CDMRF102

TCU Phone Module

Component Technical Specification Manual

Ver. 0.1

Aug. 14. 2008

Table of Contents

1 INTRODUCTION / OVERVIEW
1.1 QSC6055 Chipset

The QSC60x5 family of devices represents the next generation of chipset architecture and enhancements for the QCT value and multimedia tiers of products. The QSC60x5 family includes the QSC6055 and QSC6065 devices (supporting CDMA2000 1x voice and data, and Simultaneous-GPS (S-GPS)), the QSC6075 device (adding CDMA2000 EV-DO rel. 0 support) and the QSC6085 device (adding CDMA2000 EV-DO rev. A support). These airlink and multimedia capabilities are supported by integrating Mobile Station Modem™ (MSM™) baseband, radioOne® RF, and power management functionality into a single 12 mm x 12 mm chip scale package (CSP). Together these functions perform all the signal processing and power management tasks within a subscriber unit. This enables reduced handset complexity, cost, time-to-market, and board-space requirements while providing many features and functionalities.

The global expansion of 3G CDMA 1x networks has extended the availability of high-speed, wireless data access. With increased accessibility comes increased demand for wireless devices that function as cameras, camcorders, personal video players, MP3 audio players, gaming consoles, and phones. To efficiently support next-generation data speeds and functionality, wireless devices must integrate applications processors with high-performance modems. The QSC60x5 devices extend the level of integration to include radio frequency and power management functions.

3G products based upon the QSC60x5 devices may include:

■ Voice and data phones

■ Music player-enabled devices and applications

■ Camera phones

■ Multimedia phones, including gaming, streaming video, videoconferencing, and more

■ Position location devices

■ Other applications and devices

QSC60x5 benefits are applied to each of these product-types, including:

■ Higher integration to reduce PCB surface area, power consumption, time-to-market, and BOM costs while adding capabilities and processing power

❒ Baseband functions, including multiple hardware cores

❒ radioOne RF and analog functions (Rx and Tx, both eliminating their intermediate frequency (IF) components)

❒ Power management functions

■ Integrated hardware cores eliminate multimedia co-processors, providing superior image quality and resolution for mobile devices while extending application times:

❒ Longer run-time for mobile devices over other industry solutions that use companion processors

■ Location-based services and applications, including points of interest, personal navigation, and friend finder

■ Single platform that provides dedicated support for all market leading CODECs and other multimedia formats to support carrier deployments around the world

■ DC power reduction using innovative techniques, such as the QUALCOMM IntelliCeiver™ technology and PA bypassing

1.1.1 QSC6055 Features

■ Modem microprocessor – a low-power, high-performance RISC microprocessor core running at 192 MHz and featuring the ARM926EJ-S™ CPU and Jazelle™ accelerator circuit from ARM® Limited.

■ Modem digital signal processor (mDSP) – the low-power, high-performance QDSP4u8™ targeting 85 MHz.

■ Application digital signal processor (aDSP) – the low-power, high-performance QDSP4u8™ targeting 115 MHz.

■ 96 MHz bus clock for 16-bit DDR SDRAM and 16/32-bit PSRAM

■ Dual-memory buses separating the high-speed memory subsystem (EBI1) from low-speed peripherals (EBI2), such as LCD panels

■ 1.8 V memory interface support on EBI1

■ 1.8 V or 2.6 V memory interface support on EBI2

■ Memory types supported:

❒ 16-bit NOR flash (burst mode), including multiplexed address/data types

❒ 8-bit and 16-bit NAND flash and 16-bit OneNAND

❒ 16-bit DDR SDRAM

❒ 16-bit and 32-bit PSRAM requiring multiplexed address/data types

■ Bootup is supported from the following devices:

❒ Burst NOR on EBI1

❒ Any supported NAND memory type on EBI2

■ CDMA2000 1X revisions A and B

■ Enhanced GPS position location

❒ Integrated gpsOne functionality, featuring enhancements by SnapTrack®, Inc., to enable a wide variety of location-based services and applications, including points of interest, personal navigation, and friend finder

❒ Simultaneous-GPS (processes GPS on its Rx path while CDMA signals continue to be processed on a separate Rx path)

