HV56264 Evaluation Board User's Guide

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

- Microchip products meet the specifications contained in their particular Microchip Data Sheet.

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HV56264 Evaluation Board User's Guide

NOTES:

Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our website (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "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 HV56264 Evaluation Board. Items discussed in this chapter include:

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

DOCUMENT LAYOUT

This document describes how to use the HV56264 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 HV56264 Evaluation Board.
- **Chapter 2. "Installation and Operation"** – This chapter includes a detailed description of each function of the HV56264 Evaluation Board and instructions on how to use the HV56264 Evaluation Board.
- **Appendix A. "Schematic and Layouts"** – Shows the schematic and layout diagrams for the HV56264 Evaluation Board.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the HV56264 Evaluation Board.
- **Appendix C. "Waveforms"** – Describes the various plots and waveforms for the HV56264 Evaluation Board.

HV56264 Evaluation 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	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	`file`.o, where `file` can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options] file [options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

RECOMMENDED READING

This user's guide describes how to use the HV56264 Evaluation Board. Other useful documents are listed below. The following Microchip document is available and recommended as a supplemental reference resource:

HV56264 Data Sheet – "*Quad High-Voltage Amplifier Array*" (DS20006477)

THE MICROCHIP WEBSITE

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

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

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

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

Technical support is available through the website at:
http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (December 2020)

- Initial Release of this Document.

NOTES:

Chapter 1. Product Overview

1.1 INTRODUCTION

This chapter covers the following:

- HV56264 Device Overview
- HV56264 Evaluation Board Overview
- HV56264 Evaluation Board Kit Contents

1.2 HV56264 DEVICE OVERVIEW

The HV56264 device is an AECQ100-rated, Quad High-Voltage Amplifier Array integrated circuit. The HV56264 device operates on a 225V high-voltage supply and a 5.0V low-voltage supply. The amplifiers' input voltage ranges from 0V to 3.3V, and the output swing from 1.0V to 225V, with a 3 mA sink/source current capability.

The amplifiers are designed with a 3 dB bandwidth of 150 kHz for a capacitive load of 15 pF and 11 V/µs typical slew rate. Amplifiers are designed to be stable for the voltage gain range of 50 to 100 V/V and with the external feedback resistor network of 700 kΩ, up to 7 MΩ.

1.3 HV56264 EVALUATION BOARD OVERVIEW

The HV56264 Evaluation Board consists of a single HV56264 device with external resistors forming a noninverting configuration with a gain of 68.3 V/V. The output channels of the amplifiers are loaded with 15 pF/250V capacitors. The HV56264 Evaluation Board requires two power supplies for operation and a signal generator to input data waveforms to the amplifiers.
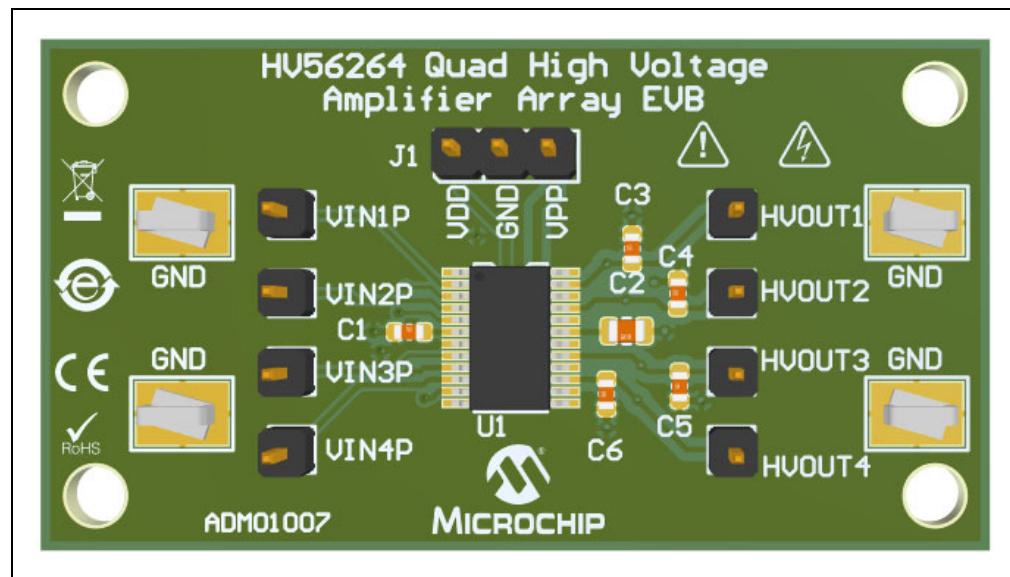

