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**EVB-USB2240-IND  
User's Guide, Rev C**

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**Object of Declaration: EVB-USB2240-IND**

### EU Declaration of Conformity

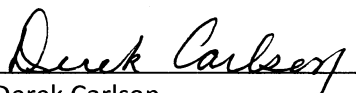
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The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units to end users under EU EMC Directive 2004/108/EC and as supported by the European Commission's Guide for the EMC Directive 2004/108/EC (8<sup>th</sup> February 2010).

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA



Derek Carlson  
VP Development Tools



Date

NOTES:

**Table of Contents**

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<b>Preface</b> .....	<b>7</b>
Introduction.....	7
Document Layout .....	7
Conventions Used in this Guide .....	8
The Microchip Web Site .....	9
Development Systems Customer Change Notification Service .....	9
Customer Support .....	9
Document Revision History .....	10
<b>Chapter 1. Overview</b>	
1.1 Introduction .....	11
1.2 Features .....	11
1.3 General Description .....	11
<b>Chapter 2. Getting Started</b>	
2.1 Hardware .....	15
2.1.1 Configuration .....	15
2.1.2 Powered State LED .....	15
2.1.3 Activity LED .....	15
2.1.4 Media Interface .....	15
2.1.5 Connector Description .....	16
2.1.6 Power source - Self/Bus Powered .....	16
2.1.7 Configuration source - USB Upstream .....	16
2.1.8 Layout Considerations .....	16
<b>Chapter 3. Appendix A. EVB-USB2240-IND Evaluation Board</b>	
A.1 Introduction .....	19
<b>Appendix B. EVB-USB2240-IND Evaluation Board Schematics</b>	
B.1 Introduction .....	21
<b>Appendix C. Bill of Materials (BOM)</b>	
C.1 Introduction .....	23
<b>Worldwide Sales and Service</b> .....	<b>27</b>

NOTES:

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## Preface

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### 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](http://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 “DSXXXXA”, where “XXXX” 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-USB2240-IND. Items discussed in this chapter include:

- [Document Layout](#)
- [Conventions Used in this Guide](#)
- [The Microchip Web Site](#)
- [Development Systems Customer Change Notification Service](#)
- [Customer Support](#)
- [Document Revision History](#)

## DOCUMENT LAYOUT

This document describes how to use the EVB-USB2240-IND Evaluation Board as a development tool for the USB2240 Ultra Fast USB 2.0 Flash Media Controller. The manual layout is as follows:

- **Chapter 1. “Overview”** – Shows a brief description of the EVB-USB2240-IND Evaluation Board.
- **Chapter 2. “Getting Started”** – Includes instructions on how to get started with the EVB-USB2240-IND Evaluation Board.
- **Appendix A. “EVB-USB2240-IND Evaluation Board”** – This appendix shows the EVB-USB2240-IND Evaluation Board.
- **Appendix B. “EVB-USB2240-IND Evaluation Board Schematics”** – This appendix shows the EVB-USB2240-IND Evaluation Board schematics.
- **Appendix C. “Bill of Materials (BOM)”** – This appendix includes the EVB-USB2240-IND Evaluation Board Bill of Materials (BOM).

## CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

### DOCUMENTATION CONVENTIONS

Description	Represents	Examples
<b>Arial font:</b>		
Italic characters	Referenced books	<i>MPLAB® IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> 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><i>File&gt;Save</i></u>
Bold characters	A dialog button	Click <b>OK</b>
	A tab	Click the <b>Power</b> 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>
<b>Courier New font:</b>		
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	<i>file.o</i> , 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	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.

## CUSTOMER SUPPORT

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

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

Technical support is available through the web site at:

<http://www.microchip.com/support>

### **DOCUMENT REVISION HISTORY**

#### **Revision A (July 2014)**

- Initial Release of this Document.

