



Highly Integrated Full Featured Hi-Speed USB 2.0 ULPI Transceiver

PRODUCT FEATURES

Data Brief

- Integrated ESD protection circuits
 - Up to $\pm 15\text{kV}$ 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
 - 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
- flexPWR[®] Technology
 - 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 ($\pm 10\%$)
- Integrated battery to 3.3V regulator
 - 2.2 μF bypass capacitor
 - 100mV dropout voltage
- “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
- Selectable Reference Clock Frequency
 - Frequencies: 12, 13, 19.2, 24, 26, 27, 38.4, 52 or 60MHz - pin selectable
- External Reference Clock operation available
 - ULPI Input Clock 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
- Internal Oscillator operation available
 - This mode requires external Quartz Crystal or Ceramic Resonator
- 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 Headset Audio Mode
- 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 $+85^{\circ}\text{C}$
- 32 pin, QFN Lead-free RoHS Compliant Package (5 x 5 x 0.90 mm height)

Applications

The USB3320 is targeted for any application where a Hi-Speed USB connection is desired and when board space, power, and interface pins must be minimized.

The USB3320 is well suited for:

- Networking
- Audio Video
- Medical
- Industrial Computers
- Printers
- Repeaters
- Communication

ORDER NUMBER(S):**USB3320C-EZK for 32 pin, QFN Lead-Free RoHS Compliant Package****USB3320C-EZK-TR for 32 pin, QFN Lead-Free RoHS Compliant Package (tape and reel)**

80 ARKAY DRIVE, HAUPPAUGE, NY 11788 (631) 435-6000, FAX (631) 273-3123

Copyright © 2009 SMSC or its subsidiaries. All rights reserved.

Circuit diagrams and other information relating to SMSC products are included as a means of illustrating typical applications. Consequently, complete information sufficient for construction purposes is not necessarily given. Although the information has been checked and is believed to be accurate, no responsibility is assumed for inaccuracies. SMSC reserves the right to make changes to specifications and product descriptions at any time without notice. Contact your local SMSC sales office to obtain the latest specifications before placing your product order. The provision of this information does not convey to the purchaser of the described semiconductor devices any licenses under any patent rights or other intellectual property rights of SMSC or others. All sales are expressly conditional on your agreement to the terms and conditions of the most recently dated version of SMSC's standard Terms of Sale Agreement dated before the date of your order (the "Terms of Sale Agreement"). The product may contain design defects or errors known as anomalies which may cause the product's functions to deviate from published specifications. Anomaly sheets are available upon request. SMSC products are not designed, intended, authorized or warranted for use in any life support or other application where product failure could cause or contribute to personal injury or severe property damage. Any and all such uses without prior written approval of an Officer of SMSC and further testing and/or modification will be fully at the risk of the customer. Copies of this document or other SMSC literature, as well as the Terms of Sale Agreement, may be obtained by visiting SMSC's website at <http://www.smSC.com>. SMSC is a registered trademark of Standard Microsystems Corporation ("SMSC"). Product names and company names are the trademarks of their respective holders.

SMSC DISCLAIMS AND EXCLUDES ANY AND ALL WARRANTIES, INCLUDING WITHOUT LIMITATION ANY AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE, AND AGAINST INFRINGEMENT AND THE LIKE, AND ANY AND ALL WARRANTIES ARISING FROM ANY COURSE OF DEALING OR USAGE OF TRADE. IN NO EVENT SHALL SMSC BE LIABLE FOR ANY DIRECT, INCIDENTAL, INDIRECT, SPECIAL, PUNITIVE, OR CONSEQUENTIAL DAMAGES; OR FOR LOST DATA, PROFITS, SAVINGS OR REVENUES OF ANY KIND; REGARDLESS OF THE FORM OF ACTION, WHETHER BASED ON CONTRACT; TORT; NEGLIGENCE OF SMSC OR OTHERS; STRICT LIABILITY; BREACH OF WARRANTY; OR OTHERWISE; WHETHER OR NOT ANY REMEDY OF BUYER IS HELD TO HAVE FAILED OF ITS ESSENTIAL PURPOSE, AND WHETHER OR NOT SMSC HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

General Description

The SMSC USB3320 is a Hi-Speed USB 2.0 Transceiver that provides a configurable physical layer (PHY) solution and is an excellent match for a wide variety of products. Both commercial and industrial temperature applications are supported.

The frequency of the reference clock is user selectable. The USB3320 includes an internal oscillator that may be used with either a quartz crystal or a ceramic resonator. Alternatively, the crystal input can be driven by an external clock oscillator. Another option is the use of a 60MHz external clock when using the ULPI Input Clock mode.

Several advanced features make the USB3320 the transceiver of choice by reducing both electrical bill of material (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 USB3320 from voltages up to 30V. By using a reference clock from the Link, the USB3320 removes the cost of a dedicated crystal reference from the design. And the integrated USB switch enables unique product features with a single USB port of connection.

