

## ISL62883EVAL2Z

Evaluation Board

AN1460  
Rev 1.00  
Jul 13, 2009

### Introduction

The ISL62883EVAL2Z evaluation board demonstrates the performance of the ISL62883 multiphase synchronous-buck PWM  $V_{CORE}$  controller implementing Intel IMVP-6.5 protocol. The ISL62883 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 25m $\Omega$  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
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  - Schematic
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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	75	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
  - J11 and J12:  $V_O$  Positive Power Output
  - J13 and 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

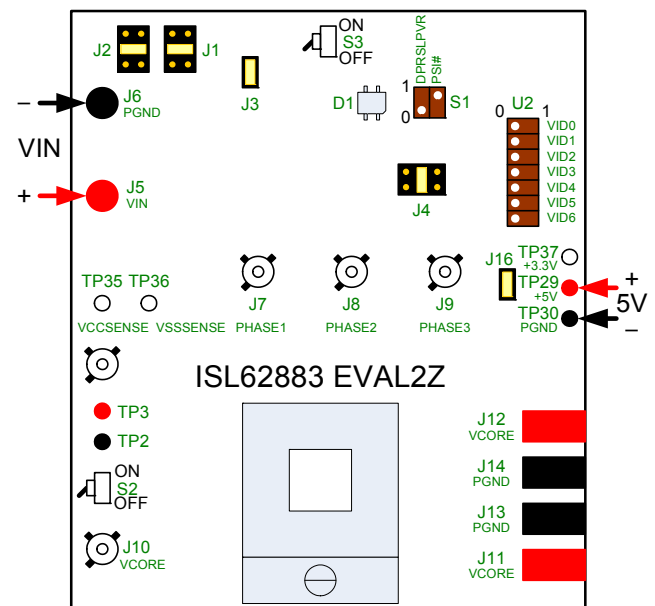


FIGURE 1. TEST SET-UP

### 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)
- S5: 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 PSI# signal
- U2: Set the VID

## Jumper Descriptions

- J1: Set the ISEN2 pin configuration. ISEN2 can be connected to the power stage, tied to +5V, GND or left floating. Connect ISEN2 to the power stage when the ISL62883 is configured for 3-phase or 2-phase application. Tie ISEN2 to 5V when the ISL62883 is configured for 1-phase application.
- J2: Set the ISEN1 pin configuration. ISEN1 can be connected to the power stage, tied to +5V, GND or left floating. Connect ISEN1 to the power stage when the ISL62883 is configured for 3-phase, 2-phase application. Leave ISEN1 floating when the ISL62883 is configured for 1-phase application
- J3: If installed, the ISEN3/FB2 pin will be connected to the power stage. If uninstalled, the ISEN3/FB2 pin will be disconnected from the power stage. Install J3 when the ISL62883 is configured for 3-phase application. Uninstall J3 when the ISL62883 is configured for 2-phase or 1-phase application.
- J4: Set the PWM3 pin configuration. PWM3 can be connected to the ISL6208 driver, tied to +5V, GND or left floating. Connect PWM3 to the ISL6208 driver when the ISL62883 is configured for 3-phase application. Tie PWM3 to 5V when the ISL62883 is configured for 2-phase or 1-phase application.
- 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 TP/37/TP30.

## Test-point Descriptions

- J7: Scope-probe socket for measuring PHASE1
- J8: Scope-probe socket for measuring PHASE2
- J9: Scope-probe socket for measuring PHASE3
- 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.
- TP8: Monitor the VR\_TT# pin.
- TP9: Monitor the PSI# pin.
- TP10: Monitor the ISEN3/FB2 pin.
- TP11: Monitor the ISEN2 pin.
- TP12: Input side of the compensator.
- TP13: Monitor the PGOOD pin.
- TP14: Monitor the VSEN pin.
- TP15: Monitor the ISEN1pin.
- 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
- TP34: Monitor MOSFET Q9 gate signal.
- TP35: Monitor the VCCSENSE pin of the CPU socket U4.
- TP36: Monitor the VSSSENSE pin of the CPU socket U4.
- TP37: +3.3V power supply positive input.
- TP38: Monitor the VTT1 rail of the CPU socket U4.
- TP39: Monitor the VTT2 rail of the CPU socket U4.

