

## MULTIDROP/9-BIT MODE FEATURE

### 1.0 INTRODUCTION

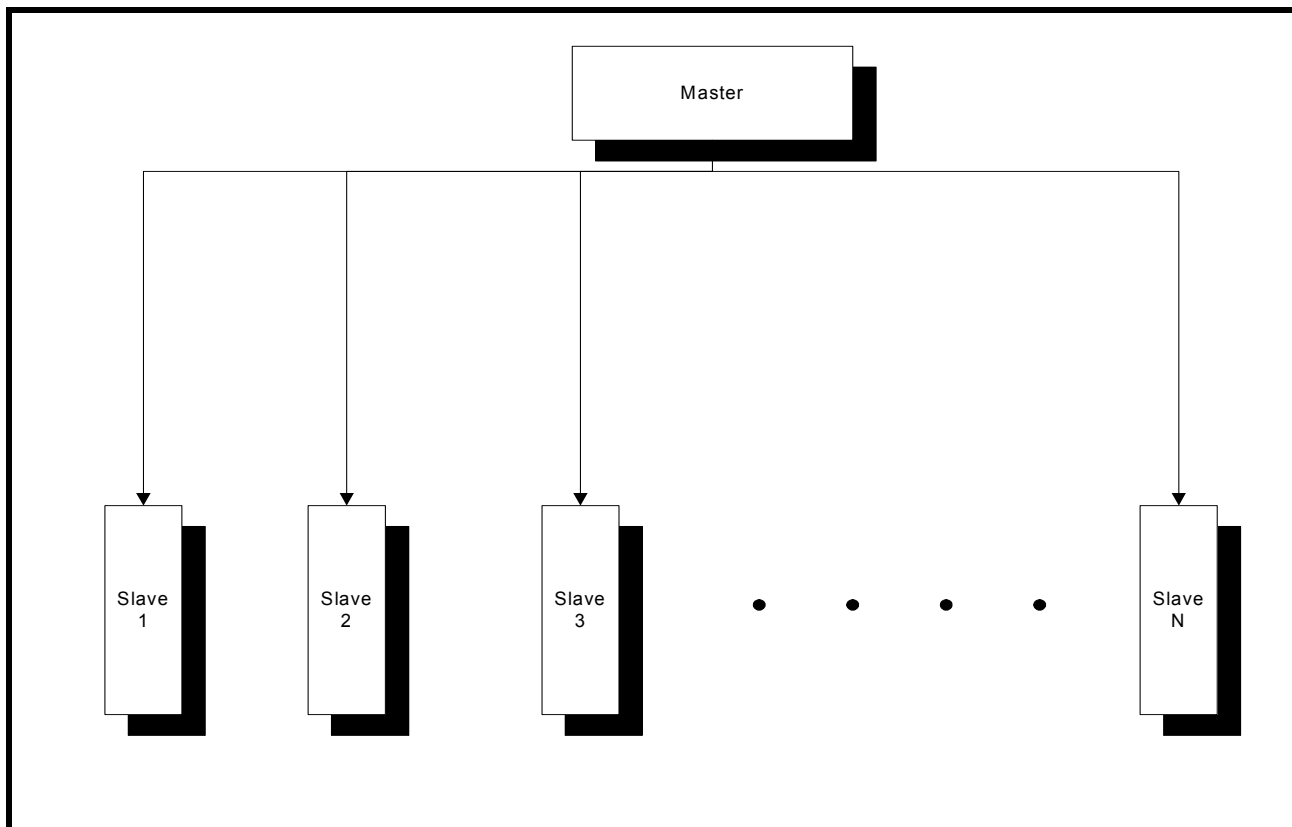
This application note describes the Multidrop/9-bit mode of Exar's low power and high speed XR16Mxxx single channel UART family.

### 2.0 MULTIDROP/9-BIT MODE

#### 2.1 MULTIDROP SYSTEM TOPOLOGY

A multidrop system is a master and slave system. One master connects with a few slaves in the system. Each time, the master communicates with one of the slaves. When the master wants to transfer a block of data to a slave, it first sends out an address byte to identify the target slave. The 9th-bit of the data byte sent from the master is set to 1 to indicate the address byte while cleared to 0 to indicate the data byte. All the slave systems will compare the address byte with their own address. Only the target slave will respond to the master. The master then starts transmitting data bytes to the target slave. The non-addressed slave systems will ignore the incoming data until a new address byte is received. **Figure 1** shows an example of the master and slave system block diagram.

