TX810, 8-Channel, Current-Programmable, Low-Noise, Transmit/Receive Switch Evaluation Module

The TX810EVM evaluation module (EVM) provides a means to evaluate the functionality and performance of the TX810 transmit/receive switch. This user's guide contains the EVM printed-circuit board layout, schematic, and bill of materials. The document discusses the board configuration and jumper setup.

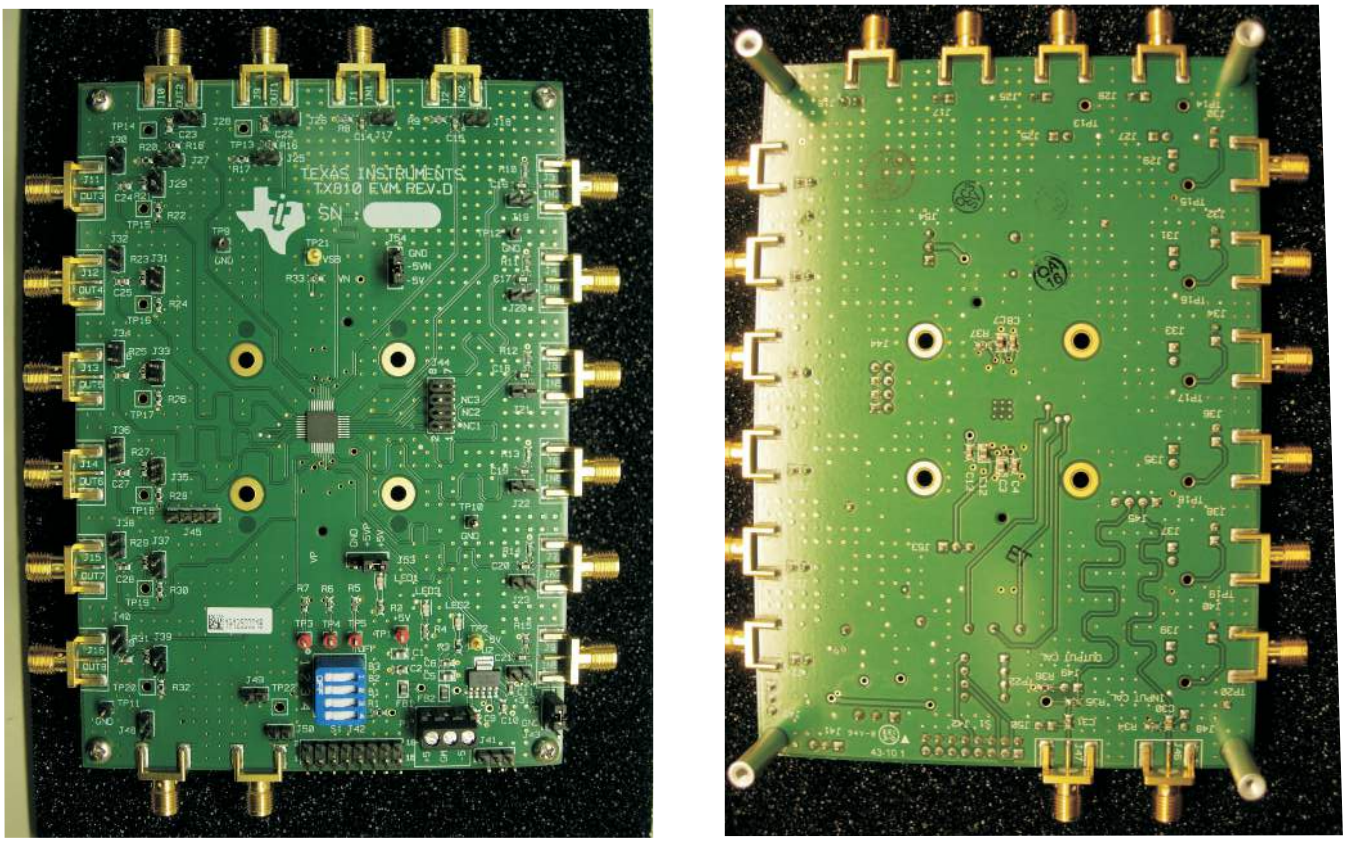
Contents

List of Figures

List of Tables

1 Introduction

The TX810 is an 8-channel, current-programmable, low-noise, transmit/receive switch. It is capable of operating with ±5-V or +10-V/0-V power supplies. The TX810 provides a highly integrated solution for a wide range of ultrasound system applications. The TX810EVM (Figure 1) offers a means to evaluate the functionality and performance of the device.



(a) Top View (b) Bottom View

Figure 1. TX810EVM

1.1 Functionality

Figure 2 is the top diagrammatic view of the EVM. The EVM has eight inputs and eight outputs. The bias current is controlled by the dip switch (S1). The bias current also can be controlled by an external controller through the J42 header. S1 and J42 are mutually exclusive;; only one of them can be used, the other must be open. The power supply is connected through J41 header or P1.

