



MCP1630
+12V In Dual Output
Buck Converter
Reference Design

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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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, Accuron, dsPIC, KEELOQ, KEELOQ logo, MPLAB, PIC, PICmicro, PICSTART, rPIC and SmartShunt are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

FilterLab, Linear Active Thermistor, MXDEV, MXLAB, SEEVAL, SmartSensor 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, CodeGuard, dsPICDEM, dsPICDEM.net, dsPICworks, dsSPEAK, ECAN, ECONOMONITOR, FanSense, In-Circuit Serial Programming, ICSP, ICEPIC, Mindi, MiWi, MPASM, MPLAB Certified logo, MPLIB, MPLINK, mTouch, PICkit, PICDEM, PICDEM.net, PICTail, PIC³² logo, PowerCal, PowerInfo, PowerMate, PowerTool, REAL ICE, rLAB, Select Mode, Total Endurance, UNI/O, 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.

© 2008, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

 Printed on recycled paper.

QUALITY MANAGEMENT SYSTEM
CERTIFIED BY DNV
== ISO/TS 16949:2002 ==

Microchip received ISO/TS-16949:2002 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

Preface	1
Chapter 1. Product Overview	
1.1 Introduction	5
1.2 What IS the MCP1630 Dual Buck Reference Design?	6
1.3 What the MCP1630 Dual Buck Reference Design kit includes	6
Chapter 2. Installation and Operations	
2.1 Introduction	7
2.2 Features	7
2.3 Getting Started	7
Appendix A. Schematic and Layouts	
A.1 Introduction and Highlights	13
A.2 Board - Schematic - Sheet 1	14
A.3 Board - SchEmatic - Sheet 2	15
A.4 Board - Top Layer	16
A.5 Board - Mid-Layer 1	17
A.6 Board - Mid-Layer 2	18
A.7 Board - Bottom Layer	19
Appendix B. Bill Of Materials (BOM)	
Appendix C. Evaluation Board Firmware	
C.1 Device Firmware	23
Worldwide Sales and Service	24

MCP1630 Dual Buck Reference Design

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 “DSXXXXA”, where “XXXX” is the document number and “A” is the revision level of the document.

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

INTRODUCTION

This chapter contains general information that will be useful to know before using the MCP1630 Dual Buck Reference Design. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Web Site
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This document describes how to use the MCP1630 Dual Buck Reference Design as a development tool. The manual layout is as follows:

- **Chapter 1. “Product Overview”** – Important information about the MCP1630 Dual Buck Reference Design.
- **Chapter 2. “Installation and Operations”** – Includes instructions on how to get started with this reference design and a description of the reference design operation.
- **Appendix A. “Schematic and Layouts”** - Shows the schematic and layout diagrams for the MCP1630 Dual Buck Reference Design.
- **Appendix B. “Bill Of Materials (BOM)”** – Lists the parts used to build the MCP1630 Dual Buck Reference Design.
- **Appendix C. “Evaluation Board Firmware”** - Provides information about the application firmware and where the source code can be found.

MCP1630 Dual Buck Reference Design

CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	<i>MPLAB[®] IDE User's Guide</i>
	Emphasized text	...is the <i>only</i> compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	<u><i>File>Save</i></u>
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	<i>file.o</i> , where <i>file</i> can be any valid filename
Square brackets []	Optional arguments	mcc18 [options] <i>file</i> [options]
Curly brackets and pipe character: { }	Choice of mutually exclusive arguments; an OR selection	errorlevel {0 1}
Ellipses...	Replaces repeated text	var_name [, var_name...]
	Represents code supplied by user	void main (void) { ... }

RECOMMENDED READING

This reference guide describes how to use MCP1630 Dual Buck Reference Design. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

MCP1630 Data Sheet, “High-Speed, Microcontroller-Adaptable, Pulse Width Modulator”, DS21896

MCP1630 NiMH Demo Board User's Guide, DS51505

AN960 - “New Components and Design Methods Bring Intelligence to Battery Charger Applications”, DS00960

MCP14628 Data Sheet, “2A Synchronous Buck Power MOSFET Driver”, DS22083

MCP1703 Data Sheet, “250 mA, 16V, Low Quiescent Current LDO”, DS22049

THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, 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 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

CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

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

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

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

DOCUMENT REVISION HISTORY

Revision B (July 2008)

- Changed U2 and U7 to MCP14628;
- Changed U4 to MCP1703.

Revision A (February 2005)

- Initial Release of this Document.

MCP1630 Dual Buck Reference Design

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP1630 Dual Buck Reference Design is used to evaluate the Microchip MCP1630 analog, high-speed Pulse Width Modulator (PWM) used in a dual synchronous, buck regulator, power-converter application. The evaluation board is a complete, stand-alone, dual-output, dc-dc converter with +12V input, adjustable dual output at 20A per output.

This chapter also covers the following topics:

- What is the MCP1630 Dual Buck Reference Design?
- What the MCP1630 Dual Buck Reference Design kit includes.

