EDM1070xx

Embedded Display Module

User Manual

Version 1.1

13th Jan 2014

A Premier Farnell Company

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Revision History:

Version	Date	Description
1.0	04/10/2013	Original Version
1.1	13/01/2014	Localisation

Table of Contents

1 Product Overview

1.1 Introduction

The EDM1070xx is an embedded display module designed by Embest Technology and built on the LPC4357FET256 (a NXP 32-bit ARM Cortex-M4/M0 dual-core MCU) / LPC1857FET256（NXP 32-bit ARM Cortex-M3 MCU). The EDM1070xx is provided with example applications for all the on-board devices and support for real-time operating systems. It has a variety of expansion interfaces such as UART, CAN, SPI, SGPIO, I2C, GPIO and ADC/DAC to satisfy the many different application requirements of users.

The EDM1070xx is suited for a wide scope of applications and can meet the requirements of many different fields including:

- Instrumentation,
- Home automation,
- Medical diagnosis,
- Motor control.

1.2 Kit Contents

- ✓ EDM1070xx Board
- ✓ CD containing:
  - ▪ User Manual
  - ▪ Source code
  - ▪ Development tools
- ✓ Four hexagonal screws
- ✓ Four hexagonal screw nuts
- ✓ **Optional:**
  - ▪ COM1000A (SPI to serial module with 4 serial ports)
  - ▪ DM-CAM130 (camera module with OV9655 and a 1.3MP CMOS SXGA camera sensor)

1.3 Board Interfaces

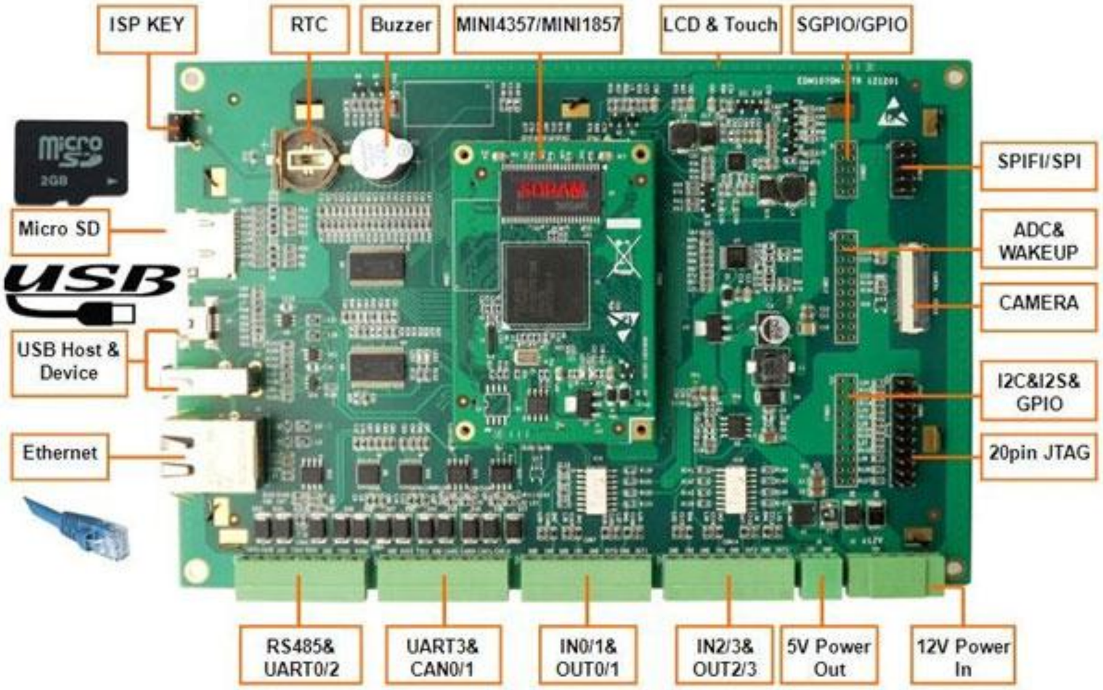


Figure 1: EDM1070xx Board Interfaces

1.4 System Block Diagram

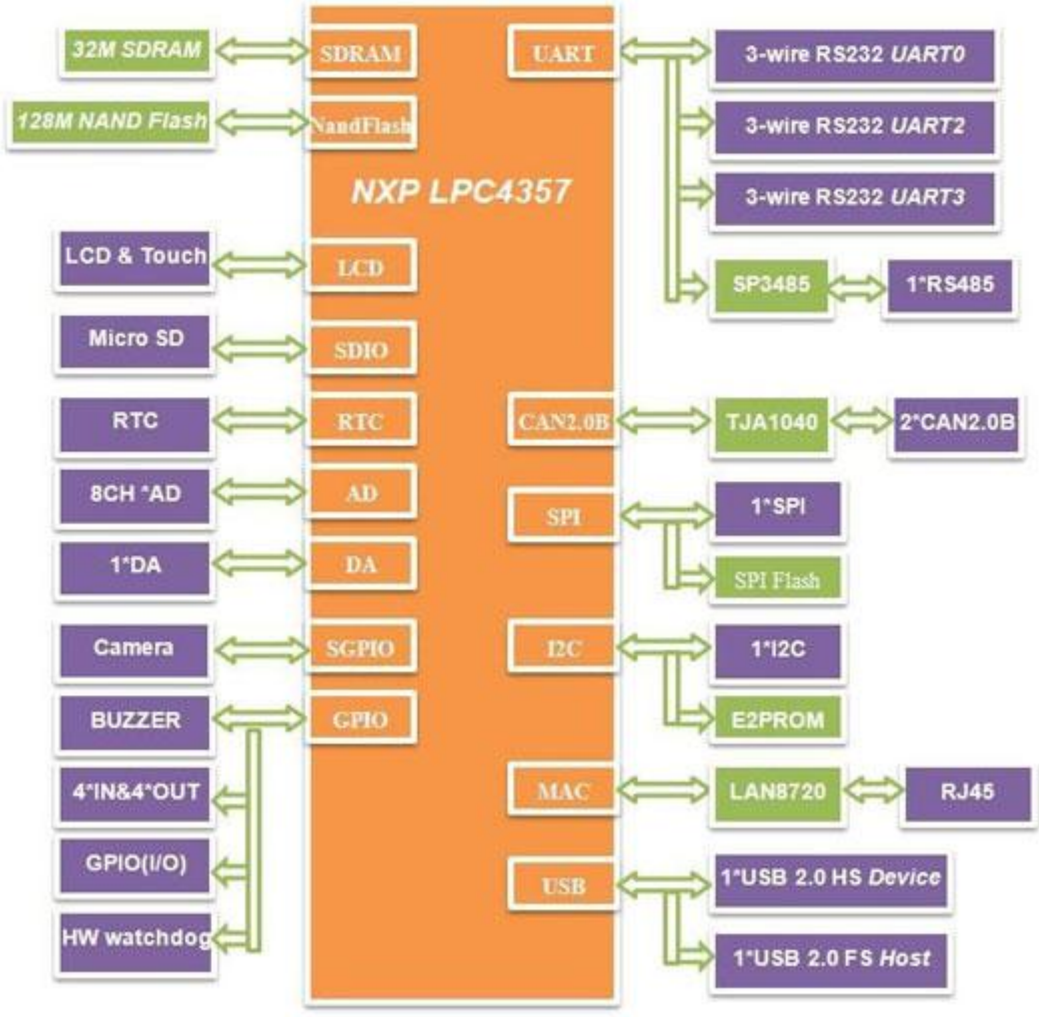


Figure 2: EDM1070xx System Block Diagram

Block Diagram Legend

Legend	Description
🟧	Interface modules of CPU
🟩	Chips or spare solder pads on the board
🟪	Interfaces on the board

1.5 Physical Dimensions

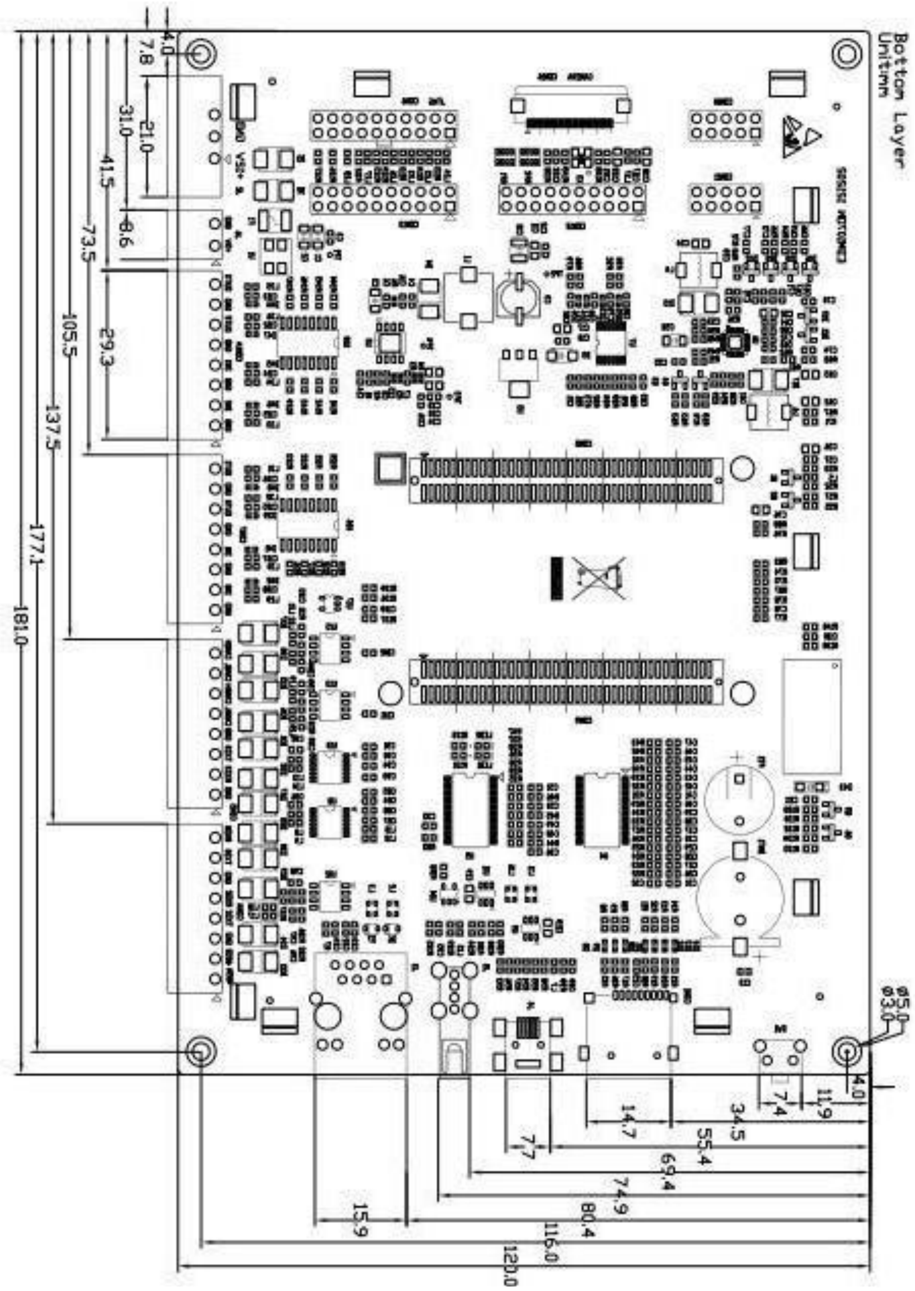


Figure 3: EDM1070xx Physical Dimensions

EDM1070A-01, EDM1070B-01	EDM1070AR-01, EDM1070BR-01
Top Layer Component Height $_{MAX}$ = 3 mm	Top Layer Component Height $_{MAX}$ = 12 mm
Bottom Layer Component Height $_{MAX}$ = 14 mm	Bottom Layer Component Height $_{MAX}$ = 14 mm
Board Thickness =1.6mm, 4 layer PCB	Board Thickness =1.6mm, 4 layer PCB

2 Hardware Features

2.1 Processor

- NXP LPC4357FET256/LPC1857FET256
- Floating-point hardware unit
- 1024KB Flash
- 136 KB SRAM
- 16KB EEPROM
- LCD controller with support for 24bpp true-colour mode and a resolution of up to 1024×768
- USB 2.0 high-speed Host/Device/OTG interface with on-chip PHY and support for DMA transmission
- USB 2.0 high-speed Host/Device interface with on-chip PHY and ULPI which supports external high-speed PHY
- 10/100 Mb Ethernet MAC MII/RMII interface
- Four-wire SPI flash interface (SPIFI) with data transfer rate of up to 40Mbps per channel
- Two CAN 2.0B, four UART, two I2S, two I2C, two SSP busses and one SPI bus
- Four 32-bit general purpose timer, two standard PWM, one motor control PWM with Quadrature encoder interface
- Two 10-bit ADCs operating at up to 400KHz
- 10-bit DAC operating at up to 400KHz
- Serial GPIO interface (SGPIO)
- 164 general-purpose I/O interfaces
- Two watchdog timers

2.2 On-Board Memories

- 128MB NAND Flash
- 32MB SDRAM
- 2Kb EEPROM
- 4Mb SPI Flash (spare solder pads)

2.3 Communication Interfaces

- Three serial interfaces implemented with phoenix connectors
- UART0: 3-wire serial interface, RS232 level
- UART2: 3-wire serial interface, RS232 level
- UART3: 3-wire serial interface, RS232 level
- RS485 interface implemented with phoenix connectors
- Two CAN2.0B interfaces implemented with phoenix connectors
- Two USB interfaces
- USB2.0 Device, High-speed, 480Mbps
- USB2.0 Host, Full-speed, 12Mbps
- 10/100Mbps Ethernet interface
- TF card slot
- 20-pin standard JTAG debug interface
- Four input and four output I/O interfaces implemented with phoenix connectors and isolated by optocouplers
- 8-channel ADC interface
- DAC interface
- SPIFI interface
- IIC interface
- I2S interface
- High-precision RTC (no battery by default)
- Spare interface for external hardware watchdog

2.4 Other

- 7” (800x480) TFT LCD, 16bit RGB565 mode, supporting 4-wire resistive touch-screen
- ISP button
- Buzzer
- 5V power output interface

2.5 Electrical Features

- Operating Temperature: 0 °C ~ 70 °C
- Storage Temperature: -40 °C ~ 85 °C
- Operating Humidity: 0% ~ 90% (Non-condensing)
- Power Supply: DC 9~24V, 150~400mA@12V
- Electrical Standards: CE, FCC and CCC
- PCB Layers: 6

3 Hardware Details

This chapter will give you an overview of the product hardware system by introducing the CPU and interfaces used on the EDM1070xx.

3.1 CPU Introduction

The EDM1070xx uses NXP's LPC4357FET256 / LPC1857FET256 – a low-power high- performance-price-ratio MCU based on ARM-32bit Cortex-M4/M0 / ARM-32bit Cortex-M3. The LPC4357FET256 is the latest processor from NXP built with asymmetric dual-core digital signal controller architecture based on the ARM Cortex-M4 and Cortex-M0 processors, which provides DSP and MCU application developers with a signal architecture and development environment. The family of the processors works at 204MHz and integrates on-chip high-speed memory and abundant peripheral interfaces.

3.2 Interface Introduction

The EDM1070xx provides many different on-board interfaces such as RS232, Ethernet, USB Host/Device, TF card and LCD interfaces. This section will give you a brief introduction for each of these interfaces.

3.2.1 Power Jack (J2)

Input Power Jack		
Pins	**Definitions**	**Descriptions**
1	+12V	Input power jack
2	GND	Grounded
3	GND	Grounded

Output Power Jack		
Pins	**Definitions**	**Descriptions**
1	+12V	Output power jack
2	GND	Grounded
3	GND	Grounded

3.2.2 Ethernet Interface (J3)

Ethernet Interface		
Pins	**Definitions**	**Descriptions**
1	TX+	TX+ output
2	TX-	TX- output
3	RX+	RX+ input
4	CT	CT
5	CT	CT
6	RX-	RX- input
7	NC	NC
8	SHIELD	Shield
9	LED1	LINK LED
10	VDD3V3	3.3V Power for LED
11	LED2	SPEED LED
12	VDD3V3	3.3V Power for LED
13	4&5	Connect to shield
14	7&8	Connect to shield
15	NC	NC
16	NC	NC

3.2.3 USB Device Interface (J4)

USB OTG Interface		
Pins	**Definitions**	**Descriptions**
1	VBUS	+5V
2	D-	USB Data-
3	D+	USB Data+
4	ID	USB ID
5	GND	GND

3.2.4 USB Host Interface (J5)

USB HOST Interface		
Pins	**Definitions**	**Descriptions**
1	VBUS	+5V
2	D-	USB Data-
3	D+	USB Data+
4	GND	GND

3.2.5 TF Card Slot (CON1)

TF Card Interface		
Pins	**Definitions**	**Descriptions**
1	DAT2	Card data 2
2	DAT3	Card data 3
3	CMD	Command Signal
4	VDD	VDD
5	CLK	Clock
6	VSS	VSS
7	DAT0	Card data 0

TF Card Interface		
Pins	**Definitions**	**Descriptions**
8	DAT1	Card data 1
9	CD	Card detect

3.2.6 LCD Interface (CON2)

LCD Interface		
Pins	**Definitions**	**Descriptions**
1	VLED+	Power for LED backlight (Anode)
2	VLED+	Power for LED backlight (Anode)
3	VLED-	Power for LED backlight (Cathode)
4	VLED-	Power for LED backlight (Cathode)
5	GND	GND
6	VCOM	Common voltage
7	DVDD	Power for Digital Circuit
8	MODE	DE/SYNC mode select
9	DE	Data Input Enable
10	VS	Vertical Sync Input
11	HS	Horizontal Sync Input
12	B7	Blue data(MSB)
13	B6	Blue data
14	B5	Blue data
15	B4	Blue data
16	B3	Blue data
17	B2	Blue data
18	B1	Blue data

LCD Interface		
Pins	**Definitions**	**Descriptions**
19	B0	Blue data(LSB)
20	G7	Green data(MSB)
21	G6	Green data
22	G5	Green data
23	G4	Green data
24	G3	Green data
25	G2	Green data
26	G1	Green data
27	G0	Green data(LSB)
28	R7	Red data(MSB)
29	R6	Red data
30	R5	Red data
31	R4	Red data
32	R3	Red data
33	R2	Red data
34	R1	Red data
35	R0	Red data(LSB)
36	GND	GND
37	DCLK	Sample clock
38	GND	GND
39	L/R	Left / right selection
40	U/D	Up/down selection
41	VGH	Gate ON Voltage

LCD Interface		
Pins	**Definitions**	**Descriptions**
42	VGL	Gate OFF Voltage
43	AVDD	Power for Analog Circuit
44	RESET	Global reset pin
45	NC	connection
46	VCOM	Common Voltage
47	DITHB	Dithering function
48	GND	GND
49	NC	connection
50	NC	connection
51	G1	Connect to GND
52	G2	Connect to GND

3.2.7 Touchscreen Interface (CON3/CON15)

Touchscreen Interface		
Pins	**Definitions**	**Descriptions**
1	X-	Left electrode
2	Y-	Bottom electrode
3	X+	Right electrode
4	Y+	Top electrode
5	G1	Connect to shield
6	G2	Connect to shield

3.2.8 UART and RS485 Interfaces (CON4)

UART & RS485 Interfaces		
Pins	**Definitions**	**Descriptions**
1	RS485A	RS485 signal A
2	RS485B	RS485 signal A
3	GND	GND
4	UART2_TX	UART2 Receive data
5	UART2_RX	UART2 Transit data
6	GND	GND
7	UART0_TX	UART0 Receive data
8	UART0_RX	UART0 Transit data

3.2.9 UART3 and CAN Interfaces (CON5)

UART3 & CAN Interfaces		
Pins	**Definitions**	**Descriptions**
1	GND	GND
2	UART3_TX	UART3 Receive data
3	UART3_RX	UART3 Transit data
4	GND	GND
5	CAN0_L	Low-level CAN0 bus line
6	CAN0_H	High-level CAN0 bus line
7	CAN1_L	Low-level CAN1 bus line
8	CAN1_H	High-level CAN1 bus line

3.2.10 JTAG Interface (CON6)

JTAG Interface		
Pins	**Definitions**	**Descriptions**
1	VTREF	+3.3V power supply
2	VSUPPLY	+3.3V power supply
3	NTRST	Test system reset
4	GND	GND
5	TDI	Test data input
6	GND	GND
7	TMS	Test mode select
8	GND	GND
9	TCK	Test clock
10	GND	GND
11	RTCK	GND
12	GND	GND
13	TDO	Test data output
14	GND	GND
15	NSRST	Test system reset
16	GND	GND
17	DBGRQ	Connect to GND
18	GND	GND
19	DBGACK	Connect to GND
20	GND	GND

3.2.11 Isolated GPIO Interface (CON7/CON14)

Isolated GPIO Interface		
Pins	**Definitions**	**Descriptions**
1	GND	GND
2	ISODATA_IN	Isolate Input
3	GND	GND
4	ISODATA_IN	Isolate Input
5	GND	GND
6	ISODATA_OUT	Isolate output
7	GND	GND
8	ISODATA_OUT	Isolate output

3.2.12 SPIFI Interface (CON10)

SPIFI Interface		
Pins	**Definitions**	**Descriptions**
1	SPIFI_MOSI	Serial clock for SPI/SSP0/SPIFI
2	VDD3V3	+3.3V power
3	NC	NC
4	PE_2	GPIO
5	SPIFI_CS	Slave Select for SPI/SSP0/SPIFI
6	PE_3	GPIO
7	SPIFI_SCK	Serial clock for SPI/SSP0/SPIFI
8	PE_4	GPIO
9	SPIFI_MISO	Master In Slave Out for SPI/SSP0/SPIFI
10	GND	GPIO

3.2.13 SGPIO Interface (CON11)

SGPIO Interface		
Pins	**Definitions**	**Descriptions**
1	P1_4	SGPIO11
2	VDD3V3	+3.3V power
3	P6_7	SGPIO6
4	VDD3V3	+3.3V power
5	P9_4	SGPIO4
6	P9_3	SGPIO9
7	PD_7	SGPIO11
8	PD_8	SGPIO12
9	PD_9	SGPIO13
10	GND	GND

3.2.14 ADC/DAC/GPIO Interfaces (CON12)

ADC/DAC/GPIO Interfaces		
Pins	**Definitions**	**Descriptions**
1	CLK1	Clock output pin 1
2	VDD3V3	+3.3V power
3	GND	GND
4	P4_4	DAC output
5	ADC0	ADC input channel 0
6	ADC1	ADC input channel 1
7	ADC2	ADC input channel 2
8	ADC3	ADC input channel 3
9	ADC4	ADC input channel 4

ADC/DAC/GPIO Interfaces		
Pins	**Definitions**	**Descriptions**
10	ADC5	ADC input channel 5
11	ADC6	ADC input channel 6
12	ADC7	ADC input channel 7
13	WAKEUP0	External wake-up input
14	WAKEUP1	External wake-up input
15	WAKEUP3	External wake-up input
16	WAKEUP4	External wake-up input
17	P4_3	GPIO
18	PE_9	GPIO
19	P7_5	GPIO
20	GND	GND

