ADS54RF63-ADX4 Single-channel, 12-bit, 2.2 GSPS Evaluation Module (EVM)

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1 Introduction

The ADX412 EVM is a high performance evaluation module which incorporates four time-interleaved AD Converters sampling a single analog input, fine-adjustable clock phases and a USB interface. The analog input is sampled with 12-bit resolution at a capture rate of 2.2 giga samples per second (GSPS).

2 Hardware Design

2.1 ADC Interface

The ADCs are clocked from an external 550MHz clock, this clock is phase shifted to 0, 90, 180 and 270 respectively for the four ADCs. The first ADC buffers the zero phase clock and drives an LVDS source synchronous clock, edge aligned to data, to the FPGA global clock input. From this clock the FPGA generates all four clock phases needed for data sampling using a PLL.

2.2 USB Interface

The FPGA is connected to a RS-232-over-USB chip. The signaling is done using LVTTL (3.3V), and is synchronous to a 24MHz clock driven by the USB chip to the FPGA. The data rate is fixed at 3Mbit.

2.3 Control and Status Interface

On the PCB there are also four LEDs and six DIP switches available. The LEDs are active low using LVTTL (3.3V). The DIP switches are also active low, but use the LVCMOS (2.5V) signaling.

3 Software Interfaces

For evaluation, both a standalone program (ADCaptureLab) and a MATLAB interface is supplied.

3.1 ADCaptureLab

See the section Using ADCapture Lab for instructions.

3.2 MATLAB Interface

Find devices:	instrusb('find')
Reset device:	instrusb('reset')
Collect data:	[a b c d] = instrusb('musb', 'FPGA', 'adx4', 4)

See the help file in .m-file for more information.

4 Installation of Software

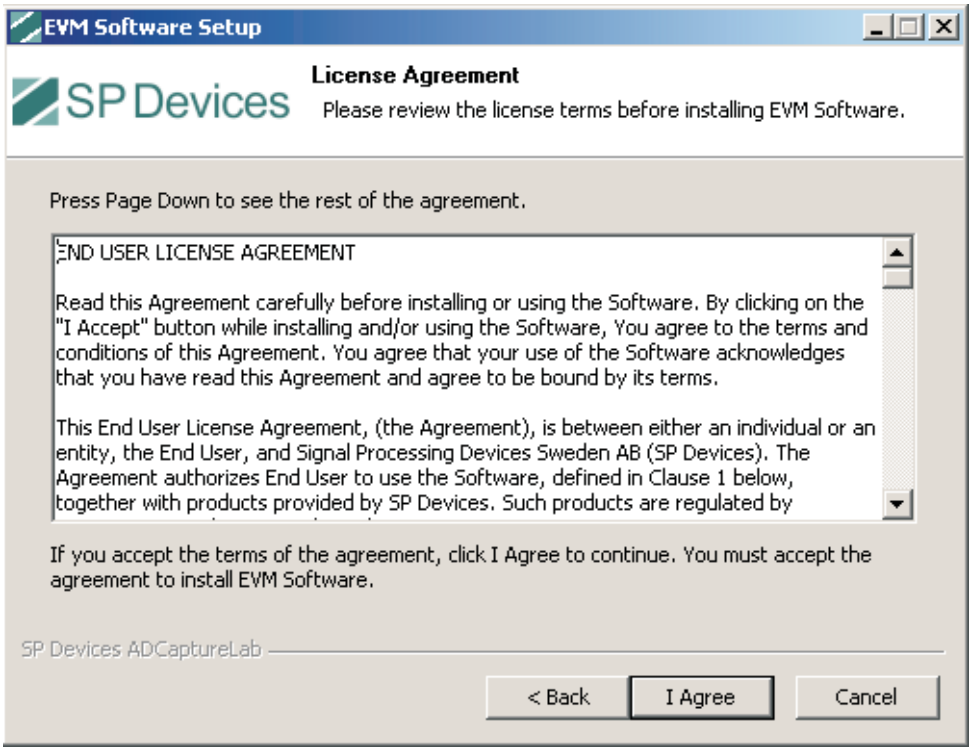
4.1 ADCaptureLab Installation

To install the software for the EVM board, run "EVM-setup.exe" found on the CD delivered with the board. This will cause all software to be installed and a shortcut to be added to the start menu. Currently, the software package is only available for use with Microsoft Windows.

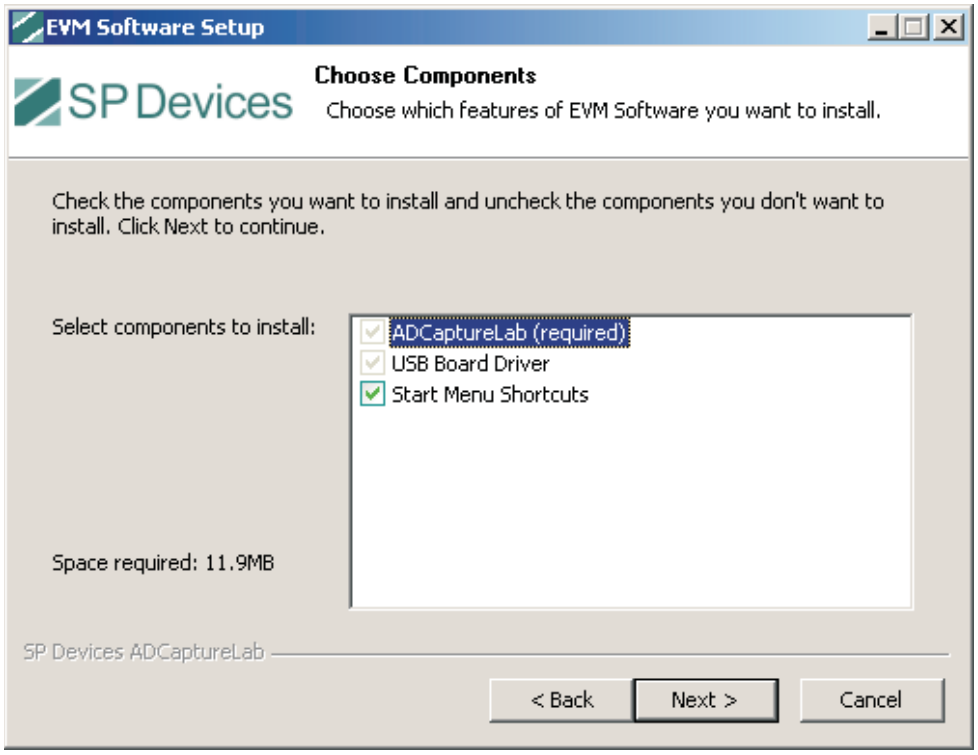
IMPORTANT: Install the software before you connect the ADX-EVM to the USB Port.

1. To install the software, run EVM-setup.exe which is included on the CD delivered with your card. The window (Figure 1) will be shown.

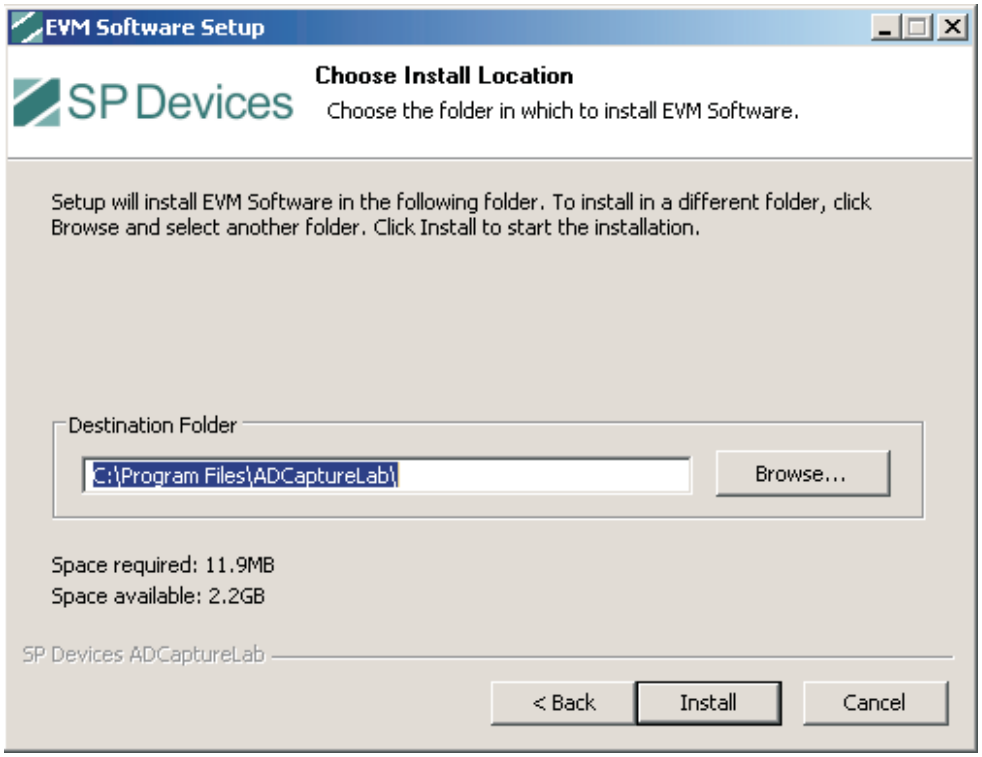
2. Press "Next >".



3. Read the license agreement, and then press "I Agree".



4. Choose the components to be installed and press "Next >".
   SP Devices recommend installation of all suggested components.



5.

If the suggested default installation location is not satisfactory, press "Browse" to choose another location. Then press "Install".

6. When all components have been installed, the software is ready for use. Press "Finish" to complete the installation.

5 Using ADCapture Lab

5.1 Overview

Figure 1 shows the main window of ADCapture Lab. A detailed description of each part shown in the main window is given in the section shown in the figure.

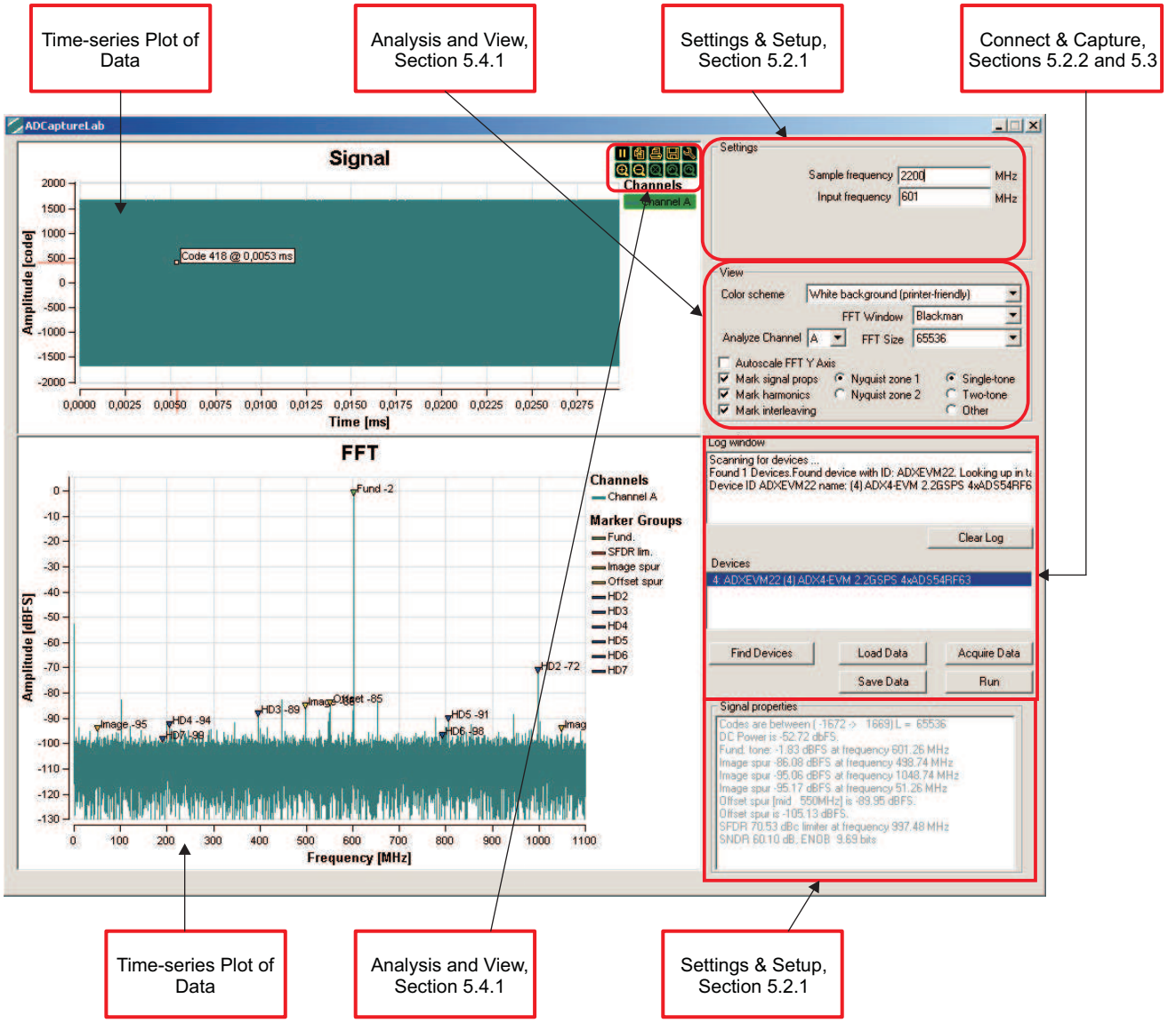


Figure 1. ADCapture Lab Main Window

5.2 Capturing Data

5.2.1 Settings and Setup

Setting	Description
Sample frequency	Set the sampling frequency for the system. Frequency axis for FFT plot will be based on this and on Nyquist zone settings (see section Nyquist Zone Settings).
Input frequency	Set the input frequency. Only used for tagging when exporting data.

5.2.2 Connect and Capture

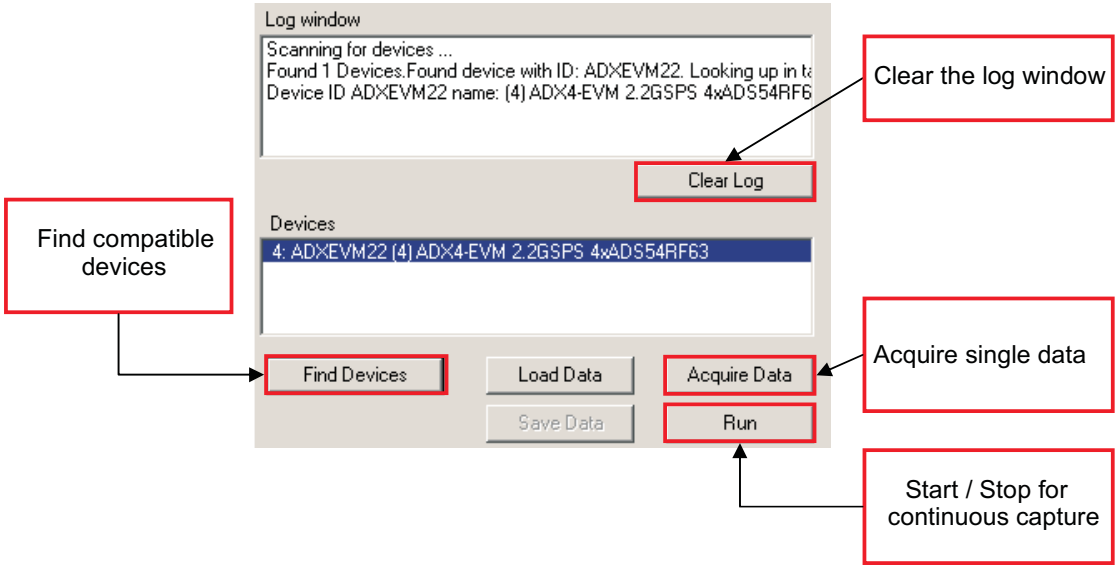


Figure 2. Buttons Used for Connect and Capture

5.2.2.1 Connecting to the Board

1. To find the board – press the button "Find USB Devices". The boards connected to the computer will then show up in the "Devices" box. Status information on the enumeration of devices will show in "Log window".
2. Select a compatible device board from the "Devices" list. The buttons "Acquire Data" and "Run" will then be activated.

5.2.2.2 Capture Single Batch

To capture a single batch from the board, press "Acquire Data".

5.2.2.3 Continuous Capture

To capture continuously, press "Run". Button will change name to "Stop", and pressing it will stop the capturing. If plots are in "Play" mode (see section Plot Tools), plots will be updated continuously as new data arrives from the board.

