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瑞萨电子公司

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M16C/65 群

定时器 A 操作（计数器模式、脉冲输出功能）

1. 要点

在定时器模式中，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 是定时器的工作时序图。本篇资料的参考例程是定时器 A1 选择定时器模式的例子。

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	
计数源	☐	内部时钟源（f1TIMAB/f2TIMAB/f8TIMAB/f32TIMAB/f64TIMAB/fOCO-F/fOCO-S/fC32）
脉冲输出功能	☐	无脉冲输出
	☐	有脉冲输出
门控功能	☐	无门控功能
	☐	只有在 TAIiN 引脚为“低”电平期间进行计数
	☐	只有在 TAIiN 引脚为“高”电平期间进行计数
输出极性控制	☐	输出波形“高”电平有效
	☐	输出波形“低”电平有效（输出反转）

注: i = 0~4

4. 定时器 A 的操作

- (1) 把计数开始标志位置为“1”，计数器开始对计数脉冲源的下降沿计数。
- (2) 在发生下溢时，重加载寄存器的设定值被加载到计数器，计数器继续进行计数。同时，定时器 Ai 中断请求位置为“1”。另外，TAiOUT 引脚的输出极性反转。
- (3) 把计数开始标志位置为“0”，计数器停止计数，并且保持当前值。另外，TAiOUT 引脚输出“低”电平。

