

致尊敬的顾客

关于产品目录等资料中的旧公司名称

NEC电子公司与株式会社瑞萨科技于2010年4月1日进行业务整合（合并），整合后的新公司暨“瑞萨电子公司”继承两家公司的所有业务。因此，本资料中虽还保留有旧公司名称等标识，但是并不妨碍本资料的有效性，敬请谅解。

瑞萨电子公司网址：<http://www.renesas.com>

2010年4月1日
瑞萨电子公司

【发行】瑞萨电子公司（<http://www.renesas.com>）

【业务咨询】<http://www.renesas.com/inquiry>

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: “Standard”, “High Quality”, and “Specific”. The recommended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as “Specific” without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as “Specific” or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is “Standard” unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.
 - “Standard”: Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots.
 - “High Quality”: Transportation equipment (automobiles, trains, ships, etc.); traffic control systems; anti-disaster systems; anti-crime systems; safety equipment; and medical equipment not specifically designed for life support.
 - “Specific”: Aircraft; aerospace equipment; submersible repeaters; nuclear reactor control systems; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

M16C R8C FOUSB/UART 软件

瑞萨单片机开发环境系统

M16C族R8C/Tiny系列单片机

连接R8C/10、R8C/11、R8C/12、R8C/13的注意事项

Keep safety first in your circuit designs!

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage.

Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

1. These materials are intended as a reference to assist our customers in the selection of the Renesas Technology Corp. product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Renesas Technology Corp. or a third party.
2. Renesas Technology Corp. assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts, programs, algorithms, or circuit application examples contained in these materials.

3. All information contained in these materials, including product data, diagrams, charts, programs and algorithms represents information on products at the time of publication of these materials, and are subject to change by Renesas Technology Corp. without notice due to product improvements or other reasons. It is therefore recommended that customers contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor for the latest product information before purchasing a product listed herein.

The information described here may contain technical inaccuracies or typographical errors.

Renesas Technology Corp. assumes no responsibility for any damage, liability, or other loss rising from these inaccuracies or errors.

Please also pay attention to information published by Renesas Technology Corp. by various means, including the Renesas Technology Corp. Semiconductor home page (<http://www.renesas.com>).

4. When using any or all of the information contained in these materials, including product data, diagrams, charts, programs, and algorithms, please be sure to evaluate all information as a total system before making a final decision on the applicability of the information and products. Renesas Technology Corp. assumes no responsibility for any damage, liability or other loss resulting from the information contained herein.
5. Renesas Technology Corp. semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Renesas Technology Corp. or an authorized Renesas Technology Corp. product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
6. The prior written approval of Renesas Technology Corp. is necessary to reprint or reproduce in whole or in part these materials.
7. If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination.
Any diversion or reexport contrary to the export control laws and regulations of Japan and/or the country of destination is prohibited.
8. Please contact Renesas Technology Corp. for further details on these materials or the products contained therein.

请遵循安全第一进行电路设计

1. 虽然瑞萨科技尽力提高半导体产品的质量和可靠性，但是半导体产品也可能发生故障。半导体的故障可能导致人身伤害、火灾事故以及财产损害。在电路设计时，请充分考虑安全性，采用合适的安全设计方法，如：冗余设计、利用非易燃材料以及防止故障或事故等。

关于利用本资料时的注意事项

1. 本资料是为了让用户根据用途选择合适的瑞萨科技产品的参考资料，不转让属于瑞萨科技或者第三者所有的知识产权和其它权利的许可。
2. 对于因使用本资料所记载的产品数据、图、表、程序、算法以及其它应用电路的例子而引起的损害或者对第三者的权力的侵犯，瑞萨科技不承担责任。
3. 本资料所记载的产品数据、图、表、程序、算法以及其它所有信息均为本资料发行时的信息，由于改进产品或者其它原因，本资料记载的信息可能变动，恕不另行通知。在购买本资料所记载的产品时，请预先向瑞萨科技或者经授权的瑞萨科技产品经销商确认最新信息。
本资料所记载的信息可能存在技术不准确或者印刷错误。因这些错误而引起的损害、责任问题或者其它损失，瑞萨科技不承担责任。
同时也请通过各种方式注意瑞萨科技公布的信息，包括瑞萨科技半导体网站。
(<http://www.renesas.com>)
4. 在使用本资料所记载部分或者全部数据、图、表、程序以及算法等信息时，在最终做出有关信息和产品是否适用的判断前，务必对作为整个系统的所有信息的评价。由于本资料所记载的信息而引起的损害、责任问题或者其它损失，瑞萨科技不承担责任。
5. 瑞萨科技的半导体产品不是为在可能和人命相关的环境下使用的设备或者系统而设计和制造的产品。在研讨将本资料所记载的产品用于运输、机动车辆、医疗、航空宇宙用、原子能控制、海底中继器的设备或者系统等特殊用途时，请与瑞萨科技或者经授权的瑞萨产品经销商联系。
6. 未经瑞萨科技的书面许可，不得翻印或者复制全部或者部分资料的内容。
7. 如果本资料所记载的某产品或者技术内容受日本出口管理限制，必须在得到日本政府的有关部门许可后才能出口，并且不准进口到批准目的地国家以外的国家。
禁止违反日本和（或者）目的地国家的出口管理法和法规的任何转卖、挪用或者再出口。
8. 如果需要了解本资料所记载的信息或者产品的详细，请与瑞萨科技联系。

1. 系统连接	2
2. 设置 M16C R8C FoUSB/UART 调试软件	3
3. 使用R8C UART调试软件时的内存分配	16
4. 监控程序占用的空间	17
5. 使用R8C UART调试软件中的注意事项	17
5.1 在调试结束后，更换调试的通讯速率，并重新启动R8C UART调试器	17
5.2 用户程序的ID码	17
5.3 能够下载用户程序的空间	17
5.4 频率特性	18
5.5 操作SFR时的限制	19
5.6 停止和等待模式下的限制	19
5.7 看门狗定时器	19
5.8 用户程序的实时操作	20
5.9 异常处理	20
5.10 外围功能的限制	21
5.11 标志寄存器的限制	21
5.12 中断对并行I/O的操作	21

