EVB-LAN9255 Evaluation Board User's Guide

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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our web site (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the Microchip EVB-LAN9255 Evaluation Board. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document features the EVB-LAN9255 Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Overview"** – This chapter provides a brief description of the EVB-LAN9255.
- **Chapter 2. "Getting Started"** – This chapter provides information on the setup and operation of the EVB-LAN9255.
- **Chapter 3. "Hardware Configuration"** – This chapter includes information on the hardware configuration of the EVB-LAN9255.
- **Appendix A. "Schematics"** – This appendix shows the EVB-LAN9255 schematic diagrams.
- **Appendix B. "Bill of Materials"** – This appendix includes the EVB-LAN9255 Bill of Materials.
- **Appendix C. "Silk Screens"** – This appendix includes the EVB-LAN9255 silk screen images.
- **Appendix D. "Slave Stack Code Generation"** – This appendix details the procedure for generating SSC for EtherCAT operation on EVB-LAN9255.

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) { ... }`

WARRANTY REGISTRATION

Please complete the enclosed Warranty Registration Card and mail it promptly. Sending the Warranty Registration Card entitles users to receive new product updates. Interim software releases are available at the Microchip website.

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- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLABCC compilers; all MPLAB assemblers (including MPASM™ assembler); all MPLAB linkers (including MPLINK™ object linker); and all MPLAB librarians (including MPLIB™ object librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB® REAL ICE™ and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 3 in-circuit debuggers and PICkit™ 3 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows® Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 3 in-circuit debugger and MPLAB PM3 device programmers. Also included are non-production development programmers such as PICSTART® Plus and PICkit™ 2 and 3.

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

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

DOCUMENT REVISION HISTORY

Revisions	Section/Figure/Entry	Correction
DS50003106A (01-19-21)	Initial release	
DS50003106B (05-18-21)	**Section 2.2 "Kit Contents"**	Removed Type A USB cable and included the requirement for a micro-B USB cable in the note
	Figure 3-1	Replaced with an updated figure
	Figure A-1 to Figure A-3	Replaced with updated schematics
	Figure B-1	Replaced with an updated Bill of Materials
	Figure C-1 and Figure C-2	Replaced with updated silk screens

Chapter 1. Overview

1.1 INTRODUCTION

The EVB-LAN9255 Evaluation Board is used to evaluate the LAN9255 device, which integrates a LAN9253 EtherCAT® device controller with a SAM E53J ARM MCU. The LAN9253 is an EtherCAT device with dual integrated Ethernet PHYs. Each Ethernet PHY contains a Full-Duplex 100BASE-TX transceiver and supports 100 Mbps (100BASE-TX) operation.

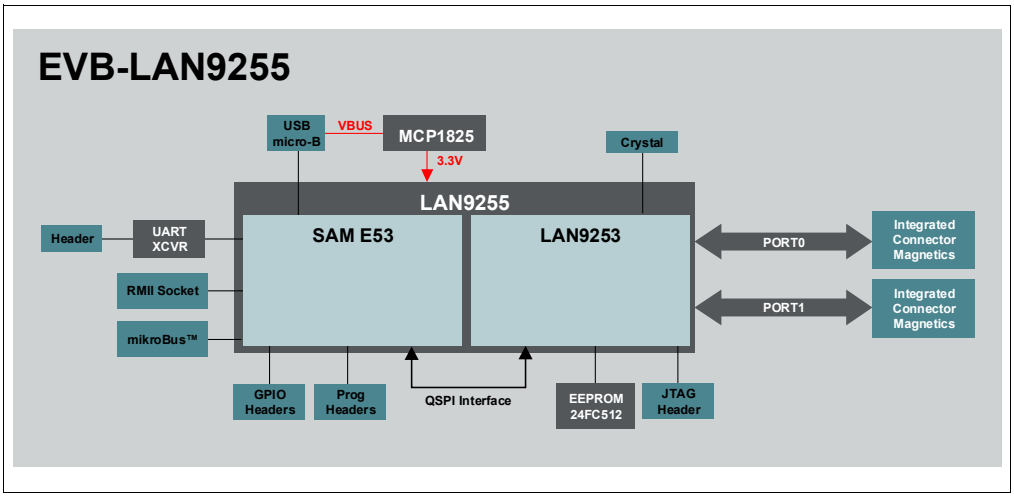
The EVB-LAN9255 allows users to gain understanding of the product and accelerate integration of the LAN9255 into their design. The evaluation platform supports two EtherCAT ports, and the SAM E53 processor that is integrated into the LAN9255 enables the configuration of the evaluation board for EtherCAT operation. For more information about EVB-LAN9255, see **Section 1.2 "Features"**.

1.2 FEATURES

- Two-port 100BASE-TX Full-Duplex EtherCAT device controller with integrated Ethernet PHYs
- LAN9255 in a 128-pin TQFP RoHS-compliant package
- USB Micro-B connector for board power
- mikroBUS™ connector for external peripherals
- MCU RMII connector for optional external Ethernet PHY
- Two RJ-45 ports with LED link/activity indicators
- Atmel-ICE 10 pin-connector
- PICkit™ 4 8-pin header for SAM E53 programming

1.3 BLOCK DIAGRAM

FIGURE 1-1: EVB-LAN9255 BLOCK DIAGRAM



1.4 REFERENCES

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

- *LAN9255 Data Sheet* (www.microchip.com/DS00003646)
- *LAN9253 Data Sheet* (www.microchip.com/DS00003421)
- *SAM D5X/E5X Family Silicon Errata and Data Sheet Clarification* (www.microchip.com/DS80000748)
- *MPLAB® PICkit™ 4 In-Circuit Debugger User's Guide* (www.microchip.com/DS50002751)

1.5 TERMS AND ABBREVIATIONS

The following are the terms and abbreviations used in this document:

- DNP – Do Not Populate
- EEPROM – Electrically Erasable Programmable Read-Only Memory
- EVB – Engineering Validation Board
- EtherCAT – Ethernet for Control Automation Technology
- IDE – Integrated Development Environment
- LOS – Loss of Signal
- MCU – Microcontroller Unit
- RJ-45 – Ethernet Port
- RMII – Reduce Media Independent Interface
- SD – Signal Detect
- SPI – Serial Protocol Interface
- SSC – Slave Stack Code
- TwinCAT – EtherCAT Runtime System Tool
- USB – Universal Serial Bus

Chapter 2. Getting Started

2.1 INTRODUCTION

The Microchip EVB-LAN9255 Evaluation Board is designed for flexible configuration solutions. It can be configured via MPLAB® Harmony, TwinCAT, and Slave Stack Coding tools. Refer to **Section 2.3 "Tools for EVB-LAN9255 Setup Procedure"** for the necessary tools to configure the board for EtherCAT functionality.

2.2 KIT CONTENTS

The EVB-LAN9255 Evaluation Board includes the basic equipment necessary for evaluation. An essential item in the kit is the EVB-LAN9255 Evaluation Board.

Note:	The EVB-LAN9255 Evaluation Board requires a PICKit™ 4 In-Circuit Debugger as additional hardware for the configuration of the integrated SAM E53 MCU. A micro-B USB cable is also needed to power the board.

