

EVB-LAN8770M_MC Evaluation Board User's Guide

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NOTES:



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 "DSXXXXA", 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-LAN8770M_MC Evaluation Board. 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 setup and use of the EVB-LAN8770M_MC hardware and software, and how to optionally reprogram the preprogrammed on-board microcontroller.

The manual layout is as follows:

- Chapter 1. "Overview" Shows a brief description of the EVB-LAN8770M_MC.
- Chapter 2. "Getting Started" Provides information about setup and operation of the EVB-LAN8770M_MC.
- Chapter 3. "Hardware Configuration" Includes information about the hardware configuration of the EVB-LAN8770M_MC.
- Appendix A. "Schematics" This appendix shows the EVB-LAN8770M_MC schematics.
- Appendix B. "Bill of Materials" This appendix includes the EVB-LAN8770M_MC Bill of Materials.

- Appendix C. "Silk Screens" This appendix includes the EVB-LAN8770M_MC silk screen.
- Appendix D. "PIC^{® MCU Programming"} This appendix includes instructions for users who wish to reprogram the EVB-LAN8770M_MC with modified initialization code.

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	<u>File>Save</u>	
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></f1></enter>	
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	-0pa+, -0pa-	
	Bit values	0, 1	
	Constants	0xFF, `A'	
Italic Courier New	A variable argument	<i>file</i> .o, where <i>file</i> can be any valid filename	
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [options]	
Curly brackets and pipe character: { }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}	
Ellipses	Replaces repeated text	<pre>var_name [, var_name]</pre>	
	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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- Field Application Engineer (FAE)
- Technical Support

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

DOCUMENT REVISION HISTORY

Revisions	Section/Figure/Entry	Correction
DS50002979A	Initial release	
(04-17-20)		



Chapter 1. Overview

1.1 INTRODUCTION

The EVB-LAN8770M_MC evaluation board is a 100BASE-T1 (single-pair Ethernet) to 100BASE-TX (Fast Ethernet) media converter that is used for evaluating the LAN8770 100BASE-T1 Ethernet transceiver.

The 100BASE-TX side of the EVB-LAN8770M_MC uses a KSZ8081MNX transceiver and a conventional RJ45 jack with integrated magnetics. It features auto-negotiation and auto-crossover.

The 100BASE-T1 side uses a LAN8770M transceiver with a 2-wire, screw-down terminal block. The board also has footprint for a 4-pin connector in place of the terminal block. The LAN8770M is configured in reverse MII mode, and connects directly to the MII interface of the KSZ8081MNX.

Software is provided to allow users to access the LAN8770 registers from a PC via the USB port and an on-board PIC[®] microcontroller. The board is powered from the USB port.

This document describes setup and use of the hardware and software. It 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: EVB-LAN8770M_MC 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.

LAN8770 Data Sheet



Chapter 2. Getting Started

2.1 PHYSICAL SETUP

The Microchip EVB-LAN8770M_MC media converter is simple to set up, as shown in Figure 2-1.

- 1. Verify that jumpers are installed on headers J6 and J11.
- 2. To configure the 100BASE-T1 port as slave, 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.
- 4. A CAT-5 Ethernet cable can be connected to the RJ45 jack for 100BASE-TX.
- 5. For 100BASE-T1, connect the single twisted pair cable to the screw terminal J9.



FIGURE 2-1: EVB-LAN8770M_MC EVALUATION BOARD CONNECTIONS

No further steps are needed for the board to pass Full-duplex 100 Mbps traffic between the two ports. Note that the CAT-5 port must be linked at 100 Mbps, and not 10 Mbps.

2.2 EVB-LAN8770M_MC CONFIGURATION TOOL SOFTWARE

The optional EVB-LAN8770M_MC Configuration Tool Software is available to monitor and configure the LAN8770M transceiver. Microsoft[®] .Net 4.5 or a newer version must be installed on the PC. The software comes as an executable (.exe) file for Windows[®] operating systems, and no installation is required. To run it, double click the file.

