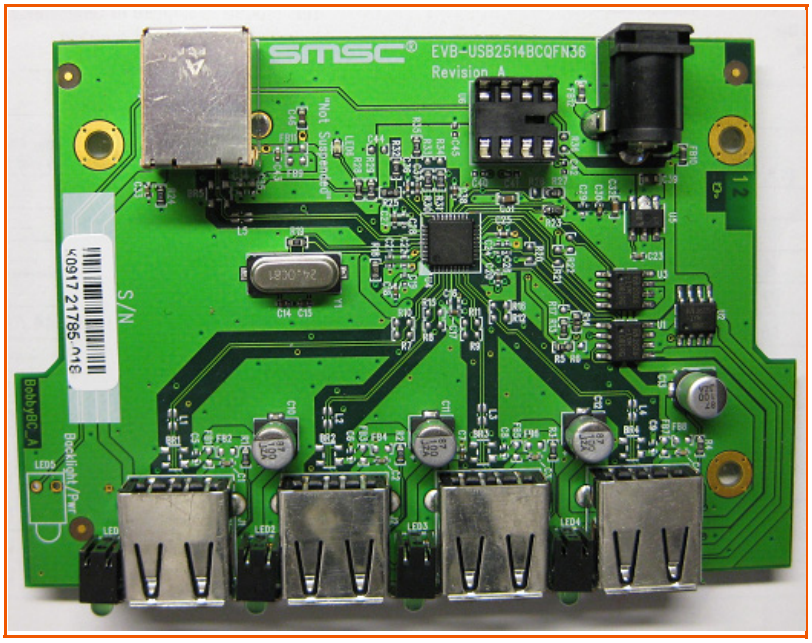
EVB-USB2514BC Evaluation Board Revision A User Guide



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1 Overview

The SMSC USB2514B MultiTRAK™ is a Low-Power, Full-Featured, OEM configurable, Hi-Speed USB 2.0 compliant hub with four downstream ports. Each of these downstream ports in the USB2514B device is capable of supporting battery charging. The EVB-USB2514BC Evaluation Board demonstrates a standalone application for the hub with all the features listed below and demonstrates 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 downstream USB Port 1 to a full 1.5 A.
- USB Battery Charging is supported on all other downstream USB ports to 500 mA (optional). (In actual use, the port 5 V path, port power controllers, and OCS circuits must be chosen to fully support the specification [ex., USB Port 1]).
- 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 (5.0 VDC, regulated) external power supply.
- Single onboard 3.3 VDC regulator.
- Red LED indicator for “Active” 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-USB2514BC is an evaluation and demonstration platform featuring the USB2514B Ultra Fast USB 2.0 Hub on a 4-layer RoHS compliant printed circuit board.

The EVB-USB2514BC 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. Downstream USB 2.0 port 1 includes a high current port power controller to fully support USB battery charging as a high current walk up port.

The EVB-USB2514BC 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 U6. 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.

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2 Hardware Configuration

2.1 Hardware Description

The EVB-USB2514BC has one onboard regulator, which generates 3.3 VDC from an external 5 VDC regulated power supply. The USB2514B 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. The USB2514B consumes power from the 3.3 VDC supply. Downstream port power is distributed by three power switches that consume power from the 5 VDC supply. U2 supplies power to the high current downstream port 1. U1 and U3 supply power to the other three ports at 500 mA. 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 with individual port power controllers. The USB2514B allows any or all of the downstream ports to be configured for high current battery USB charging, and the EVB-USB2514BC is designed to demonstrate that feature. Downstream port 1 is assigned as the default battery charging port with a high current port power controller installed.

2.1.2 USB2514B Configuration

Default: The EVB-USB2514B has been set up to support an internal default configuration as determined by the state of the CFG_SEL2, 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-USB2514B can load configuration from an external two-wire, I^2C EEPROM U6. The EEPROM must be installed at U6, and the configuration option resistors on the CFG_SEL2, CFG_SEL1, and CFG_SEL0 pins changed to enable this option. The EEPROM may be pre-programmed before installation, or be programmed with the USB host using provided SMSC USBDM applications. This option allows access to all of the configuration registers and ID strings for the USB2514B device for detailed functional analysis and exercise as desired. The EVB-USB2514B 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 (LED5) indicates when +5 VDC power is present.

2.1.4 Activity LED

An optional LED (LED6) indicates when the USB2514B 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.

2.1.6 Connector Description

The EVB-USB2514B has 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 2.0 mm power jack. Table 2.1 lists all of the connectors. For more details on the pinout of these connectors, please see the EVB-USB2514BC schematics on the CD-ROM included with your EVB-USB2514BC.