1. 系统连接

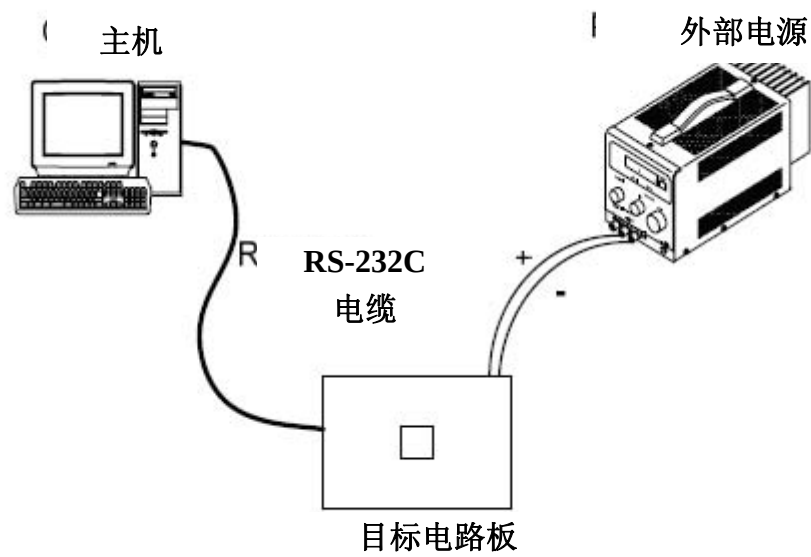


图 1 与用户系统的连接示例

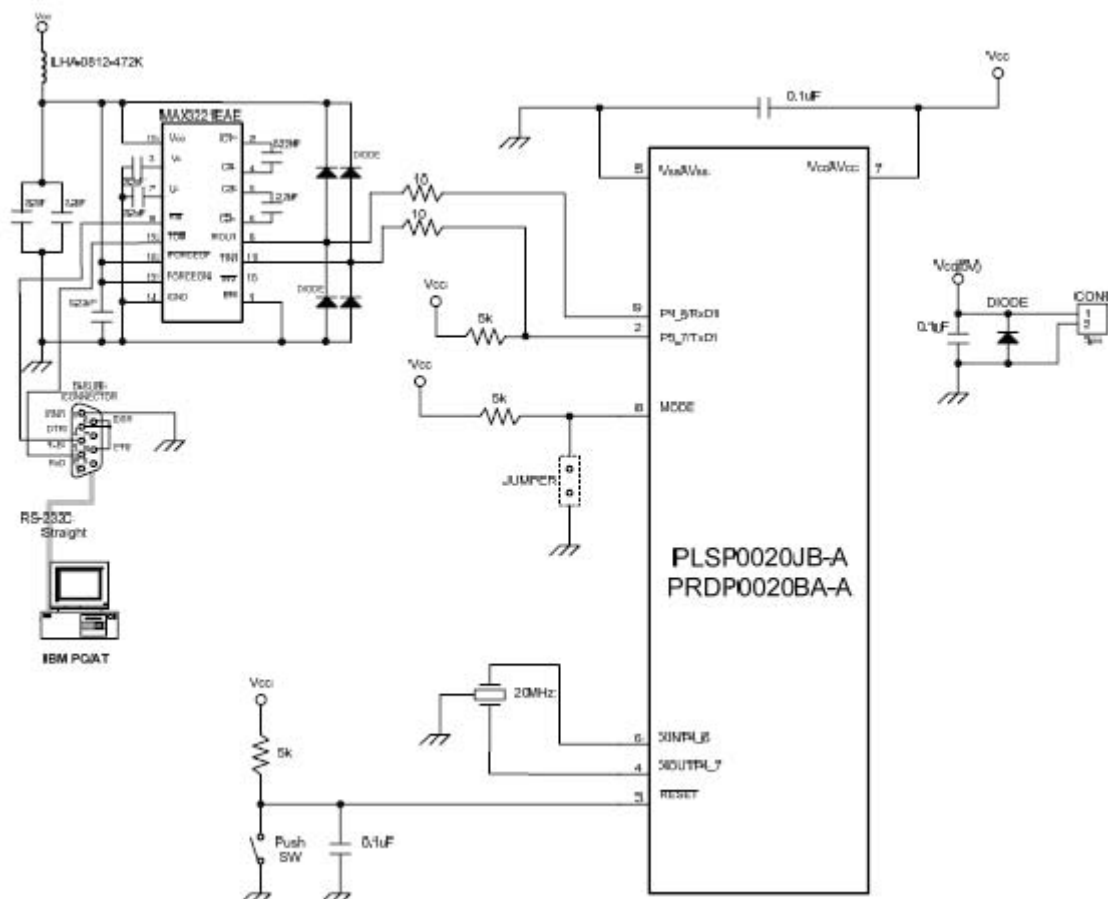


图 2 与 RS232C 电缆连接的电路示例

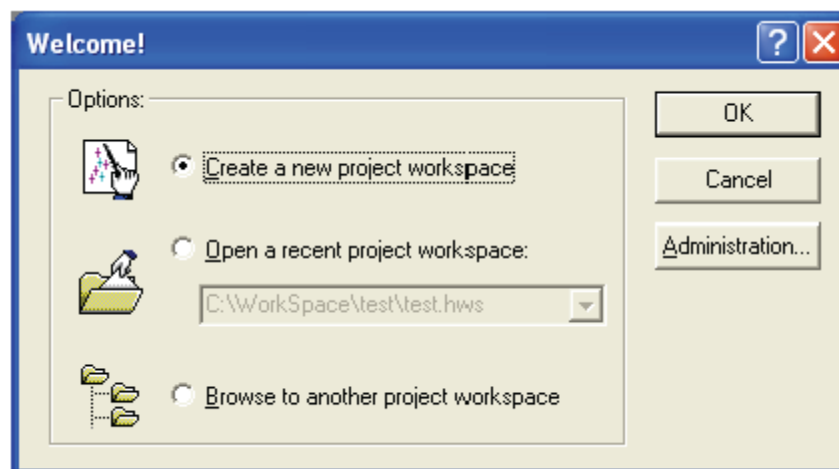
2. 设置 M16C R8C FoUSB/UART 调试软件

在使用 M16C R8C FoUSB/UART 调试软件(R8C UART 调试软件)时,用 RS232C 连接电缆将主机和目标板连接起来,就可以进行调试了。

用户不需要事先安装监控程序,因为监控程序已经在安装 M16C R8C FoUSB/UART 调试软件时捆绑安装了。

对 R8C/Tiny, 用户不需要使用 M16C FlashStarter 或其它软件预先将监控程序烧写到目标单片机中,因为 R8C UART 调试软件将自动完成这一步骤。

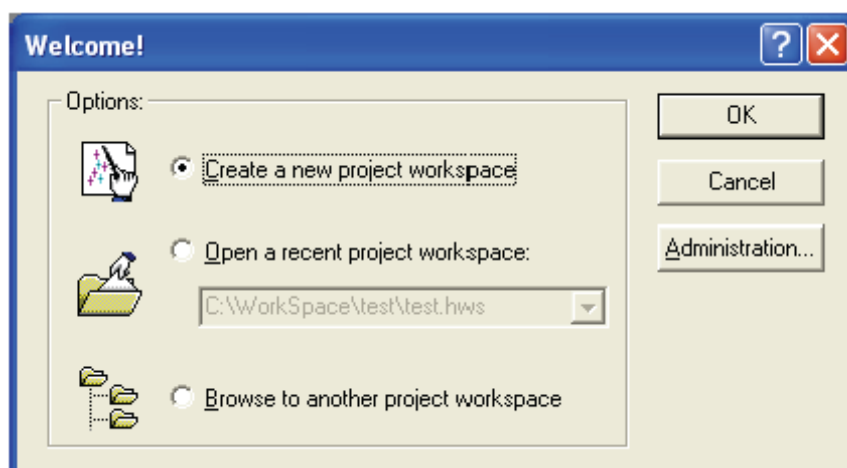
- (a) 启动 HEW。依次点击“开始”、“所有程序(P)”、“RENESAS”、“High-performance Embedded Workshop”和“High-performance Embedded Workshop”图标。将弹出“Welcome!”对话框。



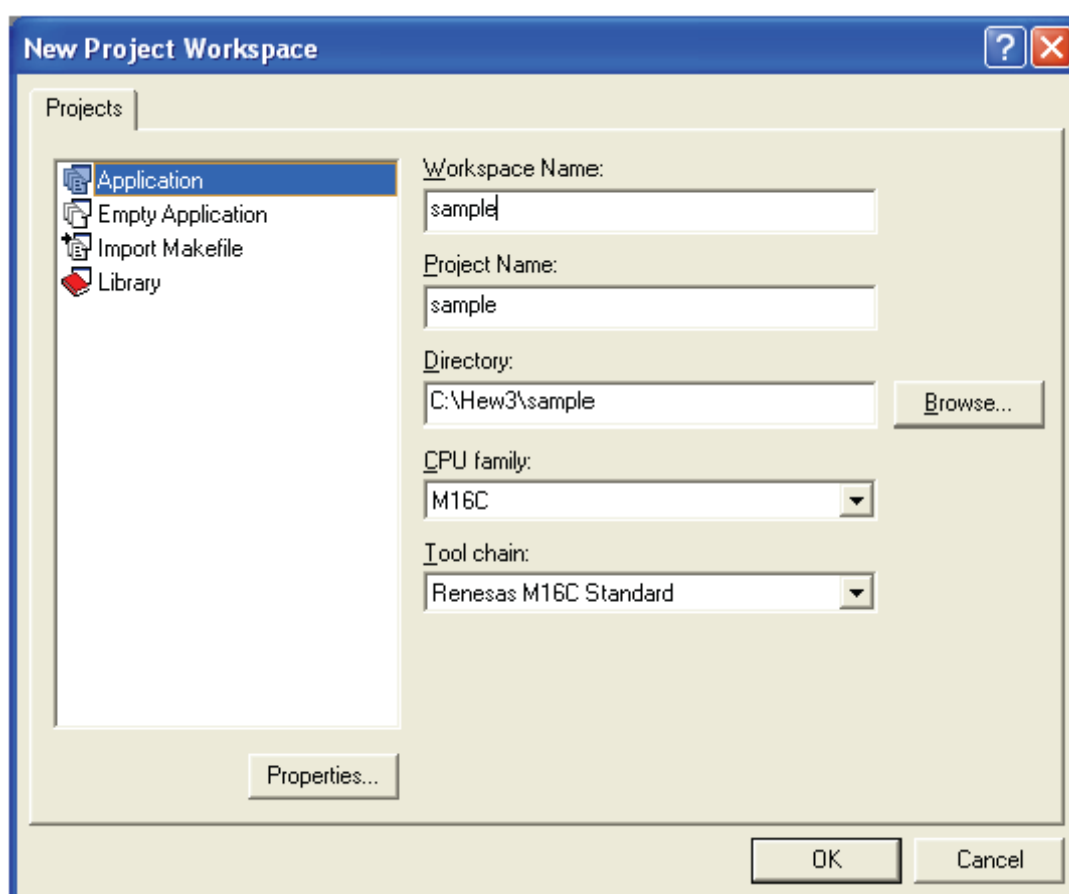
- [Create a new project workspace]
选择此项来创建新的工作空间。
- [Open a recent project workspace]
选择已经存在的工作空间。
显示使用的工作空间。
- [Browse to another project workspace]
选择已经存在的工作空间。
当历史工作空间没有保留时使用。