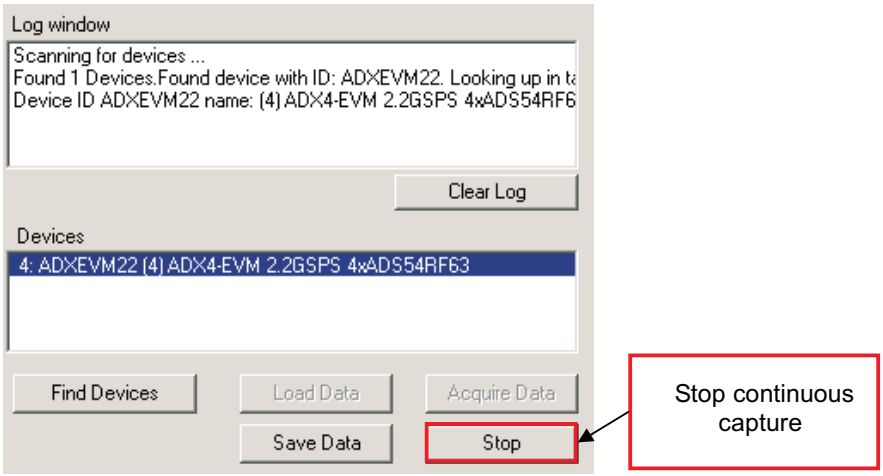


Figure 3. The Appearance and Functionality of the Start/Stop Button Changes During Continuous Capture

5.3 Import and Export of Data

5.3.1 Import Data

Press "Import Data" to load previously saved results into ADCapture Lab. In the file dialog window that opens, select the target file and press "Open". File contents will be loaded into the plot windows (unless they are in "Pause" mode). To import, the user can also drag and drop the file to the ADCapture Lab main window directly.

5.3.2 Export data

To save the results of a measurement, press "Save Data". Provide a filename in the file dialog window that opens, select a file format and press "Save". Data can be exported as a text file format with a header, binary format, or as a pure ASCII file for use with for example MATLAB.

5.4 Data Analysis

ADCapture Lab supports several data analysis functions that help interpret and evaluate the results of the measurements. The following sections explain the details about these functions.

5.4.1 Analysis and View Settings

The analysis and view settings determine which type of data analysis that is performed and how the result is displayed.

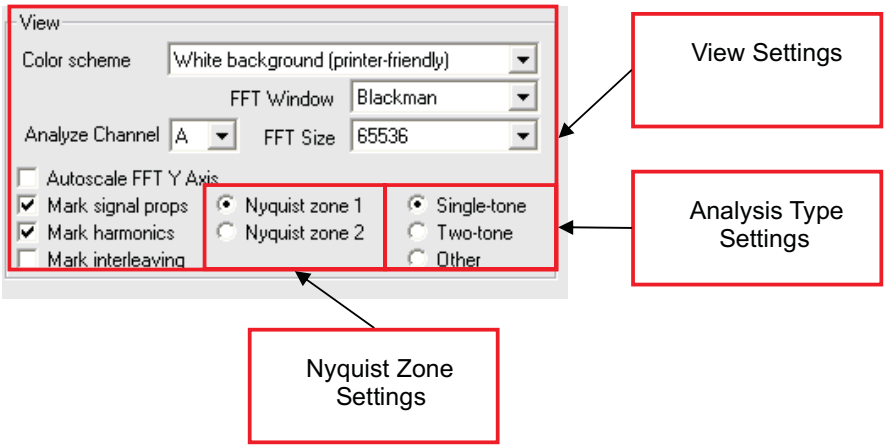


Figure 4. The Analysis and View Settings

5.4.1.1 Analysis Type Settings

Analysis Type	Description
Single-tone	Check this to indicate that the current measurement is a single-tone test. Supports analysis of code range, fundamental, harmonics, SFDR, and SNDR (ENOB).
Two-tone	Check this to indicate that the current measurement is a two-tone test. Supports analysis of code range, fundamentals, SFDR and SNDR (ENOB).
Other	Check this to indicate that the current measurement is other than above mentioned test types. Supports analysis of code range only.

5.4.1.2 Nyquist Zone Settings

Nyquist Zone	Description
Nyquist zone 1	Check this to indicate that the input signal frequencies are in the first Nyquist zone, i.e., DC < fin < fs/2. Frequency axis of FFT plot will be based on this and on the current sample frequency setting.
Nyquist zone 2	See description above. FFT plot frequency axis will change to fs/2 < fin < fs.

5.4.1.3 View Settings

Setting	Description
Color scheme	Sets the color scheme of the plot routines. Available modes are • White background (printer-friendly) • Black background • Grey background
Window	Windowing function used for FFT and analysis functions. Available windows are: • Blackman • Blackman-Harris • Hamming • Hanning • Rectangular
Autoscale FFT Y Axis	When enabled, the y-axis of the FFT plot is automatically scaled. If disabled, the y-axis is locked between 0 and -130dBFS.
Mark signal props	When enabled, fundamental tone(s) and SFDR limiter are marked in the FFT plot.
Mark harmonics	When enabled, harmonics (2nd-6th) are marked in the FFT plot. Supported for single-tone tests only.
Mark interleaving	When enabled, interleaving errors are marked in the FFT plot. Supported for single-tone tests and two-tone tests only.

5.4.2 Analysis Window Output

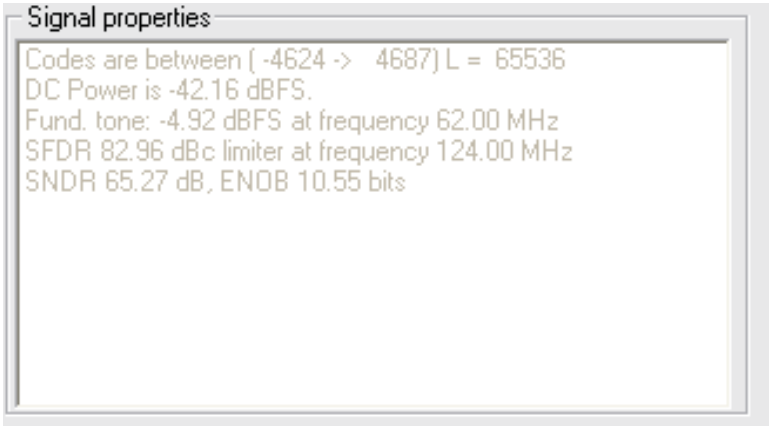


Figure 5. The result of the Data Analysis is Displayed in the Analysis Window

Analysis	Item Applicable to Analysis Type(s)	Description
Codes	All	Code range and number of samples in the current data batch.
DC Power	All	DC power in dBFS.
Fund. tone(s)	Single-tone Two-tone	Identified fundamental tones (power and frequency).
Power max	Other	Identified power maximum (power and frequency).
SFDR	Single-tone Two-tone	Spurious-Free Dynamic Range. Power relation between fundamental tone and largest distortion. For a two-tone test this is calculated as the relation between the largest fundamental tone and the largest distortion. Frequency position of limiting component is calculated.
SFDR	Single-tone Two-tone	Signal to Noise and Distortion Ratio. Power relation between fundamental tone and noise and distortion.
ENOB	Single-tone Two-tone	Effective Number Of Bits. Based directly on the SNDR value.

5.5 Plot Tools

Move the mouse cursor over any of the plot windows (time-series plot or FFT plot) to display the plot tools toolbar. When a plot tool is marked green, as for example the "Zoom to Fit" tool shown in Figure 6, it means that this specific tool is currently not a valid choice. In the case of the "Zoom to Fit" tool, this happens when the plot is already zoomed to show the full signal plot.

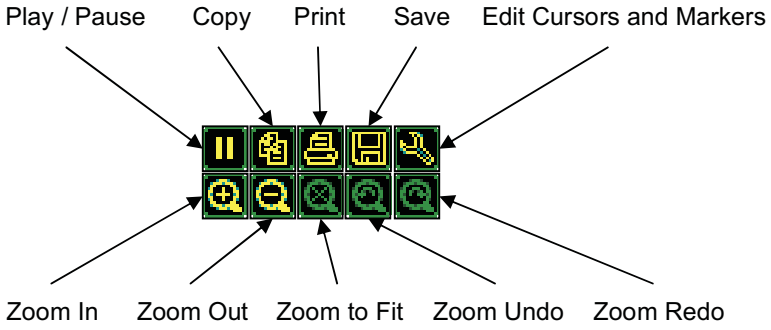


Figure 6. The Plot Tools Appear When Placing the Mouse Over any of the Plot Windows

Plot Tool	Description
Play/Pause	To put plot in Play/Pause mode. In play mode, plot will display new data as it arrives either by acquiring or by import from file. In pause mode, plot will not update.
Copy	Copies plot window to the clipboard. The result can for example be pasted into a document or similar.
Print	Prints plot window to printer.
Save	Exports plot window to bitmap or jpeg image file.
Edit Cursors and Markers	Edits the cursors and markers of the plot window. When pressed a dialog window will open which will allow for changing properties such as channel name and visibility, display color for the channel and marker shapes and colors.
Zoom In	Zooms in
Zooms Out	Zoom out
Zoom to Fit	Zooms to the original setting.
Zoom Undoit	Returns to previous zoom setting.
Zoom Redo	Returns to zoom setting before undo press.

6 Hardware Interfaces

6.1 DIP Switches

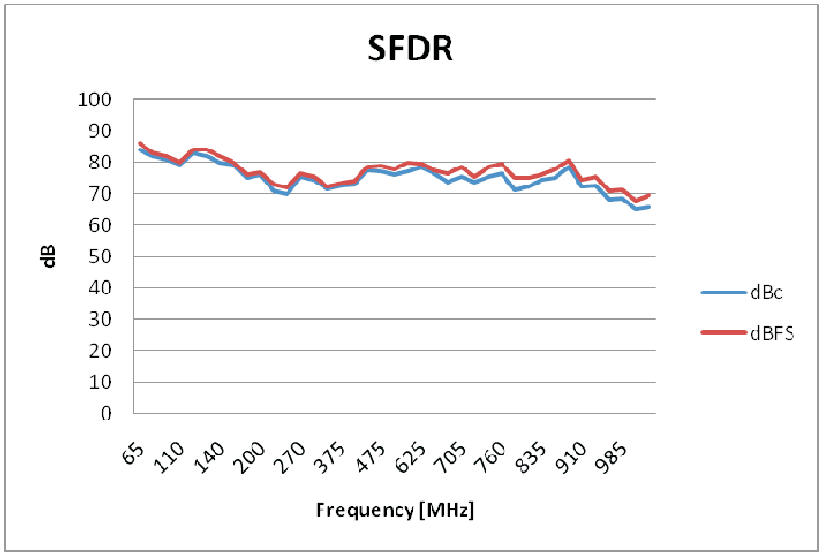
1	Reserved. Set to "Off".
2	Reserved. Set to "Off".
3	Reserved. Set to "Off".
4	Reserved. Set to "Off".
5	Store ADX IP data in data logger. "Off" selects ADC data.
6	ADC powerdown (unused)

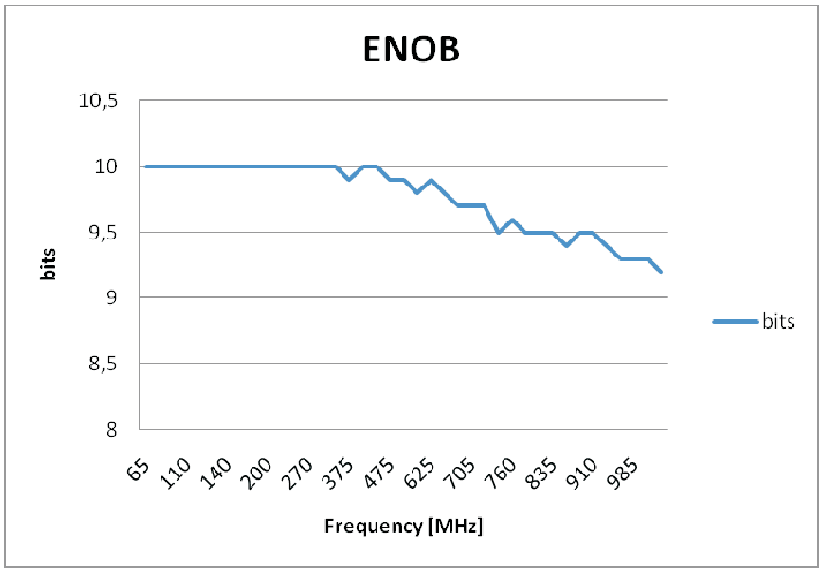
6.2 LEDs

0	Toggle when estimation done. Red.
1	Estimation enabled. Red.
2	Licence ok, will blink on license failure. Green.
3	Transmitting data logger data over USB interface. Green.

7 Performance

The performance of the EVM is limited at all measurements by the harmonic distortion of the ADCs (HD2 or HD3). Below are plots of the typical performance of the ADX4-EVM.





8 Bill of Material

Table 1. Bill of Materials

QTY	Description	Package	Manufacturer	Manufacturer PN	Supplier	Supplier PN	Regulatory	Status	Designators
8	Resistor, 0 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW04020000Z0ED			RoHS	QUL	R13, R16, R45, R46, R81, R99, R138, R139
4	Resistor, 1 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW04021R00FNED	Farnell	1469668	RoHS	QUL	R7, R8, R29, R71
9	Resistor, 10 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW040210R0FKED			RoHS	QUL	R26, R27, R28, R30, R31, R36, R37, R38, R88
2	Resistor, 22 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW040222R0FKED			RoHS	QUL	R118, R119
6	Resistor, 33 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW040233R0FKED			RoHS	QUL	R107, R108, R109, R115, R116, R117
12	Resistor, 51 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW040251R0FKED			RoHS	QUL	R80, R93, R95, R122, R123, R124, R125, R126, R127, R128, R129, R136
4	Resistor, 240 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW0402240RFKED			RoHS	QUL	R19, R20, R25, R43
2	Resistor, 330 ohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-07330RL			RoHS	QUL	R87, R89
2	Resistor, 390 ohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW0402390RFKED			RoHS	QUL	R5, R6
1	Resistor, 470 ohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-07470RL			RoHS	QUL	R76
1	Resistor, 680 ohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-07680RL			RoHS	QUL	R75
3	Resistor, 1 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-071KL			RoHS	QUL	R92, R104, R111
1	Resistor, 1.2 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-071K2L			RoHS	QUL	R94
1	Resistor, 3.3 kohm, 0402, 1%, 0.063W	0402	Yage0	RC0402FR-073K3L			RoHS	QUL	R77
18	Resistor, 4.7 kohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW04024K70FKED			RoHS	QUL	R72, R84, R85, R86, R90, R97, R100, R101, R102, R105, R110, R121, R130, R131, R132, R133, R134, R135
2	Resistor, 6.8 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-076K8L			RoHS	QUL	R3, R4

Table 1. Bill of Materials (continued)

QTY	Description	Package	Manufacturer	Manufacturer PN	Supplier	Supplier PN	Regulatory	Status	Designators
19	Resistor, 10 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-0710KL			RoHS	QUL	R1, R2, R55, R56, R57, R59, R60, R62, R63, R65, R66, R67, R68, R70, R98, R112, R113, R114, R120
1	Resistor, 15 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-0715KL			RoHS	QUL	R103
1	Resistor, 18 kohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW040218K0FKED			RoHS	QUL	R141
4	Resistor, 22 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-0722KL			RoHS	QUL	R58, R61, R64, R69
1	Resistor, 33 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-0733KL			RoHS	QUL	R106
1	Resistor, 47 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-0747KL			RoHS	QUL	R74
25	Resistor, 100 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-07100KL			RoHS	QUL	R9, R10, R11, R12, R14, R15, R17, R18, R21, R22, R23, R24, R32, R33, R34, R35, R41, R42, R48, R49, R50, R51, R52, R53, R142
0	Resistor, 150 kohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-07150KL			RoHS	QUL	
1	Resistor, 330 kohm, 0402, 1%, 0.063W	0402	VISHAY DALE	CRCW0402330KFKED			RoHS	QUL	R73
0	Resistor, 1 Mohm, 0402, 1%, 0.063W	0402	Yageo	RC0402FR-071ML			RoHS	QUL	
4	Resistor, 82 ohm, 0603, 1%, 0.1W	0603	Yageo	RC0603FR-0782RL			RoHS	QUL	R78, R79, R82, R83
1	Resistor, 100 ohm, 0603, 1%, 0.1W	0603	Yageo	RC0603FR-07100RL			RoHS	QUL	R96
1	NTC thermistor, 100k	0603	Mitsubishi	TN10-3R104JT	Panasonic	ERT-J1VS104JA	RoHS	QUL	R54
16	Capacitor, 4.7 pF +/-0.25pF, 0402, C0G, 50V	0402	TDK	C1005C0G1H4R7B			RoHS	QUL	C9, C10, C20, C21, C22, C23, C28, C29, C30, C31, C35, C36, C37, C38, C41, C42
1	Capacitor, 10 pF, 5%, 0402, C0G, 50V	0402	Murata	GRM1555C1H100JZ01D			RoHS	QUL	C67
4	Capacitor, 100 pF, 5%, 0402, C0G, 50V	0402	Murata	GRM1555C1H101JZ01D			RoHS	QUL	C95, C96, C97, C98

Table 1. Bill of Materials (continued)