FIGURE 1-1: *HV56264 Evaluation Board – Top View.*

1.4 HV56264 EVALUATION BOARD KIT CONTENTS

The HV56264 Evaluation Board kit includes:

• HV56264 Quad High-Voltage Amplifiers Evaluation Board (ADM01007)
• Important Information Sheet

Chapter 2. Installation and Operation

2.1   GETTING STARTED

The HV56264 Evaluation Board is fully assembled and tested. The board requires external voltage sources.

2.1.1   Tools Required for Operation

- One low-voltage 5V power supply
- One high-voltage 225V power supply
- A function/signal generator for the amplifiers' waveform inputs
- An oscilloscope to observe the waveforms and measure electrical parameters

2.2   SETUP PROCEDURE

WARNING
In order to prepare the HV56264 Evaluation Board, fully read the HV56264 Evaluation Board User's Guide (this document) before proceeding to board setup and usage.

Connect the power supplies to the J1 connectors by following the steps indicated in the power-up sequence.

2.2.1   Power-up Sequence

1. Connect GND.
2. Connect all VINxP pins to GND.
3. Apply V_{DD}.
4. Apply V_{PP}.

2.2.2   Power-Down Sequence:

1. Connect all VINxP pins to GND.
2. Remove V_{PP}.
3. Remove V_{DD}.
4. Remove GND.

The settings for applied voltage are detailed in Table 2-1.

TABLE 2-1:   VOLTAGE SETTINGS

Step	Terminal	Description
1	GND	Ground reference for low and high voltage
2	V_{DD}	5.0V, low-voltage supply
3	V_{PP}[1]	225V, high-voltage supply

Note 1:   It is recommended to ramp up V_{PP} voltage slowly.

HV56264 Evaluation Board User's Guide
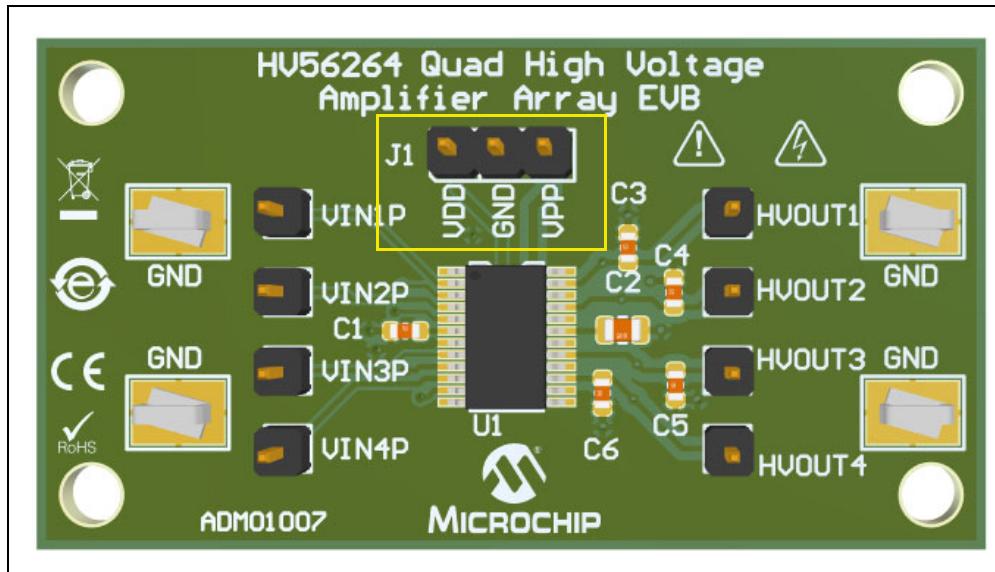
FIGURE 2-1: *HV56264 Evaluation Board – Power Supply Connections for J1.*

2.3 OPERATION

Once the HV56264 Evaluation Board is powered up, the data waveform inputs can be applied to VIN1P, VIN2P, VIN3P and VIN4P, and their respective outputs can be tested.

