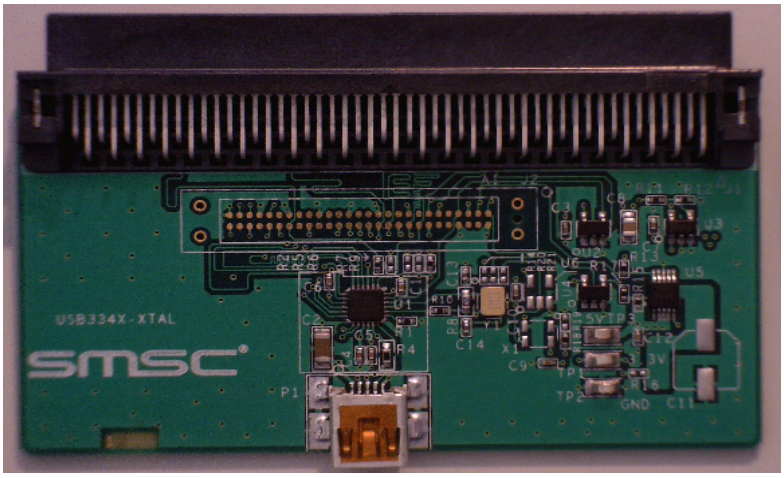
EVB-USB3343 USB Transceiver Evaluation Board User Manual



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1 Introduction

This user manual is for the USB3343 USB Transceiver Evaluation Board (EVB) for use with the USB3343 products with support for variable I/O voltage levels and 26MHz crystal operation.

The USB3343 features a ULPI interface to support systems with USB Host, Device, or On-the-Go (OTG) capability.

2 Overview

The EVB-USB3343 is a Daughter Card designed to plug into a user's test system using a T&MT connector. The card attaches to a USB link layer to create a USB Host, Device, or On-the-Go (OTG) system. The board edge connector meets the UTMI+ Low Pin Interface (ULPI) Standard requirements for the T&MT connector.

A link to the ULPI Working Group Page is available at www.smsc.com or may be obtained from your local FAE. The EVB-USB3343 includes USB3343 packaged silicon and all external components required for the USB transceiver function.

This manual describes PCB assembly PCB-7202AZ.

2.1 Supplying VBUS Voltage

In Host or OTG operation, the EVB-USB3343 must provide 5 Volts on V_{BUS} at the USB connector. The EVB-USB3343 includes a switch that can drive V_{BUS} using the 5 Volt supply that comes from pin 28 of the T&MT connector.

The VBUS switch is controlled by the DRVVBUS signal driven from the Link (T&MT connector). The 5 Volt switch is backdrive protected when in the off state. The switch does not provide protection from reverse currents when it is on. See Section 2.9 and Section 2.10 for more information on configuring the EVB-USB3343 for OTG and Host operation.

2.2 ULPI I/O Voltage

The USB3343 supports variable ULPI I/O voltage signaling. The ULPI I/O voltage is supplied in one of two ways. By default, the EVB is shipped with VDDIO supplied by the on-board LDO.

Resistor R11 is used to set VDDIO, the digital logic high voltage. To change the value of VDDIO, calculate a new value for R27 (ohms) as follows.

R11 = (VDDIO/1.225-1) x 169000

VDDIO must be in the range of 1.8 Volts - 3.3 Volts nominal.

VDDIO can also be supplied to the USB3343 from the T&MT connector instead of using the LDO. To do this, the LDO (U10) must be removed.

The VDDIO voltage level that has been configured on the EVB-USB3343 must be the same as the ULPI I/O voltage level that the link is using.

2.3 Edge Connector for Digital I/O

The T&MT edge connector is compliant to the ULPI specification. Part numbers and manufacturers for this connector and it's mate are given in Table 2.1.