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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 VDC Power Supply

2.1.7 Layout Considerations

The EVB-USB2514B 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 USB2514B match the upstream and downstream port placement simplifying routing of 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	

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

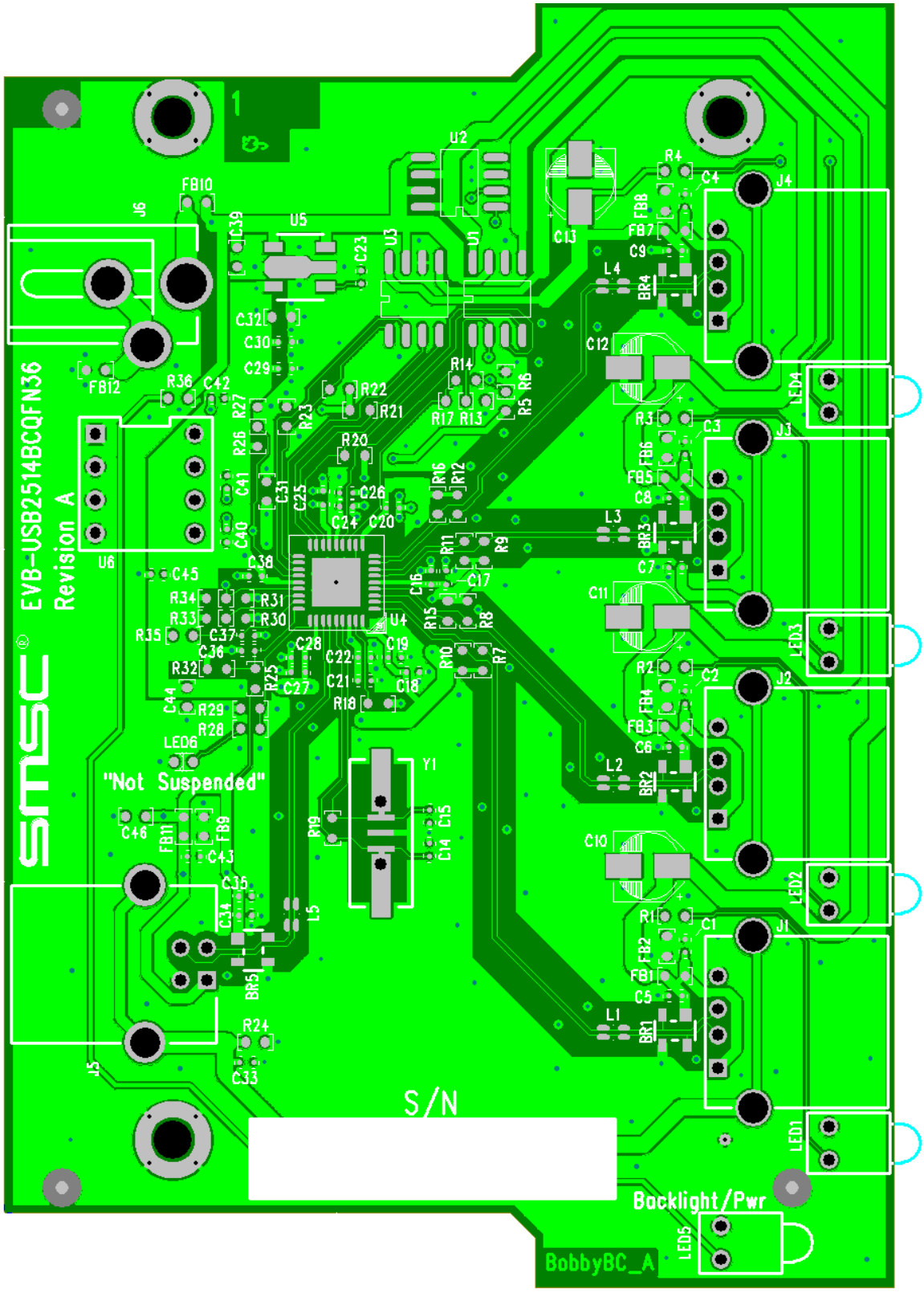

Figure 2.1 EVB_USB2514B Top Layer - Component Side

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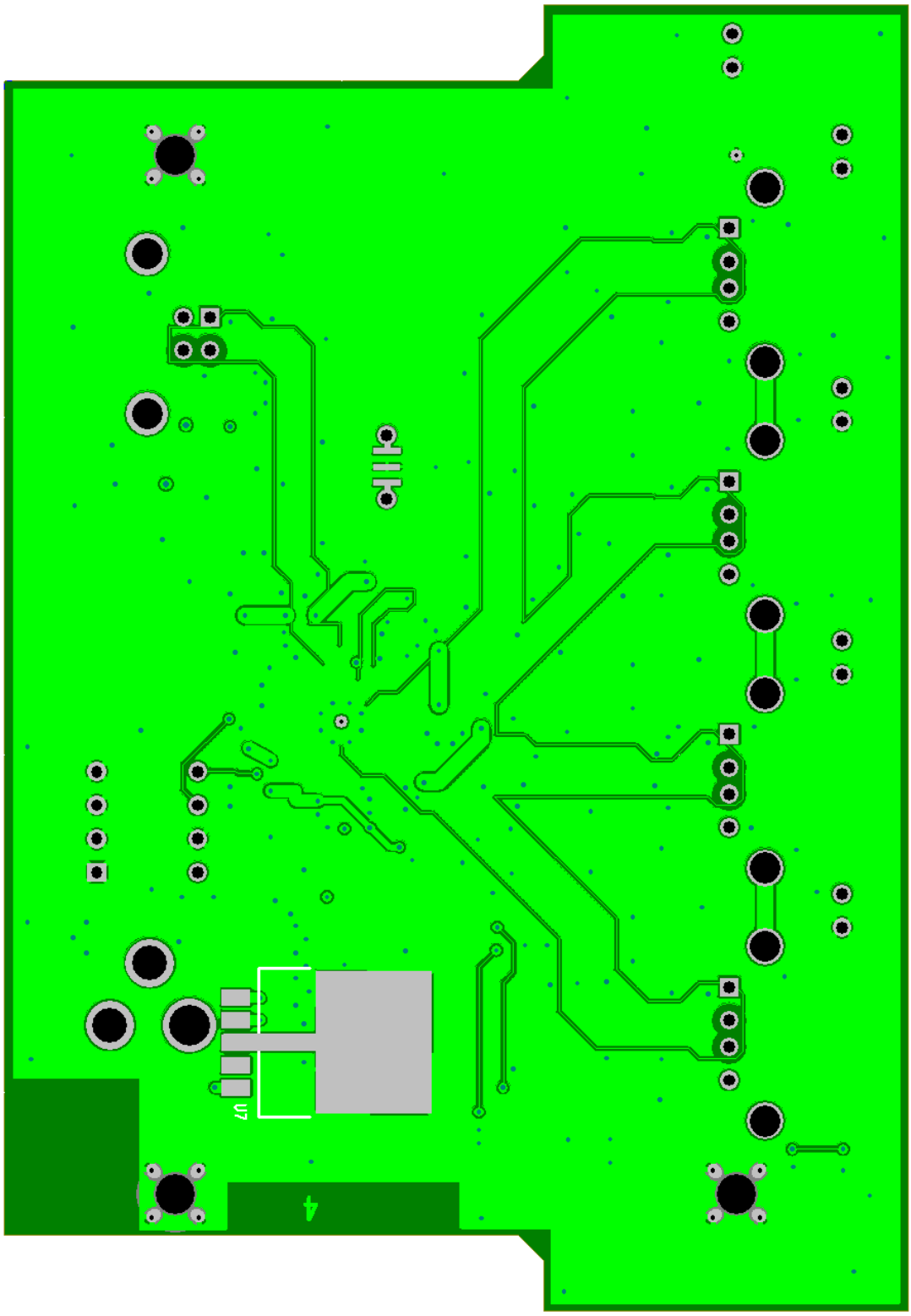

Figure 2.2 EVB_USB2514B Bottom Layer - Solder Side

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3 Revision History

NAME	REVISION LEVEL AND DATE	SECTION/FIGURE/ENTRY	CORRECTION
C. Johnson	Rev 0.3 (05-19-09)	Section 1.1, "Features"	▪ Changed “Low cost 4-Layer space saving design, two outer signal layers: - power and ground inner layers.” to “Low cost 4-Layer space saving design with two outer signal layers, a power inner layer, and a ground inner layer.” ▪ Appended “with LEDs for port power indication” to “Individual port power control.” ▪ Removed redundant item “Port OCS/port power control interface...” ▪ Removed unsupported feature “3.3 VDC power LED indicator.” ▪ Appended “(optional)” to “Red LED indicator for “Active” hub state.” ▪ Changed “Schematics, layout, and bill of materials are **included** to minimize new product development time.” to “Schematics, layout, and bill of materials are **available** to minimize new product development time.”
		Section 1.2, "General Description"	▪ Removed the incorrect reference to a socket in the last paragraph. ▪ Removed the redundant Figure 1.1.
		Section 2.1, "Hardware Description"	▪ Changed the last sentence into two sentences for clarity. ▪ Moved the last sentence of section 2.1.1 to the end of this section.
		Section 2.1.2, "USB2514B Configuration"	▪ Changed the first sentence to “...support **an** internal default configuration...” ▪ Correct a typographical error “U4” to “U6” in the second paragraph.
		Section 2.1.6, "Connector Description"	▪ Correct the last sentence to reference the schematics on the included CDROM.
		Section 2.1.7, "Layout Considerations"	▪ Revise the first sentence punctuation from “... PCB layers**,** two...” to “... PCB layers **--** two...”.

