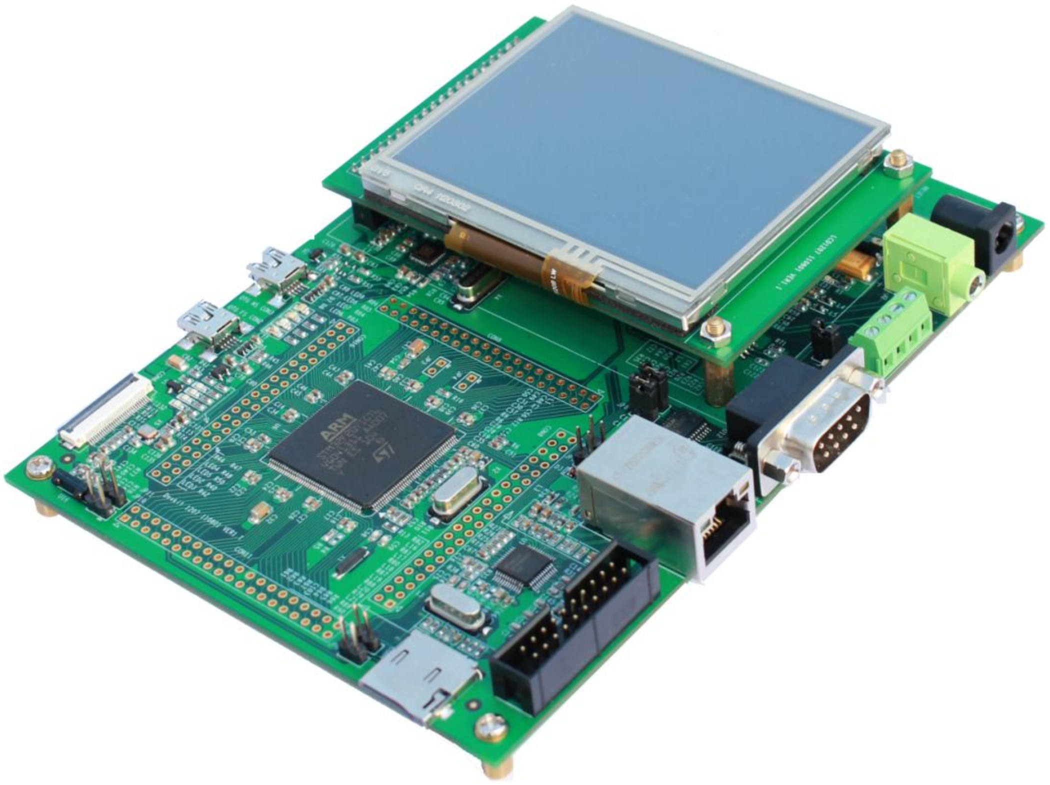
DevKit1207 Evaluation Kit

- *120MHz STM32F207IGT6 ARM Cortex-M3 32-bit Microcontroller*
- *CPU Internal 1MBytes of Flash and 128 +4 KBytes of SRAM*
- *1 USB2.0 OTG Full-Speed port and 1 USB2.0 OTG High-Speed port*
- *3.5” 240x320 TFT color LCD with 4-wire Resistive Touch Screen*
- *10/100 Ethernet with IEEE 1588v2, CAN2.0B, IrDA, TF, Audio, JTAG*
- *Three axis linear accelerometer*
- *Supports for uC/OS-II and FreeRTOS Real-time Operating Systems*



User Manual

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Important Notice

Version of update records:

Rev	Date	Description
V1.0	2011-10-24	Initial version
V1.1	2011-12-30	Added *Appendix I Operation Notes* Modified contents of *Section 4.14 IWDG*, *Section 4.15 WWDG*, *Section 4.18.2 GSensor-LIS33DE* to avoid ambiguity
V1.2	2012-01-11	Added *Appendix II PC-Development Platform* Added step 7) in *Section 3.4 Flash Loader*
V1.3	2012-04-06	Updated *Figure 2-1 DevKit1207 Hardware Interface Diagram*, *Figure 2-2 Hardware Dimensions Diagram*, *Figure 3-15 Create New Project*, *Figure 3-19 Add file groups to project*, *Figure 3-21 Finish file groups adding*, *Figure 3-22 Add files to groups* and *Figure 3-24 Source flies have been added to groups.* Added *Section 3.2 IAR EWARM* Added *.bin file support in *Section 3.3 Flash Loader*

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Contents

Chapter 1 Overview

1.1 Product introduction

The STMicroelectronics' STM32F207IGT6 flash microcontroller is from STM32F207xx family, which is based on the high-performance ARM Cortex-M3 32-bit RISC core operating at a frequency of up to 120MHz, with high-speed embedded memories (1Mbytes of flash memory and 128Kbytes of system SRAM), 4Kbytes of backup SRAM, 2Kbits EEPROM and powerful peripheral functions, including digital camera module interface, High-speed USB OTG, Full-speed USB OTG, Ethernet MAC, CAN2.0B, multiple timers, ADCs and DACs, I2C, I2S, SPI, UARTs/USARTs, SDIO, LCD interface, RTC and programmable IOs.

Embest DevKit1207 Evaluation Kit is a complete development platform for STM32F207IGT6 devices which enables engineers to easily and rapidly evaluate, prototype and test designs built around the STMicroelectronics STM32F207xx series microcontrollers. The DevKit1207 board has exposed a full range of hardware peripherals to support HS/FS USB OTG, Ethernet, CAN, Camera, Serial port, IrDA, TF card, LCD, Touch screen, Audio, G-sensor, RTC, JTAG, etc. The kit is provided with an industrial-level 3.5 inch LCD screen.

In addition Embest has ported uC/OS-II and uC/GUI on this board. Embest also has ported FreeRTOS real-time operating system for LwIP ethernet applications. Embest provides the uC/OS-II BSP, FreeRTOS source code and plenty of software examples, board schematic and user manual to help customer better understanding this board and make development based on this borad easier.

Note: You are required to purchase a license for use uC/OS-II and uC/GUI in any commercial application

DevKit1207 can be used in the following applications:

- Industrial Control
- Medical Equipment
- Home Automation
- Human Interface
- Consumer Electronics
- Test and Measurement

DevKit1207 Function Block Diagram

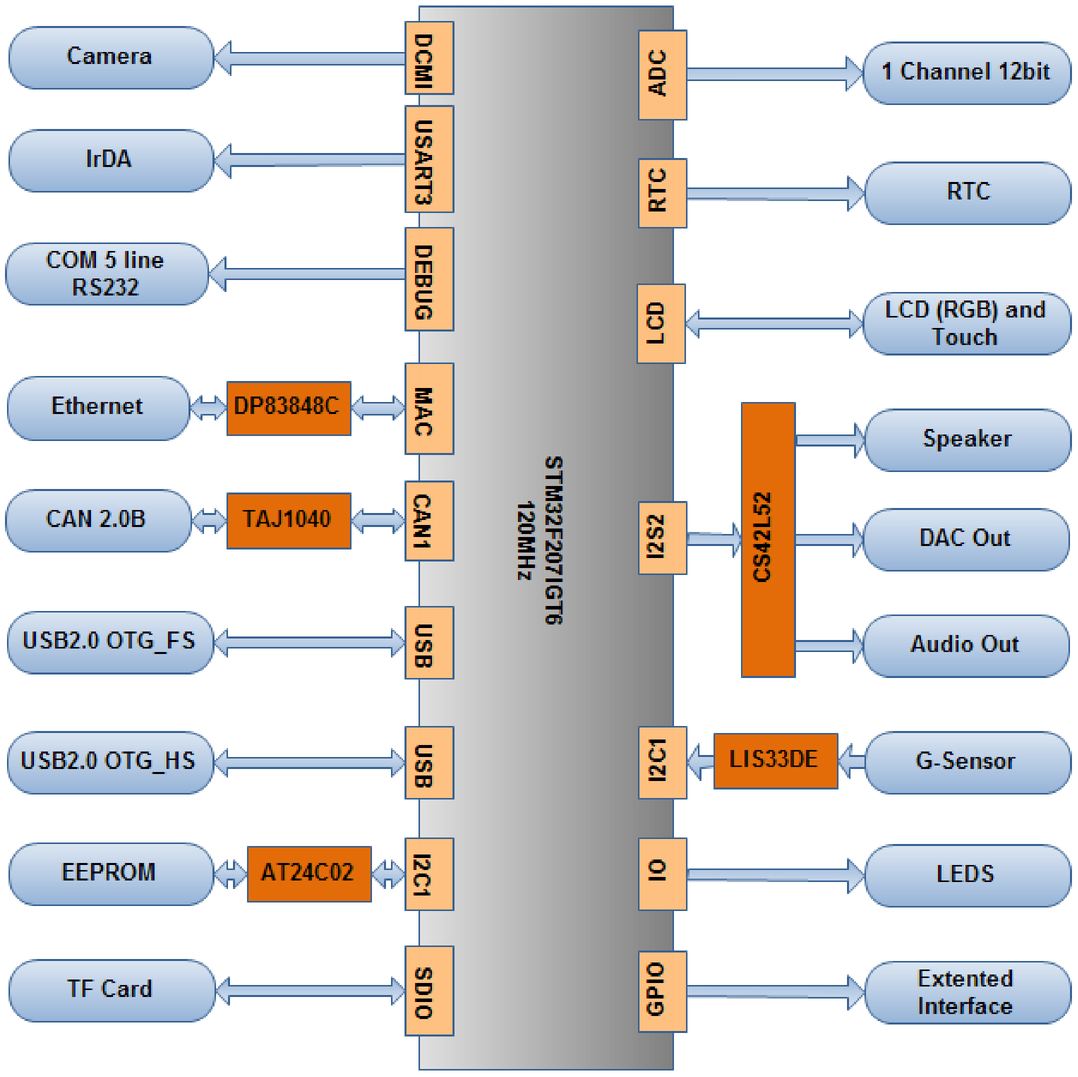


Figure 1-1 DevKit1207 Function Block Diagram

1.2 Features

DevKit1207 evaluation board is based on STM32F207IGT6 microcontroller and it integrates all the functions and features of this IC's. The features of this board are as follows:

Processor

- STMicroelectronics STM32F207IGT6 Flash Microcontroller
  - ARM 32-bit Cortex-M3 CPU with ART accelerator, frequency up to 120MHz
  - Onchip 1Mbytes of Flash memory and 128+4Kbytes of SRAM
  - Flexible static memory controller that supports Compact Flash, SRAM, PSRAM, Nor and Nand memories
  - LCD parallel interface, 8080/6800 modes
  - USB 2.0 High-Speed/Full-Speed Device/Host/OTG
  - 10/100 Ethernet MAC, supports IEEE 1588v2 hardware, MII/RMII
  - 2 CAN 2.0B interfaces;up to 4 USARTs and 2 UARTs, 3 SPI (30Mbit/s), 2 with muxed I2S
  - 8- to 14-bit parallel camera interface (up to 48Mbytes/s)
  - 1-/4-/8-bit SD/MMC/SDIO interface, supports up to 32Gbytes storage
  - Up to 140 I/O ports up to 60MHz
  - Up to 17 timers (two 32-bit timers), up to 120MHz
  - 3 x 12-bit A/D converters, 2 x 12-bit D/A converters
  - Analog true random number generator
  - Low power, supports Sleep, Stop and Standby modes
  - Supports booting from Flash, System memory or SRAM
  - Supports ISP and IAP programming

External Memory

- Onboard I2C compatible serial interface 2Kbits EEPROM
- Micro SD card slot

Audio interfaces

- 1 x stereo headphone output jack
- 1 x speaker output jack
- 1 x audio DAC output jack

LCD/Touch Screen

- 3.5 inch TFT color LCD (240 x 320-pixel RGB resolution, 262000 colors, 16-bit 8080 parallel interface, brightness control via PWM)
- 4-wire resistive touch screen

Data Transfer Interfaces

- 1 x 5-wire RS232 Serial Port
- 1 x USB2.0 OTG/Device/Host, High-speed, up to 480Mbps
- 1 x USB2.0 OTG/Device/Host, Full-speed, up to12Mbps
- 1 x 10/100 Ethernet with IEE 1588v2 (RJ45 connector)
- 1 x CAN2.0B interface
- 1 x IrDA transceiver

Input Interface and Other Facilities

- 1 x Camera interface
- 1 x Potentiometer (A/D converter)
- 2 x USER buttons
- 1 x RESET button
- 1 x WAKEUP button
- 20-pin standard JTAG interface
- RTC battery socket (User needs to prepare battery, CR1220 model is recommended)
- 1 x LED for Power indicator
- 2 x LEDs for USB OTG FS indicators
- 2 x LEDs for USB OTG HS indicators
- 4 x User LEDs
- 140 GPIO pins are all brought out

Mechanical Parameters

- Dimensions: 160 mm x 115 mm
- Input Voltage: +5V
- Power consumption: 0.4A@5V
- Working Temp.: -10 ℃ ~ 70 ℃
- Humidity Range: 20% ~ 90%

1.3 Getting Started Quickly

This section will tell the user how to understand and use DevKit1207 better and faster. For more information please refer to the listed document and location.

For hardware development:

Hardware system	Introduce CPU, expanded chip and hardware interface	User Manual->2 Hardware System
CPU Datasheet	Know principle and configuration of STM32F2xx	CD->\HW design\datasheet\CPU\
Schematic diagram of DevKit1207	Know hardware principle of DevK1207	CD->\HW design\schematic
Dimensional drawing of DevKit1207	Refer to the actual length and height of DevKit1207 to bring convenience for opening die	User Manual->2.3 Hardware Dimensions

For software development:

Establish developing and compilation environment	Building and instructions for MDK-ARM IDE	User Manual->3 Software Development
Software development	Standard peripherals driver example and how to proceed	User Manual ->4 Peripheral’s Examples
	Introduction for Ethernet drivers and applications	User Manual ->5 Ethernet Demonstration
	Introductions for USB applications and development	User Manual ->6 USB Examples
	Introduction for migration and development of uCos-II & ucgui	User Manual ->7 uCos-ii & ucgui example
	Introductions for G-Sensor application	User Manual ->8 G-Sensor application
	Documentation and reference manuals for software development	CD-ROM ->\STM32F2x_Software_ programing_manual CD-ROM ->\STM32F2xx_Application note
Test functionality of interface	Test the interface of the board carrier	User Manual-> 9 Various Tests senario

For marketing:

Hardware system	CPU feature, board carrier interface data	User Manual->1.1 Product introduction User Manual->1.2 Features
Dimensional drawing of DevKit1207	Refer to the actual length and height of DevKit1207 to bring convenience for opening die	User Manual->2.3 Hardware Dimensions

For learning personnel:

It is suggested to browse each section in each chapter of this Manual in order.

Chapter 2 Hardware System

2.1 CPU

2.1.1 CPU Introduction

The ARM Cortex™-M3-based STM32 F2 series is built on ST's advanced 90 nm NVM process technology with the innovative Adaptive Real-Time memory accelerator (ART Accelerator™) and the multi-layer bus matrix offering an unprecedented price/performance trade-off.

2.1.2 CPU Features

STM32F207IGT6 is characterized by a high degree of integration combining 1 Mbyte of Flash memory and 128 Kbytes of SRAM with Ethernet MAC, USB 2.0 HS OTG, camera interface, and hardware encryption support and external memory interface.

ST's acceleration technology enables STM32 F2 MCUs to achieve up to 150 DMIPS at 120 MHz CPU which is equivalent to zero wait state execution, while keeping the dynamic current consumption with 188 µA/MHz at an outstandingly low level.

2.2 Hardware interface

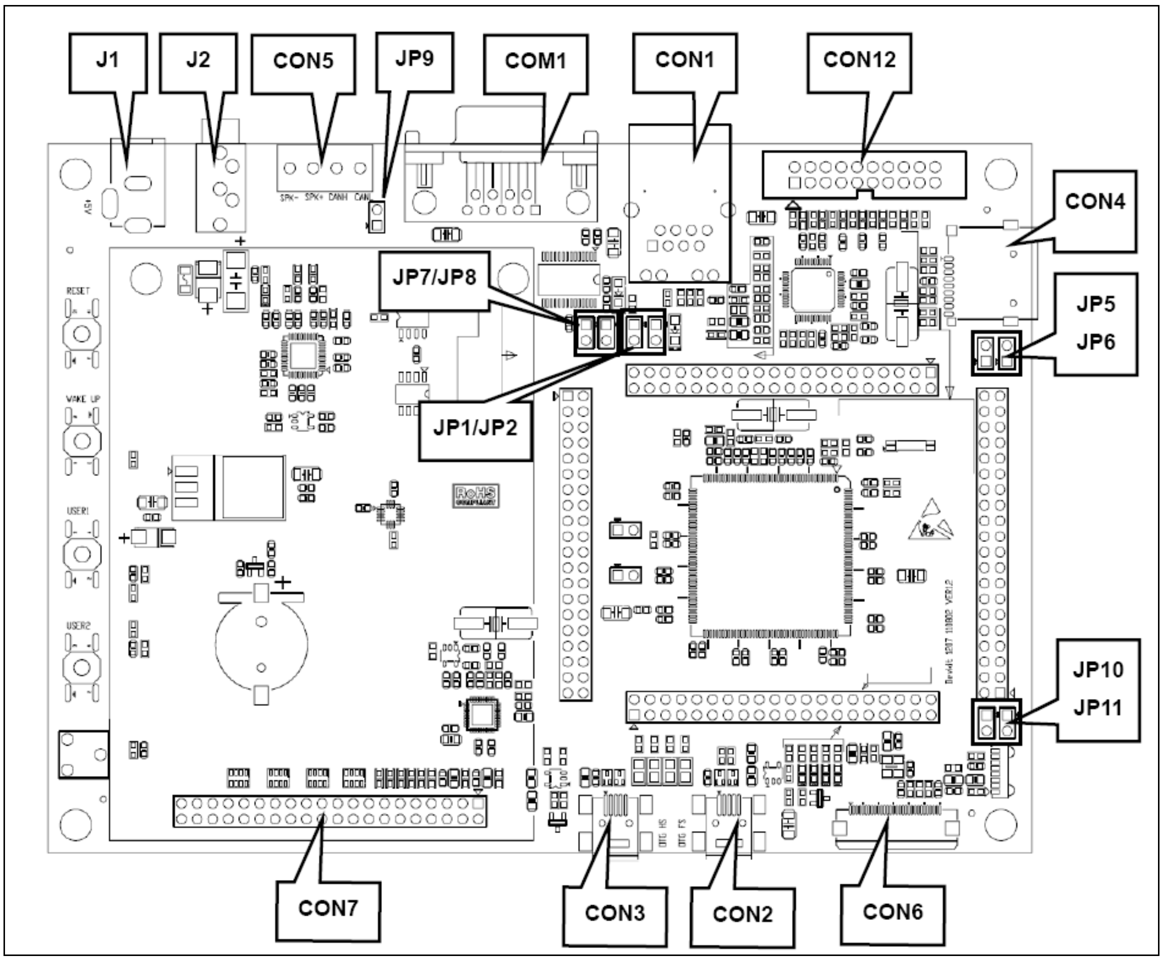


Figure 2-1 DevKit1207 Hardware Interface Diagram

The following section gives in detail about the pin numbers and its function description of various different IC's blocks present in DevKit1207.

2.2.1 Power Input Jack

Table 2-1 Power Input Jack

J1		
Pin	**Signal**	**Description**
1	GND	GND
2	GND	GND
3	+5V	Power supply(+5V) 2A (Type)

2.2.2 AUDIO OUTPUT Jack

Table 2-2 AUDIO OUTPUT Jack

J2		
Pin	**Signal**	**Description**
1	GND	GND
2	Left	Left output
3	Right	Right output
4	Right	Right output
5	Left	Left output

2.2.3 SPEAKER and CAN Interface

Table 2-3 SPEAKER and CAN Interface

CON5		
Pin	**Signal**	**Description**
1	CAN1_L	Low-level CAN bus line
2	CAN1_H	High-level CAN bus line
3	SPK_OUT+	PWM Speaker Output positive
4	SPK_OUT-	PWM Speaker Output negative

2.2.4 Serial Ports

Table 2-4 Serial Ports Interface

COM1		
Pin	**Signal**	**Description**
1	NC	NC
2	RXD	Receive data
3	TXD	Transit data
4	NC	NC
5	GND	GND

6	DSR	Data Set Ready
7	NC	NC
8	CTS	Clear To Send
9	NC	NC

2.2.5 Ethernet Interface

Table 2-5 Ethernet Interface

CON1		
Pin	**Signal**	**Description**
1	TX+	TX+ output
2	TX-	TX- output
3	VDD3V3	3.3V Power for TX/RX
4	4&5	Connect to Shelter
5	7&8	Connect to Shelter
6	VDD3V3	3.3V Power for TX/RX
7	RX+	RX+ input
8	RX-	RX- input
9	LED1	Speed LED
10	VDD3V3	3.3V Power for LED
11	LED2	Link LED
12	VDD3V3	3.3V Power for LED
13	GND	GND
14	GND	GND
15	NC	NC
16	NC	NC

2.2.6 JTAG Interface

Table 2-6 JTAG Interface

CON12		
Pin	**Signal**	**Description**
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

2.2.7 MicroSD Card Interface

Table 2-7 MicroSD Card Interface

CON4		
Pin	**Signal**	**Description**
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
8	DAT1	Card data 1
9	CD	Card detect

2.2.8 Camera Interface

Table 2-8 Camera Interface

CON6		
Pin	**Signal**	**Description**
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
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
21	XCLKA	Clock output a
22	XCLKB	NC
23	GND4	GND
24	FLD	NC
25	PWR_EN	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

2.2.9 USB OTG_FS Interface

Table 2-9 USB OTG_FS Interface

CON2		
Pin	**Signal**	**Description**
1	VBUS	+5V
2	D-	USB Data-
3	D+	USB Data+
4	ID	USB ID
5	GND	GND

2.2.10 USB OTG_HS Interface

Table 2-10 USB OTG_HS Interface

CON3		
Pin	**Signal**	**Description**

1	VBUS	+5V
2	D-	USB Data-
3	D+	USB Data+
4	ID	USB ID
5	GND	GND

2.2.11 TFT_LCD Interface

Table 2-11 TFT_LCD Interface

CON7		
Pin	**Signal**	**Description**
1	VDD5	+5V
2	VDD5	+5V
3	GND	GND
4	GND	GND
5	VDD33	+3.3V
6	VDD33	+3.3V
7	LCD_PWM	LED Dimming Control by PWM Signal
8	I2C_SCL	I2C master serial clock
9	I2C_SDA	I2C serial bidirectional data
10	TC_INT	Touch screen interrupt
11	LCD_RST	LCD reset
12	LCD_cs	LCD chip select
13	GND	GND
14	GND	GND
15	GND	GND
16	D0	16-bit 8080 parallel interface, Data bit 0
17	D1	16-bit 8080 parallel interface, Data bit 1
18	D2	16-bit 8080 parallel interface, Data bit 2
19	D3	16-bit 8080 parallel interface, Data bit 3

20	D4	16-bit 8080 parallel interface, Data bit 4
21	D5	16-bit 8080 parallel interface, Data bit 5
22	GND	GND
23	D6	16-bit 8080 parallel interface, Data bit 6
24	D7	16-bit 8080 parallel interface, Data bit 7
25	GND	GND
26	D8	16-bit 8080 parallel interface, Data bit 8
27	D9	16-bit 8080 parallel interface, Data bit 9
28	D10	16-bit 8080 parallel interface, Data bit 10
29	D11	16-bit 8080 parallel interface, Data bit 11
30	D12	16-bit 8080 parallel interface, Data bit 12
31	D13	16-bit 8080 parallel interface, Data bit 13
32	D14	16-bit 8080 parallel interface, Data bit 14
33	D15	16-bit 8080 parallel interface, Data bit 15
34	GND	GND
35	GND	GND
36	GND	GND
37	LCD_DC	LCD Parallel Interface
38	LCD_RD	Read signal
39	LCD_WR	Write signal
40	GND	GND

2.2.12 LED

Table 2-12 LEDs

LED 1～9		
LED	**Signal**	**Description**
LED1	3V3	3.3V power indicator
LED 2	VBUS_FS	USB_FS indicator 1
LED 3	3V3	USB_FS indicator 2

LED 4	VBUS_HS	USB_HS indicator 1
LED 5	3V3	USB_HS indicator 2
LED 6	PC.07	User-defined LED 1
LED 7	PG.08	User-defined LED 2
LED 8	PG.06	User-defined LED 3
LED 9	PD.12	User-defined LED 4

Note: There is a simple one to one relationship between LED1～LED4 in software and LED6～LED9 in hardware

2.2.13 KEY

Table 2-13 KEYs

SW2～SW5		
Key	**Signal**	**Description**
SW2	RESET	System reset key
SW3	WAKE_UP	System wake up key
SW4	USER1	User-defined key 1
SW5	USER2	User-defined key 2

2.2.14 CAN-related Jumper

Table 2-14 CAN-related Jumper

JP9	
Jumper	**Description**
JP9	To enable the terminal resistor for the selected CAN, fit a jumper on JP9. Default setting: Fitted

Note: JP9 should be fitted in order to enable CAN working properly.

2.2.15 BootLoader-related Jumpers

Table 2-15 BootLoader-related Jumpers

JP1 & JP2	
Jumper	**Description**
JP1	Bootloader_BOOT0 is managed by pin 6 of COM1 (RS-232 DSR signal) when JP1 is closed. This configuration is used for boot loader application only. Default setting: Not fitted.
JP2	Bootloader_RESET is managed by pin 8 of COM1 (RS-232 CTS signal) when JP2 is fitted. This configuration is used for boot loader application only. Default setting: Not fitted.

Note: JP1 and JP2 should be kept not fitted if you don't use BootLoader function.

2.2.16 MicroSD Card, RS232 and IrDA related Jumpers

Table 2-16 MicroSD Card, RS232 and IrDA related Jumpers

JP5 & JP6，JP7 & JP9，JP10 & JP11		
Jumper		**Description**
Group1	JP5 JP6	When JP5 and JP6 fitted, PC10·and PC11are connected to DATA2 and DATA3 pins of MicroSD Card.
Group2	JP7 JP8	When JP7 and JP8 fitted，PC10·and PC11are connected to TX and RX pins of MAX3243.
Group3	JP10 JP11	When JP10 and JP11 fitted，PC10·and PC11are connected to TX and RX pins of TFDU6300.

Note: There should be just one group of jumpers fitted at the same time. If more than one group of jumpers is fitted, some device may not work properly.

2.3 Hardware Dimensions

The hardware dimensions of DevKit1207 (Units: mm):

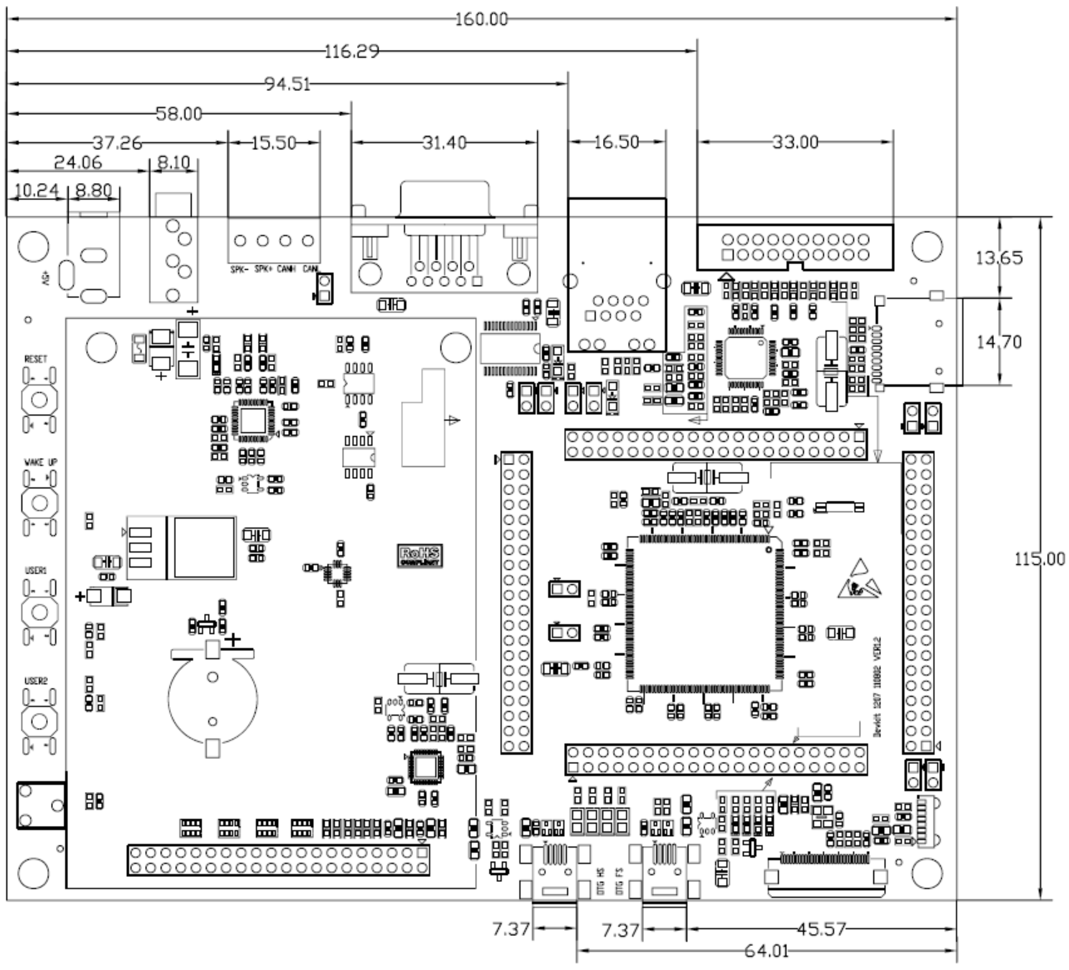


Figure 2-2 Hardware Dimensions Diagram

Chapter 3 Software Development

There are two main software development environments for STM32F2xx series MCU, Keil MDK-ARM and IAR EWARM. The following sections will give a short description of these software and show how to use them.

3.1 MDK-ARM

3.1.1 MDK-ARM Introduction

The MDK-ARM is a complete software development environment for Cortex™-M, Cortex-R4, ARM7™ and ARM9™ processor-based devices. MDK-ARM is specifically designed for microcontroller applications, it is easy to learn and use, yet powerful enough for the most demanding embedded applications.

Features

- Complete support for Cortex-M, Cortex-R4, ARM7, and ARM9 devices
- Industry-leading ARM C/C++ Compilation Toolchain
- µVision4 IDE, debugger, and simulation environment
- Keil RTX deterministic, small footprint real-time operating system (with source code)
- TCP/IP Networking Suite offers multiple protocols and various applications
- USB Device and USB Host stacks are provided with standard driver classes
- Complete GUI Library for embedded systems with graphical user interfaces
- ULINKpro enables on-the-fly analysis of running applications and records every executed Cortex-M instruction
- Complete Code Coverage information about your program's execution
- Execution Profiler and Performance Analyzer enable program optimization
- Numerous example projects help you quickly become familiar with MDK-ARM's powerful, built-in features
- CMSIS Cortex Microcontroller Software Interface Standard compliant

The following block diagram illustrates the complete µVision4 software development cycle.

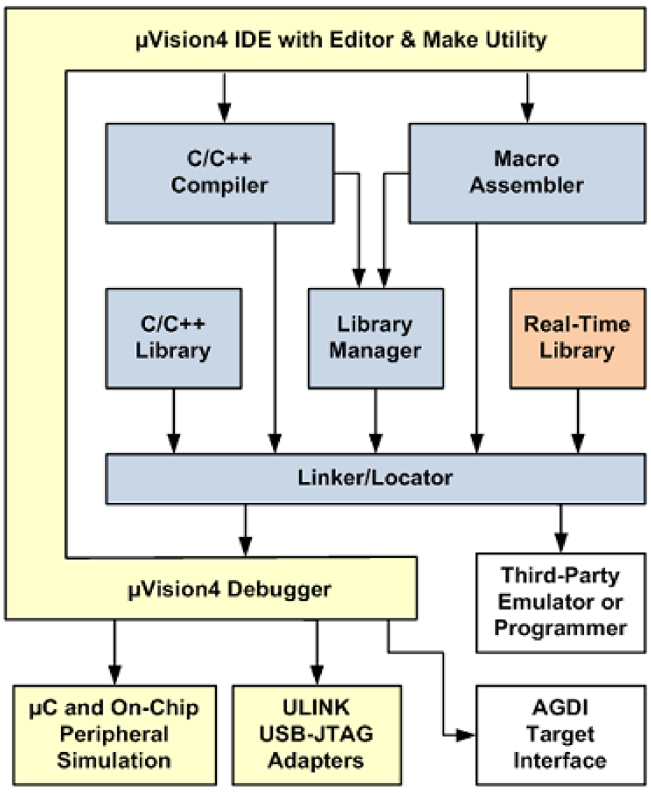


Figure 3-1 Software development cycle

The STM32F2xx series MCUs require MDK4.20 and later versions. The demo version of MDK4.22a with code limitation is supplied along with the kit in CD-ROM. User need to purchase or get the license themselves in order to use MDK-ARM software without any code limitations.

All MDK projects under folder \MDK-ARM in the CD-ROM are built with MDK4.22a. The sections *Building an existing MDK-ARM Project* and *Create a New MDK Project* give a short description of how to use the MDK-ARM to develop application software. For more detail, please refer to the relevant documentation.

3.1.2Building an existing MDK-ARM Project

In this section, ADC3_DMA as an example has been used to show how to configure an existing MDK project.

1) Open project.

Open the ADC3_DMA project from the directory as follow.

code\STM32F2xx_StdPeriph_Demo\Project\STM32F2xx_StdPeriph_Examples\ADC\ADC3_DMA\MDK-ARM

Click the icon to configure *“**Target options**”* as show in following picture.

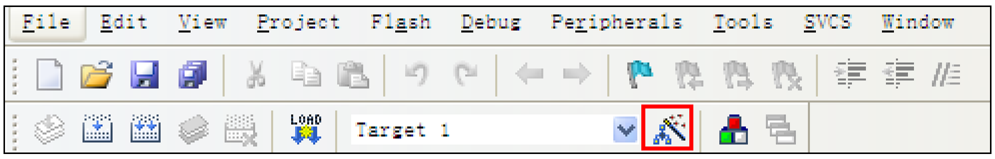
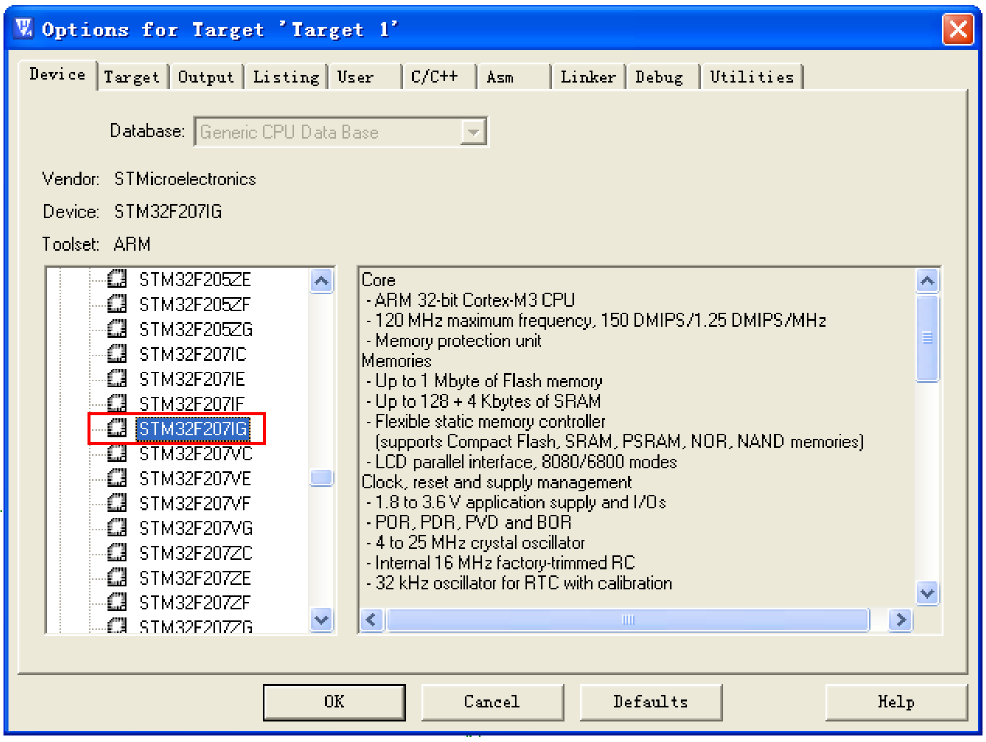


Figure 3-2 Configure Target options

2) In the opened window, select the *"**Device**"* tab, and select the MCU from the list, as shown below:



Database: Generic CPU Data Base

Vendor: STMicroelectronics

Device: STM32F207IG

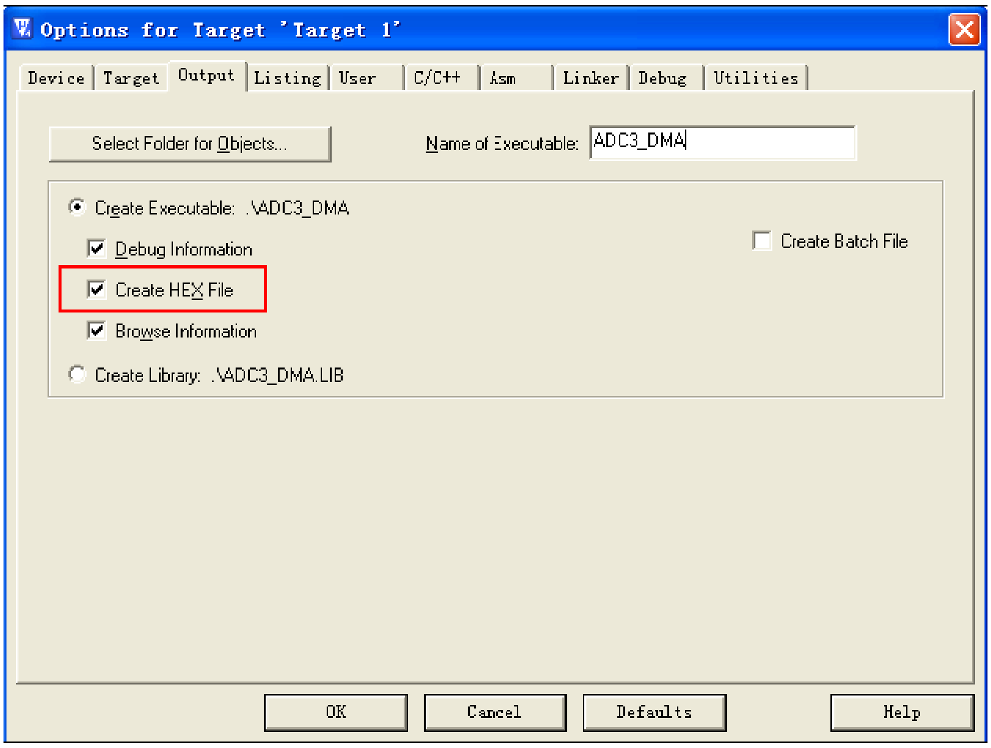
Toolset: ARM

STM32F205ZE
STM32F205ZF
STM32F205ZG
STM32F207IC
STM32F207IE
STM32F207IF
STM32F207IG
STM32F207VC
STM32F207VE
STM32F207VF
STM32F207VG
STM32F207ZC
STM32F207ZE
STM32F207ZF
STM32F207ZG

Core
- ARM 32-bit Cortex-M3 CPU
- 120 MHz maximum frequency, 150 DMIPS/1.25 DMIPS/MHz
- Memory protection unit
Memories
- Up to 1 Mbyte of Flash memory
- Up to 128 + 4 Kbytes of SRAM
- Flexible static memory controller
  (supports Compact Flash, SRAM, PSRAM, NOR, NAND memories)
- LCD parallel interface, 8080/6800 modes
Clock, reset and supply management
- 1.8 to 3.6 V application supply and I/Os
- POR, PDR, PVD and BOR
- 4 to 25 MHz crystal oscillator
- Internal 16 MHz factory-trimmed RC
- 32 kHz oscillator for RTC with calibration

Figure 3-3 Select the MCU model

3) Select the *"**Output**"* tab if you want to MDK output HEX file, and select “Create HEX File”.


Options for Target 'Target 1'
Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities
Select Folder for Objects...
OK
Cancel
Defaults
Help

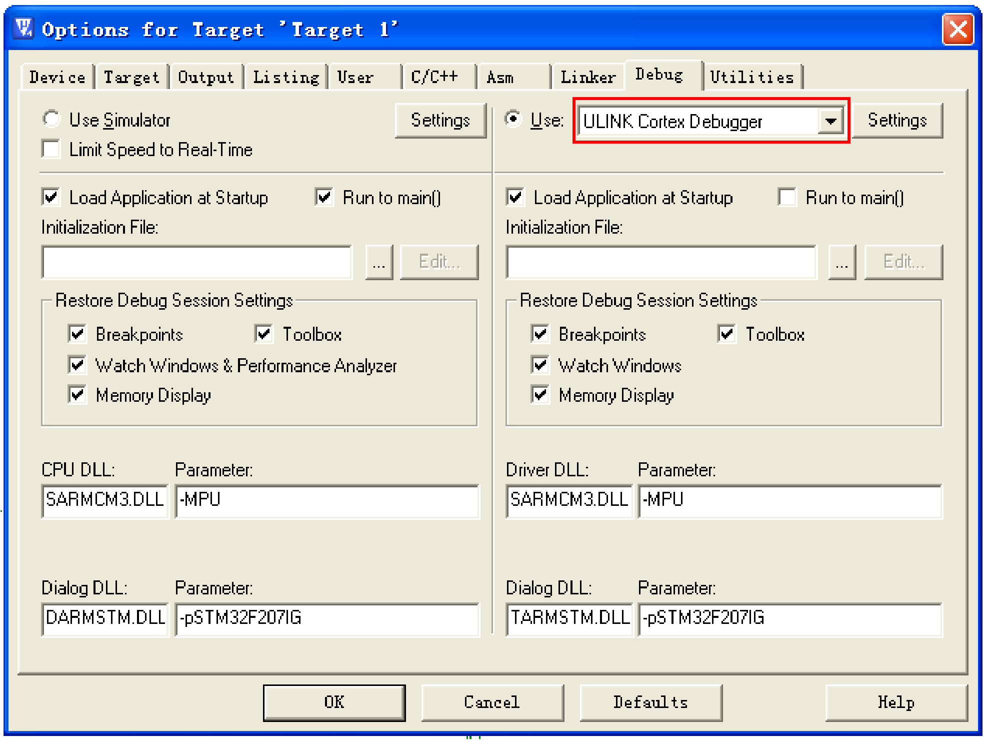
Name of Executable: ADC3_DMA

Create Executable: .\ADC3_DMA [✓]
Debug Information [✓]
Create HEX File [✓]
Browse Information [✓]
Create Library: .\ADC3_DMA.LIB [ ]
Create Batch File [ ]

Figure 3-4 Select output file

4) Select the "***Debug***" tab to choose Debug tool.

➢ If you want to use ULINK, select "ULINK Cortex Debugger" (Default setting).

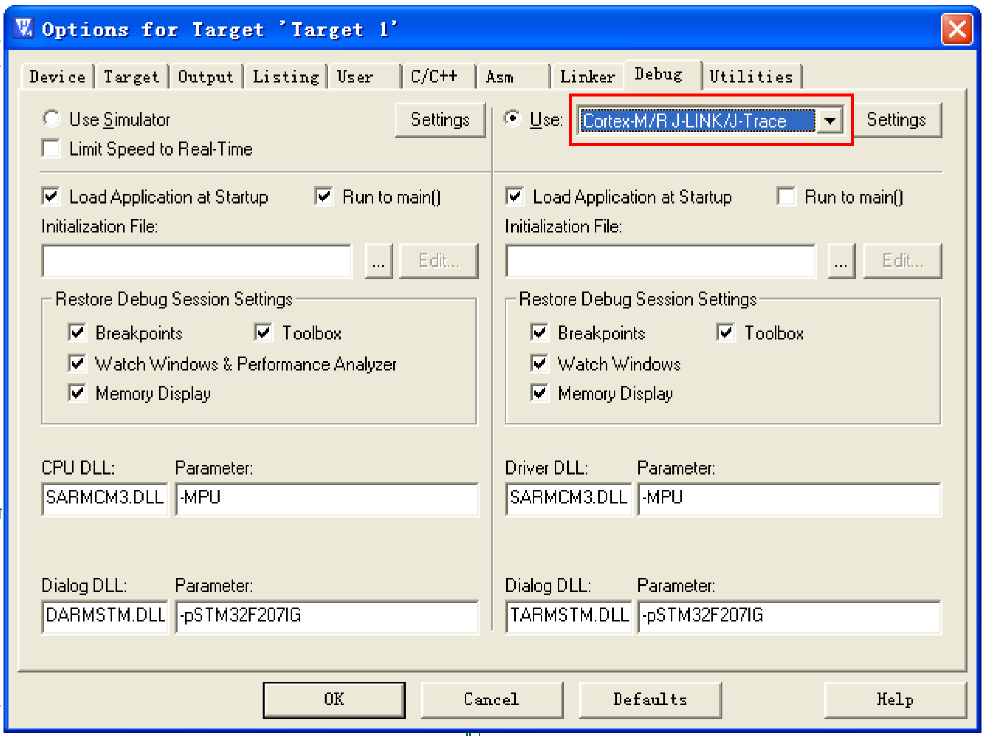

Options for Target 'Target 1'
Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities
Settings
Settings
...
Edit...
...
Edit...
OK
Cancel
Defaults
Help

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: DARMSTM.DLL Parameter: -pSTM32F207IG

Use: ULINK Cortex Debugger [✓]
Load Application at Startup [✓]
Run to main() [ ]
Initialization File:
Restore Debug Session Settings
Breakpoints [✓]
Toolbox [✓]
Watch Windows [✓]
Memory Display [✓]
Driver DLL: SARMCM3.DLL Parameter: -MPU
Dialog DLL: TARMSTM.DLL Parameter: -pSTM32F207IG

Figure 3-5 Select ULINK as Debug tool

➢ If you want to use JLINK, select "Cortex-M/R J-LINK/J-Trace".



Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

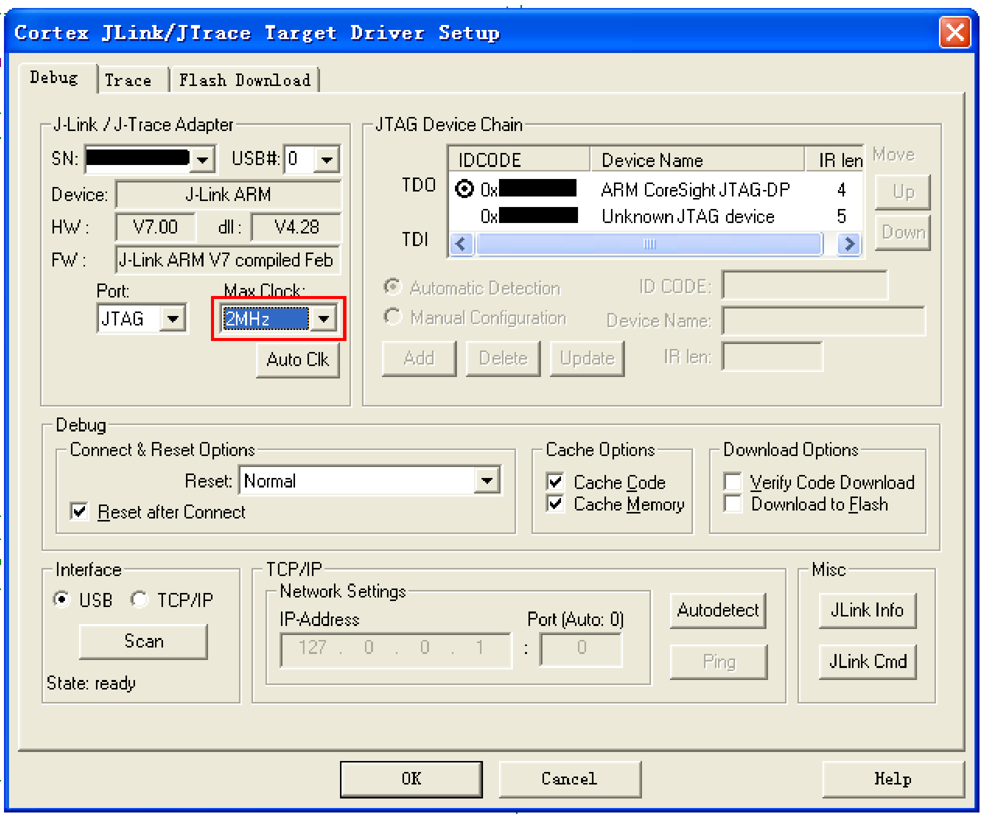
- Use Simulator — Settings
- [ ] Limit Speed to Real-Time
- [✓] Load Application at Startup — [✓] Run to main()
- Initialization File:
- Restore Debug Session Settings: [✓] Breakpoints, [✓] Toolbox, [✓] Watch Windows & Performance Analyzer, [✓] Memory Display
- CPU DLL: SARMCM3.DLL — Parameter: -MPU
- Dialog DLL: DARMSTM.DLL — Parameter: -pSTM32F207IG

- [✓ Use:] Cortex-M/R J-LINK/J-Trace — Settings
- [✓] Load Application at Startup — [ ] Run to main()
- Initialization File:
- Restore Debug Session Settings: [✓] Breakpoints, [✓] Toolbox, [✓] Watch Windows, [✓] Memory Display
- Driver DLL: SARMCM3.DLL — Parameter: -MPU
- Dialog DLL: TARMSTM.DLL — Parameter: -pSTM32F207IG

OK | Cancel | Defaults | Help

Figure 3-6 Select JLink as Debug tool

Click “Settings” to setup JLink. The “Max Clock” is suggested to be lower than 2MHz.Click”OK”, return to “Debug” window.



