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High-Frequency Clock Source Evaluation Board User's Guide

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ISBN: 978-1-5224-0646-4

Object of Declaration: High-Frequency Clock Source Evaluation Board

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Manufacturer: Microchip Technology Inc.
2355 W. Chandler Blvd.
Chandler, Arizona, 85224-6199
USA

This declaration of conformity is issued by the manufacturer.

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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.

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Signed for and on behalf of Microchip Technology Inc. at Chandler, Arizona, USA

Derek Carlson
VP Development Tools

12-Sep-14
Date

Table of Contents

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 High-Frequency Clock Source 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 High-Frequency Clock Source Evaluation Board. The manual layout is as follows:

- **Chapter 1. "Quick Start Instruction"** – Important information about the High-Frequency Clock Source Evaluation Board.
- **Appendix A. "Schematics and Layouts"** – Shows the schematic and layout diagrams.
- **Appendix B. "Bill of Materials (BOM)"** – Lists the parts used to build the High-Frequency Clock Source 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	*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 High-Frequency Clock Source Evaluation Board. Other useful documents are listed below. The following Microchip documents are available and recommended as supplemental reference resources.

- **MXT573ABC200M000 Data Sheet – *"±2.5 ppm Stability 200 MHz LVCMOSTCXO"* (Available using the ClockWorks® Configurator software available on the device product page)**
- **MCP37231-200 Data Sheet – *"200 Msps, 16-/14-Bit Low-Power ADC with 8-Channel MUX"* (DS20005322)**

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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

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 (May 2016)

- Initial Release of this Document.

Chapter 1. Quick Start Instruction

1.1 DESCRIPTION

The High-Frequency Clock Source Evaluation Board is an easy-to-use, high-frequency clock source. It contains a low-noise crystal-oscillator (TCXO, single-ended output). The oscillator requires a 3.3V supply voltage. The output is available at the SMA connector through a bandpass filter (ADM00725) or without the filter (ADM00724).

The evaluation board is initially developed for a clock source of the Microchip Technology's High Speed ADC Evaluation Boards for the MCP37XXX family devices. However, its application can expand into RF and other mixed signal applications as well, where a low noise clock is needed.

Table 1-1 shows the summary of the boards that are currently available from Microchip Technology. Figure 1-1 shows the photos of the boards.

TABLE 1-1: HIGH FREQUENCY CLOCK SOURCE EVALUATION BOARDS (Note 1)

Evaluation Board Part Number	Crystal Oscillator Part Number	Output Frequency	Output Filter	Descriptions
ADM00724	MXT573ABC200M000	200 MHz	Not Included	200 MHz clock source
ADM00725		200 MHz	Included	200 MHz clock source with bandpass filter **(Note 2)**

Note 1: Contact Microchip Technology for the availability of released evaluation boards for other frequency bands.

2: Clock source with a filter (ADM00725) is highly recommended for the applications where lower harmonic distortion is needed.

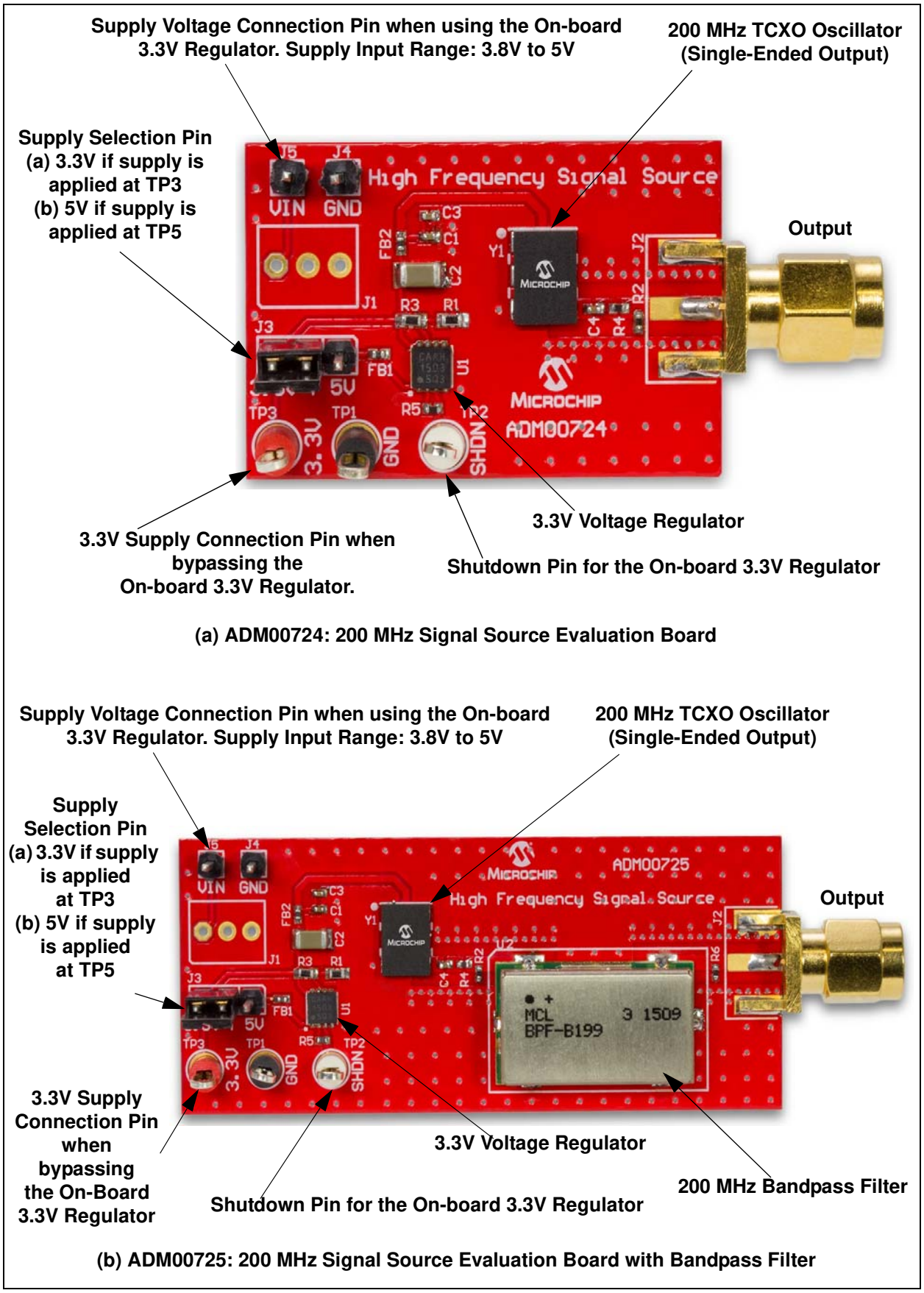


FIGURE 1-1: *High-Frequency Signal Source Evaluation Boards.*

1.2 SUPPLY VOLTAGE SETUP

Figure 1-2 shows the block diagram of the evaluation board.

Applying Supply Voltage

The oscillator requires a 3.3V supply voltage. The board includes a 3.3V regulator. The supply voltage applied to the V_{IN} pin (J5) is connected to the input pin of the regulator. Note that the user can provide an exact 3.3V supply at TP3 instead of using the on-board regulator.

Supply Voltage Option

One of the following two choices can be used.

1. When using on-board 3.3V regulator:
   - Provide 3.8V to 5V supply at J5 pin (Positive) and J4 pin (Negative).
   - Connect J3 Jumper to 5V
2. When providing 3.3V supply without using the on-board 3.3V regulator:
   - Provide 3.3V supply at TP3 (Positive) and GND pin.
   - Connect J3 Jumper to 3.3V

Once the supply voltage is applied, a clean 200 MHz LVCMOS output is available at the SMA connector. The output impedance is controlled for 50Ω.