The PIC microcontroller on the board is running as a communications device class (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 click the **Connect** button as shown in Figure 2-2.

om Port List	SMI REG's		MISC R	EG'S	STATUS	Clear Console	
COM3	Read Wr	ite	Read	Write	Read Status		
Close Serial	Address 00h 00	00	Address 01h	0000	Read Status Cont.		
PHY Address (bex)	Address 01h 00	00 RO	Address 08h	0000			
05	Address 02h 00	00	Address 09h	0000	LINK STATUS		
	Address 03h 00	00	Address 0Ah	0000	j OLink Up		
C 10 Procedures	Address 09h 00	00	Address 10h	0000	Unk Down		
Set Sleep Config	Address 0Ah 00	00 RO	Address 11h	0000	MASTER/SLAVE		
Sleep Request	Address 10h 00	00	Address 15h	0000	O Master		
Sleep Nequest	Address 11h 00	00	Address 17h	0000	◯ Slave		
Wake R from Master	Address 14h 00	00	Address 1Ah	0000	RECEIVER STATUS		
Wake R from Slave	Address 15h 00	00	Address 20h	0000	Local Rec. Status		
	Address 16h 00	00	Address 21h	0000	Remote Rec. Status		
	Address 17h 00	00	Address 22h	0000			
SOL	Address 18h 00	00	Address 24h	0000	BER (hex)		
SOI Mathed A	Address 19h	00					
Sol Metrica A	Address 10h	00					
SQI Method B	Address 1Fb 00	00					
		00					
	READ			WRITE		READ MODIFY WRITE	
Ecoad Script 1 Execute	PHY CET A			PHY C		PHY CET ADDD DA	
Load Script 2 Execute	ADDR SET AL	0	Read	ADDR	ADDR DATA	ADDR SMI ADDR DA	R-M-W
Load Script 3 Everyte	MISC	• _		05 M	SC 00 0000	MISC 00 00	0000 0000

FIGURE 2-2: COM PORT SELECTIONS

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

• Read and write the SMI Control and Status Registers (Bank 0).

om Port List	SMI R	EG's	MISC F	EG'S	STATUS	Ci	ar Console	
COM3	Read	Write	Read	Write	Read Status			
Close Serial	Address 00h	0000	Address 01h	0000	Read Status Cont.			
HY Address (bex)	Address 01h	0000 F	O Address 08h	0000				
05	Address 02h	0000	Address 09h	0000	LINK STATUS			
	Address 03h	0000	Address 0Ah	0000	C Link Up			
C 10 Procedures	Address 09h	0000	Address 10h	0000	Unk Down			
Set Sleep Config	Address 0Ah	0000 F	O Address 11h	0000	MASTER/SLAVE			
Sleep Request	Address 10h	0000	Address 15h	0000	O Master			
Sieep nequest	Address 11h	0000	Address 17h	0000	⊖ Slave			
Wake R from Master	Address 14h	0000	Address 1Ah	0000	RECEIVER STATUS			
Wake R from Slave	Address 15h	0000	Address 20h	0000	O Local Rec. Status			
	Address 16h	0000	Address 21h	0000	Remote Rec. Status			
	Address 17h	0000	Address 22h	0000				
SQI	Address 18h	0000	Address 24h	0000	BER (nex)			
SQI Method A	Address 19h	0000						
	Address 1Ah	0000						
SQI Method B	Address 1Eh	0000						
	READ			WRITE		READ MODIFY WE	ITE	
Load Script 1 Execute	PHY			DUN		DUDY		
Load Script 2 Execute	ADDR SET	ADDR	Deal	ADDR SI	ET ADDR DATA	ADDR SET	ADDR DATA MASK	DMW
Lood Costa 2	05 MISC	00	Head	05 M	SC 00 0000 Write	05 MISC	00 0000 0000	IN-M-W

FIGURE 2-3: SMI REGISTERS READ AND WRITE

• Read and write the Miscellaneous Registers (Bank 1).

