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Product Technical Specification

AirPrime HL8518, HL8528 and HL8529



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December 10, 2015

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1. Introduction

This document is the Product Technical Specification for the AirPrime HL8518, HL8528 and HL8529 Embedded Modules. It defines high level features and illustrates the interfaces for these features. This document is intended to cover hardware aspects, including electrical and mechanical, of the AirPrime HL8518, HL8528 and HL8529.

The AirPrime HL8518, HL8528 and HL8529 modules belong to the AirPrime HL Series from the Essential Connectivity Module family. These are industrial grade Embedded Wireless Modules that provide voice and data connectivity on GPRS, EDGE RX, WCDMA, HSDPA and HSUPA networks (as listed in Table 1 Supported Bands/Connectivity).

The HL8518, HL8528 and HL8529 modules support a large variety of interfaces such as Digital Audio, GPIOs and UART to provide customers with the highest level of flexibility in implementing high-end solutions.

Table 1. Supported Bands/Connectivity

RF Band	Transmit band (Tx)	Receive band (Rx)	Maximum Output Power	HL8518	HL8528	HL8529
UMTS B1	1922 to 1978 MHz	2112 to 2168 MHz	22.5 dBm (± 1.5 dB)	✓		
UMTS B2	1852 to 1908 MHz	1932 to 1988 MHz	22.5 dBm (± 1.5 dB)		✓	✓
UMTS B5	826 to 847 MHz	871 to 892 MHz	22.5 dBm (± 1.5 dB)		✓	✓
UMTS B8	882 to 913 MHz	927 to 958 MHz	22.5 dBm (± 1.5 dB)	✓		
GSM 850	824 to 849 MHz	869 to 894 MHz	33 dBm ± 2 dB GSM, GPRS		✓	
E-GSM 900	880 to 915 MHz	925 to 960 MHz	33 dBm ± 2 dB GSM, GPRS	✓		
DCS 1800	1710 to 1785 MHz	1805 to 1880 MHz	30 dBm ± 2 dB GSM, GPRS	✓		
PCS 1900	1850 to 1910 MHz	1930 to 1990 MHz	30 dBm ± 2 dB GSM, GPRS		✓	

1.1. Common Flexible Form Factor (CF³)

The AirPrime HL8518, HL8528 and HL8529 belong to the Common Flexible Form Factor (CF³) 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 CF³ 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 Socketability depending on customer needs

1.2. Physical Dimensions

The AirPrime HL8518, HL8528 and HL8529 modules are compact, robust, fully shielded modules with the following dimensions:

- Length: 23 mm
- Width: 22 mm
- Thickness: 2.5 mm
- Weight: 2.65 g

Note: Dimensions specified above are typical values.

1.3. General Features

The table below summarizes the AirPrime HL8518, HL8528 and HL8529 features.

Table 2. General Features

Feature	Description
Physical	<ul style="list-style-type: none"> • Small form factor (146-pin solderable LGA pad) – 23mm x 22mm x 2.5mm (nominal) • Metal shield can • RF connection pad • Baseband signals connection
Electrical	Single or double supply voltage (VBATT and VBATT_PA) – 3.2V – 4.5V
RF	HL8518 (dual-band UMTS and dual-band GSM): <ul style="list-style-type: none"> • UMTS B1 • UMTS B8 • E-GSM 900 • DCS 1800 HL8528 (dual-band UMTS and dual-band GSM): <ul style="list-style-type: none"> • UMTS B2 • UMTS B5 • GSM 850 • PCS 1900 HL8529 (dual-band UMTS): <ul style="list-style-type: none"> • UMTS B2 • UMTS B5
Audio interface	<ul style="list-style-type: none"> • Digital interface (ONLY) • Supports Enhanced Full Rate (EFR), Full Rate (FR), Half Rate (HR), and both Narrow-Band and Wide-band Adaptive Multirate (AMR-NB and AMR-WB) vocoders • MO and MT calling • Echo cancellation and noise reduction • Emergency calls (112, 110, 911, etc.) • Incoming call notification • DTMF generation

