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Product Technical Specification

AirPrime HL6528RDx

SIERRA WIRELESS®

4117701
3.0
March 03, 2016

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Document History

Version	Date	Updates
1.0	July 31, 2015	Creation
1.1	August 18, 2015	Added 1.8 ESD
		Updated: • 1.3 General Features • Figure 1 AirPrime HL6528RDx Architecture Overview • 3 Detailed Interface Specifications • 5.1.2 Using USB • 5.7.1 Microphone Audio Design
		Delete 1.4 Feature Restriction
2.0	December 08, 2015	Updated: • Typo in Table 24 ADC Electrical Characteristics • Table 52 AirPrime HL6528RDx FCC IDs • Table 53 AirPrime HL6528RDx IC IDs
3.0	March 03, 2016	Updated: • Table 8 Current Consumption • 8 Regulatory Legal Information
		Deleted UIM2

Contents

List of Figures

List of Tables

1. Introduction

The HL6528RDx series of embedded modules were created to improve, expand and enhance the design of the existing HL6528x.

This document defines the high level product features and illustrates the interfaces for the AirPrime HL6528RDx, and covers the hardware aspects of the product series, including electrical and mechanical.

Redesigned variants covered in this document are:

- HL6528RD
- HL6528RD-G
- HL6528RD-2.8V
- HL6528RD-G2.8V

The AirPrime HL6528RD and HL6528RD-G modules are 1.8V IO modules as defined in section 2 Pad Definition. 2.8V IO variants are also available, and defined throughout this document as HL6528RD-2.8V and HL6528RD-G2.8V. HL6528RDx denotes applicability to all four variants.

The AirPrime HL6528RDx belongs to the AirPrime HL Series from Essential Connectivity Module family. This is an industrial-grade quad-band GSM/GPRS Embedded Wireless Module, designed for the automotive market and any other market with similar quality and life-time support requirements. The following table enumerates the frequencies supported by the HL6528RDx module.

Table 1. Supported Frequencies

RF Band	Transmit band (Tx)	Receive band (Rx)	Maximum Output Power
GSM 850	824 to 849 MHz	869 to 894 MHz	2 Watts GSM and GPRS
E-GSM 900	880 to 915 MHz	925 to 960 MHz	2 Watts GSM and GPRS
DCS 1800	1710 to 1785 MHz	1805 to 1880 MHz	1 Watt GSM and GPRS
PCS 1900	1850 to 1910 MHz	1930 to 1990 MHz	1 Watt GSM and GPRS

This module supports a large variety of interfaces such as Analog and Digital Audio, as well as Dual UIM Single Standby to provide customers with the highest level of flexibility in implementing high-end solutions. In addition, both AirPrime HL6528RD-G and HL6528RD-G2.8V modules also embed a high-performance GNSS receiver.

1.1. Common Flexible Form Factor (CF^3)

The AirPrime HL6528RDx module belongs to the Common Flexible Form Factor (CF^3) family of modules. This family consists of a series of WWAN modules that share the same mechanical dimensions (same width and length with varying thicknesses) and footprint. The CF^3 form factor provides a unique solution to a series of problems faced commonly in the WWAN module space as it:

- Accommodates multiple radio technologies (from 2G to LTE advanced) and band groupings
- Supports bit-pipe (Essential Module Series) and value add (Smart Module Series) solutions
- Offers electrical and functional compatibility
- Provides Direct Mount as well as Socketability depending on customer needs

1.2. Physical Dimensions

The AirPrime HL6528RDx modules are compact, robust, fully shielded modules with the following dimensions:

- Length: 23 mm
- Width: 22 mm
- Thickness: 2.50 mm (including the label)
- Weight : 2.25g (TBC)

Note: Dimensions specified above are typical values.

1.3. General Features

The table below summarizes the AirPrime HL6528RDx module features.

