EVB-LAN8830 Evaluation Board User's Guide

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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 website (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 Microchip EVB-LAN8830 Evaluation Board. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes how to use the EVB-LAN8830 as a development tool for the LAN8830 Gigabit Ethernet Transceiver with RGMII. The manual layout is as follows:

- **Chapter 1. "Overview"** – This chapter provides a brief description of the EVB-LAN8830 evaluation board.
- **Chapter 2. "Getting Started"** – This chapter provides information about setup and operation of the EVB-LAN8830.
- **Chapter 3. "Hardware Configuration"** – This chapter provides information about setup of the EVB-LAN8830 hardware.
- **Appendix A. "Schematics"** – This appendix shows the EVB-LAN8830 schematics.
- **Appendix B. "Bill of Materials"** – This appendix includes the EVB-LAN8830 bill of materials.

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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- **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 non-production development programmers such as PICSTART® Plus and PICkit™ 2 and 3.

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- Technical Support

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

DOCUMENT REVISION HISTORY

Revisions	Section/Figure/Entry	Correction
DS50003441A (11-17-22)	Initial release	

Chapter 1. Overview

1.1 INTRODUCTION

The EVB-LAN8830 evaluation board is a plug-in daughter card that interfaces directly with a mating Microchip host processor or controller board, such as the SAMA5D3 Ethernet Development System (EDS) board, as well as a USB bridge board (EVB-LAN7801-EDS) and a PCIe® bridge board (EVB-LAN7431-EDS). It features the LAN8830, a highly integrated networking device that incorporates a 10/100/1000BASE-T physical layer transceiver (PHY). The board's PHY port is connected to an RJ45 Ethernet jack with integrated magnetics, and the PHY's RGMII connections are brought out to a high-speed (HS) multi-pin connector.

Together, the EVB-LAN8830 and the EDS base board provide a highly flexible platform for evaluation of PHY features using their internal memory registers and the management interface.

This document describes the EVB-LAN8830 setup and its user interface features.

A simplified block diagram of the board is shown in Figure 1-1.

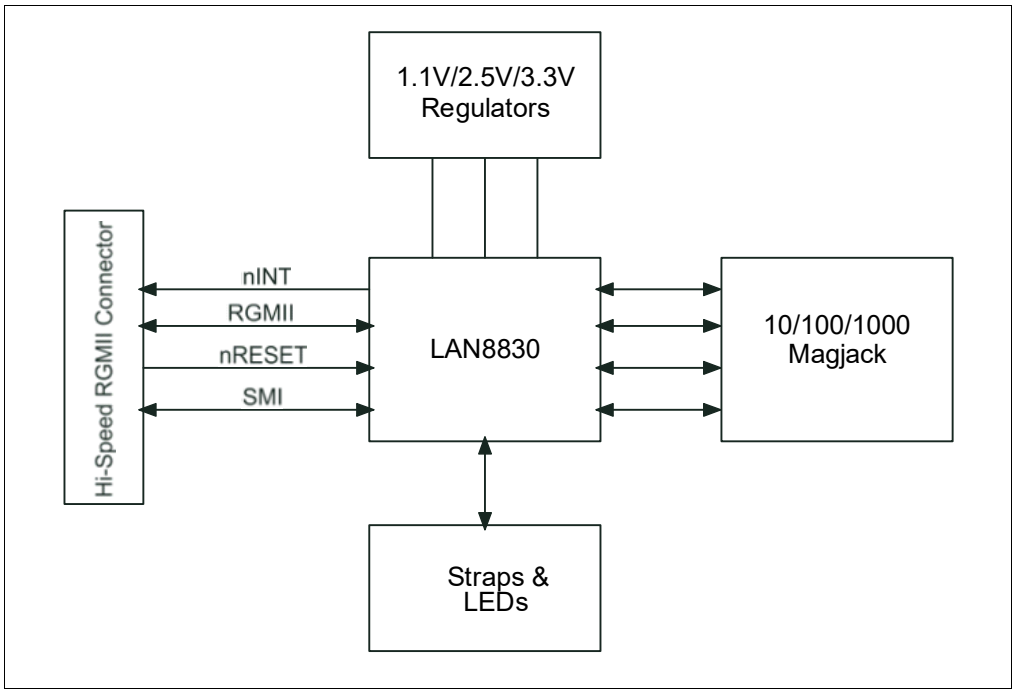
1.2 REFERENCES

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

- *LAN8830 Data Sheet*
- *EVB-LAN8830 Schematics*
- *LAN8830 Hardware Design Checklist*
- *SAMA5D3 Ethernet Development System Schematics*
- *SAMA5D3 Ethernet Development System Board User's Guide*
- *EVB-LAN7801 Ethernet Development System Schematics*
- *EVB-LAN7801 Ethernet Development System User's Guide*
- *EVB-LAN7431 Ethernet Development System Schematics*
- *EVB-LAN7431 Ethernet Development System User's Guide*
- *MIC33153 Data Sheet*
- *MIC5207 Data Sheet*

