



**MIC4684 2A Buck Regulator
with Output Level Select
Evaluation Board
User's Guide**

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

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

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

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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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 unless otherwise stated.

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

The Microchip name and logo, the Microchip logo, AnyRate, AVR, AVR logo, AVR Freaks, BeaconThings, BitCloud, CryptoMemory, CryptoRF, dsPIC, FlashFlex, flexPWR, Helder, JukeBlox, KEELoQ, KEELoQ logo, Klear, LANCheck, LINK MD, maxStylus, maxTouch, MediaLB, megaAVR, MOST, MOST logo, MPLAB, OptoLyzer, PIC, picoPower, PICSTART, PIC32 logo, Prochip Designer, QTouch, RightTouch, SAM-BA, SpyNIC, SST, SST Logo, SuperFlash, tinyAVR, UNI/O, and XMEGA are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

ClockWorks, The Embedded Control Solutions Company, EtherSynch, Hyper Speed Control, HyperLight Load, IntelliMOS, mTouch, Precision Edge, and Quiet-Wire are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Adjacent Key Suppression, AKS, Analog-for-the-Digital Age, Any Capacitor, AnyIn, AnyOut, BodyCom, chipKIT, chipKIT logo, CodeGuard, CryptoAuthentication, CryptoCompanion, CryptoController, dsPICDEM, dsPICDEM.net, Dynamic Average Matching, DAM, ECAN, EtherGREEN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, JitterBlocker, KlearNet, KlearNet logo, Mindi, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICKit, PICtail, PureSilicon, QMatrix, RightTouch logo, REAL ICE, Ripple Blocker, SAM-ICE, Serial Quad I/O, SMART-I.S., SQI, SuperSwitcher, SuperSwitcher II, Total Endurance, TSHARC, USBCheck, VariSense, ViewSpan, WiperLock, Wireless DNA, 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.

Silicon Storage Technology is a registered trademark of Microchip Technology Inc. in other countries.

GestIC is a registered trademark of Microchip Technology Germany II GmbH & Co. KG, a subsidiary of Microchip Technology Inc., in other countries.

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

© 2017, Microchip Technology Incorporated, All Rights Reserved.
ISBN: 978-1-5224-2248-8

Object of Declaration: MIC4684 2A Buck Regulator with Output Level Select Evaluation Board

EU Declaration of Conformity

This declaration of conformity is issued by the manufacturer.

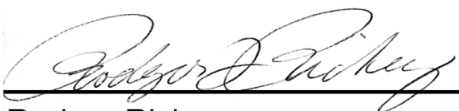
The development/evaluation tool is designed to be used for research and development in a laboratory environment. This development/evaluation tool is not a Finished Appliance, nor is it intended for incorporation into Finished Appliances that are made commercially available as single functional units 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.



Rodger Richey
Director of Development Tools



Date

NOTES:



MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD USER'S GUIDE

Table of Contents

Preface	7
Introduction	7
Document Layout	7
Conventions Used in this Guide	8
Recommended Reading	9
The Microchip Web Site	9
Customer Support	9
Document Revision History	9
Chapter 1. Product Overview	
1.1 Introduction	11
1.2 MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Overview	11
1.3 MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Features	12
1.4 What the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Kit Contains	12
Chapter 2. Installation and Operation	
2.1 System and Configuration Requirements	13
2.2 Board Setup	13
2.3 Circuit Description	14
2.3.1 Feedback Resistors	14
2.3.2 SW Node	14
2.3.3 Auxiliary Bootstrap	15
2.3.4 Safe Operating Area	15
Appendix A. Schematic and Layouts	
A.1 Introduction	19
A.2 Board – Schematic	20
A.3 Board – Top Silk Layer	21
A.4 Board – Top Copper Layer	22
A.5 Board – Bottom Copper Layer	23
Appendix B. Bill of Materials (BOM)	
Worldwide Sales and Service	27



MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD USER'S GUIDE

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 “DSXXXXXXXXA”, where “XXXXXXXX” 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 MIC4684 2A Buck Regulator with Output Level Select Evaluation Board. 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 MIC4684 2A Buck Regulator with Output Level Select Evaluation Board as a development tool to emulate and debug firmware on a target board. The manual layout is as follows:

- **Chapter 1. “Product Overview”** – Important information about the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board.
- **Chapter 2. “Installation and Operation”** – Includes instructions on installing and starting the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board.
- **Appendix A. “Schematic and Layouts”** – Shows the schematic and layout diagrams for the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board.
- **Appendix B. “Bill of Materials (BOM)”** – Lists the parts used to build the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board.

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 user's guide describes how to use the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board. Another useful document is listed below. The following Microchip document is available and recommended as a supplemental reference resource:

- **MIC4684 Data Sheet – “2A High-Efficiency SuperSwitcher™ Buck Regulator” (DSM9999-012610)**

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

DOCUMENT REVISION HISTORY

Revision A (October 2017)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter provides an overview of the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board and covers the following topics:

- [MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Overview](#)
- [MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Features](#)
- [What the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Kit Contains](#)

1.2 MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD OVERVIEW

The MIC4684 2A Buck Regulator with Output Level Select Evaluation Board is a constant-frequency, non-synchronous buck solution featuring a voltage-mode control architecture. The MIC4684 operates over an input supply range of 4V to 30V. The output voltage is adjustable down to 1.235V. The device operates with a constant switching frequency of 200 kHz.

[Figure 1-1](#) shows the evaluation board's interfaces and connectors.

