



USB333x



Industry's Smallest Hi-Speed USB Transceiver with Single Supply Operation



PRODUCT FEATURES

Data Brief

- USB-IF Battery Charging 1.1 Specification Compliant
- Link Power Management (LPM) Compliant
- Integrated ESD protection circuits
- Up to $\pm 25\text{kV}$ IEC Air Discharge without external devices
- Over-Voltage Protection circuit (OVP) protects the VBUS pin from continuous DC voltages up to 30V
- Integrated USB Switch (USB3331, USB3336 and USB3338)
 - No degradation of Hi-Speed electrical characteristics
 - Allows single USB port of connection by providing switching function for:
 - Battery charging
 - Stereo and mono/mic audio
 - USB Full-Speed/Low-Speed data
- SMSC RapidCharge Anywhere™ Provides:
 - 3-times the charging current through a USB port over traditional solutions
 - USB-IF Battery Charging 1.1 compliance to any portable device
 - Charging current up to 1.5Amps via compatible USB host or dedicated charger
 - Dedicated Charging Port (DCP), Charging (CDP) & Standard (SDP) Downstream Port support
- flexPWR® Technology
 - Extremely low current design ideal for battery powered applications
 - “Sleep” mode tri-states all ULPI pins and places the part in a low current state
 - 1.8V to 3.3V IO Voltage (USB3333)
- Single Power Supply Operation
 - Integrated 1.8V regulator
 - Integrated battery to 3.3V regulator
 - 100mV dropout voltage
- PHYBoost
 - Programmable USB transceiver drive strength for recovering signal integrity
- VariSense™
 - Programmable USB receiver sensitivity
- “Wrapper-less” design for optimal timing performance and design ease
 - Low Latency Hi-Speed Receiver (43 Hi-Speed clocks Max) allows use of legacy UTMI Links with a ULPI bridge
- External Reference Clock operation available
 - ULPI Clock In Mode (60MHz sourced by Link)
 - 0 to 3.6V input drive tolerant
 - Able to accept “noisy” clock sources as reference to internal, low-jitter PLL
 - USB3330 and USB3333 support multiple frequencies
- Smart detection circuits allow identification of USB charger, headset, or data cable insertion
- Includes full support for the optional On-The-Go (OTG) protocol detailed in the On-The-Go Supplement Revision 2.0 specification
- Supports the OTG Host Negotiation Protocol (HNP) and Session Request Protocol (SRP)
- UART mode for non-USB serial data transfers
- Internal 5V cable short-circuit protection of ID, DP and DM lines to VBUS or ground
- Industrial Operating Temperature -40°C to $+85^{\circ}\text{C}$
- 25 ball, WLCSP lead-free RoHS Compliant package (1.97 x 1.97 x 0.53 mm height)

Applications

The USB333x is the solution of choice for any application where a Hi-Speed USB connection is desired and when board space, power, and interface pins must be minimized.

- Cell Phones
- PDAs
- MP3 Players
- GPS Personal Navigation
- Scanners
- External Hard Drives
- Digital Still and Video Cameras
- Portable Media Players
- Entertainment Devices
- Printers
- Set Top Boxes
- Video Record/Playback Systems
- IP and Video Phones
- Gaming Consoles

Order Number(s):

ORDER NUMBER	REFCLK FREQUENCY (Note 0.1)	PACKAGE TYPE	REEL SIZE
USB3330E-GL-TR	Selectable	25 Ball, WLCSP Lead-Free RoHS Compliant Package (tape and reel)	3,000 pieces
USB3331E-GL-TR	26MHz		
USB3333E-GL-TR	Selectable		
USB3336E-GL-TR	19.2MHz		
USB3338E-GL-TR	38.4MHz		

Note 0.1 All versions support ULPI Clock Input Mode (60MHz input at REFCLK)

This product meets the halogen maximum concentration values per IEC61249-2-21

For RoHS compliance and environmental information, please visit www.smcs.com/rohs

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General Description

SMSC's USB333x is a family of High Speed USB 2.0 Transceivers that provides a physical layer (PHY) solution well-suited for portable electronic devices. Both commercial and industrial temperature applications are supported.

