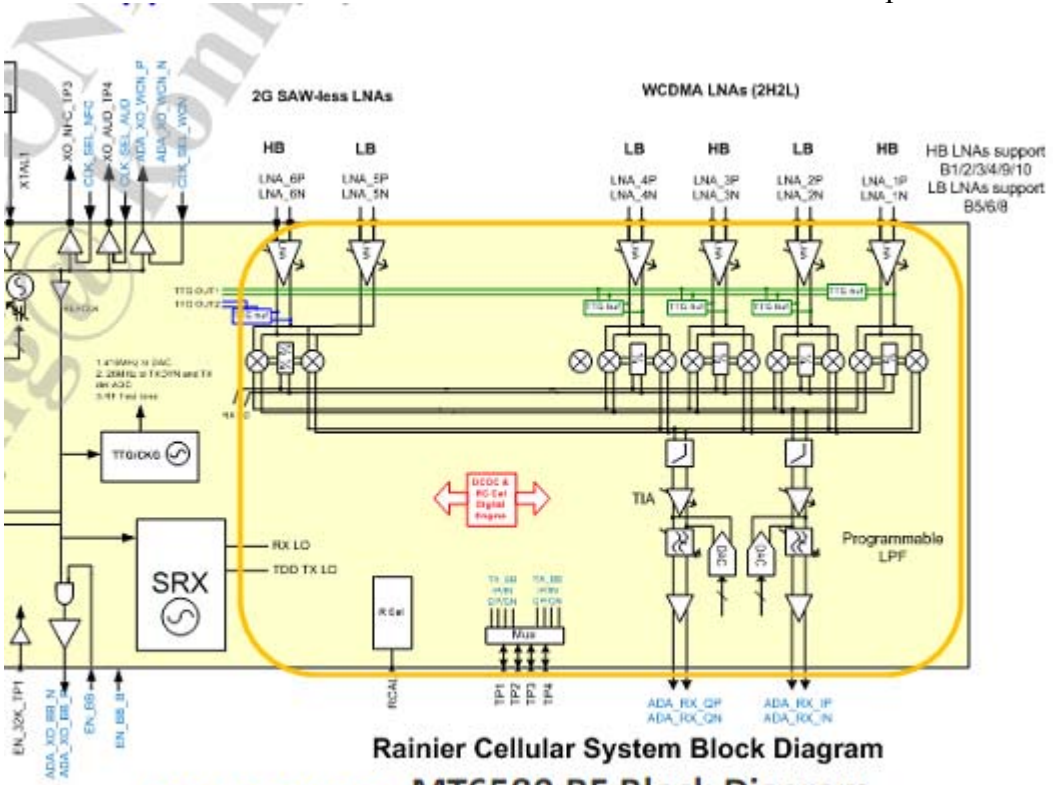
一、 Receiver operation

The frequency ranges of the synthesizer for RX mode are

RX mode EGSM 925M-960M
GSM850 864M-894M
DCS 1805M-1880M
PCS 1930M-1990M
WCDMA BAND4 1710M-1755M
WCDMA BAND2 1930M-1990M
WCDMA BAND5 869M-894M

