



Universal Serial Bus Transceiver with Level Translator

Features

- Complies with USB Specification Rev 1.1 & 2.0.
- Supports Full (12Mbit/s) speed and Low speed (1.5Mbits/s).
- Integrated 5V to 3.3V regulator.
- Used as a USB device or host transceiver.
- VBUS disconnection indication through VP, VM.
- Two single-ended receivers with hysteresis.
- Stable RCV output during SE0 condition.
- Low power operation.
- Supports 1.65 to 3.3V I/O voltage levels.
- Full industrial operating range -40 to 85 °C.
- Available in small HBCC16 Package.

Applications

- Mobile Phones.
- Digital still cameras.
- PDA (Personal Digital Assistant).
- IA (Information Appliance).

Product Description

The CM2400-04HB Universal Serial Bus (USB) transceiver is fully compliant with the USB specification Rev 1.1 and 2.0. It supports a speed of 12Mbits/s (Full Speed) and 1.5Mbits/s (Low Speed).

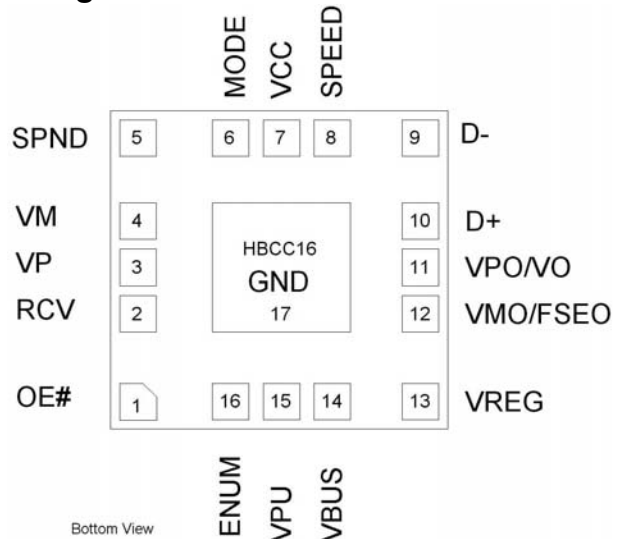
An internal level shifter allows interface to Application specific IC's (ASIC's) and Programmable logic devices (PLD's) running at core voltages of 1.65 to 3.3V.

An internal 5-3.3V regulator is used to power the CM2400-04HB USB transceiver via the USB supply V_{BUS}.

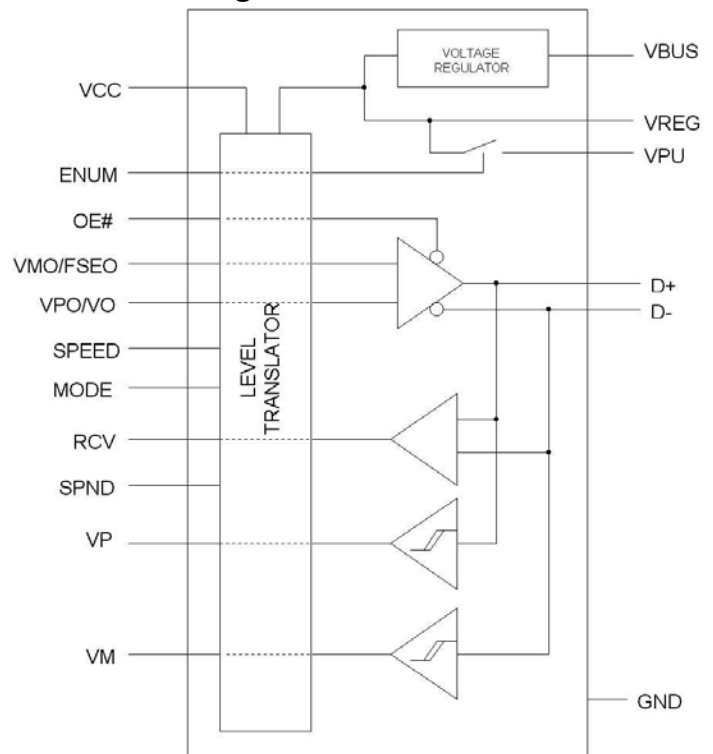
Single and differential input modes are selectable by a mode input pin.

