LAN7431-EDS Evaluation Board User's Guide

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Preface

NOTICE TO CUSTOMERS

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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 LAN7431-EDS Evaluation Board. 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 LAN7431-EDS Evaluation Board as a high-performance and low-cost USB/Ethernet connectivity solution.

The manual layout is as follows:

- **Chapter 1. "Overview"** – Shows a brief description of the LAN7431-EDS Evaluation Board.
- **Chapter 2. "Board Details and Configuration"** – Includes information about the LAN7431-EDS Evaluation Board.
- **Chapter 3. "Using the LAN7431-EDS"** – Includes information on how to use the LAN7431-EDS Evaluation Board.
- **Appendix A. "LAN7431-EDS Evaluation Board"** – This appendix shows the LAN7431-EDS Evaluation Board schematic.
- **Appendix B. "Schematics"** – This appendix shows the LAN7431-EDS Evaluation Board schematic.
- **Appendix C. "Bill of Materials"** – This appendix includes the LAN7431-EDS Evaluation Board Bill of Materials (BOM).

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 nonproduction development programmers such as PICSTART Plus and PIC-kit 2 and 3.

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• 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
DS50002842A (01-18-19)	Initial release	

Chapter 1. Overview

1.1 INTRODUCTION

The LAN7431-EDS Evaluation Board features LAN7431, PCIe to Gigabit Ethernet bridge device. LAN7431 has an integrated 10/100/1000 Mbps Ethernet MAC, PCIe PHY, OTP memory, EEPROM controller, clock/reset/power management functions, PCIe endpoint controller, DMA controller and JTAG TAP. The device supports IEEE 802.3az Energy Efficient Ethernet (EEE) and advanced power management features, which make this device highly suitable for industrial as well as automotive application areas.

This evaluation board is meant be used as the Ethernet Development System (EDS) that is connected to an Ethernet PHY or an Ethernet switch board. It can be easily connected to the PCIe slot of a PC to evaluate the LAN7431 features.

The scope of this document is to describe the LAN7431-EDS evaluation board setup and the corresponding jumper configuration.

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

FIGURE 1-1:   LAN7431-EDS BLOCK DIAGRAM
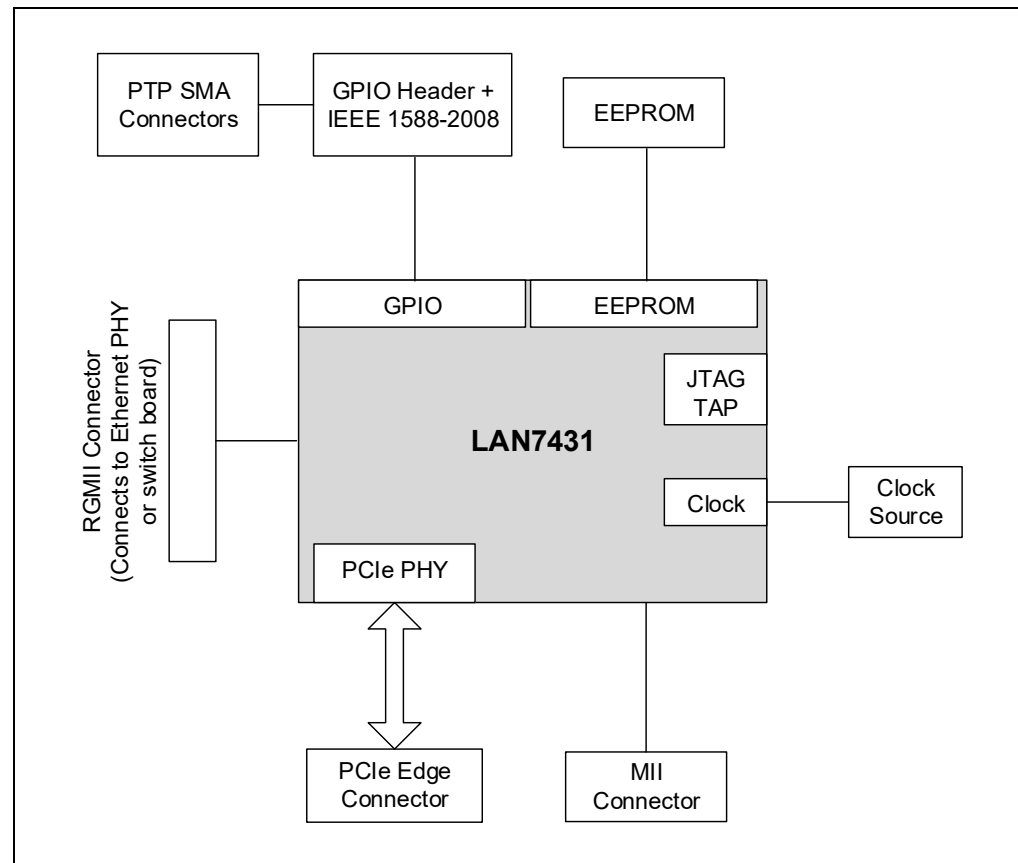
1.2   REFERENCES

