- 1 -

CV342/VTL601

HARDWARE MANUALS

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Document History

Revision	Draft	Date	Authors	Comments
--	0.0	05/11/11	Kenn. Lee/ HW	Initial draft
0.1	-	-	-	-

TABLE OF CONTENTS

1. Introduction

This manual provides the technical information to support the service activities of CV342/VTL601 model, which operates on Single mode Digital CDMA Telephone.

This manual is supplied in the electronic format for easy distribution and reference.

2. Specification

This chapter provides the product configuration and product specifications of CV342/VTL601 model, which operates on Single mode Digital CDMA Telephone and accessories

2.1 Product Structure

[Table 2.1] Standard Package

	ITEM	TYPES
1	Main Handset	CV342/VTL601
2	Lithium Ion Battery(720mAh)	CV342/VTL601
3	AC Charger	CV342/VTL601 Travel Adaptor (600mA)
4	Earphone-Mic headset	CV342/VTL601 headset
5	Owner's Operating Manual	CV342/VTL601 Manuals

2.2 CV342/VTL601 Specifications

	ITEM	800MHz Band
1	Radio Frequency	TX: 824 to 849MHz RX:869 to 894MHz
2	Number of Channels	832
3	Duplex Spacing	45MHz
4	Digital Mode	
4.1	Channel Spacing	1.23MHz
4.2	Frequency Stability	+/-300Hz
4.3	RF Output Power	24dBm
4.4	Receiver Sensitivity	-104dBm
4.5	Modulation/Demodulation	OQPSK/QPSK
5	Operating Temperature	-20 to +60 degrees
6	Power Source	Lithium Ion Battery 3.9V, 700 mAh
7	Dimensions	44(H) x 87(V) x 23.5(T) mm
8	Weight	91 g (Including Battery)
9	Power management	
	Talk Time(Up to)	T.B.D min
	Standby(Up to)	170h (SCI=2 /Power on registration off)
10	Features	Two-way Short Message Service(SMS)
		Bell/ Vibration/ LED Alert

		Multilingual (Portuguese/English/Spanish)
11	Protocol	CDMA 1X

2.3 Battery Specifications

	ITEM	TYPES
1	Battery Type	Lithium Ion Battery
2	Battery Voltage	3.7V
3	Battery Capacity	700mAh (Nominal)
4	Recharging Time With Charger	170 min MAX. at 720mAh Li-ion Battery

2.4 AC Adaptor Specifications

	ITEM	TYPES
1	Input Voltage	AC 100 ~ 240V (50 / 60Hz)
2	Output Voltage	DC 5.5V
3	Output Current	600 mA