LAN8//0 Config Tool V 0.9/	Demo Version			= U ;
om Port List	SMI REG's	MISC REG'S	STATUS	Clear Console
Onen Serial	Read Write	Read Write	Read Status	
Close Serial	Address 00h 0000	Address 01h 0000	Read Status Cont.	
HY Address (here)	Address 01h 0000 RO	Address 08h 0000		
05	Address 02h 0000	Address 09h 0000	LINK STATUS	
	Address 03h 0000	Address 0Ah 0000	🔿 Link Up	
C 10 Procedures	Address 09h 0000	Address 10h 0000	 Link Down 	
Set Sleep Config	Address 0Ah 0000 RO	Address 11h 0000	MASTER/SLAVE	
Set Steep coming	Address 10h 0000	Address 15h 0000	O Master	
Sleep Request	Address 11b 0000	Address 17h 0000	Slave	
Wake R from Master	Address 1/b 0000	Address 1Ab 0000		
Wake R from Slave	Address 15h 0000	Address 20b 0000	O Local Rec. Status	
		Address 201 0000	Bemote Rec. Status	
	Address Ibn 0000	Address 2 In 0000	0	
	Address 1/h 0000	Address 22h 0000	BER (hex)	
sqi	Address 18h 0000	Address 24h 0000		
SQI Method A	Address 19h 0000			
SQI Method B	Address 1Ah 0000			
	Address 1Eh 0000			
	READ	WRITE		READ MODIFY WRITE
Load Script 1 Execute	PHY of the Phy	PHY		PHY of the part were
Load Script 2 Execute	ADDR SET ADDR	ADDR SET		ADDR SET ADDR DATA MASK
Land Sariat 2 Even do	MISC UU	05 MISC	00 0000 vvince	05 MISC 00 0000 0000

FIGURE 2-4: MISCELLANEOUS REGISTERS READ AND WRITE

If you use the **Write** buttons in the above figures, the whole buffer with all page-values, except the Read Only values, is written to the device. This enables you to alter more than one word at a time.

Single READ, WRITE, or READ MODIFY WRITE commands are easily accomplished using the controls highlighted in Figure 2-5.

nm Port List	SMI REG's	MISC REG'S	STATUS	Class Cassala	
COM3 V			511105	Clear Console	
Open Serial	Read Write	Read Write	Read Status		
Close Serial	Address 00h 0000	Address 01h 0000	Read Status Cont.		
PHY Address (hex)	Address 01h 0000 RC	Address 08h 0000			
05	Address 02h 0000	Address 09h 0000	LINK STATUS		
	Address 03h 0000	Address 0Ah 0000	i O Link Up		
C 10 Procedures	Address 09h 0000	Address 10h 0000	Link Down		
Set Sleep Config	Address 0Ah 0000 RC	Address 11h 0000	MASTER/SLAVE		
Sleep Pequet	Address 10h 0000	Address 15h 0000	Master		
Sieep nequest	Address 11h 0000	Address 17n 0000	O Slave		
Wake R from Master	Address 14h 0000	Address 1Ah 0000	RECEIVER STATUS		
Wake R from Slave	Address 15h 0000	Address 20h 0000	O Local Rec. Status		
	Address 16h 0000	Address 21h 0000	O Remote Rec. Status		
	Address 17h 0000	Address 22h 0000			
SQI	Address 18h 0000	Address 24h 0000	DER (nex)		
SQI Method A	Address 19h 0000				
COLM-th-d D	Address 1Ah 0000				
SQI Method B	Address 1Eh 0000				
	READ	WRITE		READ MODIFY WRITE	
Load Script 1 Execute	PHY				
Load Script 2 Execute	ADDR SET ADDR	Read PHY SE	T ADDR DATA	ADDR SET ADDR DATA MASK	-M-W
Lord Control D	MISC 00	05 MI	SC 00 0000	05 MISC 00 0000 0000	

FIGURE 2-5: INDIVIDUAL REGISTER COMMANDS

The PHY Address is copied from the general setup field (PHY ADDR (hex)).

