EVB-LAN8870-MC Evaluation Board User's Guide

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EVB-LAN8870-MC
EVALUATION BOARD
USER'S GUIDE

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Preface

NOTICE TO CUSTOMERS

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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 EVB-LAN8870-MC Evaluation Board User's Guide. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes the EVB-LAN8870-MC Evaluation Board as a development tool for the LAN8870, 1000BASE-T1 Ethernet Transceiver. The manual layout is as follows:

- **Chapter 1. "Overview"** – This chapter shows a brief description of the EVB-LAN8870-MC.
- **Chapter 2. "Getting Started"** – This chapter provides information about the setup and operation of the EVB-LAN8870-MC.
- **Chapter 3. "Hardware Configuration"** – This chapter includes information about the hardware configuration of the EVB-LAN8870-MC.
- **Appendix A. "Schematics"** – This appendix shows the EVB-LAN8870-MC schematics.
- **Appendix B. "Bill of Materials"** – This appendix includes the EVB-LAN8870-MC Bill of Materials.
- **Appendix C. "Silk Screens"** – This appendix includes the EVB-LAN8870-MC

silk screen.

- **Appendix D. "PIC MCU Programming"** – This appendix includes information on how to program the EVB-LAN8870-MC's PIC18 MCU through MPLAB IDE.

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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Technical support is available through the web site at:
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DOCUMENT REVISION HISTORY

Revisions	Section/Figure/Entry	Correction
DS50003748A (09-03-24)	Initial release	

Chapter 1. Overview

1.1 INTRODUCTION

The EVB-LAN8870-MC Evaluation Board is a 1000BASE-T1 (Single-Pair Ethernet) to 1000BASE-T (Gigabit Ethernet) media converter used in evaluating the LAN8870 1000BASE-T1 Ethernet transceiver.

The 1000BASE-T side of the EVB-LAN8870-MC uses a LAN8830 transceiver and a conventional RJ-45 jack with integrated magnetics. It features auto-negotiation and auto-crossover.

The 1000BASE-T1 side uses a LAN8870 transceiver with all necessary external filtering and isolation components and an automotive single-pair Ethernet connector. The LAN8870 is configured in RGMII mode and connects to the RGMII interface of the LAN8830.

Software is provided to allow users to access the LAN8870 registers from a PC via the EVB-LAN8870-MC's USB port and an on-board PIC microcontroller. The board can be powered from either the EVB-LAN8870-MC's USB port or an external 5V supply.

This document describes the setup and use of the hardware and software. This document also explains how to optionally reprogram the preprogrammed on-board microcontroller. A simplified block diagram of the board is shown in Figure 1-1.

1.2 BLOCK DIAGRAM

FIGURE 1-1:   BLOCK DIAGRAM
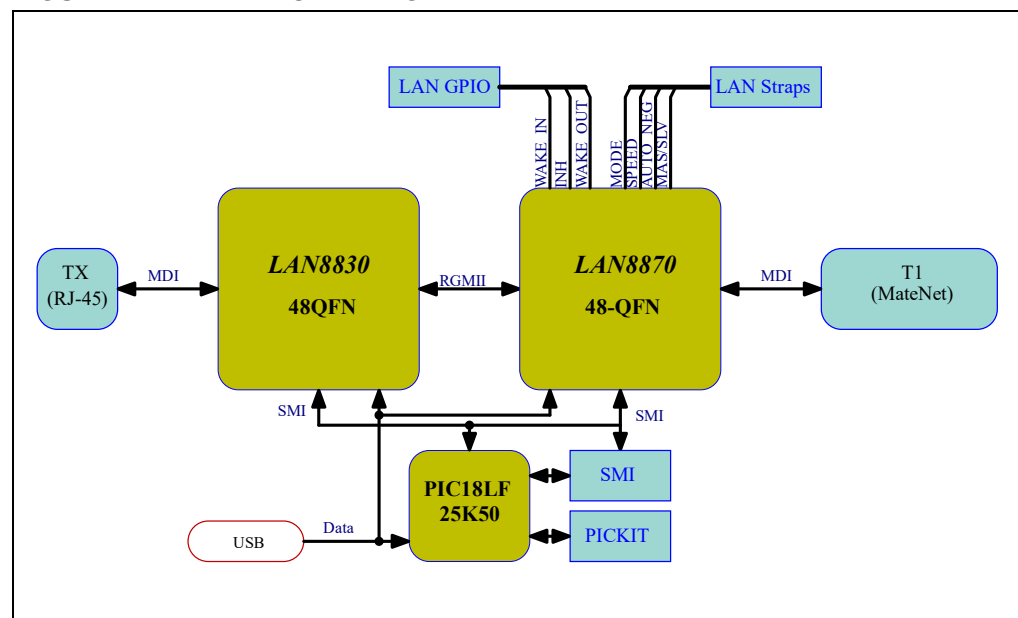
1.3   REFERENCES

Concepts and materials available in the following documents may be helpful when reading this document. Visit www.microchip.com for the latest documentation.
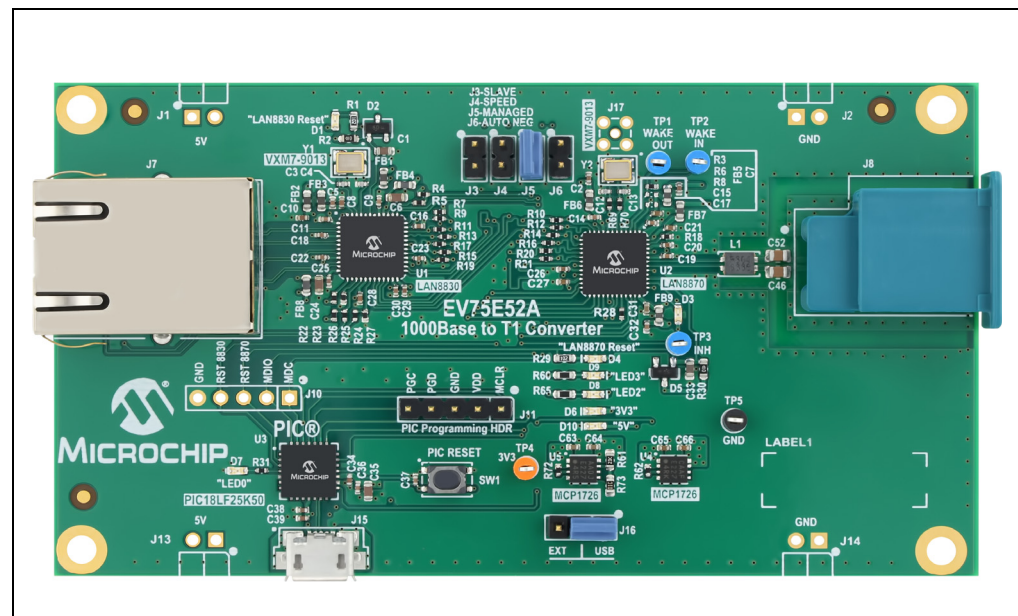
- *LAN8870 Data Sheet*
- *LAN8830 Data Sheet*
- *PIC18LF25K50 Data Sheet*
- *MCP1726 Data Sheet*
- *VMX7 Data Sheet*

Chapter 2. Getting Started

2.1 INTRODUCTION

This chapter outlines the steps for setting up and using the EVB-LAN8870-MC. It also provides guidelines on configuring the device with the EVB-LAN8870-MC Configuration Tool Software.

2.2 PHYSICAL SETUP

The Microchip EVB-LAN8870-MC media converter is simple to set up, as shown in Figure 2-1. Perform the following procedure:

1. Verify that jumpers are installed on headers J5 and J16 (1-2).
2. To configure the 1000BASE-T1 port as slave, J5 must be open. Install a jumper on header J3. To configure it as master, do not install the J3 jumper.
3. The board is powered via a micro USB cable. Alternatively, 5V/500 mA can be applied at connector J1 or J13, with ground on J2 or J14.
4. A CAT5 Ethernet cable can be connected to the RJ-45 jack for 1000BASE-T.
5. For 1000BASE-T1, connect the single twisted pair cable to the automotive Ethernet connector J9.

Note: The EVB-LAN8870-MC is configured for auto-negotiation by default.

FIGURE 2-1: EVALUATION BOARD CONNECTORS

No further steps are needed for the board to pass full-duplex 1000 Mbps traffic between the two ports. Note that the CAT5 port must be linked at 1000 Mbps.

