Multimedia Expansion Board User's Guide

Note the following details of the code protection feature on Microchip devices:

- Microchip products meet the specification contained in their particular Microchip Data Sheet.
- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.
- There are dishonest and possibly illegal methods used to breach the code protection feature. All of these methods, to our knowledge, require using the Microchip products in a manner outside the operating specifications contained in Microchip's Data Sheets. Most likely, the person doing so is engaged in theft of intellectual property.
- Microchip is willing to work with the customer who is concerned about the integrity of their code.
- Neither Microchip nor any other semiconductor manufacturer can guarantee the security of their code. Code protection does not mean that we are guaranteeing the product as "unbreakable."

Code protection is constantly evolving. We at Microchip are committed to continuously improving the code protection features of our products. Attempts to break Microchip's code protection feature may be a violation of the Digital Millennium Copyright Act. If such acts allow unauthorized access to your software or other copyrighted work, you may have a right to sue for relief under that Act.

Trademarks

ISBN: 978-1-62076-299-8

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
ISO/TS 16949

Microchip received ISO/TS-16949:2009 certification for its worldwide headquarters, design and wafer fabrication facilities in Chandler and Tempe, Arizona; Gresham, Oregon and design centers in California and India. The Company's quality system processes and procedures are for its PIC® MCUs and dsPIC® DSCs, KEELOQ® code hopping devices, Serial EEPROMs, microperipherals, nonvolatile memory and analog products. In addition, Microchip's quality system for the design and manufacture of development systems is ISO 9001:2000 certified.

Table of Contents

NOTES:

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 Multimedia Expansion Board. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This user's guide describes how to use the Multimedia Expansion Board and consists of the following chapters:

- **Chapter 1. "Introduction"** provides a brief overview of the Multimedia Expansion Board
- **Chapter 2. "Hardware"** provides the hardware descriptions of the Multimedia Expansion Board
- **Appendix A. "Board Layout and Schematics"** provides a block diagram, board layouts and detailed schematics of the Multimedia Expansion Board
- **Appendix B. "Bill of Materials (BOM)"** provides the Bill of Materials (BOM) for the Multimedia Expansion Board.

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
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 (in source code)	`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) { ... }`

RECOMMENDED READING

The following Microchip documents are available and recommended as supplemental reference resources.

Release Notes for the Multimedia Expansion Board

For the latest information, Microchip has a dedicated web page for the Multimedia Expansion Board, which can be accessed at: http://www.microchip.com/PIC32

Family Reference Manual Sections

Family Reference Manual sections are available, which explain the operation of the PIC32 microcontroller family architecture and peripheral modules. The specifics of each device family are discussed in the individual family's device data sheet.

Device Data Sheets

Refer to the appropriate device data sheet for device-specific information and specifications. These documents may be obtained from the Microchip web site or your local sales office.

Reference information found in these data sheets includes:

- Device memory maps
- Device pinout and packaging details
- Device electrical specifications
- List of peripherals included on the devices

PIC32MX Flash Programming Specification (DS61145)

Refer to this document for information on instruction sets and firmware development.

MPLAB® C Compiler for PIC32 User's Guide (DS51686)

This document, formerly the MPLAB C32 C Compiler for PIC32 User's Guide, details the use of Microchip's MPLAB C Compiler for PIC32 to develop an application.

MPLAB® IDE User's Guide (DS51519)

Refer this document for more information pertaining to the installation and implementation of the MPLAB IDE software, as well as the MPLAB Editor and MPLAB SIM Simulator software that are included with it.

THE MICROCHIP WEB SITE

Microchip provides online support through our web site at http://www.microchip.com. This web site makes files and information easily available to customers. Accessible by most Internet browsers, the web site contains the following information:

- **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 listings
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listings of seminars and events; and listings of Microchip sales offices, distributors and factory representatives

DEVELOPMENT SYSTEMS CUSTOMER CHANGE NOTIFICATION SERVICE

Microchip's customer notification service helps keep customers current on Microchip products. Subscribers will receive e-mail notification whenever there are changes, updates, revisions or errata related to a specified product family or development tool of interest.

To register, access the Microchip web site at http://www.microchip.com, click **Customer Change Notification** and follow the registration instructions.

The Development Systems product group categories are:

- **Compilers** – The latest information on Microchip C compilers and other language tools. These include the MPLAB® C compiler; MPASM™ and MPLAB 16-bit assemblers; MPLINK™ and MPLAB 16-bit object linkers; and MPLIB™ and MPLAB 16-bit object librarians.
- **Emulators** – The latest information on the Microchip MPLAB REAL ICE™ in-circuit emulator.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debugger, MPLAB ICD 3.
- **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 SIM simulator, MPLAB IDE Project Manager and general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include the MPLAB PM3 device programmer and the PICkit™ 3 development programmers.

CUSTOMER SUPPORT

Several channels are available to assist the users of Microchip products:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support
- Development Systems Information Line

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

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

DOCUMENT REVISION HISTORY

Revision A (June 2010)

This is the initial released version of the document.

Revision B (May 2012)

This revision includes the following updates:

- The Description for pins 90, 92, 94, 73, 115, and 85 in the Starter Kit Pin Descriptions table were updated (see Table 2-1)
- References to PIC32MX were removed, with the exception of the reference to the *"PIC32MX Flash Programming Specification"*
- Updates to formatting and minor text changes were incorporated throughout the document

NOTES:

Chapter 1. Introduction

Thank you for purchasing Microchip Technology Multimedia Expansion Board. This compact, highly versatile board can be connected to any PIC32 starter kit for the purpose of developing multimedia applications, such as audio, graphics and touch screen.

This chapter includes the following topics:

- Kit Contents
- Multimedia Features

1.1 KIT CONTENTS

The Multimedia Expansion Board kit contains the following items:

- Multimedia Expansion Board
- Multimedia Expansion Board Information Sheet

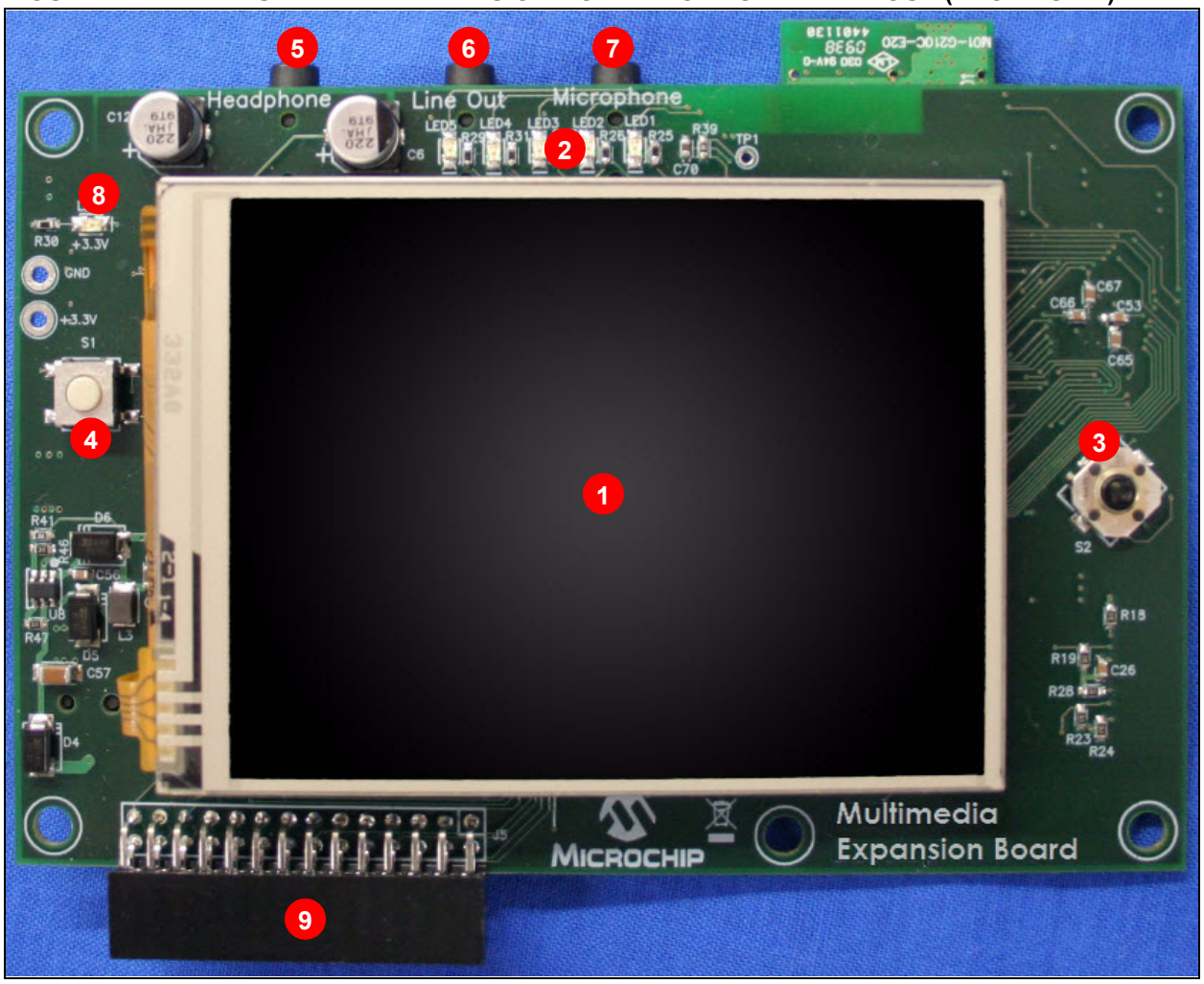
1.2 MULTIMEDIA FEATURES

The component layout of the Multimedia Expansion Board is shown in Figure 1-1 (front side) and Figure 1-2 (back side).

The front side of the board includes these key features, as shown in Figure 1-1:

1. 3.2 inch (8.1 cm) QVGA touch screen display with backlight.
2. Five user-controlled LEDs.
3. Four-way joystick (S2).
4. Fire button (S1).
5. Headphone jack.
6. Line output jack.
7. Microphone input jack.
8. Power LED.
9. I/O expansion connector.

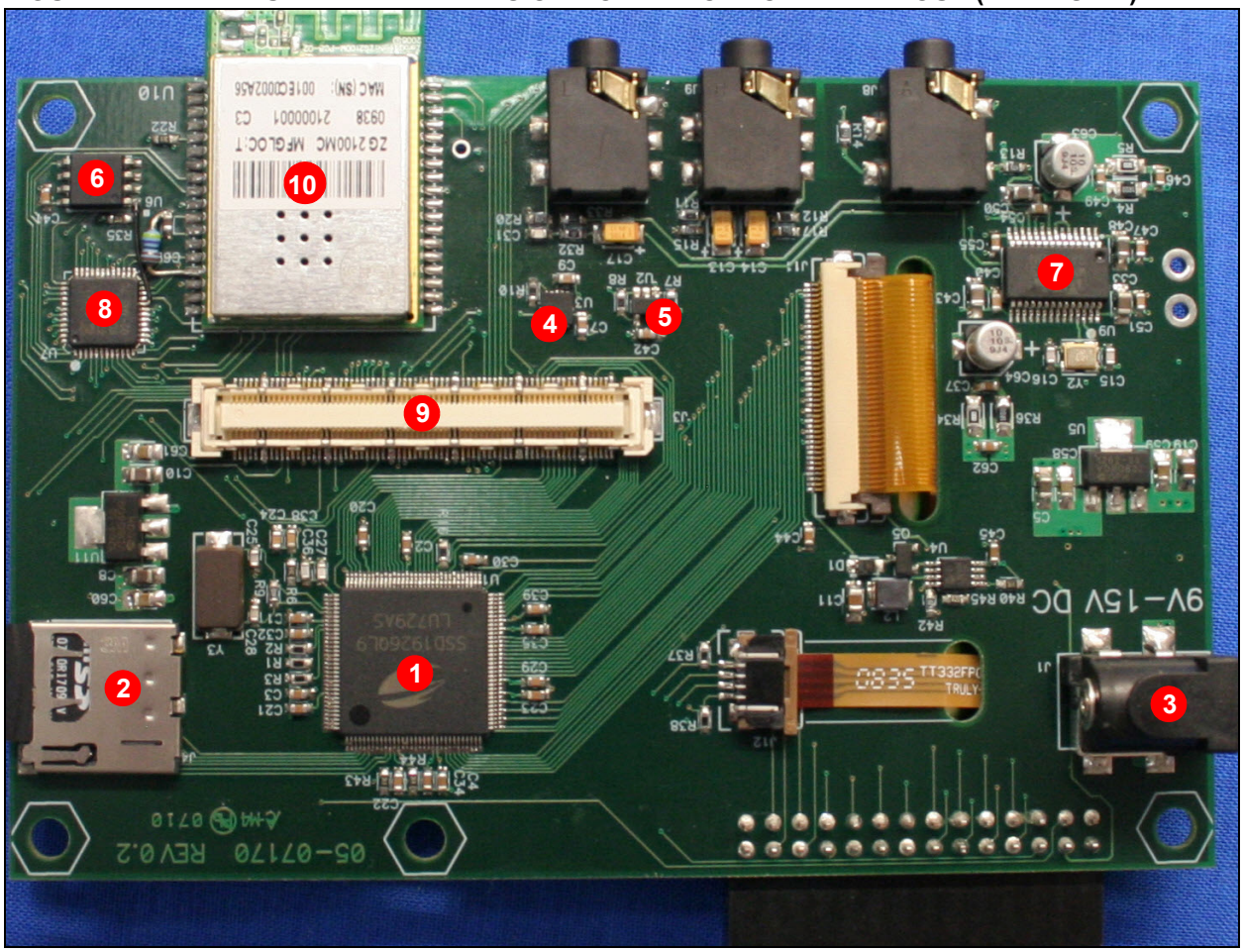
FIGURE 1-1: MULTIMEDIA EXPANSION BOARD COMPONENT LAYOUT (FRONT SIDE)



The back side of the board includes these key features, as indicated in Figure 1-2:

1. Solomon Systech Graphics Controller (SSD1926).
2. microSD card slot.
3. Regulated 3.3V and 1.8V power supply for powering the board via a starter kit or 9-14V power supply.
4. Accelerometer and temperature sensor (BMA150).
5. 24LC08 EEPROM.
6. 2 MB SPI Flash (SST25VF016).
7. 24-bit stereo audio codec (WM8731).
8. CPLD for SPI and Chip Select configuration.
9. PIC32 starter kit connector.
10. Integrated 802.11 wireless connectivity.

FIGURE 1-2: MULTIMEDIA EXPANSION BOARD COMPONENT LAYOUT (BACK SIDE)



NOTES:

Chapter 2. Hardware

This chapter describes the hardware used in the Multimedia Expansion Board. Topics covered include:

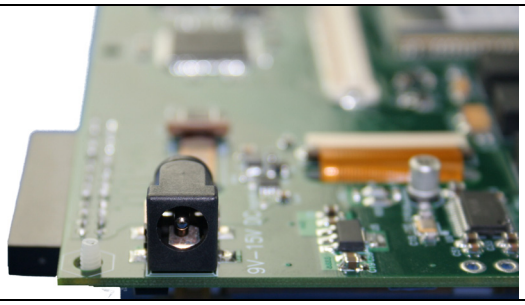
- Power Supply
- Starter Kit Connector
- Display
- microSD Card Slot
- Joystick and Fire Button
- User-Controlled LEDs
- Accelerometer and Temperature Sensor
- External Memory
- 24-bit Audio Codec
- 802.11 Wireless Connectivity
- I/O Expansion Connector
- CPLD

Note: Refer to **Appendix B. "Bill of Materials (BOM)"** for the manufacturer and part number information of the hardware components used in the Multimedia Expansion Board.

2.1 POWER SUPPLY

Power can be supplied to the Multimedia Expansion Board through the DC connector located on the Multimedia Expansion Board (Figure 2-1). By connecting a 9-14V power supply to the DC connector, the Multimedia Expansion Board and starter kit will receive the proper voltages. The user can also supply power via the starter kit. However, if the application uses multiple features of the Multimedia Expansion Board, it is recommended to use a 9-14V power supply.

FIGURE 2-1: DC POWER SUPPLY



CAUTION

When connecting the Multimedia Expansion Board or starter kit, do not have power applied when connecting the DC power supply. Failure to heed this caution could result in hardware damage.

2.2 STARTER KIT CONNECTOR

Any PIC32 starter kit can be used in conjunction with the Multimedia Expansion Board through the PIC32 expansion connector, as shown in Figure 2-2. After connecting a PIC32 starter kit, applications can be developed and run using the rich features of the Multimedia Expansion Board. Table 2-1 provides information on starter kit pins and the corresponding Multimedia Expansion Board device.

