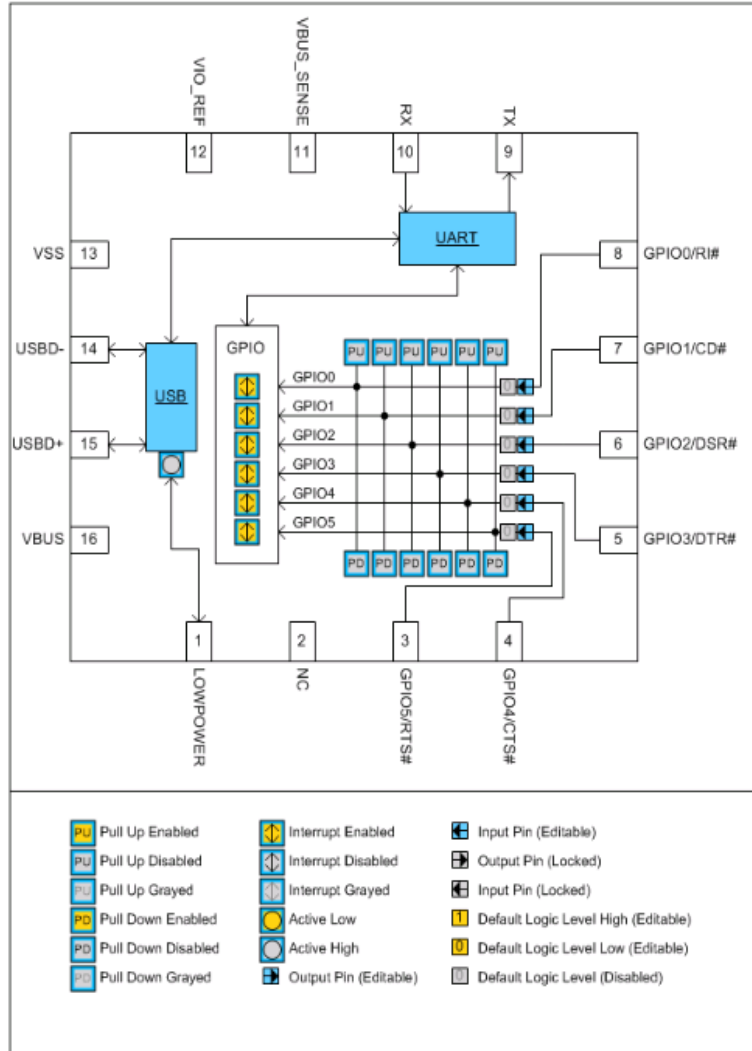


Exar XR21B1411IL 16 Enhanced 1-Ch Full-Speed USB UART



GPIO Pin Configuration

- GPIO Mode
- Auto RTS/CTS HW Flow Control
- Auto DTR/DSR HW Flow Control
- Half-Duplex XCVR Enable (RS-485)
 - Active High
 - Active Low

Manage Design Configuration Files

Check Design

Allow configuration to be viewed by Exar
(This information will be treated confidentially and will only be used to improve future designs)

Load an Existing Design

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1.0 OVERVIEW

The XR21B1411 Enhanced 1-Channel Full-Speed USB UART has internal One-Time-Programmable (OTP) memory that can be used to customize the default settings of the XR21B1411. The web configuration tool for the XR21B1411 from Exar I/O Lab is shown above and can be accessed from a link on the XR21B1411 product page on Exar's website. This tool shows a visual representation of how the device will behave upon power-up such as the GPIO settings, UART settings and USB parameters (ie. Vendor ID, Product ID, Device Maximum Power, etc.). Once the XR21B1411 has been configured using this tool, the design configuration can be downloaded and used as an input file for Exar's OTP programming tool (also available from Exar's website) to program the XR21B1411 device.

This manual provides instruction for configuring the XR21B1411 and provides notes/tips for the various settings that are available. Note that once the XR21B1411 is programmed, no further changes or modifications can be made to the OTP.

