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.

Information contained in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates. It is your responsibility to ensure that your application meets with your specifications. MICROCHIP MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WHETHER EXPRESS OR IMPLIED, WRITTEN OR ORAL, STATUTORY OR OTHERWISE, RELATED TO THE INFORMATION, INCLUDING BUT NOT LIMITED TO ITS CONDITION, QUALITY, PERFORMANCE, MERCHANTABILITY OR FITNESS FOR PURPOSE. Microchip disclaims all liability arising from this information and its use. Use of Microchip devices in life support and/or safety applications is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless Microchip from any and all damages, claims, suits, or expenses resulting from such use. No licenses are conveyed, implicitly or otherwise, under any Microchip intellectual property rights.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, KEELoq, KEELoq logo, MPLAB, PIC, PICmicro, PICSTART, PIC32 logo, rTPIC and Uni/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Hampshire, HI-TECH C, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL and The Embedded Control Solutions Company are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, Application Maestro, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, HI-TIDE, In-Circuit Serial Programming, ICSP, Mindi, MIWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, Omniscient Code Generation, PICC, PICC-18, PICDEM, PICDEM.net, PICkit, PICtail, REAL ICE, rfLAB, Select Mode, Total Endurance, TSHARC, UniWinDriver, WiperLock and ZENA are trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

SQTP is a service mark of Microchip Technology Incorporated in the U.S.A.

All other trademarks mentioned herein are property of their respective companies.

© 2010-2012, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

Printed on recycled paper.

ISBN: 978-1-62076-299-8

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.

QUALITY MANAGEMENT SYSTEM CERTIFIED BY DNV

ISO/TS 16949

DS61160B-page 2

© 2010-2012 Microchip Technology Inc.
# Table of Contents

**Preface** ...................................................................................................................................................... 5  

**Chapter 1. Introduction**  
1.1 Kit Contents .............................................................................................................................................. 11  
1.2 Multimedia Features ................................................................................................................................. 11  

**Chapter 2. Hardware**  
2.1 Power Supply .................................................................................................................................................. 15  
2.2 Starter Kit Connector ..................................................................................................................................... 16  
2.3 Display ......................................................................................................................................................... 19  
2.4 microSD Card Slot .......................................................................................................................................... 23  
2.5 Joystick and Fire Button ............................................................................................................................... 24  
2.6 User-Controlled LEDs .................................................................................................................................. 25  
2.7 Accelerometer and Temperature Sensor ...................................................................................................... 26  
2.8 External Memory ........................................................................................................................................... 27  
2.9 24-bit Audio Codec ....................................................................................................................................... 29  
2.10 802.11 Wireless Connectivity ................................................................................................................... 32  
2.11 I/O Expansion Connector ........................................................................................................................... 33  
2.12 CPLD ........................................................................................................................................................... 34  

**Appendix A. Board Layout and Schematics**  
A.1 Multimedia Expansion Board Block Diagram .......................................................................................... 37  
A.2 Multimedia Expansion Board Layout ......................................................................................................... 38  
A.3 Multimedia Expansion Board Schematics .................................................................................................... 40  

**Appendix B. Bill of Materials (BOM)**  

**Index** ............................................................................................................................................................ 57  

**Worldwide Sales and Service** ...................................................................................................................... 58
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