如果选择已经存在的工作空间并点击[OK]按钮,将显示如图 (s) 的界面。

- (b) 选择[Create a new project workspace]单选按钮。点击“OK”按钮。

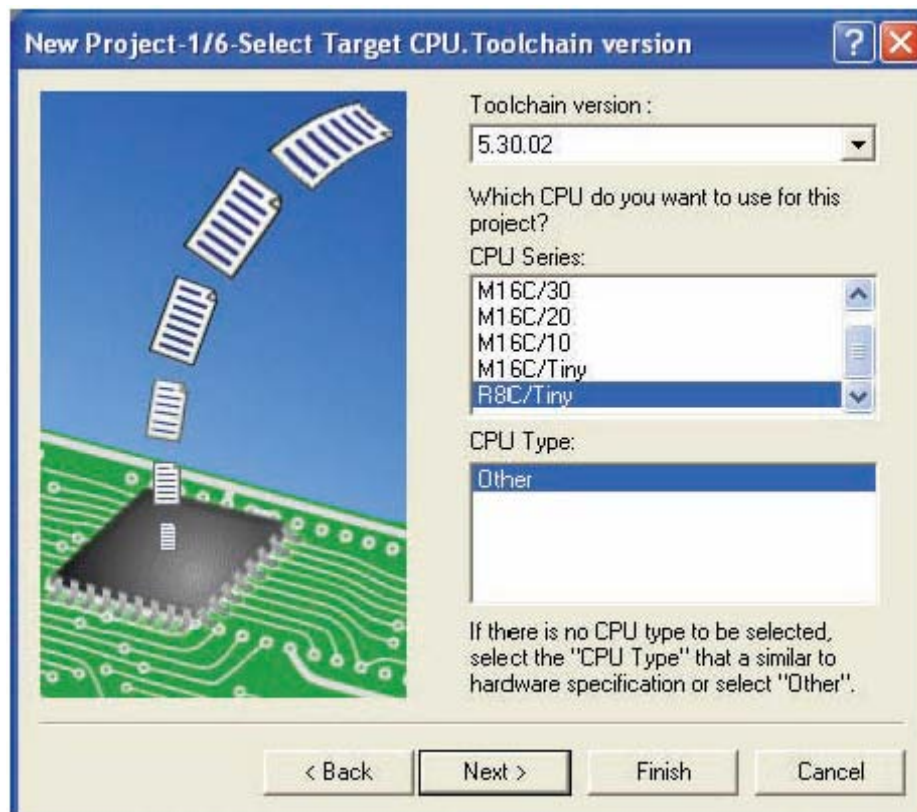


- (c) 开始创建工程。当安装工具链时，将显示如下对话框。



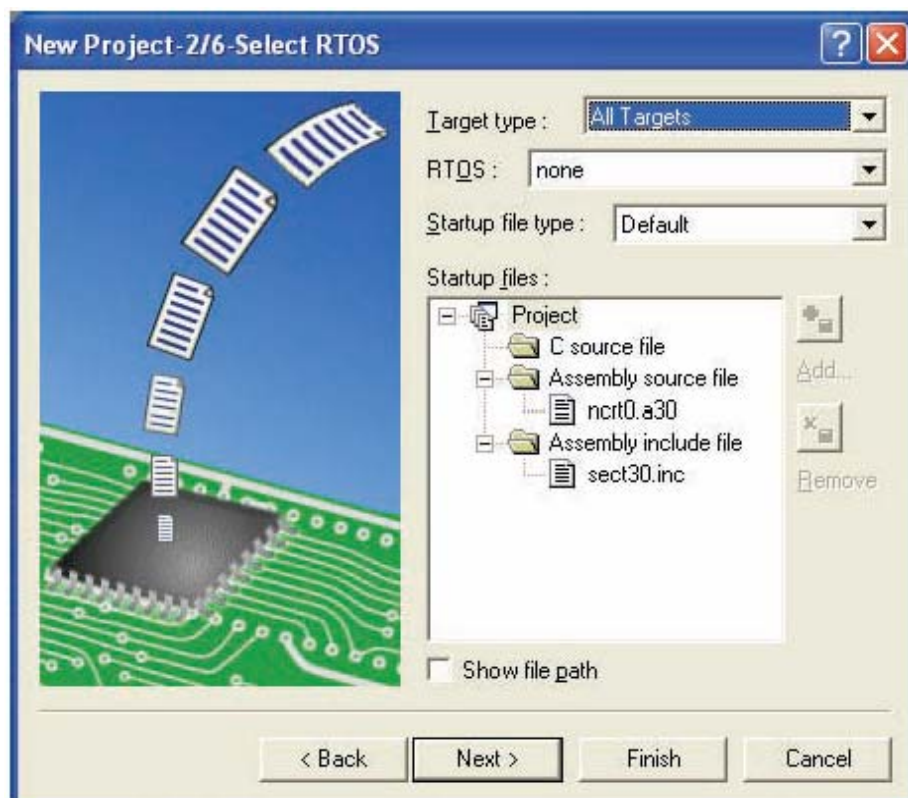
- [Workspace name]
新建工作空间名称。这里以“Sample”为例。
- [Project name]
如果用户希望改变工程名称，请输入新的工程名称。
- [CPU type]
选择使用的单片机型号。
- [Tool chain]
如果使用工具链，选择适用的工具链名称。如果不使用，选择[None]。
- [Project type]
选择一个想使用的工程类型。

