

ISL62881CCPUEVAL2Z Evaluation Board User Guide

Hardware Description

The ISL62881CCPUEVAL2Z evaluation board demonstrates the performance of the ISL62881C single-phase synchronous-buck PWM V_{CORE} controller implementing Intel IMVP-6.5 protocol. The ISL62881C features Intersil's Robust Ripple Regulator (R^{3TM}) technology. An on-board dynamic-load generator is included for evaluating the transient-load response. It applies a 300 μ s pulse of approximately 0.2 Ω load across V_O and PGND.

Contents of this document include:

- Design Criteria
- Recommended Test Equipment
- Interface Connections
- Switch Descriptions
- DIP Switch Descriptions
- Jumper Descriptions
- Test Point Descriptions
- Evaluation Board Documentation
 - Bill of materials
 - Schematic
 - Silk-screen plots
 - Board layer plots

TABLE 1. DC/DC DESIGN CRITERIA

| PARAMETER | VALUE | UNITS |
|---------------|-----------|-------|
| V_{IN} | 4.5 to 20 | VDC |
| V_O | 0 to 1.5 | VDC |
| Full-load | 26 | ADC |
| PWM Frequency | 300 | KHz |

Recommended Equipment

- (Qty. 1) Adjustable 25V, 10A Power Supply
- (Qty. 1) Fixed 5V, 100mA Power Supply
- (Qty. 1) Fixed 12V, 100mA Power Supply
- (Qty. 1) Adjustable Constant Current Electronic Load
- (Qty. 1) Digital Voltmeter
- (Qty. 1) Four-Channel Oscilloscope

Interface Connections

- V_{IN} : Input Voltage to the Power Stage
 - J5: V_{IN} Positive Power Input
 - TP31: V_{IN} Positive Voltage Sense
 - J6: V_{IN} Return Power Input
 - TP32: V_{IN} Return Voltage Sense
- V_O : Regulated Output Voltage
 - J12: V_O Positive Power Output
 - J14: V_O Return Power Output
- +5V: +5V Input Voltage
 - TP29: +5V Positive Input
 - TP30: +5V Return Input
- +12V: Input Voltage for the Dynamic-load Generator
 - TP3: 12V Positive Input
 - TP2: 12V Return Input

Test Set-Up

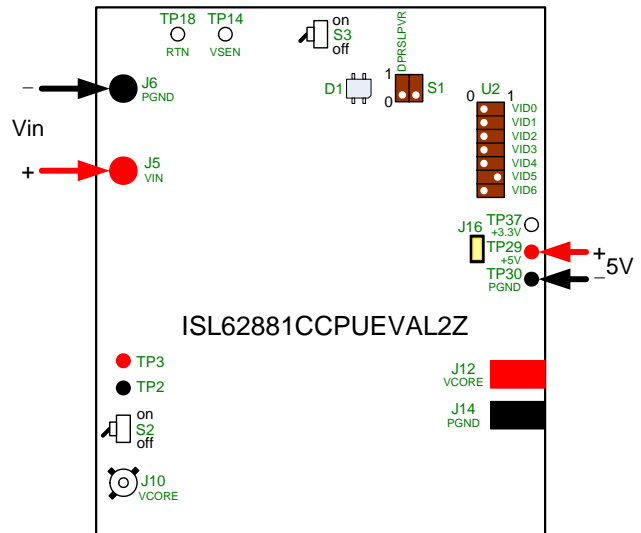


FIGURE 1. TEST SET-UP

Switch Descriptions

- S3: Enable
 - OFF: Short the VR_ON pin to GND (disable PWM)
 - ON: Allow the VR_ON pin to pull-up to +5V (enable PWM)
- S2: Dynamic Load
 - OFF: On-board dynamic load disabled
 - ON: On-board dynamic load enabled

DIP-Switch Descriptions

- S1: Set the control signals
 - S1.1: Set the DPRSLPVR signal
 - S1.2: Set the DPRSTP# signal
- U2: Set the VID

Jumper Descriptions

- J16: If installed, the +5V rail supplies the +3.3V rail to the auxiliary circuit on the board. **DO NOT APPLY +3.3V TO TP37/TP30 WHILE J16 IS INSTALLED! IT'LL SHORT THE +5V AND THE +3.3V POWER SUPPLIES.** When measuring board efficiency, uninstall J16 and apply +3.3V to TP37/TP30.

Test Point Descriptions

| TEST POINT | DESCRIPTION |
|------------|---|
| J7 | Scope-probe socket for measuring PHASE1. |
| J10 | Scope-probe socket for measuring V_O . |
| J15 | Scope-probe socket for measuring the current of the on-board transient-load emulator. |
| TP1 | Monitor the on-board 1.2V power supply. |
| TP2 | +12V power supply return input. |
| TP3 | +12V power supply positive input. |
| TP4 | Monitor the COMP pin. |
| TP5 | Monitor the VW pin. |
| TP6 | Monitor the FB pin. |
| TP7 | Monitor the DPRSLPVR pin. |

Test Point Descriptions (Continued)

| TEST POINT | DESCRIPTION |
|------------|------------------------------------|
| TP12 | Input side of the compensator. |
| TP13 | Monitor the PGOOD pin. |
| TP14 | Monitor the VSEN pin. |
| TP16 | Monitor the CLK_EN# pin. |
| TP17 | Monitor the VR_ON pin. |
| TP18 | Monitor the RTN pin. |
| TP19 | Monitor the positive side of C82. |
| TP20 | Monitor the negative side of C82. |
| TP21 | Monitor the VID6 pin. |
| TP22 | Monitor the VID5 pin. |
| TP23 | Monitor the VID4 pin. |
| TP24 | Monitor the VID3 pin. |
| TP25 | Monitor the VID2 pin. |
| TP26 | Monitor the VID1 pin. |
| TP27 | Monitor the VID0 pin. |
| TP28 | Monitor the IMON pin. |
| TP29 | +5V power supply positive input. |
| TP30 | +5V power supply return input. |
| TP31 | V_{IN} positive voltage sense. |
| TP32 | V_{IN} return voltage sense. |
| TP33 | Monitor MOSFET Q3 gate signal. |
| TP37 | +3.3V power supply positive input. |

Bill of Materials

| QTY | REFERENCE | VALUE | DESCRIPTION | MFG. | PART NUMBER | PACKAGE |
|-----|-----------------------------------|---------------|--------------------------------|---------|-------------------|---------|
| 1 | PCB | | ISL62881CPUEVAL2ZREVD | | | |
| 1 | C1 | 0.01 μ F | Multilayer Cap, 16V, 10% | GENERIC | H1045-00103-16V10 | SM0603 |
| 1 | C11 | 1000pF | Multilayer Cap, 16V, 10% | GENERIC | H1045-00102-16V10 | SM0603 |
| 1 | C12 | 330pF | Multilayer Cap, 16V, 10% | GENERIC | H1045-00331-16V10 | SM0603 |
| 1 | C13 | 1000pF | Multilayer Cap, 16V, 10% | GENERIC | H1045-00102-16V10 | SM0603 |
| 0 | C14, C15, C19, C39, C44, C81, C86 | DNP | | | | |
| 5 | C16, C2, C22, C23, C79 | 1 μ F | Multilayer Cap, 16V, 20% | GENERIC | H1045-00105-16V20 | SM0603 |
| 3 | C17, C18, C30 | 0.22 μ F | Multilayer Cap, 25V, 10% | GENERIC | H1045-00224-25V10 | SM0603 |
| 3 | C20, C45, C58 | 0.1 μ F | Multilayer Cap, 16V, 10% | GENERIC | H1045-00104-16V10 | SM0603 |
| 1 | C21 | 0.047 μ F | Multilayer Cap, 16V, 10% | GENERIC | H1045-00473-16V10 | SM0603 |
| 1 | C25 | 56 μ F | Radial SP Series Cap, 25V, 20% | SANYO | 25SP56M | CASE-CC |