#### **Revision B (September 2014)**

- Update to **Section 1.2 “Features”**

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## Chapter 1. Overview

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### 1.1 INTRODUCTION

The EVB-USB2240-IND is an Ultra Fast USB 2.0 Multi-Slot Flash Media Controller with Secure Digital (SD), MultiMediaCard™ (MMC), Memory Stick® (MS), and xD-Picture Card™ (xD) connectors. The EVB-USB2240-IND demonstrates a standalone application for developers of the following applications: Flash Media Card Reader/Writer, printers, desktop and mobile PCs, consumer A/V, and flat panel displays, among others.

### 1.2 FEATURES

The EVB-USB2240-IND provides the following features:

- 36-Pin QFN (RoHS compliant) package.
- Supports these Media Types on Media I/F:
  - Secure Digital (SD2.0, HS-SD, HC-SD)
  - MultiMediaCard™ 4.2
  - xD-Picture Card™ (population deprecated on modern assemblies)
  - Memory Stick® 1.43
  - High Speed Memory Stick™
  - Memory Stick Pro-HG™
  - Memory Stick Duo Memory Stick Pro™
- Internal FET power switch for all media types; no external power FETs needed.
- Optionally supports external configuration.
  - External I2C EEPROM for configuration options (optional).
- Low cost 4-Layer space saving design.
- Self-powered or bus-powered operation.
- Operates from a single voltage (+5.0 VDC, regulated) external power supply or from VBUS.
- Single onboard +3.3 VDC regulator.
- Optional +3.3 VDC media power LED indicator.
- Activity LED indicator.
- Single crystal clock source.

### 1.3 GENERAL DESCRIPTION

The EVB-USB2240-IND is an evaluation and demonstration platform featuring the USB2240 Ultra Fast USB 2.0 Flash Media Controller on a 4-layer RoHS compliant printed circuit board.

The EVB-USB2240-IND is designed to demonstrate the unique features of this device using a low-cost PCB implementation. It is designed to support internal default configuration settings and an external I2C EEPROM (optional) for customized configured functionality. When an I2C EEPROM device is populated on the evaluation board it provides customizing via USB by using the Microchip-provided USBDM utility, as required.

The EVB-USB2240-IND is compatible with the following:

- Microsoft® Vista
- Windows® XP
- Windows® ME
- Windows® 2k SP4
- Apple® OS X
- Linux® Mass Storage Class Drivers.

Schematics, Layout, and Bill of Materials are included minimizing new product development time.

