SmartFusion2 System-On-Module (M2S-FG484 SOM)

Hardware Architecture

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1. Introduction

This document describes the hardware architecture of the Emcraft Systems SmartFusion2 System-On-Module (M2S-FG484 SOM).

The SmartFusion2 SOM is intended to provide a flexible platform for embedded applications that require rich connectivity, low power and flexibility of the SmartFusion2 SoC (System-on-Chip) FPGA device coupled with a full-fledged Linux software execution environment running on the ARM Cortex-M3 SmartFusion2 processor core.

The SmartFusion2 SOM is based on the Microsemi SmartFusion2 versatile, low-power, high-integration microcontroller. The uClinux kernel and applications execute on the 142 MHz 32-bit ARM Cortex-M3 processor core, while the integrated controllers and FPGA fabric of the SmartFusion2 device are used to implement various communication interfaces and protocols.

Using a miniature mezzanine form factor, the SmartFusion2 SOM is specifically designed to provide the primary SmartFusion2-based intelligence on various boards targeting industrial automation, system and power management, wireless networking / sensors and other embedded applications. SmartFusion2 SOM hardware and software are architected to ensure flexibility in customizing its functionality for the needs of particular products and/or customers.

2. Hardware Platform

This section defines the hardware platform of the SmartFusion2 SOM.

2.1. Hardware Platform Overview

The following are the key hardware features of the SmartFusion2 SOM:

- Compact (30 mm x 57 mm) mezzanine module;
- External interface using two 80-pin 0.4 mm-pitch connectors;
- Compliant with the Restriction of Hazardous Substances (RoHS) directive;
- SmartFusion2 SoC FPGA in FG484 package capable of running the system clock at up to 142 MHz;
- JTAG interface to SmartFusion2;
- Powered from single +3.3 V power supply;
- External power supply can be used for select I/O banks;
- Low-power mode with fast wake-up times;
- On-module clocks;
- 64 MBytes LPDDR;
- 16 MBytes SPI Flash;
- Serial console interface at UART CMOS levels;
- 802.3 Ethernet interface;
- Watchdog Timer (WDT);
- Key uncommitted interfaces of the SmartFusion2 device available on the interface connectors.

2.2. Functional Block Diagram

The following figure is a functional block diagram of the SmartFusion2 SOM:
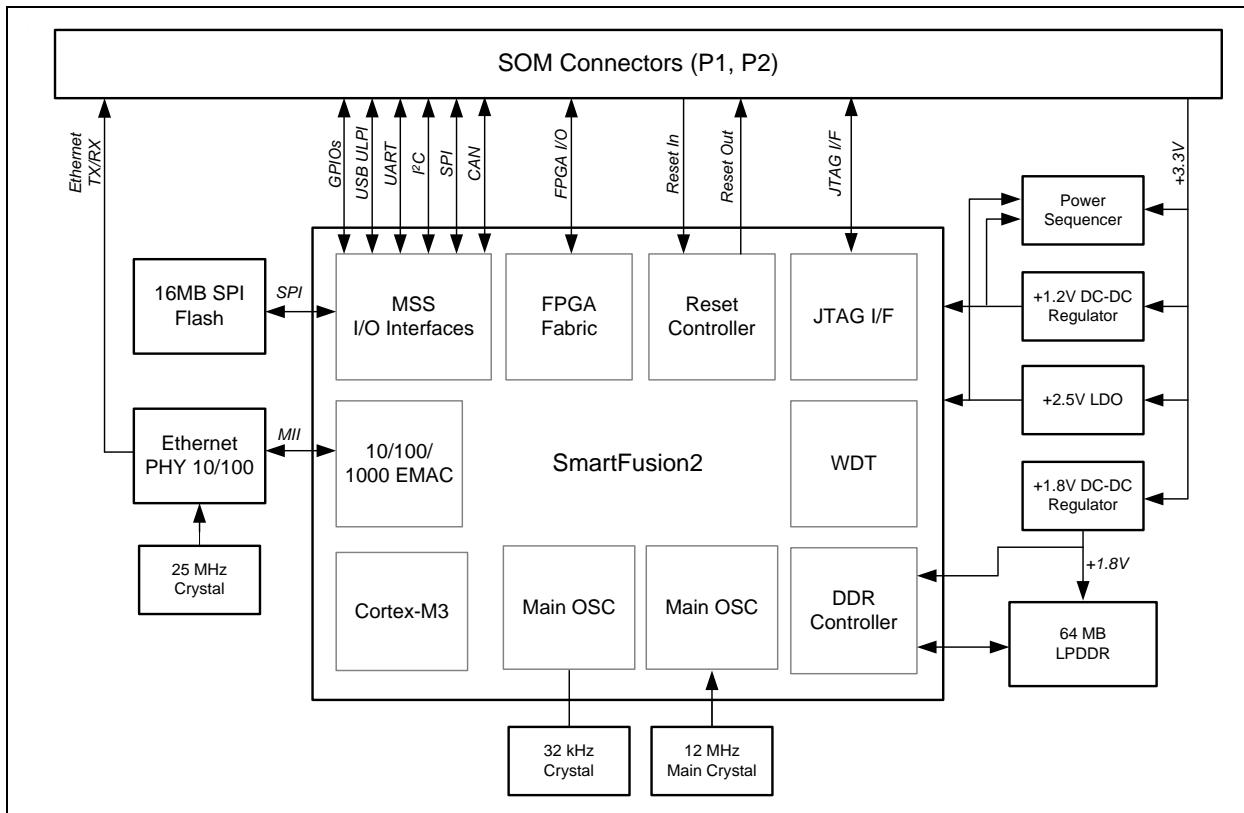
Figure 1: SmartFusion2 SOM Functional Block Diagram

2.3. Microcontroller

2.3.1. SmartFusion2 FPGA

The architecture of the SmartFusion2 SOM is built around the Microsemi SmartFusion2 SoC FPGA that combines a 32-bit ARM Cortex-M3 processor core with a wide range of the integrated peripheral controllers as well as the FPGA fabric.

The SmartFusion2 device is implemented using the FG484 package.

2.3.2. SmartFusion2 Configuration

The SmartFusion2 SOM supports build-time selection of the following SmartFusion2 devices:

- Capacity:
  - o M2S060 (56520 Logic Elements, 256 KB eNVM, 64 KB eSRAM)
  - o M2S090 (86316 Logic Elements, 512 KB eNVM, 64 KB eSRAM)
  - o M2S050 (56340 Logic Elements, 256 KB eNVM, 64 KB eSRAM)
  - o M2S025 (27696 Logic Elements, 256 KB eNVM, 64 KB eSRAM)
  - o M2S010 (12084 Logic Elements, 256 KB eNVM, 64 KB eSRAM)
  - o M2S005 (6060 Logic Elements, 128 KB eNVM, 64 KB eSRAM)
- Speed Grade:
  - o Standard Grade (142 MHz)

- Temperature Range:
  - o Commercial (0 to +85°C) or
  - o Industrial (−40 to +100°C).

Selection of any of the options above in an actual assembled unit does not affect the other sections of the hardware architecture. For those configuration options that affect software functionality, software running on the SmartFusion2 SOM is expected to determine the specific microprocessor configuration at run-time and adjust its operation accordingly.

2.4. JTAG Interface

The SmartFusion2 SOM provides a FlashPro-3/4-compatible JTAG interface on the interface connectors. The JTAG interface is routed to the corresponding signals of the SmartFusion2 device.

2.5. FPGA

2.5.1. SmartFusion2 On-Chip Configuration and FPGA Design

Customers of the SmartFusion2 SOM are provided with a SmartFusion2 on-chip configuration and FPGA design suitable for the intended operation of the SmartFusion2 SOM.

The SmartFusion2 SOM on-chip configuration and FPGA design can be viewed as an extension of the SmartFusion2 SOM hardware design. It contains a logical definition of the internal SmartFusion2 architecture, which consists of the Microcontroller Subsystem (MSS) configuration, as well as FPGA logic developed by Microsemi and Emcraft Systems. It also describes an electrical interface between the SmartFusion2 device and external components, such as the SmartFusion2 device pin configuration and assignment.

2.5.2. Libero Project

The SmartFusion2 SOM on-chip configuration and FPGA design is provided as a Libero IDE project. It is expected that customers will use this project as a starting point for their application-specific FPGA development.

Note: *It is assumed that the reader is familiar with the Microsemi FPGA development process using the Libero IDE and Libero SoC tools. For more information on these and other Microsemi development tools, refer to the Microsemi SoC Product Group web page at* http://www.microsemi.com/soc*.*

Note: *The Libero project files included in this release of the SmartFusion2 SOM are intended to be used with Libero SoC v11.1. Using these files with any other release of the Libero IDE or Libero SoC software (earlier or later) may require manual adaptation of the FPGA design.*

In addition to the Libero project files customers are provided with a resulting `.stp` file. This `.stp` file is installed on every SmartFusion2 SOM unit shipped to customers.

The `.stp` file is provided for convenience, allowing the original design to be re-programmed into the SmartFusion2 device using the Microsemi FlashPro programming tool, if necessary. Here is how the `.stp` file can be installed onto SmartFusion2 using the FlashPro tool:

1. Start FlashPro on a Windows host;

2. From the FlashPro IDE, create a new project with an arbitrary name;

3. From the main FlashPro window, push `Configure Device`;

4. Push `Browse` next to `load existing programming file`. Browse to the `.stp` file and choose it;

5. Push `Program` at the top of the main window to program the project onto the SmartFusion2 device and wait for the programming procedure to complete. If the programming completes successfully, a next reset should bring the U-Boot start-up messages and the command line interface onto the serial console interface on the SmartFusion2 SOM.

2.5.3. FPGA IP Programming Interfaces

The Libero project installs the following IP blocks to the FPGA fabric of the SmartFusion2.

Address Range	IP	Tiles	Description	Mandatory/Optional
	None			

Table 1: IP Blocks

2.6. Power

2.6.1. Power Source

The SmartFusion2 SOM is run from a single +3.3 V power source provided through multiple pins on the interface connectors. The SOM converts the +3.3 V input power into other power sources required by the SmartFusion2 SOM design using appropriate on-module circuitry.

Two I/O banks of the SmartFusion2 can be supplied from an external power source via P1 pins 78 and 80. M2S-FG484 SOM power supply nets of these banks are referred further as VCCI5 and VCCI7.

The correct voltage values of the external source of the I/O banks are shown in Table 2.

Die Type	I/O Bank #	SOM Net Name	Correct Voltage Value	Default Voltage
M2S050	5	VCCI5	1.2 V, 1.5 V, 1.8 V, 2.5 V	2.5 V
M2S050	7	VCCI7	1.2 V, 1.5 V, 1.8 V, 2.5 V	2.5 V
M2S005, M2S010, M2S025	4	VCCI5	1.2 V, 1.5 V, 1.8 V, 2.5 V, 3.3 V	3.3 V
M2S010, M2S025	6	VCCI7	1.2 V, 1.5 V, 1.8 V, 2.5 V	2.5 V
M2S005	5	VCCI7	1.2 V, 1.5 V, 1.8 V, 2.5 V	2.5 V

Table 2: Voltage Levels for Different I/O Banks and Dies

If the external power is used for supplying any of the above I/O banks, this source must be controlled by the SOM EXT_PWR_EN output signal: the high level enables the external power. This signal is available on P1 pin 72.

The following diagram provides the details on the I/O banks power connections.
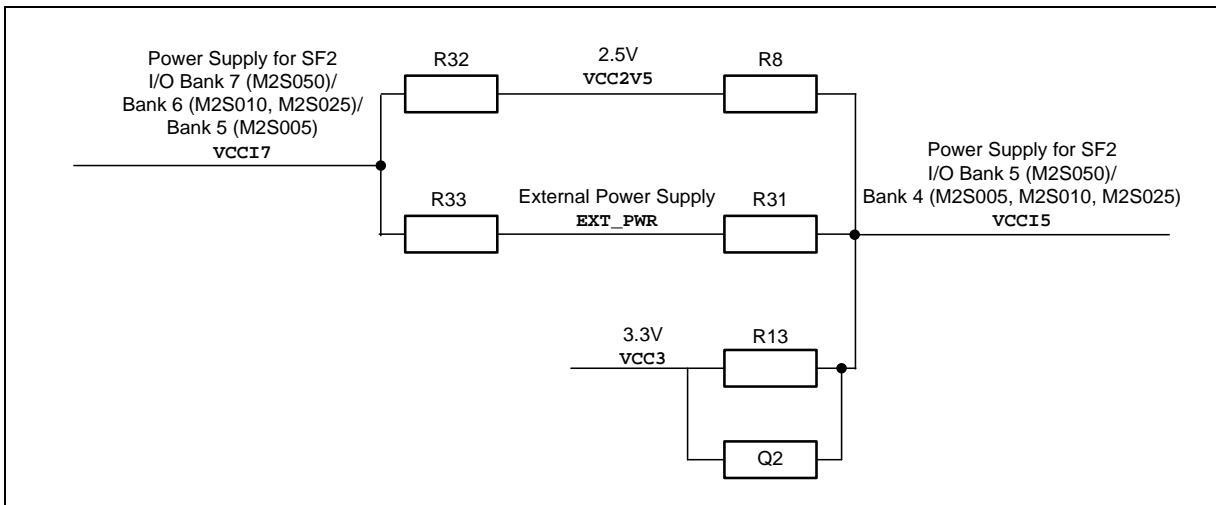

Figure 2: M2S-FG484 SOM I/O Banks Optional Power Connections

Table 3 provides information on power selection for I/O Bank 5 of the M2S050 device and I/O Bank 4 of M2S005, M2S010 and M2S025 devices. By default R8 is soldered on the SOM.

