USB
Universal Serial Bus

XMC™ microcontrollers
September 2016

Agenda

1. Support DMA mode
2. 2 KBytes RAM available for FIFO
3. USB host
4. USB device

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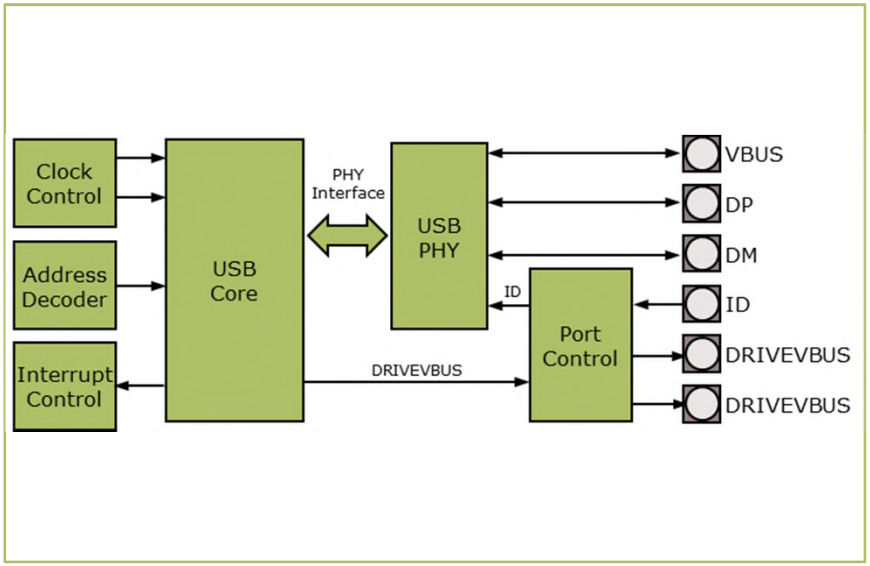


Highlights

XMC™4000 provides USB module that complies with USB 2.0 specification as well as the on-the-go supplement to USB 2.0 specification.

Key feature

- Support full speed data transfer with internal PHY
- Support OTG dual-role device
- Power saving functionality

Customer benefits

- Reduce cost for external PHY and allow fast data transfer (12 Mbps)
- Can support USB application for host only, device only or OTG device
- Reduce power consumption when USB is not in use