Table 2.1 Edge Connector on the EVB-USB3343

PART NUMBER	DESCRIPTION	MANUFACTURER
2-557101-5	100 pin edge connector on EVB-USB3343	AMP
2-557-101-5	Mating connector to the EVB-USB3343	AMP
1-1734037-0	Alternate 100 pin edge connector for EVB-USB3343	TYCO
1-1734099-0	Alternate mating connector to the EVB-USB3343	TYCO

2.4 REFCLK Frequency Selection

The EVB-USB3343 is by default configured for operation with a 26MHz crystal (Y1). The EVB also accomodates the use of a 26MHz oscillator (X1). To use a 26MHz oscillator, X1, U6, and R4 must be populated, and Y1, R30, and C22 must be removed.

2.5 USB Connector

A standard Mini-AB connector is provided to attach a USB cable or connector. Provision is made on the PCB to accept a Micro-AB connector. See the bill of materials in Section 6 for connector part numbers. Do not substitute a different part number for the Mini-AB receptacle or a short circuit of the USB signals may result at the micro-AB connector PCB footprint.

2.6 VBUS Present Detection

The USB controller must detect VBUS when a USB cable is attached in device mode or when the USB controller turns on VBUS in host or OTG mode. The USB connector VBUS signal is connected to the VBUS pin of the USB3343. The USB3343 includes all of the comparators required to detect VBUS and report the state of VBUS to the USB controller via the ULPI bus.

2.7 ULPI Signal Test Points

Probe points at location J2, provide access to all ULPI signals. Install the Tektronix logic analyzer probe retention kit at J2 to probe these signals. Ordering information for the retention kit is provided in the bill of materials.

2.8 Other Signal Test Points

There are five other test points located on the board for easy access. TP1 connects to the 5V supply coming from the T&MT connector. TP2 connects to the 3.3V VDD supply coming from the T&MT connector. TP3 connects to Ground.

2.9 Converting the EVB to an OTG System

"Out of the box", the EVB-USB3343 is delivered as a USB Device system. To convert it to be a USB OTG development board, the following modifications must be made:

1. Install R13 (zero ohm resistor). This connects the VBUS 5V switch to the VBUS signal.

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2. Remove R23. This is the R_{VBUS} value required for a USB Device.
3. Install R10 (1.0K, 1W resistor). This is the R_{VBUS} value required for a USB OTG Device.

Since the USB3343 is designed to accommodate up to 30V on VBUS, R10 is rated at 1W to accommodate this entire voltage range. Refer to the USB3343 datasheet for more information on sizing this resistor.

2.10 Converting the EVB to a Host System

"Out of the box", the EVB-USB3343 is delivered as a USB Device System. To convert it to be a USB Host development board, the following modifications must be made:

1. Install R13 (zero ohm resistor). This connects the VBUS 5V switch to the VBUS signal.
2. Install C20 (150uF capacitor). This increases the value of C_{VBUS} to be USB 2.0 Host compliant.

2.11 Converting the EVB to Support ULPI Clock Input Mode

"Out of the box", the EVB-USB3343 uses a crystal (Y1) as the clock reference, and is configured for ULPI Clock Output Mode where CLKOUT sources a 60MHz clock. To convert the EVB to support ULPI Clock Input Mode, the following changes must be made:

1. Install R12 (zero ohm resistor). This shorts CLKOUT to VDD18.
2. Install R3 (zero ohm resistor). This shorts REFCLK to the System Clock pin on the T&MT connector.
3. Confirm that R4 is not populated.
4. Remove the following components to remove the crystal circuit: Y1, R30, C22, C23

Refer to the USB3343 datasheet for more information on ULPI Clock Input Mode.

2.12 T&MT Pin Description

The T&MT signal names, pin number and function are described in Table 43 and Table 44 of the ULPI Specification rev 1.1.

The EVB-USB3343 fully implements a ULPI compliant interface to the T&MT connector, including support for ULPI Clock Input Mode. This EVB supports a 1.8-3.3V ULPI I/O voltages. All signals are described in Table 2.2.