3. Technical Description

3.1 Overview

   This product consists with 3 parts, which are RF, logic, and UI interface. The block diagram is shown in Figure 4.1. This product employs the Super-Heterodyne method for wireless communication and the Tx and Rx frequencies are 824.7~848.31MHz and 869.04~893.9MHz respectively. RF signals received through the antenna are fed into the low noise amplifier (Receiver MMIC/ LNA, U106) through the duplexer (F100). Then, they are combined with the signals of local oscillator (VCO/MQL001B967MR6/U102) at the down conversion mixer (Receiver MMIC, U106) in order to create the intermediate frequency (IF). The IF signal is fed into RX_BBA(U109) through band-pass filter (BPF, U108),. In RX_BBA(U109), the IF signal is changed into base-band signal. Then, this signal is changed into the digital signal by the analog to digital converter (ADC, A/D Converter), and the digital circuit part of the MSM(U125) processes the data from ADC. In the case of transmission, The TX_BBA(U112) receives digital signal from the MSM(U125). In MSM(U125), the digital signal is changed into analog signal by the digital to analog converter (DAC, D/A Converter), and then the quadrature signals of base-band are up-converted to the IF frequency bands in TX_BBA(U112). The Tx AGC in TX_BBA(U112) is designed to be gain-controlled from 85dB dynamic range. In TX_BBA(U112), the Tx IF frequency mixed with RF local frequency is created Tx RF frequency. After that, the Power amplifier module(U15) amplifies the RF signal in order to have enough power for radiation. Finally, the RF signal is sent out to the cell site via the antenna after going through the duplexer (F100).
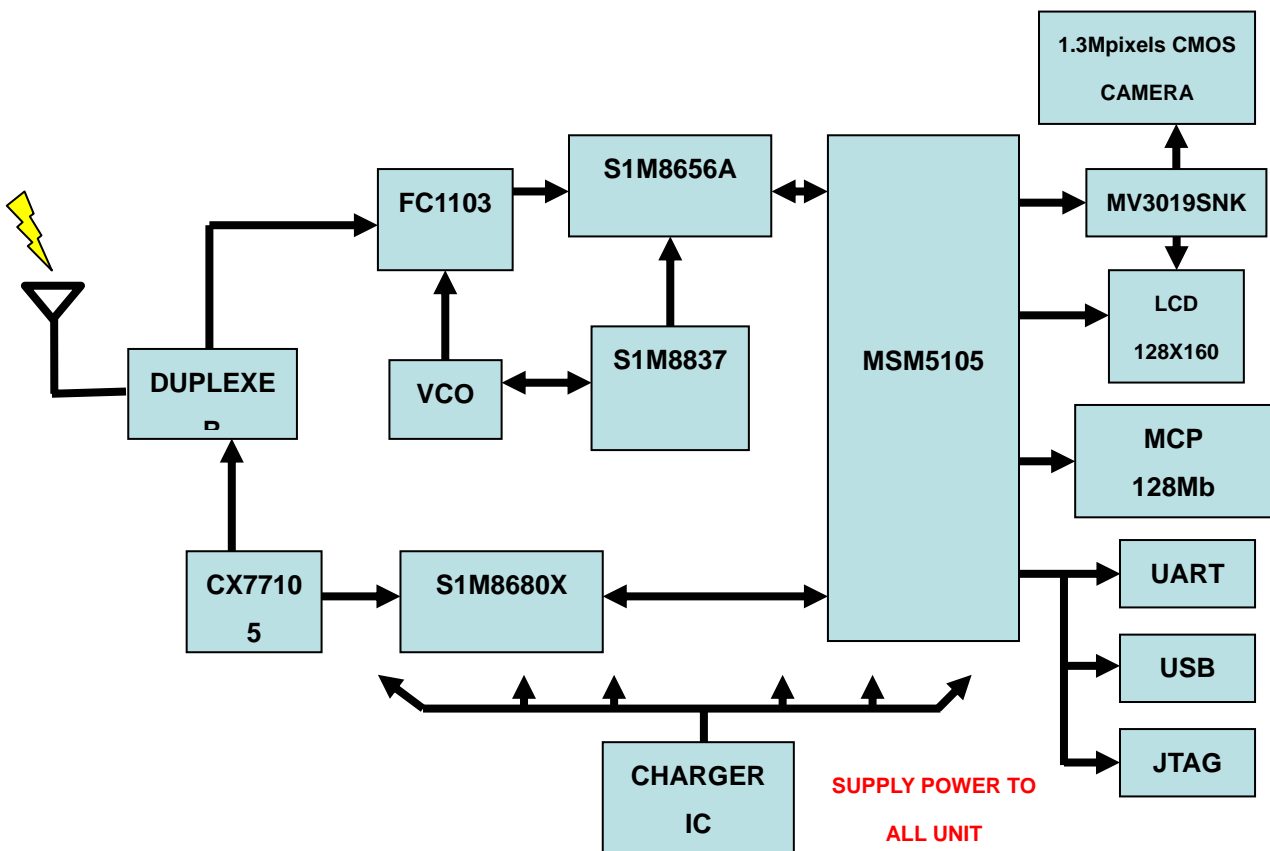

Figure 3.1 Typical Subscriber Unit Block Diagram

(a) Slider LCD Module

Figure 3.2 CV342/VTL601 LCD Board

Figure 3.3 CV342/VTL601 Main Board Top View

Figure 3.4 CV342/VTL601 Main Board Bottom view

(a) Slide Down	(b) Slide Up

Figure 3.5 CV342/VTL601 External View

3.2 RF part Description

The RF part consists of power part, synthesizing part, transmission and reception part.

