USB4604

USB 2.0 HSIC Hi-Speed 4-Port Hub Controller

PRODUCT FEATURES

Data Brief

Highlights

- Hub Controller IC with 4 downstream ports
- High-Speed Inter-Chip (HSIC) support
  - — Upstream port selectable between HSIC or USB 2.0
- USB-IF Battery Charger revision 1.2 support on up & downstream ports (DCP, CDP, SDP)
- Battery charging support for Apple® devices
- **FlexConnect**: Downstream port 1 able to swap with upstream port, allowing master capable devices to control other devices on the hub
- USB to I²C™/SPI bridge endpoint support
- USB Link Power Management (LPM) support
- SUSPEND pin for remote wakeup indication to host
- Start Of Frame (SOF) synchronized clock output pin
- Vendor Specific Messaging (VSM) support
- Enhanced OEM configuration options available through OTP or SMBus Slave Port
- Flexible power rail support
  - — VBUS or VBAT only operation
  - — 3.3V only operation
  - — VBAT + 1.8V operation
  - — 3.3V + 1.8V operation
- 48-pin (7x7mm) SQFN, RoHS compliant package

Target Applications

- LCD monitors and TVs
- Multi-function USB peripherals
- PC mother boards
- Set-top boxes, DVD players, DVR/PVR
- Printers and scanners
- PC media drive bay
- Portable hub boxes
- Mobile PC docking
- Embedded systems

Additional Features

- **MultiTRAK**™
  - — Dedicated Transaction Translator per port
- **PortMap**
  - — Configurable port mapping and disable sequencing
- **PortSwap**
  - — Configurable differential intra-pair signal swapping
- **PHYBoost**™
  - — Programmable USB transceiver drive strength for recovering signal integrity
- **VariSense**™
  - — Programmable USB receiver sensitivity
- Low power operation
- Full Power Management with individual or ganged power control of each downstream port
- Built-in Self-Powered or Bus-Powered internal default settings provide flexibility in the quantity of USB expansion ports utilized without redesign
- Supports “Quad Page” configuration OTP flash
  - — Four consecutive 200 byte configuration pages
- Fully integrated USB termination and Pull-up/Pull-down resistors
- On-chip Power On Reset (POR)
- Internal 3.3V and 1.2V voltage regulators
- On Board 24MHz Crystal Driver, Resonator, or External 24MHz clock input
- USB host/device speed indicator. Per-port 3-color LED drivers indicate the speed of USB host and device connection - hi-speed (480 Mbps), full-speed (12 Mbps), low-speed (1.5 Mbps)
- Environmental
  - — Commercial temperature range support (0ºC to 70ºC)
  - — Industrial temperature range support (-40ºC to 85ºC)

PRODUCT PREVIEW

Order Number(s):

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE TYPE
USB4604-1080HN	0°C to +70°C	48-pin SQFN
USB4604-1080HN-TR	0°C to +70°C	48-pin SQFN (Tape & Reel)
USB4604i-1080HN	-40°C to +85°C	48-pin SQFN
USB4604i-1080HN-TR	-40°C to +85°C	48-pin SQFN (Tape & Reel)

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

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

General Description

The SMSC USB4604 is a low-power, OEM configurable, MTT (Multi-Transaction Translator) USB 2.0 hub controller with 4 downstream ports and advanced features for embedded USB applications. The USB4604 is fully compliant with the USB 2.0 Specification, USB 2.0 Link Power Management Addendum, High-Speed Inter-Chip (HSIC) USB Electrical Specification Revision 1.0, and will attach to an upstream port as a Full-Speed hub or as a Full-/Hi-Speed hub. The 4-port hub supports Low-Speed, Full-Speed, and Hi-Speed (if operating as a Hi-Speed hub) downstream devices on all of the enabled downstream (non-HSIC) ports. HSIC ports support only Hi-Speed operation.

The USB4604 has been specifically optimized for embedded systems where high performance, and minimal BOM costs are critical design requirements. Standby mode power has been minimized and reference clock inputs can be aligned to the customer's specific application. Flexible power rail options ease integration into energy efficient designs by allowing the USB4604 to be powered in a single-source (VBUS, VBAT, 3.3V) or a dual-source (VBAT + 1.8, 3.3V + 1.8) configuration. Additionally, all required resistors on the USB ports are integrated into the hub, including all series termination and pull-up/pull-down resistors on the D+ and D– pins.

