

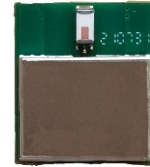
General Description

MP2652RSIPA is a multiprotocol 2.4-GHz wireless module targeted at low power sensors and PC/Phone accessories. It supports Thread, Zigbee, Bluetooth 5.0 Low Energy, IEEE 802.15.4g, IPv6-enabled smart objects (6LoWPAN), Wi-SUN, proprietary systems, SimpleLink TI 15.4-Stack (2.4- GHz), and Dynamic Multiprotocol Manager (DMM) driver.

The module highly integrates radio, stack, profile and applications in a SoC, without the need of using an external MCU. The module also offers flexible hardware interfaces for the sensor application.

It enables ultra-low power connectivity and data transfer for the applications that are sensitive to power consumption, size and cost.

The module has a very small form factor with the dimensions of 15 mm x 12.9 mm x 2.2 mm.



Key Features

- Multiprotocol, Bluetooth 5.0 low energy, Zigbee, Thread
- Powerful ARM Cortex-M4F processor
 - Clock speed: up to 48MHz
 - 352KB of In-System programmable flash
 - 80KB SRAM
 - 8KB of cache SRAM
 - 2-Pin cJTAG and JTAG debugging
 - Support Over-the-Air upgrade (OTA)
 - Ultra-Low power sensor controller with 4KB of SRAM
 - 23 GPIOs
 - 4 x 32-Bit or 8 x 16-Bit general purpose timer
 - 12-Bit ADC, 200 kSamples/s, 8 channels
 - 2 x comparator with internal reference DAC
 - Programmable current source
 - 2 x UART
 - 2 x SSI (SPI, MICROWIRE, TI)
 - IIC, IIS
 - Real-Time-Clock (RTC)
 - AES 128- and 256-bit crypto accelerator
 - ECC and RSA public key hardware accelerator
- SHA2 accelerator (Full suite up to SHA-512)
- True Random Number Generator (TRNG)
- Capacitive sensing, up to 8 channels
- Integrated temperature and battery monitor
- On-Chip buck DC/DC converter
- RF performance
 - TX power: Output power up to +5 dBm with temperature compensation
 - RX sensitivity: up to -105dBm (LE coded PHY)
- Antenna: Integrated chip antenna, 0.5 dBi peak gain
- Size: 15 mm x 12.9 mm x 2.2 mm (With Shield)
- Ultra low power consumption:
 - Shutdown: 150nA (Wake up on external events)
 - Standby: 0.94uA (RTC running and RAM/CPU retention)
 - RX current: 6.9mA
 - TX current @ 0dBm: 7.3mA
 - TX current @ 5dBm: 9.6mA
 - 32-bit timer x 3
 - Single-ended 10-bit GPADC x 4
- Standards Conformance
TBD

Applications

- 2400 to 2480 MHz ISM and SRD systems with down to 4 kHz of receive bandwidth
- Building automation
- Grid infrastructure
- Industrial transport – asset tracking
- Factory automation and control
- Medical
- Electronic point of sale (EPOS) – Electronic Shelf Label (ESL)

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1. Block Diagram

MP2652RSIPA is a power-optimized true system-on-chip (SoC) module. With a certified module on board which include 48-MHz XTAL, 32.768-KHz XTAL and all the necessary passive components, and a fine-tuned chip antenna, it allows faster time to market at reduced development cost.

Figure 1-1 shows the block diagram of the module.

