CDMRF101

TCU Phone Module

Component Technical Specification Manual

Ver. 00.1

Apr. 27. 2007

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OEM integrators and installers are instructed that the phrase. This device contains transmitter FCC ID: O6Y-CDMRF101 must be placed on the outside of the host.

	Warning: Exposure to Radio Frequency Radiation The radiated output power of this device is far below the FCC radio frequency exposure limits. Nevertheless, the device should be used in such a manner that the potential for human contact during normal operation is minimized. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna should not be less than 20cm during normal operation. The gain of the antenna for Cellular band must not exceed 0dBi. The gain of the antenna for PCS band must not exceed -3dBi.

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1 INTRODUCTION / OVERVIEW

1.1 MSM 6050 Chipset

The MSM6050 CDMA2000 1X solution is optimized to support voice and key data capabilities while enabling CDMA2000 network benefits. Designed to support the CDMA2000 1X standard to address enhanced features as simultaneous voice and data applications and utilize network optimizations, the MSM6050 chipset will support packet data rates of 153 kbps on the forward and reverse links (FL and RL). It provides a seamless migration path from 2G to 3G services and applications, and the increased voice capacity of a CDMA2000 network. The MSM6050 solution will enable manufacturers to quickly develop handsets meeting specifications for worldwide cdmaOne™ and CDMA2000 1X systems.

The MSM6050 CDMA 2000 1X solution will be used to build a phone module based solution where the module will be used in a telematics module for an automotive application. The phone module will be designed for use on the Verizon network. The phone module will not have the typical user interfaces common to handsets (i.e. keypad, display, etc.). The phone module will have an I/O connector and an RF connector. Likewise, the phone module will be designed to be certified by Verizon and FCC as a stand alone module meant for embedded applications.

The MSM6050 chipset solution consists of the MSM6050 baseband processor, direct conversion RFR6155 ™ and RFR6000™ receive devices, the direct conversion RFT61500™ transmit device MAX8629™ power management device and a compatible power amplifier device.

1.1.1 MSM 6050 Features

■gpsOne position location capabilities (not enabled in this module)
■CDMA2000 1X support, offering data rates up to 153 kbps on the forward and reverse links
■Quad-mode (CDMA cellular, CDMA PCS, AMPS cellular, gpsOne)
■Vocoder support (EVRC, 13K QCELP)
■Fast 800 Hz forward power control
■Quasi-Orthogonal functions
■Supplemental channel (SCH) support
■CDMA2000 1X Forward Quick Paging channel (F-QPCH)
■Convolutional and turbo codes on SCH
■ITU 144 kbps requirements achieved
■153 kbps on FL and RL (aggregate)
■Integrated wideband mono voice CODEC

■Voice recognition (VR) (not enabled in this application)
■Acoustic echo cancellation
■Audio AGC
■External stereo DAC support
■Internal Vocoder supporting 13kbps Pure Voice QCELP and EVRC
■Industry standard ARM7TDMI embedded microprocessor subsystem
■Internal watchdog and sleep timers
■Three universal asynchronous receiver transmitter (UART) serial ports

