Product datasheet

Name	IOT Module
Model	DK9193

History modification records

Describe the scope of the change

Version	Date	Description
1.0.0	2024/10/22	Initial release
1.0.1	2024/12/5	Add APP Function
1.0.2	2024/12/5	Add Serial communication protocol
1.0.3	2025/2/6	Add STATEMENT

Contents

TEL : +886-2-86984245   FAX: +886-2-86984108   3
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

© 2024 DEXATEK TECHNOLOGY ALL RIGHTS RESERVED.

1. Product Description

DK9193 is a low-power embedded Wi-Fi + Bluetooth module. It is composed of a highly integrated wireless radio frequency chip RTL8720CM, with built-in Wi-Fi network protocol stack and rich library functions.

It includes low-power KM4 MCU, WLAN MAC, 1T1R WLAN, maximum main frequency of 100MHz, built-in 4MB SRAM, external 4MB flash and abundant peripheral resources. It integrates Wi-Fi MAC and TCP/IP protocol library. Users can develop embedded Wi-Fi products that meet their needs based on these.

Product Features

◆Built-in low power consumption KM4 MCU，Can also serve as an application processor

◆ Main frequency support 100MHz

◆Working voltage：3.0V~3.6V

◆Wi-Fi、Bluetooth connectivity

◆802.11 b/g/n

◆Channel 1-14@2.4GHz (CH1-11 for US/CA, CH1-13 for EU/CN)

◆support WEP,WPA/WPA2,WPA2 PSK (AES) Safe Mode

◆support Bluetooth 4.2 Low Energy

◆support SmartConfig & AP Two network configuration methods (including

Android and IOS devices)

◆Onboard PCB antenna

◆Working temperature：-20℃ ～85℃

1-1. Specifications

Name	DK9193
Product Description	Wi-Fi 2.4GHz/BT4.2
Interface Type	SMT Type
Environmental protection instructions	All hardware components fully comply with EU RoHS directive

1-3. Absolute electrical parameters

Parameters	describe	Minimum	Standard	maximum
Ts	Storage temperature	-40	105	℃
VBAT	Supply voltage	3.0	3.6	V

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

5

Electrostatic discharge voltage (human body model)	TAMB -25℃	-	2	KV
Electrostatic discharge voltage (device model)	TAMB -25℃	-	0.5	KV

1-4. Normal working conditions

Parameters	describe	Minimum	Standard	maximum	Unit
Ta	Working temperature	-20	-	85	℃
VBAT	Supply voltage	3.0	3.3	3.6	V
VOL	IO Low frequency output	-	-	0.4	V
VOH	IO High frequency output	2.4	-	-	V
VIL	IO Low frequency input	-	-	0.8	V
VIH	IO High frequency input	2.0	-	-	V
I	IODriving current	-	-	16	mA
IIL	Input Leakage current	-10	±1	10	uA

1-5. RF Power Consumption

TX Power consumption during continuous transmission：

Working status	model	rate	average value	Peak	Unit	Working status
TX	11b	11Mbps	+17dBm	304	500	mA

16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

TX	11g	54Mbps	+14dBm	218	500	mA
TX	11n	MCS7	+13dBm	202	500	mA

RX Power consumption during continuous reception：

Working status	model	rate	average value	Peak	Unit
RX	11b	11Mbps	61	68	mA
RX	11g	54Mbps	61	68	mA
RX	11n	11N HT20 MCS7	61	68	mA

2. RF technical indicators

2-1 Basic RF Characteristics

Product Features	Product Description
Wireless Standards	IEEE 802.11 b/g/n
Communication frequency range	2.400~2.484GHz (2.4GHz ISM Band)
Modulation method	DSSS,DBPSK, DQPSK, CCK and OFDM (BPSK/QPSK/16-QAM/ 64-QAM)
Transfer rate	802.11b: 1,2,5.5,11 Mbps 802.11g: 6,9,12,18,24,36,48,54Mbps 802.11n：HT20 MCSO-7

Antenna Type	PCB antenna 0.8dBi

Launch performance：

Parameters	Minimum	Typical Value	Maximum	EVM
802.11b@11Mbps	15dBm	17dBm	19dBm	≤-13dB
802.11g@54Mbps	12dBm	14dBm	16dBm	≤-25dB
802.11n@N20_MCS7	11dBm	13dBm	15dBm	≤-28dB
Offset frequency error	-12ppm	-	12ppm	

Receiving performance：

RX	Typical Value	Unit
PER<8% 802.11b@11Mbps	≤-85	dBm
PER<10% 802.11g@54Mbps	≤-68	dBm
PER<10% 802.11n@N20_MCS7	≤-66	dBm

2.2 Bluetooth Technical Specifications

Product Features	Product Description
General Specifications	
Bluetooth Specifications	BT4.2
Working frequency	2.402~2.480GHz

| RF technical parameters				
Type	Minimum	Typical Value	Maximum	Unit
Transmitting power	-20	4.5	20	dBm
Connection rate	-	1	-	Mbps
frequency error	-75	-	75	Khz
Sensitivity @ PER <0.1% 1M	≤-88dBm			

3 Antenna Design Notes

When using a PCB-mounted antenna on a Wi-Fi module, to ensure optimal Wi-Fi performance, it is recommended that the distance between the module antenna and other metal parts be at least 15mm. Do not run wires or even copper-cover the PCB in the antenna area to avoid affecting the antenna
performance.

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)
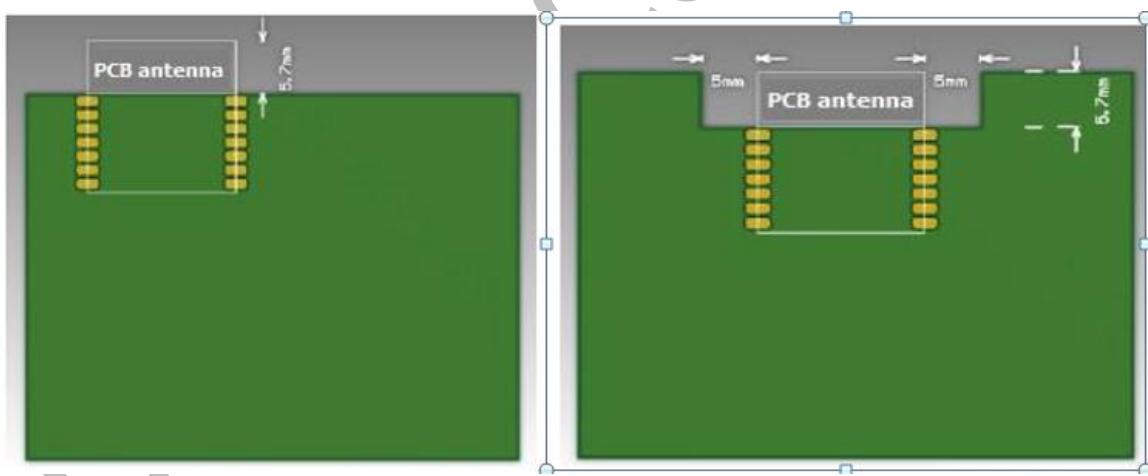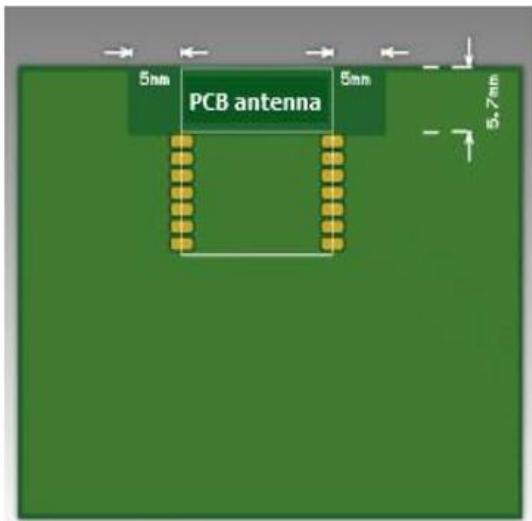
Do not place any metal in the red area above the antenna.
The recommended diameter of the circular arc is greater than 3 cm.

