



MICROCHIP

**MCP39F511N
Power Monitor
Demonstration 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in this publication regarding device applications and the like is provided only for your convenience and may be superseded by updates.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.

Trademarks

The Microchip name and logo, the Microchip logo, dsPIC, FlashFlex, flexPWR, JukeBlox, KEELOQ, KEELOQ logo, Kleer, LANCheck, MediaLB, MOST, MOST logo, MPLAB, OptoLyzer, PIC, PICSTART, PIC³² logo, RightTouch, SpyNIC, SST, SST Logo, SuperFlash and UNI/O are registered trademarks of Microchip Technology Incorporated in the U.S.A. and other countries.

The Embedded Control Solutions Company and mTouch are registered trademarks of Microchip Technology Incorporated in the U.S.A.

Analog-for-the-Digital Age, BodyCom, chipKIT, chipKIT logo, CodeGuard, dsPICDEM, dsPICDEM.net, ECAN, In-Circuit Serial Programming, ICSP, Inter-Chip Connectivity, KleerNet, KleerNet logo, MiWi, motorBench, MPASM, MPF, MPLAB Certified logo, MPLIB, MPLINK, MultiTRAK, NetDetach, Omniscient Code Generation, PICDEM, PICDEM.net, PICkit, PICtail, RightTouch logo, REAL ICE, SQI, Serial Quad I/O, 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.

© 2015, Microchip Technology Incorporated, Printed in the U.S.A., All Rights Reserved.

ISBN: 978-1-5224-0104-9

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

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

Object of Declaration: MCP39F511N Power Monitor Demonstration Board

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 intended to be a finished appliance, nor is it intended for incorporation into finished appliances that are made commercially available as single functional units to end users. This development/evaluation tool complies with 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

MCP39F511N Power Monitor Demonstration Board User's Guide

NOTES:



MCP39F511N POWER MONITOR DEMONSTRATION 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 What the MCP39F511N Power Monitor Demonstration Board Kit Includes	12
Chapter 2. Installation and Operation	
2.1 Getting Started	13
Chapter 3. Hardware Description	
3.1 Input and Analog Front End	17
3.2 Power Supply Circuit	18
Appendix A. Schematic and Layouts	
A.1 Introduction	19
A.2 Schematics and PCB Layout	19
A.3 Board – Schematic	20
A.4 Board – Schematic (Continued)	21
A.5 Board – Top Silk	22
A.6 Board – Top Copper and Silk	23
A.7 Board – Top Copper	24
A.8 Board – Bottom Copper	25
A.9 Board – Bottom Copper and Silk	26
A.10 Board – Bottom Silk	27
Appendix B. Bill of Materials (BOM)	29
Worldwide Sales and Service	32

MCP39F511N Power Monitor Demonstration Board User's Guide

NOTES:



MCP39F511N POWER MONITOR DEMONSTRATION 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 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 “DSXXXXXXA”, where “XXXXXX” 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 MCP39F511N Power Monitor Demonstration 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 MCP39F511N Power Monitor Demonstration Board as a demonstration board to evaluate the MCP39F511N device. The manual layout is as follows:

- **Chapter 1. “Product Overview”** – Provides important information about the MCP39F511N Power Monitor Demonstration Board
- **Chapter 2. “Installation and Operation”** – Provides information on using the MCP39F511N Power Monitor Demonstration Board, including **Section 2.1.1 “Step 1: Wiring connections”** that describes wiring the line and load connections
- **Chapter 3. “Hardware Description”** – Provides details on the functional blocks of the power monitor, including the analog front-end design and power supply design
- **Appendix A. “Schematic and Layouts”** – Shows the schematic and layout diagrams
- **Appendix B. “Bill of Materials (BOM)”** – Lists the parts used to build the MCP39F511N Power Monitor Demonstration Board

MCP39F511N Power Monitor Demonstration Board User's Guide

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 MCP39F511N Power Monitor Demonstration Board. Another useful document is listed below. The following Microchip document is available and recommended as a supplemental reference resource:

MCP39F511N Data Sheet – “Dual-Channel, Single-Phase Power-Monitoring IC with Calculation” (DS20005473)

This data sheet provides detailed information regarding the MCP39F511N device.

THE MICROCHIP WEB SITE

Microchip provides on-line 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, on-line 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 A (December 2015)

- Initial Release of this Document.

MCP39F511N Power Monitor Demonstration Board User's Guide

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The MCP39F511N Power Monitor Demonstration Board is a fully functional dual-channel single-phase power and energy monitor. For each channel, the system calculates active power, reactive power, RMS current, RMS voltage, active energy, (both import and export), reactive energy and other typical power quantities for two separate loads, as defined in the MCP39F511N data sheet.

The MCP39F511 Power Monitor Utility software is used to calibrate and monitor the system, and can be used to create custom calibration setups. For most accuracy requirements, only a single-point calibration is needed. The energy meter software offers an automated step-by-step calibration process that can be used to quickly calibrate energy meters.

This demonstration board uses the Power Monitor Utility Software for evaluation via a USB connection to the board. A download link for this software can be found on the evaluation board's web page. For instructions on the use of this software, refer to the software's supporting documentation included within the application install package.



FIGURE 1-1: MCP39F511N Power Monitor Demonstration Board.

1.2 WHAT THE MCP39F511N POWER MONITOR DEMONSTRATION BOARD KIT INCLUDES

This MCP39F511N Power Monitor Demonstration Board kit includes:

- MCP39F511N Power Monitor Demonstration Board (ADM00706)
- AC Line Cable
- Two IEC-to-Female AC Load Cables
- Mini-USB Cable
- Important Information Sheet

Chapter 2. Installation and Operation

2.1 GETTING STARTED

To use the MCP39F511N Power Monitor Demonstration Board, follow the steps described in the sections below. The meter design uses a 5A load for calibration current and a maximum current (I_{MAX}) of 15A.

It is not recommended to put more than 15A through the AC plugs mounted on the Printed Circuit Board (PCB).

To test the calibrated meter, the following connections can be made:

2.1.1 Step 1: Wiring connections

Figure 2-1 identifies the line and two load connections of the MCP39F511N Power Monitor Demonstration Board.

