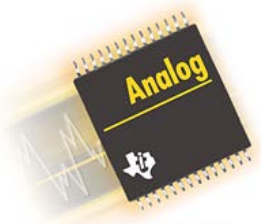







# TI USB Product Overview





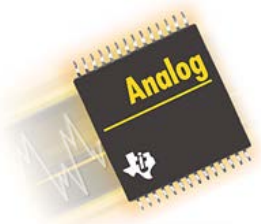
# What is USB?

- USB is a host centric bus - the host must initiate all transfers
- USB 2.0 is the current revision of the specification.
  - Adds one additional speed node to the USB 1.1 specification.
    - Low-speed = 1.5 Mbps → 
    - Full-speed = 12 Mbps → 
    - High-speed = 480 Mbps → 
  - USB 2.0 has come to mean USB 2.0 High-speed in common usage, but this is not technically correct.
- USB On-the-Go (OTG) is a new addendum to the USB 2.0 specification
  - Defines a new class of devices
  - OTG is point-to-point NOT peer-to-peer



# TI's USB Solutions Available

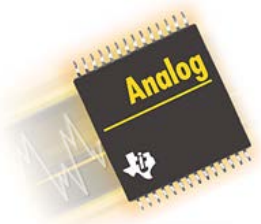
- USB Specification defines three types of devices - host controllers, hubs, and peripherals.
  - TI does not makes host controllers.
  - Many Texas Instruments DSP's have integrated USB interfaces
- USB Hub Devices
  - **TUSB2036: 1.1 compliant, 2/3 downstream ports**
  - **TUSB2046B: 1.1 compliant, 4 downstream ports**
  - **TUSB2077A: 1.1 compliant, 7 downstream ports**
  - **TUSB4040: 2.0 compliant, 1 to 4 downstream ports – 1Q05**
- USB Peripheral Devices
  - *TUSB3200A / TAS1020A: Full-speed Streaming Media Controllers*
  - TUSB3210: Full-speed General Purpose Device Controller
  - TUSB3410: Full-speed Serial Bridge (RS232/IrDA Converter) Controller
  - TUSB6250: High-speed ATA/ATAPI Bridge
- USB Compound Hub Devices
  - TUSB2136: 1.1 compliant, 2 downstream ports w/  $\mu$ Controller
  - TUSB5052: 1.1 compliant, 5 downstream ports w/  $\mu$ C and 2 Serial Ports



# How to choose a hub device

---

- What speed do you need your connection to be?
  - High-speed (2.0 Compliant) or Full-speed (1.1 Compliant)?
- How many downstream ports are needed?
  - Will some of these ports be non-removable – not accessible by end-customer?
- Will you be bus-powered or self-powered?
- Do you need an embedded function controller?
  - See separate presentation material for more information on TUSB2136 or TUSB5052 for more on compound hub devices and applications.



# USB Hub Software Support

---

- All Major Operating Systems include USB Hub support
  - Will enumerate devices as “Generic USB Hub”
  - No Additional software is required for standard hub devices
  - If using a compound hub device (such as TUSB2136 or TUSB5052), additional driver and firmware will be required for embedded application
    - See separate device-specific presentation material for more details
- Some customization is possible through VID/PID/Descriptor information contained in serial EEPROM attached to hub controller

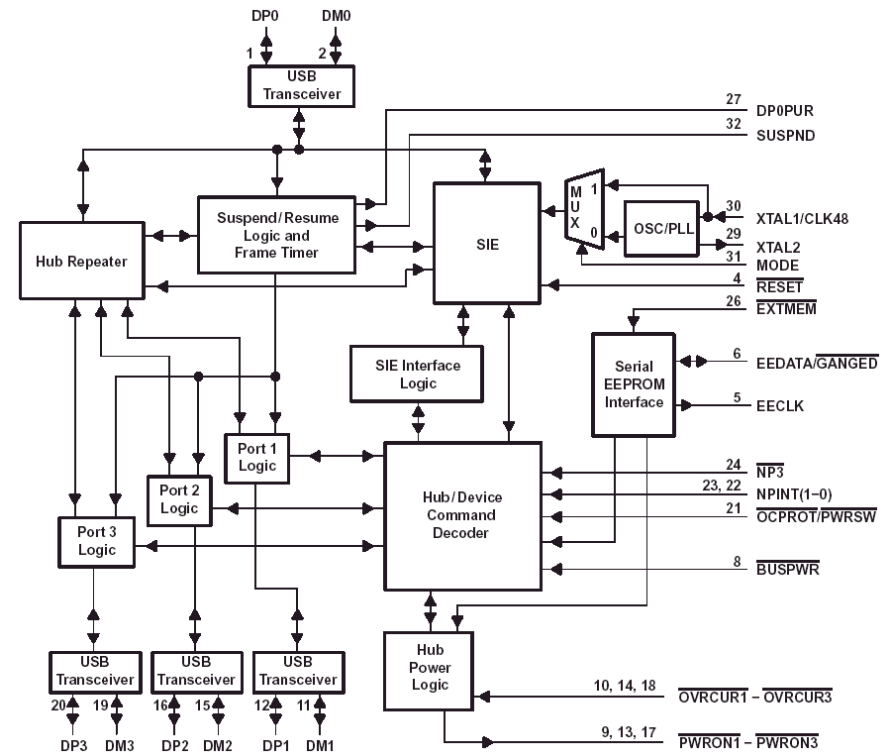


# TUSB2036



- Key Features
  - USB1.1 Compliant
  - USB Implementer's Forum Integrators List
  - Pin selectable as 2 or 3 Ports
  - State machines - no software needed
  - Support USB suspend & resume
  - VID & PID with external EEPROM
  - Supports USB Suspend/Resume and remote wakeup operation
  - 12 MHz crystal. On-chip PLL generates 48/24 MHz
  - Power-down mode
  - Data Sheet: slls372

- Typical Applications
  - Hub on Motherboard
  - Embedded in monitor/All-in-Ones
  - Embedded in Keyboard





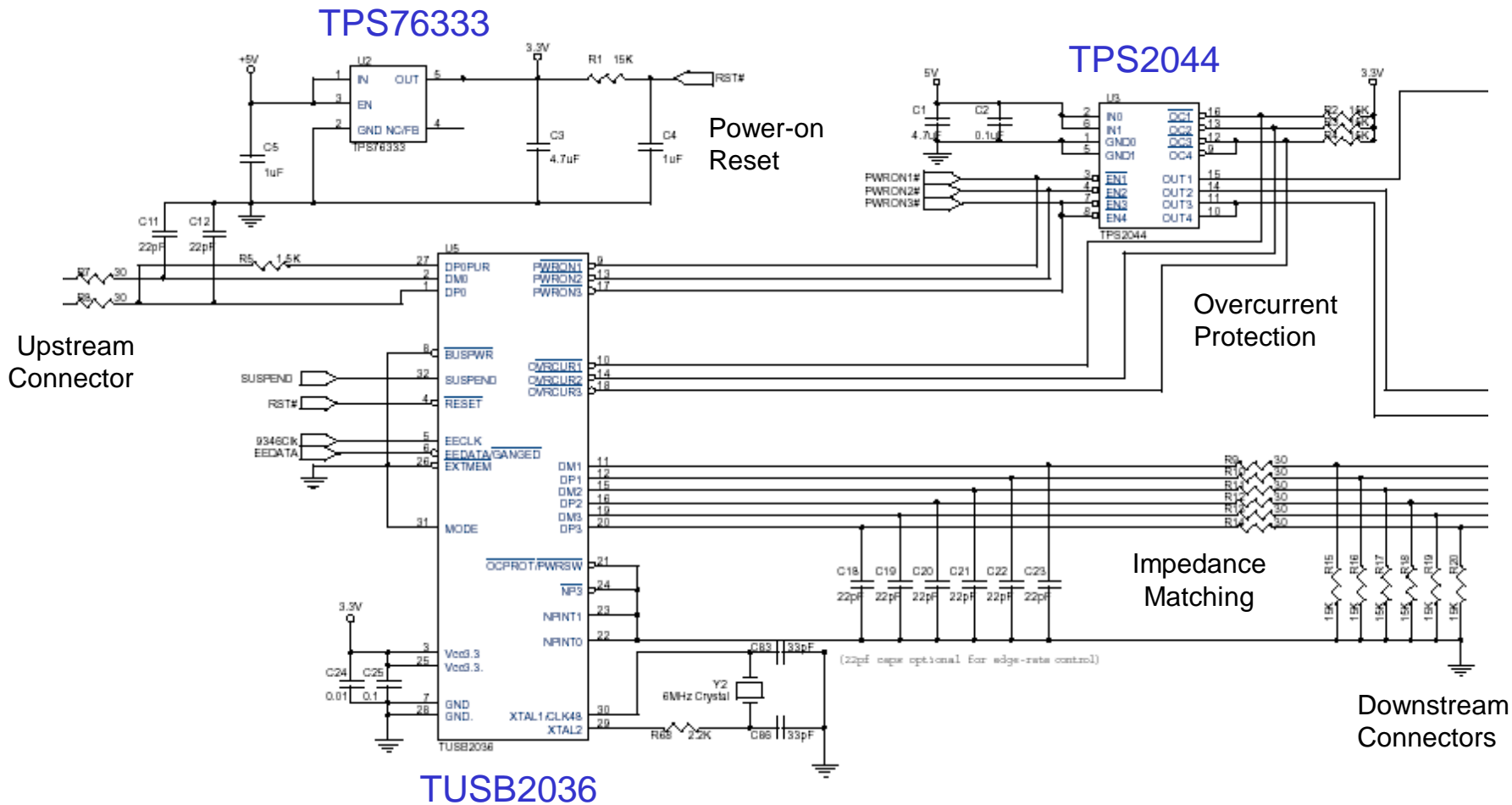
# TUSB2036EVM

- Features
  - Complete 2-Port or 3-Port Hub Reference Design TI USB Power Switches and TUSB2036 Hub Controller.
- What's Included?
  - Populated EVM Board
  - EVM Schematic
  - Reference Schematics
  - User's Guide
  - Gerber data
- Additional items needed for EVM use:
  - Utilities for monitoring USB traffic
  - USB Cable
  - Power supply for self-powered evaluation