2.3   EVB-LAN8870-MC CONFIGURATION TOOL SOFTWARE

The optional EVB-LAN8870-MC Configuration Tool Software is available to monitor and configure the LAN8870 transceiver. Microsoft .Net 4.5 or newer must be installed on the PC. The software comes as an executable (`.exe`) file for Windows. No installation is required. To run it, double click on the file.

The PIC microcontroller on the board is running as a CDC device, so it sets up a serial communication port on the PC.

Once the software is started and the application window has opened, select the appropriate COM port for the evaluation board, and press the connect button as shown in Figure 2-2.

FIGURE 2-2:   COM PORT SELECTIONS

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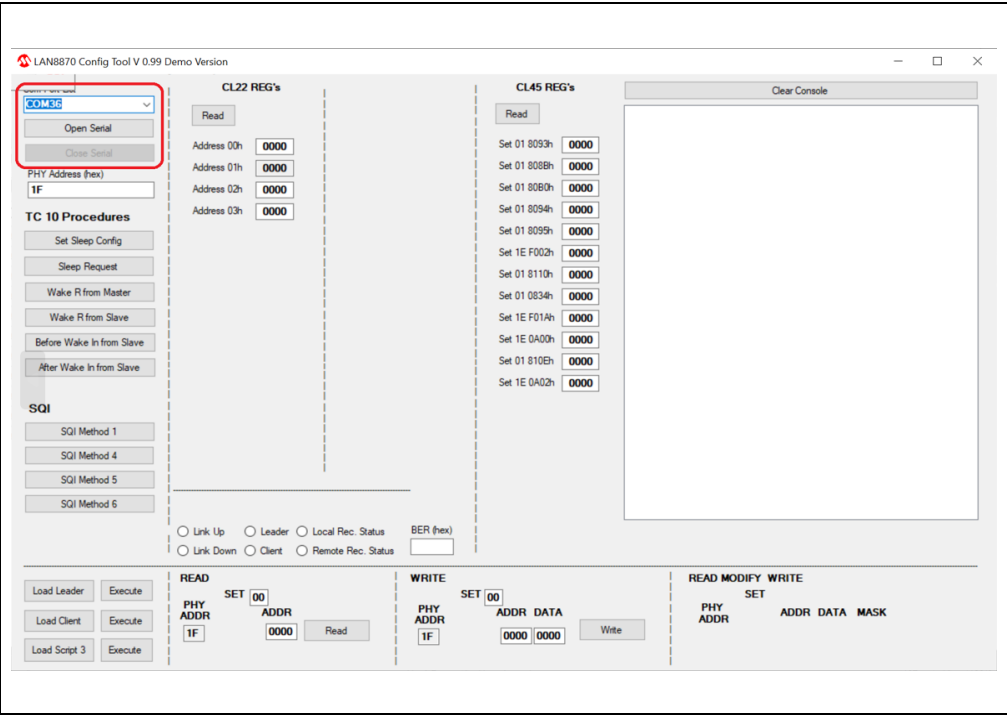
The initial condition is a blank form with all values filled in with zero. Press the **Read** buttons to update the registers. With a successful connection to the board, you should be able to:

1. Read Clause 22 registers. (See Figure 2-3.)

FIGURE 2-3: **CLAUSE 22 REGISTER READ**

2. Read Clause 45 registers. (See Figure 2-4.)

FIGURE 2-4: **CLAUSE 45 REGISTER READ**

3. Easily accomplish single READ and WRITE commands using the controls high-lighted in Figure 2-5. For Clause 22 registers, the set is 00. For Clause 45 registers, the set is the Clause 45 Address Location of the Clause 45 register.

FIGURE 2-5:   INDIVIDUAL READ AND WRITE COMMANDS
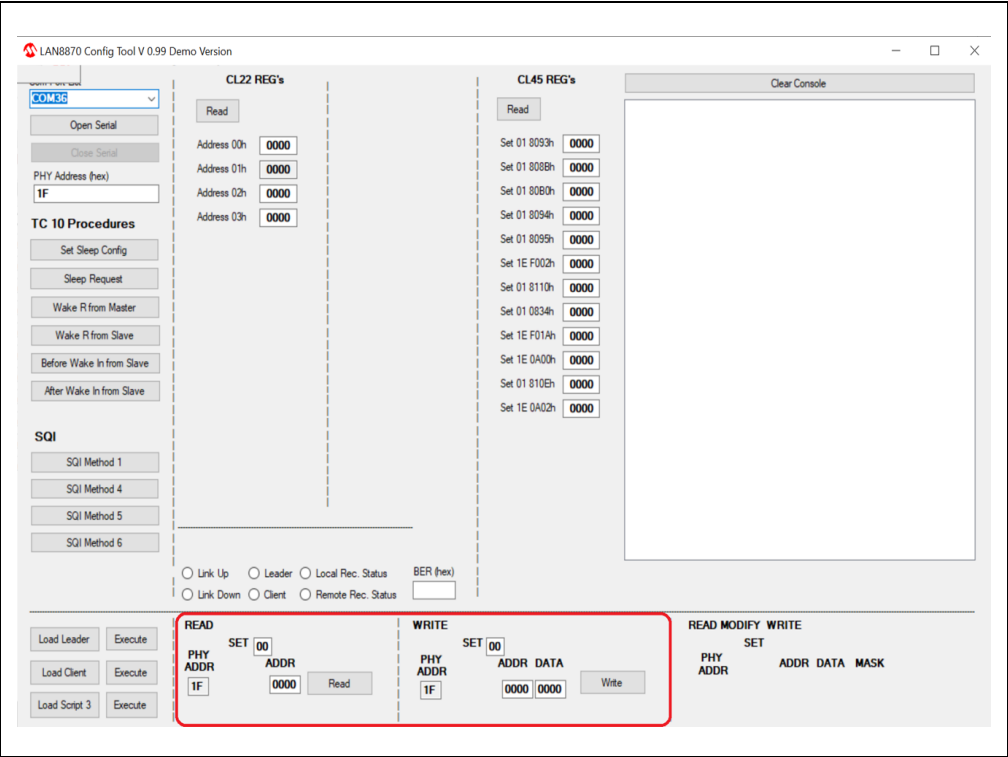
4. Load and execute configuration scripts. (See Figure 2-6.)

FIGURE 2-6:   CONFIGURATION LOAD AND EXECUTE

5. Gain access to TC10 commands for LAN8870 sleep setup, Sleep and Wake Up. (See Figure 2-7.)

FIGURE 2-7: TC10 SLEEP AND WAKE COMMANDS
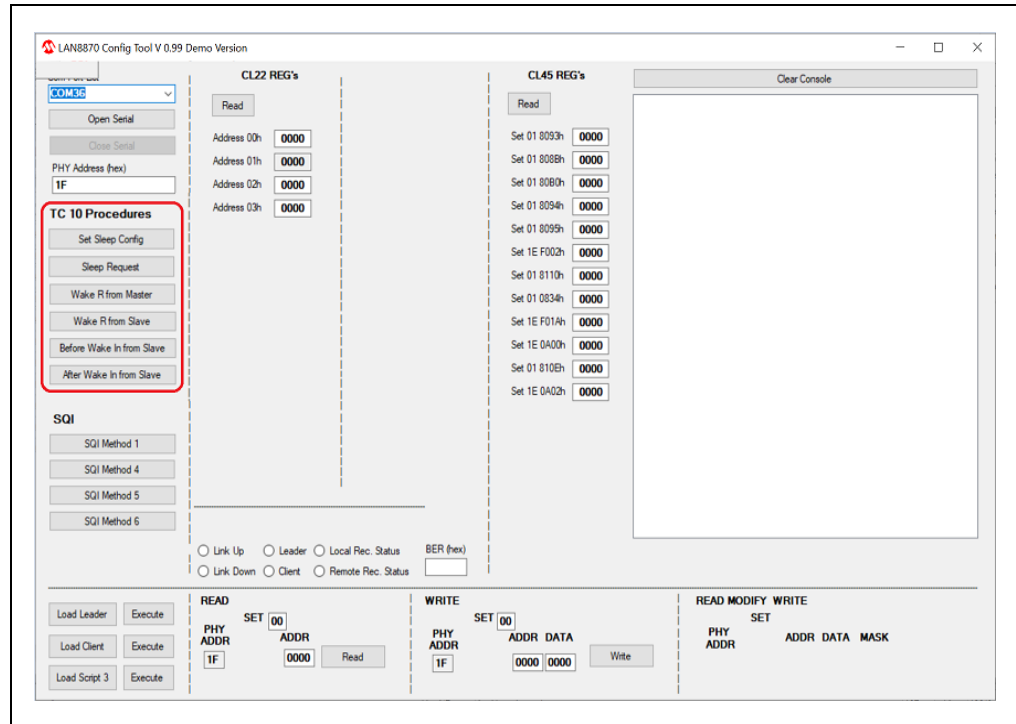
The PHY Address is copied from the general setup field (PHY Address [hex]).