Table 2. AirPrime HL6528RDx Features

Feature	Description
GSM Output Power	• Class 4 (2 W) for GSM 850 and E-GSM 900 • Class 1 (1 W) for DCS 1800 and PCS 1900
GPRS	• Quad-band GSM 850/E-GSM 900/DCS 1800/PCS 1900 • GPRS Multi-slot class 10 • R99 support • PBCCH support • Coding schemes: CS1 to CS4
Audio Interface	• Analog and Digital interfaces • Supports Full Rate (FR), Enhanced Full Rate (EFR), Half Rate (HR) and Adaptive Multi Rate (AMR) • Noise reduction and echo cancellation • DTMF generation
UIM Interface	• Dual UIM Single Standby support • 1.8V/3.0V support • Supports UIM application tool kit with proactive UIM commands
Application Interface	• Full set of AT commands for GSM/GPRS including GSM 07.07 and 07.05 AT command sets • Comprehensive set of dedicated AT commands for M2M applications
SMS	• SMS class 0,1 and 2 • SMS MT, MO • SMS storage into UIM card or Flash memory • Concatenation of MT SMS
Supplementary Services	• Call Forwarding • Call Barring • Multiparty Service • Call Waiting • Call Hold • USSD • Automatic answer

Feature	Description
RTC	Real Time Clock (RTC) with calendar and alarm
Temperature Sensor	• Temperature monitoring • Alarms

1.4. GNSS Features

The table below summarizes the GNSS capabilities of the AirPrime HL6528RD-G and HL6528RD-G2.8V modules.

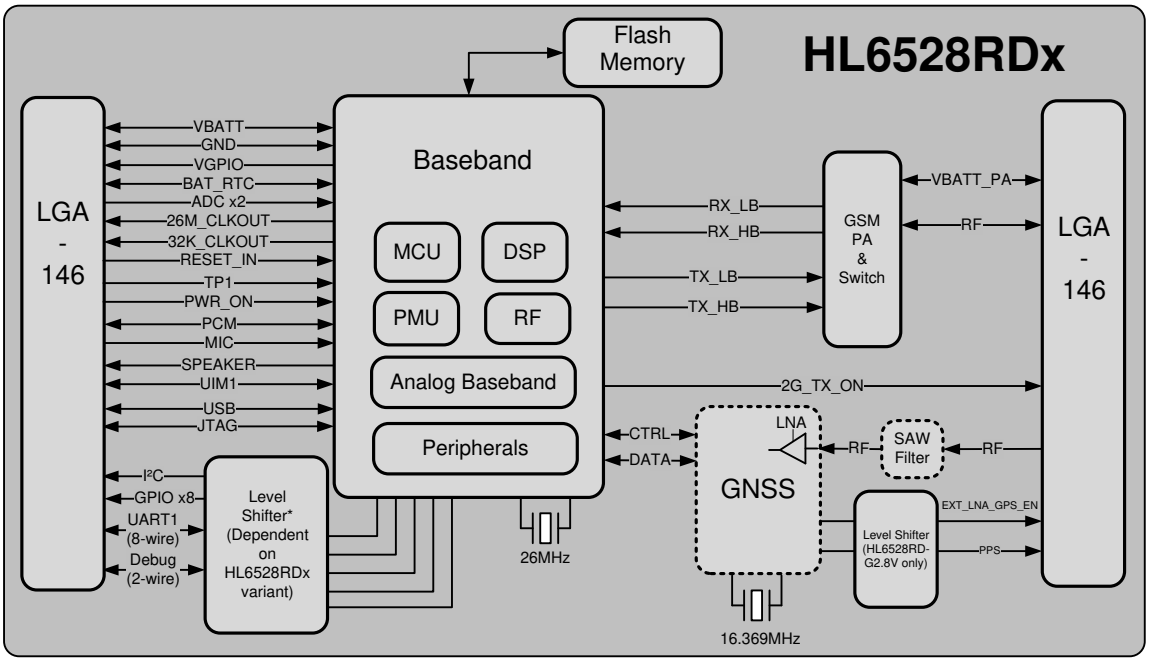
Table 3. GNSS Capabilities

Feature	Description
GPS	L1 band (CDMA 1575.42 MHz)
GLONASS	L1 Band (FDMA 1602MHz)
SBAS (TBC)	WAAS, EGNOS, MSAS, GAGAN, QZSS
Channels	52
Antenna	Passive or active antenna support
Assistance data	Server-generated Extended Ephemeris

1.5. Architecture

The figure below presents an overview of the AirPrime HL6528RDx module internal architecture and external interfaces.

Note: Dotted parts are only supported on the AirPrime HL6528RD-G and HL6528RD-G2.8V.