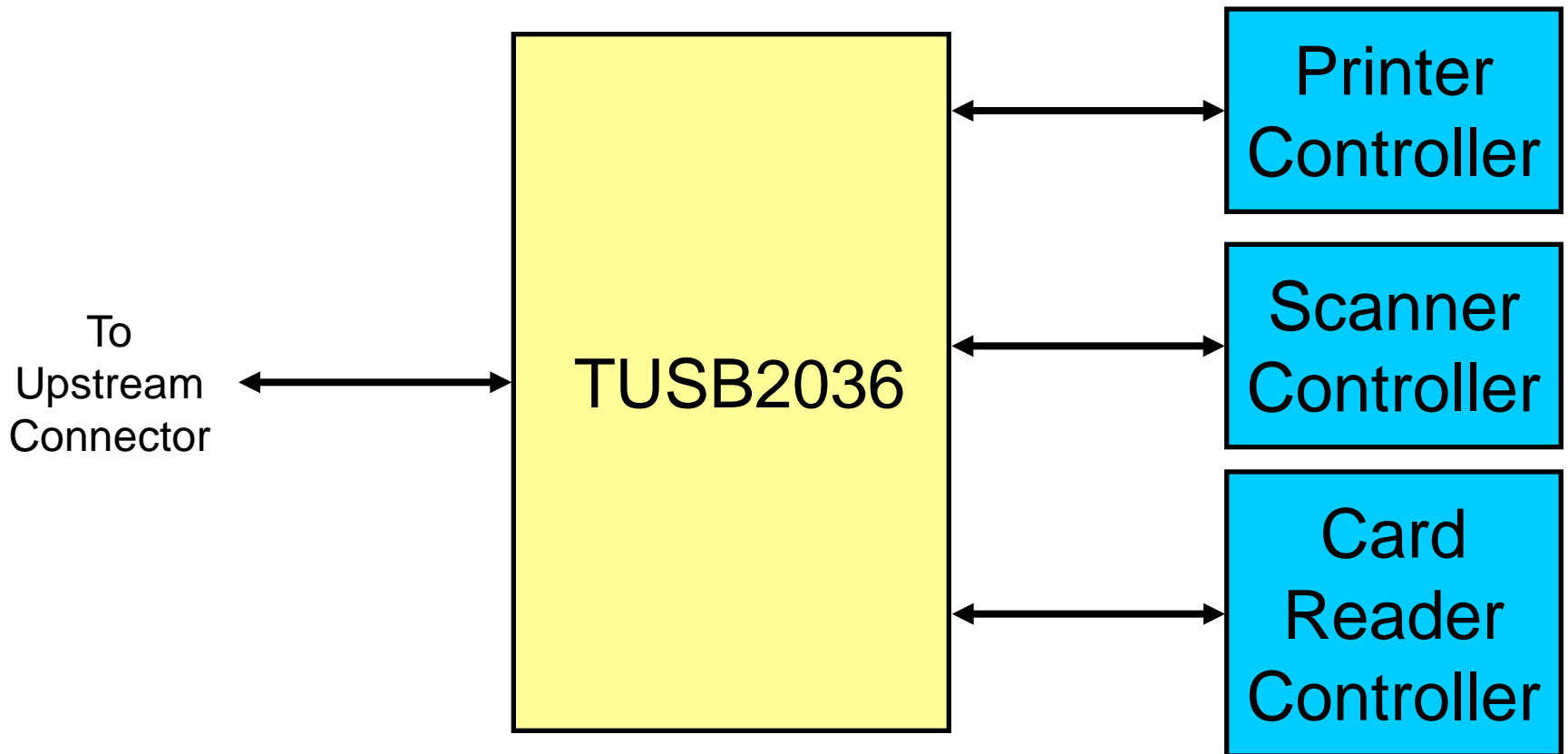
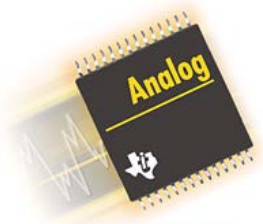
- Available for 180 day loaner by sending request to [usb@ti.com](mailto:usb@ti.com) with the following information:
  - 1) Company name
  - 2) Physical address of company
  - 3) Name of contact at company who will be responsible for the board
  - 4) Phone number and e-mail of contact in #3
  - 5) Application
  - 6) Production plans including volumes and schedules

# TUSB2036: 3-port, bus-powered





# Embedded Hub Example: AIO Printer



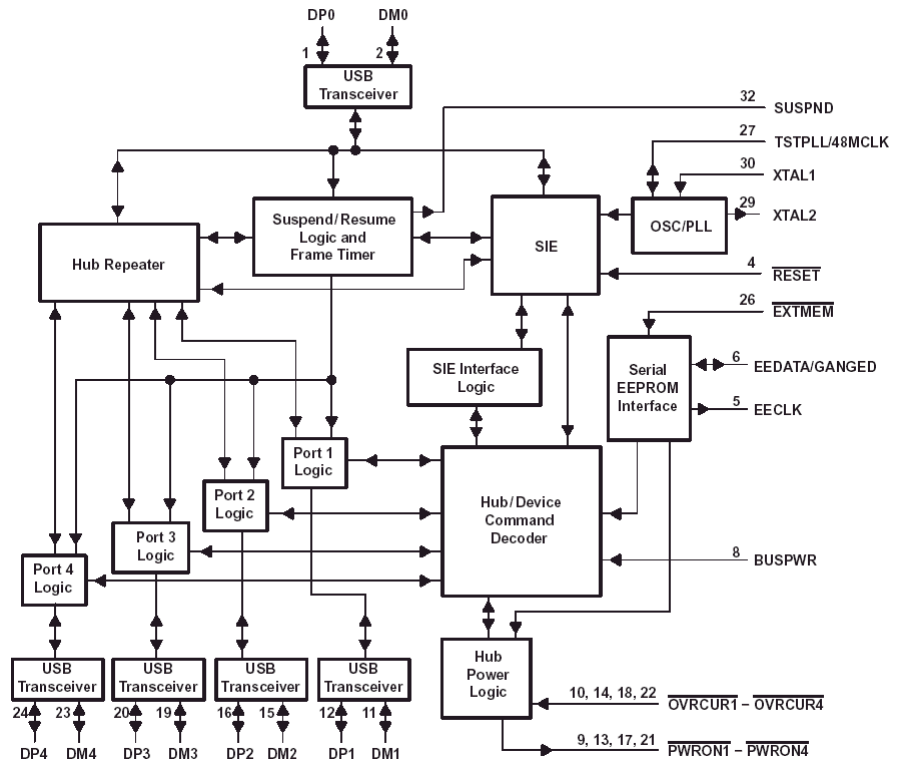


# TUSB2046B



- Key Features
  - USB1.1 Compliant
  - USB Implementer's Forum Integrators List
  - Four downstream ports
  - State machines - no software needed
  - Support USB suspend & resume
  - VID & PID with external EEPROM
  - Supports USB Suspend/Resume and remote wakeup operation
  - 12 MHz crystal. On-chip PLL generates 48/24 MHz
  - Power-down mode
  - Data Sheet: slls413

- Typical Applications
  - Hub on Motherboard
  - Embedded in monitor/All-in-Ones
  - Embedded in Keyboard
  - Standalone hub box





# TPS2071EVM-159

- Features
  - Complete 4-Port Hub Reference Design featuring TPS2071 USB Power Controller and TUSB2046B Hub Controller.
  - Smaller, simpler, and more cost-effective design due to advanced integration of TPS2071
- What's Included?
  - Populated EVM Board
  - EVM Schematic
  - Reference Schematics
  - User's Guide
  - Gerber data

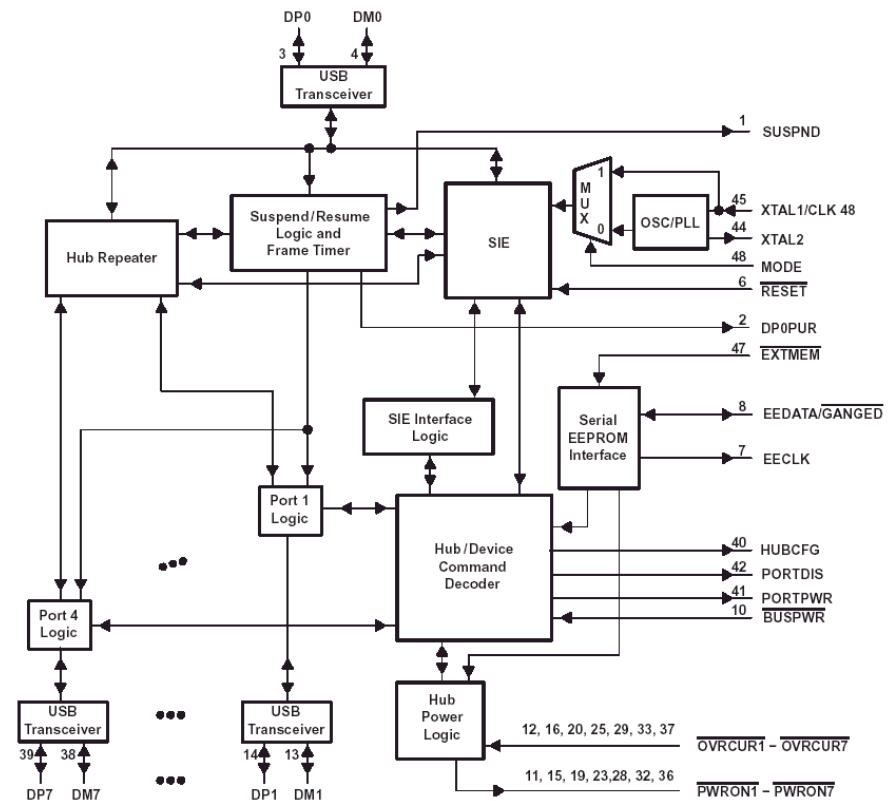




# TUSB2077A



- Key Features
  - USB1.1 Compliant
  - USB Implementer's Forum Integrators List
  - Seven downstream ports
  - Auto sense for Bus & self power
  - State machines - no software needed
  - Support USB suspend & resume
  - VID & PID with external EEPROM
  - Supports USB Suspend/Resume and remote wakeup operation
  - 12 MHz crystal. On-chip PLL generates 48/24 MHz
  - Power-down mode
  - Data Sheet: slls414
- Typical Applications
  - Standalone hub box
  - Embedded Industrial Applications