❒ 1024x searcher, DFT accelerator, off-chip RAM for measured data storage

■ Two universal asynchronous receiver transmitter (UART) serial ports

1.2 Mobile Standards

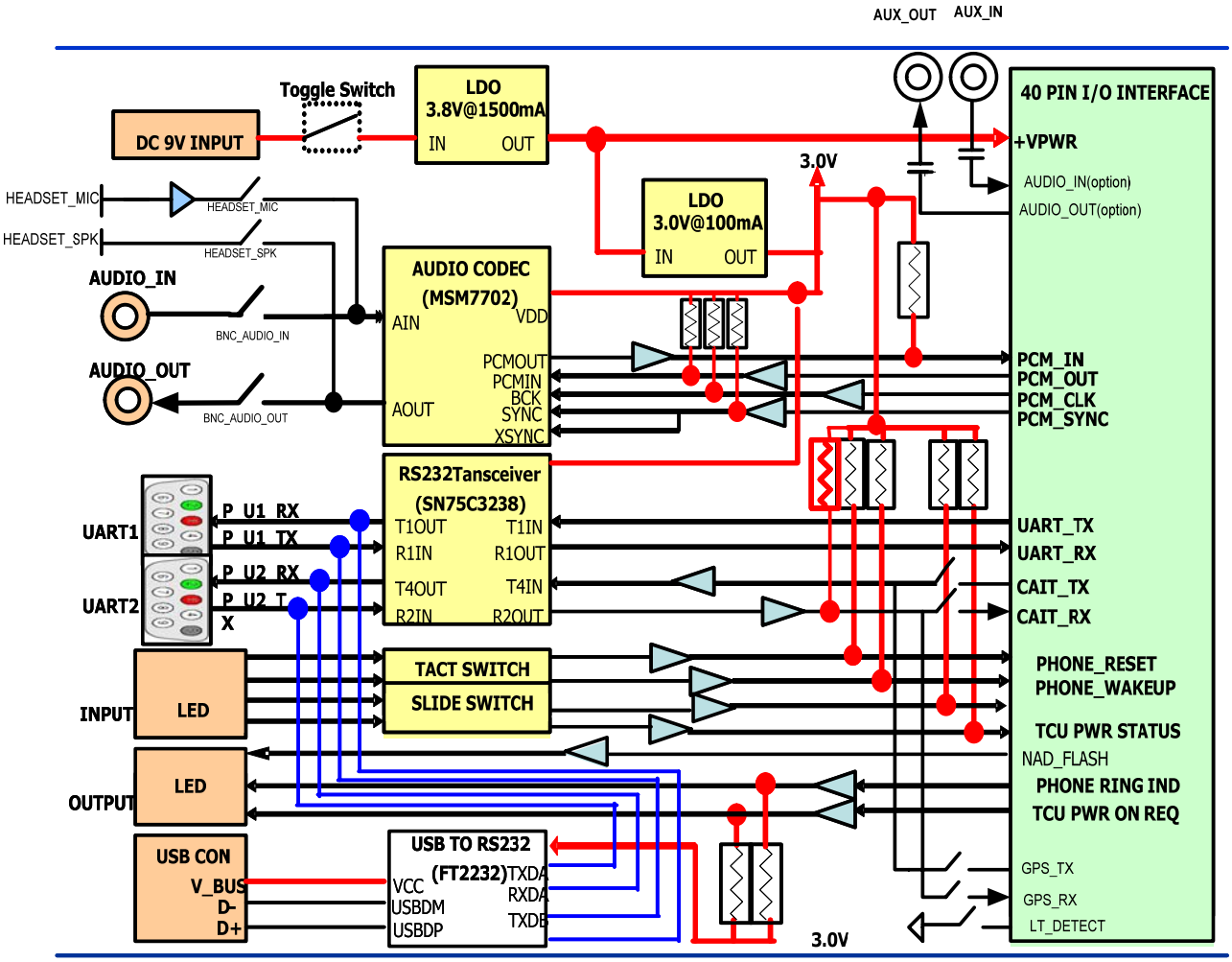
Service Provisioning- OTASP	ANSI TIA EIA-683
Parameter Administration - OTAPA	ANSI TTA ETA-683
Caller ID	IS-2000
Call Hold & Call Waiting	IS-2000
Three-Way Calling	IS-41
E911 Location Determination	TIA EIA IS-801
CDMA 1xRTT Packet Data (153 Kbps forward and reverse)	TIA EIA IS-2000
Mobile IP	TIA EIA IS-835-A
Enhanced Variable Rate Codec-B (EVRC-B)	3GPP2 C.S0014.B
Enhanced Variable Rate Codec (EVRC)	TIA EIA IS-127
EVRC TTY TDD Extension	TTA ETA IS-127-3
SMS (MT,MO)	IS-637

