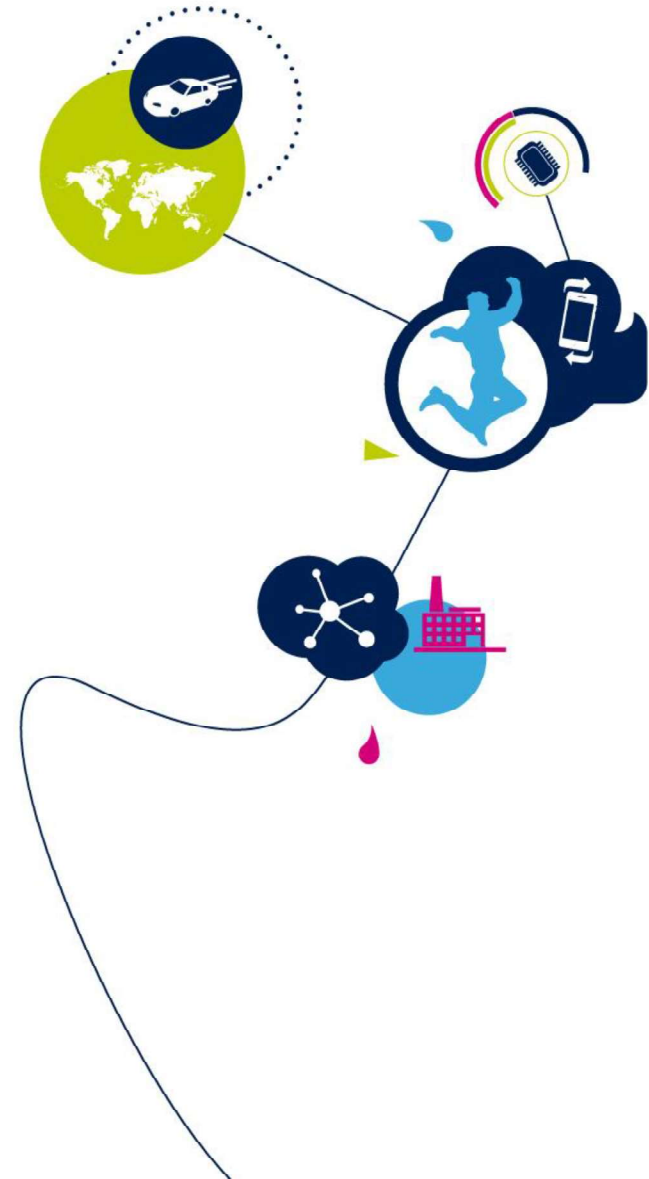


Low Power RF Modules Products family





BlueNRG Based Module Portfolio

Wireless Connectivity Made Easy





BlueNRG Modules

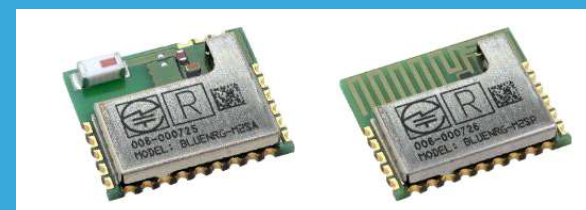
Why Using Them?

3

Bluetooth Low Energy modules allow fast time to market and huge cost savings

Modules are designed for time to market

- No RF expertise required: HW/SW Connectivity is a Black-Box in your Design!
- Fast Prototyping and HW Design
- Cost efficiency for volumes up to 150kpcs per year



Modules are pre-certified

- Multi-Regional Certifications and SIG End-Product Certification allowing ~15K\$ cost saving
- Including HW Design and Certification, total cost saving up to 50~100K\$!



