FTF 2016
TECHNOLOGY FORUM

NXP HANDS ON WITH THE SCM-i.MX 6DUAL/QUAD QUICK START BOARD

FTF-DES-N1989

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SYSTEM SOLUTIONS
FTF-DES-N1989
MAY 18, 2016

AGENDA

- Overview of Single Chip Modules (SCM)
- Product Availability and Roadmap
- Quick Start Board Features
- Software Release Process
- Hands-on Training

SCM Hands On Training Objectives

What will you learn?

- How to boot up the quick start board for SCM-i.MX 6D/Q
- How to launch a multimedia demo
- How to boot from the internal spi-nor

OVERVIEW OF SINGLE CHIP MODULES (SCM)

New Solutions are Required

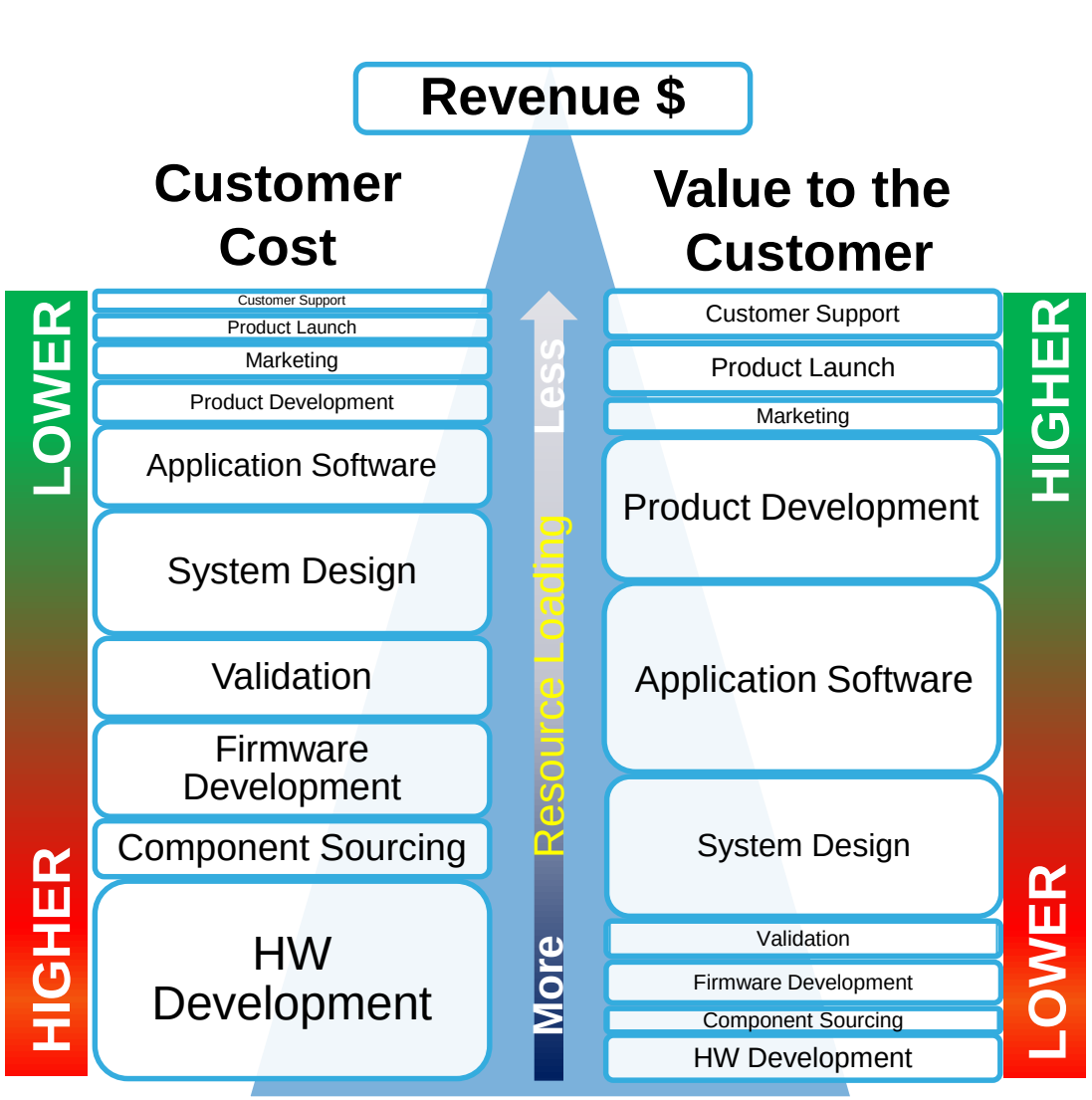
Growth Markets

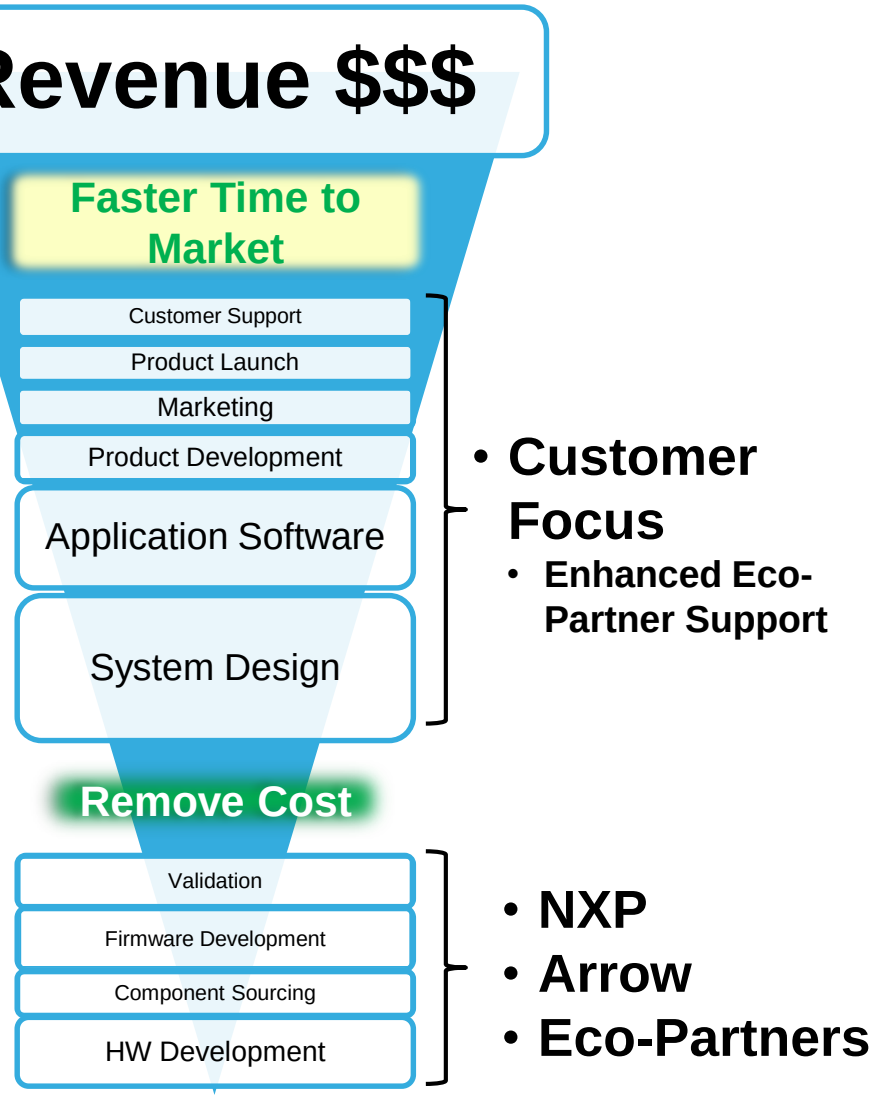
- Cloud computing – massive data storage, easy access, data on the move
- Big data analytics – local as remote manipulation and data
- Autonomous and assisted products – massive levels of integration and sensing
- Mobility and security – wearables, POS, mesh networks
- Industry 4.0 – IoT

What emerging products need

- More integration
- More features
- More communications
- More access
- More sensing
- Faster time to market

Customer Value Based Costing





- **Customer Focus**
  - **Enhanced Eco-Partner Support**

- **NXP**
- **Arrow**
- **Eco-Partners**

Why Choose a Single Chip System Module (SCM)?

- **>50% reduction** over current discrete solutions for your application board
- Reduces average **development time by up to 25%**
- **Eliminates extensive testing** and validation for your application
- **Reduces design complexity** of integrating and validating DDR memory and power management into customer design
- **Provide customizable option** for unique customer solutions
- **Higher level of customer enablement** (hardware integration and software enablement)
- **Reduces our customer's supply chain complexity**

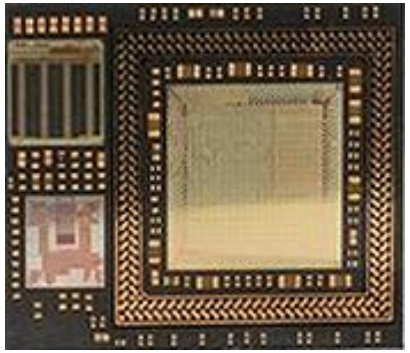
PRODUCT AVAILABILITY AND ROADMAP

NXP SINGLE CHIP SYSTEM MODULES (SCM)

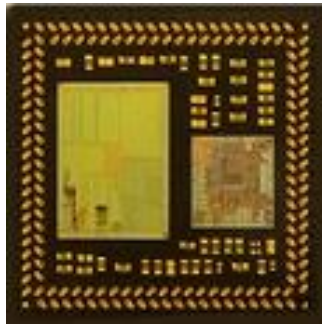
THE WORLD'S SMALLEST SINGLE CHIP SYSTEMS

SCM-i.MX 6D/6Q, 6SOLOX

Smaller than a 2-cent Euro or US Dime



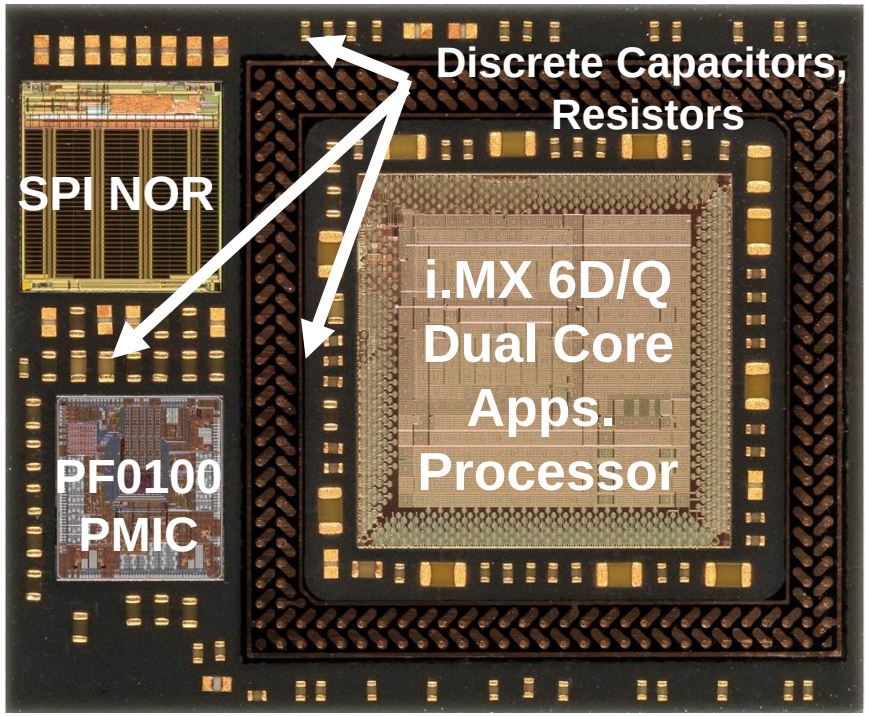
SCM Family 1:
SCM-i.MX 6Dual/6Quad

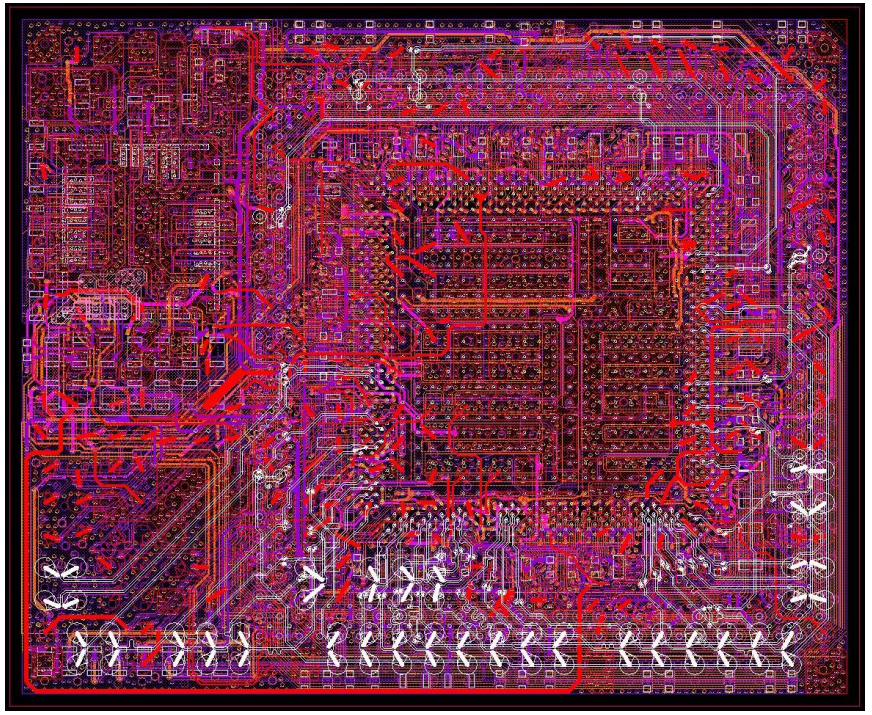


SCM Family 2:
SCM-i.MX 6SoloX

#NXPFTF

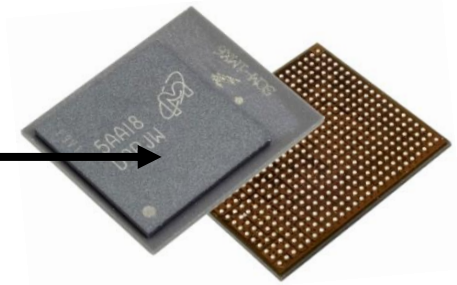
System Solution: Family 1 SCM-i.MX 6D/6Q

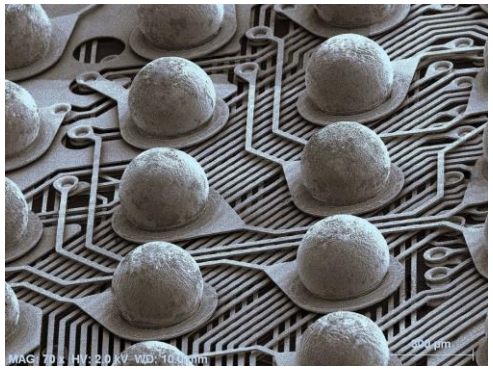


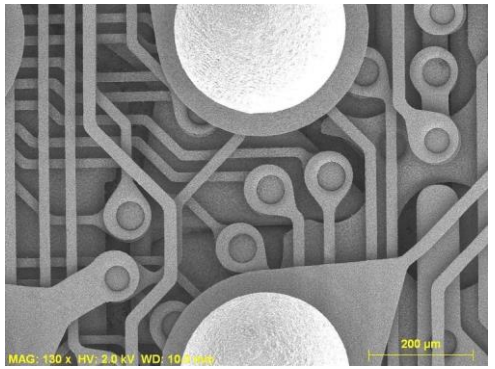


- 14 mm x 17 mm x 1.7 mm
- i.MX 6Dual or i.MX 6Quad
- PF0100 PMIC
- 16 MB SPI NOR
- Enabled for 1 GB or 2 GB LPDDR2 PoP or 512 MB plus 4 GB eMMC ePoP
- 109 discrete components
- 500 BGA balls P0.65 mm
- Commercial and industrial devices available

LPDDR2 Memory





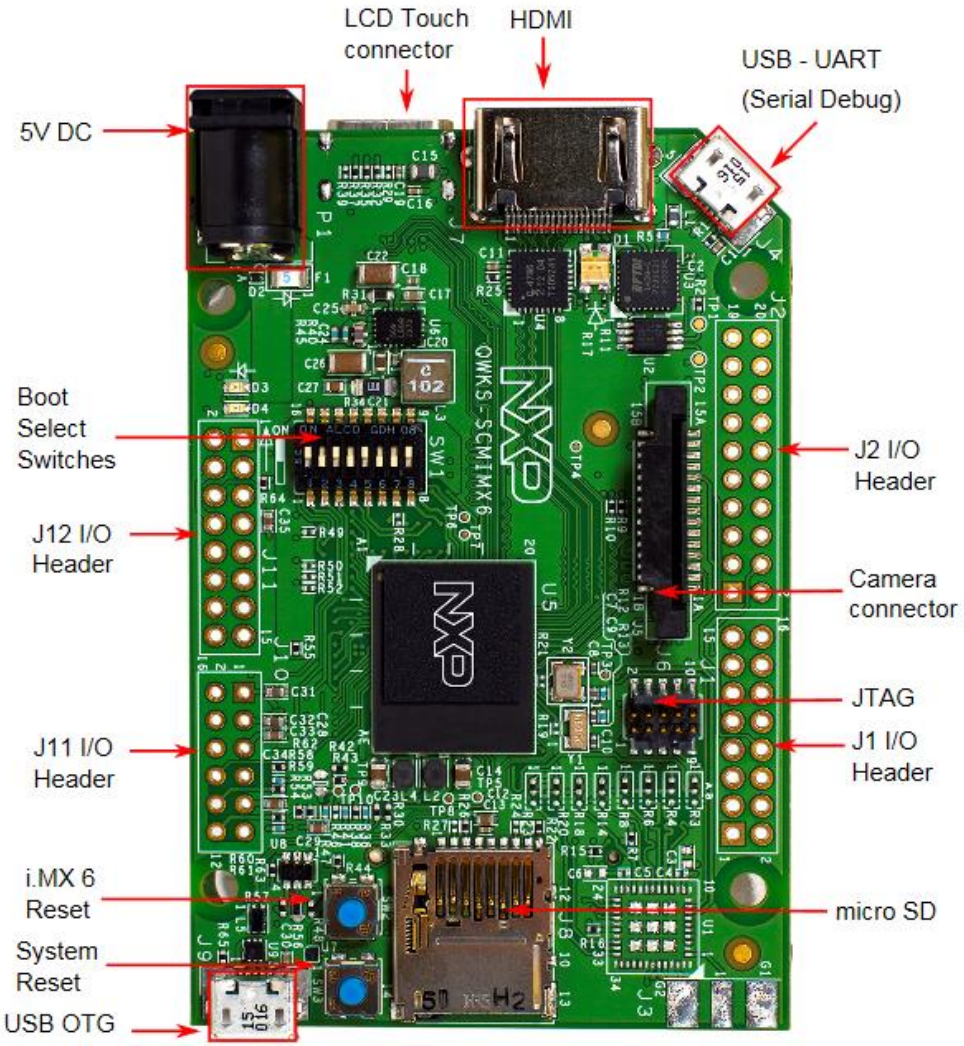


SCM-i.MX 6Dual/6Quad Collateral

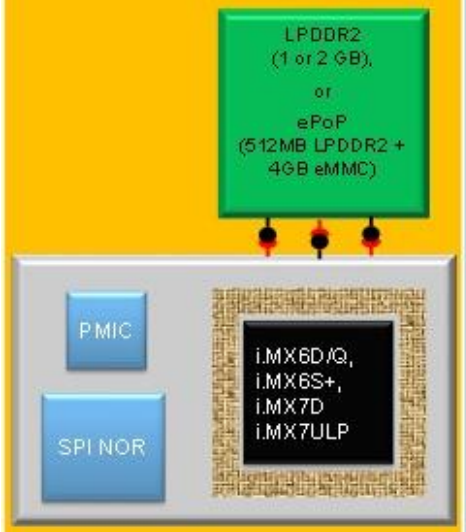
- Orderable part #’s in place (NXP p/n, Arrow p/n)