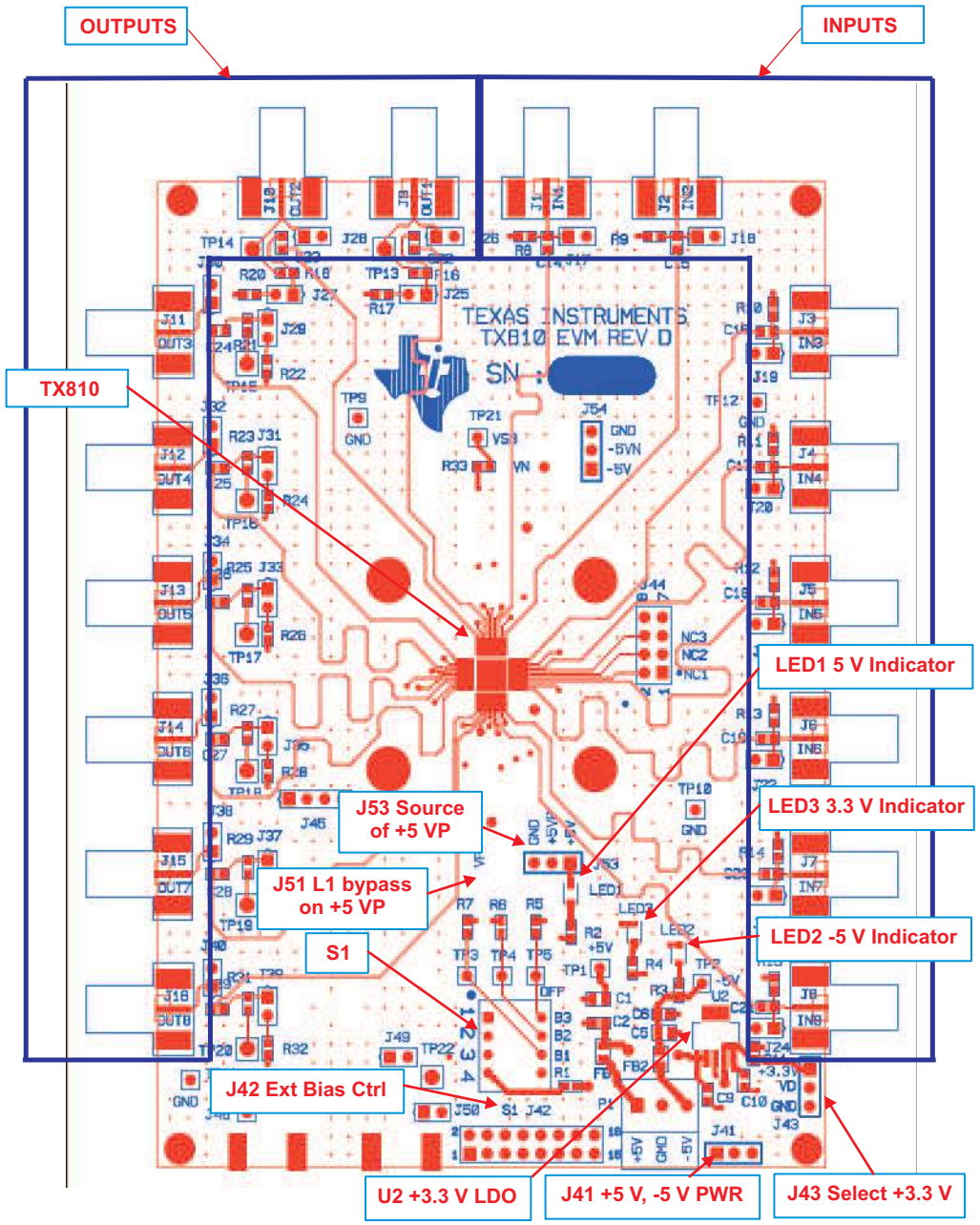


Figure 2. TX810EVM Top View Diagram

1.2 TX810EVM Kit Contents

The TX810EVM kit contains the following:

- TX810EVM board
- TX810EVM User's Guide (this document)

2 Board Configuration

2.1 Power Supplies

The current EVM requires +5-V and –5-V power supplies externally. The external power supplies are connected through the J41 header as indicated in Figure 3. Two test points are for these input supplies: TP1 (+5 V) and TP2 (–5 V). No test point is available for +3.3 V. The user can measure pin 1 of header J43 to check the voltage level.

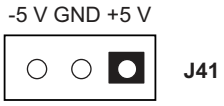


Figure 3. Power Supply Header

Table 1. Power Test Points

Test Point	Function
TP1	+5 V
TP2	–5 V

2.2 LED Indicators

The TX810EVM has three LEDs on the board as shown in Figure 2. Their states demonstrate the normal operation of the TX810EVM.

Table 2. LED Indicators

LED	Indicated Functions
D1	+5-V power supply is on
D2	–5-V power supply is on
D3	+3.3-V regulator is working

2.3 Bias Current Control – Manual

The bias current is controlled by the pins B2, B1, and B0 of the device. The three pins are connected to the 4-pin DIP switch, S1 (Figure 2). The user can adjust the switches to set up the test conditions. Three test points (TP3 for B1, TP4 for B2, and TP5 for B3) are associated with the setting. One +3.3-V LDO, U2, (Figure 2) is on the board to provide the ON/OFF setting to B2, B1, and B0 pins of the device.

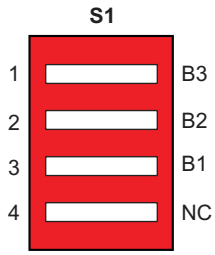


Figure 4. DIP Switch for Manual Control of Bias Current

Table 3. Test Points TP22-PT24

TEST POINTS	CONTROL PIN
TP3	B1
TP4	B2
TP5	B3

2.4 Bias Current Control – Programmable\

The bias current can be controlled by an external pattern generator or a microcontroller through the J42 header (Figure 2). The same test points TP3, TP4, and TP5 are used to verify the setting of the associated B1, B2, and B3, respectively. Pin assignment of J42 is shown in Table 4.

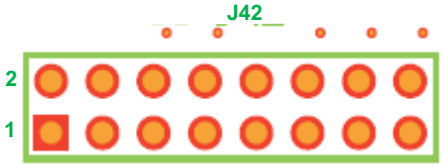


Figure 5. Header to Automated Control of Bias Current

Table 4. J42 Pinout

Pin	Signals
1	B1
2	GND
3	B2
4	GND
5	B3
6	GND
7	N/C
8	GND
9	N/C
10	GND
11	N/C
12	GND
13	N/C
14	GND
15	N/C
16	GND

2.5 Inputs

The EVM board has eight inputs. Each input has one SMA and one jumper as shown in Figure 6. The user can input the test signal through the SMA connector or through the two-pin header.

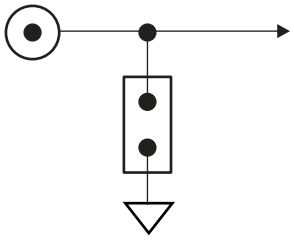


Figure 6. Input Structure

Table 5. Input SMA/Jumper Assignment

Input	SMA	Jumper
IN1	J1	J17
IN2	J2	J18
IN3	J3	J19

Table 5. Input SMA/Jumper Assignment (continued)

Input	SMA	Jumper
IN4	J4	J20
IN5	J5	J21
IN6	J6	J22
IN7	J7	J23
IN8	J8	J24

2.6 Outputs

The EVM board has eight outputs. The output structure is shown in Figure 7. Each output has an SMA connector and two jumpers associated with it.

