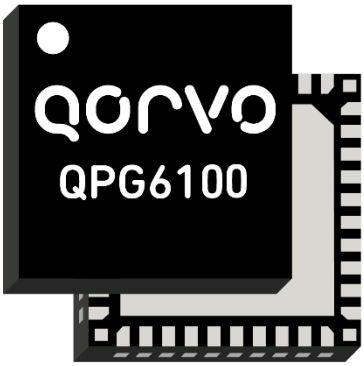
QPG6100

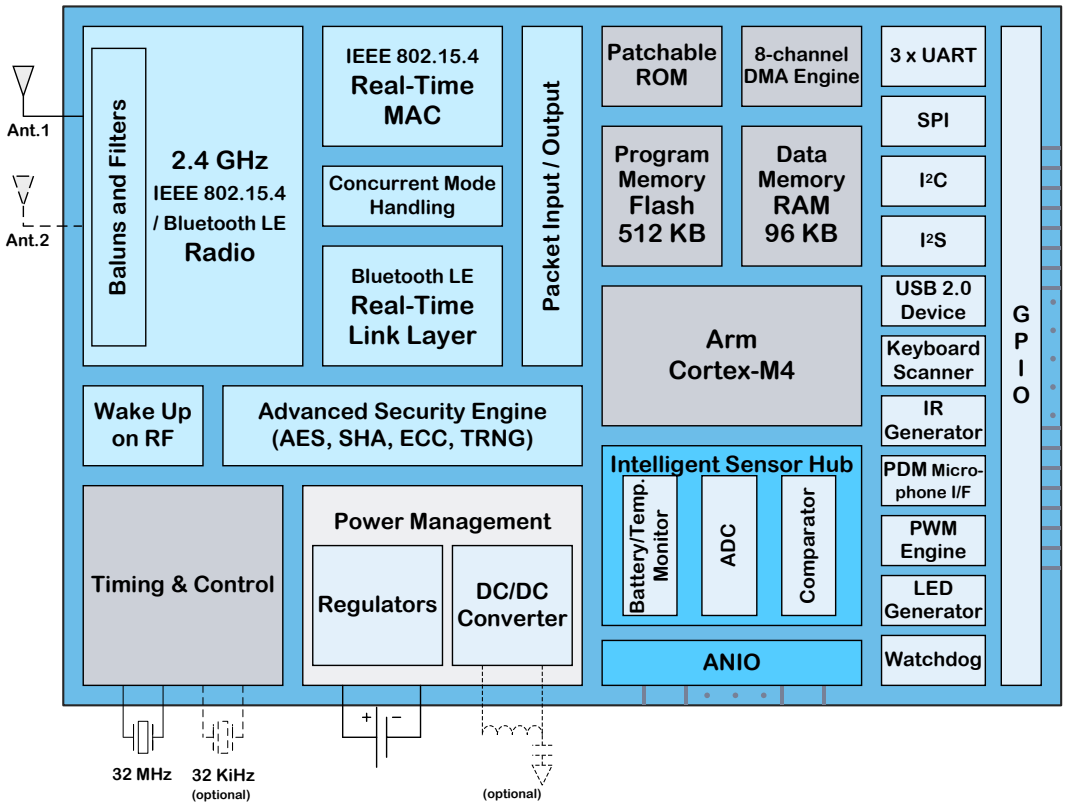
Zigbee / Thread / Bluetooth® Low Energy Smart Home Communications Controller

Product Brief

The QPG6100 is a multi-standard Smart Home Communications Controller featuring Dynamic Multi-Protocol and ConcurrentConnect™ technology. This enables Zigbee, Thread and Bluetooth® Low Energy to operate simultaneously in a single chip design.