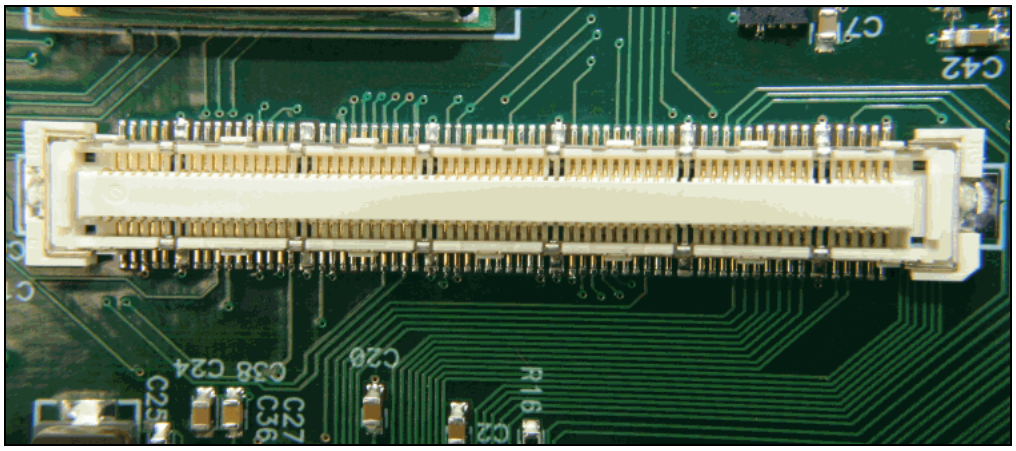
TABLE 2-1: STARTER KIT PIN DESCRIPTION

Starter Kit Connector (J3)			Multimedia Expansion Board	
Pin #	**Description**	**Pin Type**	**Device**	**Description**
25	PMP Data <7:0>	I/O	Graphics Controller (SSD1926)	8-bit or 16-bit Data Bus
23		I/O		
21		I/O		
19		I/O		
17		I/O		
15		I/O		
13		I/O		
9		I/O		
7		I/O		
10	PMP Data <15:8>	I/O		
14		I/O		
16		I/O		
18		I/O		
20		I/O		
22		I/O		
24		I/O		
26		I/O		
8	RG13	O		Chip Select
101	RB10	O		Register Select
39	RC3	I		Wait Line
115	RA10	O		Reset
103	RB11	I/O	Touch Screen	X+
105	RB12	O		Y-
107	RB13	O		X-
127	RB14	I/O		Y+
72	RB0/CN2	I	Joystick	Left
70	RB1/CN3	I		Up
66	RB3/CN5	I		Down
64	RB4/CN6	I		Right
36	RB15/CN12	I		Fire
44	RD1	O	LEDs	LED1
42	RD2	O		LED2
40	RD3	O		LED3
35	RC1	O		LED4
37	RC2	O		LED5

TABLE 2-1: STARTER KIT PIN DESCRIPTION (CONTINUED)

Starter Kit Connector (J3)			Multimedia Expansion Board	
Pin #	**Description**	**Pin Type**	**Device**	**Description**
74	SDA2	I	I^2C™ bus for BMA150, MCHP24LC08 and WM8731	I^2C Bus
76	SCL2	O		
91	SCK1	O	SPI Bus for WM8731	SPI Bus
93	SDI1	I		
95	SDO1	O		
4	RA6	O	CPLD	Control Pins
6	RA7	O		
5	RG12	O		
3	RG14	O		
45	SCK2	O		SPI Bus
47	SDI2	I		
49	SDO2	O		
51	RG9	O		Chip Select
106	SCK3A	O		SPI Bus
110	SDI3A	I		
112	SDO3A	O		
108	RF12	O		Chip Select
97	$\overline{SS1}$	O		Codec DACLRC
54	RD9	O		
81	INT3	I	MRF24WBOMA	External Interrupt
115	RA10	O		Reset
71	RB8	O		Chip Enable
76	SCL2	I/O	PICtail™ J5	Pin 3
74	SDA2	I/O		Pin 5
47	SDI2	I/O		Pin 7
49	SDO2	I/O		Pin 9
45	SCK2	I/O		Pin 11
51	RG9	I/O		Pin 13
88	U1RX	I/O		Pin 15
90	U1TX	I/O		Pin 21
92	$\overline{U1RTS}$	I/O		Pin 25
94	$\overline{U1CTS}$	I/O		Pin 27
73	RB9	I/O		Pin 19
115	RA10	O		Pin 17
85	INT1	I/O		Pin 23
84	SCL1	I/O		Pin 4
86	SDA1	I/O		Pin 6
97	$\overline{SS1}$	I/O		Pin 8
110	U2RX	I/O		Pin 16
112	U2TX	I/O		Pin 18
106	$\overline{U2RTS}$	I/O		Pin 20
108	$\overline{U2CTS}$	I/O		Pin 22

FIGURE 2-2: EXPANSION CONNECTOR FOR EASY INTERFACE TO PIC32 STARTER KITS



CAUTION

When connecting the Multimedia Expansion Board to a starter kit, do not have power applied to either the starter kit or the DC power supply. Failure to heed this caution could result in hardware damage.

2.3 DISPLAY

The Multimedia Expansion Board has a 3.2 inch (8.1 cm) QVGA TFT touchscreen, as shown in Figure 2-3. The display is controlled by a Solomon Systech SSD1926 LCD controller, which is shown in Figure 2-4. The display controller may be configured to use an 8-bit or 16-bit interface (see **Section 2.12 "CPLD"** for configuration data). The display also has a resistive touch screen and backlight controls, as shown in Figure 2-5.

FIGURE 2-3: 3.2 INCH (8.1 CM) QVGA TFT TOUCH SCREEN

FIGURE 2-4: SOLOMON SYSTECH SSD1926 LCD CONTROLLER

FIGURE 2-5: SOLOMON SYSTECH SSD1926 LCD CONTROLLER SCHEMATIC

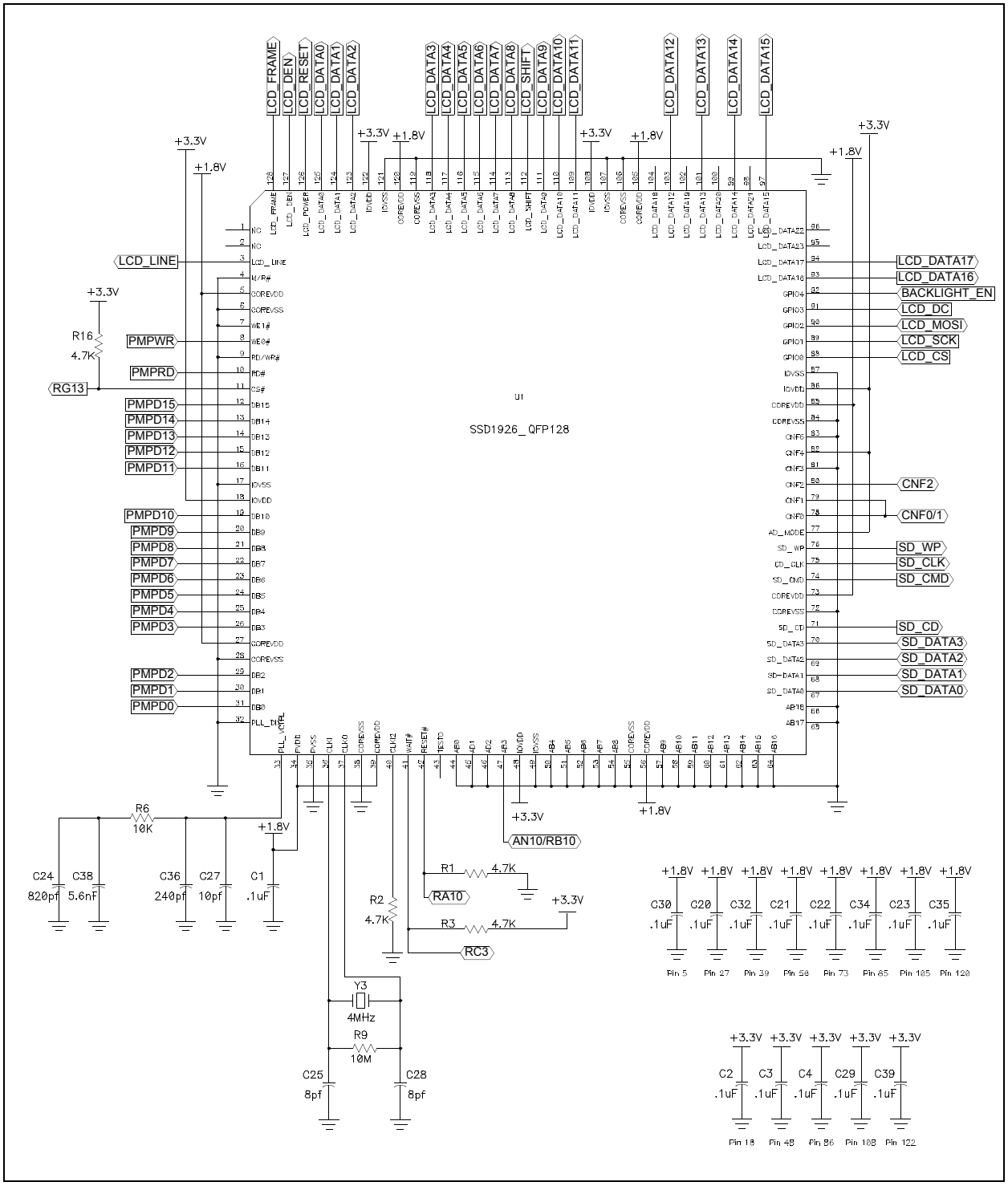


FIGURE 2-6: TOUCHSCREEN CONNECTOR

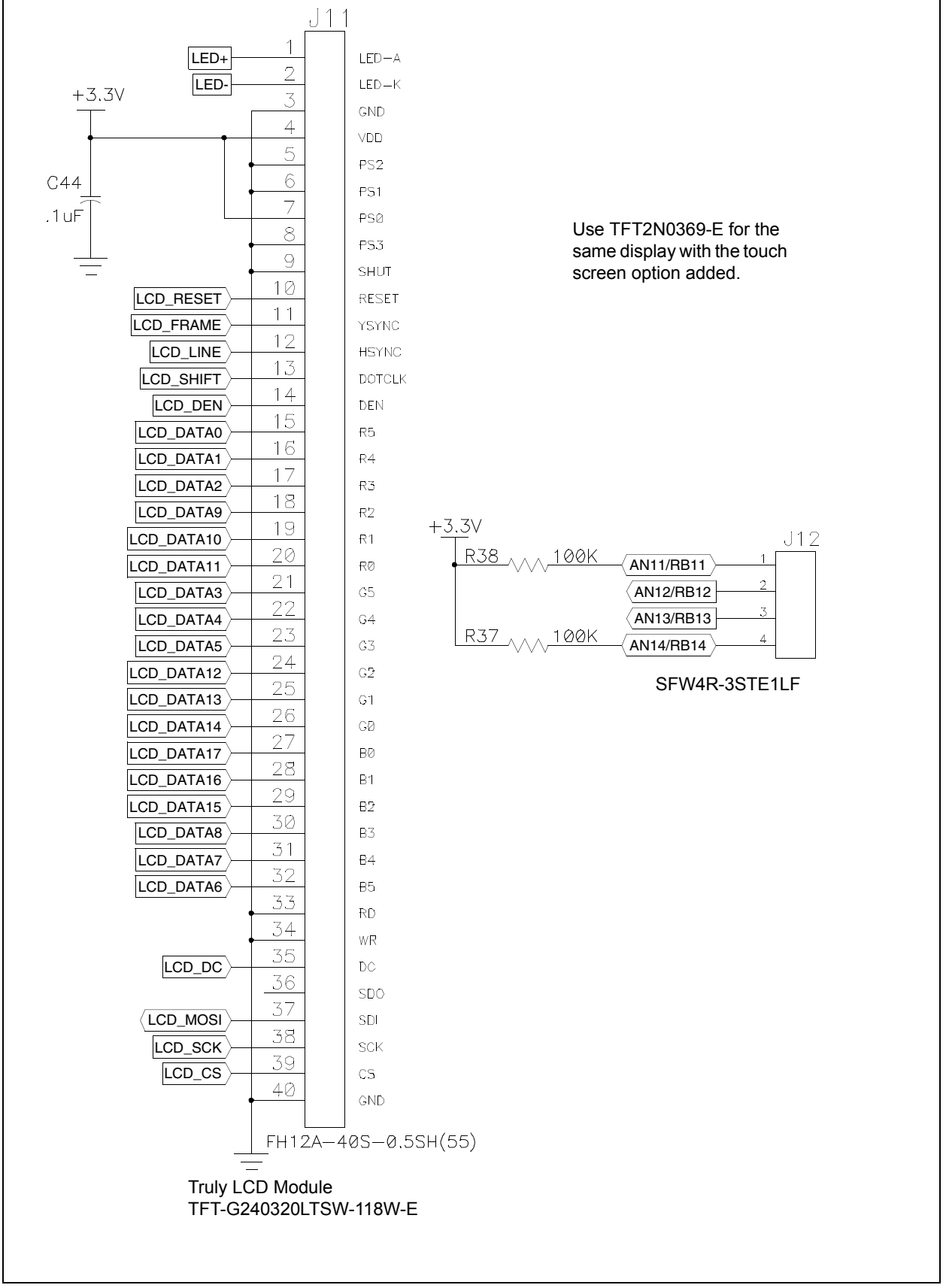


TABLE 2-2: SOLOMON SYSTECH SSD1926 LCD CONTROLLER I/O CONNECTIONS

SSD1926 Pin Description	Expansion Connector Pin
Chip Select	RG13
Chip Reset(1)	RA10
Chip Register Select	RB10
Chip Wait	RC3

Note 1: This pin is shared with 802.11 and PICtail™ daughter boards.

TABLE 2-3: DISPLAY TOUCH SCREEN I/O CONNECTIONS

Touch Screen Pin	Expansion Connector Pin
X+	AN11/RB11
X-	RB13
Y+	AN14/RB14
Y-	RB12

2.4 microSD CARD SLOT

The Solomon Systech SSD1926 Graphics Controller provides a four-wire SD card interface, as shown in Figure 2-7. The Multimedia Expansion Board takes advantage of this interface by providing a microSD card slot, as shown in Figure 2-8.

FIGURE 2-7: microSD CARD SLOT

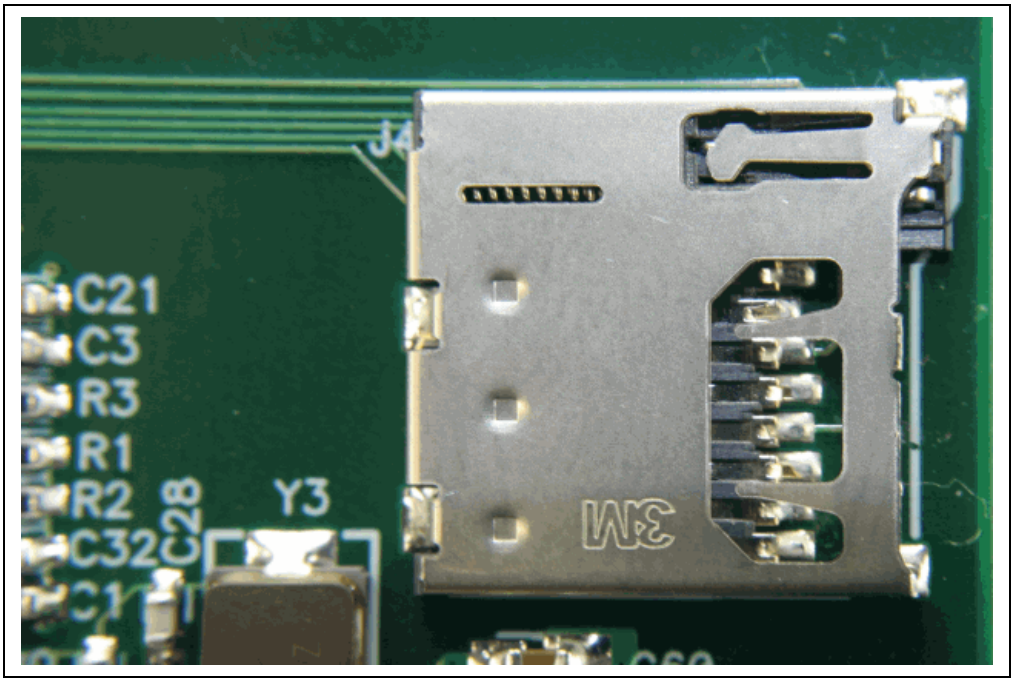
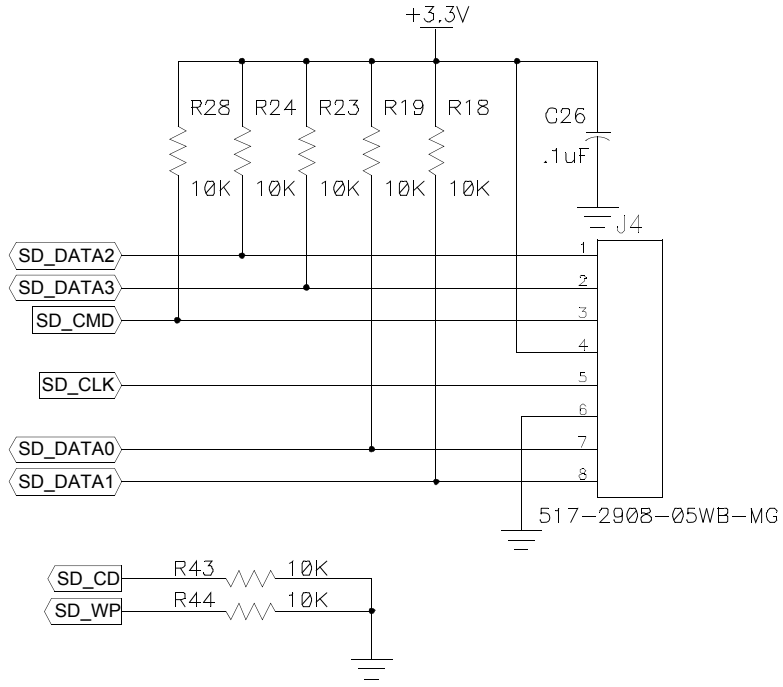


FIGURE 2-8: SOLOMON SYSTECH SSD1926 LCD CONTROLLER AND microSD CARD CONNECTION SCHEMATIC



2.5 JOYSTICK AND FIRE BUTTON

The Multimedia Expansion Board provides a four direction joystick with a fire button (Figure 2-9). The directional joystick and fire button can be used to interact with and provide feedback to an application. The joystick (S2) is also connected to the fire button (S1), as shown in Figure 2-10, which allows the user to press either the fire button or the joystick to register a fire command.

FIGURE 2-9: JOYSTICK (S2 SWITCH)

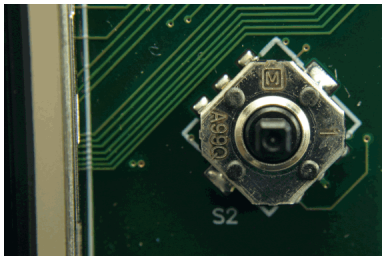


FIGURE 2-10: FIRE BUTTON (S1 SWITCH)

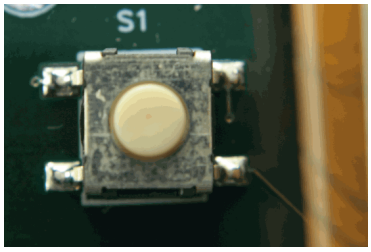


FIGURE 2-11: JOYSTICK AND FIRE BUTTON CONNECTION SCHEMATIC

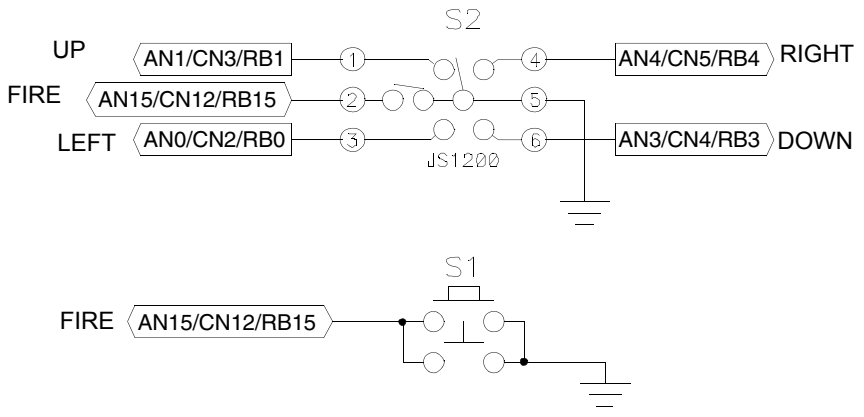


TABLE 2-4: JOYSTICK AND FIRE BUTTON CONNECTIONS

Joystick and Fire Button Pin Description	Expansion Connector Pin
Up	RB1/CN3
Down	RB3/CN5
Left	RB0/CN2
Right	RB4/CN6
Fire	RB15/CN12

2.6 USER-CONTROLLED LEDs

The Multimedia Expansion Board provides five user-controlled LEDs, as shown in Figure 2-12.

