LAN9646 EDS2 Daughter Card User's Guide

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Table of Contents

Preface

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INTRODUCTION

This chapter contains general information that will be useful to know before using the LAN9646 EDS2 Daughter Card User's Guide. Items discussed in this chapter include:

DOCUMENT LAYOUT

This document features the LAN9646 EDS2 Daughter Card. The manual layout is as follows:

- **Chapter 1. "Overview"** – This chapter provides an overview of the LAN9646 EDS2 Daughter Card and a brief description of the card's features.
- **Chapter 2. "Getting Started"** – This chapter provides information on the setup and operation of the LAN9646 EDS2 Daughter Card.
- **Chapter 3. "Hardware"** – This chapter shows the different connection types found on the LAN9646 EDS2 Daughter Card.
- **Chapter 4. "System Boot"** – This chapter explains how to use device tree overlays when booting the host system.
- **Appendix A. "Schematics"** – This section shows the schematic drawings of the LAN9646 EDS2 Daughter Card.
- **Appendix B. "Bill of Materials"** – This section shows the Bill of Materials (BOM) for the LAN9646 EDS2 Daughter Card.
- **Appendix C. "PCB Layers"** – This section shows the PCB layers of the LAN9646 EDS2 Daughter Card.

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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DOCUMENT REVISION HISTORY

Revisions	Section/Figure/Entry	Correction
DS50003758A (09-27-24)	Initial release	

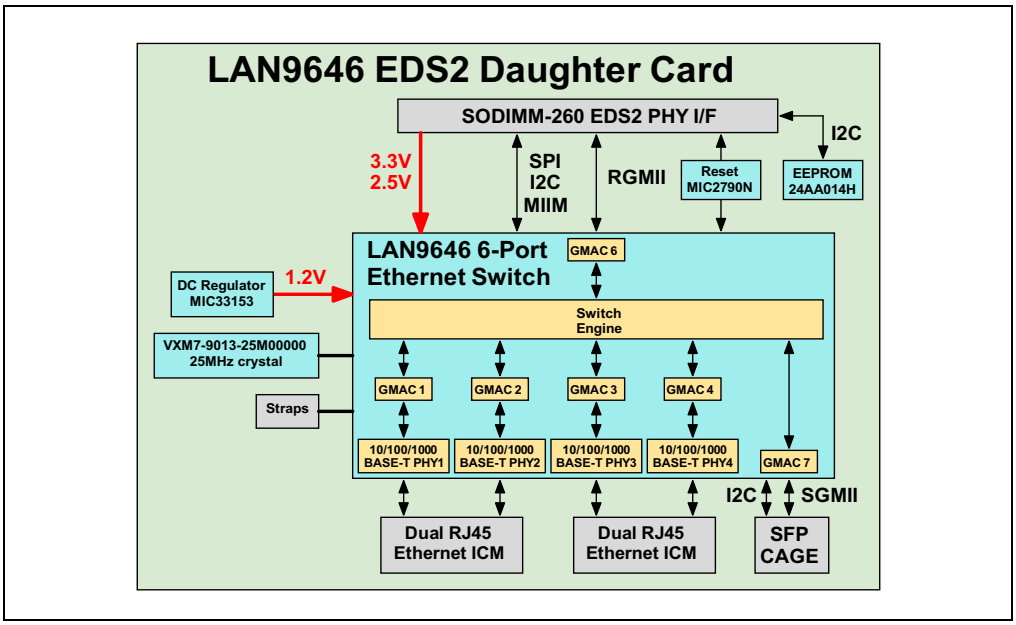
Chapter 1. Overview

1.1 INTRODUCTION

The LAN9646 EDS2 Daughter Card is designed for evaluation of the Microchip LAN9646 Gigabit Ethernet RGMII Switch when used with a Microchip EDS2 compatible host board. A SODIMM 260-pin connector for the EDS2 Host - LAN9646 EDS2 Daughter Card Interface is used due to its high performance, high pin count, and low cost.

This document describes the LAN9646 EDS2 Daughter Card setup and user interface features. A simplified block diagram is shown in Figure 1-1.

FIGURE 1-1: EVB-LAN9646 EDS2 DAUGHTER CARD BLOCK DIAGRAM



1.2 FEATURES

Below are the features of the LAN9646 EDS2 Daughter Card:

- Microchip LAN9646 Gigabit Ethernet Switch with SGMII and RGMII/MII/RMII
- Microchip VXM7-9013-25M0000 crystal for 25 MHz
- Microchip MIC33153 4 MHz Internal Inductor PWM regulator for 1.2V generation
- Microchip MIC2790N Reset supervisor with Reset LED indicator
- Microchip 24AA014H I^2C Serial EEPROM for board identification
- 2 Dual 10/100/1000 Mb RJ45 Integrated Connector and Magnetics with LEDs
- 1 SFP connector with SFP cage for SGMII port
- SPI Management interface
- Compliant with the SODIMM EDS2 Interface Specification
- Dual SPST switch for Reset and In-Band Access (IBA)
- 1x5 header to select between 3.3V and 2.5V VDDAH transceiver voltage
- Green LED indicator for 1.2V
- Test points for power rails and GND
- GPIOs can be used for IEEE1588 (Precision Time Protocol) timestamp capture and to clear event interrupts.

1.3 REFERENCES

Concepts and materials available in the following documents may be helpful when reading this document. Visit the EVB-LAN9646 EDS2 Daughter Card product page at www.microchip.com for the latest documentation.

- *LAN9646 Data Sheet*
- *LAN9646 EDS2 Daughter Card Schematics*
- *LAN9646 Hardware Design Checklist*
- *SAM9X75 Curiosity Rev 5 Schematics*
- *SAM9X75 Curiosity Rev 5 User's Guide*
- *EDS2 SODIMM IF Development Guide*

1.4 ACRONYMS AND DEFINITIONS

Table 1-1 shows the terms used in this user's guide.

TABLE 1-1: ACRONYMS AND DEFINITIONS

Term	Definition
ARP	Address Resolution Protocol
COM	Communications Port
DHCP	Dynamic Host Configuration Protocol
DIP	Dual In-line Package
DSUB	D - Subminiature
EP	Extended Page
GPIO	General Purpose Input/Output
ICM	Integrated Connector Magnetic
IEEE	Institute of Electrical and Electronics Engineers
I/O	Input/Output
IP	Internet Protocol
LAN	Local Area Network

TABLE 1-1: ACRONYMS AND DEFINITIONS (CONTINUED)

Term	Definition
LSB	Least Significant Byte/Bit
MAC	Media Access Controller
MDIO	Management/Data Input/Output
MII	Media Independent Interface
NIC	Network Interface Card
OUI	Organizationally Unique Identifier
PC	Personal Computer
PCB	Printed Circuit Board
PCS	Physical Coding Sublayer
PDU	Payload Data Unit
PHY	Physical Layer Transceiver
PN	Part Number
QSGMII	Quad Serial Gigabit Media Independent Interface
Q-USGMII	Quad Universal Serial Gigabit Media Independent Interface
SMA	Sub-Miniature version A
SODIMM	Small Outline Dual In-line Memory Module
TCXO	Temperature-Compensated Crystal Oscillator
TFTP	Trivial File Transfer Protocol
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
VDFN	Very-small Dual Flat, No Leads
VM	Virtual Machine
VREG	Voltage Regulator
XO	Crystal oscillator

NOTES:

Chapter 2. Getting Started

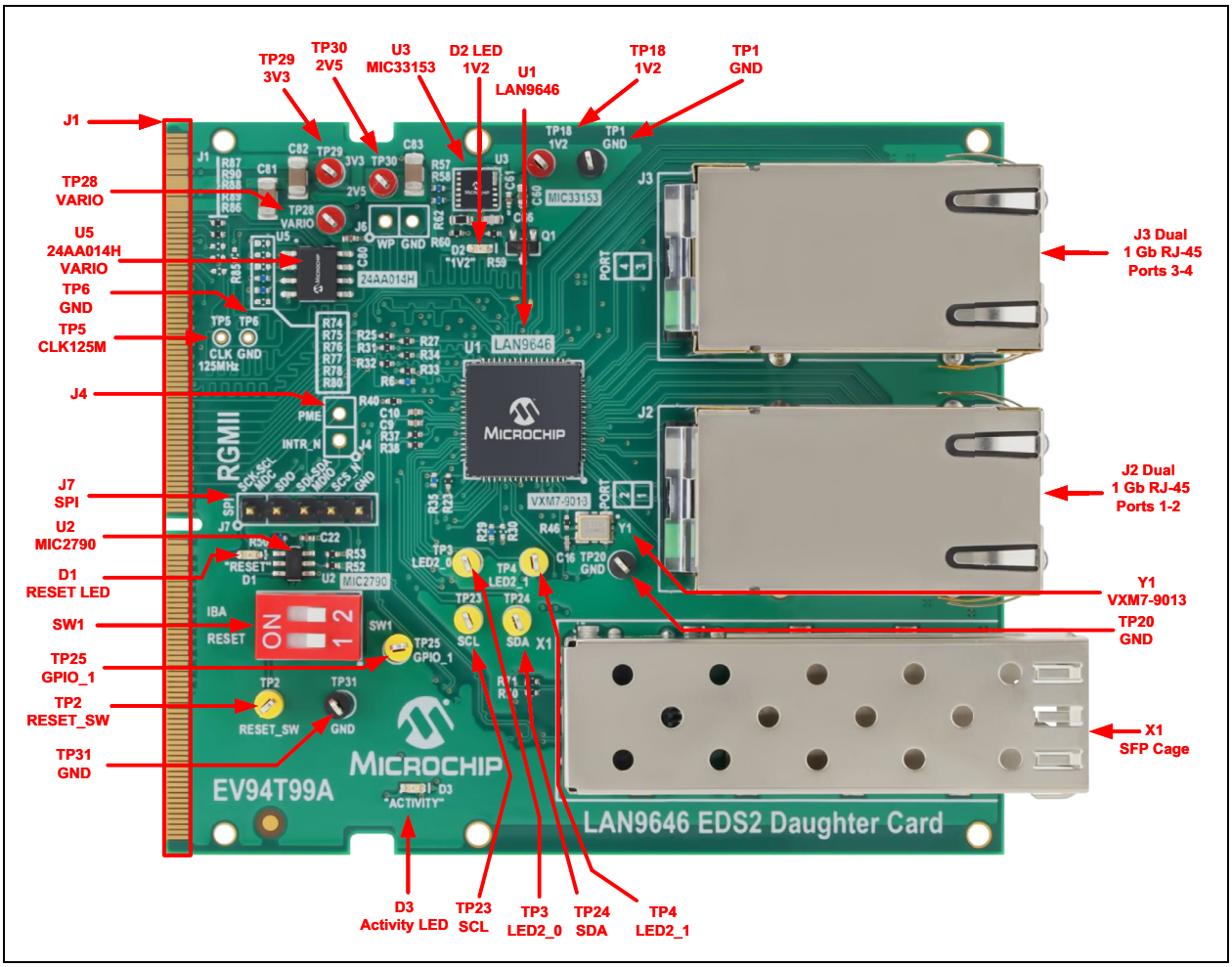
2.1 OVERVIEW

This chapter provides a quick start guide for using the LAN9646 EDS2 Daughter Card. The SAM9x75 Curiosity (Rev 5) serves as the host board. Refer to the SAM9X75 Curiosity User's Guide for the correct jumper configuration.

2.2 LAN9646 EDS2 DAUGHTER CARD INSTALLATION

Figure 2-1 shows the LAN9646 EDS2 Daughter Card key components, connectors, and test points.

FIGURE 2-1: LAN9646 EDS2 DAUGHTER CARD



Perform the following steps to install the LAN9646 EDS2 Daughter Card in the EDS2 connector:

1. Verify that the host board power is OFF.
2. To use the SFP cage, an SFP transceiver module is required. See example in Figure 2-2 and the recommended modules below.

