ISL62881CCPUEVAL2Z

Evaluation Board

AN1552
Rev 0.00
Mar 24, 2010

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 300µs pulse of approximately 0.2Ω 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
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  - 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

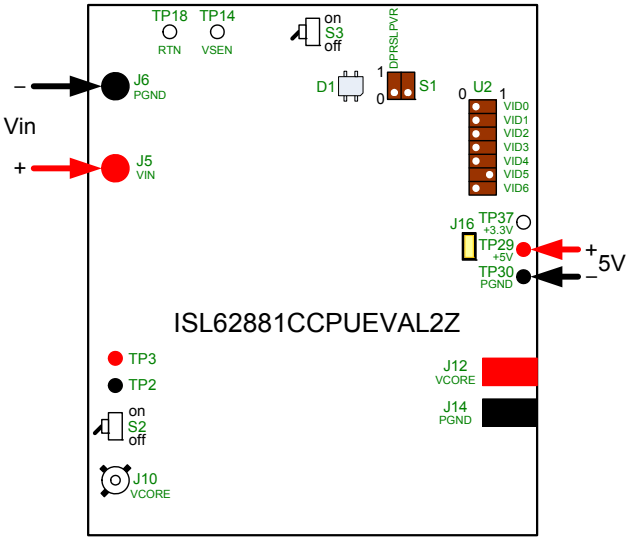

FIGURE 1. TEST SET-UP

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	0.01µF	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	1µF	Multilayer Cap, 16V, 20%	GENERIC	H1045-00105-16V20	SM0603
3	C17, C18, C30	0.22µF	Multilayer Cap, 25V, 10%	GENERIC	H1045-00224-25V10	SM0603
3	C20, C45, C58	0.1µF	Multilayer Cap, 16V, 10%	GENERIC	H1045-00104-16V10	SM0603
1	C21	0.047µF	Multilayer Cap, 16V, 10%	GENERIC	H1045-00473-16V10	SM0603
1	C25	56µF	Radial SP Series Cap, 25V, 20%	SANYO	25SP56M	CASE-CC

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	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, 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

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	DIPSWSMT-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	DIPSWSMT-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

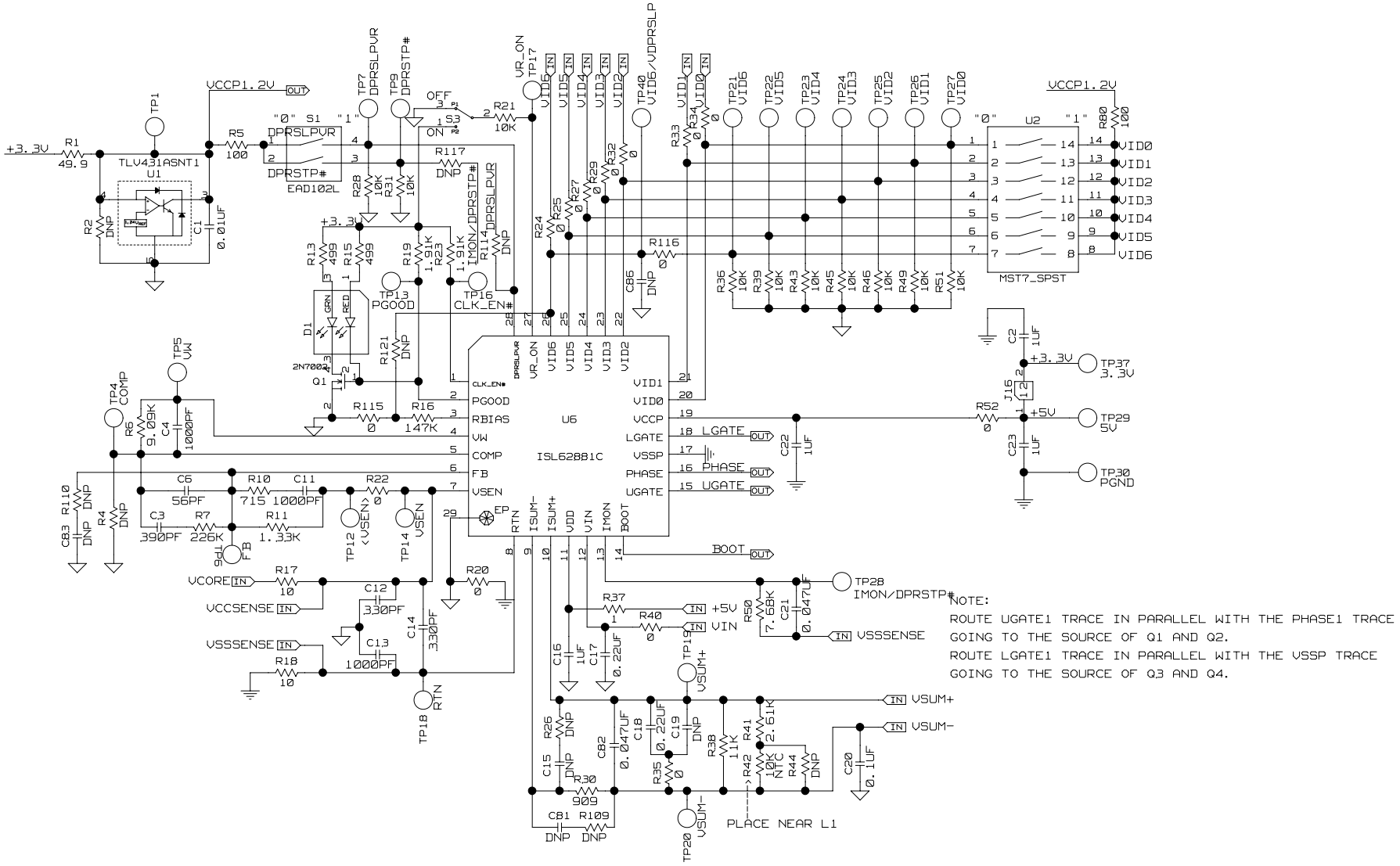

FIGURE 2. ISL62881CCPUEVAL2Z SCHEMATIC, 1 OF 5

ISL62881CCPUEVAL2Z Schematics (Continued)