2.3 TOOLS FOR EVB-LAN9255 SETUP PROCEDURE

These are the software and tools necessary for setting up the control or management PC and programming the EVB-LAN9255 Evaluation Board:

- Beckhoff TwinCAT Software
- Microchip MPLAB® X IDE (v5.30 or newer)
- Microchip XC32 Compiler
- Microchip PICKit 4 In-Circuit Debugger
- Microchip Harmony Plug-In (through MPLAB X IDE)
- EtherCAT Slave Stack Code (refer to **Appendix D. "Slave Stack Code Generation"**)
- GitHub MPLAB Harmony v3 EtherCAT repository, which provides detailed information on creating an EtherCAT application using Harmony

On the board, the following jumpers are required:

- J6, positions 1-2 (EESCL to EEPROM and header)
- J11 (power)
- J17, positions 1-2 (EMUL0 = 0)
- J17, positions 4-5 (EMUL0 = 0)
- J17, positions 7-8 (EMUL1 = 0)
- J17, positions 11-12 (EMUL2 = 1)

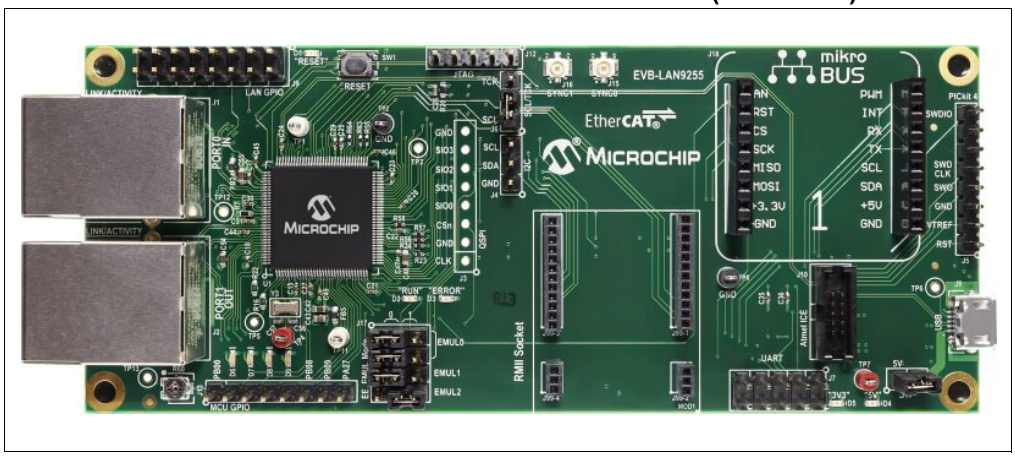
NOTES:

Chapter 3. Hardware Configuration

3.1 HARDWARE CONFIGURATION OPTIONS

Figure 3-1 shows the top view of the EVB-LAN9255 Evaluation Board.

FIGURE 3-1: EVB-LAN9255 EVALUATION BOARD (TOP VIEW)



3.1.1 Power

The EVB-LAN9255 is powered using a USB cable. Jumper J11 must be installed.

Alternatively, remove the J11 jumper and apply 5V (1A) to pin 1 of header J11.

The 5V indicator is LED D4, while the 3.3V voltage regulator output indicator is LED D5.

A standard USB 500 mA 5V supply is adequate for the EVB-LAN9255 without mikroBUS™ or Ethernet RMII daughter boards. A 500 mA supply is usually adequate for a single daughter board if the daughter board draws no more than 250 mA, since the EVB-LAN9255 by itself draws approximately 250 mA. If daughter boards are installed in both the mikroBUS and Ethernet RMII sockets, then a 1A USB supply is recommended.

3.1.2 mikroBUS™

The EVB-LAN9255 has a socket for a mikroBUS add-on board. This allows for LCD displays, motor control, and other click-board interfaces. To enable a mikroBUS board, some settings must be configured with the MCU.

3.1.3 Ethernet RMII

The EVB-LAN9255 has a socket for a Microchip RMII-connected expansion board containing an Ethernet PHY or switch. This socket connects to an Ethernet MAC on the SAM E53 MCU, and the management is via an MDC/MDIO interface. The RMII 50 MHz clock is generated on-board the EVB-LAN9255.

Examples of compatible daughter boards available from Microchip are the LAN9303 Switch Daughter Board (AC320004-4), LAN8720 PHY Daughter Board (AC320004-3), KSZ8041 PHY Daughter Board (AC320004-5), KSZ8061 PHY Daughter Board (AC320004-6), and KSZ8863 Switch Daughter Board (AC320004-7).

3.1.4 Clocks

The EVB-LAN9255 Evaluation Board has the following clocks:

- A 25 MHz reference crystal for EVB-LAN9255 (also has an option for 25 MHz oscillator). The LAN9253 outputs 25 MHz as the reference clock to the SAM E53.
- A 32.768 KHz crystal for real-time clock on the SAM E53
- An oscillator generates a 50 MHz clock for the RMII interface.

3.1.5 Ethernet Ports

The EVB-LAN9255 has two 100BASE-TX Ethernet ports for EtherCAT operation, and these are J1 (PORT0 IN) and J2 (PORT1 OUT).

3.1.6 EEPROM and EEPROM Emulation

The EVB-LAN9255 has an EEPROM for configuring the LAN9253. The LAN9253 also supports EEPROM emulation in which it is configured by the SAM E53 instead of the EEPROM. The EE Emulation mode is set by the jumpers in header J17.

Note: Two jumpers are required for EE_Emul bit 0. Set both jumpers to the same setting, either '0' or '1'. Do *not* mix them.

Table 3-1 lists the EE Emulation modes as configured by J17.

TABLE 3-1: EE EMULATION MODE CONFIGURATION STRAP VALUES

EE_EMUL [2:0]	EEPROM Emulation Mode
000	SPI
001	Not used for EVB-LAN9255
010	Not used for EVB-LAN9255
011	Not used for EVB-LAN9255
100	SPI EtherCAT Direct mode
101	Beckhoff SPI mode
110	EEPROM is enabled.
111	EEPROM is enabled.

3.1.7 LED Indicators

Table 3-2 describes the LED indicators on the EVB-LAN9255.

TABLE 3-2: EVB-LAN9255 LED INDICATOR DESCRIPTIONS

Ref. Des.	Label	Description
D1	RST LAN	Indicates EVB-LAN9255 Reset
D2	RUN	Indicates EVB-LAN9255 RUN status from the LAN9253
D3	ERROR	Indicates EVB-LAN9255 ERROR status from the LAN9253
D4	5V	Illuminates when the 5V supply is present
D5	3V3	Illuminates when the 3.3V supply is present
D6	PB04	SAM E53 pin PB04, active-low
D7	PB05	SAM E53 pin PB05, active-low
D8	PB06	SAM E53 pin PB06, active-low
D9	PB07	SAM E53 pin PB07, active-low
J1 (Green LED)	LINK0	Indicates the link status of Port0
J2 (Green LED)	LINK1	Indicates the link status of Port1

3.1.8 Switches

Table 3-3 describes the switch on the EVB-LAN9255.

TABLE 3-3: EVB-LAN9255 SWITCH DESCRIPTION

Ref. Des.	Label	Description
SW1	RESET	Momentary push-button switch to assert Reset to both LAN9253 and SAM E53

3.1.9 Connector Descriptions

Table 3-4 describes the connectors included on the PCB.

TABLE 3-4: EVB-LAN9255 CONNECTOR DESCRIPTIONS

Ref. Des.	Type	Label	Description
J1	RJ-45 Ethernet Port	PORT0 IN	100BASE-TX Ethernet port for EtherCAT ingress traffic
J2	RJ-45 Ethernet Port	PORT1 OUT	100BASE-TX Ethernet port for Ethernet egress traffic
J3	1x5 Header	QSPI	QSPI communication header, not populated, for debug only
J4	1x3 Header	I2C	I^2C communication to the I^2C EEPROM. To enable, J6 must have jumper in positions 1 and 2, and J17 must have all jumpers installed in the '1' position.
J5	1x8 Header	PICKit-4	PICKit™ 4 programming header/port
J6	1x3 Header	SCL/TCK	Selects between EEPROM I^2C communication (positions 1 and 2) and JTAG (positions 2 and 3).
J7	2x5 Header	UART	UART header to SAM E53. SAM E53 calls this Universal Synchronous and Asynchronous Receiver and Transmitter (USART).
J8	Micro-USB Connector	USB	The board receives power via the USB connector.
J9	2x8 Header	LAN GPIO	Test header for all LAN9253 GPIO signals (0 to15)
J10	2x5 Header	Atmel ICE	SAM-ICE™ programming port
J11	1x2 Header	5V	5V voltage supply header. In a closed position, VBUS from J8 is used as the 5V supply. In an open position, external 5V must be applied to position 1.
J12	1x5 Header	JTAG	JTAG port. To enable, install the J6 jumper in position 2-3.
J13	1x8 Header	MCU GPIO	SAM E53 input/output test header
J15	Micro Coax (UMC) Jack	SYNC0	SYNC0 reference to synchronize clocks
J16	Micro Coax (UMC) Jack	SYNC1	SYNC1 reference to synchronize clocks
J17	3x4 Header	EE_EMUL Mode	Configuration straps for EE Emulation mode. Both of the EMUL0 jumpers must be set to either '0' or '1'. Do not mix them. Set all jumpers to '1' to enable the EEPROM.
J18	mikroBUS™ Connector	MIKROBUS	Socket for optional mikroBUS board. Ensure 1A of 5V power when a daughter board is installed.
J99	Ethernet RMII	RMII Socket	Socket for optional Microchip Ethernet RMII™ daughter board. Ensure 1A of 5V power when a daughter board is installed.

