

## USB3503



# USB 2.0 HSIC High-Speed Hub Controller Optimized for Portable Applications

## PRODUCT FEATURES

Data Brief

### Features

- Integrated USB 2.0 Compatible 3-Port Hub.
  - HSIC Upstream Port
  - Advanced power saving features
    - 1  $\mu$ A Typical Standby Current
    - Port goes into power saving state when no devices are connected downstream
    - Port is shutdown when port is disabled.
    - Digital core shut down in Standby Mode
  - Supports either Single-TT or Multi-TT configurations for Full-Speed and Low-Speed connections.
  - Enhanced configuration options available through serial I2C Slave Port
    - VID/PID/DID
    - String Descriptors
    - Configuration options for Hub.
  - Internal Default configuration option when serial I2C host not available.
  - MultiTRAK<sup>™</sup>
    - Dedicated Transaction Translator per port.
  - PortMap
    - Configurable port mapping and disable sequencing.
  - PortSwap
    - Configurable differential intra-pair signal swapping.
  - PHYBoost<sup>™</sup>
    - Programmable USB transceiver drive strength for recovering signal integrity
  - VariSense<sup>™</sup>
    - Programmable USB receiver sensitivity
  - flexPWR<sup>®</sup> Technology
    - Low current design ideal for battery powered applications
    - Internal supply switching provides low power modes
  - External 12, 19.2, 24, 25, 26, 27, 38.4, or 52 MHz clock input
  - Internal 3.3V & 1.2V Voltage Regulators for single supply operation.
    - External VBAT and 1.8V dual supply input option
  - Internal Short Circuit protection of USB differential signal pins.
- USB Port ESD Protection (**DP/DM**)
    - $\pm 15$ kV (air and contact discharge)
    - IEC 61000-4-2 level 4 ESD protection without external devices
  - 25-pin WLCS (1.97mm x 1.97mm Wafer Level Chip Scale) Package - 0.4mm ball pitch

### Applications

The USB3503 is targeted for applications where more than one USB port is required. As mobile devices add more features and the systems become more complex it is necessary to have more than one USB port to take communicate with the internal and peripheral devices.

- Mobile Phones
- Tablet Computers
- Ultra Mobile PCs
- Digital Still Cameras
- Digital Video Camcorders
- Gaming Consoles
- PDAs
- Portable Media Players
- GPS Personal Navigation Devices
- Media Players/Viewers

**Order Number(s):**

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE TYPE	REEL SIZE
USB3503A-1-GL-TR	0C to 70C	25-Ball WLCSP	3000 pieces
USB3503AI-1-GL-TR	-40C to 85C	25-Ball WLCSP	3000 pieces

**This product meets the halogen maximum concentration values per IEC61249-2-21  
For RoHS compliance and environmental information, please visit [www.smsc.com/rohs](http://www.smsc.com/rohs)**

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## General Description

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The SMSC USB3503 is a low-power, USB 2.0 hub controller with HSIC upstream connectivity and three USB 2.0 downstream ports. The USB3503 operates as a hi-speed hub and supports low-speed, full-speed, and hi-speed downstream devices on all of the enabled downstream ports.

The USB3503 has been specifically optimized for mobile embedded applications. The pin-count has been reduced by optimizing the USB3503 for mobile battery-powered embedded systems where power consumption, small package size, and minimal BOM are critical design requirements. Standby mode power has been minimized. Instead of a dedicated crystal, reference clock inputs are aligned to mobile applications. Flexible integrated power regulators ease integration into battery powered devices. All required resistors on the USB ports are integrated into the hub. This includes all series termination resistors on D+ and D- pins and all required pull-down resistors on D+ and D- pins.

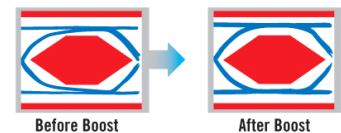
The USB3503 includes programmable features such as:

**MultiTRAK™ Technology**, which utilizes a dedicated Transaction Translator (TT) per port to maintain consistent full-speed data throughput regardless of the number of active downstream connections. MultiTRAK™ outperforms conventional USB 2.0 hubs with a single TT in USB full-speed data transfers.

**PortMap**, which provides flexible port mapping and disable sequences. The downstream ports of a USB3503 hub can be reordered or disabled in any sequence to support multiple platform designs with minimum effort. For any port that is disabled, the USB3503 hub controllers automatically reorder the remaining ports to match the USB host controller's port numbering scheme.

**PortSwap**, which adds per-port programmability to USB differential-pair pin locations. PortSwap allows direct alignment of USB signals (D+/D-) to connectors to avoid uneven trace length or crossing of the USB differential signals on the PCB.

