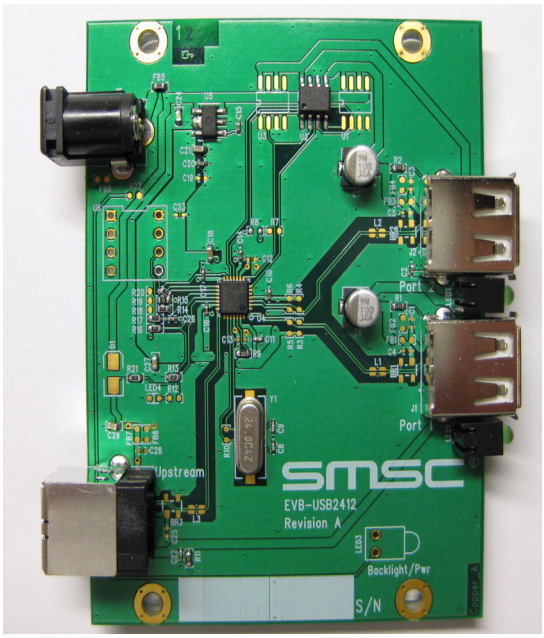
EVB-USB2412, Revision A1 Evaluation Board
User Manual



1 Overview

The SMSC USB2412 hub is a low-power, single transaction translator (STT) hub controller IC with two downstream ports for embedded USB solutions. The SMSC hub controller supports low-speed, full-speed, and hi-speed (if operating as a hi-speed hub) downstream devices on all of the enabled downstream ports. The EVB-USB2412 Evaluation Board demonstrates a stand alone application for the hub with all the features listed below and demonstrates the advanced power saving options and configurable port status.

1.1 Features

- Low pin count USB2412 28 - pin QFN package
- Hi-Speed (480 Mbits/s), Full-Speed (12 Mbits/s), and Low-Speed (1.5 Mbits/s) compatible
- Operates from a single voltage (+5.0 VDC, regulated) 'wall wart' external power supply (Self-powered operation)
  - can be configured for Bus-powered testing by use of a Schottky diode at location D1
- Low cost 4-layer design: two outer signal layers illustrate a two-layer implementation
  - ground inner layers
- Single transaction translator operation
- Supports internal default hub configuration
- Single onboard +3.3 VDC regulator
  - A footprint is provided for alternate regulator for industrial temperature operation
- Single crystal clock source
- Individual port over-current sensing and port power control
- Optional LEDs for port power indication
- Configured to report both down stream ports as removable
  - can be configured to report either, or both, down stream ports as removable
- Additional EMI suppression provided by optional ferrite bead locations
- ESD protection up to 25 kV direct contact to USB signals provided with optional diode bridges and common mode chokes

1.2 General Description

The EVB-USB2412 is a demonstration and low-cost evaluation platform featuring the USB2412 single transaction translator 2-port Low-Power High-Speed USB2.0 Hub. It is designed to robustly demonstrate the unique features of this device using a low-cost printed circuit board (PCB) implementation with individual port power control. The EVB-USB2412 is designed for low cost, power efficient implementation of a Hi-speed USB Hub with minimal bill of materials. Schematics, layout, and bill of materials are included to minimize product development time.

Revision A1 of the EVB-USB2412 has a four-layer PCB to improve coupling between power and ground and to reduce EMI. Since implementations of this device may use two-layer PCBs, the EVB-USB2412 has been designed to illustrate such an implementation with its outer two layers. Many unpopulated (DNP) sites are incorporated to support optional EMI and ESD support components beyond the minimal BOM for proper function.

Revision A1 of the EVB-USB2412 also has an added resistor (R23, 100 Kohms) pull down on NON_REM1 for configuration purposes.

2 Hardware Configuration

2.1 Hardware Description

The EVB-USB2412 has one onboard regulator, which generates +3.3 VDC from a +5.0 VDC power supply. An alternate footprint (U7) was added to support industrial temperature range operation. The alternate footprint supports a larger package and has ties into the ground plane for better thermal dissipation. The USB2412 generates is own PLL and core power rails with individual on chip regulators. No external regulators are needed to support these functions.

The USB2412 Hub consumes power from the +3.3 VDC supply while the MIC2026 Power distribution switch consumes power from the +5.0 VDC supply. The MIC2026 Power distribution switch supplies downstream power to each attached device.

2.1.1 Downstream Ports

Downstream ports are numbered 1 and 2 with individual port power controllers. The port power controllers provide 5 Volt power with over-current protection to the downstream devices. Upstream and downstream port connectors have USB 2.0 compliant decoupling, a separate shield ground, and optional filtering for EMI on signal ground and power. Additional ESD protection for USB signals is provided by optional diode bridges and common mode chokes. This gives protection up to 25 kV direct contact to USB signals.

Optionally, the down stream ports can be strapped to report as removable by changing the resistors installed that configure NON_REM0 and NON_REM1. See the schematic on the CD-ROM included with your EVB-USB2412 for implementation details.