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NAME	REVISION LEVEL AND DATE	SECTION/FIGURE/ENTRY	CORRECTION
E. Wang	Rev. 0.2 (05-11-09)		Per E. Wang: Removed xD-Picture Card disclaimer from Cover Master Page SMSC makes the following part-numbered device available for purchase only by customers who are xD-Picture Card licensees: USB2660. By purchasing or ordering any of such devices, Buyer represents, warrants, and agrees that Buyer is a duly licensed Licensee under an xD-Picture CardTM License Agreement with Fuji Photo Film Co., Ltd., Olympus Optical Co., Ltd., and Toshiba Corporation; and that Buyer will maintain in effect such xD-Picture Card license and will give SMSC reasonable advance notice of any termination or expiration of such xD-Picture Card license, but in no event less than five days advance notice. SMSC may discontinue making such devices available for purchase by Buyer and/or discontinue further deliveries of such devices if such xD-Picture Card license shall expire, terminate, or cease to be in force, or if Buyer is or becomes in default of such xD-Picture Card license.
		Various	▪ Added hyphen before pin in “#-pin QFN” ▪ Downstream = Removed spaces ▪ Over-current = Added hyphenation ▪ Mbits/s = Changed to Mbps ▪ Removed hyphen between “silk screen” ▪ “High Speed” = “Hi-Speed” per USB-IF ▪ USB2.0 = USB 2.0 ▪ Added registered trademark and footnote for I^2C technology. ▪ Applied consistent capitalization throughout ▪ Applied hyperlinked cross-referencing Figure 1.1 instead of “Figure 1” ▪ Trademarks only and acronyms are only described when first mentioned--all other instances have been deleted
		Various	▪ A space appears between units and units of measurement per 1. the SI Style Guide, 2. The *Chicago Manual of Style*, and 3. Matt Young’s *The Technical Writer’s Handbook*.
		Section 1.1, "Features"	▪ Removed “Features the USB2514B in a...”
		Section 2.1, "Hardware Description"	▪ “The USB2514B generates is own” now reads “**its** own”. ▪ The phrase “for use using on-chip 1.2 VDC regulators.” now reads “for use with on-chip 1.2 VDC regulators. use **with** on-chip 1.2 VDC regulators. ▪ Added a comma after “U3”.
		Section 2.1.1, "Port Assignment"	▪ Changed “5 Volt power” to “5 volts of power” ▪ Changed “battry charging port” to “battery...”

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NAME	REVISION LEVEL AND DATE	SECTION/FIGURE/ENTRY	CORRECTION
E. Wang	Rev. 0.2 (05-11-09)	Section 2.1.2, "USB2514B Configuration"	▪ Applied bold formatting to keyword subheadings: 1. Default 2. EEPROM Option ▪ Removed “and” before “device ID”. ▪ Added a comma after CFG_SEL1 when it appeared in a series. ▪ The phrase “are set using...” now reads “**have been set** using ROM code defaults”
		Section 2.1.6, "Connector Description"	▪ Changed “the connectors” to “these connectors”. ▪ Added the following cross-references to the end of the last sentence “see the schematics shown in Figure 2.1 and Figure 2.2”.
		Figure 2.1 and Figure 2.2	▪ Updated Figure titles from EVB_USB660 and EVB_USB2517 to EVB_USB2514B
		Section 1.2, "General Description," on page 2	Per E. Wang: ▪ “Customized configured” now reads “custom configured”. Per T. Phan: 1. References to 1.8 V have been changed to 1.2 V (3 instances) 2. The first paragraph: The EVB-USB2514BC is an evaluation and demonstration platform featuring the USB2514B Ultra Fast USB 2.0 Hub, Flash Media Controller, and Protocol Bridge Combo on a 4-layer RoHS compliant printed circuit board. now reads: The EVB-USB2514BC is an evaluation and demonstration platform featuring the USB2514B Ultra Fast USB 2.0 Hub on a 4-layer RoHS compliant printed circuit board. Per C. Johnson: 3. Deleted the third paragraph: The EVB-USB2514BC is compatible with Microsoft Vista, Windows XP, Windows ME, Windows 2k SP4, Apple OSx and Linux Mass Storage Class Drivers.
C. Johnson	Rev. 0.1 (04-09-09)		Initial document creation.

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