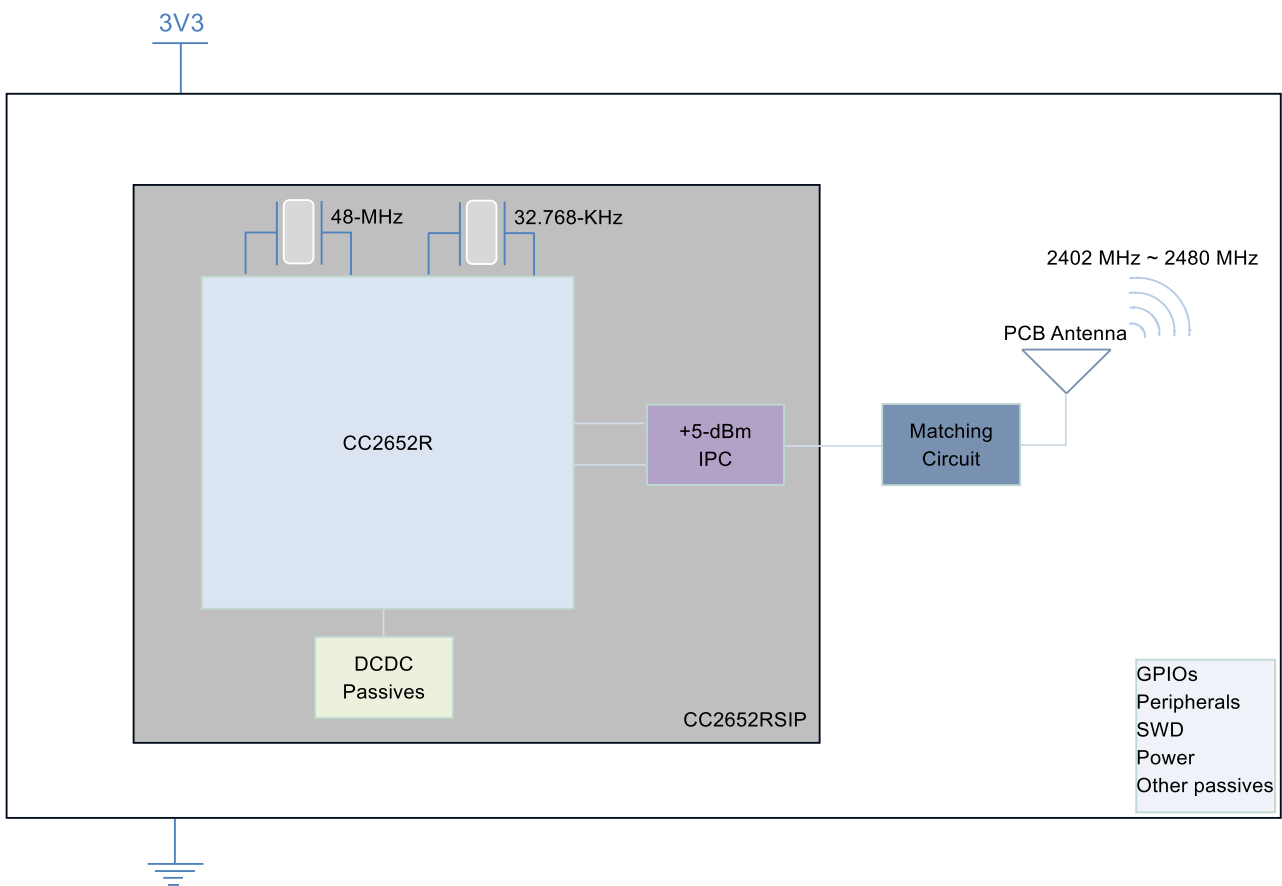
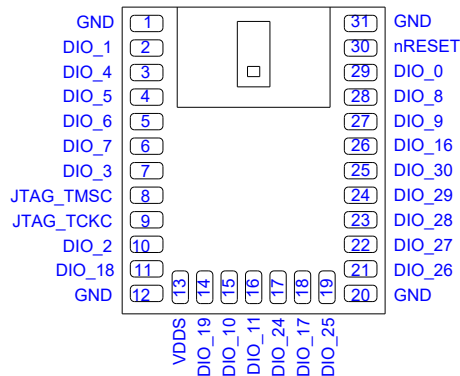


Figure 1-1. The block diagram of MP2652RSIPA

2. Pinout



Top View

Figure 2-1. Pinout Diagram Top View

Table 2-1 describes the definitions of the pins.

Table 2-1. Pin Description

Pin #	Pin Name	Type	Description
1	GND	GND	Ground
2	DIO_1	DIO ^(Note 1)	GPIO, Sensor Controller
3	DIO_4	DIO	GPIO, Sensor Controller
4	DIO_5	DIO	GPIO, Sensor Controller, high-drive capability
5	DIO_6	DIO	GPIO, Sensor Controller, high-drive capability
6	DIO_7	DIO	GPIO, Sensor Controller, high-drive capability
7	DIO_3	DIO	GPIO, Sensor Controller
8	JTAG_TMSC	DIO	JTAG TMSC, high-drive capability
9	JTAG_TCKC	DIO	JTAG TCKC
10	DIO_2	DIO	GPIO, Sensor Controller
11	DIO_18	DIO	GPIO
12	GND	GND	Power ground
13	VDDS	Power	Power supply
14	DIO_19	DIO	GPIO
15	DIO_10	DIO	GPIO
16	DIO_11	DIO	GPIO
17	DIO_24	DIO	GPIO
18	DIO_17	DIO	GPIO, JTAG_TDI, high-drive capability
19	DIO_25	DIO/AI ^(Note 1)	GPIO, Sensor Controller, Analog
20	GND	GND	Power ground
21	DIO_26	DIO/AI	GPIO, Sensor Controller, Analog
22	DIO_27	DIO/AI	GPIO, Sensor Controller, Analog
23	DIO_28	DIO/AI	GPIO, Sensor Controller, Analog

Pin #	Pin Name	Type	Description
24	DIO_29	DIO/AI	GPIO, Sensor Controller, Analog
25	DIO_30	DIO/AI	GPIO, Sensor Controller, Analog
26	DIO_16	DIO	GPIO, JTAG_TDO, high-drive capability
27	DIO_9	DIO	GPIO
28	DIO_8	DIO	GPIO
29	DIO_0	DIO	GPIO, Sensor Controller
30	nRESET	Reset	Reset, active-low
31	GND	GND	Power ground

Note 1: DIO stands for Digital Input-Output; AI stands for Analog Input.