Table 2.2 T&MT Connector Pin Definitions

PIN	NAME	DESCRIPTION	DIRECTION
86, 36, 85, 34, 83, 33, 82, 31	DATA[7:0] Refer to Schematic for Connector Pin Assignment	ULPI Data Bus	IN/OUT
96	STP	ULPI STP Signal	INPUT TO EVB
70	DIR	ULPI DIR Signal	OUTPUT FROM EVB
71	NXT	ULPI NXT Signal	OUTPUT FROM EVB

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Table 2.2 T&MT Connector Pin Definitions (continued)

PIN	NAME	DESCRIPTION	DIRECTION
90	CLKOUT	ULPI Clock Signal	OUTPUT FROM EVB
55	VBUS_FAULT_N	Driven low by the VBUS switch (U2) in the event of a switch fault condition.	OUTPUT
15	SPKR_L	N/A	N/A
45	SPKR_RM	N/A.	N/A
17	RESET	Asserting RESET will place the USB3343 in a low power state. Upon exiting this state (RESET=0), all ULPI registers will contain power-on reset values.	INPUT
47	VBUS_IN	This pin is not connected	NO CONNECT
28	VBUS_OUT	+5V from the T&MT connector	INPUT TO EVB
8, 16, 57, 69	VDD	+3.3V from the T&MT connector	INPUT TO EVB
52	SYSTEM_CLOCK	Optional clock input to EVB. The EVB is built with the USB3343 REFCLK provided by a crystal. See Section 2.11 for more information on configuring the EVB-USB3343 for ULPI Clock Input mode.	NO CONNECT (input to EVB if R3 is installed)
100	PSU_SHD_N	This pin is driven low indicating that +3.3V must be sourced from the link through the T&MT connector pins 8, 16, 57, 69 and +5.0V must be sourced from the link through the T&MT connector pin 28.	OUTPUT FROM EVB
49	DC_PSNT_N	This pin is driven low indicating a daughter card is present.	OUTPUT FROM EVB

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3 Getting Started

The block diagram in Figure 3.1 gives a simplified view of the EVB-USB3343. The EVB-USB3343 is ready for device operation. To modify the board for OTG or Host applications, refer to Section 2.9 or Section 2.10, respectively.

It is required to provide +5V to T&MT connector pin 28 and +3.3V on T&MT pins 8,16,57,69 to power the EVB-USB3343.

The EVB-USB3343 is built with a USB Mini-AB receptacle. Do not substitute a Mini-AB receptacle different from the one specified in the bill of materials, or a short circuit may occur on the USB signals at the Micro-AB connector PCB footprint.