*** For more information regarding voltage values, refer to section 3.7 Electrical Information for Digital I/O**

Figure 1. AirPrime HL6528RDx Architecture Overview

1.6. Interfaces

The AirPrime HL6528RD and HL6528RD-2.8V modules provide the following interfaces and peripheral connectivity:

- 1x – Backup Battery Interface
- 1x – 1.8V/3V UIM
- 1x – USB 1.1
- 8x – GPIOs, 3 of which have multiplexes
- 1x – 8-wire UART
- 1x – Active Low PWR_ON_N
- 1x – Active Low RESET_IN_N
- 2x – ADC
- 2x – System Clock Out
- 1x – Analog Audio Interface (Differential input/output)
- 1x – Digital Audio
- 1x – I^2C
- 1x – Debug Interface
- 1x – JTAG Interface
- 1x – GSM Antenna
- 1x – 2G TX Burst Indicator

In addition to the interfaces above, the AirPrime HL6528RD-G and HL6528RD-G2.8V modules also provide the following interfaces and peripheral connectivity:

- GPS Antenna
- External LNA Enable/Disable
- Pulse Per Second

1.7. Connection Interface

The AirPrime HL6528RDx module is an LGA form factor device. All electrical and mechanical connections are made through the 146 pads Land Grid Array (LGA) on the bottom side PCB.

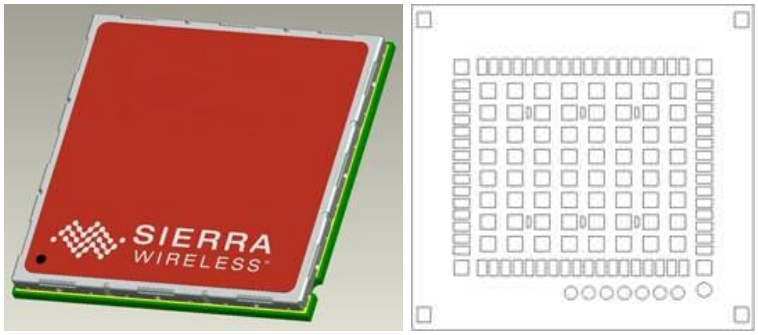


Figure 2. AirPrime HL6528RDx Module Mechanical Overview

The 146 pads have the following distribution

- 66 inner signal pads, 1x0.5mm, pitch 0.8mm
- 1 reference test point (Ground), 1.0mm diameter

- 7 test point (JTAG), 0.8mm diameter, 1.20mm pitch
- 64 inner ground pads, 1.0x1.0mm, pitch 1.825mm/1.475mm
- 4 inner corner ground pads, 1x1mm
- 4 outer corner ground pads, 1x0.9mm

1.8. ESD

Refer to the following table for ESD Specifications.

Note: Information specified in the following table is preliminary and subject to change.

Table 4. ESD Specifications

Category	Connection	Specification
Operational	RF ports	IEC-61000-4-2 — Level (Electrostatic Discharge Immunity Test) ESD protection is highly recommended at the point where the antenna (main and GPS) contacts are exposed.
Non-operational	Host connector interface	Unless otherwise specified: • JESD22-A114 +/- 1500V Human Body Model • JESD22-A115 +/- 150V Machine Model • JESD22-C101C +/- 500V Charged Device Model
Signals	SIM connector	ESD protection is highly recommended at the point where the USIM contacts are exposed, and for any other signals that would be subjected to ESD by the user.
	Other host signals	

1.9. Environmental and Certifications

1.9.1. Environmental Specifications

The environmental specification for both operating and storage conditions are defined in the table below.

Table 5. AirPrime HL6528RDx Module Environmental Specifications

Conditions	Range
Operating Class A	-30°C to +70°C
Operating Class B	-40°C to +85°C
Storage	-40°C to +90°C

Class A is defined as the operating temperature ranges that the device:

- Shall exhibit normal function during and after environmental exposure.
- Shall meet the minimum requirements of 3GPP or appropriate wireless standards.

Class B is defined as the operating temperature ranges that the device:

- Shall remain fully functional during and after environmental exposure
- Shall exhibit the ability to establish a voice, SMS or DATA call (emergency call) at all times even when one or more environmental constraint exceeds the specified tolerance.
- Unless otherwise stated, full performance should return to normal after the excessive constraint(s) have been removed.