**Bill of Materials**

REFERENCE	QTY	VALUE	PART NUMBER	DESCRIPTION	PACKAGE	VENDOR
C1	1	0.01 $\mu$ F	H1045-00103-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C11	1	390pF	H1045-00391-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C12,C14	2	330pF	H1045-00331-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C13	1	1000pF	H1045-00102-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C15	1	0.01 $\mu$ F	H1045-00103-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C16, C2, C22, C23, C26, C79	6	1 $\mu$ F	H1045-00105-16V20	Multilayer Cap, 16V, 20%	SM0603	Generic
C18	1	0.47 $\mu$ F	H1045-00474-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C19		DNP				
C36, C37, C38, C8, C83	5	DNP				
C20, C45, C58	3	0.1 $\mu$ F	H1045-00104-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C21	1	0.22 $\mu$ F	H1045-00224-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C24, C25	2	56 $\mu$ F	25SP56M	Radial SP Series Cap, 25V, 20%	CASE-CC	Sanyo
C27, C28, C29, C33, C34, C35, C80	7	10 $\mu$ F	H1065-00106-25V20	Multilayer Cap, 25V, 20%	SM1206	Generic
C3	1	150pF	H1045-00151-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C39, C44, C52, C57	4	270 $\mu$ F	EEFSX0D271E4	POSCAP, 2V, 4.5m $\Omega$		Panasonic
C4	1	1000pF	H1045-00102-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C40 to C43, C47 to C50, C54 to C56, C59 to C61, C63 to C68, C71 to C74	24	10 $\mu$ F	GRM21BR61C106KE15L	Multilayer Cap, 6.3V, 20%	SM0805	Murata
C5, C53, C62, C69, C70, C75 to C78	9	DNP				
C6	1	39pF	H1045-00390-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C7, C9, C10, C17, C30, C31, C32	7	0.22 $\mu$ F	H1045-00224-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C81	1	820pF	H1045-00821-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
C82	1	0.039 $\mu$ F	H1045-00393-16V10	Multilayer Cap, 16V, 10%	SM0603	Generic
D1	1		SSL-LXA3025IGC	3mmx2.5mm Surface Mount Red/Green LED	LED_3x2_5MM	Lumex
J1, J2, J4	3		67996-272	2x3 Header, 2.54mm(0.100) Pitch	CONN2x3	Berg/FCI
J10	1		131-4353-00	Scope Probe Test Point PCB Mount	TEK131-4353-00	Tektronix
J15, J7, J8, J9	0	DNP				
J11 to J14	4		KPA8CTP	Wire Connector Lug	KPA8CTP	Burndy
J3, J16	2		69190-202	2 Pin Header 2.54mm (0.100) Pitch	CONN2	Berg/FCI
J5	1		111-0702-001	Binding Post Red	111-07XX-001	Johnson-Comp
J6	1		111-0703-001	Binding Post Black	111-07XX-001	Johnson-Comp
L1, L2, L3	3	0.36 $\mu$ H	MPCH1040LR36	Inductor, Inductance 20%, DCR 7%		NEC-Tokin
Q1, Q14	2		2N7002-7-F	N-Channel EMF Effect Transistor (Pb-Free)	SOT23	Fairchild
Q15	1		SUD50N03-07	N-Channel 30V (D-S) MOSFET	TO-252AA	Vishay
Q2, Q4, Q6, Q8, Q10, Q12	6		IRF7821	N-Channel Power MOSFET Power Switching	PWRPAK_SO8	IR