Assembly Part Number	SCM Revision	SCM Family	DRAM	DRAM Part Number	Qualification Tier
MSCMMX6DZDK08AB	Rev1.0	SCM-i.MX6D	-	-	Commercial
MSCMMX6QZDK08AB	Rev1.0	SCM-i.MX6Q	-	-	Commercial
MSCMMX6DZDK08AB1G0A	Rev1.0	SCM-i.MX6D	1 GB LPDDR2	MT42L128M64D2LL-25AT:A	Commercial
MSCMMX6DZDK08AB2G0A	Rev1.0	SCM-i.MX6D	2 GB LPDDR2	MT42L256M64D4LM-18 WT:A	Commercial
MSCMMX6QZDK08AB1G0A	Rev1.0	SCM-i.MX6Q	1 GB LPDDR2	MT42L128M64D2LL-25AT:A	Commercial
MSCMMX6QZDK08AB2G0A	Rev1.0	SCM-i.MX6Q	2 GB LPDDR2	MT42L256M64D4LM-18 WT:A	Commercial

- Development boards in place along with support HW (LVDS display, WLAN +BT modules, etc.)
- NXP website live (www.nxp.com/scm)
  - Datasheet, fact sheets, SW users guide, HW developers guide, App notes, Linux SW patch releases, Quick Start board users guide etc.
- Software Enablement
  - Linux (3.14.x kernel)
  - Android (5.x July)
- Longevity program (10year, Feb 2026) on SCM



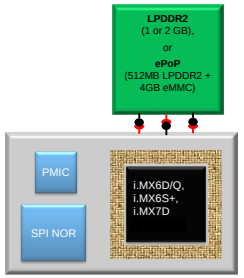
System Solutions Family of Products

SCM Family 1	SCM Family 2	SCM Family 3	SCM Family 4	SCM Family 5
High-end IoT / Graphic Hub	Low-end / Low-power SCM	Expanded Hybrid System	Integrated RF / Security SCM	Enhanced Featured Hybrid System
			• i.MX 6UL, 7S/D • NFC • BLE, 15.4 • Security – Authentication • PMIC	• i.MX 6UL, 7S/D • i.MX 8 Audio/ Video • WiFi • NFC • BLE, 15.4 • Security – Authentication • PMIC • Sensor
14mm x 17mm	13mm x13mm	15.5mm x 15.5mm		

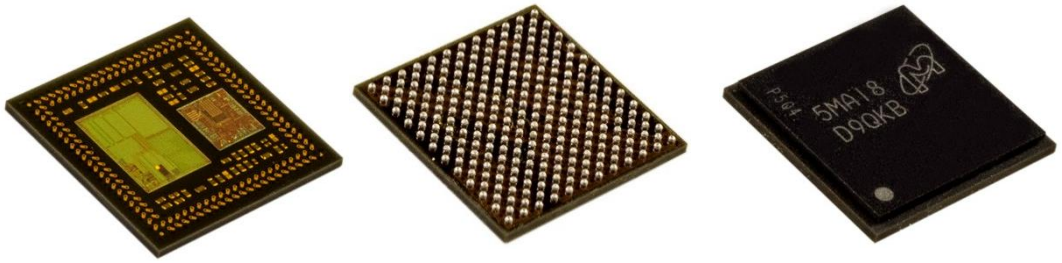
Launching this week

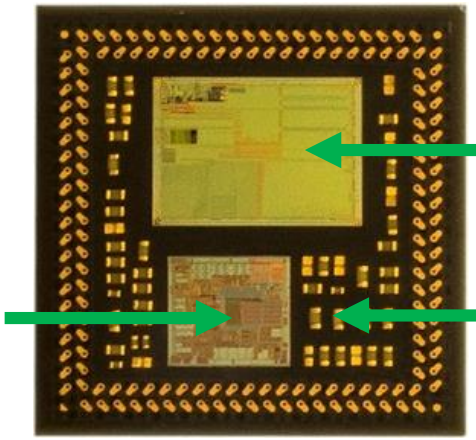
In definition

Derivative Products for Family 1

SCM	SCM Family	SCM Family	Configuration	Availability	
				Beta Samples	Production
SCM-i.MX6D (Commercial)	1		i.MX6D, PMIC, SPI-NOR, PoP LPDDR2 Memory (1 or 2 GB)		In Production
SCM-i.MX6Q (Commercial)	1		i.MX6D, PMIC, SPI-NOR, PoP LPDDR2 Memory (1 or 2 GB)		In Production
SCM-i.MX6D ePoP (Commercial)	1		i.MX6D, PMIC, SPI-NOR, ePoP (512MB LPDDR2 + 4GB eMMC) Memory	Available	Jun-16
SCM-i.MX6S (Commercial)	1		i.MX6S*, PMIC, ePoP or LPDDR2	Jun-16	Jul-16
SCM-i.MX6D/Q (Industrial)	1		i.MX6D/Q, PMIC, SPI-NOR, PoP LPDDR2 Memory		In Production

Family 2 SCM-i.MX 6SX (13 mm x 13 mm)





i.MX 6SX Apps Processor

PD0100 PMIC

47 Discrete components

PoP Memory options:

- 512MB, 1GB LPDDR2
- ePoP (512MB LPDDR@ + 4GB eMMC)

0.75 mm Ball pitch (diagonal array)
BSP released
Enabled for Linux

LPDDR2 - 168 FBGA
512 MB LPDDR2/ 1 GB LPDDR2 / ePoP - 0.5GB LPDDR2 + 4GB eMMC

SCM-i.MX6 SoloX

System Control
Secure JTAG
PLL, Osc
Clock & Reset
Smart DMA
IOMUX
Timer x3
PWM x8
Watch Dog x3
RDC

Security
RNG
TrustZone
Ciphers
Security Ctrl
Secure RTC
eFuses

Display and Camera Interface
24-bit RGB
1ch LVDS
*2x 20-bit CSI**

CPU1 Platform	
Cortex-A9	
32KB I-cache	32KB D-cache
NEON	PTM
256KB L2-cache	

CPU2 Platform	
Cortex-M4, MPU, FPU	
16KB I-cache	16KB D-cache
64KB TCM	

Multimedia	
Hardware Graphics Accelerators	
3D	2D
PXP	
CSC	Rotate
Combine	Gamma Mapping
Audio	
ASRC	

Connectivity
MMC 4.4 / SD 3.0 x3
UART x6
I^2C x 4, SPI x5
USB2 OTG & PHY
USB2 Host & PHY
1Gb Ethernet
ESAI, I^2S/SSI x5
S/PDIF Tx/Rx
2 x FlexCAN
GPIO, Keypad
*MLB25/50**
*1x PCIe 2.0 (x1 lane)**

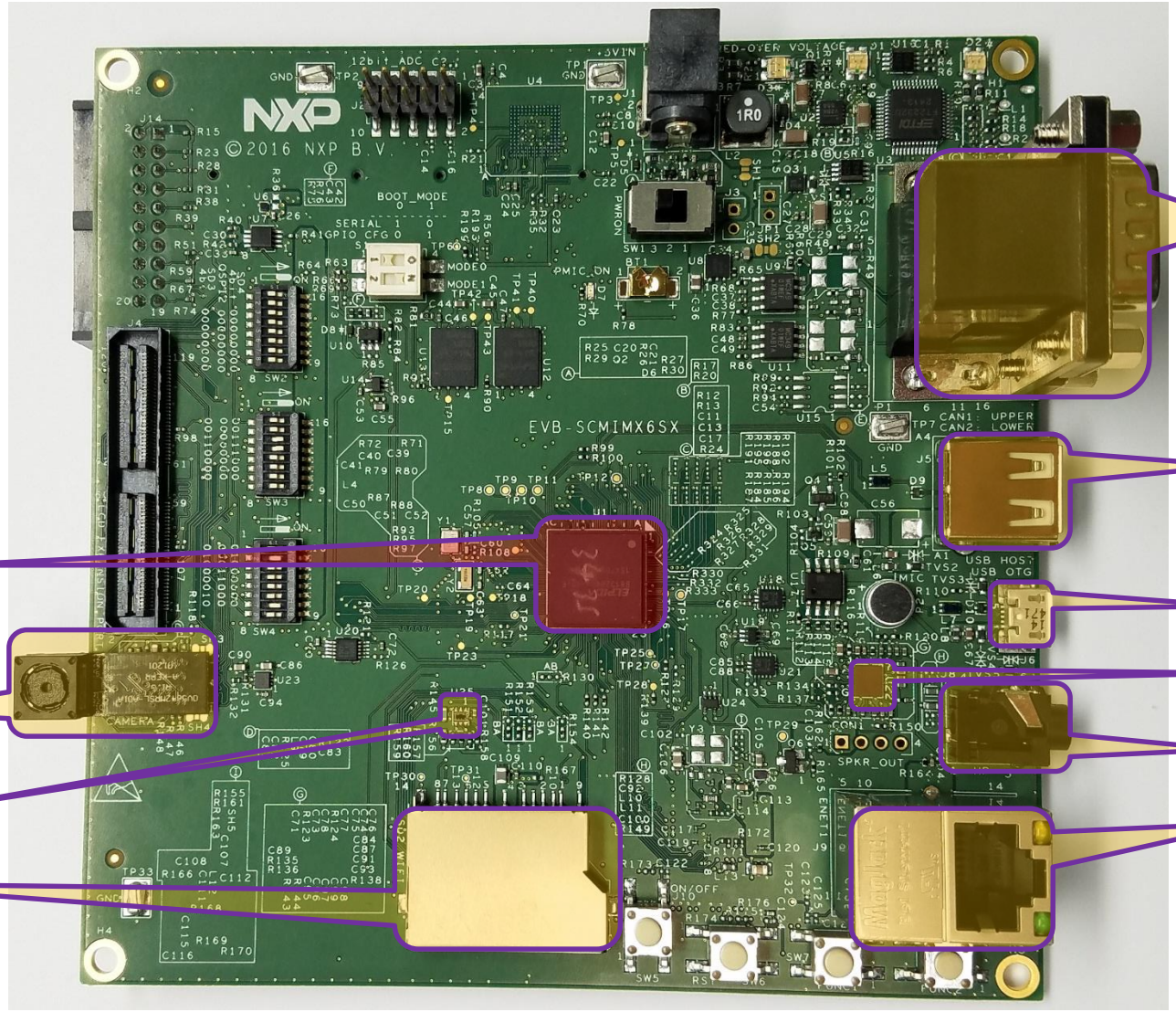
External Memory
NAND (BCH62)
16-bit NOR
2x DDR Quad SPI
LPDDR2 x32

ADC
*8ch 12-bit ADC**

Power Management - MMPF0100		
SW1AB	*SW1C**	SW2
SW3AB	*SW4**	SWBST
*VGEN1**	*VGEN2**	VGEN3
VGEN4	*VGEN5**	VGEN6

* These features are either unavailable or reduced in functionality on the 265BGA.

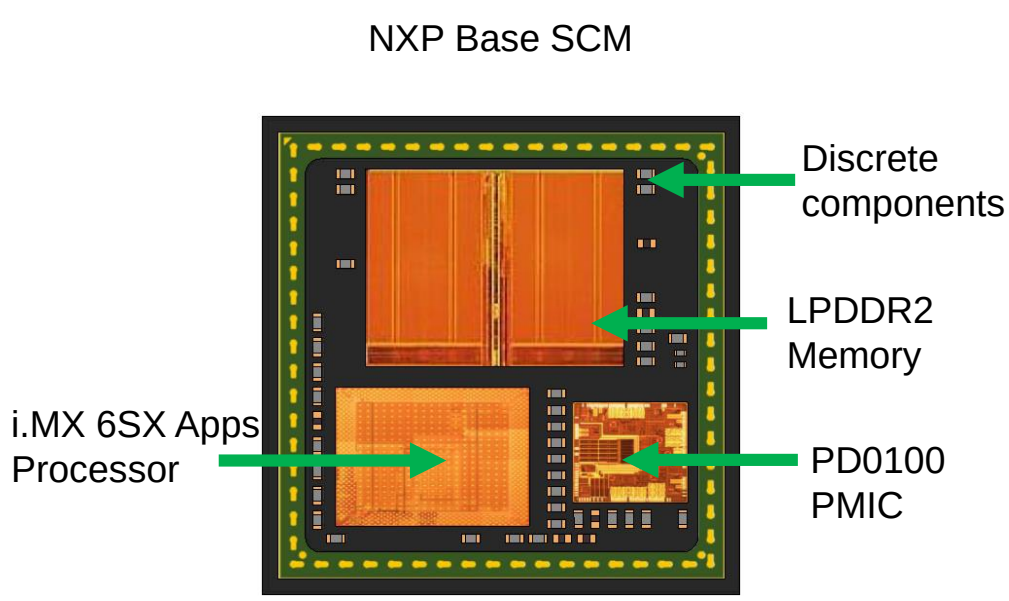
SCM-i.MX 6SX Evaluation Board

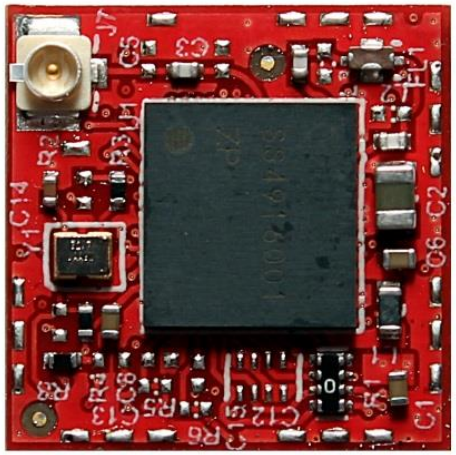


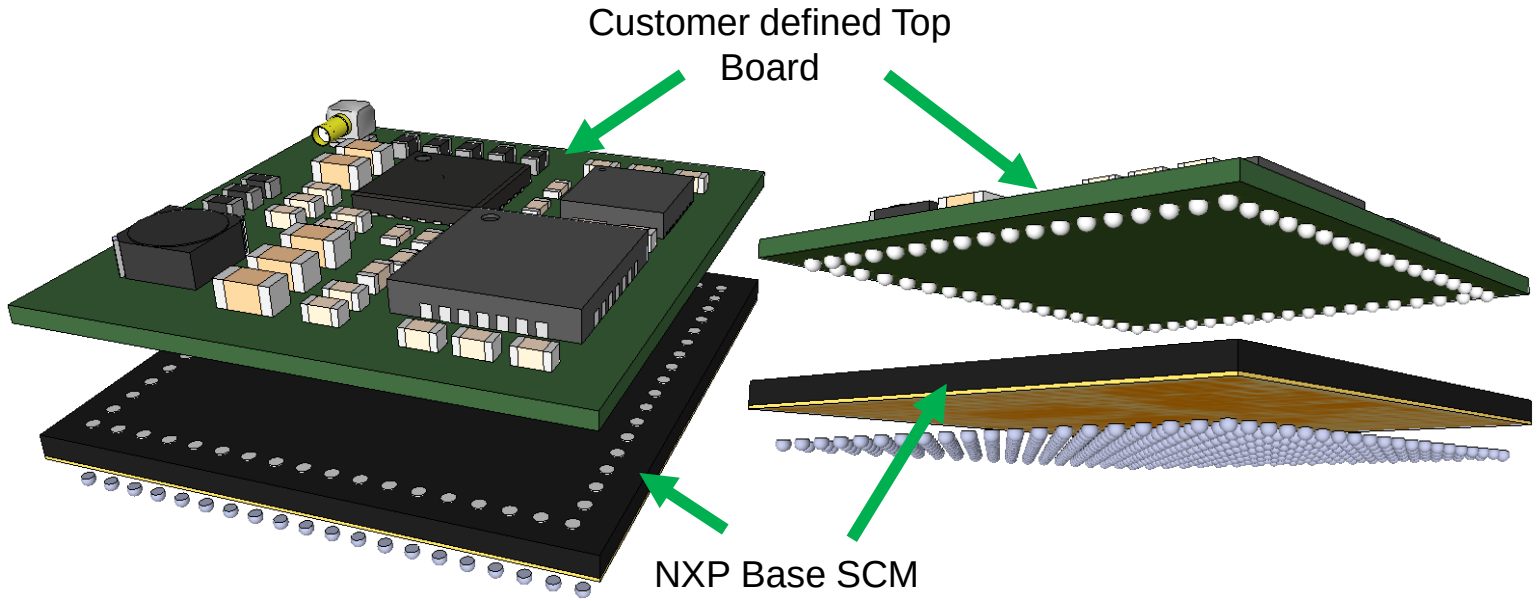
Motivation for Developing the SCM V-Link Hybrid Module

- Providing customers an integrated applications processor + PMIC + Memory ✓
  - Address design and signal integrity challenges
- Customers asking for smaller and smaller form/ factors ✓
- Customers asking for higher level of functionality ✓
- Providing customers flexibility in features and functionality
  - Adding RF (Wi-Fi, BLE, NFC, etc.), Sensors, Audio Codex, PHY interfaces, etc.
- Providing flexibility at low cost

Family 3 SCM-i.MX 6SX V-Link (15.5 mm x 15.5 mm)







Custom Top Board (PCB or Substrate Based):

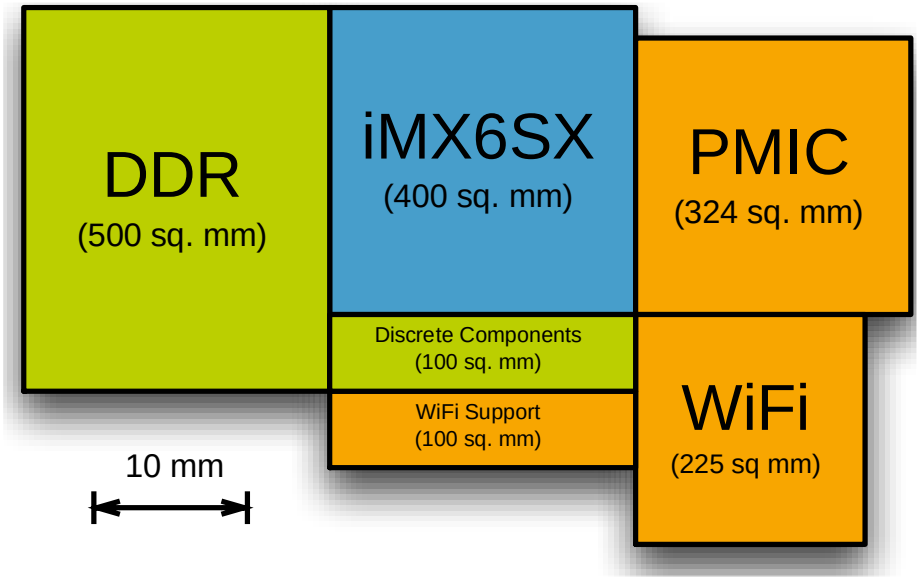
- Customer defined (RF, Sensors, Battery mgmt., PHY interface, Audio Codex, etc.)