3.1.10 Test Points

Table 3-5 describes the test points on the EVB-LAN9255. A header may be permanently installed on the through-hole test points if needed.

TABLE 3-5: EVB-LAN9255 TEST POINT DESCRIPTIONS

Ref. Des.	Type	Description
TP1	Test Loop (White)	IRQ (interrupt request) output from the LAN9253 and the SAM E53
TP3	Not Populated	This pin not used for this board.
TP4	Test Loop (Red)	1.2V oscillator supply from the LAN9253 internal regulator
TP7	Test Loop (Red)	3.3V supply
TP11	Test Loop (White)	LAN9253 WAIT_ACK/PME output
TP2, TP8	Test Loop (Black)	Ground

NOTES:

Appendix A. Schematics

A.1 INTRODUCTION

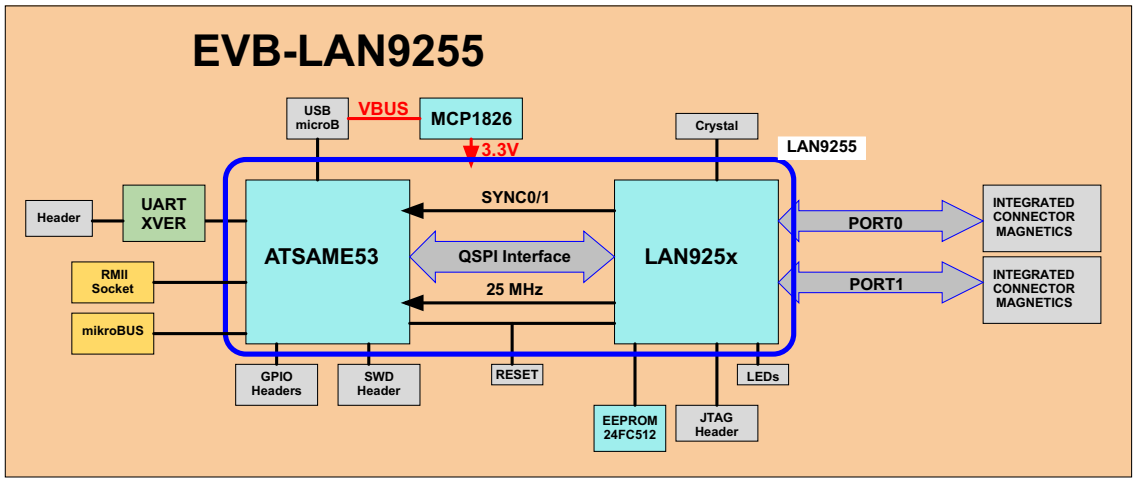
This appendix shows the EVB-LAN9255 Evaluation Board schematics.

FIGURE A-1: EVB-LAN9255 SCHEMATIC 1

Table of Contents	
Sheet	Description
1	Table of Contents, Revision History, Block Diagram
2	LAN9255 - EtherCAT controller
3	LAN9255 - MCU, MikroBUS, RMII

Revision History			
Revision	Date	Revision Summary	Author
B	1/22/2021	Initial Rev B Schematic Add R72 10k in || with LED D2 to enable strapping low Change Error LED D3 to active high (strapped low) Change C39 to high voltage and larger footprint	Kelly Maas
B	1/29/2021	Change PB04-PB07 LEDs from active low to active high	Kelly Maas
B	3/4/2021	Change LABEL1 on sheet 3	Kelly Maas

Notes	
1	All resistors are 1% unless specified otherwise
2	Shunt jumper default selections are marked with an asterisk [*].



Drawn By: Kelly Maas
Engineer: Kelly Maas
PartNumber: EVB-LAN9255
Project Title: *LAN9255 Evaluation Board*
Variant: [No Variations]
Sheet Title: Table of Contents, History, Block Diagram
Size: Tabloid | SCH #: 03-EVB-LAN9255 Rev:B0 | Date: 3/4/2021
PCB #: 04-UNG8302 Rev:B | Sheet 1 of 3
File: 1-LAN9255_TOC_B.SchDoc