**PHYBoost**, which provides programmable levels of Hi-Speed USB signal drive strength in the downstream port transceivers. PHYBoost attempts to restore USB signal integrity in a compromised system environment. The graphic on the right shows an example of Hi-Speed USB eye diagrams before and after PHYBoost signal integrity restoration.



**VariSense**, which controls the USB receiver sensitivity enabling programmable levels of USB signal receive sensitivity. This capability allows operation in a sub-optimal system environment, such as when a captive USB cable is used.

## Customer Selectable Features

A default configuration is available in the USB3503 following a reset. This configuration may be sufficient for most applications. The USB3503 hub may also be configured by an external microcontroller. When using the microcontroller interface, the hub appears as an I<sup>2</sup>C slave device.

The USB3503 hub supports customer selectable features including:

- Optional customer configuration via I<sup>2</sup>C.
- Supports compound devices on a port-by-port basis.
- Customizable vendor ID, product ID, and device ID.
- Configurable downstream port power-on time reported to the host.
- Supports indication of the maximum current that the hub consumes from the USB upstream port.
- Supports Indication of the maximum current required for the hub controller.
- Configurable as a either a Self-Powered or Bus-Powered Hub
- Supports custom string descriptors (up to 30 characters):
  - Product string
  - Manufacturer string
  - Serial number string
- When available, I<sup>2</sup>C configurable options for default configuration may include:
  - Downstream ports as non-removable ports
  - Downstream ports as disabled ports
  - USB signal drive strength
  - USB receiver sensitivity
  - USB differential pair pin location

