Migration Guide

AirPrime SL Series

SIERRA WIRELESS

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Document History

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001	November 29, 2010	Creation
002	March 30, 2011	Added compatibility information for SL501x.
		Updated the UART1 signals for SL80xx in Table 13 and Table 29; added Table 14 to describe support for full UART in SL80xx.
		Added Table 19 GPIOs available on the SL Series Embedded Modules.
		Updated available GPIOs on the SL809x from 3 to 4 (pin 4 of the SL809x is now GPIO_0).

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1. Introduction

This document aims to provide a guideline for designing applications based on the AirPrime SL series. Recommendations are provided to maximize the compatibility between the modules when using different variants of the SL series for the same application from GSM version (SL6xxx) to HSPA version (SL8xxx), or to CDMA/EVDO version (SL5xxx).

2. Reference Documents

2.1. List of References

[1] AirPrime SL6087 Product Technical Specification and Customer Design Guidelines
Reference: WA_DEV_SL6087_PTS_001

[2] AirPrime SL808x Product Technical Specification and Customer Design Guidelines
Reference: 2400058

[3] AirPrime SL809x Product Technical Specification and Customer Design Guidelines
Reference: WA_DEV_SL8090_PTS_001

[4] AirPrime SL501x Product Technical Specification and Customer Design Guidelines
Reference: 4110802

[5] AirPrime SL Series Customer Process Guidelines
Reference: WM_DEV_LG_PTS_001

[6] AirCard/AirPrime UMTS Devices Supported AT Command
Reference: 2130617

2.2. Glossary

Term	Definition
GND	Ground
NC	Not Connected When a pin is marked as not connected, it means that no connection should be made from the pin to the application board.
Reserved	When a pin is marked as Reserved, it means that no connection should be made from the module pin to the application board; and that there might be a connection to the pin from within the module.

3. General Description

3.1. General Information

The table below defines the SL6087, SL808x, SL809x and the SL501x embedded modules.

Table 1. Comparison Table Between the SL6087, SL808x, SL809x and SL501x

SL6087	SL808x	SL809x	SL501x
			
Quad band GSM EDGE CGPS compatible	Quad band GSM EDGE Dual band UMTS HSPA GPS-one support (1)	Quad band GSM EDGE Tri band UMTS HSDPA and HSUPA GPS-one support(1)	Dual band IS-95A/B and CDMA 2X Release0/A Dual band IS-856 1xEV-DO Revision A gpsOne™(1) and stand-alone GPS
GSM / GPRS Class 10, EDGE	HSDPA 3.6Mbps UL 384kbps	HSDPA 14.4Mbps HSUPA 5.76Mbps	1xEV-DO Rev. A FL/RL 3.1 Mbps / 1.8 Mbps
-30°C / +70°C Class A -40°C / +85°C Class B	SL8080/ SL8082/ SL8084 (industrial grade): -30°C / +70°C Class A -40°C / +85°C Class B -40°C / +85°C Storage SL8081/ SL8083/ SL8085 (commercial grade): -20°C / +60°C Class A -30°C / +75°C Class B -40°C / +85°C Storage	SL8090/ SL8092 (industrial grade): -30°C / +70°C Class A -40°C / +85°C Class B -40°C / +85°C Storage SL8091/ SL8093 (commercial grade): -20°C / +60°C Class A -30°C / +75°C Class B -40°C / +85°C Storage	-30°C / +70°C Class A -40°C / +85°C Class B

SL6087	SL808x	SL809x	SL501x
2 x UART interface 1 x USB 2.0 Full speed 1 x SPI interface 1 x I2C 1 x PCM 1 x Analog Audio 2 x ADC 26 x GPIO 1 x RTC 1 x Timer 2 x Interrupts 1 x Flash LED Output 1 x PWM Buzzer	1 x UART interface 1 x USB 2.0 High speed 1 x SPI interface 1 x PCM (depending on the variant) 1 x Analog Audio (depending on the variant) 3 x GPIO 1 x Flash LED Output 1 x Buzzer	1 x UART interface 1 x USB 2.0 High speed 1 x SPI interface 1 x PCM (depending on the variant) 4 x GPIO 1 x Flash LED Output 1 x Buzzer	1 x UART interface 1 x USB 2.0 Full speed 1 x PCM(3) 5 x GPIO 1 x Flash LED Output 1 x Buzzer 2 x ADC
25mm x 30mm x 2.65mm (typical)	25mm x 30mm x 2.40mm (typical) (2)	25mm x 30mm x 2.40mm (typical) (2)	25mm x 30mm x 2.47mm (typical)

(1) GPS-one support is only available on voice versions (SL8080, SL8082, SL8084, SL8090, SL8092 and SL501x).

(2) The specified module thickness includes the thickness of the module's label. The typical module thickness without label is 2.35mm.

(3) PCM support is only available on the SL5010.

3.2. Product Name

The following table enumerates the corresponding product name for each AirPrime SL embedded module.

Table 2. SL Embedded Module with Product Name

SL Series	Frequency Band	Product Name
SL6087	Quad band GSM EDGE	SL6087
SL8080	Quad band GSM EDGE, UMTS 850 / 1900 MHz, Voice or Data	SL8080
SL8081	Quad band GSM EDGE, UMTS 850 / 1900 MHz, Data only	SL8081
SL8082	Quad band GSM EDGE, UMTS 900 / 2100 MHz, GPS, Voice or Data	SL8082
SL8083	Quad band GSM EDGE, UMTS 900 / 2100 MHz, Data only	SL8083
SL8084	Quad band GSM EDGE, UMTS 850 / 2100 MHz, GPS, Voice or Data	SL8084
SL8085	Quad band GSM EDGE, UMTS 850 / 2100 MHz, Data only	SL8085
SL8090	Quad band GSM EDGE, UMTS 850 / 1900 / 2100MHz, Diversity (850, 1900MHz), Digital Voice and Data	SL8090
SL8091	Quad band GSM EDGE, UMTS 850 / 1900 / 2100MHz, Diversity (850, 1900MHz), Data Only	SL8091
SL8092	Quad band GSM EDGE, UMTS 900 / 2100MHz, Diversity (900, 2100MHz), Digital Voice and Data	SL8092
SL8093	Quad band GSM EDGE, UMTS 900 / 2100MHz, Diversity (900, 2100MHz), Data Only	SL8093
SL5010	Dual band CDMA2000 1X Rel 0, 1x EVDOrA 800 / 1900MHz, Diversity, Digital Voice and Data	SL5010
SL5011	Dual band CDMA2000 1X Rel 0, 1x EVDOrA 800 / 1900MHz, Diversity, Data Only	SL5011

