

Evaluating the HMC7044B 14 Outputs Jitter Attenuator

FEATURES

- ▶ Self-contained board, including the [HMC7044B](#) dual-loop clock jitter cleaner, loop filters, USB interface, on-board VCXO, and voltage regulators
- ▶ SMA connectors for two reference inputs, six clock outputs, and one VCXO output
- ▶ Windows®-based software allows control of synthesizer functions from a PC
- ▶ Externally powered by 6V

EVALUATION KIT CONTENTS

- ▶ EK1HMC7044BLP10B evaluation board

EQUIPMENT NEEDED

- ▶ Windows-based PC with USB port for evaluation software
- ▶ [EVAL-SDP-CK1Z \(SDP-K1\) controller board](#)
- ▶ Power supply (6V)
- ▶ 50Ω terminators
- ▶ Low noise REF_{IN} source

DOCUMENTS NEEDED

- ▶ HMC7044B data sheet
- ▶ EK1HMC7044BLP10B user guide

SOFTWARE REQUIRED

- ▶ [Analysis | Control | Evaluation \(ACE\)](#) software (version 1.30 or newer)
- ▶ HMC7044B plugin (version 1.2022.47100 or newer)

GENERAL DESCRIPTION

This user guide describes the hardware and software of the HMC7044B evaluation kit. The evaluation board schematic and printed circuit board (PCB) layout artwork can be found on the EK1HMC7044BLP10B product page at www.analog.com.

The HMC7044B meets the requirements of multicarrier GSM and LTE base station designs, and offers a wide range of clock management and distribution features that simplify baseband and radio card clock tree designs. The high performance dual-loop core of the HMC7044B enables the base station designer to attenuate the incoming jitter of a primary system reference clock, such as a CPRI source, using the narrow-band configured first phase-locked loop (PLL), which disciplines an external voltage-controlled crystal oscillator (VCXO), and to generate the low phase noise, high frequency clocks with the wider-band second PLL to drive data converter sample clock inputs.

The EK1HMC7044BLP10B evaluation board is a compact, easy-to-use platform for evaluating all the features of the HMC7044B. A 122.88MHz VCXO is mounted on the evaluation board to provide a complete solution. All inputs and outputs are configured as differential on the evaluation board. Full specifications on the HMC7044B are available in the product data sheet, which must be consulted in conjunction with this user guide when using the evaluation board.

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REVISION HISTORY

9/2025—Revision 0: Initial Version

EK1HMC7044BLP10B EVALUATION BOARD PHOTOGRAPH

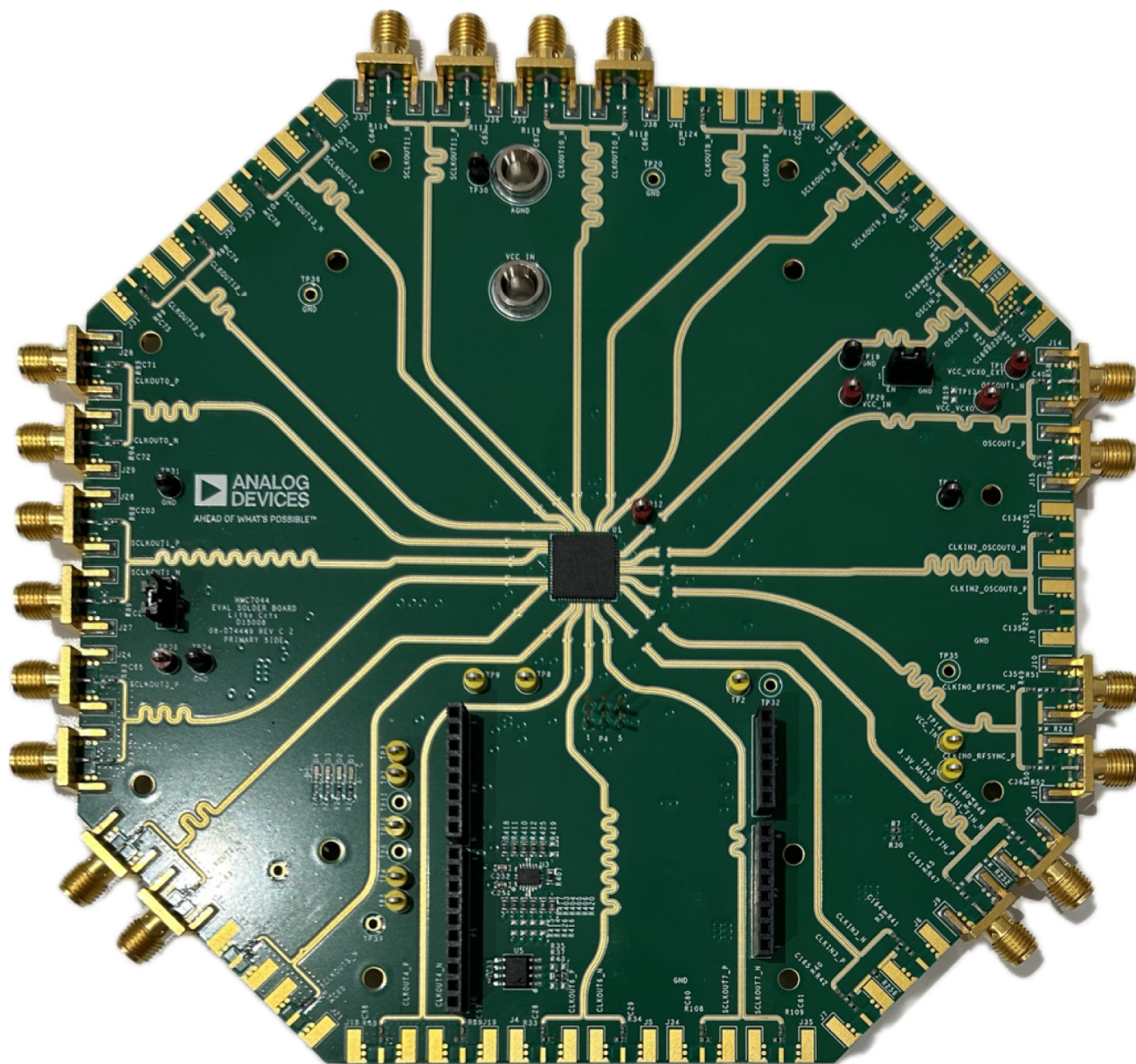


Figure 1. EK1HMC7044BLP10B Evaluation Board Photograph

GETTING STARTED

SOFTWARE INSTALLATION PROCEDURES

To install the [ACE](#) software and [HMC7044B](#) plugin, perform the following steps:

1. Install the latest version of the ACE software platform.
2. If the HMC7044B plugin appears automatically, proceed to Step 4.
3. Double click the HMC7044B plugin file, **Board.HMC7044_SDP.1.2023.47100.acezip**.
4. Check that the HMC7044B plugin appears when the EK1HMC7044BLP10B board is attached to the PC through the system demonstration platform (SDP) connector.

EVALUATION BOARD SETUP PROCEDURES

The EK1HMC7044BLP10B board uses a single 6V power supply with VCC_IN and AGND banana plugs by default. On-board low-noise, low-dropout (LDO) regulators generate nominal 3.3V and 5V supplies.

Details of the power supply circuitry are given in the [Power Supplies](#) section.

To power up the board, perform the following steps:

1. Set the power supply voltage as 6V and the current limit as 2A.
2. Connect power cables to VCC_IN and AGND (two banana cables).
3. Turn on the power.

To run the software, perform the following steps:

1. Select **Start > All Programs > Analog Devices > ACE**.
2. On the **Select Device and Connection** tab, choose **HMC7044B** and the **HMC7044B board** appears under attached hardware.
3. When connecting the EK1HMC7044BLP10B board, allow 5 sec to 10 sec for the label on the status bar to change.

EVALUATION BOARD HARDWARE

The EK1HMC7044BLP10B requires the SDP-K1 platform that uses the [EVAL-SDP-CK1Z](#).

The EK1HMC7044BLP10B schematic and artwork are shown in [Figure 9](#) to [Figure 20](#).

POWER SUPPLIES

The EK1HMC7044BLP10B board is powered by a 6V power supply connected to the banana plug, VCC_IN, and GND to the banana plug, AGND.

The power supply circuitry has an [LT8622S/LT8624S](#), step-down silent switcher 3 with ultra-low noise reference.

One LT8622S is used to generate all the supplies for the [HMC7044B](#), except VCC_VCO. The [LT3045](#), low-noise, LDO regulator on board, provides a clean supply to the on-board 122.88MHz VCXO and internal VCO of the [HMC7044B](#).

SETTING UP THE SIGNAL CONNECTIONS

After setting up the power and PC connections, use the following procedure to set up signal connections:

1. Connect a signal generator to the CLKIN0_RFSYNC_P SMA Connector J11. By default, the reference inputs on the evaluation board are AC-coupled. Terminate the CLKIN0_RFSYNC_N SMA Connector J10 with a 50 Ω termination. An amplitude setting of 6dBm from the signal generator is sufficient.
2. Connect an oscilloscope, spectrum analyzer, or other lab equipment to any output of the CLKOUTx_P or CLKOUTx_N SMA connectors. Place a 50 Ω termination on all unused differential output pairs.

BYPASSING THE 6V SUPPLY AND THE LT8622S

The evaluation board contains one on-board S, step-down silent switcher 3 with ultra-low noise reference, and two LTC3045 devices, LDO regulators to regulate the 6V to 3.3V supply domain. The evaluation board can be configured to bypass the silent switcher and the LDOs, which is useful for increasing the HMC7044B power consumption efficiency. The evaluation board schematics are provided in the [Evaluation Board Schematics and Artwork](#) section. Bypass the 6V silent switcher for the HMC7044B as follows:

1. Remove the on-board LT8622S (U2).
2. Remove R8 and L1.
3. Remove R100 and R101.
4. Install R360 and R364.

Connect a bench 3.3V power supply to each of the supply pins on the 3.3V main header (TP15). Note that it is very important to not have the 6V supply connected to the TP15 of the evaluation board.

