EVB-LAN7850 Evaluation Board User's Guide

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2355 W. Chandler Blvd.
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USA

This declaration of conformity is issued by the manufacturer.

The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8th February 2010).

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson
VP Development Tools

12-Sep-14
Date

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the LAN7850. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- The Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the EVB-LAN7850 Evaluation Board as a development tool for the LAN7850, USB 3.0 to Gigabit Ethernet Controller.

- **Chapter 1. "Overview"** – Provides a brief description of the EVB-LAN7850 Evaluation Board.
- **Chapter 2. "Board Details & Configuration"** – Includes instructions on how to get started with the EVB-LAN7850 Evaluation Board.
- **Appendix A. "EVB-LAN7850 Evaluation Board"** – This appendix shows the physical EVB-LAN7850 Evaluation Board.
- **Appendix B. "EVB-LAN7850 Schematics"** – This appendix shows the EVB-LAN7850 Evaluation Board schematics.
- **Appendix C. "EVB-LAN7850 BOM"** – This appendix includes the EVB-LAN7850 Evaluation Board Bill of Materials (BOM).
- **Appendix D. "EVB-LAN7850 Silk Screen"** – This appendix includes the EVB-LAN7850 Evaluation Board silk screen.

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

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- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit 3 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART Plus and PIC-kit 2 and 3.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the web site at:
http://www.microchip.com/support

DOCUMENT REVISION HISTORY

Revisions	Section/Figure/Entry	Correction
Rev. A (10-12-16)	Initial Release of this Document.	

Chapter 1. Overview

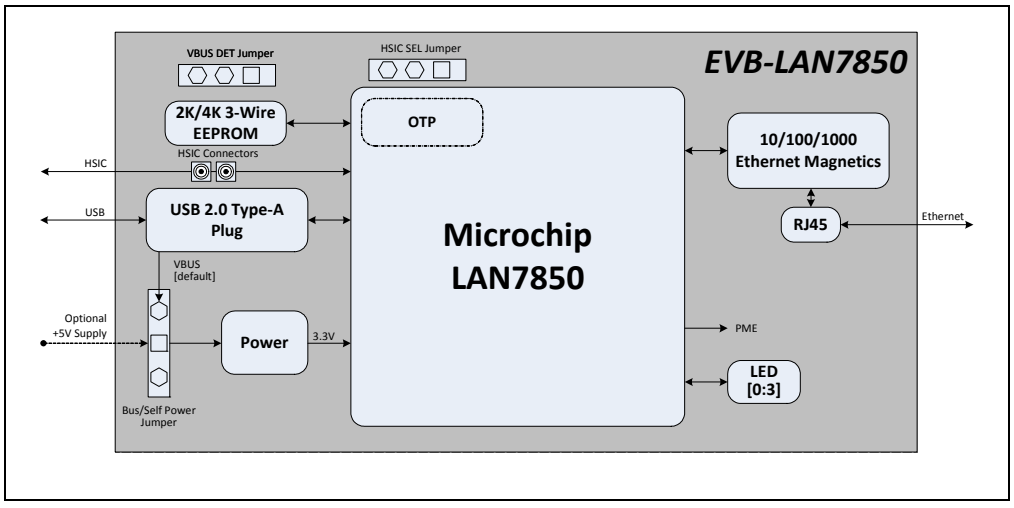
1.1 INTRODUCTION

The EVB-LAN7850 is a demonstration and evaluation platform that provides the necessary requirements and interface options for evaluating the LAN7850 USB 2.0 Gigabit Ethernet Controller with HSIC on a 4-layer RoHS-compliant Printed Circuit Board (PCB). This board has been developed to allow the user to gain an understanding of the product and accelerate the integration of the LAN7850 into their design. The LAN7850 is compliant with the USB 2.0 USB Specification and supports High-Speed (HS), Full-Speed (FS), Low-Speed (LS), and HSIC USB signaling for complete coverage of all defined USB operation speeds. It also supports 10BASE-T/100BASE-TX/1000BASE-T Ethernet (Full-Duplex Support), 802.3az Energy Efficient Ethernet, VLAN tagging, and is available in commercial and industrial temperature ranges. The EVB-LAN7850 is configured for operation through internal default settings and supports custom configurations through the external 4Kbit EEPROM device or internal one-time programmable (OTP) memory. The EVB-LAN7850 demonstrates driver compatibility with Microsoft® Windows® 10, Windows 8x, Windows 7, Mac OS® X 10.4+, and Linux® hub drivers.