<table>
<thead>
<tr>
<th>Description</th>
<th>Represents</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Arial font:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italic characters</td>
<td>Referenced books</td>
<td><em>MPLAB® IDE User’s Guide</em></td>
</tr>
<tr>
<td></td>
<td>Emphasized text</td>
<td><em>...is the only compiler...</em></td>
</tr>
<tr>
<td>Initial caps</td>
<td>A window</td>
<td>the Output window</td>
</tr>
<tr>
<td></td>
<td>A dialog</td>
<td>the Settings dialog</td>
</tr>
<tr>
<td></td>
<td>A menu selection</td>
<td>select Enable Programmer</td>
</tr>
<tr>
<td>Quotes</td>
<td>A field name in a window or dialog</td>
<td>&quot;Save project before build&quot;</td>
</tr>
<tr>
<td>Underlined, italic text with right</td>
<td>A menu path</td>
<td>*File&gt;*Save</td>
</tr>
<tr>
<td>angle bracket</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bold characters</td>
<td>A dialog button</td>
<td>Click <strong>OK</strong></td>
</tr>
<tr>
<td></td>
<td>A tab</td>
<td>Click the <strong>Power</strong> tab</td>
</tr>
<tr>
<td>Text in angle brackets <strong>&lt;&gt;</strong></td>
<td>A key on the keyboard</td>
<td>Press &lt;Enter&gt;, &lt;F1&gt;</td>
</tr>
<tr>
<td><strong>Courier New font:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plain Courier New</td>
<td>Sample source code</td>
<td>#define START</td>
</tr>
<tr>
<td></td>
<td>Filenames</td>
<td><em>autoexec.bat</em></td>
</tr>
<tr>
<td></td>
<td>File paths</td>
<td><em>C:\mcc18\h</em></td>
</tr>
<tr>
<td></td>
<td>Keywords</td>
<td><em>_asm, _endasm, static</em></td>
</tr>
<tr>
<td></td>
<td>Command-line options</td>
<td><em>-Opa+, -Opa-</em></td>
</tr>
<tr>
<td></td>
<td>Bit values</td>
<td><em>0, 1</em></td>
</tr>
<tr>
<td></td>
<td>Constants (in source code)</td>
<td><em>0xFF, ‘A’</em></td>
</tr>
<tr>
<td>Italic Courier New</td>
<td>A variable argument</td>
<td><em>file.o, where file can be any valid filename</em></td>
</tr>
<tr>
<td>Square brackets [ ]</td>
<td>Optional arguments</td>
<td><em>mcc18 [options] file [options]</em></td>
</tr>
<tr>
<td>Curly brackets and pipe character: { }</td>
<td>Choice of mutually exclusive arguments; an OR selection</td>
<td>*errorlevel {0</td>
</tr>
<tr>
<td>Ellipses...</td>
<td>Replaces repeated text</td>
<td><em>var_name [, var_name...]</em></td>
</tr>
<tr>
<td></td>
<td>Represents code supplied by user</td>
<td><em>void main (void)</em></td>
</tr>
<tr>
<td></td>
<td></td>
<td>{ ...}</td>
</tr>
</tbody>
</table>
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 to 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
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.
7. Microphone input jack.
8. Power LED.
9. I/O expansion connector.
The back side of the board includes these key features, as indicated in Figure 1-2:

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)
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

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Description</th>
<th>Pin Type</th>
<th>Multimedia Expansion Board</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>PMP Data &lt;7:0&gt;</td>
<td>I/O</td>
<td>Graphics Controller (SSD1926)</td>
<td>8-bit or 16-bit Data Bus</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>PMP Data &lt;15:8&gt;</td>
<td>I/O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>RG13</td>
<td>O</td>
<td></td>
<td>Chip Select</td>
</tr>
<tr>
<td>101</td>
<td>RB10</td>
<td>O</td>
<td></td>
<td>Register Select</td>
</tr>
<tr>
<td>39</td>
<td>RC3</td>
<td>I</td>
<td></td>
<td>Wait Line</td>
</tr>
<tr>
<td>115</td>
<td>RA10</td>
<td>O</td>
<td></td>
<td>Reset</td>
</tr>
<tr>
<td>103</td>
<td>RB11</td>
<td>I/O</td>
<td>Touch Screen</td>
<td>X+</td>
</tr>
<tr>
<td>105</td>
<td>RB12</td>
<td>O</td>
<td></td>
<td>Y-</td>
</tr>
<tr>
<td>107</td>
<td>RB13</td>
<td>O</td>
<td></td>
<td>X-</td>
</tr>
<tr>
<td>127</td>
<td>RB14</td>
<td>I/O</td>
<td></td>
<td>Y+</td>
</tr>
<tr>
<td>72</td>
<td>RB0/CN2</td>
<td>I</td>
<td>Joystick</td>
<td>Left</td>
</tr>
<tr>
<td>70</td>
<td>RB1/CN3</td>
<td>I</td>
<td></td>
<td>Up</td>
</tr>
<tr>
<td>66</td>
<td>RB3/CN5</td>
<td>I</td>
<td></td>
<td>Down</td>
</tr>
<tr>
<td>64</td>
<td>RB4/CN6</td>
<td>I</td>
<td></td>
<td>Right</td>
</tr>
<tr>
<td>36</td>
<td>RB15/CN12</td>
<td>I</td>
<td></td>
<td>Fire</td>
</tr>
<tr>
<td>44</td>
<td>RD1</td>
<td>O</td>
<td>LEDs</td>
<td>LED1</td>
</tr>
<tr>
<td>42</td>
<td>RD2</td>
<td>O</td>
<td></td>
<td>LED2</td>
</tr>
<tr>
<td>40</td>
<td>RD3</td>
<td>O</td>
<td></td>
<td>LED3</td>
</tr>
<tr>
<td>35</td>
<td>RC1</td>
<td>O</td>
<td></td>
<td>LED4</td>
</tr>
<tr>
<td>37</td>
<td>RC2</td>
<td>O</td>
<td></td>
<td>LED5</td>
</tr>
</tbody>
</table>
### TABLE 2-1: STARTER KIT PIN DESCRIPTION (CONTINUED)

