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M16C/64 群

串行 I/O 操作（UART 模式下的接收）

1. 要点

在 UART 模式下接收数据，可以选择如表 1 中所列的各种功能。在表 1 中用符号“○”表示本篇资料所选的项目，图 1 是串行 I/O 的工作时序图。本篇资料的参考例程是使用 UART0 在 UART 模式下接收数据的例子。

2. 说明

本篇资料，适用于 M16C/64 群单片机。

本篇资料中的参考例程也适用于 M16C 族产品中与 M16C/64 群具有相同 SFR（特殊功能寄存器）定义的产品。

由于 M16C 系列产品中有些功能会有所改进，请参看用户手册。如果使用本篇资料中所列功能时，请仔细检查每一步操作。

3. 选定功能

表 1. 选定功能

设定项目	设定内容		设定项目	设定内容	
传送时钟源	O	内部时钟（f1SIO/f2SIO/f8SIO/f32SIO）	数据逻辑选择功能	O	不反转
		外部时钟（CLKi 引脚）			反转
RTS 功能	O	RTS 功能允许	TxD、RxD 的 I/O 极性反转位	O	不反转
		RTS 功能禁止			反转
			总线冲突检测功能	O	不选择
					选择

4. 串行 I/O 的操作

(1) 将接收允许位置为“1”进入可接收数据状态，同时，从 $\overline{\text{RTSi}}$ 引脚输出“L”电平，通知发送方已进入可接收数据状态。

(2) 当从 RxDi 引脚接收到接收数据的第一位（开始位）时，从 $\overline{\text{RTS}}$ 引脚输出“H”电平。然后，将按照顺序一位一位的接收数据：LSB、……、MSB 和停止位。

(3) 当接收完停止位后， UARTi 接收寄存器的值将被传送到 UARTi 接收缓冲寄存器中。同时，接收完成标志位将被置为“1”，表明接收结束， UARTi 接收中断请求位也被置为“1”。

(4) 当 UARTi 接收缓冲寄存器的低字节被读取时，接收完成标志位将被置为“0”，并从 $\overline{\text{RTS}}$ 引脚输出“L”电平。

使用 UARTi 在 UART 模式下接收数据的工作时序图如下所示:

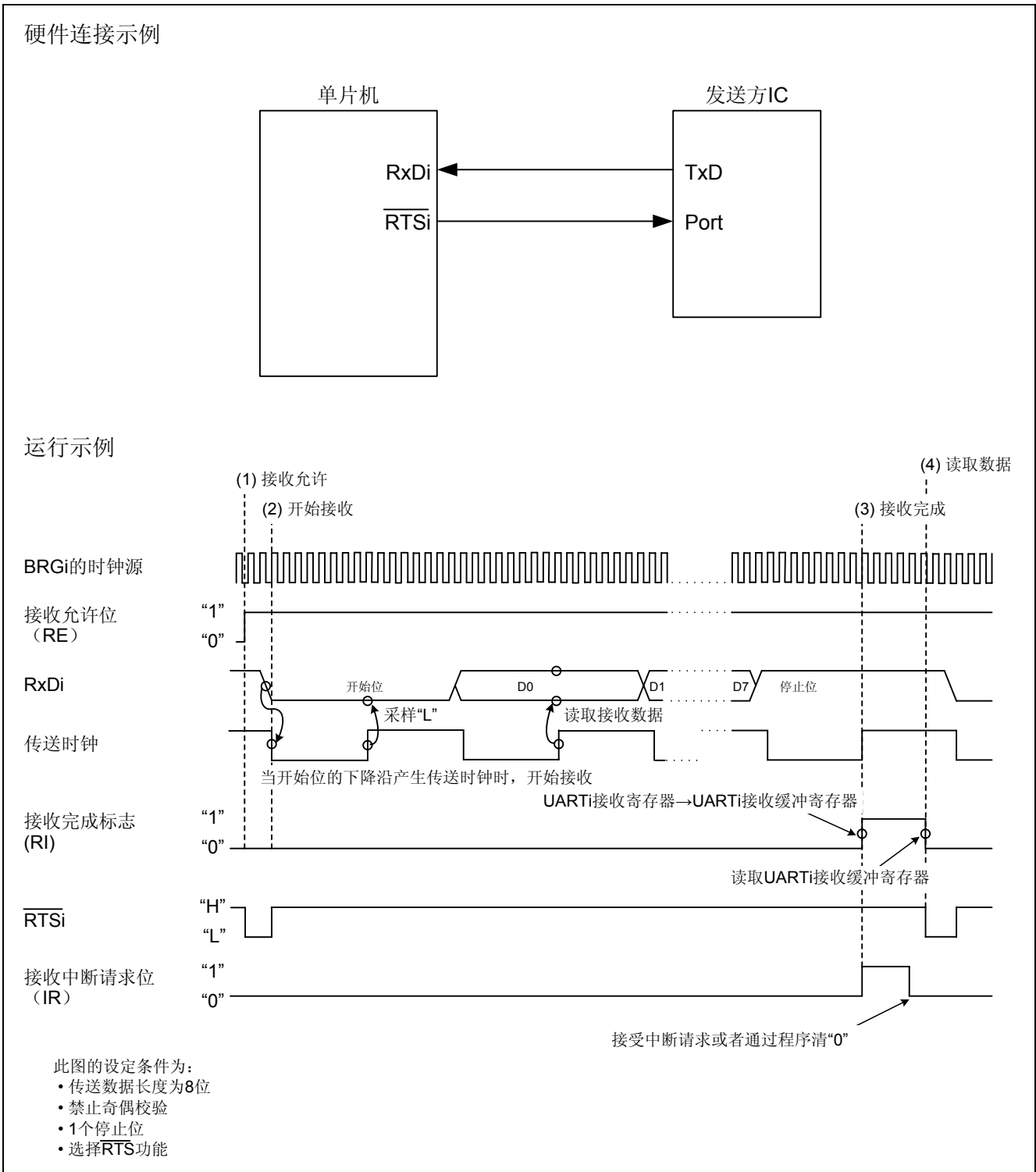
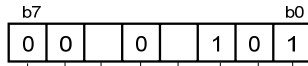