Application Note 1552

Bill of Materials (Continued)

| QTY | REFERENCE | VALUE | DESCRIPTION | MFG. | PART NUMBER | PACKAGE |
|-----|---|---------|--|------------------|---------------------|----------------|
| 3 | C27, C33, C80 | 10μF | Multilayer Cap, 25V, 20% | GENERIC | H1065-00106-25V20 | SM1206 |
| 1 | C3 | 390pF | Multilayer Cap, 16V, 10% | GENERIC | H1045-00391-16V10 | SM0603 |
| 2 | C52, C57 | 330μF | SPCAP, 2V, 4MW | PANASONIC | EEXSX0D331E4 | |
| 1 | C4 | 1000pF | Multilayer Cap, 16V, 10% | GENERIC | H1045-00102-16V10 | SM0603 |
| 30 | C40-C43, C47-C50, C53-C56, C59, C75, C78 | 10μF | Multilayer Cap, 6.3V, 20% | TAIYO | JMK212BJ106MG-T | SM0805 |
| | | | | MURATA | GRM21BR60J106ME19 | |
| | | | | Kyocera | CM21X5R106M06AT | |
| | | | | TDK | C2012X5R0J106MT009N | |
| 1 | C6 | 56pF | Multilayer Cap, 16V, 10% | GENERIC | H1045-00563-16V10 | SM0603 |
| 1 | C82 | 0.047μF | Multilayer Cap, 16V, 10% | GENERIC | H1045-00820-16V10 | SM0603 |
| 1 | D1 | | 3mmx2.5mm Surface Mount Red/Green LED | Lumex | SSL-LXA3025IGC | LED_3x2_5MM |
| 1 | J10 | | Scope Probe Test PoinT PCB Mount | TEKTRONIX | 131-4353-00 | TEK131-4353-00 |
| 0 | J15, J7 | DNP | | | | |
| 2 | J12, J14 | | Wire Connector Lug | BURNDY | KPA8CTP | KPA8CTP |
| 1 | J16 | | 2 Pin Header 2.54mm (0.100) Pitch | BERG?FCI | 69190-202 | CONN2 |
| 1 | J5 | | Binding Post Red | JOHNSON- COMP | 111-0702-001 | 111-07XX-001 |
| 1 | J6 | | Binding Post Black | JOHNSON- COMP | 111-0703-001 | 111-07XX-001 |
| 1 | L1 | 0.45μH | Inductor, Inductance 20%, DCR 7% | NEC-TOKIN | MPCG1040LR45 | 6.5mm x 6.5mm |
| 2 | Q1, Q14 | | N-Channel EMF Effect Transistor (Pb-Free) | FAIRCHILD | 2N7002-7-F | SOT23 |
| 1 | Q15 | | N-Channel 30V (D-S) MOSFET | VISHAY | SUD50N03-07 | TO-252AA |
| 2 | Q2, Q8 | | N-Channel Power MOSFET | IR | IRF7821 | PWRPAKS08 |
| 2 | Q3, Q9 | | N-Channel Power MOSFET | IR | IRF7832 | PWRPAKS08 |
| 1 | R1 | 49.9 | Thick Film Chip Resistor, 1% | GENERIC | H2511-049R9-1/16W1 | SM0603 |
| 1 | R10 | 715 | Thick Film Chip Resistor, 1% | GENERIC | H2511-07150-1/16W1 | SM0603 |
| 1 | R102 | 49.9k | Thick Film Chip Resistor, 1% | GENERIC | H2511-04992-1/16W1 | SM0603 |
| 2 | R104, R105 | 249 | Thick Film Chip Resistor, 1% | GENERIC | H2511-02490-1/16W1 | SM0603 |
| 1 | R106 | 0.2 | Thick Film Chip Resistor, 1% | GENERIC | H2515-00R20-1W1-T | SM2512 |
| 0 | R109, R110, R111, R113, R114, R121, R2, R26, R31, R4, R44, R68, R77, R93, R99, R107, R117 | DNP | | | | |
| 1 | R11 | 1.33k | Thick Film Chip Resistor, 1% | GENERIC | H2511-01331-1/16W1 | SM0603 |
| 3 | R13, R15, R103 | 499 | Thick Film Chip Resistor, 1% | GENERIC | H2511-04990-1/16W1 | SM0603 |
| 1 | R115 | 0 | Thick Film Chip Resistor, 1% | GENERIC | H2511-00R00-1/16W1 | SM0603 |
| 1 | R16 | 147k | Thick Film Chip Resistor, 1% | GENERIC | H2511-01473-1/16W1 | SM0603 |

Application Note 1552

Bill of Materials (Continued)

| QTY | REFERENCE | VALUE | DESCRIPTION | MFG. | PART NUMBER | PACKAGE |
|-----|---|------------|--|-----------|--------------------|--------------|
| 2 | R17, R18 | 10 | Thick Film Chip Resistor, 1% | GENERIC | H2511-00100-1/16W1 | SM0603 |
| 2 | R19, R23 | 1.91k | Thick Film Chip Resistor, 1% | GENERIC | H2511-01911-1/16W1 | SM0603 |
| 17 | R20, R22, R24, R25, R27, R29, R32, R33, R34, R35, R40, R52, R56, R62, R87, R112, R116 | 0 | Thick Film Chip Resistor, 1% | GENERIC | H2511-00R00-1/16W1 | SM0603 |
| 9 | R21, R28, R36, R39, R43, R45, R46, R49, R51 | 10k | Thick Film Chip Resistor, 1% | GENERIC | H2511-01002-1/16W1 | SM0603 |
| 1 | R30 | 909 | Thick Film Chip Resistor, 1% | GENERIC | H2511-09090-1/16W1 | SM0603 |
| 1 | R37 | 1 | Thick Film Chip Resistor, 1% | GENERIC | H2511-01R00-1/16W1 | SM0603 |
| 1 | R38 | 11k | Thick Film Chip Resistor, 1% | GENERIC | H2511-01102-1/16W1 | SM0603 |
| 1 | R41 | 2.61k | Thick Film Chip Resistor, 1% | GENERIC | H2511-02611-1/16W1 | SM0603 |
| 1 | R42 | 10k NTC | Thermistor, 10k NTC | PANASONIC | ERT-J1VR103J | SM0603 |
| 2 | R5, R80 | 100 | Thick Film Chip Resistor, 1% | GENERIC | H2511-01000-1/16W1 | SM0603 |
| 1 | R50 | 7.68k | Thick Film Chip Resistor, 1% | GENERIC | H2511-07681-1/16W1 | SM0603 |
| 2 | R59, R96 | 0 | Solder Joint (Heavy Duty) | | | |
| 1 | R6 | 9.09k | Thick Film Chip Resistor, 1% | GENERIC | H2511-09091-1/16W1 | SM0603 |
| 1 | R63 | 1.82k | Thick Film Chip Resistor, 1% | GENERIC | H2511-01821-1/16W1 | SM0805 |
| 1 | R7 | 226k | Thick Film Chip Resistor, 1% | GENERIC | H2511-02263-1/16W1 | SM0603 |
| 1 | S1 | | SD Series Low Profile Dip Switch | C&K | SD02H0SK | DIPSW5MT-4 |
| 2 | S2, S3 | | SPDT On-None-On SMT Ultraminiature Toggle Switch | C&K | GT11MSCKE | GT13MSCKE |
| 1 | S4 | | Schottky Barrier (Double) Diode | DIODES | BAT54S | SOT23 |
| 4 | TP2, TP3, TP29, TP30 | | Test Point Turret 0.15 Pad 0.1 Thole | KEYSTONE | 1514-2 | TP-150C100P |
| 28 | TP1, TP4-TP7, TP12-TP14, TP16-TP28, TP31-TP33, TP37, TP40 | | Miniature White Test Point 0.100 Pad 0.040 Thole | KEYSTONE | 5002 | MTP500X |
| 0 | TP38, TP39, TP9 | DNP | | | | |
| 1 | U1 | | Low Volt Precision Adjustable Shunt Regulator | ON-SEMI | TLV431ASNT1 | TSOP-5 |
| 1 | U2 | | SD Series Low Profile Dip Switch | C&K | SD07H0SK | DIPSW5MT-14 |
| 1 | U4 | | rPGA989 CPU Socket | FOXCONN | | |
| 1 | U5 | | 100V/2A Peak High Frequency Half Bridge Driver (Pb-Free) | INTERSIL | HIP2100IBZ | SOIC8_150_50 |
| 1 | U6 | | IMVP-6 PWM Controller | INTERSIL | ISL62881CHRTZ | QFN-28 |