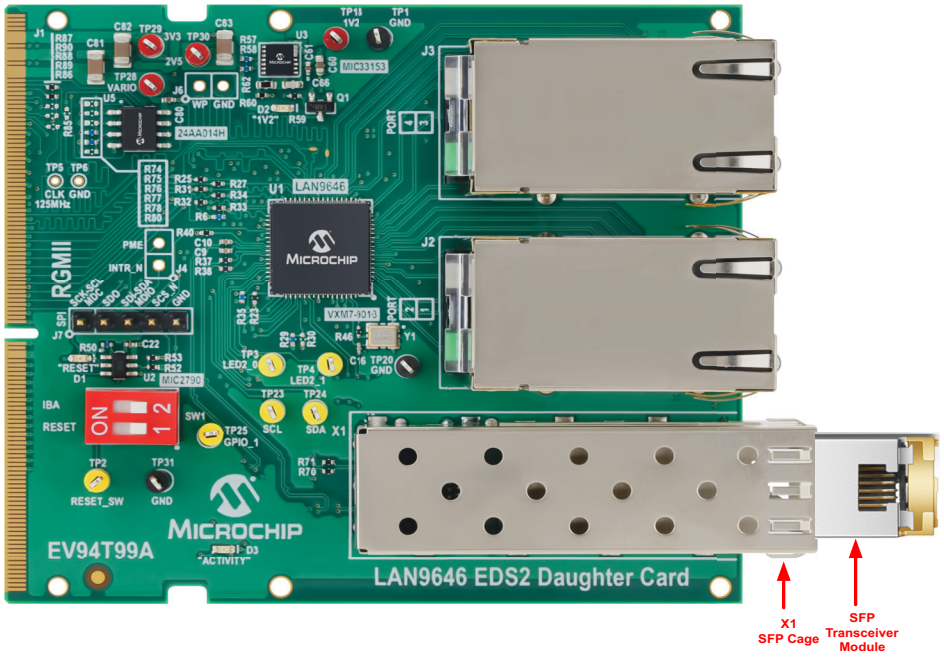
FIGURE 2-2: SFP TRANSCEIVER MODULE

The following SFP modules have been tested by Microchip with the LAN9646 EDS2 Daughter Card:

- FTLF1217P2BTL 100Base FX
- FTLF1318P3BTL 1000Base LX
- AXGT-R1T4-05I1 1000BASE_T
- SFPP-PC01 Twinax DAC Cable

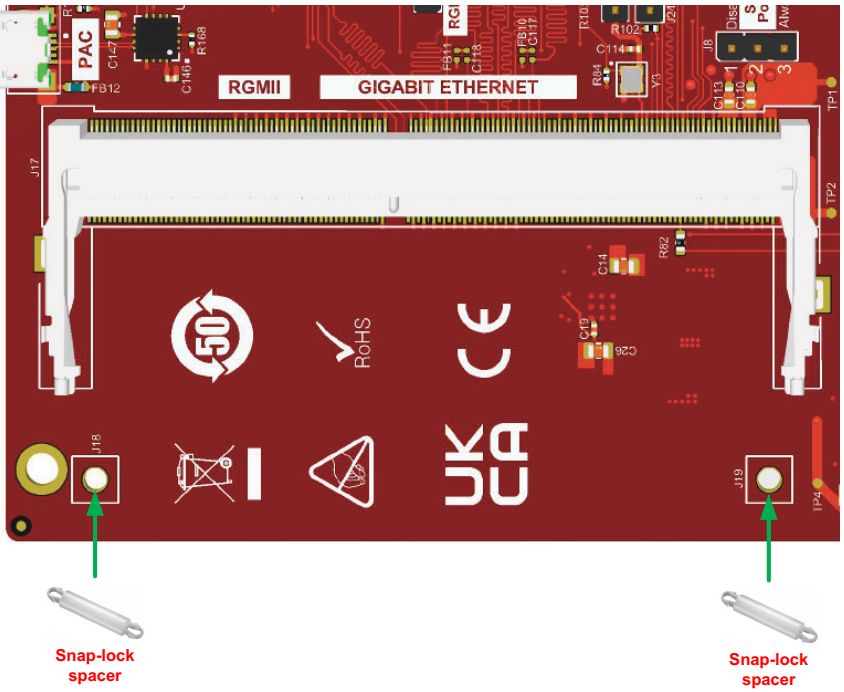
3. Install an SFP transceiver module as shown in Figure 2-3 and verify if it is fully seated in the cage.

FIGURE 2-3: LAN9646 EDS2 DAUGHTER CARD WITH SFP TRANSCEIVER MODULE



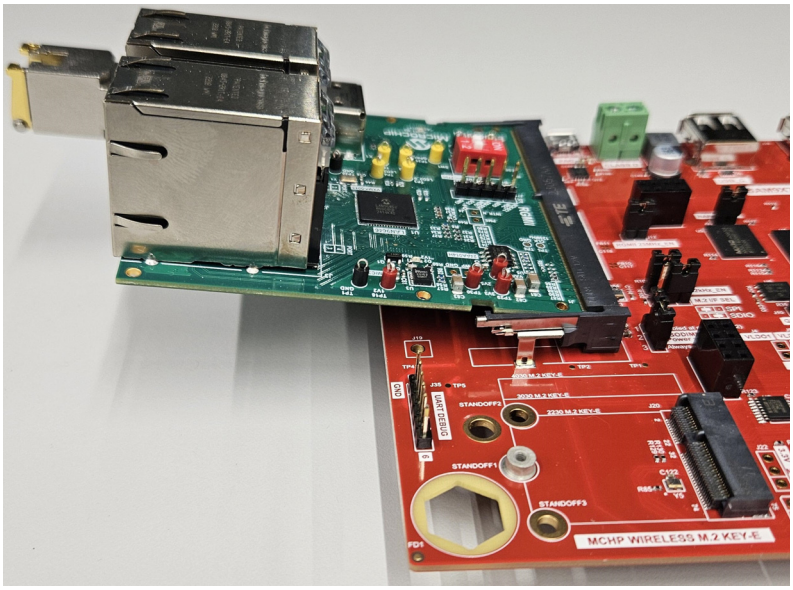
4. Install the two snap lock spacers (Wurth Elektronik part number 709652500) included in the kit on the SAM9X75 Curiosity mounting holes J18 and J19 for mechanical support. See Figure 2-4.

FIGURE 2-4: SNAP LOCK SPACERS



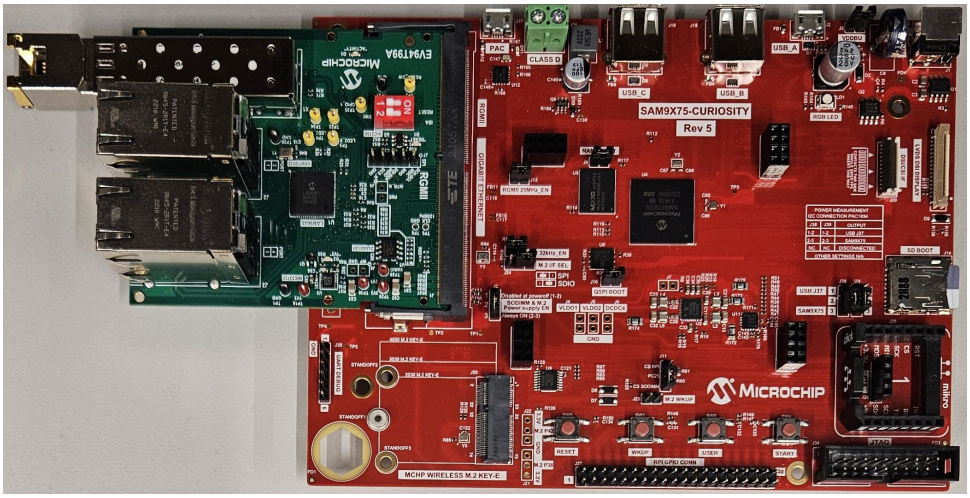
5. Grab the daughter card by its board edges. Align to SODIMM EDS2 receptacle and insert the board fingers' edge at a 45-degree angle into the SODIMM connector as shown in Figure 2-5.

FIGURE 2-5: LAN9646 EDS2 DAUGHTER CARD INSTALLATION



6. Push down the daughter card until it latches into the SODIMM receptacle latches.
7. After installation, the boards should appear as shown in Figure 2-6.

FIGURE 2-6: LAN9646 EDS2 DAUGHTER CARD INSTALLED



8. Connect an Ethernet cable between the Daughter Card's RJ45 port and a link partner device.

CAUTION

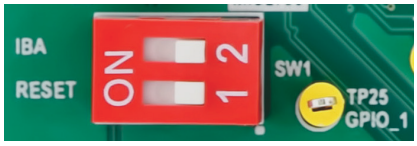
Connecting or disconnecting Ethernet cables after the board is powered is not recommended as the board fingers could be disconnected from the SODIMM receptacle and leave the board in an inconsistent state or even cause damage to the board.

2.3 QUICK START

Conduct the following steps to start using the LAN9646 EDS2 Daughter Card:

1. Verify if the SW1 slide switch is set as shown in Figure 2-7.

FIGURE 2-7: SW1 SLIDE SWITCH



2. Insert a programmed microSD card on SAM9X75 Curiosity microSD card slot J14.
3. Connect a USB to serial cable to SAM9X75 Curiosity J35.
4. A 5V 1A power supply is required with a 2.1 mm ID, 5.5 mm OD DC plug connected to the SAM9X75 Curiosity DC jack J1.
5. Press the WKUP/START buttons (SW1/SW4) on the curiosity board to turn on the system.
6. See **Chapter 4. "System Boot"** for details of the boot process.

2.4 LAN9646 EDS2 DAUGHTER CARD REMOVAL

Complete the following procedure to remove the LAN9646 EDS2 Daughter Card from the SODIMM EDS2 receptacle:

1. Verify that the host board power is OFF.
2. Disconnect the RJ45 cables.
3. If snap locks are used, release them from the daughter card. A pair of long-nose pliers can be used to close the latch pins for easy release.
4. Gently pull the SODIMM receptacle arms away from the daughter card. It should snap upwards.
5. Grab the daughter card by its edges and remove it from the SODIMM EDS2 receptacle.

NOTES:

Chapter 3. Hardware

3.1 INTRODUCTION

This chapter provides a description of the LAN9646 EDS2 Daughter Card hardware, including headers, test points, LEDs, and switches on the board.

The top side and bottom side of the LAN9646 EDS2 Daughter Card are shown in Figure 3-1 and Figure 3-2, respectively.

FIGURE 3-1: LAN9646 EDS2 DAUGHTER CARD (TOP SIDE)

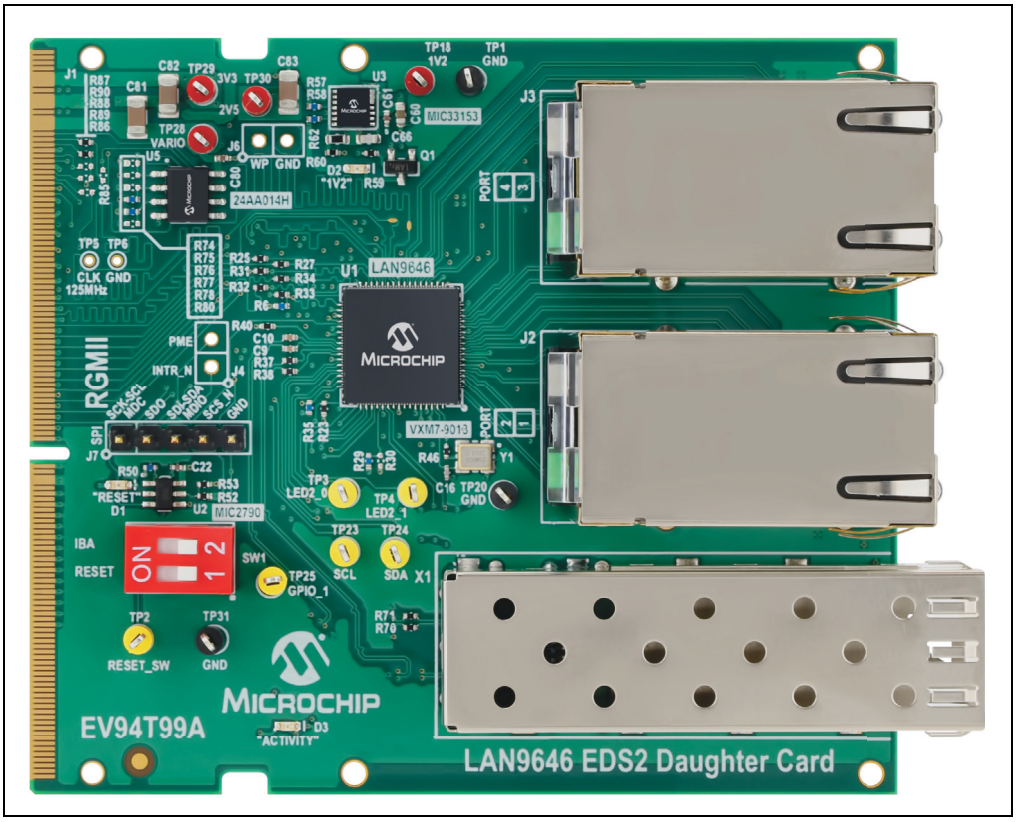
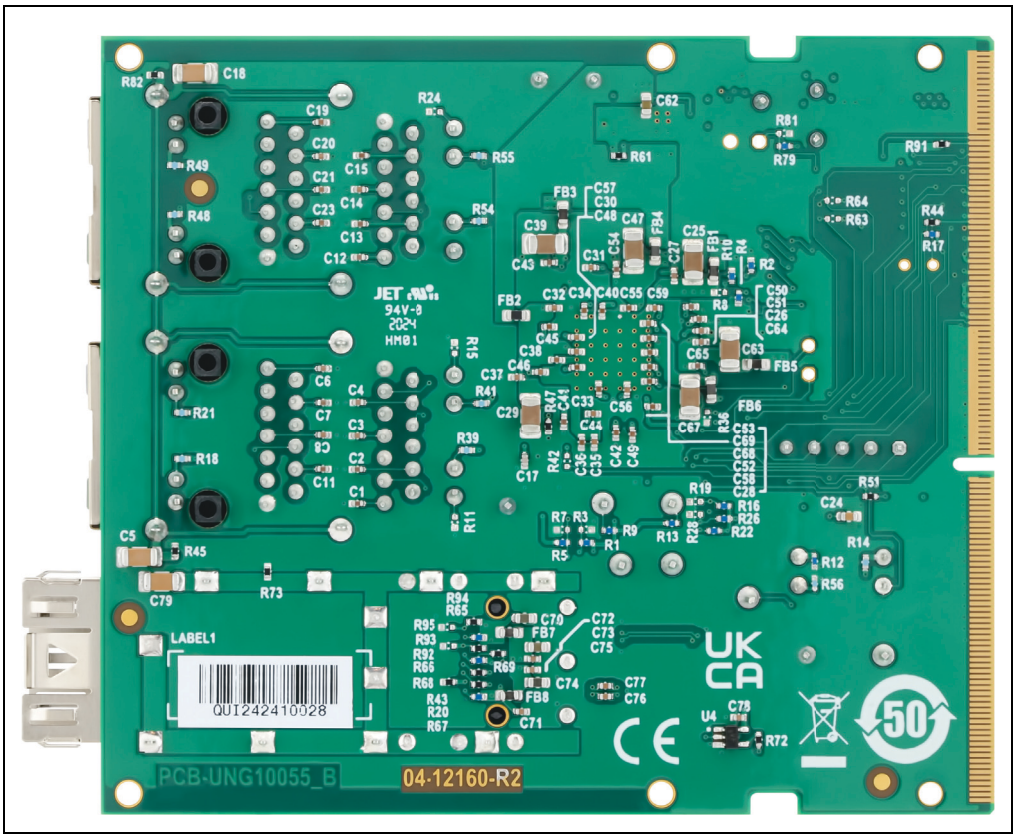