Cortex JLink/JTrace Target Driver Setup

Debug | Trace | Flash Download

J-Link / J-Trace Adapter
- SN: [redacted] — USB#: 0
- Device: J-Link ARM
- HW: V7.00 — dll: V4.28
- FW: J-Link ARM V7 compiled Feb
- Port: JTAG — Max Clock: 2MHz — Auto Clk

JTAG Device Chain

	IDCODE	Device Name	IR len
TDO	0x[redacted]	ARM CoreSight JTAG-DP	4
TDI	0x[redacted]	Unknown JTAG device	5

- Automatic Detection — ID CODE:
- Manual Configuration — Device Name:
- Add | Delete | Update — IR len:
- Move: Up | Down

Debug
- Connect & Reset Options: Reset: Normal; [✓] Reset after Connect
- Cache Options: [✓] Cache Code, [✓] Cache Memory
- Download Options: [ ] Verify Code Download, [ ] Download to Flash

Interface: [✓ USB] TCP/IP — Scan — State: ready

TCP/IP: Network Settings — IP-Address 127 . 0 . 0 . 1 — Port (Auto: 0) : 0 — Autodetect — Ping

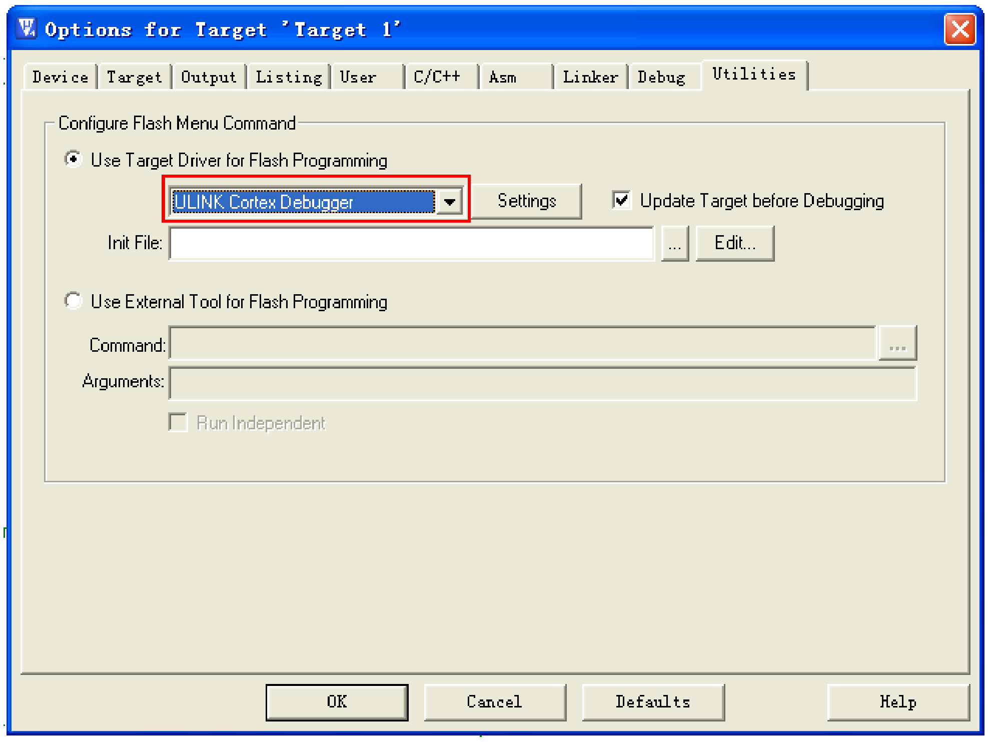
Misc: JLink Info — JLink Cmd

OK | Cancel | Help

Figure 3-7 JLink settings

5) Select “***Utilities***” tab to setup Flash Programming.

- If you want to download programs with ULINK, please select "ULINK Cortex Debugger" (Default Setting).As shown in following figure.



Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Configure Flash Menu Command

(●) Use Target Driver for Flash Programming: ULINK Cortex Debugger — Settings — [✓] Update Target before Debugging

Init File:

( ) Use External Tool for Flash Programming

Command:

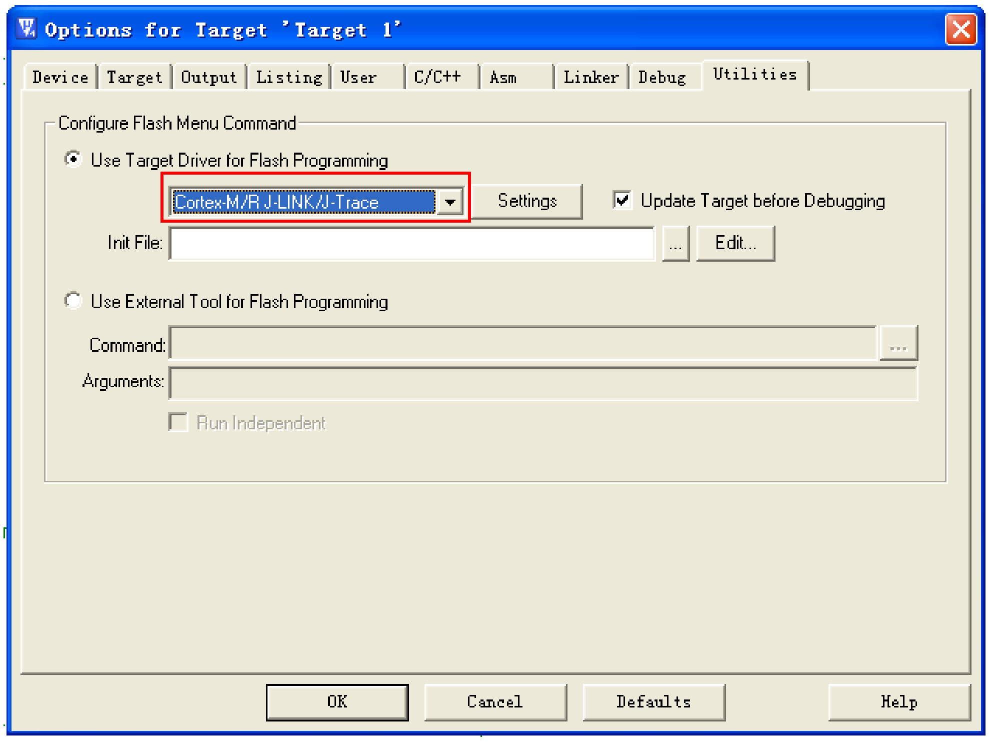
Arguments:

[ ] Run Independent

OK | Cancel | Defaults | Help

Figure 3-8 Select ULINK as program downloader

- If you want to download programs with JLink, please select "Cortex-M/R J-LINK/J-Trace".



Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Configure Flash Menu Command

(●) Use Target Driver for Flash Programming: Cortex-M/R J-LINK/J-Trace — Settings — [✓] Update Target before Debugging

Init File:

( ) Use External Tool for Flash Programming

Command:

Arguments:

[ ] Run Independent

OK | Cancel | Defaults | Help

Figure 3-9 Select JLink as program download tool

6) Click “Settings” to configure Flash download. If you want MCU to reset and run automatically after Flash downloading, please select “Reset and Run” option.

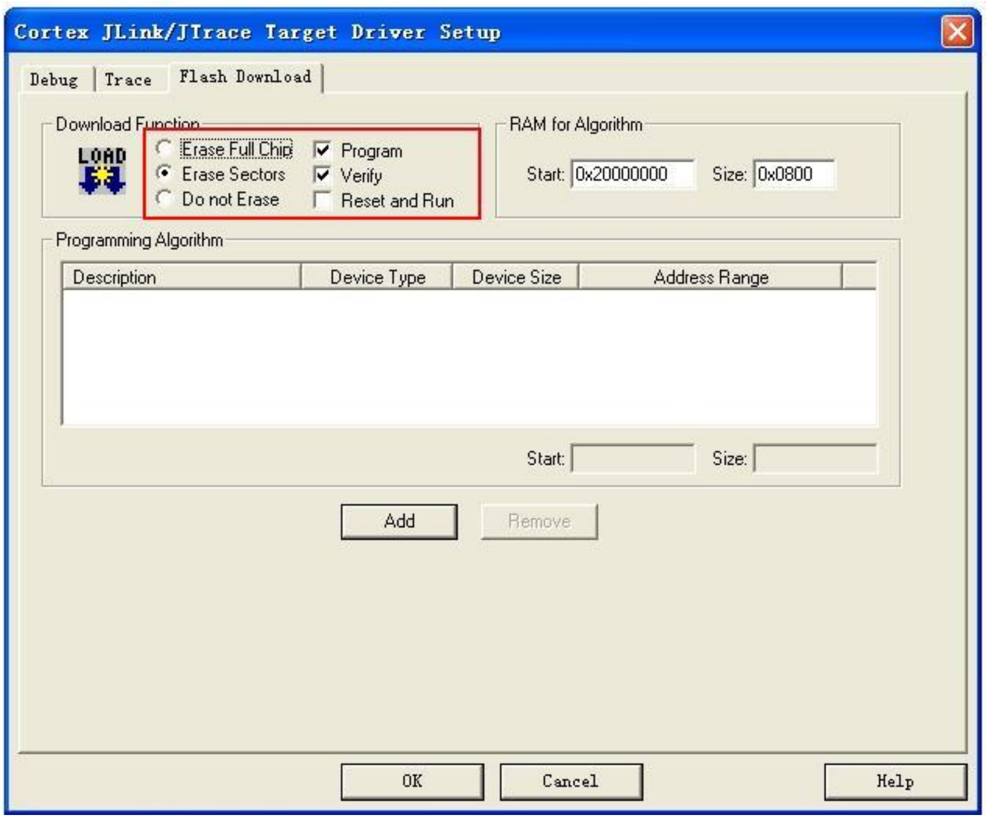
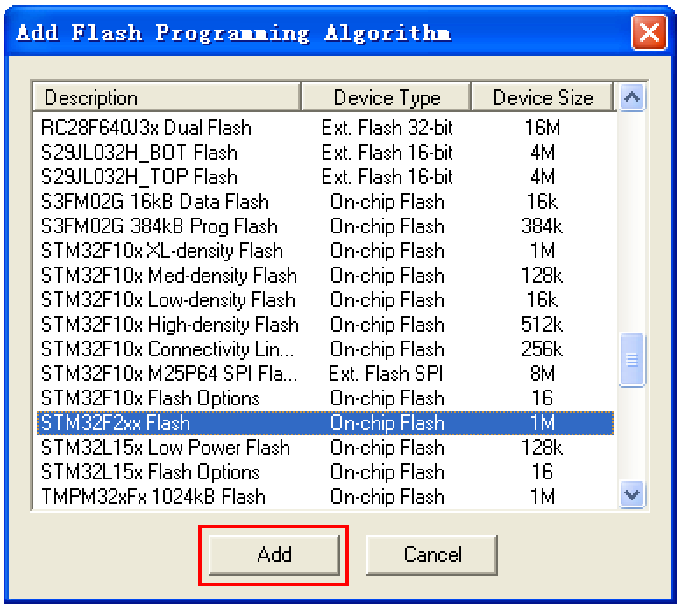


Figure 3-10 Flash download settings

7) Click “Add” to add programming algorithm.

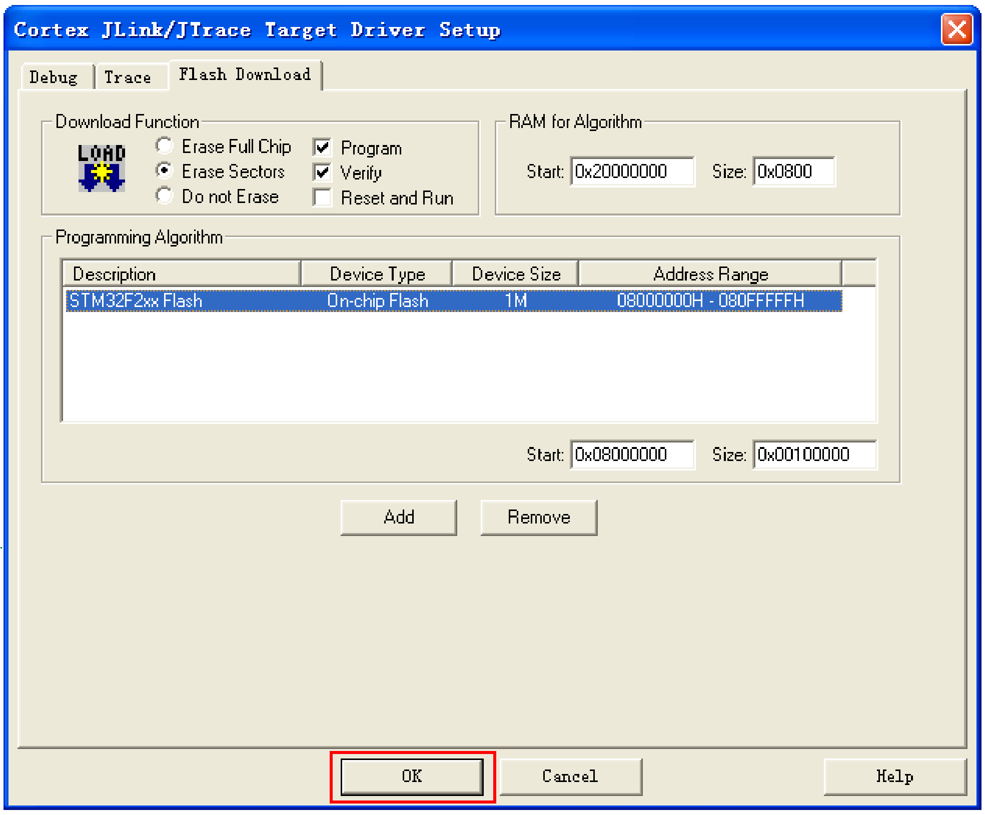
Select “STM32F2xx Flash On-chip Flash 1M” algorithm, and then click “Add”.



Description	Device Type	Device Size
RC28F640J3x Dual Flash	Ext. Flash 32-bit	16M
S29JL032H_BOT Flash	Ext. Flash 16-bit	4M
S29JL032H_TOP Flash	Ext. Flash 16-bit	4M
S3FM02G 16kB Data Flash	On-chip Flash	16k
S3FM02G 384kB Prog Flash	On-chip Flash	384k
STM32F10x XL-density Flash	On-chip Flash	1M
STM32F10x Med-density Flash	On-chip Flash	128k
STM32F10x Low-density Flash	On-chip Flash	16k
STM32F10x High-density Flash	On-chip Flash	512k
STM32F10x Connectivity Lin...	On-chip Flash	256k
STM32F10x M25P64 SPI Fla...	Ext. Flash SPI	8M
STM32F10x Flash Options	On-chip Flash	16
STM32F2xx Flash	On-chip Flash	1M
STM32L15x Low Power Flash	On-chip Flash	128k
STM32L15x Flash Options	On-chip Flash	16
TMPM32xFx 1024kB Flash	On-chip Flash	1M

Figure 3-11 Add programming algorithm

8) Click “OK” to finish the setup and return to IDE window.


Cortex JLink/JTrace Target Driver Setup

Debug | Trace | Flash Download

Download Function: Erase Full Chip ( ) / Erase Sectors (●) / Do not Erase ( ); Program [✓], Verify [✓], Reset and Run [ ]

RAM for Algorithm: Start: 0x20000000 Size: 0x0800

Programming Algorithm

Description	Device Type	Device Size	Address Range
STM32F2xx Flash	On-chip Flash	1M	08000000H - 080FFFFFH

Start: 0x08000000 Size: 0x00100000

Figure 3-12 Finish target option setup

9) Click “Build” or “Rebuild” to build or rebuild the project.

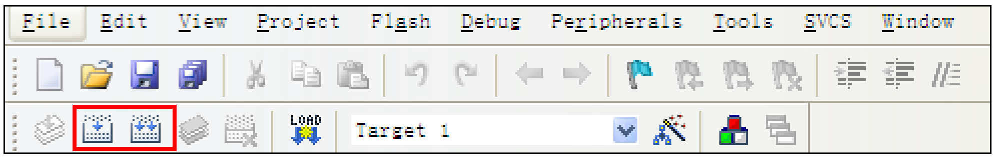

File Edit View Project Flash Debug Peripherals Tools SVCS Window
Target 1

Figure 3-13 Build or Rebuild the project

10) Click “Download” to download program to MCU.

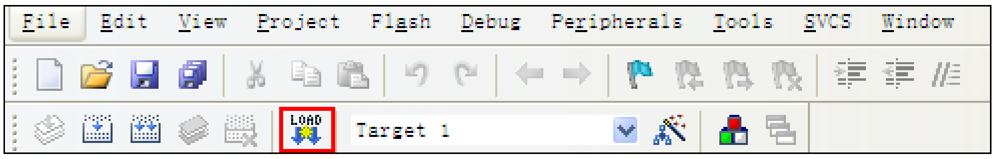

File Edit View Project Flash Debug Peripherals Tools SVCS Window
LOAD
Target 1

Figure 3-14 Download program

11) If you have selected “Reset and Run” option in step 6), MCU will reset and run automatically after downloading. If haven’t, you just need to press the Reset key on the Evaluation board to run the MCU.

3.1.3 Create a New MDK Project

This section shows how to create a new project with MDK-ARM.

1) Open the directory of *\code\STM32F2xx_StdPeriph_Demo* .Create a new folder and name it '*My project*'. Create a new folder in *\My Project* and name it, such as *ADC_example.*

   Copy source files and include files from the specified example, for example ADC3_DMA, to the folder *\ADC_example* created in previous step.

   main.c

   stm32f2xx_it.c

   stm32f2xx_it.h

   system_stm32f2xx.c

   stm32f2xx_conf.h

2) Open MDK (KEIL µVision4). Click *"**Project**"->"**New uVision Project**".*

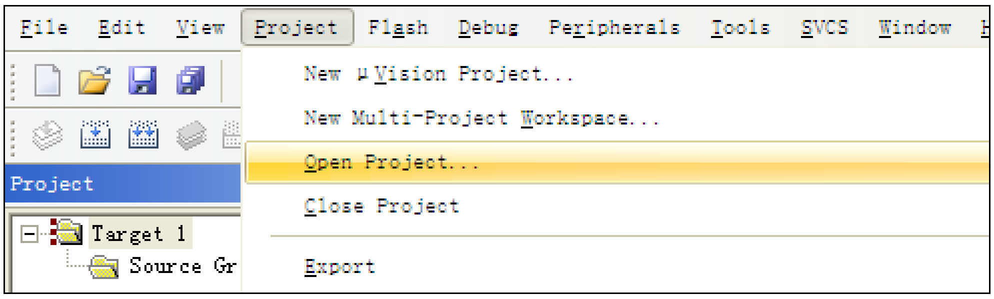


Figure 3-15 Create New Project

Save the project in the folder of *\ADC_example* as ADC_example.

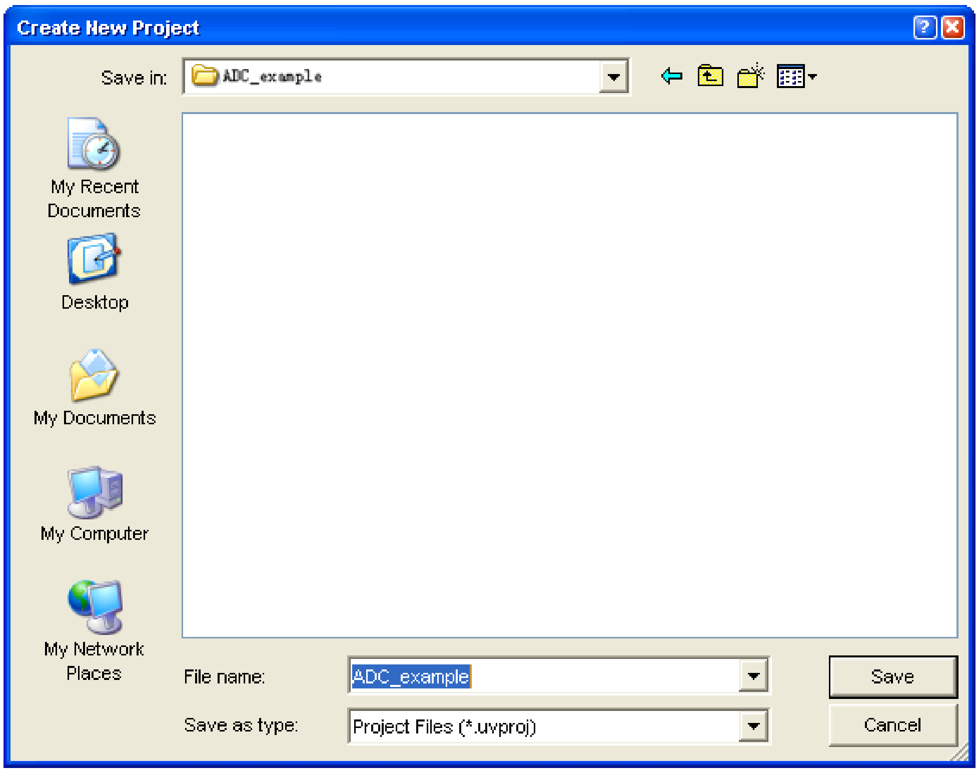
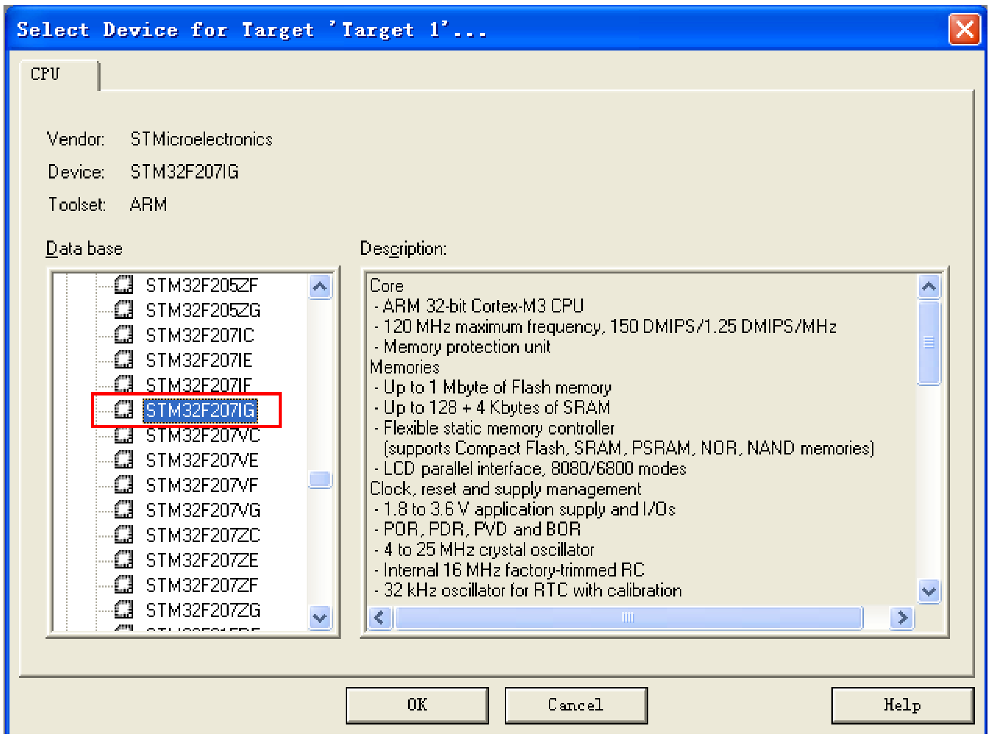


Figure 3-16 Save project

3) Then a dialog box of “Select Device for Target of Target …” will be opened. Please select a device for the project. Here we select “STM32F207IG”.



Vendor: STMicroelectronics
Device: STM32F207IG
Toolset: ARM

STM32F205ZF
STM32F205ZG
STM32F207IC
STM32F207IE
STM32F207IF
STM32F207IG
STM32F207VC
STM32F207VE
STM32F207VF
STM32F207VG
STM32F207ZC
STM32F207ZE
STM32F207ZF
STM32F207ZG

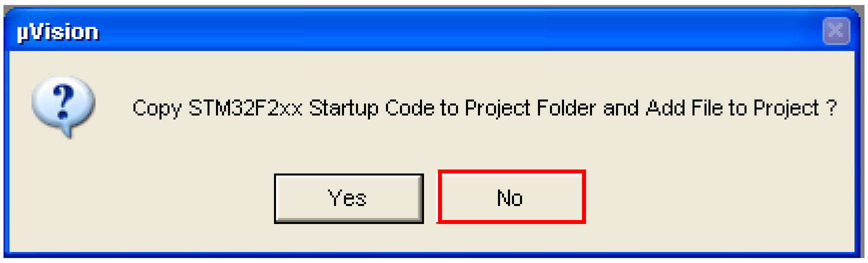
Core
- ARM 32-bit Cortex-M3 CPU
- 120 MHz maximum frequency, 150 DMIPS/1.25 DMIPS/MHz
- Memory protection unit
Memories
- Up to 1 Mbyte of Flash memory
- Up to 128 + 4 Kbytes of SRAM
- Flexible static memory controller
  (supports Compact Flash, SRAM, PSRAM, NOR, NAND memories)
- LCD parallel interface, 8080/6800 modes
Clock, reset and supply management
- 1.8 to 3.6 V application supply and I/Os
- POR, PDR, PVD and BOR
- 4 to 25 MHz crystal oscillator
- Internal 16 MHz factory-trimmed RC
- 32 kHz oscillator for RTC with calibration

Figure 3-17 Select the MCU model

4) A dialogue box pops up to ask if you want to add Startup code to project.

The Startup Code performs configuration of the microcontroller device and *initialization of the compiler run-time system.*

You can select “Yes”, uVision will add it for you, or “No” then you need to add it by yourself. Here we select “NO” and add it later.


µVision

Copy STM32F2xx Startup Code to Project Folder and Add File to Project ?

Yes [✓ No]

Figure 3-18 Add startcode

5) Now add file groups to project.

Right click on “Target”, select “Add Group…” and name the file group.

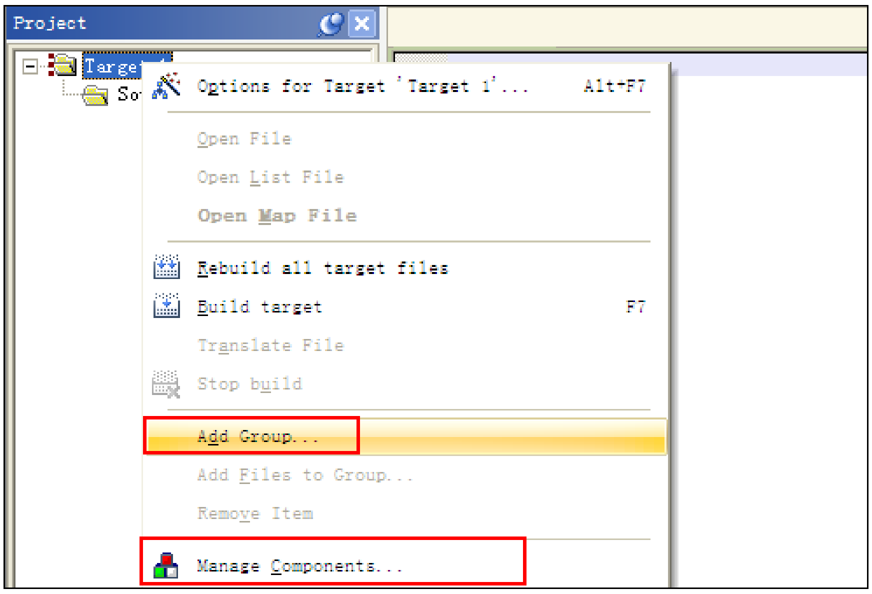


Figure 3-19 Add file groups to project

Select “Manage Components” and click icon to create new file group as shown in the figure below.

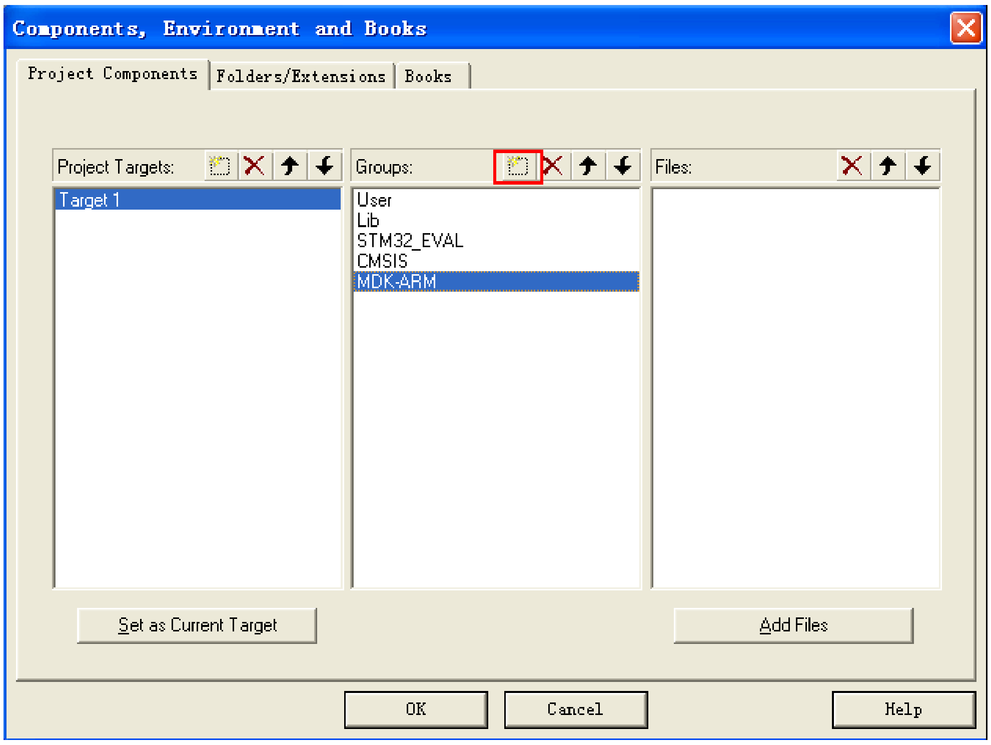


Figure 3-20 Add file groups to project with Manage Components

6) Create 5 file groups as shown: User, Lib, STM32_EVAL, CMSIS, and MDK-ARM. As shown below:

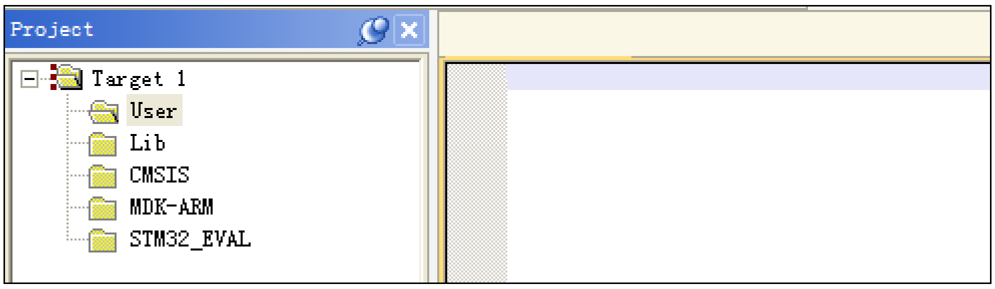


Figure 3-21 Finish file groups adding

Note: File groups are used to manage files of project.

- User Group: manage source files that user create
- Lib Group: manage STM32F2xx Standard Peripherals Library
- STM32_EVAl: manage board driver
- CMSIS: manage CMSIS files
- MDK-ARM: manage StartUp code

7) Add files to groups.

Right Click on group of User, select "Add files to Group 'User'..."

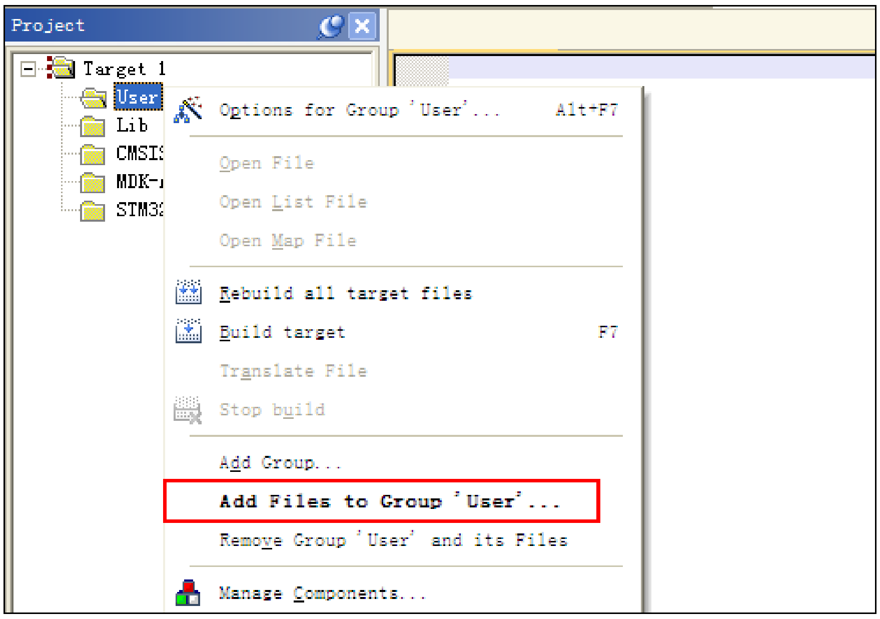


Figure 3-22 Add files to groups

Add files from the created folder \My Project\ADC_example to the group of 'User'.

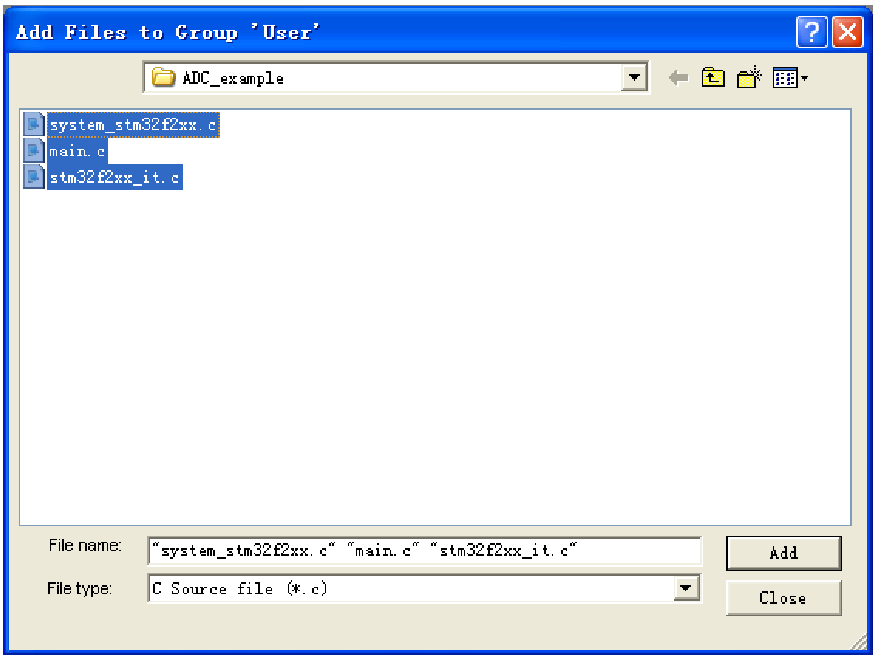

Add Files to Group 'User'
ADC_example
system_stm32f2xx.c
main.c
stm32f2xx_it.c
File name: "system_stm32f2xx.c" "main.c" "stm32f2xx_it.c"
File type: C Source file (*.c)
Add
Close

Figure 3-23 Add selected files to group

8) Add files to the group of Lib, STM32_EVAL, CMSIS, and MDK-ARM same as done in step 7).

The files need to be added to the group of Lib are located in

\code\STM32F2xx_StdPeriph_Demo\Libraries\STM32F2xx_StdPeriph_Driver\src

Note: Only related files need to be added. If you are unsure what files should be added, you can add all files to group of Lib. However, it will increase compile

time and code size.

The files need to be added to the group STM32_EVAL are located in

\code\STM32F2xx_StdPeriph_Demo\Utilities\STM32_EVAL\STM322xG_EVAL

Note: Only stm322xg_eval.c and stm322xg_eval_lcd.c need to be added to group of STM32_EVAL.

The files need to be added to the group CMSIS are located in

\code\STM32F2xx_StdPeriph_Demo\Libraries\CMSIS\CM3\CoreSupport

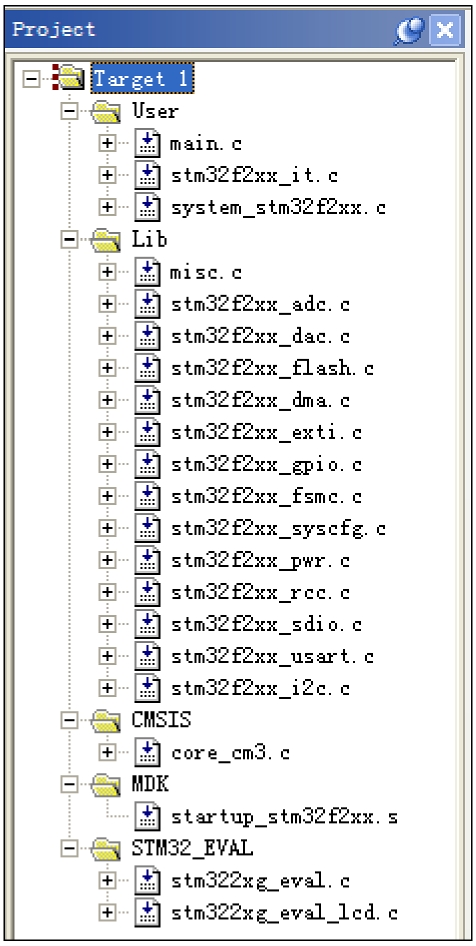
Note: Only core_cm3.c need to be added to group of CMSIS.

The files need to be added to the group MDK-ARM are located in

\code\STM32F2xx_StdPeriph_Demo\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx\startup\arm

Note: Only startup_stm32f2xx.s need to be added to group of MDK-ARM.

As the figure shown below, required source flies have been added to the groups.



```
Project
Target 1
  User
    main.c
    stm32f2xx_it.c
    system_stm32f2xx.c
  Lib
    misc.c
    stm32f2xx_adc.c
    stm32f2xx_dac.c
    stm32f2xx_flash.c
    stm32f2xx_dma.c
    stm32f2xx_exti.c
    stm32f2xx_gpio.c
    stm32f2xx_fsmc.c
    stm32f2xx_syscfg.c
    stm32f2xx_pwr.c
    stm32f2xx_rcc.c
    stm32f2xx_sdio.c
    stm32f2xx_usart.c
    stm32f2xx_i2c.c
  CMSIS
    core_cm3.c
  MDK
    startup_stm32f2xx.s
  STM32_EVAL
    stm322xg_eval.c
    stm322xg_eval_lcd.c
```

Figure 3-24 Source flies have been added to groups

9) Setup Target options.

Click the icon “Target Options”,select ‘C/C++’ tab to set C/C++ compiler specific tool options like code optimization or variable allocation.

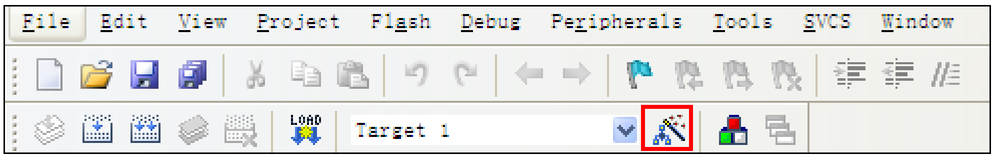
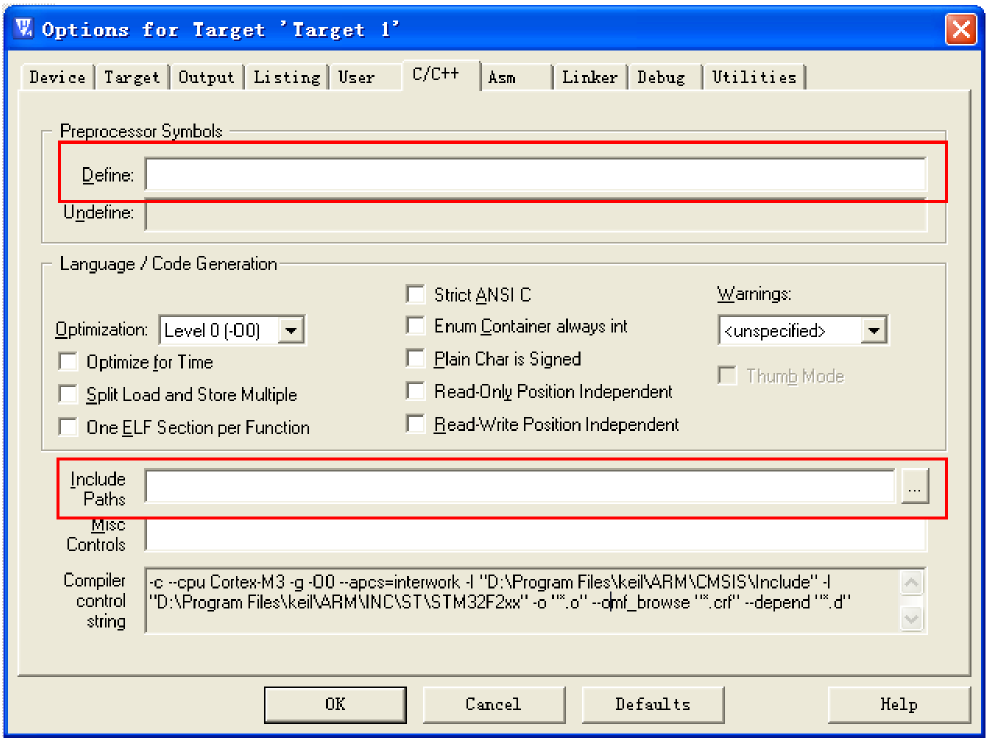


Figure 3-25 Setup Target options

There are two options we have to set.


Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

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

Misc Controls

Compiler control string

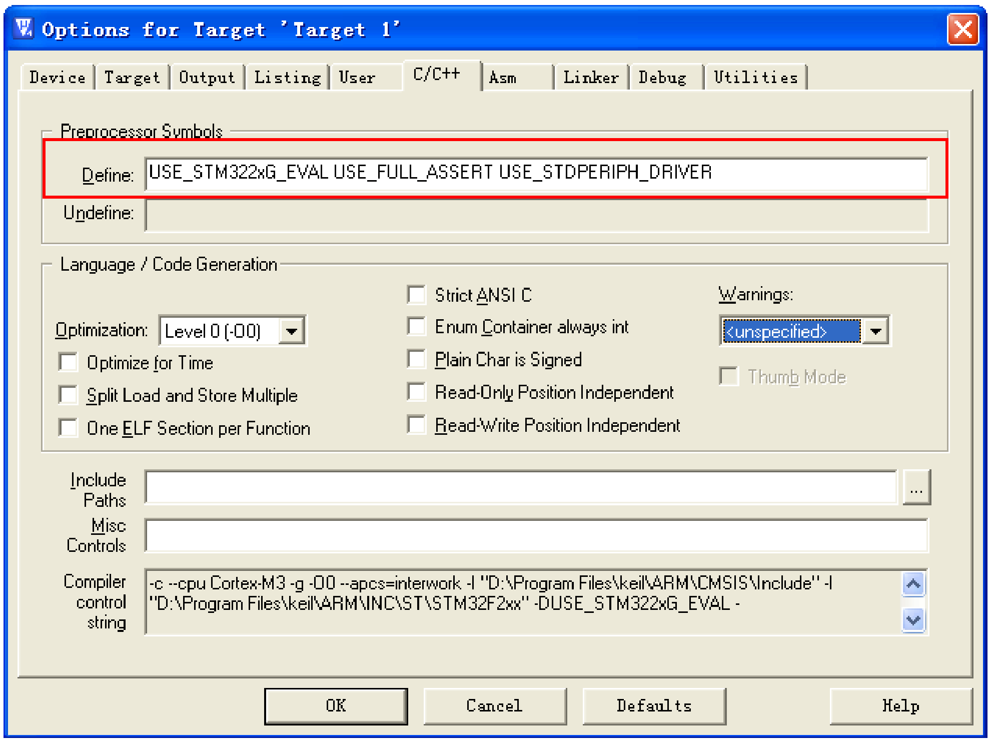
```
-c --cpu Cortex-M3 -g -O0 --apcs=interwork -I "D:\Program Files\keil\ARM\CMSIS\Include" -I
"D:\Program Files\keil\ARM\INC\ST\STM32F2xx" -o "*.o" --omf_browse "*.crf" --depend "*.d"
```

OK | Cancel | Defaults | Help

Figure 3-26 C/C++ option

10) Add Preprocessor Symbols.

As several preprocessor symbols have been defined in project, we need to add them to the column of ‘Define’.


Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Preprocessor Symbols

Define: USE_STM322xG_EVAL USE_FULL_ASSERT USE_STDPERIPH_DRIVER

Undefine:

Language / Code Generation

Optimization: Level 0 (-O0)

Strict ANSI C; Enum Container always int; Plain Char is Signed; Read-Only Position Independent; Read-Write Position Independent; Optimize for Time; Split Load and Store Multiple; One ELF Section per Function

Warnings: <unspecified>

Thumb Mode

Include Paths

Misc Controls

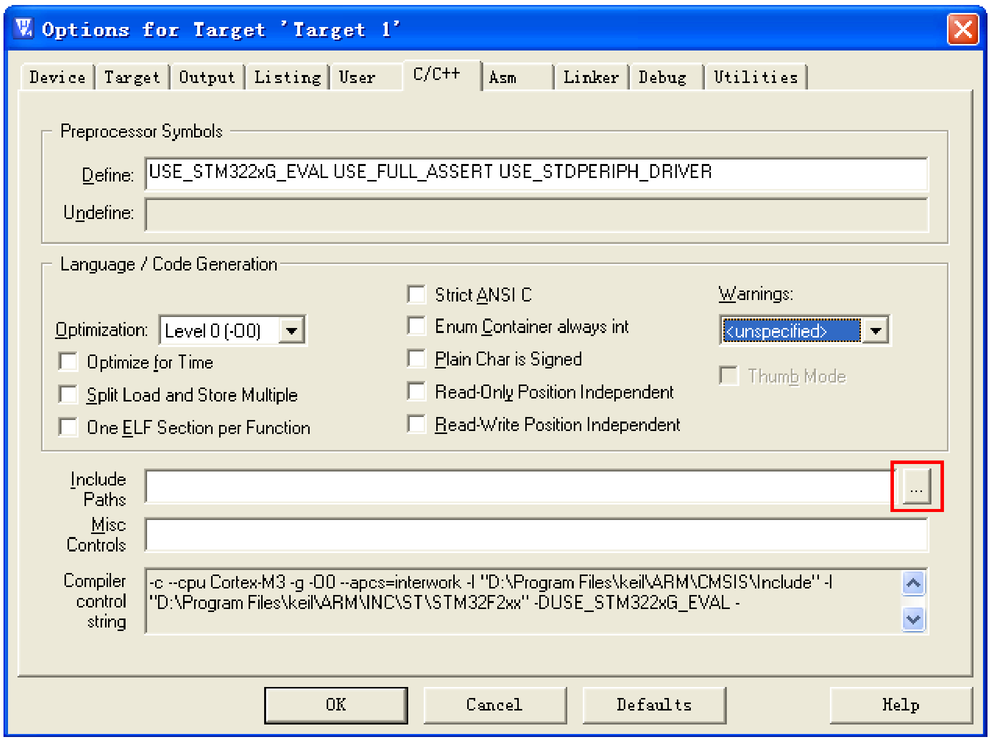
Compiler control string: -c --cpu Cortex-M3 -g -O0 --apcs=interwork -I "D:\Program Files\keil\ARM\CMSIS\Include" -I "D:\Program Files\keil\ARM\INC\ST\STM32F2xx" -DUSE_STM322xG_EVAL -

OK | Cancel | Defaults | Help

Figure 3-27 Add Preprocessor Symbols

11) Add Include Paths.

Click the icon shown in the figure below.


Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Preprocessor Symbols

Define: USE_STM322xG_EVAL USE_FULL_ASSERT USE_STDPERIPH_DRIVER

Undefine:

Language / Code Generation

Optimization: Level 0 (-O0)

Strict ANSI C; Enum Container always int; Plain Char is Signed; Read-Only Position Independent; Read-Write Position Independent; Optimize for Time; Split Load and Store Multiple; One ELF Section per Function

Warnings: <unspecified>

Thumb Mode

Include Paths ...

Misc Controls

Compiler control string: -c --cpu Cortex-M3 -g -O0 --apcs=interwork -I "D:\Program Files\keil\ARM\CMSIS\Include" -I "D:\Program Files\keil\ARM\INC\ST\STM32F2xx" -DUSE_STM322xG_EVAL -

OK | Cancel | Defaults | Help

Figure 3-28 Include Paths option

In 'Folder Setup' dialog box, click icon shown below and add Include Paths.