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)
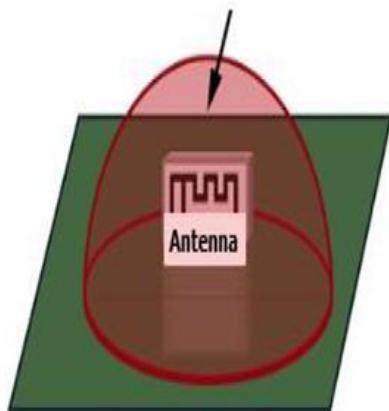
4 Pin Description

4.1 Pin Definition diagram and definition
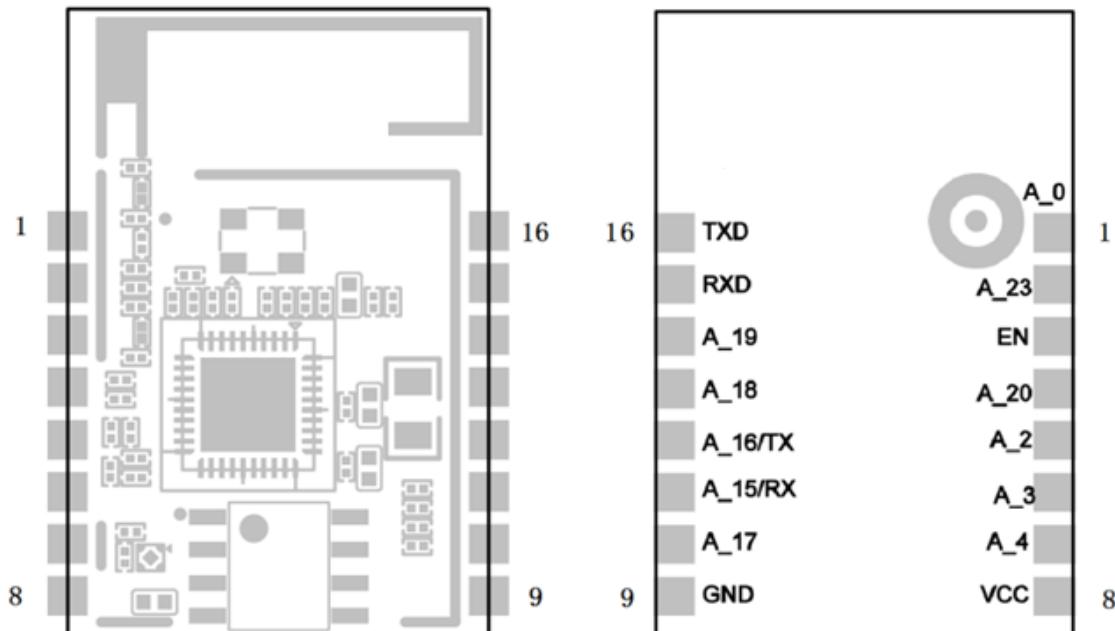
S/N	Pindefinition	IO Type	Function
1	A_0	I/O	GPIOA_0
2	A_23	I/O	GPIOA_23,IC Pin3
3	EN	I/O	Module enable pin, high voltage is valid, the module has pulled up the voltage, the user can control this pin externally
4	A_20	I/O	GPIOA_20，Common IO pins，IC Pin1
5	A_2	I/O	GPIOA_2，Hardware PWM，IC Pin18
6	A_3	I/O	GPIOA_3，Hardware PWM，IC Pin19

7	A_4	I/O	GPIOA_4，Hardware PWM，IC Pin20
8	VCC	P	Module power pin（3.3V）
9	GND	P	Power reference ground
10	A_17	I/O	GPIOA_17，Hardware PWM，IC Pin38
11	A_15/RX	I/O	GPIOA_15，Ordinary IO pins，IC Pin 36
12	A_16/TX	I/O	GPIOA_16，UART_Log_TXD(Used to print module internal information)，Can be configured as normal GPIO
13	A_18	I/O	GPIOA_18，Hardware PWM，IC Pin39
14	A_19	I/O	GPIOA_19，Hardware PWM，IC Pin40
15	RXD	I/O	GPIOA_13，UART0_RXD（User Serial Port）
16	TXD	I/O	GPIOA_14，UART0_TXD（User Serial Port）

Note: P stands for power pin, and I/O stands for input/output pin.

5 Packaging information and production guidance

5.1 Mechanical dimensions

PCB Size：16±0.3mm (L)×24±0.3mm (W) ×0.8±0.1mm (H)。Unit：mm

22101, Taiwan (R.O.C.)
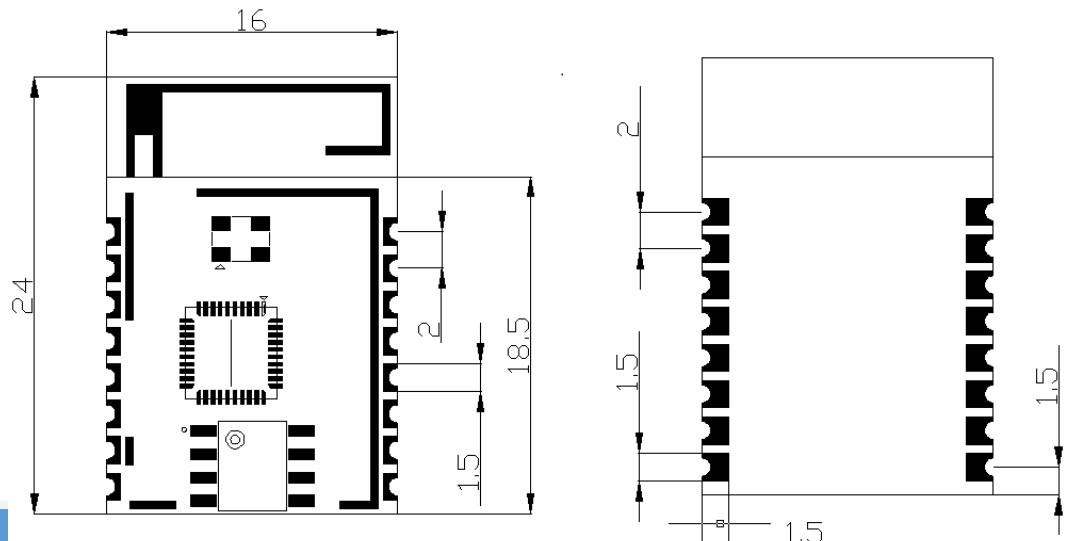
WB03A–1720CM–1624F4CP1TV3D1 Module side view   WB03A–1720CM–1624F4P1TV3D1 Module side view