1.3 Acronym Definitions

Define all acronyms that will be used in the document

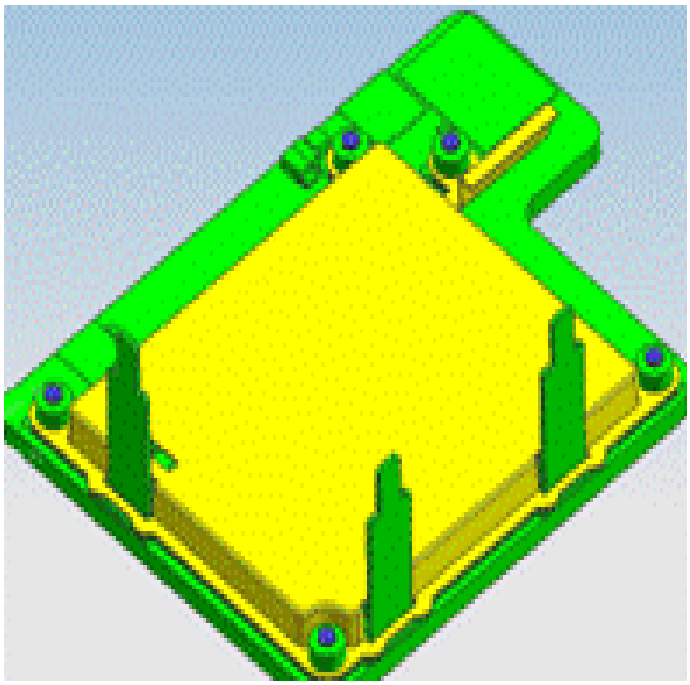
1.4 Development Tools for the Phone Module

1.4.1 LT Box



2 MECHANICAL DESCRIPTION

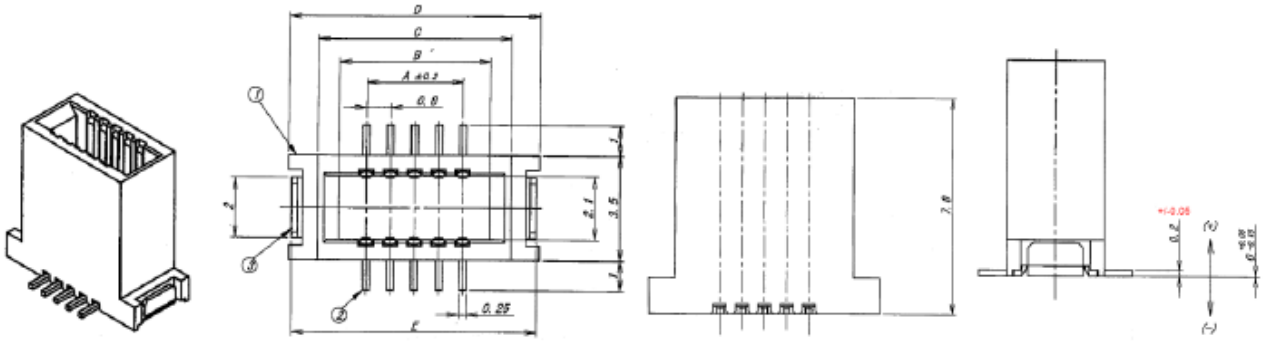
2.1 Phone Module Mechanical Outline



2.2 Phone Module I/O Connector

Iriso Part Number: 9827B-40BGFC (connector only) 9827B-40Y912 (tape and reel)