QTY	Description	Package	Manufacturer	Manufacturer PN	Supplier	Supplier PN	Regulatory	Status	Designators
164	Capacitor, 100 nF, 10%, 0402, X7R, 16V	0402	TDK	C1005X7R1C104K			RoHS	QUL	C1, C7, C11, C14, C15, C16, C17, C18, C19, C25, C26, C33, C34, C39, C40, C43, C44, C45, C48, C49, C50, C52, C53, C54, C56, C57, C58, C59, C74, C82, C83, C84, C90, C91, C92, C99, C100, C101, C104, C105, C106, C107, C108, C109, C110, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C124, C125, C126, C127, C128, C129, C130, C131, C132, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C168, C169, C170, C171, C172, C173, C174, C175, C176, C177, C178, C179, C180, C181, C182, C183, C184, C185, C186, C187, C188, C189, C190, C191, C192, C193, C194, C195, C196, C197, C198, C199, C200, C201, C202, C203, C204, C205, C206, C207, C208, C209, C210, C211, C212, C213, C214, C215, C216, C217, C218, C219, C220, C221, C222, C223, C224, C225, C226, C227, C228, C229
2	Capacitor, 100 nF, 10%, 0603, X5R, 50V	0603	Kemet	C0603C104K5RACTU	Elfa	65-202-09	RoHS	QUL	C102, C103
6	Capacitor, 1 uF, 10%, 0603, X5R, 25V	0603	Murata	GRM188R61E105KA12D	Elfa	65-202-17	RoHS	QUL	C12, C13, C32, C87, C89, C94
6	Capacitor, 2.2 uF, 10%, 0603, X5R, 16V	0603	Murata	GRM188R61C225KE15D	Elfa	65-202-25	RoHS	QUL	C2, C3, C4, C5, C6, C8

Table 1. Bill of Materials (continued)

QTY	Description	Package	Manufacturer	Manufacturer PN	Supplier	Supplier PN	Regulatory	Status	Designators
8	Capacitor, 10 uF, 10%, 0805, X5R, 16V	0805	Johanson Dielectrics Inc	160R15X106KV4E	Elfa	65-502-89	RoHS	QUL	C24, C46, C51, C55, C60, C63, C65, C230
12	Capacitor, 47 uF, 20%, 1210, X5R, 10V	1210	Taiyo Yuden	LMK325BJ476MM-T	Farnell	1463411	RoHS	QUL	C61, C64, C66, C69, C70, C75, C76, C77, C78, C79, C80, C85
5	Capacitor, 10 uF, 20%, 1210, X5R, 25V	1210	Taiyo Yuden	TMK325 BJ106MM-T	Farnell	1611923	RoHS	QUL	C71, C81, C88, C231, C232
5	Electrolytic capacitor, 100 uF, 0.39 ohm, 20%, 16V, C6, 105deg, CE-KX	C6	Sanyo	16CE100KX	Elfa	67-226-72	RoHS	QUL	C27, C47, C68, C72, C73
2	Electrolytic capacitor, 330 uF, 0.15 ohm, 20%, 25V, E10, 105deg, CE-KX	E10	Sanyo	25CE330KX	Elfa	67-227-30	RoHS	QUL	C86, C93
1	Electrolytic capacitor, 10 uF, 1.8 ohm, 20%, 25V, 105deg, CE-AX	A6	Sanyo	25CE10AX	Panasonic	EEE-FP1E100AR	RoHS	QUL	C62
5	Ferrite bead, 0603, 600 ohm, RDC=0.45 ohm, 200 mA	0603	Würth	74279265	Würth	74279265	RoHS	QUL	L1, L2, L6, L7, L15
5	Ferrite bead, 0805, 120 ohm@100MHz, RDC=0.03 ohm, 3 A	0805	Würth	742792023	Würth	742792023	RoHS	QUL	L14, L32, L33, L35, L37
16	Inductor, 2.7nH, 5%, 0.056ohm, 1500mA, 13GHz SRF	0402	Coilcraft	0402HP-2N7XJL	Coilcraft	0402HP-2N7XJL	RoHS	QUL	L3, L5, L8, L9, L12, L13, L16, L17, L20, L21, L23, L24, L27, L28, L29, L31
8	Inductor, 5.6nH, 5%, 0.048ohm, 1600mA, 6.5GHz SRF	0402	Coilcraft	0402HP-5N6XJL	Coilcraft	0402HP-5N6XJL	RoHS	QUL	L4, L10, L11, L18, L19, L25, L26, L30
2	SMT power inductor, 10uH, 10%, 0.434ohm, 1.1A (30% drop), 39.9MHz	SMD2.5x3	Coilcraft	ME3220-103KL	Coilcraft	ME3220-103KL	RoHS	QUL	L36, L39
5	SMT power inductor, 3.3uH, 20%, 0.138ohm, 1.7A (30% drop), 75.6MHz	SMD2.5x3	Coilcraft	ME3220-332ML	Coilcraft	ME3220-332ML	RoHS	QUL	L22, L34, L38, L40, L41
1	ACM7060-701-2PL, 4A Common mode power filter	SMD6x7	TDKs	ACM7060-701-2PL	Farnell	1503724	RoHS	QUL	TR3
2	MABA-007159, 4.5 - 3000 MHz, 1:1 transmission line transformer	SM-22	Tyco/Macom	MABA-007159-000000	Richardson		RoHS	QUL	TR1, TR2
1	50WQ03FN, 5A 30V schottky diode	DPAK		50WQ03FN	Elfa	70-238-07	RoHS	QUL	D23

Table 1. Bill of Materials (continued)

QTY	Description	Package	Manufacturer	Manufacturer PN	Supplier	Supplier PN	Regulatory	Status	Designators
16	BB184, UHF low-voltage varactor, 2-14 pF, max 10V	SC79	NXP	BB184	Mouser	771-BB184-T/R	RoHS	QUL	D1, D2, D3, D4, D5, D6, D7, D8, D9, D10, D11, D12, D13, D14, D15, D16
2	BAV99W, dual diode, common anode/cathode, 0.15A, 85V	SOT323	NXP	BAV99W	Elfa	70-300-83	RoHS	QUL	D24, D25
1	BC847W, NPN transistor, 0.2A, 0.2W, 45V, hFE=110-800	SOT323			Elfa	71-304-04	RoHS	QUL	Q2
3	MMBT3904WT, NPN transistor, 0.2A, 0.15W, 40V, hFE=40-300	SOT323	ON Semiconductor	MMBT3904WT1G	Farnell	1459102	RoHS	QUL	Q1, Q5, Q6
2	BC817-25, NPN transistor, 0.5A, 0.25W, 45V, hFE=160-400	SOT23			Farnell	9558608	RoHS	QUL	Q3, Q4
4	Green LED, 16mcd, 0603	0603	Everlight	EL19-21SYGC	Elfa	75-312-47	RoHS	QUL	D19, D20, D21, D22
2	Red LED, 19mcd, 0603	0603	Everlight	EL19-21SDRC	Elfa	75-308-01	RoHS	QUL	D17, D18
1	XC5VSX50T-3FFG665C, Virtex 5 FPGA	BGA FF665	Xilinx	XC5VSX50T-3FFG665C			RoHS	QUL	U20
1	AT45DB321D, 32 Mbit FPGA config memory	SO8W	Atmel	AT45DB321D-SU	Farnell	1455042	RoHS	QUL	U29
1	DS2432, 1-kbit protected 1-wire EEPROM with SHA-1 engine	TSOC8	Maxim	DS2432			RoHS	QUL	U33
2	PTH08080W, 2.2A DC/DC module, 4.5-18V in, 0.9-5.5V out	SMD	Texas Instruments	PTH08080WAZ	Digikey	296-20433-ND	RoHS	QUL	U28, U34
4	REG104GA-3.3G4, 3.3V LDO, 1A max, 480mV drop	SOT223-6	Texas Instruments	REG104GA-3.3G4	Farnell	1207259	RoHS	QUL	U11, U14, U22, U23
1	LP2980-ADJ, adjustable LDO, 50 mA, max 16V in	SOT23-5	National Semiconductor	LP2980IM5-ADJ	Elfa	73-269-76	RoHS	QUL	U25
2	PTH08T231WAZ, 6A DC/DC module, 4.5-14V in, 0.7-5.5V out, cer cap	SMD	Texas Instruments	PTH08T231WAZ	Digikey	296-21589-ND	RoHS	QUL	U26, U31
2	TPS72301, 200mA negative LDO, -2.7--10V in, -1.2--9.5V out	SOT23-5	Texas Instruments	TPS72301DBVTG4	Farnell	1207336	RoHS	QUL	U1, U2
2	REG104GA-5G4, 5.0V LDO, 1A max, 580mV drop	SOT223-6	Texas Instruments	REG104GA-5G4	Farnell	1207261	RoHS	QUL	U4, U24
4	TLV2371, opamp, 2.7 - 16V, RRIO, 3 MHz, 6 mV offset	SOT23-5	Texas Instruments	TLV2371IDBVT	Farnell	8454990	RoHS	QUL	U13, U16, U18, U19

Table 1. Bill of Materials (continued)

QTY	Description	Package	Manufacturer	Manufacturer PN	Supplier	Supplier PN	Regulatory	Status	Designators
4	ADS54RF63, 12-bit 550 MSPS ADC	HTQFP80	Texas Instruments	ADS54RF63IPFP			RoHS	QUL	U3, U5, U8, U10
4	DAC7311, 12-bit serial DAC	SC70-6	Texas Instruments	DAC7311DCK	Farnell	1661399	RoHS	QUL	U12, U15, U17, U21
1	CFPS-32, 50 MHz crystal oscillator, 2.5V	SMD7x5	C-MAC	CFPS-32IB 50.0MHz	Farnell	1276663	RoHS	QUL	U30
3	ADCLK925 6 GHz 1->2 ECL clock fanout buffer	LFCSP16	Analog Devices	ADCLK925BCPZ	Digikey	ADCLK925BCPZ-R7CT-ND	RoHS	QUL	U6, U7, U9
1	FT232RQ, USB 1.1 serial port	QFN32	FTDI chip	FT232RQ	Farnell	1146033	RoHS	QUL	U37
2	TPS3809K33, 3.3V reset circuit, active low, 2.93 V trip point	SOT23-3	Texas Instruments	TPS3809K33DBV	Farnell	1287661	RoHS	QUL	U27, U32
1	LM95234, quad remote diode temp sensor	LLP14	National	LM95234CISD	Farnell	1554779	RoHS	QUL	U36
1	TC655, dual SMBus fan controller/temp sensor	MSOP10	Microchip	TC655EUN	Mouser	579-TC655EUN	RoHS	QUL	U35
0	Retention module for E5405A pinless 17ch diff connector for Agilent logic analyzers	SMD	Agilent	E5403A (kit of 5)			RoHS	QUL	
2	SMA side launch connector, 17.45 mm overall length	SMD/hand	Multicomp	19-70-TGG	Farnell	1342651	RoHS	QUL	J1, J2
1	USB type B mini, pth	PTH	Molex	56579-0519	Molex	56579-0519	RoHS	QUL	J7
1	Power connector 2.1 mm pin , hole mounted	PTH	Cliff Electronic Components	DC10A	Farnell	224959 (10 pcs)	RoHS	QUL	J6
1	Pin header, 2x7, 2.0 mm spacing, shrouded	PTH	Molex	87831-1420	Digikey	WM17469-ND	RoHS	QUL	P1
0	Pin header, 1x2, 2.0 mm spacing	PTH					RoHS	QUL	
2	Molex 22-27-2021, 2-pin 2.54 mm with friction lock	PTH	Molex	22-27-2021	Farnell	9731148	RoHS	QUL	P2, P4
1	SMD Pushbutton, SPST, 1.6 N	SMD	ALPS	SKHUALE010	Elfa	35-790-00	RoHS	QUL	SW1
1	DIP-switch, 6PST	SMD-DIP	Taiway	DM-06	Elfa	35-404-65	RoHS	QUL	SW2

9 Layout

The layout pages are appended to the end of this user's guide.

10 Schematic

The schematic pages are appended to the end of this user's guide.

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Texas Instruments (TI) provides the enclosed product(s) under the following conditions:

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EVM Warnings and Restrictions

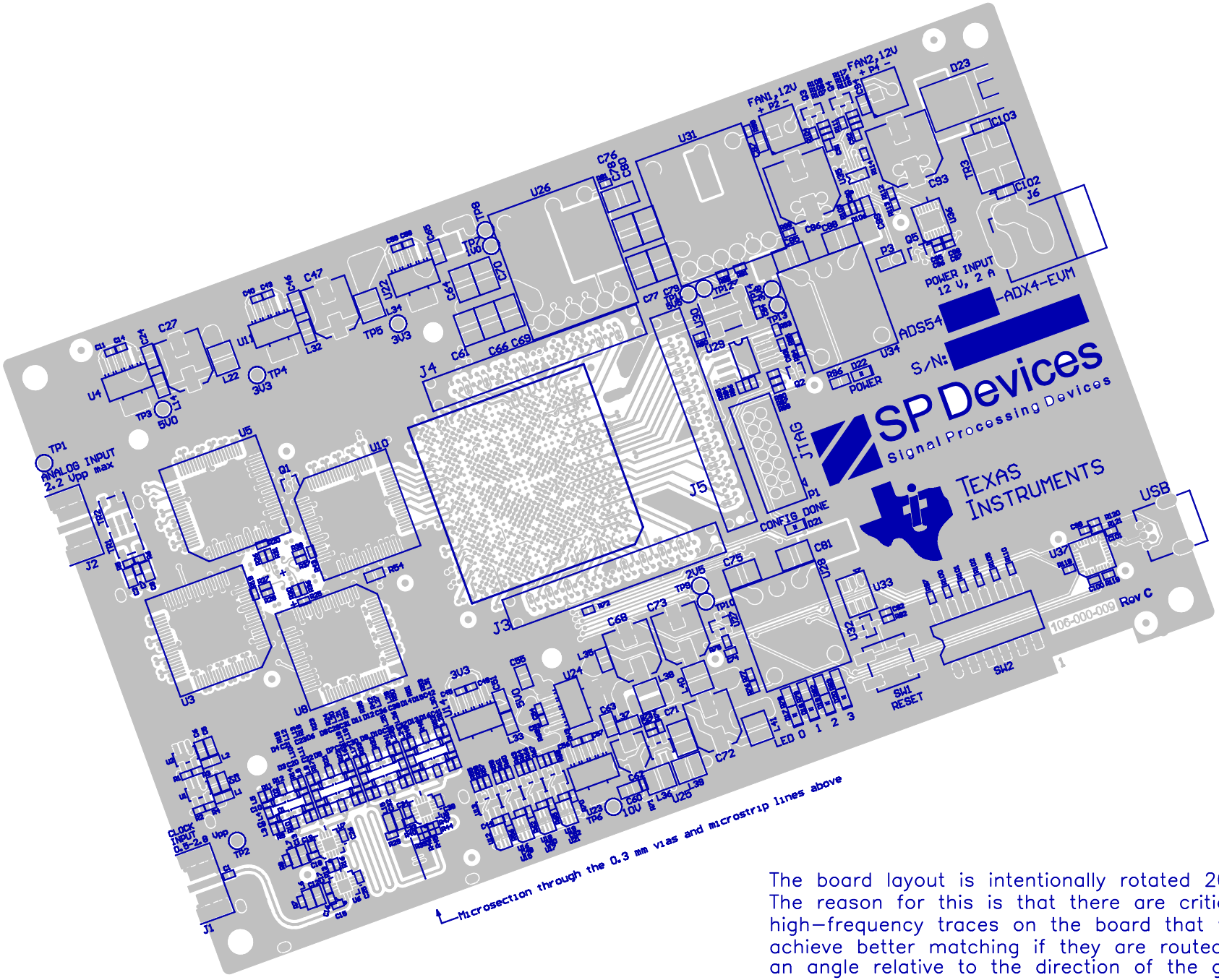
It is important to operate this EVM within the input voltage range of 11V to 14V and the output voltage range of -0.3V to 5.5V .