# TUSB2077AEVM

- Features
  - Complete 4-Port (Bus-powered) or 7-Port (self-powered) Hub Reference Design TI USB Power Switches and TUSB2077A Hub Controller.
- What's Included?
  - Populated EVM Board
  - Power supply Unit
  - EVM Schematic
  - Reference Schematics
  - User's Guide
  - Gerber data
- Additional items needed for EVM use:
  - Utilities for monitoring USB traffic
  - USB Cable



- Available for 180 day loaner by sending request to [usb@ti.com](mailto:usb@ti.com) with the following information:
  - 1) Company name
  - 2) Physical address of company
  - 3) Name of contact at company who will be responsible for the board
  - 4) Phone number and e-mail of contact in #5
  - 5) Application
  - 6) Production plans including volumes and schedules



# TUSB4040

---

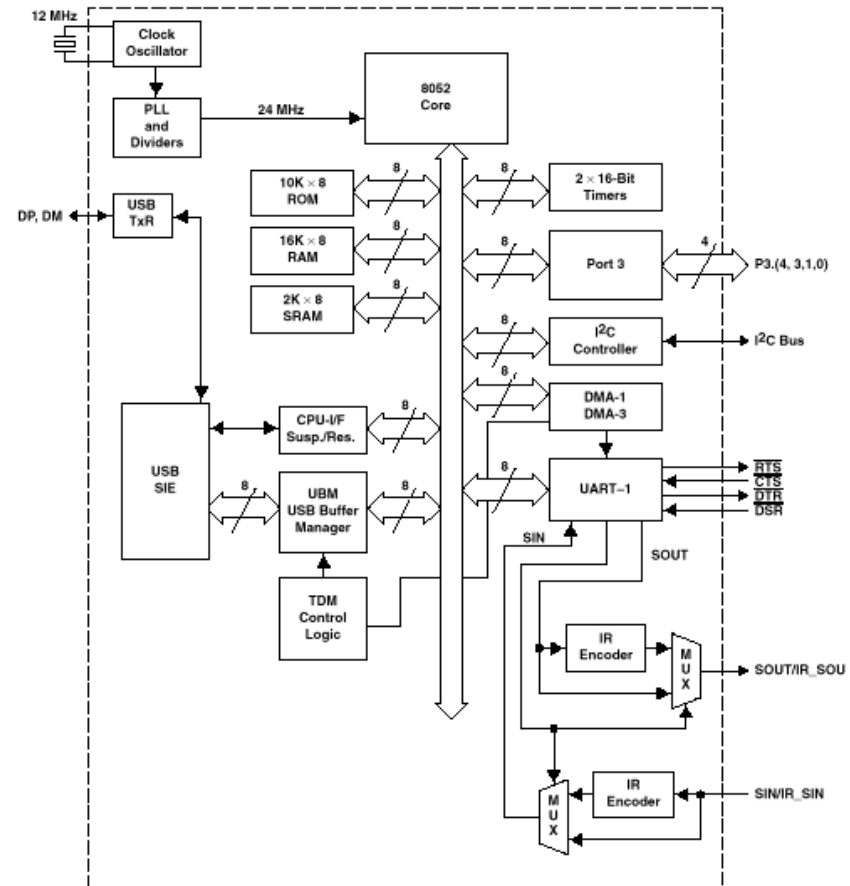
- USB 2.0 Compliant
- Features:
  - 1 Transaction Translator per downstream port
  - Fully Configurable ports
  - Small footprint = 80 Pin package
  - Support for VID, PID & serial number - No external EEPROM needed!
  - Bus & self powered support
- Target Schedule:
  - Samples                    1Q05
  - Production                2Q05



# TUSB3410

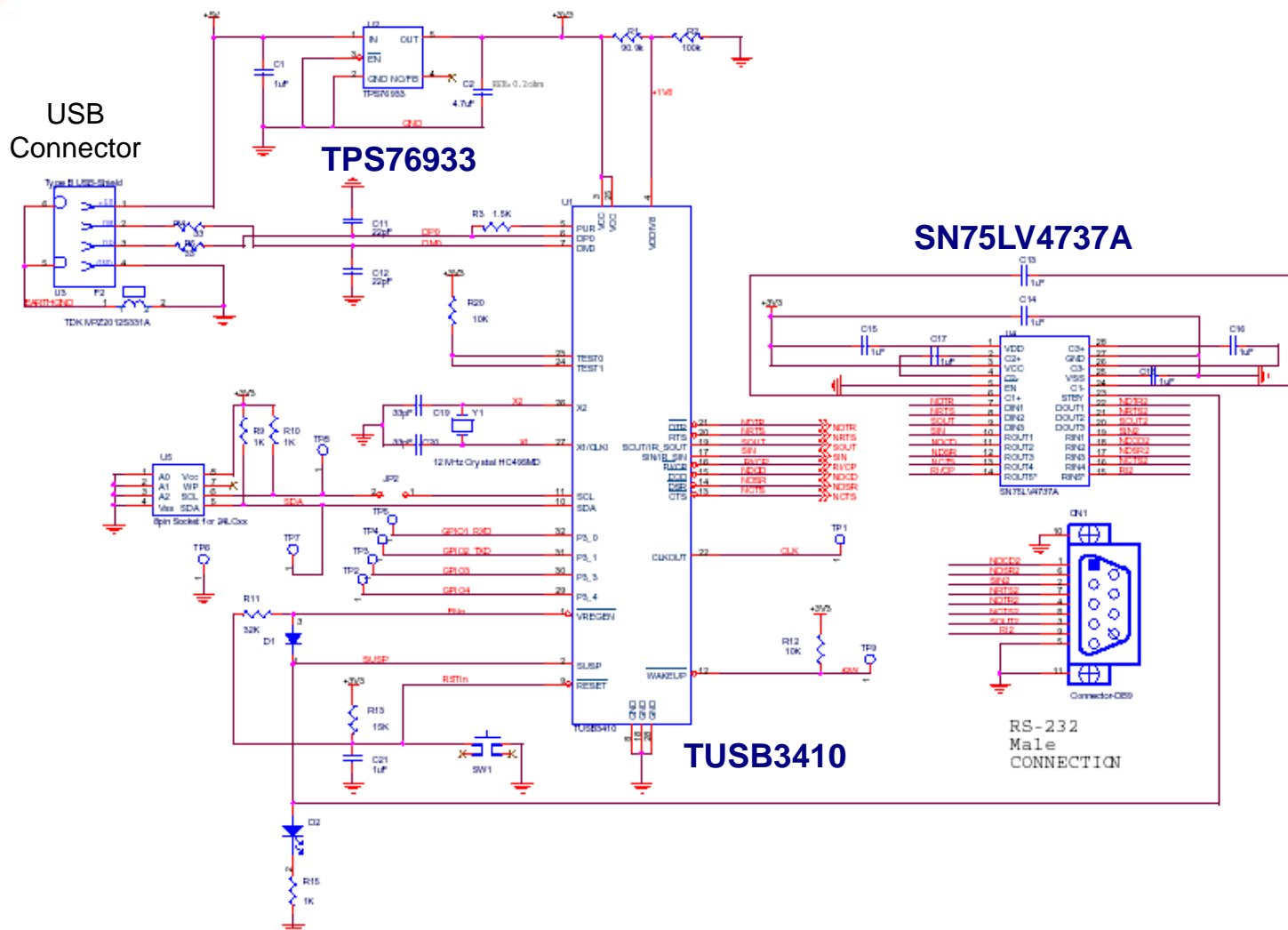
## Key Features

- USB Full-speed compliant device
- USB-to-Serial Bridge (RS232, RS485)
  - Integrated Enhanced UART to 921.6kbaud
  - Integrated Slow IrDA Controller
- Integrated 8052 Microcontroller
  - 2 MIPs
  - 16K RAM for application code space
- 4 General Purpose I/O Pins
- Firmware loaded from host PC or via I2C port.
- Supports 3-input and 3-output endpoints
- Supports USB Control, Bulk and Interrupt transfers
- Supports USB Suspend/Resume and remote wakeup operation
- Power-down mode
- 32-pin LQFP package; designator=VF





# Typical Application: USB to RS-232 Bridge





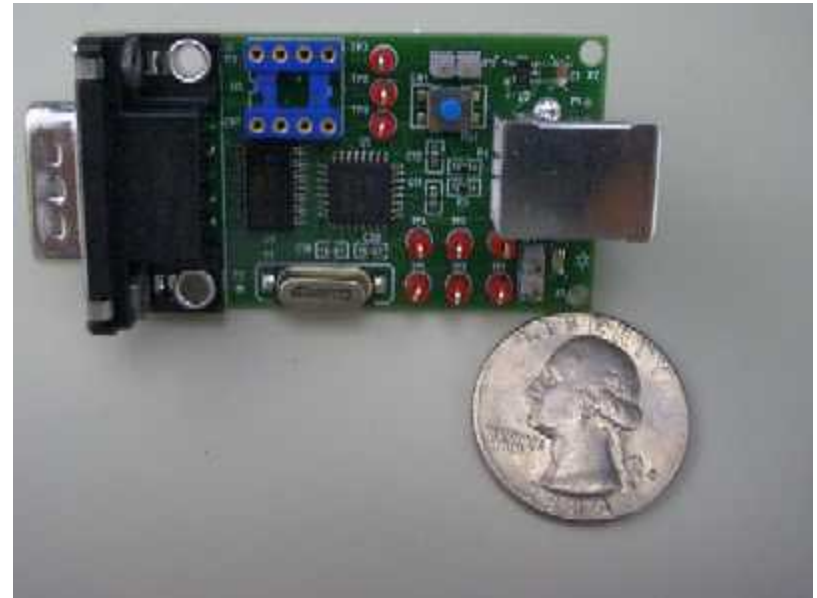


# TUSB3410 Collateral Available

- Evaluation Modules and Product Developer's Kits:
  - TUSB3410UARTPDK: TUSB3410 USB to Serial Application Specific Product Developer's Kit
    - <http://focus.ti.com/docs/toolsw/folders/print/tusb3410uartpdk.html>
  - TUSB3410GPIOPDK: TUSB3410 General Purpose USB MCU Product Development Kit
    - <http://focus.ti.com/docs/toolsw/folders/print/tusb3410gpiopdk.html>
- Technical Documentation
  - TUSB3410 Data Manual
    - slls519: <http://focus.ti.com/lit/ds/symlink/tusb3410.pdf>
  - VIDs, PIDs, and Firmware: Design Decisions When Using TI USB Device Controllers Application Note
    - slla154: <http://focus.ti.com/lit/an/slla154/slla154.pdf>
  - TUSB2136/TUSB3210 Firmware Debugging Guide :
    - sllu027: <http://focus.ti.com/lit/ug/sllu027/sllu027.pdf>
- Other Utilities and Tools
  - I2C Header Generator Utility: <http://www-s.ti.com/sc/psheets/sllc152b/sllc152b.zip>
    - DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.
  - AppLoader Driver: <http://www-s.ti.com/sc/psheets/sllc160/sllc160.zip>
    - Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM during the FW development process.
  - TUSB3410 Bootcode Source Listing: <http://www-s.ti.com/sc/psheets/sllc139/sllc139.zip>
    - Listing of ROM code used for reference only