1.9.2. Regulatory

The AirPrime HL6528RDx module is compliant with the following regulations: R&TTE directive, FCC, IC, ANATEL and NCC.

1.9.3. RoHS Directive Compliant

The AirPrime HL6528RDx module is compliant with RoHS Directive 2011/65/EU which sets limits for the use of certain restricted hazardous substances. This directive states that “from 1st July 2006, new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)”.

1.9.4. Disposing of the Product

This electronic product is subject to the EU Directive 2012/19/EU for Waste Electrical and Electronic Equipment (WEEE). As such, this product must not be disposed of at a municipal waste collection point. Please refer to local regulations for directions on how to dispose of this product in an environmental friendly manner.

1.10. References

[1] AirPrime HL Series Customer Process Guidelines
Reference Number: 4114330

[2] AirPrime HL6528RDx AT Commands Interface Guide
Reference Number: 4117743

[3] AirPrime HL Series Development Kit User Guide
Reference Number: 4114877

2. Pad Definition

AirPrime HL6528RDx module pads are divided into 3 functional categories.

- **Core functions and associated pads** cover all the mandatory features for M2M connectivity and will be available by default across all CF^3 family of modules. These Core functions are always available and always at the same physical pad locations. A customer platform using only these functions and associated pads is guaranteed to be forward and/or backward compatible with the next generation of CF^3 modules.
- **Extension functions and associated pads** bring additional capabilities to the customer. Whenever an Extension function is available on a module, it is always at the same pad location.
- **Custom functions and associated pads** are specific to a given module, and make an opportunistic use of specific chipset functions and I/Os. Custom features should be used with caution as there is no guarantee that the custom functions available on a given module will be available on other CF^3 modules.

Other pads marked as “not connected” or “reserved” should not be used.

Table 6. Pad Description

Pad #	Signal Name	Function	I/O	Active Low / High	IO Voltage Domain for HL6528RD and HL6528RD-G	IO Voltage Domain for HL6528RD-2.8V and HL6528RD-G2.8V	Reset State**	Recommendation for Unused Pads	Type
1	GPIO1 / I2C1_CLK	General purpose input/output / I^{2}C serial clock line	I/O		1.8V	2.8V	I, PU	Left Open	Extension
2	UART1_RI	UART1 Ring indicator	O		1.8V	2.8V	I, PU	Left Open	Core
3	UART1_RTS	UART1 Request to send	I	L	1.8V	2.8V	I, PU	Connect to UART1_CTS	Core
4	UART1_CTS	UART1 Clear to send	O	L	1.8V	2.8V	I, PU	Connect to UART1_RTS	Core
5	UART1_TX	UART1 Transmit data	I		1.8V	2.8V	I, PU	Mandatory connection	Core
6	UART1_RX	UART1 Receive data	O		1.8V	2.8V	O, H	Mandatory connection	Core

Pad #	Signal Name	Function	I/O	Active Low / High	IO Voltage Domain for HL6528RD and HL6528RD-G	IO Voltage Domain for HL6528RD-2.8V and HL6528RD-G2.8V	Reset State**	Recommendation for Unused Pads	Type
7	UART1_DTR	UART1 Data terminal ready	I	L	1.8V	2.8V	I, PU	Connect to UART1_DSR	Core
8	UART1_DCD	UART1 Data carrier detect	O	L	1.8V	2.8V	I, PD	Left Open	Core
9	UART1_DSR	UART1 Data set ready	O	L	1.8V	2.8V	I, PD	Connect to UART1_DTR	Core
10	GPIO2	General purpose input/output	I/O		1.8V	2.8V	O, H	Left Open	Core
11	RESET_IN_N	Input reset signal	I	L	1.8V	1.8V	O, H	Left Open (Test point recommended)	Core
12	USB_D-	USB Data Negative	I/O		3.3V	3.3V	T (TBD)	Left Open	Extension
13	USB_D+	USB Data Positive	I/O		3.3V	3.3V	T (TBD)	Left Open	Extension
14	NC	Not Connected							Not Connected
15	NC	Not Connected							Not Connected
16	USB_VBUS	USB VBUS	I		5V	5V	I, PD (TBD)		Extension
17	SPKR_N	Speaker negative output (32Ω impedance)	O		2.8V	2.8V	O, PD (TBD)	Left Open	Extension
18	SPKR_P	Speaker positive output (32Ω impedance)	O		2.8V	2.8V	O, PD (TBD)	Left Open	Extension
19	MIC_P	Microphone positive input	I		2.8V	2.8V	I, T (TBD)	Left Open	Extension
20	MIC_N	Microphone negative input	I		2.8V	2.8V	I, T (TBD)	Left Open	Extension
21	BAT_RTC	Power supply for RTC backup	I/O		2.8V	2.8V	(TBD)	C=10µF	Extension
22	26M_CLKOUT	26MHz System Clock Output	O		1.2V	1.2V	I, PD (TBD)	Left Open	Extension
23	32K_CLKOUT	32.768kHz System Clock Output	O		2.8V	2.8V	I, PD	Left Open	Extension

