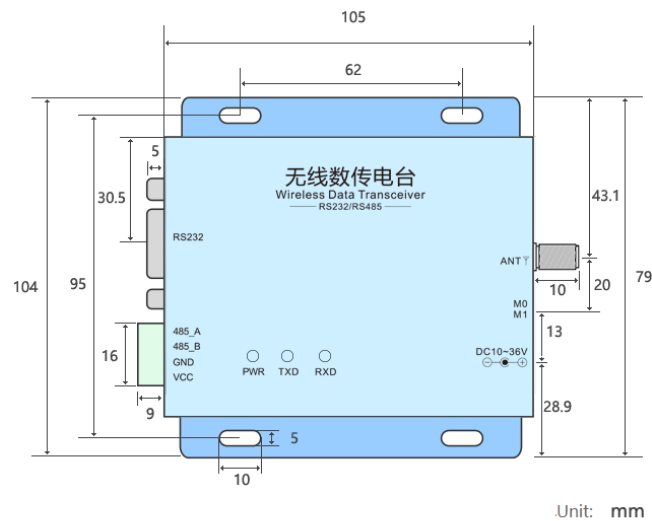
Model	Interface	Frequency (Hz)	Power (dBm)	Operation range (km)	Air data rate (bps)	Antenna
<a href="#">E51-TTL-50</a>	UART	230M	17	2.0	1.2k~70k	SMA
<a href="#">E51-TTL-500</a>	UART	230M	27	5.0	1.2k~70k	SMA
<a href="#">E51-TTL-2W</a>	UART	230M	33	8.0	1.2k~70k	SMA
<a href="#">E51-DTU-50</a>	232/485	230M	17	2.0	1.2k~70k	SMA
<a href="#">E51-DTU-500</a>	232/485	230M	27	5.0	1.2k~70k	SMA
E51-DTU-5W	232/485	230M	37	15.0	1.2~70K	SMA
E51-DTU-5W is compatible with other E51 series.						

## 4. Electrical Parameter

No.	Item	Parameter details	Description
1	Size	124 * 105 *25mm	-
2	Weight	240g	Average weight
3	Frequency band	Default: 230MHz	225~237.6MHz, Channel: 64, 200KHz stepping
4	PCB	SMT, lead-free	-
5	Connector	RS485:1*4*3.81mm RS232: DB9	Screwing 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	15km	Test condition: clear and open area & 37dBm, antenna gain: 5dBi , height: 2m , air data rate:1.2kbps
9	Transmitting power	Maximum 37dBm	5W
10	Receiving sensitivity	-118dBm@1.2kbps	Sensitivity has nothing to do with baud rate or timing
11	Air data rate	1.2kbps	Can be configured to 1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 50, 70kbps
12	Standby current	36mA	Mode 3 ( power supply: 12V )
13	Transmitting current	1.25A@37dBm	≥12V/2A (recommended)
14	Receiving current	44mA	Mode 0 (12V power source voltage)
15	Communication interface	RS232/RS485	8N1, 8E1, 8O1, eight kinds of UART 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	512 bytes buffer	43 bytes per package
18	Receiving length	512 bytes buffer	43 bytes per package
19	Address	65536 configurable addresses	Easy for networking, broadcast and fixed transmission
20	RSSI support	Built-in intelligent processing	-
21	Antenna type	SMA-K	External thread hole, 50Ω characteristic impedance
22	Operating temperature	-40 ~ +85℃	-
23	Operating humidity	10% ~ 90%	Relative humidity, no condensation
24	Storage temperature	-40 ~ +125℃	-