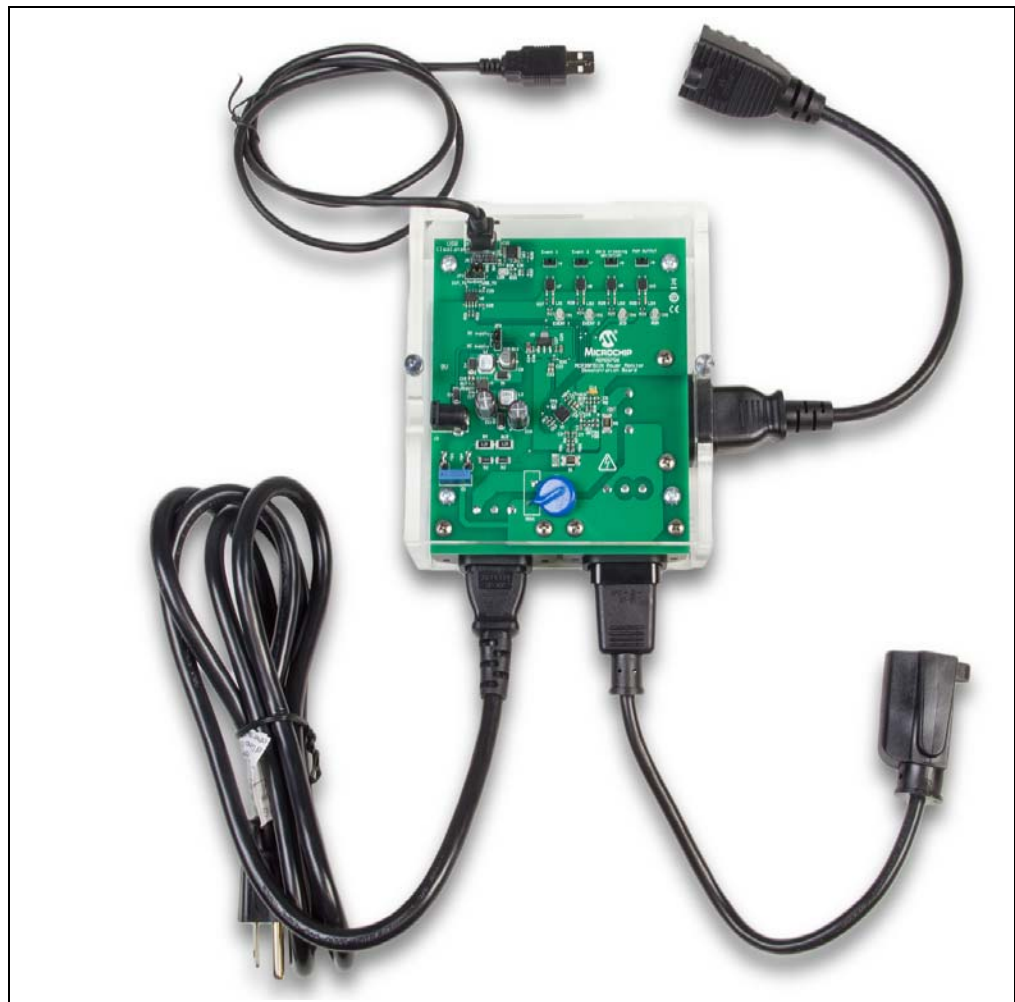


FIGURE 2-1: *Connecting the MCP39F511N Power Monitor Demonstration Board.*

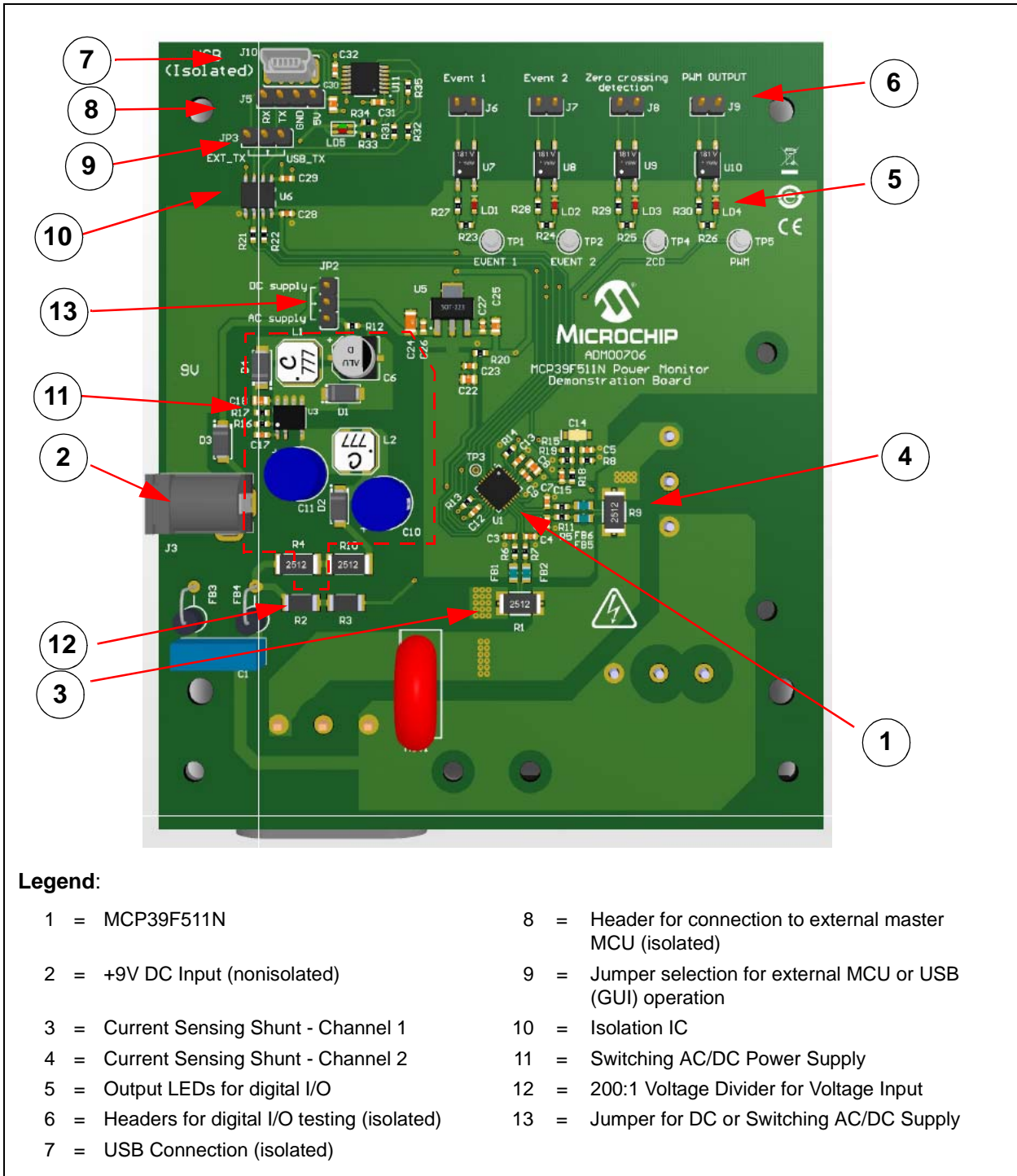
2.1.2 Step 2: Connect line/load power to the meter (power the meter)

The meter will turn on when the line connection has between 90V to 220V connected. One or two loads can be connected to the meter.

2.1.3 Step 3: Connect the USB cable to a PC with the installed MCP39F511N Power Monitor Utility software

Select the appropriate COM port. If the meter is connected correctly, the connection status in the bottom left corner of the software will display "Meter Connected". If no meter is found, the status will be "Meter Disconnected". Check that the correct COM port was selected and try again. Press the **Start** Icon to begin showing output data and UART transmission between the PC and the MCP39F511N.

Chapter 3. Hardware Description



Legend:

- | | |
|--|--|
| 1 = MCP39F511N | 8 = Header for connection to external master MCU (isolated) |
| 2 = +9V DC Input (nonisolated) | 9 = Jumper selection for external MCU or USB (GUI) operation |
| 3 = Current Sensing Shunt - Channel 1 | 10 = Isolation IC |
| 4 = Current Sensing Shunt - Channel 2 | 11 = Switching AC/DC Power Supply |
| 5 = Output LEDs for digital I/O | 12 = 200:1 Voltage Divider for Voltage Input |
| 6 = Headers for digital I/O testing (isolated) | 13 = Jumper for DC or Switching AC/DC Supply |
| 7 = USB Connection (isolated) | |

FIGURE 3-1: MCP39F511N Power Monitor Demonstration Board Top View.

