

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.

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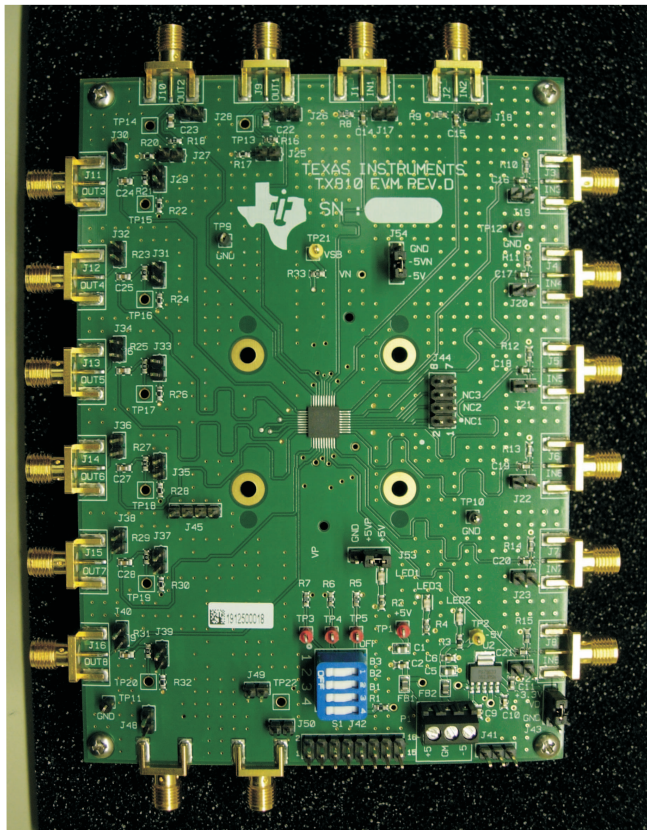
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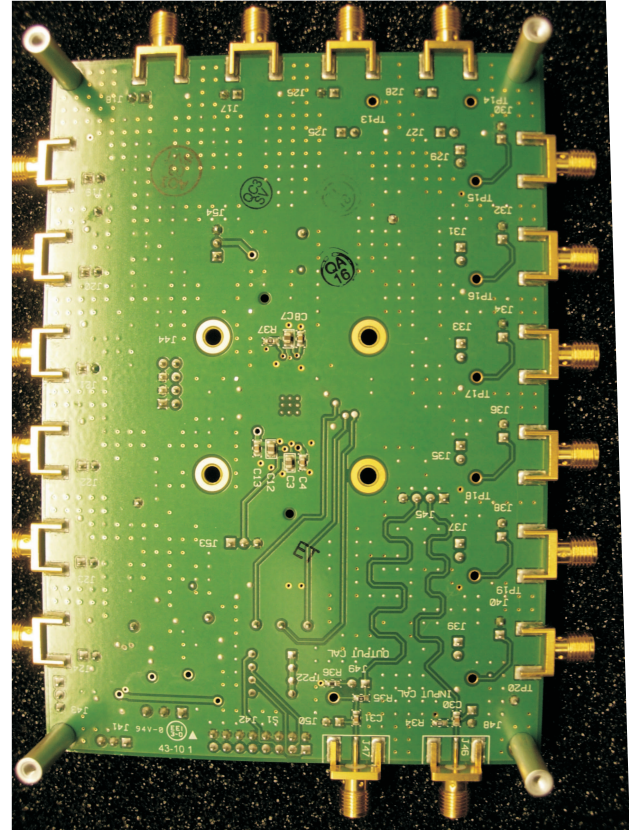
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1 Introduction

The TX810 is an 8-channel, current-programmable, low-noise, transmit/receive switch. It is capable of operating with $\pm 5\text{-V}$ or $+10\text{-V}/0\text{-V}$ 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.