FIGURE A-2: EVB-LAN9255 SCHEMATIC 2

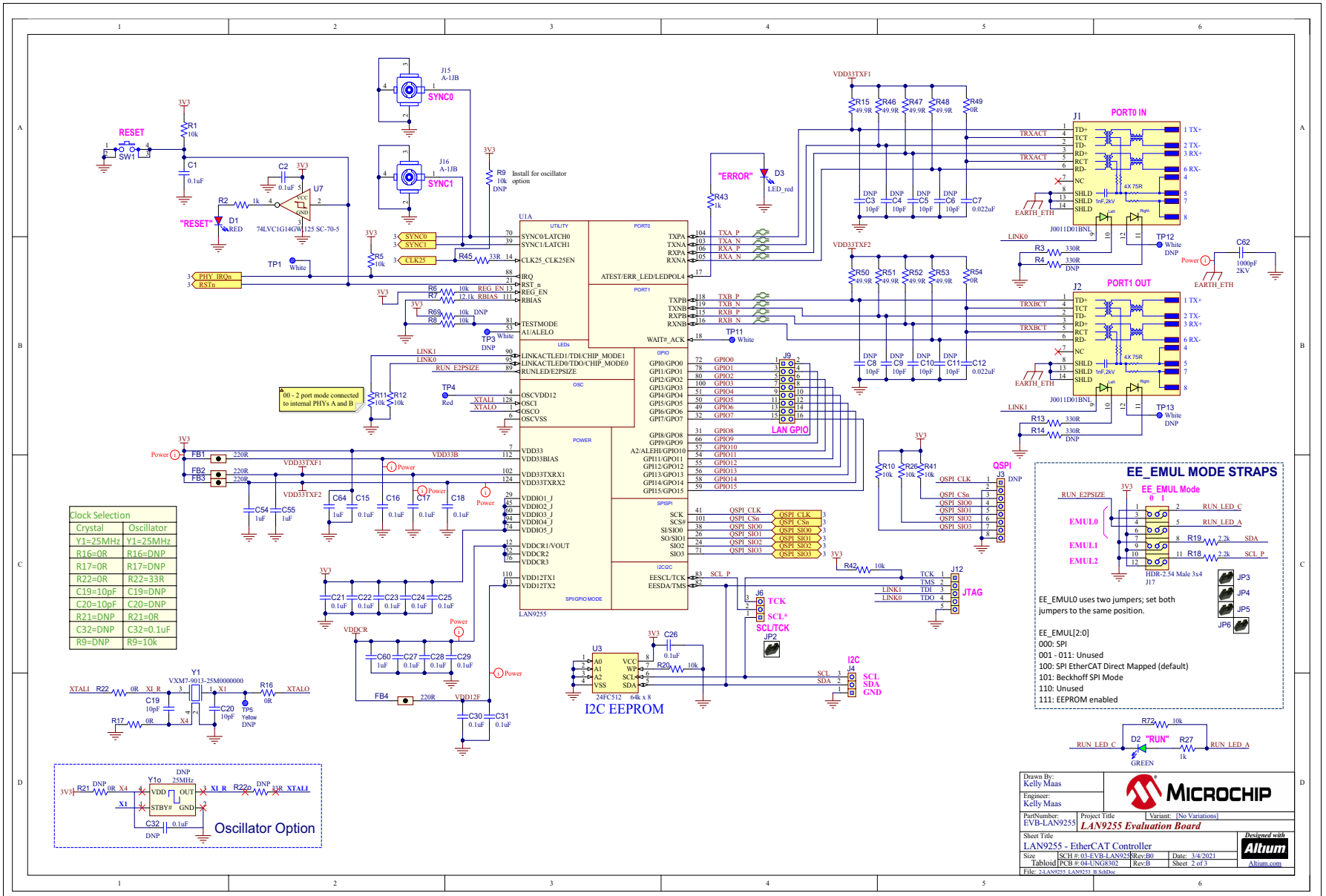
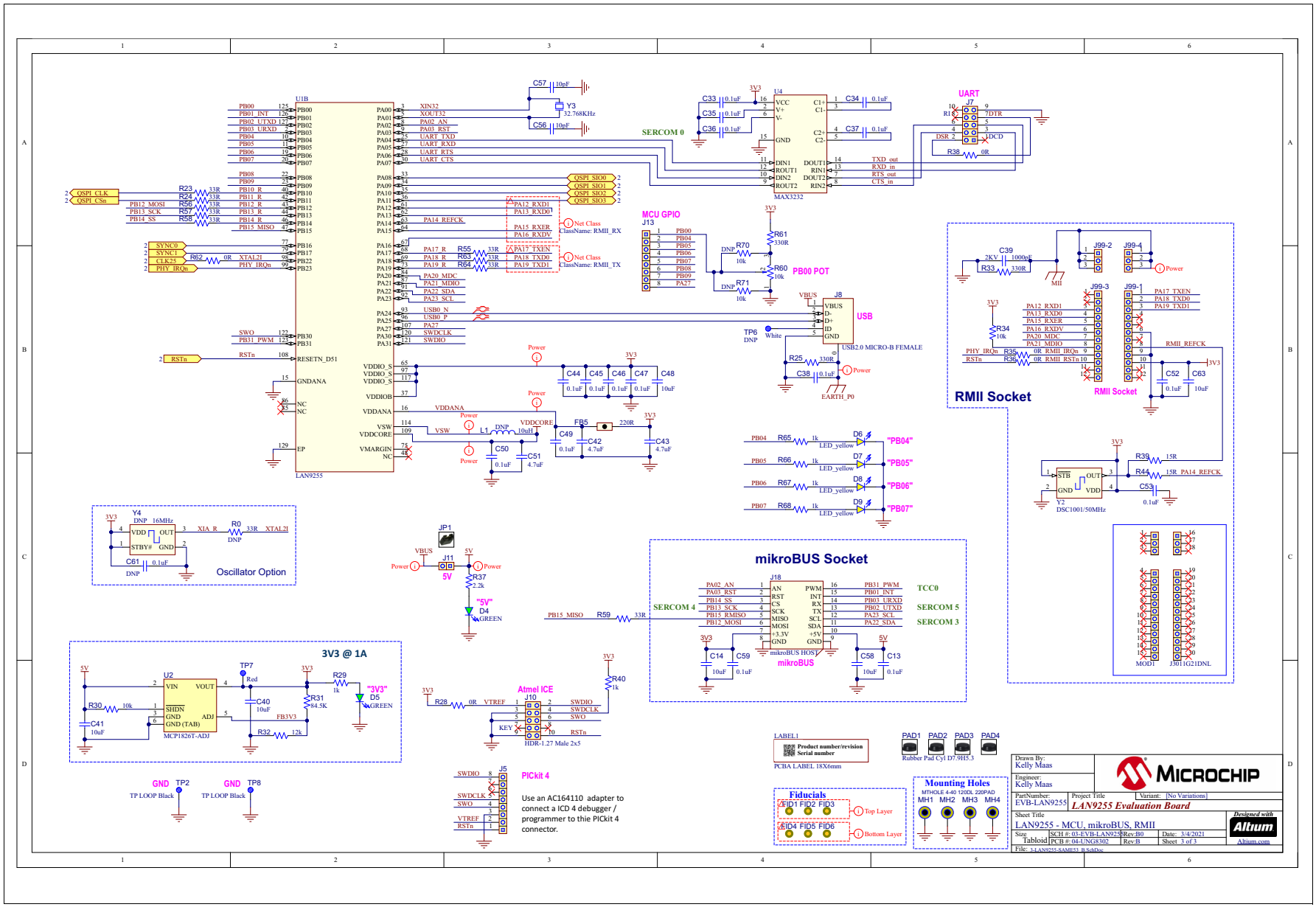


FIGURE A-3: EVB-LAN9255 SCHEMATIC 3



Appendix B. Bill of Materials

B.1 INTRODUCTION

This appendix contains the EVB-LAN9255 Evaluation Board Bill of Materials (BOM).

TABLE B-1: EVB-LAN9255 BILL OF MATERIALS

Item	Qty.	Reference	Description	Populated	Manufacturer	Manufacturer Part Number
1	33	C1, C2, C13, C15, C16, C17, C18, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C33, C34, C35, C36, C37, C38, C44, C45, C46, C47, C49, C50, C52, C53, C59	CAP CER 0.1uF 16V 10% X7R SMD 0402	Yes	Murata	GRM155R71C104KA88D
2	8	C3, C4, C5, C6, C8, C9, C10, C11	CAP CER 10pF 50V 5% NP0 SMD 0402	DNP	Kyocera AVX	04025A100JAT2A
3	2	C7, C12	CAP CER 0.022uF 50V 10% X7R SMD 0402	Yes	Murata	GCM155R71H223KA55D
4	6	C14, C40, C41, C48, C58, C63	CAP CER 10uF 16V 20% X5R SMD 0603	Yes	Taiyo Yuden	EMK107BBJ106MA-T
5	4	C19, C20, C56, C57	CAP CER 10pF 50V 5% NP0 SMD 0402	Yes	Kyocera AVX	04025A100JAT2A
6	2	C32, C61	CAP CER 0.1uF 50V 10% X7R SMD 0402	DNP	TDK	C1005X7R1H104K050BB
7	2	C39, C62	CAP CER 1000pF 2KV 10% X7R SMD 1206	Yes	Johanson	202R18W102KV4E
8	3	C42, C43, C51	CAP CER 4.7uF 10V 10% X5R SMD 0603	Yes	Taiyo Yuden	LMK107BJ475KA-T
9	4	C54, C55, C60, C64	CAP CER 1uF 16V 10% X5R SMD 0603	Yes	Taiyo Yuden	EMK107BJ105KA-T
10	2	D1, D3	DIO RED 2V 20mA 54mcd CLEAR SMD 0603	Yes	Vishay Lite-On	LTST-C191KRKT
11	3	D2, D4, D5	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	Yes	Vishay Lite-On	LTST-C191KGKT
12	4	D6, D7, D8, D9	LED YELLOW DIFFUSED 1608 SMD	Yes	Rohm	SML-D12Y1WT86
13	5	FB1, FB2, FB3, FB4, FB5	FERRITE 220R@100MHz 1.4A SMD 0603	Yes	Murata	BLM18PG221SN1D
14	2	J1, J2	CON MODULAR JACK RJ45 100 2xLEDS SHIELD TH R/A	Yes	Pulse Electronics Network	J0011D01BNL
15	1	J3	CON HDR-2.54 Male 1x8 Gold 5.84MH TH	DNP	AMPHENOL ICC (FCI)	68001-108HLF
16	2	J4, J6	CON HDR-2.54 Male 1x3 Gold 5.84MH TH VERT	Yes	Amphenol ICC	68000-103HLF
17	2	J5, J13	CON HDR-2.54 Male 1x8 Gold 5.84MH TH	Yes	AMPHENOL ICC (FCI)	68001-108HLF
18	1	J7	CON HDR-2.54 Male 2x5 0.100" (2.54mm) TH VERT	Yes	METZ CONNECT USA	PR20205VBDN
19	1	J8	CON USB2.0 MICRO-B FEMALE TH/SMD R/A	Yes	Framatome Connectors	10118194-0001LF
20	1	J9	CON HDR-2.54 Male 2x8 Gold 5.84MH TH VERT	Yes	AMPHENOL ICC (FCI)	68602-116HLF
21	1	J10	CON HDR-1.27 Male 2x5 Gold Shroud 5.4MH TH VERT	Yes	CNC Tech	3220-10-0100-00
22	1	J11	CON HDR-2.54 Male 1x2 Gold 5.84MH TH VERT	Yes	Multicomp SPC	SPC20481
23	1	J12	CON HDR-2.54 Male 1x5 Gold 5.84MH TH VERT	Yes	Amphenol ICC	68000-105HLF
24	2	J15, J16	CON RF Micro Coaxial U.FL Male 4P SMD VERT	Yes	Amphenol RF	A-1JB
25	1	J17	CON HDR-2.54 Male 3x4 Gold 5.84MH TH VERT	Yes	Samtec	TSW-104-07-G-T
26	1	J18	SOCKET mikroBUS HOST DIP 16 TH	Yes	Sullins	PPTC081LFBN-RC
27	2	J99-1, J99-3	CON HDR-1.27 FEMALE 1x12 TH VERT	Yes	Sullins	LPPB121NFFN-RC
28	2	J99-2, J99-4	CON HDR-1.27 FEMALE 1x3 TH VERT	Yes	Sullins	LPPB031NFFN-RC
29	6	JP1, JP2, JP3, JP4, JP5, JP6	MECH HW JUMPER 2.54mm 1x2	MECH	Sullins	QPC02SXGN-RC
30	1	L1	INDUCTOR 10uH 430mA 10% SMD 0805	DNP	Coilcraft	0805PS-103KLC