Feature	Description
SIM interface	<ul style="list-style-type: none"> • Dual SIM Single Standby (DSSS) with fast network switching capability • 1.8V/3V support • SIM extraction / hot plug detection • SIM/USIM support • Conforms with ETSI UICC Specifications. • Supports SIM application tool kit with proactive SIM commands
Application interface	<ul style="list-style-type: none"> • NDIS NIC interface support (Windows XP, Windows 7, Windows 8, Windows CE, Linux) • Multiple non-multiplexed USB channel support • Dial-up networking • USB selective suspend to maximize power savings • CMUX multiplexing over UART • AT command interface – 3GPP 27.007 standard, plus proprietary extended AT commands
Protocol Stack	<p>Dual-mode UMTS (WCDMA) / HSDPA / HSUPA / EDGE RX / GPRS / GSM operation</p> <ul style="list-style-type: none"> • GSM/GPRS/EDGE RX <ul style="list-style-type: none"> ▪ GPRS Class 12 ▪ EDGE RX ▪ CSD (Circuit-switched data bearers) ▪ Release 4 GERAN Feature Package 1 ▪ SAIC / DARP Phase 1 ▪ Latency Reduction ▪ Repeated FACCH and Repeated SACCH ▪ GPRS ROHC ▪ Enhanced Operator Name String (EONS) ▪ Enhanced Network Selection (ENS) • WCDMA <ul style="list-style-type: none"> ▪ 3GPP WCDMA FDD Multimode Type II UE Protocol Stack ▪ Configurable for data classes up to 384 kBit/s ▪ Inter-RAT Handover and Cell Reselection ▪ Supports two types of Compressed Mode ▪ Network Assisted Cell Change from UTRAN to GERAN and GERAN to UTRAN ▪ CSD (Circuit-switched data bearers) over WCDMA (transparent/non transparent up to 64 kBit/s; Support for Video Telephony) • HSDPA (High Speed Downlink Packet Access) <ul style="list-style-type: none"> ▪ Compliant with 3GPP Release 5 ▪ HSDPA Category 8 data rate – 7.2 Mbps (peak rate) ▪ IPv6 support • HSUPA (High Speed Uplink Packet Access) <ul style="list-style-type: none"> ▪ Compliant with 3GPP Release 6 ▪ HSUPA Category 6 data rate - 5.76 Mbps (peak rate) ▪ Robust Header Compression (RoHC) ▪ Fractional DPCH

Feature	Description
Protocol Stack	<ul style="list-style-type: none"> • HSPA+ (Evolved High Speed Packet Access) <ul style="list-style-type: none"> ▪ Compliant with 3GPP Release 7 ▪ Higher-Order Modulation (HOM) ▪ MAC-ehs support ▪ Continuous Packet Connectivity (CPC) ▪ Enhanced F-DPCH ▪ Enhanced Cell FACH ▪ Circuit Switched Voice over HSPA
SMS	<ul style="list-style-type: none"> • SMS MO and MT • CS and PS support • SMS saving to SIM card or ME storage • SMS reading from SIM card or ME storage • SMS sorting • SMS concatenation • SMS Status Report • SMS replacement support • SMS storing rules (support of AT+CNMI, AT+CNMA)
Supplementary Services	<ul style="list-style-type: none"> • Call Barring • Call Forwarding • Call Hold • Caller ID • Call Waiting • Multi-party service • USSD • Automatic answer
Connectivity	<ul style="list-style-type: none"> • Multiple (up to 20) cellular packet data profiles • Sleep mode for minimum idle power draw • Automatic GPRS attach at power-up • GPRS detach • Mobile-originated PDP context activation / deactivation • Support QoS profile <ul style="list-style-type: none"> ▪ Release 97 – Precedence Class, Reliability Class, Delay Class, Peak Throughput, Mean Throughput ▪ Release 99 QoS negotiation – Background, Interactive, and Streaming • Static and Dynamic IP address. The network may assign a fixed IP address or dynamically assign one using DHCP (Dynamic Host Configuration Protocol). • Supports PAP and CHAP authentication protocols • PDP context type (IPv4, IPv6, IPv4v6). IP Packet Data Protocol context • RFC1144 TCP/IP header compression • Interaction with existing GSM services (MO/MT SMS voice calls) while: <ul style="list-style-type: none"> ▪ GPRS is attached, or ▪ In a GPRS data session (class B GPRS suspend / resume procedures)
Environmental	<p>Operating temperature ranges (industrial grade):</p> <ul style="list-style-type: none"> • Class A: -30°C to +70°C • Class B: -40°C to +85°C

