

## 2G/3G Operation Description

Model:

Band: GSM850,GSM900,DCS1800,PCS1900,WCDMA 850,WCDMA1900

### 1. Scope

This document shows and provides the basic information about the platform we used. The more detail information about RF section are also included.

X3 product is new phone designed by GFIVE. The baseband circuit is based on Broadcom BCM23550 and RF circuit is included Transceiver named Broadcom BCM2093, Blacksand PA and RFMD PA. It works at six bands, GSM850, GSM900, DCS1800, PCS1900, WCDMA 850, WCDMA1900

### 2. Platform

BCM23550 is based on RF band support WCDMA+GSM and support LPDDR2 and NAND flash device.

- Baseband functions, including multiple hardware cores.
- Single platform that provides dedicated support for all market leading codecs and other multimedia formats to support carrier deployments around the world.
- High-quality digital still image camera performance with up to 8-megapixel resolution.
- HS-USB core with built-in PHY eliminates additional USB components.
- DC power reduction using innovative technique.

### 3. Transceiver BCM2093

- radioOne RF transceiver functions (Rx and Tx, both eliminating their intermediate frequency components).
- WCDMA (HSDPA 21M, HSUPA 5.8M) and GSM (Rel'99, GPRS).
- Wireless connectivity and analog functions-Bluetooth 4.0, FM radio.
- RF transmitters: The transmitter is based on a direct upconversion architecture that enables the use of low cost multiband, multimode power amplifier (PAS) for WCDMA transmission. GSM modulation is applied through the TX PLL using the direct modulation approach. Because of its low noise design, the transmitter is able to operate without filtering in 2G and 3G modes. It is also able to operate in power class 4 for GSM850/900, power class 1 for DCS1800/PCS1900, and class 3 for WCDMA.
- RF receivers: supports GSM850, GSM900, DCS1800, PCS1900, WCDMA850, WCDMA1900 operation with primary receiver path, using a differential configuration to maximize common-mode rejection, Tx isolation, out-of-band suppression, and second-order intermodulation performance. There are five quadrature downconverters and digital baseband interfaces to the BCM23550 device.

### 4. PA

#### GSM

RF3237 is a Multi-State non-Linear GPRS PAM designed for use with the Broadcom BCM2093 solutions and compact form factor for quad-band cellular handsets comprising GSM850/900, DCS1800, and PCS1900 operation.

**Table 2. Recommended Operating Conditions**

Parameter	Minimum	Nominal	Maximum	Unit
Supply Voltage	3	3.6	4.5	V
Logic control “High”	1.5			V
Logic control “Low”			0.5	V
Input RF Power	1		6	dBm
Operating Temperature	-20	+25	+80	°C

**Module Control and Antenna Switch Logic**

TX Module Mode	TX Enable	Mode	BS2	BS1
Off	0	0	0	0
WTRx2	0	0	0	1
WTRx3	0	0	1	0
WTRx5	0	1	0	1
WTRx6	0	1	0	0
Low Band GMSK	1	0	0	1
High Band GMSK	1	0	1	0

**WCDMA**

Blacksand BST3402/BST3405 supports multimode application UMTS Band2/Band5 and meets stringent linearity requirements up to 28.25dBm output power for UMTS Rel’99.The PA contains internal DC blocking capacitors for RF input and output ports.The BST3402/BST3405 supports 3 power modes-active low power,mid power and high power modes.A directional coupler is integrated into the module and both coupling and isolation ports are available externally,supporting daisy chain.The BST3402/BST3405 has intergrated on-chip Vre on-module bias switch ,so an external constant voltage source is not required.All of the digital control inputs pins such as the EN,M1 and M2 are fully CMOS compatible.The power amplifier is manufactured on an advanced CMOS technology.