1.3 BLOCK DIAGRAM

FIGURE 1-1: EVB-LAN8830 BLOCK DIAGRAM



Chapter 2. Getting Started

2.1 INTRODUCTION

The EVB-LAN8830 evaluation board is designed as a plug-in card to interface directly with a mating Microchip host processor or controller board, such as the SAMA5D3-EDS board, that supplies full power and provides full register access and configuration via MDIO/MDC bus management.

2.2 DEFAULT JUMPER SETTINGS

The EVB-LAN8830 ships with the necessary jumpers installed for basic operation.These are:

- J1: Shunt installed between pins [2-3]
- J2: Shunt installed between pins [2-3]
- J4: Shunt installed between pins [1-2]

See Figure 3-1 for an image of these default shunt installations.

See Section 3.4 "Connectors" for a full list of connector/header descriptions and directions for use.

2.3 POWER SOURCE

The EVB-LAN8830 can be completely bus-powered from its mating Microchip host processor or control board. Alternatively, the EVB-LAN8830 can be powered with an external 3.3V supply.

Refer to Figure 3-1 and the board schematics in Figure A-2 for details.

2.3.1 EDS-Powered Operation

For EDS-powered operation, J1 needs a jumper on the pins [2-3], and J2 needs a jumper on the VDDIO pins [2-3] as shown in Figure 3-1.

2.3.2 External-Powered Operation

For external-powered operation, J1 needs a jumper on pins [1-2], while J2 needs a jumper on either 2.5V pins [1-2] or VDDIO pins [2-3]. An external 3.3V power source should be connected to TP1.

2.4 CLOCK

The EVB-LAN8830 utilizes a 25 MHz crystal to generate input reference clock for the LAN8830 device. Refer to Figure A-3 for details.

2.5 RESET CIRCUIT

2.5.1 Power-On Reset—EDS Reset

The SAMA5D3-EDS can provide the LAN8830 Reset when a jumper is placed on EVB-LAN8830, J4 pins [1-2] (EDS Reset).

2.5.2 Manual Reset

The EVB-LAN8830 SW1 can be pressed and released to provide LAN8830 Reset after device power-up. The EVB-LAN8830 J4 must have a jumper between pins [2-3] (Reset) to utilize this manual Reset.

