

wrtnode⁷

IoT module

DataSheet

WiFi/BLE/MCU all in one

FreeRTOS/Zephyr. kernel/Javascript software



1. Overview

wrtnode^7 is the standard module for MT7697, main feature as:

CPU: ARM Cortex M4 with FPU, up to 192MHz clock speed

WiFi: 802.11 b/g/n, 2.4Ghz, up to 150Mbps

Peripherals: UART * 2, SPI master / slave, I2C * 2, I2S, 4 * 12bit ADC, GPIO * 28, PWM * 28

Bluetooth: BLE 4.2

Storage: 32Mbit nor flash

Memory: 256KB SRAM

Power supply: 3.3V input

Working temperature: -35 ~ 85 °C

Wrtnode ^ 7 is a product that meets the requirements of industrial temperature scenes.

MT7697 is a highly integrated Internet of things chip produced by the MTK, integrated MCU, 11n WiFi, Bluetooth, power management unit.

MT7697 main parameters are as follows

Power management and clock source

- Integrate high efficiency power management unit with single 3.3V power supply input
- 40/26/52MHz source crystal clock support with low power operation in idle mode

Platform

- ARM Cortex M4 MCU with FPU with up to 192MHz clock speed
- Embedded 352KB SRAM and 64KB boot ROM
- Supports external serial flash with Quad Peripheral Interface (QPI) mode
- Supports eXecute In Place (XIP) on flash
- 32KB cache in XIP mode
- Hardware crypto engines including AES, DES/3DES, SHA2 for network security
- 28 General Purpose IOs multiplexed with other interfaces
- Two UART interfaces with hardware flow control and one UART for debug, all multiplexed with GPIO
- One SPI master interface multiplexed with GPIO
- One SPI slave interface multiplexed with GPIO
- Two I2C master interface multiplexed with GPIO
- One I2S interface multiplexed with GPIO
- Four channel 12-bit ADC multiplexed with GPIO
- 28 PWM multiplexed with GPIO
- 25 channels DMA
- Low power RTC mode with 32KHz crystal support

WiFi

- Dedicated high-performance 32-bit RISC CPU N9 up to 160MHz clock speed
- IEEE 802.11 b/g/n compliant

- Supports 20MHz, 40MHz bandwidth in 2.4GHz band
- Single-band 1T1R mode with data rate up to 150Mbps
- Supports STBC, LDPC
- Greenfield, mixed mode, legacy modes support
- IEEE 802.11e support
- Security support for WFA WPA/WPA2 personal, WPS2.0
- Supports 802.11w protected managed frames
- QoS support of WFA WMM
- Integrated LNA, PA, and T/R switch
- Optional external LNA and PA support.
- RX diversity support with additional RX input

