TC1303B Dual-Output Regulator with Power-Good Output User's Guide

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TC1303B DUAL-OUTPUT REGULATOR USER'S GUIDE

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TC1303B DUAL-OUTPUT REGULATOR 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 "DSXXXXXA", where "XXXXX" is the document number and "A" is the revision level of the document.

INTRODUCTION

This chapter contains general information that will be useful to know before using the TC1303B Dual-Output Regulator with Power-Good Output Demo Board. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes how to use the TC1303B Dual-Output Regulator with Power-Good Output Demo Board. The manual layout is as follows:

- **Chapter 1. "Product Overview"** – Important information about the TC1303B Dual-Output Regulator with Power-Good Output Demo Board.
- **Chapter 2. "Installation and Operation"** – Provides a description of the demo board and includes instructions on how to get started.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the TC1303B Dual-Output Regulator with Power-Good Output Demo Board.
- **Appendix B. "Bill-Of-Materials (BOM)"** – Lists the parts used to build the TC1303B Dual-Output Regulator with Power-Good Output Demo Board.

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
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier font:		
Plain Courier	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	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 the TC1303B Dual-Output Regulator with Power-Good Output Demo Board. The following Microchip document is available and recommended as a supplemental reference resources.

TC1303B Data Sheet, *"500 mA Synchronous Buck Regulator + 300 mA LDO with Power-Good Output"*, (DS21949)

This data sheet provides detailed information regarding the TC1303B product family.

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- **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

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- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support
- Development Systems Information Line

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

IDOCUMENT REVISION HISTORY

Revision A (June 2005)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

The TC1303B Dual-Output Regulator with Power-Good Output Demo Board is used to demonstrate the operation of the TC1303B. The TC1303B combines a 500 mA synchronous buck regulator and 300 mA Low-Dropout Regulator (LDO) with a power-good monitor to provide a highly integrated solution for devices that require multiple supply voltages. The unique combination of an integrated buck switching regulator and low-dropout linear regulator provides the smallest, lowest system cost for dual-output voltage applications, with one low processor core voltage and one higher bias voltage.

The 500 mA synchronous buck regulator switches at a fixed frequency of 2.0 MHz when the load is heavy, providing a low noise, small solution. When the load on the buck output is reduced to light levels, it changes operation to a pulse frequency modulation mode to minimize quiescent current draw from the battery. No intervention is necessary for smooth transition from one mode to another.

The LDO provides a 300 mA auxiliary output that requires a single 1 µF ceramic output capacitor, minimizing board area and cost. Typical dropout voltage for the LDO output is 137 mV for a 200 mA load.

For the TC1303B, the power-good output logic level is based on the regulation of the LDO output only. The buck regulator can be turned on and off without affecting the power-good signal.

This chapter covers the following topics:

- What is the TC1303B Dual-Output Regulator with Power-Good Output Demo Board?
- What the TC1303B Dual-Output Regulator with Power-Good Output Demo Board kit includes

1.2 WHAT IS THE TC1303B DUAL-OUTPUT REGULATOR WITH POWER-GOOD OUTPUT DEMO BOARD?

The TC1303B Dual-Output Regulator with Power-Good Output Demo Board can be used to evaluate the TC1303B device over the input voltage range and output current range for both the synchronous buck regulator output and the low-dropout linear regulator output.

Test points are provided for input power, output loads, shutdown control and power-good monitoring.

1.3 WHAT THE TC1303B DUAL-OUTPUT REGULATOR WITH POWER-GOOD OUTPUT DEMO BOARD KIT INCLUDES

This TC1303B Dual-Output Regulator with Power-Good Output Demo Board kit includes:

- The TC1303B Dual-Output Regulator with Power-Good Output Demo Board Board (102-00055)
- TC1303B 500 mA Buck Regulator, 300 mA LDO with Power-Good Output Demo Board User's Guide (DS51563)
- TC1303B Data Sheet, *"500 mA Synchronous Buck Regulator, + 300 mA LDO with Power-Good Output"*, (DS21949)

Chapter 2. Installation and Operation

2.1 INTRODUCTION

The TC1303B Dual-Output Regulator with Power-Good Output Demo Board demonstrates Microchip's TC1303B Dual Output Voltage Regulator over its entire range of operation.