2.6 USING THE EVB-LAN8830

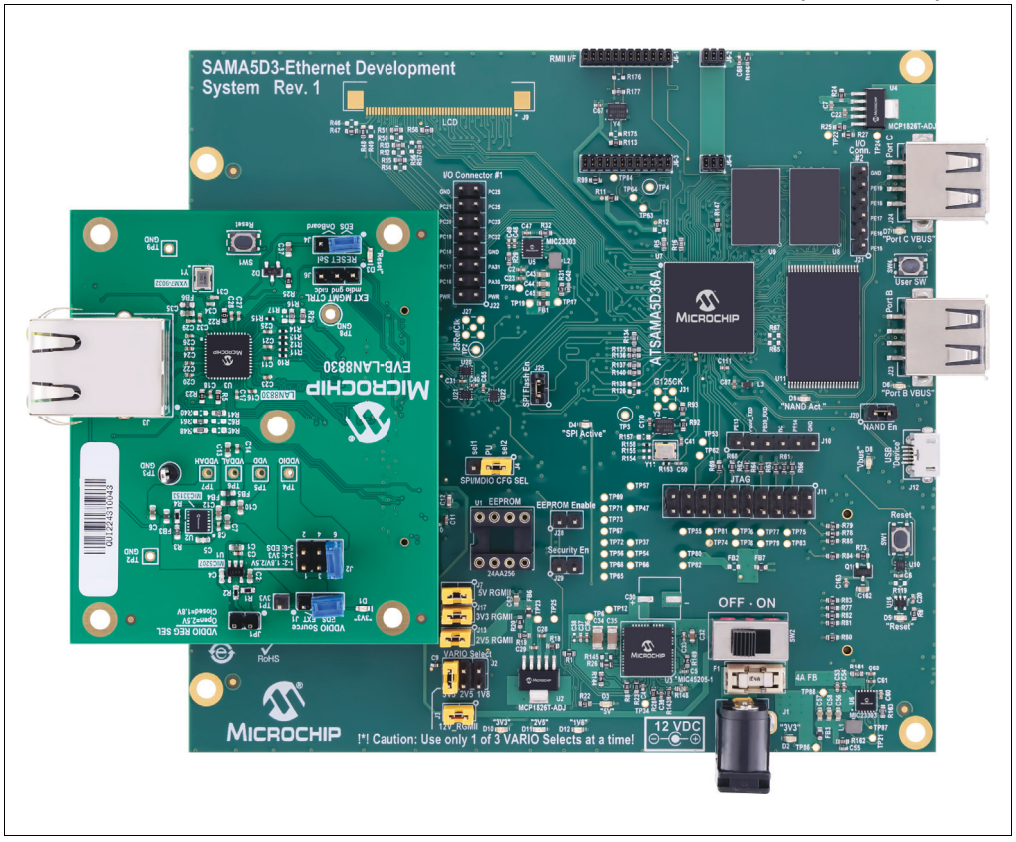
2.6.1 With SAMA5D3-EDS

The EVB-LAN8830 directly plugs into a mating Microchip host controller or processor board, such as the SAMA5D3-EDS, that can deliver full power and provide full register access and configuration via MDIO/MDC bus management.

Together, the EVB-LAN8830 and the SAMA5D3-EDS enable 10/100/1000 Mbps Ethernet traffic through RGMII and the PHY port of the EVB-LAN8830 device, with the RGMII port connecting to the SAMA5D3 processor and the PHY port connecting via copper Ethernet cable (CAT-5 UTP or better) to external Ethernet devices.

All LAN8830 registers are accessible via MDIO/MDC bus management from the SAMA5D3-EDS board, enabling full evaluation and firmware for all LAN8830 features. MDIO/MDC pins are also available for external control at header J6. Refer to the SAMA5D3 Ethernet Development System Board User's Guide. Figure 2-1 shows the EVB-LAN8830 connected to the SAMA5D3-EDS board.

FIGURE 2-1: EVB-LAN8830 AND SAMA5D3-EDS BOARD (TOP VIEW)



2.6.2 With EVB-LAN7801-EDS and EVB-LAN7431-EDS

To work with EVB-LAN7801-EDS and EVB-LAN7431-EDS with the EVB-LAN8830, a specific EEPROM image for LAN7801/LAN7431 should be programmed onto the EVB baseboard. This is necessary to ensure that RGMII TXC and RXC delays settings are appropriately configured, and the 125 MHz clock source is enabled internal to the LAN7801/LAN7431.

A `readme` file that describes the detailed configuration and the binary files used to program the EEPROM on the bridge boards are available on the EVB-LAN8830 evaluation board product page.