**Bill of Materials** (Continued)

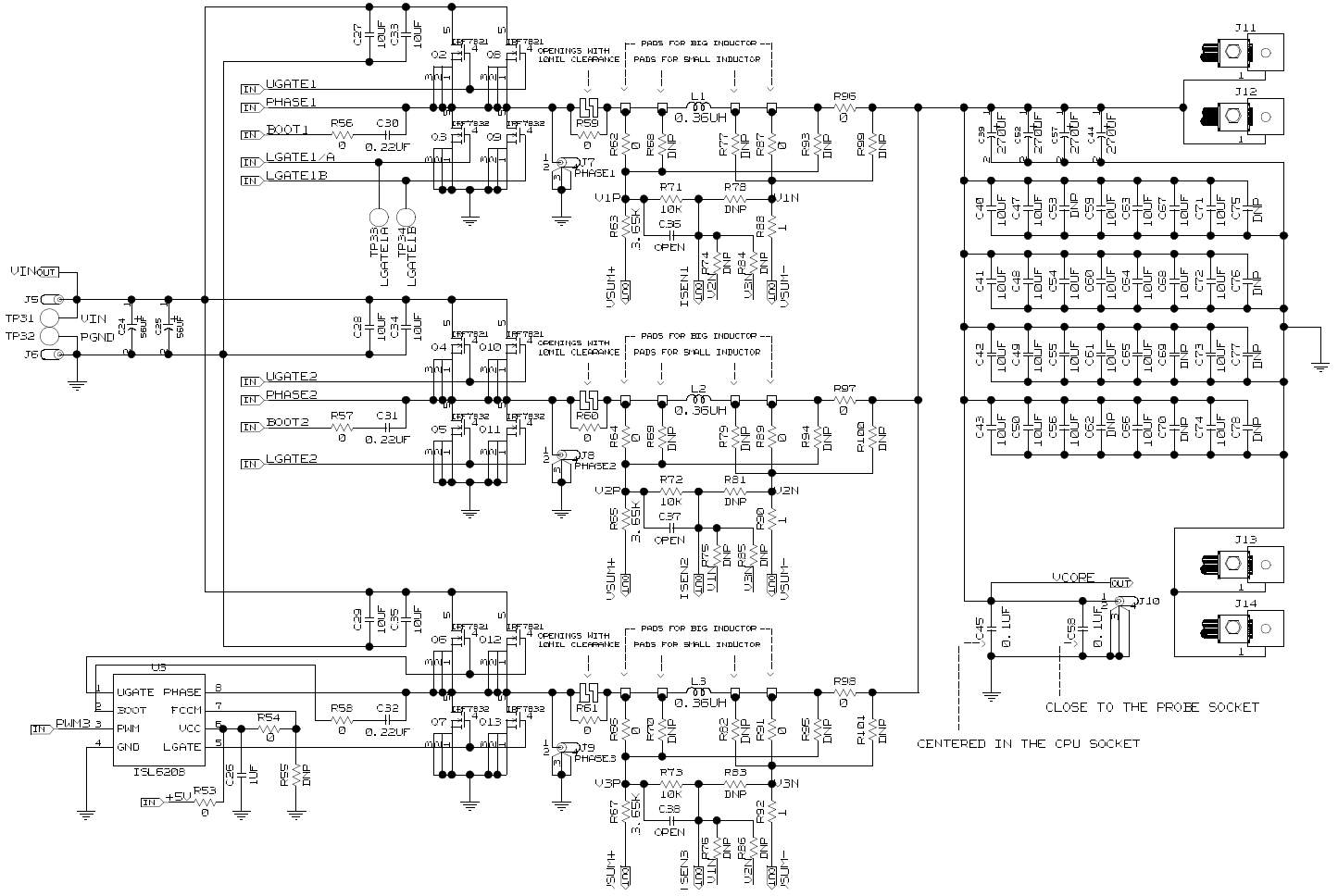
REFERENCE	QTY	VALUE	PART NUMBER	DESCRIPTION	PACKAGE	VENDOR
Q3, Q5, Q7, Q9, Q11, Q13	6		IRF7832	N-Channel Power MOSFET Power Switching	PWRPAK_SO8	IR
R1	1	49.9	H2511-049R9-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R10	1	536	H2511-05360-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R102	1	49.9k	H2511-04992-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R104, R105	2	249	H2511-02490-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R106, R107	2	0.05	H2515-00R05-1W1-T	Thick Film Chip Resistor, 1%	SM2512	Generic
R108	1	0	H2511-00R00-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R109	1	100	H2511-01000-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R11	1	2.37k	H2511-02371-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R12, R13, R15, R103	4	499	H2511-04990-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R16	1	147k	H2511-01473-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R17, R18	2	10	H2511-00100-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R19, R23	2	1.91k	H2511-01911-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R21, R28, R31, R36, R39, R43, R45, R46, R49, R51, R71, R72, R73	13	10k	H2511-01002-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R2, R8, R9, R55, R74, R75, R76, R78, R81, R83, R84, R85, R86, R110	15	DNP				
R26	1	82.5	H2511-082R5-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R14, R112, R20, R22, R24, R25, R27, R29, R32, R33, R34, R40, R52, R53, R54, R56, R57, R58	18	0	H2511-00R00-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R30	1	604	H2511-06040-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R35	1	0	H2511-00R00-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R37, R88, R90, R92	4	1	H2511-01R00-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R38	1	11k	H2511-01102-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R4	1	DNP				
R41	1	2.61k	H2511-02611-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R42	1	10k NTC	ERT-J1VR103J	Thermistor, 10k NTC	SM0603	Panasonic
R44	1	DNP				
R47	1	0	H2511-00R00-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R48	1	DNP				
R5, R80	2	100	H2511-01000-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R50	1	8.25k	H2511-08251-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R59, R60, R61	3			Solder Joint (Heavy Duty)		
R6	1	8.66k	H2511-08661-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R62, R64, R66, R87, R89, R91	6	0	H2511-00R00-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R63, R65, R67	3	3.65k	H2512-03651-1/16W1	Thick Film Chip Resistor, 1%	SM0805	Generic