# TUSB3410UARTPDK

- The TUSB3410UARTPDK is used to evaluate the TUSB3410 as a RS232 to USB converter.
- Features
  - Quickly convert an RS-232 product to USB
  - Jump start development or use as a complete USB-to-RS-232 converter
  - Bridging FW, Win drivers, and schematics provided
  - Quick connect to a USB-enabled host
  - No Power Supply required - the EVM gets power via the USB cable (not included).
- What's Included?
  - Drivers and Firmware
    - Download Object Code
    - Source Available with SWLA
  - Getting Started Letter
  - Populated EVM Board
  - USB and UART Cables
  - Schematic
  - User's Guide





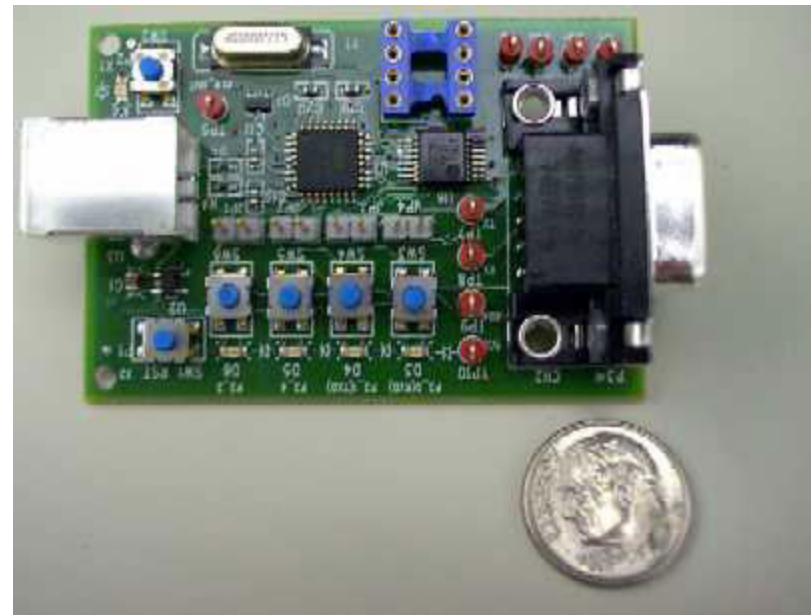
# TUSB3410UARTPK Software

- Drivers and Firmware:
  - Windows 98, Me, 2000, and XP Drivers and Firm Ware can be downloaded in object code if you agree to the online license agreement that requires registration with [MY.TI.com](http://MY.TI.com)
  - A Linux driver exists at: [www.brimson.com/downloads/io\\_ti.tgz\\_v0.2G](http://www.brimson.com/downloads/io_ti.tgz_v0.2G)
    - In its current state, it will probably require some modifications to get it to work.
    - In its current state, it checks a “manufacturing” descriptor to check the age of the firmware in EEPROM. If it knows it has more-recent firmware on the system, it downloads it to device RAM, then writes it out to EEPROM.
    - This updated, on-system version is compiled into the driver binary files, rather than a discrete binary as it is on Windows, and the firmware provided on this site is not our firmware.
  - MAC driver and FW support is in development with an estimated completion in 2Q04.
  - To create your own FW, a compiler will be necessary. The TUSB3410 is based upon the industry-standard 8052 microcontroller for which there are several compilers on the market that would be suitable. Some examples are at [www.iar.com](http://www.iar.com), [www.keil.com](http://www.keil.com), and at [www.tasking.com](http://www.tasking.com).
  - Source Code:
    - Due to licensing restrictions with the third party developer, TI is required to get a hardcopy royalty free software license agreement (SWLA) signed.
    - To request a SWLA, send an e-mail to [usb@ti.com](mailto:usb@ti.com) with the following information:
      - 1) Legal Company Name
      - 2) Physical address of #1 (not a PO Box)
      - 3) Name, Phone, e-mail, fax of company representative who will be responsible for SWLA and receiving the code
      - 4) Company website
- Utilities
  - I2C Header Generator Utility is a DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.

# TUSB3410GPIOPDK



- The TUSB3410GPIOPDK is used to evaluate the TUSB3410 as a general purpose USB MCU.
- Features
  - Jump start development with a resident TUSB3410
  - Test via on board buttons/lights
  - Quick connect to a USB-enabled host
  - Download Firm Ware changes via USB for quick debugging
  - No Power Supply required - the EVM gets power via the USB cable (not included).
- What's Included?
  - Downloadable gerber file
  - Keyboard Sample Firmware
    - Object Code comes in EEPROM
    - Source Downloadable
  - Getting Started Letter
  - Populated EVM Board
  - USB and UART Cable
  - Schematic
  - User's Guide





# TUSB3410GPIOPDK Software

- **Firmware:**
  - The EVM board comes populated with an EEPROM that has firmware that allows the PDK to act like a four-key USB keyboard.
  - Source code for this samples code is available to download from the TUSB3410GPIOPDK Tool Folder after registering through [MY.TI.com](http://MY.TI.com)
  - To create your own FW, a compiler will be necessary. The TUSB3410 is based upon the industry-standard 8052 microcontroller for which there are several compilers on the market that would be suitable. Some examples are at [www.iar.com](http://www.iar.com), [www.keil.com](http://www.keil.com), and at [www.tasking.com](http://www.tasking.com).
- **Drivers:**
  - The sample firmware included with the PDK assumes usage of the USB Human Interface Device (HID) class driver.
    - Using class drivers allow the end-equipment manufacturer to ship their products without the need for including a driver software package.
    - For more information on class drivers, refer to the USB Implementers Forum website at [www.usb.org](http://www.usb.org)
  - If a class driver will not be acceptable for the given application, a custom driver will need to be written. One option is to use a package like the Jungo WinDriver ([www.jungo.com](http://www.jungo.com)) Package. Another option would be to use the Microsoft DDK USB Driver.
- **Utilities:**
  - I2C Header Generator Utility is a DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.
  - The TI AppLoader Driver is a Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM. When a USB system using one of these devices is inserted onto the bus, Windows associates it with this driver, which downloads the firmware to the device. This application is intended to be used during the firmware development phase of the project only and is not intended for production use.



# TUSB5052

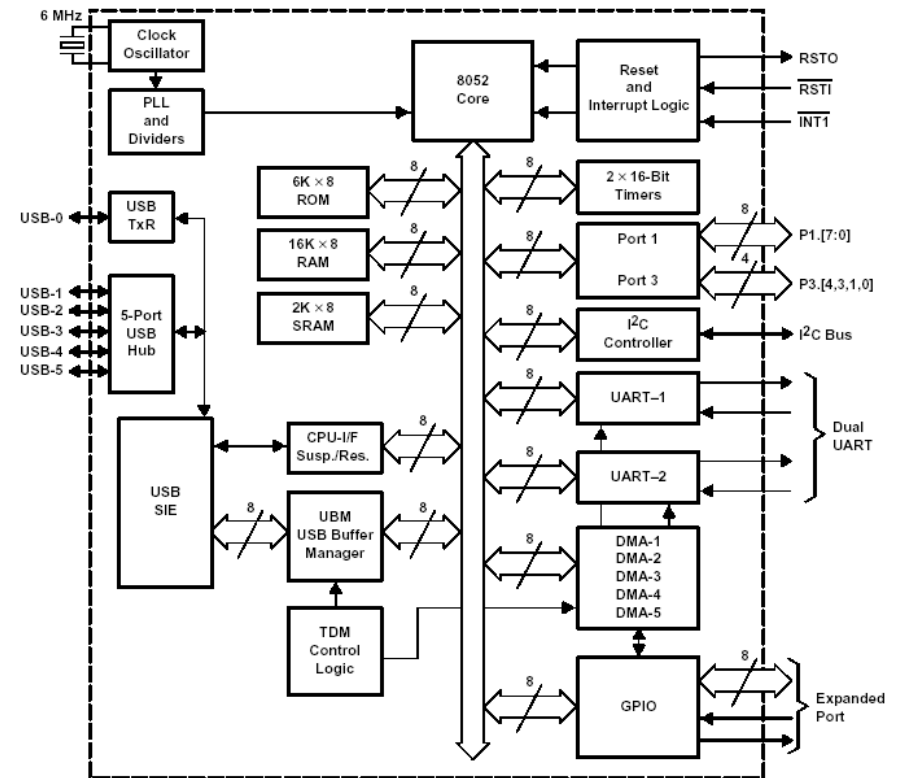


## Key Features

- Integrated Hub
  - Version 1.1 Compliance
  - On the USB-IF integrator's list.
  - One upstream port and configurable as 0 to 5 downstream ports.
- Can support a total of 8-input and 8-output endpoints
- Dual Enhanced UARTS
- Integrated 8052 Microcontroller
- Built-in five channel DMA controller
- Operates from a 6 MHz crystal. On-chip PLL generates 48/24 MHz and 7.384615 MHz for internal Baud Rate Generator.
- Power-down mode
- ESD filtering for babble, overcurrent, reset, bus-power inputs