For the READ command, select the appropriate **SET** value (register bank), and an address. After clicking the **Read** button, the value is displayed into the Clear Console window as shown in Figure 2-6.

m Port List	SMI REG's	MISC REG'S	STATUS	Clear Console
OM3 Vopen Serial	Read Write	Read Write	Read Status	READ PHY ADDRESS: 05 SET 00 ADDR 00 @05:08:36:61 READ PHY ADDRESS: 05 SET 00 ADDR 0A @05:08:43:12
Close Serial	Address 00h 0000	Address 01h 0000	Read Status Cont.	
HY Address (hex)	Address 01h 0000 RO	Address 08h 0000		
5	Address 02h 0000	Address 09h 0000	LINK STATUS	
	Address 03h 0000	Address 0Ah 0000	O Link Up	
C 10 Procedures	Address 09h 0000	Address 10h 0000	Unk Down	
Set Sleep Config	Address 0Ah 0000 RO	Address 11h 0000	MASTER/SLAVE	
Sleen Request	Address 10h 0000	Address 15h 0000	Master	
Sleep Request	Address 11h 0000	Address 17h 0000	Slave	
Wake R from Master	Address 14h 0000	Address 1Ah 0000	RECEIVER STATUS	
Wake R from Slave	Address 15h 0000	Address 20h 0000	O Local Rec. Status	
	Address 16h 0000	Address 21h 0000	O Remote Rec. Status	
	Address 17h 0000	Address 22h 0000		
QI	Address 18h 0000	Address 24h 0000	BER (hex)	
SQI Method A	Address 19h 0000			
Star Method X	Address 1Ab 0000			
SQI Method B	Address 1Fb 0000			
	0000			
	READ	WRITE		READ MODIFY WRITE
load Script 1 Execute	PHY			_
.oad Script 2 Execute	ADDR SET ADDR	ADDR SET	ADDR DATA	ADDR ADDR DATA MASK
	05 MISC 0A	Read 05 MISC	00 0000 Write	e 05 MISC 00 0000 R-M-W

FIGURE 2-6: SINGLE REGISTER READ COMMANDS

The **Read Status** button gives quick access to the following status information for the 100BASE-T1 port:

- Link Up/Down
- Master/Slave
- · Local Receiver Status
- Remote Receiver Status
- DSP Bit Error Rate

After clicking the **Read Status Cont** button, these status information are read every 200 ms, and this function stops automatically when another read or write operation is requested.

The **Load Script** buttons lets you load three different scripts to execute when the appropriate **Execute** button is clicked. Script execution is displayed in the Clear Console window.

Commands supported inside the script are:

- · Blank Lines
- # Comment Lines
- Sleep command
- r Read command
- · w Write command
- · RMW Read-Modify-Write command

The script has to be in a .txt format. All commands are lowercase letters. The sleep command is followed with a sleep time in [ms] as a decimal value. All other values for the address and data fields have to be provided in hexadecimal with a leading 0x.

EXAMPLE 2-1: EXAMPLE OF SUPPORTED COMMANDS

#this is a comment line
rmw afe 0x00 0x0518 0x3FF8
w dsp 0x34 0x0001
w pcs 0x00 0x7FFF
w smi 0x17 0x0080
rmw smi 0x10 0x0000 0x0040
rmw afe 0x0B 0x000A 0x001E
w dsp 0x25 0x23E0
sleep 500
r smi 0x01

NOTES:



Chapter 3. Hardware Configuration

3.1 HARDWARE CONFIGURATION OPTIONS

Figure 3-1 shows the top view of the EVB-LAN8770M_MC evaluation board.



FIGURE 3-1: EVB-LAN8770M_MC REV B (TOP VIEW)

3.1.1 Jumpers and Headers

Section 2.1 "Physical Setup" describes the basic setup of this media converter board. When configuring the board, it has to be decided whether it will be set up as a 100BASE-T1 master or a 100BASE-T1 slave. This is determined using the J3 jumper. 100BASE-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.

Table 3-1 lists the descriptions of the jumpers, and Table 3-2 lists the header descriptions.

Jumpers	Description
J3	Master/Slave mode selection. Open for master. Closed for slave.
J6	In-line jumper on the VBAT power rail for VBAT current measurement. Always close it for operation.
J11	In-line jumper on the USB 5V power rail. It must be closed when the board is powered from USB.

