GP565

## RF4CE Communications Controller for Remote Control
Product Brief

Product Overview

The GP565 System-on-Chip provides a fully integrated solution for a Remote Control operating according to a standard or vendor-specific RF4CE profile using 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. Its antenna diversity offers additional robustness in a crowded wireless 2.4 GHz environment.

The GP565 features a radio transceiver, integrated real-time Medium Access Control processor, integrated microcontroller, RAM and Flash memory, security engine, event scheduler, and an extensive set of peripherals including a keyboard scanner and an IR signal generator. 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.

Advanced power management features ensure that power consumption is minimized in active as well as in standby states, enabling maintenance free and very small form factor products.

The internal microcontroller of the GP565 can drive the RF remote control interface, including dual mode operation with IR remote control, and can communicate with external devices via SPI, I^{2}C and UART interfaces.
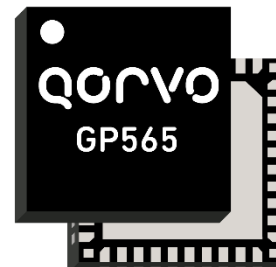
Chip Overview
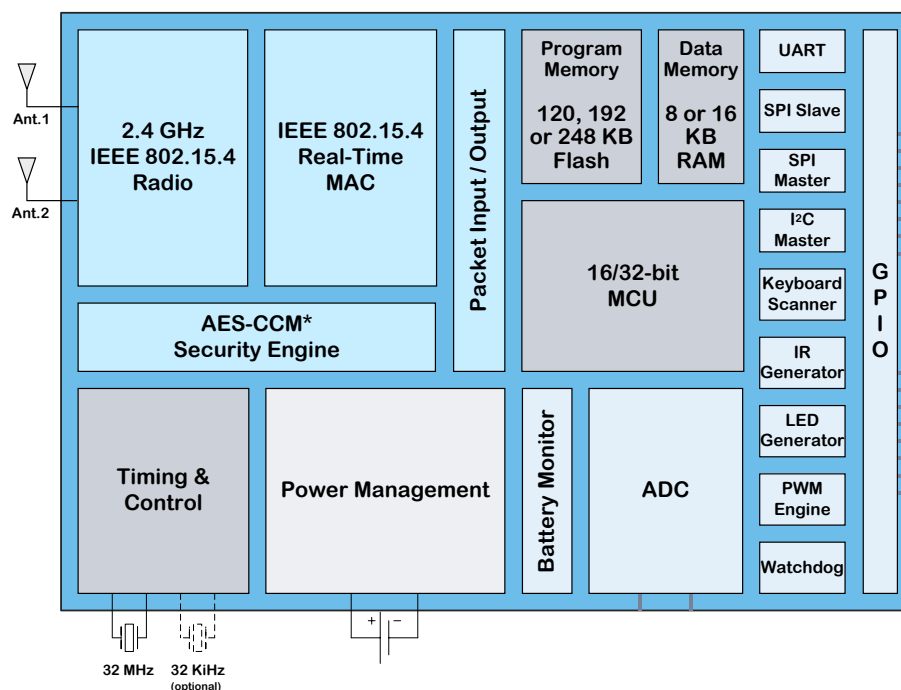
Key Features

- IEEE 802.15.4 compliant PHY and Real-Time MAC
- Operates in the worldwide 2.4 GHz ISM-band
- Excellent range by antenna diversity: 8 dB more reliable link budget compared to single antenna
- Additional robustness by packet-in-packet resynchronization
- Hardware accelerated AES and CCM* encryption with 128, 192 and 256-bit keys
- XAP5™ 16/32-bits high performance microcontroller
- 120 or 192 or 248 Kbyte Flash Program memory
- 8 or 16 Kbyte Low Leakage Retention RAM
- Integrated ZigBee RF4CE Network layer
- Integrated standard or vendor-specific RF4CE Profile for controller node
- Extremely low standby power consumption
- Supporting intermitted energy sources and coin cell batteries
- 4 LED generator with individual PWM support
- Full internal IO pull-up / pull-down support during active and standby states

Low Cost

The GP565 is designed to operate on very low cost, single layer, paper phenol like PCB material using only low cost components and printed circuit antennas. No expensive shielding, chip antennas or voltage regulators are required to design a high performance Remote Control application. The integrated microcontroller and program memory allow for fully integrated, single chip applications and the integrated Real-Time MAC greatly reduces software complexity and improves stability.

Excellent Range and Reliability

The GP565 has been optimized for reliable communication in harsh radio environments. The -96 dBm receiver sensitivity allows extended coverage. Built-in antenna diversity with two antennas improves the reliable link budget by 8 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.

Ultra-Low Power Consumption

The GP565's advanced integrated energy management system allows it to operate from a standard lithium coin cell battery, like the CR2032, as well as from intermittent power supplies like photovoltaic (solar) and electro-mechanical, 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.

Electrical Characteristics

Standby Mode Currents [1]	
Using internal RC oscillator	1 µA
Using crystal oscillator	720 µA
Operational Currents [1]	
Receive	12.5 mA
Transmit (at 0 dBm)	18 mA
Transmit (at 7 dBm)	29 mA
Supply Voltage	1.8 to 3.6 V
Interfaces and Peripherals	
Programmable GPIO lines	22
Analog input lines	2
Keyboard (HW assisted)	max 8 x 8
20 mA output drive GPIO (for IR)	1
8-bit PWM with fading support (for LED)	4 outputs
16-bit PWM engine	4 outputs
SPI Master and I²C Master peripheral interfaces	
SPI Slave interface	
UART interface	
ADC to monitor the analog input lines and the power supply level	
High speed programming interface	
Crystal Frequency	32.000 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]	-96 dBm typical
Antenna diversity gain [2] (increases the 'effective' receiver sensitivity to -104 dBm)	8 dB
Transmit Power	+7 dBm (adjustable down in 1 dB steps)
Radio Management	Antenna Diversity Digital RSSI Link Quality Indication

General Characteristics

Package	QFN40, 6x6 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 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 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