

## ISL62881CGPUEVAL2Z

Evaluation Board

AN1553  
Rev 0.00  
Mar 24, 2010

### Hardware Description

The ISL62881CGPUEVAL2Z evaluation board demonstrates the performance of the ISL62881C single-phase synchronous-buck PWM GPU V<sub>CO</sub>RE controller implementing Intel IMVP-6.5 protocol. The ISL62881C features Intersil's Robust Ripple Regulator (R<sup>3</sup><sup>™</sup>) technology. An on-board dynamic-load generator is included for evaluating the transient-load response. It applies a 300μs pulse of approximately 0.2Ω load across V<sub>O</sub> 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 <sub>IN</sub>	4.5 to 20	VDC
V <sub>O</sub>	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<sub>IN</sub>: Input Voltage to the Power Stage
  - J5: V<sub>IN</sub> Positive Power Input
  - TP31: V<sub>IN</sub> Positive Voltage Sense
  - J6: V<sub>IN</sub> Return Power Input
  - TP32: V<sub>IN</sub> Return Voltage Sense
- V<sub>O</sub>: Regulated Output Voltage
  - J12: V<sub>O</sub> Positive Power Output
  - J14: V<sub>O</sub> 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

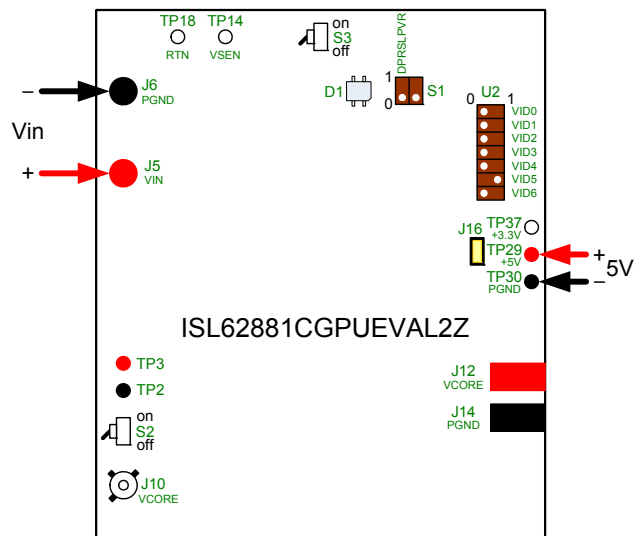


FIGURE 1. TEST SET-UP

### 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		ISL62881GPUEVAL2ZREVB			
1	C1	0.01 $\mu$ F	Multilayer Cap, 16V, 10%	GENERIC	H1045-00103-16V10	SM0603
1	C11	390pF	Multilayer Cap, 16V, 10%	GENERIC	H1045-00391-16V10	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, C42, C43, C47-C50, C53, C62-C78, C81, C86	DNP				
5	C16, C2, C22, C23, C79	1 $\mu$ F	Multilayer Cap, 16V, 20%	GENERIC	H1045-00105-16V20	SM0603
2	C17, C30	0.22 $\mu$ F	Multilayer Cap, 25V, 10%	GENERIC	H1045-00224-25V10	SM0603
1	C18	0.27 $\mu$ F	Multilayer Cap, 16V, 10%	GENERIC	H1045-00274-16V10	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

## Bill of Materials (Continued)

QTY	REFERENCE	VALUE	DESCRIPTION	MFG.	PART NUMBER	PACKAGE
1	C25	56 $\mu$ F	Radial Cap, 25V, 20%	SANYO	25SP56M	CASE-CC
3	C27, C33, C80	10 $\mu$ F	Multilayer Cap, 25V, 20%	GENERIC	H1065-00106-25V20	SM1206
1	C3	390pF	Multilayer Cap, 16V, 10%	GENERIC	H1045-00391-16V10	SM0603
2	C52, C57	220 $\mu$ F	SPCAP, 2V, 7M $\Omega$	PANASONIC	EEXSX0D221E7	
1	C4	1000pF	Multilayer Cap, 16V, 10%	GENERIC	H1045-00102-16V10	SM0603
2	C40, C41	22 $\mu$ F	Multilayer Cap, 6.3V, 20%	TAIYO	JMK212BJ226MG-T	SM0805
			MURATA	GRM21BC80J226M		
			Kyocera	CM21X5R226M04AT		
			TDK	C2012X5R0J226MT009N		
2	C55, C60	10 $\mu$ F	Multilayer Cap, 6.3V, 20%	TAIYO	JMK212BJ106MG-T	SM0805
			MURATA	GRM21BR60J106ME19		
			Kyocera	CM21X5R106M06AT		
			TDK	C2012X5R0J106MT009N		
1	C6	47pF	Multilayer Cap, 16V, 10%	GENERIC	H1045-00470-16V10	SM0603
1	C82	0.033 $\mu$ F	Multilayer Cap, 16V, 10%	GENERIC	H1045-00333-16V10	SM0603
1	D1		3mmx2.5mm Surface Mount Red/Green LED	Lumex	SSL-LXA30251GC	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	0.56 $\mu$ H	Inductor, Inductance 20%, DCR 7%	PANASONIC	ETQP4LR56AFC	10mm x 10mm
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	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	2.37k	Thick Film Chip Resistor, 1%	GENERIC	H2511-02371-1/16W1	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	H2515-00R50-1W1-T	SM2512
0	R109, R110, R111, R113, R114, R121, R2, R26, R4, R44, R62, R68, R77, R87, R93, R99, R107	DNP				
1	R11	3.48k	Thick Film Chip Resistor, 1%	GENERIC	H2511-03481-1/16W1	SM0603

## Bill of Materials (Continued)

QTY	REFERENCE	VALUE	DESCRIPTION	MFG.	PART NUMBER	PACKAGE
3	R13, R15, R103	499	Thick Film Chip Resistor, 1%	GENERIC	H2511-04990-1/16W1	SM0603
1	R16	47.5k	Thick Film Chip Resistor, 1%	GENERIC	H2511-04752-1/16W1	SM0603
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
16	R20, R22, R24, R25, R27, R29, R32, R33, R34, R35, R40, R52, R56, R62, R87, R112	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	1.07k	Thick Film Chip Resistor, 1%	GENERIC	H2511-01071-1/16W1	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	7.15k	Thick Film Chip Resistor, 1%	GENERIC	H2511-07151-1/16W1	SM0603
2	R59, R96	0	Solder Joint (Heavy Duty)			
1	R6	8.66k	Thick Film Chip Resistor, 1%	GENERIC	H2511-08661-1/16W1	SM0603
1	R63	1.82k	Thick Film Chip Resistor, 1%	GENERIC	H2511-01821-1/16W1	SM0805
1	R7	261k	Thick Film Chip Resistor, 1%	GENERIC	H2511-02613-1/16W1	SM0603
1	S1		SD Series Low Profile Dip Switch	C&K	SD02H0SK	DIPSWMT-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	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	DIPSWMT-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-6.5 PWM Controller	INTERSIL	ISL62881CHRTZ	QFN-28