TABLE 3-1: JUMPER DESCRIPTIONS

Headers	Description
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: KSZ8081 Reset Pin 4: LAN8770 Reset Pin 5: Ground
J5	These signals are either controlled by the PIC microcontroller or outputs of the LAN8770. Do not drive them externally. Pin 1: WAKE_IN - Input to the LAN8770 Pin 2: INH - Output from the LAN8770
J14	5-pin PIC programming header

TABLE 3-2: HEADER DESCRIPTIONS

3.1.2 Status LEDs

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

TABLE 3-3: LED DESCRIPTIONS

LEDs	Description
D1	"VDD Main" = 3.3V power, green
D2	"Speed" indicates KSZ8081 100 Mbps (off is 10 Mbps), yellow
D3	"Activity" indicates KSZ8081 traffic, green
D4	"Link" is driven by the LAN8770M dual-function LED/IRQ_N pin. By default, this pin is IRQ_N (interrupt) output. For LED indication of link status, the pin function must be changed via register write. Green
D6	"LED0" indicates that the PIC microcontroller is programmed, green

3.1.3 100BASE-T1 Connector

The board comes with a screw terminal connector for the single twisted pair cable. Optionally, the screw terminal can be removed, and a Molex[®] Mini50 2 mm 4-pin jack can be installed. See the Bill of Materials (BOM) for component J8.

3.1.4 Reset Push Button

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



Appendix A. Schematics

A.1 INTRODUCTION

This appendix shows the EVB-LAN8770M_MC schematic diagrams.

FIGURE A-1: EVB-LAN8770M_MC SCHEMATIC (1/2)



EVB-LAN8770M_MC Evaluation Board User's Guide



Schematics

NOTES:



Appendix B. Bill of Materials

B.1 INTRODUCTION

This appendix contains the EVB-LAN8770M_MC Bill of Materials (BOM).

