

# 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 ( $R^3$ ) technology. An on-board dynamic-load generator is included for evaluating the transient-load response. It applies a 300 $\mu$ s pulse of approximately 0.2 $\Omega$  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

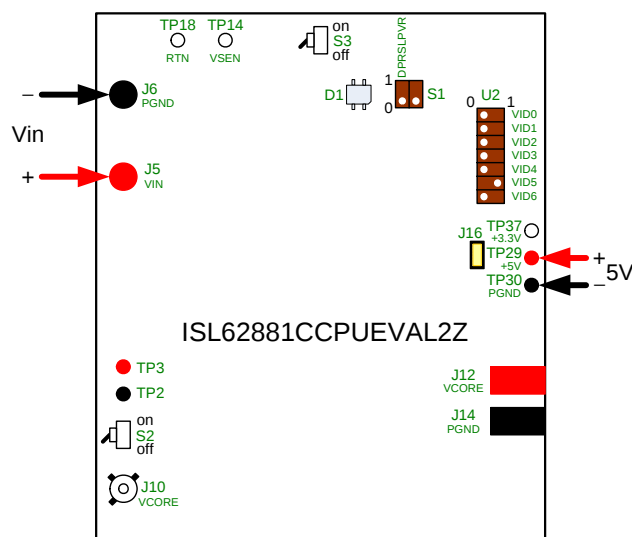


FIGURE 1. TEST SET-UP

## 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 $\mu$ 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 $\mu$ F     | Multilayer Cap, 16V, 20%       | GENERIC | H1045-00105-16V20 | SM0603  |
| 3   | C17, C18, C30                     | 0.22 $\mu$ F  | Multilayer Cap, 25V, 10%       | GENERIC | H1045-00224-25V10 | SM0603  |
| 3   | C20, C45, C58                     | 0.1 $\mu$ F   | Multilayer Cap, 16V, 10%       | GENERIC | H1045-00104-16V10 | SM0603  |
| 1   | C21                               | 0.047 $\mu$ F | Multilayer Cap, 16V, 10%       | GENERIC | H1045-00473-16V10 | SM0603  |
| 1   | C25                               | 56 $\mu$ F    | Radial SP Series Cap, 25V, 20% | SANYO   | 25SP56M           | CASE-CC |

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### 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,<br>C53-C56, C59, C75,<br>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<br>Red/Green LED     | Lumex            | SSL-LXA3025IGC      | LED_3x2_5MM    |
| 1   | J10                                                                                                   |         | Scope Probe Test POint PCB<br>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<br>(0.100) Pitch         | BERG?FCI         | 69190-202           | CONN2          |
| 1   | J5                                                                                                    |         | Binding Post Red                             | JOHNSON-<br>COMP | 111-0702-001        | 111-07XX-001   |
| 1   | J6                                                                                                    |         | Binding Post Black                           | JOHNSON-<br>COMP | 111-0703-001        | 111-07XX-001   |
| 1   | L1                                                                                                    | 0.45μH  | Inductor, Inductance 20%,<br>DCR 7%          | NEC-TOKIN        | MPCG1040LR45        | 6.5mm x 6.5mm  |
| 2   | Q1, Q14                                                                                               |         | N-Channel EMF Effect<br>Transistor (Pb-Free) | FAIRCHILD        | 2N7002-7-F          | SOT23          |
| 1   | Q15                                                                                                   |         | N-Channel 30V (D-S)<br>MOSFET                | VISHAY           | SUD50N03-07         | TO-252AA       |
| 2   | Q2, Q8                                                                                                |         | N-Channel Power MOSFET                       | IR               | IRF7821             | PWRPAKSO8      |
| 2   | Q3, Q9                                                                                                |         | N-Channel Power MOSFET                       | IR               | IRF7832             | PWRPAKSO8      |
| 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,<br>R113, R114, R121,<br>R2, R26, R31, R4,<br>R44, R68, R77, R93,<br>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         |

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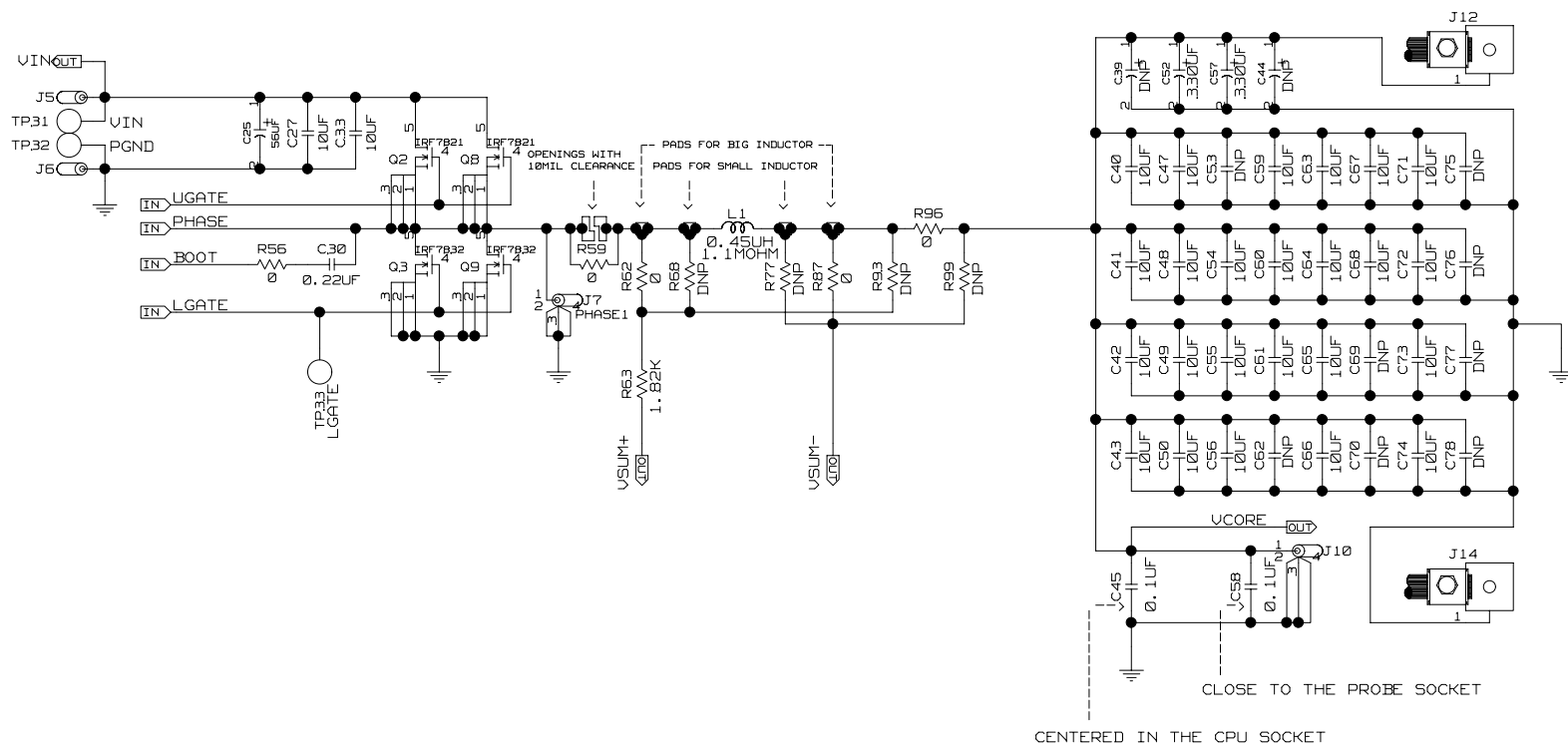
### Bill of Materials (Continued)