The USB3320 meets all of the electrical requirements to be used as a Hi-Speed USB Host, Device, or an On-the-Go (OTG) transceiver. In addition to the supporting USB signaling, the USB3320 also provides USB UART mode and USB Audio mode.

USB3320 uses the industry standard UTMI+ Low Pin Interface (ULPI) to connect the USB Transceiver to the Link. ULPI uses a method of in-band signaling and status byte transfers between the Link and transceiver to facilitate a USB session with only 12 pins.

The USB3320 uses SMSC's "wrapper-less" technology to implement the ULPI interface. This "wrapper-less" technology allows the transceiver 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.

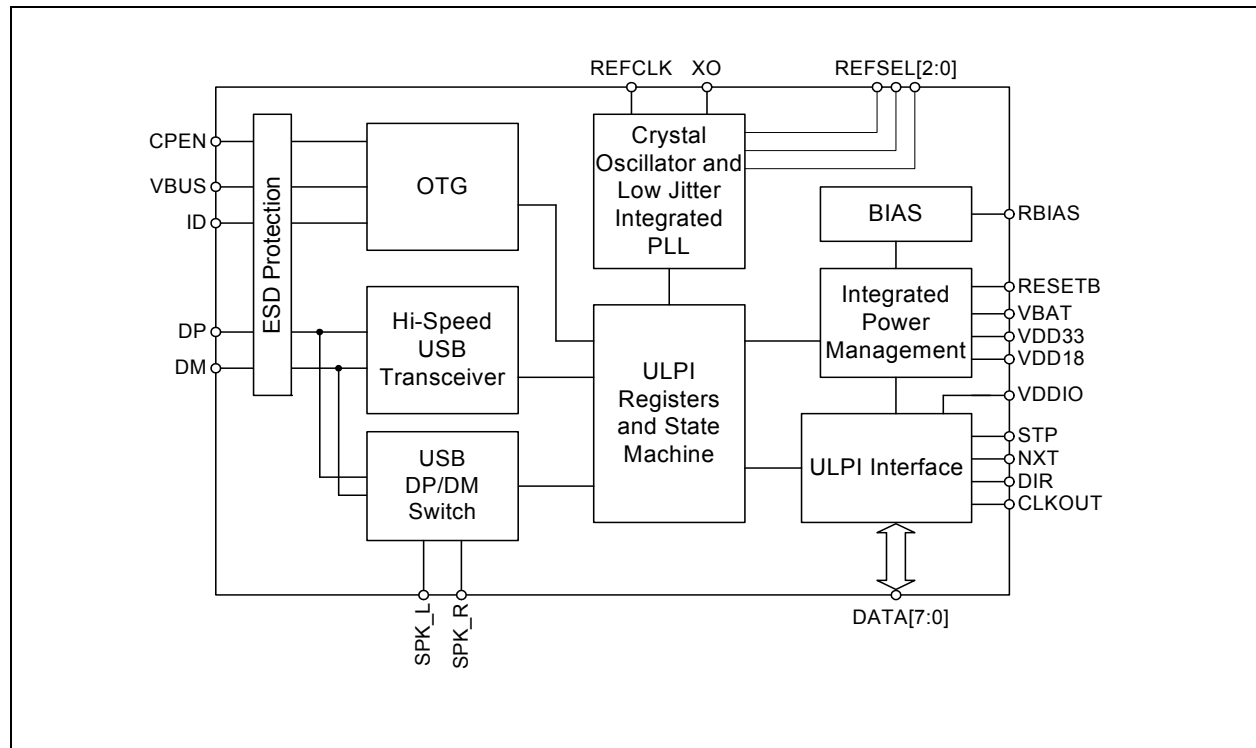


Figure 1 USB3320 Block Diagram

The USB3320 includes an integrated 3.3V Low Drop Out (LDO) regulator that may optionally be used to generate 3.3V from power applied at the **VBAT** pin. The voltage on the **VBAT** pin can range from 3.1 to 5.5V. The regulator dropout voltage is less than 100mV which allows the transceiver to continue USB signaling when the voltage on **VBAT** drops to 3.1V. The USB transceiver will continue to operate at lower voltages, although some parameters may be outside the limits of the USB specifications. If the user would like to provide a 3.3V supply to the USB3320, the **VBAT** and **VDD33** pins should be connected together.

The USB3320 also includes integrated pull-up resistors that can be used for detecting the attachment of a USB Charger. By sensing the attachment to a USB Charger, a product using the USB3320 can charge its battery at more than the 500mA allowed when charging from a USB Host. Please see SMSC Application Note AN 19.7 - Battery Charging Using SMSC USB Transceivers for more information on battery charging.