FIGURE 3-2: LAN9646 EDS2 DAUGHTER CARD (BOTTOM SIDE)



3.2 CONNECTORS

Table 3-1 describes the connectors on the LAN9646 EDS2 Daughter Card.

TABLE 3-1: LAN9646 EDS2 DAUGHTER CARD CONNECTORS

Reference Designator	Name	Description
J1	SODIMM-260 pin Edge Connector	Provides power and signals for operation. Connects to Microchip EDS2 compatible host.
J2	RJ45 ICM 1x2	Ethernet RJ45 connector with integrated magnetics for two 1 Gb ports
J3	RJ45 ICM 1x2	Ethernet RJ45 connector with integrated magnetics for two 1 Gb ports
J4	PME Header 1x2	Power Management Event footprint (header not installed). Used to configure an active-low or active-high setting.
J5	SFP Cage	SFP Cage connecting to an SGMII host interface. The **TX_Fault**, **Presence**, **Rate_Sel0**, and **Rate_Sel1** pins are unused.

TABLE 3-1: LAN9646 EDS2 DAUGHTER CARD CONNECTORS

Reference Designator	Name	Description
J6	WP Header 1x2	EEPROM Write Protect footprint (header not installed). Used to disable write protection during factory programming.
J7	SPI Header 1x5	SPI header that can be used for external “fly-wire” evaluation setups.

3.3 TEST POINTS

Table 3-2 lists the test points on the LAN9646 EDS2 Daughter Card.

TABLE 3-2: LAN9646 EDS2 DAUGHTER CARD TEST POINTS

Test Point	Color	Description
TP1	Black	GND
TP2	Yellow	RESET_SW
TP3	Yellow	LED2_0
TP4	Yellow	LED2_1
TP5	—	CLK125MHz
TP6	—	GND
TP18	Red	1V2
TP20	Black	GND
TP23	Yellow	SCL
TP24	Yellow	SDA
TP25	Yellow	GPIO_1
TP28	Red	VARIO
TP29	Red	3V3
TP30	Red	2V5
TP31	Black	GND

3.4 LEDS

Table 3-3 details the LEDS on the LAN9646 EDS2 Daughter Card.

TABLE 3-3: LAN9646 EDS2 DAUGHTER CARD LEDS

Reference Designator	Name	Description
D1	RESET	Red LED RESET indicator
D2	1V2	Green LED 1V2 indicator
D3	ACTIVITY	Green LED Signal Present indicator
J2A - Left	RJ45 Port 1 - Left	Green LED connected to LAN9646 LED1_1
J2A - Right	RJ45 Port 1 - Right	Yellow LED connected to LAN9646 LED1_0
J2B - Left	RJ45 Port 2 - Left	Green LED connected to LAN9646 LED2_1
J2B - Right	RJ45 Port 2 - Right	Yellow LED connected to LAN9646 LED2_0
J3A - Left	RJ45 Port 3 - Left	Green LED connected to LAN9646 LED3_1
J3A - Right	RJ45 Port 3 - Right	Yellow LED connected to LAN9646 LED3_0
J3B - Left	RJ45 Port 4 - Left	Green LED connected to LAN9646 LED4_1
J3B - Right	RJ45 Port 4 - Right	Yellow LED connected to LAN9646 LED4_0

3.5 CONFIGURATION STRAPS

Table 3-4 shows the configuration straps on the LAN9646 EDS2 Daughter Card.

TABLE 3-4: LAN9646 EDS2 DAUGHTER CARD CONFIGURATION STRAPS

Reference Designator PU/PD	Name	Description
R3/R1*	Quite Wire Filtering	0 – Enable 1* – Disable
R7/R5*	Flow Control	0 – Disable 1* – Enable
R11/R9*	Link-up mode	0 – Fast Link-up 1* – Normal Link-up
R15/R13*	Media I/F	0 – 1000BASE-T: Slave Mode 100BASE-TX: MDI-X 1* – 1000BASE-T: Master Mode 100BASE-TX: MDI
R28/R26*	Management I/F Bit 1	Management I/F [1:0] 0 0 – MIIM 0 1 – I2C 1 X – SPI*
R19/R16*	Management I/F Bit 0	

Note 1: Only one of the two PU/PD resistors is installed.

2: * indicates default.

TABLE 3-4: LAN9646 EDS2 DAUGHTER CARD CONFIGURATION STRAPS

Reference Designator PU/PD	Name	Description
R24/R22*	PHY Speed Select	0 – 1000BASE-T 1* – 100BASE-TX
R24/R22*	Auto Negotiation Bit 1	Auto Negotiation [1:0] 0 0 – Reserved 0 1 – Auto Negotiation Disabled 1 0 – Test Mode 1 1 – Auto Negotiation Enabled*
R15/R13*	Auto Negotiation Bit 0	
R30/R29*	SW_EN	0 – Switch disabled at startup 1* – Switch enabled at startup
R10*/R8	Port 6 Speed Select	0* – 1000 Mbps Mode 1 – 100 Mbps Mode
R6*	Port 6 MII/RMII Mode	0* – MII: PHY Mode RMII: Clock Mode. 50 MHz ref clock output is on REFCLKO6 RGMII: No effect. 1 – MII: MAC Mode RMII: Normal Mode. 50 MHz ref clock input is on REFCLKI6 RGMII: No effect.
R2*	Port 6 Mode Bit 1	Port 6 Mode [1:0] 00 – RGMII* 01 – RMII 10 – Reserved 11 – MII
R4*	Port 6 Mode Bit 0	
R36/R35*	Power Management Event	0 – Active high 1* – Active low

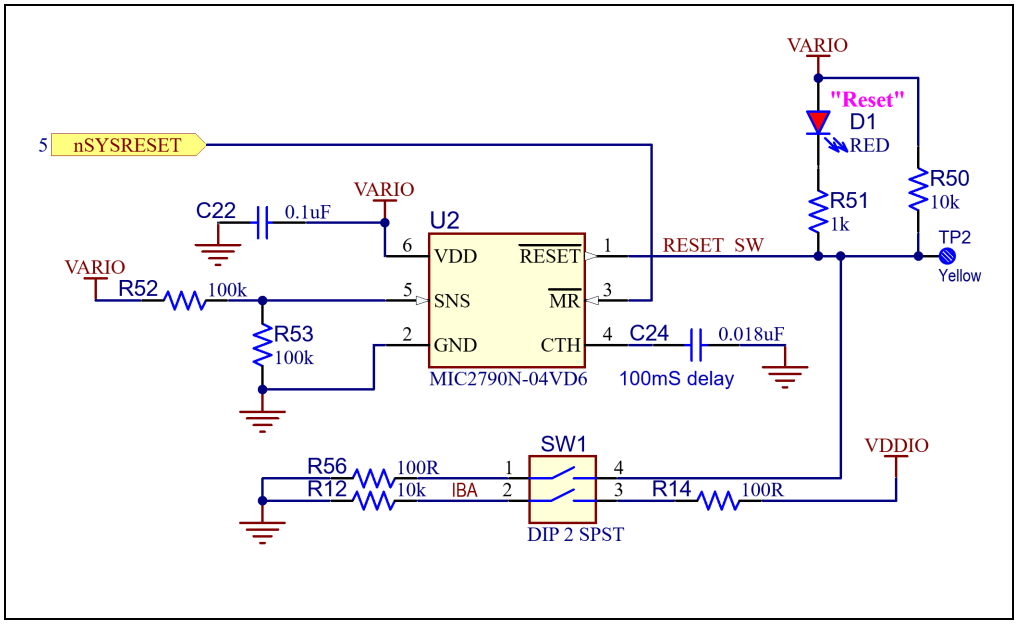
Note 1: Only one of the two PU/PD resistors is installed.

2: * indicates default.

3.6 RESET

The LAN9646 EDS2 Daughter Card includes a Reset circuit using the Microchip MIC2790 Reset supervisor as shown in Figure 3-3. The system Reset signal, **nSYSRESET,** is driven from the SODIMM EDS2 host interface and is connected to the MIC2790 master Reset input MR. When MR goes low, the MIC2790 Reset output on net **RESET_SW** goes low, resetting the LAN9646 and turning on the Reset LED D1. The **RESET_SW** net will go high 100 milliseconds after **nSYSRESET** goes high, turning the Reset LED off and releasing the LAN9646 from Reset. The configuration straps are sampled when **RESET_SW** goes high.

FIGURE 3-3: LAN9646 EDS2 DAUGHTER CARD RESET CIRCUIT



The DIP Switch (SW1), as shown in Figure 3-3, can be used to place the LAN9646 EDS2 Daughter Card in Reset without affecting the rest of the system. This Reset functionality is controlled via pole 1. This feature is useful when testing and updating the LAN9646 Linux® driver after the system has booted up. Pole 2 on the DIP switch can be used to enable In-Band Access (IBA). The IBA protocol uses Ethernet data frames to remotely manage the switch registers.

3.7 CLOCKS

The LAN9646 EDS2 Daughter Card uses a Microchip VXM7-9013-25M0000 25 MHz crystal for the LAN9646 clock reference.

The LAN9646 generates a 125 MHz clock for Synchronous Ethernet (SyncE) applications.

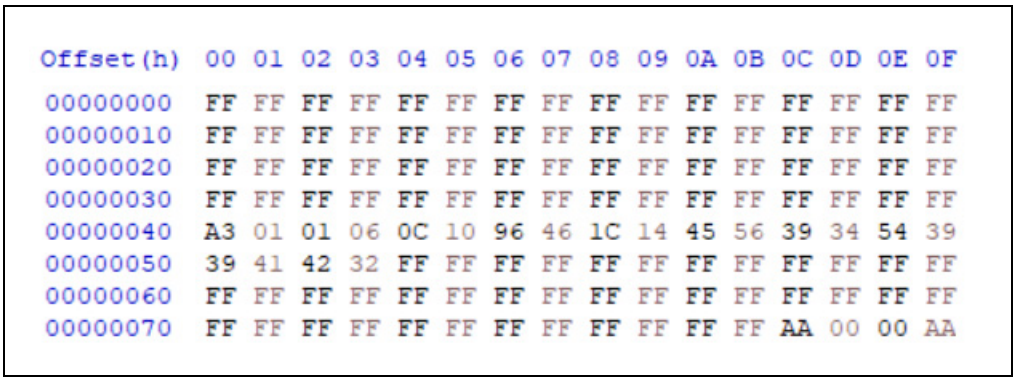
3.8 POWER

The LAN9646 EDS2 Daughter Card requires 3.3V, 2.5V, and 1.2V. The EDS2 SODIMM EDS2 interface provides 3.3V, 2.5V, and VARIO (3.3V or 2.5V). An on-board Microchip MIC33153 switching regulator is used to generate the 1.2V required by the LAN9646 analog, digital core, and PLL power inputs.

3.9 LAN9646 EDS2 DAUGHTER CARD EEPROM

The LAN9646 EDS2 Daughter Card includes a Microchip 24AA014H EEPROM with half-array write protection (40H to 7Fh) for identification. Only some locations in the protected area starting at 40h are programmed as shown in Figure 3-4. Details on these fields are specified in Table 3-5.

