May 1999

Infrared Application with ST16C580, ST16C650A or XR16C850 UART

Description

This application note describes the application of using the infrared encoder and decoder (Endec) inside the Exar ST16C580, ST16C650A or XR16C850 UART for wireless data communications. Although this appnote describes itCongraduations with a single channel UART, it also applies to the XR16C2850/2852 DUARTs and ST16C654, XR16C854 and XR16C864 QUARTs. The Endec complies with Infrared Data Association (IrDA) version 1.0 pulse shaping. The encoder converts each “zero” data bit that consists of 16 segments to a pulse that is just 3/16 segment wide. This is done to conserve battery power in portable instruments. The decoder detects the light from the transmitting LED and converts it to a full bit time of 16 segments and assembles the bit into a character (data byte) for the controlling CPU. Figure 1 on next page illustrates the CPU connections and vary examples of using infrared LED and detectors, and transceiver modules.

1.0 Hardware

Figure 1 shows the connection from the controlling CPU to the UART. The controlling CPU interface consists of an 8-bit data bus, 3-bit address bus, input/output read and write, chips select, interrupt request and reset. The UART outputs the infrared pulses on IRTX pin and drives the infrared LED. Upon power up, the IRTX output pin is at logic 1 state. After initialization, when IR mode gets enabled, IRTX pin goes to logic 0 state to its idle condition. The infrared pulses come out at logic 1 state and turns on the transistor that drives the infrared LED, see figure 1B. The 33 ohms current limiting resistor determines the intensity of the LED for the operating distances. Figure 1C illustrates the use of an external LED diode with an IR receiver. Also, infrared transceiver module may be used. The IRTX output and IRRX input would be connected to a transceiver as shown in figure 1D and 1E. The RTS# output from the UART is used to keep the IR transceiver shut down during power up and serves as an enable function. The inverter on the receiver signal path is required for the ST16C580 and ST16C650A but can be deleted when using the XR16C850 series because it has a software bit to invert the receive data signal polarity.