The EVB-LAN7850 provides the following features:

- LAN7850 in a 56-pin SQFN RoHS compliant package
- USB 2.0 compliant (HS, FS, LS) operation
- High Speed Inter-Chip (HSIC) USB compliant interface
- 10BASE-T/100BASE-TX/1000BASE-T Ethernet support
- On-board EEPROM for external downloadable firmware
- Low-cost 4-layer space saving design
- Operates from a +5.0 V, regulated external power supply or VBUS
- On-board 25 MHz crystal
- Power, Ethernet link, activity, duplex, and collision LED indicators
- PME event also available in hardware for Wake on LAN

FIGURE 1-1: EVB-LAN7850 FUNCTIONAL BLOCK DIAGRAM



1.2 REFERENCES

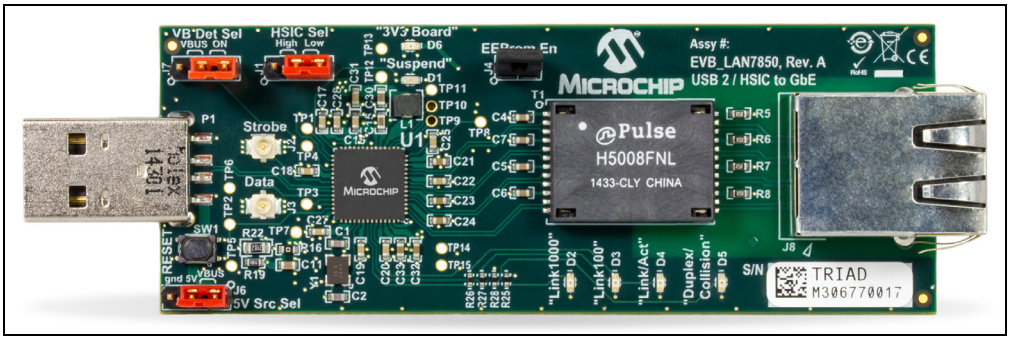
Concepts and materials available in the following documents may be helpful when reading this document. Visit www.microchip.com for the latest documentation.

- LAN7850 Datasheet
- EVB-LAN7850 Schematics

Chapter 2. Board Details & Configuration

The Microchip EVB-LAN7850 is designed for flexible configuration solutions. It can be configured via default internal register settings or by downloadable external firmware to an on-board EEPROM. When configured with the default internal register settings, the Ethernet Link status LEDs are not enabled. To enable Ethernet Link status LEDs, enable the EEPROM.

FIGURE 2-1: INITIAL CONFIGURATION



2.1 POWER SOURCE

The EVB-LAN7850 supports both bus-powered and self-powered operation (using a single +5.0V external power supply).

2.1.1 Bus-Powered Operation

For **bus-powered** (default) operation, perform the following steps:

1. Set the *5V SRC Select* jumper J6 to position J6[1-2].
2. Set the *VBDET Select* jumper J7 to position J7[2-3].
3. Plug board into USB Type-A host.

In this configuration the VBUS_DET signal will be pulled high to +3.3V through the board's +3.3V power rail (3V3_Board), supplying VBUS_DET to the device's detect pin once board-power is present.

2.1.2 Self-Powered Operation

For **self-powered** operation, with the external power supply's output voltage set to +5V and the output off, perform the following steps:

1. Remove the *5V SRC Select* jumper J6.
2. Connect J6, Pin-**3** to the power supply's **GND**.
3. Connect J6, Pin-**2** to the power supply's **+5V** output.
4. Set the *VBDET Select* jumper J7 to position J7[1-2].
5. Turn on the supply's output.
6. Plug board into USB Type-A cable (connected to host) or directly to an onboard host USB port.

In this configuration the device's VBUS_DET pin will sense whether VBUS is present from an upstream host controller whenever the USB cable is disconnected or reconnected while the board is powered.

2.2 USB OPERATION

For USB operation place a two pin jumper between pins 2 and 3 of J1.

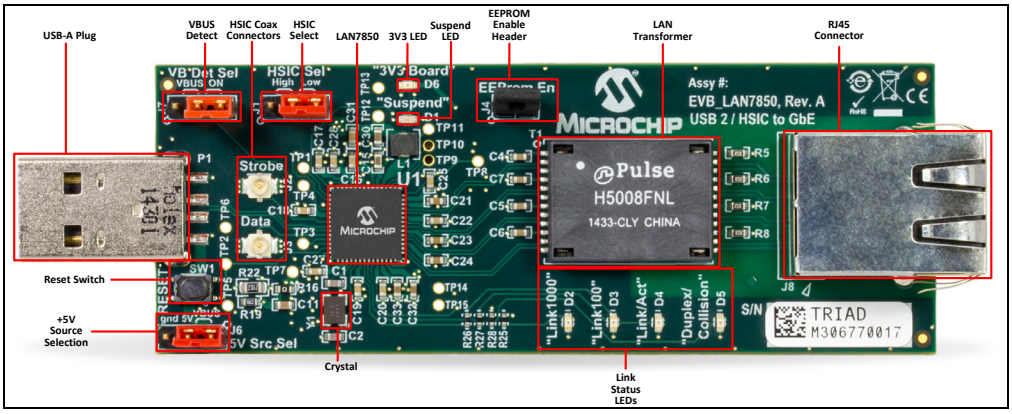
2.3 CLOCK

The EVB-LAN7850 utilizes an on-board 25 MHz 30ppm crystal to drive its internal oscillator circuit.

2.4 BOARD FEATURES AND CONFIGURATION

The following sections describe the various board features and configuration settings. Figure 2-2 provides a top view of the EVB-LAN7850.