3.2.15 I2S/I2C/GPIO Interfaces (CON13)

I2S/I2C/GPIO Interfaces		
Pins	**Definitions**	**Descriptions**
1	CLK2	Clock output pin 2
2	VDD3V3	+3.3V power
3	P6_0	GPIO / I2S0_RX_SCK
4	P3_0	GPIO / I2S0_TX_SCK
5	P6_2	GPIO / I2S0_RX_SDA
6	PC_12	GPIO / I2S0_TX_SDA
7	P6_1	GPIO / I2S0_RX_WS
8	PC_13	GPIO / I2S0_TX_WS

I2S/I2C/GPIO Interfaces		
Pins	**Definitions**	**Descriptions**
9	I2C0_SCL	I2C clock input/output
10	PC_2	GPIO
11	I2C0_SDA	I2C data input/output
12	PC_3	GPIO
13	P8_0	GPIO
14	PC_9	GPIO
15	P8_1	GPIO
16	PC_11	GPIO
17	P8_2	GPIO
18	PC_14	GPIO
19	P8_8	GPIO
20	GND	GND

3.2.16 Camera Interface (CON16)

Camera Interface		
Pins	**Definitions**	**Descriptions**
1	GND1	GND
2	D0	NC
3	D1	NC
4	D2	Digital image data bit 0
5	D3	Digital image data bit 1
6	D4	Digital image data bit 2
7	D5	Digital image data bit 3

Camera Interface		
Pins	**Definitions**	**Descriptions**
8	D6	Digital image data bit 4
9	D7	Digital image data bit 5
10	D8	Digital image data bit 6
11	D9	Digital image data bit 7
12	D10	NC
13	D11	NC
14	GND2	GND
15	PCLK	Pixel clock
16	GND3	GND
17	HS	Horizontal synchronization
18	VDD50	NC
19	VS	Vertical synchronization
20	VDD33	+3.3V power
21	XCLKA	Clock output a
22	XCLKB	NC
23	GND4	GND
24	FLD	NC
25	PWR	Power Enable
26	RST	Reset the camera
27	SDA	I2C master serial clock
28	SCL	I2C serial bidirectional data
29	GND5	GND
30	VDDIO	+3.3V for I/O

4 Preparations

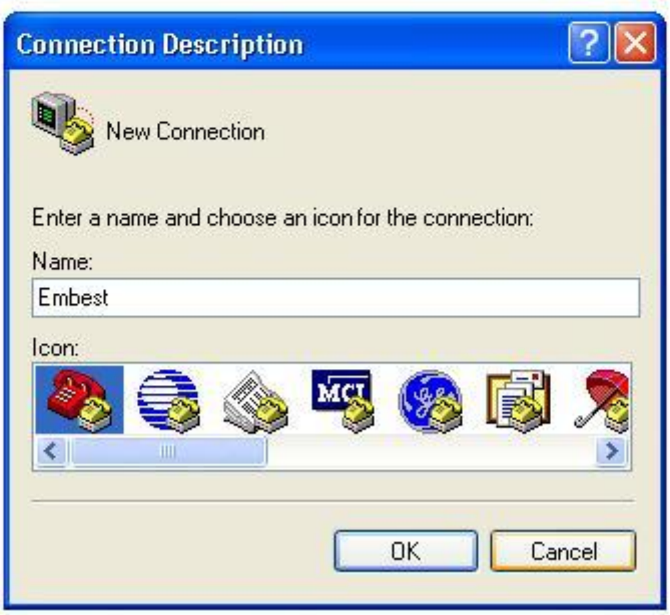
Before you get started with software development, you need to make a series of preparations including configuring HyperTerminal, setting up a network, and installing the Keil MDK or IAR EWARM integrated development environment. The following contents will show you how to complete the installation and configuration process on a PC running Windows XP.

4.1 Configuring HyperTerminal

1. Select:

- Start
- All Programs
- Accessories
- Communications
- HyperTerminal

on your PC’s desktop to open a HyperTerminal window as shown below;



Connection Description

New Connection

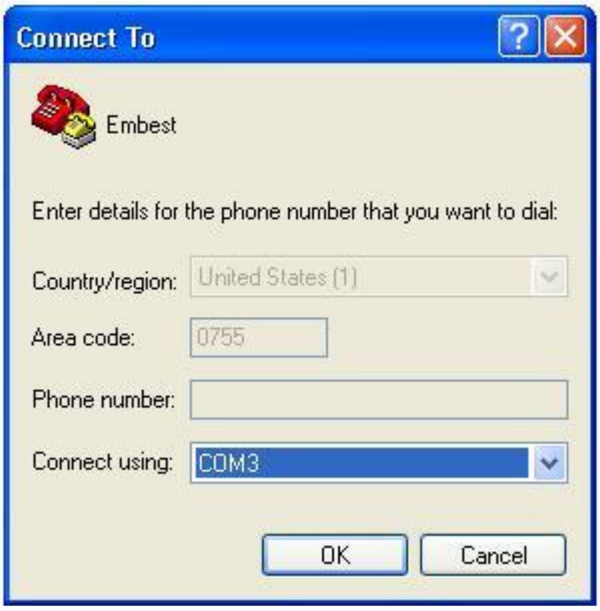
Enter a name and choose an icon for the connection:

Name: Embest

Figure 4: Setting up a new HyperTerminal

2. Enter a name for the new HyperTerminal in the **Name** textbox, and then click **OK**;

3. Select the serial interface used to connect to the EDM1070xx from the **Connect using** drop-down menu in the window (shown right), then click **OK**;



Connect To

Embest

Enter details for the phone number that you want to dial:

Country/region: United States (1)

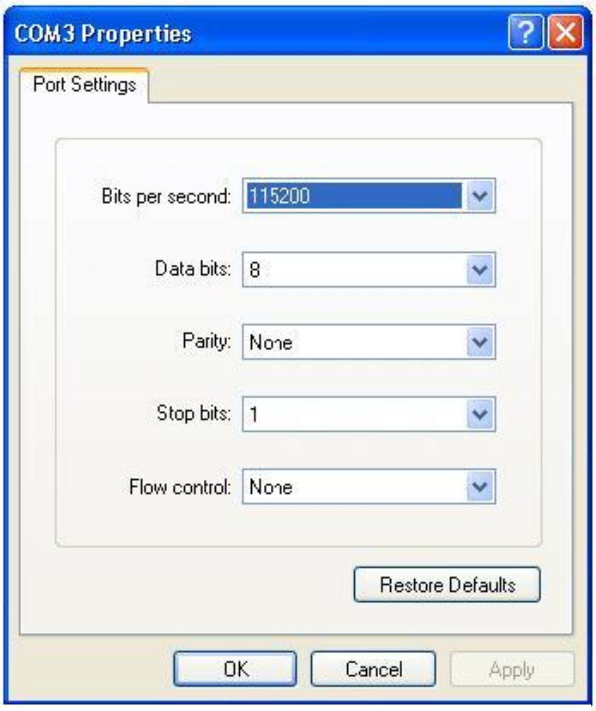
Area code: 0755

Phone number:

Connect using: COM3

Figure 5: Connection Selection Window

4. Configure the serial interface according to the configurations in the window (shown right), and then click **OK**;



COM3 Properties

Port Settings

Bits per second: 115200

Data bits: 8

Parity: None

Stop bits: 1

Flow control: None

Figure 6: HyperTerminal Configuration Settings

5. The window shown below indicates the HyperTerminal connection has been configured successfully;

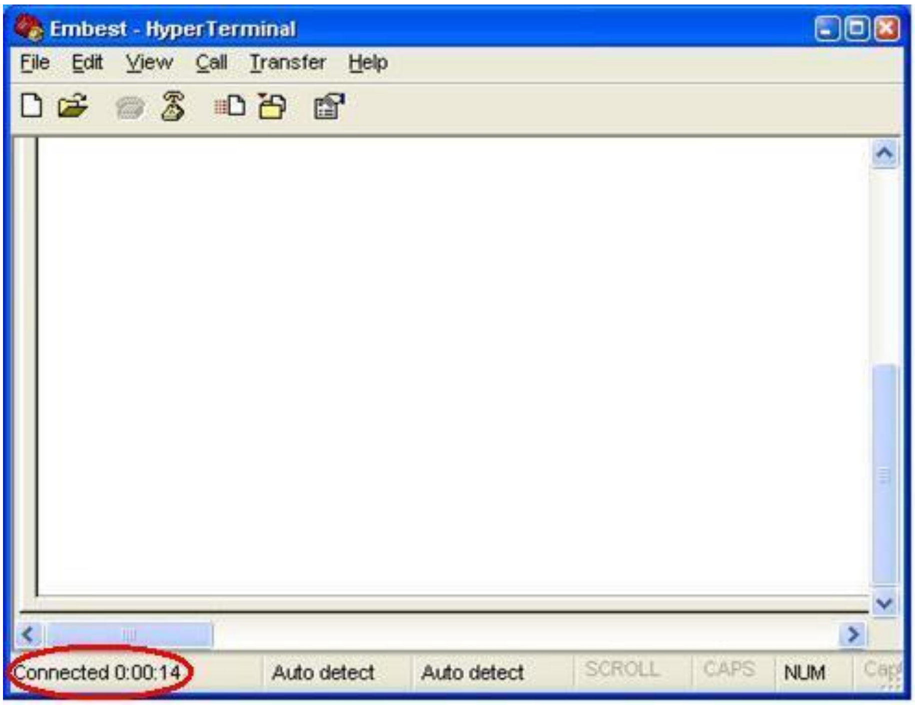
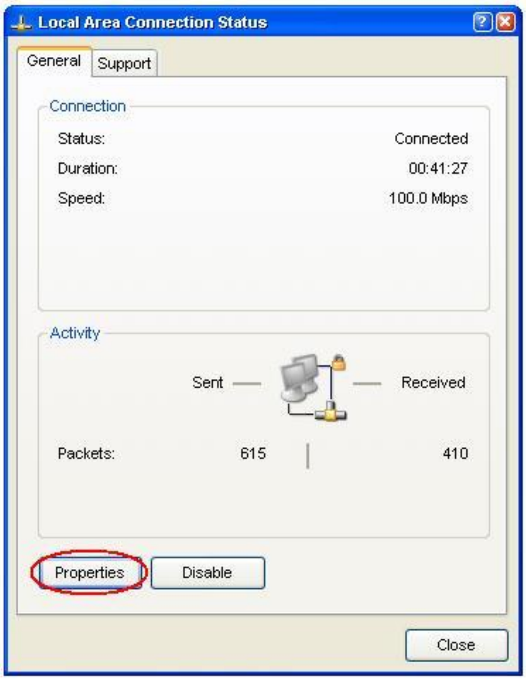


Figure 7: Successful HyperTerminal Connection

4.2 Configuring the Network



Status: Connected
Duration: 00:41:27
Speed: 100.0 Mbps
Packets: 615 410

Figure 8: Local Area Connection Properties Window

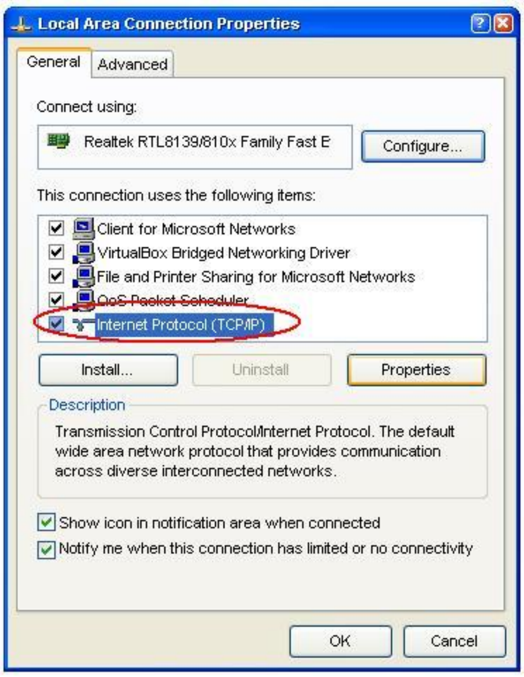
1. Click

   - Start
   - Control Panel
   - Network and Internet
   - Network Connections

on your PC’s desktop, and then double-click Local Area Connection to open the window as shown right;

2. Click Properties to open the Local Area Connection Properties window;

3. Double-click **Internet Protocol (TCP/IP)** in the window shown below;



Local Area Connection Properties

Connect using:

Realtek RTL8139/810x Family Fast E

This connection uses the following items:

☑ Client for Microsoft Networks
☑ VirtualBox Bridged Networking Driver
☑ File and Printer Sharing for Microsoft Networks
☑ QoS Packet Scheduler
☑ Internet Protocol (TCP/IP)

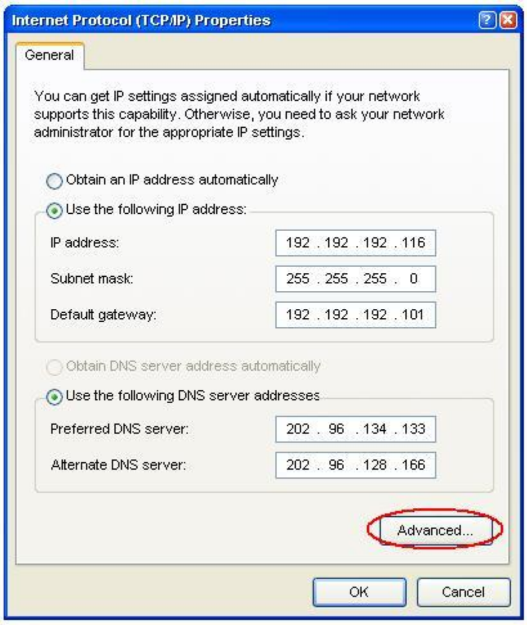
Description

Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

☑ Show icon in notification area when connected
☑ Notify me when this connection has limited or no connectivity

Figure 9: Double Click Internet Protocol (TCP/IP)

4. Click **Advanced** in the window shown below;



Internet Protocol (TCP/IP) Properties

You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

○ Obtain an IP address automatically
● Use the following IP address:

IP address: 192 . 192 . 192 . 116
Subnet mask: 255 . 255 . 255 . 0
Default gateway: 192 . 192 . 192 . 101

○ Obtain DNS server address automatically
● Use the following DNS server addresses:

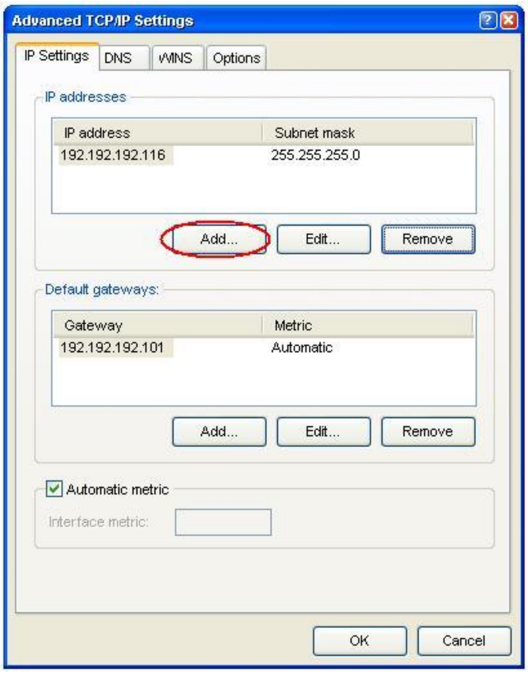
Preferred DNS server: 202 . 96 . 134 . 133
Alternate DNS server: 202 . 96 . 128 . 166

Figure 10: Click Advanced

Note:

🕮 Please ensure the option **Use the following IP address** is checked, and then click **Advanced** to specify additional IP addresses for the PC.

5. Click **Add** in the **IP address** block in the window shown right;



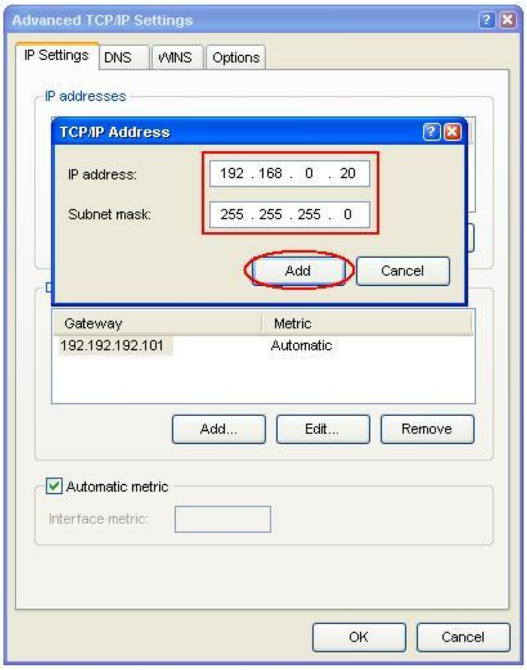
IP address	Subnet mask
192.192.192.116	255.255.255.0

Gateway	Metric
192.192.192.101	Automatic

☑ Automatic metric

Figure 11: Click Add

6. Enter an IP address that is in the same network segment as the EDM1070xx (default IP address is 192.168.0.232), e.g. 192.168.0.40 in the window, and then enter a subnet mask and click **Add**;



IP address: 192 . 168 . 0 . 20

Subnet mask: 255 . 255 . 255 . 0

Gateway	Metric
192.192.192.101	Automatic

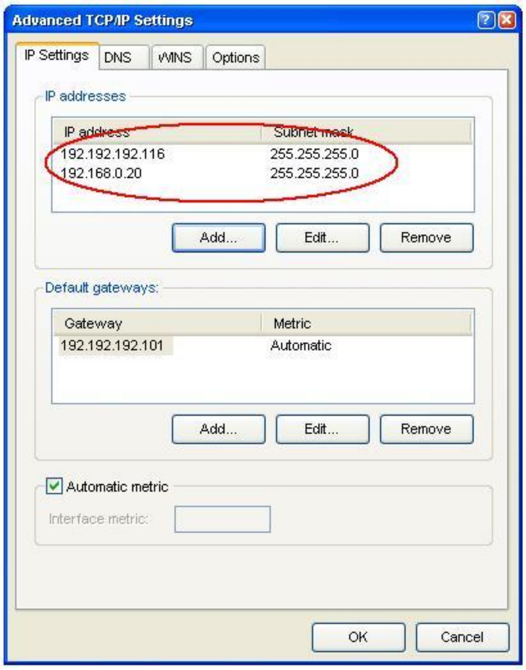
☑ Automatic metric

Figure 12: Enter Desired IP Address

Note:

🕮 You can use any IP address from 192.168.0.1 to 192.168.0.254 except 192.168.0.100, because this address will cause an IP collision when the **Ethernet** example program is running.

7. The window shown below indicates that a new IP address has been added to the PC; Now click **OK** to finish the configuration;



IP addresses

IP address	Subnet mask
192.192.192.116	255.255.255.0
192.168.0.20	255.255.255.0

Default gateways:

Gateway	Metric
192.192.192.101	Automatic

☑ Automatic metric

Interface metric:

Figure 13: Click OK

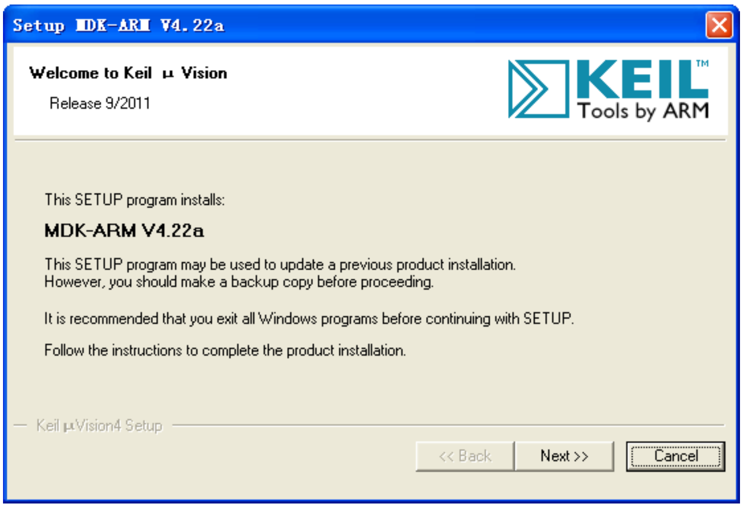
4.3 Installing the Keil MDK

Development on the LPC4357 requires version 4.60 or higher of the Keil MDK. All the MDK projects contained on the CD-ROM provided with the board are created using MDK 4.60. You can download the latest version from Keil’s official website:

www.keil.com.

The following content will show you how to install the Keil MDK integrated development environment using MDK 4.22a as an example.

1. Launch the installation package to open the window shown below;



Welcome to Keil µ Vision

Release 9/2011

This SETUP program installs:

MDK-ARM V4.22a

This SETUP program may be used to update a previous product installation.
However, you should make a backup copy before proceeding.

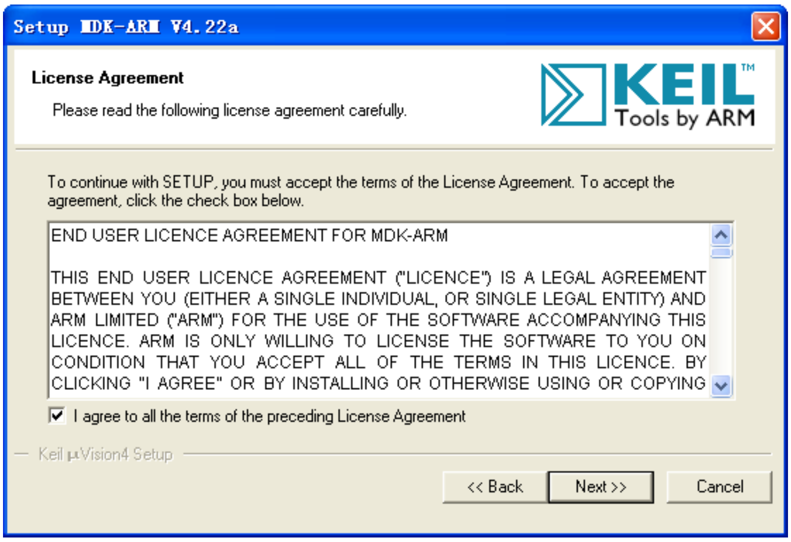
It is recommended that you exit all Windows programs before continuing with SETUP.

Follow the instructions to complete the product installation.

Figure 14: Installation Program

2. Click **Next** to continue;

3. Check I agree to all the terms of the preceding License Agreement and click Next in the window shown below;



Setup MDK-ARM V4.22a

License Agreement

Please read the following license agreement carefully.

To continue with SETUP, you must accept the terms of the License Agreement. To accept the agreement, click the check box below.