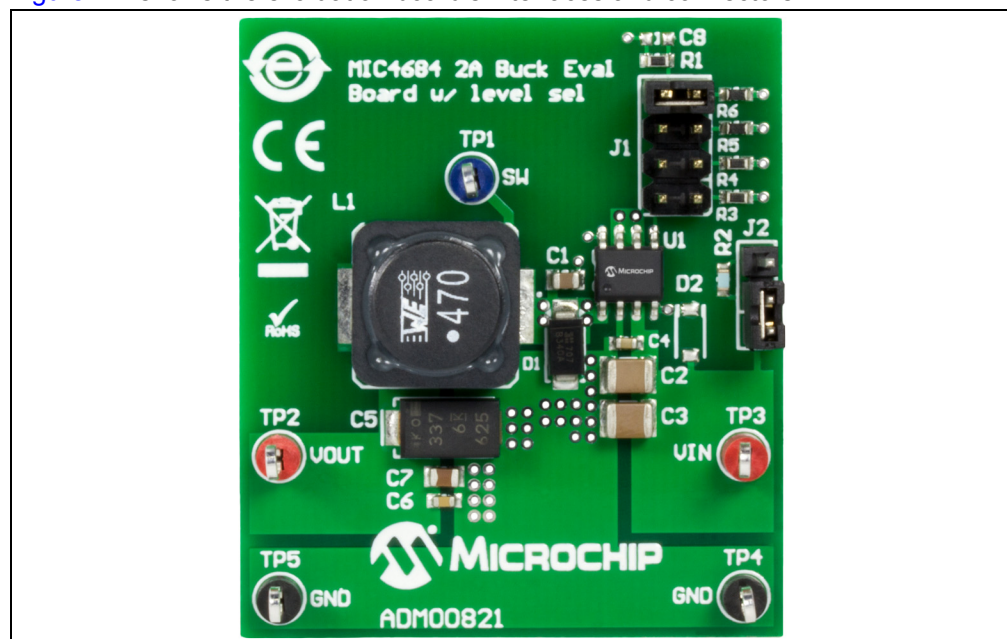


FIGURE 1-1: MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Overview.

1.3 MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD FEATURES

The MIC4684 2A Buck Regulator with Output Level Select Evaluation Board features:

- Four selectable output voltages: 1.8V, 2.5V, 3.3V and 5V
- A footprint for a feed forward diode for the bootstrap which improves the system efficiency
- A logic level enable (EN) signal can be used to enable or disable the controller
- Frequency foldback for short circuit conditions

The basic parameters of the evaluation board are:

- Input: 4V to 30V (Optimized for 12V)
- Output: 1.8V, 2.5V, 3.3V or 5V selectable through jumper J1 at 2A (default option is set to 5V)
- Switching Frequency: 200 kHz

1.4 WHAT THE MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD KIT CONTAINS

The MIC4684 2A Buck Regulator with Output Level Select Evaluation Board includes the following items:

- MIC4684 2A Buck Regulator with Output Level Select Evaluation Board (ADM00821)
- Important Information Sheet

Chapter 2. Installation and Operation

2.1 SYSTEM AND CONFIGURATION REQUIREMENTS

The MIC4684 2A Buck Regulator with Output Level Select Evaluation Board requires only a single power supply with at least 2A current capability. The output load can either be a passive or an active load.

Note: The MIC4684 2A Buck Regulator with Output Level Select Evaluation Board does not have reverse polarity protection. Applying a negative voltage to the V_{IN} and GND terminals may damage the device. The maximum V_{IN} of the board is rated at 30V. Exceeding 30V on the V_{IN} could damage the device.

2.2 BOARD SETUP

Follow these steps prior to using the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board:

1. Connect a supply to the V_{IN} and GND terminals, paying careful attention to the polarity and the supply range ($4V < V_{IN} < 30V$). Monitor I_{IN} with a current meter and input voltage at V_{IN} and GND terminals with voltmeter. Do not apply power until Step 5.
2. Connect a jumper to the top position of jumper J1. This will set the output of the converter to 5V.
3. Connect a load to the V_{OUT} and GND terminals. The load can be either a passive (resistive) or an active (electronic) type. A current meter may be placed between the V_{OUT} terminal and load to monitor the output current. Ensure the output voltage is monitored at the V_{OUT} terminal.
4. Enable input. An EN connector is provided on the evaluation board for users to easily access the enable feature. Applying an external logic signal on the EN pin to pull it low, or using a jumper to short the EN pin to GND, will shut off the output of the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board.
5. Turn on the V_{IN} supply and verify that the output voltage is regulated to the specific selected voltage.

2.3 CIRCUIT DESCRIPTION

This section describes the working principles and limitations that should be taken into account when using the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board. External components have been selected in order to optimize performance for the specific conditions of $V_{IN} = 12V$ and $V_{OUT} = 5V$.

Although the application behaves correctly for other output and input voltages, further optimization (fine tuning of the inductor and output capacitors) can be done in order to improve efficiency and transients response.

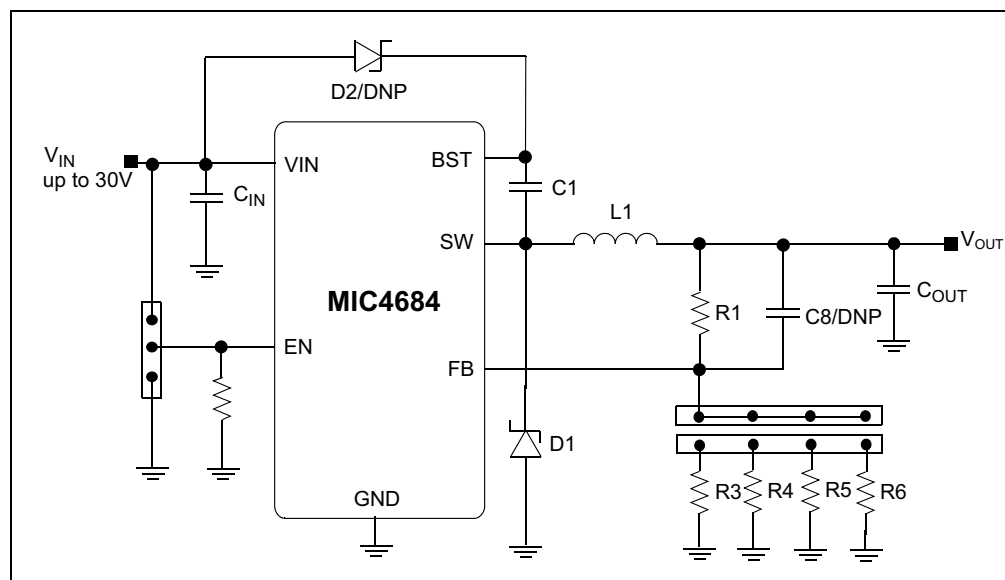


FIGURE 2-1: Evaluation Board Circuit Description.

2.3.1 Feedback Resistors

The output voltages available on the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board are: 1.8V, 2.5V, 3.3V and 5V which are selectable using jumper J1.

Voltages other than the ones already available can be set by modifying R_{bot} resistors according to Equation 2-1.

EQUATION 2-1:

$$R_{bot} = \frac{R_1 \times V_{REF}}{V_{OUT} - V_{REF}}$$

Where:

$$V_{REF} = 1.235V$$

Note: The output voltage should not be set to exceed 10V due to the 10V voltage rating on the output capacitors.