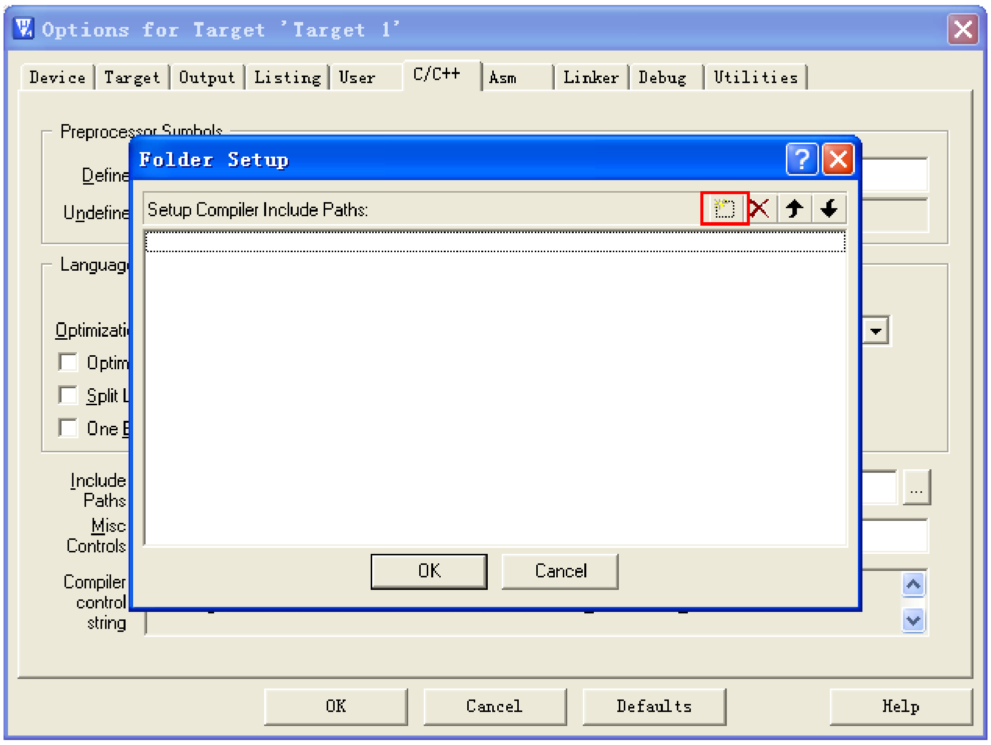
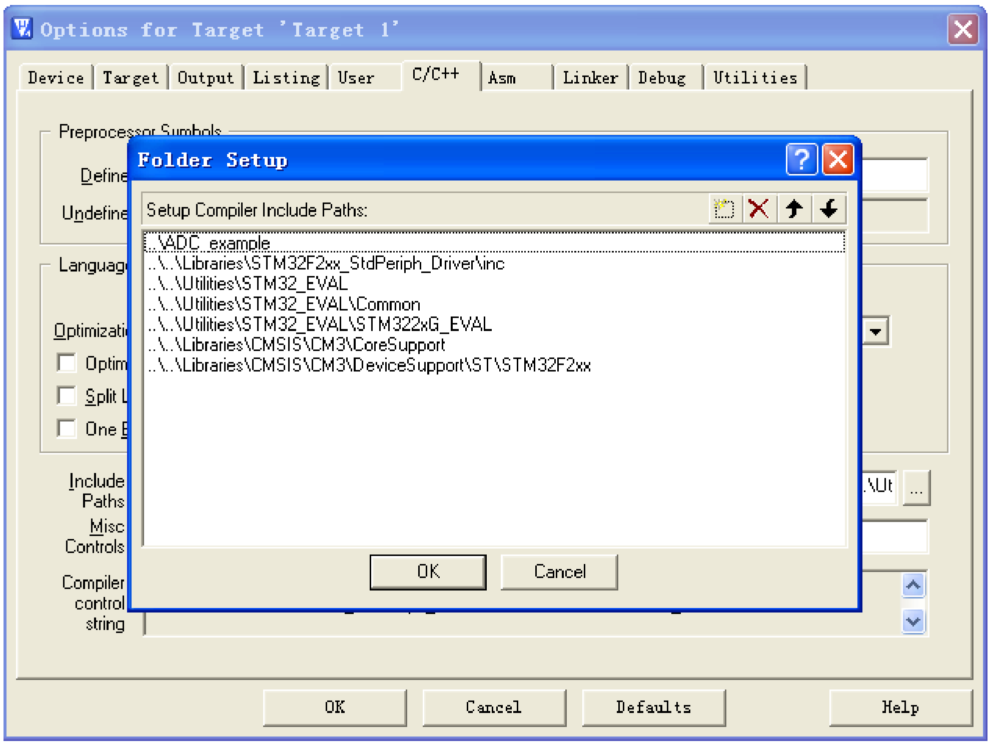


Figure 3-29 Add Include Paths

Include Paths have been setup as figure shown below.



..\ADC_example
..\..\Libraries\STM32F2xx_StdPeriph_Driver\inc
..\..\Utilities\STM32_EVAL
..\..\Utilities\STM32_EVAL\Common
..\..\Utilities\STM32_EVAL\STM322xG_EVAL
..\..\Libraries\CMSIS\CM3\CoreSupport
..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx

Figure 3-30 Add Include Paths ok

12) Click 'OK' to complete 'C/C++' setup.

For setting the 'Device', 'Output', 'Debug' and 'Utilities' tabs, please refer to *Building an existing MDK-ARM Project*.

3.2 IAR EWARM

3.2.1 IAR EWARM Introduction

IAR Embedded Workbench is a set of highly sophisticated and easy-to-use development tools for embedded applications. It integrates the IAR C/C++ Compiler™, assembler, linker, librarian, text editor, project manager, and C-SPY® Debugger in an integrated development environment (IDE). With its built-in chip-specific code optimizer, IAR Embedded Workbench generates very efficient and reliable code for ARM devices. In addition to this solid technology, IAR Systems also provides professional worldwide technical support.

Feature

- Modular and extensible IDE
- Extensive device support
- Highly optimizing C/C++ compiler
- State-of-the-art C-SPY® debugger
- Power debugging
- C-SPY debugger target system support
- RTOS support
- IAR assembler
- IAR ILINK Linker
- IAR library and library tools
- Comprehensive documentation
- Free evaluation software

The STM32F2xx series MCUs require IAR EWARM 6.20 and later versions. All IAR projects under folder \EWARM in the CD-ROM are built with IAR EWARM 6.30. User can download the evaluation edition for free from www.iar.com.

The sections Building an existing EWARM Project and Create a New IAR Project give a short description of how to use the IAR EWARM to develop application software. For more detail, please refer to the relevant documentation.

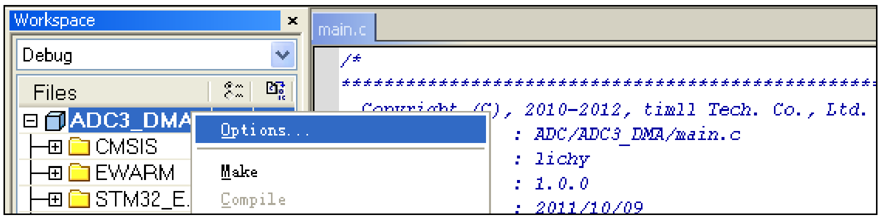
3.2.2 Building an existing EWARM Project

In this section, ADC3_DMA as an example has been used to show how to configure an existing IAR EWARM project.

1) Open project.

Open the ADC3_DMA project from the directory as follow.

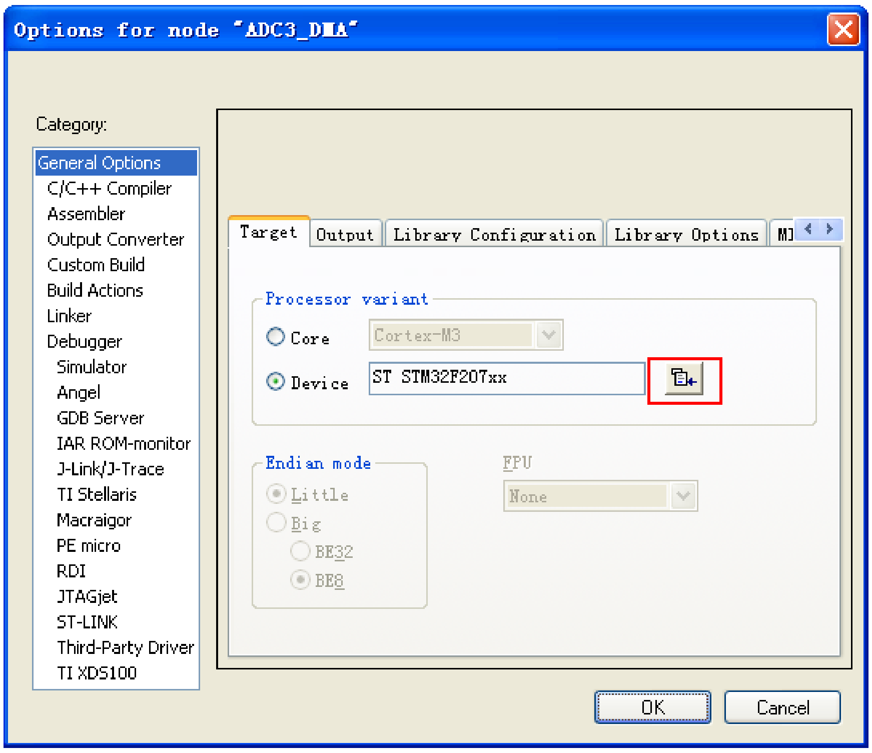
code\STM32F2xx_StdPeriph_Demo\Project\STM32F2xx_StdPeriph_Examples\ADC\ADC3_DMA\EWARM



```
/*
****************************************************
  Copyright (C), 2010-2012, timll Tech. Co., Ltd.
  : ADC/ADC3_DMA/main.c
  : lichy
  : 1.0.0
  : 2011/10/09
```

Figure 3-31 Configure options

2) In the opened window, select *General Options->Target* tab, then select the device from the list, as shown below:



Processor variant: Core [Cortex-M3] [✓ Device] ST STM32F207xx

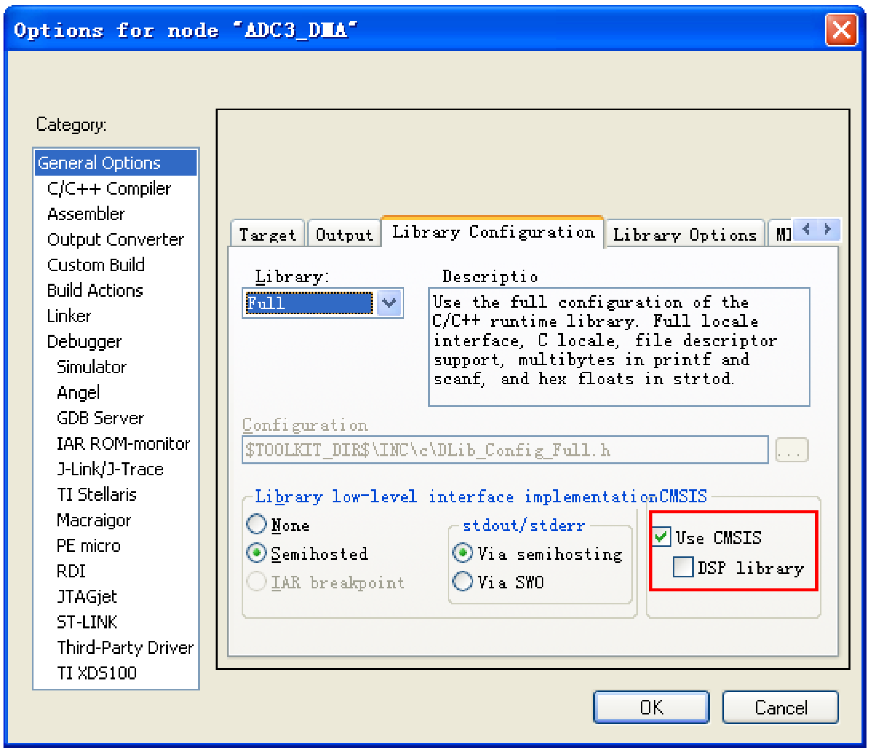
Endian mode: [✓ Little] Big (BE32 / BE8)

FPU: None

Figure 3-32 Select the MCU model

3) Select *General Options->Library Configuration* tab, then select *Use CMSIS*, as

shown below:



Library: Full

Description: Use the full configuration of the C/C++ runtime library. Full locale interface, C locale, file descriptor support, multibytes in printf and scanf, and hex floats in strtod.

Configuration: $TOOLKIT_DIR$\INC\c\DLib_Config_Full.h

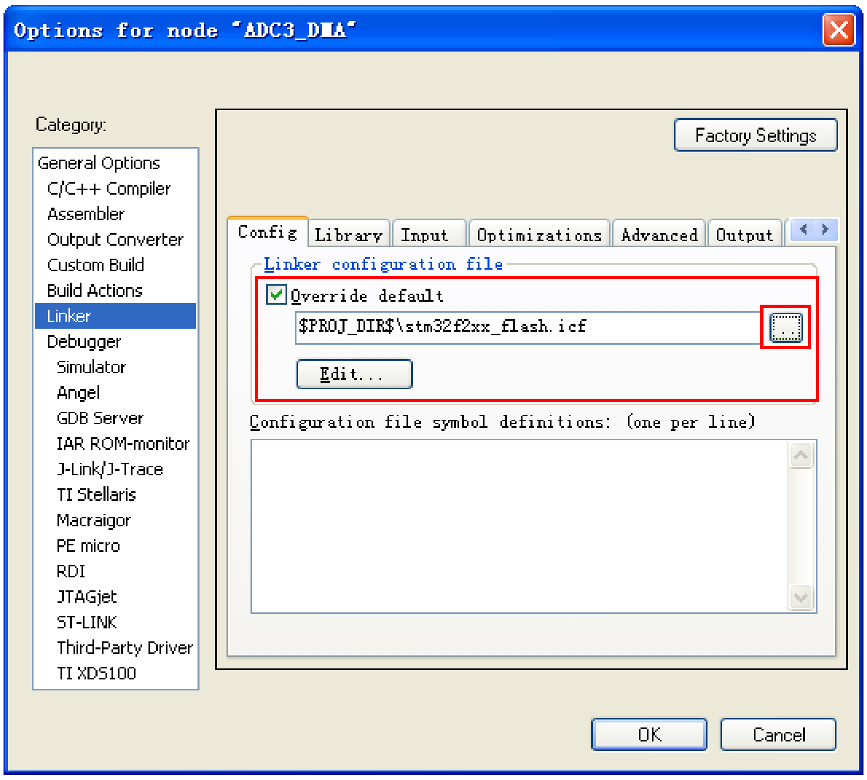
Library low-level interface implementation: None [✓ Semihosted] IAR breakpoint

stdout/stderr: [✓ Via semihosting] Via SWO

CMSIS: [✓ Use CMSIS] DSP library

Figure 3-33 Select Use CMSIS

4) Select *Linker->Config* tab; then select the path of .linker configuration file (.icf). The file is under specific project folder by default.



Linker configuration file: [✓ Override default]

$PROJ_DIR$\stm32f2xx_flash.icf

Configuration file symbol definitions: (one per line)

Figure 3-34 Edit linker configuration file path

5) Select *Debugger->Setup* tab to choose Debug tool (Default: J-Link/J-Trace).

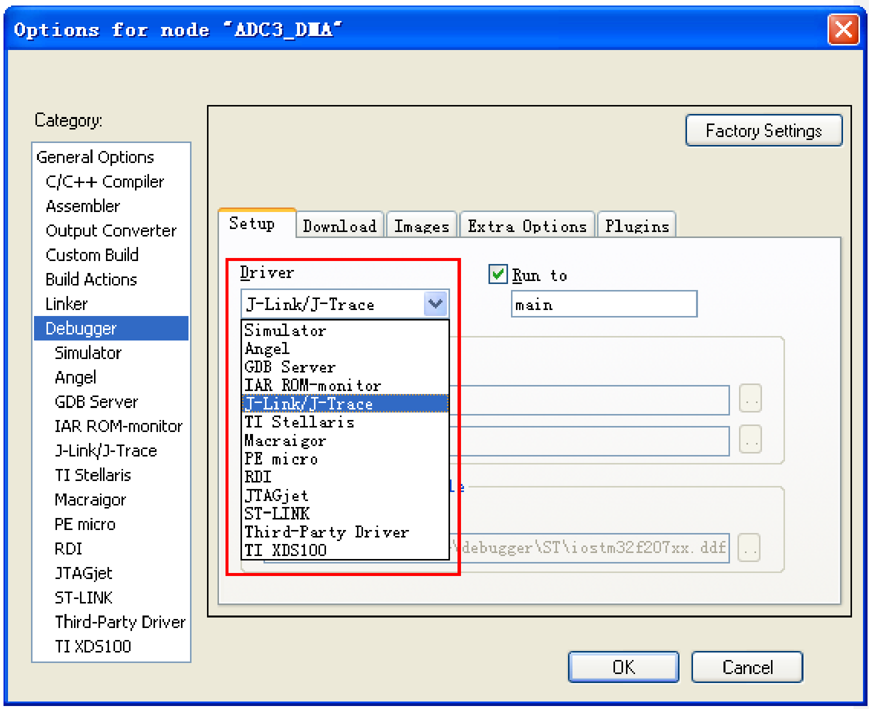


Figure 3-35 Select Debug tool

6) Select *Debugger->Download* tab, then select *Verify download* and *Use flash loader.*

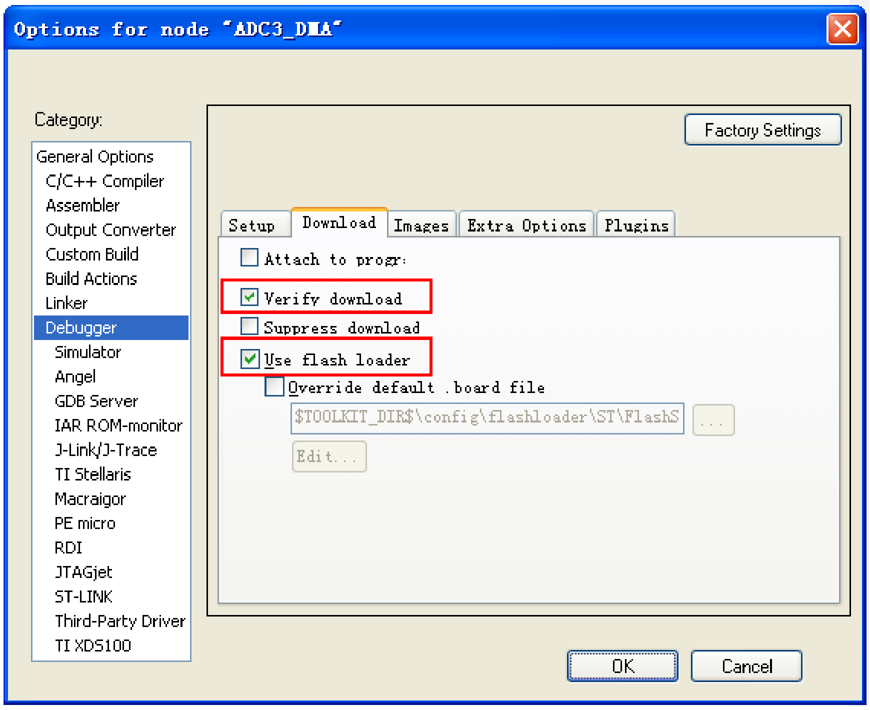


Figure 3-36 Set download mode

7) Click "OK" to finish the setup and return to IDE window.

8) Click “*Make*” to build the project.

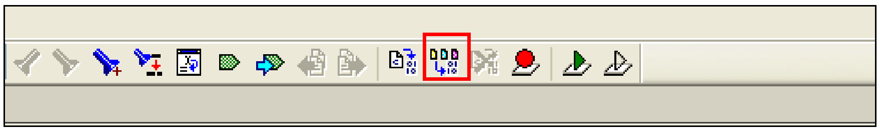


Figure 3-37 Build the project

9) Click “*Download & Debug*” to download program to MCU.

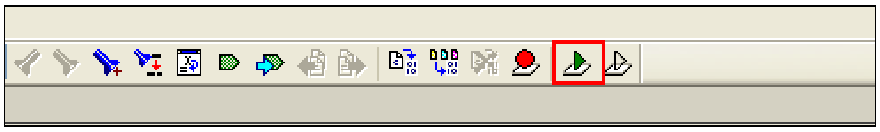


Figure 3-38 Download program

3.2.3 Create a New IAR Project

This section shows how to create a new project with IAR EWARM.

1) Open the directory of \code*STM32F2xx_StdPeriph_Demo* .Create a new folder and name it “*My project*”. Create a new folder in *My Project* and name it, such as *ADC_example.*

   Copy source files, include files and icf file from the specified example, for example ADC3_DMA, to the folder *ADC_example* created in previous step.

   main.c

   stm32f2xx_it.c

   stm32f2xx_it.h

   system_stm32f2xx.c

   stm32f2xx_conf.h

   stm32f2xx_flash.icf

2) Open IAR EWARM, click *“Project”->”Create New Project”.*

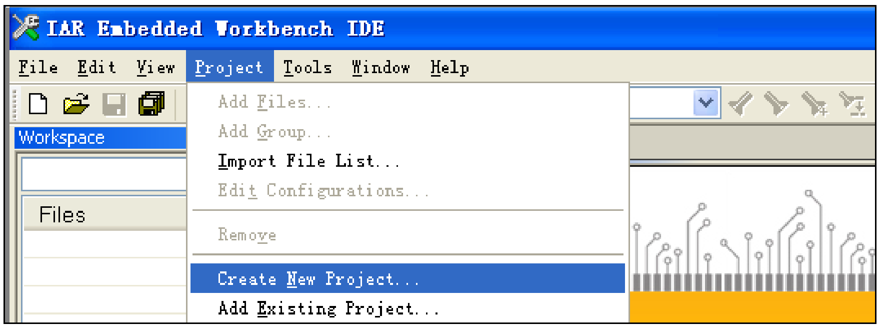
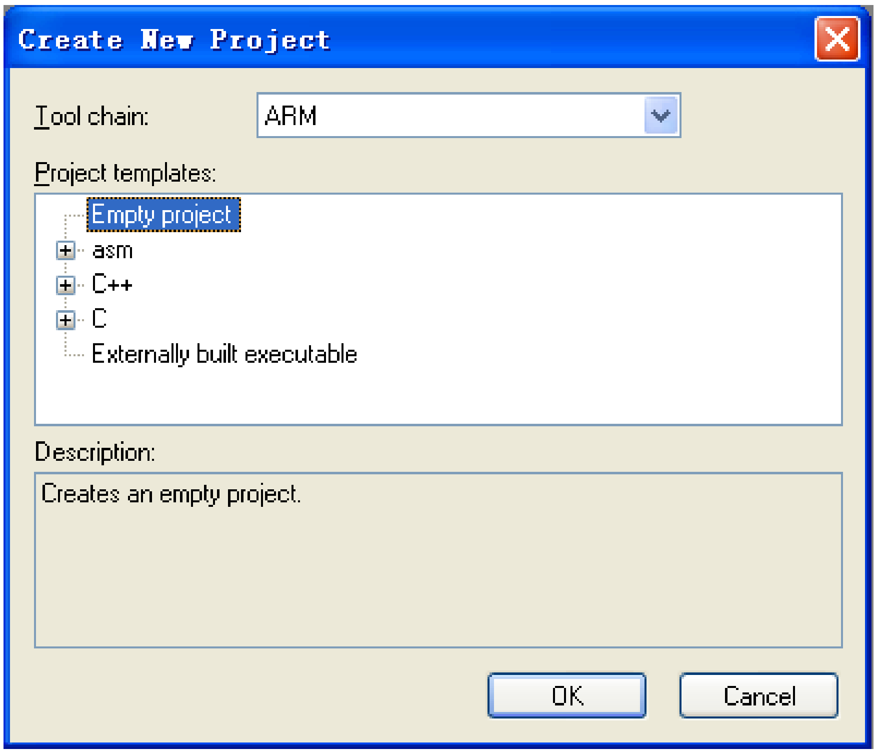


Figure 3-39 Open IAR EWARM

3) Select Empty Project in the opened window.


Create New Project

Tool chain: ARM

Project templates:

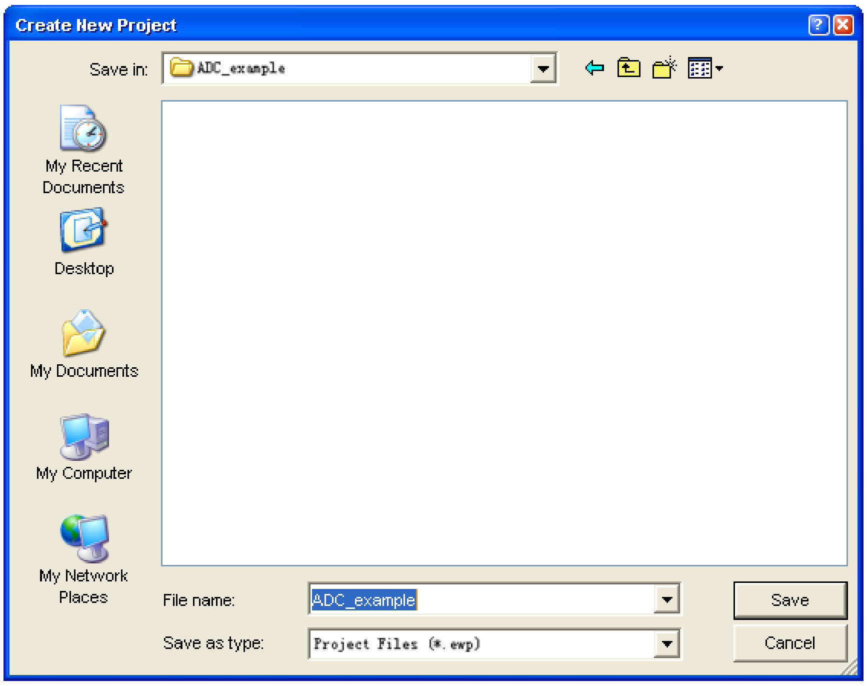
- Empty project
- asm
- C++
- C
- Externally built executable

Description:

Creates an empty project.

Figure 3-40 Create Empty Project

4) Save the project in the folder of *\ADC_example* as ADC_example.


Create New Project

Save in: ADC_example

File name: ADC_example

Save as type: Project Files (*.ewp)

Figure 3-41 Save project

5) Right click on project name in Workspace window, select *Add->Add Group.*

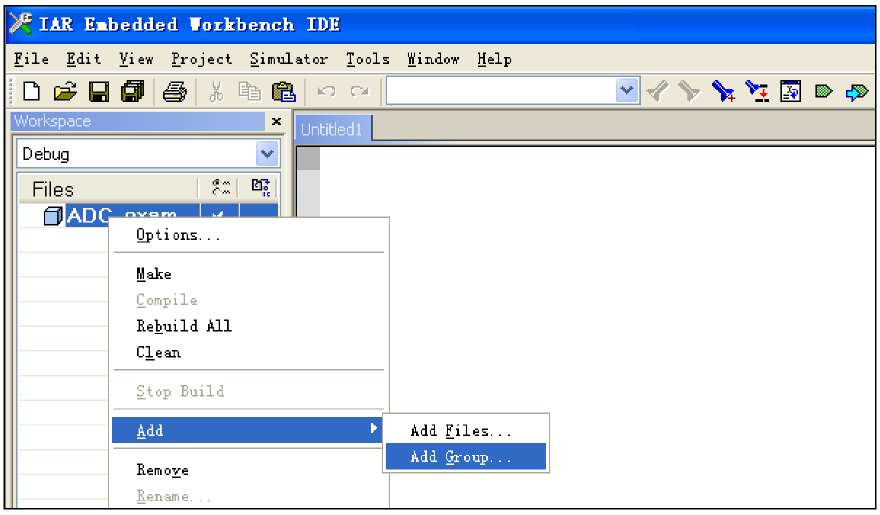


Figure 3-42 Add Group

6) Then a dialog box of “Add Group – ADC_example” will be opened. Enter Group name in as shown below:

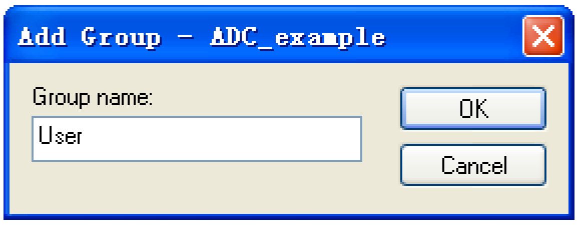


Figure 3-43 Add new group

7) Create 5 groups as shown: CMSIS, EWARM, STM32F2xxStdPeriph_Driver, User and STM32_EVAL. As shown below:

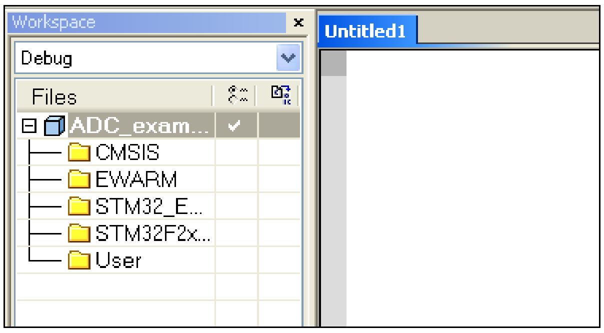


Figure 3-44 Finish groups adding

8) Add files to groups.

Right Click on group of User, select *Add->Add Files.*

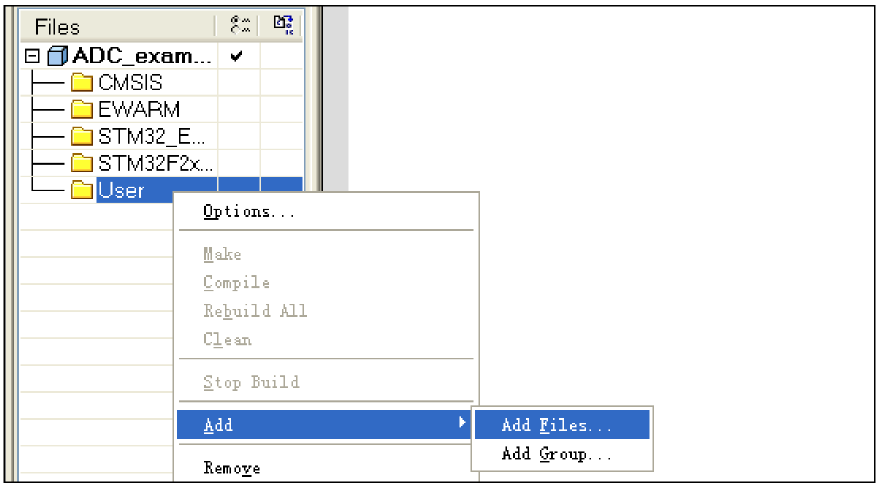
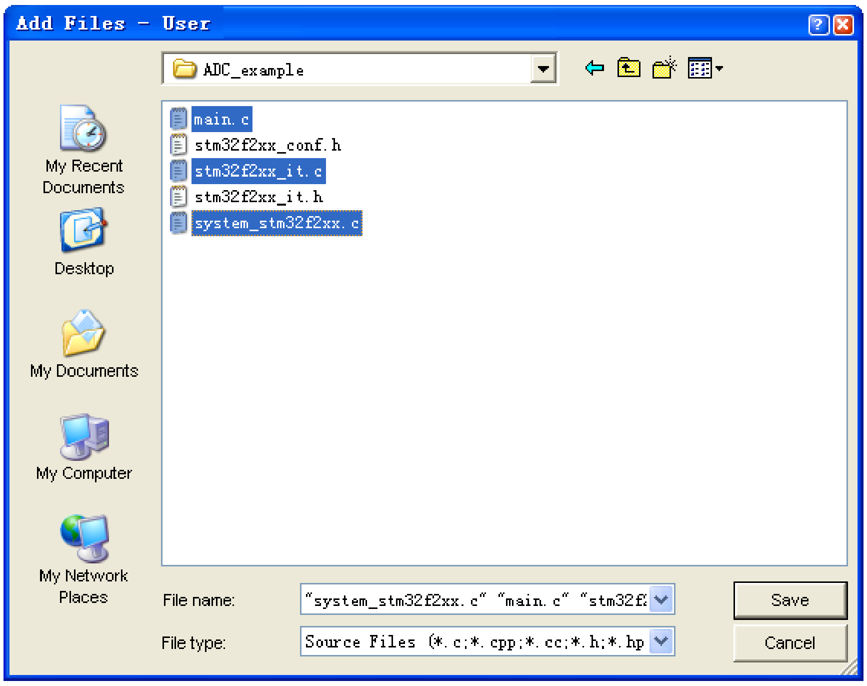


Figure 3-45 Add files to group



main.c
stm32f2xx_conf.h
stm32f2xx_it.c
stm32f2xx_it.h
system_stm32f2xx.c

File name: "system_stm32f2xx.c" "main.c" "stm32f2

File type: Source Files (*.c;*.cpp;*.cc;*.h;*.hp

Figure 3-46 Add selected files to group

9) Add files to the group of CMSIS, STM32F2xxStdPeriph_Driver, STM32_EVAL, User, EWARM same as done in step 8).

The files need to be added to group CMSIS are located in

```
\code\STM32F2xx_StdPeriph_Demo\Libraries\CMSIS\CM3\CoreSupport
```

Note: Only core_cm3.c need to be added to group of CMSIS.

The files need to be added to group of STM32F2xxStdPeriph_Driver are located in

```
\code\STM32F2xx_StdPeriph_Demo\Libraries\STM32F2xx_StdPeriph_Driver\src
```

Note: Only some files need to be added. If unsure which file should be added,

all files can be added. However, it will increase compile time and code size.

The files need to be added to group STM32_EVAL are located in

\code\STM32F2xx_StdPeriph_Demo\Utilities\STM32_EVAL\STM322xG_EVAL

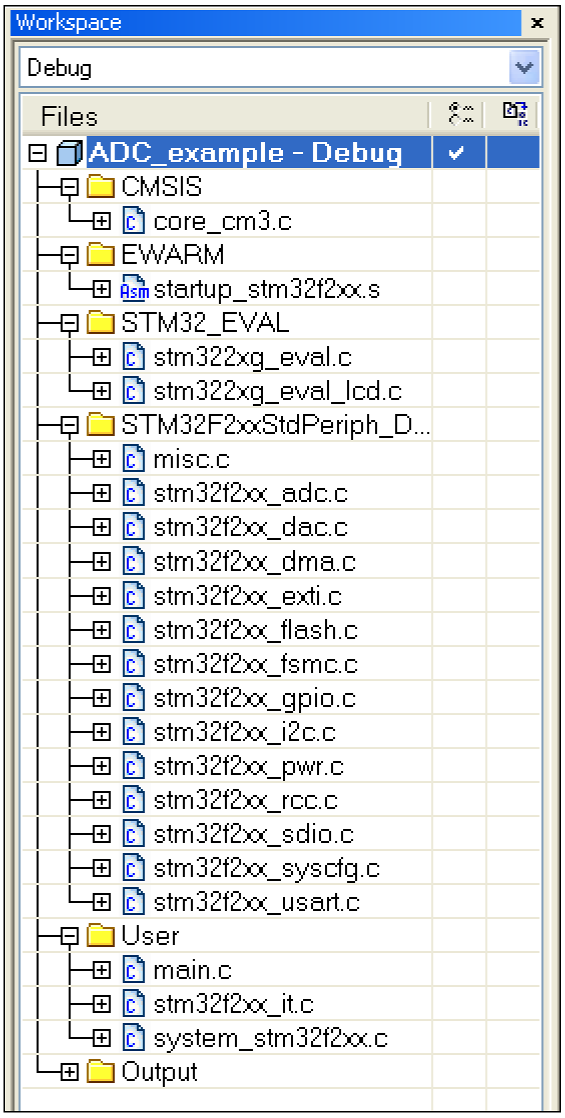
Note: Only stm322xg_eval.c and stm322xg_eval_lcd.c need to be added to group of STM32_EVAL in this example.

The files need to be added to group MDK-ARM are located in

\code\STM32F2xx_StdPeriph_Demo\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx\startup\arm

Note: Only startup_stm32f2xx.s need to be added to group of MDK-ARM.

As the figure shown below, required source flies have been added to the groups.

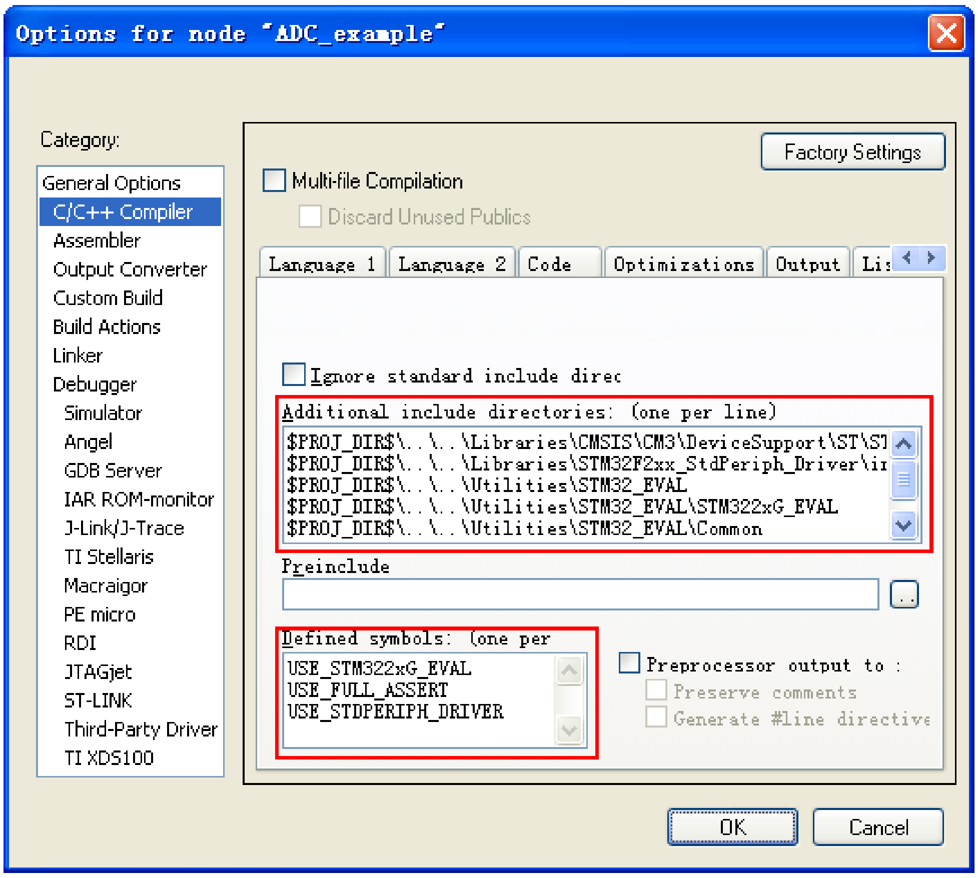


```
Workspace
Debug
Files
ADC_example - Debug ✓
├ CMSIS
│ └ core_cm3.c
├ EWARM
│ └ startup_stm32f2xx.s
├ STM32_EVAL
│ ├ stm322xg_eval.c
│ └ stm322xg_eval_lcd.c
├ STM32F2xxStdPeriph_D...
│ ├ misc.c
│ ├ stm32f2xx_adc.c
│ ├ stm32f2xx_dac.c
│ ├ stm32f2xx_dma.c
│ ├ stm32f2xx_exti.c
│ ├ stm32f2xx_flash.c
│ ├ stm32f2xx_fsmc.c
│ ├ stm32f2xx_gpio.c
│ ├ stm32f2xx_i2c.c
│ ├ stm32f2xx_pwr.c
│ ├ stm32f2xx_rcc.c
│ ├ stm32f2xx_sdio.c
│ ├ stm32f2xx_syscfg.c
│ └ stm32f2xx_usart.c
├ User
│ ├ main.c
│ ├ stm32f2xx_it.c
│ └ system_stm32f2xx.c
└ Output
```

Figure 3-47 Source flies have been added to groups

10) Set include file paths.

Right click on project name in workspace window, then select *Options->C/C++ Compiler->Preprocessor* and enter the include files paths and define symbols.



Additional include directories: (one per line)

```
$PROJ_DIR$\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\ST
$PROJ_DIR$\..\..\Libraries\STM32F2xx_StdPeriph_Driver\in
$PROJ_DIR$\..\..\Utilities\STM32_EVAL
$PROJ_DIR$\..\..\Utilities\STM32_EVAL\STM322xG_EVAL
$PROJ_DIR$\..\..\Utilities\STM32_EVAL\Common
```

Defined symbols: (one per

```
USE_STM322xG_EVAL
USE_FULL_ASSERT
USE_STDPERIPH_DRIVER
```

Figure 3-48 Set include file paths

The include files' path for this example as below:

```
$PROJ_DIR$\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx
$PROJ_DIR$\..\..\Libraries\STM32F2xx_StdPeriph_Driver\inc
$PROJ_DIR$\..\..\Utilities\STM32_EVAL
$PROJ_DIR$\..\..\Utilities\STM32_EVAL\STM322xG_EVAL
$PROJ_DIR$\..\..\Utilities\STM32_EVAL\Common
$PROJ_DIR$\
```

11) Click OK to finish include paths setup.

12) For the setting of other tabs, please refer to *Building an existing EWARM Project*

3.3 Flash Loader

The STM32F20x and STM32F21xembedded Flash memory can be programmed using incircuit programming or in-application programming.

In-application programming (IAP) can use any communication interface supported by the microcontroller (I/Os, USB, CAN, UART, I2C, SPI,etc.) to download programming data into memory. With IAP, the Flash memory can be reprogrammed while the application is running. Nevertheless, part of the application has to have been previously programmed in the Flash memory using ICP.

The in-circuit programming (ICP) method is used to update the entire contents of the Flash memory, using the JTAG, SWD protocol or the boot loader to load the user application into the microcontroller. ICP offers quick and efficient design iterations and eliminates unnecessary package handling or socketing of devices.

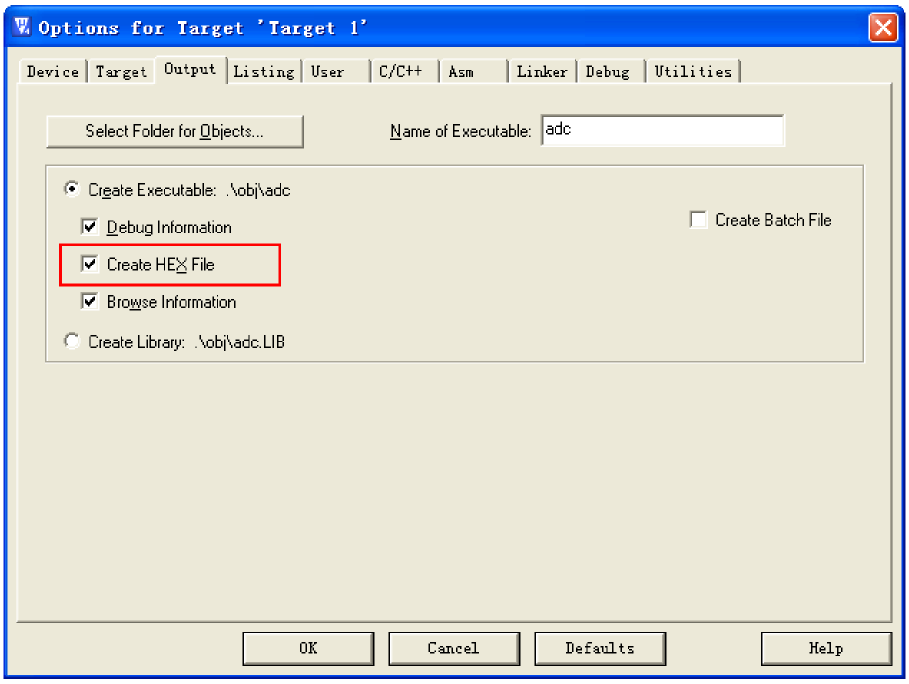
The boot loader is located in system memory. It is used to reprogram the Flash memory by using USART1 (PA9/PA10), USART3 (PC10/PC11), CAN2 (PB5/PB13), USB OTG in Device mode (PA11/PA12) through DFU (device firmware upgrade).

Now we give a description to show how to downloader program to Flash memory using boot loader (through USART3).

In order to test boot loader, please follow these steps:

1) Install *Flash Loader Demonstration* software. The software is located in the folder of *CD-ROM–>Flash_Loader.*
2) Connect a null-modem female/female RS232 cable between the DB9 connector COM1 (USART3) and PC serial port. Make sure that jumpers JP1, JP2, JP7 and JP8 are fitted, JP5, JP6, JP10 and JP11are not fitted.
3) Plug in +5V power supply.
4) Create HEX file with MDK-ARM.

   Open MDK-ARM project, configure *Target Option* and select *Create HEX file*. Rebuild the Project, generate HEX file.


Options for Target 'Target 1'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Select Folder for Objects... Name of Executable: adc

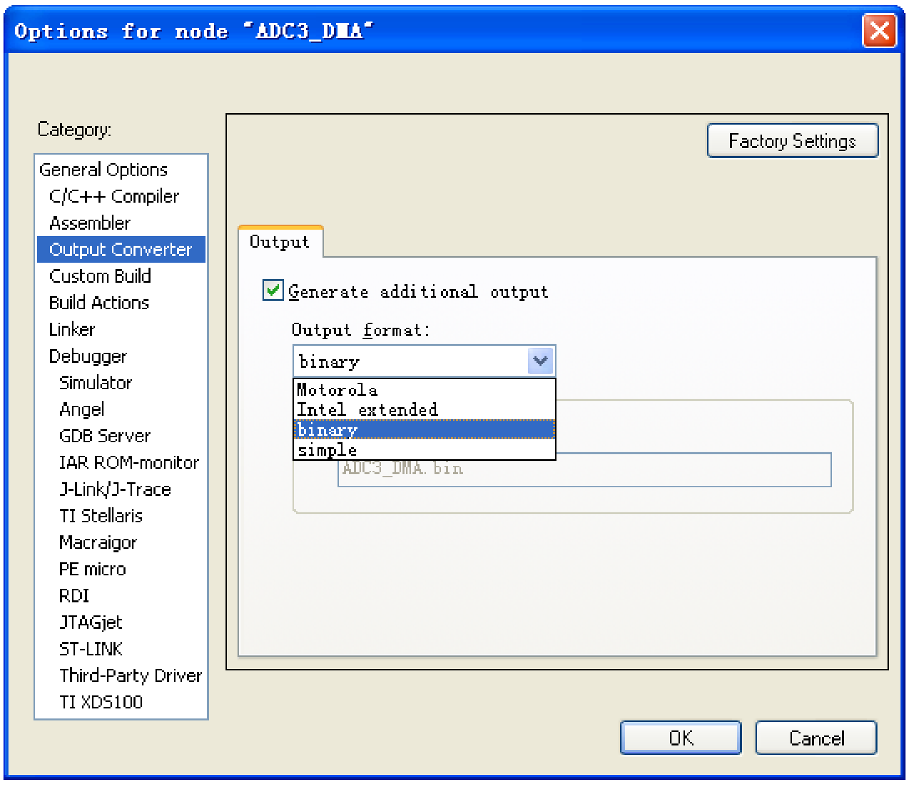
(•) Create Executable: .\obj\adc
[✓] Debug Information
[✓] Create HEX File
[✓] Browse Information
( ) Create Library: .\obj\adc.LIB
[ ] Create Batch File

OK | Cancel | Defaults | Help

Figure 3-49 Configure Target Option

5) Create HEX file or BIN file with IAR EWARM.

Open EWARM project, configure *Options* and select *output format*: Intel extended or binary. Rebuild the Project, generate hex/binary file .


Options for node "ADC3_DMA"

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

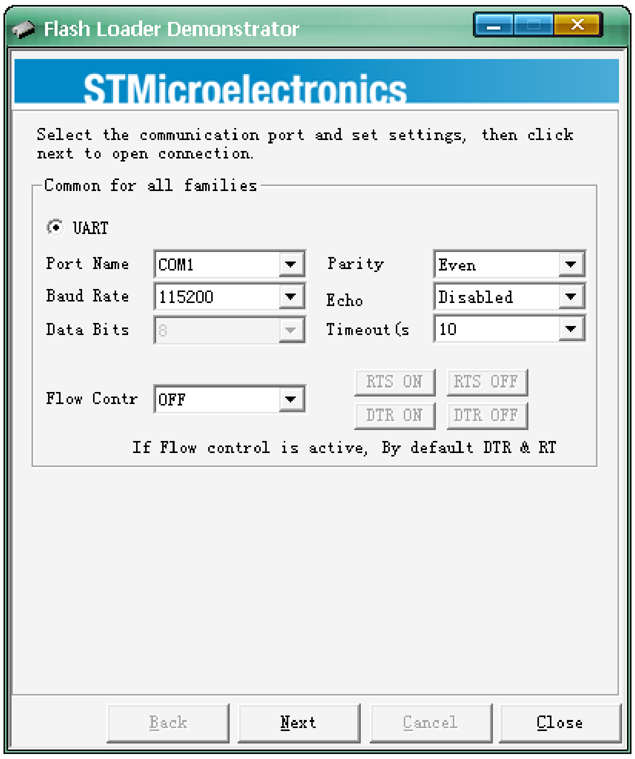
Factory Settings

Output
[✓] Generate additional output
Output format:
binary
Motorola
Intel extended
binary
simple
ADC3_DMA.bin

OK | Cancel

6) Open the Flash Loader software, configure UART.

- Port Name:COM1 (Depending on the serial port that used)
- Parity: Even or Odd
- Baud Rate: 115200
- Echo: Disable
- Data Bits: 8(Default)
- Timeout(s): 10(default)
- Flow: None



Select the communication port and set settings, then click next to open connection.

Common for all families

UART

Port Name: COM1
Parity: Even
Baud Rate: 115200
Echo: Disabled
Data Bits: 8
Timeout (s: 10
Flow Contr: OFF

If Flow control is active, By default DTR & RT

Figure 3-50 Configure UART

7) Press RESET button to reset the MCU.

8) Click on “Next”, as following figure shown.

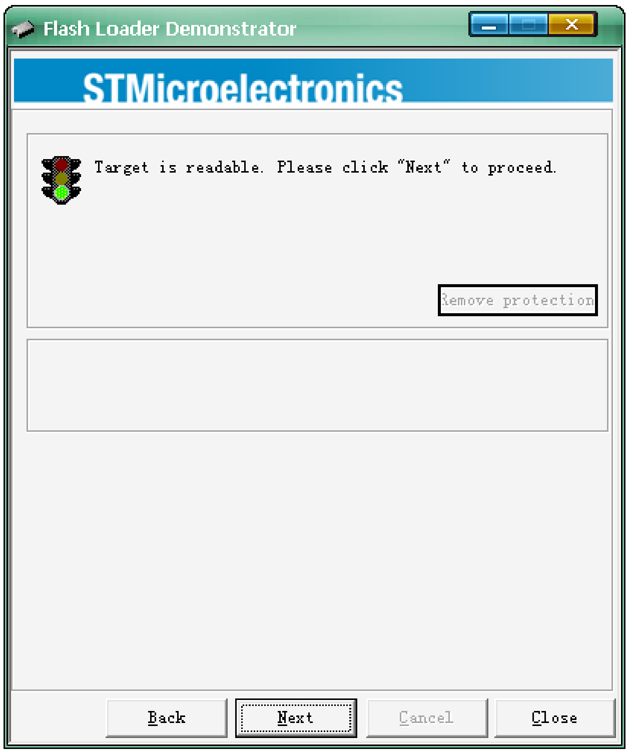
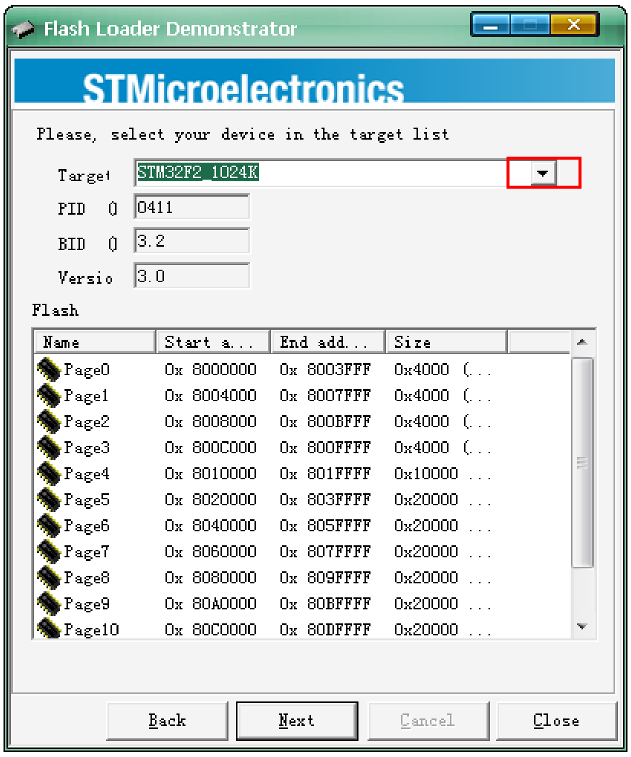

Target is readable. Please click "Next" to proceed.