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

- *LAN7431 Data Sheet*
- *LAN7431-EDS Schematic*

1.3   TERMS AND ABBREVIATIONS

- EDS - Ethernet Development System
- EEE - Energy Efficient Ethernet
- EVB - Evaluation Board
- GND - Ground
- PHY - Physical Transceiver
- PTP - Point to Point
- SMA Connector - Sub-Miniature version A Connector

Chapter 2. Board Details and Configuration

2.1 BOARD DETAILS

This section includes the following LAN7431-EDS board details:

- Power
- Resets
- Clock
- Configuration

2.1.1 Power

The board receives 3.3V supply through the PCIe interface. An internal 2.5V voltage regulator supplies power to the 2.5V tolerant supply pins such as the AVDDH_1 and VPH pins. The VDD12_SW_OUT pin supplies 1.2V to three VDD12CORE, VP, and VPTX pins. An on-board power scheme can supply 3.3V to LAN7431 and other devices through the auxiliary pin of the PCIe interface.

2.1.2 Resets

Jumper J8 is required to be populated if the reset function is required for the board.
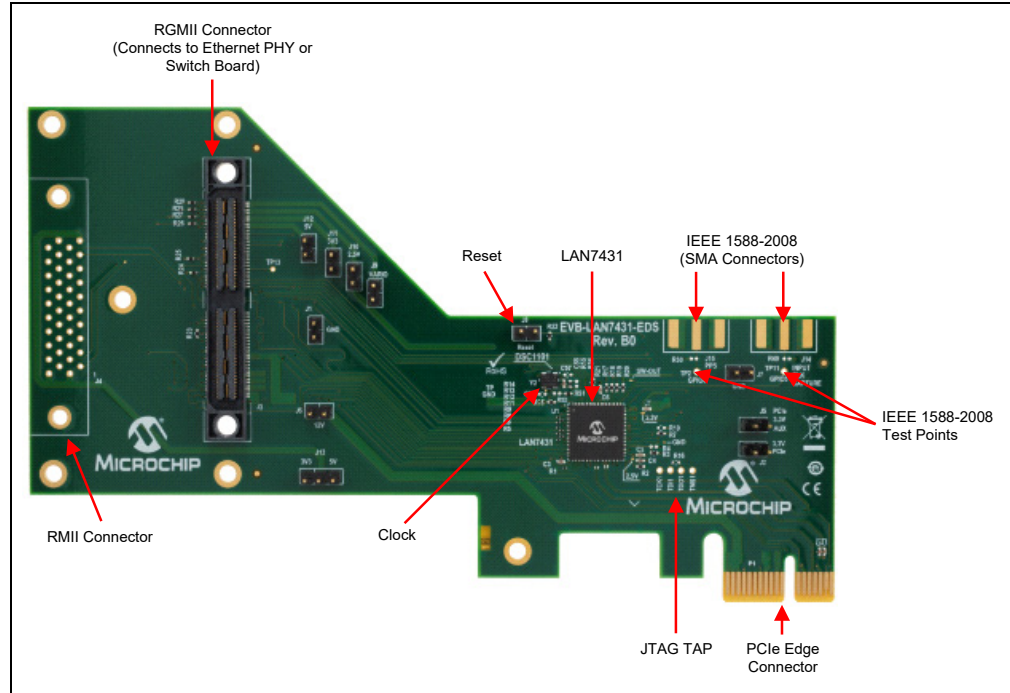
2.1.3 Clock

The evaluation board utilizes an external 25 MHz crystal oscillator.

