

K22FSH Development

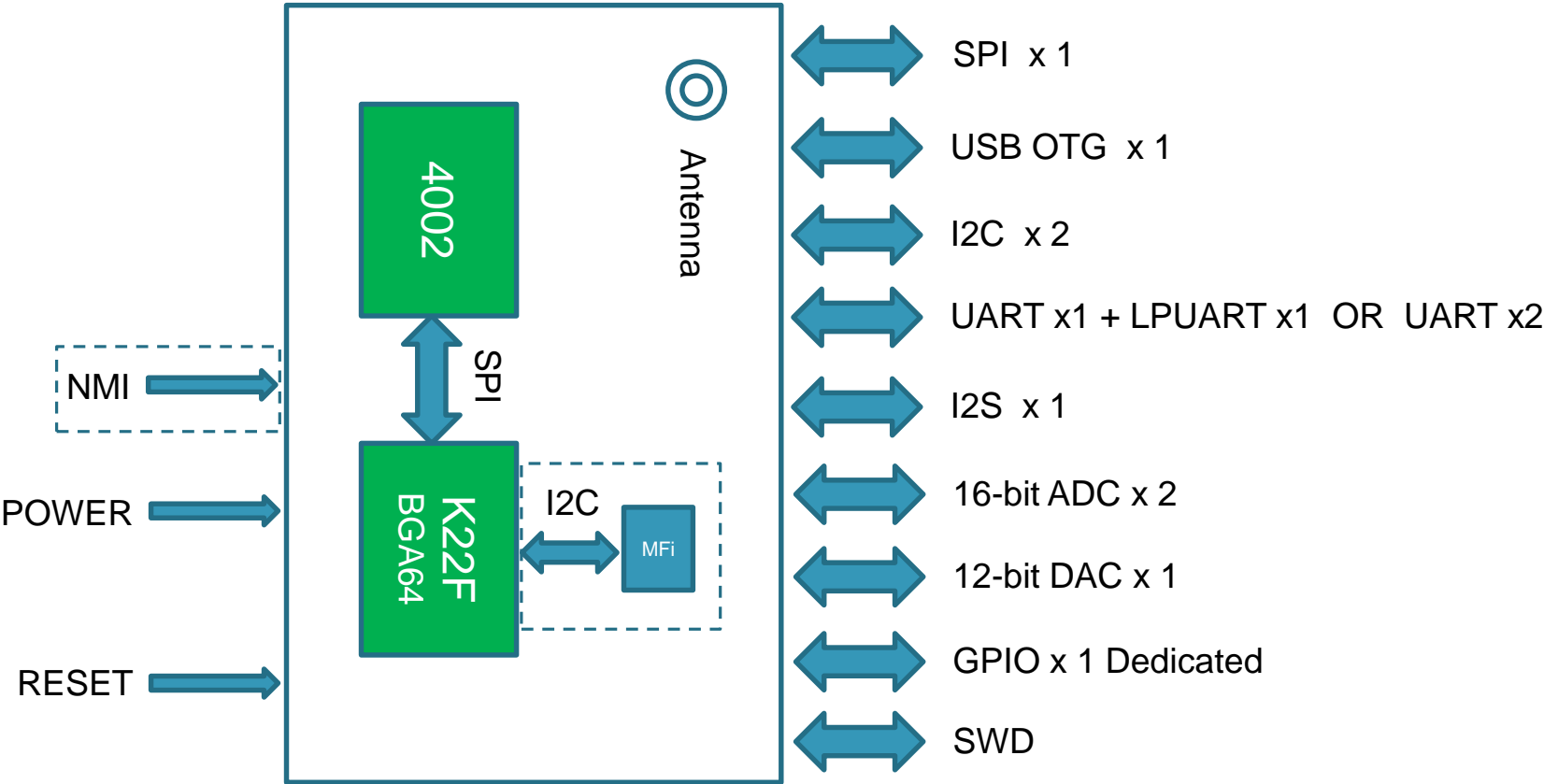
MAY. 2015



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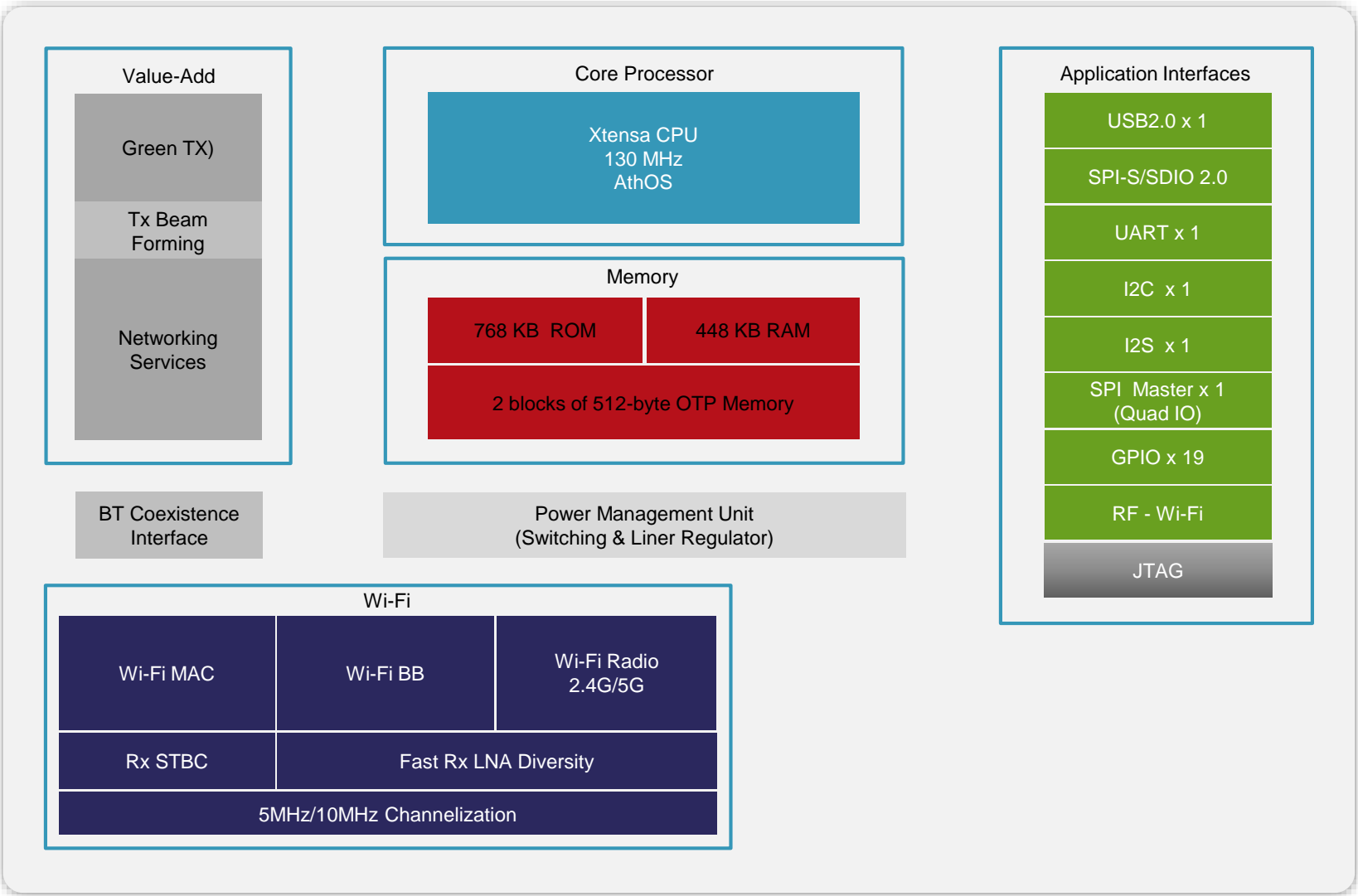
Module Block Diagram