15.5 mm x 15.5 mm
0.75 mm Ball pitch

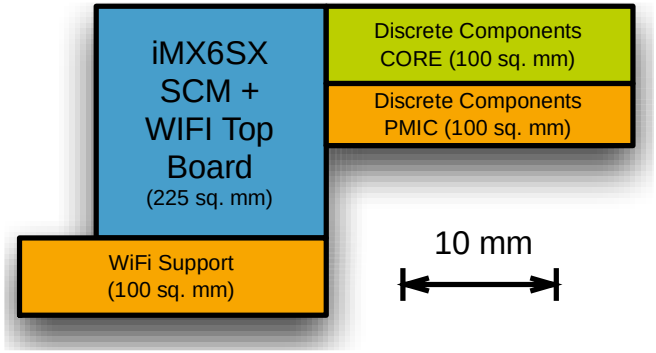
BSP released
Enabled for Linux

Change in i.MX 6 Design Topology

Traditional layout using discrete IC and components on a PCB board



Equivalent PCB Board area utilizing NXP SCM with the V-Link Top Board

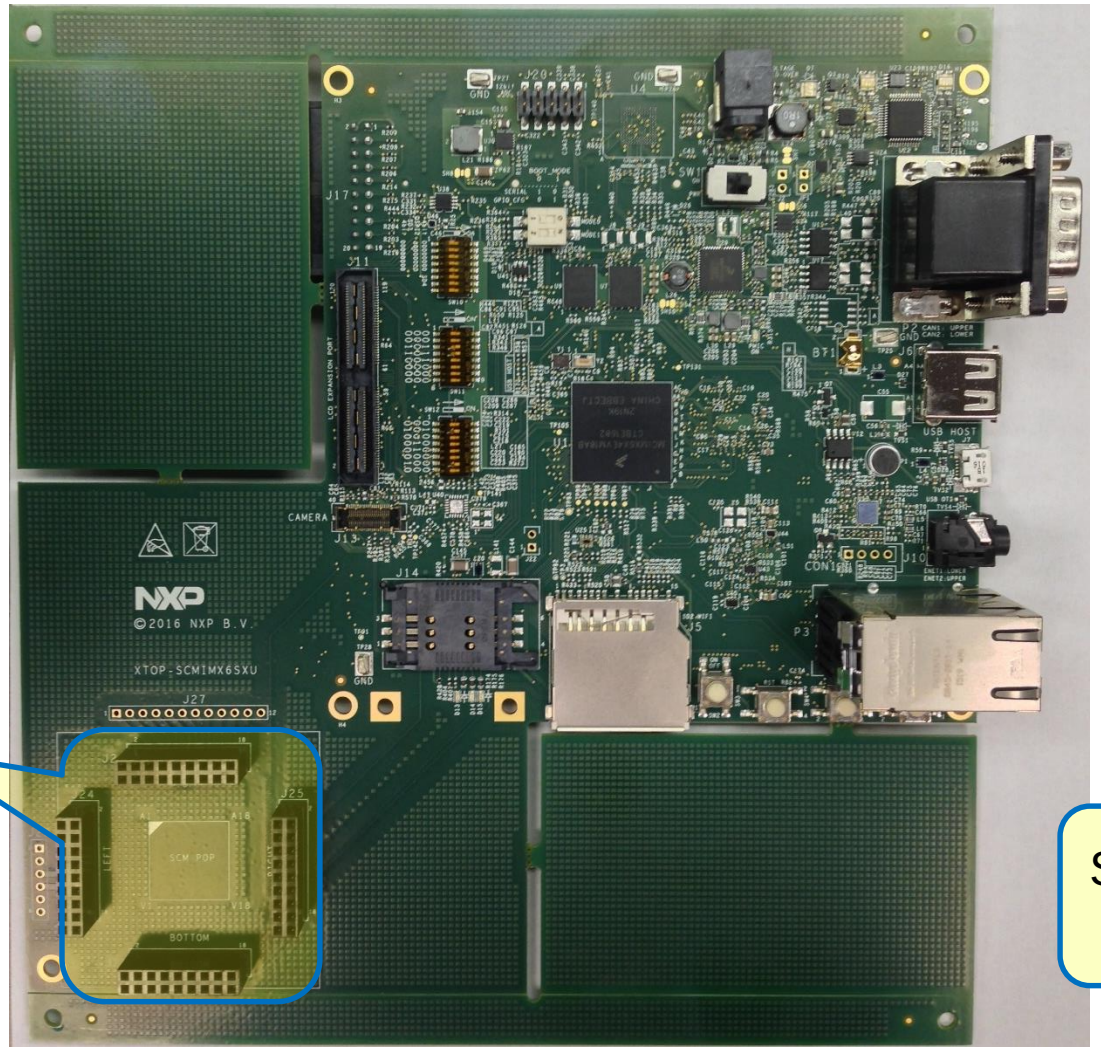


- **67.9% reduction** in board area by utilizing the NXP Base SCM (i.MX 6SX + PMIC + Memory + Discretes)
- **69.2% reduction** in board area by utilizing the SCM Top Board for the WiFi + BT + Discrete module)

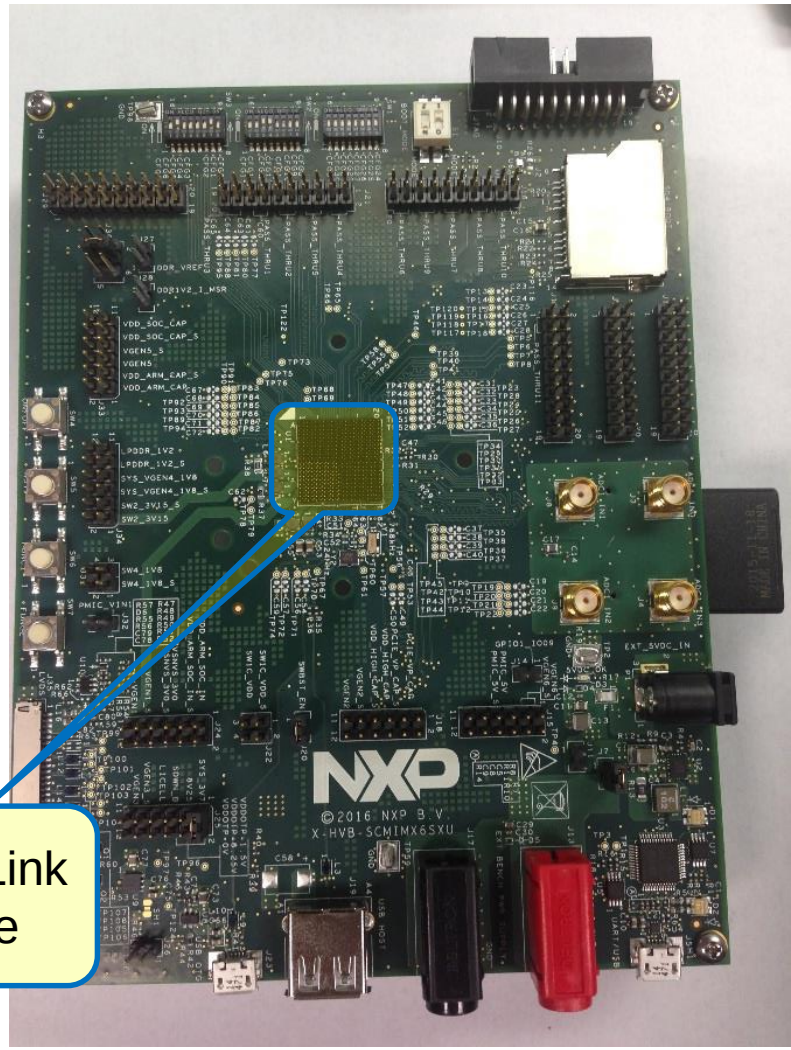
Customer Engagement

- Alpha samples available
- ECO-Partner support in place
- Development boards available

Top Board Software Developer



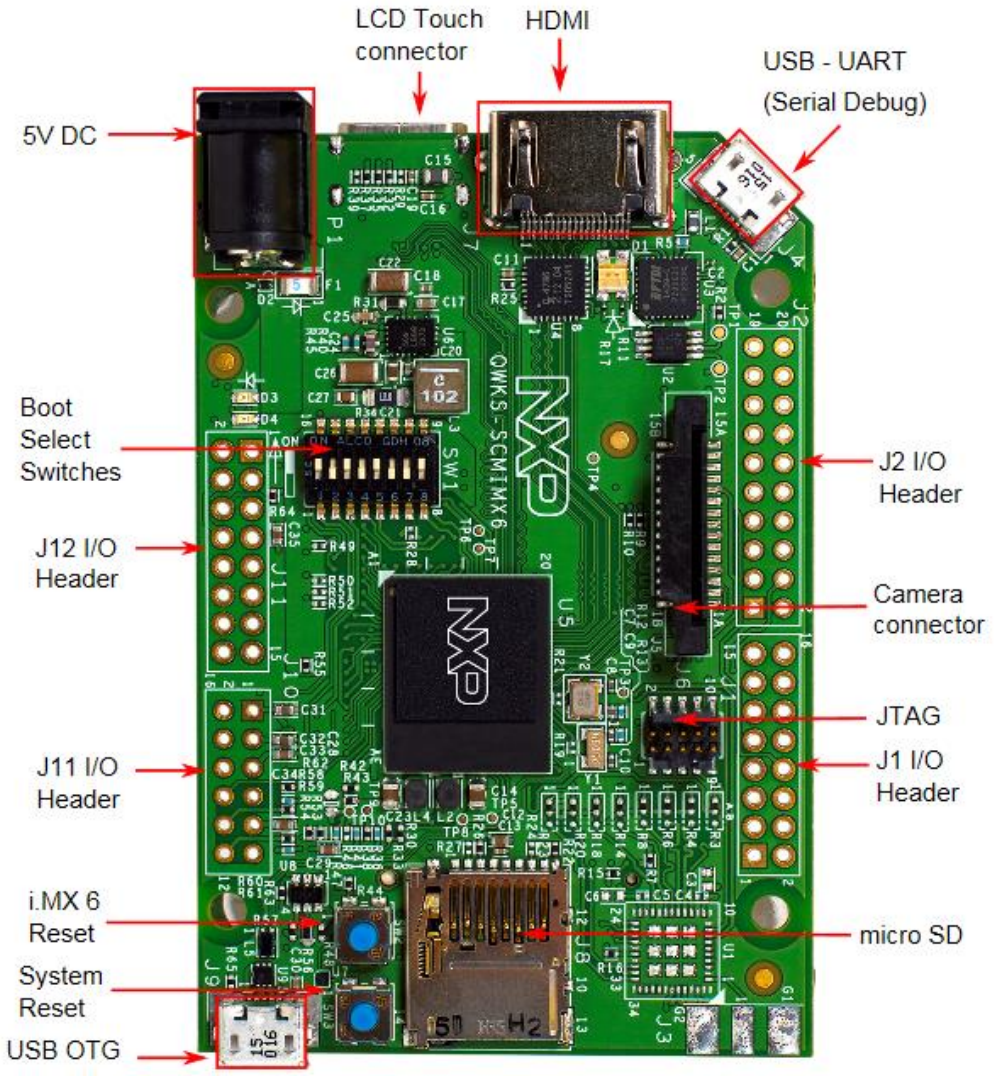
HVB SCM V-Link Development Board



SCM-i.MX 6DQ QUICK START BOARD FEATURES

SCM-i.MX 6Dual/6Quad Quick Start Board

Available **NOW**



- SCM-i.MX6D (1GB LPDDR2 + PMIC PF0100 + 16MB SPI NOR)
- Small form-factor 2.1” x 3.2”
- Micro-SD card socket
- Standard SD card socket
- HDMI connector
- JTAG (10 pin)
- USB (UART to USB serial debug)
- USB device mode
- MIPI Camera connector (compatible with Raspberry Pi 2 camera module)
- LVDS display (w/ cap. touch) connector (compatible with Element14 9.7” LCD display with mini-HDMI connection)
- Wi-Fi available via SDIO interface* (compatible with Murata SD module)
- Arduino R.3 header compatible (no ADC)
  - AUDMUX, SPDIF, ENET (10/100), SPI, UART muxed with Arduino headers

SCM-i.MX 6Dual/6Quad Quick Start Board

The following third-party accessory boards have been tested with the QWKS-SCM i.MX6 Dual/6Quad and may be available

Part Numbers	Resale	Description	Ordering Link
QWKS-SCMIMX6DQ	$249	SCM-i.MX6DQ Development Board	www.arrow.com, or www.nxp.com (Buy Direct)
QWKS-ETHACC	TBD	10/100 Ethernet and MCIMX-LVDS1 display support	TBD – available early 2Q16
17X8440	$199	9.7” TFT LVDS display w/ cap touch	www.newark.com Manufacturer: ELEMENT14 Manufacturer PN: LCD8000-97C
LBEH5HMZPC-TEMP-DS-SD	$132.05	WLAN+BT combo SD eval module, 802.11ac/a/b/g/n Bluetooth v4.1	www.arrow.com Manufacturer: Murata *BT connection not supported on QS board
81-LBEH5HMZPCTMPDSSD	$125	WLAN+BT combo SD eval module, 802.11ac/a/b/g/n Bluetooth v4.1	www.newark.com Manufacturer: Murata Manufacturer PN: LBEH5HMZPC-TEMP-DS-SD *BT connection not supported on QS board
SX-SDCAN-2830-SP	$55.56	WLAN+BT combo SD eval module, 802.11a/b/g/n Bluetooth v3.0 + HS/Bluetooth v4.0(BLE) Class 1.5	www.arrow.com Manufacturer: Silex Technology America *BT connection not supported on Quick Start board

Software Enablement

Fully validated Linux and Android BSP releases

Linux

android

Integrated with Yocto

yocto PROJECT

Board Support Package (BSP)

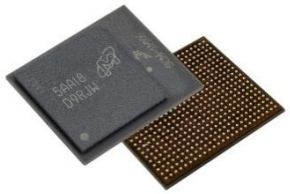
Aligned to official **i.MX 6** releases

Tools and Support Model

SCM Product	SCM Sales and Application Support	Post Sale Enablement

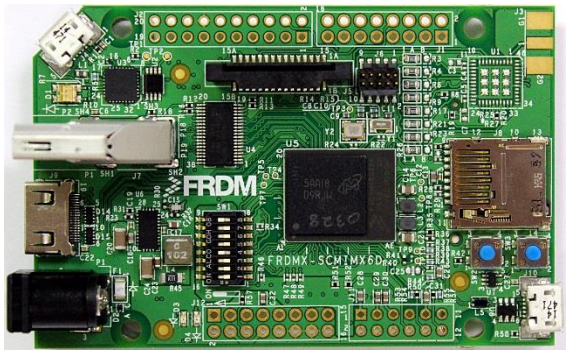
NXP

- SCM Design
- Supply Chain
- SCM Assembly
- SCM Test
- SCM Quality
- Software Enablement



NXP and Arrow

- Sales
- Field Application Engineering Support
- Evaluation Boards
- Product Collateral
- Community Support