ISL62881CCPUEVAL2Z Schematics

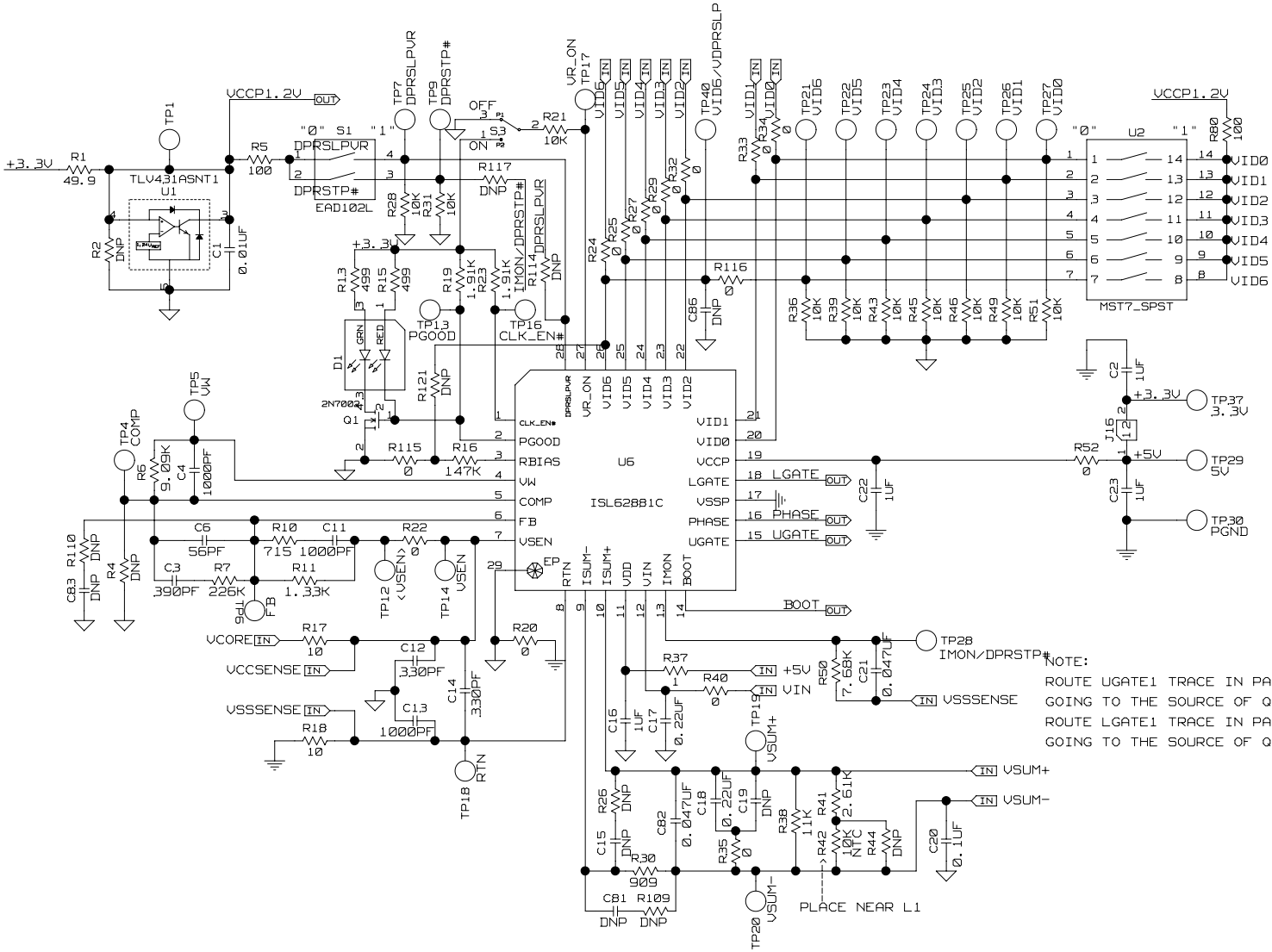


FIGURE 2. ISL62881CCPUEVAL2Z SCHEMATIC, 1 OF 5

ISL62881CCPUEVAL2Z Schematics (Continued)

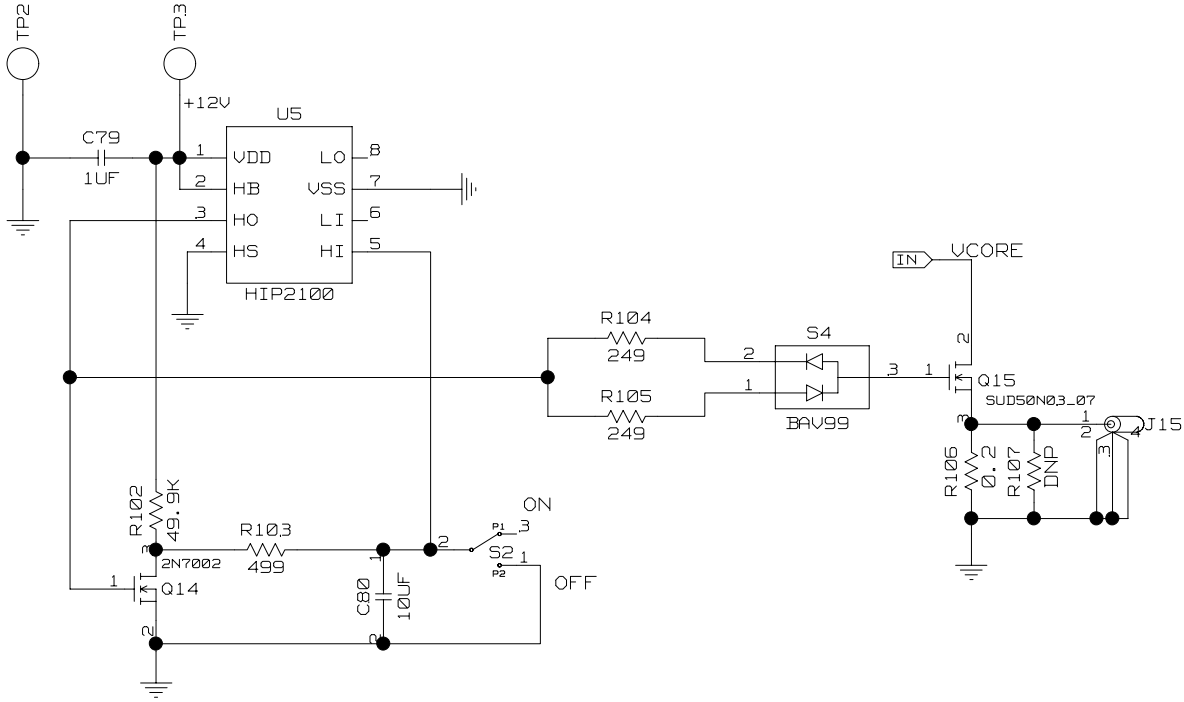


FIGURE 5. ISL62881CCPUEVAL2Z SCHEMATIC, 4 OF 5

ISL62881CCPUEVAL2Z Schematics (Continued)

