

## **EVB-USB82514Q36-BAS 36-Pin QFN Evaluation Board User Manual (Revision C)**



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## 1 Overview

The SMSC Automotive Grade USB 2.0 4-Port Hub is designed, fabricated, tested, characterized and qualified for automotive applications. The USB82514 MultiTRAK™ is a low-power, OEM configurable, full featured Hi-Speed USB 2.0 compliant hub controller IC with four down-stream ports for embedded USB solutions. The EVB-USB82514Q36-Bas 36-Pin QFN 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 assignments.

### 1.1 Features

- Low pin count USB82514 36 - pin QFN package
- Hi-Speed (480 Mbits/s), Full-Speed (12 Mbits/s), and Low-Speed (1.5 Mbits/s) compatible
- Operation from a single voltage (+5.0 VDC, regulated) 'wall wart' external power supply
- Low cost 4-layer design: two outer signal layers
  - power inner layers
  - ground inner layers
- Optional pull-up resistors for disabling individual downstream ports
- Self-powered operation
- Multi-transaction translator enabled
- Support of internal default hub configuration
- Single onboard +3.3 VDC regulator
- Single crystal clock source
- Individual port over-current sensing
- Individual port power control
- Port over-current sensing (OCS)/port power control interface with LEDs for port power indication
- Red LED indicator for active hub state (not suspend)
- EMI suppression provided by ferrite beads, selection of capacitors, and internal power/ground layers.
- ESD protection up to 25 kV direct contact to USB signals provided with diode bridges and common mode chokes.

### 1.2 General Description

The EVB-USB82514Q36-BAS is a demonstration and low-cost evaluation platform featuring the USB82514 4-port, low-power Hi-Speed USB2.0 Hub with MultiTRAK technology. The platform is designed to robustly demonstrate the unique features of this device using a low-cost PCB implementation with individual port power control. The EVB-USB82514Q36-BAS 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 minimizing the customers new product development time.

Revision C of the EVB-USB82514Q36-BAS has a four-layer printed circuit board to improve coupling between power and ground to reduce EMI. Ferrite beads have been added on all connector ground and power nets. Protective diode bridges and common mode chokes were added to all USB signals.

[Figure 2.1](#) and [Figure 2.2](#) show the top and bottom level silk screen and copper layers.

## 2 Hardware Configuration

### 2.1 Hardware Description

The EVB-USB82514Q36-BAS has one onboard regulator, which generates +3.3 VDC from a +5.0 VDC power supply. An additional U7 footprint<sup>1</sup> corresponds to the automotive temperature range with a larger package and has ties into the ground plane for better thermal dissipation. The USB82514 generates its own on-chip +1.8 VDC supply. The USB82514 Hub consumes power from the +3.3 VDC supply while the Micrel<sup>®</sup> Dual-Channel Power Distribution Switch (MIC2026) consumes power from the +5.0 VDC supply. The MIC2026 Power Distribution Switch supplies downstream power to each attached device.

#### 2.1.1 Port Assignment

Downstream ports are numbered 1 through 4 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, filtering for EMI on signal ground and power, and a separate shield ground. ESD protection for USB signals is provided by diode bridges and common mode chokes. This feature provides protection up to 25 kV direct contact to USB signals.

Optional pull-up resistors can be placed to disable a USB port. Please refer to the EVB-USB82514Q36-BAS schematics on our web site <http://www.sm-sc-ais.com> for implementation.

#### 2.1.2 HUB Configuration

The EVB-USB82514Q36-BAS has been configured to support internal default configuration with strapping options enabled as determined by the state of CFG\_SEL[1] and CFG\_SEL[0] pins immediately after reset. The internal +1.8 VDC regulator supplies voltage to the oscillator and PLL is turned off during suspend to minimize suspend current.

#### 2.1.3 Powered State LED

An optional LED (LED5) indicates when +5.0 VDC power is present.

#### 2.1.4 Active State LED

An optional LED (LED6) indicates when the hub is active (configured and not suspended).

#### 2.1.5 Port Power LEDs

LED1, LED2, LED3, and LED4 indicate when port power is available to the associated downstream USB port.

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1. This part is located on the bottom side of the board (see [Figure 2.2 on page 6](#)) and is populated for the automotive USB configuration. Note, when U7 is populated, the default onboard 3.3 V regulator U5 should be depopulated. Refer to the bill of materials for more details about U7 footprint.

## 2.1.6 Connector Description

The EVB-USB82514Q36-BAS has a set of standard USB style connectors:

- One of type B for the upstream port
- Four of type A for downstream ports

Power is supplied via a 2.0 mm power jack. [Table 2.1, "Connector Description"](#) lists all of the connectors. For more details on the pinout of these connectors, please refer to the EVB-USB82514Q36-BAS schematics on our web site: <http://www.sm-sc-ais.com>.

