

# ABLUE TECHNOLOGY

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## ***PTR5638***

*Coin-size Ultra Low Power Bluetooth Low Energy  
System on Module  
Embedded Cortex™ M4F 32 bit processor*

The PTR5638 ultra-low power Bluetooth Low Energy/Mesh/ANT/2.4GHz Proprietary Multi-protocol modules based on the nRF52832 from Nordic Semiconductor. The module with an ARM® Cortex™ M4F 32 bit processor, embedded 2.4GHz transceiver, and integrated antenna, provide a complete solution with no additional RF design, allowing faster time to market, while simplifying designs, reducing BOM costs, also reduce the burden of Regulatory approvals to enter the world market. Making you more quickly into the bluetooth smart application and remove the worries.

### **Features**

- System on Module(SOM) base on Nordic nRF52832
- Bluetooth Low Energy/Mesh/ANT/2.4GHz Proprietary Multi-protocol support
- Complete Bluetooth Low Energy stack/profiles solution (Bluetooth 5.0 and Higher)
- ARM® Cortex™ M4F 32 bit processor, 512 kB flash memory, 64 kB RAM
- 11 General Purpose I/O, Configurable mapping Pins, Simple layout of external application
- 12-bit/200KSPS ADC, PWM, SPI Master/Slave (8 Mbps)
- Low power comparator, Temperature sensor, Random Number Generator
- Two 2-wire Master/Slave (I2C compatible)
- I2S audio interface, PDM audio interface
- UART (w/ CTS/RTS and DMA)
- 20 channel CPU independent Programmable Peripheral Interconnect (PPI)
- Quadrature Demodulator (QDEC)
- 128-bit AES HW encryption
- 5 x 32bit Timers, 3 x 24bit Real Timer Counters (RTC), Watchdog Timer
- Internal RC Oscillator 32.768 kHz(± 250 ppm).
- No external components required
- Over-the-Air (OTA) firmware updates available
- Ultra small size(smaller than CR2032 coin battery), about 19x12x1.9mm with Antenna.

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## Typical Applications:

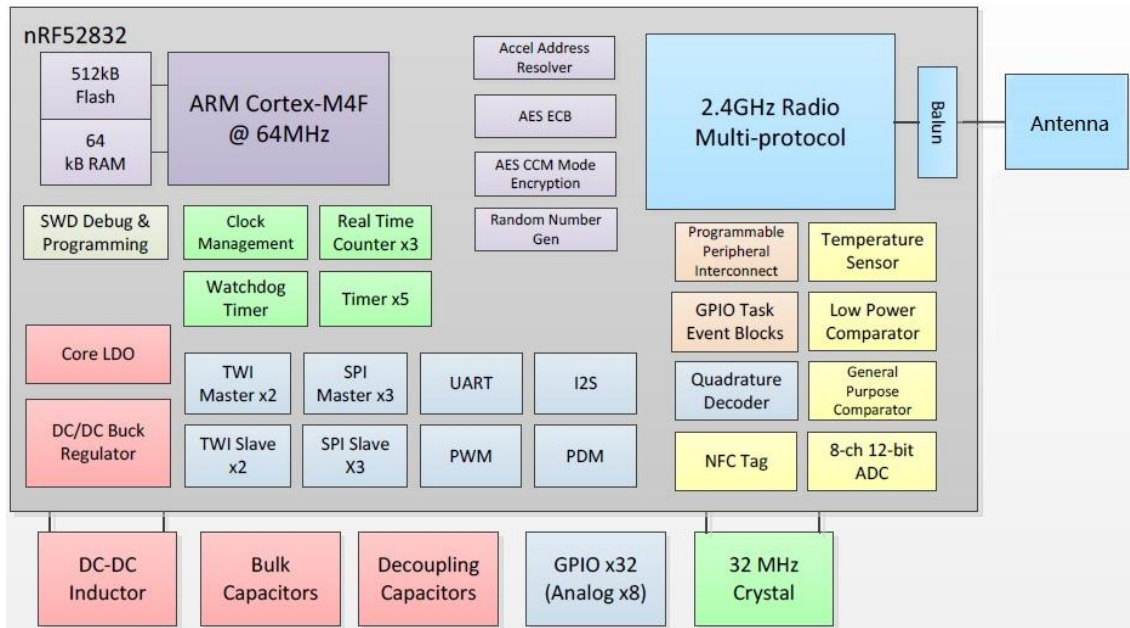
- 2.4 GHz Bluetooth low energy systems
- Proprietary 2.4 GHz systems
- Sports and leisure equipment
- Mobile phone accessories, Connected Appliances
- Health Care and Medical
- Consumer Electronics, Game pads
- Human Interface Devices, Remote control
- Building environment control / monitoring
- RFID, Security Applications, Low-Power Sensors
- Bluetooth Low Energy GateWay
- iBeacons™, Indoor navigation
- Lighting Products
- Fitness devices
- Wearables