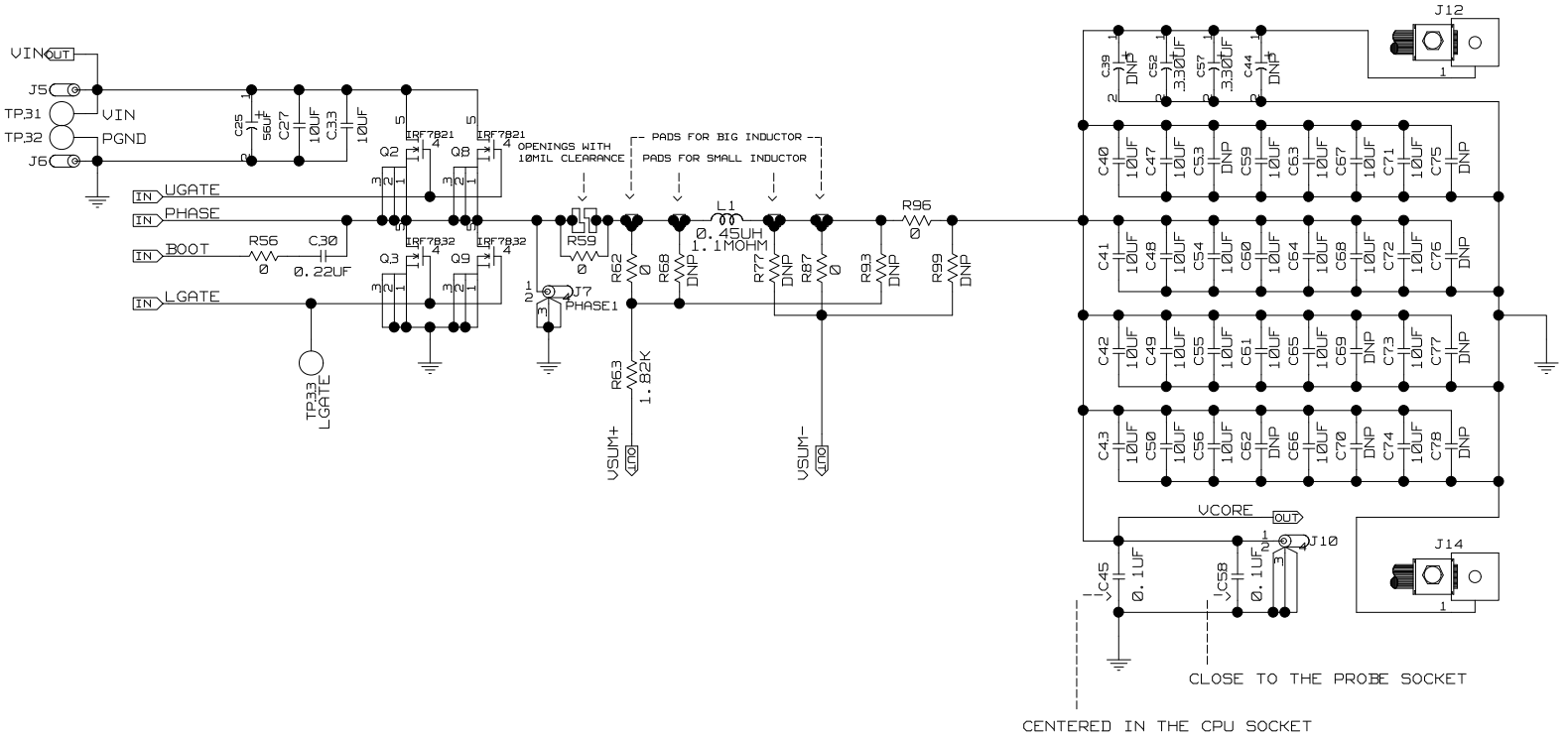

FIGURE 3. ISL62881CCPUEVAL2Z SCHEMATIC, 2 OF 5

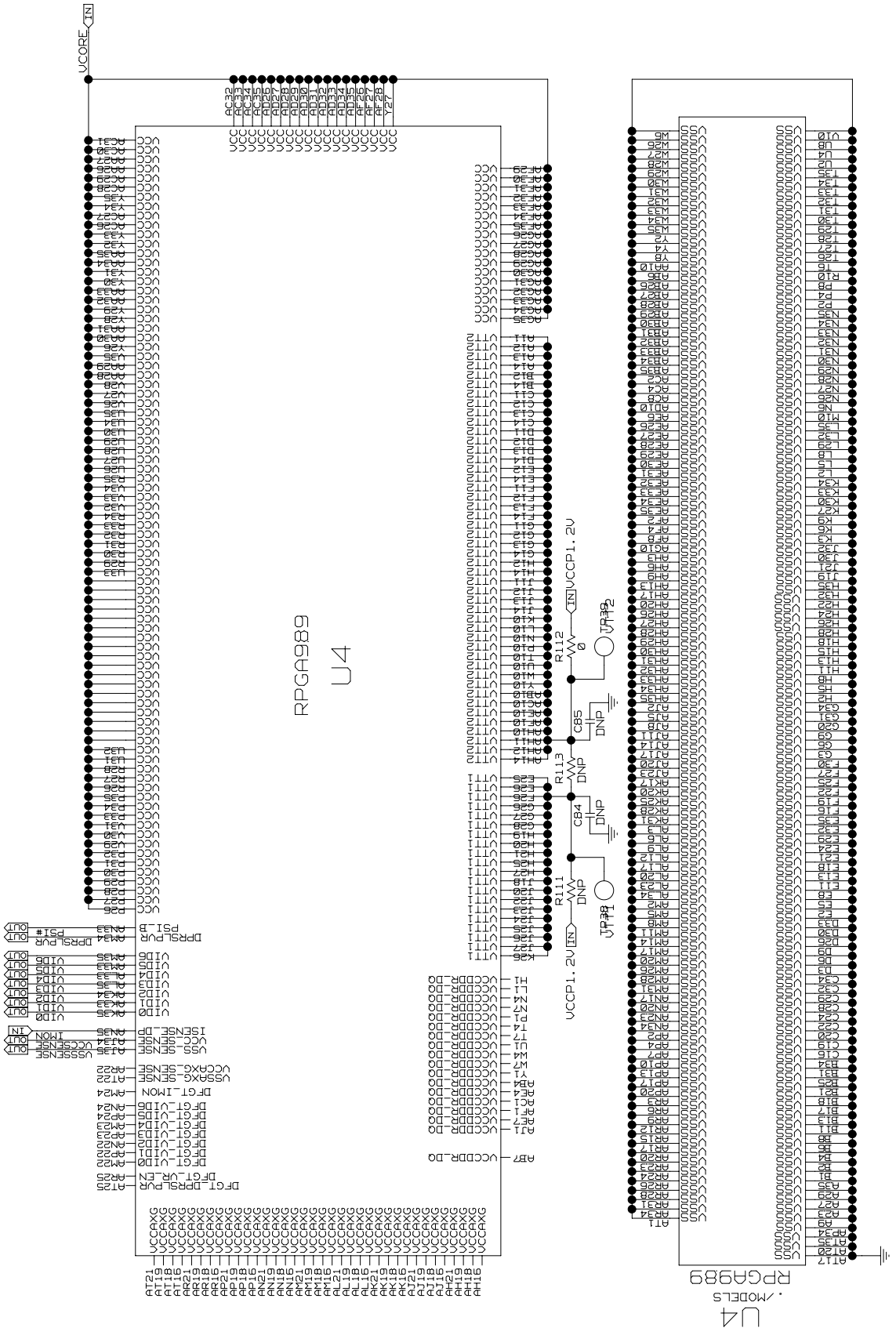

FIGURE 4. ISL62881CCPUEVAL2Z SCHEMATIC, 3 OF 5

ISL62881CCPUEVAL2Z Schematics (Continued)