**Table 2.1 Connector Description**

CONNECTOR	TYPE	DESCRIPTION
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	USB B	Upstream USB Port 0
J6	Power Jack 2.0 mm	+5.0 VDC Power Supply

## 2.1.7 Layout Considerations

The EVB-USB82514Q36-BAS 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 top and bottom layers. Internal layers are ground and power. Note that the differential signals from the USB82514 match the upstream and downstream port placement simplifying routing of critical signals.

**Table 2.2 PCB Layer Stack**

<b>Component Side</b>	
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	
<b>Solder Side</b>	

Component side top layer is shown in [Figure 2.1](#) with silk screen information to identify component locations.

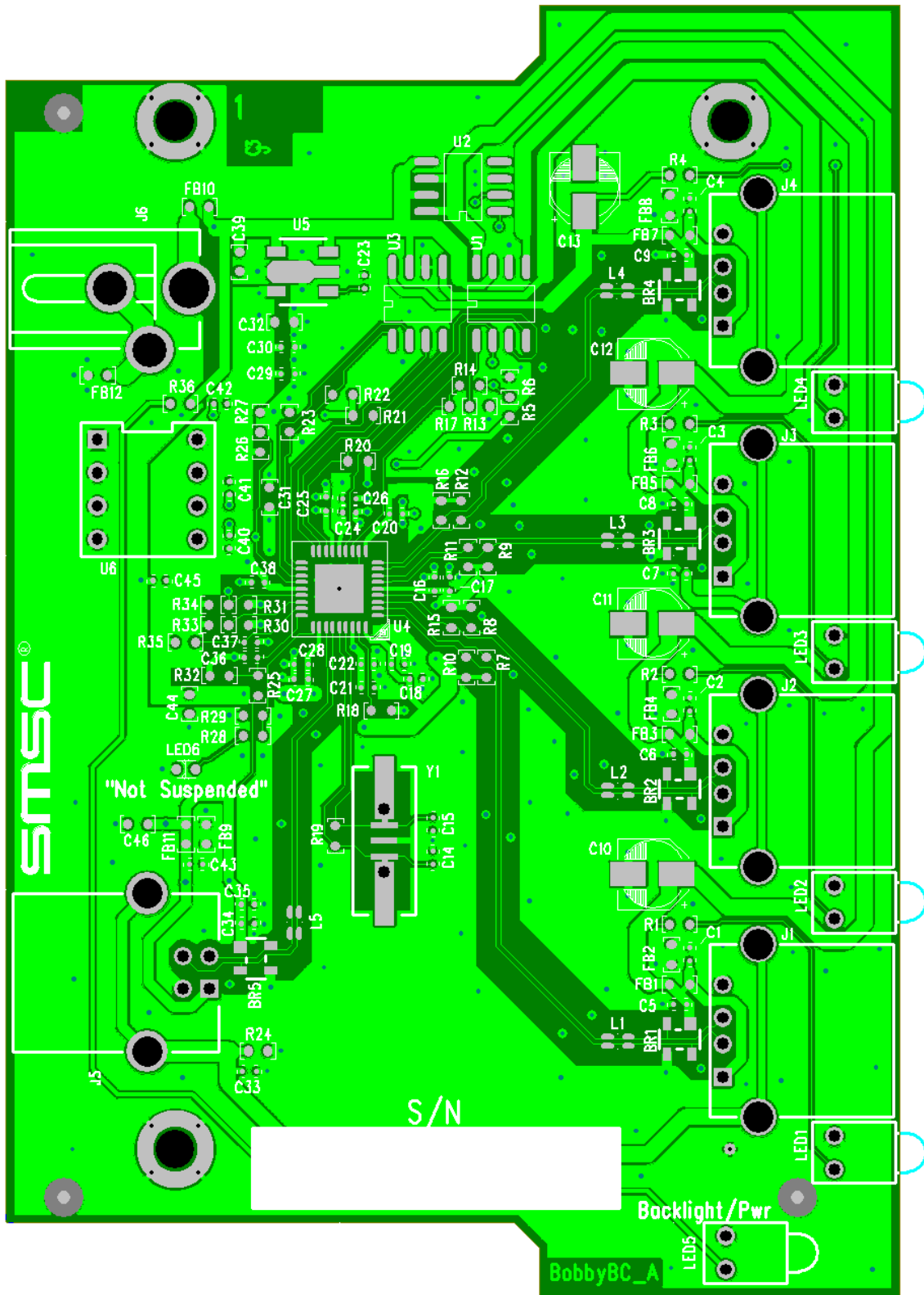


Figure 2.1 EVB-USB82514Q36-BAS Top Layer - Component Side

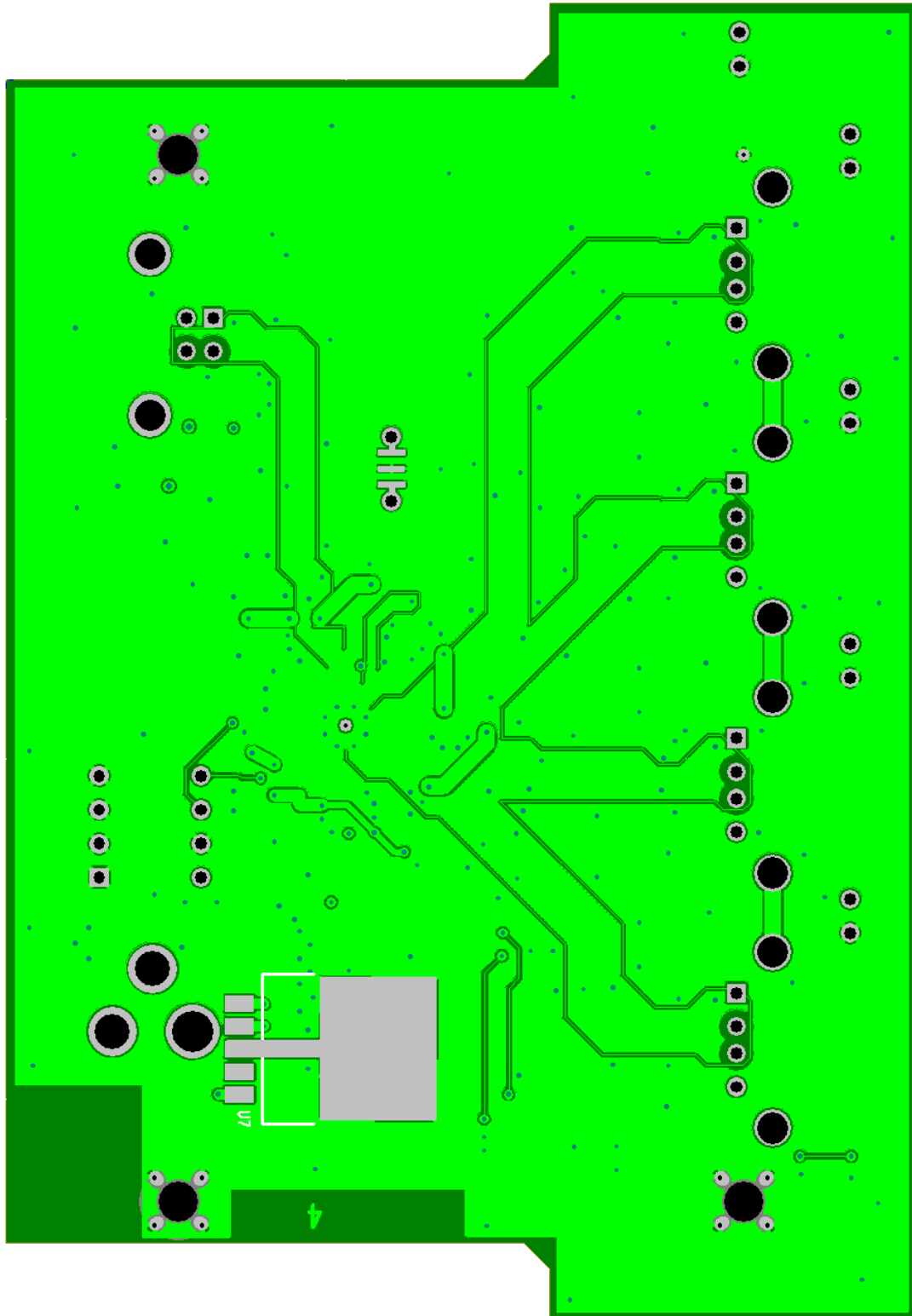


Figure 2.2 EVB-USB82514Q36-BAS Bottom Layer - Solder Side

### 3 User Manual Revision History

**Table 3.1 Customer Revision History**

REVISION LEVEL & DATE	SECTION/FIGURE/ENTRY	CORRECTION
Rev. 1.1 (07-13-11)	All	Changed title from EVB-USB82514-QFN36 to EVB-USB82514Q36-BAS 36-Pin QFN
		Changed revision "B" to "C". Figures and values adapted.
	<a href="#">Section 2.1</a>	Correction: U5 footprint replaced by U7 footprint, footnote added providing more information about this part.
Rev. 1.0 (03-13-09)		Initial document

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