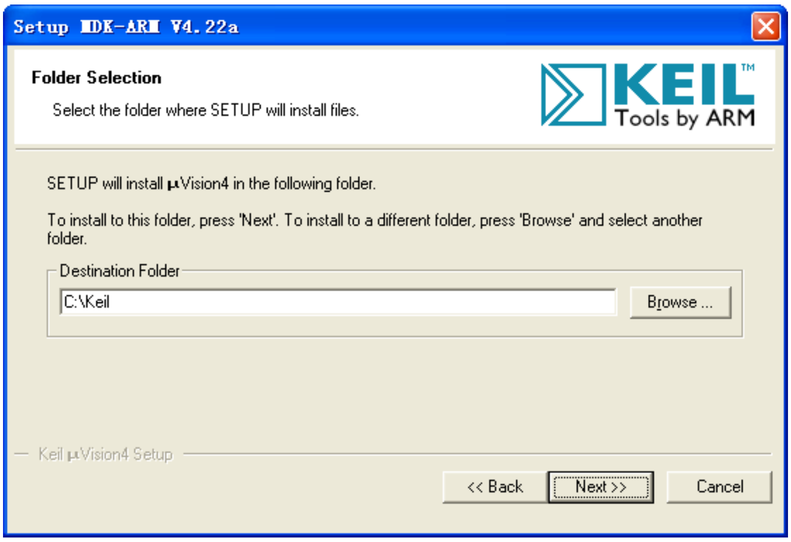
END USER LICENCE AGREEMENT FOR MDK-ARM

THIS END USER LICENCE AGREEMENT ("LICENCE") IS A LEGAL AGREEMENT BETWEEN YOU (EITHER A SINGLE INDIVIDUAL, OR SINGLE LEGAL ENTITY) AND ARM LIMITED ("ARM") FOR THE USE OF THE SOFTWARE ACCOMPANYING THIS LICENCE. ARM IS ONLY WILLING TO LICENSE THE SOFTWARE TO YOU ON CONDITION THAT YOU ACCEPT ALL OF THE TERMS IN THIS LICENCE. BY CLICKING "I AGREE" OR BY INSTALLING OR OTHERWISE USING OR COPYING

☑ I agree to all the terms of the preceding License Agreement

Figure 15: License Agreement

4. Click **Browse** in the window shown below to specify an installation path, and then click **Next**;



Setup MDK-ARM V4.22a

Folder Selection

Select the folder where SETUP will install files.

SETUP will install µVision4 in the following folder.

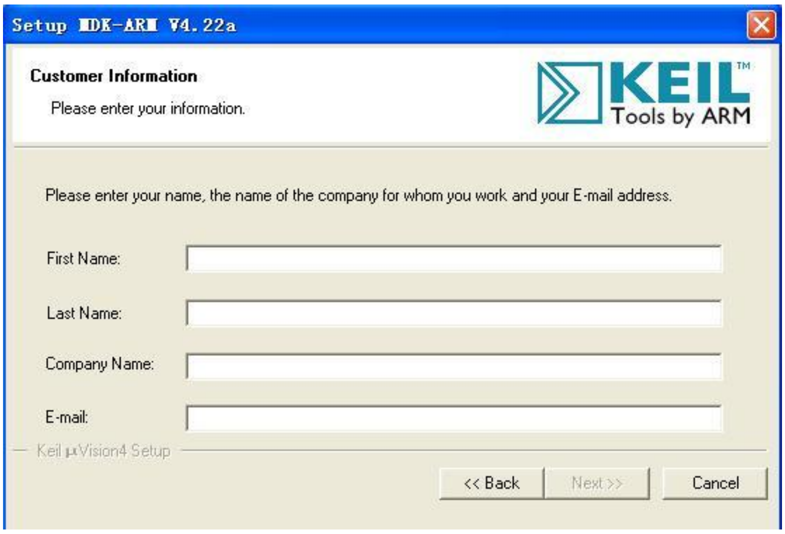
To install to this folder, press 'Next'. To install to a different folder, press 'Browse' and select another folder.

Destination Folder

C:\Keil

Figure 16: Specify the installation path

5. Enter user information such as name, company name and email, and then click **Next** to start file installation process;



Setup MDK-ARM V4.22a

Customer Information

Please enter your information.

Please enter your name, the name of the company for whom you work and your E-mail address.

First Name:

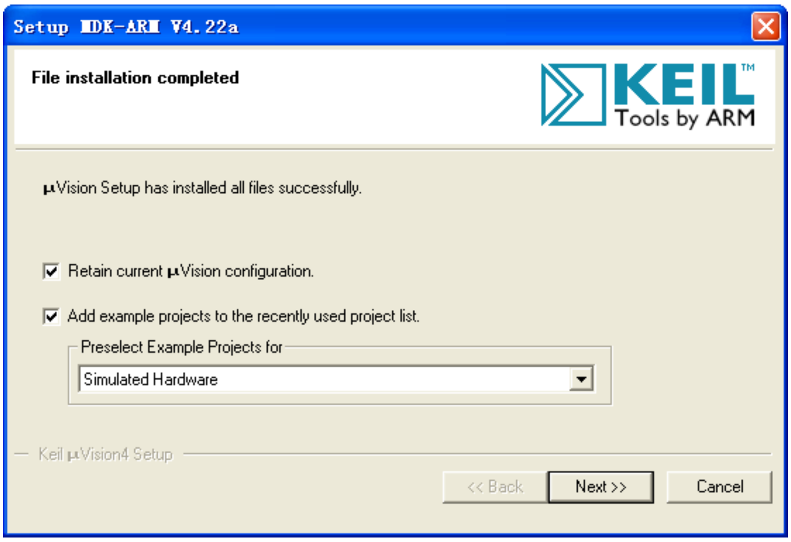
Last Name:

Company Name:

E-mail:

Figure 17: Enter User Information

6. After file installation is completed, keep the default settings unchanged in the window shown below and click **Next**;



Setup MDK-ARM V4.22a

File installation completed

µVision Setup has installed all files successfully.

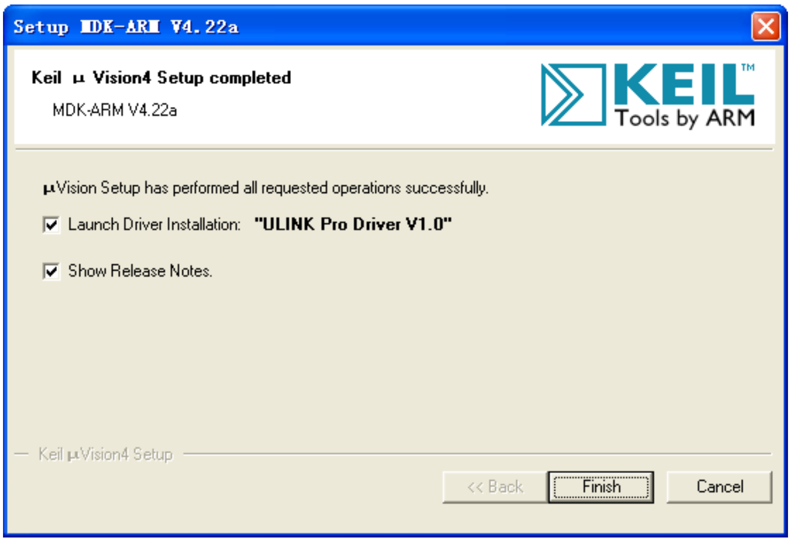
☑ Retain current µVision configuration.

☑ Add example projects to the recently used project list.

Preselect Example Projects for: Simulated Hardware

Figure 18: Installing Example Projects

7. Keep the default settings unchanged in the window shown below and click **Finish**;



Setup MDK-ARM V4.22a

Keil µ Vision4 Setup completed

MDK-ARM V4.22a

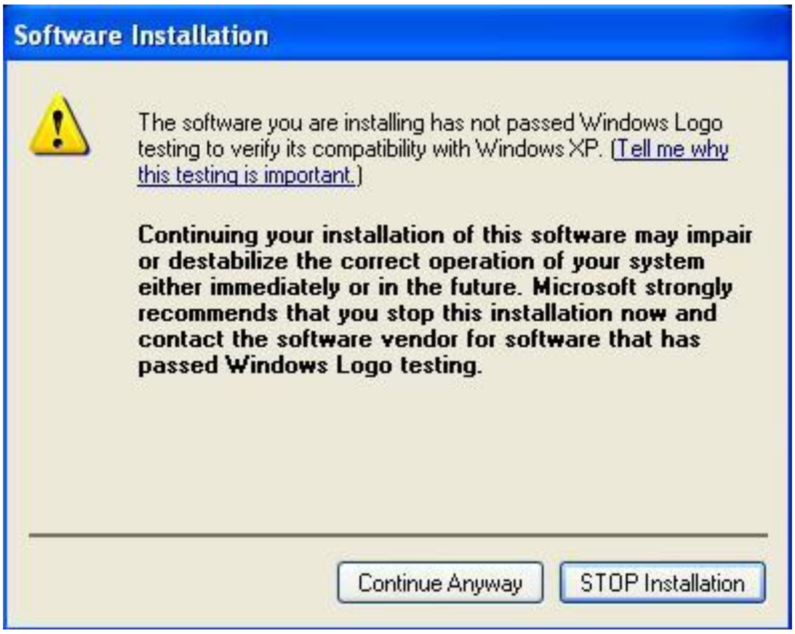
µVision Setup has performed all requested operations successfully.

☑ Launch Driver Installation: **"ULINK Pro Driver V1.0"**

☑ Show Release Notes.

Figure 19: Installing ULINK Pro Driver

8. Click **Continue Anyway** in the pop-up window as shown below;



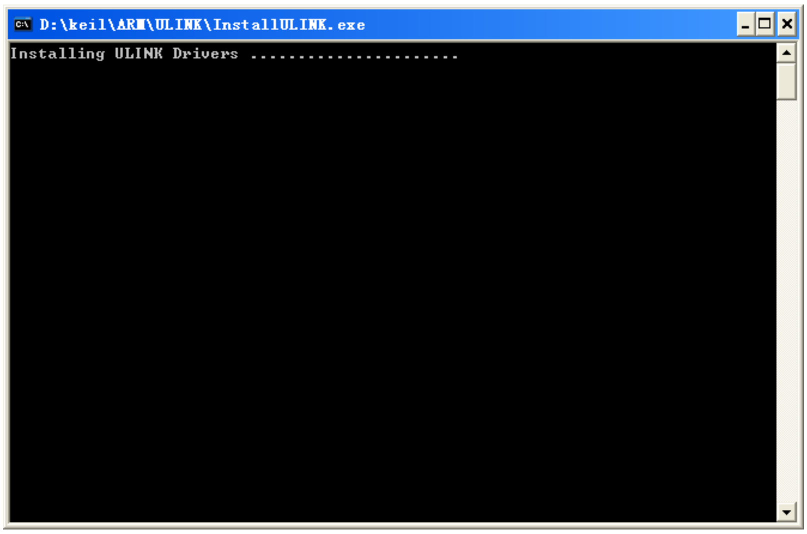
Software Installation

The software you are installing has not passed Windows Logo testing to verify its compatibility with Windows XP. (Tell me why this testing is important.)

Continuing your installation of this software may impair or destabilize the correct operation of your system either immediately or in the future. Microsoft strongly recommends that you stop this installation now and contact the software vendor for software that has passed Windows Logo testing.

Figure 20: Click Continue Anyway

9. The installation window as shown below will be closed automatically after ULINK Pro driver is installed;



```
Installing ULINK Drivers ......................
```

Figure 21: Installing ULINK Pro Driver

10. Now the installation of the Keil MDK integrated development environment has been completed successfully.

4.4 Installing IAR EWARM

Development on the LPC4357 requires version 6.40 or higher of IAR EWARM. All the EWARM projects contained in the CD-ROM provided with the board are created by using IAR EWARM 6.40.2. You can download the latest version from IAR's official website:

💻 www.iar.com.

The following content will show you how to install an IAR EWARM integrated development environment, using IAR EWARM 6.40.2 as an example.

1. Double-click the installation file of IAR EWARM to open the installation interface as shown below;

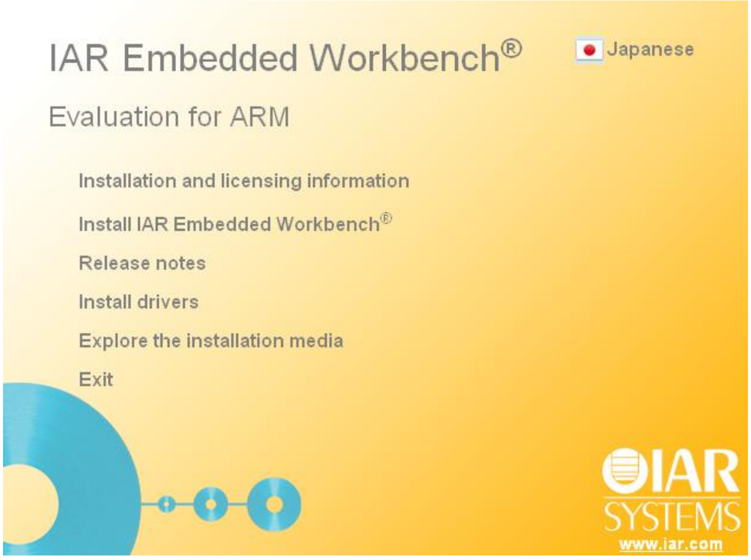
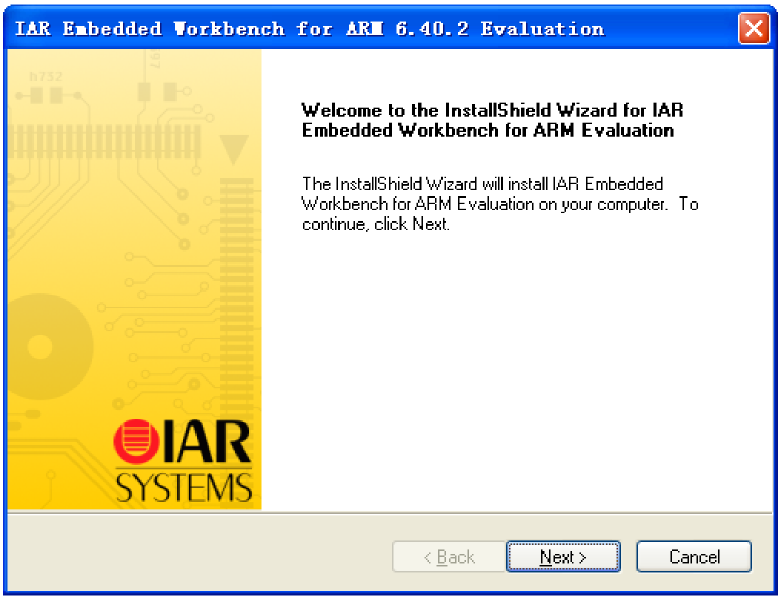


Figure 22: IAR EWARM Installation Interface

2. Click **Install IAR Embedded Workbench**;

3. Click **Next** in the following window to continue installation;

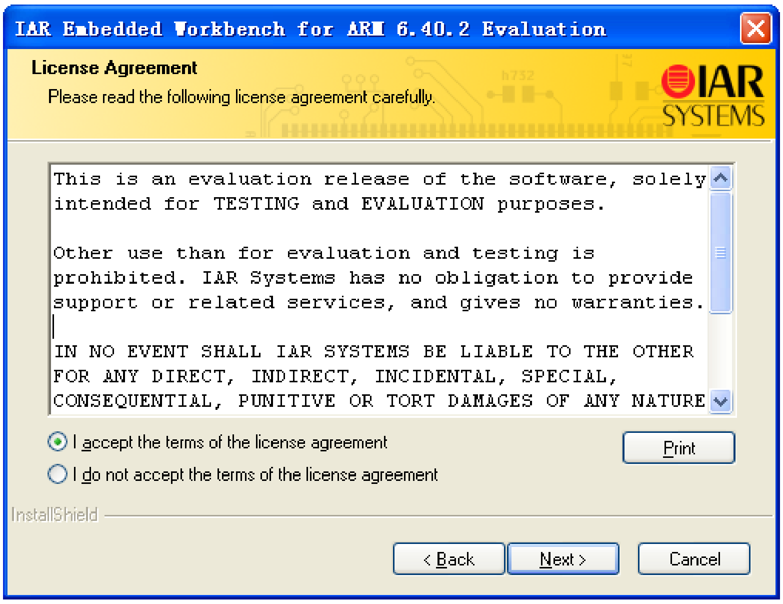


Welcome to the InstallShield Wizard for IAR Embedded Workbench for ARM Evaluation

The InstallShield Wizard will install IAR Embedded Workbench for ARM Evaluation on your computer. To continue, click Next.

Figure 23: Click Next

4. Select the radio button **I accept the terms of the license agreement**, and the click **Next** in the following window;



License Agreement

Please read the following license agreement carefully.

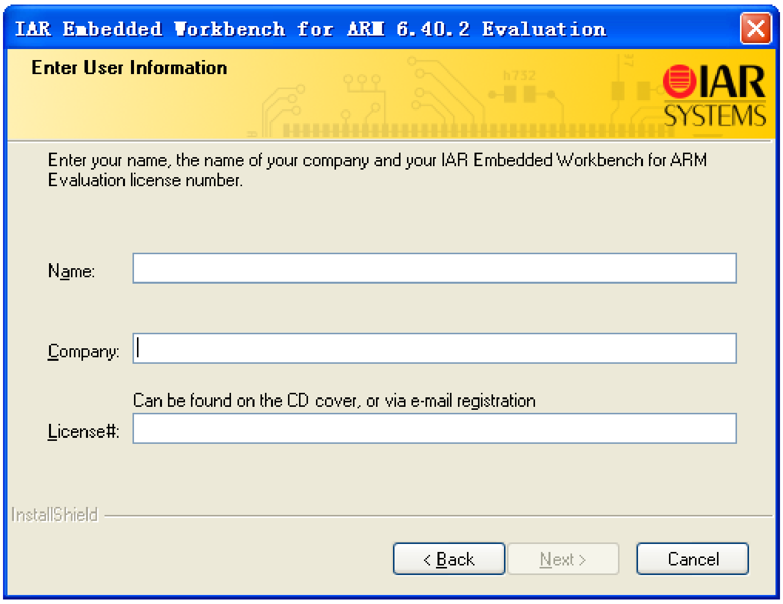
```
This is an evaluation release of the software, solely
intended for TESTING and EVALUATION purposes.

Other use than for evaluation and testing is
prohibited. IAR Systems has no obligation to provide
support or related services, and gives no warranties.

IN NO EVENT SHALL IAR SYSTEMS BE LIABLE TO THE OTHER
FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL,
CONSEQUENTIAL, PUNITIVE OR TORT DAMAGES OF ANY NATURE
```

● I accept the terms of the license agreement

○ I do not accept the terms of the license agreement

Figure 24: License Agreement

5. Enter your name and your company’s name, as well as the license number in the following window, and then click **Next**;



IAR Embedded Workbench for ARM 6.40.2 Evaluation

Enter User Information

Enter your name, the name of your company and your IAR Embedded Workbench for ARM Evaluation license number.

Name:

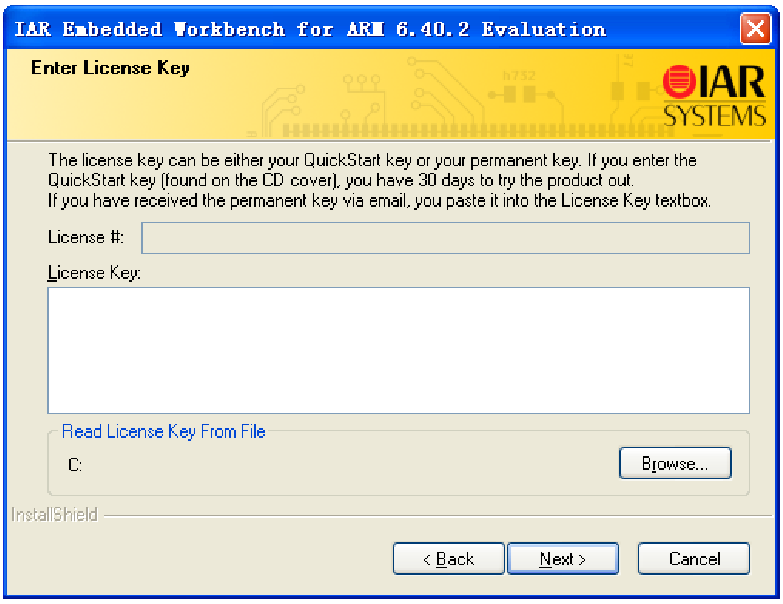
Company:

Can be found on the CD cover, or via e-mail registration

License#:

Figure 25: Enter User Information

6. Copy your license key into the **License Key** textbox, or click **Browse** to specify the path where the license key is saved, and then click **Next**;



IAR Embedded Workbench for ARM 6.40.2 Evaluation

Enter License Key

The license key can be either your QuickStart key or your permanent key. If you enter the QuickStart key (found on the CD cover), you have 30 days to try the product out.
If you have received the permanent key via email, you paste it into the License Key textbox.

License #:

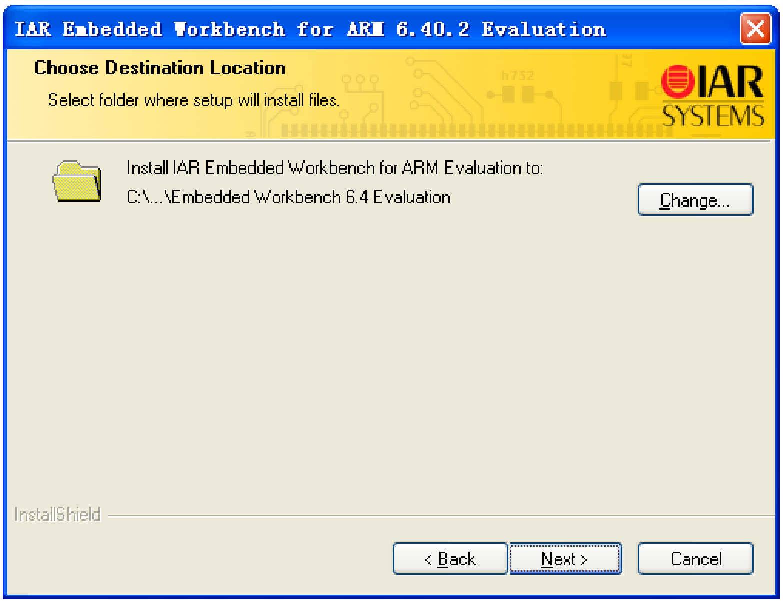
License Key:

Read License Key From File

C:

Figure 26: Enter License Key

7. Click **Change** in the following window to specify installation path, and then click **Next**;



IAR Embedded Workbench for ARM 6.40.2 Evaluation

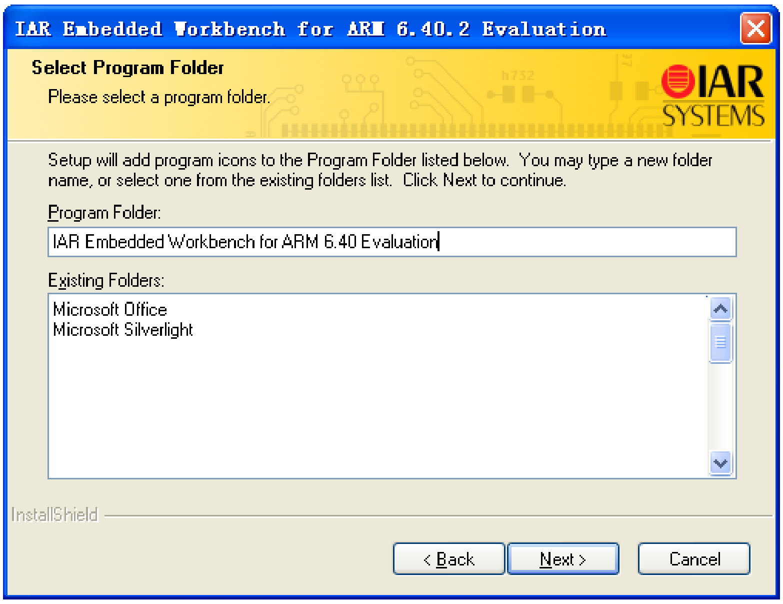
Choose Destination Location

Select folder where setup will install files.