Figure 3-51 Target is readable

9) Click "Next" and select target MCU model.


Please, select your device in the target list

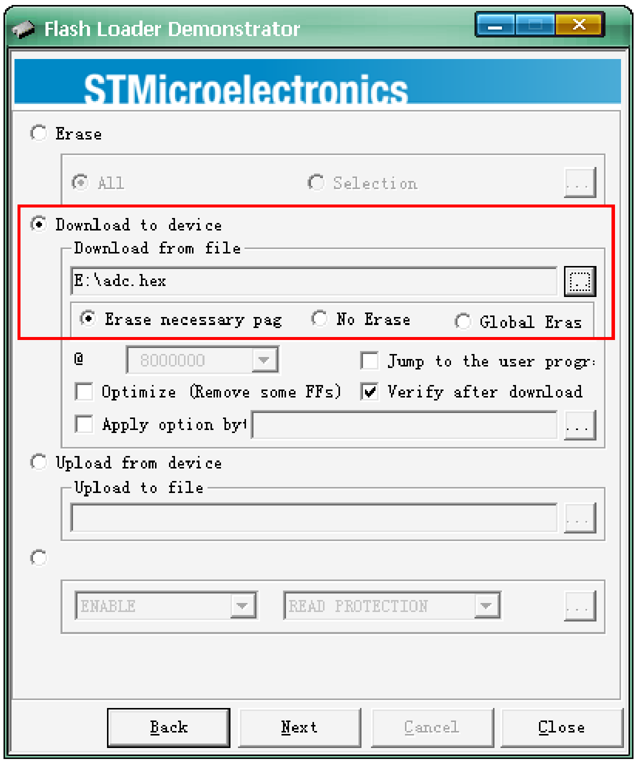
Target: STM32F2_1024K
PID (): 0411
BID (): 3.2
Versio: 3.0

Flash

Name	Start a...	End add...	Size
Page0	0x 8000000	0x 8003FFF	0x4000 (...
Page1	0x 8004000	0x 8007FFF	0x4000 (...
Page2	0x 8008000	0x 800BFFF	0x4000 (...
Page3	0x 800C000	0x 800FFFF	0x4000 (...
Page4	0x 8010000	0x 801FFFF	0x10000 ...
Page5	0x 8020000	0x 803FFFF	0x20000 ...
Page6	0x 8040000	0x 805FFFF	0x20000 ...
Page7	0x 8060000	0x 807FFFF	0x20000 ...
Page8	0x 8080000	0x 809FFFF	0x20000 ...
Page9	0x 80A0000	0x 80BFFFF	0x20000 ...
Page10	0x 80C0000	0x 80DFFFF	0x20000 ...

Figure 3-52 Select MCU model

10) Click "Next", and select the file that crated by step 4) or step 5).



[ ] Erase

[✓ All] [ ] Selection

[✓ Download to device]

Download from file

E:\adc.hex

[✓ Erase necessary pag] [ ] No Erase [ ] Global Eras

@ 8000000

[ ] Jump to the user progr

[ ] Optimize (Remove some FFs)

[✓ Verify after download]

[ ] Apply option byt

[ ] Upload from device

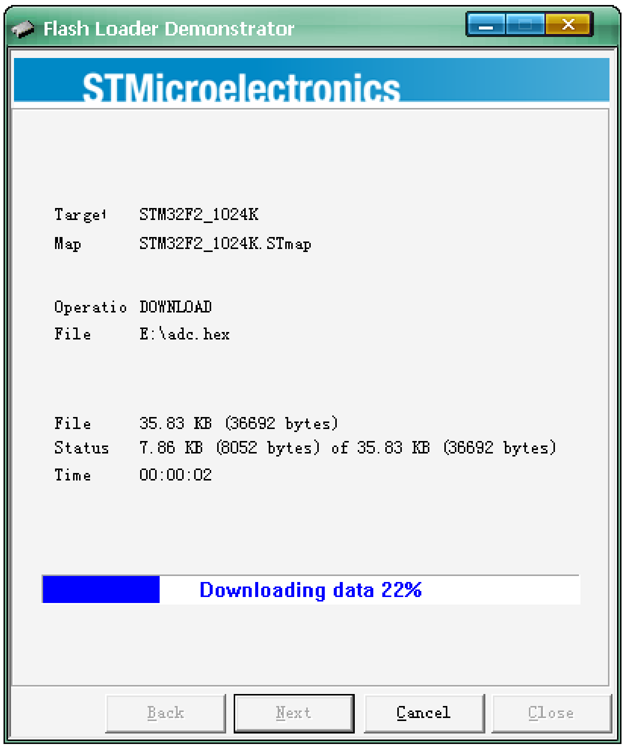
Upload to file

ENABLE

READ PROTECTION

Figure 3-53 Select download file

11) Click “Next” to download the hex file to target device.

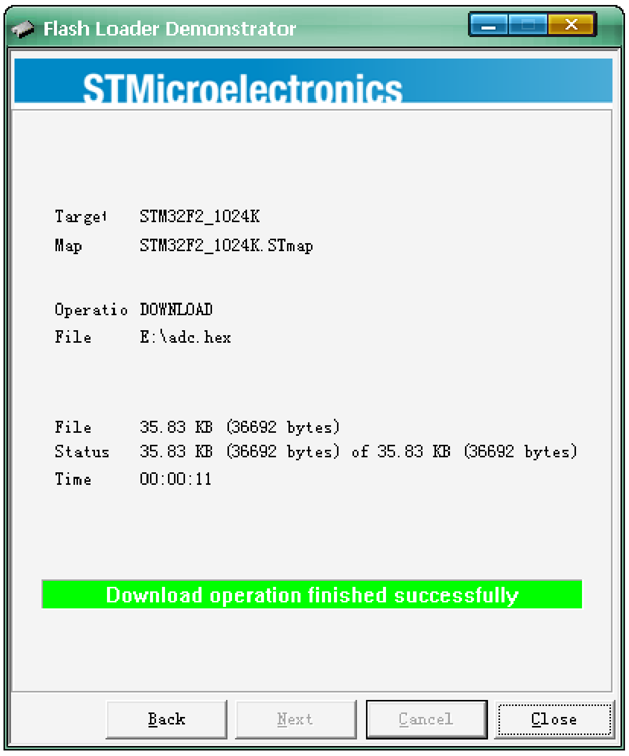


```
Target    STM32F2_1024K
Map       STM32F2_1024K.STmap

Operatio  DOWNLOAD
File      E:\adc.hex


File      35.83 KB (36692 bytes)
Status    7.86 KB (8052 bytes) of 35.83 KB (36692 bytes)
Time      00:00:02
```

Downloading data 22%

Figure 3-54 Start to download

12) Finish downloading and there will be a message as following figure shown



```
Target     STM32F2_1024K
Map        STM32F2_1024K.STmap

Operatio   DOWNLOAD
File       E:\adc.hex


File       35.83 KB (36692 bytes)
Status     35.83 KB (36692 bytes) of 35.83 KB (36692 bytes)
Time       00:00:11
```

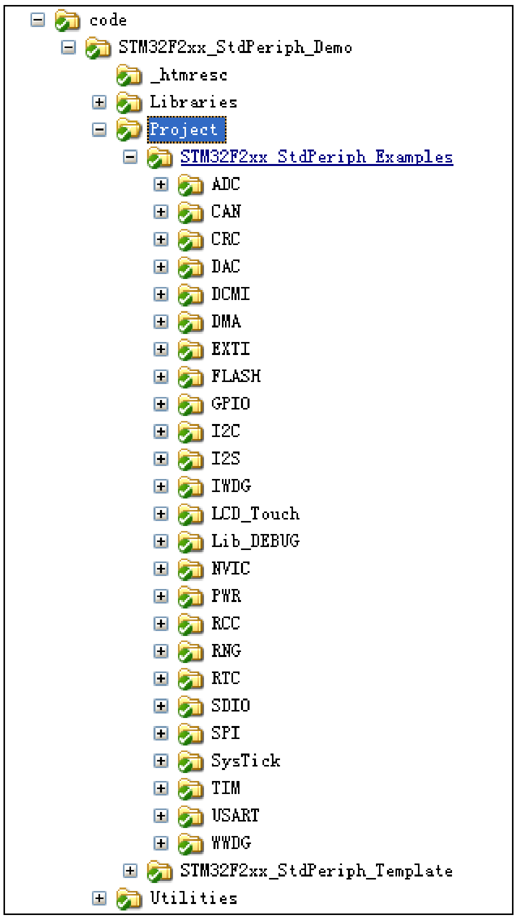
Download operation finished successfully

Figure 3-55 Download operation finished successfully

13) Click “Close”. Remove jumpers from JP1 and JP2. Press RESET key then MCU start to run.

Chapter 4 Peripheral’s Examples

The STM32F2xx Standard Peripherals library provides a rich set of examples covering the main features of each peripheral. Peripheral’s examples are located in the folder *code\STM32F2xx_StdPeriph_Demo\Project\STM32F2xx_StdPeriph_Examples.*



```
code
  STM32F2xx_StdPeriph_Demo
    _htmresc
    Libraries
    Project
      STM32F2xx_StdPeriph_Examples
        ADC
        CAN
        CRC
        DAC
        DCMI
        DMA
        EXTI
        FLASH
        GPIO
        I2C
        I2S
        IWDG
        LCD_Touch
        Lib_DEBUG
        NVIC
        PWR
        RCC
        RNG
        RTC
        SDIO
        SPI
        SysTick
        TIM
        USART
        WWDG
      STM32F2xx_StdPeriph_Template
    Utilities
```

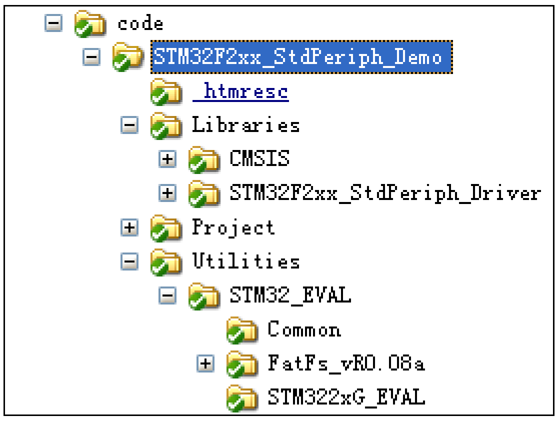
Figure 4-1 Peripheral’s example structure

Source files are provided for each example along with MDK-ARM projects. User can run the selected example on DevKit1207 evaluation board directly. User can also tailor the provided project template to run the selected example using his preferred toolchain.

Some examples may require additional hardware such as an oscilloscope. For further information on the required hardware, please refer to the Readme file provided within each example folder.

4.1 Description of the Standard Peripherals Library

The file structure of the folder *code**STM32F2xx_StdPeriph_Demo,* is shown in figure below.



```
code
  STM32F2xx_StdPeriph_Demo
    _htmresc
    Libraries
      CMSIS
      STM32F2xx_StdPeriph_Driver
    Project
    Utilities
      STM32_EVAL
        Common
        FatFs_vR0.08a
        STM322xG_EVAL
```

Figure 4-2 Standard Peripherals Library structure

4.1.1 Libraries folder

This folder contains the Hardware Abstraction Layer (HAL) for STM32F2xx Devices.

1) CMSIS\CM3 subfolder

This subfolder contains the CoreSupport and DeviceSupport files.

CoreSupport files consist of:

- core_cm3.c and core_cm3.h : Core Peripheral Access Layer, contains name definitions, address definitions and helper functions to access Cortex-M3 core registers and peripherals.

DeviceSupport files consist of:

- startup_stm32f2xx.s: Provides the Cortex-M3 startup code and interrupt vectors for all STM32F2xx device interrupt handlers with MDK-ARM and IAR.
- stm32f2xx.h: this file contains the definitions of all peripheral registers, bits, and memory mapping for STM32F2xx devices. The file is the unique include file used in the application C source code, usually in the main.c.
- system_stm32f2xx.c/.h: This file contains the system clock configuration for STM32F2xx devices. It exports SystemInit() function which sets up the system clock source, PLL multiplier and divider factors, AHB/APBx prescalers and Flash

settings. This function is called at startup just after reset and before connecting to the main program. The call is made inside the startup_stm32f2xx.s file.

2) **STM32F2xx_StdPeriph_Driver subfolder**

This subfolder contains sources of STM32F2xx peripheral drivers (excluding USB and Ethernet).

Each driver consists of a set of routines and data structures covering all peripheral functionalities. The development of each driver is driven by a common API (application programming interface) which standardizes the driver structure, the functions and the parameter names.

Each peripheral has a source code file, stm32f2xx_ppp.c, and a header file, stm32f2xx_ppp.h. The stm32f2xx_ppp.c file contains all the firmware functions required to use the PPP peripheral.

4.1.2 Project folder

This folder contains the source files of the DevKit1207 firmware applications.

1) **Peripheral_Examples subfolder**

This subfolder contains a set of examples for some peripherals with preconfigured projects for EWARM and MDK-ARM toolchains.

2) **STM32F2xx_StdPeriph_Template subfolder**

This subfolder contains a project template that user can get a quick start to run an example.

4.1.3 Utilities folder

This folder contains the abstraction layer for the DevKit1207 hardware and software. It provides the following drivers:

1) **Common**

This files provides text fonts for DevKit1207's LCD driver.

2) **FatFs_vR0.08a**

This file provides FatFs source code. FatFs module is an open source software to implement FAT file system into small embedded systems. This is a free software and is opened for education purpose, research and commercial developments under license policy of following trems.

3) **STM32_EVAL\STM322xG_EVAL**

This file provides:

- set of firmware functions to manage Leds, push-button and COM ports
- low level initialization functions for SD card (on SDIO) and serial EEPROM (sEE) available on DevKit1207 evaluation board from STMicroelectronics.

The Section 4.2～4.23 describes the peripheral firmware examples provided for the DevKit1207 evaluation board.

4.2 GPIO example

The GPIO folder contains two examples:

- IOToggle
- JTAG_Remap

IOToggle example shows how to use the GPIO port bit set/reset registers (BSRRL and BSRRH) for I/O toggling.

JTAG_Remap example provides a short description of how to use the JTAG/SWD IOs as standard GPIOs and gives a configuration sequence.

Let’s see how to toggle GPIO’s using IOToggle example in detail. .

IOToggle example

1) **Purpose**

This example describes how to use BSRRH and BSRRL (Bit Set/Reset Register High and Bit Set/Reset Register Low) for IO toggling. The duration between the ON and OFF states depends on the inserted delay.

2) Description

In this example:

- GPIOC, GPIOG and GPIOD clock is enabled.
- Configure PC7, PG8, PG6 and PD12 in output pushpull mode
- Three kinds of light effect.

When the program is executed, the four LEDs LED1, LED2, LED3 and LED4, which connected to PC7, PG8, PG6 and PD12, are turned ON then OFF in an infinite loop. The duration between the ON and OFF states corresponds to the inserted delay. Use the USER1 and USER2 key to change the direction of LEDs.

Note: There is a simple one to one relationship between LED1～LED4 in software and LED6～LED9 in hardware

4.3 NVIC example

The NVIC folder contains three examples:

- DMA_WFIMode
- IRQ_Priority
- VectorTable_Relocation

DMA_WFIMode example shows how to enter into the system WFI mode by enabling DMA transfer and how to wake-up from this mode using DMA End of Transfer interrupt.

IRQ_Priority example demonstrates the use of the Nested Vectored Interrupt Controller (NVIC).

VectorTable_Relocation example describes how to relocate the CortexM3 vector table into a specific address other than the default Flash memory base address.

Let’s discuss IRQ_Priority example in detail to see how to use NVIC.

IRQ_Priority example

1) Purpose

This example demonstrates the use of the Nested Vectored Interrupt Controller

(NVIC).

2) Description

In this example:

- Configure 2 EXTI Lines (WAKEUP button EXTI Line and USER1 button EXTI Line) to generate an interrupt on each falling edge and to use the SysTick interrupt.
- Using following parameters you can configure the above interrupts:

  - WAKEUP button EXTI Line:

    - PreemptionPriority = PreemptionPriorityValue

    - SubPriority = 0

  - USER1 button EXTI Line:

    - PreemptionPriority = 0

    - SubPriority = 1

  - SysTick Handler:

    - PreemptionPriority = !PreemptionPriorityValue

    - SubPriority = 0

  First, the PreemptionPriorityValue is equal to 0; the WAKEUP button EXTI Line has higher preemption priority than the SysTick handler.

  In the USER1 button EXTI Line interrupt routine the WAKEUP button EXTI Line and SysTick preemption priorities are inverted.

  In the WAKEUP button EXTI Line interrupt routine the pending bit of the SysTick interrupt is set this will cause SysTick ISR to preempt the WAKEUP button EXTI Line ISR only if it has higher preemption priority.

The system behaves as following:

- The first time USER1 button EXTI Line interrupt occurs the SysTick preemption become higher than WAKEUP button EXTI Line one. So when the WAKEUP button EXTI Line interrupt occurs, the SysTick ISR is executed and the PreemptionOccured variable becomes TRUE and the four leds (LED1, LED2, LED3, and LED4) start toggling.

- When the next USER1 button EXTI Line interrupt occurs the SysTick preemption become lower than WAKEUP button EXTI Line one. So when the WAKEUP button EXTI Line interrupt occurs, the PreemptionOccured variable became FALSE and the four leds (LED1, LED2, LED3 and LED4) stop toggling.

This behavior is repeated and performed in an infinite loop.

4.4 EXTI example

The EXTI folder contains one example:

- ➢ EXTI_Example

EXTI_Example

1) Purpose

This example shows how to configure an external interrupt line.

2) Description

In this example:

- EXTI Line0 is connected to PA0 pin
- EXTI Line15 is connected to PG15 pin

After EXTI configuration, a software interrupt is generated on the EXTI0 toggles LED1.

After that, when falling edge is detected on EXTI Line0, LED1 toggles and when falling edge is detected on EXTI Line15, LED2 toggles

4.5 DMA example

The DMA folder contains one example:

- ➢ FLASH_RAM

FLASH_RAM example

1) **Purpose**

This example demonstrates how to use a DMA channel to transfer a word data buffer from FLASH memory to embedded SRAM memory.

2) **Description**

DMA2 Stream0 channel0 is configured to transfer the contents of a 32-word data buffer stored in Flash memory to the reception buffer declared in RAM.

The start of transfer is triggered by software which enables DMA2 Stream0 channel0 memory-to-memory transfer and also enables the source and destination addresses incrementing is also enabled.

The transfer is started by setting the Channel enable bit for DMA2 Stream0 channel0. At the end of the transfer a Transfer Complete interrupt is generated since it is enabled. The Transfer Complete Interrupt pending bit is then cleared.

When the DMA transfer is completed the DMA Stream is disabled by hardware. The main application can check on the Stream Enable status to detect the end of transfer or can also check on the number of remaining transfers which should be equal to 0 at the end of the transfer.

A comparison between the source and destination buffers is done to check that all data have been correctly transferred.

DevKit1207 evaluation board's LEDs can be used to monitor the transfer status:

- LED1 is ON when the program starts.
- LED2 is ON when the configuration phase is done and the transfer is started.
- LED3 is ON when the transfer is complete (into the Transfer Complete interrupt routine)
- LED4 is ON when the comparison result between source buffer and destination buffer is passed.

It is possible to select a different Stream and/or channel for the DMA transfer example by modifying defines values in the file main.h.

Note: Only DMA2 Streams are able to perform Memory-to-Memory transfers.

There are many different options to check for the DMA end of transfer:

- By using DMA Transfer Complete interrupt.
- By using DMA enable state (the DMA stream is disabled by hardware when transfer is complete).
- By using DMA Stream transfer counter value (the counter value is decremented when transfer is ongoing and is equal to 0 at the transfer end).
- By using DMA Transfer Complete flag (polling mode).

In this example methods 1, 2 and 3 are used to identify the DMA end of transfer (user can select between method 2 and 3 by uncommenting relative code in the waiting loop in the main.c file).

4.6 ADC example

The ADC folder contains four examples:

- ADC3_DMA
- DualADC_Interleaved_DMAmode3
- DualADC_RegulSimu_DMAmode1
- TripleADC_Interleaved_DMAmode2

ADC3_DMA example demonstrates how to use the ADC3 and DMA to transfer continuously converted data from ADC3 to memory.

DualADC_Interleaved_DMAmode3 example demonstrates how to use the ADC peripheral to convert a regular channel in Dual interleaved mode using DMA in mode 3 with 5Msps.

DualADC_RegulSimu_DMAmode1 example demonstrates how to use the ADC peripheral to convert regular channels simultaneously in dual mode using DMA in mode 1.

TripleADC_Interleaved_DMAmode2 example demonstrates how to use the ADC peripheral to convert a regular channel in Triple interleaved mode using DMA in mode 2 with 6Msps.

Let’s see how to use ADC with DMA in detail.

ADC3_DMA example

1) **Purpose**

This example shows how to use the ADC3 and DMA to transfer continuously converted data from ADC3 to memory.

2) **Description**

- The ADC3 is configured to convert continuously channel7.
- Each time an end of conversion occurs the DMA transfers, in circular mode, the converted data from ADC3 DR register to the ADC3ConvertedValue variable.
- In this example, the system clock is 120MHz, APB2 =60MHz and ADC clock = APB2 /2.
- Since ADC3 clock is 30 MHz and sampling time is set to 3 cycles, the total conversion time is 0.5 us (2Msps).

The voltage at ADC3 channel 7 can be varied by using the evaluation board potentiometer RV1.The converted voltage is displayed on the evaluation Board LCD (only if the define PRINT_ON_LCD is enabled in main.c file)

4.7 DAC example

The DAC folder contains one example:

- ➢ DAC_SignalsGeneration

1) **Purpose**

This example demonstrates how to use the DAC peripheral to generate several analog signals using DMA controller.

2) **Description**

When the user presses the USER1 push-button, DMA transfers the two selected waveforms to the DAC.

For each press on USER1 button, 2 signals are selected and can be monitored on the two DAC channels:

- Escalator waveform (Channel 1) and Sine waveform (Channel 2).
- Noise waveform (Channel 1) and Triangle waveform (Channel 2).

4.8 USART example

The UASRT folder contains two examples:

- USART_IRDA
- USART_Printf

4.8.1 USART_Printf

1) Purpose

This example shows how to retarget the C library printf function to the USART. This will output the printf message on the Hyperterminal using USART3.

2) Description

The USART3 is configured as below:

- BaudRate = 115200 baud
- Word Length = 8 Bits
- One Stop Bit
- No parity
- Hardware flow control disabled (RTS and CTS signals)
- Receive and transmit enabled

When the program is executed, a message will be printed on the Hyperterminal as follows:

USART Printf Example: retarget the C library printf function to the USART

Try to type a character using keyboard, the character will be sent to DevKit1207 and printed on the Hyperterminal.

Note:

- ***Make sure that jumpers JP7 and JP8 are fitted.***
- ***Connect a null-modem female/female RS232 cable between the DB9***

connector COM1 (USART3) and PC serial port if you want to display data on the Hyper Terminal.

- ***Hyperterminal configuration: Word Length = 8 Bits, One Stop Bit, No parity, BaudRate= 115200 baud,flow control: None***

4.8.2 USART_IRDA

1) Purpose

This example shows how to implement communication between two devices using Infrared Transceiver Module. MCU communicates with Infrared Transceiver Module via USART3.

Note:

- ***This example requires two DevKit1207 evaluation board.***
- ***Make sure that jumpers JP10 and JP11 are fitted.***

2) Description

In this example:

- Infrared Transceiver Module work in simplex mode.

  The program for sender need to be modified as below in main.c file:

  ```
  #define configTYPE      SEND_MODE
  //#define configTYPE    RECV_MODE
  ```

  The program for receiver need to be modified as below in main.c file:

  ```
  //#define configTYPE    SEND_MODE
  #define configTYPE      RECV_MODE
  ```

- The USART3 is configured as follow:

  - BaudRate = 115200 baud
  - Word Length = 8 Bits
  - One Stop Bit
  - No parity
  - Hardware flow control disabled (RTS and CTS signals)

  Receive and transmit enabled

When the program is executed, the sender transmits the data while receiver receives the data with the help of Infrared Transceiver Module. The amount of data sent and received will be displayed on LCD.

4.9 PWR example

The PWR folder contains five examples:

- BOR(Brown out reset)
- CurrentConsumption
- PWR(Programmable voltage detector)
- STANDBY
- STOP

BOR example shows how to configure the programmable BOR thresholds using the FLASH option bytes.

CurrentConsumption example shows how to configure the STM32F2xx system to measure the current consumption in different Low Power Modes.

PVD example shows how to configure the programmable voltage detector using an external interrupt line.

STANDBY example shows how to enter the system into STANDBY mode and wake-up from this mode using external RESET, RTC Alarm A or WKUP pin.

STOP example shows how to enter the system into STOP mode and wake-up from this mode using RTC Wakeup Timer Event connected to EXTI Line 22.

Now let’s see the STANDBY example in detail..

STANDBY example

1) Purpose

This example shows how to enter the system into STANDBY mode and wake-up from this mode using: external RESET, RTC Alarm A or WKUP pin.

2) Description

In the associated software

- The system clock is set to 120 MHz
- The EXTI_Line15 is configured to generate interrupt on falling edge
- The EXTI_Line22 connected internally to the RTC Wakeup event is configured to generate an interrupt on rising edge each 4s
- The SysTick is programmed to generate an interrupt each 250 ms
- In the SysTick interrupt handler, LED2 is toggled; this is used to indicate whether the MCU is in STOP or RUN mode.

When the system enters into STOP mode , it will wait for the RTC Wakeup event to be generated each 4s, or USER1 push button is pressed.

- When MCU wake up from STOP mode due to the RTC WakeUp event (EXTI_Line22), LED1 is toggled.

- If MCU wake up from STOP mode due to the USER1 button (EXTI_Line15), LED4 is toggled.

LEDs are used to monitor the system state as following:

- LED2 toggling: system is in RUN mode
- LED1 toggled: system woken up from STOP mode due to RTC WakeUp Interrupt
- LED4 toggled: system woken up from STOP mode due to EXTI_Line15 (USER1 push button)

This behavior is repeated in an infinite loop.

4.10 RCC example

The RCC folder contains one example:

➢ RCC_Example

RCC_Example

1) Purpose

This example shows how to use (for debug purpose) the RCC_GetClocksFreq function to retrieve the current status and frequencies of different on chip clocks.

2) **Description**

For debug purposes, the RCC_GetClocksFreq() function is used to retrieve the current status and frequencies of different on chip clocks.

This example also handles the High Speed External clock (HSE) failure detection. At the time of the HSE clock failure (broken or disconnected external Quartz); HSE and PLL are disabled (but no change on PLL config), and HSI is selected as a source for system clock source and an interrupt (NMI) is generated. Once the HSE clock recovers, the HSERDY interrupt is generated and the system clock is reconfigured in the RCC ISR routine to its previous state (before HSE clock failure). HSE clock can be monitored at the MCO1 pin (PA8).

Four LEDs are toggled with a timing defined by the Delay function.

4.11 RTC example

The RTC folder contains three examples:

- BKP_Domain
- HW_Calendar
- TimeStamp

BKP_Domain example demonstrates and explains how to use the peripherals available on Backup Domain.

HW_Calendar example demonstrates how to setup the RTC peripheral, in terms of prescaler and interrupts, to be used to keep time and to generate alarm interrupt.

TimeStamp example provides a short description of how to use the RTC peripheral and the Time Stamp feature.

Now let's see how to use RTC peripheral using TimeStamp example.

TimeStamp

1) Purpose

This example shows how to use the RTC peripheral and the Time Stamp feature.

2) Description

One from the following clock can be used as RTC clock source (uncomment the corresponding define in main.c):

- LSE oscillator clock usually delivered by a 32.768 kHz quartz.
- LSI oscillator clock

Note:

- ***Make sure that jumpers JP7 and JP8 are fitted.***
- ***Connect a null-modem female/female RS232 cable between the DB9 connector COM1 (USART3) and PC serial port if you want to display data on the Hyper Terminal.***
- ***Hyperterminal configuration: Word Length = 8 Bits, One Stop Bit, No parity, BaudRate= 115200 baud,flow control: None***

The program behaves as follows:

- After startup the program checks the backup data register 0 value:
  - BKP_DR0 value not correct: (RTC_BKP_DR0 value is not correct or has not yet been programmed when the program is executed for the first time) the RTC is configured and the user is asked to set the time and date (entered on HyperTerminal).
  - BKP_DR0 value correct: this means that the RTC is configured and the time date and timestamp (time and date) are displayed on HyperTerminal.
- When an External Reset occurs the BKP domain is not reset and the RTC configuration is not lost.
- When power on reset occurs:
  - If a battery is connected to the VBAT pin: the BKP domain is not reset and the RTC configuration is not lost.
  - If no battery is connected to the VBAT pin: the BKP domain is reset and the RTC configuration is lost.

- It configures the RTC_AF1 pin TimeStamp to be falling edge and enables the TimeStamp detection.
- On applying a low level on the RTC_AF1 pin (PC.13), the calendar is saved in the time-stamp registers thanks to the timestamp event detection.

The example uses HyperTerminal to configure the RTC clock, display the current time and timestamp registers contents:

- Pressing USER2 push button, the current time and date are saved in RTC TSTR and TSDR registers.
- When pressing WAKEUP push button, the TimeStamp Calendar is cleared.
- When pressing USER1 push button, the current RTC Calendar (Time and date) and RTC TimeStamp Calendar (Time and date) are displayed.

4.12 SysTick example

The SysTick folder contains one example:

➢ SysTick_Example

SysTick_Example

1) Purpose

This example shows how to configure the SysTick to generate a time base equal to 1 ms. The system clock is set to 120 MHz, and the SysTick is clocked by the AHB clock (HCLK).

2) Description

In this example:

- The system tick timer is initialized.
- The system tick timer interrupt is enabled in the NVIC.
- The system tick timer/counter starts in free running mode to generate periodical interrupts.
- The system tick timer interrupt is triggered every 1 ms.
- A Delay function is implemented based on the system tick timer end-of-count

event.

The four LEDs LED1, LED2, LED3 and LED4 are toggled with a timing defined by the Delay function.

4.13 TIM example

The TIM folder contains a set of examples:

Table 4-1 TIM example

TIM	6Steps	This example shows how to configure the TIM1 peripheral to generate 6 Steps.
	InputCapture	This example shows how to use the TIM peripheral to measure the frequency of an external signal.
	OCActive	This example shows how to configure the TIM peripheral to generate four different signals with four different delays
	OCInactive	This example shows how to configure the TIM peripheral in Output Compare Inactive mode with the corresponding Interrupt requests for each channel.
	OCToggle	This example shows how to configure the TIM3 peripheral to generate four different signals with four different frequencies.
	OnePulse	This example shows how to use the TIM peripheral to generate a One pulse Mode after a Rising edge of an external signal is received at Timer Input pin.
	Parallel_Synchro	This example shows how to synchronize TIM peripherals in parallel mode.
	PWM_Input	This example shows how to use the TIM peripheral to measure the frequency and duty cycle of an external signal.
	PWM_Output	This example shows how to configure the TIM

TIM		peripheral in PWM (Pulse Width Modulation) mode.
	TIM1_Synchro	This example shows how to synchronize TIM1 and Timers (TIM3 and TIM4) in parallel mode.
	TIM9_OCToggle	This example shows how to configure the TIM9 peripheral to generate four different signals with four different frequencies.
	TIM10_PWMOutput	This example shows how to configure the TIM peripheral in PWM (Pulse Width Modulation) mode.
	TimeBase	This example shows how to configure the TIM peripheral in Output Compare Timing mode with the corresponding Interrupt requests for each channel in order to generate 4 different time bases.

Now let's discuss about PWM_Output example and TimeBase example to understand how to use TIM peripheral.

4.13.1 PWM_Output example

1) Purpose

This example shows how to configure the TIM peripheral in PWM (Pulse Width Modulation) mode.

2) Description

The TIM3CLK frequency is set to SystemCoreClock / 2 (Hz), to get TIM3 counter clock at 20 MHz the Prescaler is computed as following:

- Prescaler = (TIM3CLK / TIM3 counter clock) - 1
- SystemCoreClock is set to 120 MHz for STM32F2xx Devices RevA, RevZ and RevB.
- The TIM3 is running at 30 KHz:

  TIM3 Frequency = TIM3 counter clock/ (ARR + 1) = 20 MHz / 666 = 30 KHz
- The TIM3 CCR1 register value is equal to 333, so the TIM3 Channel 1 generates a PWM signal with a frequency equal to 30 KHz and a duty cycle equal to 50%:

TIM3 Channel1 duty cycle = (TIM3_CCR1/ TIM3_ARR + 1)* 100 % = 50%

- The TIM3 CCR2 register value is equal to 249, so the TIM3 Channel 2 generates a PWM signal with a frequency equal to 30 KHz and a duty cycle equal to 37.5%:

  TIM3 Channel2 duty cycle = (TIM3_CCR2/ TIM3_ARR + 1)* 100 % = 37.5%

- The TIM3 CCR3 register value is equal to 166, so the TIM3 Channel 3 generates a PWM signal with a frequency equal to 30 KHz and a duty cycle equal to 25%:

  TIM3 Channel3 duty cycle = (TIM3_CCR3/ TIM3_ARR + 1)* 100 % = 25%

- The TIM3 CCR4 register value is equal to 83, so the TIM3 Channel 4 generates a PWM signal with a frequency equal to 30 KHz and a duty cycle equal to 12.5%:

  TIM3 Channel4 duty cycle = (TIM3_CCR4/ TIM3_ARR + 1)* 100 % = 12.5%

The PWM waveform can be displayed using an oscilloscope.

4.13.2 TimeBase

1) Purpose

This example shows how to configure the TIM peripheral in Output Compare Timing mode with the corresponding Interrupt requests for each channel in order to generate 4 different time bases.

2) Description

The TIM3CLK frequency is set to SystemCoreClock / 2 (Hz), to get TIM3 counter clock at 6 MHz.

- The Prescaler is computed as following:

  Prescaler = (TIM3CLK / TIM3 counter clock) - 1

- SystemCoreClock is set to 120MHz for STM32F2xx Devices RevA, RevZ and RevB.

- The TIM3 CC1 register value is equal to 40961

  CC1 update rate = TIM3 counter clock / CCR1_Val = 146.48 Hz, so the TIM3 Channel 1 generates an interrupt each 6.8ms

- The TIM3 CC2 register is equal to 27309

  CC2 update rate = TIM3 counter clock / CCR2_Val = 219.7 Hz, so the

TIM3 Channel 2 generates an interrupt each 4.55ms

- The TIM3 CC3 register is equal to 13654

  CC3 update rate = TIM3 counter clock / CCR3_Val = 439.40Hz, so the TIM3 Channel 3 generates an interrupt each 2.27ms
- The TIM3 CC4 register is equal to 6826

  CC4 update rate = TIM3 counter clock / CCR4_Val = 878.9 Hz, so the TIM3 Channel 4 generates an interrupt each 1.13ms.

When the counter value reaches the Output compare registers values, the Output Compare interrupts are generated and, in the handler routine, 4 pins(PC.07, PG.08, PG.06, and PD.12) are toggled with the following frequencies:

- PC.07: 73.24Hz (CC1)
- PG.08: 109.8Hz (CC2)
- PG.06: 219.7Hz (CC3)
- PD.12: 439.4Hz (CC4)

4.14 IWDG example

The IWDG folder contains one example:

➢ IWDG_Example

IWDG_Example

1) Purpose

This example shows how to update at regular period the IWDG reload counter and how to simulate a software fault generating an MCU IWDG reset on expiry of a programmed time period.

2) Description

In this example:

- The IWDG timeout is set to 250 ms (the timeout may vary due to LSI frequency dispersion).
- The TIM5 timer is configured to measure the LSI frequency as the LSI is

internally connected to TIM5 CH4, in order to adjust the IWDG clock.

- The IWDG reload counter is configured to obtain 250 ms according to the measured LSI frequency. The IWDG reload counter is refreshed each 240 ms in the main program infinite loop to prevent a IWDG reset. LED2 is also toggled each 240 ms indicating that the program is running.
- An EXTI Line is connected to a GPIO pin, and configured to generate an interrupt on the rising edge of the signal.
- The EXTI Line is used to simulate a software failure: once the EXTI Line event occurs, by pressing the USER1 push-button, the corresponding interrupt is served.
  In the ISR, a write to invalid address generates a Hardfault exception containing an infinite loop and preventing to return to main program (the IWDG reload counter is not refreshed).As a result, when the IWDG counter reaches 00h, the IWDG reset occurs.

When the program is executed, If the IWDG reset is generated, after the system resumes from reset, LED1 turns on. If the EXTI Line event does not occur, the IWDG counter is indefinitely refreshed in the main program infinite loop, and there is no IWDG reset.

4.15 WWDG example

The WWDG folder contains one example:

- ➢ WWDG_Example

WWDG_Example

1) **Purpose**

   This example shows how to update at regular period the WWDG counter and how to simulate a software fault generating an MCU WWDG reset on expiry of a programmed time period.

2) **Description**

- The WWDG timeout is set to 69.9 ms and the refresh window is set to 80.
- The WWDG counter is refreshed each 50ms in the main program infinite loop to prevent a WWDG reset.LED2 is also toggled each 53 ms indicating that the program is running.
- An EXTI Line is connected to a GPIO pin, and configured to generate an interrupt on the rising edge of the signal.
- The EXTI Line is used to simulate a software failure: once the EXTI Line event occurs, by pressing the USER1 push-button, the corresponding interrupt is served.

  In the ISR, a write to invalid address generates a Hardfault exception containing an infinite loop and preventing to return to main program (the WWDG counter is not refreshed).As a result, when the WWDG counter falls to 63, the WWDG reset occurs.

When the program is executed, if the WWDG reset is generated, after the system resumes from reset, LED1 turns on. If the EXTI Line event does not occur, the WWDG counter is indefinitely refreshed in the main program infinite loop, and there is no WWDG reset.

4.16 CAN example

The CAN folder contains two examples:

- LoopBack
- Networking

LoopBack example provides a description of how to set a communication with the CAN in loopback mode.

Networking example shows how to configure the CAN peripheral to send and receive CAN frames in normal mode. The sent frames are used to control Leds by pressing key push button.

Now let’s discuss Networking example in detail to show how to use CAN peripheral.

Networking example

1) Purpose

This example shows how to configure the CAN peripheral to send and receive CAN frames in normal mode. The sent frames are used to control Leds by pressing key push button.

2) Description

The CAN serial communication link is a bus to which a number of units may be connected. This number has no theoretical limit. Practically the total number of units will be limited by delay times and/or electrical loads on the bus line.

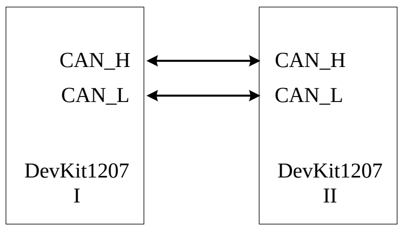
This program behaves as follows:

- After reset LED1 is ON.
- By Pressing on USER1 Button : LED2 turns ON and all other LEDs are OFF, on the N evaluation boards connected to the bus.
- Press on USER1 Button again to send CAN Frame to command LEDn+1 ON, all other Leds are OFF on the N evaluation boards.

This example is tested with a bus of 3 units. The same program example is loaded in all units to send and receive frames. Any unit in the CAN bus may play the role of sender (by pressing USER1 button) or receiver.

Note:

- ***Make sure that JP9 is fitted.***
- ***It requires two evaluation boards.***
- ***Use cable to connect two evaluation boards. As shown in figure below:***



4.17 FLASH example

The FLASH folder contains two examples:

- Program
- Write_Protection

Program example provides a description of how to program the STM32F2xx FLASH.

Write_Protection example provides a description of how to enable and disable the write protection for the STM32F2xx FLASH.

Now let's discuss Program example in detail to show how to use FLASH.

Program example

1) **Purpose**

   This example provides a description of how to program the STM32F2xx FLASH.

2) **Description**

   In this example:

   - After Reset, the Flash memory Program/Erase Controller is locked. To unlock it, the FLASH_Unlock function is used.
   - Before programming the desired addresses, an erase operation is performed using the flash erase sector feature. The erase procedure starts with the calculation of the number of sector to be used. Then all these sectors will be erased one by one by calling FLASH_EraseSector function.
   - Once this operation is finished, the programming operation will be performed by using the FLASH_ProgramWord function. The written data is then checked and the result of the programming operation is stored into the MemoryProgramStatus variable.

4.18 I2C example

The I2C folder contains two examples:

- EEPROM
- GSensor-LIS33DE

4.18.1 EEPROM

1) Purpose

This firmware provides a basic example of how to use the I2C firmware library and an associate I2C EEPROM driver to communicate with an I2C EEPROM device (here the example is interfacing with AT24C02 EEPROM)

2) Description

I2C peripheral is configured in Master transmitter during write operation and in Master receiver during read operation from I2C EEPROM.

The peripheral used is I2C1 but can be configured by modifying the defines values in stm322xg_eval.h file. The speed is set to 100kHz and can be configured by modifying the relative define in stm322xg_eval_i2c_ee.h file.

For AT24C02 devices all the memory is accessible through the two-bytes addressing mode and need to define block addresses. In this case, only the physical address has to be defined (according to the address pins (E0,E1 and E2) connection).

This address is defined in stm322xg_eval_i2c_ee.h (default is 0xA0: E0, E1 and E2 tied to ground).

The EEPROM addresses where the program start the write and the read operations is defined in the main.c file.

The program behaves as follows:

- First, the content of Tx1_Buffer is written to the EEPROM_WriteAddress1 and the written data are read. The written and the read buffers data are then compared. Following the read operation, the program waits that the EEPROM reverts to its Standby state.
- A second write operation is, then, performed and this time, Tx2_Buffer is written

to EEPROM_WriteAddress2, which represents the address just after the last written one in the first write.

- After completion of the second write operation, the written data are read. The contents of the written and the read buffers are compared.

All transfers are managed in DMA mode (except when 1-byte read/write operation is required). Once sEE_ReadBuffer() or sEE_WriteBuffer() function is called, the user application may perform other tasks in parallel while Read/Write operation is managed by DMA.

This example provides the option to use the DevKit1207 LCD screen for messages display (transfer status: Ongoing, PASSED, FAILED).To enable this option, user need to uncomment the define ENABLE_LCD_MSG_DISPLAY in the main.c file.

4.18.2 GSensor-LIS33DE

1) **Purpose**

This example shows how to configure the MEMS accelerometer to detect acceleration on X/Y/Z axes.

Note:

- ***Make sure that jumpers JP7 and JP8 are fitted.***
- ***Connect a null-modem female/female RS232 cable between the DB9 connector COM1 (USART3) and PC serial port if you want to display data on the Hyper Terminal.***
- ***Hyperterminal configuration:Word Length = 8 Bits, One Stop Bit, No parity, BaudRate= 115200 baud,flow control: None***

2) **Description**

After startup, the program checks for the G-Sensor (MEMS accelerometer) status registers and behaves as follows:

- If the board is moved as shown below, the acceleration is detected on the X/Y/Z axis.

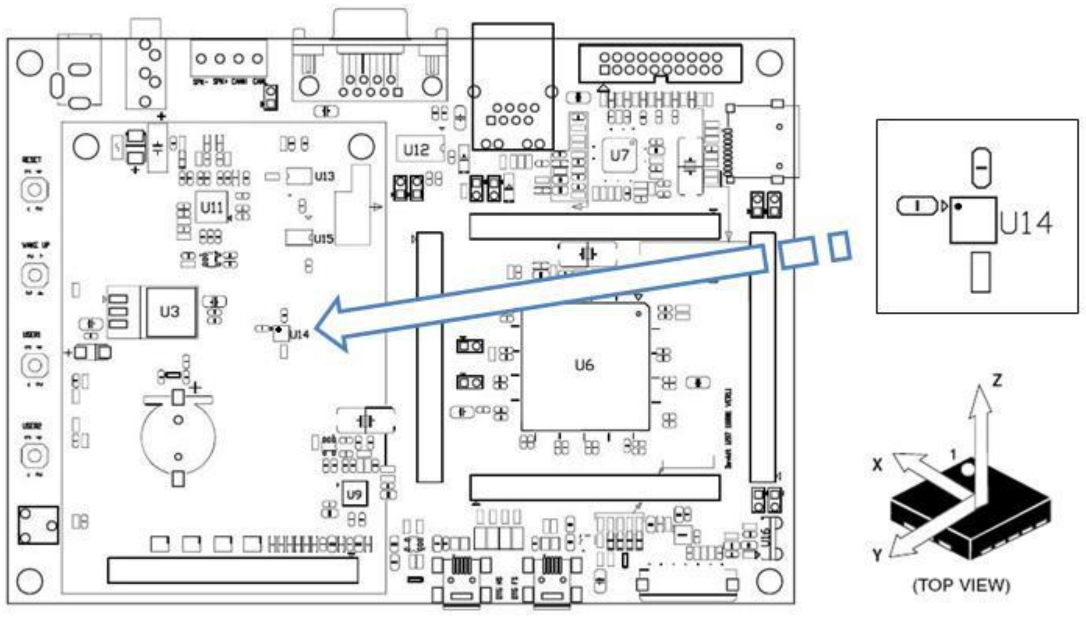


Figure 4-3 Direction of LIS33DE

- The values of X/Y/Z axis are printed on Hyperterminal using USART3.

All transfers are managed in DMA mode.

4.19 I2S example

The I2S folder contains one example:

- ➢ Audio

Audio example

1) Purpose

This example demonstrates the basic of audio features. It allows playing an audio file through the I2S peripheral and using the external codec implemented on the DevKit1207 board.

2) Description

In this example the I2S input clock, provided by a dedicated PLL (PLLI2S), is configured to have an audio sampling frequency at 48 KHz with Master clock enabled.

This example uses an audio codec driver which consists of three independent layers:

- Codec Hardware layer: which controls and communicates with the audio codec

(CS42L52) implemented on the evaluation board.

- MAL (Media Access Layer): which controls and interfaces with storage media storing or providing the audio file/stream.
- The high layer: which implements overall control and interfacing API allowing to perform basic audio operations (Init, Play, Pause, Resume, Stop, Volume control and audio file pointer management)

In this example the audio file is stored in the internal flash memory (Stereo, 16-bit, 48 KHz). The analog output device is automatically detected (Speaker or Headphone) when the Headphone is plugged/unplugged in/from the audio jack of the evaluation board. The example also manages information display and control interface through push buttons:

- When the application is Playing audio file:
  + USER1 : Pause
  + USER2: Volume UP
  + Wakeup: Volume DOWN
- When the application is Paused:
  + USER1 : Play
  + USER2: Switch output target to Headphone
  + Wakeup: Switch output target to Speaker

Note: User needs to prepare a Speaker (0.25W/8Ω) and connect it to CON5.

4.20 SDIO example

The SDIO folder contains one example:

- uSDCard

uSDCard example

1) Purpose

This example shows a basic example of how to use the SDIO firmware library and an associate driver to perform read/write operations on the SD Card memory (SD Card

V1.0, V1.1, V2.0 and SDHC (High Capacity) protocol) that could be mounted on the board. This example also migrate the FatFs-R0.08a file system.

2) Description

The example provides different SD Card transfer states and operations. Steps involved in this process are given below:

- The SDIO peripheral and SD Card are initialized using the SD_Init() function.
- SD Card Erase Operation
- SD Card Single Block Operation
- SD Card Multiple Block Operation
- Starts a Multiple Write operation: Write a multi Blocks using the SD_Write MultiBlocks() function.
- Read a multiple Blocks using the SD_ReadMultiBlocks() function
- Compare the written Blocks and the read one: check if the TransferStatus2 variable is equal to PASSED.

The program behaves as follows:

- Check the Micro SD (TF) card is mounted or not.
- Open message.txt test if the file exit.
- Create a new Hello.txt
- Read Hello.txt create in previous step
- Open the root directory

All data transfers are made by DMA. At each operation, the SD Card presence and status is checked using the SD_GetStatus() function and a global variable "Status" storing the results of the last operation. LCD will display the status when each operation finish.

4.21 LCD_Touch example

The LCD_Touch folder contains one example:

➢ STMPE811QTR

STMPE811QTR example

1) **Purpose**

This example shows how to do LCD touch screen calibration.

2) **Description**

In this example, four points on the corner of touch screen need to be touch to complete calibration.

The program behaves as follows:

- Click calibration points accurately using a touch pen.
- LCD will give massage whether calibration is OK. If calibration is OK, then MCU will enter into Calibration_Test_Dispose function.
- In this function LCD will display the value of points touch by the pen. Both ADC values and coordinate values are displayed.

Note: User should click calibration points in order.

4.22 CRC example

The CRC folder contains one example:

- CRC_Example

CRC_Example

1) **Purpose**

This example shows how to use CRC (cyclic redundancy check) calculation unit to get a CRC code of a given buffer of data word(32-bit), based on a fixed generator polynomial(0x4C11DB7).

2) **Description**

The CRC (cyclic redundancy check) calculation unit is used to get a CRC code from a 32-bit data word and a fixed generator polynomial.

In this example, CRC-32 (Ethernet) polynomial is 0x4C11DB7

- X32 + X26 + X23 + X22 + X16 + X12 + X11 + X10 +X8 + X7 + X5 + X4 +X2+X+1

4.23 RNG_Touch example

The RNG folder contains one example:

- ➢ RNG_MultiRNG

1) Purpose

This example shows how to use the RNG peripheral to generate Random 32bit numbers.

2) Description

In this example, an interactive human interface is developed to allow user to display 8 (arbitrary value, which can be updated by user) random 32bit numbers using the evaluation board LCD and/or USART (COM1) with PC HyperTerminal. Numbers can be displayed on LCD and/or PC Hyperteminal by using PRINT_ON_LCD and PRINT_ON_USART defined in main.c file.

After startup, user is asked to press USER1 button.The 8 Random 32bit numbers are displayed as soon as the USER1 button is pressed.

Note:

- ***Make sure that jumpers JP7 and JP8 are fitted.***
- ***Connect a null-modem female/female RS232 cable between the DB9 connector COM1 (USART3) and PC serial port if you want to display data on the Hyper Terminal.***
- ***Hyperterminal configuration:Word Length = 8 Bits, One Stop Bit, No parity, BaudRate= 115200 baud,flow control: None***

4.24 Lib_DEBUG example

The Lib_DEBUG folder contains one example:

1) Purpose

This example demonstrates how to declare a dynamic peripherals pointers used for Debug mode.

