



Microsemi SmartFusion2 MSS MMUART Configuration User Guide

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Introduction

The SmartFusion2 Micro controller Subsystem (MSS) provides two MMUART hard peripherals (APB_0 and APB_1 sub busses) with Full/Half Duplex, Asynchronous/ Synchronous mode and Modem interface option. On the MSS Canvas, you must enable (default) or disable each MMUART instance based on whether it is being used in your current application. Disabled MMUART instances are held in reset (lowest power state). By default, ports of enabled MMUART instances are configured to connect to the device Multi Standard I/Os (MSIOs). Note that MSIOs allocated to a MMUART instance are shared with other MSS peripherals. These shared I/Os are available to connect to MSS GPIOs and other peripherals when the MMUART instance is disabled or if the MMUART instance ports are connected to the FPGA fabric. The functional behavior of each MMUART instance must be defined at the application level using the SmartFusion2 MSS MMUART Driver provided by Microsemi.

In this document, we describe how you to configure the MSS MMUART instances and define how the peripheral signals are connected.

For more details about the MSS MMUART hard peripherals, please refer to the SmartFusion2 User Guide.

Configuration Options

Duplex Mode:

- Full Duplex – Provides two signals for serial data, RXD and TXD
- Half Duplex – Provides a single signal for serial data, TXD_RXD

Async/Sync Mode – Selecting Synchronous mode provides a CLK signal.

Modem Interface – Selecting the Modem interface enables access to individual ports in the MODEM port group.

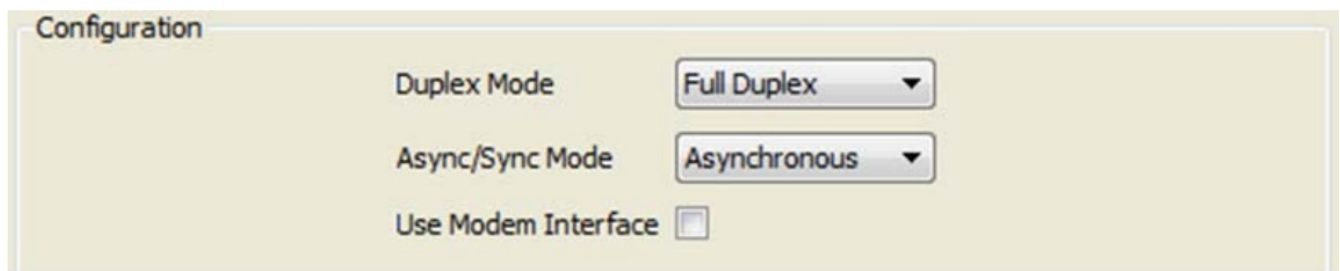
A screenshot of a software configuration window titled "Configuration". It contains three settings: "Duplex Mode" set to "Full Duplex", "Async/Sync Mode" set to "Asynchronous", and "Use Modem Interface" which is an unchecked checkbox.

Figure 1-1 • MMUART Configuration Options

Peripheral Signals Assignment Table

The SmartFusion2 architecture provides a very flexible schema for connecting peripheral signals to either MSIOs or the FPGA fabric. Use the signal assignment configuration table to define what your peripheral is connected to in your application. The assignment table has the following columns (Figure 2-1):

MSIO – Identifies the peripheral signal name configured in a given row.

Main Connection – Use the drop-down list to select whether the signal is connected to an MSIO or the FPGA fabric.

Direction – Indicates if the signal direction is IN, OUT or IN OUT.

Package Pin – Shows the package pin associated with the MSIO when the signal is connected to an MSIO.

Extra Connections – Use the Advanced Options check-box to view the extra connection options:

- Select the Fabric option to observe into the FPGA fabric a signal that is connected to an MSIO.
- Select the GPIO option to observe an input direction signal – from either the FPGA fabric or an MSIO – using an MSS GPIO.