2.3.2 SW Node

Test point TP9 (V_{SW}) is placed for monitoring the switching waveform, one of the most critical waveforms for the converter.

2.3.3 Auxiliary Bootstrap

The MIC4684 2A Buck Regulator with Output Level Select Evaluation Board features an optional bootstrap diode that improves the system efficiency by providing an external bias source directly to the main pass element, thus reducing V_{SAT} . This also allows the MIC4684 to be used in very low head-room applications ($5 V_{IN}$ to $3.3 V_{OUT}$).

2.3.4 Safe Operating Area

Depending on the conditions (input voltage, output voltage and temperature) and the configuration of the board the safe operating area is summarized below.

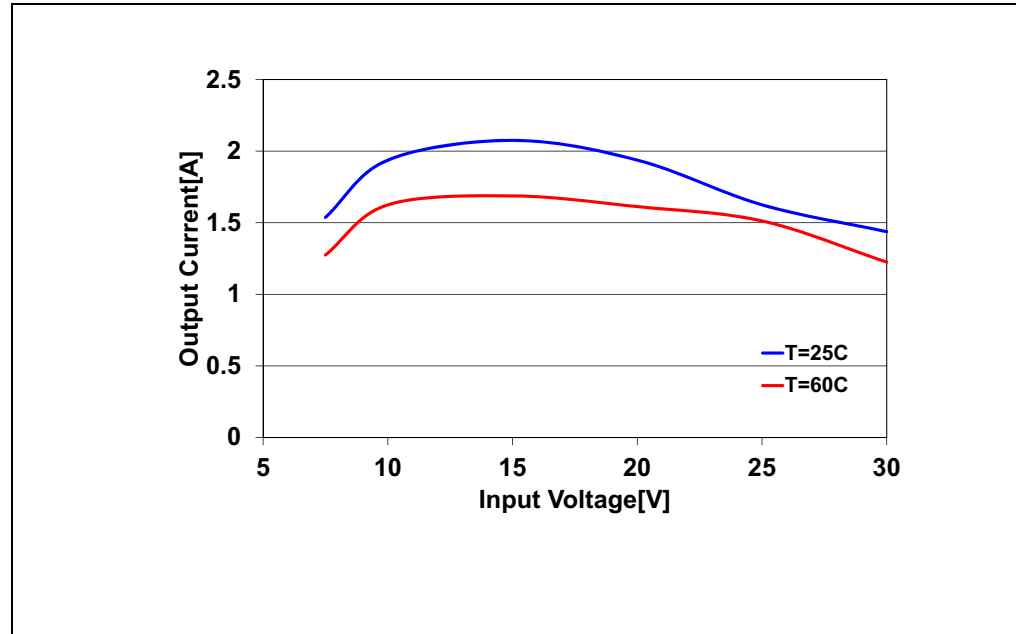


FIGURE 2-2: $V_{OUT} = 5V$, Standard Configuration.

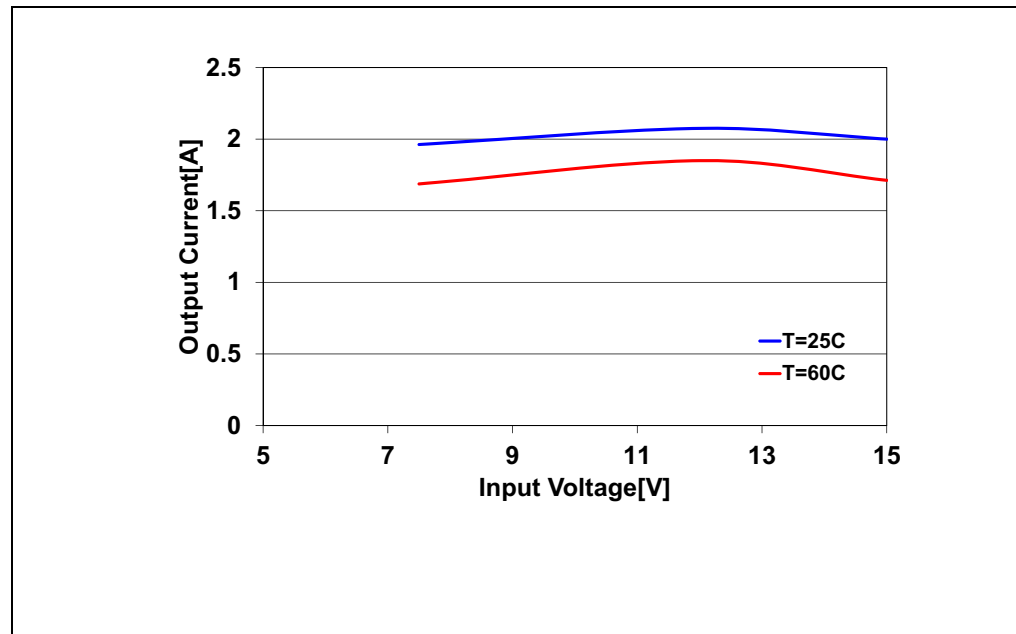


FIGURE 2-3: $V_{OUT} = 5V$, Feed Forward Diode Configuration.