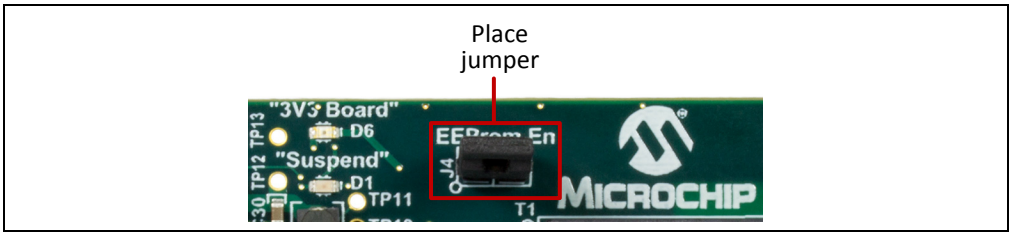
FIGURE 2-2: EVB-LAN7850 TOP VIEW



2.4.1 External EEPROM / Internal OTP

At power-up, the LAN7850 searches for an external EEPROM. If an external EEPROM is detected the LAN7850 configuration is loaded from it. If no EEPROM is found, the device checks the OTP. If there is no OTP, the device will use default CSR settings. The EEPROM stores the default values for the USB descriptors and the MAC address. To enable the EEPROM, place a jumper on the **EEPROM En** header (J4), as shown in Figure 2-3.

FIGURE 2-3: ENABLE EEPROM

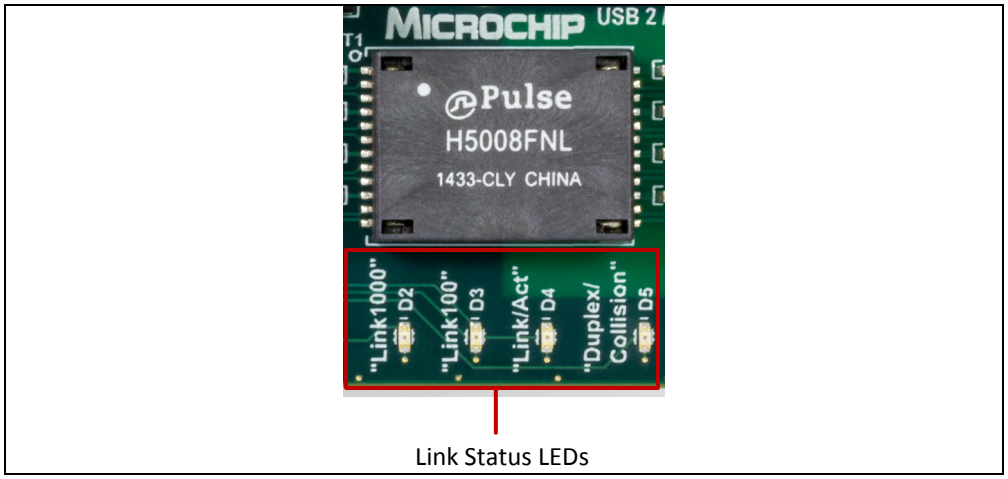


2.4.2 Enable Link Status LED

When configured with the default internal register settings, the Ethernet Link status LEDs are not enabled. To enable Ethernet Link status LEDs, enable the EEPROM. Each LED is detailed below:

- **Link1000:** LED is ON with a valid 1000Mbps link.
- **Link100:** LED is ON with a valid 100Mbps link.
- **Link/Act:** LED is ON with network activity.
- **Duplex/Collision:** LED is ON in full-duplex mode. LED is OFF in half-duplex mode. LED is blinking during collision.

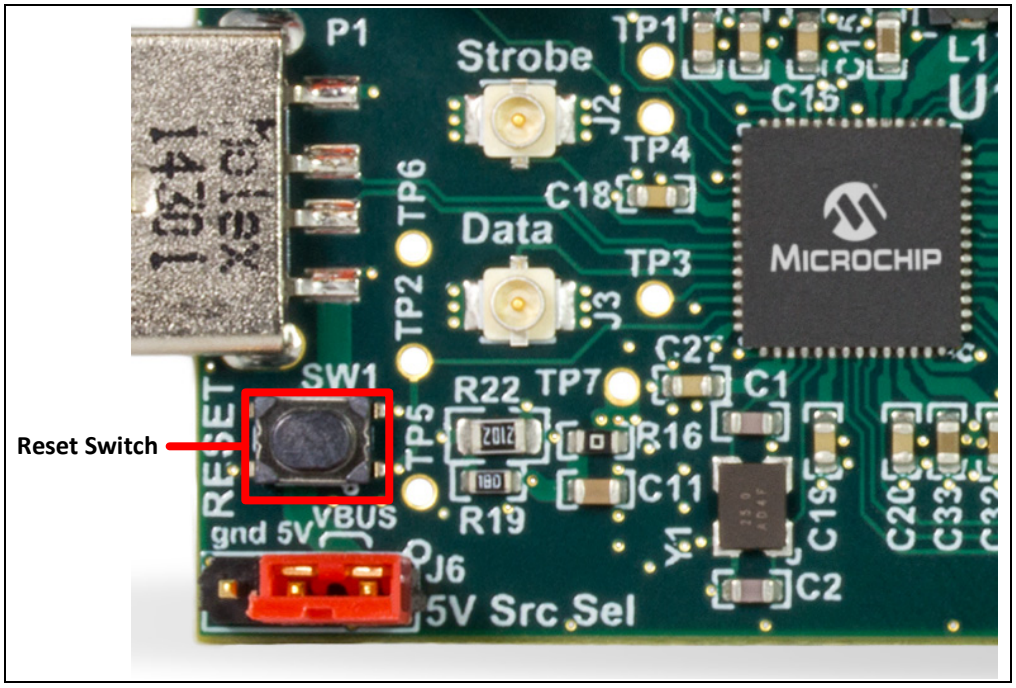
FIGURE 2-4: ENABLE LINK STATUS LEDS



2.4.3 External Chip Reset

By pressing the SW1 push-button switch, the device places all pins into their default state and the entire contents of the EEPROM or OTP are reloaded.

