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2010年4月1日
瑞萨电子公司

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M16C/65 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/65 群单片机。

本篇应用说明也适用于 M16C 族中与上面所述的群具有相同 SFR（特殊功能寄存器）定义的产品。关于产品功能的改进，请参看手册中的相关信息。在使用本篇应用说明的程序前，需进行详细的评价。

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	
分频前时钟选择	O	f_1	数据逻辑选择功能	O	不反转
		f_{OCO-F}			反转
外围时钟	O	f_{1SIO}	TxD、RxD 的 I/O 极性反转位	O	不反转
		f_{2SIO}			反转
传送时钟源	O	内部时钟（f_{1SIO}/f_{2SIO}/f_{8SIO}/f_{32SIO}）	$\overline{CTS}$ / $\overline{RTS}$ 引脚独立（注 1）	O	复用引脚
		外部时钟（CLKi 引脚）			独立
$\overline{RTS}$ 功能	O	$\overline{RTS}$ 功能允许			
		$\overline{RTS}$ 功能禁止			

注 1: $\overline{CTS0}$ / $\overline{RTS0}$ 独立功能是 $\overline{CTS0}$ 与 $\overline{RTS0}$ 引脚功能不复用，从 P6_0 引脚输出 $\overline{RTS0}$，从 P6_4 引脚输出 $\overline{CTS0}$ 的功能。当选择这个功能时，不能使用 UART1 的 $\overline{CTS}$ / $\overline{RTS}$ 功能，请将 $\overline{CTS}$ / $\overline{RTS}$ 禁止位设置为“1”。

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 $\overline{RTSi}$ 引脚输出“L”电平，通知发送方已进入可接收数据状态。

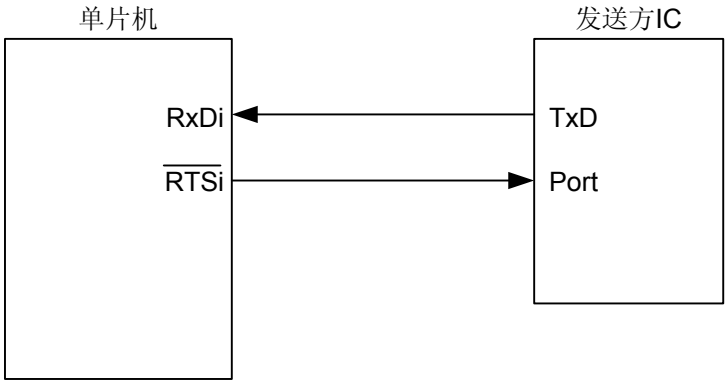
(2) 当从 RxDi 引脚接收到接收数据的第一位（开始位）时，从 $\overline{RTS}$ 引脚输出“H”电平。然后，将按照顺序一位一位的接收数据：LSB、……、MSB 和停止位。