## Quick Specifications:

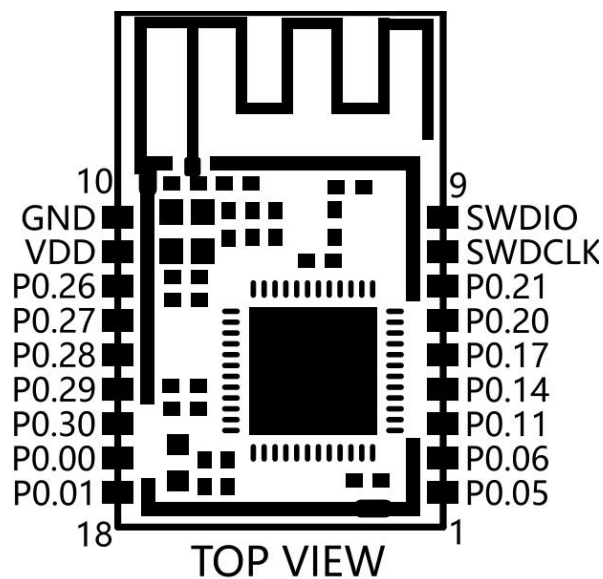
Bluetooth	
Version	Bluetooth 5.0 and Higher
Security	AES-128
Radio	
Frequency	2.360GHz to 2.500GHz
Modulations	GFSK at 1 Mbps, 2 Mbps data rates
Transmit power	+4 dBm
Receiver sensitivity	-96 dBm (BLE mode)
Antenna	Integrated
Current Consumption	
TX only @ +4 dBm, @ 3V, DC/DC enabled	7.5 mA
TX only @ 0 dBm, @ 3V, DC/DC enabled	5.3 mA
TX only @ +4 dBm	16.6 mA
TX only @ 0 dBm	11.6 mA
RX only @ 1 Mbps @ 3V, DC/DC enabled	5.4 mA
RX only @ 1 Mbps	11.7 mA
CPU @ 64MHz from flash	7.5 mA
CPU @ 64MHz from RAM	6.7 mA
CPU @ 64MHz from flash @ 3V, DC/DC	3.7 mA
CPU @ 64MHz from flash RAM @ 3V, DC/DC	3.3 mA
System On	1.2 $\mu$ A
System Off	0.7 $\mu$ A
Additional current for RAM retention	20 nA / 4K block
Operating conditions	
Power supply	1.7~3.6V
Operating temperature	-25~+85 °C

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## Block diagram:



## Pin Description of Module (Top View) :



Pin No.	Name	Description	Note
1	P0.05	I/O	
2	P0.06	I/O	
3	P0.11	I/O	
4	P0.14	I/O	
5	P0.17	I/O	
6	P0.20	I/O	
7	P0.21	Reset/ IO	Configurable as pin reset.
8	SWDCLK	Debug and flash programming I/O	
9	SWDIO	Debug and flash programming I/O	
10	GND	Power Ground	

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11	VDD	Power Supply	1.7~3.6V
12	P0.26	I/O	
13	P0.27	I/O	
14	P0.28	I/O	ADC IN
15	P0.29	I/O	ADC IN
16	P0.30	I/O	ADC IN
17	P0.00	I/O	
18	P0.01	I/O	

Note: An internal 4.7μF bulk capacitor has been included on the module. For those application that with heavy GPIO usage and/or current draw, it is good design practice to add additional bulk capacitance as required for your application.