**FIGURE 1. MULTIDROP SYSTEM TOPOLOGY DIAGRAM**

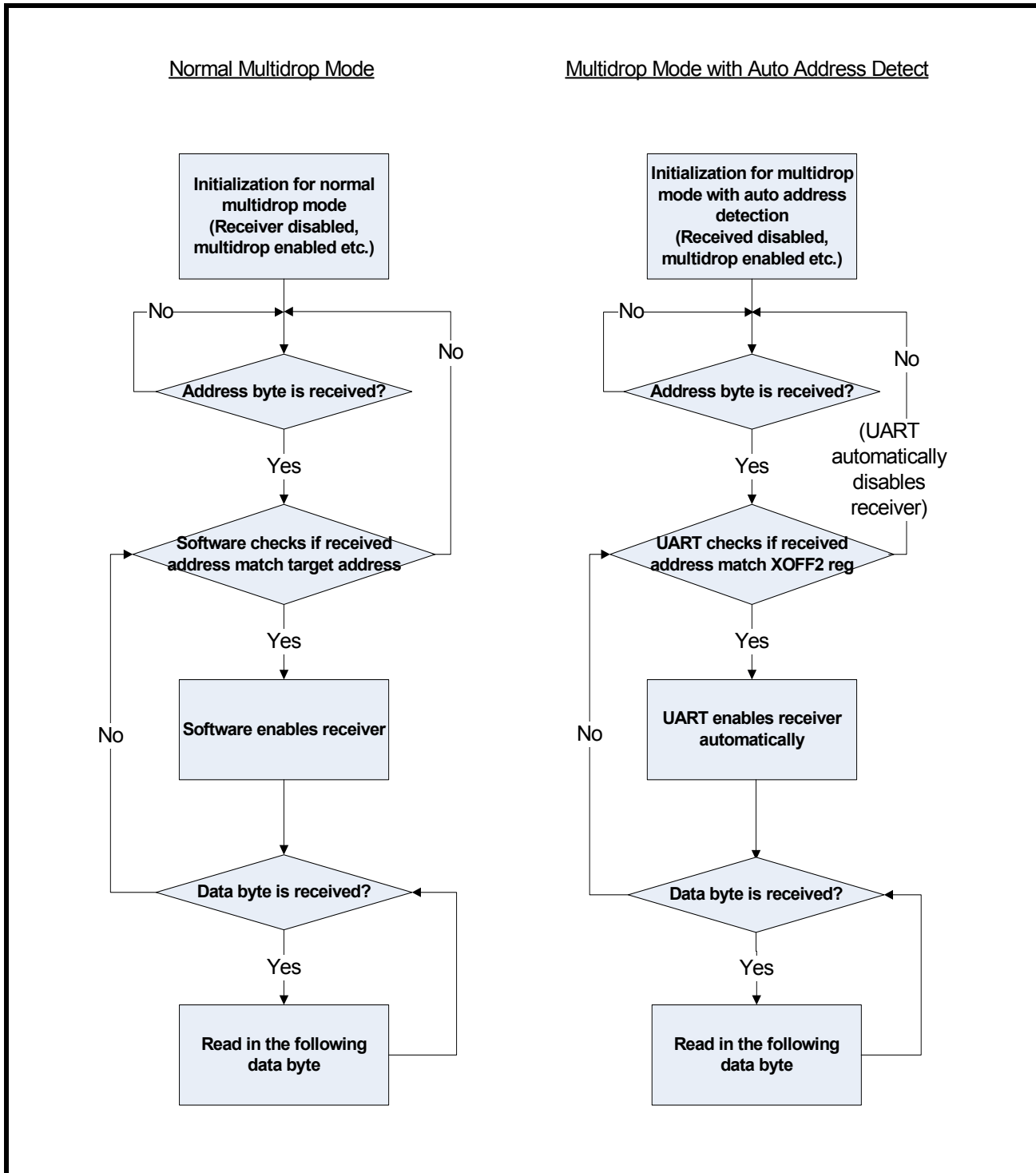


Since UARTs are 8-bit devices, the parity bit is used as the 9th-bit. Thus, the master needs to set parity bit before it sends out data and the slave needs to check the parity bit to decide whether it is an address byte or a data byte. The XR16Mxxx single channel UART family provides two multidrop mode to simplify the software.

2.2 NORMAL MULTIDROP MODE AND MULTIDROP MODE WITH AUTO ADDRESS DETECTION

The XR16Mxxx single channel UART family provides two multidrop (9-bit) mode: normal multidrop mode and multidrop mode with auto address detection. The main difference is that the software for normal multidrop mode needs to enable the receiver after detecting the matched address, while the software for auto address detection mode does not need to do anything. The UART will enable the receiver automatically in the multidrop mode without auto address detection. Figure 2 shows the flow charts for normal multidrop and auto address detect multidrop mode.