4. Hardware Compatibility

4.1. Electrical Compatibility

4.1.1. Block Level Functional Compatibility

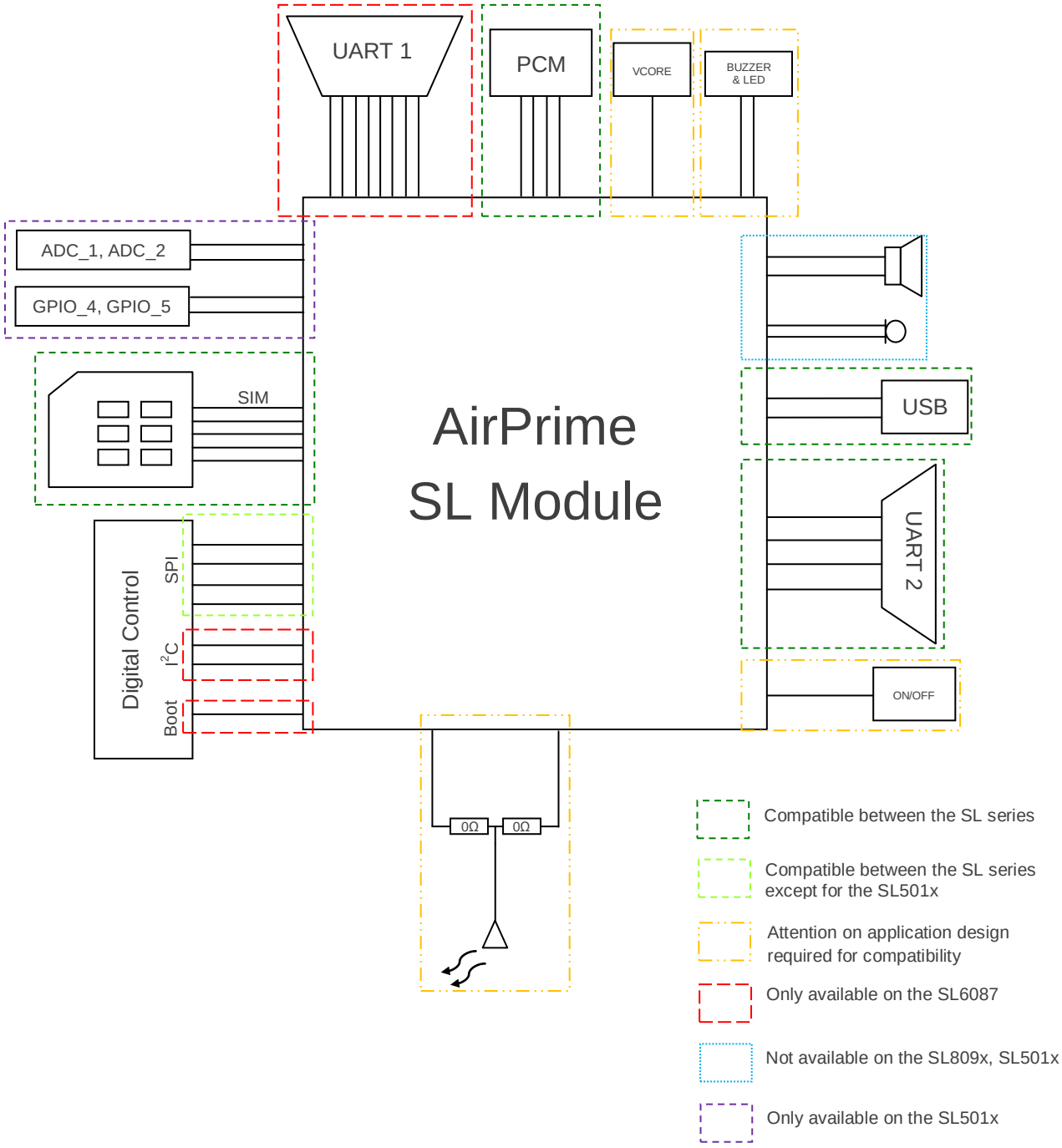

Figure 1. Block Level Functional Compatibility

4.1.1.1. RF Band

The SL series intelligent embedded modules are currently available in footprint compatible EDGE, HSPA and CDMA 1X Rel 0, 1x EVDOrA versions. The following table shows the RF capabilities of each embedded module variant.

Table 3. RF Band Supported by the SL Series Embedded Modules

SL Series Embedded Module	RF Band	Bandwidth
SL6087	Quad band GSM EDGE	GPRS Class 10 / EDGE
SL8080	Quad band GSM EDGE, UMTS 850 / 1900 MHz	EDGE Class 12, HSDPA 3.6Mbps
SL8081	Quad band GSM EDGE, UMTS 850 / 1900 MHz, Data only	EDGE Class 12, HSDPA 3.6Mbps
SL8082	Quad band GSM EDGE, UMTS 900 / 2100 MHz, GPS, Voice or Data	EDGE Class 12, HSDPA 3.6Mbps
SL8083	Quad band GSM EDGE, UMTS 900 / 2100 MHz, Data only	EDGE Class 12, HSDPA 3.6Mbps
SL8084	Quad band GSM EDGE, UMTS 850 / 2100 MHz, GPS, Voice or Data	EDGE Class 12, HSDPA 3.6Mbps
SL8085	Quad band GSM EDGE, UMTS 850 / 2100 MHz, Data only	EDGE Class 12, HSDPA 3.6Mbps
SL8090	Quad band GSM EDGE, UMTS 850 / 1900 / 2100MHz, Diversity (850, 1900MHz), Voice or Data	EDGE Class 12, HSDPA 14.4Mbps, HSUPA 5.76Mbps
SL8091	Quad band GSM EDGE, UMTS 850 / 1900 / 2100MHz Diversity (850, 1900MHz), Data only	EDGE Class 12, HSDPA 14.4Mbps, HSUPA 5.76Mbps
SL8092	Quad band GSM EDGE, UMTS 900 / 2100MHz, Diversity (900, 2100MHz), Digital Voice or Data	EDGE Class 12, HSDPA 14.4Mbps, HSUPA 5.76Mbps
SL8093	Quad band GSM EDGE, UMTS 900 / 2100MHz, Diversity (900, 2100MHz), Data only	EDGE Class 12, HSDPA 14.4Mbps, HSUPA 5.76Mbps
SL5010	Dual band CDMA2000 1X Rel 0, 1x EVDOrA 800 / 1900MHz, Diversity, Digital Voice and Data	CDMA2000 1X Rel 0 EVDOrA FL/RL 3.1 Mbps / 1.8 Mbps
SL5011	Dual band CDMA2000 1X Rel 0, 1x EVDOrA 800 / 1900MHz, Diversity, Data Only	CDMA2000 1X Rel 0 EVDOrA FL/RL 3.1 Mbps / 1.8 Mbps

4.1.1.2. Temperature Range

The SL series has an extended temperature range. Refer to the following table for the temperature range comparison depending on product reference.

Table 4. Operating Temperature Range of the SL Series Embedded Modules

Product Reference	Operating Temperature Range
SL6087	-30°C to +70°C Class A -40°C to +85°C Class B
SL8080/SL8082/SL8084 (industrial grade)	-30°C to +70°C Class A -40°C to +85°C Class B -40°C to +85°C Storage

Product Reference	Operating Temperature Range
SL8081/SL8083/SL8085 (commercial grade)	-20°C to +60°C Class A -30°C to +75°C Class B -40°C to +85°C Storage
SL8090/SL8092 (industrial grade)	-30°C to +70°C Class A -40°C to +85°C Class B -40°C to +85°C Storage
SL8091/SL8093 (commercial grade)	-20°C to +60°C Class A -30°C to +75°C Class B -40°C to +85°C Storage
SL5010/SL5011	-30°C to +70°C Class A -40°C to +85°C Class B

4.1.1.3. Power Supply

The nominal voltage is 3.6V across all SL series variant. However, the SL6087 offers a wider voltage range as compared to the other SL series embedded modules. Refer to the following table for more details.

Table 5. Operating Voltages of the SL Series Embedded Modules

V_{in}	SL6087	SL808x	SL809x	SL501x
V_{in} Max.	4.8 volt	4.3 volt	4.3 volt	4.3 volt
V_{in} Nominal	3.6 volt	3.6 volt	3.6 volt	3.6 volt
V_{in} Min.	3.2 volt	3.3 volt	3.3 volt	3.3 volt

Note: For the SL6087 and SL80xx embedded modules, the host-provided input voltage should provide an instantaneous current of 3A that lasts for 5ms and a continuous current of 1.5A while staying within the specified voltage range. For the SL501x, the host-provided input voltage should provide a 1.2A current.

4.1.2. Application Design Limitation

4.1.2.1. Antenna Interface

There is a difference between the main antenna port of the SL6087, SL80xx and SL501x. It is recommended to reserve an antenna path selection circuit on the application design.

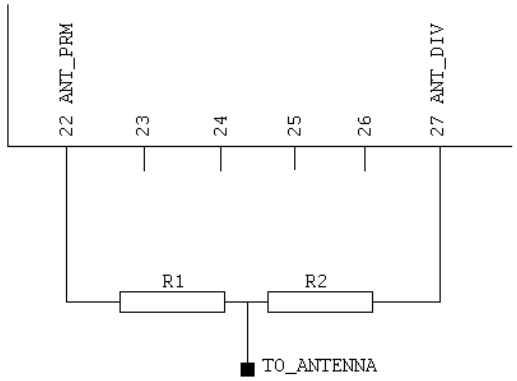

Figure 2. Recommended Schematic Design of Antenna Port Selection for SL6087, SL80xx and SL501x

Note: Antenna path impedance control (50Ω) is necessary for the layout implementation.

It is recommended to reserve the ESD protection circuit on each antenna port.

The following table shows the antenna pin-out ports of the SL Series embedded modules.

Table 6. Antenna Interface of the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
22	ANT	Antenna port	--	NC	--	--	ANT_DRX	Diversity Antenna Port	--	ANT_DIV	Diversity Antenna Port	--
29	NC	--	--	ANT_PRM	Main Antenna Port	--	ANT_PRM	Main Antenna Port	--	ANT_PRM	Main Antenna Port	--
36	Reserved_36	--	--	ANT_GPS	GPS Antenna Port	--	ANT_GPS	GPS Antenna Port	--	ANT_GPS	GPS Antenna Port	--

4.1.2.2. Audio Interface

4.1.2.2.1. Analog Audio Interface

4.1.2.2.1.1. Electrical Connection

The SL6087 and SL808x offers compatible analog audio pin outs.