**Bill of Materials** (Continued)

REFERENCE	QTY	VALUE	PART NUMBER	DESCRIPTION	PACKAGE	VENDOR
R68, R69, R70, R77, R79, R82	6	DNP				
R7	1	324k	H2511-03243-1/16W1	Thick Film Chip Resistor, 1%	SM0603	Generic
R93, R94, R95, R99, R100, R101, R111, R113	8	DNP				
R96, R97, R98	3			Solder Joint (Heavy Duty)		
S1	1		SD02H0SK	SD Series Low Profile Dip Switch	DIPSWMT-4	C&K
S2, S3	2		GT11MSCKE	SPDT On-None-On SMT Ultraminiature Toggle Switch	GT13MSCKE	C&K
S4	1		BAT54S	Schottky Barrier (Double) Diode	SOT23	Diodes
T2, T3, T29, T30	4		1514-2	Test Point Turret 0.15 Pad 0.1 Thole	TP-150C100P	Keystone
TP1, TP4 to TP28, TP31 to TP37	33		5002	Miniature White Test Point 0.100 Pad 0.040 Thole	MTP500X	Keystone
TP38, TP39	2	DNP				
U1	1		TLV431ASNT1	Low Volt Precision Adjustable Shunt Regulator	TSOP-5	On-Semi
U2	1		SD07H0SK	SD Series Low Profile Dip Switch	DIPSWMT-14	C&K
U3	1		ISL6208CBZ	Synchronous Rectified MOSFET Driver	SOIC8	Intersil
U4	1		rPGA989M	rPGA989 CPU Socket		Foxconn
U5	1		HIP2100IBZ	100V/2A Peak High Freq Half Bridge Driver (Pb-Free)	SOIC8	Intersil
U6	1		ISL62883HRZ	IMVP-6.5 PWM Controller	QFN-40	Intersil



**ISL62883EVAL2Z Schematic (Continued)**



**FIGURE 3. ISL62883EVAL2Z SCHEMATICS, PAGE 2 OF 5**

ISL62883EVAL2Z Schematic (Continued)