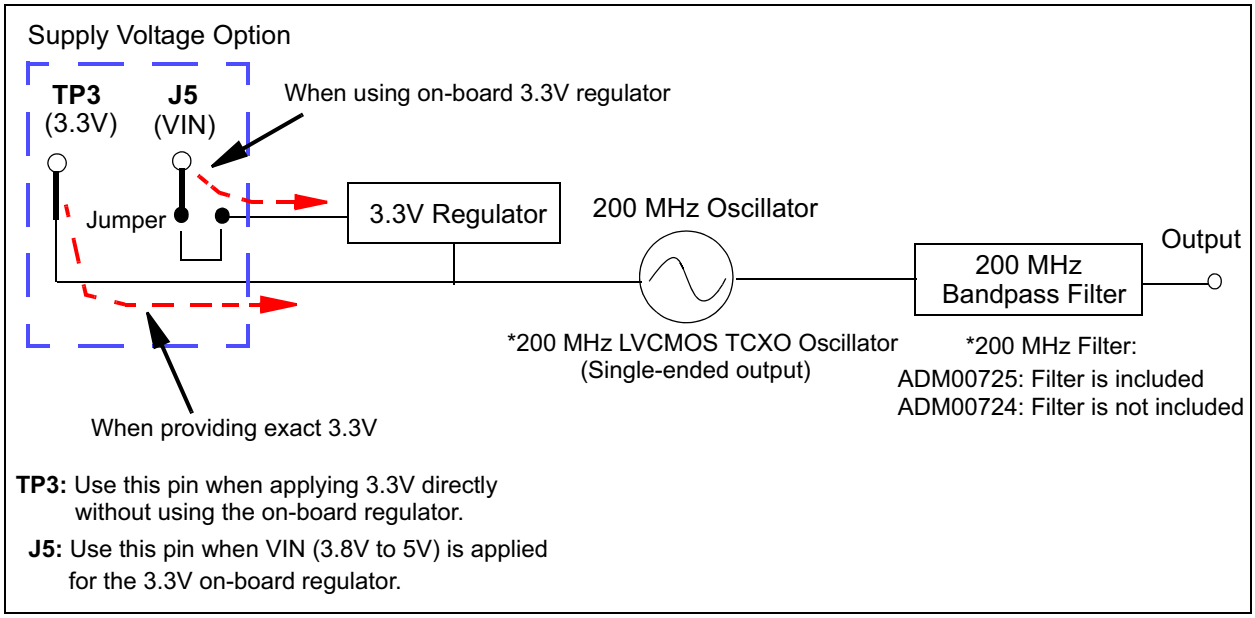


FIGURE 1-2: *Evaluation Board Block Diagram.*

1.3 OSCILLATOR PHASE NOISE

Figure 1-3 shows the oscillator phase noise plots for the ADM00724 and ADM00725.