Module Photo



QCA4002 Architecture Overview



Hardware Features

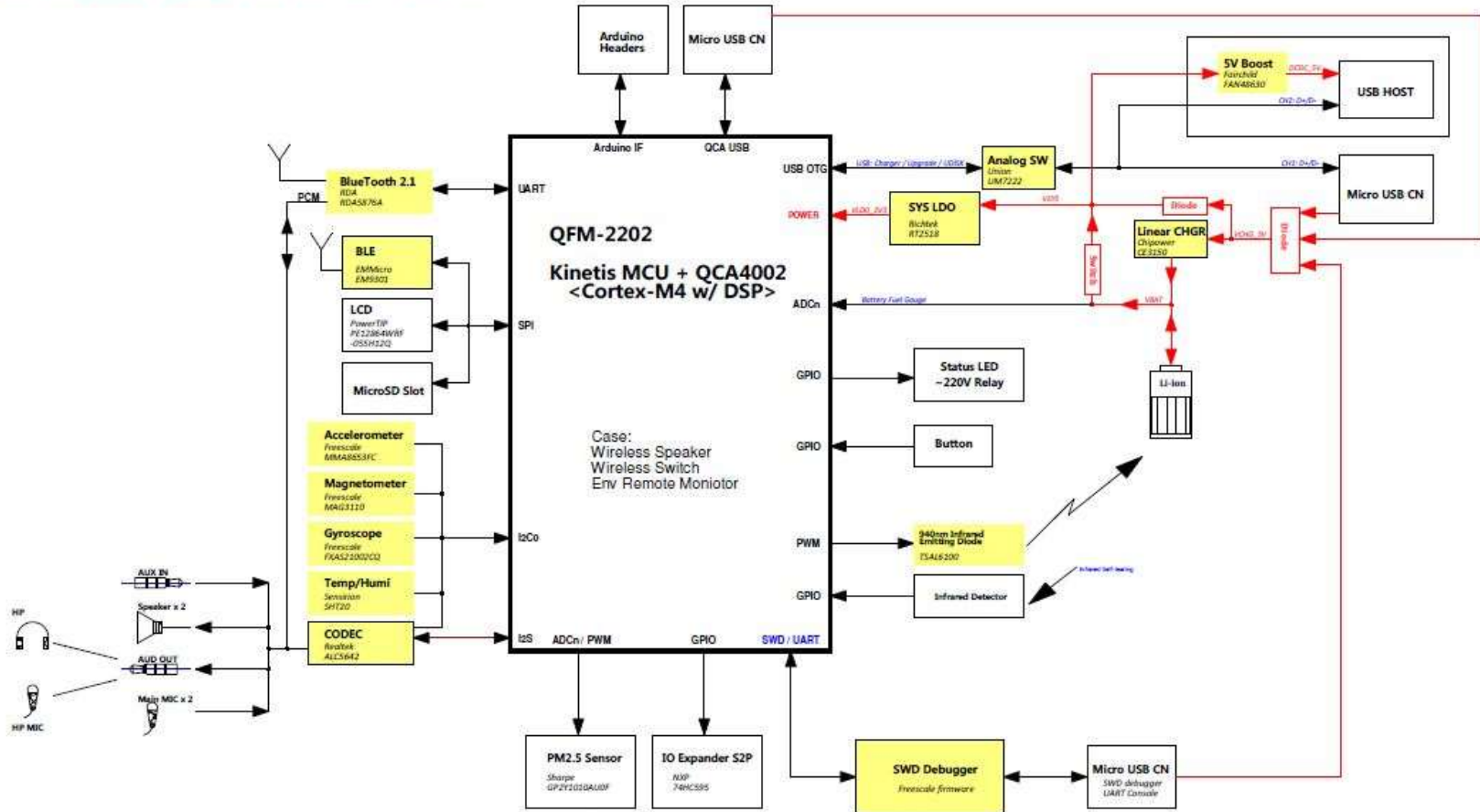
- Physical size 15x30mm
- Operation voltage: 3.3V
- Power consumption:
- CPU: 120MHz CortexM4 with 128K RAM and 512K Flash
- PCB: 4 layers with Industry Grade
- Peripherals
 - 1 x USB OTG
 - 1 x UART + 1xLPUART OR 2 x UARTs, including hardware flow control
 - 1 x SPI
 - 1 x I2S
 - 2 x I2C
 - 1 x GPIO Dedicated
 - 2 x ADC
 - 1 x DAC
- **Wi-Fi Connectivity (Supported by QCA4002)**
 - Integrated IPV4/IPV6 TCP/IP Stack
 - Integrated Network services such as HTTP, DNS, FTP,SSL,SNTP, Auto-IP
 - Full Security support: WEP WPA/WAP2 PSK WPS/WPS 2.0
 - SoftAP mode: Soft AP, Hidden SSID, STA-STA offload, Multiple STAs
 - Standards: 802.11b,802.11d,802.11g,802.11h(radar),802.11n,WPS2.0, P2P

Software Features & Certifications

- Software
 - MQX
 - Cloud Client
 - ALL JOYN
 - Firmware upgrade via Wi-Fi and UART
 - Security Bootloader with RSA2048/SHA-256
 - HomeKit support
- Certifications
 - FCC