Feature	Description
RTC	Real Time Clock (RTC) with calendar and alarm
Temperature Sensor	<ul style="list-style-type: none"> Temperature monitoring Alarms

1.4. Encryption Support

The AirPrime HL8518, HL8528 and HL8529 supports the following encryption algorithms:

- Ciphering algorithms A51, A52 and A53
- GEA1/GEA2 and GEA3 algorithm for GPRS encryption
- Cyclic Redundancy Check (CRC) with programmable polynomial
- UMTS confidentiality algorithm f8 for message ciphering (Kasumi based UEA1)
- UMTS integrity algorithm f9 for message authentication (Kasumi based UIA1 and SNOW 3G based UIA2)

1.5. Architecture

The figure below presents an overview of the AirPrime HL8518, HL8528 and HL8529 modules internal architecture and external interfaces.

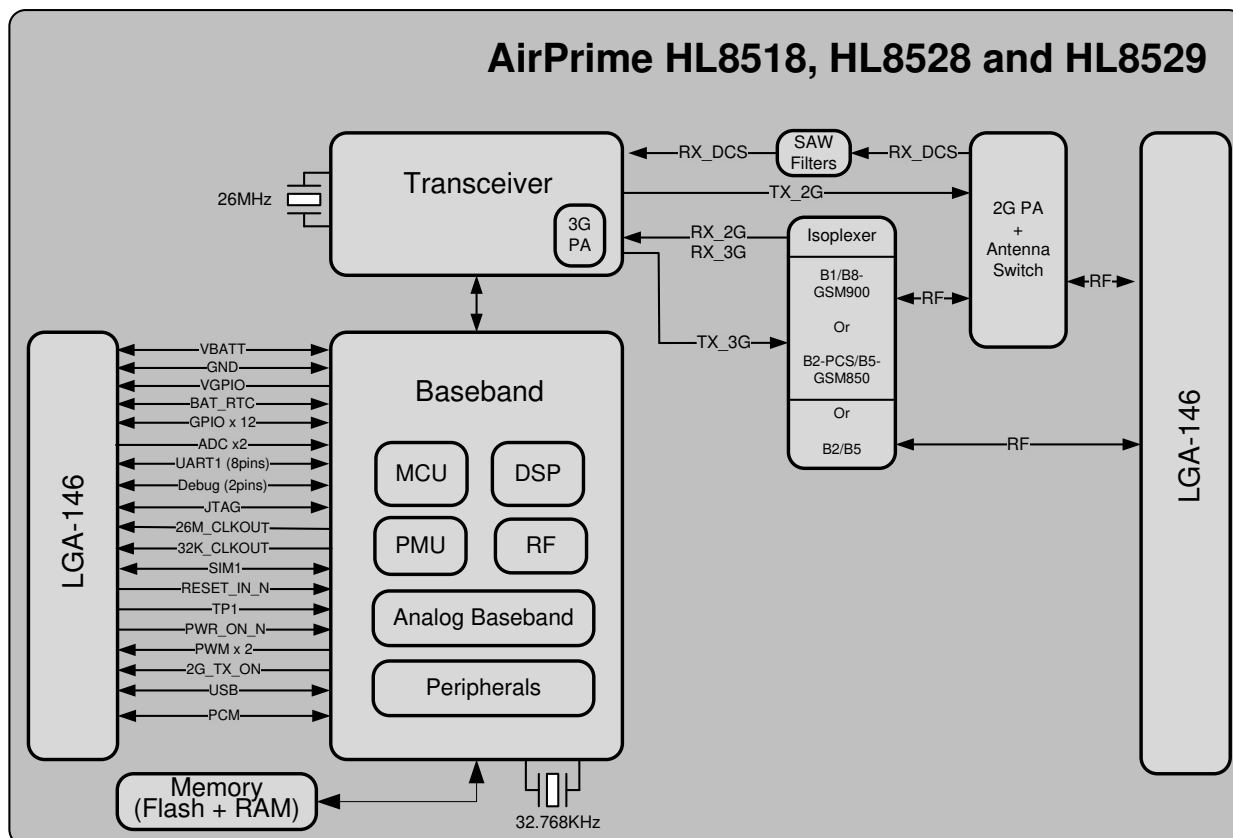


Figure 1. Architecture Overview

1.6. Interfaces

The AirPrime HL8518, HL8528 and HL8529 modules provide the following interfaces and peripheral connectivity:

- 1x – 8-pin UART
- 1x – Active Low RESET
- 1x – USB 2.0
- 1x – Backup Battery Interface
- 2x – System Clock Out
- 1x – Active Low POWER ON
- 1x – 1.8V/3V SIM
- 1x – Digital Audio
- 2x – ADC
- 1x – JTAG Interface
- 1x – Debug Interface
- 2x – PWM
- 12x – GPIOs
- 1x – 2G TX Burst Indicator
- 1x – GSM Antenna

1.7. Connection Interface

The AirPrime HL8518, HL8528 and HL8529 modules are an LGA form factor device. All electrical and mechanical connections are made through the 146 Land Grid Array (LGA) pads on the bottom side of the PCB.