1.2 IS- Mobile Standards

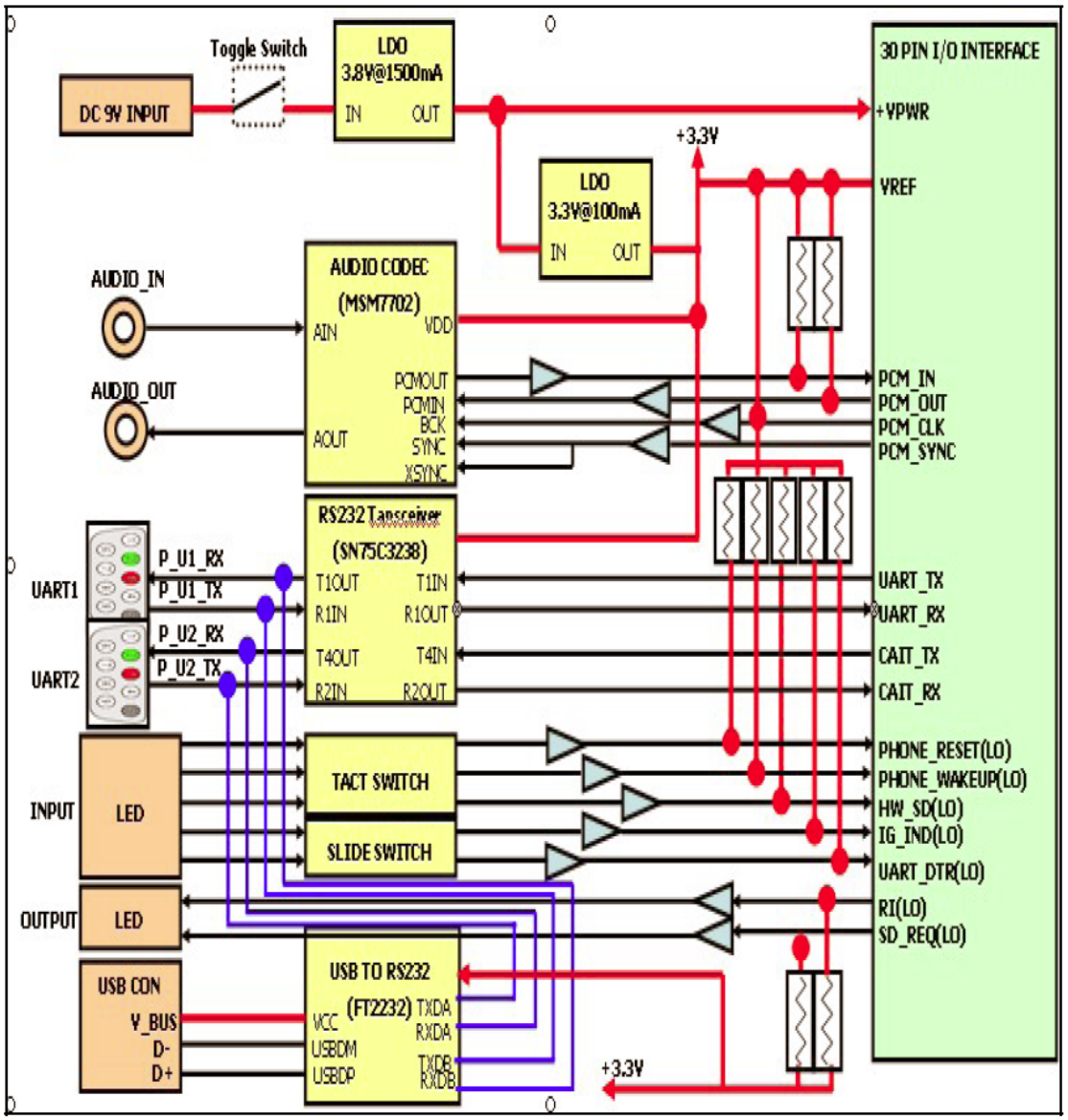
Standard	Description	Comment
IS-707	Data Service Options for Spread Spectrum Systems	
IS-127	Enhanced Variable Rate Codec (EVRC)	EVRC
IS-733	High Rate Speech Service Option 17 for Wide Band Spread Spectrum Communication Systems	13k codec
IS-99	Data Services Option Standard for Wideband Spread Spectrum Digital Cellular System	
IS-657	Packet Data Service Option Standard for Wideband Spread Spectrum Systems	
IS-687	Medium Speed Interface for Data Terminal Equipment and Data Circuit Terminating Equipment	
IS-19	Recommended Minimum Standards for 800-MHz Cellular Subscriber Units-Replaced by TIA/EIA-690	
IS-41	The protocol for 'roaming' within the USA, describing how services should 'hand over' between operators	
IS-683	Over-the-Air Service Provisioning of Mobile Stations in Spread Spectrum Standards	
IS-2000	Introduction to CDMA2000 Spread Spectrum Systems	
IS-801	Position Determination Service for cdma2000 Spread Spectrum Systems	
IS-91	Analog Cellular and PCS. The TIA version of the analog cellular standard, incorporating the functionality of IS-88 (narrowband analog) and IS-94 as well as PCS band operation.	AMPS
IS-95	XXXXXX	

1.3 Acronym Definitions

Define all acronyms that will be used in the document

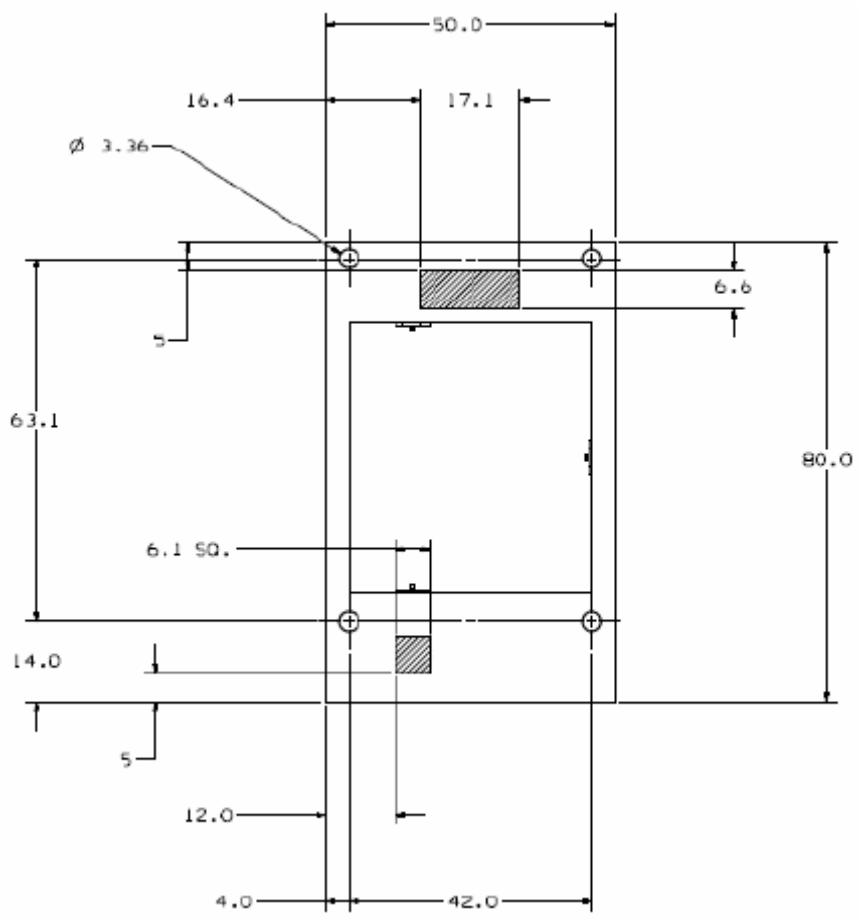
1.4 Development Tools for the Phone Module