FIGURE 3-4: EEPROM CONTENTS



Offset(h)	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
00000000	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
00000010	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
00000020	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
00000030	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
00000040	A3	01	01	06	0C	10	96	46	1C	14	45	56	39	34	54	39
00000050	39	41	42	32	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
00000060	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
00000070	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	AA	00	00	AA

TABLE 3-5: EDS2 DAUGHTER CARD EEPROM

Byte Address	Name	Type	Description	Value
40	KEY	INT	Magic number = A3h	A3h
41	REV	INT	EEPROM Revision	01h
42	DCTYPE	INT	Daughter Card type: 0 = PHY, 1 = SWITCH	01h
43	NPORTS	INT	Number of ports including the host port	06h
44	MACIF	INT	MAC Interface: RMII 07h RGMII 09h RGMII_ID 0Ah RGMII_RXID 0Bh RGMII_TXID 0Ch SGMII 04h QSGMII 13h	0Ch
45	DPN_PNUM	INT	Device Part number:[23:20] Product Family 0 - KSZ 1 - LAN 2 - VSC	[23:20]=1h=LAN
			Device Part number:[19:16] Part Number	[19:16]=0h=PN0
46			Device Part number bits [15:8]	[15:08]=96h=PN1
47			Device Part number bits [7:0]	[7:0]=46h=PN2

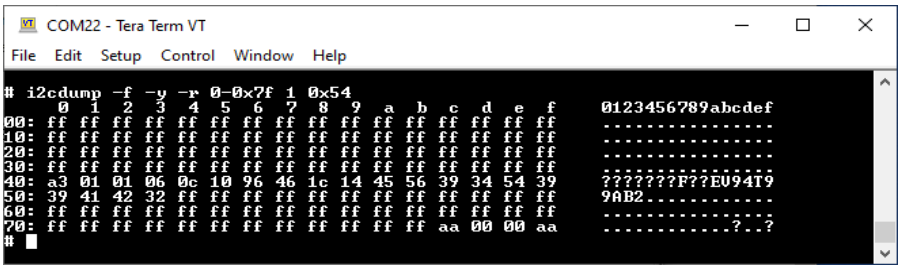
TABLE 3-5: EDS2 DAUGHTER CARD EEPROM (CONTINUED)

Byte Address	Name	Type	Description	Value
48	CTRLIF	INT	Control interface:[7:5] Reserved	[7:5]=000b
4A			Control interface:[4:3] SPI Mode	[4:3]=11b
4B			Control interface:[2] SPI Control available	[2]=1b
4C			Control interface:[1] I^2C Control available	[1]=0b
4D			Control interface:[0] MIIM Control available	[0]=0b
4E	SPIR	INT	SPI rate	14h
4F	DEVT	ASCII	Dev Tools Part number	45h = 'E'
50				56h = 'V'
51				39h = '9'
52				34h = '4'
53				54h = 'T'
7C				39h = '9'
7D				39h = '9'
7E				41h = 'A'
7F	BREVU	ASCII	UNG Board Revision Letter	42h = 'B'

The EEPROM's contents can be read within Linux via the following command:

```
# i2cdump -f -y -r 0-0x7F 1 0x54
```

FIGURE 3-5: EEPROM DUMP

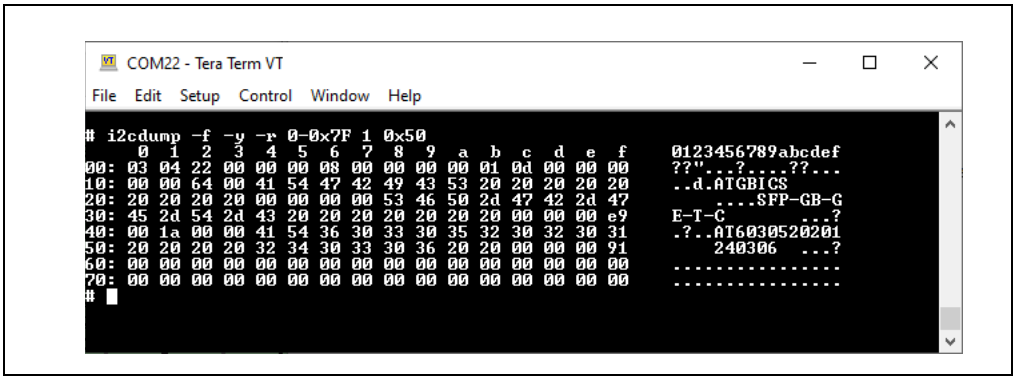


3.10 SFP MODULE EEPROM

The SFP Module includes an EEPROM and can be accessed with the command:

```
# i2cdump -f -y -r 0-0x7F 1 0x50.
```

FIGURE 3-6: SFP MODULE EEPROM DUMP



NOTES:

Chapter 4. System Boot

4.1 OVERVIEW

This chapter describes the boot process using the SAM9X75 Curiosity EDS2 host using Linux software running on the SAM9X75. The boot process for other EDS2 host platforms should be similar.

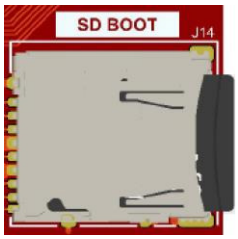
The EDS2 host board should be properly configured with Linux and driver supporting the LAN9646 EDS2 Daughter Card. Refer to the software documentation on the LAN9646 EDS2 Daughter Card product page at https://www.microchip.com/en-us/development-tool/EV94T99A. Download the microSD card image and program into a microSD card using a tool such as balenaEtcher.

4.2 LAN9646 EDS2 SYSTEM POWER-UP

At this point the LAN9646 EDS2 Daughter Card should be installed in the SODIMM EDS2 connector. Perform the following steps to power up the SAM9X75 Curiosity EDS2:

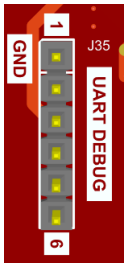
1. Verify the host board's default jumper settings within the SAM9X75 Curiosity EDS2 User's Guide.
2. Insert the microSD card in SAM9X75 Curiosity microSD card slot J14. See Figure 4-1.

FIGURE 4-1: MICROSD CARD



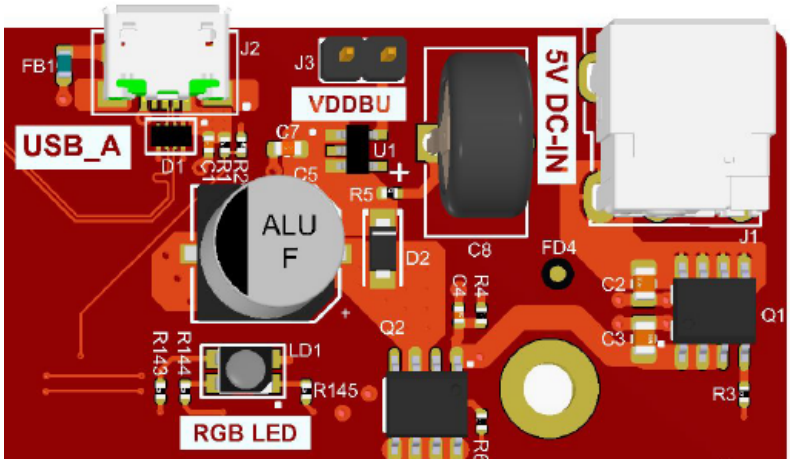
3. Connect the 1x6 female header of an FTDI or compatible TTL-232R-3V3 USB-to-serial cable into the UART debug header J35 on the SAM9X75 Curiosity EDS2. Note that the header black wire must connect to pin 1 of J35. See Figure 4-2.

FIGURE 4-2: SAM9X75 CURIOSITY UART DEBUG HEADER



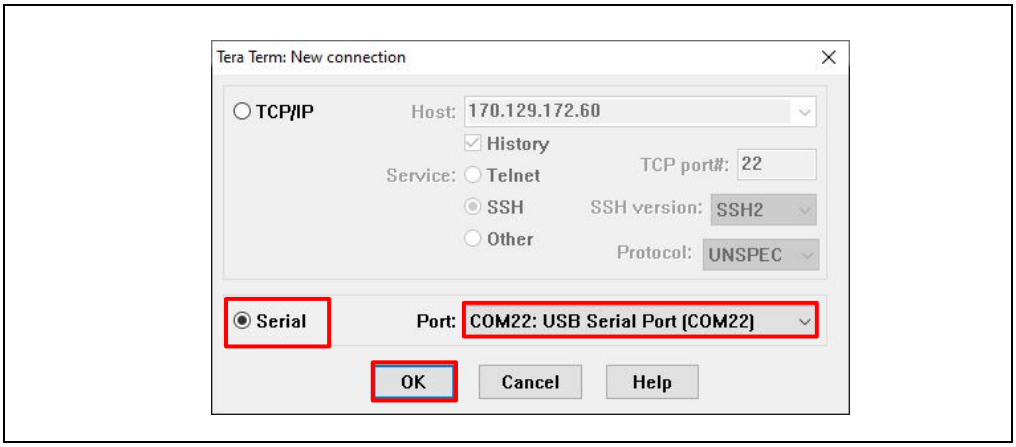
4. Press the WKUP/START buttons (SW1/SW4) on the curiosity board to turn on the system.
5. Connect a 5V 1A (minimum) power supply with a DC plug to DC Jack J1 on the SAMA9X75 Curiosity EDS2 host. The RGB LED LD1 should begin its startup sequence. See Figure 4-3.

FIGURE 4-3: SAM9X75 CURIOSITY DC JACK, MICRO USB, AND RGB LED



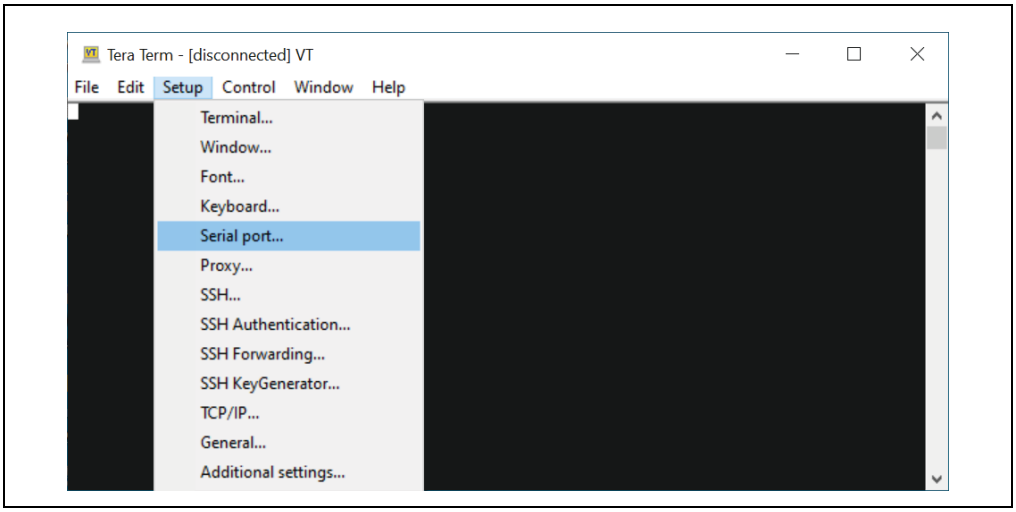
6. Open Tera Term. Tick the **Serial** radial button and look for COMx:USB Serial Port.
7. COM22 is shown in Figure 4-4. Windows may assign a different port number. Click on **OK**.

FIGURE 4-4: TERA TERM SERIAL PORT SELECTION



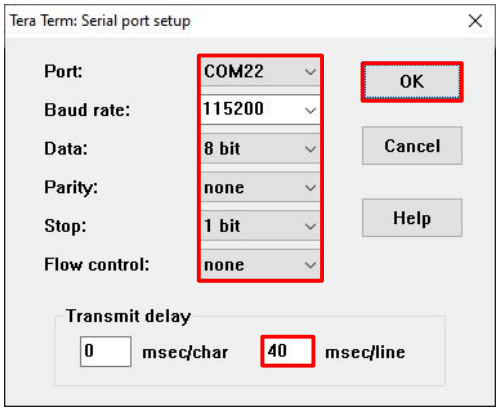
8. Go to the Setup menu and select Serial port. See Figure 4-5.

FIGURE 4-5: TERA TERM SETUP MENU



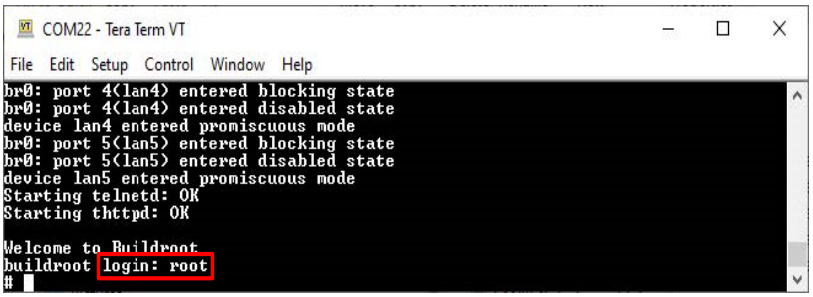
9. Set the selected port to 115200, 8-bit, no parity, 1 stop bit, no flow control, and 40 msec/line. Click on **OK**. See Figure 4-6.