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

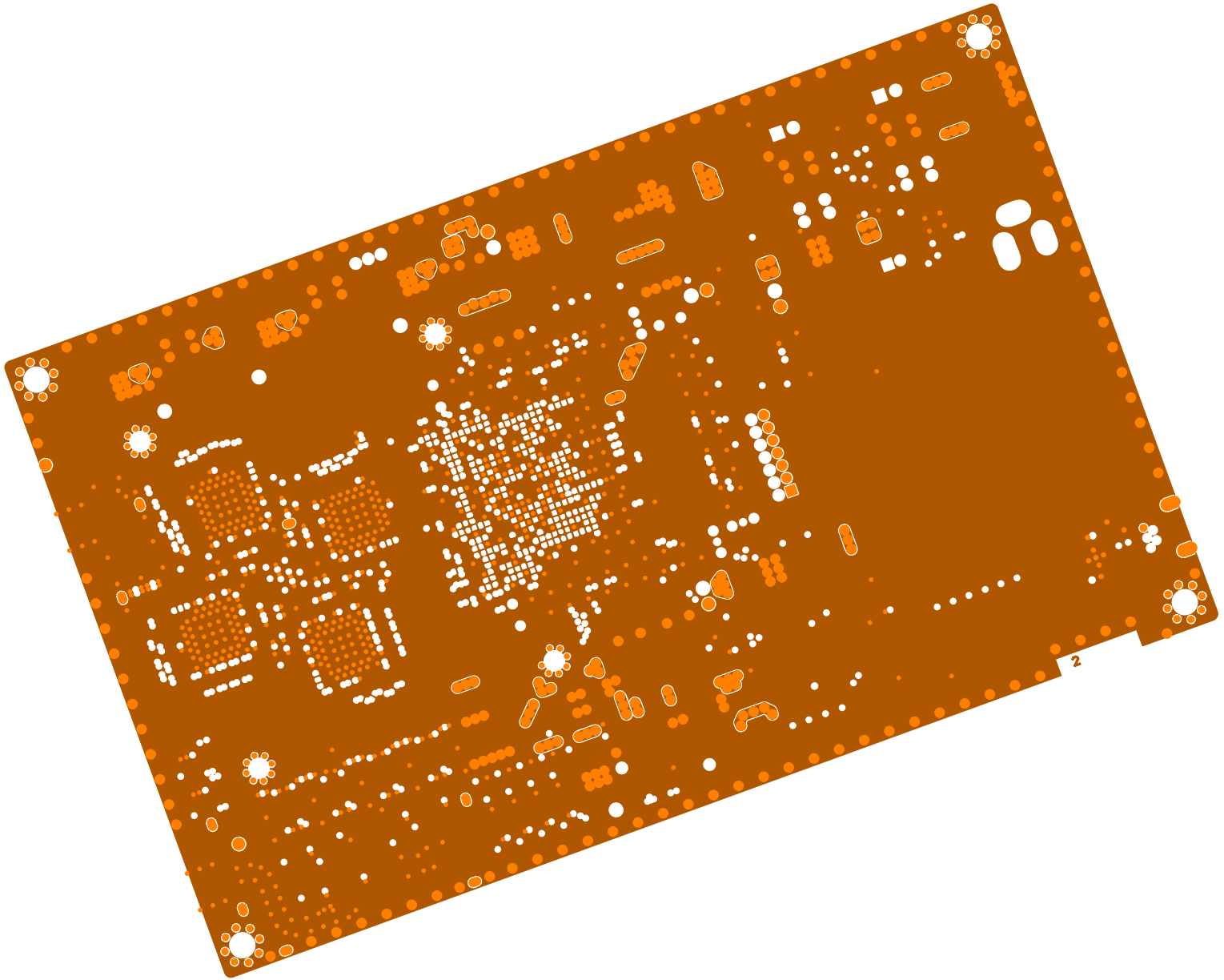
During normal operation, some circuit components may have case temperatures greater than 65°C. The EVM is designed to operate properly with certain components above 65°C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265

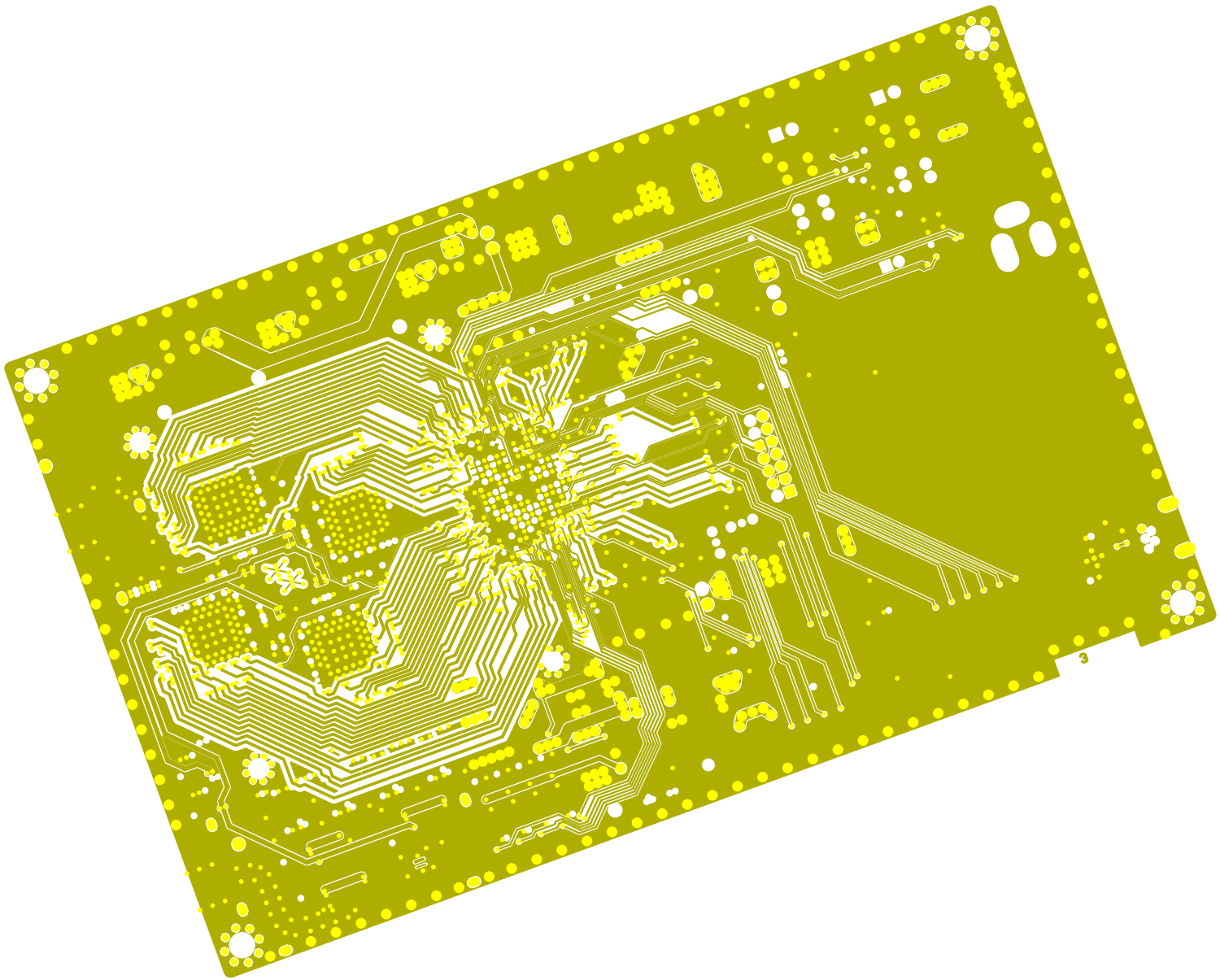


The board layout is intentionally rotated 20 degrees. The reason for this is that there are critical high–frequency traces on the board that will achieve better matching if they are routed at an angle relative to the direction of the glass fibers.

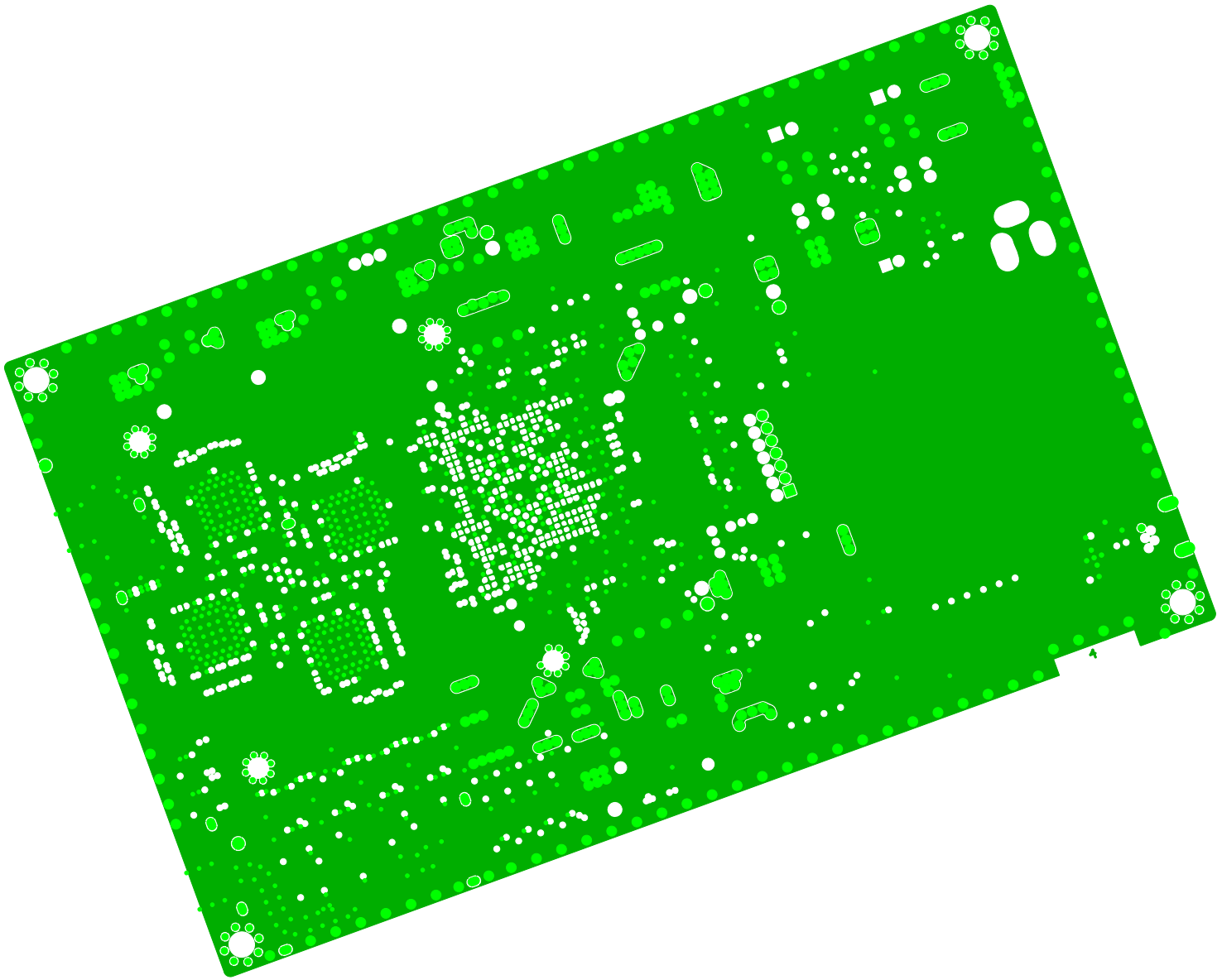
Please do not rotate the layout back. Let it stay in this angular position on the PCB panel.



Layer 2 (GND)



Layer 3



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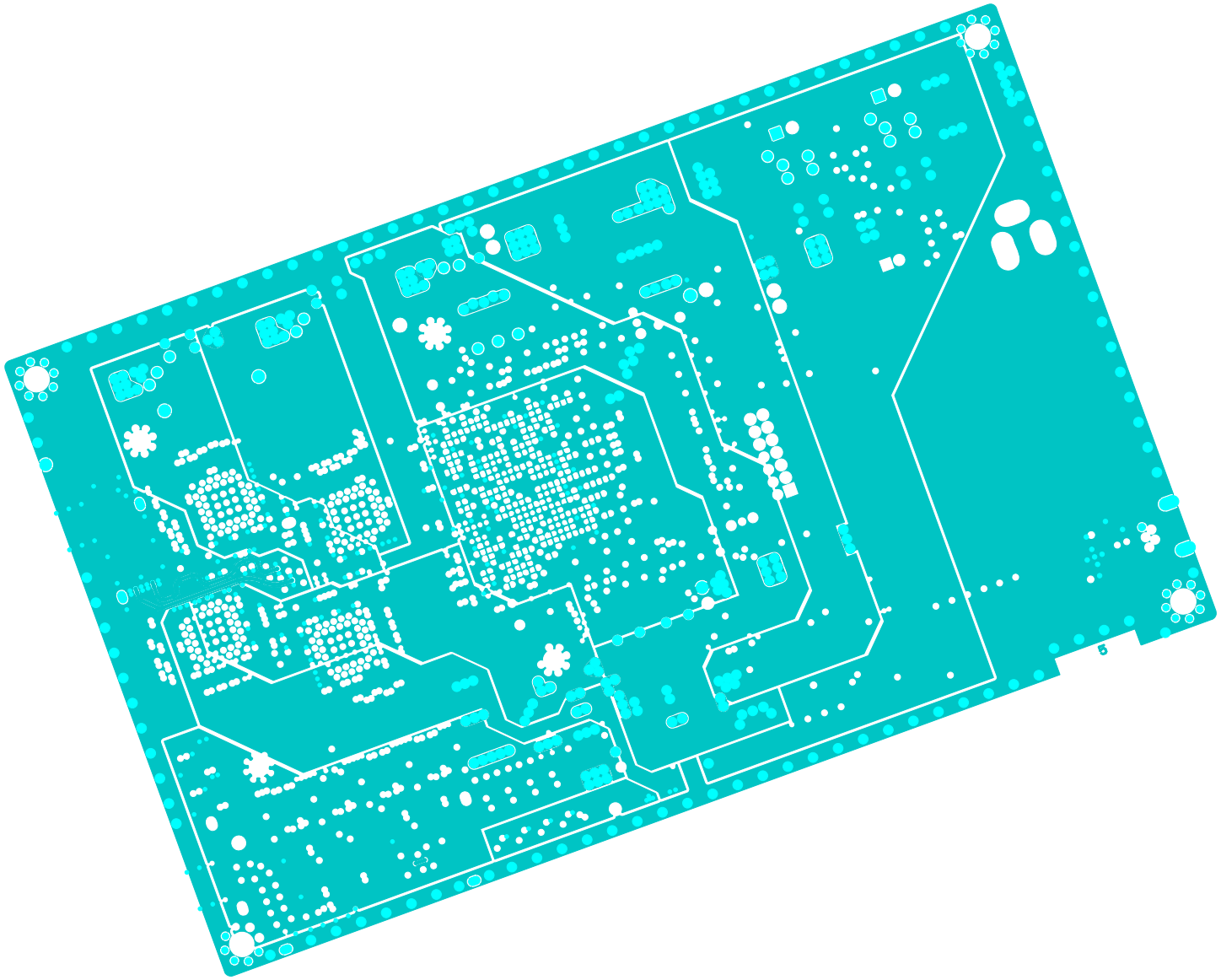
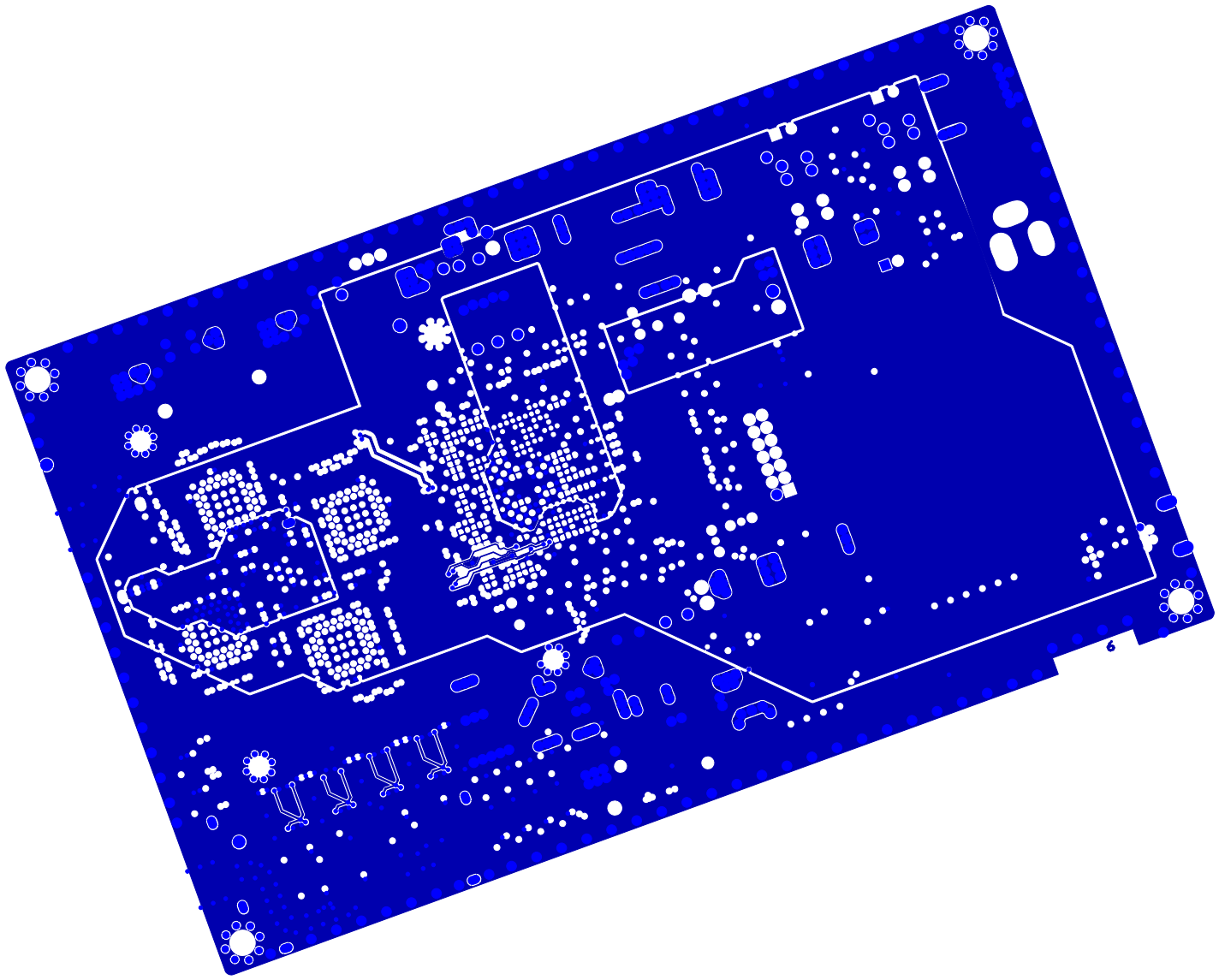
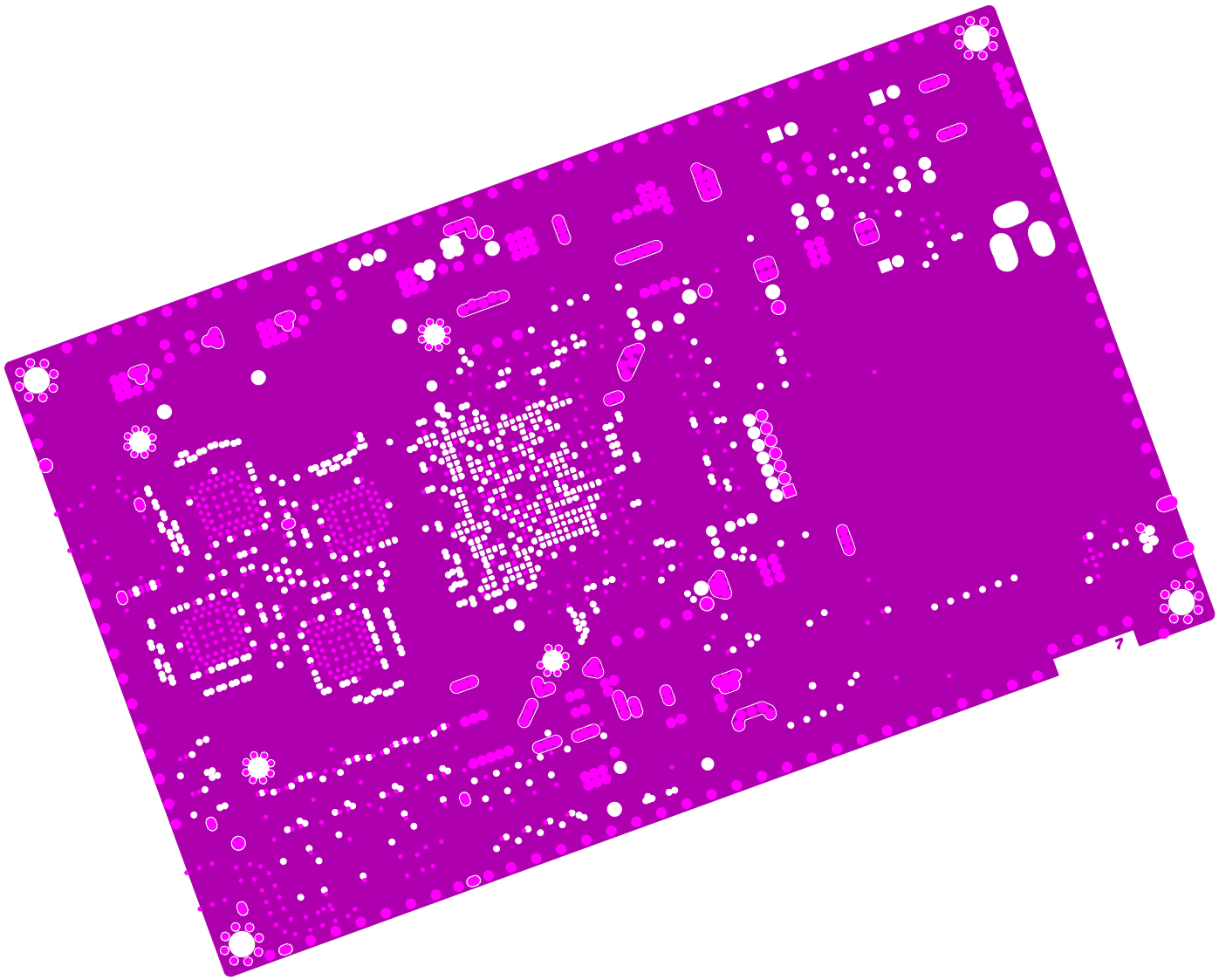