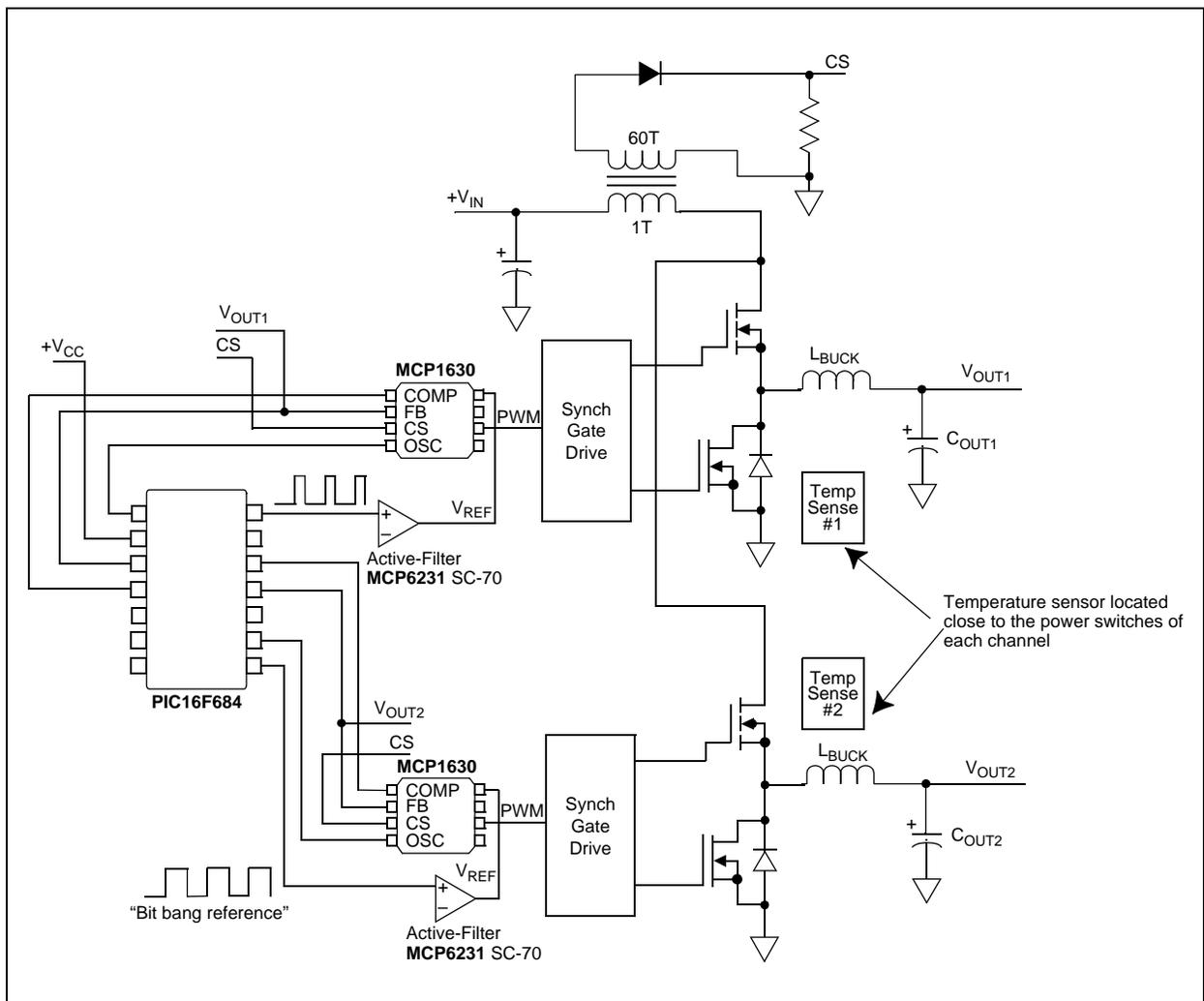


FIGURE 1-1: Dual Buck Converter Block Diagram.

MCP1630 Dual Buck Reference Design

1.2 WHAT IS THE MCP1630 DUAL BUCK REFERENCE DESIGN?

The MCP1630 Dual Buck Reference Design is a complete, stand-alone, dual-output power supply capable of 20A per output, powered from a +12V input source. This board utilizes Microchip's MCP1630 (high-speed PIC[®] MCU PWM MSOP8), MCP1703 (LDO SOT-89), PIC16F684 (MCU Flash TSSOP14), MCP6231U (Op Amp SC-70), TC6501 (Temperature Switch SOT23A-5) and MCP14628 (synchronous MOSFET driver SOIC8). The input voltage range for the reference design is +9.0V to +13.5V. Both adjustable regulated outputs are capable of 20A.

Input terminals are provided to apply an input voltage to the power supply. Output terminals are also provided as a way to connect the 20A outputs to a load.

1.3 WHAT THE MCP1630 DUAL BUCK REFERENCE DESIGN KIT INCLUDES

This MCP1630 Dual Buck Reference Design Kit includes:

- The MCP1630 Dual Buck Reference Design (102-00035)
- Analog and Interface Product Demonstration Boards CD-ROM (DS21912)
 - MCP1630 Dual Buck Reference Design (DS51531)
 - MCP1630 Data Sheet (DS21896)

Chapter 2. Installation and Operations

2.1 INTRODUCTION

The MCP1630 Dual Buck Reference Design demonstrates Microchip's MCP1630 high-speed PWM, used in an adjustable, dual-output, buck regulator application. The MCP1630 is a high-speed, microcontroller-adaptable, PWM that, when used in conjunction with a microcontroller, will control the power system duty cycle to provide output voltage regulation. The PIC16F684 microcontroller can be used to regulate output voltage or current, switching frequency and setting maximum duty cycle. The MCP1630 generates duty cycle, provides fast overcurrent protection and utilizes variable external inputs. External signals include the input oscillator and the reference voltage. The power train signals include the current sense and the feedback voltage. The output signal is a square-wave pulse. The power train used for the MCP1630 Dual Buck Reference Design is a dual synchronous buck regulator.

2.2 FEATURES

The MCP1630 Dual Buck Reference Design has the following features:

- Input Voltage Range: +9.0V to +13.5V
- Adjustable Output Voltage Capable of Calibration
- Sequencing or Tracking Outputs
- Outputs are 180° out of phase, each capable of 20A
- Independent Overcurrent Protection
- Independent Overtemperature Protection
- Input Overvoltage and Undervoltage Lockout (UVLO)
- Power Good Indication (LED) with Adjustable Delay
- Switching Frequency Dithering

2.3 GETTING STARTED

The MCP1630 Dual Buck Reference Design is fully assembled and tested over its range of input voltage, output voltage and output current. This board requires the use of an external input voltage source (+9.0V to +13.5V) and external load (electronic or resistive).

Note: It is recommended that a minimum 300 linear feet per minute of airflow blown directly across the board to cool the power dissipating components when operating above 10A loads.

MCP1630 Dual Buck Reference Design

2.3.1 Power Input and Output Connections

Powering the MCP1630 Dual Buck Reference Design.

