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38D2 群

应用于遥控器时的低功耗设计

1. 要点

本篇资料介绍当 38D2 群单片机应用于遥控器时的低功耗设计。

2. 说明

该应用说明适用于以下条件：

采用的 MCU：38D2 群（例如：M38D24G6HP）

振荡频率： X_{IN} 为 4MHz，X_{CIN} 为 32.768KHz

存储容量： ROM 24KB，RAM 640 字节

3. 内容

3.1 时钟的选择和切换

- 概要

  对于单片机的低功耗设计来说，时钟的选择和切换是很重要的一点。当 38D2 群单片机应用于低功耗设计时，有以下几个设计要点：

  1. 对于单片机的功能模块，尽量选择 XCIN 作为时钟源。比如，定时器、LCD 显示模块等。如果 1 个 8 位定时器的定时时间不够长，可以选择 1 个 16 位定时器或者 2 个 8 位定时器串连的形式来满足长时间的定时需求。
  2. 如果某些功能模块必须使用 XIN 作为时钟源，可以在运行此功能模块之前，先使 XIN 振荡起来，其功能运行完成后，再停掉 XIN，以此来降低系统的功耗。
  3. 在大多数时间，尽量选择 XCIN 作为系统时钟源。在必要时，再切换为 XIN 工作。

- 实例说明

  比如在进行有 LCD 显示的遥控器设计时，资源分配如下：

  1. 定时器 X 用于 38KHz 载波输出，其时钟源为 XIN；
  2. 定时器 3 用于载波输出的控制，其时钟源为 XIN；
  3. 定时器 1 和定时器 2 串连用于 250ms 定时控制，其时钟源为 XCIN；
  4. LCD 显示模块，其时钟源为 XCIN；
  5. 系统工作时钟在平时没有按键和不需要发射载波信号时，选择 XCIN 作为系统时钟源，停掉 XIN；在有按键唤醒后和需要发射载波信号之前，使 XIN 振荡起来，等待稳定后切换到 XIN 作为系统时钟源。

3.2 工作模式的切换

在没有按键时，在选择 XCIN 作为系统时钟源的同时，设置系统进入 WIT 模式，从而降低系统功耗。因为 38D2 群的 LCD 驱动模块不能在 STP 模式下正常工作，为保证 LCD 在任何时刻都能正常显示，系统不能设置为 STP 模式，只能设置为 WIT 模式，达到降低功耗的效果。