2.1.2 Powered State LED

An optional LED (LED3) indicates when +5.0 VDC power is present.

2.1.3 Port Power LEDs

LED1 and LED2 indicate when port power is available to the associated downstream USB port.

2.1.4 Connector Description

The EVB-USB2412 has a set of standard USB style connectors, one of type B for the upstream port and two of type A for downstream ports. Power is supplied via a 2.1 mm power jack. Table 2.1 lists all of the connectors. For more details on the pinout of these connectors, please see the EVB-USB2412 schematics on the CD-ROM included with your EVB-USB2412.

Table 2.1 Connector Description

CONNECTOR	TYPE	DESCRIPTION
J1	USB A	Downstream USB Port 1
J2	USB A	Downstream USB Port 2
J3	USB B	Upstream USB Port 0
J4	Power Jack 2.1 mm	+5.0 VDC Power Supply

2.1.5 Layout Considerations

The EVB-USB2412 is designed on four PCB layers--two signal layers and two ground layers. The PCB layer stackup is shown in Table 2.2. All signals and power are routed on top and bottom layers, along with ground floods. Internal layers are ground. Note that the differential signals from the USB2412 match the upstream and downstream port placement simplifying the routing of the critical USB signals.

Table 2.2 PCB Layer Stack

COMPONENT SIDE	
Solder mask	
Layer 1	1.8 - 3.1 mil, finished
Pre-preg	4.25 mil, +/- 0.25 mil FR-4
Layer 2 -- GND	1.3 mil (nominal)
Core	~24 mil FR-4
Layer 3 -- GND	1.3 mil (nominal)
Pre-preg	4.25 mil, +/- 0.25 mil FR-4
Layer 4	1.8 - 3.1 mil, finished
Solder mask	
Solder Side	

2.1.6 Layout

The component side (top) layer is shown in Figure 2.1 with silk screen information to identify component locations and illustrate PCB routing and ground treatment. The solder side (bottom) layer is shown in Figure 2.2 to identify the alternate +3.3 Volt regulator location and to illustrate PCB routing and ground treatment.