In USB UART mode, the USB3320 **DP** and **DM** pins are redefined to enable pass-through of asynchronous serial data. The USB3320 can only enter UART mode when the user programs the part into this mode.

In USB audio mode, a switch connects the **DP** pin to the **SPK_R** pin, and another switch connects the **DM** pin to the **SPK_L** pin. The USB3320 can be configured to enter USB audio mode. In addition, these switches are on when the **RESETB** pin of the USB3320 is asserted. The USB audio mode enables audio signalling from a single USB port of connection, and the switches may also be used to connect Full Speed USB from another transceiver onto the USB cable.

Package Outline

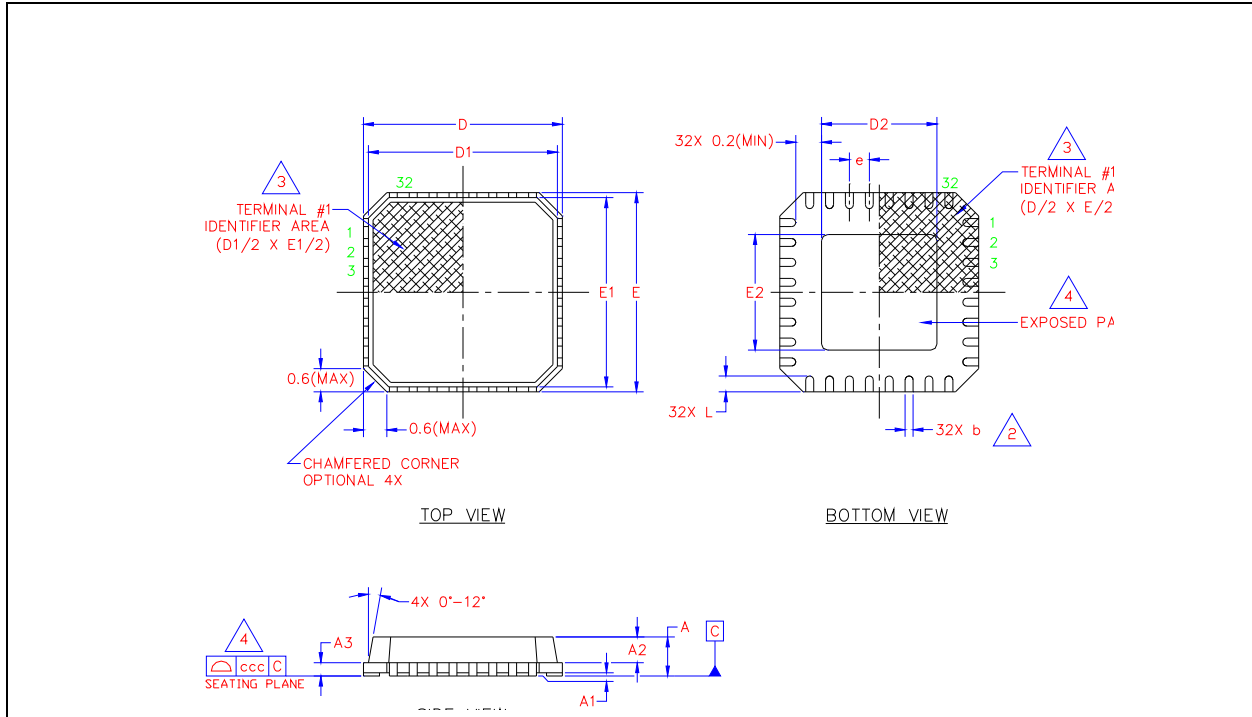


Figure 2 USB3320 32 Pin QFN Package Outline, 5 x 5 x 0.9 mm Body (Lead-Free)

Table 1 32 Terminal QFN Package Parameters

	MIN	NOMINAL	MAX	REMARKS
A	0.70	~	1.00	Overall Package Height
A1	0	0.02	0.05	Standoff
A2	~	~	0.90	Mold Thickness
A3	0.20 REF			Copper Lead-frame Substrate
D	4.85	5.0	5.15	X Overall Size
D1	4.55	~	4.95	X Mold Cap Size
D2	3.15	3.3	3.45	X exposed Pad Size
E	4.85	5.0	5.15	Y Overall Size
E1	4.55	~	4.95	Y Mold Cap Size
E2	3.15	3.3	3.45	Y exposed Pad Size
L	0.30	~	0.50	Terminal Length
e	0.50 BSC			Terminal Pitch
b	0.18	0.25	0.30	Terminal Width
ccc	~	~	0.08	Coplanarity

Notes:

- Controlling Unit: millimeter.
- Dimension b applies to plated terminals and is measured between 0.15mm and 0.30mm from the terminal tip. Tolerance on the true position of the leads is ± 0.05 mm at maximum material conditions (MMC).
- Details of terminal #1 identifier are optional but must be located within the zone indicated.
- Coplanarity zone applies to exposed pad and terminals.