2.0 Software

An initialization sample routine for XRT16C580, ST16C650A or XR16C850 is shown below. While the routine is applicable to all 3 UARTs mentioned above, each UART has few enhancement of its own with the main difference in FIFO size. The XR16C850 series has the receive data input inversion software bit that would eliminate the need for an external inverter as shown in Figure 1D and 1E. Please consult with their respective data sheet. They can be found in Exar’s web site.

```
set LCR to 0x80          ; point to special registers and
set DLL to 0x01          ; set baud rate to 115.2Kbps (assume a 1.8432 MHz crystal is used)
set DLM to 0x00          ;
set LCR to 0xBF          ; point to enhanced registers, in XR16C850 only.
set FCTR bit-2 = 1       ; invert receive input signal, in XR16C850 only.
set LCR to 0x12          ; return to general registers and set character to 7 data, even parity and 1 stop bit.
set MCR to 0x4D          ; turn on IR mode and RTS# to enable the IR LED or transceiver
set FCR to 0x1F          ; enable FIFO mode with DMA mode 1 operation and
                         ; set RX and TX FIFOs to 8 bytes trigger level for INT
set IER to 0x03          ; enable TX and RX interrupts
                         ; load transmit data upon a TX empty interrupt (ISR bit-1=1) or poll the THR empty flag in
                         ; LSR bit-5 for logic 1.
                         ; unload receive data upon a RX interrupt (ISR bit-2 or bit-3) and
                         ; check LSR for any data error or poll receive data ready bit in LSR bit-0 for logic 1.
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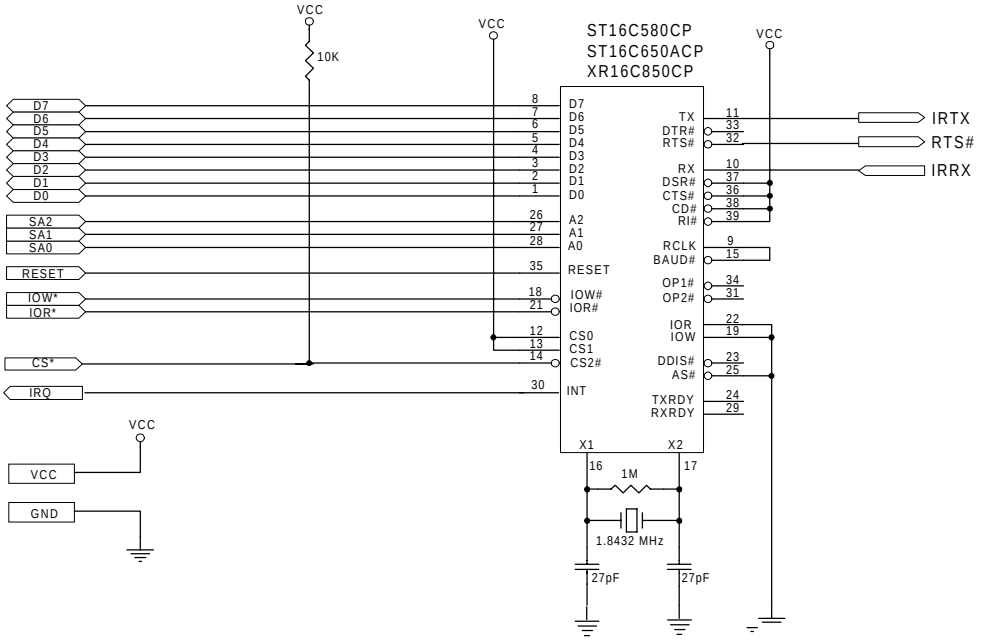

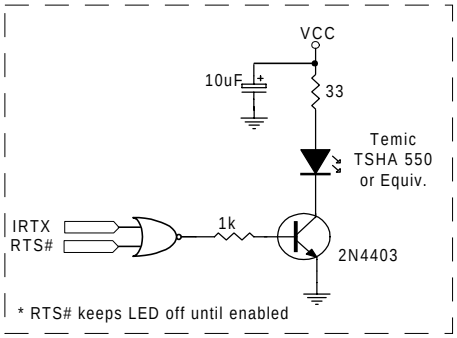

FIGURE 1B - TRANSMITTER

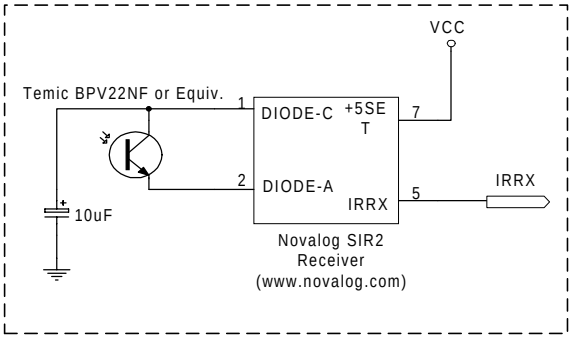

FIGURE 1C - RECEIVER

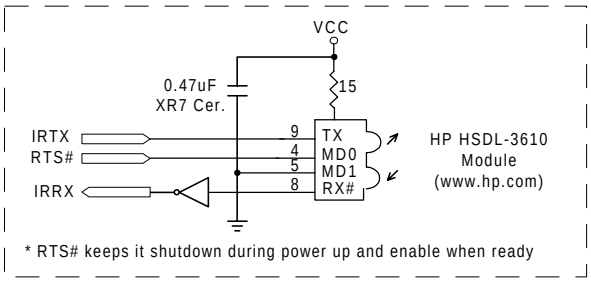

FIGURE 1D - TRANSCEIVER A

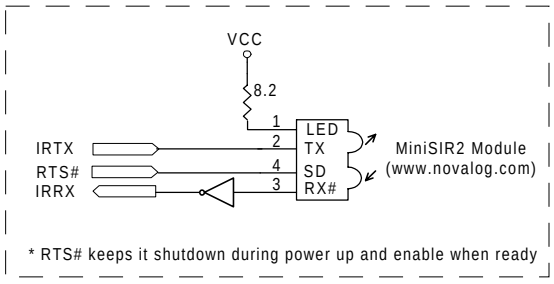

FIGURE 1E - TRANSCEIVER B

Figure 1. 115.2Kbps Infrared Applications Examples

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