Configuration

Duplex Mode
Full Duplex

Async/Sync Mode
Asynchronous

Use Modem Interface
☐

Assignment

Advanced Options
☒

| MSIO | Direction | Main Connect... | Package Pin | Extra Connection | |
|-------------|-----------|-----------------|-------------|--------------------------|----------------------------------|
| | | | | Fabric | GPI |
| Full Duplex | | | | | |
| RXD | IN | IO | L23 | <input type="checkbox"/> | <input type="checkbox"/> GPIO_28 |
| TXD | OUT | IO | H27 | <input type="checkbox"/> | <input type="checkbox"/> GPIO_27 |
| Half Duplex | | | | | |
| TXD_RXD | INOUT | IO | H27 | <input type="checkbox"/> | <input type="checkbox"/> GPIO_27 |
| Sync/ Async | | | | | |
| CLK | INOUT | IO | H26 | <input type="checkbox"/> | <input type="checkbox"/> GPIO_29 |
| Modem | | | | | |
| RTS | OUT | NotUsed | | <input type="checkbox"/> | <input type="checkbox"/> GPIO_17 |
| DTR | OUT | NotUsed | | <input type="checkbox"/> | <input type="checkbox"/> GPIO_18 |
| DSR | IN | NotUsed | | <input type="checkbox"/> | <input type="checkbox"/> GPIO_20 |
| CTS | IN | NotUsed | | <input type="checkbox"/> | <input type="checkbox"/> GPIO_19 |
| RI | IN | NotUsed | | <input type="checkbox"/> | <input type="checkbox"/> GPIO_21 |
| DCD | IN | NotUsed | | <input type="checkbox"/> | <input type="checkbox"/> GPIO_22 |

Figure 2-1 • I2C Peripheral Signals Assignment Table

Connectivity Preview

The Connectivity Preview panel on the right of the MSS MMUART Configurator dialog shows a graphical view of the current connections for the highlighted signal row (Figure 3-1).

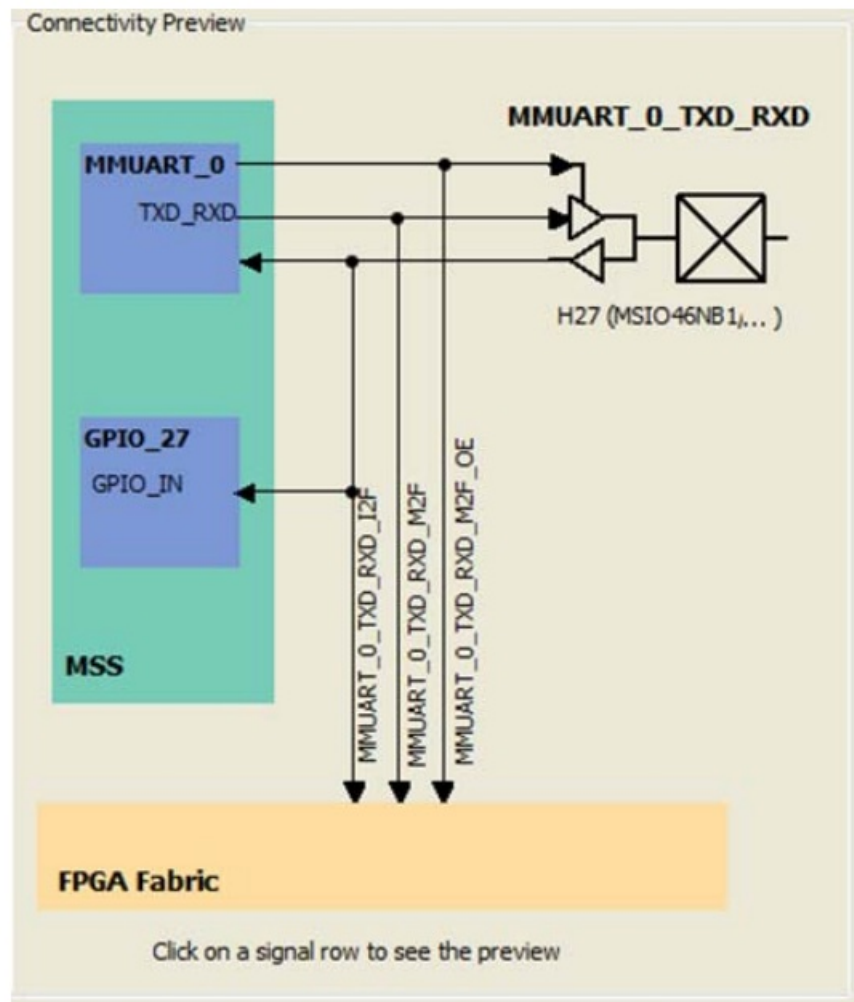


Figure 3-1 • I2C Connectivity Preview

Resource Conflicts

Because MSS peripherals (MMUART, I2C, SPI, CAN, GPIO, USB, Ethernet MAC) share MSIO and FPGA fabric access resources, the configuration of any of these peripherals may result in a resource conflict when you configure an instance of the current peripheral. Peripheral configurations provide clear indicators when such a conflict arises.