For Voltage	Assembly			
	R31	**R8**	**R13**	**Q2**
3.3 V	Do Not Install (DNI)	DNI	DNI	Install
2.5 V	DNI	Install	DNI	DNI
External power	Install	DNI	DNI	DNI
Permanent 3.3 V (Disable power sequencing)	DNI	DNI	Install	DNI
Default Assembly	DNI	Install	DNI	DNI

Table 4: Power Selection for I/O Bank 5 (4)

The power sources for Bank 5 and Bank 7 for the M2S050 device and Bank 4 and Bank 6 for the M2S005, M2S010 and M2S025 devices are selected by assembling/disassembling resistors R32 and R33. Only one of these resistors must be soldered. The on-module 2.5 V is selected by soldering R32 (the default setting) and the external power source by soldering R33.

2.6.2. Power Modes

The SmartFusion2 SOM supports the following power modes:

- Full-power mode. This is the normal mode of operation where both the MSS and the FPGA fabric are operational. The main clock is running and the Cortex-M3 is active running RTOS and/or application code. All memory controllers are enabled.

  Software is configured to enable only those SmartFusion2 sub-systems that are used by installed device drivers; all other sub-systems are in reset and do not consume power. If the Ethernet interface is not enabled by a corresponding device driver, the digital I/O power to the Ethernet PHY is switched off (refer to section 2.12.5).

- Low-power mode. This is the mode of operation the Linux software may be configured to enter when the SmartFusion2 SOM is idle from the software perspective. To elaborate, this mode may be entered when Linux has no active processes to run and is running the so-called "idle process". When Linux finds itself in the idle state, it transitions the SmartFusion2 to the Standby mode, which is intended by the SmartFusion2 architecture for applications that intend to put the device into a low-power state but be ready to respond to an interrupt sourced from the MSS and the FPGA. Software transitions into this mode by executing a "wait for interrupt" (WFI) instruction in the Cortex-M3, causing the reference clock to be gated off to the Cortex-M3 processor. This disables the majority of the Cortex-M3 logic. In the Standby mode, the SmartFusion2 device is active, but running off of a lower frequency clock than what is used for normal system operation. Peripherals not being used can be put into a low-power state by asserting their individual resets.

  To put external devices into a low-power mode, the SmartFusion2 SOM provides a dedicated output signal intended as a control for switching off-board devices to low-power modes. This active-low signal of the SmartFusion2 is available on pin 16 (`MSIO102NB8`) of the module interface connector P1.

  When switching the system to the low-power mode, software activates the low-power mode signal. Various on-board and off-board devices are expected to react to activation of that signal by switching themselves to low-power modes. Conversely, when software is switching back to the full-power mode, it de-asserts the low-power mode signal indicating to on-board and off-board devices that they are expected to switch back to the full-power mode.

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2.7. System Reset

2.7.1. Reset Architecture Overview

The SmartFusion2 SOM implements a sophisticated reset architecture that ensures that the SmartFusion2 device is reset as appropriate on various hardware and software events.

The SmartFusion2 SOM ensures that the on-board PHY is reset as soon as the SmartFusion2 SOM is subjected to a reset by connecting its nRESET_OUT signal to the PHY reset input. The nRESET_OUT is an inverted copy of the internal SmartFusion2 EXT_RESET_OUT signal.

Those off-board devices that require synchronizing their resets with SmartFusion2 SOM resets must connect the active-low nRESET_OUT signal to the reset inputs of the respective devices.

2.7.2. Types of System Resets

The following types of reset are implemented by the SmartFusion2 SOM:

- Power-on reset. This type of reset occurs when the SmartFusion2 SOM is being powered-up.

- Power down or power supply fault reset. The integrated triggers the power-on reset sequence as soon as the on-module voltages have gone below certain levels.

- Brown-out reset. In case the +3.3 V supply falls below +2.5 V, the integrated power supply monitor of SmartFusion2 may be configured by software to trigger a brown-out interrupt to the Cortex-M3 processor core. Software running on the SmartFusion2 SOM may chose to handle such an event by initiating the software reset sequence.

- Software reset. This type of reset is activated by software running on the SmartFusion2 SOM through performing the SmartFusion2 software reset sequence.

- WDT reset. This type of reset is activated when the integrated WDT of the SmartFusion2 expires.

- Manual reset. To activate this type of reset, a baseboard drives low the nRESET signal.

2.8. System Clocks

The SmartFusion2 SOM provides a 12 MHz quartz crystal as a reference to the internal oscillator of the SmartFusion2 device.

The SmartFusion2 device contains integrated PLLs driven by the above oscillator from which the various clocks required by the SmartFusion2 subsystems are derived. More specifically, the SmartFusion2 on-chip configuration and FPGA design (refer to section 2.5.1) provide the following clocks for the various SmartFusion2 domains:

Clock	Frequency (MHz)	Purpose
MCCC_CLK_BASE	80	MSS CCC clock source
M3_CLK	142	Cortex-M3 and main MSS clock
MDDR_CLK	142	LPDDR clock
APB_0_CLK	71	APB_0 bus clock
APB_1_CLK	71	APB_1 bus clock

Table 5: System Clocks

In addition to the 12 MHz crystal, the SmartFusion2 SOM provides a dedicated clock reference for the Ethernet sub-section (refer to section 2.12.3).

Further, using the M2S005, M2S010 and M2S025 product options, the SmartFusion2 provides a 32.768 KHz crystal as a reference for the SmartFusion2 RTC (refer to section 2.14).

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2.9. SDRAM

2.9.1. SDRAM Architecture

The SmartFusion2 SOM provides 64 MBytes of 5 ns 16-bit LPDDR SDRAM using the Micron MT46H32M16 device. The SDRAM resides at `nDDR_CS` chip select of the integrated SDRAM controller of the SmartFusion2 MCU.

2.9.2. SDRAM Operational Mode

The SmartFusion2 MCU SDRAM controller operates in the Low-Power Dual Data Rate Mode.

2.9.3. SDRAM Low-Power Modes

When not accessed, the LPDDR power consumption is only 0.3 mA.

2.10. SPI Flash

2.10.1. SPI Flash Architecture

The SmartFusion2 SOM provides 16 MBytes of SPI Flash memory, using the Spansion S25FL128SDPBHICO device. The SPI Flash is connected to the SPI0 controller of the SmartFusion2 device.

2.10.2. Flash Low-Power Mode

When not accessed, the SPI Flash power consumption is only 100 uA.

2.11. Serial

2.11.1. UART Controller

The SmartFusion2 SOM provides an UART serial interface at CMOS levels (no RS-232 buffer) using the integrated UART0 controller of the SmartFusion2 device on the interface connectors.

This interface is intended as the console interface for the U-Boot and Linux software.

2.11.2. Serial Baud Rate

The UART controller features an internal divider that allows this serial interface to operate at standard baud rates up to 921.6 Kbps.

2.12. Ethernet

2.12.1. Ethernet Controller

The SmartFusion2 SOM provides a full-featured, configurable Ethernet interface capable of 10/100 Mbps data rates using the integrated 802.3 controller of the SmartFusion2 device.

2.12.2. Ethernet Physical Layer

The physical layer of the Ethernet port is implemented using the Micrel KSZ8081MNLI PHY device to provide a full-featured, 10/100 Mps 802.3 interface.

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2.12.3. Ethernet Clock

The SmartFusion2 SOM provides a 25 MHz quartz crystal as a clock reference to the Ethernet PHY device.

The KSZ8081MNLI PHY device drives a 25 MHz RX and TX clock inputs of the integrated Ethernet MAC interface of the SmartFusion2 device.

2.12.4. Ethernet Status LEDs

The SmartFusion2 SOM provides two status signals for the Ethernet channel on the interface connectors for controlling off-module Ethernet LEDs. The functionality of these signals is as follows:

- LED_ACT, used to indicate link status (Link when low, No Link when high) and the RX activity when toggling;

- LED_SPD, used to indicate the 10/100 Mbit link status (100 Mbit when low, 10 Mbit when high).

On a baseboard, the status LEDs must be connected between the SmartFusion2 SOM output signals and a +3.3 V plane.

2.12.5. Ethernet Low Power Mode

When not accessed, the PHY can be switched to the Power-Down mode under software control. When in the Power-Down mode, the PHY current consumption is only 2 mA.

Note further that when the low-power mode signal is activated by software (refer to section 2.6.2), the power to the Ethernet PHY transceiver is switched off (the digital I/O power to the Ethernet PHY is kept). This reduces the power consumption of the Ethernet PHY to 0,5 mA.

2.13. WDT

The SmartFusion2 SOM provides a hardware watchdog function using the integrated WDT module of the SmartFusion2 device.

If the WDT is enabled and software fails to strobe the WDT within the predefined period of time, the watchdog triggers reset.

The WDT timeout period is defined by software.

2.14. RTC

The SmartFusion2 SOM supports Real-Time Clock (RTC) functionality using the SmartFusion2 Real-Time counter system.

The Real-Time counter is clocked from an on-module 32.768 KHz oscillator of the SmartFusion2 SOM.

The RTC is not supported in the SmartFusion2 SOM using the M2S050 device (for details see SAR46571 http://www.microsemi.com/document-portal/doc_download/132599-libero-soc-v11-1-sp3-release-notes). In the SmartFusion2 SOM using the M2S010 or M2S025 device the RTC is supported.

2.15. External Interface

2.15.1. Interface Connectors

The external interfaces of the SmartFusion2 SOM are routed through two 80-pin Hirose DF40 series 0.4 mm-pitch board-to-board connectors.

2.15.2. Connectors Pin-Out

Note: Several I/O banks of the SmartFusion2 are limited to a 2.5 V maximum operating voltage. Any signals of the SmartFusion2 SOM implemented using signals of those banks are marked as "(2.5 V)" in the column "Type". Further, the maximum operating voltage of a certain I/O bank is 2.5 V (Bank 5 for the M2S050 device), while it is 3.3 V for the M2S005, M2S010 and M2S050 devices (where that bank is referred to as Bank 4). Signals of that bank used in the SmartFusion2 SOM design are marked as "(2.5 V in M2S050)" in the column "Type". In the default SOM configuration, these signals are 2.5 V for the M2S050 and 3.3 V for the other devices. Any signals that do not have the above markings are 3.3 V signals.

Note: Using the FG484 package, the M2S050 pin names differ from the pin names of the other family members (M2S025, M2S010 and M2S005). Therefore, the "SmartFusion2 Pin" column provides several pin names for such signals. The respective die type is placed after the colon.

Note: For the multi-function SmartFusion2 signals, the item in Bold shows the function initialized by the Libero project included with the SmartFusion2 Starter Kit.

The following table details the allocation of the external interface connectors pins on the P1 connector:

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
Power (17 pins)					
2, 3, 5, 8, 9, 11, 14, 57, 75, 76	GND	Power	SOM ground	SmartFusion2 GND	Must be connected to GND on a baseboard.
77, 79	VCC3	Power	+3.3 V power supply	SmartFusion2 +3.3 V power supply	An external +3.3 V+/- 5% power supply must be applied to these pins.
78, 80	EXT_PWR	Power	Additional power supply for I/O banks	Unconnected by default, can be connected via build-time option parts	Refer to Table 8 for details.
72	EXT_PWR_EN	Output	Control for additional power supply	NC	Must be used to enable additional external power supply EXT_PWR: high level enables EXT_PWR.
13	nRESET_IN	Input	SOM reset input	R15 **DEVRST_N**	Active-low hardware reset to the SOM.
15	nRESET_OUT	Output	SOM reset output	D5 M2S090: MSIO127NB8 M2S060: MSIO107NB9 M2S050: MSIO96NB8 M2S025: MSIO80NB7 M2S010: MSIO64NB7 M2S005: NC	Active-low reset from the SOM to external devices.