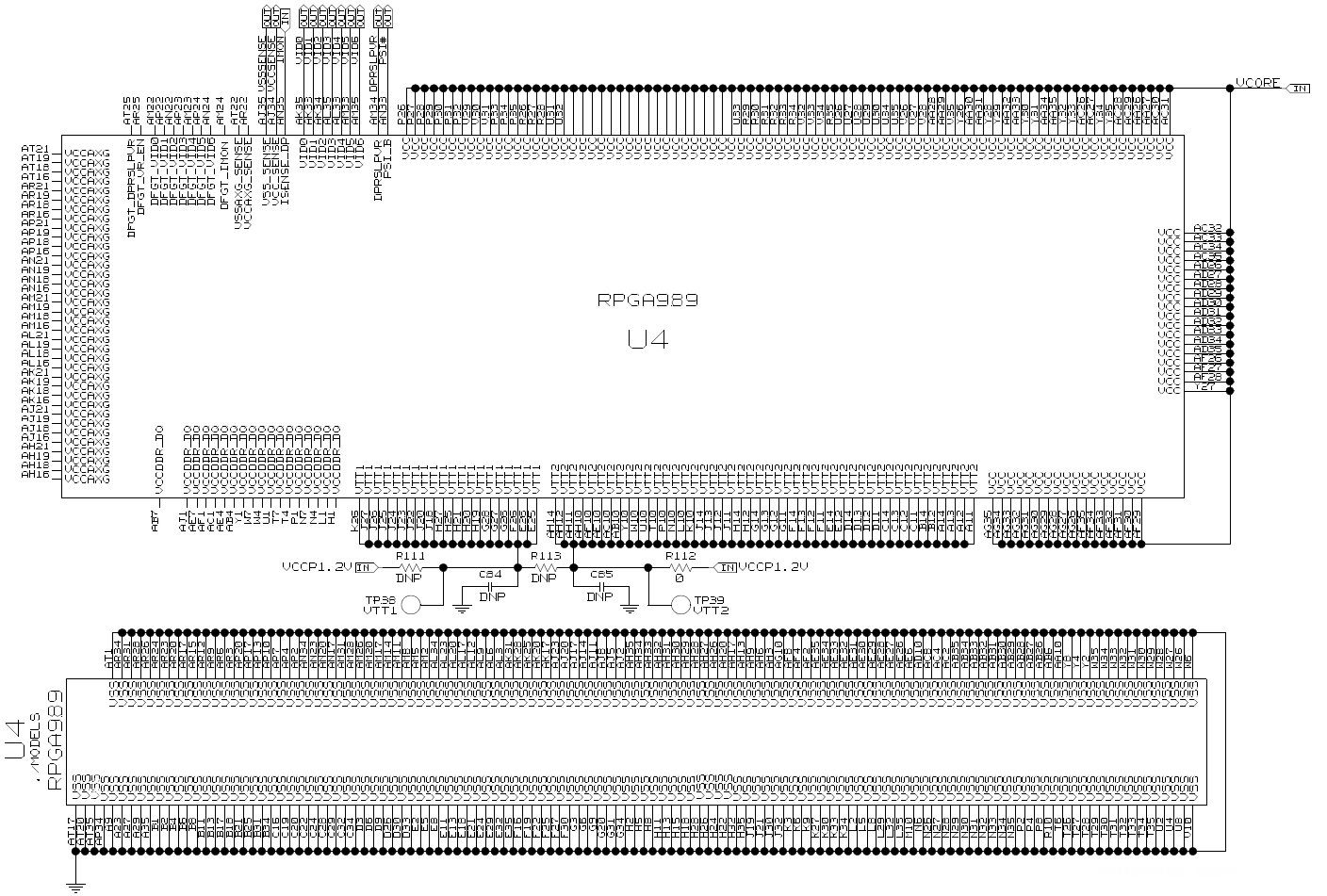


FIGURE 4. ISL62883EVAL2Z SCHEMATICS, PAGE 3 OF 5



**ISL62883EVAL2Z Schematic** (Continued)