3.2.1 Description of Frequency Synthesizer Circuit

The UHF band frequency synthesizer is composed of an indirect frequency synthesizer, Phase Locked Loop (PLL IC, U2), VCO(U102) with the center frequency of 966.88MHz for CDMA mode and Loop Filter. PLL IC(U2)'s phase detector compares the reference clock frequency (19.68MHz, TCXO(U104) clock) divided down to 30kHz by the reference divider with a signal divided by the PLL IC(U2) main divider from the VCO(U102), and generates a local oscillation signals with zero phase difference. These local oscillation signals are used for Tx and Rx. The other PLL synthesizer controls Tx IF frequency and is implemented on the TX_BBA(U112). The Tx phase detector receives Tx IF local oscillation signal(260.76MHz) within the TX_BBA(U112). In Rx IF synthesizer, UHF PLL synthesizer support dual frequencies. Thus RX_BBA(U109) use UHF PLL to generate the Rx IF frequency(170.76MHz).

■ Voltage Control Temperature Compensation Crystal Oscillator (VCTCXO, U104)

The temperature variation of reference frequency in a mobile phone can be compensated by VCTCXO(U104). The reference frequency of a mobile phone is operated stably from –30 to +60 °C. The VCTCXO(U104) receives frequency tuning signals called TRK_LO_ADJ from MSM(U125) through low-pass filter in order to generate the reference frequency of 19.68MHz and is used for system main clock. Frequency stability depending on temperature is within ±1.5 ppm.

■ RF Frequency Synthesizer

The RF PLL is consisted of the dual mode PLL IC(U2), loop filter, VCO(U102) and VCTCXO(U104). It generates the RF local frequency of 954.38 ~ 979.38 MHz.

■ RX IF Frequency Synthesizer

The Rx IF PLL is consisted of the dual mode PLL IC(U2), Rx IF VCO included in the RX_BBA(U109), loop filter and VCTCXO(U104). The Rx IF VCO included in the RX_BBA(U109) oscillates twice Rx IF frequency as 170.76MHz and then generates the RX IF frequency of 85.38MHz by dividing the Rx IF VCO output frequency by two.

■ TX IF Frequency Synthesizer

The Tx IF PLL Loop is consisted of the Tx IF PLL synthesizer, VCO(U108) that are internally installed in the TX_BBA(U112), loop filter and VCTCXO(U104). The Tx IF VCO included the TX_BBA(U112) generates Tx IF local frequency of 260.76MHz and then generates the Tx IF frequency of 130.38MH by dividing the Tx IF VCO output frequency by two.

3.2.2 Description of Rx Part Circuit

Cellular Receiver covers the RF frequency band of 869 ~ 894 MHz and the IF frequency of 85.38MHz. The RF signal received is sent out to the Receiver MMIC/ LNA(U106) via a duplexer(F100) for amplification and then, is sent out to the Receiver MMIC/ Down mixer(U106) through Rx RF SAW filter(U107). Here, the RF signal is mixed with the VCO(U102) signal of 954.38 MHz ~979.38 MHz. IF signal converted by the Receiver MMIC/ Down mixer(U106) are sent out to IF SAW Filter(U108), which have a role to filter a wanted frequency. The signal that has passed the IF SAW filter(U108) is fed into AGC AMP that is controlled by the power density modulation (PDM) signal of the MSM(U125) based on the strength of received signal. This AGC AMP is tuned into the level corresponding to the input window of the base band analog processor (RX_BBA, U109). The AGC AMP controls Rx power level within 85dB dynamic range. The signal entered to RX_BBA(U109) is converted again to 1.2288 MHz base band signal. To do second frequency conversion, the frequency synthesizer in RX_BBA (U109) generates frequency of 170.76MHz and these signals are divided by two in order to use the Rx IF LO signal. These signals are used to convert RX IF signals to I/Q base band signal. I and Q base-band signals are respectively sent out to the analog digital converter via a low pass filter.