3. Characteristics

All MIN/MAX specification limits are guaranteed by design, production testing and/or statistical characterization. Typical values are based on characterization results at default measurement conditions and are informative only.

Default measurement conditions (unless otherwise specified): $V_{DD5} = 3.3\text{ V}$, $T_A = 25\text{ }^\circ\text{C}$. All radio measurements are performed with standard RF measurement equipment.

3.1. Absolute Maximum Ratings

Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, so functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification are not implied. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

Table 3-1. Absolute Maximum Ratings

PARAMETER	MIN	MAX	UNIT	Notes
VDD5	-0.3	4.1	V	
Other Digital Terminals	-0.3	$V_{DD5}+0.3 \leq 4.1$	V	
Voltage on ADC input	-0.3	VDD5	V	Voltage scaling enabled
	-0.3	1.49	V	Voltage scaling disabled, internal reference
	-0.3	$V_{DD5}/2.9$	V	Voltage scaling disabled, VDD5 as reference
Storage Temperature	-40	125	°C	

3.2. Recommended Operating Conditions

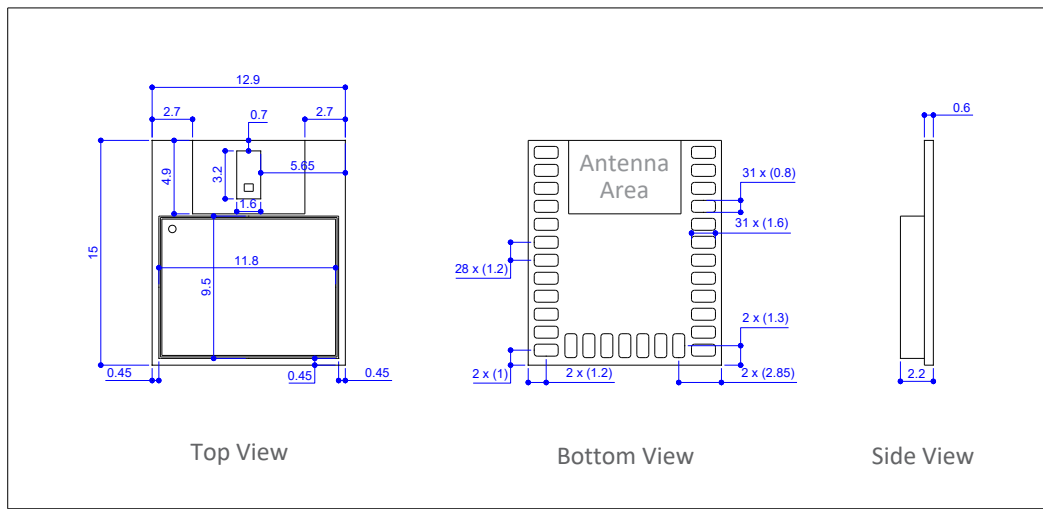
Table 3-2. Recommended Operating Conditions

PARAMETER	MIN	TYP	MAX	UNIT
VDDS	1.8	3.3	3.8	V
Operating Temperature	-40	-	85	°C

4. Mechanical Specifications

4.1. Dimensions

The module dimensions are presented in the following figure:

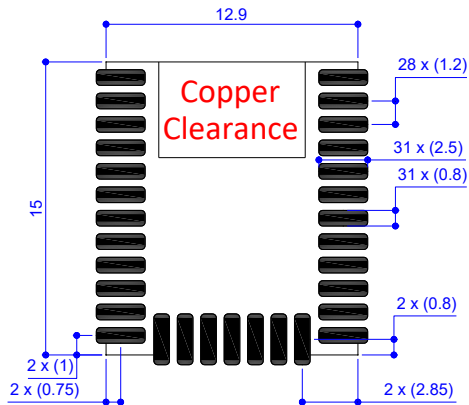


Note: All dimensions are in millimeter

Figure 4-1. Mechanical Drawing

4.2. PCB Footprint

The footprint for the PCB is presented in the following figure:



Note: All dimensions are in millimeter

Figure 4-2. Module Footprint Top View

5. Ordering Information

Part Number	Description	Size (mm)	Package	MOQ
MP2652RSIPA	Multi-Protocol 2.4-GHz Module	15 × 12.9 × 2.2	Tape & Reel	1000

6. Revision History

Revision	Date	Description
V1.0	16-July-2021	Initial Release, brief
V1.1	23-Apr-2022	Correct some mistakes

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