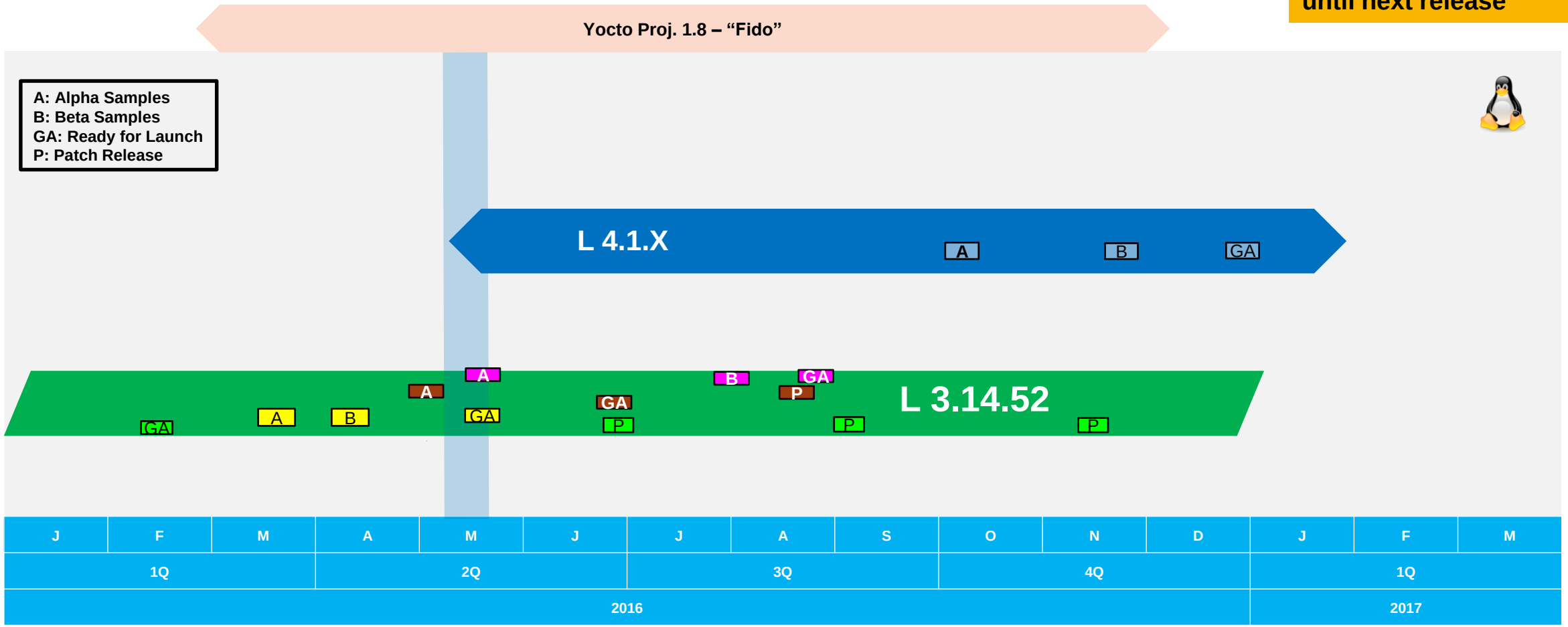
Ecosystem

- PoP Assembly Support
- Software/ Firmware/ Application Enhancement Support
- Hardware Support (Customer Board, Enhancements, Implementation)
- Community Support

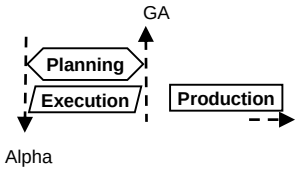
SOFTWARE RELEASE PROCESS

Linux Roadmap

GA – Support for 1 year from date of release
Alpha/Beta – Support until next release



Release Schedule



Linux Kernel

- 4.1.x
- 3.14.x
- 3.10.x

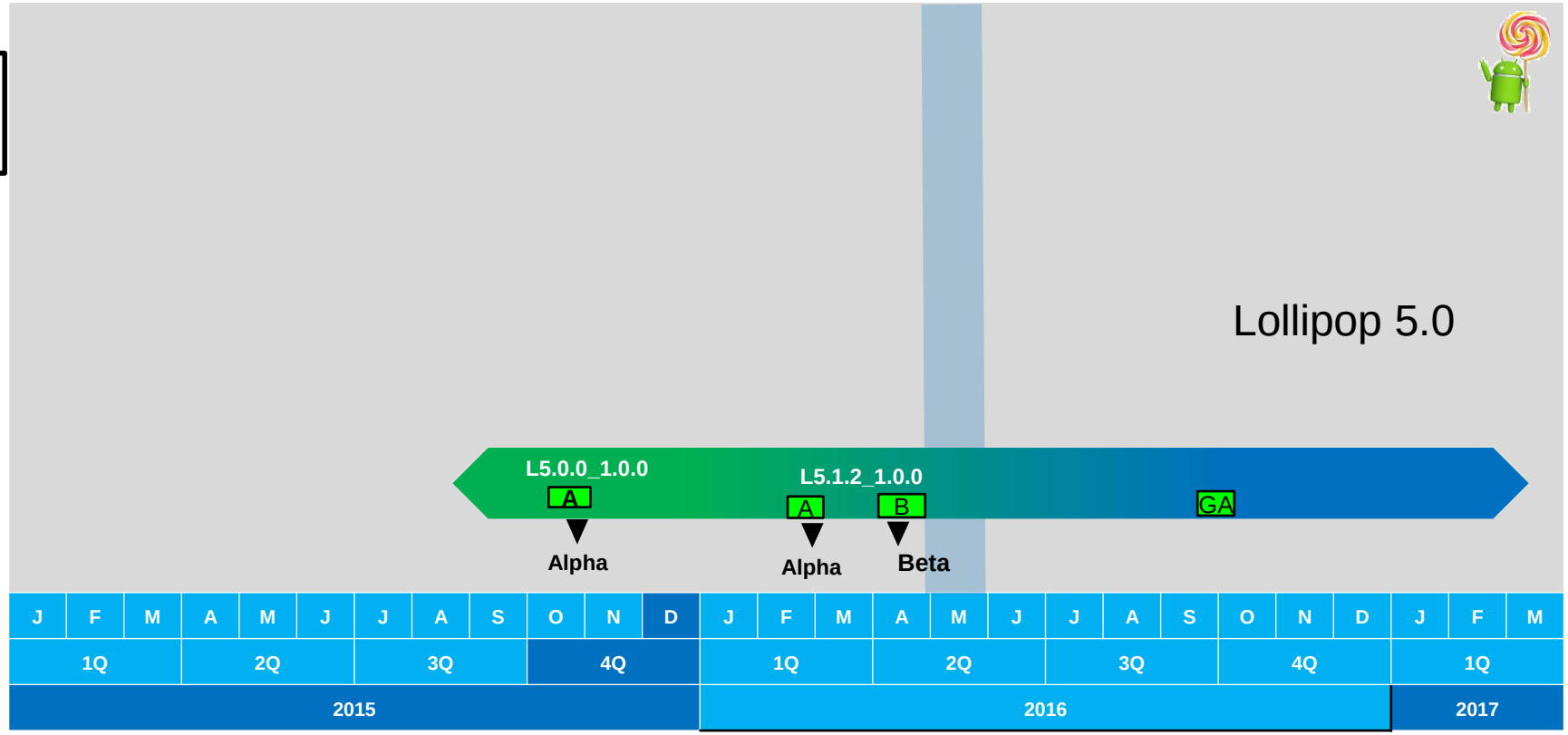
Supported Platforms

- SCM-i.MX 7 EVB Board
- SCM-i.MX 6SX EVB Board
- SCM-i.MX 6D/Q-1G Quick Start Board
- SCM-i.MX 6D/Q-ePOP Quick Start Board
- SCM-i.MX 6SX V-link EVB Board

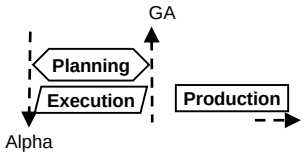
Android Roadmap

GA – Support for 1 year from date of release
Alpha/Beta – Support until next release

A: Alpha Samples
B: Beta Samples
GA: Ready for Launch
P: Patch Release



Release Schedule



Linux Kernel

- 3.10.x
- 3.14.x
- 4.1.x

Supported Platforms

- SCM-i.MX 6D/Q-1G Quick Start Board

HANDS-ON TRAINING

SCM-i.MX 6D/Q Hands-On Training – Getting Started

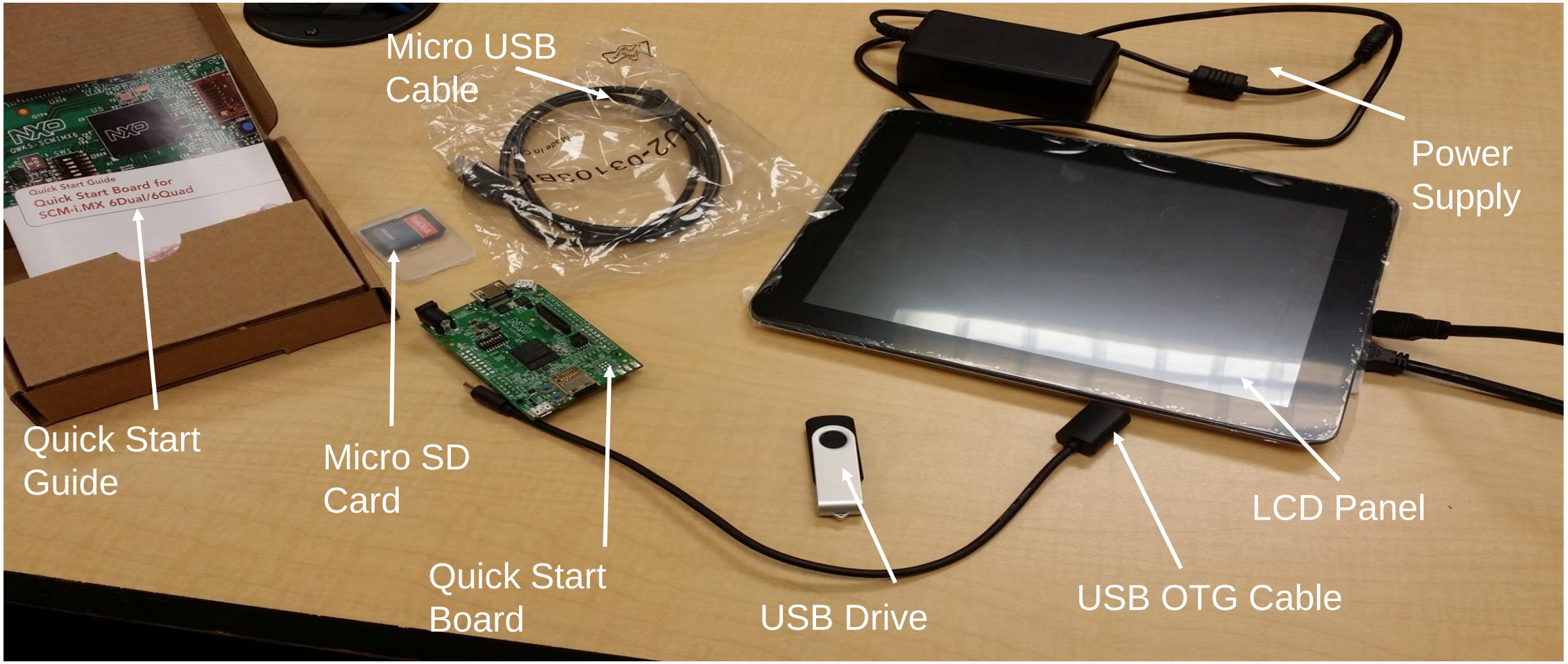
Hardware

- Laptop/PC
- Quick Start Board Kit (power supply, micro-USB cable…)
- LVDS Display
- USB Stick

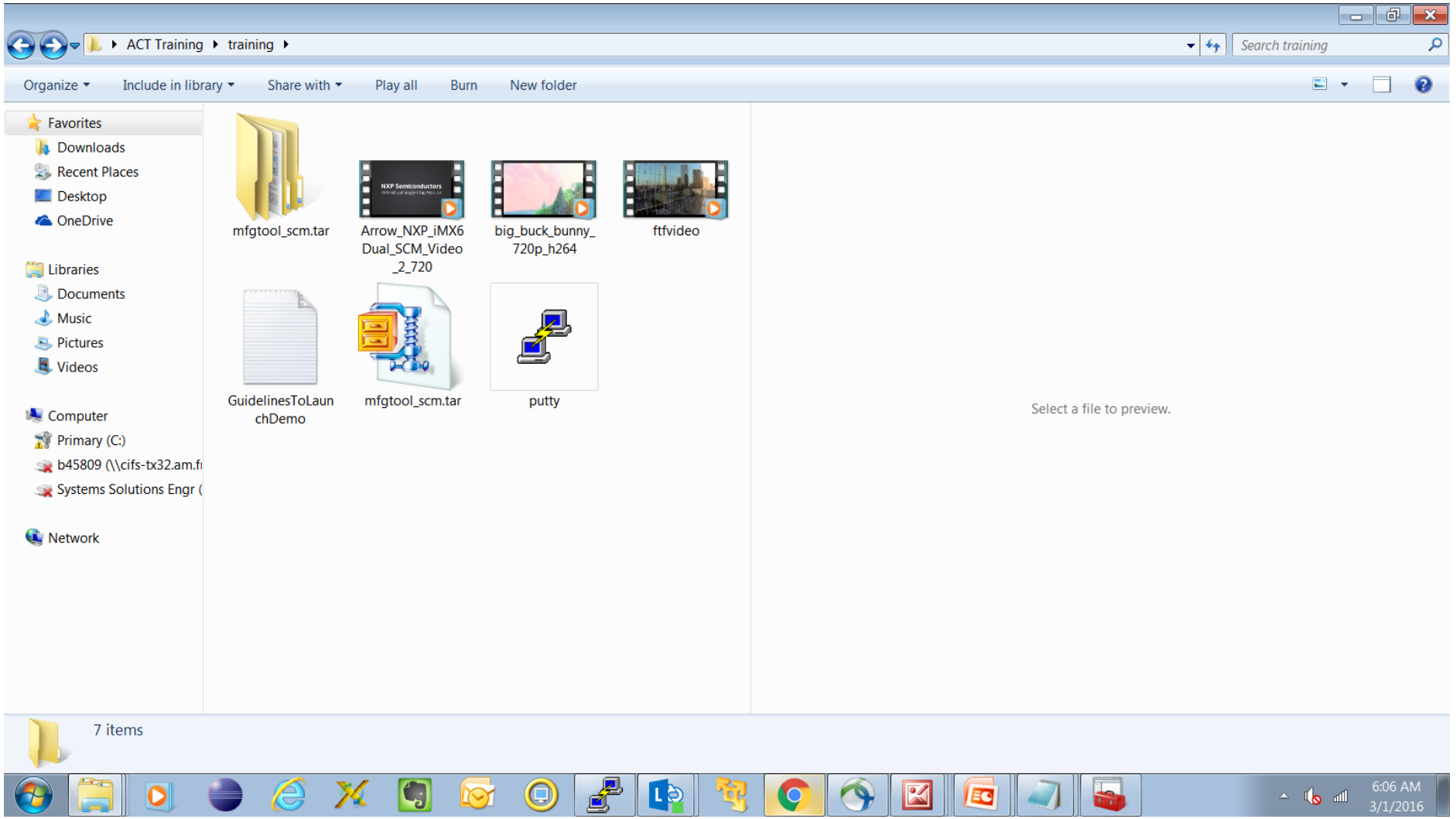
Software

- TeraTerm or Putty
- Demo image on a Micro-SD Card

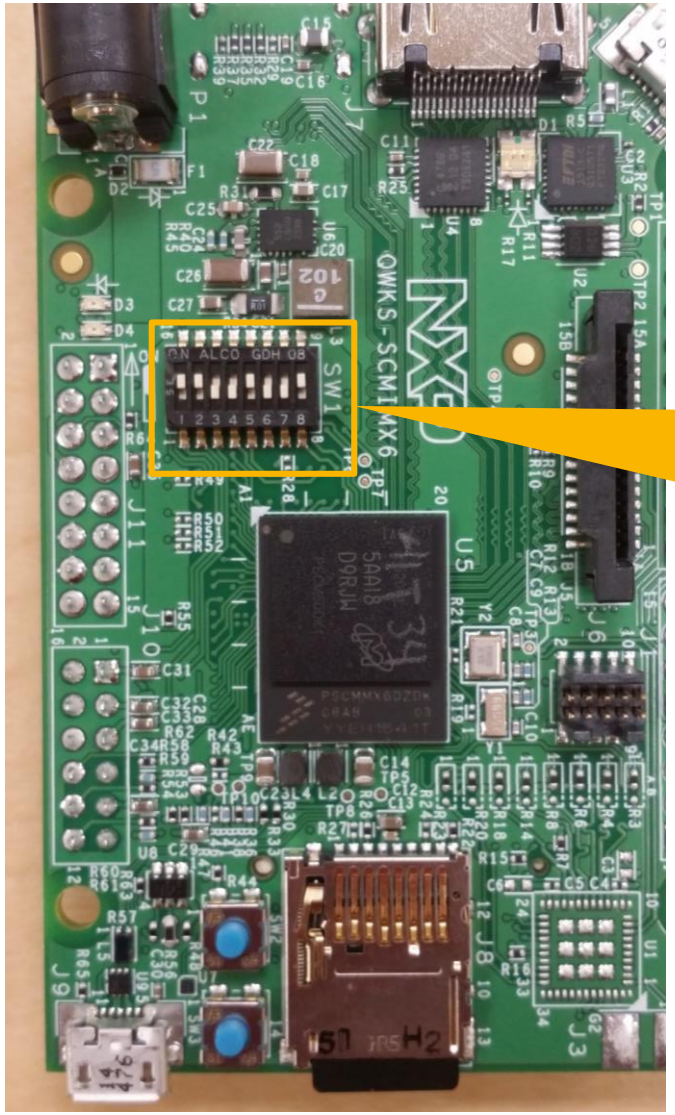
Before We Start…



Before We Start… (Inside USB Drive)



1. Get to Know the Quick Start Board



Look at the boot switch settings, the default setting boots from the micro SD card