2.2.1 I/O Connector Drawing and Supplier Part Number



Pins	P/N	A	B	C	D	E
40	9827B-40B-GFC	15.2	17.0	18.4	20.3	20.1

This connector is placed on the phone module

2.2.2 I/O Connector Electrical Characteristics

2.2.2.1 I/O Connector Pin Assignment, I/O Interface, and Circuit Diagrams

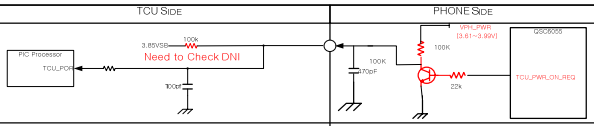
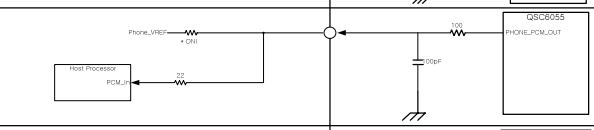
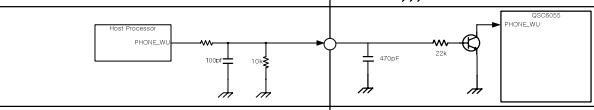
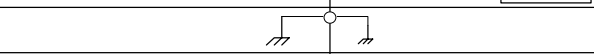
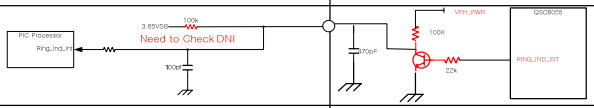
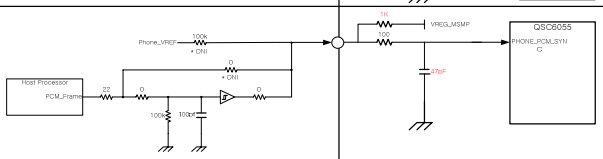
Pin #	Pin Type	Signal Name	Signal Description	Signal Type	Signal Voltage Level	Impedance TCU	Impedance PHONE	Current	Analog or Digital	I/O	Interface TCU Side	Interface PHONE Side	Comments
J1-1		Phone_PWR	3.8 volts supply voltage to phone module	DC input.	Min: 3.61V Max: 3.99V	NA	NA	Max: 1.5A	ANALOG	I	3.85V Switching Reg LTC3835 FBATT	3.8V Over_Voltage Protection VPH_PWR QSC6055	
J1-2		Phone_PWR	3.8 volts supply voltage to phone module	DC input.	Min: 3.61V Max: 3.99V	NA	NA	Max: 1.5A	ANALOG	I			
J1-3		Phone_PWR	3.8 volts supply voltage to phone module	DC input.	Min: 3.61V Max: 3.99V	NA	NA	Max: 1.5A	ANALOG	I			
J1-4		Phone_PWR	3.8 volts supply voltage to phone module	DC input.	Min: 3.61V Max: 3.99V	NA	NA	Max: 1.5A	ANALOG	I			
J1-5		GND											
J1-6		GND											

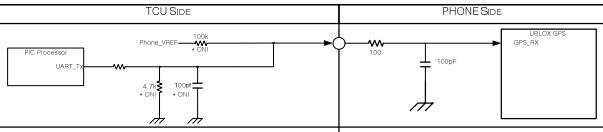
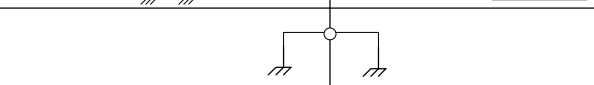
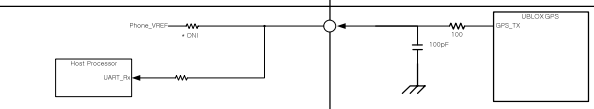
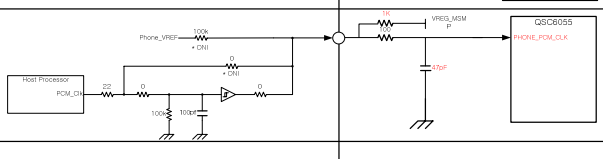
Pin #	Pin Type	Signal Name	Signal Description	Signal Type	Signal Voltage Level	Impedance TCU	Impedance PHONE	Current	Analog or Digital	I/O	Interface TCU Side	Interface PHONE Side	Comments
J1-7		Phone_VREF	2.6V +/- 2% supply output from NAD to TCU	DC supply output	Min.:2.548V, Max:2.652V	NA	NA	10mA	Analog	O			
J1-8		DNAD_RX	CAIT Receive Data from TCU to Phone.	Digital Input	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V		10K		Digital	I			
J1-9		5VSW_FROM_PHONE	5V +/- 5% supply output from NAD to TCU	DC supply output	Min.:4.75V. Max:5.25V	NA	NA	70mA	Analog	O			
J1-10		DNAD_TX	CAIT transmit Data from phone to TCU	Digital Output	Voh: Vdd_P-0.45 to Vdd_P Vol:0 to 0.45 Vdd_P=2.85 V		47K		Digital	O			
J1-11		GND	Power Ground	Ground		NA	NA		Analog				
J1-12		DNAD_CTS (Removed)	CAIT CTS data from TCU from Phone	Digital Input	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.85V		10K		Digital	I			