(d) 下一步，设置工具链。



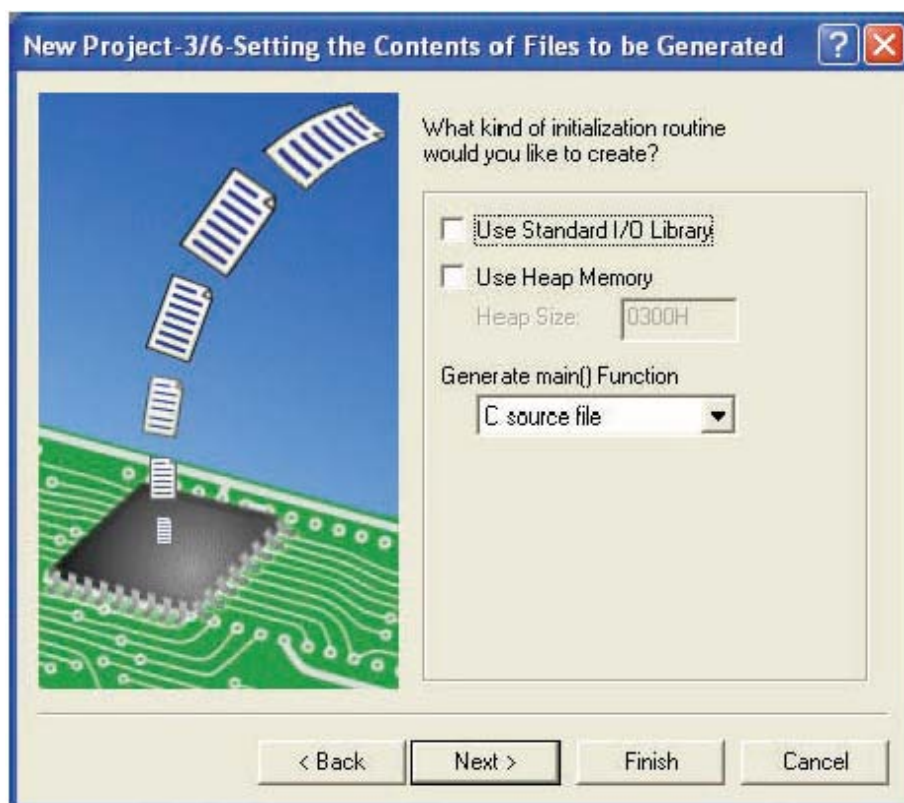
选择工具链版本和单片机系列，然后点击[Next]按钮。

(e) 下一步，设置 RTOS。



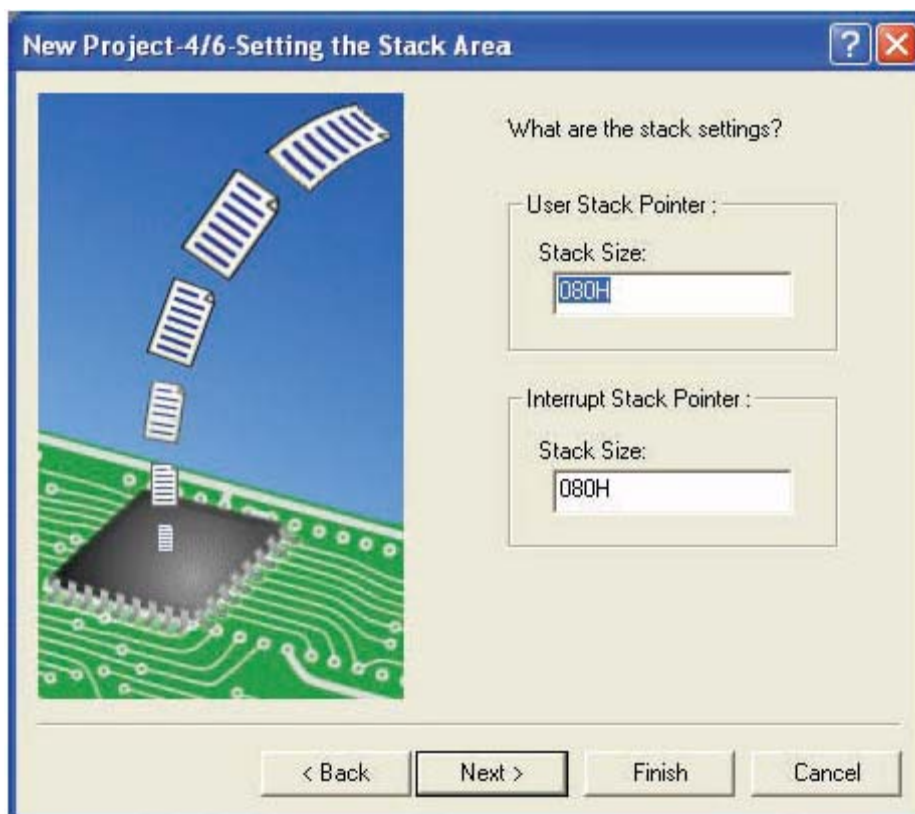
选择要使用的 RTOS 和启动文件类型，点击[Next]按钮。

(f) 下一步，设置堆空间等。



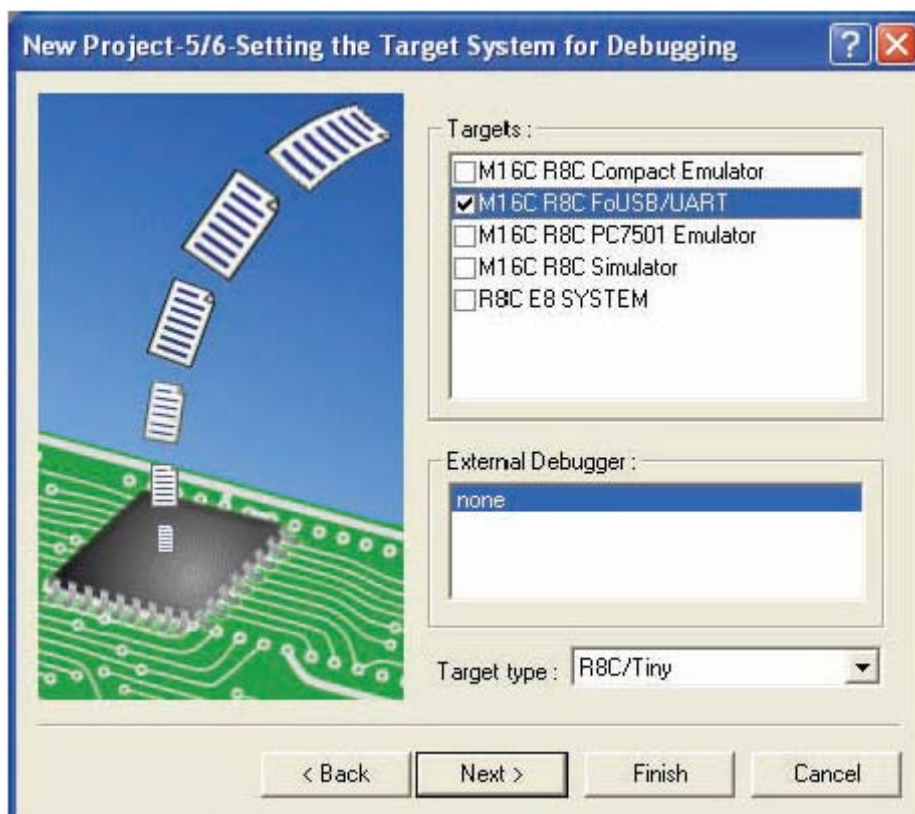
设置完堆空间等后，点击[Next] 按钮。

(g) 下一步，设置堆栈空间。



设置堆栈大小后，点击[Next] 按钮。

(h) 设置完工具链后，将显示如下的界面。

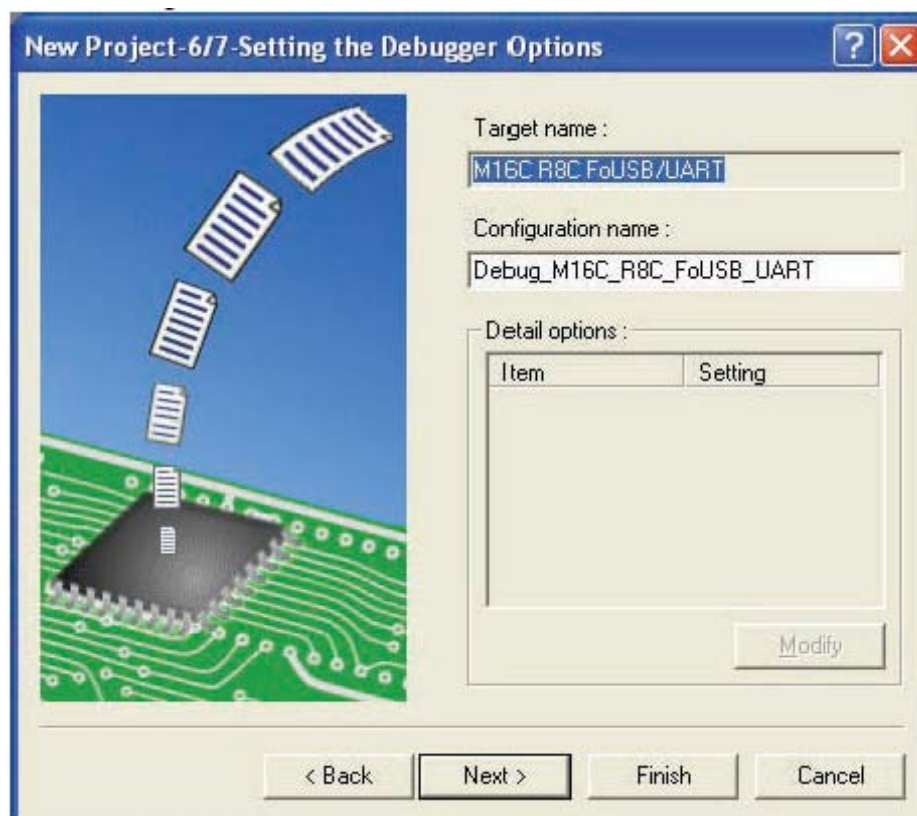


选择 M16C R8C FoUSB/UART 复选框并点击[Next]按钮。

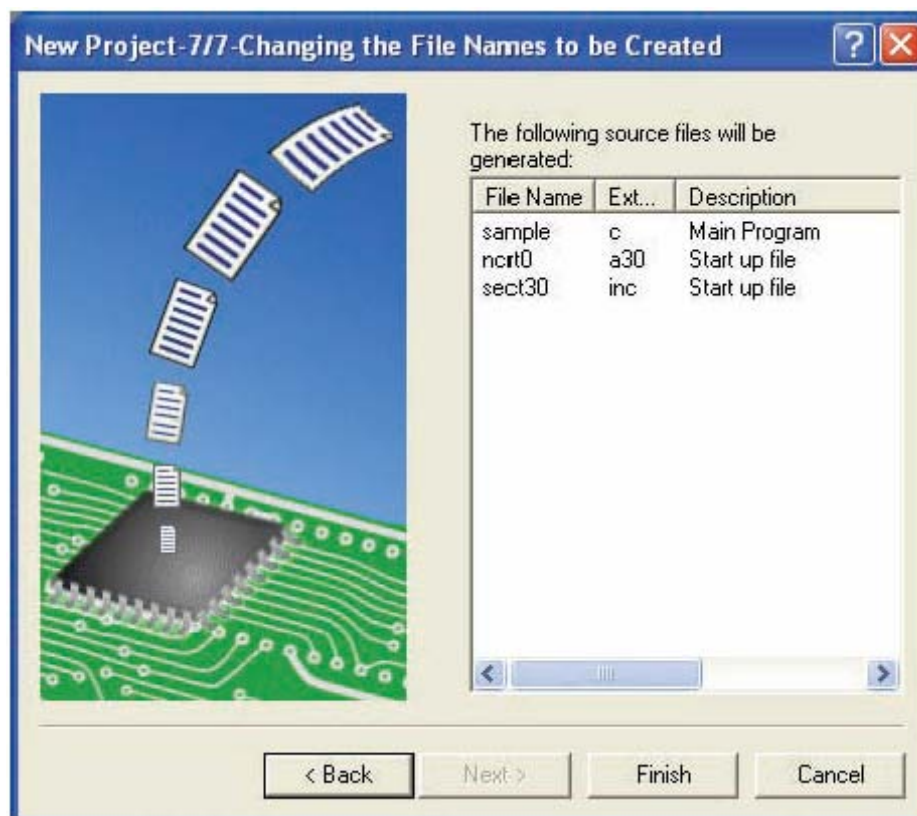
如有必要，请同时选择其他工具。

(i) 下一步，设置配置文件名称。

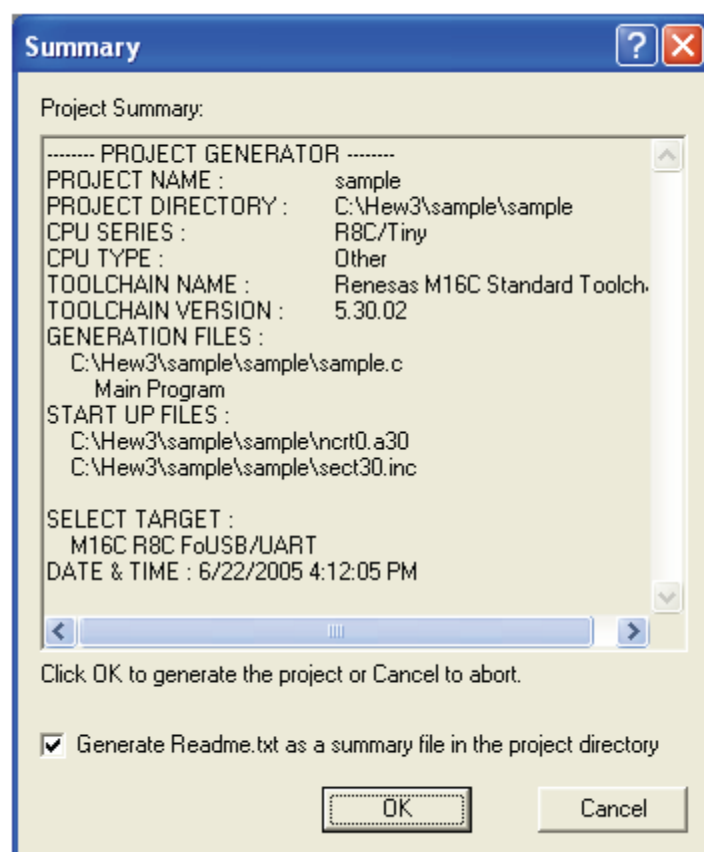
配置文件是 build 选项的设置。(例如，输出调试信息或者优化设置)。术语“configuration”也可被称为“build configuration”。