FIGURE 2-12: LEDs

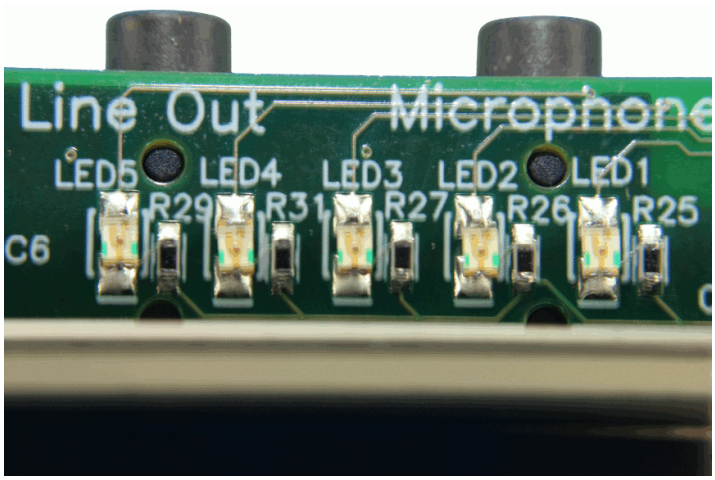


FIGURE 2-13: LED CONNECTION SCHEMATIC

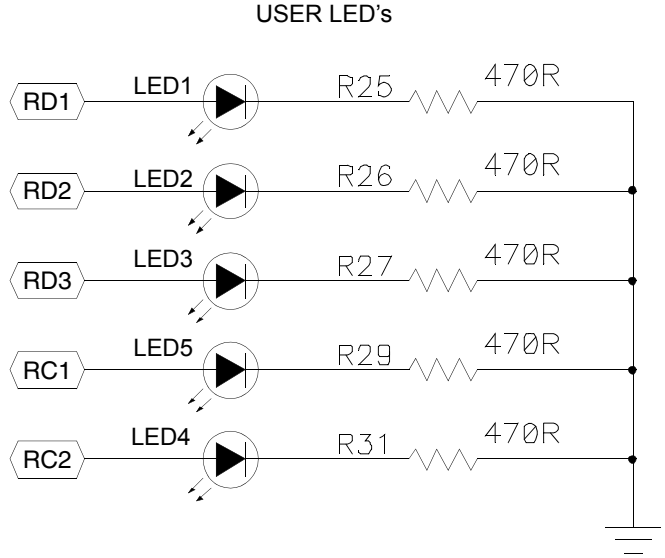


TABLE 2-5: LED CONNECTIONS

LED Description	Expansion Connector Pin
LED 1	RD1
LED 2	RD2
LED 3	RD3
LED 4	RC1
LED 5	RC2

2.7 ACCELEROMETER AND TEMPERATURE SENSOR

To measure acceleration and temperature, the Multimedia Expansion Board provides an interface to the BMA150, which is a 3-axis (x, y and z plane) accelerometer and temperature sensor, as shown in Figure 2-14. The PIC® microcontroller uses an I²C™ bus interface to communicate with the BMA150.

FIGURE 2-14: BMA150 ACCELEROMETER AND TEMPERATURE SENSOR

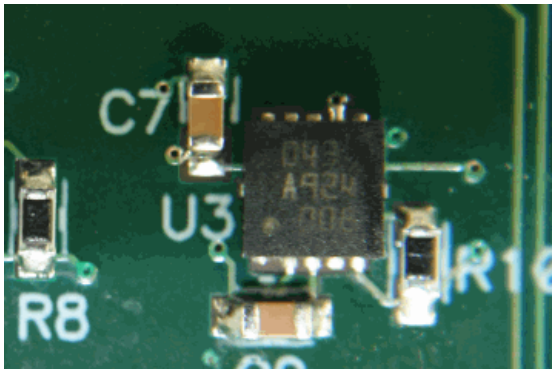
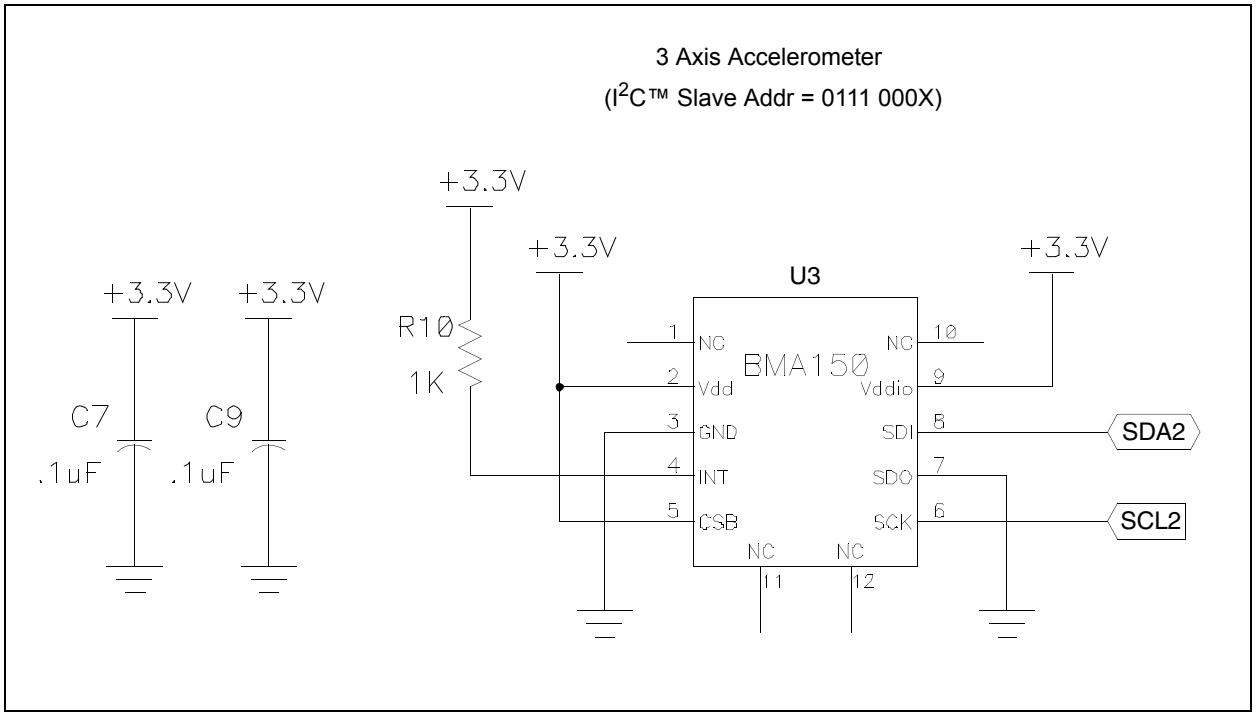


FIGURE 2-15: BMA150 CONNECTION SCHEMATIC



2.8 EXTERNAL MEMORY

The Multimedia Expansion Board provides two different on-board storage mediums, an EEPROM (24LC08) and serial NOR Flash (SST25VF016).

2.8.1 EEPROM

The 24LC08 is a 128-byte EEPROM, as shown in Figure 2-16. The PIC32 microcontroller uses an I^2C bus interface to communicate to the 24LC08.

FIGURE 2-16: 24LC08 EEPROM

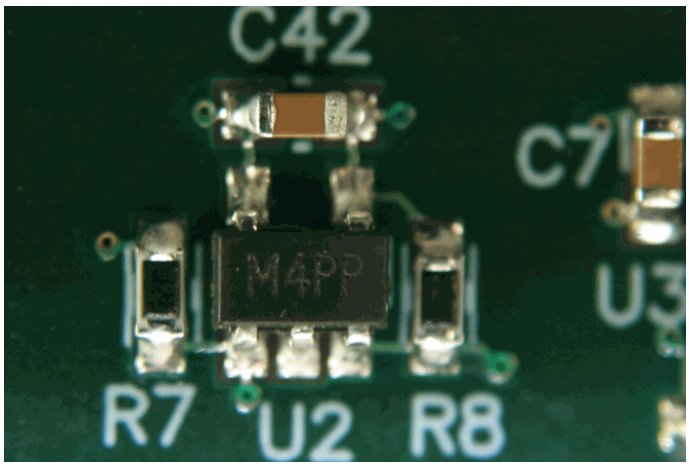
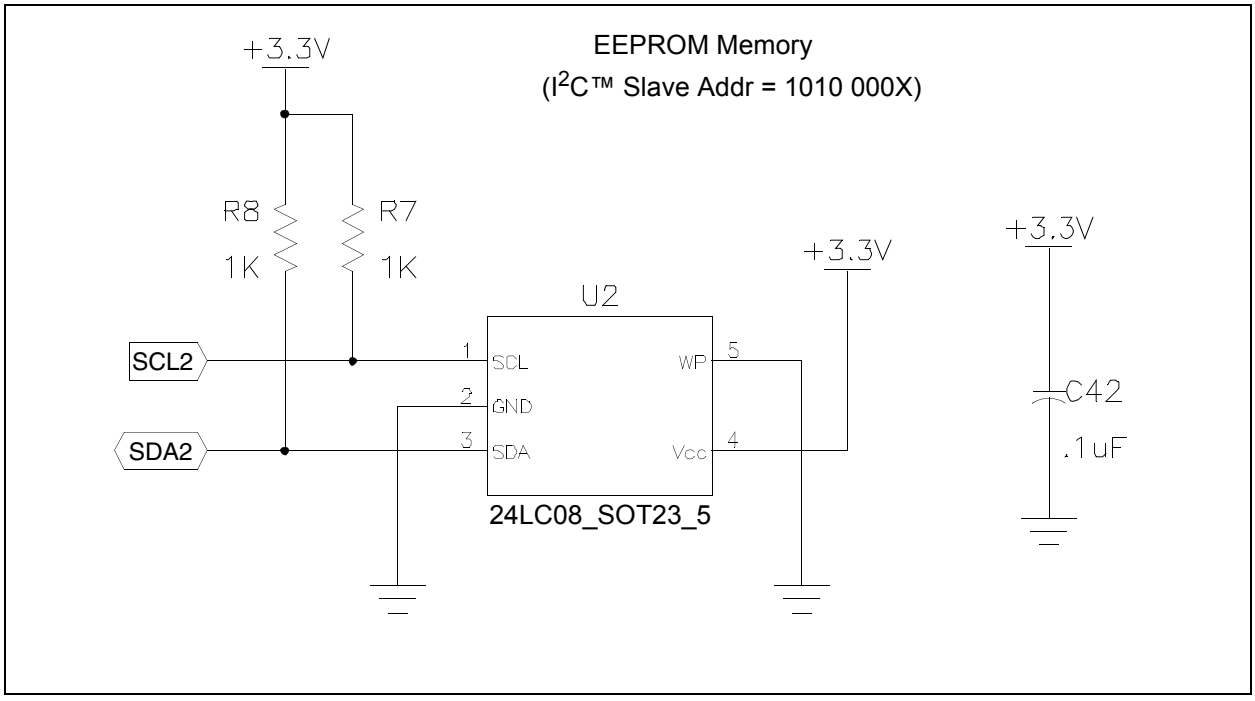


FIGURE 2-17: 24LC08 CONNECTION SCHEMATIC



2.8.2 NOR Flash

The SST25VF016 is a 2 MB NOR Flash, as shown in Figure 2-18. The PIC32 microcontroller uses a SPI bus interface to communicate to the SST25VF016. The CPLD needs to be properly configured for the PIC32 microcontroller to be able to access the SST25VF016. For configuration information, see **Section 2.12 "CPLD"**.

FIGURE 2-18: SST25VF016 NOR FLASH

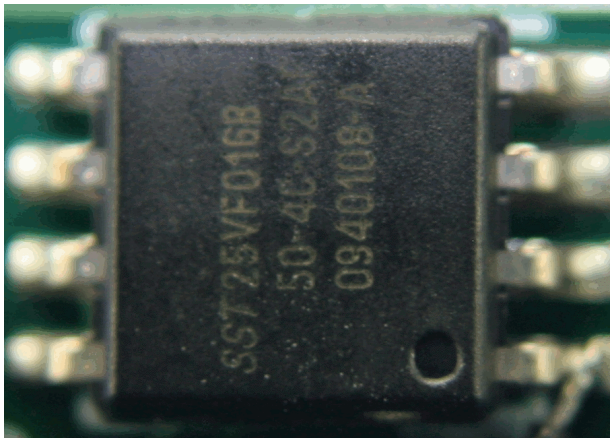
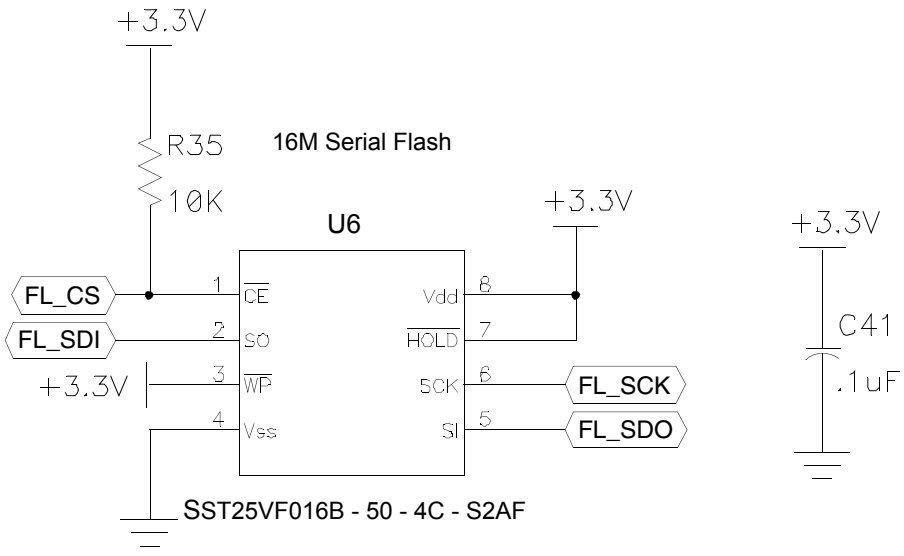


FIGURE 2-19: SST25VF016 CONNECTION SCHEMATIC



2.9 24-BIT AUDIO CODEC

Using the WM8731 24-bit Audio Codec, the Multimedia Expansion Board can run applications that require audio playback and/or recording, as shown in Figure 2-20. For playing back audio, the Multimedia Expansion Board provides two output jacks, a headphone and line out jack, which are shown in Figure 2-21. A microphone input jack is also provided for audio recording. The WM8731 interfaces to the PIC32 microcontroller via the SPI and I^2C buses.