Wi-Fi Block Diagram

QFM2202 Base Board



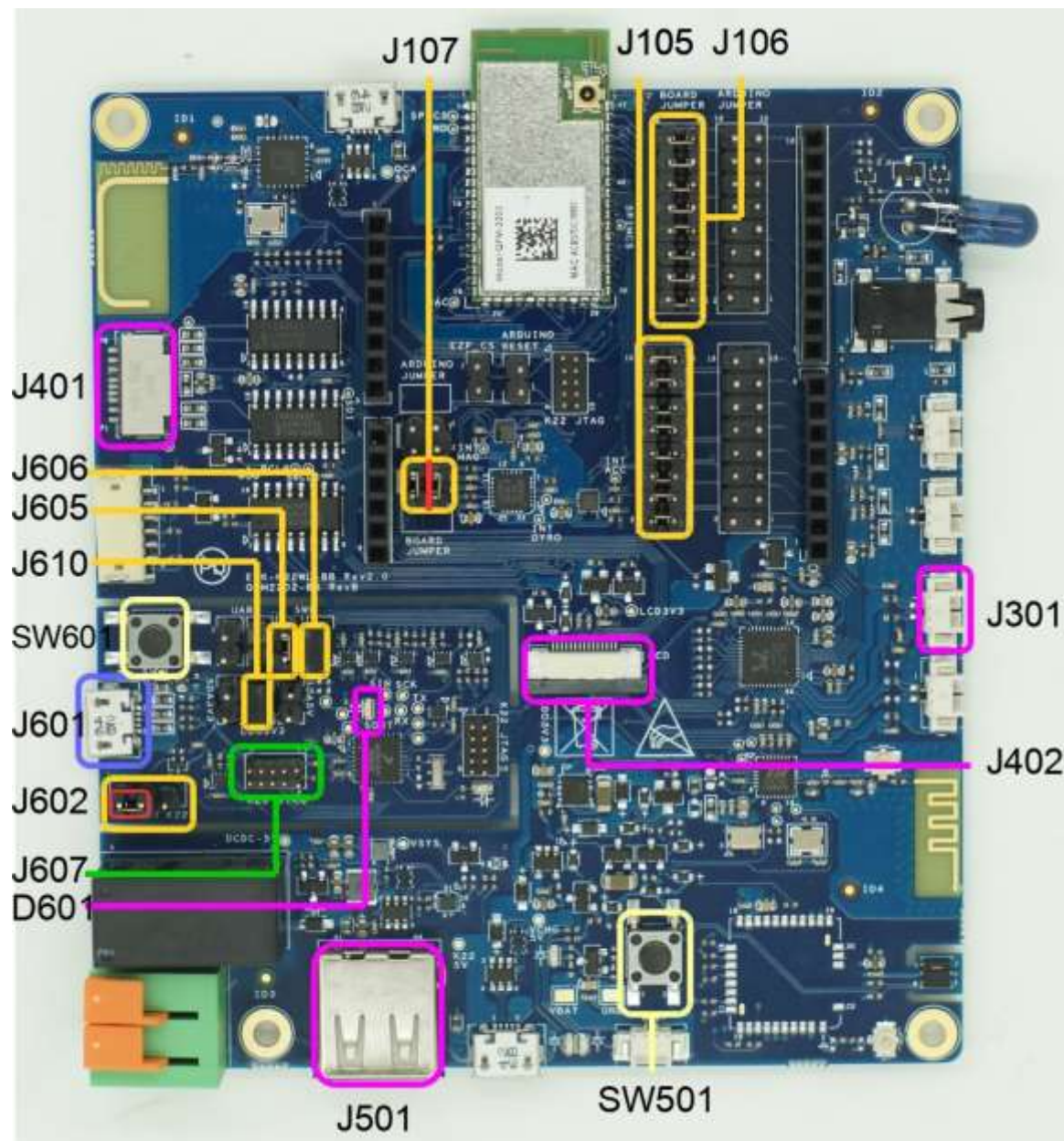
Hardware Feature

- Bluetooth 2.1 UART Interface: RDA5876A
- Smart Remote Control: Support self-learning
- 220V Relay
- ALC3261 HIFI Codec
- PM2.5 Sensor
- Accelerometer: Freescale MMA8653FC
- Magnetometer: Freescale MAG3110
- Gyroscope: Freescale FXAS21001CQ
- Temperature/Humidity Sensor: SHT20
- BLE SPI Interface: EM9301
- Micro SD Slot
- MONO LCD: PowerTIP PE12864WRF-055H12Q
- Li-ion Battery
- Arduino Header
- OpenSDA Debug Port (J-Link, CMSIS, P&EMicro)

Software Feature

- Bluetooth Profile Support: HFP HID A2DP AVRCP
- Local Music Player: Play from UMASS or SD Card
- AllJoyn Support
- MFI Audio Support
- AOAP support
- [HomeKit Support](#)

K22FSH Development Board Overview



K22FSH Development Board Default Jumper Configuration

- **Default OpenSDA Jumpers Configurations Table**

Jumper	Description	Configuration
J605	SWD_DIO	Short
J606	SWD_CLK	Short
J602	RESET	1-2 Short
J610	Power	Short

- **Default K22F MCU IO Pins Mux to Baseboard Table**

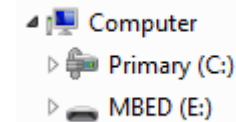
Jumper	Description	Configuration
J105	I2S MCLK/RX_BCLK SPI1 I2C0 mux to baseboard	1-2/3-4/5-6/7-8/9-10/11-12/13-14/15-16 Short
J106	UART1 I2S TX_BCLK/TX_FS/RXD/TXD mux to baseboard	1-2/3-4/5-6/7-8/9-10/11-12/13-14/15-16 Short
J107	ADC_DP0 ADC_DP3 mux to baseboard	1-2/3-4 Short
J701	RESET mux to Arduino interface	1-2 Open
J706	ADC_DP0 ADC_DP3 mux to Arduino interface	1-2/3-4 Open
J707	I2S MCLK/RX_BCLK SPI1 I2C0 mux to Arduino interface	1-2/3-4/5-6/7-8/9-10/11-12/13-14/15-16 Open
J708	UART1 I2S TX_BCLK/TX_FS/RXD/TXD mux to Arduino interface	1-2/3-4/5-6/7-8/9-10/11-12/13-14/15-16 Open

K22FSH Development Board Console Connection

- J601 is an OpenSDA debugger/UART port to enable a PC to communicate with the K22FSH development board.
 1. Use a micro USB cable to connect the K22FSH development board to a PC through J601.
 2. Press and release the K22FSH development board SW501 button to power on the board.

K22FSH Development Board Console Connection

3A: If the K22FSH development board OpenSDA debugger firmware is CMSIS-DAP(factory default), a new mobile U disk which labeled with “MBED” will appear on the PC side.



Download CMSIS-DAP mbed debugger/UART driver from [mbed.org](http://developer.mbed.org).

<http://developer.mbed.org/handbook/Windows-serial-configuration>



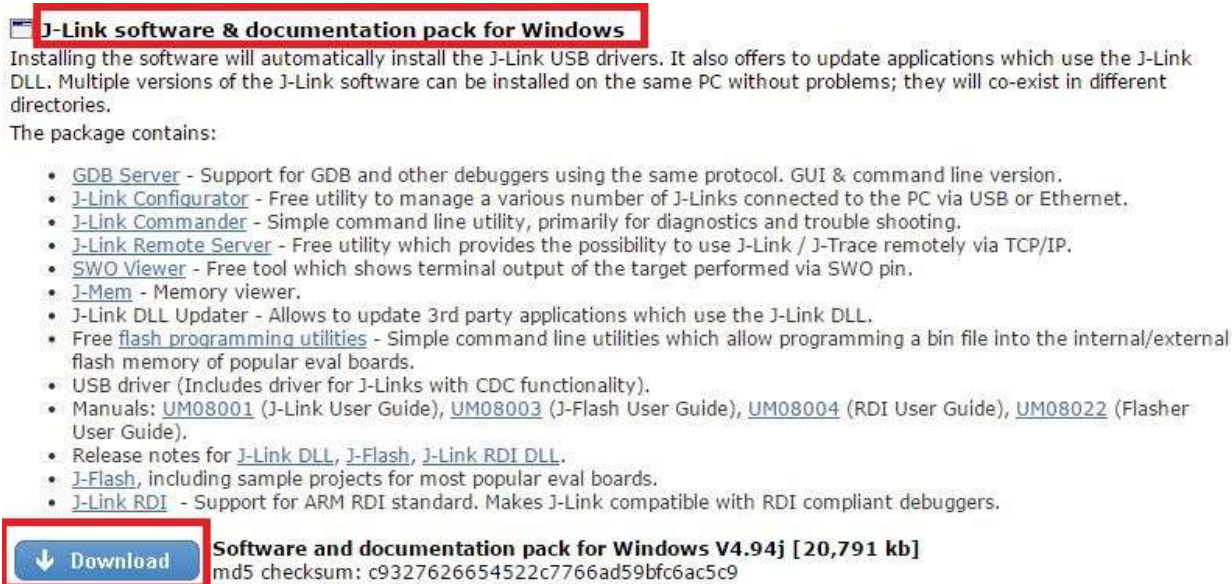
Install mbed debugger/UART driver.