2.1.4 Configuration

Figure 2-1 describes the board features and configuration settings.

FIGURE 2-1: **LAN7431-EDS TOP VIEW WITH CALLOUTS**

2.1.4.1   JUMPER SETTINGS

Table 2-1 and Table 2-2 describe the two-pin jumper and the three-pin settings, respectively. The default configuration is shown in bold.

TABLE 2-1: **TWO-PIN JUMPERS**

Jumper	Label	Description	Open	Close
J2	3.3V PCIe	Provides 3.3V supply to the board	No supply voltage to the board	**(Default)** Board receives 3.3V supply
J5	PCIe 3.3V Aux	Provides auxiliary power supply (3.3V) to the board, in case of 3.3V failure	Auxiliary power will not be supplied	**(Default)** Board supplies 3.3V auxiliary
J6	12V	Enables 12V to a PHY or a switch if it is required to do so	**(Default)** Does not supply 12V	Supplies 12V
J8	Reset	Enables reset to LAN7431 device	**(Default)** LAN7431 operates in normal mode	LAN7431 resets
J9	VARIO	Variable I/O power supply	**(Default)** Supplies 3.3V to LAN7431	Supplies variable power supply to LAN7431
J10	2.5V	Supplies 2.5V to external PHY or switch board	**(Default)** Does not supply 2.5V to the external board	Supplies 2.5V to the external board
J11	3V3	Supplies 3.3 V to external PHY or switch board	Does not supply 3.3V to the external board	**(Default)** Supplies 3.3V to the external board
J12	5V	Supplies 5V to external PHY or switch board	Does not supply 5V to the external board	**(Default)** Supplies 5V to the external board

TABLE 2-2: **THREE-PIN JUMPERS**

Jumper	Label	Description	Position 1 (3V3)	Position 2
J13	3V3/5V	Supplies either 3.3V or 5V to the external PHY connected on the RMII connector (J4)	Supplies 3.3V to the external PHY on the RMII connector	Supplies 5V to the external PHY on the RMII connector

2.1.4.2   HEADERS AND CONNECTORS

Table 2-3 describes the functions of the headers on the board.

TABLE 2-3: **HEADERS AND CONNECTORS**

| Header	Label	Description
J1	GND	These pins can be used as ground reference.
J7	GND	These pins can be used as ground reference.
J3	—	J3 is used to connect an external PHY or switch board to LAN7431-EDS.
J4	—	J4 is for the RMII interface. It is used to connect an external PHY board to LAN7431-EDS.
JTAG TAP	TCK1/TDI1/ TDO1/TMS1	Signals to enable fly-wiring of JTAG TAP from LAN7431 to the PCIe connector. When using the TAP, remove R16.

NOTES:

Chapter 3. Using the LAN7431-EDS

The LAN7431-EDS board is connected to a PCIe slot of a PC. The LAN7431 device supports Windows 10 and Linux operating system. The drivers are provided on the LAN7431 device's product page for both operating systems. A 'readme' file is also provided with the drivers, which describes the driver installation process in detail.

Once the drivers are installed correctly for Windows 10, for example, the board can be detected in Device Manager as shown in Figure 3-1.