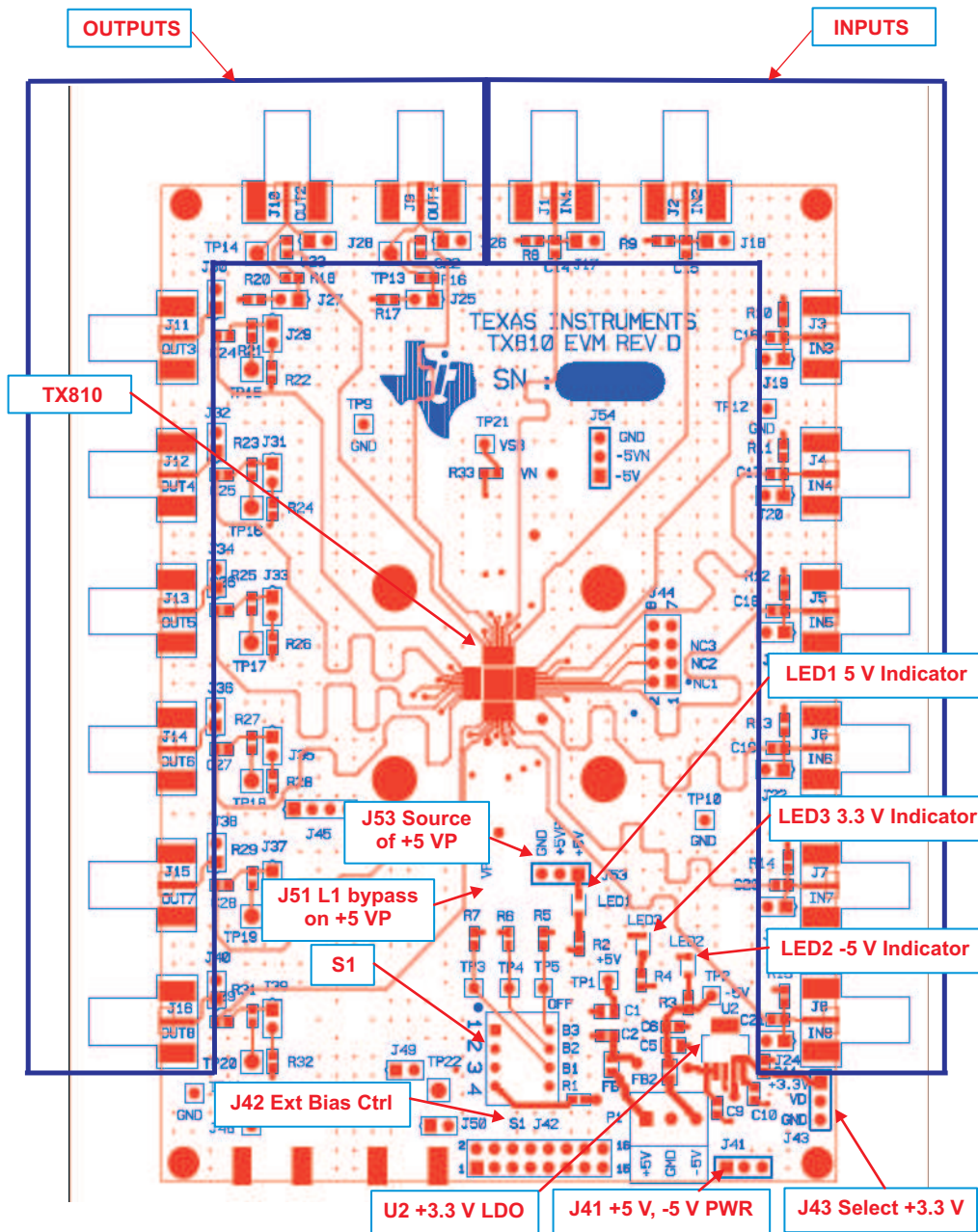


Figure 2. TX810EVM Top View Diagram

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.

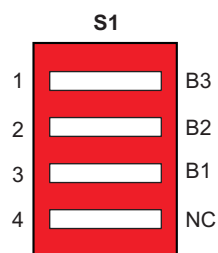


Figure 4. DIP Switch for Manual Control of Bias Current

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.

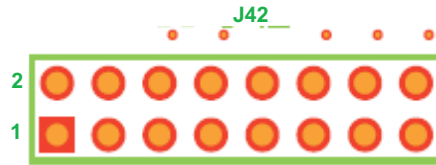


Figure 5. Header to Automated Control of Bias Current

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.

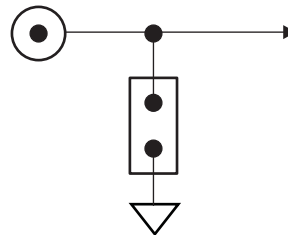


Figure 6. Input Structure

Table 5. Input SMA/Jumper Assignment

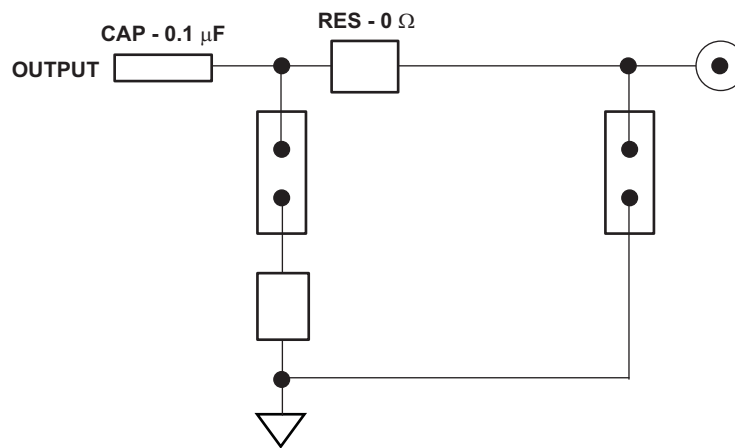
| Input | SMA | Jumper |
|-------|-----|--------|
| IN1 | J1 | J17 |
| IN2 | J2 | J18 |
| IN3 | J3 | J19 |

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.