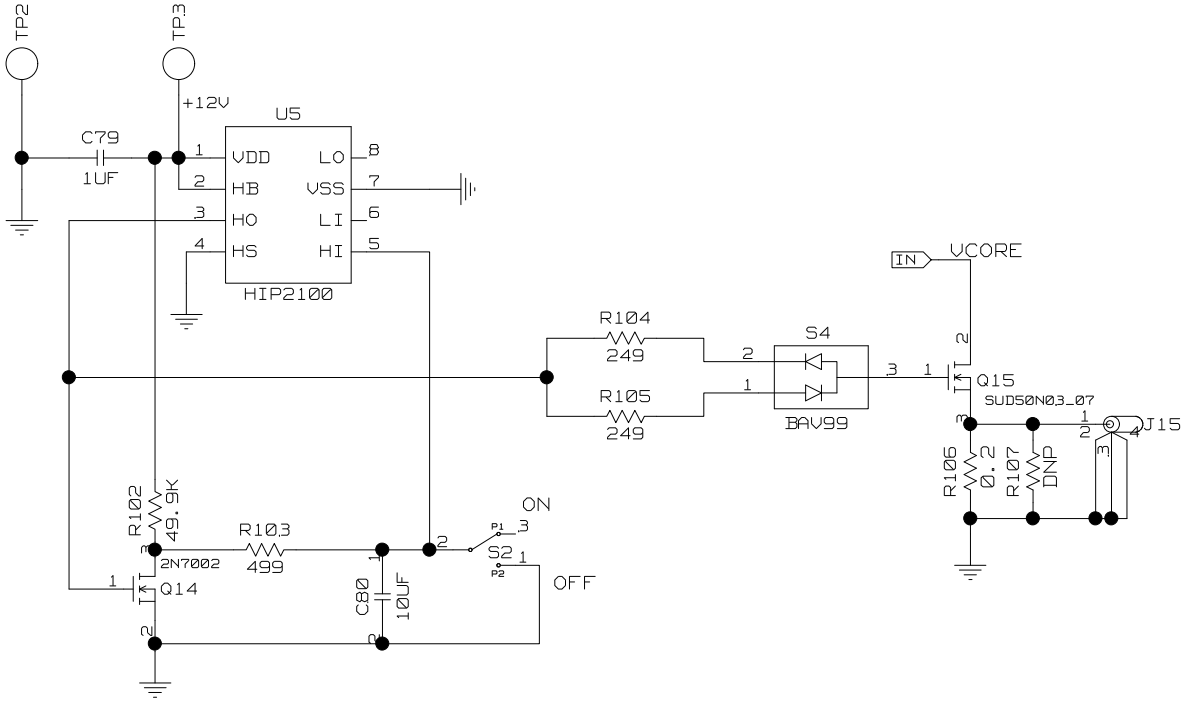

FIGURE 5. ISL62881CCPUEVAL2Z SCHEMATIC, 4 OF 5

ISL62881CCPUEVAL2Z Schematics (Continued)