| 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,<br>R27, R29, R32, R33,<br>R34, R35, R40, R52,<br>R56, R62, R87,<br>R112, R116 | 0          | Thick Film Chip Resistor, 1%                             | GENERIC   | H2511-00R00-1/16W1 | SM0603       |
| 9   | R21, R28, R36, R39,<br>R43, R45, R46, R49,<br>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<br>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           | DIPSW-SMT-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,<br>TP30                                                                           |            | Test Point Turret 0.15 Pad 0.1 Thole                     | KEYSTONE  | 1514-2             | TP-150C100P  |
| 28  | TP1, TP4-TP7,<br>TP12-TP14,<br>TP16-TP28,<br>TP31-TP33, TP37,<br>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           | DIPSW-SMT-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       |

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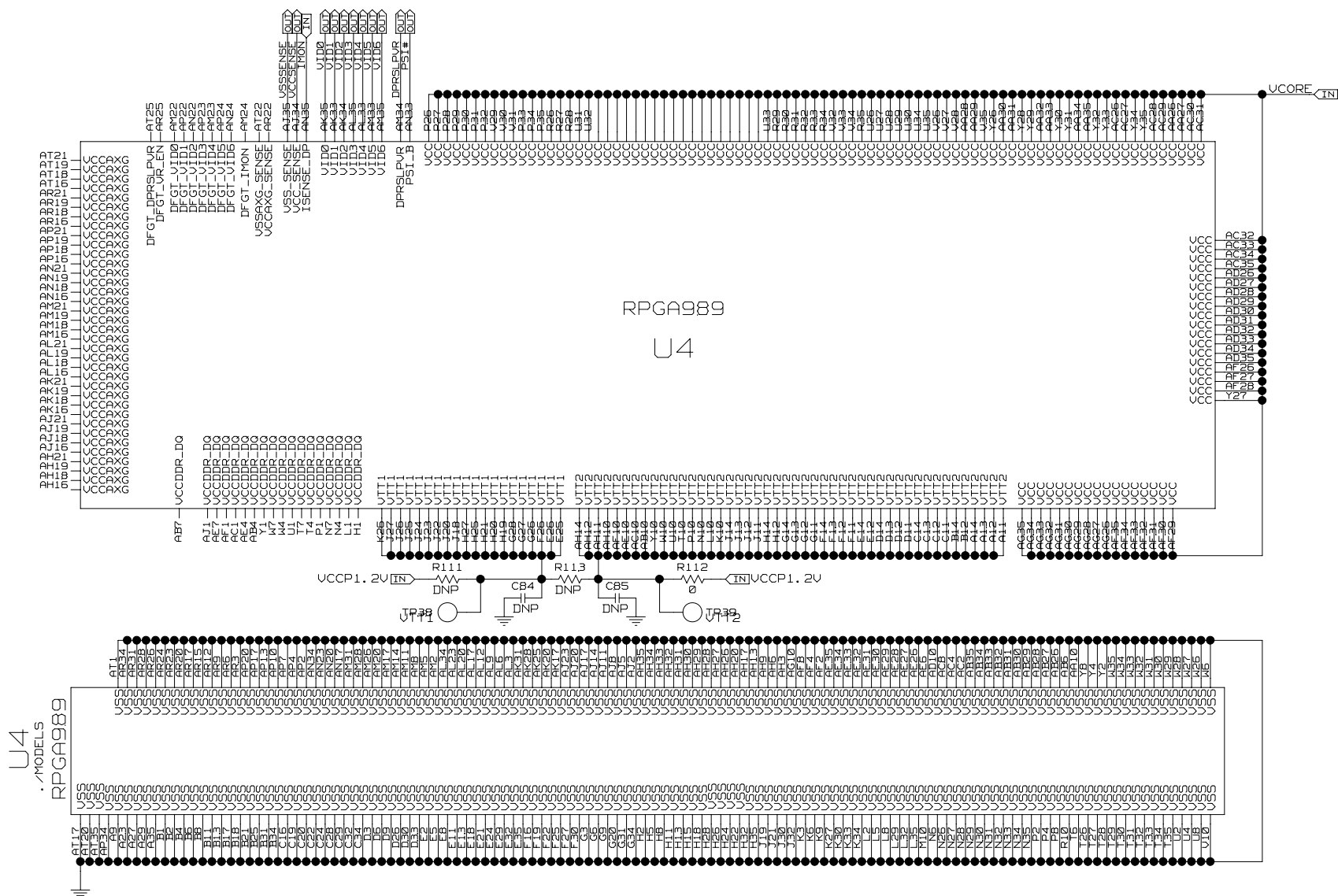