TABLE 2-2: **INPUT VOLTAGE RANGE**

VINxP	Default Gain	Notes
0V up to 3.3V	68.3 V/V	225V(V_{PP})/68.3 V/V

Appendix A. Schematic and Layouts

A.1   INTRODUCTION

This appendix contains the following schematics and layouts for the HV56264 Evaluation Board (ADM01007).

- ADM01007 – Schematic
- ADM01007 – Top Silk
- ADM01007 – Top Copper and Silk
- ADM01007 – Top Copper
- ADM01007 – Bottom Copper
- ADM01007 – Bottom Copper and Silk
- ADM01007 – Bottom Silk

A.2   ADM01007 – SCHEMATIC

Schematic and Layouts
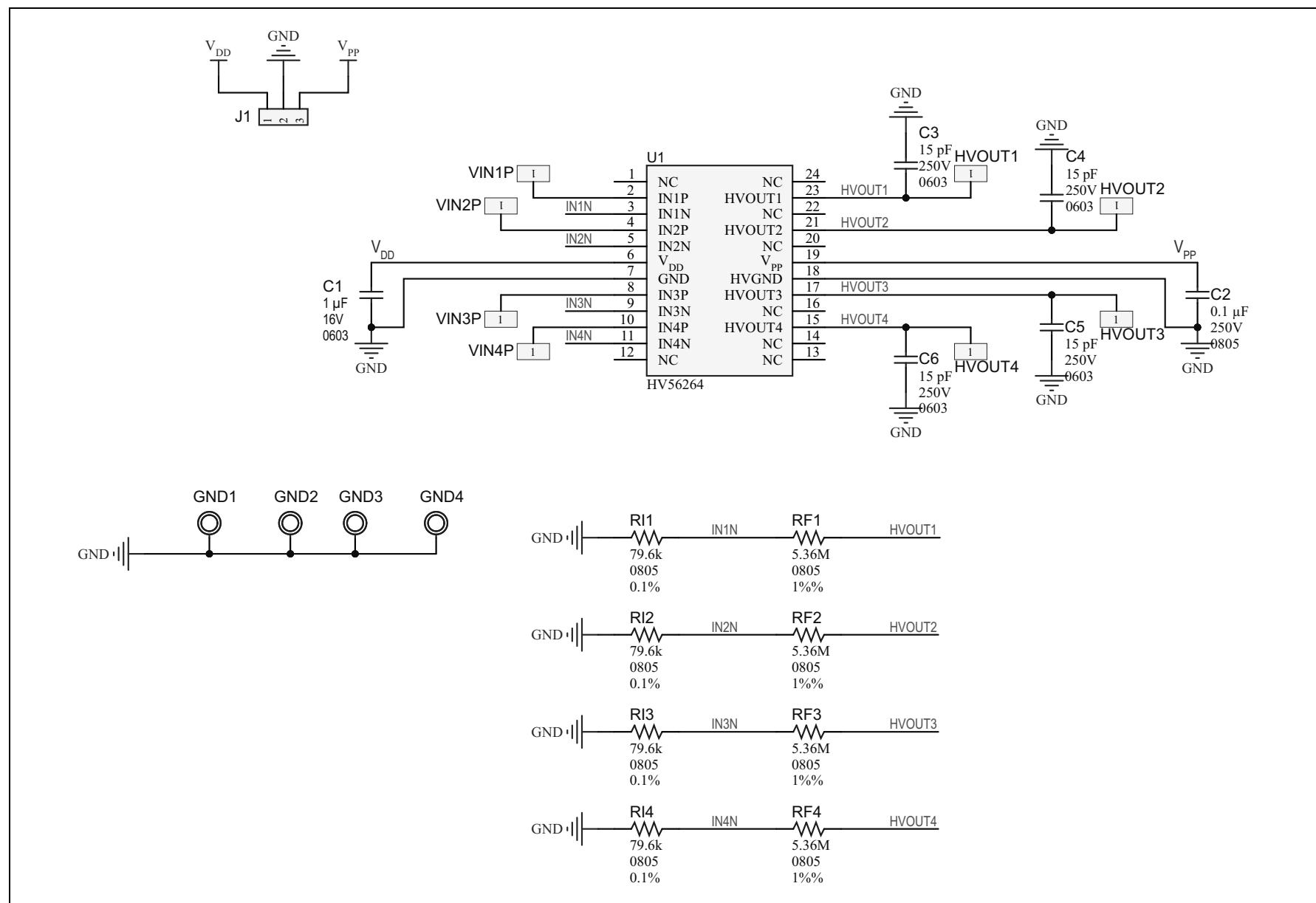
A.3   ADM01007 – TOP SILK
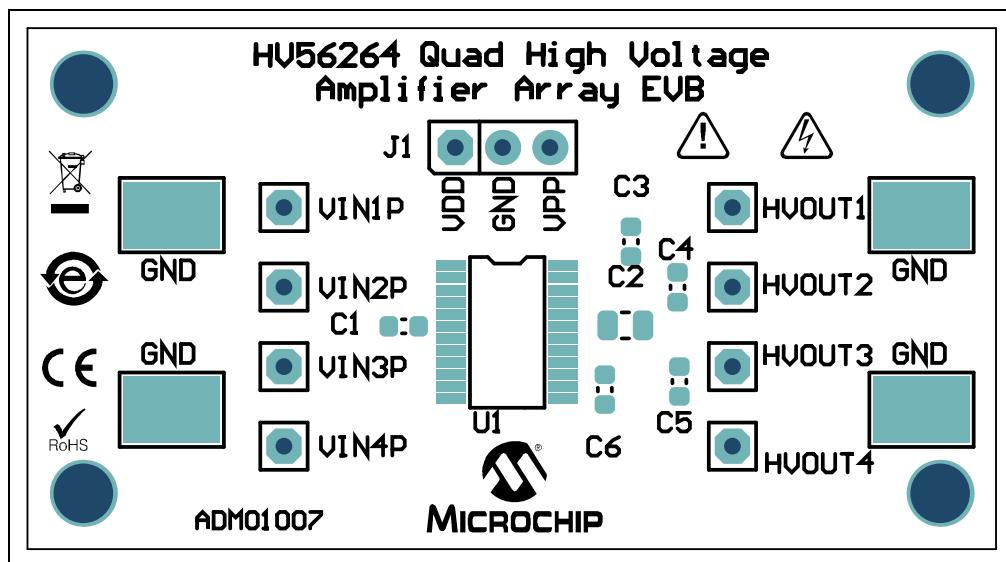
A.4   ADM01007 – TOP COPPER AND SILK
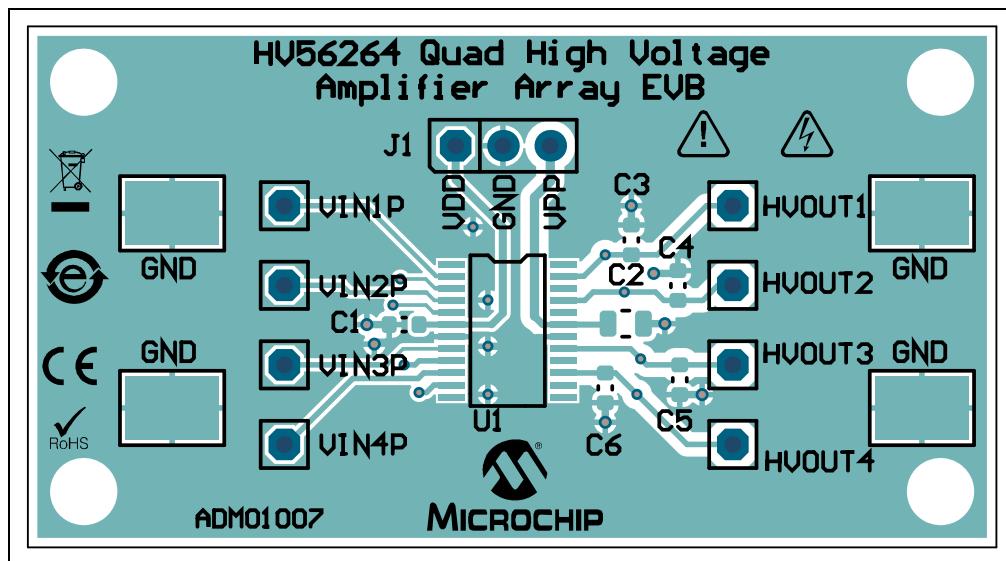
A.5   ADM01007 – TOP COPPER