Install IAR Embedded Workbench for ARM Evaluation to:
C:\...\Embedded Workbench 6.4 Evaluation

Figure 27: Select Installation Path

8. The following window allows you select a folder in which the software icon is contained; You may keep the default settings unchanged and click **Next**;



IAR Embedded Workbench for ARM 6.40.2 Evaluation

Select Program Folder

Please select a program folder.

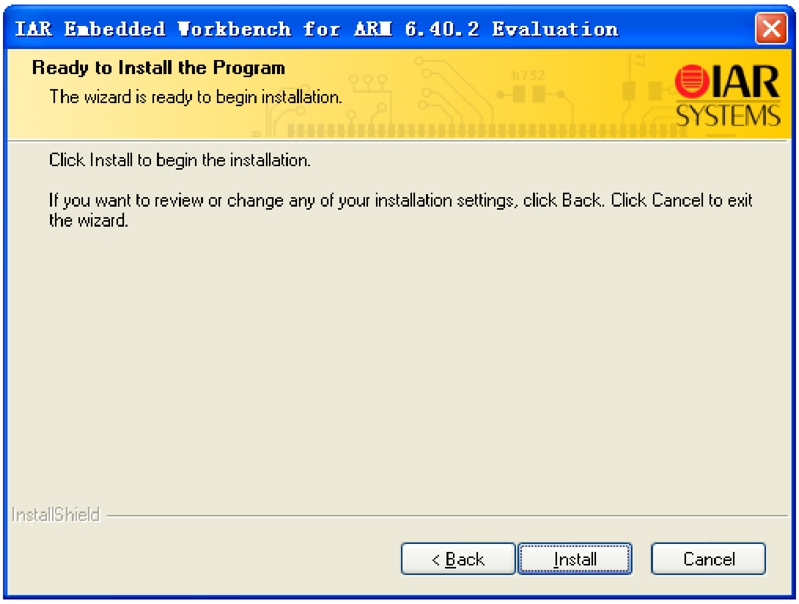
Setup will add program icons to the Program Folder listed below. You may type a new folder name, or select one from the existing folders list. Click Next to continue.

Program Folder:
IAR Embedded Workbench for ARM 6.40 Evaluation

Existing Folders:
Microsoft Office
Microsoft Silverlight

Figure 28: Select Software Icon Location

9. Click **Install** in the following window to start the installation process;



IAR Embedded Workbench for ARM 6.40.2 Evaluation

Ready to Install the Program

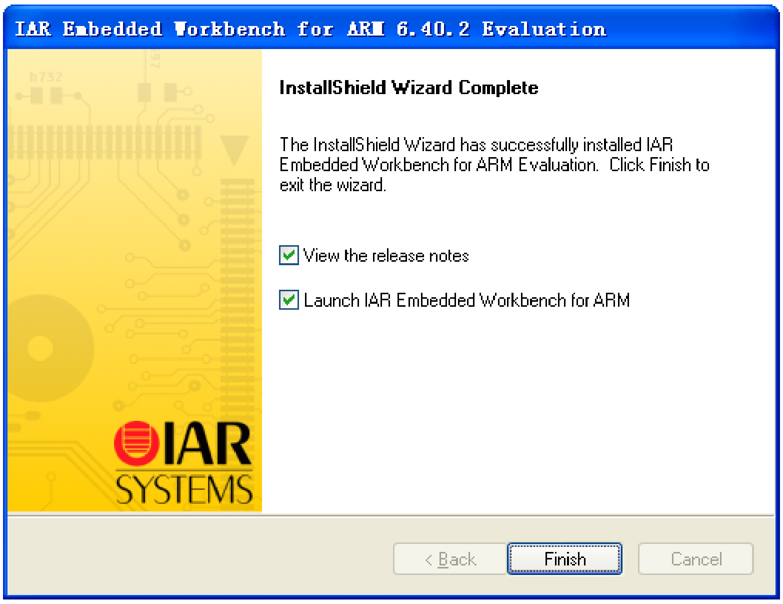
The wizard is ready to begin installation.

Click Install to begin the installation.

If you want to review or change any of your installation settings, click Back. Click Cancel to exit the wizard.

Figure 29: Select Install

10. Click Finish in the following window to finish the installation process;



IAR Embedded Workbench for ARM 6.40.2 Evaluation

InstallShield Wizard Complete

The InstallShield Wizard has successfully installed IAR Embedded Workbench for ARM Evaluation. Click Finish to exit the wizard.

☑ View the release notes

☑ Launch IAR Embedded Workbench for ARM

Figure 30: Installation is Complete

5 Software Development Process

After all the preparations are completed, the development process can be started. This chapter will introduce how to conduct software development under two different environments, Keil MDK and IAR EWARM by using the development of NXP's LPC1788 processor as an example.

Note:

📖 Development on the LPC4357 requires version 4.60 or higher of Keil MDK or, version 6.40 or higher of IAR EWARM; this document uses Keil MDK 4.60 and IAR EWARM 6.40.2.

5.1 Development Based on the Keil MDK

The following content is composed of two parts which introduce how to create and compile MDK projects, as well as program and debug the compiled files.

5.1.1 Creating and Compiling a New Project

1. Click

   - Start
   - All Programs
   - Keil uVision4

on the PC's desktop to open a uVision4 window as shown right;

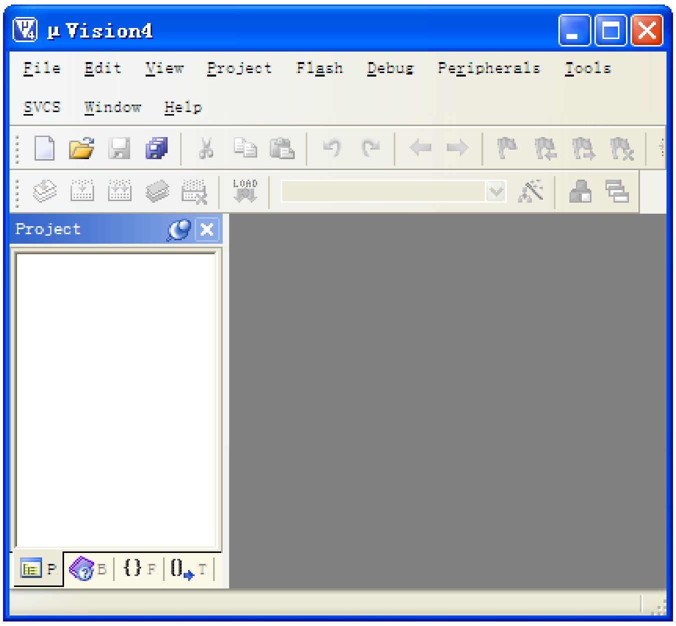


Figure 31: uVision 4 Window

2. Click **Project** > **New uVision Project** on the menu bar of the uVision4 window to open the following window;

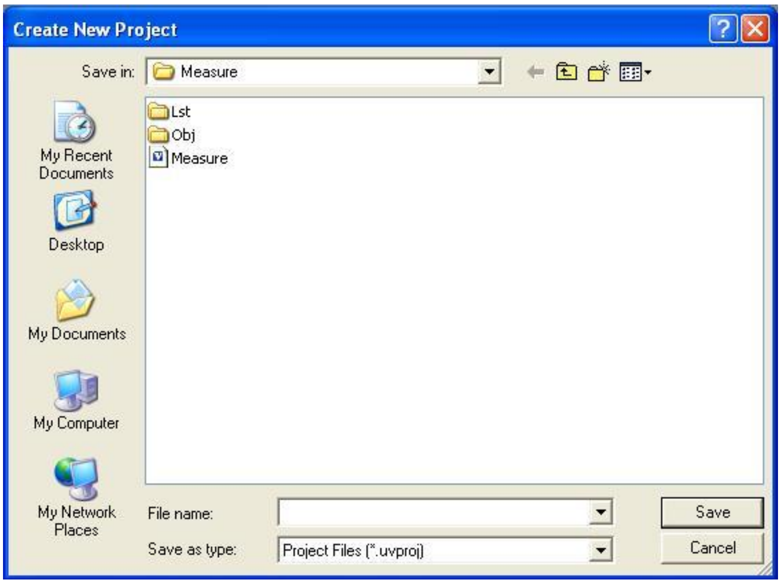
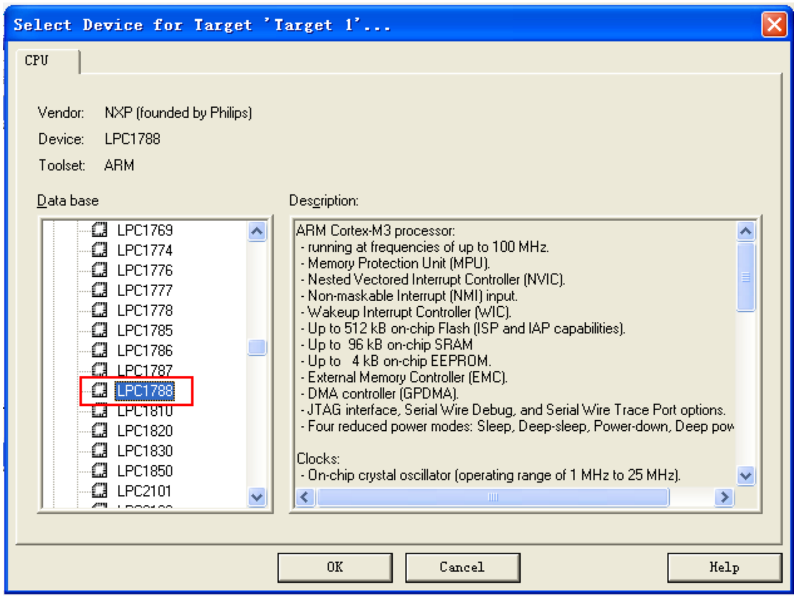


Figure 32: Create a New Project

3. Specify the storage path and name for the new project (e.g. Target1), and then click **Save**;

4. Select **NXP (founded by Philips)** > **LPC4357** in the tree view of the window shown below, and then click **OK**;



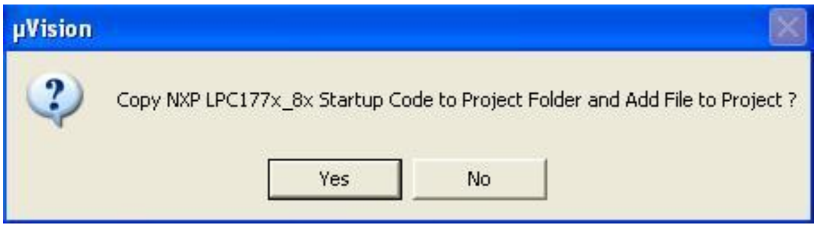
Vendor: NXP (founded by Philips)
Device: LPC1788
Toolset: ARM

ARM Cortex-M3 processor:
- running at frequencies of up to 100 MHz.
- Memory Protection Unit (MPU).
- Nested Vectored Interrupt Controller (NVIC).
- Non-maskable Interrupt (NMI) input.
- Wakeup Interrupt Controller (WIC).
- Up to 512 kB on-chip Flash (ISP and IAP capabilities).
- Up to 96 kB on-chip SRAM
- Up to 4 kB on-chip EEPROM.
- External Memory Controller (EMC).
- DMA controller (GPDMA).
- JTAG interface, Serial Wire Debug, and Serial Wire Trace Port options.
- Four reduced power modes: Sleep, Deep-sleep, Power-down, Deep pow

Clocks:
- On-chip crystal oscillator (operating range of 1 MHz to 25 MHz).

Figure 33: CPU Selection

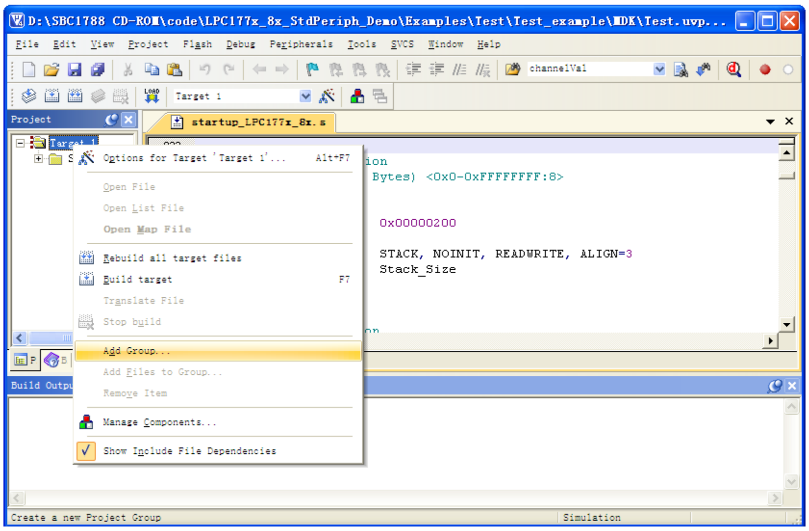
5. The following pop-up window prompts you to determine if NXP LPC177x_8x Start Code should be copied to the project folder; “**Yes**” is recommended;


µVision

Copy NXP LPC177x_8x Startup Code to Project Folder and Add File to Project ?

Figure 34: Adding Start Code

6. Right-click the project **Target1** in the tree view on the left part of the following window and select **Add Group** to create different groups to which the corresponding code will be added, for example a group named “Drivers” to which the EDM1070xx’s driver source files will be added later;

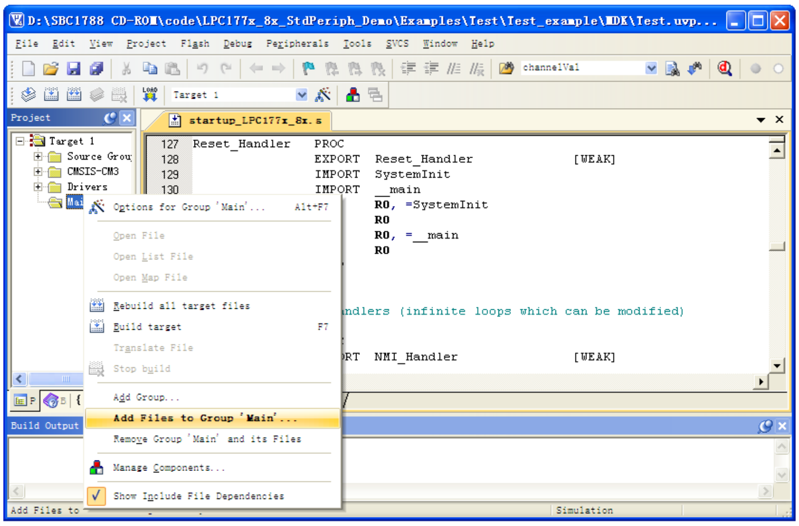

D:\SBC1788 CD-ROM\code\LPC177x_8x_StdPeriph_Demo\Examples\Test\Test_example\MDK\Test.uvp...

```
ion
 Bytes) <0x0-0xFFFFFFFF:8>

 0x00000200

 STACK, NOINIT, READWRITE, ALIGN=3
 Stack_Size
```

Create a new Project Group

Figure 35: Add New Groups

7. After all the groups are created, right-click each group and select **Add Files to Group…** to add relevant source code;

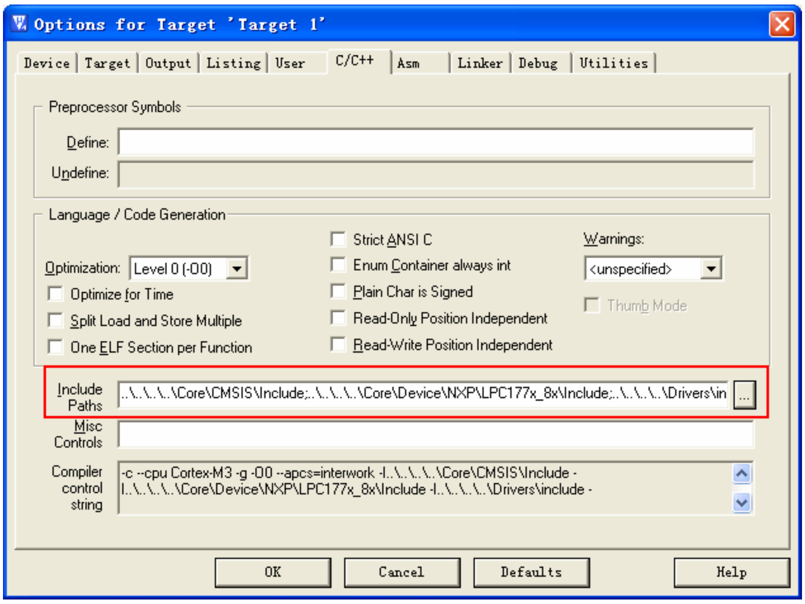


D:\SBC1788 CD-ROM\code\LPC177x_8x_StdPeriph_Demo\Examples\Test\Test_example\MDK\Test.uvp...

```
127  Reset_Handler    PROC
128                   EXPORT  Reset_Handler             [WEAK]
129                   IMPORT  SystemInit
130                   IMPORT  __main
                              R0, =SystemInit
                              R0
                              R0, =__main
                              R0

                    ndlers (infinite loops which can be modified)

                    RT  NMI_Handler                     [WEAK]
```

Figure 36: Adding Source Code to Groups

8. Right-click **Target1** in the tree view of the uVision4 window and select **Options for Target 'Target1'**, and then select **C/C++** tab in the pop-up window as shown below;



Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities
OK
Cancel
Defaults
Help

Preprocessor Symbols

Define:

Undefine:

Language / Code Generation

Optimization: Level 0 (-O0)

□ Optimize for Time

□ Split Load and Store Multiple

□ One ELF Section per Function

□ Strict ANSI C

□ Enum Container always int

□ Plain Char is Signed

□ Read-Only Position Independent

□ Read-Write Position Independent

Warnings: <unspecified>

□ Thumb Mode

Include Paths: ..\..\..\..\Core\CMSIS\Include;..\..\..\..\Core\Device\NXP\LPC177x_8x\Include;..\..\..\..\Drivers\in

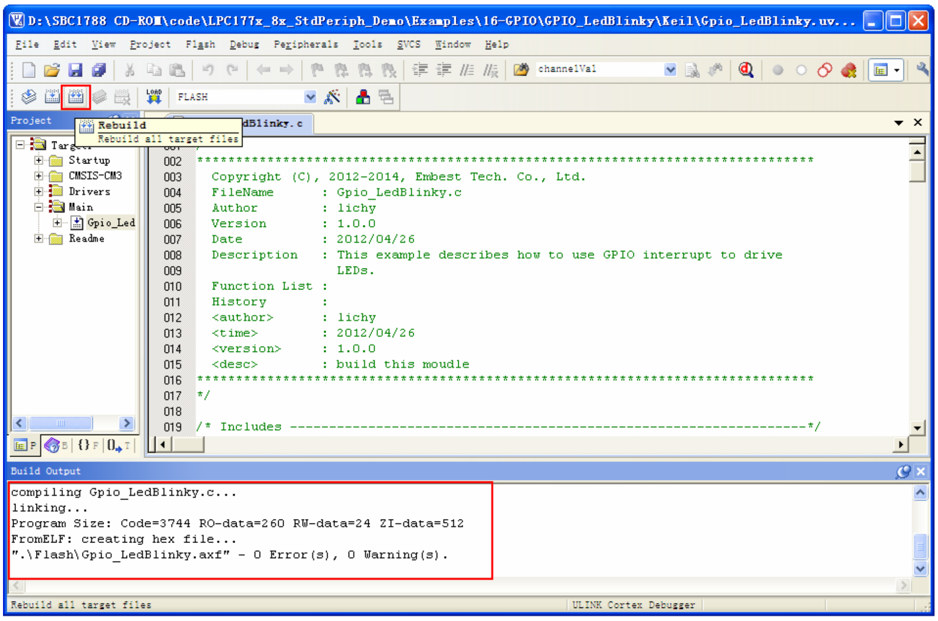
Misc Controls:

Compiler control string: -c --cpu Cortex-M3 -g -O0 --apcs=interwork -I..\..\..\..\Core\CMSIS\Include -I..\..\..\..\Core\Device\NXP\LPC177x_8x\Include -I..\..\..\..\Drivers\include -

Figure 37: C/C++ Tab

Specify the paths where the head files are saved in the **Include Paths** textbox, and then click **OK**;

9. Click the **Rebuild button:** on the tool bar as shown in the following window to start compiling all the files;


D:\SBC1788 CD-ROM\code\LPC177x_8x_StdPeriph_Demo\Examples\16-GPIO\GPIO_LedBlinky\Keil\Gpio_LedBlinky.uv...
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
channelVal
FLASH
Project
Rebuild
Rebuild all target files
dBlinky.c
Target
Startup
CMSIS-CM3
Drivers
Main
Gpio_Led
Readme
Build Output
Rebuild all target files
ULINK Cortex Debugger

```
*******************************************************************************
  Copyright (C), 2012-2014, Embest Tech. Co., Ltd.
  FileName       : Gpio_LedBlinky.c
  Author         : lichy
  Version        : 1.0.0
  Date           : 2012/04/26
  Description    : This example describes how to use GPIO interrupt to drive
                   LEDs.
  Function List  :
  History        :
  <author>       : lichy
  <time>         : 2012/04/26
  <version>      : 1.0.0
  <desc>         : build this moudle
*******************************************************************************
*/

/* Includes ------------------------------------------------------------------*/
```

```
compiling Gpio_LedBlinky.c...
linking...
Program Size: Code=3744 RO-data=260 RW-data=24 ZI-data=512
FromELF: creating hex file...
".\Flash\Gpio_LedBlinky.axf" - 0 Error(s), 0 Warning(s).
```

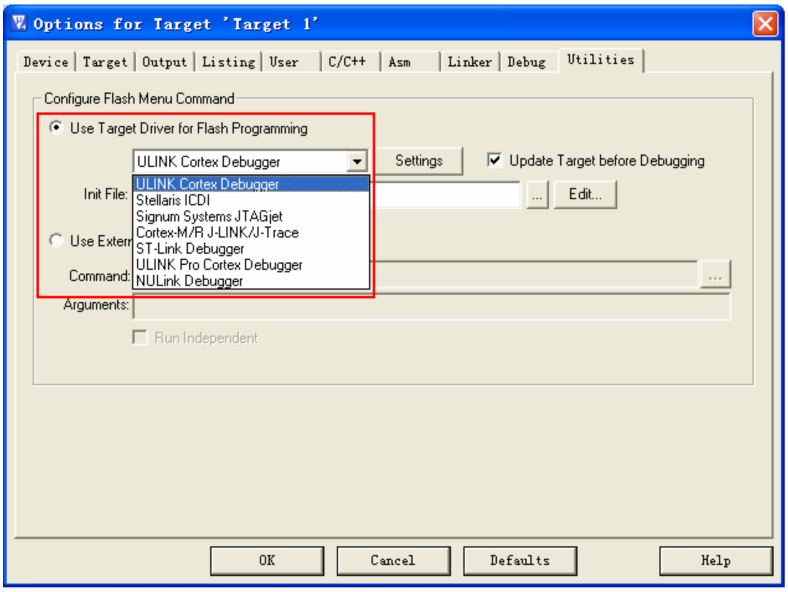
Figure 38: Click Rebuild

The information box at the bottom of the window shows that compilation has completed successfully. Now the process of creating and compiling a project is finished.