ISL62881CGPUEVAL2Z Schematics

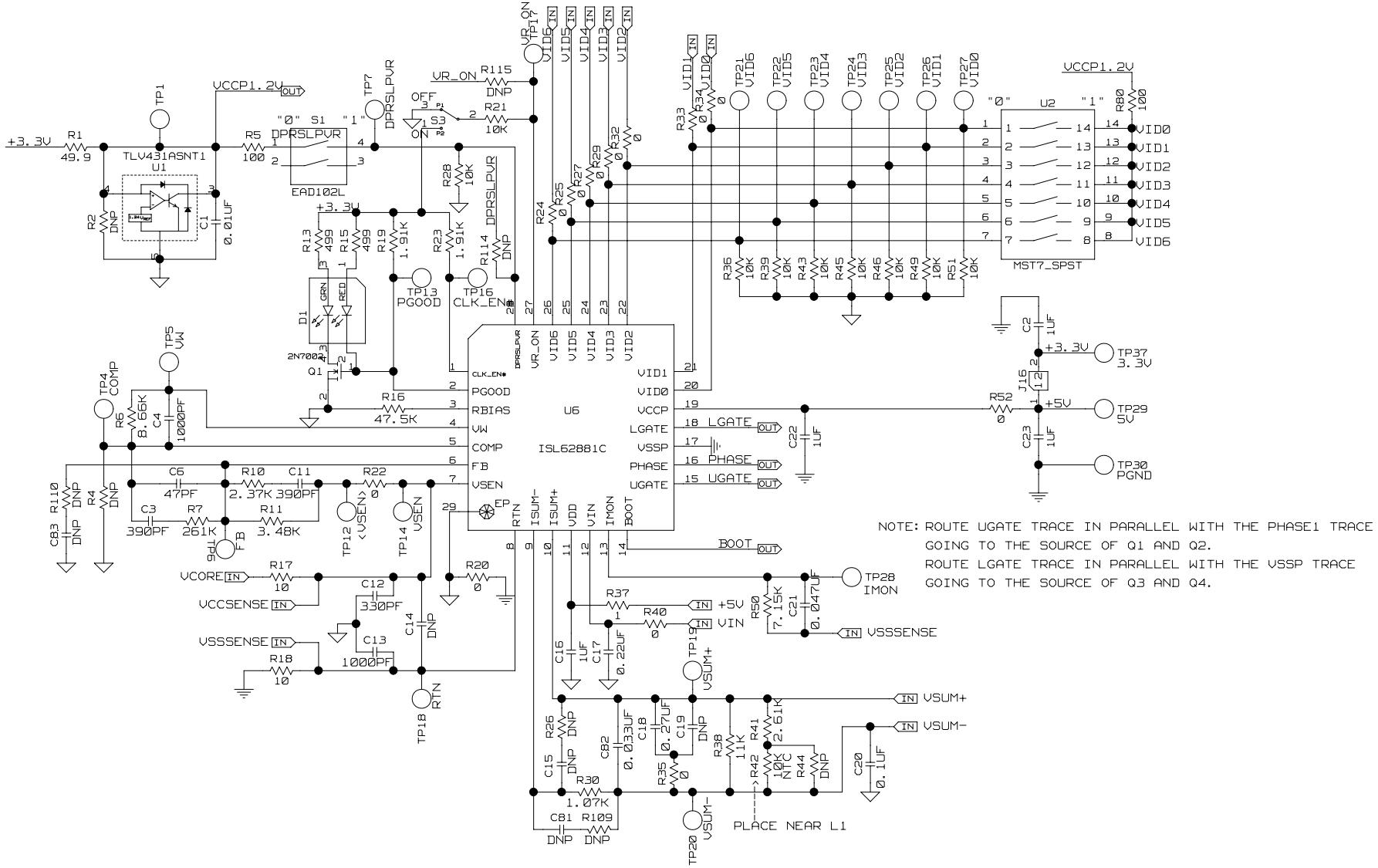


FIGURE 2. ISL62881CGPUEVAL2Z SCHEMATIC, 1 OF 5

ISL62881CGPUEVAL2Z Schematics (Continued)