Pin #	Pin Type	Signal Name	Signal Description	Signal Type	Signal Voltage Level	Impedance TCU	Impedance PHONE	Current	Analog or Digital	I/O	Interface TCU Side	Interface PHONE Side	Comments
J1-13		AUDIO_OUT	Analog Audio signal from phone to TCU	Analog Audio	Max. 1.65Vpp* with 600ohm load condition	600ohm	600ohm		Analog	O			
J1-14		DNAD_RTS (Removed)	CAIT RTS Data from phone to TCU	Digital Output	Voh: Vdd_P-0.45 to Vdd_P Vol:0 to 0.45 Vdd_P=2.85 V		47K		Digital	O			
J1-15		GND	Power Ground	Ground		NA	NA		Analog				
J1-16		DNAD_FLASH	Timer signal from phone to TCU (Only for test pupose)	Digital Output	Voh: Vdd_P-0.45 to Vdd_P Vol:0 to 0.45 Vdd_P=2.65 V		2.2K		Digital	O			
J1-17		AUDIO_IN	Analog Audio signal from TCU to Phone	Analog Audio	Max. 171mVpp		10K		Analog	I			
J1-18		PHONE_UART_TXD	UART TX data from TCU to Phone	Digital Input	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.6V		1K		Digital	I			

PIN #	PIN TYPE	SIGNAL NAME	SIGNAL DESCRIPTION	SIGNAL TYPE	SIGNAL VOLTAGE LEVEL	IMPEDANCE		CURRENT	ANALOG OR DIGITAL	I/O	INTERFACE		COMMENTS
						TCU	PHONE				TCU SIDE	PHONE SIDE	
J1-19		GND	Power Ground	Ground		NA	NA		Analog				
J1-20		PHONE_UART_RXD	UART RX data from Phone to TCU	Digital	Voh: Vdd_P~0.45 to Vdd_P Vol:0 to 0.45 Vdd_P=2.6V			4mA	Digital	O	Phone_VREF 100k * DNI; Host Processor RI; 22; 100; PHONE_UART_TX; 47pF; QSC6055		
J1-21		LT	LT detection between LT & Phone(Active Low)	Digital	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.6V		100K		Digital	I	NC; 100; 470pF; LT_DETECT_N; QSC6055		
J1-22		PHONE_UART_RTS	UART RTS from TCU to Phone	Digital	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.6V		1K		Digital	I	Host Processor RTS; Phone_VREF 100k * DNI; 22; 100; 100nF; VREG_MSMP 1K; 100; PHONE_UART_CTS; 47pF; QSC6055		
J1-23		NC											
J1-24		PHONE_UART_CTS	UART CTS from Phone to TCU	Digital	Voh: Vdd_P~0.45 to Vdd_P Vol:0 to 0.45 Vdd_P=2.6V			4mA	Digital	O	Phone_VREF 100k * DNI; Host Processor CTS; 22; 100; PHONE_UART_RFR; 47pF; QSC6055		

PIN #	PIN TYPE	SIGNAL NAME	SIGNAL DESCRIPTION	SIGNAL TYPE	SIGNAL VOLTAGE LEVEL	IMPEDANCE		CURRENT	ANALOG OR DIGITAL	I/O	INTERFACE		COMMENTS
						TCU	PHONE				TCU SIDE	PHONE SIDE	
J1-25		TCU_RESET	TCU reset from Phone to TCU (Active Low)	Digital Output	Voh: Vdd_P~0.45 to Vdd_P Vol:0 to 0.45 Vdd_P=2.6V			2mA	DIGITAL	O	Phone_VREF 100k * DNI; Host Processor HRESET; 100k; 100; TCU_RESET_N; 470pF; QSC6055		
J1-26		GND	Power Ground	Ground					Analog				
J1-27		TCU_PWR_STATUS	TCU Power indication from TCU to Phone (High:Ignition on Low :Ignition off)	Digital Input	3.3V		4.7K		DIGITAL	I	3.3VSW; 100nF; 10K; VREG_MSMP; 470pF; 100K; 4.7K; TCU_PWR_STATUS; QSC6055		
J1-28		PHONE_PCM_OUT	Digital PCM audio out from TCU to Phone	Digital Input	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.6V		1K		DIGITAL	I	Host Processor PCM_Out; Phone_VREF 100k * DNI; 22; 100; 100nF; VREG_MSMP 1K; 100; PHONE_PCM_IN; 47pF; QSC6055		
J1-29		PHONE_RESET	Reset Signal from TCU to Pone (Active Low)	Digital Input	3.85V		10K		DIGITAL	I	PIC Processor Phone_Reset; 3.85VSB 100k; 100nF; PHONE_PWR; Over_Voltage Protection/ Power Switch; SW_ON (H:On, L:Off); 10K; VPH_PWR; QSC6055		
J1-30		GND	Power Ground	Ground					Analog				