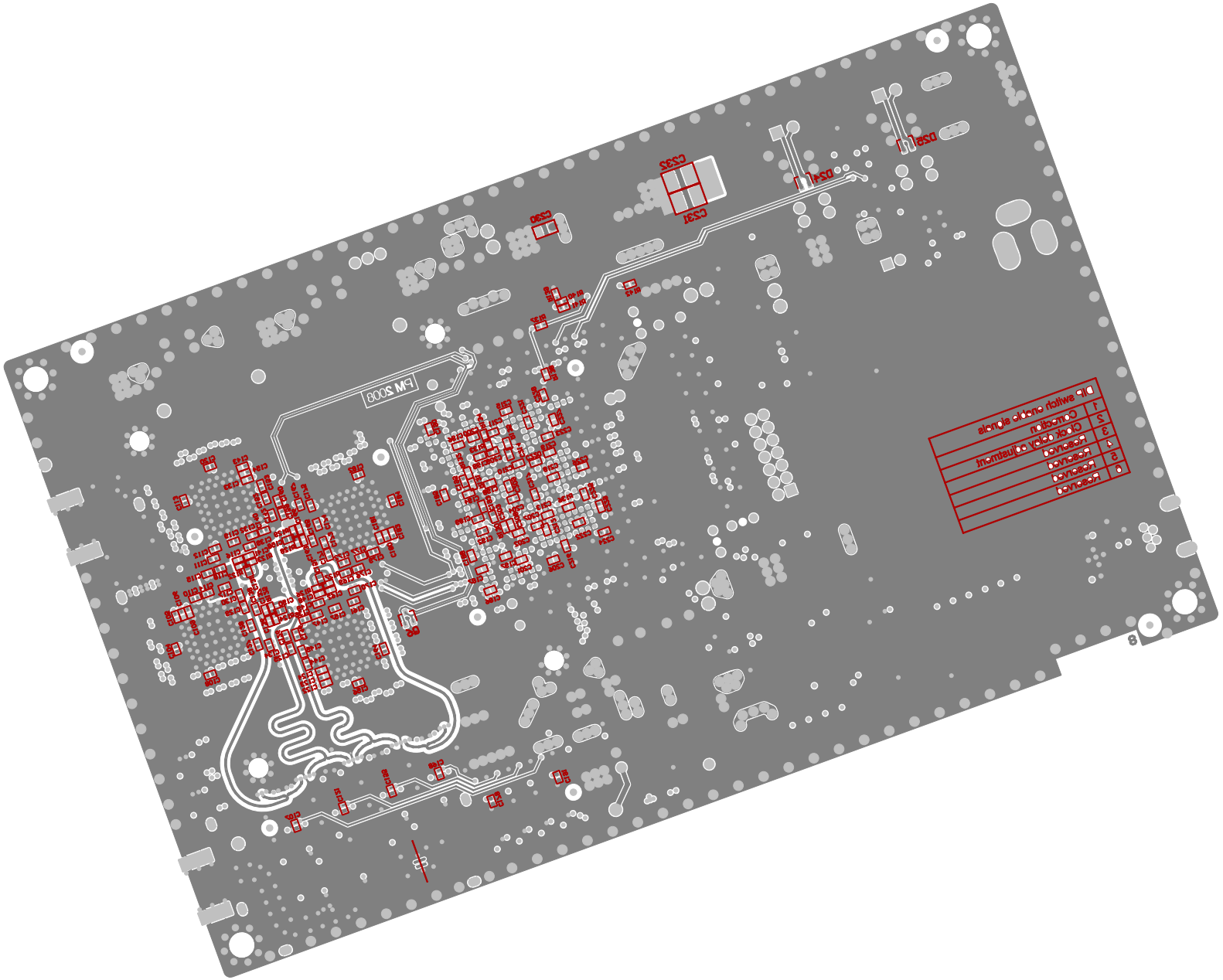
Layer 5



Layer 6



Layer7 (GND)



Layer 8 bottom

ADS54RF63 ADX4 EVM

Table of Contents

Project: ***ADS54RF63 ADX4 EVM***			
Title: ***Front Page***			
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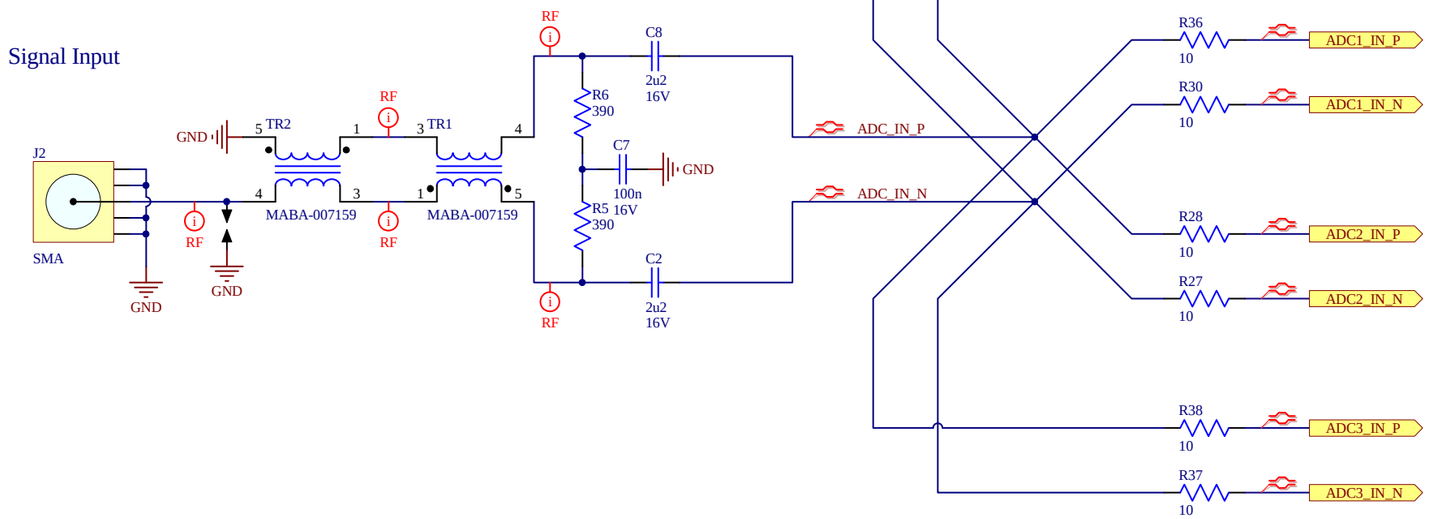
SP Devices
Signal Processing Devices

Frontend

Signal Input



Project: ***ADS54RF63 ADX4 EVM***			
Title: ***Frontend***			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
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SP Devices
Signal Processing Devices

ADC clock phase adjustment

1-10V on bias gives from 290 ps to 190 ps delay

Clock Input

J1 SMA — CLK_IN — ADCCLK — C1 100n 16V — CLK_IN_AC

C15 100n 16V, C16 100n 16V

U6A ADCLK925BCPZ: VREF, VT (50 / 50), D/D, Q1/Q1, Q2/Q2

CLKB1_P, CLKB1_N, CLKB2_P, CLKB2_N

455 ps delay line

170 ps delay line — R44 NM 0, R45 0, R46 0, R39 NM 0, R47 NM 0, R40 NM 0 — CLK2SE_N, CLK2SE_P

455 ps = 90 deg @ 550 MHz

625 ps = 90 deg @ 400 MHz

VTTCLK1 — C18 100n 16V — C33 100n 16V

U7A ADCLK925BCPZ: CLKB3_P, CLKB3_N

U9A ADCLK925BCPZ: CLKB4_P, CLKB4_N

R13 0, R16 0

CLKB_0_P, CLKB_0_N, CLKB_180_N, CLKB_180_P, CLKB_270_N, CLKB_270_P, CLKB_90_P, CLKB_90_N

ADCCLK

L3 2n7, L4 5n6, L5 2n7, L8 2n7, L9 2n7, L10 5n6, L11 5n6, L12 2n7, L13 2n7, L16 2n7, L17 2n7, L18 5n6, L19 5n6, L20 2n7, L21 2n7, L23 2n7, L24 2n7, L25 5n6, L26 5n6, L27 2n7, L28 2n7, L29 2n7, L30 5n6, L31 2n7

C9 4p7 50V, C10 4p7 50V, C20 4p7 50V, C21 4p7 50V, C22 4p7 50V, C23 4p7 50V, C28 4p7 50V, C29 4p7 50V, C30 4p7 50V, C31 4p7 50V, C35 4p7 50V, C36 4p7 50V, C37 4p7 50V, C38 4p7 50V, C41 4p7 50V, C42 4p7 50V

R9 100k, R11 100k, R14 100k, R15 100k, R17 100k, R18 100k, R22 100k, R24 100k, R33 100k, R34 100k, R41 100k, R42 100k, R49 100k, R50 100k, R52 100k, R53 100k

D1 BB184, D2 BB184, D3 BB184, D4 BB184, D5 BB184, D6 BB184, D7 BB184, D8 BB184, D9 BB184, D10 BB184, D11 BB184, D12 BB184, D13 BB184, D14 BB184, D15 BB184, D16 BB184

R10 100k, R12 100k, R21 100k, R23 100k, R32 100k, R35 100k, R48 100k, R51 100k

DLY_BIAS_0, DLY_BIAS_180, DLY_BIAS_270, DLY_BIAS_90

C107 100n 16V, C121 100n 16V, C155 100n 16V, C168 100n 16V

GND

CLK_0_P, CLK_0_N, CLK_180_N, CLK_180_P, CLK_270_N, CLK_270_P, CLK_90_P, CLK_90_N

VCC3V3CLK — R8 1, R7 1, R29 1 — L7 74279265 600ohm, L6 74279265 600ohm, L15 74279265 600ohm

VCC3V3CLK1, VCC3V3CLK2, VCC3V3CLK3

C13 1u 25V, C26 100n 16V, C19 100n 16V, C12 1u 25V, C25 100n 16V, C17 100n 16V, C32 1u 25V, C39 100n 16V, C34 100n 16V