## Typical Applications:

- Docking Stations
- Hub Box with Legacy Port Support
- Industrial Control Support





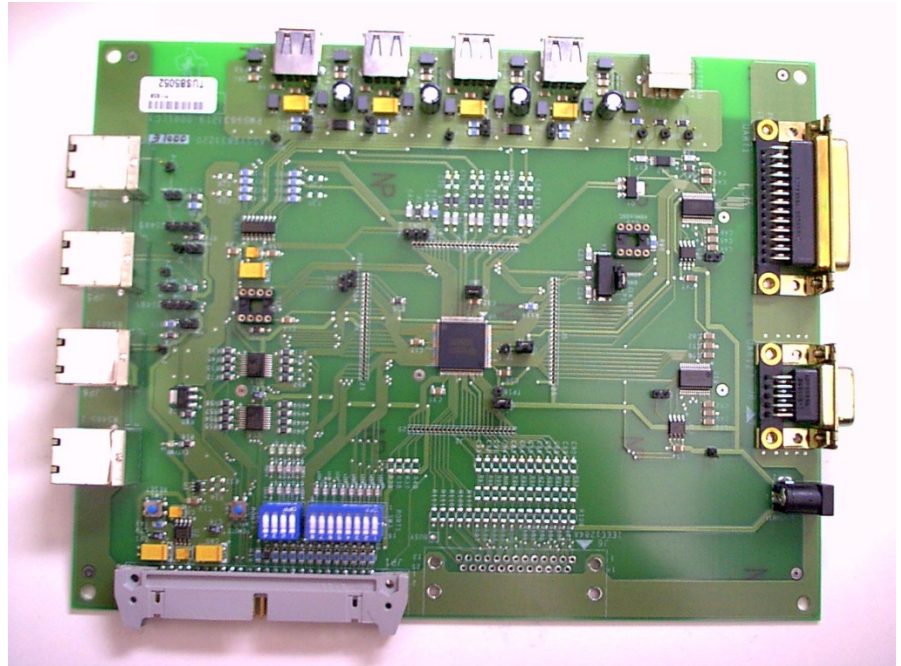
# TUSB5052 Collateral Available

- Evaluation Modules and Product Developer's Kits:
  - TUSB5052EVM: TUSB5052 USB Hub and Serial Bridge Evaluation Module
    - Contact [usb@ti.com](mailto:usb@ti.com) with the following information:
      - 1) Company name
      - 2) Physical address of company
      - 3) Name of contact at company who will be responsible for the board
      - 4) Phone number and e-mail of contact in #5
      - 5) Application
      - 6) Production plans including volumes and schedules
- Technical Documentation
  - TUSB5052 Data Manual
    - slls454: <http://focus.ti.com/lit/ds/symlink/tusb5052.pdf>
  - VIDs, PIDs, and Firmware: Design Decisions When Using TI USB Device Controllers Application Note
    - slla154: <http://focus.ti.com/lit/an/slla154/slla154.pdf>
  - TUSB2136/TUSB3210 Firmware Debugging Guide :
    - sllu027: <http://focus.ti.com/lit/ug/sllu027/sllu027.pdf>
  - TUSB2136/TUSB3210/TUSB5052 USB Firmware Programming Flow 8052 Embedded
    - sllu020: <http://focus.ti.com/lit/ug/sllu025a/sllu020.pdf>
- Other Utilities and Tools
  - I2C Header Generator Utility: <http://www-s.ti.com/sc/psheets/sllc152b/sllc152b.zip>
    - DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.
  - AppLoader Driver: <http://www-s.ti.com/sc/psheets/sllc160/sllc160.zip>
    - Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM during the FW development process.



# TUSB5052EVM

- The TUSB5052EVM is used to evaluate the TUSB5052 as a USB Hub with dual serial bridge converter.
- Features
  - Full function USB 1.1 Hub
  - Jump start development or use as a complete USB-to-RS-232 converter
  - Bridging FW, Win drivers, and schematics provided
  - Quick connect to a USB-enabled host
- What's Included?
  - Drivers and Firmware
    - Download Object Code
    - Source Available with SWLA
  - Populated EVM Board
  - Schematic
  - User's Guide







# TUSB5052EVM Software

- Drivers and Firmware:
  - Windows 98, Me, 2000, and XP Drivers and Firm Ware can be downloaded in object code if you agree to the online license agreement that requires registration with [MY.TI.com](http://MY.TI.com)
  - A UMP Linux driver exists in the public domain Linux servers
    - In their current state, they probably would require some modifications
  - MAC driver and FW support for UMP applications is in development with an estimated completion in 2Q04.
  - To create your own FW, a compiler will be necessary. The TUSB3410 is based upon the industry-standard 8052 microcontroller for which there are several compilers on the market that would be suitable. Some examples are at [www.iar.com](http://www.iar.com), [www.keil.com](http://www.keil.com), and at [www.tasking.com](http://www.tasking.com).
  - Source Code:
    - Due to licensing restrictions with the third party developer, TI is required to get a hardcopy royalty free software license agreement (SWLA) signed.
    - To request a SWLA, send an e-mail to [usb@ti.com](mailto:usb@ti.com) with the following information:
      - 1) Legal Company Name
      - 2) Physical address of #1 (not a PO Box)
      - 3) Name, Phone, e-mail, fax of company representative who will be responsible for SWLA and receiving the code
      - 4) Company website
- Utilities
  - I2C Header Generator Utility is a DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.



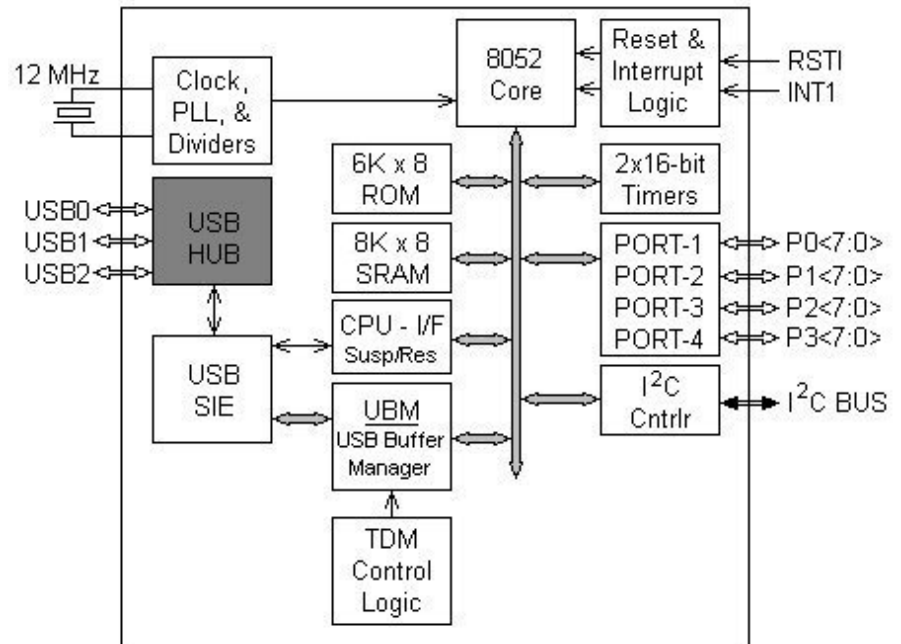
# TUSB2136

## Key Features

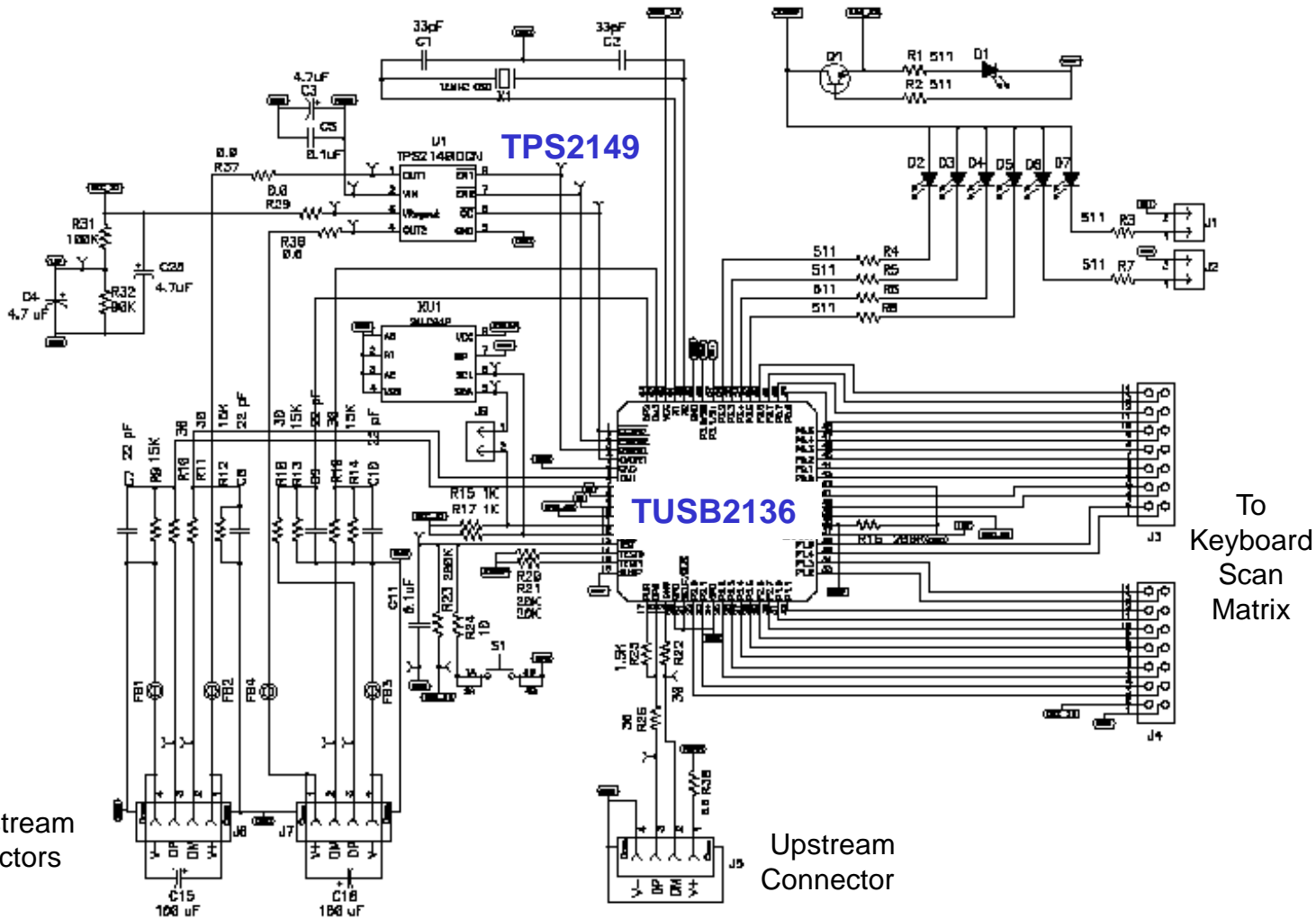
- Hub is fully compliant to the USB 1.1 specification
- Integrated 8052 Microcontroller
- Firmware loaded from host PC or via I2C port.
- Integrated, configurable 0 to 2 port hub with power management per port
- Customized ROM codes to support special functions
  - VID/PID Customization available to better enable WHQL Logo
- Can support a total of 4-input and 4-output endpoints
- Supports USB Suspend/Resume and remote wakeup operation
- 12 MHz crystal. On-chip PLL generates 48/24 MHz
- Power-down mode