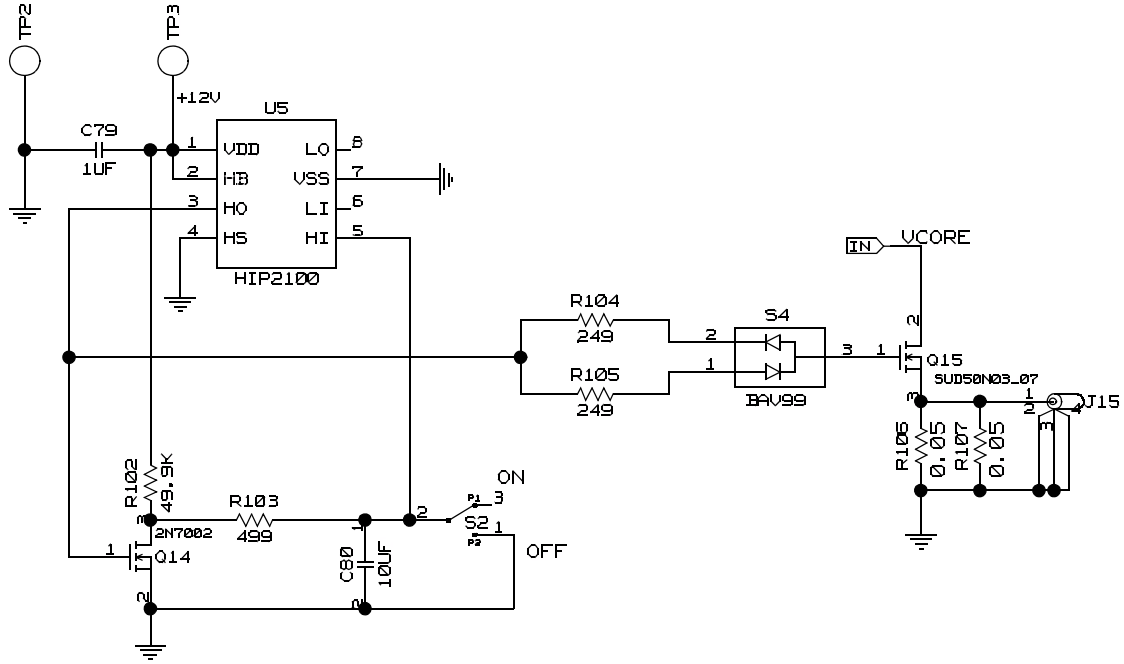


FIGURE 5. ISL62883EVAL2Z SCHEMATICS, PAGE 4 OF 5

ISL62883EVAL2Z Schematic (Continued)