## ISL62881CCPUEVAL2Z Schematics (Continued)



**FIGURE 3. ISL62881CCPUEVAL2Z SCHEMATIC, 2 OF 5**

## ISL62881CCPUEVAL2Z Schematics (Continued)



**FIGURE 4. ISL62881CCPUEVAL2Z SCHEMATIC, 3 OF 5**

# ISL62881CCPUEVAL2Z Schematics (Continued)

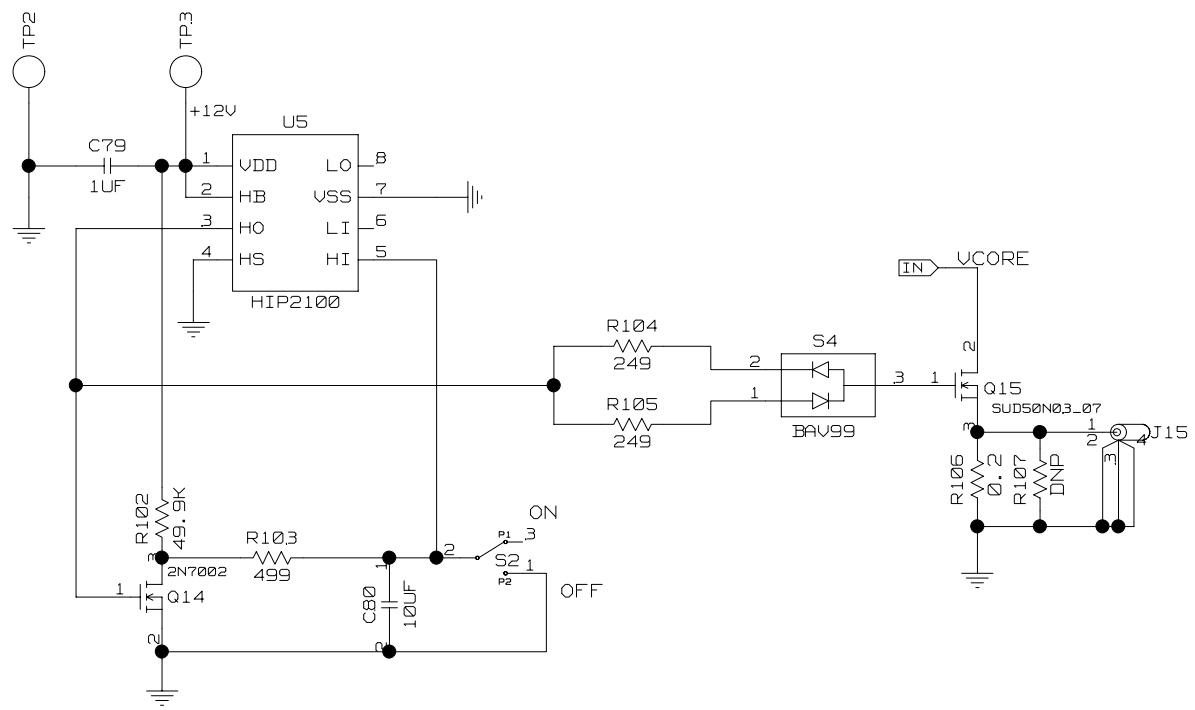


FIGURE 5. ISL62881CCPUEVAL2Z SCHEMATIC, 4 OF 5

ISL62881CCPUEVAL2Z Schematics (Continued)