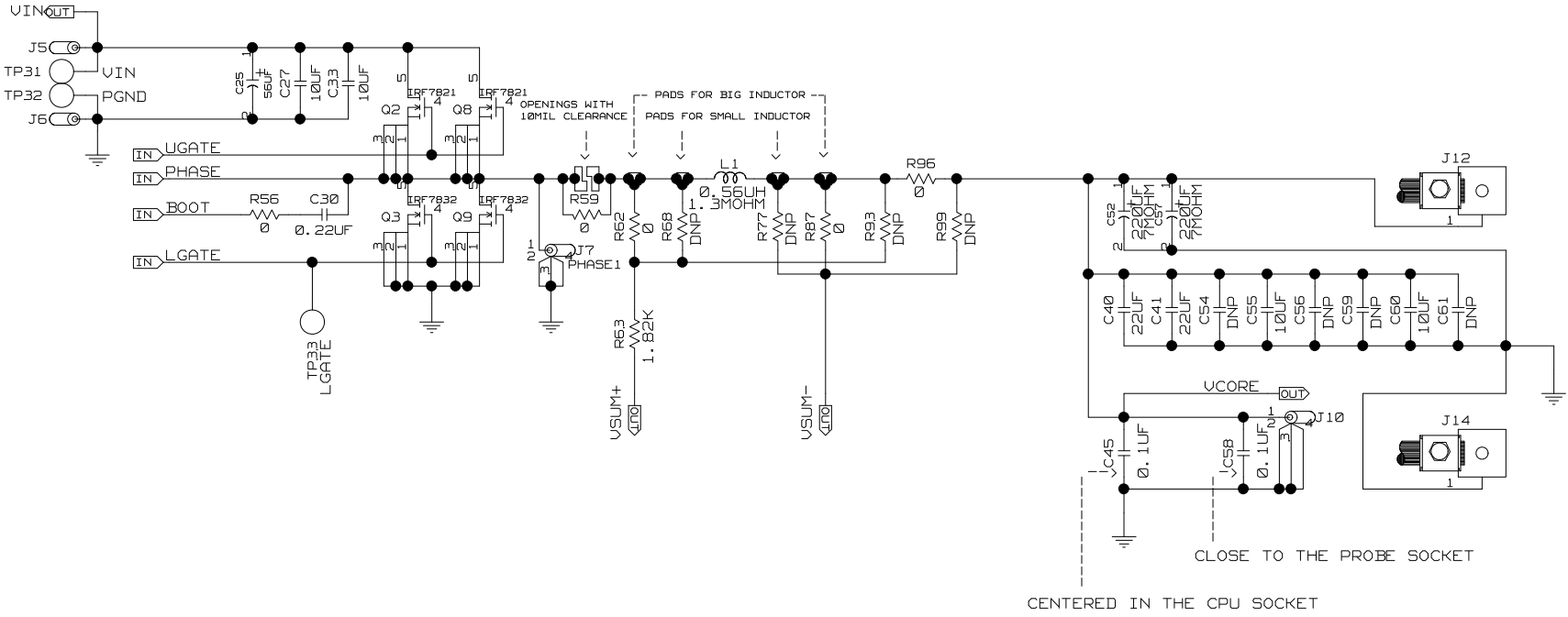


FIGURE 3. ISL62881CGPUEVAL2Z SCHEMATIC, 2 OF 5

# ISL62881CGPUEVAL2Z Schematics (Continued)

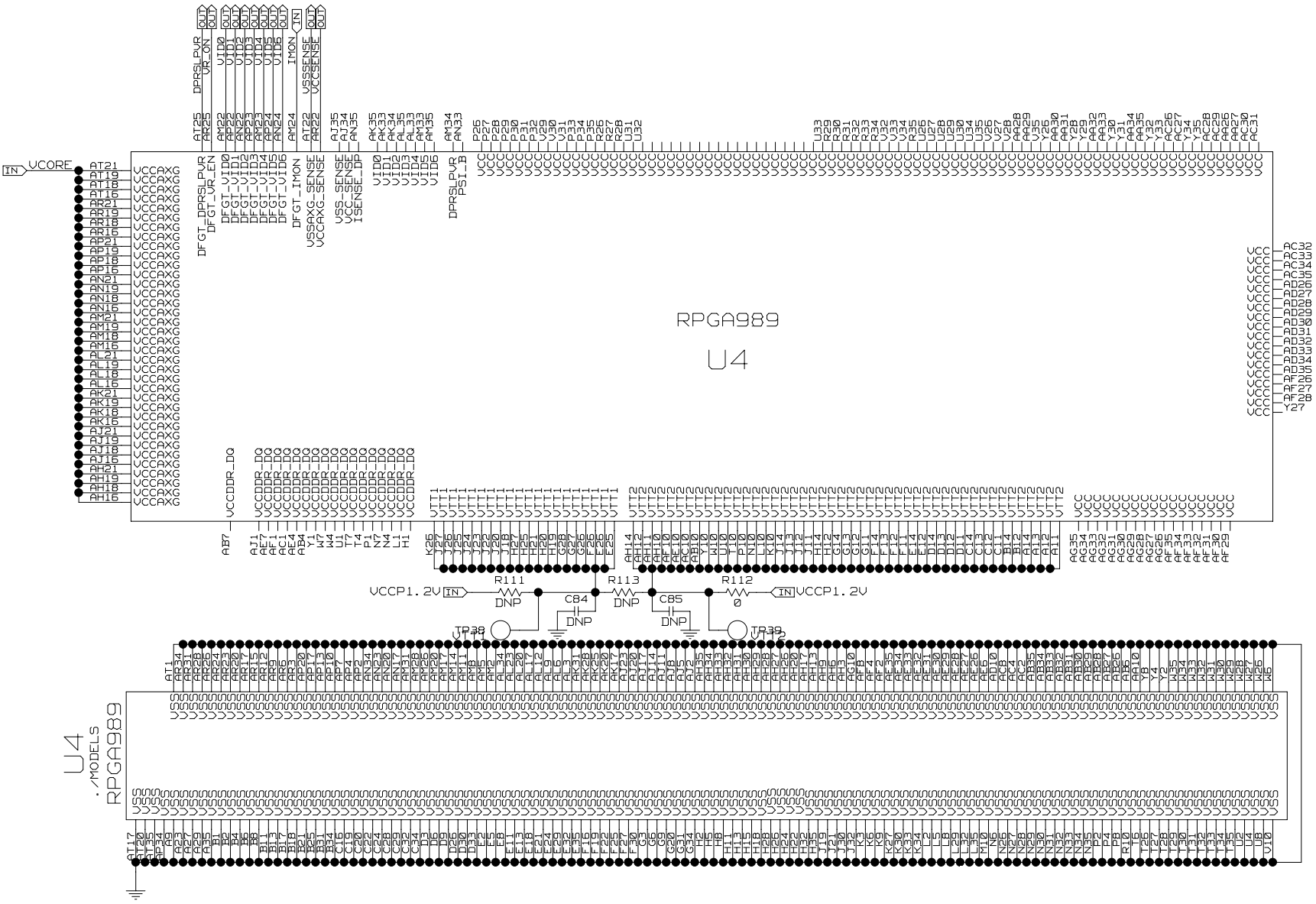


FIGURE 4. ISL62881CGPUEVAL2Z SCHEMATIC, 3 OF 5

ISL62881CGPUEVAL2Z Schematics (Continued)