FIGURE 2. FLOW CHART FOR NORMAL AND AUTO ADDRESS DETECT MULTIDROP MODE



### 3.0 SAMPLE CODE TO INITIALIZE UART FOR MULTIDROP MODE

Exar's single channel XR16Mxxx UART family can operate in the 9th-bit (Multidrop) mode by enabling MSR bit-6. The multidrop mode features are for receiver (RX) side only. The transmitter (TX) side needs to be controlled manually by the software.

The following sections discuss the two initialization routines for UART receiver.

#### 3.1 NORMAL MULTIDROP MODE

To initialize the single channel XR16Mxxx UART family to operate in the 9-bit (Multidrop) mode, here are what you need to do:

- Enable Multidrop mode
- Force Parity bit '0'
- Disable Receiver
- Enable LSR RX line interrupt

Here is an example to initialize the normal multidrop mode:

```
write(LCR, 0xBF);  
write(EFR, 0x10);    //EFR[4] = 1 to enable access to MSR bit-6;  
                    //EFR[5] = 0 to disable the special character detect feature;  
write(LCR, 0x3B);    //Force parity 0 to detect address byte;  
                    //Set data format 8-bit data, 1-bit stop  
write(MSR, 0x60);    //Enable 9-bit mode & Disable RX  
write(IER, 0x4);     //Enable LSR interrupt
```

When an address byte is received, an interrupt will be generated:

```
read(ISR);          //Get 0xC6; Indicates that LSR interrupt is pending and FIFO is enabled;  
read(LSR);          //Get 0xE5; Indicates that address data has been received;  
read(RHR);          //Read address byte
```

If this address byte matches its slave address byte, the control software will enable the receiver (MSR bit-5= 1) to start receiving data.

#### 3.2 MULTIDROP MODE WITH AUTO ADDRESS DETECTION

To initialize the UART in the auto address detection multidrop mode, there are two extra steps:

- Enable Multidrop mode
- Force Parity bit '0'
- Write target address byte to XOFF2 register
- Enable Special Character Detect feature
- Disable Receiver
- Enable LSR RX line interrupt (Optional)

## DAN 200

---

Here is an example to initialize multidrop mode with auto address detection:

```
write(LCR, 0xBF);  
write(EFR, 0x30);    //EFR[4] = 1 to enable access to MSR bit-6;  
                    //EFR[5] = 1 to enable the special character detect feature;  
write(XOFF2, 0xAA); //Set the desired address to 0xaa (or other values for your application);  
write(LCR, 0x3B);    //Force parity 0 to detect address byte;  
                    //Set data format 8-bit data, 1-bit stop  
write(MSR, 0x60);    //Enable 9-bit mode & Disable RX  
write(IER, 0x4);     //Enable LSR interrupt
```

When a matching target address byte is received, single channel XR16Mxxx UART family will enable receiver to start receiving data automatically. When a new address byte is received that does not match the target address byte in XOFF2 register, the receiver will be disabled automatically.

### 4.0 TECHNICAL SUPPORT

For any questions regarding the multidrop mode, send an email to [uarttechsupport@exar.com](mailto:uarttechsupport@exar.com).

### NOTICE

EXAR Corporation reserves the right to make changes to the products contained in this publication in order to improve design, performance or reliability. EXAR Corporation assumes no responsibility for the use of any circuits described herein, conveys no license under any patent or other right, and makes no representation that the circuits are free of patent infringement. Charts and schedules contained here in are only for illustration purposes and may vary depending upon a user's specific application. While the information in this publication has been carefully checked; no responsibility, however, is assumed for inaccuracies.

EXAR Corporation does not recommend the use of any of its products in life support applications where the failure or malfunction of the product can reasonably be expected to cause failure of the life support system or to significantly affect its safety or effectiveness. Products are not authorized for use in such applications unless EXAR Corporation receives, in writing, assurances to its satisfaction that: (a) the risk of injury or damage has been minimized; (b) the user assumes all such risks; (c) potential liability of EXAR Corporation is adequately protected under the circumstances.

Copyright 2009 EXAR Corporation

Datasheet April 2009.

Send your UART technical inquiry with technical details to hotline: [uarttechsupport@exar.com](mailto:uarttechsupport@exar.com).

Reproduction, in part or whole, without the prior written consent of EXAR Corporation is prohibited.

---