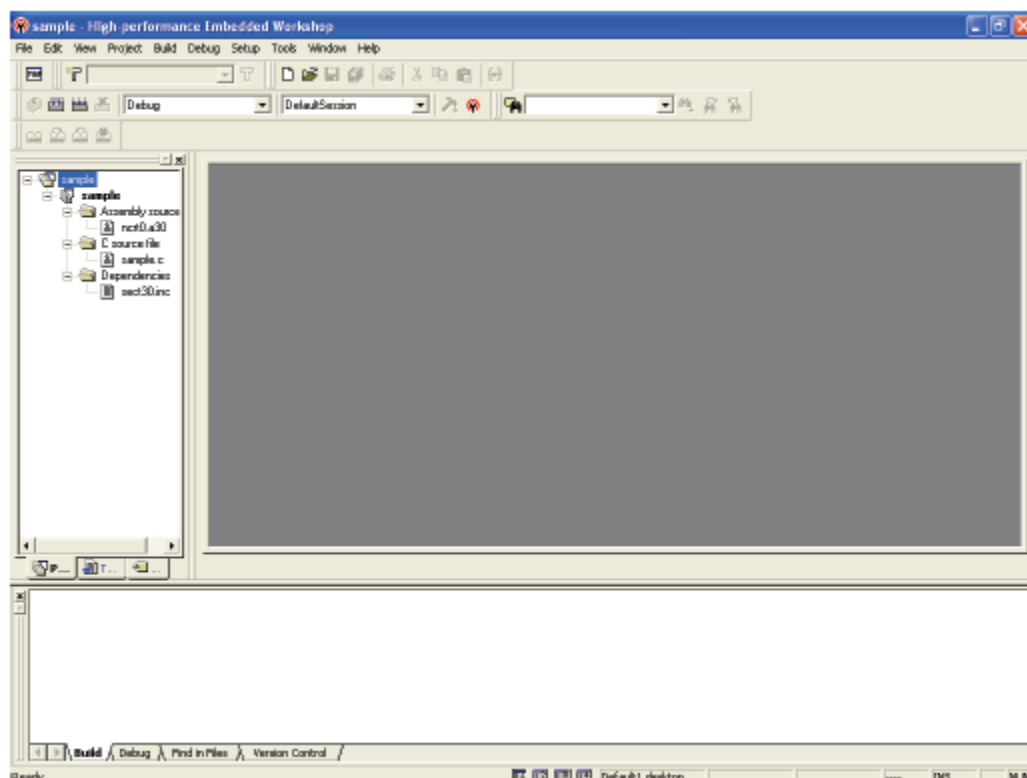
(j) 最后，检查生成的文件名称。



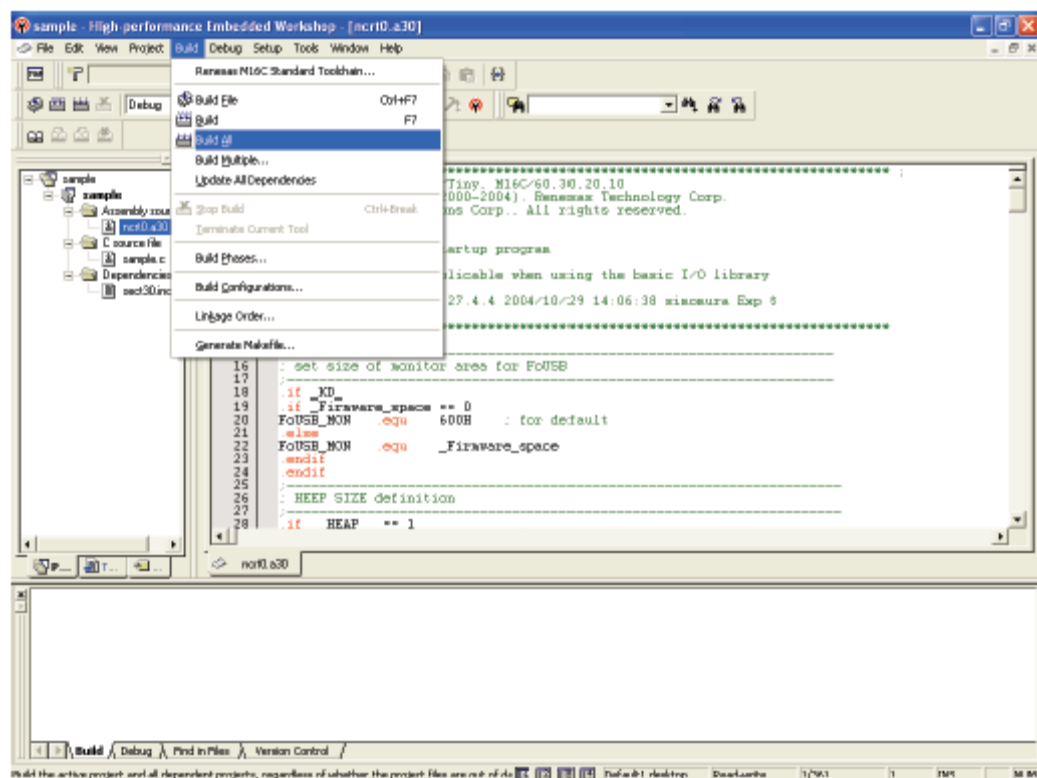
- (k) 以上的设置将显示 High-performance Embedded Workshop 生成的文件。点击[OK]按钮，启动 High-performance Embedded Workshop。