K22FSH Development Board Console Connection

3B: If the K22FSH development board OpenSDA debugger firmware is J-Link.

Download J-Link debugger/UART driver from Segger.com

<https://www.segger.com/jlink-software.html>




J-Link software & documentation pack for Windows

Installing the software will automatically install the J-Link USB drivers. It also offers to update applications which use the J-Link DLL. Multiple versions of the J-Link software can be installed on the same PC without problems; they will co-exist in different directories.

The package contains:

- [GDB Server](#) - Support for GDB and other debuggers using the same protocol. GUI & command line version.
- [J-Link Configurator](#) - Free utility to manage a various number of J-Links connected to the PC via USB or Ethernet.
- [J-Link Commander](#) - Simple command line utility, primarily for diagnostics and trouble shooting.
- [J-Link Remote Server](#) - Free utility which provides the possibility to use J-Link / J-Trace remotely via TCP/IP.
- [SWO Viewer](#) - Free tool which shows terminal output of the target performed via SWO pin.
- [J-Mem](#) - Memory viewer.
- J-Link DLL Updater - Allows to update 3rd party applications which use the J-Link DLL.
- Free [flash programming utilities](#) - Simple command line utilities which allow programming a bin file into the internal/external flash memory of popular eval boards.
- USB driver (Includes driver for J-Links with CDC functionality).
- Manuals: [UM08001](#) (J-Link User Guide), [UM08003](#) (J-Flash User Guide), [UM08004](#) (RDI User Guide), [UM08022](#) (Flasher User Guide).
- Release notes for [J-Link DLL](#), [J-Flash](#), [J-Link RDI DLL](#).
- [J-Flash](#), including sample projects for most popular eval boards.
- [J-Link RDI](#) - Support for ARM RDI standard. Makes J-Link compatible with RDI compliant debuggers.

 **Software and documentation pack for Windows V4.94j [20,791 kb]**
md5 checksum: c9327626654522c7766ad59bfc6ac5c9

Install J-Link debugger/UART driver.

K22FSH Development Board Console Connection

4. Start a terminal application from the PC to connect using the port setting **115200,8,n,1,no flow control**.

5. The serial terminal application displays:

shell >

The console connection is established. Type the following command at the terminal to view the version information. The driver and the firmware versions can be different.

wmiconfig --version

Host version : 3.3.0.0

Target version : 0x31c80997

Firmware version : 3.3.0.31

Interface version: 1

K22FSH Development Board Installation and Configuration

Development Tools

- Windows IAR
- Linux: GCC/KDS

K22FSH Development Board Installation and Configuration

Install K22FSH Software Development Kit

Those three parts of software development kit must be installed into the same directory.

- ✓The MQX 4.1.0 RTOS operation system
- ✓The QCA4002 driver
- ✓The K22FSH development kit patches

K22FSH Development Board Installation and Configuration

Install K22FSH Software Development Kit

1. Download MQX RTOS 4.1.0 : FSLMQXOS_4_1_0_GA.exe

<http://www.freescale.com/webapp/sps/site/overview.jsp?code=MQXSWDW>

Freescale > Freescale MQX™ Software Solutions > Freescale MQX™ Software Solutions - Releases and Patches

Freescale MQX™ Software Solutions - Releases and Patches

Check out what's new with Freescale MQX RTOS including new releases and patches. As always, you're encouraged to tell us what you think or what features you need by filing a [service request](#).

Installation

- Run the self-extracting installer application and proceed according to instructions.
- In case you change the default installation location it is recommended to re-compile all core libraries. Otherwise, any time the application is started under debugger, the debugger may ask for a path to MQX source code files.
- Refer to Release Notes and Getting Started documents for more information about building MQX libraries.

Older MQX Downloads

For all MQX downloads including those not listed on this page, visit [Freescale MQX™ Software Solutions Downloads](#).

What's New in Freescale MQX Software Solutions

- ▶ RTOS 4.1.2 for Vybrid **NEW**
- ▶ RTOS 4.1.2 for Vybrid Linux Base **NEW**
- ▶ RTOS 4.1.1
- ▶ RTOS 4.1.1 for Linux
- ▶ RTOS for Kinetis SDK v1.0.0 (beta)
- ▶ **RTOS 4.1.0**
- ▶ RTOS 4.1.0.1 Patch
- ▶ RTOS 4.1.0 for the TWR-K64F120M
- ▶ RTOS 4.1.0 for the FRDM-K64F
- ▶ RTOS 4.1.0 for Linux Beta
- ▶ RTOS 4.1.0 for the FRDM-K22F
- ▶ RTOS 4.1 for TWR-K22F120M (MK22FN512)
- ▶ RTOS 4.1 for TWR-K22F120M (MK22FN256)
- ▶ RTOS 4.1 for TWR-K22F120M (MK22FN128)

MQX™ RTOS Support



MQX™ RTOS Support
A range of support options for your design needs

MQX Software Components

Included in Freescale MQX Software Solutions
Freescale MQX RTOS
Freescale MQX RTCS
Freescale MQX File System (MFS)
Freescale MQX USB Host/Device Stack

Additional MQX Components
Freescale MQX Design and Development Tools
Freescale MQX Add-on Software

Getting Started

Learn to use MQX™
General FAQs
Latest releases and patches
[Freescale MQX Software Solutions Home](#)
Technical Forums
General
Chinese



K22FSH Development Board Installation and Configuration

Install K22FSH Software Development Kit

2: Download QCA4002 Driver v3.3: pkd3.3-141.zip

<https://developer.qualcomm.com/mobile-development/development-devices/ioe-wifi-development-platform/tools-and-resources>

Internet Of Everything (IoE) Wi-Fi Development Platform Tools & Resources

Use the IoE Wi-Fi Development Platform tools and resources below to enable full-featured, low-power Wi-Fi on virtually any product.

If you are looking for a previous software version, please [contact us](#).

Tools

IoE Wi-Fi QCA4002 Platform Dev Kit SP140/141 (v3.3) Updated 27 Jan 15	Download (16.9 mb)
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This updated v3.3 SP140/141 Development Platform uses the Qualcomm Atheros QCA4002 1x1 single band 802.11a/b/g/n Wi-Fi SoC and operates on 2.4 GHz band only.