1.4.1 LT Box



2 MECHANICAL DESCRIPTION

2.1 Phone Module Mechanical Outline

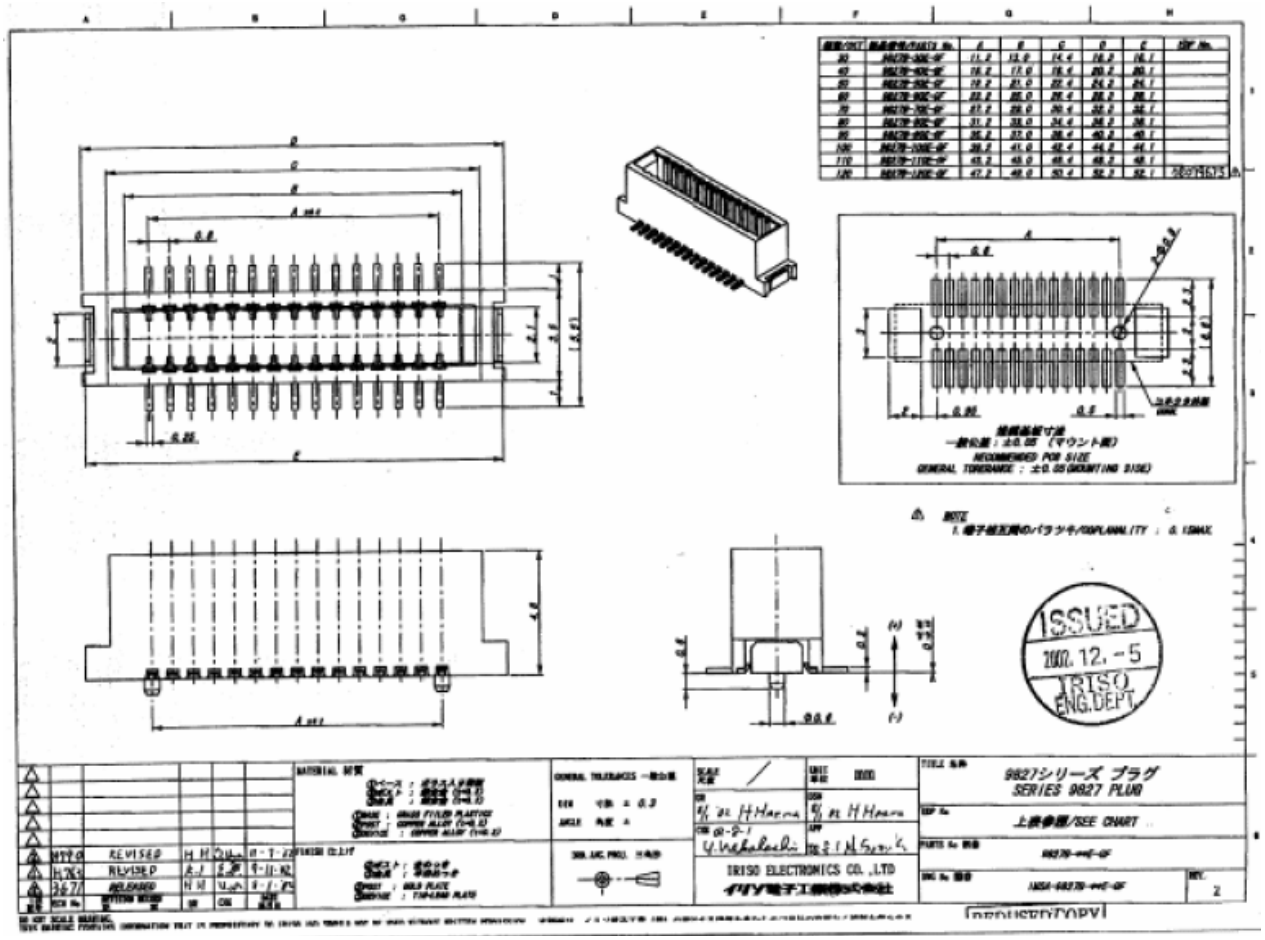


2.2 Phone Module I/O Connector

Iriso 30 pin connector, 9827B-30C-GF

2.2.1 I/O Connector Drawing and Supplier Part Number

This connector is placed on the phone module



2.2.2 I/O Connector Electrical Characteristics

I

2.2.2.1 I/O Connector Pin Assignment

Pin No	Name	Description	Default @ Low est current mode	I/O @ Phone	Logic Condition
1	GND	Ground	Low	O	System ground
2	NC	NA	NA	NA	NA
3	PHONE_PWR	3.8 volts +/-5% supply voltage to phone module	High	I	The application provides the main power of the phone module