Modules are pre-certified

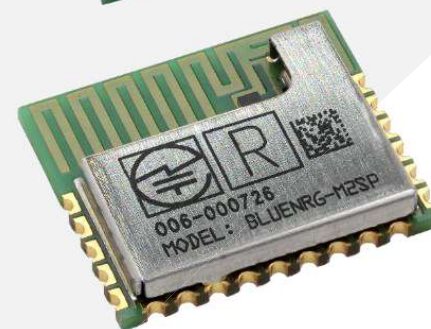
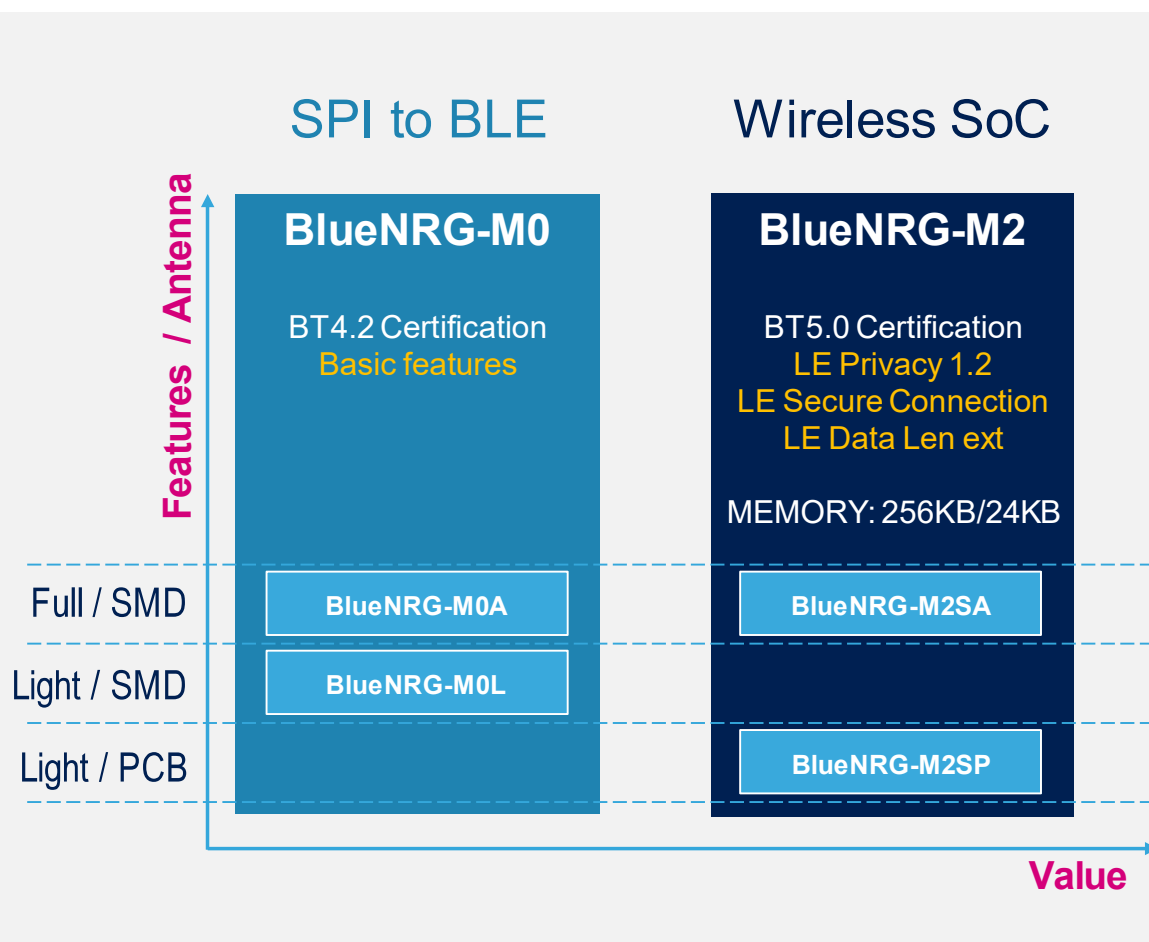
- Cost vs. features and antenna type
- Easy migration from legacy generation SPBTLE to new generation BlueNRG-M
 - Hardware pin-to-pin compatibility and same SW resources (BlueNRG-Navigator and SDK available as well)
 - Improved performance (immunity, output power)
 - 10 years longevity (do not take care of inner components availability)