■ Duplexer (F100)

The duplexer(F100) consists of the Rx bandpass filter (BPF) and the Tx BPF which have the function of separating Tx and Rx signals in the full duplex system for using the common antenna. The Tx BPF is used to suppress noises and spurious out of the Tx frequency band. The Rx BPF is used to receive only Rx signal coming from the antenna, which is usually called preselector. Its main function limits the bandwidth of spectrum reaching the Receiver MMIC/ LNA(U106) and attenuates receiver spurious response. As a result, the frequency sensitivity and selectivity of mobile phone increase.

■ Receiver MMIC/ LNA (U106)/ Down Mixer (U106)

- LNA : The characteristics of Low Noise Amplifier (LNA, U106) are low noise figure, high gain, high intercept point and high reverse isolation. The frequency selectivity characteristic of mobile phone is mostly determined by LNA(U106).

- The Down Mixer(U106) performs frequency translation by multiplying two signals. The downconversion mixer employed in the Rx path has two distinctly different inputs, which are RF and Local Oscillator (LO) signal. The RF signal is downconverted to IF signal by the local oscillator.

■ Rx RF SAW Filter (U107)

The main function of Rx RF SAW filter(U107) is to attenuate mobile phone spurious frequency, attenuate direct IF frequency pick up, attenuate noise at the image frequency originating in or amplified by the LNA(U106) and suppress second harmonic originated in the LNA(U106). The Rx RF SAW filter(U107) is usually called image filter.

■ Rx IF SAWFilter (U108)

The Rx IF SAW filter(U108) protects its following stages from close-in Inter Modulation (IM) signals, provides adjacent channel selectivity, and attenuates the second image.

■ RX_BBA (U109)

Rx_BBA is divided three main parts, IF frequency processing, base-band processing, and digital interface. It is a receiver IC, installed with a Rx AGC, base-band converter, base-band analog filter, and A-D converter. It can send a digital base-band signal to digital base-band IC.

The circuit functions of the RX_BBA(U109) include Rx Automatic Gain Controller (AGC) with 90dB dynamic range input, quadrature IF mixers and Analog to Digital Converters (ADC) for converting to digital base-band. The RX_BBA(U109) includes clock generators that drive the digital processor and the VCO(U109) which generates the IF LO frequency for base-band down-conversion. The Rx AGC either amplifies or attenuates the received CDMA IF signal to provide a constant-amplitude signal to the I/Q down converter. The IF output of the Rx AGC amplifier separates into I-channel and Q-channel base-band components and down- converted by mixer with quadrature LO. Rx IF LO signals are generated by the Voltage Controlled Oscillator of Rx IF. Frequency is stabilized by external varactor-tuned resonant tank circuit. The I/Q down converter outputs the CDMA signals at base-band frequency. Low-pass filtering enables the receiver to select the desired base-band signals from the effects of unwanted noise or adjacent-channel interference. I/Q base band components are converted to digital signals by two identical 4-bit ADCs. The Block Diagram of the RX_BBA(U109) is shown in Figure 4.6.
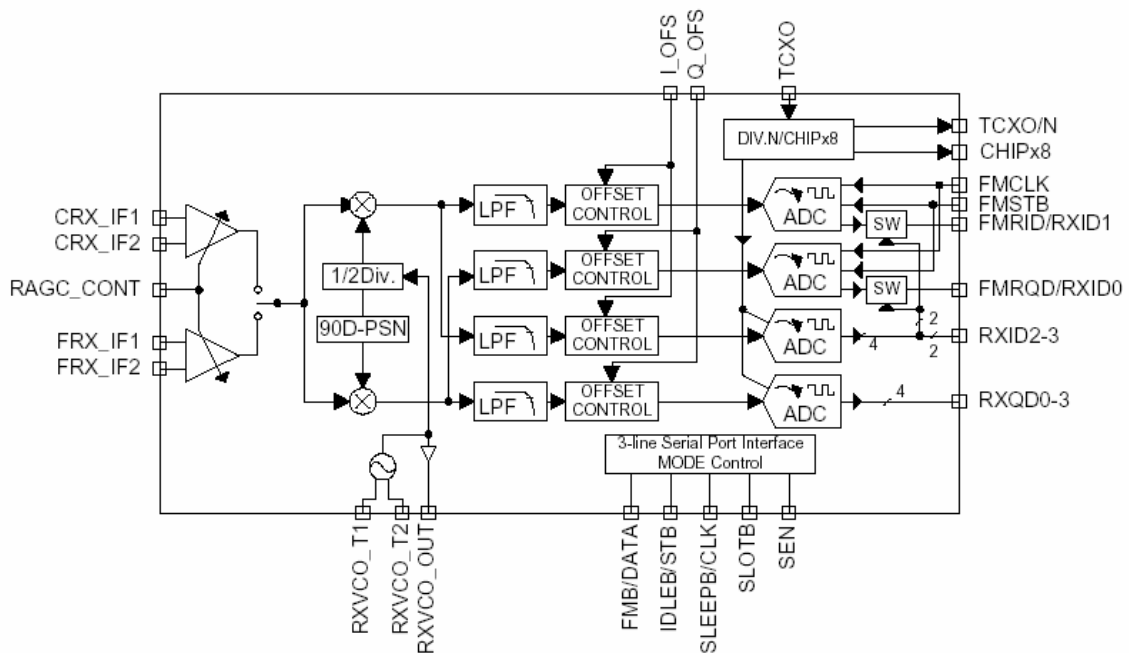