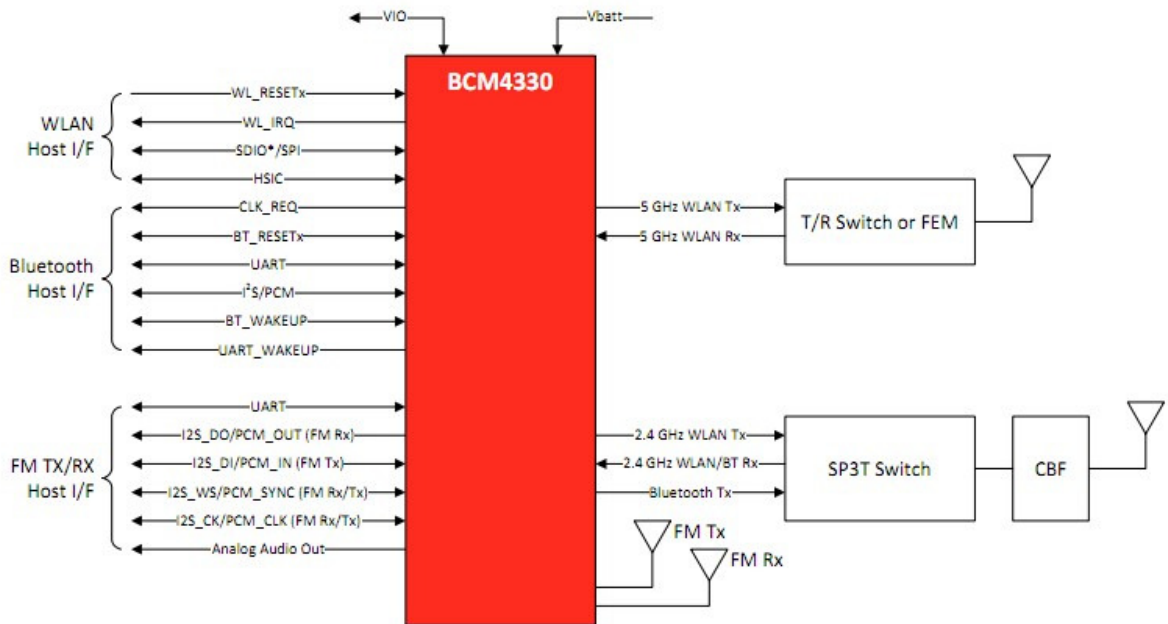
**TABLE 1. Absolute Minimum and Maximum Ratings\***

Specification	Symbol	Min	Typ	Max	Units
Supply voltage (no RF input)	$V_{BAT}$			5.0	V
Input/Output pins	$V_{IO}$	-0.5		3.5	V
RF input power	$P_{IN}$			+10	dBm
Operating temperature (case temperature at ground pad)	$T_{CMAX}$	-40		+110	°C
Storage temperature (ambient)	$T_A$	-55		+150	°C