Resources used by a previously configured peripheral result in three types of feedback in the current peripheral configurator:

- **Information** – If a resource used by another peripheral does not conflict with the current configuration, an information icon appears in the connectivity preview panel, on that resource. A tool tip on the icon provides details about which peripheral uses that resource.
- **Warning/Error** – If a resource used by another peripheral conflicts with the current configuration, a warning or error icon appears in the connectivity preview panel, on that resource. A tool tip on the icon provides details about which peripheral uses that resource.

When errors are displayed you will not be able to commit the current configuration. You can either resolve the conflict by using a different configuration or cancel the current configuration using the Cancel button.

When warnings are displayed (and there are no errors), you can commit the current configuration. However, you cannot generate the overall MSS; you will see generation errors in the Libero SoC log window. You must resolve the conflict that you created when you committed the configuration by re configuring either of the peripherals causing the conflict.

The peripheral configurations implement the following rules to determine if a conflict should be reported as an

error or a warning.

1. If the peripheral being configured is the GPIO peripheral then all conflicts are errors.
2. If the peripheral being configured is not the GPIO peripheral then all conflicts are errors unless the conflict is with a GPIO resource in which case conflicts will be treated as warnings.

Error Example

The USB peripheral is used and uses the device PAD bounded to package pin H27. Configuring the MMUART_0 peripheral such that the TXD_RXD port is connected to an MSIO will result in an error.

Figure 4-1 shows the error icon displayed in the connectivity assignment table for the TXD_RXD port.

| | | | | |
|---|---------|-------|----|-----|
| ✖ | TXD_RXD | INOUT | IO | H27 |
|---|---------|-------|----|-----|

Figure 4-1 • Error Displayed in the Connectivity Assignment Table

Figure 4-2 shows the error icon displayed in the preview panel on the PAD resource for the TXD_RXD port.

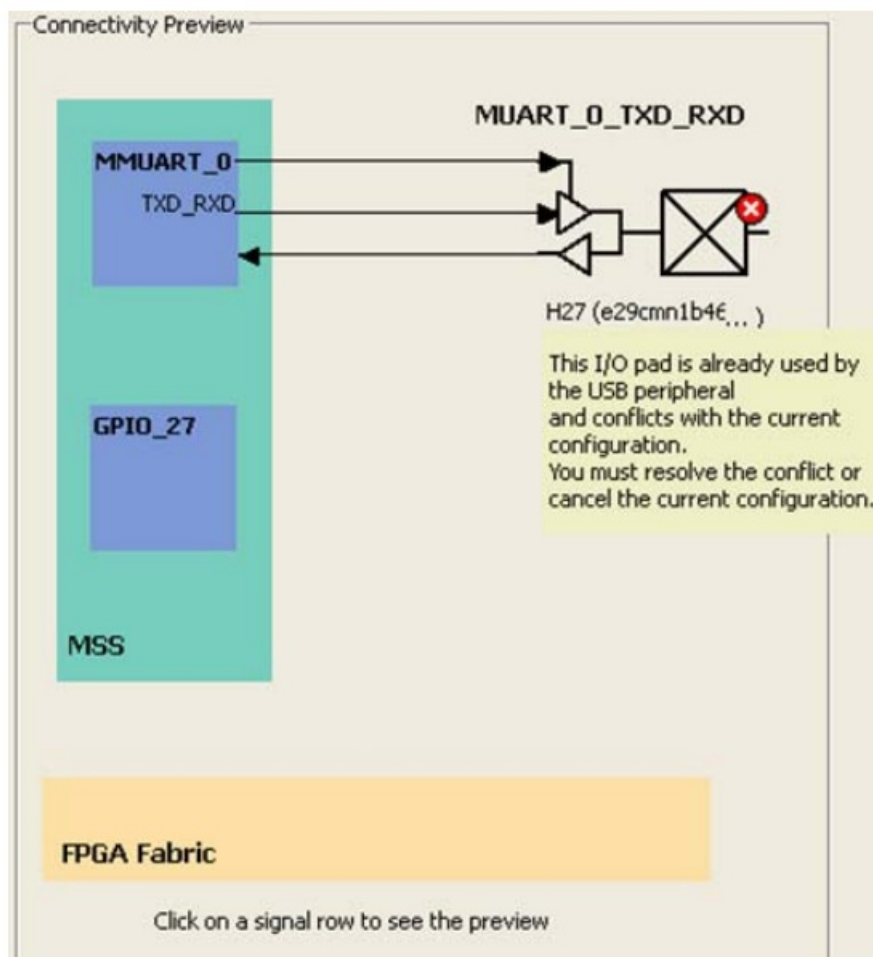


Figure 4-2 • Error in the Preview Panel

Warning Example

The GPIO peripheral is used and uses the device PAD bounded to package pin H27 (GPIO_27). Configuring the MMUART_0 peripheral such that the TXD_RXD port is connected to an MSIO will result in a warning.