TABLE B-1: EVB-LAN8770M_MC BILL OF MATERIALS

Item	Qty	Designator	Description	Populated	Manufacturer	Manufacturer Part Number
1	23	C1, C6, C8, C9, C11, C12, C13, C14, C17, C20, C23, C27, C31, C37, C38, C39, C40, C41, C44, C46, C47, C49, C50	CAP CER 0.1uF 50V 10% X7R SMD 0402	YES	TDK Corporation	C1005X7R1H104K050BB
2	12	C2, C7, C10, C15, C16, C18, C24, C26, C30, C42, C45, C48	CAP CER 1uF 35V 10% X5R SMD 0402	YES	Murata Electronics North America	GRM155R6YA105KE11D
3	4	C3, C25, C35, C43	CAP CER 10UF 25V 20% X5R SMD 0603	YES	Murata Electronics North America	GRM188R61E106MA73D
4	4	C4, C5, C22, C28	CAP CER 18pF 50V 5% C0G SMD 0402	YES	Murata	GRM1555C1H180JA01D
5	2	C19, C21	CAP CER 0.1uF 250V 10% X7T SMD 0805	YES	TDK Corporation	C2012X7T2E104K125AA
6	1	C29	CAP CER 4700pF 100V 10% X7R SMD 0805	YES	TDK Corporation	C2012X7R2A472K
7	3	C32, C33, C34	CAP CER 4.7uF 35V 10% X5R SMD 0603	YES	Murata Electronics North America	GRM188R6YA475KE15D
8	1	C36	CAP CER 1000pF 50V 10% X7R SMD 0402	YES	Murata	GRM155R71H102KA01D
9	4	D1, D3, D4, D6	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	YES	Lite-On Inc	LTST-C191KGKT
10	1	D2	DIO LED YELLOW 2.2V 25mA 3.4mcd Diffuse SMD 0603	YES	Stanley Electric Co	FY1111C-TR
11	1	D5	DIO TVS ARRAY RCLAMP0582BQTCT 5V 300W SMD SC-75-3	YES	Semtech Corporation	RCLAMP0582BQTCT
12	6	FB1, FB2, FB3, FB4, FB7, FB8	FERRITE 600mA 120R SMD 0603	YES	TDK Corporation	MMZ1608B121CTAH0
13	2	FB5, FB6	FERRITE 220R@100MHZ 2A SMD 0603	YES	Murata Electronics North America	BLM18EG221SN1D
14	1	J1	CON HDR-2.54 Female 1x2 Gold TH R/A	DNP	Sullins Connector Solutions	PPPC021LGBN-RC
15	5	J2, J3, J5, J6, J11	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT	YES	FCI	77311-118-02LF
16	1	J4	CON HDR-2.54 Male 1x5 Gold 5.84MH TH VERT	DNP	FCI	68000-105HLF
17	1	J7	CON MODULAR JACK RJ45 10/100 MAGNETICS 0xLEDs SHIELD TH R/A	YES	Bel Fuse Inc.	08B1-1X1T-36-F
18	1	J8	CON JACK MINI50 2MM BLACK MALE TH R/A	DNP	Molex, LLC	0347930040
19	1	19	CON TERMINAL 3.5mm 1x2 Female 16-28AWG 6A TH R/A	YES	On Shore Technology Inc	ED555/2DS
20	2	J10, J13	CON HDR-2.54 Male 1x2 Gold 6.75MH TH R/A	DNP	Molex, LLC	0901210762
21	1	J12	CON USB2.0 MICRO-AB FEMALE SMD R/A	YES	Hirose	ZX62-AB-5PA(31)
22	1	J14	CON HDR-1.27 Male 1x5 TH VERT	YES	Sullins Connector Solutions	GRPB051VWVN-RC
23	1	L1	CM CHOKE 5.5R@100kHZ 200UH SMD 3.2X2.5MM	YES	TDK Corporation	ACT1210L-201-2P-TL00
24	2	R1, R25	RES TKF 330R 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF3300V
25	2	R2, R32	RES TKF 1k 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF1001V
26	10	R3, R5, R26, R31, R35, R38, R44, R47, R48, R49	RES TF 1k 0.1% 1/16W SMD 0402	YES	Yageo	RT0402BRD071KL
27	1	R4	RES TKF 200k 1% 1/10W SMD 0603	YES	Panasonic	ERJ-3EKF2003V
28	6	R6, R7, R24, R27, R30, R52	RES TKF 10k 5% 1/16W SMD 0402	YES	Vishay	CRCW040210K0JNED
29	2	R8, R15	RES TF 1k 1% 1/2W SMD 1206	YES	Stackpole Electronics Inc.	RNCP1206FTD1K00
30	12	R9, R10, R11, R12, R13, R14, R16, R17, R20, R21, R22, R23	RES TKF 0R 1/16W SMD 0402	YES	Yageo	RC0402JR-070RL

Item	Qty	Designator	Description	Populated	Manufacturer	Manufacturer Part Number
31	2	R18, R51	RES TKF 4.7k 1% 1/16W SMD 0402	DNP	Yageo	RC0402FR-074K7L
32	1	R19	RES TKF 100k 1% 1/4W SMD 0603	YES	Vishay	CRCW0603100KFKEAHP
33	2	R28, R29	RES TKF 2.2k 1% 1/10W SMD 0402	YES	Panasonic	ERJ-2RKF2201X
34	9	R33, R34, R37, R40, R41, R42, R43, R46, R50	RES TKF 4.7k 1% 1/16W SMD 0402	YES	Yageo	RC0402FR-074K7L
35	2	R36, R45	RES TkF 6.49K 0.1% 1/16W SMD 0402	YES	Panasonic Electronic Compo- nents	ERA-2ARB6491X
36	1	SW1	SWITCH TACT SPST 16V 50mA PTS810 SJM 250 SMTR LFS SMD	YES	C&K Components	PTS810 SJM 250 SMTR LFS
37	1	TP1	CON TP LOOP Orange TH	YES	Keystone Electronics	5003
38	1	TP2	MISC, TEST POINT MULTI PURPOSE MINI BLACK	YES	Keystone	5001
39	1	U1	MCHP INTERFACE ETHERNET KSZ8081MNXIA QFN-32	YES	Microchip Technology	KSZ8081MNXIA-TR
40	1	U2	MCHP INTERFACE T1 ETHERNET LAN8770M QFN-32	YES	Microchip Technology	LAN8770M/PRA
41	1	U3	MCHP ANALOG LDO 3.3V MCP1725T-3302E/MC DFN-8	YES	Microchip	MCP1725T-3302E/MC
42	1	U4	MCHP MCU 8-BIT 48MHz 32kB 2kB PIC18LF25K50-I/ML QFN-28	YES	Microchip Technology	PIC18LF25K50-I/ML
43	2	Y1, Y2	CRYSTAL 25MHz 10pF SMD ABM8G	YES	Abracon LLC	ABM8G-25.000MHZ-B4Y-T