(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”。

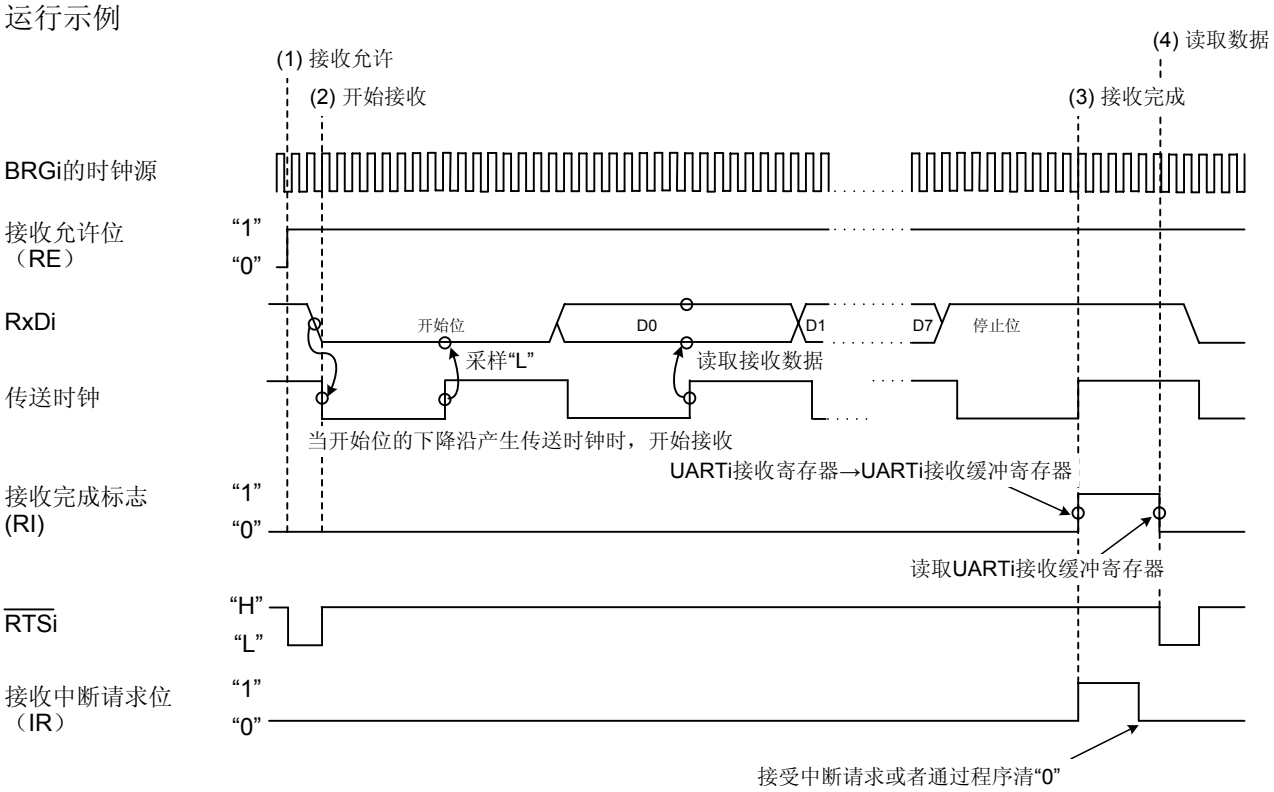
(4) 当 UARTi 接收缓冲寄存器的低字节被读取时，接收完成标志位将被置为“0”，并从 $\overline{RTS}$ 引脚输出“L”电平。