## General Purpose I/O:

The general purpose I/O is organized as one port enabling access and control of the 32 available GPIO pins through one port. Each GPIO can be accessed individually with the following user configurable features:

- Input/output direction
- Output drive strength
- Internal pull-up and pull-down resistors
- Wake-up from high or low level triggers on all pins
- Trigger interrupt on all pins
- All pins can be used by the PPI task/event system; the maximum number of pins that can be interfaced through the PPI at the same time is limited by the number of GPIOTE channels
- All pins can be individually configured to carry serial interface or quadrature demodulator signals

## Hardware RESET:

There is on-chip power-on reset circuitry, But can still be used in external reset mode, in this case, GPIO pin P0.21 as an external hardware reset pin(Active Low). In order to utilize P0.21 as a hardware reset, the UICR registers PSELRESET[0] and PSELRESET[1] must be set alike, to the value of 0x7FFFFFFF. When P0.21 is programmed as RESET, the internal pull-up is automatically enabled.

## HW debug and flash programming of Module :

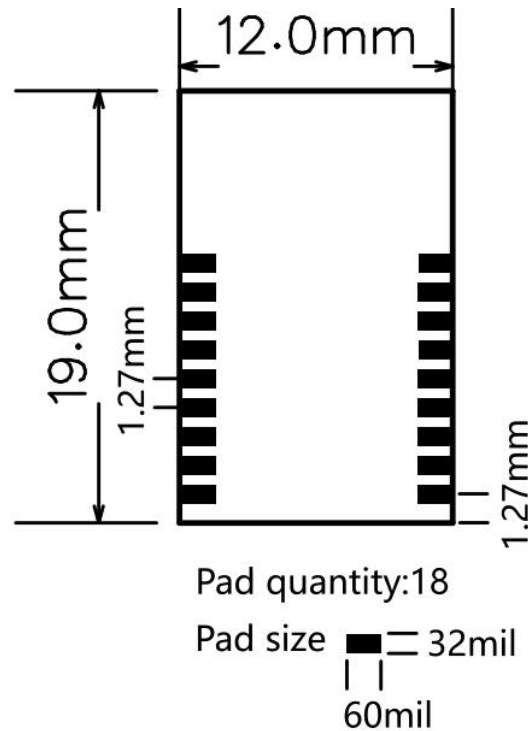
The Module support the two pin Serial Wire Debug (SWD) interface and offers flexible and powerful mechanism for non-intrusive debugging of program code. Breakpoints, single stepping, and instruction trace capture of code execution flow are part of this support.

Pin	Flash Program interface
SWDIO	Debug and flash programming I/O
SWCLK	Debug and flash programming I/O

This is the hardware debug and flash programming of module, J-Link Lite support, please refer [www.segger.com](http://www.segger.com).

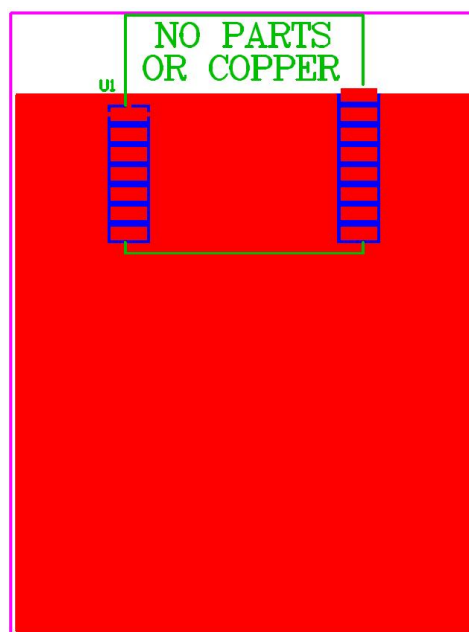
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## PCB Footprint (Top View) :