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6	NC	NA	NA	NA	NA
7	GND	Ground	Low	O	System ground
8	V_REF	Reference Logic Voltage level generated by the Phone	High	O	Provide the application with its logic supply
9	RI	Ring Indicator Generated by the phone	High	O	The phone module indicates the incoming call condition by pulling down
10	CAIT_RX	CAIT Receive Data Input to the Phone	Low	I	CAIT RX provides diagnostic signals from the application to the phone using AT commands
11	CAIT_TX	CAIT Transmit Data Output from the Phone	NA	O	CAIT TX provides diagnostic signals from the application to the phone using the monitor
12	IG_IND	The Ignition status indicator	High	I	Ignition indicator provides the status of the gnition. Ignition on condition is indicated by pulling down and ignition off condition is indicated by pulling up
13	HW_SD	Hardware Shutdown	High	I	The phone module can be shut down by pulling down
14	SD_REQ	Hardware Shutdown request	High	O	The phone module can request hardwarw shutdown by pulling down and it will be back to pull up after completion of the hardware shut down
15	PHONE_WU	Reuest to wake_up the phone from TCU	High	I	Phone wake up is requested by pulling down for 500ms
16	UART_DTR	UART Data terminal ready to Phone from TCU	High	I	UART DTR provides the status signal that indicates the TCU processor is active when it is Low
17	UART_TX	UART Transimt from the Phone to TCU	Low	O	UART TX provides control signals from the application to the phone using AT commands
18	UART_RX	UART Recevie to the	Low	I	UART RX provides co signals from the

		Phone from TCU			applic to the phone using AT commands
19	PHONE_RST	Phone Reset gnerated by the application	High	I	The application can reset the phone module by pulling down
20	SPK_OUT_PHONE	Speaker low level audio Output to TCU from Phone	TBD	O	TBD
21	GND	Ground	Low	O	System ground
22	MIC_IN_PHONE	Microphone low level Audio input to Phone from TCU	TBD	I	TBD
23	GND	Ground	Low	O	System ground
24	PCM_IN	PCM Audio Input to the Phone from TCU	Low	I	PCM IN provides the and data information f the TCU application t phone
25	GND	GND	Low	O	System ground
26	PCM_OUT	PCM Audio Output from the Phone to the TCU	High	O	PCM OUT provides v and data information f the phone to the appli
27	GND	GND	Low	O	System ground
28	PCM_CLK	PCM Audio Clock Generated by the Phone	Low	O	PCM CLK provides v and data information f the phone to the appli
29	PCM _SYNC	PCM Audio Sync Generated by the Phone	Low	O	PCM sync indicate the signal when it is high
30	GND	GND	Low	O	System ground

3 OPERATING TEMPERATURE AND STORAGE

3.1 Temperature

3.1.1 Storage Temperature

The phone module shall be capable of being stored at -30C – 85C without any degregation in performance.

3.1.2 Operating Temperature

The phone module shall operate within specification from -30C – 85C

4 ELECTRICAL INTERFACE

Phone / TCU System Mechanization

4.1 Design Guidelines

4.1.1 Component Derating

4.1.1.1 Ceramic Capacitors / Parallel Plate Capacitors

Ceramic capacitors or parallel plate capacitors on power lines shall be two devices in series to protect against capacitor shorts.

4.1.1.2 Electrolytic Capacitors

Electrolytic capacitors shall be rated at 2x the maximum voltage for a given circuit.

4.1.1.3 Tantalum Capacitors

Tantalum capacitors shall be rated at 3x the maximum voltage for a given circuit on a power supply. They shall be rated at 2X for applications on signal lines.

Tantalum capacitors shall not be placed on circuits with currents that exceed a current of 1A or the current shall be limited to 1A.

4.1.2 Communication Pins and Unused Pins

Serial communications signals shall be terminated per manufacturers specifications.

Unused IC pins should be terminated according to manufacturer's recommendations.

4.2 Supply Voltage

Supply Voltage (From TCU to Phone)	Min	Max	Units	I_{Max}	$Ripple_{Max}$

3.8V Supply	3.61	3.99	V	1.0A	100 mV p-p

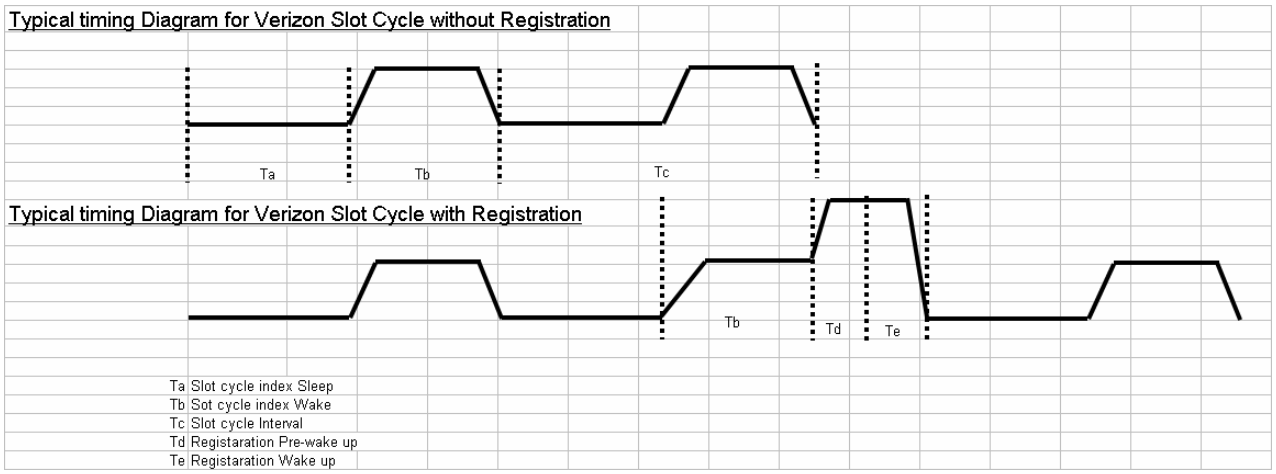
Regulation type and frequency: Step-down Switching regulator, 220 kHz to 280 kHz