Figure 4-3 shows the warning icon displayed in the connectivity assignment table for the TXD_RXD port.

| | | | | |
|--|---------|-------|----|-----|
|  | TXD_RXD | INOUT | IO | H27 |
|--|---------|-------|----|-----|

Figure 4-3 • Warning Displayed in the Connectivity Assignment Table

Figure 4-4 shows the warning icon displayed in the preview panel on the PAD resource for the TXD_RXD port.

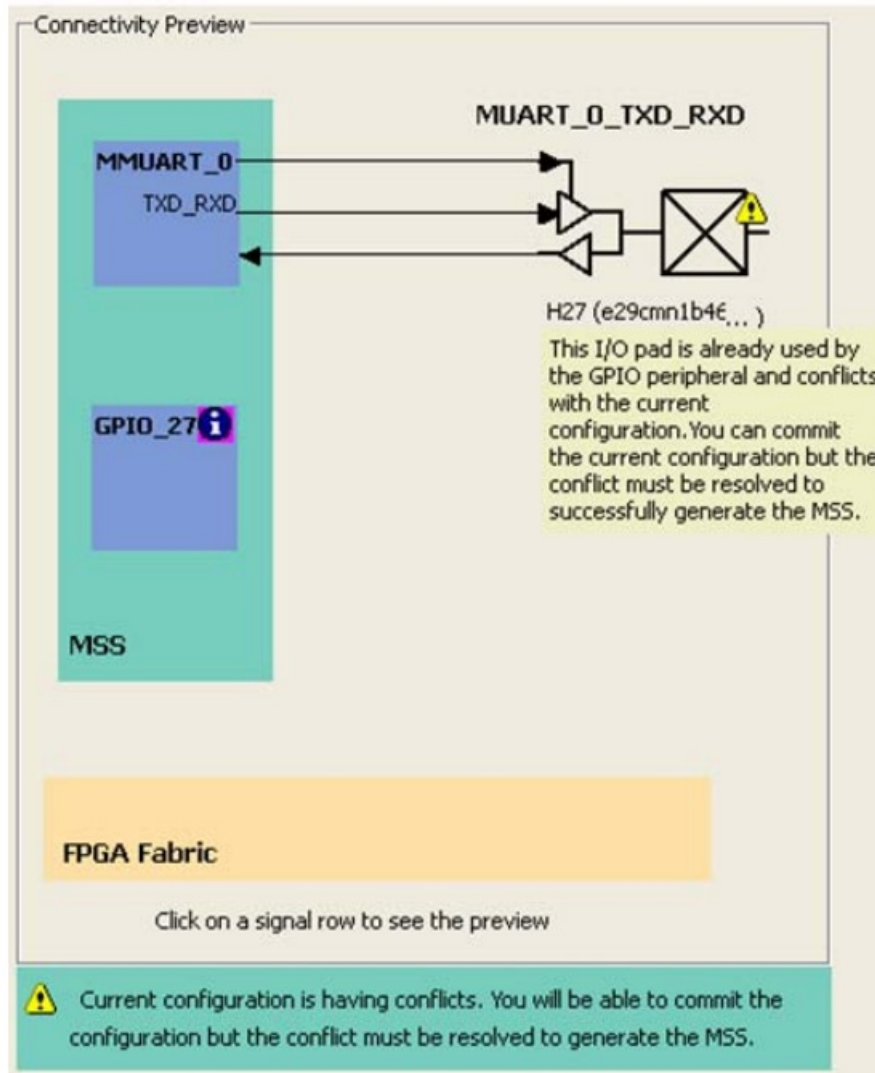


Figure 4-4 • Warning in the Preview Panel

Information Example

The USB peripheral is used and uses the device PAD bounded to package pin H27 (Figure 4-5). Configuring the MMUART_0 peripheral such that the TXD_RXD port is connected to the FPGA fabric does not result in a conflict. However, to indicate that the PAD associated with the TXD_RXD port (but not used in this case), the information icon is displayed in the preview panel. A tool tip associated with the icon provides a description of how the resource is used (USB in this case).