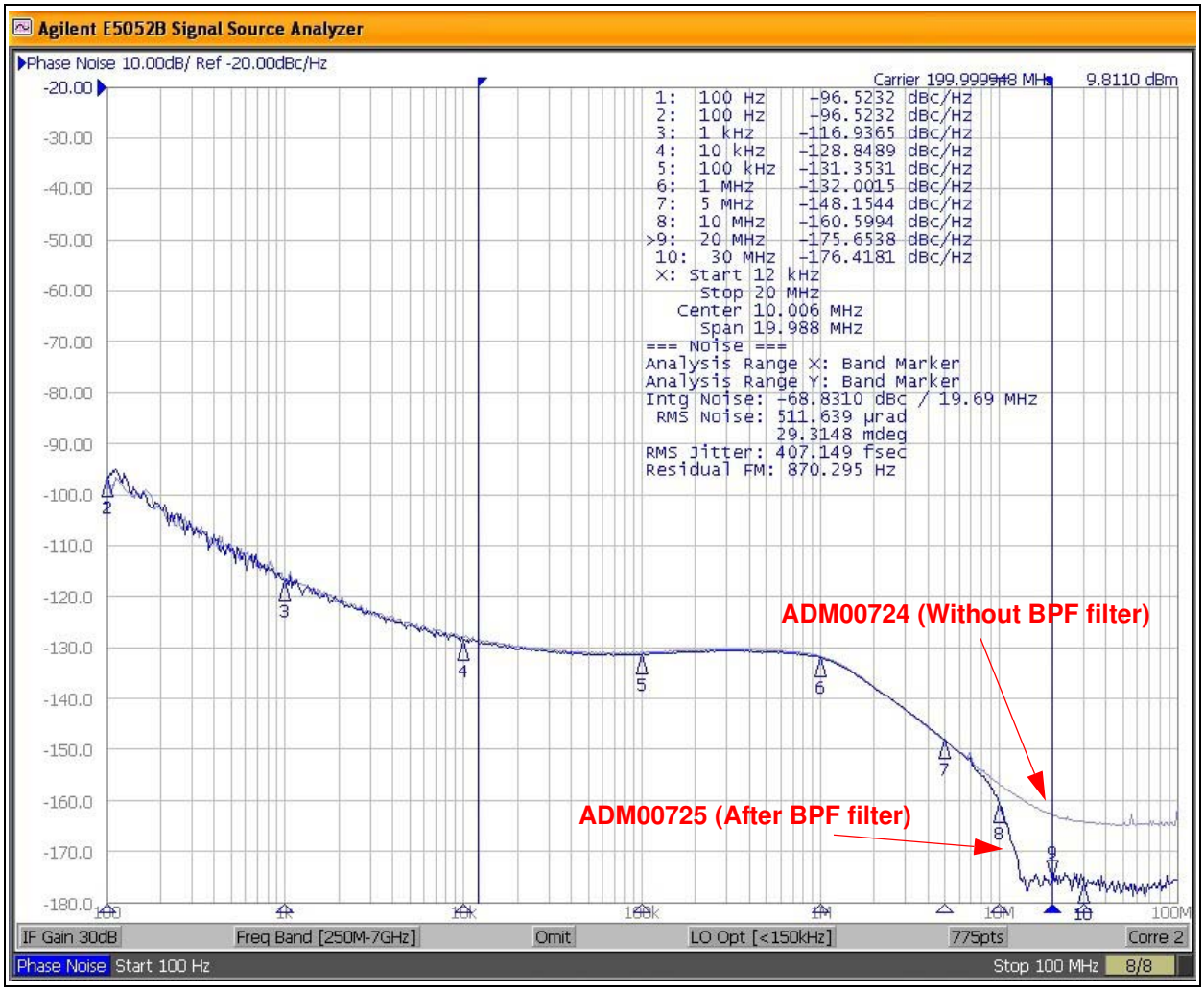


FIGURE 1-3: *Phase Noise Plot.*

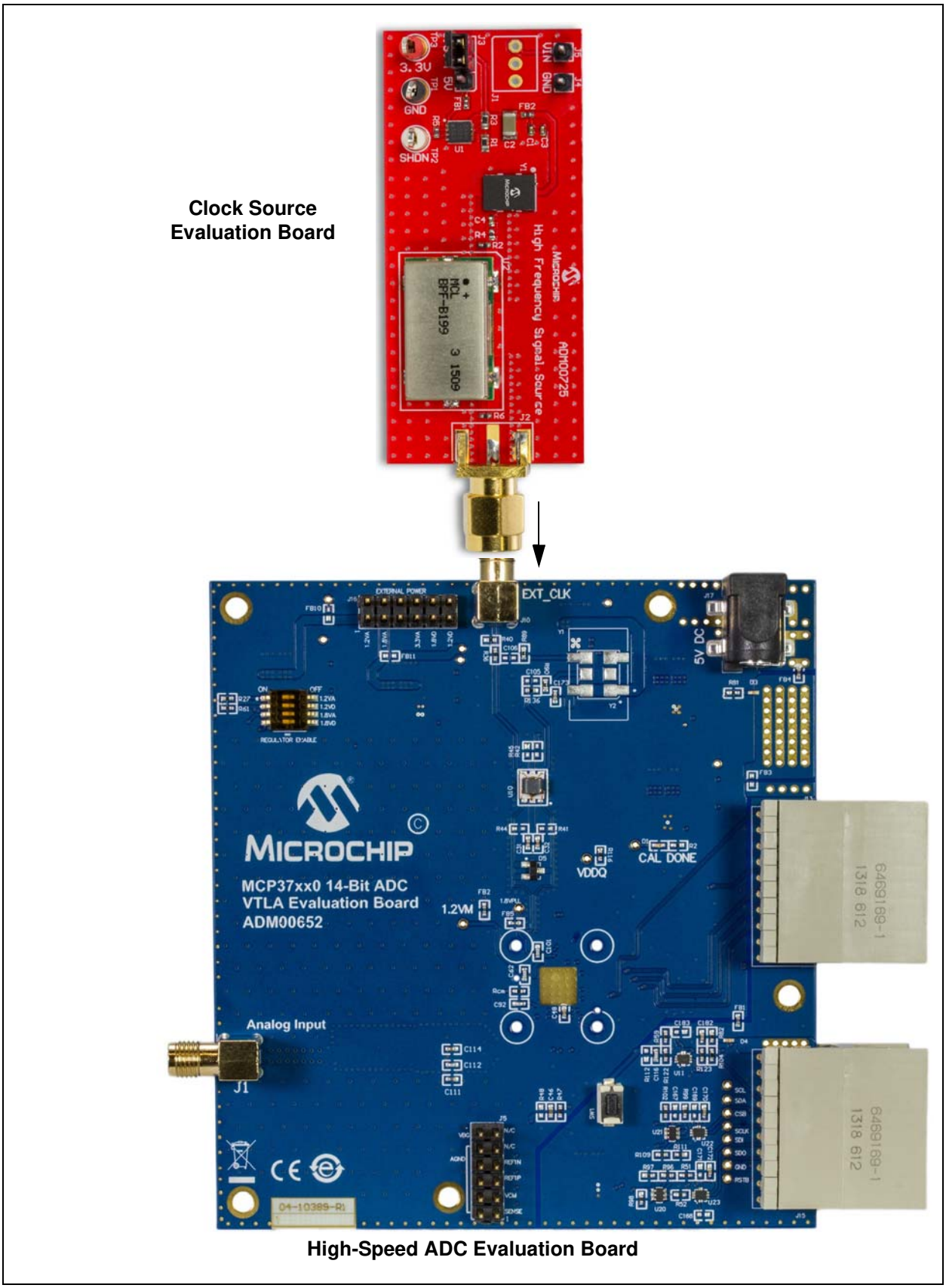


FIGURE 1-4: *Application Example: When the Clock Source Evaluation Board is used with the MCP37XX0 High-Speed ADC Evaluation Board.*

Appendix A. Schematics and Layouts

A.1 INTRODUCTION

This appendix contains the following schematics and layouts for the High-Frequency Clock Source Evaluation Board:

ADM00724

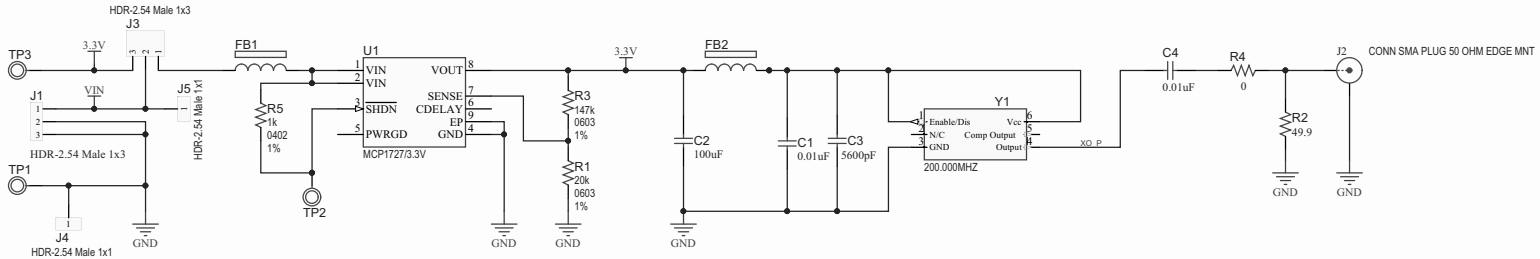
- Board – Schematic
- Board – Top Silk
- Board – Top Copper and Silk
- Board – Top Copper
- Board – Bottom Copper
- Board – Bottom Copper and Silk
- Board – Bottom Silk

ADM00725

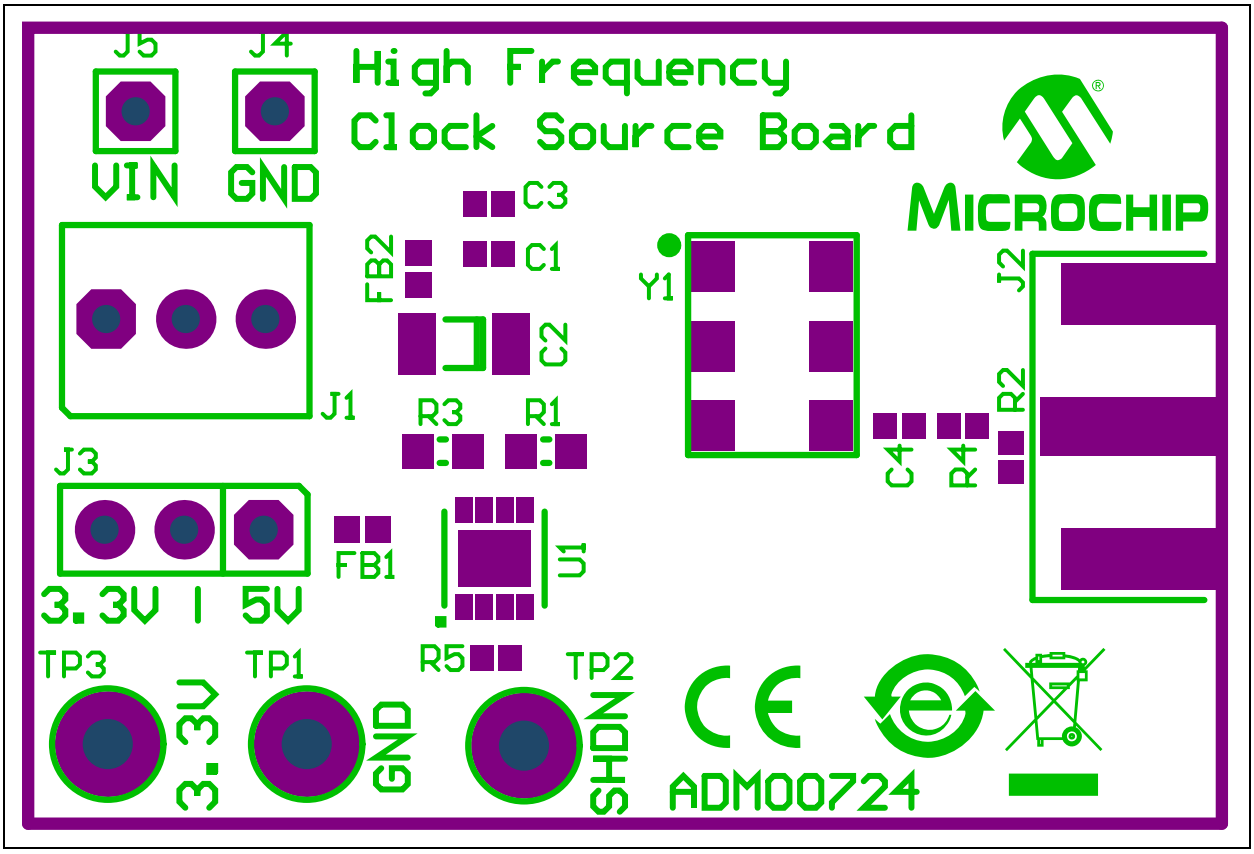
- Board – Schematic
- Board – Top Silk
- Board – Top Copper and Silk
- Board – Top Copper
- Board – Bottom Copper
- Board – Bottom Copper and Silk
- Board – Bottom Silk