2.0 GPIO PIN CONFIGURATIONS

There are 4 modes available for the GPIO pins. Details of these 4 modes can be found in the XR21B1411 datasheet on [Exar's website](#). The 4 modes that can be selected are:

- GPIO Mode
 - Auto RTS/CTS HW Flow Control
 - Auto DTR/DSR HW Flow Control
 - Auto Half-Duplex Transceiver Enable (typically used for RS-485)

2.1 *Configuring the GPIO pins in GPIO Mode*

There are 6 GPIO pins on the XR21B1411. By default, they are General Purpose I/Os that can be configured either as inputs or outputs. In this mode, the defaults for the GPIOs are:

- Inputs
 - Internal pull-up and pull-down resistors disabled
 - Interrupts are enabled for GPIOs configured as inputs

2.1.1 Configuring GPIO inputs

2.1.1.1 Enabling internal pull-up or pull-down resistors

As an input, a GPIO can have either an internal pull-up or pull-down resistor enabled. The pull-up or pull-down resistor for an input can be configured by clicking on "PU" or "PD" for the desired GPIO input pins (shown in the green circles in the image above). If enabled, the "PU" or "PD" will turn yellow for "enabled". Note that the configuration tool will not allow both to be enabled at the same time. The last block clicked, "PU" or "PD", will determine if the GPIO has an internal pull-up or pull-down resistor enabled. Clicking on the "PU" and "PD" blocks will not have any effects if the GPIO is an output. Also, changing an input to an output will clear any "PU" or "PD" block that has been enabled for that GPIO.

2.1.1.2 Enabling GPIO interrupts

By default, the GPIO interrupts are enabled. Any GPIO that is an input will generate an interrupt when its input state changes. The GPIO interrupt can be disabled by clicking on the GPIOs in the purple circle in the image above. If a GPIO is configured as an output, the interrupt will automatically be disabled for that GPIO.

2.1.2 Configuring GPIO outputs

By clicking on the arrows highlighted with the red circle above, the GPIOs will change from inputs to outputs as shown in the image below. Once the GPIO is an output, the block next to the output arrow will turn yellow and display "0" indicating that the default output state will be low upon power-up. Clicking on this block will change it to a "1" indicating that the default output state will be high upon power-up. An example of this is shown below for GPIO2.

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Storage
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Power

Exar XR21B1411L 16 Enhanced 1-Ch Full-Speed USB UART

GPIO Pin Configuration

GPIO Mode

Auto RTS/CTS HW Flow Control

Auto DTR/DSR HW Flow Control

Half-Duplex XCVR Enable (RS-485)

Active High

Active Low

Manage Design Configuration Files

Check Design

Allow configuration to be viewed by Exar
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Load an Existing Design

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Pull Up Enabled	Interrupt Enabled	Input Pin (Editable)
Pull Up Disabled	Interrupt Disabled	Output Pin (Locked)
Pull Up Grayed	Interrupt Grayed	Input Pin (Locked)
Pull Down Enabled	Active Low	Default Logic Level High (Editable)
Pull Down Disabled	Active High	Default Logic Level Low (Editable)
Pull Down Grayed	Output Pin (Editable)	Default Logic Level (Disabled)

2.2 Configuring the GPIO Pins in Auto RTS/CTS Flow Control Mode

In Auto RTS/CTS flow control mode, GPIO5/RTS# becomes an output pin and GPIO4/CTS# becomes an input pin. GPIO5/RTS# can not be changed to an input and, similarly, GPIO4/CTS# can not be changed to an output. The configuration is shown below.

The screenshot shows the EXAR I/O LAB web interface. At the top, there is a navigation bar with links for Home, About Us, News, Careers, Investors, Contact, Quality, PartnerNet, and Welcome, Patong. Below this is a search bar and a menu with categories: Communications, Networking, Storage, Interface, and Power. The main content area is titled "Exar XR21B1411IL 16 Enhanced 1-Ch Full-Speed USB UART".

The central diagram illustrates the internal architecture of the device. It shows a USB controller connected to pins 14 (USB-), 15 (USB+), and 16 (VBUS). A UART module is connected to pins 9 (TX), 10 (RX), 11 (VBUS_SENSE), and 12 (VIO_REF). A GPIO controller is connected to pins 1, 2, 3, 4, 5, 6, 7, and 8. The GPIO pins are configured as follows: GPIO0/R# (pin 8) is an output pin; GPIO1/CD# (pin 7) is an input pin; GPIO2/DSR# (pin 6) is an input pin; GPIO3/DTR# (pin 5) is an input pin; GPIO4/CTS# (pin 4) is an input pin; and GPIO5/RTS# (pin 3) is an output pin. The diagram also shows the internal connections between the USB controller, UART, and GPIO controller, including pull-up and pull-down resistors.