FIGURE 3-1:   LAN7431 DETECTED IN DEVICE MANAGER
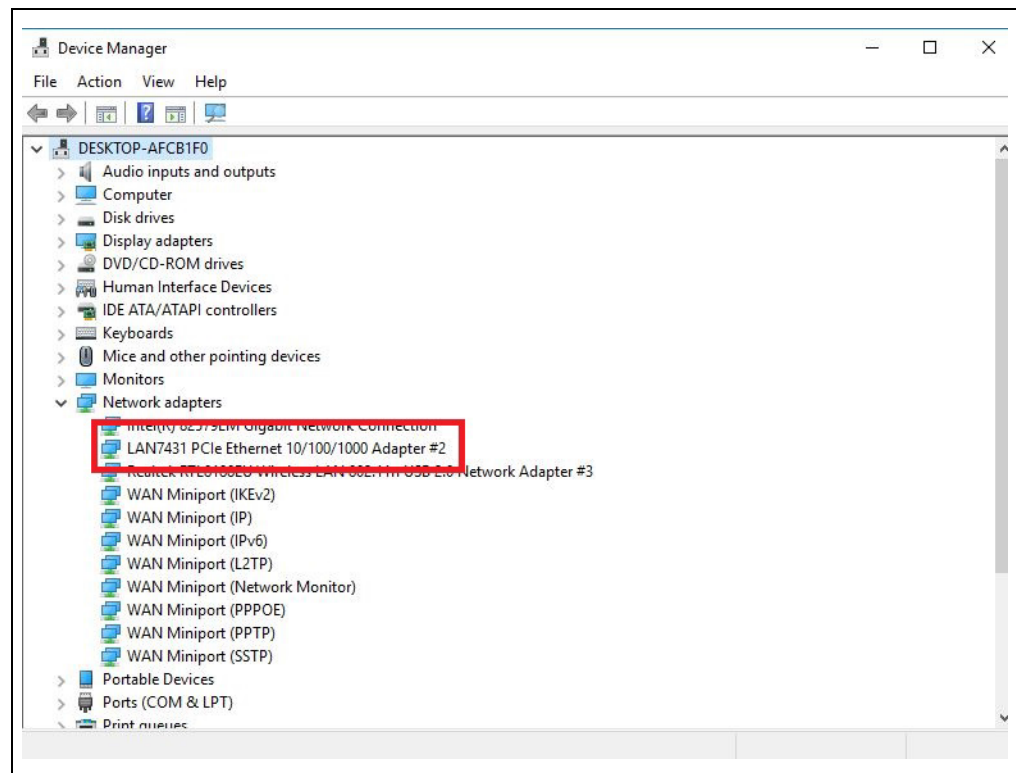
Once the PC detects the LAN7431 board correctly, the PC can then be connected to the Internet using an Ethernet cable to test the board.

NOTES:

Appendix A. LAN7431-EDS Evaluation Board

A.1   INTRODUCTION

This appendix shows the LAN7431-EDS Evaluation Board.