5.1.2 Programming and Debugging

You can now proceed with flash programming and debugging by following the steps listed below;

1. Right-click **Target1** in the tree view of uVision4 window and select **Options for Target 'Target1'**, and then select the **Utilities** tab in the pop-up window as shown below;



Options for Target 'Target 1'

Configure Flash Menu Command

● Use Target Driver for Flash Programming

ULINK Cortex Debugger

☑ Update Target before Debugging

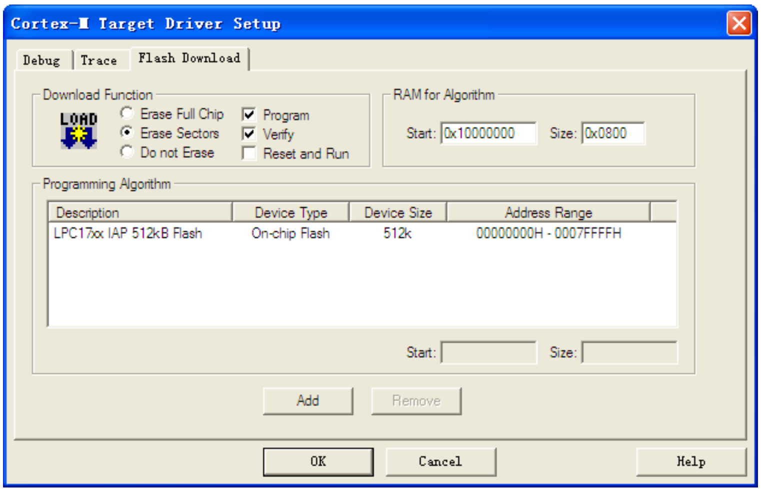
○ Use Extern

□ Run Independent

Figure 39: Utilities Tab

2. Check the radio button **Use Target Device for Flash Programming** and the checkbox **Update Target before Debugging**, select **ULINK Cortex Debugger** in the corresponding drop-down menu, and then click **Settings**;

3. Select the **Flash Download** tab in the pop-up window as shown right;



Cortex-M Target Driver Setup

Download Function

○ Erase Full Chip

● Erase Sectors

○ Do not Erase

☑ Program

☑ Verify

□ Reset and Run

RAM for Algorithm

Start: 0x10000000 Size: 0x0800

Programming Algorithm

Description	Device Type	Device Size	Address Range
LPC17xx IAP 512kB Flash	On-chip Flash	512k	00000000H - 0007FFFFH

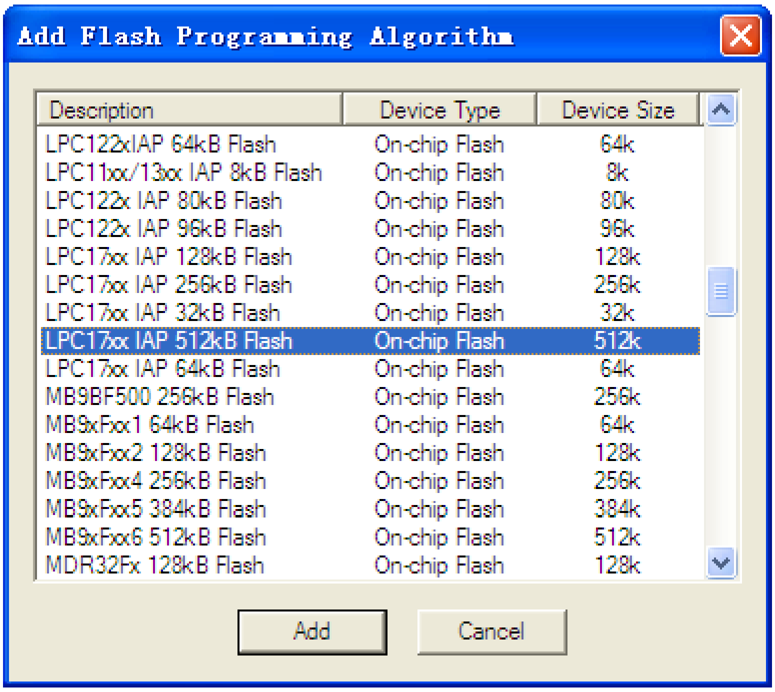
Figure 40: Flash Download Settings

Click **Add** at the bottom of the window;

Note:

🕮 The purpose of this step is to add necessary flash programming algorithms. If LPC17xx IAP 512kB Flash is already in the list of Programming Algorithms, there is no need to add it again and you can jump to step 4.

4. Select **LPC17xx IAP 512Kb Flash** in the pop-up window as shown below and click **Add**;

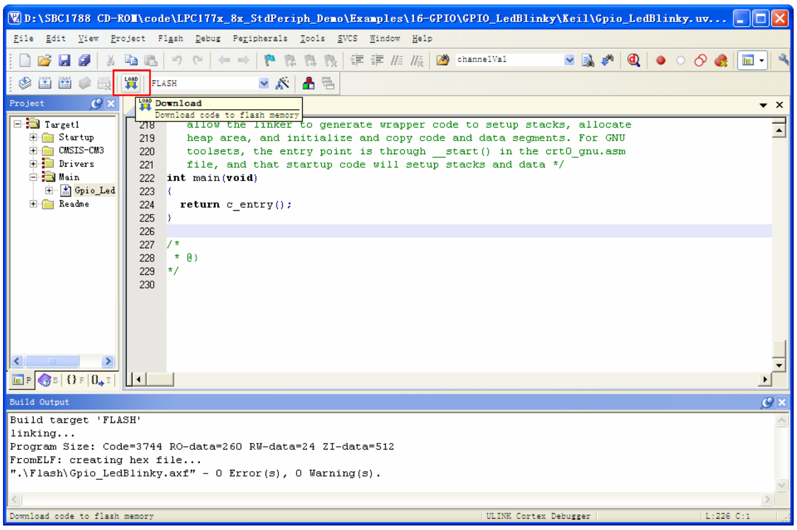


Description	Device Type	Device Size
LPC122xIAP 64kB Flash	On-chip Flash	64k
LPC11xx/13xx IAP 8kB Flash	On-chip Flash	8k
LPC122x IAP 80kB Flash	On-chip Flash	80k
LPC122x IAP 96kB Flash	On-chip Flash	96k
LPC17xx IAP 128kB Flash	On-chip Flash	128k
LPC17xx IAP 256kB Flash	On-chip Flash	256k
LPC17xx IAP 32kB Flash	On-chip Flash	32k
LPC17xx IAP 512kB Flash	On-chip Flash	512k
LPC17xx IAP 64kB Flash	On-chip Flash	64k
MB9BF500 256kB Flash	On-chip Flash	256k
MB9xFxx1 64kB Flash	On-chip Flash	64k
MB9xFxx2 128kB Flash	On-chip Flash	128k
MB9xFxx4 256kB Flash	On-chip Flash	256k
MB9xFxx5 384kB Flash	On-chip Flash	384k
MB9xFxx6 512kB Flash	On-chip Flash	512k
MDR32Fx 128kB Flash	On-chip Flash	128k

Figure 41: Add a Flash Programming Algorithm

5. Click **OK** twice to go back to the uVision4 window;

6. Click the **Download button:** LOAD on the tool bar of the uVision4 window to start flash programming;



D:\SBC1788 CD-ROM\code\LPC177x_8x_StdPeriph_Demo\Examples\16-GPIO\GPIO_LedBlinky\Keil\Gpio_LedBlinky.uv...

File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
channelVal
FLASH
Project
Target1
Startup
CMSIS-CM3
Drivers
Main
Gpio_Led
Readme
Download
Download code to flash memory

```
   allow the linker to generate wrapper code to setup stacks, allocate
   heap area, and initialize and copy code and data segments. For GNU
   toolsets, the entry point is through __start() in the crt0_gnu.asm
   file, and that startup code will setup stacks and data */
int main(void)
{
  return c_entry();
}

/*
 * @}
*/
```

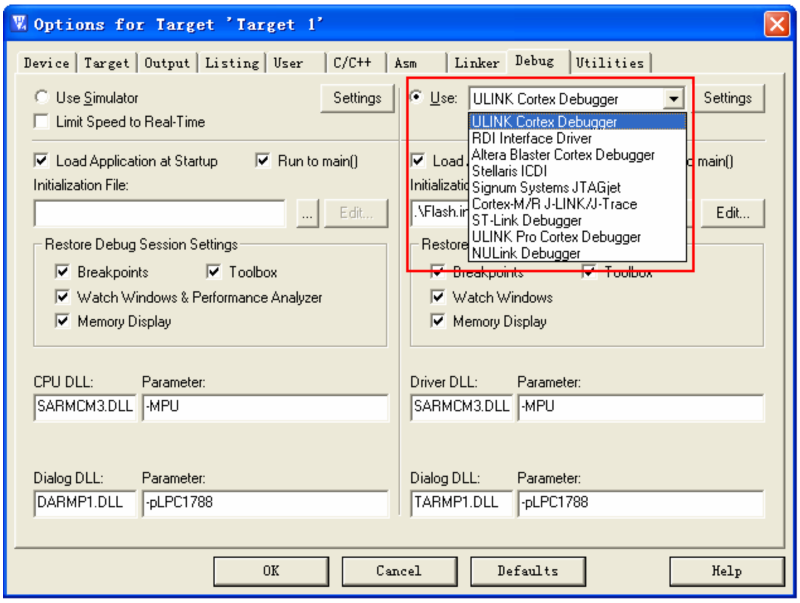
Build Output

```
Build target 'FLASH'
linking...
Program Size: Code=3744 RO-data=260 RW-data=24 ZI-data=512
FromELF: creating hex file...
".\Flash\Gpio_LedBlinky.axf" - 0 Error(s), 0 Warning(s).
```

Download code to flash memory | ULINK Cortex Debugger | L:226 C:1

Figure 42: Start Flash Programming

7. After programming is done, right-click **Target1** in the tree view of the uVision4 window and select **Options for Target 'Target1'**, and then select the **Debug** tab in the pop-up window as shown below;



Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities
Settings
Settings
Edit...
Edit...
OK
Cancel
Defaults
Help

○ Use Simulator
□ Limit Speed to Real-Time
☑ Load Application at Startup ☑ Run to main()
Initialization File:
Restore Debug Session Settings
☑ Breakpoints ☑ Toolbox
☑ Watch Windows & Performance Analyzer
☑ Memory Display
CPU DLL: SARMCM3.DLL Parameter: -MPU
Dialog DLL: DARMP1.DLL Parameter: -pLPC1788

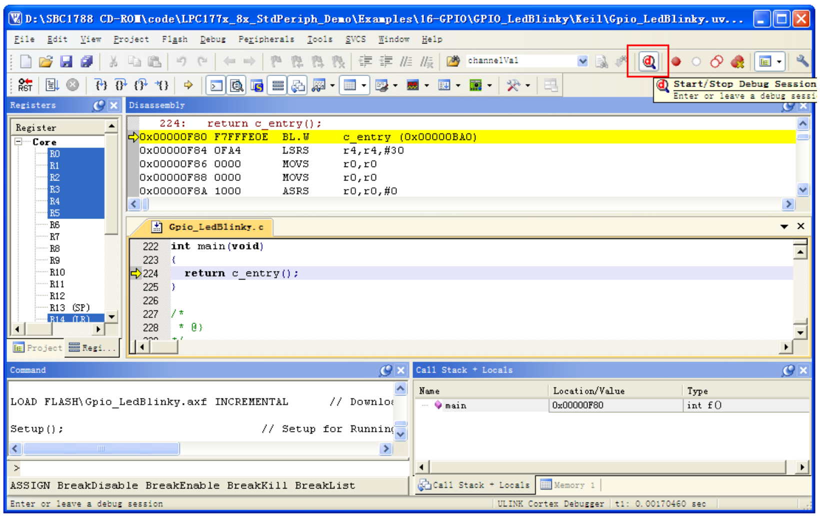
● Use: ULINK Cortex Debugger
- ULINK Cortex Debugger
- RDI Interface Driver
- Altera Blaster Cortex Debugger
- Stellaris ICDI
- Signum Systems JTAGjet
- Cortex-M/R J-LINK/J-Trace
- ST-Link Debugger
- ULINK Pro Cortex Debugger
- NULink Debugger

☑ Load ... main()
Initializatio... .\Flash.in...
Restore ...
☑ Breakpoints ☑ Toolbox
☑ Watch Windows
☑ Memory Display
Driver DLL: SARMCM3.DLL Parameter: -MPU
Dialog DLL: TARMP1.DLL Parameter: -pLPC1788

Figure 43: Debug Settings

8. Check the radio button **Use** at the top right of the **Debug** tab and select **ULINK Cortex Debugger** in the corresponding drop-down menu, and then click **OK**;

9. Click the **Debug button:** on the tool bar of the uVision4 window as shown below to start online debugging;


D:\SBC1788 CD-ROM\code\LPC177x_8x_StdPeriph_Demo\Examples\16-GPIO\GPIO_LedBlinky\Keil\Gpio_LedBlinky.uv...
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help
channelVal
Start/Stop Debug Session
Enter or leave a debug sessi
Registers
Register
Core
R0
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13 (SP)
R14 (LR)
Project
Regi...
Disassembly
Gpio_LedBlinky.c
Command
Call Stack + Locals
Memory 1

```
   224:    return c_entry();
0x00000F80 F7FFFE0E  BL.W     c_entry (0x00000BA0)
0x00000F84 0FA4      LSRS     r4,r4,#30
0x00000F86 0000      MOVS     r0,r0
0x00000F88 0000      MOVS     r0,r0
0x00000F8A 1000      ASRS     r0,r0,#0
```

```
int main(void)
{
  return c_entry();
}

/*
 * @}
```

```
LOAD FLASH\Gpio_LedBlinky.axf INCREMENTAL      // Downloa

Setup();                               // Setup for Runnin
>
ASSIGN BreakDisable BreakEnable BreakKill BreakList
```

Name	Location/Value	Type
main	0x00000F80	int f()

Enter or leave a debug session   ULINK Cortex Debugger   t1: 0.00170460 sec

Figure 44: Start Debugging

5.2 Development Based on IAR EWARM

The following content is composed of two parts which introduce how to create and compile IAR projects, as well as program and debug the compiled files.

5.2.1 Creating New Project Compiling

1. Launch the software to open the IAR Embedded Workbench IDE window as shown below;

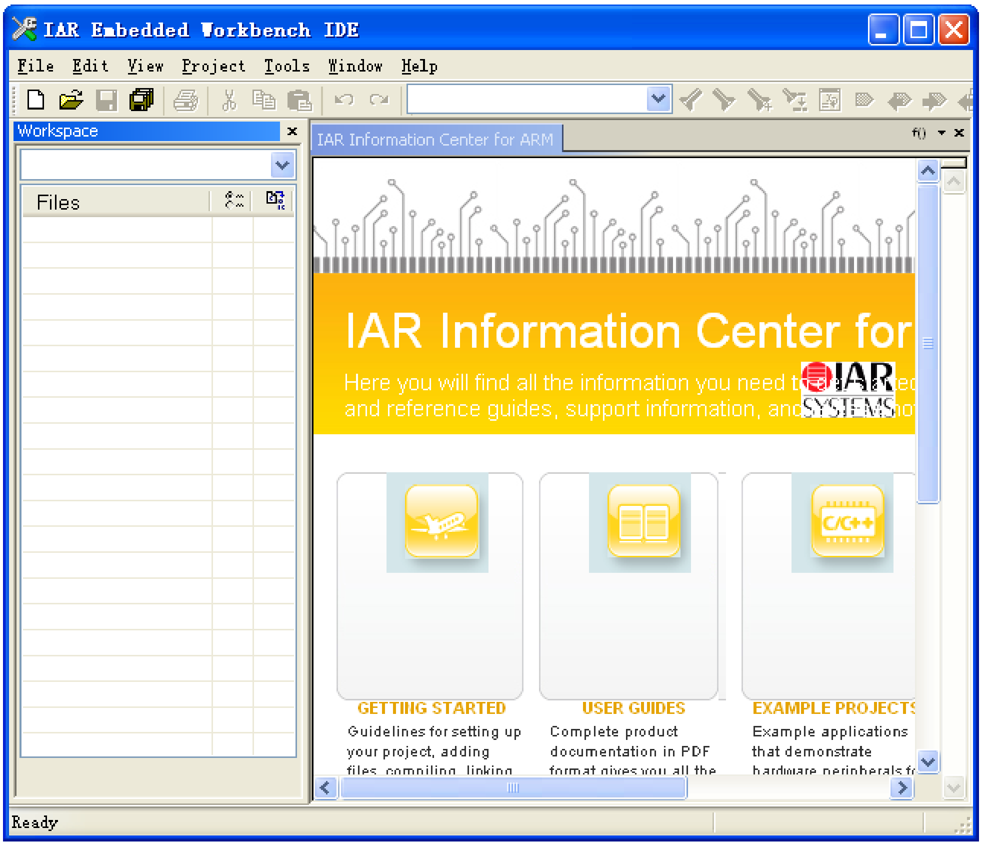

IAR Embedded Workbench IDE
File Edit View Project Tools Window Help
Workspace
Files
IAR Information Center for ARM
IAR Information Center for
Here you will find all the information you need to get started
and reference guides, support information, and
IAR SYSTEMS
GETTING STARTED
Guidelines for setting up your project, adding files, compiling, linking
USER GUIDES
Complete product documentation in PDF format gives you all the
EXAMPLE PROJECTS
Example applications that demonstrate hardware peripherals f
Ready

Figure 45: IAR Embedded Workbench Window

2. Select **Project > Create new project** on the menu bar of the above window to create a new project;

3. Select **Empty project** in the following pop-up window, and then click **OK**;

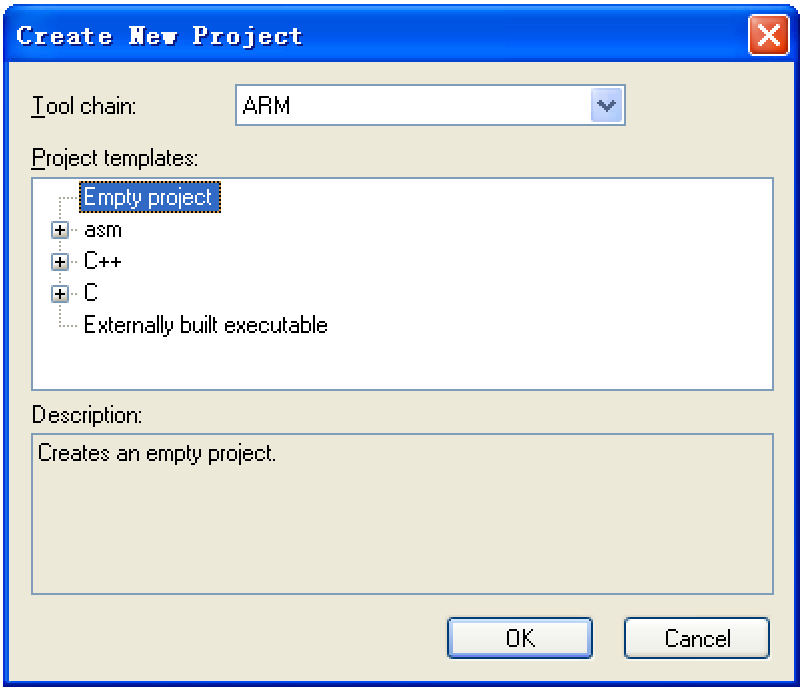


Figure 46: Select an Empty Project

4. Select a path to save the new project in the following pop-up window, and then click **Save**;

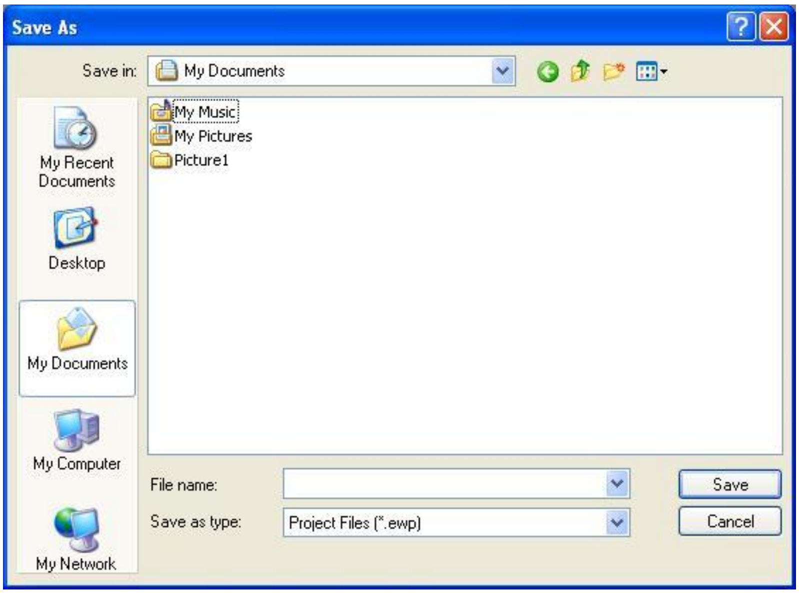
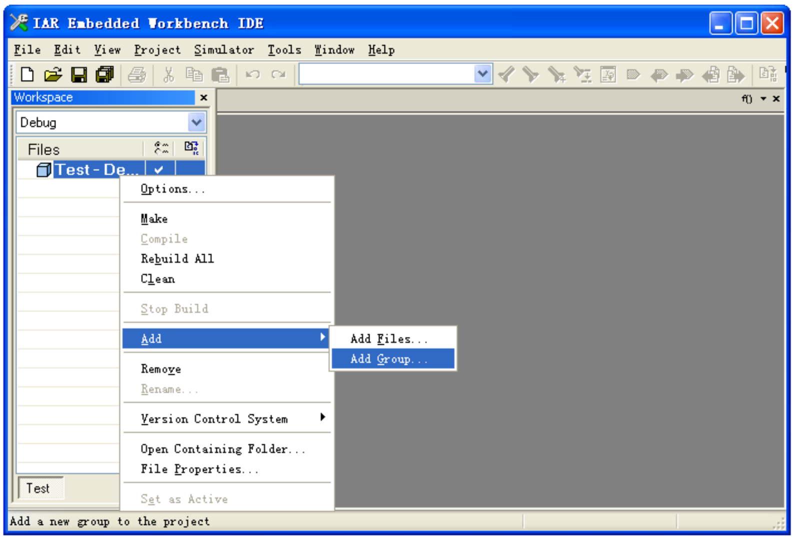