FIGURE 2-5: EXTERNAL CHIP RESET SWITCH

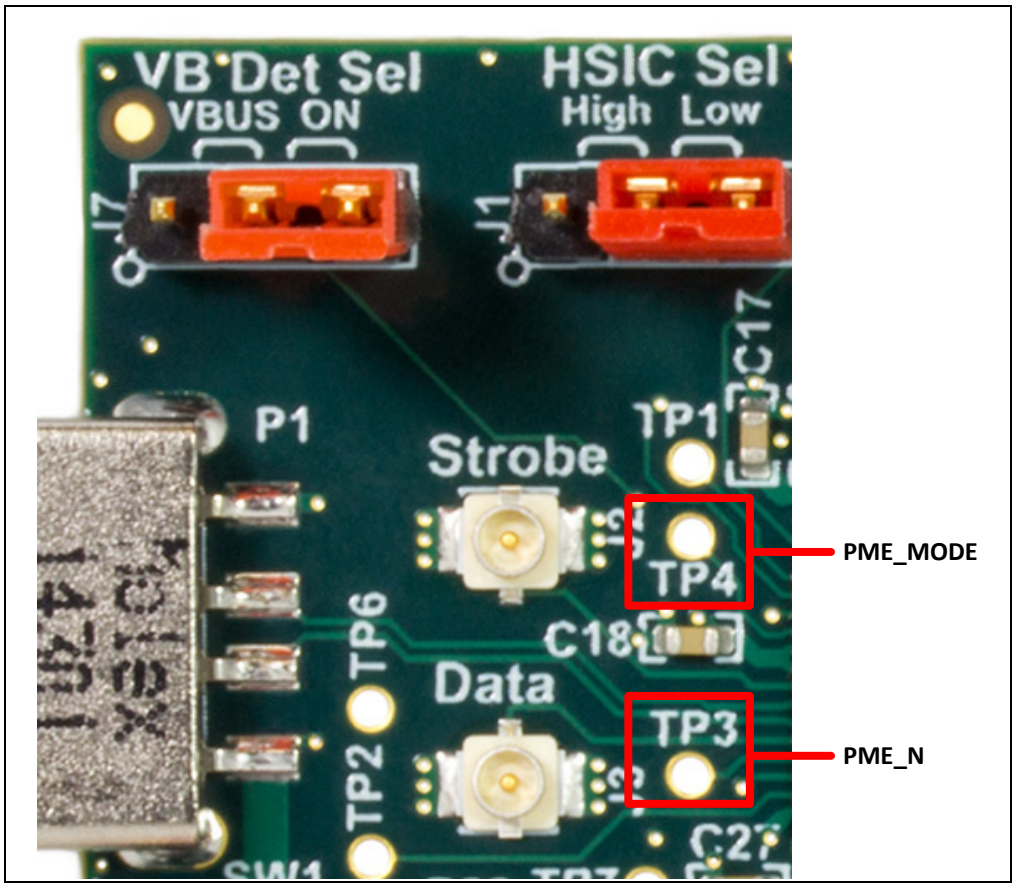


2.4.4 PME Operation

The LAN7850 supports PME (Power Management Events) for WoL (Wake on LAN). To enable PME operation, follow these steps:

1. TP3 is connected to PME_N pin. Connect this pin to the embedded controller via fly-wire.
2. TP4 is connected to the PME_MODE pin. Connect this pin to the embedded controller via fly-wire.
3. Connect a 10K Ohm pull-up resistor to TP3 and to 3V3_Board.