A.2 BOARD – SCHEMATIC

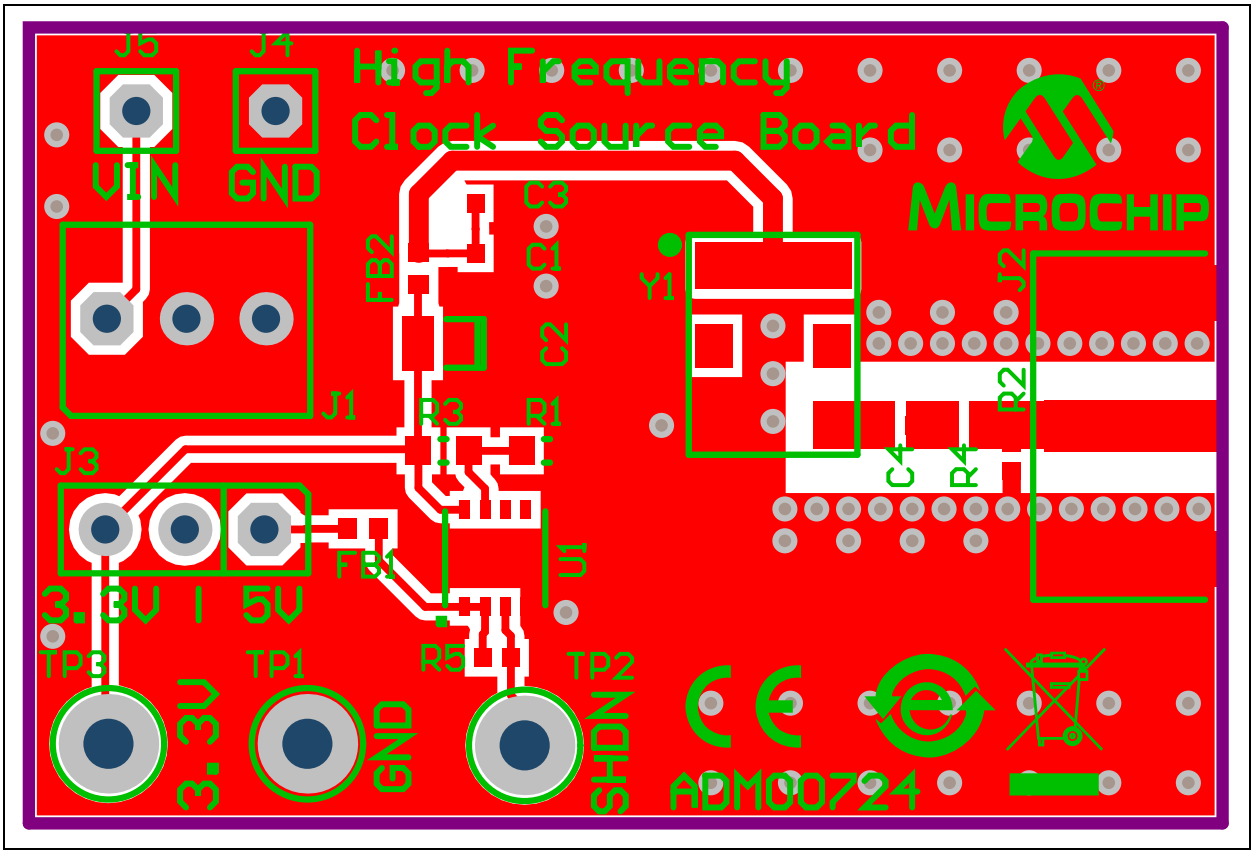
ADM00724



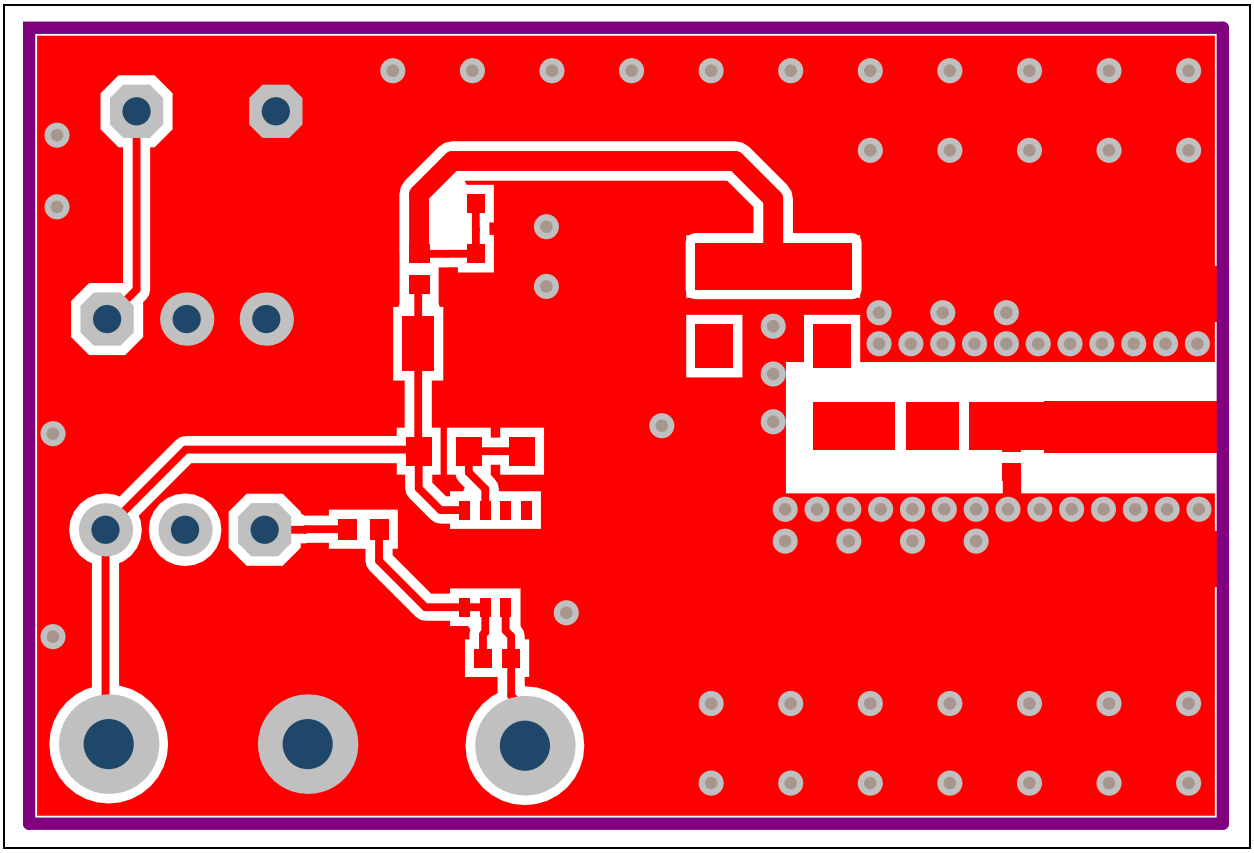
A.3 BOARD – TOP SILK



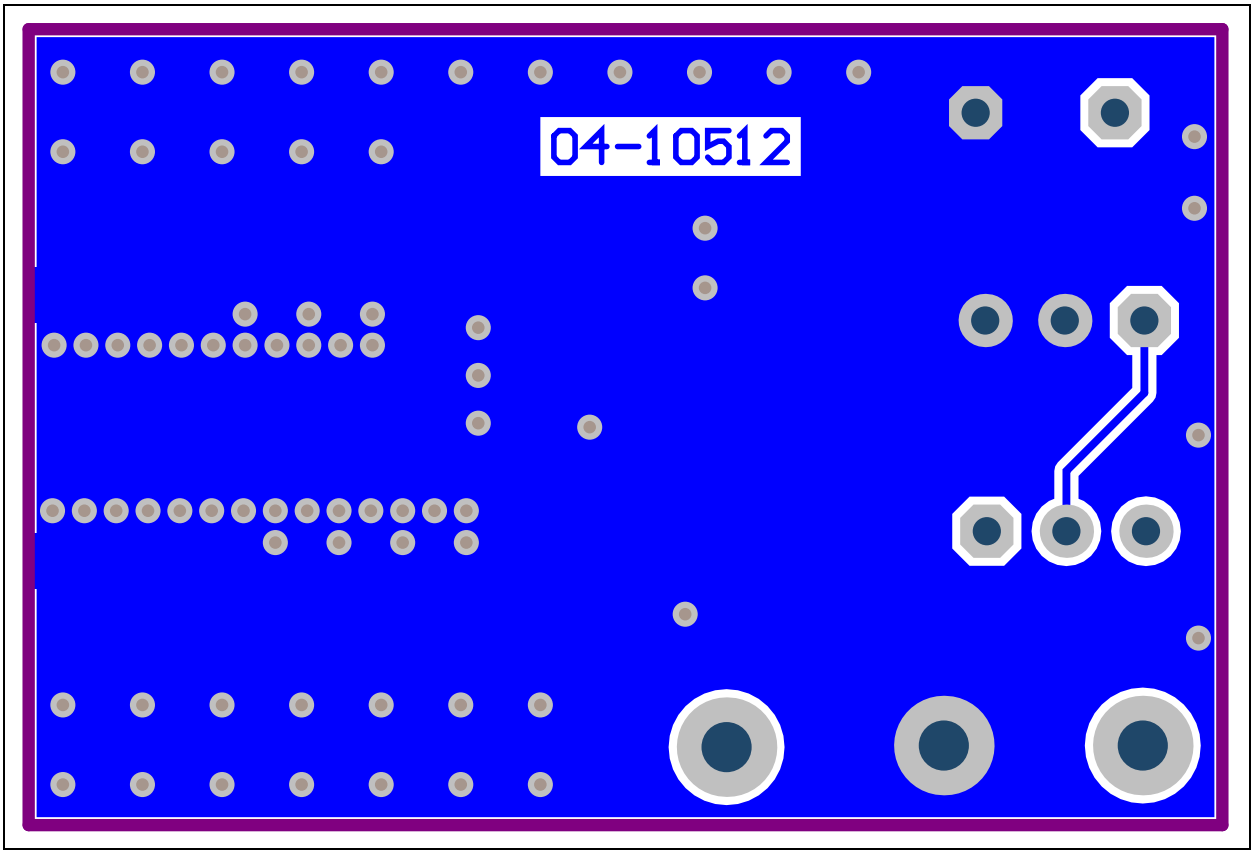
A.4 BOARD – TOP COPPER AND SILK



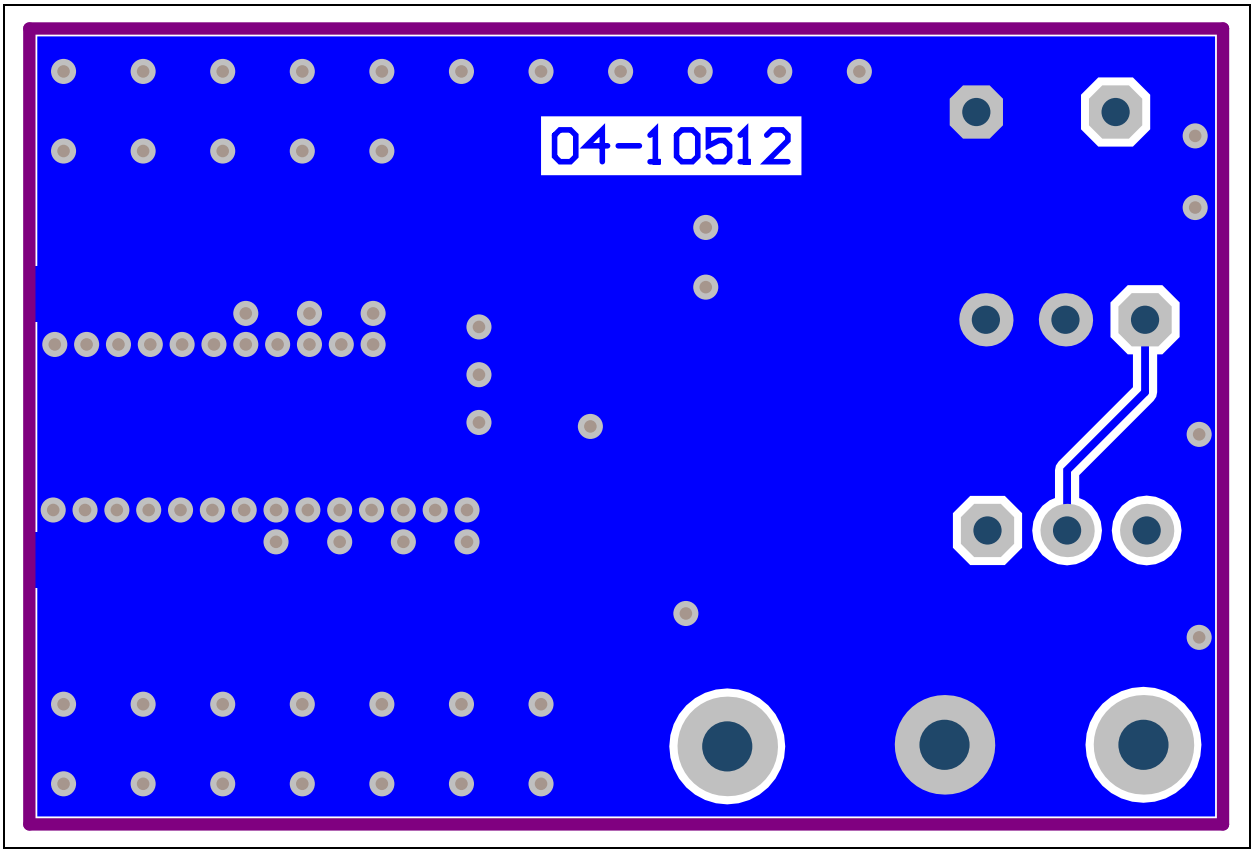
A.5 BOARD – TOP COPPER



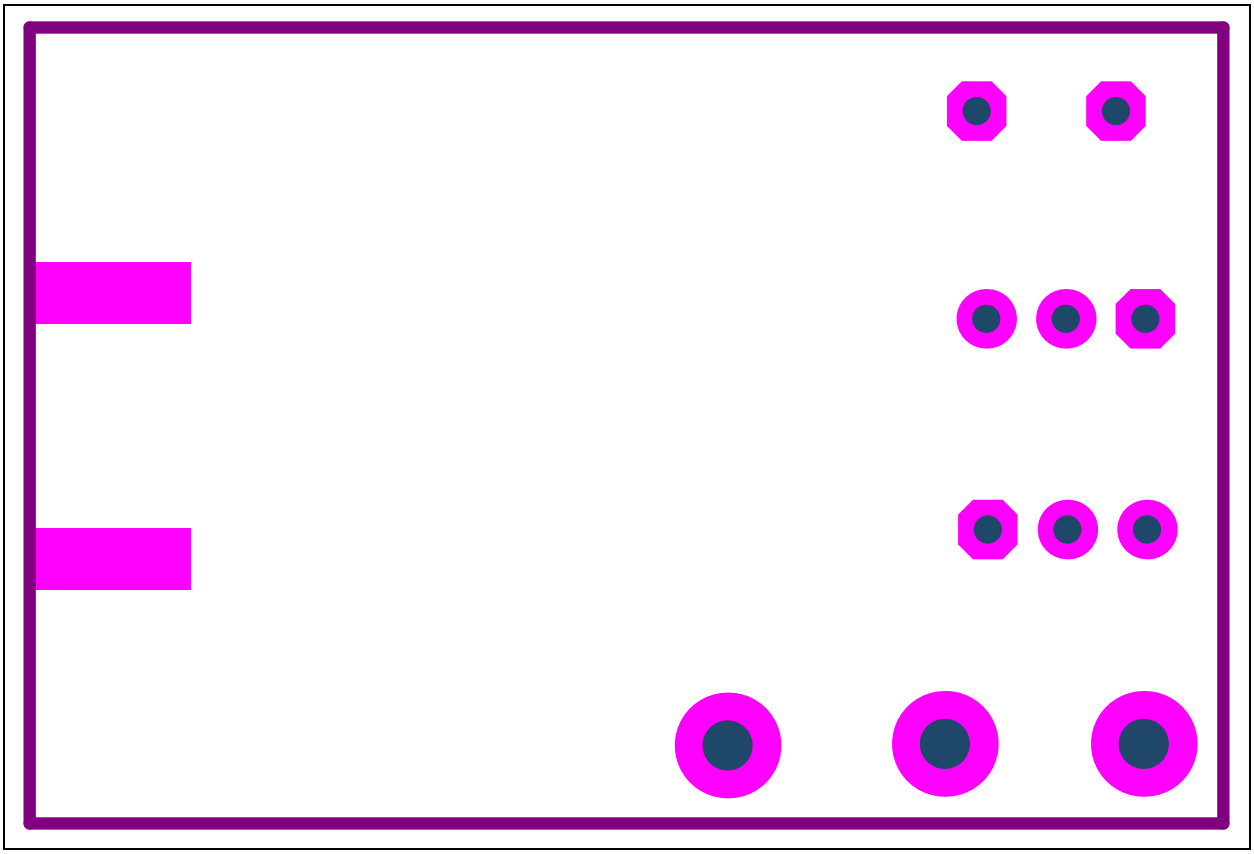
A.6 BOARD – BOTTOM COPPER



A.7 BOARD – BOTTOM COPPER AND SILK

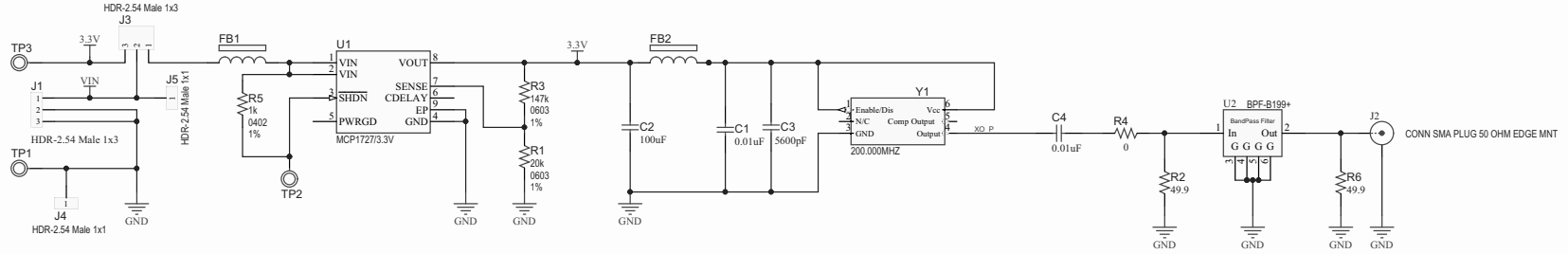


A.8 BOARD – BOTTOM SILK

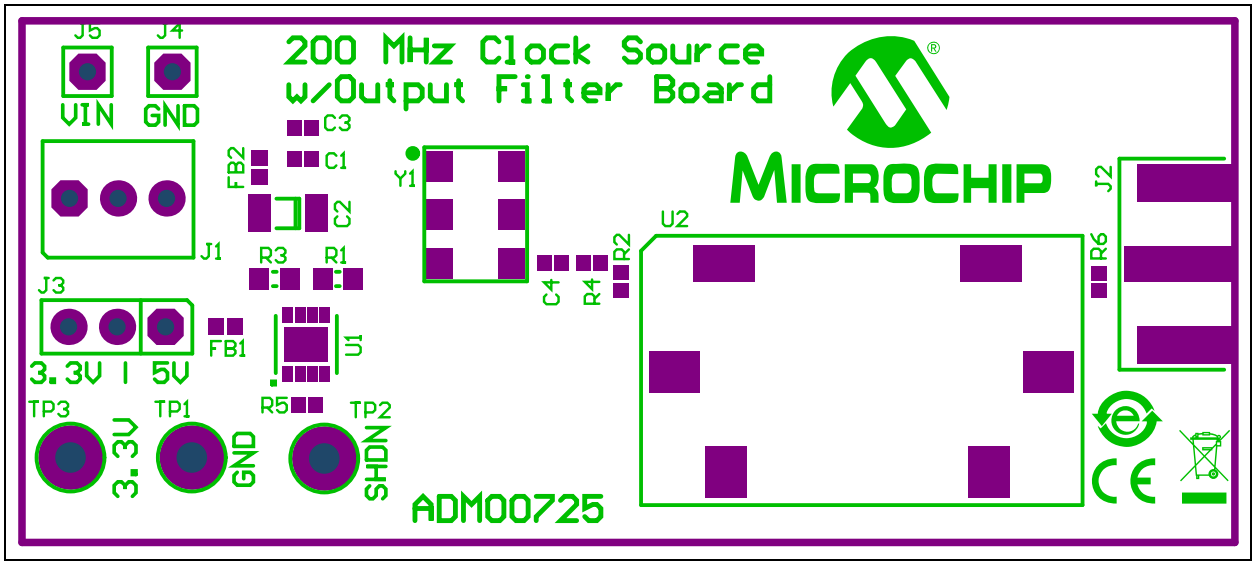


A.9 BOARD – SCHEMATIC

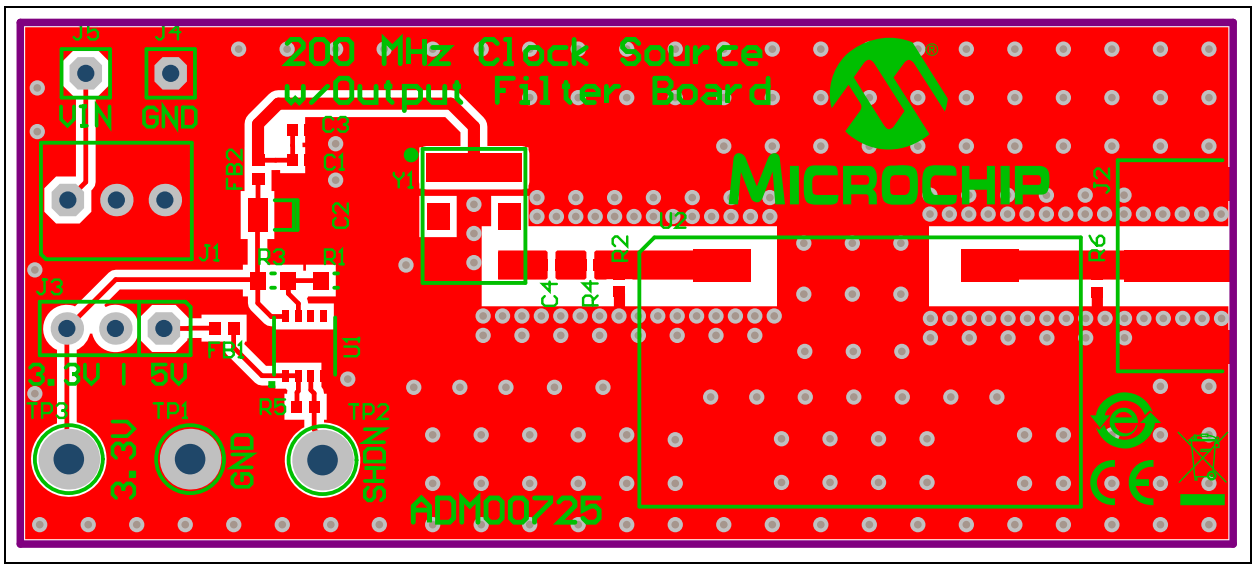
ADM00725



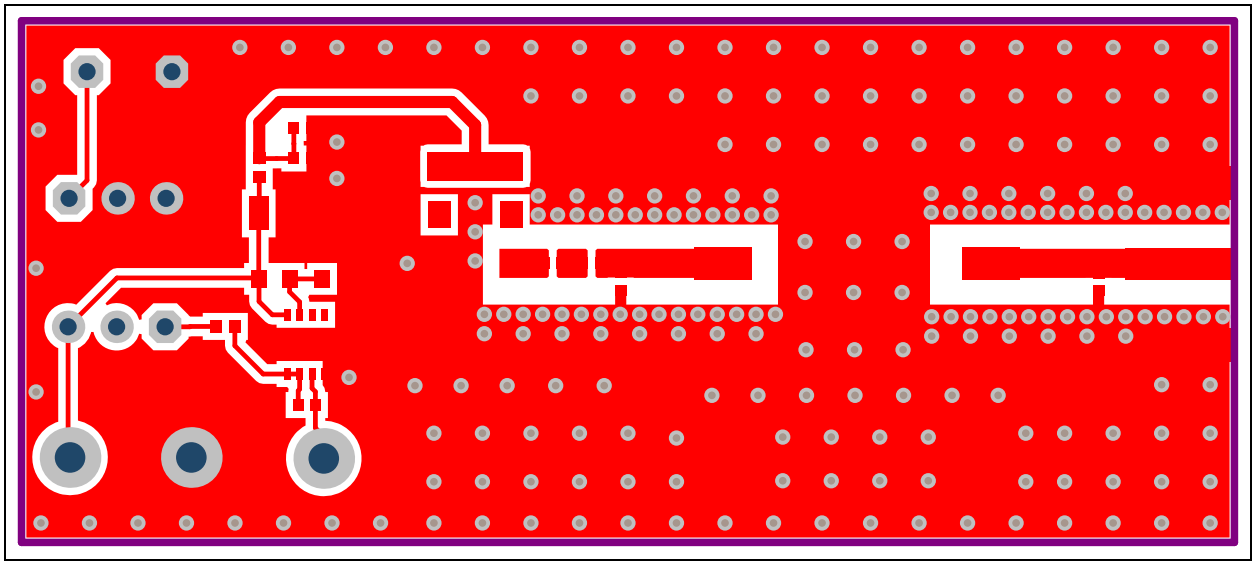
A.10 BOARD – TOP SILK



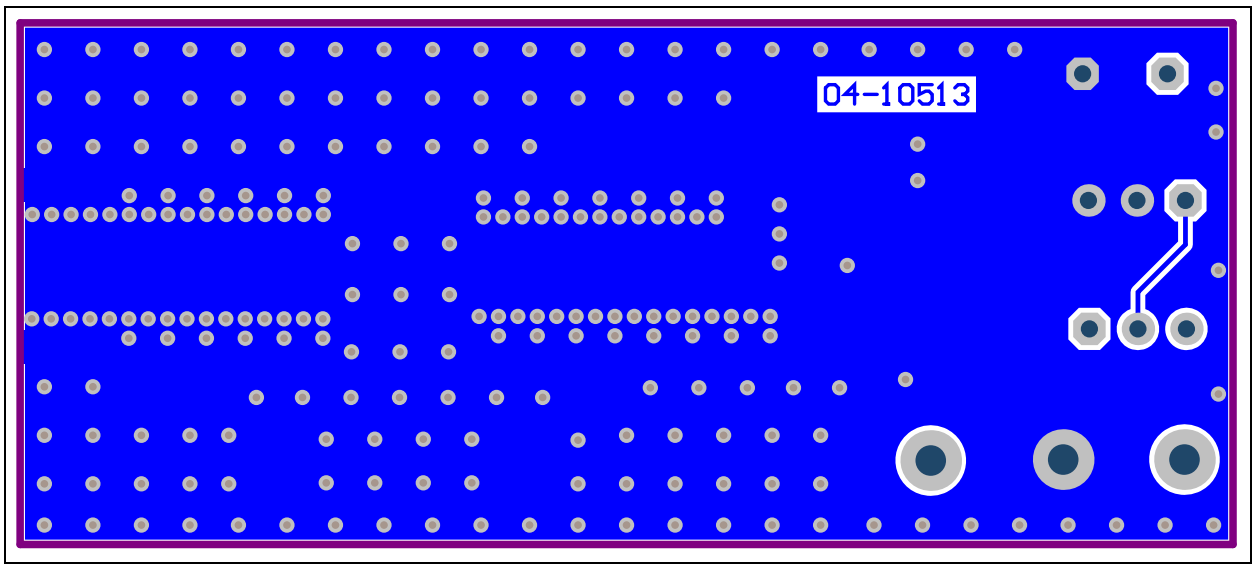
A.11 BOARD – TOP COPPER AND SILK



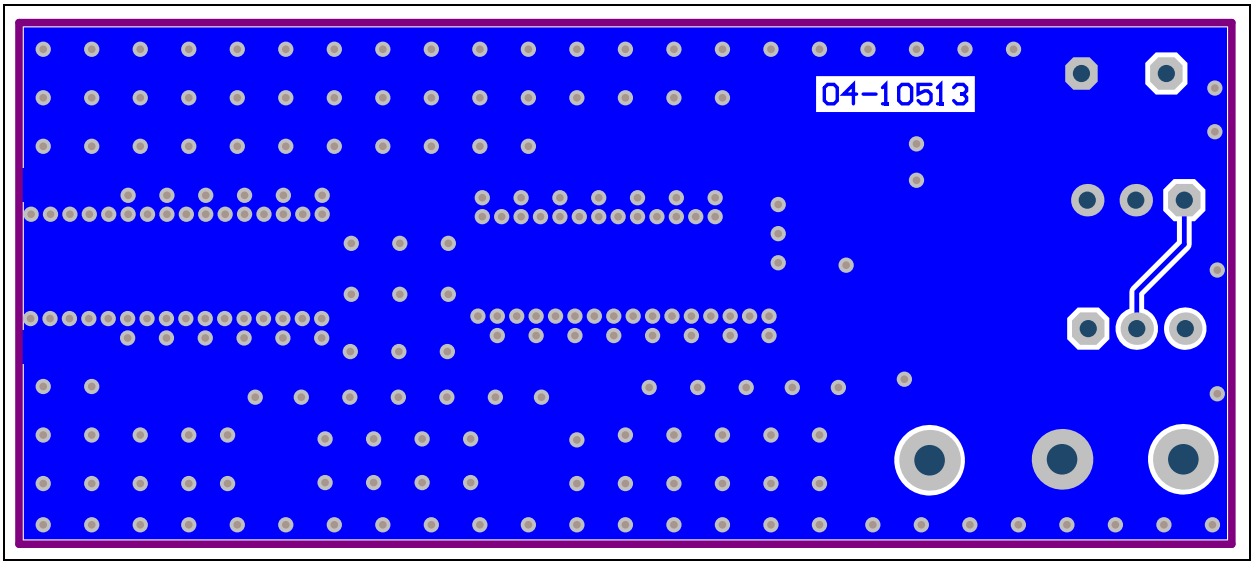
A.12 BOARD – TOP COPPER



A.13 BOARD – BOTTOM COPPER



A.14 BOARD – BOTTOM COPPER AND SILK



A.15 BOARD – BOTTOM SILK