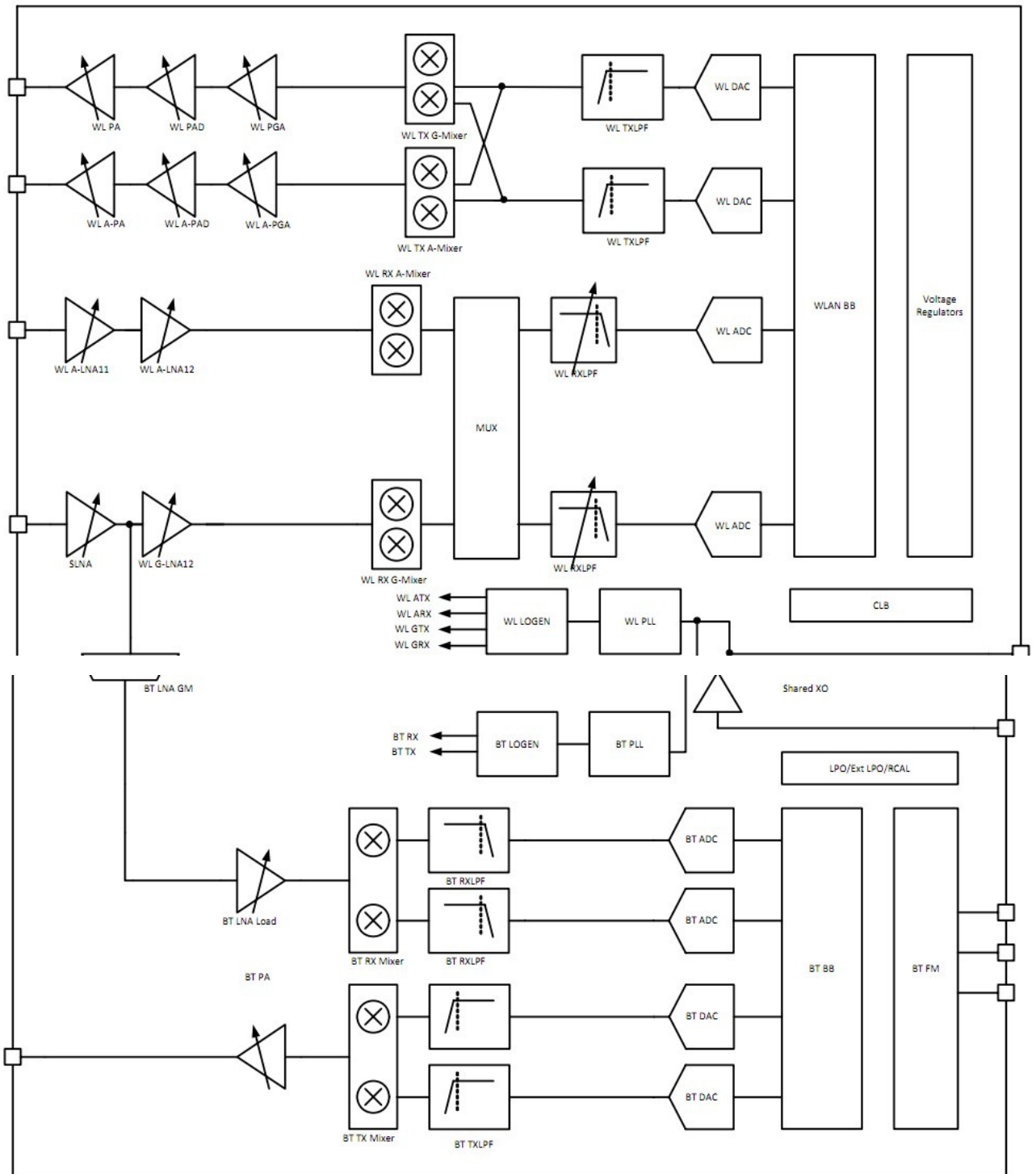
**TABLE 2. Mode Control**

Specification		Logic	Min	Typ	Max	Units
Power Down (PD)	EN	0	0.0		0.5	V
	M1	X	-		-	-
	M2	X	-		-	-
High Power Mode (HPM) ( $P_{OUT} \leq 27.5\text{dBm}$ )	EN	1	1.4		3.3	V
	M1	0	0.0		0.5	V
	M2	0	0.0		0.5	V
Medium Power Mode (MPM) ( $P_{OUT} \leq 19\text{dBm}$ )	EN	1	1.4		3.3	V
	M1	1	1.4		3.3	V
	M2	0	0.0		0.5	V
Low Power Mode (LPM) ( $P_{OUT} \leq 8\text{dBm}$ )	EN	1	1.4		3.3	V
	M1	1	1.4		3.3	V
	M2	1	1.4		3.3	V

**WIFI/BT operation block**



The WIFI device and Bluetooth solution receives digital clock from Transceiver BCM2093. One Buck regulator, four LDO regulators, and a Power Management Unit (PMU) are integrated into the BCM4330. All regulators are programmable via the PMU. These blocks simplify power supply design for Bluetooth, WLAN, and FM functions in embedded designs. A single host power supply can be used (including VBATT ranging from 2.3V to 4.8V) with all additional voltages being provided by the regulators in the BCM4330. The WIFI device has a SDIO lines which is intended to connect to host processor and the Transceiver Bluetooth solution is intended to host processor via UART bus on the Transceiver itself. The coexistence between WIFI and Transceiver Bluetooth is linked through the controlled GPIO named the BT active, the BT status and WLAN active.



The WIFI device and the BT module on the transceiver itself have the similar Tx/Rx functional hardware. For example, the receive is comprised of an LNA, a direct conversion mixer, and a baseband programmable gain filter. This receiver is implemented using the direct conversion topology. The mixer down converts the signal to baseband in-phase and quadrature-phase signals. The I/Q signals are low-pass filtered and amplified by the baseband programmable gain filter controlled by digital logic. The baseband I/Q signals are sent to the ADC.

The transmitter is comprised of a programmable reconstruction filter, a direct conversion

mixer, a preamplifier and a PA. This transmitter is implemented using the direct conversion topology. The transmit output power is adjusted by a digitally programmable control loop at the start of each packet and the Tx signal is amplified by the PA to the sky.