EVALUATION BOARD HARDWARE

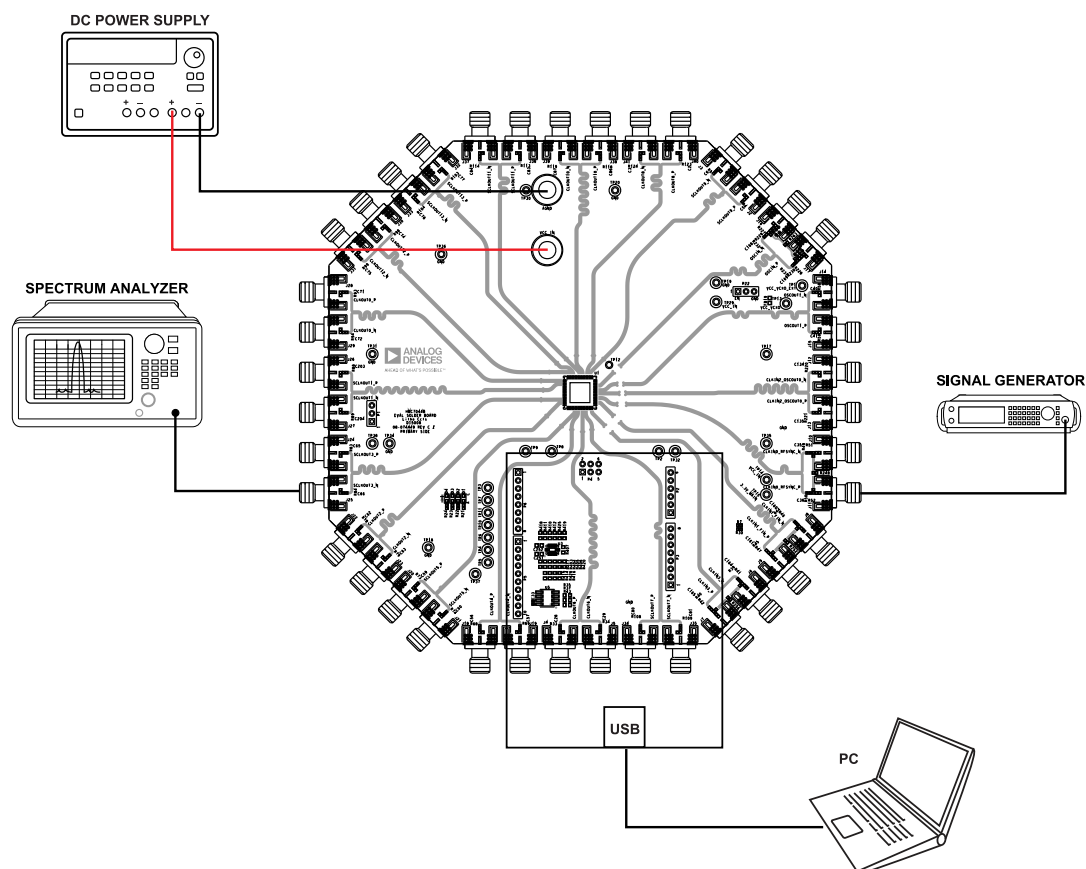


Figure 2. Evaluation Board Setup Diagram

EVALUATION BOARD SOFTWARE

The [ACE](#) software is the main platform that is used to control the EK1HMC7044BLP10B. The [HMC7044](#) plugin includes user interfaces that relate to the [HMC7044B](#) and allow evaluation of the device. Use the following steps to open the main control window for the HMC7044B:

- 1. Launch the ACE application. With the [SDP-K1](#) board connected to the EK1HMC7044BLP10B, the attached hardware appears in the graphical user interface (GUI) as shown in [Figure 3](#).

- 2. Double click the **HMC7044 Board** icon and the tab shown in [Figure 4](#) appears.
- 3. Double click the **HMC7044** icon that appears on the board GUI to open the main control window shown in [Figure 5](#).

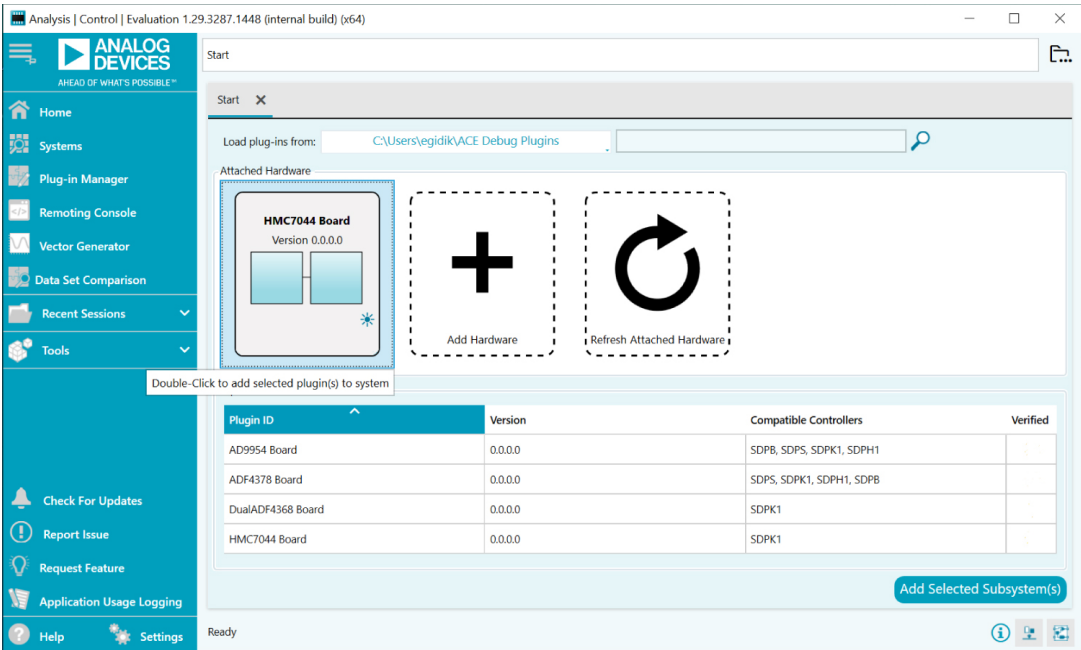


Figure 3. ACE Start Page, Attached Hardware (HMC7044B Evaluation Board)

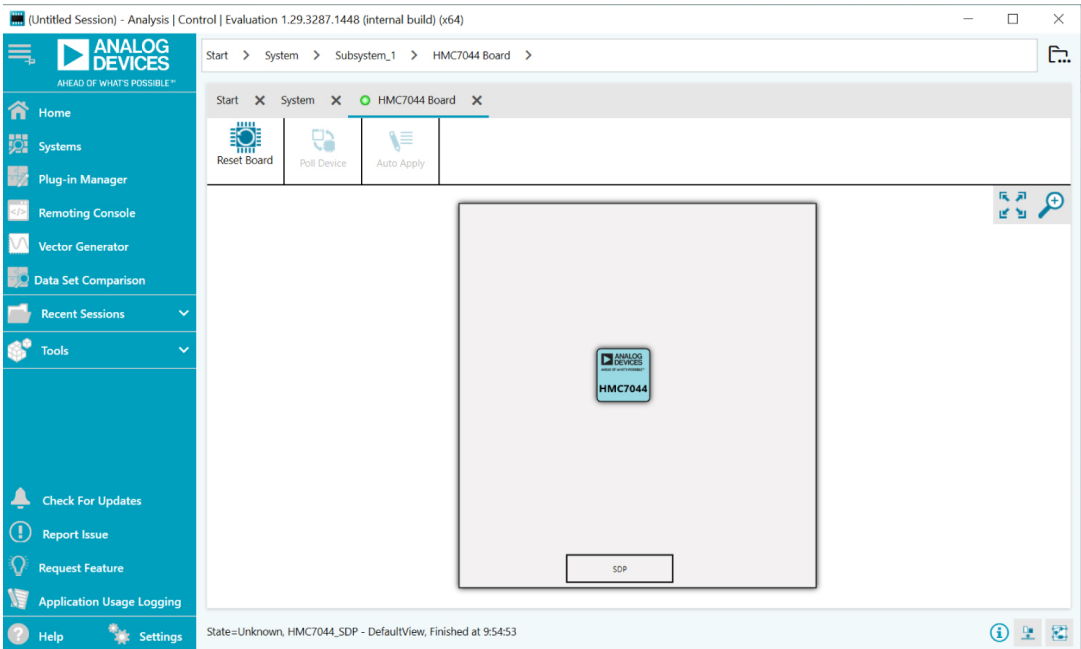


Figure 4. ACE Board Page, Device Selection

EVALUATION BOARD SOFTWARE

MAIN CONTROLS

The main controls are available in the high-level register map shown in [Figure 5](#). To modify registers, perform the following steps:

1. **ACE** plugin is opened with preconfigured register values for jitter cleaner application. Click **Apply Changes** to upload suggested register settings for initialization.
2. Modify the registers as required.
3. Click **Apply Changes** to load modified settings to the device. This action loads the updated registers only.
4. Some of the internal frequencies can be calculated depending on the user input. Therefore, other changes are expected when the user interact with certain fields.
5. **Restart**, **Slip**, **Reseed**, **Pulsor**, and **Sleep** requests can be triggered by the buttons at the bottom part shown in [Figure 5](#).
6. Click **Memory Map Side-By-Side** and **Export** to save the specific register configuration. It exports the register values to a CSV file.