Figure 47: Set New Project Save Path

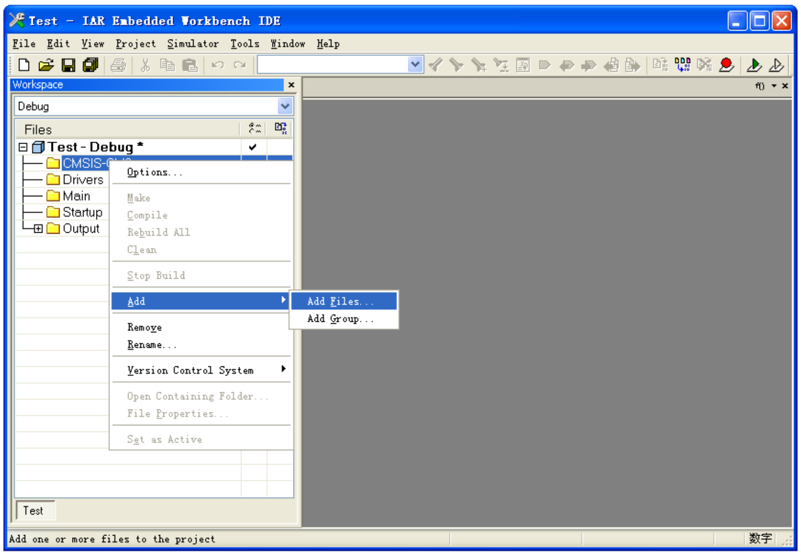
5. Right-click the project name on the left side of the IAR Embedded Workbench IDE window and select **Add > Add Group** to create different groups to which the corresponding code will be added, for example a group named "Drivers" to which driver source files will be added later;



Add a new group to the project

Figure 48: Create New Groups

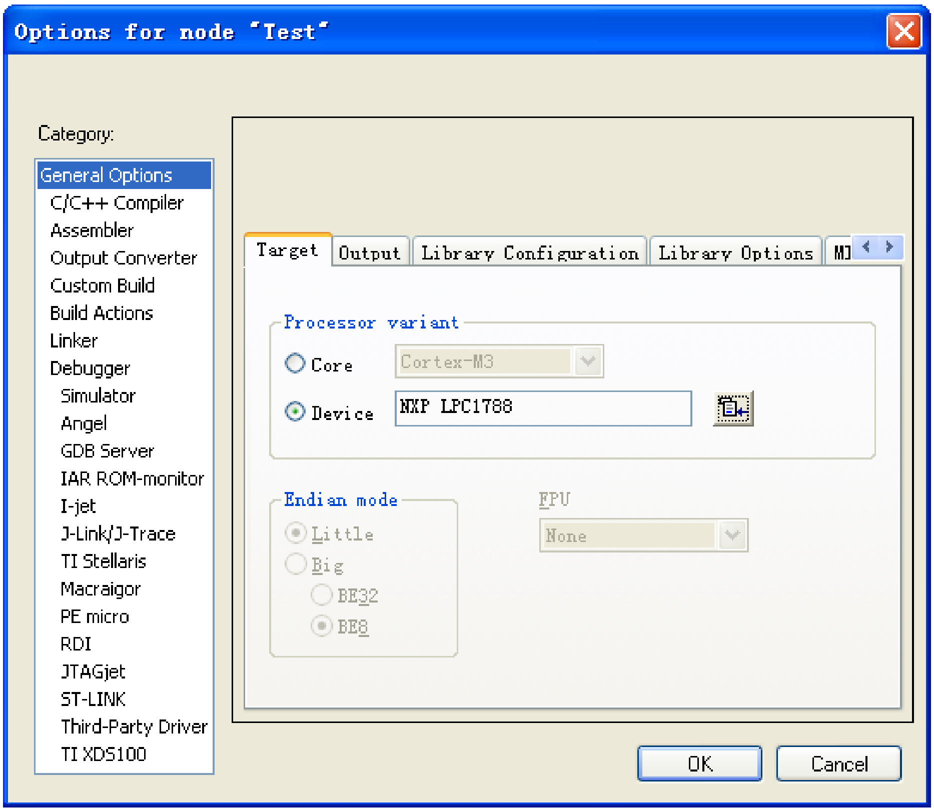
6. After all the necessary groups are added, right-click each group and select **Add > Add Files** to add relevant source code;



Add one or more files to the project

Figure 49: Add Source Code to Groups

7. After all the files are added, right-click the project name and select **Options** to open the window below;



Options for node "Test"

Category:

General Options
C/C++ Compiler
Assembler
Output Converter
Custom Build
Build Actions
Linker
Debugger
Simulator
Angel
GDB Server
IAR ROM-monitor
I-jet
J-Link/J-Trace
TI Stellaris
Macraigor
PE micro
RDI
JTAGjet
ST-LINK
Third-Party Driver
TI XDS100

Target | Output | Library Configuration | Library Options | MI

Processor variant
○ Core: Cortex-M3
● Device: NXP LPC1788

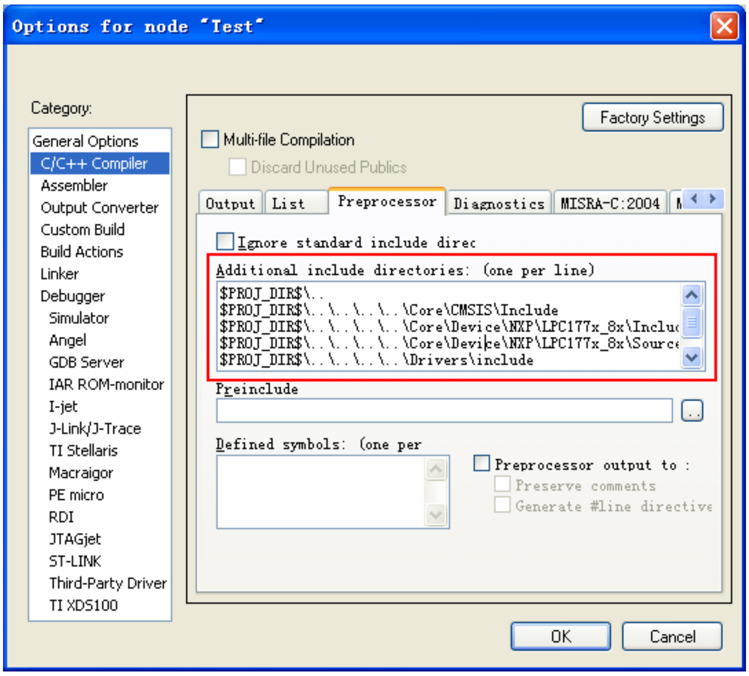
Endian mode
● Little
○ Big
○ BE32
● BE8

FPU: None

Figure 50: Project Options Window

8. Under the **Target** tab, check the radio button Device and click the ⊡ button on the right, and then select **NXP > LPC1700 > NXP LPC1788** in the pop-up menu;

9. Click **C/C++ Compiler** on the left side of the window and select the **Preprocessor** tab in the right part of the window, and then add the paths of the head files to the **Additional include directories** textbox;



□ Multi-file Compilation
□ Discard Unused Publics
□ Ignore standard include direc
Additional include directories: (one per line)

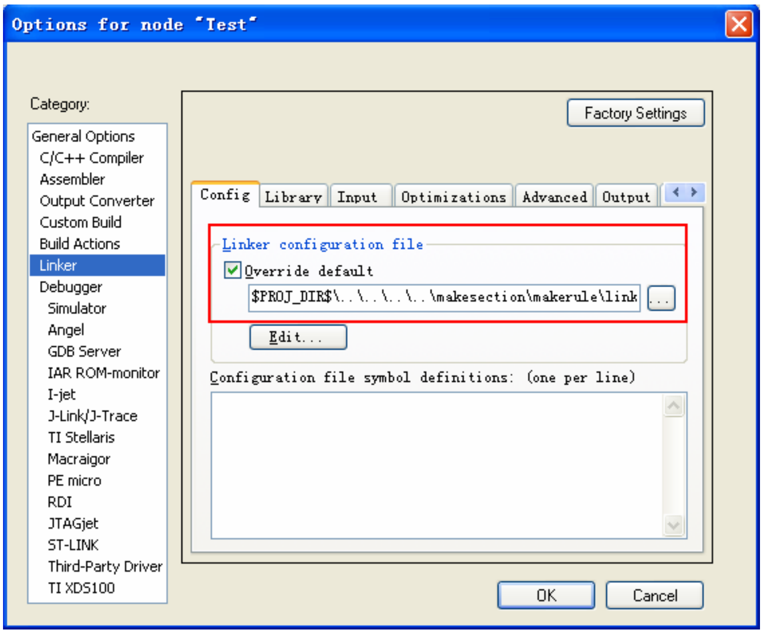
```
$PROJ_DIR$\..
$PROJ_DIR$\..\..\..\..\Core\CMSIS\Include
$PROJ_DIR$\..\..\..\..\Core\Device\NXP\LPC177x_8x\Incluc
$PROJ_DIR$\..\..\..\..\Core\Device\NXP\LPC177x_8x\Source
$PROJ_DIR$\..\..\..\..\Drivers\include
```

Preinclude
Defined symbols: (one per
□ Preprocessor output to :
□ Preserve comments
□ Generate #line directive

Figure 51: Head File Paths

10. Click **Linker** on the left side of the window and select the **Config** tab in the right part of the window, and then check the **Override default** checkbox and click the ... button as shown below to specify the paths of the linker configuration files;

11. Click **OK** to save settings;



Linker configuration file
☑ Override default
`$PROJ_DIR$\..\..\..\..\makesection\makerule\link`
Configuration file symbol definitions: (one per line)

Figure 52:Linker Configuration File Locations

12. Right-click the project name on the left side of the IAR Embedded Workbench IDE window and select **Rebuild All** to recompile the project;

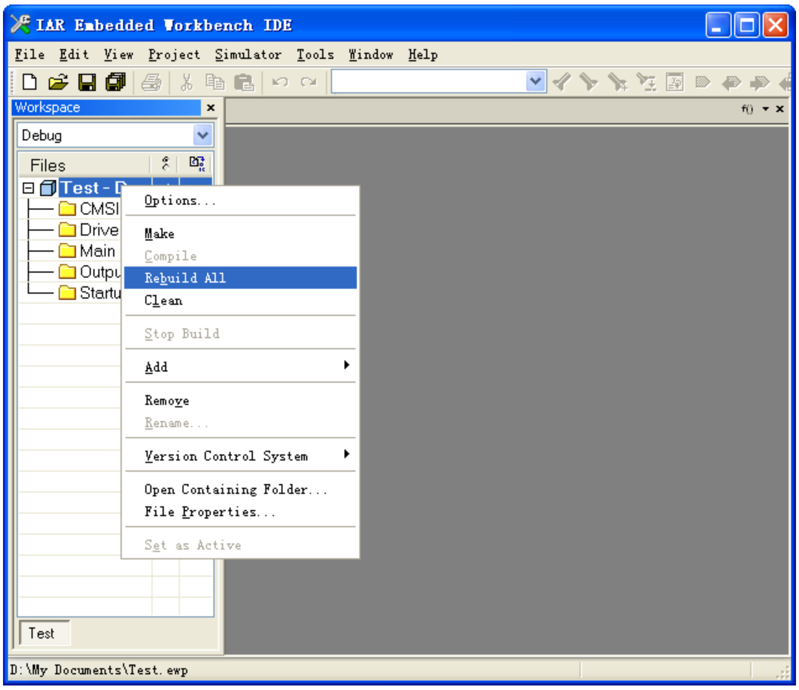


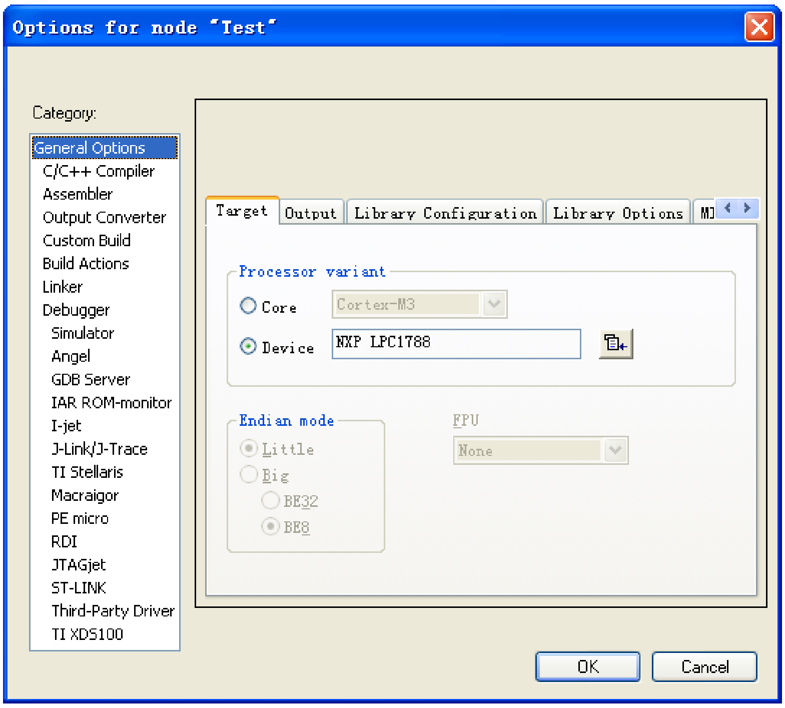
Figure 53: Recompile the Project

13. Now the creation and compilation of a new project has been completed successfully.

5.2.2 Programming and Debugging

1. You can now proceed with flash programming and debugging by following the steps listed below;

2. Right-click the project name on the left side of the IAR Embedded Workbench IDE window and select **Options** to open the following window;



Options for node "Test"

Category: General Options

Target | Output | Library Configuration | Library Options | MI

Processor variant

○ Core Cortex-M3

● Device NXP LPC1788

Endian mode

● Little

○ Big

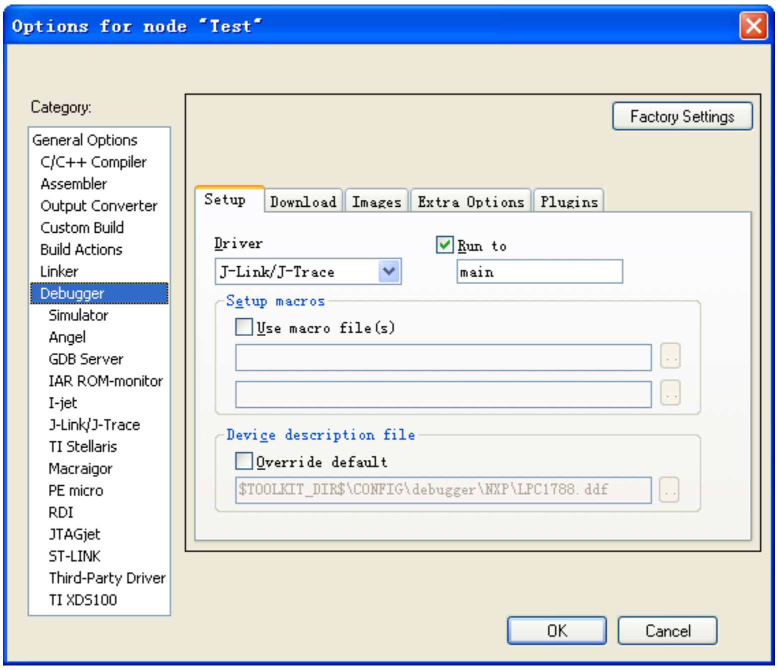
○ BE32

● BE8

FPU None

Figure 54: Project Options Window

3. Click **Debugger** on the left side of the window and select the **Setup** tab in the right part, and then select **J-Link/J-Trace** in the **Driver** drop-down menu;



Options for node "Test"

Category: Debugger

Setup | Download | Images | Extra Options | Plugins

Driver: J-Link/J-Trace

☑ Run to: main

Setup macros

☐ Use macro file(s)

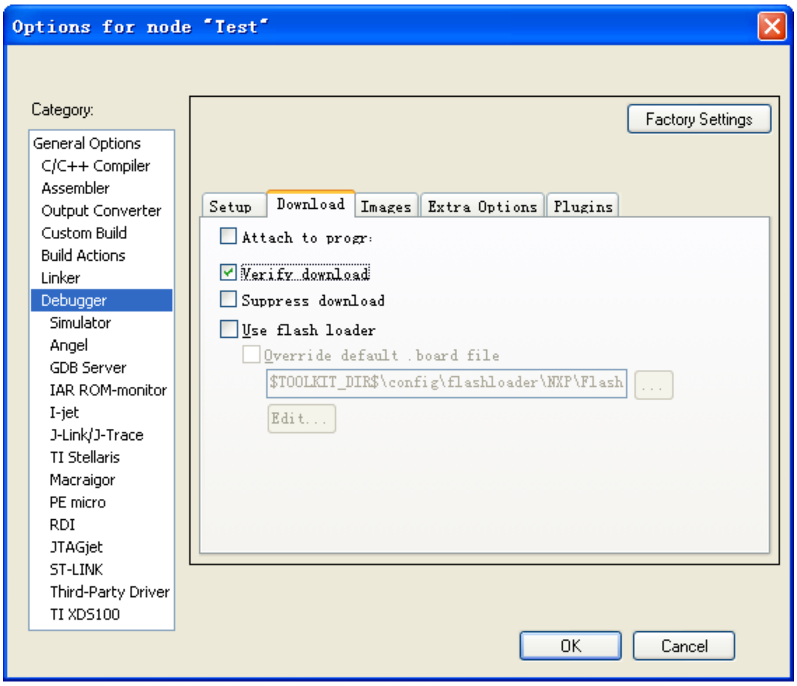
Device description file

☐ Override default

$TOOLKIT_DIR$\CONFIG\debugger\NXP\LPC1788.ddf

Figure 55: Downloading & Debugging Tool

4. Click the Download tab and check the **Verify download** checkbox, and then click **OK**;



□ Attach to progr:

☑ Verify download

□ Suppress download

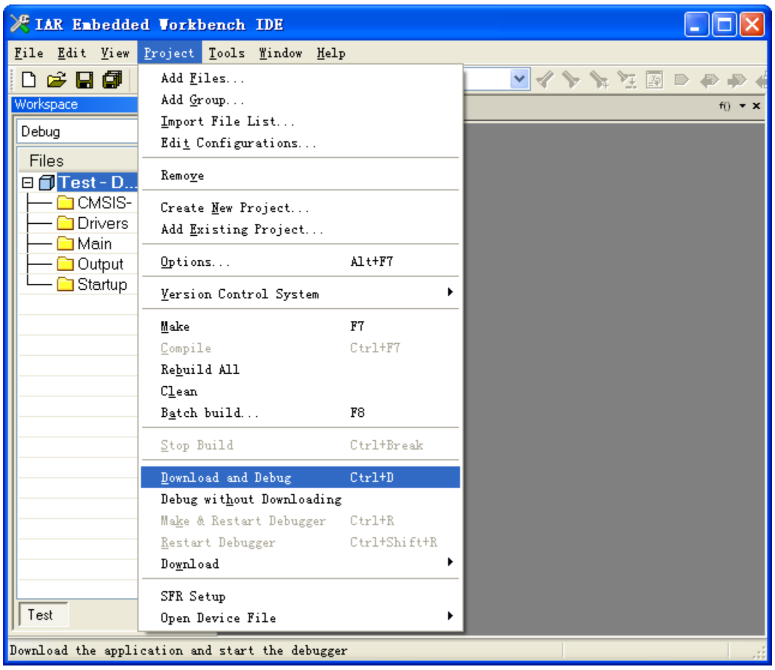
□ Use flash loader

□ Override default .board file

$TOOLKIT_DIR$\config\flashloader\NXP\Flash

Figure 56: Check the Verify Download Checkbox

5. Select **Project > Download and Debug** on the menu bar of the IAR Embedded Workbench IDE window to start downloading and debugging;



Download the application and start the debugger

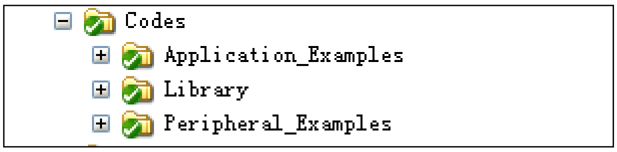
Figure 57: Select Download and Debug

6 Example Programs

The CD-ROM provided along with the EDM1070xx contains abundant example programs. All the programs are created based on the standard peripheral libraries from NXP. This chapter will introduce how to learn about the features of LPC4357 through a variety of example programs which consist of basic and additional examples.

6.1 Basic Example Programs for Peripherals

The basic example programs are saved under **X:\Codes\Peripheral_Examples** of the CD-ROM (where X:\ is the label of CD-ROM drive) as shown below;



```
⊟ Codes
    ⊞ Application_Examples
    ⊞ Library
    ⊞ Peripheral_Examples
```

The folders that are under the same directory as **Peripheral_Examples** include **Application_Examples** and **Library**; the following numbered entries give a brief introduction of the files contained in these folders;

1. **Application_Examples:** Project files of EDM1070xx example applications;

2. **Library:** Peripheral device drivers and USB libraries for EDM1070xx;

3. **Peripheral_Example:** Project files of the LPC4357's basic peripheral example programs;

The table on the next page lists all the basic example programs for peripherals and the relevant descriptions. This section will choose a part of the example programs to introduce the detailed operations.

Example Programs

Name of Example Programs		Descriptions
ADC	Adc_Burst	Using AD conversion under burst mode
	Adc_Dma	Using AD conversion function and transferring AD conversion results under DMA mode
	Adc_Interrupt	Using AD conversion under interrupt mode
	Adc_Polling	Using AD conversion under polling mode
ATIMER	Atimer_Wic	Using Alarm Timer to wake up system
CCAN	Ccan_SimpleTxRx	Using CAN to receive and transfer data
EMAC	Emac_EasyWeb	A simple web application
EMC	Emc_NandFlash	Writing and calibrating on-board NAND Flash
	Emc_Sdram	Writing and calibrating on-board SDRAM
GPDMA	Gpdma_Flash2Ram	Testing GPDMA (General Purpose Direct Memory Access) by data transfer from Flash to RAM
	Gpdma_Ram2Ram	Testing GPDMA (General Purpose Direct Memory Access) by data transfer from RAM to RAM
GPIO	Gpio_LedBlinky	Using GPIO to drive LED
I2C	I2C_EEPROM	Using I2C to drive EEPROM
LCD	Lcd_Demo	Using LCD controller of LPC4357 to drive LCD module
	Lcd_Touch	Configuring LCD and calibrate touch-screen
NVIC	Nvic_VectorTableRelocation	Relocating vector table
RTC	Rtc_Alarm	Generating interrupts in the second counter increment interrupts, and an alert interrupt every 10 seconds as well
	Rtc_Calendar	Configuring RTC calendar

Name of Example Programs		Descriptions
	Rtc_Calibration	Calibrating RTC clock
SDIO	Sdio_FatFs	Using MicroSD card in filesystem
	Sdio_Readwrite	Testing Read/Write speed of MicroSD card
SSP	Ssp_LcdTouch	Using SPI bus to configure LCD touch-screen chip
USB_HOST	Usb_MassStorage	Configuring LPC4357 as a USB Host
TIMER	Timer_Capture	Using the input capture function of timer
	Timer_FreMeasure	Using timer to measure the frequency of an input signal
	Timer_MatchInterrupt	Using timer matching to generate certain time interval (e.g. 1 second) under interrupt mode.
	Timer_MatchPolling	Using timer matching to generate certain time interval (e.g. 1 second) under polling mode.
USB_DEV	Usb_Cdc	Configure USB interface as a virtual serial interface
	Usb_MassStorage	A simple USB mass-storage application
WDT	Ext_Wdt	External watch dog application
	Wdt_Interrput	Generating an interrupt by using WDT after a certain time
UART	Uart_Autoband	UART communication under auto baud mode
	Uart_Dma	Using UART under DMA mode
	Uart_Interrupt	Using UART under interrupt mode
	Uart_Polling	Using UART under polling mode
	Uart_Rs485Master	Host application for RS485 communication
	Uart_Rs485Slave	Slave application for RS485 communication
OTP	OTP_API	Showing how to use the programming function of on-chip OTP

Name of Example Programs		Descriptions
PWR	Pwr_DeepPowerDown	System enters deep power down mode and is waked up by RTC interrupt
	Pwr_DeepSleep	System enters deep sleep mode and is waked up by an external interrupt
	Pwr_PowerDown	System enters power down mode and is waked up by NMI interrupt
	Pwr_Sleep	System enters sleep mode and is waked up by WWD interrupt
DUALCORE	Int_Demo	Interrupt configuration of LPC43xx M4 and M0
	Mbx_Demo	Using mailbox to realize communication between LPC43xx M4 core and M0 core
	Queue_Demo	Using queue to realize communication between LPC43xx M4 core and M0 core

Note:

🕮 The LPC1857FET256-based EDM1070xx does not support DUALCORE example programs.