FIGURE 2-20: WM8731 24-BIT AUDIO CODEC

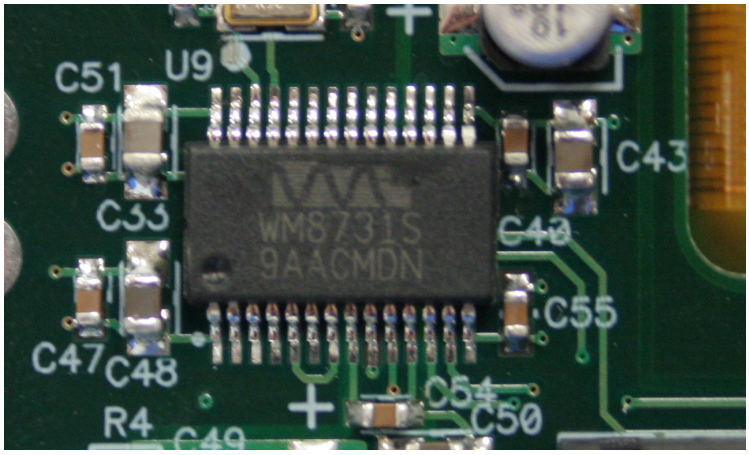


FIGURE 2-21: HEADPHONE, LINE OUT AND MICROPHONE JACKS

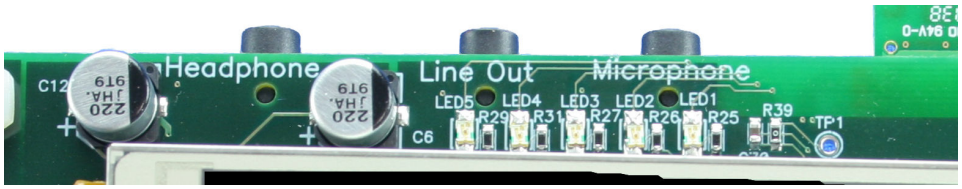


FIGURE 2-22: WM8731 CONNECTION SCHEMATIC

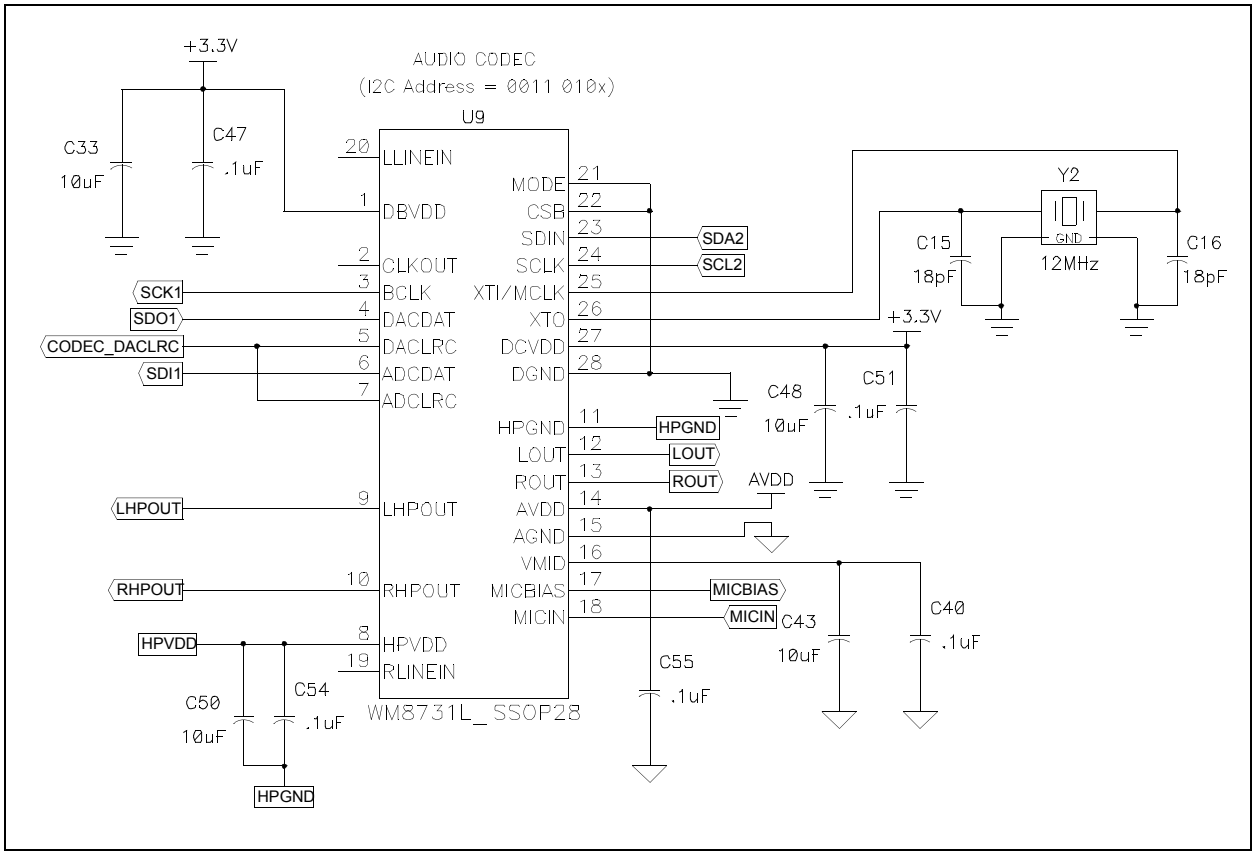
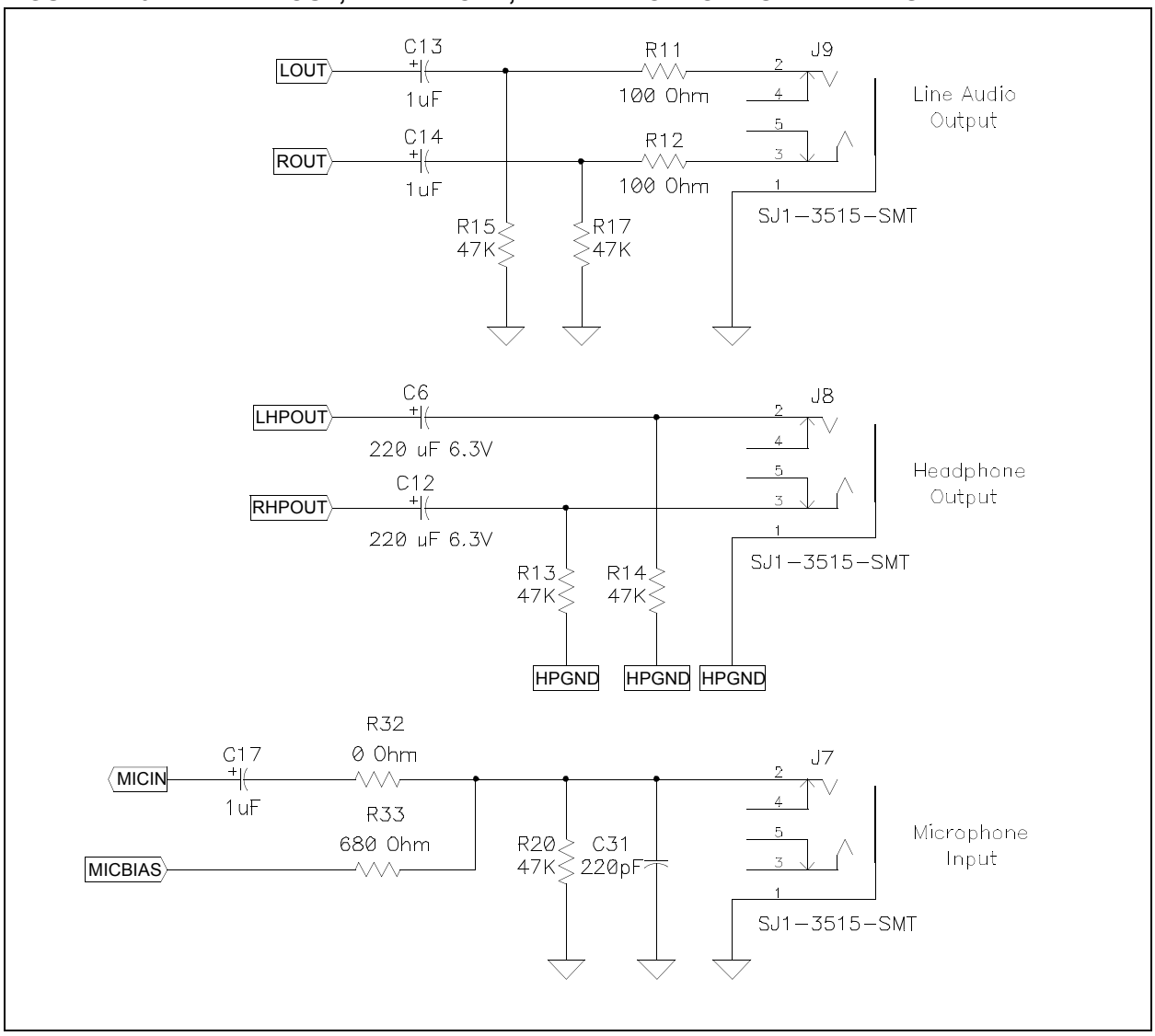


FIGURE 2-23: LINE OUT, HEADPHONE, AND MICROPHONE SCHEMATICS

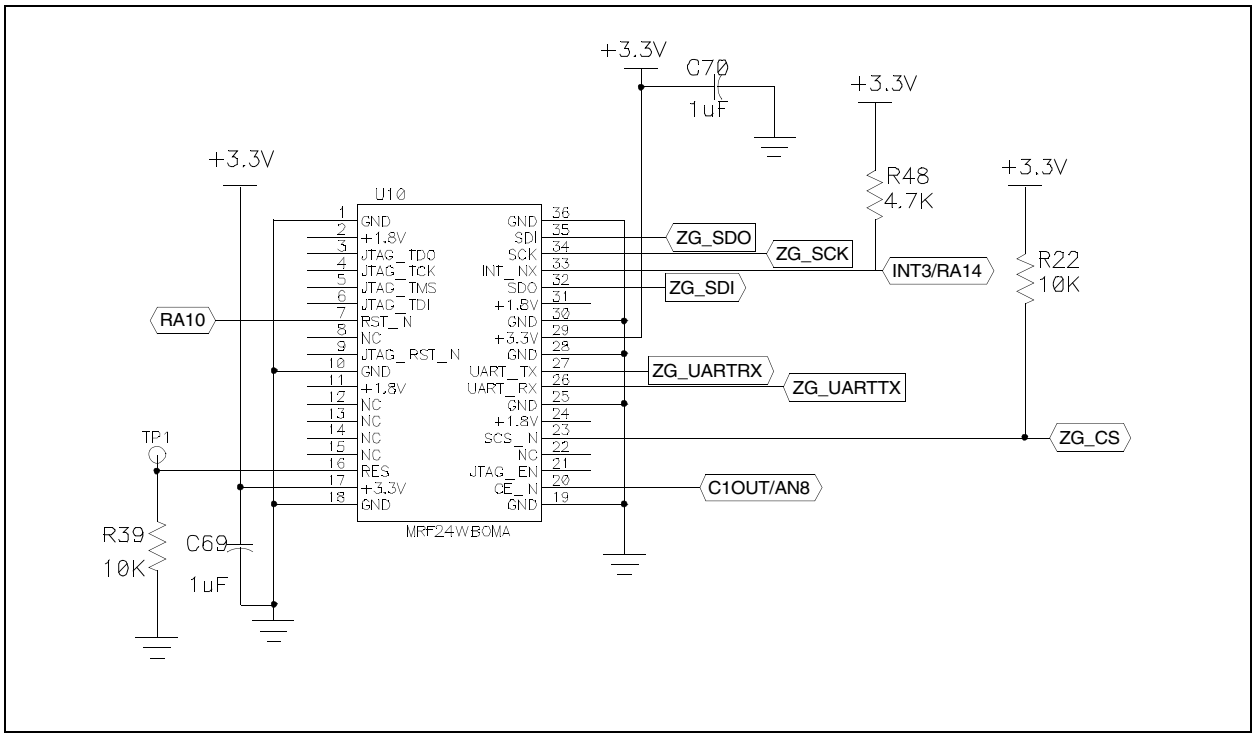


2.10 802.11 WIRELESS CONNECTIVITY

The Multimedia Expansion Board has 802.11 wireless connectivity, which is provided by the Microchip MRF24WBOMA module, as shown in Figure 2-24. The PIC32 microcontroller uses a SPI bus interface to communicate to the MRF24WBOMA. The CPLD needs to be properly configured for the PIC32 microcontroller to access the MRF24WBOMA. For configuration information, see **Section 2.12 "CPLD"**.

FIGURE 2-24: MRF24WBOMA 802.11 WIRELESS CONNECTIVITY

FIGURE 2-25: MRF24WBOMA CONNECTION SCHEMATIC



2.11 I/O EXPANSION CONNECTOR

The Multimedia Expansion Board provides an expansion slot, which enables the use of several of Microchip's PICtail™ daughter boards, as shown in Figure 2-26. For more information on how to properly interface to the board as not all daughter boards are compatible, refer to the specific PICtail daughter board schematic.

FIGURE 2-26: I/O EXPANSION CONNECTOR

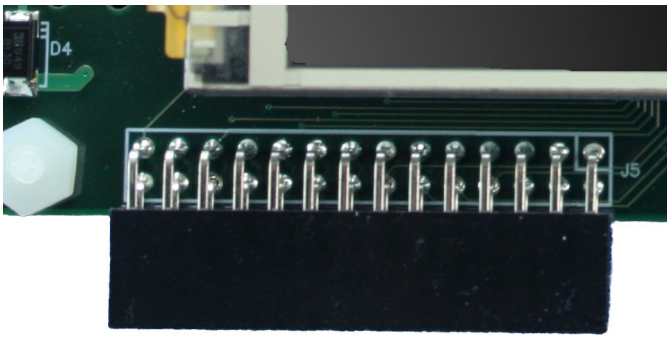
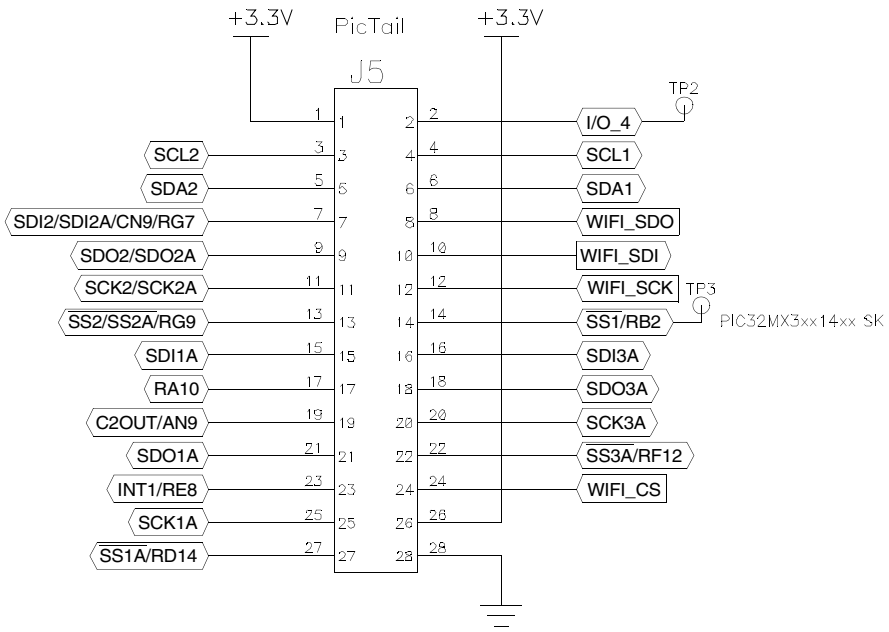


FIGURE 2-27: I/O EXPANSION CONNECTOR SCHEMATIC



2.12 CPLD

A CPLD is provided to configure the graphics controller bus interface, SPI channel and Chip Selects used for SPI Flash, the MRF24WBOMA, and the expansion slot, as shown in Figure 2-28. The general I/O inputs are used to change the configuration, which can be done at run time. Table 2-6 provides information on the Graphics Bus Width CPLD configuration. Table 2-7 and Table 2-8 provide information on the SPI channels that are configured by the CPLD. Table 2-9 provides information on the default CPLD configuration combinations for PIC32 Starter Kits.

FIGURE 2-28: CPLD

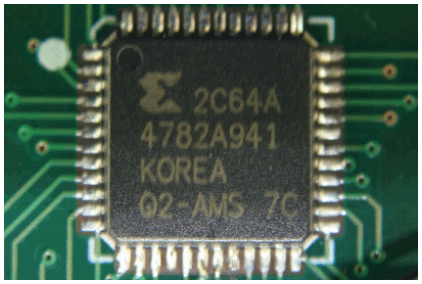


FIGURE 2-29: CPLD SLOT CONNECTION SCHEMATIC

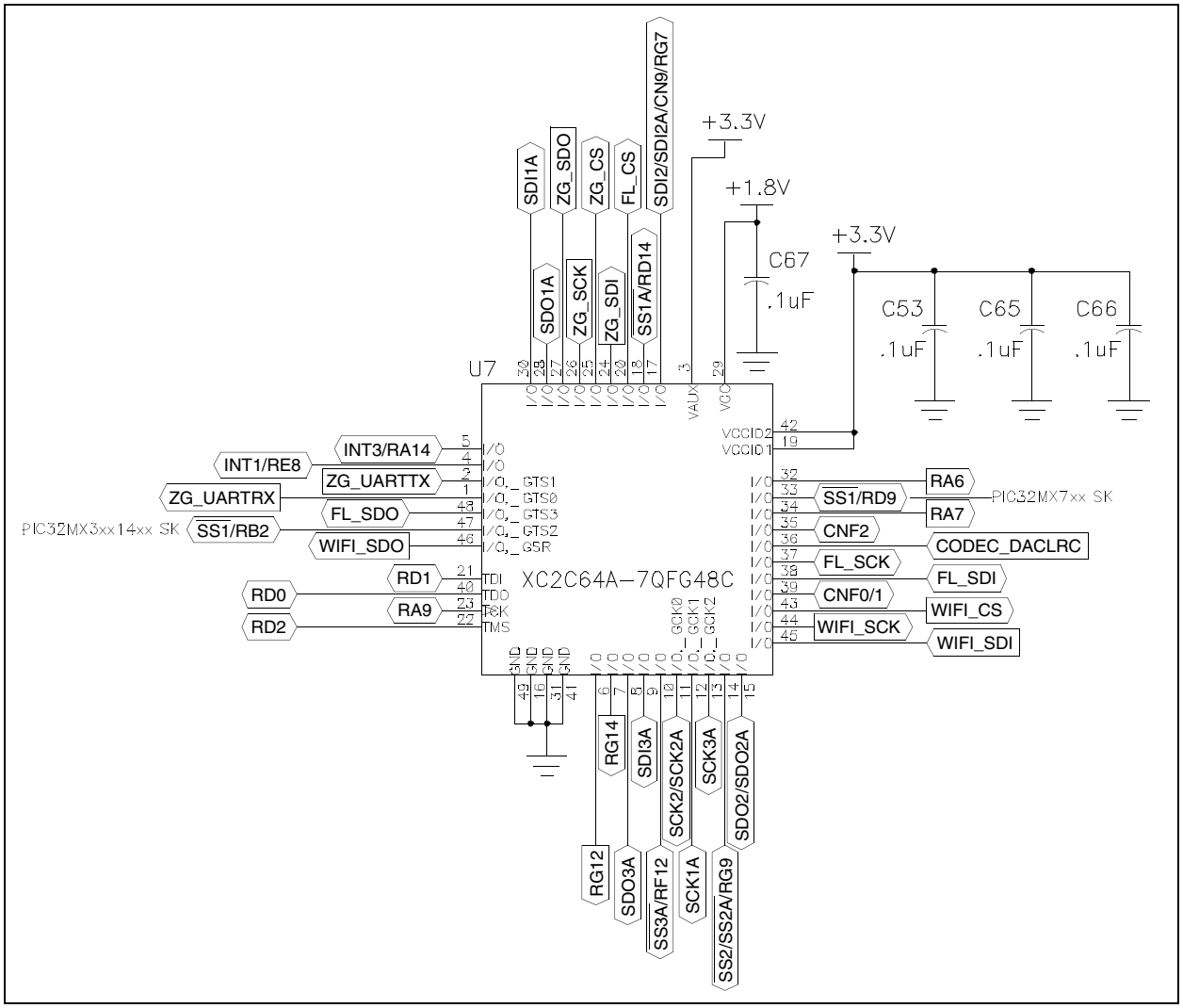


TABLE 2-6: GRAPHICS BUS WIDTH

RG14 Pin Setting	Width
0	8
1	16

TABLE 2-7: CPLD SPI SOURCE SELECT

RG12 Pin Setting	SPI	Chip Select
0	SPI3A	RF12
1	SPI2/SPI2A	RG9

TABLE 2-8: CPLD SPI PERIPHERAL DESTINATION SELECT

RA7 Pin Setting	RA6 Pin Setting	Peripheral
0	0	SPI Flash
0	1	MRF24WBOMA
1	0	Expansion Slot
1	1	Reserved

TABLE 2-9: PIC32 STARTER KIT CPLD

Expansion Connector Pin				PIC32 Starter Kit CPLD Configuration		
RG14	RG12	RA7	RA6	PIC32 General Purpose Starter Kit (DM320001)	PIC32 USB Starter Kit II (DM320003-2)	PIC32 Ethernet Starter Kit (DM320004)
0	x	x	x	Yes	Yes	Yes
1	x	x	x	Yes	Yes	Yes
x	0	x	x	No	Yes	Yes
x	1	x	x	Yes	Yes	No
x	x	0	0	Yes	Yes	Yes
x	x	0	1	Yes	Yes	Yes
x	x	1	0	Yes	Yes	Yes
x	x	1	1	Yes	Yes	Yes