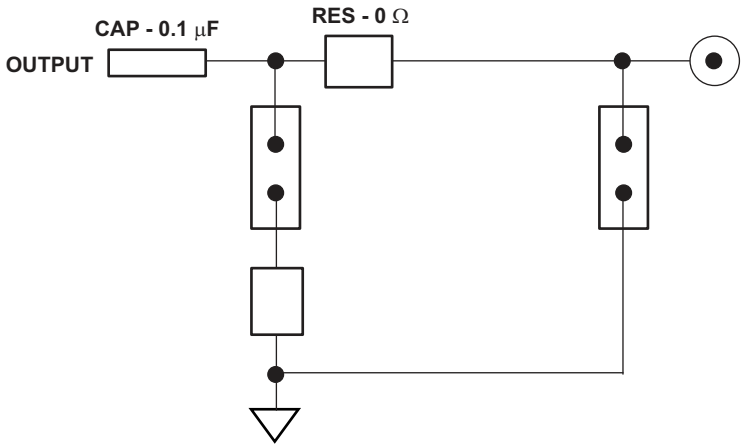


Figure 7. Output Structure

Table 6. Output SMA/Jumper Assignment

Output	SMA	Jumper	Jumper
OUT1	J9	J25	J26
OUT2	J10	J27	J28
OUT3	J11	J29	J30
OUT4	J12	J31	J32
OUT5	J13	J33	J34
OUT6	J14	J35	J36
OUT7	J15	J37	J38
OUT8	J16	J39	J40

3 Jumper Setup

Five jumpers are needed for typical operation. See Figure 2 and Figure 2 for the location on the board.. Jumpers J43, J53, and J54 need to be set up as shown in Figure 8–Figure 10 depending on whether an external supply is used. Jumpers J52 and J51 bypass the filter inductor and must be installed.

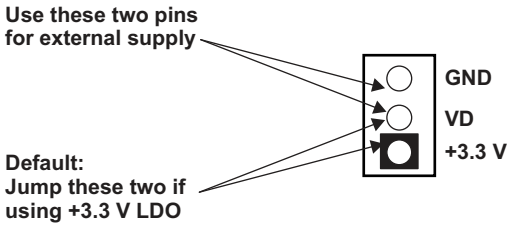


Figure 8. Jumper J43

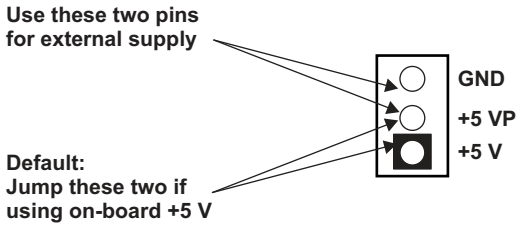


Figure 9. Jumper J53

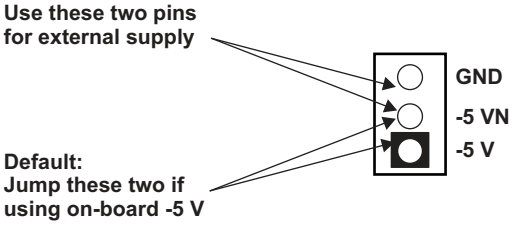


Figure 10. Jumper J54

4 PCB Layout

Figure 11 through Figure 14 illustrate this four-layer, printed-circuit board.