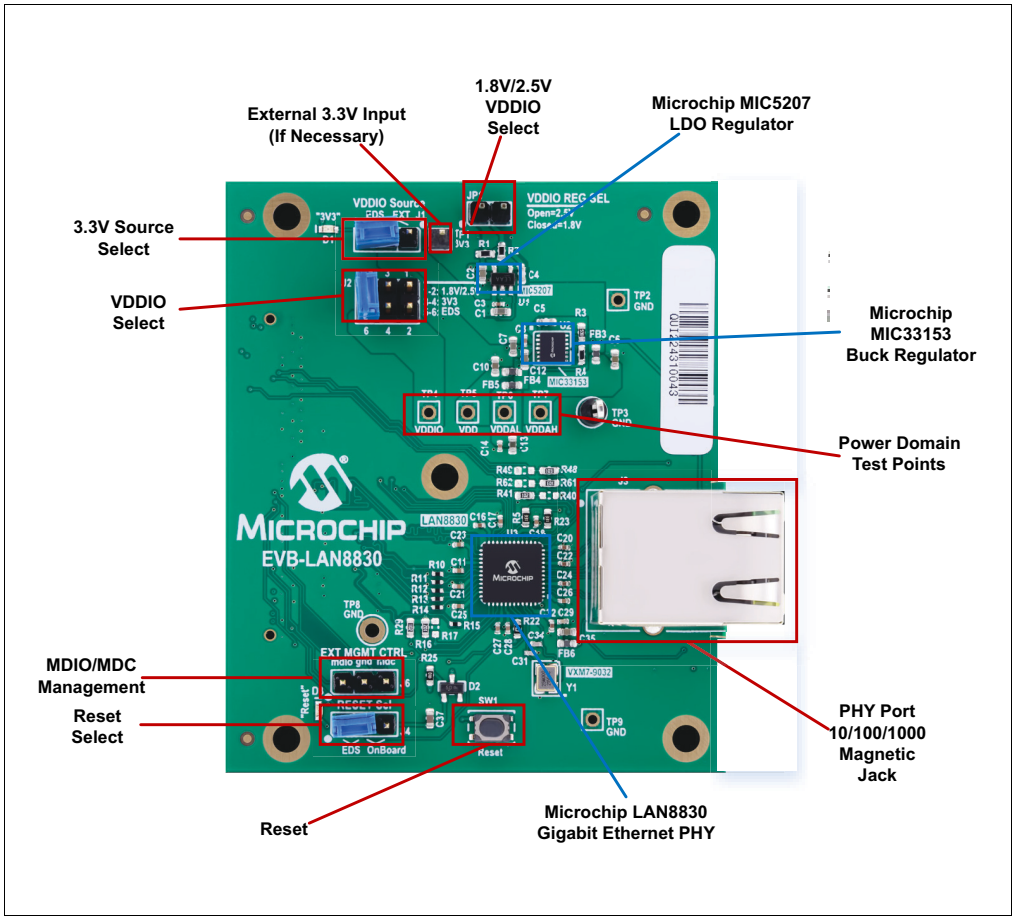
NOTES:

Chapter 3. Hardware Configuration

3.1 HARDWARE CONFIGURATION OPTIONS

Figure 3-1 shows the top view of the EVB-LAN8830.

FIGURE 3-1: EVB-LAN8830 TOP VIEW WITH CALLOUTS



3.2 PHY PORT

PHY port (J3) supports 10BASE-T/100BASE-TX/1000BASE-T with both auto-negotiation enabled and Auto-MDI/MDI-X enabled as the power-up defaults.

3.3 TEST POINTS

Table 3-1 lists the test points on the EVB-LAN8830:

TABLE 3-1: TEST POINTS

Test Point	Description
TP1	3V3
TP2	GND
TP3	GND
TP4	VDDIO
TP5	VDD
TP6	VDDAL
TP7	VDDAH
TP8	GND
TP9	GND

3.4 CONNECTORS

Table 3-2 lists the connectors on the EVB-LAN8830:

TABLE 3-2: CONNECTORS

Connector Reference Designator	Function	Options
J1	VDDIO Source Selection	Shunt pins [1-2]: External VDDIO applied on TP1. Shunt pins [2-3]: VDDIO comes from MAC (EDS).
J2	VDDIO Voltage Selection	Shunt pins [1-2]: VDDIO is from MAC. Shunt pins [3-4]: VDDIO is 3.3V. Shunt pins [5-6]: VDDIO is 1.8V/2.5V.
J3	Ethernet RJ45 Connector	N/A
J4	Reset Select	Shunt pins [1-2]: Reset comes from MAC (EDS) device. Shunt pins [2-3]: Reset comes from local reset button (SW1).
J5	Board to Board Connector	N/A
J6	MDIO Probe Header	For probe only. Do not connect shunt across any pins on J6. Pin 1: MDC Pin 2: GND Pin 3: MDIO
JP1	1.8V/2.5V VDDIO Select	Open: VDDIO is 2.5V. Closed: VDDIO is 1.8V.

Appendix A. Schematics

A.1 INTRODUCTION

This appendix shows the EVB-LAN8830 schematic.