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
JTAG (7 pins)					
20	JTAG_TCK	Input	JTAG clock signal to the SmartFusion2	W20 JTAG_TCK/M3_TCK	
22	JTAGSEL	Input	SmartFusion2 JTAG controller mode selection	AA22 JTAGSEL	When driven high, the SmartFusion2 JTAG controller is in the FPGA programming mode. When driven low, the SmartFusion2 JTAG controller is in the Cortex-M3 debug mode.
24	JTAG_TMS	Input	JTAG mode select	V20 JTAG_TMS/M3_TMS/ M3_SWDIO	
36	JTAG_nTRST	Input	JTAG controller reset	Y22 **JTAG_TRSTB**/M3_TRSTB	Active-low
38	JTAG_TDO	Output	JTAG data output from the SmartFusion2	Y21 JTAG_TDO/M3_TDO/ M3_SWO	
47	JTAG_TDI	Input	JTAG data input to the SmartFusion2	W22 JTAG_TDI/M3_TDI	
62	VJTAG_VPP	Power			Not connected on the SmartFusion2 SOM.
Serial (4 pins)					
28	UART_1_TXD	Output	SmartFusion2 MSS UART1 transmit data output/ GPIO	H19 M2S090: MSIO54NB2/ MMUART_1_TXD/ GPIO_24_B/USB_DATA2_C M2S060: MSIO42NB2/ MMUART_1_TXD/ GPIO_24_B/USB_DATA2_C M2S050: MSIO41NB1/ MMUART_1_TXD/ GPIO_24_B M2S025: MSIO27NB1/ MMUART_1_TXD/ GPIO_24_B/USB_DATA2_C M2S010: MSIO21NB1/ MMUART_1_TXD/ GPIO_24_B/USB_DATA2_C M2S005: MSIO14NB1/ MMUART_1_TXD/	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				GPIO_24_B/USB_DATA2_C	
29	UART_0_TXD	Output	SmartFusion2 MSS UART0 transmit data output/ GPIO	D21 M2S090: MSI59NB2/ MMUART_0_TXD/ GPIO_27_B/USB_DIR_C M2S060: MSI47NB2/ MMUART_0_TXD/ GPIO_27_B/USB_DIR_C M2S050: MSI46NB1/ MMUART_0_TXD/ GPIO_27_B M2S025: MSI32NB1/ MMUART_0_TXD/ GPIO_27_B/USB_DIR_C M2S010: MSI26NB1/ MMUART_0_TXD/ GPIO_27_B/USB_DIR_C M2S005: MSI16NB1/ MMUART_0_TXD/ GPIO_27_B/USB_DIR_C	Used for the software console interface.
30	UART_0_RXD	Input	SmartFusion2 MSS UART0 receive data input/ GPIO	C22 M2S090: MSIO60PB2/ MMUART_0_RXD/ GPIO_28_B/USB_STP_C M2S060: MSIO48PB2/ MMUART_0_RXD/ GPIO_28_B/USB_STP_C M2S050: MSIO47PB1/ MMUART_0_RXD/ GPIO_28_B M2S025: MSIO33PB1/ MMUART_0_RXD/ GPIO_28_B/USB_STP_C M2S010: MSIO27PB1/ MMUART_0_RXD/ GPIO_28_B/USB_STP_C M2S005: MSIO17PB1/ MMUART_0_RXD/ GPIO_28_B/USB_STP_C	Used for the software console interface.
31	UART_1_RXD	Input	SmartFusion2 MSS UART1 receive data input/	GPIOG18 M2S090: MSIO55NB2/ MMUART_1_RXD/ GPIO_26_B/ USB_DATA3_C M2S060: MSIO43NB2/ MMUART_1_RXD/GPIO_26_ B/USB_DATA3_C M2S050: MSIO42NB1/ MMUART_1_RXD/ GPIO_26_B M2S025: MSIO28NB1/ MMUART_1_RXD/ GPIO_26_B/USB_DATA3_C	Used for the software console interface.

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				M2S010: MSIO22NB1/ MMUART_1_RXD/ GPIO_26_B/USB_DATA3_C M2S005: MSIO15NB1/ MMUART_1_RXD/ GPIO_26_B/USB_DATA3_C	
Ethernet (6 pins)					
1	LED_ACT	Output	Ethernet PHY Link/Activity status	Not connected	Low – Link, High – No Link, Toggling – RX activity.
4	TD_P	Output	Ethernet PHY differential positive transmit signal	Not connected	TD_N and TD_P signals should be routed on a baseboard with a 100 Ohm differential impedance.
6	TD_N	Output	Ethernet PHY differential negative transmit signal	Not connected	
7	LED_SPD	Output	Ethernet PHY 10/100Mbit link status	Not connected	Low – 100 Mbit, High – 10 Mbit.
10	RD_P	Input	Ethernet PHY differential positive receive signal	Not connected	RD_N and RD_P signals should be routed on a baseboard with a 100 Ohm differential impedance.
12	RD_N	Input	Ethernet PHY differential negative receive signal	Not connected	
GPIO (29 pins)					
16	MSIO102NB8	Input/ Output		E5 M2S090: MSIO138NB8 M2S060: MSIO113NB9 M2S050: MSIO102NB8 M2S025: MSIO86NB7 M2S010: MSIO70NB7 M2S005: MSIO55NB6	When low, enables a low-power mode of external devices.
17	MSIOD121PB7	Input/ Output (2.5 V)		K1 M2S090: MSIOD178PB7/ CCC_SW0_CLKI0 M2S060: MSIOD145PB8/ CCC_SW0_CLKI0 M2S050: MSIOD121PB7/ CCC_SW0_CLKI0 M2S025: MSIOD103PB6/ CCC_SW0_CLKI0 M2S010: MSIOD85PB6/	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				CCC_NE1_CLKI1 M2S005: MSIOD70PB5/ CCC_NE1_CLKI1	
18	MSIOD121NB7	Input/ Output (2.5 V)		K2 M2S090: MSIOD178NB7 M2S060: MSIOD145NB8 M2S050: MSIOD121NB7 M2S025: MSIOD103NB6 M2S010: MSIOD85NB6 M2S005: MSIOD70NB5	
19	MSIOD128NB7	Input/ Output (2.5 V)		M1 M2S090: MSIOD185NB7 M2S060: MSIOD154NB8 M2S050: MSIOD128NB7 M2S025: MSIOD110NB6 M2S010: MSIOD92NB6 M2S005: MSIOD77NB5	
21	MSIOD128PB7	Input/ Output (2.5 V)		N1 M2S090: MSIOD185PB7 M2S060: MSIOD154PB8 M2S050: MSIOD128PB7 M2S025: MSIOD110PB6 M2S010: MSIOD92PB6 M2S005: MSIOD77PB5	
23	MSIOD130PB7	Input/ Output (2.5 V)		P1 M2S090: MSIOD187PB7 M2S060: MSIOD157PB8 M2S050: MSIOD130PB7 M2S025: MSIOD112PB6 M2S010: MSIOD94PB6 M2S005: MSIOD79PB5	
32	MSIOD133NB7	Input/ Output (2.5 V)		R1 M2S090: MSIOD190NB7 M2S060: MSIOD158NB8 M2S050: MSIOD133NB7 M2S025: MSIOD115NB6 M2S010: MSIOD97NB6 M2S005: NC	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
34	MSIOD130NB7	Input/ Output (2.5 V)		P2 M2S090: MSIOD187NB7 M2S060: MSIOD157NB8 M2S050: MSIOD130NB7 M2S025: MSIOD112NB6 M2S010: MSIOD94NB6 M2S005: MSIOD79NB5	
35	MSIOD129NB7	Input/ Output (2.5 V)		P3 M2S090: MSIOD186NB7 M2S060: MSIOD153NB8 M2S050: MSIOD129NB7 M2S025: MSIOD111NB6 M2S010: MSIOD93NB6 M2S005: MSIOD78NB5	
37	MSIOD127NB7	Input/ Output (2.5 V)		N4 M2S090: MSIOD184NB7 M2S060: MSIOD146NB8 M2S050: MSIOD127NB7 M2S025: MSIOD109NB6 M2S010: MSIOD91NB6 M2S005: MSIOD76NB5	
39	MSIOD127PB7	Input/ Output (2.5 V)		N3 M2S090: MSIOD184PB7 M2S060: MSIOD146PB8 M2S050: MSIOD127PB7 M2S025: MSIOD109PB6 M2S010: MSIOD91PB6 M2S005: MSIOD76PB5	
40	MSIOD126NB7	Input/ Output (2.5 V)		M2 M2S090: MSIOD183NB7 M2S060: MSIOD150NB8 M2S050: MSIOD126NB7 M2S025: MSIOD108NB6 M2S010: MSIOD90NB6 M2S005: MSIOD75NB5	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
41	MSIOD129PB7	Input/ Output (2.5 V)		P4 M2S090: MSIOD186PB7 M2S060: MSIOD153PB8 M2S050: MSIOD129PB7 M2S025: MSIOD111PB6 M2S010: MSIOD93PB6 M2S005: MSIOD78PB5	
42	MSIOD126PB7	Input/ Output (2.5 V)		M3 M2S090: MSIOD183PB7 M2S060: MSIOD150PB8 M2S050: MSIOD126PB7 M2S025: MSIOD108PB6 M2S010: MSIOD90PB6 M2S005: MSIOD75PB5	
43	MSIOD122PB7	Input/ Output (2.5 V)		L2 M2S090: MSIOD179PB7 M2S060: MSIOD151PB8 M2S050: MSIOD122PB7 M2S025: MSIOD104PB6 M2S010: MSIOD86PB6 M2S005: MSIOD71PB5	
44	MSIOD123PB7	Input/ Output (2.5 V)		L4 M2S090: MSIOD180PB7 M2S060: MSIOD152PB8 M2S050: MSIOD123PB7 M2S025: MSIOD105PB6 M2S010: MSIOD87PB6 M2S005: MSIOD72PB5	
45	MSIOD122NB7	Input/ Output (2.5 V)		L3 M2S090: MSIOD179NB7 M2S060: MSIOD151NB8 M2S050: MSIOD122NB7 M2S025: MSIOD104NB6 M2S010: MSIOD86NB6 M2S005: MSIOD71NB5	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
46	MSIOD123NB7	Input/ Output (2.5 V)		L5 M2S090: MSIOD180NB7 M2S060: MSIOD152NB8 M2S050: MSIOD123NB7 M2S025: MSIOD105NB6 M2S010: MSIOD87NB6 M2S005: MSIOD72NB5	
48	MSIOD125PB7	Input/ Output (2.5 V)		N5 M2S090: MSIOD182PB7 M2S060: MSIOD148PB8 M2S050: MSIOD125PB7 M2S025: MSIOD107PB6 M2S010: MSIOD89PB6 M2S005: MSIOD74PB5	
49	MSIOD118PB7	Input/ Output (2.5 V)		K4 M2S090: MSIOD175PB7/ GB5/CCC_SW1_CLKI1 M2S060: MSIOD142PB8/ GB5/CCC_SW1_CLKI1 M2S050: MSIOD118PB7/ GB5/CCC_SW1_CLKI1 M2S025: MSIOD100PB6/ GB5/CCC_SW1_CLKI1 M2S010: MSIOD82PB6 M2S005: MSIOD67PB5	
50	MSIOD125NB7	Input/ Output (2.5 V)		N6 M2S090: MSIOD182NB7 M2S060: MSIOD148NB8 M2S050: MSIOD125NB7 M2S025: MSIOD107NB6 M2S010: MSIOD89NB6 M2S005: MSIOD74NB5	
51	MSIOD118NB7	Input/ Output (2.5 V)		K5 M2S090: MSIOD175NB7 M2S060: MSIOD142NB8 M2S050: MSIOD118NB7 M2S025: MSIOD100NB6 M2S010: MSIOD82NB6 M2S005: MSIOD67NB5	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
52	MSIOD124PB7	Input/ Output (2.5 V)		M5 M2S090: MSIOD181PB7 M2S060: MSIOD147PB8 M2S050: MSIOD124PB7 M2S025: MSIOD106PB6 M2S010: MSIOD88PB6 M2S005: MSIOD73PB5	
53	MSIOD132PB7	Input/ Output (2.5 V)		P6 M2S090: MSIOD189PB7 M2S060: MSIOD155PB8 M2S050: MSIOD132PB7 M2S025: MSIOD114PB6 M2S010: MSIOD96PB6 M2S005: NC	
54	MSIOD124NB7	Input/ Output (2.5 V)		M6 M2S090: MSIOD181NB7 M2S060: MSIOD147NB8 M2S050: MSIOD124NB7 M2S025: MSIOD106NB6 M2S010: MSIOD88NB6 M2S005: MSIOD73NB5	
55	MSIOD132NB7	Input/ Output (2.5 V)		P7 M2S090: MSIOD189NB7 M2S060: MSIOD155NB8 M2S050: MSIOD132NB7 M2S025: MSIOD114NB6 M2S010: MSIOD96NB6 M2S005: NC	
56	MSIOD131PB7	Input/ Output (2.5 V)		N8 M2S090: MSIOD188PB7 M2S060: MSIOD149PB8 M2S050: MSIOD131PB7 M2S025: MSIOD113PB6 M2S010: MSIOD95PB6 M2S005: MSIOD80PB5	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
58	MSIOD131NB7	Input/ Output (2.5 V)		M8 M2S090: MSIOD188NB7 M2S060: MSIOD149NB8 M2S050: MSIOD131NB7 M2S025: MSIOD113NB6 M2S010: MSIOD95NB6 M2S005: MSIOD80NB5	
60	MSIOD133PB7	Input/ Output (2.5 V)		R2 M2S090: MSIOD190PB7 M2S060: MSIOD158PB8 M2S050: MSIOD133PB7 M2S025: MSIOD115PB6 M2S010: MSIOD97PB6 M2S005: NC	
I^2C (4 pins)					
25	I2C_1_SCL	Input/ Output	SmartFusion2 MSS I2C1 bus serial clock input/output/ GPIO	R22 M2S090: MSIO11NB3/ CCC_NE1_CLKI0/ I2C_1_SCL/ GPIO_1_A/USB_DATA4_A M2S060: MSIO11NB4/ I2C_1_SCL/ GPIO_1_A/USB_DATA4_A/ CCC_NE1_CLKI0 M2S050: MSIO11NB3/ CCC_NE1_CLKI0/ I2C_1_SCL/GPIO_1_A M2S025: MSIO11NB2/ CCC_NE1_CLKI0/ I2C_1_SCL/ GPIO_1_A/USB_DATA4_A M2S010: MSIO11NB2/ CCC_NE0_CLKI2/ I2C_1_SCL/ GPIO_1_A/USB_DATA4_A M2S005: MSIO11NB2/ CCC_NE0_CLKI2/ I2C_1_SCL/ GPIO_1_A/USB_DATA4_A	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
26	I2C_1_SDA	Input/ Output	SmartFusion2 MSS I2C1 bus serial data input/output/ GPIO	P22 M2S090: MSIO11PB3/ CCC_NE0_CLKI0/ I2C_1_SDA/ GPIO_0_A/USB_DATA3_A M2S060: MSIO11PB4/ I2C_1_SDA/GPIO_0_A/ USB_DATA3_A/ CCC_NE0_CLKI0 M2S050: MSIO11PB3/ CCC_NE0_CLKI0/ I2C_1_SDA/GPIO_0_A M2S025: MSIO11PB2/ CCC_NE0_CLKI0/ I2C_1_SDA/GPIO_0_A/ USB_DATA3_A M2S010: MSIO11PB2/ CCC_NE0_CLKI1/I2C_1_S DA/GPIO_0_A/ USB_DATA3_A M2S005: MSIO11PB2/ CCC_NE0_CLKI1/ I2C_1_SDA/GPIO_0_A/ USB_DATA3_A	
27	I2C_0_SDA	Input/ Output	SmartFusion2 MSS I2C0 bus serial data input/output/ GPIO	G17 M2S090: MSIO61PB2/ I2C_0_SDA/GPIO_30_B/ USB_DATA0_C M2S060: MSIO49PB2/ I2C_0_SDA/GPIO_30_B/ USB_DATA0_C M2S050: MSIO48PB1/ I2C_0_SDA/GPIO_30_B M2S025: MSIO34PB1/ I2C_0_SDA/GPIO_30_B/ USB_DATA0_C M2S010: MSIO28PB1/ I2C_0_SDA/GPIO_30_B/ USB_DATA0_C M2S005: MSIO18PB1/ I2C_0_SDA/GPIO_30_B/ USB_DATA0_C	
33	I2C_0_SCL	Input/ Output	SmartFusion2 MSS I2C0 bus serial clock input/output/ GPIO	G16 M2S090: MSIO61NB2/ I2C_0_SCL/GPIO_31_B/ USB_DATA1_C M2S060: MSIO49NB2/ I2C_0_SCL/GPIO_31_B/ USB_DATA1_C M2S050: MSIO48NB1/ I2C_0_SCL/GPIO_31_B M2S025: MSIO34NB1/ I2C_0_SCL/GPIO_31_B/ USB_DATA1_C	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				M2S010: MSIO28NB1/ I2C_0_SCL/GPIO_31_B/ USB_DATA1_C M2S005: MSIO18NB1/ I2C_0_SCL/GPIO_31_B/ USB_DATA1_C	
SPI (12 pins)					
59	SPI_1_DO	Output	SmartFusion2 MSS SPI1 serial data output/ GPIO	L21 M2S090: MSIO17PB3/ SPI_1_SDO/GPIO_12_A M2S060: MSIO17PB4/ SPI_1_SDO/GPIO_12_A M2S050: MSIO17PB3/ SPI_1_SDO/GPIO_12_A M2S025: MSIO17PB2/ SPI_1_SDO/GPIO_12_A M2S010: MSIO15PB2/ SPI_1_SDO/GPIO_12_A M2S005: NC	
61	SPI_1_DI	Input	SmartFusion2 MSS SPI1 serial data input/ GPIO	M22 M2S090: MSIO16NB3/ SPI_1_SDI/GPIO_11_A M2S060: MSIO16NB4/ SPI_1_SDI/GPIO_11_A M2S050: MSIO16NB3/ SPI_1_SDI/GPIO_11_A M2S025: MSIO16NB2/ SPI_1_SDI/GPIO_11_A M2S010: MSIO14NB2/ SPI_1_SDI/GPIO_11_A M2S005: NC	
63	SC_SPI_DO	Output	SmartFusion2 MSS Golden Flash serial data output/ GPIO	P19 SC_SPI_DO	
64	SPI1_nSS1	Input/ Output	SmartFusion2 MSS SPI1 slave select 1/ GPIO	K16 M2S090: MSIO23NB3/ SPI_1_SS1/GPIO_14_A M2S060: MSIO23NB4/ SPI_1_SS1/GPIO_14_A M2S050: MSIO23NB3/ SPI_1_SS1/GPIO_14_A M2S025: MSIO22NB2/ SPI_1_SS1/GPIO_14_A M2S010: MSIO19NB2/ SPI_1_SS1/GPIO_14_A M2S005: NC	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
65	SC_SPI_DI	Input	SmartFusion2 MSS Golden Flash serial data input/ GPIO	R21 SC_SPI_SDI	
66	SPI1_nSS2	Input/ Output	SmartFusion2 MSS SPI1 slave select 2/ GPIO	K18 M2S090: MSIO24PB3/ SPI_1_SS2/GPIO_15_A M2S060: MSIO24PB4/ SPI_1_SS2/GPIO_15_A M2S050: MSIO24PB3/ SPI_1_SS2/GPIO_15_A M2S025: MSIO23PB2/SPI_1_SS2/GPIO_15_A M2S010: MSIO20PB2/ SPI_1_SS2/GPIO_15_A M2S005: NC	
67	SPI1_CLK	Output	SmartFusion2 MSS SPI1 serial clock output/ GPIO	M21 M2S090: MSIO16PB3/ SPI_1_CLK M2S060: MSIO16PB4/ SPI_1_CLK M2S050: MSIO16PB3/ SPI_1_CLK M2S025: MSIO16PB2/ SPI_1_CLK M2S010: MSIO14PB2/ SPI_1_CLK M2S005: NC	
68	SPI1_nSS3	Input/ Output	SmartFusion2 MSS SPI1 slave select 3/ GPIO	J18 M2S090: MSIO24NB3/ SPI_1_SS3/GPIO_16_A M2S060: MSIO24NB4/ SPI_1_SS3/GPIO_16_A M2S050: MSIO24NB3/ SPI_1_SS3/GPIO_16_A M2S025: MSIO23NB2/ SPI_1_SS3/GPIO_16_A M2S010: MSIO20NB2/ SPI_1_SS3/GPIO_16_A M2S005: NC	