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Description</th>
<th>Pin Type</th>
<th>Device</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>74</td>
<td>SDA2</td>
<td>I</td>
<td>I²C™ bus for BMA150, MCHP24LC08 and WM8731</td>
<td>I²C Bus</td>
</tr>
<tr>
<td>76</td>
<td>SCL2</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>SCK1</td>
<td>O</td>
<td>SPI Bus for WM8731</td>
<td>SPI Bus</td>
</tr>
<tr>
<td>93</td>
<td>SDI1</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>SDO1</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RA6</td>
<td>O</td>
<td>CPLD</td>
<td>Control Pins</td>
</tr>
<tr>
<td>6</td>
<td>RA7</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>RG12</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RG14</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>SCK2</td>
<td>O</td>
<td>SPI Bus</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>SDI2</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>SDO2</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>RG9</td>
<td>O</td>
<td>Chip Select</td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>SCK3A</td>
<td>O</td>
<td>SPI Bus</td>
<td></td>
</tr>
<tr>
<td>110</td>
<td>SDI3A</td>
<td>I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>112</td>
<td>SDO3A</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>108</td>
<td>RF12</td>
<td>O</td>
<td>Chip Select</td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>SS1</td>
<td>O</td>
<td>Codec DACLR</td>
<td></td>
</tr>
<tr>
<td>54</td>
<td>RD9</td>
<td>O</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>INT3</td>
<td>I</td>
<td>MRF24WBOMA</td>
<td>External Interrupt</td>
</tr>
<tr>
<td>115</td>
<td>RA10</td>
<td>O</td>
<td></td>
<td>Reset</td>
</tr>
<tr>
<td>71</td>
<td>RB8</td>
<td>O</td>
<td></td>
<td>Chip Enable</td>
</tr>
<tr>
<td>76</td>
<td>SCL2</td>
<td>I/O</td>
<td>PicTail™ J5</td>
<td>Pin 3</td>
</tr>
<tr>
<td>74</td>
<td>SDA2</td>
<td>I/O</td>
<td></td>
<td>Pin 5</td>
</tr>
<tr>
<td>47</td>
<td>SDI2</td>
<td>I/O</td>
<td></td>
<td>Pin 7</td>
</tr>
<tr>
<td>49</td>
<td>SDO2</td>
<td>I/O</td>
<td></td>
<td>Pin 9</td>
</tr>
<tr>
<td>45</td>
<td>SCK2</td>
<td>I/O</td>
<td></td>
<td>Pin 11</td>
</tr>
<tr>
<td>51</td>
<td>RG9</td>
<td>I/O</td>
<td></td>
<td>Pin 13</td>
</tr>
<tr>
<td>88</td>
<td>U1RX</td>
<td>I/O</td>
<td></td>
<td>Pin 15</td>
</tr>
<tr>
<td>90</td>
<td>U1TX</td>
<td>I/O</td>
<td></td>
<td>Pin 21</td>
</tr>
<tr>
<td>92</td>
<td>U1RTS</td>
<td>I/O</td>
<td></td>
<td>Pin 25</td>
</tr>
<tr>
<td>94</td>
<td>U1CTS</td>
<td>I/O</td>
<td></td>
<td>Pin 27</td>
</tr>
<tr>
<td>73</td>
<td>RB9</td>
<td>I/O</td>
<td></td>
<td>Pin 19</td>
</tr>
<tr>
<td>115</td>
<td>RA10</td>
<td>O</td>
<td></td>
<td>Pin 17</td>
</tr>
<tr>
<td>85</td>
<td>INT1</td>
<td>I/O</td>
<td></td>
<td>Pin 23</td>
</tr>
<tr>
<td>84</td>
<td>SCL1</td>
<td>I/O</td>
<td></td>
<td>Pin 4</td>
</tr>
<tr>
<td>86</td>
<td>SDA1</td>
<td>I/O</td>
<td></td>
<td>Pin 6</td>
</tr>
<tr>
<td>97</td>
<td>SS1</td>
<td>I/O</td>
<td></td>
<td>Pin 8</td>
</tr>
<tr>
<td>110</td>
<td>U2RX</td>
<td>I/O</td>
<td></td>
<td>Pin 16</td>
</tr>
<tr>
<td>112</td>
<td>U2TX</td>
<td>I/O</td>
<td></td>
<td>Pin 18</td>
</tr>
<tr>
<td>106</td>
<td>U2RTS</td>
<td>I/O</td>
<td></td>
<td>Pin 20</td>
</tr>
<tr>
<td>108</td>
<td>U2CTS</td>
<td>I/O</td>
<td></td>
<td>Pin 22</td>
</tr>
</tbody>
</table>
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 2-6: TOUCHSCREEN CONNECTOR

Use TFT2N0369-E for the same display with the touchscreen option added.