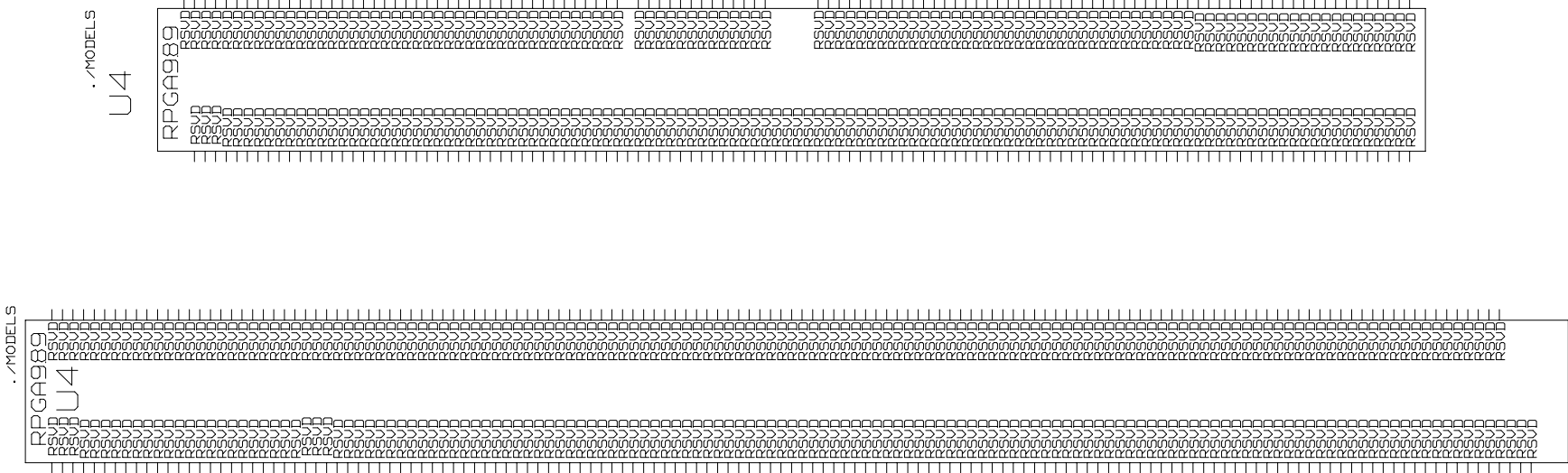


FIGURE 6. ISL62881CCPUEVAL2Z SCHEMATIC, 5 OF 5

# ISL62881CCPUEVAL2Z Evaluation Board Layout

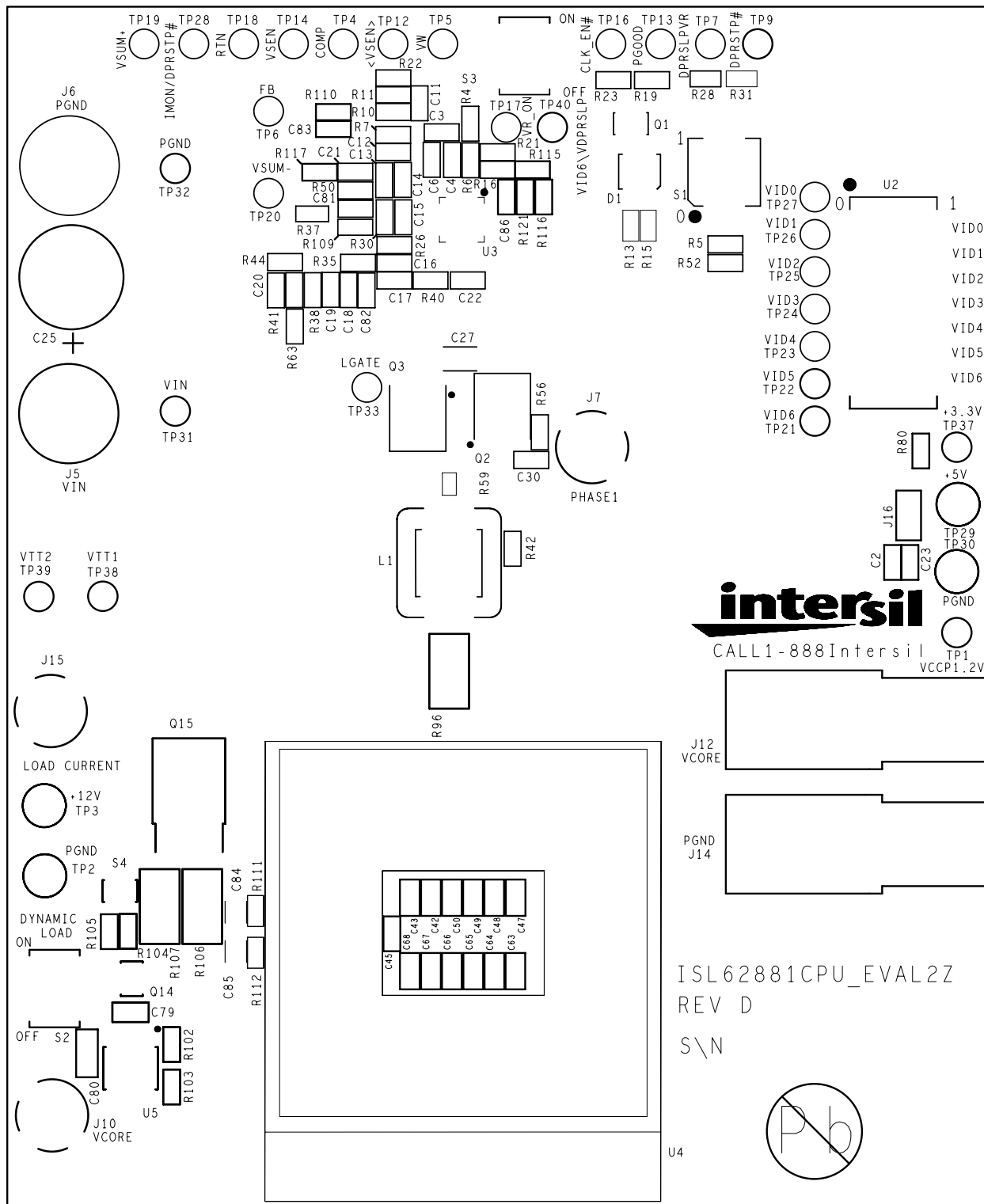


FIGURE 7. TOP SILKSCREEN

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

