PIC18F66K80 100-Pin Plug-In Module 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.

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 ═

Trademarks

ISBN: 978-1-5224-0956-4

Object of Declaration: PIC18F66K80 100-Pin Plug-In Module

EU Declaration of Conformity

Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

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

This development/evaluation tool complies with EU RoHS2 Directive 2011/65/EU.

This development/evaluation tool, when incorporating wireless and radio-telecom functionality, is in compliance with the essential requirement and other relevant provisions of the R&TTE Directive 1999/5/EC and the FCC rules as stated in the declaration of conformity provided in the module datasheet and the module product page available at www.microchip.com.

For information regarding the exclusive, limited warranties applicable to Microchip products, please see Microchip's standard terms and conditions of sale, which are printed on our sales documentation and available at www.microchip.com.

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

Derek Carlson
VP Development Tools

12-Sep-14
Date

NOTES:

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 website (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 PIC18F66K80 100-Pin Plug-In Module. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes how to use the PIC18F66K80 100-Pin Plug-In Module as a development tool to emulate and debug firmware on a target board, as well as how to program devices. The document is organized as follows:

- **Chapter 1. "Introduction and Review"**
- **Chapter 2. "Important Notes"**
- **Chapter 3. "Hardware Configuration/Jumper Settings"**
- **Chapter 4. "Demo Code/Reference Firmware"**
- **Appendix A. "PIC18F66K80 100-Pin Plug-In Module Schematics"**

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user's guide describes how to use PIC18F66K80 100-Pin Plug-In Module. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

Release Notes for MPLAB® ICD 3 In-Circuit Debugger

For the latest information on using the PIC18F66K80 100-Pin Plug-In Module, read the "`Readme for PIC18F66K80 100-Pin Plug-In Module.htm`" file (an HTML file) in the Readmes subdirectory of the MPLAB IDE installation directory. The release notes (Readme) contains update information and known issues that may not be included in this user's guide.

THE MICROCHIP WEBSITE

Microchip provides online support via our website at www.microchip.com. This website is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the website 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 listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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 website at www.microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:

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

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

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

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

Technical support is available through the website at:

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

REVISION HISTORY

Revision A (September, 2016)

This is the initial release of this document.

Chapter 1. Introduction and Review

1.1 INTRODUCTION

The PIC18F66K80 Plug-In Module (PIM) allows the users to easily experiment with the PIC18F66K80 family of microcontrollers in conjunction with the Automotive Networking Development Board (ADM00716). The PIC18F66K80 family of devices fully supports applications requiring cost-effective, low-power CAN solutions with high performance and robust peripheral set. The PIM has an integrated ECAN™ module that conforms to the CAN 2.0B Active specification.

TABLE 1-1: 64-PIN TO 100-PIN PIM MAPPING

Device Pin	PIC18F66K80 64-Pin TQFP	PIM Pin	Device Pin	PIC18F66K80 64-Pin TQFP	PIM Pin
1	RC7/CCP4	80	33	VDDCORE/VCAP	85
2	RD4/ECCP1/P1A/PSP4	60	34	RA5/AN4/HLVDIN/T1CKI/SS	84
3	RD5/P1B/PSP5	61	35	RF2/MDCIN1	76
4	RD6/P1C/PSP6	91	36	RF3	77
5	RD7/P1D/PSP7	92	37	RE0/AN5/RD	94
6	RG0/RX1/DT1	52	38	RE1/AN6/C1OUT/WR	99
7	RG1/CANTX2	12	39	RE2/AN7/C2OUT/CS	100
8	VSS	75	40	AVDD	30
9	AVDD	30	41	VDD	37
10	VDD	2	42	AVSS	31
11	RG2/T3CKI	14	43	VSS	36
12	RG3/TX1/CK1	51	44	RF4/MDCIN2	81
13	RBO/AN10/FLT0/INT0 (Jumper J3)	21	45	RF5	82
		66	46	OSC1/CLKIN/RA7	63
14	RB1/AN8/CTDIN/INT1 (Jumper J4)	19	47	OSC2/CLKOUT/RA6	64
		67	48	RC0/SOSCO/SCLKI	74
15	RB2/CANTX/CTED1/INT2	88	49	RC1/SOSCI	73
16	RB3/CANRX/CTED2/INT3	87	50	RC2/T1G/CCP2	4
17	RF0/MDMIN	47	51	RC3/REFO/SCL/SCK (Jumper J2)	55
18	RG4/T0CKI	35			57
19	RF1	48	52	RF6/MDOUT	5
20	RB4/AN9/CTPLS/KBI0	83	53	RF7	18
21	RB5/T0KI/T3CKI/CCPS/KBI1	72	54	RD0/C1INA/PSPO	17
22	RB6/PGC/KBI2	26	55	RD1/C1INB/PSP1	38
23	RB7/PGD/T3G/KBI3	27	56	VSS	45
24	RE5/CANTX	89	57	VDD	46
25	VDD	16	58	RD2/C2INA/PSP2	58
26	VSS	15	59	RD3/C2INB/CTMUI/PSP3	59
27	RE4/CANRX	90	60	RE6/RX2/DT2	49