PIN #	PIN TYPE	SIGNAL NAME	SIGNAL DESCRIPTION	SIGNAL TYPE	SIGNAL VOLTAGE LEVEL	IMPEDANCE		CURRENT	ANALOG OR DIGITAL	I/O	INTERFACE		COMMENTS
						TCU	PHONE				TCU SIDE	PHONE SIDE	
J1-31		TCU_PWR_ON_REQ	TCU Power on Request from Phone to TCU(Active LOW)	Digital output	High :3.61~3.99V Low :0~0.3V	10K	100K		DIGITAL	O		
J1-32		PHONE_PCM_IN	Digital PCM audio In from Phone to TCU		Voh: Vdd_P-0.45 to Vdd_P Vol:0 to 0.45 Vdd_P=2.6V			2mA	DIGITAL	O		
J1-33		PHONE_WU	Phone Wake Up signal from TCU to Phone(Active High:500mS)	Digital input	3.85V		22K		DIGITAL	I		
J1-34		GND	Power Ground	Ground					Analog				
J1-35		RING_IND_INT	Ring Indication signal from Phone to TCU(Active Low)	Digital Output	High :3.61~3.99V Low :0~0.3V	100K			DIGITAL	O		
J1-36		PHONE_PCM_FRAME	Digital PCM Frame Sync from TCU to Phone(Phone to LT)	Digital Input(TCU to Phone) Digital Output(Phone to LT)	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.6V		1K		Digital	I(O)		

PIN #	PIN TYPE	SIGNAL NAME	SIGNAL DESCRIPTION	SIGNAL TYPE	SIGNAL VOLTAGE LEVEL	IMPEDANCE		CURRENT	ANALOG OR DIGITAL	I/O	INTERFACE		COMMENTS
						VCP	PHONE				TCU SIDE	PHONE SIDE	
J1-37		GPS_UART_TXD	GPS UART signal from TCU to GPS chip	Digital Input	VHigh: 0.7*Vdd to TBD VLow: Up to 0.2*Vdd *Vdd_P=3.0V				DIGITAL	I		
J1-38		GND	Power Ground	Ground					Analog				
J1-39		GPS_UART_RXD	GPS UART signal from GPS chip to TCU	Digital output	Voh: Vdd-0.4 to Vdd_P Vol:0 to 0.4 Vdd=3.0V			4mA	DIGITAL	O		
J1-40		PHONE_PCM_CLK	Digital PCM CLK from TCU to Phone(Phone to LT)	Digital Input(TCU to Phone) Digital Output(Phone to LT)	VHigh: 0.65*Vdd_P to Vdd_p+0.3V VLow: -0.3V to 0.35*Vdd_p *Vdd_P=2.6V		1K		Digital	I(O)		

3 OPERATING TEMPERATURE AND STORAGE

3.1 Temperature

3.1.1 Storage Temperature

The phone module shall be capable of being stored at -40C ~ 85C without any damage.

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

A power supply or supplies with the following characteristics shall power the NAD:

Power Supply	Unit	Value			Notes
		MIN	TYP	MAX	
V_{DD}	V	3.61	3.8	3.99	Single supply for NAD
I_{DD}	A			1.125	
$V_{DD\ Ripple\ MAX}$	mV			100	

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

4.3 Current Draw

4.3.1 TX Current Drain

<Voice Call>
-. USCellular(Ch.384) Current: 245 mA
-. USPCS(Ch.675) Current : 230 mA
<Data Call>
-. USCellular(Ch.384) Current: 350 mA
-. USPCS(Ch.675) Current: 360 mA

4.3.2 Standby Current Drain.

Band	Celluar (ch 384)		PCS (ch 600)	
Slot Mode	SLOT1	SLOT2	SLOT1	SLOT2
Current [mA]	3.78 mA	2.63 mA	3.76 mA	2.59 mA