使用 UARTi 在 UART 模式下接收数据的工作时序图如下所示：

硬件连接示例



运行示例

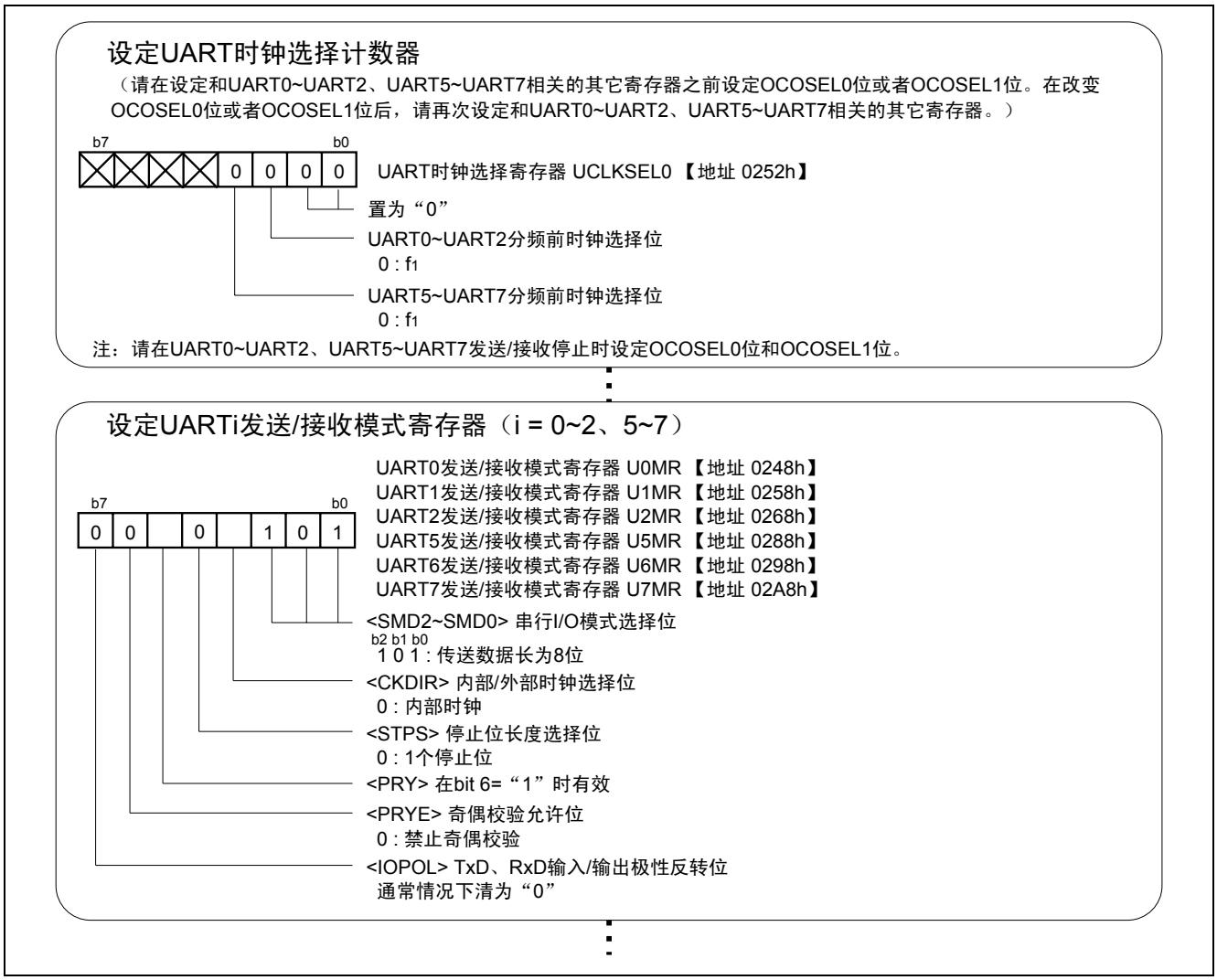


此图的设定条件为：
- 传送数据长度为8位
- 禁止奇偶校验
- 1个停止位
- 选择RTS功能

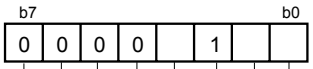
图 1. 使用 UARTi 在 UART 模式下接收数据的工作时序图

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/65 群的硬件手册。



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 : f_{1SIO}或f_{2SIO}（注1）
0 1 : f_{8SIO}
1 0 : f_{32SIO}
1 1 : 不能设定

<CRS> $\overline{CTS}$/$\overline{RTS}$功能选择位（在bit4=“0”时有效）
1 : 选择$\overline{RTS}$功能（注2）

<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> $\overline{CTS}$/$\overline{RTS}$禁止位
0 : 允许$\overline{CTS}$/$\overline{RTS}$功能

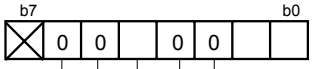
<NCH> 数据输出选择位
0 : TxDi/SDAi、SCLi引脚为CMOS输出
1 : TxDi/SDAi、SCLi引脚为N沟道漏极开路

<CKPOL> 在UART模式时清为“0”

<UFORM> 传送格式选择位
0 : LSB先

注1：当PCLKR寄存器的PCLK0位为“1”时，选择时钟 f_{1SIO}，当PCLKR寄存器的PCLK0位为“0”时，选择时钟 f_{2SIO}。
注2：请将对应引脚的端口方向位清“1”（输出模式）。

设定UART发送/接收控制寄存器2



UART发送/接收控制寄存器2 UCON【地址 0250h】

<U0RRM> 在UART模式时清为“0”

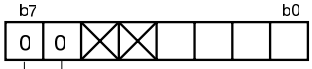
<U1RRM> 在UART模式时清为“0”

<CLKMD0> 在UART模式时无效

<CLKMD1> 在UART模式时清为“0”

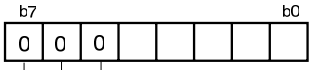
<RCSP> UART0 $\overline{CTS}$/$\overline{RTS}$独立位
0 : $\overline{CTS}$/$\overline{RTS}$复用引脚

设定UARTi发送/接收控制寄存器1（i = 0~2、5~7）



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】

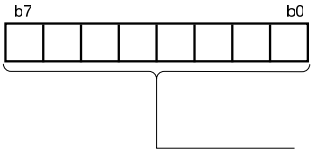
<UiLCH> 数据逻辑选择位
0：无反转
<UiERE> 错误信号输出允许位
0：禁止输出



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】

<UiRRM> 在UART模式时通常置为“0”
<UiLCH> 数据逻辑选择位
0：无反转
<UiERE> 错误信号输出允许位
0：禁止输出

设定UARTi位速率寄存器（i = 0~2、5~7）

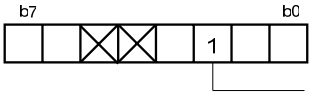


UART0位速率寄存器 U0BRG 【地址 0249h】
UART1位速率寄存器 U1BRG 【地址 0259h】
UART2位速率寄存器 U2BRG 【地址 0269h】
UART5位速率寄存器 U5BRG 【地址 0289h】
UART6位速率寄存器 U6BRG 【地址 0299h】
UART7位速率寄存器 U7BRG 【地址 02A9h】