**FIGURE 1-1: TOP LEVEL SILK SCREEN AND COPPER LAYER**

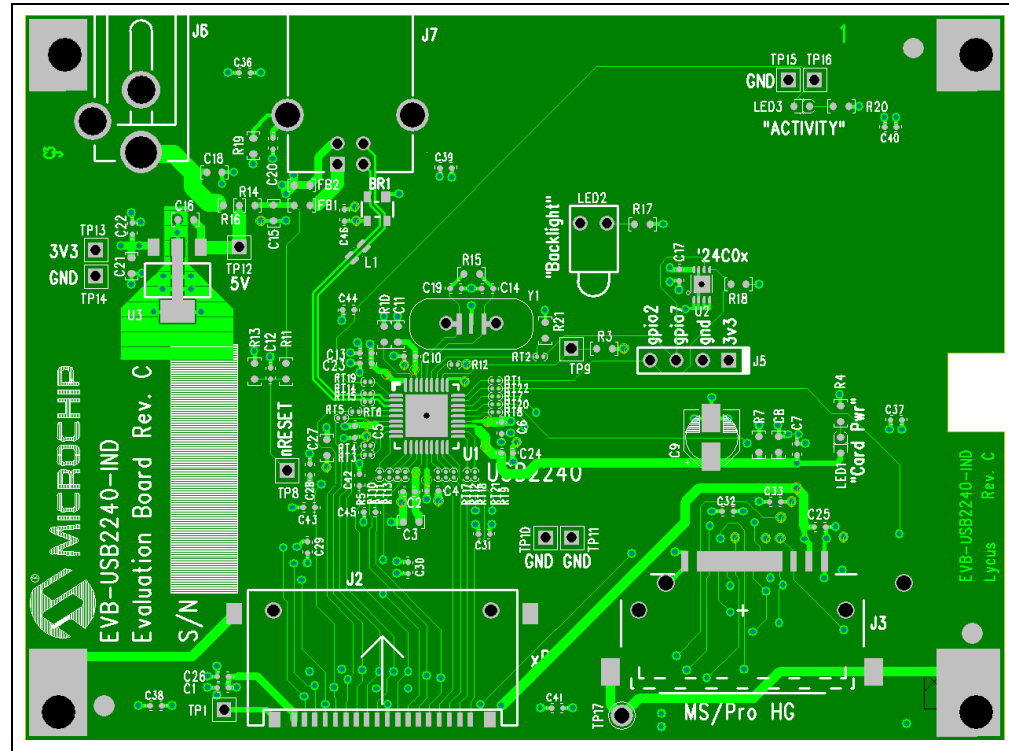
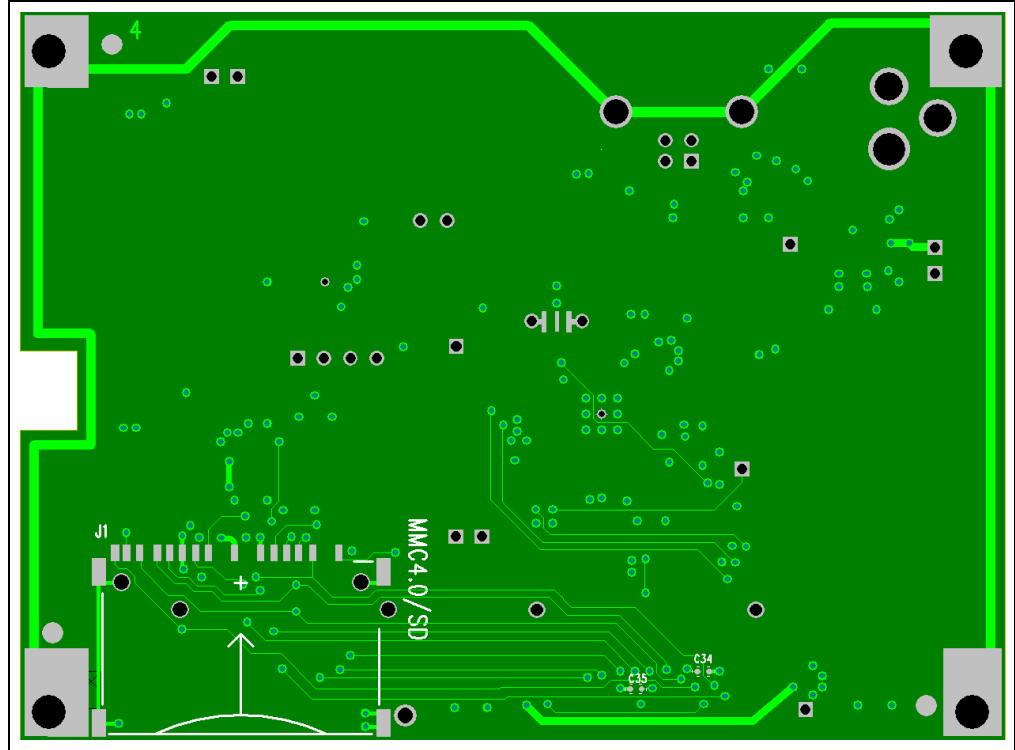


FIGURE 1-2: BOTTOM LEVEL SOLDIER SIDE AND COPPER LAYER



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## Chapter 2. Getting Started

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### 2.1 HARDWARE CONFIGURATION

The EVB-USB2240-IND has one onboard regulator, which generates +3.3 VDC from an external +5 VDC regulated power supply. The USB2240 generates its own +1.8 VDC for internal use using on-chip +1.8 VDC regulators. The internal 1.8 Volt regulator to the oscillator and PLL is turned off during suspend to minimize suspend current. The USB2240 consumes power from the 3.3 Volt supply.

