QORVO

QPG6105
Multi-Standard Smart Home Communications Controller
Product Brief

The QPG6105 is a multi-standard Smart Home communications controller supporting Zigbee, Thread, Matter, Bluetooth® Low Energy and Bluetooth® Mesh, enabling greater interoperability and scalability.
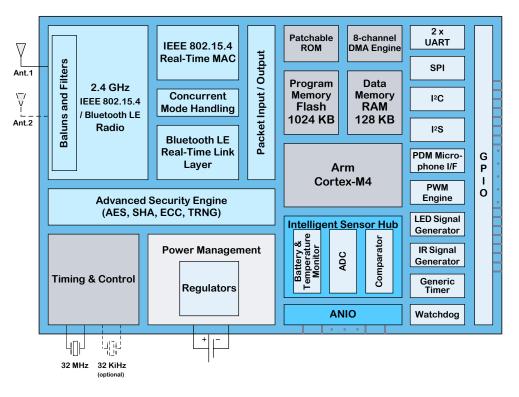
It features ConcurrentConnect™ technology enabling multiple protocols to operate simultaneously, delivering improved capacity and enhanced interoperability with the leading low power standards.

Qorvo's turn-key development kits include complete software applications and hardware designs; enabling quick development of new Connected Lighting and Smart Home products.

- **ConcurrentConnect™ Multi-Radio capability allows concurrent listening by continuously scanning for incoming packets across Bluetooth Low Energy and IEEE 802.15.4 protocols with no observable blind spots**
- **Simplify Gateway dependencies by bridging Zigbee, Thread and/or Bluetooth Low Energy Mesh networks**
- **Enhanced security capabilities enable highly secure solution with built in support for secure boot, secure OTA software upgrade and secure identity**
- **Patented ConcurrentConnect™ Antenna Diversity enables increased effective range**
- **ConcurrentConnect™ Multi-Channel capability allows operating in up to 3 PANs on different channels**
- **Optimized connected lighting design BOM, reducing the number of components and PCBs in the design**
- **Designed for low power IoT end node applications such as:**
  - **Connected Lighting**
  - **Sensors**
  - **Smart Plugs**
  - **Thermostats**
  - **Wearables**

Key Features

- Operates in the worldwide 2.4 GHz ISM-band
- Integrated baluns and RF filters
- IEEE 802.15.4 compliant PHY and Real-Time MAC
  - Preamble-based ConcurrentConnect Antenna Diversity
  - Packet-in-Packet resynchronization
  - ConcurrentConnect Multi-Channel capability, operating in up to 3 PANs on different channels
- Bluetooth v 5.3 compliant Low Energy Controller
  - Enhanced Data Rate (2 Mbit/s)
  - Link Layer Privacy
  - Advertising Extensions
  - Full connection utilization
- Multi-Stack Support
  - Multiple IEEE 802.15.4 based stacks MAC API
  - Bluetooth Low Energy HCI
- Dynamic Multi-Protocol
  - Hardware accelerated Dynamic Multi-Protocol Bluetooth Low Energy and IEEE 802.15.4 communications
  - → Allows combining Bluetooth Low Energy Peripheral with any type of Zigbee/Matter-over-Thread device
- ConcurrentConnect Multi-Radio capability
  - Concurrent IEEE 802.15.4 and Bluetooth listening
  - → Allows combining Bluetooth Low Energy Central/Observer or Mesh Node with Zigbee/Matter-over-Thread router
- Arm Cortex-M4 processor with DSP functionality, executing code from Flash or RAM at up to 64 MHz clock speed.
- 1 Mbyte Flash Program memory; patchable ROM containing Security Primitives, Bluetooth LE controller and 802.15.4 MAC software, significantly reducing the Flash memory footprint of a typical application
- 128 Kbyte Low Leakage Retention RAM
- Advanced Security Engine
  - Hardware accelerated AES and CCM* encryption with 128, 192 and 256-bit keys
  - Hashing engine: SHA-128, SHA-2 (SHA-256, SHA-512)
  - Public Key Crypto
    - Elliptic Curve; support for ECDSA, ECDH, P256, Curve25519, J-Pake, ECMQV, EdDSA, etc.
  - Cryptographic Random Number Generator
- Built in support for secure boot from ROM, secure OTA software upgrades and secure identity
- Fast and low-power analog measurements