0.80

2.00

Side View

0.80

0.80

Side View

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)
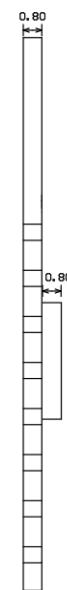
5.2 Production Guide

1. The assembly method of the outgoing P&P modules is selected according to the customer's baseboard design. If the baseboard is designed for P&P, the SMT process is used for production. If the baseboard is designed for plug-in packaging, the wave soldering process is used for production. It is recommended to complete the soldering within 24 hours after the module product is unpacked. Otherwise, it needs to be placed in a dry cabinet with a humidity not exceeding 10%RH, or re-vacuum packaged and the exposure time recorded. The total exposure time shall not exceed 168 hours.

- (SMT process) Instruments or equipment required for SMT patch:

    – Chip Mounting Machine

    – SPI

    – Reflow

    – Furnace temperature tester

    – AOI

- (Wave soldering process) Instruments or equipment required for wave soldering:

    – Wave soldering equipment

- Wave soldering fixture

- Constant temperature soldering iron

- Solder bars, solder wire, flux

- Furnace temperature tester

• Baking equipment or devices：

- Cabinet oven

- Anti-static and high temperature resistant tray

- Anti-static and high temperature resistant gloves

2. The storage conditions of the factory-produced modules are as follows:：

• Moisture-proof bags must be stored in an environment with a temperature of ＜ 40℃ and a humidity of ＜

90%RH.

• For dry packaged products, the shelf life is 12 months from the date the package is sealed.

• A humidity indicator card is included in the sealed package:

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

15
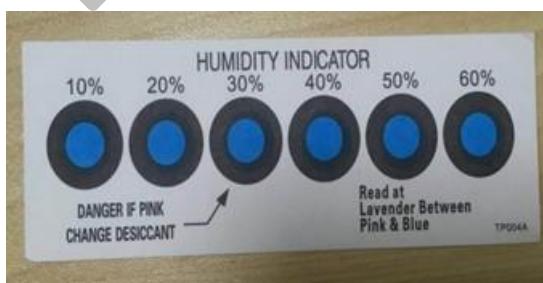
3. If the module is likely to be damp, it needs to be baked:

- The vacuum packaging bag was found to be damaged before opening

- After unpacking, I found that there was no humidity indicator card in the packaging bag.

- After unpacking, if the humidity indicator card reads above 10%, the color ring will turn pink.

- Total exposure time after unsealing exceeds 168 hours

- More than 12 months from the date of first sealing of the package

4. If the exposure time exceeds 168 hours and is not used up, it is not recommended

to use reflow soldering or wave soldering process to solder this batch of modules.

Because the module is a Class 3 moisture-sensitive device, the product may be

affected by moisture if the exposure time exceeds the allowable time.

High-temperature soldering may cause device failure or poor soldering.

5. Please perform electrostatic discharge (ESD) protection on the module during the

entire production process.

6. In order to ensure the product qualification rate, it is recommended to use SPI and

AOI testing equipment to monitor the solder paste printing and placement quality.

5-3. Furnace temperature curve

Please select the corresponding soldering method according to the process. For SMT, refer to the recommended reflow soldering furnace temperature curve. For wave soldering process, refer to the recommended wave soldering furnace temperature curve. There is a certain gap between the set furnace temperature and the measured furnace temperature. The temperatures shown in this article are all measured temperatures.

Method 1: SMT process (SMT reflow soldering recommended furnace temperature curve)
Please refer to the reflow soldering furnace temperature curve requirements to set the furnace temperature. The reflow soldering temperature curve is shown in the figure below:

- A: Temperature axis

- B: Time axis

- C: Alloy liquidus temperature range is 217-220℃

- D: Heating slope is 1-3℃/S

- E: Constant temperature time is 60-120S; constant temperature range is 150-200

℃

- F: Time above liquidus is 50-70S

- G: Peak temperature is 235-245℃

- H: Cooling slope is 1-4℃/S

Note: The above recommended curve is based on SAC305 alloy solder paste; for other alloy solder pastes, please set the furnace temperature curve according to the solder paste specification.

Method 2: Wave soldering process (wave soldering furnace temperature curve)
Please refer to the wave soldering furnace temperature recommendations to set the furnace temperature. The peak temperature is 260℃±5℃. The wave soldering temperature curve is shown in the figure

DIP Type Product Pass Wavesolder Graph
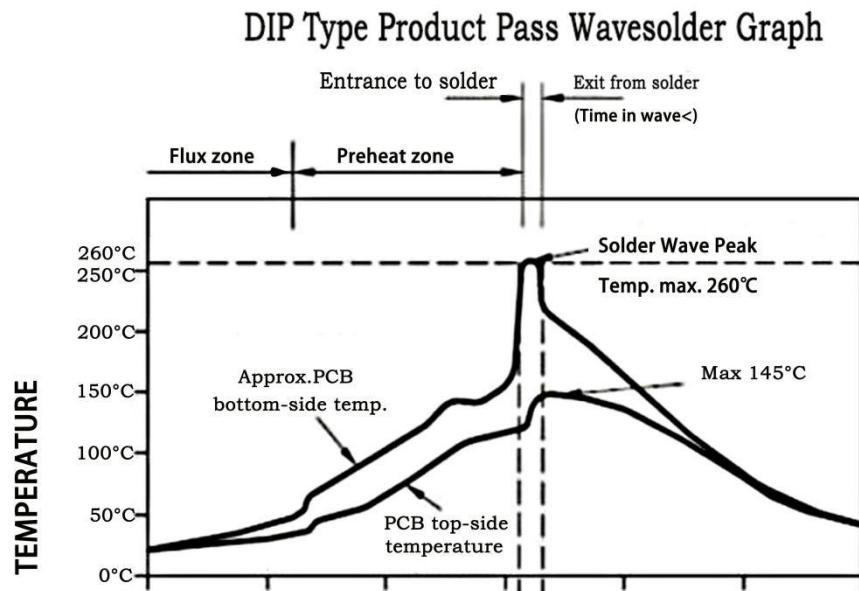
below:

Wave soldering furnace temperature curve recommendations/manual heating recommendations			
Preheating temperature	80-130℃	Welding temperature	360℃±20
Warm-up time	75-100S	Welding time	<3S/ point
Peak contact time	3-5S	NA	NA
Tin steel temperature	260±5℃	NA	NA
Heating slope	≤2℃/S	NA	NA
Cooling slope	≤6℃/S	NS	NA

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

18

5-4 Storage conditions
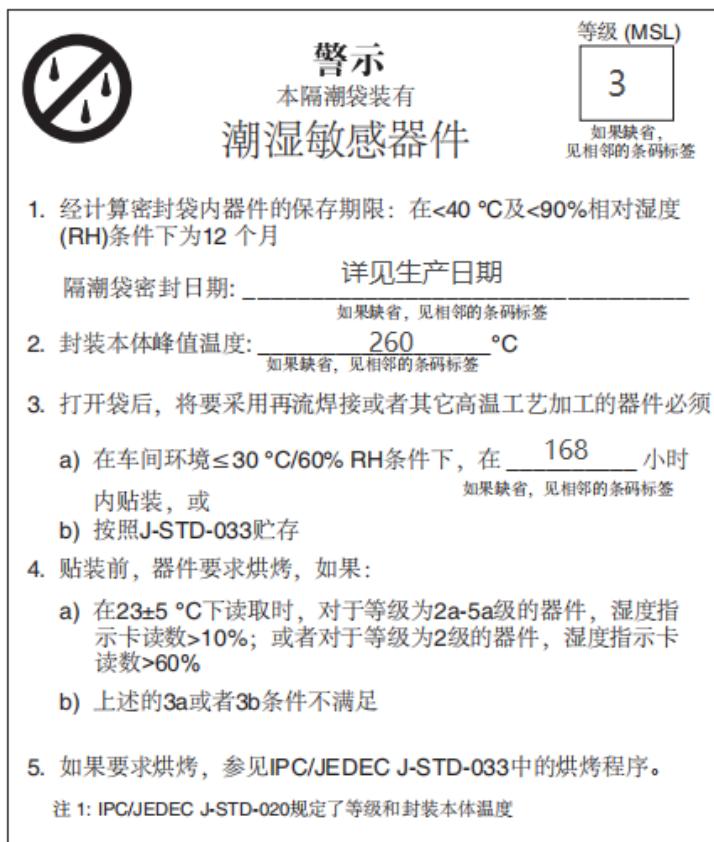
6 Product key device information

No.	Parts	Specification	Manufacturer	Note
1	主控芯片	RTL8720CM	瑞昱半導體股份有限公司	
2	PCB	PKM8720CM	深圳市翔宇電路有限公司 深圳市科翔精密電路科技股份有限公司	
3	晶振	3225/40MHz/± 10ppm/12pF(-20~85°C)	合肥晶威特電子有限責任公司 安徽晶賽科技股份有限公司 浙江藍晶芯微電子有限公司	
4	FLASH	ZB25VQ32BTIG	恆爍半導體(合肥)股份有限公司	
		GD25Q32CTJGR	北京兆易創新科技股份有限公司	
		GD25Q32CT2GR	北京兆易創新科技股份有限公司	

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

7 Product packaging information

7.1 Chain bag description

A roll of 600pcs
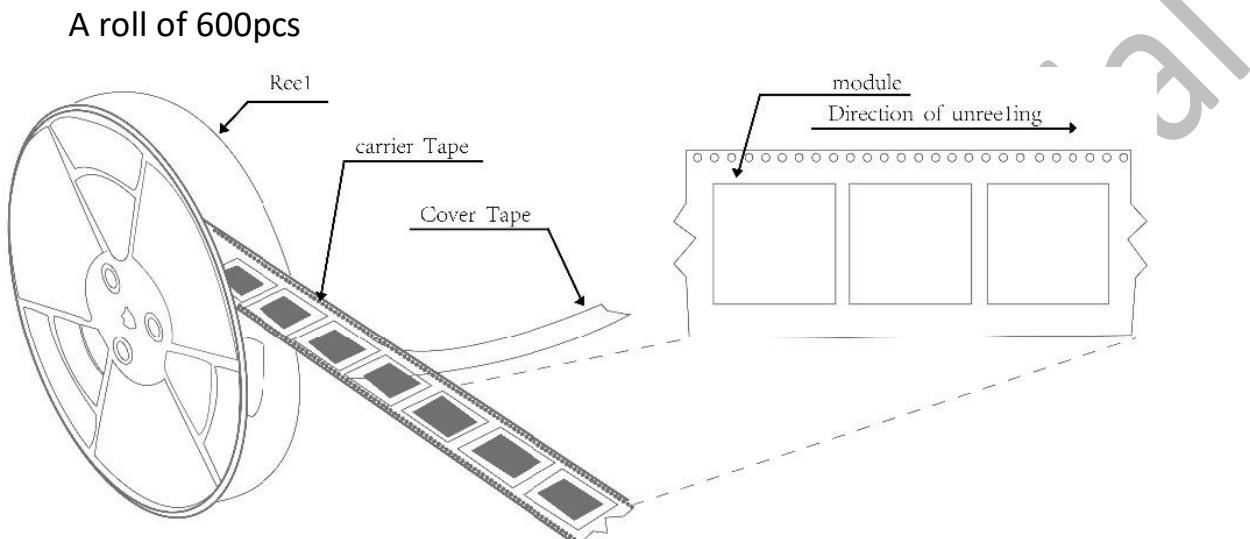
7.2 Chain Specifications