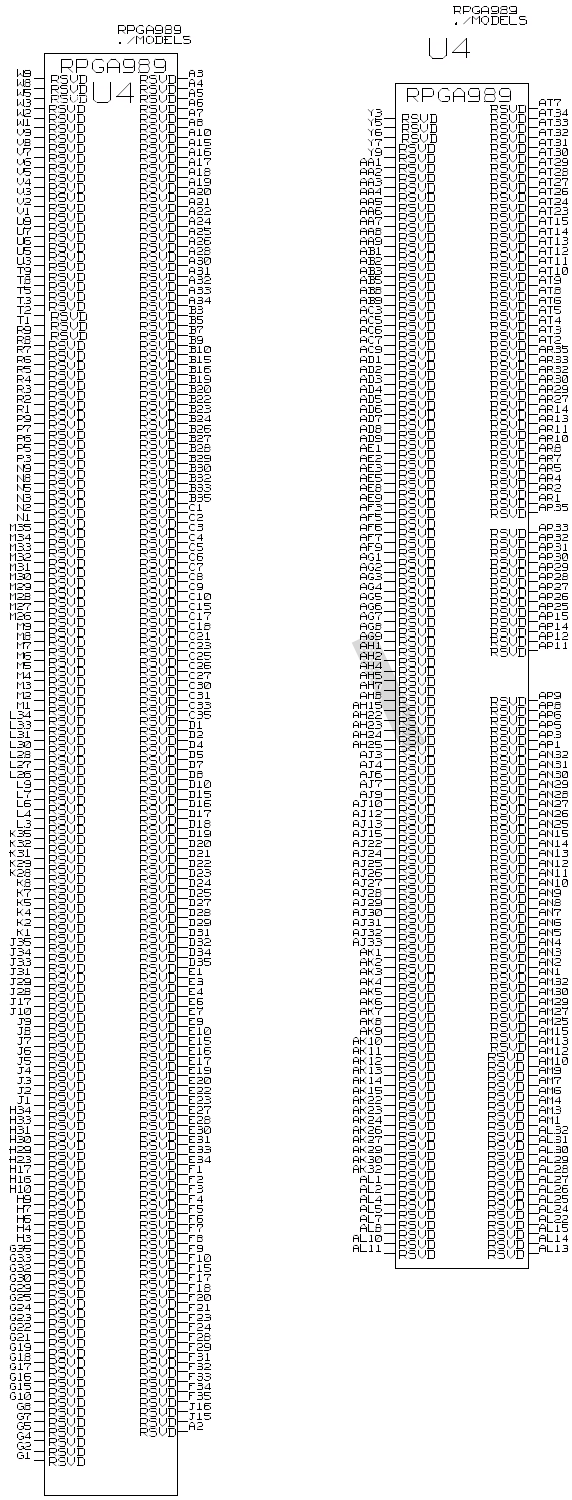
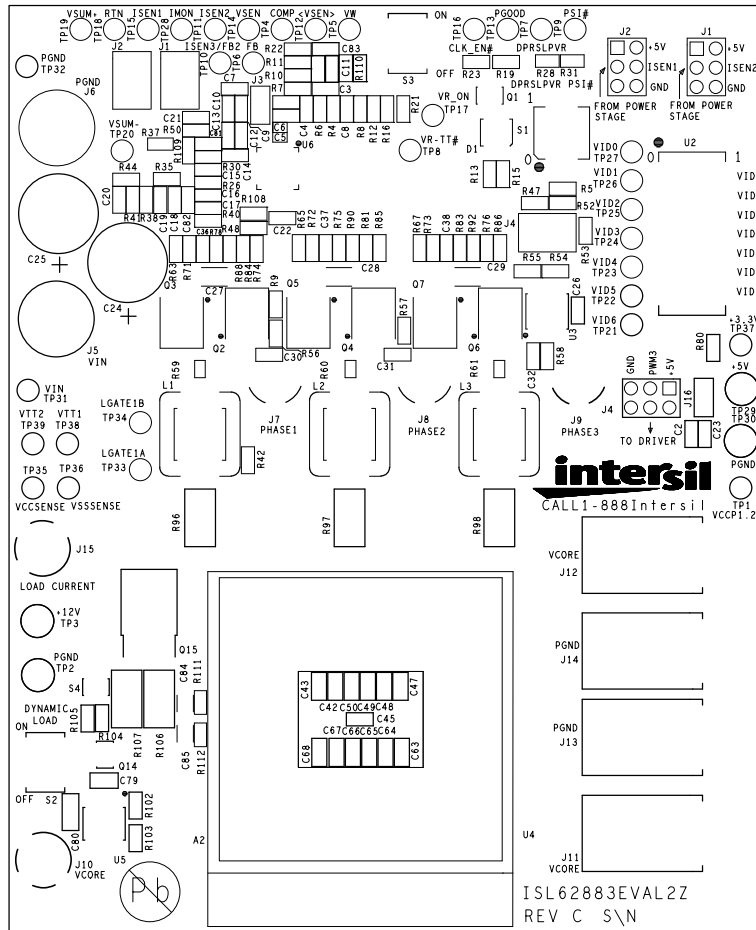