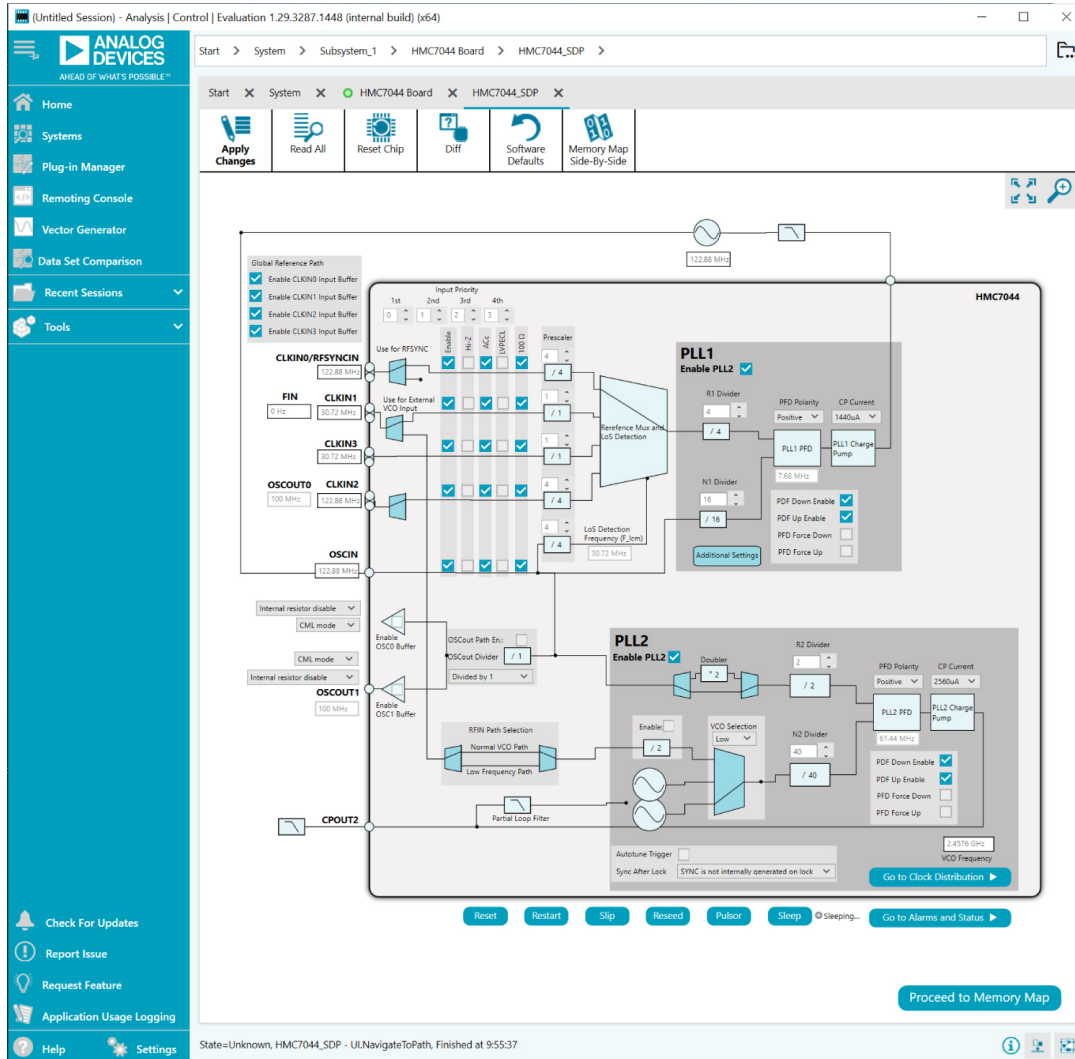


Figure 5. Main Page

005

EVALUATION BOARD SOFTWARE

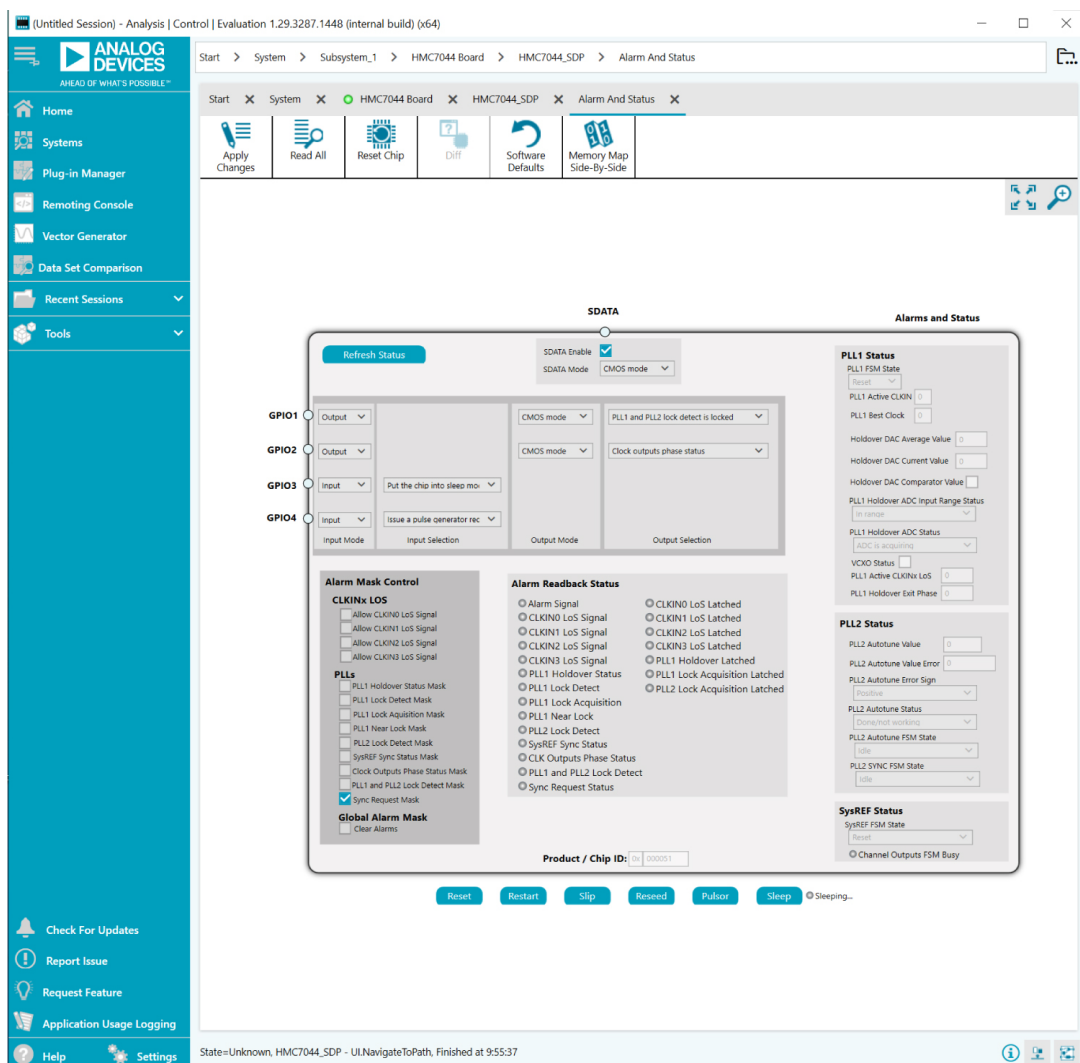


Figure 6. Alarms, General-Purpose Input/Output (GPIO), and Status Page

EVALUATION BOARD SOFTWARE

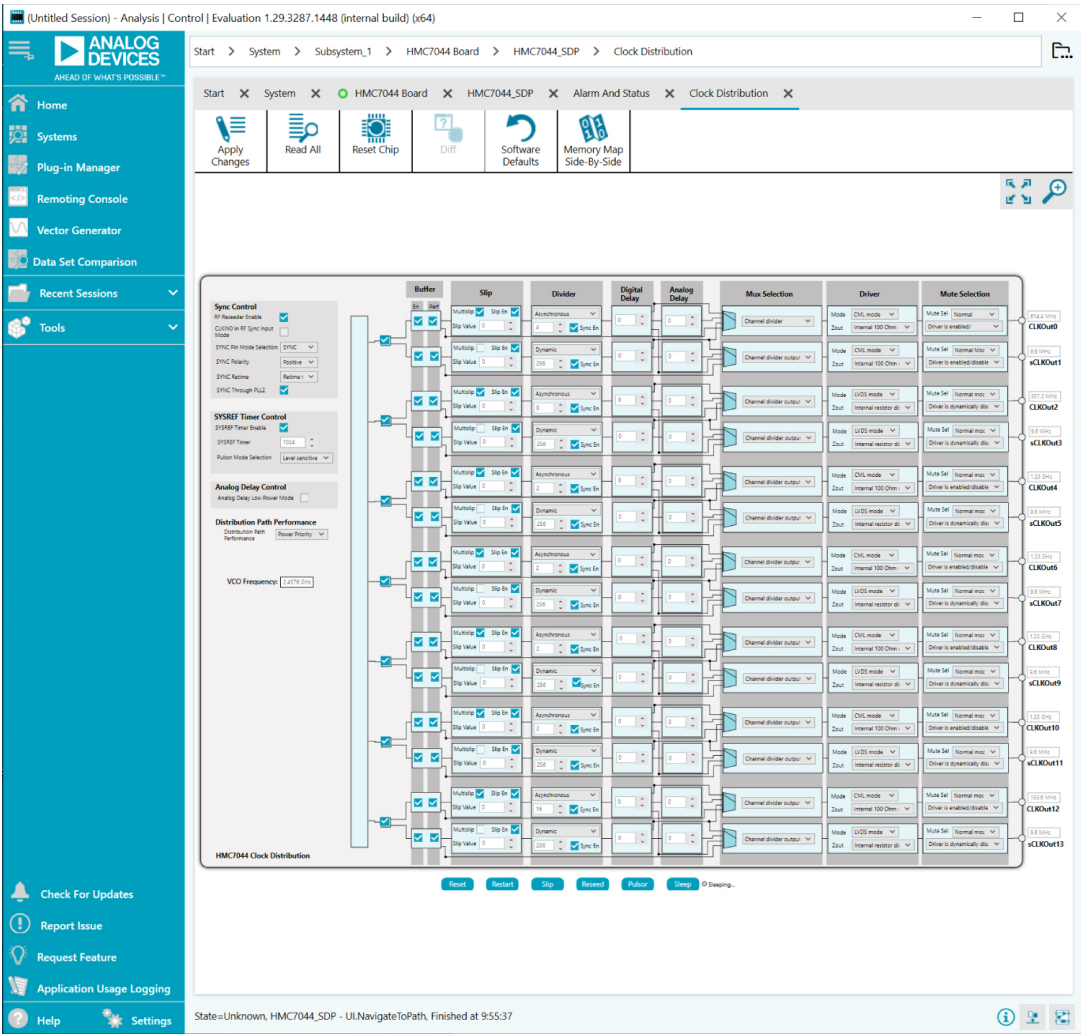


Figure 7. Clock Distribution Page

EVALUATION AND TEST

To evaluate and test the performance of the HMC7044B, proceed with the following steps:

- 1. Prepare the hardware and software setup as explained in the Evaluation Board Hardware section and the Evaluation Board Software section.
- 2. Run the software and follow the steps given in the Evaluation Board Software section to open the main page as shown in Figure 5.

- 3. Click **Apply Changes**, which provides a 10GHz clock at CLKOUT0P/CLKOUT0N output.
- 4. Measure the output spectrum and single sideband phase noise on a spectrum analyzer.

Figure 8 shows a phase noise plot of the SMA CLKOUT0P output equal to 2703.36MHz.