Excellent Range and Reliability

The QPG6105 has been optimized for reliable communication in harsh radio environments. Built-in IEEE 802.15.4 antenna diversity with two antennas improves the reliable link budget by 8 dB resulting in approximately 70% more reliable range compared to similar systems with only one antenna. In high density networks the packet-in-packet resynchronization further improves the communication reliability.

Ultra-Low Power Consumption

The QPG6105's advanced integrated energy management system allows it to operate from a standard lithium coin cell battery, with a minimum of additional components. It includes ultra-low power voltage level detectors and overvoltage protection circuitry, allowing safe operation and graceful shutdown. The built-in battery monitor provides an easy-to-use interface to measure the power supply and remaining capacity of the battery. The intelligent sensor hub allows for quick and low power measurements during standby.

Electrical Characteristics

Standby Mode Currents [1]	
Using internal LjRC oscillator	0.9 µA
Using 32 KiHz crystal oscillator (optional)	1.6 µA
Using 32 MHz crystal oscillator	765 µA
Operational Currents [1]	
Receive IEEE 802.15.4, single antenna	5.6 mA
Receive IEEE 802.15.4, antenna diversity	7.4 mA
Receive Bluetooth (1 Mbit/s)	10.4 mA
Transmit (at 0 dBm)	16.7 mA
Transmit (at 7 dBm, low power mode)	26.4 mA
Transmit (at 10 dBm)	38.8 mA
Supply Voltage	1.8 to 3.6 V
Interfaces and Peripherals	
Programmable GPIO lines	up to 23
Analog input lines	up to 4
LED Signal Generator; 8-bit PWM with fading support	4 outputs
16-bit PWM engine	8 outputs
UART interfaces	2
SPI and I²C Master and Slave peripheral interfaces	
I²S Master/Slave interface for digital audio devices	
PDM Microphone interface	
IR Signal Generator	
10/12-bit ADC to monitor the analog input lines, the power supply level and the temperature	
Low power comparator	
High speed programming interface	
Crystal Frequency	32.000 MHz (±40 ppm)
Optional	32.768 kHz

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General Characteristics

Package	QFN32, 4x4 mm (0.4 mm pitch)
Operating Temperature	-40 to +125 °C
Storage Temperature	-50 to +150 °C
Soldering Temperature	260 °C (10 s max)
Compliance	RoHS

Radio Characteristics

Radio Regulations compliant	ETSI EN 300 328 FCC CFR-47 Part 15 ARIB STD-T66
Transmit Power	(adjustable down in 1 dB steps)
Low power mode	+7 dBm
High power mode	+10 dBm

IEEE 802.15.4 Radio Characteristics

Standards compliant	IEEE 802.15.4-2015
Frequency Band	2400 – 2483.5 MHz
Channels	16 (programmable, 5 MHz steps)
Data Rate	250 kbit/s
Receiver Sensitivity [1]	-101 dBm typical
Antenna diversity gain [2] (increases the 'effective' receiver sensitivity to -109 dBm)	8 dB

Bluetooth Low Energy Radio Characteristics

Standards compliant	Bluetooth Core Specification v 5.3, Low Energy
Frequency Band	2402 – 2480 MHz
Channels	40 (2 MHz step size)
Data Rate	1 Mbit/s, 2 Mbit/s
Receiver Sensitivity [1]	
2 Mbit/s	-94.5 dBm typical
1 Mbit/s	-97 dBm typical

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 8 dB improved link budget at a 1% outage probability compared to no antenna diversity. The 8 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.

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 other IEEE 802.15.4 / Bluetooth Low Energy communication products.

Contact Information

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

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Important Notice