2) Description

To use Debug mode, user have to add the stm32f2xx_ip_dbg.c file to your application. This creates a pointer to the peripheral structure in SRAM. Debugging consequently becomes easier and all register settings can be obtained by dumping a peripheral variable.

When the "USE_FULL_ASSERT" label is uncommented (in stm32f2xx_conf.h file), the assert_param macro is expanded and run-time checking is enabled in the firmware library code. The run-time checking allows checking that all the library functions input value lies within the parameter allowed values.

The associated program simulates wrong parameter passed to library function and the source of the error is printed on Hyperterminal (through USART).

Note:

- ***Make sure that jumpers JP7 and JP8 are fitted.***
- ***Connect a null-modem female/female RS232 cable between the DB9 connector COM1 (USART3) and PC serial port if you want to display data on the Hyper Terminal.***
- ***Hyperterminal configuration:Word Length = 8 Bits, One Stop Bit, No parity, BaudRate= 115200 baud,flow control: None***

Chapter 5 Ethernet Demonstration

5.1 Description of Ethernet Demonstration

STM32F2x7xx microcontrollers features a high-quality 10/100 Mbit/s Ethernet peripheral that supports IEEE 1588v2 protocol, both the Media Independent Interface (MII) and Reduced Media Independent Interface (RMII) to interface with the Physical Layer (PHY).

The CD-ROM provides a demonstration built on top of the LwIP (Lightweight IP) TCP/IP stack which is an open source stack intended for embedded devices. This demonstration is located in *\code\STM32F2x7_ETH_LwIP_V1.0.2* folder.

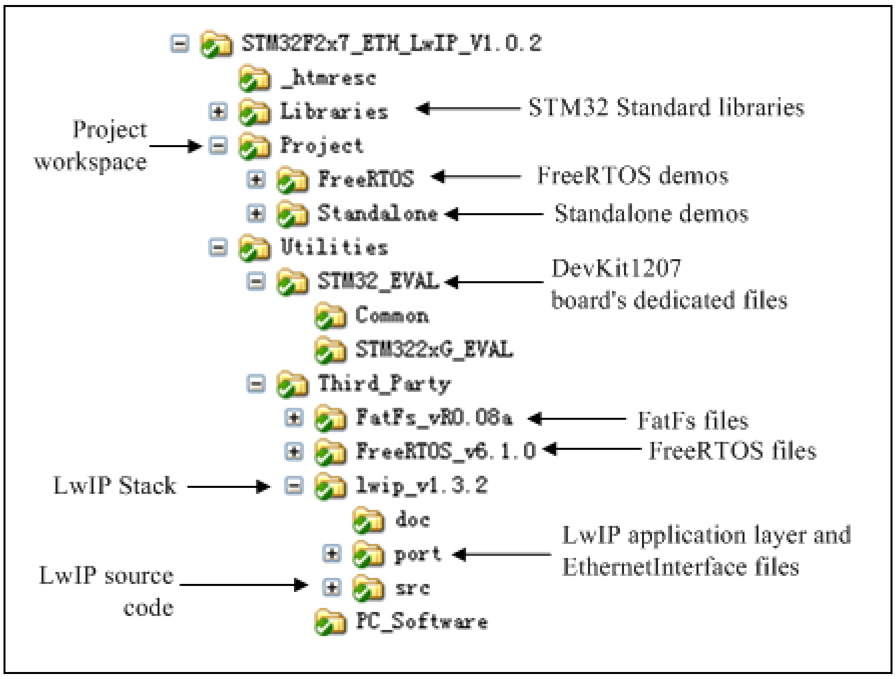


Figure 5-1 Demonstration structure

The demonstration contains nine applications running on top of the LwIP stack.

1) Applications running in standalone mode (without an RTOS):

- A Web server
- A TFTP server
- A TCP echo client application
- A TCP echo server application

- ➢ A UDP echo client application
- ➢ A UDP echo server application

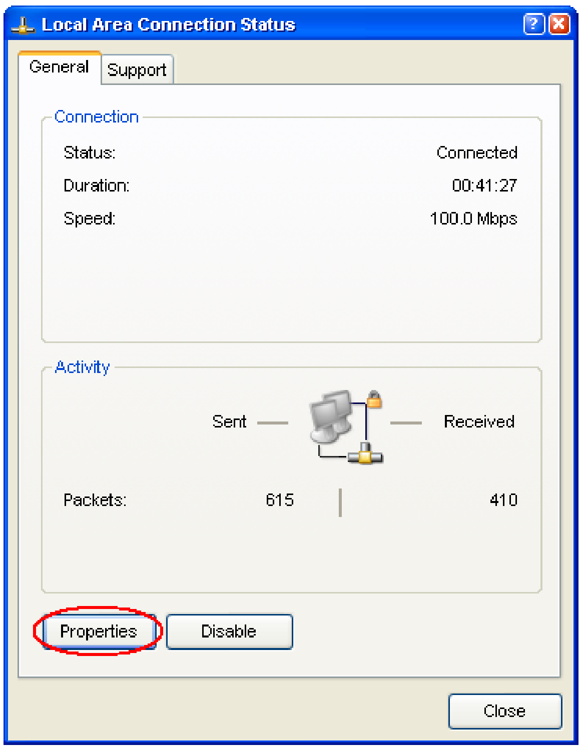
2) Applications running with the FreeRTOS operating system:

- ➢ A Web server based on the netconn API
- ➢ A Web server based on the socket API
- ➢ A TCP/UDP echo server application based on the netconn API

Remote PC settings

In order to run the demos provided within the CD-ROM, set up the remote PC network environment. Make sure that the PC's IP address and the evaluation board's IP address are on the same network. For example to setup a network in Microsoft Windows XP operating system:.

1) On remote PC, select Start > Control Panel > Network connections > Local Area Connection > Properties, as shown below:

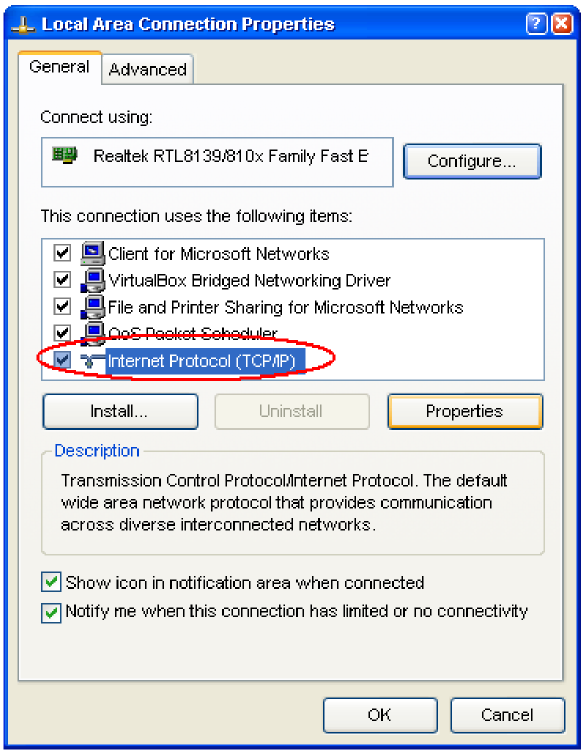


Status: Connected
Duration: 00:41:27
Speed: 100.0 Mbps

Packets: 615 | 410

Figure 5-2 Local Area Connection

2) Click "Properties", this will open the window of Local Area Connection Properties, as shown below:


Local Area Connection Properties

General | Advanced

Connect using:

Realtek RTL8139/810x Family Fast E

Configure...

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)

Install... | Uninstall | Properties

Description

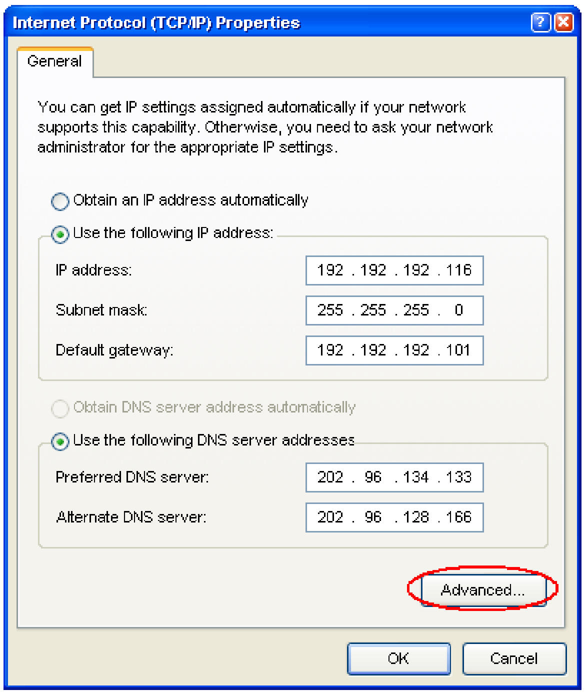
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.

- [✓] Show icon in notification area when connected
- [✓] Notify me when this connection has limited or no connectivity

OK | Cancel

Figure 5-3 Local Area Connection Properties

3) Double click "TCP / IP Options", opens a window for TCP / IP Properties, as shown below:


Internet Protocol (TCP/IP) Properties

General

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:]

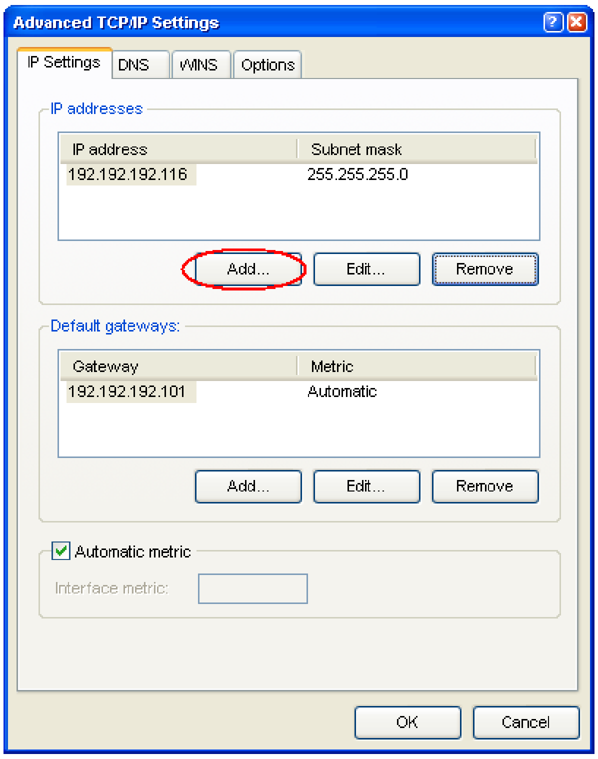
Preferred DNS server:	202 . 96 . 134 . 133
Alternate DNS server:	202 . 96 . 128 . 166

Advanced...

OK | Cancel

Figure 5-4 TCP / IP Options

4) Double click the "Advanced" option, open a window for “Advanced TCP / IP settings”, as shown below:



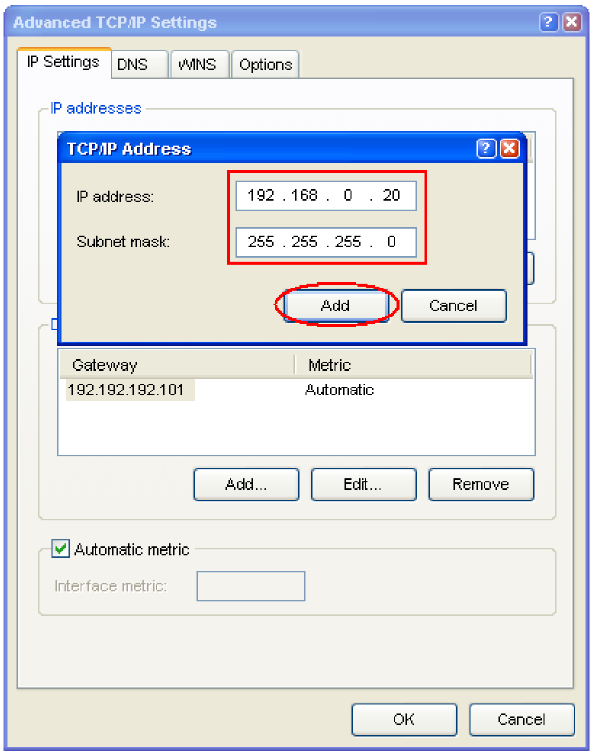
IP address	Subnet mask
192.192.192.116	255.255.255.0

Gateway	Metric
192.192.192.101	Automatic

Figure 5-5 Advanced TCP / IP settings

5) Click the "Add" option, open a window for "Add TCP / IP".

Enter the IP address and subnet mask, and then click "Add”, as shown below:



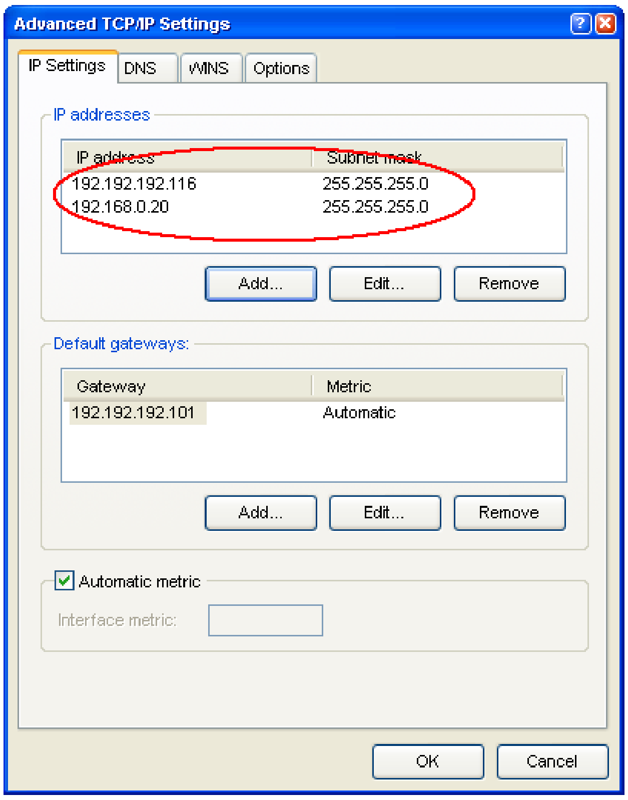
IP address: 192 . 168 . 0 . 20

Subnet mask: 255 . 255 . 255 . 0

Gateway	Metric
192.192.192.101	Automatic

Figure 5-6 Add TCP/IP address

6) Click “OK” to finish network settings.


Advanced TCP/IP Settings

IP Settings | DNS | WINS | Options

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 5-7 TCP/IP address setup ok

5.2 Standalone demos

5.2.1 HTTP server demo

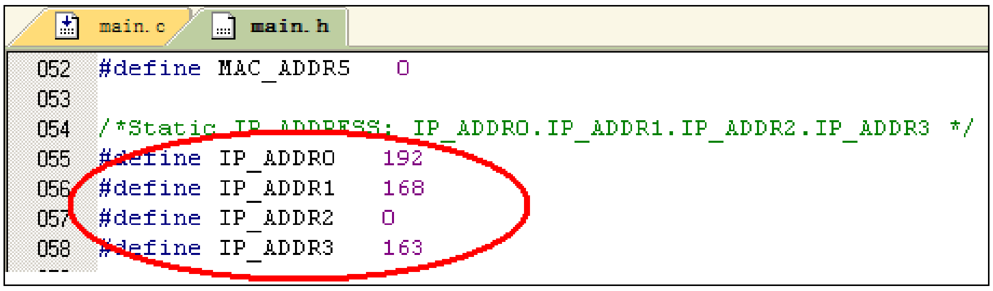
The HTTP server demo shows an implementation of a web server with the following features:

- URL parsing
- support of CGI (Common Gateway Interface)
- support of SSI (Server Side Includes)
- dynamic Header generation
- support of HTTP Post request

In order to test the HTTP server demo, please follow the steps below:

1) Plug in +5V power supply to the DevKit1207. Connect a crossover cable between DevKit1207 RJ45 CON1 and PC Ethernet port.
2) Configure IP address (The default Static IP address) of evaluation board; modify the

relevant macro in main.h file as per your requirement, as shown below.



```
#define MAC_ADDR5   0

/*Static IP ADDRESS: IP_ADDR0.IP_ADDR1.IP_ADDR2.IP_ADDR3 */
#define IP_ADDR0   192
#define IP_ADDR1   168
#define IP_ADDR2   0
#define IP_ADDR3   163
```

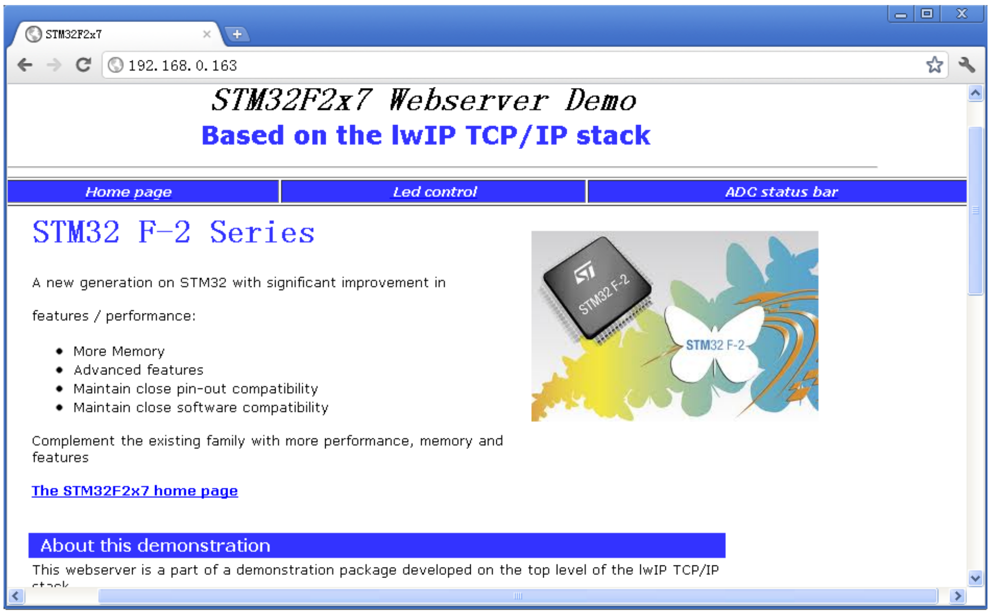
Figure 5-8 Configure IP address of DevKit1207

You can also uncomment option “USE_DHCP” to enable the DHCP to assign IP addresses dynamically.

3) Rebuild the demo, and then download the program into Flash.

4) At power on, LCD will display the IP address of the evaluation board.

5) On the remote PC, open a web client (Mozilla Firefox or Internet Explorer) and type the board’s IP address in a web browser. By default, the following static IP address is used: 192.168.0.163.



STM32F2x7 Webserver Demo

Based on the lwIP TCP/IP stack

STM32 F-2 Series

A new generation on STM32 with significant improvement in features / performance:

- More Memory
- Advanced features
- Maintain close pin-out compatibility
- Maintain close software compatibility

Complement the existing family with more performance, memory and features

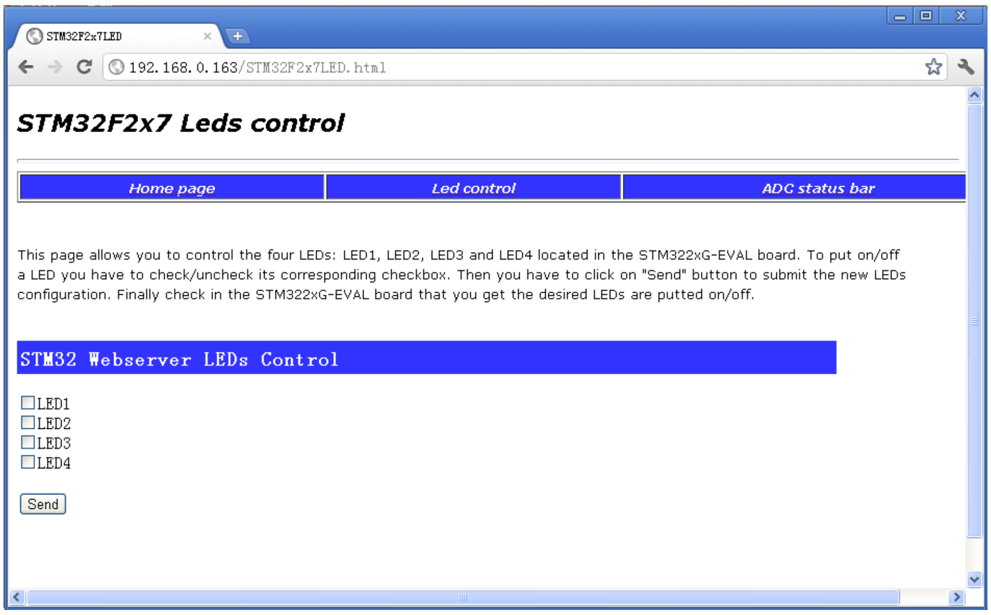
The STM32F2x7 home page

About this demonstration

This webserver is a part of a demonstration package developed on the top level of the lwIP TCP/IP stack

Figure 5-9 Home page of the HTTP server demo

6) Click “LED control” to get into LED control interface, select or cancel LED1, LED2, LED3, LED4 and press “Send”, the LEDs on the board will work accordingly.



STM32F2x7LED

192.168.0.163/STM32F2x7LED.html

STM32F2x7 Leds control

Home page | Led control | ADC status bar

This page allows you to control the four LEDs: LED1, LED2, LED3 and LED4 located in the STM322xG-EVAL board. To put on/off a LED you have to check/uncheck its corresponding checkbox. Then you have to click on "Send" button to submit the new LEDs configuration. Finally check in the STM322xG-EVAL board that you get the desired LEDs are putted on/off.

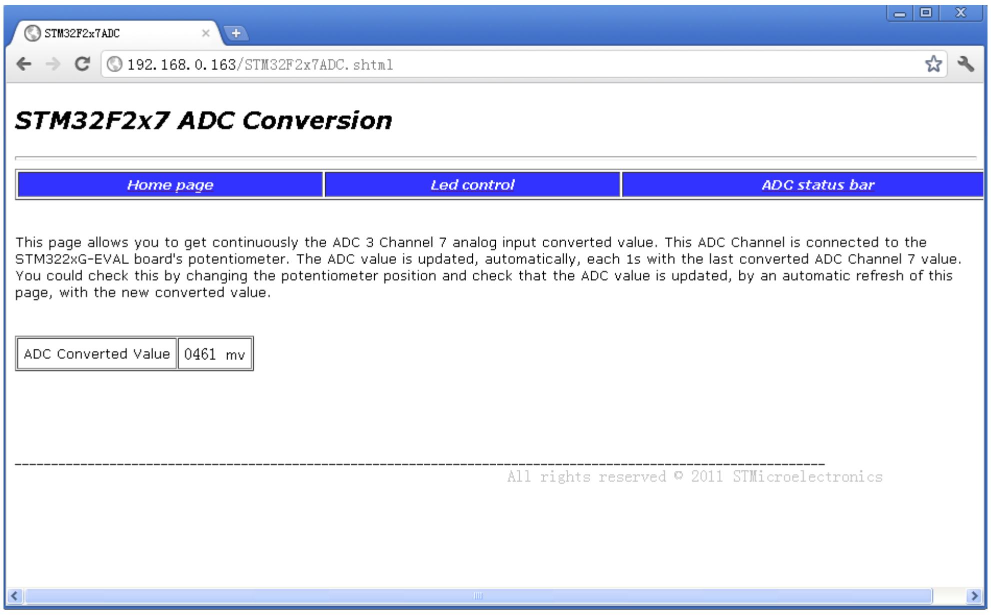
STM32 Webserver LEDs Control

☐ LED1
☐ LED2
☐ LED3
☐ LED4

Send

Figure 5-10 Led control page of the HTTP server demo

7) Click “ADCstatus bar” to get the voltage value of potentiometer RV1 on the board.



STM32F2x7ADC

192.168.0.163/STM32F2x7ADC.shtml

STM32F2x7 ADC Conversion

Home page | Led control | ADC status bar

This page allows you to get continuously the ADC 3 Channel 7 analog input converted value. This ADC Channel is connected to the STM322xG-EVAL board's potentiometer. The ADC value is updated, automatically, each 1s with the last converted ADC Channel 7 value. You could check this by changing the potentiometer position and check that the ADC value is updated, by an automatic refresh of this page, with the new converted value.

ADC Converted Value	0461 mv

All rights reserved © 2011 STMicroelectronics

Figure 5-11 ADC status bar

5.2.2 TFTP server demo

The TFTP server is a file transfer application that needs a remote TFTP client. The files are transferred to and from the microSD card located on the DevKit1207 evaluation board. In order to test the tftpserver demo, please follow the steps below:

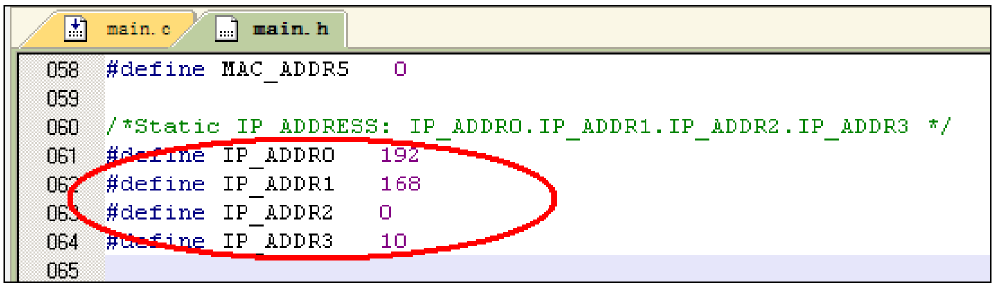
1) Install TFTP Client software on the remote PC.

The software is located in the folder:

\code\STM32F2x7_ETH_LwIP_V1.0.2\Utilities\Third_Party\PC_Software

2) Plug in +5V power supply to the DevKit1207. Connect a crossover cable between DevKit1207 RJ45 CON1 and PC Ethernet port.

3) Configure IP address (The default Static IP address) of evaluation board, modify the relevant macro in main.h file as per your requirement, as shown below.



```
#define MAC_ADDR5    0

/*Static IP ADDRESS: IP_ADDR0.IP_ADDR1.IP_ADDR2.IP_ADDR3 */
#define IP_ADDR0    192
#define IP_ADDR1    168
#define IP_ADDR2    0
#define IP_ADDR3    10
```

Figure 5-12 Configure IP address of DevKit1207

4) DevKit1207 settings.

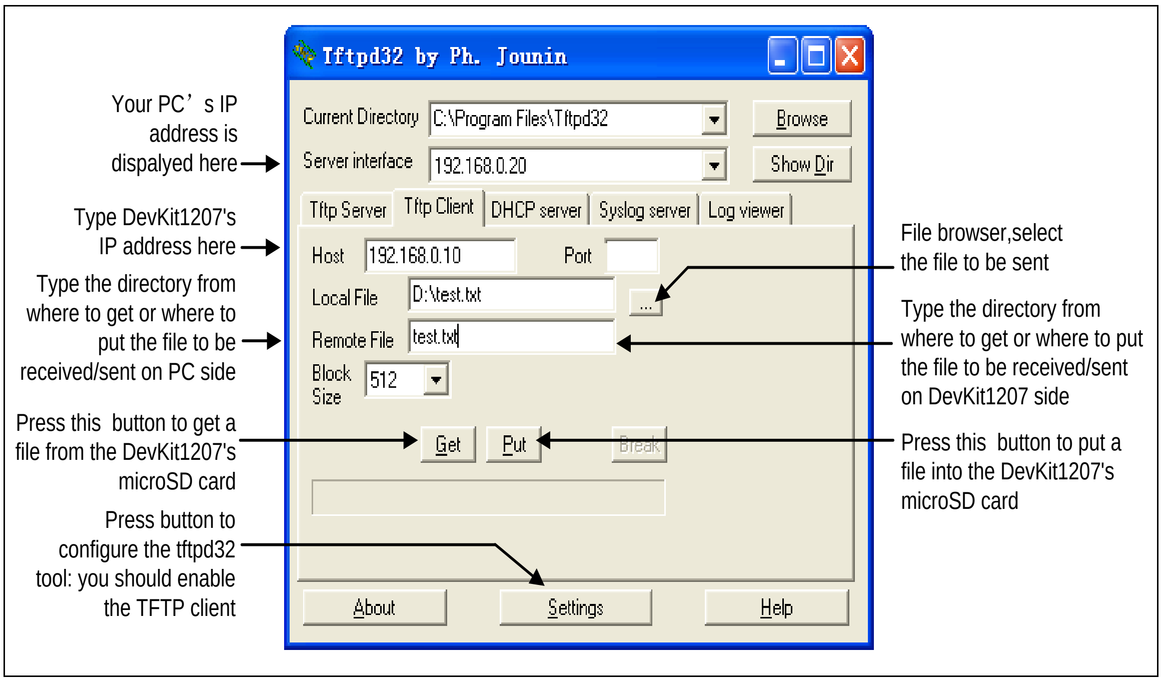
Plug the microSD™ card into the dedicated connector CON4.

Make sure that jumpers JP5 and JP6 are fitted, JP7, JP8, JP10 and JP11 are not fitted.

5) Rebuild the demo, and then download the program into Flash.

6) At power on, LCD will display the IP address of the evaluation board.

7) On the remote PC, open the TFTP client (for example, TFTPD32), and configure the TFTP server address (host address in TFTPD32).



Current Directory: C:\Program Files\Tftpd32
Server interface: 192.168.0.20
Host: 192.168.0.10
Port:
Local File: D:\test.txt
Remote File: test.txt
Block Size: 512

Your PC's IP address is dispalyed here

Type DevKit1207's IP address here

Type the directory from where to get or where to put the file to be received/sent on PC side

Press this button to get a file from the DevKit1207's microSD card

Press button to configure the tftpd32 tool: you should enable the TFTP client

File browser,select the file to be sent

Type the directory from where to get or where to put the file to be received/sent on DevKit1207 side

Press this button to put a file into the DevKit1207's microSD card

Figure 5-13 TFTP tool (tftpd32)

8) Start transferring files to and from the microSD card located on the DevKit1207 board.

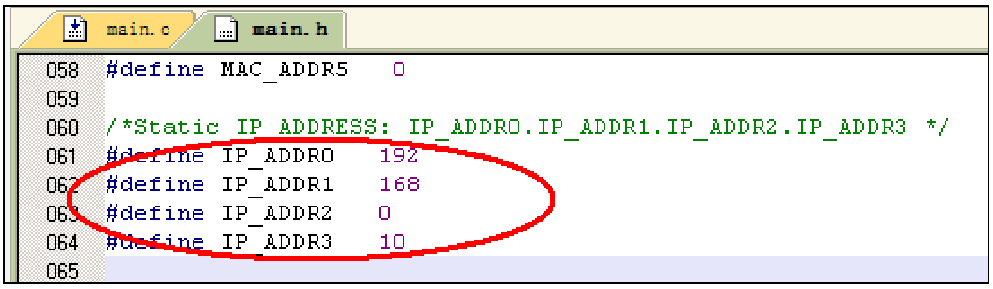
5.2.3 TCP_echo_client demo

This demo is used to test a basic TCP connection. In this demo, the STM32 acts as a TCP client that connects to the TCP server. The client sends a string and the server echoes back the same string to the client.

In order to test the TCP echo client demo, please follow the below steps:

1) Plug in +5V power supply to the DevKit1207. Connect a crossover cable between DevKit1207 RJ45 CON1 and PC Ethernet port.

2) Configure IP address (The default Static IP address) of evaluation board, modify the relevant macro in main.h file as per your requirement, as shown below.



```
#define MAC_ADDR5    0

/*Static IP ADDRESS: IP_ADDR0.IP_ADDR1.IP_ADDR2.IP_ADDR3 */
#define IP_ADDR0    192
#define IP_ADDR1    168
#define IP_ADDR2    0
#define IP_ADDR3    10
```

Figure 5-14 Configure IP address of DevKit1207

3) Rebuild the demo, and then download the program into Flash.

4) At power on, LCD will display the IP address of the evaluation board.

5) On the remote PC , Copy the echotool software to C root directory.

   The echotool software is located in the folder of CD-ROM:

   \code\STM32F2x7_ETH_LwIP_V1.0.2\Utilities\Third_Party\PC_Software

6) On the remote PC, open a command prompt window. (In Windows, select ***Start > All Programs > Accessories > Command Prompt.***)

7) At the command prompt, enter:

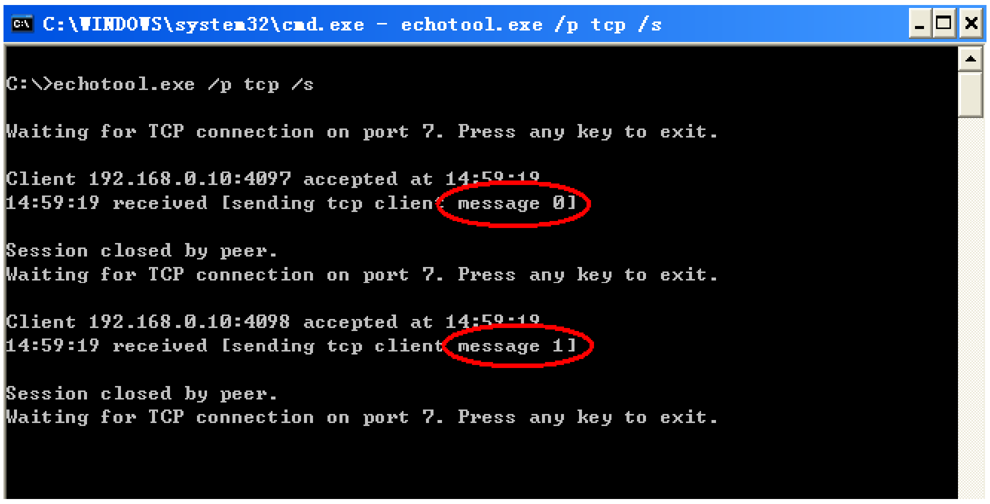
   C:\>echotool /p tcp /s

   where;

   – /p tcp is the TCP protocol (TCP protocol)

– /s is the actual mode of connection (Server mode)

8) When the USER1 button on the DevKit1207 board is pressed, the client sends a string and the server echoes back the same string to the client. The below screenshot shows an example of the command string and the module’s response.



```
C:\WINDOWS\system32\cmd.exe - echotool.exe /p tcp /s

C:\>echotool.exe /p tcp /s

Waiting for TCP connection on port 7. Press any key to exit.

Client 192.168.0.10:4097 accepted at 14:59:19
14:59:19 received [sending tcp client message 0]

Session closed by peer.
Waiting for TCP connection on port 7. Press any key to exit.

Client 192.168.0.10:4098 accepted at 14:59:19
14:59:19 received [sending tcp client message 1]

Session closed by peer.
Waiting for TCP connection on port 7. Press any key to exit.
```

Figure 5-15 TCP echo client demo

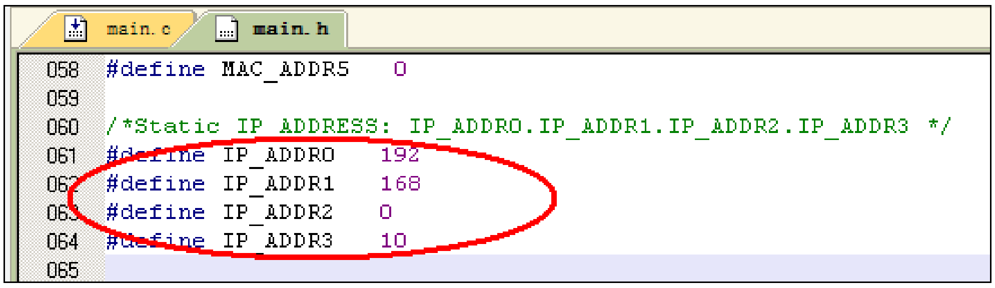
5.2.4 TCP_echo_server demo

This demo is used to test a basic TCP connection. In this demo, the STM32 acts as a TCPserver that waits for client requests. It simply echoes back whatever is sent.

In order to test the TCP echo server demo, please follow the below steps:

1) Plug in +5V power supply to the DevKit1207. Connect a crossover cable between DevKit1207 RJ45 CON1 and PC Ethernet port.

2) Configure IP address (The default Static IP address) of evaluation board, modify the relevant macro in main.h depending on your needs, as shown below.



```
#define MAC_ADDR5    0

/*Static IP ADDRESS: IP_ADDR0.IP_ADDR1.IP_ADDR2.IP_ADDR3 */
#define IP_ADDR0    192
#define IP_ADDR1    168
#define IP_ADDR2    0
#define IP_ADDR3    10
```

Figure 5-16 Configure IP address of DevKit1207

3) Rebuild the demo, and then download the program into Flash.

4) At power on, LCD will display the IP address of the evaluation board.

5) On the remote PC , Copy the echotool software to C root directory.

   The echotool software is located in the folder of CD-ROM:

   \code\STM32F2x7_ETH_LwIP_V1.0.2\Utilities\Third_Party\PC_Software

6) On the remote PC, open a command prompt window. (In Windows, select ***Start > All Programs > Accessories > Command Prompt.***)

7) At the command prompt, enter:

   C:\>echotool.exe IP_address /p tcp /r 7 /n 15 /t 2 /d Testing LwIP TCP echo server

   where;

   – IP_address is the actual board's IP address;

   By default the following static IP address is used: 192.168.0.10

   – /p tcp is the protocol (TCP protocol)

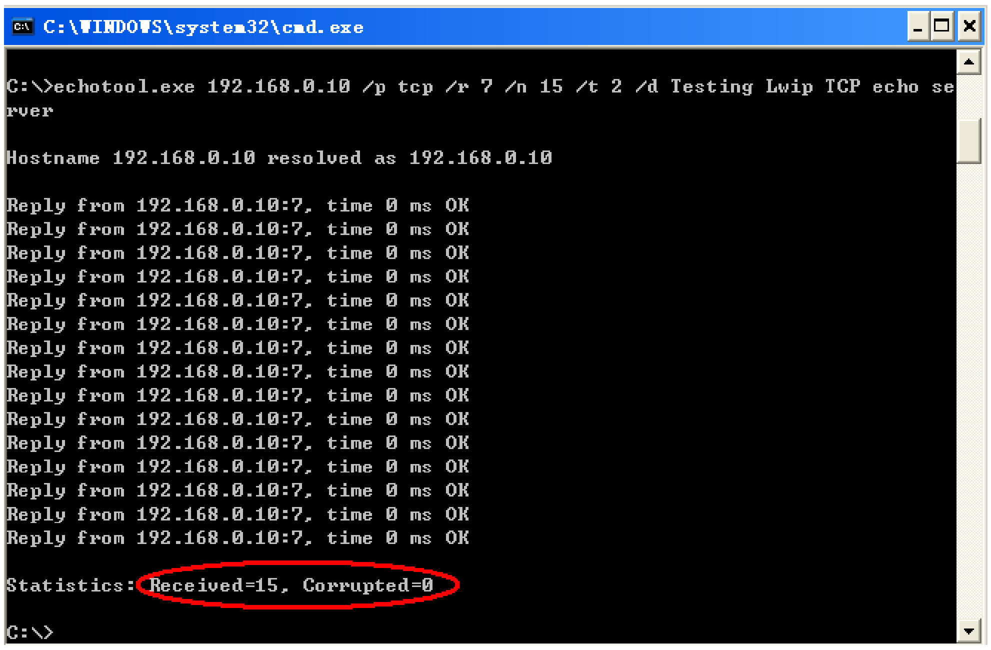
   – /r is the actual remote port on the echo server (echo port)

   – /n is the number of echo requests

   – /t is the connection timeout in seconds

   – /d is the message to be sent for echo

8) The below screenshot shows an example of this command string and the module's response.



```
C:\>echotool.exe 192.168.0.10 /p tcp /r 7 /n 15 /t 2 /d Testing Lwip TCP echo se
rver

Hostname 192.168.0.10 resolved as 192.168.0.10

Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK

Statistics: Received=15, Corrupted=0

C:\>
```

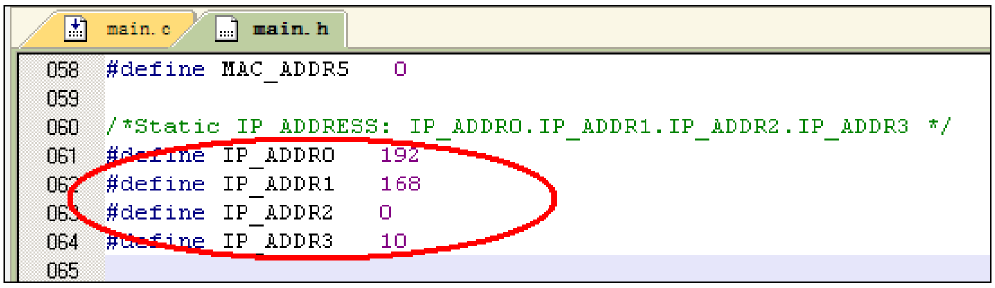
Figure 5-17 TCP echo server demo

5.2.5 UDP_echo_client demo

This demo is used to test a basic UDP echo connection. In this demo the STM32 acts as a UDP client that connects to a UDP server.

In order to test the UDP echo client demo, please follow the below steps:

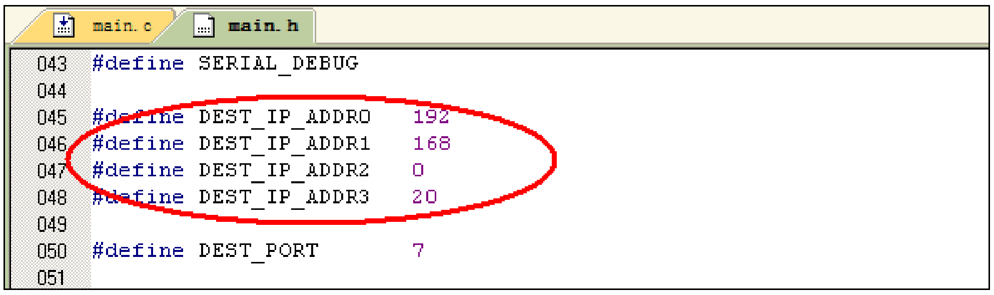
1) Plug in +5V power supply to the DevKit1207. Connect a crossover cable between DevKit1207 RJ45 CON1 and PC Ethernet port.
2) Configure IP address (The default Static IP address) of evaluation board, modify the relevant macro in main.h file as per your requirement.



```
#define MAC_ADDR5    0

/*Static IP ADDRESS: IP_ADDR0.IP_ADDR1.IP_ADDR2.IP_ADDR3 */
#define IP_ADDR0    192
#define IP_ADDR1    168
#define IP_ADDR2    0
#define IP_ADDR3    10

```

Figure 5-18 Configure IP address of DevKit1207

3) Configure IP address (The default Static IP address) of remote PC, modify the relevant macro in main.h depending on your needs, as shown below.



```
#define SERIAL_DEBUG

#define DEST_IP_ADDR0    192
#define DEST_IP_ADDR1    168
#define DEST_IP_ADDR2    0
#define DEST_IP_ADDR3    20

#define DEST_PORT        7

```

Figure 5-19 Configure IP address of remote PC

4) Rebuild the demo, and then download the program into Flash.
5) At power on, LCD will display the IP address of the evaluation board.
6) On the remote PC , Copy the echotool software to C root directory.

   The echotool software is located in the folder of CD-ROM:

   \code\STM32F2x7_ETH_LwIP_V1.0.2\Utilities\Third_Party\PC_Software
7) On the remote PC, open a command prompt window. (In Windows, select ***Start > All Programs > Accessories > Command Prompt.***)
8) At the command prompt, enter:

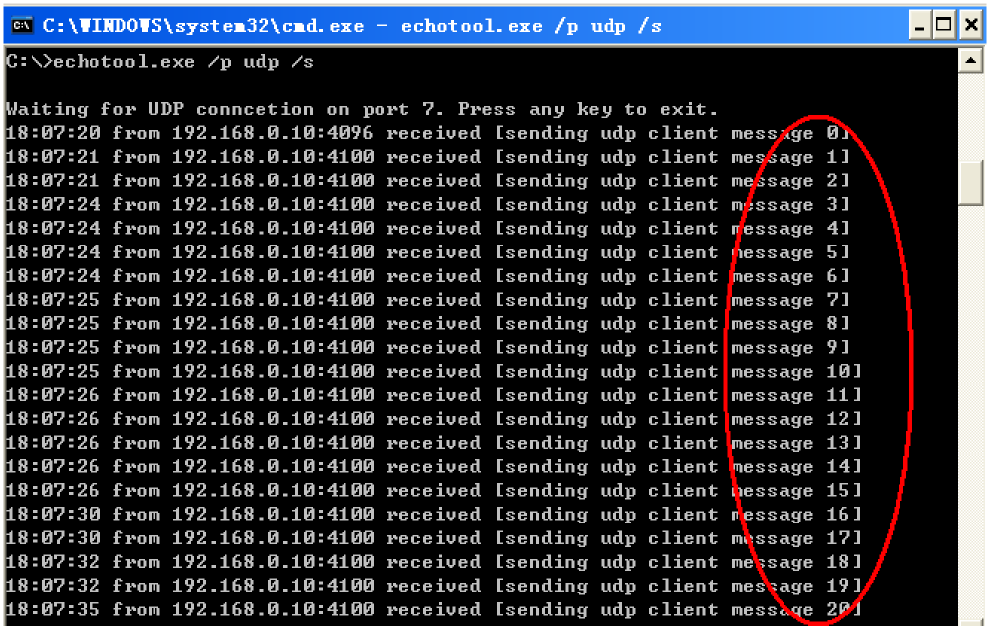
C:\>echotool /p udp /s

where;

– /p udp is the protocol (UDP protocol)

– /s is the actual mode of connection (Server mode)

9) When the USER1 button on the DevKit1207 board is pressed, the client sends a string and the server echoes back the same string to the client. The follow figure shows an example of this command string and the module's response.



```
C:\WINDOWS\system32\cmd.exe - echotool.exe /p udp /s
C:\>echotool.exe /p udp /s

Waiting for UDP conncetion on port 7. Press any key to exit.
18:07:20 from 192.168.0.10:4096 received [sending udp client message 0]
18:07:21 from 192.168.0.10:4100 received [sending udp client message 1]
18:07:21 from 192.168.0.10:4100 received [sending udp client message 2]
18:07:24 from 192.168.0.10:4100 received [sending udp client message 3]
18:07:24 from 192.168.0.10:4100 received [sending udp client message 4]
18:07:24 from 192.168.0.10:4100 received [sending udp client message 5]
18:07:24 from 192.168.0.10:4100 received [sending udp client message 6]
18:07:25 from 192.168.0.10:4100 received [sending udp client message 7]
18:07:25 from 192.168.0.10:4100 received [sending udp client message 8]
18:07:25 from 192.168.0.10:4100 received [sending udp client message 9]
18:07:25 from 192.168.0.10:4100 received [sending udp client message 10]
18:07:26 from 192.168.0.10:4100 received [sending udp client message 11]
18:07:26 from 192.168.0.10:4100 received [sending udp client message 12]
18:07:26 from 192.168.0.10:4100 received [sending udp client message 13]
18:07:26 from 192.168.0.10:4100 received [sending udp client message 14]
18:07:26 from 192.168.0.10:4100 received [sending udp client message 15]
18:07:30 from 192.168.0.10:4100 received [sending udp client message 16]
18:07:30 from 192.168.0.10:4100 received [sending udp client message 17]
18:07:32 from 192.168.0.10:4100 received [sending udp client message 18]
18:07:32 from 192.168.0.10:4100 received [sending udp client message 19]
18:07:35 from 192.168.0.10:4100 received [sending udp client message 20]
```

Figure 5-20 UDP echo client demo

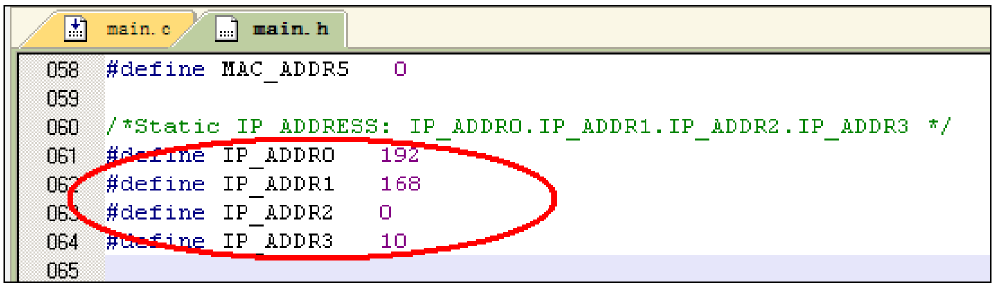
5.2.6 UDP_echo_server demo

This demo is used to test a basic UDP connection. In this demo, the STM32 acts as a UDP server that waits for client requests.

In order to test the UDP echo server demo, please follow steps below:

1) Plug in +5V power supply to the DevKit1207. Connect a crossover cable between DevKit1207 RJ45 CON1 and PC Ethernet port.

2) Configure IP address (The default Static IP address) of evaluation board, modify the relevant macro in main.h file as per your requirement, as shown below.



```
#define MAC_ADDR5   0

/*Static IP ADDRESS: IP_ADDR0.IP_ADDR1.IP_ADDR2.IP_ADDR3 */
#define IP_ADDR0   192
#define IP_ADDR1   168
#define IP_ADDR2   0
#define IP_ADDR3   10
```

Figure 5-21 Configure IP address of DevKit1207

3) Rebuild the demo, and then download the program into Flash.

4) At power on, LCD will display the IP address of the evaluation board.

5) On the remote PC , Copy the echotool software to C root directory.