IoE Wi-Fi QCA4004 Platform Dev Kit SP140/144 (v3.3) Updated 27 Jan 15	Download (16.9 mb)
--	------------------------------------

This updated v3.3 SP140/144 Development Platform uses the Qualcomm Atheros QCA4004 1x1 dual band 802.11a/b/g/n Wi-Fi SoC and supports 2.4 GHz/5 GHz operation with antenna diversity.

IoE Wi-Fi QCA4002 Platform Dev Kit SP140/141 (v3.0.2) Updated 24 Apr 14	Download (22.3 mb)
--	------------------------------------

The SP140/141 Development Platform uses the Qualcomm Atheros QCA4002 1x1 single band 802.11a/b/g/n Wi-Fi SoC and operates on 2.4 GHz band only.

IoE Wi-Fi QCA4004 Platform Dev Kit SP140/144 (v3.0.2) Updated 24 Apr 14	Download (22.5 mb)
--	------------------------------------

The SP140/144 Development Platform uses the Qualcomm Atheros QCA4004 1x1 dual band 802.11a/b/g/n Wi-Fi SoC and supports 2.4 GHz/5 GHz operation with antenna diversity.

unzip pkd3.3-141.zip
In software directory
there is a QCA4002
driver installation file:
setup.exe, install it to
the MQX4.1.0
installation directory

K22FSH Development Board Installation and Configuration

Installation directory structure

audio	Freescall audio decode library.
build	Globe and board level build rules.
config	MQX globe and board level configuration file.
demo	Demo source code.
demo\aj	Allseen alliance source code.
demo\bluetooth_uart	RDA5876 bluetooth A2DP,HFP application demo code.
demo\player	USB bluetooth\AOA\MFI\UDisk music player demo code.
demo\throughput_demo	QCA WIFI demo code.
doc	MQX document.
lcd	LCD driver.
mfs	Freescall MFS file system source code.

K22FSH Development Board Installation and Configuration

Installation directory structure

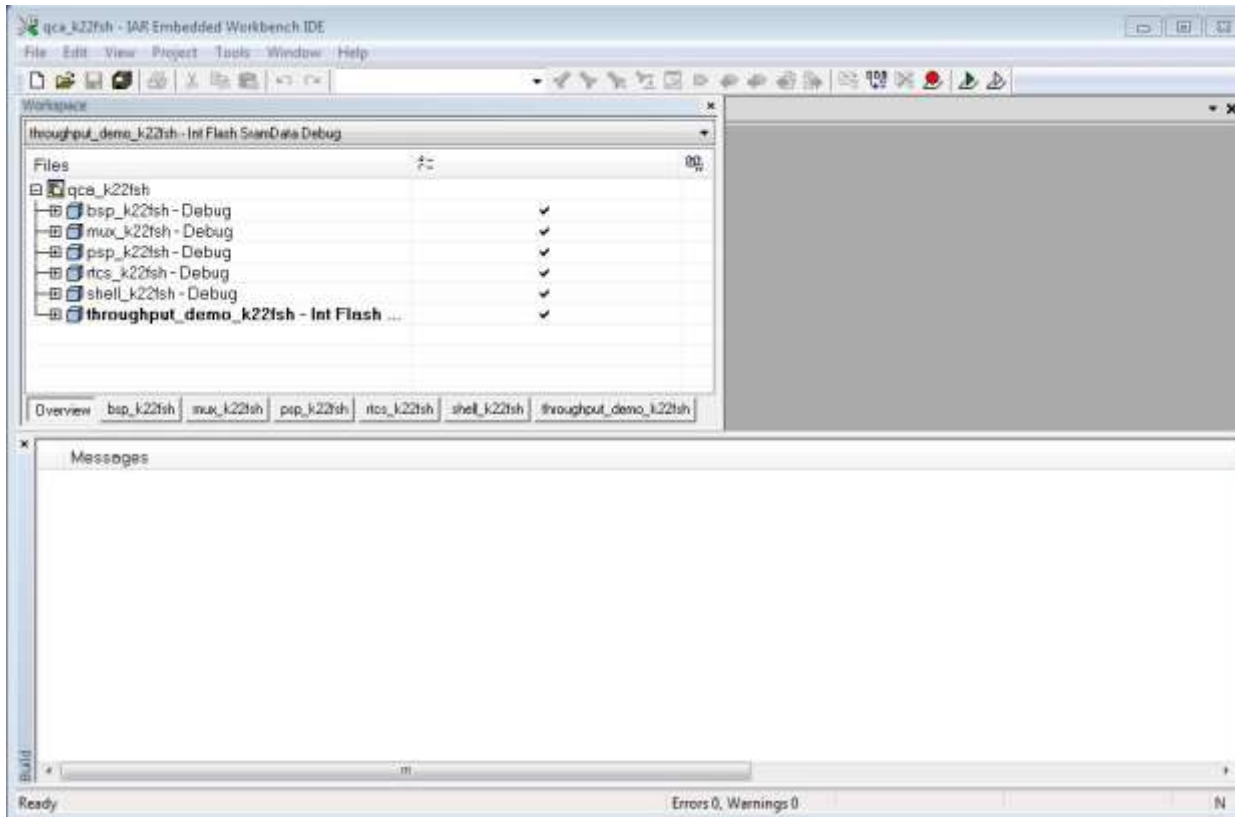
mqx	Freescal MQX source code.
mqx\source\bsp\k22fsh	K22FSH board support package source code.
mqx\source\io\enet\atheros_wifi	Qualcomm QCA4002 driver source code.
msi	Audio adaptive layer source code.
mux	GPIO serial to parallel chip driver source code.
player	Music player middleware source code.
rtcs	Freescal network protocol stack source code.
sensors	Sensor driver source code.
shell	MQX shell source code.
usb	Freescal K22FSH USB driver source code.

K22FSH Development Board Installation and Configuration

Building Utilities and Demo Applications

Building Qualcomm QCA4002 demo

Double click demo\qca_k22fsh.eww which is under MQX installation directory



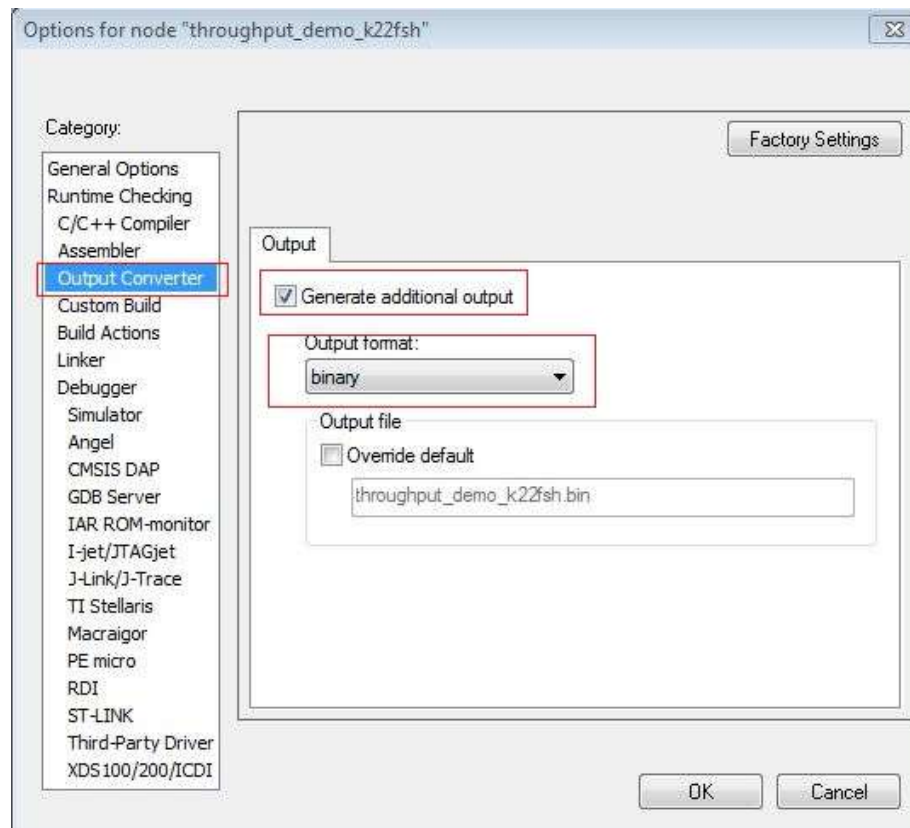
Follow the
psp/bsp/mux/rtcs/shell
project order, for every
project, right click and
select **Make**,
at last right click
throughput_demo_k22
fsh project and select
Set as Active then
select **Make**.