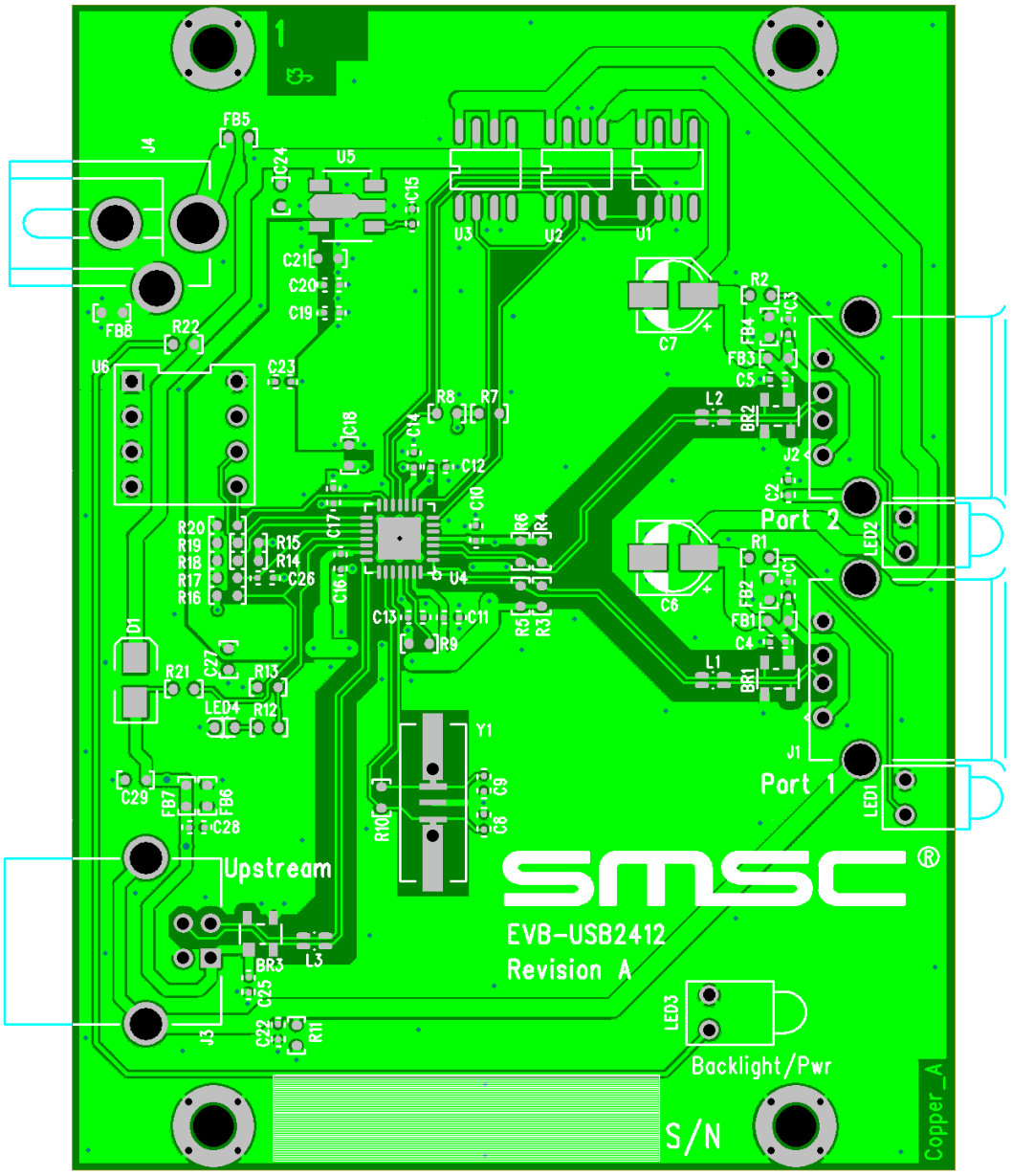


Figure 2.1 EVB-USB2412 Top Layer - Component Side

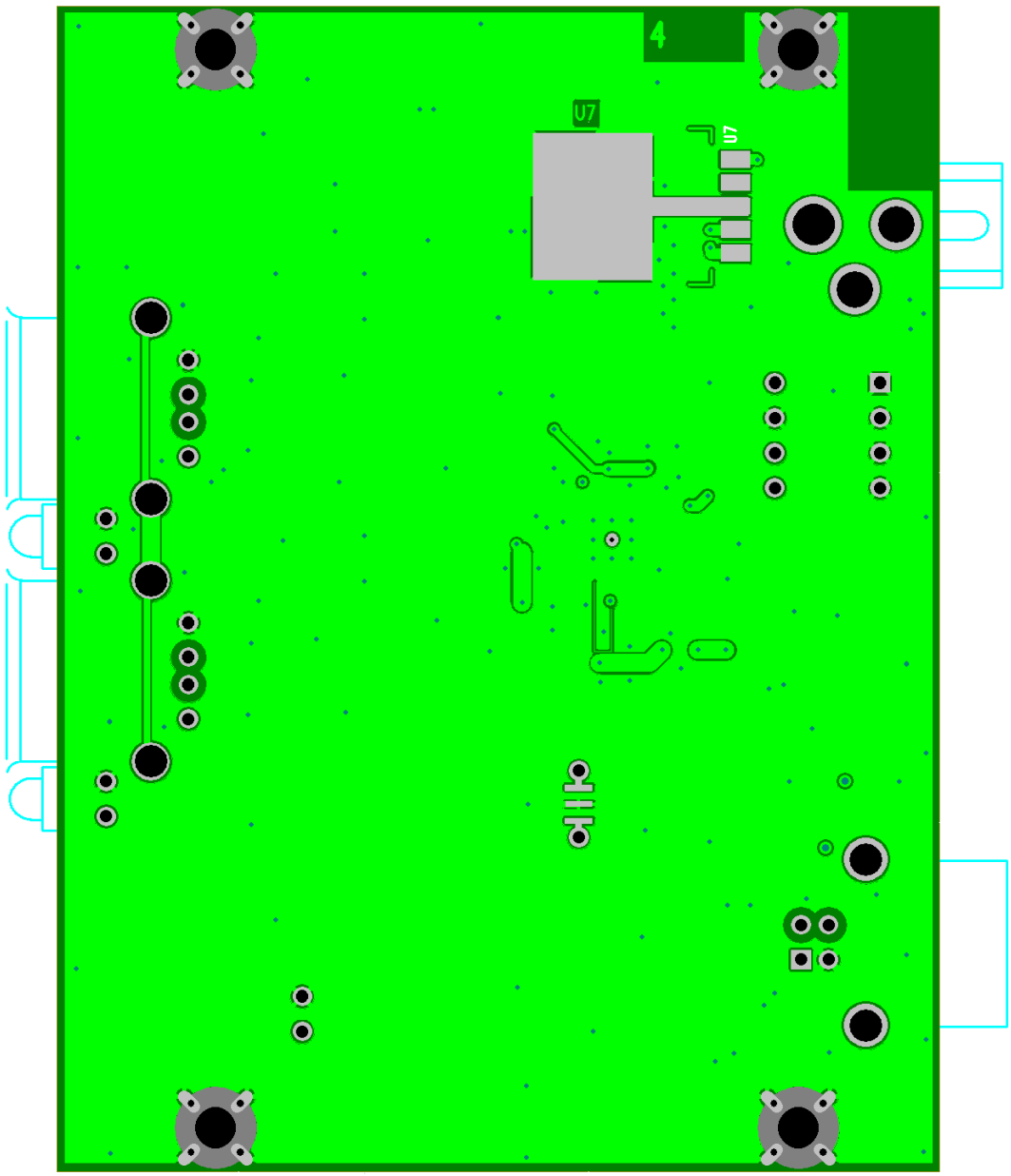


Figure 2.2 EVB_USB2412 Bottom Layer - Solder Side

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