FIGURE 2-6: PME SELECTION HEADER

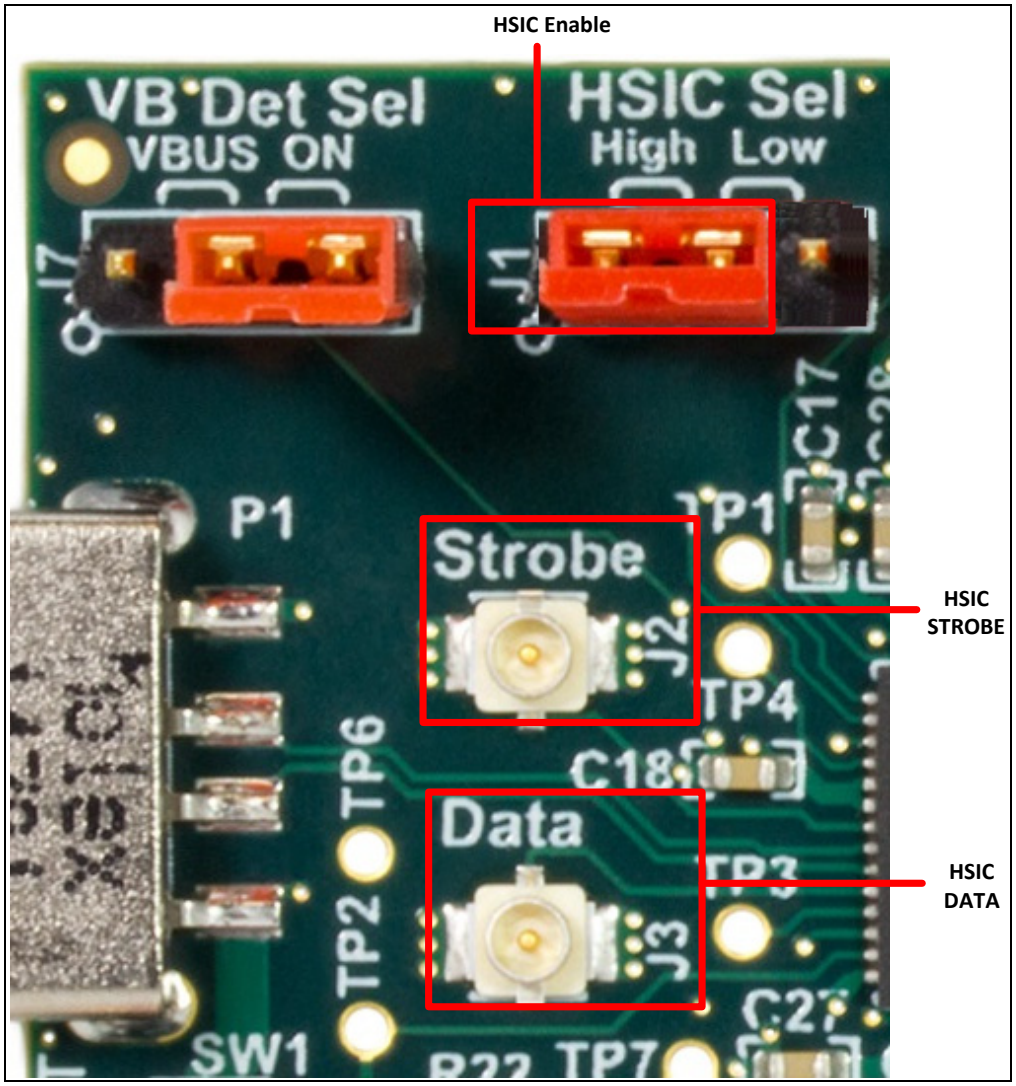


2.4.5 HSIC Operation

The LAN7850 supports High Speed Inter-Chip (HSIC) operation. To enable HSIC operation, follow these steps:

1. Place a two pin jumper between pins 1 and 2 of header J1 to enable HSIC operation.
2. U.FL male jack coaxial connectors J2 (HSIC Strobe) and J3 (HSIC Data) on the board are used for connection to the HSIC interface.
3. Use a suitable U.FL cable assembly to connect the USB HSIC host to the corresponding HSIC strobe and data signals on J2 and J3.