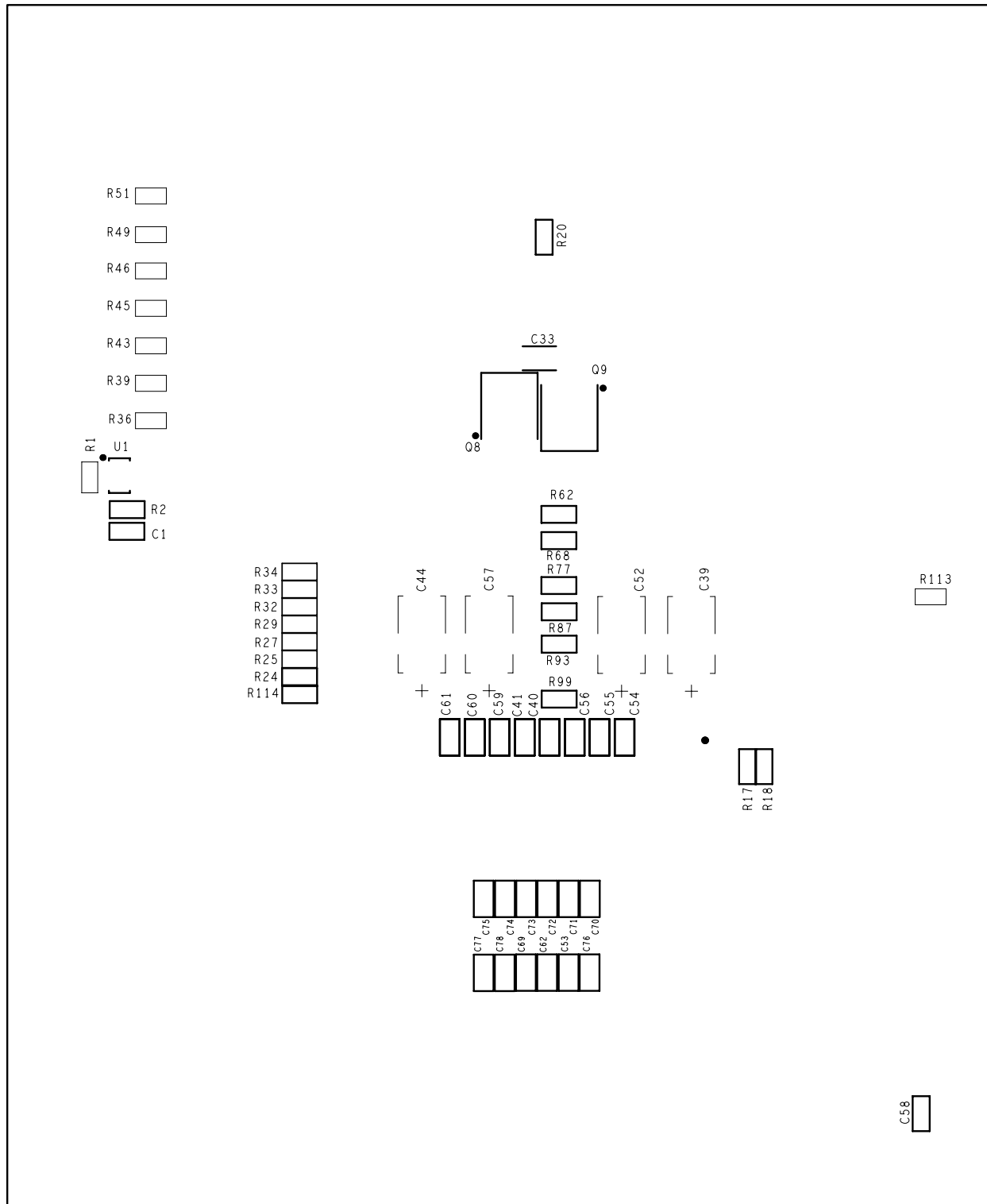


FIGURE 8. BOTTOM SILKSCREEN

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

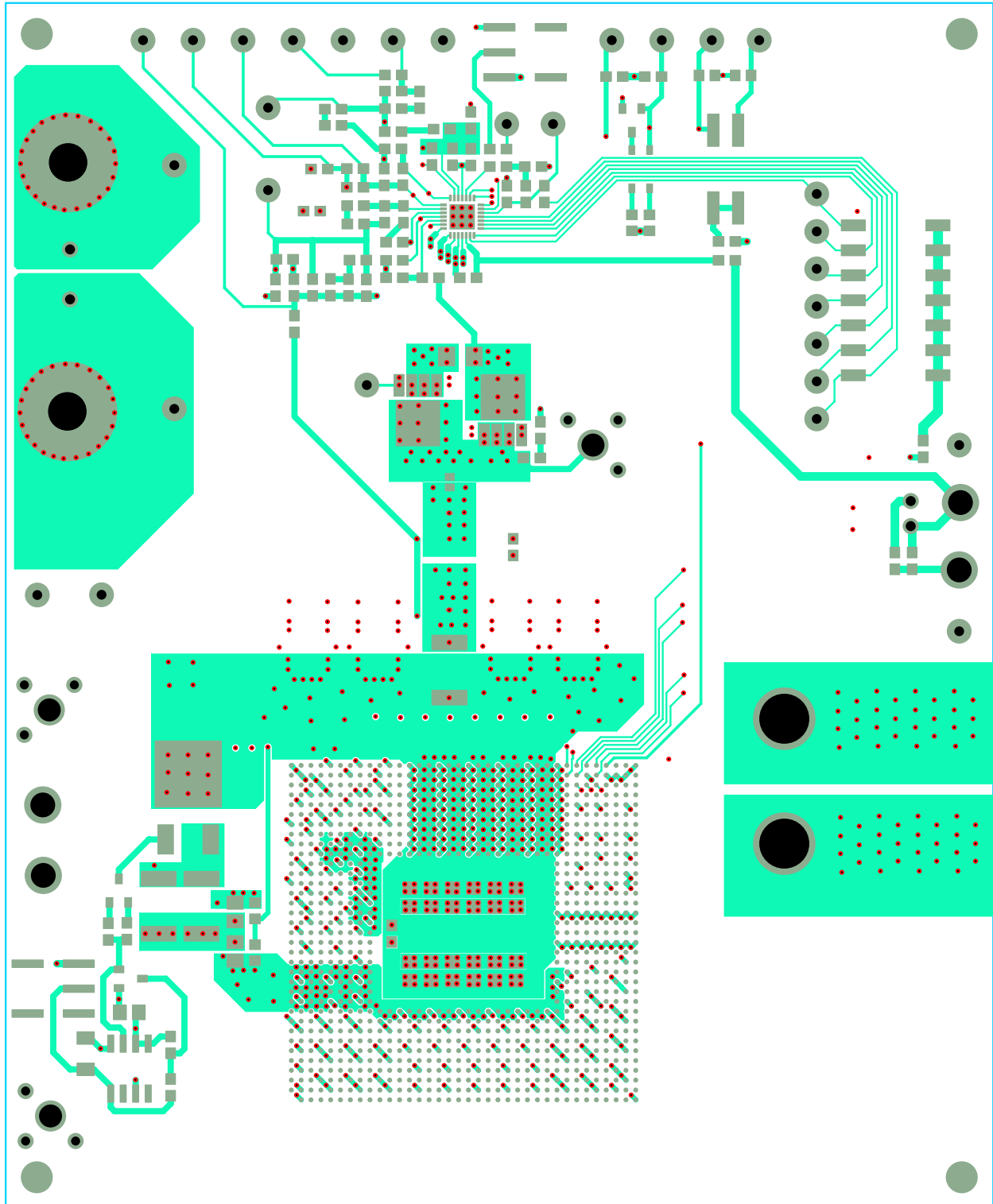


FIGURE 9. LAYER 1

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

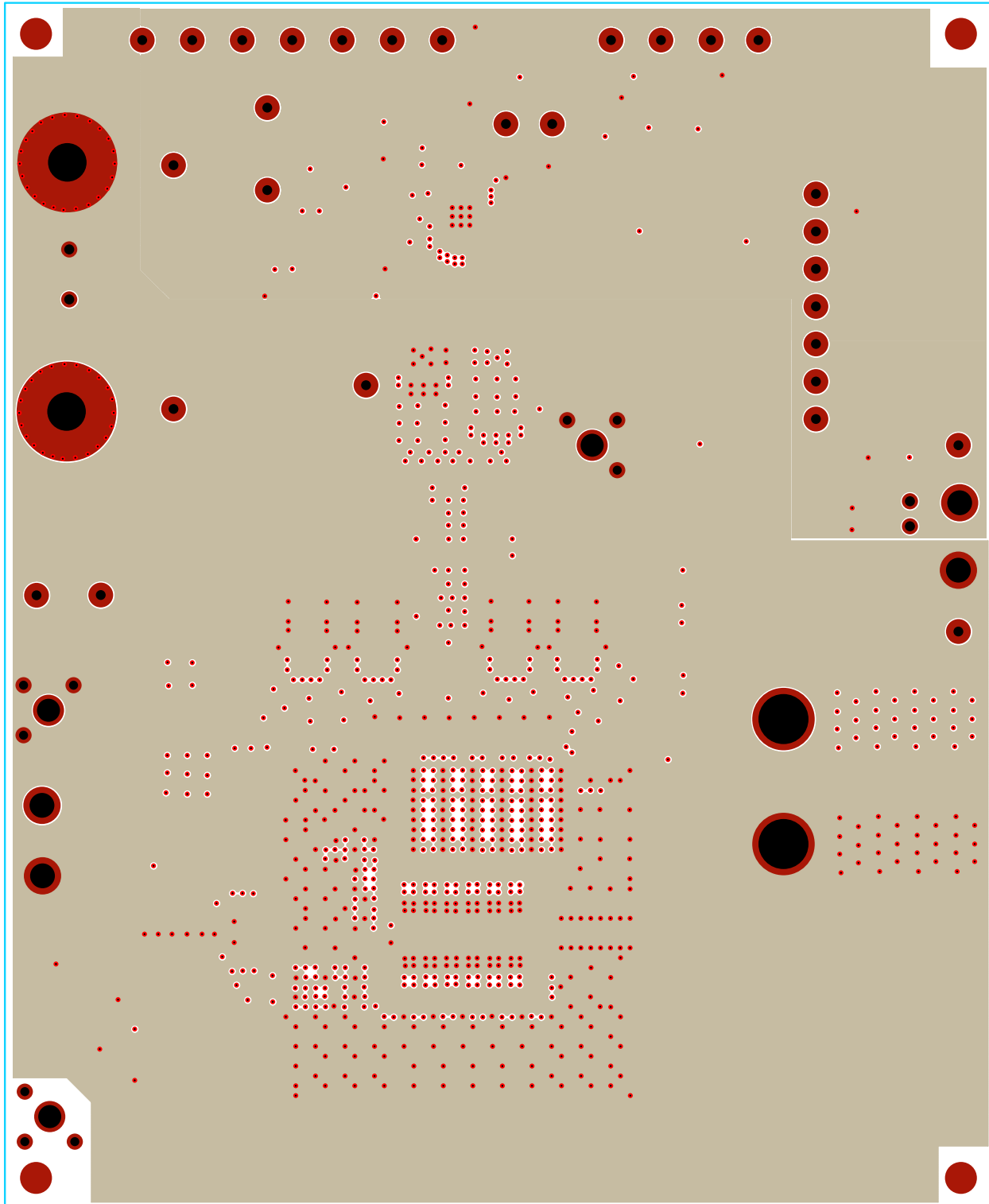


