**Qorvo**

## Product Overview

The GP501 ZigBee-ready IEEE 802.15.4 communications controller is a fully integrated transceiver solution for ultra-low power wireless communications. It is compliant with the IEEE Standard 802.15.4, providing robust spread spectrum data communication with a secure encrypted data flow.

The GP501 interference robustness and antenna diversity offer superior performance in a crowded wireless 2.4 GHz environment. In addition, the GP501 presents a Coexistence Interface to enable coexistence with other potentially interfering radios (Bluetooth, Wi-Fi) within the same host device.

The GP501 features a radio transceiver, integrated real-time Medium Access Control processor, security engine, event scheduler and advanced power management features. A high-speed SPI interface is provided for communication with the external controller. The integrated RF filtering simplifies the RF design complexity enabling very low cost single layer applications using simple PCB antennas requiring no shielding and a minimum number of external components. The embedded security engine automatically encrypts, decrypts and authenticates messages with locally stored keys, so minimizing the overhead for the controller. Advanced power management features ensure that power consumption is minimized in both active and standby states.

The combination of a GP501 with a microcontroller forms an IEEE 802.15.4 node, examples of which include a ZigBee coordinator, router or end device, or an RF4CE Target or Controller device.
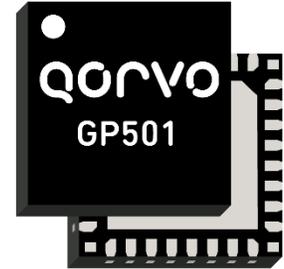
## Chip Overview
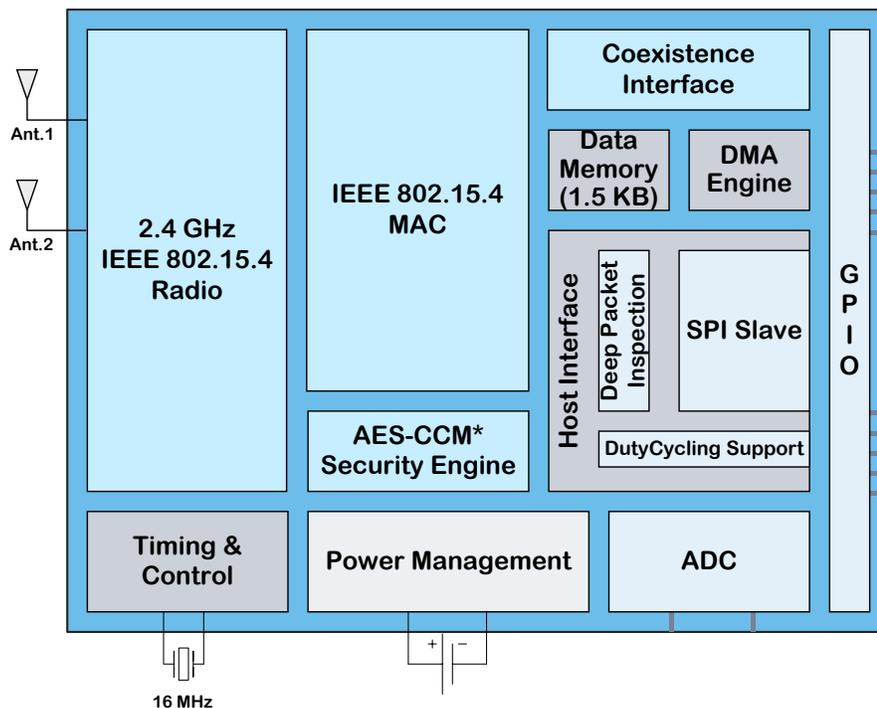
## Key Features

- IEEE 802.15.4 compliant PHY and Real-Time MAC
- Operates in the worldwide 2.4 GHz ISM-band
- Excellent range by antenna diversity: 9 dB more reliable link budget compared to single antenna
- Additional robustness by packet-in-packet resynchronization
- 30 dB better robustness to Wi-Fi Interference
- External LNA/PA signals for extended range
- Hardware accelerated AES and CCM* encryption with 128, 192 and 256-bit keys
- 1.5 Kbyte RAM for data buffering
- Advanced Energy Management, supporting intermitted energy sources and coin cell battery operation
- External Controller SPI Slave interface
- Stand-alone RF4CE DutyCycling support and RF4CE packet filtering when the host is asleep
- Coexistence Interface with other radios in the device