2.2 FEATURES

The TC1303B Dual-Output Regulator with Power-Good Output Demo Board has the following features:

- Test points for applying input voltage (0V to 5.5V)
- Test points for connecting external loads
  - Buck V_{OUT1} = 0 mA to 500 mA
  - LDO V_{OUT2} = 0 mA to 300 mA
  - PG Output
  - Shutdown V_{OUT1} and shutdown V_{OUT2}
- The fixed output voltages for the TC1303B can be determined by using the data sheet section titled **"Product Identification System"**. Refer to the TC1303B data sheet (DS21949) for details.

2.3 GETTING STARTED

The TC1303B Dual-Output Regulator with Power-Good Output Demo Board is fully assembled and tested for evaluating the TC1303B device operation.

2.3.1 Power Input and Output Connections

2.3.1.1 POWERING THE TC1303B DUAL-OUTPUT REGULATOR WITH POWER-GOOD OUTPUT DEMO BOARD

For normal operation, it is not necessary to pull up the shutdown pins of the TC1303B device, pull-up resistors are placed on the board.

1. Apply the input voltage (+2.7V to +5.5V for normal operation) to board test point TP2 ($+V_{IN}$) and TP4 (P_{GND}).
2. Connect buck regulator load (0 mA to 500 mA for normal operation) to board test point TP3 ($+V_{O1}$) and TP7 (P_{GND}).
3. Connect LDO regulator load (0 mA to 300 mA for normal operation) to TP10 ($+V_{O2}$) and TP11 (A_{GND}).
4. The power-good output signal is available on test point TP5 (PG).
5. To shutdown V_{OUT1}, a jumper wire from TP8, ($\overline{SHDN1}$) to the A_{GND} test point (TP11) can be used. This will disable the buck regulator output voltage (the LDO output voltage is not affected).
6. To shutdown V_{OUT2}, a jumper wire from TP9 ($\overline{SHDN2}$) to the A_{GND} test point (TP11) can be used. This will disable the LDO output voltage (the buck regulator output voltage is not affected).

Note: When grounding the shutdown pins, the input voltage is placed across the 1 MΩ pull-up resistor. This will cause the input current to increase by a few micro-amps.

