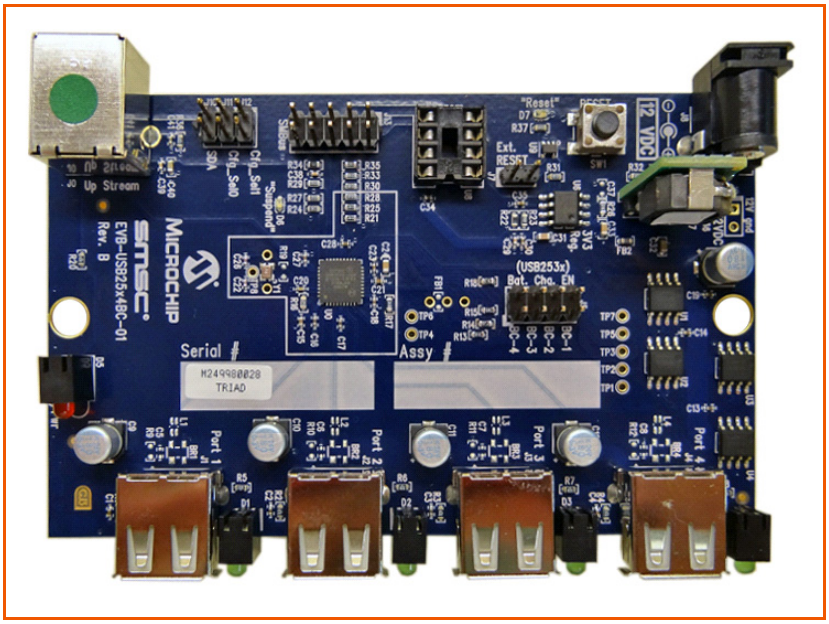
# EVB-USB2534BC-01 Evaluation Board User Manual



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# 1 Overview

The SMSC USB2534 is a Low-Power, Full-Featured, OEM configurable, Hi-Speed USB 2.0 compliant hub with four downstream ports, each capable of supporting battery charging. The EVB-USB2534BC-01 Revision B Evaluation Board demonstrates a standalone hub application with the features listed below, advanced power saving options, and configurable port assignments.

## 1.1 Features

- 36-pin QFN RoHS compliant package.
- Four USB 2.0 downstream hub ports with individual port power and over-current sense (OCS).
- Hi-Speed (480 Mbps), Full-Speed (12 Mbps), and Low-Speed (1.5 Mbps) compatible.
- USB Battery Charging is supported on all downstream USB ports up to 2 A.
- Multi-Transaction Translator is enabled.
- Supports internal default hub configuration. Optionally supports configuration from external EEPROM.
- Low cost 4-Layer space saving design with two outer signal layers, a power inner layer, and a ground inner layer.
- Individual port over-current sensing.
- Individual port power control with LEDs for port power indication.
- Self-powered operation.
- Operates from a single voltage (12.0 VDC, regulated) external power supply.
- External supply provides up to 6 A of 5.0 VDC for system use and USB downstream power through an onboard 5 VDC regulator.
- Onboard MCP1725 3.3 VDC regulator provides power to the USB2534 circuits and RESETn control.
- LED indicator for “Suspend” hub state (optional).
- EMI suppression provided by selection of capacitors and inner power/ground PCB layers.
- ESD component footprints provided (optional).
- Single crystal clock source.
- Schematics, layout, and bill of materials are available to minimize new product development time.

## 1.2 General Description

The EVB-USB2534BC-01 is an evaluation and demonstration platform featuring the USB2534 USB 2.0 Hub on a 4-layer RoHS compliant printed circuit board.

The EVB-USB2534BC-01 is designed to demonstrate the unique features of this device using a low-cost PCB implementation with individual port power control for the downstream USB 2.0 ports. All downstream USB 2.0 ports include a high current port power controller to fully support USB battery charging as a high current walk up port. (Note: Do not exceed 6 A total current consumption from 5 VDC.)

The EVB-USB2534BC-01 is designed to support internal default configuration settings and an external $I^2C^{®1}$ EEPROM (optional) for custom configured functionality. A location is provided for an external $I^2C$ EEPROM device for configuration at U8. Figure 2.1 and Figure 2.2 show the top and bottom level silk screen and copper layers.

1.$I^2C$ is a registered trademark of Philips Corporation.