Below the diagram is a legend explaining the symbols used in the configuration tool:

- Pull Up/Down:**
 - PU (Yellow): Pull Up Enabled
 - PU (Blue): Pull Up Disabled
 - PU (Grey): Pull Up Grayed
 - PD (Yellow): Pull Down Enabled
 - PD (Blue): Pull Down Disabled
 - PD (Grey): Pull Down Grayed
- Interrupts:**
 - Interrupt Enabled (Yellow): Interrupt Enabled
 - Interrupt Disabled (Blue): Interrupt Disabled
 - Interrupt Grayed (Grey): Interrupt Grayed
- Pin Configuration:**
 - Input Pin (Editable): Blue square with a white circle
 - Output Pin (Locked): Blue square with a white circle and a lock icon
 - Input Pin (Locked): Blue square with a white circle and a lock icon
 - Default Logic Level High (Editable): Yellow square
 - Default Logic Level Low (Editable): Blue square
 - Default Logic Level (Disabled): Grey square

On the right side of the screenshot, there are two configuration panels. The top panel is titled "GPIO Pin Configuration" and shows the following options:

- GPIO Mode
- Auto RTS/CTS HW Flow Control
- Auto DTR/DSR HW Flow Control
- Half-Duplex XCVR Enable (RS-485)
- Active High (radio)
- Active Low (radio)

The bottom panel is titled "Manage Design Configuration Files" and contains a "Check Design" button, a checkbox for "Allow configuration to be viewed by Exar", and a "Load an Existing Design" section with "Browse..." and "Load Design" buttons.

In this mode, GPIO3-GPIO0 can still be configured as described in "Section 2.1, Configuring the GPIO pins in GPIO Mode" on page 1.

2.3 Configuring the GPIO Pins in Auto DTR/DSR Flow Control Mode

Auto DTR/DSR Flow Control Mode is similar to Auto RTS/CTS Flow Control Mode. In this mode, GPIO3/DTR# is configured as an output and GPIO2/DSR# is configured as an input and their direction can not be changed. The Auto DTR/DSR Flow Control configuration is shown below.

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Networking
Storage
Interface
Power

Exar XR21B1411L16 Enhanced 1-Ch Full-Speed USB UART

	Pull Up Enabled		Interrupt Enabled		Input Pin (Editable)
	Pull Up Disabled		Interrupt Disabled		Output Pin (Locked)
	Pull Up Grayed		Interrupt Grayed		Input Pin (Locked)
	Pull Down Enabled		Active Low		Default Logic Level High (Editable)
	Pull Down Disabled		Active High		Default Logic Level Low (Editable)
	Pull Down Grayed		Output Pin (Editable)		Default Logic Level (Disabled)

GPIO Pin Configuration

GPIO Mode

Auto RTS/CTS HW Flow Control

Auto DTR/DSR HW Flow Control

Half-Duplex XCVR Enable (RS-485)

Active High

Active Low

Manage Design Configuration Files

Allow configuration to be viewed by Exar
(This information will be treated confidentially and will only be used to improve future designs)

Load an Existing Design

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In this mode, GPIO5, GPIO4, GPIO1, and GPIO0 can still be configured as described in **“Section 2.1, Configuring the GPIO pins in GPIO Mode”** on page 1.

2.4 Configuring the GPIO Pins in Auto Half-Duplex Transceiver Enable Mode

The Auto Half-Duplex Transceiver enable mode is typically used in half-duplex RS-485 applications. In this mode the GPIO5/RTS# pin is used to control the driver enable of an RS-485 transceiver. When this mode is selected, the polarity will also need to be selected as active high or active low.

- Active High - The GPIO5/RTS# pin will be low when the UART is not transmitting data and the GPIO5/RTS# pin will be high when the UART is transmitting data.
- Active Low - The GPIO5/RTS# pin will be high when the UART is not transmitting data and the GPIO5/RTS# pin will be low when the UART is transmitting data.

An example of how the Auto Half-Duplex Transceiver enable mode is shown below. The block next to the "TX EN" also shows whether the selected polarity is active high or active low.