The USB4604 supports both upstream battery charger detection and downstream battery charging. The USB4604 integrated battery charger detection circuitry supports the USB-IF Battery Charging (BC1.2) detection method and most Apple devices. These circuits are used to detect the attachment and type of a USB charger and provide an interrupt output to indicate charger information is available to be read from the device's status registers via the serial interface. The USB4604 provides the battery charging handshake and supports the following USB-IF BC1.2 charging profiles:

- DCP: Dedicated Charging Port (Power brick with no data)
- CDP: Charging Downstream Port (1.5A with data)
- SDP: Standard Downstream Port (0.5A with data)
- Custom profiles loaded via SMBus or OTP

The USB4604 provides an additional USB endpoint dedicated for use as a USB to I^2C/SPI interface, allowing external circuits or devices to be monitored, controlled, or configured via the USB interface. Additionally, the USB4604 includes many powerful and unique features such as:

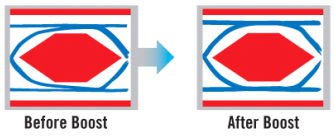
FlexConnect, which provides flexible connectivity options. The USB4604's downstream port 1 can be swapped with the upstream port, allowing master capable devices to control other devices on the hub.

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 USB4604 hub can be reordered or disabled in any sequence to support multiple platform designs with minimum effort. For any port that is disabled, the USB4604 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.

The USB4604 is available in commercial (0°C to +70°C) and industrial (-40°C to +85°C) temperature range versions.

Figure 1 details the internal block diagram of the USB4604.