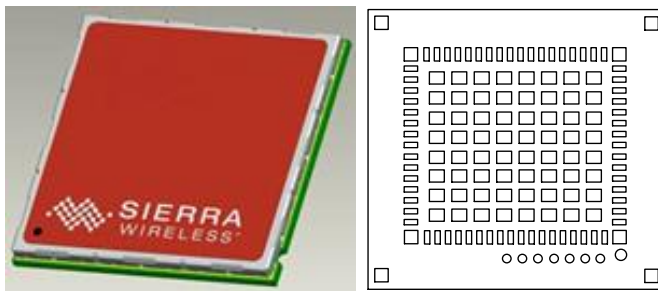


Figure 2. Mechanical Overview

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 3. ESD Specifications

Category	Connection	Specification
Operational	RF ports	IEC-61000-4-2 — Level (Electrostatic Discharge Immunity Test)
Non-operational	Host connector interface	Unless otherwise specified: <ul style="list-style-type: none"> • JESD22-A114 +/- 1kV Human Body Model • JESD22-A115 +/- 200V Machine Model • JESD22-C101C +/- 250V 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 4. Environmental Specifications

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

Note: The upper limit of Class A is subject to module PCB temperature. A progressive 3G output power reduction feature is implemented for when PCB temperatures are above +80°C. This leads to a calibrated 3G TX power output up to +80°C for the PCB temperature and automatic decrease at higher temperatures. Therefore, depending on module activity and customer design, the upper limit of Class A could be lower than 70°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 HL8518, HL8528 and HL8529 modules are compliant with the following regulations:

- R&TTE directive 1999/5/EC
- FCC
- IC

These compliances will be reflected on the AirPrime HL8518, HL8528 and HL8529 modules labels when applicable.