## 5. Functional Description (default)

### 5.1 Pin definition

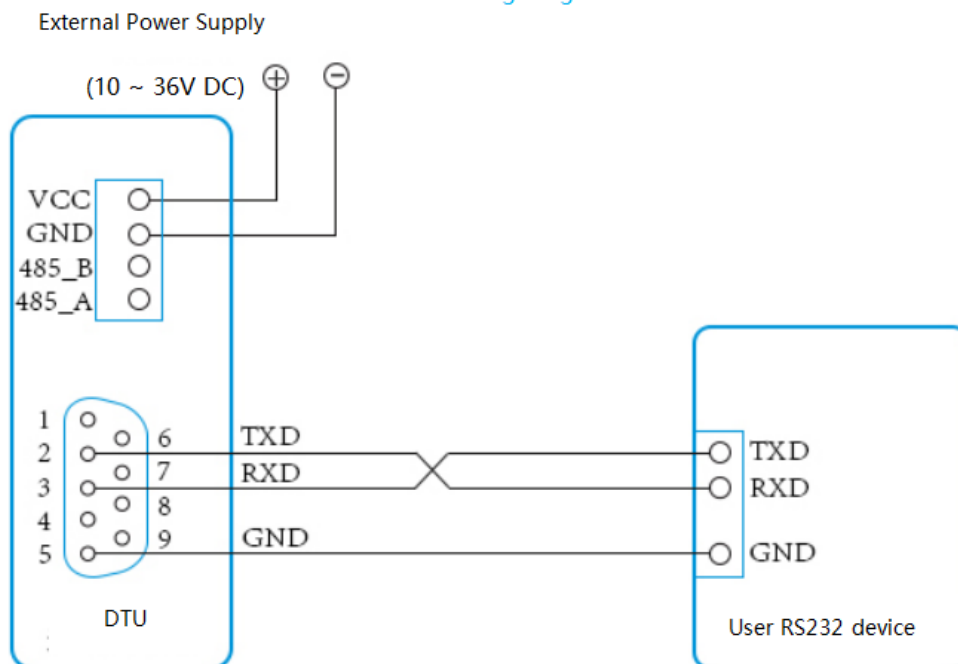


No.	Pin item	Application
1	RS232	Standard DB9, hole
2	485_A	Connect to end A of other RS485 devices
3	485_B	connect to end B of other RS485 devices
4	GND	Ground
5	VCC	Power supply , default: 10~36V
6	DC10~36V	DC power connector ( 5.5*2.5 ) for DC10~36V
7	ANT	Antenna ( SMA-K : External thread hole, 50Ω 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)

