Qualcomm
TECHNOLOGIES, INC

MSM8974AB Linux Android™ Current Consumption Data

80-NA437-7A M

August 28, 2014

Submit technical questions at:
https://support.cdmatech.com/

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Revision history

Revision	Date	Description
A	Aug 2013	Initial release
B	Oct 2013	Updated Figure 2-1 and Tables 1-1 and 4-1; added Table 4-2
C	Nov 2013	Updated Section 4.1 and Table 4-2
D	Dec 2013	Updated Tables 3-1, 4-1, and 4-2; added Tables 4-3 to 4-28
E	Jan 2014	Added Section 1.9.1, updated Table 4-2 and Section 4.3
F	Jan 2014	Updated Table 4-2
G	Jan 2014	Updated Section 4.1 and Table 4-2
H	Mar 2014	Updated for AB devices with feature codes AB and AC; added LGGS1 and TGGS1 test cases to Tables 3-1 and 4-1; updated text in Section 4.1 to clarify projections in Table 4-1; updated Table 4-2 headers to clarify hardware configuration; added Appendix A for (AP) Krait power curves
J	Mar 2014	Updated Tables 1-1, 2-1, 3-1, 4-1, and 4-2
K	May 2014	Updated Table 4-2
L	Jul 2014	Updated Section 1.8.1
M	Aug 2014	Updated Table 3-1 and Table 4-1

Note: There is no Rev. I, O, Q, S, X, or Z per Mil. standards.

1 Introduction

1.1 Purpose

This document provides current consumption data for the MSM8974AB devices with feature codes AB and AC with AMSS 8974 software. The consumption is highly dependent on software optimization.

Multiple MSM™ chipsets are addressed in this document, i.e., MSM8974AB, MSM8674AB, and MSM8274AB devices, as well as the feature codes AB and AC that denote various maximum operating frequency differences. See [Q2] for further information regarding device differerences. When the material presented applies equally to all, they are jointly referred to as the MSM8x74AB device.

This document is intended for engineers who are currently using or are planning to use MSM8x74AB devices and/or AMSS 8974 software.

1.2 Expectations

1.2.1 Device variation

The current consumption measurements recorded in this document are measured on Qualcomm Technologies, Inc. (QTI) reference hardware and hence may not match the current consumption measurements of a customer design.

Variations in measurement compared to the customer device can be caused by the CDP using different components than the customer design, e.g., memory ICs, display ICs, peripheral ICs, etc. Potential variations in measurement when compared to an identical CDP loaded with identical software can also be caused by normal silicon process variations in both the QTI and non-QTI components and power-supply tolerances. Any differences in measurement technique, equipment, or temperature also causes variations. Other factors, e.g., floating CMOS inputs or taking measurements at maximum Tx power, can affect both reliability and repeatability of current consumption measurements.

The targets and measurements contained herein are typical values measured on a single CDP on a typical production part in a lab bench environment (room temperature). They are provided as a relative reference point.

1.2.2 Test case selection

The test cases selected for measurement in this document are intended to provide a wide range of coverage. Although the specific conditions a customer needs may not appear in this list, there is generally a test case or combination of test cases that is close enough to the customer requirement to be used for a baseline comparison.

1.3 Customer platform power optimization

Customer platform power optimization is best started with comparisons to the QTI platform under one or more baseline test conditions given in this document. When the customer platform and CDP8974AB platform are compared and optimized in this known test case, then the differences between baseline and required test cases can be measured on the customer platform and analyzed with QTI for optimization, if necessary.

Power optimization of a customer platform is an iterative process, which involves:

- Identifying power consumption differences between a customer platform and QTI platform in similar test conditions
- Determining the source of those differences; these could be test conditions, hardware configuration differences, software control differences, etc.
- Deciding whether the source is an error that must be corrected or is intentional
- Correcting errors that are identified
- Repeating until all differences are corrected or determined to be intentional

As customers update their hardware platform or integrate new software releases from QTI, power consumption may change, triggering additional power optimization. It is important to understand that during the software development process, current consumption for some test cases may increase, as power improvement features may need to be delayed to a later release to meet stability requirements. Figure 1-1 is an example of customer power consumption vs CDP power consumption.

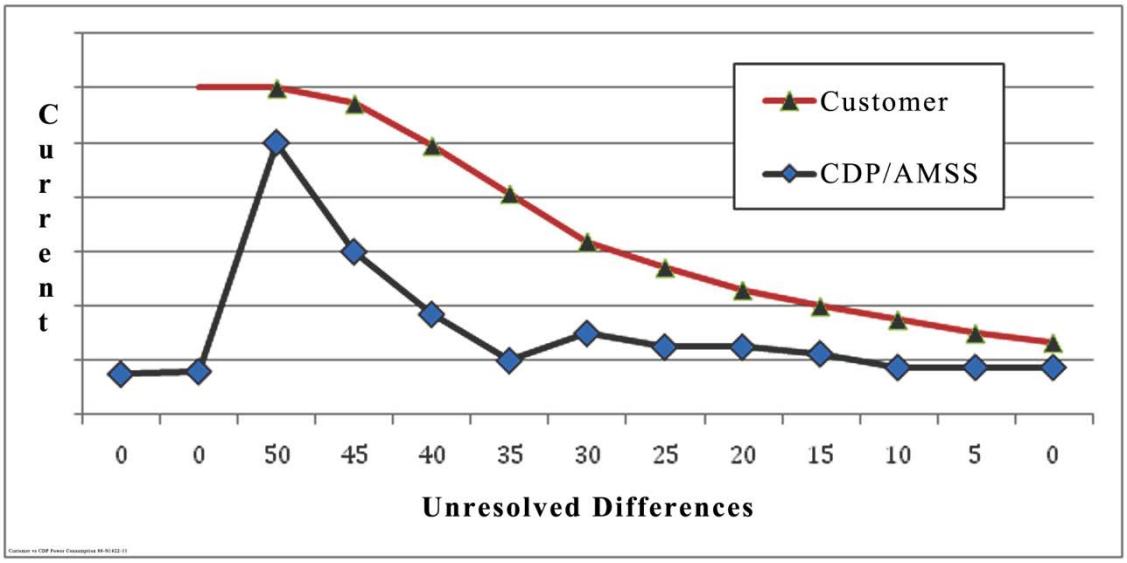

Figure 1-1 Representation of customer vs CDP power consumption

When discussing power optimization with QTI, try to provide as much information as possible, including:

- Specific test conditions
- Available history of power measurements for these test conditions
- Goals for power optimization
- Recent hardware or software changes that may have affected power consumption
- Power consumption breakdown per voltage rail, if possible

1.4 Publication timeline for power measurement data

This document will be updated approximately monthly with the latest available current consumption goals and battery-level measurements. Following the Feature Complete (FC) software release, key power rail breakdowns will be included as they become available. Measurement of these power rail breakdowns will depend upon customer requests for specific test cases and software releases.

Table 1-1 lists the publication timeline for current consumption data.

Table 1-1 Timeline for publishing current consumption data

Information provided	Guideline for availability
Target current consumption for commercial software release	Available at the time of hardware engineering samples
Battery-level measured values for Table 3-1 test cases	Available, starting with FC until generic CS release
Key power rail breakdowns for Table 3-1 test cases	Will be provided for FC and generic CS release; submit request at https://support.cdmatech.com

1.5 Note regarding GPIO configuration

To minimize current consumption, the user must configure any and all unused GPIOs in one of two ways:

- As outputs in their logic low state
- As inputs with their internal pull-downs enabled

In addition, any GPIO pin configured as an input that is normally driven by a peripheral device, e.g., Bluetooth® (BT), WLAN, NFC, etc., must be programmed with an internal pull-down when the corresponding peripheral signal is set to its high impedance state. The GPIO should then be reprogrammed to remove the pull-down when the peripheral signal is taken out of its high impedance state.

These steps are required to prevent unwanted oscillation or high current leakage on the device's pins. For additional information, see [Q6].

1.6 Conventions

Function declarations, function names, type declarations, and code samples appear in a different font, e.g., `#include`.

Shading indicates content that has been added or changed in this revision of the document.

1.7 References

Reference documents are listed in Table 1-2. Reference documents that are no longer applicable are deleted from this table; therefore, reference numbers may not be sequential.

Table 1-2 Reference documents and standards

Ref.	Document	
Qualcomm Technologies		
Q1	*Application Note: Software Glossary for Customers*	CL93-V3077-1
Q2	*MSM8274/MSM8274AB, MSM8674/MSM8674AB, MSM8974/MSM8974AB Device Specification*	80-NA437-1
Q3	*MSM8274/MSM8674/MSM8974/APQ8074 Software Interface for OEMs*	80-NA437-2
Q4	*MSM8274, MSM8674, MSM8974 Device Revision Guide*	80-NA437-4
Q5	*Configuration of Input Pins During Device Sleep*	80-VN499-7
Q6	*EXE, PowerLift 3D OpenG™L ES Graphics Benchmark Tool V.4.6.01 for Linux Android™-Enabled Devices*	72-N5481-1
Q7	*EXE, IBENCH V.4.6.01 for Linux Android-Enabled Devices*	72-N7696-1
Q8	*MSM8274/MSM8274AB, MSM8674/MSM8674AB, MSM8974/MSM8974AB Device Specification*	80-NA437-1

1.8 Technical assistance

For assistance or clarification on information in this document, submit a case to Qualcomm Technologies, Inc. (QTI) at https://support.cdmatech.com/.

If you do not have access to the CDMATech Support website, register for access or send email to support.cdmatech@qti.qualcomm.com.

1.8.1 Submitting core modem power consumption measurement requests

To submit a request for a power measurement not currently found in this document, open a Wireless Device Support Case at https://support.cdmatech.com. The following information must be included in the case:

- Correct chipset, AMSS software build ID, and Operating System (OS)
- Initial problem type – Software
- Problem area 1 – BSP/HLOS
- Problem area 2 – Power (BSP/HLOS)
- Problem area 3 – Customer-appropriate selection
- Problem Description field – Include Battery Level or Breakdown and Test Case

Priority is given to standard test cases, as listed in Table 4-1, and the measurement can typically be provided within one week. Requests for nonstandard test conditions are evaluated on a case-by-case basis.

1.8.2 Submitting multimedia power consumption measurement requests

To submit a request for a multimedia power measurement not currently found in this document, open a Wireless Device Support Case at https://support.cdmatech.com. The following information must be included in the case:

- Correct chipset, AMSS software build ID, and OS
- Initial problem type – Software
- Problem area 1 – Multimedia
- Problem area 2 – Power
- Problem area 3 – Customer appropriate selection
- Problem Description field – Include Battery Level or Breakdown and Test Case

Priority is given to standard test cases, as listed in Table 4-1, and the measurement can typically be provided within one week. Requests for nonstandard test conditions are evaluated on a case-by-case basis.

1.8.3 Submitting questions regarding Krait™ sweeps

To submit questions regarding Krait sweeps in the appendix of this document, open a Wireless Device Support Case at https://support.cdmatech.com. The following information must be included in the case:

- Correct chipset, AMSS software build ID, and OS
- Initial problem type – Hardware
- Problem area 1 – System Power
- Problem area 2 – Other (System Power)
- Problem area 3 – None
- Problem Description field – Include the details of the question

1.9 Acronyms

For definitions of terms and abbreviations, see [Q1].