The **Load Script** buttons allow users to load three different scripts to execute when the appropriate **Execute** button is clicked on. The execution of the script will be displayed inside the console window.
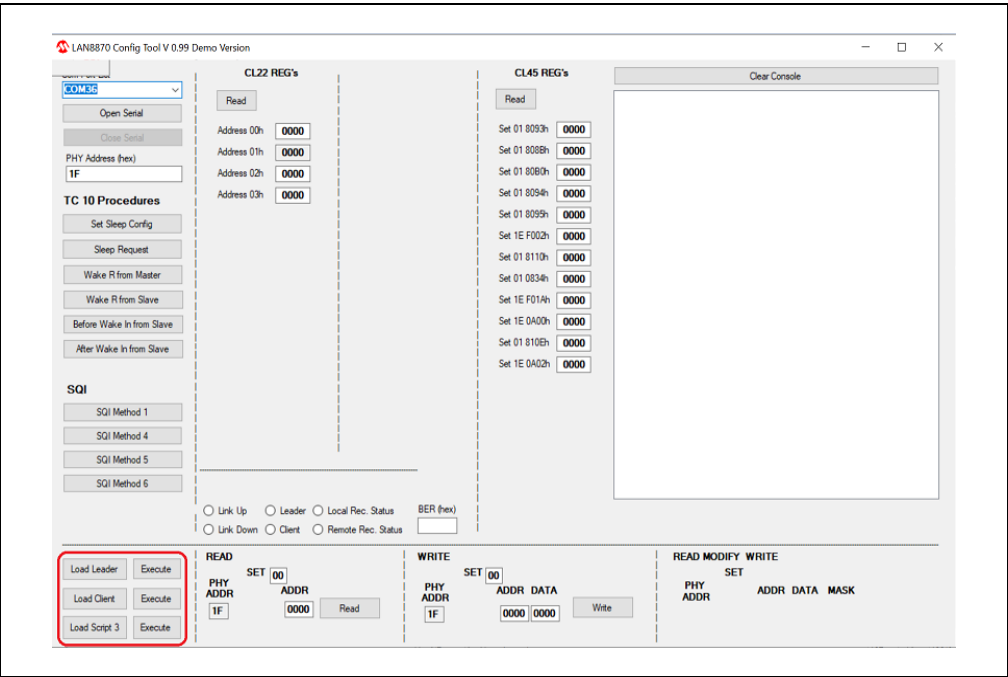
The following are commands supported inside the script:

- Blank Lines
- # Comment Lines
- sleep command
- r - Read command
- w45 - Write command

The script has to be in `.txt` format. All commands are lowercase letters. The sleep command is followed with a sleep time in [ms] as a decimal value.

The following is the format for a write, of 0xA08F to CL45 Address 0x01, CL45 Register 0x808B:

```
w45 01 0x80 0x8B 0xA08F
```

The following is the format for a read of CL45 Address 0x1F, CL45 Register 0x0A02 for PHY with PHY Address of 0x15:

```
r 1F 0x0A 0x02 0x15
```

Below is one example of the supported commands:

```
w45 07 0x02 0x00 0x0000
w45 01 0x80 0x93 0x8040
w45 01 0x80 0x8B 0x0084
w45 01 0x80 0xB0 0x001F
w45 01 0x80 0x94 0x0000
r 01 0x08 0x34 0x1F
r 01 0x0A 0x00 0x1F
```

2.4   QUICK START

Perform the following steps to quickly start using the board:

1. Connect a USB Micro-A cable to the EVB-LAN8870-MC USB port (J15).
2. Connect the 5V of an external supply to either J1 or J2. Connect the GND of the external power supply to either J13 or J14.

To implement any configuration changes, launch the MPLAB® X IDE software on your management PC and connect a PICKit™ 4 or a newer PICKit to J11 (aligning pin 1).

Chapter 3. Hardware Configuration

3.1 INTRODUCTION

This chapter features the configuration options for the EVB-LAN8870-MC as well as detailed information on the jumpers, headers, status LEDs, and other essential parts of the board.

3.2 HARDWARE CONFIGURATION OPTIONS

Figure 3-1 shows the top view of the EVB-LAN8870-MC.

FIGURE 3-1: **EVB-LAN8870-MC REV B (TOP VIEW)**

3.2.1 Jumpers and Headers

The Section 2.4 "Quick Start" describes the basic setup of this media converter board. The one key configuration decision is whether the board is configured as a 1000BASE-T1 master or slave. This is determined by jumper J3. The 1000BASE-T1 links must always be statically configured with one end as a master and the other end as a slave. If both ends are the same type, the connection will not work.

The descriptions of the jumpers are given in Table 3-1, and the descriptions of the other headers are given in Table 3-2.

TABLE 3-1: **JUMPER DESCRIPTIONS**

Jumpers	Description
J3	Master-Slave mode/PHYAD2 Selection. If J5 is open: Open - Master. Closed - Slave If J5 is closed: Open - PHYAD2 = 1. Closed - PHYAD2 = 0
J4	Speed/PHYAD4 Selection. If J5 is open: Open - 1000BASE-T1. Closed - 100BASE-T1 If J5 is closed: Open - PHYAD4 = 1. Closed - PHYAD4 = 0
J5	Managed Mode. Open - Autonomous mode

TABLE 3-1:   JUMPER DESCRIPTIONS (CONTINUED)

Jumpers	Description
J6	Master-Slave mode/PHYAD3 Selection. If J5 is open: Open - Auto-Negotiation Enabled. Closed - Auto-Negotiation Disabled If J5 is closed: Open - PHYAD3 = 1. Closed - PHYAD3 = 0
J16	Position 1-2: USB Powered. Position 2-3: Ext 5V Power (Apply Positive 5V on either J1 or J13 and GND on either J2 or J14)).

TABLE 3-2:   HEADER DESCRIPTIONS

Headers	Description
J1 & J13	+5V power. This is an alternative to powering the board via USB.
J2 & J14	Ground
J4	These signals are controlled by the PIC microcontroller. They should not be controlled externally, but they may be monitored. Pin 1: MDC Pin 2: MDIO Pin 3: LAN8830 Reset Pin 4: LAN8870 reset Pin 5: Ground
J5	These signals are either controlled by the PIC microcontroller, or are outputs of the EVB-LAN8870-MC. Do not drive them externally. Pin 1: WAKE_IN - Input to the EVB-LAN8870-MC Pin 2: INH - Output from the EVB-LAN8870-MC
J11	5-pin PIC programming header
TP1	WAKE OUT test point
TP2	WAKE IN test point
TP3	INH test point
TP4	3.3V Power test point
TP5	GND test point

3.2.2   Status LEDs

Descriptions of the status LEDs are given in Table 3-3.

TABLE 3-3:   LED DESCRIPTIONS

LEDs	Description
D1	LAN8830 Reset indicator
D3	LAN8870 Link indicator
D4	LAN8870 Reset indicator
D6	3V3 indicator
D7	PIC Programming LED (On = PIC Initialization complete)
D8	Secondary LAN8870 Link indicator
D9	LAN8870 Master/Slave indicator
D10	5V indicator

3.2.3   1000BASE-T1 Connector

The board comes with an automotive Ethernet connector for the single twisted pair cable.

3.2.4   Reset Push Button

The "SW1 Reset" push button resets the PIC microcontroller, which in turn resets both transceivers.

NOTES:

Appendix A. Schematics

A.1   INTRODUCTION

This appendix shows the EVB-LAN8870-MC schematics.