TABLE 1-1: 64-PIN TO 100-PIN PIM MAPPING (CONTINUED)

Device Pin	PIC18F66K80 64-Pin TQFP	PIM Pin	Device Pin	PIC18F66K80 64-Pin TQFP	PIM Pin
28	$\overline{\text{MCLR}}$/RE3	13	61	RE7/TX2/CK2	50
29	RA0/CVREF/AN0/ULPWU	20	62	RC4/SDA/SDI (Jumper J1)	54
30	RA1/AN1/C1INC	93			56
31	RA2/VREF-/AN2/C2INC	28	63	RC5/SDO	53
32	RA3/VREF+/AN3	29	64	RC6/CCP3	3

1.2 HIGHLIGHTS

Items discussed in this chapter include:

- PIC18F66K80 Plug-In Module Kit Contents
- Overview of the PIC18F66K80 Family CAN Capabilities

1.3 PIC18F66K80 PLUG-IN MODULE KIT CONTENTS

The PIM module kit contains the following items:

- PIC18F66K80 100-pin Plug-In Module

1.4 OVERVIEW OF THE PIC18F66K80 FAMILY CAN CAPABILITIES

- Conforms to CAN 2.0B Active Specification
- Three Operating modes:
  - Legacy mode (full backward compatibility with existing PIC18CXX8/FXX8 CAN modules)
  - Enhanced mode (programmable TX/RX buffers)
  - FIFO mode (programmable TX/RX buffers)
- Message Bit Rates up to 1 Mbps
- DeviceNet™ Data Byte Filter Support
- Six Programmable Receive/Transmit Buffers
- Three Dedicated Transmit Buffers with Prioritization
- Two Dedicated Receive Buffers
- Sixteen Full, 29-Bit Acceptance Filters with Dynamic Association
- Three Full, 29-Bit Acceptance Masks

Chapter 2. Important Notes

2.1 HIGHLIGHTS

This chapter discusses:

- Using the PIM with the Automotive Networking Board
- Programming the Microcontroller

2.2 USING THE PIM WITH THE AUTOMOTIVE NETWORKING DEVELOPMENT BOARD

The PIC18F66K80 100-pin PIM brings out SPI and I^2C on the same PIM pins. Use the jumpers J1 and J2 on the PIM to select between the two.

To enable INT access to all four click connections on the Automotive Networking Development Board, the PIC18F66K80 PIM allows the user to jumper the PIC18F INT0 or INT1 into the various INT pins on the four click headers by using jumpers J3 and J4 on the PIM.

Refer to **Section 3.4 "Jumpers"** for more details.

2.3 PROGRAMMING THE MICROCONTROLLER

When the PIM is mated to the Automotive Networking Development Board, it may be reprogrammed directly through the modular RJ11 jack (JP1) or the PICkit™ connection (J11) on the Automotive Networking Development Board.

NOTES:

Chapter 3. Hardware Configuration/Jumper Settings

3.1 HIGHLIGHTS

This chapter discusses:

- Hardware Features
- Crystal
- Jumpers

3.2 HARDWARE FEATURES

The PIC18F66K80 PIM has a number of hardware features intended to make it useful as an initial development platform and demonstration board. Refer to **Appendix A. "PIC18F66K80 100-Pin Plug-In Module Schematics"** for the Schematics of the PIM. The board offers the following hardware features:

- 32.768 kHz surface-mounted crystal
- Jumpers for added configurability

3.3 CRYSTAL

The PIM is populated with a 32.768 kHz crystal oscillator on the secondary oscillator pins.

3.4 JUMPERS

The PIM has four jumper headers on it to provide additional flexibility for experimentation and development purposes. The default position for these jumpers are:

- J1 – Jumper
  - Pins 1 and 2 (connects port 54 to RC4): SPI SDI connection to PIM (default setting)
  - Pins 2 and 3 (connects port 56 to RC4): I^2C SDA connection to PIM
- J2 – Jumper
  - Pins 1 and 2 (connects port 55 to RC3): SPI connection click headers (default setting)
  - Pins 2 and 3 (connects port 57 to RC3): I^2C connection click headers
- J3 – Jumper
  - Pins 1 and 2 (connects port 21 to RB0/INT0): click 1 INT connection (default setting)
  - Pins 2 and 3 (connects port 66 to RB0/INT0): click 3 INT connection
- J4 – Jumper
  - Pins 1 and 2 (connects port 19 to RB1/INT1): click 2 INT connection (default setting)
  - Pins 2 and 3 (connects port 67 to RB1/INT1): click 4 INT connection