选择定时器模式的定时器工作时序图如下所示：

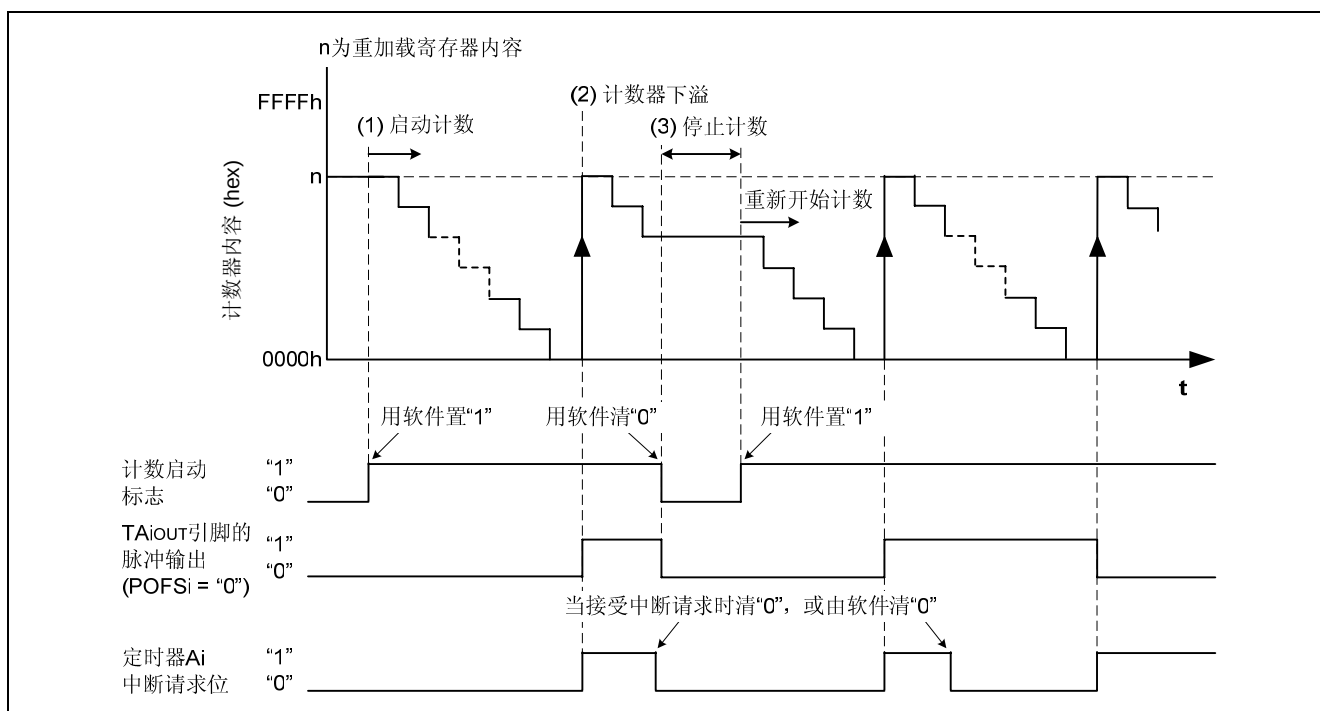


图 1. 选择定时器模式、脉冲输出功能时的工作时序图

5. 寄存器设置

在定时器模式中，定时器 A 可以选择如表 2 中所列的各种计数源，定时器 A 计数源的结构框图如图 2 所示。

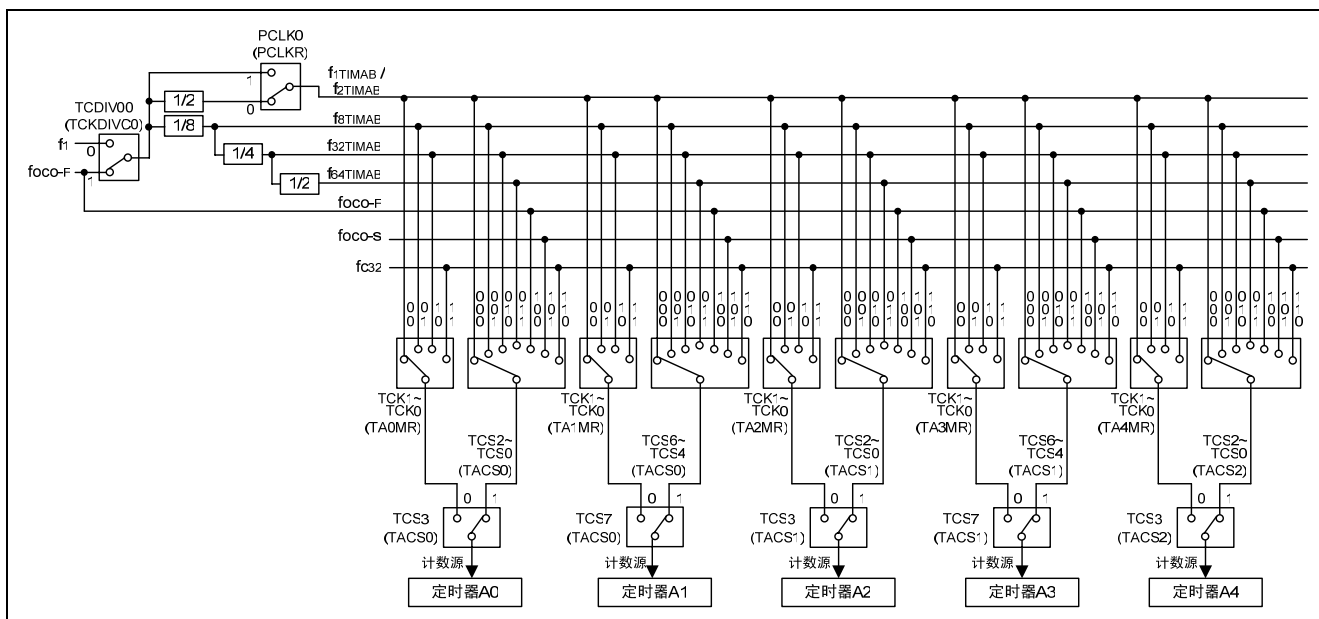
表 2. 定时器 A 计数源的选择

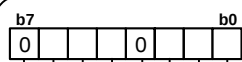
TCKDIVC0 寄存器（注 1）	TACSi 寄存器（注 2）				TAiMR 寄存器		计数源	计数源周期
TCDIV00	TCS3/ TCS7	TCS2/ TCS6	TCS1/ TCS5	TCS0/ TCS4	TCK1	TCK0		f(XIN):20MHz f(XCIN):32.768kHz f(OCO-F):约 20MHz f(OCO-S):约 125kHz
0	0	-	-	-	0	0	f1TIMAB/f2TIMAB （注 3）	50ns/100ns
0	0	-	-	-	0	1	f8TIMAB	400ns
0	0	-	-	-	1	0	f32TIMAB	1600ns
0	0	-	-	-	1	1	fc32	976.56μs
0	1	0	0	0	-	-	f1TIMAB/f2TIMAB （注 3）	50ns/100ns
0	1	0	0	1	-	-	f8TIMAB	400ns
0	1	0	1	0	-	-	f32TIMAB	1600ns
0	1	0	1	1	-	-	f64TIMAB	3200ns
0	1	1	0	0	-	-	fOCO-F	约 50ns
0	1	1	0	1	-	-	fOCO-S	约 8μs
0	1	1	1	0	-	-	fc32	976.56μs
1	1	0	0	0	-	-	f1TIMAB/f2TIMAB （注 3）	约 50ns/100ns
1	1	0	0	1	-	-	f8TIMAB	约 400ns
1	1	0	1	0	-	-	f32TIMAB	约 1600ns
1	1	0	1	1	-	-	f64TIMAB	约 3200ns

