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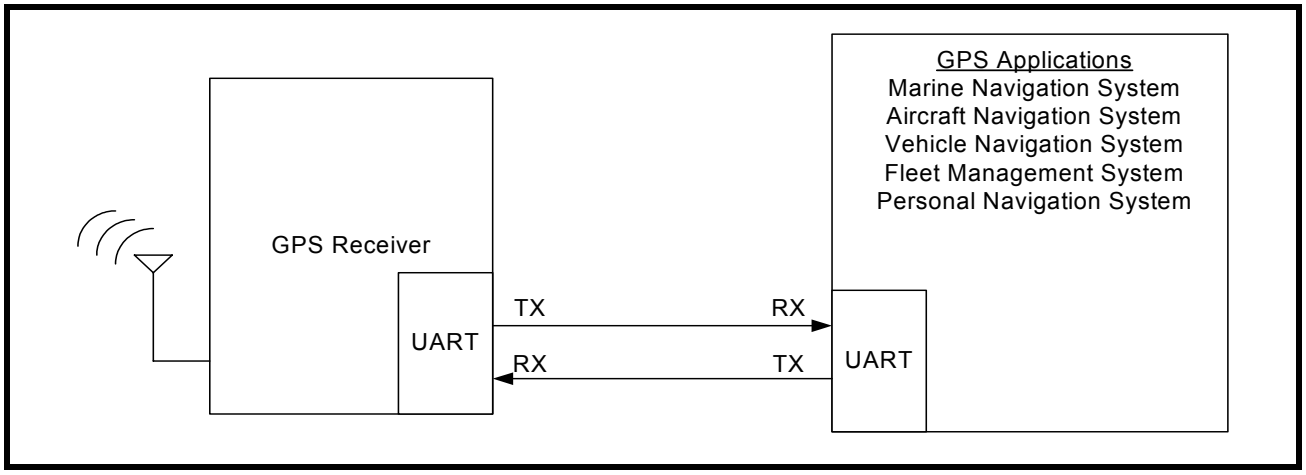
EXAR UARTS IN GPS APPLICATIONS

1.0 INTRODUCTION

This application note describes where an Exar UART can be used in a Global Positioning System (GPS) application. GPS has traditionally been used in military applications such as marine navigation, aircraft navigation, and weapon's guidance. However, GPS applications have recently expanded to industrial and consumer applications such as vehicle navigation systems, fleet management, and personal navigation. In these applications, the Exar UART can be used in the GPS receiver and in the GPS application.

FIGURE 1. GPS APPLICATION EXAMPLES



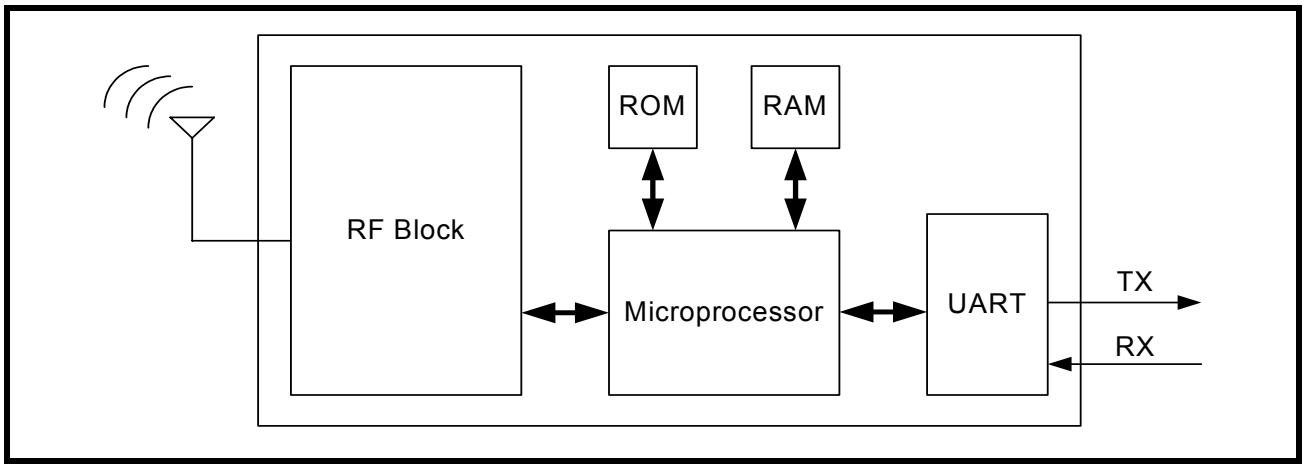
1.1 GPS Receiver

A GPS receiver typically includes the following:

- RF block for receiving the GPS data and converting it to digital data
- Microprocessor for processing the data
- ROM to store the firmware for processing the data
- RAM used by the microprocessor for data processing
- UART to send data to the GPS application

The figure below shows a block diagram of a GPS receiver.

FIGURE 2. GPS RECEIVER BLOCK DIAGRAM



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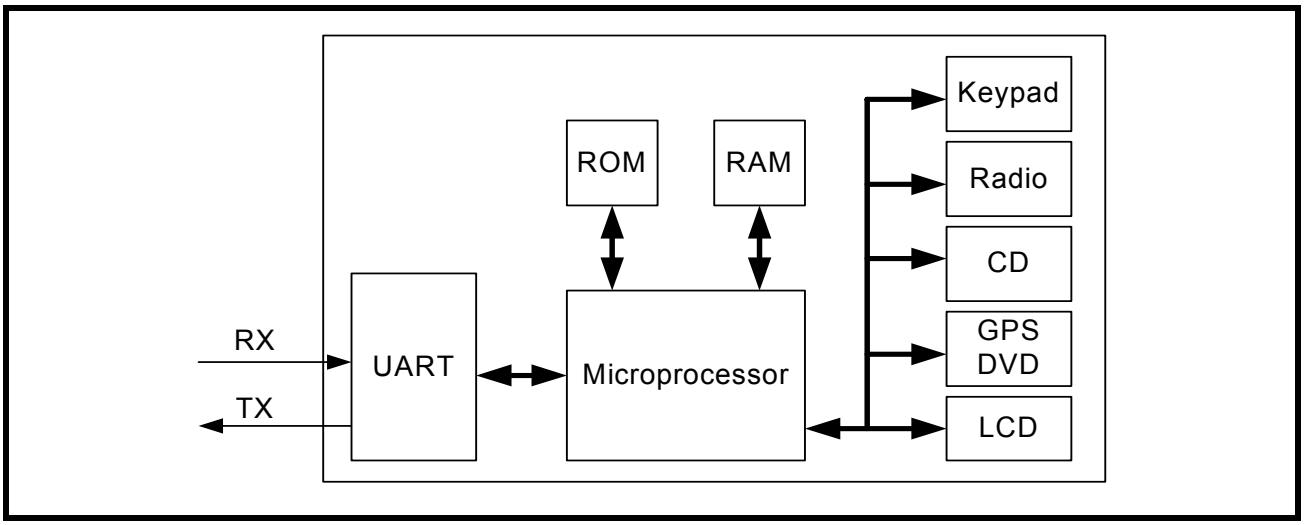
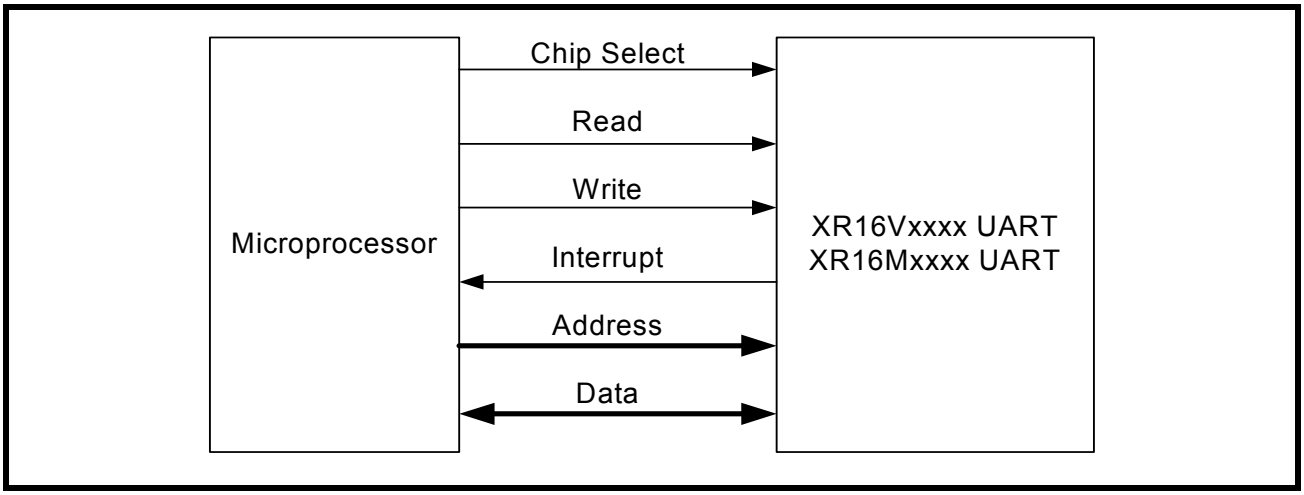
The figure below shows a block diagram of an automobile GPS navigation system:

FIGURE 3. AUTOMOBILE GPS NAVIGATION SYSTEM EXAMPLE



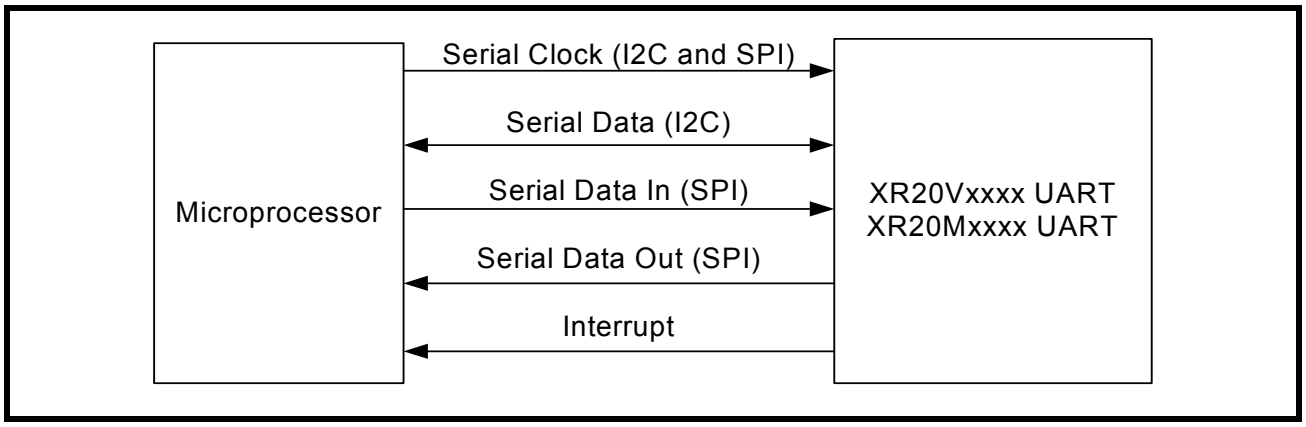
The UART that has been used in the GPS receiver or in the GPS application has typically been an industry standard 16550 UART or a UART that is available on the microprocessor. In place of the standard UART, an enhanced Exar UART can be used to replace the UART on both the GPS receiver and GPS application to increase performance and data throughput. If the micrprocessor has a local 8-bit (Intel or Motorola) bus interface, then any of the XR16Vxxxx or XR16Mxxxx high performance UARTs can be used.