FIGURE A-1: EVB-LAN8830 SCHEMATIC 1

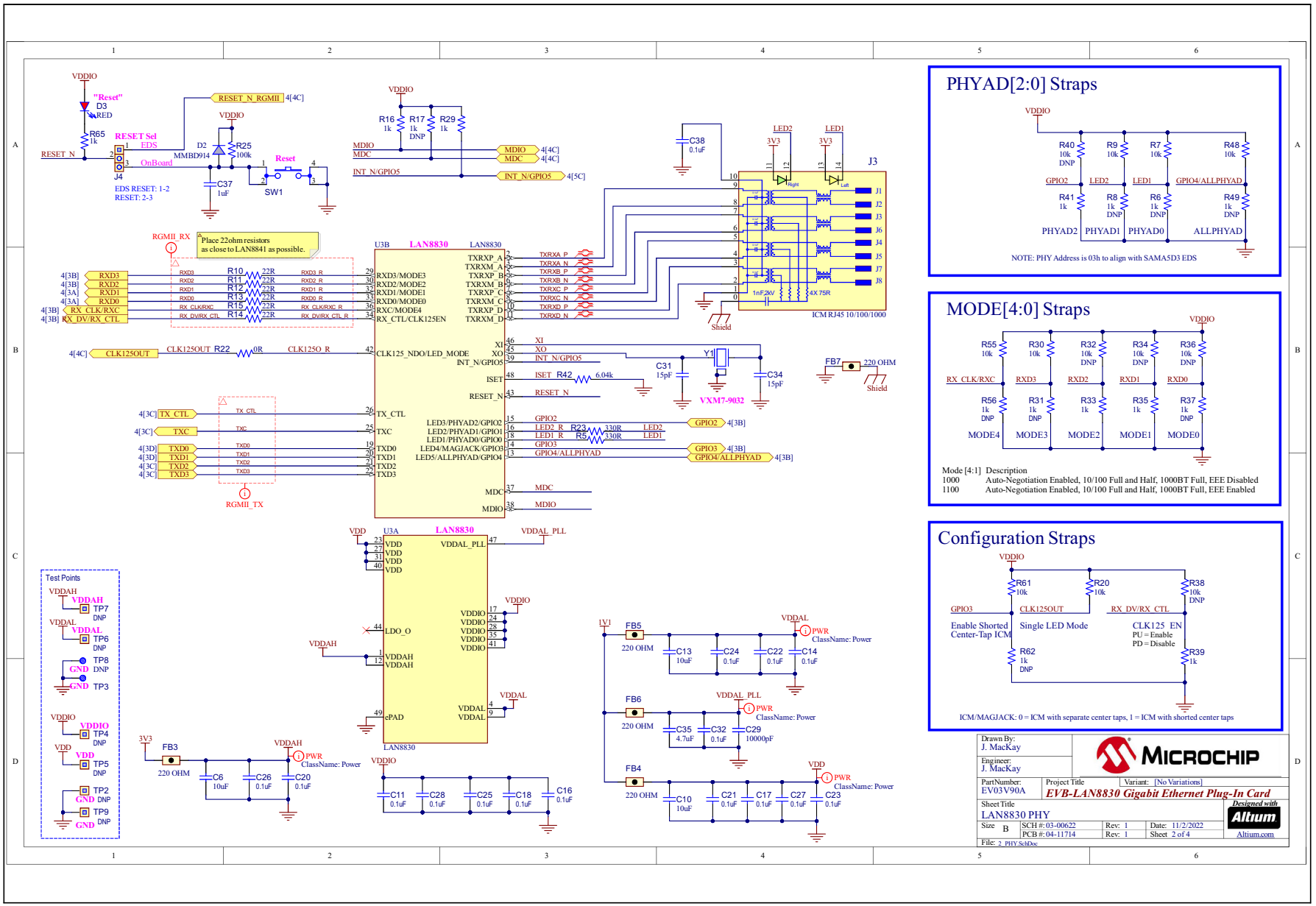