Table 5. Regulation Compliance

Document	Current Version	Title
NAPRD.03	v5.18 or later	Overview of PCS Type certification review board (PTCRB) Mobile Equipment Type Certification and IMEI control
GCF-CC	v3.51.1 or later	GCF Conformance Certification Criteria
TS 51.010-1	V10.0.0 (2012-03)	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 1: Conformance specification
TS 51.010-2	V10.0.0 (2012-03)	3rd Generation Partnership Project; Technical Specification Group GSM/EDGE Radio Access Network; Mobile Station (MS) conformance specification; Part 2: Protocol Implementation Conformance Statement (PICS) proforma specification
EN 301511	V9.0.2 (2003-03)	Global System for Mobile Communications (GSM); Harmonized EN for Mobile Stations in the GSM 900 and GSM 1800 Bands Covering Essential Requirements Under Article 3.2 of the R&TTE Directive (1999/5/EC)
EN 301489-1	V1.9.2 (2011-09)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
EN 301489-3	V1.4.1 (2002-08)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz
EN 301489-7	V1.3.1 (2005-11)	Electromagnetic Compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) Standard for Radio Equipment and Services; Part 7: Specific Conditions for Mobile and Portable Radio and Ancillary Equipment of Digital Cellular Radio Telecommunications Systems (GSM and DCS)
EN 60950-1	NA	IEC 60950-1:2005/A1:2009 EN 60950-1:2006/A11:2009/A1:2010/A12:2011/AC :2011 Information technology equipment – safety- and general requirements
EN 300440-1	v1.6.1 (2012-08)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 1: Technical characteristics and test methods
EN 300440-2	V1.4.1 (2012-08)	Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive

Document	Current Version	Title
FCC Part 22H	NA	Cellular Radiotelephone Service; Subpart H: Cellular Radiotelephone Service
FCC Part 24E	NA	Personal Communications Service; Subpart E: Broadband PCS.

1.9.3. RoHS Directive Compliant

The AirPrime HL8518, HL8528 and HL8529 modules are 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 HL6 and HL8 Series AT Commands Interface Guide
Reference Number: 4114680
- [3] AirPrime HL Series Dual SIM Single Standby Application Note
Reference Number: 2174034

>> 2. Pad Definition

AirPrime HL8518, HL8528 and HL8529 pins are divided into 3 functional categories.

- **Core functions and associated pins** cover all the mandatory features for M2M connectivity and will be available by default across all CF³ family of modules. These Core functions are always available and always at the same physical pin locations. A customer platform using only these functions and associated pins is guaranteed to be forward and/or backward compatible with the next generation of CF³ modules.
- **Extension functions and associated pins** bring additional capabilities to the customer. Whenever an Extension function is available on a module, it is always at the same pin location.
- **Custom functions and associated pins** 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 CF³ modules.

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

Table 6. Pad Definition

Pin #	Signal Name	Function	I/O	I/O HW Reset State**	Driver Pad Class*	Active Low / High	Power Supply Domain	Recommendation for Unused Pins	Type
1	GPIO1	General purpose input/output	I/O	I, T	E		1.8V	Left Open	Extension
2	UART1_RI	UART1 Ring indicator	O	I, T/PD	A		1.8V	Left Open	Core
3	UART1_RTS	UART1 Request to send	I	I, T/PD		L	1.8V	Connect to UART1_CTS	Core
4	UART1_CTS	UART1 Clear to send	O	I, T/PD	A	L	1.8V	Connect to UART1_RTS	Core
5	UART1_TX	UART1 Transmit data	I	I, T/PD			1.8V	Mandatory connection	Core
6	UART1_RX	UART1 Receive data	O	I, T/PD	A		1.8V	Mandatory connection	Core
7	UART1_DTR	UART1 Data terminal ready	I	I, T/PD		L	1.8V	Connect to UART1_DSR	Core
8	UART1_DCD	UART1 Data carrier detect/	O	I, L	A	L	1.8V	Left Open	Core
9	UART1_DSR	UART1 Data set ready	O	I, T/PD	A	L	1.8V	Connect to UART1_DTR	Core
10	GPIO2	General purpose input/output	I/O	I, T/PD	A		1.8V	Left Open	Core