K22FSH Development Board Installation and Configuration

Download images to K22FSH

Download image through OpenSDA 2.1 CMSIS-DAP USB mass storage

1: Enable IAR build option: enable binary format output converter, see below picture

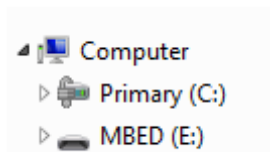


K22FSH Development Board Installation and Configuration

Download images to K22FSH

Download image through OpenSDA 2.1 CMSIS-DAP USB mass storage

- 2 : Connect PC and K22FSH development board J601 through micro USB cable.
- 3 : Press then release K22FSH development board SW501 button to power on the board.
- 4 : A new USB mass storage device which is labeled as “MBED” will appear on the PC side



- 5 : Drag the binary file which is generated in the step 1 to the “MBED” USB mass storage device, this binary file will be download to K22FSH K22F MCU internal flash in a few seconds, after this download was completed, OpenSDA firmware will be restarted, to enable new binary file running, power off and power on K22FSH board is needed.

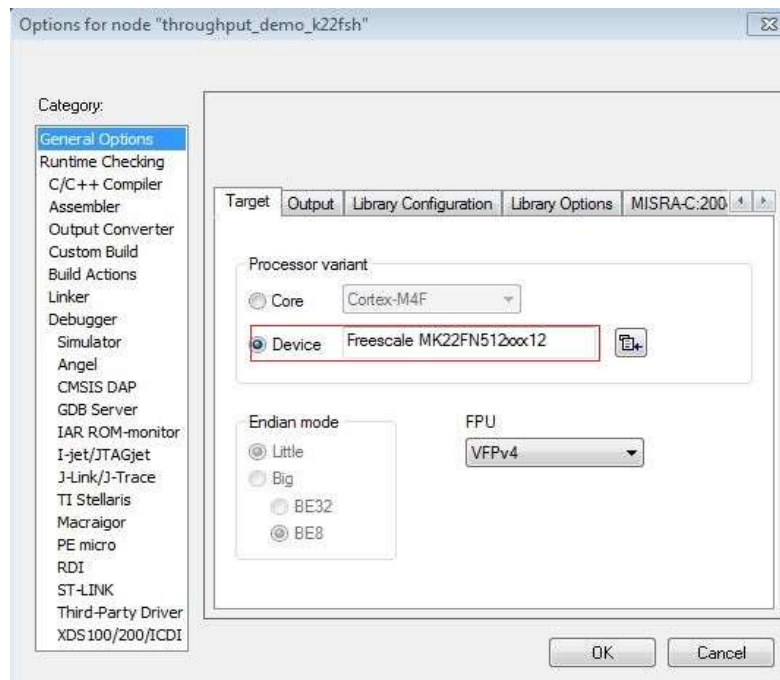
K22FSH Development Board Installation and Configuration

Download images to K22FSH

Download image through OpenSDA 2.1 J-Link

throughput_demo_k22fsh as example

- 1: Open qca_k22fsh.eww work space in the IAR IDE
- 2: Right click throughput_demo_k22fsh project and select **Option...**
- 3: In **General Options->Target** tab, set Device to “Freescale MK22FN512xxx12”.

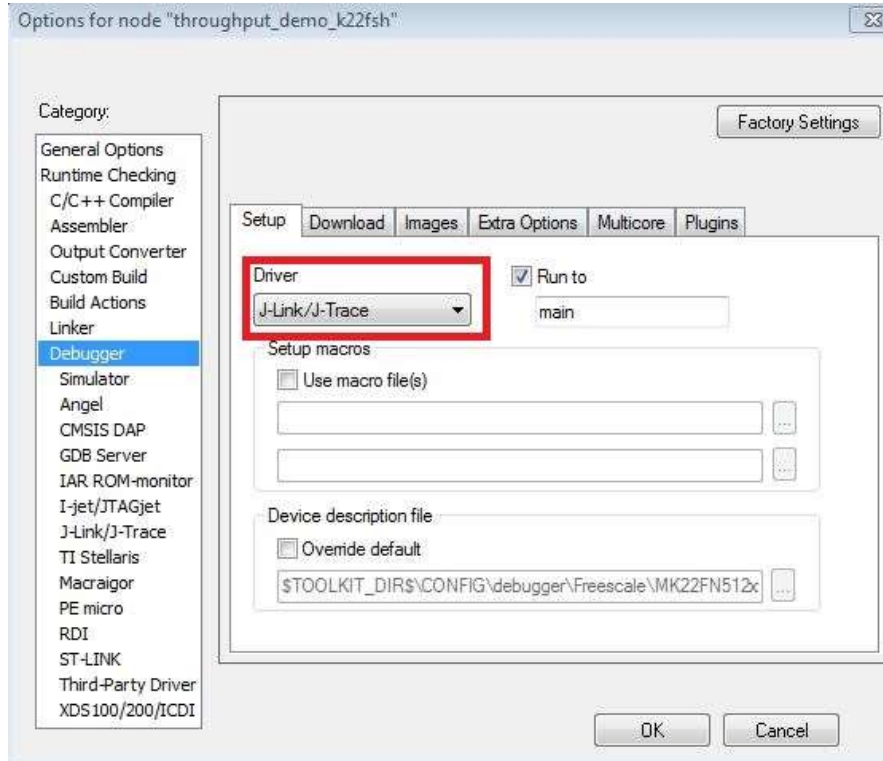


K22FSH Development Board Installation and Configuration

Download images to K22FSH

Download image through OpenSDA 2.1 J-Link

4: In Debugger->Setup tab, set Driver to J-Link/J-Trace.