1. Get to Know the Quick Start Board

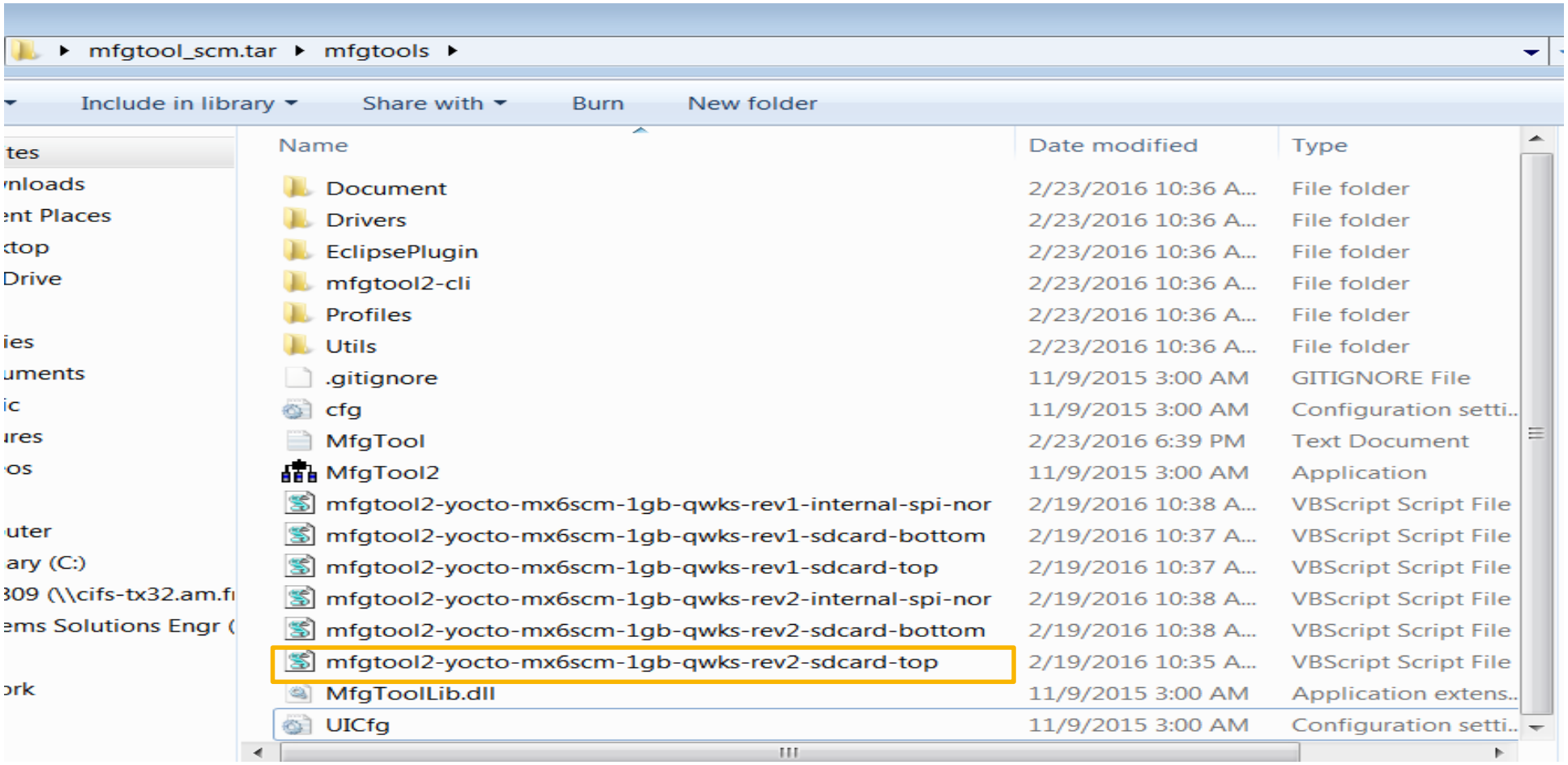
SW1

DIP#	8	7	6	5	4	3	2	1
	BOOT_CFG1_[6]	BOOT_CFG1_[5]	BOOT_CFG1_[4]	BOOT_CFG2_[4]	BOOT_CFG2_[3]	BOOT_CFG3_[5]	BOOT_CFG3_[4]	BOOT_MODE1
SPI NOR	0	1	1	x	x	DDR Memory Map default config		0 = Boot from Fuses
SD/ESD	1	0	x	0 = SD2	1 = SD2	'00' – Single DDR Channel		0 = Boot from Fuses
						'01' – Fixed 2 x 32 map		1 = Boot from Board settings
				1 = SD3	0 = SD3	'10' – 4 KB Interleaving Enabled		1 = Boot from Board settings
						'11' – Illegal		
DEFAULT	1	0	0	1	0	1	0	1

Power Up The Board

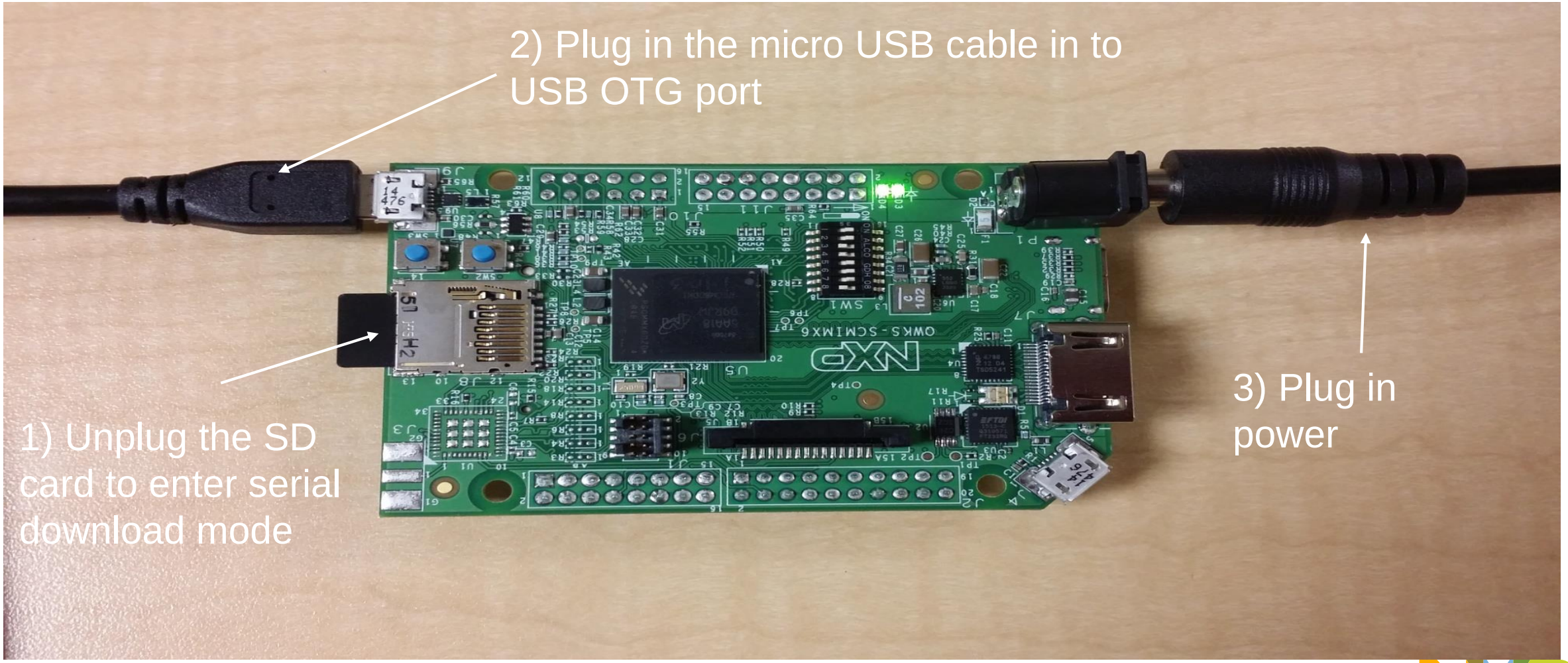
Plug in the power and mini HDMI cable from the panel to the board, you should see the Yocto environment booting on the panel

How To Load the Image On To SD Card Using MFG Tool

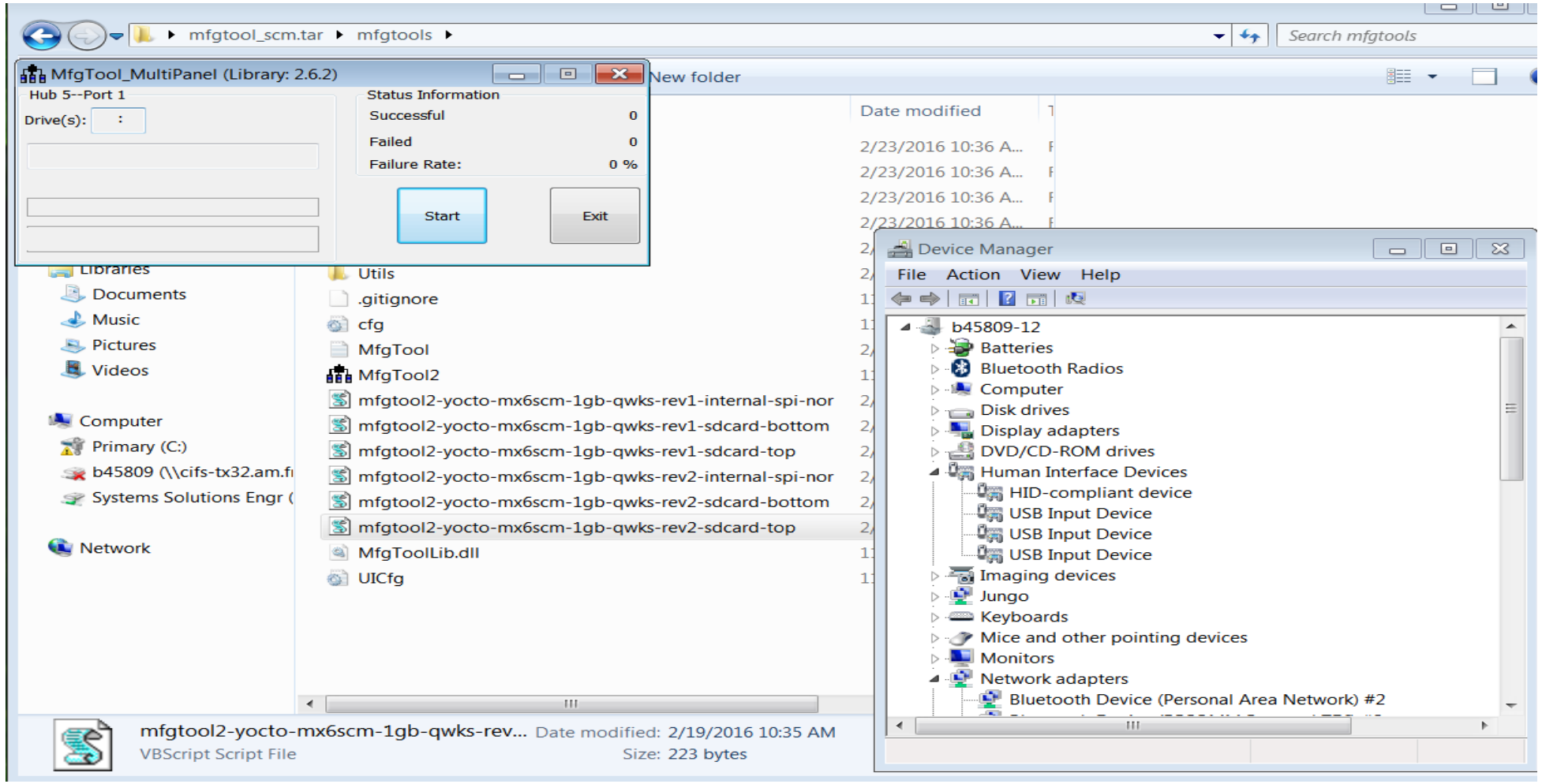


How To Load Image Onto SD Card Using MFG Tool

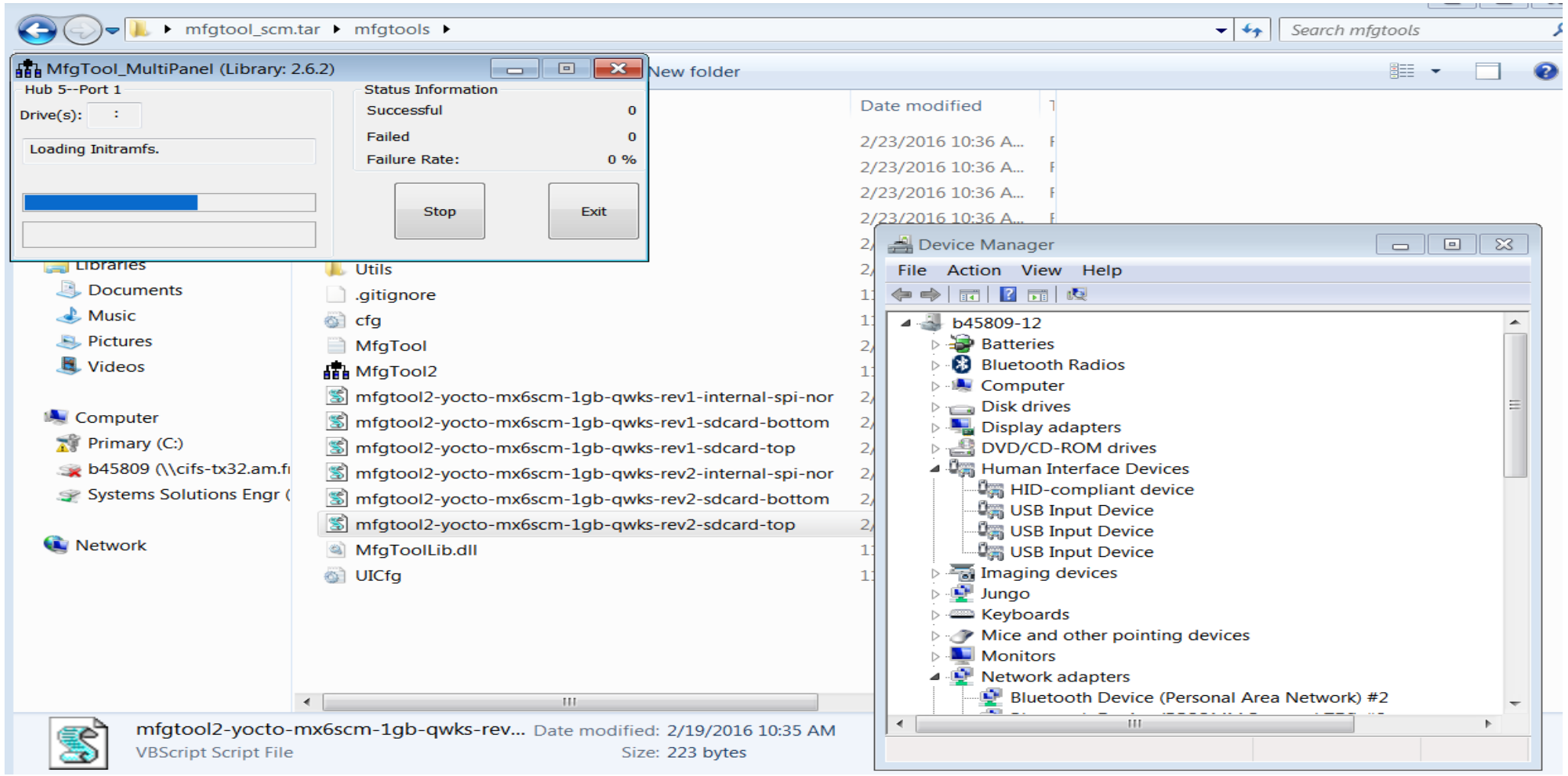
(Hardware Setup)



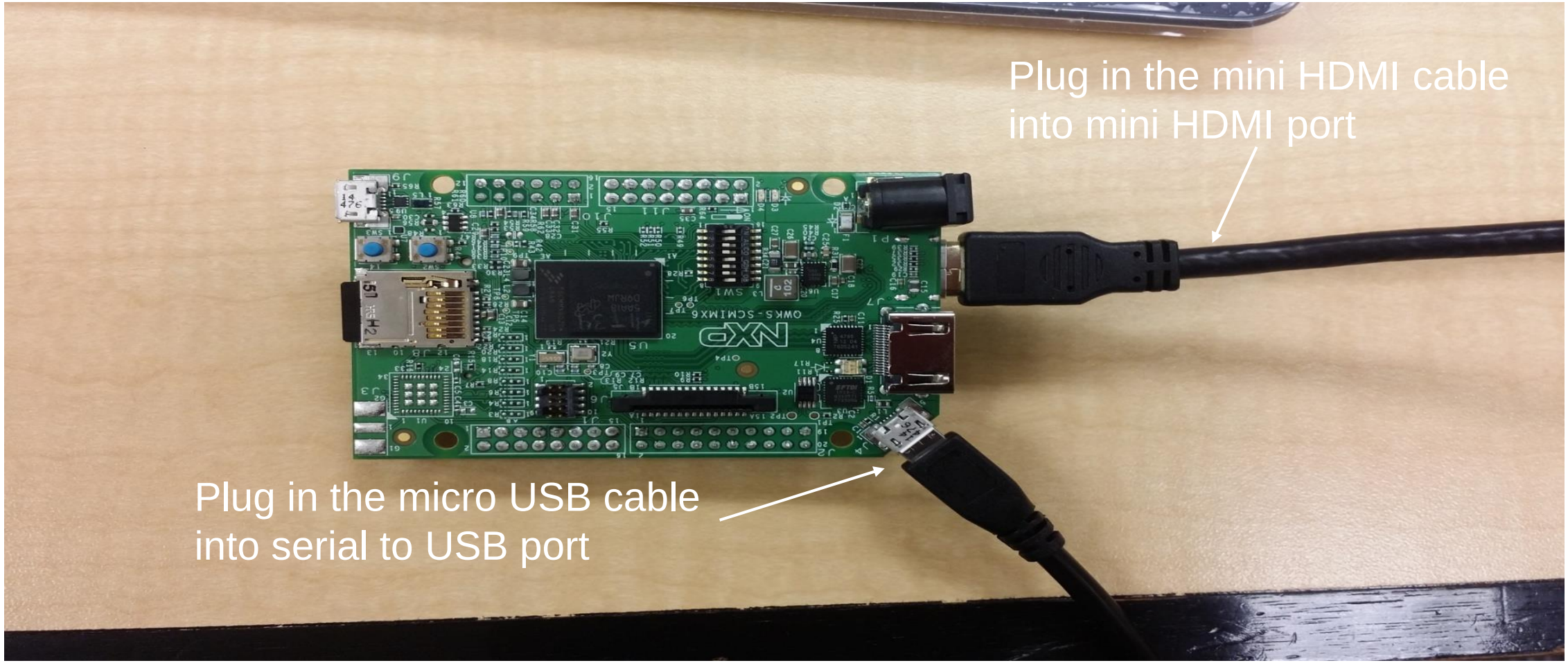
How To Load the Image Onto SD Card Using MFG Tool