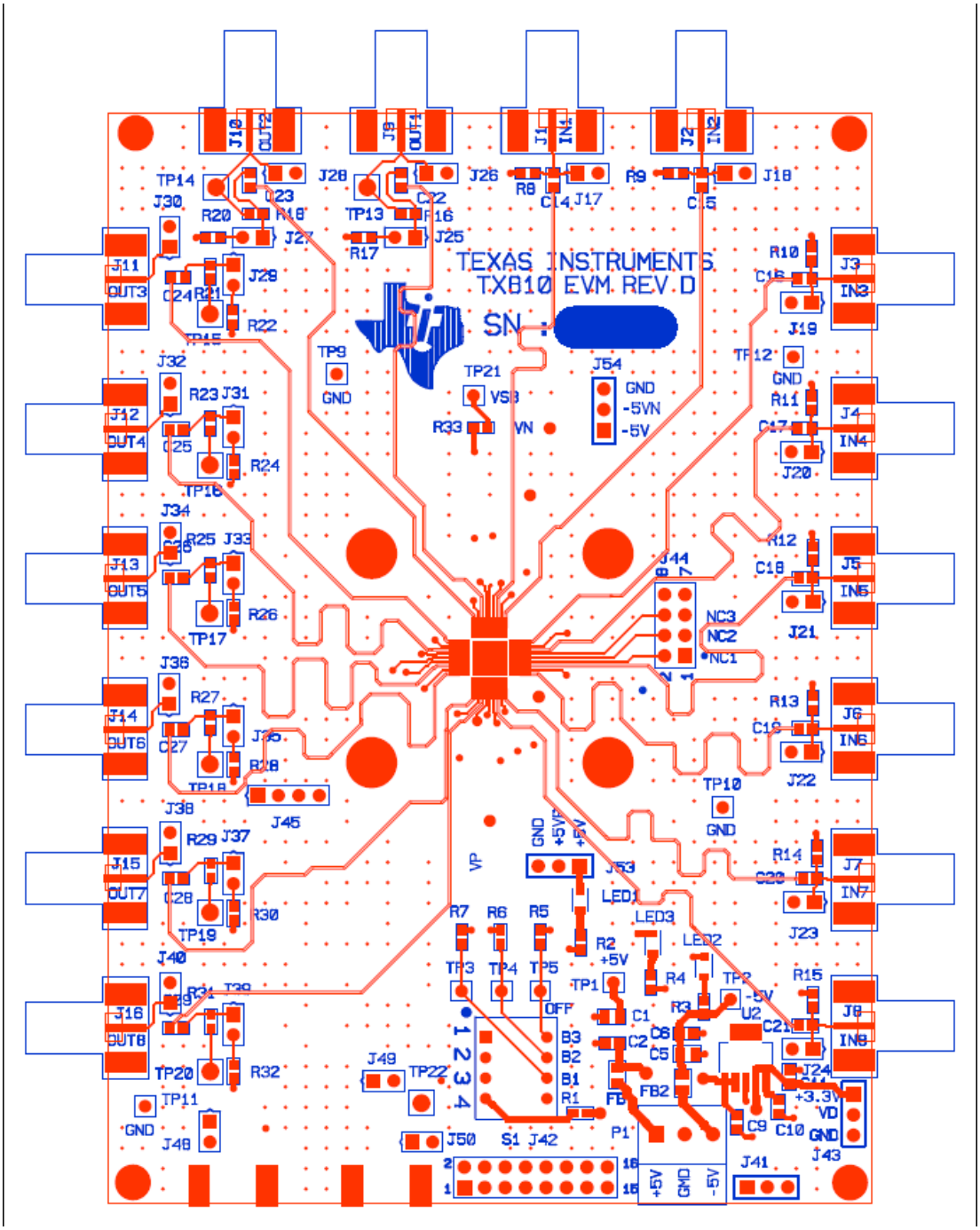


Figure 11. Top Layer – Signal

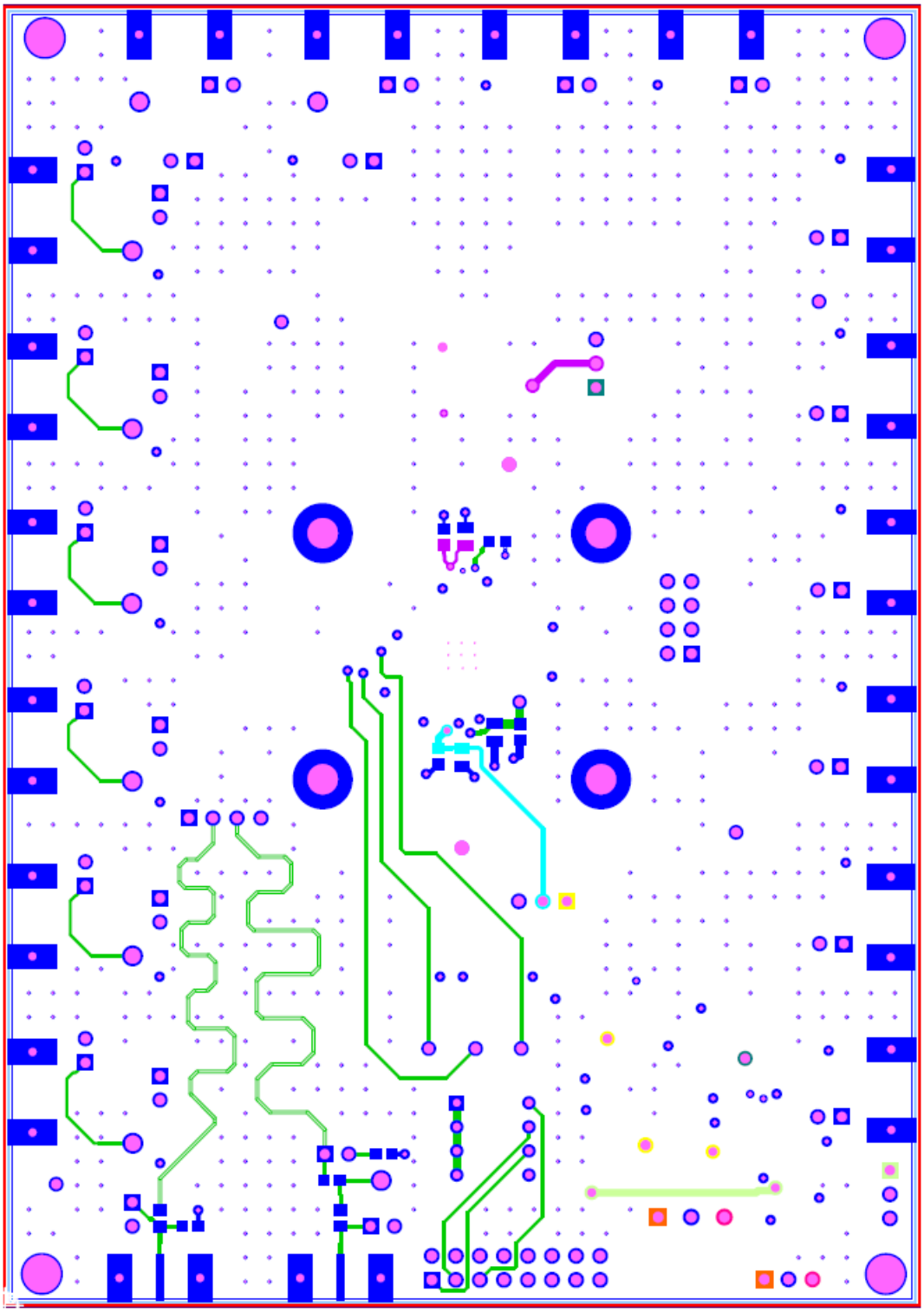


Figure 12. Bottom Layer – Signal

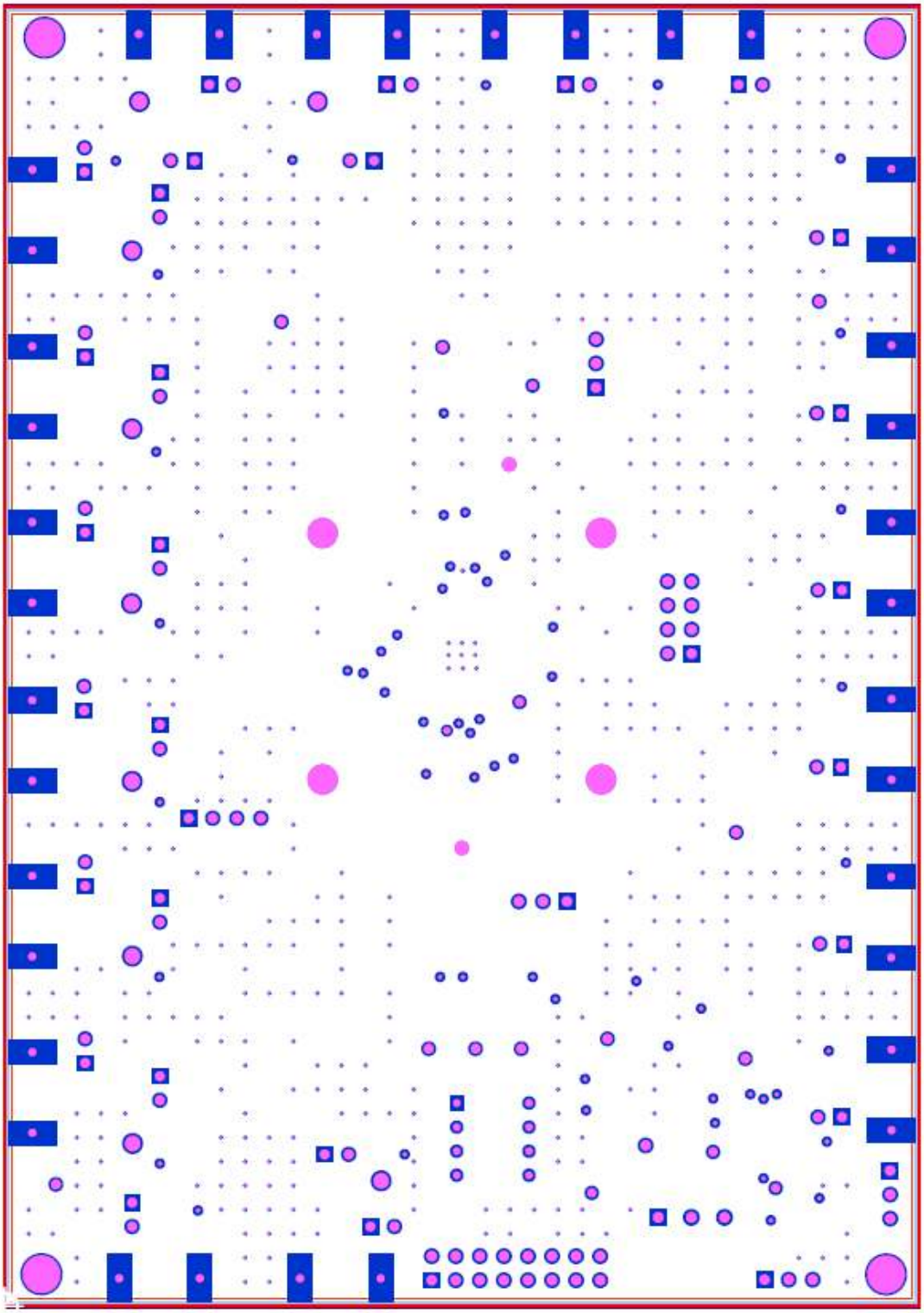


Figure 13. Layer 2 – Ground

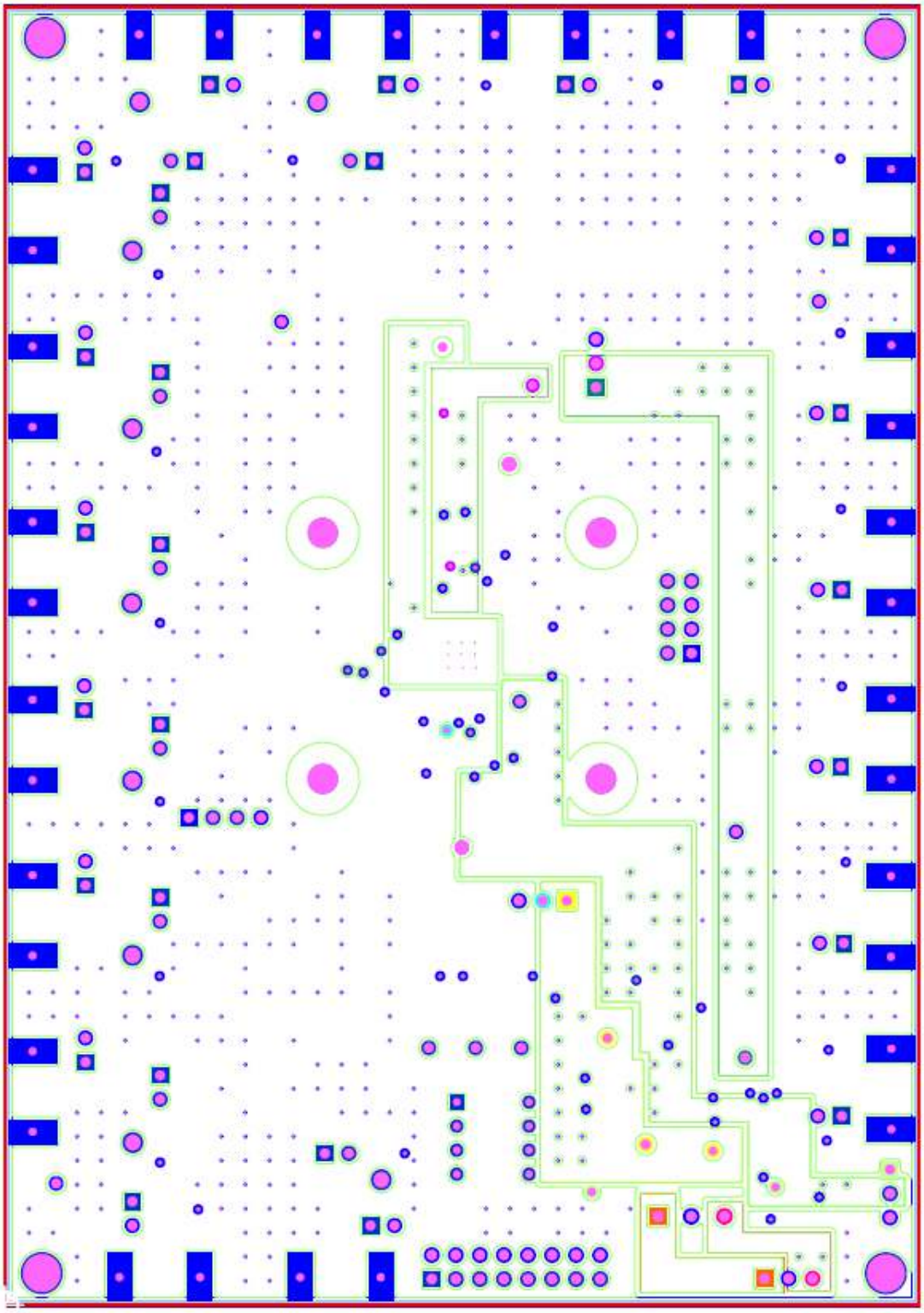


Figure 14. Layer 3 – Power

5 Schematics

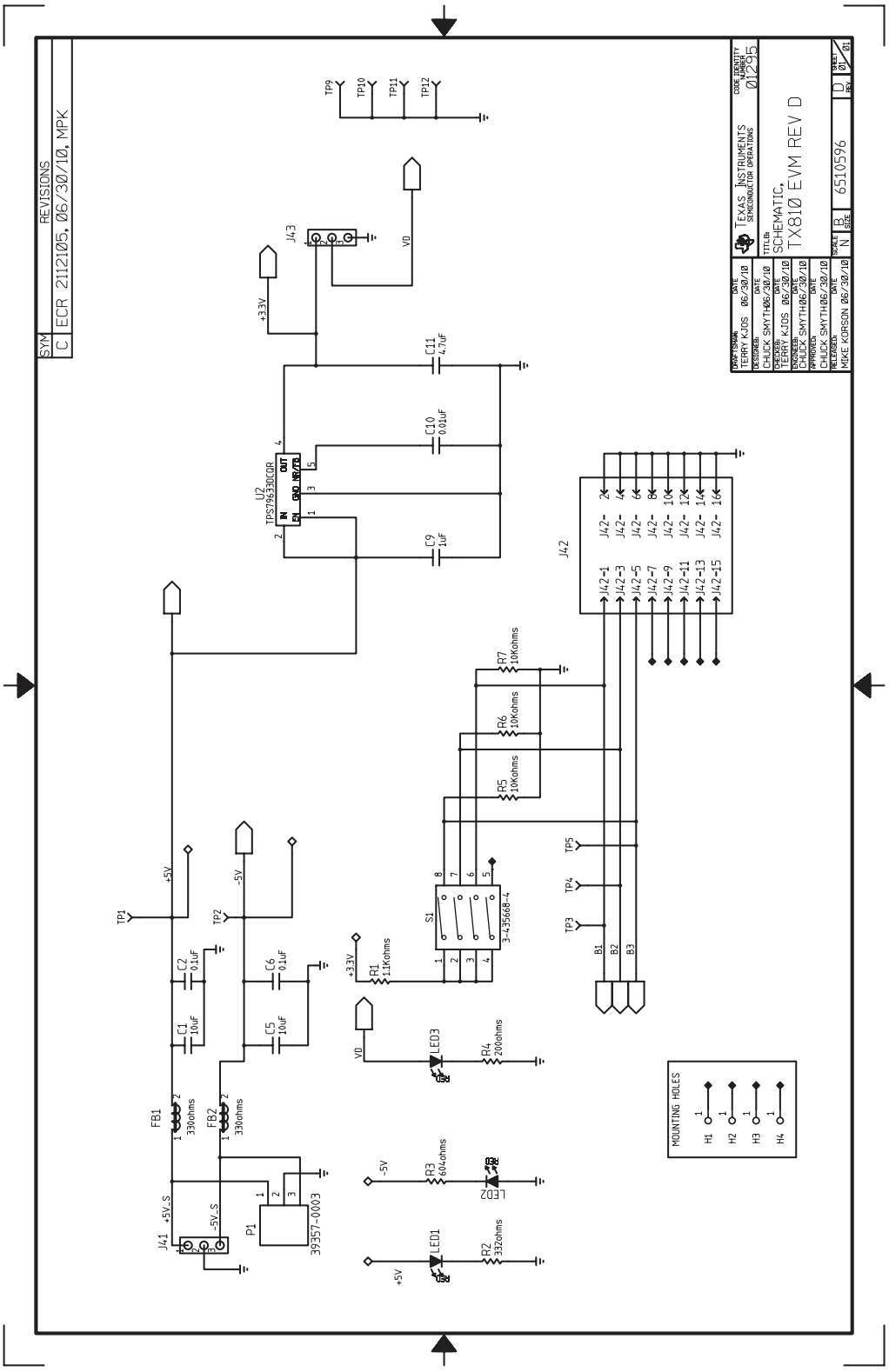


Figure 15. Schematic Page 1 – Power and Bias Control

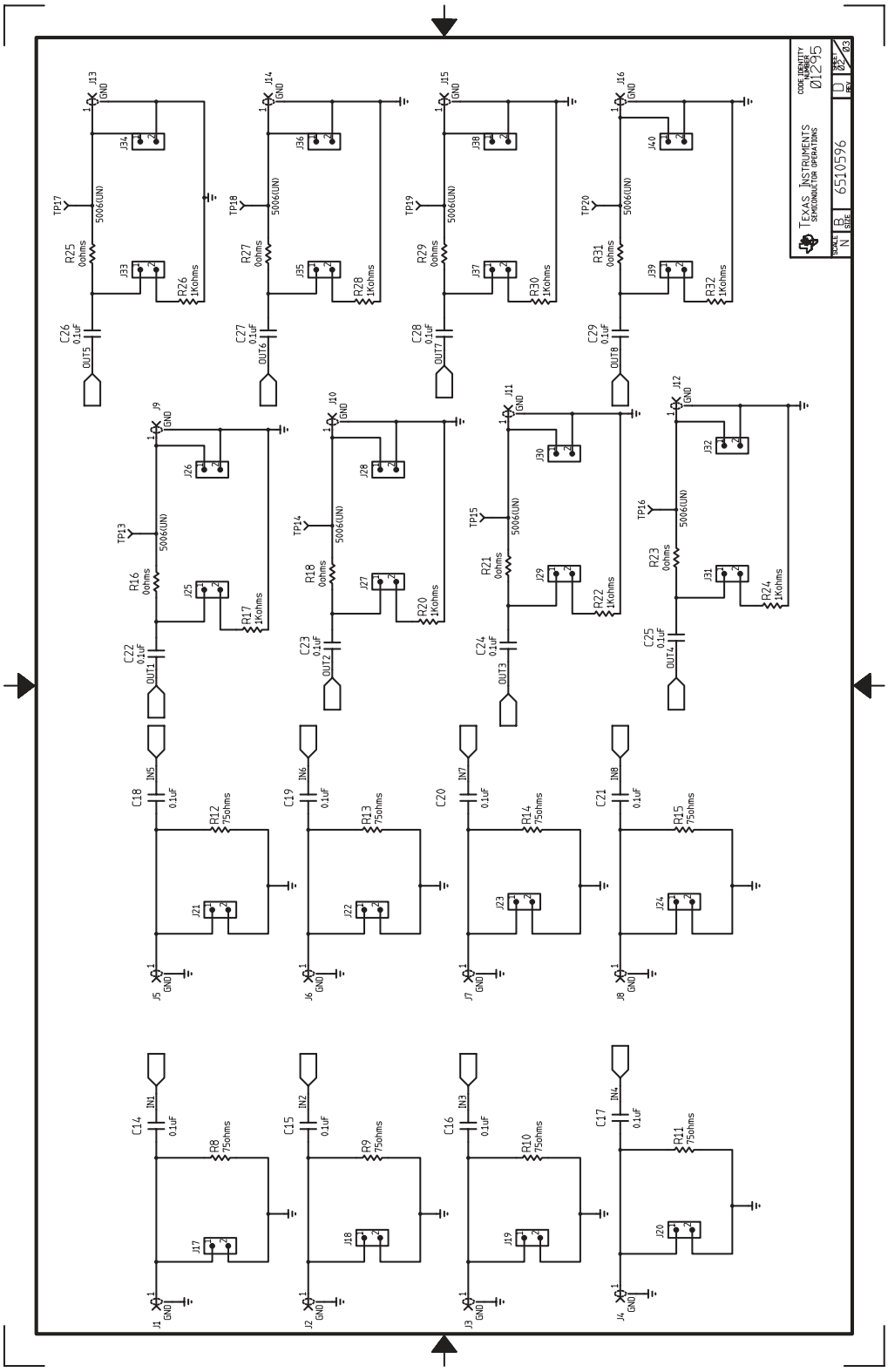


Figure 16. Schematic Page 2 – IO

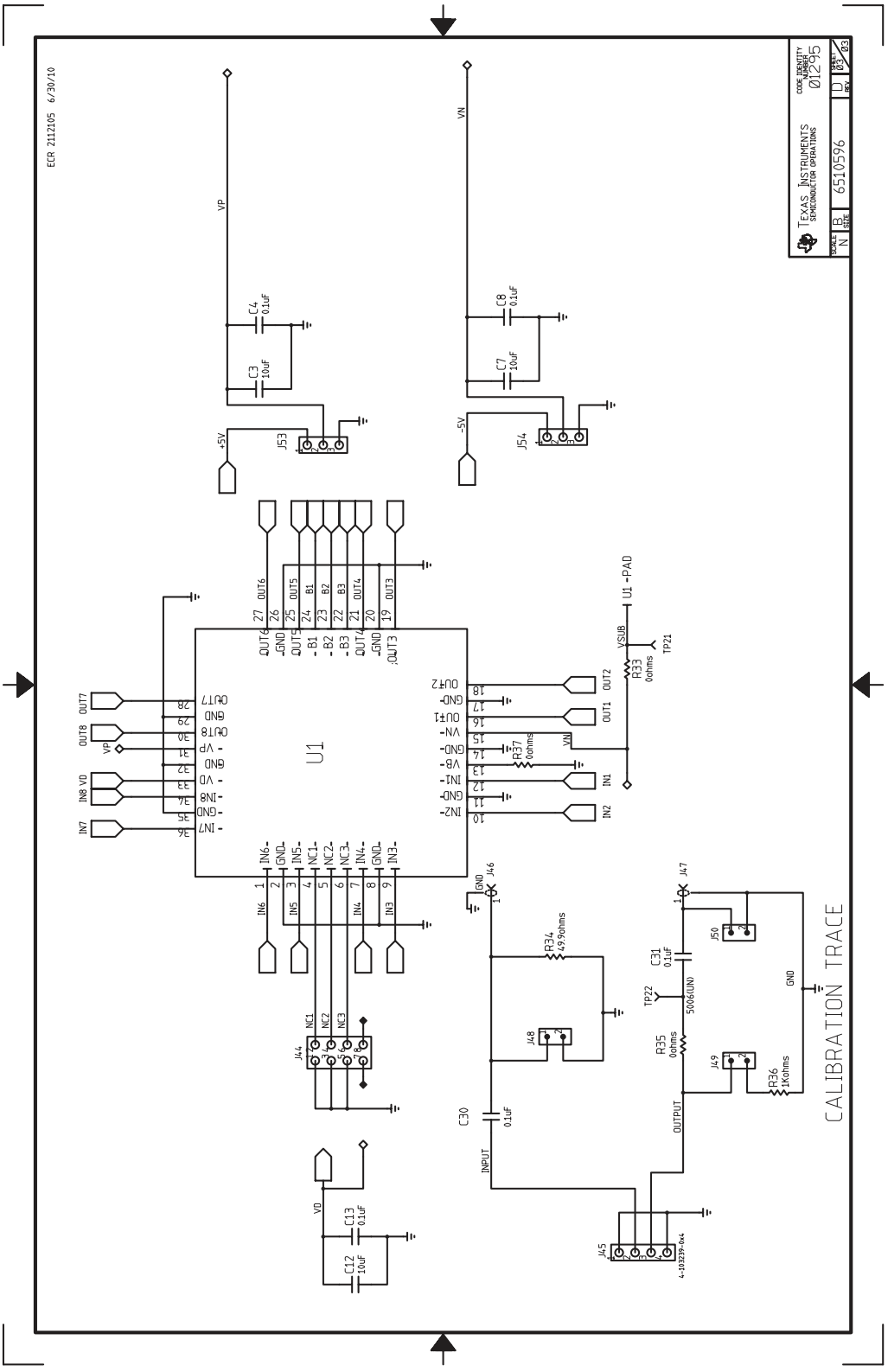


Figure 17. Schematic Page 3 – DUT

6 Bill of Materials

Table 7. Bill of Materials

QTY	MFG	MFG PART#	REF DES	Description	Value or Function
REF	–	6510596D	–	ASSEMBLY	–
REF	–	6510596D	–	SCHEMATIC	–
1	NPI	6510596D	–	FABRICATION	–
REF	–	6510596D	–	ARTWORK	–
1	PANASONIC	ECJ-1VB0J475K	C11	CAP,SMT,0603	CAPACITOR,SMT,0603,CERAMIC,4.7µF,6.3V,10%,X5R