Figure 3.6   RX_BBA Functional Block Diagram

3.2.3 Description of Tx Part Circuit

The 8 bit digital signal fed into TX_BBA(U112) passes through DAC using TXCLK and TXCLK/ as triggers to produce base band I/Q signal. Inside the MSM(U125), each signal is sent out to the up mixer via a digital low pass filter. At the mixer, 130.38 MHz I/Q signal obtained by dividing the 260.76MHz VCO signal by half is used as carrier for the up-conversion of base band signal to Tx IF signal. This signal is again up-converted into Tx RF frequency signal. The signal converted into Tx RF frequency is amplified at the drive amplifier. At the Tx AGC AMP, this Tx IF signal level is varied according to the several parameters defined in mobile station and base station. The proper gain control signal comes out from the MSM(U125) in the waveform of PDM and rectified to constant DC voltage level by RC low pass filter. The gain variable range of Tx AGC AMP is 90 dB. The signal is amplified at the power amplifier. Finally, it is transmitted out to antenna via a duplexer(F100).

■ TX_BBA (U112)

The TX_BBA(U112) Base-band-to-RF Transmit Processor including Tx AGC Amplifier, quadrature mixers, IF synthesized PLL, RF single sideband up converter, RF driver and Tx IF VCO. It converts a base-band analog signal coming from a digital base-band processor (Modem chip) to an analog RF signal to be able to Tx PAM.

The TX_BBA(U112) offers the most advanced and integrated CDMA Tx solution along with minimized power consumption for extended talk-time performance.

The TX_BBA(U112) connects directly with QUALCOMM's by the MSM(U125) utilizing an analog base-band interface. The base-band quadrature signals are up-converted to the cellular band and amplified to provide signal drive capability to the PAM(U15). The TX_BBA(U112) includes an IF frequency, single sideband up-conversion from IF to RF, two cellular driver amplifiers, and Tx power control through an 85dB VGA. TX_BBA(U112) functionality is specifically controlled from the MSM(U125) via the three-line serial bus interface(SBI).

The Block Diagram of the TX_BBA(U112) is shown in Figure 4.7.