A.6   ADM01007 – BOTTOM COPPER

04-10905-R1

Schematic and Layouts
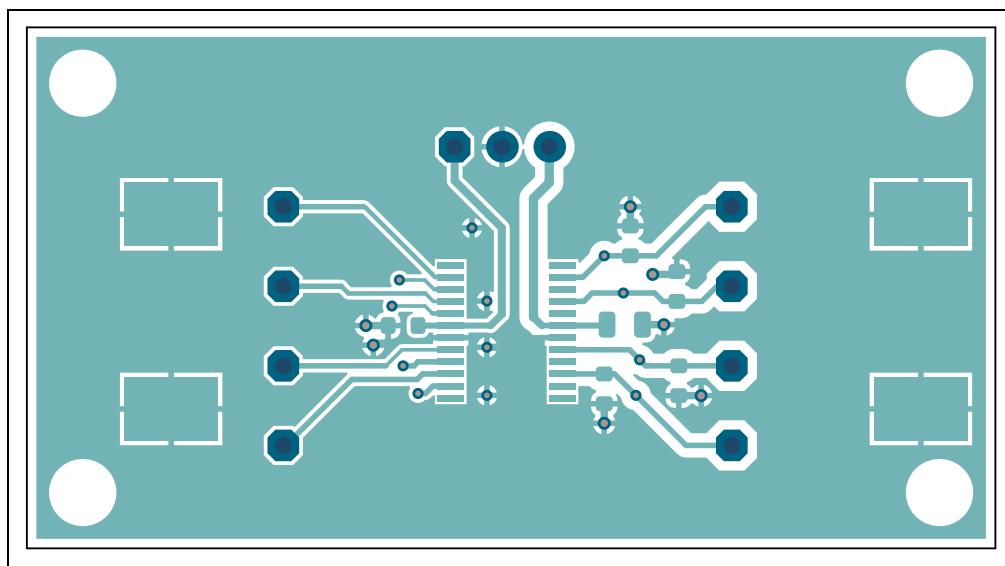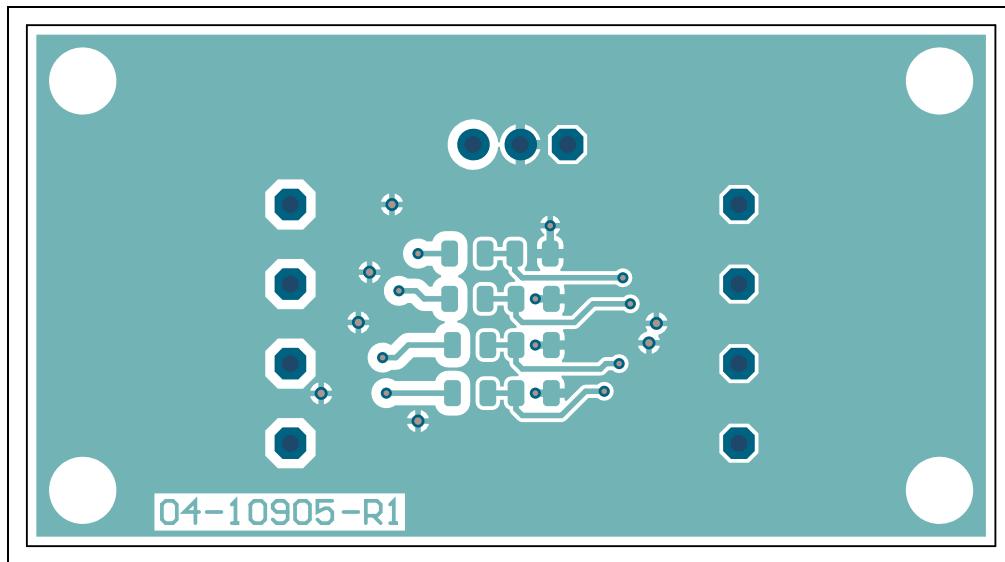