1	PANASONIC	ECJ-1VB1A105K	C9	CAP,SMT,0603	CAPACITOR,SMT,0603,CERAMIC,1.0µF,10V,10%,X5R
8	MURATA	GCM188R72A104KA64D	C14, C15, C16, C17, C18, C19, C20, C21,	CAP,SMT,0603,100V	CAPACITOR,SMT,0603,CERAMIC,100V,10%,0.1µF,X7R
15	PANASONIC	ECJ-1VB1H104K	C2, C4, C6, C8, C13, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31	CAP,SMT,0603	CAPACITOR,SMT,0603,CERAMIC,50V,10%,0.1µF,X7R
1	MURATA	GRM39X7R103K25V	C10	CAP,SMT,0603	CAPACITOR,SMT,0603,CERAMIC,25V,10%,.01µF
5	MURATA	GRM21BR71A106KE51L	C1, C3, C5, C7, C12	CAP,SMT,0805	CAPACITOR,SMT,0805,CERAMIC,10µF,10V,10%,X7R
18	JOHNSON / EMERSON NETWORK	142-0701-801	J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16, J46, J47	CONNECTOR,SMT,2P	CONNECTOR,SMT,2P,SMA JACK RECEPTACLE, END LAUNCH,062PCB,GOLD
1	TI	TX810	U1	TX810 T/R SWITCH TEXAS INSTRUMENTS	T/R SWITCH
2	MURATA	BLM21AG331SN1	FB1, FB2	FERRITE BEAD,SMT,0805	CHIP INDUCTOR,SMT,0805,25%,200mA,330 Ω@100MHz