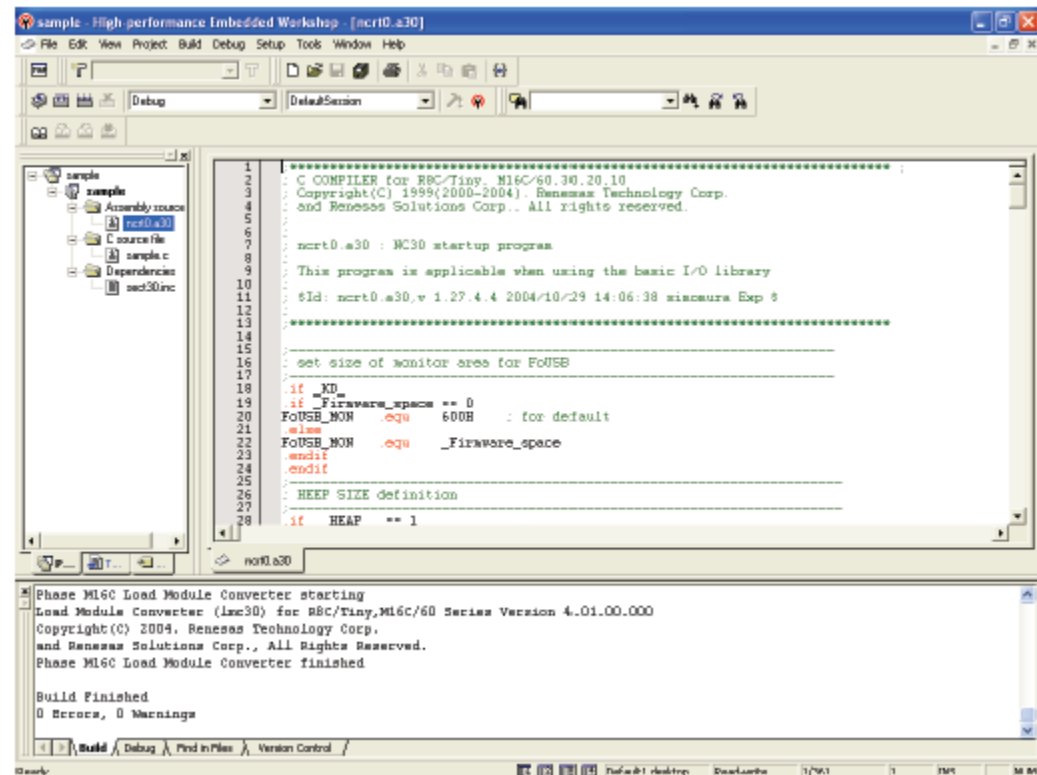
- (l) 双击源程序，文本编辑器将启动，这时就可以编辑了。



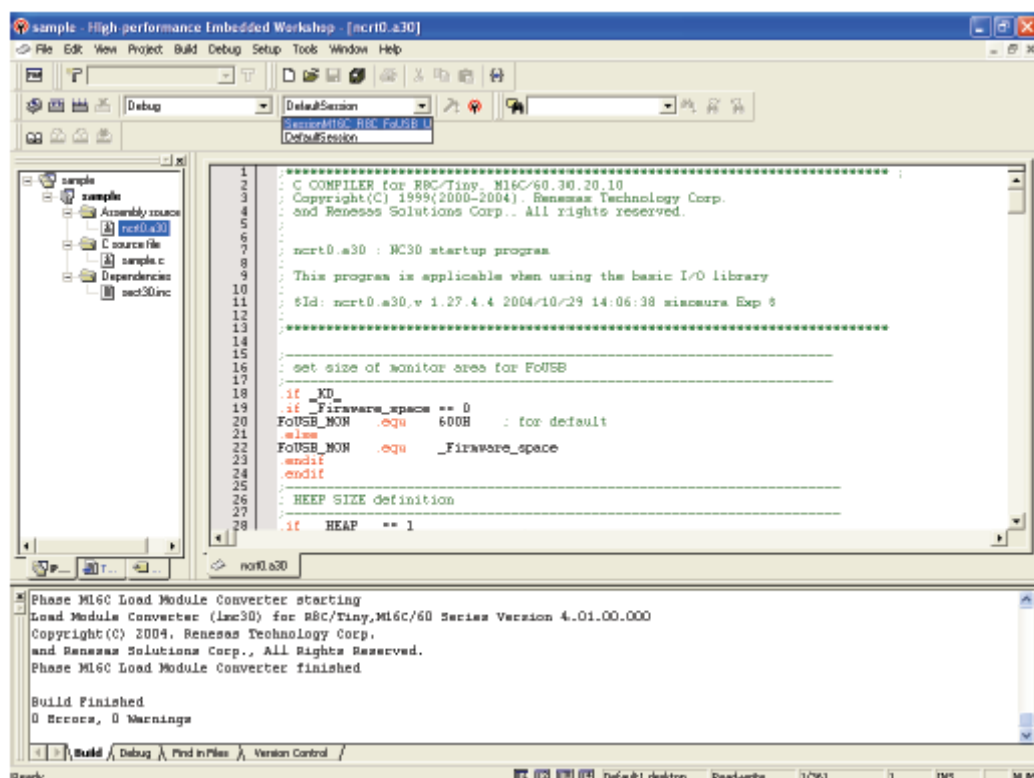
- (m) 点击“Build”菜单，接着“Build”或者“Build All”将在创建一个程序后 build。



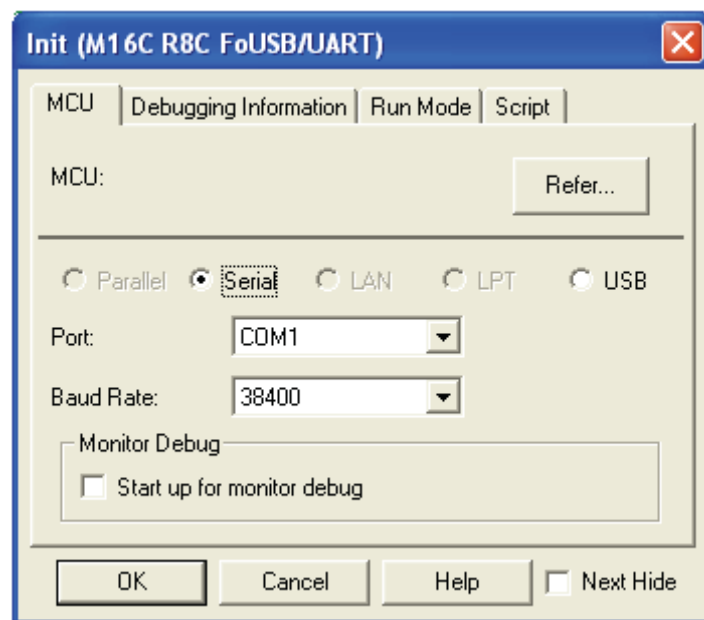
- (n) Build 的结果显示如下。



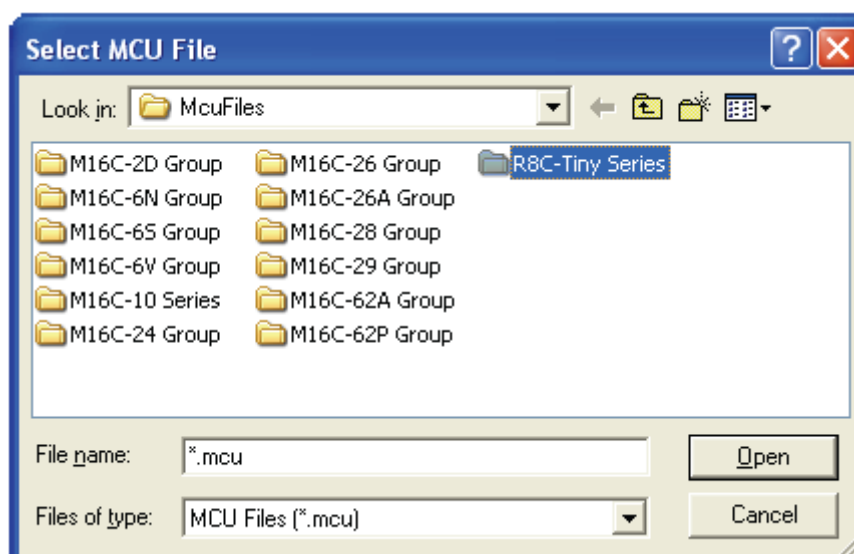
- (o) 下一步，连接目标。从 registered session 中选择使用 R8C UART 调试器，可以很容易地连接目标板。



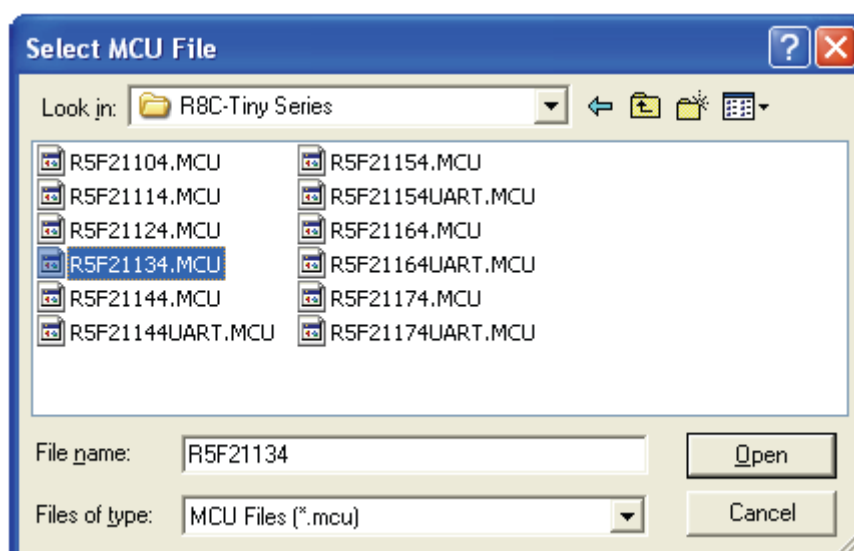
- (p) 显示如下初始化窗口。选择[Serial]单选按钮并点击[Reference]按钮。