TABLE B-1: EVB-LAN8770M_MC BILL OF MATERIALS (CONTINUED)

NOTES:



Appendix C. Silk Screens

C.1 INTRODUCTION

This appendix shows the top and bottom silk screen images of the EVB-LAN8770M_MC.

FIGURE C-1: EVB-LAN8770M_MC TOP SILK SCREEN IMAGE



FIGURE C-2: EVB-LAN8770M_MC BOTTOM SILK SCREEN IMAGE



NOTES:



Appendix D. PIC[®] MCU Programming

D.1 INTRODUCTION

The EVB-LAN8770M_MC has a PIC18LF25K50 microcontroller that initializes the LAN8770M at power-on, and provides user access to the registers via the USB interface. The PIC microcontroller 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

To set up the MPLAB X IDE and MPLAB XC8 Compiler:

- 1. Download the latest MPLAB X IDE (5.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 **Next** on every step to launch the installation.
- 3. When installation is finished, additional items to install are prompted. For this, only the MPLAB XC8 Compiler is necessary. See Figure D-1 for items to check and then click **Finish**. This opens a web page to the Microchip XC Compilers.

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 in step 2). Accept the license agreement and click **Next** on every step of the installation.
- 6. Once the installation is complete, click **Next** (if activating a license, which is not necessary), activate your license, and then click **Next**.

D.3 SETTING UP PROJECT IN MPLAB[®] X IDE

- 1. Open MPLAB X IDE.
- 2. Go to *File>Open Project*.
- 3. Navigate to the folder where UNG8187_TX_T1_Version_1_USB.X folder is located. Select it and click Open Project.

FIGURE D-2: UNG8187_TX_T1_VERSION_1_USB.X FOLDER NAVIGATION

LOOK IN: C:	\Users\c20371\Documents\Anfield WPS\PIC Code	1 E C	
Recent Items Desktop Documents This PC Desktop Documents Desktop Documents Documents Documents	nfs_usb_k50.x es for User Manual 1_Test2.X 187_TX_11_trialt4a-150_50kHz.X 187_TX_T1_Version_1_USB V0.94 187_TX_T1_Version_1_USB V0.94 187_TX_T1_Version_1_USB_V0.951 187_TX_T1_Version_1_USB_X	Project Name: UN08187_TX_T1_Version_ Open Required Project	<u>1_USB</u> s:
Network			

4. The project for the 100BASETX to 100BASET1 PIC Program opens. Expand the project in the upper-left corner. The PIC microcontroller is programmed with the register read and write functions in the Initialize_LAN8770() function in the LAN8770.c file. Double click to open. The default programming in this function is to set the EVB-LAN8770M_MC to its best interoperability with other 100BASE-T1 link partners, but other read and write functions can be done after the default initialization.