Pin #	Signal Name	Function	I/O	I/O HW Reset State**	Driver Pad Class*	Active Low / High	Power Supply Domain	Recommendation for Unused Pins	Type
11	RESET_IN_N	Input reset signal	I	I, T/PU		L	1.8V	Left Open	Core
12	USB_D-	USB Data Negative (Low / Full Speed)	I/O	T			3.3V	Left Open	Extension
		USB Data Negative (High Speed)					0.38V		
13	USB_D+	USB Data Positive (Low / Full Speed)	I/O	T			3.3V	Left Open	Extension
		USB Data Positive (High Speed)					0.38V		
14	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
15	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
16	USB_VBUS	USB VBUS	I				5V	Left Open	Extension
17	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
18	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
19	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
20	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
21	BAT_RTC	Power supply for RTC backup	I/O	N/A			1.8V	Left Open	Extension
22	26M_CLKOUT	26MHz System Clock Output	O	I, T/PD	B		1.8V	Left Open	Extension
23	32K_CLKOUT	32.768kHz System Clock Output	O	I, T/PD	B		1.8V	Left Open	Extension
24	ADC1	Analog to digital conversion	I	N/A			1.2V	Left Open	Extension
25	ADC0	Analog to digital conversion	I	N/A			1.2V	Left Open	Extension
26	UIM1_VCC	1.8V/3V SIM1 Power supply	O	N/A			1.8V/3V	Mandatory connection	Core
27	UIM1_CLK	1.8V/3V SIM1 Clock	O	O, L	E		1.8V/3V	Mandatory connection	Core
28	UIM1_DATA	1.8V/3V SIM1 Data	I/O	O, L/PD	E		1.8V/3V	Mandatory connection	Core
29	UIM1_RESET	1.8V/3V SIM1 Reset	O	O, L	E	L	1.8V/3V	Mandatory connection	Core

Pin #	Signal Name	Function	I/O	I/O HW Reset State**	Driver Pad Class*	Active Low / High	Power Supply Domain	Recommendation for Unused Pins	Type
30	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
31	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
32	NC	Not Connected (Reserved for future use)	-	-	-	-	-	Left Open	Not connected
33	PCM_OUT	PCM data out	O	I, T/PD	C		1.8V	Left Open	Extension
34	PCM_IN	PCM data in	I	I, T/PD			1.8V	Left Open	Extension
35	PCM_SYNC	PCM sync out	I/O	I, T/PD	C		1.8V	Left Open	Extension
36	PCM_CLK	PCM clock	I/O	I, T/PD	C		1.8V	Left Open	Extension
37	GND	Ground	0V				0V	Mandatory connection	Core
38	NC	Not Connected	-	-	-	-	-	Left Open	Not connected
39	GND	Ground	0V				0V	Mandatory connection	Core
40	GPIO7	General purpose input/output	I/O	O, L	A		1.8V	Left Open	Core
41	GPIO8	General purpose input/output	I/O	I, T/PD	A		1.8V	Left Open	Core
42	NC	Not Connected	-	-	-	-	-	Left Open	Not connected
43	NC	Not Connected	-	-	-	-	-	Left Open	Not connected
44	DEBUG_TX	Debug transmit data	O	I, T/PD	A		1.8V	Left Open	Extension
45	VGPI0	GPIO voltage output	O	N/A			1.8V	Left Open	Core
46	GPIO6	General purpose input/output	I/O	O, L	A		1.8V	Left Open	Core
47	TP1	Test Point 1 0 - Download Mode Open - Normal Mode	I	O, L		L	1.8V	Left Open	Extension
48	GND	Ground	0V				0V	Mandatory connection	Core
49	RF_MAIN	RF GSM Input/output		N/A				Mandatory connection	Core
50	GND	Ground	0V				0V	Mandatory connection	Core
51	DEBUG_RX	Debug receive data	I	I, T/PD			1.8V	Left Open	Extension