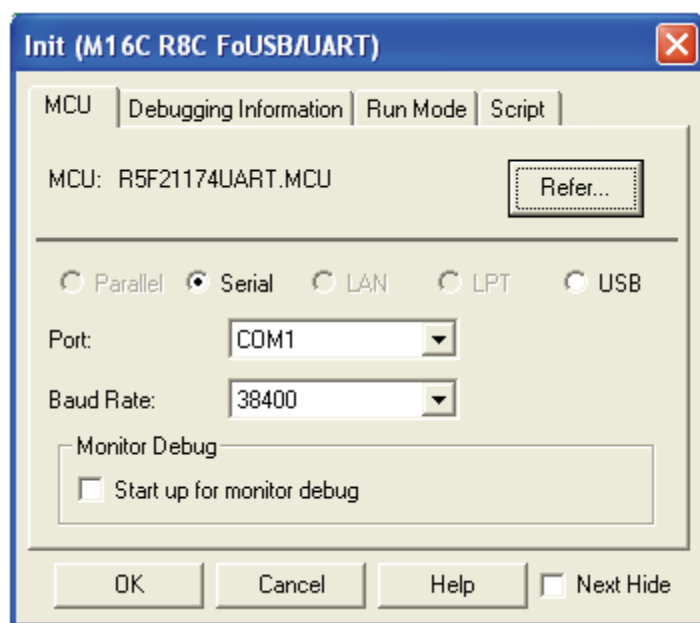
- (q) 选择 R8C-Tiny 系列。



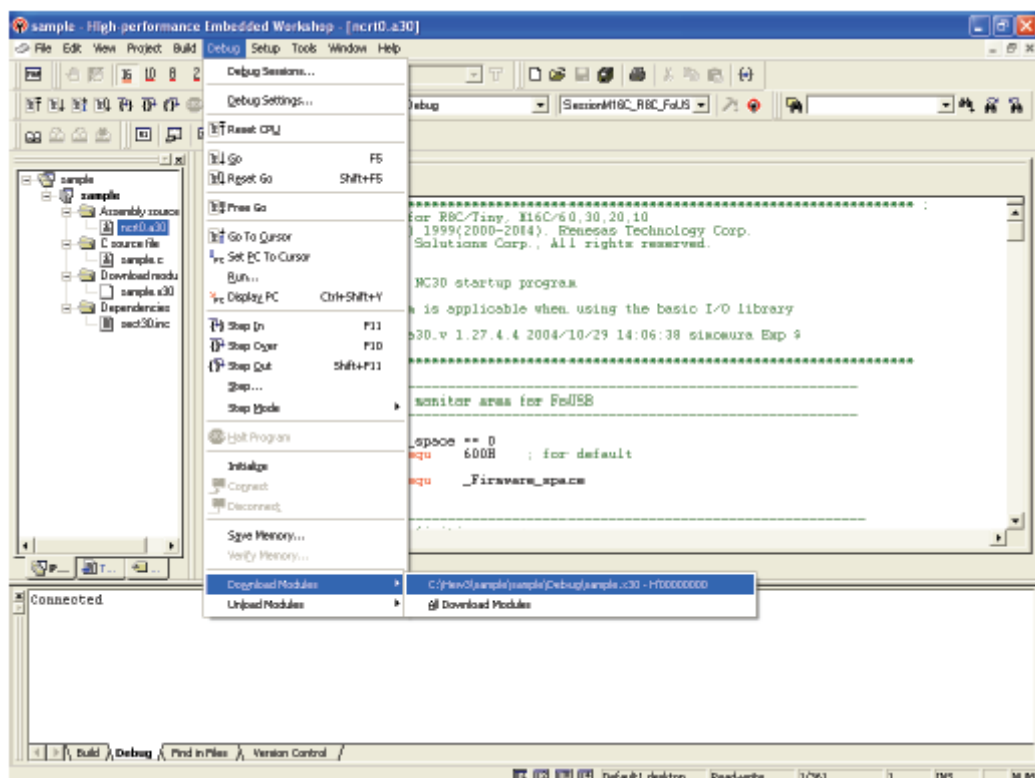
- (r) 选择对应的单片机文件。



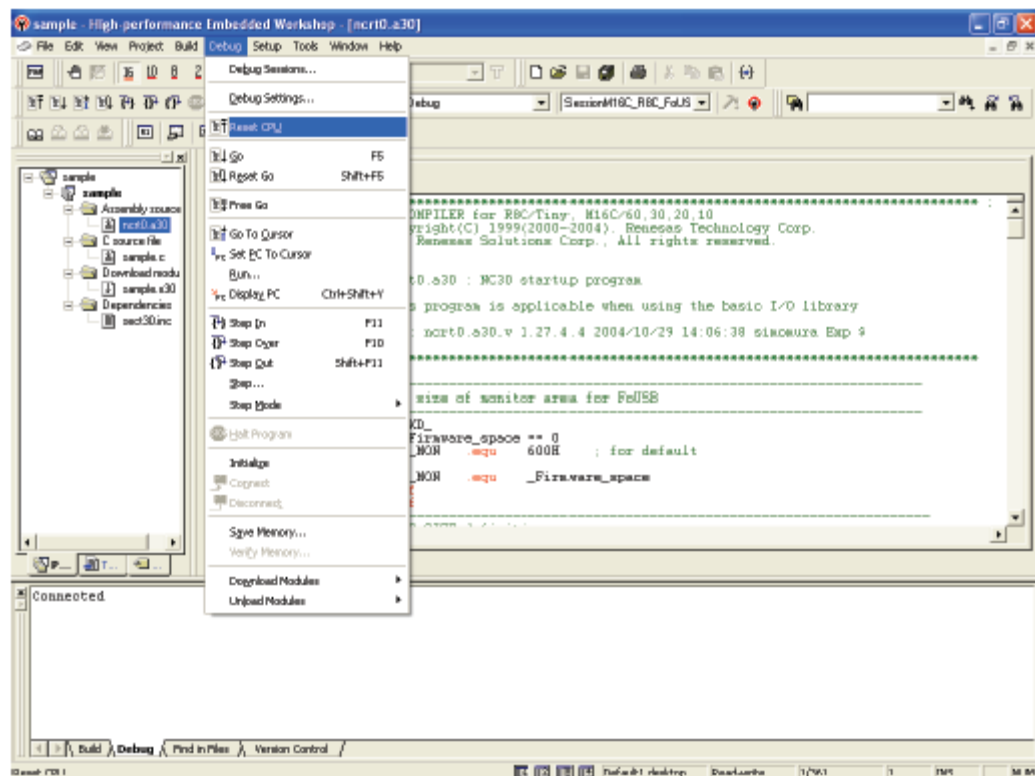
- (s) 点击 OK 后，将下载监控程序。



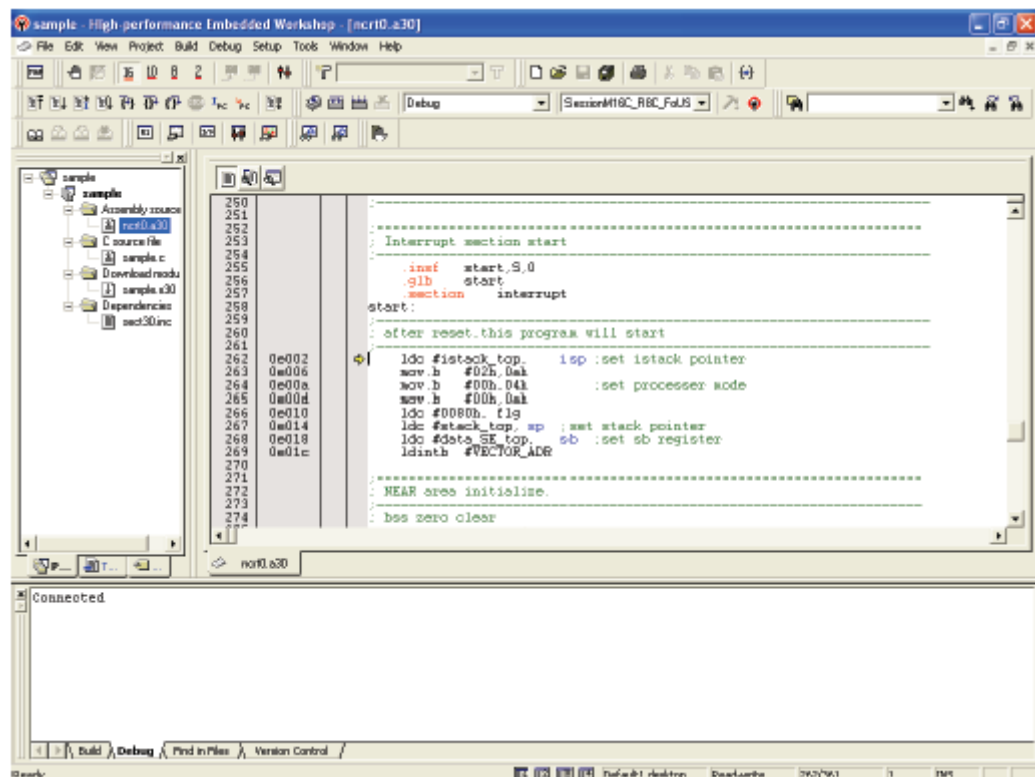
- (t) 通过“Debug”中的“Download”和“Download File (X30 file)”下载用户程序。



- (u) 点击“Debug”菜单中的“Reset CPU”来复位用户程序。



- (v) 光标将跳至用户程序的起始处，就可以开始调试了。



3. 使用 R8C UART 调试软件时的内存分配

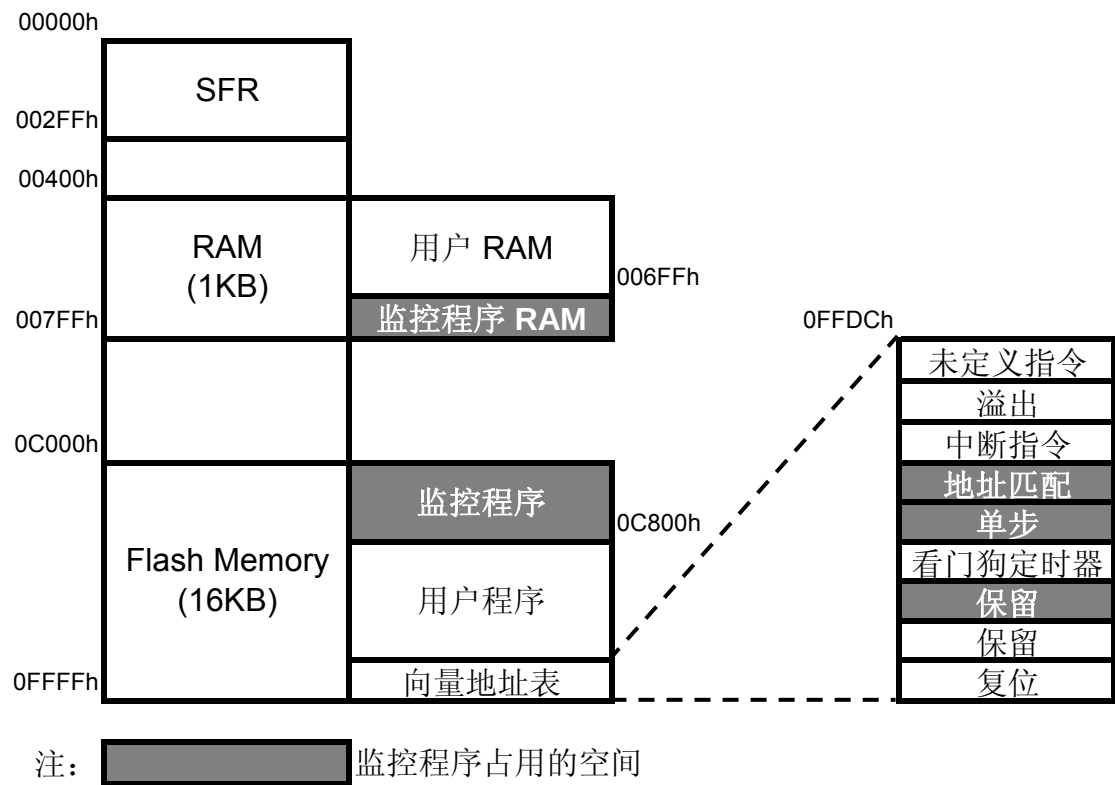


图 3 R8C/Tiny 的内存分配

4. 监控程序占用的空间

表 1 监控程序占用的空间

ROM/RAM	监视程序占用的空间	
8KB/512B	向量	FFE8h ~ FFEbH, FFECh ~ FFEfH, FFF4h ~ FFF7h
12KB/768B	RAM 向量	6FFh FFE8h ~ FFEbH, FFECh ~ FFEfH, FFF4h ~ FFF7h
16KB/1KB	RAM Flash Memory 向量	6FFh ~ 7FFh C000h ~ C7FFh FFE8h ~ FFEbH, FFECh ~ FFEfH, FFF4h ~ FFF7h