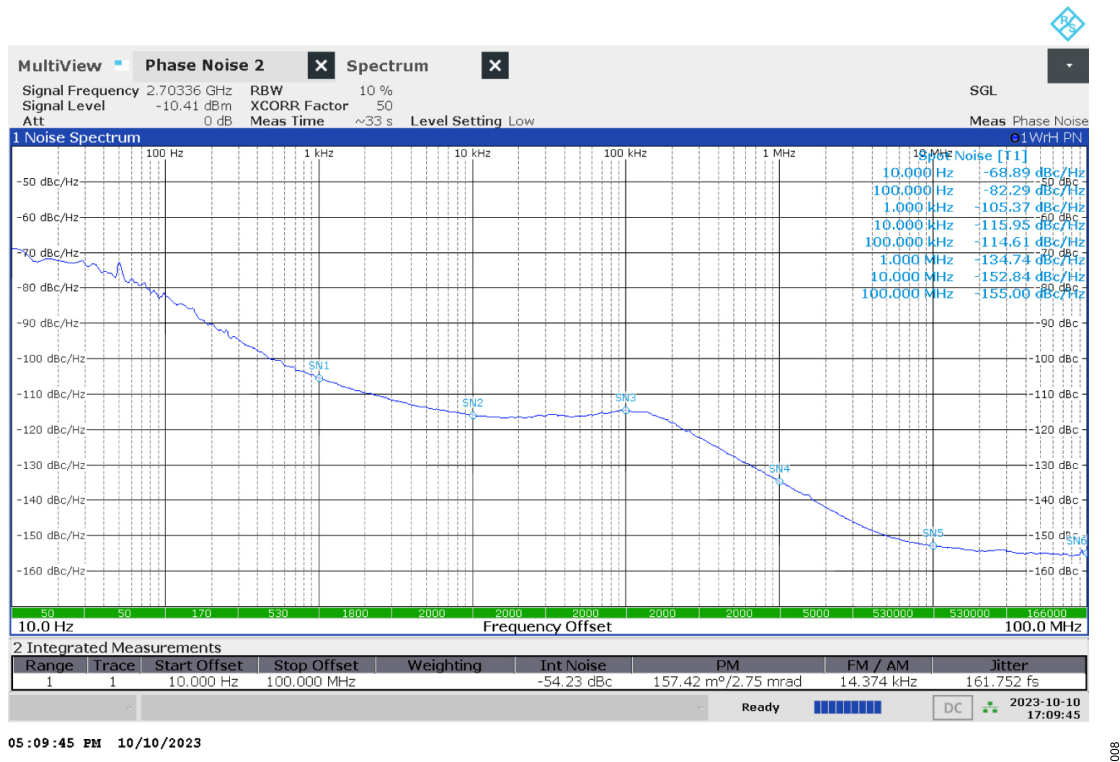


Figure 8. Single Sideband Phase Noise of 2.7GHz Output with On-Board 122.88MHz VCXO

600

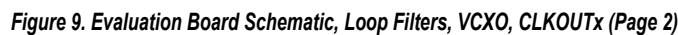


Figure 10. Evaluation Board Schematic, LDO, Power Distribution, (Page 3)

EVALUATION BOARD SCHEMATICS AND ARTWORK

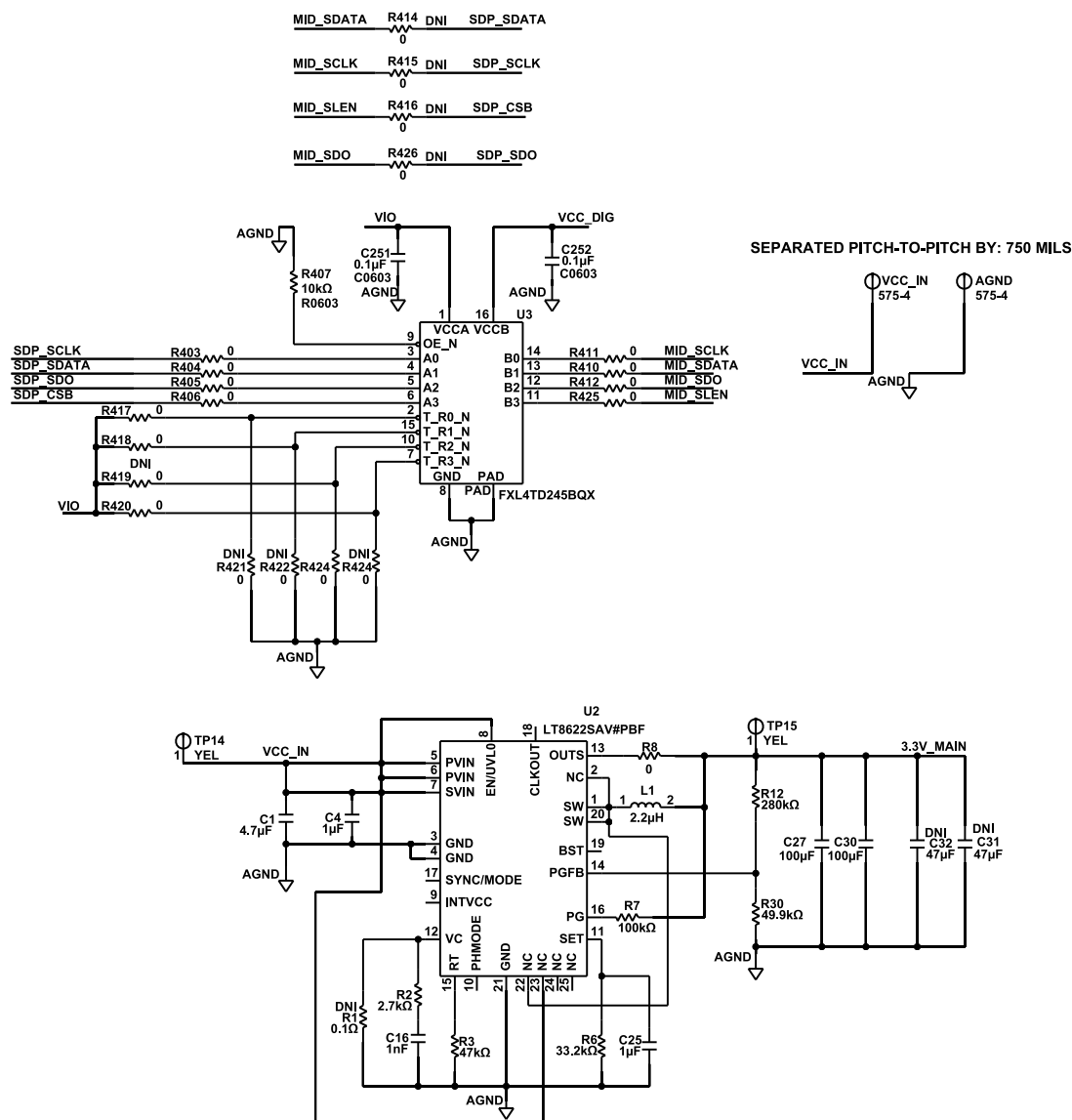


Figure 11. Evaluation Board Schematic, Silent Switcher (Page 4)

011

EVALUATION BOARD SCHEMATICS AND ARTWORK

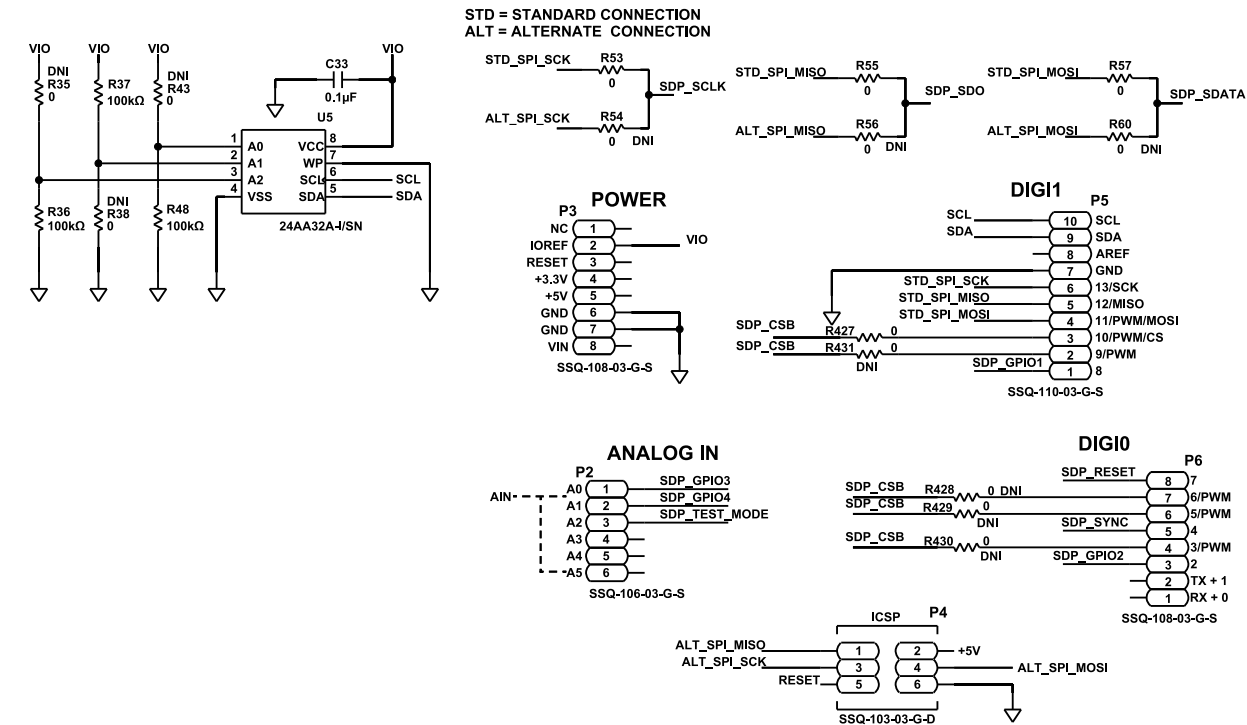


Figure 12. Evaluation Board Schematic, SDP-K1 Interface (Page 5)