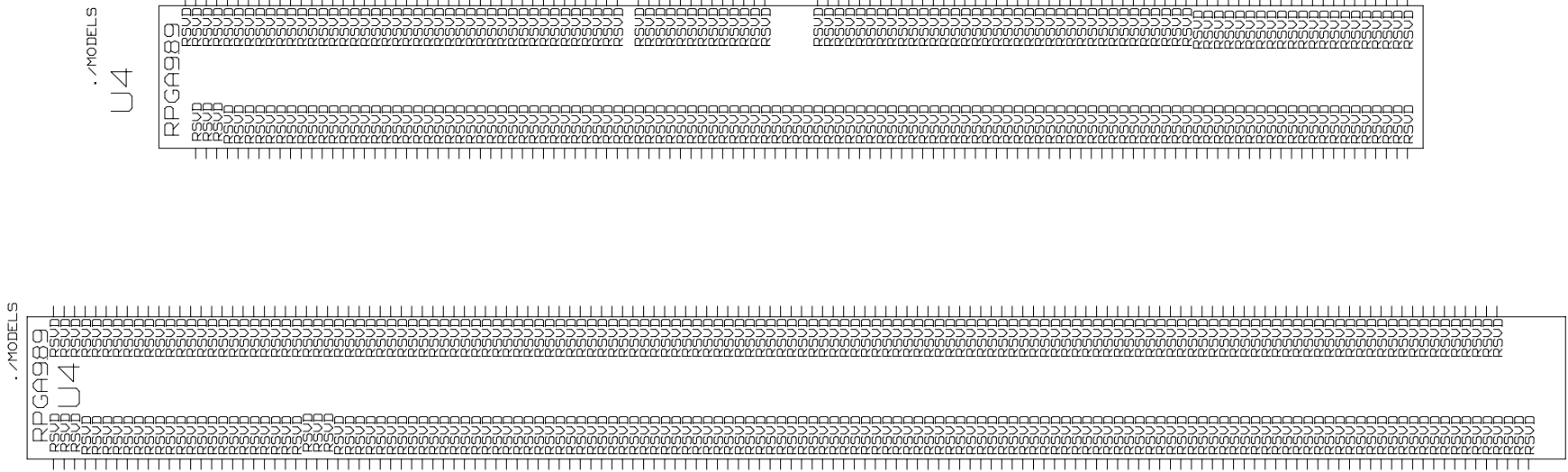


FIGURE 6. ISL62881CCPUEVAL2Z SCHEMATIC, 5 OF 5

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

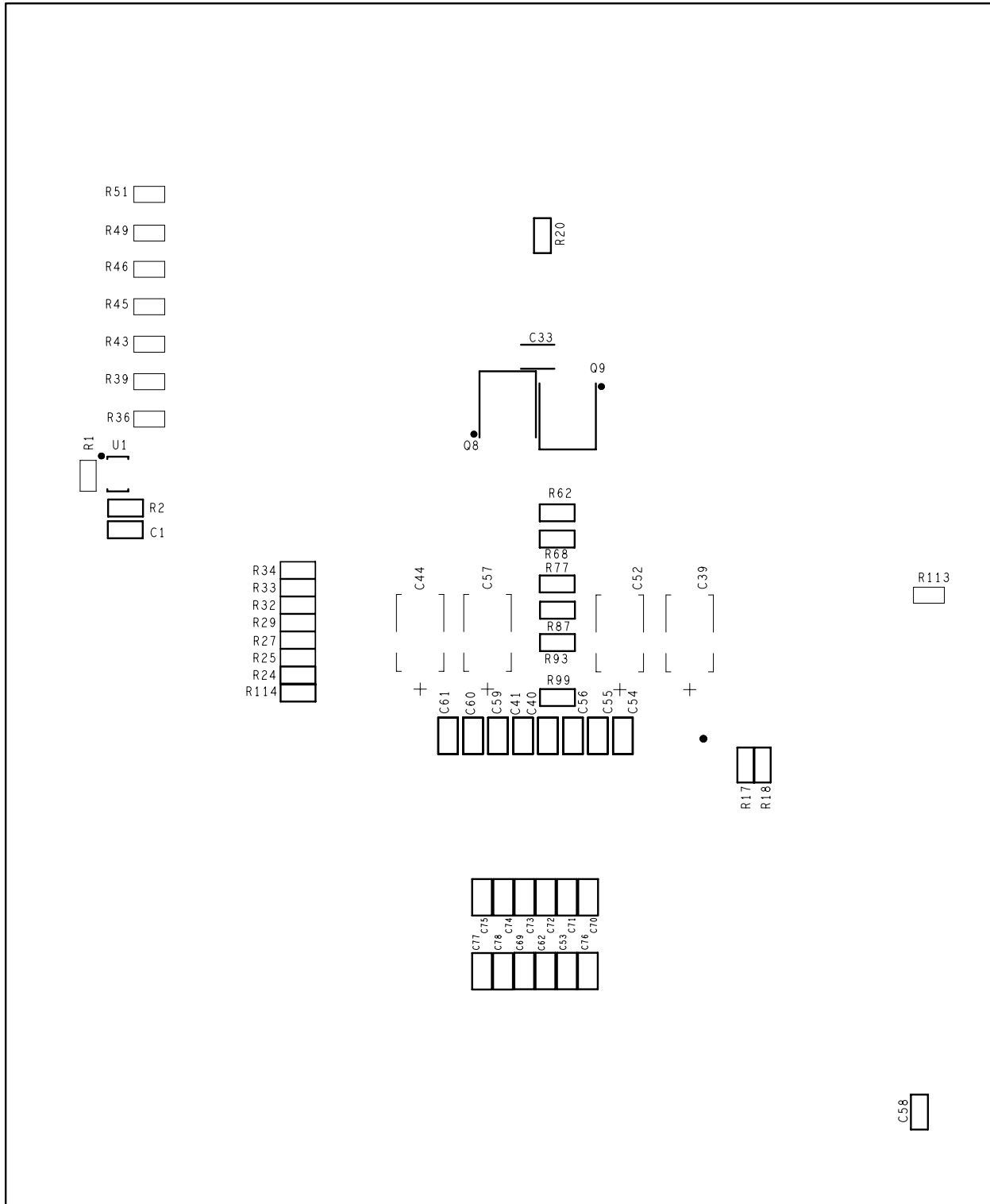


FIGURE 8. BOTTOM SILKSCREEN

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