Truly LCD Module
TFT-G240320LTSCW-118W-E
### TABLE 2-2: SOLOMON SYSTECH SSD1926 LCD CONTROLLER I/O CONNECTIONS

<table>
<thead>
<tr>
<th>SSD1926 Pin Description</th>
<th>Expansion Connector Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chip Select</td>
<td>RG13</td>
</tr>
<tr>
<td>Chip Reset(^{(1)})</td>
<td>RA10</td>
</tr>
<tr>
<td>Chip Register Select</td>
<td>RB10</td>
</tr>
<tr>
<td>Chip Wait</td>
<td>RC3</td>
</tr>
</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Touch Screen Pin</th>
<th>Expansion Connector Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>X+</td>
<td>AN11/RB11</td>
</tr>
<tr>
<td>X-</td>
<td>RB13</td>
</tr>
<tr>
<td>Y+</td>
<td>AN14/RB14</td>
</tr>
<tr>
<td>Y-</td>
<td>RB12</td>
</tr>
</tbody>
</table>
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**

<table>
<thead>
<tr>
<th>Joystick and Fire Button Pin Description</th>
<th>Expansion Connector Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up</td>
<td>RB1/CN3</td>
</tr>
<tr>
<td>Down</td>
<td>RB3/CN5</td>
</tr>
<tr>
<td>Left</td>
<td>RB0/CN2</td>
</tr>
<tr>
<td>Right</td>
<td>RB4/CN6</td>
</tr>
<tr>
<td>Fire</td>
<td>RB15/CN12</td>
</tr>
</tbody>
</table>
2.6 USER-CONTROLLED LEDS

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

FIGURE 2-12: LEDs

![LEDs Image]

FIGURE 2-13: LED CONNECTION SCHEMATIC

![LED Connection Schematic]

TABLE 2-5: LED CONNECTIONS

<table>
<thead>
<tr>
<th>LED Description</th>
<th>Expansion Connector Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED 1</td>
<td>RD1</td>
</tr>
<tr>
<td>LED 2</td>
<td>RD2</td>
</tr>
<tr>
<td>LED 3</td>
<td>RD3</td>
</tr>
<tr>
<td>LED 4</td>
<td>RC1</td>
</tr>
<tr>
<td>LED 5</td>
<td>RC2</td>
</tr>
</tbody>
</table>
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 \( \text{i}^2\text{C} \) 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 I²C bus interface to communicate to the 24LC08.
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 I²C 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

- **Line Audio Output**
  - C13 1μF
  - R11 100 Ohm
  - J9

- **Headphone Output**
  - C6 220 μF 6.3V
  - C12 220 μF 8.3V
  - R13 47K
  - R14 47K

- **Microphone Input**
  - C17 0 Ohm
  - R33 680 Ohm
  - R20 47K
  - C31 228pF

- **Biasing**
  - MICBIAS
  - HPGND

All components are labeled with their respective parts and values, and the diagram includes a legend for the components used.
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**

<table>
<thead>
<tr>
<th>RG14 Pin Setting</th>
<th>Width</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>16</td>
</tr>
</tbody>
</table>

**TABLE 2-7:  CPLD SPI SOURCE SELECT**

<table>
<thead>
<tr>
<th>RG12 Pin Setting</th>
<th>SPI</th>
<th>Chip Select</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>SPI3A</td>
<td>RF12</td>
</tr>
<tr>
<td>1</td>
<td>SPI2/SPI2A</td>
<td>RG9</td>
</tr>
</tbody>
</table>

**TABLE 2-8:  CPLD SPI PERIPHERAL DESTINATION SELECT**

<table>
<thead>
<tr>
<th>RA7 Pin Setting</th>
<th>RA6 Pin Setting</th>
<th>Peripheral</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>SPI Flash</td>
</tr>
<tr>
<td>0</td>
<td>1</td>
<td>MRF24WBOMA</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>Expansion Slot</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

**TABLE 2-9:  PIC32 STARTER KIT CPLD**

<table>
<thead>
<tr>
<th>Expansion Connector Pin</th>
<th>PIC32 Starter Kit CPLD Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PIC32 General Purpose Starter Kit (DM320001)</td>
</tr>
<tr>
<td>RG14</td>
<td>RG12</td>
</tr>
<tr>
<td>0</td>
<td>x</td>
</tr>
<tr>
<td>1</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>0</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

**Legend:** An ‘x’ indicates this pin is a ‘don’t care’, — = unimplemented.
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)

9V–15V DC
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

UP
AN1/CN3/RB1
AN15/CN12/RB15

FIRE
AN0/CN2/RB0
AN15/CN12/RB15

LEFT
J51200

RIGHT
AN4/CN5/RB4

DOWN
AN3/CN4/RB3

S1

S2
FIGURE A-9: TOUCHSCREEN SOCKETS

Use TFT2N0369-E for the same display with the touch screen option added.