# 2 Hardware Configuration

## 2.1 Hardware Description

The EVB-USB2534BC-01 includes two onboard regulators. One generates 5 VDC from an external 12 VDC regulated power supply. This supplies power to the downstream USB ports and to the 3.3 VDC regulator. The second is an MCP1725, which generates 3.3 VDC for the hub device circuitry and also performs voltage supervisor and RESETn functions. The USB2534 generates its own 1.2 VDC for internal use with on-chip 1.2 VDC regulators. The internal 1.2 VDC regulator to the oscillator and the PLL is turned off during suspend to minimize suspend current. Downstream port power is distributed by four independent power switches at up to 2 A per port. (Note: Do not exceed 6 A total current consumption from 5 VDC.). Upstream and downstream port connectors have USB 2.0 compliant decoupling and a separate shield ground.

### 2.1.1 Port Assignment

Downstream ports are numbered 1 through 4. The USB2534 allows any or all of the downstream ports to be configured for high current battery USB charging, and the EVB-USB2534BC-01 is designed to demonstrate this feature.

In the default configuration, battery charging can be independently configured for each port with the Battery Charging Strapping header. Battery charging can also be configured using an external configuration, as described below.

### 2.1.2 USB2534 Configuration

**Default**: The EVB-USB2534BC-01 has been set up to support an internal default configuration as determined by the state of the CFG_SEL1, and CFG_SEL0 pins immediately after reset. The vendor ID, product ID, language ID, device ID, and other choices have been set using ROM code defaults.

**EEPROM Option**: The EVB-USB2534BC-01 can load configuration from an external two-wire, $I^2C$ EEPROM (U8). The EEPROM must be installed and the configuration option resistors on the CFG_SEL1 and CFG_SEL0 pins changed to enable this option. The EEPROM may be pre-programmed before installation, or be programmed via the USB Host. This option allows access to all USB2534 configuration registers and ID strings, providing detailed functional analysis and exercise as desired. The EVB-USB2534BC-01 is compatible with $I^2C$ EEPROMs from several manufacturers. The memory capacity must be at least 512 bytes.

### 2.1.3 Powered State LED

An optional LED (D5) indicates when +5 VDC and +3.3 VDC power is present.

### 2.1.4 RESETn LED

An optional LED (D7) indicates when the RESETn signal is driven low and the USB2534 is held in the Reset state.

### 2.1.5 Port Power LEDs

D1, D2, D3, and D4 indicate when 5 VDC port power is available to the associated downstream USB port(s).

### 2.1.6 Suspend LED

An optional LED (D5) indicates the active state of the hub.

### 2.1.7 Connector Description

The EVB-USB2534BC-01 provides a set of standard USB style connectors, one of type B for the upstream port and four of type A for downstream ports. Power is supplied via a 2.5 mm power jack. Table 2.1 lists all of the connectors. For more details on the pinout of these connectors, please refer to the EVB-USB2534BC-01 schematics.

**Table 2.1 Connector Description**

| CONNECTOR | TYPE | DESCRIPTION |
|---|---|---|
| J0 | USB B | Upstream USB Port 0 |
| J1 | USB A | Downstream USB Port 1 |
| J2 | USB A | Downstream USB Port 2 |
| J3 | USB A | Downstream USB Port 3 |
| J4 | USB A | Downstream USB Port 4 |
| J5 | 1x2 header | Battery Charging Strap Selector |
| J6 | 1x2 header (not populated) | Optional Ext. +12 VDC supply header |
| J7 | 1x2 header | External Reset Control |
| J8 | Power Jack 2.5 mm | +12 VDC Regulated Power Supply |
| J10 | 1x2 header | I2C & SMBus Enable |
| J11, J12 | 1x2 headers | Configuration |
| J13 | 2x5 header | SMBus IF connection |

### 2.1.8 Layout Considerations

The EVB-USB2534BC-01 is designed on four PCB layers - two signal layers and two supply layers. The PCB layer stackup is shown in Table 2.2. All signals are routed on the top and bottom layers, while the internal layers are ground and power. Note that the differential signals from the USB2534 neatly fan out to match the upstream and downstream port placement, thus simplifying routing of these critical signals.