Note: GSM 900 and DCS 1800 are not used in USA. the dual-sim is passive



Rainier Cellular System Block Diagram

MT6580 RF Block Diagram

RX (2G/3G): LIF/DCR

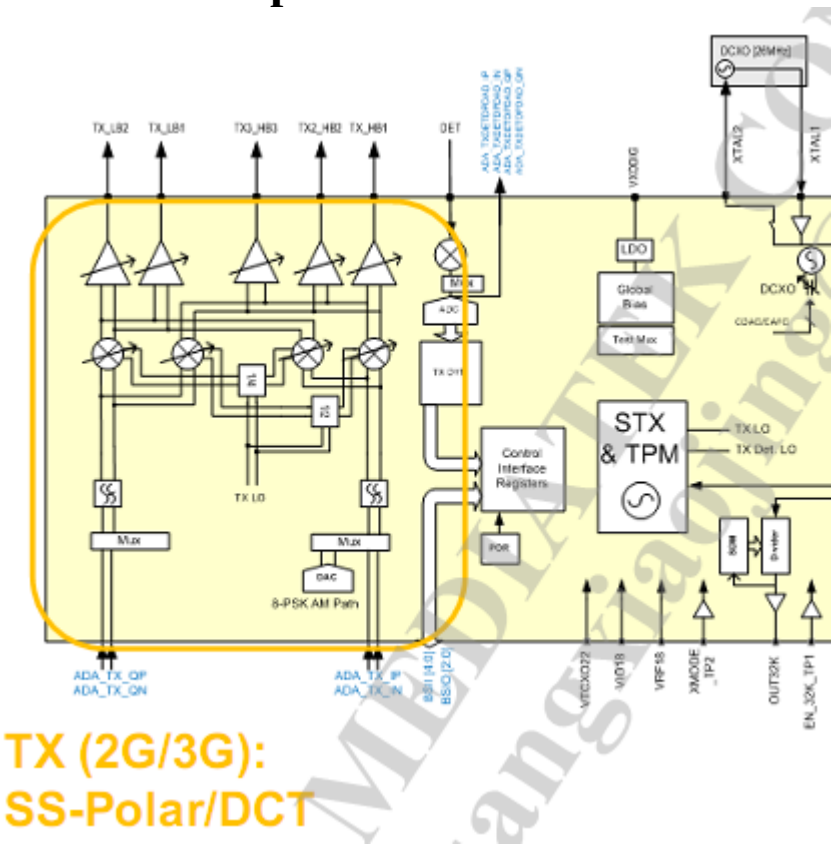
The Receiver structure in MT6580 is a very-low IF solution. More than 100DB gain, more than 110DB control range. And by the way, all of the DC-offset canceling processes are done within chip. we do not have to care about that.

The LNA amplifies the RF signal after passing the T/R switch and RF SAW filter and before it enters the down-converter section. The RF signal is mixed with a local oscillator(LO) signal to generate the baseband signal.

Four LPFs are used in the baseband signal processing for reduce block signals. The first LPF employs two external capacitors, and we can check whether the front-end (LNA+MIXer) is functionally well or not by probing these two capacitors to see if there is any baseband signal(<200kHz).

After three stages of DC-offset canceling,the signal(I+/I-/Q+/Q-) then output to the baseband IC for further processing.

二、 Transmitter Operation



The frequency ranges of the synthesizer for TX mode are

TX mode	EGSM	880M-915M
	GSM850	824M-849M
	DCS	1710M-1785M
	PCS	1850M-1910M
	WCDMA BAND4	1710M-1755M
	WCDMA BAND2	1930M-1990M
	WCDMA BAND5	869M-894M

Note: GSM 900 and DCS 1800 are not used in USA.

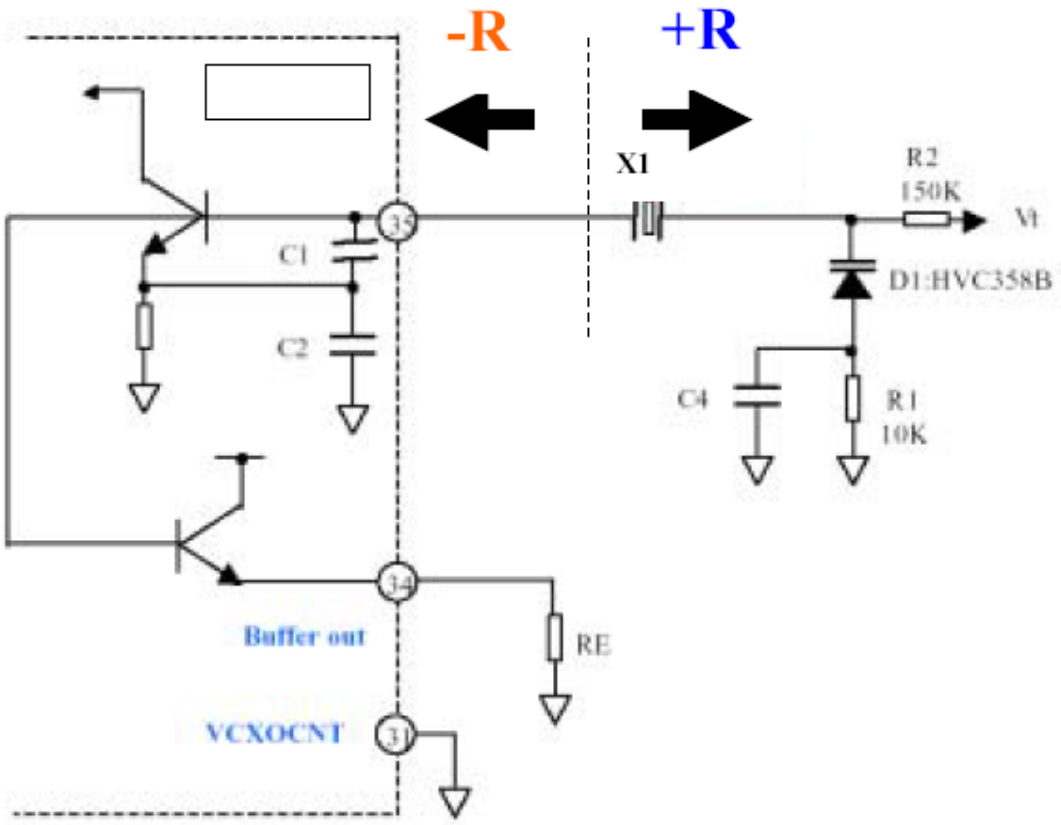
The transmitter chain converts differential IQ baseband signals to a suitable format for transmission by a power amplifier.