FIGURE 2-7: HSIC CONNECTORS

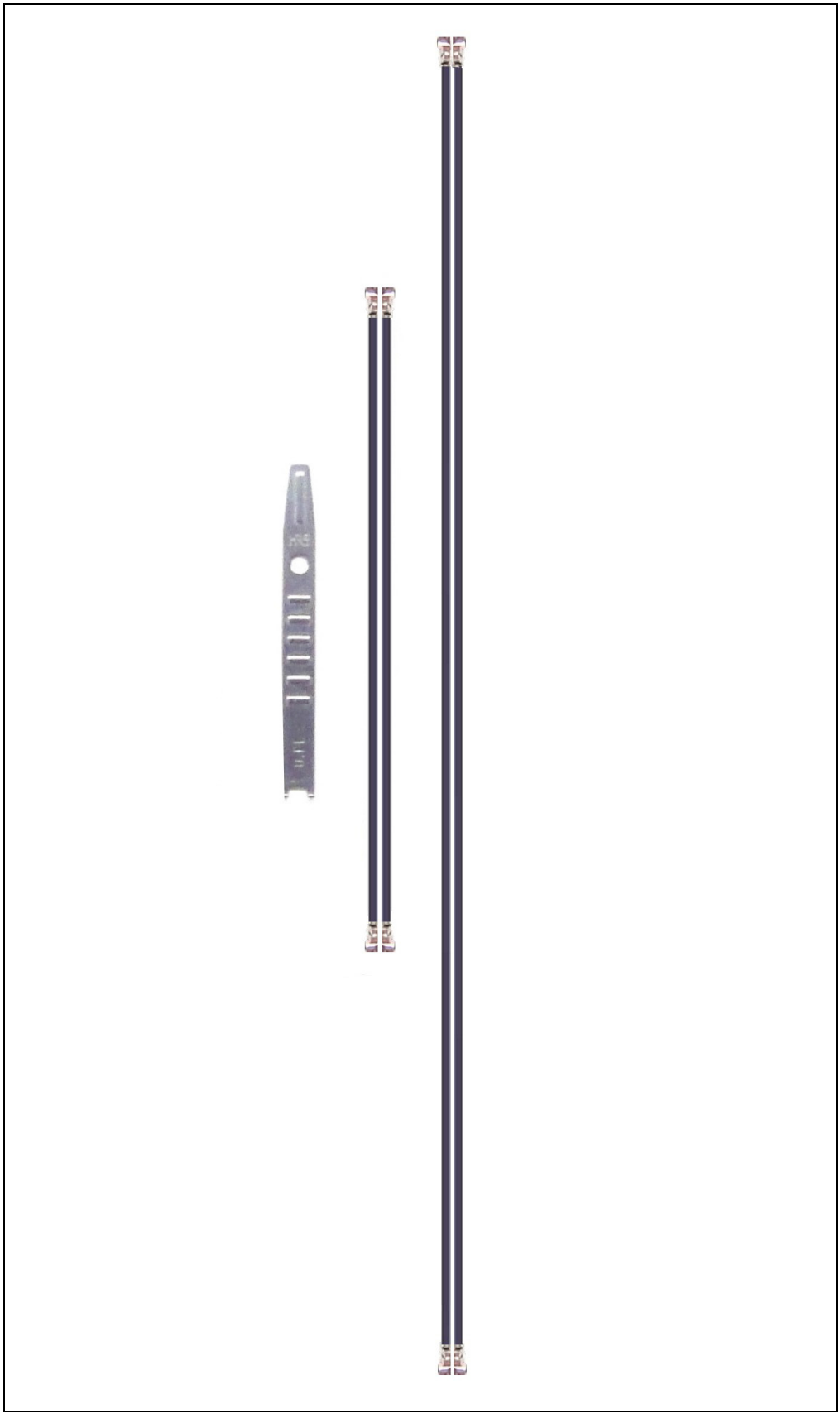


Note 1: The EVB-USB4624BCUH evaluation board available on Microchip Direct may be used as a USB HSIC host for evaluation of the EVB-LAN7850 HSIC feature.

2: The 100mm (3.94 inches) part number U.FL-LP-066J1-A-(100) is a suitable RF cable assembly that may be used with the HSIC connectors (Figure 2-8).

3: The extraction tool part number U.FL-LP-N-2 may be used for safely disconnecting the U.FL cables (Figure 2-8).

FIGURE 2-8: U.FL CABLES AND EXTRACTION TOOL



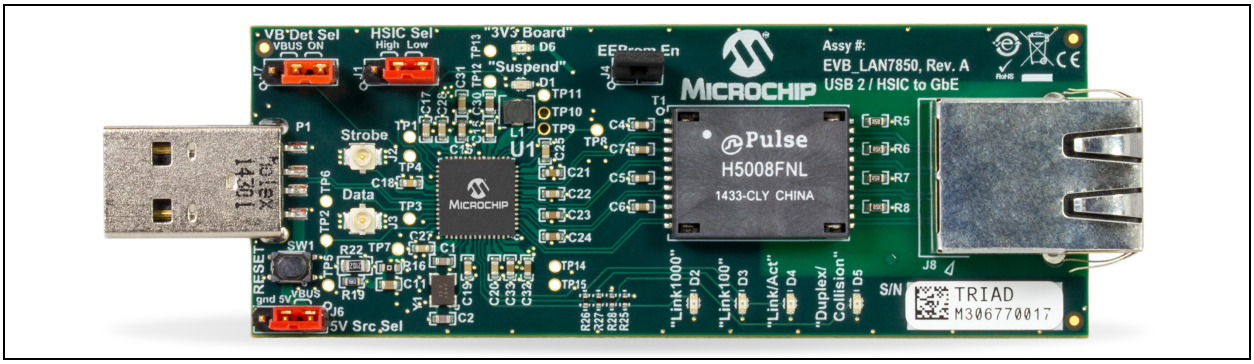
NOTES:

Appendix A. EVB-LAN7850 Evaluation Board

A.1 INTRODUCTION

This appendix shows the EVB-LAN7850 Evaluation Board.