   The echotool software is located in the folder of CD-ROM:

   \code\STM32F2x7_ETH_LwIP_V1.0.2\Utilities\Third_Party\PC_Software

6) On the remote PC, open a command prompt window. (In Windows, select ***Start > All Programs > Accessories > Command Prompt.***)

7) At the command prompt, enter:

   C:\>echotool.exe IP_address /p udp /r 7 /l 7 /n 15 /t 2 /d Testing LwIP UDP echo server

   where;

   – IP_address is the actual board's IP address;

   By default the following static IP address is used: 192.168.0.10

   – /p udp is the protocol (UDP protocol)

   – /r is the actual remote port on the echo server (echo port)

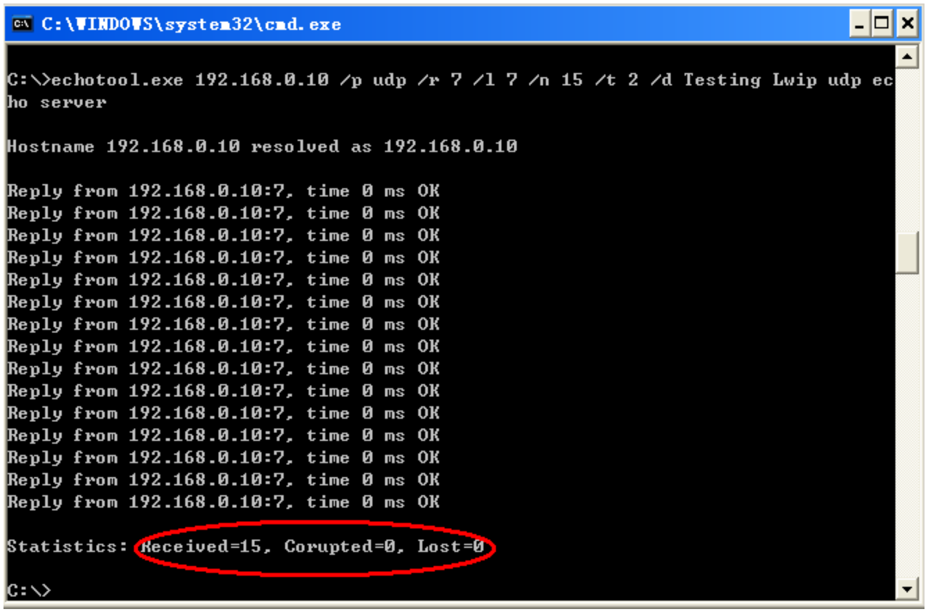
   – /l is the actual local for the client (echo port)

   – /n is the number of echo requests

   – /t is the connection timeout in seconds

   – /d is the message to be sent for echo

8) The below screenshot shows an example of this command string and the module's response.



```
C:\WINDOWS\system32\cmd.exe

C:\>echotool.exe 192.168.0.10 /p udp /r 7 /l 7 /n 15 /t 2 /d Testing Lwip udp ec
ho server

Hostname 192.168.0.10 resolved as 192.168.0.10

Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK
Reply from 192.168.0.10:7, time 0 ms OK

Statistics: Received=15, Corupted=0, Lost=0

C:\>
```

Figure 5-22 UDP echo server demo

5.3 FreeRTOS demos

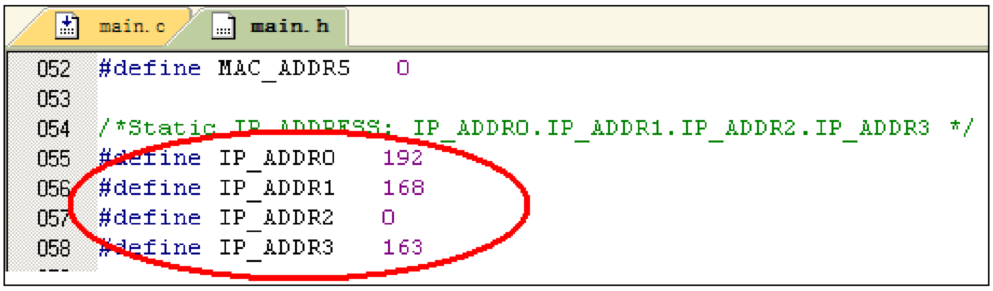
5.3.1 HTTP server netconn demo

The HTTP server netconn demo shows an implementation of a web server application based on the netconn API. This demo is used to connect the DevKit1207 board with a web browser and to load HTML pages.

This demo has two HTML pages. The first one contains general information about STM32F2x7 microcontrollers, the demonstration package and the stack LwIP. The second one contains the list of running tasks and their status. This page is automatically updated every second.

In order to test the HTTP server netconn demo, please follow the below steps:

1) Plug in +5V power supply to DevKit1207. Connect a crossover cable between DevKit1207 RJ45 CON1 and PC Ethernet port.
2) Configure IP address (The default Static IP address) of evaluation board, modify the relevant macro in main.h file as per your requirement, as shown below.



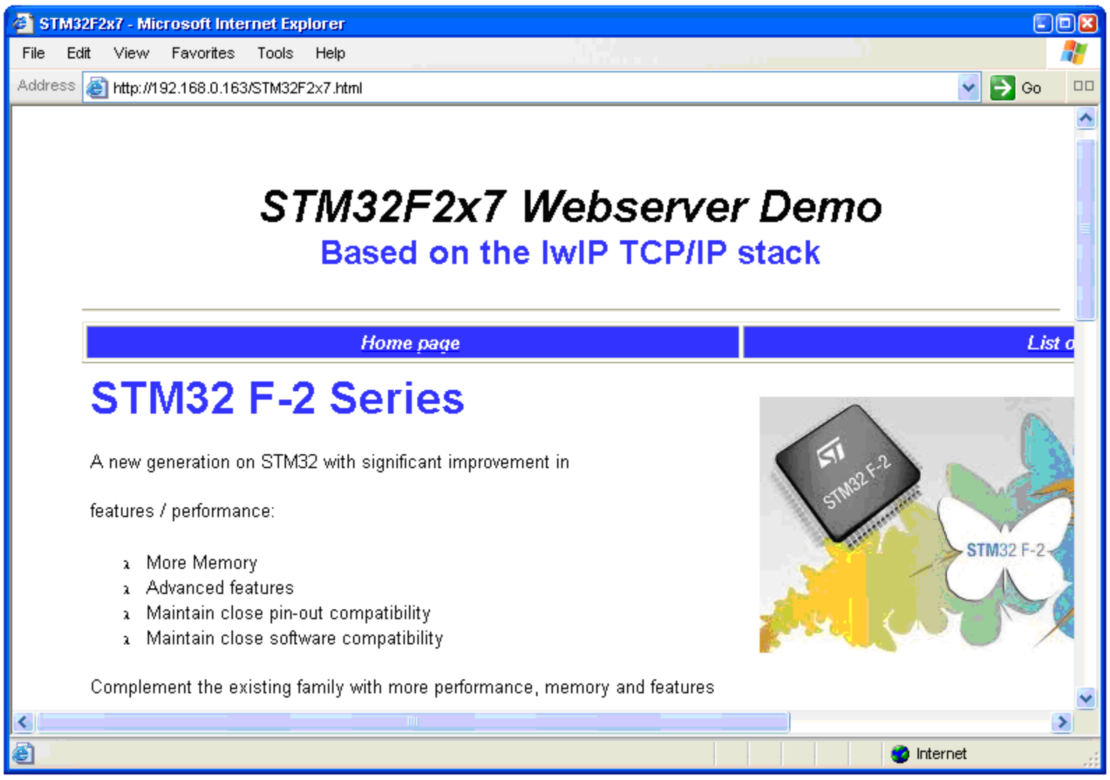
```
#define MAC_ADDR5    0

/*Static IP ADDRESS: IP_ADDR0.IP_ADDR1.IP_ADDR2.IP_ADDR3 */
#define IP_ADDR0    192
#define IP_ADDR1    168
#define IP_ADDR2    0
#define IP_ADDR3    163
```

Figure 5-23 Configure IP address of DevKit1207

3) Rebuild the demo, and then download the program into Flash.

4) At power on, LCD will display the IP address of the evaluation board.

5) On the remote PC, open a web client (Mozilla Firefox or Internet Explorer) and type the board's IP address in a web browser. By default, the following static IP address is used: 192.168.0.163.


STM32F2x7 - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://192.168.0.163/STM32F2x7.html
Go
Home page
List o
STM32 F-2
Internet

STM32F2x7 Webserver Demo

Based on the lwIP TCP/IP stack

STM32 F-2 Series

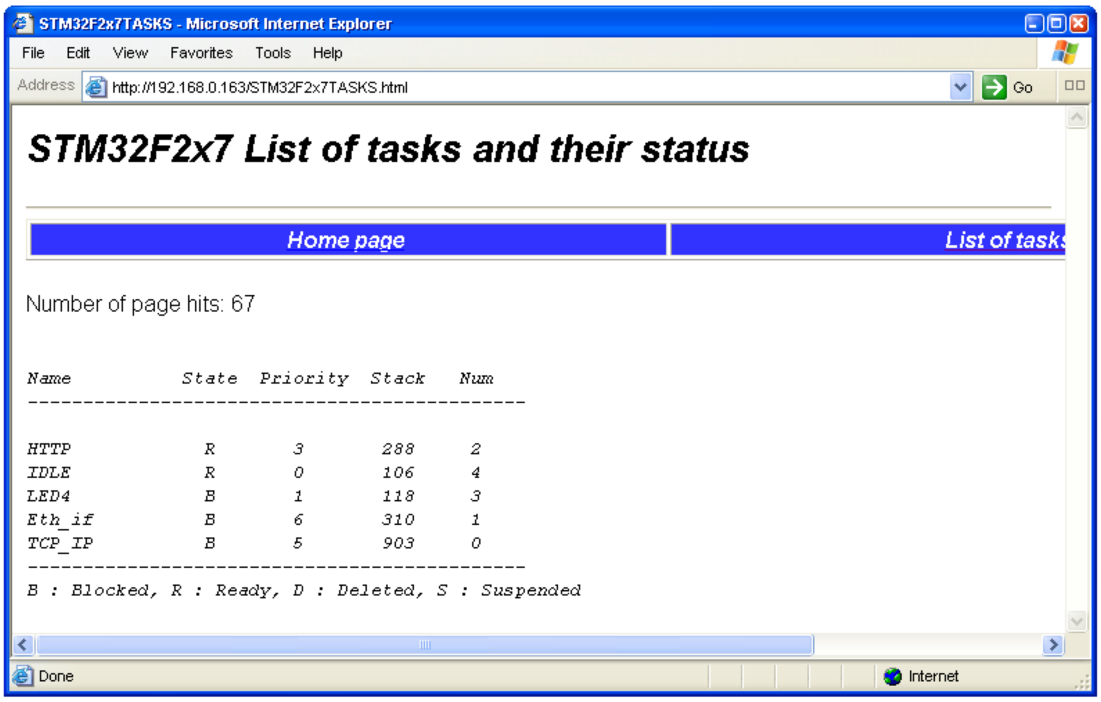
A new generation on STM32 with significant improvement in features / performance:

- More Memory
- Advanced features
- Maintain close pin-out compatibility
- Maintain close software compatibility

Complement the existing family with more performance, memory and features

Figure 5-24 Home page of the HTTP server netconn demo

6) Click the "List of tasks" into task status monitor page of FreeRTOS real-time system. As shown below:


STM32F2x7TASKS - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Address http://192.168.0.163/STM32F2x7TASKS.html
Go
Home page
List of tasks
Done
Internet

STM32F2x7 List of tasks and their status

Number of page hits: 67

```
Name          State  Priority  Stack   Num
---------------------------------------------

HTTP            R       3       288     2
IDLE            R       0       106     4
LED4            B       1       118     3
Eth_if          B       6       310     1
TCP_IP          B       5       903     0
---------------------------------------------
B : Blocked, R : Ready, D : Deleted, S : Suspended
```

Figure 5-25 List of tasks page of the HTTP server netconn demo

5.3.2 HTTP server_socket demo

The HTTP server socket demo shows an implementation of web server application based on the socket API. To test this demo, please refer to the Section 5.3.1: HTTP server netconn demo.

5.3.3 UDP tcp_echo_server_netconn demo

This demo provides the echo service application on both TCP and UDP protocols:

To test the UDP TCP echo server netconn demo in TCP server mode, please refer to the Section 5.2.4: TCP echo server demo.

To test the UDP TCP echo server netconn demo in UDP server mode, please refer to the Section 5.2.6: UDP echo server demo.

Chapter 6 USB Examples

6.1 Description of USB Examples

The STM32F207 embed an USB OTG high-speed and an USB OTG full-speed device/host/OTG peripheral with integrated transceivers. The USB OTG HS and USB OTG FS peripheral are compliant with the USB 2.0 specification and with the OTG 1.0 specification.

OTG_FS interface description

- On-chip FS OTG PHY
- Operates in Full Speed (12 Mbps) and Low Speed (1.2 Mbps) modes as host.
- Operates in Full Speed (12 Mbps) modes as device.

OTG_HS interface description

- On-chip Full Speed PHY and ULPI (UTMI+ low pin interface) interface
- In Host mode, supports high-speed (480 Mbps, need external High Speed PHY), full-speed(12 Mbps) and low-speed (1.5 Mbps) transfers
- In Device mode, only supports high-speed and full-speed transfers.

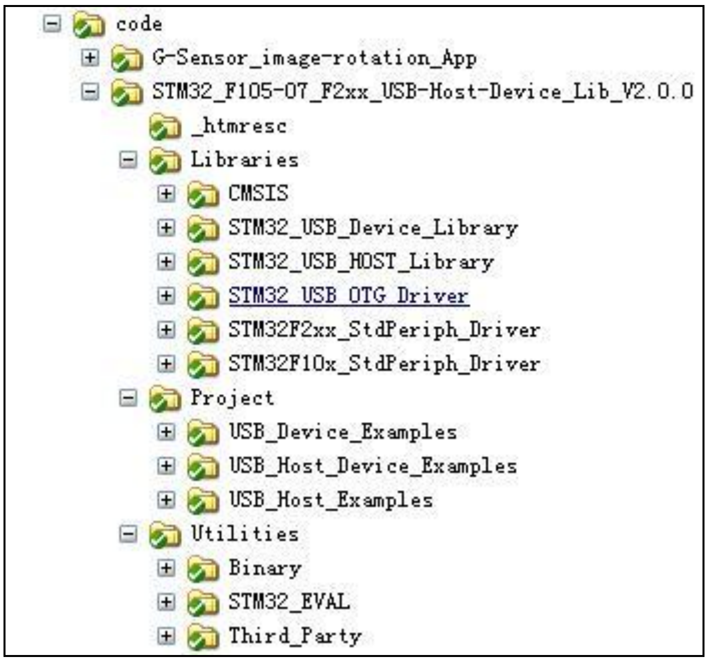
The following table gives a brief definition of acronyms and abbreviations used in this section.

Table 6-1 List of terms

Term	**Meaning**
PHY	Physical Layer (as described in the OSI model)
OTG	USB On-The-Go
LS	Low Speed (1.5 Mbps)
FS	Full Speed (12 Mbps)
HS	High Speed (480 Mbps)
CDC	Communication Device Class
HID	Human Interface Device

MSC	Mass Storage Class
DFU	Device Firmware Upgrade
DRD	Dual Role Device
DCD	Device Core Driver
HCD	Host Core Driver

The following figure illustrates the tree structure of the USB host and device library folder.



```
⊟ code
    ⊞ G-Sensor_image-rotation_App
    ⊟ STM32_F105-07_F2xx_USB-Host-Device_Lib_V2.0.0
        _htmresc
        ⊟ Libraries
            ⊞ CMSIS
            ⊞ STM32_USB_Device_Library
            ⊞ STM32_USB_HOST_Library
            ⊞ STM32_USB_OTG_Driver
            ⊞ STM32F2xx_StdPeriph_Driver
            ⊞ STM32F10x_StdPeriph_Driver
        ⊟ Project
            ⊞ USB_Device_Examples
            ⊞ USB_Host_Device_Examples
            ⊞ USB_Host_Examples
        ⊟ Utilities
            ⊞ Binary
            ⊞ STM32_EVAL
            ⊞ Third_Party
```

Figure 6-1 USB example structure

The project is composed of three main directories, organized as follows:

1) ***Libraries***: contains the STM32 USB OTG low-level driver, the standard peripherals libraries, the host and the device libraries.

2) ***Project***: contains the workspaces and the source files for the examples given with the package.

- USB_Device_Examples
- USB_Host_Device_Examples
- USB_Host_Examples

3) ***Utilities***: contains the STM32 drivers relatived to the used boards (LCD, SD card, buttons, LED, etc). This folder also contains the FatFs generic file system used for the Host demos.

4) The following figure gives an overview of the USB host and device libraries.

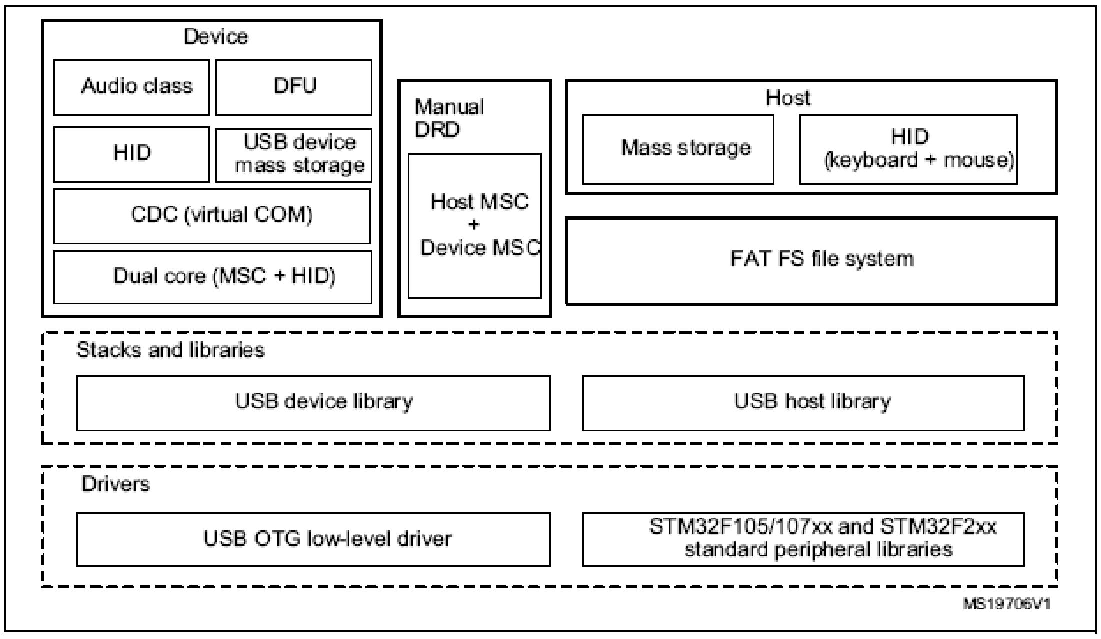


Figure 6-2 USB host and device library organization overview

The USB host and device libraries are built around the common STM32 USB OTG low level driver and the USB device and host libraries.

6.2 USB_Device_Examples

This folder contains six examples when USB work in device mode.

- AUDIO
- DFU
- DualCore
- HID
- MSC
- VCP

As shown below, the USB device library is composed of two main parts: the library core and the class drivers.

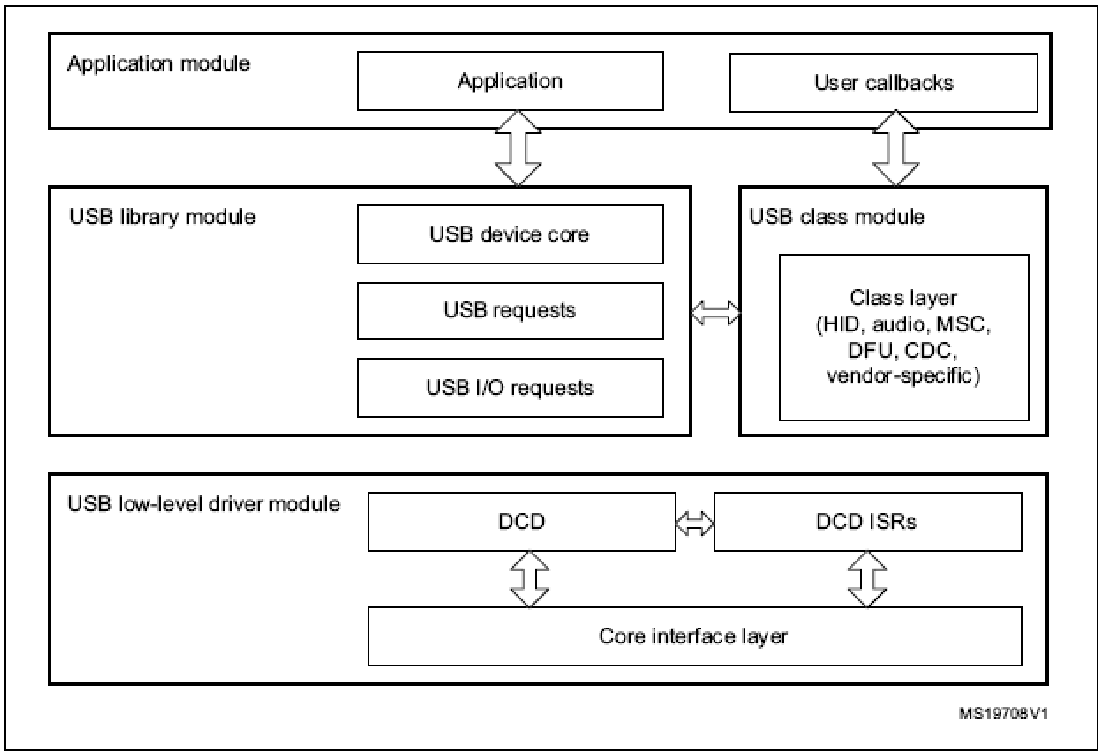


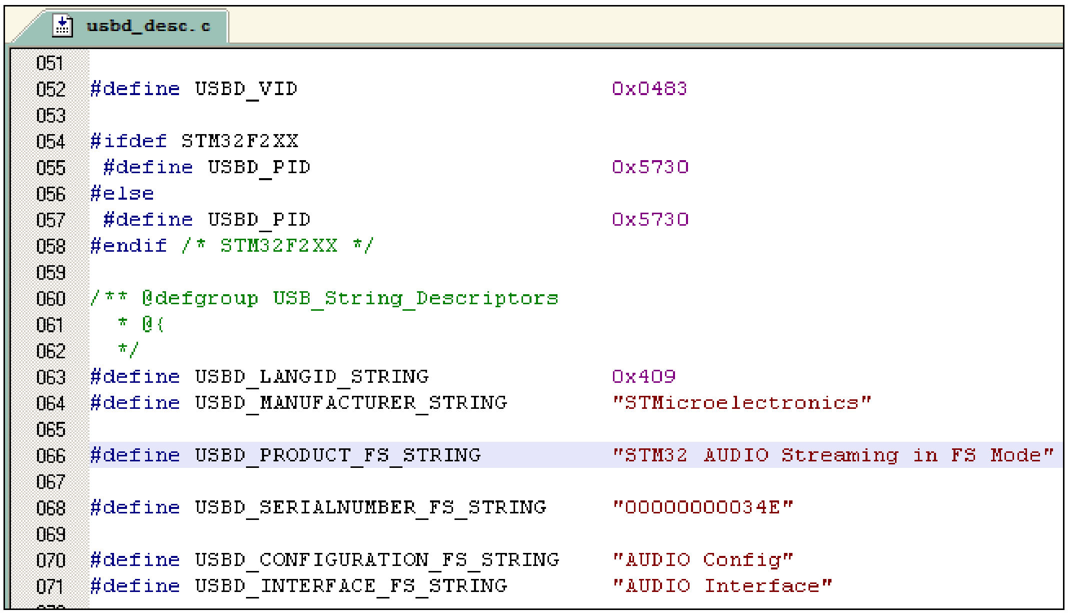
Figure 6-3 USB device library architecture

6.2.1 USB AUDIO device example

The Audio device example allows device to communicate with host (PC) as USB Speaker using isochronous pipe for audio data transfer along with some control commands (Mute, Next, Previous, Forward, Rewind, Start, Stop, etc.).

Users can switch output target to Headphone or speaker by pressing USER1 button on the evaluation board. The Headphone is selected as output by default. If you want output target to speaker, you need to prepare a Speaker (0.25W/8Ω) and connect it to CON5.

The Audio device works in full speed mode only, so only USB_FS(CON2) is available for this example. Audio device information is located in usbd_desc.c, as shown below:

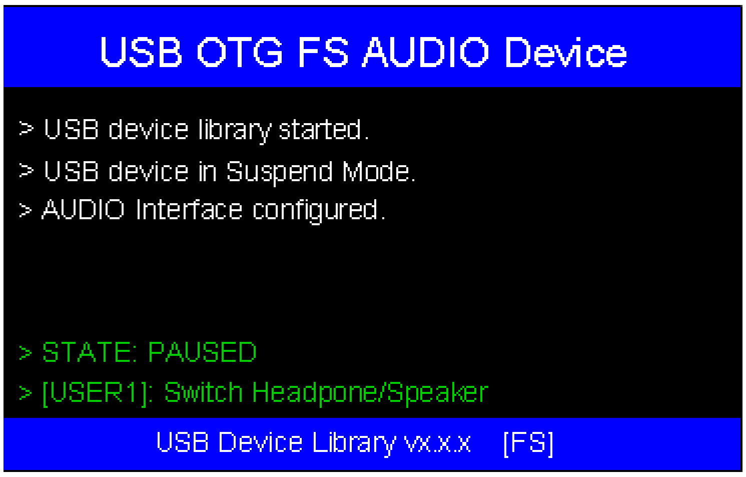


```
usbd_desc.c

#define USBD_VID                        0x0483

#ifdef STM32F2XX
 #define USBD_PID                       0x5730
#else
 #define USBD_PID                       0x5730
#endif /* STM32F2XX */

/** @defgroup USB_String_Descriptors
  * @{
  */
#define USBD_LANGID_STRING              0x409
#define USBD_MANUFACTURER_STRING        "STMicroelectronics"

#define USBD_PRODUCT_FS_STRING          "STM32 AUDIO Streaming in FS Mode"

#define USBD_SERIALNUMBER_FS_STRING     "00000000034E"

#define USBD_CONFIGURATION_FS_STRING    "AUDIO Config"
#define USBD_INTERFACE_FS_STRING        "AUDIO Interface"
```

Figure 6-4 USB ADUIO device information

In order to test the USB AUDIO example, please follow the below step:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 USB_FS CON2 and PC USB port.
2) Plug in Headphone or connect Speaker to CON5.
3) Rebuild the demo, and then download the program into Flash.
4) At power on, the LCD displays the following messages.



```
USB OTG FS AUDIO Device

> USB device library started.
> USB device in Suspend Mode.
> AUDIO Interface configured.


> STATE: PAUSED
> [USER1]: Switch Headpone/Speaker
USB Device Library vx.x.x    [FS]
```

Figure 6-5 USB audio device cable connected display message

5) At power on, PC will automatically recognize DevKit1207 as USB Audio Device.
6) Open the music player and play any music file on PC, then you can hear the music from Headphone or Speaker.

Note:

- ***Supported audio sampling rates are from: 96 kHz to 24 kHz. It is advised to***

set a high and standard sampling rate in order to get best audio quality (i.e. 96 kHz or 48 kHz).

- ***If a low audio sampling rate is configured (define USBD_AUDIO_FREQ below 24 kHz) it may result in noise issue at pause/resume/stop operations.***

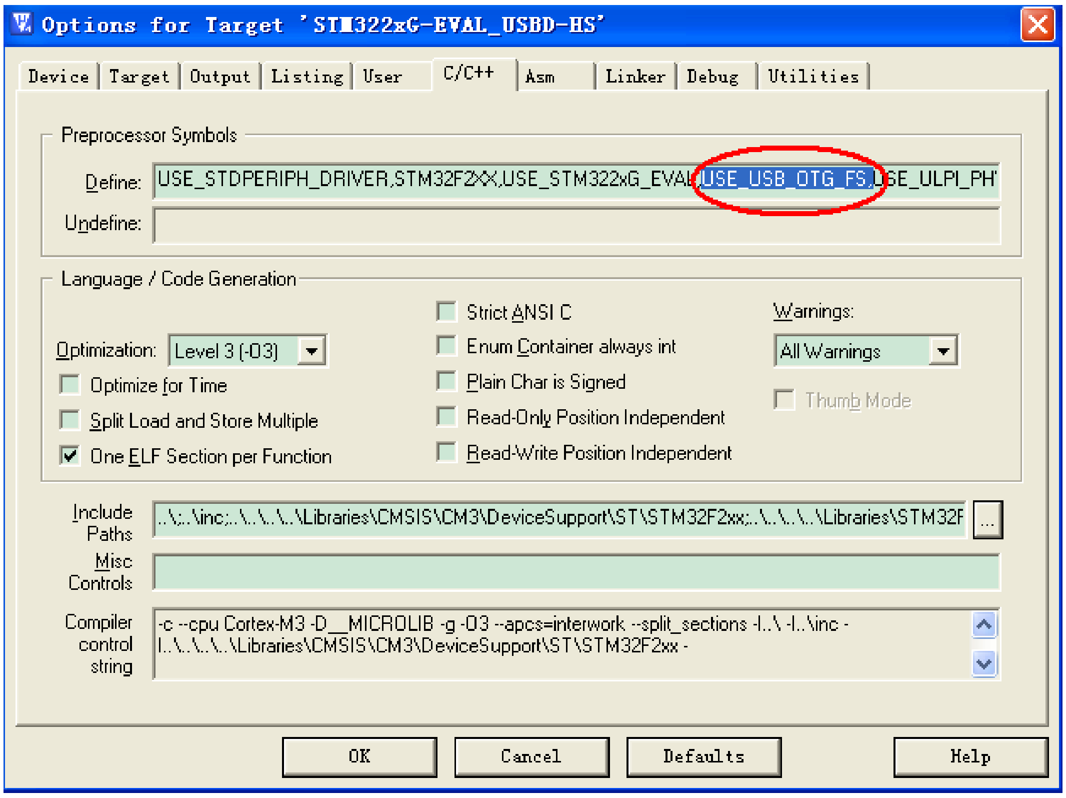
6.2.2 USB DFU device example

The DFU(Device Firmware Upgrade)example allows a device firmware upgrade using the DFU drivers.

The supported memories for this example are:

- Internal Flash memory for STM32F105/7 and STM32F2xx devices
- OTP memory for STM32F2xx devices.

The DFU device example works in High-Speed and Full-Speed modes. Users can select High-Speed/Full-Speed mode by modifying the relevant macro in MDK, as shown below:


Options for Target 'STM322xG-EVAL_USBD-HS'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Preprocessor Symbols
Define: USE_STDPERIPH_DRIVER,STM32F2XX,USE_STM322xG_EVAL,USE_USB_OTG_FS,USE_ULPI_PH
Undefine:

Language / Code Generation
Optimization: Level 3 (-O3)
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: All Warnings
Thumb Mode

Include Paths: ..\;..\inc;..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx;..\..\..\..\Libraries\STM32F
Misc Controls:
Compiler control string: -c --cpu Cortex-M3 -D__MICROLIB -g -O3 --apcs=interwork --split_sections -I..\ -I..\inc -I..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx -

OK | Cancel | Defaults | Help

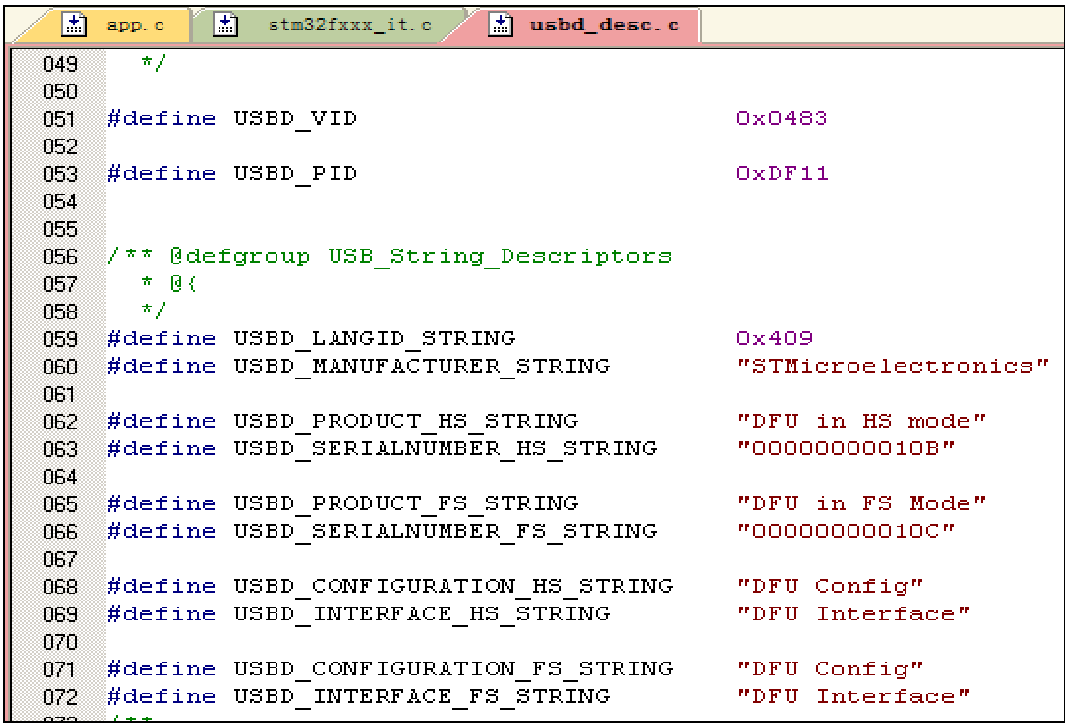
Figure 6-6 Select USB FS/HS mode for DFU device demo

If "Preprocessor Symbols" includes USE_USB_OTG_FS, the demo will work in

Full-Speed mode. If "Preprocessor Symbols" includes USE_USB_OTG_HS, the DEMO will work in High-Speed mode.

Note: USE_USB_OTG_FS and USE_USB_OTG_HS should not be included in "Preprocessor Symbols" at the same time.

DFU device information is located in usbd_desc.c, as shown below:



```
app.c    stm32fxxx_it.c    usbd_desc.c

   */

#define USBD_VID                     0x0483

#define USBD_PID                     0xDF11


/** @defgroup USB_String_Descriptors
   * @{
   */
#define USBD_LANGID_STRING           0x409
#define USBD_MANUFACTURER_STRING     "STMicroelectronics"

#define USBD_PRODUCT_HS_STRING       "DFU in HS mode"
#define USBD_SERIALNUMBER_HS_STRING  "00000000010B"

#define USBD_PRODUCT_FS_STRING       "DFU in FS Mode"
#define USBD_SERIALNUMBER_FS_STRING  "00000000010C"

#define USBD_CONFIGURATION_HS_STRING "DFU Config"
#define USBD_INTERFACE_HS_STRING     "DFU Interface"

#define USBD_CONFIGURATION_FS_STRING "DFU Config"
#define USBD_INTERFACE_FS_STRING     "DFU Interface"
```

Figure 6-7 USB DFU device information

In order to test the USB DFU device example, please follow the below steps:

1) Install DfuSe_Demo_V3.0.2 software on the PC. The software is located in the folder at CD-ROM:

   \code\STM32_F105-07_F2xx_USB-Host-Device_Lib_V2.0.0\Utilities\Third_Party\PC_Software\ DfuSe_ Demo_V3.0.2

   If your PC is 64-bit, please install *DfuSe Demo V3.0.2_Setup_amd64.exe*.

2) Generate DFU upgrade file on the PC(Optional)

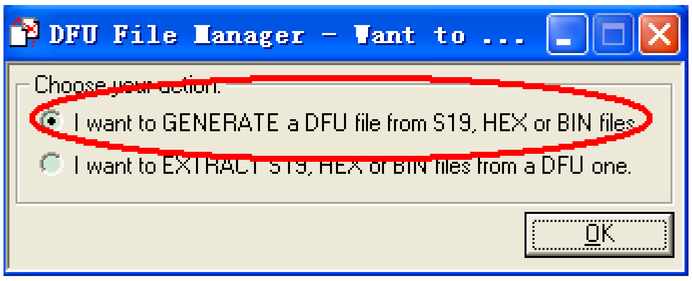
   Note: There is a DFU file for testing the USB DFU example. User can skip this step.

   The DFU file is located in following folder:

   \code\STM32_F105-07_F2xx_USB-Host-Device_Lib_V2.0.0\Project\USB_Device_E

xamples\DFU\binary_template\MDK-ARM

In Installation directory of DfuSe_Demo_V3.0.2, open *BIN* folder, this opens a *DfuFileMgr* software, as shown below:



DFU File Manager - Want to ...

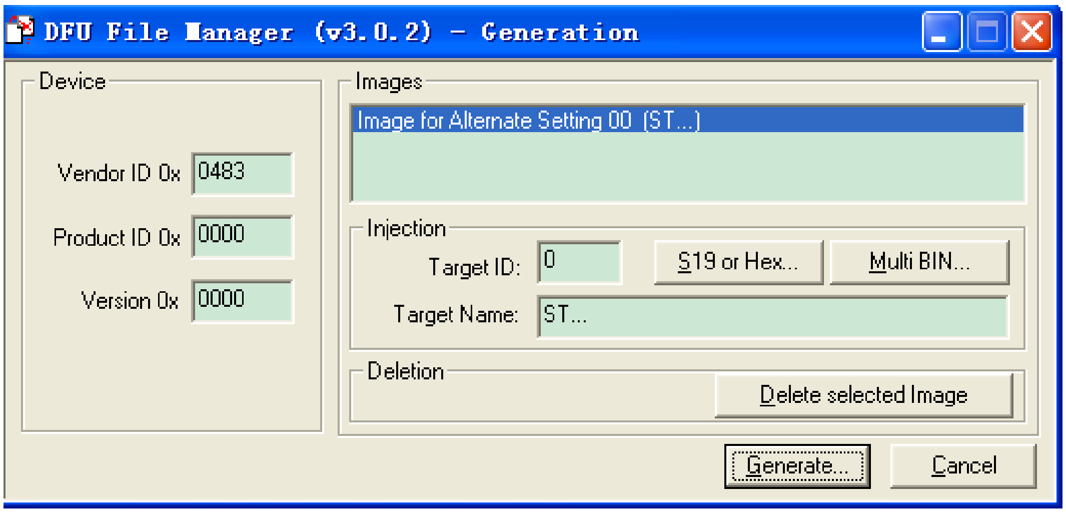
Choose your action:

[✓ I want to GENERATE a DFU file from S19, HEX or BIN files]

I want to EXTRACT S19, HEX or BIN files from a DFU one.

Figure 6-8 DFU file manage

Click “OK”, this opens a window as shown below:



DFU File Manager (v3.0.2) - Generation

Device

Vendor ID 0x 0483

Product ID 0x 0000

Version 0x 0000

Images

Image for Alternate Setting 00 (ST...)

Injection

Target ID: 0

Target Name: ST...

Deletion

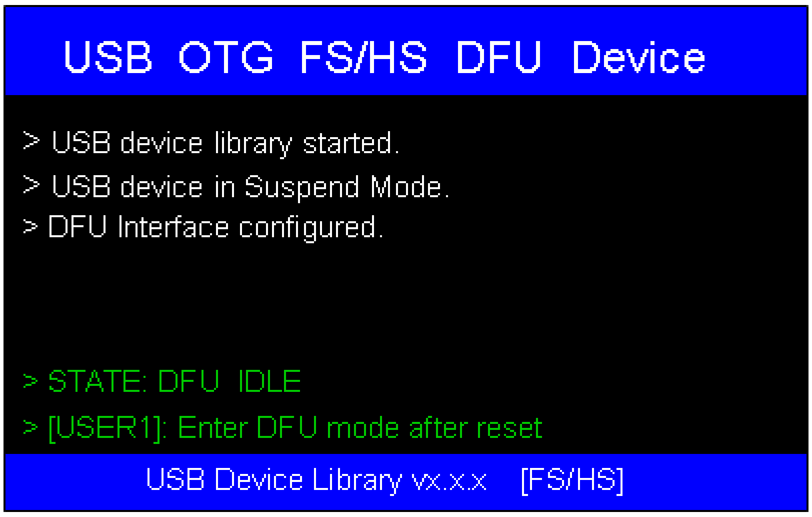
Figure 6-9 Generate DFU file

Click “S19 or Hex” button, select the file to be upgraded, then click “generate” button to generate DFU file.

3) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON2/CON3 and PC USB port.

4) Rebuild the demo, and then download the program into Flash.

5) At power on, the LCD displays the following messages.



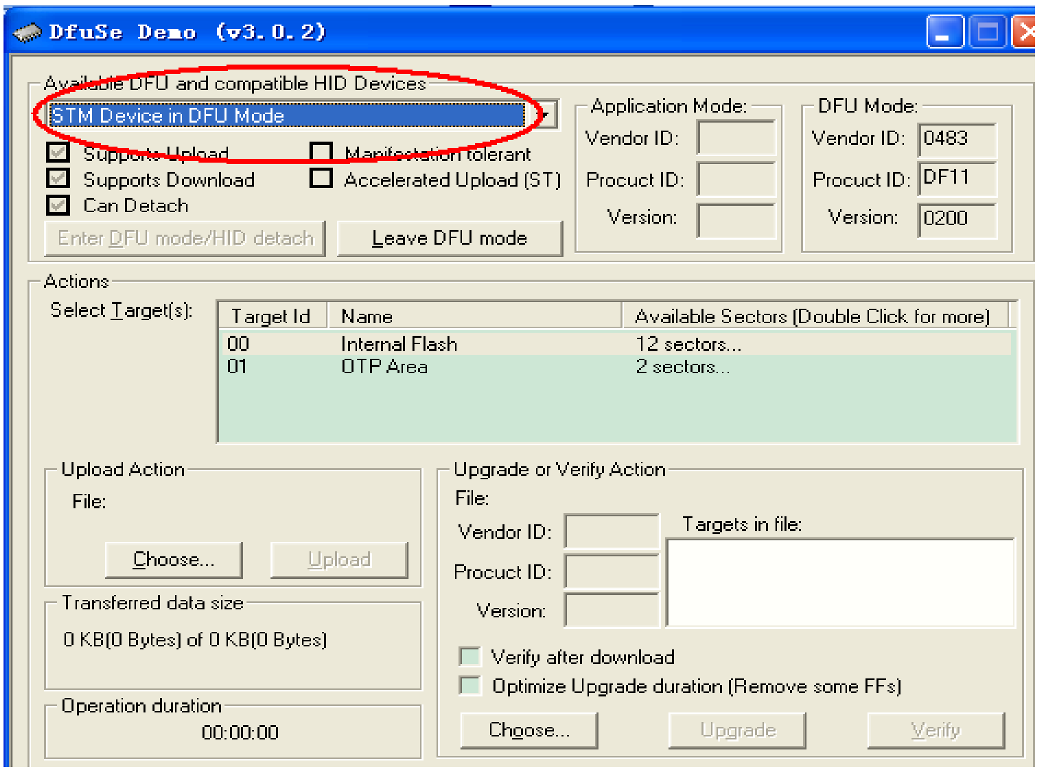
USB OTG FS/HS DFU Device

```
> USB device library started.
> USB device in Suspend Mode.
> DFU Interface configured.


> STATE: DFU IDLE
> [USER1]: Enter DFU mode after reset
```

USB Device Library vx.x.x [FS/HS]

Figure 6-10 USB device firmware upgrade cable connected display message

6) Run DfuSe DEMO software on PC. If PC identify the DFU device (DevKit1207 board), below window will be displayed, which means board is ready for USB DFU test.



DfuSe Demo (v3.0.2)

Available DFU and compatible HID Devices: STM Device in DFU Mode

- [✓] Supports Upload
- [✓] Supports Download
- [✓] Can Detach
- [ ] Manifestation tolerant
- [ ] Accelerated Upload (ST)

	Application Mode	DFU Mode
Vendor ID:		0483
Procuct ID:		DF11
Version:		0200

Actions

Select Target(s):

Target Id	Name	Available Sectors (Double Click for more)
00	Internal Flash	12 sectors...
01	OTP Area	2 sectors...

Upload Action — File:

Transferred data size: 0 KB(0 Bytes) of 0 KB(0 Bytes)

Operation duration: 00:00:00

Upgrade or Verify Action — File:

Vendor ID: Procuct ID: Version: Targets in file:

- [ ] Verify after download
- [ ] Optimize Upgrade duration (Remove some FFs)

Figure 6-11 STM Device in DFU mode

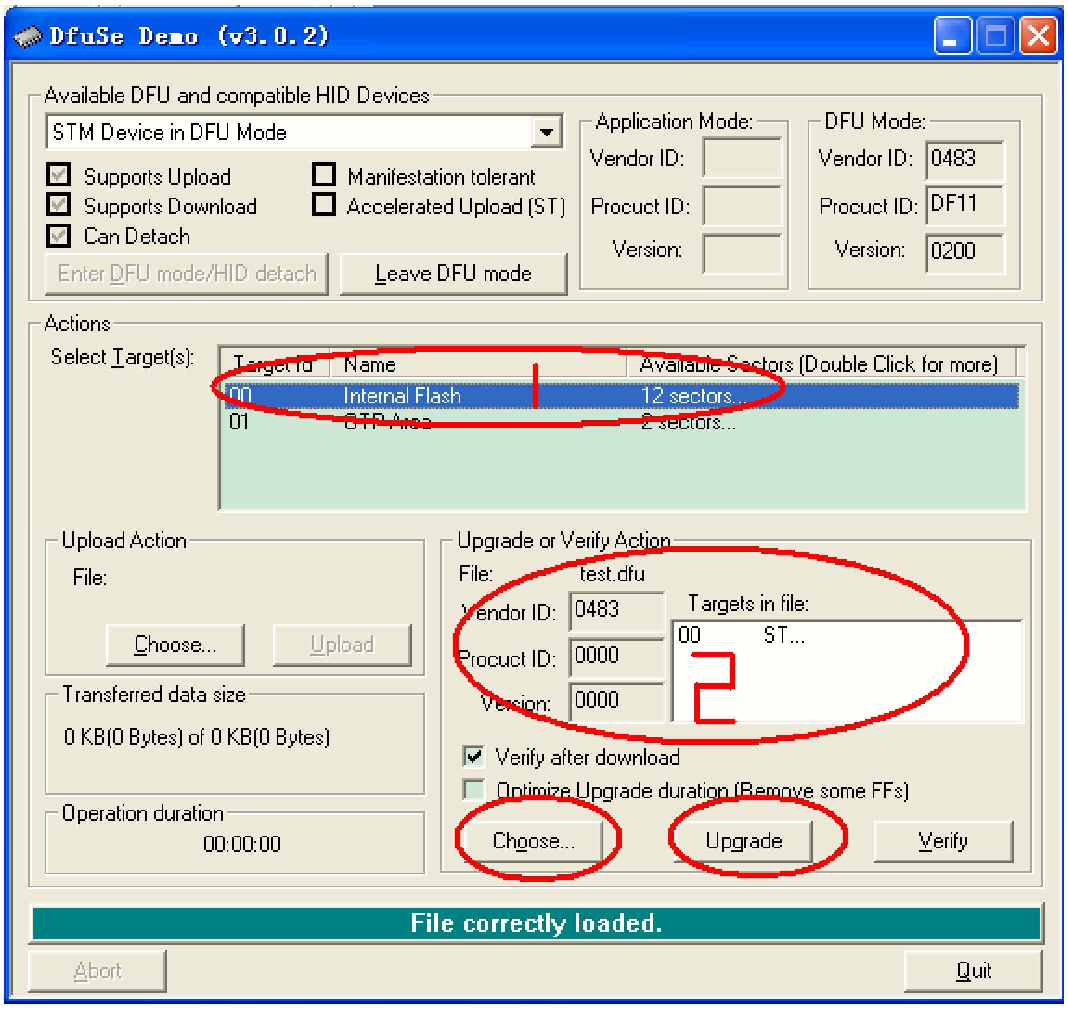
7) Select the target area to be programmed, as shown in below figure with number 1.

8) Select the DFU file to be programmed. Click “Choose” button select the DFU to be upgraded, as shown in below figure with number 2.

There is a DFU file for USB DFU testing purpose at the folder location:

\code\STM32_F105-07_F2xx_USB-Host-Device_Lib_V2.0.0\Project\USB_Device_E

xamples\DFU\binary_template\MDK-ARM


DfuSe Demo (v3.0.2)

Available DFU and compatible HID Devices: STM Device in DFU Mode

- [✓] Supports Upload
- [✓] Supports Download
- [✓] Can Detach
- [ ] Manifestation tolerant
- [ ] Accelerated Upload (ST)

Application Mode: Vendor ID: , Procuct ID: , Version:

DFU Mode: Vendor ID: 0483, Procuct ID: DF11, Version: 0200

Actions — Select Target(s):

Target Id	Name	Available Sectors (Double Click for more)
00	Internal Flash	12 sectors...
01	OTP Area	2 sectors...

Upload Action — File:

Transferred data size: 0 KB(0 Bytes) of 0 KB(0 Bytes)

Operation duration: 00:00:00

Upgrade or Verify Action — File: test.dfu

Vendor ID: 0483, Procuct ID: 0000, Version: 0000

Targets in file: 00 ST...

- [✓] Verify after download
- [ ] Optimize Upgrade duration (Remove some FFs)

File correctly loaded.

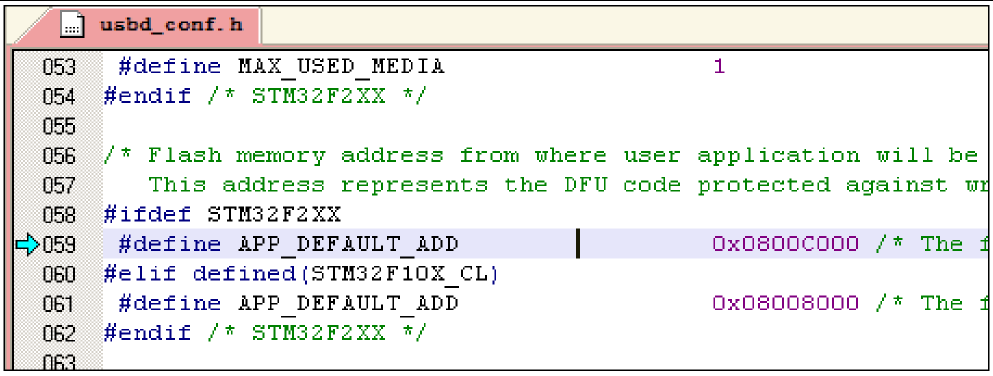
Figure 6-12 Upgrade DFU file

9) In order to update the firmware click "Upgrade" button to start the firmware update. Once completed a message will appear to indicate upgrade is successful or not.

10) At power on, MCU run in the new firmware.

To go back to the DFU example, you have to reset the device (using RESET button or software reset) while the KEY button is pushed.

Note: In the DFU DEMO, the application start address is set to 0x0800C000, as shown below. This address represents the DFU code protected against write and erase operations. You can modify this address in usbd_conf.h, but you must make sure that there enough space for DFU code (0x08000000 ～ application start address).