The screenshot shows the EXAR I/O LAB web interface. At the top, there is a navigation menu with links for Home, About Us, News, Careers, Investors, Contact, Quality, PartnerNet, and Welcome. A search bar is also present. Below the navigation, there are tabs for Communications, Networking, Storage, Interface, and Power. The main content area is titled "Exar XR21B1411IL 16 Enhanced 1-Ch Full-Speed USB UART".

The central part of the screenshot is a pin configuration diagram. It shows a 16-pin connector with pins labeled 1 through 16. Pin 1 is LOWPOWER, Pin 2 is NC, Pin 3 is GPIO5/RTS#, Pin 4 is GPIO4/CTS#, Pin 5 is GPIO3/DTR#, Pin 6 is GPIO2/DSR#, Pin 7 is GPIO1/CD#, Pin 8 is GPIO0/R#, Pin 9 is TX, Pin 10 is RX, Pin 11 is VBUS_SENSE, Pin 12 is VIO_REF, Pin 13 is VSS, Pin 14 is USB-, Pin 15 is USB+, and Pin 16 is VBUS. The diagram shows a USB controller block connected to pins 14, 15, and 16. A UART controller block is connected to pins 9, 10, and 11. A GPIO controller block is connected to pins 3, 4, 5, 6, 7, and 8. The TX EN pin (GPIO5/RTS#) is shown with a pull-down resistor and an active low symbol.

On the right side of the screenshot, there is a "GPIO Pin Configuration" panel. It has several radio button options:

- GPIO Mode
- Auto RTS/CTS HW Flow Control
- Auto DTR/DSR HW Flow Control
- Half-Duplex XCVR Enable (RS-485)
 - Active High
 - Active Low

Below the configuration panel, there is a "Manage Design Configuration Files" section with a "Check Design" button and a checkbox for "Allow configuration to be viewed by Exar". There is also a "Load an Existing Design" section with a "Browse..." button and a "Load Design" button.

At the bottom of the diagram, there is a legend for various pin configurations:

- PU** Pull Up Enabled
- PU** Pull Up Disabled
- PU** Pull Up Grayed
- PD** Pull Down Enabled
- PD** Pull Down Disabled
- PD** Pull Down Grayed
- I** Interrupt Enabled
- I** Interrupt Disabled
- I** Interrupt Grayed
- A** Active Low
- A** Active High
- O** Output Pin (Editable)
- I** Input Pin (Editable)
- L** Output Pin (Locked)
- L** Input Pin (Locked)
- H** Default Logic Level High (Editable)
- L** Default Logic Level Low (Editable)
- D** Default Logic Level (Disabled)

In this mode, GPIO4-GPIO0 can still be configured as described in "Section 2.1, Configuring the GPIO pins in GPIO Mode" on page 1.

3.0 USB CONFIGURATIONS

By clicking on the "USB" block, an additional configuration window will appear on the right hand side of the screen, as shown below.

GPIO Pin Configuration

- GPIO Mode
- Auto RTS/CTS HW Flow Control
- Auto DTR/DSR HW Flow Control
- Half-Duplex XCVR Enable (RS-485)
- Active High
- Active Low

USB Configuration

Vendor ID: 0x0000 (4 digit hex value ONLY)

Product ID: 0x0000 (4 digit hex value ONLY)

Manufacturer String: [] Left

Product String: [] Left

Serial Number String: [] Left

Remote Wakeup

Self Powered

Enable VBUS Sense

USB Max Power in mA: [100] mA

Manage Design Configuration Files

Allow configuration to be viewed by Exar
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3.1 Entering a Valid Vendor ID and Product ID

In this new window, the USB parameters can be entered. The configuration tool will have defaults of 0x0000 in the Vendor ID (VID) and Product ID (PID) field. A VID or PID of 0x0000 is not an acceptable and will reported later as an error when the "Check Design" button is pressed if valid IDs have not been entered. If using Exar's VID (0x04E2) and PID (0x1411), these values will need to be entered. A unique range of PIDs can be requested from Exar by sending an e-mail request to uarttechsupport@exar.com.

3.2 USB Manufacturer, Product, Serial Number Strings

The default Manufacturer String is "Exar" and Product String is "XR21B1411" if no string values have been entered. There is no default value for the Serial Number String. If one string is entered, then all three strings need to be updated or they will not have a value when the OTP is programmed. Entering a value for the Serial Number String is optional.