FIGURE A-2: EVB-LAN8830 SCHEMATIC 2

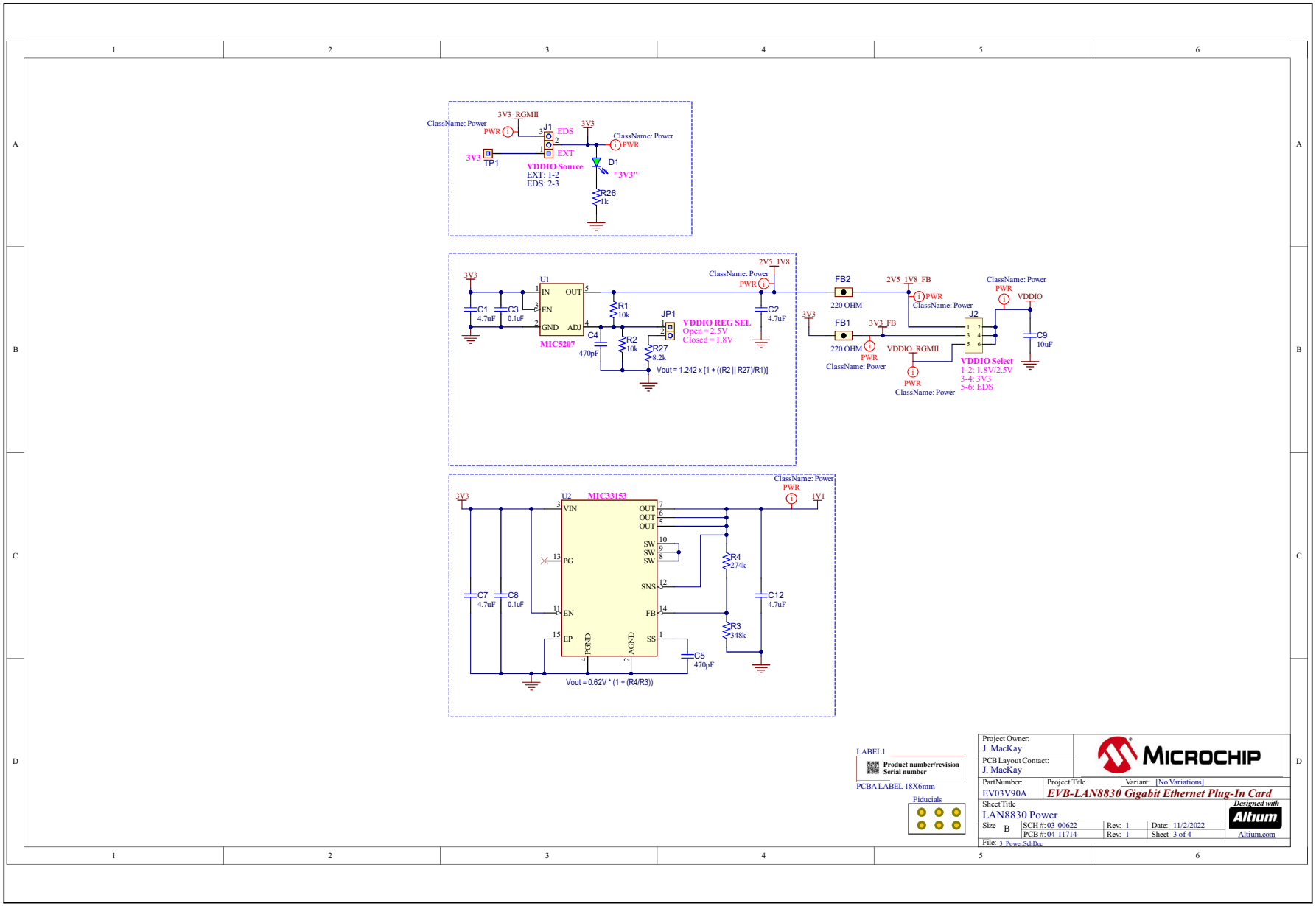
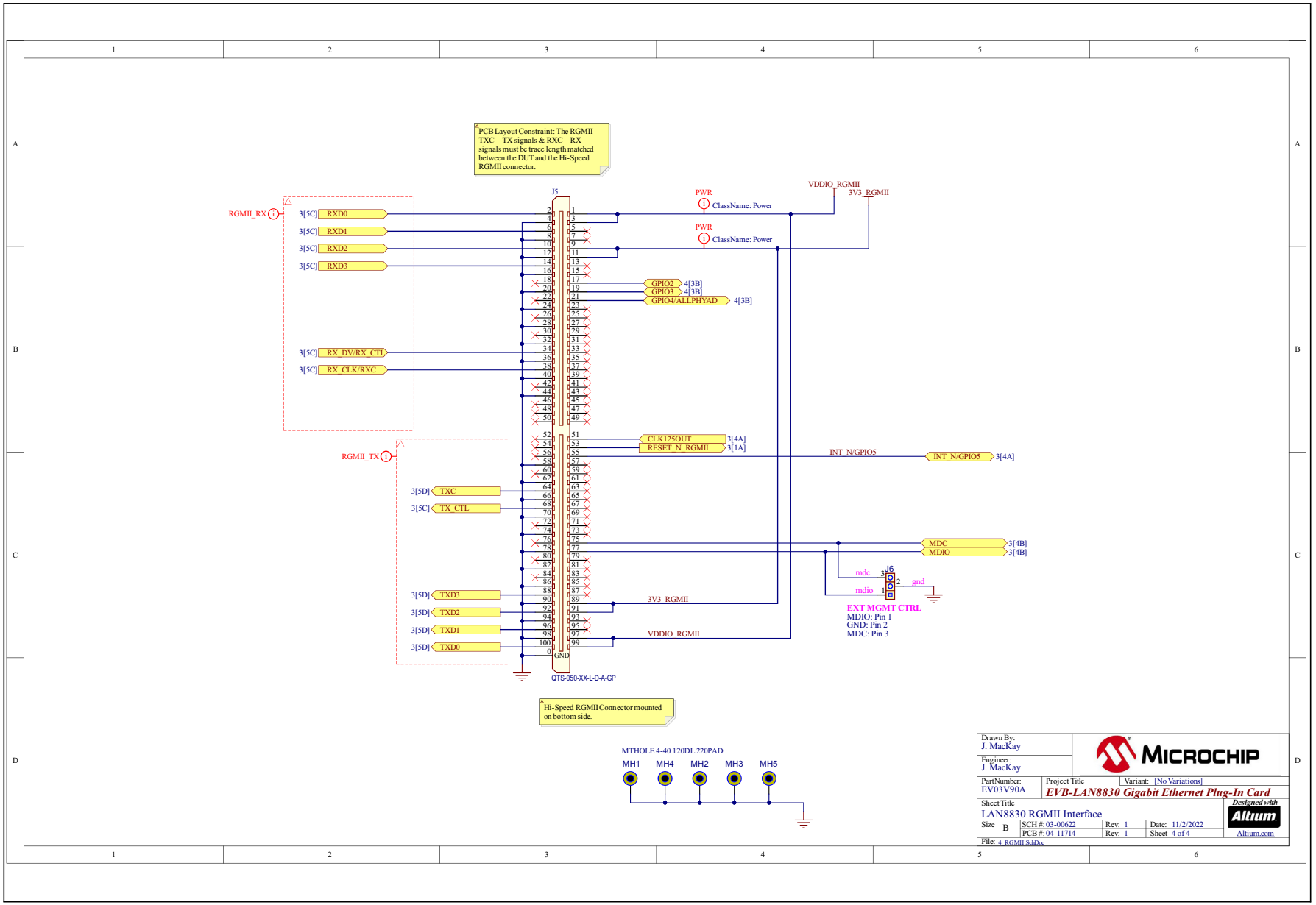