Table 7. Analog Audio Interface Pin Out of SL6087and SL808x

Pin #	SL6087			SL8080/SL8082/SL8084			SL809x			SL501x		
	Signal Name	Function	DC Bias	Signal Name	Function	DC Bias	Signal Name	Function	DC Bias	Signal Name	Function	DC Bias
53	MIC2P	mic +ve with internal bias	2.1V	MIC1P	mic +ve with internal bias	2.1V	DNC	--	--	NC	--	--
54	MIC2N	mic -ve	--	MIC1N	mic -ve	--	DNC	--	--	NC	--	--
56	SPK2N	Speaker -ve output	--	SPK_N	Speaker –ve output	--	DNC	--	--	NC	--	--
57	SPK2P	Speaker +ve output	--	SPK_P	Speaker +ve output	--	DNC	--	--	NC	--	--

Note: SL8081, SL8083 and SL8085 do not provide Analog Audio Interface. The above mentioned pins will be NC (not connected) instead.

4.1.2.2.1.2. Speaker Output Power

The SL6087 and SL808x use different audio amplifiers which results in different output power levels. The difference in the output power level can be easily compensated using gain control. Refer to the AT Command Reference Guide compatible with the specific SL embedded module for more information.

Table 8. Speaker Output Difference Between the SL6087 and SL808x

Parameter	SL6087	SL8080/SL8082/SL8084
Output Power*	250mW (max)	TBD
Supported mode	Differential / Single Ended	Differential / Single Ended
Load resistance	8Ω / 4Ω	8Ω / 4Ω

* The output power specified is achieved while using a differential output with 8Ω load resistances.

4.1.2.2.2. Digital Audio Interface

The SL series embedded modules have compatible pin outs for the digital audio interface.

Table 9. Digital Audio Interface Pin Out of the SL Series Embedded Modules

Pin #	SL6087			SL8080/SL8082/SL8084			SL8090/SL8092			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
64	PCM-SYNC	Frame Sync	1V8 output	PCM_SYNC	Frame Sync	1V8 output	PCM_SYNC	Frame Sync	1V8 output	PCM-SYNC	Frame Sync	2V6 output
65	PCM-OUT	Data output	1V8 output	PCM_DOUT	Data output	1V8 output	PCM_DOUT	Data output	1V8 output	PCM-OUT	Data output	2V6 output
66	PCM-IN	Data input	1V8 input	PCM_DIN	Data input	1V8 input	PCM_DIN	Data input	1V8 input	PCM-IN	Data input	2V6 input
67	PMC-CLK	Bit Clock	1V8 output	PMC_CLK	Bit Clock	1V8 output	PMC_CLK	Bit Clock	1V8 output	PMC-CLK	Bit Clock	2V6 output

The SL series embedded modules' digital audio interface works in master mode. To make the application compatible with various SL series embedded modules, the external device which connects to the embedded modules' digital audio interface must be compatible with the embedded modules' operating clock rates. The following table shows the operating mode details between the SL series embedded modules.

Table 10. Digital Audio Interface Features of the SL Series Embedded Modules

Parameter	SL6087	SL8080/SL8082/SL8084	SL8090/SL8092	SL501x
Operating Mode	Master	Master	Master	Master
Bit rate	768kHz only	2.048MHz	2.048MHz	2.048MHz
Sample rate	8kHz	8kHz	8kHz	8kHz
Frame format	16 bits MSB first	16 bits MSB first	16 bits MSB first	16 bits MSB first
Frame Sync type	Long Frame Sync only	Long Frame Sync only	Long Frame Sync only	Short Frame Sync only

4.1.2.3. JTAG and UART1 Interface

The pins used for UART1 in the SL6087 correspond to the JTAG pins of the SL808x, SL809x and SL501x. To make the SL6087 application compatible with either HSPA version SL808x/SL809x or EVDO version SL501x, UART1 must not be used. It is recommended to reserve test points for these pins in the application board for debugging use or for SL6087 firmware upgrade.

In case the UART interface is required, it is suggested to use UART2 of the SL6087 or UART1 of the SL808x/SL809x/SL501x instead. Note that UART2 is not enabled by default on the SL6087. Software customization is required before the SL6087 is soldered onto the application board. Refer to section 4.1.2.4 UART2 Interface for more information about the UART2 interface of the SL6087.

The following table describes the JTAG pin out of the SL808x, SL809x and SL501x whose pin numbers correspond to the UART1 signals of the SL6087.

Table 11. JTAG Pin Out of SL808x, SL809x and SL501x and UART1 Pin Out of SL6087

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
1	RXD1	Receive Serial Data	2V8 output	GPIO_3	GPIO	1V8 I/O	GPIO_3	GPIO	1V8 I/O	GPIO_3	GPIO	2V6 I/O
2	CTS1	Clear to Send	2V8 output	GPIO_2	GPIO	1V8 I/O	GPIO_2	GPIO	1V8 I/O	GPIO_2	GPIO	2V6 I/O
69	DCD1	Data Carrier	2V8 output	TDI	Data in	--	TDI	Data in	--	TDI	Data in	--

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
		Detect										
70	DTR1	Data Terminal Ready	2V8 input	TMS	Mode select input	--	TMS	Mode select input	--	TMS	Mode select input	--
71	RI1	Ring Indicator	2V8 output	TCK	Clock input	--	TCK	Clock input	--	TCK	Clock input	--
72	DSR1	Data Set Ready	2V8 output	TRST_N	Reset	--	TRST_N	Reset	--	TRST_N	Reset	--
73	RTS1	Request to Send	2V8 input	TDO	Data out	--	TDO	Data out	--	TDO	Data out	--
74	TXD1	Transmit Serial Data	2V8 input	RTCK	Return clock	--	RTC	Return clock	--	RTCK	Return clock	--

The following table describes the JTAG pin out of the SL6087.

Table 12. JTAG Pin Out of SL6087

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
19	RTCK	Return clock	--	GND	--	--	GND	--	--	GND	--	--
20	TRST_N	Reset	--	GND	--	--	GND	--	--	GND	--	--
31	TDI	Data in	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--
32	TMS	Mode select input	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
33	TDO	Data out	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--
34	TCK	Clock input	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--

For the SL6087's JTAG interface, it is recommended to have test points on the application board design. The application board must have a 0Ω jumper to short pins 19 and 20 to GND when the SL808x/SL809x/SL501x is used.

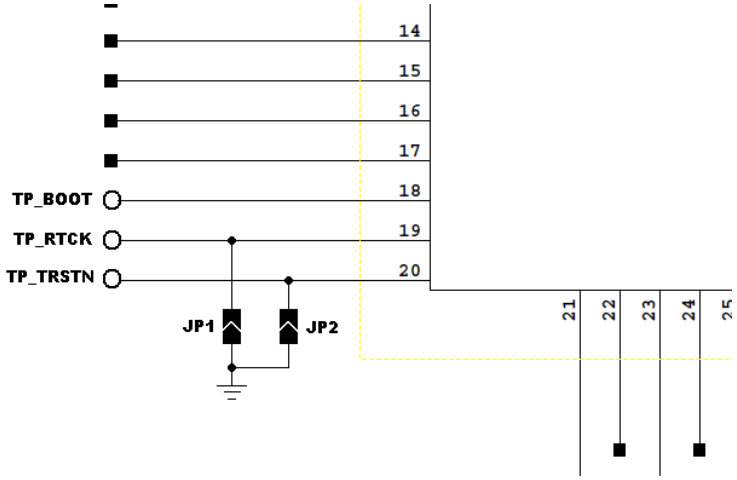

Figure 3. Recommended Schematic Design for the SL6087 JTAG Pins

Short JP1 and JP2 on the application board when SL808x/SL809x/SL501x is in use.

4.1.2.4. UART2 Interface

The SL6087's UART2 interface is assigned to the same pin of the SL808x, SL809x and SL501x's UART1 interface. In case the UART interface is required, it is necessary to have software customization on the SL6087 to enable UART2 which is not enabled by default.

Table 13. Common UART Interface on the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
45	TXD2	Transmit serial data	1V8 input	UART1_TXD	Transmit serial data	1V8 input	UART1_TXD	Transmit serial data	1V8 input	UART1_TXD	Transmit serial data	2V6 input
46	RXD2	Receive serial data	1V8 output	UART1_RXD	Receive serial data	1V8 output	UART1_RXD	Receive serial data	1V8 output	UART1_RXD	Receive serial data	2V6 output
47	CTS2	Clear to send	1V8 output	UART1_CTS_N	Clear to send	1V8 output	UART1_CTS_N	Clear to send	1V8 output	UART1_CTS_N	Clear to send	2V6 output
48	RTS2	Ready to send	1V8 input	UART1_RTS_N	Ready to send	1V8 input	UART1_RTS_N	Ready to send	1V8 input	UART1_RTS_N	Ready to send	2V6 input

The four-line serial interface is based on TIA-232 standard interface. Note however that for the SL80xx and SL501x, there is an option to configure the embedded module to support full UART using the configurations listed in the table below.