Appendix B. Bill of Materials (BOM)

TABLE B-1: ADM00724 BILL OF MATERIALS (BOM)

Qty.	Reference	Description	Manufacturer	Part Number
2	C1, C4	Capacitor ceramic 0.01 µF 16V 10% X7R SMD 0402	KEMET	C0402C103K4RACTU
1	C2	Capacitor ceramic 100 µF 6.3V 20% X5R SMD 1206	Murata Electronics®	GRM31CR60J107ME39L
1	C3	Capacitor ceramic 5600 PF 50V 10% X7R 0402	Samsung Electro-Mechanics America, Inc.	CL05B562KB5NNNC
2	FB1, FB2	Ferrite Chip 5Ω 300 MA 0402	Murata Electronics	BLM15BA050SN1D
1	J1	Connector Header-2.54 male 1x3 tin lock 7.49 MH TH. vertical	Molex®	0022272031
1	J2	Connector SMA Plug 50Ω Edge mount	Amphenol Commercial	132365-10
1	J3	Connector Header-2.54 male 1x3 tin 5.84 MH TH. vertical	Samtec, Inc.	TSW-103-07-T-S
2	J4, J5	Connector Header-2.54 male 1x1 gold 5.97 MH TH. vert.	Samtec, Inc.	TSW-101-07-L-S
1	PCB	Printed Circuit Board – High-Frequency Clock Source Evaluation Board	Microchip Technology Inc.	04-10512