USB
Full speed data transfer with internal PHY

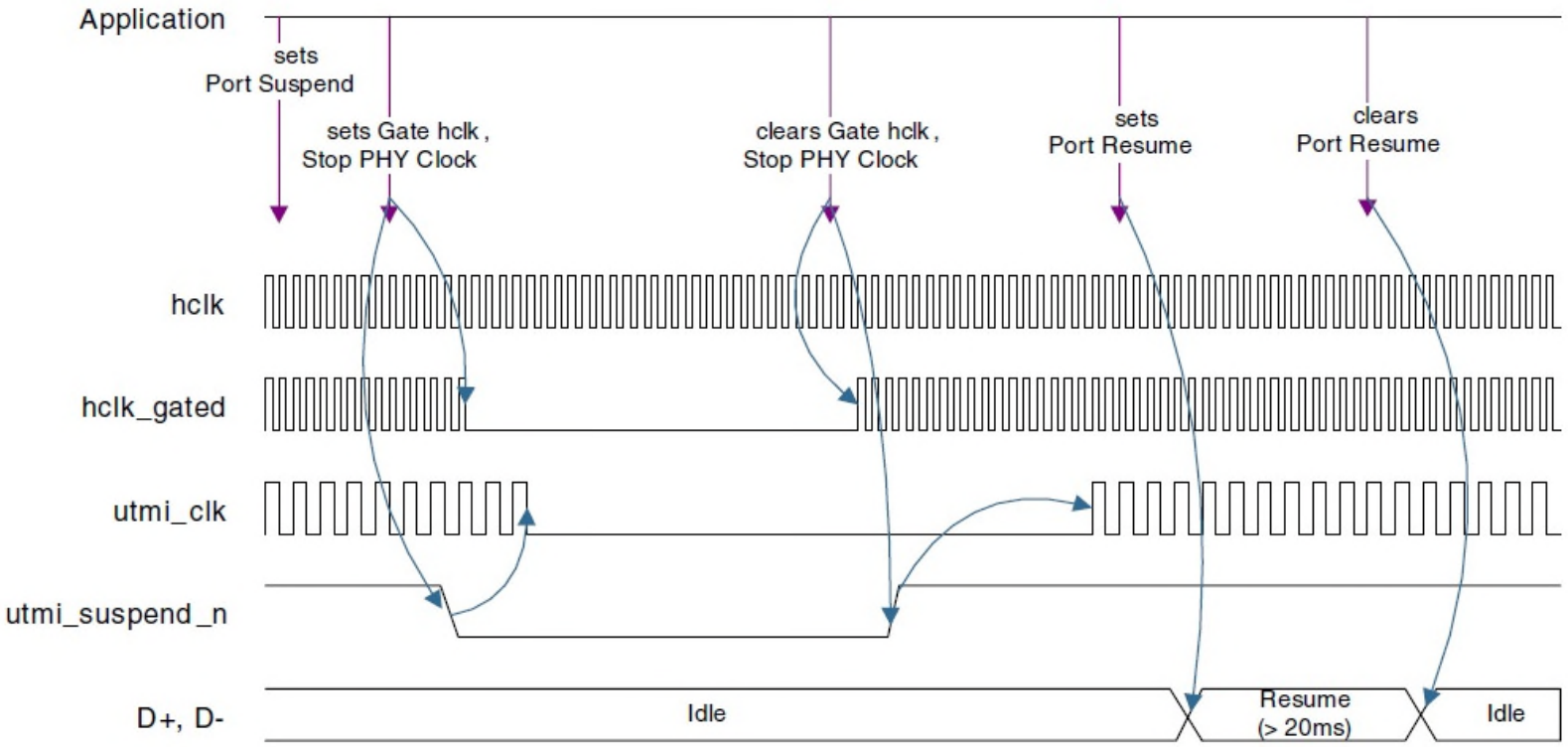
- Internal USB PHY is included in the USB module
- USB PHY supports full speed transfer rate up to 12 Mbps
- It also supports USB low speed data transfer

USB
Supports host only, device only and dual-role

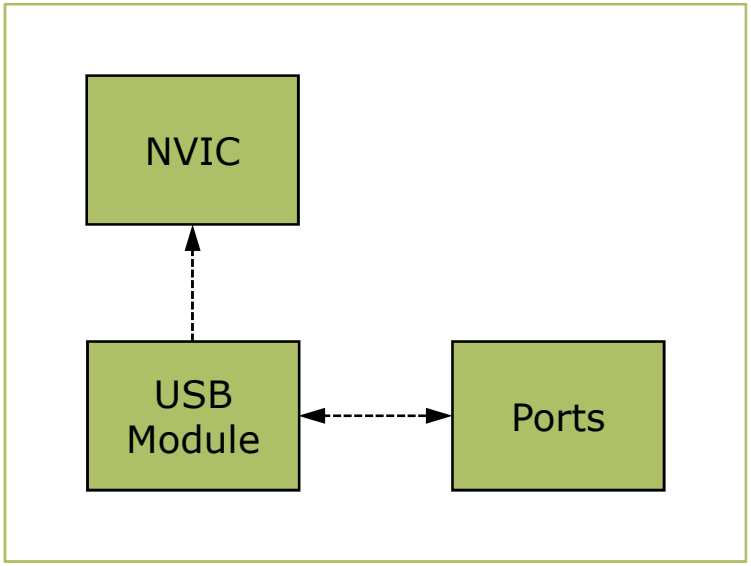
- Supports Host Negotiation Protocol (HNP) → allows OTG devices to exchange their capabilities and adjust the device type
- Supports also host only or device only
- Suitable for all kind of USB applications

USB
Power saving functionality

- Supports USB suspend/resume command
- Supports clock gating of USB hardware when suspend command is used



