

# **DLC Mesh Module**

- -- TDD OFDM full duplex wireless transceiver module for video and data Link
- -- RF Power:  $23 \pm 1$ dBm \*2 channel
- -- Working Frequency: 566~678MHz, 1420~1530MHz
- -- 3 Ethernet and 1 RS232/TTL uart data link, control uart(TTL)
- -- Transmit distance: 500~2000 meter(ground-to-ground), 5~20km(UAV-to-ground)





Sihid DLC module was designed for video and data wireless transmission with two way wireless data link. This OFDM radio module works at 600MHz and 1.4GHz bands, with frequency hopping technology (FHSS) to make sure better stability signal communication.

Features:

- TDD OFDM modulation
- Supports 2 bands (566~678MHz/1420~1530MHz)
- Supports FHSS inside each band



- 1.4/3/5/10/20/40MHz bandwidths
- Max 100Mbps throughput
- RF transmission power:  $23 \pm 1$  dBm \*2 channel
- Constellation: QPSK, 16QAM, 64QAM, self-adaption
- Sensitivity: -102dBm(1Mbps@20MHz)
- Supports IP data transmission(3 Ethernet port)
- Supports serial data transmission(1 channel, RS232 as default and can modify to TTL uart too)
- Up to 20km LOS (UAV-to-ground) and 2km LOS(ground-to-ground)
- Web UI and control uart for management
- AES128 encryption
- Uplink and downlink stream control
- Networking mode: mesh
- Power consumption: <7W
- Dimensions: 80\*57\*9.1mm
- Weight: 41g
- Working Temp.  $-20^{\circ}$ C ~  $-+65^{\circ}$ C
- Storage Temp.  $-40^{\circ}C \sim +80^{\circ}C$

Power in	2PIN PH2.0mmConnector, DC in:9~30V
Ethernet-1	4PIN PH1.25mm Connector
Ethernet-2	4PIN PH1.25mm Connector
Ethernet-3	4PIN PH1.25mm Connector
Data UART	3PIN PH1.25mm Connector, RS232(or TTL 3.3V as requirement)
Control UART	3PIN PH1.25mm Connector, TTL 3.3V
USB	Micro USB Connector, for software upgrading
Switch	Tx/Rx control signal for outside power amplifier
Main-Antenna	Tx/Rx Antenna port, IPEX
Second-Antenna	Tx/Rx Antenna port, IPEX
12V out	On-board 12V out(<200mA), for cool fan power supply

#### Ethernet1, Ethernet2 and Ethernet3

The three Ethernet ports is bridged connection on board, so the IP address of the three Ethernet ports are the same. The 4PIN signals of Ethernet1 are showed on the below photo.





### **Switch Port**

This port is Tx/Rx control signal for outside power amplifier. The maximum RF transmission power of DLC module is  $24\pm1$  dBm \* 2channel, Sihid also provides power amplifier to increase the RF Power to 2W/5W/10W. Below diagram shows how to add power amplifier outside of the DLC module.



Signal	<b>Electrical level</b>	I/O	Description	mark
PA-enable1	1.8V	0	High electrical level: data transmitting, change to	
			high electrical level at 3.19us before transmitting	High-Tx
PA-enable2	1.8V	0	and to low electrical level at 0.26us after	Low-Rx
			transmitting finished.	

## Data uart

The data uart is RS232 as default. It can be changed to TTL 3.3V uart before ship out. The baud rate of data uart can be set as 115200, 57600, 38400, 19200, 9600, 4800, 2400, 1200.

Data communication via data uart:



## **Control UART and USB port**

Only one of these two ports is valid at the same time. Control uart is valid by default shipment. Please contact with Sihid if you need to use USB uart. DLC module can be managed with Web UI or AT command via control uart.

## LEDs

LED1: Power LED, red, light on normal powered.

LED2: blue, LED3: green, LED2 and LED3 indicate the wireless working status as described in below table.

Logical	Blue LED2 light on all the time and green LED3 is not light
control node	
Logical	Green LED3 light on all the time when the access node is connected with the

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Access Node	Logical control node.	
The blue LED2 indicate the access node linking signal status with the contr		
	When the wireless linking signal is strong, blue LED2 blinks every 30 seconds;	
	When the wireless linking signal is middle, blue LED2 blinks every 6 seconds;	
	When the wireless linking signal is weak, blue LED2 blinks every 1 second.	

Sometimes customers may need to assemble the indicating LEDs on their housing case panel, so the DLC board also provide soldering hole for the three LEDs signal. The LEDs signal is described in below table.

LED	Description	Representation soldering hole
LED1	Power LED	LED1-GND and LEDs-VCC
LED2	Winalass indicating LED	LED2-GND and LEDs-VCC
LED3	wireless indicating LED	LED3-GND and LEDs-VCC

# Mesh transmitting



- Mesh network capacity: supports a maximum of 32 Nodes(N,  $2 \le N \le 32$ );
- Transport: unicast, multicast, and broadcast are supported. Any node can communicate with each other in these three modes;
- Time synchronization: self-synchronization can be performed independently without external clock;
- Power control: all nodes adaptively adjust the transmission power, supports fixed power configuration and takes effect permanently too;
- The topology: supports multi-hop routing topology with a maximum of 32 nodes and 31-hop routing;
- Rrouting: automatically adjust routing, fixed routes can be configured permanently too;
- Data rate level: adaptive average distribution system rate;
- Transmission delay(Note: N is the number of nodes within two hops, hop number: H)
  - Common scenario calculation formula, One-way delay indicator formula (MS): 6\*H + (5/2) \* N/2 \*H \* 3, Two-way delay multiplied by 2;
  - > Two-node optimization delay: unidirectional delay of one hop between two nodes <= 10ms;
  - Four node chain optimization delay: three-hop single-hop unidirectional delay of four nodes <= 10ms;</p>
  - > Typical system delay(from big data statistics):
    - Six point-chain networking, three hops, unidirectional delay: 50ms;
    - 8 points, all points one hop, one-way delay: 36ms;



- 8 points, serial 7 hops: unidirectional 170ms

- Boot time delay:
  - Network establishment delay of logical main control node after startup 20-80s. (Generally, the logical main control node is the node which turned on firstly);
  - Cold startup: The network access delay of the logic access node is less than 30 seconds, and the logical main control node signal is received;
  - Hot startup: The latency of connecting the secondary node to the network is less than 1s (common one-hop node networking scenario)