6.1.2 LCD_Touch Program

1. Open the Lcd_Touch project;
2. Power on the EDM1070xx, recompile the project and download it to flash;
3. Reboot the EDM1070xx and use a stylus to touch the points which are marked with “+” symbols on the screen to implement calibration. When **please touch the screen** appears on the screen, use a stylus to touch a random point on the screen. The voltage value generated will be converted by the ADC and displayed on the screen, along with the corresponding coordinates.

6.1.3 Lcd_Demo Program

1. Open the Lcd_Demo project;

2. Power on the EDM1070xx, recompile the project and download it to flash;

3. Reboot the EDM1070xx, the LCD will display 3 colours –green, blue and red circularly;

6.1.4 USB_DEV/Usb_MassStorage Program

1. Connect the EDM1070xx to your PC with a USB-A (Male) to Mini-B (Male) cable;

2. Connect the UART0 (6th, 7th and 8th pins of the **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

3. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

4. Power on the EDM1070xx and recompile the project, and then download it to flash;

5. Reboot the EDM1070xx; The board will be recognized as a USB mass storage device by the PC; You can find a file named **README.TXT** by opening the drive **LPC4300 USB** in the **My Computer** window on your PC as shown right;

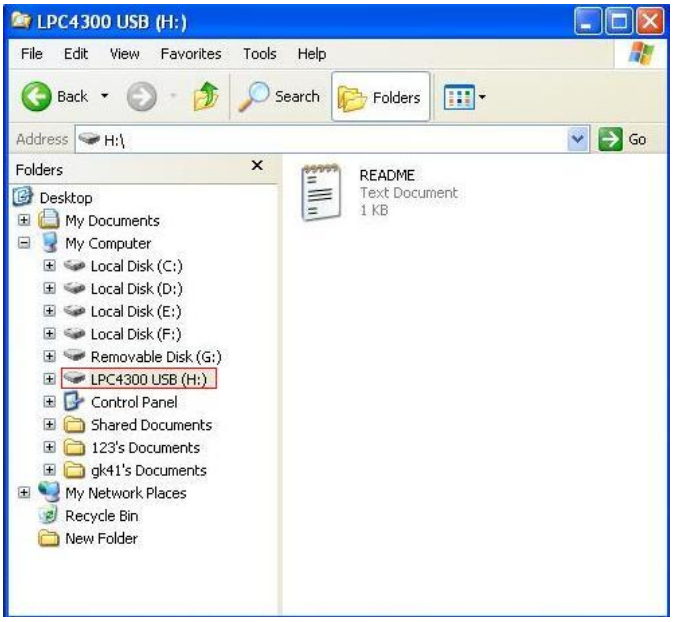


Figure 58: EDM1070xx as a USB Mass Storage Device

6.1.5 USB_DEV/Usb_Cdc Program

1. Connect the EDM1070xx to your PC with a USB-A (Male) to Mini-B (Male) cable;

2. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

3. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

4. Power on the EDM1070xx and recompile the project, and then download it to flash;

5. Reboot the EDM1070xx; The board will be recognized as a virtual serial device and the LED6 indicator lights up; You can find a serial device named **LPC43xx USB VCOM Port (COMx)** under the **Ports (COM & LPT)** branch in the **Device Manager** window of your PC as shown below;

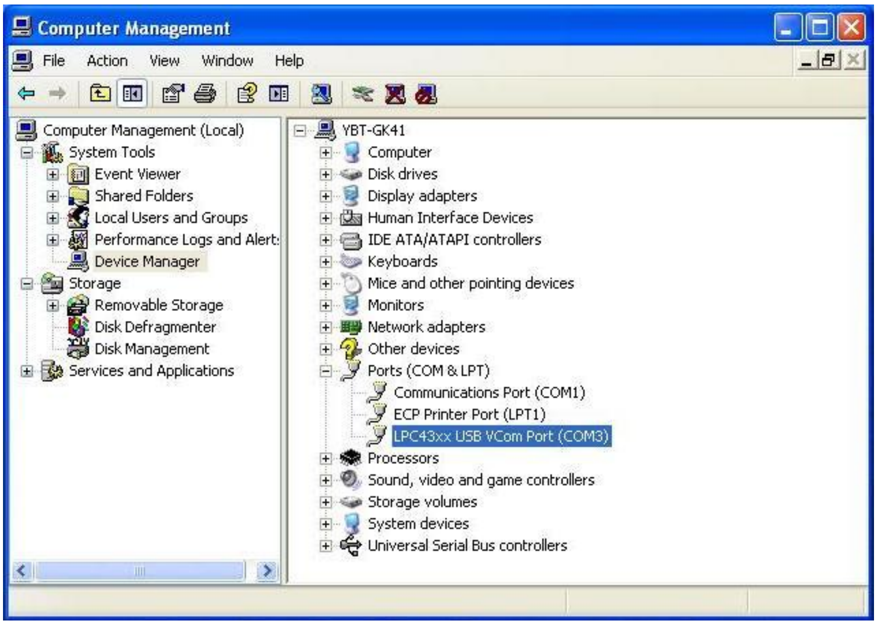
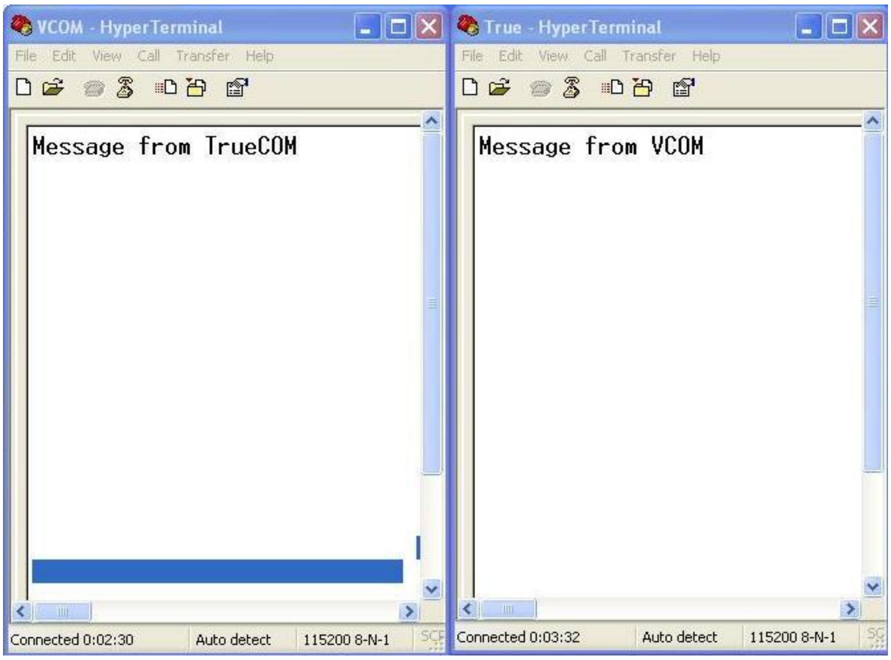


Figure 59: EDM1070 xx as a Serial Device

Note:

🕮 If the PC prompts you to install a driver, you can find the driver under X:\ Codes\Peripheral_Examples\17-USB_DEV\Usb_Cdc. (where X:\ is the label of your CD-ROM drive)

6. Open a HyperTerminal window for the virtual serial device; Any characters entered in a window will be received and displayed in the other as shown below;



```
Message from TrueCOM
```

```
Message from VCOM
```

Figure 60: Serial Interface Communication

6.1.6 USB_HOST/Usb_MassStorage Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1 Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx;

5. Copy the folder **Folder** and the file **FILENAME_R.txt** from **X:\Codes\Peripheral_Examples\14-USB_HOST\Usb_MassStorage** (where X:\ is the label of CD-ROM drive) to a flash drive, and then insert the drive into the USB interface of the EDM1070xx; the HyperTerminal window displays information as shown below;

```
***********************************************************
*********************
Hello NXP Semiconductors
USB Host MassStorage (test or debug mode) demo
         - MCU:lpc18xx/lpc43xx
         - Core: Cortex M3/M4
         - Communicate via: UART0 -  115200 bps
***********************************************************
*********************
Wait for the mass storage device to connectHost Initialized

Device Attached...
Device Enumeration Complete...
The mass storage device is connected...
Mass Storage Capacity 3.729492 GB
Open a test file (FILENAME_R.txt)
The test file Connect is:
hello!
The is the LPC43xx USB Test DEMO.
Writing to Folder1/FILENAME_W.txt...
Copy completed
```

Note:

🕮 Due to the uncertainty of compatibility, some USB flash drives may not work properly with this program. Please try another drive if you encounter this issue.

6. Connect the USB flash drive to your PC and check the contents of the drive to see if **FILENAME_R.txt** is copied to the folder **Folder**;

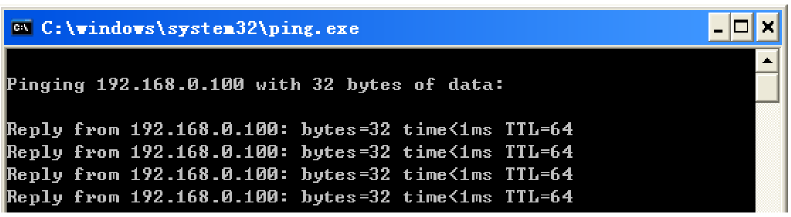
6.1.7 Emac_EasyWeb Program

1. Connect one leg of a 10K potentiometer to a 3.3V input, another to ground, and the center leg to the ADC2 pin of the EDM1070xx (the 4th pin of **ADC&WAKEUP** connector in Figure 1 on page 3);

2. Connect the EDM1070xx to your PC with a cross-over network cable and a cross-over serial cable, and then power on the board; LED1 will be lit up to indicate the proper connection of network;

3. Recompile the project and download it to flash, and then reboot the EDM1070xx;

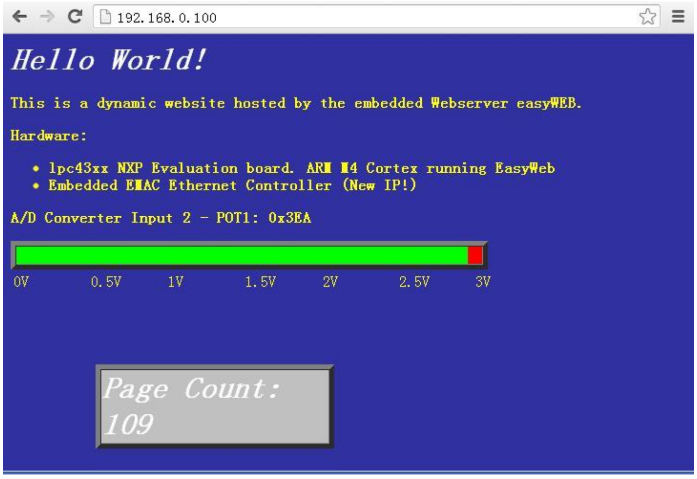
4. Click **Start > Run** on your PC's desktop, type **cmd** in the pop-up window, and then press **Enter** on your keyboard to open a command line window; Type **ping 192.168.0.100 –t** in the window and press **Enter** again to receive the information as shown below;



```
C:\windows\system32\ping.exe

Pinging 192.168.0.100 with 32 bytes of data:

Reply from 192.168.0.100: bytes=32 time<1ms TTL=64
Reply from 192.168.0.100: bytes=32 time<1ms TTL=64
Reply from 192.168.0.100: bytes=32 time<1ms TTL=64
Reply from 192.168.0.100: bytes=32 time<1ms TTL=64
```

Figure 61: Network Testing

5. Type http://192.168.0.100 in the address bar of your Internet browser and press **Enter** on your keyboard to open the page as shown right;



192.168.0.100

Hello World!

This is a dynamic website hosted by the embedded Webserver easyWEB.

Hardware:

- lpc43xx NXP Evaluation board. ARM M4 Cortex running EasyWeb
- Embedded EMAC Ethernet Controller (New IP!)

A/D Converter Input 2 - POT1: 0x3EA

Page Count:
109

Figure 62: easyWEB Interface

When the potentiometer is being turned, the voltage value converted by the ADC changes accordingly;

6.1.8 Adc_Polling Program

1. Connect the one leg of a 10K potentiometer to a 3.3V input, another to ground, and the center leg to the ADC2 pin of the EDM1070xx (the 4th pin of **ADC&WAKEUP** connector in Figure 1 on page 3);

2. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

3. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

4. Power on the EDM1070xx and recompile the project, and then download it to flash;

5. Reboot the EDM1070xx; When the potentiometer is being turned, the voltage value converted by the ADC changes accordingly in the HyperTerminal window as shown below;

```
**********************************************************
************
 Hello NXP Semiconductors
 ADC POLLING example:
         - MCU: lpc18xx/lpc43xx
         - Core: ARM CORTEX-M3/M4
         - Communicate via: UART0 - 115200 bps
 Use  ADC  with  12-bit  resolution  rate  of  200KHz,  read  in
POLLING mode
 To get ADC value and display via UART interface
 Turn the potentiometer to see ADC value changes
**********************************************************
************
ADC value on channel  2 is: 0000000807
ADC value on channel  2 is: 0000000808
ADC value on channel  2 is: 0000000808
ADC value on channel  2 is: 0000000808
ADC value on channel  2 is: 0000000806
ADC value on channel  2 is: 0000000806
ADC value on channel  2 is: 0000000807
ADC value on channel  2 is: 0000000806
ADC value on channel  2 is: 0000000808
ADC value on channel  2 is: 0000000808
ADC value on channel  2 is: 0000000806
ADC value on channel  2 is: 0000000806
ADC value on channel  2 is: 0000000807
```

6.1.9 Atimer_Wic Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
***********************************************************
*********************
Hello NXP Semiconductors
Timer delay demo
         - MCU: lpc18xx/lpc43xx
         - Core: ARM Cortex-M3/M4
         - Communicate via: UART0 - 115200 bps
 Using Alarm Timer to generate Interrupt and wake up system
***********************************************************
*********************
Waked Up by Alarm Timer
Waked Up by Alarm Timer
Waked Up by Alarm Timer
Waked Up by Alarm Timer
Waked up by Alarm Timer
Waked Up by Alarm Timer
Waked Up by Alarm Timer
Waked Up by Alarm Timer
Waked Up by Alarm Timer
Waked Up by Alarm Timer
```

6.1.10 Ccan_SimpleTxRx Program

1. Connect the CAN interfaces of two EDM1070xx to each other as shown below (5th and 6th pins of CAN0 or 7th and 8th pins of CAN1 on **UART3&CAN0/1** connector in Figure 1 on page 3)

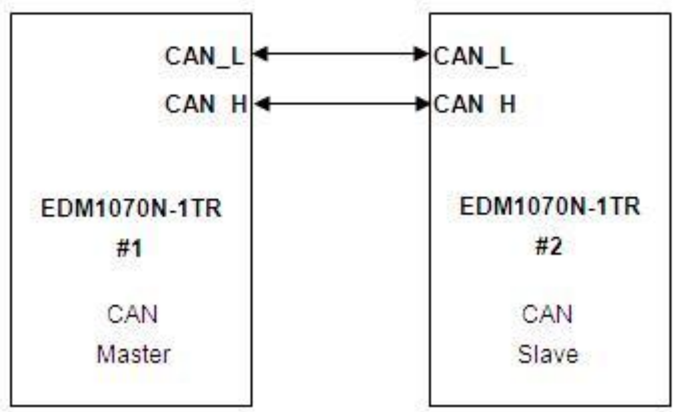
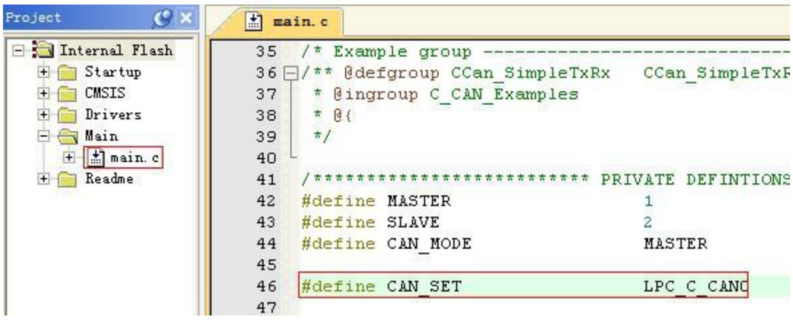


Figure 63: Connection of Two EDM1070xxs

2. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on one of the two EDM1070xxs to your PC with a cross-over serial cable;

3. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

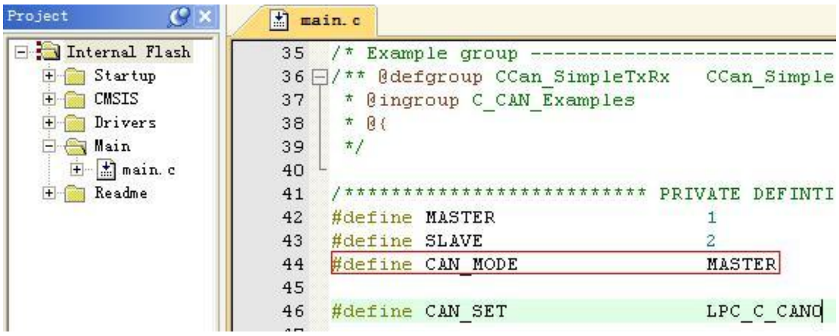
4. Open the project and expand the Main entry in the tree-view of the uVision4 window; double-click **main.c** and configure the CAN channel that will be tested (CAN0 by default) as shown below;



```
/* Example group ----------------------------
/** @defgroup CCan_SimpleTxRx    CCan_SimpleTxF
 * @ingroup C_CAN_Examples
 * @{
 */

/************************** PRIVATE DEFINTIONS
#define MASTER                           1
#define SLAVE                            2
#define CAN_MODE                         MASTER

#define CAN_SET                          LPC_C_CANC
```

Figure 64: CAN Configuration

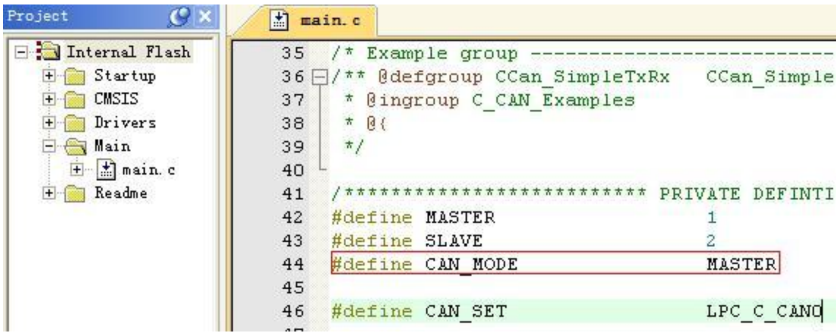
5. Configure Master mode according to the figure shown below and recompile the project, and then download it to the flash on one of the two EDM1070xx;



```
/* Example group --------------------------
/** @defgroup CCan_SimpleTxRx    CCan_Simple
 * @ingroup C_CAN_Examples
 * @{
 */

/************************** PRIVATE DEFINTI
#define MASTER                    1
#define SLAVE                     2
#define CAN_MODE                  MASTER

#define CAN_SET                   LPC_C_CAN0
```

Figure 65: CAN Configured as Master Mode

6. Configure Slave mode according to the figure shown below and recompile the project, and then download it to the flash on the other EDM1070xx;



```
/* Example group --------------------------
/** @defgroup CCan_SimpleTxRx    CCan_Simple
 * @ingroup C_CAN_Examples
 * @{
 */

/************************** PRIVATE DEFINTI
#define MASTER                    1
#define SLAVE                     2
#define CAN_MODE                  MASTER

#define CAN_SET                   LPC_C_CAN0
```

Figure 66: CAN Configured as Slave Mode

7. Reboot both EDM1070xxs; the HyperTerminal window displays information as shown below;

```
***********************************************************
********************
Hello NXP Semiconductors
CCAN Simple RxTx demo
         - MCU: lpc18xx/lpc43xx
         - Core: ARM CORTEX-M3/M4
         - Communicate via: UART0 - 115200 bps
This example used to test C CAN feature of LPC18xx/LPC43xx
processor
***********************************************************
********************
CAN init
```

```
Message object 17 TX configured
Message object 17 TX complete
Message object 1 RX STD
Message object 17 TX configured STD
Message object 17 TX complete
Message object 1 RX STD
Message object 17 TX configured STD
Message object 17 TX complete
Message object 1 RX STD
Message object 17 TX configured STD
Message object 17 TX complete
Message object 1 RX STD
Message object 17 TX configured STD
Message object 17 TX complete
Message object 1 RX STD
Message object 17 TX configured STD
Message object 17 TX complete
Message object 1 RX STD
Message object 17 TX configured STD
Message object 17 TX complete
Message object 1 RX STD
```

6.1.11 Emc_NandFlash Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
************************************************************
*********************
 Hello NXP Semiconductors
 # NANDFLASH K9F1G08U0B testing
           - MCU: lpc18xx/lpc43xx
```

```
         - Core: ARM Cortex-M3/M4
         - UART Comunication: 115200 bps
 Write and verify data with on-board NAND FLASH
***********************************************************
*********************

Init NAND Flash...
Read NAND Flash ID:  0xECF19500
Erase entire NAND Flash...
Erase NAND Flash fail at block: 0000000491
Erase NAND Flash fail at block: 0000000666

Select block :0000000006
Select Page :0000000009
Write a block of 2K data to NAND Flash...
Read back a block of 2K data from NAND Flash...
Verify data...
Verifying okay! Testing terminated!
```

6.1.12 Emc_Sdram Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
***********************************************************
*********************
Hello NXP Semiconductors
Ex SDRAM Demo
         - MCU: lpc18xx/lpc43xx
         - Core: ARM Cortex-M3/M4
         - Communicate via: UART0 -  115200 bps
 This example will fill then check the SDRAM content on
```

```
EDM1070xx board
************************************************************
*********************
Core M4 Clk = 0120000000 Hz
Fill RAM...
Check RAM...
RAM Check Finish...
Clear RAM content...
```

6.1.13 Gpdma_Flash2Ram Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
************************************************************
********************
Hello NXP Semiconductors
GPDMA demo
         - MCU: lpc18xx/lpc43xx
         - Core: ARM CORTEX-M3/M4
         - Communicate via: UART0 - 115200 bps
This example used to test GPDMA function by transfer data
from Flash
to RAM memory
************************************************************
*********************
Start transfer...
Buffer Check success!
```

6.1.14 Gpio_LedBlinky Program

1. Power on the EDM1070xx;

2. Open the Gpio_LedBlinky example program and recompile it, and then download it to flash;

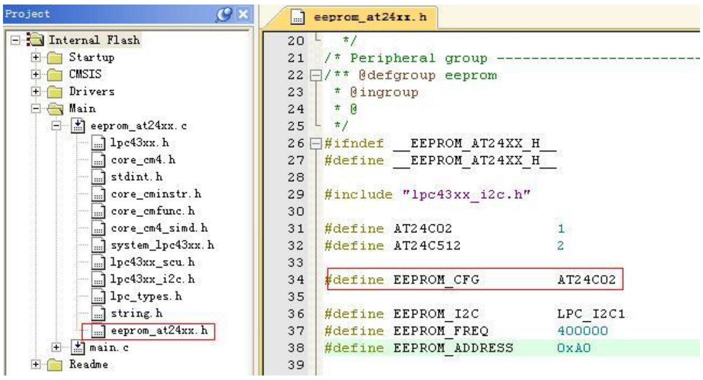
3. Reboot the EDM1070xx; the LED2 on the EDM1070xx will be blinking constantly;

6.1.15 I2C_EEPROM Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Expand the **Main** entry in the tree-view of the uVision4 window and double-click **eeprom_at24xx.h**, and then select initialization macro definition as shown below according to EEPROM model;



```
   */
/* Peripheral group ------------------------
/** @defgroup eeprom
  * @ingroup
  * @
  */
#ifndef __EEPROM_AT24XX_H__
#define __EEPROM_AT24XX_H__

#include "lpc43xx_i2c.h"

#define AT24C02             1
#define AT24C512            2

#define EEPROM_CFG          AT24C02

#define EEPROM_I2C          LPC_I2C1
#define EEPROM_FREQ         400000
#define EEPROM_ADDRESS      0xA0

```

Figure 67: EEPROM Model Selection

Note:

🕮 EDM1070xx provides an EEPROM IC, AT24C02 by default.

