Tigerkin User Guide

Project:Tigerkin Bluetooth 5 BLE module

Model name:Tigerkin

Designed:Suzhou Pairlink Network Technology Ltd.

Version	Note	Date
V1.0	Create	2019/03/28

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1.Functional Characteristics

Tigerkin is SOC module developed based on the Bluetooth 5 standards. the internal integration architecture ARM® Cortex®-M4 processor.It has the advantage of small volume, low power consumption, long distance transmission, strong anti-jamming capability, low cost.Specifically applied to Bluetooth low power control area,and suitable for various occasions short distance wireless communication.

Tigerkin integral compact, simplifies the design in hardware and institution for user. The module interface open completely to make the users has more flexible secondary development space.

The module has a PUART interface with CTS/RTS, The PUART is a standard 2-wire interface (RX and TX) and has adjustable baud rates from 9600bps to 3Mbps.The default baud rate for H5 is 115.2K baud. Both high and low baud rates can be supported by running the UART clock at 24 MHz. The Tigerkin UART operates correctly with the host UART as long as the combined baud rate error of the two devices is within ±1%.

The module includes 24Mhz Crystal and 8Mb SPI flash. The module also integrated with Ipex connector and ceramic antenna.users can better the expansion of the RF performance.

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1.1.Product Feature

1: Tigerkin under Bluetooth 5 specification.

2: Supports Cypress proprietary data rate up to 2 Mbps

2: Support SIG Mesh/Pairlink Connected Mesh

3: Easy to extend SPI Flash.The default value is 8Mbit.Memory size is optional.

4: Integrated IPEX connector and Ceramic antenna

5: Support OTA function.

1.2. Main Application Domain

1: Home automation/ Intelligent lighting / Intelligent access control system.

2: Industrial telemetry / Industrial data collection.

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2.Electrical Specifications

Recommended Operating Conditions

Parameter	Specification			Unit
	Min.	Typical	Max.	
Power Supply	2.7	3.3	3.6	V

Digital I/O Characteristic

Characteristics	Symbol	Specification			Unit
		Min.	Typical	Max.	
Input Low Voltage	VIL	-	-	0.8	V
Input High Voltage	VIH	2.0	-	-	V

RF Specifications

Parameter	Conditions	Min.	Target output power	Max.	Unit
Receiver RF Specifications					
Frequency range	-	2402	-	2480	MHz
RX sensitivity[b]	-	-	-91.5	-	-
Maximum input	GFSK,1 Mbps	-	-	-20	dBm
Transmitter RF Specifications(TBD)					
Frequency range	-	2402	-	2480	MHz
Class 1: GFSK TX power		-	7.79	-	dBm

a.Typical operating conditions are 3.3V operating voltage and 25°C ambient temperature.
b.The receiver sensitivity is measured at BER of 0.1% on the device interface.

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3.Physical Parameters

Parameter	Performance	Note
Distance	50M	Environment: Sunny and open Antenna: Ceramic antenna, Airspeed: 1Mbps
Crystal	24MHz	Industry Standard
Protocol	BLE5	Supported data rates: 1 Mbps, 2 Mbps
Package	Patch	Refer to section 4.4
IC	CYW20735B1	60PIN-QFN
RAM	320KB	
ROM	2MB	
FLASH	8Mb	
Core	ARM Cortex-M4	
Dimensions	14.0mm*23.0mm*2.6mm	L*W*H
RF Interface	1:Ceramic antenna 2:Ipex Connector	50ohm impedance matching

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4.Hardware design and PCB layout

4.1.Pin assignment and Pin description[a][b]

Tigerkin Pin definition can refer to .