1. Apply the input voltage to the connector (J3) provided. Connect the positive side of the input source (+) to the test point (J3-1). Connect the negative (or return side (-)) of the input source to the GND terminal (J3-2). J3 is the center two position terminal block located on the left side of the board. A 14-gauge wire size is recommended for evaluating the board at 20A per output. The power supply input voltage must be in the specified operating range for the board to operate. An undervoltage lockout circuit prevents the converter from running when the input voltage is too low.
2. An on/off push-button switch (SW3) is used to turn the converter outputs on and off. During normal power-up, the outputs are turned on by pressing SW3 once. To turn the outputs off, press SW3 again.
3. In the event of a fault, (input voltage out-of-range, output voltage out-of-range or power train overtemperature), both V_{OUT1} and V_{OUT2} will shut down, indicated by the D1 power good LED flashing. To restart, the input voltage must be brought to 0V and raised back to the specified input voltage range of the converter prior to pressing the on/off button. A solid D1 power good LED indicates that the regulator outputs are operating properly at their programmed values.

Applying the load to the MCP1630 Dual Buck Reference Design.

1. To apply a load to V_{OUT1} of the MCP1630 Dual Buck Reference Design, the positive side of the V_{O1} load (+) should be connected to the terminal + V_{O1} (J2-2). The negative side of the V_{O1} load should be connected to the terminal GND (J2-1).
2. To apply a load to V_{OUT2} of the MCP1630 Dual Buck Reference Design, the positive side of the V_{O2} load (+) should be connected to the terminal + V_{O2} (J4-2). The negative side of the V_{O2} load should be connected to the terminal GND (J4-1).
3. Outputs V_{O1} and V_{O2} are independent of each other and are loaded separately. Both outputs have independent over current protection, overtemperature and short-circuit protection.

Note: The maximum rated load is 20A per output. When loading the board over 10A, airflow is necessary to prevent the overtemperature protection circuitry from automatically turning off the power train that has the overtemperature condition.

2.3.2 Power Present and Power Good Indication

1. The MCP1630 Dual Buck Reference Design has two status LED's. One LED (D3) is used to determine if input voltage is present.
2. The second LED (D1) is used for fault and power good indication. During normal operation, if both regulator outputs are within regulation, D1 is illuminated to provide indication that power is good. If either output is out of regulation, D1 will blink, providing indication that one or both of the outputs are not in regulation.

2.3.3 Programming

1. The MCP1630 Dual Buck Reference Design can be programmed to calibrate V_{OUT1} , V_{OUT2} , output sequencing or tracking and switching frequency dithering on or off.
2. To enter the programming mode, apply input voltage within the specified operating range (9V to 13.5V). Press and hold the M (SW1) button. While still holding the M button, press and release the on/off (SW3) button. The flashing rate of LED D1 should increase, indicating Programming mode.
3. Once in Programming mode, the first variable to set is V_{OUT1} . Press the select S button to increase V_{OUT1} . Keep pressing the S button to increase V_{OUT1} until it wraps around to the minimum setting.

Note: The range of V_{OUT1} is controlled by the value of fixed resistors R_{34} , R_{35} and R_{10} . The range of V_{OUT1} is typically from 2.42V (minimum) to 3.39V (maximum).

4. Press M once to select V_{OUT2} . V_{OUT2} is increased by pressing the S button similar to setting V_{OUT1} .

Note: The range of V_{OUT2} is controlled by the value of fixed resistors R_{14} , R_{15} and R_{42} . The range of V_{OUT2} is typically from 1.22V (minimum) to 2.3V (maximum).

5. Press M once to select between output sequencing or tracking. D1 flashing indicates that sequencing is selected. Press M to change from sequencing to tracking, or from tracking to sequencing.
6. Press M once to select between frequency dithering on and frequency dithering off. D1 flashing indicates that frequency dithering is selected.
7. By pressing and holding the M button, the selected settings will be programmed. The next power-up cycle for the converter will return to the programmed settings.

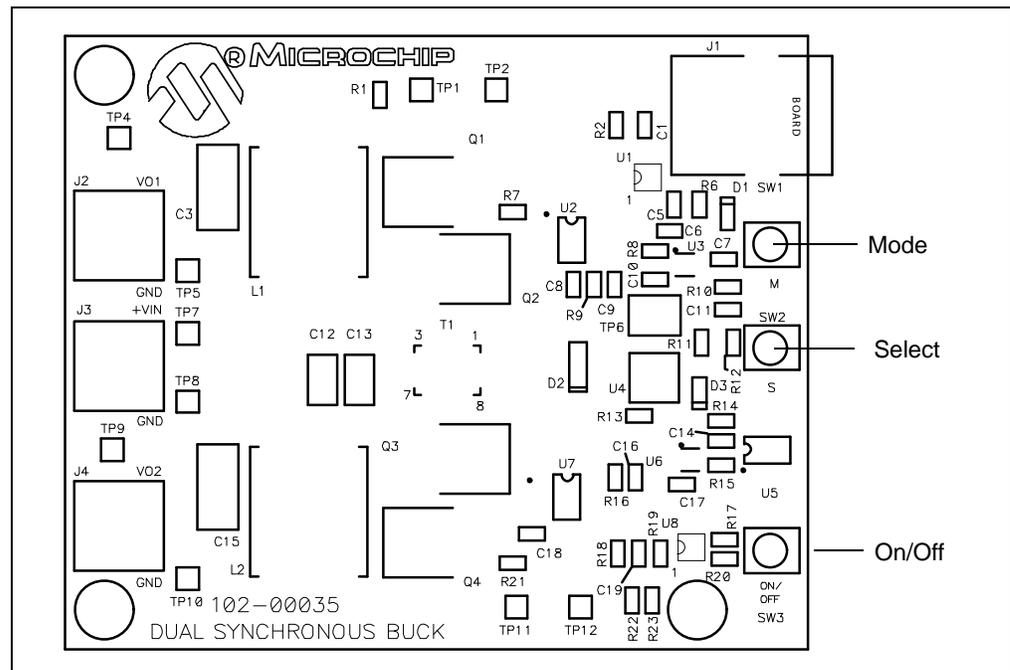


FIGURE 2-1: Mode, Select and On/Off Switch Location.