FIGURE A-3: EVB-LAN8830 SCHEMATIC 3



Appendix B. Bill of Materials

B.1 INTRODUCTION

This appendix contains the EVB-LAN8830 Bill of Materials (BOM).

TABLE B-1: EVB-LAN8830 BILL OF MATERIALS

Item	Qty	Designator	Description	Populated	Manufacturer	Manufacturer Part Number
1	5	C1, C2, C7, C12, C35	CAP CER 4.7uF 10V 10% X5R SMD 0603	YES	Yageo	CC0603MRX5R5BB475
2	18	C3, C8, C11, C14, C16, C17, C18, C20, C21, C22, C23, C24, C25, C26, C27, C28, C32, C38	CAP CER 0.1uF 50V 10% X7R SMD 0402	YES	TDK Corporation	C1005X7R1H104K050BB
3	2	C4, C5	CAP CER 470pF 25V 5% NP0 SMD 0603	YES	AVX	06033A471JAT2A
4	4	C6, C9, C10, C13	CAP TANT 10uF 20V 10% 2.1Ohm SMD B	YES	AVX	06036D106MAT2A
5	1	C29	CAP CER 10000pF 16V 10% X7R SMD 0402	YES	KEMET	C0402C103K4RACTU
6	2	C31,C34	CAP CER 15pF 50V 5% NP0 SMD 0402	YES	Johanson Technology Inc	500R07S150JV4T
7	1	C37	CAP CER 1uF 16V 10% X5R SMD 0603	YES	AVX	0603YD105KAT2A
8	1	D1	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	YES	Lite-On Inc	LTST-C191KGKT
9	1	D2	DIO RECT MMBD914LT1G 1V 10mA 100V SMD SOT-23-3	YES	ON Semiconductor	MMBD914LT1G
10	1	D3	DIO RED 2V 20mA 54mcd CLEAR SMD 0603	YES	Lite-On Inc.	LTST-C191KRKT
11	7	FB1, FB2, FB3, FB4, FB5, FB6, FB7	FERRITE 500mA 220R SMD 0603	YES	Murata Electronics North America	BLM18AG221SN1D
12	3	J1, J4, J6	CON HDR-2.54 Male 1x3 Gold 5.84MH TH VERT	YES	FCI	68000-103HLF
13	1	J2	CON HDR-2.54 Male 2x3 Gold 5.84MH TH VERT	YES	Samtec	TSW-103-07-S-D
14	1	J3	CONN MAGJACK 1PORT 1000 BASE-T	YES	Pulse Electronics Network	JD1-0001NL
15	1	J5	CON STRIP High Speed Stacker 5mm Male 2x50 SMD VERT	YES	Samtec	QTS-050-01-L-D-A-GP
16	1	JP1	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT	YES	Wurth Electronics Inc.	61300211121
17	2	R1, R2	RES TKF 10k 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF1002V
18	1	R3	RES TKF 348k 1/10W 1% SMD 0603	YES	Stackpole Electronics Inc	RMCF0603FT348K
19	1	R4	RES TKF 274K 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF2743V
20	2	R5, R23	RES TKF 330R 5% 1/10W SMD 0603	YES	Stackpole Electronics Inc	RMCF0603JT330R
21	7	R7, R9, R20, R30, R48, R55, R61	RES TKF 10k 5% 1/10W SMD 0603	YES	Panasonic	ERJ-3GEYJ103V
22	6	R10, R11, R12, R13, R14, R15	RES TKF 22R 1% 1/20W SMD 0402	YES	Panasonic	ERJ-2RKF22R0X
23	8	R16, R26, R29, R33, R35, R39, R41, R65	RES TKF 1k 5% 1/10W SMD 0603	YES	Panasonic	ERJ-3GEYJ102V
24	1	R22	RES TKF 0R 1/10W SMD 0603	YES	Panasonic	ERJ-3GSY0R00V
25	1	R25	RES TKF 100k 1% 1/10W SMD 0603	YES	Stackpole Electronics Inc	RMCF0603FT100K
26	1	R27	RES TKF 8.2k 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF8201V
27	1	R42	RES TKF 6.04k 1% 1/10W SMD 0603	YES	Vishay/Dale	CRCW06036K04FKEA
28	1	SW1	SWITCH TACT SPST-NO 16V 0.05A PTS810 SMD	YES	C&K Components	PTS810 SJM 250 SMTR LFS

TABLE B-1: EVB-LAN8830 BILL OF MATERIALS (CONTINUED)

Item	Qty	Designator	Description	Populated	Manufacturer	Manufacturer Part Number
29	1	TP1	CON HDR-2.54 Male 1x1 Gold 5.84MH TH VERT	YES	TE Connectivity	5-146280-1
30	2	TP3	CON TP LOOP Black TH	YES	Keystone	5011
31	1	U1	MCHP ANALOG LDO ADJ MIC5207YM5 SOT-23-5	YES	Microchip	MIC5207YM5-TR
32	1	U2	MCHP ANALOG SWITCHER Buck 0.6V to 3.6V MIC33153YHJ-TR VFDFN-14	YES	Microchip	MIC33153YHJ-TR
33	1	U3	MCHP INTERFACE ETHERNET LAN8830 QFN-48	YES	Microchip	LAN8830/PSA
34	1	Y1	MCHP CRYSTAL 25Mhz +/-20ppm 10pF SMD L3.2W2.5H0.8	YES	Microchip	VXM7-9032-25M000
35	1	C30	CAP CER 0.1uF 50V 10% X7R SMD 0402	DNP	TDK Corporation	C1005X7R1H104K050BB
36	8	R6, R8, R17, R31, R37, R49, R56, 662	RES TKF 1k 5% 1/10W SMD 0603	DNP	Panasonic	ERJ-3GEYJ102V
36	5	R32, R34, R36, R38, R40	RES TKF 10k 5% 1/10W SMD 0603	DNP	Panasonic	ERJ-3GEYJ103V
37	2	R19, R24	RES TKF 0R 1/16W SMD 0402	DNP	Yageo	RC0402JR-070RL
38	6	R6, R8, R17, R31, R33, R35	RES TKF 1k 5% 1/10W SMD 0603	DNP	Panasonic	ERJ-3GEYJ102V
39	6	TP2, TP4, TP5, TP6, TP7, TP9	CON HDR-2.54 Male 1x1 Gold 5.84MH TH VERT	DNP	TE Connectivity	5-146280-1
40	1	TP8	CON TP LOOP Black TH	DNP	Keystone	5011

NOTES:

NOTES:

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