#### 2.1.1 Configuration

**Default:** The EVB-USB2240-IND has been set up to support internal default configuration as determined by the empty state (no valid signature ID) of the EEPROM immediately after reset. When no valid EEPROM image is detected, the Vendor ID, Product ID, Language ID, and Device ID, and a few other choices are set using ROM code defaults.

**EEPROM Option:** The EVB-USB2240-IND can load configuration from an external two-wire, I2C EEPROM U2. The EEPROM must be installed in socket U2. The EEPROM may be pre-programmed before installation, or it can be programmed with the USB host using the provided Microchip USBDM application.

This option allows access to all of the configuration registers and ID strings for the USB2240 device for detailed functional analysis and exercise as desired. The EVB-USB2240-IND is compatible with I2C EEPROMs from several manufacturers. The memory capacity must be at least 512 bytes.

#### 2.1.2 Powered State LED

An optional LED, LED1, indicates when +3.3 VDC power is present on the media sockets.

#### 2.1.3 Activity LED

LED3 indicates when the USB2240 is active, as defined by firmware.

#### 2.1.4 Media Interface

The USB2240 supports a wide array of devices. Media Interface accommodates all of the media types supported through the use of three media socket connectors. Adapters may be needed for some form factors.

- J1 supports SD media up to the specification limit of 4 bits wide. It also supports MMC media up to the specification 4.2 of 8 bits wide.
- J2 supports xD-Picture Card media.
- J3 supports MS, MS Pro, MS Duo, and MS Pro-HG media at up to the specification limit of 8 bits wide.

Since these connectors are all on the same media bus, only one device is allowed to be inserted into any of these media socket connectors at one time for the Media Interface.

## 2.1.5 Connector Description

The EVB-USB2240-IND has a standard USB style connector of type B for the upstream port. It also has a standard set of media storage style connectors, which supports popular flash media formats from the xD, MS, SD, and MMC families. Power is supplied via a 2.0 mm power jack. Table 2.1 lists all of the connectors. For more details on the pinout of the connectors please schematics in Figure B-1.

**TABLE 2-1: CONNECTOR DESCRIPTION**

CONNECTOR	TYPE	DESCRIPTION
J1	SD/MMC4.0	SD/MMC I/F
J2	xD	xD I/F
J3	MS/MS Duo/MS Pro-HG	MS I/F
J5	Header	GPIO Test - DNP
J6	Power Jack 2.0 mm	+5 VDC Power Supply - DNP
J7	USB 2.0 Style B	Upstream Port
J1	SD/MMC4.0	SD/MMC I/F

## 2.1.6 Power source - Self/Bus Powered

The EVB-USB2240-IND supports both self and bus powered operation. By default the EVB-USB2240-IND is populated for bus powered operation. Refer to the table Table 2.2 below for resistor population options to change the power source.

**TABLE 2-2: POPULATION OPTIONS FOR SELF OR BUS POWERED OPERATION**

POWER SOURCE	R14	R16
Bus Powered (Default)	Populate	DNP
Self Powered	DNP	Populate

**Note:** DNP = Do not populate.

## 2.1.7 Configuration source - USB Upstream

The Microchip configuration tool named USBDM, see USB2240 Software Release Notes for details ([https://www2.smsc.com/mkt/CW\\_SFT\\_PUB.nsf/Agreements/OBJ+Card+Reader](https://www2.smsc.com/mkt/CW_SFT_PUB.nsf/Agreements/OBJ+Card+Reader)), can configure the EEPROM when it is populated. USBDM can modify Vendor ID, Product ID, Language ID, Device ID, and configuration settings, see Figure 2.1.

## 2.1.8 Layout Considerations

The EVB-USB2240-IND is designed on four PCB layers: two signal layers and two supply layers. The PCB layer stack is shown in Table 2.3. All signals are routed on top and bottom layers. The internal layers are ground and power. Note that the media I/F signals flow easily to their destination connectors simplifying routing of critical signals.