注 1: TCDIV00 位是定时器 AB 分频前时钟选择位。请在设定和定时器 A 相关的其它寄存器之前设定 TCDIV00 位。在改变 TCDIV00 位后，请再次设定和定时器 A 相关的其它寄存器。

注 2: TACS0 寄存器的 TCS3~TCS0 位和定时器 A0 计数源的选择相对应，TACS0 寄存器的 TCS7~TCS4 位和定时器 A1 计数源的选择相对应，TACS1 寄存器的 TCS3~TCS0 位和定时器 A2 计数源的选择相对应，TACS1 寄存器的 TCS7~TCS4 位和定时器 A3 计数源的选择相对应，TACS2 寄存器的 TCS3~TCS0 位和定时器 A4 计数源的选择相对应。

注 3 如果 PCLKR 寄存器中的 PCLK0 位为“0”选择 f2TIMAB 作为计数源，PCLK0 位为“1”选择 f1TIMAB 作为计数源（复位设定值）。





定时器A计数源选择寄存器0 TACS0【地址 01D0h】

定时器A计数源选择寄存器1 TACS1【地址 01D1h】

<TCS2~TCS0> TAI计数源选择位 (注1)

000 : f1TIMAB或f2TIMAB (注2)

001 : f8TIMAB

010 : f32TIMAB

011 : f64TIMAB

100 : fOCO-F

101 : fOCO-S

110 : fc32

111 : 不能设定

<TCS3> TAI计数源选择指定位 (注1)

0 : TCK0、TCK1有效, TCS2~TCS0无效

<TCS6~TCS4> TAI计数源选择位 (注1)

000 : f1TIMAB或f2TIMAB (注2)

001 : f8TIMAB

010 : f32TIMAB

011 : f64TIMAB

100 : fOCO-F

101 : fOCO-S

110 : fc32

111 : 不能设定

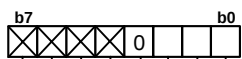
<TCS7> TAI计数源选择指定位 (注1)

0 : TCK0、TCK1有效, TCS6~TCS4无效

TACS0寄存器: i = 0、j = 1, TACS1寄存器: i = 2、j = 3

注1: 关于各种设定情况下的计数源周期, 请参考表2。

注2: 如果PCLKR寄存器中的PCLK0位为0选择f2TIMAB作为计数源, PCLK0位为1选择f1TIMAB作为计数源(复位设定值)。



定时器A计数源选择寄存器2 TACS2【地址 01D2h】

<TCS2~TCS0> TA4计数源选择位 (注1)

000 : f1TIMAB或f2TIMAB (注2)

001 : f8TIMAB

010 : f32TIMAB

011 : f64TIMAB

100 : fOCO-F

101 : fOCO-S

110 : fc32

111 : 不能设定

<TCS3> TA4计数源选择指定位 (注1)