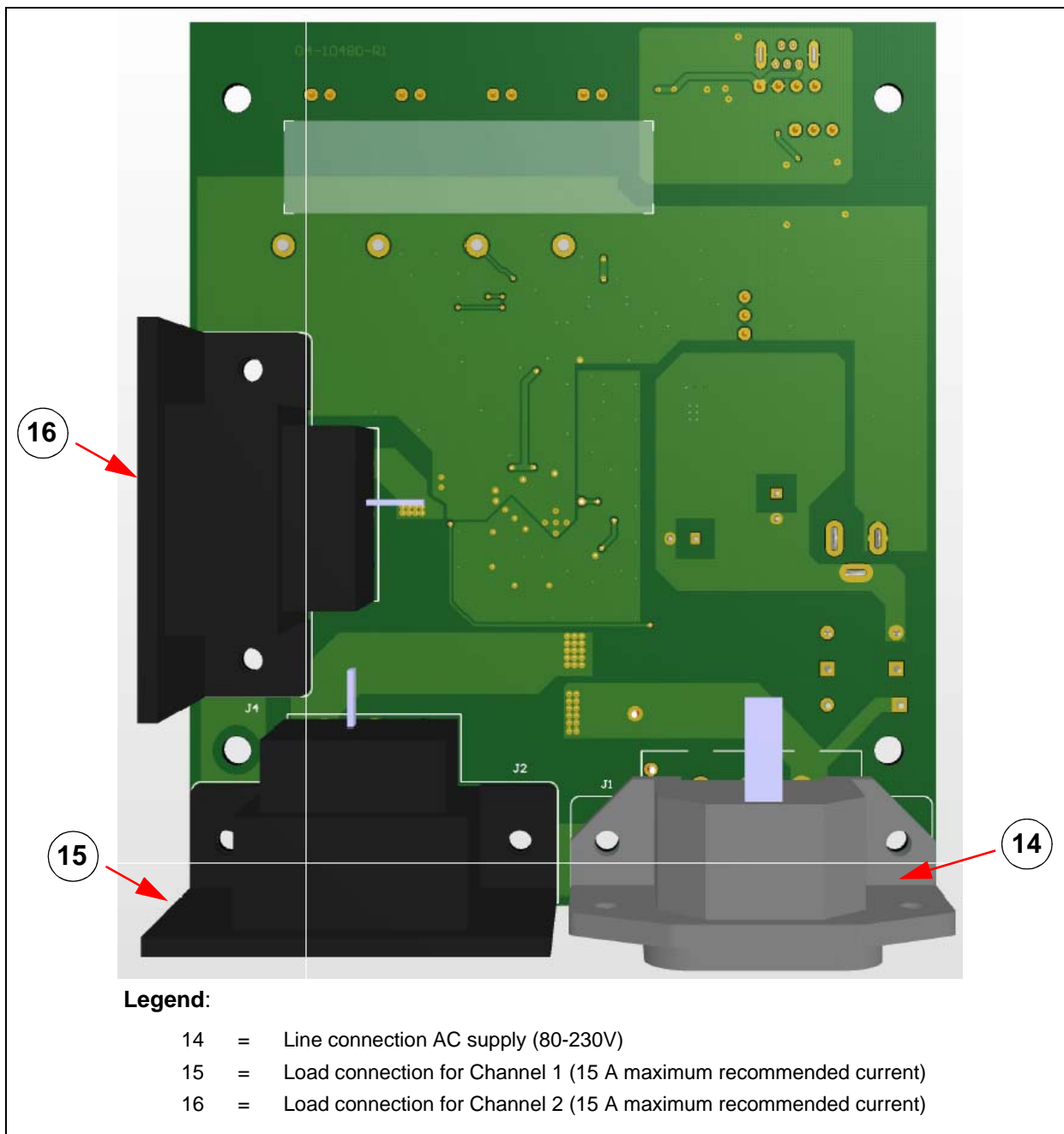


FIGURE 3-2: MCP39F511N Power Monitor Demonstration Board Bottom View.

3.1 INPUT AND ANALOG FRONT END

The MCP39F511N Power Monitor Demonstration Board will operate from 80V to 230V. At the bottom of the main board, there are the high-voltage line and neutral connections. The shunts sit on the neutral or low-side of a two-wire system. The board comes populated with two surface mount 2 mΩ shunts.

The line side of the two-wire system goes into a resistive divider on the voltage channel input, along with a DC offset added from V_{DD} . Anti-aliasing low-pass filters are included. The voltage channel uses two 499 kΩ resistors and the additional components to achieve a divider ratio of approximately 236:1. For a line voltage of 236 V_{RMS}, the channel 1 input signal size will be 1V_{RMS} with a DC offset voltage of $DV_{DD}/2$ per the schematic snippet below.

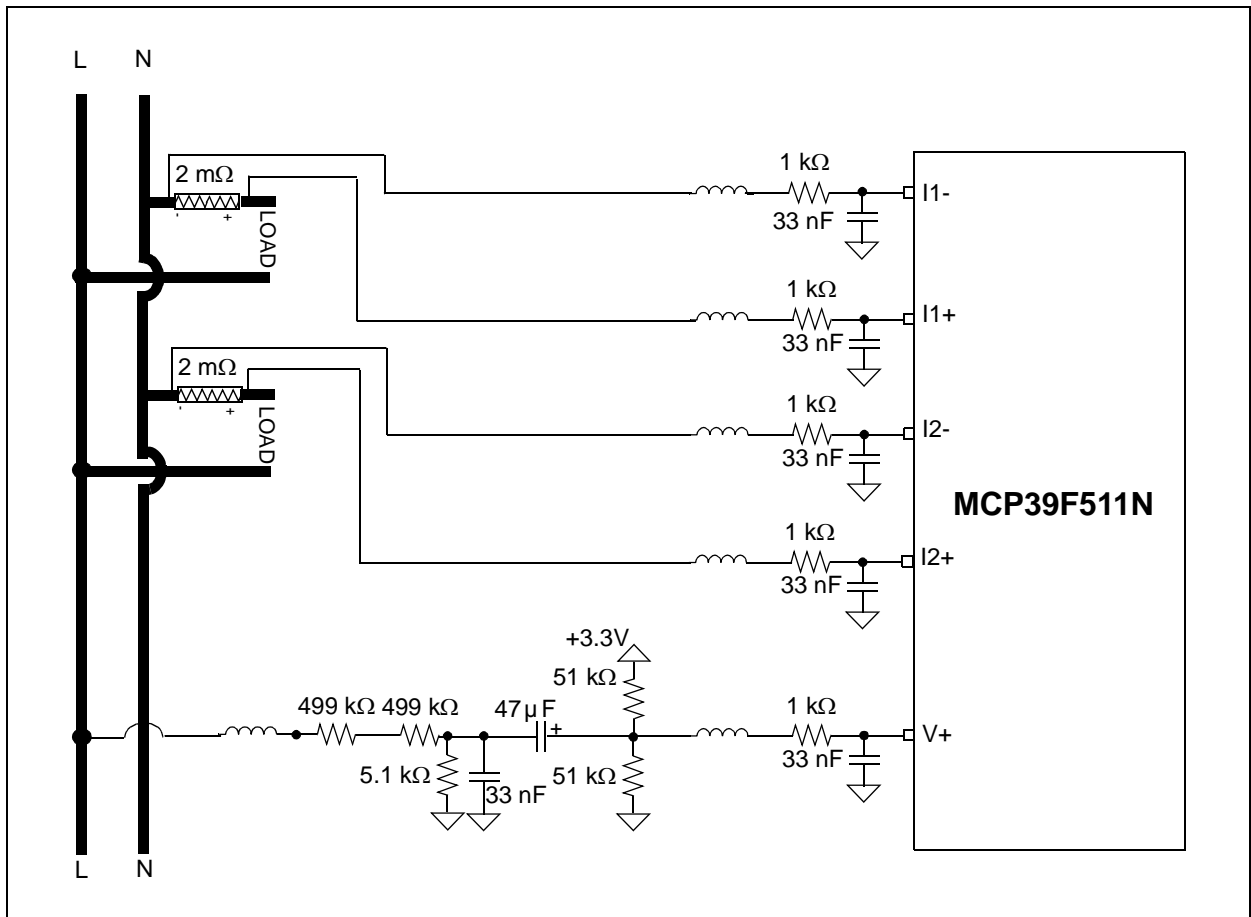


FIGURE 3-3: Analog Front-End Circuitry.

Note that all of the analog circuitry associated with this part of the circuit is connected to the analog ground plane (A_{GND}).

MCP39F511N Power Monitor Demonstration Board User's Guide

3.2 POWER SUPPLY CIRCUIT

The power supply circuit for the MCP39F511N Power Monitor Demonstration Board is shown in [Figure 3-4](#).