■ Power Amplifier Module (U15)

The power amplifier Module(PAM,U15) that can be used in the CDMA has linear amplification capability, whereas in the FM mode, it has a high efficiency. For higher efficiency, it is made up of one MMIC (Monolithic Microwave Integrated Circuit) for which RF input terminal and internal interface circuit are integrated onto one IC after going through the GaAs HBT (heterojunction bipolar transistor) process. The PAM(U15) is made up of an output end interface circuit including this MMIC. The RF transmit signals that have been amplified through the PAM(U15) are sent to the duplexer(F100).
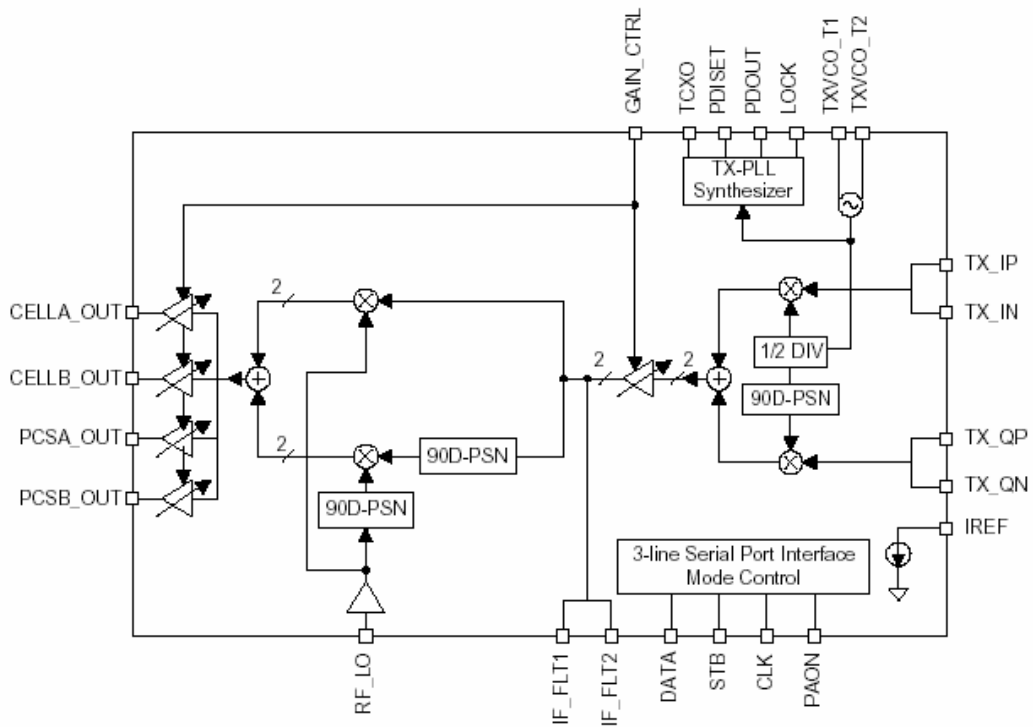
Figure 3.7 TX_BBA Functional Block Diagram

3.3 Logic Part Description

The logic part processes the user's commands and processes all the digital in order to operate in the phone. The logic part is made up of a keypad/ LCD, receptacle part, voice processing part, mobile station modem(MSM, U125) part, memory part(U113), and power supply part.

3.3.1 Keypad/ LCD

This is used to transmit keypad signals to MSM(U125).

It is made up of a keypad backlight part that illuminates the keypad, LCD part that displays the operation status onto the screen, and a receptacle that receives and sends out voice and data with external sources.

3.3.2 Voice Processing Part

The voice processing part is made up of an audio codec and an amplifier used to convert SMT Type Microphone(CON102) signals into digital voice signals and digital voice signals into analog voice signals.

3.3.3 Mobile Station Modem(MSM, U125)

The MSM(U125) integrates functions that support a CDMA subscriber unit. Subsystems within the MSM(U125) include a CDMA processor, a QUALCOMM Code Excited Linear Predication (QCELP) Vocoder, an Enhanced Variable Rate CODEC (EVRC) Vocoder, an ARM7TDMI microprocessor, and assorted peripheral interfaces that are used to support other functions.