针对实例，时钟的选择和切换以及工作模式的切换流程如下图：

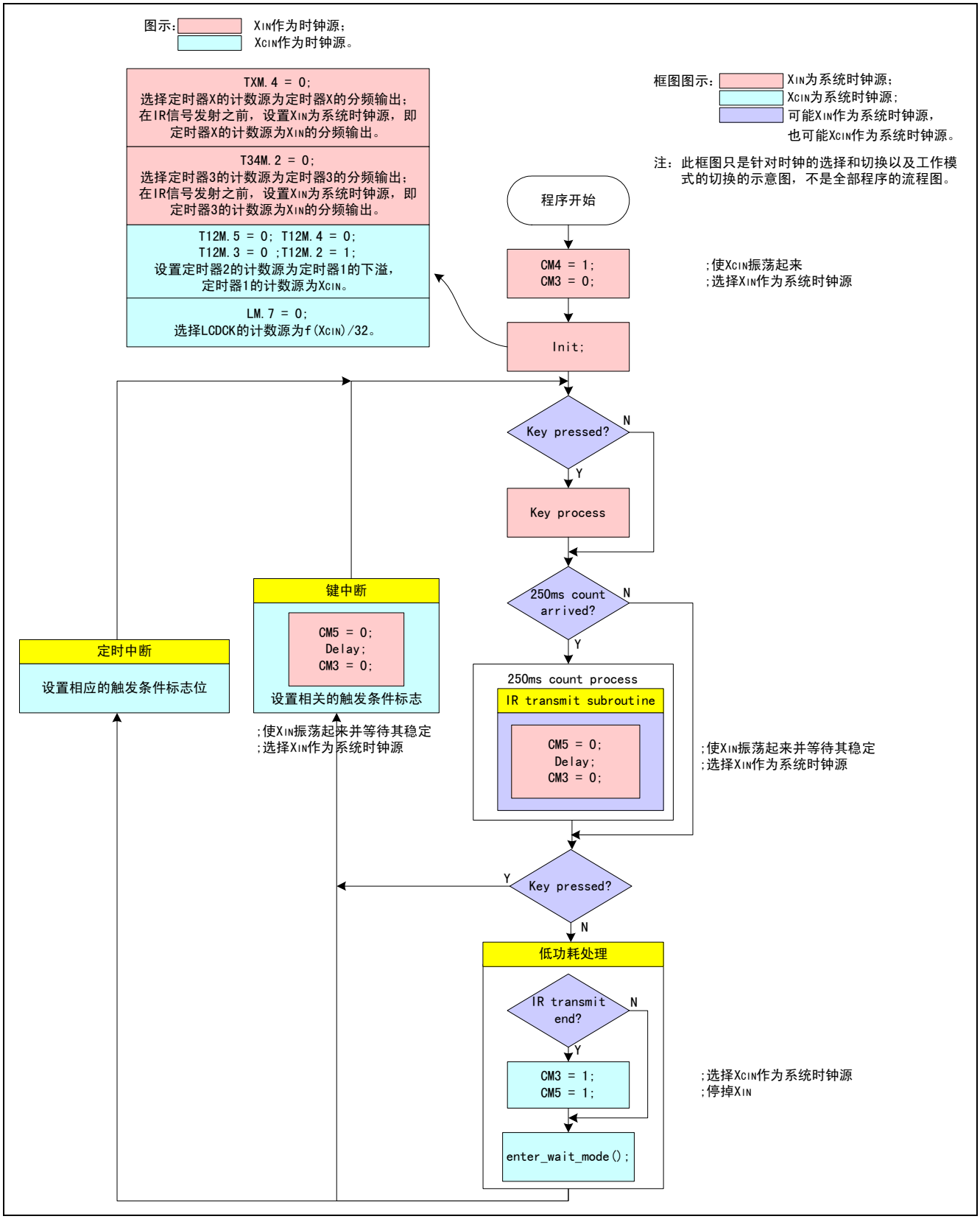

图 1. 时钟的选择和切换以及工作模式的切换

3.3 其他相关设置

3.3.1 LCD 分压电阻的选择

38D2 群的内部分压电阻阻值为 200KΩ。在选择分压电阻阻值大于 200KΩ的情况下，可以保证 LCD 显示清晰，可以设置外部分压电阻电路供给 LCD 驱动电路。因为分压电阻阻值越大，系统功耗就会越低。所以要在保证 LCD 显示清晰的情况下，尽量减小系统的功耗。

3.3.2 AD 电阻网络

在 38D2 群的 AD 转换电路中，AD 电阻网络与参考电压的输入管脚（VREF）可以通过 VREF 输入切换位（ADL 的 bit0 位）进行控制。当此位的值为“1”时，AD 电阻网络总是与 VREF 管脚相连。当此位的值为“0”时，AD 电阻网络在没有 AD 转换时不与 VREF 相连。当设计带有 AD 采样电路的遥控器时，设置此位的值为“0”，从而减小系统的功耗。

- 下图为一个使用 38D2 群设计的遥控器，其各项因素对减少功耗的作用的对比图：

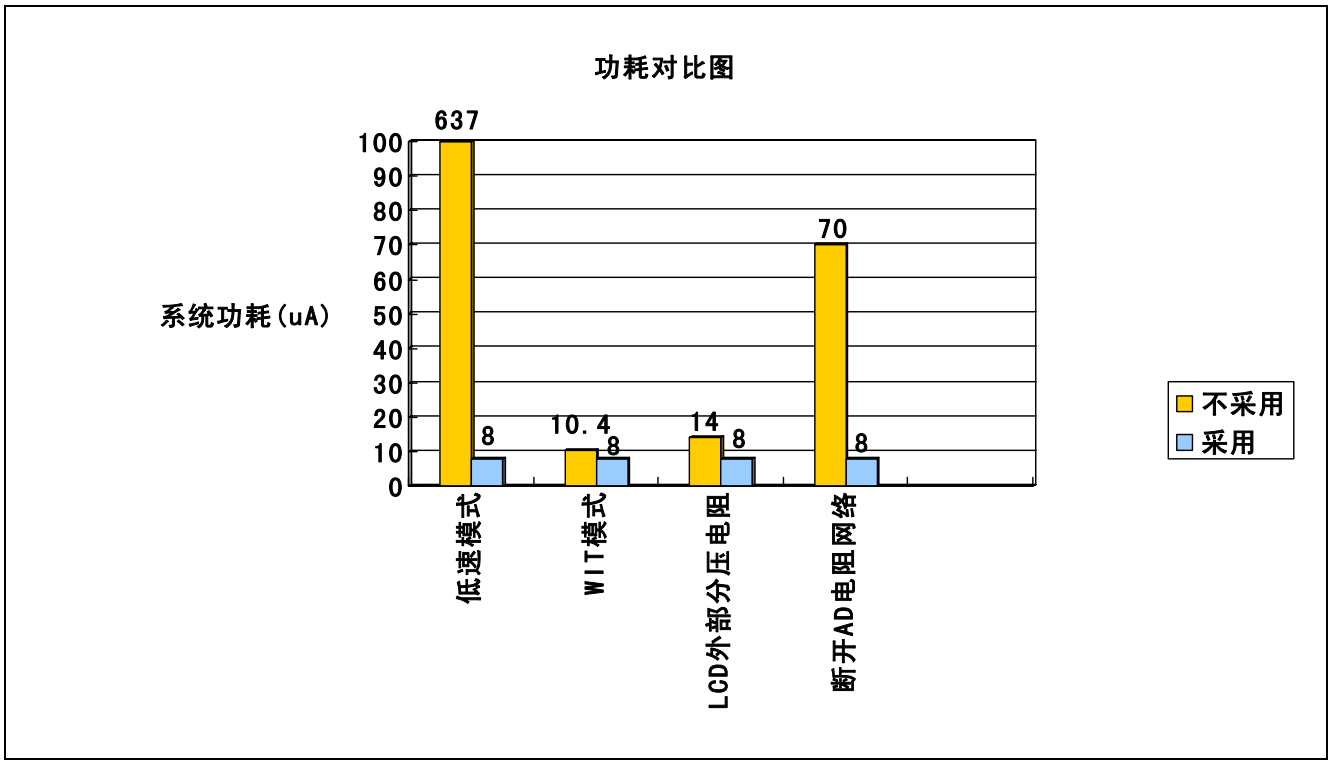

图 2.功耗对比图

【注】
1. XIN 作为系统时钟源时，系统时钟为 XIN/2，XCIN 作为系统时钟源时，系统时钟为 XCIN/2。
2. LCD 外部分压电阻为 3MΩ，内部分压电阻为 200KΩ。
3. 测试条件为 2.50V 工作电压。不同工作电压会影响系统功耗值。
4. 不同的系统电路会影响系统的功耗值。

4. 参考文献

硬件手册

38D2 群数据手册

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1.01	2008.03.17	5	更新咨询邮箱地址，修改硬件手册名称

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