FIGURE 4-6: TERA TERM SERIAL PORT SETUP



10. At the login prompt, enter `root`. See Figure 4-7.

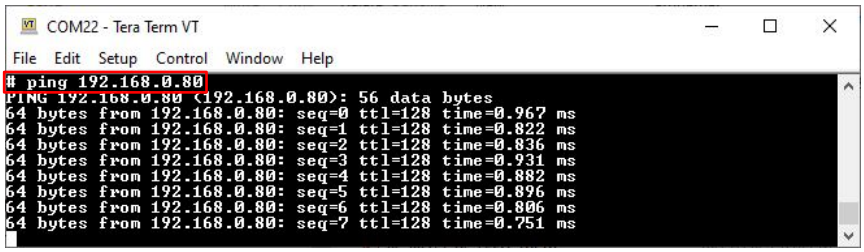
FIGURE 4-7: LINUX® PING



Note: For the succeeding steps, it is assumed that a host PC with an Ethernet port that can be pinged at `192.168.0.80` is available.

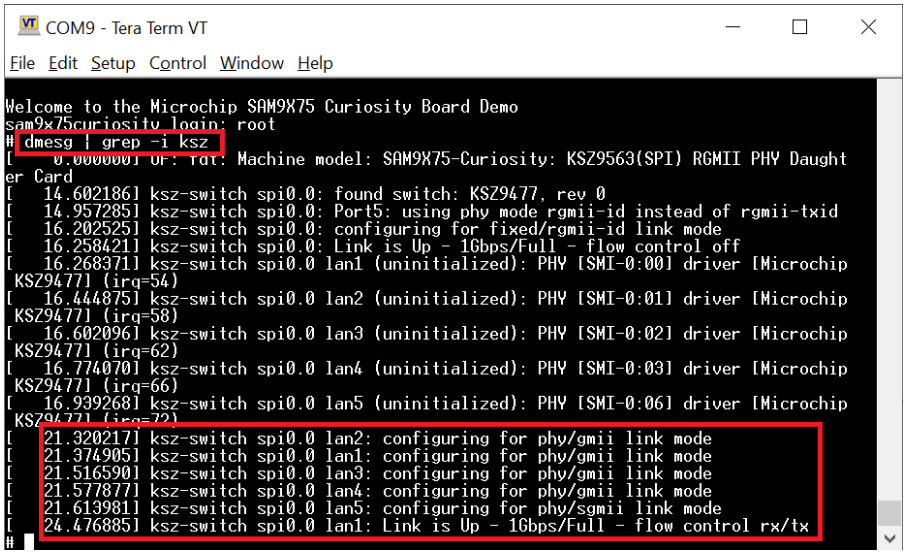
11. Enter the following command to perform a ping test (see Figure 4-8):
    `#ping 192.168.0.80`

FIGURE 4-8: CURIOSITY LAN9646 EDS2 PINGS



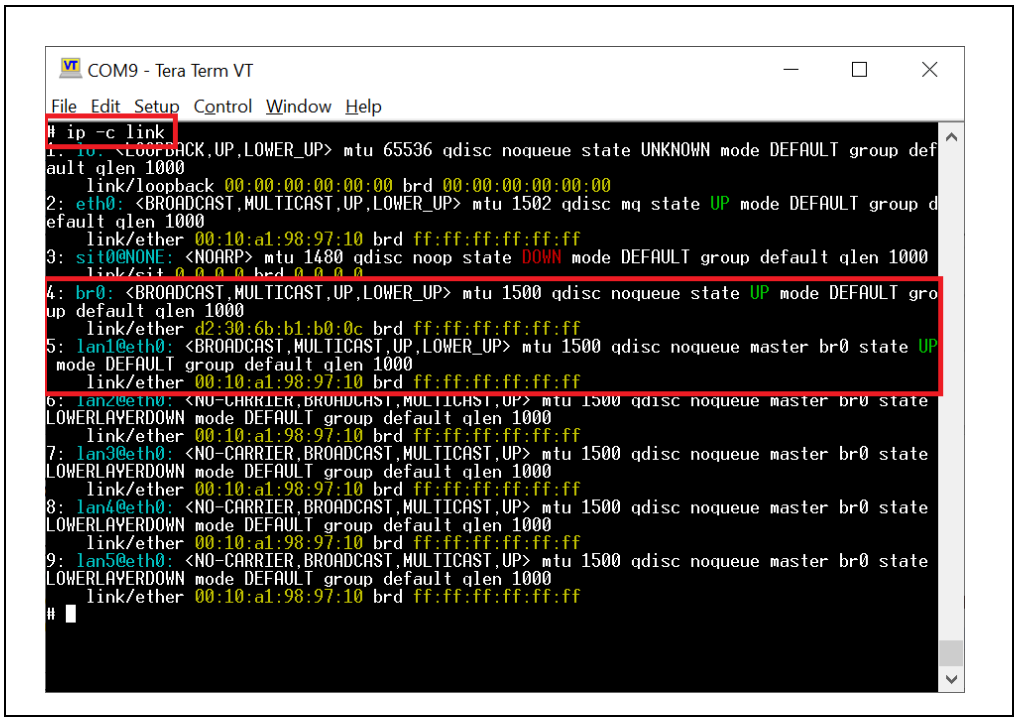
12. Verify that the LAN9646 driver has loaded into the kernel. This switch utilizes DSA drivers from prior existing switch models. It should display KSZ9563 or KSZ9477 depending on how the image was built. Either option is fine. See Figure 4-9.

FIGURE 4-9: # DMESG | GREP -I KSZ



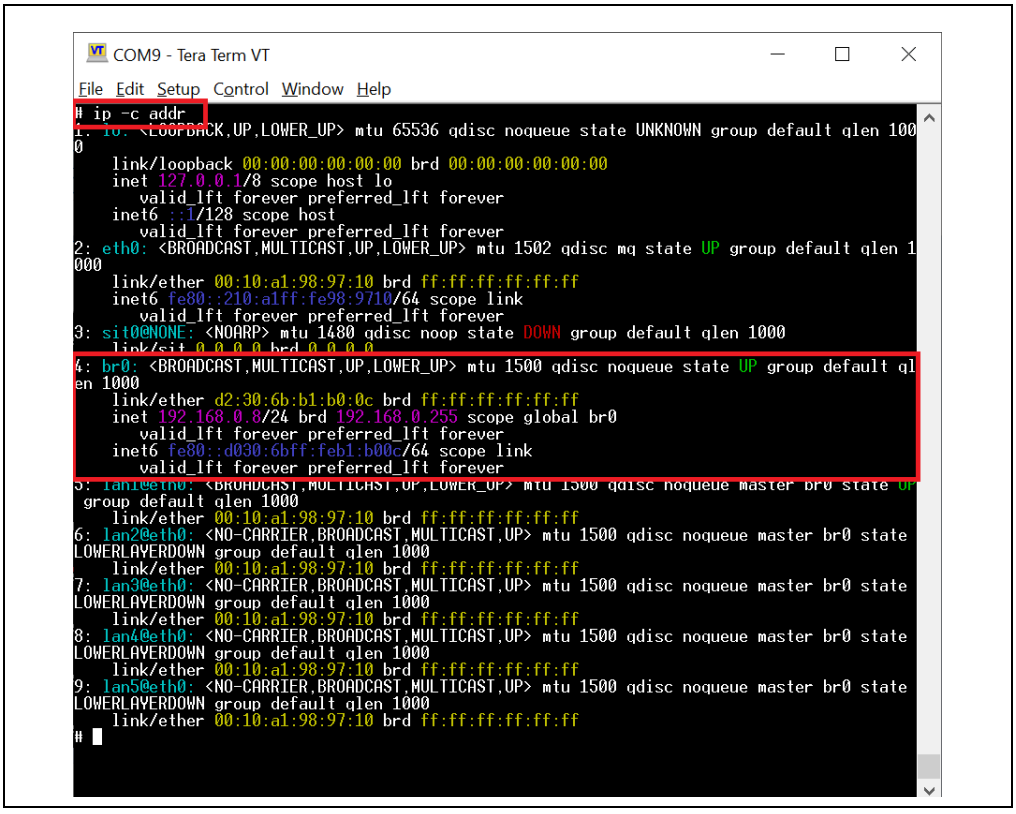
13. Plug an Ethernet cable into one of the RJ45 ports. Check the link status with the ip utility. One of the LAN ports shows an "Up" status indicator. See Figure 4-10.

FIGURE 4-10: # IP -C LINK



14. Verify that your IP configuration is compatible with your network. The example in Figure 4-11 indicates the switch is configured with an IP address of 192.168.0.8 with 24 bits for the network mask which is equivalent to 255.255.255.0. This configuration provides access to other devices on the 192.168.0.x addressed network.

FIGURE 4-11: # IP -C ADDR



NOTES:

Appendix A. Schematics

A.1 INTRODUCTION

This appendix shows the LAN9646 EDS2 Daughter Card schematics.

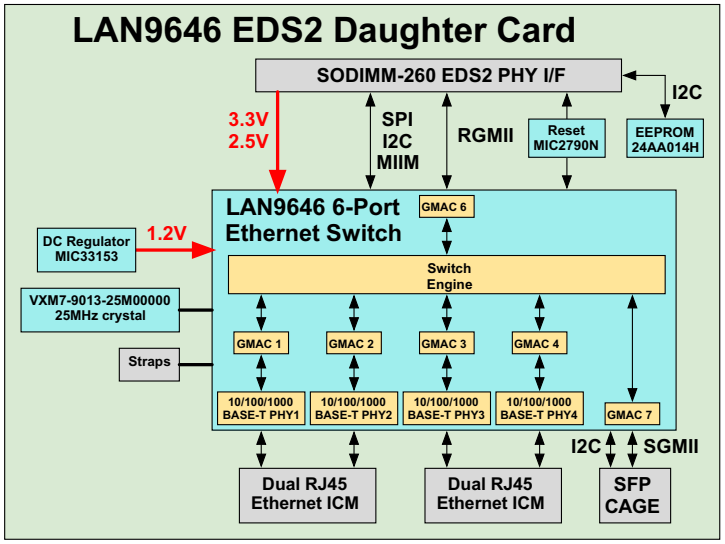
FIGURE A-1: LAN9646 EDS2 DAUGHTER CARD

Table of Contents

Sheet	Description
1	Table of Contents, Revision History, Block Diagram
2	LAN9646, Ethernet Ports
3	LAN9646 Power
4	SFP Cage
5	SODIMM EDS2 Edge Connector

Revision History

Revision	Date	Revision Summary	Author
00B	04/05/2024	Transferred from Rev A0.	Arnaldo Cruz
01B	04/12/2024	Fixed nets S.OUT7_P/N.	Arnaldo Cruz
02B	04/26/2024	Updated as per 4/26 review comments.	Arnaldo Cruz
03B	04/29/2024	Pulldown strap resistors connected to LEDs changed to 330R for valid low levels.	Arnaldo Cruz
B0	05/03/2024	Released for prototypes.	Arnaldo Cruz
R2	08/02/2024	Released for manufacturing.	Arnaldo Cruz



Notes

1	Reference: UNG10055-B
2	All resistors are 1% unless speficied otherwise.

Project Owner: Arnaldo Cruz			MICROCHIP
PCB Layout Contact: Sam Charles			
PartNumber: EV94T99A	Project Title: *LAN9646 EDS2 Daughter Card*	Variant: Standard	
Sheet Title: Table of Contents, Block Diagram, Revision History			Designed with Altium
Size B	SCH #: 02-01094	Rev: 2	Date: 8/15/2024
	PCB #: 04-12160	Rev: 2	Sheet 1 of 5
File: 1_Title_UNG10055_B.SchDoc			Altium.com