3.3 Remote Wake-up Support

By default, remote wake-up support is enabled. This can be disabled by unchecking the box. Note that if the software driver does not have the remote wake-up feature enabled, then the XR21B1411 will not issue a remote wake-up signal when a remote wake-up event occurs. Note that the standard CDC-ACM driver does not support the Remote Wake-up feature.

3.4 Selecting the Power Mode

By default, bus-powered mode is enabled. The XR21B1411 can be configured for self-powered mode by checking the box next to "Self Powered". For self-power mode, it is recommended that the box next to "Enable VBUS Sense" also be checked. The VBUS Sense feature disables the internal pull-up resistor on the USBD+ pin when there is no power on the VBUS pin. This is required for USB compliance. If the VBUS Sense feature is not available, then an external mechanism is required to disable the power supply to the XR21B1411.

3.5 USB Max Power

By default, the USB maximum power is configured as 100 mA. This is the maximum for a low power device, as described in the USB specifications. Any board that requires more than 100 mA from VBUS will be considered a high power device. The maximum allowable supply current is 500 mA for a high power device. The USB max power can be changed by clicking on the arrows on either end of the scroll bar or by dragging the horizontal scroll bar.

3.6 LOWPOWER Pin Polarity

The default polarity of the LOWPOWER pin (pin 1) is active high as shown in the drawing. The polarity can be changed by clicking on the box below the USB block in the drawing. The inner circle will become yellow to indicate that the LOWPOWER pin is now active low.

4.0 UART SETTING CONFIGURATIONS

Clicking on the "UART" block will remove the USB Configuration window and display the "UART Configuration Window" as shown below.

GPIO Pin Configuration

- GPIO Mode
- Auto RTS/CTS HW Flow Control
- Auto DTR/DSR HW Flow Control
- Half-Duplex XCVR Enable (RS-485)
- Active High
- Active Low

UART Configuration

Core Clock

- 6 Mhz
- 12 Mhz
- 24 Mhz
- 48 Mhz

Baud Rate: Max: 12000000 Baud

Data Bits	Stop Bits	Parity
<input type="radio"/> 7	<input checked="" type="radio"/> 1	<input checked="" type="radio"/> None
<input checked="" type="radio"/> 8	<input type="radio"/> 2	<input type="radio"/> Mark
<input type="radio"/> 9		<input type="radio"/> Space
		<input type="radio"/> Even
		<input type="radio"/> Odd

Manage Design Configuration Files

Allow configuration to be viewed by Exar
(This information will be treated confidentially and will only be used to improve future designs)

Load an Existing Design

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4.1 Selecting the Core Clock Frequency

The available core clock frequencies are 6 MHz, 12 MHz, 24 MHz and 48 MHz. The selection of the core clock frequency will affect the maximum baud rate and the power consumption. The maximum baud rate can be calculated by dividing the core clock frequency by 4.

- 6 MHz core clock frequency => 1.5 Mbps maximum baud rate
- 12 MHz core clock frequency => 3 Mbps maximum baud rate
- 24 MHz core clock frequency => 6 Mbps maximum baud rate
- 48 MHz core clock frequency => 12 Mbps maximum baud rate