BlueNRG Product Family

4



Bluetooth 5

2.4 GHz
proprietary

Bluetooth SIG
Mesh



BlueNRG Modules Portfolio

Suitable for motion algorithms, audio, Mesh over BLE

5

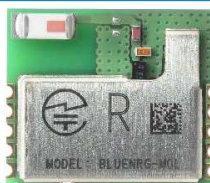
SPI to BLE

based on

BlueNRG-MS



BlueNRG-M0L
BlueNRG-M0A



Ramp-up now

- Including high efficient chip antenna, filter and balun **BALF-NRG-01D3**
- BLE4.2 certification
- Up to **+6 dBm** output power
- 5-wires **SPI interface** to external host

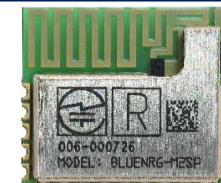
BLE SoC

based on

BlueNRG-2



BlueNRG-M2SA
BlueNRG-M2SP



Ramp-up Q4 2019

- Including high efficient chip antenna [-M2SA] or PCB antenna [-M2SP], filter and balun **BALF-NRG-02D3**
- BLE5.0 certification
- Up to **+5 dBm** [-M2SA] or **+7 dBm** [-M2SP] output power
- Extensive **peripheral set**

- Bluetooth SIG End Product certification
- CE/RED qualified, FCC/IC/TELEC modular approval certified

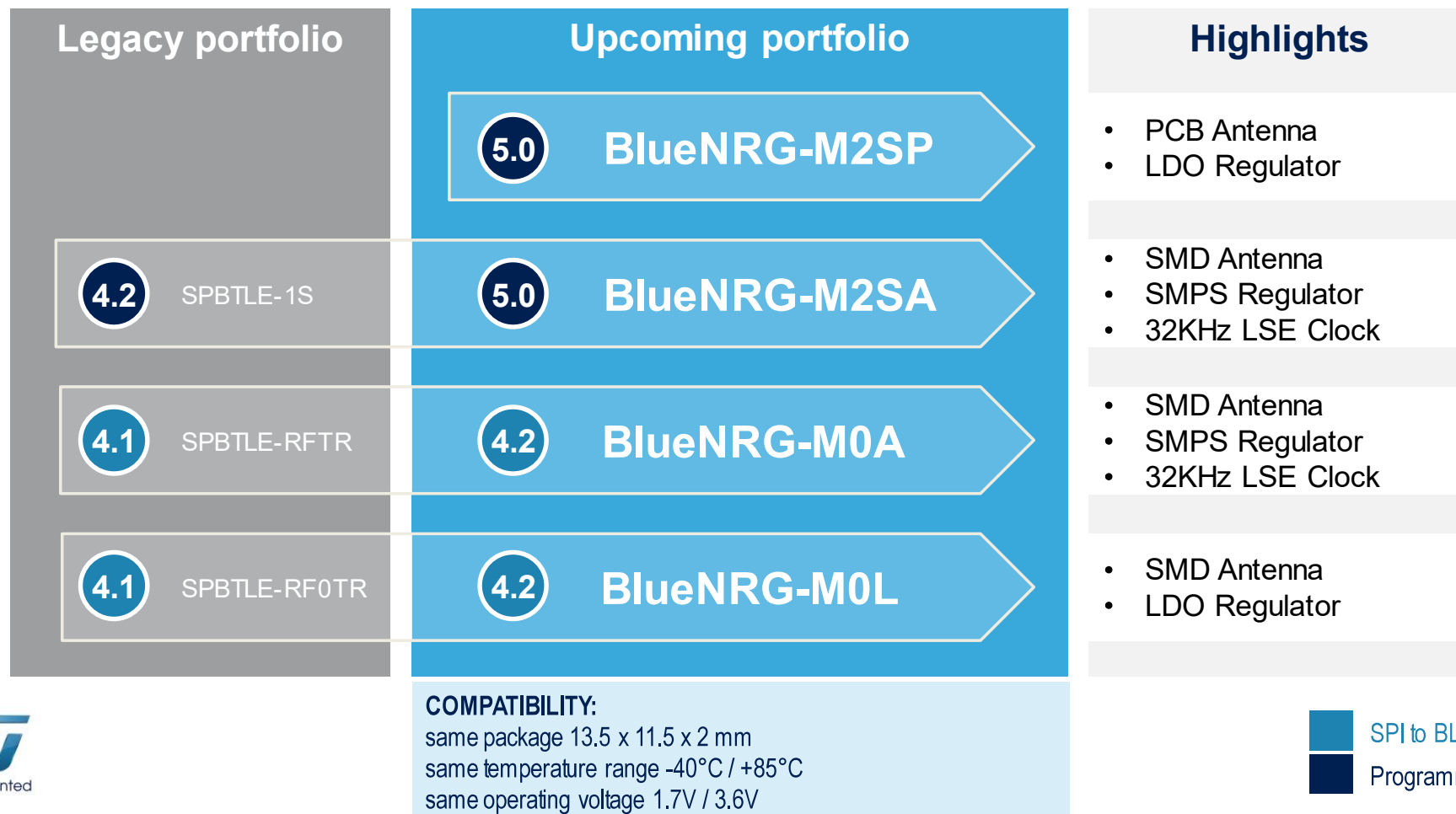
- -85 dBm Rx sensitivity
- Small form factor: 13.5 x 11.5 x 2 mm