FIGURE 6. ISL62881CCPUEVAL2Z SCHEMATIC, 5 OF 5

ISL62881CCPUEVAL2Z Evaluation Board Layout

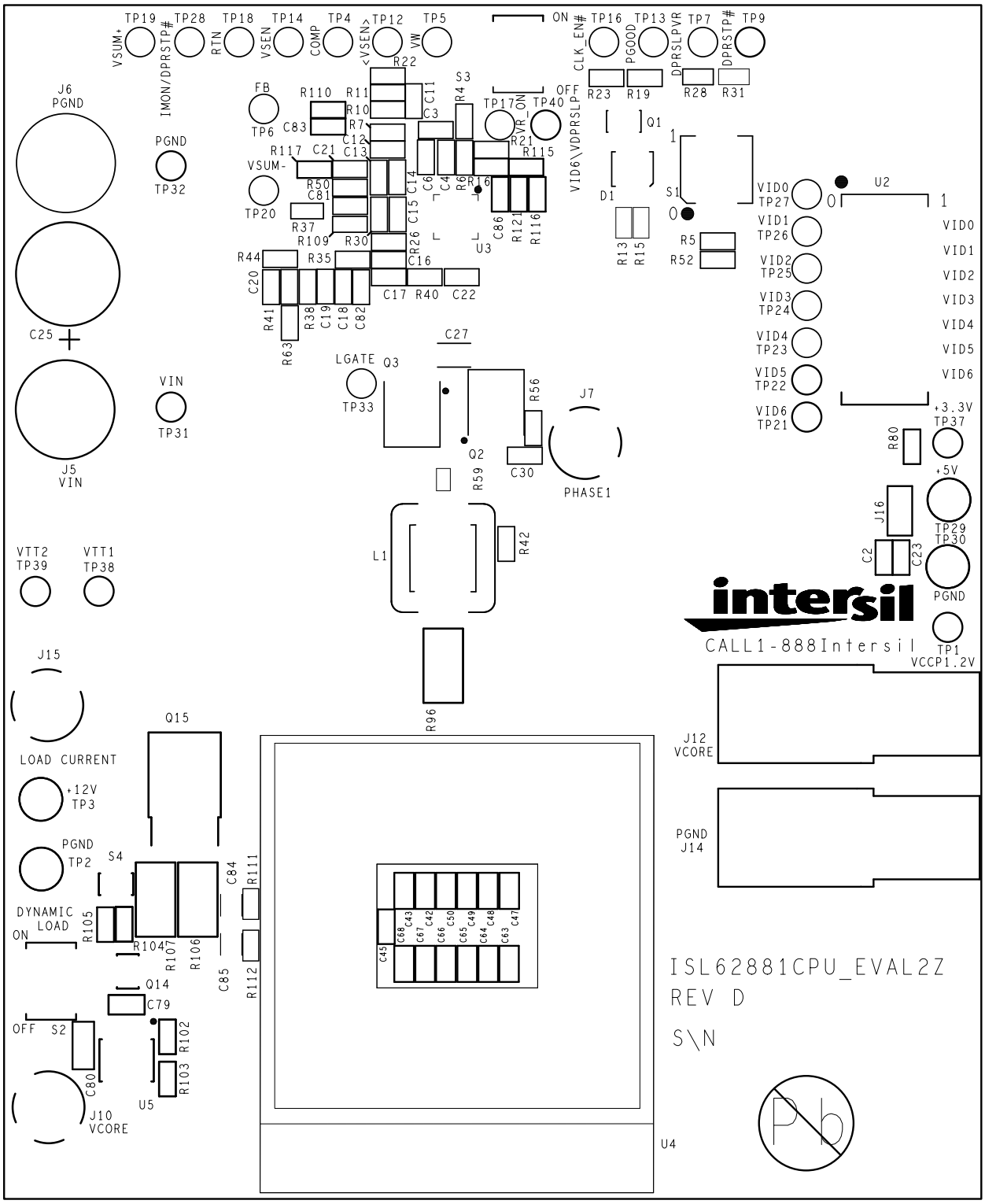

FIGURE 7. TOP SILKSCREEN

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

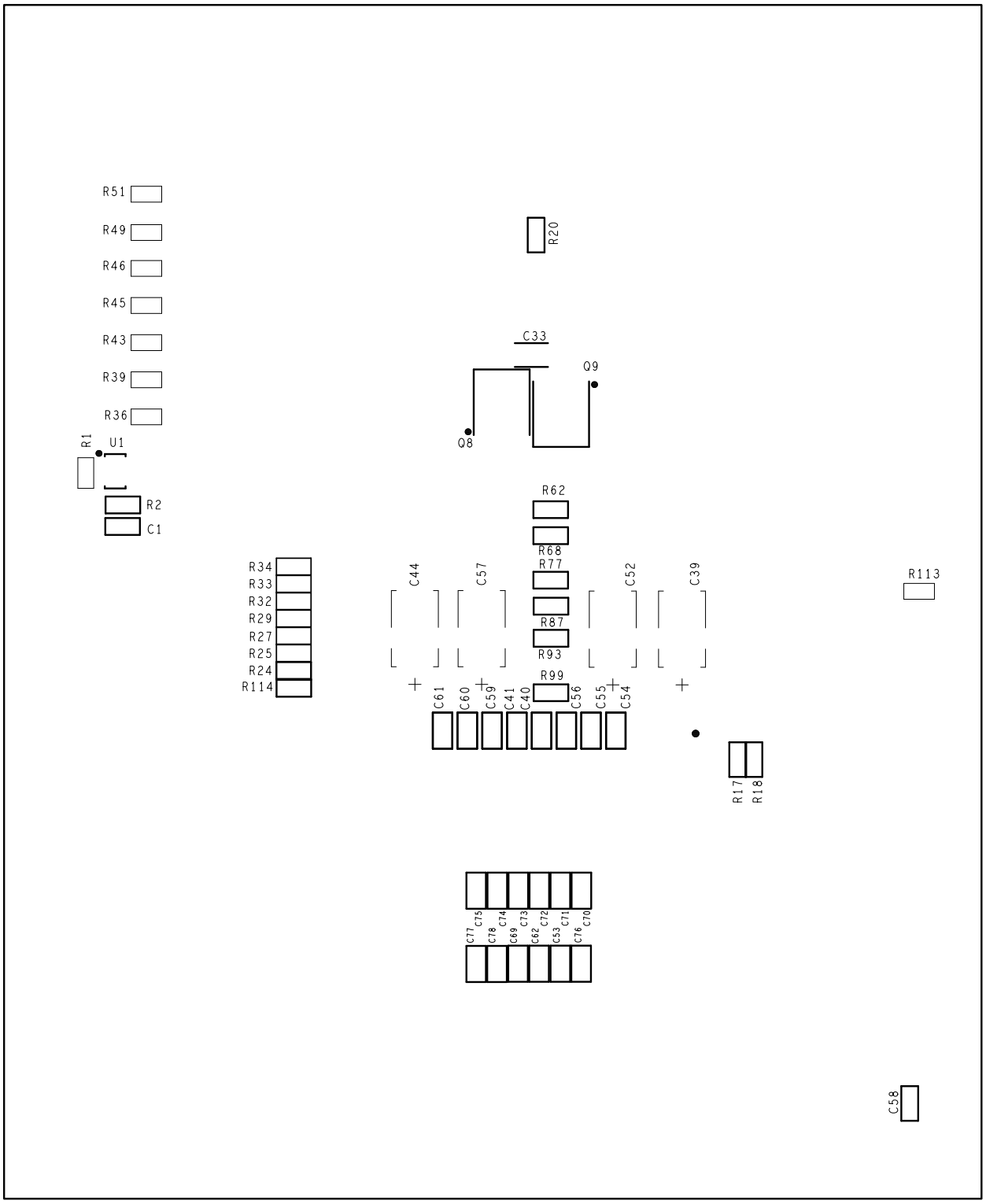