EVALUATION BOARD SCHEMATICS AND ARTWORK

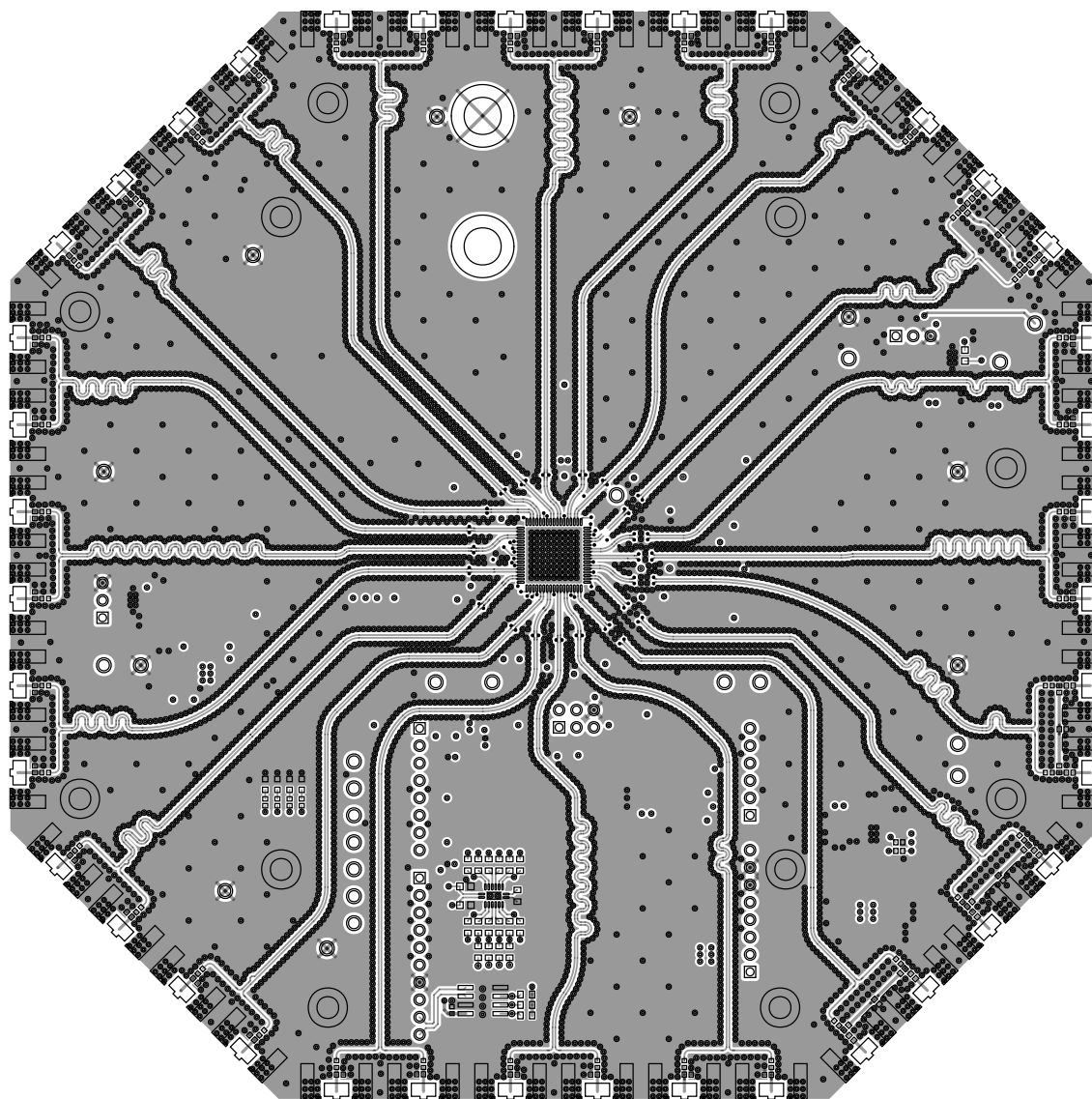


Figure 13. Evaluation Board Layer 1, Primary

EVALUATION BOARD SCHEMATICS AND ARTWORK

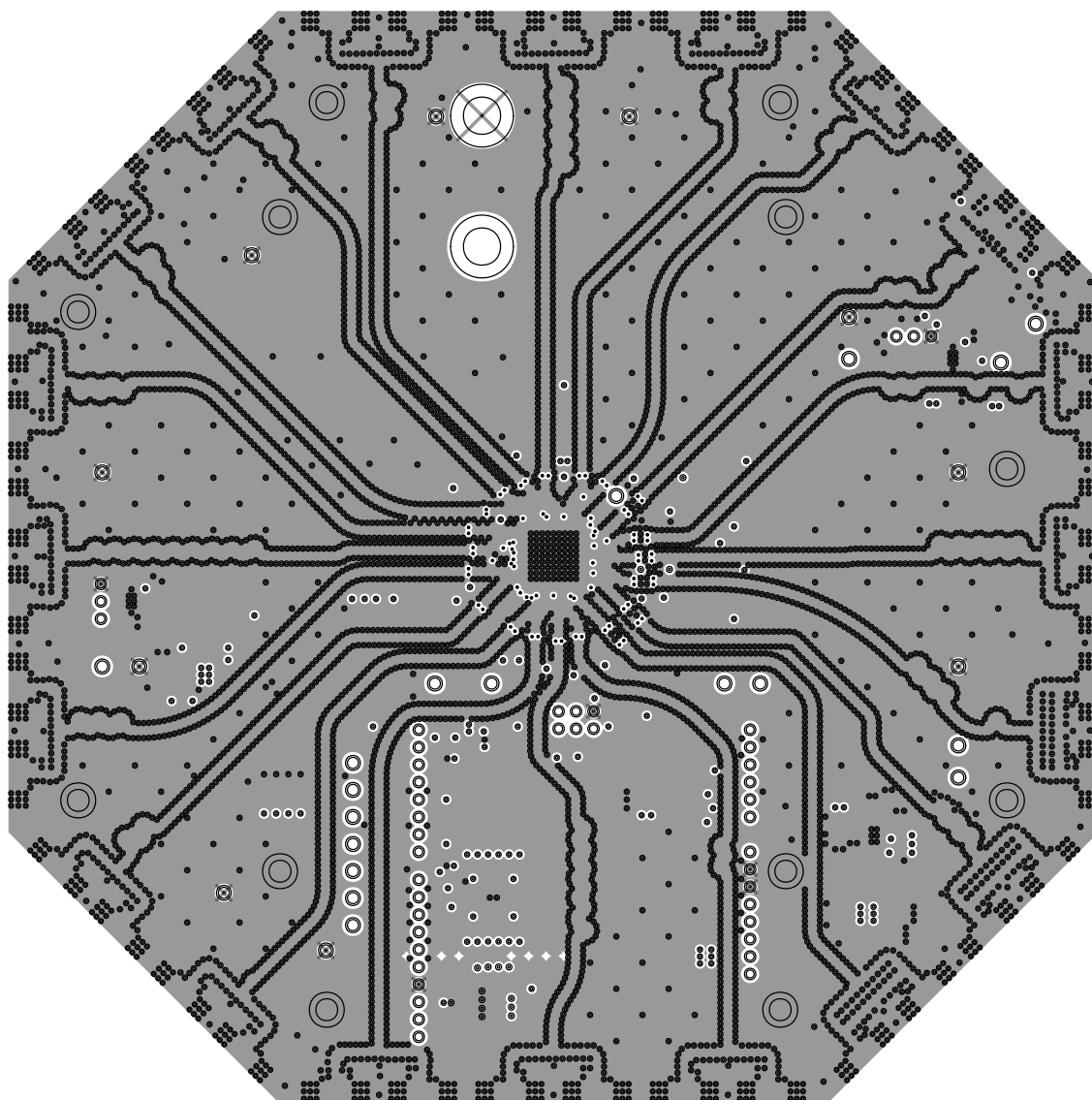


Figure 14. Evaluation Board Layer 2

014

EVALUATION BOARD SCHEMATICS AND ARTWORK

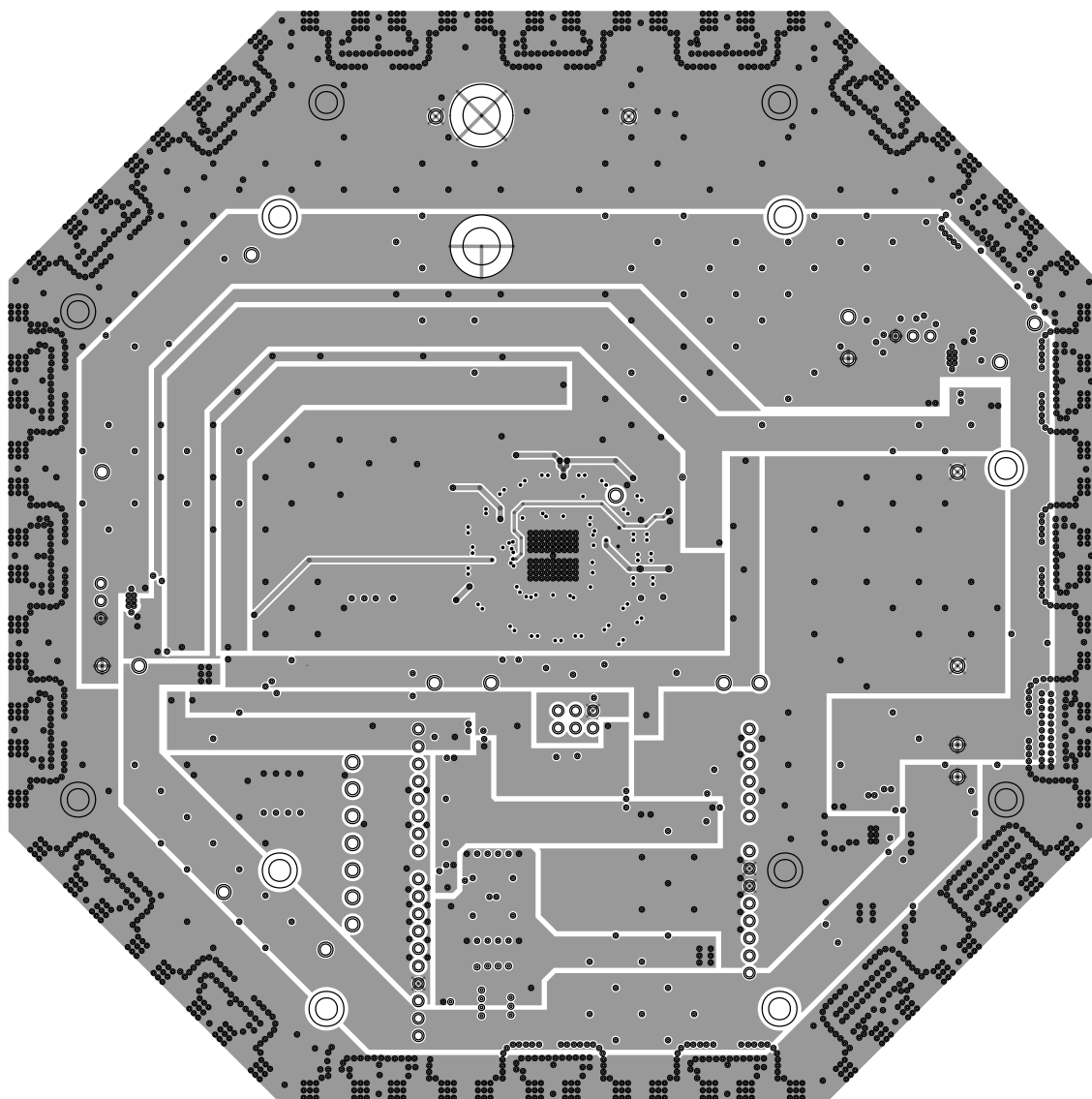


Figure 15. Evaluation Board Layer 3

EVALUATION BOARD SCHEMATICS AND ARTWORK

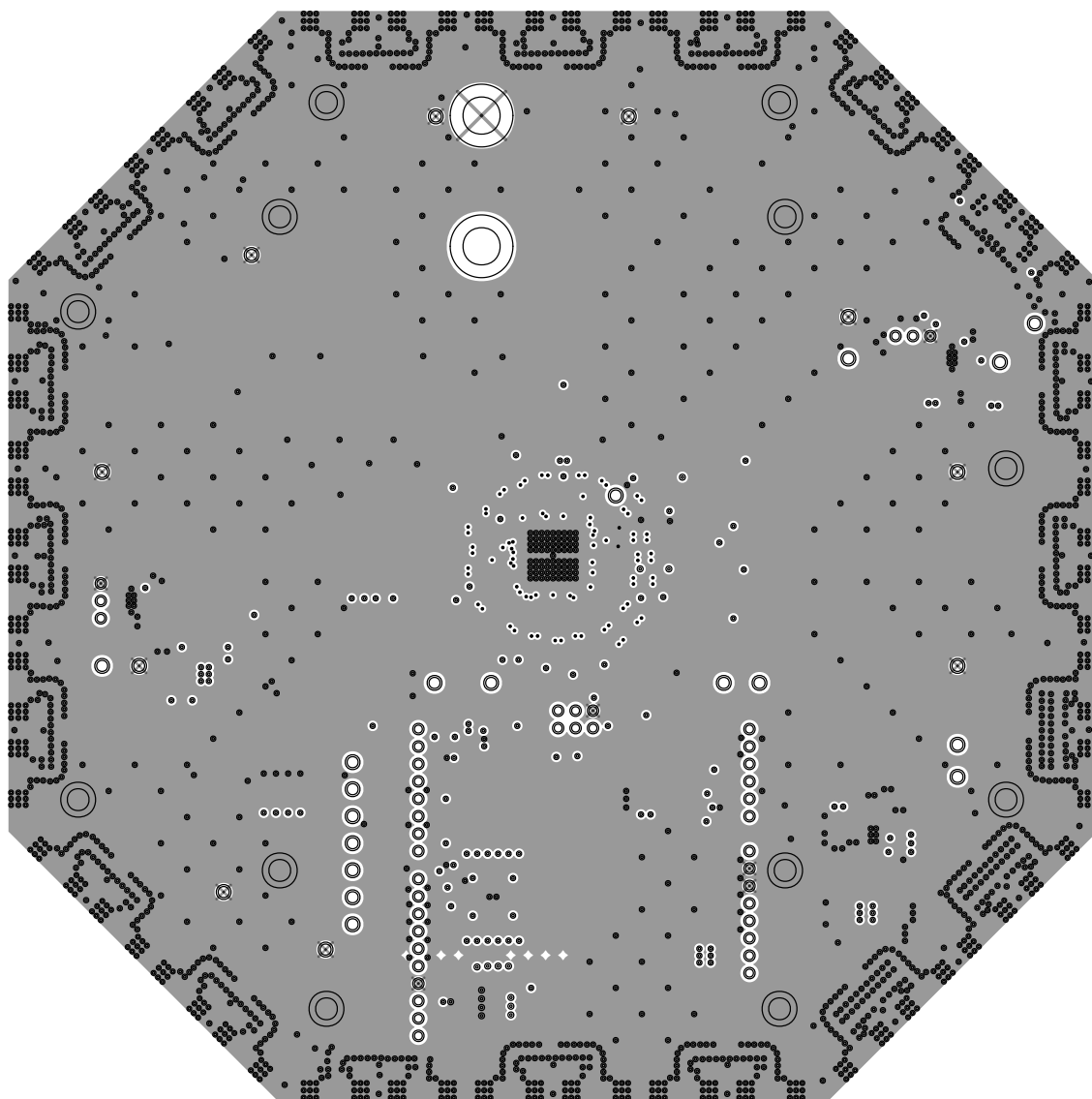


Figure 16. Evaluation Board Layer 4

EVALUATION BOARD SCHEMATICS AND ARTWORK

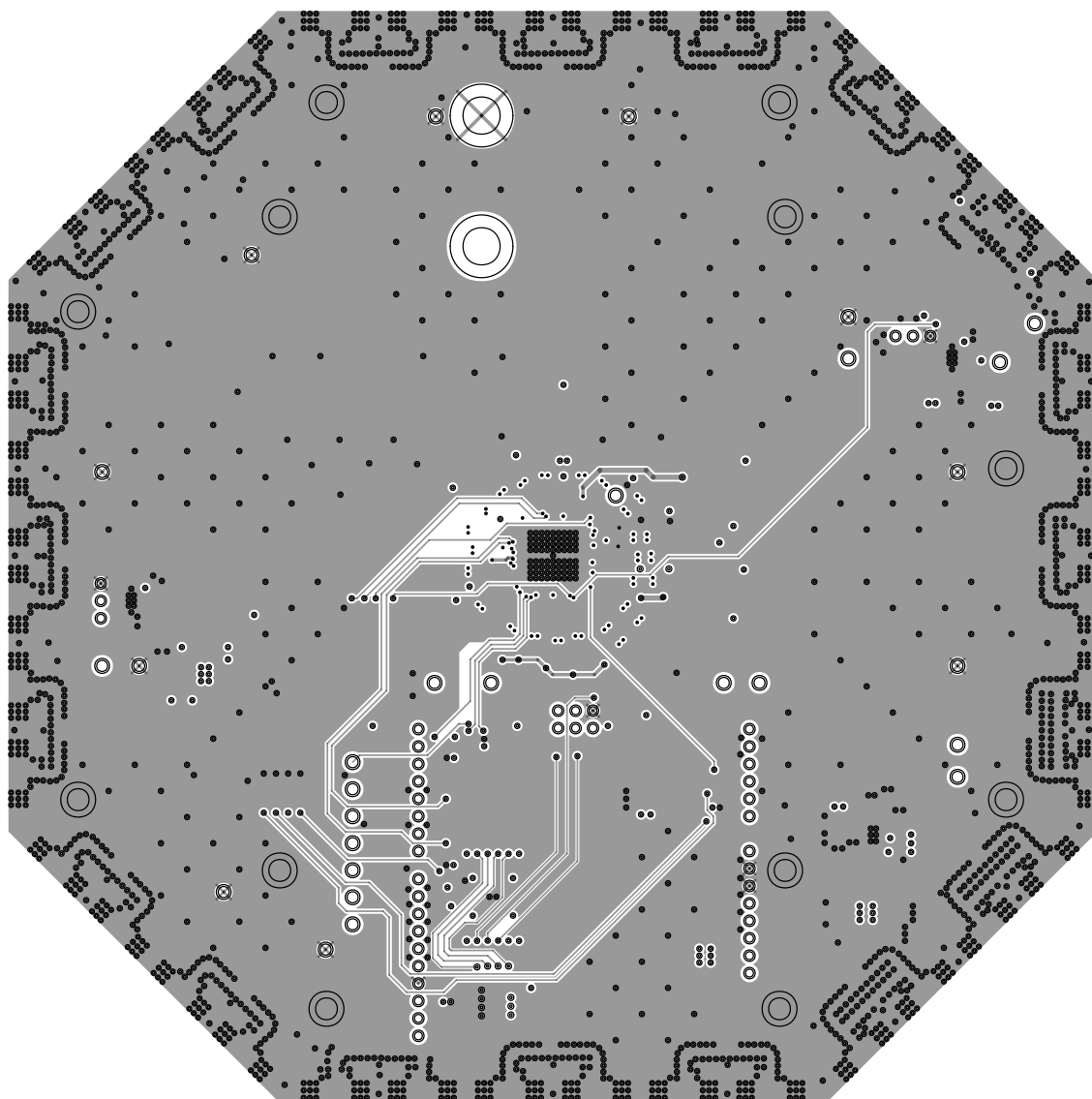


Figure 17. Evaluation Board Layer 5

017

EVALUATION BOARD SCHEMATICS AND ARTWORK

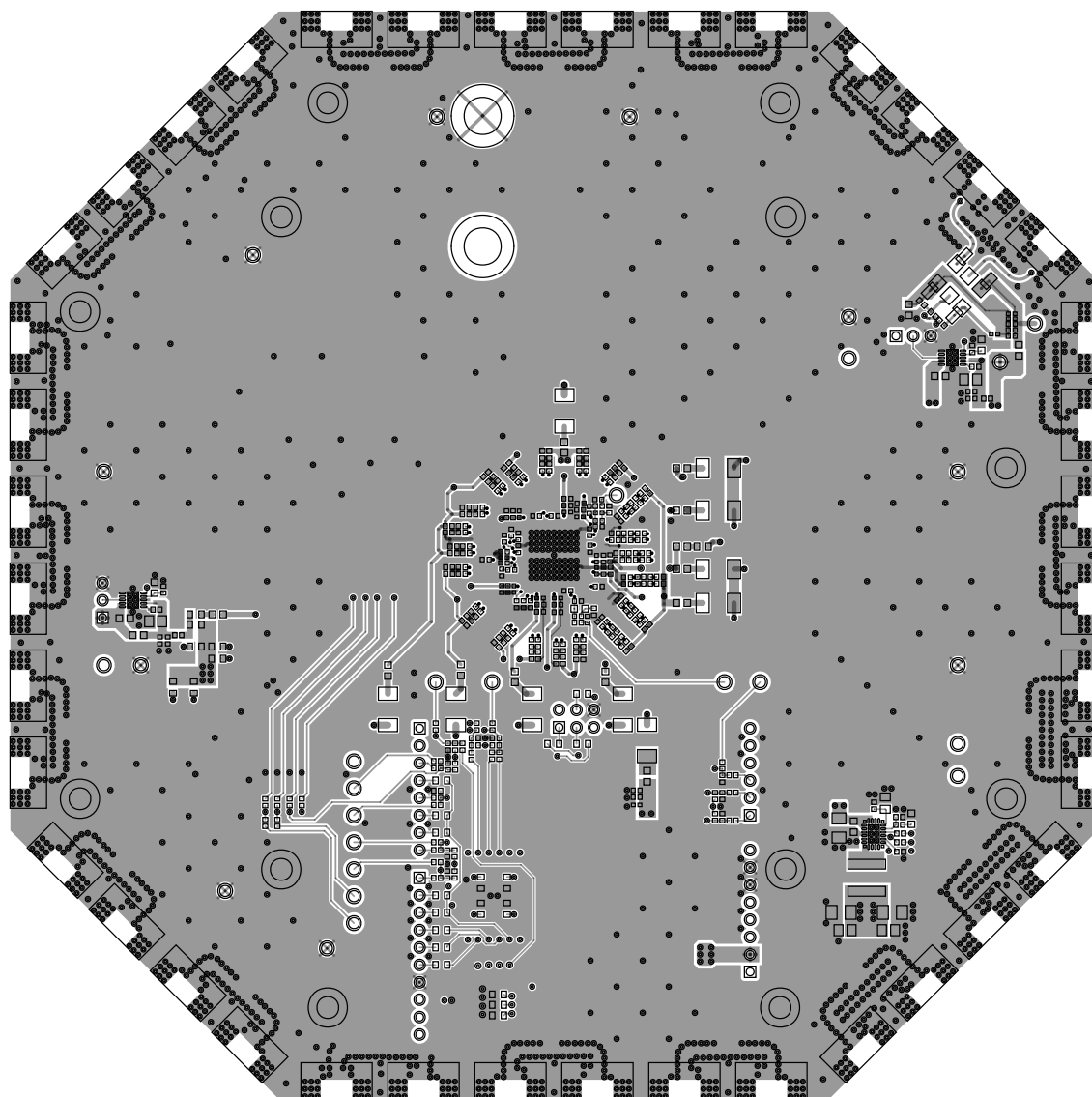


Figure 18. Evaluation Board Layer 6, Secondary

018

EVALUATION BOARD SCHEMATICS AND ARTWORK

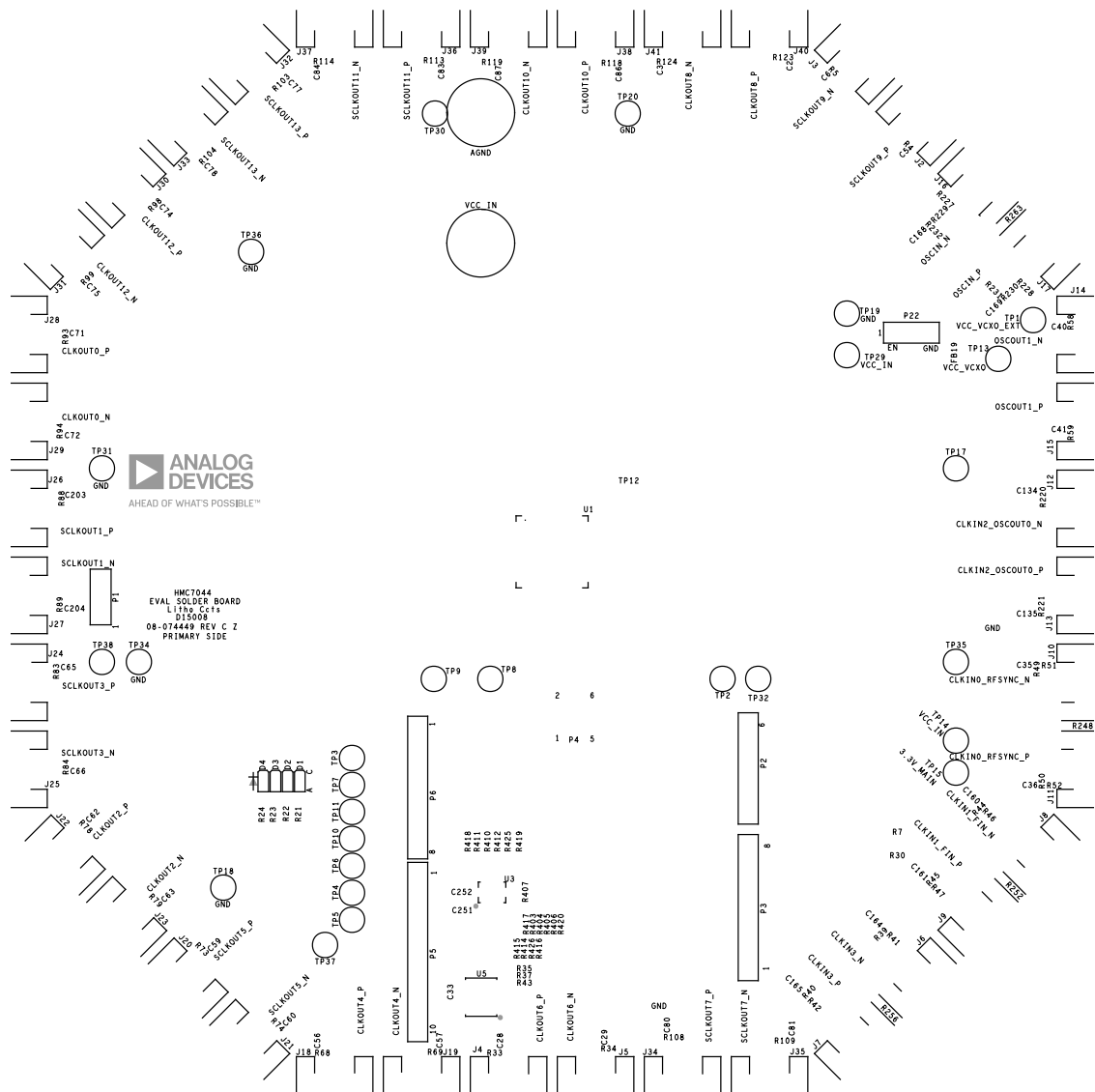


Figure 19. Evaluation Board Silkscreen, Top Side

EVALUATION BOARD SCHEMATICS AND ARTWORK

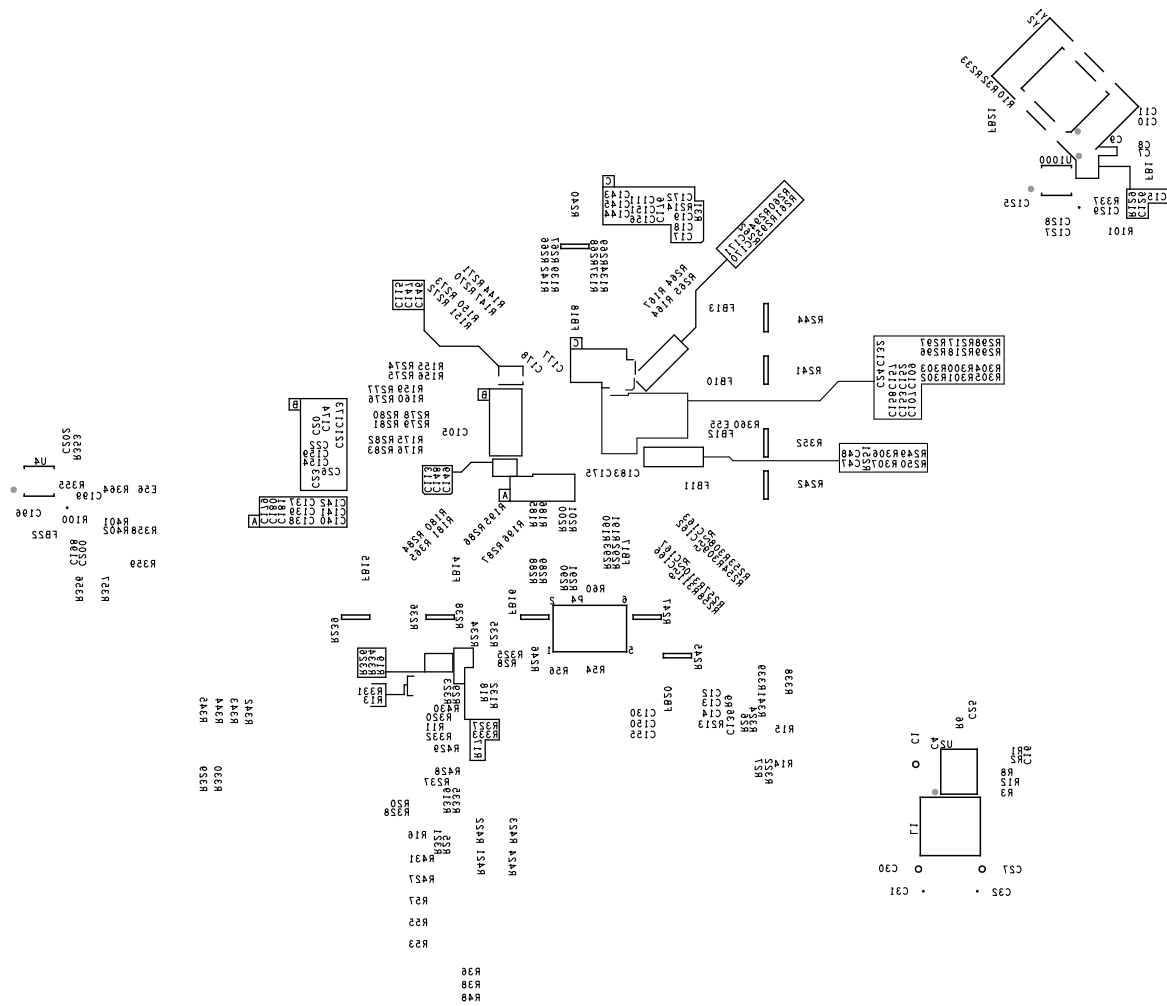


Figure 20. Evaluation Board Silkscreen, Bottom Side

020

ORDERING INFORMATION

BILL OF MATERIALS

Table 1. Bill of Materials

Quantity	Reference Designator	Description	Value	Manufacturer	Part Number
2	AGND, VCC_IN	Connector-PCB, banana jack, female, non-insulated, through-hole, swage, 0.218inch length	575-4	Keystone Electronics	575-4
1	C1	Ceramic capacitor, 4.7μF, 25V, 10%, X7R, 1206	4.7μF	KEMET	C1206C475K3RACTU
1	C10	Ceramic capacitor, 100pF, 50V, 5%, C0G, 0402, extreme low equivalent series resistance (ESR)	100pF	KEMET	C0402C101J5GACTU
12	C23, C107, C109, C111, C113, C115, C128, C130, C138, C140, C143, C198	Ceramic capacitor, 1μF, 16V, 10%, 0402, low ESR	1μF	TDK	C1005X6S1C105K050BC
1	C11	Ceramic capacitor, 82pF, 50V, 5%, C0G, 0402	82pF	YAGEO	CC0402JRNPO9BN820
2	C12, C18	Ceramic capacitor, 4700pF, 50V, 10%, X7R, 0402	4700pF	KEMET	C0402C472K5RACTU
4	C125, C126, C196, C202	Ceramic capacitor, 4.7μF, 16V, 10%, X5R, 0603, low ESR	4.7μF	TDK	C1608X5R1C475K080AC
54	C2, C3, C5, C6, C8, C26, C28, C29, C35, C36, C40, C41, C56, C57, C59, C60, C62, C63, C65, C66, C71, C72, C74, C75, C77, C78, C80, C81, C83, C84, C86, C87, C127, C134, C135, C139, C141, C145, C147, C148, C150, C151, C152, C153, C160, C161, C164, C165, C168, C169, C170, C200, C203, C204	Ceramic capacitor, 0.1μF, 16V, 10%, X7R, 0402	0.1μF	KEMET	C0402C104K4RACTU
