

PTR5618PA

Coin-size Bluetooth Low Energy System on Module with PA Embedded Cortex™ M4F 32 bit processor

The PTR5618PA ultra-low power Bluetooth Low Energy/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/2.4GHz Proprietary Multi-protocol support
- Complete Bluetooth Low Energy stack/profiles solution (Bluetooth 4.x and Higher)
- ARM® Cortex™-M4F 32 bit processor, 512 kB flash memory, 64 kB RAM
- 2.4 GHz transceiver, Max TX Power +15 dBm, -96 dBm sensitivity@BLE
- 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 15mmx15mmx1.8mm.

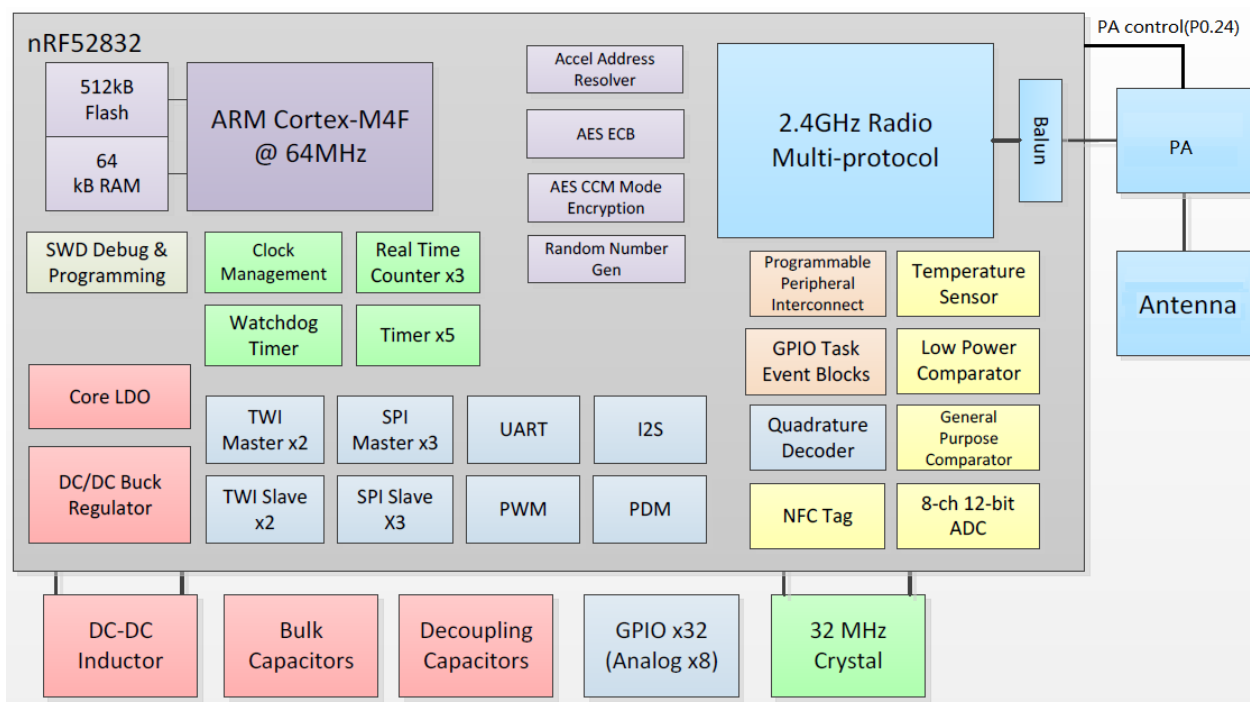
Typical Applications:

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

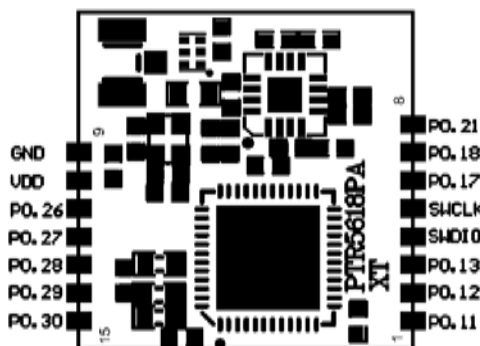
Quick Specifications:

Multi-protocol	
Version	Bluetooth 4.x and Higher/ANT/2.4GHz Proprietary
Security	AES-128
Radio	
Frequency	2.402GHz to 2.480GHz
Modulations	GFSK at 1 Mbps, 2 Mbps data rates
Transmit power	Max +15dBm @setting nRF52832 0dBm output
Receiver sensitivity	-96dBm (BLE mode)
Antenna	IPX interface
Current Consumption	
TX only @ +15 dBm	~100 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 μ A
System Off	0.7 μ A
Operating conditions	
Power supply	2.7~3.6V
Operating temperature	-25~+85 °C

Block diagram:



Pin Description of Module (Top View) :



Pin No.	Name	Description	Note
1	P0.11	I/O	
2	P0.12	I/O	
3	P0.13	I/O	
4	SWDIO	Debug and flash programming I/O	
5	SWDCLK	Debug and flash programming I/O	
6	P0.17	I/O	
7	P0.18	I/O	
8	P0.21	Reset/ IO	Configurable as pin reset.
9	GND	Power Ground	
10	VDD	Power Supply	
11	P0.26	I/O	
12	P0.27	I/O	
13	P0.28	I/O	ADC IN

14	P0.29	I/O	ADC IN
15	P0.30	I/O	ADC IN

Note 1: P0.20 and P0.24 are reserved for PA control internal.