1	R1	Resistor TKF. 20 kΩ 1% 1/10W SMD 0603	Yageo Corporation	9C06031A2002FKHFT
1	R2	Resistor SMD. 49.9Ω 0.1% 1/16W 0402	Panasonic® – ECG	ERA-2AEB49R9X
1	R3	Resistor TKF. 147 kΩ 1% 1/10W SMD 0603	Panasonic – ECG	ERJ-3EKF1473V
1	R4	Resistor TKF. 0R 1/16W SMD. 0402	Yageo Corporation	RC0402JR-070RL
1	R5	Resistor TKF. 1 kΩ 1% 1/10W SMD. 0402	Panasonic – ECG	ERJ-2RKF1001X
1	TP1	Connector TP loop black TH.	Keystone Electronics Corp.	5011
1	TP2	Connector TP loop white TH.	Keystone Electronics Corp.	5012
1	TP3	Connector TP loop red TH.	Keystone Electronics Corp.	5010
1	U1	Micorchip Analog LDO 3.3V MCP1727T-3302E/MF DFN-8	Microchip Technology Inc.	**MCP1727T-3302E/MF**
1	Y1	±2.5 ppm Stability 200 MHz LVCMOS TCXO	Microchip Technology Inc.	**MXT573ABC200M000**

Note: 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: ADM00725 BILL OF MATERIALS (BOM)