2	C129, C199	Ceramic capacitor, 10μF, 16V, 10%, X5R, 0805, extreme low ESR	10μF	Johanson Dielectrics	160R15X106KV4E
1	C13	Ceramic capacitor, 1μF, 16V, 10%, X7R, 0603	1μF	AVX	0603YC105KAT2A
5	C20, C21, C22, C24, C132	Ceramic capacitor, 4.7μF, 6.3V, 20%, X5R, 0402	4.7μF	Murata	GRM155R60J475ME87D
9	C137, C142, C144, C146, C149, C155, C156, C157, C158	Ceramic capacitor, 1000pF, 50V, 10%, X7R, 0402, AEC-Q200, low ESR	1000pF	TDK	CGA2B2X7R1H102K050B A
1	C16	Ceramic capacitor, 1nF, 100V, 10%, X7R, 0603	1nF	AVX Corporation	06031C102KAT2A
1	C17	Ceramic capacitor, 160pF, 50V, 5%, C0G, 0402	160pF	YAGEO	CC0402JRNPO9BN161
1	C25	Ceramic capacitor, 1μF, 25V, 10%, X8R, 0805	1μF	TDK	C2012X8R1E105K125AC
2	C251, C252	Ceramic capacitor, 0.1μF, 25V, 10%, X8R, 0603	0.1μF	TDK	C1608X8R1E104K080AA
2	C27, C30	Ceramic capacitor, 100μF, 10V, 20%, X5R, 1206, low ESR	100μF	TDK	C3216X5R1A107M160AC
1	C33	Ceramic capacitor, 0.1μF, 16V, 10%, X7R, 0402, AEC-Q200	0.1μF	Murata	GCM155R71C104KA55D
1	C4	Ceramic capacitor, 1μF, 6.3V, 10%, X7R, 0603	1μF	KEMET	C0603X105K9RACTU
1	C7	Ceramic capacitor, 10μF, 6.3V, 20%, X5R, 0402	10μF	Samsung	CL05A106MQ5NUNC
1	C9	Ceramic capacitor, 2.2nF, 50V, 5%, X7R, 0402	2.2nF	AVX Corporation	04025C222JAT2A
4	D1, D2, D3, D4	Diode hyper bright low current LED, green	LG L29K-G2J1-24-Z	OSRAM Opto Semiconductors	LG L29K-G2J1-24-Z
12	E55, E56, FB1, FB11, FB13, FB14, FB15, FB16, FB17, FB18, FB20, FB21	Inductor chip ferrite bead, 0.3Ω maximum, DC resistance, 0.5A	120Ω at 100MHz	Würth Elektronik	74279262
18	J8, J9, J10, J11, J14, J15, J22, J23, J24, J25, J26, J27, J28, J29, J36, J37, J38, J39	Connector-PCB, jack assembly, end launch, SMA, 62 mils board thick, for 30 and 10 mils board thick, use ALT symbols	142-0701-851	Cinch Connectivity Solutions	142-0701-851
1	L1	Inductor shielded power, 0.01397Ω, DC resistance, 10A	2.2μH	Coilcraft, Inc.	XEL6030-222MEC

ORDERING INFORMATION

Table 1. Bill of Materials (Continued)

Quantity	Reference Designator	Description	Value	Manufacturer	Part Number
2	P1, P22	Connector, 3 position male unshrouded, single row, straight tip, 2.54mm pitch, 5.84mm post height, 5.08mm solder tail	TSW-103-08-T-S	Samtec	TSW-103-08-T-S