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**TABLE 2-3: PCB LAYER STACK**

Layer 1 Component Side	1.3 - 2.3 oz. Cu finished wt.	40 mil (+/- 6 mil)
	4.0 - 4.5 mil FR-4	
Layer 2 Ground Plane	1 oz. nominal Cu wt.	
Core	~25 mil FR-4	
Layer 3 Power Plane	1 oz. nominal Cu wt.	
	4.0 - 4.5 mil FR-4	
Layer 4 Solder Side	1.3 - 2.3 oz Cu finished wt.	

The component side top layer is shown in Figure 1-1 with silk screen information to identify component locations. Solder side and bottom layer is shown in Figure 1-2.

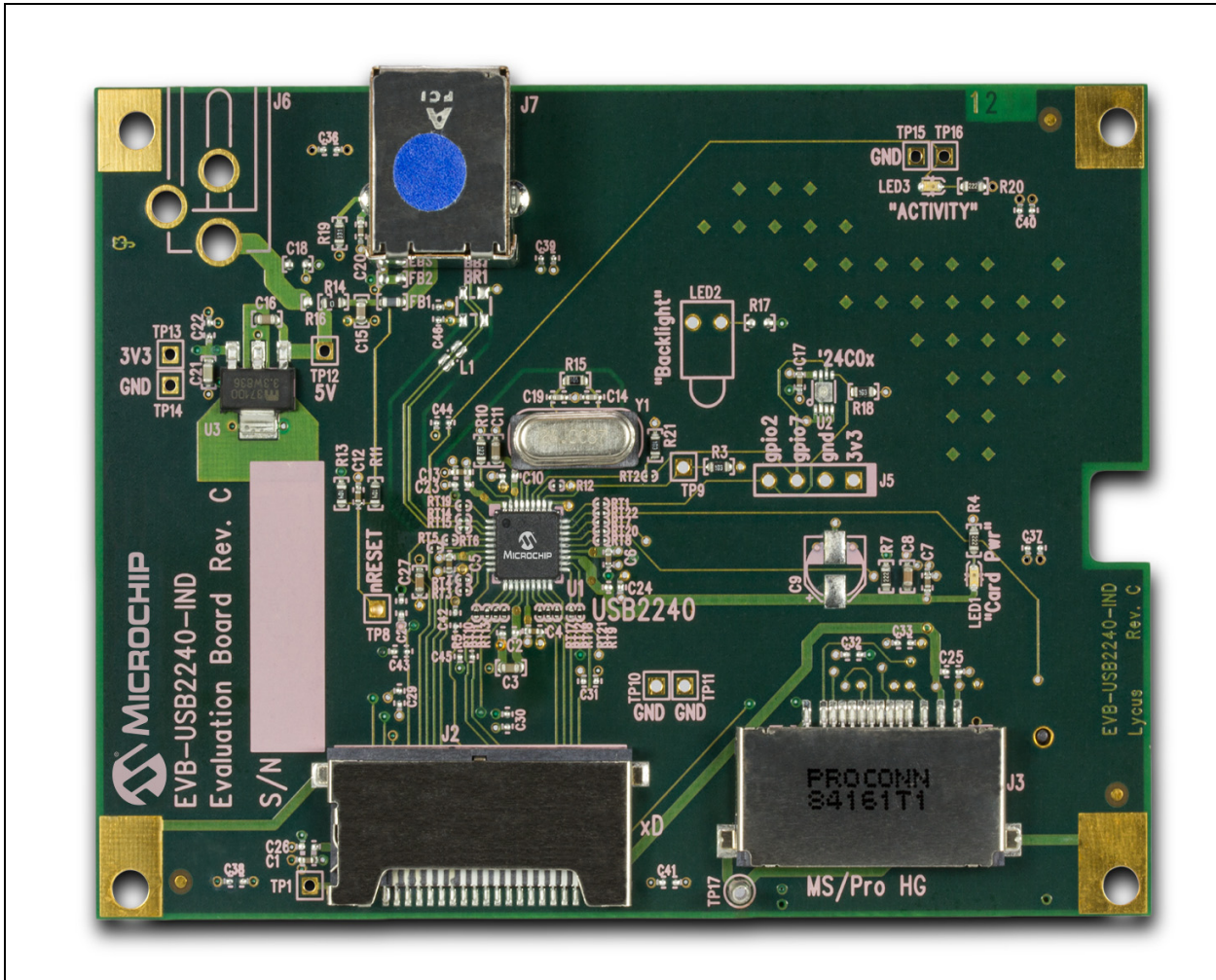
NOTES:

**Appendix A. EVB-USB2240-IND Evaluation Board**

**A.1 INTRODUCTION**

This appendix shows the EVB-USB2240-IND Evaluation Board.

**FIGURE A-1: EVB-USB2240-IND EVALUATION BOARD**



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## **Appendix B. EVB-USB2240-IND Evaluation Board Schematics**

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### **B.1 INTRODUCTION**

This appendix shows the EVB-USB2240-IND Evaluation Board Schematics.





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## **Appendix C. Bill of Materials (BOM)**

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### **C.1 INTRODUCTION**

This appendix includes the EVB-USB2240-IND Evaluation Board Bill of Materials (BOM).

TABLE C-1: EVB-USB2240-IND EVALUATION BOARD BILL OF MATERIALS

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number	Notes
1	9		C1,C4,C5,C6,C7,C12,C13,C17,C20	Capacitor, 0.1uF, 6.3V, 10%, X5R, 0402	Murata	GRM155R71A104KA01D	
2	2		C14,C19	Capacitor, 18pF, 50V, 5%, NPO, 0402	Murata	GRM155C1H180JZ01D	Critical Device
3	1		C21	Capacitor, 10uF, 6.3VDC, 20%, X5R, 0603	Murata	GRM188R60J106ME47D	
4	4		C3,C11,C15,C16	Capacitor, 1.0uF, 16VDC, 10%, X5R, 0603	Murata	GRM188R61C105KA93D	
5	2		C8,C27	Capacitor, 4.7uF, 6.3VDC, 20%, X5R, 0603	Murata	GRM188R60J475KE19D	
6	1		FB1	Ferrite Bead, 220 Ohm, 2A, 0.05DCR, 0603	Murata	BLM18EG221SN1D	
7	1		J1	Connector, SD/MMC4.0, Normal Mount, SMT	Proconn	SDC013-A0-5002	
8	1		J2	Connector Housing Assembly, XD, SMT	Proconn	XDC020-A0-0000	
9	1		J3	Connector, Mem. Stick, Classic-Duo-Pro-HG, Top Mount, SMT	Proconn	MSCN14-X0-2200	
10	1		J7	Receptacle, USB, Style B, Right Angle, Through-hole	FCI	61729-x0xxBLF	
11	1		LED1	LED, Bright Green, 0603	Rohm	SML-412MWT86	
12	1		LED3	LED, Bright Green, 0603	Rohm	SML-412MWT86	
13	1		R10	Resistor, 12.0K, 1%, 1/16W, 0603	Panasonic	ERJ-3EKF1202V	Critical Device
14	2		R11,R13	Resistor, 100K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ104V	
15	1		R14	Resistor, ZERO, 0.1W, 0603	Panasonic	ERJ-3GEY0R00V	
16	1		R15	Resistor, 1Meg, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ105V	
17	1		R19	Resistor, 330, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ331V	
18	3		R3,R18,R21	Resistor, 10K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ103V	
19	1		R4	Resistor, 2.2K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ222V	
20	2		R7,R20	Resistor, 2.2K, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ222V	
21	18		RT1,RT2,RT3,RT4,RT5,R5,RT6,RT7,RT8,RT9,RT10,RT11,RT12,R12,RT13,RT17,RT18,RT19	Resistor, 33ohm, 5%, 1/20W, 0201	Rohm	MCR006YZPJ330	
22	3		RT20,RT21,RT22	Resistor, Zero, 5%, 1/20W, 0201	Rohm	MCR006YZPJ000	
23	1		TP17	Pin, Ferrule, Uninsulated, for 0.5mm wire, 6mm long	Phoenix Contact	3200218	
25	1		U1	IC, USB2240, USB 2.0 Bus Powered Flash Media Controller, QFN-36B	SMSC	USB2240-AEZG	
25	1		U3	IC, MIC37100-3.3WS, LDO Regulator, 3.3V, 1A, SOT223-3	Micrel	MIC37100-3.3WS	
26	1		Y1	Crystal, 24.000MHz, 50ppm, 18pF, HC-49SMT	Citizen America	HCM49-24.000MABJ-JT	