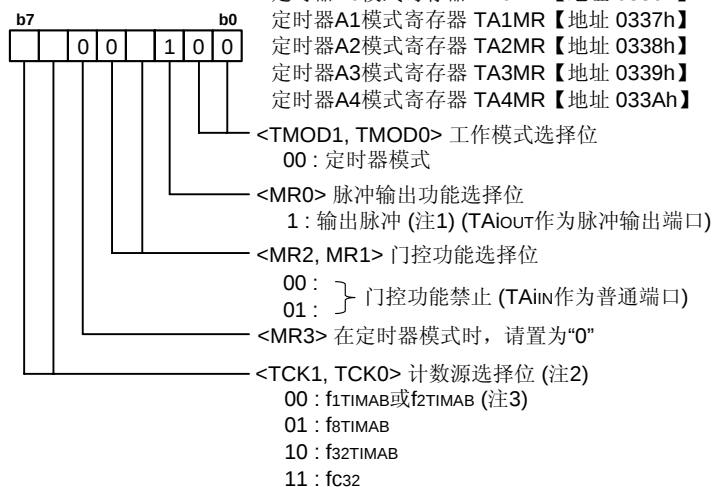
0 : TCK0、TCK1有效, TCS2~TCS0无效

什么也不指定。只能写“0”, 读时值不定

注1: 关于各种设定情况下的计数源周期, 请参考表2。

注2: 如果PCLKR寄存器中的PCLK0位为0选择f2TIMAB作为计数源, PCLK0位为1选择f1TIMAB作为计数源(复位设定值)。

(2) 选择定时器模式和功能

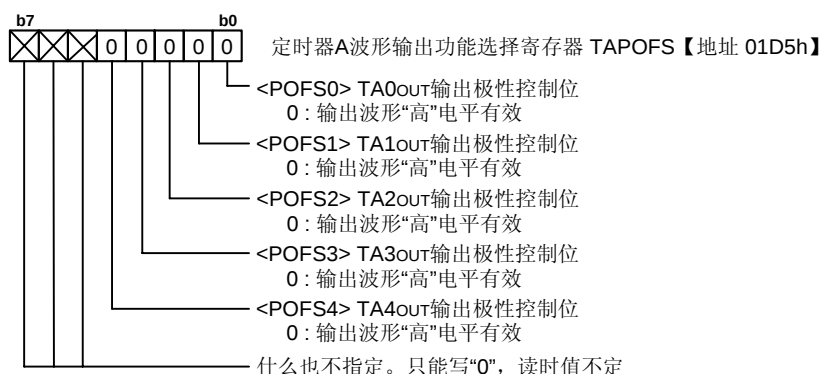


注1: 对应的端口寄存器和端口方向寄存器的设定无效。

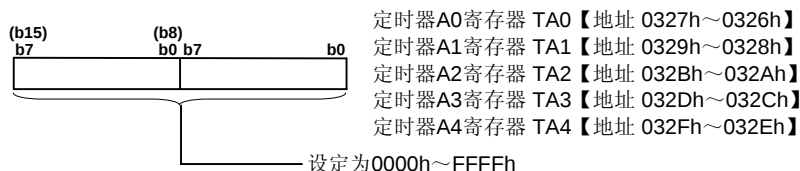
注2: TACS0~TACS2寄存器的TCS3位和TCS7位设置为0 (TCK0位、TCK1位有效)。关于各种设定情况下的计数源周期, 请参考表2。

注3: 如果PCLKR寄存器中的PCLK0位为0选择f2TIMAB作为计数源, PCLK0位为1选择f1TIMAB作为计数源 (复位设定值)。

(3) 选择定时器波形输出功能



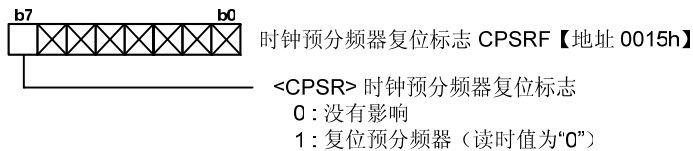
(4) 设置定时器Ai寄存器 (i=0~4)



(5) 设置时钟预分频器复位标志位

:

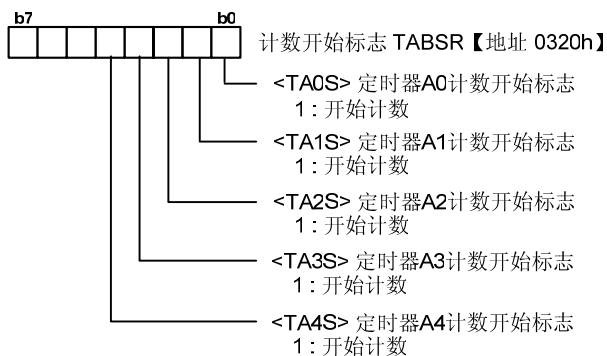
这一功能只在选择fc32作为计数源时有效，复位预分频器的目的是为了产生Xcin时钟的32分频即fc32。



:

(6) 设置定时器计数开始标志位

:



:

开始计数

6. 参考文献

数据手册

M16C/65 群硬件手册

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9. 在使用本资料所记载的产品时，对于最大额定值、工作电源电压的范围、放热特性、安装条件及其他条件请在本公司规定的保证范围内使用。如果超出了本公司规定的保证范围使用时，对于由此而造成的故障和出现的事故，本公司将不承担任何责任。
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