- Dynamic Multi-Protocol and ConcurrentConnect™ technology allows concurrent listening and instantaneous switching between Bluetooth Low Energy and IEEE 802.15.4 protocols with no observable blind spots
- Simplify Gateway dependencies by bridging Zigbee, Thread and Bluetooth Low Energy Mesh networks
- Enhanced security capabilities ensure inherent highly secure smart home solution with built in support for secure boot and OTA software upgrade
- Simple and compact solution requires minimal board space
- Patented IEEE 802.15.4 antenna diversity scheme enables increased effective range
- Designed for low power IoT end node applications such as:
  - Connected Lighting
  - Sensors
  - Smart Plugs
  - Thermostats
  - Smart Meters



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Key Features

- Operates in the worldwide 2.4 GHz ISM-band
- Integrated baluns and RF filters
- Support for external LNA and/or PA
- IEEE 802.15.4 compliant PHY and Real-Time MAC
  - Preamble-based antenna diversity
  - Packet-in-Packet resynchronization
  - Multi-Stack / Multi-Channel support, operating in up to 3 PANs on different channels
- Bluetooth v 5.1 compliant Low Energy Controller
  - High Data Rate (2 Mbits/s)
  - Long Range Coded PHY
  - Link layer security
  - Advertising extensions
  - Mesh
  - Support for Angle of Arrival and Angle of Departure
- **ConcurrentConnect technology**
  - Concurrent IEEE 802.15.4 and Bluetooth listening
  - Allows combining Bluetooth Low Energy Central/Observer or Mesh Node with Zigbee/Thread router
- 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
  - Support for Physical Unclonable Function (PUF)
- Arm® Cortex®-M4 processor with DSP functionality, executing code from Flash or RAM at up to 64 MHz clock speed.
- 512 Kbyte Flash Program memory; patchable ROM
- 96 Kbyte Low Leakage Retention RAM
- Full internal IO pull-up / pull-down support during active and standby states
- Fast and low-power analog measurements
- Wake Up on RF pattern

Excellent Range and Reliability

The QPG6100 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 QPG6100'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 battery lifetime monitor tracks the usage of the battery and provides an early exhaustion warning. The intelligent sensor hub allows for quick and low power measurements during standby. The integrated DC/DC Buck converter can be used to further lower the power consumption in active mode, at the cost of two external components.

General Characteristics

Package	QFN40, 6x6 mm
Operating Temperature	-40 to +125 °C
Storage Temperature	-50 to +150 °C
Soldering Temperature	260 °C (10 s max)
Compliance	RoHS

Electrical Characteristics

Standby Mode Currents [1]	
Using internal LjRC oscillator	0.9 µA
Using 32KiHz crystal oscillator (optional)	1.5 µA
Using 32MHz crystal oscillator	850 µA
Operational Currents [1] (with / without DC/DC Converter)	
Receive IEEE 802.15.4, single antenna	3.9 / 5.5 mA
Receive IEEE 802.15.4, antenna diversity	5.0 / 7.2 mA
Receive Bluetooth (1 Mbit/s)	7 / 10.2 mA
Transmit (at 0 dBm)	11.1 / 16.8 mA
Transmit (at 7 dBm, low power mode)	18.8 / 27.1 mA
Transmit (at 10 dBm)	24 / 37 mA
Supply Voltage	1.8 to 3.6 V
Interfaces and Peripherals	
Programmable GPIO lines	up to 31
Analog input lines	up to 6
Keyboard (HW assisted)	max 8 x 8
8-bit PWM with fading support	4 outputs
16-bit PWM engine	8 outputs
UART interfaces	3 (one for SW debug)
SPI and I^2C Master and Slave peripheral interfaces	
I^2S Master/Slave interface for digital audio devices	
USB 2.0 Device interface	
PDM Microphone interface	
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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Radio Characteristics

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

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]	8 dB (increases the 'effective' receiver sensitivity to -110 dBm)

Bluetooth Low Energy Radio Characteristics

Standards compliant	Bluetooth Core Specification v 5.1, Low Energy
Frequency Band	2402 – 2480 MHz
Channels	40 (2 MHz step size)
Data Rate	125 kbit/s, 500 kbit/s, 1 Mbit/s, 2 Mbit/s
Receiver Sensitivity [1]	(typical)
2 Mbit/s	-95 dBm
1 Mbit/s	-98 dBm
500 kbit/s	-101 dBm
125 kbit/s	-105 dBm

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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