Overview

**Cadence® IP Factory** delivers custom, synthesizable IP to support specific design requirements.

Compliant with *Universal Serial Bus Specification*, Revision 2.0, the **Cadence USB 1.1 Device Controller IP** operates in Full-Speed (12Mbps) or Low-Speed (1.5Mbps) modes.

The **Cadence USB 1.1 Device Controller IP** is architected to quickly and easily integrate into any system on chip (SoC), and to connect seamlessly to a Cadence, or third-party, USB 1.1 PHY. Host applications access the controller through an industry-standard ARM® AMBA® Advanced Peripheral Bus (APB) or simple read/write interface.

The **Cadence USB 1.1 Device Controller IP** is delivered with a low-level driver to ease integration into the target application. Both the driver and the **Cadence USB 1.1 Device Controller IP** support all available USB 1.1 device classes.

The **Cadence USB 1.1 Device Controller IP** is silicon-proven, and has been extensively validated with multiple hardware platforms.

**Cadence IP Factory** offers comprehensive IP solutions that are in volume production, and have been successfully implemented in more than 400 applications.

### Key Features

- Compliant to USB 2.0 specification
- Optional DMA Engine with 8-, 16-, or 32-bit ARM AMBA AHB, or slave FIFO interface
- Supports Full-Speed (12Mbps) and Low-Speed (1.5Mbps) operation
- 8-bit APB or simple read/write configuration interface
- Up to 15 IN and 15 OUT configurable endpoints
- Supports Link Power Management (L0 through L3)
- Endpoint 0 with 64 byte buffer for control transfers
- Data toggle synchronization mechanism
- Provides Remote Wake-Up function
- Single-Port RAM interface for endpoint buffers
## Product Details

The **Cadence USB 1.1 Device Controller IP** handles data transfer autonomously, and bridges the USB interface to a simple read/write parallel interface. Controller operation can be customized for specific applications.

### USB Block

The USB Block is divided into three main functions, the Serial Interface Engine (SIE), the Parallel Interface Engine (PIE), and the Clock Controller.

The SIE contains a digital phase-locked loop (DPLL) that uses four times oversampling of the USB data stream for clock extraction. Data is passed between the PHY Interface and the SIE via the SIE.

The PIE implements functions to control the behavior of the **Cadence USB 1.1 Device Controller IP**. Special Function Registers are used to configure the PIE.

The Clock Controller provides support for the suspend-resume function.

### DMA Engine

The DMA Engine transfers data between endpoint buffers and external memory. The host initializes a DMA transfer by writing to the DMA Special Function Registers.

The DMA Engine can be configured for little-Endian or big-Endian transfers.

### Port Controller

The Port Controller contains multiplexers and address decoders to route data to the appropriate port. The Port Controller logic handles all microprocessor and DMA read and write accesses to and from the Special Function Registers and endpoint buffer RAM. The number and size of endpoints can be configured independently.

## PHY Interface

The **Cadence USB 1.1 Device Controller IP** connects to the USB 1.1 PHY through a serial interface.

### Application Interface

The **Cadence USB 1.1 Device Controller IP** supports a simple 8-bit read/write or APB slave interface for configuration and SFR access.

Access to the DMA engine is realized through a slave FIFO interface. The DMA engine features an AMBA AHB interface.

### Cadence IP Factory

**Cadence IP Factory** can deliver various configurations of USB controller IP to meet your design requirements.

With 10+ years of experience and 400+ successful designs in process nodes ranging from 180nm to 22nm, **Cadence IP Factory** solutions have been proven in everything from low-power MP3 players to leading edge supercomputers.

For more information, visit ip.cadence.com

## Benefits

- Complete hardware and software solution—less time spent on application development
- High level of configurability—better fit for application needs
- Industry-standard interfaces—simple system integration

## Deliverables

- Synthesizable RTL
- Testbench
- Synthesis and simulation support files
- Documentation

## Available Products

- USB 1.1 Device Controller IP

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