## Typical Applications

- USB Keyboards with Hub
- Smart Media/Flash Card Reader Interface
- Peripheral with Integrated HUB
- UPS Controller



# Typical Application: Keyboard





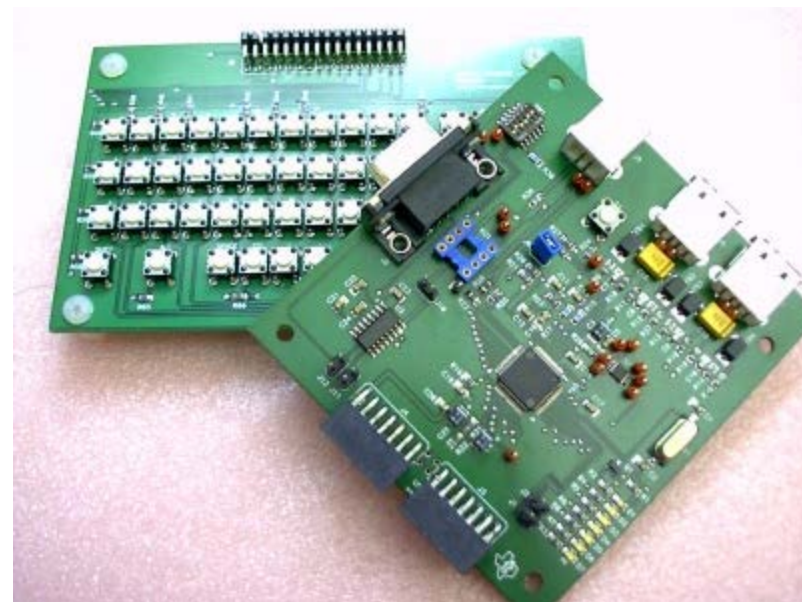
# TUSB2136 Collateral Available

- Evaluation Modules and Product Developer's Kits:
  - TUSB2136TPS2149PDK: USB Keyboard/Hub EVM
    - <http://focus.ti.com/docs/toolsw/folders/print/tusb2136tps2149pdk.html>
- Technical Documentation
  - TUSB2136 Data Manual
    - slls442: <http://focus.ti.com/lit/ds/symlink/tusb2136.pdf>
  - VIDs, PIDs, and Firmware: Design Decisions When Using TI USB Device Controllers Application Note
    - slla154: <http://focus.ti.com/lit/an/slla154/slla154.pdf>
  - TUSB2136/TUSB3210 Firmware Debugging Guide :
    - sllu027: <http://focus.ti.com/lit/ug/sllu027/sllu027.pdf>
  - TUSB2136/3210 Bootcode Document for USB to General-Purpose Device Controller
    - sllu025a: <http://focus.ti.com/lit/ug/sllu025a/sllu025a.pdf>
  - TUSB2136/TUSB3210/TUSB5052 USB Firmware Programming Flow 8052 Embedded
    - sllu020: <http://focus.ti.com/lit/ug/sllu025a/sllu020.pdf>
- Software, Utilities, and Tools
  - I2C Header Generator Utility: <http://www-s.ti.com/sc/psheets/sllc152b/sllc152b.zip>
    - DOS-based tool that generates an image file for your I2C EEPROM using your binary object code as input.
  - AppLoader Driver: <http://www-s.ti.com/sc/psheets/sllc160/sllc160.zip>
    - Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM during the FW development process.
  - Keyboard Sample Source Code is available to download from the TUSB2136TPS2149PDK Tool Folder after registering through [MY.TI.com](http://MY.TI.com).



# TUSB2136TPS2149PDK

- The TUSB2136TPS2149PDK is used to evaluate the TUSB2136 in a keyboard application.
- Features
  - Facilitate Development with a resident TUSB2136 USB micro-controller
  - Test the on-board TPS2149 power controller
  - Quick keyboard testing via mini input keys
  - Connection to a USB-enabled host
- What's Included?
  - Downloadable gerber file
  - Keyboard Sample Firmware
    - Object Code comes in EEPROM
    - Source Downloadable
  - Getting Started Letter
  - Populated EVM Board
  - USB Cable
  - Schematic
  - User's Guide





# TUSB2136TPS2149PDK Software

- Firmware:
  - The EVM board comes populated with an EEPROM that has firmware that allows the PDK to act like a standard USB keyboard.
  - Source code for this samples code is available to download from the TUSB2136TPS2149PDK Tool Folder after registering through [MY.TI.com](http://MY.TI.com)
  - To create your own FW, a compiler will be necessary. The TUSB2136 is based upon the industry-standard 8052 microcontroller for which there are several compilers on the market that would be suitable. Some examples are at [www.iar.com](http://www.iar.com), [www.keil.com](http://www.keil.com), and at [www.tasking.com](http://www.tasking.com).
- Drivers:
  - The sample firmware included with the PDK assumes usage of the USB Human Interface Device (HID) class driver.
    - Using class drivers allow the end-equipment manufacturer to ship their products without the need for including a driver software package.
    - For more information on class drivers, refer to the USB Implementers Forum website at [www.usb.org](http://www.usb.org)
  - If a class driver will not be acceptable for the given application, a custom driver will need to be written. One option is to use a package like the Jungo WinDriver ([www.jungo.com](http://www.jungo.com)) Package. Another option would be to use the Microsoft DDK USB Driver.
- Utilities:
  - I2C Header Generator Utility is a DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.
  - The TI AppLoader Driver is a Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM. When a USB system using one of these devices is inserted onto the bus, Windows associates it with this driver, which downloads the firmware to the device. This application is intended to be used during the firmware development phase of the project only and is not intended for production use.



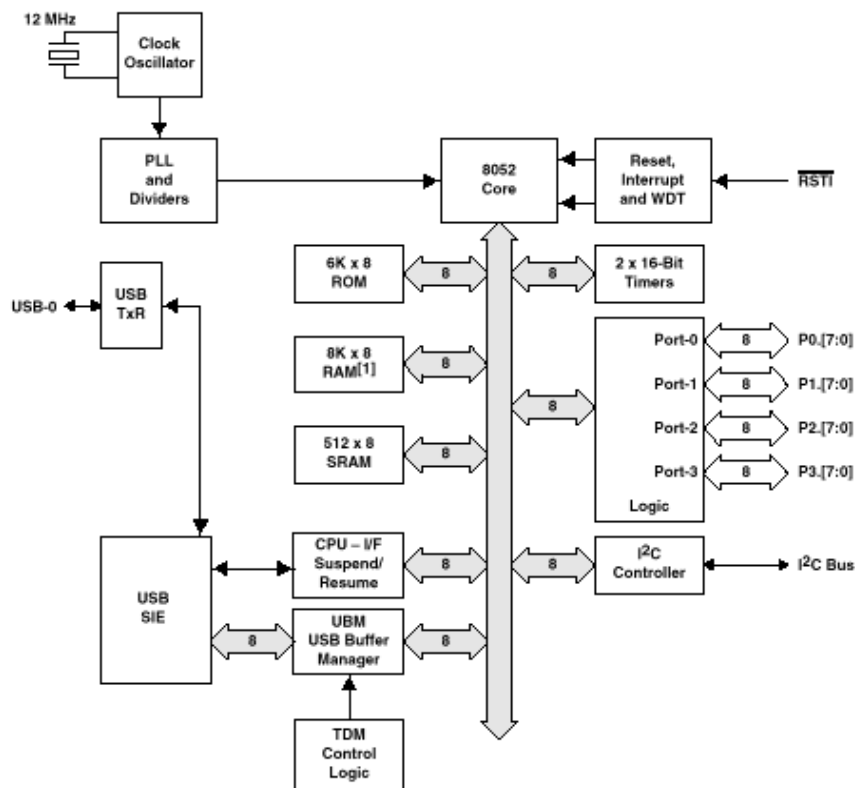
# TUSB3210

## Key Features

- USB2.0 Full-speed compliant device
- Integrated 8052 Microcontroller
  - 4 MIPs
  - 8KB RAM for application code space
- 32 General Purpose I/O
- Firmware loaded from host PC or via I2C port
- Supports Control, Bulk, and Interrupt transfers
- Can support a total of 4-input and 4-output endpoints
- Supports USB Suspend/Resume and remote wakeup operation
- 12 MHz crystal. On-chip PLL generates 48/24 MHz
- Power-down mode

## Typical Applications

- USB Keyboards
- Compact Flash Card Reader Interface
- UPS Controller
- Full-speed, Low-MIPs Peripherals