U7B ADCLK925BCPZ, U6B ADCLK925BCPZ, U9B ADCLK925BCPZ: 2V5 - 3V3, VCC, VEE, NC, NC-PAD

Project: *ADS54RF63 ADX4 EVM*			
Title: *ADC Clocking*			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
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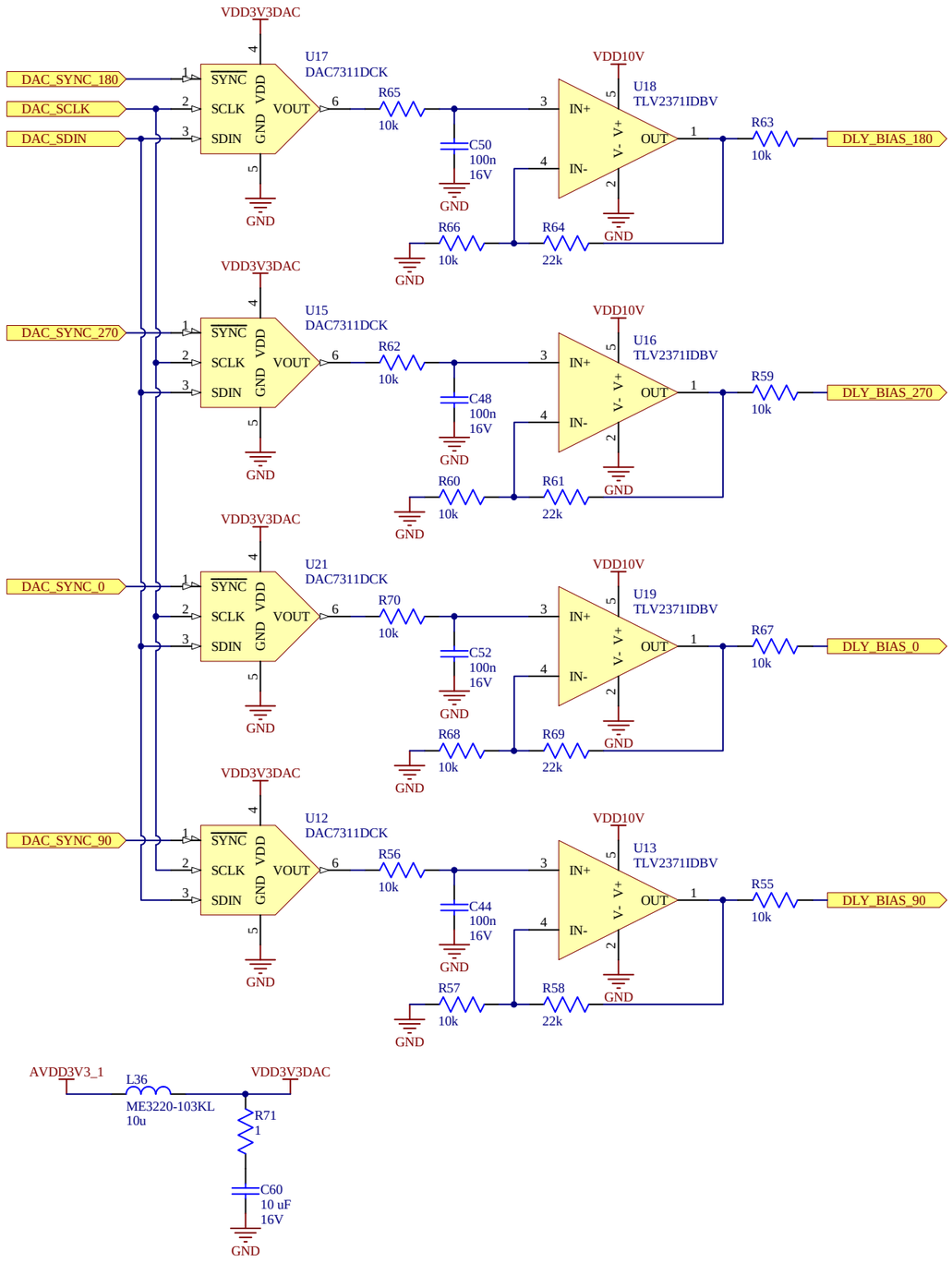
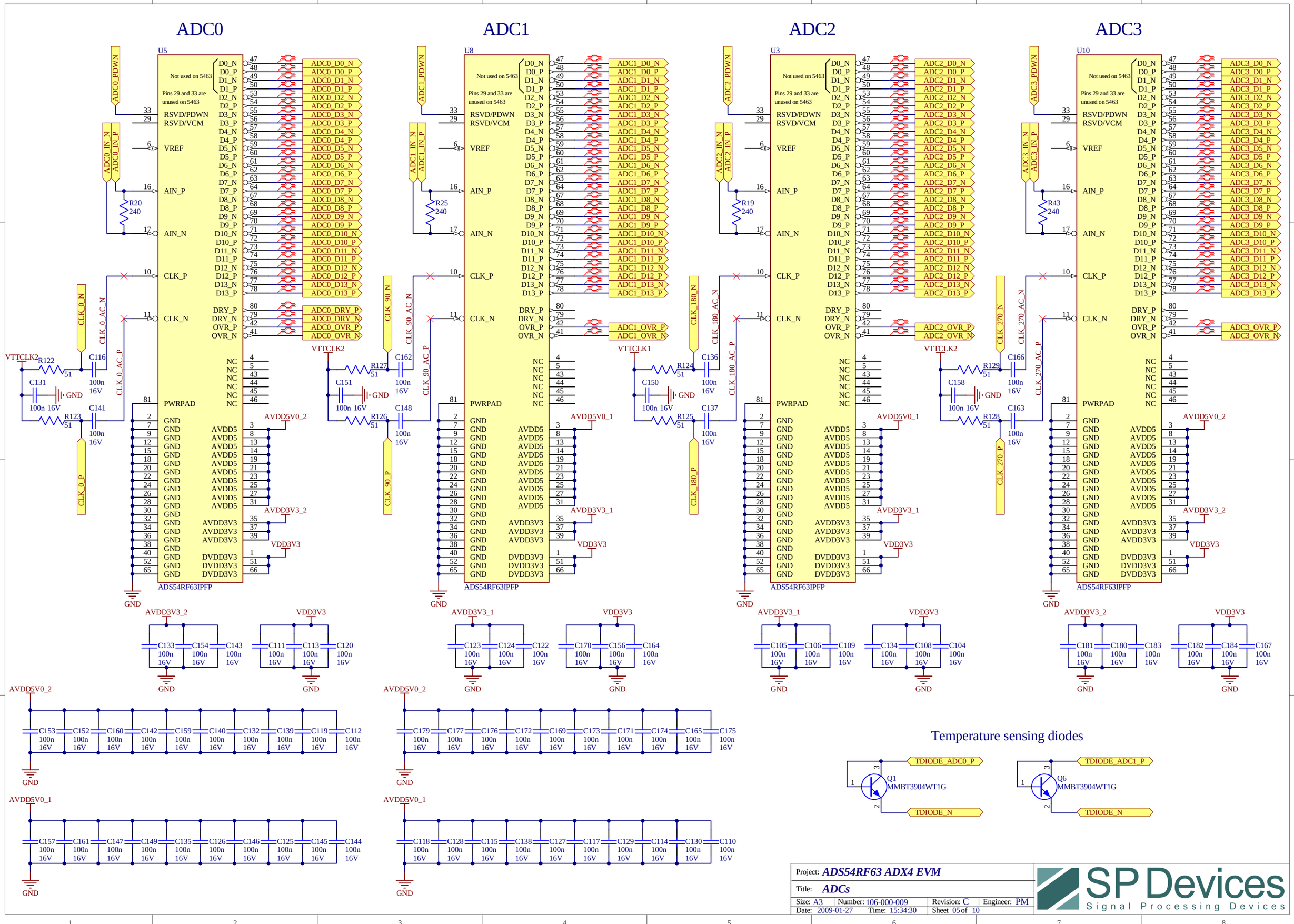
SP Devices — Signal Processing Devices

Delay line bias DACs



Project: *ADS54RF63 ADX4 EVM*			
Title: *Delay Line DACs*			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
Date: 2009-01-27	Time: 15:34:30	Sheet 04 of 10	

SP Devices
Signal Processing Devices


ADC0
ADC1
ADC2
ADC3
U5
U8
U3
U10
Not used on 5463
Pins 29 and 33 are unused on 5463
RSVD/PDWN
RSVD/VCM
VREF
AIN_P
AIN_N
CLK_P
CLK_N
PWRPAD
DRY_P
DRY_N
OVR_P
OVR_N
ADS54RF63IPFP
ADC0_PDWN
ADC1_PDWN
ADC2_PDWN
ADC3_PDWN
ADC0_IN_N
ADC0_IN_P
ADC1_IN_N
ADC1_IN_P
ADC2_IN_N
ADC2_IN_P
ADC3_IN_N
ADC3_IN_P
R20 240
R25 240
R19 240
R43 240
CLK_0_N
CLK_0_AC_N
CLK_0_AC_P
CLK_0_P
CLK_90_N
CLK_90_AC_N
CLK_90_AC_P
CLK_90_P
CLK_180_N
CLK_180_AC_N
CLK_180_AC_P
CLK_180_P
CLK_270_N
CLK_270_AC_N
CLK_270_AC_P
CLK_270_P
VTTCLK2
VTTCLK1
R122 51
R123 51
R126 51
R127 51
R124 51
R125 51
R128 51
R129 51
C116 100n 16V
C131 100n 16V
C141 100n 16V
C148 100n 16V
C162 100n 16V
C151 100n 16V
C136 100n 16V
C150 100n 16V
C137 100n 16V
C166 100n 16V
C158 100n 16V
C163 100n 16V
GND
AVDD5V0_2
AVDD5V0_1
AVDD3V3_2
AVDD3V3_1
VDD3V3
C133 100n 16V
C154 100n 16V
C143 100n 16V
C111 100n 16V
C113 100n 16V
C120 100n 16V
C123 100n 16V
C124 100n 16V
C122 100n 16V
C170 100n 16V
C156 100n 16V
C164 100n 16V
C105 100n 16V
C106 100n 16V
C109 100n 16V
C134 100n 16V
C108 100n 16V
C104 100n 16V
C181 100n 16V
C180 100n 16V
C183 100n 16V
C182 100n 16V
C184 100n 16V
C167 100n 16V
C153 C152 C160 C142 C159 C140 C132 C139 C119 C112 100n 16V
C179 C177 C176 C172 C169 C173 C171 C174 C165 C175 100n 16V
C157 C161 C147 C149 C135 C126 C146 C125 C145 C144 100n 16V
C118 C128 C115 C138 C127 C117 C129 C114 C130 C110 100n 16V
Temperature sensing diodes
TDIODE_ADC0_P
TDIODE_ADC1_P
TDIODE_N
Q1 MMBT3904WT1G
Q6 MMBT3904WT1G
Project: ADS54RF63 ADX4 EVM
Title: ADCs
Size: A3
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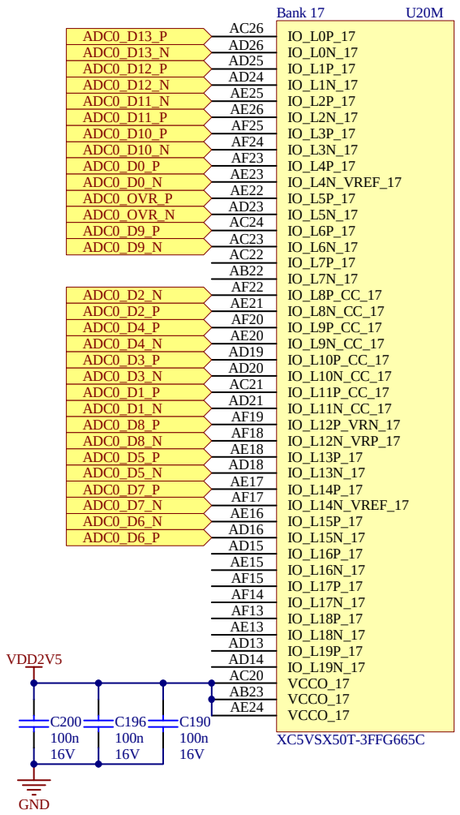
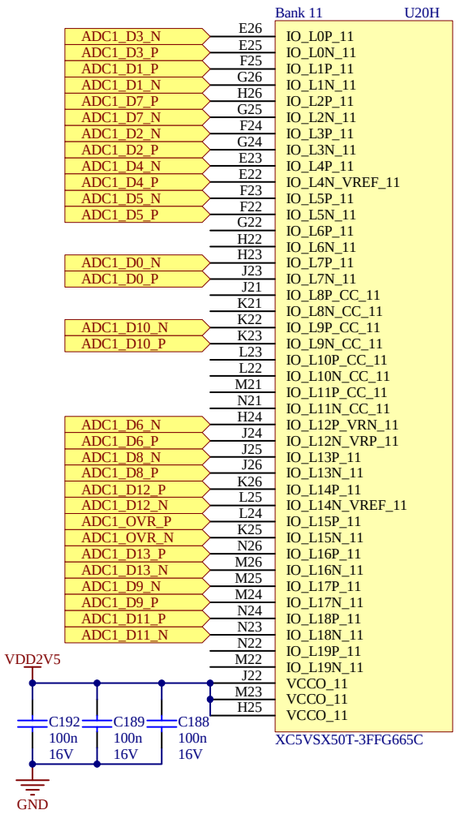
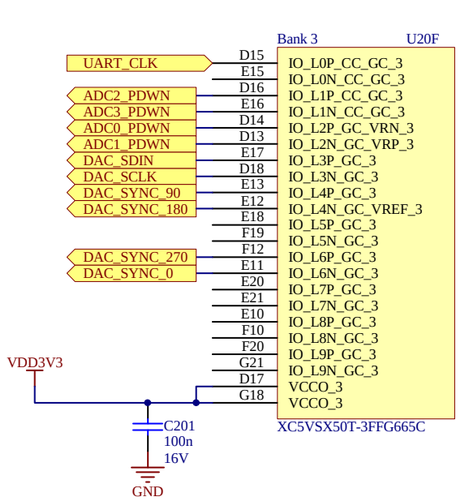
SP Devices
Signal Processing Devices

