



Wavecom Wismo Quik Q2438F Module

Function of RF Active Device:

1.0 Transmitter

1.1 RFT6100

The RFT6100 is a Baseband-to-RF transmitter IC, an integral component of QUALCOMM's radioOne Zero-IF chipset. It provides the Zero-IF transmitter signal path, from analog baseband to RF driver amplifiers, for multi-band multi-mode handsets including combinations of the following:

- Bands:
 - Cellular bands
 - PCS bands
- Modes:
 - AMPS-FM
 - CDMA (known as IS-95, cdmaOne, IS-98, cdma2000, 1x, 1x EV-DO, etc.)

Numerous secondary functions are integrated on-chip as well: the signal reference for the transmit DACs, two phase-locked loop circuits (Tx LO and Rx LO), the Tx VCO circuit, Tx LO generation and distribution circuits, and various interface, control, and status circuits. The RFT6100 IC interfaces with one of QUALCOMM's Mobile Station Modem (MSM6050) devices for its analog baseband inputs as well as status and control signaling. Power reduction features controlled by the MSM (such as selective circuit power-down, gain control, and transmit puncturing) extend handset talk-time. Sophisticated Tx LO circuits provide frequency plan flexibility and are completely implemented on-chip except for the loop filter (two resistors and two capacitors). The RFT6100 integrates the Rx PLL as well (compatible with the RFR6000 receiver IC), fulfilling all handset PLL requirements without an additional PLL IC. Most transmit LO signals are generated using on-chip VCO circuits – only one Rx VCO is needed off-chip to support all receiver bands. The device is designed to operate with 2.7 to 3.0 Volt power supplies. The RFT6100 IC is available in the 40-pin bump chip carrier (40 BCCP) package that includes a large center ground slug for improved RF grounding, mechanical strength, and thermal continuity.

1.2 Power Amplifier

The Power Amplifier Module (PAM) is a fully matched 10-pin surface mount module developed in cellular band and PCS band. It amplifies the transmitter signal from RFT6100 to meet the stringent spectral linearity requirements of Code Division Multiple Access (CDMA) transmission, with high power added efficiency for power output of up to 28 dBm. A low current (VCONT) pin is provided to improve efficiency for the low RF power range of operation. The single Gallium Arsenide (GaAs) Microwave Monolithic Integrated Circuit (MMIC) contains all active circuitry in the module. The MMIC contains on-board bias circuitry, as well as input and interstage matching circuits. The output match is realized off-chip within the module package to optimize efficiency and power performance into a 50 Ω load. Primary bias to the PAM is supplied in the 3 to 4 volt range. Power down is accomplished by setting the voltage on the low current reference pin to zero volts. No external supply side switch is needed as typical "off" leakage is a few microamperes with full primary voltage supplied from the battery.

2.0 Receiver

2.1 RFL6000

The RFL6000 is a dual LNA IC, an integral component of QUALCOMM's radioOne Zero-IF chipset. It includes two LNA circuits, one optimized for the Cellular band and one for PCS. The LNAs are separated from all other receive functions contained within the RFR6000 receiver IC to improve mixer LO to RF isolation – a critical parameter in the Zero-IF architecture. Isolation is further improved using high reverse isolation circuits in the LNA designs. The RFL6000 is a multi-band multi-mode IC:

- Bands
 - Cellular bands
 - PCS bands
- Modes
 - AMPS-FM
 - CDMA (known as IS-95, cdmaOne, IS-98, cdma2000, 1xEVDO)

The two LNAs are dedicated to different frequency bands; the CLNA supports Cellular bands while the PLNA supports PCS bands. The PLNA gain is always controlled via the Serial Bus Interface (SBI) with three valid settings: Max, Mid, and Low. Three CLNA gain states are also controlled via the SBI for CDMA signal reception, but only two gain states are available for FM operation (Max and Low). When operating in the Cellular-FM mode, the CLNA gain is controlled by a dedicated MSM signal applied to pin 6 (FM_STEP) rather than the SBI. The IC operating mode and LNA bias currents are automatically adjusted via software to minimize DC power consumption. The IC is placed in Sleep, Rx, and Rx/Tx modes depending upon the handset's status, with LNA bias current also adjusted to meet RF performance requirements with minimal power dissipation when active. The device is fabricated using a SiGe BiCMOS process ideally suited for high-performance RF circuits and digital I/O functions. All analog/RF functions operate off a common supply voltage (VDDA), with the digital I/O circuits operating off a separate supply (VDDM). VDDM is connected to the MSM_PAD voltage to assure compatibility across the digital interface and prevent latch-up conditions. The RFL6000 IC is packaged in a very small 16-pin bump chip carrier (16 BCCP) that includes a center slug for soldering directly to PCB ground. This provides excellent RF grounding, mechanical strength, and a solid thermal path.

2.2 RFR6000

The RFR6000 is an RF-to-Baseband receiver IC, an integral component of QUALCOMM's radioOne Zero-IF chipset. It provides the Zero-IF receiver signal path, from RF to analog baseband, for multi-band, multi-mode handsets including combinations of the following:

- Bands
 - Cellular bands
 - PCS bands
 - GPS band
- Modes
 - AMPS-FM
 - CDMA (known as IS-95, cdmaOne, IS-98, cdma2000, 1x EV-DO)
 - gpsOne

Numerous secondary functions are integrated on-chip as well: the Rx LO generation and distribution circuits; the GPS VCO circuit; and various interface, control, and status circuits. The RFR6000 IC accepts as many as three inputs from the handset RF front-end design (PCS, Cellular, and GPS). The analog baseband outputs interface with one of QUALCOMM's Mobile Station Modem (MSM6050) devices that also provide status and control signaling. Power reduction features controlled by the MSM (such as selective circuit power-down, gain control, and bias control) extend handset standby time. Integrated Rx LO circuits, ideally supplemented by the RFT6100 transmitter IC, provide frequency plan flexibility and further reduce PCB parts count. The device is fabricated using an advanced SiGe BiCMOS process that accommodates high-frequency, high-precision analog circuits as well as low-power CMOS functions and is designed to operate with 2.7 to 3.0 volt power supplies. The RFR6000 IC is available in the 40-pin bump chip carrier (40 BCCP) package that includes a large center ground slug for improved RF grounding, mechanical strength, and thermal continuity.

3.0 Synthesizer

Most of the PLL and VCO is integrated in RFT6100 and RFR6000. There is only RX VCO required external. The Rx VCO is a key component. Its performance directly impacts receiver performance.

The other external active device in Synthesizer circuit tree is Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO). It provides the frequency reference input to the RFT6100 PLLs. Its performance directly impacts PLL and handset-level performance.