

# GR5525 Product Brief

Single-mode, low-power, high-performance Bluetooth 5.3 System-on-Chip (SoC) targeting at wearables and Internet of Things (IoT) applications

Based on Arm® Cortex®-M4F CPU core, the GR5525 series integrates Bluetooth 5.3 Protocol Stack, a 2.4 GHz RF transceiver, on-chip programmable Flash memory, SRAM, and a rich set of peripherals. The device can be configured as a Broadcaster, an Observer, a Central or a Peripheral, and supports the combination of all the above roles, making it an ideal choice for Internet of Things (IoT) and smart wearable devices.

GOODiX  
GR5525



## Key Features

- Up to 96 MHz Arm® Cortex®-M4F CPU
- 256 KB SRAM and up to 1 MB internal Flash
- Bluetooth LE 5.3 transceiver integrating Controller and Host layers
- TX current: 6.3 mA @ 0 dBm, 3.3 V VBAT input
- RX current: 5.3 mA @ 1 Mbps, 0 dBm, 3.3 V VBAT input
- RX sensitivity: -97 dBm @ 1 Mbps and -93 dBm @ 2 Mbps
- TX power: -20 dBm to +7 dBm
- Security: AES, HMAC, PKC, TRNG, secure boot, and secure key storage
- Up to 50 I/Os, QSPI, SPI, DSPI, I2S, I2C, UART, DMA, ADC, PDM, PWM

## Packages

GR5525 offers QFN56 and QFN68 packages to support different environmental requirements.

- QFN56: 7.0 mm x 7.0 mm, 0.4 mm pitch
- QFN68: 7.0 mm x 7.0 mm, 0.35 mm pitch

QFN56



QFN68

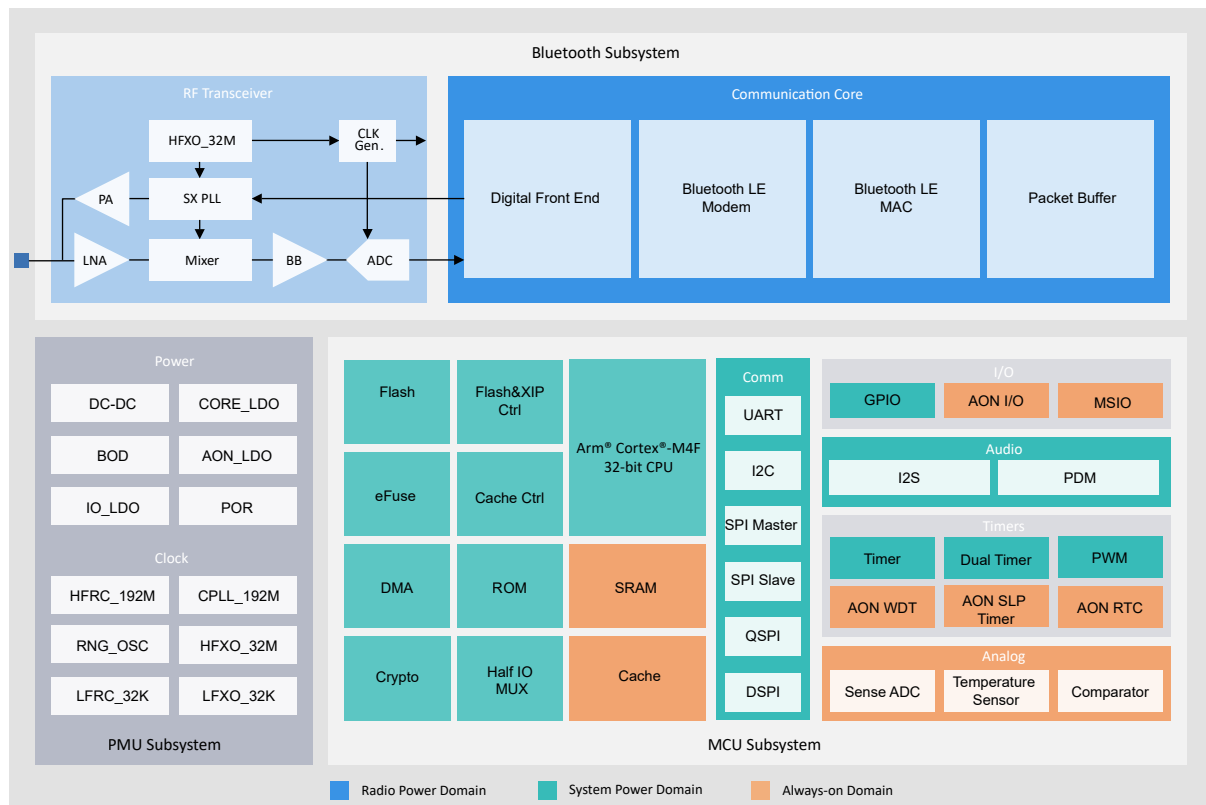


## Product Part Number

GR5525 is available in multiple packages and provides system-in-package (SiP) Flash, meeting your diverse project demands.