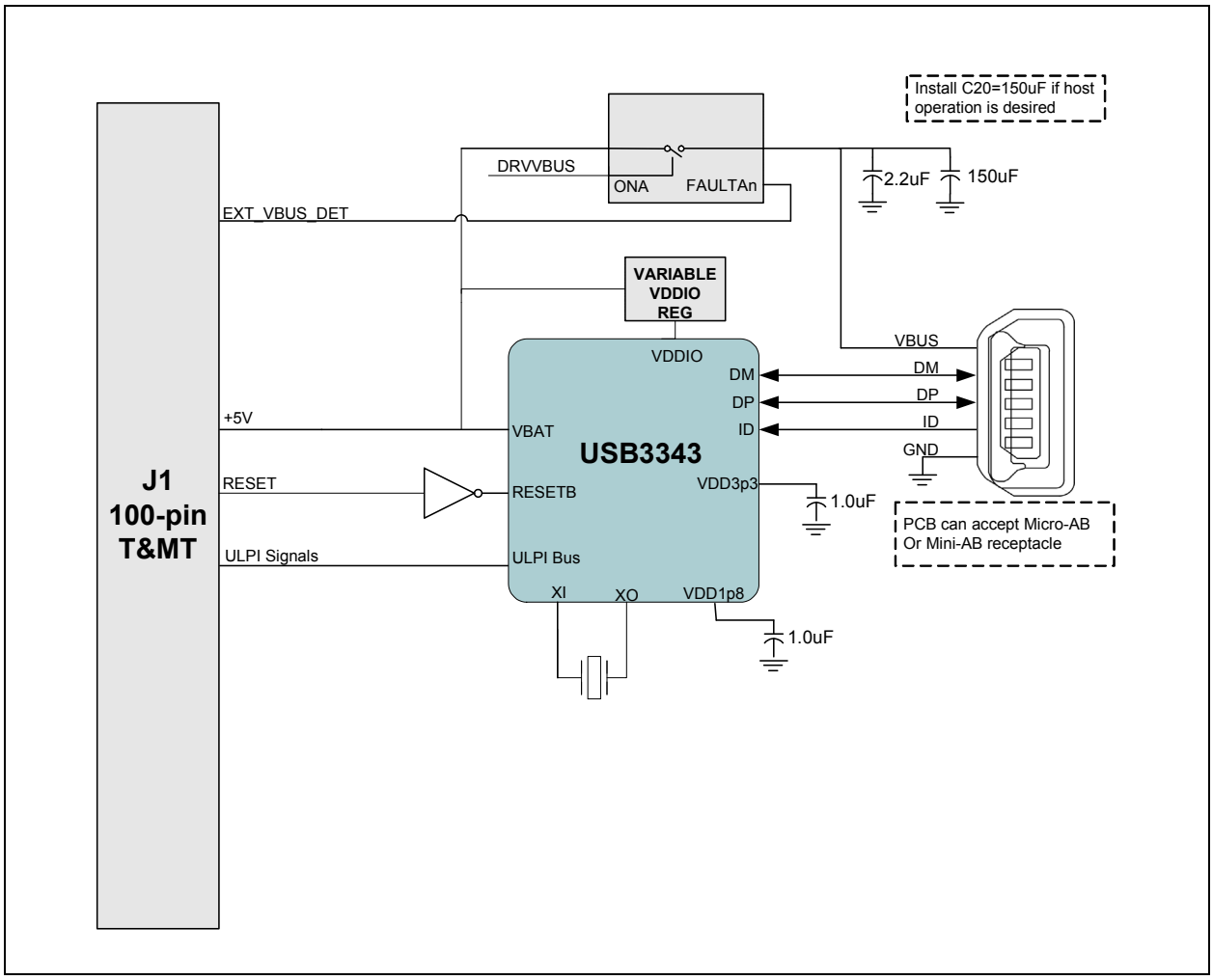

Figure 3.1 Block Diagram of EVB-USB3343

When the EVB-USB3343 is powered on, check the following things to be certain the board is functioning normally:

- RESET should be de-asserted (logic low at the T&MT connector and RESETB at the USB3343 should be logic high = VDD18). If RESETB=0, the USB3343 will be in a low power state.

- The voltage at R2 (RBIAS) should be 0.8V DC. If this voltage is not present, the USB3343 is in a low power state.
- There should be a digital 60 MHz square wave signal at T&MT connector pin 90. The amplitude should be approximately VDDIO. This is the CLKOUT signal of the USB3343.
- The voltage at C3 should be approximately 3.3V. This is the USB3343 internal 3.3V voltage regulator output.
- The voltage at C4 should be 1.8V. This is the 1.8V regulator output.

4 Protecting VBUS from Non-Compliant VBUS Voltages

The USB3343 is fully tolerant to VBUS voltages up to 30V. An external resistor on the VBUS line (R_{VBUS}) is required for the integrated overvoltage protection circuit in the USB3343. R_{VBUS} is either R10 or R23 on the EVB-USB3343. For peripheral and host applications, R_{VBUS} is 10K (install R23, remove R10). For OTG applications, R_{VBUS} is 1K (install R10, remove R23).