■ MSM(U125) Internal Block

1) ARM Microprocessor Subsystem

The MSM(U125) uses an embedded ARM7TDMI microprocessor. The ARM7TDMI microprocessor, through the system software, controls most of the functionality for the Mobile Station, including control of the external peripherals such as the keypad, LCD display, RAM and ROM/FLASH(U113) devices.

2) RF Interface

This block communicates with the MSM(U125) RF, IF and Analog Base-band circuitry.

3) CDMA Subsystem: Digital IS-2000 Signal Processing.

Searcher engine

Demodulating fingers

Combining block

Frame de-interleaver

Viterbi decoder

Reverse link subsystem

4) UART (Universal Asynchronous Receiver Transmitter)

Two identical UARTs, UART1 has dedicated pins while UART2 share multiplexed pins with the Auxiliary PCM CODEC interface.

5) Vocoder Subsystem

The MSM(U125)'s QDSP2000 supports EVRC and QCELP13K vocoders. In addition, the QDSP2000 has modules to support the following audio functions; DTMF tone generation, DTMF tone detection, Tx/Rx volume controls, Tx/Rx automatic gain control(AGC), Rx Automatic Volume Control(AVC), Ear Seal Echo Canceller(ESEC), Acoustic Echo Canceller(AEC), Noise Suppression(NS), and programmable, 13-tap, Type-I, FIR, Tx/Rx compensation filters. The MSM(U125)'s integrated ARM7TDMI processor downloads the firmware into the QDSP2000 and configures QDSP2000 to support the desired functionality.

6) General Purpose Interface Bus

The MSM(U125) has 48 general-purpose bi-directional input/output pins (GPIO_INT[47:0]) that double as general-purpose interrupt inputs. Some of the GPIO_INT pins have alternate functions supported on them. The alternate functions include, USB interface, additional RAM, ROM/Flash(U113), general-purpose chip selects, parallel LCD interface, and a UART interface. The function of these pins is documented in the various software releases.

7) Serial Bus Interface

This interface is specifically designed to be a quick, low pin count control protocol for Qualcomm's TX_BBA(U112) can be configured for different operating modes and configured for minimum power consumption, extending battery life in standby mode.

8) User Interface

MSM(U125) user interface comprises digital connections to the subscriber unit ringer transducer, keypad and LCD display.

9) Mode Select and JTAG Interfaces

The Mode select inputs to the MSM(U125) determine overall mode of the ASIC. The options under the control of the Mode select inputs are Native Mode which is the normal subscriber unit operation and ICE Mode in which the on-chip ARM microprocessor is disabled, allowing off-chip emulation by the ICE unit.

3.3.4 Memory Part (U113)

Components: Combination Memory [Flash Memory (128Mbit) + SRAM (32Mbit)]

1) Flash Memory (128Mbit)

Stores telephone's main and sub programs.

Memory for source code : 12Mbyte .

Memory for NV parameter value , SMS, Phone Book, Download data, PIMS data, camera data.. etc : 4Mbyte.

- Code Flash memory: 8MB (4Mbit x 16), Random Access Time is 70ns
- Data Flash memory: 8MB (4Mbit x 16), Random Access Time is 70ns

2) SRAM (32Mbit)

Stores changes in other person's system parameter and Data Task data Buffer and stack of each task.

- SRAM: 4MB (2Mbit x 16), Max. Access Time is 70ns

3.3.5 Power Supply Part

Power is supplied by battery which range is 3.2~4.2V voltage or external source which range is 4.5V~5.5V. External power source is supplied to MIC79110(Charging IC) and charge the battery directly.