Note 2: An internal 4.7μF bulk capacitor has been included on the module. it is good design practice to add additional bulk capacitance(e.g 10uF) 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

PA control:

Additional logic signals are needed to control TX PA and RX LNA. On the nRF51 there was an option to use the VDD_PA pin to detect when the radio was in TX mode, but this is not an option on the nRF52, making the SoftDevice solution necessary. The S132 SoftDevice for the nRF52 has support for enable/disable switching of external Power Amplifiers (PA) and LNA using GPIO pins.

On the module, P0.20 and P0.24 are reserved to control PA and LNA, so these two pins can Not be allocated to other usage.

The truth table of PA/LNA control signals as bellow:

PIN24	PIN20	PA status
1	0	TXEN
0	1	RXEN
0	0	IDLE
1	1	INVALID

The following function can be used to enable PA/LNA signal with P0.20 and P0.24. Add this function to your project and call it after ble_stack_init():

```
static void pa_assist(uint32_t gpio_pa_pin,uint32_t gpio_lna_pin)
{
    ret_code_t err_code;
```

```
static const uint32_t gpio_toggle_ch = 0;

static const uint32_t ppi_set_ch = 0;

static const uint32_t ppi_clr_ch = 1;

// Configure SoftDevice PA assist

ble_opt_t opt;

memset(&opt, 0, sizeof(ble_opt_t));

// Common PA config

opt.common_opt.pa_lna.gpiote_ch_id = gpio_toggle_ch;      // GPIOTE channel

opt.common_opt.pa_lna.ppi_ch_id_clr = ppi_set_ch;          // PPI channel for pin clearing

opt.common_opt.pa_lna.ppi_ch_id_set = ppi_clr_ch;          // PPI channel for pin setting

// PA config

opt.common_opt.pa_lna.pa_cfg.active_high = 1;             // Set the pin to be active high

opt.common_opt.pa_lna.pa_cfg.enable = 1;                  // Enable toggling

opt.common_opt.pa_lna.pa_cfg.gpio_pin = gpio_pa_pin;      // The GPIO pin to toggle

opt.common_opt.pa_lna.lna_cfg.active_high = 1;

opt.common_opt.pa_lna.lna_cfg.enable = 1;

opt.common_opt.pa_lna.lna_cfg.gpio_pin = gpio_lna_pin;

err_code = sd_ble_opt_set(BLE_COMMON_OPT_PA_LNA, &opt);

APP_ERROR_CHECK(err_code);

}
```

The following main function is an example that to show you how to enable PA/LNA signal in your project:

```
int main(void)

{

    uint32_t err_code;

    // Initialize.

    APP_TIMER_INIT(APP_TIMER_PRESCALER, APP_TIMER_OP_QUEUE_SIZE, false);

    ble_stack_init();

    pa_assist(24,20);

    gap_params_init();

    services_init();

    advertising_init();

    conn_params_init();

    err_code = ble_advertising_start(BLE_ADV_MODE_FAST);

    APP_ERROR_CHECK(err_code);

    // Enter main loop.

    for (;;)

    {

        power_manage();

    }

}
```

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 0x7FFFFFFF15. When P0.21 is programmed as RESET, the internal pull-up is automatically enabled.

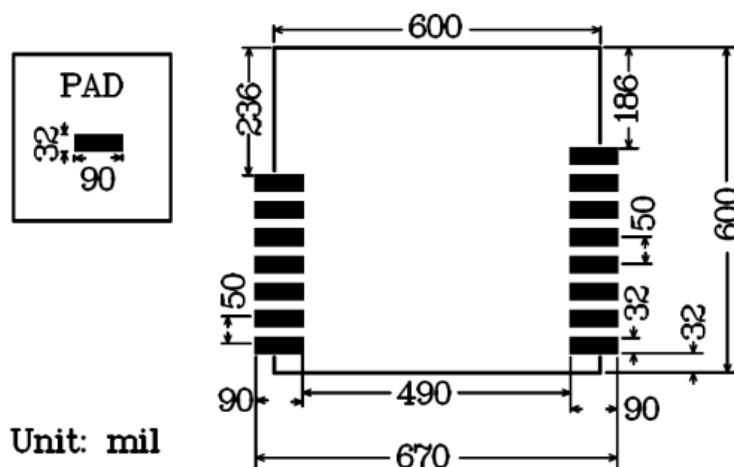
HW debug and flash programming of Module:

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.

PCB Footprint (Top View) :



Ordering Information:

Part Number	Description
PTR5618PA	Bluetooth Low Energy System on Module with PA
PTR5618PA-EVB	Evaluation boards for module, with key, LED, I/O extend, sock for coin cell battery.

Absolute Maximum Ratings:

Symbol	Parameter	Min.	Max.	Unit
V _{CC_MAX}	Voltage on supply pin	-0.3	3.9	V
V _{IO_MAX}	Voltage on GPIO pins (V _{CC} > 3.6V)	-0.3	3.9	V
V _{IO_MAX}	Voltage on GPIO pins (V _{CC} ≤ 3.6V)	-0.3	V _{CC} + 0.3V	V
T _S	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
Observe Precaution for handling.

