



USB2504/USB2504A



## Integrated USB2.0 Compatible 4-Port Hub

### PRODUCT FEATURES

### Data Brief

- Integrated USB2.0 Compatible 4-Port Hub
  - 4 Transaction Translators for highest performance
  - High-Speed (480Mbps/s), Full-Speed (12Mbps/s) and Low-Speed (1.5Mbps/s) compatible
  - Full power management with per port or ganged, selectable power control
  - Detects Bus-Power/Self-Power source and changes mode automatically
- Complete USB Specification 2.0 Compatibility
  - Includes USB2.0 Transceivers
- VID/PID/DID, and Port Configuration for Hub via:
  - Single Serial I<sup>2</sup>C EEPROM
  - SMBus Slave Port
- Default VID/PID/DID, allows functionality when configuration EEPROM is absent
- Hardware Strapping options allow for configuration without an external EEPROM or SMBus Host
- On-Board 24MHz Crystal Driver Circuit or 24 MHz external clock driver
- Internal PLL for 480MHz USB2.0 Sampling
- Internal 1.8V Linear Voltage Regulator
- Integrated USB termination and Pull-up/Pull-down resistors
- Internal Short Circuit protection of USB differential signal pins
- 1.8 Volt Low Power Core Operation
- 3.3 Volt I/O with 5V Input Tolerance
- 64-Pin TQFP or 56 Pin QFN Package; green, lead-free package also available

**ORDER NUMBER(S):**

**USB2504/USB2504A-JD FOR 64 PIN TQFP PACKAGE, USB2504/USB2504A-ABZJ FOR 56 PIN QFN PACKAGE AND  
USB2504/USB2504A-JT FOR 64 PIN TQFP PACKAGE (GREEN, LEAD-FREE)**



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## General Description

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The SMSC 4-Port Hub is fully compliant with the USB2.0 Specification and will attach to a USB host as a Full-Speed Hub or as a Full-/High-Speed Hub. The 4-Port Hub supports Low-Speed, Full-Speed, and High-Speed (if operating as a High-Speed Hub) downstream devices on all of the enabled downstream ports.

A dedicated Transaction Translator (TT) is available for each downstream facing port. This architecture ensures maximum USB throughput for each connected device when operating with mixed-speed peripherals.

The Hub works with an external USB power distribution switch device to control  $V_{BUS}$  switching to downstream ports, and to limit current and sense over-current conditions.

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 and pull-up resistors on D+ and D- pins. The over-current sense inputs for the downstream facing ports have internal pull-up resistors.

Throughout this document the upstream facing port of the hub will be referred to as the upstream port, and the downstream facing ports will be called the downstream ports.

## OEM Selectable Features

A default configuration is available in the USB2504/USB2504A following a reset. This configuration may be sufficient for some applications. Strapping option pins make it possible to modify a limited subset of the configuration options.

The USB2504/USB2504A may also be configured by an external EEPROM or a microcontroller. When using the microcontroller interface, the Hub appears as an SMBus slave device. If the Hub is pin-strapped for external EEPROM configuration but no external EEPROM is present, then a value of '0' will be written to all configuration data bit fields (the hub will attach to the host with all '0' values).

The 4-Port Hub supports several OEM selectable features:

- Operation as a Self-Powered USB Hub or as a Bus-Powered USB Hub.
- Operation as a Dynamic-Powered Hub (Hub operates as a Bus-Powered device if a local power source is not available and switches to Self-Powered operation when a local power source is available).
- Multiple Transaction Translator (Multi-TT) or Single-TT support.
- Optional OEM configuration via I2C EEPROM or via the industry standard SMBus interface from an external SMBus Host.
- Port power switching on an individual or ganged basis.
- Port over-current monitoring on an individual or ganged basis.
- LED indicator support.
- Compound device support (port is permanently hardwired to a downstream USB peripheral device).
- Hardware strapping options enable configuration of the following features.
  - Non-Removable Ports
  - Port Power Polarity (active high or active low logic)
  - Port Disable
  - LED support
  - MTT enable
  - Ganged Vs Port power switching and over-current sensing