Qty.	Reference	Description	Manufacturer	Part Number
2	C1, C4	Capacitor ceramic 0.01 µF 16V 10% X7R SMD 0402	KEMET	C0402C103K4RACTU
1	C2	Capacitor ceramic 100 µF 6.3V 20% X5R SMD 1206	Murata Electronics®	GRM31CR60J107ME39L
1	C3	Capacitor ceramic 5600 PF 50V 10% X7R 0402	Samsung Electro-Mechanics America, Inc.	CL05B562KB5NNNC
2	FB1, FB2	Ferrite Chip 5Ω 300MA 0402	Murata Electronics	BLM15BA050SN1D
1	J1	Connector Header-2.54 male 1x3 tin lock 7.49 MH TH. vertical	Molex®	0022272031
1	J2	Connector SMA Plug 50Ω Edge mount	Amphenol Commercial	132365-10
1	J3	Connector Header-2.54 male 1x3 tin 5.84 MH TH. vertical	Samtec, Inc.	TSW-103-07-T-S
2	J4, J5	Connector Header-2.54 male 1x1 gold 5.97 MH TH. vertical	Samtec, Inc.	TSW-101-07-L-S
1	PCB	Printed Circuit Board – High-Frequency Clock Source Evaluation Board	Microchip Technology Inc.	04-10513
1	R1	Resistor TKF. 20 kΩ 1% 1/10W SMD 0603	Yageo Corporation	9C06031A2002FKHFT