Table 14. Configurations for Supporting a Full UART on the SL80xx/SL501x

Additional UART2 Signal			Configuration A			Configuration B			Configuration C		
Signal Name	Function	Value	Pin Number	Signal Name	Function	Pin Number	Signal Name	Function	Pin Number	Signal Name	Function
DCD	Data Carrier Detect	1V8 output	3	GPIO_1	General Purpose I/O	65	PCM_DOUT	PCM Data Output	11	SPI_CS_N	SPI Chip Select
DTR	Data Terminal Ready	1V8 input	2	GPIO_2	General Purpose I/O	66	PCM_DIN	PCM Data Input	12	SPI_CLK	SPI Clock

Additional UART2 Signal			Configuration A			Configuration B			Configuration C		
Signal Name	**Function**	**Value**	**Pin Number**	**Signal Name**	**Function**	**Pin Number**	**Signal Name**	**Function**	**Pin Number**	**Signal Name**	**Function**
DSR	Data Set Ready	1V8 output	1	GPIO_3	General Purpose I/O	67	PCM_CLK	PCM Clock	13	SPI_DATA _MOSI	SPI Master Output
RI	Ring Indicator	1V8 output	61	WAKE_N	Wake Host Interface	61	WAKE_N	Wake Host Interface	61	WAKE_N	Wake Host Interface

For more information about configuring these signals, refer to document [6] AirCard/AirPrime UMTS Devices Supported AT Command.

Caution: *SL501x only supports configuration A.*

Note: When either configuration B or C is used to support full UART, the PCM or SPI pins can no longer be used for digital audio or serial bus interface.

The baud rate limitation for the UART port is as listed below.

Table 15. UART Baud Rate Limit of the SL Series Embedded Modules

Parameter	SL6087	SL808x	SL809x	SL501x
Baud Rate	Up to 921kbits/s	Up to 230.4kbits/s (TBC)	Up to 230.4kbits/s (TBC)	Up to 230.4kbits/s (TBC)

4.1.2.5. USB Interface

The SL series embedded modules share common pins for the USB interface. However, the SL6087 require an external voltage input (VPAD-USB/USB_VBUS) for the USB interface. The SL6087 is connected to the USB host through an additional 3.3V LDO.

The SL808x and SL809x support USB 2.0 High Speed while the SL6087 and SL501x support up to USB 2.0 Full speed. The application design must be compatible with both USB 2.0 operating modes.

Table 16. Common USB Interface on the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
49	VPAD-USB	USB Power Supply	3V3 input	NC	--	--	NC	--	--	NC	--	--
50	USB-DP	USB Data +ve	--	USB_D+	USB Data +ve	--	USB_D+	USB Data +ve	--	USB-DP	USB Data +ve	--
51	USB-DM	USB Data -ve	--	USB_D-	USB Data -ve	--	USB_D-	USB Data -ve	--	USB-DM	USB Data -ve	--

4.1.2.6. SIM Detection

The SIM Detection pin of the SL6087 is in conflict with the 1V8 regulator output of the SL808x/SL809x, and the 2V6 regulator output of the SL501x. A 0Ω resistor can be placed in serial connection and equipped only when SL6087 is used.

Table 17. SIM Detection Pin of the SL6087 or VREG pin of the SL808x/SL809x and SL501x

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
10	SIMPRES	SIM Card Detect	1V8 input	VREF_1V8	1V8 LDO output	--	VREF_1V8	1V8 LDO output	--	VREG_GP_2V6	2V6 LDO output	--

4.1.2.7. Voltage Regulator Output

The SL6087 provides two regulator outputs as VCC_2V8 (pin 58) and VCC_1V8 (pin 59). However, only a 1V8 output is available on the SL808x/SL809x, and only a 2V6 output is available on the SL501x.

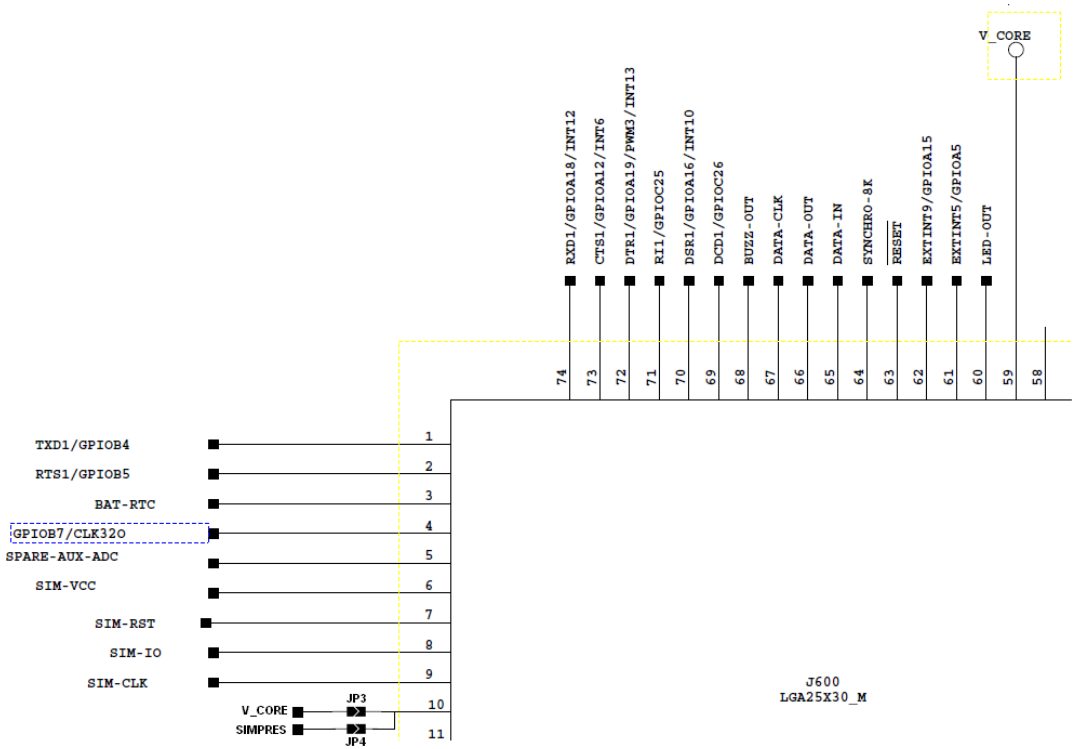

Figure 4. Recommended Schematic Design for Using SL808x/SL809x 1V8 or SL501x 2V6 Regulator Output

If the VCC_1V8 regulator output from the SL808x/SL809x or the VCC_2V6 regulator output from the SL501x is used on the application board, JP3 has to be shorted and JP4 has to be open. JP4 is reserved for the SIM Detection function when SL6087 is in use.

Table 18. Regulator Output of the SL Series Embedded Module

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
10	SIMPRES	SIM Card Detect	1V8 input	VREF_1V8	1V8 LDO output	--	VREF_1V8	1V8 LDO output	--	VREG_GP_2V6	2V6 LDO output	--
58	VCC_2V8	2V8 Supply Output	O	NC	--	--	NC	--	--	NC	--	--
59	VCC_1V8	1V8 Supply Output	O	NC	--	--	NC	--	--	NC	--	--

4.1.2.8. GPIO(s)

The number of GPIO varies depending on the SL series embedded module. The SL6087 provides 26 GPIOs, while the SL808x provides 3 GPIOs, the SL809x provides 4 GPIOs, and the SL501x provides 5 GPIOs.

The following table enumerates the available GPIOs on each SL series embedded module.

Table 19. GPIOs available on the SL Series Embedded Modules

Pin Number	SL6087 GPIO Name	SL808x GPIO Name	SL809x GPIO Name	SL501x GPIO Name
1	CT104-RXD1 / GPIO5	GPIO_3	GPIO_3	GPIO_3
2	~CT106-CTS1 / GPIO7	GPIO_2	GPIO_2	GPIO_2
3	-	GPIO_1	GPIO_1	GPIO_1
4	CLK32O/GPIO0	-	GPIO_0	GPIO_4
5	-	-	-	GPIO_5
10	SIMPRES / GPIOI8	-	-	-
11	~SPI1-I_CS / GPIO20	-	-	-
12	SPI1-CLK / GPIO12	-	-	-
13	SPI1-IO / GPIO13	-	-	-
14	SPI1-I / GPIO19	-	-	-
15	GPIO21	-	-	-
16	SDA / GPIO2	-	-	-
17	SCL / GPIO1	-	-	-
37	GPIO24	-	-	-
38	GPIO22	-	-	-
39	GPIO23	-	-	-
45	CT103-TXD2 / GPIO14	-	-	-
46	CT104-RXD2 / GPIO15	-	-	-
47	~CT106-CTS2 / GPIO16	-	-	-
48	CT105-RTS2 / GPIO17	-	-	-
61	INT0 / A26 / GPIO3	-	-	-

Pin Number	SL6087 GPIO Name	SL808x GPIO Name	SL809x GPIO Name	SL501x GPIO Name
62	INT1 / GPIO25	-	-	-
69	~CT109-DCD1 / GPIO11	-	-	-
70	~CT108-2-DTR1 / GPIO9	-	-	-
71	~CT125-RI1 / GPIO10	-	-	-
72	~CT107-DSR1 / GPIO8	-	-	-
73	~CT105-RTS1 / GPIO6	-	-	-
74	CT103-TXD1 / GPIO4	-	-	-

Only common GPIO pins could be used on the application board when the application board has to be compatible with all SL series embedded module variants. The following table shows the common GPIOs between the AirPrime SL series embedded modules.