2 Test Setup

2.1 Devices used for testing

The following hardware and software configurations are used for the measurements:

- MSM8x74AB device and two PMIC devices; PM8941 and PM8841 are installed on the customized configuration of the CDP8974AB evaluation platform for power measurement purposes only. The memory configuration is interleaved 3 GB (4x512 MB+2x512 MB) LPDDR3, which is a 6-die configuration.
- Various MSM8974AB software releases as defined throughout this document, along with the current consumption data, is being presented.
- Display resolution used is 1080 HD DSI (1920x1080).
- All current consumption measurement is performed using the QTI Xerxes tool.

Table 2-1 lists the chipset's device revisions used on the CDP8974AB power measurement platform for each set of tests. Throughout this document, the phrase *MSM8x74AB chipset* means this particular combination of devices.

Table 2-1 Chipset ICs tested

QTI IC
MSM8x74AB
PM8941 and PM8841
WTR1625
WCD9320
WCN3660

2.2 Air interface test equipment

Chipset current consumption is measured with the MSM8974AB platform configured for an air interface operating in a specific mode. The tested modes are defined in Chapter 3. The test equipment used to emulate the air interface is:

- Most CDMA measurements – Agilent 8960 Wireless Communications Test Set
- Most LTE measurements – Anritsu MT8820C
- Most WCDMA measurements – Agilent 8960 or the Anritsu MT8820C Radio Communication Analyzer
- Most GSM measurements – Agilent 8960 or Anritsu MT8820C

2.3 Power tree

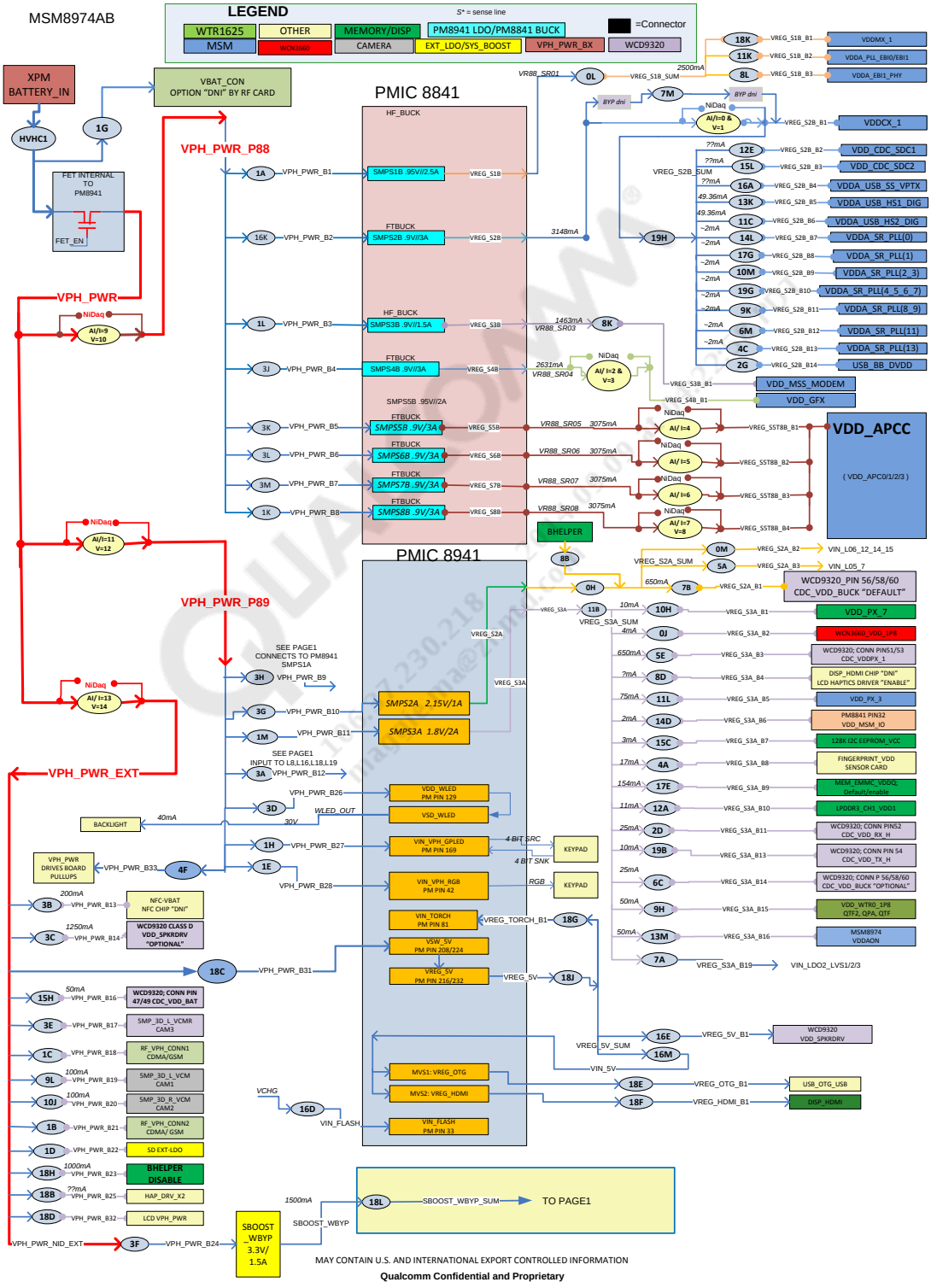

Figure 2-1 Power tree (1 of 2)

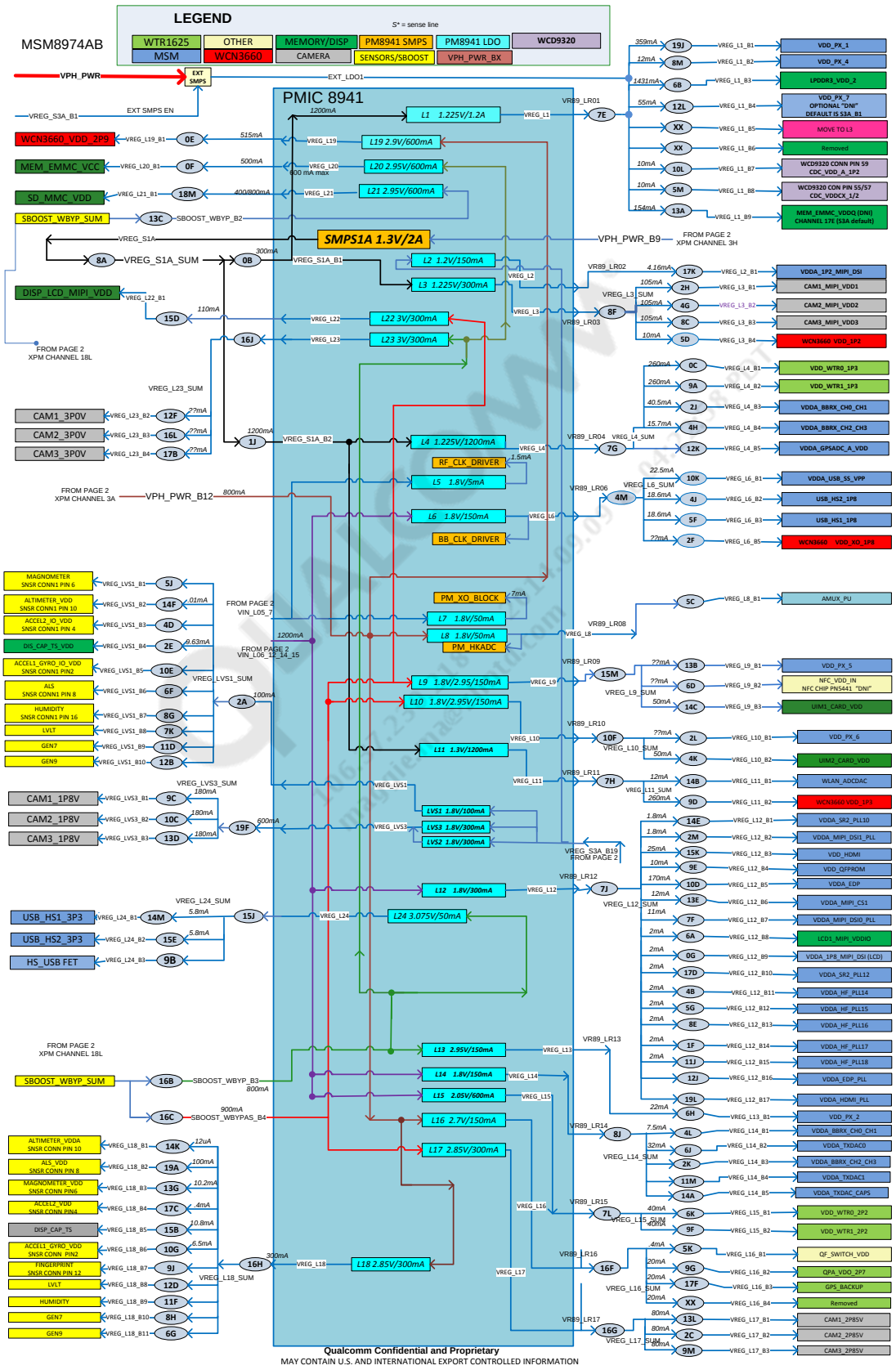

Figure 2-2 Power tree (2 of 2)

3 Test Definitions

Definitions of test conditions, i.e., air interface configuration, multimedia, display activity, lighting status, etc., for the current consumption tests are listed in Table 3-1.

Table 3-1 Test definitions

Test case	Code	Operating band	Definition
Airplane mode	AIR1		Airplane mode selected through UI; if no UI support, make sure the modem is in power collapse with no wakeups for paging processing; backlight and display off
WSLEEP	RBSC	IMT	The baseline currently consumed during the interval between two consecutive awakes when UE is camped in a WCDMA cell and is actively monitoring paging channel; backlight and display off
WCDMA standby 2.56 sec	WS1	IMT	WCDMA idle, Stationary A, Discontinuous Receive (DRX) 2.56 sec, RxAGC at phone ~ -50 dBm, duration 64 sec; Sintrasearch (intrafrequency) and Sintersearch (interfrequency) CPICH E_c/I_0 < -10 dB; backlight and display off
WCDMA talk + 0 dBm, IMT	WT1	IMT	WCDMA AMR voice, muted, empty frames on UL and DL, total Tx 0 dBm, RxAGC at phone ~ -50 dBm, IMT, no Receive Diversity (RxD); backlight and display off
CDMA QPCH standby 5.12 sec	CS2	Cell	CDMA QPCH Standby mode, SCI = 2 (5.12 sec), RxAGC at phone ~ -50 dBm, single sector, no neighbors; cell band; backlight and display off
CDMA talk +0 dBm, cell band	CT1	Cell	CDMA Only mode, muted, empty frames on UL and DL, total Tx = 0 dBm, RxAGC at phone ~ -50 dBm, EVRC RC3 full rate, no headset, cell band; backlight and display off
GSM standby 1.18 sec	GS1	PGSM	GPRS standby, MFRM5 [1.17 sec], RxAGC at phone ~ -50 dBm, PGSM, no neighbor, duration 59 sec; backlight and display off
GSM talk 5 dBm, no Discontinuous Transmit (DTX), PGSM	GT1	PGSM	GSM full-rate voice, muted, DTx OFF, empty frames on UL and DL, total Tx = 5 dBm, RxAGC at phone ~ -50 dBm, PGSM, 100% voice activity; backlight and display off
HSDPA DL 7.2 Mbps+0 dBm, IMT (RxD/no RxD)	HS22E/ HS21E	IMT	HSDPA embedded, data socket initiated through the UI, DL 7.2 Mbps, FTP, Tx = +0 dBm, no USB, RxD on/RxD off
HSDPA DC 42 Mbps + 0 dBm, IMT (RxD)	HS62E	IMT	HSPA+Cat 24 data socket initiated through the UI, dual carrier [42 Mbps], UDP, 64 QAM, RxD on, IMT band