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69	SPI1_nSS0	Output	SmartFusion2 MSS SPI1 slave select 0/ GPIO	L20 M2S090: MSIO17NB3/ SPI_1_SS0/GPIO_13_A M2S060: MSIO17NB4/ SPI_1_SS0/GPIO_13_A M2S050: MSIO17NB3/ SPI_1_SS0/GPIO_13_A M2S025: MSIO17NB2/ SPI_1_SS0/GPIO_13_A M2S010: MSIO15NB2/ SPI_1_SS0/GPIO_13_A M2S005: NC	
70	FPGA_RPRG	Output	Control Golden Flash operation	D22 FLASH_GOLDEN	
71	SC_SPI_CLK	Output	SmartFusion2 MSS Golden Flash serial clock output/ GPIO	R20 SC_SPI_CLK	
73	SC_SPI_nSS	Output	SmartFusion2 MSS Golden Flash slave select/ GPIO	P20 SC_SPI_SS	
Unconnected pins (1 pins)					
74		N/A			

Table 6: SmartFusion2 SOM P1 Connector

The following table details the allocation of the external interface connectors pins on the P2 connector:

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
Power (3 pins)					
24, 28, 52	GND	Power	SOM ground	SmartFusion2 GND	
GPIO (53 pins)					
1	MSIO103NB8	Input/ Output		B1 M2S090: MSIO140NB8 M2S060: MSIO114NB9 M2S050: MSIO103NB8 M2S025: MSIO87NB7 M2S010: MSIO71NB7 M2S005: MSIO56NB6	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
2	MSIO101PB8	Input/ Output		B2 M2S090: MSIO136PB8 M2S060: MSIO112PB9 M2S050: MSIO101PB8 M2S025: MSIO85PB7 M2S010: MSIO69PB7 M2S005: MSIO54PB6	
3	MSIO97PB8	Input/ Output		C3 M2S090: MSIO129PB8 M2S060: MSIO109PB9 M2S050: MSIO97PB8 M2S025: MSIO81PB7 M2S010: MSIO65PB7 M2S005: NC	
4	MSIO101NB8	Input/ Output		A2 M2S090: MSIO136NB8 M2S060: MSIO112NB9 M2S050: MSIO101NB8 M2S025: MSIO85NB7 M2S010: MSIO69NB7 M2S005: MSIO54NB6	
5	MSIO96PB8	Input/ Output		C4 M2S090: MSIO127PB8 M2S060: MSIO107PB9 M2S050: MSIO96PB8 M2S025: MSIO80PB7 M2S010: MSIO64PB7 M2S005: NC	
6	MSIO97NB8	Input/ Output		B3 M2S090: MSIO129NB8 M2S060: MSIO109NB9 M2S050: MSIO97NB8 M2S025: MSIO81NB7 M2S010: MSIO65NB7 M2S005: NC	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
7	MSIO102PB8	Input/ Output		E4 M2S090: MSIO138PB8 M2S060: MSIO113PB9 M2S050: MSIO102PB8 M2S025: MSIO86PB7 M2S010: MSIO70PB7 M2S005: MSIO55PB6	
8	MSIO100NB8	Input/ Output		D4 M2S090: MSIO134NB8 M2S060: MSIO111NB9 M2S050: MSIO100NB8 M2S025: MSIO84NB7 M2S010: MSIO68NB7 M2S005: MSIO53NB6	
9	MSIO99PB8	Input/ Output		F5 M2S090: MSIO132PB8 M2S060: MSIO110PB9 M2S050: MSIO99PB8 M2S025: MSIO83PB7 M2S010: MSIO67PB7 M2S005: NC	
10	DDRIO148NB5/ PROBE_B	Input/ Output (2.5 V in M2S050)		Y9 M2S090: MSIO196NB5/ CCC_SW0_CLKI2 M2S060: MSIO162NB6/ CCC_SW0_CLKI2 M2S050: DDRIO148NB5/ PROBE_B M2S025: MSIO120NB4/ CCC_SW0_CLKI2 M2S010: MSIO102NB4/ CCC_NE1_CLKI0 M2S005: MSIO81NB4/ CCC_NE1_CLKI0	
11	MSIO98NB8	Input/ Output		G6 M2S090: MSIO131NB8 M2S060: MSIO108NB9 M2S050: MSIO98NB8 M2S025: MSIO82NB7 M2S010: MSIO66NB7 M2S005: MSIO52NB6	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
12	DDRIO148PB5/ PROBE_A	Input/ Output (2.5 V in M2S050)		W9 M2S090: MSIO196PB5 M2S060: MSIO162PB6 M2S050: DDRIO148PB5/ PROBE_A M2S025: MSIO120PB4 M2S010: MSIO102PB4 M2S005: MSIO81PB4	
13	MSIO99NB8	Input/ Output		F6 M2S090: MSIO132NB8 M2S060: MSIO110NB9 M2S050: MSIO99NB8 M2S025: MSIO83NB7 M2S010: MSIO67NB7 M2S005: NC	
14	DDRIO151NB5/ LPROBE_B)	Input/ Output (2.5 V in M2S050)		Y10 M2S090: MSIO197NB5/ PROBE_B M2S060: MSIO163NB6/ PROBE_B M2S050: DDRIO151NB5 M2S025: MSIO121NB4/ PROBE_B M2S010: MSIO103NB4/ PROBE_B M2S005: MSIO82NB4/ PROBE_B	
15	MSIO107NB8	Input/ Output		G7 M2S090: MSIO146NB8 M2S060: MSIO118NB9 M2S050: MSIO107NB8 M2S025: MSIO91NB7 M2S010: MSIO75NB7 M2S005: MSIO60NB6	
16	DDRIO151PB5/ LPROBE_A	Input/ Output (2.5 V in M2S050)		W10 M2S090: MSIO197PB5/ PROBE_A M2S060: MSIO163PB6/ PROBE_A M2S050: DDRIO151PB5 M2S025: MSIO121PB4/ PROBE_A M2S010: MSIO103PB4/ PROBE_A M2S005: MSIO82PB4/ PROBE_A	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
17	MSIO107PB8	Input/ Output		H7 M2S090: MSIO146PB8 M2S060: MSIO118PB9 M2S050: MSIO107PB8 M2S025: MSIO91PB7 M2S010: MSIO75PB7 M2S005: MSIO60PB6	
18	DDRIO156NB5	Input/ Output (2.5 V in M2S050)		W11 M2S090: MSIO201NB5/ GB7/CCC_SW1_CLKI2 M2S060: MSIO167NB6/ GB7/CCC_SW1_CLKI2 M2S050: DDRIO156NB5 M2S025: MSIO125NB4/ GB7/CCC_SW1_CLKI2 M2S010: MSIO104NB4/ GB7 M2S005: MSIO83NB4/GB7	
19	MSIO108NB8	Input/ Output		J6 M2S090: MSIO148NB8 M2S060: MSIO119NB9 M2S050: MSIO108NB8 M2S025: MSIO92NB7 M2S010: MSIO76NB7 M2S005: MSIO61NB6	
20	DDRIO156PB5	Input/ Output (2.5 V in M2S050)		V11 M2S090: MSIO201PB5/ GB3/CCC_SW0_CLKI3 M2S060: MSIO167PB6/ GB3/CCC_SW0_CLKI3 M2S050: DDRIO156PB5 M2S025: MSIO125PB4/ GB3/CCC_SW0_CLKI3 M2S010: MSIO104PB4/ GB3 M2S005: MSIO83PB4/GB3	
21	MSIO117NB8	Input/ Output		K7 M2S090: MSIO159NB8 M2S060: MSIO126NB9 M2S050: MSIO117NB8 M2S025: MSIO99NB7 M2S010: MSIO81NB7 M2S005: MSIO66NB6	