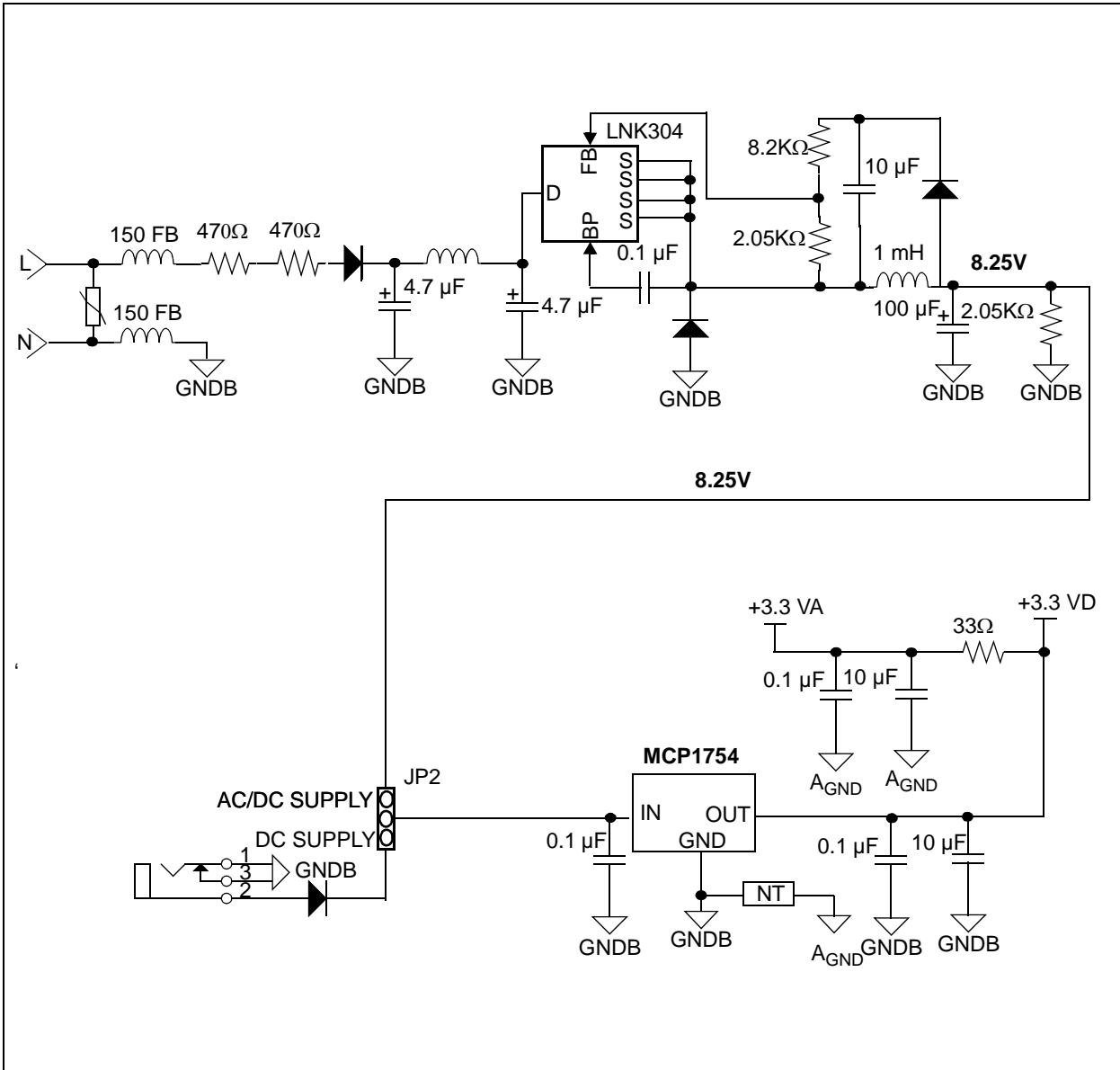


FIGURE 3-4: Power Supply Circuit with Option for AC/DC Switching Supply from Mains or DC Supply.

Appendix A. Schematic and Layouts

A.1 INTRODUCTION

This appendix contains the following schematics and layouts for of the MCP39F511N Power Monitor Demonstration Board:

- Board – Schematic
- **Board – Schematic (Continued)**
- **Board – Top Silk**
- **Board – Top Copper and Silk**
- **Board – Top Copper**
- Board – Bottom Copper
- Board – Bottom Copper and Silk
- Board – Bottom Silk

A.2 SCHEMATICS AND PCB LAYOUT

The layer order is shown in [Figure A-1](#).

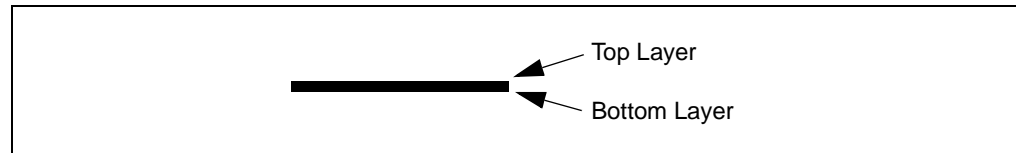
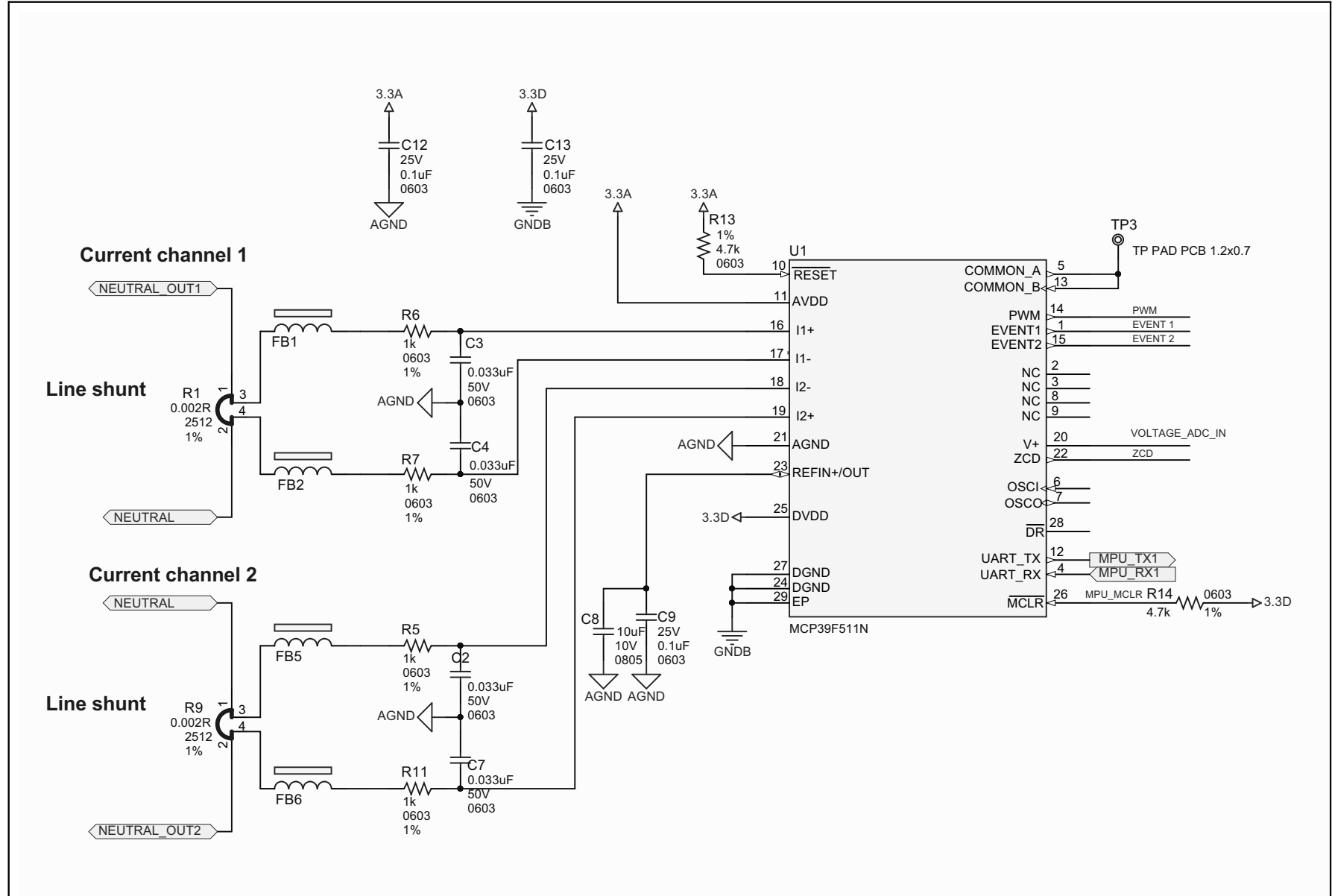
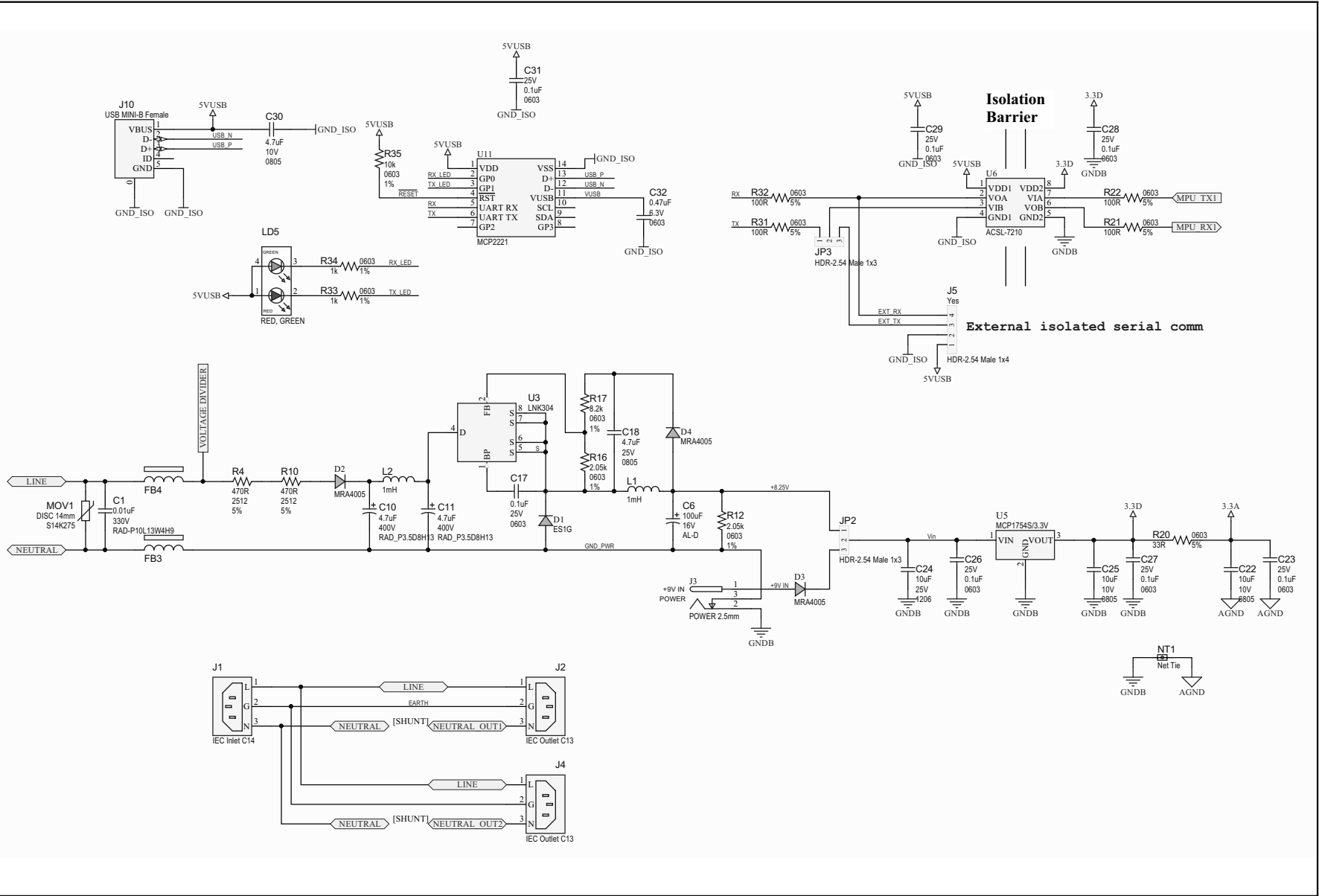