MCP1630 Dual Buck Reference Design

NOTES:



MCP1630 DUAL BUCK REFERENCE DESIGN

Appendix A. Schematic and Layouts

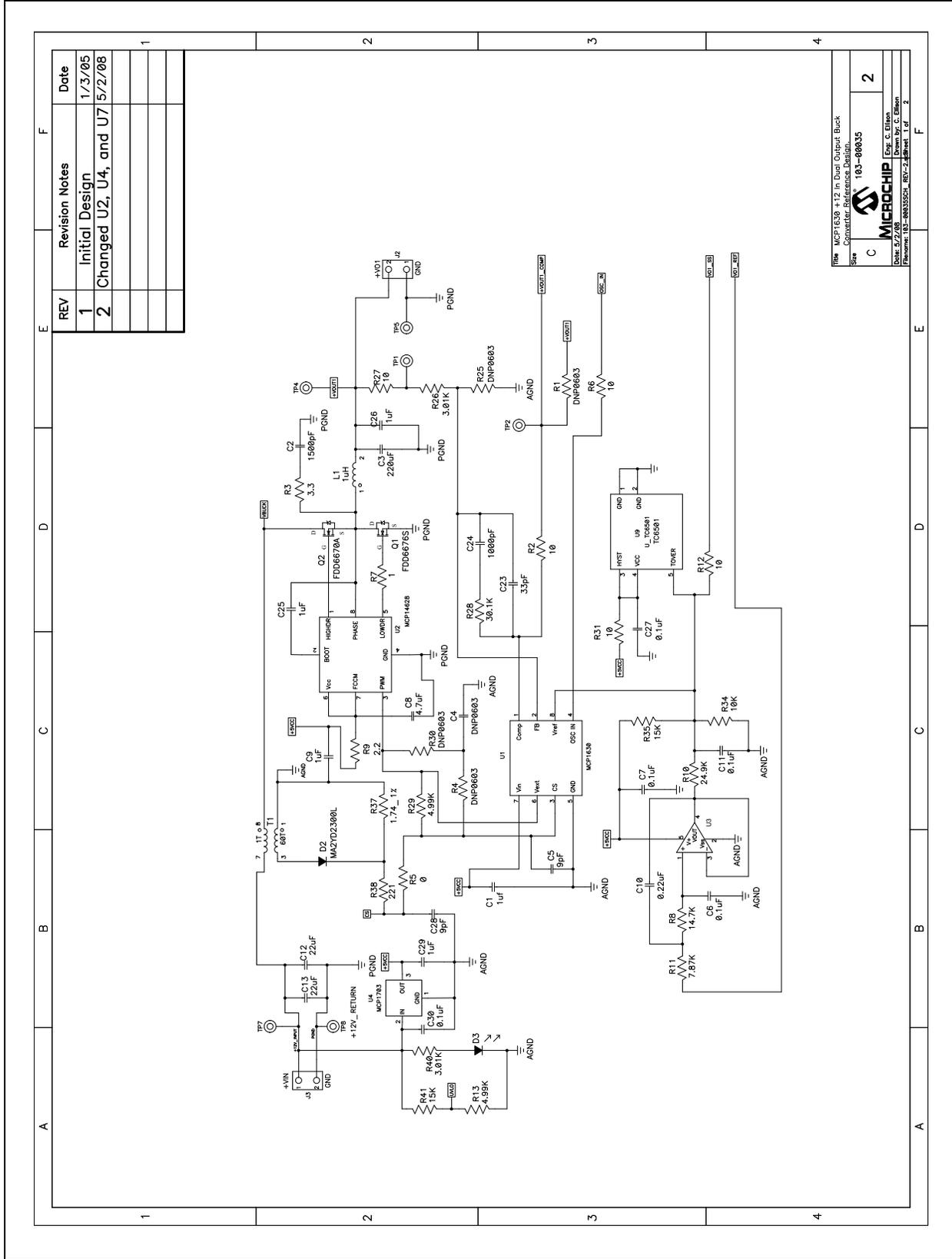
A.1 INTRODUCTION AND HIGHLIGHTS

This appendix contains the following schematics and layouts for the MCP1630 Dual Buck Reference Design:

- Board Schematic - Sheet 1
- Board Schematic - Sheet 2
- Board - Top Layer
- Board - Mid-Layer 1
- Board - Mid-Layer 2
- Board - Bottom Layer