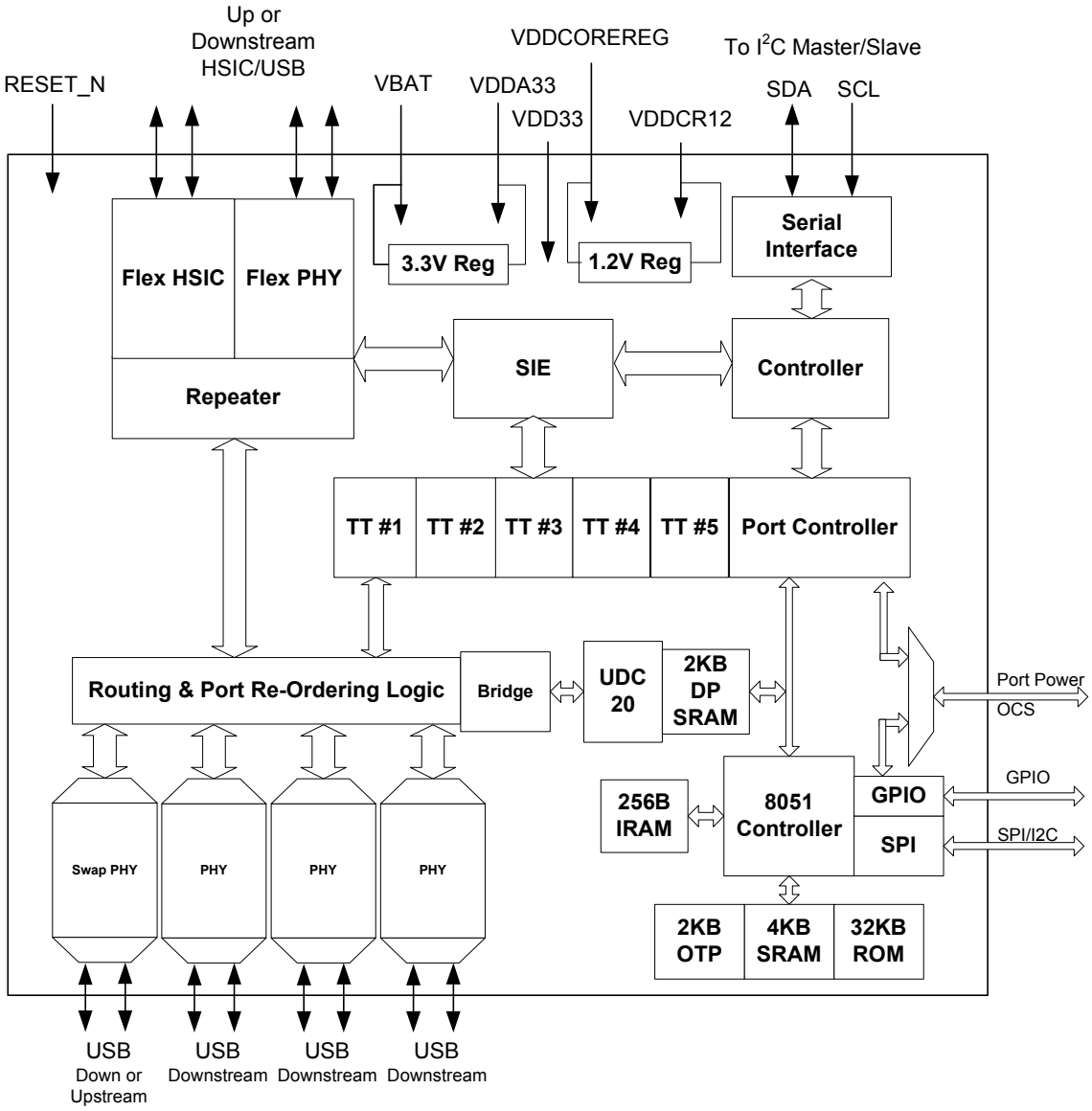


Figure 1 System Block Diagram

Package Outline

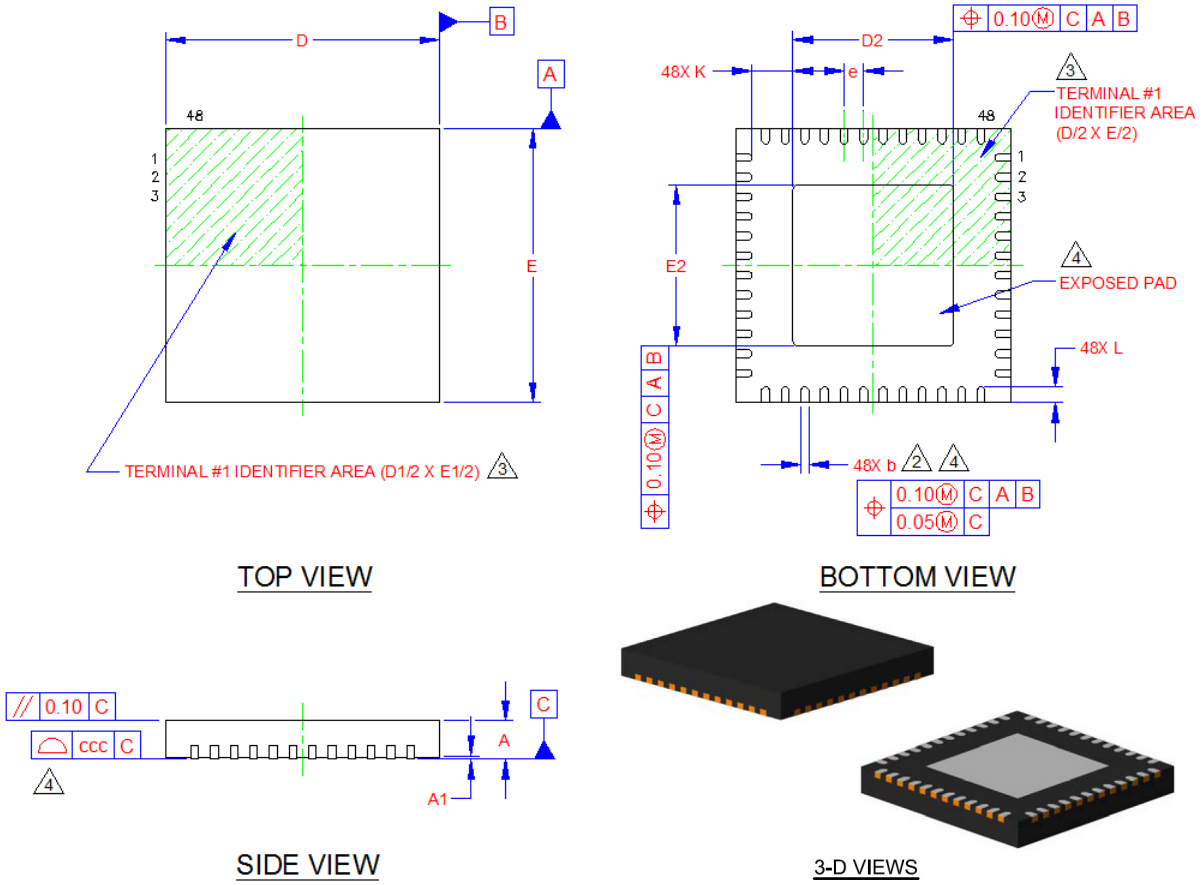


Figure 2 48-SQFN Package Drawing

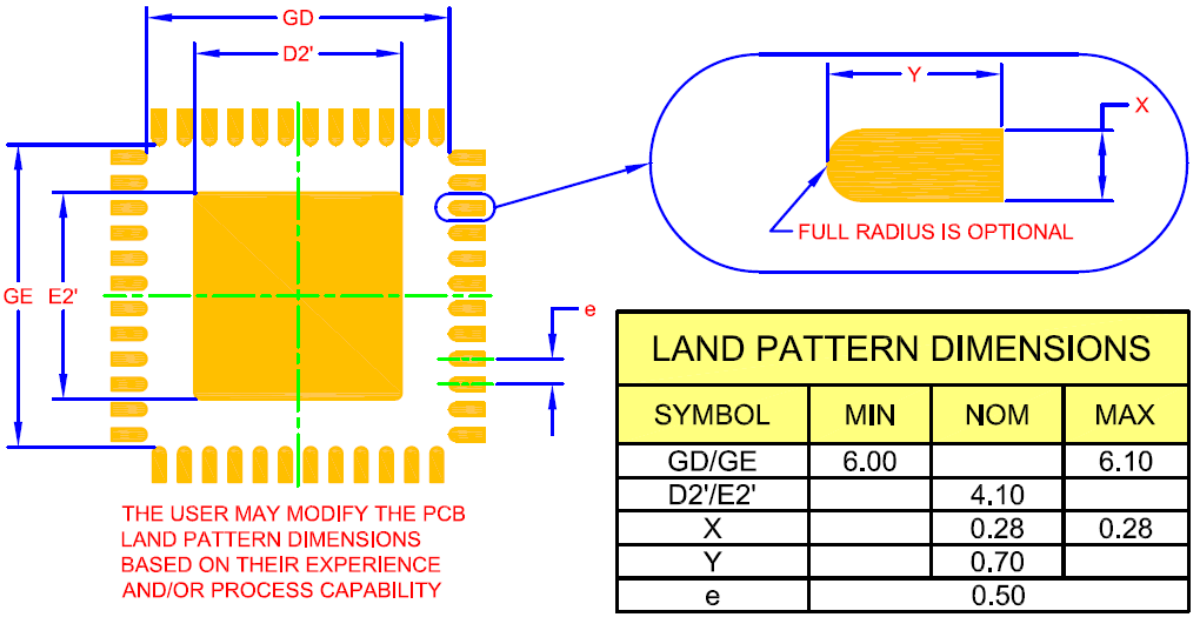
Figure 3 48-SQFN Package Dimensions

	MIN	NOMINAL	MAX	REMARKS
A	0.80	0.90	1.00	Overall Package Height
A1	0	0.02	0.05	Standoff
D/E	6.90	7.00	7.10	X/Y Body Size
D2/E2	4.00	4.10	4.20	X/Y Exposed Pad Size
L	0.30	0.40	0.50	Terminal Length
b	0.18	0.25	0.30	Terminal Width
k	0.95	1.05	-	Terminal to Exposed Pad Clearance
ccc	-	-	0.08	Coplanarity
e		0.50 BSC		Terminal Pitch

Notes:

1. All dimensions are in millimeters unless otherwise noted.
2. Dimension “b” applies to plated terminals and is measured between 0.15 and 0.30 mm from the terminal tip.

3. The pin 1 identifier may vary, but is always located within the zone indicated.
4. Coplanarity zone applies to exposed pad and terminals.



LAND PATTERN DIMENSIONS			
SYMBOL	MIN	NOM	MAX
GD/GE	6.00		6.10
D2'/E2'		4.10	
X		0.28	0.28
Y		0.70	
e		0.50	

Figure 4 48-SQFN Package Recommended Land Pattern

PRODUCT PREVIEW