- Industrial temperature range: -40 °C to +85 °C
- Power supply voltage from 1.7V to 3.6V



BlueNRG Modules Evolution

6





BlueNRG Modules Product Family

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	SPBTLE-RF0TR	SPBTLE-RFTR	BLUENRG-M0L	BLUENRG-M0A	SPBTLE-1S	BLUENRG-M2SA	BLUENRG-M2SP
BlueNRG device	BlueNRG-MS				BlueNRG-1	BlueNRG-2	
Balun	Companion BALF-NRG-01D3					Companion BALF-NRG-02D3	
Bluetooth certification / SIG end product certification	BLE4.1 / D028766 – QDID 71984		BLE4.2 / D043964 – QDID 122868		BLE4.2 / D034470 – QDID 92838	BLE5.0 (*) / D043965 – QDID 121363	
Core	Companion MCU				Cortex-M0 up to 32MHz		
Memory [KB]	-				160KB Flash / 24KB RAM	256KB Flash / 24KB RAM	
Antenna	SMD (connector option by 00hm)		SMD		SMD (pin option by 00hm)	SMD	PCB
Sensitivity [dBm]	-86		-85		-84	-85	
Max Power level [dBm]	+4		+6		+4	+5	+7
LSE clock	N/A	Included	N/A	Included			N/A
Voltage regulator	LDO	SMPS	LDO	SMPS			LDO
Modular approval	RED, FCC, IC	RED, FCC, IC, TELEC			RED, FCC, IC, SRRC	RED, FCC, IC, TELEC, SRRC (Q1'20)	RED, FCC, IC, TELEC, WPC
Form factor	Castellation Holes						
Size [mm]	13.5 x 11.5 x 2						
Family Pin2Pin compatibility	SPBTLE-RFTR	SPBTLE-RF0TR	SPBTLE-RFx		SPBTLE-RFx (partial)	SPBTLE-1S	SPBTLE-1S (partial)
Status	Active						

(*) **Supported BLE5.0 features:** Enhanced security with LE Secure Connections, power-efficient privacy with LL Privacy 1.2, up to 2.6x higher throughput with LE Data Length Extension



BlueNRG Longevity Program

New Portfolio

8

Staying in production for 10 years, or offering pin2pin replacements

4.1 SPBTLE-RFTR

4.2 BlueNRG-M0A

14 years
of commitment
(since 2015)

4.1 SPBTLE-RF0TR

4.2 BlueNRG-M0L

13 years
of commitment
(since 2016)