MCP1630 Dual Buck Reference Design

A.2 BOARD SCHEMATIC - SHEET 1

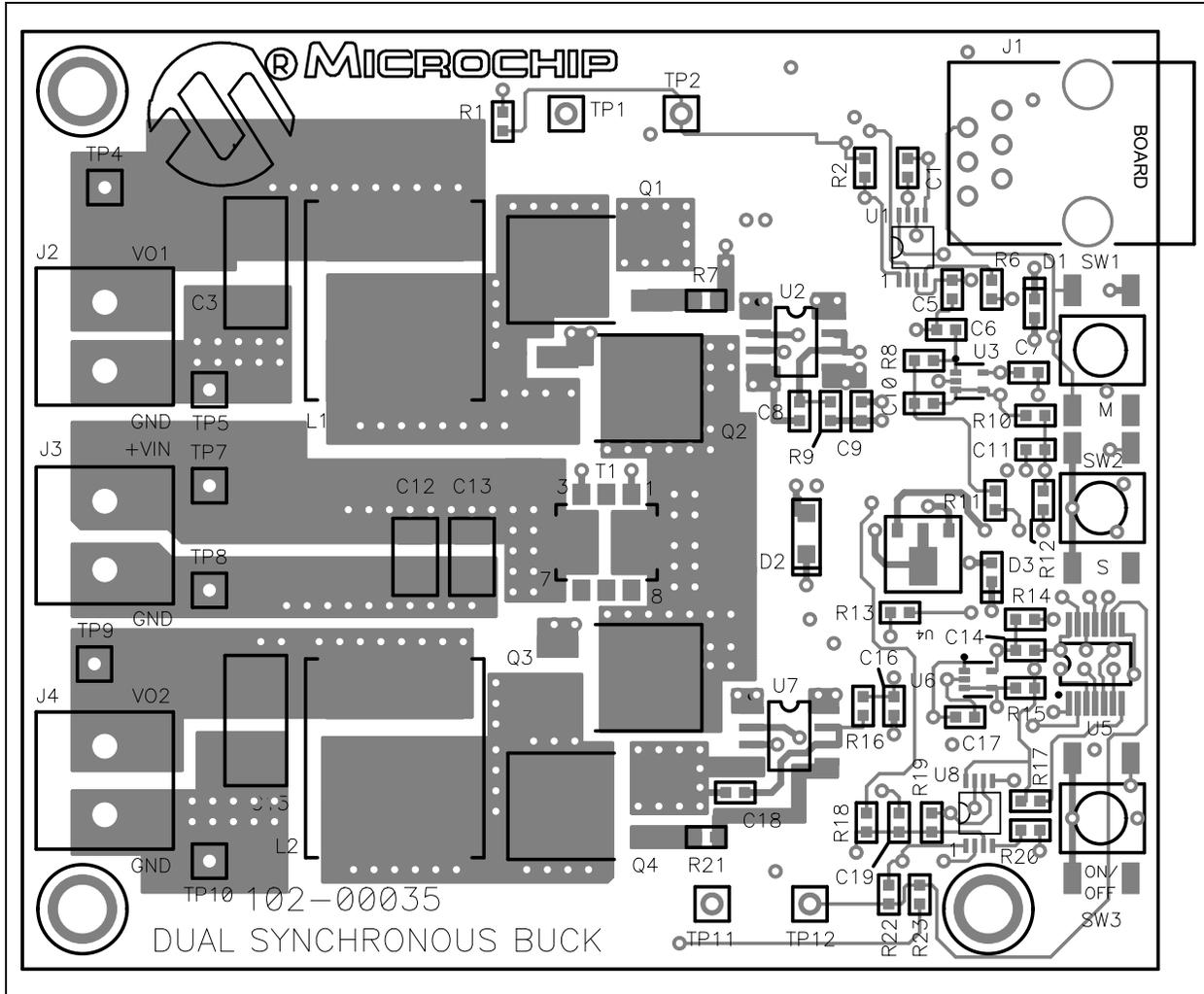


REV	Revision Notes	Date
1	Initial Design	1/3/05
2	Changed U2, U4, and U7	5/2/08

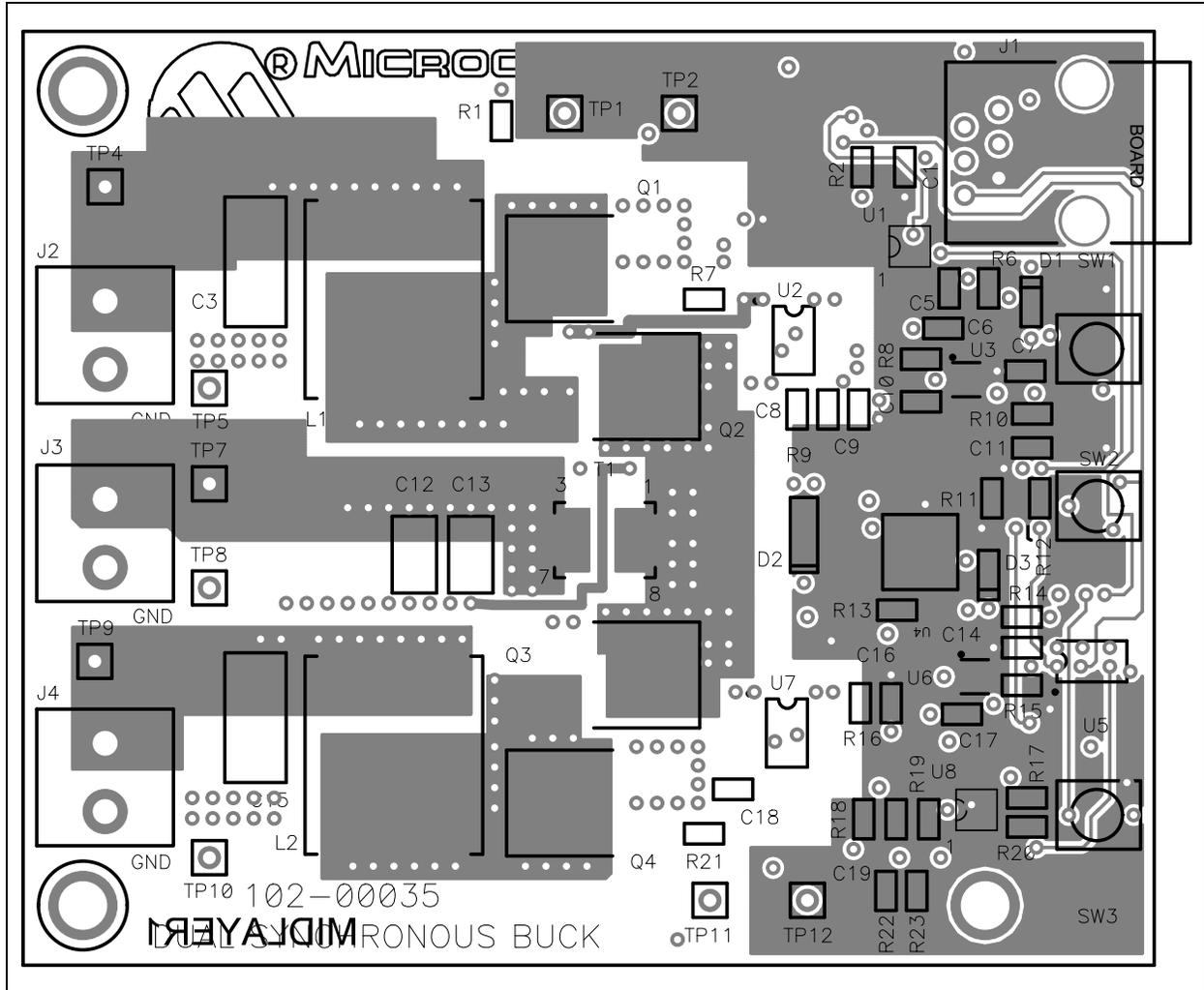
Title: MCP1630 +12 In. Dual Output Buck Converter Reference Design	
Rev: C	103-00035
MICROCHIP	
DATE: 5/2/08	Drawn by: C. Ellison
Filename: 103-000355A_05V-2_Sheet_1 of 2	