**TABLE C-1: EVB-USB2240-IND EVALUATION BOARD BILL OF MATERIALS (CONTINUED)**

Item	Qty	Qty Populated	Reference Designator(s)	Description	Manufacturer	Manufacturer Part Number	Notes
27	1	0	BR1	Diode, Bridge, Switching, 50V, 140mA, KCAC, SOT-143	Infineon Tech	BGX50A	Do Not Populate
28	1	0	C18	Capacitor, 1.0uF, 16VDC, 10%, X5R, 0603	Murata	GRM188R61C105KA93D	Do Not Populate
29	2	0	C2,C10	Capacitor, 0.1uF, 6.3V, 10%, X5R, 0402	Murata	GRM155R71A104KA01D	Do Not Populate
30	8	0	C22,C23,C24,C25,C26,C39,C40,C41	Capacitor, 1000pF, 50V, 10%, X7R, 0402	Murata	GRM155R71H102KA01D	Do Not Populate
31	12	0	C28,C29,C30,C31,C32,C33,C34,C35,C36,C37,C38,C46	Capacitor, 0.1uF, 6.3V, 10%, X5R, 0402	Murata	GRM155R71A104KA01D	Do Not Populate
32	4	0	C42,C43,C44,C45	Capacitor, 4.7pF, 50V, +/-0.25pF, NPO, 0402	Murata	GRM1555C1H4R7CZ01D	Do Not Populate
33	1	0	C9	Capacitor, 47uF, 16VDC, 20%, Aluminum, SMT, 5mm x 6mm	Panasonic	EEV-FK1C470UR	Do Not Populate
34	1	0	FB2	Ferrite Bead, 220 Ohm, 2A, 0.05DCR, 0603	Murata	BLM18EG221SN1D	Do Not Populate
35	1	0	J5	Header, 1 x 4, 0.1 Inch, Vertical	AMP	9-146285-0	Do Not Populate
36	1	0	J6	Connector, Power Jack, 2.0mm, 12V, 4A, Right Angle	Cui Stack	PJ-002AH	Do Not Populate
37	1	0	L1	Inductor, Common Mode Choke, DLP11SN900SL2, 0504	Murata	DLP11SN900SL2	Do Not Populate
38	1	0	LED2	LED, Orange, 5mm, TH, Right Angle	Dialight	550-2505	Do Not Populate
39	1	0	R16	Resistor, ZERO, 0.1W, 0603	Panasonic	ERJ-3GEY0R00V	Do Not Populate
40	1	0	R17	Resistor, 470, 5%, 1/16W, 0603	Panasonic	ERJ-3GEYJ471V	Do Not Populate
41	2	0	RT14,RT15	Resistor, Zero, 5%, 1/20W, 0201	Rohm	MCR006YZPJ000	Do Not Populate
42	10	0	tp1,tp8,tp9,tp10,tp11,tp12,tp13,tp14,tp15,tp16	Header, 1 x 1, 0.1 Inch, Vertical	AMP	9-146285-0	Do Not Populate
43	1	0	U2	IC, 24C04, 2 Wire Serial EPROM, 4Kb, 2.5V, DFN-8	Microchip Technology	24LC04BT-I/MC	Do Not Populate

NOTES:



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