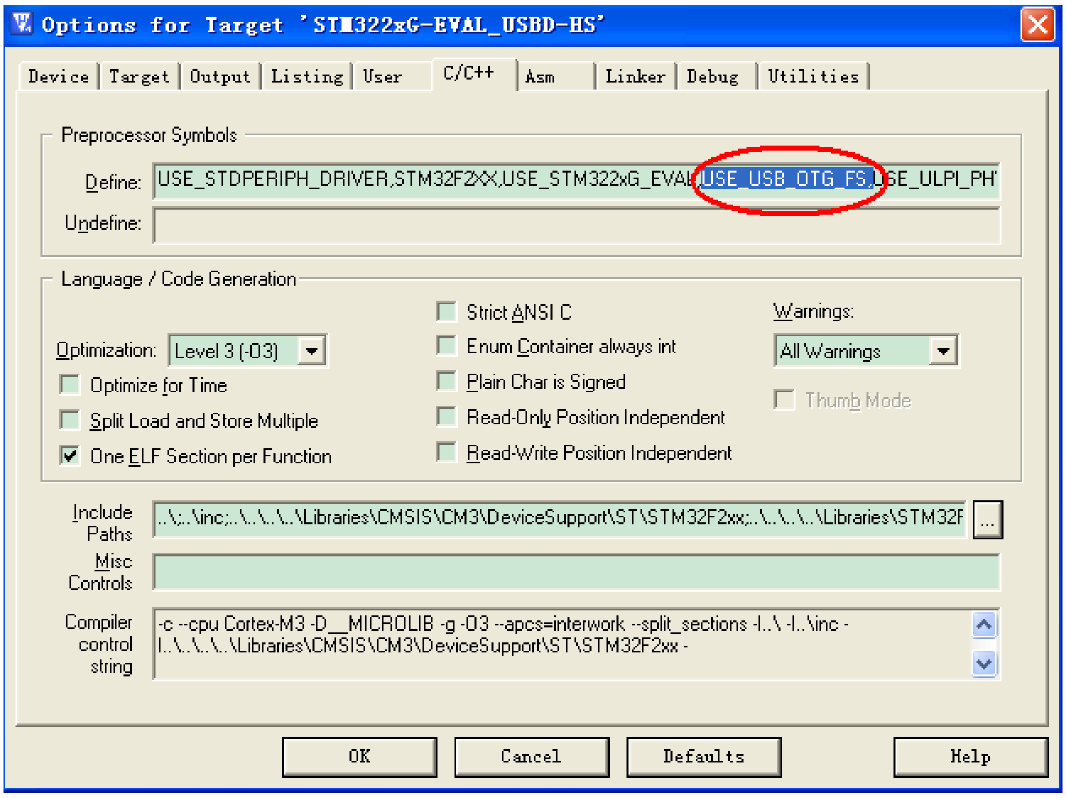
```
usbd_conf.h
 #define MAX_USED_MEDIA                 1
#endif /* STM32F2XX */

/* Flash memory address from where user application will be
   This address represents the DFU code protected against wr
#ifdef STM32F2XX
 #define APP_DEFAULT_ADD                0x0800C000 /* The f
#elif defined(STM32F10X_CL)
 #define APP_DEFAULT_ADD                0x08008000 /* The f
#endif /* STM32F2XX */
```

Figure 6-13 Configure start address of application

6.2.3 USB MSC device example

The MSC (Mass Storage) example gives a typical example of how to use the STM32F2xx USB OTG Device peripheral to communicate with a PC Host using the bulk transfer while the microSD card is used as storage media. On PC, user can open, close, create, delete, copy and paste the files stored in the SD card.

The MSC device example works in High-Speed and F Full-Speed modes. Users can select High-Speed/Full-Speed mode by modifying the relevant macro in MDK, as shown below:



Options for Target 'STM322xG-EVAL_USBD-HS'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Preprocessor Symbols

Define: USE_STDPERIPH_DRIVER,STM32F2XX,USE_STM322xG_EVAL,USE_USB_OTG_FS,USE_ULPI_PH

Undefine:

Language / Code Generation

Optimization: Level 3 (-O3)

[ ] 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: All Warnings

[ ] Thumb Mode

Include Paths: ..\;..\inc;..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx;..\..\..\..\Libraries\STM32F

Misc Controls:

Compiler control string: -c --cpu Cortex-M3 -D__MICROLIB -g -O3 --apcs=interwork --split_sections -I..\ -I..\inc -I..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx -

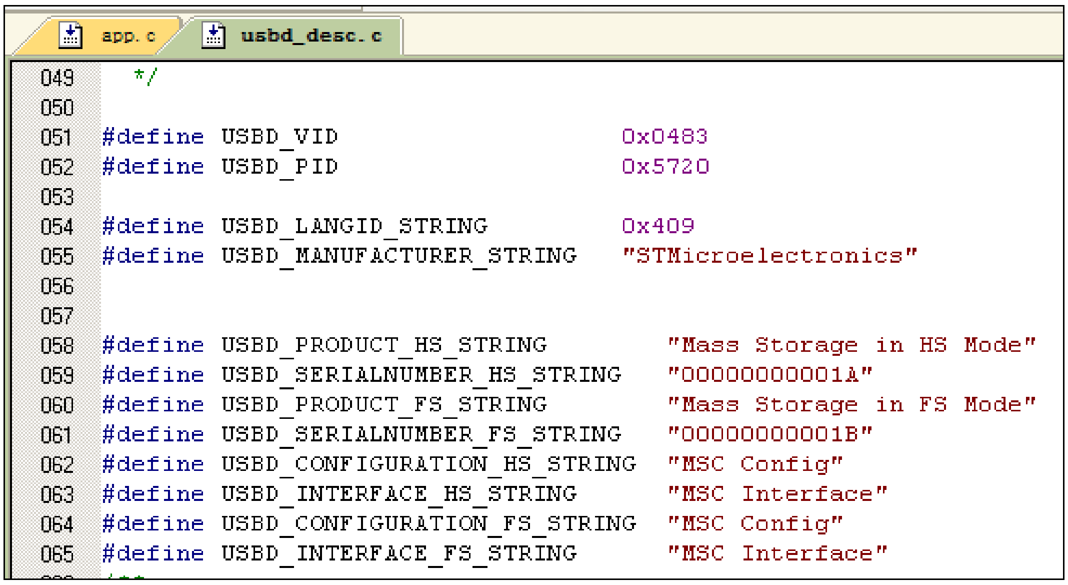
OK | Cancel | Defaults | Help

Figure 6-14 Select USB FS/HS mode for MSC device demo

If "Preprocessor Symbols" includes USE_USB_OTG_FS, the DEMO will work in Full-Speed mode. If "Preprocessor Symbols" includes USE_USB_OTG_HS, the DEMO will work in High-Speed mode.

Note: USE_USB_OTG_FS and USE_USB_OTG_HS should not be included in "Preprocessor Symbols" at the same time.

MSC device information is located in usbd_desc.c, as shown below:

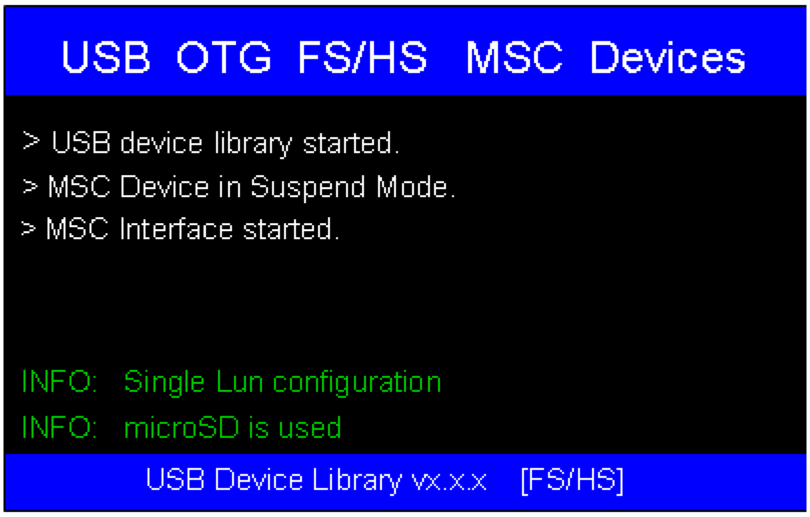


```
  */

#define USBD_VID                     0x0483
#define USBD_PID                     0x5720

#define USBD_LANGID_STRING           0x409
#define USBD_MANUFACTURER_STRING     "STMicroelectronics"


#define USBD_PRODUCT_HS_STRING          "Mass Storage in HS Mode"
#define USBD_SERIALNUMBER_HS_STRING     "00000000001A"
#define USBD_PRODUCT_FS_STRING          "Mass Storage in FS Mode"
#define USBD_SERIALNUMBER_FS_STRING     "00000000001B"
#define USBD_CONFIGURATION_HS_STRING    "MSC Config"
#define USBD_INTERFACE_HS_STRING        "MSC Interface"
#define USBD_CONFIGURATION_FS_STRING    "MSC Config"
#define USBD_INTERFACE_FS_STRING        "MSC Interface"
```

Figure 6-15 USB MSC device information

In order to test the USB MSC device example, follow these steps:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON2/CON3 and PC USB port.
2) Plug in SD card into CON4. Make sure that jumpers JP5 and JP6 are fitted, JP7, JP8, JP10 and JP11 are not fitted.
3) Rebuild the demo, and then download the program into Flash.
4) At power on, the LCD displays the following messages.



USB OTG FS/HS MSC Devices

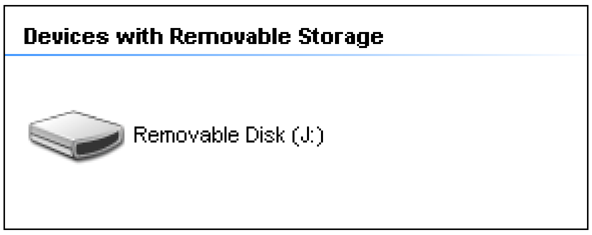
> USB device library started.
> MSC Device in Suspend Mode.
> MSC Interface started.

INFO: Single Lun configuration
INFO: microSD is used

USB Device Library vx.x.x [FS/HS]

Figure 6-16 Cable connected display message

5) PC will identify the removable disk automatically. Users can use it the same as an U-disk, as shown below:



Devices with Removable Storage

Removable Disk (J:)

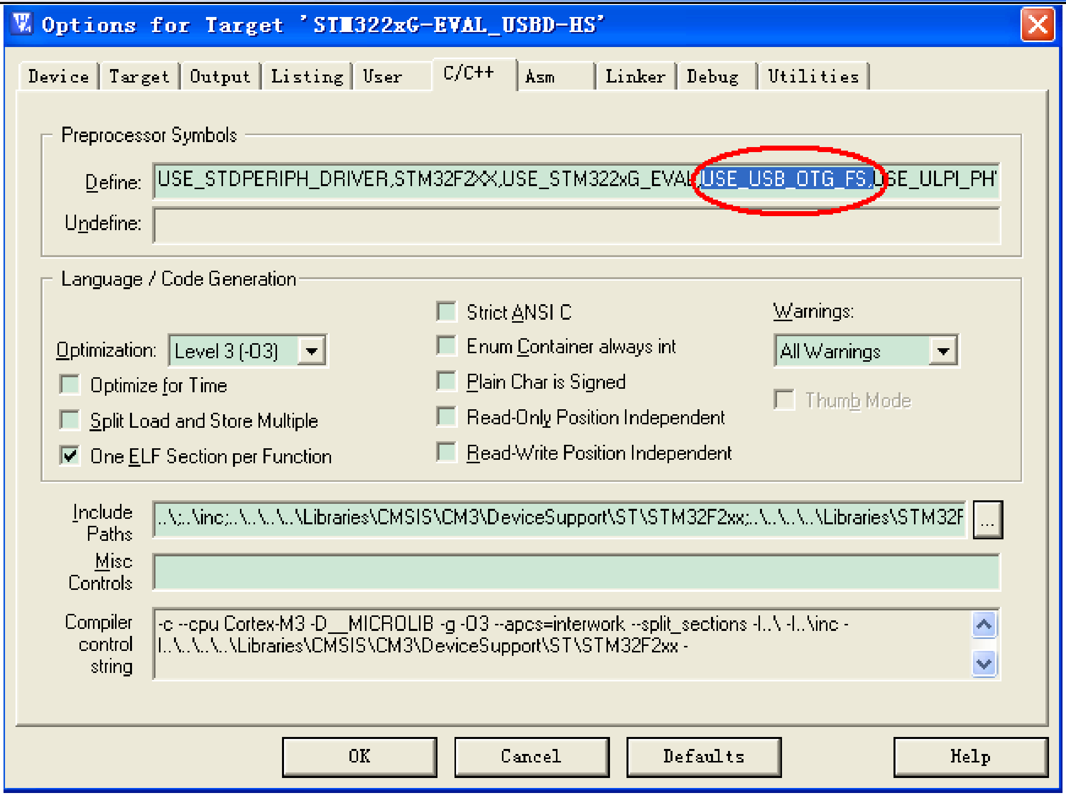
Figure 6-17 MSC device displayed on PC

Note: In this example, Kingston's 1GB/2GB microSD card, SanDisk's 2GB microSD card pass test. It does not guarantee that this example supports all kinds of SD card.

6.2.4 USB HID device example

This example demonstrates how to use the USB OTG Device peripheral on the STM32F2xx. The STM32 device is enumerated as an USB Device Joystick Mouse that uses the native PC Host HID driver. The USER1 and USER2 key mounted on the DevKit1207 boards are used to emulate the Mouse directions.

The HID device example works in High-Speed and Full-Speed modes. Users can select High-Speed/Full-Speed mode by modifying the relevant macro in MDK, as shown below:



Options for Target 'STM322xG-EVAL_USBD-HS'

Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities

Preprocessor Symbols

Define: USE_STDPERIPH_DRIVER,STM32F2XX,USE_STM322xG_EVAL,USE_USB_OTG_FS,USE_ULPI_PH

Undefine:

Language / Code Generation

Optimization: Level 3 (-O3)

- [ ] Optimize for Time
- [ ] Split Load and Store Multiple
- [x] 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: All Warnings

- [ ] Thumb Mode

Include Paths: ..\;..\inc;..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx;..\..\..\..\Libraries\STM32F

Misc Controls:

Compiler control string: -c --cpu Cortex-M3 -D__MICROLIB -g -O3 --apcs=interwork --split_sections -I..\ -I..\inc -I..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx -

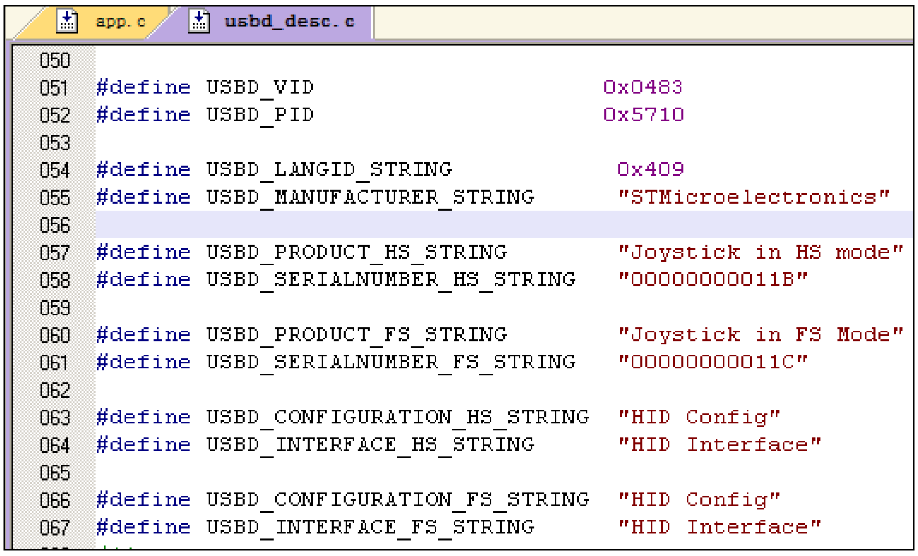
OK | Cancel | Defaults | Help

Figure 6-18 Select USB FS/HS mode for HID device demo

If "Preprocessor Symbols" includes USE_USB_OTG_FS, the DEMO will work in Full-Speed mode. If "Preprocessor Symbols" includes USE_USB_OTG_HS, the DEMO will work in High-Speed mode.

Note: USE_USB_OTG_FS and USE_USB_OTG_HS should not be included in "Preprocessor Symbols" at the same time.

HID device information is located in usbd_desc.c, as shown below:



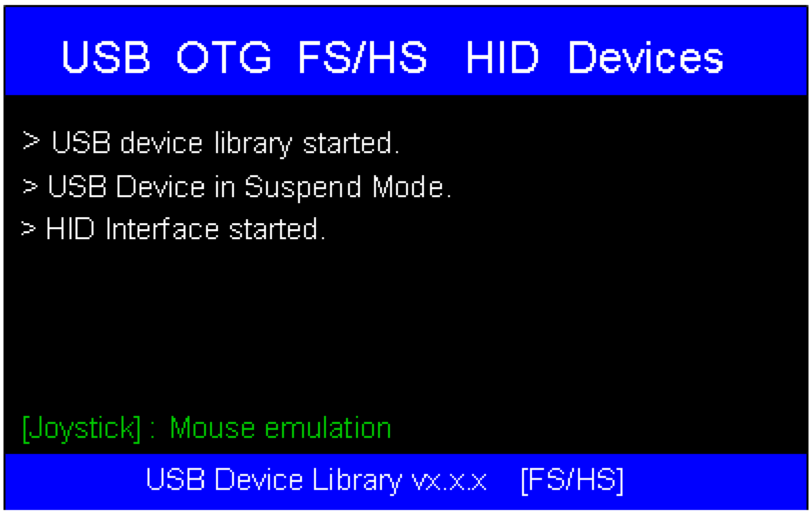
app.c | usbd_desc.c

```

#define USBD_VID                     0x0483
#define USBD_PID                     0x5710

#define USBD_LANGID_STRING            0x409
#define USBD_MANUFACTURER_STRING      "STMicroelectronics"

#define USBD_PRODUCT_HS_STRING        "Joystick in HS mode"
#define USBD_SERIALNUMBER_HS_STRING   "00000000011B"

#define USBD_PRODUCT_FS_STRING        "Joystick in FS Mode"
#define USBD_SERIALNUMBER_FS_STRING   "00000000011C"

#define USBD_CONFIGURATION_HS_STRING  "HID Config"
#define USBD_INTERFACE_HS_STRING      "HID Interface"

#define USBD_CONFIGURATION_FS_STRING  "HID Config"
#define USBD_INTERFACE_FS_STRING      "HID Interface"
```

Figure 6-19 Select USB FS/HS mode for HID device demo

In order to test the USB HID device example, please follow steps below:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON2/CON3 and PC USB port.
2) Rebuild the demo, and then download the program into Flash.
3) At power on, the LCD displays the following messages.



```
USB OTG FS/HS HID Devices

> USB device library started.
> USB Device in Suspend Mode.
> HID Interface started.

[Joystick] : Mouse emulation
USB Device Library vx.x.x [FS/HS]
```

Figure 6-20 Cable connected display message

4) PC will identify DevKit1207 board as HID device automatically.
5) Press USER1 button on DevKit1207 board, mouse will move rightward. Press USER2 button, mouse will move upward. There are no more keys on the board for moving downward and rightward.

6.2.5 USB DualCore device example

The Dual core USB device example integrates the two mass storage and HID example described above in same project and uses the multi core support feature. The Mass storage device is connected to the High speed USB connector (CON3) while the HID is connected to the Full Speed connector (CON2).

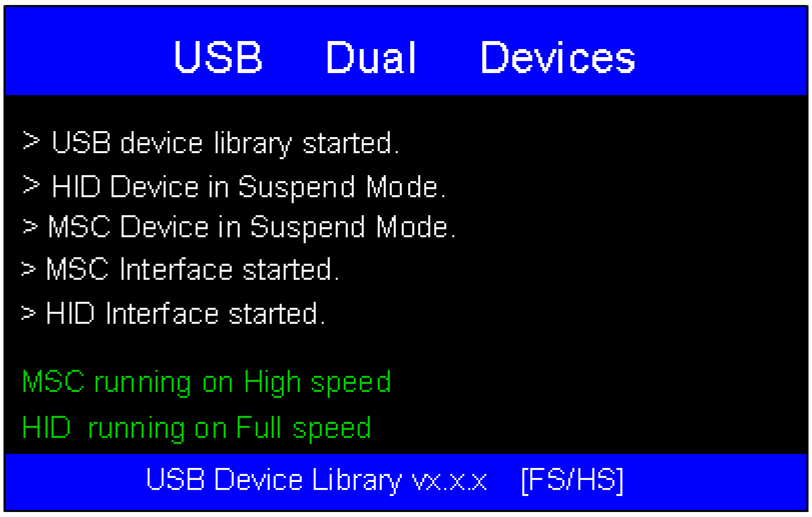
In order to test the USB DualCore device example, please follow steps below:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON2 and PC USB port. Connect another one USB cable (Type A Male to Type Mini-B Male) between CON3 and PC USB port.

2) Plug in SD card into CON4. Make sure that jumpers JP5 and JP6 are fitted, JP7, JP8, JP10 and JP11 are not fitted.

3) Rebuild the demo, and then download the program into Flash.

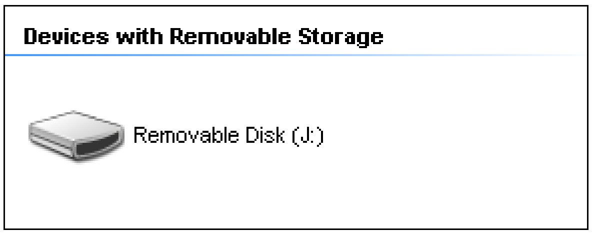
4) At power on, the LCD displays the following messages.



```
USB    Dual    Devices

> USB device library started.
> HID Device in Suspend Mode.
> MSC Device in Suspend Mode.
> MSC Interface started.
> HID Interface started.

MSC running on High speed
HID  running on Full speed
USB Device Library vx.x.x    [FS/HS]
```

Figure 6-21 DualCore Cable connected display message

5) PC will identify the removable disk automatically. Users can use it the same as an U-disk, as shown below:



Devices with Removable Storage

Removable Disk (J:)

Figure 6-22 MSC device displayed on PC

Note: In this example, Kingston's 1GB/2GB microSD card, SanDisk's 2GB microSD card pass test. It does not guarantee that this example supports all kinds of SD card.

6) PC will identify DevKit1207 board as HID device automatically.

Press USER1 button on DevKit1207 board, mouse will move rightward. Press USER2 button, mouse will move upward. There are no more keys on the board for moving downward and rightward.

6.2.6 USB VCP device example

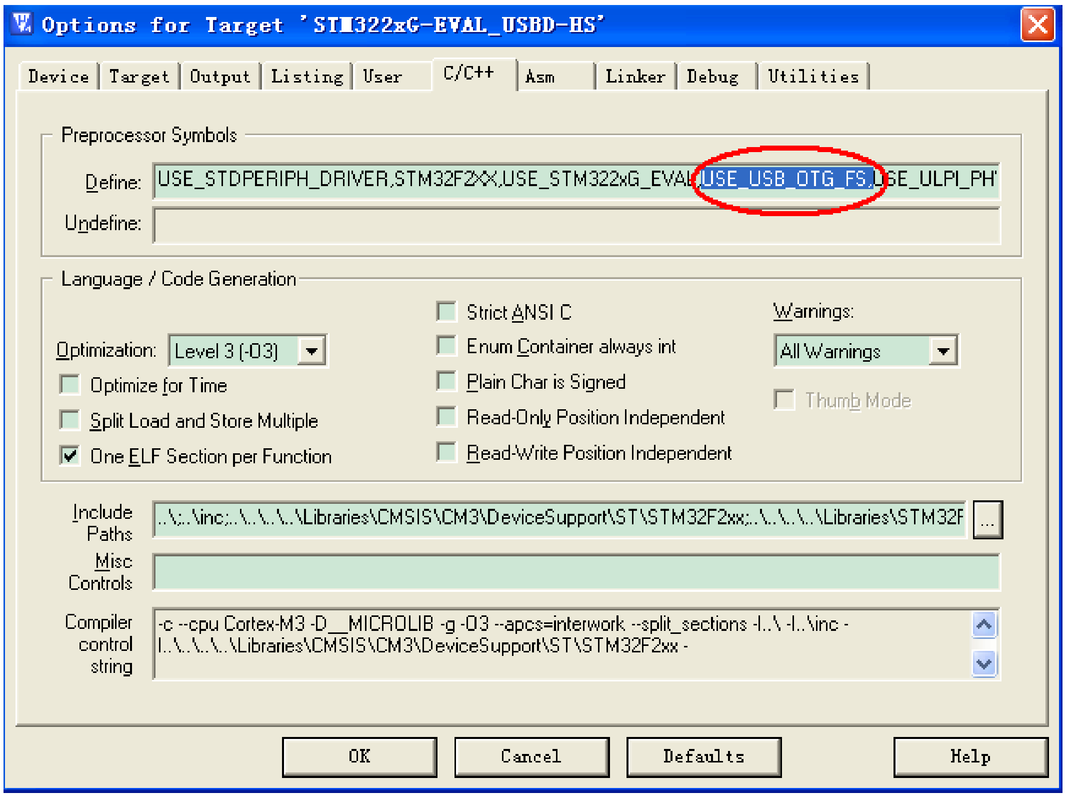
The VCP example illustrates an implementation of the CDC class following the PSTN subprotocol.

The VCP example allows the STM32 device to behave as a USB-to-RS232 bridge.

- On one side, the STM32 communicates with host (PC) through USB interface in Device mode.
- On the other side, the STM32 communicates with other devices (same host, other host, other devices…) through the USART interface (RS232).

The support of the VCP interface is managed through the ST Virtual Com Port driver.

The VCP device example works in High-Speed and Full-Speed modes. Users can select High-Speed/Full-Speed mode by modifying the relevant macro in MDK, as shown below:



Options for Target 'STM322xG-EVAL_USBD-HS'

Preprocessor Symbols

Define: USE_STDPERIPH_DRIVER,STM32F2XX,USE_STM322xG_EVAL,USE_USB_OTG_FS,USE_ULPI_PH

Undefine:

Language / Code Generation

Optimization: Level 3 (-O3)

- [ ] Optimize for Time
- [ ] Split Load and Store Multiple
- [x] 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: All Warnings

- [ ] Thumb Mode

Include Paths: ..\;..\inc;..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx;..\..\..\..\Libraries\STM32F

Misc Controls:

Compiler control string: -c --cpu Cortex-M3 -D__MICROLIB -g -O3 --apcs=interwork --split_sections -I..\ -I..\inc -I..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx -

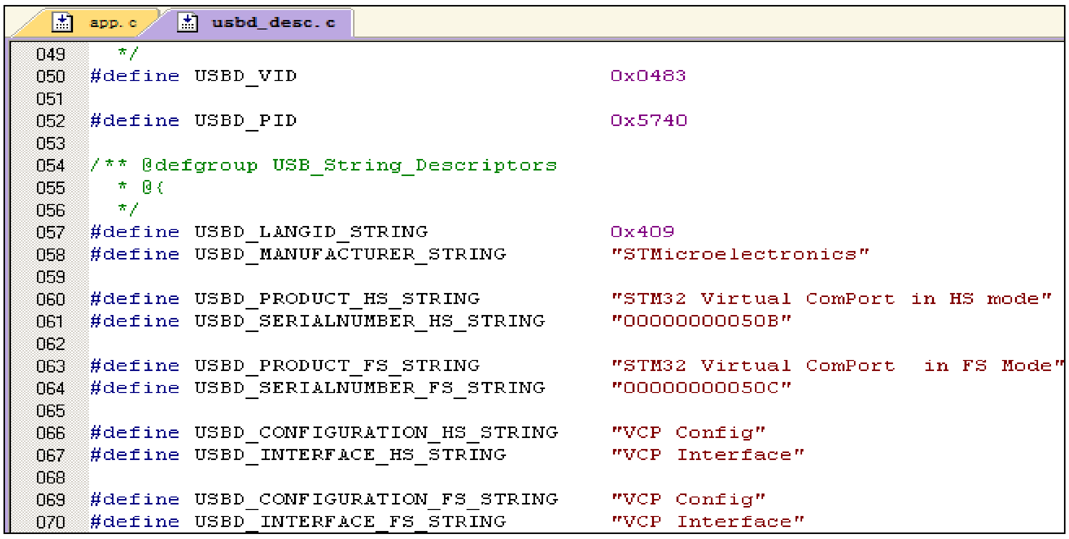
Figure 6-23 Select USB FS/HS mode for VCP device demo

If "Preprocessor Symbols" includes USE_USB_OTG_FS, the DEMO will work in Full-Speed mode. If "Preprocessor Symbols" includes USE_USB_OTG_HS, the DEMO will work in High-Speed mode.

Note: USE_USB_OTG_FS and USE_USB_OTG_HS should not be included in

"Preprocessor Symbols" at the same time.

VCP device information is located in usbd_desc.c, as shown below:



```
  */
#define USBD_VID                          0x0483

#define USBD_PID                          0x5740

/** @defgroup USB_String_Descriptors
  * @{
  */
#define USBD_LANGID_STRING                0x409
#define USBD_MANUFACTURER_STRING          "STMicroelectronics"

#define USBD_PRODUCT_HS_STRING            "STM32 Virtual ComPort in HS mode"
#define USBD_SERIALNUMBER_HS_STRING       "00000000050B"

#define USBD_PRODUCT_FS_STRING            "STM32 Virtual ComPort  in FS Mode"
#define USBD_SERIALNUMBER_FS_STRING       "00000000050C"

#define USBD_CONFIGURATION_HS_STRING      "VCP Config"
#define USBD_INTERFACE_HS_STRING          "VCP Interface"

#define USBD_CONFIGURATION_FS_STRING      "VCP Config"
#define USBD_INTERFACE_FS_STRING          "VCP Interface"
```

Figure 6-24 USB VCP device information

In order to facilitate testing, a PC plays as two host of VCP.

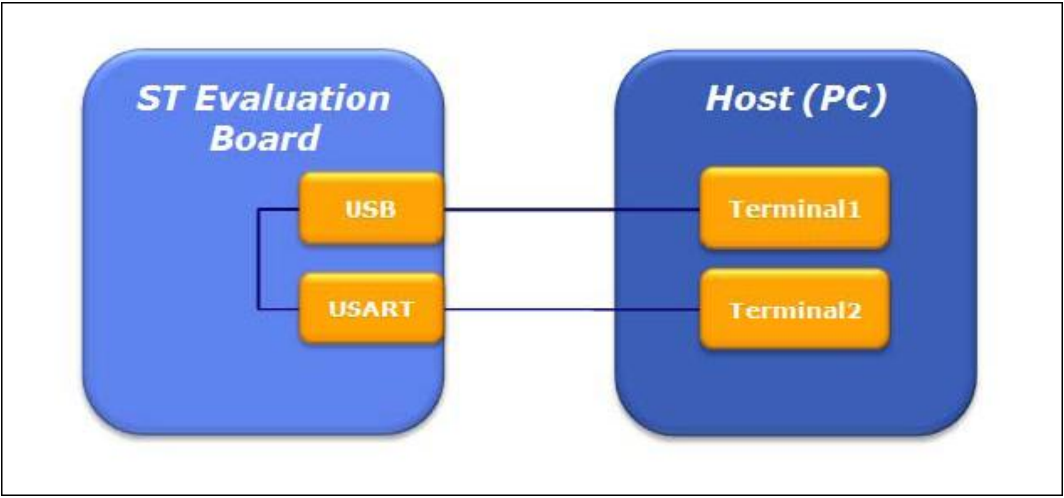


Figure 6-25 One single Host for USB and USART

In order to test the USB VCP device example, please follow the below steps:

1) Install VCP_V1.3.1_Setup.exe on the PC. The software is located CD-ROM at the following location:

   \code\STM32_F105-07_F2xx_USB-Host-Device_Lib_V2.0.0\Utilities\Third_Party\PC_Software\stm32_vcp

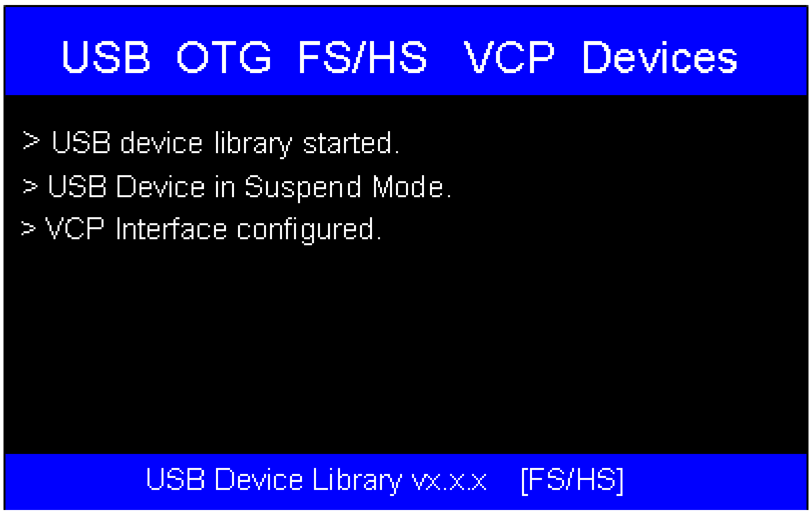
   If your PC is 64-bit, please install *VCP_V1.3.1_Setup_x64.exe*.

2) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON2/CON3 and PC USB port.

3) Connect a null-modem female/female RS232 cable between the DB9 connector COM1 (USART3) and PC serial port. Make sure that jumpers JP7 and JP8 are fitted, JP5, JP6, JP10 and JP11 are not fitted.

4) Rebuild the demo, and then download the program into Flash.

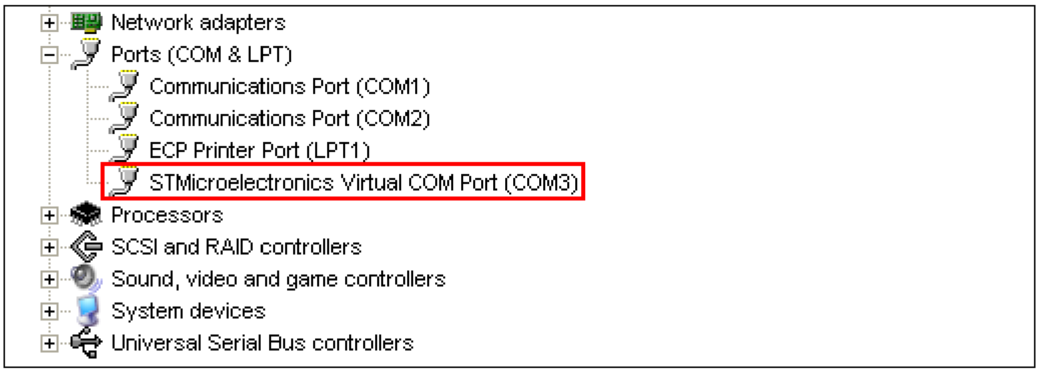
5) At power on, the LCD displays the following messages.



```
USB OTG FS/HS VCP Devices

> USB device library started.
> USB Device in Suspend Mode.
> VCP Interface configured.

USB Device Library vx.x.x    [FS/HS]
```

Figure 6-26 USB audio device cable connected display message

6) USB device (DevKit1207) is enumerated as serial communication port



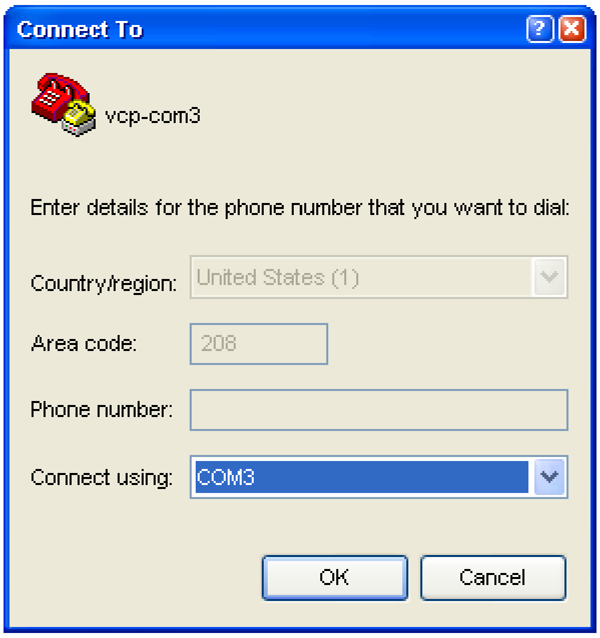
```
+ Network adapters
- Ports (COM & LPT)
    Communications Port (COM1)
    Communications Port (COM2)
    ECP Printer Port (LPT1)
    STMicroelectronics Virtual COM Port (COM3)
+ Processors
+ SCSI and RAID controllers
+ Sound, video and game controllers
+ System devices
+ Universal Serial Bus controllers
```

Figure 6-27 DevKit1207 have been enumerated as VCP device

7) Configure the virtual com port as below.

Start HyperTerminal by clicking on ***Start -> Programs -> Accessories -> Communications ->HyperTerminal***.

The ‘Connect To’ dialog box appears. Ignore the first three boxes – these are used with dial-up modem services. In the last box ‘Connect using’ select the COM port that you will be using and press ‘OK’.



Connect To

vcp-com3

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

Country/region: United States (1)

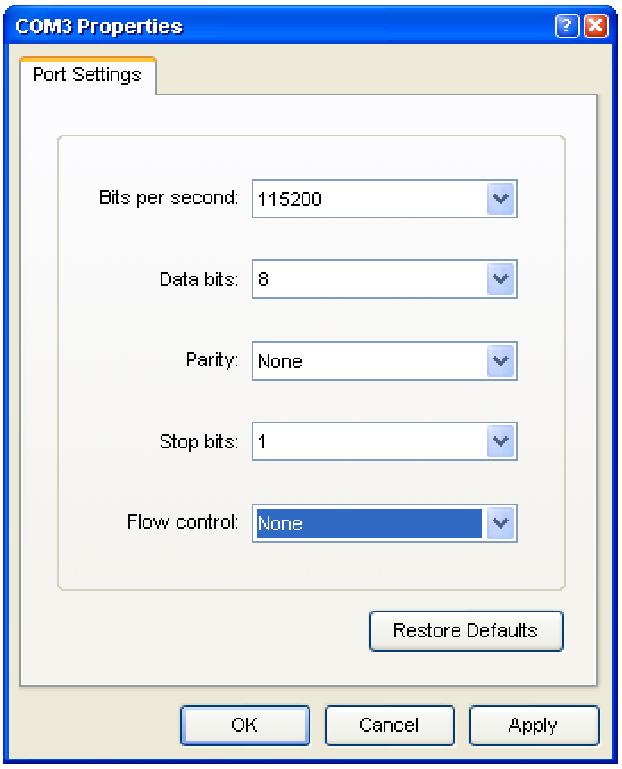
Area code: 208

Phone number:

Connect using: COM3

Figure 6-28 Create HyperTerminal for the virtual com port

In the following 'COM properties' dialog box you can set up the communication parameters for the COM port. Set for 115200 bits per second, 8 data bits, no parity, 1 stop bit and no flow control. Press 'OK' when done.



COM3 Properties

Port Settings

Bits per second: 115200

Data bits: 8

Parity: None

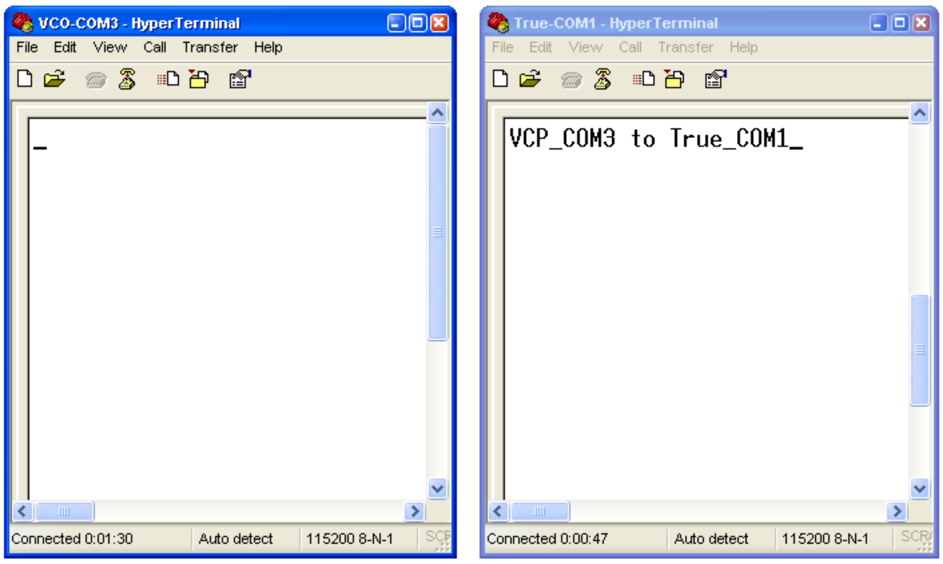
Stop bits: 1

Flow control: None

Figure 6-29 VCP port settings

8) Configure com port that connected to DevKit1207 board in the same way.

9) Communication test. Try sending some characters with the HyperTerminal of virtual serial port, the other HyperTerminal (COM3) will receive these characters.


VCO-COM3 - HyperTerminal
File Edit View Call Transfer Help
True-COM1 - HyperTerminal
File Edit View Call Transfer Help

```
_
```

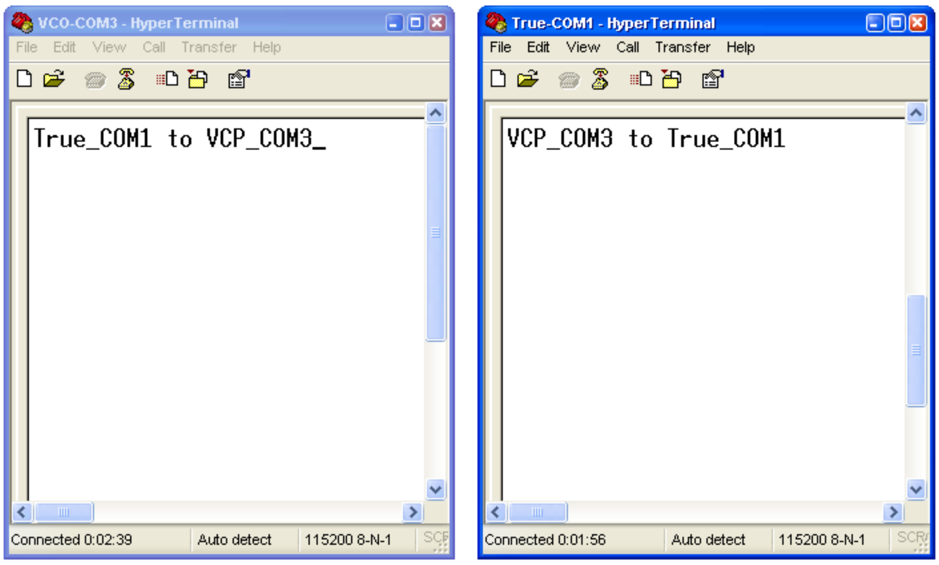
```
VCP_COM3 to True_COM1_
```

Connected 0:01:30 Auto detect 115200 8-N-1

Connected 0:00:47 Auto detect 115200 8-N-1

Figure 6-30 Message from VCP COM to True COM

Both the two HyperTerminals can send or receive data. As shown below:


VCO-COM3 - HyperTerminal
File Edit View Call Transfer Help
True-COM1 - HyperTerminal
File Edit View Call Transfer Help

```
True_COM1 to VCP_COM3_
```

```
VCP_COM3 to True_COM1
```

Connected 0:02:39 Auto detect 115200 8-N-1

Connected 0:01:56 Auto detect 115200 8-N-1

Figure 6-31 Message from True COM to VCP COM

6.3 USB_Host example

This folder contains three examples when USB works in host mode.

- DualCore
- HID

- MSC

As shown in the above figure, the USB host library is composed of two main parts: the library core and the class drivers.

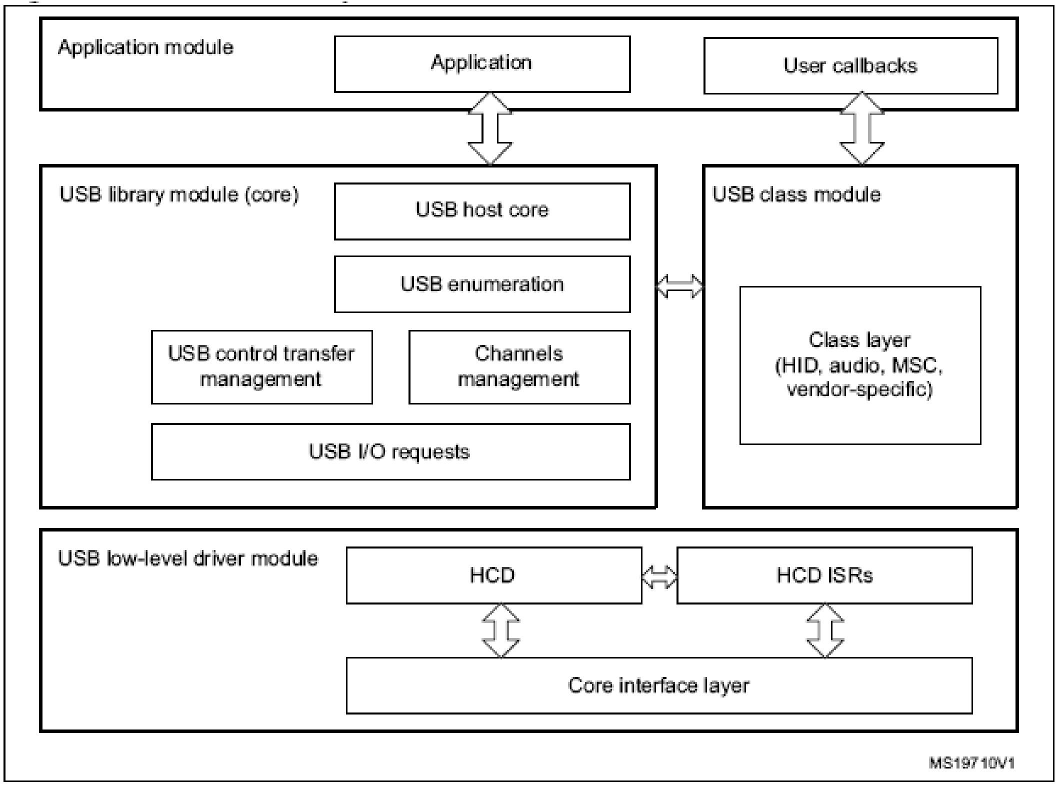


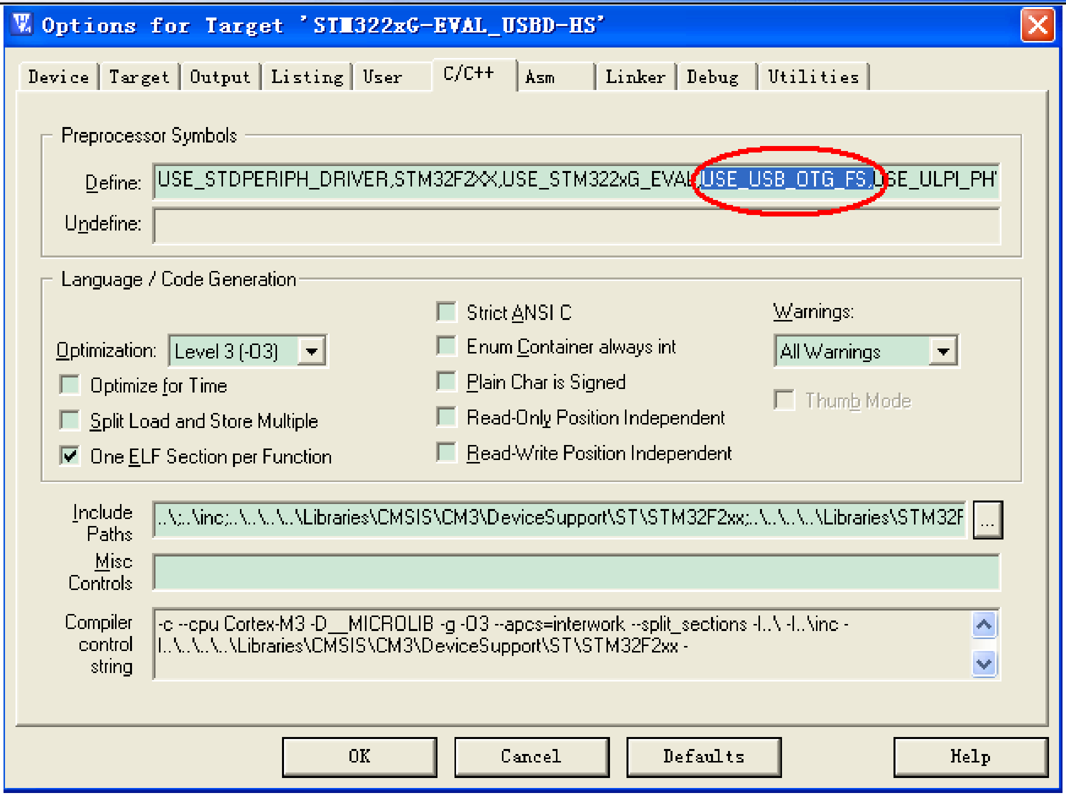
Figure 6-32 USB host library overview

6.3.1 USB MSC host example

This example shows how to use the USB OTG host peripheral on the STM32F2xx devices.

The STM32 behave as a mass storage Host that can enumerate, show content and display the supported BMP image in the attached USB flash disk.