FIGURE A-1: EVB-LAN7850 EVALUATION BOARD



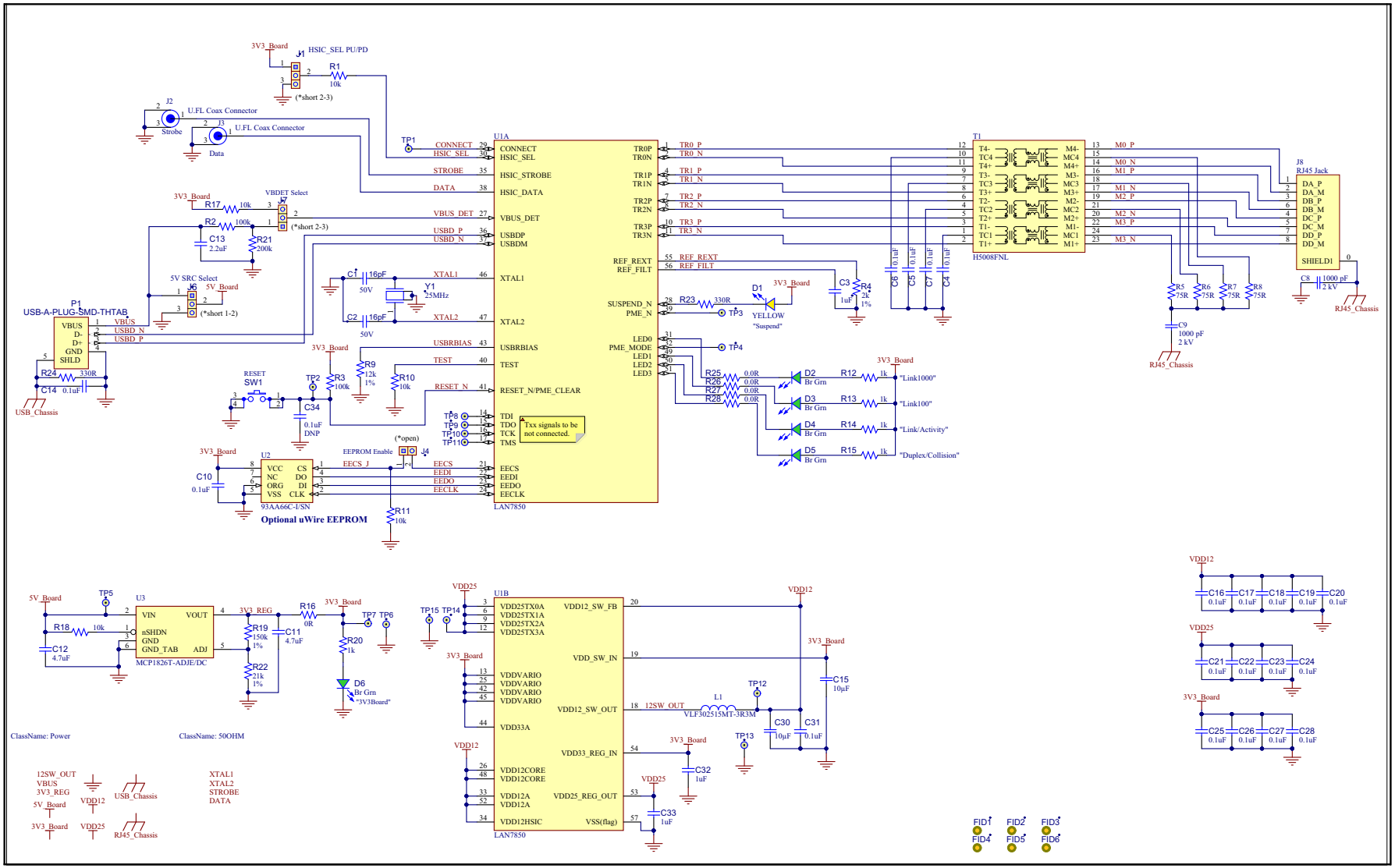
NOTES:

Appendix B. EVB-LAN7850 Schematics

B.1 INTRODUCTION

This appendix includes the EVB-LAN7850 Evaluation Board schematics.

FIGURE B-1: EVB-LAN7850 EVALUATION BOARD SCHEMATIC



Appendix C. EVB-LAN7850 BOM

C.1 INTRODUCTION

This appendix shows the EVB-LAN7850 Evaluation Bill of Materials

TABLE C-1: EVB-LAN7850 BILL OF MATERIALS

Designator	Description	Manufacturer	Manufacturer Part Number	Quantity
C1, C2	CAP CER 16PF 5% 50V C0G NP0 0603	Murata	GCM1885C1H160JA16D	2
C3, C32, C33	CAP CER 1uF 16V 10% X5R SMD 0603	AVX	0603YD105KAT2A	3
C4, C5, C6, C7, C10, C14, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C31	CAP CER 0.1uF 25V 10% X7R SMD 0603	Murata	GRM188R71E104KA01D	20
C8, C9	CAP CER 1000PF 2KV 10% X7R 1808	Murata Electronics	GR442QR73D102KW01L	2
C11, C12	CAP CER 4.7uF 6.3V 20% X5R SMD 0603	Panasonic	ECJ-1VB0J475M	2
C13	CAP CER 2.2uF 6.3V 10% X7R SMD 0603	TDK	C1608X7R0J225K	1
C15, C30	CAP CER 10UF 6.3V 20% X5R 0603	Murata Electronics	GRM188R60J106ME47D	2
C34	CAP CER 0.1uF 25V 10% X7R SMD 0603	Murata	GRM188R71E104KA01D	0
D1	DIO LED YELLOW 2.2V 25mA 3.4mcd Diffuse SMD 0603	Stanley Electric Co	AY1111C-TR	1
D2, D3, D4, D5, D6	LED, Bright Green, 0603	Lite-On	LTST-C191KGKT	5
J1	CONN HEADER 3POS .100" SGL GOLD	Samtec	TSW-103-07-G-S	1
J2, J3	U.FL, Ultra Miniature Coaxial Connector Receptacle, Male Pin 50 Ohm Surface Mount Solder	Hirose Electric Co Ltd	U.FL-R-SMT-1(01)	2
J4	CONN HEADER 2POS .100" SGL GOLD	Samtec Inc.	TSW-102-07-G-S	1
J6, J7	HDR 3POS .100" SGL GOLD	Samtec Inc.	TSW-103-07-G-S	2
J8	CONN MOD JACK R/A SHIELDED NO LED (RJ45)	Stewart Connector	SS-7188S-A-PG4-1-BA	1
L1	3.3µH Shielded Wirewound Inductor 1.11A 72 mOhm Max	TDK Corporation	VLF302515MT-3R3M	1
P1	USB - A USB 2.0 Plug Connector 4 Position Surface Mount, Right Angle, Horizontal	Molex	0480371000	1
R1, R10, R11, R17, R18	RES TKF 10k 5% 1/10W SMD 0603	Panasonic	ERJ-3GEYJ103V	5