## 5.2 Connection

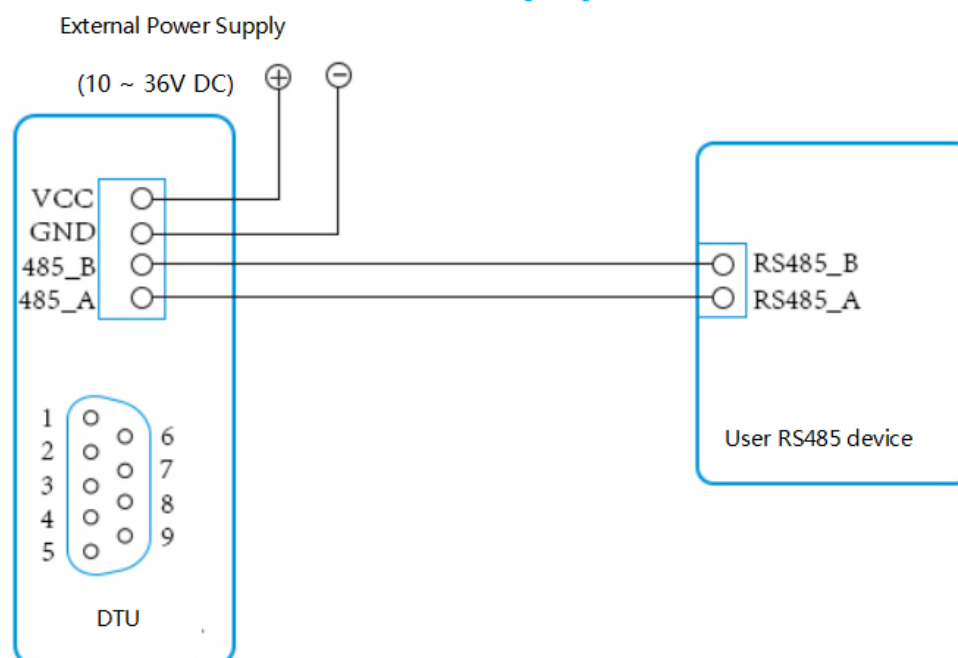
- RS232 Connection

RS232 Wiring Diagram



- RS485 Connection

RS485 Wiring Diagram



## 6. Operating Mode



	Mode	M1	M0	Description
M0	Normal Mode	On	On	Open UART, RF and transparent transmission are on
M1	Wake-up Mode	On	Off	The DTU can transmit data in this mode and data packet contains preamble code
M2	Power-saving Mode	Off	On	DTU in Mode 2 cannot transmit data. DTU in Mode 2 can only receive data transmitted from DTU in Mode 1 and the receiving power in Mode 2 is saved
M3	Sleep Mode	Off	Off	Sleep mode, it accepts parameter setting commands.

## 7. 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.	Format	Description
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.

## 7.1 Default parameter

Model	Factory default parameter: C0 00 00 18 19 44						
DTU	Frequency	Address	Channel	Air data rate	Baud rate	UART format	Transmitting power
E51-DTU-5W	230MHz	0x0000	0x19	1.2kbps	9600	8N1	37dBm

## 7.2 Parameter setting instruction

C0 and C2 are operating parameters. 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 19 44

No.	Item	Description	Notes
0	HEAD	Fix 0xC0 or 0xC2, it means this frame data is control instruction	<ul style="list-style-type: none"> <li>Must be 0xC0 or 0xC2</li> </ul> C0: Save the parameters when power-down C2: Do not save the parameters when power- down
1	ADDH	High address byte of module (the default 00H)	00H-FFH
2	ADDL	Low address byte of module (the default 00H)	00H-FFH
3	SPED	Rate parameter , including UART baud rate and air data rate 7 , 6     UART parity bit 00 : 8N1 (default) 01 : 8O1 10 : 8E1 11 : 8N1 (equal to 00) ----- 5 , 4 , 3   TTL UART baud rate (bps) 000 : 1200bps 001 : 2400bps 010 : 4800bps 011 : 9600bps (default) 100 : 19200bps 101 : 38400bps 110 : 57600bps 111 : 115200bps -----	<ul style="list-style-type: none"> <li>UART mode can be different between communication parties.</li> </ul> ----- <ul style="list-style-type: none"> <li>UART baud rate can be different between communication parties.</li> <li>The UART baud rate has nothing to do with wireless transmission parameters &amp; won' t affect the wireless transmit/receive features.</li> </ul> -----



		<p>2, 1, 0 Air data rate (bps)</p> <p>000 : 1.2k (default)</p> <p>001 : 2.4k</p> <p>010 : 4.8k</p> <p>011 : 9.6k</p> <p>100 : 19.2k</p> <p>101 : 38.4k</p> <p>110 : 50k</p> <p>111 : 70k</p>	<ul style="list-style-type: none"> <li>• The lower the air data rate, the longer the transmitting distance, the better anti-interference performance and longer transmitting time.</li> <li>• The air data rate must keep the same for both communication parties.</li> </ul>
4	CHAN	<p>Communication frequency ( 225M + CHAN * 0.2M )</p> <p>default 19H (230MHz )</p>	<ul style="list-style-type: none"> <li>• 00H-3FH 225 ~ 237.6MHz</li> </ul>
5	OPTION	<p>7, Fixed transmission ( similar to MODBUS )</p> <p>0 : Transparent transmission mode</p> <p>1 : Fixed transmission mode</p> <p>-----</p> <p>6 IO drive mode (the default 1)</p> <p>1 : TXD and AUX push-pull outputs, RXD pull-up inputs</p> <p>0 :TXD, AUX open-collector outputs, RXD open-collector inputs</p> <p>-----</p> <p>5, 4, 3 wireless wake-up time ( for the receiver, it means the monitor interval time ,while for the transmitter it means continuously sending preamble code time. )</p> <p>000 : 250ms ( default )</p> <p>001 : 500ms</p> <p>010 : 750ms</p> <p>011 : 1000ms</p> <p>100 : 1250ms</p> <p>101 : 1500ms</p> <p>110 : 1750ms</p> <p>111 : 2000ms</p>	<ul style="list-style-type: none"> <li>• In fixed transmission mode, the first three bytes of each user's data frame can be used as high/low address and channel. The module changes its address and channel when transmitting. And it will revert to original setting after the process is completed.</li> <li>• This bit is used to the internal pull-up resistor. It also increases the level' s adaptability in case of open drain. But in some cases, it may need external pull-up resistor</li> <li>• The transmit &amp; receive module work in mode 0, whose delay time is invalid &amp; can be arbitrary value.</li> <li>• The transmitter works in mode 1 can transmit the preamble code of the corresponding time continuously.</li> <li>• When the receiver works in mode 2, the time means the monitor interval time (wireless wake-up). Only the data from transmitter that works in mode 1 can be received.</li> <li>• The wake-up time set by transmitter cannot be less than the monitor interval time of</li> </ul>