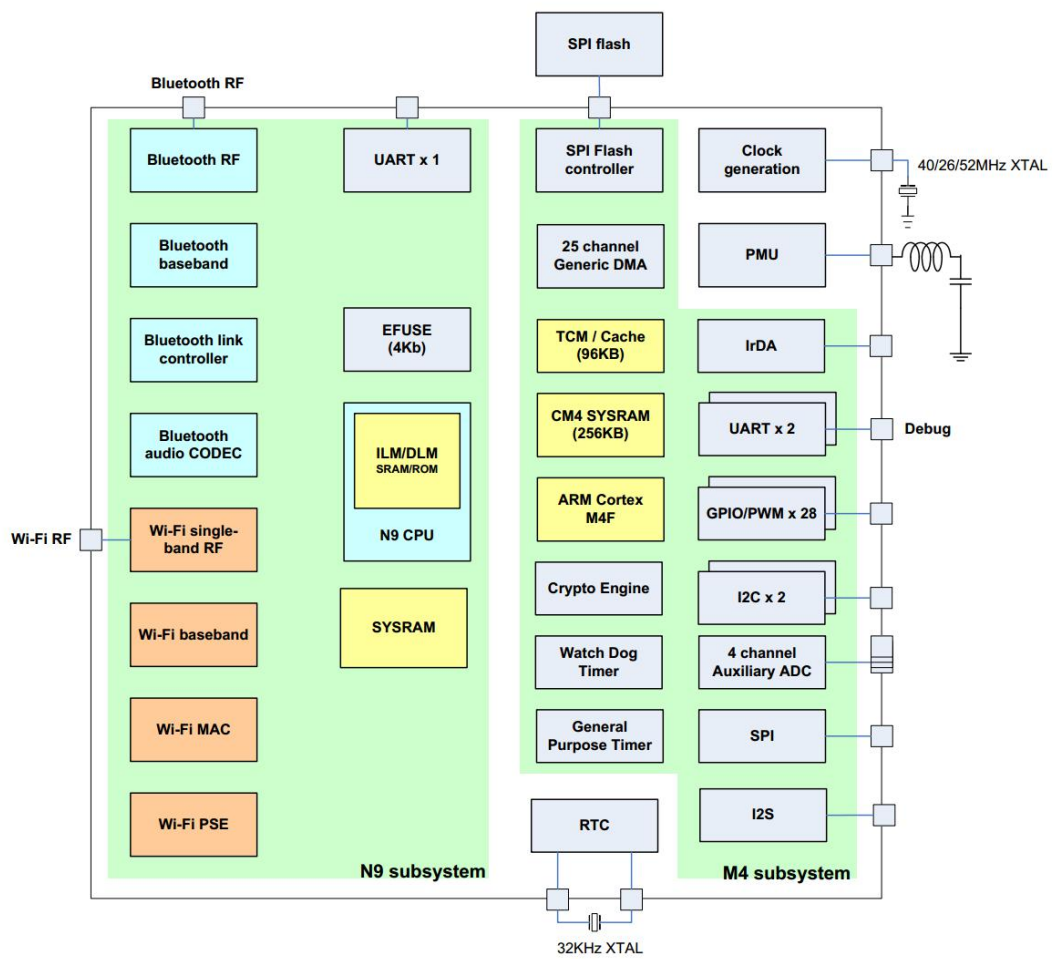
Bluetooth

- Bluetooth 4.2 Low Energy (LE)
- Integrated BALUN and PA
- Support SCO and eSCO link with re-transmission
- Channel assessment for AFH

Optional Antenna

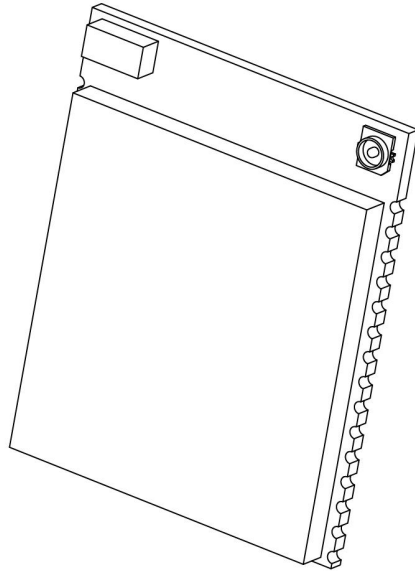
- Ceramic antenna
 - Peak Gain : 0.5dbi typ
 - S.W.R <= 2.0 @ 2400 MHz ~ 2500 MHz4.9~5.9GHz
- FPC antenna (connected with ipex4)
 - Peak Gain : 4.5dbi typ
 - S.W.R <= 2.0 @ 2400 MHz ~ 2500 MHz4.9~5.9GHz

MT7697 system structure as follows:

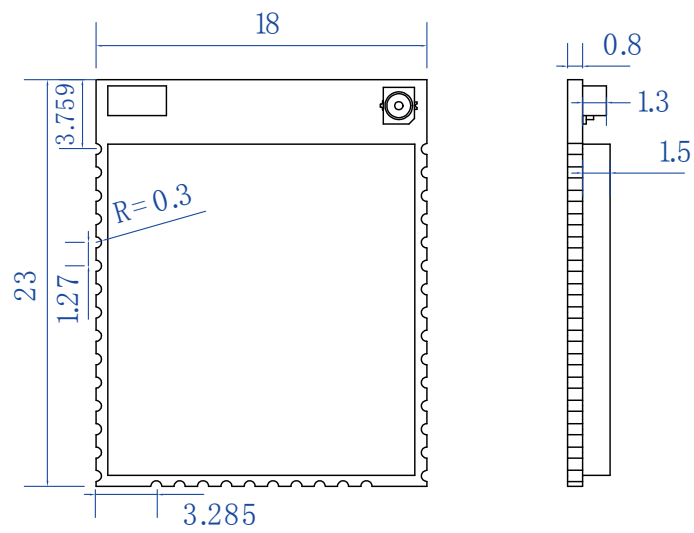


2、 interface definition

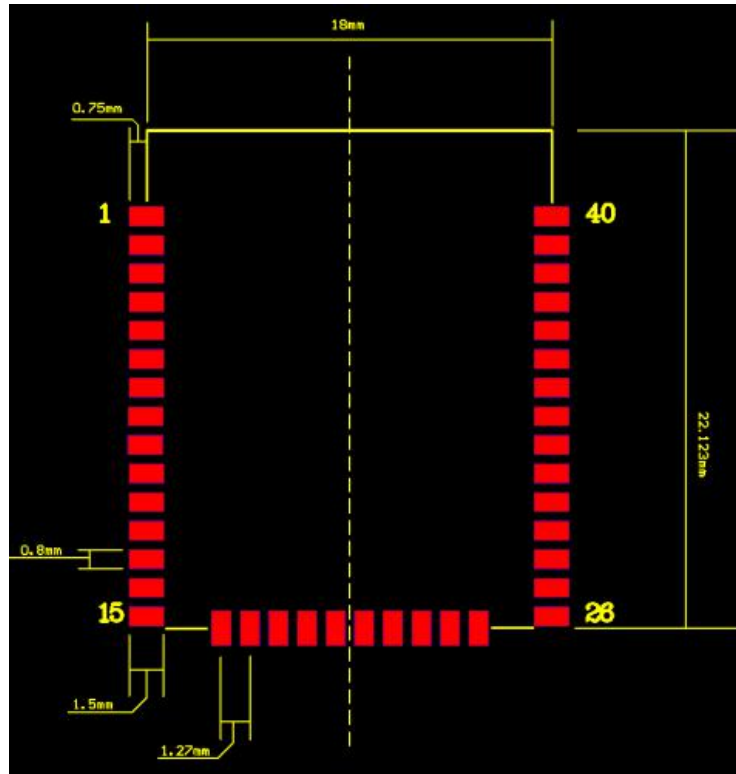
Module size specification (in mm, 0.15mm acceptable engineering



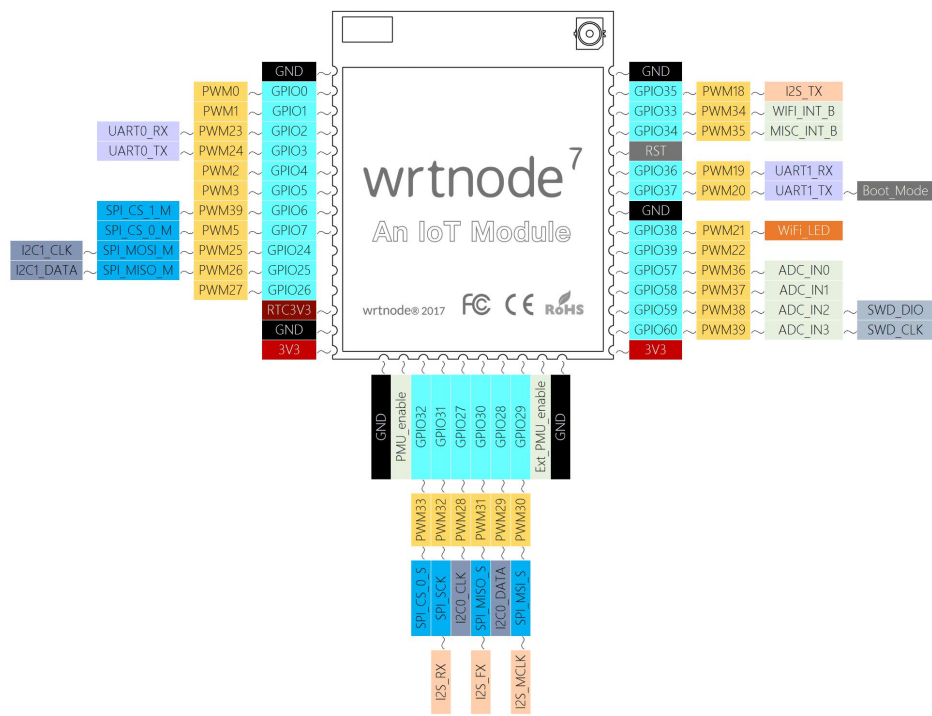
deviation)



Reference Layout



Pin multiplexing



2.1 RF characteristics

2.1.1 RF characteristics for 802.11b 11M

802.11b Transmit					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channal1		Channal13	
Tx Power Level	DQPSK	19	20	21	dbm
Frequency Tolerance		-10	0	10	ppm
Modulation Accuracy	All Data Rate		5		%
802.11b Receiver					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channal1		Channal13	
Min Input	11Mbps PER<5%	-76	-76	-76	dbm