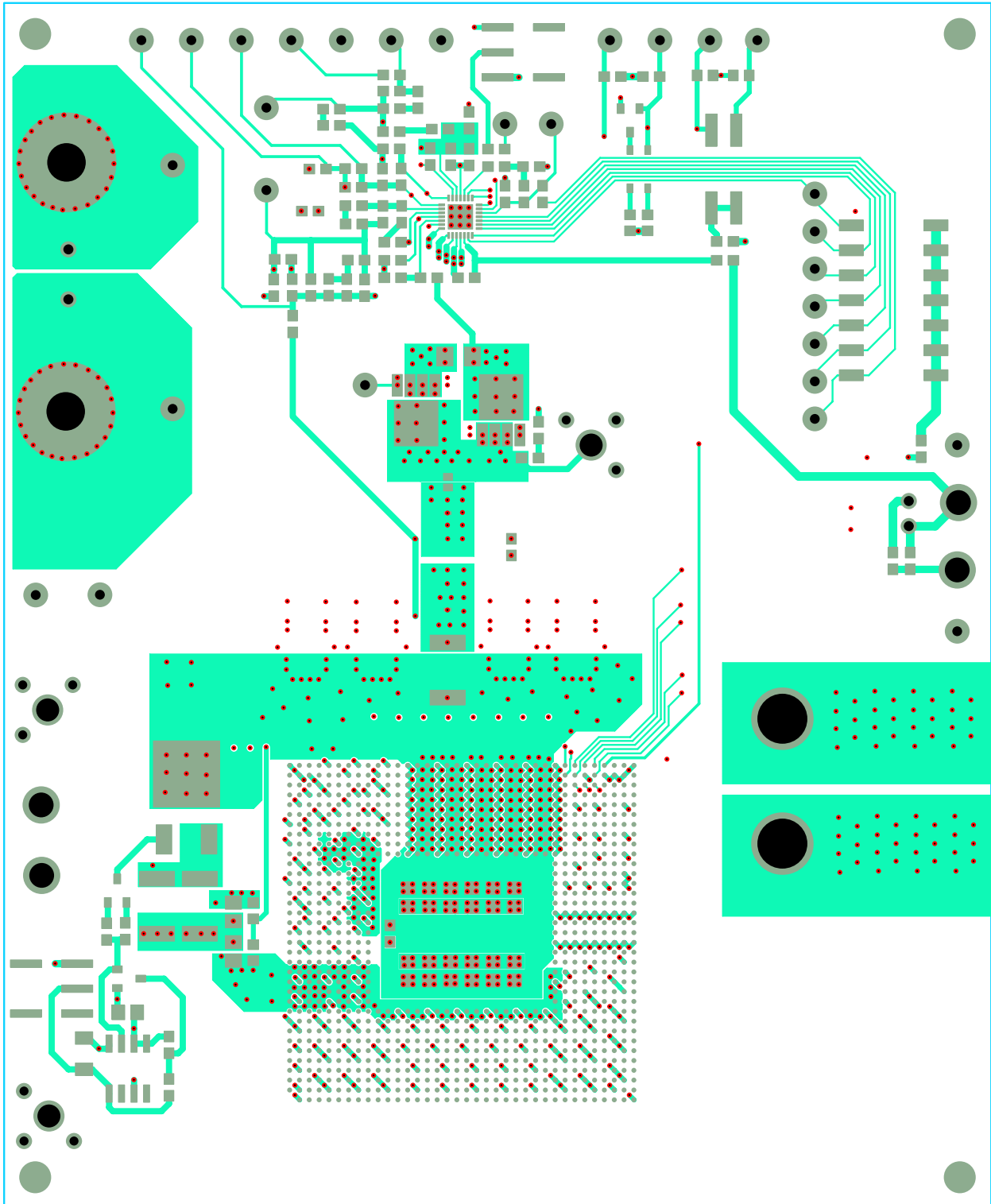


FIGURE 9. LAYER 1

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

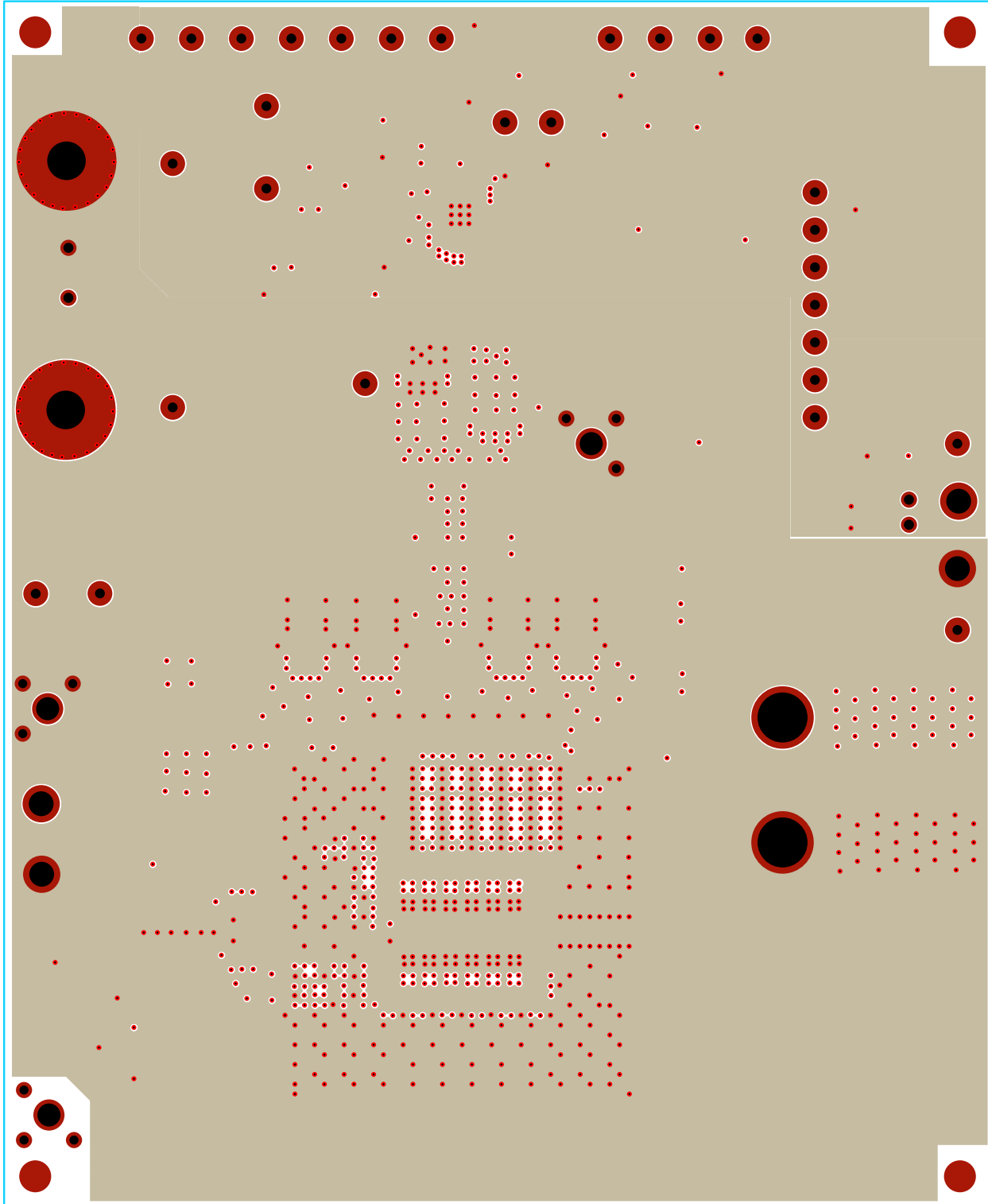


FIGURE 10. LAYER 2

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

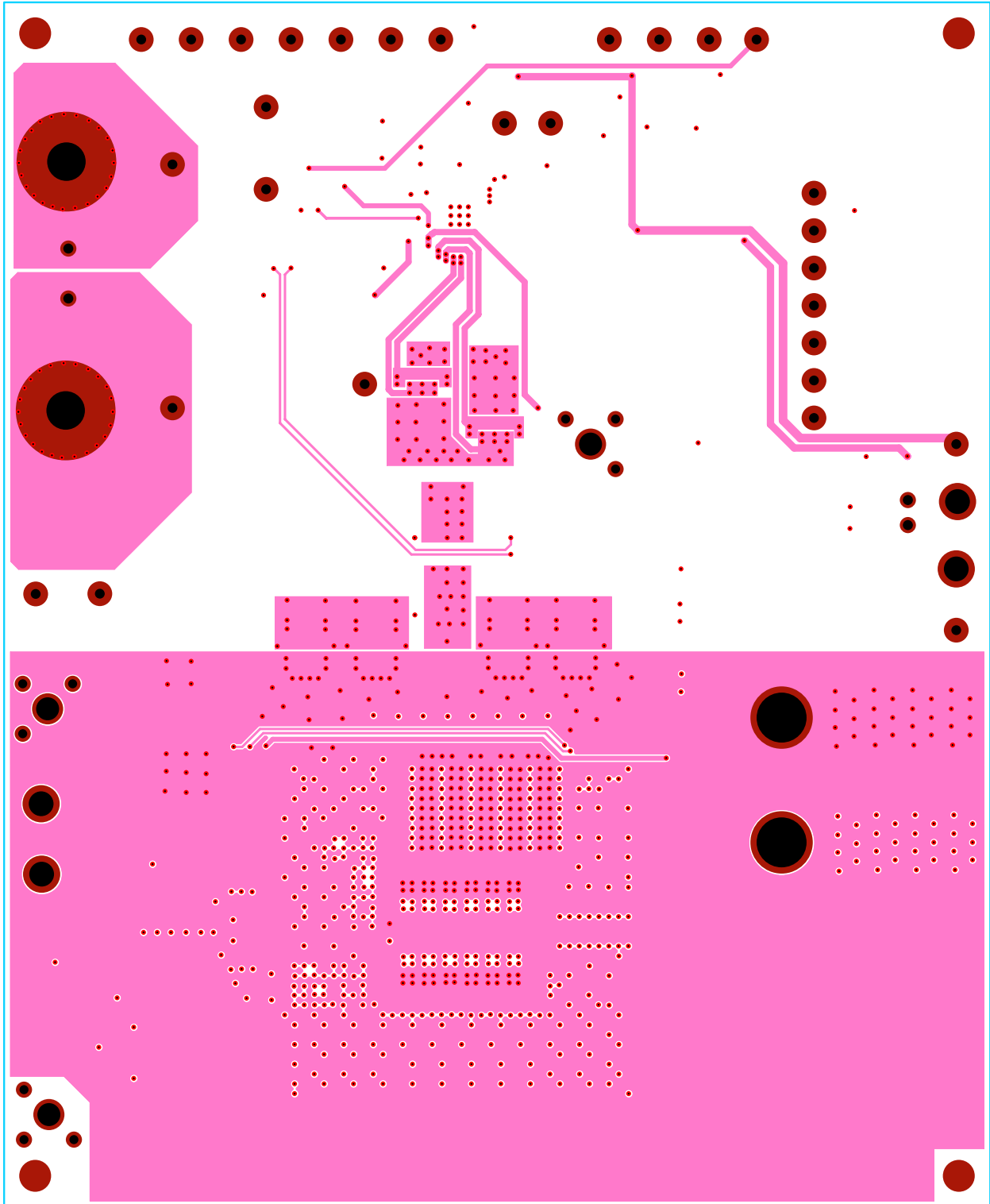


FIGURE 11. LAYER 3