The common mode voltage range of the modulator inputs is 1.0V-1.4V and they have 0.5 Vp-p swing. The modulator circuit uses double-balance mixers for the I/Q paths. The Local signals are generated by dividing the IFLO signals by 8 in GSM band and by 4 in DCS band, and then passed to the modulator through a phase splitter/shifter. The IF signals generated are then summed to produce a signal modulated IF signal which is amplified and fed into the offset PLL block.

Within the offset PLL block there are a down converter, a phase comparator and a VCO driver. The down converter mixes the first local signal and the TXVCO signal to create a reference local signal for use in the offset PLL circuit. The phase comparator and the VCO driver generate an error current, which is proportion to the phase differential between the diference IF and the modulated IF signals, this current is used in a third order loop filter to generate a voltage, which in turn modulates the TXVCO.

The RF signal is then amplified by PA and power control loop to the assigned power level within the burst ramping mask. After passing the LPF of the T/R switch, the signal is then radiated through the antenna.

VCXO Operation



MT6580 procides a VCXO function. With that function, we can build a reference clock generation circuits as shown in the above graph. This means that the VCTCXO module is not necessary for clock application. And only one crystal with 8ppm tolerance and one varactor are enough.

The transistor in MT6580 and two internal capacitors (C1,C2) provide a negative resistance, and the crystal(X1) combined with some other passive components (including varactor:DI) to provide a positive resistance. When these two resistance values equal to each other at some frequency, the oscillation will happen at that frequency. In our design target, the oscillation frequency should be within 26MHz +/-15ppm.

三、RF Specification Requirement

GSM Band(s)	: GSM 850/900/1800/1900MHz
GPRS/EGPRS Class	: 12
WCDMA Band(s)	: FDD Band II/IV/V (Release 5)
Wi-Fi Specification	: 2.4G: 802.11b/g/n HT20/n HT40
Bluetooth Version	: Bluetooth v4.0 with BLE
GPS	: Support

NFC	: N/A
Operation Frequency	: GSM/GPRS/EDGE 850: 824~849MHz PCS/GPRS/EDGE1900: 1850~1910MHz WCDMA Band II: 1850~1910MHz WCDMA Band IV:1710~1755MHz WCDMA Band V: 824~849MHz WiFi: 802.11b/g/n HT20: 2412~2462MHz 802.11n HT40: 2422-2452MHz Bluetooth: 2402~2480MHz
Type of Modulation	: GSM,GPRS: GMSK EDGE: GMSK, 8PSK WCDMA: BPSK WiFi: CCK, OFDM Bluetooth: GFSK, Pi/4 DQPSK,8DPSK
Antenna installation	: GSM/WCDMA: internal permanent antenna WiFi/Bluetooth: internal permanent antenna
Antenna Gain	: GSM 850: 0.11dBi PCS1900: 0.87dBi WCDMA Band II: 0.86dBi WCDMA Band IV: 0.78dBi WCDMA Band V: 0.13dBi WiFi: 1.033dBi Bluetooth: 1.033dBi