# Block Diagram

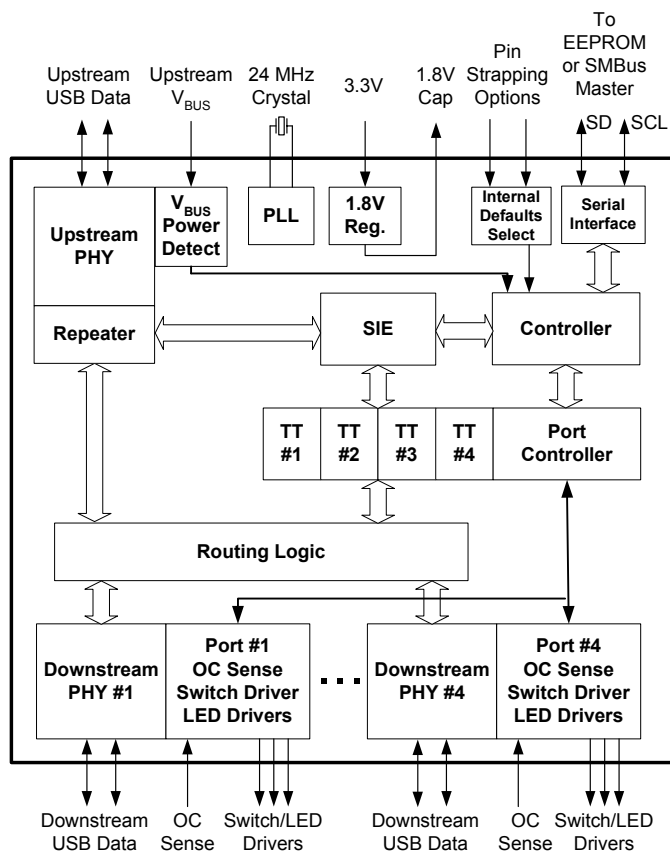
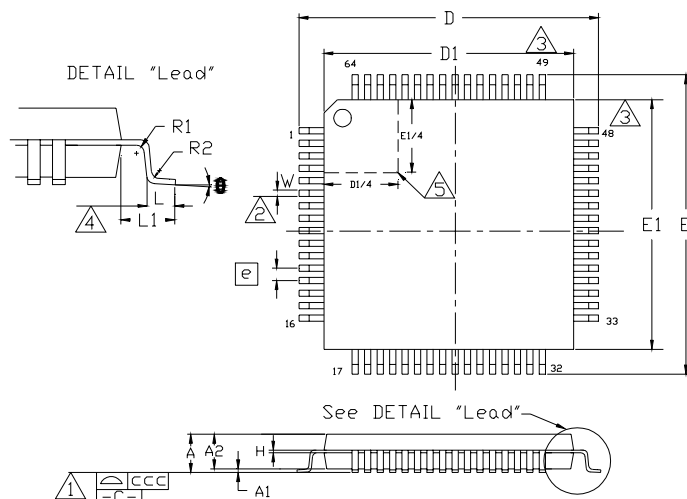


Figure 1 4-Port Block Diagram

## Package Outlines



**Figure 2 64 Pin TQFP Package Outline (10x10x1.4 mm body - 2 mm footprint)**

**Table 1 64 Pin TQFP Package Parameters**

	MIN	NOMINAL	MAX	REMARKS
A	~	~	1.60	Overall Package Height
A1	0.05	~	0.15	Standoff
A2	1.35	~	1.45	Body Thickness
D	11.80	~	12.20	X Span
D1	9.80	~	10.20	X body Size
E	11.80	~	12.20	Y Span
E1	9.80	~	10.20	Y body Size
H	0.09	~	0.20	Lead Frame Thickness
L	0.45	0.60	0.75	Lead Foot Length
L1	~	1.00	~	Lead Length
e	0.50 Basic			Lead Pitch
q	0°	~	7°	Lead Foot Angle
W	0.17	0.22	0.27	Lead Width
R1	0.08	~	~	Lead Shoulder Radius
R2	0.08	~	0.20	Lead Foot Radius
ccc	~	~	0.08	Coplanarity

**Notes:**

- Controlling Unit: millimeter.
- Tolerance on the true position of the leads is  $\pm 0.04$  mm maximum.
- Package body dimensions D1 and E1 do not include the mold protrusion.  
Maximum mold protrusion is 0.25 mm per side.
- Dimension for foot length L measured at the gauge plane 0.25 mm above the seating plane.
- Details of pin 1 identifier are optional but must be located within the zone indicated.