Note: Phone Module should not be damaged by the instantaneous loss of the supply voltage

4.3 Current Draw

Current Draw Chart @ Room Temperature 25C

Phone Mode		Current @ 5.0V			Units	Duration			Units	Period			Units
		Min	Typ	Max		Min	Typ	Max		Min	Typ	Max	
CDMA: 0 dBW Call		NA	NA	NA	uA	NA	NA	NA	us	NA	NA	NA	us
CDMA: -7 dBW Call				800	mA	NA	NA	NA	us	NA	NA	NA	us
CDMA: Verizon Slot cycle index for waiting for incomming call	Wake	90	110	130	mA		130		ms				us
	Sleep		600	800	uA		5.12-wakeuptime		s				
CDMA Registration	Pre-Wake up			150	mA			20	s				min
	Wake up			800	mA				us				



4.4 Inputs/Outputs Logic Levels

Parameter		Limits		Units
		Min	Max	
Voltage Output High	V_{OH}	2.437	3.187	Volts
Voltage Output Low	V_{OL}	0.00	0.45	Volts
Voltage Input High	V_{IH}	1.87655	3.187	Volts

Voltage Input Low	V_{IL}	-0.3	1.01045	Volts	

4.5 Output Power

The phone output power is measured at the end of phone module antenna connector using the RF power meter. The power level of the phone module is controlled by the base station and the range of the power level is varied from Min output power to Max output power that is defined in the table below.

Item	Specification	Min	Typical	Maximum	Unit
Max Output Power	Power Class II	23	24	26	dBm/1.23MHz
Min Output Power			-53	-50	dBm/1.23MHz

4.6 Audio Interface

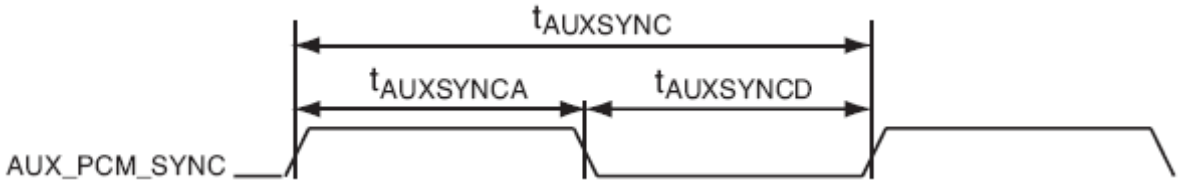
4.6.1 PCM Audio

4.6.1.1 MSM Timing Parameters

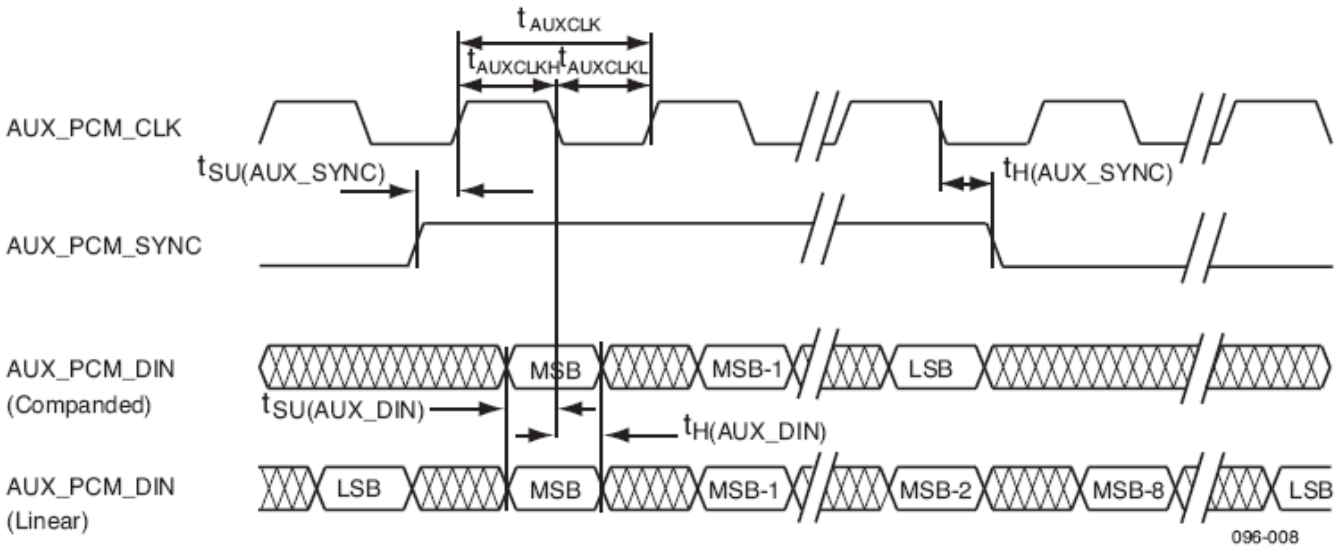
Parameter	Description	Min	Typical	Max	Units	Notes
$t_{AUXSYNC}$	AUX_PCM_SYNC cycle time	—	125	—	µs	a
$t_{AUXSYNCA}$	AUX_PCM_SYNC "asserted" time	62.4	62.5	—	µs	a
$t_{AUXSYNCD}$	AUX_PCM_SYNC "deasserted" time	62.4	62.5	—	µs	a
t_{AUXCLK}	AUX_PCM_CLK cycle time	—	7.8	—	µs	a
$t_{AUXCLKH}$	AUX_PCM_CLK high time	3.8	3.9	—	µs	a
$t_{AUXCLKL}$	AUX_PCM_CLK low time	3.8	3.9	—	µs	a
$t_{SU(AUX\_SYNC)}$	AUX_PCM_SYNC setup time to AUX_PCM_CLK rising	1.95	—	—	µs	
$t_{H(AUX\_SYNC)}$	AUX_PCM_SYNC hold time after AUX_PCM_CLK rising	1.95	—	—	µs	
$t_{SU(AUX\_DIN)}$	AUX_PCM_DIN setup time to AUX_PCM_CLK falling	70	—	—	ns	
$t_{H(AUX\_DIN)}$	AUX_PCM_DIN hold time after AUX_PCM_CLK falling	20	—	—	ns	
$t_{PAUXDOUT}$	Propagation delay from AUX_PCM_CLK rising to AUX_PCM_DOUT valid	—	—	50	ns	