USB
System integration



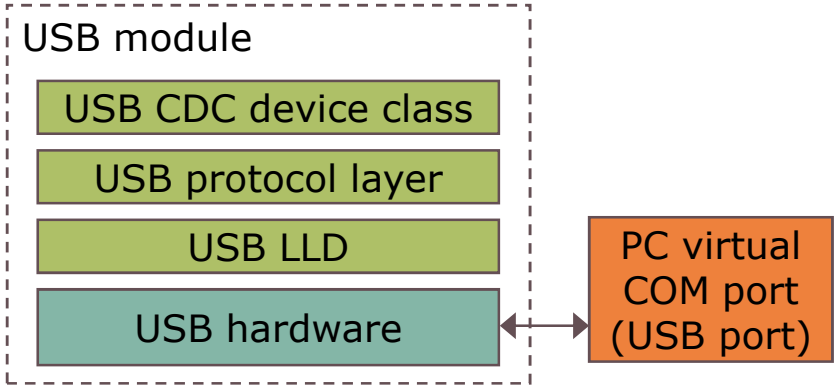
XMC™4100	XMC™4200	XMC™4400	XMC™4500
●*	●	●	●

*** USB device only**

The USB module provides single service request connected to the NVIC. The interrupt node is handled by the USB driver in order to manage the USB protocol.

- Target applications
  - Virtual COM Port
  - Mass storage device
  - Firmware upgrade
  - Human machine interface
  - Connectivity
  - General purpose

Application example: serial communication with PC via virtual COM port



In brief

With USB module, the microcontroller is able to create a virtual COM port on the PC and allows the PC to communicate with the microcontroller via terminal program such as HYPERTERMINAL™.

Overview

USB module can be configured to work as device only. With CDC device class stack running on the microcontroller, it is able to create a virtual COM port on the PC with the microcontroller connected through the PC USB port. Thus allows the PC to communicate with the microcontroller via USB.

PC communicates with the microcontroller via terminal program by connecting through the virtual COM port. No additional hardware is required unlike other serial communication such as UART where UART-to-USB conversion is required.

USB
Support DMA mode

- In DMA mode, the core fetches the data to be transmitted or updates the received data on the AHB
- Two modes are supported in DMA mode
  - Scatter/gather mode
  - Buffer-pointer based mode
- Decouple the CPU from direct data transfer on USB line

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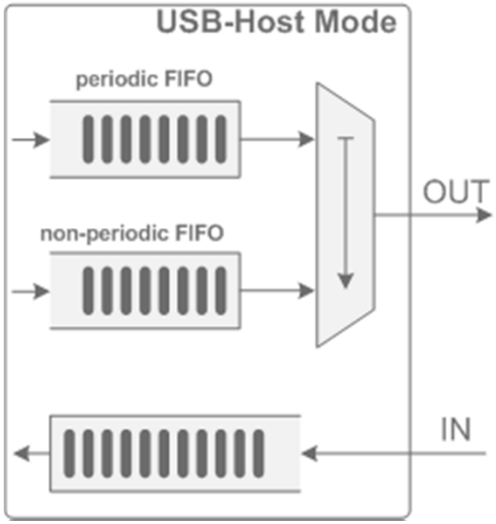
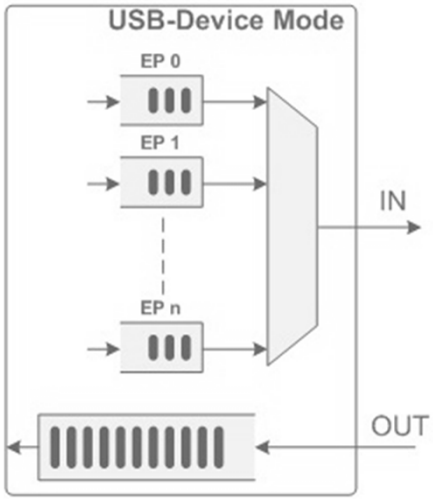
USB
2 KBytes RAM available for FIFO

- USB host
  - Outgoing traffic → two FIFOs with different priorities
    - Periodic FIFO has the higher priority
    - Non periodic FIFO has the lower priority
  - Incoming traffic → All incoming traffic is stored in one FIFO
- USB device
  - Outgoing traffic → each endpoint has its own FIFO. No priority between the FIFOs required. The host starts the transfer from endpoint FIFOs
  - Incoming traffic → all incoming traffic is stored in one FIFO