4.2 SPBTLE-1S

5.0 BlueNRG-M2SA

12 years
of commitment
(since 2017)

SPI to BLE
Programmable BLE SoC

5.0 BlueNRG-M2SP

10 years
of commitment
(since 2019)

Starting July 1st, 2019

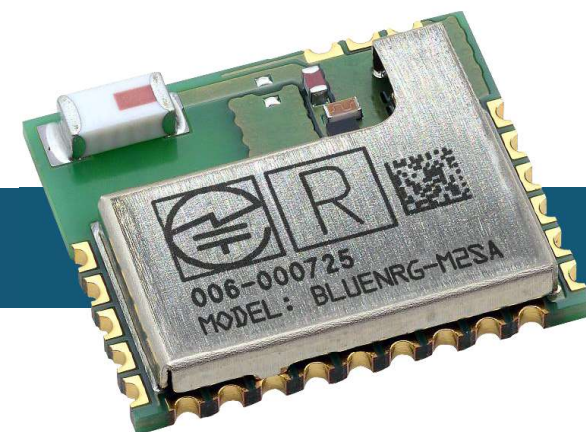




BlueNRG Modules

Ordering Information

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BlueNRG-M

2

S

A

Product Family

Bluetooth Low Energy Processor Module

Antenna type (BlueNRG-M2 only)

A – SMD Antenna
P – PCB Antenna

Antenna type (BlueNRG-M0 only)

A – SMD Antenna (Full)
L – SDM Antenna (Light)

Stack Configuration (BlueNRG-M2 only)

S – Software Programmable

Device Generation

0 – BlueNRG-MS based
2 – BlueNRG-2 based

 **Bluetooth®**





BlueNRG-M2SA/P Unveiled

Full-featured solution for BLE Connectivity

10

High efficiency Chip Antenna (*)

13.5 mm

Balun
BALF-NRG-02D3

32KHz XTAL

to enable ultra-low-power BLE sleep mode (*)

SMPS Inductor

to enable low-power BLE active mode (*)

Metallic shield to protect from EMI/RFI

11.5 mm

Suitable for:

- **Motion Algorithms**
- **Voice over BLE**
- **Mesh over BLE**

Bluetooth Low Energy SoC
BlueNRG-232
Powered by Cortex-M0



(*) Not available on BlueNRG-M2SP, based on PCB antenna



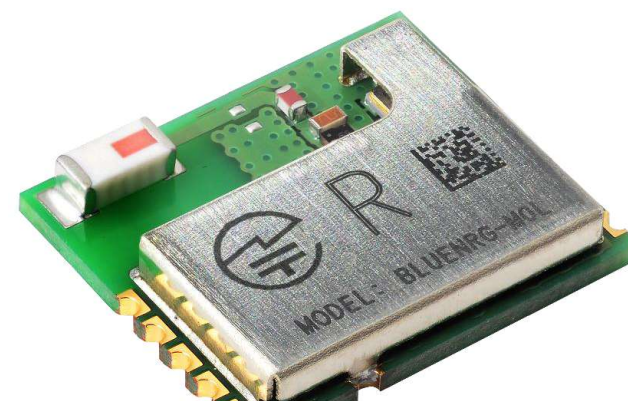
BlueNRG-M0A/L

11

Full-featured solution for BLE Connectivity

Integration

- **BlueNRG-MS** Bluetooth Low Energy network processor
- **BALF-NRG-01D3** balun
- 4-wires **SPI interface** to external host, plus IRQ and RESET lines
- Included 10uH SMPS regulator (**-M0A only**)
- **Precise sleep timer** through included 32KHz LSE oscillator (**-M0A only**)
- Included AES-128 security co-processor
- **Upgradable BLE protocol stack**



Optimized BLE protocol stack

- Compliant with **Bluetooth v4.2** standard
- Supports **master and slave** modes, up to 2 masters simultaneously
- Multiple roles supported simultaneously
- Embedded GAP, ATT/GATT, SM and L2CAP layers
- Bluetooth low energy profiles provided separately