FIGURE A-2: LAN9646 EDS2 DAUGHTER CARD ETHERNET SWITCH AND DUAL RJ45 CONNECTORS

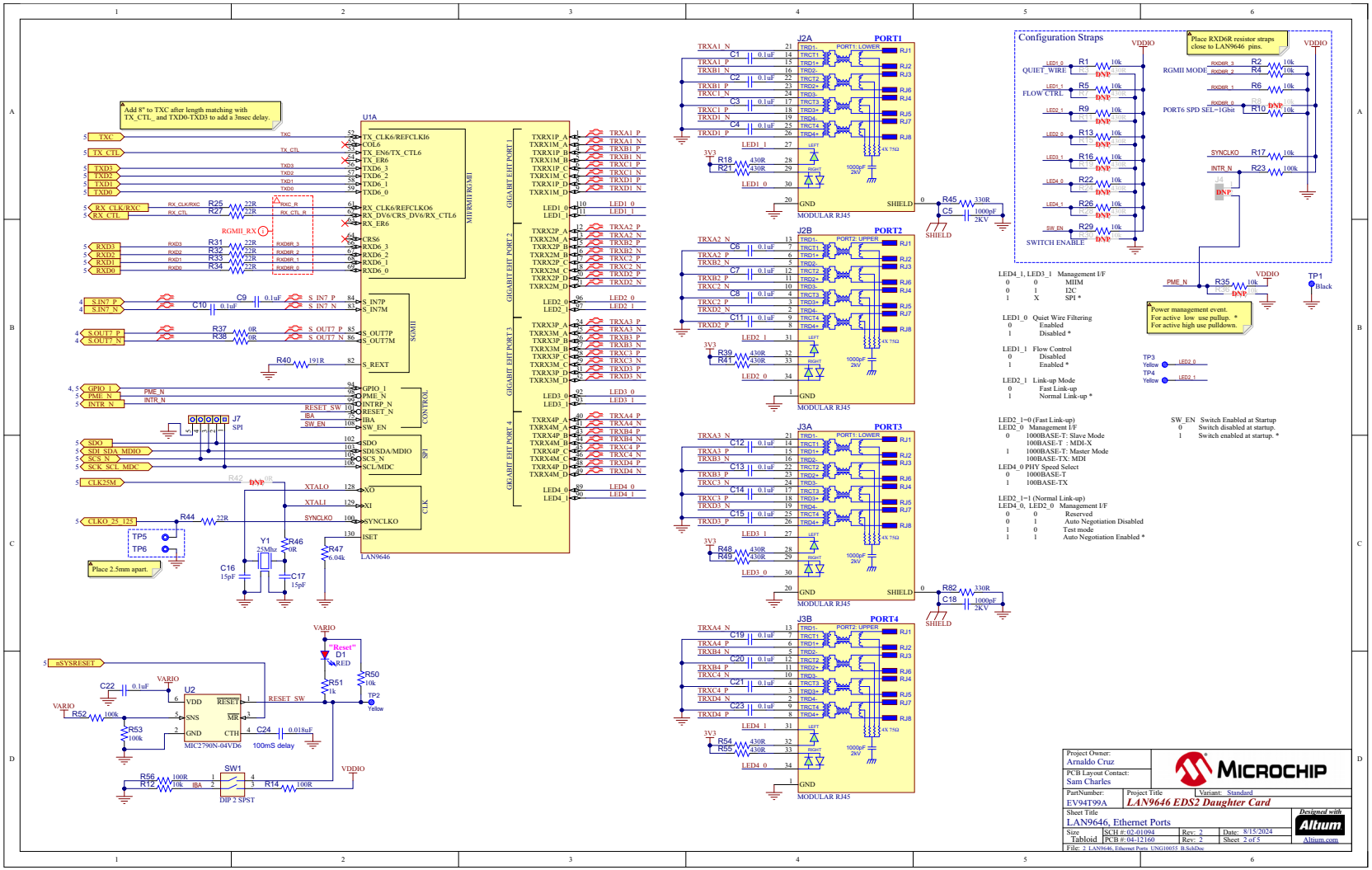


FIGURE A-3: LAN9646 EDS2 DAUGHTER CARD POWER

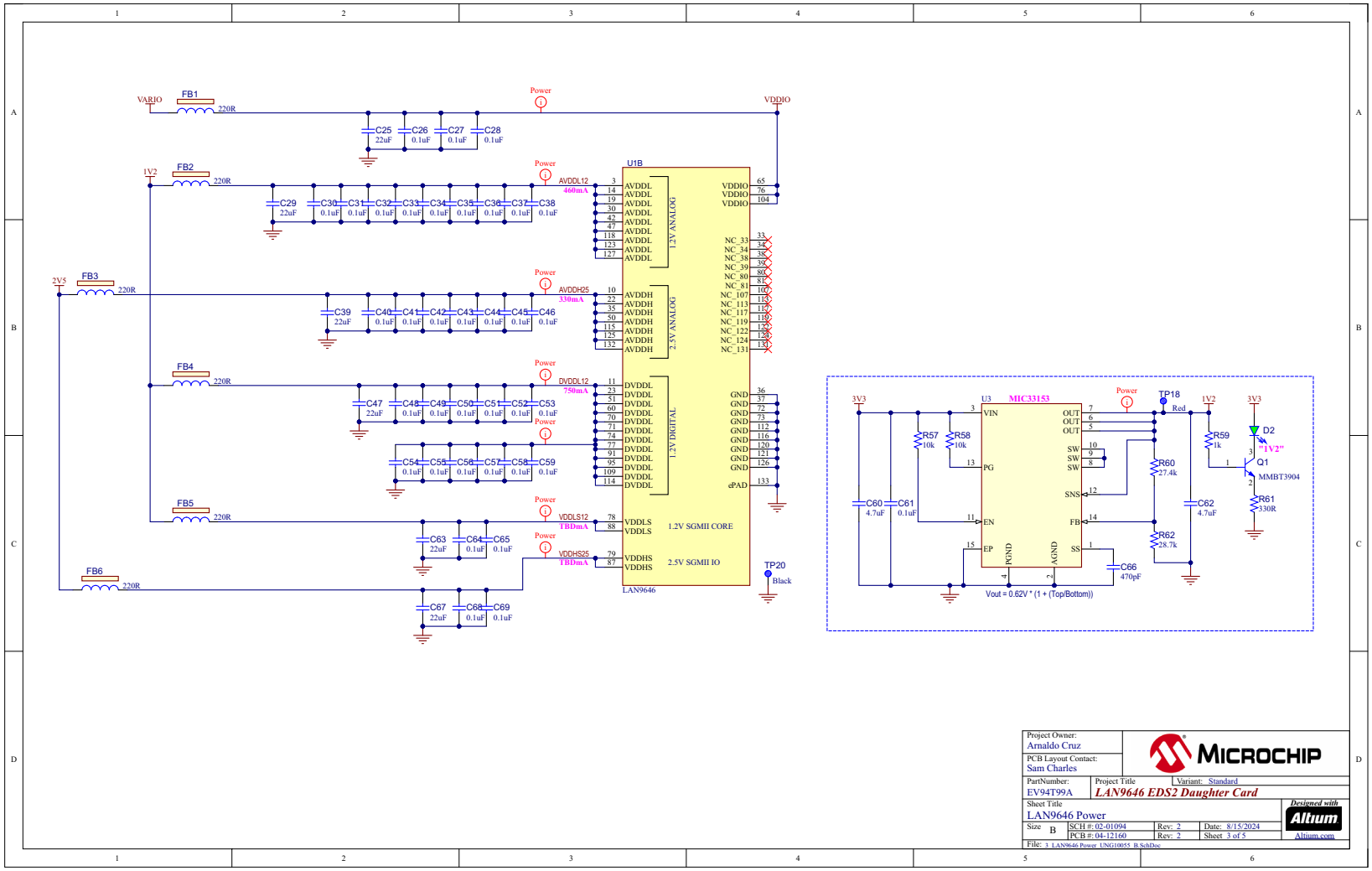


FIGURE A-4: LAN9646 EDS2 DAUGHTER CARD SFP CONNECTOR AND CAGE

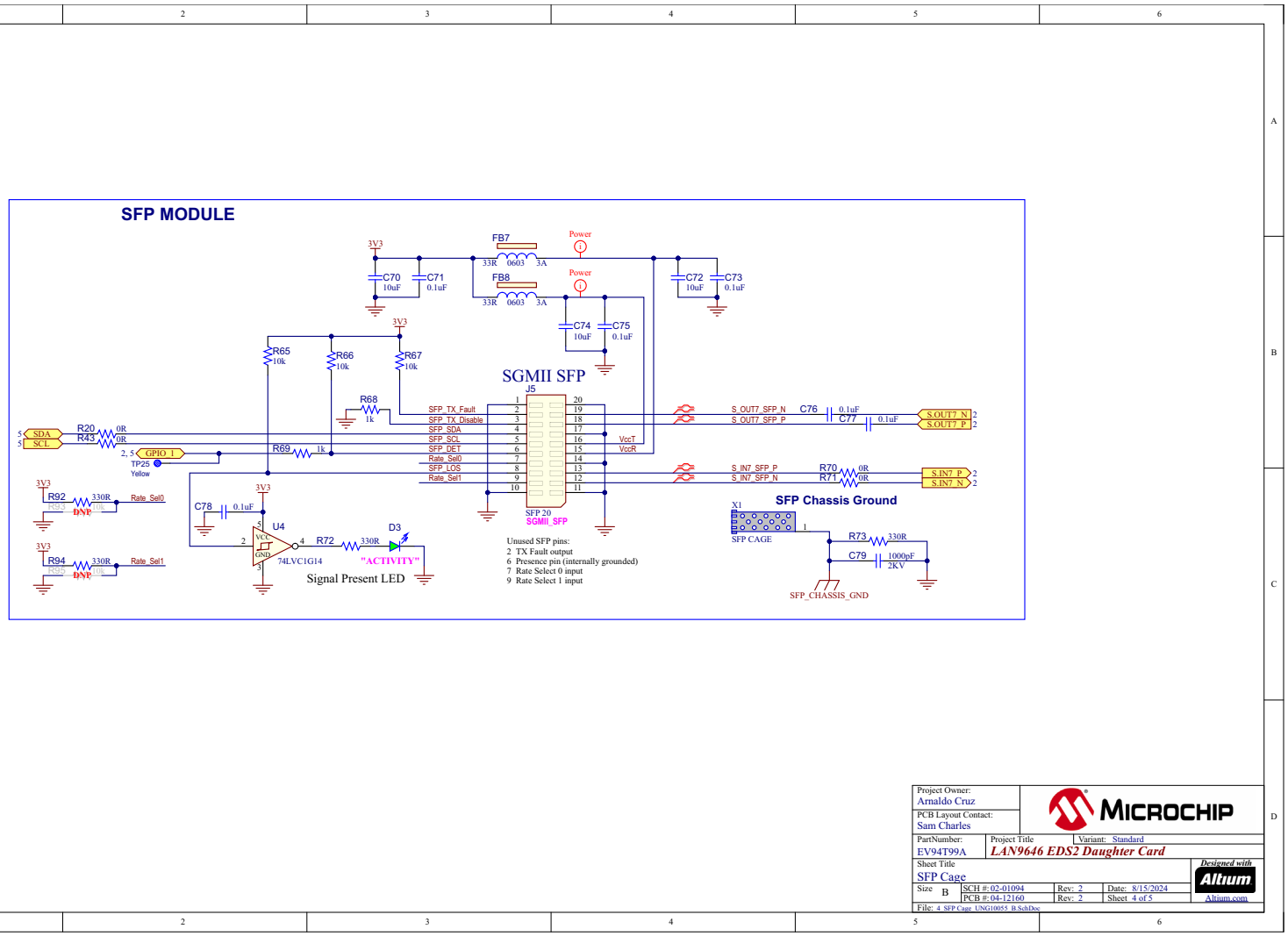
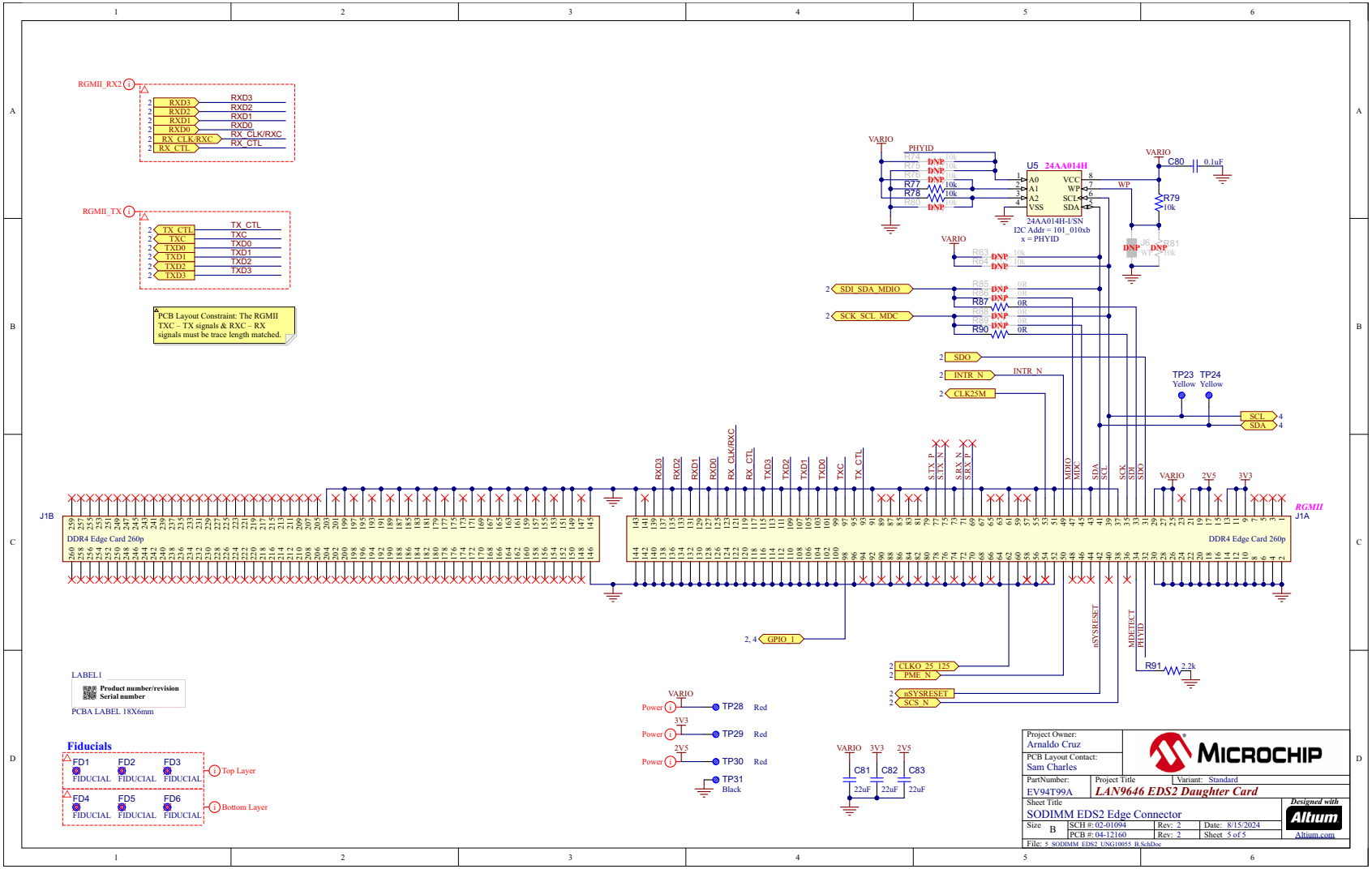


FIGURE A-5: LAN9646 EDS2 DAUGHTER CARD SODIMM EDS2 INTERFACE AND EEPROM



Appendix B. Bill of Materials

B.1 INTRODUCTION

This appendix contains the LAN9646 EDS2 Daughter Card Bill of Materials (BOM).