FIGURE 8. BOTTOM SILKSCREEN

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

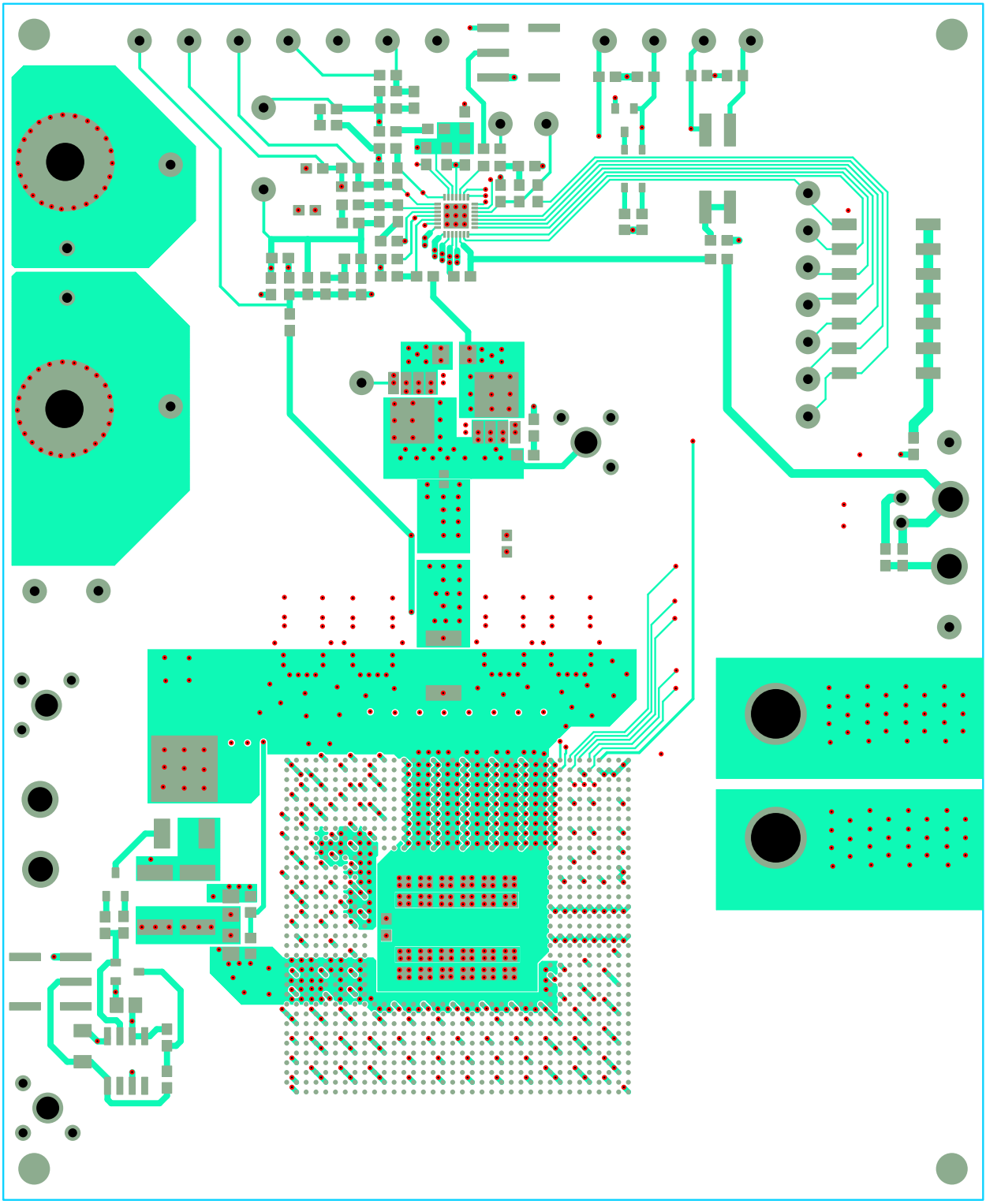

FIGURE 9. LAYER 1

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

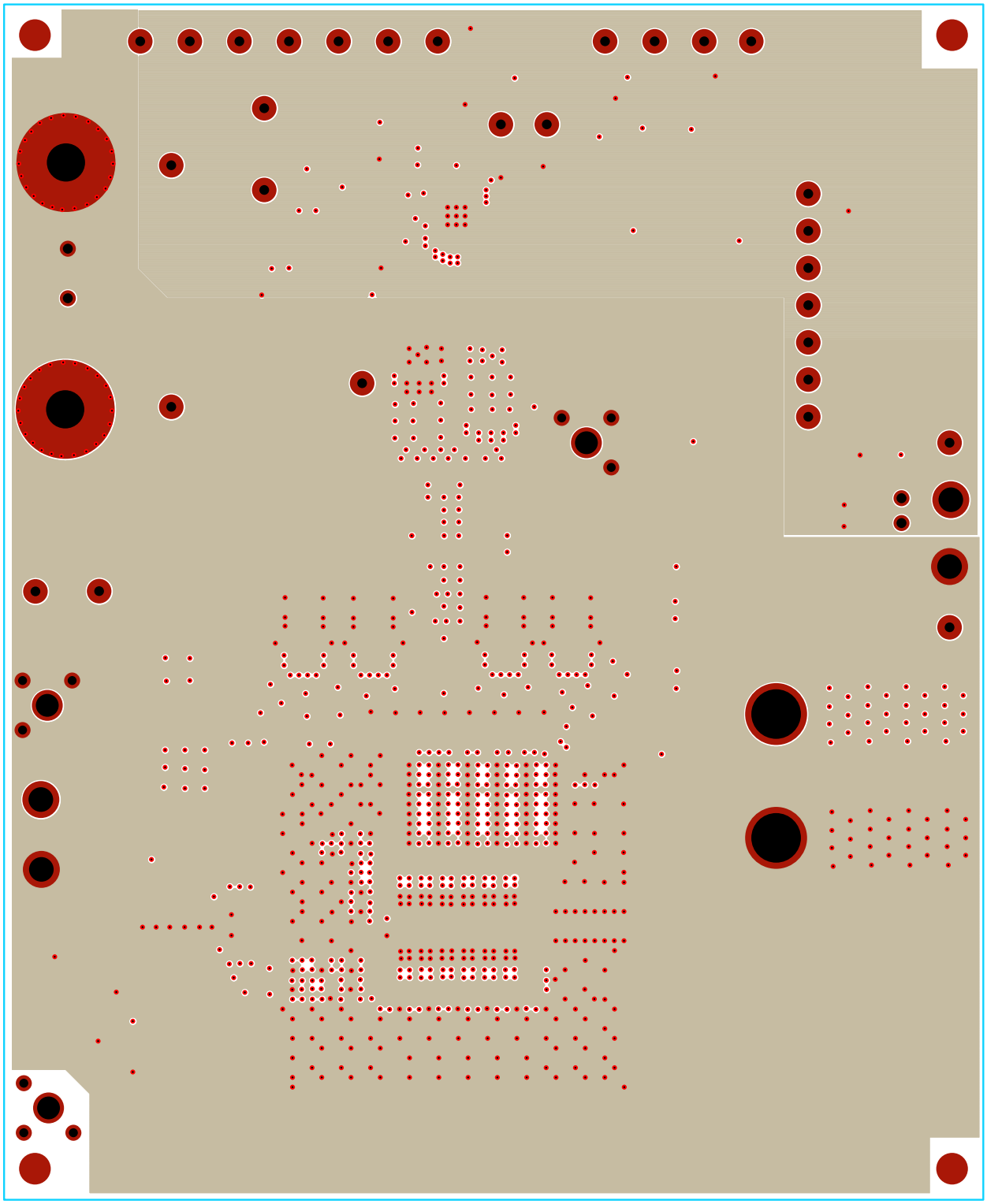

FIGURE 10. LAYER 2