Operating ranges

- **Small** form factor: 13.5 x 11.5 x 2 mm
- **Industrial** temperature range: -40 °C to +85 °C
- Power supply voltage from **1.7V to 3.6V**

Certified RF interface

- Included high efficient chip antenna, filter and balun
- Up to **+6 dBm** output power, **-85 dBm** Rx sensitivity
- CE/RED qualified, FCC, IC and TELEC modular approval certified
- BT SIG **End Product QDID 122868**

Applications

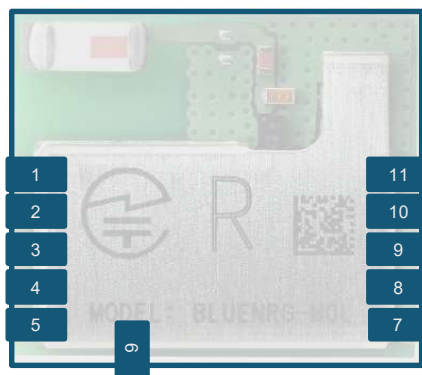
- Watches
- Fitness, wellness and sports
- Consumer medical
- Security/proximity
- Remote control
- Home and industrial automation
- Assisted living
- Mobile phone peripherals
- PC peripherals



BlueNRG-M0A/L Pin Assignment

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BlueNRG-M0x Module Pin	BlueNRG-MS ICs pin	Function
1	N/A	N/C
2	14	N/C
3	13	N/C
4	3	SPI_IRQ
5	19, 24	Vin



BlueNRG-M0x Module Pin	BlueNRG-MS ICs pin	Function
11	25	BT_RESET
10	31	SPI_CS
9	1	SPI_MOSI
8	32	SPI_MISO
7	2	SPI_CLK

BlueNRG-M0x Module Pin	BlueNRG-MS ICs pin	Function
6	N/A	GND

Typical current consumption Vin = 3.3 V, T = 25 °C	BlueNRG-M0A	BlueNRG-M0L
Reset	5 nA	
Standby	1.8 uA	1.7 uA
Sleep (12 KB retention RAM)	1.7 uA (XO)	2.8 uA (RO)
Sleep (24 KB retention RAM)	2.2 uA (XO)	3.2 uA (RO)
Active	2.12 mA	2.54 mA
RX	9.36 mA	16.6 mA
TX +8 dBm	16.5 mA	27.35 mA
TX +2 dBm	10.4 mA	18.29 mA
TX -14 dBm	7.82 mA	13.25 mA





BlueNRG-M2SA/P

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Host-less Solution for BLE Connectivity

Integration

- **BlueNRG-2** Bluetooth Low Energy application processor
- **BALF-NRG-02D3** balun
- 1x UART, 1x SPI, 1x I2C, 14x GPIO, 2x TIM, Watchdog, RTC, 1x ADC, 1x PDM, DMA controller, SWD interface
- **Cortex-M0** @ 32MHz, 2x 12KB RAM and 160 KB Flash memory
- Included 10uH SMPS regulator (**-M2SA only**)
- **Precise sleep timer** through included 32KHz LSE oscillator (**-M2SA only**)
- Included AES-128 security co-processor

Optimized BLE protocol stack

- Compliant with **Bluetooth v5.0** standard
- Supports **master and slave** modes, up to 2 masters simultaneously
- Multiple roles supported simultaneously
- Embedded GAP, ATT/GATT, SM and L2CAP layers
- Multiple sample projects are available in SDK and **Mesh-SDK**

Certified RF interface

- Included high efficient chip antenna (**-M2SA only**), filter and balun
- Up to **+7 dBm** output power (**-M2SP only**), **-85 dBm** Rx sensitivity
- CE/RED qualified, FCC, IC, TELEC, WPC (**-M2SP only**) and SRRC (**-M2SA only**) modular approval certified
- BT SIG End Product QDID 121363



Operating ranges

- **Small** form factor: 13.5 x 11.5 x 2 mm
- **Industrial** temperature range: -40 °C to +85 °C
- Power supply voltage from **1.7V to 3.6V**