FIGURE 10. LAYER 2

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

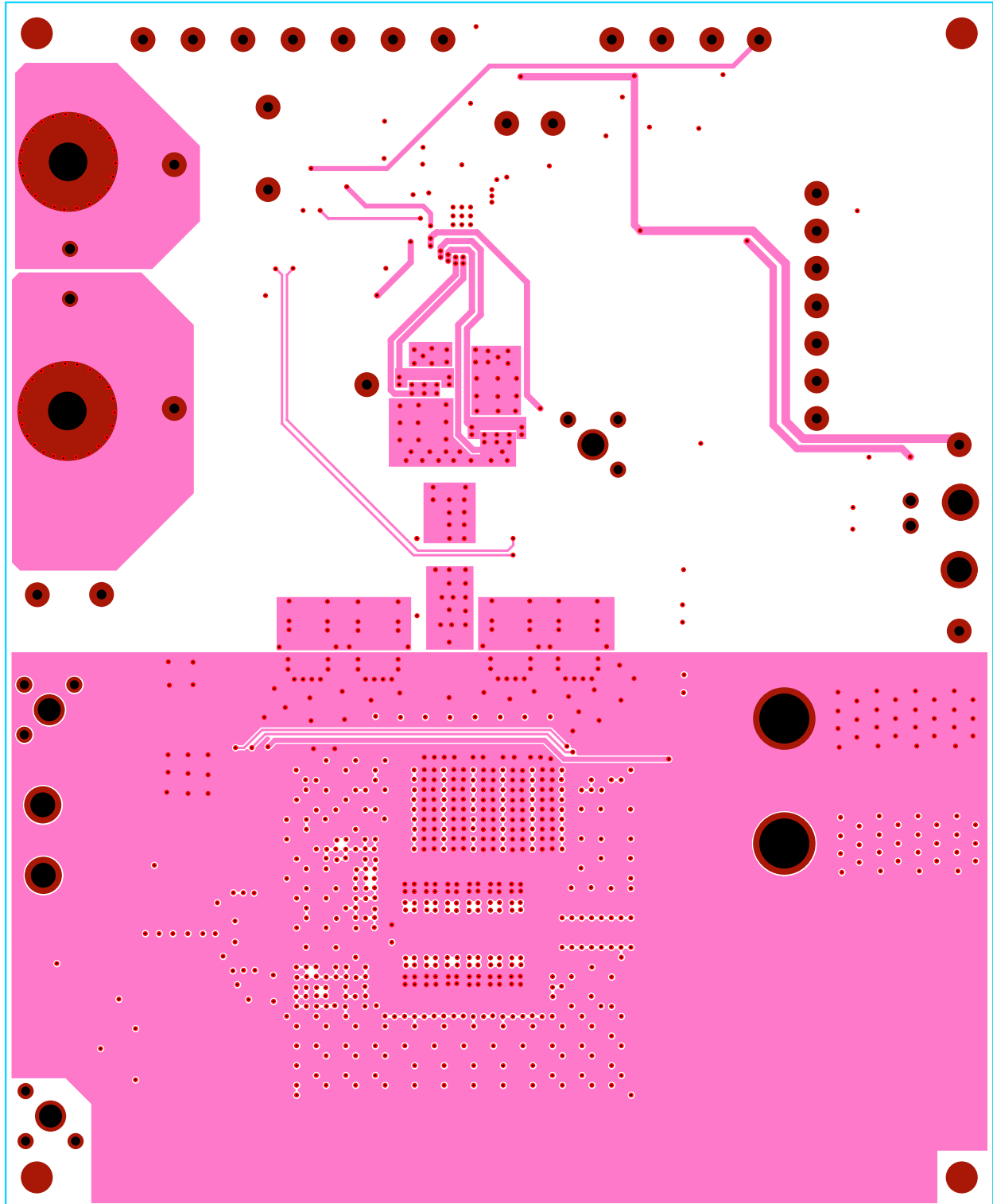


FIGURE 11. LAYER 3

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

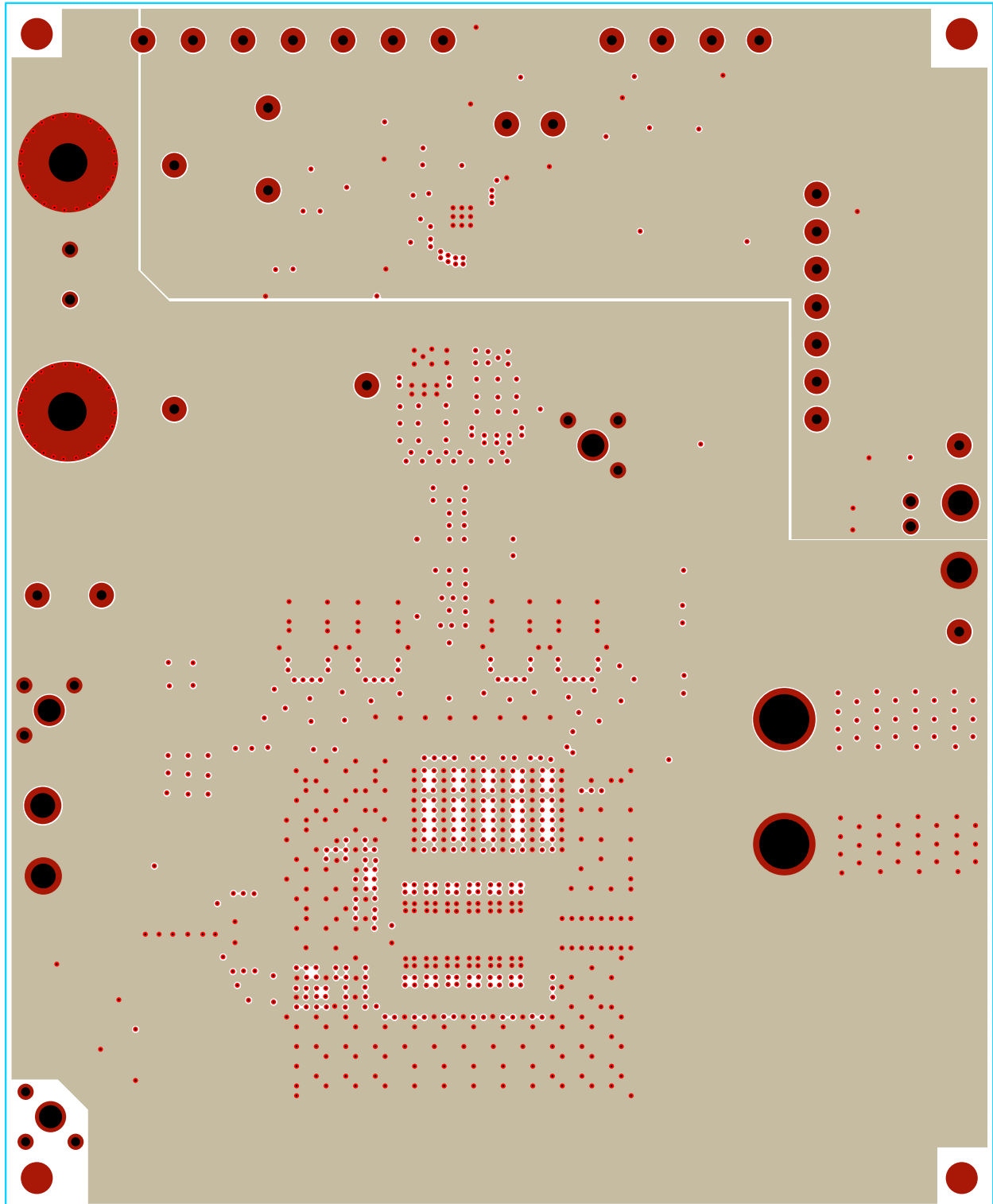


FIGURE 12. LAYER 4