FIGURE A-1: Layer Order.

A.3 BOARD – SCHEMATIC

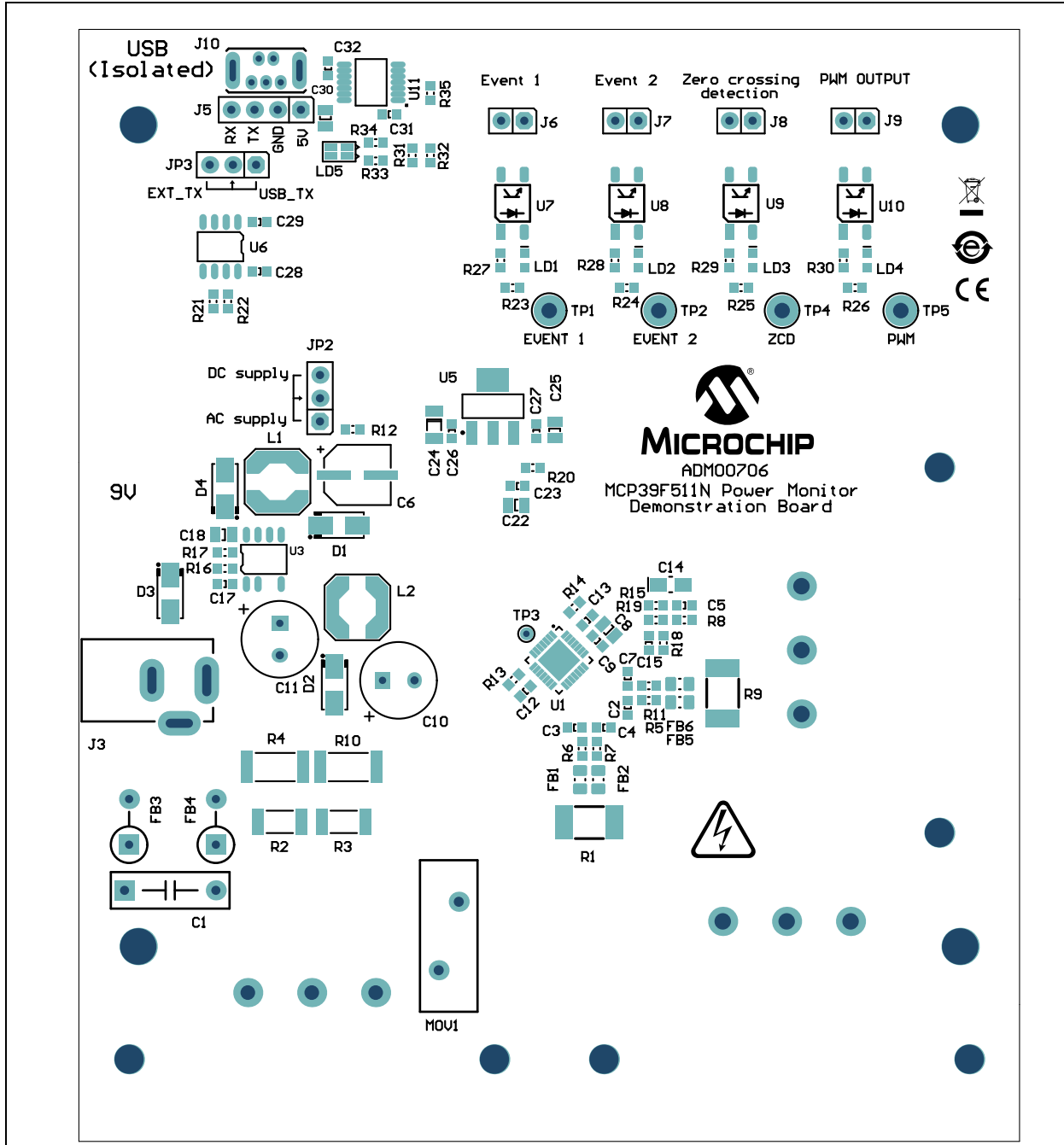


A.4 BOARD – SCHEMATIC (CONTINUED)