Table 20. Common GPIO(s) of the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
1	RXD1/ GPIO5	GPIO, reset state is “1”	2V8 I/O	GPIO_3	GPIO	1V8 IO voltage	GPIO_3	GPIO	1V8 IO voltage	GPIO_3	GPIO	2V6 IO voltage
2	CTS1/ GPIO7	GPIO, reset state is Hi-Z	2V8 I/O	GPIO_2	GPIO	1V8 IO voltage	GPIO_2	GPIO	1V8 IO voltage	GPIO_2	GPIO	2V6 IO voltage

GPIO22, GPIO23 and GPIO24 on the SL6087 must be configured as GPI, as these pins have to be shorted to GND for compatibility with SL808x/SL809x/SL501x.

4.1.2.9. Digital Control Signal

4.1.2.9.1. Turn ON the Embedded Modules

Turning the embedded module ON or OFF is controlled by pin 43. Note that the control logic is different between the SL6087 and the SL808x/SL809x/SL501x. The following table shows the differences between the control logic of the SL series embedded modules.

Table 21. On / Off Logic, pin 43, of the SL Series Embedded Modules

State	SL6087	SL808x	SL809x	SL501x
Power On	High at pin 43	Low at pin 43	Low at pin 43	Low at pin 43
Power Off	Low at pin 43	High at pin 43	High at pin 43	High at pin 43

The following sub-sections describe in general the two ways to control the embedded modules' on/off pin.

For details on timing and triggering methods, refer to the Product Technical Specifications document of the corresponding SL embedded module. Refer to section 2.1 List of References for the list of available documents.

4.1.2.9.1.1. By Software/External Application Processor

Depending on the application design, on/off could be controlled by the external processor. In order to be compatible with all SL series embedded modules, the external processor must be capable of switching the control logic.

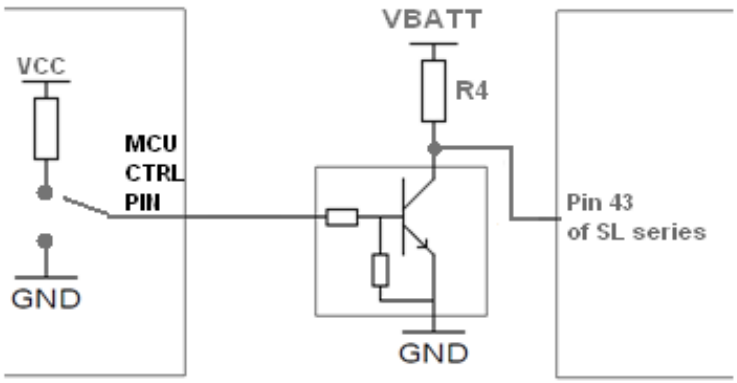

Figure 5. SL Series Embedded Module Power On/Off Control by an External Application Processor

Note: Remove R4 when using SL808x/SL809x/SL501x.

4.1.2.9.1.2. By Fixed Hardware Configuration

When the application is used as a standalone device, the on/off pin can be tied to the active logic level. The system will automatically turn on when power supply is present. In this case, it is recommended to reserve both pull up and pull low circuits on the application board (the active logic level for SL6087 is high, while the active logic level for SL80xx and SL501x is low).

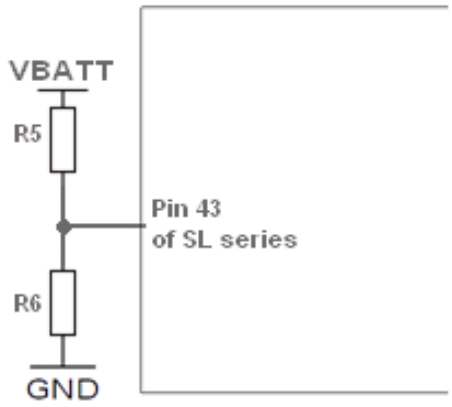

Figure 6. Recommended Schematic Design for Fixed Hardware Configuration of the On/Off Control

Note the following:

- Remove R6 and place R5 when using SL6087.
- Remove R5 and place R6 when using SL808x/SL809x/SL501x.

4.1.2.9.2. External Buzzer/Flash LED

The Buzzer output and Flash LED output of the SL6087 are different compared to the Buzzer/Flash LED outputs of the SL808x/SL809x/SL501x:

- The SL6087 provides an open drain output which allows the buzzer/LED to be directly connected to the SL6087; while the SL808x/SL809x/SL501x is a GPO output that cannot drive the buzzer/LED directly.
- The Buzzer output of the SL6087 is controlled by a PWM; while the SL808x/SL809x/SL501x is controlled by GPIO.

In order for the application to be compatible with SL808x/SL809x/SL501x, it is recommended to have an open drain circuit for driving the external LED and an additional frequency generator for the buzzer output.

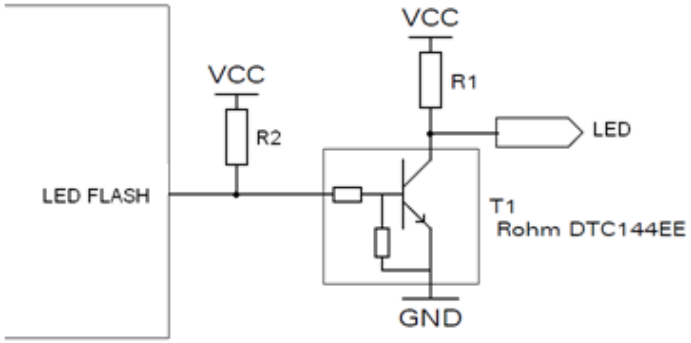

Figure 7. Recommended External Open Drain Driving Circuit for Flash LED

Note: Remove R2 when using SL808x/SL809x/SL501x. The value of R1 could be tuned to fit the LED brightness.

4.1.2.9.3. BOOT for SL6087

External control is necessary for the SL6087 during firmware upgrade. It is recommended to reserve a test point for the BOOT pin.

Table 22. BOOT Pin of the SL6087

Pin #	Signal Name	Function	Value
18	BOOT	Download mode selection	1V8, input

4.1.2.9.4. Pull Up for SL808x/SL809x Control Pins

The SL808x/SL809x requires having an external 1V8 pull up for:

- **W_DISABLE_N**, pin 62
- **SYSTEM_RESET_N**, pin 63

The application board has to reserve the pull up resistor pads when using SL808x/SL809x.

Because pin 62 of the SL6087 is an interrupt pin, the pull up resistor must be removed from the application board when the SL6087 is in use. Furthermore, this interrupt pin must be programmed as a GPI by AT command.

For the SL501x, pins 62 and 63 need not be pulled up.

4.1.2.10. Features Only Supported by SL6087

The SL6087 provides additional features not supported by SL808x/SL809x/SL501x. These features cannot be used when compatibility is required with SL808x/SL809x/SL501x. The following table shows the features only supported by SL6087.

Table 23. Features Only Supported by SL6087

Pin #	Signal Name	Function	SL6087 Value
3	BAT-RTC	RTC Battery Connection	3.0V Input / 2.5V Output
4	GPIO0/CLK32O*	• GPIO (**compatible**) or • Optional 32.768KHz output for external circuit (**not compatible**)	
5	ADC2	Analog to Digital Input 2	Analog Input, 2V input range
16	SDA	I^2C Data	Input / Open Drain Output
17	SCL	I^2C Clock	Open Drain Output
40	ADC1	Analog to Digital Input 1	Analog Input, 2V input range

* Using pin 4 as a GPIO allows for compatibility with the SL809x and SL501x; however, CLK32O function cannot be used when compatibility with other SL embedded modules is required.

4.1.2.11. Features Only Supported by SL6087/SL80xx

The SL6087/SL80xx provides SPI features which are not supported by SL501x. The following table enumerates the SPI features not supported by the SL501x.