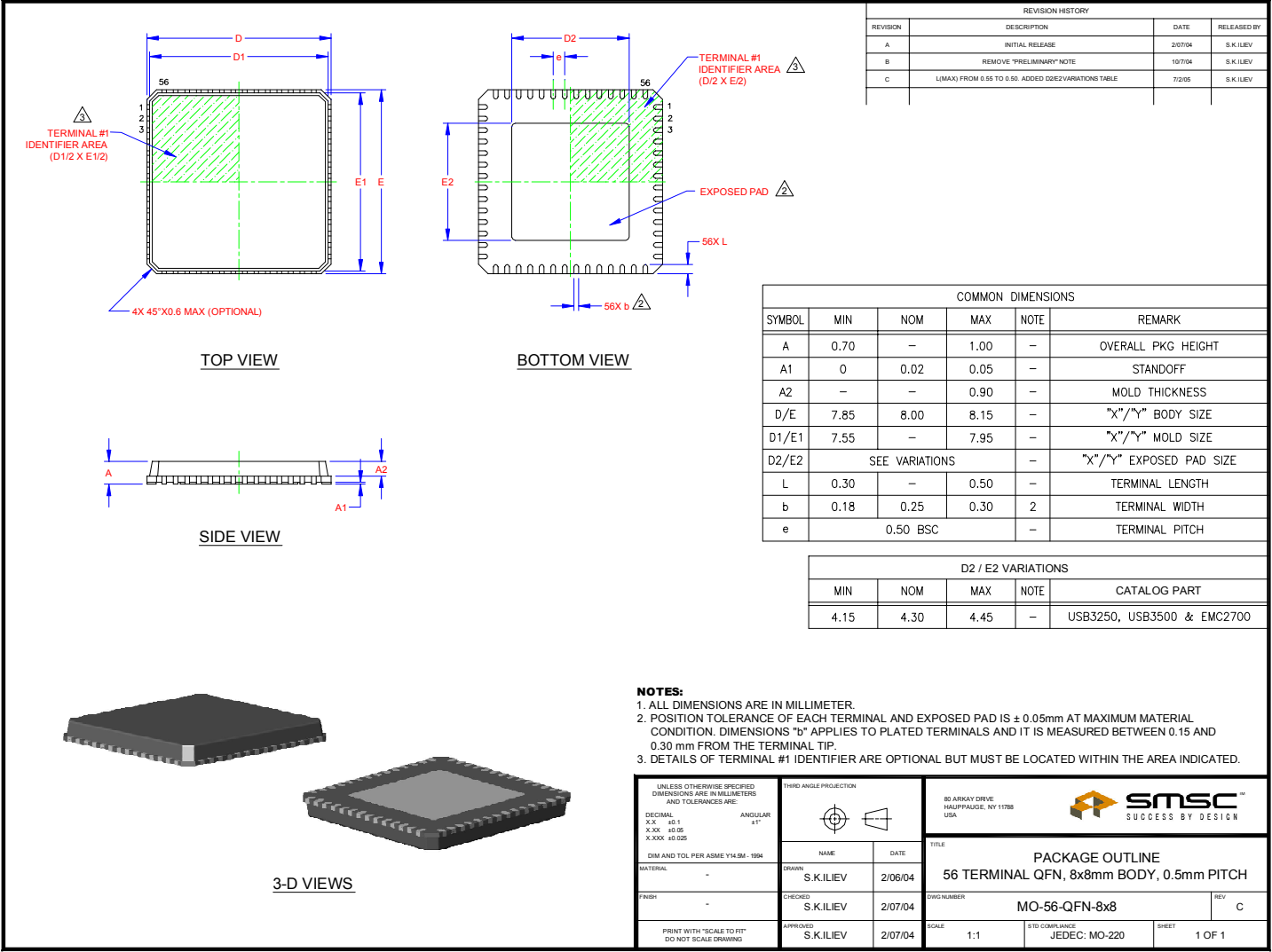


Figure 3 56 Pin QFN Package and Parameters