ITEM	W	A0	B0	D	E	F	F1	K0	P0	P2	P	T
DIM	44.00	16.5	24.6	1.5	1.75	20.2	40.4	3.90	4.0	2.0	24.0	0.30
TOLE	±0.3	±0.15	±0.15	±0.1	±0.1	±0.15	±0.1	±0.1	±0.1	±0.15	±0.1	±0.05
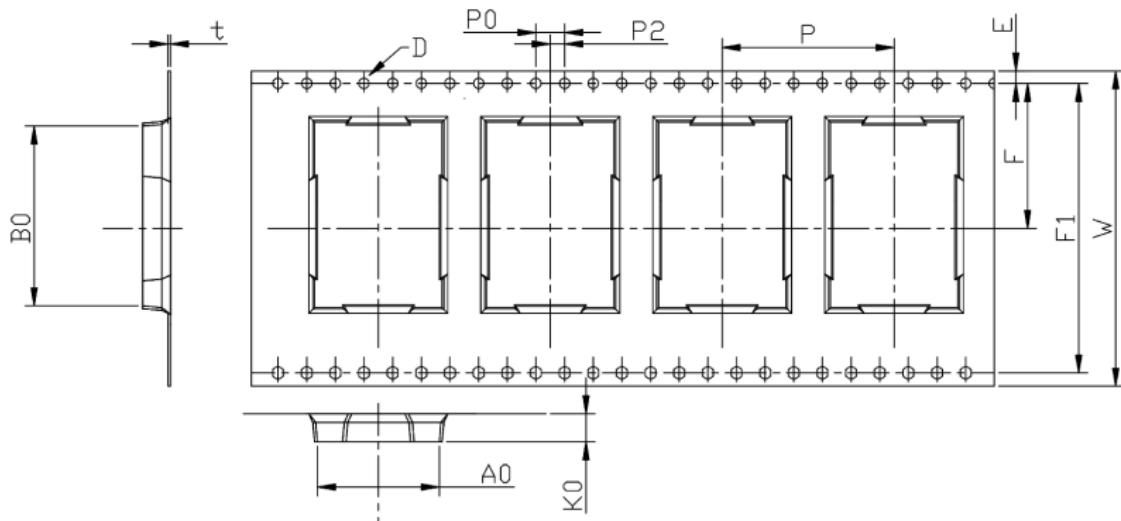
7.3 Packaging details
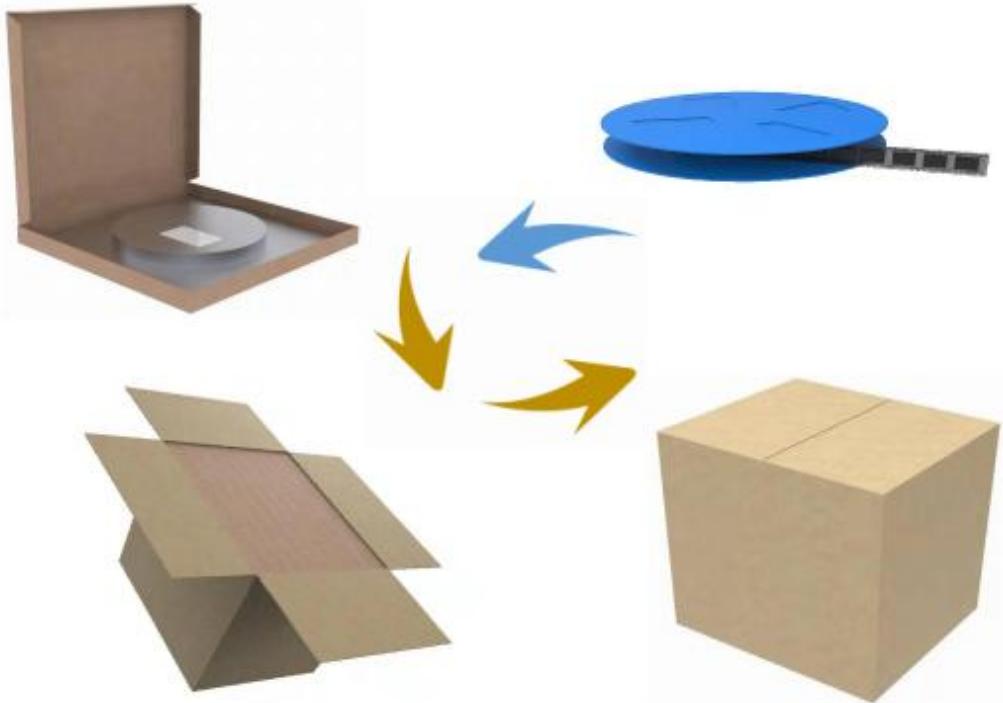
8. APP Function

1.	Fan on / off
2.	Fan + - speed
3.	Forward and reverse switching
4.	Light on / off
5.	Light Dimming
6.	Light CCT
7.	Natural Wind
8.	Timing 1H、4H、6H
9.	RGB lights - There are two types of lights: general lights and RGB mixed color lights (three colors are set to 0~255 for color mixing). Different control points will produce different delays at different positions. Some APPs will add an RGB automatic cycle and RGB breathing function.

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

21

10.	Anti-theft light - light mode that simulates someone being at home
11.	One-click (set and memorize to execute with one click)
12.	Automation (weekly schedule setting: select the time for the fan to run, select the speed and light brightness and color temperature options)

9. Serial communication protocol

Product Name: IOT Module
ProductID: DK9193
Product Function:

dpID	Function	Data transfer type	Data Type	Functional properties	Remark
20	Light on/off	Can be issued and reported	Bool		
21	Light Mode	Can be issued and reported	Enum	List Scope: Yellow, Mix, White	
22	Brightness value	Can be issued and reported	Value	List Scope:2-100 / Spacing: 2 units	
23	Warm and cold	Can be issued and	Value	List Scope:2-100	

	values	reported		/ Spacing: 2 units	
25	Scene	Can be issued and reported	String	Maximum length:255	
51	Fan switch	Can be issued and reported	Bool		
52	Fan Mode	Can be issued and reported	Enum	List Scope: Nature, Sleep	
53	Fan Speed	Can be issued and reported	Value	List Scope: 1-6 間距:1 單位	
54	Fan direction	Can be issued and reported	Enum	List Scope: For ward, Reverse	
55	Fan Countdown Timer	Can be issued and reported	Value	List Scope:0-8 Spacing 2 Units	
57	Buzzer	Can be issued and reported	Bool		

Communication protocol:

Serial communication protocol

Baud rate: 9600

Data bit: 8

Parity check: None

Stop bit: 1

Data flow control: None

MCU: Control board control chip, connected to the graffiti module through the serial port

Frame format description:

Field	Length (byte)	instruction
Frame	2	Fixed to 0*55aa
Version	1	Upgrade and expansion
Order	1	Specific frame type

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

Data length	2	Big Endian
Data	Xxxx	
Checksum	1	The sum of the bytes starting from the frame header is modulo 256.

Communication Protocol-Basic Protocol

1. Heartbeat Detection

1.1 After the module is powered on, the module continuously sends heartbeats. If no reply is received, the heartbeat is kept sent. If a reply is received, the heartbeat interval becomes 15s;

1.2 The MCU can also periodically detect whether the module is operating normally based on the heartbeat.

2. Query product information

2.1 Product ID: corresponds to the PID (product identification) of the Graffiti Developer Platform, generated by the Graffiti Developer Platform, and used to record product-related information in the cloud;

2.2 MCU software version number format definition: use dotted decimal form, "x.x.x" (0≤x≤9), x is a decimal number.

2.3 Network configuration mode

There are three network configuration modes: default network configuration; low power network configuration; special network configuration. Usually use 00 default network configuration

2.3.1. Normal network configuration mode: the first time you power on the network, the module will enter the SmartConfig network configuration mode by default. If no other instructions are issued, the network configuration state will be maintained and the mobile phone will be connected to the network.

2.3.2. Low power network configuration: In order to meet the needs of different customers, the low power mode is divided into two sections.

a). 10s timeout: After entering the network configuration mode, if the user does not connect to the network for 10s, then (10s ~ 3min) the device is restarted, and the module will enter the low power mode.

b). 3min timeout: The module directly enters the low power mode.

In low-power network configuration mode, if there is no network configuration action for a period of time after the network configuration starts, the network configuration will be stopped to prevent the network configuration status light from flashing all the time.