EVB-LAN8870-MC Evaluation Board User's Guide

FIGURE A-1: **LAN8870 SCHEMATIC 1**
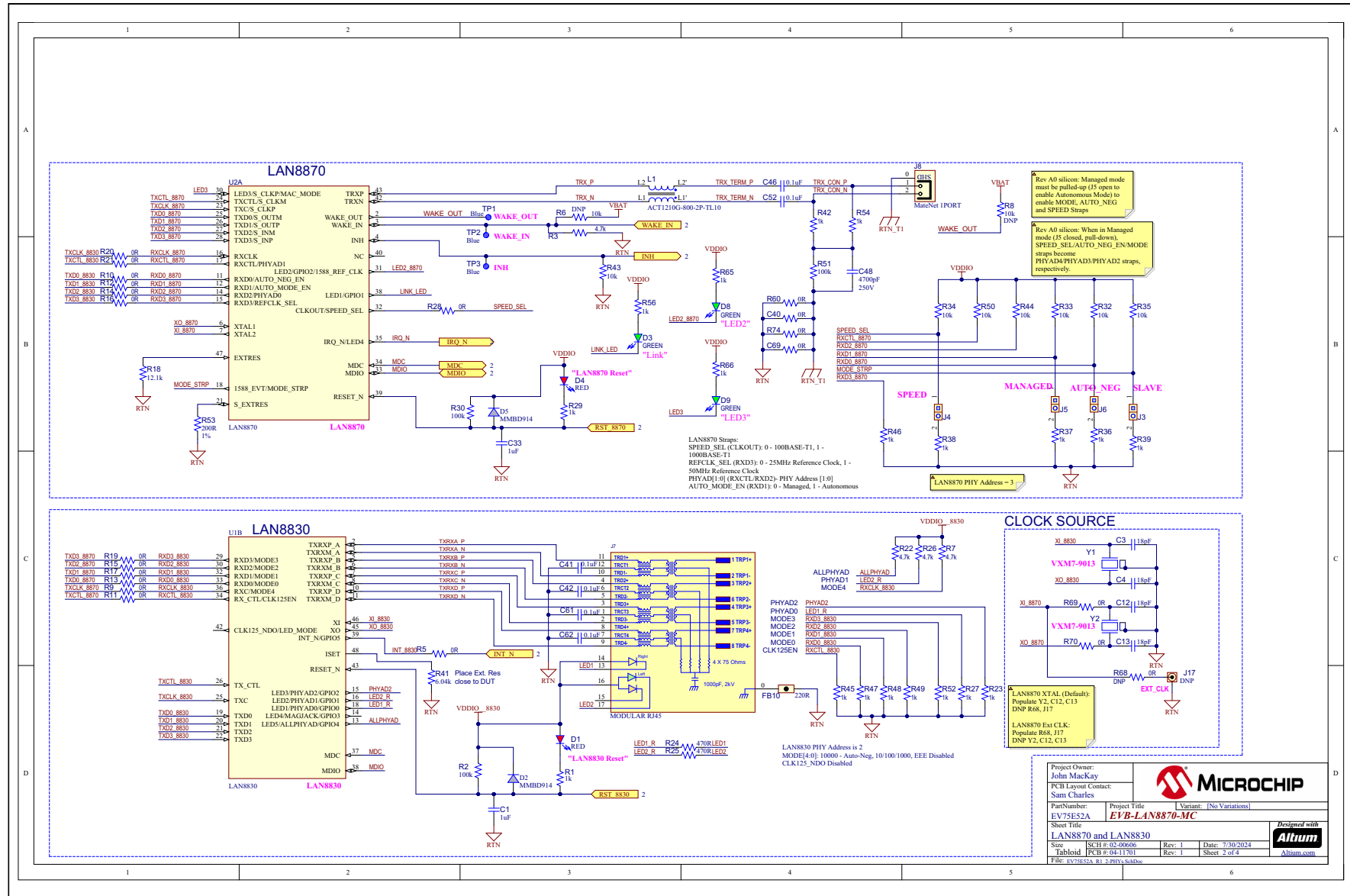
FIGURE A-2: **LAN8870 SCHEMATIC 2**

Schematics

LAN8870 POWER

VOLTAGE REGULATOR, 500mA, 1.1V

LAN8830 POWER

Project Owner: John MacKay
PCB Layout Contact: Sam Charles
PartNumber: EV75E52A
Project Title: *LAN8870 Media Converter*
Variant: [No Variations]
Sheet Title: Power
Size: Tabloid
SCH #: 02-00606
PCB #: 04-11701
Rev: 1
Rev: 1
Date: 7/1/2024
Sheet: 3 of 4
File: UNG8356_LAN8870_MC_3-Power.SchDoc

FIGURE A-3:   LAN8870 SCHEMATIC 3

LAN8870 POWER

VOLTAGE REGULATOR, 500mA, 1.1V

LAN8830 POWER

Project Owner: John MacKay		
PCB Layout Contact: Sam Charles		
PartNumber: EV75E52A	Project Title: *EVB-LAN8870-MC*	Variant: [No Variations]
Sheet Title: Power		
Size: Tabloid	SCH #: 02-00606	Rev: 1	Date: 7/30/2024
	PCB #: 04-11701	Rev: 1	Sheet 3 of 4
File: EV75E52A_R1_3-Power.SchDoc			

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Appendix B. Bill of Materials

B.1 INTRODUCTION

This appendix contains the EVB-LAN8870-MC Bill of Materials (BOM).

TABLE B-1:   EVB-LAN8870-MC BILL OF MATERIALS

Item	Quantity	Designator	Description	Populated	Manufacturer	Manufacturer Part Number
1	2	C1, C33	CAP CER 1uF 16V 10% X5R SMD 0603	YES	AVX	0603YD105KAT2A
2	18	C2, C7, C14, C17, C19, C20, C26, C32, C43, C47, C49, C50, C53, C55, C57, C58, C59, C60	CAP CER 0.1uF 35V 10% X7R SMD 0402	YES	TDK	CGA2B3X7R1V104K050BB
3	4	C3, C4, C12, C13	CAP CER 18pF 50V 5% C0G SMD 0402	YES	Murata	GRM1555C1H180JA01D
4	20	C5, C9, C11, C16, C18, C22, C23, C25, C29, C30, C36, C37, C38, C41, C42, C51, C56, C61, C62, C68	CAP CER 0.1uF 50V 10% X7R SMD 0402	YES	TDK	C1005X7R1H104K050BB
5	3	C6, C24, C35	CAP CER 10UF 25V 20% X5R SMD 0603	YES	Murata Electronics North America	GRM188R61E106MA73D
6	7	C8, C10, C28, C34, C39, C45, C54	CAP CER 1uF 35V 10% X5R SMD 0402	YES	Murata Electronics North America	GRM155R6YA105KE11D
7	9	C15, C21, C27, C31, C44, C63, C64, C65, C66	CAP CER 4.7uF 6.3V 20% X5R SMD 0402	YES	Murata	GRM155R60J475ME47D
8	4	C40, C69, R60, R74	RES TKF 0R 1/10W SMD 0603 AEC-Q200	YES	Panasonic Electronic Components	ERJ-3GEY0R00V
9	2	C46, C52	CAP CER 0.1uF 250V 10% X7T SMD 0805	YES	TDK	C2012X7T2E104K125AA
10	1	C48	CAP CER 4700pF 250V 10% X7R SMD 0805	YES	KEMET	C0805C472KARACAUTO
11	1	C67	CAP CER 4.7uF 35V 10% X5R SMD 0603	YES	Murata Electronics North America	GRM188R6YA475KE15D
12	2	D1, D4	DIO RED 2V 20mA 54mcd CLEAR SMD 0603	YES	Lite-On Inc	LTST-C191KRKT
13	2	D2, D5	DIO RECT MMBD914LT1G 1V 10mA 100V SMD SOT-23-3	YES	ON Semiconductor	MMBD914LT1G
14	6	D3, D6, D7, D8, D9, D10	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	YES	Lite-On Inc	LTST-C191KGKT
15	4	FB1, FB2, FB3, FB10	FERRITE 220R@100MHZ 2A SMD 0603	YES	Murata Electronics North America	BLM18EG221SN1D
16	2	FB4, FB8	FERRITE 600mA 120R SMD 0603	YES	TDK	MMZ1608B121CTAH0
17	5	FB5, FB6, FB7, FB9, FB11	FERRITE 600R 500mA SMD 0603	YES	Murata Electronics North America	BLM18AG601SH1D
18	4	J3, J4, J5, J6	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT	YES	FCI	77311-118-02LF
19	1	J7	CON MODULAR JACK RJ45 10/100/1000 MAGNETICS 2xLEDs SHIELD TH	YES	Bel-Fuse	L829-1J1T-43
20	1	J8	CON HDR-1.8 MALE 1X2 TIN SHROUD 7MH TH R/A	YES	TE Connectivity	9-2304372-9