Truly LCD Module
TFT-G240320LTSW-118W-E
FIGURE A-10: MEMORY

EEPROM Memory
(I2C Slave Addr = 1010 000X)

+3.3V
R8 1K
R7 1K
SCL2
SDA2
U2
24LC08_SOT23_5
+C42 .1uF

16M Serial Flash
U6
SST25VF016B-50-4C-S2AF

+3.3V
R35 10K
FL_CS
FL_SDI
FL_SCK
FL_SDO

© 2010-2012 Microchip Technology Inc.
FIGURE A-11: AUDIO

[Diagram of audio circuitry showing components such as C33, C47, C54, C55, C59, C13, C14, C17, C31, R11, R12, R13, R14, R15, R16, R32, R33, R47, and connections to audio-related peripherals.]
FIGURE A-12: POWER SUPPLY

[Diagram of a power supply circuit with various components such as resistors, capacitors, and diodes labeled with values and connections to power sources (+5V, +3.3V, +3.3V, +3.3V, +1.8V).]
FIGURE A-16: ANALOG PLANES

FIGURE A-17: DIGITAL PLANES
FIGURE A-18: ACCELEROMETER

3 Axis Accelerometer
(I2C Slave Addr = 0111 000X)

FIGURE A-19: USER AND POWER LEDs

USER LED'S

POWER

LED6

+3.3V

R30 470 Ohm
### Table B-1: Multimedia Expansion Board Bill of Materials (BOM)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td></td>
<td>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</td>
<td>CAP CER. 10UF 16V 0803</td>
<td>CAP0603</td>
<td>TDK Corporation</td>
<td>C1608Y5V1C104Z</td>
<td>DKC</td>
<td>445-1326-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C11</td>
<td>CAP CER 4.7UF 50V Y5V 0505</td>
<td>CAP1206</td>
<td>TDK Corporation</td>
<td>C3216Y5V1H475Z</td>
<td>DKC</td>
<td>445-3472-1-ND</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>C13, C14, C17</td>
<td>CAP TANTALUM 1.0UF 35V 20% SMD</td>
<td>CAP1206_POL</td>
<td>Kemet</td>
<td>B45196H6105M109</td>
<td>DKC</td>
<td>495-2279-1-ND</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>C15, C16</td>
<td>CAP CER 18PF 50V C0G 0603</td>
<td>CAP0603</td>
<td>TDK Corporation</td>
<td>C1608C0G1H180J</td>
<td>DKC</td>
<td>445-1272-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C24</td>
<td>CAP CER 820PF 50V 10% X7R 0603</td>
<td>CAP0603</td>
<td>Murata</td>
<td>GRM188R71H821KA01D</td>
<td>DKC</td>
<td>490-1493-1-ND</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>C25, C28</td>
<td>CAP CER 8.0PF 50V C0G 0603</td>
<td>CAP0603</td>
<td>TDK Corporation</td>
<td>C1608C0G1H080D</td>
<td>DKC</td>
<td>445-5043-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C27</td>
<td>CAP CERAMIC 10PF 50V NP0 0603</td>
<td>CAP0603</td>
<td>Kemet</td>
<td>C0603C100J5GACTU</td>
<td>DKC</td>
<td>399-1049-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C31</td>
<td>CAP CERAMIC 220PF 50V NP0 0603</td>
<td>CAP0603</td>
<td>Kemet</td>
<td>C0603C221J5GACTU</td>
<td>DKC</td>
<td>399-1066-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C36</td>
<td>CAP CER 240PF 50V 5% C0G 0603</td>
<td>CAP0603</td>
<td>Murata</td>
<td>GRM1885C1H241J01D</td>
<td>DKC</td>
<td>490-1436-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C38</td>
<td>CAP CER 5600PF 50V 10% X7R 0603</td>
<td>CAP0603</td>
<td>Murata</td>
<td>GRM188R71H562KA01D</td>
<td>DKC</td>
<td>490-1507-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C45</td>
<td>CAP CER 4.7UF 10V Y5V 0603</td>
<td>CAP0603</td>
<td>Murata</td>
<td>GRM188F51A475ZE20D</td>
<td>DKC</td>
<td>490-3302-1-ND</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>C5, C8, C10, C11, C13, C33, C43, C45, C50</td>
<td>CAP CER 10UF 16V Y5V 0805</td>
<td>CAP0805</td>
<td>Murata</td>
<td>GRM21BF51C106ZE15L</td>
<td>DKC</td>
<td>490-3347-1-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C57</td>
<td>CAP CER 22UF 16V Y5V 1206</td>
<td>CAP1206</td>
<td>TDK Corporation</td>
<td>C3216Y5V1C226Z</td>
<td>DKC</td>
<td>445-3466-1-ND</td>
</tr>
</tbody>
</table>
### TABLE B-1: MULTIMEDIA EXPANSION BOARD BILL OF MATERIALS (BOM)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>C69, C70, C58, C59, C60, C61</td>
<td>CAP CER 1.0UF 16V Y5V 0603</td>
<td>CAP0603</td>
<td>Murata</td>
<td>GRM188F051C0105Z010D</td>
<td>DKC</td>
<td>490-1582-1-ND</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>C6, C12</td>
<td>CAP 10UF 10V ELECT VS BI-POLAR</td>
<td>CAP_SMT_C</td>
<td>Panasonic</td>
<td>EEE-HA0221WP</td>
<td>DKC</td>
<td>PCE4161CT-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>D1</td>
<td>Schottky (Diodes &amp; Rectifiers) 30V</td>
<td>DIODE_SOD-323</td>
<td>Central Semi</td>
<td>CMDSH-3TR</td>
<td>Mouser</td>
<td>610-CMDSH-3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>D4, D5, D6</td>
<td>DIODE SCHOTTKY 30V 1A SMA</td>
<td>DIODE_DO214_SMT</td>
<td>Diodes Inc.</td>
<td>B130-13-F</td>
<td>DKC</td>
<td>B130-FDICT-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>J1</td>