2.3.3. Special network configuration: Special network configuration is based on low power consumption and adds the judgment of whether the network configuration has been successful before this time (connected to the cloud).

a). 10s timeout: If the network configuration is not successful before this time, the module will enter the low-power mode after the device restarts (10s ~ 3min), otherwise, the module will use

the routing information of the last network configuration to connect to the router after the device restarts (10s ~ 3min).

b). 3min timeout: If the network configuration is not successful before this time, the module will directly enter the low-power mode, otherwise, it will directly use the routing information of the last network configuration to connect to the router.

Example: {"p":"RN2FVAgXG6WfAktU","v":"1.0.0","m":0}

p means the product ID is RN2FVAgXG5WfAktU, v means the MCU version is 1.0.0, m means the network configuration mode

is 0 (0: default network configuration 1: low power consumption 2: special network configuration)

55	aa	03	01	00	2a	7b	22	70	22	3a	22	52	4e	32	46
帧头						{	"	P	"	:	"	R	N	2	F
56	41	67	58	47	36	57	66	41	6b	74	55	22	2c	22	76
V	A	g	X	G	6	W	f	A	k	t	U	"	,	"	v

22	3a	22	31	2e	30	2e	30	22	2c	22	6d	22	3a	30	7d
"	:	"	1	.	0	.	0	"	,	"	m	"	:	0	}

0c
校验位

3. Query the MCU to set the working mode of the module

There are two working modes of the module:

3.1 MCU and module cooperation

The module notifies the MCU of the current working status of WiFi through the serial port, and the MCU provides display support; the MCU detects the need to reset WiFi and notifies the module to reset WiFi through the serial port;

3.2 Module self-processing

The working status of WiFi is driven by the LED status display through the WiFi GPIO pin; WiFi reset is processed through the GPIO input demand;

If the product adopts the module self-processing method, the following 4-6 protocols do not need to be concerned. The module self-processing WiFi reset method

is: WiFi detects that the GPIO input is low for more than 5s to trigger WiFi reset.

4. Device Network Status

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

25

4.1 Device Network Status: 1 SmartConfig Setting Status 2 AP Setting Status 3 WIFI Setting Successfully but Not Connected

Router 4 WIFI Setting Successfully and Connected to Router 5 Device Connected to Router and Connected to Cloud 6 WIFI is in

Low Power Mode. The LED displays corresponding to the "module self-processing" working mode are: 1 flashing at intervals of 250ms; 2 flashing at intervals of 1500ms; 3 or 6 long dark state; 4 or 5 long bright state

4.2 When the module detects that the MCU is restarting or the MCU is disconnected and then online, it will actively send the WIFI status to the MCU

4.3 When the module's WIFI status changes, it will actively send the WIFI status to the MCU

4.4 If the module working mode is set to "module self-processing", the MCU does not need to implement this protocol

Device network status	Description	Status value
condition 1	smartconfig Configuration Status	0*00
condition 2	AP Configuration Status	0*01
condition 3	WIFI Configured but not connected to router	0*02
condition 4	WIFI Configured and connected to router	0*03
condition 5	Connected to a router and connected to the cloud	0*04
condition 6	WIFI Device is in low power mode	0*05

5. Reset WiFi

When the module is in the network configuration state, you can reset the WiFi to put the device in the network configuration state. After resetting WiFi, it will enter the Smartconfig configuration
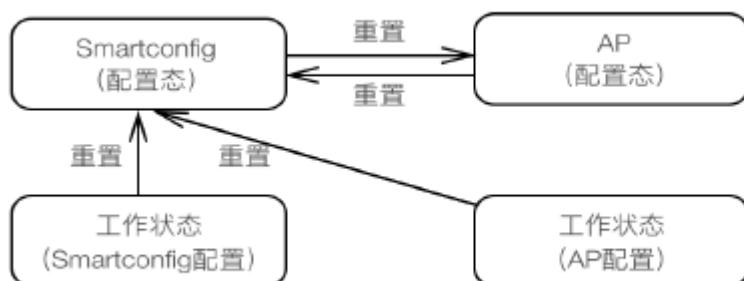
state by default.

6. Reset WiFi-Select Mode

Smartconfig setting status and AP setting status can be switched with each other (as shown above). Enter the configuration status directly through the corresponding protocol command.

7. Command issuance and status reporting

For the command issuance and status reporting protocol for this product function, please refer to the "Communication Protocol (Product Function Part) Command Receive and Send Table" below.

8. MCU working status reporting conditions

8.1 08 command word query: After the MCU receives the MCU working status query command, it needs to report the status of all functions (switches, modes, etc.);

8.2 Active reporting: When the MCU status changes (non-app control, such as control panel buttons), the MCU needs to actively report;

8.3 Timed reporting: If there is a timer function, the MCU needs to report the countdown remaining time every minute, in minutes.

9. MCU upgrade support (optional)

1) MCU can selectively support it according to its own situation, which can be set by the developer account extension function-firmware upgrade;

2) When the upgrade is triggered by the app, the module only serves as a data transmission channel to support MCU upgrade;

3) The upgrade supports hardware forced upgrade (not recommended), app reminder upgrade, app forced upgrade and app detection upgrade.

You can select a specific mode when uploading the upgrade firmware through the Graffiti Cloud Development Platform.

4) The upgrade only supports upgrading from low to high versions

9.1 Upgrade startup

The upgrade startup methods include automatic and manual upgrades. When the upgrade is in automatic mode, if the module detects that the cloud MCU has a newer version of firmware, it will automatically start the interaction process with the MCU upgrade package; when the upgrade is in manual mode, the module will start the interaction process with the MCU upgrade package only after confirmation through the APP.

9.2 Upgrade Packet Transmission

1) Upgrade Packet Transmission Data Format: Packet Offset (unsigned short) + Packet Data

2) If the MCU receives a frame with a data length of 4 and a packet offset >= firmware size, the packet transmission ends

Example:

If the file size to be upgraded is 530 Bytes, (the last packet of data may not be responded to)

(1) The first packet of data, the packet offset is 0x00000000, the packet length is 256

0x55aa 00 0b 0104 00000000 xx…xx XX

(2) The second packet of data, the packet offset is 0x00000100, the packet length is 256

0x55aa 00 0b 0104 00000100 xx…xx XX

(3) The third packet of data, the packet offset is 0x00000200, the packet length is 18

0x55aa 00 0b 0016 00000200 xx…xx XX

(4) The last packet, the packet offset is 0x00000212, the packet length is 0

0x55aa 00 0b 0004 00000212 xx…xx XX

10. Get local time (optional)

Product care that supports MCU time calibration function.

11. WiFi function production test

Scan the specified SSID of tuya_mdev_test and return the scan result and signal strength percentage. Mainly used for WiFi testing during product mass production. Production test command, please wait for power-on initialization to complete and call again after 5S.