1	P2	Connector-PCB, receptacle, 25mils square post, 2.54mm pitch	SSQ-106-03-G-S	Samtec	SSQ-106-03-G-S
2	P3, P6	Connector-PCB, receptacle, 25mils square post, 2.54mm pitch	SSQ-108-03-G-S	Samtec	SSQ-108-03-G-S
1	P4	Connector-PCB, receptacle, 25mils square post, dual row, 2.54mm pitch	SSQ-103-03-G-D	Samtec	SSQ-103-03-G-D
1	P5	Connector-PCB, receptacle, 25mils square post, 2.54mm pitch	SSQ-110-03-G-S	Samtec	SSQ-110-03-G-S
48	R8, R10, R17, R19, R41, R42, R46, R47, R51, R52, R132, R227, R228, R229, R230, R233, R234, R235, R236, R237, R256, R266, R269, R274, R276, R282, R289, R290, R294, R295, R298, R299, R304, R305, R306, R307, R308, R309, R310, R311, R329, R330, R331, R342, R343, R344, R345, R365	Resistor surface-mount device (SMD), 0Ω, jumper, 1/10W, 0402, AEC-Q200	0Ω	Panasonic	ERJ-2GE0R00X
22	R4, R5, R33, R34, R39, R40, R68, R69, R73, R74, R98, R99, R103, R104, R108, R109, R123, R124, R220, R221, R231, R232	Resistor SMD, 49.9Ω, 1%, 1/10W, 0402, AEC-Q200	49.9Ω	Panasonic	ERJ-2RKF49R9X
1	R12	Resistor SMD, 280kΩ, 1%, 1/16W, 0402, AEC-Q200	280kΩ	Vishay	CRCW0402280KFKED
3	R6, R129, R353	Resistor SMD, 33.2kΩ, 1%, 1/16W, 0402, AEC-Q200	33.2kΩ	Vishay	CRCW040233K2FKED
12	R134, R137, R139, R142, R159, R160, R180, R181, R185, R186, R200, R201	Resistor SMD, 150Ω, 1%, 1/10W, 0402, AEC-Q200	150Ω	Panasonic	ERJ-2RKF1500X
1	R18	Resistor SMD, 1.62kΩ, 1%, 1/10W, 0402, AEC-Q200	1.62kΩ	Panasonic	ERJ-2RKF1621X
1	R2	Resistor SMD, 2.7kΩ, 5%, 1/10W, 0402, AEC-Q200	2.7kΩ	Panasonic	ERJ-2GEJ272X
2	R21, R22	Resistor SMD, 100Ω, 5%, 1/10W, 0402, AEC-Q200	100Ω	Panasonic	ERJ-2GEJ101X
9	R238, R239, R240, R242, R244, R245, R246, R247, R352	Resistor SMD, 0Ω, jumper, 2010, AEC-Q200	0Ω	Vishay	CRCW20100000Z0EF
2	R25, R29	Resistor SMD, 1.5kΩ, 1%, 1/10W, 0402, AEC-Q200	1.5kΩ	Panasonic	ERJ-2RKF1501X
7	R27, R319, R320, R322, R324, R334, R341	Resistor SMD, 27kΩ, 5%, 1/10W, 0402, AEC-Q200	27kΩ	Panasonic	ERJ-2GEJ273X
1	R28	Resistor SMD, 100kΩ, 1%, 1/5W, 0402, AEC-Q200, anti-surge	100kΩ	Panasonic	ERJ-PA2F1003X
1	R3	Resistor SMD, 47kΩ, 1%, 1/10W, 0402, AEC-Q200	47kΩ	Panasonic	ERJ-2RKF4702X
1	R30	Resistor SMD, 49.9kΩ, 1%, 1/10W, 0402, AEC-Q200	49.9kΩ	Panasonic	ERJ-2RKF4992X