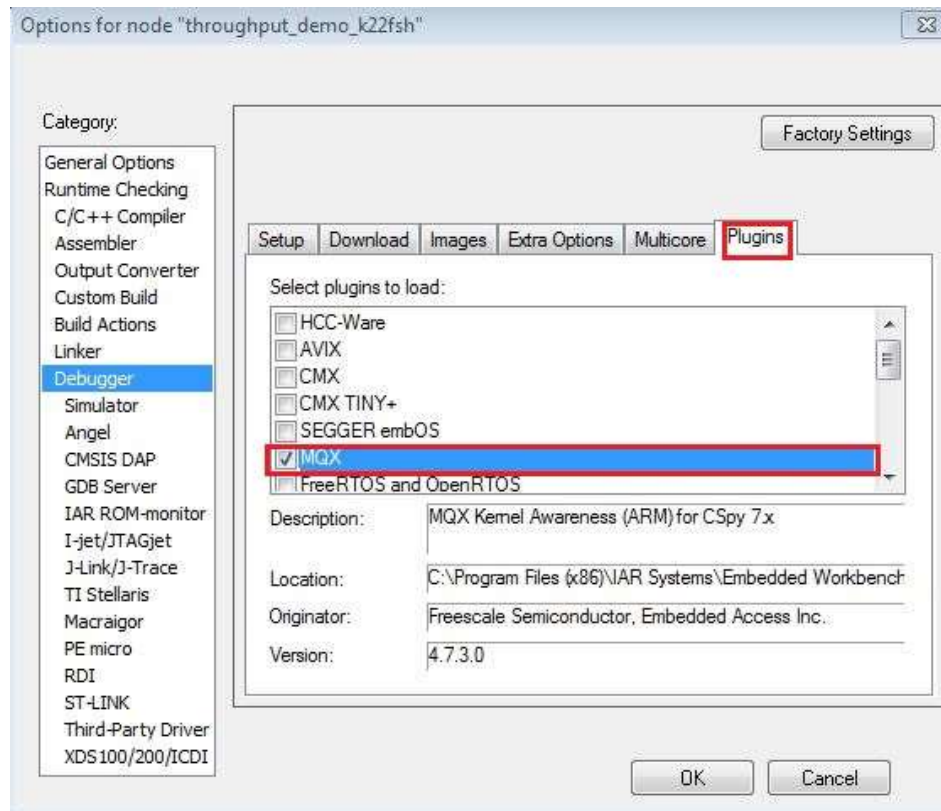


K22FSH Development Board Installation and Configuration

Download images to K22FSH

Download image through OpenSDA 2.1 J-Link

5: In **Debugger->Plugins** tab, select **MQX**.

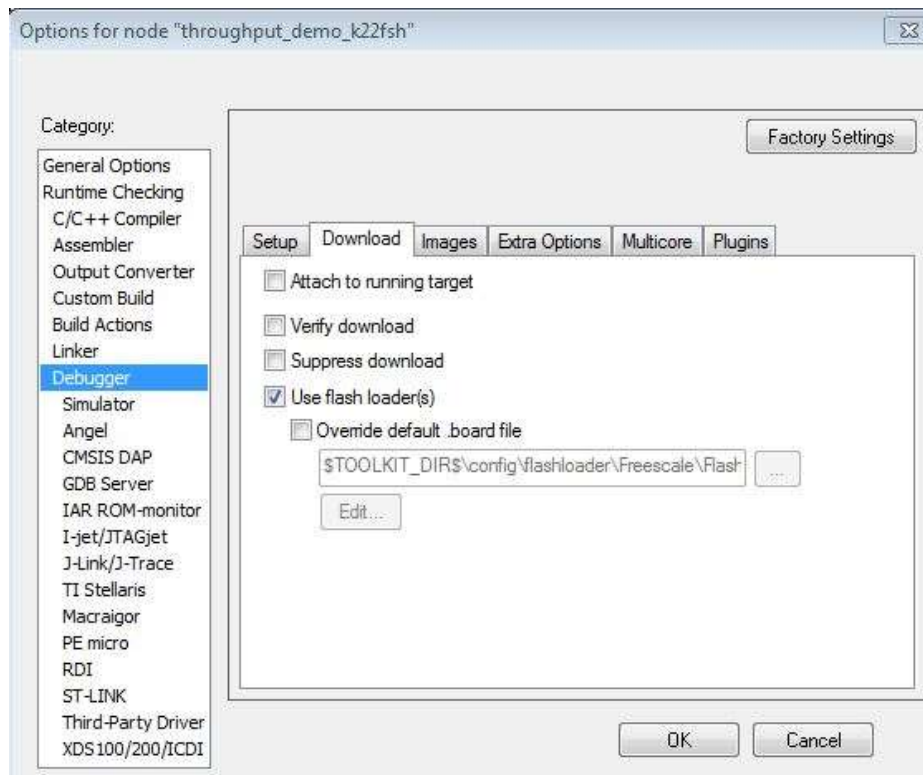


K22FSH Development Board Installation and Configuration

Download images to K22FSH

Download image through OpenSDA 2.1 J-Link

6: In **Debugger->Download** tab, select **Use flash loader(s)**.



K22FSH Development Board Installation and Configuration

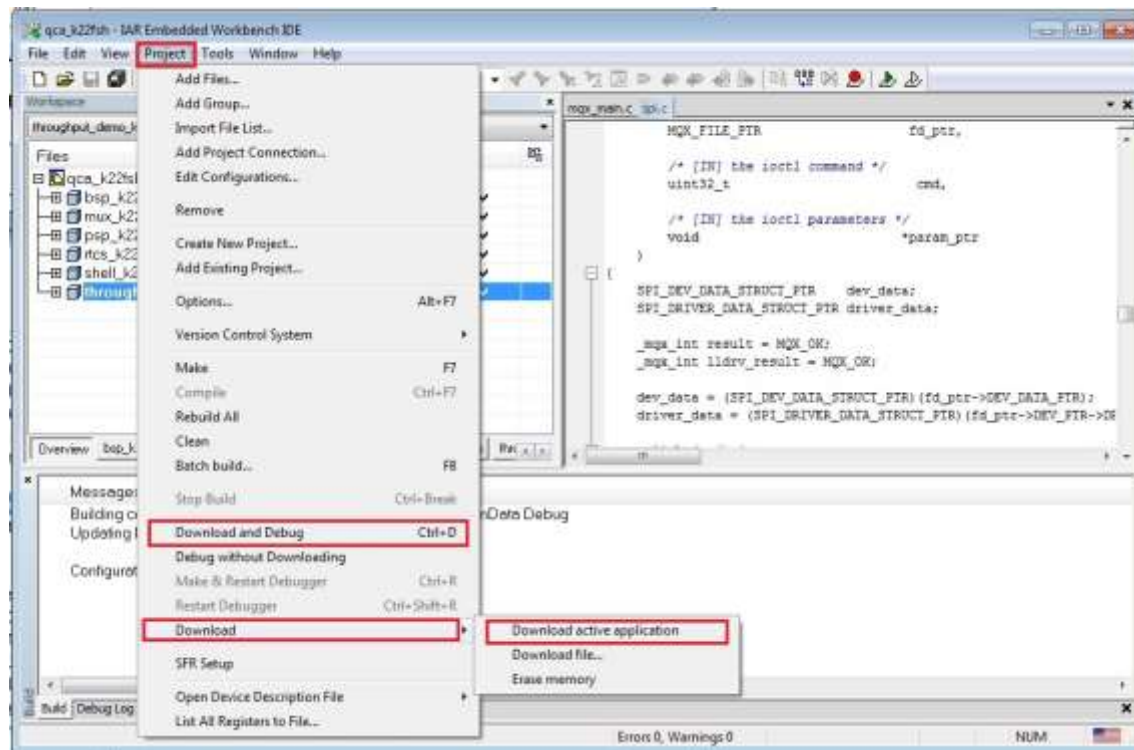
Download images to K22FSH

Download image through OpenSDA 2.1 J-Link

8: Save the project.