TABLE B-1:   EVB-LAN8870-MC BILL OF MATERIALS (CONTINUED)

Item	Quantity	Designator	Description	Populated	Manufacturer	Manufacturer Part Number
21	1	J11	CON HDR-2.54 Male 1x5 Gold 5.84MH TH VERT	YES	FCI	68000-105HLF
22	1	J15	CON USB2.0 MICRO-AB FEMALE SMD R/A	YES	Hirose	ZX62-AB-5PA(31)
23	1	J16	CON HDR-2.54 Male 1x3 AU 5.84MH TH VERT	YES	Samtec Inc	TSW-103-07-G-S
24	1	L1	CM CHOKE 2.4R@100kHZ 80uH SMD 3.2X2.5MM AEC-Q200	YES	TDK	ACT1210G-800-2P-TL10
25	2	R1, R29	RES TKF 1k 5% 1/10W SMD 0603	YES	Panasonic	ERJ-3GEYJ102V
26	2	R2, R30	RES TKF 100k 1% 1/10W SMD 0603	YES	Stackpole Electronics Inc	RMCF0603FT100K
27	5	R3, R7, R22, R26, R40	RES TKF 4.7k 1% 1/16W SMD 0402	YES	Yageo	RC0402FR-074K7L
28	3	R4, R57, R63	RES TKF 10k 5% 1/16W SMD 0402	YES	Vishay	CRCW040210K0JNED
29	16	R5, R9, R10, R11, R12, R13, R14, R15, R16, R17, R19, R20, R21, R28, R69, R70	RES TKF 0R 1/16W SMD 0402	YES	Yageo	RC0402JR-070RL
30	1	R18	RES TKF 12.1k 1% 1/16W SMD 0402	YES	Vishay	CRCW040212K1FKEDC
31	13	R23, R27, R31, R36, R37, R38, R39, R45, R46, R47, R48, R49, R52	RES TF 1k 0.1% 1/16W SMD 0402	YES	Yageo	RT0402BRD071KL
32	2	R24, R25	RES TKF 470R 5% 1/16W SMD 0402	YES	Panasonic	ERJ-2GEJ471X
33	7	R32, R33, R34, R35, R43, R44, R50	RES TKF 10k 1% 1/16W SMD 0402	YES	TE Connectivity Passive Product	CRG0402F10K
34	1	R41	RES TKF 6.04k 1% 1/16W SMD 0402	YES	Yageo	RC0402FR-076K04L
35	2	R42, R54	RES TF 1k 1% 1/2W SMD 1206	YES	Stackpole Electronic Inc	RNCP1206FTD1K00
36	1	R51	RES TKF 100k 1% 1/4W SMD 0603	YES	Vishay	CRCW0603100KFKEAHP
37	1	R53	RES TKF 200R 1% 1/10W SMD 0402	YES	Panasonic	ERJ-2RKF2000X
38	2	R55, R71	RES TKF 0R SMD 0402 AEC-Q200	YES	Panasonic	ERJ-2GE0R00X
39	3	R56, R65, R66	RES TKF 1k 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF1001V
40	2	R58, R59	RES TKF 2.2k 1% 1/10W SMD 0402	YES	Panasonic	ERJ-2RKF2201X
41	1	R61	RES TKF 16.9k 1% 1/10W SMD 0603 AEC-Q200	YES	Stackpole Electronics Inc	RMCF0603FT16K9
42	2	R62, R72	RES TKF 10k 1% 1/10W SMD 0402	YES	Panasonic	ERJ-2RKF1002X
43	1	R64	RES TKF 330R 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF3300V
44	1	R67	RES TKF 2.2k 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF2201V
45	1	R73	RES TF 10k 1% 1/16W SMD 0603	YES	TE Connectivity Passive Product	CPF0603F10KC1
46	1	SW1	SWITCH TACT SPST 16V 50mA PTS810 SJM 250 SMTR LFS SMD	YES	C&K Components	PTS810 SJM 250 SMTR LFS
47	3	TP1, TP2, TP3	CON TP LOOP BLUE Ag TH	YES	Keystone Electronics	5117
48	1	TP4	CON TP LOOP Orange TH	YES	Keystone Electronics	5003

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TABLE B-1:   EVB-LAN8870-MC BILL OF MATERIALS (CONTINUED)

Item	Quantity	Designator	Description	Populated	Manufacturer	Manufacturer Part Number
49	1	TP5	MISC, TEST POINT MULTI PURPOSE MINI BLACK	YES	Keystone	5001
50	1	U1	MCHP INTERFACE ETHERNET LAN8830 QFN-48	YES	Microchip Technology	LAN8830/PSA
51	1	U2	MCHP INTERFACE LAN8870 1000BASE-T1 TRANSCEIVER	YES	Microchip Technology	LAN8870-V/PUAVAO
52	1	U3	MCHP MCU 8-BIT 48MHz 32kB 2kB PIC18LF25K50-I/ML QFN-28	YES	Microchip Technology	PIC18LF25K50-I/ML
53	1	U4	MCHP ANALOG LDO 3.3V MCP1726T-3302E/MF DFN-8	YES	Microchip Technology	MCP1726T-3302E/MF
55	1	U5	MCHP ANALOG LDO 0.8V-5V MCP1726T-ADJE/MF DFN-8	YES	Microchip Technology	MCP1726T-ADJE/MF
56	6	Y1, Y2	MCHP CRYSTAL 25Mhz 10pF SMD L3.2W2.5H0.8	YES	Microchip Technology	VXM7-9013-25M0000000
57	2	J1, J2	CON HDR-2.54 Female 1x2 Gold TH R/A	DNP	Sullins Connector Solutions	PPPC021LGBN-RC
58	1	J10	CON HDR-2.54 Male 1x5 Gold 5.84MH TH VERT	DNP	FCI	68000-105HLF
59	2	J13, J14	CON HDR-2.54 Male 1x2 Gold 6.75MH TH R/A	DNP	Molex, LLC	0901210762
60	1	J17	CON RF Coaxial MMCX Female 2P TH VERT	DNP	Cinch Connectivity Solutions	135-3701-211
61	2	R6, R8	RES TKF 10k 1% 1/16W SMD 0402	DNP	TE Connectivity Passive Product	CRG0402F10K
62	1	R68	RES TKF 0R 1/16W SMD 0402	DNP	Yageo	RC0402JR-070RL

Appendix C. Silk Screens

C.1   INTRODUCTION

This appendix shows the top and bottom silk screen images of the EVB-LAN8870-MC.