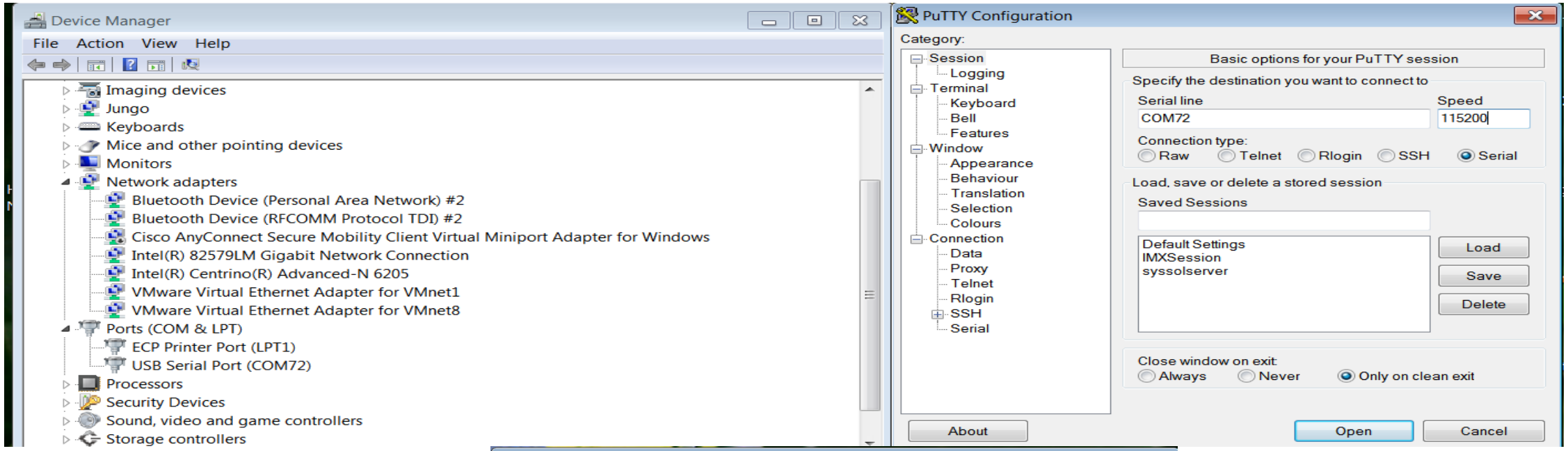
How To Load The Image Onto SD Card Using MFG Tool

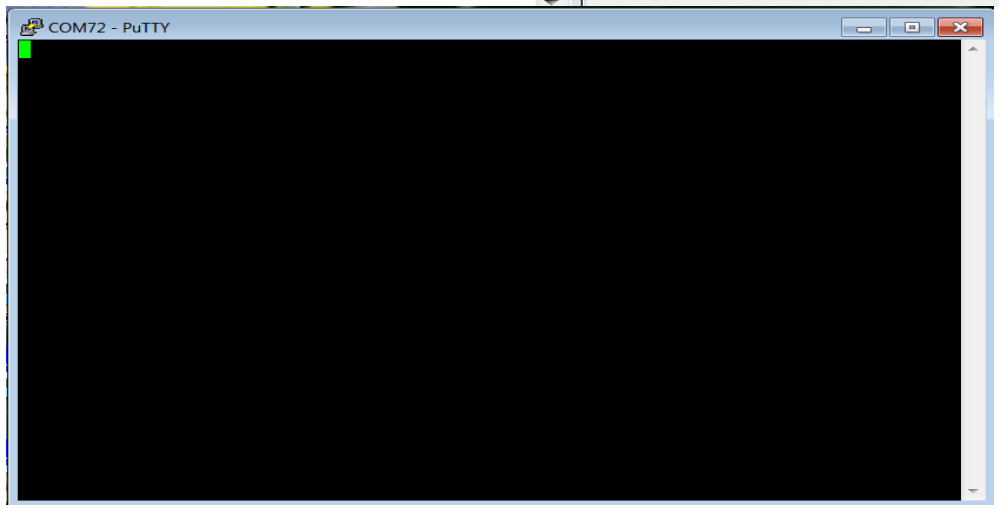


2. Board Set Up for Running Demo (Hardware)

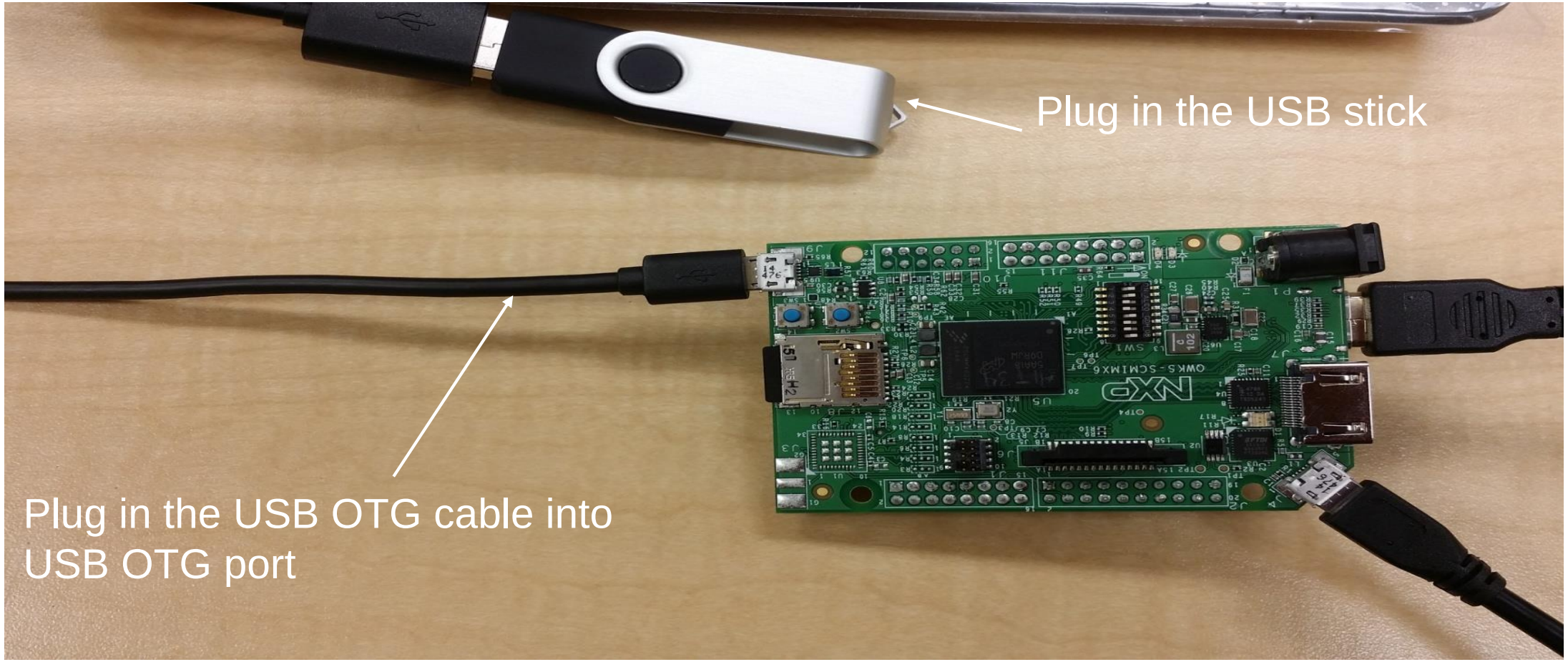


2. Board Set Up (open Putty or TeraTerm)

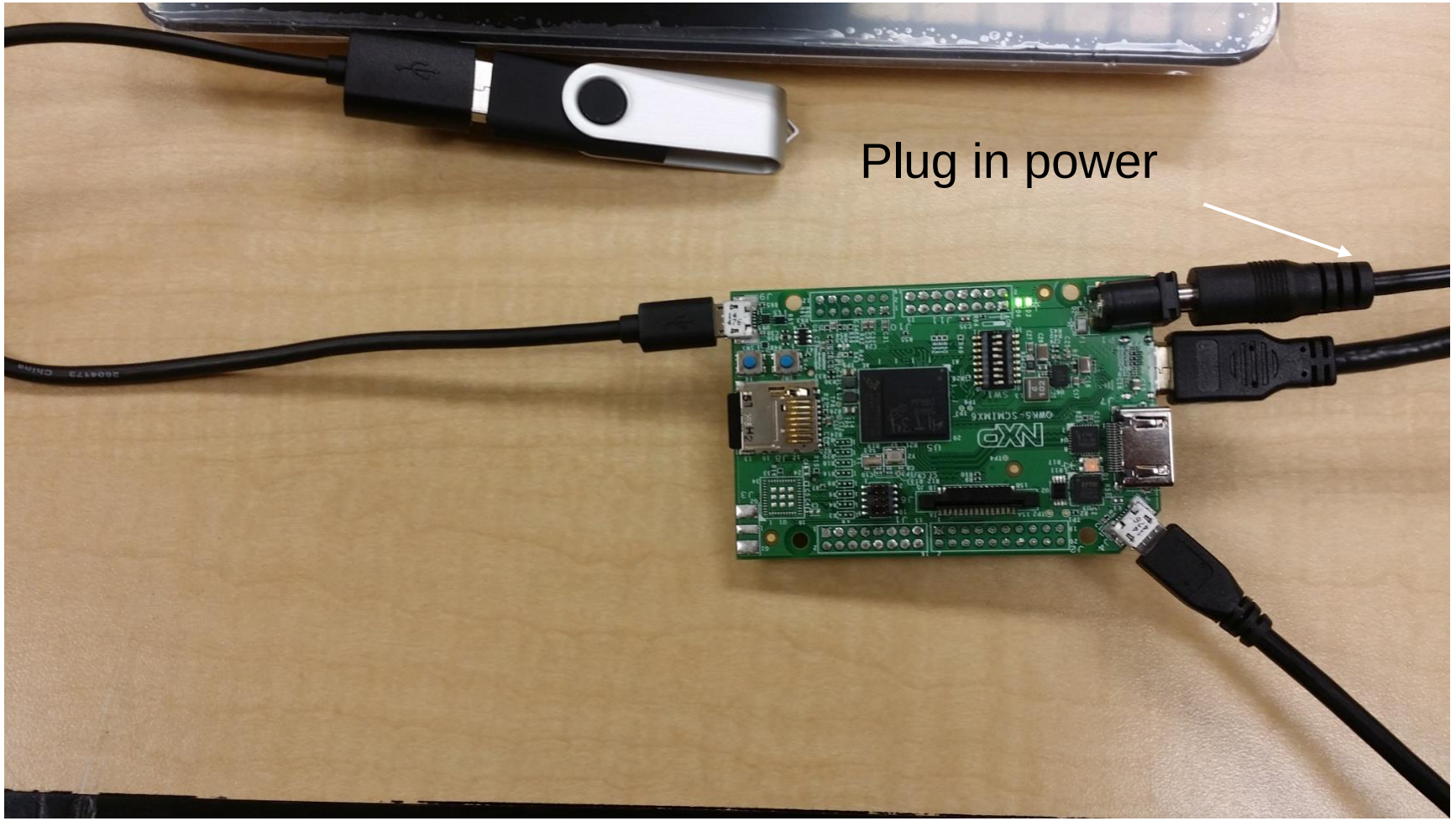




3. Board Set Up for Running Demo



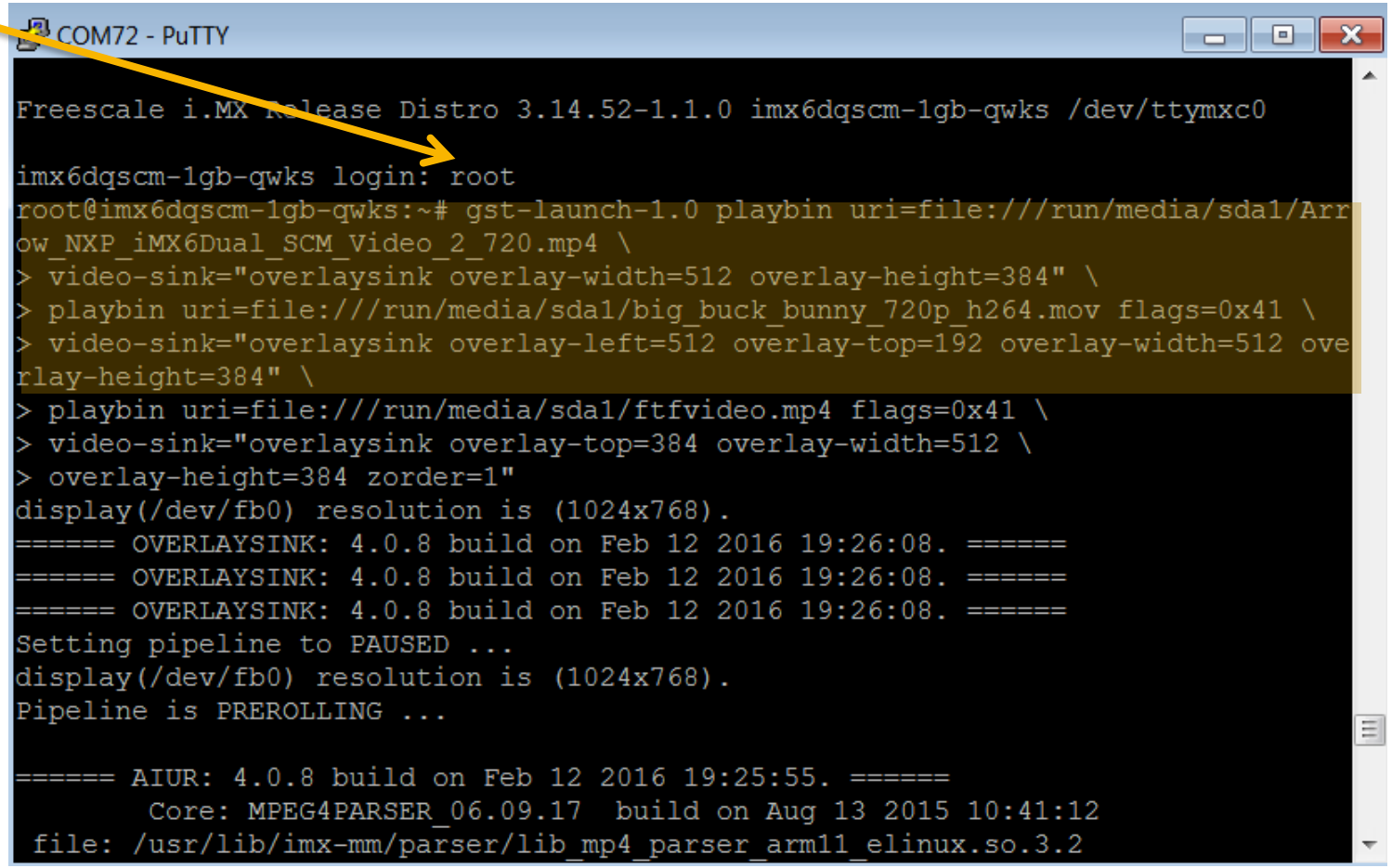
4. Board Set Up for Running Demo



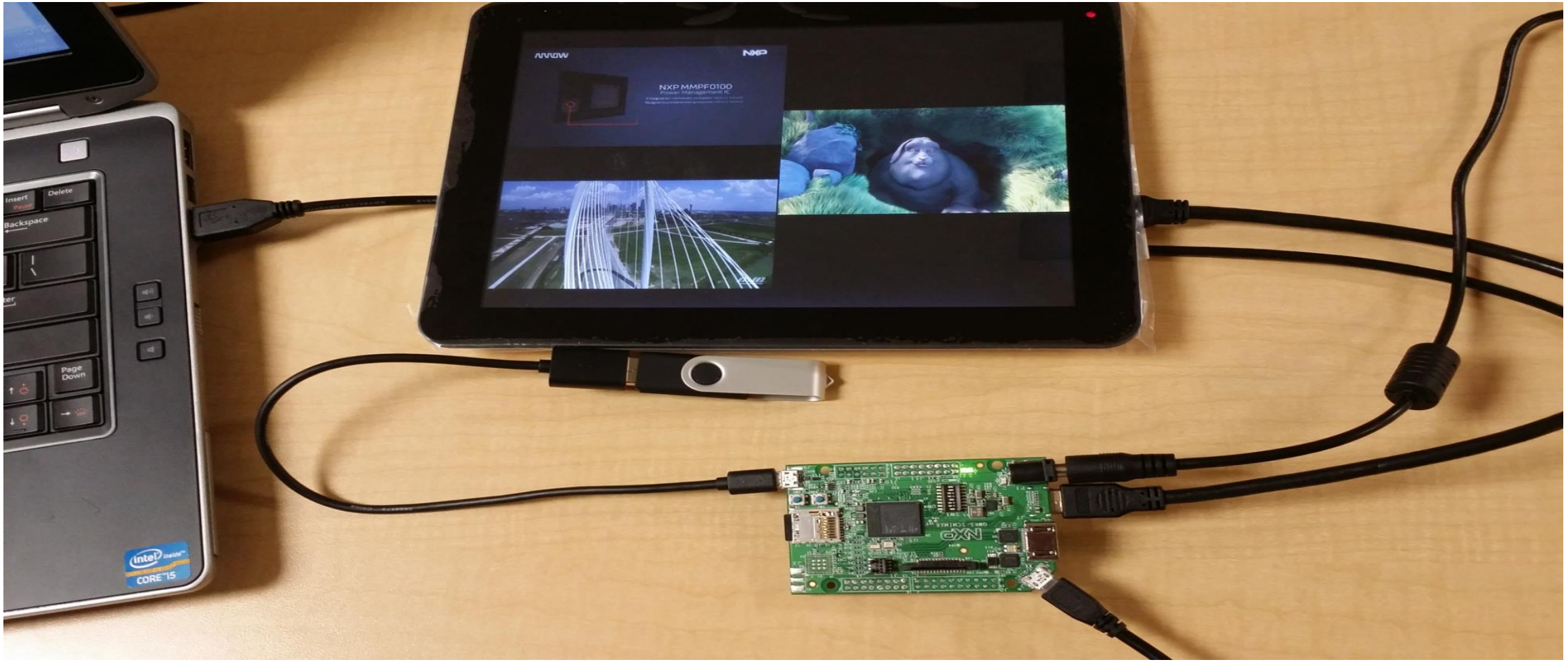
Board Set Up for Running the Demo

3. Run the Demo

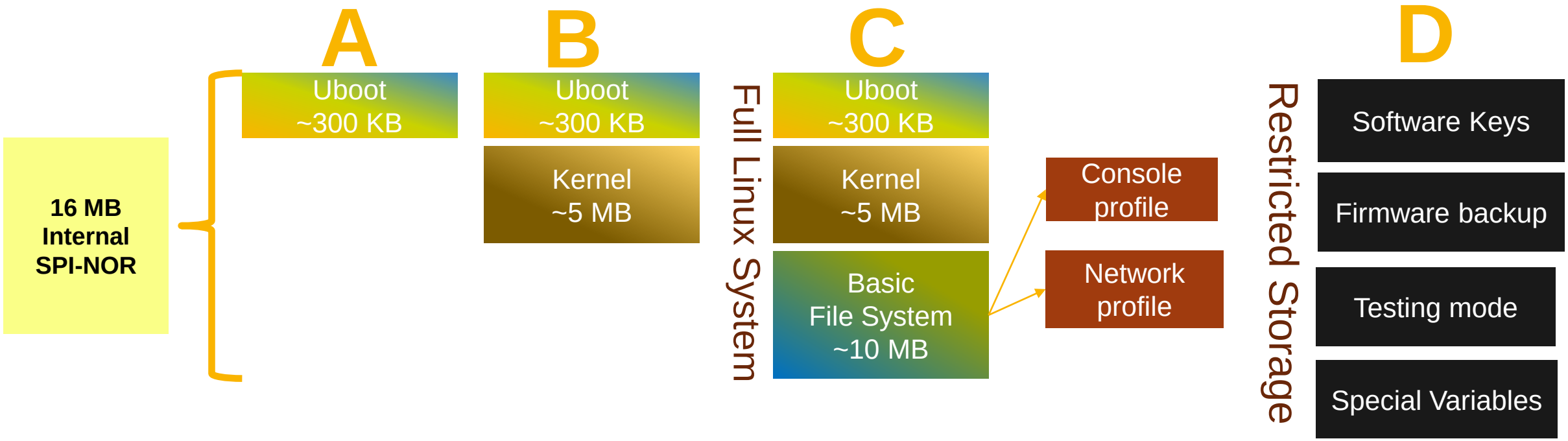
Enter the command to run the multimedia demo