Pin #	Signal Name	Function	I/O	I/O HW Reset State**	Driver Pad Class*	Active Low / High	Power Supply Domain	Recommendation for Unused Pins	Type
52	GPIO10	General purpose input/output	I/O	I, T/PD	A		1.8V	Left Open	Extension
53	GPIO11	General purpose input/output	I/O	I, T/PD	A		1.8V	Left Open	Extension
54	GPIO15	General purpose input/output	I/O	I, T/PD	A		1.8V	Left Open	Extension
55	NC1	Reserved for future use						Left Open	Not connected
56	NC2	Reserved for future use						Left Open	Not connected
57	PWM1	Pulse Width Modulation	O	I, T/PD	A		1.8V	Left Open	Extension
58	PWM2 / GPIO12	Pulse Width Modulation / General purpose input/output	I/O	L	A		1.8V	Left Open	Extension
59	PWR_ON_N	Active Low Power On control signal	I			L	1.8V	Mandatory connection	Core
60	2G_TX_ON	2G TX burst indicator	O	I, T/PD	A	H	1.8V	Left Open	Extension
61	VBATT_PA	Power supply (refer to section 3.1 Power Supply for more information)	I	N/A			3.2V (min) 3.7V (typ) 4.5V (max)	Mandatory connection	Core
62	VBATT_PA	Power supply (refer to section 3.1 Power Supply for more information)	I	N/A			3.2V (min) 3.7V (typ) 4.5V (max)	Mandatory connection	Core
63	VBATT	Power supply	I	N/A			3.2V (min) 3.7V (typ) 4.5V (max)	Mandatory connection	Core
64	UIM1_DET / GPIO3	UIM1 Detection / General purpose input/output	I/O	I, T/PD	A	H	1.8V	Left Open	Core
65	GPIO4	General purpose input/output	I/O	I, T/PD	A	H	1.8V	Left Open	Extension
66	GPIO5	General purpose input/output	I/O	I, T/PU	E		1.8V	Left Open	Extension
67-70	GND	Ground	0V				0V		Core
71 - 166	Note: These pins are not available on the AirPrime HL8518, HL8528 and HL8529 modules.								
167-234	GND	Ground	0V				0V		Core
236	JTAG_RESET	JTAG RESET	I	I, T		L	1.8V	Left Open	Extension

Pin #	Signal Name	Function	I/O	I/O HW Reset State**	Driver Pad Class*	Active Low / High	Power Supply Domain	Recommendation for Unused Pins	Type
237	JTAG_TCK	JTAG Test Clock	I	I, PD			1.8V	Left Open	Extension
238	JTAG_TDO	JTAG Test Data Output	O	O, T	A		1.8V	Left Open	Extension
239	JTAG_TMS	JTAG Test Mode Select	I	I, PU			1.8V	Left Open	Extension
240	JTAG_TRST	JTAG Test Reset	I	I, PU		L	1.8V	Left Open	Extension
241	JTAG_TDI	JTAG Test Data Input	I	I, PU			1.8V	Left Open	Extension
242	JTAG_RTCK	JTAG Returned Test Clock	O	O, L	A		1.8V	Left Open	Extension

* Refer to Table 22 Digital I/O Electrical Characteristics for more information.