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22	DDRIO166NB5	Input/ Output (2.5 V in M2S050)		T13 M2S090: MSIO210NB5 M2S060: MSIO176NB6 M2S050: DDRIO166NB5 M2S025: MSIO131NB4 M2S010: MSIO107NB4 M2S005: MSIO92NB4	
23	MSIO117PB8	Input/ Output		K6 M2S090: MSIO159PB8/ CCC_NW0_CLKI0 M2S060: MSIO126PB9/ CCC_NW0_CLKI0 M2S050: MSIO117PB8/ CCC_NW0_CLKI0 M2S025: MSIO99PB7/ CCC_NW0_CLKI0 M2S010: MSIO81PB7 M2S005: MSIO66PB6	
25	MSIO108PB8	Input/ Output		H6 M2S090: MSIO148PB8 M2S060: MSIO119PB9 M2S050: MSIO108PB8 M2S025: MSIO92PB7 M2S010: MSIO76PB7 M2S005: MSIO61PB6	
26	ULPI_CLK	Input/ Output		R17 M2S090: MSIO1PB3/ USB_XCLK_B M2S060: MSIO1PB4/ USB_XCLK_B M2S050: MSIO1PB3 M2S025: MSIO1PB2/ USB_XCLK_B M2S010: MSIO1PB2/U SB_XCLK_B M2S005: MSIO1PB2/ USB_XCLK_B	
27	MSIO22NB3	Input/ Output		K15 M2S090: MSIO22NB3/ SPI_0_SS2/GPIO_9_A/ USB_DATA6_A M2S060: MSIO22NB4/ SPI_0_SS2/GPIO_9_A/ USB_DATA6_A M2S050: MSIO22NB3/ SPI_0_SS2/GPIO_9_A	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				M2S025: MSIO21NB2/ SPI_0_SS2/GPIO_9_A/ USB_DATA6_A M2S010: MSIO18NB2/ SPI_0_SS2/GPIO_9_A/ USB_DATA6_A M2S005: NC	
29	MSIO22PB3	Input/ Output		L16 M2S090: MSIO22PB3/ SPI_0_SS1/GPIO_8_A/ USB_DATA5_A M2S060: MSIO22PB4/ SPI_0_SS1/GPIO_8_A/ USB_DATA5_A M2S050: MSIO22PB3/ SPI_0_SS1/GPIO_8_A M2S025: MSIO21PB2/ SPI_0_SS1/GPIO_8_A/ USB_DATA5_A M2S010: MSIO18PB2/ SPI_0_SS1/GPIO_8_A/ USB_DATA5_A M2S005: NC	
30	ULPI_DATA7	Input/ Output		V19 M2S090: MSIO0NB3/ USB_DATA7_B M2S060: MSIO0NB4/ USB_DATA7_B M2S050: MSIO0NB3 M2S025: MSIO0NB2/ USB_DATA7_B M2S010: MSIO0NB2/U SB_DATA7_B M2S005: MSIO0NB2/ USB_DATA7_B	
31	MSIO7NB3	Input/ Output		P16 M2S090: MSIO7NB3/ CAN_TX/GPIO_2_A/ USB_DATA0_A M2S060: MSIO7NB4/ CAN_TX/GPIO_2_A/ USB_DATA0_A M2S050: MSIO7NB3/ CAN_TX/GPIO_2_A M2S025: MSIO7NB2/ CAN_TX/GPIO_2_A/ USB_DATA0_A M2S010: MSIO7NB2/ CAN_TX/GPIO_2_A/ USB_DATA0_A	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				M2S005: MSIO7NB2/ CAN_TX/GPIO_2_A/ USB_DATA0_A	
32	ULPI_DATA6	Input/ Output		P17 M2S090: MSIO6PB3/ USB_DATA6_B M2S060: MSIO6PB4/ USB_DATA6_B M2S050: MSIO6PB3 M2S025: MSIO6PB2/ USB_DATA6_B M2S010: MSIO6PB2/ USB_DATA6_B M2S005: MSIO6PB2/ USB_DATA6_B	
33	MSIO7PB3	Input/ Output		R16 M2S090: MSIO7PB3 M2S060: MSIO7PB4 M2S050: MSIO7PB3 M2S025: MSIO7PB2 M2S010: MSIO7PB2 M2S005: MSIO7PB2	
34	ULPI_DATA5	Input/ Output		T21 M2S090: MSIO5NB3/ USB_DATA5_B M2S060: MSIO5NB4/ USB_DATA5_B M2S050: MSIO5NB3 M2S025: MSIO5NB2/ USB_DATA5_B M2S010: MSIO5NB2/ USB_DATA5_B M2S005: MSIO5NB2/ USB_DATA5_B	
35	MSIO8NB3	Input/ Output		N17 M2S090: MSIO8NB3/ CAN_TX_EN_N/GPIO_4_A/ USB_DATA2_A M2S060: MSIO8NB4/ CAN_TX_EN_N/GPIO_4_A/ USB_DATA2_A M2S050: MSIO8NB3/ CAN_TX_EN_N/GPIO_4_A M2S025: MSIO8NB2/CAN_TX_EN_N/ GPIO_4_A/USB_DATA2_A M2S010: MSIO8NB2/ CAN_TX_EN_N/GPIO_4_A/ USB_DATA2_A	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				M2S005: MSIO8NB2/ CAN_TX_EN_N/GPIO_4_A/ USB_DATA2_A	
36	ULPI_DATA4	Input/ Output		T20 M2S090: MSIO5PB3/ USB_DATA4_B M2S060: MSIO5PB4/ USB_DATA4_B M2S050: MSIO5PB3 M2S025: MSIO5PB2/ USB_DATA4_B M2S010: MSIO5PB2/ USB_DATA4_B M2S005: MSIO5PB2/ USB_DATA4_B	
37	MSIO8PB3	Input/ Output		N16 M2S090: MSIO8PB3/ CAN_RX/GPIO_3_A/ USB_DATA1_A M2S060: MSIO8PB4/ CAN_RX/GPIO_3_A/ USB_DATA1_A M2S050: MSIO8PB3/ CAN_RX/ GPIO_3_A M2S025: MSIO8PB2/ CAN_RX/GPIO_3_A/ USB_DATA1_A M2S010: MSIO8PB2/ CAN_RX/GPIO_3_A/ USB_DATA1_A M2S005: MSIO8PB2/ CAN_RX/GPIO_3_A/ USB_DATA1_A	
38	ULPI_DATA3	Input/ Output		U21 M2S090: MSIO4NB3/ USB_DATA3_B M2S060: MSIO4NB4/ USB_DATA3_B M2S050: MSIO4NB3 M2S025: MSIO4NB2/ USB_DATA3_B M2S010: MSIO4NB2/ USB_DATA3_B M2S005: MSIO4NB2/ USB_DATA3_B	

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39	MSIO6NB3	Input/ Output		P18 M2S090: MSIO6NB3 M2S060: MSIO6NB4 M2S050: MSIO6NB3 M2S025: MSIO6NB2 M2S010: MSIO6NB2 M2S005: MSIO6NB2	
40	ULPI_DATA2	Input/ Output		U22 M2S090: MSIO4PB3/ USB_DATA2_B M2S060: MSIO4PB4/ USB_DATA2_B M2S050: MSIO4PB3 M2S025: MSIO4PB2/ USB_DATA2_B M2S010: MSIO4PB2/ USB_DATA2_B M2S005: MSIO4PB2/ USB_DATA2_B	
41	MSIO23PB3	Input/ Output		K17 M2S090: MSIO23PB3/ SPI_0_SS3/GPIO_10_A/ USB_DATA7_A M2S060: MSIO23PB4/ SPI_0_SS3/GPIO_10_A/ USB_DATA7_A M2S050: MSIO23PB3/ SPI_0_SS3/GPIO_10_A M2S025: MSIO22PB2/SPI_0_SS3/G PIO_10_A/USB_DATA7_A M2S010: MSIO19PB2/ SPI_0_SS3/GPIO_10_A/ USB_DATA7_A M2S005: NC	
42	ULPI_DATA1	Input/ Output		V21 M2S090: MSIO3NB3/ USB_DATA1_B M2S060: MSIO3NB4/ USB_DATA1_B M2S050: MSIO3NB3 M2S025: MSIO3NB2/ USB_DATA1_B M2S010: MSIO3NB2/ USB_DATA1_B M2S005: MSIO3NB2/ USB_DATA1_B	

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43	MSIO44NB1	Input/ Output		F18 M2S090: MSIO57NB2/ MMUART_0_DSR/ GPIO_20_B M2S060: MSIO45NB2/ MMUART_0_DSR/ GPIO_20_B M2S050: MSIO44NB1/ MMUART_0_DSR/ GPIO_20_B M2S025: MSIO30NB1/ MMUART_0_DSR/ GPIO_20_B M2S010: MSIO24NB1/ MMUART_0_DSR/ GPIO_20_B M2S005: NC	
44	ULPI_DATA0	Input/ Output		V22 M2S090: MSIO3PB3/ USB_DATA0_B M2S060: MSIO3PB4/ USB_DATA0_B M2S050: MSIO3PB3 M2S025: MSIO3PB2/ USB_DATA0_B M2S010: MSIO3PB2/ USB_DATA0_B M2S005: MSIO3PB2/ USB_DATA0_B	
45	MSIO44PB1	Input/ Output		F19 M2S090: MSIO57PB2/ MMUART_0_CTS/ GPIO_19_B/USB_DATA7_C M2S060: MSIO45PB2/ MMUART_0_CTS/ GPIO_19_B/USB_DATA7_C M2S050: MSIO44PB1/ MMUART_0_CTS/ GPIO_19_B M2S025: MSIO30PB1/ MMUART_0_CTS/ GPIO_19_B/USB_DATA7_C M2S010: MSIO24PB1/ MMUART_0_CTS/ GPIO_19_B/USB_DATA7_C M2S005: NC	