Communication protocol (basic protocol) command transmission and reception table

		Header Version	Order	Data length	Data	Calibration
Heartbeat detection	Module Send	0x55aa 0x00	0x00	0x0000		0xff
	MCU report	0x55aa 0x03	0x00	0x0001	0x00(1st time) 0x01(other)	Checksum
Query product information	Module Send	0x55aa 0x00	0x01	0x0000		0x00
	MCU report	0x55aa 0x03	0x01	0x002a	Mode: 0: Default network configuration 1: Low power consumption 2: Special network configuration Format:{"p":"emb84 ptmnztvnfkh ","v":"1.0.0","m":0}	Checksum
Query MCU settings Module operation	Module Send	0x55aa 0x00	0x02	0x0000		0x01
	MCU reports (MCU and	0x55aa 0x03	0x02	0x0000		Checksum

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

28

mode	module cooperate to handle)					
	MCU report (module processing)	0x55aa 0x03	0x02	0x0002	The first byte is the WiFi status indicator GPIO serial number ; the second byte is the WiFi reset key GPIO serial number	Checksum
Report Wifi working status	Module Send	0x55aa 0x00	0x03	0x0001	Indicates WiFI status： 0x00： Smartconfig Network configuration mode (light flashes quickly) ； 0x01： AP network configuration mode (light flashes slowly); 0x02: WiFi configuration is successful but not connected to the router (light is off); 0x04: connected to the router and connected to the cloud (light is always on)	Checksum
	MCU report	0x55aa 0x03	0x03	0x0000		Checksum
Reset WiFi	MCU report	0x55aa 0x03	0x04	0x0000		Checksum
	Module Send	0x55aa 0x00	0x04	0x0000		0x03
Reset WiFi Select mode	MCU report (Smart	0x55aa 0x03	0x05	0x0001	0x00	Checksum

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

29

(MCU reports two options)	config mode)					
	MCU report (AP mode)	0x55aa 0x03	0x05	0x0001	0x01	Checksum
	Module Send	0x55aa 0x00	0x05	0x0000		
Check mcu working status	Module Send	0x55aa 0x00	0x08	0x0000		Checksum
	MCU report	0x55aa 0x03	0x07	N	Report all DP point data as initial display value	Checksum
Upgrade Start	Module Send	0x55aa 0x00	0x0a	0x0004	Firmware package size	Checksum
	MCU report	0x55aa 0x03	0x0a	0x0001	Upgrade package sub-packet transmission size： 0x00： Default 256byte (compatible with old firmware) 0x01：512byte 0x02：1024byte	Checksum
Upgrade package transfer	Module Send	0x55aa 0x00	0x0b	0x0004 + Packet length	The first four bytes are fixed as the packet offset, and the rest are the packet contents.	Checksum
	MCU report	0x55aa 0x03	0x0b	0x0000		Checksum
Get local time (optional)	MCU report	0x55aa 0x03	0x1c	0x0000		Checksum
	Module Send	0x55aa 0x00	0x1c	0x0008	The data length is 8 bytes: Data[0] is the flag for whether the time is obtained successfully, 0 indicates failure, 1 indicates success;	Checksum

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

30

					Data[1] is the year, 0x00 indicates 2000; Data[2] is the date, 1-12; Data[3] is the date of the week, 1-31; Data[4] is the clock, 0-23; Data[5] is the minute, 0-59; Data[6] is the second, 0-59; Data[7] is the day of the week, 1-7	
WiFi function production test (Note: scan the specified SSID of tuya_mdev_test)	MCU report	0x55aa 0x03	0x0e	0x0000		Checksum
	Module Send	0x55aa 0x00	0x0e	0x0002	The data length is 2 bytes: Data[0]: 0x00 failure, 0x01 success; When Data[0] is 0x01, success, Data[1] indicates the signal strength (0-100, 0 is the worst signal, 100 is the strongest signal) When Data[0] is 0x00, that is, failure, Data[1] is 0x00 indicating that the specified SSID was not scanned, Data[1] is 0x01 indicating that the module has not burned the authorization key	Checksum

Communication protocol-functional protocol

Communication protocol (product function part) command sending and receiving table

ID	Function Name		Header Version	Order	Data length	dpl D	Data Type	Functional length	Functional instructions	Checksum
2 0	Light on/off	Module Send	0*0.55a a 0*00	0x0 6	0x0 0 0 x05	0x1 4	0x0 1	0x0 0 0 x01	off:0x00 on:0x01	Checksum
		MCU report	0*0.55a a 0*03	0x0 7	0x0 0 0 x05	0x1 4	0x0 1	0x0 0 0 x01		Checksum
2 1	Light Mode	Module Send	0*0.55a a 0*00	0x0 6	0x0 0 0 x05	0x1 5	0x0 4	0x0 0 0 x01	yellow:0x 00 mix:0x01 white:0x0 2	Checksum
		MCU report	0*0.55a a 0*03	0x0 7	0x0 0 0 x05	0x1 5	0x0 4	0x0 0 0 x01		Checksum
2 2	Brightness value	Module Send	0*0.55a a 0*00	0x0 6	0x0 0 0 x08	0x1 6	0x0 2	0x0 0 0 x04	0x2-0x64	Checksum
		MCU report	0*0.55a a 0*03	0x0 7	0x0 0 0 x08	0x1 6	0x0 2	0x0 0 0 x04		Checksum
2 3	Warm and cold values	Module Send	0*0.55a a 0*00	0x0 6	0x0 0 0 x08	0x1 7	0x0 2	0x0 0 0 x04	0x0-0x64	Checksum
		MCU report	0*0.55a a 0*03	0x0 7	0x0 0 0 x08	0x1 7	0x0 2	0x0 0 0 x04		Checksum
2 5	Sense	Module Send	0*0.55a a 0*00	0x0 6	N	0x1 9	0x0 3	N	0x00-0xff	Checksum
		MCU report	0*0.55a a 0*03	0x0 7	N	0x1 9	0x0 3	N		Checksum
5 1	Fan Switch	Module Send	0*0.55a a 0*00	0x0 6	0x0 0 0 x05	0x3 3	0x0 1	0x0 0 0 x01	off:0x00 on:0x01	Checksum

		MCU report	0*0.55aa 0*03	0x07	0x00 0x05	0x33	0x01	0x00 0x01		Checksum
52	Fan Mode	Module Send	0*0.55aa 0*00	0x06	0x00 0x05	0x34	0x04	0x00 0x01	nature:0x00 sleep:0x01	Checksum
		MCU report	0*0.55aa 0*03	0x07	0x00 0x05	0x34	0x04	0x00 0x01		Checksum
53	Fan Speed	Module Send	0*0.55aa 0*00	0x06	0x00 0x08	0x35	0x02	0x00 0x04	0x1-0x6	Checksum
		MCU report	0*0.55aa 0*03	0x07	0x00 0x08	0x35	0x02	0x00 0x04		Checksum
54	Fan direction	Module Send	0*0.55aa 0*00	0x06	0x00 0x05	0x36	0x04	0x00 0x01	forward:0x00 reverse:0x01	Checksum
		MCU report	0*0.55aa 0*03	0x07	0x00 0x05	0x36	0x04	0x00 0x01		Checksum
55	Fan Countdown Timer	Module Send	0*0.55aa 0*00	0x06	0x00 0x08	0x37	0x02	0x00 0x04	0x0-0x8	Checksum
		MCU report	0*0.55aa 0*03	0x07	0x00 0x08	0x37	0x02	0x00 0x04		Checksum
57	Buzzer	Module Send	0*0.55aa 0*00	0x06	0x00 0x05	0x39	0x01	0x00 0x01	off:0x00 on:0x01	Checksum
		MCU report	0*0.55aa 0*03	0x07	0x00 0x05	0x39	0x01	0x00 0x01		Checksum

STATEMENT

FCC STATEMENT

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.