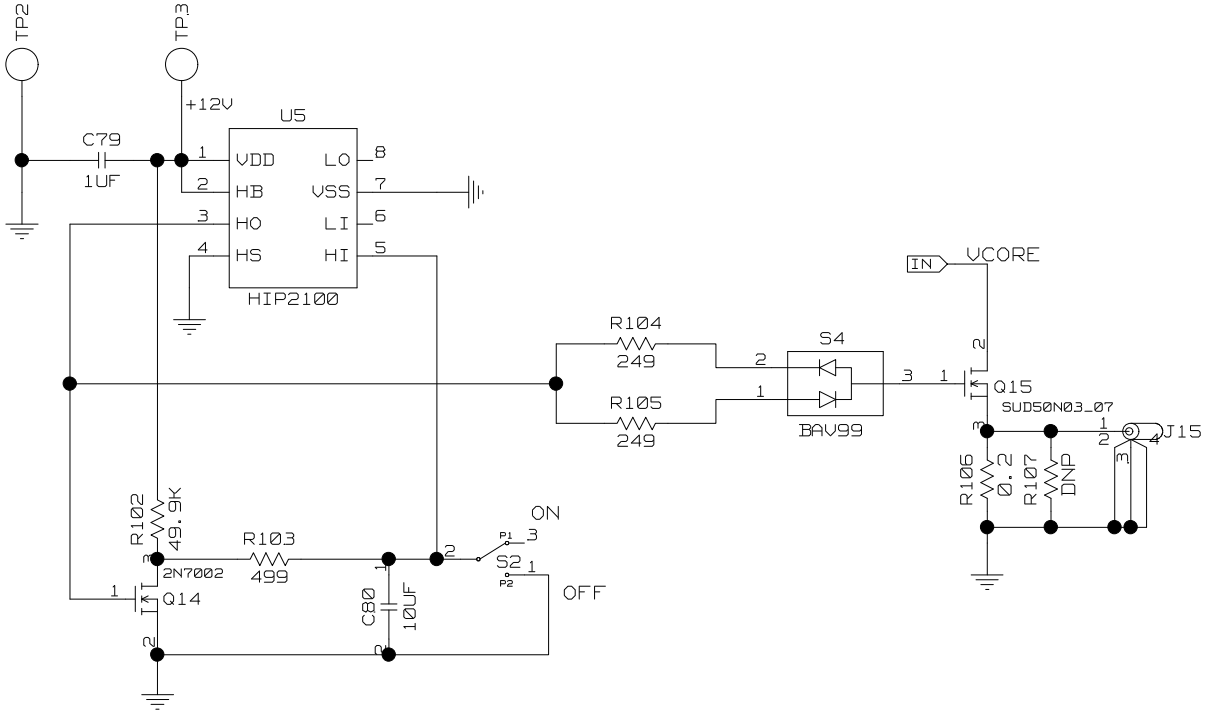


FIGURE 5. ISL62881CGPUEVAL2Z SCHEMATIC, 4 OF 5



# ISL62881CGPUEVAL2Z Schematics (Continued)

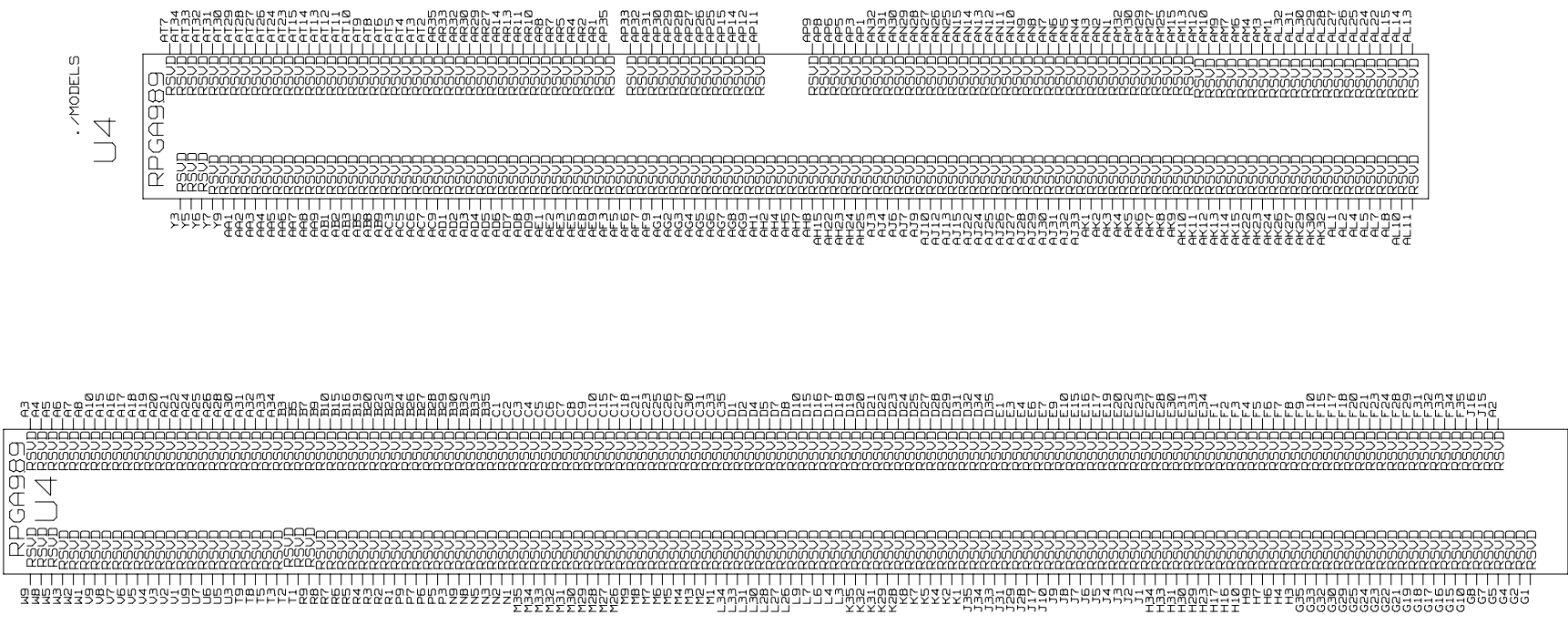


FIGURE 6. ISL62881CGPUEVAL2Z SCHEMATIC, 5 OF 5

# ISL62881CGPUEVAL2Z Evaluation Board Layout

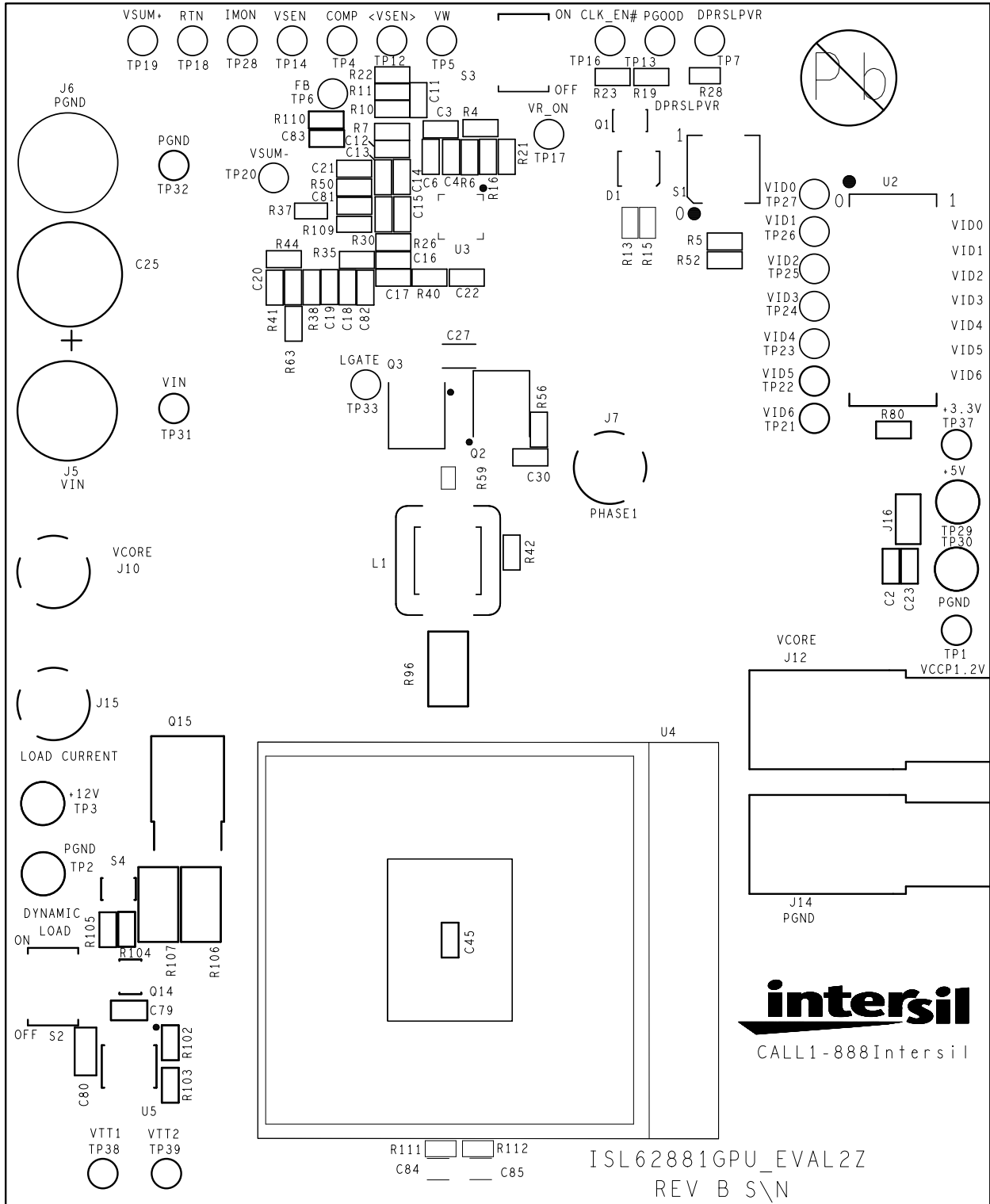