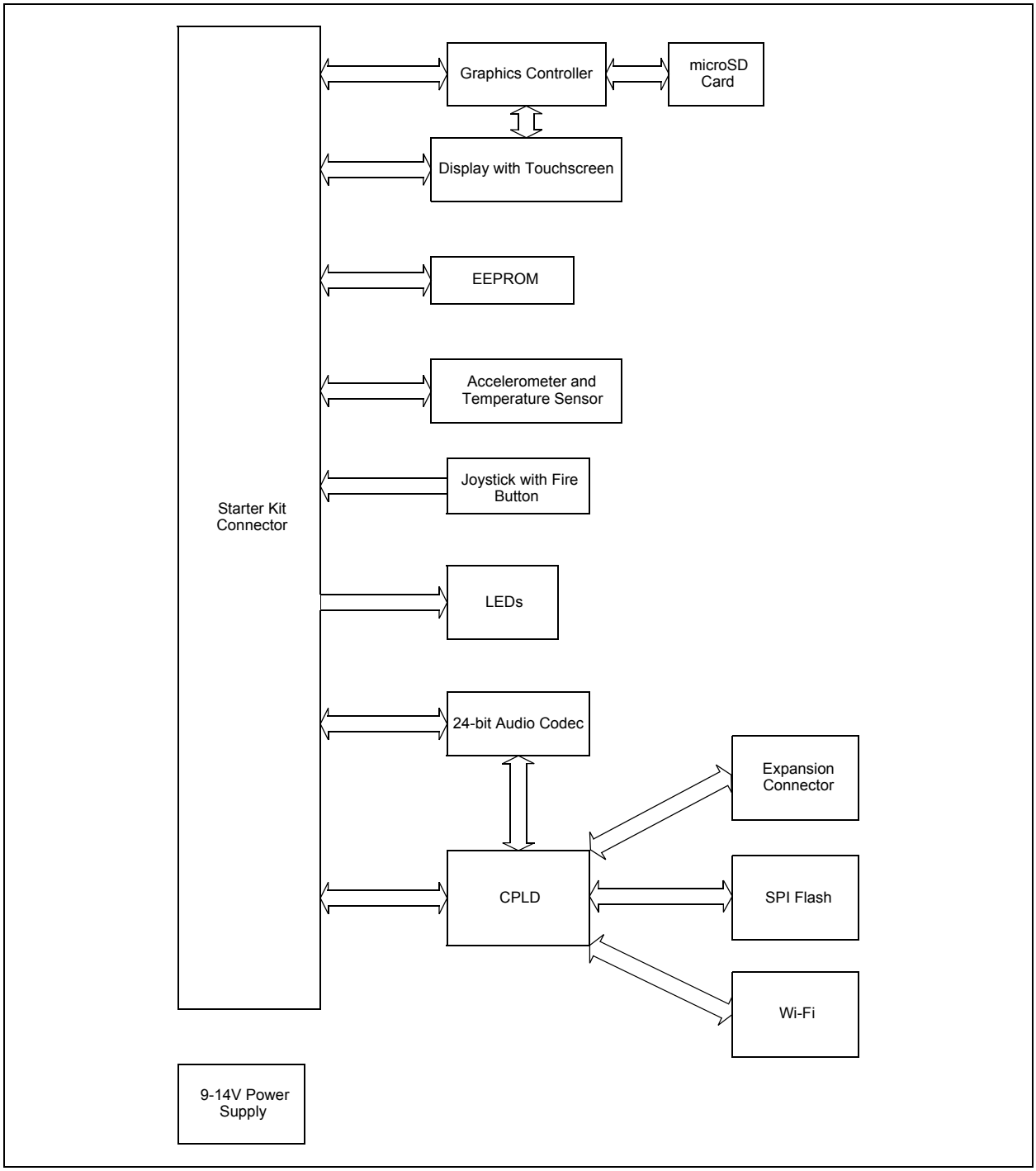
Legend: An 'x' indicates this pin is a 'don't care', — = unimplemented.

NOTES:

Appendix A. Board Layout and Schematics

A.1 MULTIMEDIA EXPANSION BOARD BLOCK DIAGRAM

FIGURE A-1: HIGH-LEVEL BLOCK DIAGRAM OF THE MULTIMEDIA EXPANSION BOARD



A.2 MULTIMEDIA EXPANSION BOARD LAYOUT

FIGURE A-2: MULTIMEDIA EXPANSION BOARD LAYOUT - FRONT SIDE (TOP ASSEMBLY)

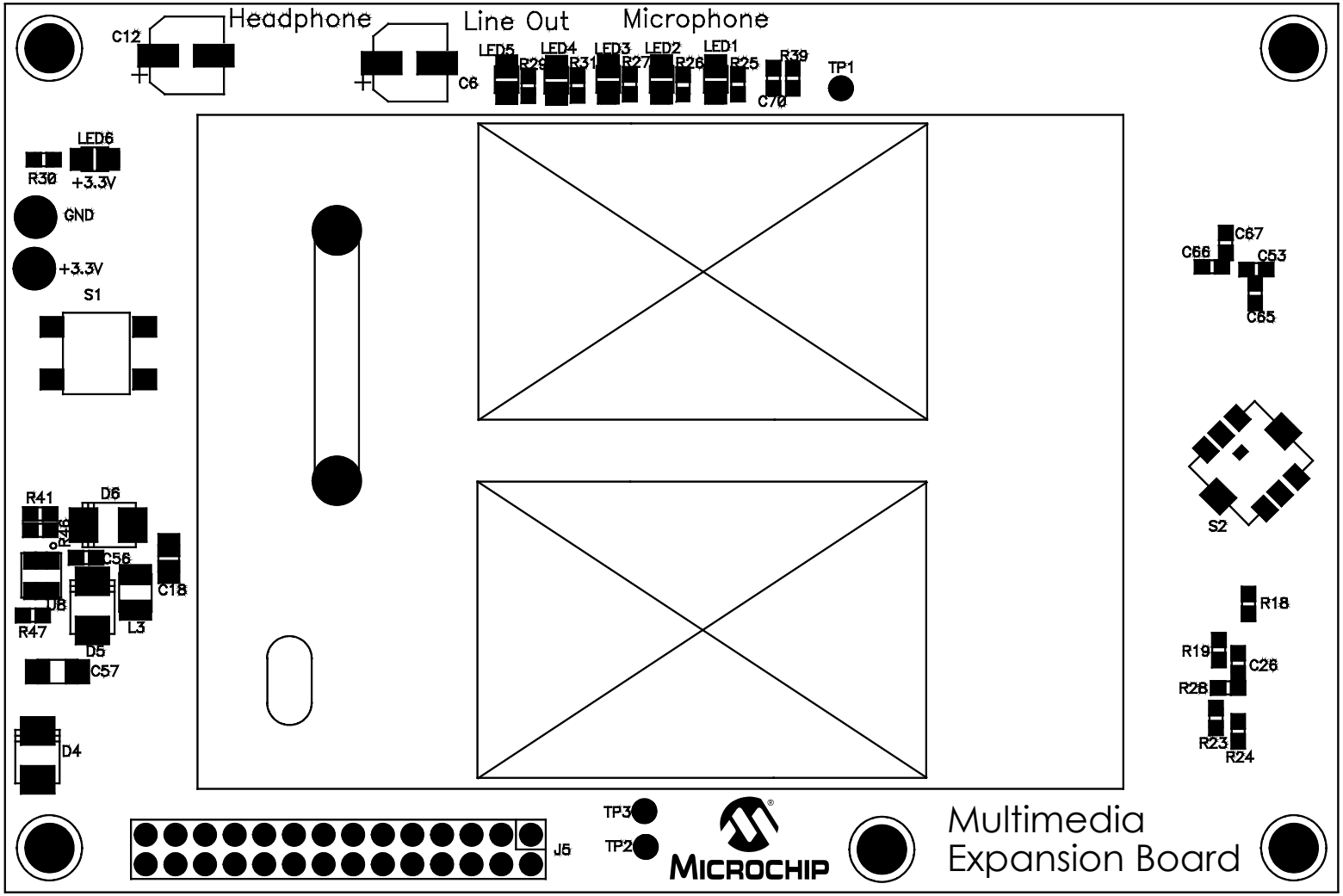
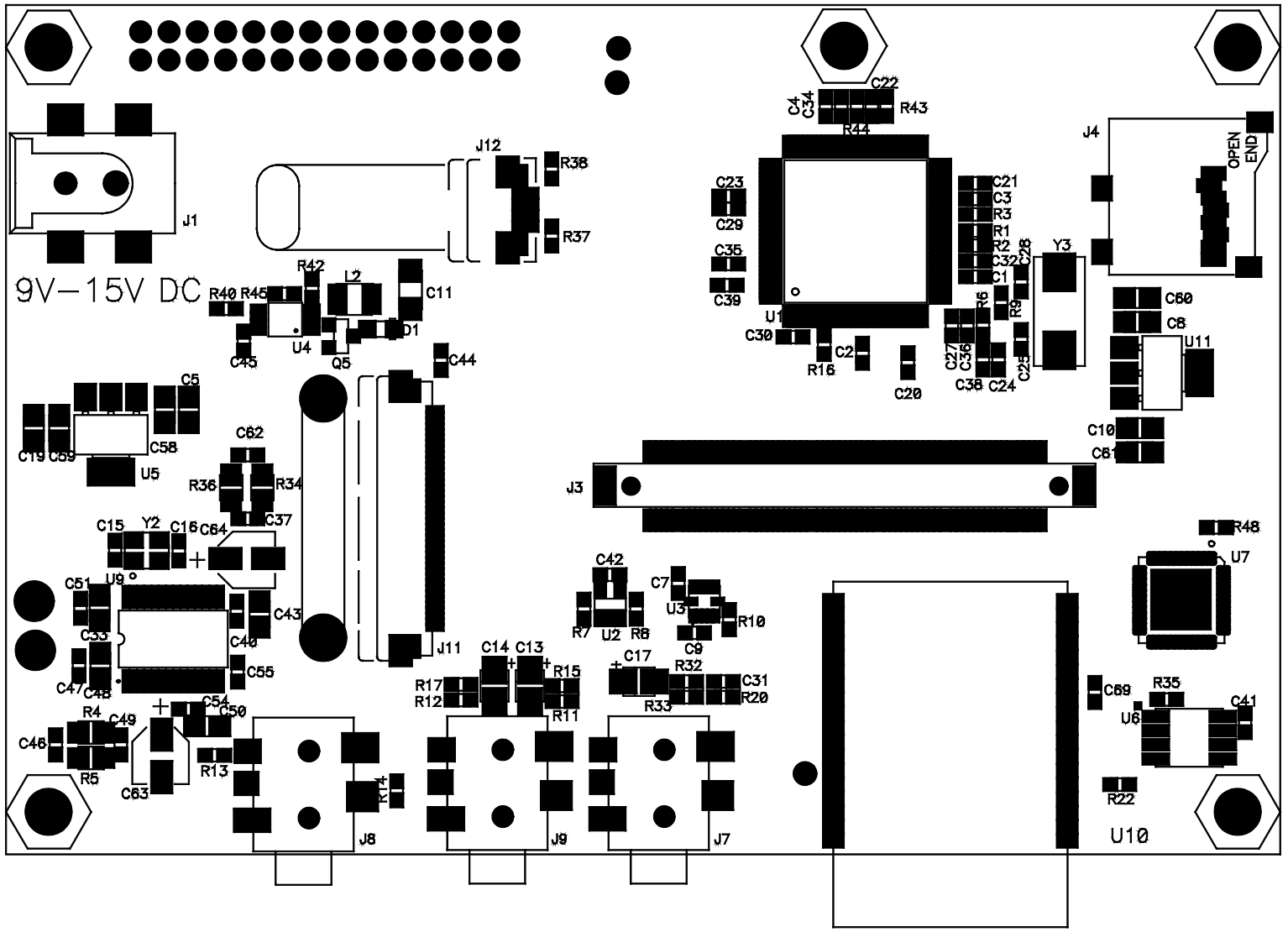


FIGURE A-3: MULTIMEDIA EXPANSION BOARD LAYOUT - BACK SIDE (TOP ASSEMBLY)