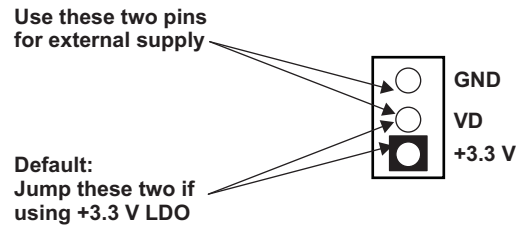


Figure 8. Jumper J43

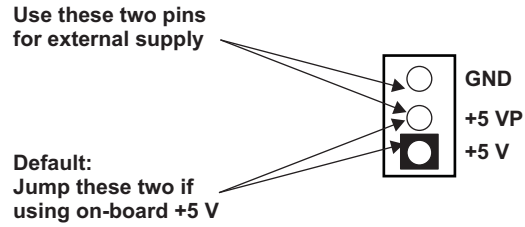


Figure 9. Jumper J53

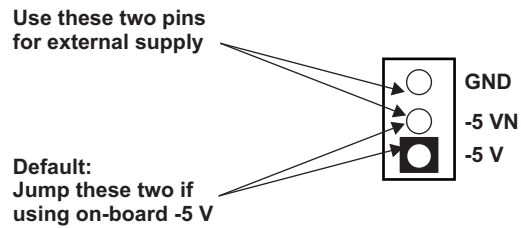


Figure 10. Jumper J54

4 PCB Layout

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