5. 使用 R8C UART 调试软件中的注意事项

5.1 在调试结束后，更换调试的通讯速率，并重新启动 R8C UART 调试器。

当 R8C UART 调试软件关闭后，目标单片机还保存着上次的通讯速率。因此，改变通讯速率并重新开始 R8C UART 将产生一个通讯错误（R8C UART 调试软件可以使用上次的通讯速率启动）。需要改变通讯速率时，关闭目标单机电源并重新上电。

5.2 用户程序的 ID 码

使用 R8C UART 调试软件时，用户程序的 ID 码被全部设置成 FFh。

表 2 ID 码的存储地址 (R8C/10 群)

地址	ID 序号	向量表
0FFDFh - 0FFDCh	ID1	未定义指令
0FFE3h - 0FFE0h	ID2	溢出
0FFE7h - 0FFE4h		中断指令
0FFEBh - 0FFE8h	ID3	地址匹配
0FFEfH - 0FFECh	ID4	单步
0FFF3h - 0FFF0h	ID5	看门狗定时器 振荡停止检测
0FFF7h - 0FFF4h	ID6	保留
0FFFBh - 0FFF8h	ID7	保留
0FFFFh - 0FFFCCh	(注 1)	复位

注： 1. 0FFFFh 的值请参照硬件手册进行设定

5.3 能够下载用户程序的空间

如图 3 所示，使用 R8C UART 调试软件时，一部分 RAM 和 Flash Memory 空间被调试软件使用。因此如果用户程序的地址和那些被调试软件使用的地址相重叠时，R8C UART 调试软件将不会下载这部分重叠的用户程序。注意，这种情况下，R8C UART 调试软件不会弹出错误信息。

5.4 频率特性

监控程序能在下表所示的主时钟（Xin）频率下工作。由于监控程序可能在一些频率下无法正常工作，因此请选用下表中的频率作为晶振的频率。

1MHz (最小) ~ 20MHz (最大)

表 3 列出了所有的可以工作的频率和在该频率下可用的通讯速率。然而，尽管晶振的频率正确，由于对主时钟分频而引起的频率低于 1MHz 也可能导致监控程序无法正常工作。

表 3 可选频率和对应的可用通讯速率

频率	通讯速率 (bps)					
	1200	2400	4800	9600	19200	38400
20MHz	N/A	N/A	√	√	√	√
16MHz	N/A	N/A	√	√	√	√
14MHz	N/A	N/A	√	√	√	√
12MHz	N/A	N/A	√	√	√	√
10MHz	N/A	√	√	√	√	√
8MHz	N/A	√	√	√	√	√
6MHz	N/A	√	√	√	√	√
4MHz	√	√	√	√		N/A
2MHz	√	√	√	√	N/A	N/A
1MHz	√	√	√	N/A	N/A	N/A

√: 可以通讯

N/A: 不能通讯

注:

由于环境温度和电源电压的原因，监控程序也可能无法正常工作。在这种情况下，在较低的通讯速率下运行 R8C UART 调试软件。

5.5 操作 SFR 时的限制

表 4 列出了操作 SFR 时的限制。如果那些不能被改变的寄存器被改变，监控程序可能不能正常工作。

表 4 操作 SFR 时的限制

寄存器	默认值	限制	改变
处理器模式寄存器 0	复位 00h	只支持单芯片模式	*
处理器模式寄存器 1	复位 00h	—————	√
系统时钟控制寄存器 0	复位 08h	将 CM05 位设为“0”	*
系统时钟控制寄存器 1	复位 28h	将 CM13 和 CM15 位设为“1”	*
高速片内振荡器控制寄存器 0	复位 03h	—————	√
高速片内振荡器控制寄存器 1	复位 07h	—————	√
振荡停止检测寄存器	复位 00h	—————	N/A
保护寄存器	—————	—————	√
标志寄存器	—————	不能对 D 标志进行写操作 不要设为“1”	*
中断堆栈指针 (ISP)	复位 05FFh	设为 06FFh 以下 06FFh~07FFh 为监控程序	*
UART1 发送/接收模式寄存器	复位 15h	不要改变	N/A
UART1 波特率寄存器	—————		
UART1 发送/接收控制寄存器 0	复位 00h		
UART1 发送/接收控制寄存器 1	复位 07h		
UART1 发送/接收控制寄存器 2	复位 22h		
UART1 发送缓冲寄存器	—————	不能写数据	N/A
UART1 接收缓冲寄存器	—————	不能读	N/A

√: 可以改变 N/A: 不能改变 *: 可以改变 (有限制)

5.6 停止和等待模式下的限制

如要在用户程序中使用停止或等待模式，请使用 Free-run 模式启动 R8C UART 调试软件，并且关闭 RAM 窗口，C watch 窗口和 ASM 窗口。同时，在停止或等待模式时，不要操作调试软件直到程序停止在断点。

5.7 看门狗定时器

R8C UART 调试软件不支持看门狗定时器。因此，使用 R8C UART 调试软件时不要使用看门狗定时器。

5.8 用户程序的实时操作

- Sampling Run (Sampling) 模式

在 Sampling 模式下，用户程序中的 Go 和 Come 指令的执行状况将通过和主机的来回交流得到有规律的监控。因此，由断点引起的用户程序中断能够被检测出来。在一般的调试情况下请使用这种模式。

- Free Run (Free run)模式

在 Free run 模式下，如果执行 Go 或者 Come 指令，用户程序的状态将不能被监视。尽管用户程序已经停止，但由断点引起的用户程序中断不能被检测到。因此，即使用户程序已经停止，R8C UART 调试软件无法停止 Go 或者 Come 指令。如要停止，点击 STOP 按钮。

注：

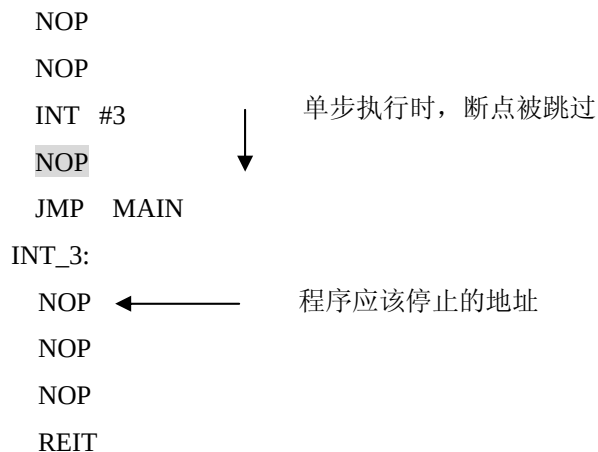
在 Free run 模式下，在关闭 RAM 窗口，C watch 窗口和 ASM 窗口时使用 R8C UART 调试软件。

5.9 异常处理

- 软件中断指令

当执行连续的能产生软件中断的内部处理指令（未定义指令，溢出，断点指令和中断指令）时，不能使用单步执行。

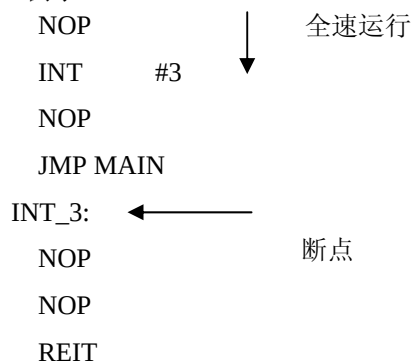
例子：INT 指令



- INT 指令

对于内部处理的 INT 指令，设置软件中断并用 Go 指令来调试那些使用 INT 的指令。

例子：



5.10 外围功能的限制

UART1 用作监控程序与主机通讯。在用户程序中不要使用 UART1。

下列管脚被用作调试，它们负责监控程序和主机之间的通讯。不要将它们和其它管脚相连。

- R8C/10-13 群
TxD11 (32pin), RxD1 (1pin)

5.11 标志寄存器的限制

在用户程序中对标志寄存器进行操作时，不要执行 FSET 指令和 FCLR 指令修改调试标志（D 标志）。

5.12 中断对并行 I/O 的操作

虽然中断不会被响应，并行 I/O 仍然执行。例如，操作一个定时器后通过断点停止用户程序时，定时器仍然在计数，但是定时器中断不会被响应。

[备注]

M16C R8C FoUSB/UART 软件用户手册
连接R8C/10、R8C/11、R8C/12、R8C/13的注意事项

Publication Date: Rev.1.00 Oct. 27, 2006

Published by:

Edited by: Renesas Technology Corp.
 MCU Application Engineering Dept.

 Renesas Solutions Corp.

© 2006. Renesas Technology Corp., All rights reserved.

M16C R8C FOUSB/UART 软件



瑞萨电子株式会社

RCC10J0006-0100