Part Number	CPU	RAM	SiP Flash	I/O Voltage	I/O Number	Package (mm)
GR5525RGNI	Cortex®-M4F	256 KB	1 MB	1.8 V~3.6 V	50	QFN68 (7.0 x 7.0 x 0.85)
GR5525IENI	Cortex®-M4F	256 KB	512 KB	1.8 V~3.6 V	39	QFN56 (7.0 x 7.0 x 0.75)
GR5525I0NI	Cortex®-M4F	256 KB	N/A	Follow Flash	39	QFN56 (7.0 x 7.0 x 0.75)

## Block Diagram



## Specifications

### Bluetooth LE 5.3 Transceiver

- Data rates: 1 Mbps, 2 Mbps, Long Range (500 kbps, 125 kbps)
- TX power: -20 dBm to +7 dBm
- RX sensitivity:
  - -97 dBm sensitivity @ 1 Mbps
  - -93 dBm sensitivity @ 2 Mbps
  - -101 dBm sensitivity @ LR 500 kbps
  - -103 dBm sensitivity @ LR 125 kbps
- TX current: 6.3 mA @ 0 dBm, 3.3 V VBAT input, 64 MHz
- RX current: 5.3 mA @ 1 Mbps, 3.3 V VBAT input, 64 MHz

### Arm® Cortex®-M4F 32-bit Micro-processor with Floating Point

- Up to 96 MHz clock frequency
- Built-in Memory Protection Unit (MPU) supporting eight programmable regions
- Hardware Floating Point Unit (FPU)
- Built-in Nested Vectored Interrupt Controller (NVIC)
- Non-maskable Interrupt (NMI) input
- Serial Wire Debug (SWD) with 16 breakpoints, two watchpoints, and a debug timestamp counter
- 56  $\mu$ A/MHz CoreMark running from Flash @ 3.3 V, 64 MHz from HFXO

### On-chip Memory

- 256 KB RAM data memory with retention capabilities
- 8 KB cache RAM instruction memory with retention capabilities
- Stack ROM (including boot ROM and Bluetooth LE Stack)
- 1 MB internal QSPI Flash (512 KB for GR5525IENI, and external Flash for GR5525I0NI)

### Low-power Consumption

- Ultra deep sleep mode: 5.0  $\mu$ A (Typical), with no memory data in retention and wakeup sources from SLP Timer or AON I/Os
- OFF mode: 200 nA (Typical), with system in reset mode

### Digital Peripherals

- 2 x general-purpose DMA engines with six channels and up to 16 programmable request/trigger sources

### Analog Peripherals

- 1 x 13-bit Sense ADC with sampling rate of 1 Msps, supporting up to eight external I/O channels and three internal signal channels
- Built-in die temperature and voltage sensors
- Low-power comparator, supporting wakeup from sleep mode

### Flexible Serial Peripherals

- 4 x UART modules up to 2 Mbps with flow control and IrDA features
- 4 x I2C modules for peripheral communication, up to 3.4 MHz, operating as either Master or Slave
- 1 x I2S master interface and 1 x I2S slave interface
- PDM interface with hardware sampling rate converter
- 1 x 8-bit/16-bit/32-bit SPI master interface and 1 x SPI slave interface for host communication
- 1 x Dual-lane SPI (DSPI) interface for display, with MIPI DBI Type-C support
- 3 x Quad SPI (QSPI) interfaces, up to 48 MHz; supporting direct access via memory mapping when connecting with external NOR Flash

## Specifications

### I/O Peripherals

- Up to 50 multiplexed I/O pins in total
  - Up to 34 general-purpose I/O (GPIO) pins with configurable pull-up/pull-down resistors
  - Up to eight always-on I/O (AON I/O) pins, supporting wakeup from sleep mode
  - Up to eight mixed signal I/O (MSIO) pins, configurable to be digital/analog signal interfaces

### Timers

- 2 x 32-bit general-purpose timers
- 1 x dual timer with two programmable 32-bit or 16-bit down counters
- 1 x sleep timer for waking the device up from sleep mode
- 2 x 3-channel PWMs with edge-aligned and center-aligned modes
- 2 x real-time counters (1 x Calendar, 1 x real-time counter)

### Power Management

- On-chip DC-DC to provide RF analog voltage and supply core LDO
- On-chip I/O LDO to provide I/O voltage and supply external components
- Programmable thresholds for brownout detector (BOD)
- Supply voltage: 2.4 V–3.8 V
- I/O voltage: 1.8 V–3.6 V

### Security

- Complete secure computing engine:
  - AES 128-bit/192-bit/256-bit symmetric encryption (ECB, CBC)
  - Hash-based Message Authentication Code (HMAC-SHA256)
  - Public key cryptography (PKC)
  - True random number generator (TRNG)
- Comprehensive security operation mechanism:
  - Secure boot
  - Encrypted firmware running directly from Flash
  - eFuse for encrypted key storage
  - Differentiate application data key and firmware key, supporting one data key per device/product

### Operating Temperature

- Temperature range: -40°C to +85°C

### Packages

- QFN68: 7.0 x 7.0 x 0.85 mm, 0.35 mm pitch
- QFN56: 7.0 x 7.0 x 0.75 mm, 0.4 mm pitch

## Applications

GR5525 can be used in a rich set of applications.



### Advanced Wearables

- Sport bracelet
- Smart watch

### Bluetooth HID Devices

- Voice remote control
- Keyboard/Mouse
- Gaming controller
- Stylus pen

### IoT Applications

- Smart lock and smart home
- Beacon and smart tracker
- Electronic shelf label (ESL)
- Mesh applications
- Asset tracking

## Support



We offer a wide range of online resources that are accessible anytime, anywhere at [High Performance Bluetooth Products](#).



Get answers from the most popular community [Q&A](#) and easily learn from others by [Blogs](#).



Email us for any questions or problems you might have while reading docs at [docs@reg.goodix.com](mailto:docs@reg.goodix.com).