TABLE C-1: EVB-LAN7850 BILL OF MATERIALS (CONTINUED)

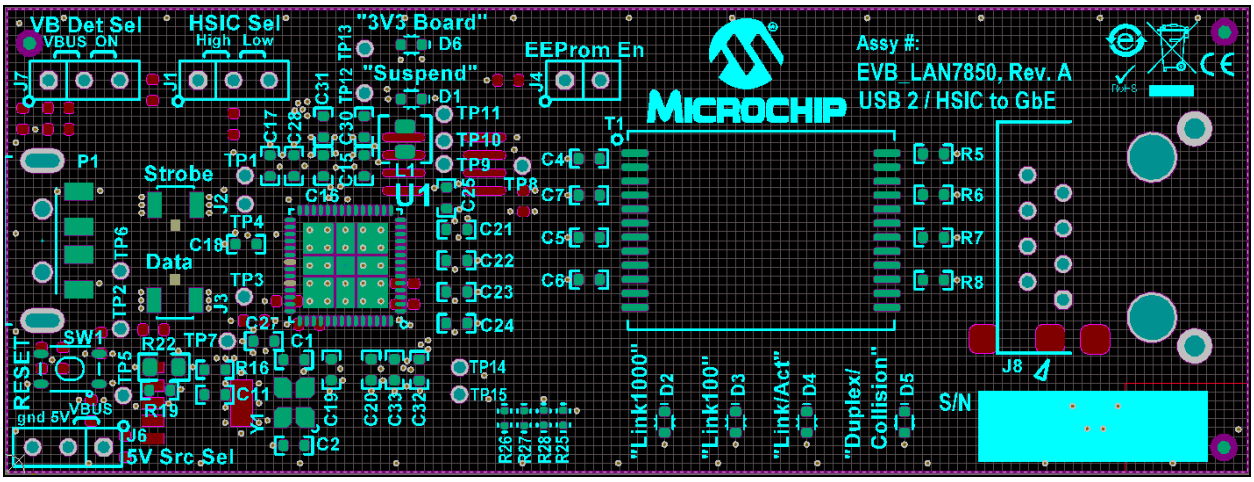
Designator	Description	Manufacturer	Manufacturer Part Number	Quantity
R2, R3	RES TKF 100k 5% 1/10W SMD 0603	Panasonic	ERJ-3GEYJ104V	2
R4	RES TKF 2k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF2001V	1
R5, R6, R7, R8	RES 75 OHM 1/10W 1% 0603	KOA Speer	RK73H1JTTD75R0F	4
R9	RES TKF 12k 1% 1/10W SMD 0603	Yageo	RC0603FR-0712KL	1
R12, R13, R14, R15, R20	RES TKF 1k 5% 1/10W SMD 0603	Panasonic	ERJ-3GEYJ102V	5
R16	RES TKF 0R 1/10W SMD 0603	NIC Components	NRC06Z0TRF	1
R19	RES TKF 150k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF1503V	1
R21	RES TKF 200k 5% 1/10W SMD 0603	Panasonic	ERJ-3GEYJ204V	1
R22	RES TKF 21k 1% 1/8W SMD 0805	Panasonic	ERJ-6ENF2102V	1
R23	RES TKF 330R 5% 1/10W SMD 0603	Panasonic Electronic Components	ERJ-3GEYJ331V	1
R24	RES 330 5% 1/10W SMD 0603	Panasonic Electronic Components	ERJ-3GEYJ331V	1
R25, R26, R27, R28	RES 0.0R 1/10W 0402 SMD	Rohm Semiconductor	MCR01MRTJ000	4
SW1	Tactile Switch SPST-NO Top Actuated Surface Mount	C&K Components	PTS810 SJM 250 SMTR LFS	1
T1	TRANSFORMER MODULE SINGLE GIGABIT LAN 24SOIC	Pulse Electronics	H5008FNL	1
U1	Hi-Speed USB 2.0 to 10/100/1000 Ethernet Controller with HSIC	Microchip Technology	LAN7850/4F	1
U2	IC EEPROM 4Kbit 3MHz Microwire SOIC8	Microchip Technology	93AA66C-I/SN	1
U3	1A Low Voltage LDO regulator	Microchip Technology	MCP1826T-ADJE/DC	1
Y1	25MHz ±30ppm Crystal 10pF 60 Ohm -20°C ~ 70°C Surface Mount DFN4	Abracon LLC	ABM8G-25.000MHZ-B4Y-T	1

Appendix D. EVB-LAN7850 Silk Screen

D.1 INTRODUCTION

This appendix shows the EVB-LAN7850 Top Silk Screen image.

FIGURE D-1: EVB-LAN7850 TOP SILK SCREEN



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