MIC79110 output voltage is sent to U6(TC1300-2.8V/LDO), which supply 2.8V for Logic power through Q5, SI3865DV.
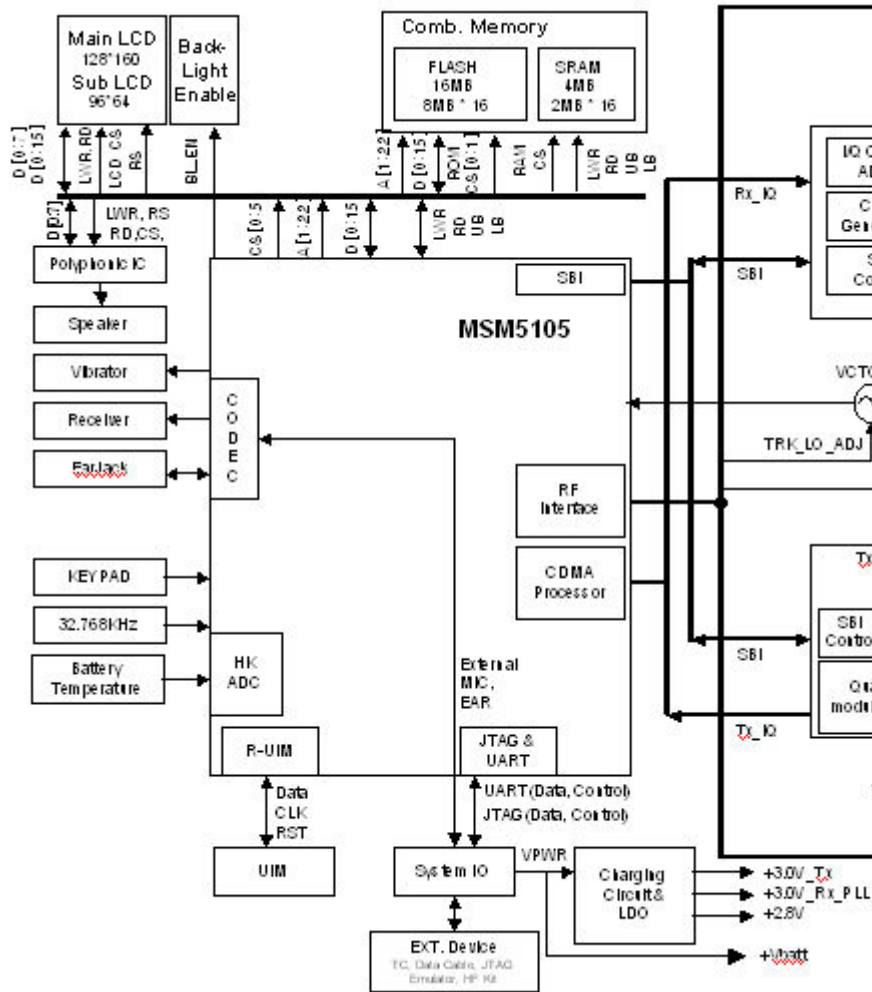
Figure 3.8 PANTOJA Logic Part Block Diagram

3.4   Power Up Sequence

This section describes the steps how the PANTOJA phone wakes up.

- ■   Place a Battery Pack

The battery pack, which the protection circuit is implemented, is placed into the phone.

- ■   Press and Hold [POWER ON] Key

The Power on circuit (Q12 Pin3) generates the control voltage to be used for U6.

■ Regulators Activated

U6 feeds 2.8V to MSM (U125), LCD

U6 feeds 2.8V to Flash ROM / SRAM (U113) and others.

U6 feeds 2.8V to VCTCXO(U104) and others.

■ VCTCXO Activated

When the power is fed to the VCTCXO(U104), it generates 19.68MHz to be used for the MPU clock.

■ Reset Pulses Generated

a) The reset pulse is generated with U6 when it is feed with the power.

b) The reset pulse (RESOUT/) for the MCP is generated with MSM(U125) right after the item a).

c) The reset pulse (RESOUT/) for the LCD is generated by MSM, GPIO21(U125)

■ MSM(U125) Starts

Based on the reset pulse a), the MSM(U125) starts to operate including accesses to the MCP (U113). The watchdog timer operates repeatedly.

■ Phone Wakes Up

Under control of the MSM(U125), the phone displays a wake-up animation, turn the backlight on and sounds a melody..