Pad #	Signal Name	Function	I/O	Active Low / High	IO Voltage Domain for HL6528RD and HL6528RD-G	IO Voltage Domain for HL6528RD-2.8V and HL6528RD-G2.8V	Reset State**	Recommendation for Unused Pads	Type
24	ADC1	Analog to digital conversion	I		2.8V	2.8V	I, T (TBD)	Connected to Ground	Extension
25	ADC0	Analog to digital conversion	I		2.8V	2.8V	I, T (TBD)	Connected to Ground	Extension
26	UIM1_VCC	1.8V/3V UIM1 Power supply	O		1.8V/3V	1.8V/3V	N/A	Mandatory connection	Core
27	UIM1_CLK	1.8V/3V UIM1 Clock	O		1.8V/3V	1.8V/3V	I, PD	Mandatory connection	Core
28	UIM1_DATA	1.8V/3V UIM1 Data	I/O		1.8V/3V	1.8V/3V	I, PD	Mandatory connection	Core
29	UIM1_RESET	1.8V/3V UIM1 Reset	O	L	1.8V/3V	1.8V/3V	I, PD	Mandatory connection	Core
30	NC	NC (Reserved for 3G compatibility)							Not Connected
31	NC	NC (Reserved for 3G compatibility)							Not Connected
32	NC	NC (Reserved for 3G compatibility)							Not Connected
33	PCM_OUT	PCM data out	O		2.8V	2.8V	I, PD	Left Open	Extension
34	PCM_IN	PCM data in	I		2.8V	2.8V	I, PD	Left Open	Extension
35	PCM_SYNC	PCM sync out	I/O		2.8V	2.8V	I, PD	Left Open	Extension
36	PCM_CLK	PCM clock	I/O		2.8V	2.8V	I, PD	Left Open	Extension
37	GND	Ground	GND		0V	0V		Mandatory connection	Core
38	RF_GPS*	RF GPS Input	I					Mandatory connection	Extension
39	GND	Ground	GND		0V	0V		Mandatory connection	Core
40	GPIO7	General purpose input/output	I/O		1.8V	2.8V	I, PD	Left Open	Core
41	GPIO8	General purpose input/output	I/O		1.8V	2.8V	I, PD	Left Open	Core
42	PPS*	GPS Pulse Per Second	O		1.8V	2.8V	T	Left Open	Extension
43	EXT_LNA_ GPS_EN*	External GPS LNA enable	O	H	1.8V	2.8V	T	Left Open	Extension