🕮 This program can support two models of EEPROM currently- AT24C02 and AT24C512

4. Power on the EDM1070xx and recompile the project, and then download it to flash;

5. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
************************************************************
********************
Hello NXP Semiconductors
AT24xx eeprom read and write demo
         - MCU: lpc18xx/lpc43zx
         - Core: Cortex M3/M4
         - Communicate via: UART0 -  115200 bps
************************************************************
********************


Write EEPROM OK!
Read EEPROM OK!
I2C EEPROM Test Success!!
```

6.1.16 Rtc_Calendar Program

1. Install a CR1220 battery in the RTC battery holder (marked as **RTC** in Figure 1 on page 3) on the EDM1070xx;

2. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

3. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

4. Power on the EDM1070xx and recompile the project, and then download it to flash;

5. Reboot the EDM1070xx; the HyperTerminal window displays information as shown on the next page;

```
***********************************************************
*********************
Hello NXP Semiconductors
 RTC demo
         - MCU: lpc18xx/lpc43xx
         - Core: ARM CORTEX-M3/M4
         - Communicate via: UART0 - 115200 bps
 A simple RTC Calendar example.
 To generate interrupt in Second Counter Increment
Interrupt (1s)
***********************************************************
*********************
Current time set to: 08:00:00  28/02/2013
Current time : 08:00:05  28/02/2013
Current time : 08:00:06  28/02/2013
Current time : 08:00:07  28/02/2013
Current time : 08:00:08  28/02/2013
Current time : 08:00:09  28/02/2013
Current time : 08:00:10  28/02/2013
Current time : 08:00:11  28/02/2013
Current time : 08:00:12  28/02/2013
Current time : 08:00:13  28/02/2013
```

6.1.17 Sdio_FatFs Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Insert a TF card in the TF card slot (marked as **Micro SD** in Figure 1 on page 3) on the EDM1070xx;

4. Power on the EDM1070xx and recompile the project, and then download it to flash;

5. Reboot the EDM1070xx; the HyperTerminal window displays information as shown on the next page;

```
***********************************************************
*********************
Hello NXP Semiconductors
 SD/MMC FAT file system module R0.08a demo
         - MCU: lpc18xx/lpc43xx
         - Core: ARM CORTEX-M3/M4
         - Communicate via: UART0 - 115200 bps
 This example is used to demonstrate how to implement a
filesystem using MCI.
 FatFs,a generic FAT file system module for small embedded
systems, is used in
 ver = R0.08a
***********************************************************
*********************
Create a new file (hello.txt)
Write a text data. (hello.txt)
14 bytes written
Close the file
read the file (hello.txt)
Type the file content(hello.txt)
Hello world!
Close the file (hello.txt)
Test complete!
```

Note:

- This program passed the test on 1GB/2GB Kingston and 2GB SanDisk TF cards, but it does not mean all the TF cards will work properly with the program.

6.1.18 Wdt_Interrput Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
***********************************************************
*********************
Hello NXP Semiconductors
Watch dog timer interrupt (test or debug mode) demo
         - MCU: lpc18xx/lpc43xx
         - Core: Cortex M3/M4
         - Communicate via: UART1 -  115200 bps
***********************************************************
*********************
Watchdog is frequently fed by SysTick_Handler
Rress '1' to disable feeding Watchdog timer
Press '2' to enable feeding Watchdog timer
Disable feeding
Warning...watchdog timeout!
Warning...watchdog timeout!
Warning...watchdog timeout!
Enable feeding
```

Type **1** to stop erasing the number counted by WDT, and WDT interrupts will be generated; Type **2** to erase WDT interrupts every 500ms, and WDT interrupts will no longer be generated.

6.1.19 Uart_Autoband Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

Note:

🕮 The Uart_Autoband program requires a HyperTerminal configured at a baud rate lower than 115200.

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx and type **a** to enter auto baud rate mode as shown below;

```
AutoBaudrate Status: Synchronous!
***********************************************************
*********************
Hello NXP Semiconductors
UART Auto Baudrate demo
        - MCU: lpc18xx/lpc43xx
        - Core: ARM CORTEX-M3/M4
UART0 - Auto Baud rate mode used
***********************************************************
*********************
a
```

- Type any character and the HyperTerminal window will respond with the same character;
- Type **r** to show the welcome string again;
- Press **ESC** on your keyboard to terminate the program.

6.1.20 Uart_Rs485Master& Uart_Rs485Slave Program

1. Connect the RS485 interfaces (1st and 2nd pins of **RS485&UART0/2** connector in Figure 1 on page 3) of two EDM1070xxs to each other as shown below;

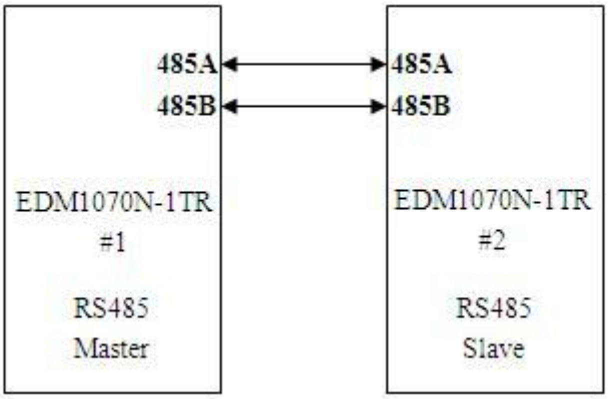


Figure 68: Connection between two EDM1070xx

2. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on one EDM1070xx to your PC with a cross-over serial cable;

3. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

4. Power on both EDM1070xxs and recompile the Uart_Rs485Master and Uart_Rs485Slave projects, and then download them to the flash on the master (the one that connected with a cross-over serial cable) and the slave respectively;

5. Reboot both EDM1070xxs; the HyperTerminal window displays information as shown below;

```
***********************************************************
********
Hello NXP!Semiconductors
RS485 demo
        - MCU: lpc18xx/lpc43xx
        - Core: ARM CORTEX-M3/M4
RS485 demo in Master mode
***********************************************************
********
Sending...
Receive: ACK
Sending...
Receive:
Sending...
Receive: ACK
Sending...
Receive:
Sending...
Receive: ACK
```

6.1.21 Pwr_DeepSleep Program

1. Connect the WEAKUP0 pin (13th pin of **ADC&WEAKUP** connector in Figure 1 on page 3) to ground;

2. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

3. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

4. Power on the EDM1070xx and recompile the project, and then download it to flash;

5. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
***********************************************************
********************
Hello NXP Semiconductors
Power control demo
         - MCU: lpc18xx/lpc43xx
         - Core: ARM CORTEX-M3/M4
         - Communicate via: UART0 - 115200 bps
This example used to enter system in deep sleep mode and
wake up it
by using WAKEUP0 pin
***********************************************************
*********************
Press '1' to start demo...
Enter deep sleep...
connect WAKEUP0 pin to 3.3V to exit...
Waked up from deep sleep
```

6. Type **1** in the HyperTerminal window to instruct the system to enter deep sleep mode, and then connect the WEAKUP0 pin to a 3.3V power supply to wake up the system from deep sleep mode.

6.1.22 Mbx_Demo Program

1. Connect the UART0 (6th, 7th and 8th pins of **RS485&UART0/2** connector in Figure 1 on page 3) on the EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx, open the M0_Project and compile it;

4. Open the M4_Project, compile it and then download it to flash;

5. Reboot the EDM1070xx; the HyperTerminal window displays information as shown below;

```
--- M0 Started ---
*************************************
** LPC4300 = Cortex M4 + Cortex M0 **
************************************.
> M0 Sending: lpc4300 has two cores inside
        [ M4 :LPG4300 HAS TWO CORES INSIDE ]
> M0 Sending: request for pow(0,3)
        [ M4: 0 ^ 3 = 0 _

> M0 Sending: heureka
        [ M4:akerueh ]
> M0 Sending: lpc4300 has two cores inside
        [ M4 :LPC4300 HAS TWO CORES INSIDE ]
> M0 Sending: request r pow(1,3)
        [ M4: 1 ^ 3 = 1 ]
> M0 Sending: heureka
        [ M4:akerueh ]
> M8 Sending: lp▒4300 has vwo cores inside
        [ M4 :LPC4300 HAS TWO CORES INSIDE ]
> M0 Sending: request for pow(2,3)
        [ M4: 2 ^ 3 = 8 ]
> M0 Sending: heureka
        [ M4:akerueh ]
--- M0 : CM4 processed 9 calls ---
> M0 Sending: lpc4300 has two cores inside
        [ M4 :LPC4300 HAS TWO CORES INSIDE ]
> M0 Sending: request for pow(3,3)
        [ M4: 3 ^ 3 = 27 ]
```

```
> M0 Sending: heureka
        [ M4:akerueh ]
> M0 Sending: lpc4300 has two cores inside
        [ M4 :LPC4300 HAS TWO CORES INSIDE ]
> M0 Sending: request for pow(4,3)
)[ M4: 4 ^ 3 = 64 ]
> M0 Sending: heureoa
        [ M4:akerueh ]
> M0 Sending: lpc4300 has two cores inside
        [ M4 :LPC4300 HAS TWO CORES INSIDE ]
> M0 Sending: request for pow(5,3)
        [ M4: 5 ^ 3 = 125 ]
> M0 Sendinw: heureka
        [(M4:akerueh ]
--- M0 : CM4 processed 18 calls ---
```

6.2 Application Programs

Application programs are developed based on the basic examples in order to provide system-level demonstration programs with extended features. These programs include uC/OS-II, GUI and LWIP examples. The table shown below lists all the application programs and their corresponding descriptions. This section will introduce the detailed operations required to run the application programs.

Application Programs	
Names	**Description**
Ethernet_Example	Implementing a HTTP server on the EDM1070xx
emWin518_Exanple	emWin GUI demonstration program
uCOS_II&emWin518_Example	uC/OS-II and emWin518 demonstration program
uCOS_II_Example	uC/OS-II application program

6.2.1 Camera_Example Program

1. Connect the UART0 on EDM1070xx to your PC with a cross-over serial cable;

2. Open HyperTerminal on your PC (please refer to 4.1Configuring HyperTerminal on page 22);

3. Power on the EDM1070xx and recompile the project, and then download it to flash;

4. Reboot the EDM1070xx and the LCD will display 640x480 images; the HyperTerminal window displays information as shown on the next page;

```
***********************************************************
*********************
Hello NXP Semiconductors
  Camera demo
         - MCU:lpc18xx/ lpc43xx
         - Core: ARM CORTEX-M3/M4
         - Communicate via: UART0 - 115200 bps
 This example configures SGPIO to interface a video camera.
*******************:******************************:********
*********************
Initialization Camera OV9655
Please enter 1,2,3 select Camera Size
1: Set Camera size is 640 * 480
2: Set Camera size is 320 * 240
3: Se| Camera size is 160 * 120
```

Type **1** to set the resolution of the camera to 640x480; Type **2** to set the resolution of the camera to 320x240;

6.2.2 emWin518_Example Program

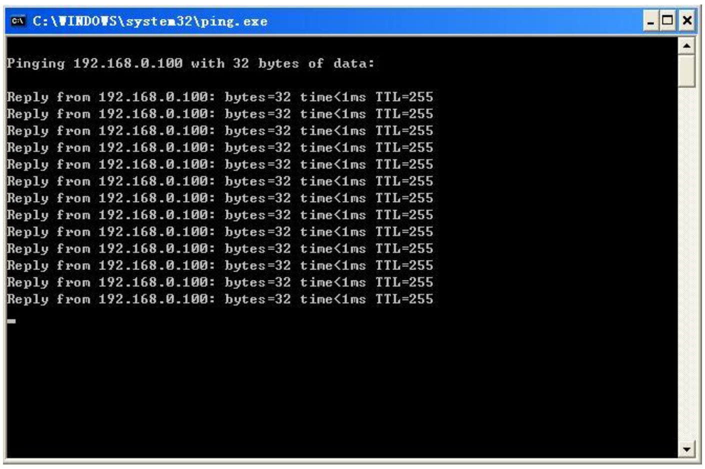
1. Power on the EDM1070xx;
2. Open the Gpio_LedBlinky program and compile it, and then download it to flash;
3. Reboot the EDM1070xx; the LCD will display the demonstration images of emWin;
4. Use a stylus to press the **Next** and **Halt** buttons on the screen to fast forward and stop the demonstration;

6.2.3 Ethernet_Example Program

1. Connect the EDM1070xx to a PC with a cross-over network cable, and power on the EDM1070xx, LED1 will be lit up to indicate proper connection of the network;

2. Recompile the project, and then download it to flash;

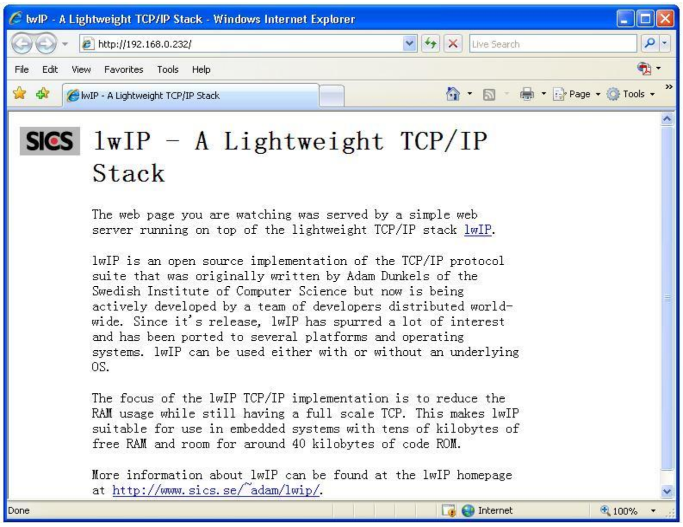
3. Reboot the EDM1070xx; Select **Start > Run** on your PC's desktop and type **cmd** in the pop-up window, and then press **Enter** on your keyboard; Type **ping 192.168.0.100 –t** in following command line window and press **Enter** again to receive replies from the board;



```
Pinging 192.168.0.100 with 32 bytes of data:

Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
Reply from 192.168.0.100: bytes=32 time<1ms TTL=255
```

Figure 69: Network Test

4. Open an Internet browser and type http://192.168.0.100 in the address bar to open the following page;


lwIP - A Lightweight TCP/IP Stack - Windows Internet Explorer
http://192.168.0.232/
Live Search
File
Edit
View
Favorites
Tools
Help
lwIP - A Lightweight TCP/IP Stack
Page
Tools
SICS
Done
Internet
100%

lwIP - A Lightweight TCP/IP Stack

The web page you are watching was served by a simple web server running on top of the lightweight TCP/IP stack lwIP.

lwIP is an open source implementation of the TCP/IP protocol suite that was originally written by Adam Dunkels of the Swedish Institute of Computer Science but now is being actively developed by a team of developers distributed world-wide. Since it's release, lwIP has spurred a lot of interest and has been ported to several platforms and operating systems. lwIP can be used either with or without an underlying OS.

The focus of the lwIP TCP/IP implementation is to reduce the RAM usage while still having a full scale TCP. This makes lwIP suitable for use in embedded systems with tens of kilobytes of free RAM and room for around 40 kilobytes of code ROM.

More information about lwIP can be found at the lwIP homepage at http://www.sics.se/~adam/lwip/.

Figure 70: 1wIP Landing Page

6.2.4 uCOS_II&emWin518_Example Program

1. Power on the EDM1070xx, open the Gpio_LedBlinky program and compile it, and then download it to flash;

2. Reboot the EDM1070xx; the LCD will display the demonstration images of emWin, and LED2 on the EDM1070xx will be blinking constantly;

3. Use a stylus to press the **Next** and **Halt** buttons on the screen to fast forward and stop the demonstration;

6.2.5 uCOS_II_Example Program

1. Power on the EDM1070xx, open the Gpio_LedBlinky program and compile it, and then download it to flash;

2. Reboot the EDM1070xx; LED2 on the EDM1070xx will be blinking constantly;

7 Function Test

The testing entries listed in the following table can help users verify the function of the peripherals on the EDM1070xx;

7.1 Function Test Table

Entries	Descriptions
LCD & Touch Screen	Please refer to 6.1.2LCD_Touch Program and 6.1.3 Lcd_Demo Program
USB Device	Please refer to 6.1.4 USB_DEV/Usb_MassStorage Program
USB Host	Please refer to 6.1.6 USB_HOST/Usb_MassStorage Program
Ethernet	Please refer to 6.1.7 Emac_EasyWeb Program
UART	Please refer to 6.1.9 Atimer_Wic Program
RS485	Please refer to 6.1.206.1.20 Uart_Rs485Master& Uart_Rs485Slave Program
NAND Flash	Please refer to 6.1.11 Emc_NandFlash Program
SDRAM	Please refer to 6.1.12 Emc_Sdram Program
RTC	Please refer to 6.1.16 Rtc_Calendar Program
CAN	Please refer to 6.1.106.1.10 Ccan_SimpleTxRx Program
LED & Buzzer	Please refer to 0 Gpio_LedBlinky Program
MicroSD	Please refer to 6.1.176.1.17 Sdio_FatFs Program
ADC	Please refer to 6.1.86.1.8 Adc_Polling Program

Appendix 1: ESD Precautions & Proper Handling Procedures

Please note that the board comes without any case/box and all components are exposed. Therefore, extra attention must be paid to ESD (electrostatic discharge) precautions. To effectively prevent electrostatic damage, please follow the steps below:

- Avoid carpets in cool, dry areas. Leave development kits in their anti-static packaging until ready to be installed.
- Dissipate static electricity before handling any system components (development kits) by touching a grounded metal object, such as the system unit unpainted metal chassis.
- If possible, use antistatic devices, such as wrist straps and floor mats.
- Always hold an evaluation board by its edges. Avoid touching the contacts and components on the board.
- Take care when connecting or disconnecting cables. A damaged cable can cause a short in the electrical circuit.
- Prevent damage to the connectors by aligning connector pins before you connect the cable. Misaligned connector pins can cause damage to system components at power-on.
- When disconnecting a cable, always pull on the cable connector or strain-relief loop, not on the cable itself.

Warning:

🕮 This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Appendix 2: Technical support & Warranty

Embest Technology Co., Ltd. established in March of 2000, is a global provider of embedded hardware and software. Embest aims to help customers reduce time to market with improved quality by providing the most effective total solutions for the embedded industry. In the rapidly growing market of high end embedded systems, Embest provides comprehensive services to specify, develop and produce products and help customers to implement innovative technology and product features. Progressing from prototyping to the final product within a short time frame and thus shortening the time to market, and to achieve the lowest production costs possible. Embest insists on a simple business model: to offer customers high-performance, low-cost products with the best quality and service.

2.1 Technical support service

Embest provides one year of free technical support for all products. The technical support service covers:

- Embest embedded platform products software/hardware materials
- Assistance to customers with regards to compiling and running the source code we offer.
- Troubleshooting problems occurring on embedded software/hardware platforms if users have followed the instructions provided.
- Judge whether a product failure exists.

The situations listed below are not covered by our free technical support service, and Embest will handle the situation at our discretion:

- Customers encounter issues related to software or hardware during their development process

- Issues occur when users compile/run the embedded OS which has been modified by themselves.
- Customers encounter issues related to their own applications.
- Customers experience problems caused by unauthorised alteration of our software source code

2.2 Maintenance service clause

1. Product warranty will commence on the day of sale and last 12 months provided the product is used under normal conditions

2. The following situations are not covered by the warranty, Embest will charge service fees as appropriate:

- Customers fail to provide valid proof of purchase or the product identification tag is damaged, unreadable, altered or inconsistent with the product.
- Products are subject to damage caused by operations inconsistent with their specification;
- Products are subject to damage in either appearance or function due to natural disasters (flood, fire, earthquake, lightning strike or typhoon) or natural aging of components or other force majeure;
- Products are subject to damage in appearance or function due to power failure, external forces, water, animals or foreign materials;
- Products malfunction due to disassembly or alteration of components by customers, or repair by persons or organizations unauthorized by Embest Technology, or alteration from factory specifications, or configured or expanded with components that are not provided or recognized by Embest Technology;
- Product failures due to the software or systems installed by customers, inappropriate software settings or computer viruses;
- Products purchased from unauthorized merchants;

- Embest Technology takes no responsibility for fulfilling any warranty (verbal or written) that is not made by Embest Technology and not included in the scope of our warranty.

3. Within the period of warranty, the cost for sending products to Embest should be paid by the customer. The cost for returning the product to the customer will be paid by Embest. Any returns in either direction occurring after the warranty period has expired should be paid for by the customer.

4. Please contact technical support with any repair requests.

Note:

🕮 Embest Technology will not take any responsibility for products returned without the prior permission of the company.

2.3 Basic guidelines for protection and maintenance of LCDs

1. Do not use finger nails or other hard sharp objects to touch the surface of the LCD

2. Embest recommends purchasing specialist wipes to clean the LCD after long time use, avoid cleaning the surface with fingers or hands as this may leave fingerprints or smudges.

3. Do not clean the surface of the screen with unsuitable chemicals

Note:

🕮 Embest do not supply a maintenance service for LCDs. We suggest the customer immediately checks the LCD once in receipt of the goods. In the event that the LCD does not run or shows no display, the customer should inform Embest within 7 business days of delivery.

2.4 Value Added Services

We will provide following value added services:

- Driver development based on Embest embedded platforms for devices such as: serial ports, USB interface devices, and LCD screens.
- Control system transplantation, BSP driver development, API software development.
- Other value added services including supply of power adapters and LCD parts.
- Other OEM/ODM services.
- Technical training.

Please contact Embest with any technical support queries:

💻 http://www.embest-tech.com/contact-us.html