MCP1630 Dual Buck Reference Design

A.4 BOARD - TOP LAYER

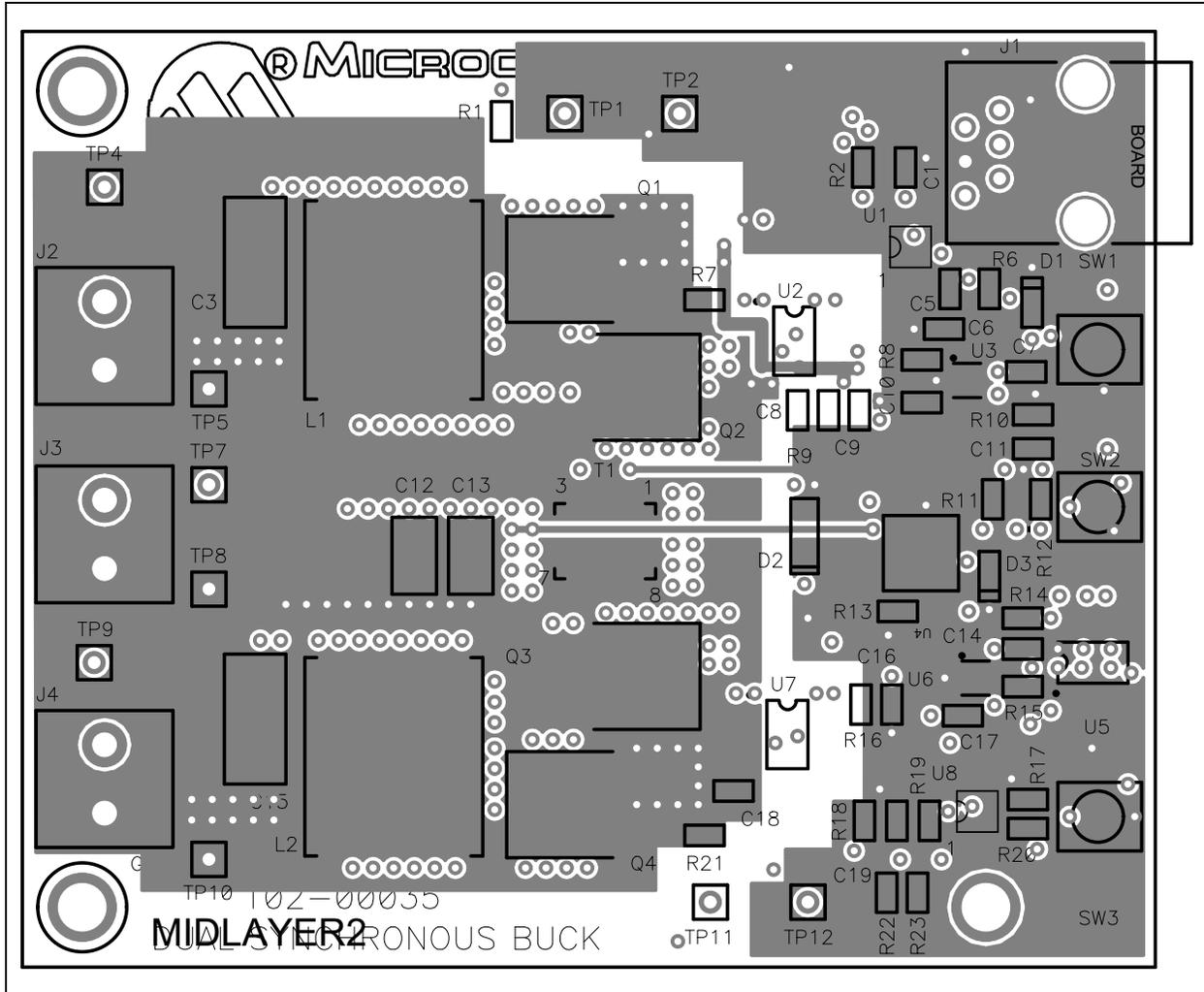


A.5 BOARD - MID-LAYER 1

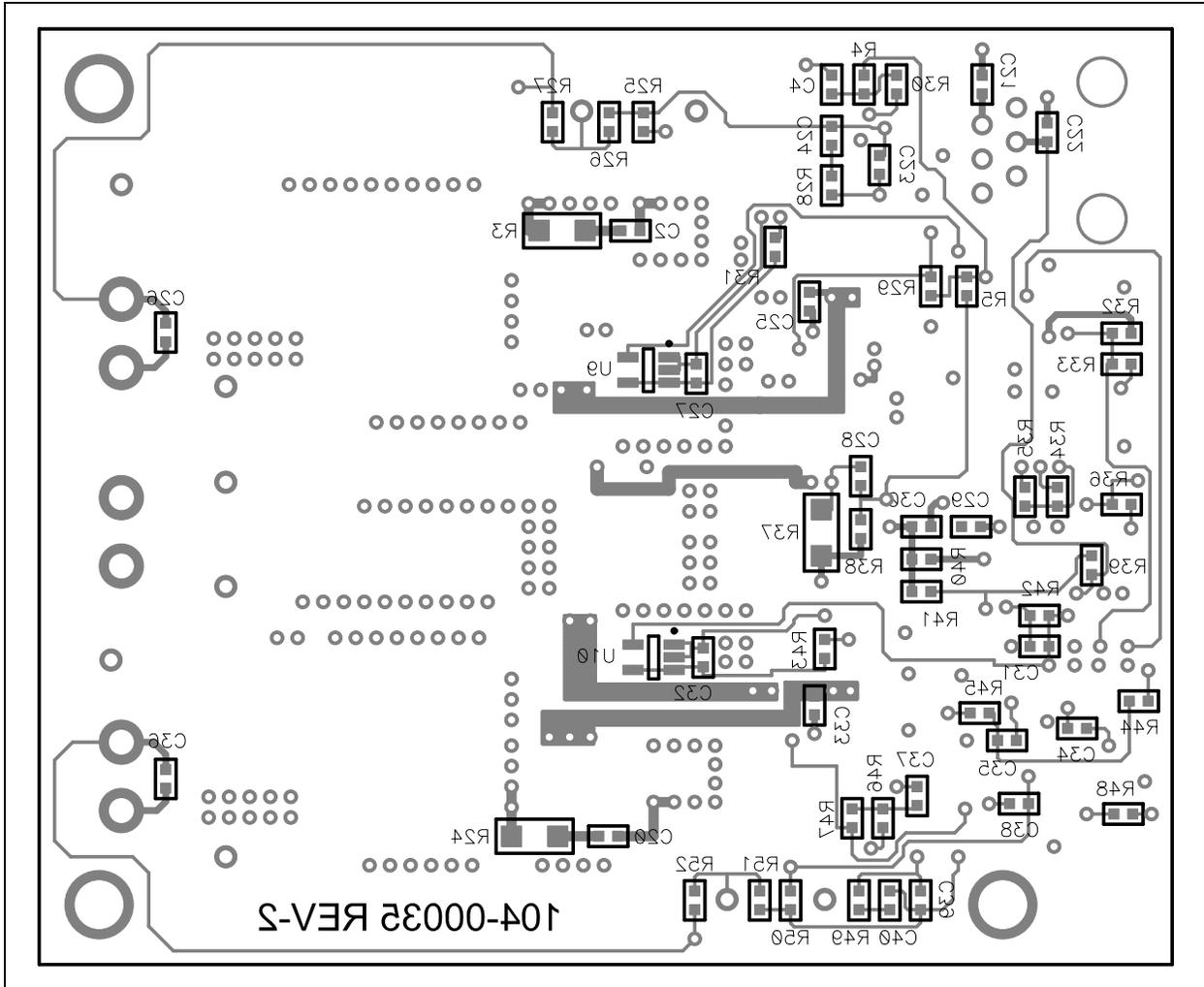


MCP1630 Dual Buck Reference Design

A.6 BOARD - MID-LAYER 2



A.7 BOARD - BOTTOM LAYER



MCP1630 Dual Buck Reference Design

NOTES:

Appendix B. Bill Of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty	Reference	Description	Manufacturer	Part Number
9	C1, C9, C16, C25, C26, C29, C33, C36, C38	CAP 1.0UF 10V CERAMIC X5R 0603	Panasonic® - ECG	ECJ-1VB1A105K
4	C2, C4, C20, C37	CAP 1500PF 50V CERAMIC NPO 0603	Panasonic - ECG	ECJ-1VB1H152K
2	C3, C15	CAP 220UF 4V AO X7343	Kemet Electronics®	A700X227M004ATE015
2	C5, C19	CAP 9.0PF 50V CERAMIC NPO 0603	Panasonic - ECG	ECJ-1VC1H090D
10	C6, C7, C11, C14, C17, C27, C30, C31, C32, C34	CAP .10UF 10V CERAMIC X7R 0603	Kemet Electronics	C0603C104K8RACTU
2	C8, C18	CAP 4.7UF 10V CERAMIC X5R 0603	Panasonic - ECG	ECJ-1VB0J475M
2	C10, C35	CAP .22UF 10V CERAMIC X5R 0603	Panasonic - ECG	ECJ-1VB1A224K
2	C12, C13	CAP 22UF 16V CERAMIC X5R 1210	TDK Electronics Corporation	C3225X5R1C226M
2	C21, C22	CAP DNP0603		
2	C23, C39	CAP 33PF 50V CERAMIC NPO 0603	Panasonic - ECG	ECJ-1VC1H330J
2	C24, C40	CAP 1000PF 50V CERAMIC NPO 0603	Panasonic - ECG	ECJ-1VC1H102J