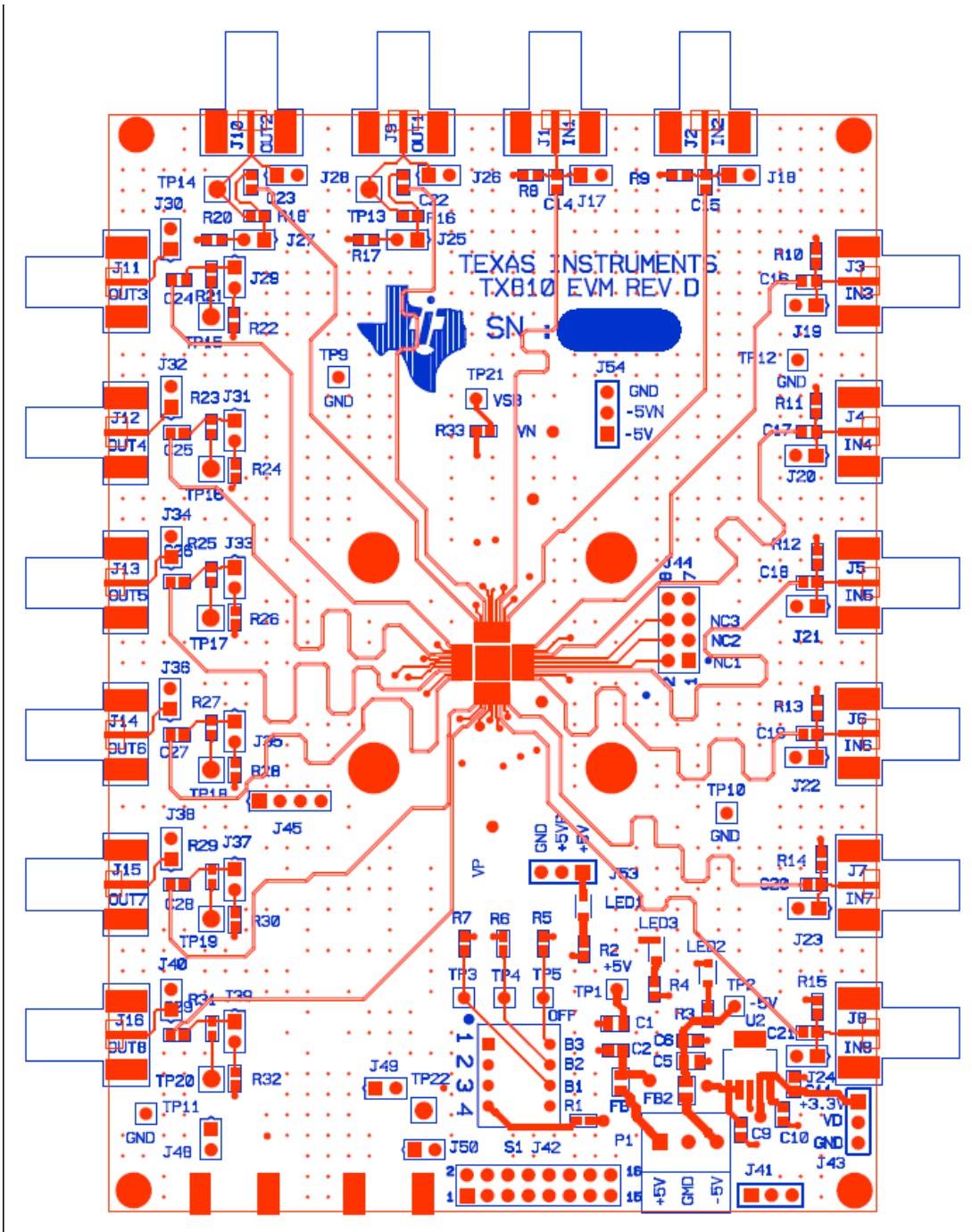


Figure 11. Top Layer – Signal

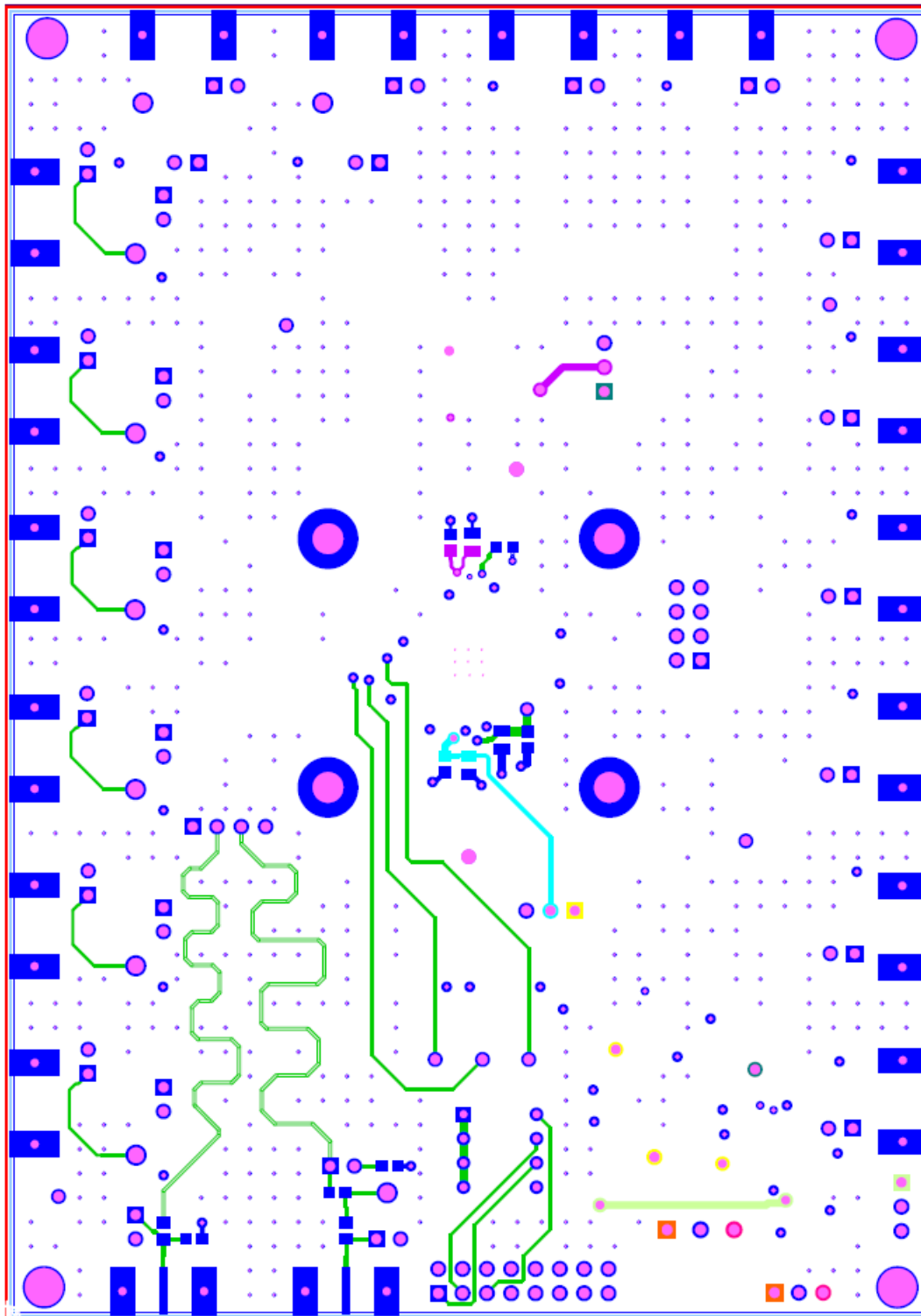