This device is ideal for portable electronic devices such as mobile phones, digital still cameras, PDA (Personal Digital Assistants) and IR (Information Appliances).

Pin Diagram



Functional Diagram



STANDARD PART ORDERING INFORMATION

Package		Ordering Information	
Pads	Style	Tape & Reel	Part Marking
16	HBCC16		



Pin Functions

Pin	Symbol	Description
1	OE#	Input for Output enable (Active low) Enables transceiver driver to transmit data on the USB bus. When OE# pin = LOW driver circuitry is enabled.
2	RCV	Differential receiver output of D+ and D- input data lines. The output state of RCV is preserved and stable during an SE0 condition.
3	VP	Single-ended D+ receiver output for detection of a single ended zero, error conditions, or speed of connected device.
4	VM	Single-ended D- receiver output for detection of a single ended zero, error conditions, or speed of connected device.
5	SPND	Suspend input. Allows the device to enter a low power state while the USB is inactive.
6	MODE	Mode input. Selects between differential (VPO, VMO) and single-ended mode (VO, FSEO).
7	V _{CC}	Supply voltage for digital I/O pins. Voltages supported: 1.65 to 3.3V.
8	SPEED	Speed Input. If SPEED is logic '1', selects full speed. If SPEED is logic '0', selects low speed.
9	D-	Negative USB data connection. Low speed connect mode, connect V _{PU} via a 1.5kΩ resistor. Tolerance of this resistor is defined in the USB specification REV 1.1 & 2.0
10	D+	Positive USB data connection. Full speed connect mode, connect V _{PU} via a 1.5kΩ resistor. Tolerance of this resistor is defined in the USB specification REV 1.1 & 2.0
11	VPO/VO	Driver data input.
12	VMO/FSEO	Driver data input.
13	V _{REG}	Regulated supply voltage output during USB operation of VBUS. 1uF decoupling capacitor is required. Regulator bypass option connected to VBUS
14	V _{BUS}	Supply voltage input. Can be directly connected to USB VBUS.
15	V _{PU}	Pull-up supply voltage. Pin function is controlled by input ENUM.
16	ENUM	Enumerate, allows software to control connection of the external pull-up via the level translator. If ENUM = LOW then V _{PU} is floating. If ENUM = HIGH then V _{PU} is internally connected to V _{REG} .
17	GND	The ground terminal is connected to the exposed diepad.

Functional Description:

The CM2400-04HB USB Transceiver supports 3 different power supply configurations, which can be configured dynamically. *Table 1* details the various configurations. In **Normal Mode** the internal regulator produces 3.3V from V_{BUS} to power the internal drivers and receivers associated with the USB protocol.

In **Disable** and **Sharing Mode**, all input/output pins follow the states defined in *Table 2*.

Table 3 lists the functions of the modes associated with suspend and OE# pins. When Suspend is low and OE# is high, signal levels on D+ and D- are determined by other USB devices and pull-up/down resistors. In **Suspend Mode** (SPND = HIGH) the differential receiver is inactive and output RCV is always LOW. Out of suspend signaling is detected via the single-ended receivers VP and VM. During suspend and while the output is still enabled (OE# = LOW), D+ and D- lines are driven to their intended states. This is permitted because driving during suspend is used to signal remote wake-up by driving a 'K' signal for a period of 1 to 15ms.

Detailed in *Table 4.1* and *4.2* are the operating modes selected when MODE is set to HIGH and LOW. When MODE = HIGH, the differential input data interface mode is selected. The 2 driver inputs function as VMO and VPO. When MODE = LOW, the single-ended input data interface mode is selected. The 2 driver inputs function as FSEO and VO.

Table 5 details the receiving function when OE# is HIGH (driver disabled). RCV denotes the signal level on the output RCV just before an SE0 state occurs. This level is stable during the SE0 period.

The CM2400-04HB USB transceiver includes an enumeration pin (ENUM) which internally connects V_{PU} to V_{REG}