FIGURE 7. TOP SILKSCREEN

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

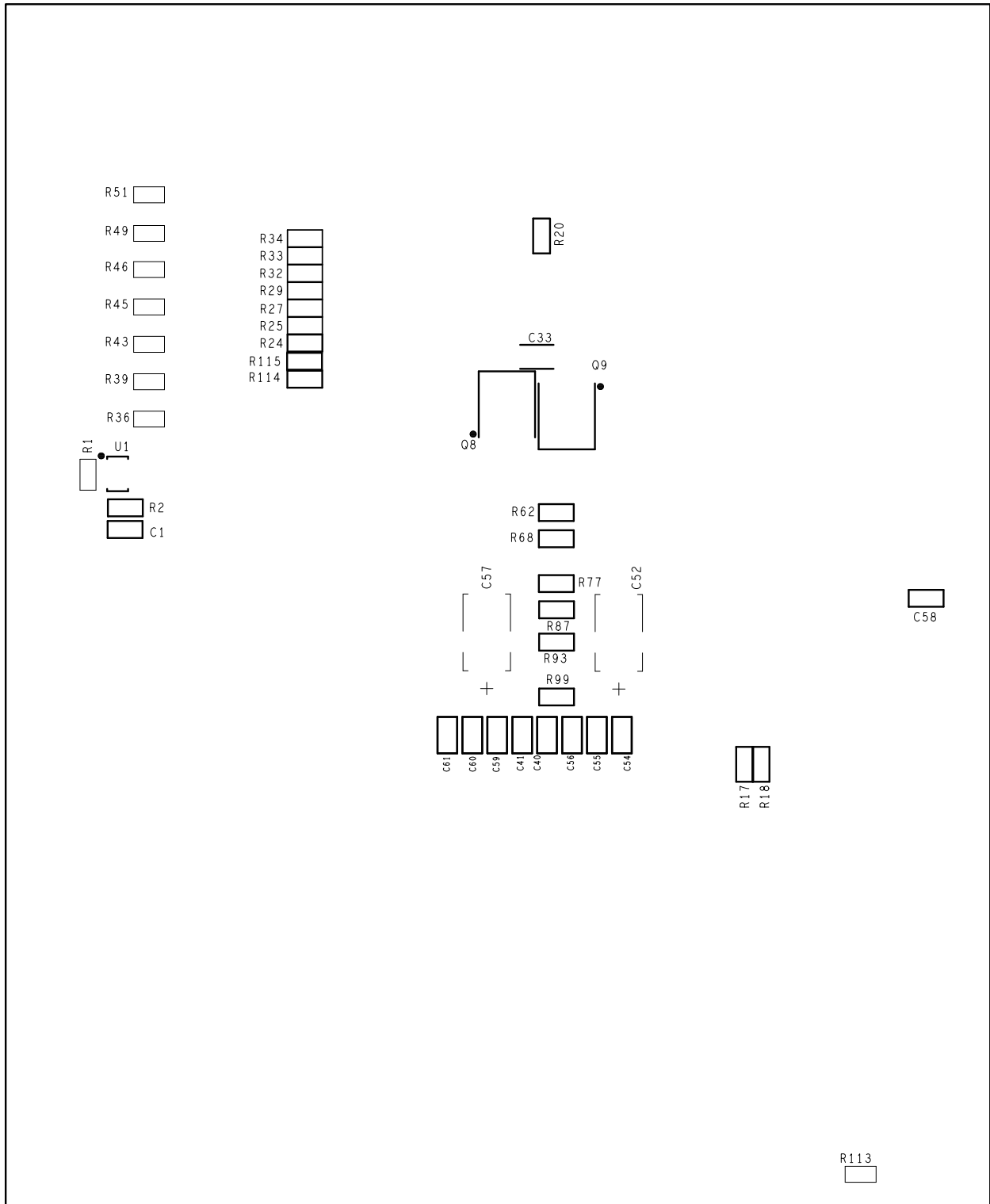


FIGURE 8. BOTTOM SILKSCREEN

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

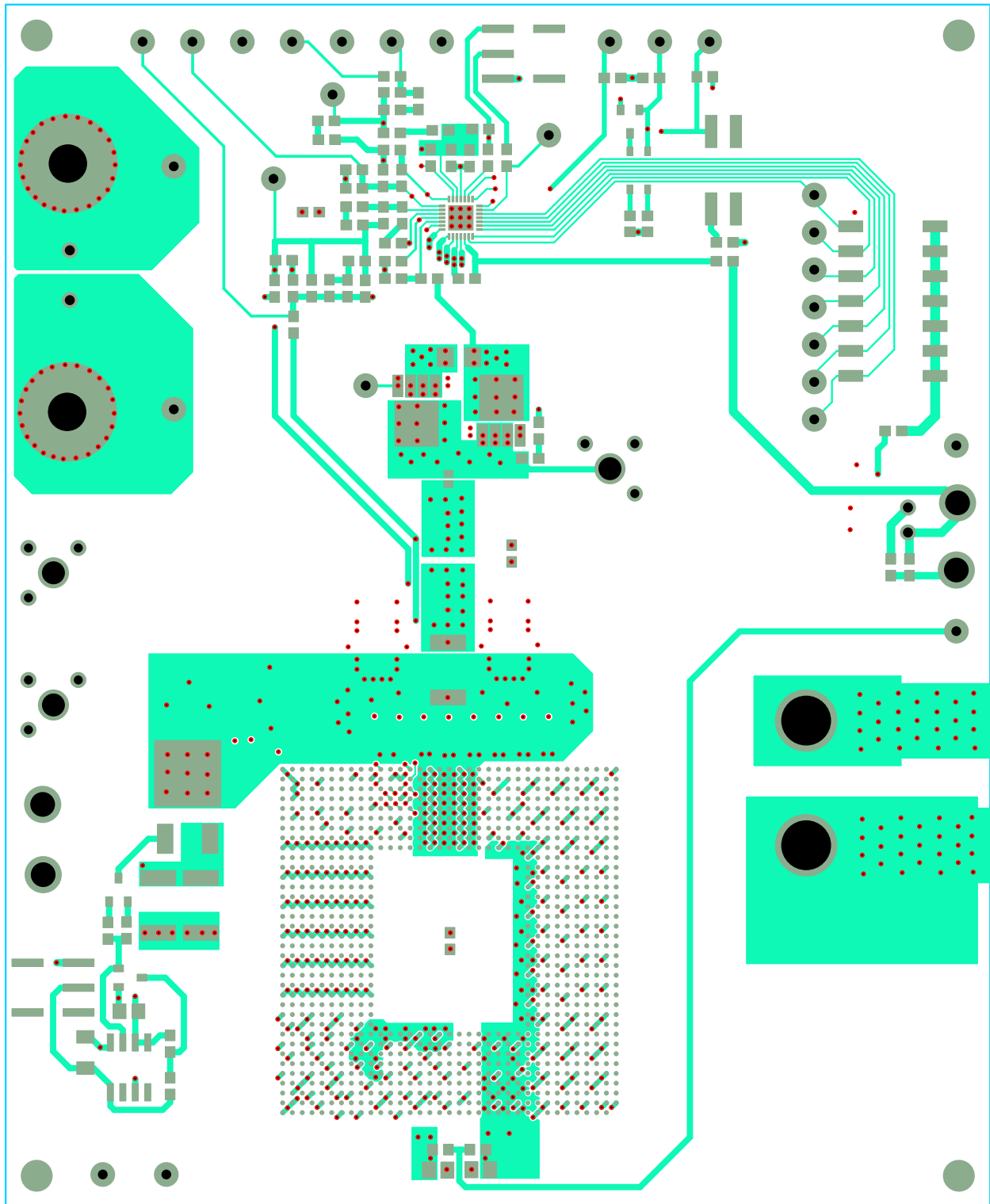


FIGURE 9. LAYER 1

