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APN Content Level	BASIC	INTERMEDIATE	<input checked="" type="checkbox"/> ADVANCED	Confidentiality	Public	<input checked="" type="checkbox"/> Private
Hardware Compatibility	Product Line	AirPrime	Series	Q26xx	SL6087	
				SL80xx	WS2xx	
				WMPxx	AR series	
Software Compatibility	Series		ALL			



1 Version

Application Notes may be updated over their lifetime. To ensure you design with the correct version, please check the application notes page in www.sierrawireless.com for latest versions.

2 Introduction

This APN (Application Note) is provided to Sierra Wireless distributors and clients to aid more rapid development of embedded applications using the Sierra Wireless portfolio of cellular solutions. To request a new application note, contact your regional Sierra Wireless Product Marketing Manager.

3 Overview

This application note describes how to calculate the battery life estimation. These parameters will be taken account for this estimation:

- Measured current consumption
- Different module's operating modes.
- Different scenarios.

This application note will be useful for those customers who want to optimize the size and the capacity of the battery to be used.

4 Abbreviations

Abbreviation	Definition
GPRS	General Packet Radio Service
GSM	Global System for Mobile communication
N/A	Not Applicable
SMS	Short Message Service

5 Current Consumption and Battery Life Estimate Calculation

In order to estimate battery life, different parameters have to be taken from the "Product Technical Specification" document (please, go to <http://developer.sierrawireless.com> in order to download the document linked to your product).

Note: The Battery Life Estimation Worksheet featured in this section is available in the Attachments tab of this PDF.

The following subsections show how to fill in the tables in order to perform the battery life calculation.

5.1 Cells Description

Yellow fields are INPUTS

Green fields are CALCULATED values

Current consumption and battery life estimates calculation													
GSM module operating modes													
	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C		
Current consumption (mA)	221	230	5	20,5	1,8	37	0,021	62	0	0	0		
Time (in minutes) in each profile per hour	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C	GSM Resulting amount of Minutes (must <60)	
Scenario 1	GSM Start up + 1 SMS Sent + Power removed	0	0,5	0	0,5	0	0	0,5	0	0	0	1,0	
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	1	0	58,5	0	0	0	0,5	0	0	0	60,00	
Scenario 3	OpenAT app + 2min GPRS exchange	2	0	0	57,5	0	0	0,5	0	0	0	60,00	
Consumption in each mode (in mA/h)	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C	Resulting total average consumption (mA/h)	
Scenario 1	GSM Start up + 1 SMS Sent + Power removed	0,00	1,84	0,00	2,17	0,00	0,00	0,52	0,00	0,00	0,00	2,93	
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	3,83	0,00	4,88	0,00	0,00	0,00	0,52	0,00	0,00	0,00	9,23	
Scenario 3	OpenAT app + 2min GPRS exchange	7,67	0,00	0,00	19,65	0,00	0,00	0,52	0,00	0,00	0,00	27,83	
Typical cell sizes													
	Physical size LxWxT (mm)	50x30x4	50x34x6	50x34x10									
	Nominal cell capacity (mAh)	760	1200	1900									
	Usable cell capacity (90%)	684	1080	1710									
Expected battery life with typical cells (in days)													
Scenario 1	GSM Start up + 1 SMS Sent + Power removed	11,3	17,6	29,2									
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	3,1	4,9	7,7									
Scenario 3	OpenAT app + 2min GPRS exchange	1,0	1,6	2,6									
Scenarios													
Scenario 1 GSM Start up + 1 SMS Sent + Power removed													
Scenario 2 GPRS transfer > SLEEP mode with GSM stack in Idle													
Scenario 3 OpenAT app + 2min GPRS exchange													
Notes:													
1) Single GSM Tx slot operation assumed.													
2) Other cell capacities/combinations are possible.													
3) Cells in Yellow are data input													
4) Cells in Green are calculated results													
5) Cells in Red show errors in data inputs													

The current consumption values are filled from the Product Technical Specification, are used to calculate the battery lifetime, in order to size the suitable battery to be used.