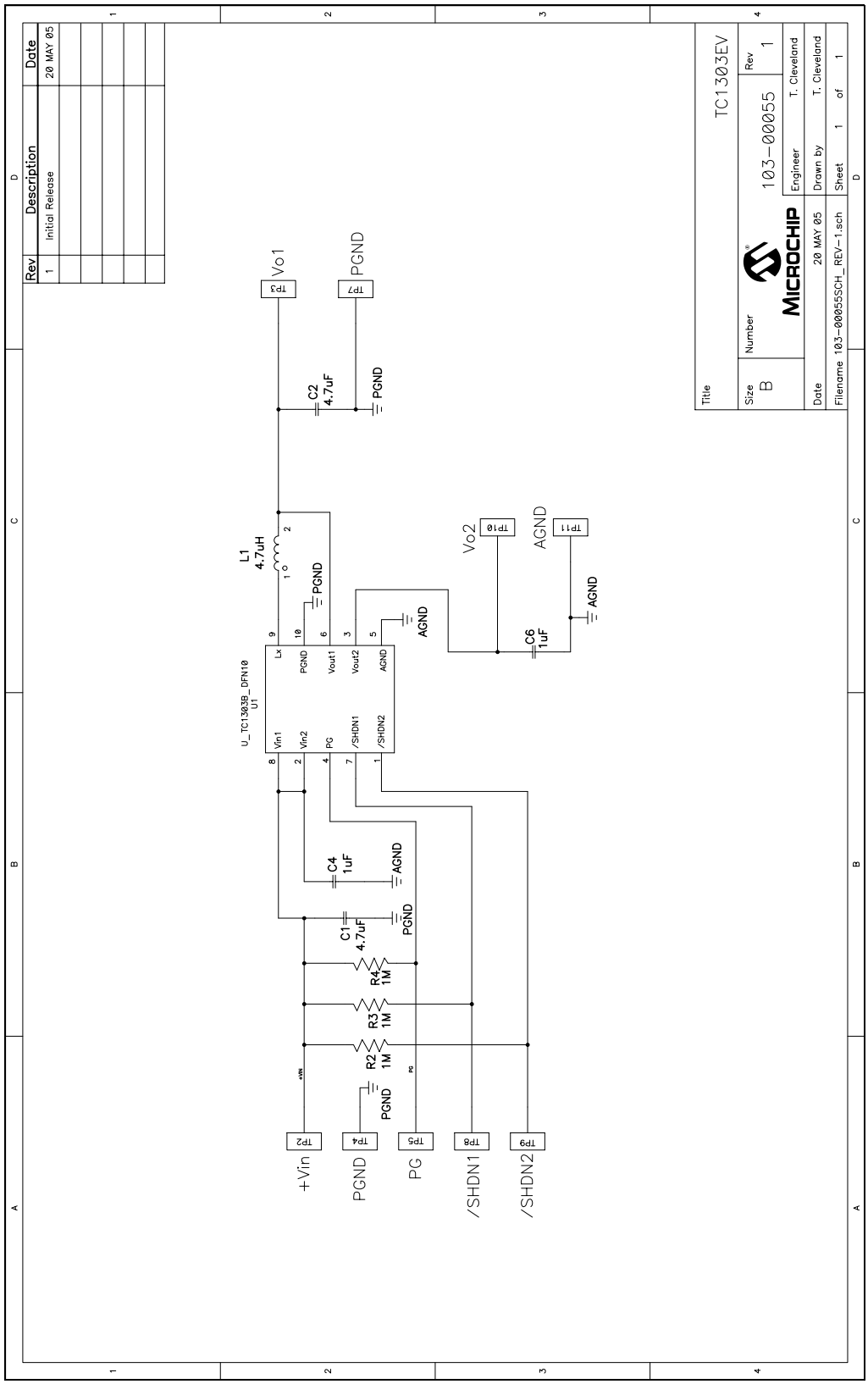
Appendix A. Schematic and Layouts

A.1 INTRODUCTION

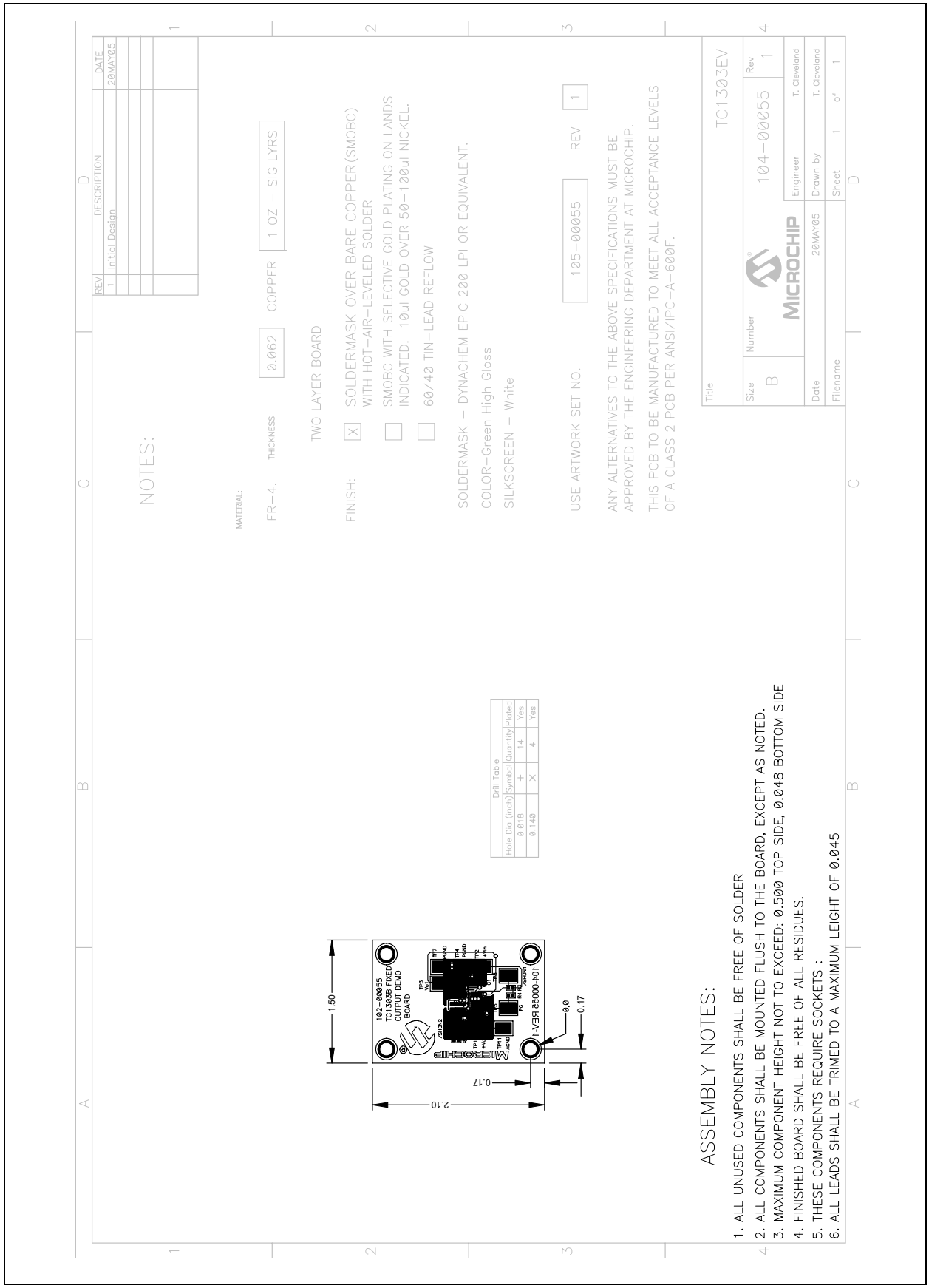
This appendix contains the following schematic and layout diagrams for the TC1303B Dual-Output Regulator with Power-Good Output Demo Board:

- Board Schematic
- Board – Assembly Drawing
- Board – Top Overlay
- Board – Top Layer
- Board – Bottom Layer