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

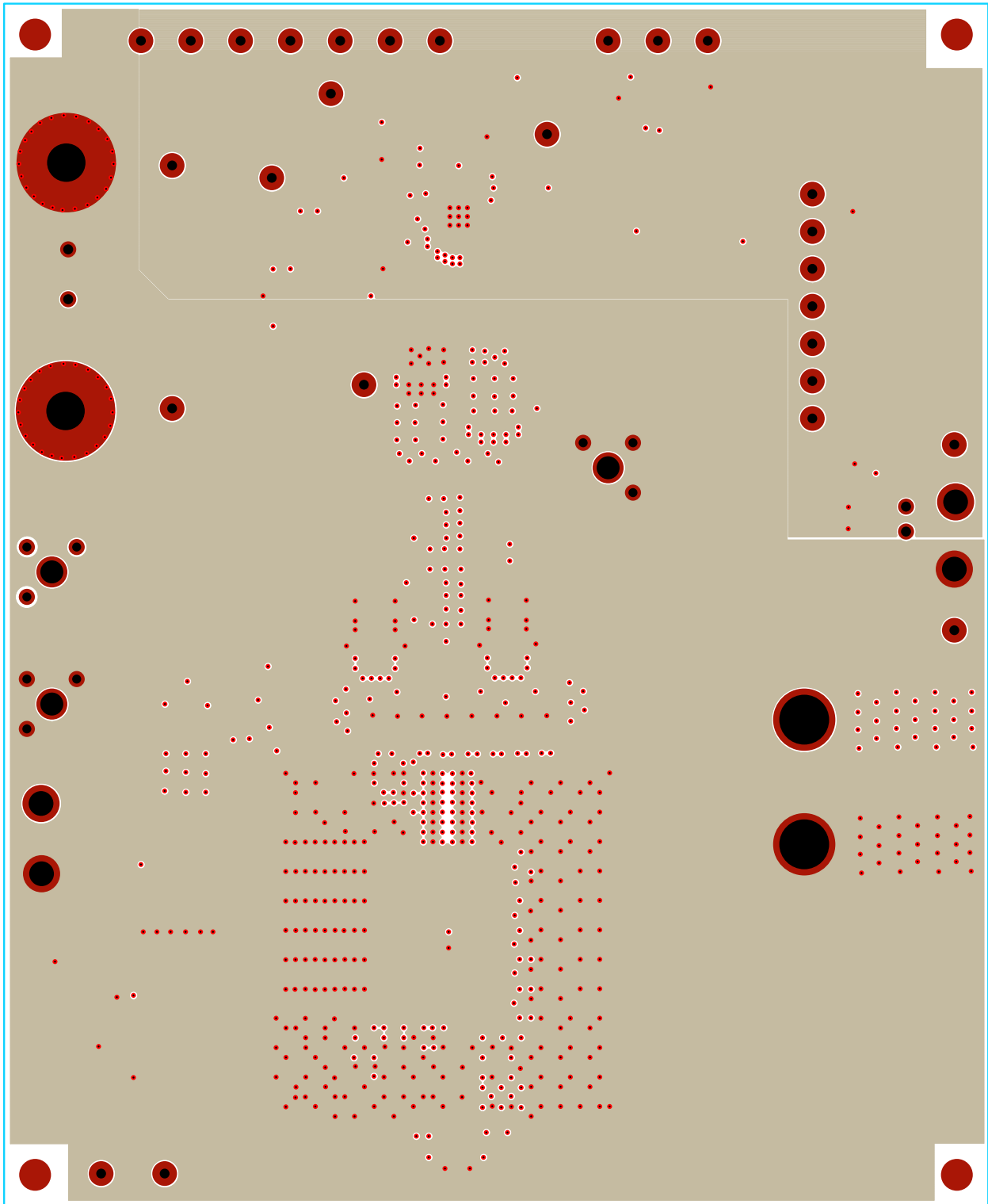


FIGURE 10. LAYER 2

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

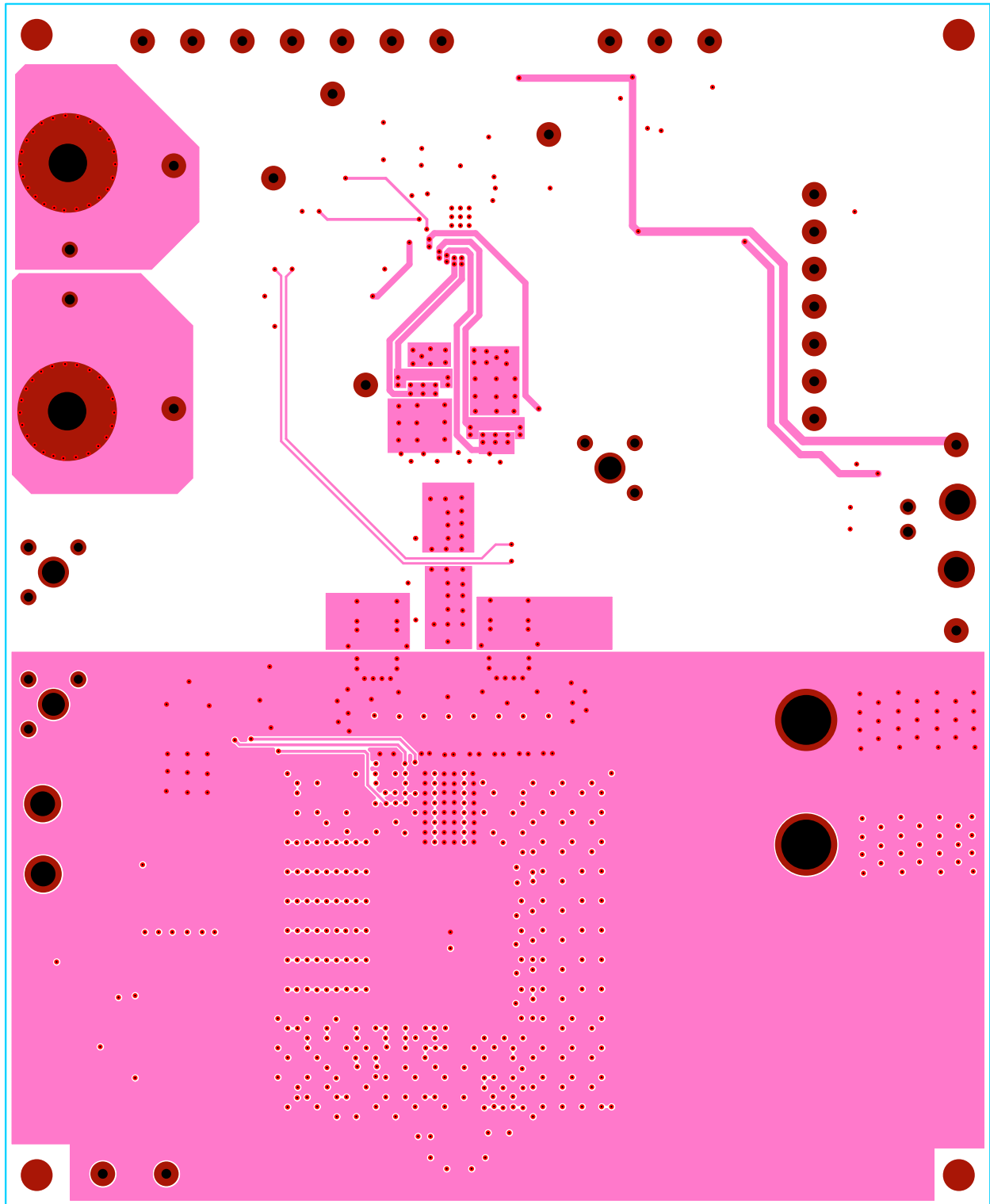


FIGURE 11. LAYER 3

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