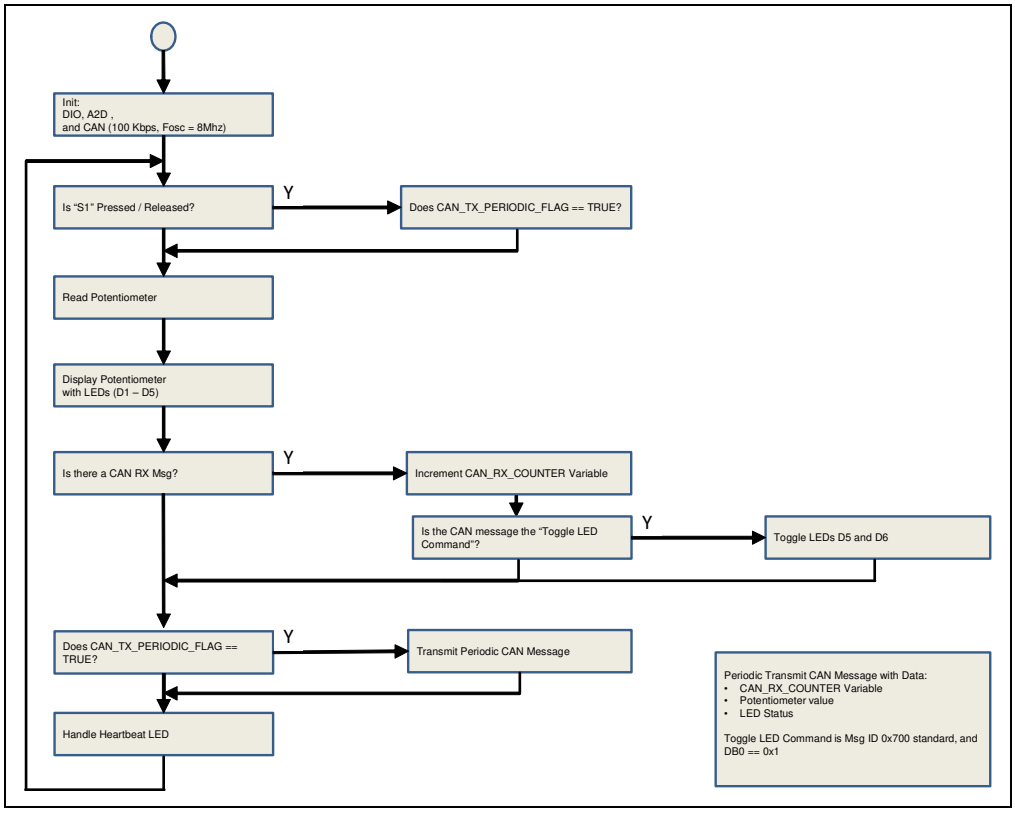
FIGURE 3-1: 3D VIEW OF PIC18F66K80 100-PIN PIM

Chapter 4. Demo Code/Reference Firmware

4.1 PREPROGRAMMED DEMONSTRATION FIRMWARE

The PIC18F66K80 100-pin PIM is programmed with firmware demonstrating basic features on the Automotive Networking Development Board. The source for the PIC18F66K80 PIM demo code may be downloaded from the Microchip website www.microchip.com.