Pad #	Signal Name	Function	I/O	Active Low / High	IO Voltage Domain for HL6528RD and HL6528RD-G	IO Voltage Domain for HL6528RD-2.8V and HL6528RD-G2.8V	Reset State**	Recommendation for Unused Pads	Type
44	DEBUG_TX	Debug Transmit Data	O		1.8V	2.8V	I, PD	Left Open (Test point mandatory)	Extension
45	VGPIO	GPIO voltage output	O		1.8V	2.8V		Left Open	Core
46	GPIO6	General purpose input/output	I/O		1.8V	2.8V	I, PD	Left Open	Core
47	TP1	Test Point 1 0 - JTAG Enable Open - Normal Mode	I	L	2.8V	2.8V	I, PU	Mandatory Left Open	Extension
48	GND	Ground	GND		0V	0V		Mandatory connection	Core
49	RF_MAIN	RF GSM Input/output	I/O					Mandatory connection	Core
50	GND	Ground	GND		0V	0V		Mandatory connection	Core
51	DEBUG_RX	Debug Receive Data	I		1.8V	2.8V	I, PD	Left Open (Test point mandatory)	Extension
52	Reserved								Not Connected
53	Reserved								Not Connected
54	NC	Not connected							Not Connected
55	NC	Not connected							Not Connected
56	NC	Not connected							Not Connected
57	NC	Not connected							Not Connected
58	NC	Not connected							Not Connected
59	PWR_ON_N	Active Low Power On control signal	I	L	2.8V	2.8V	I, PD (TBD)	Mandatory connection	Core
60	2G_TX_ON	2G TX burst indicator	O	H	2.8V	2.8V	T	Left Open	Extension
61	VBATT_PA	3.7V Power Amplifier Power supply	I		3.7V	3.7V		Mandatory connection	Core
62	VBATT_PA	3.7V Power Amplifier Power supply	I		3.7V	3.7V		Mandatory connection	Core

Pad #	Signal Name	Function	I/O	Active Low / High	IO Voltage Domain for HL6528RD and HL6528RD-G	IO Voltage Domain for HL6528RD-2.8V and HL6528RD-G2.8V	Reset State**	Recommendation for Unused Pads	Type
63	VBATT	3.7V Power supply	I		3.7V	3.7V		Mandatory connection	Core
64	UIM1_DET / GPIO3	UIM1 Detection / General purpose input/output	I/O	H	1.8V	2.8V	I, PD	Left Open	Core
65	GPIO4	General purpose input/output	I/O		1.8V	2.8V	I, PD	Left Open	Extension
66	GPIO5 / I2C1_DATA	General purpose input/output / I²C serial data line	I/O		1.8V	2.8V	I, PD	Left Open	Extension
67-70	GND	Ground	GND		0V	0V		Mandatory connection	Core
71-166	*Note: These pads are not available on the HL6528RDx module.*								
167-234	GND	GND	GND		0V	0V		Mandatory connection	Core
236	JTAG_RESET	JTAG RESET	I	L	2.8V	2.8V	O, H (1.8V)	Left Open	Extension
237	JTAG_TCK	JTAG Test Clock	I		2.8V	2.8V	I, PU	Left Open	Extension
238	JTAG_TDO	JTAG Test Data Output	O		2.8V	2.8V	I, PD	Left Open	Extension
239	JTAG_TMS	JTAG Test Mode Select	I		2.8V	2.8V	O, H	Left Open	Extension
240	JTAG_TRST	JTAG Test Reset	I	L	2.8V	2.8V	I, PD	Left Open	Extension
241	JTAG_TDI	JTAG Test Data Input	I		2.8V	2.8V	I, PD	Left Open	Extension
242	JTAG_RTCK	JTAG Returned Test Clock	O		2.8V	2.8V		Left Open	Extension

* This pad is only available on the HL6528RD-G and H6528-G2.8V.