FIGURE A-1:   LAN7431-EDS EVALUATION BOARD
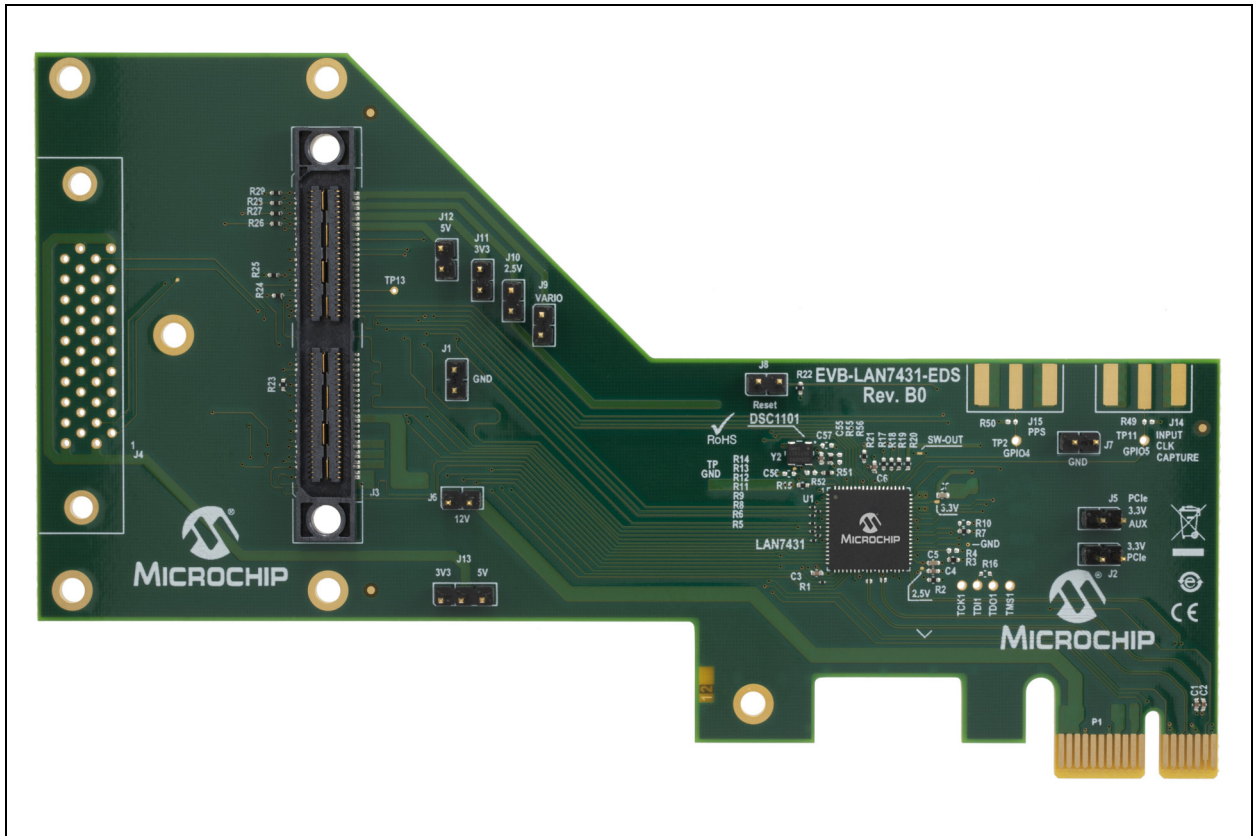
NOTES:

Appendix B. Schematics

B.1 INTRODUCTION

This appendix shows the LAN7431-EDS Evaluation Board schematics.

LAN7431-EDS Evaluation Board User's Guide

FIGURE B-1: **LAN7431-EDS EVALUATION BOARD SCHEMATICS**

Appendix C. Bill of Materials

C.1   INTRODUCTION

This appendix includes the LAN7431-EDS Bill of Materials (BOM).