5 EVB-USB3343 Schematic

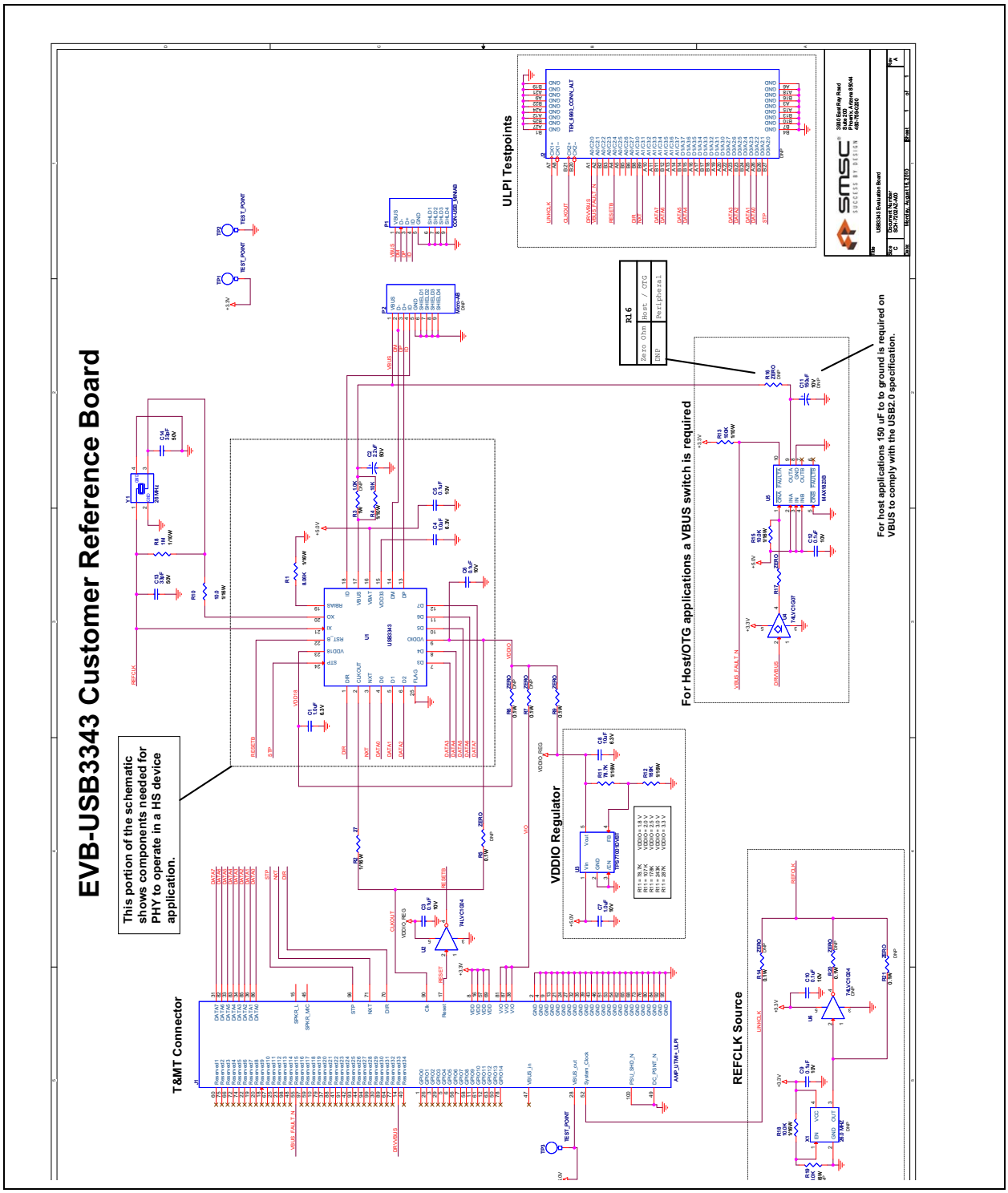

Figure 5.1 EVB-USB3343 Schematic

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6 EVB-USB3343 Bill of Materials