**Table 2.2 PCB layer stack**

| **Component Side** | |
|---|---|
| Solder mask | |
| Layer 1 | 1.9 - 2.8 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 -- POWER | 1.3 mil (nominal) |
| Pre-preg | 4.25 mil, +/- 0.25 mil FR-4 |
| Layer 4 | 1.9 - 2.8 mil, finished |
| Solder mask | |
| **Solder Side** | |

Component side top layer is shown in Figure 2.1 with silk screen information to identify component locations.

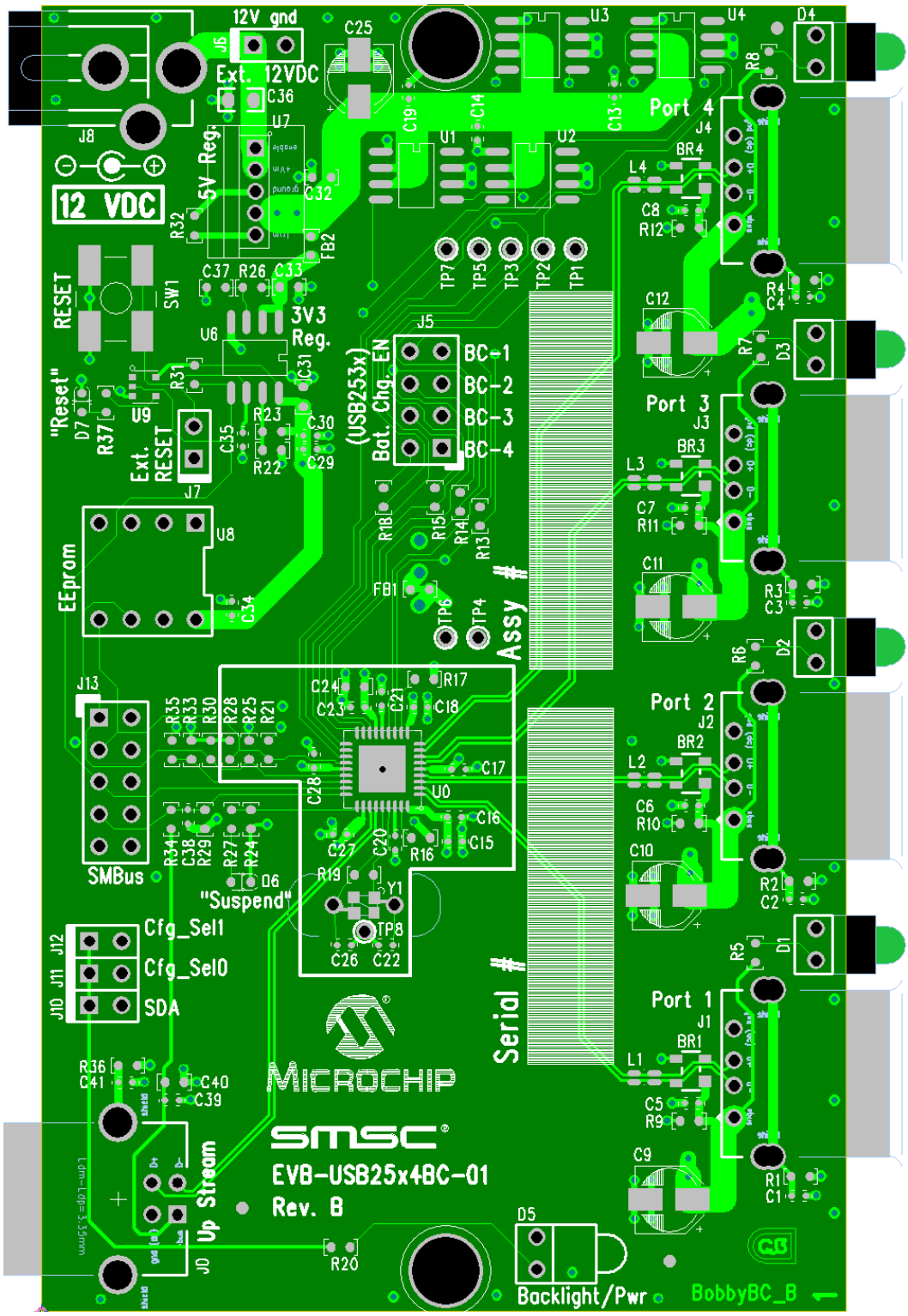


**Figure 2.1 EVB-USB2534BC-01 Top Layer - Component Side**

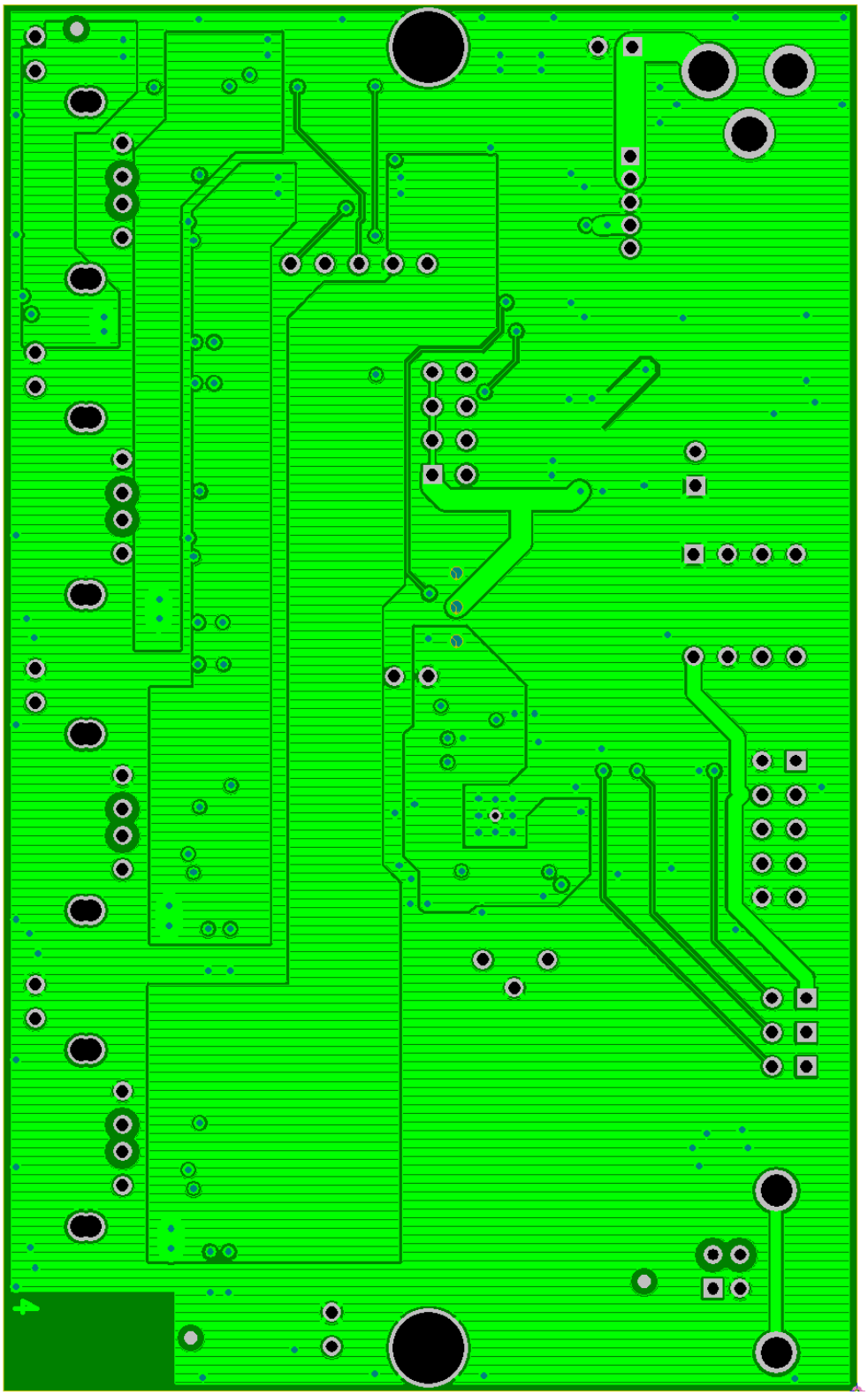

**Figure 2.2 EVB-USB2534BC-01 Bottom Layer - Solder Side**

# 3 User Manual Revision History

**Table 3.1 Customer Revision History**

| REVISION LEVEL & DATE | SECTION/FIGURE/ENTRY | CORRECTION |
|---|---|---|
| Rev. 1.0 (06-24-13) | All | Initial Release |