图 1. 使用 UARTi 在 UART 模式下接收数据的工作时序图

5. 寄存器设置

为了能够实现定义在“4. 串行 I/O 的操作”的功能，下列寄存器必须按步骤顺序进行设置。对于每个寄存器的具体结构，请参考 M16C/64 群的硬件手册。

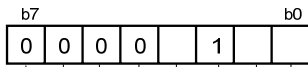
设定UARTi发送/接收模式寄存器 (i = 0~2、5~7)



- UART0发送/接收模式寄存器 U0MR 【地址: 0248h】
- UART1发送/接收模式寄存器 U1MR 【地址: 0258h】
- UART2发送/接收模式寄存器 U2MR 【地址: 0268h】
- UART5发送/接收模式寄存器 U5MR 【地址: 0288h】
- UART6发送/接收模式寄存器 U6MR 【地址: 0298h】
- UART7发送/接收模式寄存器 U7MR 【地址: 02A8h】

- <SMD2~SMD0> 串行I/O模式选择位
- b2 b1 b0
1 0 1: 传送数据长为8位
- <CKDIR> 内部/外部时钟选择位
- 0: 内部时钟
- <STPS> 停止位长度选择位
- 0: 1个停止位
- <PRY> 在bit 6 = “1” 时有效
- <PRYE> 奇偶校验允许位
- 0: 禁止奇偶校验
- <IOPOL> TxD、RxD输入/输出极性反转位
- 通常情况下设置为“0”

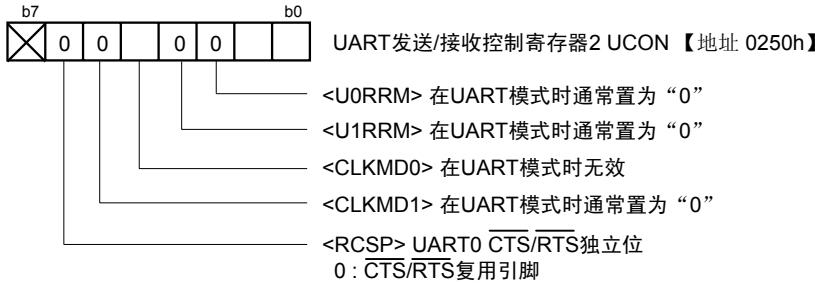
设置UARTi发送/接收控制寄存器0 (i = 0~2、5~7)



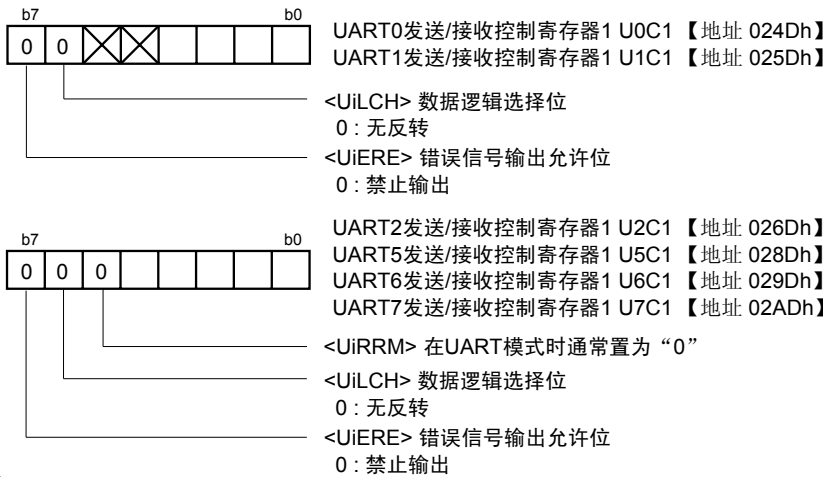
- UART0发送/接收控制寄存器0 U0C0 【地址: 024Ch】
- UART1发送/接收控制寄存器0 U1C0 【地址: 025Ch】
- UART2发送/接收控制寄存器0 U2C0 【地址: 026Ch】
- UART5发送/接收控制寄存器0 U5C0 【地址: 028Ch】
- UART6发送/接收控制寄存器0 U6C0 【地址: 029Ch】
- UART7发送/接收控制寄存器0 U7C0 【地址: 02ACh】