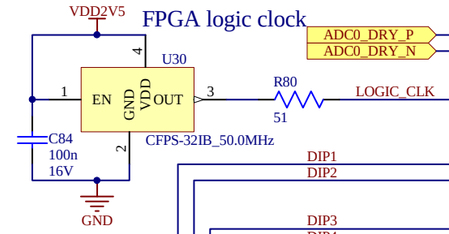
FPGA IO

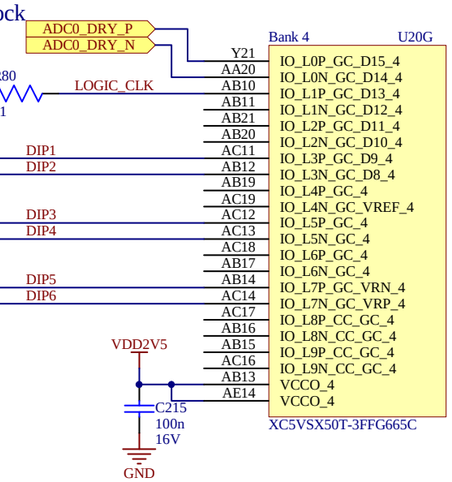




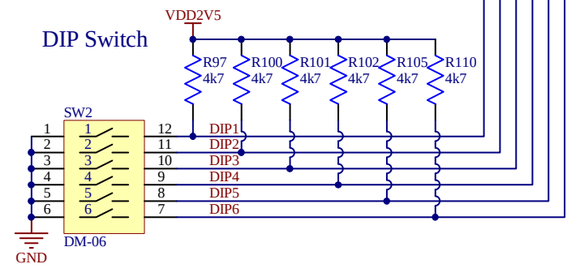


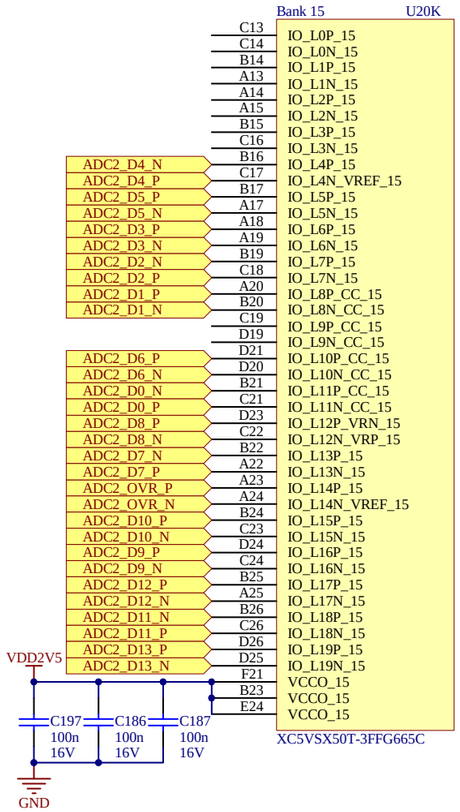
FPGA logic clock

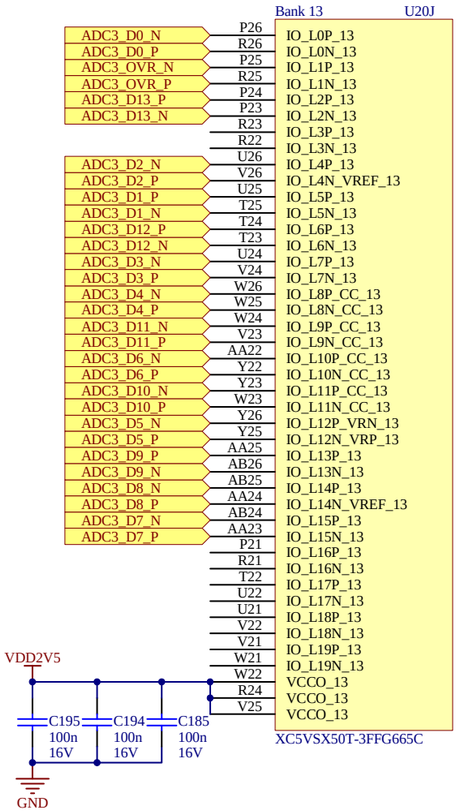




DIP Switch



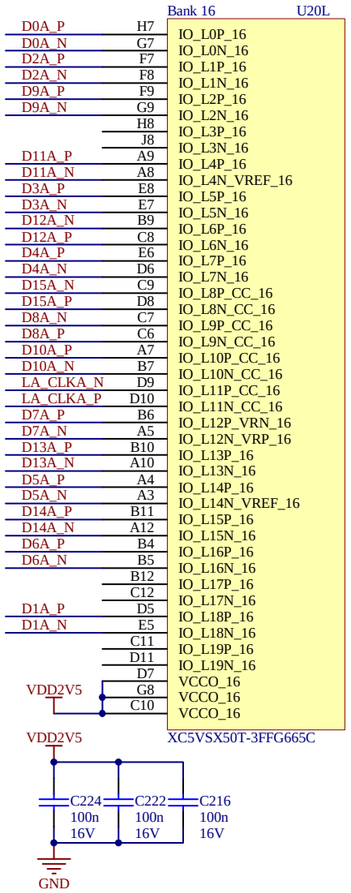


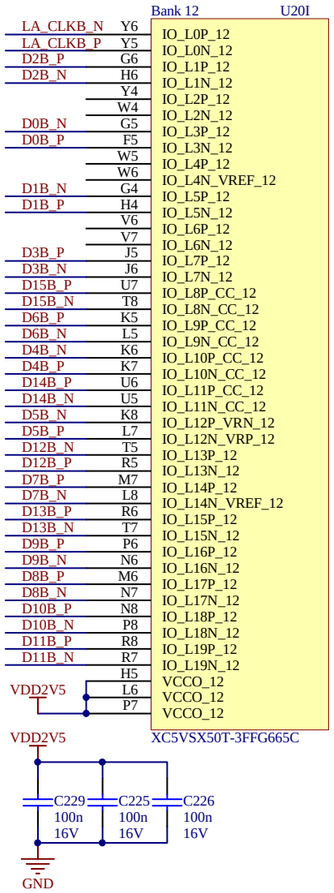


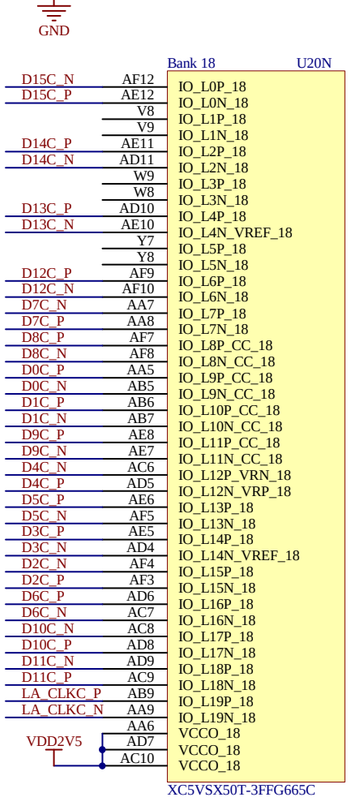
Project: *ADS54RF63 ADX4 EVM*			
Title: *FPGA IO*			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
Date: 2009-01-27	Time: 15:34:31	Sheet 06 of 10	

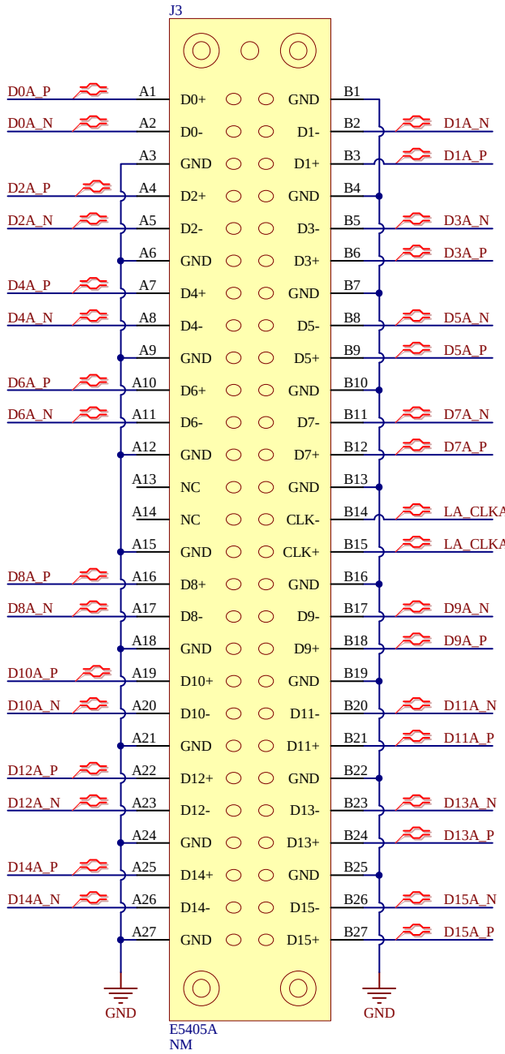
SP Devices
Signal Processing Devices

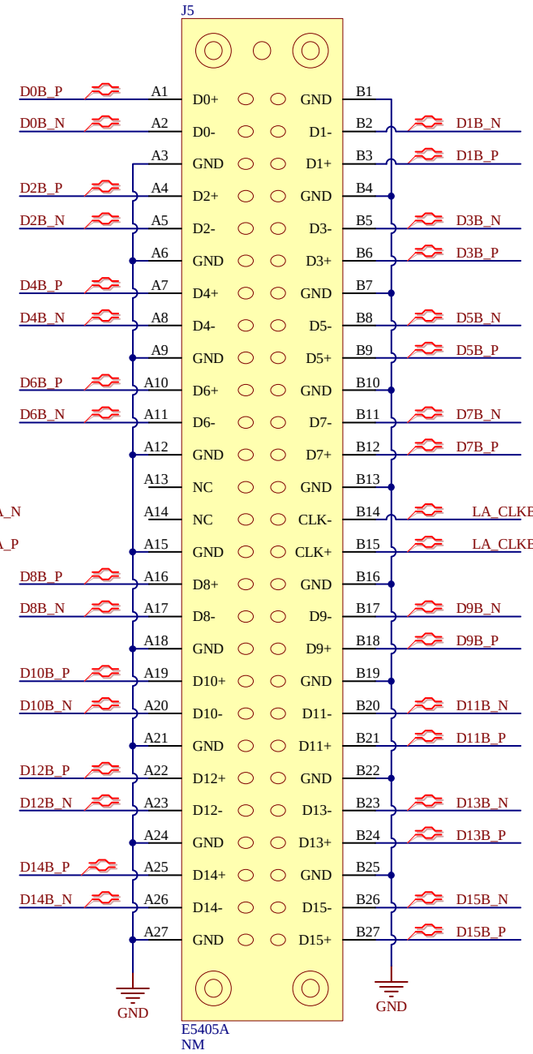
Logic Analyzer Connectors

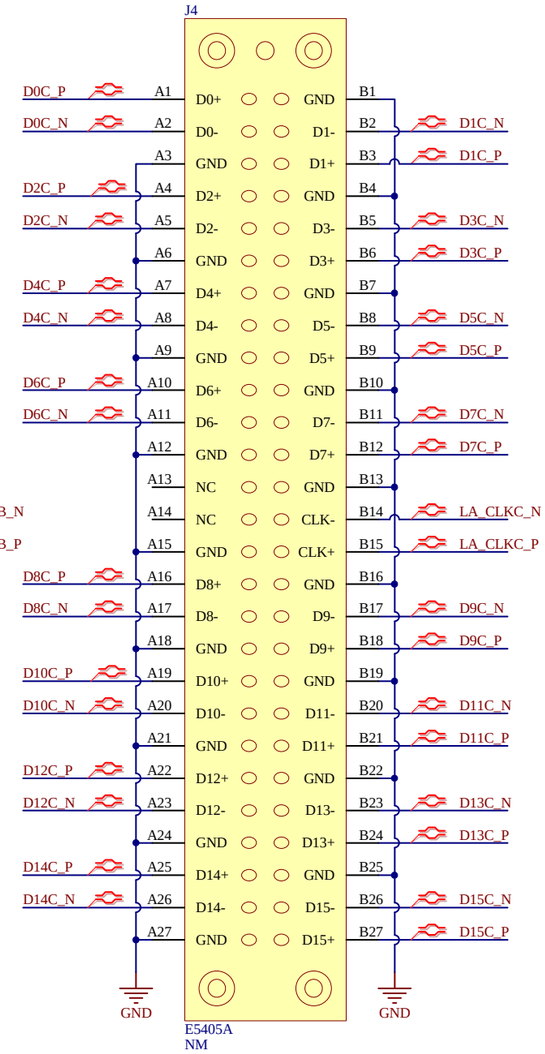












Project: *ADS54RF63 ADX4 EVM*			
Title: *Logic Analyzer Connectors*			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
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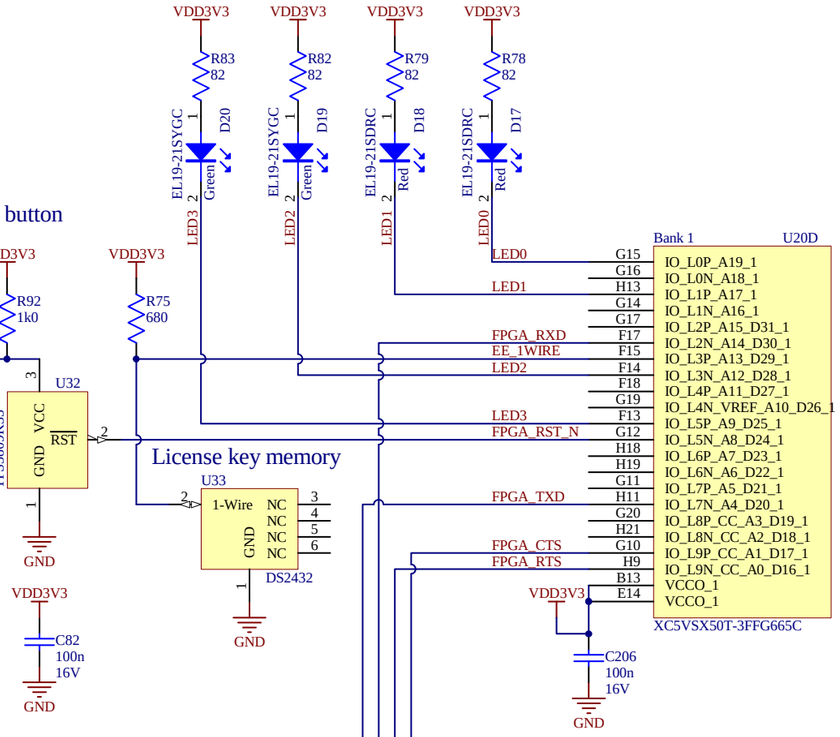
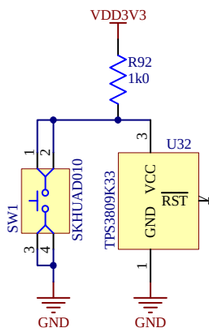
SP Devices
Signal Processing Devices

FPGA System

LEDs

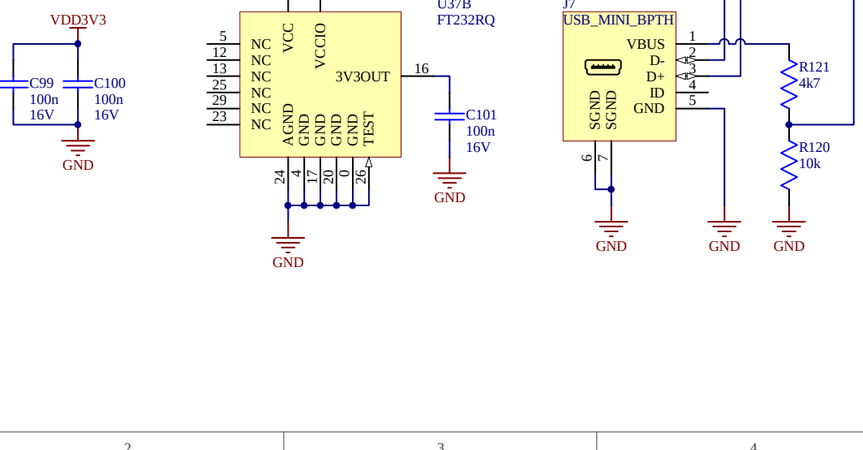


Reset button

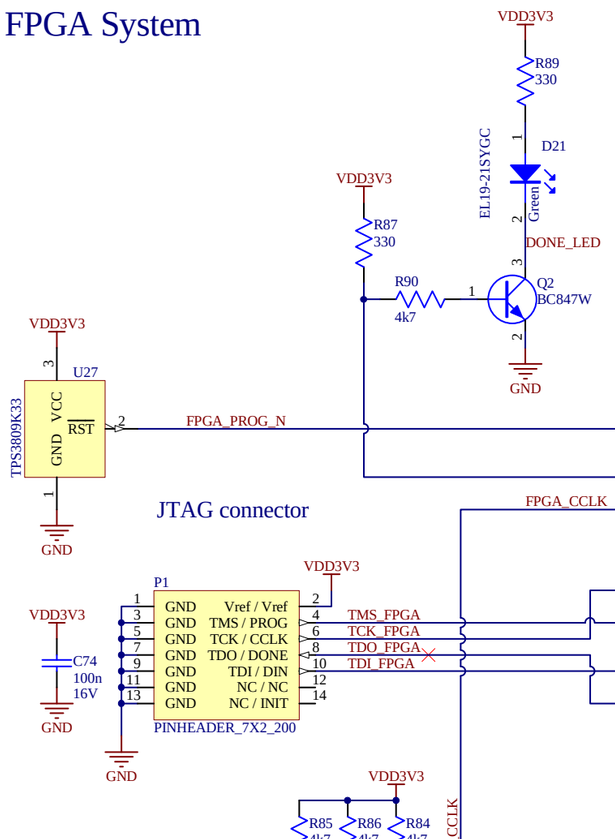


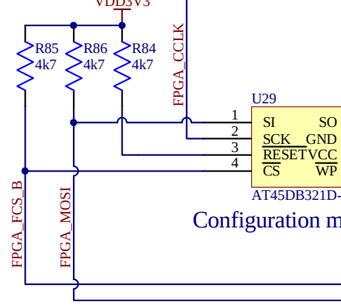
License key memory

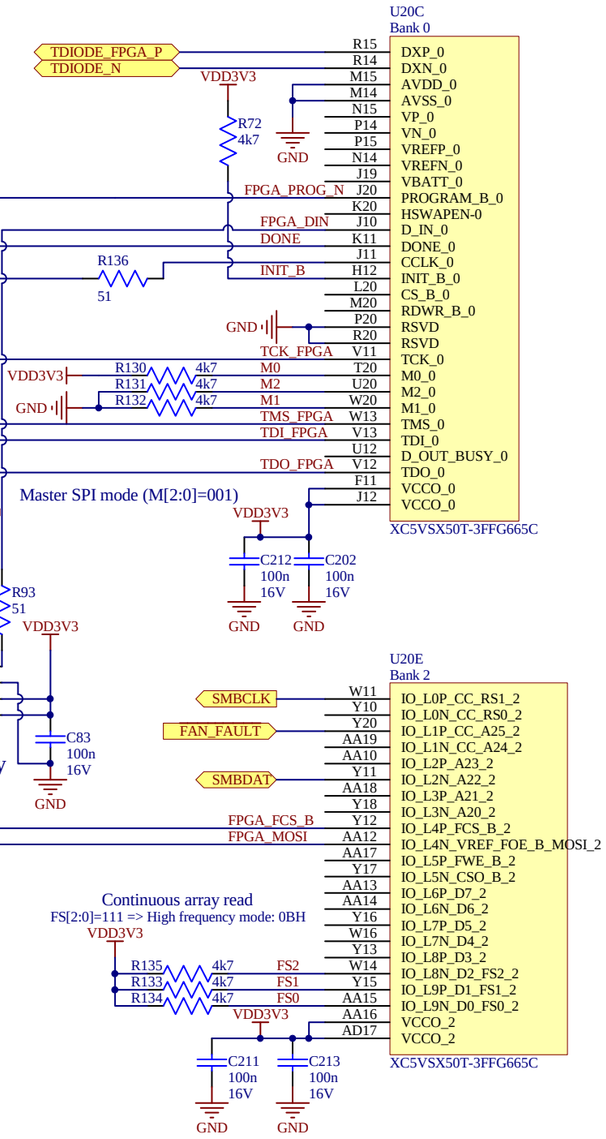
USB interface



JTAG connector







Project: *ADS54RF63 ADX4 EVM*			
Title: *FPGA System*			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
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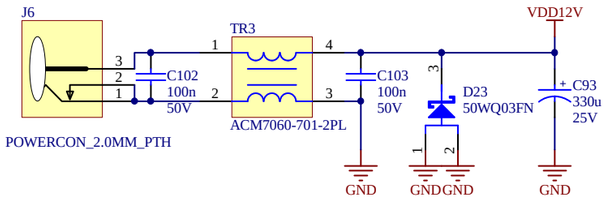
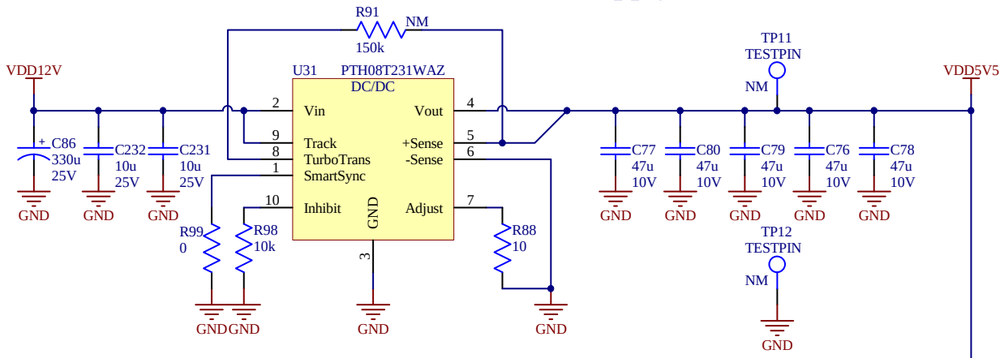
SP Devices
Signal Processing Devices