Each model in the USB333x family may use a 60MHz reference clock or the model-number specific reference clock shown in Order Numbers on page 2. The USB3330 and USB3333 can support several different frequencies driven on the **REFCLK** pin. The configuration of the frequency selection pins set the desired reference frequency.

Several advanced features make the USB333x the transceiver of choice by reducing both eBOM part count and printed circuit board (PCB) area. Outstanding ESD robustness eliminates the need for external ESD protection devices in typical applications. The internal Over-Voltage Protection circuit (OVP) protects the USB333x from voltages up to 30V on the **VBUS** pin. By using a reference clock from the Link, the USB333x removes the cost of a dedicated crystal reference from the design. The USB333x includes integrated 3.3V and 1.8V regulators, making it possible to operate the device from a single power supply.

Versions of the USB333x with the integrated USB switch enable unique product features with a single USB port of connection.

The USB333x is optimized for use in portable applications where a low operating current and standby current is essential. The USB333x also supports the Link Power Management protocol (LPM) to further reduce USB operating currents.

The USB333x also includes integrated battery charger detection circuitry. These circuits are used to detect the attachment of a USB Charger. By sensing the attachment to a USB Charger, a product using the USB333x can draw more than 500mA from the USB connector.

The USB333x meets all of the electrical requirements for a High Speed USB Host, Device, or an On-the-Go (OTG) transceiver. In addition to the supporting USB signaling, the USB333x also provides USB UART mode and, in versions with the integrated USB switch, USB Audio mode.

USB333x uses the industry standard UTMI+ Low Pin Interface (ULPI) to connect the USB PHY to the Link. ULPI uses a method of in-band signaling and status byte transfers between the Link and PHY to facilitate a USB session with only twelve pins.

The USB333x uses SMSC's "wrapper-less" technology to implement the ULPI interface. This "wrapper-less" technology allows the PHY to achieve a low latency transmit and receive time. SMSC's low latency transceiver allows an existing UTMI Link to be reused by adding a UTMI to ULPI bridge. By adding a bridge to the ASIC the existing and proven UTMI Link IP can be reused.