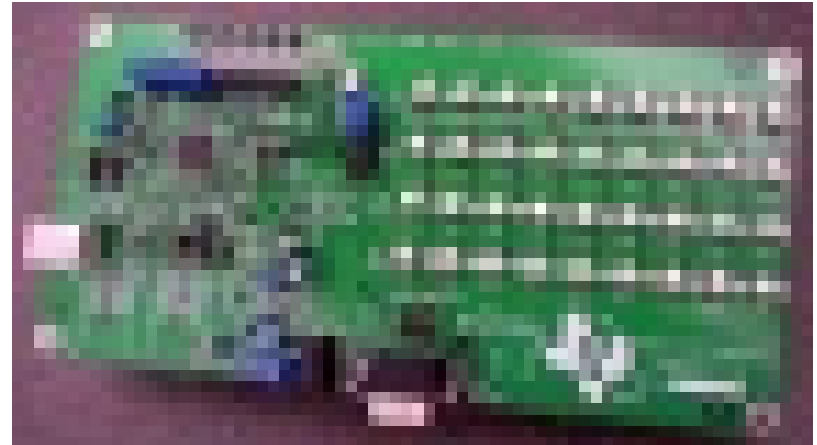
# TUSB3210 Collateral Available

- Evaluation Modules and Product Developer's Kits:
  - TUSB3210KBDPDK: TUSB3210 Keyboard Evaluation Board
    - <http://focus.ti.com/docs/toolsw/folders/print/tusb3210kbdpdk.html>
  - TUSB3210GENPDK: TUSB3210 Generic Evaluation Board
    - <http://focus.ti.com/docs/toolsw/folders/print/tusb3210genpdk.html>
- Technical Documentation
  - TUSB3210 Data Manual
    - slls466: <http://focus.ti.com/lit/ds/symlink/tusb3210.pdf>
  - VIDs, PIDs, and Firmware: Design Decisions When Using TI USB Device Controllers Application Note
    - slla154: <http://focus.ti.com/lit/an/slla154/slla154.pdf>
  - TUSB2136/TUSB3210 Firmware Debugging Guide :
    - sllu027: <http://focus.ti.com/lit/ug/sllu027/sllu027.pdf>
  - TUSB2136/3210 Bootcode Document for USB to General-Purpose Device Controller
    - sllu025a: <http://focus.ti.com/lit/ug/sllu025a/sllu025a.pdf>
  - TUSB2136/TUSB3210/TUSB5052 USB Firmware Programming Flow 8052 Embedded
    - sllu020: <http://focus.ti.com/lit/ug/sllu025a/sllu020.pdf>
- Other Utilities and Tools
  - I2C Header Generator Utility: <http://www-s.ti.com/sc/psheets/sllc152b/sllc152b.zip>
    - DOS-based tool that generates an image file for your I2C EEPROM using your binary object code as input.
  - AppLoader Driver: <http://www-s.ti.com/sc/psheets/sllc160/sllc160.zip>
    - Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM during the FW development process.
  - TUSB3210 Bootcode Source Listing: <http://www-s.ti.com/sc/psheets/sllc148/sllc148.zip>
    - Listing of ROM code used for reference only
  - Keyboard Sample Source Code is available to download from the either PDK Tool Folder after registering through [MY.TI.com](http://MY.TI.com).



# TUSB3210KBDPDK

- The TUSB3210KBDPDK is used to evaluate the TUSB3210 in a keyboard application.
- Features
  - Facilitate development with a resident TUSB3210 USB micro-controller
  - Ready keyboard test via mini input keys
  - Connection to a USB-enabled host
- What's Included?
  - Downloadable gerber file
  - Keyboard Sample Firmware
    - Object Code comes in EEPROM
    - Source Downloadable
  - Getting Started Letter
  - Populated EVM Board
  - USB Cable
  - Schematic
  - User's Guide





# TUSB3210GENPDK

- The TUSB3210GENPDK is used to evaluate the TUSB3210 as a general purpose USB MCU.
- Features
  - A resident TUSB3210 USB micro-controller
  - Easy access to the TUSB3210 via a 50-pin connector header
  - Connection to a USB-enabled host
- What's Included?
  - Downloadable gerber file
  - Keyboard Sample Firmware
    - Object Code comes in EEPROM
    - Source Downloadable
  - Getting Started Letter
  - Populated EVM Board
  - USB Cable
  - Schematic
  - User's Guide
- Additional items needed for EVM use:
  - Daughter Card for target Application Interface





# TUSB3210 PDK Software

- **Firmware:**
  - Both EVM boards come populated with an EEPROM that has firmware that allows the PDK to act like a USB keyboard.
  - Source code for this sample code is available to download from the Tool Folders after registering through [MY.TI.com](http://MY.TI.com)
  - To create your own FW, a compiler will be necessary. The TUSB3210 is based upon the industry-standard 8052 microcontroller for which there are several compilers on the market that would be suitable. Some examples are at [www.iar.com](http://www.iar.com), [www.keil.com](http://www.keil.com), and at [www.tasking.com](http://www.tasking.com).
- **Drivers:**
  - The sample firmware included with the PDK assumes usage of the USB Human Interface Device (HID) class driver.
    - Using class drivers allow the end-equipment manufacturer to ship their products without the need for including a driver software package.
    - For more information on class drivers, refer to the USB Implementers Forum website at [www.usb.org](http://www.usb.org)
  - If a class driver will not be acceptable for the given application, a custom driver will need to be written. One option is to use a package like the Jungo WinDriver ([www.jungo.com](http://www.jungo.com)) Package. Another option would be to use the Microsoft DDK USB Driver.
- **Utilities:**
  - I2C Header Generator Utility is a DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.
  - The TI AppLoader Driver is a Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM. When a USB system using one of these devices is inserted onto the bus, Windows associates it with this driver, which downloads the firmware to the device. This application is intended to be used during the firmware development phase of the project only and is not intended for production use.

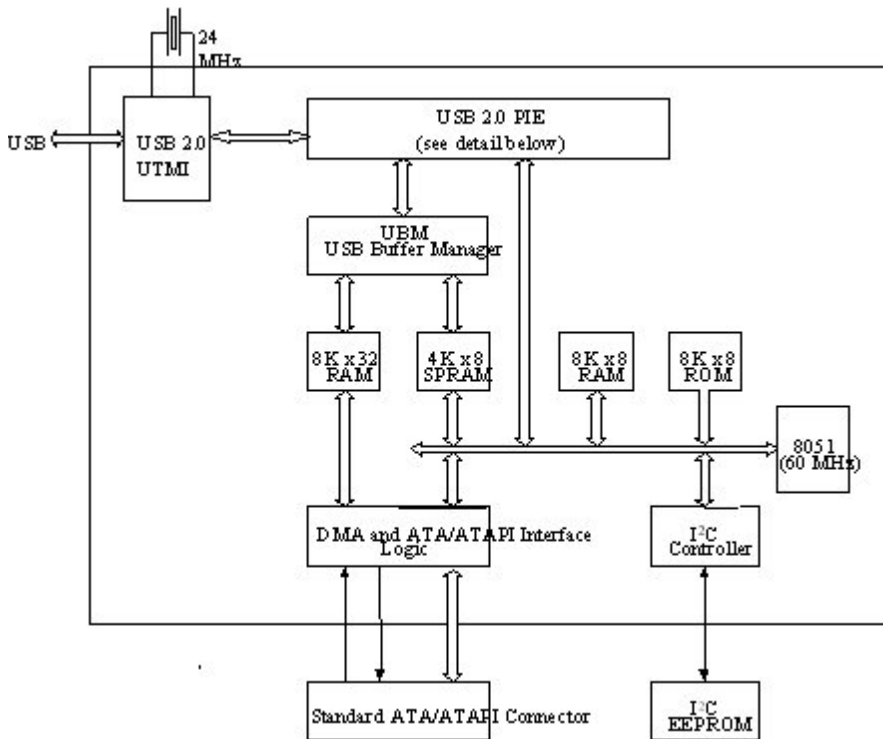
# TUSB6250

## Key Features

- Integrated, USB 2.0 compliant transceiver - full and high speed
- Optimized for bus-powered applications: 80 mA operational I<sub>cc</sub>
- Supports all ATA and ATAPI devices, including Compact Flash and > 160 GB HDDs
- Supports auto-detect of ATA or ATAPI drives
- Integrated 60 MHz WARP processor (2 clocks per instruction)
  - Enables quick time to market
  - Gives customers the flexibility to modify the code on demand
- 12 GPIO pins for customer customization

## Typical Applications

- External HDD, CD-R/W, or DVD drives
- Compact Flash Card Reader
- HDD-Based Audio Players





# Key Benefits

## Low power operation

- Single 3.3V supply operation with integrated 1.8V regulator
  - 1.8V core logic results in low operating current - only 80mA Icc
  - Compliant with USB enumeration specification; <100mA required during enumeration
- Power conservation mode
  - Compliant with USB bus power requirement of <500uA for bus-powered drives during suspend
- Cable-powered 5&10 GB HDDs have been demonstrated by combining the TUSB6250 with a 1.8" HDD
  - All power supplied via the cable - no battery assist necessary

## Value Added Architecture

- Compliant with the USB Mass Storage Specification, including the Host/Device Data Transfer Matrix (The Thirteen Cases)
- Thirteen case compliance assures essential bridge and drive interoperability, which means:
  - Elimination of hang conditions
  - No possibility of data loss
  - Zero data corruption
- Tolerant of ATA & ATAPI drive operational abnormalities, including
  - Random data request lengths
  - Random pause/terminates/requests
  - A tolerant and flexible architecture allows drive manufacturers to get to market fast with the drive of your choice