TABLE B-1: BILL OF MATERIALS (BOM)

Item	Qty	Reference	Description	Populated	Manufacturer	Manufacturer Part Number
1	62	C1, C2, C3, C4, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C19, C20, C21, C22, C23, C26, C27, C28, C30, C31, C32, C33, C34, C35, C36, C37, C38, C40, C41, C42, C43, C44, C45, C46, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C61, C64, C65, C68, C69, C71, C73, C75, C76, C77, C78, C80	CAP CER 0.1uF 35V 10% X7R SMD 0402	Yes	TDK Corporation	CGA2B3X7R1V104K050BB
2	3	C5, C18, C79	CAP CER 1000pF 2KV 10% X7R SMD 1206	Yes	Johanson Dielectrics Inc	202R18W102KV4E
3	2	C16, C17	CAP HiQ 15pF 50V 5% NP0 2.32GHz SMD 0402	Yes	Johanson Technology Inc	500R07S150JV4T
4	1	C24	CAP CER 0.018uF 50V 10% X7R SMD 0603	Yes	KEMET	C0603C183K5RACTU
5	9	C25, C29, C39, C47, C63, C67, C81, C82, C83	CAP CER 22uF 10V 10% X7R SMD 1206	Yes	Samsung Electro-Mechanics, Samsung Electro-Mechanics America, Inc	CL31B226KPHNNNE
6	2	C60, C62	CAP CER 4.7uF 10V 10% X5R SMD 0603	Yes	KEMET	C0603C475K8PACTU
7	1	C66	CAP CER 470pF 25V 5% NP0 SMD 0603	Yes	AVX	06033A471JAT2A
8	3	C70, C72, C74	CAP CER 10uF 6.3V 20% X5R SMD 0603	Yes	AVX	06036D106MAT2A
9	1	D1	DIO RED 2V 20mA 54mcd CLEAR SMD 0603	Yes	Lite-On Inc.	LTST-C191KRKT
10	2	D2, D3	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	Yes	Lite-On Inc	LTST-C191KGKT
11	6	FB1, FB2, FB3, FB4, FB5, FB6	FERRITE 220R @ 100MHz 2A SMD 0603	Yes	Murata Electronics North America	BLM18EG221SN1D
12	2	FB7, FB8	FERRITE 33R@100MHz 3A SMD 0603	Yes	Murata	BLM18PG330SN1D
13	2	J2, J3	CON MODULAR JACK RJ45 10/100/1000 MAGNETICS 2xLEDS SHIELD TH RA	Yes	Bel Fuse Inc	0845-2R1T-E4
14	0	J4, J6	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT	Yes	FCI	77311-118-02LF
15	1	J5	CON JACK SFP FEMALE SMD R/A	Yes	TE Connectivity AMP Connectors	1367073-1
16	1	J7	CON HDR-2.54 Male 1x5 Gold 5.84MH TH VERT	Yes	FCI	68000-105HLF
17	1	Q1	TRANS BJT NPN MMBT3904 40V 200mA 310mW SOT-23-3	Yes	Micro Commercial Components Corporation	MMBT3904-TP
18	24	R1, R2, R4, R5, R6, R9, R10, R12, R13, R16, R17, R22, R26, R29, R35, R50, R57, R58, R65, R66, R67, R77, R78, R79	RES TF 10k 1% 1/10W SMD 0402 AEC-Q200	Yes	Vishay	MCS0402MC1002FE000
19	0	R3, R7, R11, R15, R19, R24, R28	RES TKF 430R 1% 1/10W SMD 0402 AEC-Q200	Yes	KOA Speer	RK73H1ETTP4300F
20	0	R8, R30, R36, R63, R64, R74, R75, R76, R80, R81, R93, R95	RES TF 10k 1% 1/10W SMD 0402 AEC-Q200	Yes	Vishay	MCS0402MC1002FE000
21	2	R14, R56	RES TKF 100R 1% 1/10W SMD 0402 AEC-Q200	Yes	KOA Speer	RK73H1ETTP1000F

TABLE B-1: BILL OF MATERIALS (BOM)

22	8	R18, R21, R39, R41, R48, R49, R54, R55	RES TKF 430R 1% 1/10W SMD 0402 AEC-Q200	Yes	KOA Speer	RK73H1ETTP4300F
23	9	R20, R37, R38, R43, R46, R70, R71, R87, R90	RES TKF 0R SMD 0402 AEC-Q200	Yes	Panasonic	ERJ-2GE0R00X
24	3	R23, R52, R53	RES TKF 100k 1% 1/10W SMD 0402 AEC-Q200	Yes	Panasonic	ERJ-2RKF1003X
25	7	R25, R27, R31, R32, R33, R34, R44	RES TKF 22R 1% 1/20W SMD 0402	Yes	Panasonic Electronic Components	ERJ-2RKF22R0X
26	1	R40	RES TKF 191R 1% 1/16W SMD 0402	Yes	Yageo	RC0402FR-07191RL
27	0	R42, R85, R86, R88, R89	RES TKF 0R SMD 0402 AEC-Q200	Yes	Panasonic	ERJ-2GE0R00X
28	7	R45, R61, R72, R73, R82, R92, R94	RES TKF 330R 1% 1/10W SMD 0402 AEC-Q200	Yes	Panasonic Electronic Components	ERJ-2RKF3300X
29	1	R47	RES TKF 6.04k 1% 1/10W SMD 0402 AEC-Q200	Yes	Panasonic Electronic Components	ERJ-2RKF6041X
30	4	R51, R59, R68, R69	RES TKF 1k 1% 1/10W SMD 0402	Yes	Panasonic	ERJ-2RKF1001X
31	1	R60	RES TKF 27.4k 1% 1/16W SMD 0402	Yes	Yageo	RC0402FR-0727K4L
32	1	R62	RES TKF 28.7k 1% 1/10W SMD 0603	Yes	Panasonic	ERJ-3EKF2872V
33	1	R91	RES TKF 2.2k 1% 1/10W SMD 0402	Yes	Panasonic	ERJ-2RKF2201X
34	1	SW1	SWITCH DIP 2 SPST 24V 25mA 418117270902 TH 2.54mm	Yes	Würth Elektronik	418117270902
35	3	TP1, TP20, TP31	MISC, TEST POINT MULTI PURPOSE MINI BLACK	Yes	Keystone	5001
36	6	TP2, TP3, TP4, TP23, TP24, TP25	MISC, TEST POINT PC MINI, 0.040" D YELLOW	Yes	Keystone	5004
37	4	TP18, TP28, TP29, TP30	MISC, TEST POINT MULTI PURPOSE MINI RED	Yes	Keystone	5000
38	1	U1	MCHP INTERFACE ETHERNET LAN9646 VQFN-132	Yes	Microchip Technology	LAN9646-I/MXX
39	1	U2	MCHP ANALOG SUPERVISOR 0.4V to 5.5V MIC2790N-04VD6 SOT-23-3	Yes	Microchip Technology	MIC2790N-04VD6
40	1	U3	MCHP ANALOG SWITCHER Buck 0.6V to 3.6V MIC33153YHJ-TR VFDFN-14	Yes	Microchip Technology	MIC33153YHJ-TR
41	1	U4	74LVC1G14GW,125 SCHMITT-TRG INVERTER	Yes	Nexperia	74LVC1G14GW,125
42	1	U5	MCHP MEMORY SERIAL EEPROM 1kb I2C 24AA014H-I/SN 8SOIC	Yes	Microchip Technology	24AA014H-I/SN
43	1	X1	MECH HW SFP Cage TIN TH	Yes	Amphenol Commercial Products	U77A11182001
44	1	Y1	MCHP CRYSTAL 25Mhz 10pF SMD L3.2W2.5H0.8	Yes	Microchip Technology	VXM7-9013-25M0000000

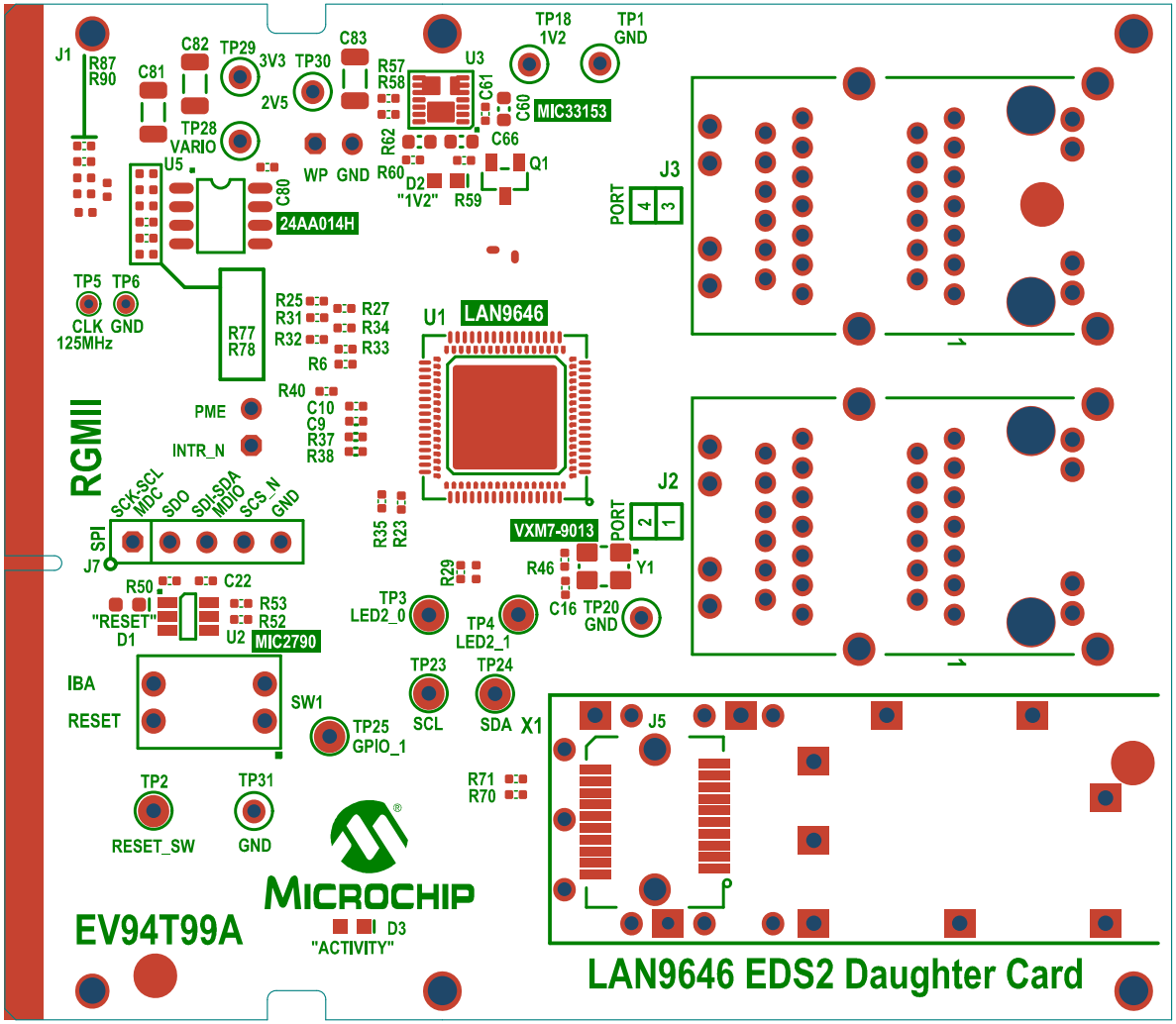
NOTES:

Appendix C. PCB Layers

C.1 INTRODUCTION

This appendix contains the LAN9646 EDS2 Daughter Card's silkscreen top and bottom layers.