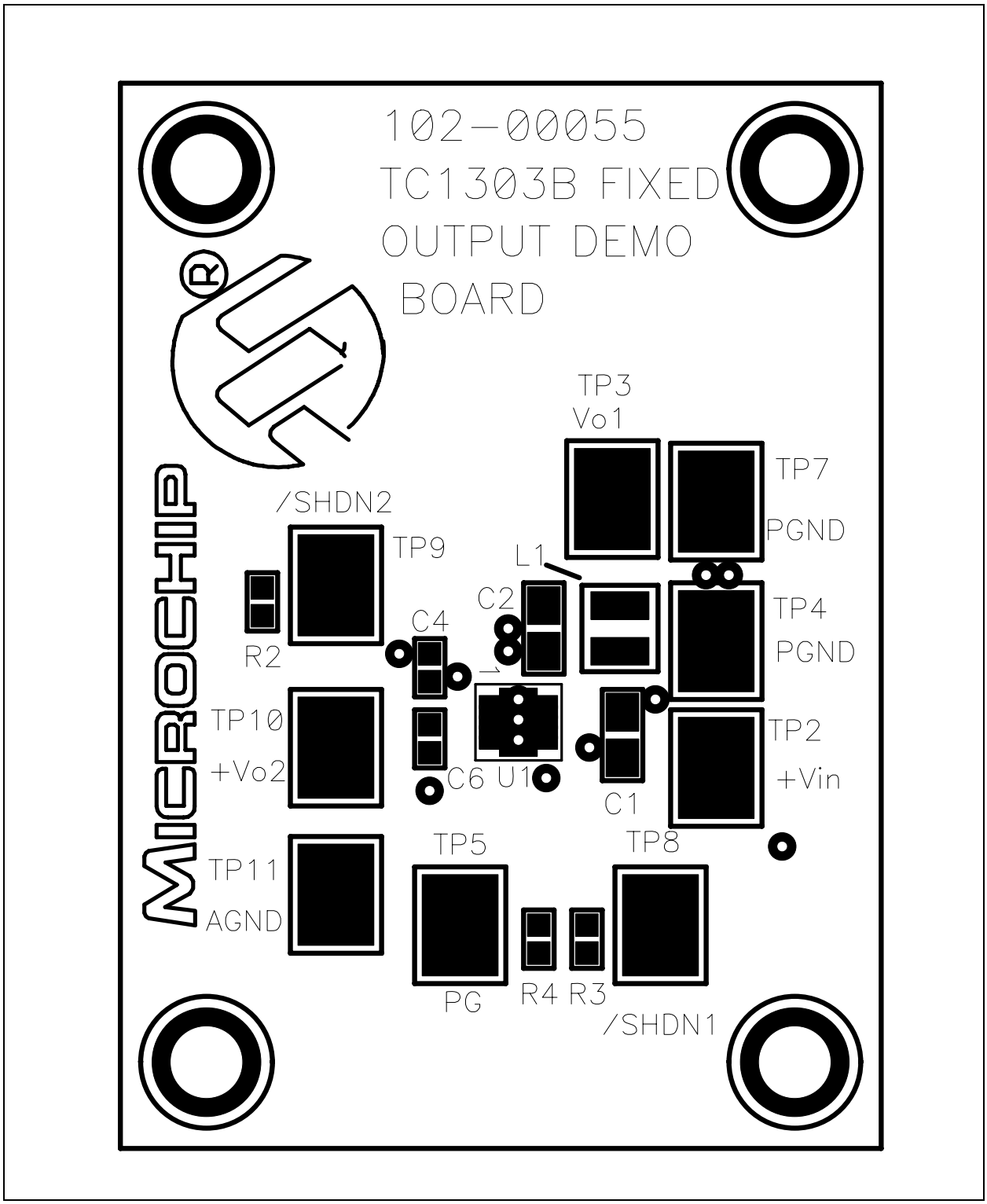
A.2 BOARD SCHEMATIC



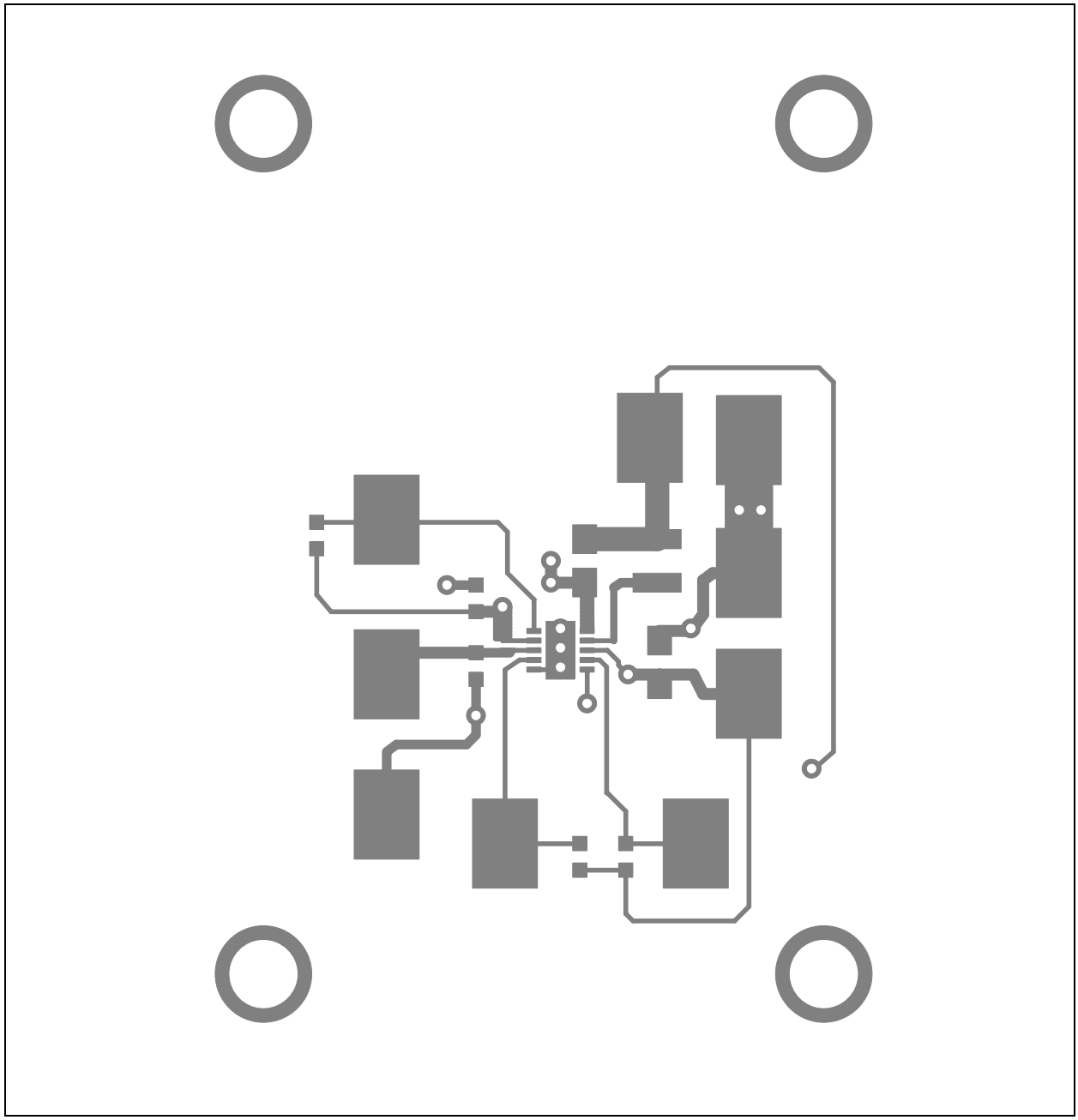
A.3 BOARD – ASSEMBLY DRAWING



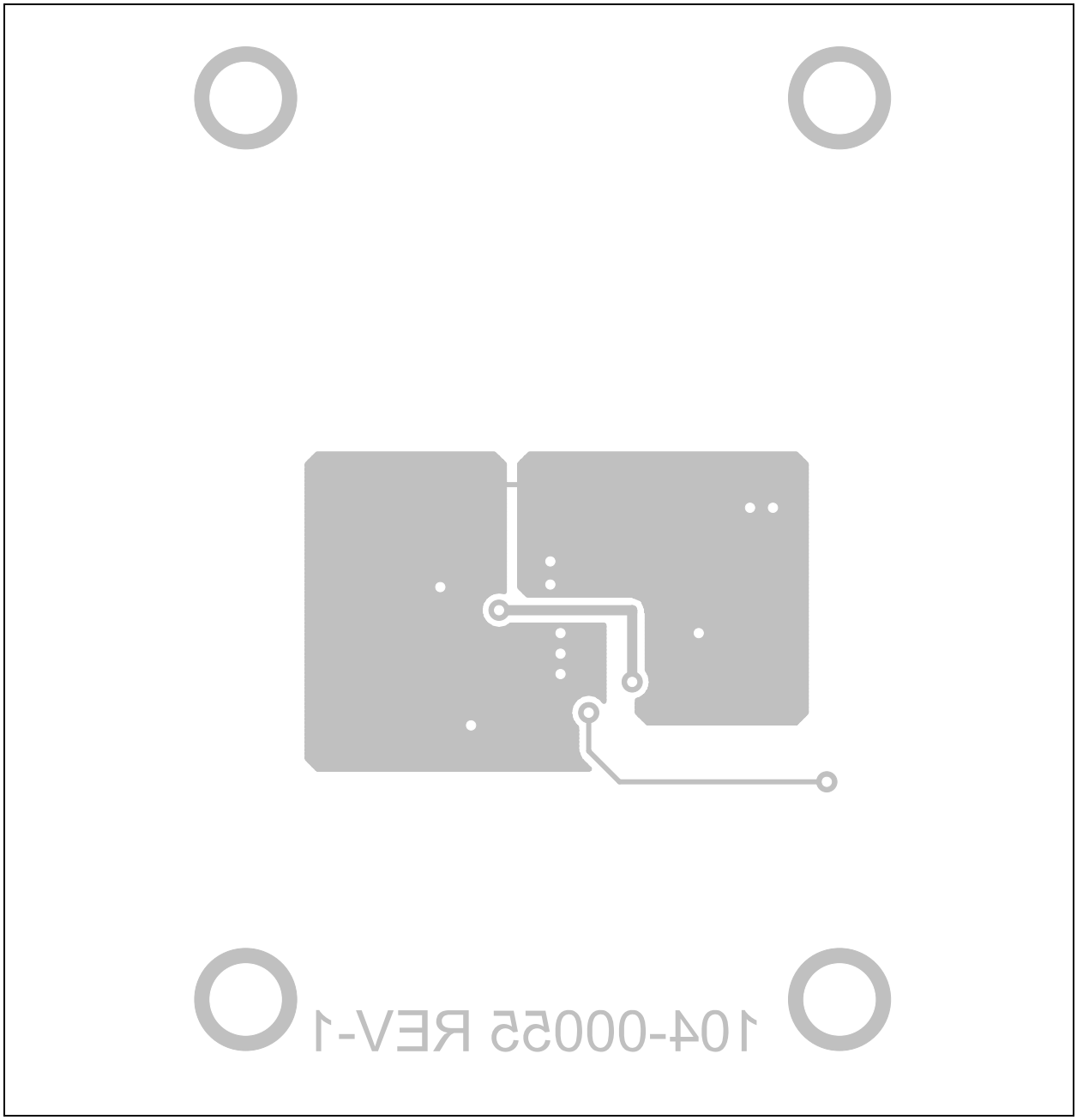
A.4 BOARD – TOP OVERLAY



A.5 BOARD – TOP LAYER



A.6 BOARD – BOTTOM LAYER



Appendix B. Bill-Of-Materials (BOM)

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

Qty.	Reference	Description	Mfgr.	Part Number
2	C1, C2	4.7 µF, X7R Ceramic, 6.3V, 0805	Panasonic®-ECG	ECJ-2FB0J475M
2	C4,C6	1 µF, X5R Ceramic, 6.3V, 0603	Panasonic-ECG	ECJ-1VB0J105K
1	L1	4.7 µH Surface Mount Inductor	Coilcraft®	1008PS-472KL
1	U1	TC1303B Dual Output Regulator	Microchip Technology Inc.	TC1303B-PG0EMF
3	R2, R3, R4	1M, 1/16W, Chip Resistor, 0603	Panasonic-ECG	ERJ-3EKF1004V
9	TP2, TP3, TP4, TP5, TP7, TP8, TP9, TP10, TP11	PC TEST POINT COMPACT SMT	Keystone Electronics®	5016

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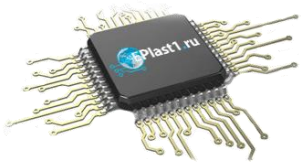

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