3. Run the Demo



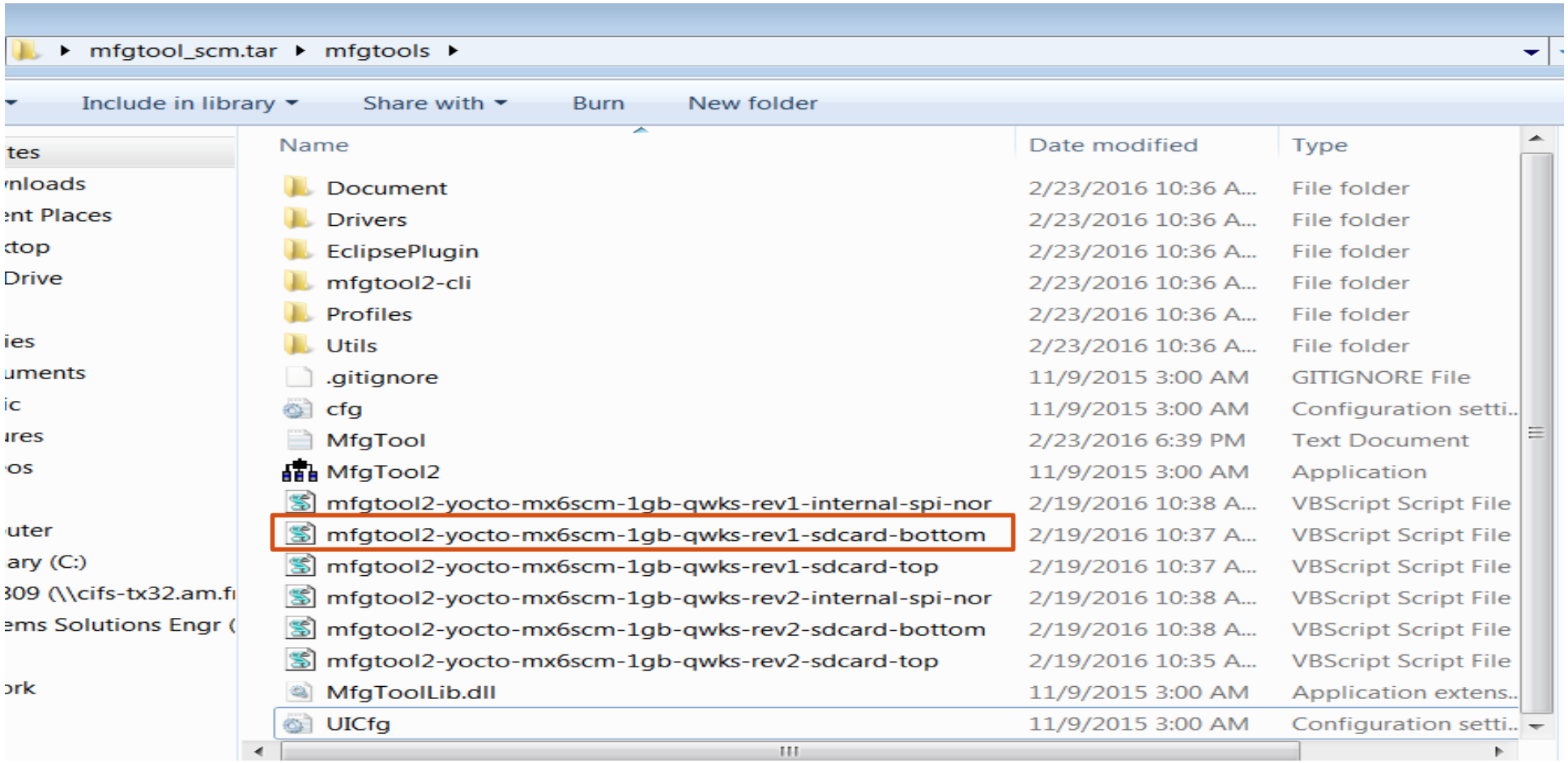
Advantages of SPI-NOR Flash



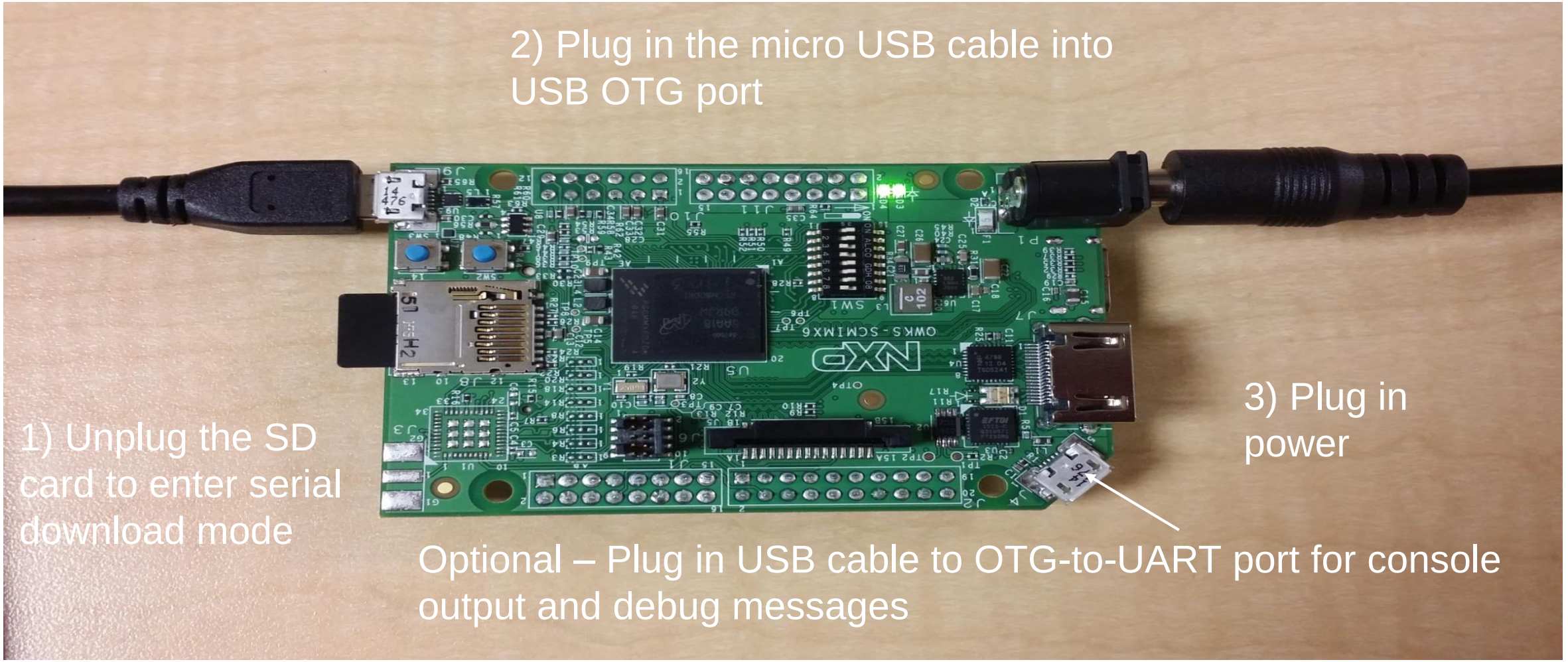
- Fully validated Linux and Android BSP releases will be supported on the SCM platform. This support will be aligned with official i.MX releases.
- Standard configurations can be structured using external NVMs such as eMMC, NAND, SD, SATA, etc.

- LPDDR2 configuration (uBoot & Kernel)
- PFUZE voltage rails to meet SCM requirements (uBoot & Kernel)
- SPI-NOR driver support added (uBoot & kernel)

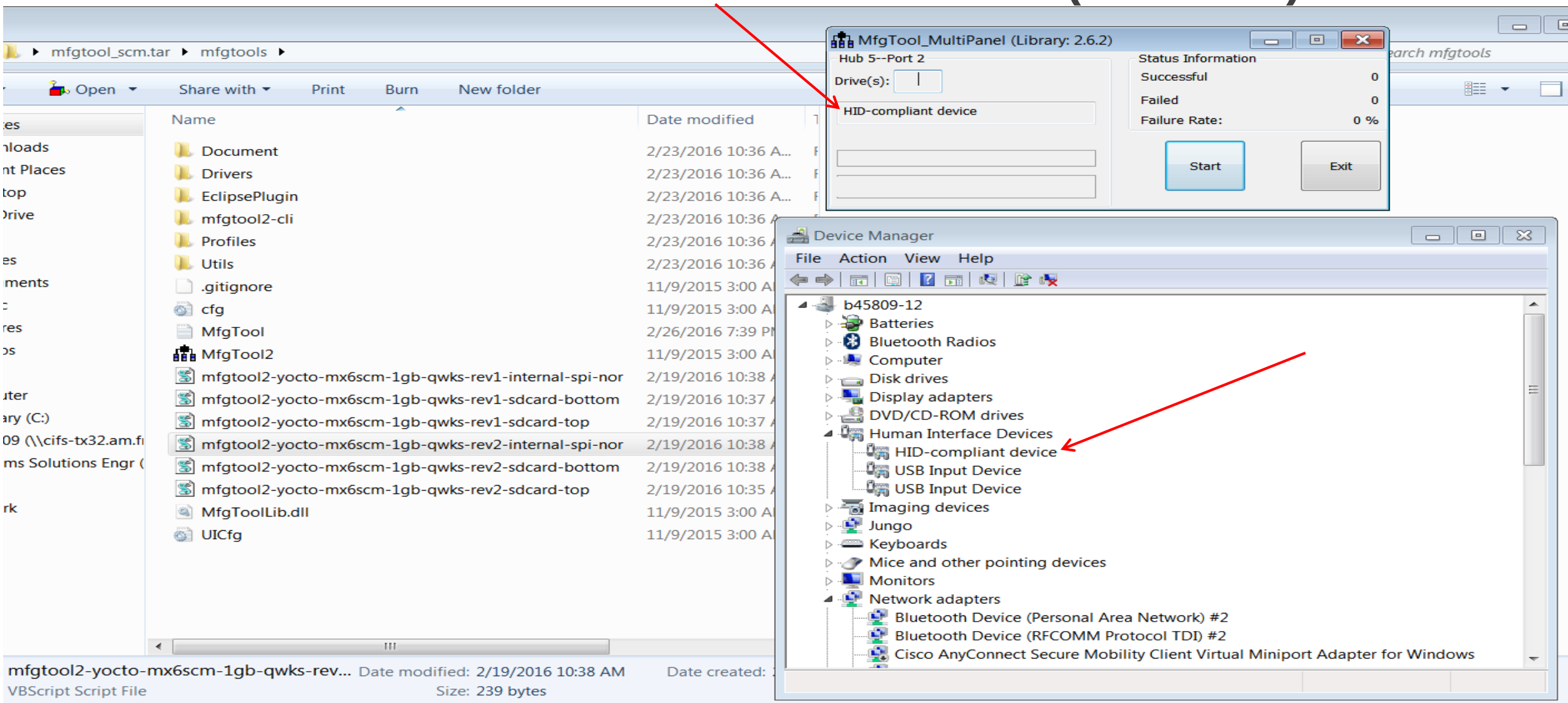
How to Boot from the Internal SPI-NOR Flash



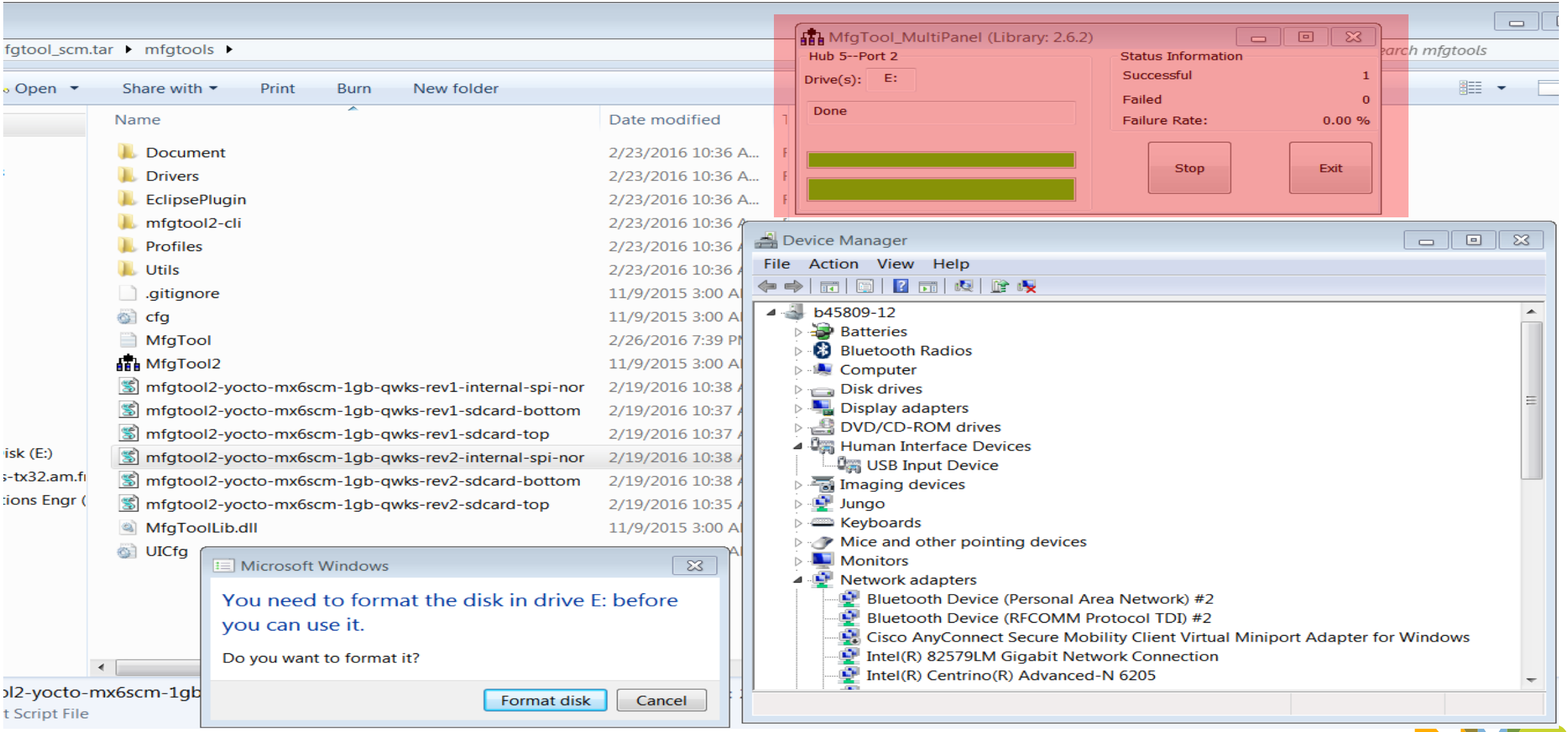
How to Boot from the Internal SPI-NOR Flash (Hardware)



How to Boot from the Internal SPI-NOR Flash (Software)