Test case	Code	Operating band	Definition
LTE standby 2.56 sec	LS1	Band 13	LTE Standby mode, DRX = 2.56 sec, RxAGC at phone ~ -50 dBm, no neighbors, duration 64 sec; backlight and display off
LTE TDD standby 2.56 sec	LS3	Band 41	LTE TDD Standby mode, DRX = 2.56 sec, ULDL2, SSF7, B41, Rx power level -50 dBm at phone antenna connector, measurement duration 64 sec; Sintra = 0 and Snonintra = 0, no neighbor cells, backlight and display off; EPRE= -50 dBm/kHz
LTE Cat 3 (68/23 Mbps, +0 dBm, B13)	LTE1E	Band 13	LTE Data Cat 3, 2x2 MIMO, RB 50, MCS 28, 64 QAM, CP normal; PCFICH 3sym, DCI 1A, Type 0, PHICH 1/6, Tx 0 dBm, DL spectrum bandwidth 10 MHz; backlight and display off; embedded
LTE Cat 3 (100/50 Mbps, 0 dBm, B7)	LTE6E	Band 7	LTE Data Cat 3, 2x2 MIMO, RB 100, MCS 23, 64 QAM, CP normal; PCFICH 3sym, DCI 1A, Type 0, PHICH 1/6, Tx 0 dBm, DL spectrum bandwidth 20 MHz; backlight and display off; embedded
LTE Cat 4 (150/50 Mbps, 0 dBm, B7)	LTE7E	Band 7	LTE Data Cat 4, 2x2 MIMO, RB 100, MCS 28, 64 QAM, CP normal; PCFICH 3 sym, DCI 1A, Type 0, PHICH 1/6, Tx 0 dBm, DL spectrum bandwidth 20 MHz; backlight and display off; embedded
LTE Cat 3 CA 10+10 (100/25 Mbps, 0 dBm, B4+B17, Tx B17)	LTE8E	Band 4, 17	Carrier aggregation, 10 MHz bandwidth from one carrier and 10 MHz bandwidth from a second carrier and each carrier uses these parameters: 2x2 MIMO, RB 50, MCS 23, 64 QAM, CP normal; PCFICH 3sym, DCI 1A, DL Res. PHICH 1/6, Tx 0 dBm, TM3; backlight and display off, LTE data socket-initiated through UI; embedded
LTE TDD Cat 3 DL + UL (60/19 Mbps) 0 dBm, 20 MHz bandwidth, MIMO	LTE5E	Band 41	LTE Data Cat 3, ULDL1, SSF7, 2x2 MIMO, RB 100, MCS 23, 64 QAM, B41, CP normal, PCFICH 3 sym, DCI 1A, Type 0, PHICH 1/6, Tx 0 dBm, DL spectrum bandwidth 20 MHz; backlight and display off
VoLTE Talk 0 dBm 50% DTX, 40 ms CDRx, SPS	VoLTE1	Band 5	Embedded LTE AMR-WB full-rate voice, Tx power 0 dBm, LTE 10 MHz bandwidth, 40 ms CDRx, HARQ 4; SPS scheduling in UL and DL, 40% voice activity + 40% listen state + 20% silent state; backlight and display off, on-duration of 2 ms; inactivity timer of 2 ms Average the power over three runs 1. First run with 0% voice activity (play 100% VA file in the remote device, mute local device) 2. Second run with 100% voice activity (mute remote device, play 100% VA file in the local device) 3. Third run with 0% activity with both devices (mute remote device and local device)
TD-SCDMA standby 1.28 sec	TCS1	Band 39	TD-SCDMA idle Stationary A, DRX 1.28 sec, Rx power level -50 dBm at phone antenna connector, test duration 64 sec; Sintrasearch (intrafrequency) and Sintersearch (interfrequency) CPICH E_c/I_0 is ~ -15 dB; backlight and display off
TD-SCDMA talk 0 dBm, B34	TCT1	Band 34	TD-SCDMA voice, muted, empty frames on UL and DL, total Tx 0 dBm, Rx power level -50 dBm at phone antenna connector, IMT [B1]; backlight and display off

Test case	Code	Operating band	Definition
EV-DO DL 3.1 Mbps+0 dBm, cell, RxD OFF	DD2E	Cell	EV-DO data DL at 3.1 Mbps [Rev A], 0 dBm on UL, single carrier, Tx 0 dBm; RxD disabled; cell band, with USB, cell power or Ior = -45 dBm, with rake receiver
SVLTE Cat 2 (50 Mbps, +0 dBm, B13) and 1X voice	L2CT1E	Band 13	LTE data socket DL Cat 2, 2x2 MIMO, RB 50, MCS 28, 64 QAM, CP normal; PCFICH 3 sym, DCI 1A, Type 0, PHICH 1/6, Tx = 0 dBm, RxAGC at phone ~ -10 MHz bandwidth + CDMA Active mode, muted, empty frames on UL and DL, total Tx = 0 dBm, RxAGC at phone ~ -50 dBm, EVRC RC3 full rate, no headset, cell band; backlight and display off
TDD LTE Cat 3 20 MHz Cfg 1. B38+GSM voice	LDEGT1	Band 38	LTE Data Cat 3, ULDL2, SSF7, 2x2 MIMO, RB 100, MCS 23, 64 QAM, B38, CP normal, PCFICH 3 sym, DCI 1A, Type 0, PHICH 1/6, Tx 0 dBm, DL spectrum bandwidth 20 MHz; backlight and display off; +GSM full-rate voice, muted, DTX off, empty frames on UL and DL, total Tx = 5 dBm, RxAGC at phone ~ -50 dBm, PGSM, 100% voice activity; backlight and display off
TD-LTE standby (1.28 sec)+GSM standby (0.47 sec)	LSGS1	Band 38, PGSM	LTE TDD Standby mode, DRX = 2.56 sec, ULDL1, SSF7, B38, Rx power level -50 dBm at phone antenna connector, measurement duration 64 sec, no neighbor cells, backlight and display off; +EPRE = -50 dBm/kHz GPRS standby, DRX [0.47 sec], RxAGC at phone ~ -50 dBm, PGSM, no neighbor, duration 64 sec; backlight and display off
TD-SCDMA standby (0.64 sec)+GSM standby (0.47 sec)	TCSGS1	Band 39, PGSM	TD-SCDMA idle, stationary A, DRX 0.64 sec, Rx power level -50 dBm at phone antenna connector, test duration 64 sec; CPICH E_c/I_0 is approximately -15 dB; backlight and display off +EPRE = -50 dBm/kHz +GPRS standby, DRX [0.47 sec], RxAGC at phone ~ -50 dBm, PGSM, no neighbor, duration 64 sec; backlight and display off
DSDS/DSDA G+G: 0.47 sec+0.47 sec	GGS2	PGSM	GSM Slot1 – MFRM=4 [0.47s], Rx AGC ~-50 dBm; GSM Slot2 – MFRM=2 [0.47s], Rx AGC ~-50 dBm; GSM band – PGSMDSDS mode backlight and display off
DSDS/DSDA W+G: 0.64 sec+0.47 sec	WGS3	IMT, PGSM	WCDMA Slot1 – DRX = 0.64 sec, Rx AGC ~-50 dBm; GSM Slot2 – MFRM=2 [0.47 sec], Rx AGC ~-50 dBm; Sintrasearch (intrafrequency) and Sintersearch (interfrequency) CPICH E_c/I_0 < -10 dB DSDS mode; backlight and display off
DSDA GSM talk 5 dBm + HSDPA 7.2 Mbps 0 dBm (no RxD)	GTHS21E1	IMT, PGSM	System in Dual SIM mode; GSM Slot1 – GSM full-rate voice, muted, DTX off, empty frames on UL and DL, total Tx = 5 dBm, RxAGC at phone ~ -50 dBm, PGSM, 100% voice activity; WCDMA Slot2 – 3G data enabled and DC HSDPA DL 7.2 Mbps data call established total Tx 0 dBm, location services, backlight, data monitoring and display off, RxD off

Test case	Code	Operating band	Definition
DSDA GSM talk 5 dBm+DC HSDPA DL 42 Mbps +0 dBm, IMT (no RxD)	GTHS62E1	IMT, PGSM	System in Dual SIM mode; GSM Slot1 – GSM full-rate voice, muted, DTX off, empty frames on UL and DL, total Tx=5 dBm, RxAGC at phone ~ -50 dBm, PGSM, 100% voice activity; WCDMA Slot2 – 3G data enabled and DC HSDPA DL 42 Mbps data call established total Tx 0 dBm, location services, backlight, data monitoring and display off, RxD off
DSDA GSM talk 5 dBm+EV-DO DL 3.1 Mbps 0 dBm (no RxD)	GTDD2E1	PGSM, Cell	System in Dual SIM mode; GSM Slot1 – GSM full-rate voice, muted, DTX off, empty frames on UL and DL, total Tx = 5 dBm, RxAGC at phone ~ -50 dBm, PGSM, 100% voice activity, EV-DO PRL loaded and 3G data enabled, EV-DO 3.1 DL Mbps data call established total Tx 0 dBm, location services, backlight, data monitoring and display off, RxD off
LTE TDD (1.28 sec) +GSM (0.47 sec) +GSM (0.47 sec) Standby, SGLTE+G DSDA mode	LGGSA1	PGSM, B41	SIM1 LTE – LTE TDD Standby mode, DRX = 1.28 sec, ULDL1, SSF7, B41, Rx power evel -50 dBm at phone antenna connector, Sintra = 0 and Snonintra = 0, no neighbor cells, EPRE = -50 dBm/kHz; SIM1 GSM – RxAGC at phone ~ -50 dBm, no neighbor, GPRS standby, MFRM2 [0.47 sec], RxAGC at phone ~ -50 dBm, PGSM, no neighbor; SIM2 GSM only – GPRS standby, MFRM5 [0.47 sec], RxAGC at phone ~ -50 dBm, PGSM, no neighbor; duration 64 sec; backlight and display off
TDS (0.64 sec) +GSM (0.47 sec) +GSM (0.47 sec) Standby, SGTDS+G DSDA mode	TGGSA1	PGSM	SIM1 TD-SCDMA – TD-SCDMA Idle, Stationary A, DRX 0.64 sec, Rx power level -50 dBm at phone antenna connector, test duration 64 sec; Sintrasearch (intrafrequency) and Sintersearch (interfrequency) CPICH E_c/I_0 is approximately -15 d; BSIM1 GSM – RxAGC at phone ~ -50 dBm, no neighbor; GPRS standby, MFRM2 [0.47 sec], RxAGC at phone ~ -50 dBm, PGSM, no neighbor; SIM2 GSM only – GPRS standby, MFRM5 [0.47 sec], RxAGC at phone ~ -50 dBm, PGSM, no neighbor; duration 64 sec; backlight and display off
SRLTE [1X talk+ LTE OOS], 0 dBm	SRLTET1	Cell, Band13	Phone is set to SRLTE mode; muted, empty frames on UL and DL, total Tx = 0 dBm, RxAGC at phone ~ -50 dBm, EVRC RC3 full rate, no headset, cell band; backlight and display off
SRLTE [1X standby + LTE CAT2 data], 0 dBm, B13, embedded	SRLTED1E	CELL, Band13	Phone is set to SRLTE mode; CDMA QPCH Standby mode, SCI = 2 (5.12 sec), RxAGC at phone ~ -50 dBm, single sector, no neighbors; cell band; LTE Cat 2 (50/0 DL) 0 dBm, LTE data socket initiated through UI, Cat 2, 2x2 MIMO, RB 50, MCS 28, 64 QAM ,CP normal; PCFICH 3 sym, DCI 1A, DL Res. PHICH 1/6, Tx 0 dBm, TM3; backlight and display off – Embedded
SRLTE standby [1X QPCH 5.12 sec, LTE 2.56 sec)	SRLTES1	CELL, Band13	Phone is set to SRLTE mode; CDMA QPCH Standby mode, SCI=2 (5.12 sec), RxAGC at phone ~ -50 dBm, single sector, no neighbors; cell band; LTE Standby mode, DRX = 2 .56 sec, RxAGC at phone ~ -50 dBm, no neighbors, duration 64 sec; backlight and display off
MP3 playback 128 kbps TM	AU4A		MP3 at 44.1 kHz 128 kbps stereo