** I = Input, O = Output, PU = Pull up, PD = Pull down, H = High, L = Low, T = High impedance, N/A = Not applicable

2.1. Pin Types

Table 7. Pin Type Codes

Type	Definition
I	Digital Input
O	Digital Output
I/O	Digital Input / Output
L	Active High
H	Active Low
T	Tristate
T/PU	Tristate with pull-up enabled
T/PD	Tristate with pull-down enabled

2.2. Pin Configuration (Top View, Through Module)

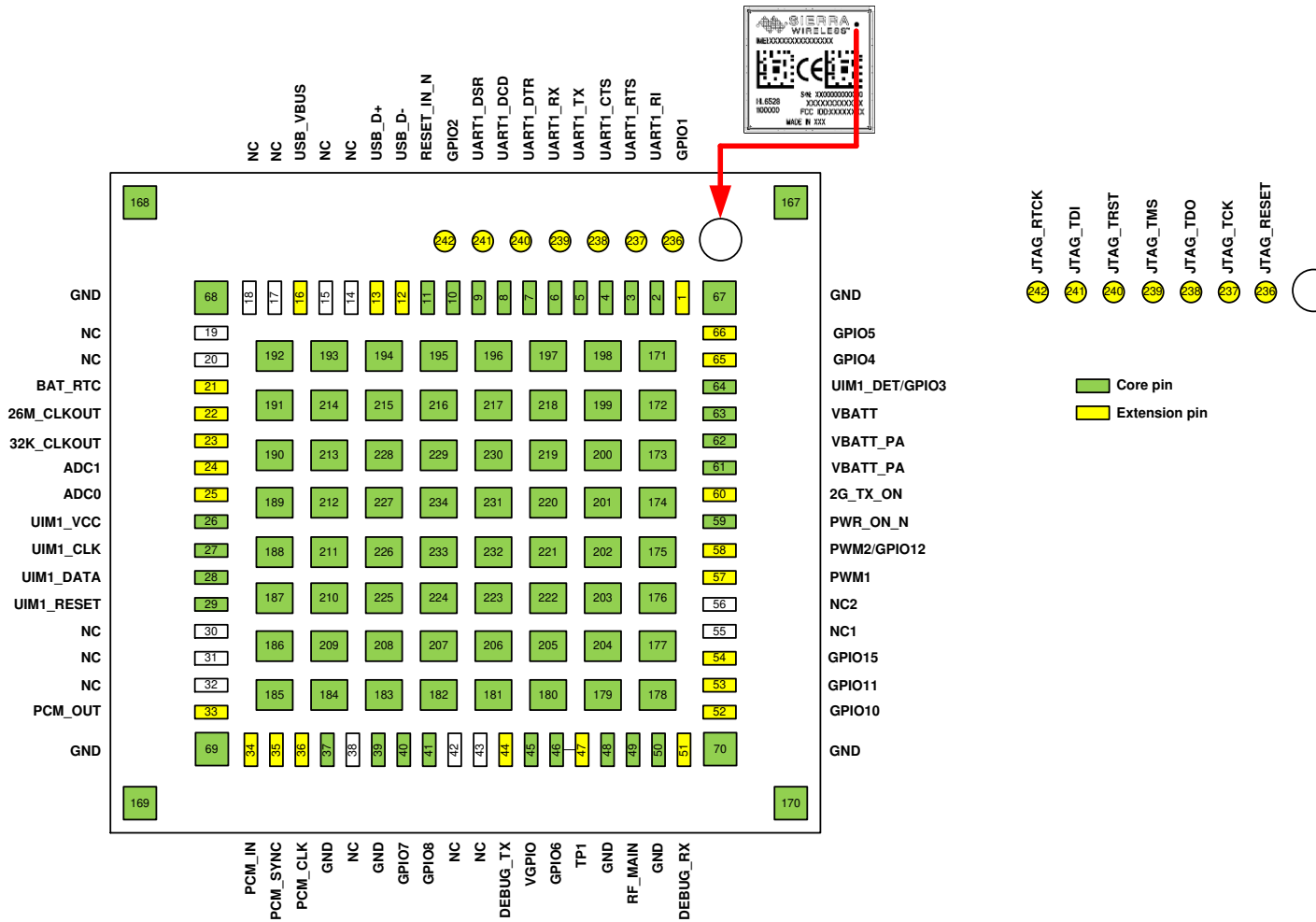


Figure 3. Pin Configuration