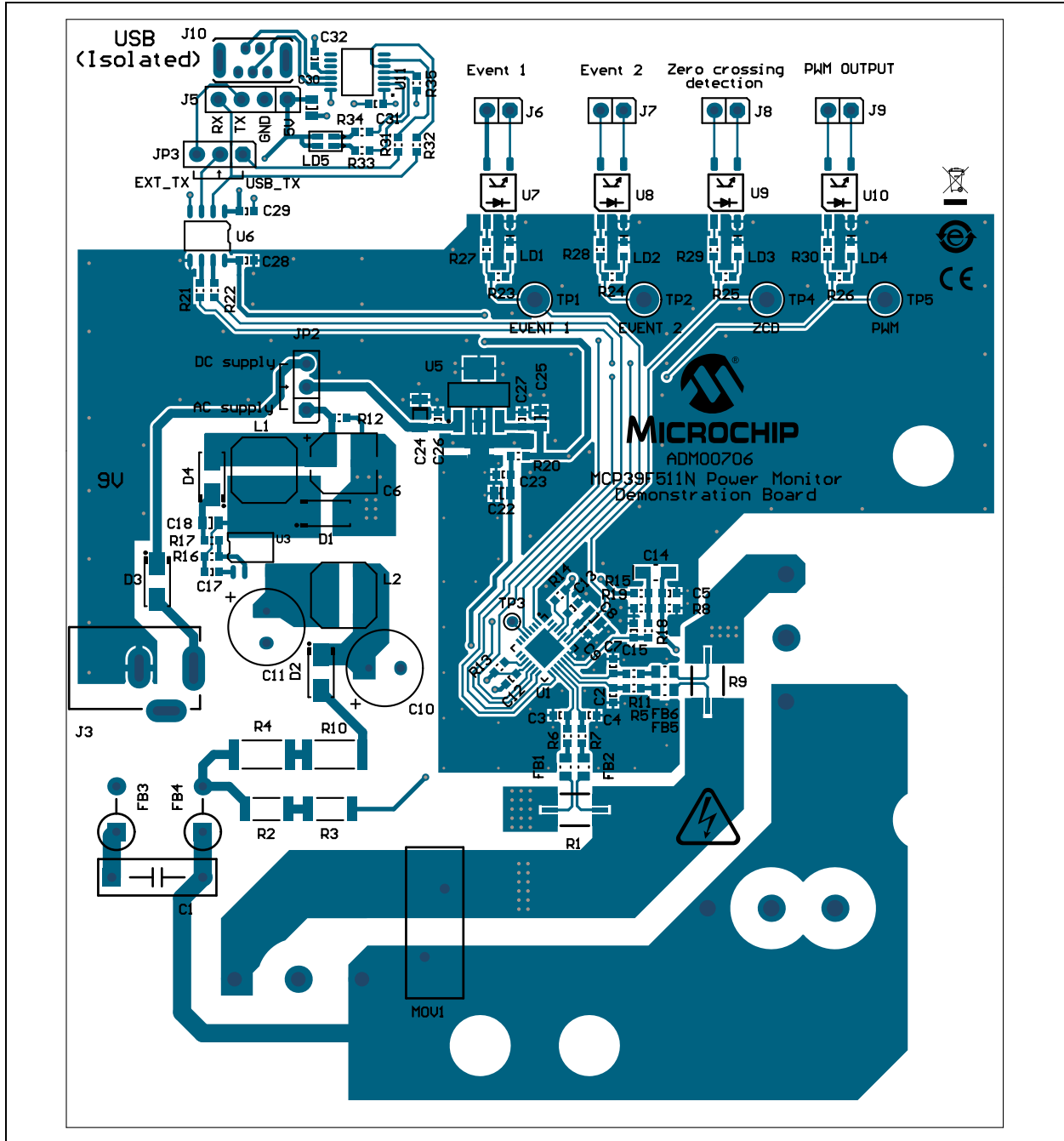


MCP39F511N Power Monitor Demonstration Board User's Guide

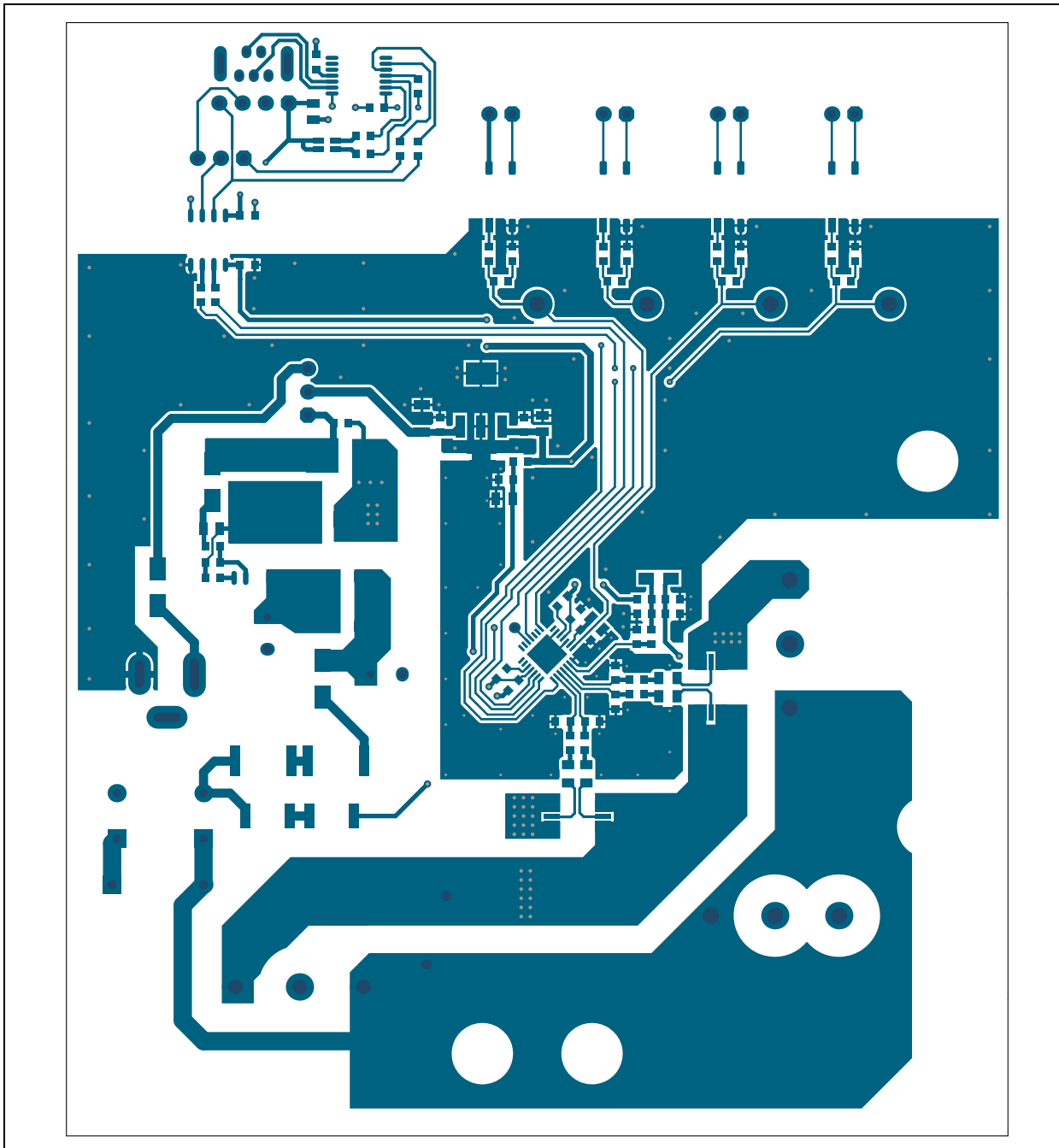
A.5 BOARD – TOP SILK



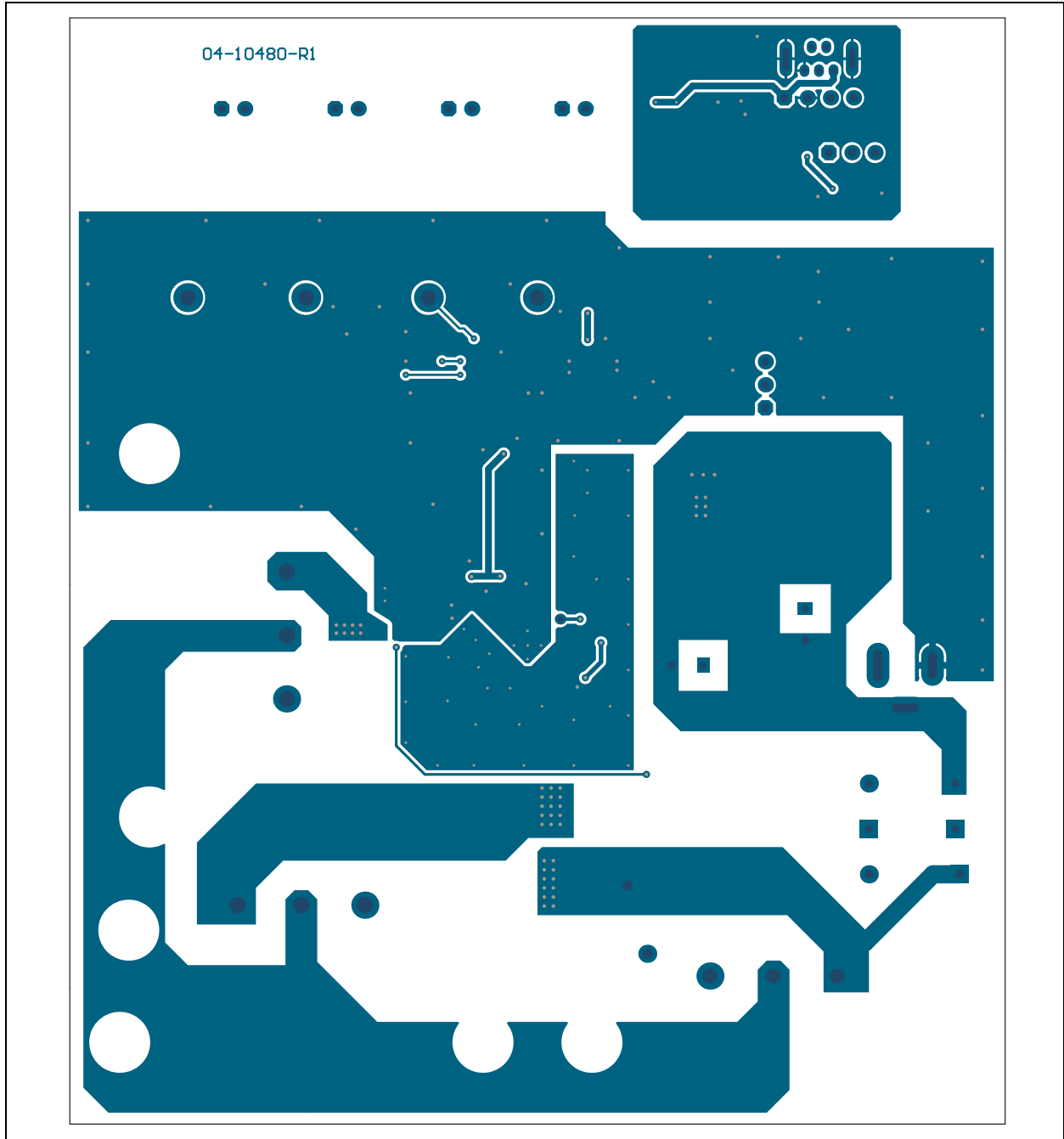
A.6 BOARD – TOP COPPER AND SILK