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46	ULPI_DIR	Input/ Output		R18 M2S090: MSIO1NB3/ USB_DIR_B M2S060: MSIO1NB4/ USB_DIR_B M2S050: MSIO1NB3 M2S025: MSIO1NB2/ USB_DIR_B M2S010: MSIO1NB2/ USB_DIR_B M2S005: MSIO1NB2/ USB_DIR_B	
47	MSIO18NB3	Input/ Output		L18 M2S090: MSIO18NB3/ SPI_1_SS5/GPIO_18_A M2S060: MSIO18NB4/ SPI_1_SS5/GPIO_18_A M2S050: MSIO18NB3/ SPI_1_SS5/GPIO_18_A M2S025: MSIO18NB2/ SPI_1_SS5/GPIO_18_A M2S010: MSIO16NB2/ SPI_1_SS5/GPIO_18_A M2S005: NC	
48	ULPI_NXT	Input/ Output		T19 M2S090: MSIO2NB3/ USB_NXT_B M2S060: MSIO2NB4/ USB_NXT_B M2S050: MSIO2NB3 M2S025: MSIO2NB2/ USB_NXT_B M2S010: MSIO2NB2/ USB_NXT_B M2S005: MSIO2NB2/ USB_NXT_B	
49	MSIO18PB3	Input/ Output		L19 M2S090: MSIO18PB3/ SPI_1_SS4/GPIO_17_A M2S060: MSIO18PB4/ SPI_1_SS4/GPIO_17_A M2S050: MSIO18PB3/ SPI_1_SS4/GPIO_17_A M2S025: MSIO18PB2/SPI_1_SS4/GPIO_17_A M2S010: MSIO16PB2/ SPI_1_SS4/GPIO_17_A M2S005: NC	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
50	ULPI_STP	Input/ Output		T18 M2S090: MSIO2PB3/ USB_STP_B M2S060: MSIO2PB4/ USB_STP_B M2S050: MSIO2PB3 M2S025: MSIO2PB2/USB_STP_B M2S010: MSIO2PB2/ USB_STP_B M2S005: MSIO2PB2/ USB_STP_B	
51	MSIO42PB1	Input/ Output		G19 M2S090: MSIO55PB2/ GB14/VCCC_SE1_CLKI/ MMUART_1_CLK/ GPIO_25_B/USB_DATA4_C M2S060: MSIO43PB2/ MMUART_1_CLK/ GPIO_25_B/ USB_DATA4_C/GB14/ VCCC_SE1_CLKI M2S050: MSIO42PB1/ GB14/VCCC_SE1_CLKI/ MMUART_1_CLK/ GPIO_25_B M2S025: MSIO28PB1/ GB14/VCCC_SE1_CLKI/ MMUART_1_CLK/ GPIO_25_B/USB_DATA4_C M2S010: MSIO22PB1/ GB6/MMUART_1_CLK/ GPIO_25_B/USB_DATA4_C M2S005: MSIO15PB1/ GB6/MMUART_1_CLK/ GPIO_25_B/USB_DATA4_C	
53	MSIO41PB1	Input/ Output		H20 M2S090: MSIO54PB2/ GB10/VCCC_SE0_CLKI/ USB_XCLK_C M2S060: MSIO42PB2/ USB_XCLK_C/GB10/ VCCC_SE0_CLKI M2S050: MSIO41PB1/ GB10/VCCC_SE0_CLKI M2S025: MSIO27PB1/ GB10/VCCC_SE0_CLKI/ USB_XCLK_C M2S010: MSIO21PB1/ GB5/USB_XCLK_C M2S005: MSIO14PB1/ GB5/USB_XCLK_C	Connected to the SmartFusion2 pin R9 (MSIO117PB8/ CCC_NW0_I0) in SOM Rev 3A.

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54	MSIOD120PB7	Input/ Output (2.5 V)		M7 M2S090: MSIOD177PB7/ CCC_SW1_CLKI0 M2S060: MSIOD144PB8/ CCC_SW1_CLKI0 M2S050: MSIOD120PB7/ CCC_SW1_CLKI0 M2S025: MSIOD102PB6/ CCC_SW1_CLKI0 M2S010: MSIOD84PB6/ CCC_NE1_CLKI2 M2S005: MSIOD69PB5/ CCC_NE1_CLKI2	
55	MSIO43NB1	Input/ Output		F20 M2S090: MSIO56NB2/ MMUART_0_DTR/ GPIO_18_B/USB_DATA6_C M2S060: MSIO44NB2/ MMUART_0_DTR/ GPIO_18_B/USB_DATA6_C M2S050: MSIO43NB1/ MMUART_0_DTR/ GPIO_18_B M2S025: MSIO29NB1/ MMUART_0_DTR/ GPIO_18_B/USB_DATA6_C M2S010: MSIO23NB1/ MMUART_0_DTR/ GPIO_18_B/USB_DATA6_C M2S005: NC	
56	MSIOD120NB7	Input/ Output (2.5 V)		L7 M2S090: MSIOD177NB7 M2S060: MSIOD144NB8 M2S050: MSIOD120NB7 M2S025: MSIOD102NB6 M2S010: MSIOD84NB6 M2S005: MSIOD69NB5	
57	MSIO43PB1	Input/ Output		F21 M2S090: MSIO56PB2/ MMUART_0_RTS/ GPIO_17_B/USB_DATA5_C M2S060: MSIO44PB2/ MMUART_0_RTS/ GPIO_17_B/USB_DATA5_C M2S050: MSIO43PB1/ MMUART_0_RTS/ GPIO_17_B M2S025: MSIO29PB1/ MMUART_0_RTS/ GPIO_17_B/USB_DATA5_C	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
				M2S010: MSIO23PB1/ MMUART_0_RTS/ GPIO_17_B/USB_DATA5_C M2S005: NC	
58	MSIOD119NB7	Input/ Output (2.5 V)		L8 M2S090: MSIOD176NB7 M2S060: MSIOD143NB8 M2S050: MSIOD119NB7 M2S025: MSIOD101NB6 M2S010: MSIOD83NB6 M2S005: MSIOD68NB5	
59	MSIO19NB3	Input/ Output		K20 M2S090: MSIO19NB3/ SPI_1_SS7/GPIO_24_A M2S060: MSIO19NB4/ SPI_1_SS7/GPIO_24_A M2S050: MSIO19NB3/ SPI_1_SS7/GPIO_24_A M2S025: MSIO19NB2/ SPI_1_SS7/GPIO_24_A M2S010: MSIO17NB2/ SPI_1_SS7/GPIO_24_A M2S005: NC	
60	MSIOD119PB7	Input/ Output (2.5 V)		K8 M2S090: MSIOD176PB7/ GB1/CCC_SW0_CLKI1 M2S060: MSIOD143PB8/ GB1/CCC_SW0_CLKI1 M2S050: MSIOD119PB7/ GB1/CCC_SW0_CLKI1 M2S025: MSIOD101PB6/ GB1/CCC_SW0_CLKI1 M2S010: MSIOD83PB6 M2S005: MSIOD68PB5	
61	MSIO19PB3	Input/ Output		K21 M2S090: MSIO19PB3/ SPI_1_SS6/GPIO_23_A M2S060: MSIO19PB4/ SPI_1_SS6/GPIO_23_A M2S050: MSIO19PB3/ SPI_1_SS6/GPIO_23_A M2S025: MSIO19PB2/ SPI_1_SS6/GPIO_23_A M2S010: MSIO17PB2/ SPI_1_SS6/GPIO_23_A M2S005: NC	

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Pin	Name	Type	Description	SmartFusion2 Pin	Notes
62	DDRIO164PB5	Input/ Output (2.5 V in M2S050)		AB15 M2S090: MSIO213PB5/ VCCC_SE1_CLKI M2S060: MSIO179PB6/ VCCC_SE1_CLKI M2S050: DDRIO164PB5/ VCCC_SE1_CLKI M2S025: MSIO134PB4/ VCCC_SE1_CLKI M2S010: MSIO110PB4 M2S005: MSIO95PB4	
63	MSIO45PB1	Input/ Output		E22 M2S090: MSIO58PB2/ MMUART_0_RI/GPIO_21_B M2S060: MSIO46PB2/ MMUART_0_RI/GPIO_21_B M2S050: MSIO45PB1/ MMUART_0_RI/GPIO_21_B M2S025: MSIO31PB1/ MMUART_0_RI/GPIO_21_B M2S010: MSIO25PB1/ MMUART_0_RI/GPIO_21_B M2S005: NC	
64	DDRIO164NB5	Input/ Output (2.5 V in M2S050)		AA15 M2S090: MSIO213NB5 M2S060: MSIO179NB6 M2S050: DDRIO164NB5 M2S025: MSIO134NB4 M2S010: MSIO110NB4 M2S005: MSIO95NB4	
65	MSIO45NB1	Input/ Output		E21 M2S090: MSIO58NB2/ MMUART_0_DCD/ GPIO_22_B M2S060: MSIO46NB2/ MMUART_0_DCD/ GPIO_22_B M2S050: MSIO45NB1/ MMUART_0_DCD/ GPIO_22_B M2S025: MSIO31NB1/ MMUART_0_DCD/ GPIO_22_B M2S010: MSIO25NB1/ MMUART_0_DCD/ GPIO_22_B M2S005: NC	

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66	DDRIO172NB5	Input/ OutputM (2.5 V in M2S050)		W15 M2S090: MSIO216NB5 M2S060: MSIO182NB6 M2S050: DDRIO172NB5 M2S025: MSIO135NB4 M2S010: MSIO111NB4 M2S005: MSIO96NB4	
67	MSIO47NB1	Input/ Output		B22 M2S090: MSIO60NB2/ MMUART_0_CLK/ GPIO_29_B/USB_NXT_C M2S060: MSIO48NB2/ MMUART_0_CLK/ GPIO_29_B/USB_NXT_C M2S050: MSIO47NB1/ MMUART_0_CLK/ GPIO_29_B M2S025: MSIO33NB1/ MMUART_0_CLK/ GPIO_29_B/USB_NXT_C M2S010: MSIO27NB1/ MMUART_0_CLK/ GPIO_29_B/USB_NXT_C M2S005: MSIO17NB1/ MMUART_0_CLK/ GPIO_29_B/USB_NXT_C	
68	DDRIO172PB5	Input/ Output (2.5 V in M2S050)		Y15 M2S090: MSIO216PB5 M2S060: MSIO182PB6 M2S050: DDRIO172PB5 M2S025: MSIO135PB4 M2S010: MSIO111PB4 M2S005: MSIO96PB4	
69	DDRIO181PB5	Input/ Output (2.5 V in M2S050)		Y18 M2S090: MSIO228PB5 M2S060: MSIO193PB6 M2S050: DDRIO181PB5 M2S025: MSIO141PB4 M2S010: MSIO117PB4 M2S005: MSIO102PB4	

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70	DDRIO176NB5	Input/ Output (2.5 V in M2S050)		U15 M2S090: MSIO218NB5 M2S060: MSIO188NB6 M2S050: DDRIO176NB5 M2S025: MSIO136NB4 M2S010: MSIO112NB4 M2S005: MSIO97NB4	
71	DDRIO167NB5	Input/ Output (2.5 V in M2S050)		AA17 M2S090: MSIO222NB5 M2S060: MSIO184NB6 M2S050: DDRIO167NB5 M2S025: MSIO138NB4 M2S010: MSIO114NB4 M2S005: MSIO99NB4	
72	DDRIO182NB5	Input/ Output (2.5 V in M2S050)		Y17 M2S090: MSIO226PB5 M2S060: MSIO191PB6 M2S050: DDRIO182PB5 M2S025: MSIO140PB4 M2S010: MSIO116PB4 M2S005: MSIO101PB4	
73	DDRIO167PB5	Input/ Output (2.5 V in M2S050)		AA16 M2S090: MSIO222PB5 M2S060: MSIO184PB6 M2S050: DDRIO167PB5 M2S025: MSIO138PB4 M2S010: MSIO114PB4 M2S005: MSIO99PB4	
74	DDRIO182NB5	Input/ Output (2.5 V in M2S050)		W17 M2S090: MSIO226NB5 M2S060: MSIO191NB6 M2S050: DDRIO182NB5 M2S025: MSIO140NB4 M2S010: MSIO116NB4 M2S005: MSIO101NB4	

Pin	Name	Type	Description	SmartFusion2 Pin	Notes
75	DDRIO184PB5	Input/ Output (2.5 V in M2S050)		W16 M2S090: MSIO224PB5 M2S060: MSIO187PB6 M2S050: DDRIO184PB5 M2S025: MSIO139PB4 M2S010: MSIO115PB4 M2S005: MSIO100PB4	
76	DDRIO174PB5	Input/ Output (2.5 V in M2S050)		AB17 M2S090: MSIO221PB5 M2S060: MSIO190PB6 M2S050: DDRIO174PB5 M2S025: MSIO137PB4 M2S010: MSIO113PB4 M2S005: MSIO98PB4	
77	DDRIO184NB5	Input/ Output (2.5 V in M2S050)		V16 M2S090: MSIO224NB5 M2S060: MSIO187NB6 M2S050: DDRIO184NB5 M2S025: MSIO139NB4 M2S010: MSIO115NB4 M2S005: MSIO100NB4	
78	DDRIO174NB5	Input/ Output (2.5 V in M2S050)		AA18 M2S090: MSIO221NB5 M2S060: MSIO190NB6 M2S050: DDRIO174NB5 M2S025: MSIO137NB4 M2S010: MSIO113NB4 M2S005: MSIO98NB4	
79	MSIO0PB3	Input/ Output		U19 M2S090: MSIO0PB3 M2S060: MSIO0PB4 M2S050: MSIO0PB3 M2S025: MSIO0PB2 M2S010: MSIO0PB2 M2S005: MSIO0PB2	

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80	DDRIO177PB5	Input/ Output (2.5 V in M2S050)		AB18 M2S090: MSIO230PB5 M2S060: MSIO192PB6 M2S050: DDRIO177PB5 M2S025: MSIO142PB4 M2S010: MSIO118PB4 M2S005: MSIO103PB4	

Table 7: SmartFusion2 SOM P2 Connector

2.15.3. Unavailable Signals of SmartFusion2

The following signals of the SmartFusion2 device are not available on the interface connectors. These signals are unused and left unconnected on the SmartFusion2 SOM:

SF2 Pin	Device-Specific Name					
	M2S090	**M2S060**	**M2S050**	**M2S025**	**M2S010**	**M2S005**
A3	DDRIO99NB1	DDRIO87NB1	DDRIO72NB0/ MDDR_DQS2_N	DDRIO79NB0	DDRIO63NB0	NC
A5	DDRIO98NB1	DDRIO86NB1	DDRIO67NB0/ MDDR_DQ27	DDRIO78NB0	DDRIO62NB0	NC
A6	DDRIO92NB1/ GB4/ CCC_NW1_CLKI2	DDRIO80NB1/ GB4/ CCC_NW1_CLKI2	DDRIO66NB0/ MDDR_DQS3_N	DDRIO65NB0/GB4/ CCC_NW1_CLKI2	DDRIO59NB0/GB4	NC
A7	DDRIO89PB1/MDDR_DQ_ECC1	DDRIO77PB1/MDDR_DQ_ECC1	DDRIO88PB0/ MDDR_DQ_ECC0	DDRIO62PB0/ MDDR_DQ_ECC0	DDRIO56PB0/ MDDR_DQ_ECC0	DDRIO46PB0/ MDDR_DQ_ECC1
A8	DDRIO89NB1/MDDR_DQ_ECC0	DDRIO77NB1/MDDR_DQ_ECC0	DDRIO88NB0/ MDDR_DQ_ECC1	DDRIO62NB0/ MDDR_DQ_ECC1	DDRIO56NB0/ MDDR_DQ_ECC1	DDRIO46NB0/ MDDR_DQ_ECC0
B3	MSIO129NB8	MSIO109NB9	MSIO97NB8	MSIO81NB7	MSIO65NB7	NC
B5	**DDRIO98PB1**	DDRIO86PB1	DDRIO67PB0/ MDDR_DQ26	DDRIO78PB0	DDRIO62PB0	NC
B6	DDRIO92PB1/ GB0/ CCC_NW0_CLKI3	DDRIO80PB1/ GB0/ CCC_NW0_CLKI3	**DDRIO66PB0/ MDDR_DQS3**	DDRIO65PB0/GB0/ CCC_NW0_CLKI3	DDRIO59PB0/ GB0	DDRIO49PB0/ GB0
B7	DDRIO91NB1/ MDDR_DQS_ECC_N	DDRIO79NB1/ MDDR_DQS_ECC_N	DDRIO90NB0/ MDDR_DQS_ECC_N	DDRIO64NB0/ MDDR_DQS_ECC_N	DDRIO58NB0/ MDDR_DQS_ECC_N	DDRIO48NB0/ MDDR_DQS_ECC_N
C5	DDRIO97PB1	DDRIO85PB1	DDRIO74PB0/ MDDR_DQ16	DDRIO77PB0	DDRIO61PB0	NC
C7	DDRIO91PB1/ MDDR_DQS_ECC	DDRIO79PB1/ MDDR_DQS_ECC	DDRIO90PB0/ MDDR_DQS_ECC	DDRIO64PB0/ MDDR_DQS_ECC	DDRIO58PB0/ MDDR_DQS_ECC	DDRIO48PB0/ MDDR_DQS_ECC
C9	DDRIO88NB1	DDRIO76NB1	DDRIO87NB0/ MDDR_DQ_ECC3	DDRIO61NB0/QDR1	DDRIO55NB0/QDR1	DDRIO45NB0
C11	DDRIO85NB1/MDDR_DQS 0_N	DDRIO73NB1/MDDR_DQS 0_N	DDRIO84NB0/ MDDR_DQS0_N	DDRIO58NB0/ MDDR_DQS0_N	DDRIO52NB0/ MDDR_DQS0_N	DDRIO42NB0/ MDDR_DQS0_N
C13	DDRIO79NB1/MDDR_DQS 1_N	DDRIO67NB1/MDDR_DQS 1_N	DDRIO78NB0/ MDDR_DQS1_N	DDRIO52NB0/ MDDR_DQS1_N	DDRIO46NB0/ MDDR_DQS1_N	DDRIO36NB0/ MDDR_DQS1_N
C20	DDRIO66PB1/MDDR_ODT	DDRIO54PB1/MDDR_ODT	DDRIO53PB0/ MDDR_ODT	DDRIO39PB0/ MDDR_ODT	DDRIO33PB0/ MDDR_ODT	DDRIO23PB0/ MDDR_ODT

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	M2S090	**M2S060**	**M2S050**	**M2S025**	**M2S010**	**M2S005**
D6	DDRIO97NB1	DDRIO85NB1	DDRIO74NB0/ MDDR_DQ17	DDRIO77NB0	DDRIO61NB0	DDRIO51NB0
D8	DDRIO90NB1/MDDR_DM_ RDQS_ECC	DDRIO78NB1/MDDR_DM_ RDQS_ECC	DDRIO89NB0/ MDDR_DM_RDQS4_ECC	DDRIO63NB0/ MDDR_DM_RDQS4_ECC	DDRIO57NB0/ MDDR_DM_RDQS4_ECC	DDRIO47NB0/ MDDR_DM_RDQS_ECC
D9	DDRIO88PB1/CCC_NW1_ CLKI3	DDRIO76PB1/CCC_NW1_ CLKI3	DDRIO87PB0/ CCC_NW1_CLKI3/ MDDR_DQ_ECC2	DDRIO61PB0/ CCC_NW1_CLKI3/ QDR0	DDRIO55PB0/ CCC_NE0_CLKI3/ QDR0	DDRIO45PB0/ CCC_NE0_CLKI3
E15	DDRIO73PB1/MDDR_RES ET_N	DDRIO61PB1/MDDR_RES ET_N	DDRIO60PB0/ MDDR_RST_N	DDRIO46PB0/ MDDR_RST_N	DDRIO40PB0/ MDDR_RST_N	DDRIO30PB0/ MDDR_RESET_N
F2	MSIO152NB8	MSIO121NB9	MSIO110NB8	MSIO94NB7	NC	NC
F8	DDRIO93NB1/CCC_NW0_ CLKI2	DDRIO81NB1/CCC_NW0_ CLKI2	DDRIO92NB0/ CCC_NW0_CLKI2	DDRIO66NB0/ CCC_NW0_CLKI2	DDRIO60NB0/ CCC_NE1_CLKI3	DDRIO50NB0/ CCC_NE1_CLKI3
G2	MSIO152PB8	MSIO121PB9	MSIO110PB8	MSIO94PB7	NC	NC
G3	MSIO154NB8	MSIO122NB9	MSIO111NB8	MSIO95NB7	NC	NC
G21	MSIO53NB2/MMUART_1_ DCD/GPIO_16_B	MSIO41NB2/MMUART_1_ DCD/GPIO_16_B	MSIO40NB1/ MMUART_1_DCD/ GPIO_16_B	MSIO26NB1/ MMUART_1_DCD/ GPIO_16_B	NC	NC
G22	MSIO53PB2/CCC_NE1_C LKI1/MMUART_1_RI/GP IO_15_B	MSIO41PB2/MMUART_1_ RI/GPIO_15_B/CCC_NE 1_CLKI1	MSIO40PB1/ CCC_NE1_CLKI1/ MMUART_1_RI/ GPIO_15_B	MSIO26PB1/ CCC_NE1_CLKI1/ MMUART_1_RI/ GPIO_15_B	NC	NC
H3	MSIO154PB8	MSIO122PB9	MSIO11PB8	MSIO95PB7	NC	NC
H21	MSIO51NB2/ MMUART_1_DTR/ GPIO_12_B	MSIO39NB2/ MMUART_1_DTR/ GPIO_12_B	MSIO38NB1/ MMUART_1_DTR/ GPIO_12_B	MSIO24NB1/ MMUART_1_DTR/ GPIO_12_B	NC	NC
H22	MSIO51PB2/ MMUART_1_RTS/ GPIO_11_B	MSIO39PB2/ MMUART_1_RTS/ GPIO_11_B	MSIO38PB1/ MMUART_1_RTS/ GPIO_11_B	MSIO24PB1/ MMUART_1_RTS/ GPIO_11_B	NC	NC
J19	MSIO52NB2/ MMUART_1_DSR/ GPIO_14_B	MSIO40NB2/ MMUART_1_DSR/ GPIO_14_B	MSIO39NB1/ MMUART_1_DSR/ GPIO_14_B	MSIO25NB1/ MMUART_1_DSR/ GPIO_14_B	NC	NC
J20	MSIO52PB2/ CCC_NE0_CLKI1/ MMUART_1_CTS/ GPIO_13_B	MSIO40PB2/ MMUART_1_CTS/ GPIO_13_B/ CCC_NE0_CLKI1	MSIO39PB1/ CCC_NE0_CLKI1/ MMUART_1_CTS/ GPIO_13_B	MSIO25PB1/ CCC_NE0_CLKI1/ MMUART_1_CTS/ GPIO_13_B	NC	NC
J22	MSIO20NB3/GB13/ VCCC_SE1_CLKI/ GPIO_26_A	MSIO20NB4/ GPIO_26_A/GB13/ VCCC_SE1_CLKI	MSIO20NB3/ GB13/ VCCC_SE1_CLKI/ GPIO_26_A	MSIO20NB2/ GB13/ VCCC_SE1_CLKI/ GPIO_26_A	NC	NC
K22	MSIO20PB3/GB9/ VCCC_SE0_CLKI/ GPIO_25_A	MSIO20PB4/ GPIO_25_A/GB9/ VCCC_SE0_CLKI	MSIO20PB3/ GB9/ VCCC_SE0_CLKI/ GPIO_25_A	MSIO20PB3/GB9/ VCCC_SE0_CLKI/ GPIO_25_A	NC	NC
M16	MSIO14PB3/ SPI_0_SS4/ GPIO_19_A	MSIO14PB4/ SPI_0_SS4/ GPIO_19_A	MSIO14PB3/ SPI_0_SS4/ GPIO_19_A	MSIO14PB3/ SPI_0_SS4/ GPIO_19_A	NC	NC
M17	MSIO14NB3/ SPI_0_SS5/	MSIO14NB4/ SPI_0_SS5/	MSIO14NB3/ SPI_0_SS5/	MSIO14NB3/ SPI_0_SS5/	NC	NC

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	M2S090	**M2S060**	**M2S050**	**M2S025**	**M2S010**	**M2S005**
	GPIO_20_A	GPIO_20_A	GPIO_20_A	GPIO_20_A		
M18	MSIO15PB3/ SPI_0_SS6/ GPIO_21_A	MSIO15PB4/ SPI_0_SS6/ GPIO_21_A	MSIO15PB3/ SPI_0_SS6/ GPIO_21_A	MSIO15PB3/ SPI_0_SS6/ GPIO_21_A	NC	NC
M19	MSIO15NB3/ SPI_0_SS7/ GPIO_22_A	MSIO15NB4/ SPI_0_SS7/ GPIO_22_A	MSIO15NB3/ SPI_0_SS7/ GPIO_22_A	MSIO15NB3/ SPI_0_SS7/ GPIO_22_A	NC	NC
R3	MSIOD191PB7	MSIOD156PB8	MSIOD134PB7	MSIOD116PB6	MSIOD98PB6	NC
R4	MSIOD191NB7	MSIOD156NB8	MSIOD134NB7	MSIOD116NB6	MSIOD98NB6	NC
T1	MSIOD193NB6/ SERDES_0_REFCLK0_N	MSIOD160NB7/ SERDES_0_REFCLK0_N	MSIOD145NB6/ SERDES_0_REFCLK0_N	MSIOD118NB5/ SERDES_0_REFCLK0_N	MSIOD100NB5/ SERDES_0_REFCLK0_N	NC
T3	MSIOD192NB7	MSIOD159NB8	MSIOD135NB7	MSIOD117NB6	MSIOD99NB6	NC
T4	MSIOD192PB7	MSIOD159PB8	MSIOD134PB7	MSIOD117PB6	MSIOD99PB6	NC
T16	MSIO232NB5	MSIO195NB6	DDRIO186NB5	MSIO143NB4	NC	MSIO104NB4
U1	MSIOD193PB6/ SERDES_0_REFCLK0_P	MSIOD160PB7/ SERDES_0_REFCLK0_P	MSIOD145PB6/ SERDES_0_REFCLK0_P	MSIOD118PB5/ SERDES_0_REFCLK0_P	MSIOD100PB5/ SERDES_0_REFCLK0_P	NC
U3	MSIOD194PB6/ SERDES_0_REFCLK1_P	MSIOD161PB7/ SERDES_0_REFCLK1_P	MSIOD146PB6/ SERDES_0_REFCLK1_P	MSIOD119PB5/ SERDES_0_REFCLK1_P	MSIOD101PB5/ SERDES_0_REFCLK1_P	NC
U4	MSIOD194NB6/ SERDES_0_REFCLK1_N	MSIOD161NB7/ SERDES_0_REFCLK1_N	MSIOD146NB6/ SERDES_0_REFCLK1_N	MSIOD119NB5/ SERDES_0_REFCLK1_N	MSIOD101NB5/ SERDES_0_REFCLK1_N	NC
U10	MSIO199PB5	MSIO164PB6	DDRIO154PB5	MSIO123PB4	NC	MSIO90PB4
U11	MSIO199NB5	MSIO164NB6	DDRIO154NB5	MSIO123NB4	NC	MSIO90NB4
U13	MSIO210PB5/GB11/VCC C_SE0_CLKI	MSIO176PB6/GB11/VCC C_SE0_CLKI	DDRIO166PB5	MSIO131PB4/ GB11/ VCCC_SE0_CLKI	MSIO107PB4	MSIO92PB4
U14	MSIO218PB5	MSIO188PB6	DDRIO176PB5	MSIO136PB4	MSIO112PB4	MSIO97PB4
U16	MSIO232PB5	MSIO195PB6	DDRIO186PB5	MSIO143PB4	NC	MSIO104PB4
U17	MSIO234NB5	MSIO194NB6	DDRIO189NB5	MSIO144NB4	NC	MSIO105NB4
U18	MSIO238NB5	MSIO199NB6	DDRIO190NB5	MSIO145NB4	NC	MSIO107NB4
V12	MSIO206NB5	MSIO172NB6	DDRIO159PB5	MSIO128NB4	NC	MSIO91NB4
V13	MSIO211PB5	MSIO183PB6	DDRIO171PB5	MSIO132PB4	MCIO108PB4	MSIO93PB4
V14	MSIO211NB5	MSIO183NB6	DDRIO171NB5	MSIO132NB4	MSIO108NB4	MSIO93NB4
V17	MSIO234PB5	MSIO194PB6	DDRIO189PB5	MSIO144PB4	NC	MSIO105PB4
V18	MSIO238PB5	MSIO199PB6	DDRIO190PB5	MSIO146PB4	NC	MSIO107PB4
W1	SERDES_0_RXD0_P	SERDES_0_RXD0_P	SERDES_0_RXD0_P	SERDES_0_RXD0_P	SERDES_0_RXD0_P	NC
W3	SERDES_0_RXD1_P	SERDES_0_RXD1_P	SERDES_0_RXD1_P	SERDES_0_RXD1_P	SERDES_0_RXD1_P	NC
W5	SERDES_0_RXD2_P	SERDES_0_RXD2_P	SERDES_0_RXD2_P	SERDES_0_RXD2_P	SERDES_0_RXD2_P	NC