1	MOLEX	39357-0003	P1	HEADER, THRU, 3P	HEADER, THRU, POWER, 3P,3.5MM, EUROSTYLE
1	SAMTEC	TSW-104-07-G-D	J44	HEADER,THU	HEADER,THU,8P,2X4,MALE,DUAL ROW,100LS,100TL
1	SAMTEC	TSW-108-07-G-D	J42	HEADER,THU	HEADER,THU,16P,2X8,MALE,DUAL ROW,100LS,100TL
27	TYCO ELECTRONICS	4-103239-0x2	J17, J18, J19, J20, J21, J22, J23, J24, J25, J26, J27, J28, J29, J30, J31, J32, J33, J34, J35, J36, J37, J38, J39, J40, J48, J49, J50	HEADER,THU,JUMPER	MALE,2PIN,0.100CC MAKE FROM 4-103239-0x2
4	TYCO ELECTRONICS	4-103239-0x3	J41, J43, J53, J54	HEADER,THU,JUMPER	MAKE FROM 4-103239-0
1	TYCO ELECTRONICS	4-103239-0x4	J45	HEADER,THU,JUMPER	MAKE FROM 4-103239-0
1	TI	TPS79633DCQR	U2	IC,SMT,SOT223-6	ULTRALOW-NOISE HI PSRR FAST RF 1-A LDO LINEAR REGULATOR,3.3V
3	PANASONIC	LN1271R(TR)	LED1, LED2, LED3	LED,SMT,2P	RED,20mA