9: Right click the throughput_demo_k22fsh project and select Set As Active.

10: In the IAR IDE menu select Project->Download->Download active application to download this application image to K22FSH development board K22F MCU internal flash; or select Project->Download and Debug to download and debug.



K22FSH Development Board Installation and Configuration

Download images to K22FSH

Update OpenSDA 2.1 debugger application to J-Link

K22FSH development board default OpenSDA2.1 debugger application is CMSIS-DAP

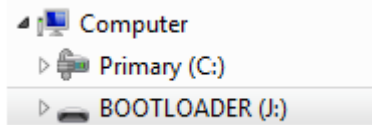
1. Download segger OpenSDA V2.1 firmware from Segger.com. Firmware name is JLink_OpenSDA_V2.1.bin

<https://segger.com/opensda.html>

2. Connect PC and K22FSH development board J601 through micro USB cable, don't press power button SW501.

3. Press and hold K22FSH development board button SW601, then power on the board through press and release button SW501, at last release button SW601.

4. An USB mass storage disk which is labeled "BOOTLOADER" will appear on the PC side



5. Drag the JLink_OpenSDA_V2.1.bin from step 1 to the new USB mass storage device, after this OpenSDA2.1 application was updated to K22FSH development board, OpenSDA2.1 would automatic restart and apply this new debugger application.

K22FSH Development Board Installation and Configuration

Download images to K22FSH

Update OpenSDA 2.1 debugger application to CMSIS-DAP

1 : Download CMSIS-DAP OpenSDA 2.1 application binary :

<http://developer.mbed.org/handbook/Firmware-FRDM-K22F>



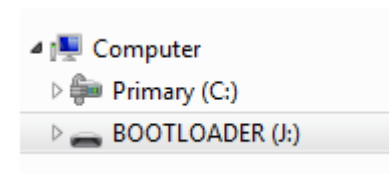
The latest mbed interface upgrade file for the FRDM-K22F is :

• 0203_k20dx128_k22f_0x8000.bin

2. Connect PC and K22FSH development board J601 through micro USB cable, don't press power button SW501.

3. Press and hold K22FSH development board button SW601, then power on the board through press and release button SW501, at last release button SW601.

4. An USB mass storage disk which is labeled "BOOTLOADER" will appear on the PC side



5 : Drag the 0203_k20dx128_k22f_0x8000.bin from step 1 to the new USB mass storage device, after this OpenSDA2.1 application was updated to K22FSH development board, OpenSDA2.1 would automatic restart and apply this new debugger application.

K22FSH Development Kit Demos

- Demos include three parts
 - QCA4002 Wi-Fi demos
 - AllJoyn demos
 - Music player demos

K22FSH Development Kit Demos

- Wi-Fi Demo: Throughput Demo
 - The **configuration component** provides an interface to configure and control the behavior of the QCA4002 Wi-Fi chipset. It exposes a set of configuration commands that can be used to configure and connect to an existing network.
 - The **benchmark component** provides a set of commands to run bidirectional throughput streams to analyze network throughput performance. Both TCP and UDP traffic is supported. The **ath_console.exe** application running on PC supports the benchmark component on its console

K22FSH Development Kit Demos

Wi-Fi Demo: Throughput Demo

SETUP

Windows PC1 setup Console1

1. Use a Micro USB cable to connect PC1 to J601 of the K22FSH board.
2. Press button SW502 to power on the K22FSH board
3. Start terminal applications from PC1 to communicate with the K22FSH UART port. The port setting is: 115200, 8, n, 1, no flow control.

Windows PC2 setup Console2

1. Use the Ethernet cable to connect to the AP and configure the IP address to 192.168.0.3.
2. Run **ath_console.exe** as Console 2 at the windows DOS prompt.

K22FSH Development Kit Demos

Wi-Fi Demo: Throughput Demo

SETUP: Connect K22FSH Wi-Fi to AP

WPA2 AP

```
wmiconfig --p <password>  
wmiconfig --wpa 2 CCMP CCMP  
wmiconfig --connect <ssid>  
#wait connected event  
<wmiconfig -ipdhcp>
```

WPA1 AP

```
wmiconfig --p <password>  
wmiconfig --wpa 1 TKIP TKIP  
wmiconfig --connect <ssid>  
#wait connected event  
<wmiconfig -ipdhcp>
```

K22FSH Development Kit Demos

Wi-Fi Demo: Throughput Demo

Test Procedures

TCP uplink test

Console2

```
ath_console.exe rx 192.168.0.3 2390 tcp v4
```

Console1

```
wmiconfig --connect Qtest-1
```

```
wmiconfig --ipstatic 192.168.0.2 255.255.255.0 192.168.0.1
```

```
benchtx 192.168.0.3 2390 tcp 1400 0 20 0
```

TCP downlink test

Console1

```
wmiconfig --connect Qtest-1
```

```
wmiconfig --ipstatic 192.168.0.2 255.255.255.0 192.168.0.1
```

```
benchrx tcp 2390
```

Console2

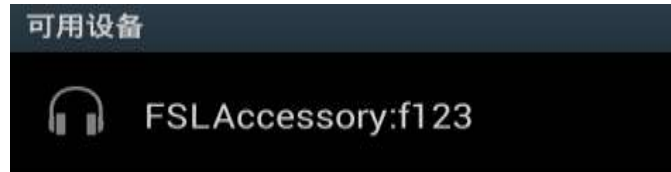
```
ath_console.exe tx 192.168.0.2 2390 tcp 1400 0 20 0 v4
```

K22FSH Development Kit Demos

Music Player Demo: USB/SD Device Music Player

Feature:

- Bluetooth USB Dongle 2.0 ~4.1 A2DP/AVRCP/HFP, PIN "0000"



- Andorid AOAP
- Apple MFi audio (Wi-Fi module QFM-2202-A)
- SD Card
- USB mass storage device

File system support :

MFS FAT file system

Audio decoder support:

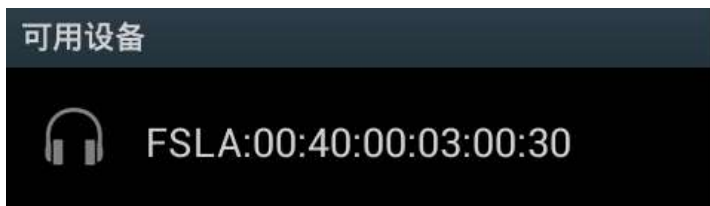
FLAC,mp3,WAV

K22FSH Development Kit Demos

Music Player Demo: On Board RDA5876 UART

Bluetooth 2.1

A2DP/AVRCP/HFP PIN "0000"





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