1	C28	CAP CERAMIC 18PF 50V 0603 SMD	Panasonic - ECG	ECJ-1VC1H180J
2	D1, D3	LED 660NM SUPER RED DIFF 0603SMD	Lumex® Opto/Components Inc.	SML-LX0603SRW-TR
1	D2	DIODE SCHOTTKY 25V 1.0A MINI-2P	Panasonic - SSG	MA2YD2300L
1	J1	CONN MOD JACK 6-6 R/A PCB 50AU	AMP/Tyco Electronics	555165-1
3	J2, J3, J4	CONN TERM BLOCK 2POS 5MM PCB	Phoenix Contact®	1715022
2	L1, L2	HIGH CURRENT SMT 1UH INDUCTORS	Cooper Electronics	HC1-1R1
2	Q1, Q4	N-CHANNEL MOSFET DPAK	Fairchild® Semiconductor	FDD6676S
2	Q2, Q3	N-CHANNEL MOSFET DPAK	Fairchild Semiconductor	FDD6670A
10	R1, R6, R12, R17, R20, R23, R27, R31, R43, R52	RES 10.0 OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF10R0V
6	R2, R19, R22, R25, R29, R50	RES DNP0603		
2	R3, R24	RES 3.30 OHM 1/4W 1% 1206 SMD	Yageo America	9C12063A3R30FGHFT
2	R4, R46	RES 1.00K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	P1.00KHCT-ND
2	R5, R18	RES 221 OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF2210V
4	R7, R9, R16, R21	RESISTOR 1.0 OHM 1/10W 5% 0603	Panasonic - ECG	ERJ-3GEYJ1R0V
2	R8, R45	RES 14.7K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1472V
2	R10, R15	RES 24.9K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF2492V

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

MCP1630 Dual Buck Reference Design

TABLE B-1: BILL OF MATERIALS (BOM) (CONTINUED)