A.3 MULTIMEDIA EXPANSION BOARD SCHEMATICS

FIGURE A-4: SOLOMON SYSTECH SSD1926 LCD CONTROLLER

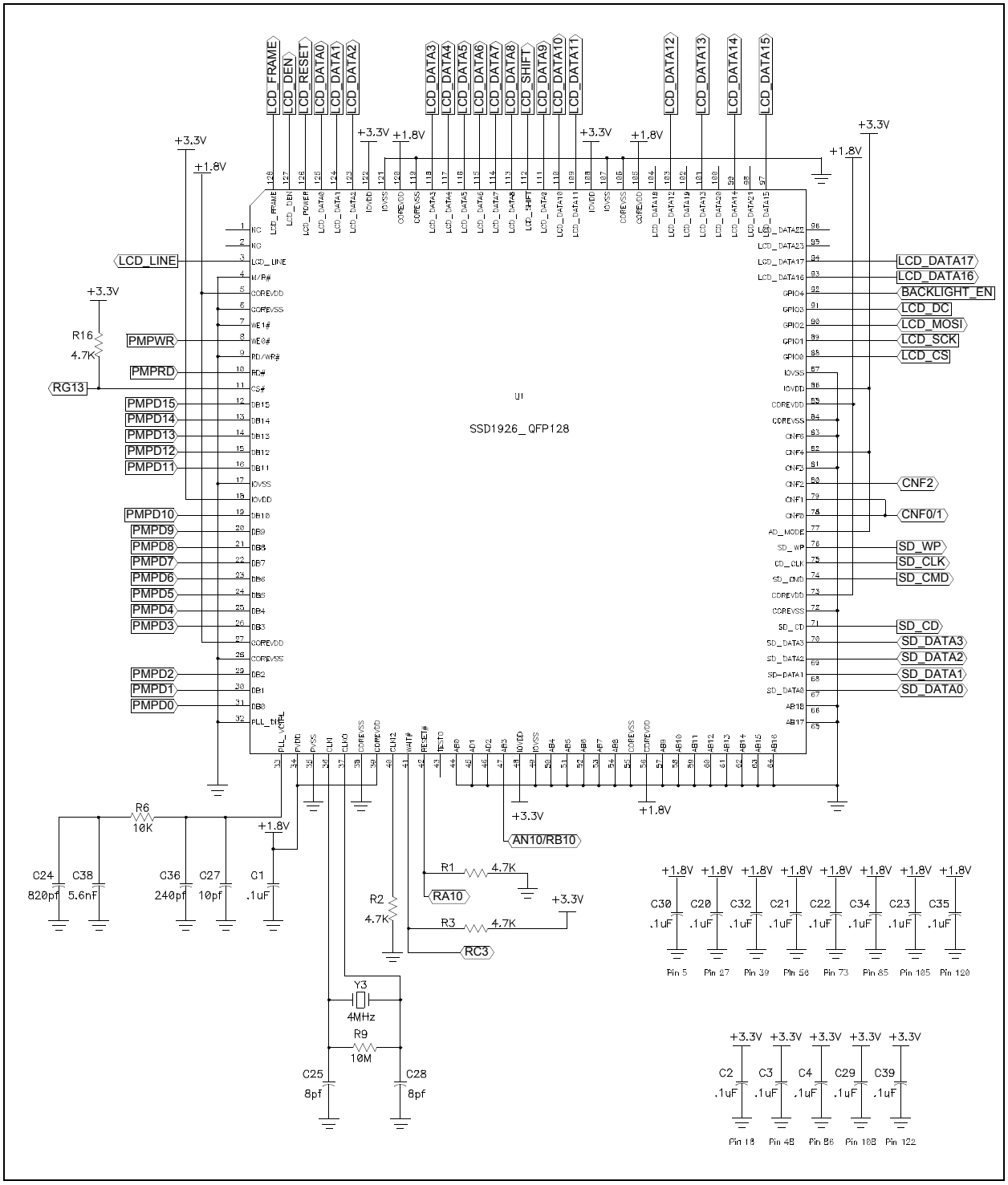


FIGURE A-5: CPLD

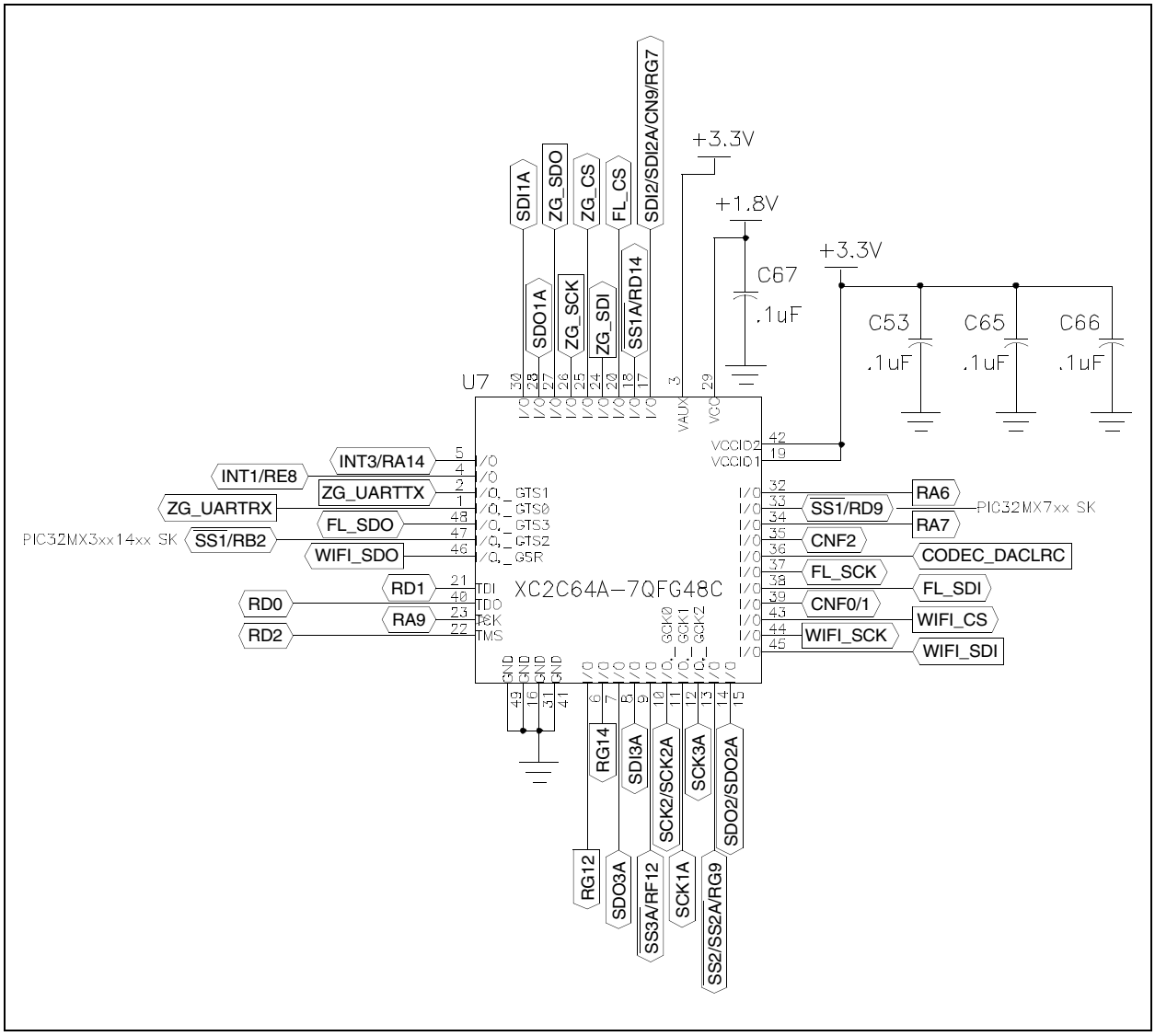


FIGURE A-6: microSD CARD CONNECTOR

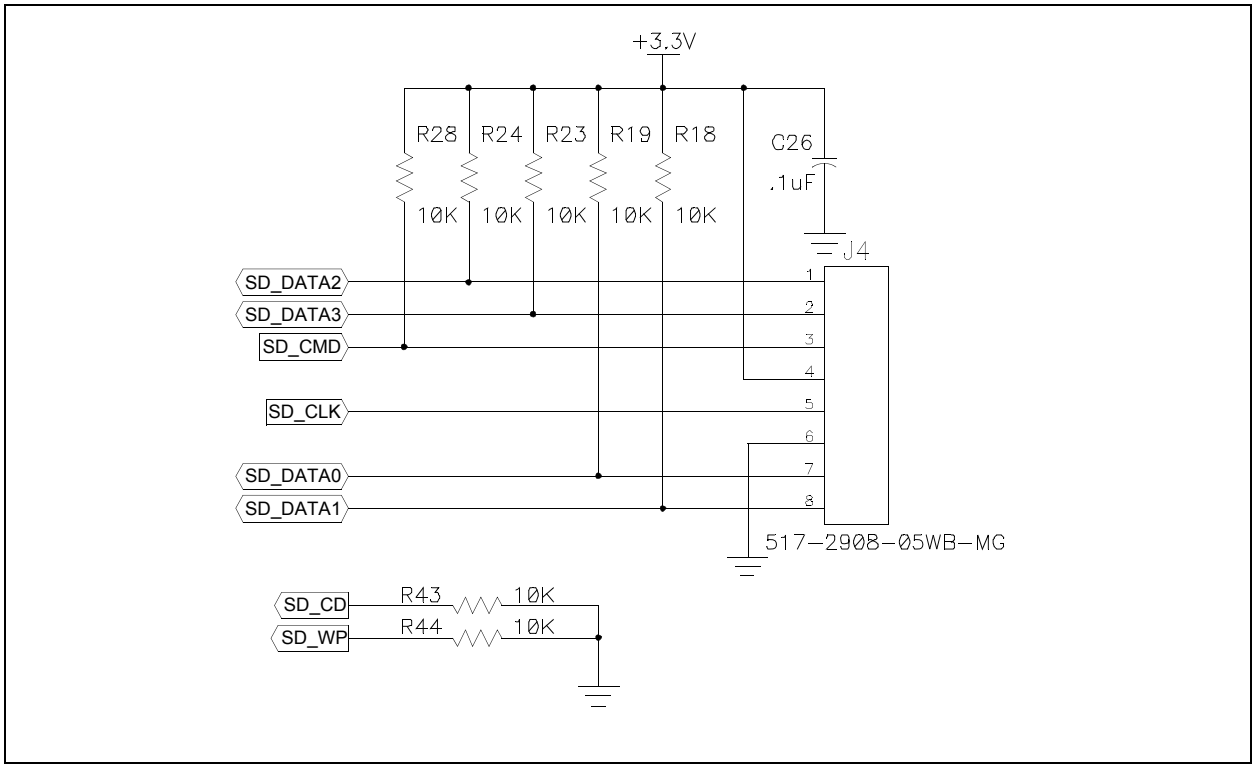


FIGURE A-7: DISPLAY BACKLIGHT

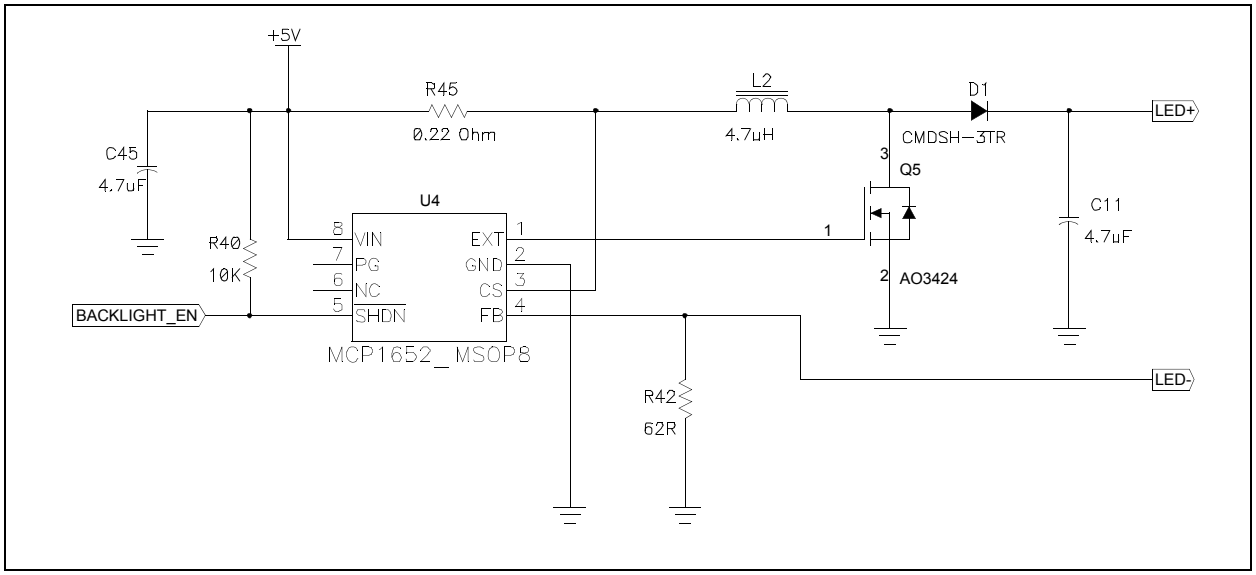


FIGURE A-8: JOYSTICK AND FIRE BUTTON

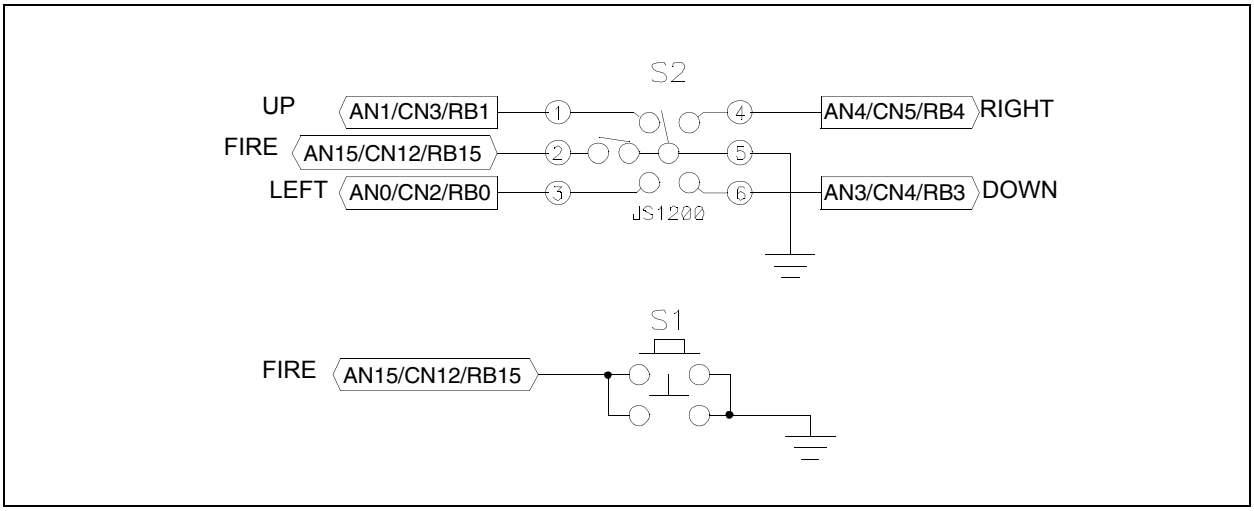


FIGURE A-9: TOUCHSCREEN SOCKETS

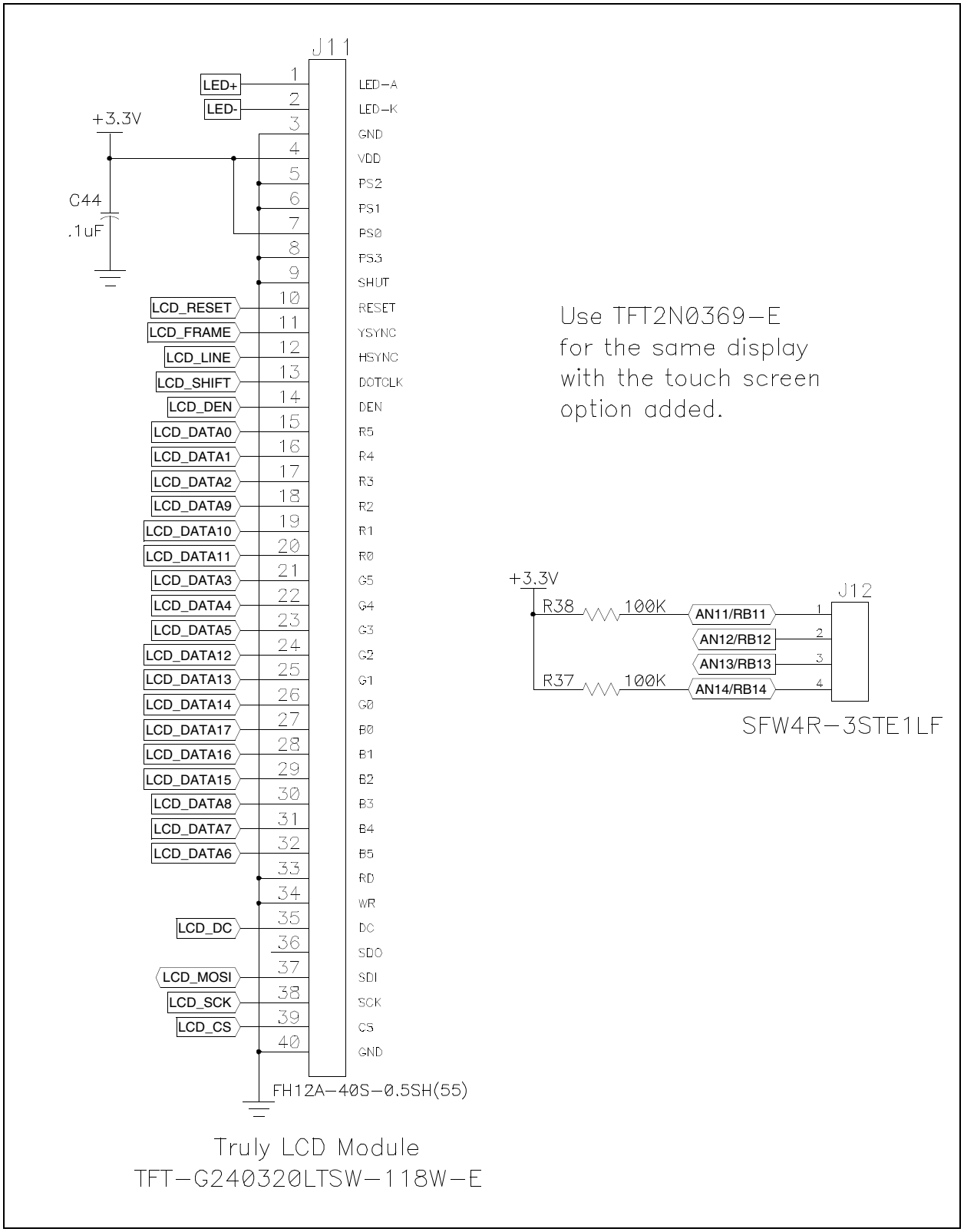


FIGURE A-10: MEMORY

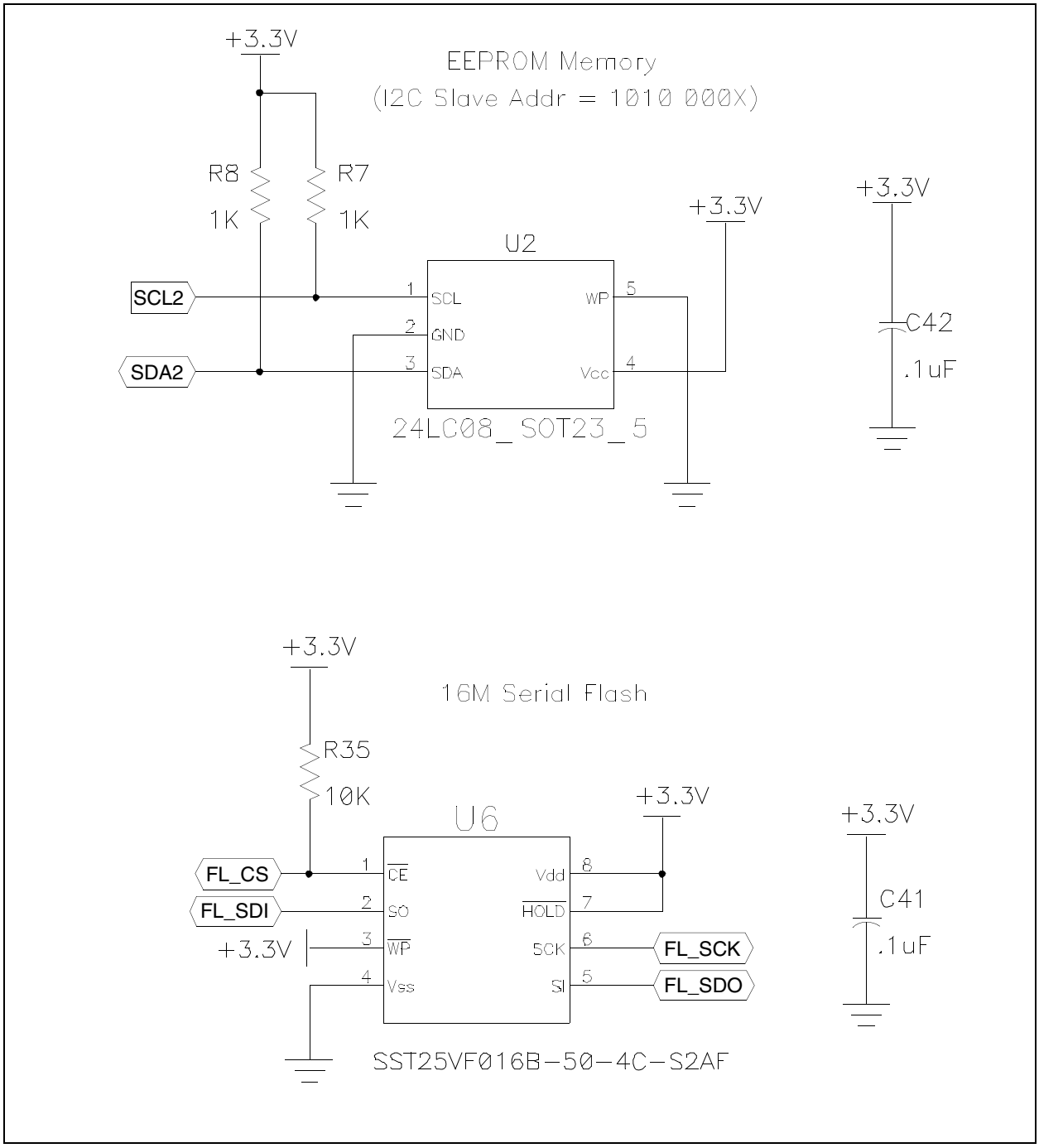


FIGURE A-11: AUDIO