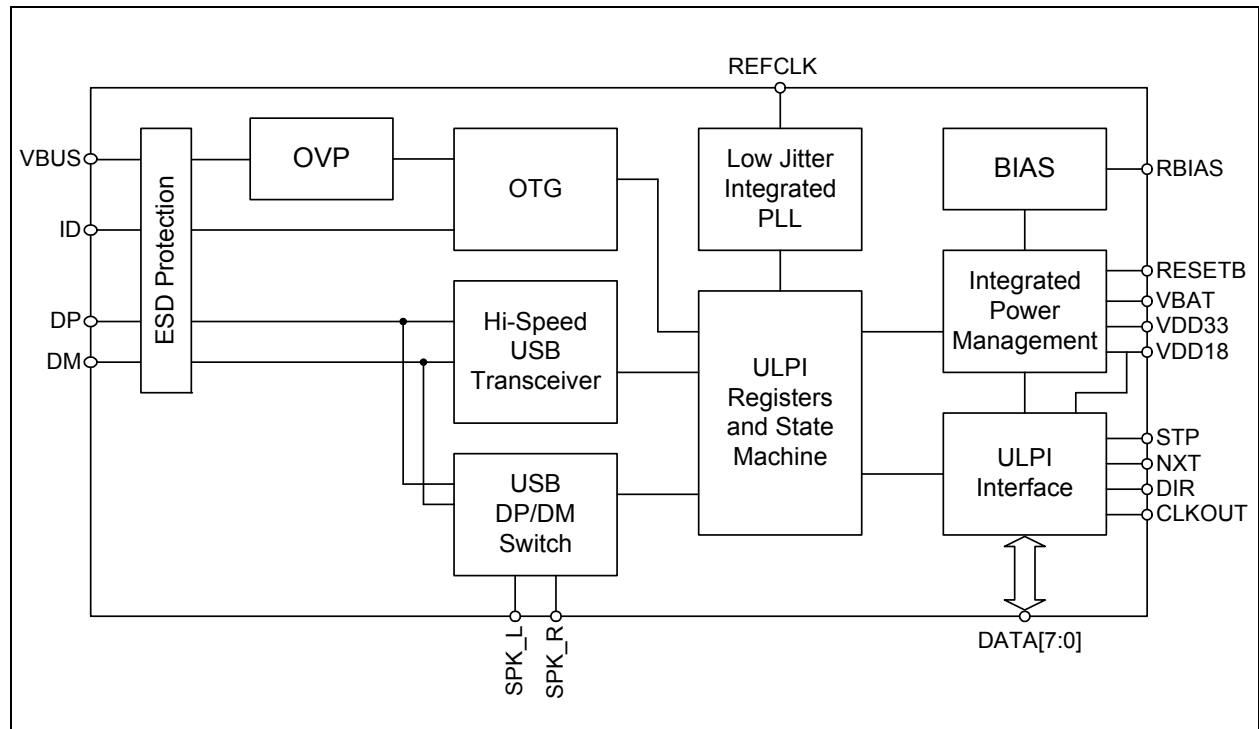


Figure 1 Block Diagram (USB3331, USB3336 and USB3338)