2	R2, R6	Resistor SMD. 49.9Ω 0.1% 1/16W 0402	Panasonic® – ECG	ERA-2AEB49R9X
1	R3	Resistor TKF. 147 kΩ 1% 1/10W SMD. 0603	Panasonic – ECG	ERJ-3EKF1473V
1	R4	Resistor TKF. 0R 1/16W SMD. 0402	Yageo Corporation	RC0402JR-070RL
1	R5	Resistor TKF. 1 kΩ 1% 1/10W SMD 0402	Panasonic – ECG	ERJ-2RKF1001X
1	TP1	Connector TP loop black TH.	Keystone Electronics Corp.	5011
1	TP2	Connector TP loop white TH.	Keystone Electronics Corp.	5012
1	TP3	Connector TP loop red TH.	Keystone Electronics Corp.	5010
1	U1	Microchip Analog LDO 3.3V MCP1727T-3302E/MF DFN-8	Microchip Technology Inc.	**MCP1727T-3302E/MF**
1	U2	IC Filter Band Pass. 194 TO 204 MHZ HZ1198 SMD	Mini-Circuits®	BPF-B199+
1	Y1	±2.5 ppm Stability 200 MHz LVCMOS TCXO	Microchip Technology Inc.	**MXT573ABC200M000**

Note: 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.

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