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

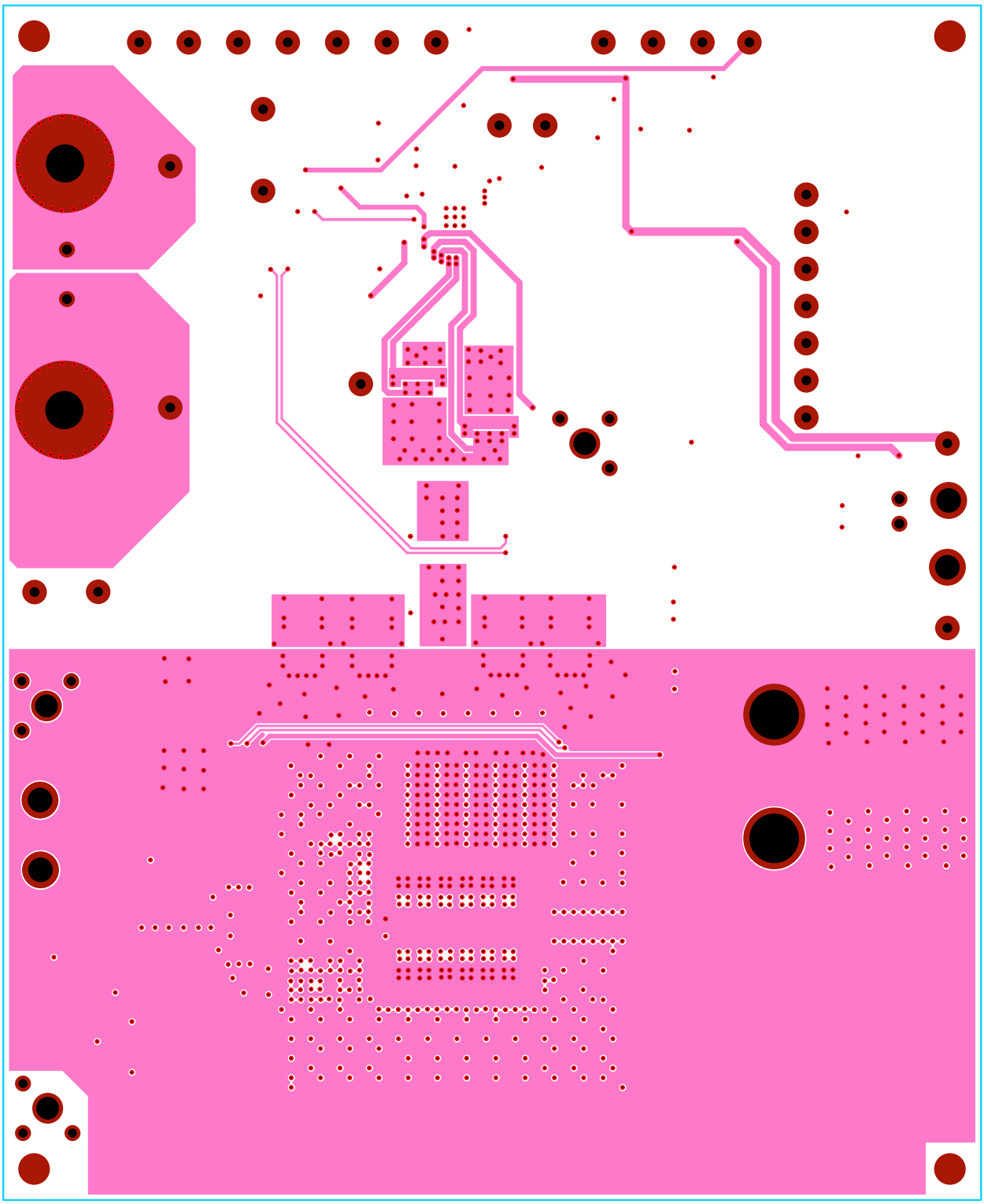

FIGURE 11. LAYER 3

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

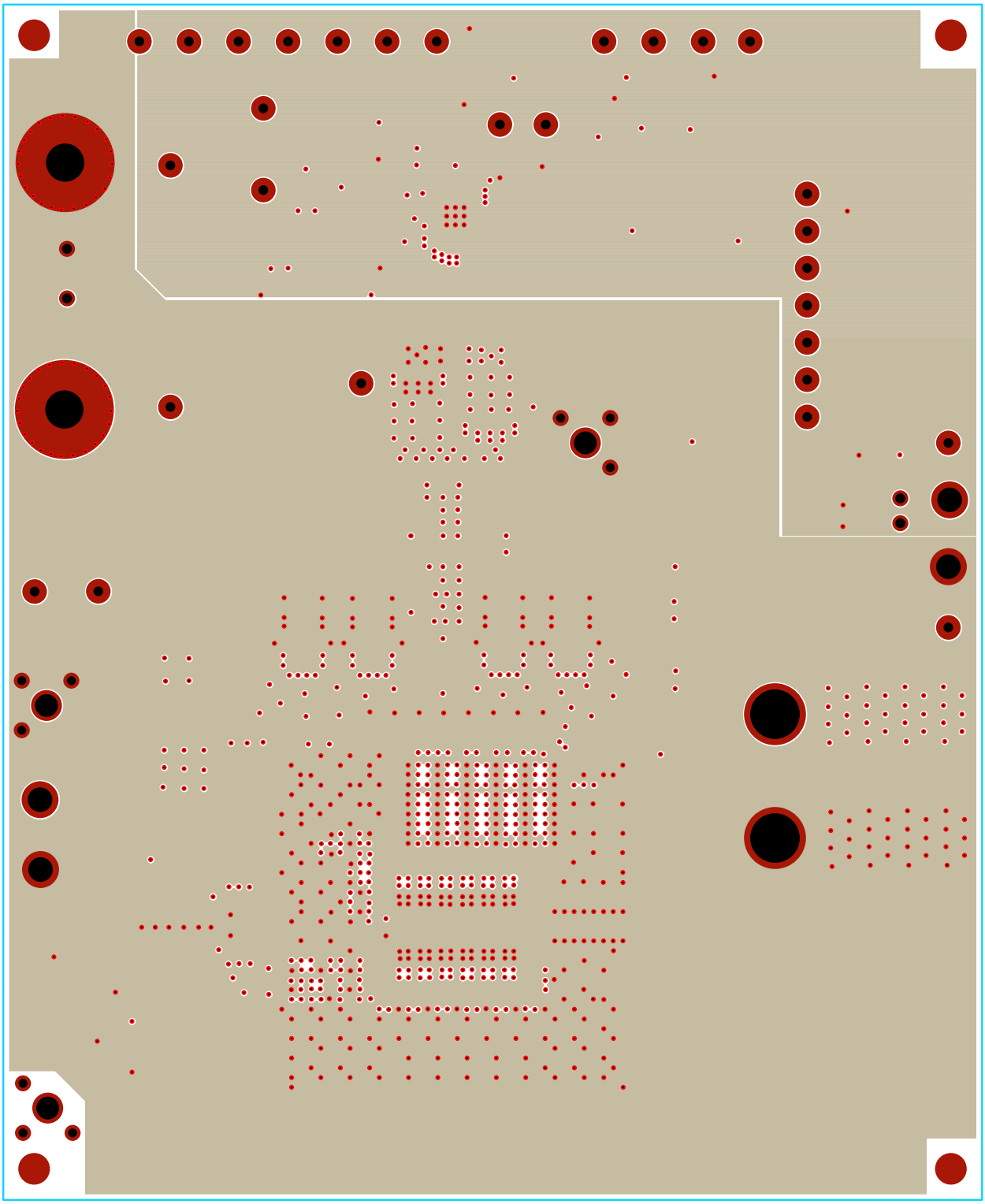

FIGURE 12. LAYER 4