[a] This value assumes that CODEC_CTL is not being used to override the CDMA CODEC clock and sync operation.

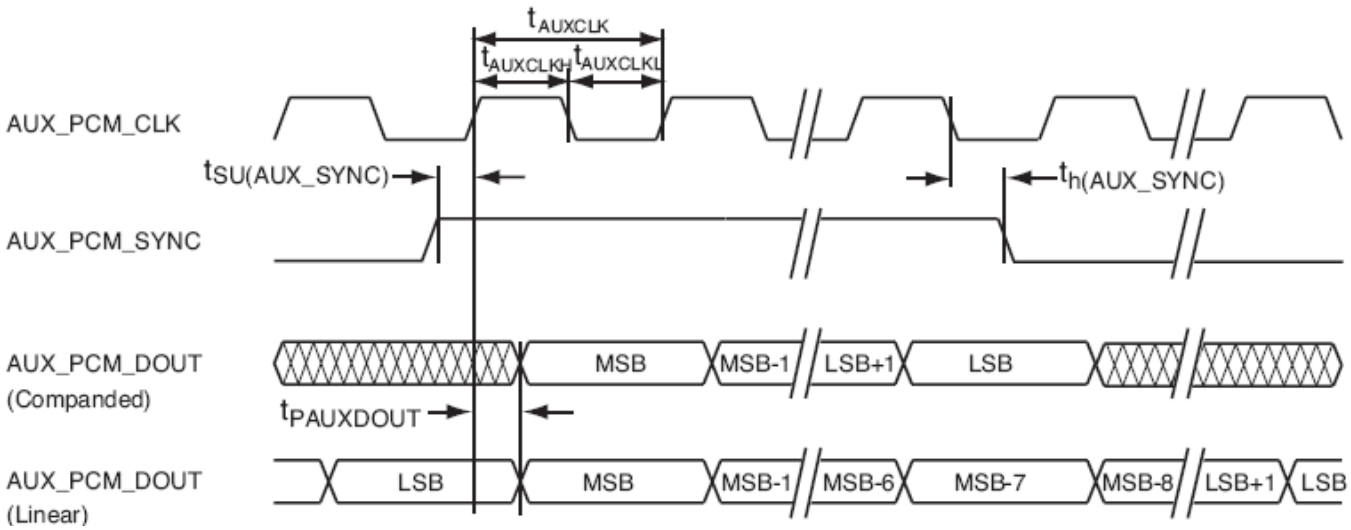
4.6.1.2 PCM Sync Timing



4.6.1.3 MSM Receive Timing



4.6.1.4 MSM Transmitting Timing



4.6.2 UART Data Interface

The Universal Asynchronous Receiver Transmitter (UART) communicates with serial data that conforms to RS-232 interface protocol. The UART can be used as a serial data port in Mobile Station testing and debugging with a properly written, user-defined download program. All communication between the microprocessor and the UART goes through the microprocessor interface. The microprocessor interface synchronizes the data and command signals to the UART.

The UART has a 512-byte transmit FIFO and a 512-byte receive FIFO.

UART1 (CAIT_RX, CAIT_TX)	Mobile Station Test, Debugging, Download
UART2 (UART_RX, UART_TX)	Communication between the Phone Module and TCU

The phone shall have the following UART parameters set by default.

Baud = 9600

Data Bits = 8

Parity = ODD

Stop Bit = 1

Start Bit = 1

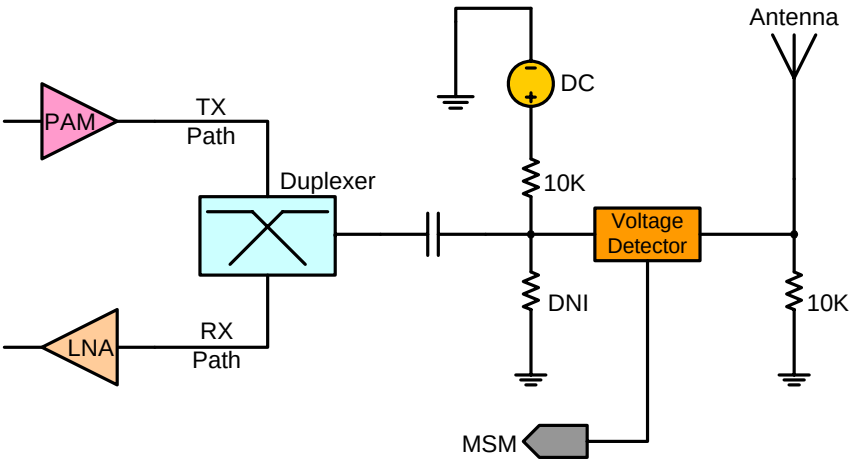
Flow Control = None

Line feed and Carriage return shall be sent following each command and response.