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

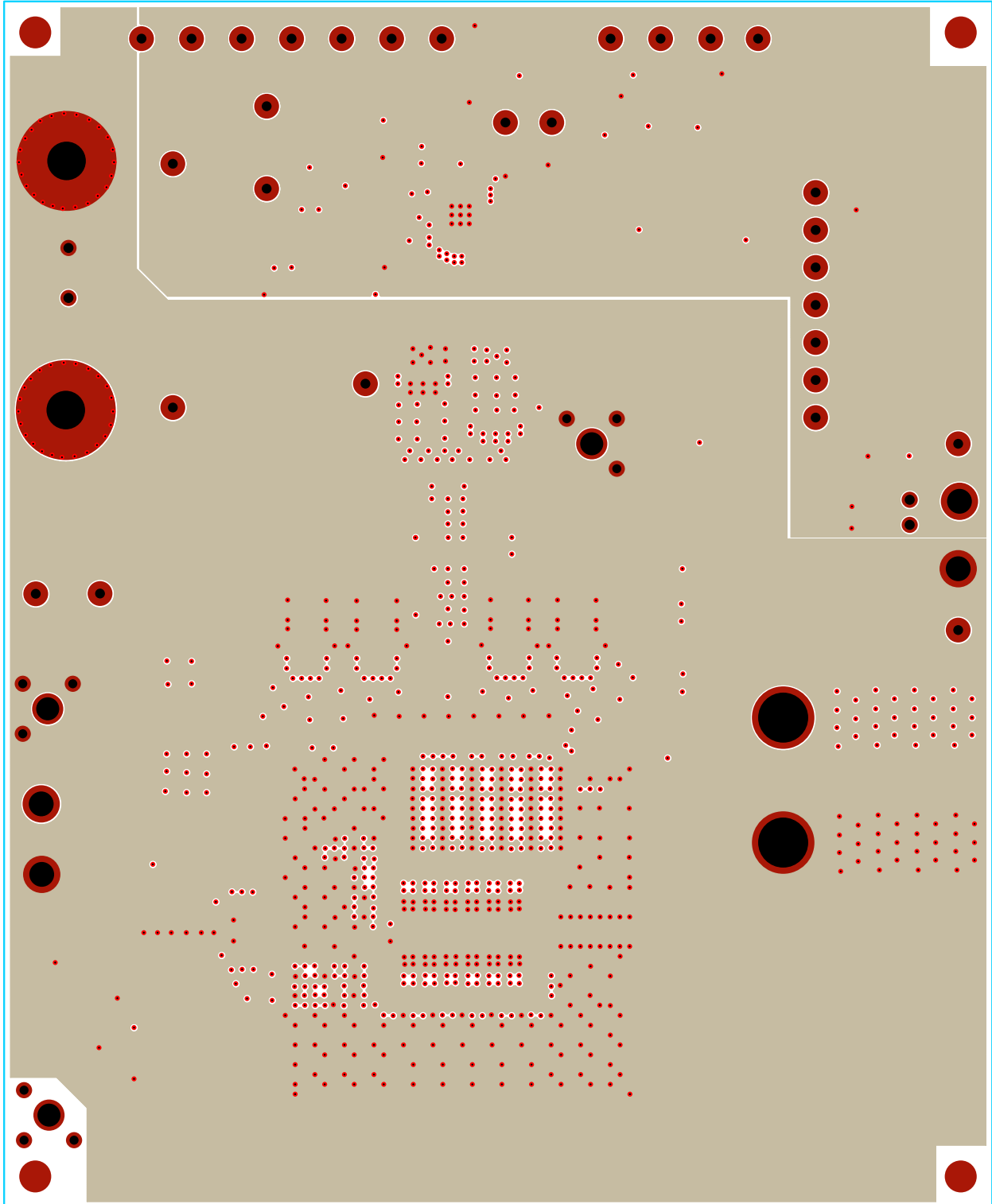


FIGURE 12. LAYER 4

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

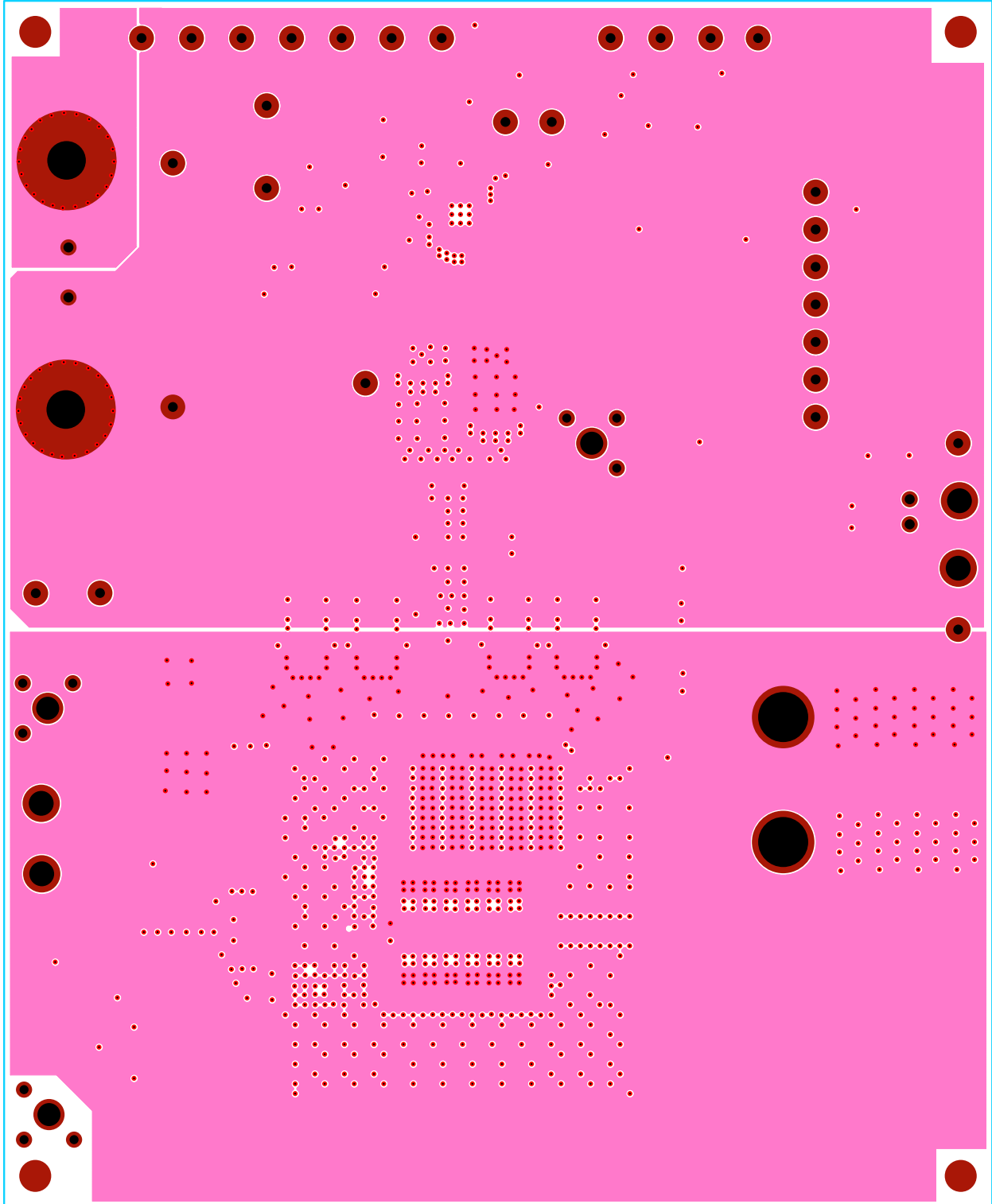


FIGURE 13. LAYER 5

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