** I = Input, O = Output, PU = Pull up, PD = Pull Down, H = High, T = High Impedance

2.1. Pad Configuration (Top View)

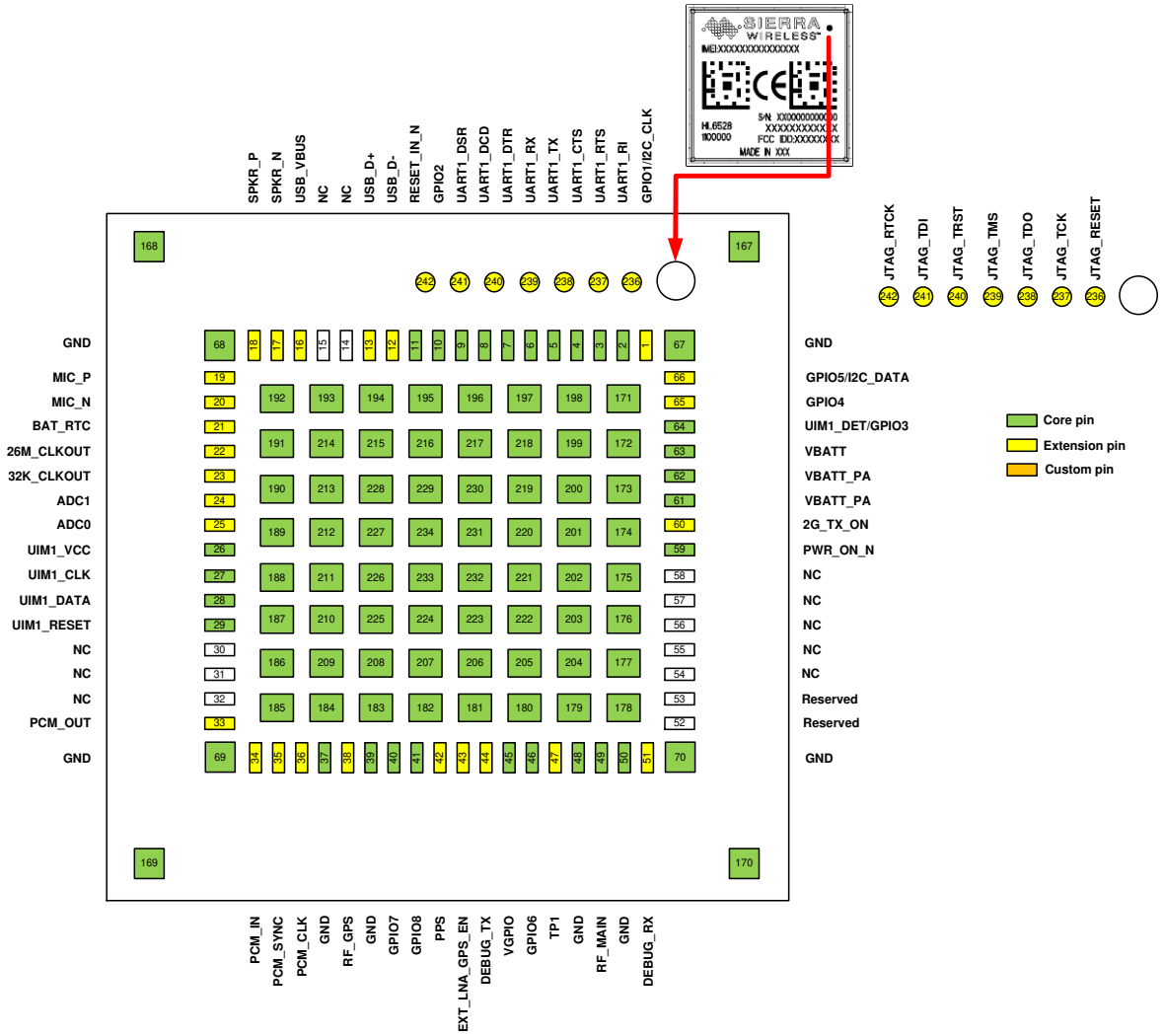


Figure 3. Pad Configuration

3. Detailed Interface Specifications

Note: If not specified, all electrical values are given for VBATT=3.7V and an operating temperature of 25°C.

If needed, the AirPrime HL6528RDx module can support two different voltages for VBATT and VBATT_PA power inputs. However, using the same power supply for both signals is recommended.

3.1. Power Supply

The AirPrime HL6528RDx module is supplied through the VBATT signal with the following characteristics.

Table 7. Power Supply

	Minimum	Typical	Maximum
VBATT voltage (V)	3.35[1]	3.7	4.3
VBATT_PA voltage (V) Full Specification	3.35[1]	3.7	4.3
VBATT_PA voltage (V) Extended Range[2]	2.8[2]	3.7	4.3

1 This value has to be guaranteed during the burst

2 No guarantee of 3GPP performances over extended range

3.2. Current Consumption

The following table lists the current consumption of the AirPrime HL6528RDx module at different conditions.

Note: Typical values are defined for VBATT/VBATT_PA at 3.7V and 25°C, for 50Ω impedance at all RF ports. Maximum values are provided for VSWR 3:1 with worst conditions among supported ranges of voltage and temperature.