1	YAGEO	9C06031A6040FKHFT	R3	RES,SMT,0603	RESISTOR,SMT,0603,THICK FILM,604 Ω,1%,1/10W
9	VISHAY	CRCW06031001F	R17, R20, R22, R24, R26, R28, R30, R32, R36	RES,SMT,0603	RESISTOR,SMT,0603,1%,1/10W,1.00K
3	VISHAY	CRCW06031002F	R5, R6, R7	RES,SMT,0603	RESISTOR,SMT,0603,1%,1/10W,10.0K
1	VISHAY	CRCW0603200F	R4	RES,SMT,0603	RESISTOR,SMT,0603,1%,1/10W,200 Ω
1	VISHAY	CRCW0603332F	R2	RES,SMT,0603	RESISTOR,SMT,0603,1%,1/10W,332 Ω
8	VISHAY	CRCW060375F	R8, R9, R10, R11, R12, R13, R14, R15	RES,SMT,0603	RESISTOR,SMT,0603,1%,1/10W,75.0 Ω
11	PANASONIC	ERJ-3GEY0R00	R16, R18, R21, R23, R25, R27, R29, R31, R33, R35, R37	RES,SMT,0603	RESISTOR,SMT,0603,0 Ω,5%,ZERO Ω JUMPER
1	PANASONIC	ERJ-3GSYJ112	R1	RES,SMT,0603	RESISTOR,SMT,0603,5%,1/10W,1.1K
1	VISHAY	CRCW060349R9F	R34	RESISTOR,SMT,1/6W,0603	RESISTOR,SMT,0603,1%,1/10W,49.9 Ω
1	AMP	3-435668-4	S1	SWITCH,DIP,8P	SWITCH, SPST, DIP8
4	KEYSTONE ELECTRONICS	5000	TP1, TP3, TP4, TP5	TESTPOINT,THU,1P	TESTPOINT,THU,MINIATURE,0.1LS,120TL, RED
4	KEYSTONE ELECTRONICS	5001	TP9, TP10, TP11, TP12	TESTPOINT,THU,1P	TESTPOINT,THU,MINIATURE,0.1LS,120TL, BLACK
2	KEYSTONE ELECTRONICS	5004	TP2, TP21	TESTPOINT,THU,1P	TESTPOINT,THU,MINIATURE,0.1LS,120TL, YELLOW
9	KEYSTONE ELECTRONICS	5006(UN)	TP13, TP14, TP15, TP16, TP17, TP18, TP19, TP20, TP22	TESTPOINT,THU,1P	(UNINSTALLED PART)

NOTE: ASTERISK(*) NEXT TO PART MANUFACTURER'S NAME DENOTES POSSIBLE LONG LEAD TIME ITEM.

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of -90 V to +90 V and the output voltage range of -2 V to +2 V .

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 85° C. The EVM is designed to operate properly with certain components above 85° 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.

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