Test case	Code	Operating band	Definition
Listen (40% silence, 40% stationary noise, 20% speech)	AU30A		40% silence, 40% stationary noise, 20% speech 1. System in Airplane mode 2. Audio test file played through PC using sound card USB Sound Wave 7.1 Pro 3. Special headset in cable connected through headset jack 4. Volume on PC and Windows media player 50% 5. LCD display is off 6. GPS is off
Video decode (H.264 720p, 30 fps)	QTC77A		30 fps at HD 720p H.264 10 Mbps AAC+96 kbps 44.1 kHz stereo
Video decode (H.264 30 fps 1080p, 20 Mbps)	QTC88A		30 fps at HD 1080p 20 Mbps AAC+96 kbps 44 kHz stereo

Video encode (H.264 30 fps 1080p, 20 Mbps)	QMC31A		30 fps at HD 1080p 20 Mbps normal power encode, AAC 128 kbps 44.1 kHz stereo
			1. In the Camcorder settings menu, set the setting to 1080p resolution, H.264 encoding, ZSL on, and ACC audio.
			2. Insert the USB and run the following command at the command prompt. Reboot the phone. This is performed one time.
			`adb shell setprop persist.audio.handset.mic analog`
			`adb shell setprop persist.camera.mem.usecache 0`
			`adb shell sync`
			`adb reboot`
			3. Turn off AWB stats. To do this, in the camcorder preview screen, press Settings (the white circle in the lower right corner of the screen). From the pop-up menu, ensure that instead of AW, the icon that looks like a lightbulb is selected.
			4. Via the Camera app, set encode to Normal Power Encode.
			5. Make sure fps is 30.

Graphics (3D UI full-screen resolution, 30 fps (PowerLift))	QGC23A		3D UI, full-screen resolution, 30 fps (PowerLift) (see the video in [Q7])
3D Gaming (Egypt 2.5 HD), 60 fps at 75ºC, onscreen	QGC26A		GLB2.7 Egypt 2.5 HD, scene 57, at Vsync, at full-screen resolution; Airplane mode, display on, Full-Screen mode, fps (full speed, capped by platform Vsync) **Note:** It is expected that every platform will yield differing power results. These results are a function of LCD intensity, serial interface, display resolution, and fps.
Static image display	LCD04A		Static image display, at full-screen resolution, at Vsync

Test case	Code	Operating band	Definition
GPS 1 Hz Trk (DPO) with WCDMA standby	GPS2	IMT	GPS standalone 1 Hz tracking (DPO); GPS standalone 1 Hz tracking in strong signal conditions; backlight and display off
GNSS 1 Hz Trk high sensitivity with WCDMA standby	GNSS1	IMT	GLONASS standalone 1 Hz tracking high sensitivity; backlight and display off
Bluetooth (Page scan+sniff) with WCDMA standby	BT2	IMT	Bluetooth headset bonded, connected, and UE accepting other Bluetooth connection requests; Bluetooth sniff cycle 1.28 sec and page scan cycle of 1.28 sec; backlight and display off
WLAN DTIM1 with WCDMA standby	WLS1	IMT	1. Turn on Airplane mode. 2. In the config file, Listen Interval = 100 ms and BET is enabled. 3. Turn on Wi-Fi and connect to the AP. 4. Turn off the display. **Note:** Measurement should be in a shielded environment.
Accelerometer background processing at10 Hz	SNS5A		Accelerometer 10 Hz background processing
Accelerometer active processing at 15 Hz	SNS4A		Accelerometer 15 Hz active processing
Browser over Wi-Fi	WB1A	Wi-Fi	Loading and rendering of low-complexity webpage (no JavaScript, no Flash), reload every 40 sec (see the video in [Q8])
Video streaming over Wi-Fi	VS6A	Wi-Fi	Video streaming over Wi-Fi (720p 2.3 Mbps)

Note: All test codes ending in A were performed in Airplane mode.

1

4 Chipset Current Consumption

4.1 Commercial software release target values – Top level

Commercial software release target values are predictions of the current consumption for the first commercial-quality software release for an OS. These targets *will not be updated* after the commercial software is released.

Commercial software release target values for the operational modes defined in Table 3-1 are listed in Table 4-1. These values reflect optimized hardware and software configurations. These values are normalized to a 3.7 V supply voltage.

The MSM8974AB hardware used in the targets listed in Table 4-1 includes 3 GB LPDDR3 (4x512 MB+2x512 MB), which is a 6-die configuration. For the 3 GB memory, which has 2 GB on one chip select and 1 GB on the second chip select, it is very important that the device is reset before each measurement. The nonuniform memory configuration can cause run-to-run variation due to Android™ dynamic memory allocation. Therefore, ensure the device is reset and starts each measurement from the same software memory map allocation.

The power ranges shown in Table 4-1 are the projected power consumption for a typical device (~50th percentile) and a device at the 95th percentile of the device distribution. Devices that fall outside this range are to be expected. For maximum power specifications, QTI provides a power limit for the AP (KRAIT) Dhrystone power and the sleep power of the VDD_CORE and VDD_MEM voltage rails. See [Q2] for details.

NOTE: The 28 nm manufacturing process variation across parts and foundries will lead to a power distribution. The exact shape and median of this distribution is expected to vary over time with the maturing of the 28 nm process across foundries.

Table 4-1 Commercial software release top-level current consumption targets

	Test case	Code	MSM8974AB WTR1625 3GB (4x512 MB+2x512 MB) LPDDR3 1080HD DSI (1920x1080) estimated power range goal (mA)
Modem	Airplane mode	AIR1	3.4 to 4
	WCDMA standby 2.56 sec	WS1	4.0 to 4.6
	WCDMA talk+0 dBm, IMT	WT1	105 to 110
	CDMA QPCH standby 5.12 sec	CS2	4.2 to 4.8
	CDMA talk+0 dBm, cell band	CT1	114 to 118
	GSM standby 1.18 sec	GS1	4.3 to 4.9
	GSM talk+5 dBm, no DTX, PGSM	GT1	76 to 81

	Test case	Code	MSM8974AB WTR1625 3GB (4x512 MB+2x512 MB) LPDDR3 1080HD DSI (1920x1080) estimated power range goal (mA)
	HSDPA DL 7.2 Mbps+0 dBm, IMT (RxD/no RxD)	HS22E/ HS21E	165 to 180/ 146 to 161
	HSDPA DC 42 Mbps+0 dBm, IMT (RxD)	HS62E	212 to 220
	LTE standby (2.56 sec)	LS1	4.3 to 4.9
	LTE TDD standby 2.56 sec	LS3	4.3 to 4.9
	LTE Cat 3 (68/23 Mbps, 0 dBm, B13)	LTE1E	270 to 290
	LTE Cat 3 (100/50 Mbps, 0 dBm, B7)	LTE6E	392 to 422
	LTE Cat 4 (150/50 Mbps, 0 dBm, B7)	LTE7E	435 to 465
	LTE Cat 3 CA 10+10 (100/25 Mbps, 0 dBm, B4+B17, Tx B17)	LTE8E	425 to 445
	LTE TDD Cat 3 20 MHz (60/18 Mbps, +0 dBm, B38)	LTE5E	292 to 310
	VoLTE (40 ms DRx, SPS, 40% VAF)	VOLTE1	80 to 84
	TD-SCDMA standby 1.28 sec	TCS1	4.2 to 4.8
	TD-SCDMA talk 0 dBm, B34	TCT1	81 to 85
	EV-DO DL 3.1 Mbps+0 dBm, cell	DD2E	158 to 174
	SVLTE Cat 2 (50 Mbps, 0 dBm, B13) and 1X voice	L2CT1E	370 to 395
	TDD LTE Cat 3 20 MHz Cfg 1; B38+GSM voice	LDEGT1	392 to 422
	TD-LTE standby (1.28 sec)+GSM standby (0.47 sec)	LSGS1	7.2 to 7.8
	TD-SCDMA standby (0.64 sec)+GSM standby (0.47 sec)	TCSGS1	6.6 to 7.2
	DSDS/DSDA G+G, 0.47 sec+0.47 sec	GGS2	6.7 to 7.3
	DSDS/DSDA W+G, 0.64 sec+0.47 sec	WGS3	6.5 to 7.1
	DSDA GSM talk 5 dBm+HSDPA 7.2 Mbps 0 dBm (no RxD)	GTHS21E1	220 to 240
	DSDA GSM talk 5 dBm+DC HSDPA DL 42 Mbps+0 dBm, IMT (no RxD)	GTHS62E1	230 to 250
	DSDA GSM talk 5 dBm+EV-DO DL 3.1 Mbps 0 dBm (no RxD)	GTDD2E	210 to 230
	LTE TDD (1.28 sec)+GSM (0.47 sec)+ GSM (0.47 sec) standby, SGLTE+G DSDA mode	LGGSA1	9.0 to 9.6
	TDS (0.64 sec)+GSM (0.47 sec)+GSM (0.47 sec) standby, SGTDS+G DSDA mode	TGGSA1	8.5 to 9.1
	SRLTE [1X talk+ LTE OOS], 0 dBm	SRLTET1	115 to 119
	SRLTE [1X standby + LTE CAT2 data], 0 dBm, B13, embedded	SRLTED1E	240 to 255
	SRLTE standby [1X QPCH 5.12 sec, LTE 2.56 sec)	SRLTES1	4.3 to 4.9

	Test case	Code	MSM8974AB WTR1625 3GB (4x512 MB+2x512 MB) LPDDR3 1080HD DSI (1920x1080) estimated power range goal (mA)
GPS	GPS 1 Hz Trk (DPO)+with W standby	GPS2	12.5 to 14
	GNSS 1 Hz Trk high sensitivity with W standby	GNSS1	47.5 to 53.5
Multimedia	MP3 playback 128 kbps TM	AU4A	20.8 to 23.8
	Listen (40% silence, 40% stationary noise, and 20% speech)	AU30A	TBD
	Video decode – H.264 720p, 30 fps	QTC77A	118 to 133
	Video decode – H.264 30 fps 1080p, 20 Mbps	QTC88A	155.2 to 177
	30 fps at HD 1080p 20 Mbps normal power encode, AAC 128 kbps 44.1 kHz stereo	QMC31A	400 to 440
	Graphics – 3D UI full-screen resolution, 30 fps (PowerLift)	QGC23A	162 to 182
	3D gaming (Egypt 2.5 HD) 60 fps at 75ºC, onscreen	QGC26A	1100 to 1200
	Static image display	LCD04A	75.2 to 77.2
Connectivity	Bluetooth (page scan+sniff) with WCDMA standby	BT2	4.8 to 5.4
	WLAN (DTIM1) with WCDMA standby	WLS1	5.8 to 6.4
Sensors	Accelerometer background processing at 10 Hz	SNS5A	5.2 to 5.9
	Accelerometer active processing at 15 Hz	SNS4A	81 to 87
Netapps	Browser over Wi-Fi	WB1A	107 to 120
	Video streaming over Wi-Fi	VS6A	170 to 190

NOTE: For the 3D gaming case, a uniform MSM T_j (junction temperature) of 75°C (vs 25°C for the other cases) owing to the high power dissipation is assumed. The exact power profile depends on the dissipation and form-factor thermal.