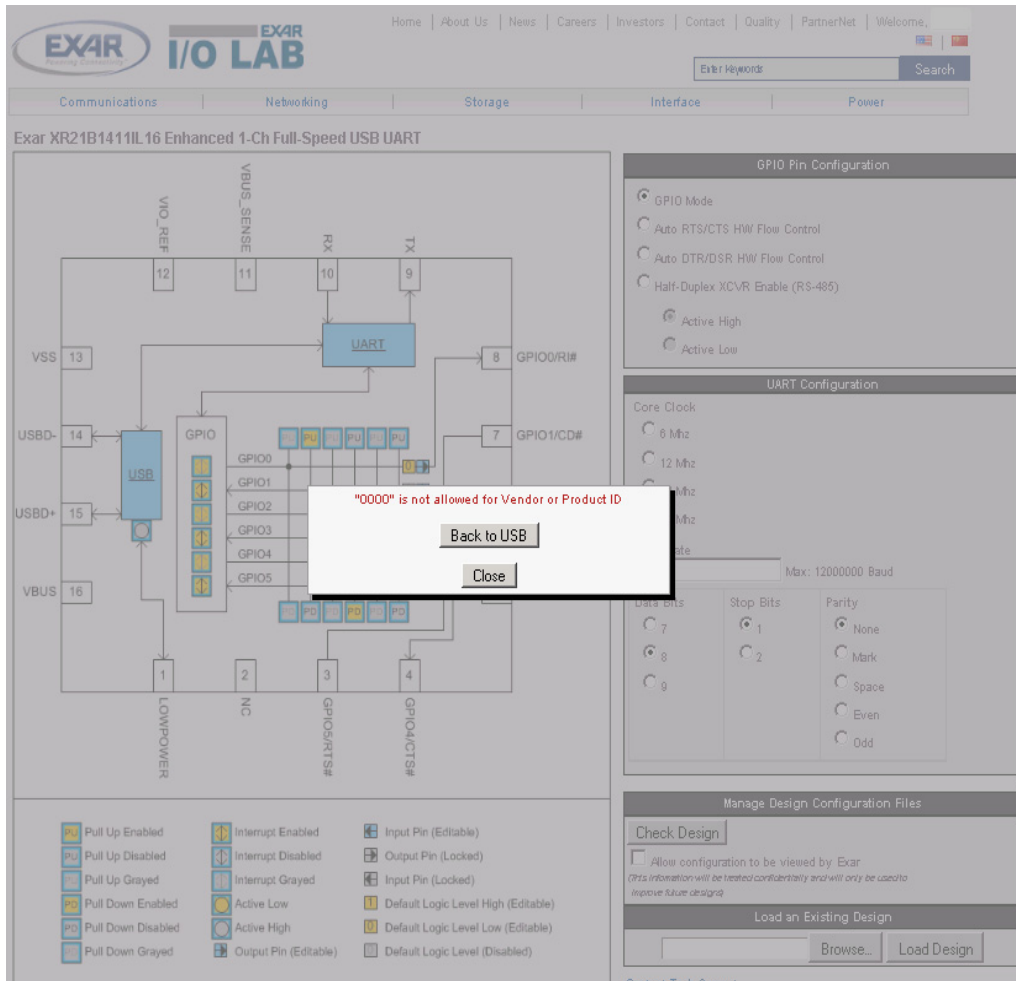
For details of how much power the XR21B1411 consumes with each core clock frequency, refer to the XR21B1411 datasheet on [Exar's website](#). Note that the higher the core clock frequency, the more power it consumes. If an application is battery-powered, it will be beneficial to use a 6 MHz core clock frequency if baud rates above 1.5 Mbps do not need to be supported.

4.2 Selecting the UART default settings

Default baud rates and character formats can be entered and selected. Most standard software drivers and applications will typically initialize the UART settings. However, this may be helpful for custom software drivers and/or software applications that do not initialize/configure the UART settings.

5.0 CHECK DESIGN AND GENERATE CONFIGURATION FILE

Once all of the desired configurations have been entered or selected, click on the "Check Design" button. This will check to see if there are any errors. If there are errors, then a pop-up message, as shown below, will appear indicating the error and a button to go back to the correct page to fix it.



In this example, the VID and PID were not entered. Clicking on "Back to USB" will bring up the "USB Configuration" block where the VID and PIDs can be entered. Once the error has been fixed, click "Check Design" again. If there are no errors, then a pop-up window similar to the one below will appear.

Click on "Download Design File" to view and save the generated file. The file will have a ".xml" extension. This saved file can be used at a later date by loading it using the "Load an Existing Design" block.

6.0 XR21B1411 SOFTWARE DRIVER AND OTP PROGRAMMING TOOL

The XR21B1411 Software Driver and OTP Programming Tool can be downloaded from [Exar's website](#). The software driver needs to be installed before the OTP Programming Tool can be used. It is recommended that the configuration be carefully reviewed before programming the OTP memory. Once the OTP memory has been programmed, it can not be un-programmed. It is also recommended that samples be programmed and tested before programming in volume.

7.0 TECHNICAL SUPPORT

If there are any questions about the web configuration tool, configuration file or the XR21B1411, send your questions to uarttechsupport@exar.com.

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