FIGURE 4. 8-BIT BUS INTERFACE



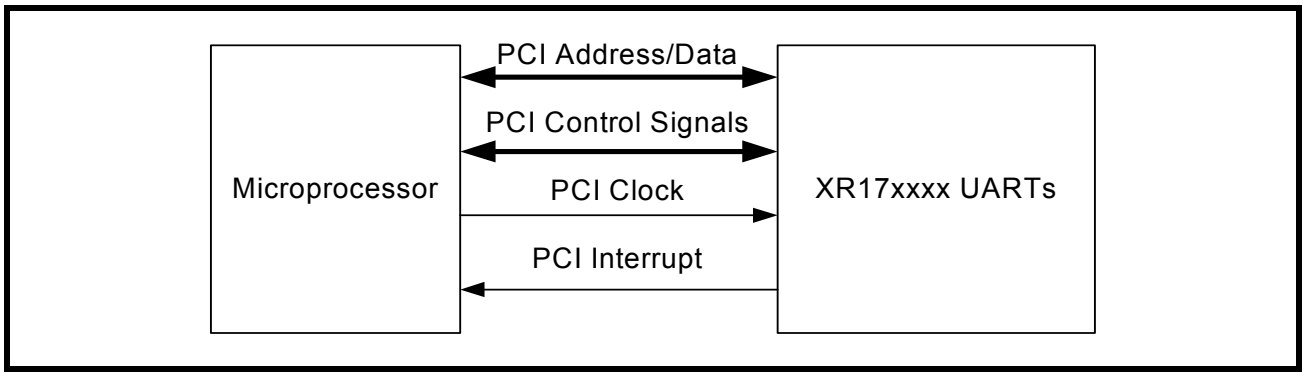
If the microprocessor has either an SPI or I2C bus interface, then any of the XR20Mxxxx or XR20Vxxxx I2C/SPI UARTs can be used.

FIGURE 5. I2C/SPI INTERFACE



In the case that a microprocessor has a PCI bridge, then any of the XR17xxx PCI UARTs can be used.

FIGURE 6. PCI BUS INTERFACE



The advantages of using an enhanced Exar UART are discussed in the following sections.

1.1.1 Advantages of using Exar UARTs in a GPS Application

1.1.1.1 Higher data throughput

The data throughput can be significantly increased as the maximum baud rate is 16 Mbps. The maximum baud rate for a UART on existing GPS receivers range from 4800 bps up to 115.2 Kbps. For example, assuming that each byte is 10 bits long (1 start bit, 8 data bits, no parity, 1 stop bit), it would take approximately 10 milliseconds to send 128 bytes of data at 115.2 Kbps. With Exar's UART operating at 16 Mbps, it would only take 80 microseconds to send the same data.

1.1.1.2 Larger FIFOs

To support the higher data rates, Exar UART's have larger FIFOs to reduce the servicing time between interrupts to allow the microprocessor more time to perform other tasks.

1.1.1.3 Automatic Flow Control

To prevent data overrun errors, Exar UARTs have automatic hardware (RTS/CTS) flow control and software (XON/XOFF) flow control features that can be enabled. Current GPS applications do not use any flow control features resulting in slower baud rates.

1.1.1.4 Fractional Baud Rate Generator

The industry standard 16550 UART requires a standard clock or crystal to generate standard baud rates. With the fractional baud rate generator feature of enhanced Exar UARTs, that is no longer a requirement. The enhanced Exar UART can generate any standard or custom baud rate with any clock frequency. Therefore, any existing clock source on the board (such as the clock used by the microprocessor) can be used by the Exar UART resulting in reduced board costs.

1.1.1.5 Wide Operating Voltage Range

The XR16Mxxxx and XR20Mxxxx UARTs can operate from 1.62V to 3.63V, the XR16Vxxxx and XR20Vxxxx UARTs can operate from 2.25V to 3.63V and the XR17xxxx (PCI) UARTs can operate 3.3V.

1.1.1.6 Lower power consumption

In addition to lower operating voltages, Exar's enhanced UARTs have a sleep and/or PowerSave mode to further conserve power when the UART is not being used. In the sleep/PowerSave mode, the power consumption is less than 30 uA at 3.3V and less than 15 uA at 1.8V. This feature would be ideal in extending the battery life for portable/handheld applications.

1.1.1.7 Small package footprint

Most Exar UARTs are available in a leadless QFN package (as small as 4mm X 4mm X 0.9mm) to optimize the use of board space in space-constrained applications.

2.0 CONCLUSION

Any existing or new GPS application can be improved by using an enhanced Exar UART. Exar's UARTs have enhanced features that can increase data throughput while preventing data loss and data errors. Exar's enhanced UARTs can easily be interfaced with any microcontroller that has an 8-bit (Intel or Motorola) bus interface, an I2C/SPI interface or a PCI interface.

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Send your UART technical inquiry with technical details to hotline: uarttechsupport@exar.com.