NOTE: Power targets for the respective APQ design are expected to be the same as the MSM, provided the same XO solution is used. A power delta due to a change in the XO solution, i.e., TCXO, should be completely attributed to the design difference.

4.2 Measured values – Top level

Table 4-2 Measured values – Top level

	Test case	Code	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 3027.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2140.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2134.1 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2030.2 (mA)
Modem	Airplane mode	AIR1	3.31	3.46	3.5	3.2

	Test case	Code	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 3027.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2140.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2134.1 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2030.2 (mA)
	WCDMA standby 2.56 sec	WS1	3.55	3.8	3.81	3.6
	WCDMA talk+0 dBm, IMT	WT1	97	98.9	97.8	99
	CDMA QPCH standby 5.12 sec	CS2	3.43	3.62	3.67	3.4
	CDMA talk+0 dBm, cell band	CT1	101.60	95.5	97.5	95.5
	GSM standby 1.18 sec	GS1	3.85	4.12	4.09	3.95
	GSM talk+5 dBm, no DTx, PGSM	GT1	73	71	71.0	73.5
	HSDPA DL 7.2 Mbps+0 dBm, IMT (RxD/no RxD)	HS22E/ HS21E	122	124	123	127
	HSDPA DC 42 Mbps+0 dBm, IMT (RxD)	HS62E	NA	180	178	182
	LTE standby (2.56 sec)	LS1	3.73	3.94	3.92	3.8
	LTE TDD standby 2.56 sec	LS3	3.74	4.01	4.03	3.90
	LTE Cat 3 (68/23 Mbps, 0 dBm, B13)	LTE1E	247	237	243	262
	LTE Cat 3 (100/50 Mbps, 0 dBm, B7)	LTE6E	370	356	354	390
	LTE Cat 4 (150/50 Mbps, 0 dBm, B7)	LTE7E	404	382	382	416
	LTE Cat 3 CA 10+10 (100/25 Mbps, 0 dBm, B4+B17, Tx B17)	LTE8E	NA	375	368	388
	LTE TDD Cat 3 20 MHz (60/18 Mbps, +0 dBm, B38)	LTE5E	236	249	253	250
	VoLTE (40 ms DRX, SPS, 40% VAF)	VOLTE1	87	75.3	81	82.6

	Test case	Code	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 3027.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2140.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2134.1 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2030.2 (mA)
	TD-SCDMA standby 1.28 sec	TCS1	4.10	4.07	4.12	3.95
	TD-SCDMA talk 0 dBm, B34	TCT1	67	61	61.0	63
	EV-DO DL 3.1 Mbps+0 dBm, cell	DD2E	136	130	137	130
	SVLTE Cat 2 (50 Mbps, 0 dBm, B13) and 1X voice	L2CT1E	319	326	315	347
	TDD LTE Cat 3 20 MHz Cfg 1 B38 + GSM voice	LDEGT1	298	317	NA	320
	TD-LTE standby (1.28 sec) + GSM standby (0.47 sec)	LSGS1	6.84	6.66	NA	6.2
	TD-SCDMA standby (0.64 sec) +GSM standby (0.47 sec)	TCSGS1	7.04	6.83	8.13	6.5
GPS	GPS 1 Hz Trk (DPO) + with W standby	GPS2	12.57	11.4	11.2	11.7
	GNSS 1 Hz Trk high sensitivity with W standby	GNSS1	49	45	46.0	48
Multimedia	MP3 playback 128 kbps TM	AU4A	21	21.4	22.3	22
	Listen (40% silence, 40% stationary noise, 20% speech)	AU30A	8.50	5.8	NA	6.3
	Video decode – H.264 720p, 30 fps	QTC77A	111	118.1	133.0	126.4
	Video decode – H.264 30 fps 1080p, 20 Mbps	QTC88A	146	137.3	152.8	143.5
	30 fps at HD 1080p 20 Mbps normal power encode, AAC 128 kbps 44.1 kHz stereo	QMC31A	352	337.9	351.3	411.8

	Test case	Code	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 3027.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2140.2 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2134.1 KitKat (mA)	MSM8974AB WTR1625 3 GB (4x512 MB+ 2x512 MB) LPDDR3 1080HD DSI (1920x1080) measurement 2030.2 (mA)
	Graphics – 3D UI full-screen resolution, 30 fps (PowerLift)	QGC23A	142	170.7	178.7	164.3
	3D gaming (Egypt 2.5 HD) 60 fps, onscreen*	QGC26A	755	764.2	762.1	774
	Static image display	LCD04A	66.35	66.4	64.8	62.6
Connectivity	Bluetooth (page scan+sniff) with WCDMA standby	BT2	4.37	7.1	NA	4.24
	WLAN (DTIM1) with WCDMA standby	WLS1	4.93	4.16	NA	4.8
Sensors	Accelerometer background processing at 10 Hz	SNS5A	4.97	5	5.2	31.6
	Accelerometer active processing at 15 Hz	SNS4A	65.8	71.2	69.6	63.3
Netapps	Browser over Wi-Fi	WB1A	71.51	77	78.0	99.1
	Video streaming over Wi-Fi	VS6A	146	169.5	NA	164

*Measurement on a reference device is lower for Egypt 2.5 HD than the projection because the CPU junction temperature on XPM is lower than 75°C, which was originally considered for projection.

4.3 Breakdown measurements, per regulator values

This section shows the breakdown data for the dashboard use cases based on software Rel 2030.2.

Table 4-3 Airplane mode

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.683	0.78
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.604	0.97
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon™, SMPS, S3B	0.029	0.00
AI_23	GFX	SMPS, S4B	0.006	0.00
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.000	0.00
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.000	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.000	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.000	0.00
8A	S1A_OUTPUT	RF1,LPDDR2, SMPS, S1A	1.250	2.95
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.184	0.00
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.825	2.01
3L(0E)	WCN_PA_2.9V	LDO, L19	0.018	0.05
5C	L8_SUM	AMUX_PU, LDO, L8	1.797	0.01
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.205	0.00
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.848	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.299	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.001	0.02
6H	PX2	LDO, L13, SUB SBOOST	0.000	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.185	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.001	0.00
0F	MEM_EMMC	LDO, L20	2.931	0.03
3M(16G)	L17_SUM	CAM123, LDO, L17	0.002	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.01
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.790	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.687	0.00
16D	VIN_FLASH	VCHG	3.316	0.00
1G	—	RF_CARD_INPUT	3.698	0.00
—	—	Battery (measured)	3.698	3.22

Table 4-4 WCDMA talk + 0 dBm, IMT

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.957	18.07
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.821	49.92
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.786	38.71
AI_23	GFX	SMPS, S4B	0.018	0.06
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.000	0.05
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.000	0.07
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.000	0.07
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.000	0.08
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.269	78.78
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.178	26.80
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.822	10.92
3L(0E)	WCN_PA_2.9V	LDO, L19	0.018	0.07
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.01
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.661	1.72
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.845	0.07
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.315	0.28
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.03
6H	PX2	LDO, L13, SUB SBOOST	0.000	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.187	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.01
0F	MEM_EMMC	LDO, L20	2.927	0.04
3M(16G)	L17_SUM	CAM123, LDO, L17	0.002	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.01
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.03
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.695	11.84
16D	VIN_FLASH	VCHG	3.323	0.00
1G	—	RF_CARD_INPUT	3.697	0.03
—	—	Battery (measured)	3.698	98.47

Table 4-5 GSM talk + 5 dBm, no DTx, PGSM

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.954	13.52
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.819	50.90
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.819	22.63
AI_23	GFX	SMPS, S4B	0.820	0.52
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.000	0.00
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.000	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.000	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.000	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.261	28.58
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.160	20.71
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.817	10.20
3L(0E)	WCN_PA_2.9V	LDO, L19	0.005	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.794	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.656	1.88
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.834	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.319	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO,L24, SUB SBOOST	1.179	0.00
16J	L23_SUM	CAM123_3.0V,LDO,L23	0.000	0.00
0F	MEM_EMMC	LDO,L20	2.921	0.02
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.796	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.698	14.73
16D	VIN_FLASH	VCHG	3.306	0.00
1G	—	RF_CARD_INPUT	3.699	0.00
—	—	Battery (measured)	3.700	71.40

1 **Table 4-6 CDMA talk + 0 dBm, cell band**

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	15.43
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.820	47.51
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.770	31.83
AI_23	GFX	SMPS, S4B	0.026	0.12
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.002	0.08
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.002	0.10
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.002	0.10
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.002	0.10
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.262	87.43
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.161	26.62
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.816	10.60
3L(0E)	WCN_PA_2.9V	LDO, L19	0.000	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.794	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.657	1.98
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.837	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.317	0.00
18M	SD_MMC	LDO, L21,SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.137	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.000	0.00
0F	MEM_EMMC	LDO, L20	2.921	0.01
3M(16G)	L17_SUM	CAM123, LDO, L17	0.000	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.797	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.697	10.95
16D	VIN_FLASH	VCHG	3.326	0.00
1G	—	RF_CARD_INPUT	3.700	0.00
—	—	Battery (measured)	3.699	97.71

Table 4-7 TD-SCDMA talk 0 dBm, B34

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	16.13
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.820	49.95
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.783	27.77
AI_23	GFX	SMPS, S4B	0.024	0.11
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.000	0.00
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.000	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.000	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.000	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.263	35.05
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.160	18.02
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.816	9.69
3L(0E)	WCN_PA_2.9V	LDO, L19	0.000	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.794	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.657	0.37
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.837	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.320	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.000	0.00
0F	MEM_EMMC	LDO, L20	2.921	0.01
3M(16G)	L17_SUM	CAM123, LDO, L17	0.000	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.797	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.699	2.72
16D	VIN_FLASH	VCHG	3.329	0.00
1G	—	RF_CARD_INPUT	3.700	0.00
—	—	Battery (measured)	3.699	61.31

Table 4-8 HSDPA DL 7.2 Mbps + 0 dBm, IMT (RxD/no RxD)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	30.25
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.819	57.37
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.782	54.45
AI_23	GFX	SMPS, S4B	0.025	0.12
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.758	15.56
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.758	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.758	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.758	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.262	87.30
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.161	28.63
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.816	8.59
3L(0E)	WCN_PA_2.9V	LDO, L19	0.000	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.794	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.657	1.70
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.837	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.316	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.137	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.000	0.00
0F	MEM_EMMC	LDO, L20	2.927	0.01
3M(16G)	L17_SUM	CAM123, LDO, L17	0.000	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.797	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.696	10.40
16D	VIN_FLASH	VCHG	3.322	0.00
1G	—	RF_CARD_INPUT	3.699	0.00
—	—	Battery (measured)	3.699	125.21