4.3.3 Off current drain.

-Under 100uA

4.4 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

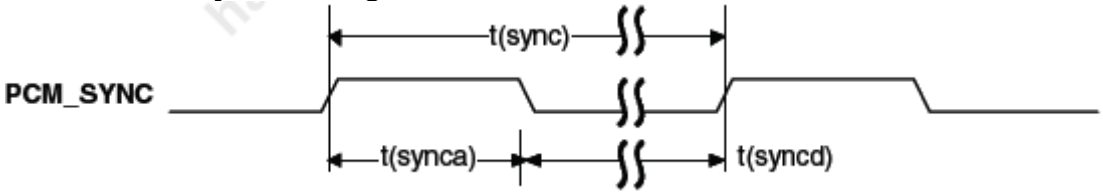
4.6.1 PCM Audio

4.6.1.1 QSC Timing Parameters

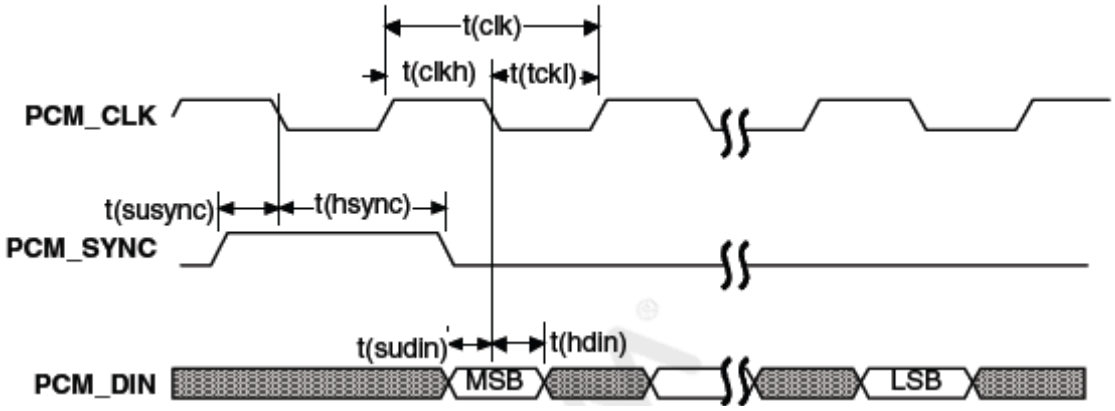
Parameter	Description	Min	Typical	Max	Unit	Note
t(sync)	PCM_SYNC cycle time (PCM_SYNC_DIR=1)	—	125	—	µs	1
	PCM_SYNC cycle time (PCM_SYNC_DIR=0)	—	125	—	µs	
t(synca)	PCM_SYNC asserted time (PCM_SYNC_DIR=1)	400	500	—	ns	1
	PCM_SYNC asserted time (PCM_SYNC_DIR=0)	—	—	—	ns	
t(syncd)	PCM_SYNC de-asserted time (PCM_SYNC_DIR=1)	—	124.5	—	µs	1
	PCM_SYNC de-asserted time (PCM_SYNC_DIR=0)	—	—	—	µs	
t(clk)	PCM_CLK cycle time (PCM_CLK_DIR=1)	400	500	—	ns	1
	PCM_CLK cycle time (PCM_CLK_DIR=0)	—	—	—	ns	

Parameter	Description	Min	Typical	Max	Unit	Note
t(clkh)	PCM_CLK high time (PCM_CLK_DIR=1)	200	250	—	ns	1,2
	PCM_CLK high time (PCM_CLK_DIR=0)	—	—	—	ns	
t(clkl)	PCM_CLK low time (PCM_CLK_DIR=1)	200	250	—	ns	1,2
	PCM_CLK low time (PCM_CLK_DIR=0)	—	—	—	ns	
t(susync)	PCM_SYNC setup time to PCM_CLK falling	—	150	—	ns	
	(PCM_SYNC_DIR=1, PCM_CLK_DIR=1)					
	PCM_SYNC setup time to PCM_CLK falling	—	—	—	ns	
	(PCM_SYNC_DIR=0, PCM_CLK_DIR=0)					
t(hsync)	PCM_SYNC hold time after PCM_CLK falling	—	300	—	ns	
	(PCM_SYNC_DIR=1, PCM_CLK_DIR=1)					
	PCM_SYNC hold time after PCM_CLK falling	—	—	—	ns	
	(PCM_SYNC_DIR=0, PCM_CLK_DIR=0)					
t(sudin)	PCM_DIN setup time to PCM_CLK falling	50	—	—	ns	
t(hdin)	PCM_DIN hold time after PCM_CLK falling	10	—	—	ns	
t(pdout)	Delay from PCM_CLK rising to PCM_DOUT valid	—	—	350	ns	
t(zdout)	Delay from PCM_CLK falling to PCM_DOUT HIGH-Z	—	160	—	ns	