<td>CONN POWER JACK 2.5X5.5MM SMD</td>
<td>PWR_CON_PJ-00_2B-SMT</td>
<td>Cui Inc.</td>
<td>PJ-002B-SMT</td>
<td>DKC</td>
<td>CP-002BPJCT-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>J11</td>
<td>CONN FPC/FFC 40POS .5MM HORZ SMD</td>
<td>CONN_FH12-40S-0.5S</td>
<td>Hirose</td>
<td>FH12A-40S-0.5SH</td>
<td>DKC</td>
<td>HFK140CT-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>J12</td>
<td>CONN FPC/FFC 4POS 1MM R/A SMD</td>
<td>CONN_FFC_SFW 4R-4</td>
<td>FCI</td>
<td>SFW4R-3STE1LF</td>
<td>DKC</td>
<td>609-1885-1-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>J3</td>
<td>CONN RECEP 120POS W/POST SMD</td>
<td>CONN_CL570-020_3_FLIP</td>
<td>Hirose</td>
<td>FX10A-120S/12-SV(71)</td>
<td>DKC</td>
<td>H11234-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>J4</td>
<td>CONN EJECT MICROSD PUSH-PUSH SMD</td>
<td>CONN_2908-05W_S-MG</td>
<td>3M</td>
<td>2908-05WB-MG</td>
<td>DKC</td>
<td>3M5607CT-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>J5</td>
<td>CONN FEMALE 28POS DL .1” R/A TIN</td>
<td>HDR2X14</td>
<td>Sullins</td>
<td>PPTC142LJ8N-RC</td>
<td>DKC</td>
<td>S5528-ND</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>J7, J8, J9</td>
<td>CONN JACK STE-REO 5POS 3.5MM SMD</td>
<td>PHONE_SJ21-3515_SMT</td>
<td>Cui Inc.</td>
<td>SJ1-3515-SMT</td>
<td>DKC</td>
<td>CP1-351SJC7-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>L2</td>
<td>INDUCTOR 4.7UH 1.0A 20% SMD</td>
<td>INDUCTOR-1210SMT</td>
<td>TDK Corporation</td>
<td>FLF3215T-4R7M</td>
<td>DKC</td>
<td>445-4846-1-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>L3</td>
<td>INDUCTOR 10UH 900MA 1210 SMD</td>
<td>INDUCTOR-1210SMT</td>
<td>Taiyo Yuden</td>
<td>BRL3225T100K</td>
<td>DKC</td>
<td>587-2167-1-ND</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>LED1, LED2, LED3, LED4, LED5, LED6</td>
<td>LED GREEN CLEAR THIN 0805 SMD</td>
<td>LED-0805</td>
<td>Lite-On Inc.</td>
<td>LTST-C171GKT</td>
<td>DKC</td>
<td>160-1423-1-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Q5</td>
<td>MOSFET N-CH 30V 2A SOT23</td>
<td>MOSFET-NCHAN_SOT_23</td>
<td>Alpha &amp; Omega Semiconductor Inc.</td>
<td>AO3424</td>
<td>DKC</td>
<td>785-1017-1-ND</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>R1, R2, R3, R16, R48</td>
<td>RES 4.70K OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Panasonic</td>
<td>ERJ-3EKF4701V</td>
<td>DKC</td>
<td>P4.70KHC7-ND</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>R11, R12</td>
<td>RES 100 OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Panasonic</td>
<td>ERJ-3EKF1000V</td>
<td>DKC</td>
<td>P100HC7-ND</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>R13, R14, R15, R17, R20</td>
<td>RES 47K OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Stackpole</td>
<td>RMCF 1/16 47K 1% R</td>
<td>DKC</td>
<td>RMCF1/1647KFRCT-ND</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>-----------</td>
<td>-------</td>
<td>-----------</td>
<td>------</td>
<td>----------</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>14</td>
<td>R18,R19, R23, R24, R25, R26, R27, R28, R30, R31</td>
<td>RES 10K OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Stackpole</td>
<td>RMCF 1/16 10K 1% R</td>
<td>DKC</td>
<td>RMCF1/1610KFRCT-ND</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>RES 470 OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Panasonic</td>
<td>ERJ-3EKF4700V</td>
<td>DKC</td>
<td>P470HCT-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RES 52.3K OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Yageo</td>
<td>RC0603FR-0752K3L</td>
<td>DKC</td>
<td>311-52.3KHRTC-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RES 62.0 OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Yageo</td>
<td>RC0603FR-0762RL</td>
<td>DKC</td>
<td>311-62.0HRCT-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RES 22 OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Yageo</td>
<td>RL0603FR-070R22L</td>
<td>DKC</td>
<td>311-22QCT-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RES 1.00 OHM 1/8W 1% 0805 SMD</td>
<td>RES0805</td>
<td>Vishay</td>
<td>CRCW08051R00FKEA</td>
<td>DKC</td>
<td>541-1.00CCTC-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>RES 50K OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Panasonic</td>
<td>ERJ-3EKF1003V</td>
<td>DKC</td>
<td>P100KHC-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RES 0.0 OHM 1/8W 5% 0805 SMD</td>
<td>RES0805</td>
<td>Panasonic</td>
<td>ERJ-6GEY0R00V</td>
<td>DKC</td>
<td>P0.0ACT-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>RES 1.00K OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Panasonic</td>