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

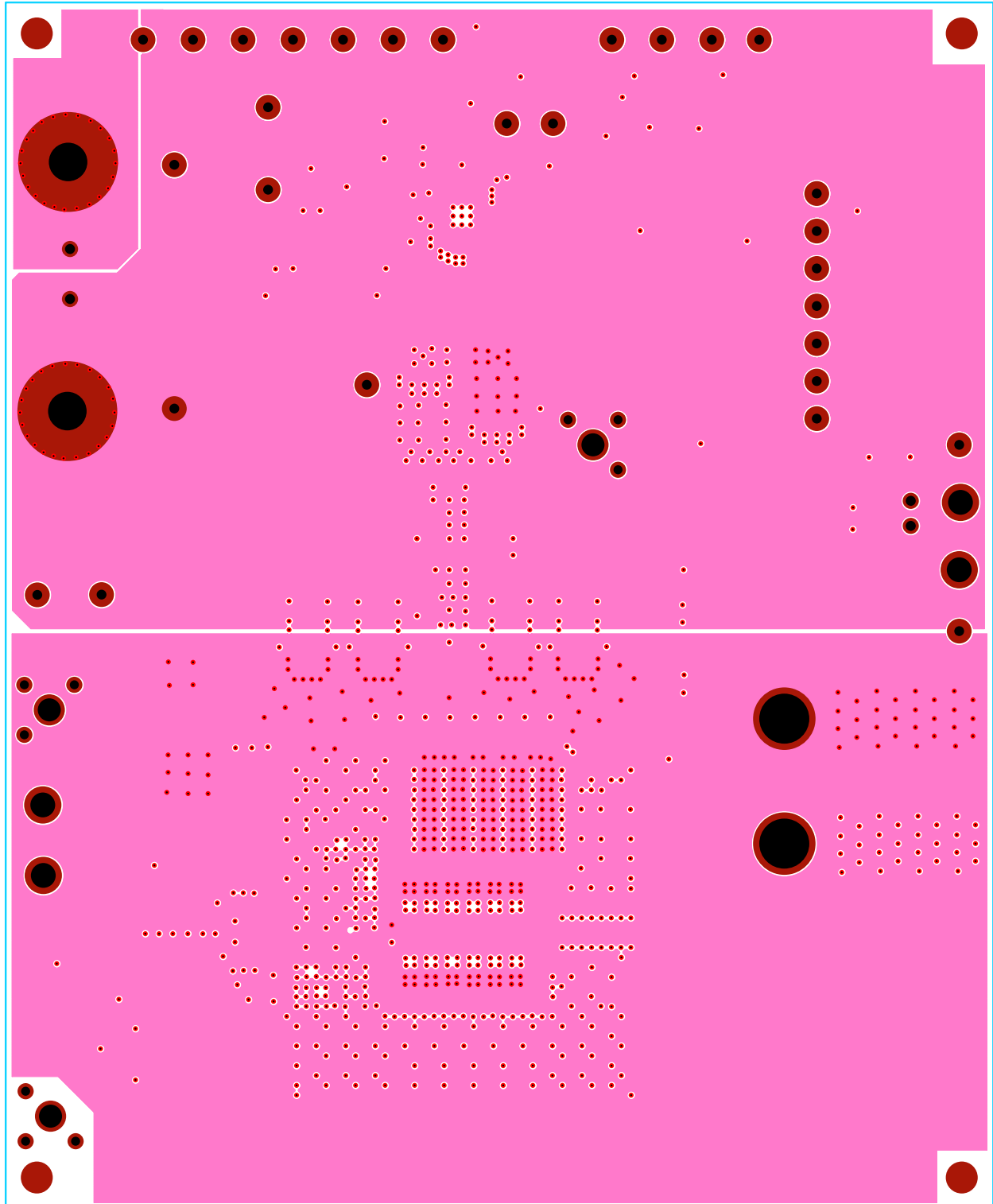


FIGURE 13. LAYER 5

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

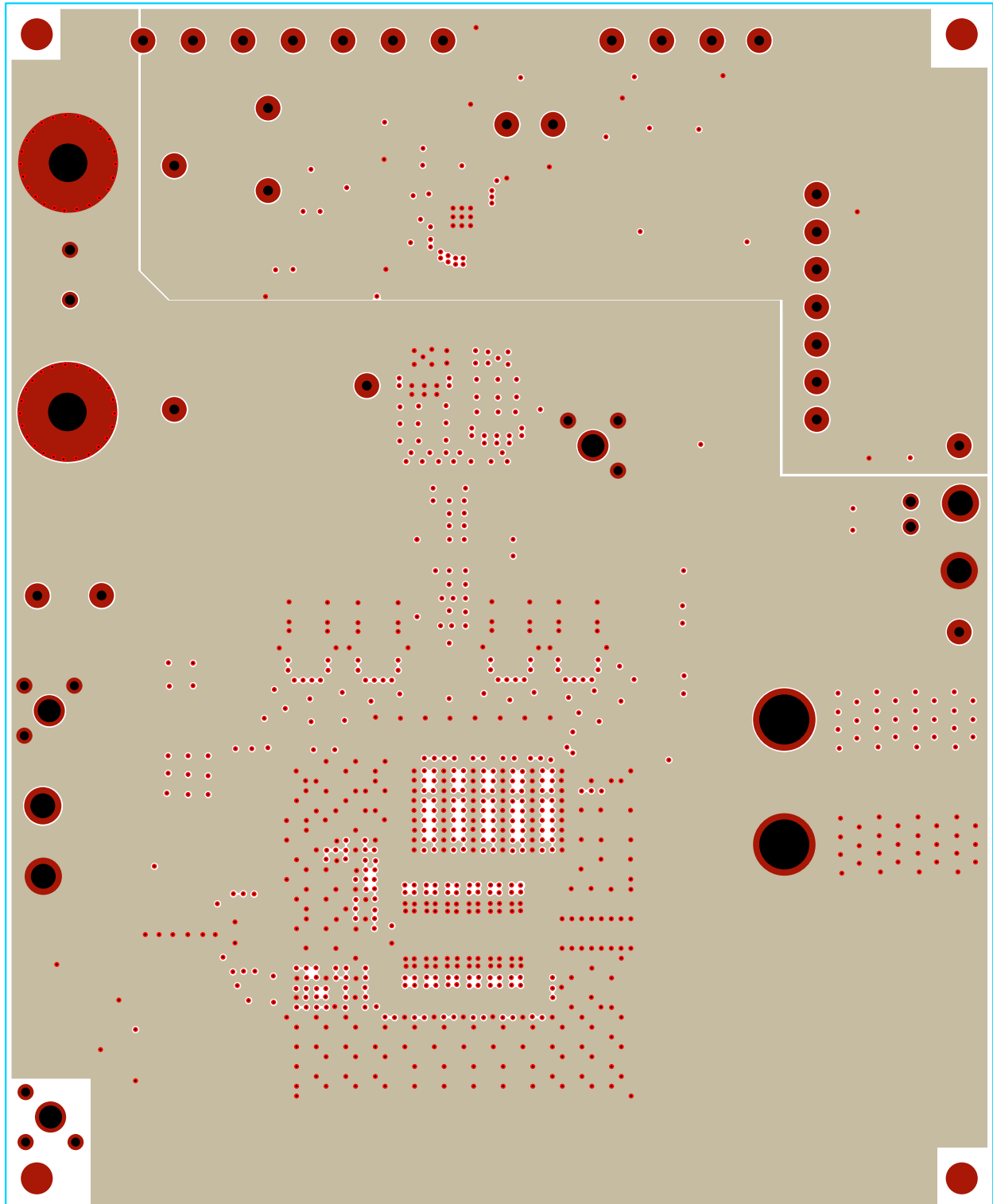


FIGURE 14. LAYER 6

# ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

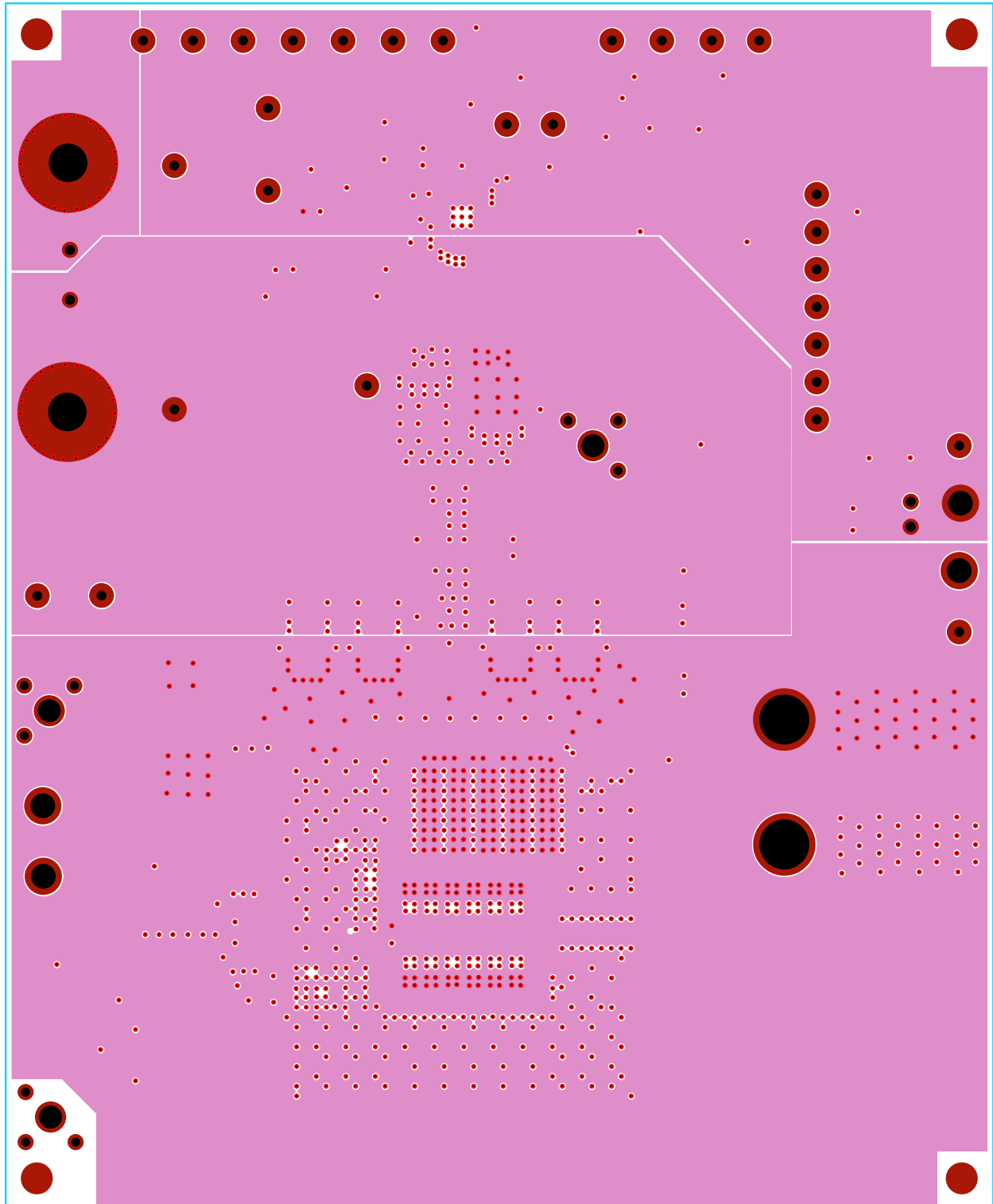


FIGURE 15. LAYER 7

## ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

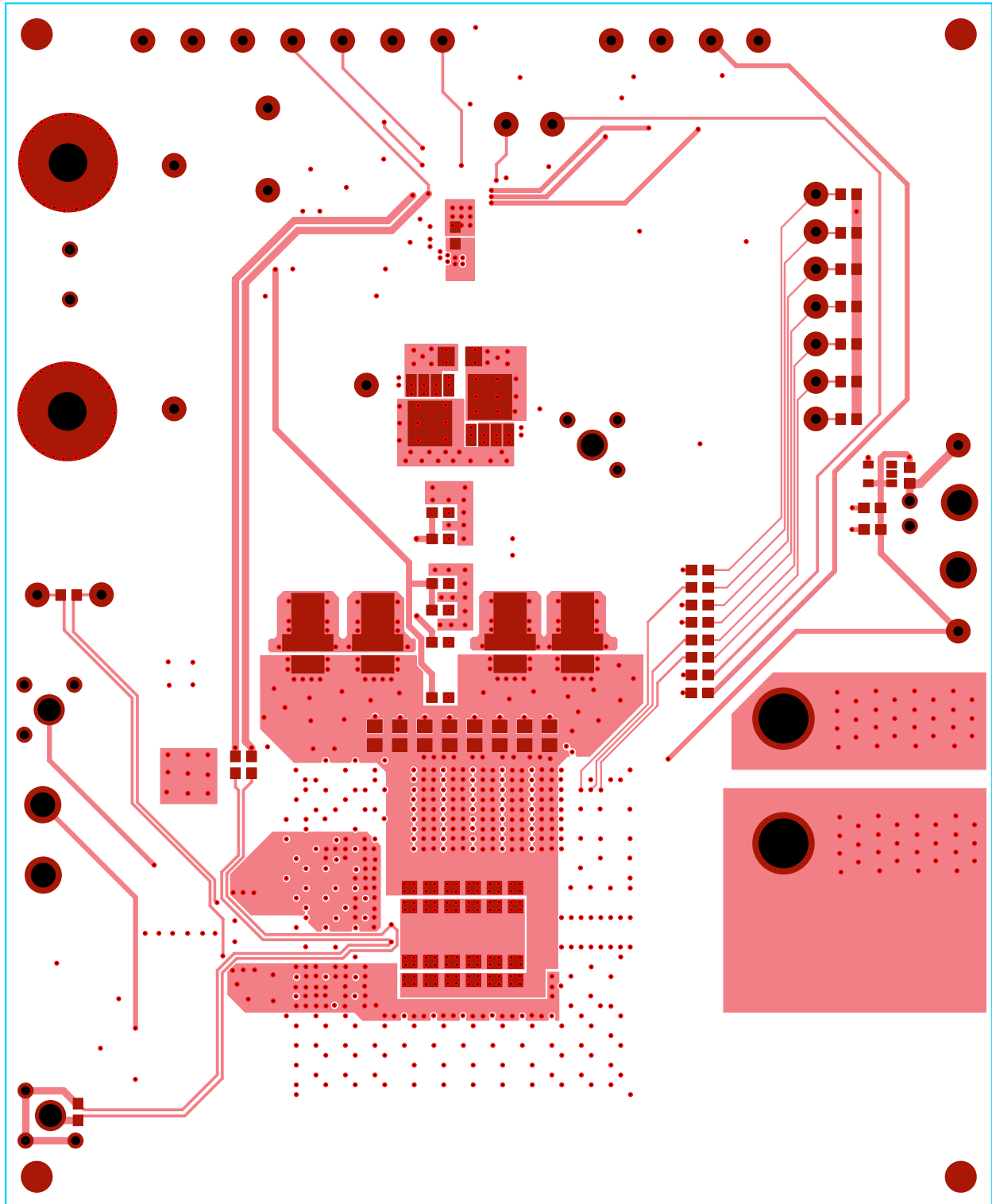


FIGURE 16. LAYER 8

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