Table 24. Features Only Supported by SL6087/SL80xx

Pin #	Signal Name	Function	Value
11	SPI_CS_N	SPI Chip Select	O
12	SPI_CLK	SPI Clock	O
13	SPI_DATA_MOSI	SPI Master Output	O
14	SPI_DATA_MISO	SPI Master Input	I

The above mentioned pins may also be used to configure a full UART for the SL80xx.Refer to section 4.1.2.4 UART2 Interface for more information about configuring these pins as additional UART signals.

Note: These pins cannot be used as SPI interface pins when used to configure a full UART in the SL80xx.

4.1.2.12. Features Only Supported by SL501x

The SL501x provides additional features not supported by SL6087/SL808x/SL809x. These features cannot be used when compatibility is required with SL6087/SL808x/SL809x. The following table shows the features only supported by SL501x.

Table 25. Features Only Supported by SL501x

Pin #	Signal Name	Function	Value
4	GPIO_4*	General purpose input / output	2V6, Input / Output
5	GPIO_5	General purpose input / output	2V6, Input / Output
17	ADC_1	Analog to Digital Input	Analog Input
18	ADC_2	Analog to Digital Input	Analog Input

* GPIO_4 (pin 4) may be used compatibly with SL809x.Compatibility with SL6087 varies depending on how pin 4 of the SL6087 was used. Refer to Table 23 Features Only Supported by SL6087 for more information.

4.2. Soldering Pad Design

The application PCB will be the same among the SL series embedded modules. Nevertheless, a different Solder Mask will be used for the case of SL6087 to cover the 2nd row of GND pads and to prevent soldering those pads.

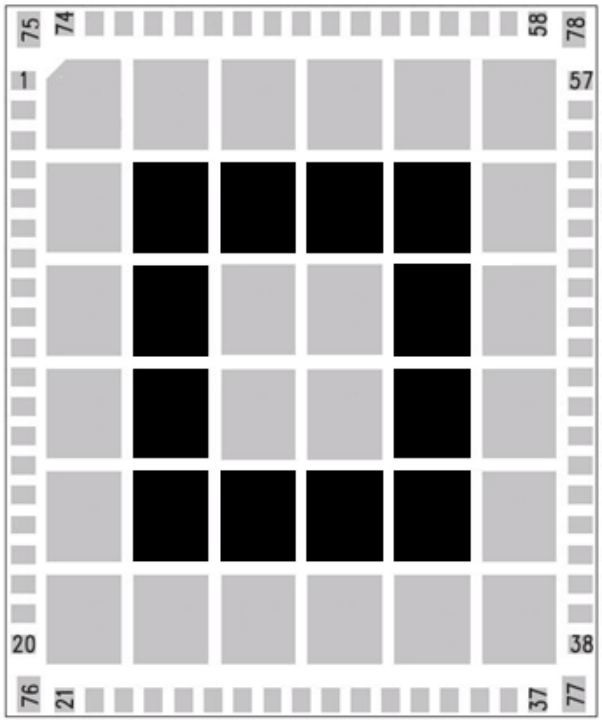

Figure 8. Recommended Soldering PAD Design

When the SL6087 is used, the highlighted GND pads should be covered by Solder Mask.

Warning: *It is recommended to have a GROUND area under the SL series module; this ground area should be a whole area of copper with proper ground vias to provide a good grounding system between the application and the embedded module and improved thermal dissipation. It should be covered by solder resist on the non-soldered area.*

The ground vias may be micro-vias, filled or unfilled.

For SL6087 modules, the ground vias should not be placed in the test points' location.

In any case, there shall not be any SIGNAL-trace or SIGNAL-hole/micro-via other than GROUND under the AirPrime SL Series product.

For more details, refer to document [5] AirPrime SL Series Customer Process Guidelines.

4.3. Stencil Design

For SL6087, **DO NOT** open the stencil for the 16 center GND pads as shown in the figure below.

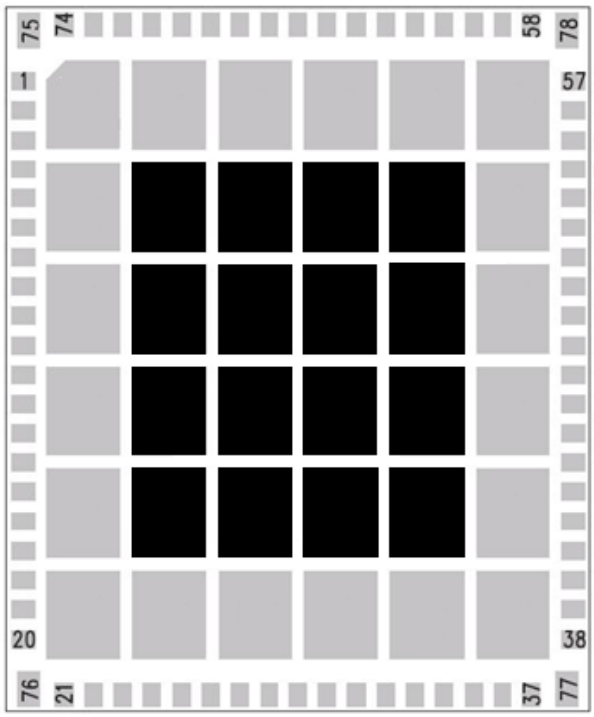

Figure 9. Stencil Design for the SL6087

4.4. Mechanical Differences

The module thickness varies depending on the SL series embedded module. The following table enumerates the thickness of each SL series embedded module.

Table 26. Thickness of the SL Series Embedded Modules

	SL6087	SL808x	SL809x	SL501x
Thickness	2.65mm (typical) 2.85mm (max)	2.40mm (typical)* 2.55mm (max)	2.40mm (typical)* 2.55mm (max)	2.47mm (typical) 2.50mm (max)

* The specified module thickness includes the thickness of the module's label. The typical module thickness without label is 2.35mm.

5. SL Series Embedded Module Pin Out

Table 27. Pin Out List of the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Voltage	Signal Name	Function	I/O	Signal Name	Function	I/O	Signal Name	Function	I/O
1	CT104-RXD1 / GPIO5	Main RS232 Receive	VCC_2V8	GPIO_3	General Purpose I/O	I/O	GPIO_3	General Purpose I/O	I/O	GPIO_3	General Purpose I/O	I/O
2	~CT106-CTS1 / GPIO7	Main RS232 Clear to Send	VCC_2V8	GPIO_2	General Purpose I/O	I/O	GPIO_2	General Purpose I/O	I/O	GPIO_2	General Purpose I/O	I/O
3	BAT_RTC	RTC Battery Connection	BAT-RTC	GPIO_1	General Purpose I/O	I/O	GPIO_1	General Purpose I/O	I/O	GPIO_1	General Purpose I/O	I/O
4	CLK32O/GPIO0	--	VCC_2V8	NC	--	--	GPIO_0	General Purpose I/O	I/O	GPIO_4	General Purpose I/O	I/O
5	ADC2	Analog to Digital Input	2V	NC	--	--	NC	--	--	GPIO_5	General Purpose I/O	I/O
6	SIM-VCC	SIM Power Supply	1V8 or 3V	EXT_VREG_USIM	USIM VCC Supply	O	EXT_VREG_USIM	USIM VCC Supply	O	EXT_VREG_USIM	USIM VCC Supply	O
7	~SIM-RST	SIM reset Output	1V8 or 3V	EXT_USIM_RESET	USIM reset	O	EXT_USIM_RESET	USIM reset	O	EXT_USIM_RESET	USIM reset	O
8	SIM-IO	SIM Data	1V8 or 3V	EXT_USIM_DATA	USIM I/O pin	I/O	EXT_USIM_DATA	USIM I/O pin	I/O	EXT_USIM_DATA	USIM I/O pin	I/O
9	SIM-CLK	SIM Clock	1V8 or 3V	EXT_USIM_CLK	USIM Clock	O	EXT_USIM_CLK	USIM Clock	O	EXT_USIM_CLK	USIM Clock	O
10	SIMPRES / GPIOI8	SIM Detection	VCC_1V8	VREF_1V8	1V8 LDO	O	VREF_1V8	1V8 LDO	O	VREG_MSMP_2V6	2V6 LDO	O
11	~SPI1-I_CS / GPIO20	SPI1 Chip Select	VCC_2V8	SPI_CS_N	SPI Chip Select	O	SPI_CS_N	SPI Chip Select	O	NC	--	--
12	SPI1-CLK / GPIO12	SPI1 Clock	VCC_2V8	SPI_CLK	SPI Clock	O	SPI_CLK	SPI Clock	O	NC	--	--
13	SPI1-IO / GPIO13	SPI1 Data input / output	VCC_2V8	SPI_DATA_MOSI	SPI Master Output	O	SPI_DATA_MOSI	SPI Master Output	O	NC	--	--
14	SPI1-I /	SPI1 Data	VCC_2V8	SPI_DATA_MIS	SPI Master	I	SPI_DATA_MIS	SPI Master	I	NC	--	--