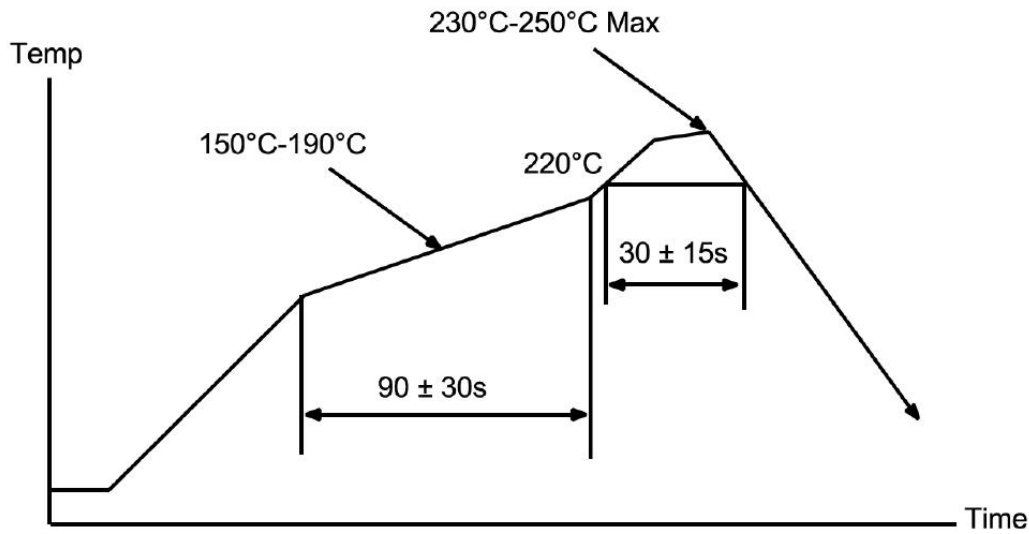


## Recommended RF Layout & Ground Plane:

The module integrated antenna requires a suitable ground plane to radiate effectively. The area under and extending out from the antenna portion of the module should be kept clear of copper and other metal. The module should be placed at the edge of the PCB with the antenna edge facing out. Reducing the ground plane will reduce the effective radiated power.



## Reflow Welding Curve:



## Absolute Maximum Ratings:

Symbol	Parameter	Min.	Max.	Unit
V <sub>CC_MAX</sub>	Voltage on supply pin	-0.3	3.9	V
V <sub>IO_MAX</sub>	Voltage on GPIO pins (V <sub>CC</sub> > 3.6V)	-0.3	3.9	V
V <sub>IO_MAX</sub>	Voltage on GPIO pins (V <sub>CC</sub> ≤ 3.6V)	-0.3	V <sub>CC</sub> + 0.3V	V
T <sub>S</sub>	Storage Temperature Range	-40	125	°C

## Important Notice:

- Reserves the right to make corrections, modifications, and/or improvements to the product and/or its specifications at any time without notice.
- Assumes no liability for the user's product and/or applications.
- Products are not authorized for use in safety-critical applications, including but not limited to life-support applications.

## ■ ATTENTION!

Electrostatic Sensitive Device

Humidity Sensitive Device

Observe Precaution for handling



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## Ordering Information:

Part Number	Description
PTR5638	Bluetooth Low Energy System on Module,PCB Antenna
PTR5638-X	Bluetooth Low Energy System on Module,IPX Ext Antenna
PTR5638-N	Bluetooth Low Energy System on Module,Connect the antenna externally through the antenna pin
PTR5638-EVB	Evaluation boards for module, with key, LED, I/O extend, sock for coin cell battery.

### ORIGINAL EQUIPMENT MANUFACTURER (OEM) NOTES

The OEM must certify the final end product to comply with unintentional radiators (FCC Sections 15.107 and 15.109) before declaring compliance of the final product to Part 15 of the FCC rules and regulations. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change.

The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: 2AWMN-PTR5638"

Additionally, the following statement should be included on the label and in the final product's user manual:

"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 interferences, and
- (2) this device must accept any interference received, including interference that may cause undesired operation. "

The module is limited to installation in mobile or fixed applications. Separate approval is required for all other operating configurations, including portable configuration with respect to Part 2.1093 and different antenna configurations.

A module or modules can only be used without additional authorizations if they have been tested and granted under the same intended end use operational conditions, including simultaneous transmission operations. When they have not been tested and granted in this manner, additional testing and/or FCC application filing may be required. The most straightforward approach to address additional testing conditions is to have the grantee responsible for the certification of at least one of the modules submit a permissive change application. When having a module grantee file a permissive change is not practical or feasible, the following guidance provides some additional options for host manufacturers. Integrations using modules where additional testing and/or FCC application filing(s) may be required are: (A) a module used in devices requiring additional RF exposure compliance information (e.g., MPE evaluation or SAR testing); (B) limited and/or split modules not meeting all of the module requirements; and (C) simultaneous transmissions for independent collocated transmitters not previously granted together.

This Module is full modular approval, it is limited to OEM installation ONLY. Integration into devices that are directly or indirectly connected to AC lines must add with Class II Permissive Change. (OEM) Integrator has to assure compliance of the entire end product include the integrated Module. Additional measurements (15B) and/or equipment authorizations (e.g. Verification) may need to be addressed depending on co-location or simultaneous transmission issues if applicable. (OEM) Integrator is reminded to assure that these installation instructions will not be made available to the end user