Quantity	DNP	Reference	description	MANUFACTURER	PART NUMBER	DIGIKEY
1	3	C1,C4,C7	CAP CER 1UF 10V X5R 0402	Murata Electronics	GRM155R61A105KE15D	490-3890-1-ND
2	1	C2	CAP CER 2.2UF 50V X7R 1206	MURATA ELECTRONICS	GRM31CR71H225KA88L	490-3367-1-ND
3	6	C3,C5,C6,C9, C10, C12	CAP .1UF 16V CERAMIC X7R 0402	PANASONIC-ECG	ECJ-0EX1C104K	PCC13490CT-ND
4	1	C8	CAP CER 10UF 16V X5R 20% 0805	AVX CORP	0805YD106MAT2A	478-4598-1-ND
5	C11		CAP 150UF 16V ELECT FK SMD	PANASONIC-ECG	EEV-FK1C151XP	PCE3512CT-ND
2		C13,C14	CAP CER 33PF 25V S 0402 UHI Q	Johanson Technology	250R07S330GV4T	712-1297-1-ND
6	1	J1	RCPT ASSY,R/A,CHAMP050,100POS	TYCO ELECTONICS	1-1734037-0	A33470-ND
7	1 J2		Retention Kit for P6960/P6980 Logic analyzer Probe	TEKTRONIX	020-2539-00	
8	P2		CONN RCPT MICRO USB TYPE AB	TYCO ELECTONICS	1981584-1	A97799CT-ND
9	1	P2	CONN RECEPT USB 5POS RT ANG SMD	MOLEX CONN CORP	56579-0576	WM17122CT-ND
10	1	R1	RES 8.06K OHM 1/16W 1% 0402 SMD	PANASONIC-ECG	ERJ-2RKF8061X	P8.06KLCT-ND
11	1	R2	RES 27 OHM 1/10W 5% 0402 SMD	PANASONIC-ECG	ERJ-2GEJ270X	P27JCT-ND
12	R3		RES 1.0K OHM 2W 1% 2512 SMD	STACKPOLE ELECT	RHC 2512 1K 1% R	RHC25121KFCT-ND
13	1	R4	RES 10.0K OHM 1/10W 1% 0603 SMD	PANASONIC-ECG	ERJ-3EKF1002V	P10.0KHCT-ND
14	2	R5,R6,R7,R14,R16, R20,R21	RES ZERO OHM 1/10W 5% 0402 SMD	PANASONIC-ECG	ERJ-2GE0R00X	P0.0JCT-ND
15	1	R9,R17	RES 1.0M OHM 1/10W 5% 0603 SMD	PANASONIC-ECG	ERJ-3GEYJ105V	P1.0MGCT-ND
16	1	R8	RES 10 OHM 1/10W 5% 0402 SMD	PANASONIC-ECG	ERJ-2GEJ100X	P10JCT-ND
17	1	R10	RES 78.7K OHM 1/16W 1% 0402 SMD	PANASONIC-ECG	ERJ-2RKF7872X	P78.7KLCT-ND
18	1	R11	RES 169K OHM 1/16W 1% 0402 SMD	PANASONIC-ECG	ERJ-2RKF1693X	P169KLCT-ND
19	1	R12	RES 100K OHM 1/16W .1% 0402 SMD	PANASONIC-ECG	ERA-2AEB104X	P100KDCCT-ND
20	3 R19	R13	RES 10.0K OHM 1/16W 1% 0402 SMD	PANASONIC-ECG	ERJ-2RKF1002X	P10.0KLCT-ND
21	3	R15,R18	PC TEST POINT MINIATURE SMT	KEYSTONE ELECT	5015	5015KCT-ND
22	1	TP1,TP2,TP3	USB3343-24QFN	SMSC	CONSIGNED	
23	2 U6	U1	IC SINGLE INVERTER-GATE SOT-23-5	TEXAS INSTRUMENTS	SN74LVC1G04DBVR	296-11599-1-ND
24	1	U2	IC ADJ 50MA LDO REG SOT-23-5	TEXAS INSTRUMENTS	TPS77001DBVT	296-2762-1-ND
25	1	U3	IC BUFF/DVR NON-INVERT SOT235	TEXAS INSTRUMENTS	SN74LVC1G07DBVR	296-8485-1-ND
26	1	U4	IC SW USB DUAL W/FB 10-UMAX	MAXIM INTEGRATED	MAX1823BEUB+	MAX1823BEUB+-ND
27	1 X1	U5	OSCILLATOR PROG 3.3V +-50PPM SMD 26MHZ	ABRACON CORP	AP3S-BLANKS	AP3S3EC-ND
28	1	Y1	CRYSTAL 26.0000MHZ 18PF SMD	CITIZEN FINETECH	CS325 26.000MABJ-UT	300-8675-1-ND

Figure 6.1 EVB-USB3343 Bill of Materials

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7 User Manual Revision History

Table 7.1 Customer Revision History

REVISION LEVEL & DATE	SECTION/FIGURE/ENTRY	CORRECTION
Rev. 1.0 (05-06-13)		Co-branded document
Rev. 1.0 (08-18-10)	Initial Release	