NOTE: 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.

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

This equipment complies with FCC 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 a human body.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module, Contains FCC ID: SZY-DK9193.

Co-location of this module with other transmitters that operate simultaneously are required to be evaluated using the multi-transmitter procedures.

The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369.

TEL : +886-2-86984245   FAX: +886-2-86984108
16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City
22101, Taiwan (R.O.C.)

34

Radiation Exposure Statement:

This equipment complies with FCC/ISED 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 a human body.

The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

IMPORTANT NOTE: In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/ISED authorization is no longer considered valid and the FCC/ISED ID cannot be used on the final product. In these circum stances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

If the identification number is not visible when the module is installed inside another device, then the outside of the device into

which the module is installed must also display a label referring to the enclosed module, Contains FCC ID: SZY-DK9193.

The grantee's FCC ID can be used only when all FCC/ISED compliance requirements are met.

The host integrator must follow the integration instructions provided in this document and ensure that the composite-system end product complies with the requirements by a technical assessment or evaluation to the rules and to KDB Publication 996369.

The host integrator installing this module into their product must ensure that the final composite product complies with the requirements by a technical assessment or evaluation to the rules, including the transmitter operation and should refer to guidance in KDB 996369.

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual. 31

TEL : +886-2-86984245 FAX: +886-2-86984108 16F.-1, No.81, Sec. 1, Xintai 5th Rd., Xizhi Dist., New Taipei City 22101, Taiwan (R.O.C.) © 2024 DEXATEK TECHNOLOGY ALL RIGHTS RESERVED.

Déclaration d'exposition aux radiations :

Cet équipement est conforme aux limites d'exposition aux rayonnements FCC/ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec une distance minimale de 20 cm entre le radiateur et un corps humain.

Le module émetteur ne doit pas être colocalisé avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, aucun test supplémentaire de l'émetteur ne sera nécessaire. Cependant, l'intégrateur OEM est toujours responsable de tester son produit final pour toute exigence de conformité supplémentaire requise avec ce module installé.

REMARQUE IMPORTANTE : Dans le cas où ces conditions ne peuvent être remplies (par exemple certaines configurations d'ordinateur portable ou colocalisation avec un autre émetteur), alors l'autorisation FCC/ISED n'est plus considérée comme valide et l'identifiant FCC/ISED ne peut pas être utilisé sur le dernier émetteur. produit. Dans ces circonstances, l'intégrateur OEM sera responsable de réévaluer le produit final (y compris le transmetteur) et d'obtenir une autorisation FCC distincte.

Si le numéro d'identification n'est pas visible lorsque le module est installé à l'intérieur d'un autre appareil, alors l'extérieur de l'appareil dans

sur lequel le module est installé doit également afficher une étiquette faisant référence au module fourni, contenant l'ID FCC : SZY-DK9193.

L'identifiant FCC du bénéficiaire ne peut être utilisé que lorsque toutes les exigences de conformité FCC/ISED sont respectées.

L'intégrateur hôte doit suivre les instructions d'intégration fournies dans ce document et s'assurer que le produit final du système composite est conforme aux exigences par une évaluation technique ou une évaluation des règles et de la publication KDB 996369.

L'intégrateur hôte installant ce module dans son produit doit s'assurer que le produit composite final est conforme aux exigences par une évaluation technique ou une évaluation des règles, y compris le fonctionnement de l'émetteur et doit se référer aux directives du KDB 996369.

Informations manuelles destinées à l'utilisateur final

L'intégrateur OEM doit veiller à ne pas fournir d'informations à l'utilisateur final sur la manière d'installer ou de retirer ce module RF dans le manuel d'utilisation du produit final qui intègre ce module. Le manuel de l'utilisateur final doit inclure toutes les informations/avertissements réglementaires requis, comme indiqué dans ce manuel.

FCC WARNING

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.

This device and its antenna(s) must not be co-located or operating in conjunction
with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the
user shall include the following or similar statement, placed in a prominent
location in the text of the manual:

Note: 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.

This equipment complies with FCC radiation exposure limits set forth for an uncon-
trolled environment. This equipment should be installed and operated with minimum
distance 20
cm between the radiator and your body.

Radiation Exposure Statement:

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

This transmitter must not be co-located or operating in conjunction with any other

antenna or transmitter.

The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination.

The firmware setting is not accessible by the end user.

The final end product must be labelled in a visible area with the following:

"Contains Transmitter Module "FCC ID:SZY-DK9193"

Requirement per KDB996369 D03

2.2 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.3

Explanation: This module meets the requirements of FCC part 15C (15.247).it Specifically identified AC Power Line Conducted Emission, Radiated Spurious emissions, Band edge and RF Conducted Spurious Emissions, Conducted Peak Output Power, Bandwidth, Power Spectral Density, Antenna Requirement.

2.3 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The product antenna uses an irreplaceable antenna with a gain of -0.58dBi

2.4 Single Modular

If a modular transmitter is approved as a "Single Modular ," then the module manufacturer isresponsible for approving the host environment that the Single Modular is used with. The manufacturer of a Single Modular must describe, both in the filing and in the installation instructions, the alternative means that the Single Modular manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.
A Single Modular manufacturer has the flexibility to define its alternative method to address the conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited

module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This Single Modular procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited

module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is a single module.

2.5 Trace antenna designs

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects: layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna); b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered); c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout; d) Appropriate parts by manufacturer and specifications; e) Test procedures for design verification; and f) Production test procedures for ensuring compliance

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: The module complies with FCC radiofrequency radiation exposure limits for uncontrolled environments. The device is installed and operated with a distance of more than 20 cm between the radiator and your body." This module follows FCC statement design, FCC ID :SZY-DK9193

2.7 Antennas

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type").

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product.

The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: The product antenna uses an irreplaceable antenna with a gain of -0.58dBi

2.8 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This

includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: SZY-DK9193

2.9 Information on test modes and additional testing requirements5

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: Dexatek Technology Ltd. can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

2.10 Additional testing, Part 15 Subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product

as being Part 15
Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuity, so the module does not require an evaluation by FCC Part 15 Subpart B. The host shoule be evaluated by the FCC Subpart B.