2.1.2 RF characteristics for 802.11g 54M

802.11g Transmit					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channal1		Channal13	
Tx Power Level	DQPSK	15	17.5	19	dbm
Frequency Tolerance		-10	0	10	ppm
Modulation Accuracy	All Data Rate	-27	-29	-32	
802.11g Receiver					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channal1		Channal13	
Min Input	54Mbps PER<5%	-65	-65	-65	dbm

2.1.3 RF characteristics for 802.11n MCS7(HT20)

802.11n Transmit					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channal1		Channal13	
Tx Power Level	OFDM	15	17.5	18.5	dbm
Frequency Tolerance		-10	0	10	ppm
Modulation Accuracy	All Data Rate	-30	-31	-34	
802.11g Receiver					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channal1		Channal13	
Min Input	MCS7 PER<6%	-64	-64	-64	dbm

2.1.4 RF characteristics for 802.11n MCS7(HT40)

802.11g Transmit					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channel1		Channel13	
Tx Power Level	OFDM	15	17.4	18	dbm
Frequency Tolerance		-10	0	10	ppm
Modulation Accuracy	All Data Rate	-27	-30	-33	
802.11g Receiver					
Item	Condition	Min	Type	Max	Unit
Frequency Range		Channel1		Channel13	
Min Input	MCS7 PER<6%	-61	-61	-61	dbm

2.2 RF characteristics for Bluetooth LE

2.2.1 Bluetooth LE Transmitter Specification

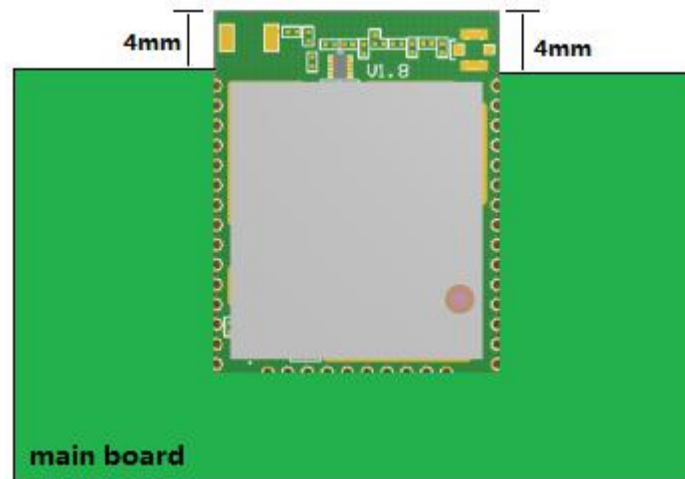
Item	Description	Min	Type	Max	Unit
Frequency Range		2402		2480	MHZ
Output Power	Max power output level	-21	7.29	9	dbm
Carrier Frequency offset and drift	Frequency offset	-150		150	KHZ
	Frequency drift	-50		50	KHZ
In-band Spurious Emission	± 2M offset			-49	dbm
	> ± 3M offset			-56	dbm

2.2.2 Bluetooth LE Receiver Specification

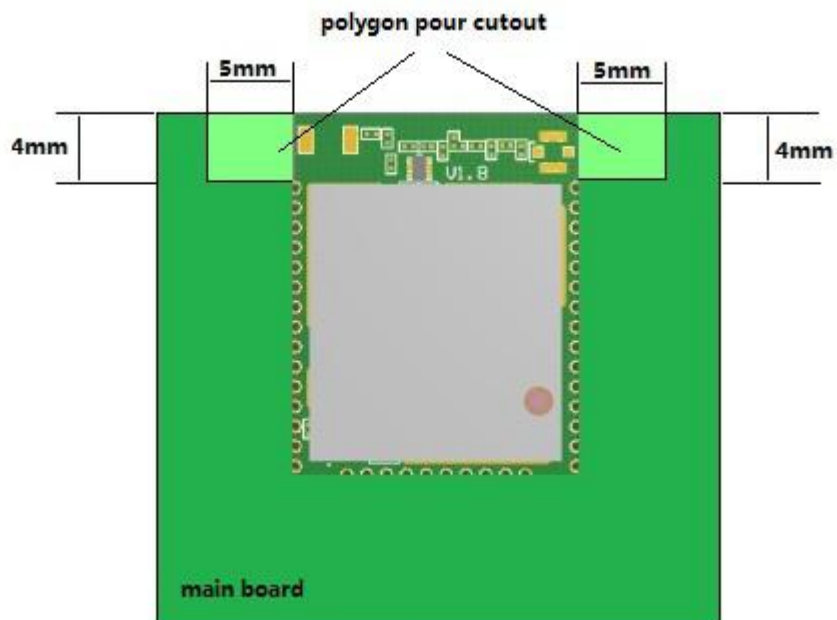
Item	Description	Min	Type	Max	Unit
Frequency Range		2402		2480	MHZ
Receiver sensitivity	PER<30.8%		-90		dbm
Inter-modulation		-50	-34		KHZ
Out-of-band Blocking	30MHz to 2000MHz	-30			dbm
	2001MHz to 2339MHz	-35			dbm
	2501MHz to 3000MHz	-35			dbm