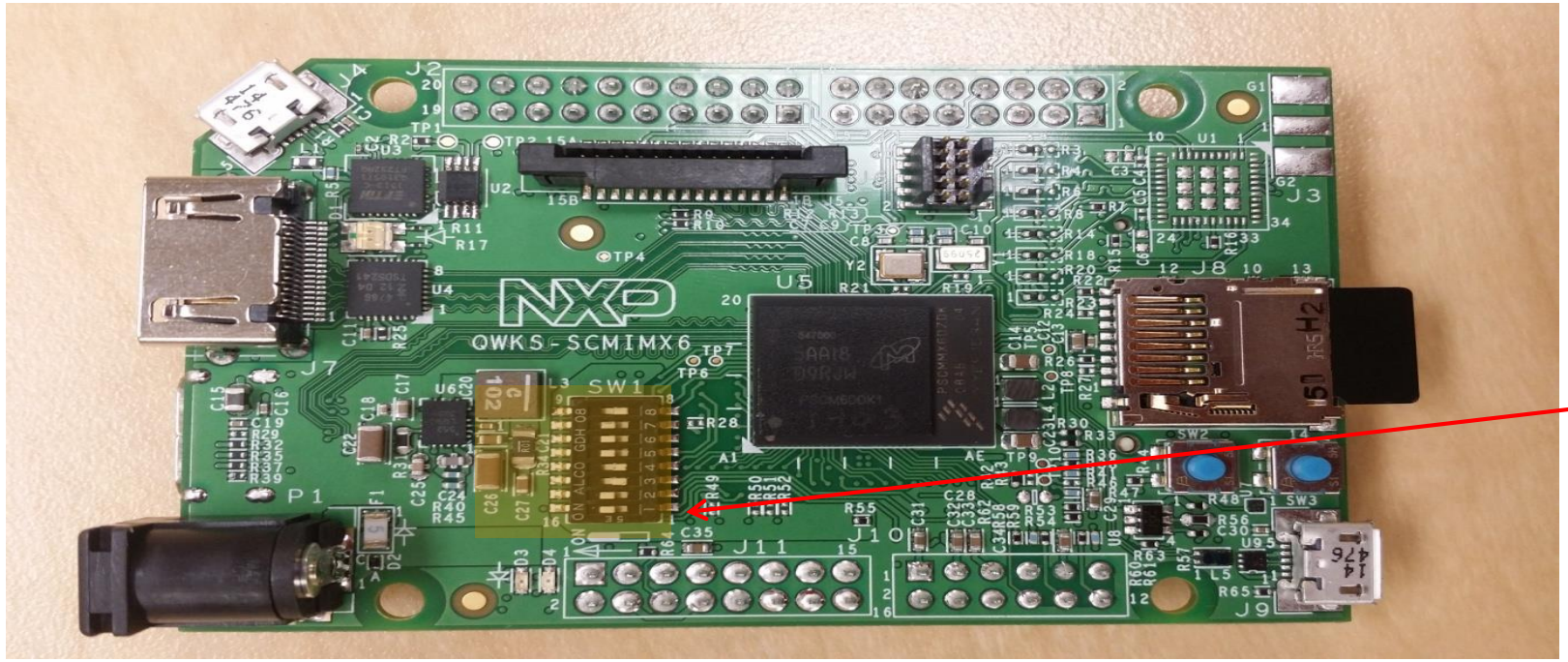
How to Boot from the Internal SPI-NOR Flash



How to Boot from the Internal SPI-NOR Flash

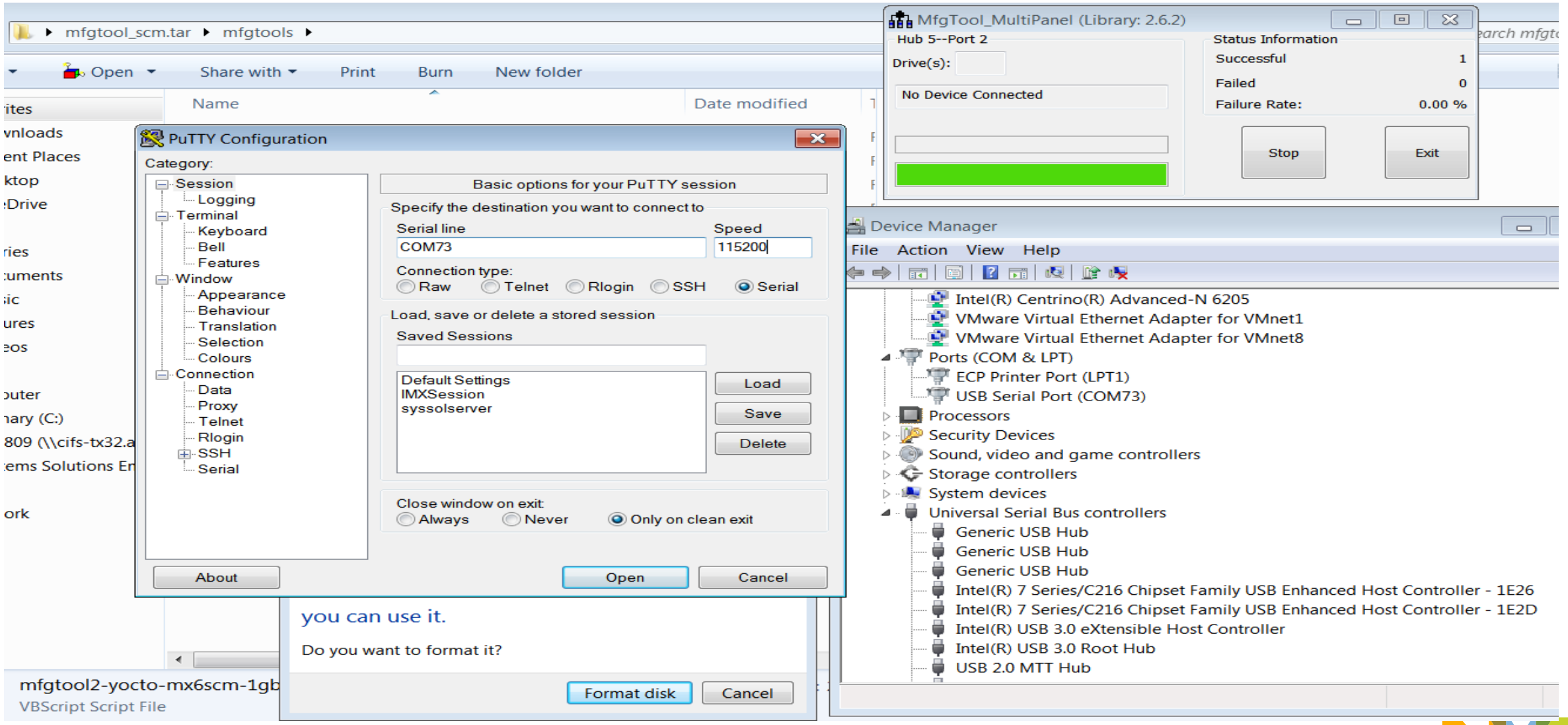
SW1

DIP#	8	7	6	5	4	3	2	1
	BOOT_ CFG1_ [6]	BOOT_ CFG1_ [5]	BOOT_ CFG1_ [4]	BOOT_ CFG2_ [4]	BOOT_ CFG2_ [3]	BOOT_ CFG3_ [5]	BOOT_ CFG3_ [4]	BOOT_ MODE1
SPI NOR	0	1	1	x	x	DDR Memory Map default config		0 = Boot

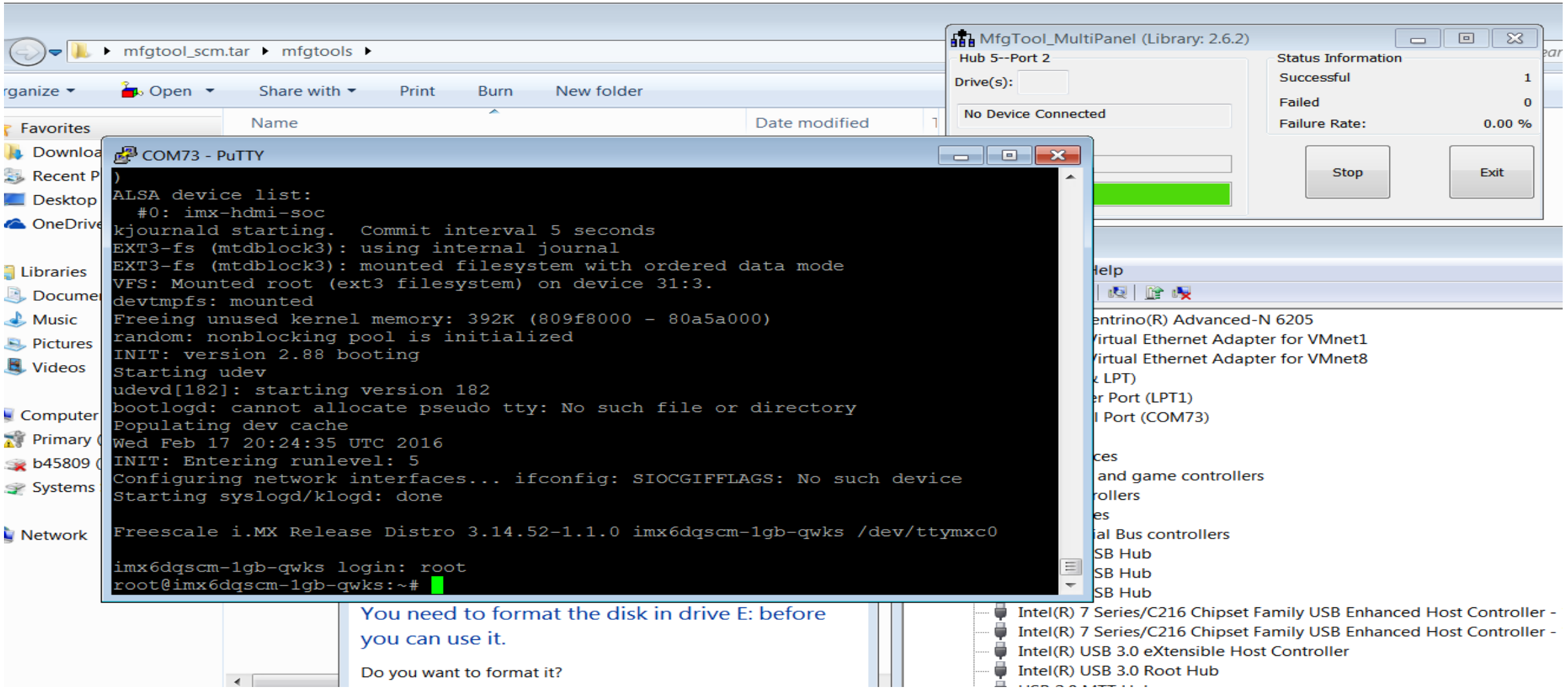


Change the boot switch settings from SD card to SPI NOR

How to Boot from the Internal SPI-NOR Flash



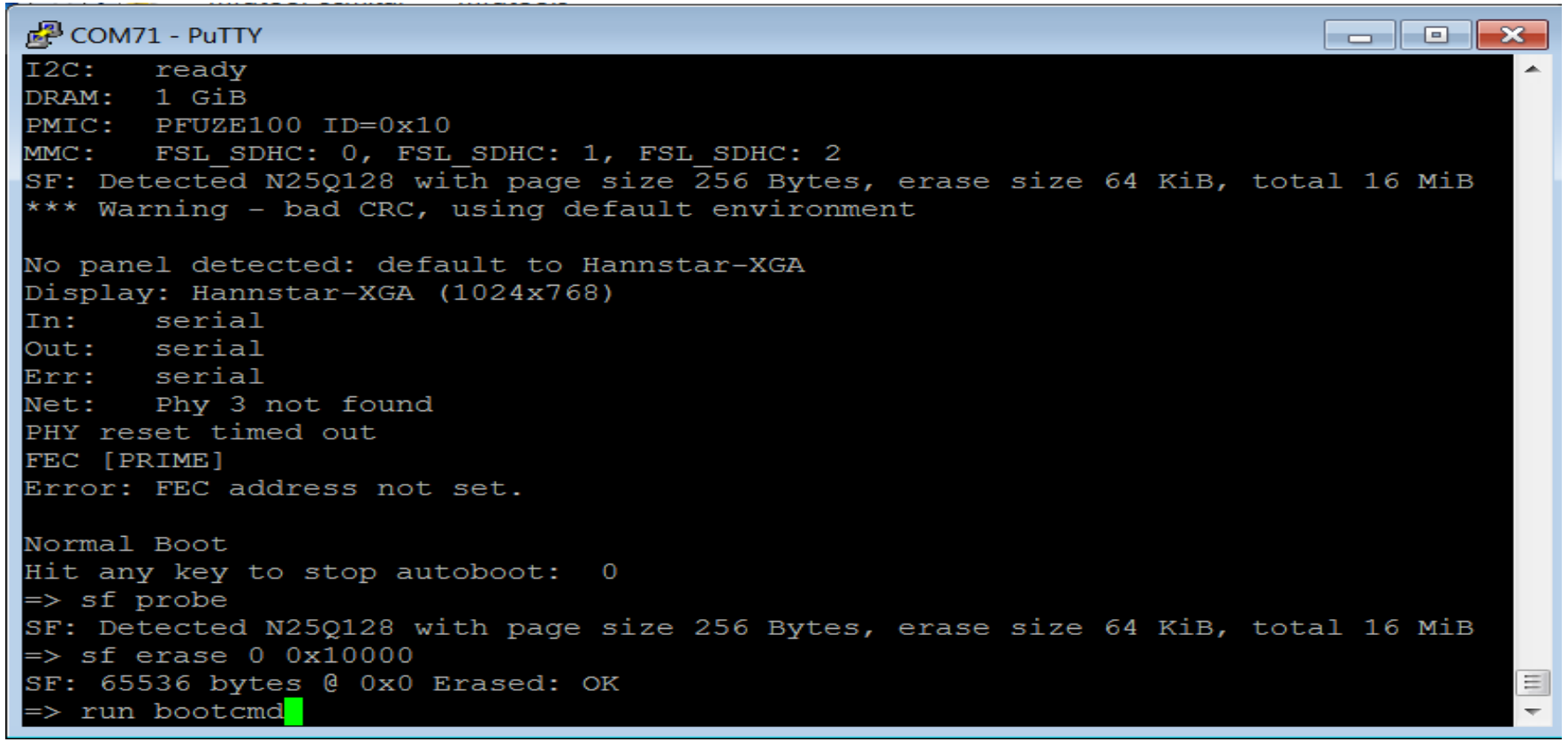
How to Boot from the Internal SPI-NOR Flash



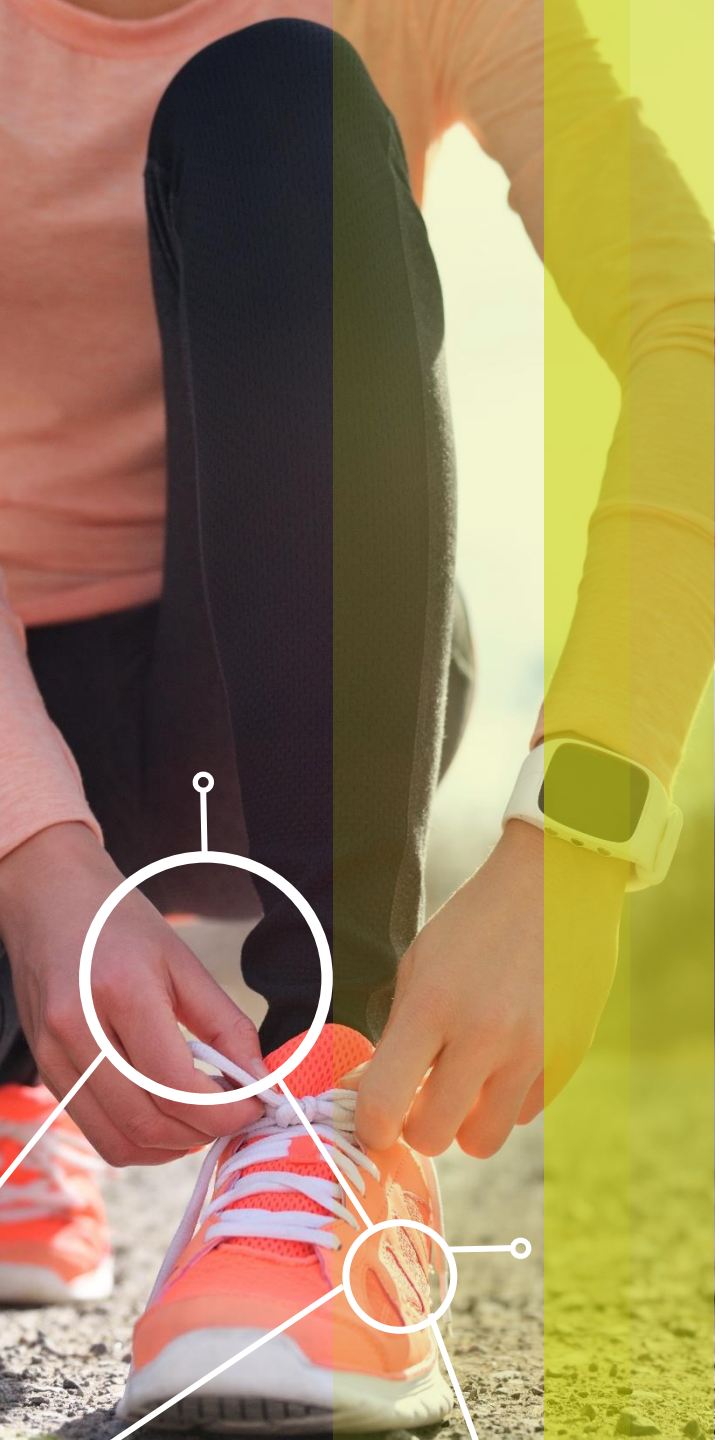
How to Erase the Internal SPI-NOR from uboot

sf probe

sf erase 0 0x10000



CONCLUSION



NXP Single Chip System Modules

They are available

SCM-i.MX 6Dual/6Quad is full enabled for design starts. SCM-i.MX 6SoloX and SCM-i.MX 6SoloX V-Link are available for early adoption. Talk to us about how to get on the beta program.

Get started on your design

SCMs are proven to reduce PCB size by up to 68% and shorten time-to-market by more than 25%. You now have the tools and know-how to get started on your own design.

Compelling roadmap

New and exciting products will continue to be released in 2016, with enhanced integration such as other i.MX applications processors, security, connectivity and RF.

THANK YOU

Resources

- SCM Webpage
  - http://www.nxp.com/scm
- SCM-i.MX 6D
  - http://www.nxp.com/products/single-chip-modules/single-chip-module-i.mx-6d:SCM-i.MX6D
- SCM-i.MX 6Q
  - http://www.nxp.com/products/single-chip-modules/single-chip-module-i.mx-6q:SCM-i.MX6Q
- SCM-i.MX 6SX
  - http://www.nxp.com/products/single-chip-modules/single-chip-module-i.mx-6sx:SCM-i.MX6SX
- SCM Quick Start Board
  - http://www.nxp.com/qwks-scm-imx6dq
- SCM Software Download
  - http://www.nxp.com/products/single-chip-modules/quick-start-board-for-scm-i.mx-6dq:QWKS-SCM-IMX6DQ?fpsp=1&tab=Design_Tools_Tab

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FOR A SMARTER WORLD

ATTRIBUTION STATEMENT