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Voltage	Signal Name	Function	I/O	Signal Name	Function	I/O	Signal Name	Function	I/O
	GPIO19	input		O	Input		O	Input				
15	GPIO21	--	VCC_2V8	NC	--	--	NC	--	--	NC	--	--
16	SDA / GPIO2	I2C Data	Open Drain	NC	--	--	NC	--	--	NC	--	--
17	SCL / GPIO1	I2C Clock	Open Drain	NC	--	--	NC	--	--	ADC_1	Analog to Digital Input	I
18	BOOT	--	VCC_1V8	NC	--	--	NC	--	--	ADC_2	Analog to Digital Input	I
19	RTCK	JTAG return clock	VCC_1V8	GND	--	--	GND	--	--	GND	--	--
20	~TRST	JTAG reset	VCC_1V8	GND	--	--	GND	--	--	GND	--	--
21	GND	--		GND	--	--	GND	--	--	GND	--	--
22	ANT_PRM	Main Antenna		NC	--	--	ANT_DRX	Diversity Antenna	--	ANT_DIV	Diversity Antenna	--
23	GND	--		GND	--	--	GND	--	--	GND	--	--
24	NC	--		NC	--	--	NC	--	--	NC	--	--
25	GND	--		NC	--	--	NC	--	--	NC	--	--
26	NC	--		NC	--	--	NC	--	--	NC	--	--
27	NC	--		NC	--	--	NC	--	--	NC	--	--
28	GND	--		GND	--	--	GND	--	--	GND	--	--
29	NC	--		ANT_PRM	Main Antenna	--	ANT_PRM	Main Antenna	--	ANT_PRM	Main Antenna	--
30	GND	--		GND	--	--	GND	--	--	GND	--	--
31	TDI	--	VCC_1V8	NC	--	--	NC	--	--	NC	--	--
32	TMS	--	VCC_1V8	NC	--	--	NC	--	--	NC	--	--
33	TDO	--	VCC_1V8	NC	--	--	NC	--	--	NC	--	--
34	TCK	--	VCC_1V8	NC	--	--	NC	--	--	NC	--	--
35	Reserved_35	--		GND	--	--	GND	--	--	GND	--	--
36	Reserved_36	--		ANT_GPS	GPS Antenna	--	ANT_GPS	GPS Antenna	--	ANT_GPS	GPS Antenna	--

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Voltage	Signal Name	Function	I/O	Signal Name	Function	I/O	Signal Name	Function	I/O
37	GPIO24	--	VCC_2V8	GND	--	--	GND	--	--	GND	--	--
38	GPIO22	--	VCC_2V8	GND	--	--	GND	--	--	GND	--	--
39	GPIO23	--	VCC_2V8	GND	--	--	GND	--	--	GND	--	--
40	ADC1	Analog to Digital Input	Analog	NC	--	--	NC	--	--	NC	--	--
41	Reserved_41	--		DNC	--	--	DNC	--	--	NC	--	--
42	VBATT	Power Supply	VBATT	VCC_3V6	3V6 Supply	I	VCC_3V6	3V6 Supply	I	VCC_3V6	3V6 Supply	I
43	ON/~OFF	ON / ~OFF control	VBATT	POWER_ON_N	Power on	I	POWER_ON_N	Power on	I	POWER_ON_N	Power on	I
44	VBATT	Power Supply	VBATT	VCC_3V6	3V6 Supply	I	VCC_3V6	3V6 Supply	I	VCC_3V6	3V6 Supply	I
45	CT103-TXD2 / GPIO14	Auxiliary RS232 Transmit	VCC_1V8	UART1_TXD	UART Transmit Data	I	UART1_TXD	UART Transmit Data	I	UART1_TXD	UART Transmit Data	I
46	CT104-RXD2 / GPIO15	Auxiliary RS232 Receive	VCC_1V8	UART1_RXD	UART Receive Data	O	UART1_RXD	UART Receive Data	O	UART1_RXD	UART Receive Data	O
47	~CT106-CTS2 / GPIO16	Auxiliary RS232 Clear to Send	VCC_1V8	UART1_CTS_N	UART Clear To Send	O	UART1_CTS_N	UART Clear To Send	O	UART1_CTS_N	UART Clear To Send	O
48	CT105-RTS2 / GPIO17	Auxiliary RS232 Request to Send	VCC_1V8	UART1_RTS_N	UART Request to Send	I	UART1_RTS_N	UART Request to Send	I	UART1_RTS_N	UART Request to Send	I
49	VPAD-USB	USB Power Supply input	VPAD-USB	NC	--	--	NC	--	--	NC	--	--
50	USB-DP	USB Data +	VPAD-USB	USB_D+	USB Data +	I/O	USB_D+	USB Data +	I/O	USB_D+	USB Data +	I/O
51	USB-DM	USB Data -	VPAD-USB	USB_D-	USB Data -	I/O	USB_D-	USB Data -	I/O	USB_D-	USB Data -	I/O
52	GND	--		GND	--	--	GND	--	--	GND	--	--
53	MIC2P	Microphone input +	Analog	MIC1_P	Microphone input +	I	NC	--	--	NC	--	--

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Voltage	Signal Name	Function	I/O	Signal Name	Function	I/O	Signal Name	Function	I/O
54	MIC2N	Microphone input -	Analog	MIC1_N	Microphone input -	I	NC	--	--	NC	--	--
55	INSIM_TEST	--		NC	--	--	NC	--	--	NC	--	--
56	SPK2N	Speaker output -	Analog	SPK_N	Speaker output -	O	NC	Speaker output -	O	NC	--	--
57	SPK2P	Speaker output +	Analog	SPK_P	Speaker output +	O	NC	Speaker output +	O	NC	--	--
58	VCC_2V8	2V8 Supply Output	VCC_2V8	NC	--	--	NC	--	--	NC	--	--
59	VCC_1V8	1V8 Supply Output	VCC_1V8	NC	--	--	NC	--	--	NC	--	--
60	FLASH-LED	LED0 Output	Open Drain	LED_FLASH	LED driver	O	LED_FLASH	LED driver	O	LED_FLASH	LED driver	O
61	INT0 / A26 / GPIO3	Interrupt 0 Input	VCC_1V8	WAKE_N	Wake Host Interface	O	WAKE_N	Wake Host Interface	O	WAKE_N	Wake Host Interface	O
62	INT1 / GPIO25	Interrupt 1 Input	VCC_2V8	W_DISABLE_N	Wireless disable	I	W_DISABLE_N	Wireless disable	I	W_DISABLE_N	Wireless disable	I
63	~RESET	RESET Input	VCC_1V8	SYSTEM_RESET_N	Reset	I	SYSTEM_RESET_N	Reset	I	SYSTEM_RESET_N	Reset	I
64	PCM-SYNC	PCM Frame Synchro	VCC_1V8	PCM_SYNC	PCM Frame Synchro	O	PCM_SYNC	PCM Frame Synchro	O	PCM_SYNC	PCM Frame Synchro	O
65	PCM-OUT	PCM Data Output	VCC_1V8	PCM_DOUT	PCM Data Output	O	PCM_DOUT	PCM Data Output	O	PCM_DOUT	PCM Data Output	O
66	PCM-IN	PCM Data Input	VCC_1V8	PCM_DIN	PCM Data Input	I	PCM_DIN	PCM Data Input	I	PCM_DIN	PCM Data Input	I
67	PCM-CLK	PCM Clock	VCC_1V8	PCM_CLK	PCM Clock	O	PCM_CLK	PCM Clock	O	PCM_CLK	PCM Clock	O
68	BUZZ-OUT	Buzzer Output	Open Drain	BUZZER_EN	--	O	BUZZER_EN	--	O	BUZZER_EN	--	O
69	~CT109-DCD1 / GPIO11	Main RS232 Data Carrier Detect	VCC_2V8	TDI	Test Data Input	I/O	TDI	Test Data Input	I/O	TDI	Test Data Input	I/O
70	~CT108-2-DTR1 /	Main RS232 Data	VCC_2V8	TMS	Test Mode Select	I/O	TMS	Test Mode Select	I/O	TMS	Test Mode Select	I/O

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Voltage	Signal Name	Function	I/O	Signal Name	Function	I/O	Signal Name	Function	I/O
	GPIO9	Terminal Ready										
71	~CT125-RI1 / GPIO10	Main RS232 Ring Indicator	VCC_2V8	TCK	Test Clock	I/O	TCK	Test Clock	I/O	TCK	Test Clock	I/O
72	~CT107-DSR1 / GPIO8	Main RS232 Data Set Ready	VCC_2V8	TRST_N	Test Reset	I/O	TRST_N	Test Reset	I/O	TRST_N	Test Reset	I/O
73	~CT105-RTS1 / GPIO6	Main RS232 Request to Send	VCC_2V8	TDO	Test Data Output	I/O	TDO	Test Data Output	I/O	TDO	Test Data Output	I/O
74	CT103-TXD1 / GPIO4	Main RS232 Transmit	VCC_2V8	RTC	Return TCK	I/O	RTC	Return TCK	I/O	RTCK	Return TCK	I/O

6. Interface Selection

Each of the AirPrime SL series embedded modules provides 74 signal pins. It might or might not be necessary for these pins to be connected depending on the application requirement. Particularly for interfaces such as SPI, USB and UART, the selection only depends on the external host connection. The following tables show the necessary pins to be used based on the interfaces selected.

