

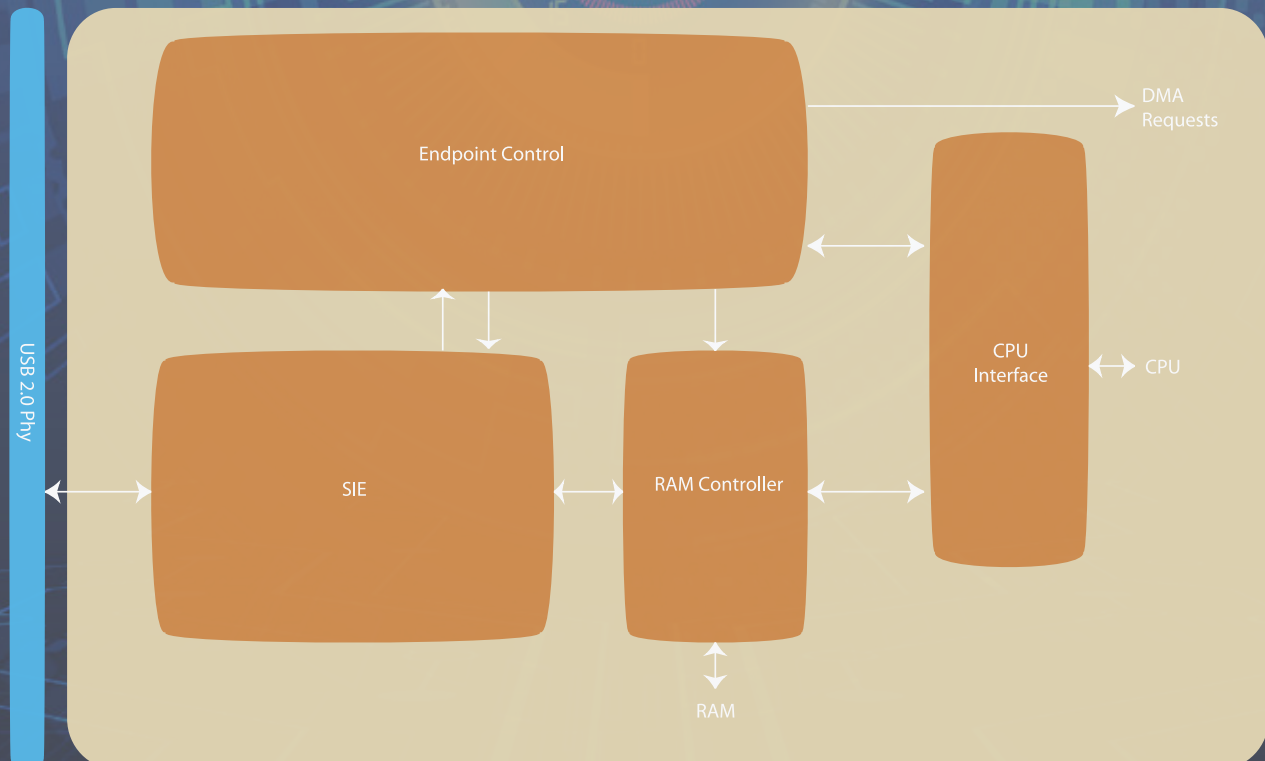
General Description

Innovative Logic's USBFDRS primarily provides a 'Dual-role' USB controller for use as either the host or the peripheral in point-to-point communications with another USB function (which may be either full-speed or low-speed). Alternatively it can be used as device controller for a full-speed USB peripheral. It complies with both the USB standard for full-speed functions and the On-The-Go supplement to the USB 2.0 specification. The USB On-The-Go specification has been introduced to provide a low-cost connectivity solution for consumer portable devices such as mobile phones, PDAs, digital still cameras and MP3 players. Devices that are solely peripherals initiate transfers through a Session Request Protocol (SRP) while Dual-role devices support both SRP and Host Negotiation Protocol (HNP).

Features

- Operates either as a device or host controller
- Complies with the USB standard for full-speed (12 Mbps) functions and with the On-The-Go supplement to the USB 2.0 specification
- Supports point-to-point communications with one full-speed or low-speed device
- Supports both Session Request Protocol (SRP) and Host Negotiation Protocol (HNP)
- Standard Device Requests handled efficiently in software for flexibility
- Supports Suspend and Resume signaling
- Configurable for up to 15 additional Transmit endpoints and up to 15 additional Receive endpoints
- Configurable FIFOs, with option of dynamic FIFO sizing
- Synchronous RAM interface for FIFOs
- Support for DMA access to FIFOs
- Supports AMBA™ AHB interface

Block Diagram



Block Diagram of USB 2.0 Full Speed OTG Controller

Details

Modes of Operation

The USBFDRM has two main modes of operation – Peripheral mode and Host mode. When acting as a peripheral, the USBFDRM provides all the encoding, decoding and checking needed in sending and receiving USB packets – interrupting the CPU only when endpoint data has been successfully transferred.

When acting as a host, the USBFDRM additionally maintains a frame counter and automatically schedules SOF, Isochronous, Interrupt and Bulk transfers. It also includes support for the Session Request and Host Negotiation Protocols required for point-to-point communications, details of which are given in the USB On-The-Go supplement to the USB 2.0 specification. Whether the USBFDRM initially operates in Host mode or in Peripheral mode depends on whether it is being used in an 'A' device or a 'B' device. When the USBFDRM is operating as an 'A' device, it is initially configured to operate in Host mode. When operating as a 'B' device, the USBFDRM is initially configured to operate in Peripheral mode. The USBFDRM determines whether it is the 'A' device by monitoring the CID input, which should be connected to the ID pin on the mini-AB receptacle.

Target Applications

- Removable hard disks
- Digital camera
- Printer, scanner, etc.
- Multimedia Applications
- Mobile phones and Tablets
- TV, DVD players, Set top Boxes

Deliverables

- Synthesizable RTL developed in Verilog HDL
- Constraints & scripts for synthesis
- Test bench and Test cases developed in SystemVerilog
- Sample Driver code
- User Manual

Session Request (SRP)

A session is defined as the period when VBus is on. VBus is always supplied by the 'A' device on the bus. Sessions can be started by the CPU associated with either an 'A' device or a 'B' device setting the Session bit in the DevCtl register. Where the 'B' device wishes to start the session, it will first try pulsing the data line, then pulsing VBus to wake the 'A' device. Sessions are ended by the CPU clearing the Session bit.

Host Negotiation (HNP)

When the USBFDRM is the 'A' device, it automatically enters Host mode when a session starts. When the USBFDRM is the 'B' device, it automatically enters Peripheral mode when a session starts. The CPU can however request that the USBFDRM becomes the Host by setting the Host Req bit in the DevCtl register. Host Negotiation is then conducted using the defined protocol when the USBFDRM next enters Suspend mode.

Key Benefits

- Optimized designed to achieve lowest power and area for portable electronics
- Extensive debug capabilities
- Configurable options to tune the core as per requirement

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