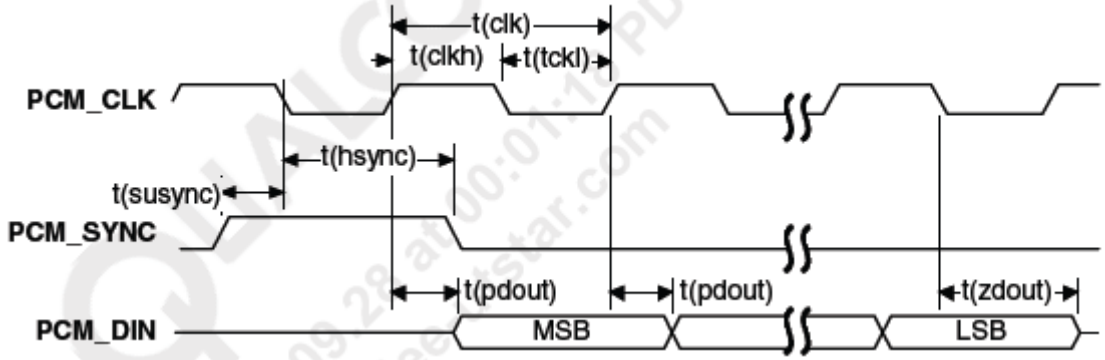
4.6.1.2 PCM Sync Timing



4.6.1.3 QSC Receive Timing



4.6.1.4 MSM Transmitting Timing



4.6.2 UART Data Interface

QSC6055 devices are capable of providing up to two universal asynchronous receiver transmitter (UART) ports. Each UART communicates with serial data ports that conform to the RS-232 interface protocol. With a properly written and user-defined download program, the UART can be used as the handset's serial data port for test and debug, and can support additional interface functions such as an external keypad or ringer. If the handset uses EEPROM or flash memory, then the UART can be used to load and/or upgrade system software.

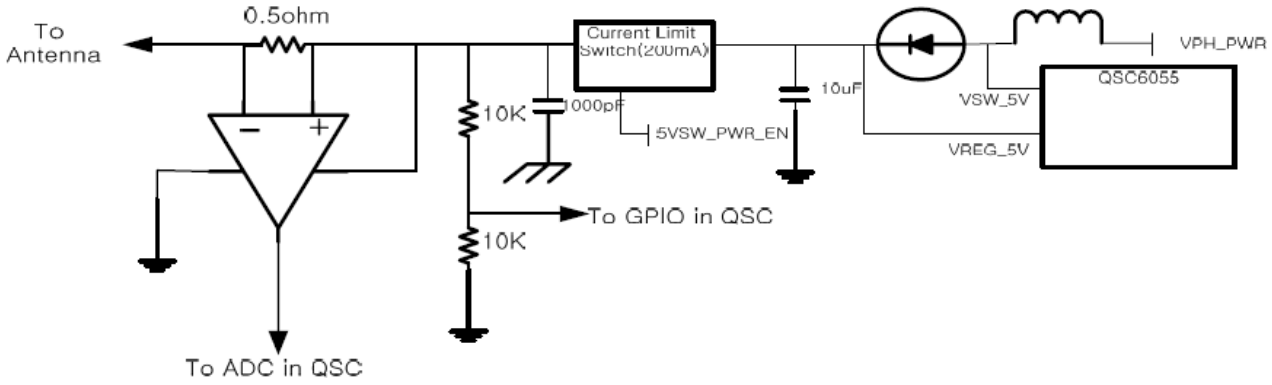
UART1 capability is expanded to include a high-speed (Up to 4 Mbps) mode.

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 senses current drain through anttena and sends analog voltage to QSC. QSC reads analog voltage by its ADC and monitors the antenna status.

Fault	Duration	Fault Specification
Shorted Antenna	Indefinite	Phantom Current > 60mA
Open Antenna	Indefinite	Phantom Current < 10mA

<Antenna Input Fault Requirement>



<Antenna Detection Circuit>

Notice

OEM integrators and installers are instructed that the phrase. This device contains transmitter FCC ID: O6Y-CDMRF102 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 -1.5dBi. The gain of the antenna for PCS band must not exceed -2.5dBi.