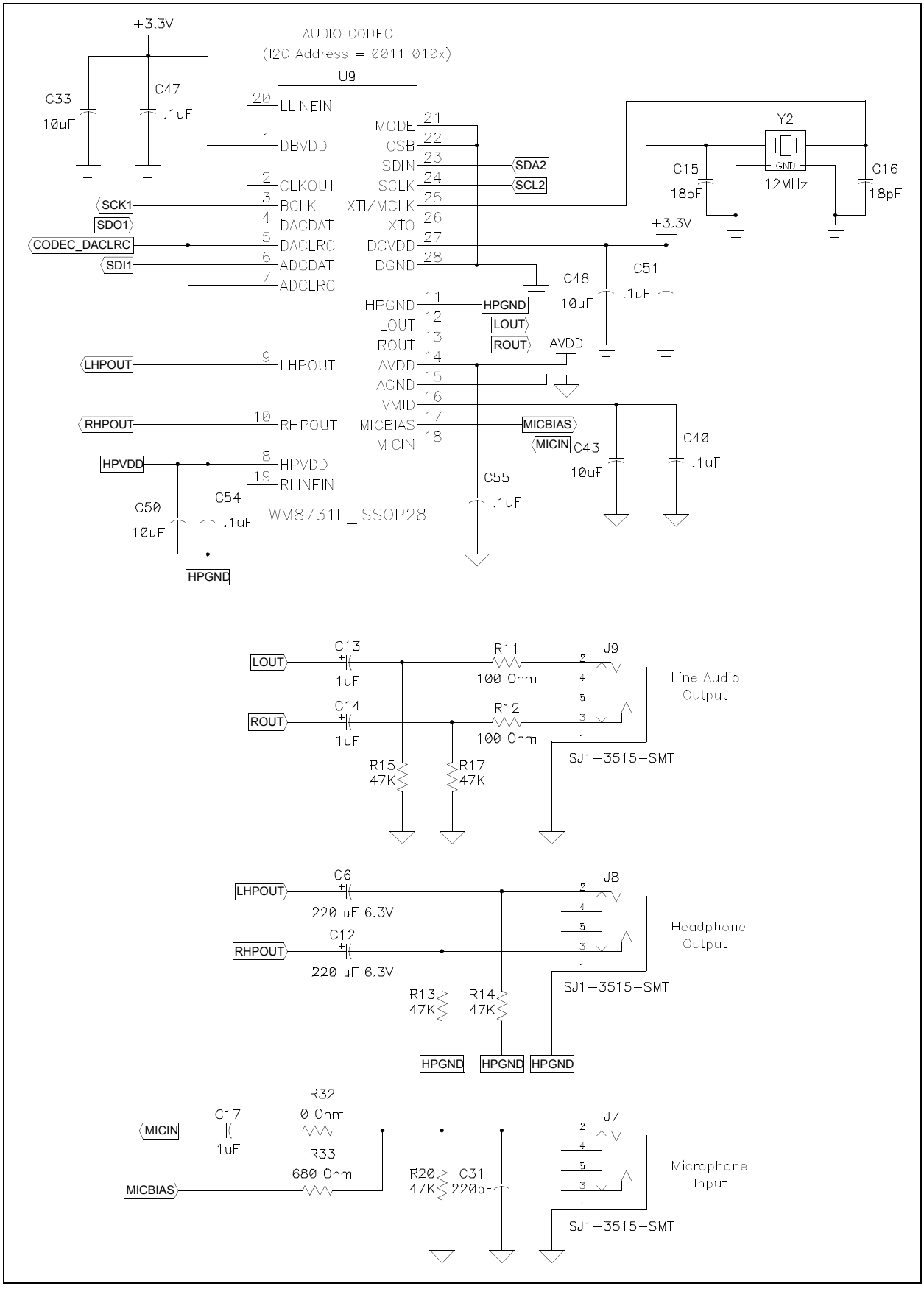


FIGURE A-12: POWER SUPPLY

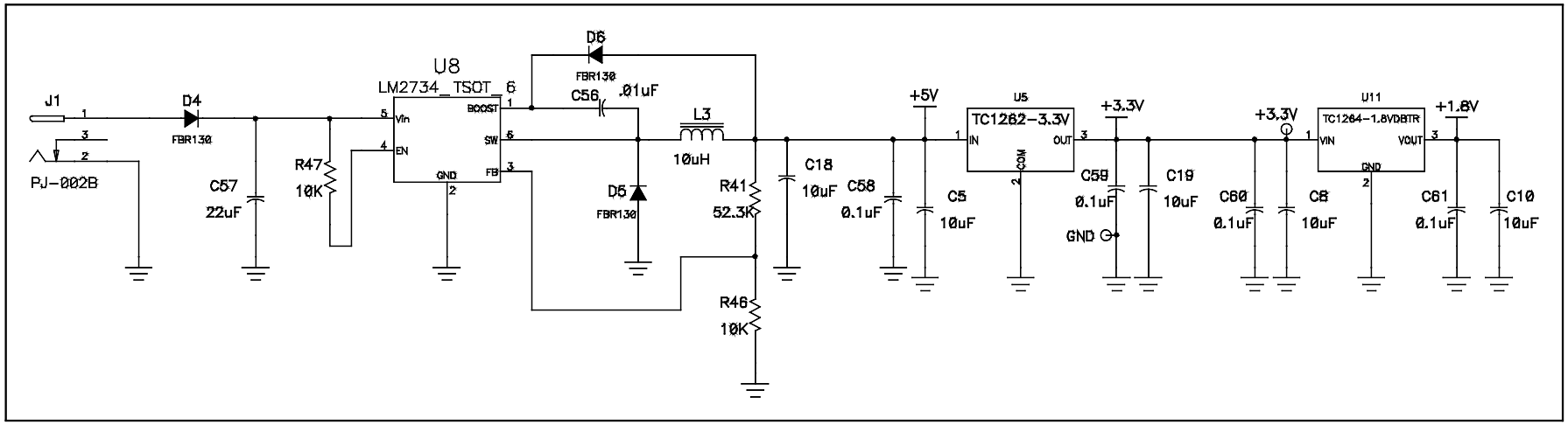


FIGURE A-13: WIRELESS

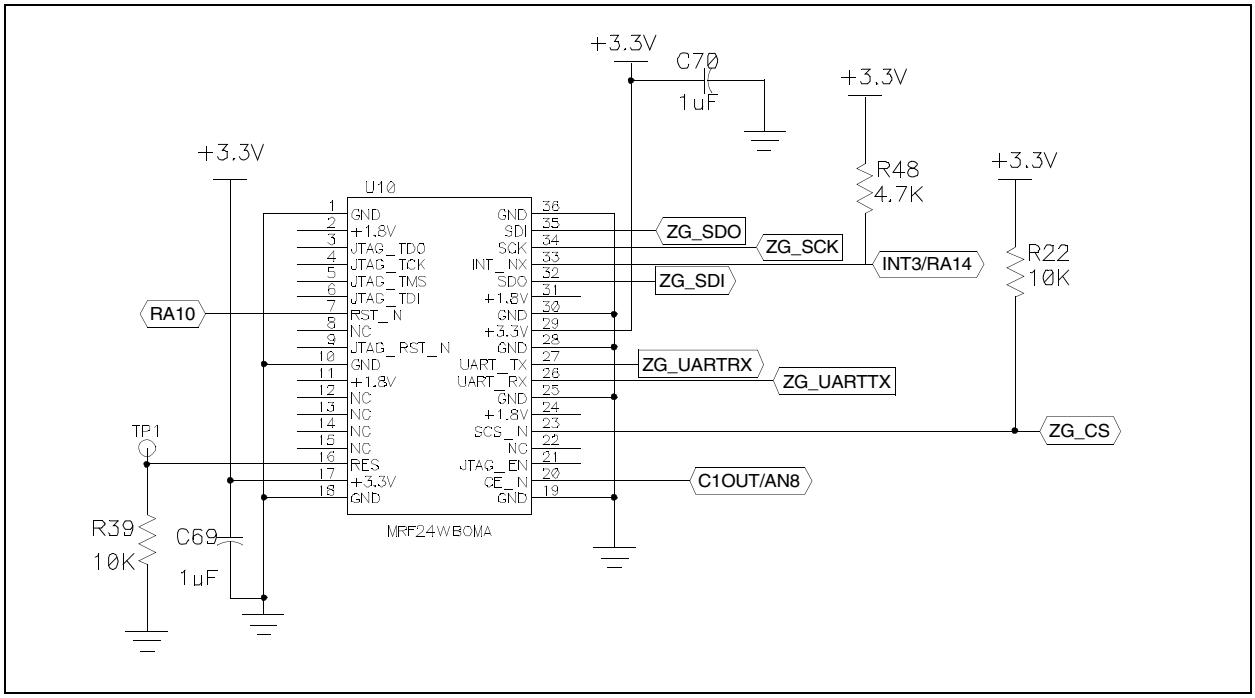


FIGURE A-14: I/O EXPANSION CONNECTOR

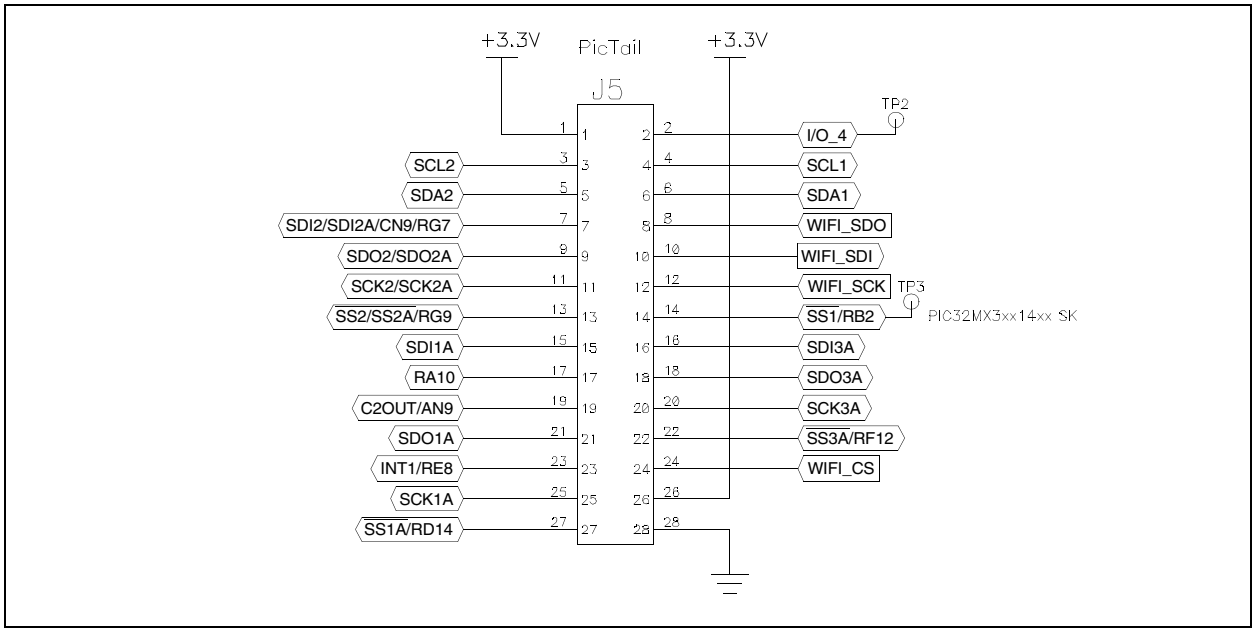


FIGURE A-15: STARTER KIT CONNECTOR

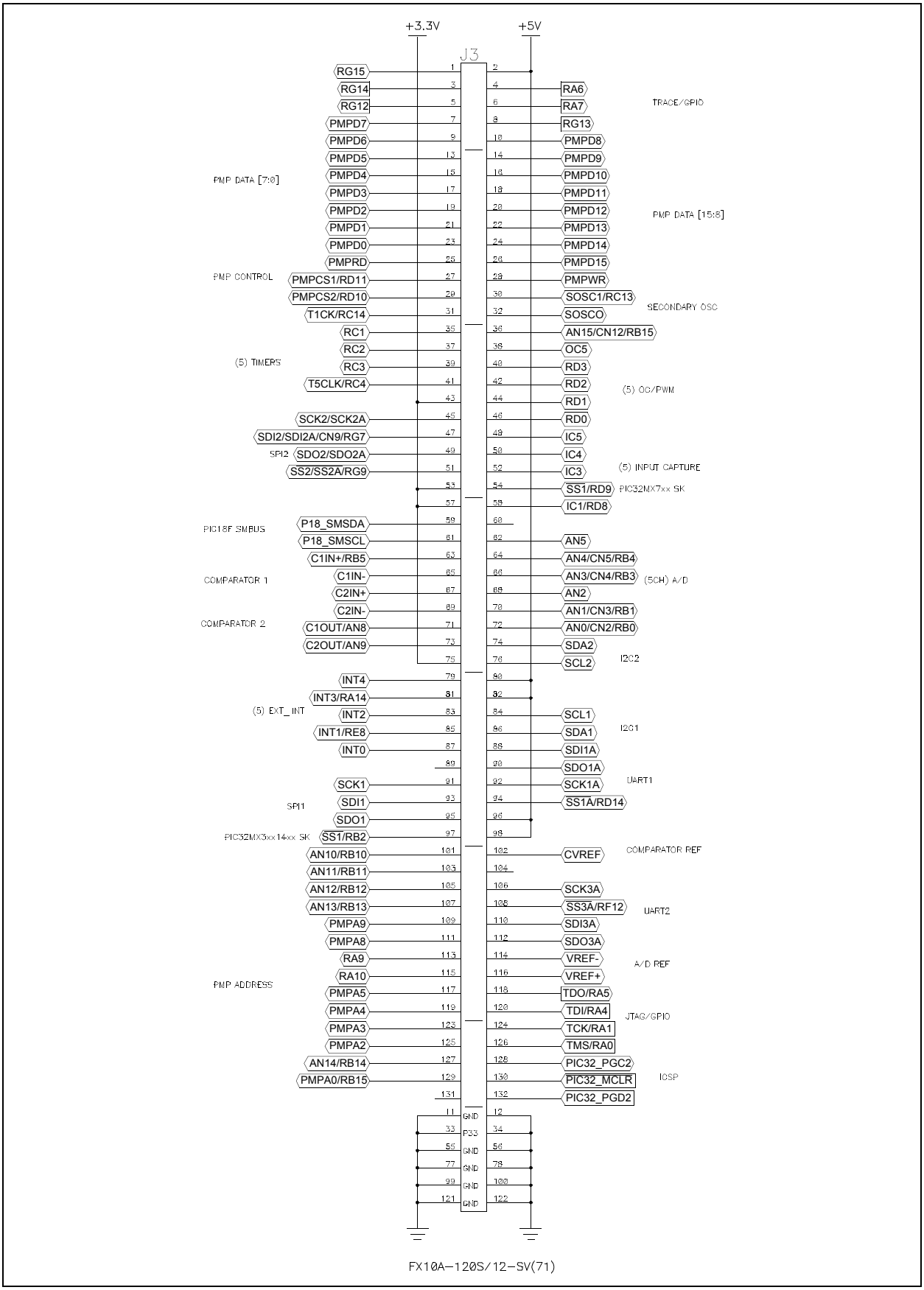


FIGURE A-16: ANALOG PLANES

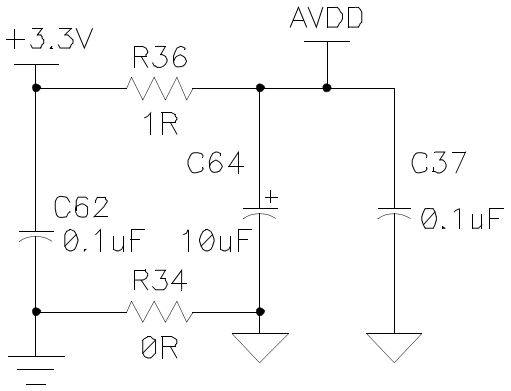


FIGURE A-17: DIGITAL PLANES

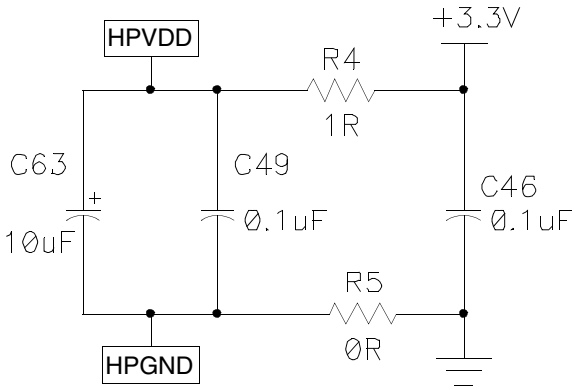


FIGURE A-18: ACCELEROMETER

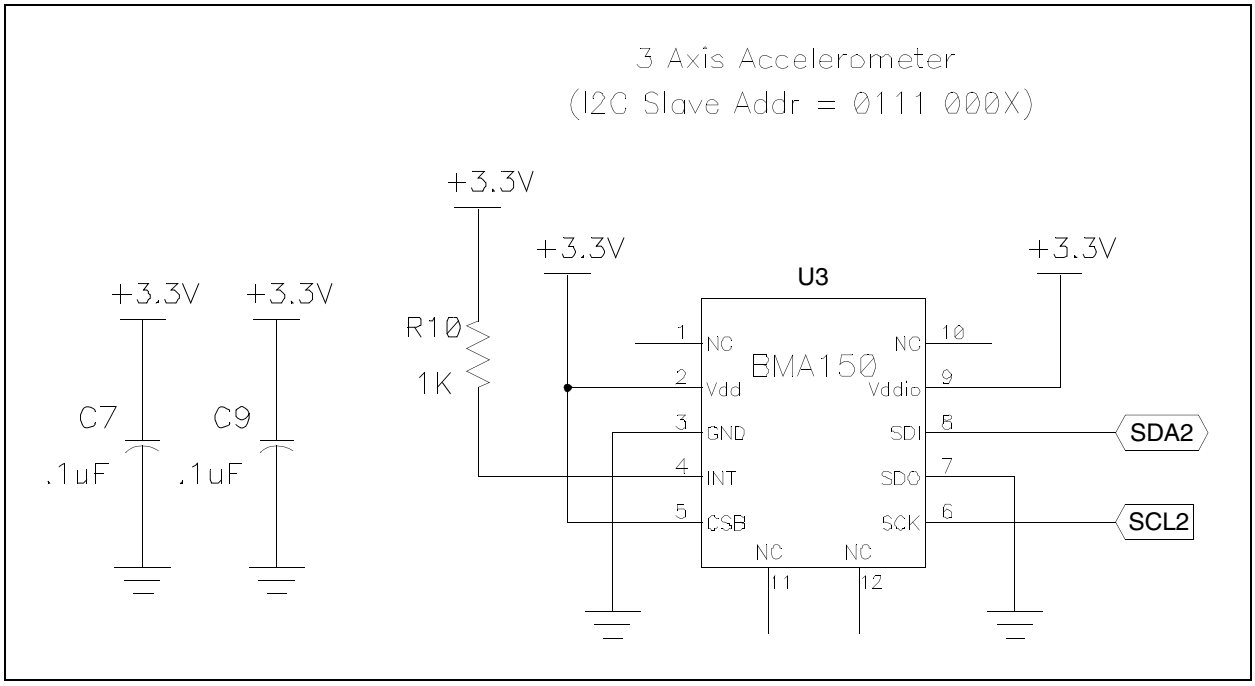
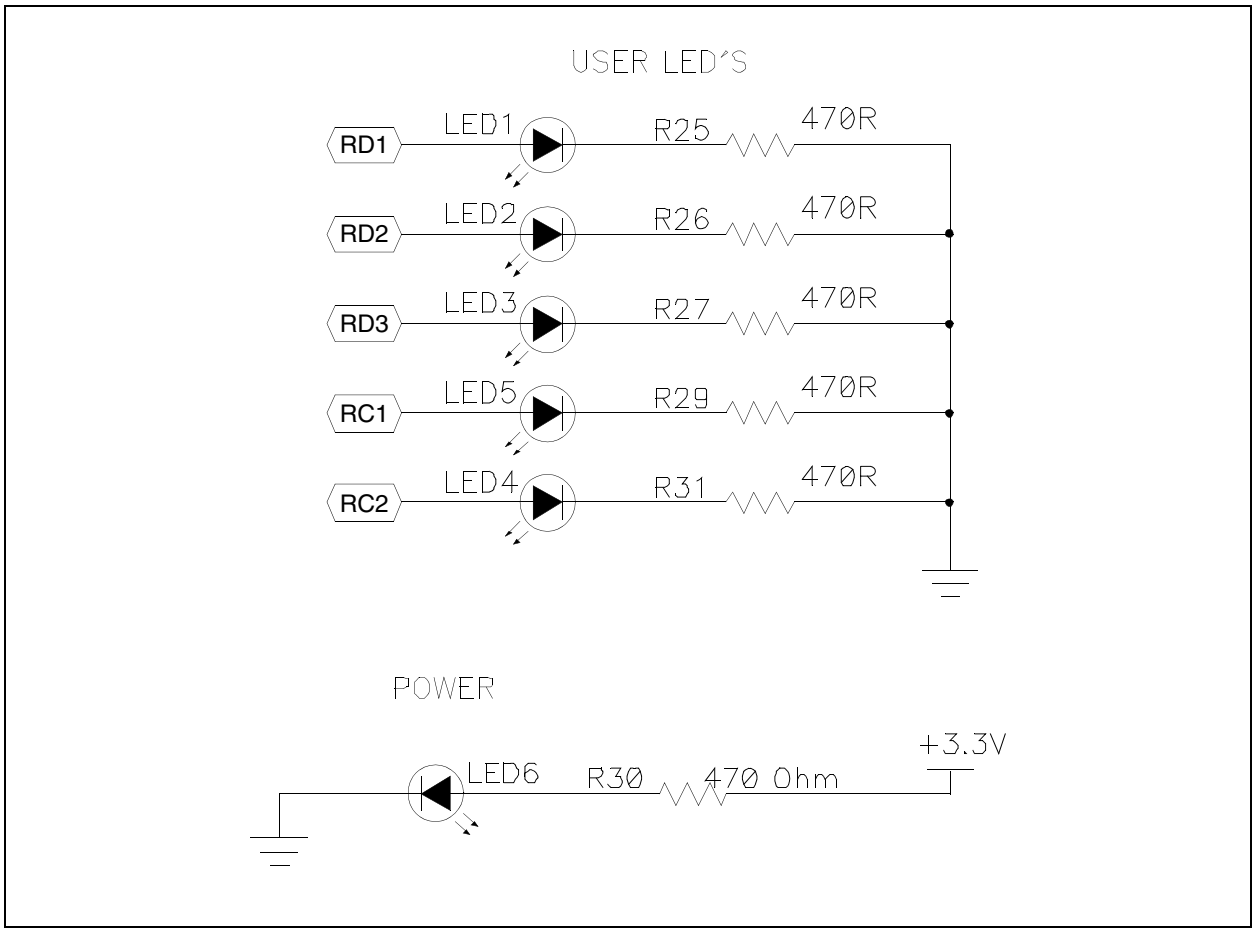