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

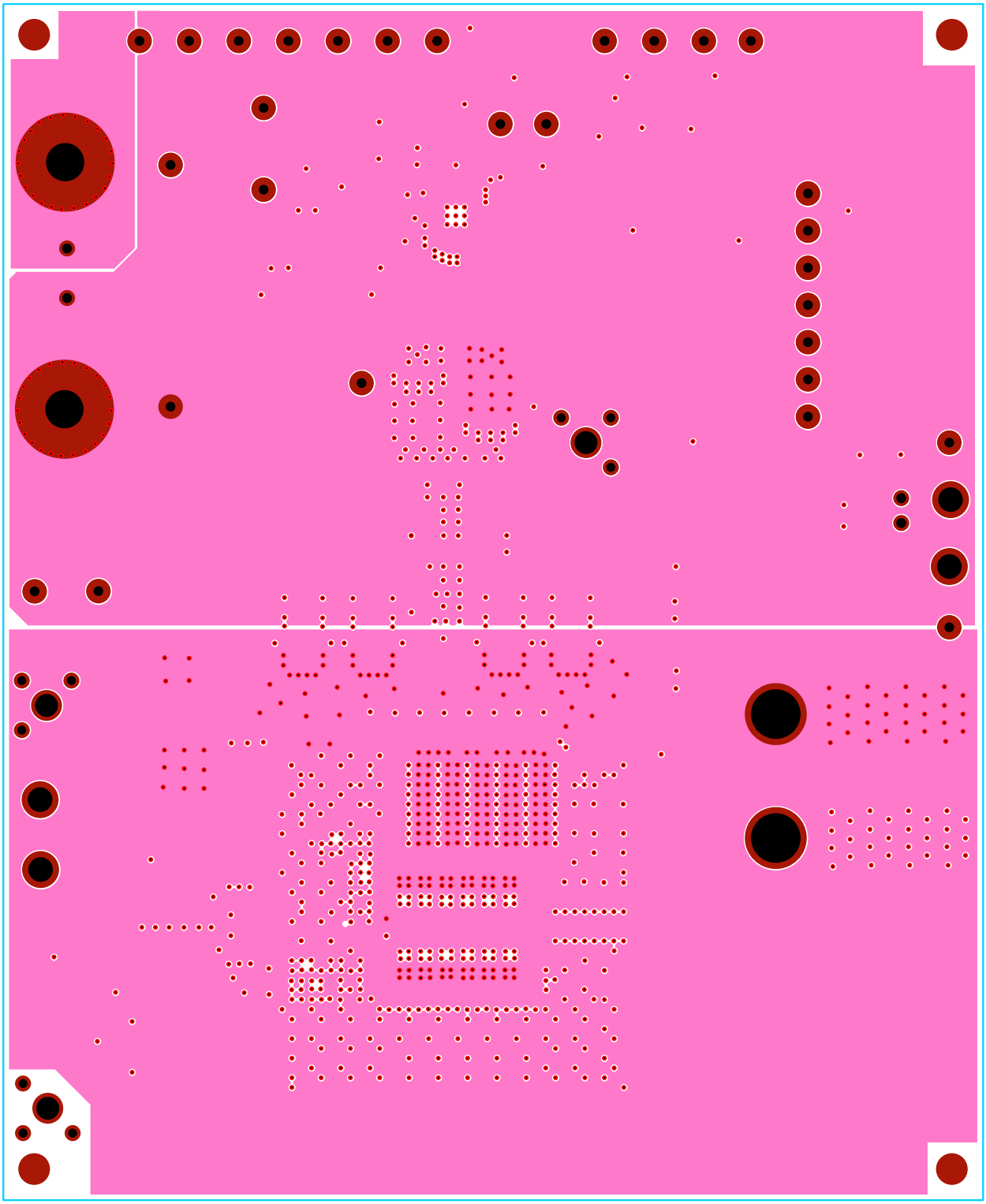

FIGURE 13. LAYER 5

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

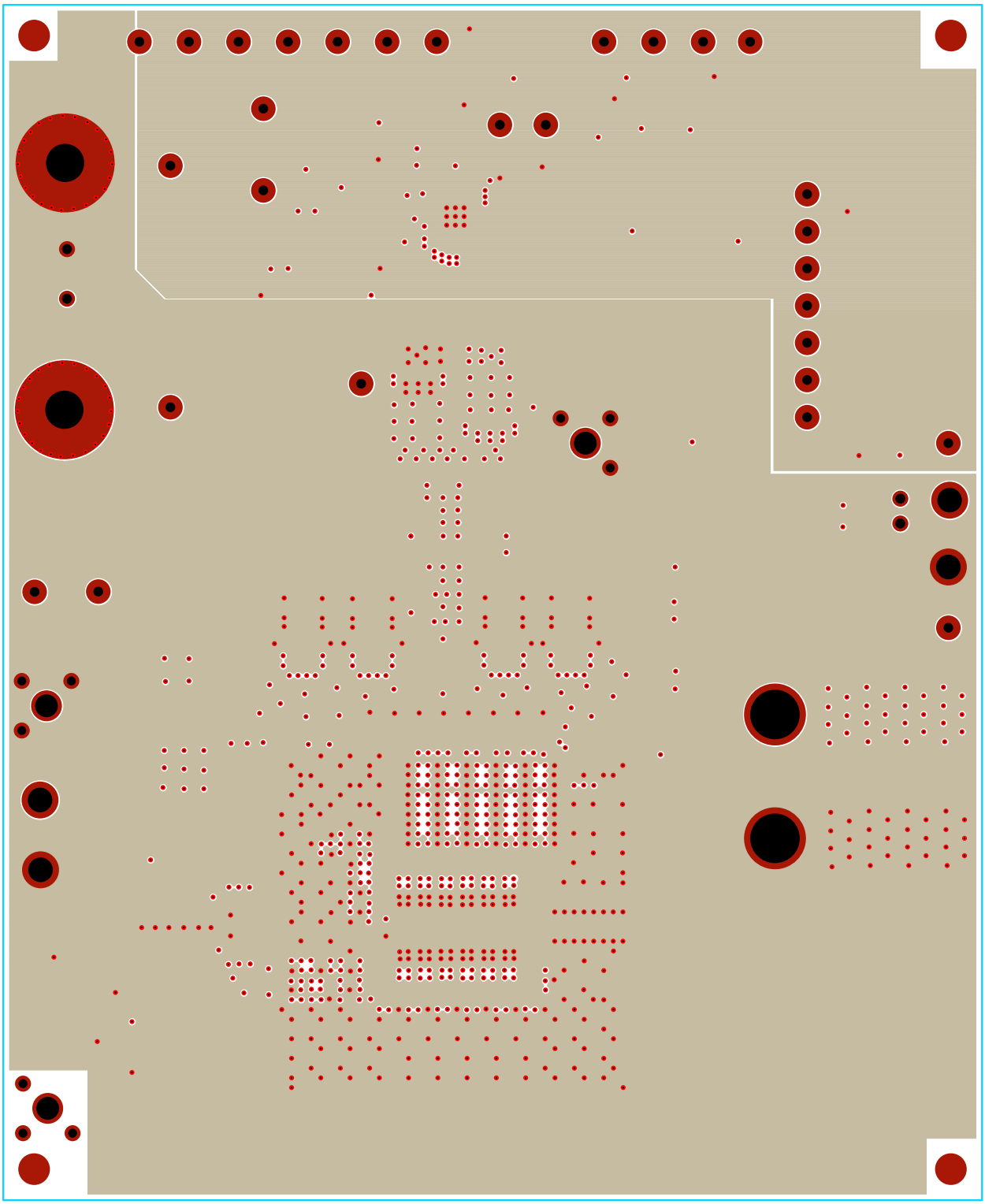

FIGURE 14. LAYER 6

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