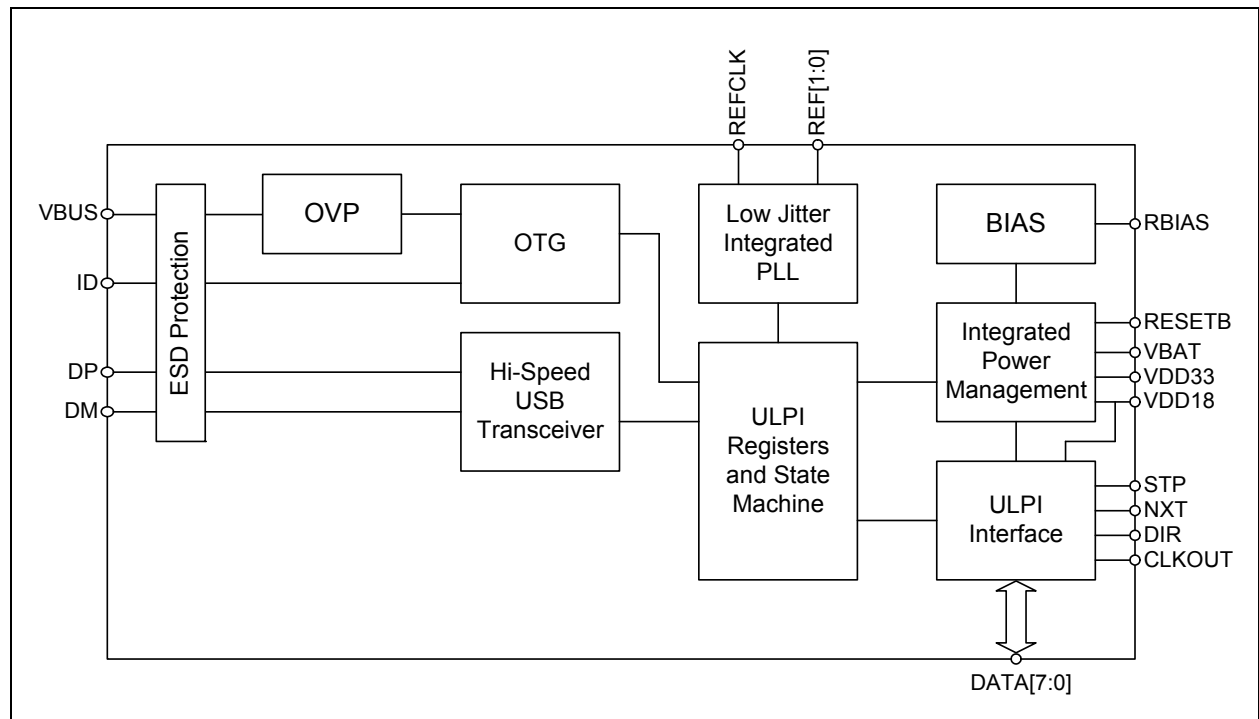


Figure 2 Block Diagram (USB3330)

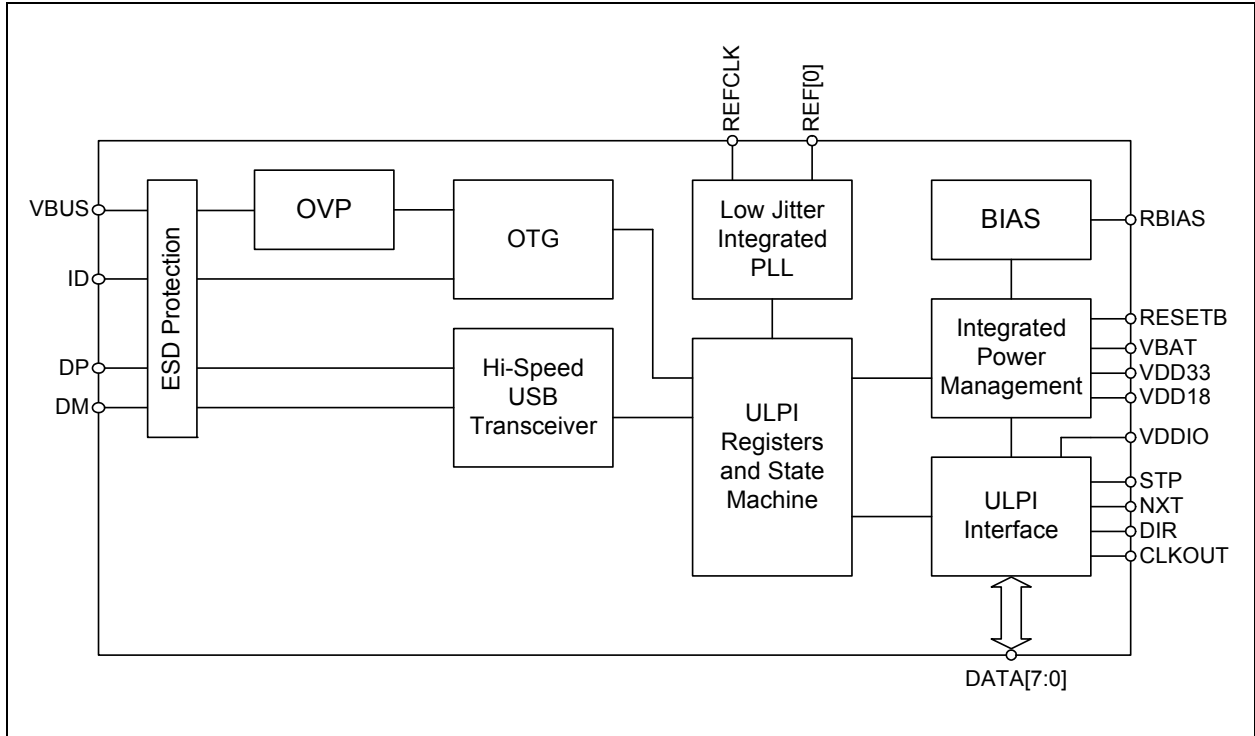


Figure 3 Block Diagram (USB3333)