Qty	Reference	Description	Manufacturer	Part Number
3	R11, R39, R44	RES 7.87K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF7871V
1	R13	RES 4.99K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF4991V
1	R14	RES 22.1K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF2212V
3	R26, R40, R51	RES 3.01K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF3011V
2	R28, R49	RES 30.1K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF3012V
1	R30	RES 4.75K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF4751V
1	R32	RES 2.0K OHM 1/10W 5% 0603 SMD	Panasonic - ECG	ERJ-3GEYJ202V
3	R33, R36, R48	RES 100K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1003V
2	R34, R41	RES 15.0K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1502V
2	R35, R42	RES 10.0K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF1002V
1	R37	RES 2.2 OHM 1/4W 1% 1206 SMD	Panasonic - ECG	ERJ-8RQF2R2V
1	R38	RES 332 OHM 1/16W 1% 0603 SMD	Panasonic - ECG	ERJ-3EKF3320V
1	R47	RES 2.21K OHM 1/16W 1% 0603 SMD	Panasonic - ECG	P2.21KHCT-ND
3	SW1, SW2, SW3	SWITCH TACT 6MM 260GF SMT	E-Switch Inc.	TL3301NF260QG
1	T1	SMD Current Sense Transformer	Datatronics™	CT323-060
1	TP6	PC TEST POINT COMPACT SMT	Keystone Electronics	5016
2	U1, U8	High-Speed Analog PWM MSOP8	Microchip Technology Inc.	MCP1630-E/MS
2	U2, U7	2A Synchronous MOSFET Driver	Microchip Technology Inc.	MCP14628-E/SN
2	U3, U6	5 Lead SC70 OP AMP	Microchip Technology Inc.	MCP6231U
1	U4	250 mA Low Iq LDO Regulator	Microchip Technology Inc.	MCP1703-5002E/MB
1	U5	IC PIC® MCU FLASH 2KX14 14TSSOP	Microchip Technology Inc.	PIC16F684-I/ST
2	U9, U10	MCP6501 TEMPERATURE SWITCH 75°C	Microchip Technology Inc.	TC6501P075VCTTR

Note 1: The components listed in this Bill of Materials are representative of the PCB assembly. The released BOM used in manufacturing uses all RoHS-compliant components.

Appendix C. Evaluation Board Firmware

C.1 DEVICE FIRMWARE

For the latest version of the MCP1630 Dual Buck Reference Design firmware, visit the Microchip web site at www.microchip.com.

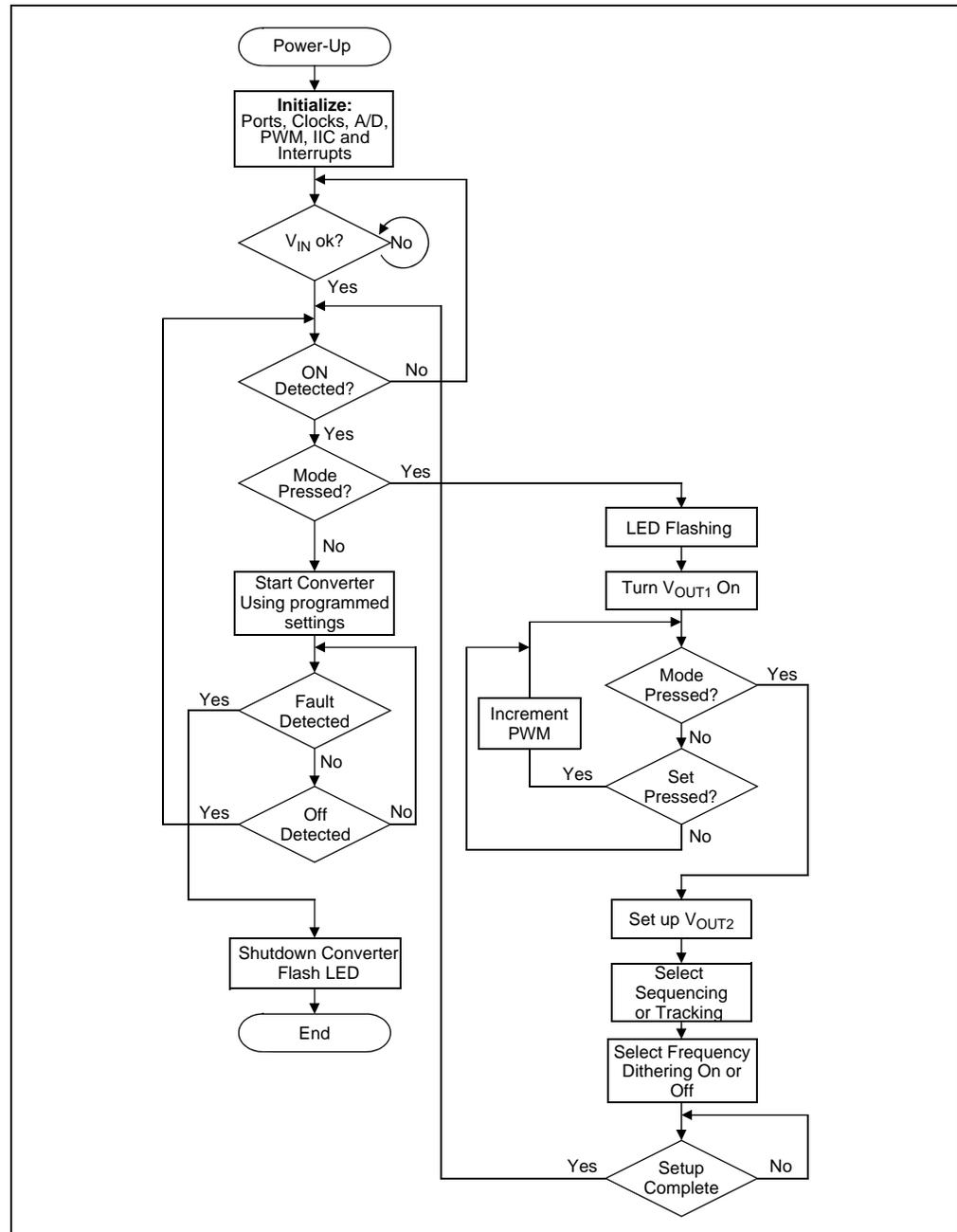


FIGURE C-1: Firmware Flowchart - Page 1.



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://support.microchip.com>
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

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

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

Kokomo
Kokomo, IN
Tel: 765-864-8360
Fax: 765-864-8387

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: 86-10-8528-2100
Fax: 86-10-8528-2104

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

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

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

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

ASIA/PACIFIC

India - Bangalore
Tel: 91-80-4182-8400
Fax: 91-80-4182-8422

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 - 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: 886-3-572-9526
Fax: 886-3-572-6459

Taiwan - Kaohsiung
Tel: 886-7-536-4818
Fax: 886-7-536-4803

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