TABLE B-1: EVB-LAN9255 BILL OF MATERIALS

Item	Qty.	Reference	Description	Populated	Manufacturer	Manufacturer Part Number
31	1	LABEL1	LABEL PCBA 18x6mm BarCode-AssyID-Rev-Serno	MECH	Sunrise Paper (M) Sdn Bhd	037268-5
32	4	PAD1, PAD2, PAD3, PAD4	MECH HW RUBBER PAD CYLINDRICAL D7.9 H5.3 BLACK	MECH	3M	SJ61A11
33	2	R0, R22o	RES TKF 33R 1% 1/10W SMD 0603	DNP	Stackpole Electronics	RMCF0603FT33R0
34	14	R1, R5, R6, R8, R10, R11, R12, R20, R26, R30, R34, R41, R42, R72	RES TKF 10k 1% 1/10W SMD 0603	Yes	Vishay	CRCW060310K0FKEA
35	9	R2, R27, R29, R40, R43, R65, R66, R67, R68	RES TKF 1k 1% 1/10W SMD 0603	Yes	Stackpole Electronics	RMCF0603FT1K00
36	5	R3, R13, R25, R33, R61	RES TKF 330R 1% 1/10W SMD 0603	Yes	Stackpole Electronics	RMCF0603FT330R
37	2	R4, R14	RES TKF 330R 1% 1/10W SMD 0603	DNP	Stackpole Electronics	RMCF0603FT330R
38	1	R7	RES TKF 12.1k 1% 1/10W SMD 0603	Yes	Panasonic	ERJ-3EKF1212V
39	4	R9, R69, R70, R71	RES TKF 10k 1% 1/10W SMD 0603	DNP	Vishay	CRCW060310K0FKEA
40	8	R15, R46, R47, R48, R50, R51, R52, R53	RES TKF 49.9R 1% 1/10W SMD 0603	Yes	Panasonic	ERJ3EKF49R9V
41	10	R16, R17, R22, R28, R35, R36, R38, R49, R54, R62	RES TKF 0R 1/10W SMD 0603	Yes	Stackpole Electronics	RMCF0603ZT0R00
42	3	R18, R19, R37	RES TKF 2.2k 1% 1/10W SMD 0603	Yes	Panasonic	ERJ-3EKF2201V
43	1	R21	RES TKF 0R 1/10W SMD 0603	DNP	Stackpole Electronics	RMCF0603ZT0R00
44	9	R23, R24, R45, R55, R56, R57, R58, R63, R64	RES TKF 33R 1% 1/10W SMD 0402	Yes	Panasonic	ERJ-2RKF33R0X
45	1	R31	RES TKF 84.5k 1% 1/10W SMD 0603	Yes	Yageo	RC0603FR-0784K5L
46	1	R32	RES TKF 12k 1% 1/10W SMD 0603	Yes	Yageo	RC0603FR-0712KL
47	2	R39, R44	RES TKF 15R 1% 1/16W SMD 0603	Yes	Stackpole Electronics	RMCF0603FT15R0
48	1	R59	RES TKF 33R 1% 1/10W SMD 0603	Yes	Stackpole Electronics	RMCF0603FT33R0
49	1	R60	RES TRIMMER 10k 25% 0.1W SMD TC33	Yes	Bourns	TC33X-2-103E
50	1	SW1	SWITCH TACT SPST 16V 50mA PTS810 SJM 250 SMTR LFS SMD	Yes	ITT C&K	PTS810SJM250SMTRLFS
51	2	TP1, TP11	MISC, TEST POINT MULTI PURPOSE MINI WHITE	Yes	Keystone Electronics	5002
52	2	TP2, TP8	MISC, TEST POINT MULTI PURPOSE MINI BLACK	Yes	Keystone Electronics	5001
53	4	TP3, TP6, TP12, TP13	MISC, TEST POINT MULTI PURPOSE MINI WHITE	DNP	Keystone Electronics	5002
54	2	TP4, TP7	MISC, TEST POINT MULTI PURPOSE MINI RED	Yes	Keystone Electronics	5000
55	1	TP5	MISC, TEST POINT PC MINI, 0.040" D YELLOW	DNP	Keystone Electronics	5004
56	1	U1	MCHP INTERFACE ETHERNET LAN9255 ETHERCAT DEVICE W/CORTEX M4F MCU TQFP128	Yes	Microchip	LAN9255-I/ZMX020

TABLE B-1: EVB-LAN9255 BILL OF MATERIALS

Item	Qty.	Reference	Description	Populated	Manufacturer	Manufacturer Part Number
57	1	U2	MCHP ANALOG LDO ADJ MCP1826T-ADJE/DC SOT-223-5	Yes	Microchip	MCP1826T-ADJE/DC
58	1	U3	MCHP MEMORY SERIAL EEPROM 512kb 1MHZ I2C 24FC512T-I/SN SOIC-8	Yes	Microchip	24FC512T-I/SN
59	1	U4	IC TRANSCEIVER MAX3232 SSOP-16	Yes	Texas Instruments	MAX3232CDBR
60	1	U7	74LVC1G14GW,125 SCHMITT-TRG INVERTER	Yes	Nexperia USA	74LVC1G14GW,125
61	1	Y1	MCHP CRYSTAL 25Mhz 10pF SMD L3.2W2.5H0.8	Yes	Microchip	VXM7-9013-25M0000000
62	1	Y1o	MCHP CLOCK OSCILLATOR SINGLE 25MHZ DSC1001CI2-025.0000T CDFN-4	DNP	Microchip	DSC1001CI2-025.0000T
63	1	Y2	MCHP CLOCK OSCILLATOR 50MHz DSC1001CI2-050.0000T DFN-4	Yes	Microchip	DSC1001CI2-050.0000T
64	1	Y3	CRYSTAL 32.768KHz 12.5pF SMD L3.2W1.5H0.9	Yes	Fox Electronics	FK135EIHM0.032768-T3
65	1	Y4	MCHP CLOCK OSCILLATOR SINGLE 16MHZ DSC1001CI2-016.0000T CDFN-4	DNP	Microchip	DSC1001CI2-025.0000T

Appendix C. Silk Screens

C.1 INTRODUCTION

This appendix shows the top and bottom silk screen images of the EVB-LAN9255 Evaluation Board.