A.7   ADM01007 – BOTTOM COPPER AND SILK
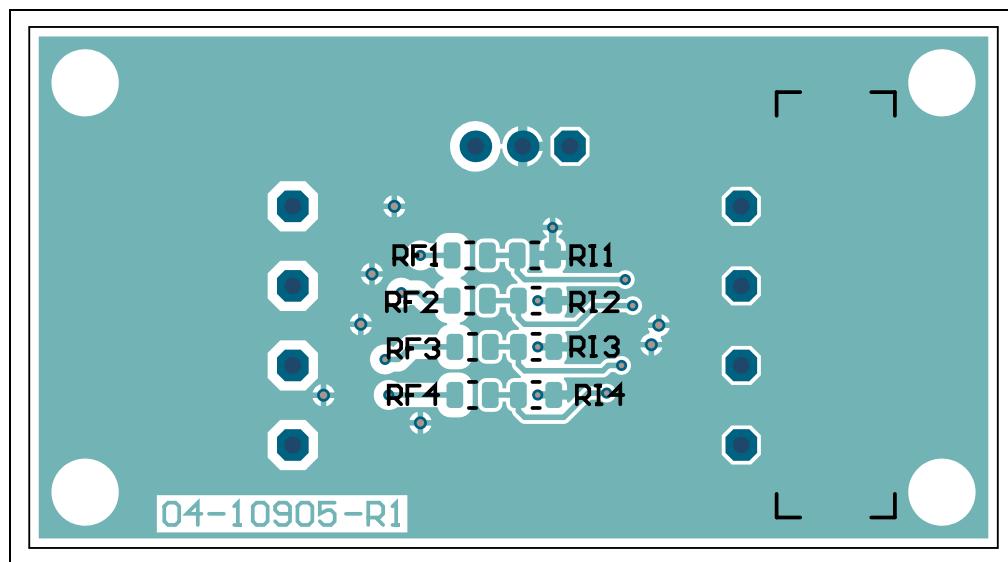
A.8   ADM01007 – BOTTOM SILK
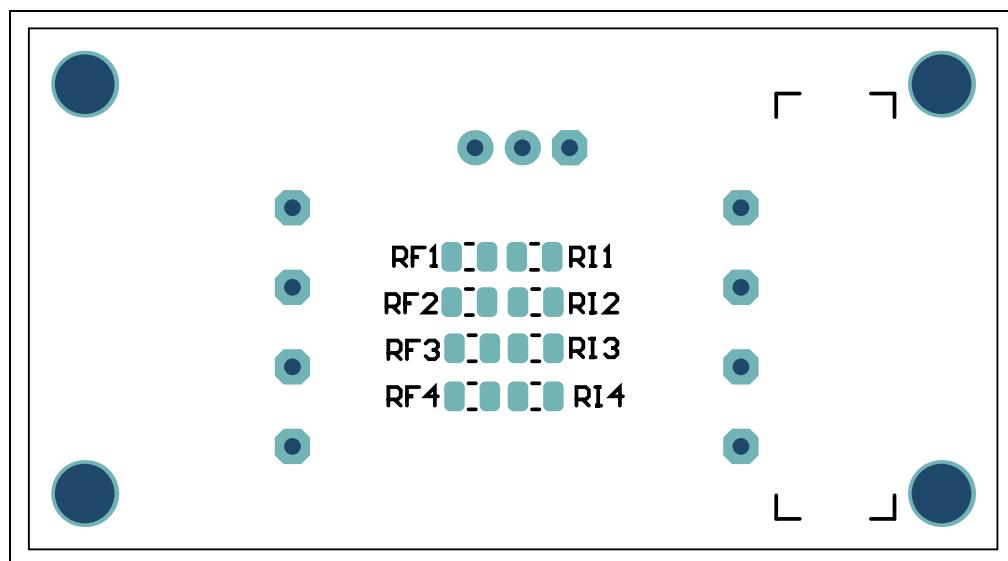
NOTES:

Appendix B. Bill of Materials (BOM)

B.1 HV56264 EVALUATION BOARD – BILL OF MATERIALS (BOM)

TABLE B-1: HV56264 EVALUATION BOARD – BILL OF MATERIALS (BOM)

Qty.	Reference	Description	Manufacturer	Part Number
1	C1	Ceramic Capacitor, 1 µF, 16V, 10%, X7R, Surface Mount, 0603	Yageo Corporation	CC0603KRX7R7BB105
1	C2	Ceramic Capacitor, 0.1 µF, 250V, 10%, X7T, Surface Mount, 0805	TDK Corporation	C2012X7T2E104K125AA
4	C3, C4, C5, C6	Ceramic Capacitor, 15 pF, 250V, 1%, C0G, Surface Mount, 0603	KEMET	CBR06C150FAGAC
4	GND1, GND2, GND3, GND4	Connector, Test Point, Loop, Silver, 3.4x5, Surface Mount	Keystone Electronics Corp.	5016
8	HVOUT1, HVOUT2, HVOUT3, HVOUT4, VIN1P, VIN2P, VIN3P, VIN4P	Connector, Header-2.54, Male, 1x1, Gold, 5.84 MH, Through-Hole, Vertical	TE Connectivity, Ltd., Alcoswitch	5-146868-1
1	J1	Connector Header-2.54, Male, 1x3, Gold, 5.84 MH, Through-Hole, Vertical	Samtec, Inc.	TSW-103-07-G-S
1	PCB1	HV56264 Evaluation Board – Printed Circuit Board	Microchip Technology Inc.	**04-10905-R1**
4	RF1, RF2, RF3, RF4	Resistor, Thick Film, 5.36M, 1%, 1/8W, Surface Mount, 0805, AEC-Q200	Vishay/Dale	CRCW08055M36FKEA
4	RI1, RI2, RI3, RI4	Resistor, Thin Film, 79.6 kΩ, 0.1%, 1/10W, Surface Mount, 0805	KOA Speer Electronics, Inc.	RN732ATTD7962B25
1	U1	Integrated Circuit, Op Amp, HV56264 Quad High-Voltage Amplifier Array, TSSOP-24	Microchip Technology Inc.	**HV56264-E/QE**

NOTES:

Appendix C. Waveforms

This appendix contains the waveform obtained from the HV56264 Evaluation Board by using a low-frequency sine wave.
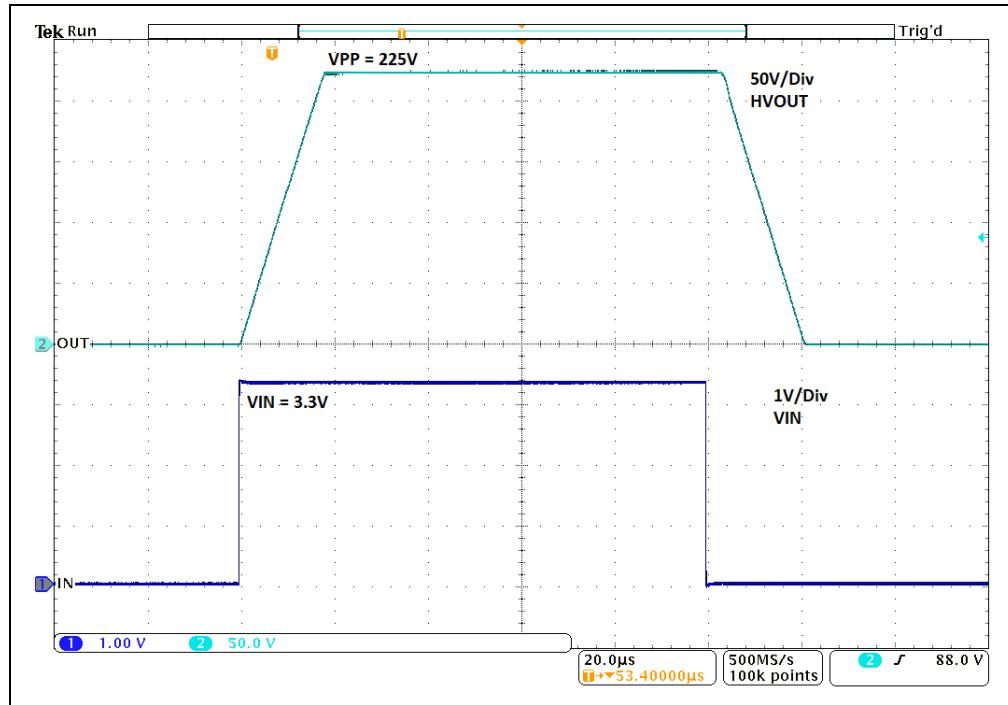
FIGURE C-1:   *HV56264 Evaluation Board – Input Step.*
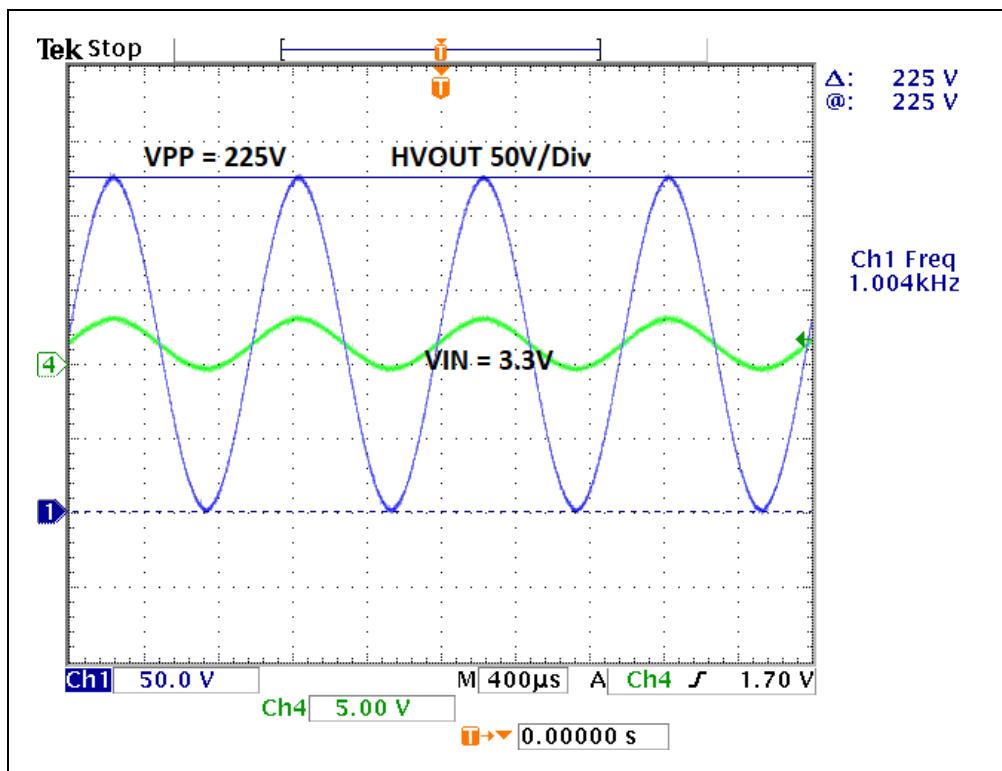
FIGURE C-2:   *HV56264 Evaluation Board – Sine Wave.*

NOTES:

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