TABLE C-1:   LAN7431-EDS BILL OF MATERIALS

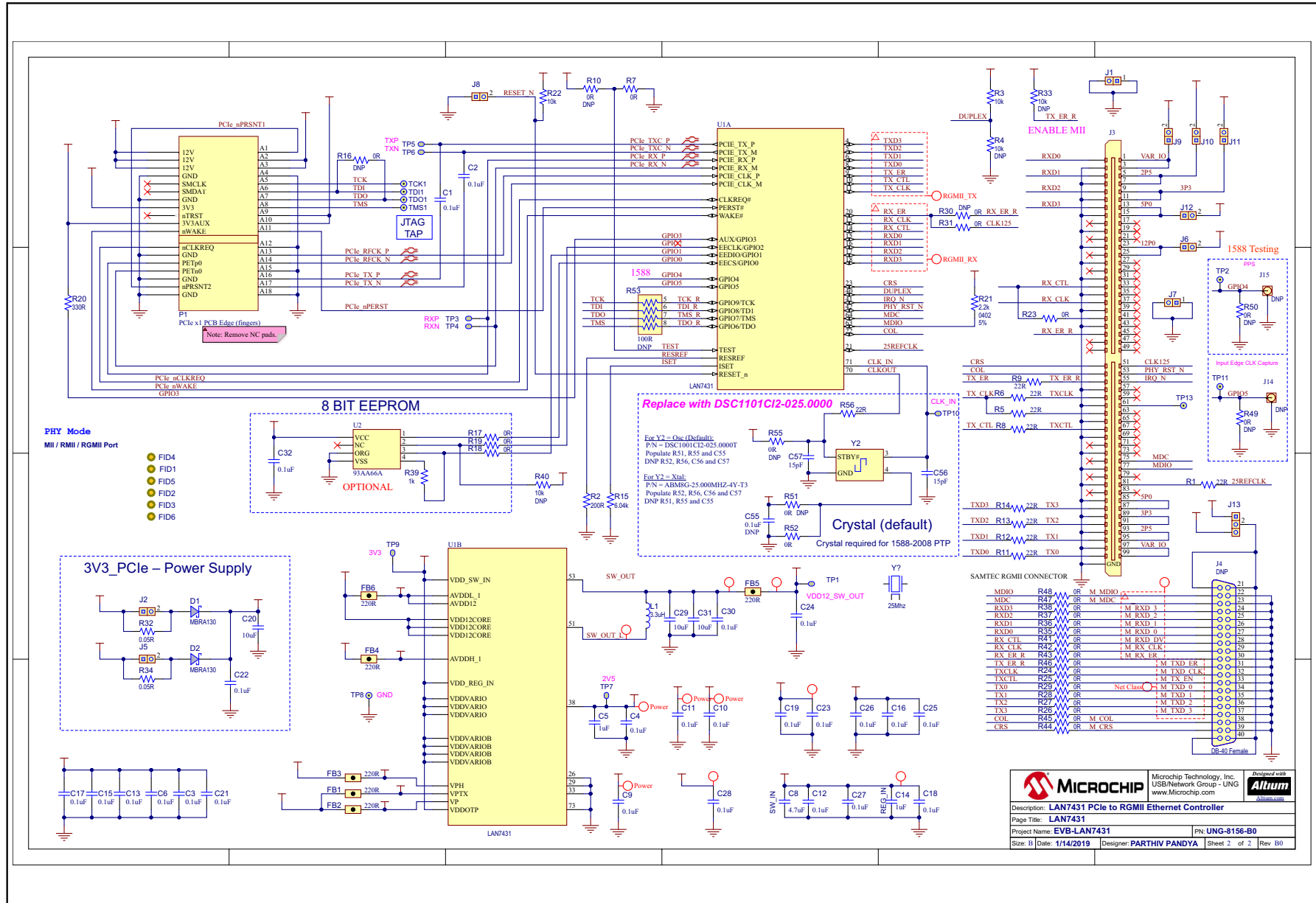| Item	Qty	Reference	Description	Populated	Manufacturer	Manufacturer Part Number
1	25	C1, C2, C3, C4, C6, C9, C10, C11, C12, C13, C15, C16, C17, C18, C19, C21, C22, C23, C24, C25, C26, C27, C30, C32, C55	CAP CER 0.1uF 50V 10% X7R SMD 0402	YES	TDK Corporation	C1005X7R1H104K050BB
2	2	C5, C14	CAP CER 1uF 35V 10% X5R SMD 0402	YES	Murata Electronics North America	GRM155R6YA105KE11D
3	1	C8	CAP CER 4.7uF 6.3V 20% X5R SMD 0402	YES	Murata	GRM155R60J475ME47D
4	3	C20, C29, C31	CAP CER 10UF 25V 20% X5R SMD 0603	YES	Murata Electronics North America	GRM188R61E106MA73D
5	1	C28	CAP CER 0.1uF 16V 10% X7R SMD 0402	YES	Murata	GRM155R71C104KA88D
6	2	D1, D2	DIO SCTKY MBRA130LT3G 410mV 1A 30V SMD DO-214AC SMA	YES	ON Semiconductor	MBRA130LT3G
7	5	FB1, FB2, FB3, FB5, FB6	FERRITE 500mA 220R SMD 0603	YES	Murata	BLM18AG221SN1D
8	1	FB4	FERRITE 220R@100MHz 1.4A SMD 0603	YES	Murata Electronics North America	BLM18PG221SN1D
9	10	J1, J2, J5, J6, J7, J8, J9, J10, J11, J12	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT	YES	FCI	77311-118-02LF
10	1	J3	CON STRIP High Speed Stacker 6.36mm Female 2x50 SMD VERT	YES	Samtec Inc	QSS-050-01-L-D-A-GP
11	1	J13	CON HDR-2.54 Male 1x3 Gold 5.84MH TH VERT	YES	FCI	68000-103HLF
12	1	L1	INDUCTOR 3.3UH 2.25A 20% SMD L3W2.5H1.5	YES	TDK Corporation	VLF302515MT-3R3M
13	9	R1, R5, R6, R8, R9, R11, R12, R13, R14	RES TKF 22R 1% 1/20W SMD 0201	YES	Panasonic Electronic Components	ERJ-1GEF22R0C
14	1	R2	RES TKF 200R 1% 1/10W SMD 0402	YES	Panasonic	ERJ-2RKF2000X
15	2	R3, R22	RES TKF 10k 5% 1/16W SMD 0402	YES	Vishay	CRCW040210K0JNED