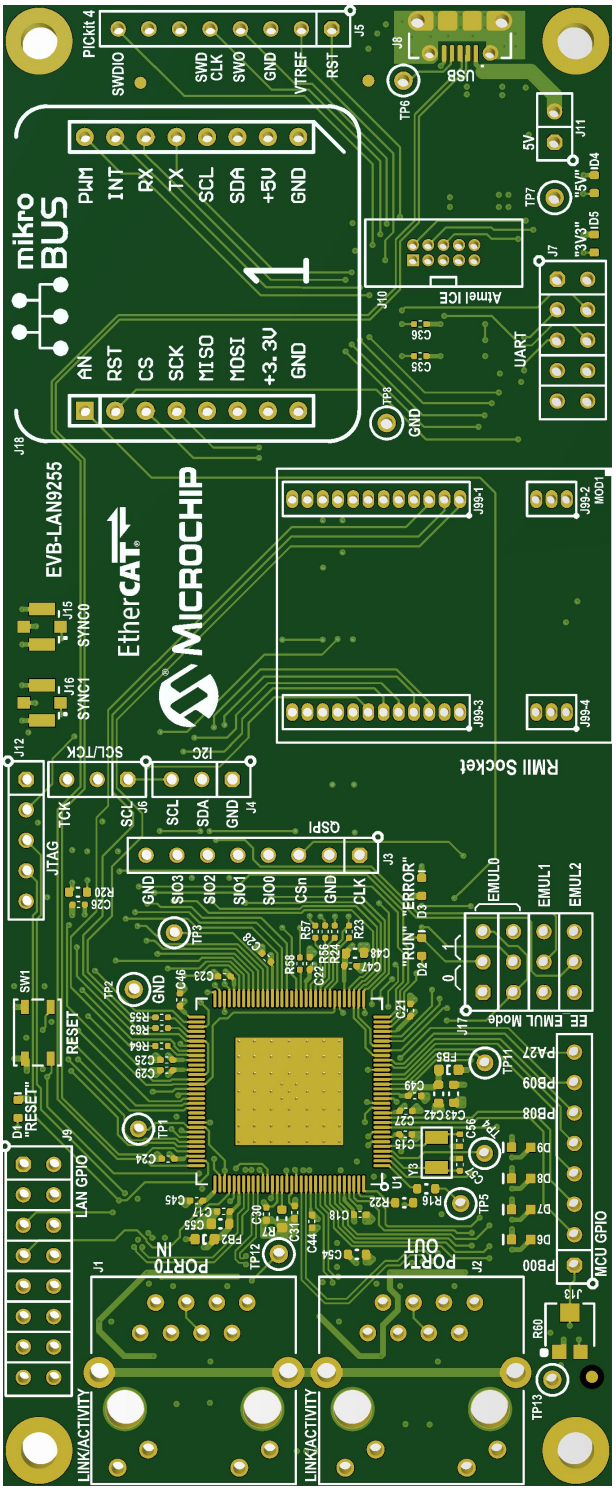
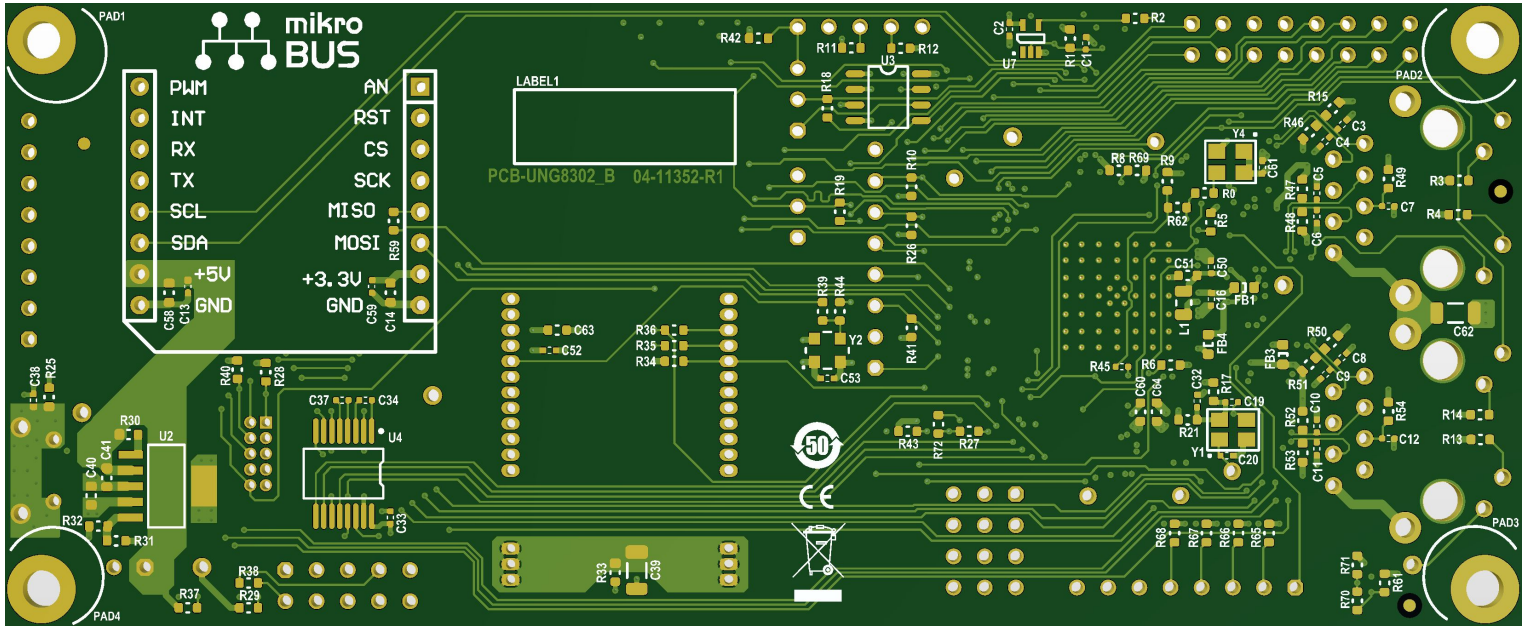


FIGURE C-1: EVB-LAN9255 TOP SILK SCREEN IMAGE

FIGURE C-2: EVB-LAN9255 BOTTOM SILK SCREEN IMAGE



NOTES:

Appendix D. Slave Stack Code Generation

D.1 INTRODUCTION

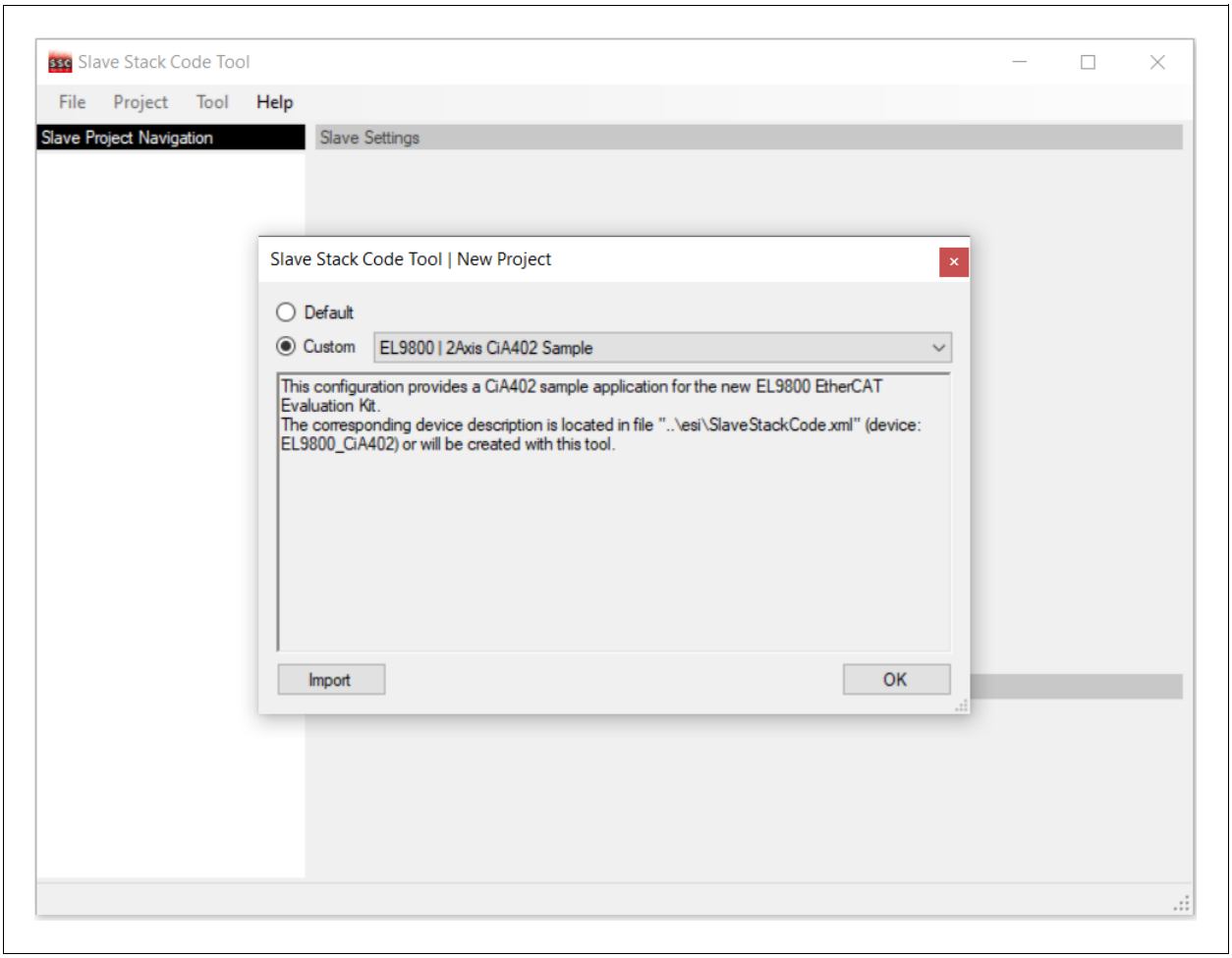
This appendix details the procedure for generating the Slave Stack Code (SSC) for EtherCAT operation on the EVB-LAN9255 Evaluation Board.

D.2 PROCEDURE

Perform the following steps to generate the SSC:

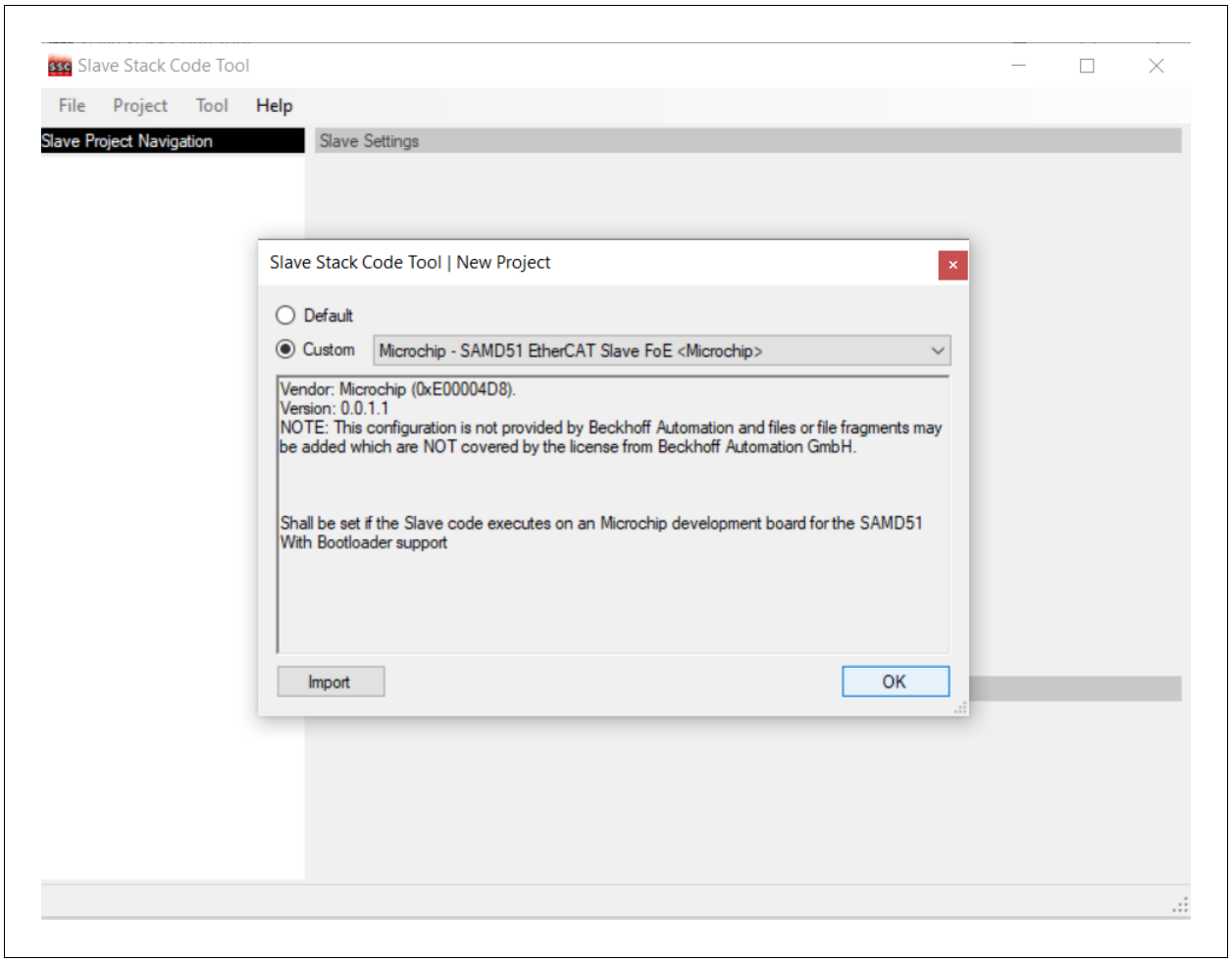
1. Download the SSC tool from EtherCAT.org website. An EtherCAT membership is necessary for downloading the code.
2. Install the SSC tool on the control or management PC.
3. Open the SSC tool and navigate to *File>New* to create a new project.
4. Select the "Custom" option, and then click on **Import**. See Figure D-1.

FIGURE D-1: IMPORT THE CONFIGURATION FILE



5. Import the `Microchip-LAN9255-SSC_Config.xml` configuration file from `<Harmony Directory>\ethercat\apps\ethercat_counter_foe_app\firmware\src\slave_stack`. After importing the configuration file, the Microchip SAM E53 appears in the "Custom" field. Select it and click on **OK**. See Figure D-2.