6.1. Standalone Operation Terminal

Table 28. Necessary Pins for Working as a Standalone Operation Terminal

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
42, 44	VBATT	Power Supply	--	VCC_3V6	--	--	VCC_3V6	--	--	VCC_3V6	--	--
21, 23, 25, 28, 30, 52	GND	--	--	GND	--	--	GND	--	--	GND	--	--
19, 20, 35	Reserved	--	--	GND	--	--	GND	--	--	GND	--	--
37, 38, 39	GPIO24, 22,23	--	--	GND	--	--	GND	--	--	GND	--	--
43	ON/~OFF	ON/~OFF Control	High enable	POWER_ ON_N	~ON/OFF Control	Low enable	POWER_ ON_N	~ON/OFF Control	Low enable	POWER_ ON_N	~ON/OFF Control	--
22	ANT	Antenna	--	NC	--	--	ANT_DRX	Diversity Antenna	--	NC / ANT_DIV	--	--
29	NC	--	--	ANT_PRM	Primary Antenna	--	ANT_PRM	Primary Antenna	--	ANT_PRM	Antenna	--
6	SIM-VCC	SIM power supply	--	VREG_US IM	USIM VCC supply	--	VREG_US IM	USIM VCC supply	--	VREG_US IM	USIM VCC supply	--

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
7	~SIM_RST	SIM reset output	--	USIM_RESET	USIM reset	--	USIM_RESET	USIM reset	--	USIM_RESET	USIM reset	--
8	SIM-IO	SIM data	--	USIM_DATA	USIM I/O pin	--	USIM_DATA	USIM I/O pin	--	USIM_DATA	USIM I/O pin	--
9	SIM-CLK	SIM clock	--	USIM_CLK	USIM clock	--	USIM_CLK	USIM clock	--	USIM_CLK	USIM clock	--

6.2. Remote Accessible Terminal

6.2.1. Access through UART

Table 29. UART Interface of the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
45	TXD2	Transmit serial data	1V8 input	UART1_TXD	Transmit serial data	1V8 input	UART1_TXD	Transmit serial data	1V8 input	UART1_TXD	Transmit serial data	2V6 input
46	RXD2	Receive serial data	1V8 output	UART1_RXD	Receive serial data	1V8 output	UART1_RXD	Receive serial data	1V8 output	UART1_RXD	Receive serial data	2V6 output
47	CTS2	Clear to send	1V8 output	UART1_CTS_N	Clear to send	1V8 output	UART1_CTS_N	Clear to send	1V8 output	UART1_CTS_N	Clear to send	2V6 output
48	RTS2	Ready to send	1V8 input	UART1_RTS_N	Ready to send	1V8 input	UART1_RTS_N	Ready to send	1V8 input	UART1_RTS_N	Ready to send	2V6 input

Note: The SL80xx and SL501x can be configured to support full UART. For more information, refer to section 4.1.2.4 UART2 Interface.

6.2.2. Access through USB

Table 30. USB Interface of the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
49	VPAD-USB	USB Power Supply	3V3 input	NC	--	--	NC	--	--	NC	--	--
50	USB-DP	USB Data +ve	--	USB_D+	USB Data +ve	--	USB_D+	USB Data +ve	--	USB-DP	USB Data +ve	--
51	USB-DM	USB Data -ve	--	USB_D-	USB Data -ve	--	USB_D-	USB Data -ve	--	USB-DM	USB Data -ve	--

6.3. External Peripheral Attached

6.3.1. Buzzer/LED

Table 31. Buzzer/LED Interface of the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
60	LED0	--	--	LED_FLASH	--	--	LED_FLASH	--	--	LED_FLASH	--	--

Pin #	SL6087			SL808x			SL809x			SL501x		
68	BUZZER0	--	--	BUZZER_EN	--	--	BUZZER_EN	--	--	BUZZER_EN	--	--

6.3.2. Audio Device

6.3.2.1. Digital Audio Device

Table 32. Digital Audio Interface Pin Out of SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
64	PCM-SYNC	Frame Sync	1V8 output	PCM_SYNC	Frame Sync	1V8 output	PCM_SYNC	Frame Sync	1V8 output	PCM-SYNC	Frame Sync	2V6 output
65	PCM-OUT	Data output	1V8 output	PCM_DOUT	Data output	1V8 output	PCM_DOUT	Data output	1V8 output	PCM-OUT	Data output	2V6 output
66	PCM-IN	Data input	1V8 input	PCM_DIN	Data input	1V8 input	PCM_DIN	Data input	1V8 input	PCM-IN	Data input	2V6 input
67	PCM-CLK	Bit Clock	1V8 output	PCM_CLK	Bit Clock	1V8 output	PCM_CLK	Bit Clock	1V8 output	PCM-CLK	Bit Clock	2V6 output

The above mentioned pins may also be used to configure a full UART for the SL80xx.Refer to section 4.1.2.4 UART2 Interface for more information about configuring these pins as additional UART signals.

Note: These pins cannot be used as digital audio interface pins when used to configure a full UART in the SL80xx.

6.3.2.2. Analog Audio Device

Table 33. Analog Audio Interface Pin Out of the SL Series Embedded Modules

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
53	MIC2P	mic +ve with internal bias	--	MIC1P	mic +ve with internal bias	--	DNC	--	--	NC	--	--
54	MIC2N	mic -ve	--	MIC1N	mic -ve	--	DNC	--	--	NC	--	--
56	SPK2N	Speaker – ve output	--	SPK_N	Speaker – ve output	--	DNC	--	--	NC	--	--
57	SPK2P	Speaker +ve output	--	SPK_P	Speaker +ve output	--	DNC	--	--	NC	--	--

6.4. Debugging Purpose

6.4.1. JTAG (SL808x, SL809x and SL501x) / UART 1 (SL6087)

Table 34. JTAG Pin Out of the SL808x, SL809x and SL501x; or UART 1 on the SL6087

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
1	RXD1	Receive Serial Data	2V8 output	GPIO_3	GPIO	1V8 I/O	GPIO_3	GPIO	1V8 I/O	GPIO_3	GPIO	2V6 I/O
2	CTS1	Clear to Send	2V8 output	GPIO_2	GPIO	1V8 I/O	GPIO_2	GPIO	1V8 I/O	GPIO_2	GPIO	2V6 I/O
69	DCD1	Data Carrier Detect	2V8 output	TDI	Data in	--	TDI	Data in	--	TDI	Data in	--
70	DTR1	Data Terminal Ready	2V8 input	TMS	Mode select input	--	TMS	Mode select input	--	TMS	Mode select input	--
71	RI1	Ring Indicator	2V8 output	TCK	Clock input	--	TCK	Clock input	--	TCK	Clock input	--
72	DSR1	Data Set Ready	2V8 output	TRST_N	Reset	--	TRST_N	Reset	--	TRST_N	Reset	--
73	RTS1	Request to Send	2V8 input	TDO	Data out	--	TDO	Data out	--	TDO	Data out	--
74	TXD1	Transmit serial Data	2V8 input	RTCK	Return clock	--	RTC	Return clock	--	RTCK	Return clock	--

Table 35. JTAG Pin Out of the SL6087

Pin #	SL6087			SL808x			SL809x			SL501x		
	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value	Signal Name	Function	Value
19	RTCK	Return clock	--	GND	--	--	GND	--	--	GND	--	--
20	TRST_N	Reset	--	GND	--	--	GND	--	--	GND	--	--
31	TDI	Data in	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--
32	TMS	Mode select input	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--
33	TDO	Data out	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--
34	TCK	Clock input	--	NC	Not Connected	--	NC	Not Connected	--	NC	Not Connected	--

6.4.2. BOOT

Table 36. BOOT Pin of the SL6087

Pin #	Signal Name	Function	Value
18	BOOT	Download mode selection	1V8, input

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