Table 4-9 EV-DO DL 3.1 Mbps + 0 dBm, cell

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.959	31.62
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.891	74.57
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.861	57.05
AI_23	GFX	SMPS, S4B	0.023	0.10
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.761	13.80
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.761	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.761	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.761	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.274	86.40
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.179	29.17
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.828	7.57
3L(0E)	WCN_PA_2.9V	LDO, L19	0.006	0.06
5C	L8_SUM	AMUX_PU, LDO, L8	1.799	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.652	1.84
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.856	0.06
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.316	0.14
18M	SD_MMC	LDO, L21, SUB SBOOST	0.000	0.03
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.140	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.05
0F	MEM_EMMC	LDO, L20	2.934	0.04
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.03
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.805	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.000	0.00
AI_13_14	—	PWR_EXT	3.695	6.81
16D	VIN_FLASH	VCHG	3.324	0.00
1G	—	RF_CARD_INPUT	3.697	0.09
—	—	Battery (measured)	3.702	130.57

Table 4-10 HSDPA DC 42 Mbps + 0 dBm, IMT (RxD)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.956	41.65
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.818	73.35
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.818	117.47
AI_23	GFX	SMPS, S4B	0.016	0.05
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.750	31.76
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.750	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.750	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.750	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.267	136.15
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.177	37.21
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.822	12.02
3L(0E)	WCN_PA_2.9V	LDO, L19	0.018	0.07
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.01
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.660	1.85
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.845	0.07
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.312	0.30
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.03
6H	PX2	LDO, L13, SUB SBOOST	0.000	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.171	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.01
0F	MEM_EMMC	LDO, L20	2.927	0.03
3M(16G)	L17_SUM	CAM123, LDO, L17	0.002	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.01
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.03
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.692	10.42
16D	VIN_FLASH	VCHG	3.320	0.00
1G	—	RF_CARD_INPUT	3.695	0.05
—	—	Battery (measured)	3.698	183.68

Table 4-11 LTE Cat 3 (68/23 Mbps, 0 dBm, B5)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.956	59.98
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.816	96.14
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.773	171.83
AI_23	GFX	SMPS, S4B	0.023	0.00
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.757	86.71
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.757	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.757	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.757	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.244	181.18
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.162	45.32
11B	S3A_OUTPUT	MSME, LPDDR2 ,SMPS, S3A	1.815	20.25
3L(0E)	WCN_PA_2.9V	LDO, L19	0.000	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.794	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.657	1.92
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.837	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.311	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.000	0.00
0F	MEM_EMMC	LDO, L20	2.921	0.00
3M(16G)	L17_SUM	CAM123, LDO, L17	0.000	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.797	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.691	7.10
16D	VIN_FLASH	VCHG	3.321	0.00
1G	—	RF_CARD_INPUT	3.696	0.00
—	—	Battery (measured)	3.699	251.57

Table 4-12 LTE Cat 3 (100/50 Mbps, 0 dBm, B1)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	89.67
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.880	143.32
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.872	323.24
AI_23	GFX	SMPS, S4B	0.013	92.35
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.760	153.39
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.760	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.760	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.760	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.240	196.61
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.177	62.58
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.821	22.25
3L(0E)	WCN_PA_2.9V	LDO, L19	0.018	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.01
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.661	1.79
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.845	0.07
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.304	0.26
18M	SD_MMC	LDO, L21, SUB SBOOST	0.001	0.02
6H	PX2	LDO, L13, SUB SBOOST	0.000	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.159	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.00
0F	MEM_EMMC	LDO, L20	2.928	0.03
3M(16G)	L17_SUM	CAM123, LDO, L17	0.002	0.00
10F	L10_SUM	PX6, UIM2, LDO,L10	0.000	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.03
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.686	11.09
16D	VIN_FLASH	VCHG	3.317	0.00
1G	—	RF_CARD_INPUT	3.691	0.02
—	—	Battery (measured)	3.699	369.64

Table 4-13 LTE Cat 4 (150/50 Mbps, 0 dBm, B1)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.956	92.26
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.879	156.46
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.859	320.42
AI_23	GFX	SMPS, S4B	0.013	51.31
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.789	159.84
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.789	57.46
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.789	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.789	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.241	200.87
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.177	63.35
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.817	26.35
3L(0E)	WCN_PA_2.9V	LDO, L19	0.018	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.01
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.661	1.85
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.845	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.305	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.000	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.153	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.00
0F	MEM_EMMC	LDO, L20	2.931	0.09
3M(16G)	L17_SUM	CAM123, LDO, L17	0.002	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.684	11.13
16D	VIN_FLASH	VCHG	3.313	0.00
1G	—	RF_CARD_INPUT	3.691	0.00
—	—	Battery (measured)	3.699	399.56

Table 4-14 LTE TDD Cat 3 20 MHz (60/18 Mbps, +0 dBm, B41)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.956	50.46
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.881	111.62
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.864	178.09
AI_23	GFX	SMPS, S4B	0.015	70.82
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.750	88.73
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.750	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.750	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.750	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.242	155.32
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.178	44.95
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.822	15.54
3L(0E)	WCN_PA_2.9V	LDO, L19	0.018	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.797	0.01
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.661	1.69
16H	L18_SUM	SNRS,DISP_TS, HUM, GEN, LDO, L18	2.845	0.07
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.311	0.25
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.000	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.160	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.00
0F	MEM_EMMC	LDO, L20	2.931	0.12
3M(16G)	L17_SUM	CAM123, LDO, L17	0.002	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.03
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.690	9.18
16D	VIN_FLASH	VCHG	3.321	0.00
1G	—	RF_CARD_INPUT	3.694	0.01
—	—	Battery (measured)	3.699	255.13

Table 4-15 LTE Cat 3 CA 10+10 (100/25 Mbps, 0 dBm, B4+B17, Tx B17)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	88.72
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.902	140.94
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.884	327.05
AI_23	GFX	SMPS, S4B	0.011	0.05
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.759	108.05
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.759	0.19
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.759	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.759	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.243	264.69
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.163	66.57
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.823	28.86
3L(0E)	WCN_PA_2.9V	LDO, L19	0.000	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.798	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.665	1.86
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.852	0.05
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.308	0.06
18M	SD_MMC	LDO, L21, SUB SBOOST	0.001	0.02
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.164	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.000	0.01
0F	MEM_EMMC	LDO, L20	2.922	0.03
3M(16G)	L17_SUM	CAM123, LDO,L17	0.000	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.790	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.685	11.90
16D	VIN_FLASH	VCHG	3.293	0.00
1G	—	RF_CARD_INPUT	3.691	0.01
—	—	Battery (measured)	3.701	392.83

Table 4-16 TDD LTE Cat 3 20 MHz Cfg 1 B38 + GSM Voice

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	52.95
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.892	115.56
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.873	188.93
AI_23	GFX	SMPS, S4B	0.021	0.09
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.759	56.36
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.759	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.759	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.759	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.244	170.79
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.161	61.37
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.815	20.40
3L(0E)	WCN_PA_2.9V	LDO, L19	0.000	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.794	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.657	2.46
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.837	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.310	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.137	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.000	0.00
0F	MEM_EMMC	LDO, L20	2.921	0.00
3M(16G)	L17_SUM	CAM123, LDO, L17	0.000	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.797	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.687	64.11
16D	VIN_FLASH	VCHG	3.319	0.00
1G	—	RF_CARD_INPUT	3.694	0.00
—	—	Battery (measured)	3.699	321.97

Table 4-17 SVLTE Cat 2 (50 Mbps, 0 dBm, B13) and 1X Voice

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	65.36
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.891	122.70
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.871	227.01
AI_23	GFX	SMPS, S4B	0.020	0.00
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.758	43.63
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.758	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.758	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.758	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.242	255.18
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.162	59.09
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.815	22.91
3L(0E)	WCN_PA_2.9V	LDO, L19	0.000	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.794	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.657	2.09
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.837	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.309	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.000	0.00
0F	MEM_EMMC	LDO, L20	2.933	0.07
3M(16G)	L17_SUM	CAM123, LDO, L17	0.000	0.00
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.797	0.02
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT	3.688	44.88
16D	VIN_FLASH	VCHG	3.319	0.00
1G	—	RF_CARD_INPUT	3.694	0.00
—	—	Battery (measured)	3.699	345.29

Table 4-18 VoLTE talk state (B5, 0 dbm)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	23.79
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.822	74.58
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.773	61.89
AI_23	GFX	SMPS, S4B	0.014	0.00
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.000	0.00
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.000	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.000	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.000	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.248	87.92
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.174	25.24
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.819	13.02
3L(0E)	WCN_PA_2.9V	LDO, L19	0.009	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.792	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.665	1.70
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.860	0.04
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.318	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.198	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.01
0F	MEM_EMMC	LDO, L20	2.942	0.02
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.05
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.696	3.43
16D	VIN_FLASH	VCHG	3.329	0.00
1G	—	RF_CARD_INPUT	3.701	0.00
—	—	Battery (measured)	3.703	108.32

Table 4-19 VoLTE listen state (B5, 0 dbm)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	21.59
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.823	69.02
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.773	38.90
AI_23	GFX	SMPS, S4B	0.014	0.00
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.000	0.00
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.000	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.000	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.000	0.00
8A	S1A_OUTPUT	RF1,LPDDR2, SMPS, S1A	1.249	59.89
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.174	17.49
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.819	11.54
3L(0E)	WCN_PA_2.9V	LDO, L19	0.009	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.792	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.665	1.81
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.860	0.04
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.320	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.001	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.198	0.00
16J	L23_SUM	CAM123_3.0V, LDO,L23	0.002	0.01
0F	MEM_EMMC	LDO, L20	2.942	0.02
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.05
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.698	2.16
16D	VIN_FLASH	VCHG	3.330	0.00
1G	—	RF_CARD_INPUT	3.702	0.00
—	—	Battery (measured)	3.703	82.72

1 **Table 4-20 VoLTE silent state (B5, 0 dbm)**

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.955	20.54
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.823	67.75
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.773	32.57
AI_23	GFX	SMPS, S4B	0.014	0.00
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.000	0.00
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.000	0.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.000	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.000	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.249	51.77
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.174	16.19
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.819	11.15
3L(0E)	WCN_PA_2.9V	LDO, L19	0.009	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.792	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	2.666	1.82
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.860	0.04
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.321	0.00
18M	SD_MMC	LDO, L21, SUB SBOOST	0.001	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.002	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.197	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.002	0.01
0F	MEM_EMMC	LDO, L20	2.942	0.02
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.002	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	1.788	0.05
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.002	0.00
AI_13_14	—	PWR_EXT	3.699	1.96
16D	VIN_FLASH	VCHG	3.331	0.00
1G	—	RF_CARD_INPUT	3.702	0.00
—	—	Battery (measured)	3.703	75.35

Table 4-21 Video decode – H.264 30 fps 1080p, 20 Mbps (QTC88A)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.963	39.02
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.890	183.13
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.775	1.06
AI_23	GFX	SMPS, S4B	0.770	3.08
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.760	35.97
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.760	0.01
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.760	2.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.760	0.01
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.234	54.63
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.150	43.34
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.800	34.99
3L(0E)	WCN_PA_2.9V	LDO, L19	0.002	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.001	0.00
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.839	9.54
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.322	0.20
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.00	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.001	0.00
0F	MEM_EMMC	LDO, L20	2.935	1.16
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	0.001	0.00
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	2.994	0.00
AI_13_14	—	PWR_EXT		
16D	VIN_FLASH	VCHG	3.315	0.00
1G	—	RF_CARD_INPUT	3.690	0.00
—	—	Battery (measured)	3.702	438.19