3、 The Suggestion about PCB Design

For the high RF performance for the end device, please note the placement for the antenna and the module. It is suggested that the module is placed along with PCB side, the antenna is placed outside the board, or along with the PCB side, and the below board is blank, please refer to the scheme 1 ;if the PCB antenna must placed on the board, please do not cover the copper at the bottom of PCB antenna, as can be shown at scheme 2.



Scheme 1



Scheme 2

This document online version <http://wrtnode.cc/node7.html>, please check the latest version online.

1. Example 1. Wi-Fi station mode.

- Find your Wi-Fi access point settings: Before connecting to a Wi-Fi access point, the following information needs to be collected:
 - # The SSID of your Wi-Fi access point.
 - # The authentication mode of your Wi-Fi access point. In general, the authentication mode is WPA PSK or WPA2 PSK. To change the mode, please refer to Table 1 for the list of supported authentication modes.
 - # The password of your Wi-Fi access point.
 - # The encryption mode of your Wi-Fi access point. In general, AES or TKIP is used. To change the mode, please refer to Table 2 for the list of supported encryption modes.
- Once the information is collected, use the following commands to configure the wrtnode^7.

```
config write STA AuthMode 9
config write STA EncryptType 8
config write STA Ssid myhome
config write STA SsidLen 6
config write STA WpaPsk 12345678
config write STA WpaPskLen 8
config write common OpMode 1
```

- Press the reset button on the wrtnode^7 to restart the system.
- Boot up with the new configuration. If everything is correct, similar messages will be shown in the console to notify your HDK has received an IP address.

```
DHCP got IP:10.10.10.101
```

- PING from the wrtnode^7. If the IP address is fetched and the network is operating, the LinkIt 7687 can ping other devices on the network with the following command in the console.

```
ping 10.10.10.254 3 64
```

The ping stops after sending three packets to 10.10.10.254.

The ping usage is: ping <ip address> <times> <ping packet length>

- Wi-Fi configuration options for AuthMode and EncryptType.

0	open, no security
4	WPA PSK
7	WPA2 PSK
9	Support both WPA and WPA2 PSK

Table 1. Supported AuthMode(s)

0	WEP
1	No encryption
4	TKIP
6	AES
8	Support TKIP and AES

Table 2. Supported EncrypType(s)

2. Example 2. Wi-Fi access point mode.

- Provide the Wi-Fi access point settings:
 - SSID
 - Authentication Mode
 - Encryption Type
 - Password
- Once the information is collected, use the following commands to configure the LinkIt 7687 HDK. This example assumes WPA2 PSK is used for authentication, AES for encryption, 'iot_ap' (length 6) for the SSID, and the password of the WPA2 is '87654321' (length 8).

```
config write AP Ssid iot_ap
config write AP SsidLen 6
config write AP AuthMode 7
config write AP EncrypType 6
```

```
config write AP WpaPsk 87654321
config write AP WpaPskLen 8
config write common OpMode 2
```

- Press the reset button on the wrtnode^7 to restart the system.
- Use a handheld device or a laptop computer to connect to the access point 'iot_ap'. In the console, the IP address assigned to the the handheld device or laptop is: [DHCPD:DBG]lease_ip:10.10.10.2

Warning

This device complies with part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

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:

- 1、 Reorient or relocate the receiving antenna.
- 2、 Increase the separation between the equipment and receiver.
- 3、 Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- 4、 Consult the dealer or an experienced radio/TV technician for help.

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body: Use only the supplied antenna.

FCC ID:2ALR4-WRTNODE7

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) This device and its antenna(s) must not be co-located with any other transmitters except in accordance with FCC multi-transmitter product procedures. Referring to the multi-transmitter policy, multiple-transmitter(s) and module(s) can be operated simultaneously without C2P.
- 3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

USERS MANUAL OF THE END PRODUCT:

In the users manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio-frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of 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.

LABEL OF THE END PRODUCT:

The final end product must be labeled in a visible area with the following " Contains FCC ID:2ALR4-WRTNODE7 ". If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of 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.