Figure 12. Bottom Layer – Signal

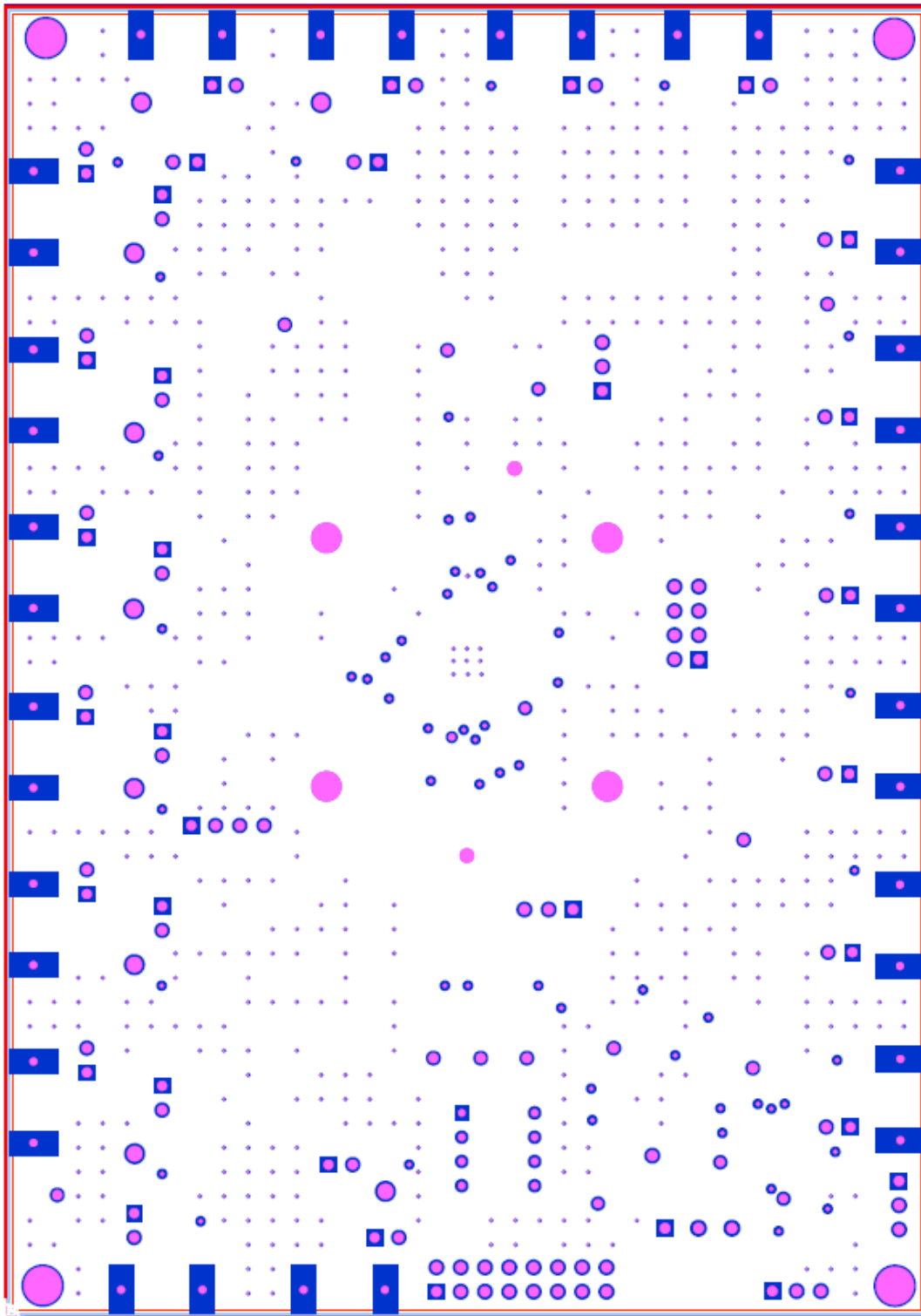


Figure 13. Layer 2 – Ground

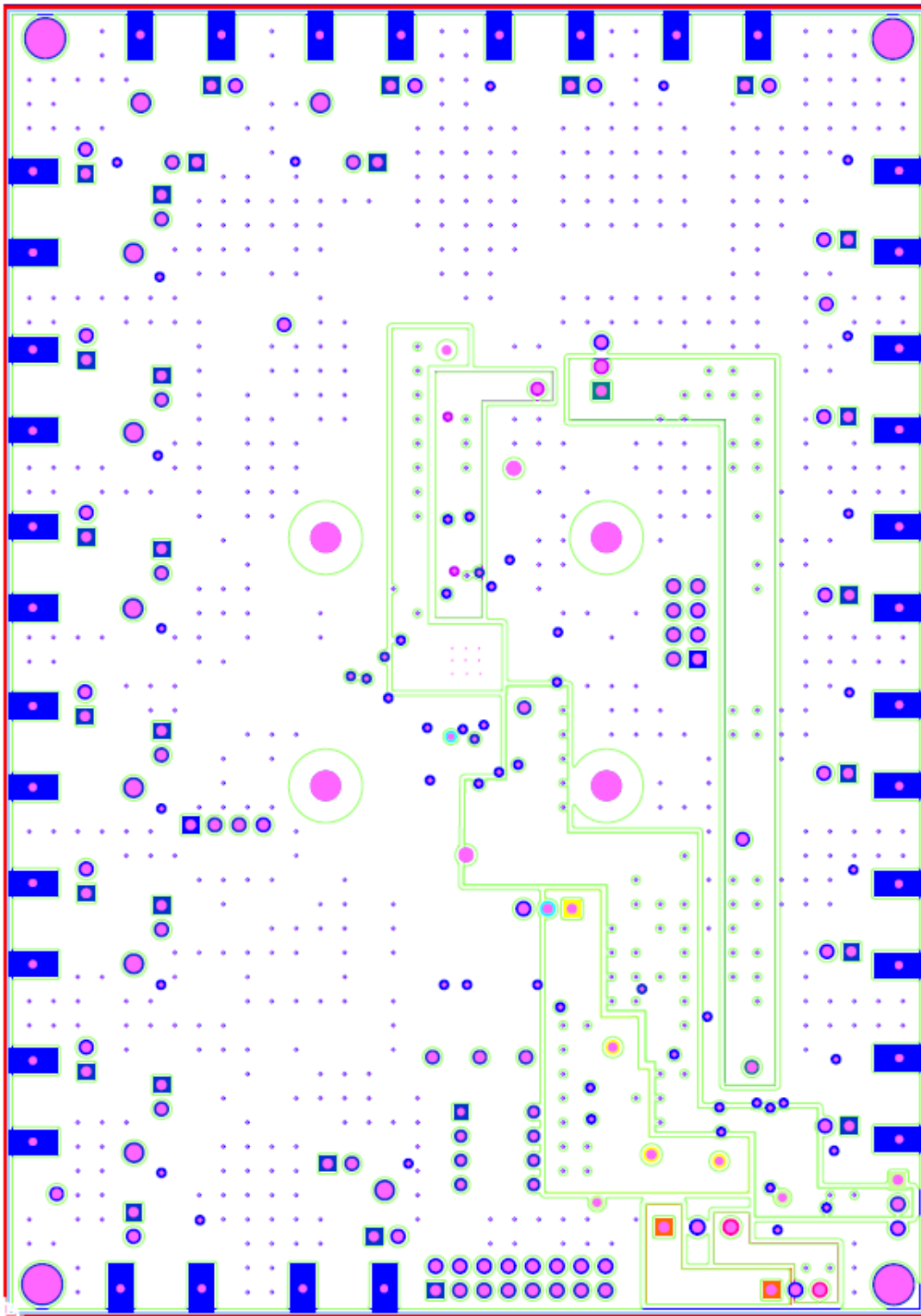