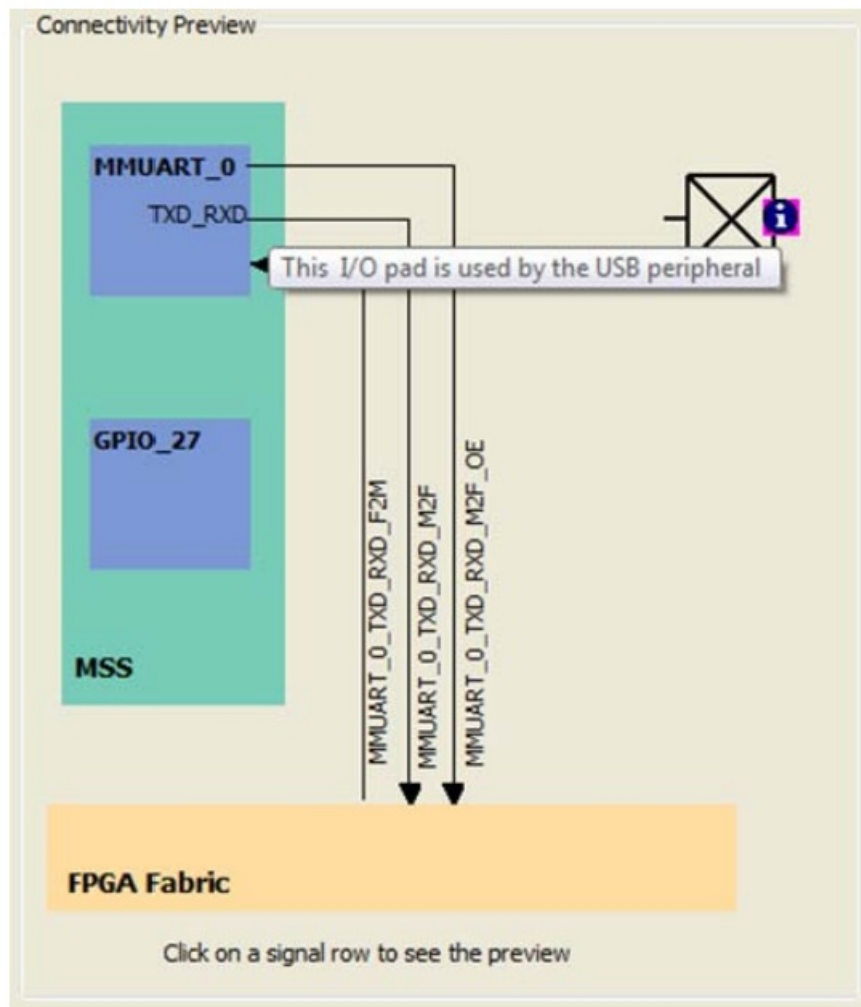


Figure 4-5 • Information Displayed in the Preview Panel

Port Description

Table 5-1 • Port Description

| Port Name | Port Group | Direction | Description |
|-----------|--|-----------|--|
| TXD | MMUART_<n>_PADS MMUART_<n>_FABRIC | Out | Serial output data in Full Duplex mode. This is the data that will be transmitted from Core16550. It is synchronized with the BAUD OUT output pin. |
| RXD | MMUART_<n>_PADS MMUART_<n>_FABRIC | In | Serial Input Data in Full Duplex mode. This is the data that will be transmitted into Core16550. It is synchronized with the PCLK input pin. |
| TXD_RXD | MMUART_<n>_PADS MMUART_<n>_FABRIC | In out | Serial output and input data in Half Duplex mode. |
| CLK | MMUART_<n>_CLK MMUART_<n>_FABRIC_CLK | In out | Clock in synchronous mode. |
| RTS | MMUART_<n>_MODEM_PADS MMUART_<n>_FABRIC_MODEM | Out | Request to Send. This active high output signal is used to inform the attached device (modem) that Core16550 is ready to send data. It is programmed by the CPU via the Modem Control Register. |
| DTR | MMUART_<n>_PADS_MODEM MMUART_<n>_FABRIC_MODEM | Out | Data Terminal Ready. This active high output signal informs the attached device (modem) that Core16550 is ready to establish a communications link. It is programmed by the CPU via the Modem Control Register. |
| DSR | MMUART_<n>_PADS_MODEM MMUART_<n>_FABRIC_MODEM | In | Data Set Ready. This active high signal is an input indicating when the attached device (modem) is ready to set up a link with Core16550. Core16550 passes this information to the CPU via the Modem Status Register. This register also indicates if the DSR signal has changed since the last time the register was read. |
| CTS | MMUART_<n>_PADS_MODEM MMUART_<n>_FABRIC_MODEM | In | Clear to Send. This active high signal is an input showing when the attached device (modem) is ready to accept data. Core16550 passes this information to the CPU via the Modem Status register. This register also indicates if the CTS signal has changed since the last time the register was read. |