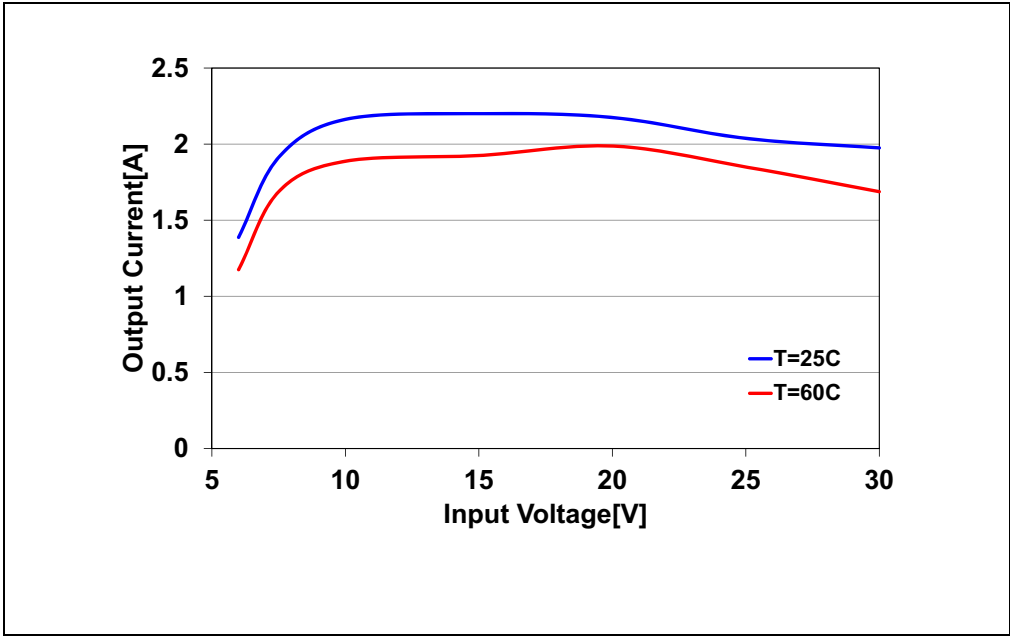


FIGURE 2-4: *VOUT = 3.3V, Standard Configuration.*

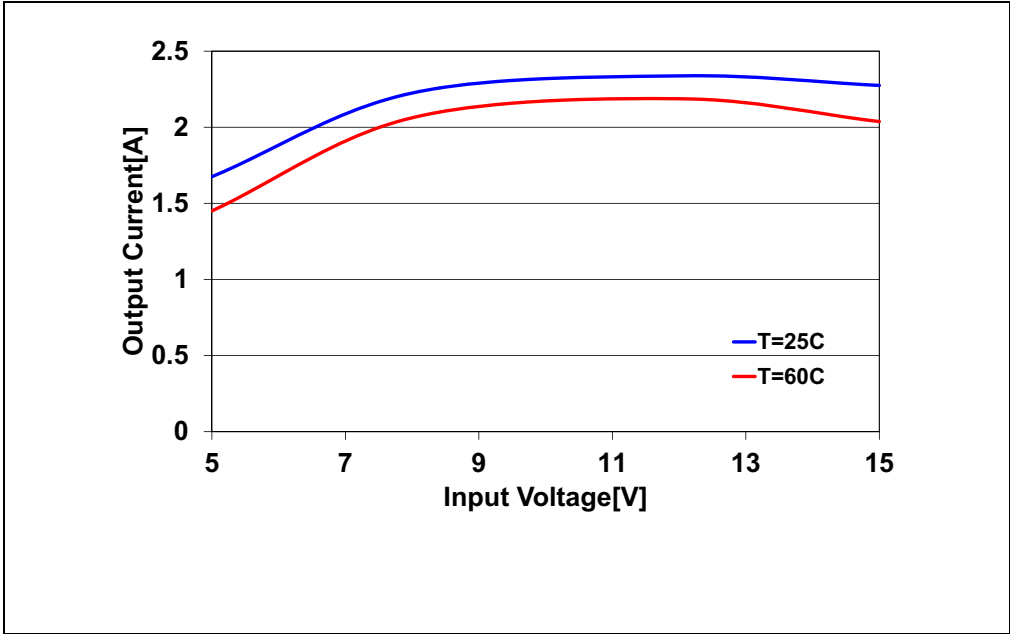


FIGURE 2-5: *VOUT = 3.3V, Feed Forward Diode Configuration.*

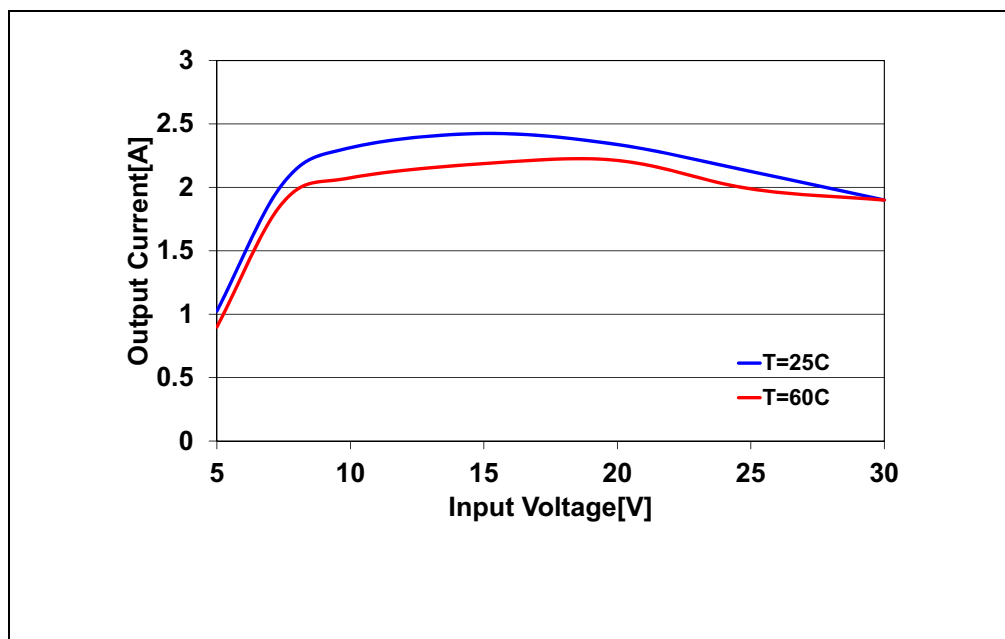


FIGURE 2-6: $V_{OUT} = 2.5V$, Standard Configuration.

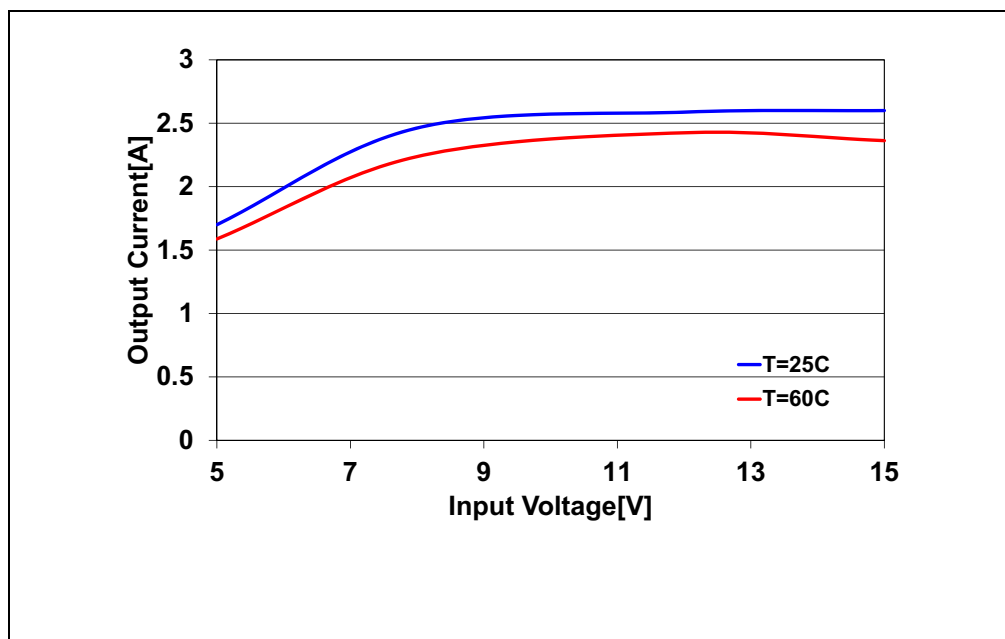


FIGURE 2-7: $V_{OUT} = 2.5V$, Feed Forward Diode Configuration.