Figure 14. Layer 3 – Power

5 Schematics

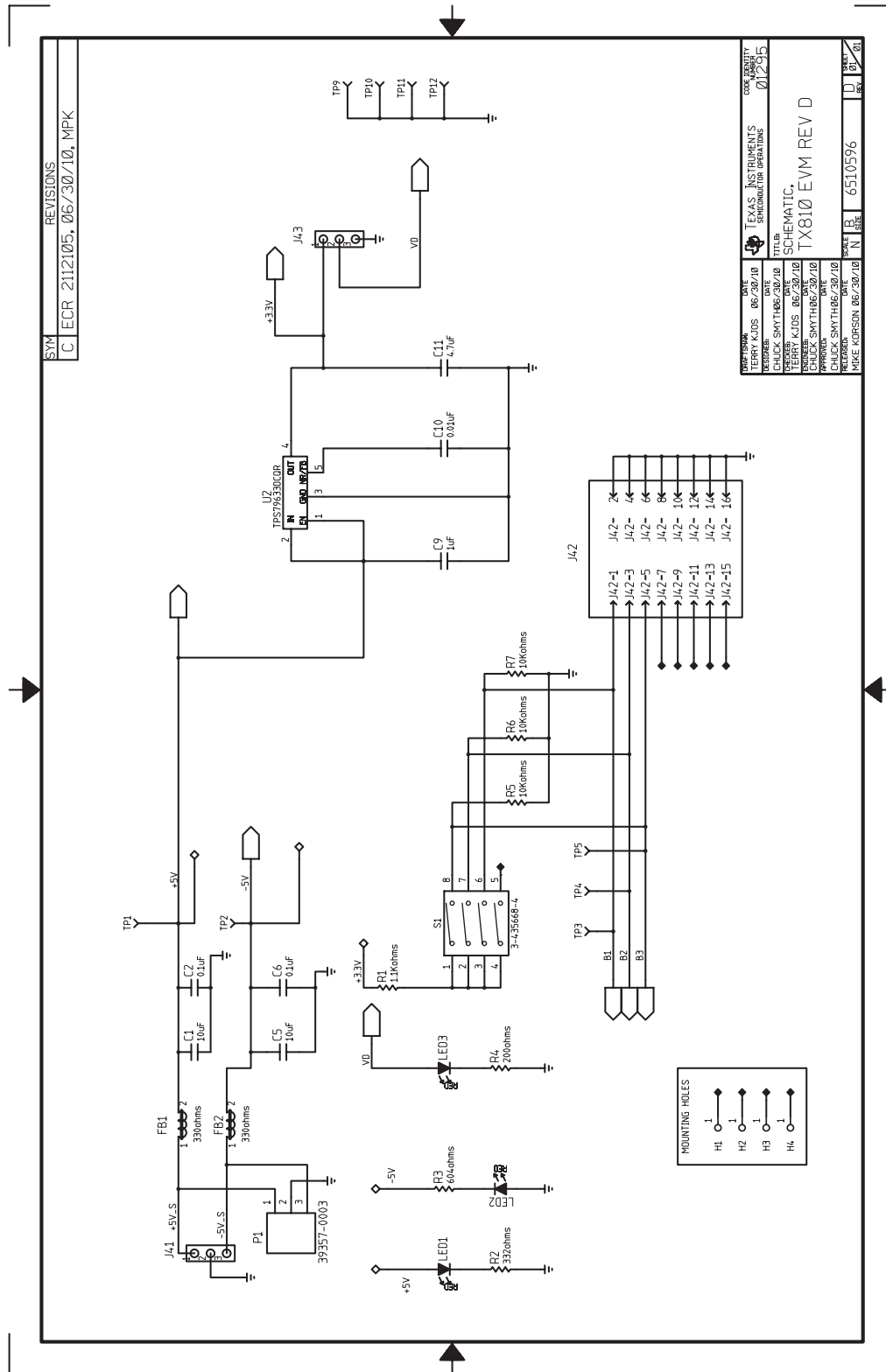
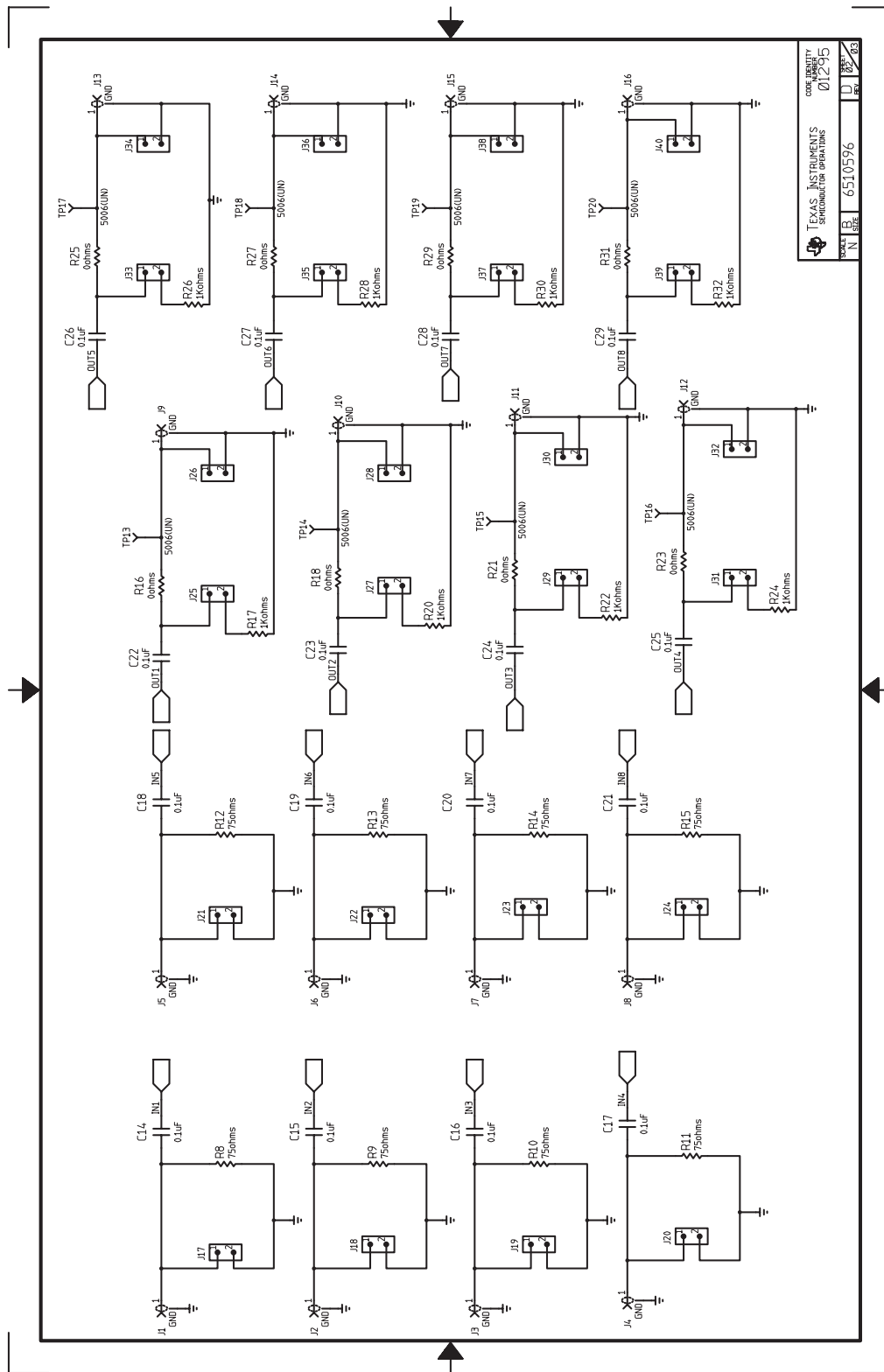