## Block Diagram

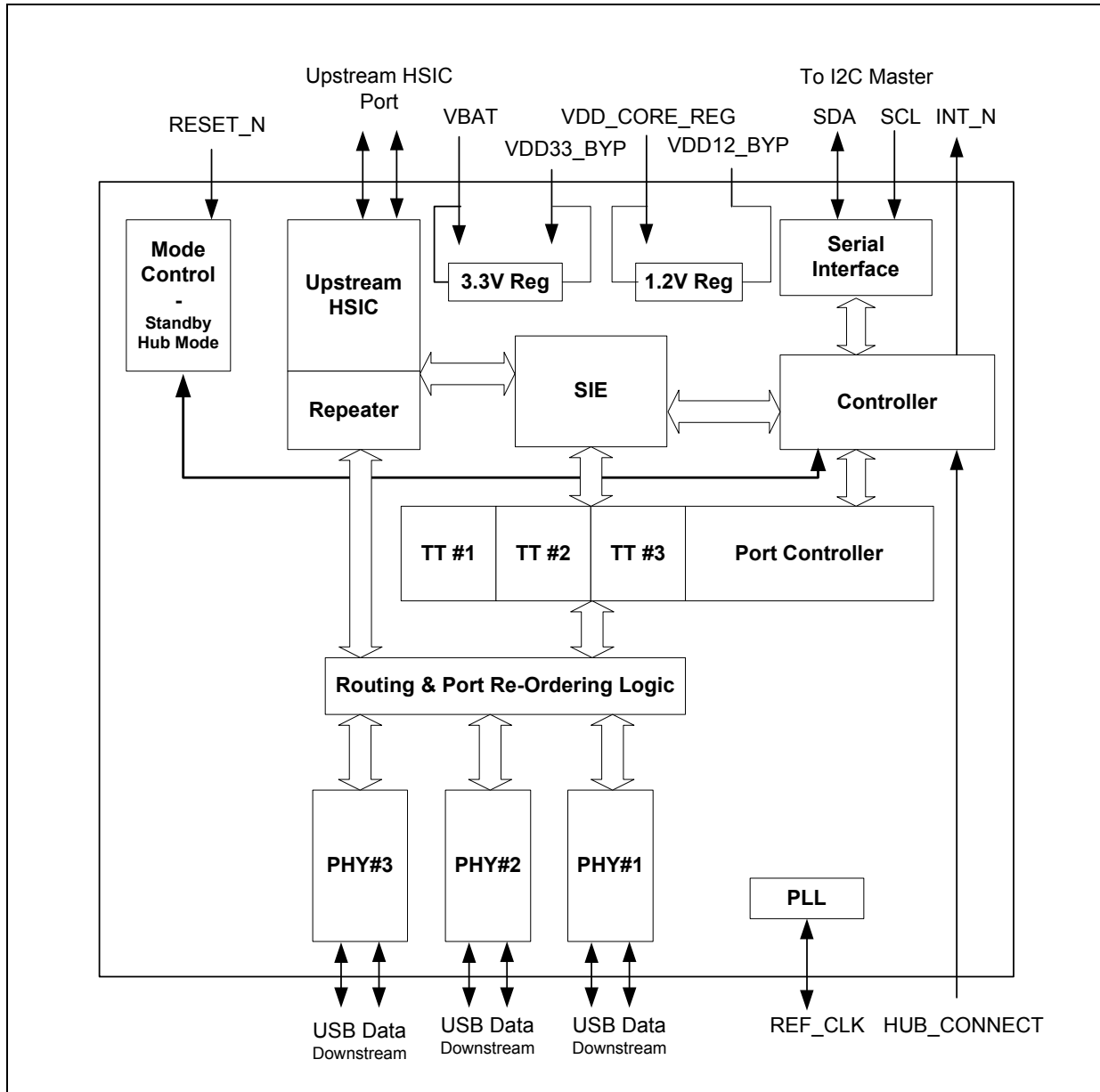


Figure 1 USB3503 Block Diagram

# Package Outline

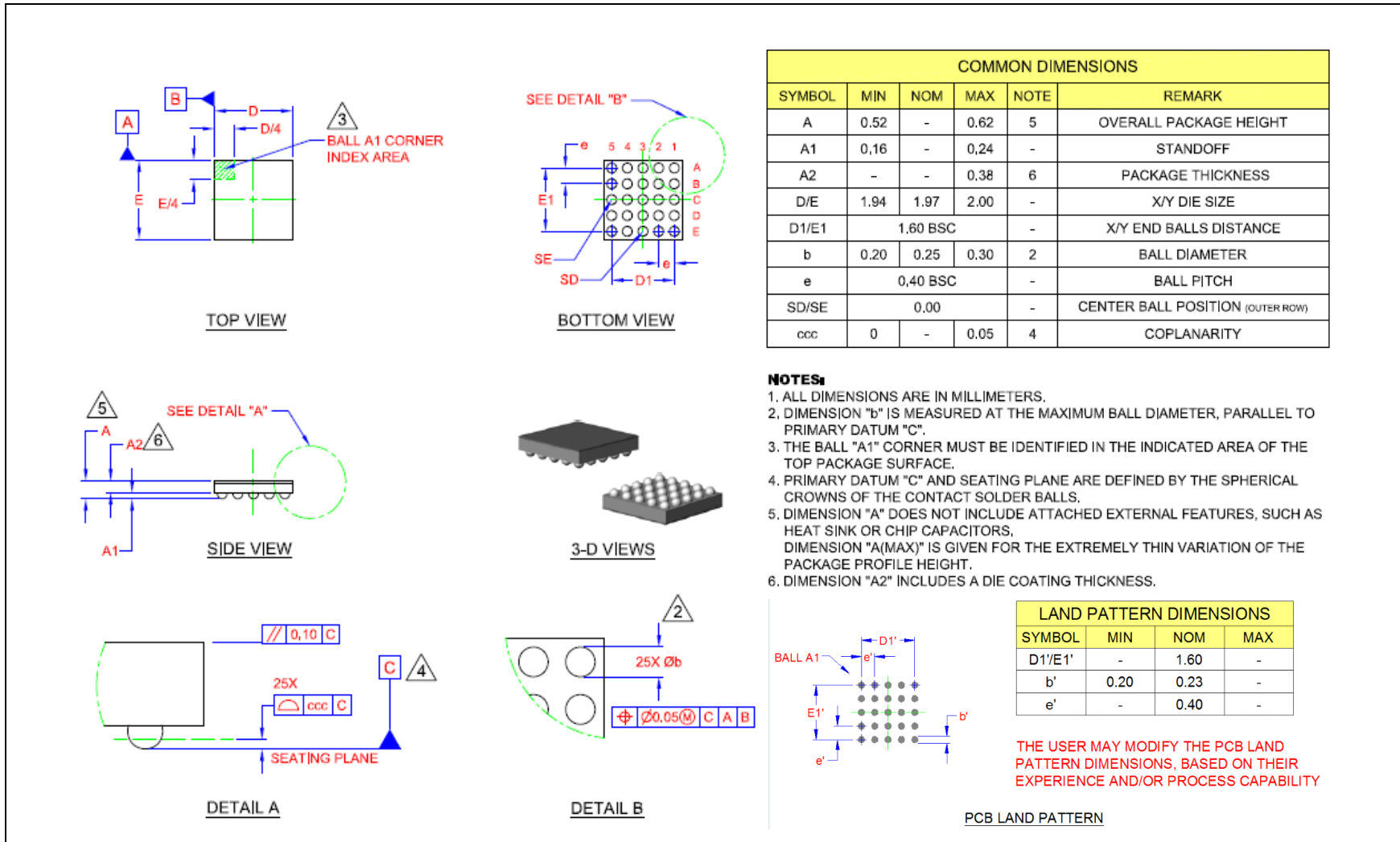


Figure 2 WLCSP25, 1.97x1.97mm Body, 0.4mm Pitch

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