FIGURE A-19: USER AND POWER LEDs



NOTES:

Appendix B. Bill of Materials (BOM)

TABLE B-1: MULTIMEDIA EXPANSION BOARD BILL OF MATERIALS (BOM)

DNP	Qty.	Reference	Desc.	Footprint	Mfgr.	Mfgr. P/N	Dist.	Dist. P/N
	34	C1, C2, C3, C4, C7, C9, C20, C21, C22, C23, C26, C29, C30, C32, C34, C35, C39, C41, C44, C37, C40, C42, C46, C47, C49, C51, C54, C55, C56, C62, C67, C53, C65, C66	CAP CER .10UF 16V Y5V 0603	CAP0603	TDK Corporation	C1608Y5V1C104Z	DKC	445-1326-1-ND
	1	C11	CAP CER 4.7UF 50V Y5V 1206	CAP1206	TDK Corporation	C3216Y5V1H475Z	DKC	445-3472-1-ND
	3	C13, C14, C17	CAP TANTALUM 1.0UF 35V 20% SMD	CAP1206_POL	Kemet	B45196H6105M109	DKC	495-2279-1-ND
	2	C15, C16	CAP CER 18PF 50V C0G 5% 0603	CAP0603	TDK Corporation	C1608C0G1H180J	DKC	445-1272-1-ND
	1	C24	CAP CER 820PF 50V 10% X7R 0603	CAP0603	Murata	GRM188R71H821KA01D	DKC	490-1493-1-ND
	2	C25, C28	CAP CER 8.0PF 50V C0G 0603	CAP0603	TDK Corporation	C1608C0G1H080D	DKC	445-5043-1-ND
	1	C27	CAP CERAMIC 10PF 50V NP0 0603	CAP0603	Kemet	C0603C100J5GACTU	DKC	399-1049-1-ND
	1	C31	CAP CERAMIC 220PF 50V NP0 0603	CAP0603	Kemet	C0603C221J5GACTU	DKC	399-1066-1-ND
	1	C36	CAP CER 240PF 50V 5% C0G 0603	CAP0603	Murata	GRM1885C1H241JA01D	DKC	490-1436-1-ND
	1	C38	CAP CER 5600PF 50V 10% X7R 0603	CAP0603	Murata	GRM188R71H562KA01D	DKC	490-1507-1-ND
	1	C45	CAP CER 4.7UF 10V Y5V 0603	CAP0603	Murata	GRM188F51A475ZE20D	DKC	490-3302-1-ND
	9	C5, C8, C10, C18, C19, C33, C43, C48, C50	CAP CER 10UF 16V Y5V 0805	CAP0805	Murata	GRM21BF51C106ZE15L	DKC	490-3347-1-ND
	1	C57	CAP CER 22UF 16V Y5V 1206	CAP1206	TDK Corporation	C3216Y5V1C226Z	DKC	445-3466-1-ND

TABLE B-1: MULTIMEDIA EXPANSION BOARD BILL OF MATERIALS (BOM)

DNP	Qty.	Reference	Desc.	Footprint	Mfgr.	Mfgr. P/N	Dist.	Dist. P/N
	2	C69, C70,	CAP CER 1.0UF 16V Y5V 0603	CAP0603	Murata	GRM188F51C105ZA01D	DKC	490-1582-1-ND
	4	C58, C59, C60, C61	CAP CER .1UF 16V Y5V 0805	CAP0805	Murata	GRM216F51C104ZA01D	DKC	490-1734-1-ND
	2	C6, C12	CAP 220UF 6.3V ELECT HA SMD	CAP_SMT_C	Panasonic	EEE-HA0J221WP	DKC	PCE4161CT-ND
	2	C63, C64	CAP 10UF 10V ELECT VS BI-POLAR	CAP_VS_B	Panasonic	EEE-1AA100NR	DKC	PCE4288CT-ND
	1	D1	Schottky (Diodes & Rectifiers) 30V	DIODE_SOD-323	Central Semi	CMDSH-3TR	Mouser	610-CMDSH-3
	3	D4, D5, D6	DIODE SCHOTTKY 30V 1A SMA	DIODE_DO214_SMT	Diodes Inc.	B130-13-F	DKC	B130-FDICT-ND
	1	J1	CONN POWER JACK 2.5X5.5MM SMD	PWR_CON_PJ-002B-SMT	Cui Inc.	PJ-002B-SMT	DKC	CP-002BPJCT-ND
	1	J11	CONN FPC/FFC 40POS .5MM HORZ SMD	CONN_FH12-40S-0.5SH	Hirose	FH12A-40S-0.5SH(55)	DKC	HFK140CT-ND
	1	J12	CONN FPC/FFC 4POS 1MM R/A SMD	CONN_FFC_SFW4R-4	FCI	SFW4R-3STE1LF	DKC	609-1885-1-ND
	1	J3	CONN RECEPT 120POS W/POST SMD	CONN_CL570-0203_FLIP	Hirose	FX10A-120S/12-SV(71)	DKC	H11234-ND
	1	J4	CONN EJECT MICROSD PUSH-PUSH SMD	CONN_2908-05WB-MG	3M	2908-05WB-MG	DKC	3M5607CT-ND
	1	J5	CONN FEMALE 28POS DL .1" R/A TIN	HDR2X14	Sullins	PPTC142LJBN-RC	DKC	S5528-ND
	3	J7, J8, J9	CONN JACK STEREO 5POS 3.5MM SMD	PHONE_SJ1-3515-SMT	Cui Inc.	SJ1-3515-SMT	DKC	CP1-3515SJCT-ND
	1	L2	INDUCTOR 4.7UH 1.0A 20% SMD	INDUCTOR-1210SMT	TDK Corporation	FLF3215T-4R7M	DKC	445-4846-1-ND
	1	L3	INDUCTOR 10UH 900MA 1210 SMD	INDUCTOR-1210SMT	Taiyo Yuden	BRL3225T100K	DKC	587-2167-1-ND
	6	LED1, LED2, LED2, LED3, LED4, LED5, LED6	LED GREEN CLEAR THIN 0805 SMD	LED-0805	Lite-On Inc.	LTST-C171GKT	DKC	160-1423-1-ND
	1	Q5	MOSFET N-CH 30V 2A SOT23	MOSFET-NCHAN_SOT23	Alpha & Omega Semiconductor Inc.	AO3424	DKC	785-1017-1-ND
	5	R1, R2, R3, R16, R48	RES 4.70K OHM 1/10W 1% 0603 SMD	RES0603	Panasonic	ERJ-3EKF4701V	DKC	P4.70KHCT-ND
	2	R11, R12	RES 100 OHM 1/10W 1% 0603 SMD	RES0603	Panasonic	ERJ-3EKF1000V	DKC	P100HCT-ND
	5	R13, R14, R15, R17, R20	RES 47K OHM 1/10W 1% 0603 SMD	RES0603	Stackpole	RMCF 1/16 47K 1% R	DKC	RMCF1/1647KFRCT-ND

TABLE B-1: MULTIMEDIA EXPANSION BOARD BILL OF MATERIALS (BOM)

DNP	Qty.	Reference	Desc.	Footprint	Mfgr.	Mfgr. P/N	Dist.	Dist. P/N
	14	R18,R19, R23, R24, R28, R6, R22, R35, R43, R44, R46, R47, R40, R39	RES 10K OHM 1/10W 1% 0603 SMD	RES0603	Stackpole	RMCF 1/16 10K 1% R	DKC	RMCF1/1610KFRCT-ND
	6	R30, R25,R26, R27, R29, R31	RES 470 OHM 1/10W 1% 0603 SMD	RES0603	Panasonic	ERJ-3EKF4700V	DKC	P470HCT-ND
	1	R32	RES ZERO OHM 1/10W 5% 0603 SMD	RES0603	Panasonic	ERJ-3GEY0R00V	DKC	P0.0GCT-ND
	1	R33	RES 680 OHM 1/10W 1% 0603 SMD	RES0603	Panasonic	ERJ-3EKF6800V	DKC	P680HCT-ND
	2	R37, R38	RES 100K OHM 1/10W 1% 0603 SMD	RES0603	Panasonic	ERJ-3EKF1003V	DKC	P100KHCT-ND
	2	R4, R36	RES 1.00 OHM 1/8W 1% 0805 SMD	RES0805	Vishay	CRCW08051R00FKEA	DKC	541-1.00CCCT-ND
	1	R41	RES 52.3K OHM 1/10W 1% 0603 SMD	RES0603	Yageo	RC0603FR-0752K3L	DKC	311-52.3KHRCT-ND
	1	R42	RES 62.0 OHM 1/10W 1% 0603 SMD	RES0603	Yageo	RC0603FR-0762RL	DKC	311-62.0HRCT-ND
	1	R45	RES .22 OHM 1/10W 1% 0603 SMD	RES0603	Yageo	RL0603FR-070R22L	DKC	311-.22QCT-ND
	2	R5, R34	RES 0.0 OHM 1/8W 5% 0805 SMD	RES0805	Panasonic	ERJ-6GEY0R00V	DKC	P0.0ACT-ND
	3	R7, R8, R10	RES 1.00K OHM 1/10W 1% 0603 SMD	RES0603	Panasonic	ERJ-3EKF1001V	DKC	P1.00KHCT-ND
	1	R9	S 10.0M OHM 1/10W 1% 0603 SMD	RES0603	Yageo	RC0603FR-0710ML	DKC	311-10.0MHRCT-ND
	1	S2	SWITCH LT MULTI DIREC-TION SMD	SW_JS1200	Panasonic	EVQ-Q7GA50	DKC	P13351SCT-ND
	1	S1	SWITCH TACT 6MM SMD MOM 160GF		Omron	B3S-1000	DKC	SW415-ND
	1	U3	3-AXIS ACCEL-EROMETER DIGI-TAL I/F	BMA150	Bosch	BMA150	DKC	828-1003-1-ND
	1	U6	Flash 16M Serial Flash 50MHz	SST25VF020_SO8	SST	SST25VF016B-50-4C-S2AF	Mouser	804-25VF016B504CS2AF
	1	U7	IC CRII CPLD 64MCRCELL 48QFN	XC2C64A-7QFG48C_QFN48	Xilinx	XC2C64A-7QFG48C	DKC	122-1418-ND
	1	U8	IC PWM STP-DWN REG 1A TSOT23-6	LM2734_TSOT_6	National Semi	LM2734YMK/NOPB	DKC	LM2734YMKCT-ND
	1	U9	Audio CODECs Stereo Codec with H/P	WM8731L_SSOP28	Wolfson	WM8731SEDS/V	Mouser	238-WM8731SEDS/V
	1	Y2	CRYSTAL 12.0000 MHZ 18PF SMD	CRYSTAL_ABM8	Abracon	ABM8-12.000MHZ-B2-T	DKC	535-9826-1-ND

TABLE B-1: MULTIMEDIA EXPANSION BOARD BILL OF MATERIALS (BOM)

DNP	Qty.	Reference	Desc.	Footprint	Mfgr.	Mfgr. P/N	Dist.	Dist. P/N
	1	Y3	CRYSTAL 4.00 MHZ 8.0 PF SMD	CRYSTAL_4.5X8 MM	NDK	NX8045GB 4MHZ AT-W	DKC	644-1138-1-ND
	1	U4	IC CONTROLLER BOOST 2.55V 8MSOP	MCP1652_MSOP8	Microchip	MCP1652S-E/MS	N/A	N/A
	1	U5	IC CMOS LDO 3.3V 500MA SOT223-3	TC1262-2.5_SOT223	Microchip	TC1262-3.3VDBTR	N/A	N/A
	1	U11	IC CMOS LDO 1.8V 800MA SOT223-3	TC1262-SOT223	Microchip	TC1264-1.8VDBTR	N/A	N/A
	1	U2	IC EEPROM 8KBIT 400KHZ SOT23-5	24LC08_SOT23_5	Microchip	24LC08BT-I/OT	N/A	N/A
	1	U10	802.11 Wireless module	—	Microchip	MRF24WBOMA	N/A	N/A
	1	LCD	Truly TFT 3.2 320x240 Color Display with 4-wire Touch Panel	—	—	—	mD	LCD0025
	1	U1	Solomon Systech SSD1926 LCD Graphic Controller	SSD1926_QFP128	Solomon	SSD1926	mD	IC00409
		Tape	TAPE DOUBLE SIDED FOAM 1/16 X 1"	—	3M	4026-1"X36YD	DKC	3M4026-ND
	4	standoff	STANDOFF M/F HEX 4-40 NYL .875"L	—	Keystone	4805	DKC	4805K-ND
	5	nut	NUT HEX 4-40 NYLON	—	B&F Fastener Supply	NY HN 440	DKC	H616-ND
	1	spacer	SPACER NYLON #4 SCREW 3/16"	—	Bivar Inc	9908-187	DKC	492-1073-ND
	1	screw	SCREW MACH PHIL 4-40X1/2 NYLON	—	B&F Fastener Supply	NY PMS 440 0050 PH	DKC	H546-ND
X	3	TP1, TP2, TP3	—	—	—	—	—	—
X	1	+3.3V	3.3	TP-125R63	—	—	—	—
X	1	GND	GND	TP-125R63	—	—	—	—

Index

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

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

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

Cleveland
Independence, OH
Tel: 216-447-0464
Fax: 216-447-0643

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

Detroit
Farmington Hills, MI
Tel: 248-538-2250
Fax: 248-538-2260

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

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

Santa Clara
Santa Clara, CA
Tel: 408-961-6444
Fax: 408-961-6445

Toronto
Mississauga, Ontario,
Canada
Tel: 905-673-0699
Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon
Hong Kong
Tel: 852-2401-1200
Fax: 852-2401-3431

Australia - Sydney
Tel: 61-2-9868-6733
Fax: 61-2-9868-6755

China - Beijing
Tel: 86-10-8569-7000
Fax: 86-10-8528-2104

China - Chengdu
Tel: 86-28-8665-5511
Fax: 86-28-8665-7889

China - Chongqing
Tel: 86-23-8980-9588
Fax: 86-23-8980-9500

China - Hangzhou
Tel: 86-571-2819-3187
Fax: 86-571-2819-3189

China - Hong Kong SAR
Tel: 852-2401-1200
Fax: 852-2401-3431

China - Nanjing
Tel: 86-25-8473-2460
Fax: 86-25-8473-2470

China - Qingdao
Tel: 86-532-8502-7355
Fax: 86-532-8502-7205

China - Shanghai
Tel: 86-21-5407-5533
Fax: 86-21-5407-5066

China - Shenyang
Tel: 86-24-2334-2829
Fax: 86-24-2334-2393

China - Shenzhen
Tel: 86-755-8203-2660
Fax: 86-755-8203-1760

China - Wuhan
Tel: 86-27-5980-5300
Fax: 86-27-5980-5118

China - Xian
Tel: 86-29-8833-7252
Fax: 86-29-8833-7256

China - Xiamen
Tel: 86-592-2388138
Fax: 86-592-2388130

China - Zhuhai
Tel: 86-756-3210040
Fax: 86-756-3210049

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-3090-4444
Fax: 91-80-3090-4123

India - New Delhi
Tel: 91-11-4160-8631
Fax: 91-11-4160-8632

India - Pune
Tel: 91-20-2566-1512
Fax: 91-20-2566-1513

Japan - Osaka
Tel: 81-66-152-7160
Fax: 81-66-152-9310

Japan - Yokohama
Tel: 81-45-471- 6166
Fax: 81-45-471-6122

Korea - Daegu
Tel: 82-53-744-4301
Fax: 82-53-744-4302

Korea - Seoul
Tel: 82-2-554-7200
Fax: 82-2-558-5932 or
82-2-558-5934

Malaysia - Kuala Lumpur
Tel: 60-3-6201-9857
Fax: 60-3-6201-9859

Malaysia - Penang
Tel: 60-4-227-8870
Fax: 60-4-227-4068

Philippines - Manila
Tel: 63-2-634-9065
Fax: 63-2-634-9069

Singapore
Tel: 65-6334-8870
Fax: 65-6334-8850

Taiwan - Hsin Chu
Tel: 886-3-5778-366
Fax: 886-3-5770-955

Taiwan - Kaohsiung
Tel: 886-7-536-4818
Fax: 886-7-330-9305

Taiwan - Taipei
Tel: 886-2-2500-6610
Fax: 886-2-2508-0102

Thailand - Bangkok
Tel: 66-2-694-1351
Fax: 66-2-694-1350

EUROPE

Austria - Wels
Tel: 43-7242-2244-39
Fax: 43-7242-2244-393

Denmark - Copenhagen
Tel: 45-4450-2828
Fax: 45-4485-2829

France - Paris
Tel: 33-1-69-53-63-20
Fax: 33-1-69-30-90-79

Germany - Munich
Tel: 49-89-627-144-0
Fax: 49-89-627-144-44

Italy - Milan
Tel: 39-0331-742611
Fax: 39-0331-466781

Netherlands - Drunen
Tel: 31-416-690399
Fax: 31-416-690340

Spain - Madrid
Tel: 34-91-708-08-90
Fax: 34-91-708-08-91

UK - Wokingham
Tel: 44-118-921-5869
Fax: 44-118-921-5820

11/29/11