Current consumption and battery life estimates calculation													
GSM module operating modes										Other Consumption model			
	GPRS Transfer	Connecte d	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C		
Current consumption (mA)	221	230	5	20,5	1,85	37	0,021	62	0	0	0		
Time (in minutes) in each profile per hour	GPRS Transfer	Connecte d	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C	GSM Resulting amount of Minutes (must <60)	
Scenario 1	GSM Start up + 1 SMS Sent + Power removed	0	0,5	0	0,5	0	0	0	0,5	0	0	0	1,50
Scenario 2	RS transfer > SLEEP mode with GSM stack in Idle	0	0	58,5	0	0	0	0	0,5	0	0	0	60,00
Scenario 3	OpenAT app + 2min GPRS exchange	2	0	0	57,5	0	0	0	0,5	0	0	0	60,00
Consumption in each mode (in mA/h)	GPRS Transfer	Connecte d	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C	Resulting total average consumption (mA/h)	
Scenario 1	GSM Start up + 1 SMS Sent + Power removed	0,00	1,84	0,00	0,17	0,00	0,00	0,52	0,00	0,00	0,00	2,53	
Scenario 2	RS transfer > SLEEP mode with GSM stack in Idle	3,83	0,00	4,88	0,00	0,00	0,00	0,52	0,00	0,00	0,00	9,23	
Scenario 3	OpenAT app + 2min GPRS exchange	7,67	0,00	0,00	19,65	0,00	0,00	0,52	0,00	0,00	0,00	27,83	
Potential Battery Size & Capacity													
Typical cell sizes													
	Physical size LxWxT (mm)	50x30x4,4	50x34x6	50x34x6									
	Nominal cell capacity (mA/h)	760	1200	1900									
	Usable cell capacity (90%)	684	1080	1710									
Expected battery life with typical cells (in days)													
Scenario 1	GSM Start up + 1 SMS Sent + Power removed	11,3	17,8	28,2									
Scenario 2	RS transfer > SLEEP mode with GSM stack in Idle	3,1	4,9	7,7									
Scenario 3	OpenAT app + 2min GPRS exchange	1,0	1,6	2,6									
Notes:													
1) Single GSM Tx slot operation assumed.													
2) Other cell capacities/combinations are possible.													
3) Cells in Yellow are data input													
4) Cells in Green are calculated results													
5) Cells in Red show errors in data inputs													

5.2 Basic Battery Lifetime Estimation

Current consumption and battery life estimates calculation													
GSM module operating modes										Other Consumption model			
	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C		
1- Check latest values from PTS	Current consumption (mA)	221	230	5	20,5	1,85	37	0,021	62	0	0	0	
	Time (in minutes) in each profile per hour	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C	GSM Resulting amount of Minutes (must <60)
Scenario 1	GSM Start up + 1SMS Sent + Power removed	0	0,5	0	0,5	0	0	0	0,5	0	0	0	1,50
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	0	0	58,5	0	0	0	0	0,5	0	0	0	60,00
Scenario 3	OpenAT app + 2min GPRS exchange	0	0	0	57,5	0	0	0	0,5	0	0	0	60,00
3- Fill in detailed consumption data (in minutes)	Consumption (mA/h)	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C	Resulting total average consumption (mA/h)
Scenario 1	Power removed	0,00	1,84	0,00	0,17	0,00	0,00	0,00	0,52	0,00	0,00	0,00	2,53
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	3,83	0,00	4,88	0,00	0,00	0,00	0,00	0,52	0,00	0,00	0,00	9,23
Scenario 3	OpenAT app + 2min GPRS exchange	7,67	0,00	0,00	19,65	0,00	0,00	0,00	0,52	0,00	0,00	0,00	27,83
	Typical cell sizes												
	Physical size LxWxT (mm)	50x30x4,4	50x34x6	50x34x10									
	Nominal cell capacity (mAh)	760	1200	1900									
	Usable cell capacity (90%)	684	1080	1710									
	Expected battery life with typical cells												
		(in days)											
Scenario 1	GSM Start up + 1SMS Sent + Power removed	11,3	17,8	28,2									
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	3,1	4,9	7,7									
Scenario 3	OpenAT app + 2min GPRS exchange	1,0	1,6	2,6									
5- Read Final calculation (in days)													
	Scenarios												
	Scenario 1	GSM Start up + 1SMS Sent + Power removed											
	Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle											
	Scenario 3	OpenAT app + 2min GPRS exchange											
	Notes:												
	1) Single GSM Test operation assumed.												
	2) Other cell capacities/combinations are possible.												
	3) Cells in Yellow are data input												
	4) Cells in Green are calculated results												
	5) Cells in Red are errors in data inputs												
	2- Fill in scenario description & names												
	4- Look at Intermediates calculation												

This table shows the different steps to fill the input datas to calculate the battery lifetime.

5.3 Advanced Battery Life Estimation

6- Add additional platform consumption details

Current consumption and battery life estimates calcul															
GSM module operating modes												Other Consumption model			
	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	GPS in low power mode	GPS in tracking mode	Ext. CPU				
Current consumption (mA)	221	230	5	20,5	1,85	37	0,021	62	0,01	0,043	5				
Time (in minutes) in each profile per hour												GSM Resulting amount of Minutes (must <60)			
Scenario 1	GSM Start up + 1SMS Sent + Power removed	0	0,5	0	0,5	0	0	0	0,5	59	1	60	1,50		
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	1	0	58,5	0	0	0	0	0,5	0	0	0	60,00		
Scenario 3	OpenAT app + 2min GPRS exchange	2	0	0	57,5	0	0	0	0,5	0	0	0	60,00		
Consumption in each mode (in mA/h)												Resulting total average consumption (mA/h)			
Scenario 1	GSM Start up + 1SMS Sent + Power removed	0,00	1,84	0,00	0,17	0,00	0,00	0,00	0,52	0,01	0,04	5,00	7,58		
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle	3,83	0,00	4,88	0,00	0,00	0,00	0,00	0,52	0,00	0,00	0,00	9,23		
Scenario 3	OpenAT app + 2min GPRS exchange	7,67	0,00	0,00	19,65	0,00	0,00	0,00	0,52	0,00	0,00	0,00	27,83		