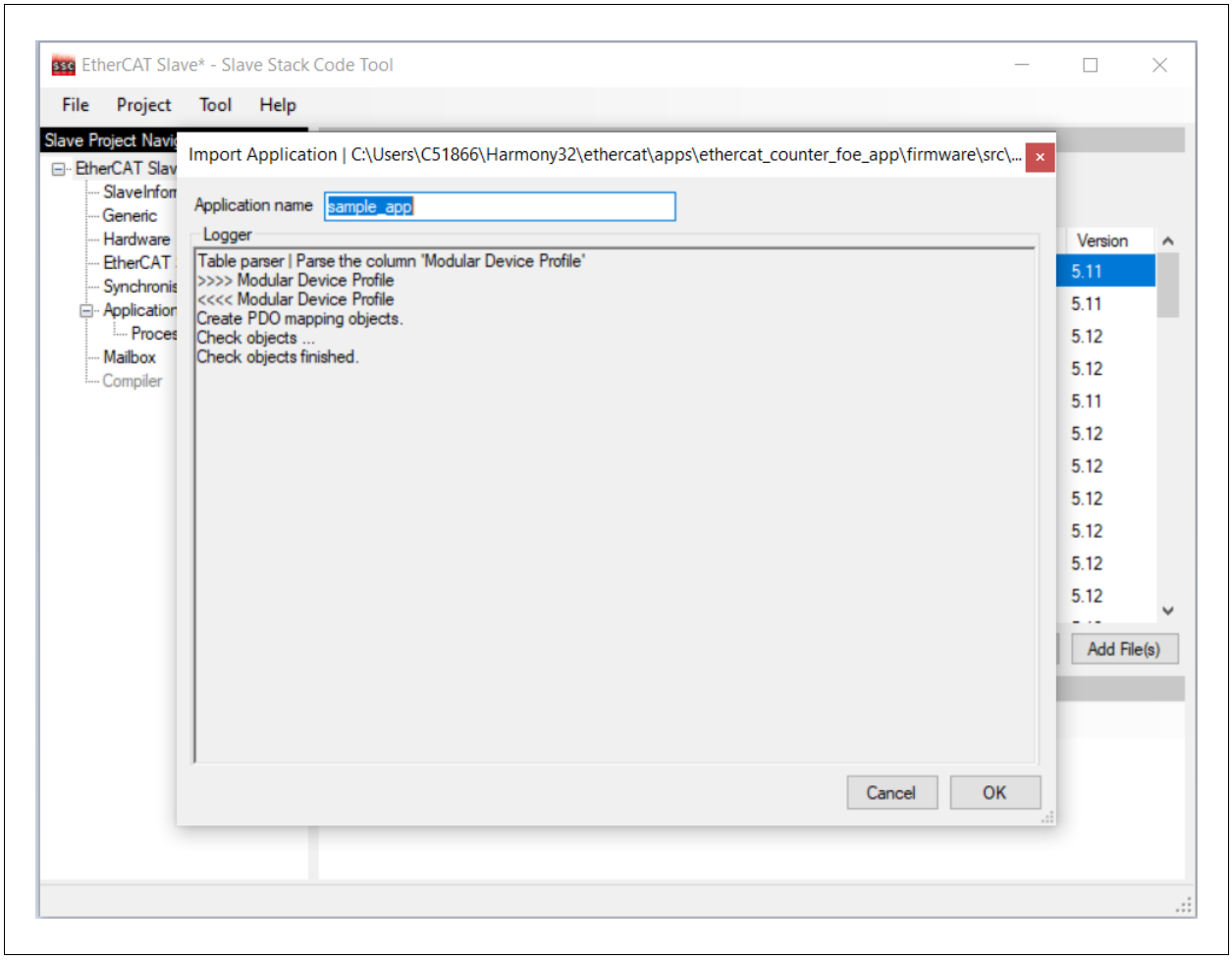
FIGURE D-2: CREATE A NEW PROJECT



6. Click on **Yes** for the next two prompts.
7. Navigate to the `<Harmony Directory>\ethercat\apps\ethercat_counter_foe_app\firmware\src\config\lan9255_evb\driver\lan9255` directory to point to the `drv_lan9255.c` file and click on **Open**. This loads the code.

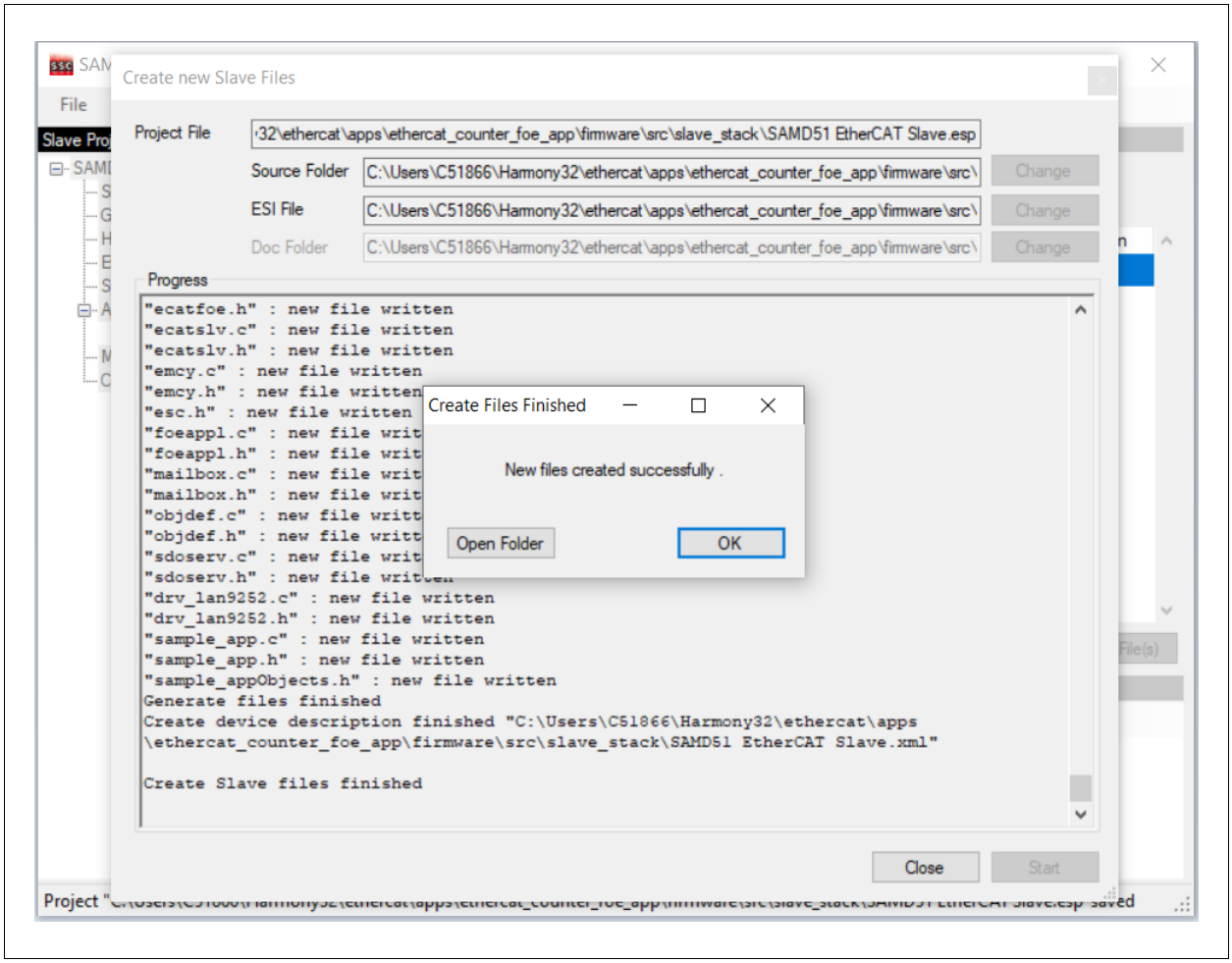
8. Go to *Tools>Application>Import Application*. In the “Application name” field, enter **sample_app**, and click on **OK.** See Figure D-3.

FIGURE D-3: IMPORT THE APPLICATION FILE



9. Go to *Tools>Create New Slave Files*. When prompted to save the project, save it in the directory provided. Click on the **Start** button to create the slave files (see Figure D-4).
10. When creation is complete, click on the **Open Folder** button to open a window with all the slave files. See Figure D-4.

FIGURE D-4: CREATE NEW SLAVE FILES



11. Copy the files from the directory in the previous step (including the `sample_app.c`, `sample_app.h`, `sample_appObject.h`, and `SAME53 EtherCAT Slave.xml` files) and paste them to the *<Harmony Directory>*`\ethercat\slave_stack` directory.

NOTES:

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