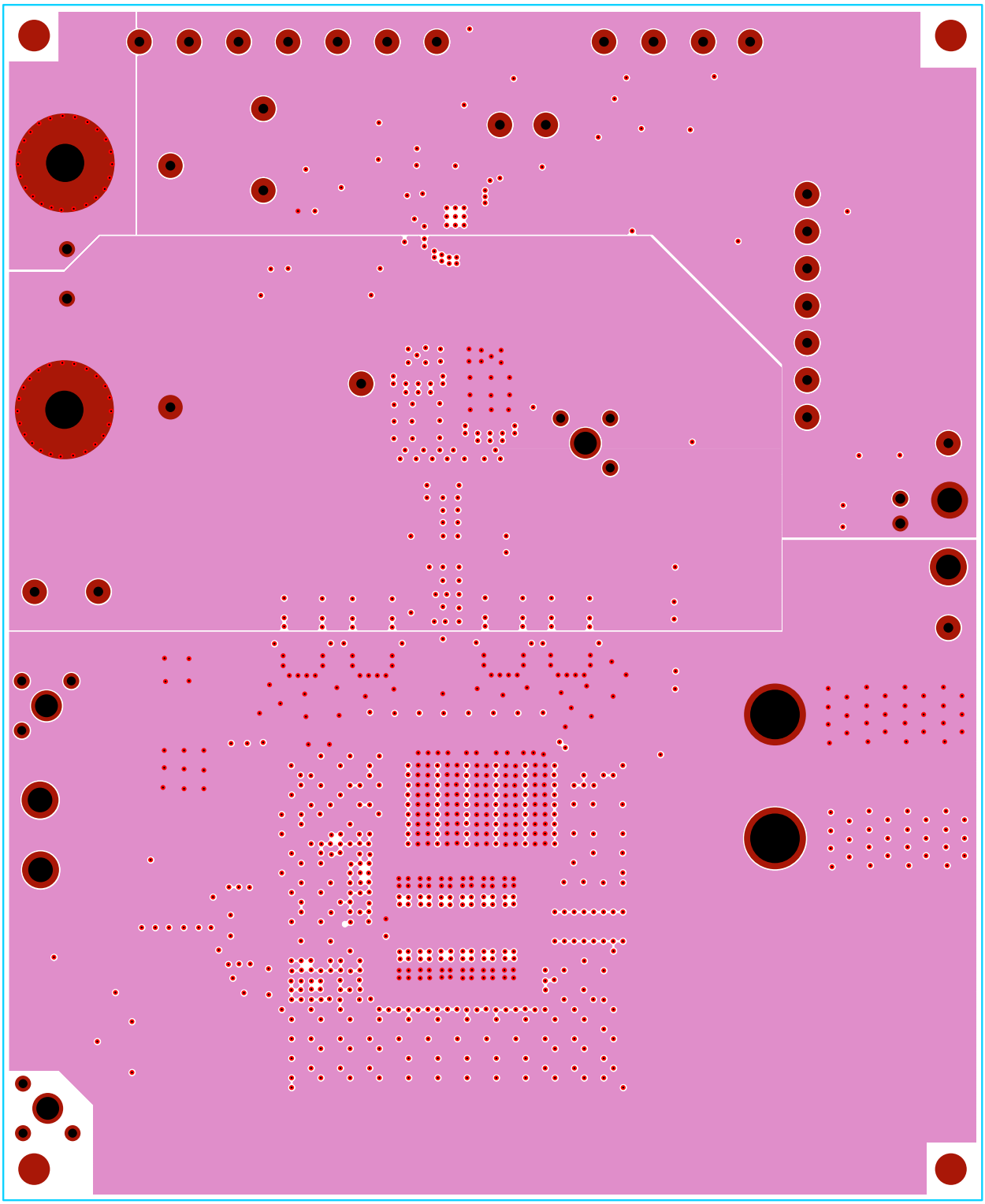

FIGURE 15. LAYER 7

ISL62881CCPUEVAL2Z Evaluation Board Layout (Continued)

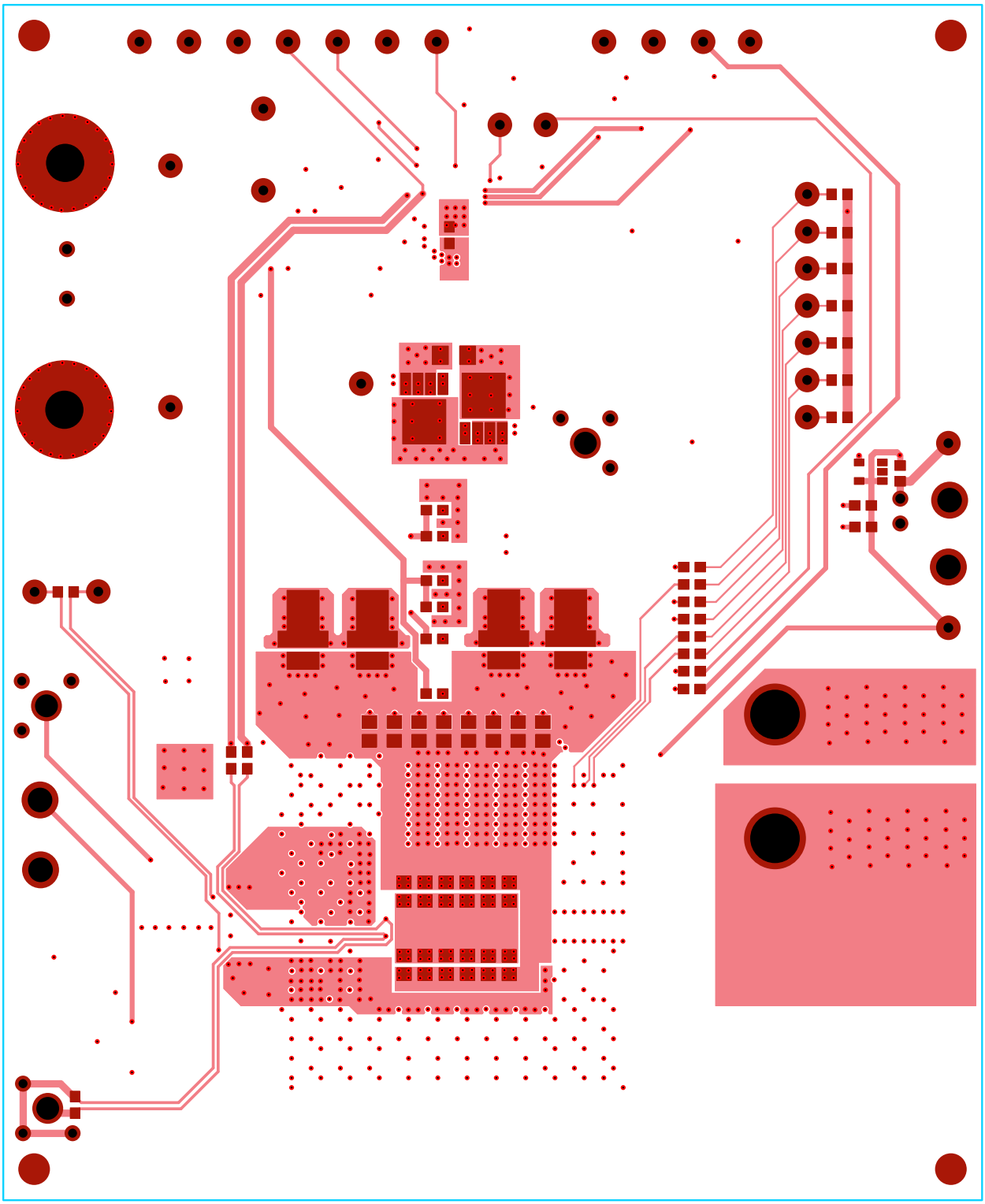

FIGURE 16. LAYER 8

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