EVB-LAN8870-MC Evaluation Board User's Guide

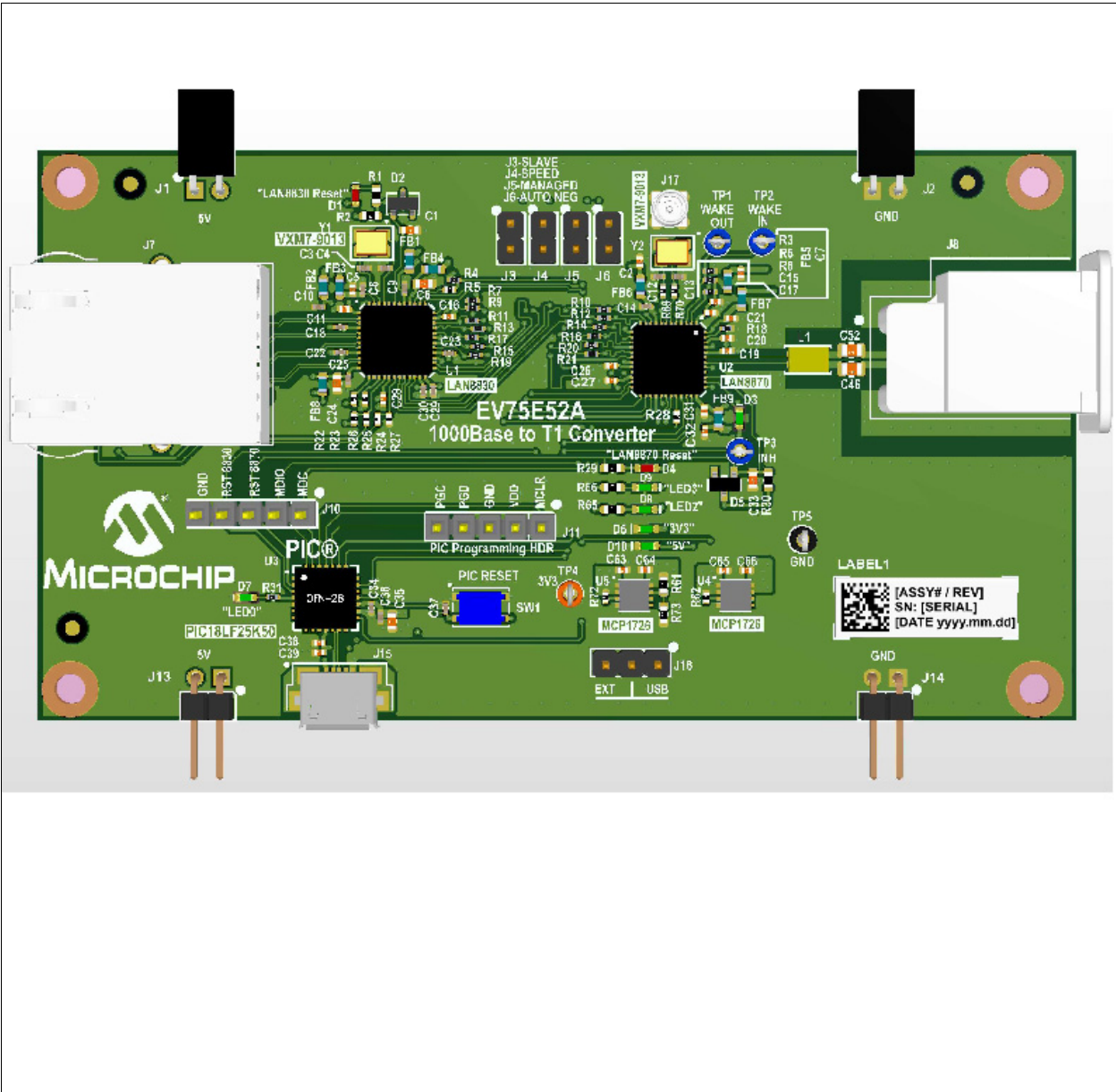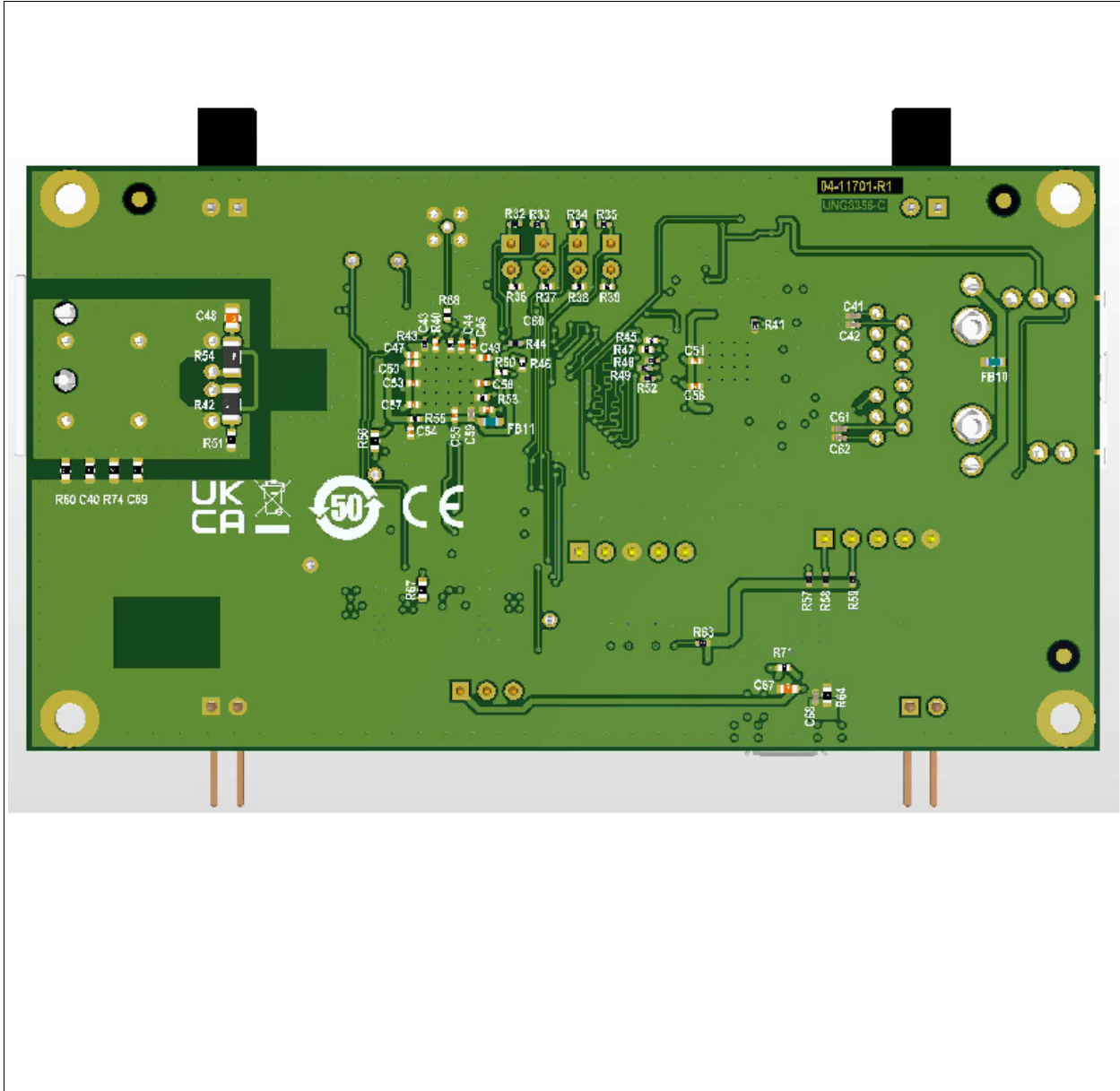**FIGURE C-1:** EVB-LAN8870-MC TOP SILK SCREEN IMAGE

FIGURE C-2:   EVB-LAN8870-MC BOTTOM SILK SCREEN IMAGE

NOTES:

Appendix D. PIC MCU Programming

D.1   INTRODUCTION

The EVB-LAN8870-MC has a PIC18LF25K50 microcontroller that initializes the LAN8870 at power-on and provides users access to the registers via the USB interface. The PIC is already programmed, so users are not expected to reprogram it. However, the following instructions are provided for users who wish to reprogram it with modified initialization code.

D.2   SETTING UP MPLAB® X IDE AND MPLAB XC8 COMPILER

1. Download the latest MPLAB X IDE (6.xx) from the Microchip X IDE website.
2. Open the installer. (In Windows®, it will be in the Downloads directory.) Accept the license agreement and click on **Next** on every step to launch the installation.
3. After the installation is finished, the prompt will ask to launch additional items to install. For this, the XC8 Compiler is necessary but nothing else. See Figure D-1 for items to check and then click on **Finish**. This will open a webpage to the Microchip XC Compilers website.