- <CLK1, CLK0> UiBRG计数源选择位
- b1 b0
0 0: 选择f1SIO或者f2SIO
- 0 1: 选择f8SIO
- 1 0: 选择f32SIO
- 1 1: 不能设定
- <CRS> CTS/RTS功能选择位 (在bit4 = “0” 时有效)
- 1: 选择RTS功能
- <TXEPT> 发送寄存器空标志
- 0: 发送寄存器中有数据 (在发送中)
- 1: 发送寄存器中无数据 (发送结束)
- <CRD> CTS/RTS禁止位
- 0: 允许CTS/RTS功能
- <NCH> 数据输出选择位
- 0: TxDi/SDAi、SCLi引脚为CMOS输出
- 1: TxDi/SDAi、SCLi引脚为N沟道漏极开路
- <CKPOL> 在UART模式时通常置为“0”
- <UFORM> 传送格式选择位
- 0: LSB先

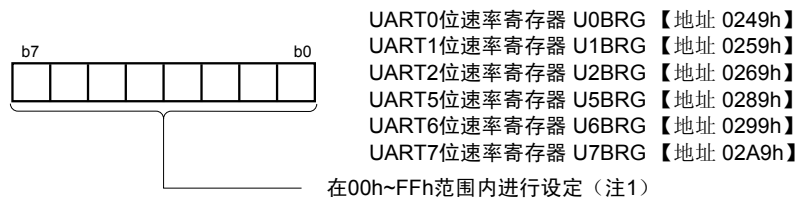
设定UART发送/接收控制寄存器2



设定UARTi发送/接收控制寄存器1 (i = 0~2、5~7)

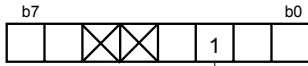


设定UARTi位速率寄存器 (i = 0~2、5~7)



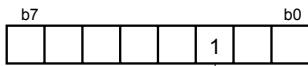
注1: 请在发送/接收停止时对UARTi位速率寄存器进行写操作。

接收允许



UART0发送/接收控制寄存器1 U0C1 【地址: 024Dh】
 UART1发送/接收控制寄存器1 U1C1 【地址: 025Dh】

<RE> 接收允许位
 1: 允许接收

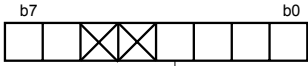


UART2发送/接收控制寄存器1 U2C1 【地址: 026Dh】
 UART5发送/接收控制寄存器1 U5C1 【地址: 028Dh】
 UART6发送/接收控制寄存器1 U6C1 【地址: 029Dh】
 UART7发送/接收控制寄存器1 U7C1 【地址: 02ADh】

<RE> 接收允许位
 1: 允许接收

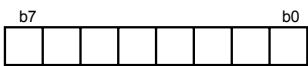
开始接收

查看接收结束



UART0发送/接收控制寄存器1 U0C1 【地址: 024Dh】
 UART1发送/接收控制寄存器1 U1C1 【地址: 025Dh】

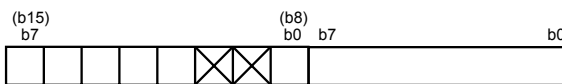
<RI> 接收结束标志
 0: 接收缓冲寄存器中无数据
 1: 接收缓冲寄存器中有数据



UART2发送/接收控制寄存器1 U2C1 【地址: 026Dh】
 UART5发送/接收控制寄存器1 U5C1 【地址: 028Dh】
 UART6发送/接收控制寄存器1 U6C1 【地址: 029Dh】
 UART7发送/接收控制寄存器1 U7C1 【地址: 02ADh】

<RI> 接收结束标志
 0: 接收缓冲寄存器中无数据
 1: 接收缓冲寄存器中有数据

错误检查



UART0接收缓冲寄存器 U0RB 【地址: 024Fh、024Eh】
 UART1接收缓冲寄存器 U1RB 【地址: 025Fh、025Eh】
 UART2接收缓冲寄存器 U2RB 【地址: 026Fh、026Eh】
 UART5接收缓冲寄存器 U5RB 【地址: 028Fh、028Eh】
 UART6接收缓冲寄存器 U6RB 【地址: 029Fh、029Eh】
 UART7接收缓冲寄存器 U7RB 【地址: 02AFh、02AEh】

接收数据
 <OER> 溢出错误标志
 0: 无溢出错误
 1: 发生溢出错误
 <FER> 帧错误标志
 0: 无帧错误
 1: 发生帧错误
 <PER> 奇偶校验错误标志
 0: 无奇偶校验错误
 1: 发生奇偶校验错误
 <SUM> 总错误标志
 0: 无错误
 1: 发生错误

读取数据后进行处理

6. 参考文献

数据手册

M16C/64 群硬件手册

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 - 2) 植埋于人体使用的装置。
 - 3) 用于治疗（切除患部、给药等）的装置。
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