The MSC host example works in High-Speed and Full-Speed modes. Users can select High-Speed/Full-Speed mode by modifying the relevant macro in MDK, as shown below:


Options for Target 'STM322xG-EVAL_USBD-HS'

Preprocessor Symbols

Define: USE_STDPERIPH_DRIVER,STM32F2XX,USE_STM322xG_EVAL,USE_USB_OTG_FS,USE_ULPI_PH

Undefine:

Language / Code Generation

Optimization: Level 3 (-O3)

[ ] 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: All Warnings

[ ] Thumb Mode

Include Paths: ..\;..\inc;..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx;..\..\..\..\Libraries\STM32F

Misc Controls:

Compiler control string: -c --cpu Cortex-M3 -D__MICROLIB -g -O3 --apcs=interwork --split_sections -I..\ -I..\inc -I..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx -

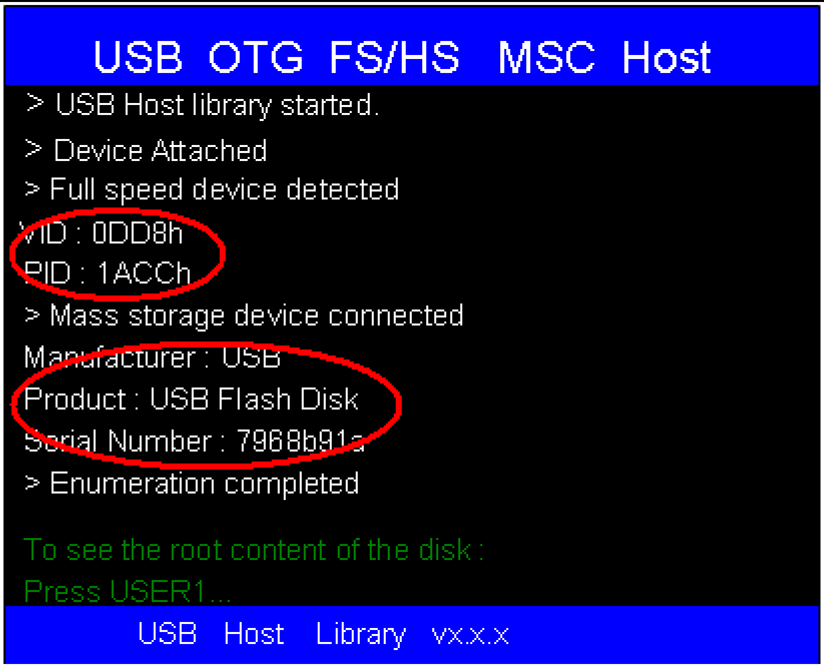
Figure 6-33 Select USB FS/HS mode for MSC host demo

If "Preprocessor Symbols" includes USE_USB_OTG_FS, the DEMO will work in Full-Speed mode. If "Preprocessor Symbols" includes USE_USB_OTG_HS, the DEMO will work in High-Speed mode.

Note: USE_USB_OTG_FS and USE_USB_OTG_HS should not be included in "Preprocessor Symbols" at the same time.

In order to test the USB MSC host example, please follow the below steps:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON2/CON3 and PC USB port.
2) Rebuild the demo, and then download the program into Flash.
3) At power on, the LCD displays the following messages.

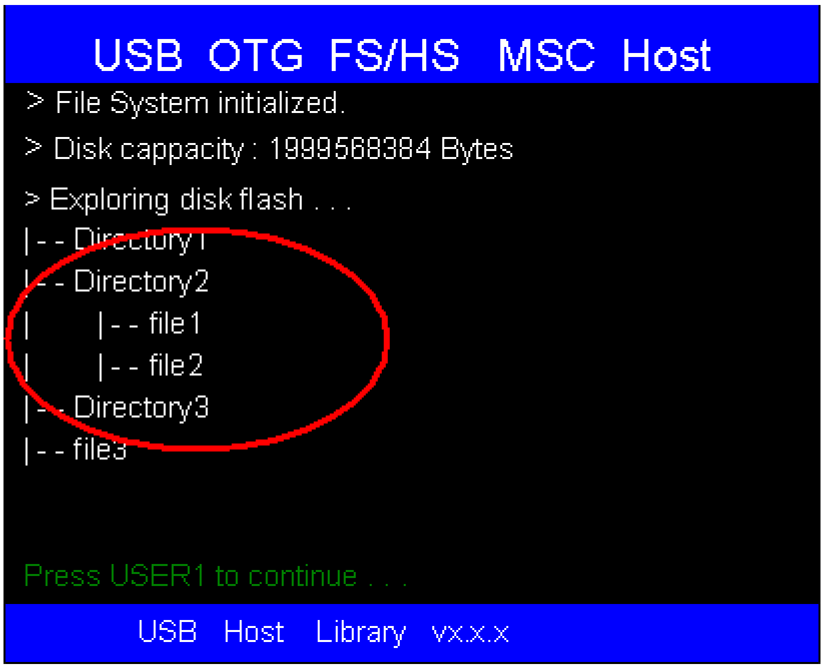


```
USB OTG FS/HS  MSC Host
> USB Host library started.
> Device Attached
> Full speed device detected
VID : 0DD8h
PID : 1ACCh
> Mass storage device connected
Manufacturer : USB
Product : USB Flash Disk
Serial Number : 7968b91a
> Enumeration completed

To see the root content of the disk :
Press USER1...
USB  Host  Library  vx.x.x
```

Figure 6-34 USB mass storage host display message

Note: The contents circled by red color are USB device information. It depends on the USB device that plugged in.

4) When the user press the USER1 button, the application explore the USB flash disk content and the LCD displays the following messages:

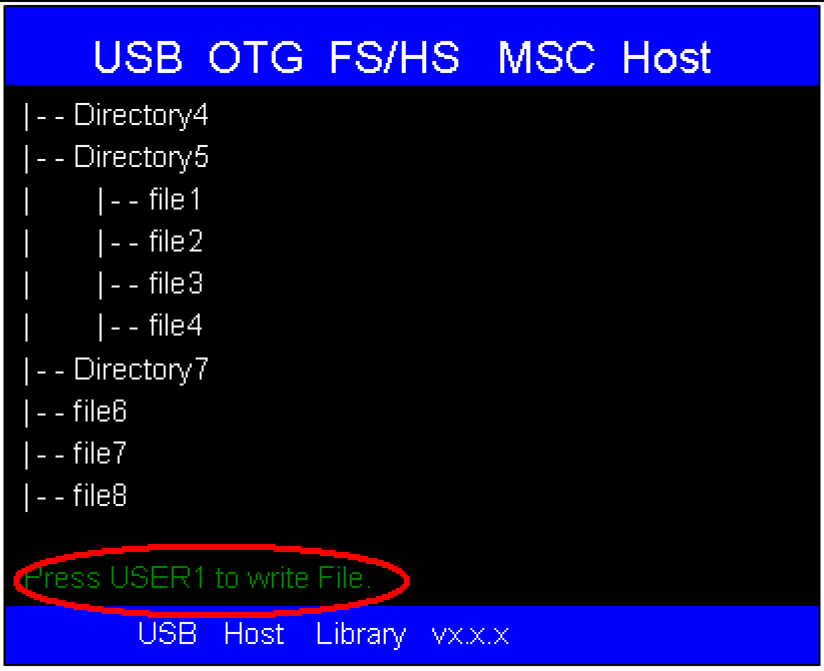


```
USB OTG FS/HS  MSC Host
> File System initialized.
> Disk cappacity : 1999568384 Bytes
> Exploring disk flash . . .
|-- Directory1
|-- Directory2
|      |-- file1
|      |-- file2
|-- Directory3
|-- file3

Press USER1 to continue . . .
USB  Host  Library  vx.x.x
```

Figure 6-35 USB mass storage explorer display message

Note: The contents circled by red color depend on the USB device that plugged in.

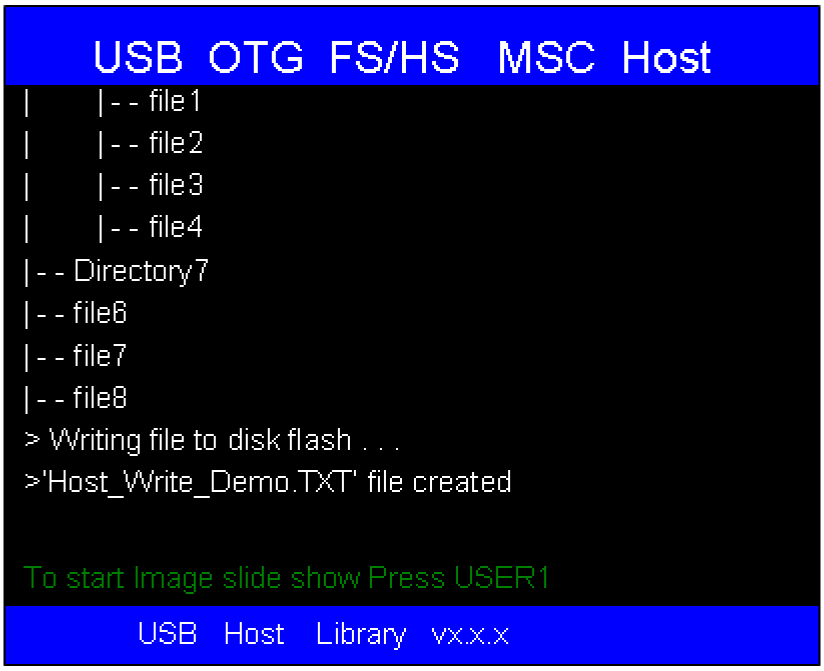
5) User has to press the USER1 button to display the whole disk (recursion level 2). Below is a screenshot when the entire flash disk is shown:



```
USB OTG FS/HS  MSC Host
|-- Directory4
|-- Directory5
|      |-- file1
|      |-- file2
|      |-- file3
|      |-- file4
|-- Directory7
|-- file6
|-- file7
|-- file8

Press USER1 to write File.
USB  Host  Library  vx.x.x
```

Figure 6-36 USB mass storage explorer display message (last screen)

6) The user has to press the USER1 button to write a small file, e.g. Host_Write_Demo.txt (less to 1 KB) on the disk.



```
USB OTG FS/HS  MSC Host
|      |-- file1
|      |-- file2
|      |-- file3
|      |-- file4
|-- Directory7
|-- file6
|-- file7
|-- file8
> Writing file to disk flash . . .
>'Host_Write_Demo.TXT' file created

To start Image slide show Press USER1
USB  Host  Library  vx.x.x
```

Figure 6-37 USB mass storage write file display message

7) After writing the file to the disk, user can press the USER1 button to start the Image slide show.Only the BMP files with the following format are supported :

● Width:	320
● Height:	240
● BPP:	16

- Compression: RGB bitmap with RGB masks

There are some BMP files for testing purpose located in the following location:

\code\STM32_F105-07_F2xx_USB-Host-Device_Lib_V2.0.0\Utilities\Binary\Media

Copy these files to the root of the USB flash disk, then press the USER1 button to start the Image slide show:

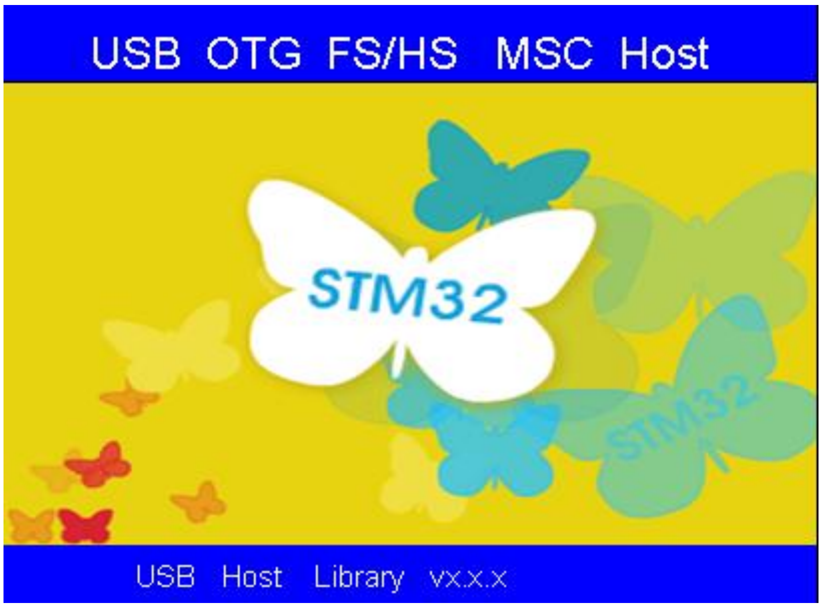


Figure 6-38 USB mass storage slideshow example

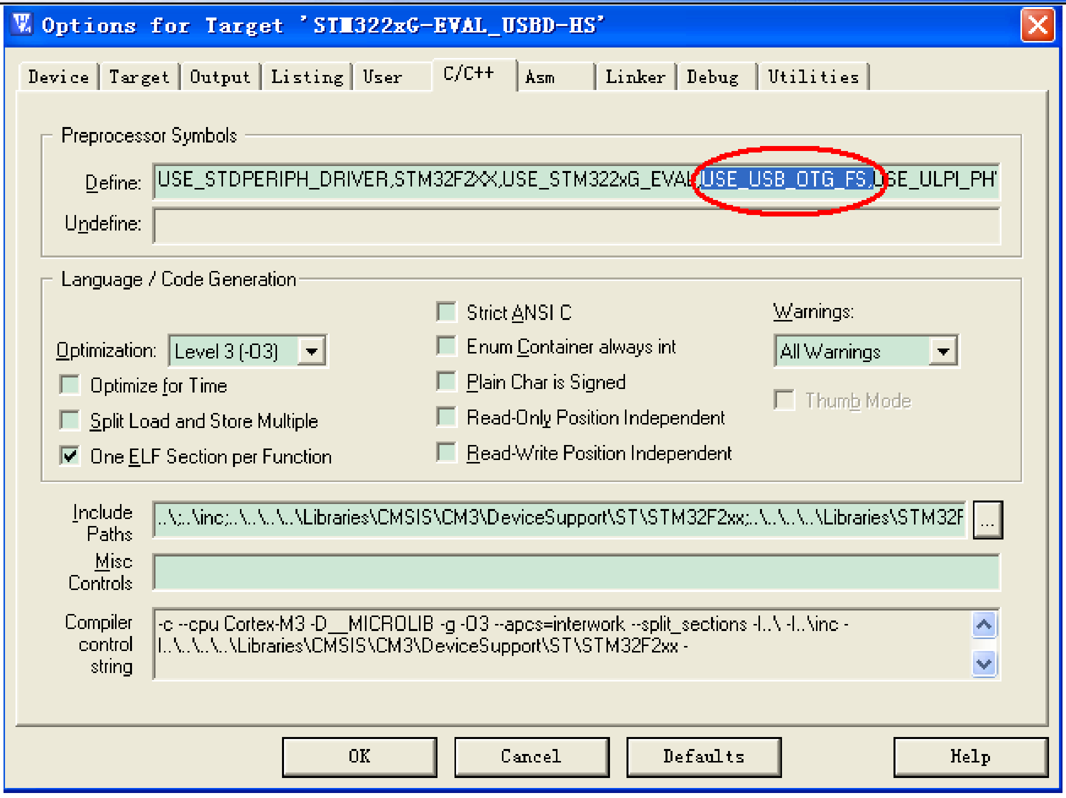
Note: BMP files should be located in the USB Disk root.

6.3.2 USB HID host example

This example shows how to use the USB OTG host peripheral on the STM32F2xx.

When an USB Device is attached to the Host port, the device is enumerated and checked whether it can support HID device or not, if the attached device supports HID, upon pressing the USER1 button, the mouse or the keyboard application will be launched.

The HID host example works in High-Speed and Full-Speed modes. Users can select High-Speed/Full-Speed mode by modifying the relevant macro in MDK, as shown below:


Options for Target 'STM322xG-EVAL_USBD-HS'
Device | Target | Output | Listing | User | C/C++ | Asm | Linker | Debug | Utilities
OK | Cancel | Defaults | Help

Preprocessor Symbols

Define: USE_STDPERIPH_DRIVER,STM32F2XX,USE_STM322xG_EVAL,USE_USB_OTG_FS,USE_ULPI_PH

Undefine:

Language / Code Generation

Optimization: Level 3 (-O3)

- [ ] Optimize for Time
- [ ] Split Load and Store Multiple
- [x] 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: All Warnings

- [ ] Thumb Mode

Include Paths: ..\;..\inc;..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx;..\..\..\..\Libraries\STM32F

Misc Controls:

Compiler control string:

```
-c --cpu Cortex-M3 -D__MICROLIB -g -O3 --apcs=interwork --split_sections -I..\ -I..\inc -
I..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx -
```

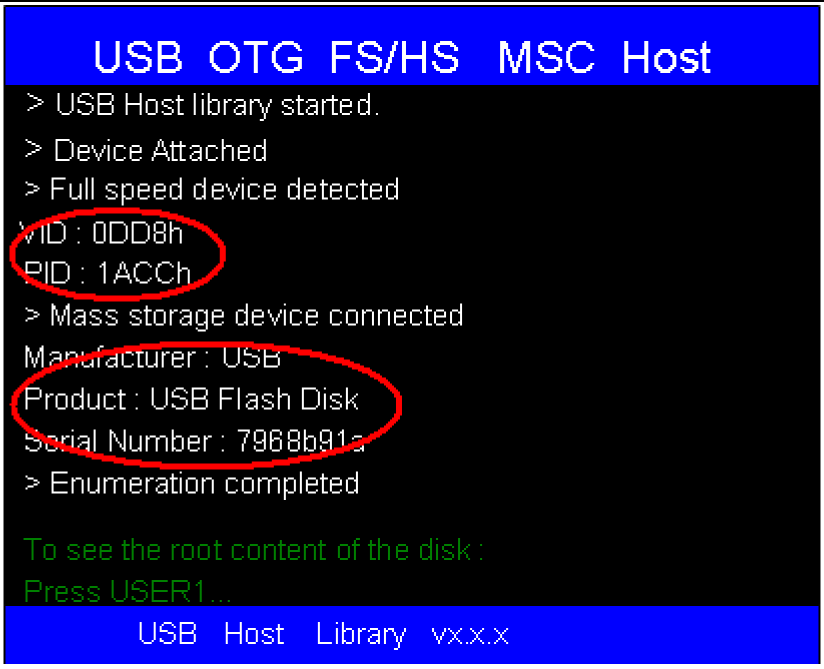
Figure 6-39 Select USB FS/HS mode for HID host demo

If "Preprocessor Symbols" includes USE_USB_OTG_FS, the DEMO will work in Full-Speed mode. If "Preprocessor Symbols" includes USE_USB_OTG_HS, the DEMO will work in High-Speed mode.

Note: USE_USB_OTG_FS and USE_USB_OTG_HS should not be included in "Preprocessor Symbols" at the same time.

In order to test the USB HID host example, please follow steps below:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) DevKit1207 between CON2/CON3 and PC USB port.
2) Rebuild the demo, and then download the program into Flash.
3) At power on, the LCD displays the following messages.

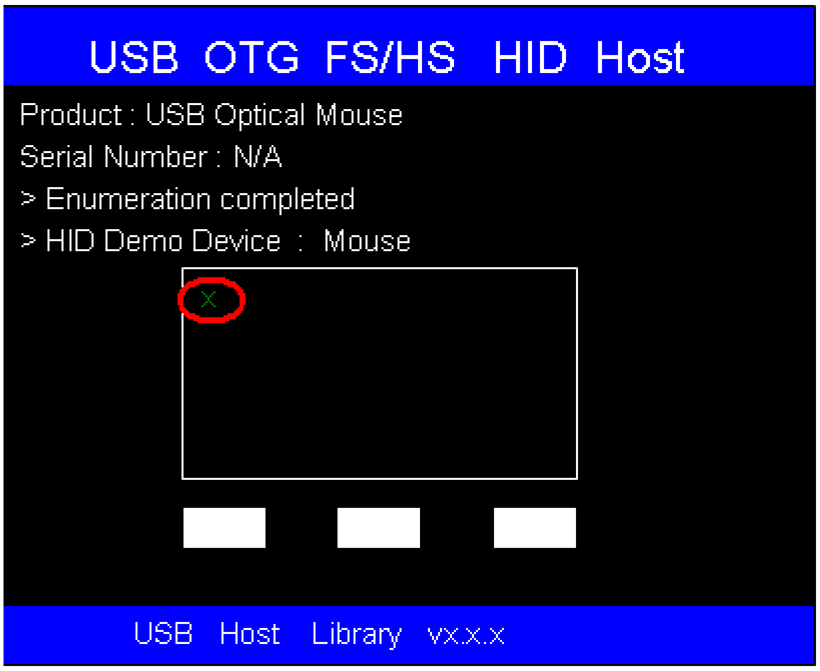


```
USB OTG FS/HS  MSC Host
> USB Host library started.
> Device Attached
> Full speed device detected
VID : 0DD8h
PID : 1ACCh
> Mass storage device connected
Manufacturer : USB
Product : USB Flash Disk
Serial Number : 7968b91a
> Enumeration completed

To see the root content of the disk :
Press USER1...
USB Host Library vx.x.x
```

Figure 6-40 USB HID Host connected display message

Note: The contents circled by red color are USB device information. It depends on the USB device that plugged in.

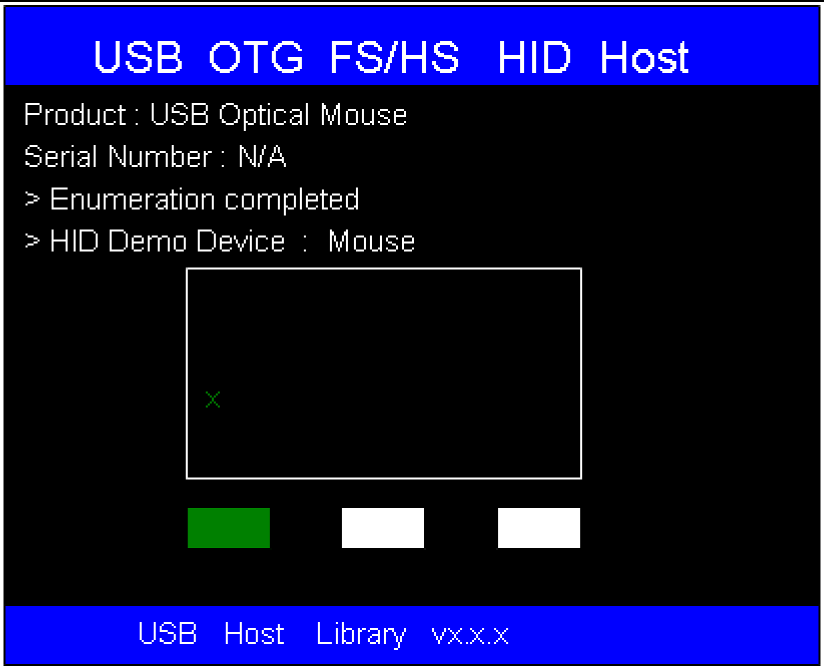
4) When user presses the USER1 button, the application displays the mouse pointer and buttons.



```
USB OTG FS/HS  HID Host
Product : USB Optical Mouse
Serial Number : N/A
> Enumeration completed
> HID Demo Device :  Mouse
USB Host Library vx.x.x
```

Figure 6-41 USB HID Host user key message

Moving the mouse will move the pointer in the display rectangle and if a button is pressed, the corresponding rectangle will be highlighted in green.



```
USB OTG FS/HS HID Host
Product : USB Optical Mouse
Serial Number : N/A
> Enumeration completed
> HID Demo Device : Mouse
USB Host Library vx.x.x
```

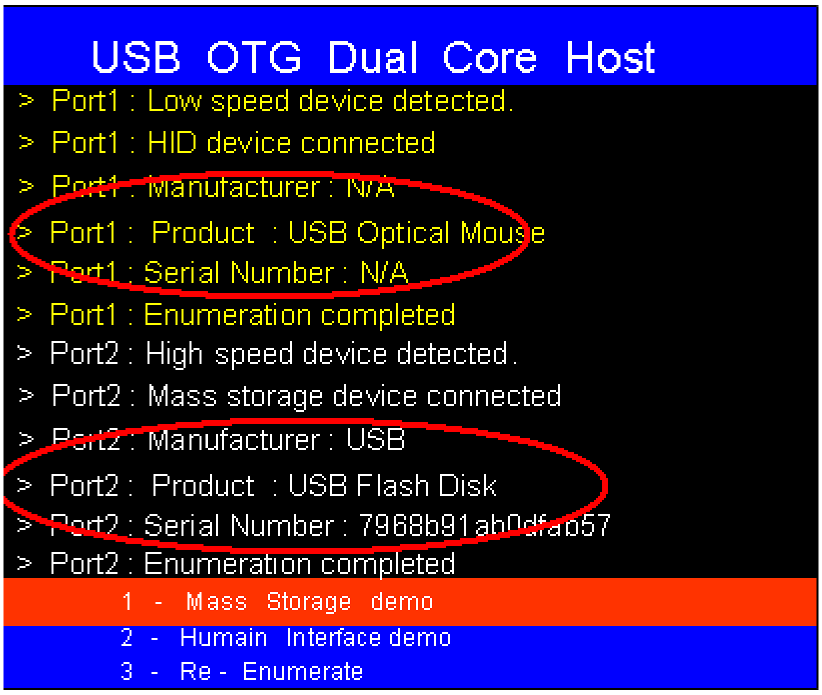
Figure 6-42 USB HID Host user key pressed

6.3.3 USB DualCore host example

In this demonstration, the user can use one or two devices, the mass storage device should be connected to the high speed port (CON3) while the HID device should be connected to the full speed port (CON2).

In order to test the USB DualCore host example, please follow the below steps:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between CON2 and PC USB port. Connect another one USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON3 and PC USB port.
2) Rebuild the demo, and then download the program into Flash.
3) At power on, the LCD displays the following messages.



```
USB OTG Dual Core Host
> Port1 : Low speed device detected.
> Port1 : HID device connected
> Port1 : Manufacturer : N/A
> Port1 :  Product  : USB Optical Mouse
> Port1 : Serial Number : N/A
> Port1 : Enumeration completed
> Port2 : High speed device detected.
> Port2 : Mass storage device connected
> Port2 : Manufacturer : USB
> Port2 :  Product  : USB Flash Disk
> Port2 : Serial Number : 7968b91ab0dfab57
> Port2 : Enumeration completed
        1 -  Mass  Storage  demo
        2 -  Humain  Interface demo
        3 -  Re - Enumerate
```

Figure 6-43 USB dual core host example

Note: The contents circled by red color are USB device information. It depends on the USB device that plugged in.

4) User has to use USER2 button to select the item of menu and use USER1 to open it. The menu structure is as follows.

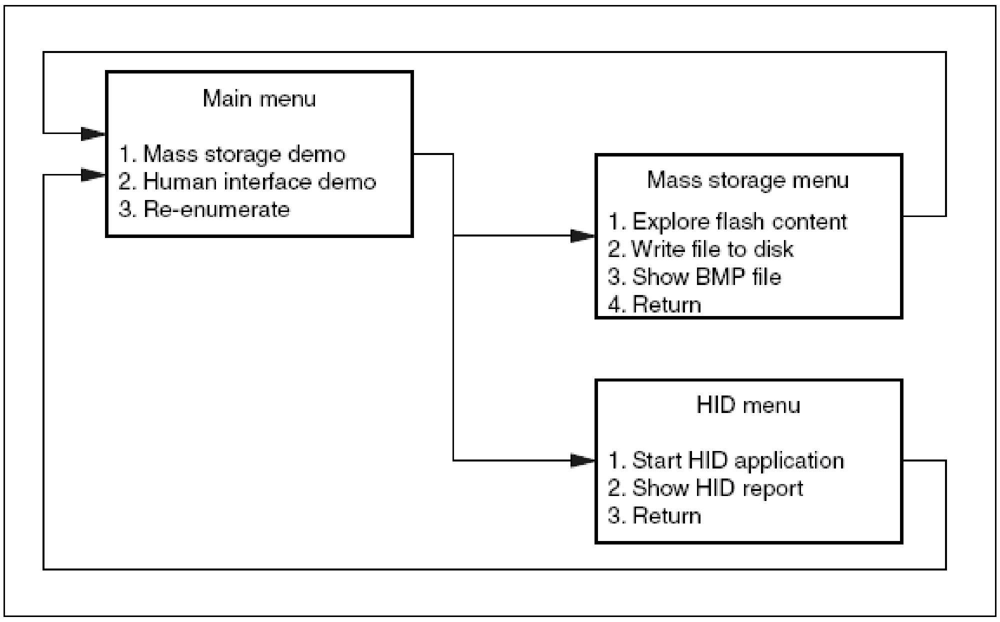


Figure 6-44 Menu structure

5) Select item 1 fromf the menu to test MSC host demo. Please refer to the Section 6.3.1 USB MSC host example

6) Select item 2 from the menu to test MSC host demo. Please refer to the

Section 6.3.2 USB HID host example

6.4 USB_Host_Device example

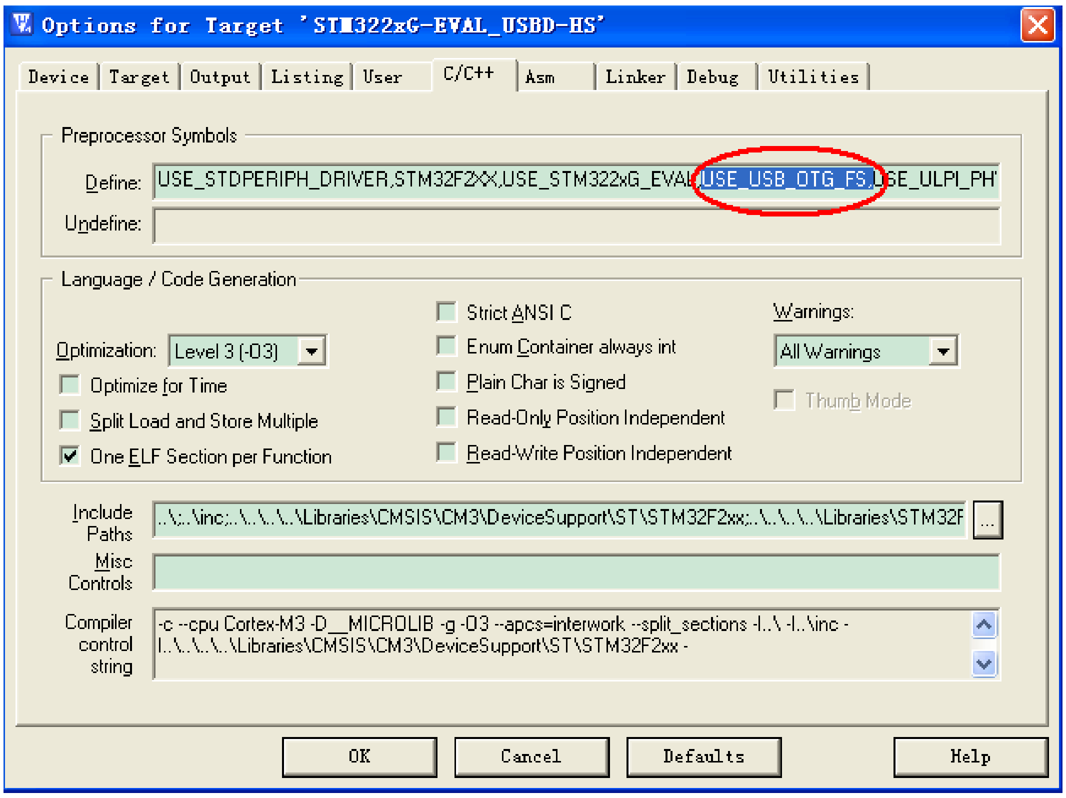
This folder contains one example when USB works in OTG mode.

- DRD

This example show how to use the USB OTG Device/Host peripheral on the STM32F2xx devices.

In device mode The STM32 is enumerated as an USB Mass storage Device that uses the embedded microSD as storage media. In Host mode, the STM32 behave as a mass storage Host that can enumerate, show content and display the supported BMP image in the attached USB flash disk.

This example works in High-Speed and Full-Speed modes. Users can select High-Speed/ Full-Speed mode by modifying the relevant macro in MDK, as shown below:



Options for Target 'STM322xG-EVAL_USBD-HS'

Preprocessor Symbols

Define: USE_STDPERIPH_DRIVER,STM32F2XX,USE_STM322xG_EVAL,USE_USB_OTG_FS,USE_ULPI_PH

Undefine:

Language / Code Generation

Optimization: Level 3 (-O3)

- [ ] Optimize for Time
- [ ] Split Load and Store Multiple
- [x] 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: All Warnings

- [ ] Thumb Mode

Include Paths: ..\;..\inc;..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx;..\..\..\..\Libraries\STM32F

Misc Controls:

Compiler control string: -c --cpu Cortex-M3 -D__MICROLIB -g -O3 --apcs=interwork --split_sections -I..\ -I..\inc -I..\..\..\..\Libraries\CMSIS\CM3\DeviceSupport\ST\STM32F2xx -

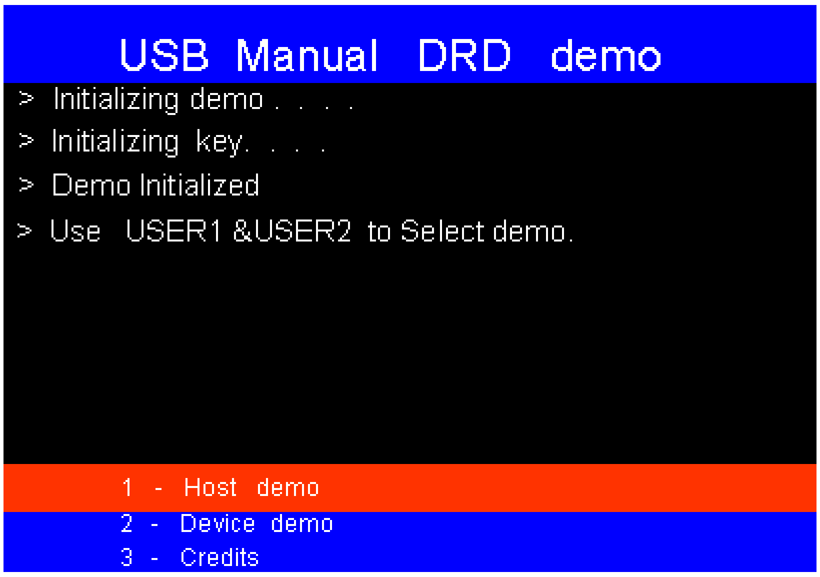
Figure 6-45 Select USB FS/HS mode for OTG demo

If "Preprocessor Symbols" includes USE_USB_OTG_FS, the DEMO will work in Full-Speed mode. If "Preprocessor Symbols" includes USE_USB_OTG_HS, the DEMO will work in High-Speed mode.

Note: USE_USB_OTG_FS and USE_USB_OTG_HS should not be included in "Preprocessor Symbols" at the same time.

In order to test the USB_Host_Device example, please follow the below steps:

1) Plug in +5V power supply to the DevKit1207. Connect a USB cable (Type A Male to Type Mini-B Male) between DevKit1207 CON2/CON3 and PC USB port.
2) Rebuild the demo, and then download the program into Flash.
3) At power on, the LCD displays the following messages.



```
USB Manual DRD demo
> Initializing demo . . . .
> Initializing key. . . .
> Demo Initialized
> Use USER1 &USER2 to Select demo.
```

Figure 6-46 USB OTG example

4) User has to use USER2 button to select the item from the menu and USER1 to open it. The menu structure is as follows.

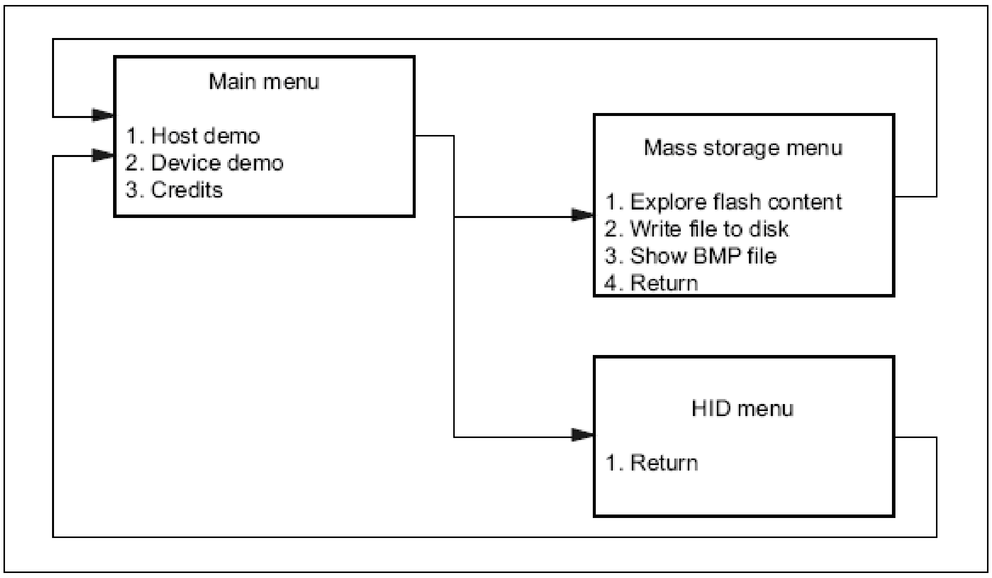


Figure 6-47 Menu structure

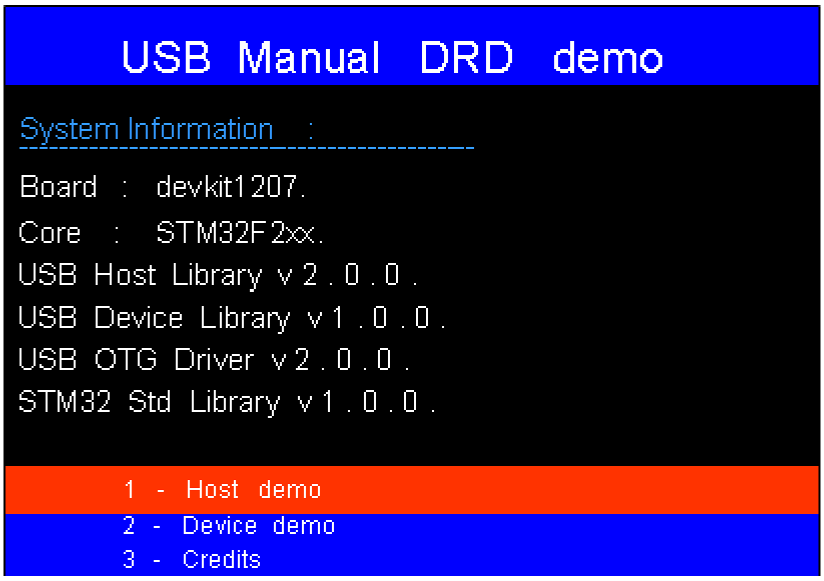
5) Select item 1 from the menu to test host demo. Please refer to the

   [Section 6.3.1 USB MSC host example]

   Select item 2 from the menu to test device demo. Please refer to the

   [Section 6.2.3 USB MSC host example]

6) Select item 3 of the menu, the LCD displays the following messages.



```
USB Manual DRD demo

System Information :

Board : devkit1207.
Core : STM32F2xx.
USB Host Library v2.0.0.
USB Device Library v1.0.0.
USB OTG Driver v2.0.0.
STM32 Std Library v1.0.0.

1 - Host demo
2 - Device demo
3 - Credits
```

Figure 6-48 System information

Chapter 7 uC/OS-II & uC/GUI Demo

This demo is located in the CD-ROM at the below following location:

\code\uCos-ucgui\EvalBoards\ST\Devkit1207-EVAL\RVMDK\OS-Probe

This demo shows an implementation of

- uCos-II_v2.86 migration
- ucgui_v3.90a migration
- uCos-II and ucgui demonstration with LED blink and GUI demo tasks.

In order to test the uCos-II and ucgui demo, please follow the below steps:

1) Plug in +5V power supply to the DevKit1207.
2) Rebuild the demo, and then download the program into Flash.
3) At power on,

- LED1～LED4 turn on then turn off in an infinite loop.
- LCD displays ucgui demo in an infinite loop.

Note: There is a simple one to one relationship between LED1～LED4 in software and LED6～LED9 in hardware

Chapter 8 G-Sensor Demonstration

This demo is located in the CD-ROM at the below following location:

\code\G-Sensor_image-rotation_App

This demo shows an implementation of

- detecting acceleration on X/Y/Z axes
- detecting angle on X/Y/Z axes reference to horizon flat
- flipping BMP picture according to the angle detected in step 2)

Note: This demo can detect the acceleration on X/Y/Z axes. Pictures can also be flipped according to acceleration. This demo does not provide this functionality yet. You can try it yourself.

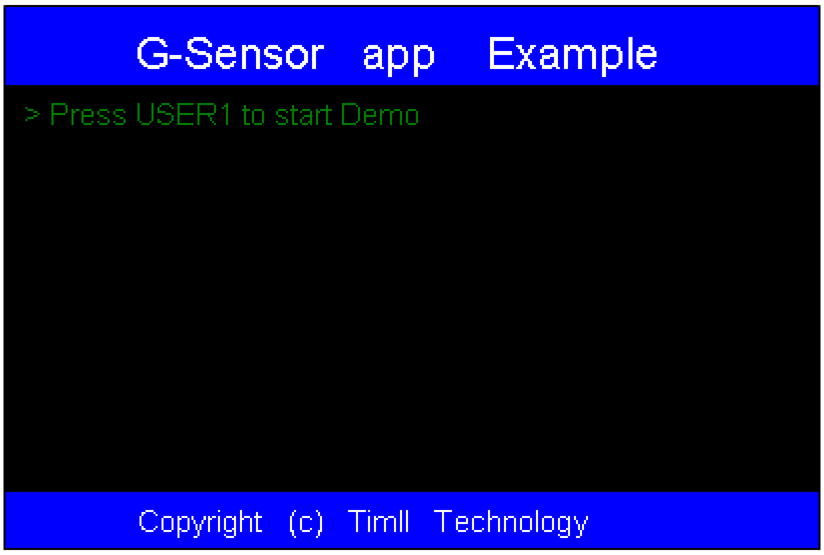
In order to test the G-Sensor demo, please follow the below steps:

1) Plug in +5V power supply to the DevKit1207.
2) Plug in SD card into CON4. Make sure that jumpers JP5 and JP6 are fitted, JP7, JP8, JP10 and JP11 are not fitted.
3) Prepare BMP files for testing purpose. There are two BMP pictures in the folder *\code\G-Sensor_image-rotation_App\Utilities\image*

   Copy these files to the root of the MicroSD card.

   User can use other pictures as well; the supported BMP file formats are shown below:

   - Width: 320
   - Height: 240
   - BPP: 16
   - Compression: RGB bitmap with RGB masks
4) Rebuild the demo, and then download the program into Flash.
5) At power on, the LCD displays the following messages. LED 6 will turn ON and then turn OFF.


G-Sensor app Example

> Press USER1 to start Demo

Copyright (c) TimII Technology

Figure 8-1 G-Sensor example

6) User has to press USER1 button to start the demo.

7) If user turns the board upside, the picture will be displayed in vertically. If user turn it downside, the picture will be displayed horizontally.

8) Press USER1 button once again, the demo go back to the initial status as step 5).

NOTE: In this example, Kingston's 1GB/2GB microSD card, SanDisk's 2GB microSD card pass test. It does not guarantee that this example supports all kinds of SD card.

Chapter 9 Various Other Tests Scenario

9.1 LED and Key Testing

Please refer to the Section 4.2 GPIO example.

9.2 ADC Testing

Please refer to the Section 4.6 ADC example.

9.3 DAC Testing

Please refer to the Section 4.7 DAC example.

9.4 USART Testing

Please refer to the Section 4.8.1 USART example.

9.5 IRDA Testing

Please refer to the Section 4.8.2 IRDA example.

9.6 CAN Testing

Please refer to the Section 4.16 CAN example.

9.7 I2S Testing

Please refer to the Section 4.19 I2S example.

9.8 MicroSD Card Testing

Please refer to the Section 4.20 SDIO example.

9.9 RTC Testing

Please refer to the Section 4.11 RTC example.

9.10 Ethernet Testing

Please refer to the Section 5.2.1 HTTP server demo (Standalone).

9.11 USB Testing

Please refer to the Section 6.3.1 USB MSC host example.

9.12 LCD_Touch Testing

Please refer to the Section 4.21 LCD_Touch example.

9.13 Camera Testing

DevKit1207 supports camera module now. The source code and user manual can be downloaded from Embest website. Please visit the website to get more information.

Chapter 10 What's in the BOX

Devkit1207 development kit is supplied in standard configuration with the following accessories:

- One DevKit1207 Evaluation board
- One 3.5 inch LCD with Touch screen
- One 5V Power adapter
- One cross serial cable (DB9 to DB9)
- One cross Ethernet cable
- One USB cable (Type A Male to Type Mini-B Male)
- One USB cable (Type A Female to Type Mini-A Male)
- One Product CD (including user manual, schematic in PDF format, datasheet, uC/OS-II BSP, FreeRTOS source tree, software examples)

Appendix I Operation Notes

In order to protect the LCD module, please pay attention to following tips

1) Do not remove the LCD module from DevKit1207 evaluation board if not necessary.
2) Do not touch the FPC (Flexible Printed Circuit) to avoid ESD damage and physical damage.

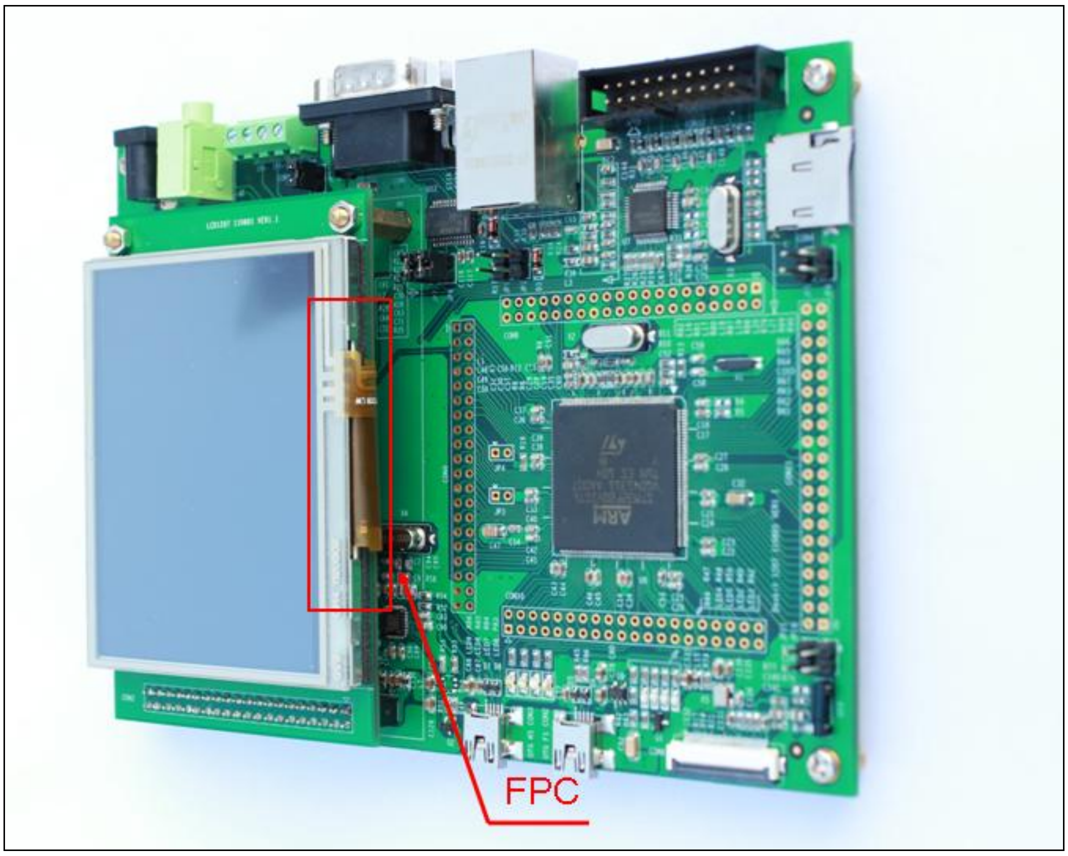


Figure Appendix 1 Flexible Printed Circuit

Appendix II PC-Development Platform

The information of the PC for DevKit1207 software development and testing as below:

- CPU: Intel Celeron(R) D 3.2GHz
- Memory: 1GB
- Hard Disk: 80GB
- Operation System: Windows XP
- Files System: NTFS

The recommended PC configuration for user as below:

- CPU: Intel Pentium 4 or above
- Memory: 512MB or above
- Hard Disk:30GB or above
- Operation System: Windows XP
- Files System: NTFS

Technical support & Warranty Service

Embest Technology Co.,LTD., established in March of 2000, is a global provider of embedded hardware and software. Embest aims to help customers to 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 shorten 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 best quality and service. The content below is the matters need attention for our products technical support and warranty service:

Technical support service

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

- Embest embedded platform products software/hardware materials
- Assist customers compile and run the source code we offer.
- Solve the problems occurs on embedded software/hardware platform if users follow the instructions in the documentation we offer.
- Judge whether the product failure exists.

Special explanation, the situations listed below are not included in the range of our free technical support service, and Embest will handle the situation with discretion:

- Software/Hardware issues user meet during the self-develop process

- Issues happen when users compile/run the embedded OS which is tailored by users themselves.
- User's own applications.
- Problems happen during the modification of our software source code

Maintenance service clause

1) The products except LCD, which are not used properly, will take the warranty since the day of the sale:

   PCB: Provide 12 months free maintenance service.

2) The situations listed below are not included in the range of our free maintenance service, Embest will charge the service fees with discretion:

   a) Can't provide valid Proof-of-Purchase, the identification label is torn up or illegible, the identification label is altered or doesn't accord with the actual products;
   b) Don't follow the instruction of the manual in order to damage the product;
   c) Due to the natural disasters (unexpected matters), or natural attrition of the components, or unexpected matters leads to the defects of appearance/function;
   d) Due to the power supply, bump, leaking of the roof, pets, moist, impurities into the boards, all those reasons which lead the defects of appearance/function;
   e) User unauthorized weld or dismantle parts leads the product's bad condition, or let other people or institution which are not authorized by Embest to dismantle, repair, change the product leads the product bad connection or defects of appearance/function;
   f) User unauthorized install the software, system or incorrect configuration or computer virus leads the defects;
   g) Purchase the products through unauthorized channel;

h) Those commitments which is committed by other institutions should be responsible by the institutions, Embest has nothing to do with that;

3) During the warranty period, the delivery fee which delivery to Embest should be covered by user, Embest will pay for the return delivery fee to users when the product is repaired. If the warranty period is expired, all the delivery fees will be charged by users.
4) When the board needs repair, please contact technical support department.

Note: Those products are returned without the permission of our technician, we will not take any responsibility for them.

Basic notice to protect and maintenance LCD

1) Do not use finger nails or hard sharp object to touch the surface of the LCD, otherwise user can't enjoy the above service.
2) Embest recommend user to purchase a piece of special wiper to wipe the LCD after long time use, please avoid clean the surface with fingers or hands to leave fingerprint.
3) Do not clean the surface of the screen with chemicals, otherwise user can not enjoy above service.

Note: Embest do not supply maintenance service to LCD. We suggest the customer first check the LCD after getting the goods. In case the LCD can not run or show no display, customer should inform Embest within 7 business days from the moment of getting the goods.

Value Added Services

We will provide following value added services:

- Provided services of driver develop based on Embest embedded platform, like serial port, USB interface devices, LCD screen.
- Provided the services of control system transplant, BSP drivers development, API software development.
- Other value added services like power adapter, LCD parts.
- Other OEM/ODM services.
- Technically training.

Please contact Embest to get technical support:

- Support Tel:+86-755-25503401
- Fax:+86-755-25616057
- Pre-Sale consultation: market@embedinfo.com
- After-Sale consultation: support@embedinfo.com