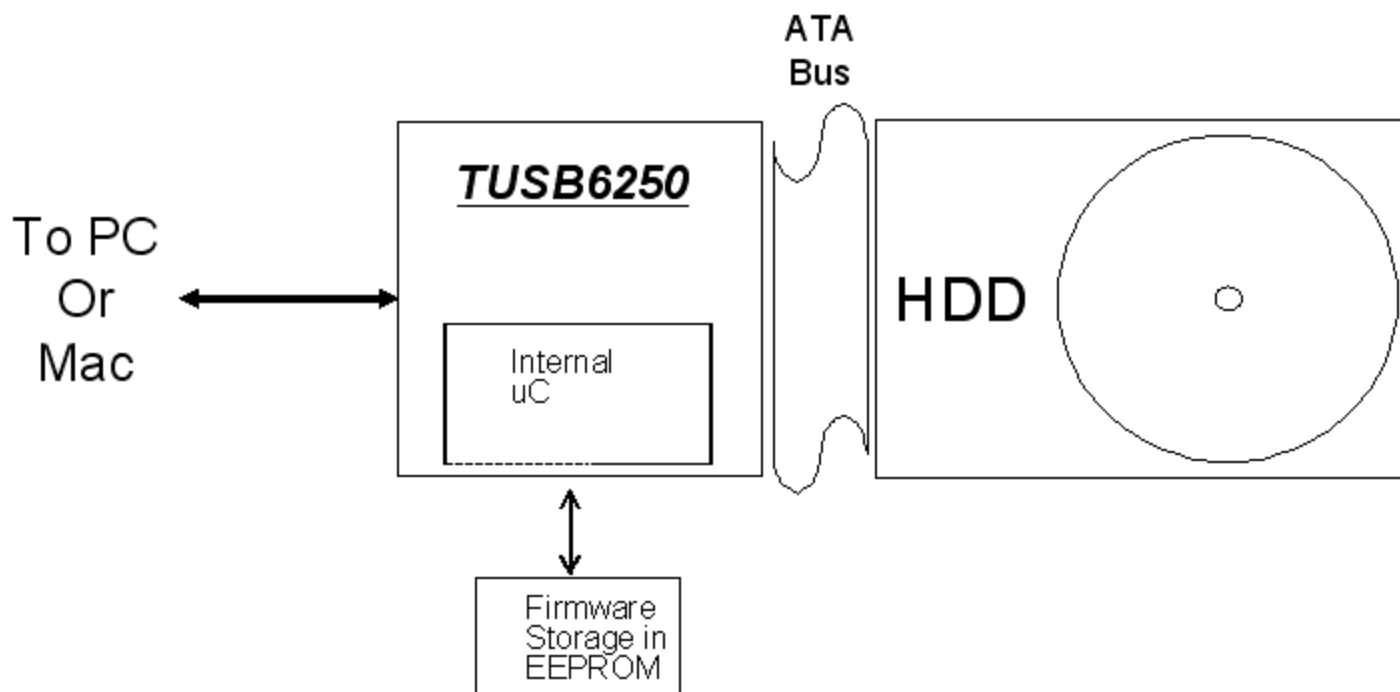
## ATA/ATAPI Interface

- Glue-less interface to ATA/ATAPI drives with full ATA/ATAPI protocol support
  - ATA-66 compliant
  - ATA-100 compatible interface
  - 48-bit LBA => supports ultra-large (>128GB) HDDs
- Fully programmable ATA/ATAPI interface access timing
- Tri-state and 5V failsafe ATA/ATAPI I/Os
- ATA/ATAPI drive can be powered down during bus enumeration to enable cable-powered drives
- ATA/ATAPI Interface is tri-stated during enumeration, protecting sensitive drive I/Os
- Dual drive support - simultaneous support for ATA master and slave

## Industry Standard Throughput

- World class throughput with standard Microsoft storage class drivers
  - Competitive offerings claim high performance throughput, but often require use of custom drivers
  - Our results achieved using Windows native drivers
  - No need to ship or support custom drivers
    - Eliminate customer support expenses and headaches that come with custom drivers
- Using HDTach on Compaq 2.24 GHz PC with WinXP and ICH4-based USB 2.0 Host chipset
  - 28 MB/s sustained throughput
  - 33 MB/s peak throughput

# Typical Application: USB to HDD Bridge





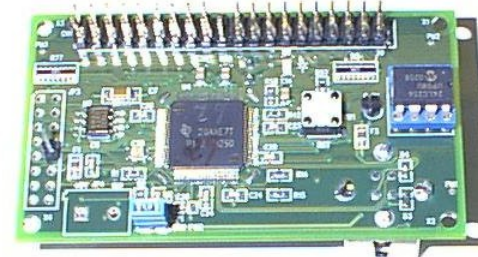
# TUSB6250 Collateral Available

- Evaluation Modules and Product Developer's Kits:
  - TUSB6250DEMO: TUSB6250 USB to ATA/ATAPI Demonstration Module
    - Contact [usb@ti.com](mailto:usb@ti.com) to request a demonstration module
- Technical Documentation
  - TUSB62500 Data Manual
    - slls535a: <http://focus.ti.com/lit/ds/symlink/tusb6250.pdf>
  - VIDs, PIDs, and Firmware: Design Decisions When Using TI USB Device Controllers Application Note
    - slla154: <http://focus.ti.com/lit/an/slla154/slla154.pdf>
  - Selection and Specification of Crystals for Texas Instruments USB 2.0 Devices:
    - slla122: <http://focus.ti.com/lit/an/slla122/slla122.pdf>
  - TUSB6250 Bootcode Application Note:
    - slla126: <http://focus.ti.com/lit/an/slla126/slla126.pdf>
- Other Utilities and Tools
  - I2C Header Generator Utility: <http://www-s.ti.com/sc/psheets/sllc152b/sllc152b.zip>
    - DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.
  - AppLoader Driver: <http://www-s.ti.com/sc/psheets/sllc160/sllc160.zip>
    - Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM during the FW development process.
  - TI USB Field Firmware Programmer Utility: contact [usb@ti.com](mailto:usb@ti.com)
    - Tool that allows you to update an already-programmed EEPROM with a new firmware build.



# TUSB6250DEMO Board

- A proven, production-ready reference design, applicable for both cable-powered and wall powered drives
- Included:
  - User's Guide
  - Schematic
  - BOM
  - Firmware Programming Application and User's Guide
  - Win98 mass storage driver
- Firmware Source Code Available under a Royalty-free license – contact [usb@ti.com](mailto:usb@ti.com)







# TUSB6250DEMO Software

- **Firmware:**

- The EVM board comes populated with an EEPROM that has firmware that allows the demonstration board to support a single ATA or ATAPI drive.
- In addition to the standard firmware build, there are many additional builds available for specific applications. Contact [usb@ti.com](mailto:usb@ti.com) for additional information on what is available.
- Source code for this samples code is available by contact Texas Instruments at [usb@ti.com](mailto:usb@ti.com) and providing the following information:
  - 1) Legal Company Name
  - 2) Physical address of #1 (not a PO Box)
  - 3) Name, Phone, e-mail, fax of company representative who will be responsible for the code
  - 4) Company website
- To create your own FW, a compiler will be necessary. The TUSB6250 is based upon the industry-standard 8052 microcontroller for which there are several compilers on the market that would be suitable. Some examples are at [www.iar.com](http://www.iar.com), [www.keil.com](http://www.keil.com), and at [www.tasking.com](http://www.tasking.com).

- **Drivers:**

- The sample firmware included with the PDK assumes usage of the USB Mass Storage Class Driver (MSC).
  - Using class drivers allow the end-equipment manufacturer to ship their products without the need for including a driver software package.
  - For more information on class drivers, refer to the USB Implementers Forum website at [www.usb.org](http://www.usb.org)
- If a class driver will not be acceptable for the given application, a custom driver will need to be written. One option is to use a package like the Jungo WinDriver ([www.jungo.com](http://www.jungo.com)) Package.

- **Utilities:**

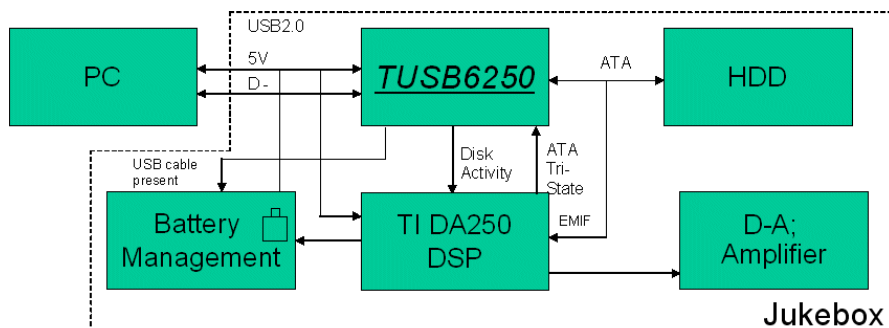
- I2C Header Generator Utility is a DOS-based tool that generates an image file for your I2C EEPROM using your binary object code and/or custom descriptors as inputs.
- TI USB Field Firmware Programmer Utility is a tool that allows you to update an already-programmed EEPROM with a new firmware build.
- The TI AppLoader Driver is a Windows USB device driver that enables firmware to be kept on the PC rather than in the USB device's EEPROM. When a USB system using one of these devices is inserted onto the bus, Windows associates it with this driver, which downloads the firmware to the device. This application is intended to be used during the firmware development phase of the project only and is not intended for production use.



# Enhanced Application: HDD-Based Audio/Video Player

## Audio player firmware revision inter-operates with DSP to provide a USB 2.0 audio or video player solution

- Why is it important to use a firmware based bridge solution for audio players?
  - An intelligent bridge enables product differentiation
- PC to DSP communication is enabled, this means:
  - Play lists can be synchronized
  - Data can be updated
    - Time of day / date information, firmware updates, calendars, phone numbers, contact lists, appointments, to do lists, expense entries...the list is endless
  - You can add applications that rely on flexible communications between the PC and the DSP
  - The result: Your audio player is different than the next one on the store shelf.
- Intelligent battery management when connected to the USB cable
  - The USB cable can act as a battery charging unit
  - No wall adapter needed
  - When charging is occurring, the DSP should be powered off, saving current for battery recharge
  - An intelligent bridge can control the power states of the HDD (Active, idle, standby, sleep, off)
  - An intelligent bridge can write messages such as “Battery Charging” and “Battery Fully Charged” to the player’s LCD





# Connectivity Developer Network

- The worldwide Connectivity Developer Network consists of independent companies that provide products and services to help TI 1394, USB, PCI CardBus and UART customers accelerate their development efforts and cut time-to-market.
- The Network is designed to simplify the navigation to “best fit” solutions for customers and Texas Instruments.

<http://www.ti.com/devnet>



	<u>Software Products</u>	<u>Hardware Products</u>	<u>Consulting &amp; Training</u>
1394	✓	✓	✓
USB	✓	✓	✓
PCI Cardbus & Bridges	✓	✓	✓