FIGURE C-1: LAN9646 EDS2 DAUGHTER CARD TOP SILK SCREEN



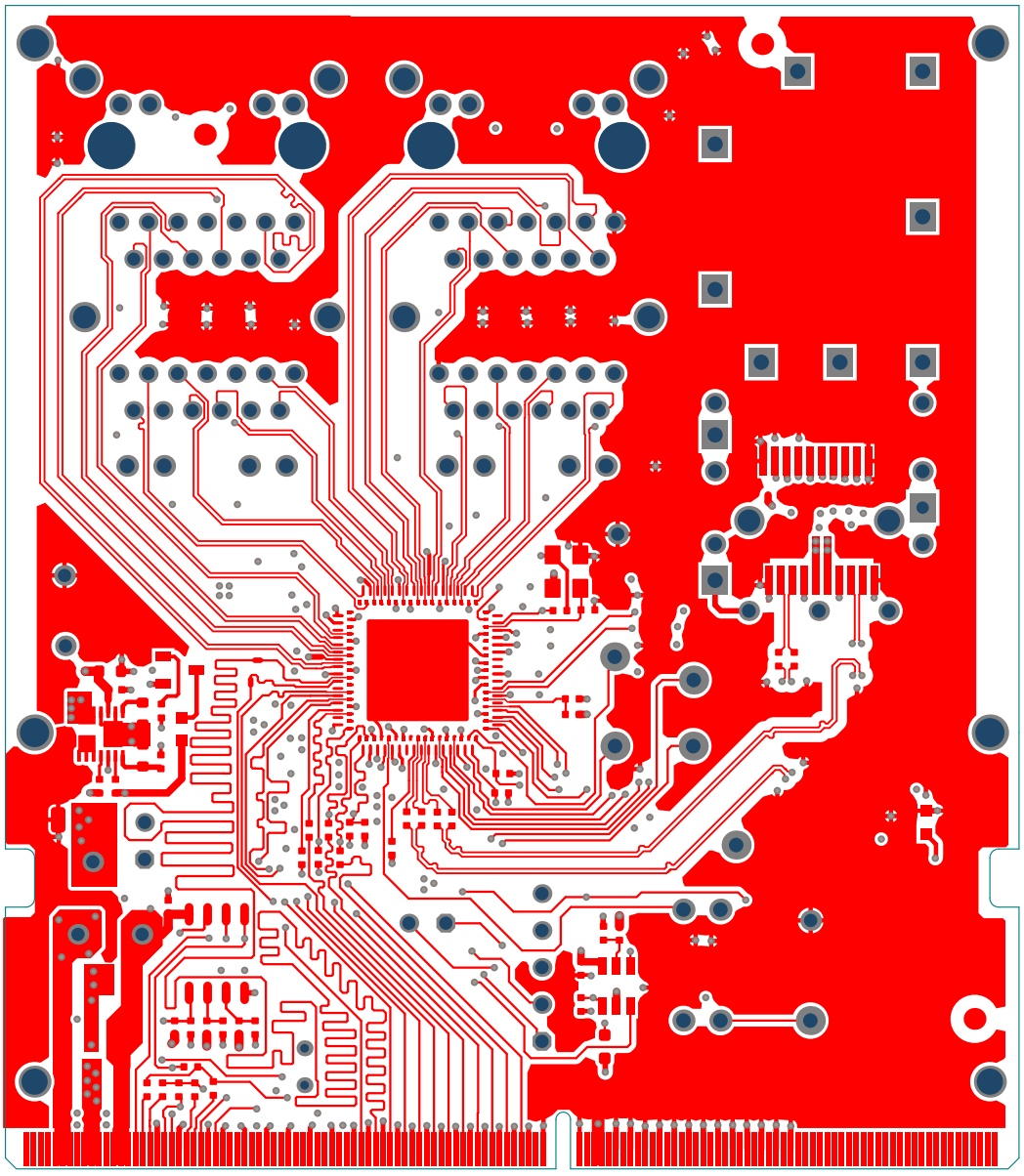


FIGURE C-2: LAN9646 EDS2 DAUGHTER CARD TOP LAYER

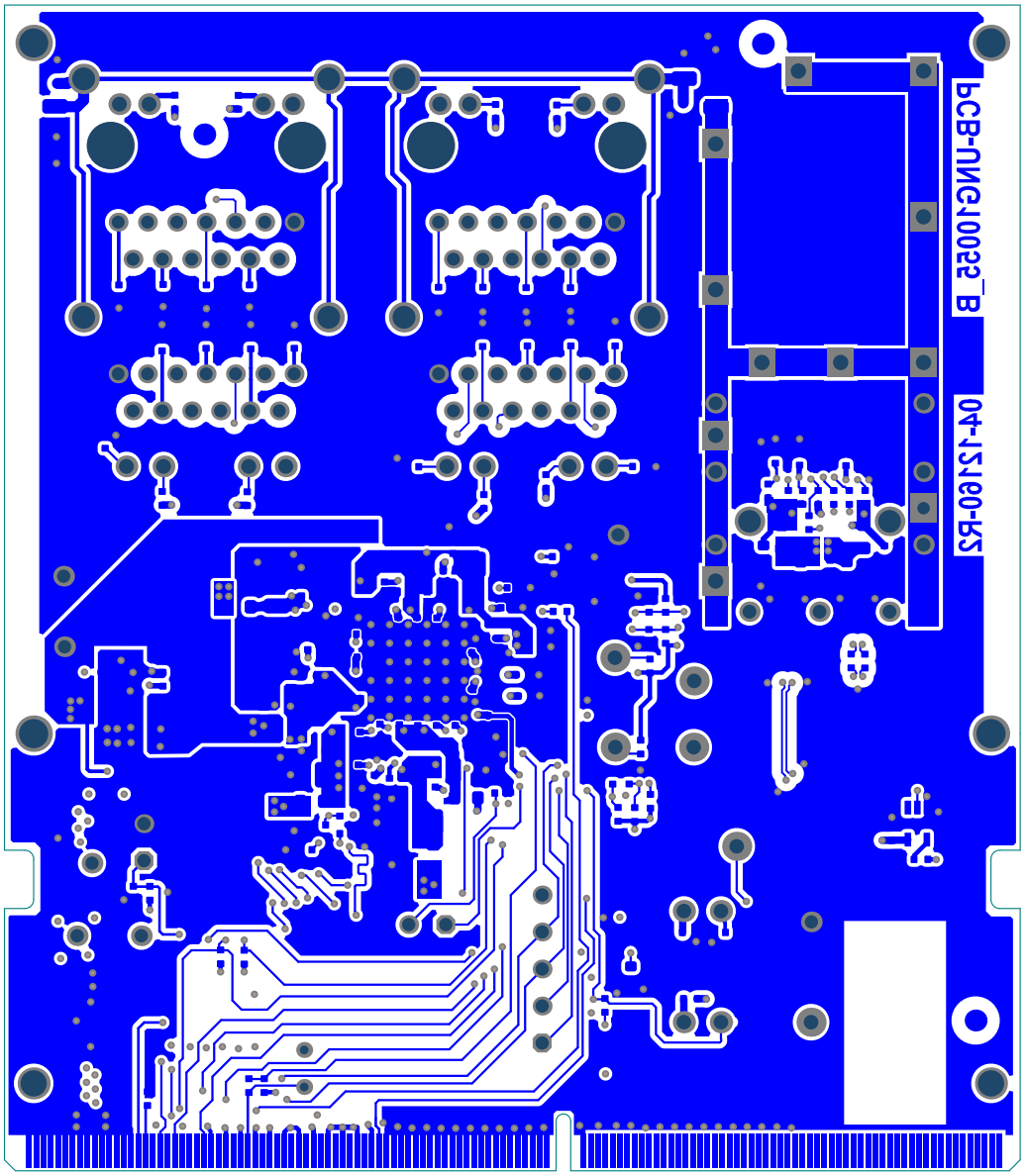


FIGURE C-3: LAN9646 EDS2 DAUGHTER CARD BOTTOM LAYER

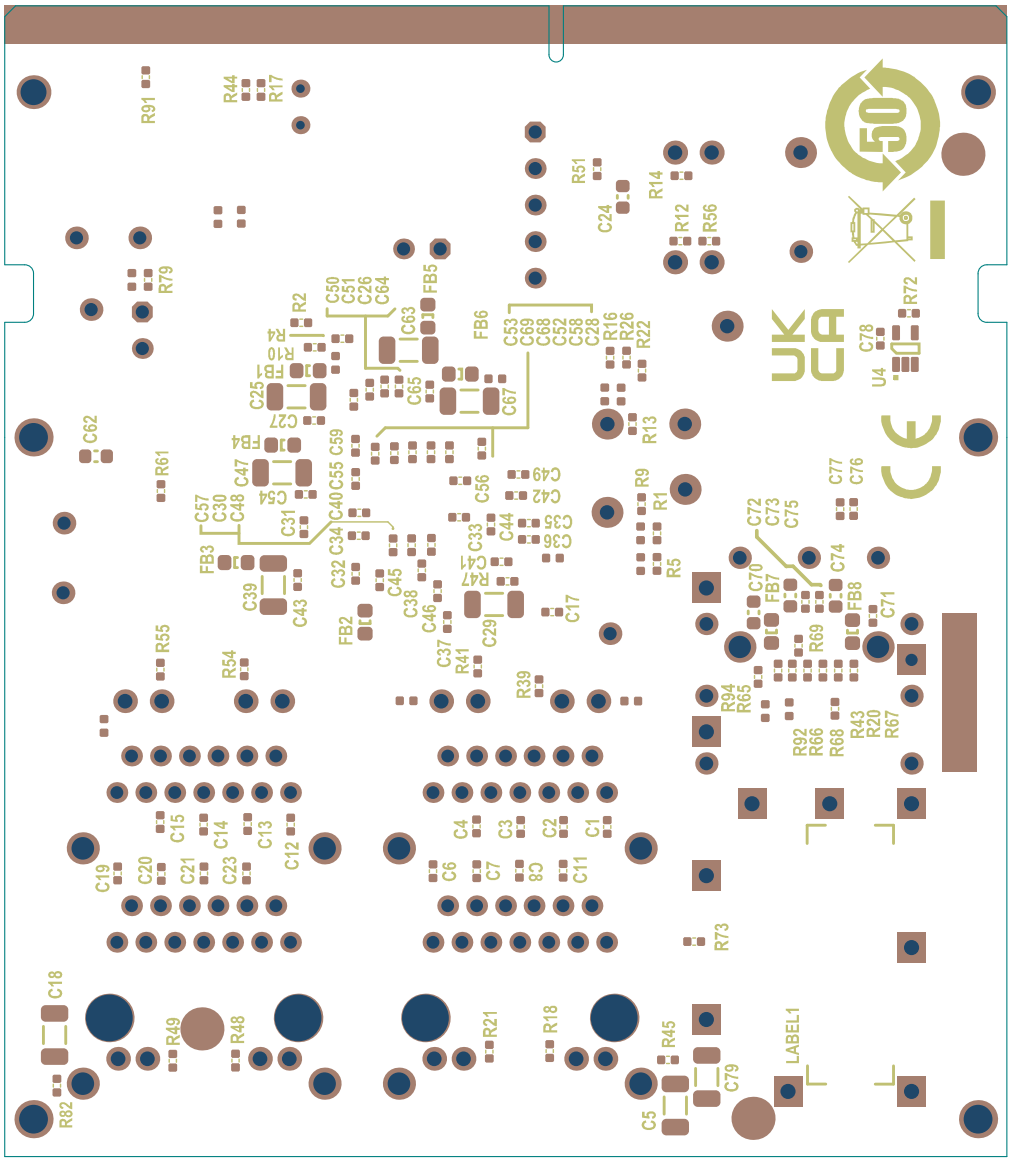


FIGURE C-4: LAN9646 EDS2 DAUGHTER CARD BOTTOM SILK SCREEN

Worldwide Sales and Service

AMERICAS

Corporate Office
2355 West Chandler Blvd.
Chandler, AZ 85224-6199
Tel: 480-792-7200
Fax: 480-792-7277
Technical Support:
http://www.microchip.com/support
Web Address:
www.microchip.com

Atlanta
Duluth, GA
Tel: 678-957-9614
Fax: 678-957-1455

Austin, TX
Tel: 512-257-3370

Boston
Westborough, MA
Tel: 774-760-0087
Fax: 774-760-0088

Chicago
Itasca, IL
Tel: 630-285-0071
Fax: 630-285-0075

Dallas
Addison, TX
Tel: 972-818-7423
Fax: 972-818-2924

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

Indianapolis
Noblesville, IN
Tel: 317-773-8323
Fax: 317-773-5453
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

Canada - Toronto
Tel: 905-695-1980
Fax: 905-695-2078

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