Typical cell sizes			
Physical size LxWxT (mm)	50x34x4	50x34x6	50x34x10
Nominal cell capacity (mAh)	760	1200	1900
Capacity (mAh)	684	1080	1710

Scenarios			
Scenario 1	GSM Start up + 1SMS Sent + Power removed		
Scenario 2	GPRS transfer > SLEEP mode with GSM stack in Idle		
Scenario 3	OpenAT app + 2min GPRS exchange		

cells (in days)			
Scenario 1	3,8	5,9	9,4
Scenario 2	3,1	4,9	7,7
Scenario 3	1,0	1,6	2,6

7- Battery lifetime models are automatically updated

Notes:

- 1) Single GSM Tx slot operation assumed.
- 2) Other cell capacities/combinations are possible.
- 3) Cells in Yellow are data input
- 4) Cells in Green are calculated results
- 5) Cells in Red are calculated results having errors in data inputs

This table shows some additional current consumption to fit the battery lifetime model to be chosen.

5.4 Input Fields Error Notification

Current consumption and battery life estimates calculation														
GSM module operating modes										Other Consumption model				
	GPRS Transfer	Connected	SLEEP with GSM Stack in Idle	ACTIVE with GSM Stack in Idle	SLEEP with GSM Stack off	ACTIVE with GSM Stack off	Alarm & Power Off modes	GSM Module Start-up	A	B	C			
	221	230	5	20,5	1,85	37	0,021	62	0	0	0			
	Time (in minutes) in each prome per hour										A	B	C	GSM Resulting amount of Minutes (must <60)
Scenario 1	0	0,5	70	0	0	0	0	0,5	0	0	0	71,00		
Scenario 2	0	0	0	0	0	0	0	0	0	0	0	0,00		
Scenario 3	0	0	0	0	0	0	0	0	0	0	0	0,00		
	Consumption in each mode (in mA/h)										A	B	C	Resulting total average consumption (mA/h)
Scenario 1	0,00	1,84	5,83	0,00	0,00	0,00	0,00	0,52	0,00	0,00	0,00	8,19		
Scenario 2	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00		
Scenario 3	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00		
	Typical cell sizes									Scenarios				
	Physical size LxWxT (mm)	50x30x4	50x34x6	50x34x10					Scenario 1	1 SMS Sent > GSM in SLEEP mode with GSM stack in Idle				
	Nominal cell capacity (mAh)	760	1200	1900					Scenario 2					
	Usable cell capacity (90%)	684	1080	1710					Scenario 3					
	Expected battery life with typical cells			(in days)			Notes:							
Scenario 1	3,5	5,5	8,7	1) Single GSM Tx slot operation assumed.										
Scenario 2	#DIV/0!	#DIV/0!	#DIV/0!	2) Other cell capacities/combinations are possible.										
Scenario 3	#DIV/0!	#DIV/0!	#DIV/0!	3) Cells in Yellow are data input										
				4) Cells in Green are calculated results										
				5) Cells in Red show errors in data inputs										

This table shows how the error is figured out when the table is not filled correctly.

6 Reference Documents

	Filename	Reference number
[1]	AirPrime WISMO218 Product Technical Specification	4111957
[2]	AirPrime Q2686 Product Technical Specification & customer design guideline	4111963
[3]	AirPrime Q2687 Product Technical Specification & customer design guideline	4111964
[4]	AirPrime WMP100 Product Technical Specification & Customer Design Guideline	4111967
[5]	AirPrime SL6087 Product Technical Specification & Customer Design Guideline	4111952
[6]	AirPrime Q2698 Product Technical Specification & Customer Design Guideline	4111754
[7]	AirPrime AR Series 3G Product Technical Specification & Customer Design Guidelines	-

7 Support

For direct clients: contact your Sierra Wireless FAE
 For distributor clients: contact your distributor FAE
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7.1 Documentation

Filename	Description
AirPrime-Battery Life Estimation-Application Note-Rev1.0.pdf	Application Note
Battery Life Estimation Worksheet.xlsx	Spreadsheet featured in this document, and available via this PDF's Attachments tab.

8 Document History

Version	Date	History
1.0	November 25, 2013	Creation
1.1	January 6, 2014	Fixed an error that left some of the figure callouts blank.

9 Legal Notice

Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless modem are used in a normal manner with a well-constructed network, the Sierra Wireless modem should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless modem, or for failure of the Sierra Wireless modem to transmit or receive such data.

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