16	26	R7, R17, R18, R19, R23, R24, R25, R26, R27, R28, R29, R31, R35, R36, R37, R38, R41, R42, R43, R44, R45, R46, R47, R48, R51, R55	RES TKF 0R 1/16W SMD 0402	YES	Yageo	RC0402JR-070RL
17	1	R15	RES TKF 6.04k 1% 1/16W SMD 0402	YES	Rohm Semiconductor	MCR01MRTF6041
18	1	R20	RES TKF 330R 5% 1/10W SMD 0402	YES	Panasonic Electronic Components	ERJ-2GEJ331X
19	1	R21	RES TKF 2.2k 5% 1/16W SMD 0402	YES	Vishay Dale	CRCW04022K20JNED
20	2	R32, R34	RES TKF 0.05R 1% 1/4W SMD 0805	YES	Bourns Inc.	CRM0805-FW-R050ELF
21	1	R39	RES TKF 1k 1% 1/10W SMD 0402	YES	Panasonic	ERJ-2RKF1001X
22	1	U1	MCHP INTERFACE GIGe ETHERNET LAN7431 SQFN-72	YES	Microchip Technology	LAN7431/YXX
23	1	U2	MCHP MEMORY SERIAL EEPROM 4k Microwire 93AA66A-I/SN SOIC-8	YES	Microchip	93AA66A-I/SN
24	1	Y2	MCHP CLOCK OSCILLATOR SINGLE 25MHZ DSC1001-CI2-025.0000T CDFN-4	NO	Microchip Technology	DSC1001CI2-025.0000T
25	1	Y2	CRYSTAL 25MHz 10pF SMD ABM8G	YES	Abracon LLC	ABM8G-25.000MHZ-4Y-T3
26	2	C56, C57	CAP CER 15pF 50V 5% NP0 SMD 0402	NO	Murata	GRM1555C1H150JA01D
27	1	J4	CON DSUB DB-40 FEMALE TH R/A	NO	TE Connectivity AMP Connectors	5787170-4

TABLE C-1:   LAN7431-EDS BILL OF MATERIALS (CONTINUED)

Item	Qty	Reference	Description	Populated	Manufacturer	Manufacturer Part Number
28	2	J14, J15	CON RF Coaxial SMA Female 2P EDGE MNT 142-0701-801	NO	Cinch Connectivity Solutions Johnson	142-0701-801
29	3	R4, R33, R40	RES TKF 10k 5% 1/16W SMD 0402	NO	Vishay	CRCW040210K0JNED
30	6	R10, R16, R30, R49, R50, R52	RES TKF 0R 1/16W SMD 0402	NO	Yageo	RC0402JR-070RL
31	1	R53	RES NET TKF 100R 5% 100mW SMD 0805x4	NO	CTS Resistor Products	743C083101JP
32	1	R56	RES TKF 22R 1% 1/20W SMD 0402	NO	Panasonic Electronic Components	ERJ-2RKF22R0X

Bill of Materials

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