FIGURE D-3: 100BASE-TX TO 100BASE-T1 PIC[®] PROGRAM PROJECT SCREEN

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	pource nergecor production Debug leam 100	ns <u>W</u> ind		CC search (Ctri+I)
1월 🔚 🔡 🖷 🗏	🤊 🥐 🛛 Pickit4_Power_OFF 🔍 🍸 📲	👸 • D	* 👱 * 💁 * 🖓 🚯 * 🥶 PC: 0x0 n ov z dc c : W:0x0 : bank 0 🛛 🏹 📖 🖶 How do 17 (symond(s)	
Projects x Services	s files	Start Pa	x 19:1 LAN8770.c x	
B- UNG8187_TX_T1_	_Version_1_US8	Source		
🕀 💼 Header Files		1	1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年) 1999年 1999年) 1999年) 1999年 1999年) 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999年 1999 1999 1999 1999 1999 1997 1997	
🗈 📴 Important File	es	2 🗉	/* methode intring Alerochip Technology	
E - Enker Files		3	* File: LAN8770.c	
Source Hies		4	* Author: M90729	
in Contraction		5	*	
toacables		6	* Created on August 5, 2019, 3:51 PM	
		7	*/	
		8	/**/	
		9	// defines	
		10		
		11	/**/	
		12	// module global yara	
		13		
		14	/**/	
		15	// include files	
		16 🗐	#include <xc.h></xc.h>	
		17	<pre>#include <stdint.h></stdint.h></pre>	
		18	finclude <stdbool.h></stdbool.h>	
_TX_T1_Version_1_U	ISB - Dashboard ×	19	*/	
22 18 UNG8187_TX_T1	1_Version_1_USB ^	20	// own include file	
Project Type	: Application - Configuration: PicKit4_Power_O	21 🕀	finclude "system.h"	
🔤 🕞 🧼 Device		22	finclude "smi_functions.h"	
PIC18LF	F25K50	23		
Checksu	m: Blank, no code loaded	24	#define LAN8770_USER_DEF	
PIC 18E-K	K DFP (1.0.48)	25	finclude "LAN8770.h"	
Complet Too	lichain	26	*/	
"XC8 (v2.	10) [C:\Program Files (x86)\Microchip\xc8\v2.	27		
Productio	on Image: Optimization: +space +asm	28	bool Initialize_LAN8770 (void)	
Memory		29 -	đ	
🕀 🎆 Data 2,0	048 (0x800) bytes	30	//Put into managed mode	
	3279	1		
- Ittl Data	Lised: 207 (0x2C3) Free: 1.341 (0x530)	/		
- 200 Data	a Used: 707 (0x2C3) Free: 1,341 (0x53D) 32,768 (0x8000) bytes	llenner	Configuration Bits Call Graph Output, Project Loading Warning, X	

D.4 PROGRAMMING THE PIC[®] MICROCONTROLLER

- 1. To program the PIC microcontroller, connect the programmer to J14 on the EVB-LAN8770M_MC, with pin 1 of J14 lining up with pin 1 of the programmer.
 - **Note:** The programmer may have additional lines that are not connected to the J14 pins of the board, which are acceptable.
- Go to <u>Production>Set Project Configuration>Customize</u>. The following window (Figure D-4) appears. Choose the Hardware Tool (PICKit3, PICKit4, and so on) and XC8 compiler. Click **Apply** and then click **OK**.



FIGURE D-4: PROJECT CONFIGURATION SCREEN

3. Click the green play button in the toolbar to program the PIC microcontroller (Figure D-5).

FIGURE D-5: PROGRAMMING BUTTON IN TOOLBAR

UNG8187_TX_T1_Version_1_USB : PicKit4_Power_OFF Source Refactor Production Debug Team Tools Wind Wind X IDE v5.15 - UNG8187_TX_T1_Version_1_USB : PicKit4_Power_C Eile Edit View Navigate Source Refactor Production Debug Team I	DW Help FF	Q Sea
ices	Image: Provide the state of the st	()) ()
es proven	Source Hstary Image: Source Image: Source <td< th=""><th></th></td<>	

This programs the PIC microcontroller. The bottom-right window will display the following messages as in Figure D-6 when the PIC programming is successful.

FIGURE D-6: PROGRAMMING CONFIRMATION



4. On the EVB-LAN8770M_MC, press the **Reset** button. This resets the PIC microcontroller, which then initializes the EVB-LAN8770M_MC registers.

NOTES:



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