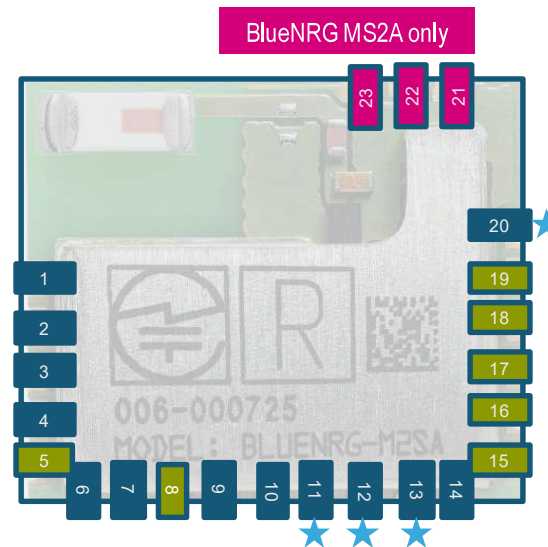
BlueNRG-M2SA/P

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Pin Assignment

Module Pin	ICs pin	Main Function	Alternate Function
1	16	ADC2	N/A
2	15	ADC1	N/A
3	8	DIO4 (mode 000)	UART_RXD (mode 001) I2C2_CLK (mode 100) PWM0 (mode 101)
4	7	DIO5 (mode 000)	UART_TXD (mode 001) I2C2_DAT (mode 100) PWM1 (mode 101)
5	19, 24	Vin	N/A
6	13	ANATEST0/DIO14 (mode 000)	SPI_CLK (mode 100)
7	4	DIO7/BOOT (mode 000)	UART_CTS (mode 001) I2C2_DAT (mode 100) PDM_CLK (mode 101)
8	N/A	GND	N/A
9	5	DIO6 (mode 000)	UART_RTS (mode 001) I2C2_CLK (mode 100) PDM_DATA (mode 101)
10	3	DIO8 (mode 000)	UART_TXD (mode 001) SPI_CLK (mode 100) PDM_DATA (mode 101)

Module Pin	ICs pin	Main Function
21	N/A	GND
22	N/A	N/C
23	N/A	GND



★ Wake-up

In green, compatibility between BlueNRG-M0x and BlueNRG-M2Sx

Module Pin	ICs pin	Main Function	Alternate Function
20	30	DIO12 (mode 000)	N/A
19	25	BT_RESET	N/A
18	11	DIO1 (mode 000)	UART_RTS (mode 001) SPI_CS1 (mode 100) PDM_DATA (mode 101)
17	9	DIO2 (mode 000)	PWM0 (mode 001) SPI_OUT (mode 100) PDM_CLK (mode 101)
16	10	DIO3 (mode 000)	PWM1 (mode 001) SPI_IN (mode 100)
15	12	DIO0 (mode 000)	UART_CTS (mode 001) SPI_CLK (mode 100)

Module Pin	ICs pin	Main Function	Alternate Function
11	32	DIO11 (mode 000)	UART_RXD (mode 001) SPI_CS1 (mode 100)
12	2	DIO9 (mode 000)	SWCLK (mode 001) SPI_IN (mode 100)
13	1	DIO10 (mode 000)	SWDIO (mode 001) SPI_OUT (mode 100)
14	14	ANATEST1	N/A

BlueNRG-M2SA/P

Characteristics

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Typical current consumption Vin = 3.3 V, T = 25 °C, 24 KB RAM	BlueNRG-M2SA	BlueNRG-M2SP
Reset		5 nA
Standby		0.5 uA
Sleep	0.9 uA (XO)	2.1 uA (RO)
Active	1.89 mA	2.75 mA
RX	7.55 mA	15 mA
TX +8 dBm	14.78 mA	33.9 mA
TX +2 dBm	9.27 mA	19.1 mA
TX -14 dBm	7.01 mA	13.7 mA



Thank you