<div align="center">Table 1:Module Pin Description</div>

Pin Number	Pin Name	I/O	POR State	Alternate Function Description
10	VBAT	ADI	/	Power Supply
1,2,20	GND	GND	/	Connect to Ground
9	RESET	DI		INPUT. Reset signal (active Low). Floating if not used
3	UART_RTS	I,PU		RTS for HCI UART interface. NC if unused.
4	UART_CTS	I,PU		CTS for HCI UART interface: NC if unused.
5	UART_TXD	O,PU		Serial data input for the HCI UART interface.
6	UART_RXD	I		Serial data input for the HCI UART interface.
7	SPI_MISO	I		SPI Master In Slave Out. For Test.
8	P7	DIO	Floating	GPIO:P7/PUART_CTS PWM5
11	P4/PUART_RX	DIO	Floating	GPIO:P4/PUART_RX
12	P5/PUART_TX	DIO	Floating	GPIO:P5/PUART_TX
13	P6	DIO	Floating	GPIO:P6/PUART_RTS PWM4
14	P0/ADC0	DIO	Floating	GPIO:P0 ADC0
15	P1/ADC1	DIO	Floating	GPIO:P1 ADC1
16	P29/PWM3	DIO	Floating	GPIO:P29/PWM3
17	P28/PWM2	DIO	Floating	GPIO:P28/PWM2
18	P27/PWM1	DIO	Floating	GPIO:P27/PWM1
19	P26/PWM0	DIO	Floating	GPIO:P26/PWM0

a. All GPIOs are supermux. All GPIOs can be programmed for any alternative functions. For example, key scan, SPI, I2C, IR_TX, quadrature, peripheral UART, PWM, etc.

b. During power-on reset, all inputs are disabled.

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4.2.Reference Design

The latest schematic and design examples, bill of material, and layout file are available from original developer . Contact us for details.

Circuit Description
1:VBAT supply voltage value is 2.70V-3.60V.
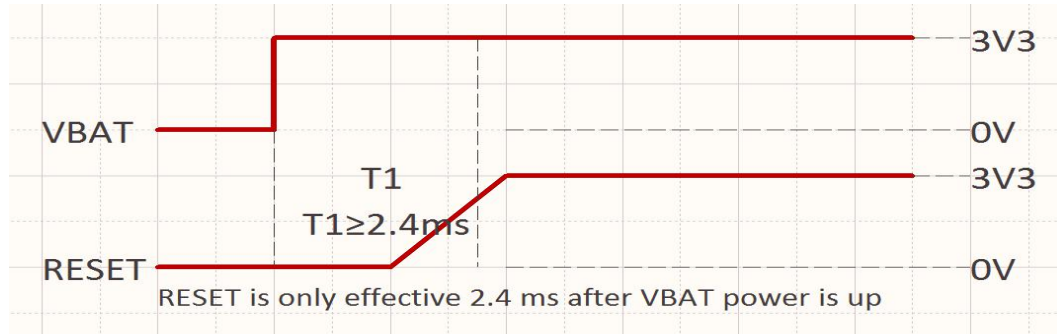2:PIN7(SPI_MOSI) reserved for testing.
3:PIN9(RST_L) is Module Reset_Control (active Low) ,Keep floating if the user is not using
4:Reserve JP1 burning interface if the PCB board has enough space.
5:Tigerkin support GPIOs supermux, All GPIOs can be defined as SPI /UART/I2C/PWM.
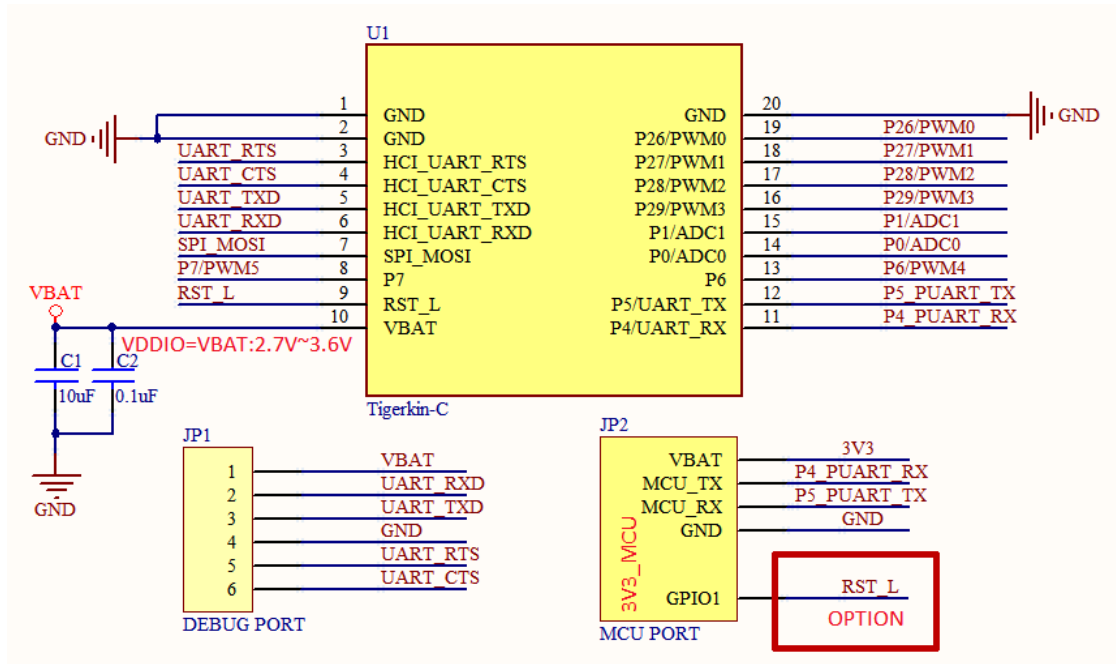6:Only PIN14(P0) and PIN15(P1) support ADC function.
7:Tigerkin Power on Reset sequence.