**FIGURE D-1:   MPLAB X IDE SETUP WIZARD SCREEN**
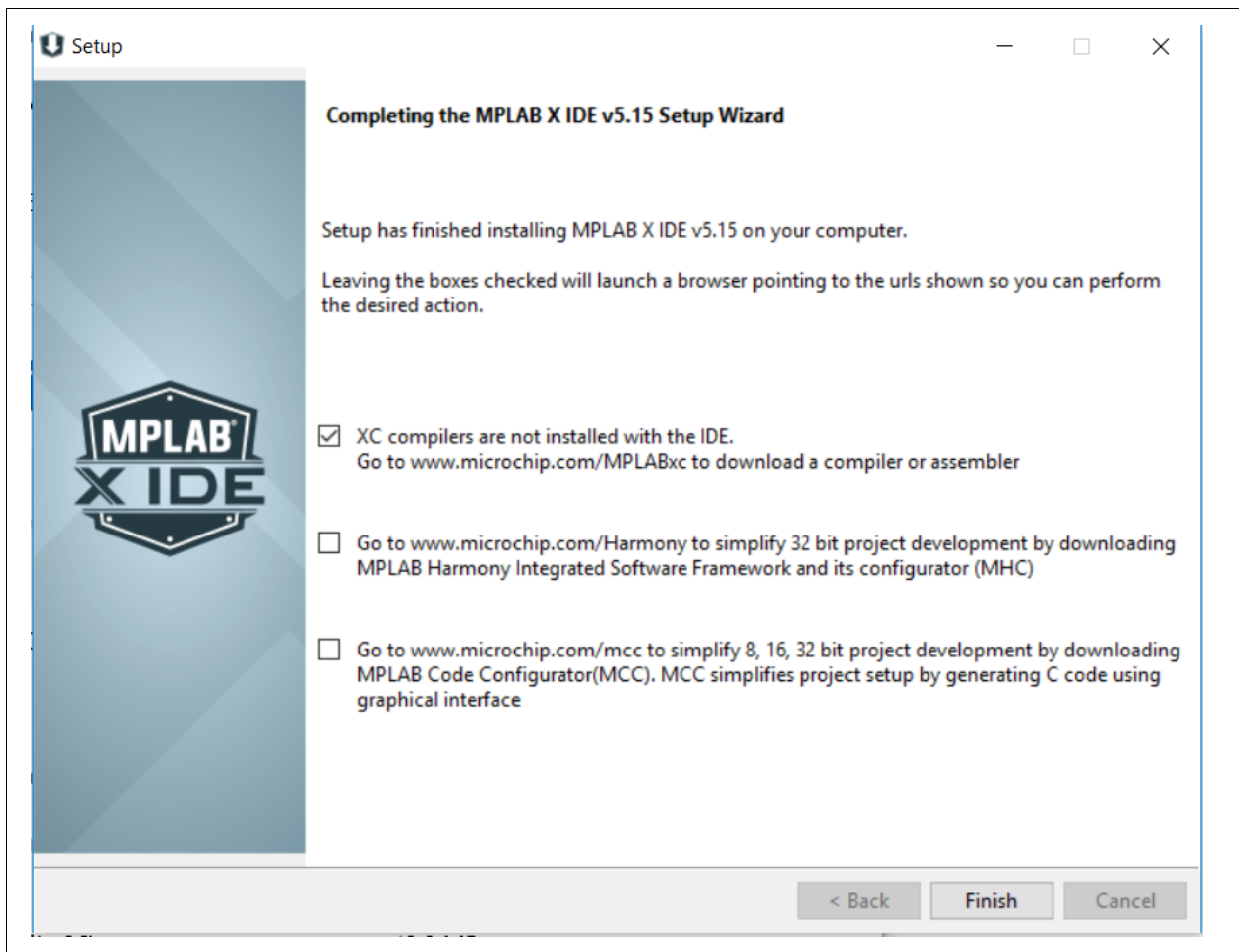
4. On the Microchip XC Compilers website, download the MPLAB XC8 Compiler.

5. Open the XC8 Compiler installer (same directory as step 2 above). Accept the license agreement and click on **Next** on every step of the installation.

6. Once the installation is complete, click on **Next** (if activating a license, which is not necessary), activate your license, and then click on **Next**.

D.3   SETTING UP PROJECT IN MPLAB X IDE

7. Open MPLAB X IDE.

8. Go to *File>Open Project*.

9. Navigate to the folder where UNG8356_TX_T1_Version_1_USB.X folder is located. Highlight and click on **Open Project**. See Figure D-2.

FIGURE D-2:   **FOLDER NAVIGATION**
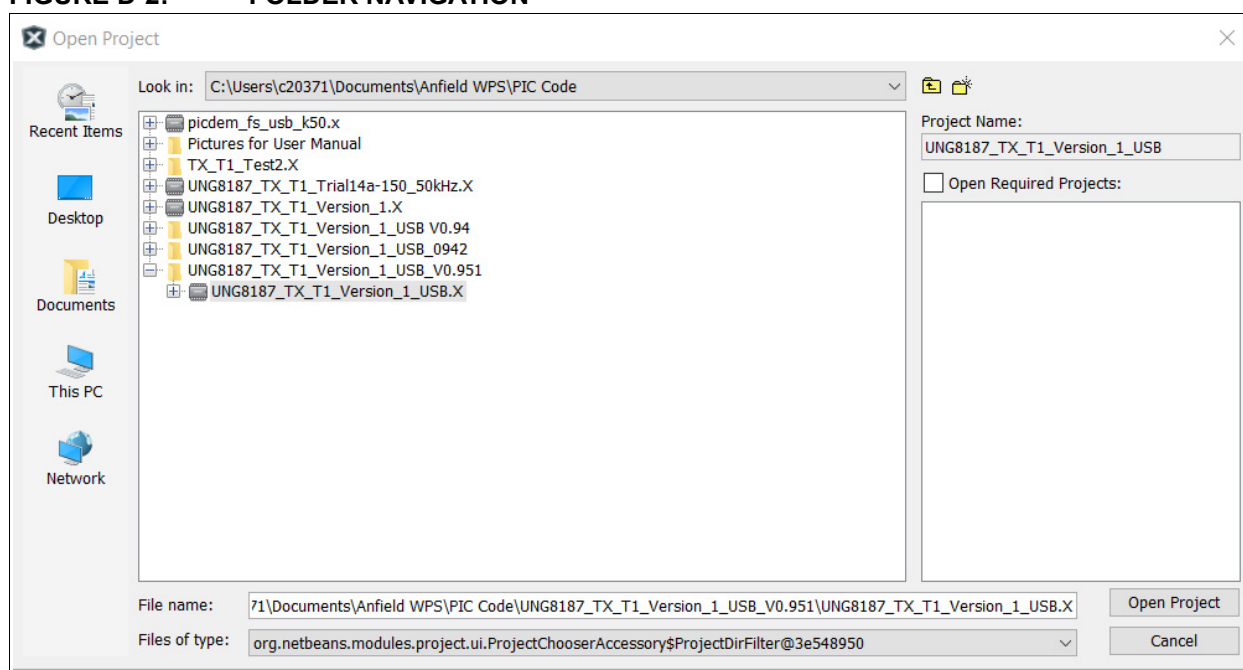
10. This will open the project for the 1000BASET to 1000BASET1 PIC Program. (See Figure D-3.) Expand the project in the upper left corner. The PIC is programmed with the register reads and writes in the Initialize_LAN8870() function in the `LAN8870.c` file (double-click to open). The default programming in this function is to set the EVB-LAN8870-MC to its best interoperability with other 1000BASE-T1 link partners, but other reads and writes can be done after the default initialization.