<td>ERJ-3EKF1001V</td>
<td>DKC</td>
<td>P1.00KHC-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>S 10.0M OHM 1/10W 1% 0603 SMD</td>
<td>RES0603</td>
<td>Yageo</td>
<td>RC0603FR-0710ML</td>
<td>DKC</td>
<td>311-10.0MRCT-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SWITCH LT MULTI DIRECTION SMD</td>
<td>SW_JS1200</td>
<td>Panasonic</td>
<td>EVQ-Q7GA50</td>
<td>DKC</td>
<td>P13351SCT-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SWITCH TACT 8MM SMD MOM 1600GF</td>
<td>Omron</td>
<td>B3S-1000</td>
<td>DKC</td>
<td>SW415-ND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3-AXIS ACCELERO METER DIGITAL I/F</td>
<td>BMA150</td>
<td>Bosch</td>
<td>BMA150</td>
<td>DKC</td>
<td>828-1003-1-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Flash 16M Serial Flash 50MHz</td>
<td>SST25VFO020_SO8</td>
<td>SST</td>
<td>SST25VFO16B-50-4C-8AF</td>
<td>Mouser</td>
<td>804-25VF016B504CS2AF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>IC CR II CPLD 64MCRCELL 48QFN</td>
<td>XC2C64A-7QFG48C_QFQ48</td>
<td>Xilinx</td>
<td>XC2C64A-7QFG48C</td>
<td>DKC</td>
<td>122-1418-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>IC PWM STP-DWN REG 1A TSOT23-6</td>
<td>LM2734_TSOT_6</td>
<td>National Semi</td>
<td>LM2734YMK/NOPB</td>
<td>DKC</td>
<td>LM2734YMKT-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Audio CODECs Stereo Codec with H/P</td>
<td>WM8731L_SSOP28</td>
<td>Wolfson</td>
<td>WM8731SEDS/V</td>
<td>Mouser</td>
<td>238-WM8731SEDS/V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>CRYSTAL 12.0000 MHZ 18PF SMD</td>
<td>CRYSTAL_ABM8</td>
<td>Abracon</td>
<td>ABMB-12.000MHZ-B2-T</td>
<td>DKC</td>
<td>535-9826-1-ND</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>------</td>
<td>-----------</td>
<td>-------</td>
<td>-----------</td>
<td>------</td>
<td>----------</td>
<td>-------</td>
<td>----------</td>
</tr>
<tr>
<td>1</td>
<td>Y3</td>
<td>CRYS1AL</td>
<td>4.00</td>
<td>MHz 6.0 PF SMD</td>
<td>NDK</td>
<td>NX8045GB 4MHZ AT-W</td>
<td>DKC</td>
<td>644-1138-1-ND</td>
</tr>
<tr>
<td>1</td>
<td>U4</td>
<td>IC CONTROLLER</td>
<td>BOOST 2.55V</td>
<td>8MSOP</td>
<td>MCP1652_MSOP8</td>
<td>Microchip</td>
<td>MCP1652S-E/MS</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>U5</td>
<td>IC CMOS LDO</td>
<td>3.3V 500MA</td>
<td>SOT223-3</td>
<td>TC1262-2.5_SOT223</td>
<td>Microchip</td>
<td>TC1262-3.3VDBTR</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>U11</td>
<td>IC CMOS LDO</td>
<td>1.8V 800MA</td>
<td>SOT223-3</td>
<td>TC1262-SOT223</td>
<td>Microchip</td>
<td>TC1264-1.8VDBTR</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>U2</td>
<td>IC EEPROM</td>
<td>8KBIT</td>
<td>400KHZ</td>
<td>SOT23-5</td>
<td>24LC08_SOT23_5</td>
<td>Microchip</td>
<td>24LC08BT-I/OT</td>
</tr>
<tr>
<td>1</td>
<td>U10</td>
<td>802.11 Wireless module</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>mD</td>
<td>LCD0025</td>
</tr>
<tr>
<td>1</td>
<td>LCD</td>
<td>Truly TFT 3.2</td>
<td>320x240 Color Display with 4-wire Touch Panel</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>mD</td>
<td>SSD1926</td>
</tr>
<tr>
<td>1</td>
<td>U1</td>
<td>Solomon Systech</td>
<td>SSD1926 QFP128</td>
<td>SSD1926 LCD Graphic Controller</td>
<td>Solomon</td>
<td>SSD1926</td>
<td>mD</td>
<td>IC00409</td>
</tr>
<tr>
<td>1</td>
<td>Tape</td>
<td>TAPE DOUBLE SIDED FOAM 1/16 X 1”</td>
<td>—</td>
<td>3M</td>
<td>4026-1”X36YD</td>
<td>DKC</td>
<td>3M4026-ND</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>standoff</td>
<td>STANDOFF M/F</td>
<td>HEX 4-40 NYL. 875°L</td>
<td>—</td>
<td>Keystone</td>
<td>4805</td>
<td>DKC</td>
<td>4805K-ND</td>
</tr>
<tr>
<td>5</td>
<td>nut</td>
<td>NUT HEX 4-40 NYLON</td>
<td>—</td>
<td>B&amp;F Fastener Supply</td>
<td>NY HN 440</td>
<td>DKC</td>
<td>H616-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>spacer</td>
<td>SPACER NYLON #4 SCREW 3/16”</td>
<td>—</td>
<td>Bivar Inc</td>
<td>9908-187</td>
<td>DKC</td>
<td>492-1073-ND</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>screw</td>
<td>SCREW MACH PHIL 4-40X1/2 NYLON</td>
<td>—</td>
<td>B&amp;F Fastener Supply</td>
<td>NY PMS 440 0050 PH</td>
<td>DKC</td>
<td>H546-ND</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>3</td>
<td>TP1, TP2, TP3</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>X</td>
<td>1</td>
<td>+3.3V</td>
<td>3.3</td>
<td>TP-125R63</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>X</td>
<td>1</td>
<td>GND</td>
<td>GND</td>
<td>TP-125R63</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>
Index