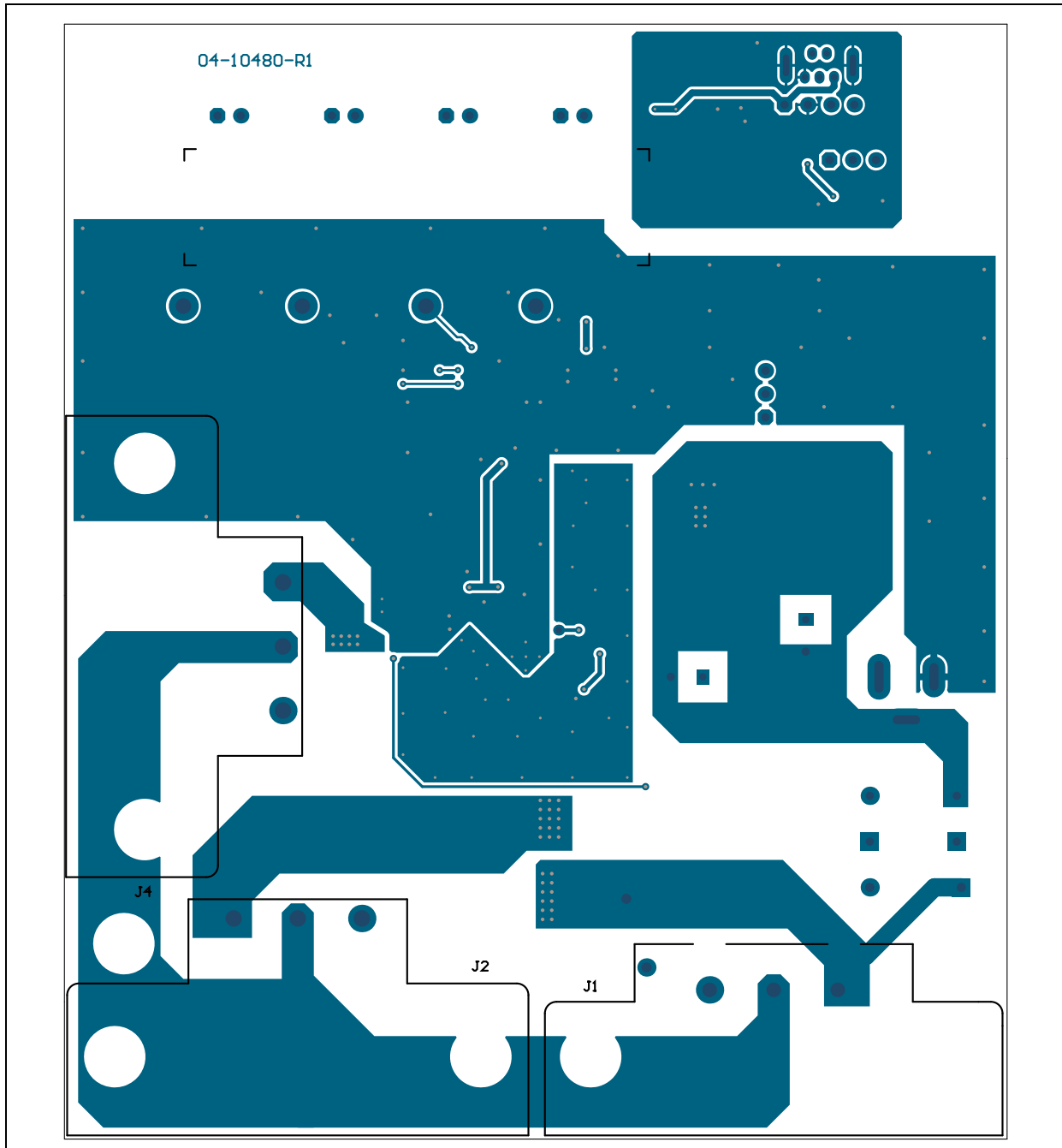
A.7 BOARD – TOP COPPER



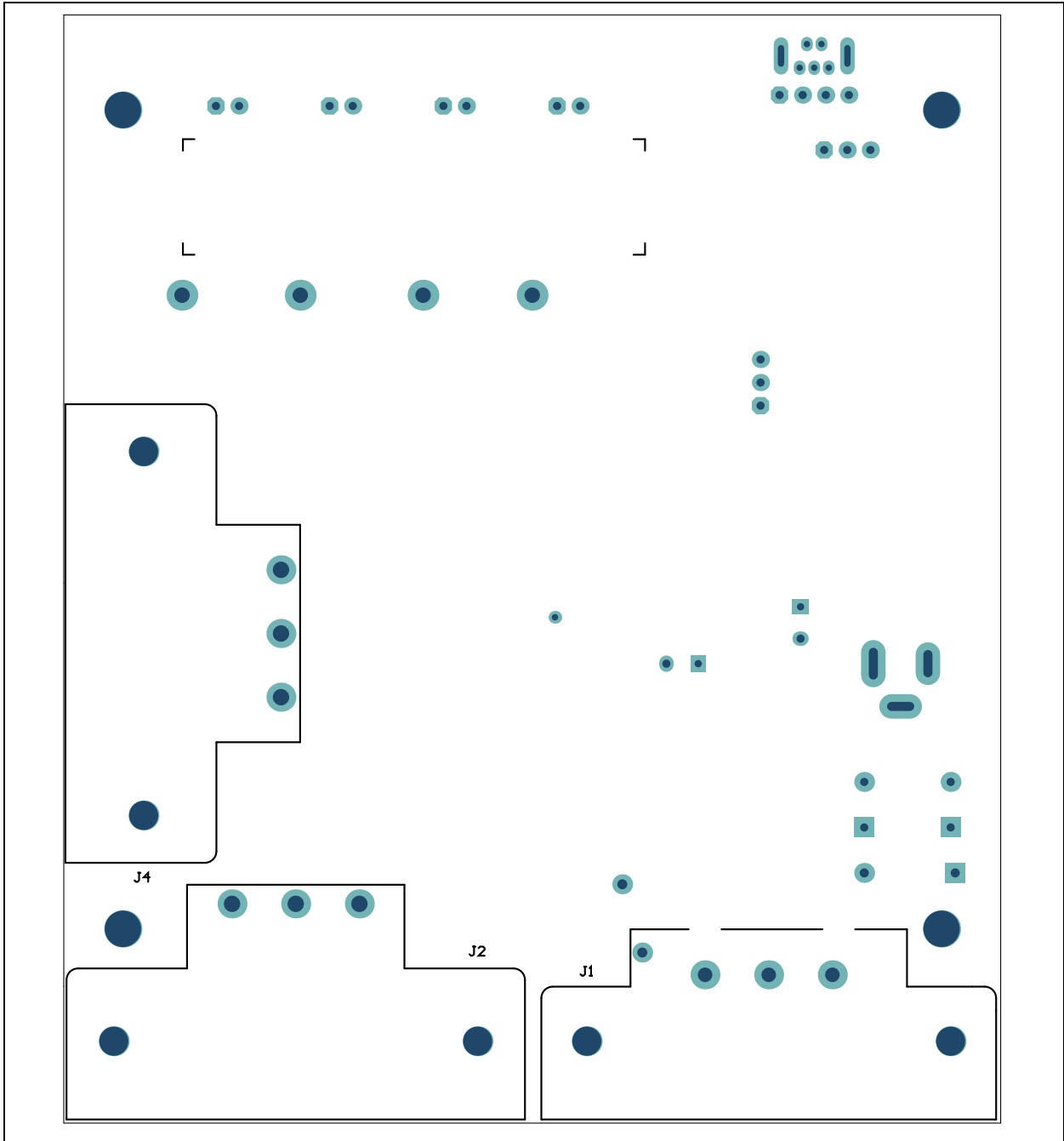
A.8 BOARD – BOTTOM COPPER



A.9 BOARD – BOTTOM COPPER AND SILK



A.10 BOARD – BOTTOM SILK



MCP39F511N Power Monitor Demonstration Board User's Guide

NOTES:

Appendix B. Bill of Materials (BOM)

TABLE B-1: BILL OF MATERIALS (BOM)

Qty.	Reference	Description	Manufacturer	Part Number
1	C1	Capacitor film 0.01 μ F 330V 20% RAD P10L13W4H9	EPCOS AG	B32911A3103M
6	C2, C3, C4, C5, C7, C15	Capacitor ceramic 0.033 μ F 50V 10% X7R SMD 0603	TDK Corporation	C1608X7R1H333K
1	C6	Capacitor alum. 100 μ F 16V 20% SMD D	Nichicon Corporation	UWX1C101MCL1GB
3	C8, C22, C25	Capacitor ceramic 10 μ F 10V 10% X7R SMD 0805	TDK Corporation	C2012X7R1A106K125AC
10	C9, C12, C13, C17, C23, C26, C27, C28, C29, C31	Capacitor ceramic 0.1 μ F 25V 10% X7R SMD 0603	Murata Electronics	GRM188R71E104KA01D
2	C10, C11	Capacitor alum. 4.7 μ F 400V 20% RAD_P3.5D8H13	Nichicon Corporation	UVC2G4R7MPD1TD
1	C14	Capacitor tantalum 47 μ F 4V 10% 2.6Ohm SMD A	AVX Corporation	TAJA476K004RNJ
1	C18	Capacitor ceramic 4.7 μ F 25V 10% X7R SMD 0805	TDK Corporation	C2012X7R1E475K125AB
1	C24	Capacitor ceramic 10 μ F 25V 10% X7R SMD 1206	Taiyo Yuden Co., Ltd.	TMK316B7106KL-TD
1	C30	Capacitor ceramic 4.7 μ F 10V 10% X5R SMD 0805	Taiyo Yuden Co., Ltd.	LMK212BJ475KD-T
1	C32	Capacitor ceramic 0.47 μ F 6.3V 10% X5R SMD 0603	Murata Electronics®	GRM188R60J474KA01D
1	CBL1	Mech. HW cable USB-A male-to-mini USB-B male 3 ft black	Katerno	10UM-02103BK
2	CBL2, CBL3	Mech. HW 1ft 18 AWG monitor power adapter cord (NEMA 5-15R to IEC320C14)	Katerno	152360
1	CBL4	Mech. HW 6 ft 16 AWG universal power cord (IEC320C13 to NEMA 5-15P)	Katerno	153879
1	D1	Diode rectifier ES1G 1.25V 1A 400V SMD DO-214AC_SMA	Diodes® Incorporated	ES1G-13-F
3	D2, D3, D4	Diode rectifier MRA4005 1.1V 1A 600V DO-214AC_SMA	ON Semiconductor®	MRA4005T3G
1	ENCLOSURE1	Mech. enclosure slim ref. side port meter	Tech-Demos.com	TD03-0102R0
4	FB1, FB2, FB5, FB6	Ferrite 800mA 0.15R SMD 0805	Laird Technologies®	LI0805H151R-10
2	FB3, FB4	Ferrite 7A RAD P5L5.3D3.8	Murata Electronics North America, Inc.	BL02RN1R2M2B

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.

Bill of Materials (BOM)

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

Qty.	Reference	Description	Manufacturer	Part Number
1	J1	Conn. IEC 250V 15A inlet C14 TH R/A	SCHURTER Inc.	GSP1.9103.1
2	J2, J4	Conn. IEC 250V 15A outlet C13 TH R/A	SCHURTER Inc.	6182.0033
1	J3	Conn. pwr. 2.5mm 5.5mm switch TH R/A	CUI Inc.	PJ-002B
1	J5	Conn. header-2.54 male 1x4 tin 5.84 MH TH vert.	FCI	68002-404HLF
4	J6, J7, J8, J9	Conn. header-2.54 male 1x2 tin 6.10 MH TH vert.	Molex®	0022284020
1	J10	Conn. USB mini-B female TH vert.	Molex® Connector Corporation	500075-1517
2	JP2, JP3	Conn. header-2.54 male 1x3 gold 5.84 MH TH vert.	FCI	68000-103HLF
2	JP4, JP5	Mech. HW jumper 2.54 mm 1x2 handle gold	TE Connectivity, Ltd.	881545-2
2	L1, L2	Inductor 1 mH 240 mA 20% SMD L6W6H2.4	Coilcraft®	LPS6225-105MRB
1	LABEL1	Label, NEED HELP WITH ASSY/SERIAL		
1	LABEL2	Mech. HW LABEL HIGH VOLTAGE	Panduit Corp.	PLD-56
4	LD1, LD2, LD3, LD4	Diode LED red 1.95V 30 mA 700 MCD clear SMD 0603	Kingbright Electronic Co., Ltd.	APTD1608SURCK
1	LD5	Diode LED bi. red, green 1.95V, 2.1V 30 mA 0805	Kingbright Corp.	APHBM2012SURKCGKC
1	MOV1	Resistor varistor 275V 130J TH disc 14 mm	EPCOS AG	S14K275E2K1
6	NUT1, NUT2, NUT3, NUT4, NUT5, NUT6	Hex. nut 0.217" steel M3	Keystone Electronics Corp.	4708
1	PCB1	Printed Circuit Board – MCP39F501 Power Monitor Demonstration Board	Microchip Technology Inc.	04-10480-1
2	R1, R9	Resistor shunt MF 0.002R 1% 2W 2512	Stackpole Electronics, Inc.	CSNL2512FT2L00
2	R2, R3	Res. TKF 499k 1% 3/4W SMD 2010	Vishay/Dale	CRCW2010499KFKEF
2	R4, R10	Res. TKF 470R 5% 1W SMD 2512	Panasonic® - ECG	ERJ-1TYJ471U
15	R5, R6, R7, R11, R18, R23, R24, R25, R26, R27, R28, R29, R30, R33, R34	Res. TKF 1k 1% 1/10W SMD 0603	Panasonic - ECG	ERJ-3EKF1001V
1	R8	Res. TKF 5.1k 1% 1/10W SMD 0603	Panasonic - ECG	ERJ-3EKF5101V
2	R12, R16	Res. TKF 2.05k 1% 1/10W SMD 0603	Yageo Corporation	RC0603FR-072K05L
2	R13, R14	Res. TKF 4.7k 1% 1/10W SMD 0603	Panasonic - ECG	ERJ-3EKF4701V
2	R15, R19	Res. TKF 51k 1% 1/10W SMD 0603	Panasonic - ECG	ERJ-3EKF5102V
1	R17	Res. TKF 8.2k 1% 1/10W SMD 0603	Panasonic - ECG	ERJ-3EKF8201V
1	R20	Res. TKF 33R 5% 1/10W SMD 0603	Yageo Corporation	9C06031A33R0JLHFT
4	R21, R22, R31, R32	Res. TKF 100R 5% 1/10W SMD 0603	Vishay/Dale	CRCW0603100RJNEA

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.

Bill of Materials (BOM)

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

Qty.	Reference	Description	Manufacturer	Part Number
1	R35	Resistor TKF 10k 1% 1/10W SMD 0603	Panasonic - ECG	ERJ-3EKF1002V
6	SCR1, SCR2, SCR3, SCR4, SCR5, SCR6	Machine screw pan Phillips M3	Digi-Key® Electronics	335-1156-ND
4	TP1, TP2, TP4, TP5	Conn. TP pin tin TH	Harwin Plc.	H2121-01
1	U1	Microchip Analog Energy Measurement 4000:1 MCP39F511N-E/MQ QFN-28	Microchip Technology Inc.	MCP39F511N-E/MQ
1	U3	IC switcher LNK304 SO-8C	Power Integrations™	LNK304DG-TL
1	U5	Microchip Analog LDO 3.3V MCP1754ST-3302E/DB SOT-223-3	Microchip Technology Inc.	MCP1754ST-3302E/DB
1	U6	IC photo ACSL-7210-06RE Bi-Dir. 3.3V and 5V SOIC-8	Avago Technologies	ACSL-7210-06RE
4	U7, U8, U9, U10	IC Photo HCPL-181 4-SMD	Avago Technologies	HCPL-181-00CE
1	U11	Microchip interface USB I2C UART MCP2221-I/ST TSSOP-14	Microchip Technology Inc.	MCP2221-I/ST

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.



MICROCHIP

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](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: 905-673-0699

Fax: 905-673-6509

ASIA/PACIFIC

Asia Pacific Office

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

Hong Kong

Tel: 852-2943-5100

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 - 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

07/14/15



Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331