| Port Name | Port Group | Direction | Description |
|-----------|--|-----------|---|
| RI | MMUART_<n>_PADS_MODEM MMUART_<n>_FABRIC_MODEM | in | Ring Indicator. This active high signal is an input showing when the attached device (modem) has sensed a ring signal on the telephone line. Core16550 passes this information to the CPU via the Modem Status Register. This register also indicates when the RI trailing edge was sensed. |
| DCD | MMUART_<n>_PADS_MODEM MMUART_<n>_FABRIC_MODEM | In | Data Carrier Detect. This active high signal is an input indicating when the attached device (modem) has detected a carrier. Core16550 passes this information to the CPU via the Modem Status Register. This register also indicates if the DCD signal has changed since the last time the register was read. |

Note

- Port names have the name of the MMUART instance as a prefix, e.g. MMUART_<n>_TXD_RXD.
- Fabric 'main connection' input ports names have "F2M" as a suffix, e.g. MMUART_<n>_RXD_F2M.
- Fabric 'extra connection' input ports names have "I2F" as a suffix, e.g. MMUART_<n>_TXD_RXD_I2F.
- Fabric output and output-enable ports names have "M2F" and "M2F_OE" as a suffix, e.g. MMUART_<n>_TXD_RXD_M2F and MMUART_<n>_TXD_RXD_M2F_OE.
- PAD ports are automatically promoted to top throughout the design hierarchy.

Product Support

Microsemi SoC Products Group backs its products with various support services, including Customer Service, Customer Technical Support Center, a website, electronic mail, and worldwide sales offices. This appendix contains information about contacting Microsemi SoC Products Group and using these support services.

Customer Service

Contact Customer Service for non-technical product support, such as product pricing, product upgrades, update information, order status, and authorization.

From North America, call 800.262.1060

From the rest of the world, call 650.318.4460

Fax, from anywhere in the world, 408.643.6913

Customer Technical Support Center

Microsemi SoC Products Group staffs its Customer Technical Support Center with highly skilled engineers who can help answer your hardware, software, and design questions about Microsemi SoC Products. The Customer Technical Support Center spends a great deal of time creating application notes, answers to common design cycle questions, documentation of known issues, and various FAQs. So, before you contact us, please visit our online resources. It is very likely we have already answered your questions.

Technical Support

Visit the Customer Support website (www.microsemi.com/soc/support/search/default.aspx) for more information and support. Many answers available on the searchable web resource include diagrams, illustrations, and links to other resources on the website.

Website

You can browse a variety of technical and non-technical information on the SoC home page, at www.microsemi.com/soc.

Contacting the Customer Technical Support Center

Highly skilled engineers staff the Technical Support Center. The Technical Support Center can be contacted by email or through the Microsemi SoC Products Group website.

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You can communicate your technical questions to our email address and receive answers back by email, fax, or phone. Also, if you have design problems, you can email your design files to receive assistance. We constantly monitor the email account throughout the day. When sending your request to us, please be sure to include your full name, company name, and your contact information for efficient processing of your request.

The technical support email address is soc_tech@microsemi.com.

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Microsemi SoC Products Group customers may submit and track technical cases online by going to My Cases.

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ITAR Technical Support

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Documents / Resources

| | |
|---|---|
| The logo for the Microsemi SmartFusion2 MSS MMUART Configuration document. It features a small rectangular box with the text "SmartFusion2 MSS MMUART Configuration" inside, and the Microsemi logo at the bottom left. | <p>Microsemi SmartFusion2 MSS MMUART Configuration [pdf] User Guide SmartFusion2 MSS MMUART Configuration, MSS MMUART Configuration, MMUART Configuration</p> |
|---|---|

References

- [Microsemi | Semiconductor & System Solutions | Power Matters](#)
- [Libero® SoC Design Suite Versions 2023.1 to 12.0 | Microchip Technology](#)
- [Libero® SoC Design Suite Versions 2023.1 to 12.0 | Microchip Technology](#)
- [Libero® SoC Design Suite Versions 2022.3 to 12.0 | Microchip Technology](#)
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