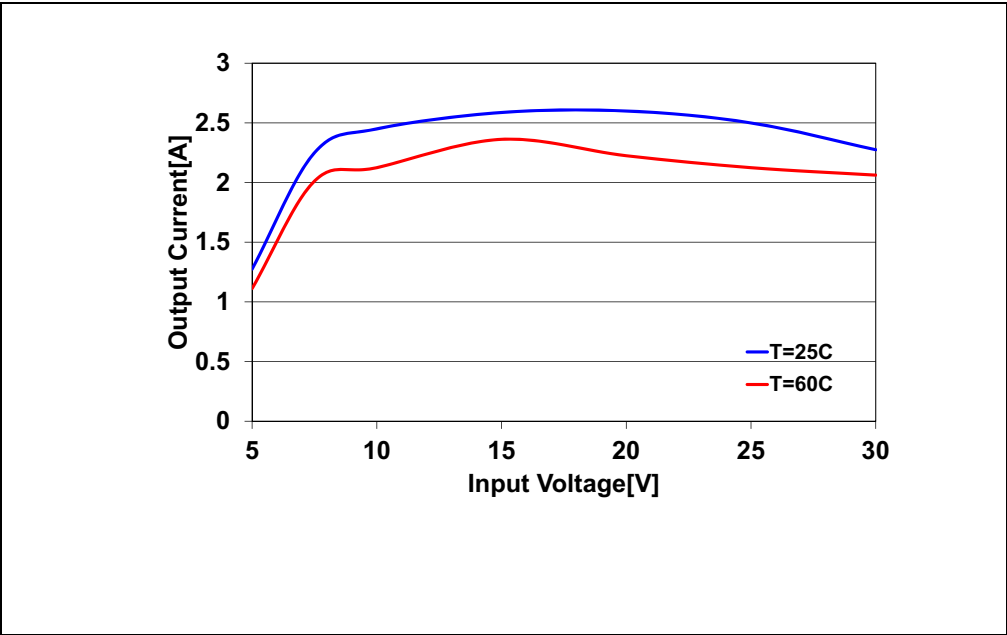


FIGURE 2-8: $V_{OUT} = 1.8V$, Standard Configuration.

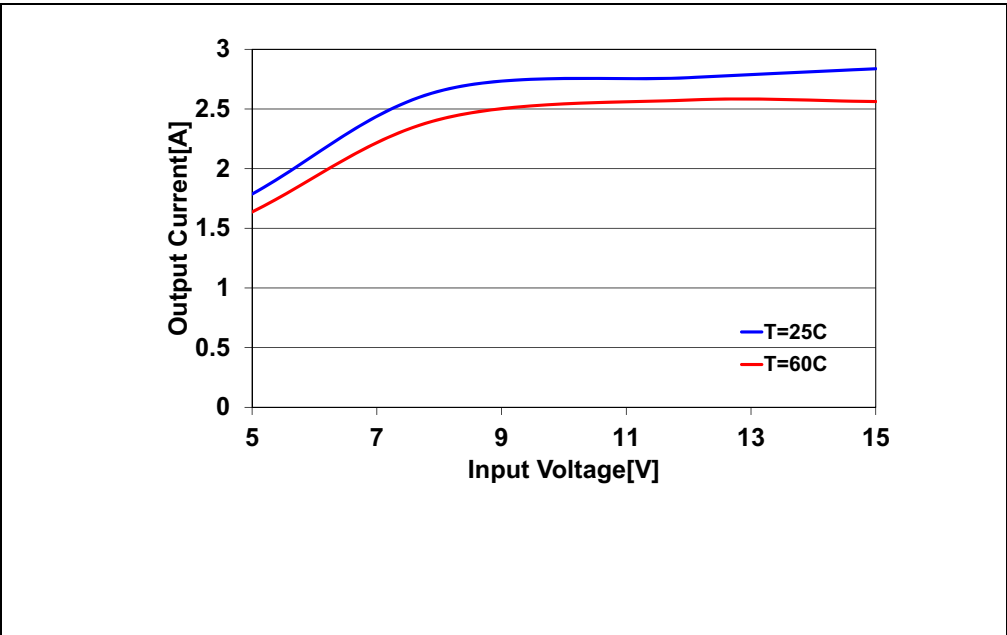


FIGURE 2-9: $V_{OUT} = 1.8V$, Feed Forward Diode Configuration.



MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD USER'S GUIDE

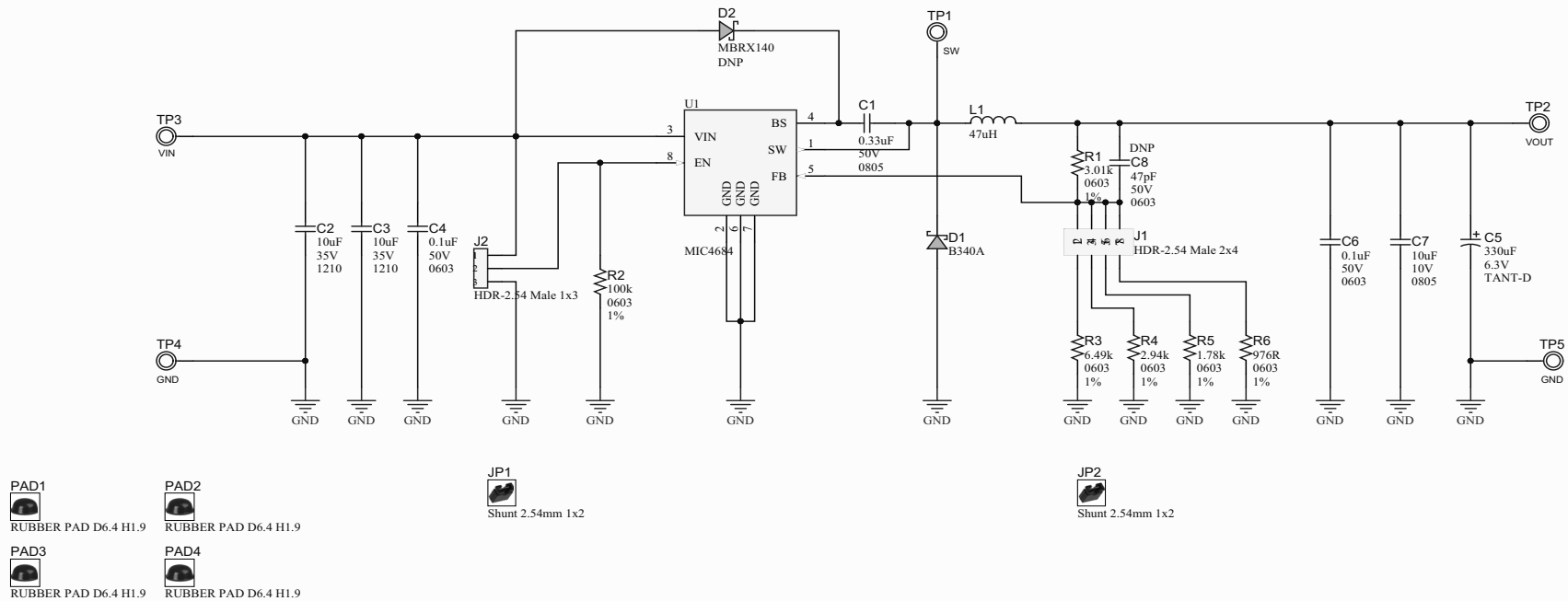
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

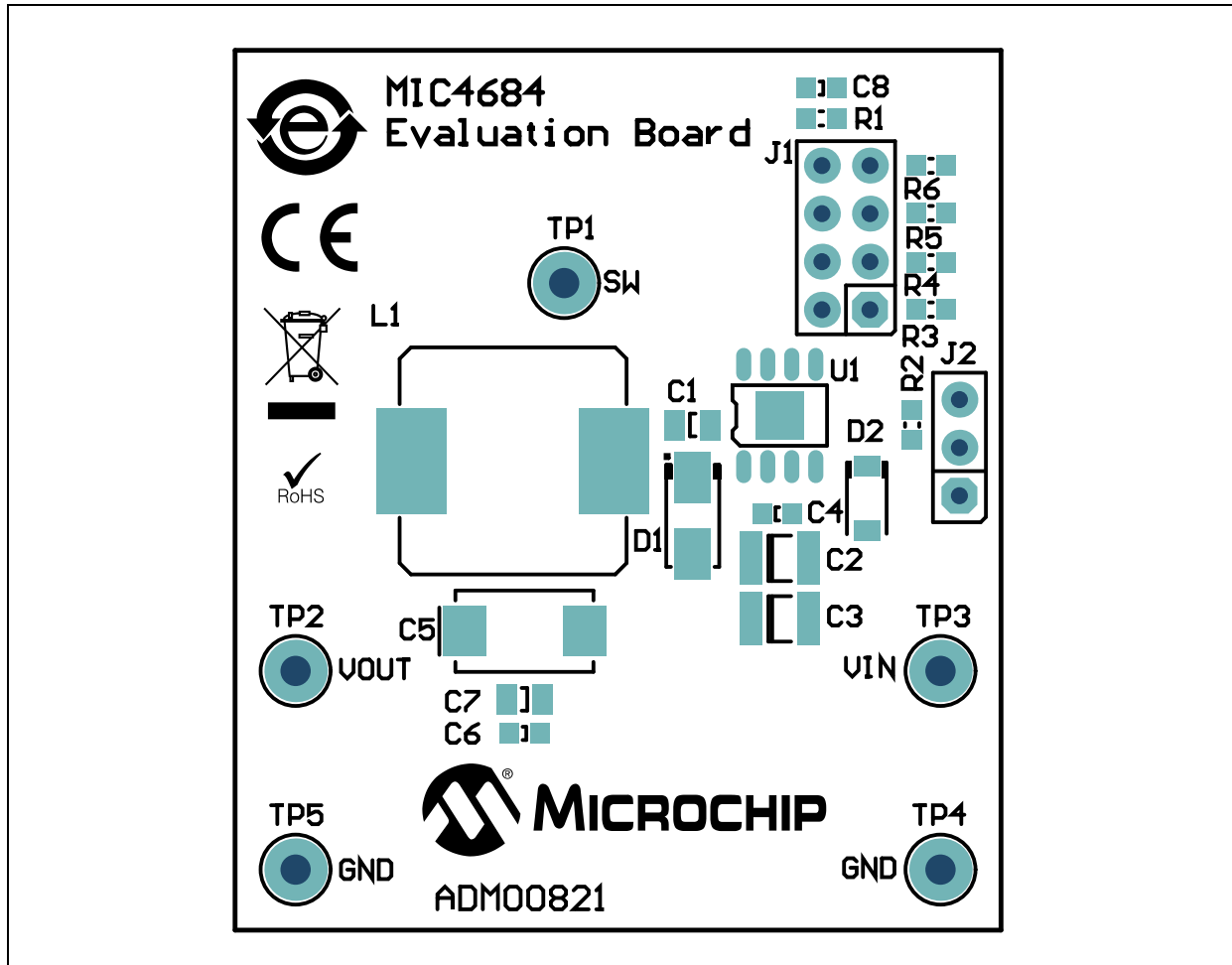
This appendix contains the following schematics and layouts for the MIC4684 2A Buck Regulator with Output Level Select Evaluation Board:

- Board – Schematic
- Board – Top Silk Layer
- Board – Top Copper Layer
- Board – Bottom Copper Layer