Dashboard data = 438.19 mA - 293 mA (touchscreen + display) = 145.19 mA

Table 4-22 Video decode – H.264 720p, 30 fps (QTC77A)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.960	32.64
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.890	163.34
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.775	1.20
AI_23	GFX	SMPS, S4B	0.770	2.66
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.760	32.77
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.760	0.01
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.760	1.97
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.760	0.01
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.234	39.31
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.150	42.86
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.800	29.63
3L(0E)	WCN_PA_2.9V	LDO, L19	0.002	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.001	0.00
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.839	9.54
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.322	0.18
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.001	0.00
0F	MEM_EMMC	LDO, L20	2.935	0.61
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	0.001	0.00
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	2.994	0.00
AI_13_14	—	PWR_EXT		
16D	VIN_FLASH	VCHG	3.316	0.00
1G	—	RF_CARD_INPUT	3.690	0.00
—	—	Battery (measured)	3.702	415.39

Dashboard data = 415.39 mA - 292.7 mA (touchscreen + display) = 122.69 mA

Table 4-23 30 fps at HD 1080p 20 Mbps Normal power encode, AAC 128 kbps 44.1 kHz stereo (QMC31A)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.961	72.71
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.900	415.31
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.775	1.32
AI_23	GFX	SMPS, S4B	0.770	67.62
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.790	169.63
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.790	26.39
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.790	2.79
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.790	0.01
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.218	248.61
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.150	48.71
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.790	76.39
3L(0E)	WCN_PA_2.9V	LDO, L19	0.002	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.001	0.00
16H	L18_SUM	SNRS,DISP_TS, HUM, GEN, LDO, L18	2.839	0.33
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.305	0.18
18M	SD_MMC	LDO, L21, SUB SBOOST	0.003	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.139	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	2.983	77.50
0F	MEM_EMMC	LDO, L20	2.934	5.26
3M(16G)	L17_SUM	CAM123, LDO, L17	2.842	50.33
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	0.001	0.00
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	2.994	0.00
AI_13_14	—	PWR_EXT		
16D	VIN_FLASH	VCHG	3.310	0.00
1G	—	RF_CARD_INPUT	3.678	0.00
—	—	Battery (measured)	3.702	849.41

Dashboard data = 849.41 mA - 459.7 mA (touchscreen + display + sensor) = 389.71 mA

Table 4-24 3D gaming (Egypt 2.5 HD) 60 fps, onscreen (QGC26A)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	1.049	281.75
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	1.030	409.90
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.775	1.68
AI_23	GFX	SMPS, S4B	1.030	784.46
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.810	182.56
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.810	8.84
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.810	2.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.810	0.01
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.289	295.82
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.150	45.61
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.788	91.96
3L(0E)	WCN_PA_2.9V	LDO, L19	0.002	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.001	0.00
16H	L18_SUM	SNRS,DISP_TS, HUM, GEN, LDO, L18	2.839	9.54
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.300	0.19
18M	SD_MMC	LDO, L21, SUB SBOOST	0.003	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.139	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.001	0.00
0F	MEM_EMMC	LDO, L20	2.948	0.05
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.03
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	0.001	0.00
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	2.994	0.00
AI_13_14	—	PWR_EXT		
16D	VIN_FLASH	VCHG	3.296	0.00
1G	—	RF_CARD_INPUT	3.674	0.00
—	—	Battery (measured)	3.702	1066.64

Dashboard data = 1066.64 mA – 295.9 mA (touchscreen + display + sensor) = 770.74 mA

Table 4-25 Graphics – 3D UI full-screen resolution, 30 fps (PowerLift) (QGC23A)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.961	56.64
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.896	165.89
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.775	1.11
AI_23	GFX	SMPS, S4B	0.771	80.77
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.765	52.95
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.765	0.01
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.765	2.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.765	0.01
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.232	59.86
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.150	40.99
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.800	28.67
3L(0E)	WCN_PA_2.9V	LDO, L19	0.002	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.001	0.00
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	2.839	9.54
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.321	0.19
18M	SD_MMC	LDO,L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.001	0.00
0F	MEM_EMMC	LDO, L20	2.955	0.04
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	0.001	0.00
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	2.994	0.00
AI_13_14	—	PWR_EXT		
16D	VIN_FLASH	VCHG	3.315	0.00
1G	—	RF_CARD_INPUT	3.689	0.00
—	—	Battery (measured)	3.702	463.53

Dashboard data = 463.53 mA – 295.5 mA (touchscreen + display + sensor) = 168.03 mA

Table 4-26 Static image display (LCD04A)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.961	18.93
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.897	76.79
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.775	1.19
AI_23	GFX	SMPS, S4B	0.020	1.34
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.084	0.87
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.084	2.05
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.084	0.00
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.084	0.00
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.236	40.00
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.150	38.67
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.799	22.69
3L(0E)	WCN_PA_2.9V	LDO, L19	0.002	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.001	0.00
16H	L18_SUM	SNRS, DISP_TS,HUM,GEN,LDO, L18	2.839	9.54
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.326	0.17
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.001	0.00
0F	MEM_EMMC	LDO, L20	2.954	0.04
3M(16G)	L17_SUM	CAM123, LDO, L17	0.001	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.001	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	0.001	0.00
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	2.994	0.00
AI_13_14	—	PWR_EXT		
16D	VIN_FLASH	VCHG	3.318	0.00
1G	—	RF_CARD_INPUT	3.692	0.00
—	—	Battery (measured)	3.702	358.28

Dashboard data = 358.28 mA – 291.1 mA (touchscreen + display + sensor) = 67.18 mA

Table 4-27 MP3 playback 128 kbps TM (AU4A)

Xerxes channel	Regulator	Description	V (volts)	I (mA)
0L	S1B_SUM	On-chip memory, JC_PLL, EBI1, SMPS, S1B	0.961	8.40
AI_01	S2B_SUM	CX1, ADSP, CDC_SDC, USB, PLLs, SMPS, S2B	0.820	31.57
8K	S3B_SUM_MODEM_MSS	Modem hardware, Unicore Hexagon, SMPS, S3B	0.775	1.00
AI_23	GFX	SMPS, S4B	0.020	1.14
AI_4	Multiphase Phase0	Krait, SMPS, S5B	0.070	0.87
AI_5	Multiphase Phase1	Krait, SMPS, S6B	0.070	2.00
AI_6	Multiphase Phase2	Krait, SMPS, S7B	0.070	0.01
AI_78	Multiphase Phase3	Krait, SMPS, S8B	0.070	0.01
8A	S1A_OUTPUT	RF1, LPDDR2, SMPS, S1A	1.234	6.07
0H	S2A_OUTPUT	RF2, SMPS, S2A	2.151	5.61
11B	S3A_OUTPUT	MSME, LPDDR2, SMPS, S3A	1.801	5.32
3L(0E)	WCN_PA_2.9V	LDO, L19	0.002	0.00
5C	L8_SUM	AMUX_PU, LDO, L8	1.796	0.00
16F	L16_SUM	QF, QPA, GPS, LDO, L16	0.001	0.00
16H	L18_SUM	SNRS, DISP_TS, HUM, GEN, LDO, L18	0.001	0.00
18J	VREG_5V	TORCH, SPKRDRV, USB_OTG, DISP_HDMI, BOOST	3.340	0.17
18M	SD_MMC	LDO, L21, SUB SBOOST	0.002	0.00
6H	PX2	LDO, L13, SUB SBOOST	0.001	0.00
15J	L24_SUM	USB_HS1_2_3_3.3V, USB_FET, LDO, L24, SUB SBOOST	1.138	0.00
16J	L23_SUM	CAM123_3.0V, LDO, L23	0.001	0.01
0F	MEM_EMMC	LDO, L20	2.955	0.04
3M(16G)	L17_SUM	CAM123, LDO, L17	0.000	0.02
10F	L10_SUM	PX6, UIM2, LDO, L10	0.000	0.00
15M	L9_SUM	PX5, UIM1, UICC, LDO, L9	0.001	0.00
15D	L22_SUM	DISP_LCD_MIPI, LDO, L22	0.001	0.00
AI_13_14	—	PWR_EXT		
16D	VIN_FLASH	VCHG	3.331	0.00
1G	—	RF_CARD_INPUT	3.700	0.06
—	—	Battery (measured)	3.702	21.58

A Dhrystone Power Curves

A.1 MSM8974AB (Feature Code=AB) AP (KRAIT) Dhrystone power curves

NOTE: The Dhrystone sweeps shown in this appendix are not related to the dashboard use cases in Chapter 4 of this document. No correlation should be made between the appendix data and Chapter 4 data.

Figure A-1 and Figure A-2, representing a single KRAIT Dhrystone sweep, are projections for a typical part with characteristics near the projected 50th percentile of devices. The temperature indicated for the three different curves would be on die using the MSM internal temperature sensor.