FIGURE 4-1: FIRMWARE DETAILS



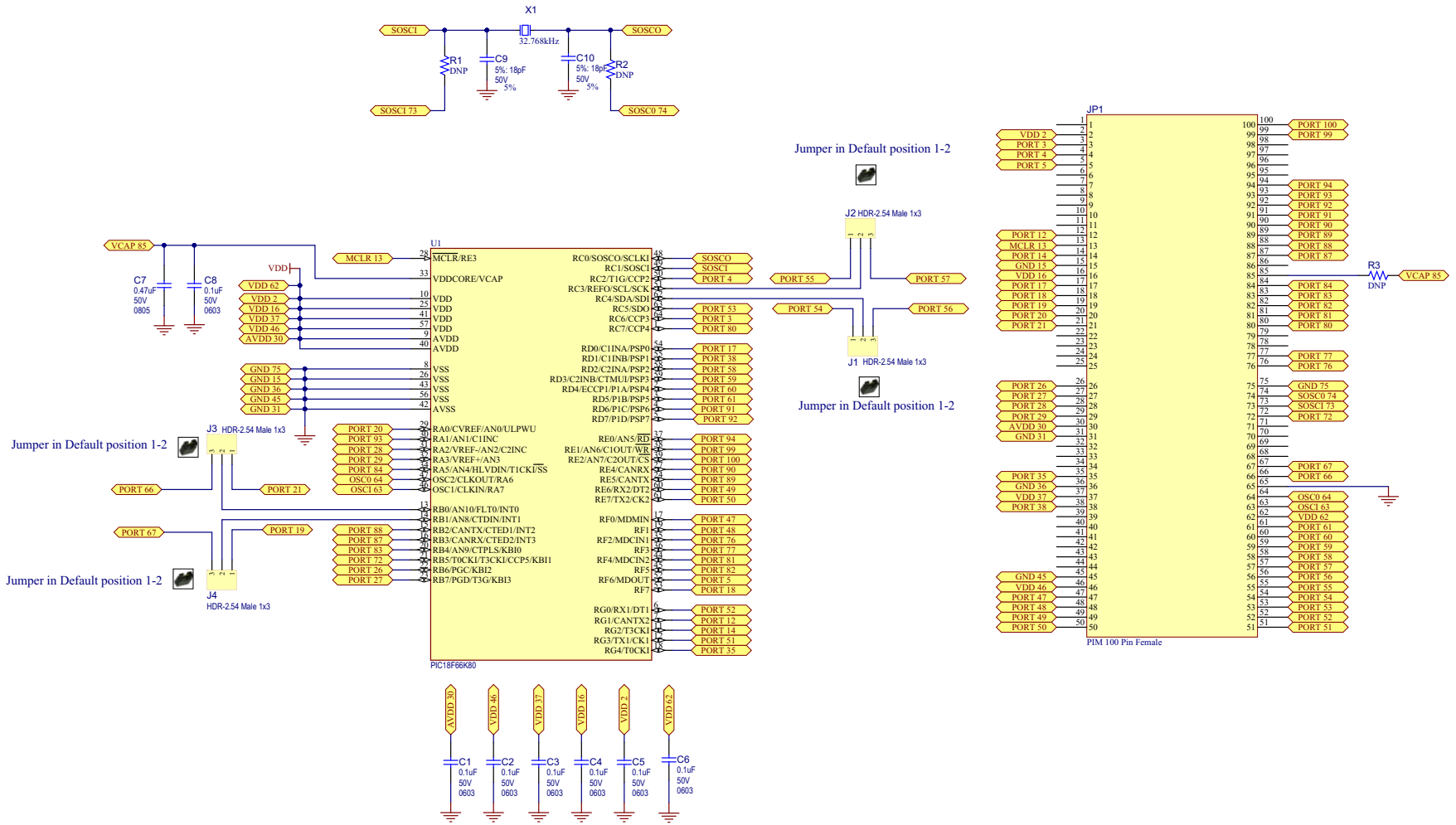
NOTES:

Appendix A. PIC18F66K80 100-Pin Plug-In Module Schematics

A.1 SCHEMATICS

The PIC18F66K80 100-Pin Plug-In Module schematics are shown in Figure A-1. By default, the PIM ships from the factory with the PIC18F66K80 pre-installed in location U1. The board revision number can be found etched into the copper on the bottom side of the PCB.

FIGURE A-1: PIC18F66K80 100-PIN PIM SCHEMATIC



Worldwide Sales and Service

AMERICAS

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

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

Austin, TX
Tel: 512-257-3370

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

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

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

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

Detroit
Novi, MI
Tel: 248-848-4000

Houston, TX
Tel: 281-894-5983

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

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

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110

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

ASIA/PACIFIC

Asia Pacific Office
Suites 3707-14, 37th Floor
Tower 6, The Gateway
Harbour City, Kowloon

Hong Kong
Tel: 852-2943-5100
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 - Dongguan
Tel: 86-769-8702-9880

China - Guangzhou
Tel: 86-20-8755-8029

China - Hangzhou
Tel: 86-571-8792-8115
Fax: 86-571-8792-8116

China - Hong Kong SAR
Tel: 852-2943-5100
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: 86-755-8864-2200
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

ASIA/PACIFIC

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

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

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: 91-20-3019-1500

Japan - Osaka
Tel: 81-6-6152-7160
Fax: 81-6-6152-9310

Japan - Tokyo
Tel: 81-3-6880- 3770
Fax: 81-3-6880-3771

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: 886-7-213-7828

Taiwan - Taipei
Tel: 886-2-2508-8600
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 - Dusseldorf
Tel: 49-2129-3766400

Germany - Karlsruhe
Tel: 49-721-625370

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

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

Italy - Venice
Tel: 39-049-7625286

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

Poland - Warsaw
Tel: 48-22-3325737

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

Sweden - Stockholm
Tel: 46-8-5090-4654

UK - Wokingham
Tel: 44-118-921-5800
Fax: 44-118-921-5820

06/23/16