在00h~FFh范围内进行设定（注1）

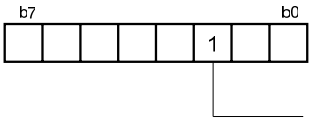
注1：请在发送/接收停止时对UiBRG寄存器进行写操作。请使用MOV指令写UiBRG寄存器。请在设定UiC0寄存器的CLK1和CLK0位后写UiBRG寄存器。

接收允许



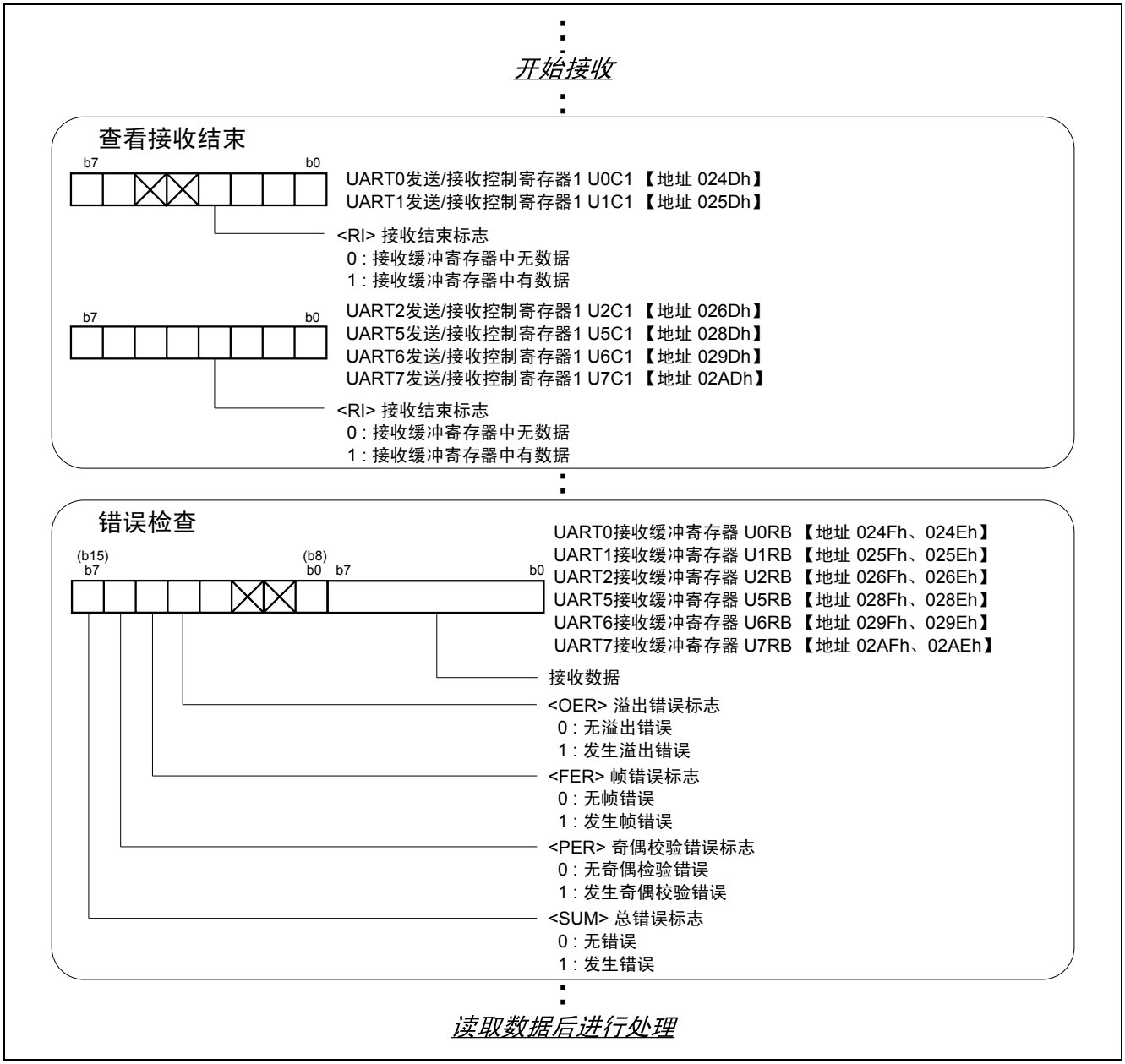
UART0发送/接收控制寄存器1 U0C1 【地址 024Dh】
UART1发送/接收控制寄存器1 U1C1 【地址 025Dh】

<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
b7
b0
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
b7
b0
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
(b15)
b7
(b8)
b0
b7
b0
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 : 无奇偶检验错误
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

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