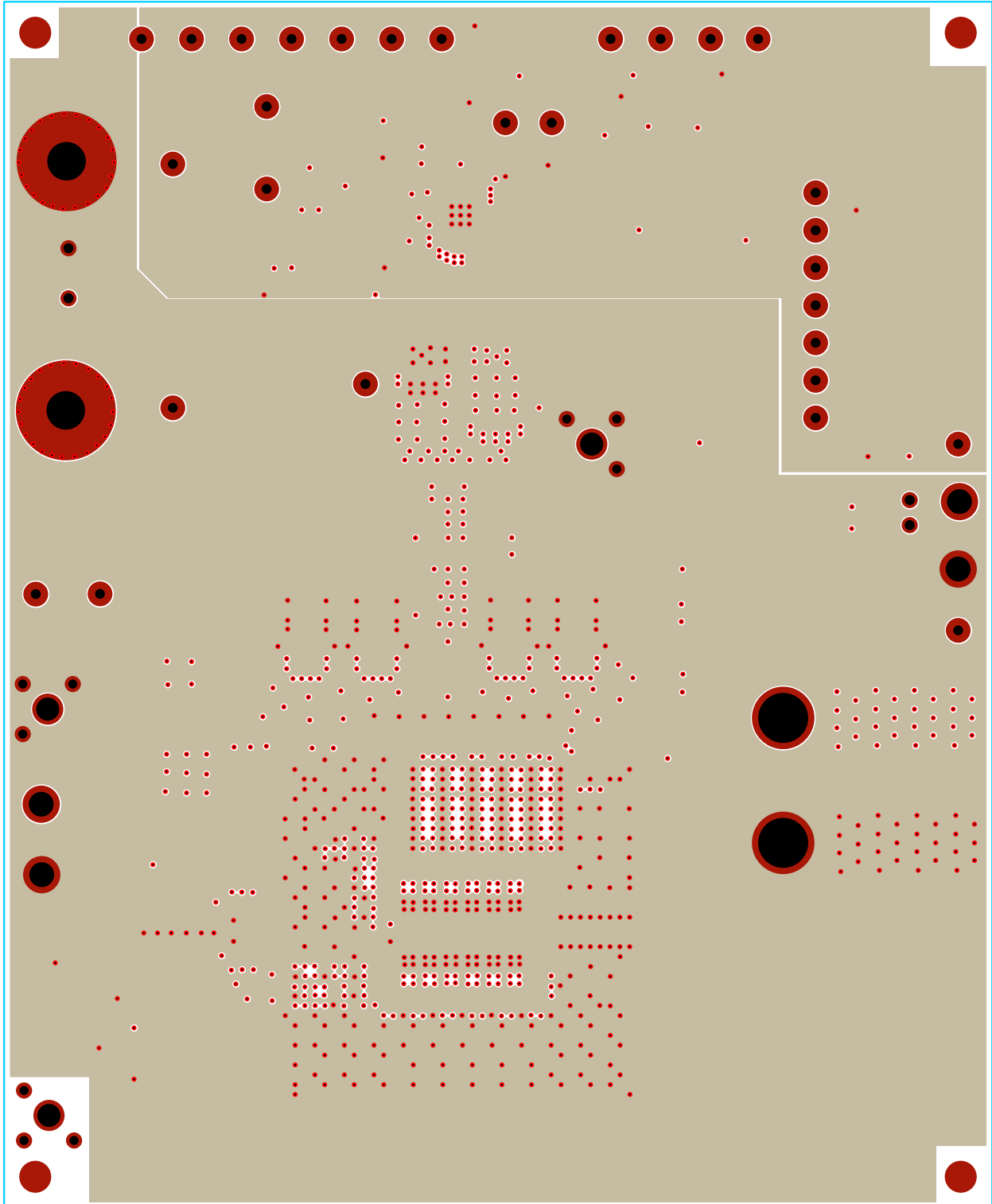


FIGURE 14. LAYER 6

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

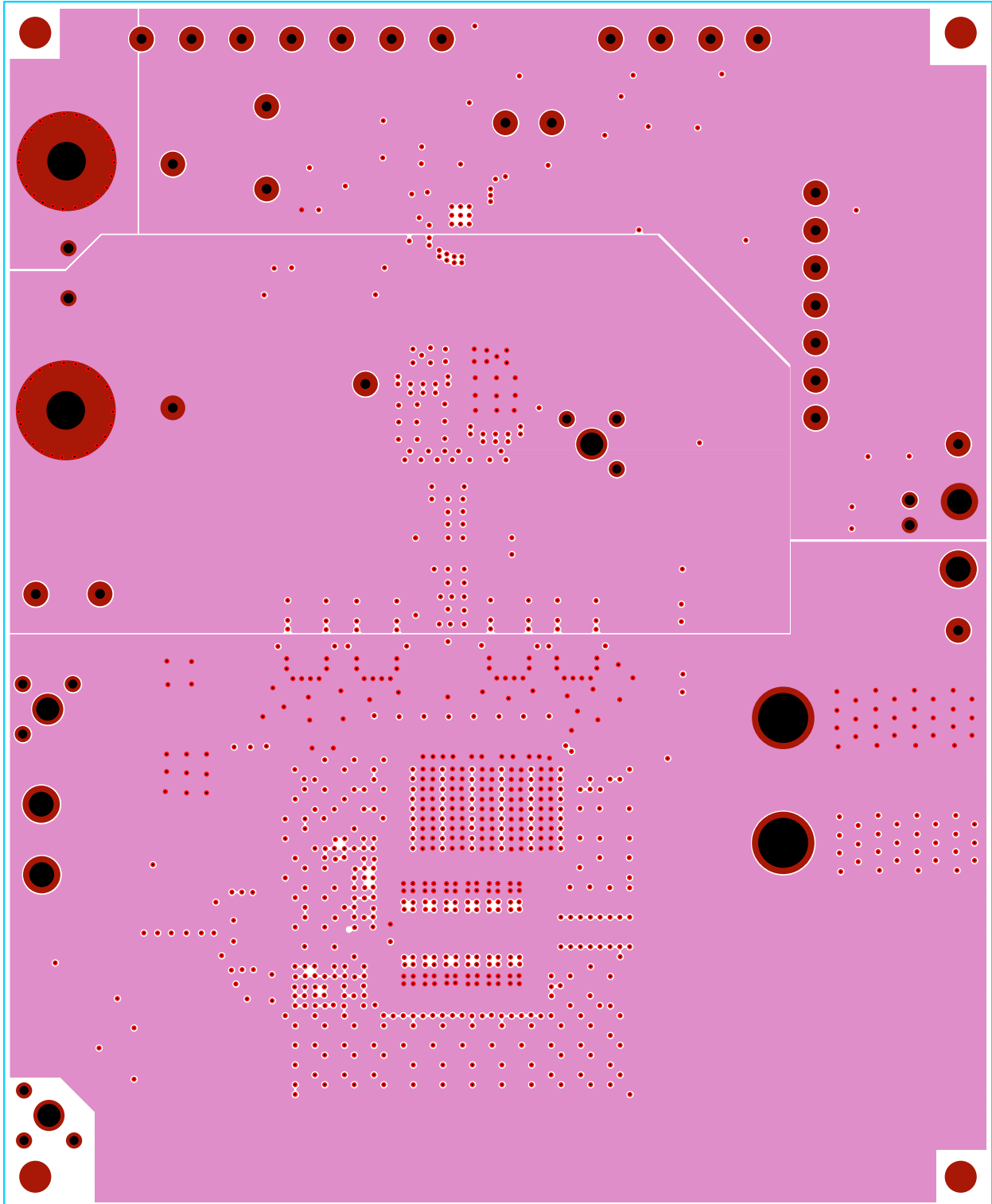


FIGURE 15. LAYER 7

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

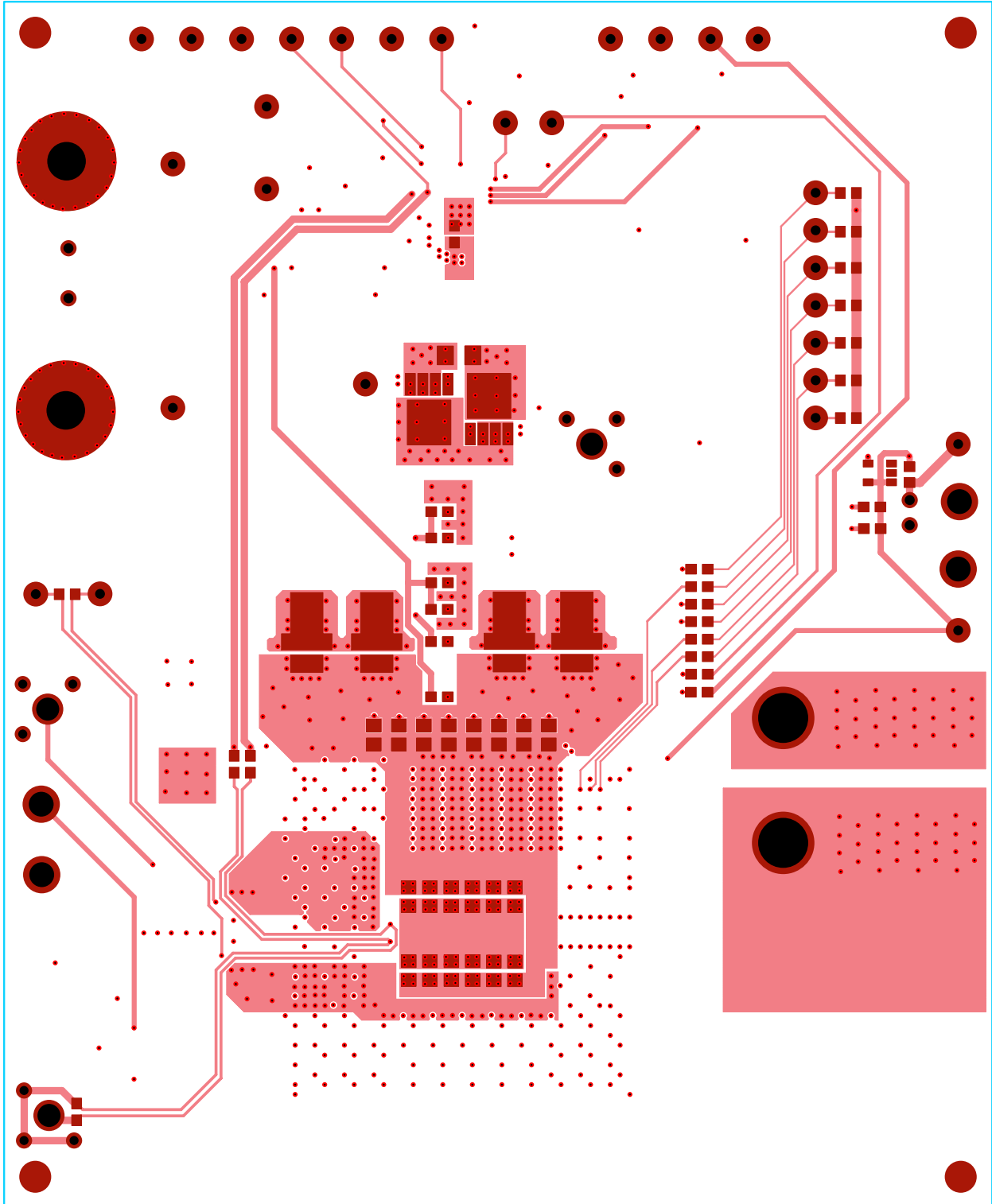


FIGURE 16. LAYER 8

Intersil Corporation reserves the right to make changes in circuit design, software and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that the Application Note or Technical Brief is current before proceeding.

For information regarding Intersil Corporation and its products, see www.intersil.com