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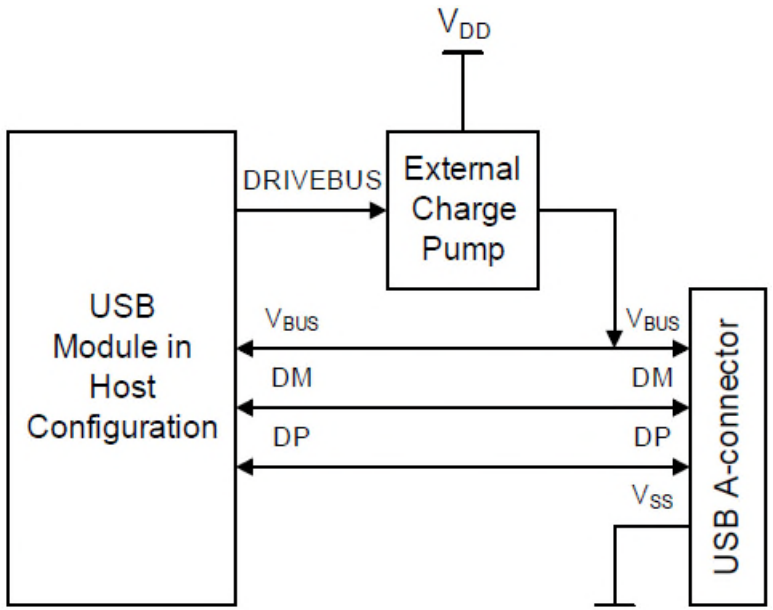
USB
USB host

- Up to 14 host channels
- Supports all transfer types: control, bulk, interrupt and isochronous
- Can drive the V_{BUS} by using an external charge pump
- Two transmit FIFOs
  - Periodical
  - Non periodical



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USB
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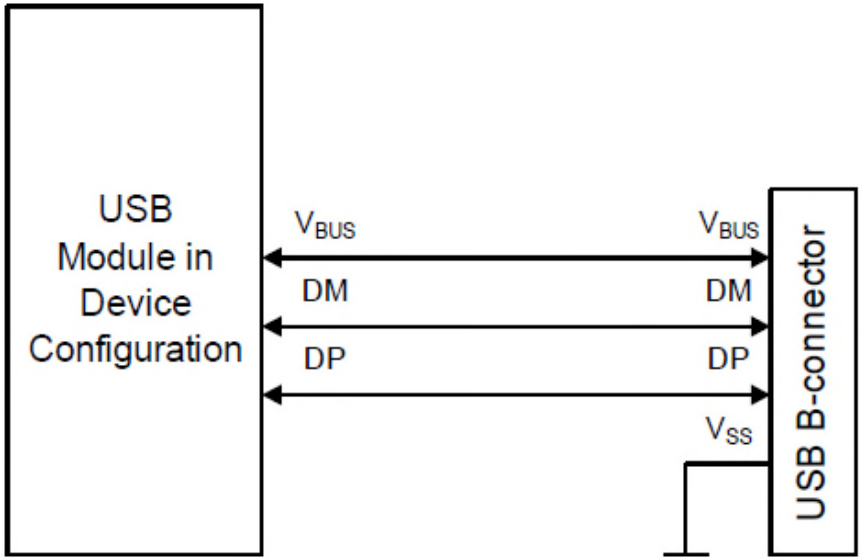
- 7 bidirectional endpoints; endpoint 0 used for control transfers
- Support all transfer types: control, bulk, interrupt, isochronous
- Self powered device; no additional external voltage required
- Individual transmit FIFOs for each IN endpoint



General information

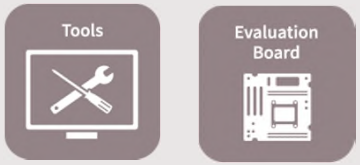
- For latest updates, please refer to:

  www.infineon.com/xmc4000

- For support:

  http://www.infineonforums.com/forums/8-XMC-Forum

Support material

Collaterals and Brochures 	– Product Briefs – Selection Guides – Application Brochures – Presentations – Press Releases, Ads	– www.infineon.com/XMC
Technical Material 	– Application Notes – Technical Articles – Simulation Models – Datasheets, MCDS Files – PCB Design Data	– www.infineon.com/XMC – Kits and Boards – DAVE™ – Software and Tool Ecosystem
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