### Excellent Range and Reliability

The GP501 has been optimized for reliable communication in harsh radio environments. The -93 dBm receiver sensitivity allows extended coverage. Built-in antenna diversity with two antennas improves the reliable link budget by 9 dB resulting in approximately twice the reliable range compared to similar systems with only one antenna. In high density networks the packet-in-packet resynchronization further improves the communication reliability. The potential risks of interference by Wi-Fi and/or Bluetooth devices have been reduced by the combination of excellent receiver interference rejection capability and dynamic adaption of the frequency channel.

The Coexistence Interface can be used to enable coexistence of the IEEE 802.15.4 radio of the GP501 with other potentially interfering radios (Wi-Fi, Bluetooth) within the same device.

### Ultra-Low Power Consumption

The GP501 is designed for ultra-low power network applications. It supports RF4CE duty cycling and can wake up the host when a specified message has been received, with RF4CE Network layer and Profile layer Deep Packet Inspection, to allow the host to stay asleep as much as possible.

### Low Cost

The GP501 is designed to operate on PCB designs using only low cost components and printed circuit antennas. No expensive shielding, chip antennas or voltage regulators are required.

## Electrical Characteristics

| Standby Mode Currents [1] | |
|---|---|
| Reset mode | 10 nA |
| Timed, using 16 MHz crystal | 800 µA |
| Operational Currents [1] | |
| Receive | 20 mA |
| Transmit (at 0 dBm) | 21 mA |
| Supply Voltage | 2.1 to 3.6 V |
| Interfaces | |
| SPI Slave serial host interface | |
| Control for external LNA/PA | |
| Coexistence Interface with other radios | |
| Crystal Frequency | 16.000 MHz (±40 ppm) |

## Radio Characteristics

| Standards compliant | IEEE 802.15.4-2003 IEEE 802.15.4-2006 |
|---|---|
| Radio Regulations compliant | ETSI EN 300 328 FCC CFR-47 Part 15 ARIB STD-T66 |
| Frequency Band | 2400 – 2483.5 MHz |
| Channels | 16 (programmable, 5 MHz steps) |
| Modulation | IEEE 802.15.4 |
| Chip rate | 2 Mchip/s |
| Data Rate | 250 kbit/s |
| Receiver Sensitivity [1] | -93 dBm typical |
| Antenna diversity gain [2] (increases the 'effective' receiver sensitivity to -102 dBm) | 9 dB |
| Co-channel Rejection | > -2.5 dB |
| Adjacent Channel Rejection | > 30 dB |
| Alt. Adjacent Channel Rejection | > 45 dB |
| Wi-Fi IEEE 802.11g Rejection[3] | > 27 dB |
| Bluetooth Rejection[4] | > 27 dB |
| Transmit Power | +3 dBm (adjustable down in 1 dB steps) |
| Radio Management | Antenna Diversity Digital RSSI Link Quality Indication |

## General Characteristics

| | |
|---|---|
| Package | QFN32, 5x5 mm |
| Operating Temperature | -40 to +85 °C (industrial) |
| Storage Temperature | -50 to +150 °C |
| Soldering Temperature | 260 °C (10 s max) |
| Compliance | RoHS |

1) Typical, at 3.0 V and 25 °C, unless specified otherwise.
2) For typical indoor usage in an environment with 50 ns delay spread and 2 MHz signal bandwidth using the Rayleigh fading model: antenna diversity with 2 antennas results in a 9 dB improved link budget at a 1% outage probability compared to no antenna diversity. The 9 dB in link budget translates into 70% more range, if using a two slope range model with the breakpoint at 10 m and g1 = 2, g2 = 3.5.
3) At +12 MHz and -13 MHz.
4) At +4 MHz and -4 MHz.

## Reference Designs, Tools and SW

Qorvo reference designs, development kits, software libraries and production platforms provide a quick time-to-market solution for sensor and control devices for Smart Home networks and for RF4CE/BLE Remote Control products.

## Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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## Important Notice