Table 8. Current Consumption

Parameters		Typical	Maximum
Off mode (HL6528RD and HL6528RD-2.8V) (µA)		200	260
Off mode (HL6528RD-G and HL6528RD-G2.8V) (µA)		200	260
GSM Sleep mode (average, mA) Single UIM operation	DRX2	1.8	2.9
	DRX5	1.4	2.5
	DRX9	1.3	2.4
GSM in communication mode (average, mA)	E-GSM 900 / GSM 850 (PCL=5)	220	243
	DCS 1800 / PCS 1900 (PCL=0)	150	164
GPRS (2 TX, 3 RX) (average, mA)	E-GSM 900 / GSM 850 (PCL=5)	330	377
	DCS 1800 / PCS 1900 (PCL=0)	230	251
Peak Current consumption (peak, A)	E-GSM 900 / GSM 850	1.5	1.6
	DCS 1800 / PCS 1900	0.9	1.2

Parameters		Typical	Maximum
GNSS Acquisition[1] (average, mA) GSM registered on network	Max value[3]	TBD	TBD
	Min value[4]	TBD	TBD
GNSS Acquisition[1] (average, mA) GSM in Flight mode	Max value[3]	TBD	TBD
	Min value[4]	TBD	TBD
GNSS Navigation (1Hz)[1] (average, mA) GSM registered on network	Max value[3]	TBD	TBD
	Min value[4]	TBD	TBD
GNSS Navigation (1Hz)[1] (average, mA) GSM in Flight mode	Max value[3]	TBD	TBD
	Min value[4]	TBD	TBD
GNSS Hibernate mode[2] (average, mA) GSM registered on network	Max value[3]	TBD	TBD
	Min value[4]	TBD	TBD

1 Maximum SVs in view, signal level @-130dBm, high gain configuration

2 Hot start conditions are maintained in Hibernate mode

3 Baseband is running (or no sleep mode allowed) in max value condition. Refer to document [2] AirPrime HL6528RDx AT Commands Interface Guide for sleep mode description.

4 Baseband is in sleep mode in min value condition. Refer to document [2] AirPrime HL6528RDx AT Commands Interface Guide for sleep mode description.

Table 9. Current Consumption per Power Supply (VBATT / VBATT_PA)

Parameters			Typical	Maximum
VBATT_PA	Peak current (A) GPRS communication mode, 2TX	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD
	Peak current (A) GSM communication mode, 1TX	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD
	Average current (mA) GSM communication mode, 1TX	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD
VBATT (HL6528RD and HL6528RD-2.8V)	Peak current (A) GPRS communication mode, 2TX	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD
	Peak current (A) GSM communication mode, 1TX	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD
	Average current (mA) GSM communication mode, 1TX	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD

Parameters			Typical	Maximum
VBATT (HL6528RD-G and HL6528RD-G2.8V)	Peak current (A) GPRS communication mode, 2TX GNSS Navigation mode	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD
	Peak current (A) GSM communication mode, 1TX GNSS Navigation mode	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD
	Average current (mA) GSM communication mode, 1TX GNSS Navigation mode	E-GSM 900 / GSM 850 (PCL=5)	TBD	TBD
		DCS 1800/ PCS 1900 (PCL=0)	TBD	TBD

3.3. VGPIO

The VGPIO output can be used to:

- Pull-up signals such as I/Os
- Supply the digital transistors driving LEDs

The VGPIO output is available when the AirPrime HL6528RDx module is switched ON.

Caution: *VGPIO is only on when RESET_IN_N and PWR_ON_N are both at low level.*

Table 10. VGPIO Electrical Characteristics

Parameter	HL6528RD, HL6528RD-G			HL6528RD-2.8V, HL6528RD-G2.8V			Remarks
	Min	Typ	Max	Min	Typ	Max	
Voltage level (V)	1.70	1.80	1.90	2.7	2.80	2.95	Both active mode and sleep mode
Current capability active mode (mA)	-	-	50	-	-	50	
Current capability sleep mode (mA)	-	-	3 (TBC)	-	-	3 (TBC)	
Line regulation (mV/V)	-	-	50 (TBC)	-	-	50 (TBC)	Iout = MAX
Rise Time(ns)	-	-	6 (TBC)	-	-	6 (TBC)	Test load capacitor = 30 pF

3.4. BAT_RTC

The AirPrime HL6528RDx module provides an input/output to connect a Real Time Clock power supply.

This pad is used as a back-up power supply for the internal Real Time Clock. The RTC is supported when VBATT is available but a back-up power supply is needed to save date and hour when VBATT is switched off.