1	R31	Resistor SMD, 430Ω, 5%, 1/10W, 0402, AEC-Q200	430Ω	Panasonic	ERJ-2GEJ431X
2	R337, R355	Resistor SMD, 0Ω, jumper, 1/8W, 0402, AEC-Q200	0Ω	Vishay	RCC04020000Z0ED
8	R356, R357, R358, R359, R360, R364, R401, R402	Resistor SMD, 0Ω jumper 1/3W 0603 AEC-Q200	0Ω	Vishay	CRCW06030000Z0EAHP
3	R36, R37, R48	Resistor SMD, 100kΩ, 1%, 1/10W, 0603, AEC-Q200	100kΩ	Vishay	CRCW0603100KFKEA
16	R53, R55, R57, R403, R404, R405, R406, R410,	Resistor SMD, 0Ω, jumper, 1/10W, 0603, AEC-Q200	0Ω	Panasonic	ERJ-3GEY0R00V

ORDERING INFORMATION

Table 1. Bill of Materials (Continued)

Quantity	Reference Designator	Description	Value	Manufacturer	Part Number
	R411, R412, R417, R418, R420, R423, R425, R427				
1	R407	Resistor SMD, 10kΩ, 1%, 1/10W, 0603, AEC-Q200	10kΩ	Panasonic	ERJ-3EKF1002V
1	R7	Resistor SMD, 100kΩ, 1%, 1/10W, 0402, AEC-Q200	100kΩ	Panasonic	ERJ-2RKF1003X
1	R9	Resistor SMD, 11kΩ, 1%, 1/16W, 0402, AEC-Q200	11kΩ	Vishay	CRCW040211K0FKED
5	TP1, TP12, TP13, TP29, TP38	Connector-PCB, test point, red	Red	Keystone Electronics	5005
10	TP2, TP3, TP4, TP5, TP7, TP8, TP9, TP10, TP14, TP15	Connector-PCB, test point, yellow	Yellow	Components Corporation	TP-104-01-04
5	TP17, TP19, TP30, TP31, TP34	Connector-PCB, test point, black	Black	Keystone Electronics	5006
1	U1	Please use the part in the HMC7044B	HMC7044 BLP10BE	Analog Devices, Inc.	HMC7044BLP10BE
1	U1000	IC-Analog Devices, 20V, 200mA, ultra-low noise, ultra-high power supply rejection ratio (PSRR), radio frequency, linear regulator	LT3042ED D#PBF	Analog Devices	LT3042EDD#PBF
1	U2	IC-Analog Devices, 18V, 2A, step-down silent switcher 3 with ultra-low noise reference, prelim	LT8622SA V#PBF	Analog Devices	LT8622SAV#PBF
1	U3	IC, dual supply 4-bit signal translator	FXL4TD24 5BQX	Fairchild Semiconductor	FXL4TD245BQX
1	U4	IC-linear, 20V, 500mA, ultra-low noise, ultra-high PSRR, linear regulator	LT3045ED D#PBF	Analog Devices	LT3045EDD#PBF
1	U5	IC, 32kb, serial electrically erasable programmable read-only memory	24AA32A-I/SN	Microchip Technology	24AA32A-I/SN
1	Y1	IC, VCXO, ultra-low phase noise oscillator	122.88MHz	Crystek Corporation	CVHD-950-122.880

ORDERING INFORMATION

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