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	M2S090	**M2S060**	**M2S050**	**M2S025**	**M2S010**	**M2S005**
W7	SERDES_0_RXD3_P	SERDES_0_RXD3_P	SERDES_0_RXD3_P	SERDES_0_RXD3_P	SERDES_0_RXD3_P	NC
W12	MSIO206PB5	MSIO172PB6	DDRIO159PB5/ CCC_SW1_CLKI3	MSIO128PB4	NC	MSIO91PB4
W14	MSIO212NB5	MSIO178NB6	DDRIO169NB5	MSIO133NB4	MCIO109NB4	MSIO94NB4
W19	MSIO236NB5	MSIO196NB6	DDRIO187NB5	MSIO145NB4	NC	MSIO106NB4
Y1	SERDES_0_RXD0_N	SERDES_0_RXD0_N	SERDES_0_RXD0_N	SERDES_0_RXD0_N	SERDES_0_RXD0_N	NC
Y3	SERDES_0_RXD1_N	SERDES_0_RXD1_N	SERDES_0_RXD1_N	SERDES_0_RXD1_N	SERDES_0_RXD1_N	NC
Y5	SERDES_0_RXD2_N	SERDES_0_RXD2_N	SERDES_0_RXD2_N	SERDES_0_RXD2_N	SERDES_0_RXD2_N	NC
Y7	SERDES_0_RXD3_N	SERDES_0_RXD3_N	SERDES_0_RXD3_N	SERDES_0_RXD3_N	SERDES_0_RXD3_N	NC
Y12	MSIO204NB5	MSIO173NB6	DDRIO157NB5	MSIO127NB4	NC	MSIO88NB4
Y13	MSIO209NB5	MSIO175NB6	DDRIO162NB5	MSIO130NB4	MSIO106NB4	MSIO89NB4
Y14	MSIO212PB5/GB15/VCC C_SE1_CLKI	MSIO178PB6/GB15/VCC C_SE1_CLKI	DDRIO169PB5	MSIO133PB4/ GB15/ VCCC_SE1_CLKI	MSIO109PB4	MSIO94PB4
Y19	MSIO228NB5	MSIO193NB6	DDRIO181NB5	MSIO141NB4	MSIO117NB4	MSIO102NB4
Y20	MSIO236PB5	MSIO196PB6	DDRIO187PB5	MSIO145PB4	NC	MSIO106PB4
AA2	SERDES_0_TXD0_N	SERDES_0_TXD0_N	SERDES_0_TXD0_N	SERDES_0_TXD0_N	SERDES_0_TXD0_N	NC
AA4	SERDES_0_TXD1_N	SERDES_0_TXD1_N	SERDES_0_TXD1_N	SERDES_0_TXD1_N	SERDES_0_TXD1_N	NC
AA6	**SERDES_0_TXD2_N**	**SERDES_0_TXD2_N**	**SERDES_0_TXD2_N**	**SERDES_0_TXD2_N**	**SERDES_0_TXD2_N**	NC
AA8	SERDES_0_TXD3_N	SERDES_0_TXD3_N	SERDES_0_TXD3_N	SERDES_0_TXD3_N	SERDES_0_TXD3_N	NC
AA10	MSIO198PB5	MSIO168PB6	DDRIO149PB5	MSIO122PB4	NC	MSIO85PB4
AA11	MSIO203PB5	MSIO171PB6	**DDRIO152PB5/** GB3/ CCC_SW0_CLKI3	MSIO124PB4	NC	MSIO86PB4
AA12	MSIO204PB5	MSIO173PB6	DDRIO157PB5	MSIO127PB4	NC	MSIO88PB4
AA13	MSIO209PB5/ VCCC_SE0_CLKI	MSIO175PB6/ VCCC_SE0_CLKI	DDRIO162PB5	MSIO130PB4/ VCCC_SE0_CLKI	MSIO106PB4	MSIO89PB4
AB2	SERDES_0_TXD0_P	SERDES_0_TXD0_P	SERDES_0_TXD0_P	SERDES_0_TXD0_P	SERDES_0_TXD0_P	NC
AB4	SERDES_0_TXD1_P	SERDES_0_TXD1_P	SERDES_0_TXD1_P	SERDES_0_TXD1_P	SERDES_0_TXD1_P	NC
AB6	SERDES_0_TXD2_P	SERDES_0_TXD2_P	SERDES_0_TXD2_P	SERDES_0_TXD2_P	SERDES_0_TXD2_P	NC
AB8	SERDES_0_TXD3_P	SERDES_0_TXD3_P	SERDES_0_TXD3_P	SERDES_0_TXD3_P	SERDES_0_TXD3_P	NC
AB10	MSIO198NB5	MSIO168NB6	DDRIO149NB5	MSIO122NB4	NC	MSIO85NB4
AB11	MSIO203NB5	MSIO171NB6	DDRIO152NB5/ GB7/ CCC_SW1_CLKI2	MSIO124NB4	NC	MSIO86NB4

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	M2S090	**M2S060**	**M2S050**	**M2S025**	**M2S010**	**M2S005**
AB13	MSIO208PB5/ CCC_SW1_CLKI3	MSIO174PB6/ CCC_SW1_CLKI3	DDRIO161PB5/ GB11/ VCCC_SE0_CLKI	MSIO129PB4/ CCC_SW1_CLKI3	MSIO105PB4/ CCC_NE0_CLKI0	MSIO84PB4/ CCC_NE0_CLKI0
AB14	MSIO208NB5	MSIO174NB6	DDRIO161NB5	MSIO129NB4	MSIO105NB4	MSIO84NB4
AB19	MSIO230NB5	MSIO192NB6	DDRIO177NB5	MSIO142NB4	MSIO118NB4	MSIO103NB4

Table 8: Unavailable Signals of SmartFusion2

3. Mechanical Specifications

3.1. SmartFusion2 SOM Mechanicals

The SmartFusion2 SOM is implemented as a miniature 30 x 57 x 5.2 mm module.

The SmartFusion2 SOM PCB thickness is 2.0+/- 0.2 mm. The maximum height of the SOM components is 1.6 mm.

The following figure shows the location of the SOM connectors on the module:
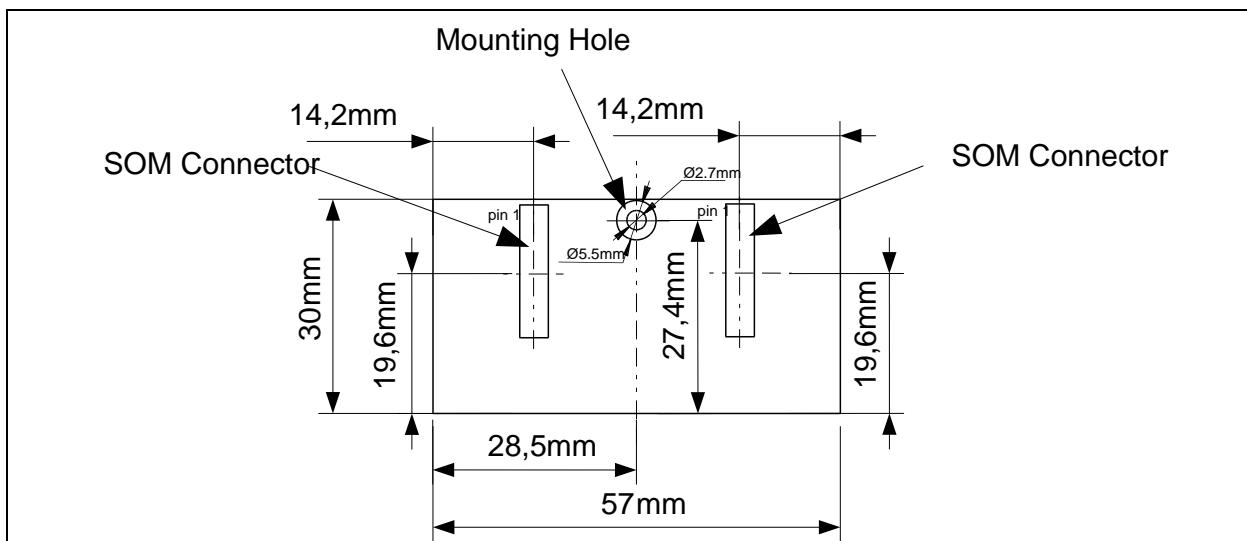

Figure 3: SmartFusion2 SOM Bottom View

3.2. SmartFusion2 SOM Connector Mechanicals

On a baseboard, the SmartFusion2 SOM is installed into two 80-pin Hirose DF40 series 0.4 mm-pitch board-to-board connectors. The exact part number of the connectors is Hirose DF40C-80DP-0.4V(51).

The recommended mating connectors for a baseboard are the Hirose DF40HC(4.0)-80DS-0.4V connector, which provides 4 mm stacking height for the SmartFusion2 SOM. The maximum height of the SOM above a baseboard for 4 mm stacking height is 8 mm.

4. Environment Specifications

4.1. Recommended Operating Conditions

The following table lists the recommended operating conditions of the SmartFusion2 SOM:

Symbol	Parameter	Range
T_A	Ambient temperature	0 to +70 °C using Commercial SmartFusion2 SoC
		-40 to +85 °C using Industrial SmartFusion2 SoC
VCC3	+3.3 V power supply	+3.3 V +/-5%

Table 9: Recommended Operating Conditions

5. Revision History

Revision	Date	Changes Summary
1.10	September 29, 2016	Updated the description of the MSIO102NB8 signal in Table 6 "SmartFusion2 SOM P1 Connector".
1.9	April 13, 2016	Replaced Micrel KSZ8051 with Micrel KSZ8081.
1.8	December 29, 2015	Updated Sections 2.15.2 "Connectors Pin-Out" and 2.15.3 "Unavailable Signals of SmartFusion2".
1.7	November 17, 2015	• Updated Section 2.3.2 "SmartFusion2 Configuration" to add M2S060 and M2S090 configurations; • Replaced 166MHz with 142MHz thought the document; • Updated Table 5 "System Clocks".
1.6	May 29, 2015	• Added Section 4 "Environment Specifications".
1.5	July 4, 2014	Fixed mistakes in Table 6 "SmartFusion2 SOM P1 Connector" for pins 35 and 45 and in Table 7 "SmartFusion2 SOM P2 Connector" for pins 12, 16, 74, and 78.
1.4	January 20, 2014	Fixed mistakes in Table 6 "SmartFusion2 SOM P1 Connector" for pin19 and pin 21 and in Table 7 "SmartFusion2 SOM P2 Connector" for pin 8.
1.3	January 15, 2014	Fixed mistakes in the Default Voltage and Correct Voltage Value columns in Table 2 "Voltage Levels for Different I/O Banks and Dies".
1.2	November 26, 2013	Added reference to SAR46571 in Section 2.14 "RTC".
1.1	August 22, 2013	Clean-up version.
1.0	July 12, 2013	Initial version.

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