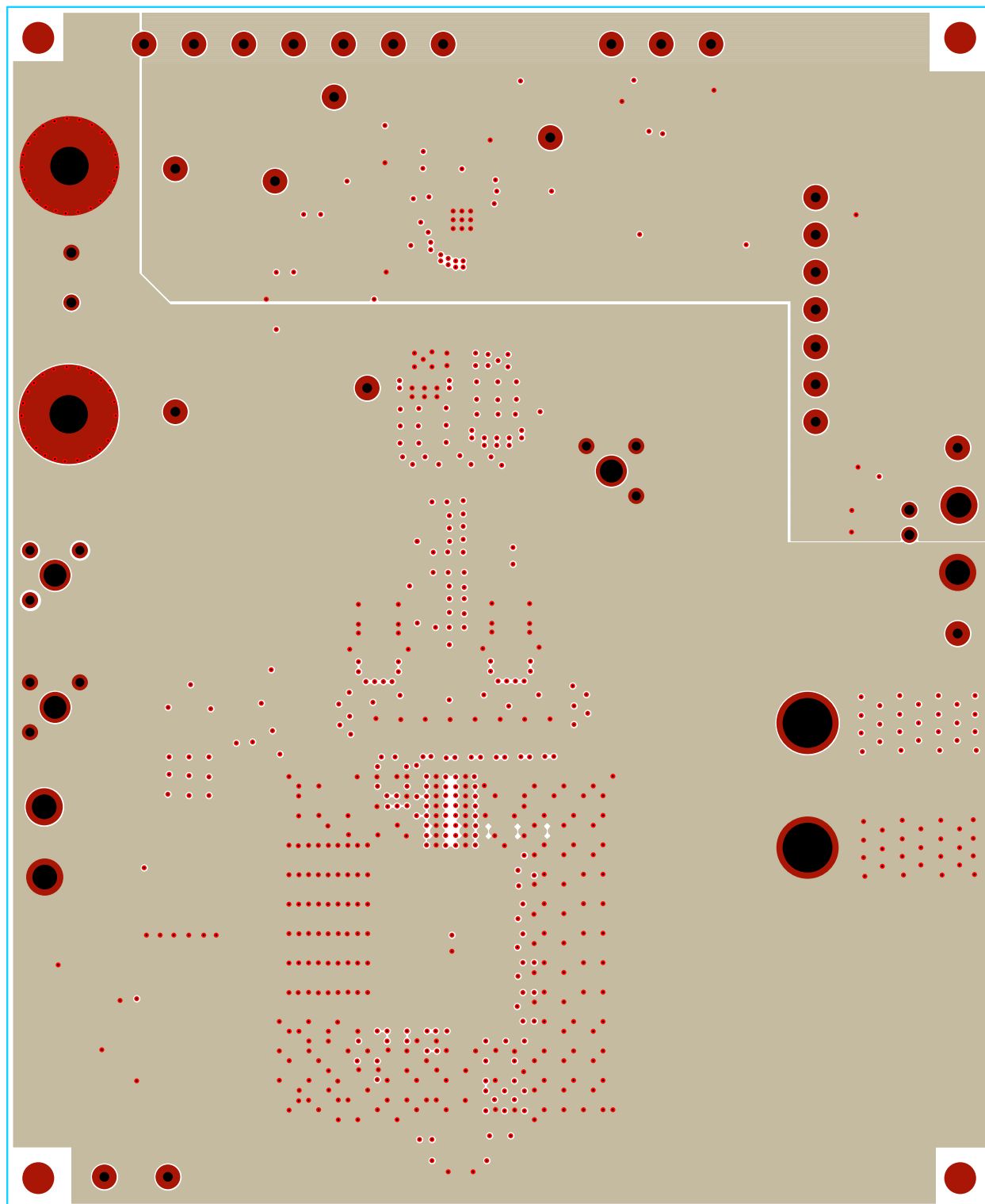


FIGURE 12. LAYER 4

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

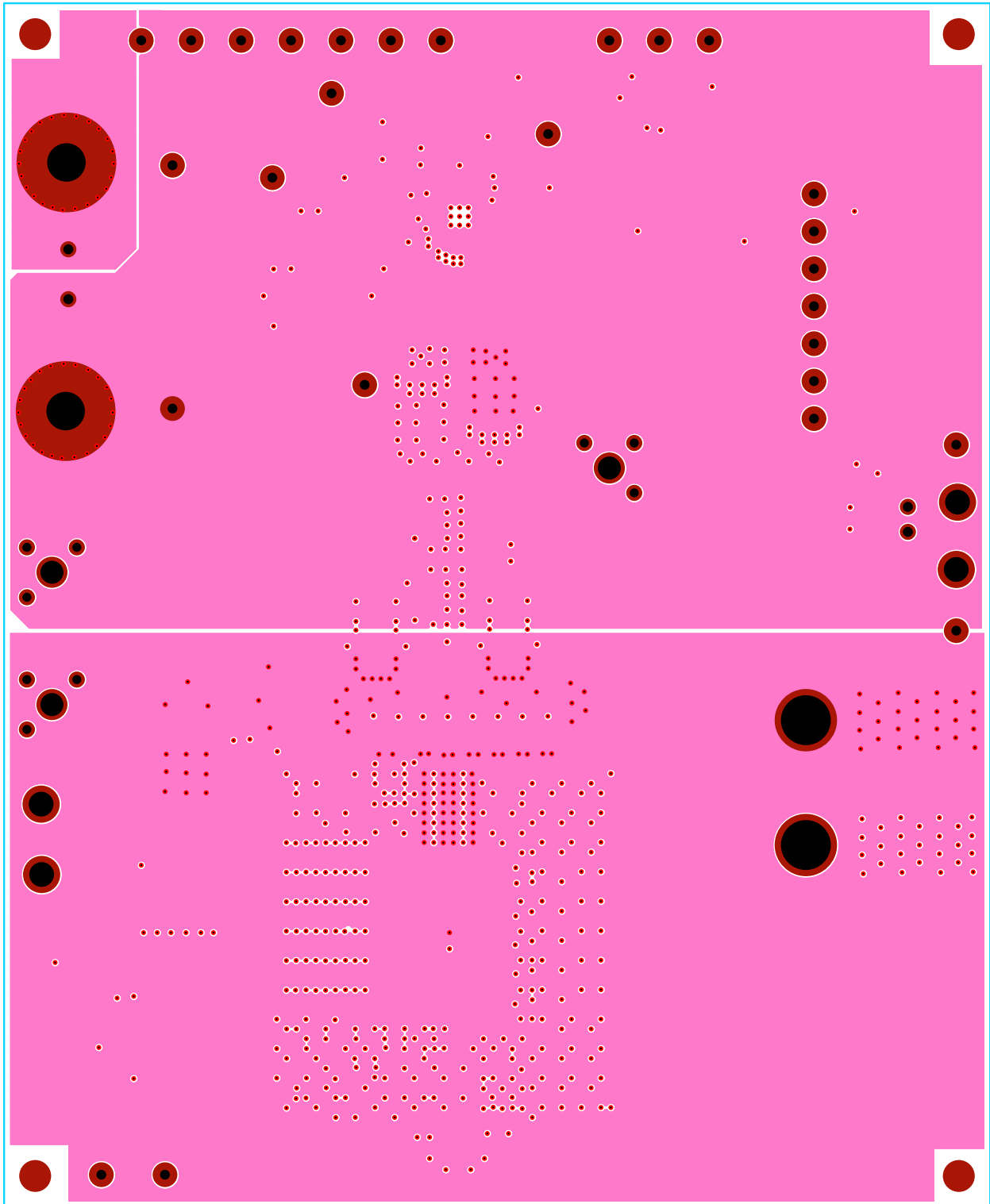


FIGURE 13. LAYER 5



ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

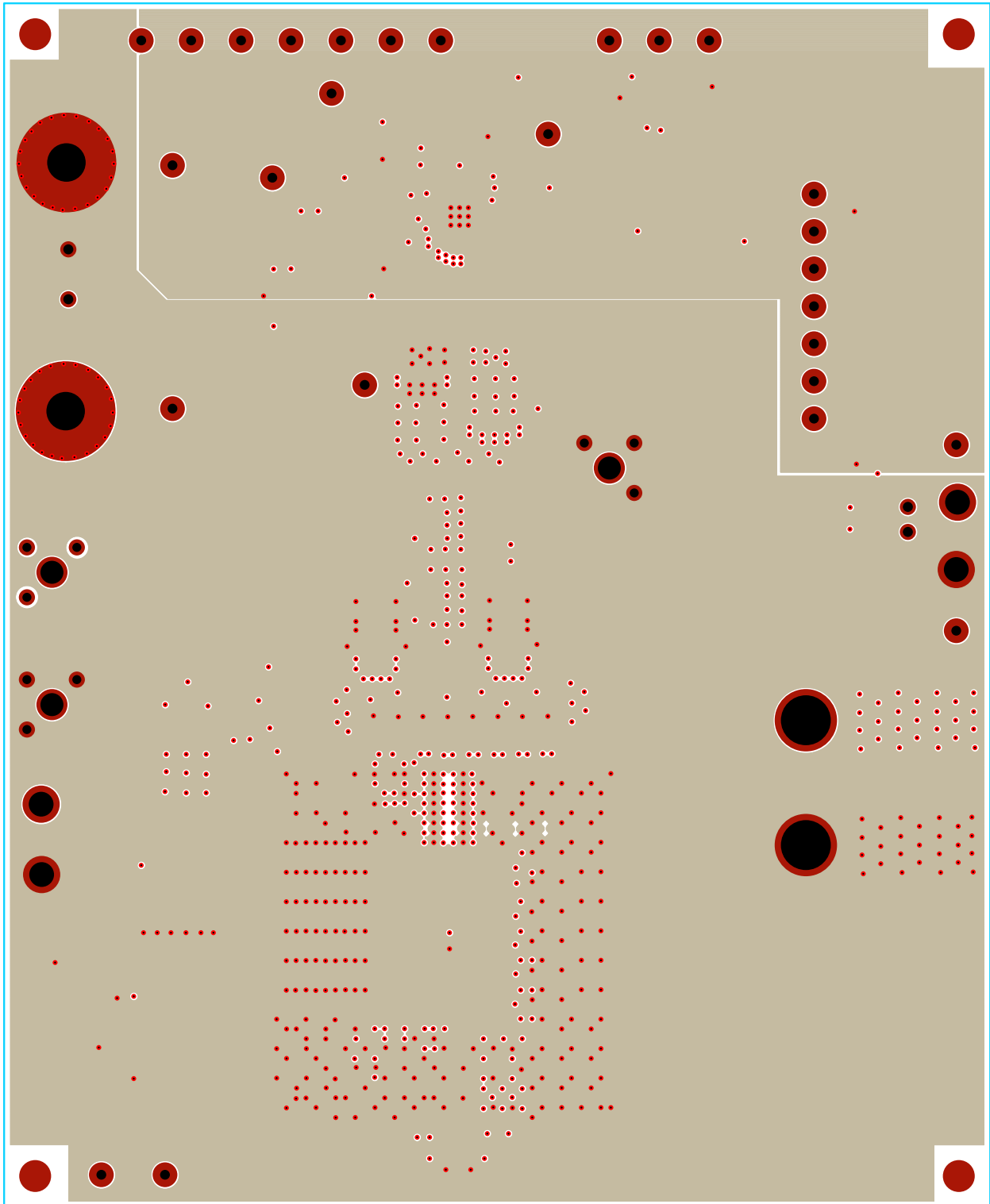


FIGURE 14. LAYER 6