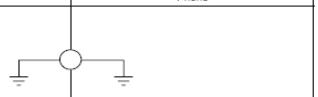
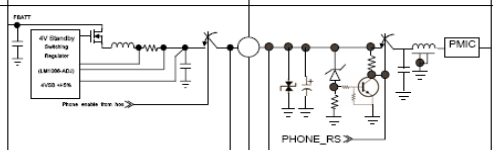
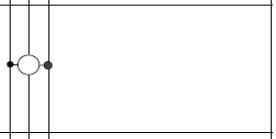
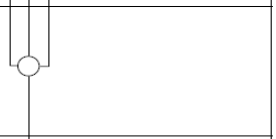
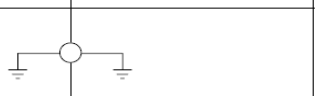
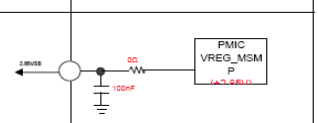
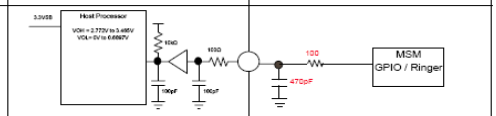
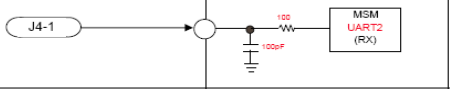
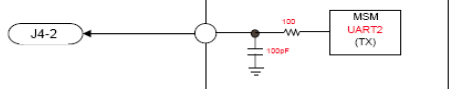
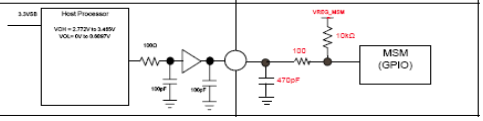
4.6.3 Cellular Antenna Open/Short Sense

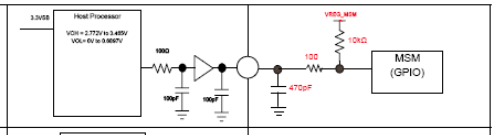
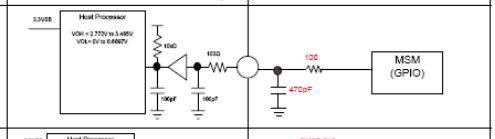
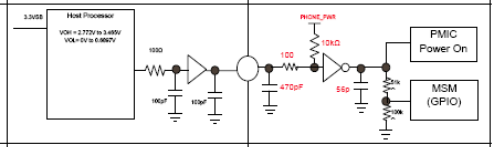
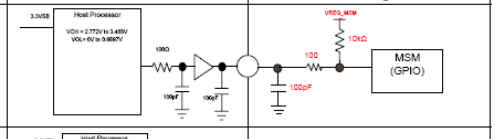
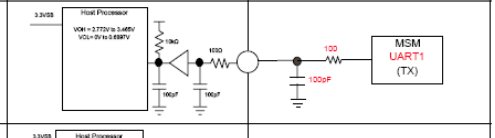
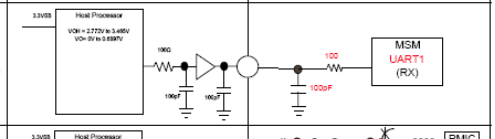
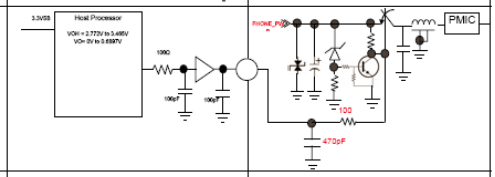
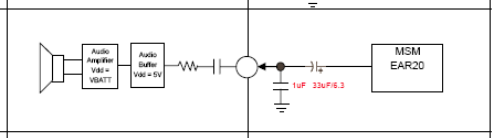
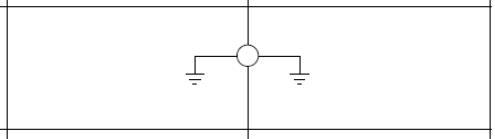
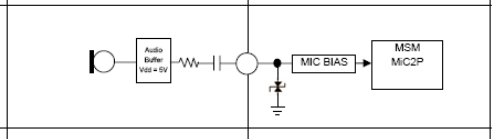
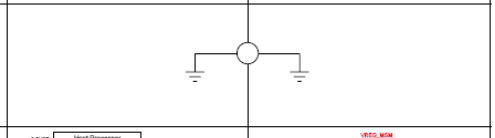
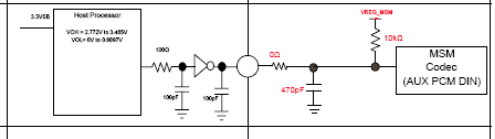
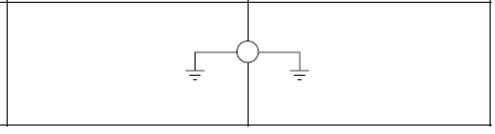
The phone module provides the antenna diagnostics function by the antenna detection circuit. The antenna detection circuit can detect three statuses: GOOD, OPEN and SHORTED. The detection circuit can support the antenna resistance values of 1 kOhm to 20 kOhm. The commands are detailed in the AT command manual.