B
Bill of Materials (BOM) ............................................. 53
Block Diagrams
High-level ................................................................ 37
Board Layout
  Back side components ........................................ 12
  Front side components ........................................ 11
  Top Assembly (Back of Board) .............................. 39
  Top Assembly (Front Side of Board) ...................... 38

C
Customer Change Notification Service ...................... 8
Customer Support ...................................................... 8

D
Documentation
  Conventions ........................................................ 6

H
Hardware
  Accelerometer and temperature sensor .................. 26
  Audio codec ....................................................... 29
  CPLD ................................................................. 34
  External memory ................................................ 27
  I/O Expansion Connector ..................................... 33
  Joystick and Fire Button ..................................... 24
  LCD controller ................................................... 19
  microSD card interface ...................................... 23
  PIC32 expansion connector ................................. 16
  Power supply .................................................... 15
  QVGA TFT touchscreen ....................................... 19
  User-controlled LEDs ........................................ 25
  Wireless connectivity ......................................... 32

I
Internet Address .................................................... 8

M
Microchip Internet Web Site ...................................... 8
MPLAB IDE Simulator, Editor User’s Guide ........... 7
Multimedia Expansion Board
  Kit contents ..................................................... 11

R
Readme .............................................................. 7

S
Schematics
  Accelerometer ................................................... 51
  Analog Planes ................................................... 50
  Audio ............................................................... 46
  CPLD ............................................................... 41
  Digital planes ................................................... 50
  Display backlight .............................................. 42
  Joystick and fire button ..................................... 43
  Memory ............................................................ 45
  microSD card connector ..................................... 42
  PICtail™ expansion connector ............................ 48
  Power supply .................................................... 47
  Solomon Systech SSD1926 LCD Controller .......... 40
  Starter Kit connector ......................................... 49
  Touchscreen sockets ......................................... 44
  User and power LEDs ........................................ 51
  Wireless .......................................................... 48

W
WWW Address ........................................................... 8
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
Suits 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 - Xianmen
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: 81-6-152-7160
Fax: 81-6-152-9310

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: 886-2-2506-6610
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