Package Outline

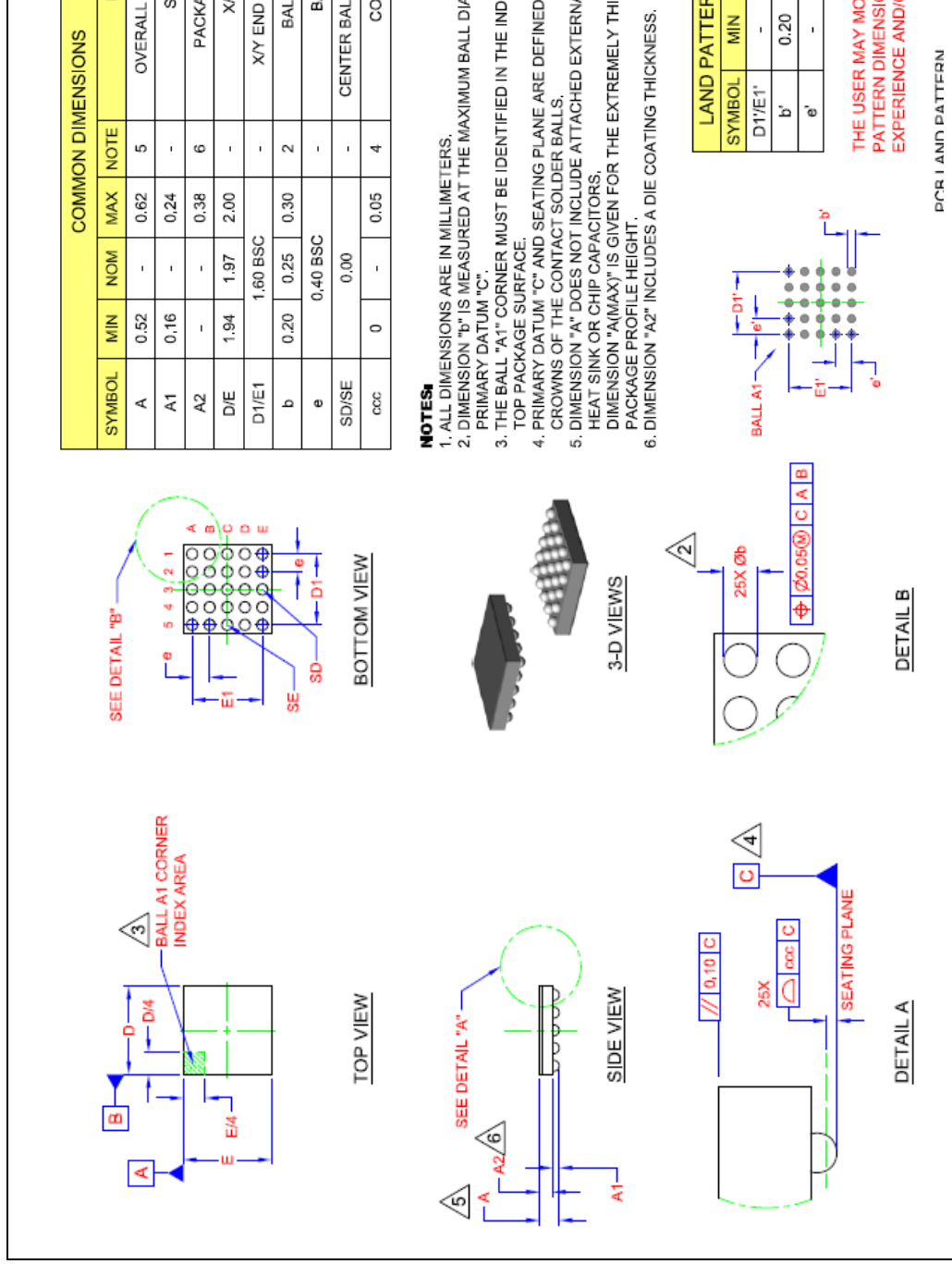


Figure 4 25WLCSP, 1.97x1.97mm Body, 0.4mm Pitch

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- ⊖ [Microchip Technology](#) Information

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