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

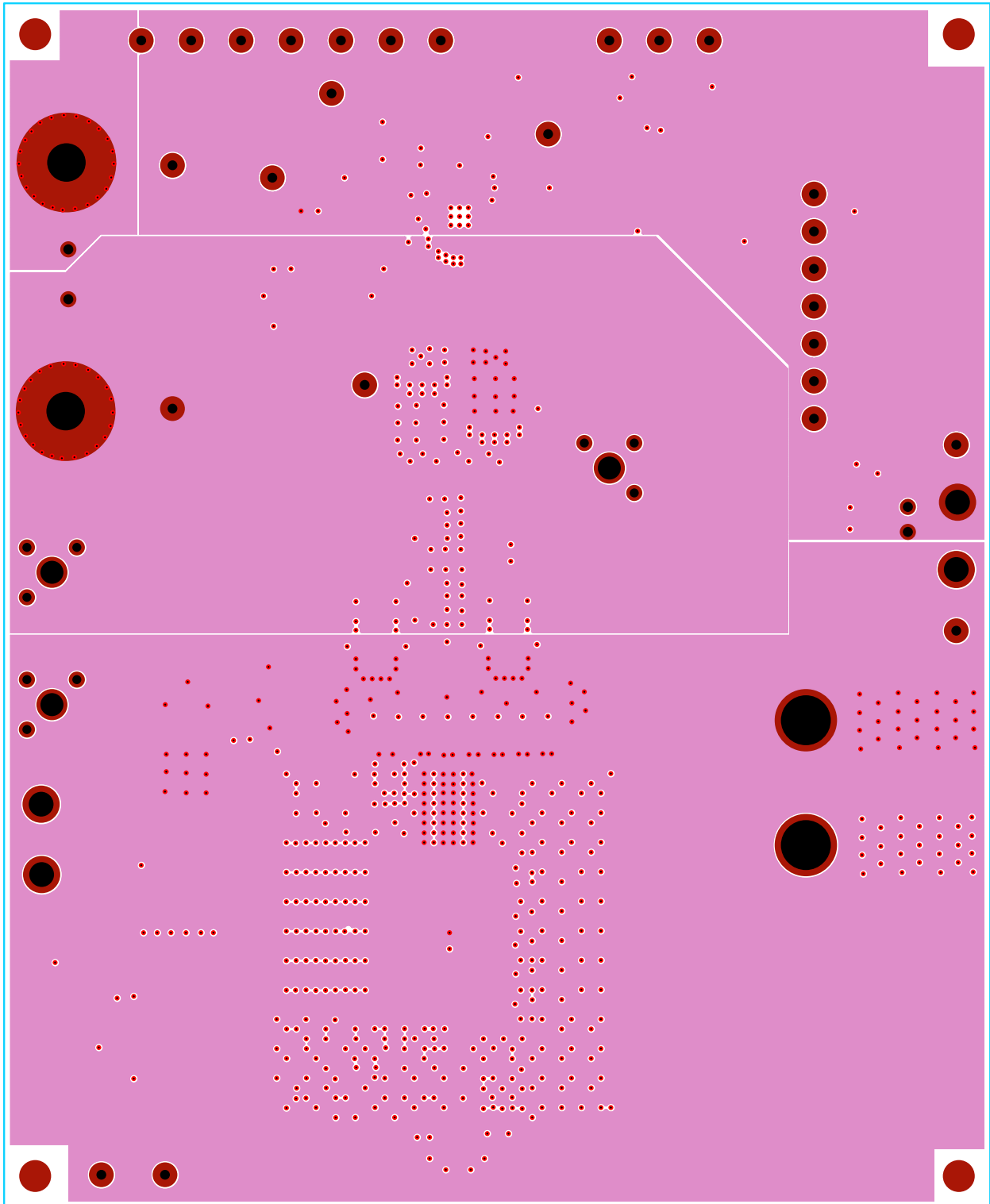


FIGURE 15. LAYER 7

ISL62881CGPUEVAL2Z Evaluation Board Layout (Continued)

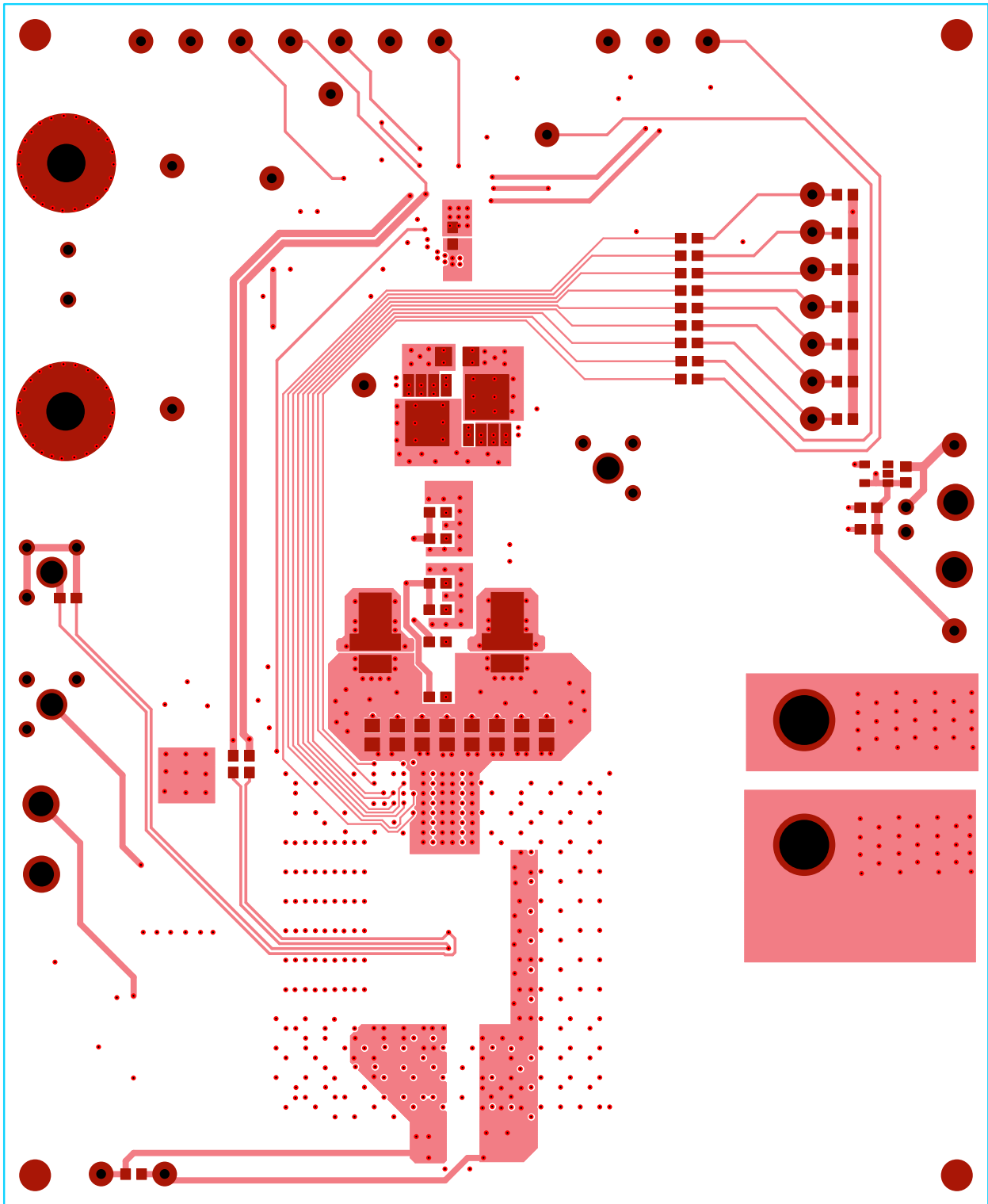


FIGURE 16. LAYER 8

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