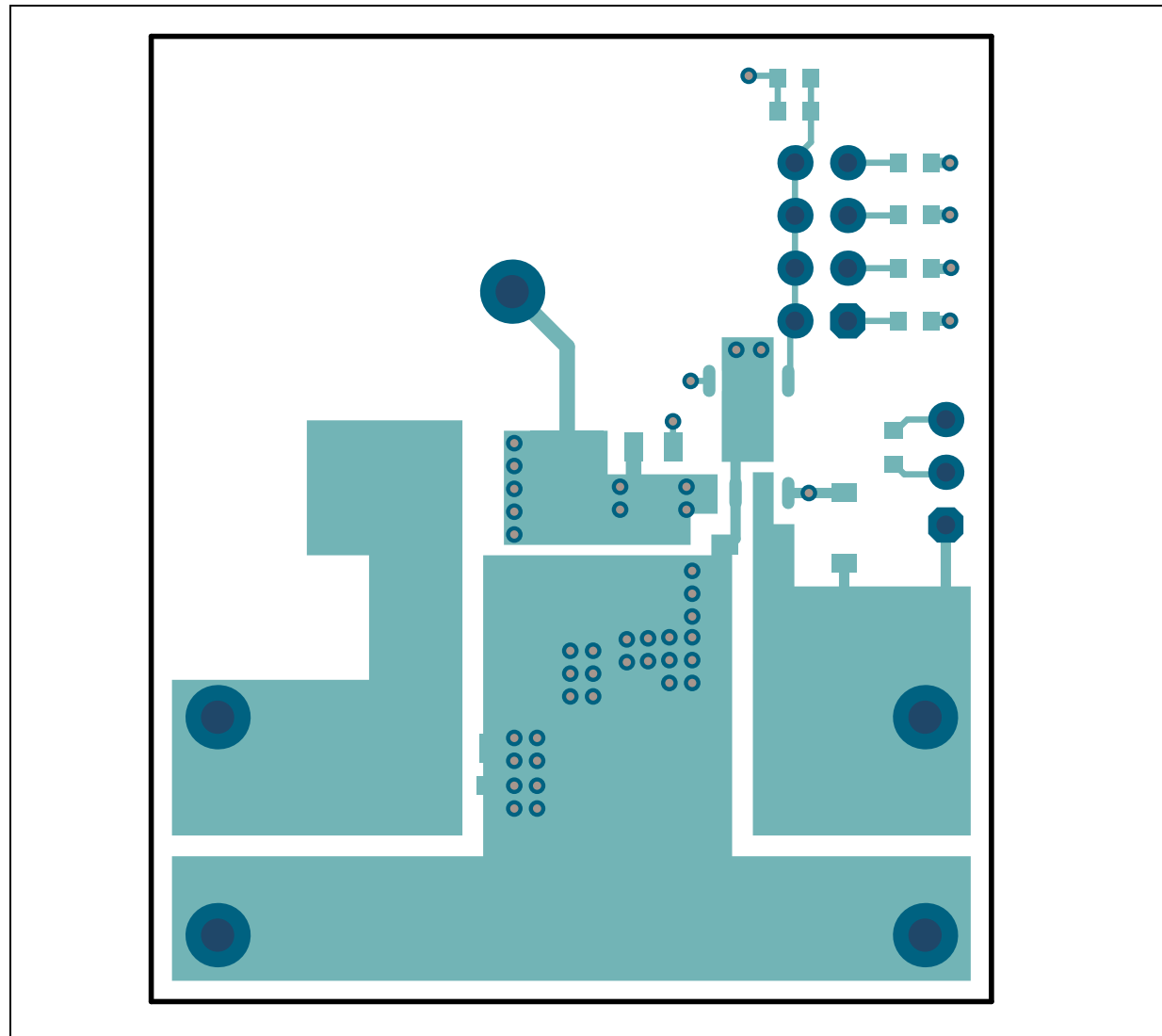
A.2 BOARD – SCHEMATIC



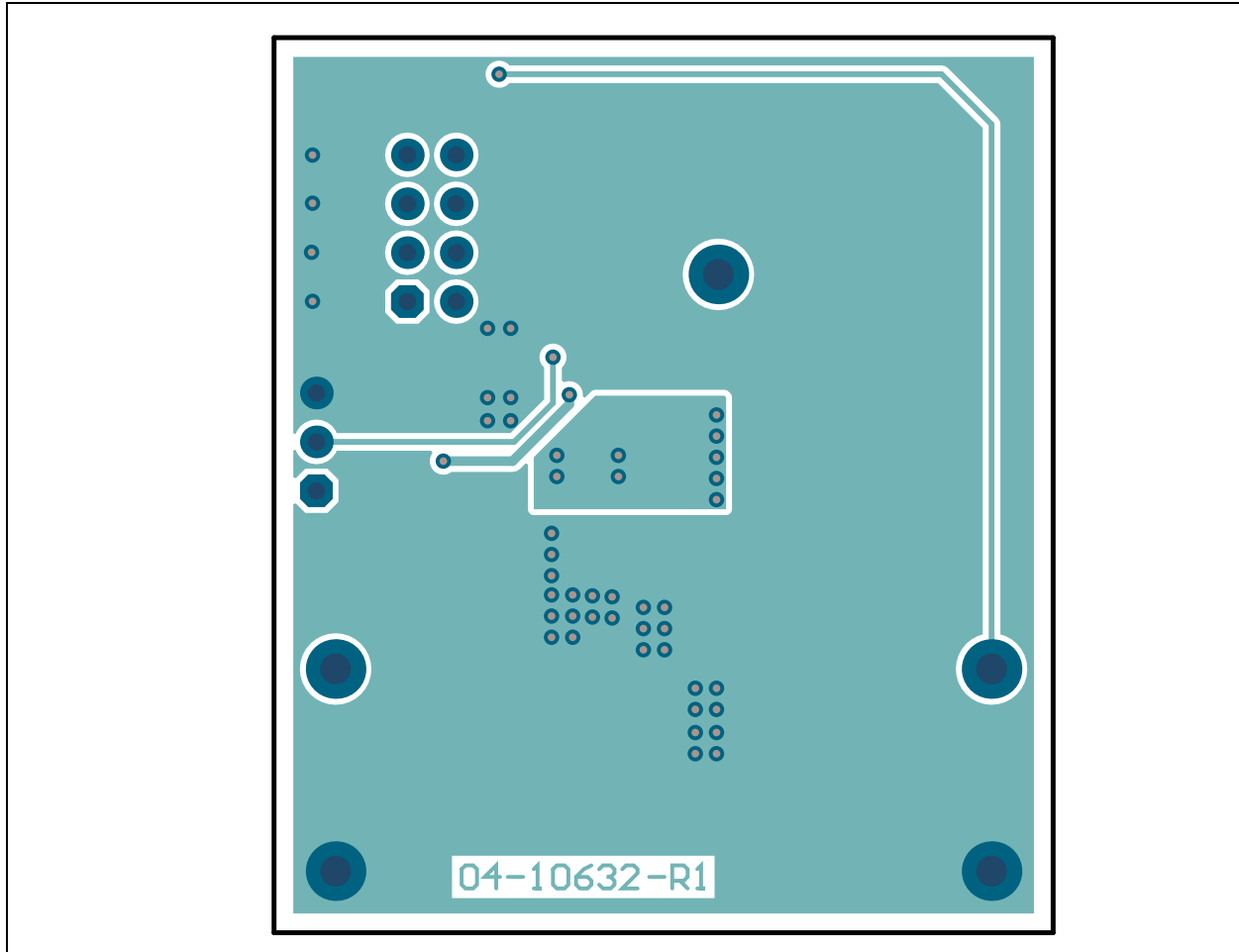
A.3 BOARD – TOP SILK LAYER



A.4 BOARD – TOP COPPER LAYER



A.5 BOARD – BOTTOM COPPER LAYER



NOTES:

Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM) FOR MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD (ADM00821)⁽¹⁾

Qty.	Reference	Description	Manufacturer	Part Number
1	C1	Capacitor ceramic 0.33 μ F, 50V, 10%, X7R, SMD, 0805	TDK Corporation	C2012X7R1H334K125AA
2	C2, C3	Capacitor ceramic 10 μ F, 35V, 20%, X7R, SMD, 1210	Taiyo Yuden Co., Ltd.	GMK325AB7106MM-T
2	C4, C6	Capacitor ceramic 0.1 μ F, 50V, 20%, X7R, SMD, 0603	TDK Corporation	C1608X7R1H104M
1	C5	Capacitor tantalum 330 μ F, 6.3V, 20%, 45 M Ω , SMD D	KEMET	T520D337M006ATE045
1	C7	Capacitor ceramic 10 μ F, 10V, 10%, X7R, SMD, 0805	TDK Corporation	C2012X7R1A106K125AC
1	C8	Capacitor ceramic 47 pF, 50V, 5%, NP0, SMD, 0603 DO NOT POPULATE	KEMET	C0603C470J5GACTU
1	D1	Diode schottky, B340A 500 mV, 3A, 40V, DO-214AC_SMA	Diodes Incorporated®	B340A-13-F
1	D2	Diode schottky, MBRX140-TP 550 mV, 1A, 40V, SMD SOD-123 DO NOT POPULATE	Micro Commercial Components	MBRX140-TP
1	J1	Connector header-2.54 male 2 x 4, gold, 5.84MH, TH, vertical	Würth Elektronik	61300821121
1	J2	Connector header-2.54 male 1 x 3, tin, 5.84MH, TH, vertical	Samtec, Inc.	TSW-103-07-T-S
1	L1	Inductor 47 μ H 3A, 20%, SMD, 12 x 12 x 8	Würth Elektronik	744770147
4	PAD1, PAD2, PAD3, PAD4	Mechanical hardware rubber pad, hemisphere, D6.4 H1.9, clear	3M	SJ5382
1	PCB1	MIC4684 2A Buck Regulator with Output Level Select Evaluation Board Printed Circuit Board	Microchip Technology Inc.	04-10632-R1
1	R1	Resistor TKF, 3.01k, 1%, 1/10W, SMD, 0603	Panasonic® - ECG	ERJ-3EKF3011V
1	R2	Resistor TF, 100k, 1%, 1/8W, SMD, 0603	Vishay Intertechnology, Inc.	MCT06030C1003FP500
1	R3	Resistor TKF, 6.49k, 1%, 1/16W, SMD, 0603	Panasonic® - ECG	ERJ-3EKF6491V
1	R4	Resistor TKF, 2.94k, 1%, 1/10W, SMD, 0603	Panasonic® - ECG	ERJ3EKF2941V
1	R5	Resistor TKF, 1.78k, 1%, 1/4W, SMD, 0603	Panasonic® - ECG	ERJPA3F1781V
1	R6	Resistor TKF, 976R 1% 1/4W SMD 0603	Panasonic® - ECG	ERJPA3F9760V
1	TP1	CON TP LOOP, Blue, TH	Keystone Electronics Corp.	5127

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.