		<div>-----</div> <div>2 ,            FEC switch 0 : Turn off FEC 1 : Turn on FEC (default)</div> <div>-----</div> <div>1, 0            transmission power (approximation) 00 : 37dBm (default) 01 : 37dBm (equal to 00) 10 : 37dBm (equal to 00) 11 : 37dBm (equal to 00)</div>	<div>receiver; otherwise, it may lead to data loss. In case of two-way communication, both parties should keep the wake-up time the same.</div> <div>● The longer the wake-up time, the lower the average receive current consumption</div> <div>-----</div> <div>● After turn off FEC, the actual data transmission rate increases while anti-interference ability decreases. Also the transmission distance is relatively short.</div> <div>● Both communication parties must keep on the same pages about turn-on or turn-off FEC</div> <div>-----</div> <div>● The external power must ensure that the ability of current output is more than 2A and the power supply ripple is within 100mV.</div> <div>● Low power transmission is not recommended due to its low power supply efficiency.</div>					
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 data rate is 1.2k		
Corresponding hexadecimal	1				8			

### 7.3 Reading operating parameters

Instruction format	Description
C1+C1+C1	In sleep mode , user gives the DTU instruction (HEX format): C1 C1 C1, DTU returns the present configuration parameters. For example, C0 00 00 18 19 44

### 7.4 Reading version number

Instruction format	Description
C3+C3+C3	In sleep mode, user gives the DTU instruction (HEX format): C3 C3 C3, DTU returns its present version number, for example C3 51 xx yy. 51 here means the DTU model (E51 series); xx is the version number and yy refers to other features.

## 7.5 Reset instruction

Instruction format	Description
C4+C4+C4	In sleep mode, user gives the DTU instruction (HEX format): C4 C4 C4, it resets for one time. During the reset process, the DTU will conduct self-check, AUX outputs low level. After reset is completed, the AUX outputs high level, then it starts to work regularly, then the working mode can be switched or be given another instruction.

## 8. Parameter Setting

Configure the DTU to sleep mode.  
Switch the dip switch to M3 (as shown in the picture)



RF Setting V3.0

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Chengdu Ebyte Electronic Technology Co.,Ltd.

中文

English

ID: E51  
Version: 4.6  
Freq Now: 230.0MHz  
Param Now: 0x0, 0x0, 0x18, 0x19, 0x44

COM4 ClosePort Models

GetParam SetParam Preset

UartRate 9600bps ▾

Parity 8N1 ▾

AirRate 1.2Kbps ▾

Power 37dBm ▾

FEC Enable ▾

Fixed mode Disable ▾

WOR timing 250ms ▾

IO mode PushPull ▾

Address 0

Channel 25

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## 9. Customization

★Please contact us for customization.

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



## 10. About us



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