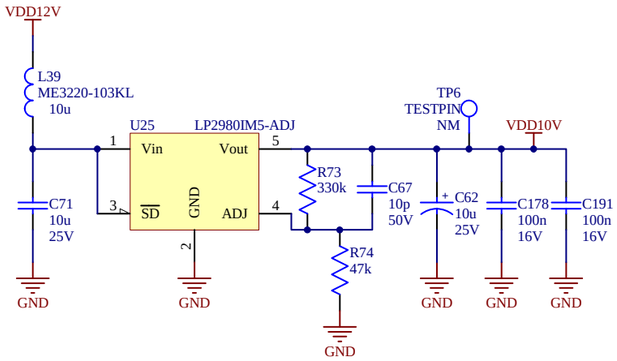
Power input connector

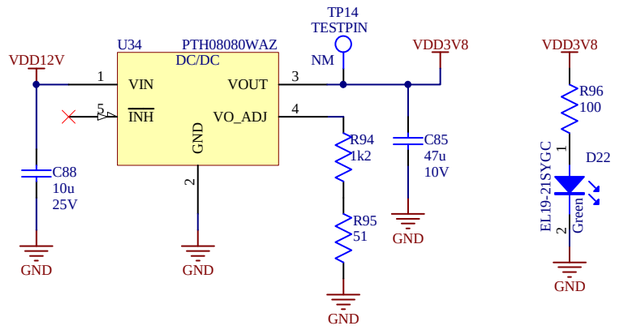
12V, 2A

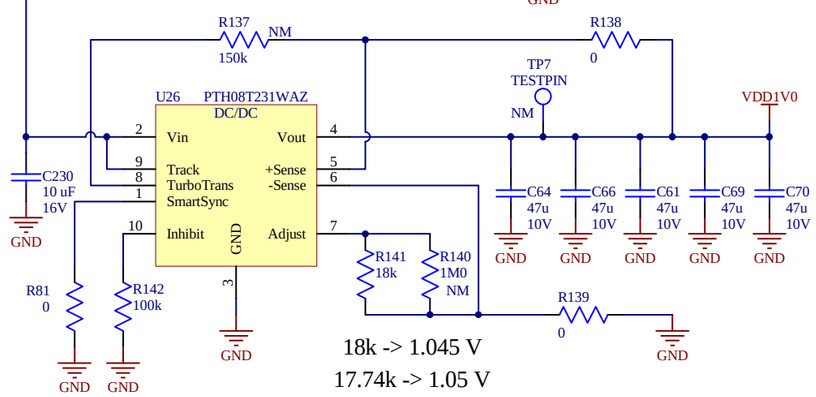


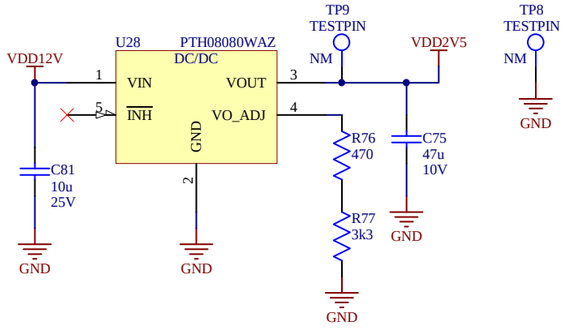
Power supply

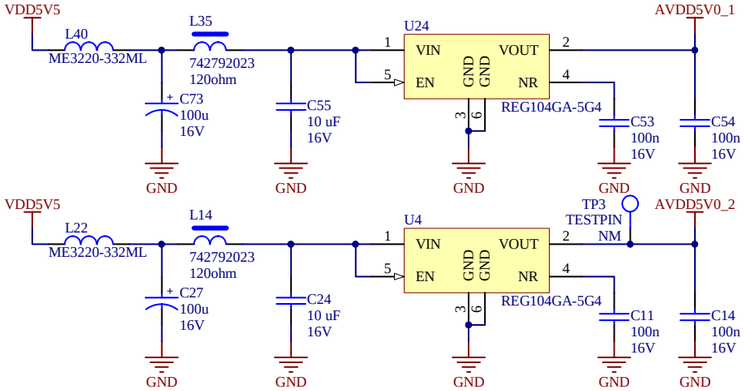


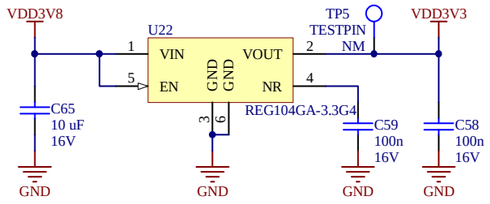


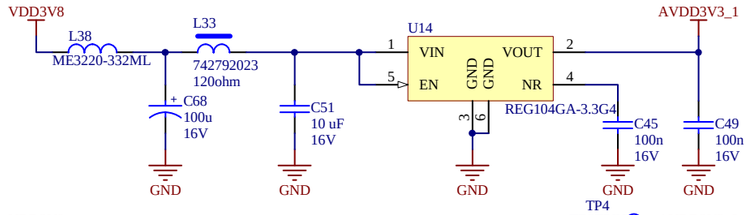


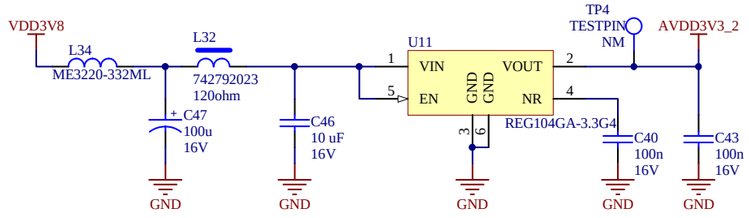


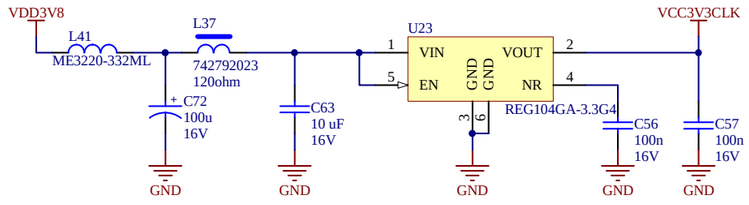


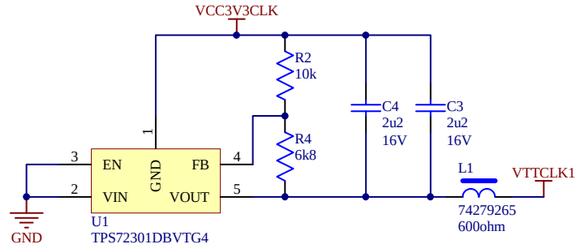


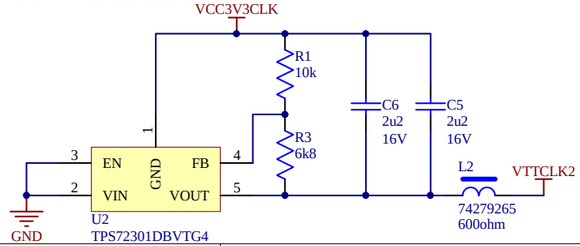


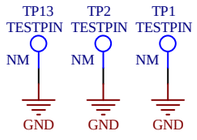












Project: ***ADS54RF63 ADX4 EVM***			
Title: ***Power***			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
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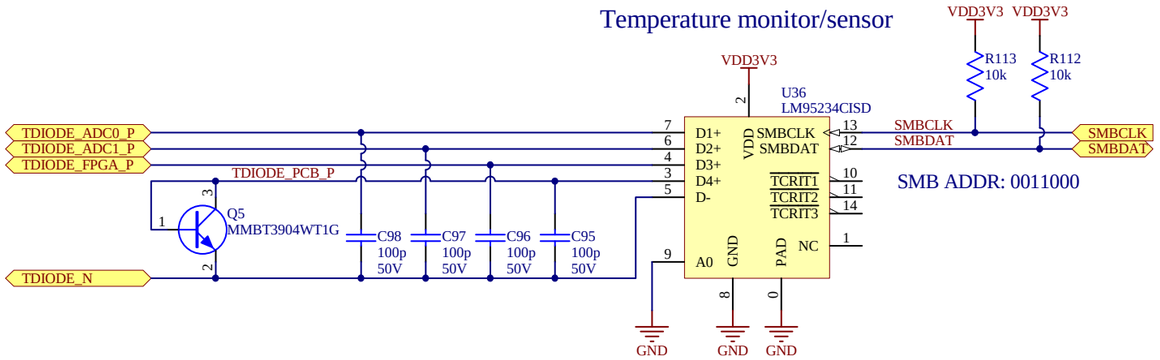
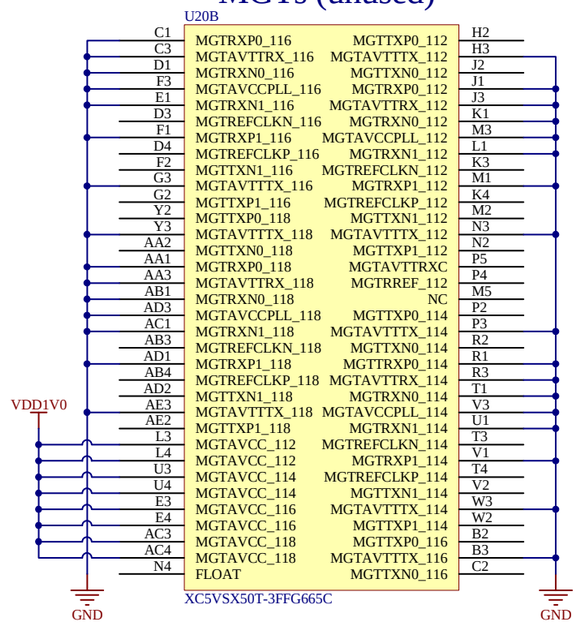
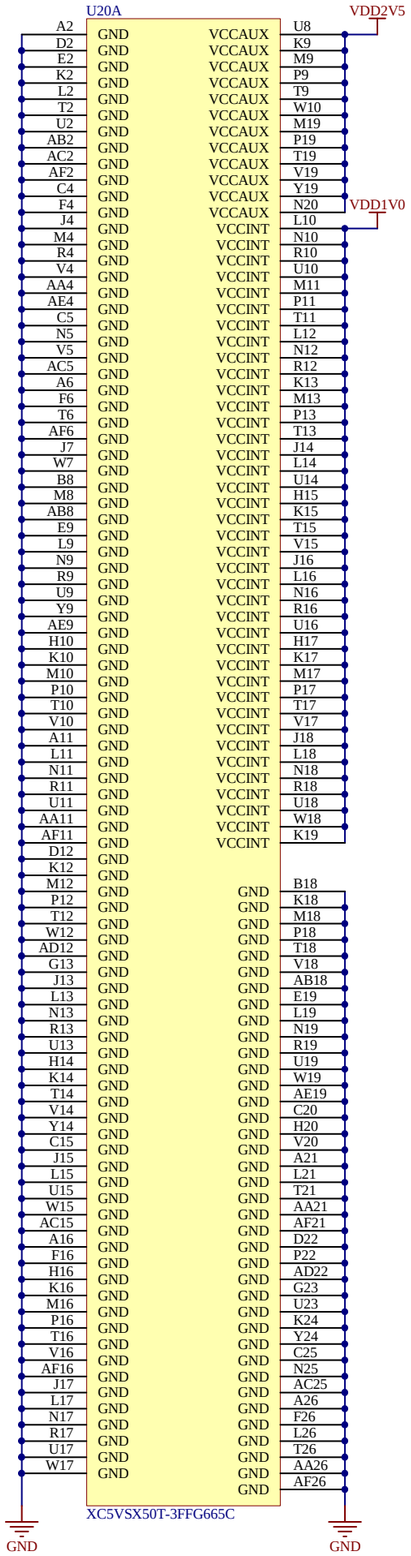
SP Devices
Signal Processing Devices

Temperature monitor/sensor

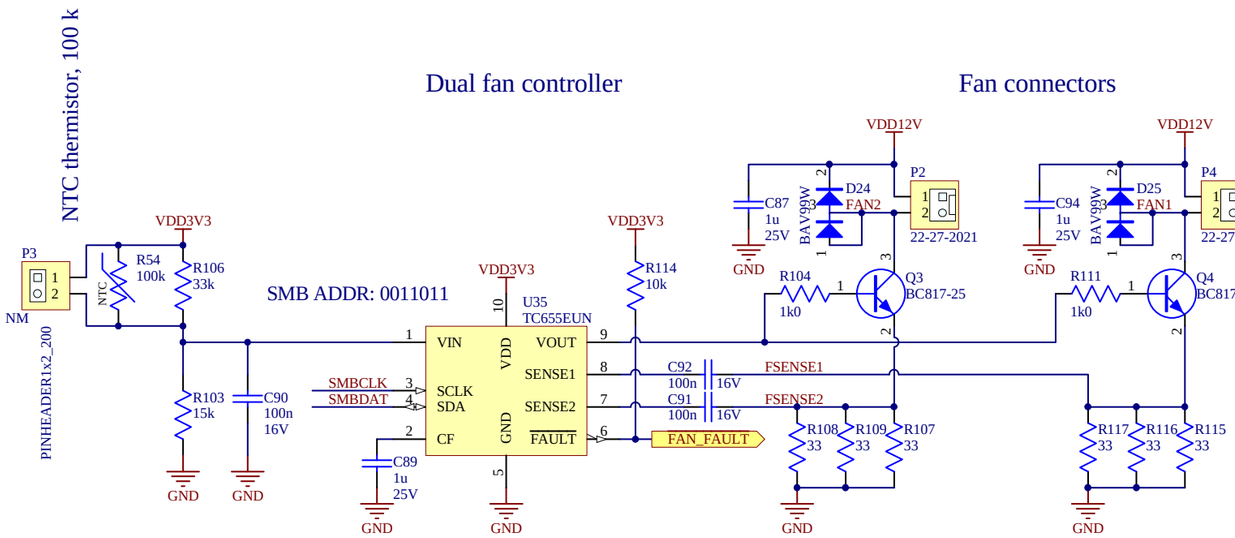


MGTs (unused)



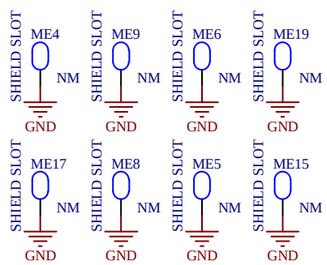


Dual fan controller

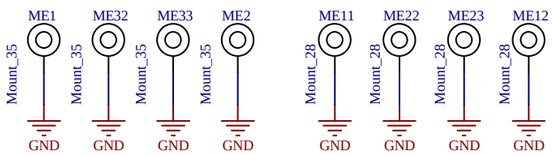


Fan connectors

Holes for shields



Mounting holes



Logos

LOGO1

SP Devices
Signal Processing Devices

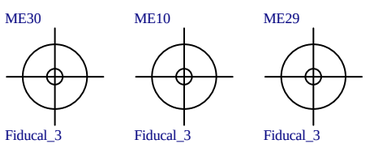
Logo
NM

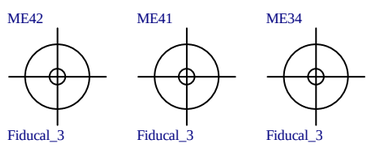
LOGO2

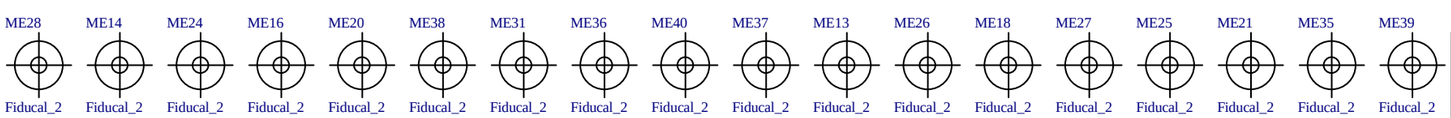
Texas Instruments

TI logo
NM

Fiducials







Project: *ADS54RF63 ADX4 EVM*			
Title: *Miscellaneous*			
Size: A3	Number: 106-000-009	Revision: C	Engineer: PM
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SP Devices
Signal Processing Devices

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