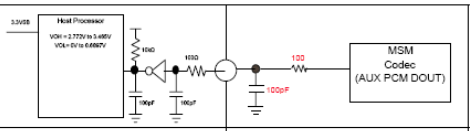
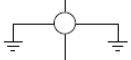
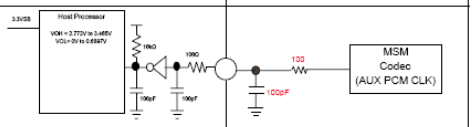
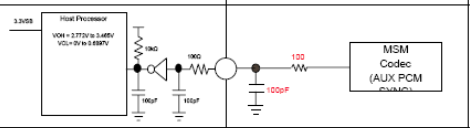
DC Voltage	2.60V	
Status	ADC Voltage	HEX
GOOD	1.30V	0x80
OPEN	2.60V	0xFF
SHORTED	0.00V	0x00



4.6.4 I/O Interface Circuit Diagrams

Pin#	Name	Description	TCU I/O	Signal Voltage Level	Impedance TCU	Impedance Phone	I_{max}	Interface TCU / Phone
1	GND	Ground	I	Typ: 0	NA	NA	1.0A	
2	NC	Not Connected	_		_	_	_	
3	PHONE_PWR	Main Supply voltage to phone module	O	Min: V_{PHONE_PWR}-5% (3.80V) Max: V_{PHONE_PWR}+5% (4.20V) *V_{PHONE_PWR}= 4.0V	NA	NA	1..0A	
4	PHONE_PWR	Main Supply voltage to phone module	O	Min: V_{PHONE_PWR}-5% (3.80V) Max: V_{PHONE_PWR}+5% (4.20V) *V_{PHONE_PWR}= 4.0V	NA	NA	1.0A	
5	PHONE_PWR	Main Supply voltage to phone module	O	Min: V_{PHONE_PWR}-5% (3.80V) Max: V_{PHONE_PWR}+5% (4.20V) *V_{PHONE_PWR}= 4.0V	NA	NA	1.0A	
6	NC	Not Connected	_		_	_	_	
7	Gnd	Ground	I	Typ: 0	NA	NA	1..0A	
8	VREF	Reference Logic Voltage level generated by the Phone	I	Vref: 0.65*Vdd_P to Vdd_p+0.3V *Vdd_P=2.85V	10MΩ			
9	RI	Ring Indicator Generated by the Phone	I	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10MΩ		3mA	
10	CAIT_RX	CAIT Receive Data Input to the Phone	O	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V			-	
11	CAIT_TX	CAIT Transmit Data Output from the Phone	I	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V			3mA	
12	IG_IND	Ignition Indicator	O	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10kΩ		3mA	

13	HW_SD	Hardware Shutdown	O	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	Output : 100Ω Input: 10MΩ		-	
14	SD_REQ	Hardware Shutdown Request	I	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	Output : 100Ω Input: 10MΩ		-	
15	PHONE_WU	Reuest to wake_up the phone from TCU	O	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10kΩ		3mA	
16	UART_DTR	UART DTR	O	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10kΩ		3mA	
17	UART_TX	UART Transimt from the Phone to TCU	I	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10MΩ		3mA	
18	UART_RX	UART Recevie to the Phone from TCU	O	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10kΩ		- (3mA)	
19	PHONE_RST	Phone reset from TCU to Phone	O	V_{High}: 0.95* V_{PHONE_PWR} to V_{PHONE_PWR}*1.05 V_{Low}: -0.3V to 0.35*V_{PHONE_PWR} *V_{PHONE_PWR}= 4.0V	10kΩ		3mA	
20	SPKR_OUT_PHONE	audio signal output to TCU	I	1.125V to 1.375V (Type 1.25V) @Avss Vdd : 2.5V ~ 2.7V 1.664Vpp (It defends on Volume level)	Hiz			
21	GND	Ground	I	Typ: 0	NA	NA	1.0A	
22	MIC_IN_PHONE	audio signal output From TCU	O	Vpp : 229mV	Hiz		1mA	
23	GND	Ground	I	Typ: 0	NA	NA	1.0A	
24	PCM_IN	PCM Audio Input to the Phone from TCU	O	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10kΩ		3mA	
25	GND	Ground	I	Typ: 0	NA	NA	1.0A	

26	PCM_OUT	PCM Audio Output from the Phone to the TCU	I	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10MΩ		3mA	
27	Gnd	Ground	I	Typ: 0	NA	NA	1.0A	
28	PCM_CLK	PCM Audio Clock Generated by the Phone	I	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10MΩ		3mA	
29	PCM_SYNC	PCM Audio Sync Generated by the Phone	I	V_{High}: 0.65*Vdd_P to Vdd_p+0.3V V_{Low}: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V	10MΩ		3mA	
30	GND	Ground	I	Typ: 0	NA	NA	1.0A