TABLE B-1: BILL OF MATERIALS (BOM) (CONTINUED) FOR MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD (ADM00821)⁽¹⁾

Qty.	Reference	Description	Manufacturer	Part Number
2	TP2, TP3	CON TP LOOP, Red, TH	Keystone Electronics Corp.	5010
2	TP4, TP5	CON TP LOOP, Black, TH	Keystone Electronics Corp.	5011
1	U1	MCHP Analog Switcher Buck, 1.25V to 28.3V, MIC4684YM, SOP-8	Microchip Technology Inc.	MIC4684YM

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.

TABLE B-2: BILL OF MATERIALS (BOM) - MECHANICAL PARTS FOR MIC4684 2A BUCK REGULATOR WITH OUTPUT LEVEL SELECT EVALUATION BOARD (ADM00821)⁽¹⁾

Qty.	Reference	Description	Manufacturer	Part Number
2	JP1, JP2	Mechanical hardware jumper, 2.54 mm 1 x 2	3M	969102-0000-DA
1	LABEL3	LABEL, ASSY W/REV LEVEL (SMALL MODULES) PER MTS-0002		

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.

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

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
Tel: 317-536-2380

Los Angeles
Mission Viejo, CA
Tel: 949-462-9523
Fax: 949-462-9608
Tel: 951-273-7800

Raleigh, NC
Tel: 919-844-7510

New York, NY
Tel: 631-435-6000

San Jose, CA
Tel: 408-735-9110
Tel: 408-436-4270

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: 86-21-3326-8000
Fax: 86-21-3326-8021

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: 886-7-213-7830

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

Finland - Espoo
Tel: 358-9-4520-820

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

Germany - Garching
Tel: 49-8931-9700

Germany - Haan
Tel: 49-2129-3766400

Germany - Heilbronn
Tel: 49-7131-67-3636

Germany - Karlsruhe
Tel: 49-721-625370

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

Germany - Rosenheim
Tel: 49-8031-354-560

Israel - Ra'anana
Tel: 972-9-744-7705

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

Italy - Padova
Tel: 39-049-7625286

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

Norway - Trondheim
Tel: 47-7289-7561

Poland - Warsaw
Tel: 48-22-3325737

Romania - Bucharest
Tel: 40-21-407-87-50

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

Sweden - Gothenberg
Tel: 46-31-704-60-40

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

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