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Figure 2: Module Reference Design

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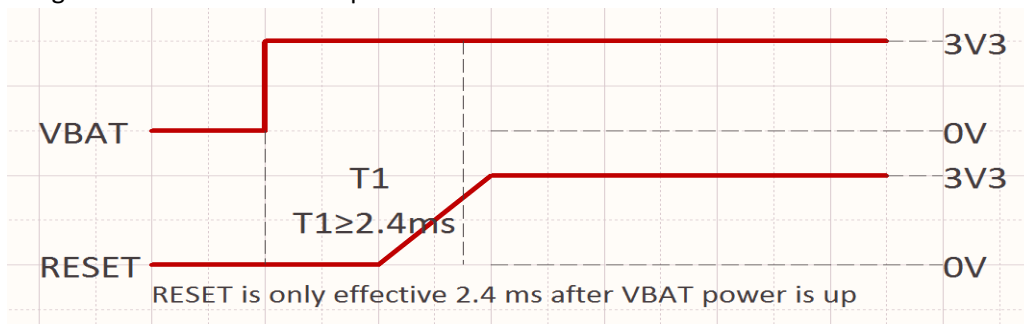
5.Regulatory Module Integration Instructions

List of applicable FCC rules

This device complies with part 15.247 of the FCC Rules.

Summarize the specific operational use conditions

This module can be used in household electrical appliances as well as lighting equipments.
The input voltage to the module should be nominally 2.7~3.6V_{DC}, Typical value 3.3V_{DC} and the ambient temperature of the module should not exceed 85℃.
The module using two type antennas.
Two antennas are used for the certification,please check the specification for the details.
A: Tigerkin/Tigerkin-B   Antenna type: 2.4GHz Chip Antenna with maximum gain is 2.0dBi
B: Tigerkin-C   Antenna type: 2.4GHz Dipole antenna with maximum gain is 0dBi
The antenna is not field replaceable. If the antenna needs to be changed, the certification should be re-applied.

Limited module procedure

Not applicable

Trace antenna designs

Not applicable

RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by § 2.1093.

Antennas

The module using two type antennas.
A: Tigerkin/Tigerkin-B   Antenna type: 2.4GHz Ceramics Antenna
B: Tigerkin-C   Antenna type: 2.4GHz Dipole antenna

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Label and compliance information

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID: 2AQV6TIGERKIN" or "Contains FCC ID: 2AQV6TIGERKIN", Any similar wording that expresses the same meaning may be used.

Information on test modes and additional testing requirements

a) The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

c) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected

The Tigerkin module is based on CYW20735 chip .support standard Bluetooth HCI UART commands. For the testing module on your product, user can refer to specification of the Bluetooth system on how to configure and evaluate the module.

This specification can also be found on the official Bluetooth web site: https://www.bluetooth.org/en-us/specification/adopted-specifications.

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Additional testing, Part 15 subpart B disclaimer

The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

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

Frequency spectrum to be investigated

For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation.

Operating the host product

When testing the host product, all the transmitters must be operating.The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available.

When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

The product under test is placed into a normal "paired" mode with another Bluetooth device, as per the normal intended use of the product. For example, data transfer, music playing, etc.

FCC Statement

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

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