FIGURE D-3:   PROJECT SCREEN
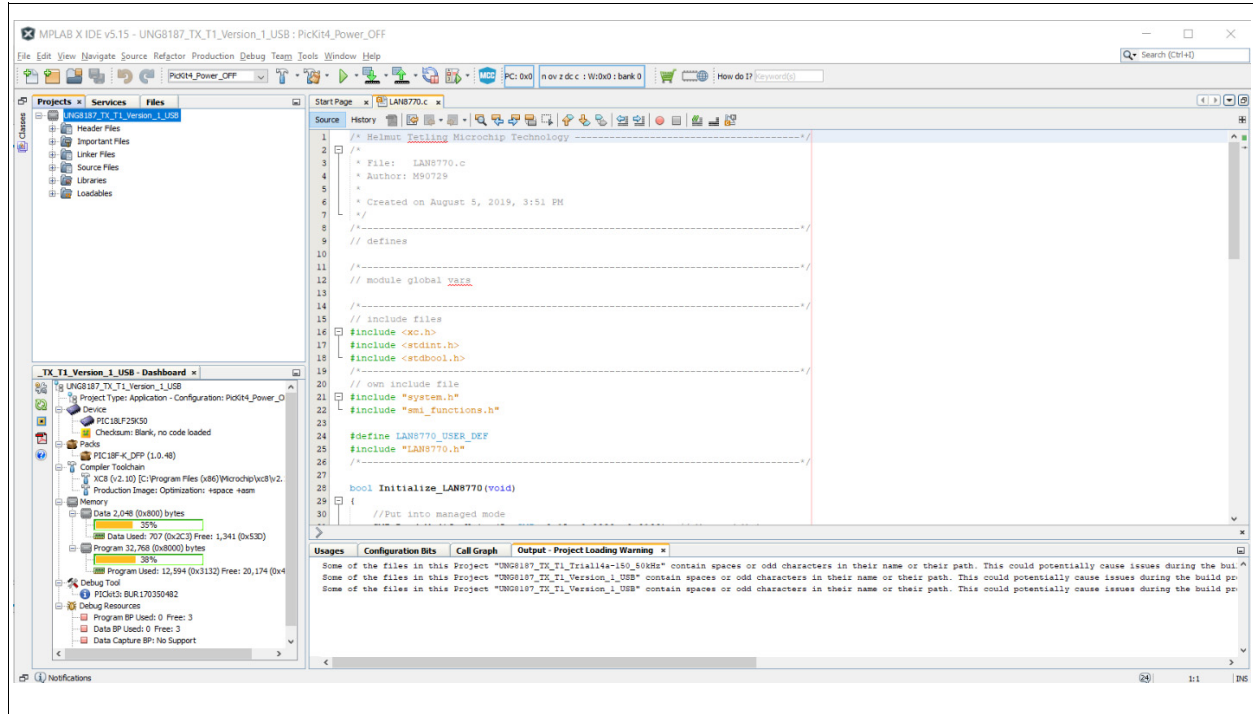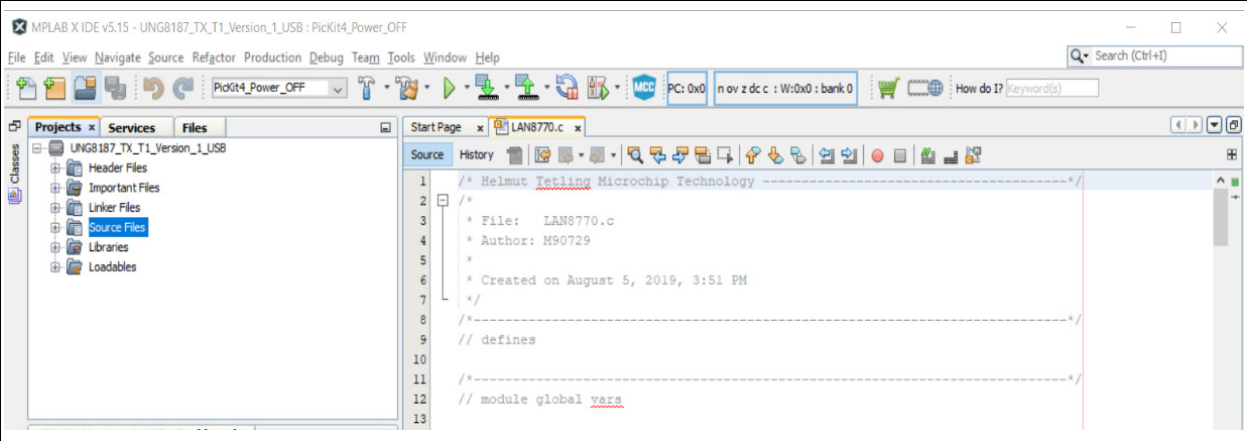

D.4   PROGRAMMING THE PIC

11. To program the PIC microcontroller, connect the programmer to J11 on the EVB-LAN8870-MC, with pin 1 of J11 lining up with pin 1 of the programmer. Note that the programmer may have additional lines which are not connected to the board's J11 pins. This is acceptable.

12. Go to *Production>Set Project Configuration> Customize*. The window in Figure D-4 will appear. Choose the Hardware Tool (PICKit3, PICKit4, etc.) and XC8 compiler. Click on **Apply** and then click on **OK**.

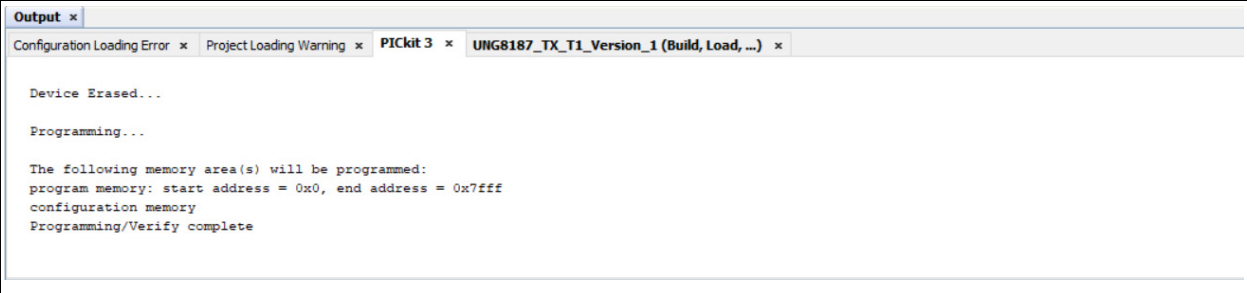**FIGURE D-4:   PROJECT CONFIGURATION SCREEN**
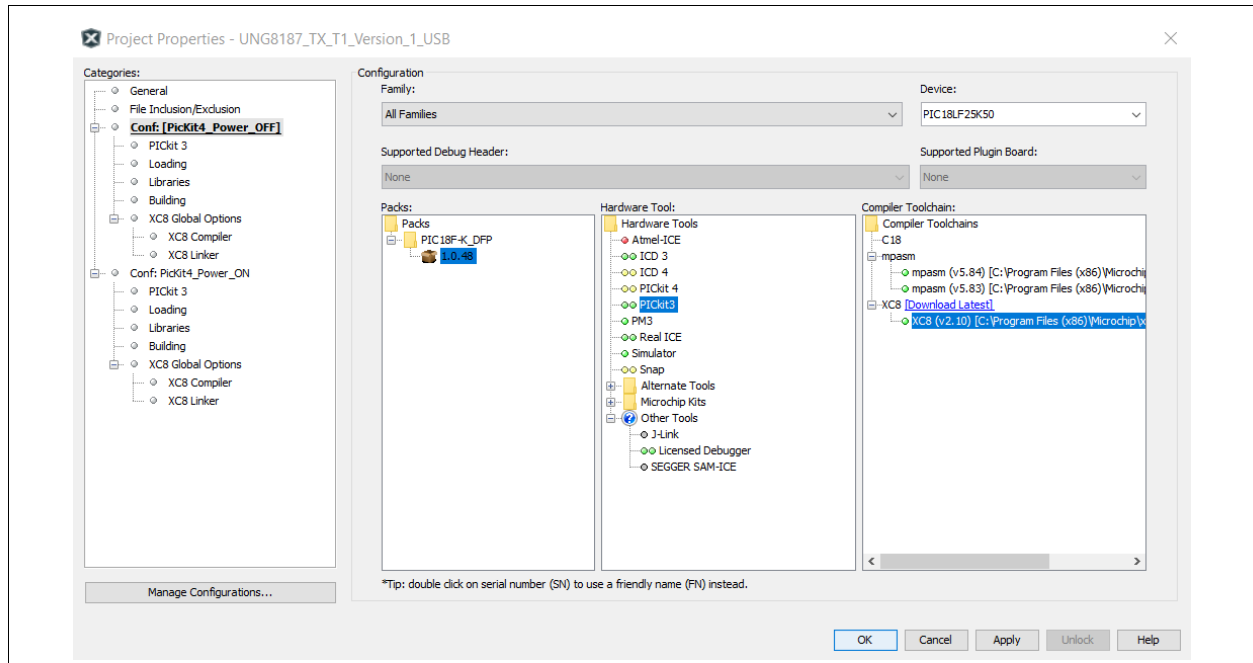
13. Now, the PIC can be programmed by clicking the green play button in the toolbar. Refer to Figure D-5.

FIGURE D-5:   PROGRAMMING BUTTON IN TOOLBAR

14. This will program the PIC. The bottom right window in Figure D-6 will display the following when PIC programming is successful.

FIGURE D-6:   PROGRAMMING CONFIRMATION

15. On the EVB-LAN8870-MC, press the **Reset** button. This will reset the PIC, which will initialize the EVB-LAN8870-MC registers.

NOTES:

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