Figure 15. Schematic Page 1 – Power and Bias Control



| | | |
|---|-----|-------------|
| CODE AVAILABILITY | | 01295 |
| TEXAS INSTRUMENTS SEMICONDUCTOR OPERATIONS | | |
| DATE | REV | DESCRIPTION |
| 06/11/09 | B | 6510596 |

Figure 16. Schematic Page 2 – IO

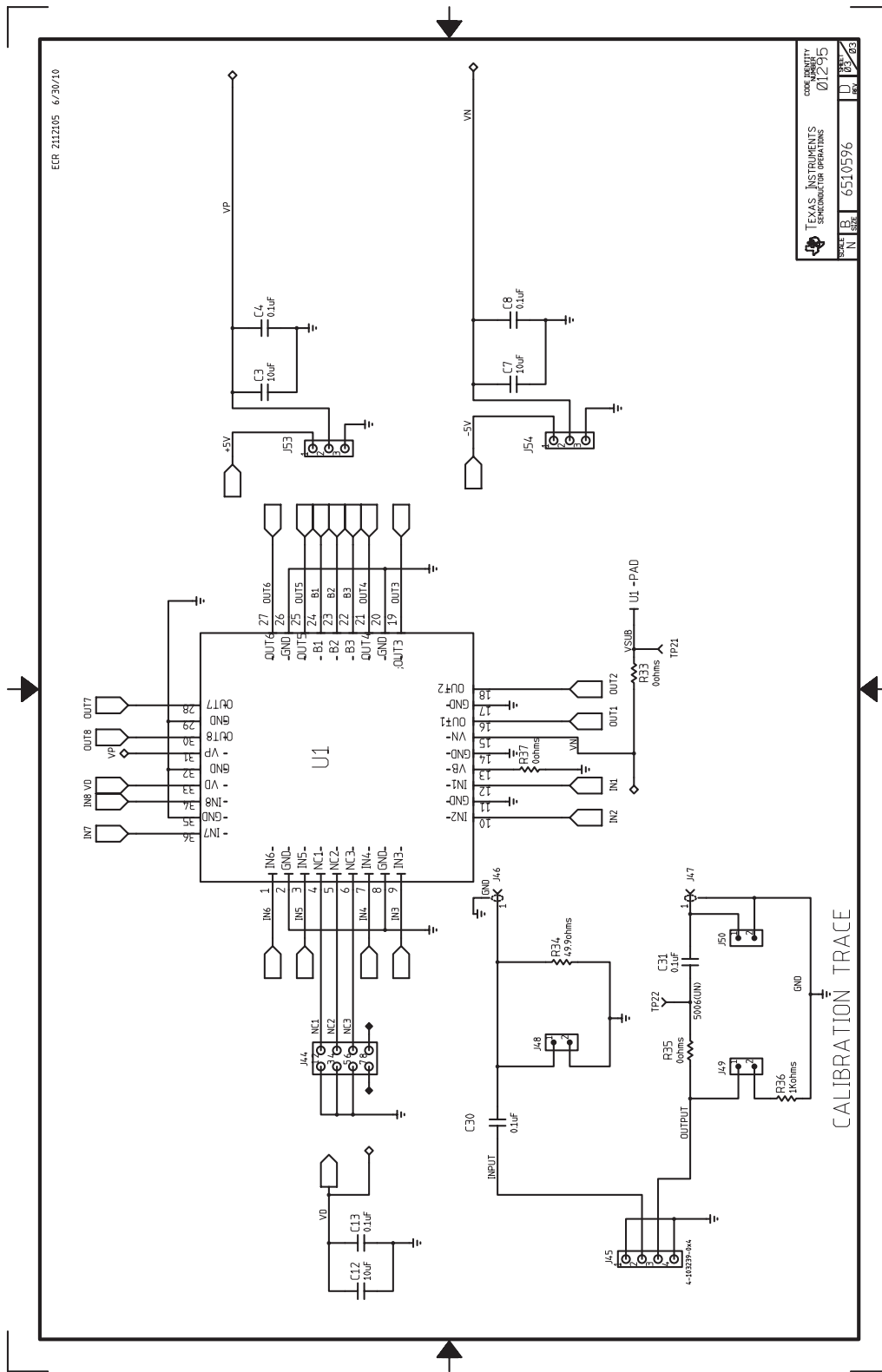


Figure 17. Schematic Page 3 – DUT

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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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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| Security | www.ti.com/security |
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