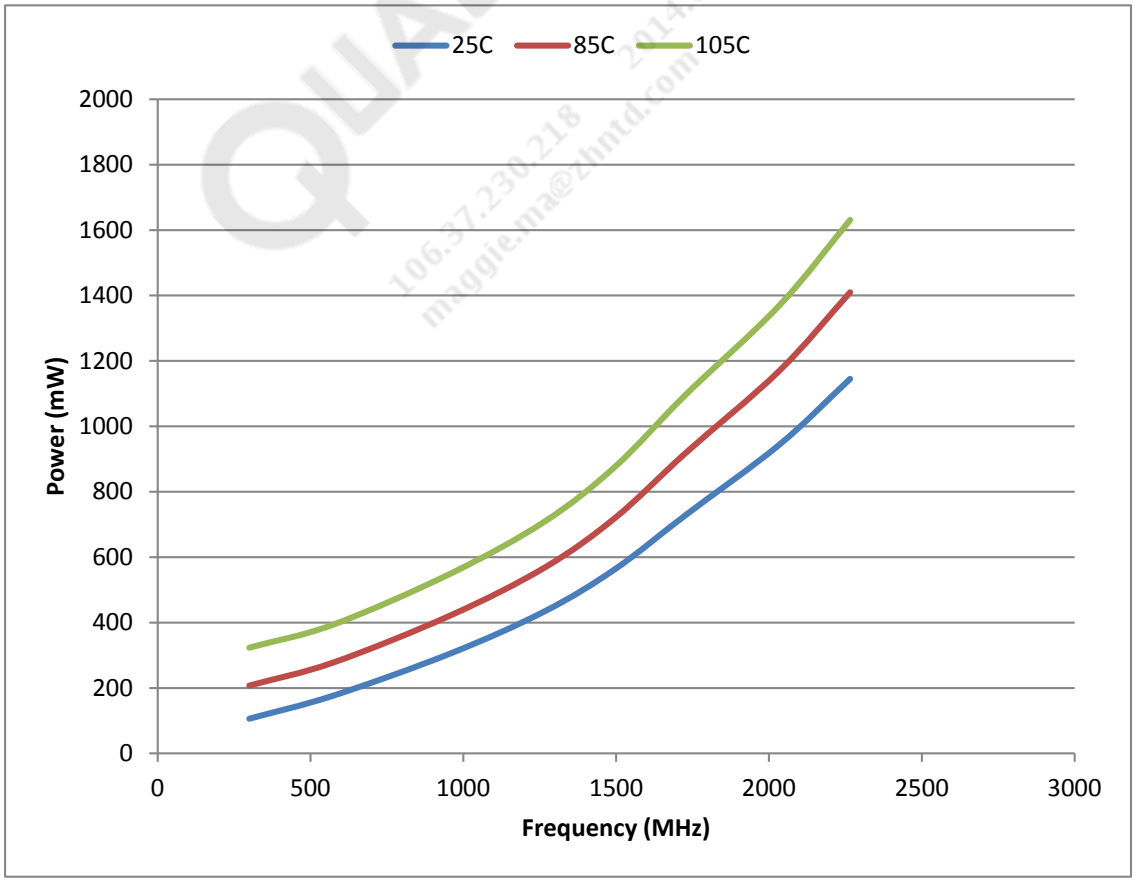

Figure A-1 MSM8974AB 2.3 GHz KRAIT Dhrystone power vs frequency

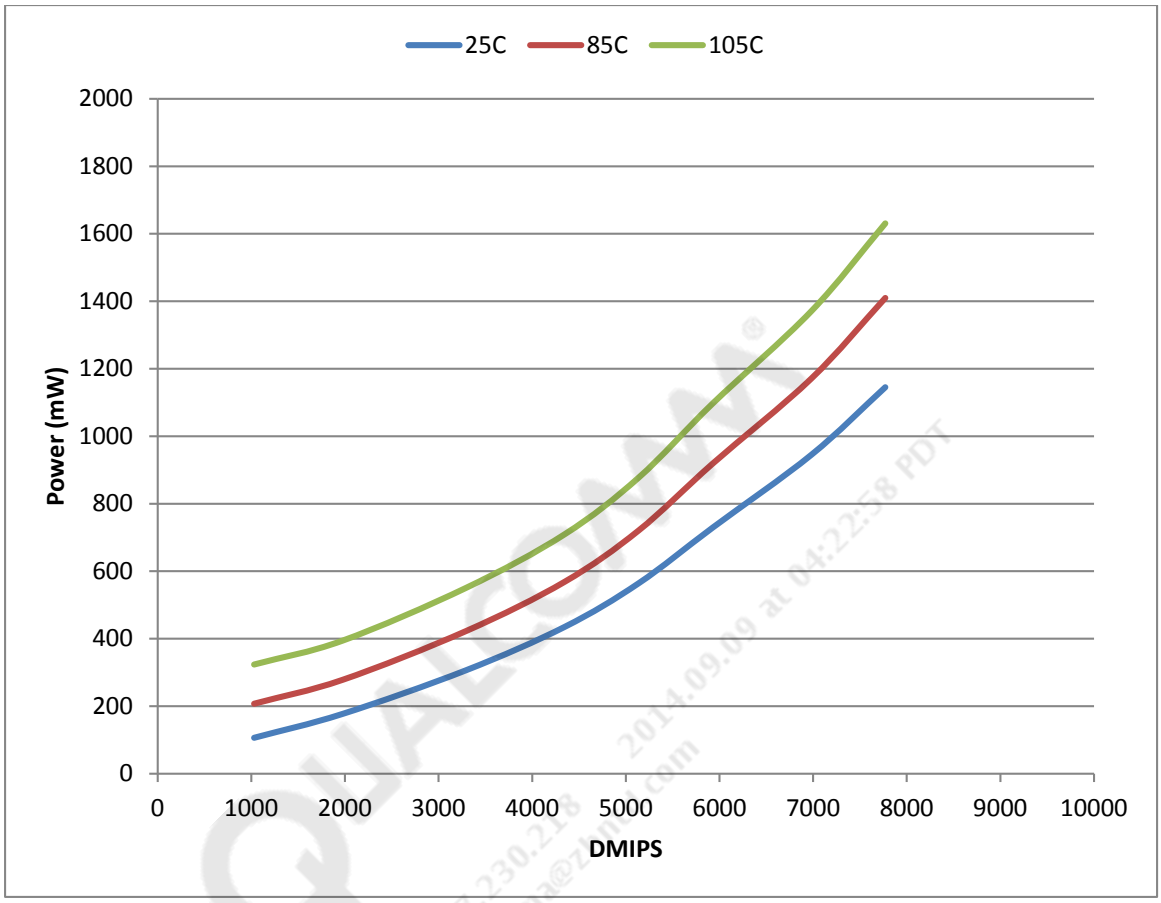

Figure A-2 MSM8974AB 2.3 GHz KRAIT Dhrystone power vs DMIPS

A.2 MSM8974AB (Feature Code=AC) AP (KRAIT) Dhrystone power curves

NOTE: The Dhrystone sweeps shown in this appendix are not related to the dashboard use cases in Chapter 4 of this document. No correlation should be made between the appendix data and Chapter 4 data.

Figure A-3 and Figure A-4, representing a single KRAIT Dhrystone sweep, are projections for a typical part with characteristics near the projected 50th percentile of devices. The temperature indicated for the three different curves would be on die using the MSM internal temperature sensor.

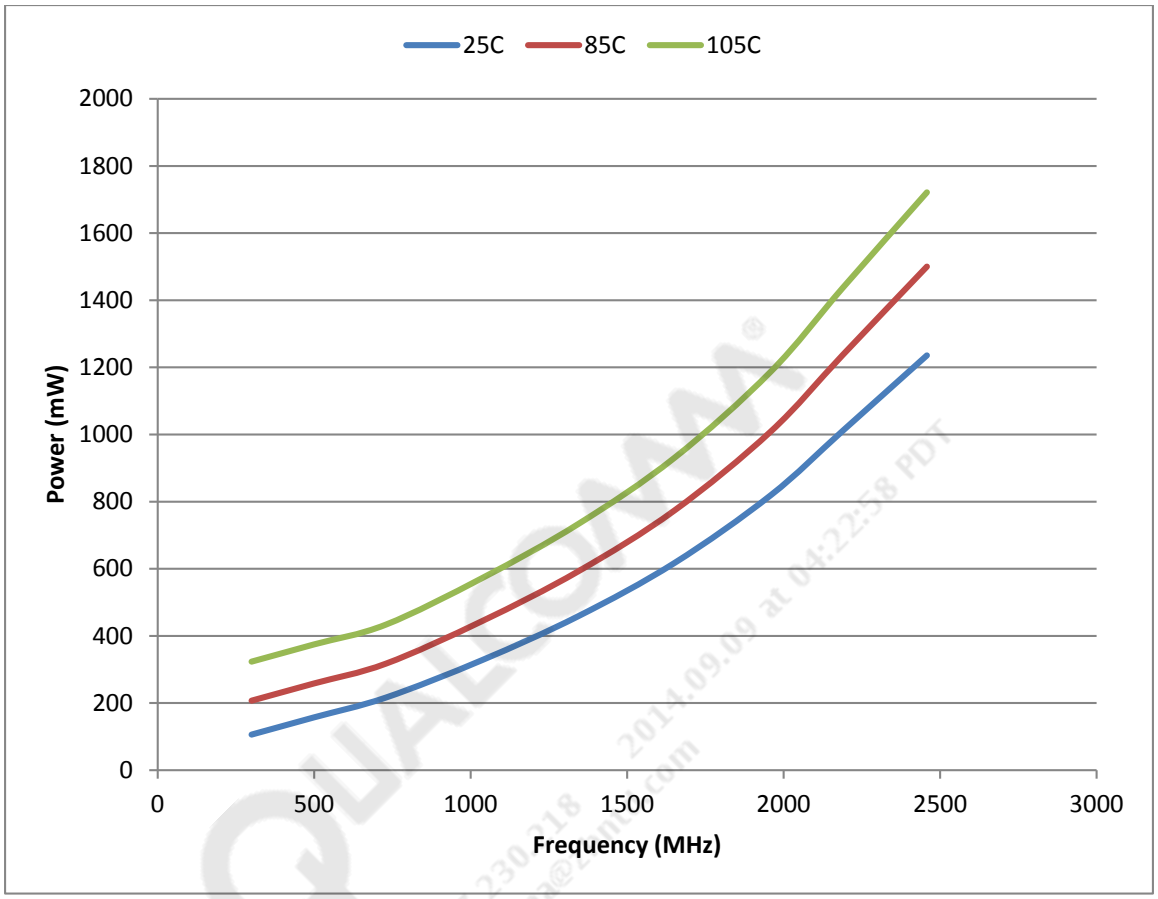

Figure A-3 MSM8974AC 2.5 GHz KRAIT Dhrystone power vs frequency

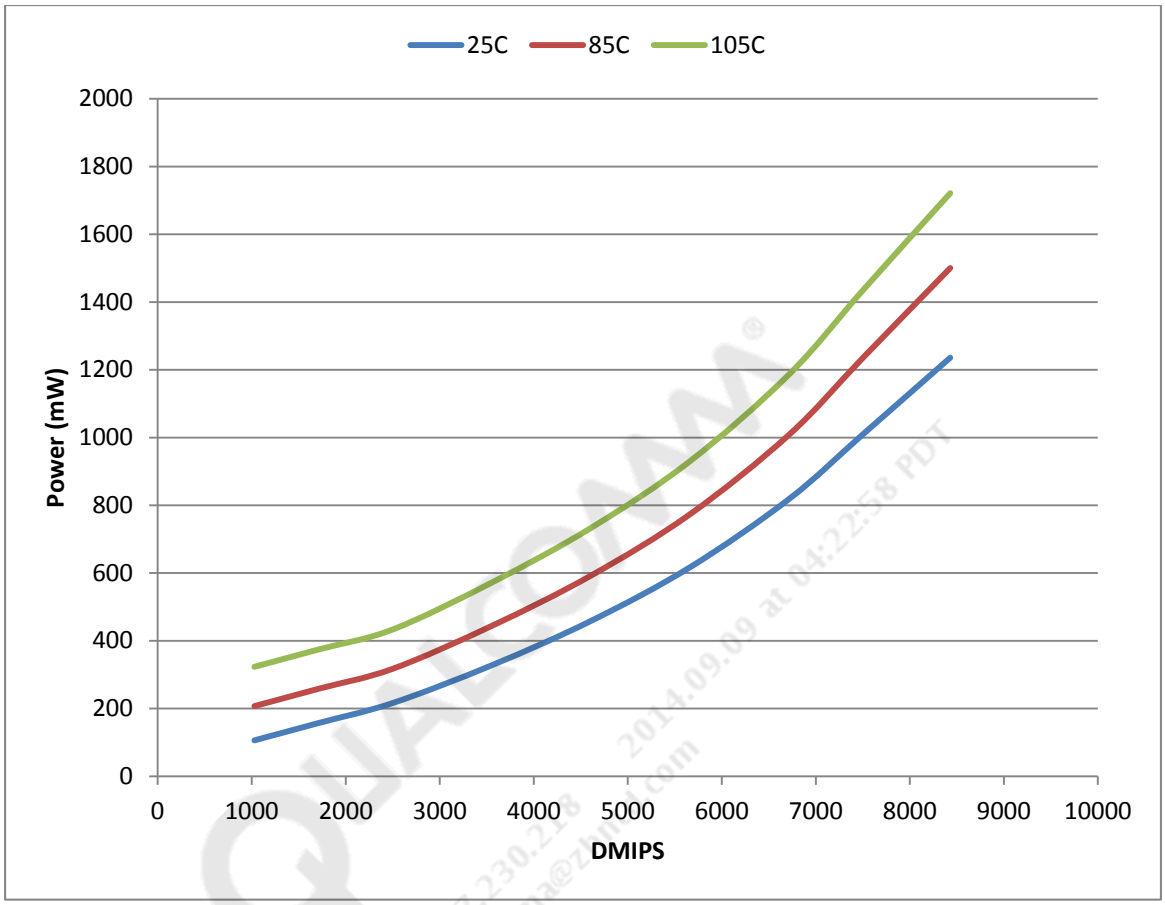

Figure A-4 MSM8974AC 2.5 GHz KRAIT Dhrystone power vs DMIPS