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2010年4月1日
瑞萨电子公司

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1. 要点
   在重复传送模式中，可以选择如表 1 中所列的各种功能。在表 1 中用符号“〇”表示本篇资料所选的项目。

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

<table>
<thead>
<tr>
<th>设定项目</th>
<th>设定内容</th>
</tr>
</thead>
<tbody>
<tr>
<td>传送地址空间</td>
<td>从 1MB 空间的任意地址到固定地址</td>
</tr>
<tr>
<td></td>
<td>从固定地址到 1MB 的任意空间</td>
</tr>
<tr>
<td></td>
<td>从固定地址到固定地址</td>
</tr>
<tr>
<td>传送单位</td>
<td>8 位</td>
</tr>
<tr>
<td></td>
<td>16 位</td>
</tr>
<tr>
<td>重复传送模式</td>
<td>单次传送</td>
</tr>
<tr>
<td></td>
<td>重复传送</td>
</tr>
<tr>
<td>传送源地址方向</td>
<td>固定</td>
</tr>
<tr>
<td></td>
<td>正向</td>
</tr>
<tr>
<td>传送目标地址方向</td>
<td>固定</td>
</tr>
<tr>
<td></td>
<td>正向</td>
</tr>
</tbody>
</table>

4. 操作

(1) 如果选择软件触发，将软件 DMA 请求位置 “1”，就产生一次 DMA 请求。

(2) 在允许 DMAC 后开始传送数据，将 DMAi 源指针所指向的地址的内容传送到 DMAi 正向地址指针所指向的地址。另外，在允许 DMAC 后开始传送数据，DMAi 传送计数器内的值将被重新加载到 DMA 传送计数器内，同时 DMAi 目标指针被重新加载到 DMAi 正向地址指针内。

每产生一次 DMA 传送请求，就传送两个字节的数据。DAMi 传送计数器进行减计数，DMAi 正向地址指针进行加计数。

(3) 即使 DMAi 传送计数器发生下溢，DMAi 传送允许位仍然为 “1”。同时，DMA 中断请求位置 “1”。

(4) DMA 传送计数器下溢后，如果发生下一次 DMA 请求，就从(1)重新开始 DMA 传送。

工作时序图如下所示:
DMAC 的操作（重复传送模式）

传送次数为2

图 1. 单次传送模式时的工作时序图
5. 寄存器设置

为了能实现定义在“4. 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。

### 设定DMAi请求源选择寄存器

<table>
<thead>
<tr>
<th>寄存器</th>
<th>地址</th>
<th>功能描述</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMA0请求源选择寄存器 DM0SL</td>
<td>0398h</td>
<td>选择DMA0的请求源</td>
</tr>
<tr>
<td>DMA1请求源选择寄存器 DM1SL</td>
<td>039Ah</td>
<td>选择DMA1的请求源</td>
</tr>
<tr>
<td>DMA2请求源选择寄存器 DM2SL</td>
<td>0390h</td>
<td>选择DMA2的请求源</td>
</tr>
<tr>
<td>DMA3请求源选择寄存器 DM3SL</td>
<td>0392h</td>
<td>选择DMA3的请求源</td>
</tr>
</tbody>
</table>

- **DSEL4~DSEL0** (DMA4~DMA0请求选选择位)
  - 00001: 软件触发
  - <DSR> 软件DMA请求位
  - 清为“0”

### 设定DMAi控制寄存器

<table>
<thead>
<tr>
<th>寄存器</th>
<th>地址</th>
<th>功能描述</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMA0控制寄存器 DM0CON</td>
<td>018Ch</td>
<td>控制DMA0的传送操作</td>
</tr>
<tr>
<td>DMA1控制寄存器 DM1CON</td>
<td>019Ch</td>
<td>控制DMA1的传送操作</td>
</tr>
<tr>
<td>DMA2控制寄存器 DM2CON</td>
<td>01ACh</td>
<td>控制DMA2的传送操作</td>
</tr>
<tr>
<td>DMA3控制寄存器 DM3CON</td>
<td>01BCh</td>
<td>控制DMA3的传送操作</td>
</tr>
</tbody>
</table>

- **DMBIT** (传送单位选择位)
  - 0: 16位
- **DMASL** (重复传送模式选择位)
  - 1: 重复传送
- **DMAS** (DMA请求位)
  - 0: DMA无请求
- **DMAE** (DMA允许位)
  - 0: 禁止
- **DSD** (传送源地址方向选择位)
  - 0: 固定（bit4和bit5不能同时设置为“1”）
  - 1: 正向（bit4和bit5不能同时设置为“1”）

### 设定DMAi源指针

<table>
<thead>
<tr>
<th>寄存器</th>
<th>地址</th>
<th>功能描述</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMA0源指针 SAR0</td>
<td>0182h~0180h</td>
<td>源指针</td>
</tr>
<tr>
<td>DMA1源指针 SAR1</td>
<td>0192h~0190h</td>
<td>源指针</td>
</tr>
<tr>
<td>DMA2源指针 SAR2</td>
<td>01A2h~01A0h</td>
<td>源指针</td>
</tr>
<tr>
<td>DMA3源指针 SAR3</td>
<td>01B2h~01B0h</td>
<td>源指针</td>
</tr>
</tbody>
</table>

### 设定DMAi目标指针

<table>
<thead>
<tr>
<th>寄存器</th>
<th>地址</th>
<th>功能描述</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMA0目标指针 DAR0</td>
<td>0186h~0184h</td>
<td>目标指针</td>
</tr>
<tr>
<td>DMA1目标指针 DAR1</td>
<td>0196h~0194h</td>
<td>目标指针</td>
</tr>
<tr>
<td>DMA2目标指针 DAR2</td>
<td>01A6h~01A4h</td>
<td>目标指针</td>
</tr>
<tr>
<td>DMA3目标指针 DAR3</td>
<td>01B6h~01B4h</td>
<td>目标指针</td>
</tr>
</tbody>
</table>
DMAC 的操作（重复传送模式）

设定DMA/传送计数器

DMA0传送计数器 TCR0【地址 0180h ~ 0181h】
DMA1传送计数器 TCR1【地址 0190h ~ 0191h】
DMA2传送计数器 TCR2【地址 01A0h ~ 01A1h】
DMA3传送计数器 TCR3【地址 01B0h ~ 01B1h】

传送计数器
设定 “传送次数 - 1”

设定DMA/控制寄存器

DMA0控制寄存器 DM0CON【地址 0180h】
DMA1控制寄存器 DM1CON【地址 0190h】
DMA2控制寄存器 DM2CON【地址 01A0h】
DMA3控制寄存器 DM3CON【地址 01B0h】

<DMAE> DMA允许位
1: 允许

注：请再次将DMA请求位同时清“0”

当软件DMA请求位 = “1”

开始DMA传送
6. 参考文献

数据手册
M16C/65 群硬件手册
（最新版本请从瑞萨科技网页上取得）

技术信息/技术更新
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contact.china@renesas.com
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<table>
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<td>2009.12</td>
<td>初版发行</td>
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