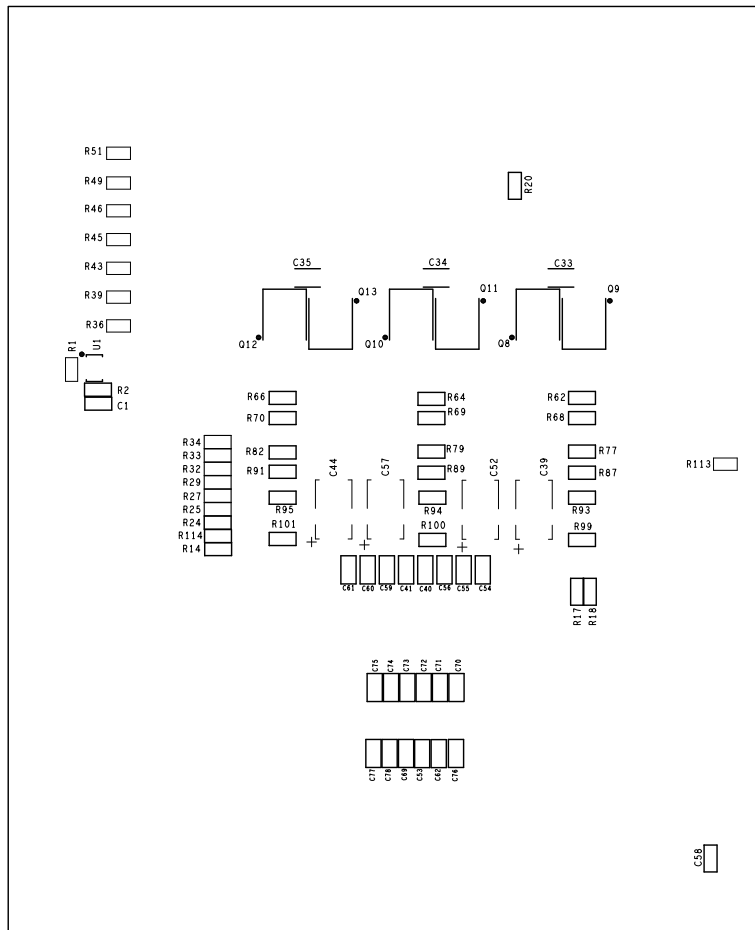
FIGURE 6. ISL62883EVAL2Z SCHEMATICS, PAGE 5 OF 5

**ISL62883EVAL2Z Evaluation Board Layout**



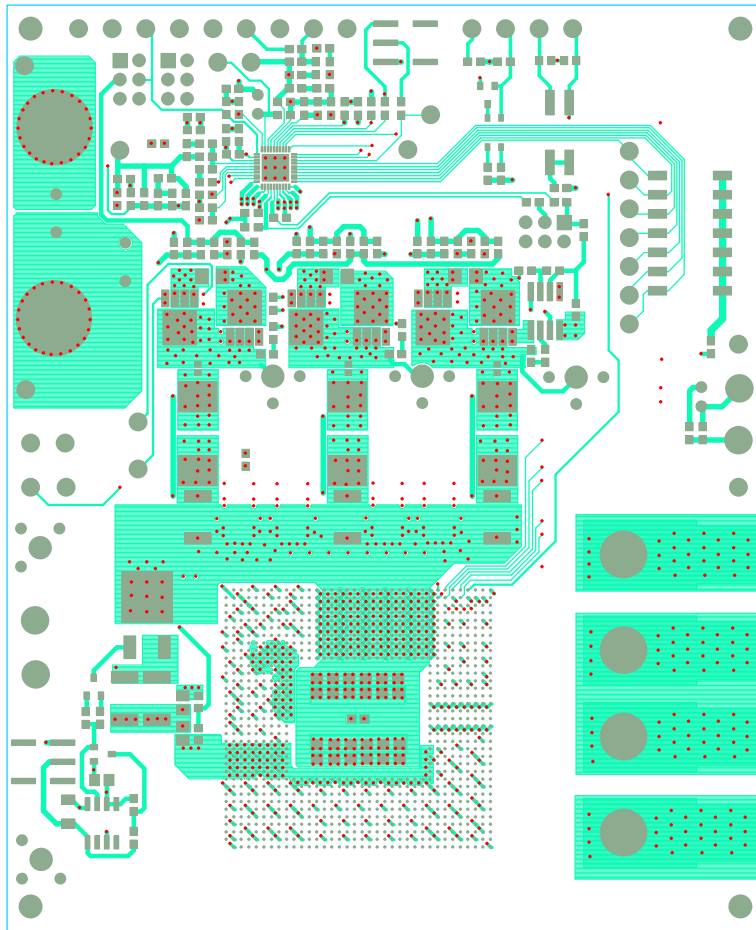
**FIGURE 7. TOP SILKSCREEN**

**ISL62883EVAL2Z Evaluation Board Layout (Continued)**



**FIGURE 8. BOTTOM SILKSCREEN**

**ISL62883EVAL2Z Evaluation Board Layout** (Continued)



**FIGURE 9. LAYER 1**

**ISL62883EVAL2Z Evaluation Board Layout** (Continued)

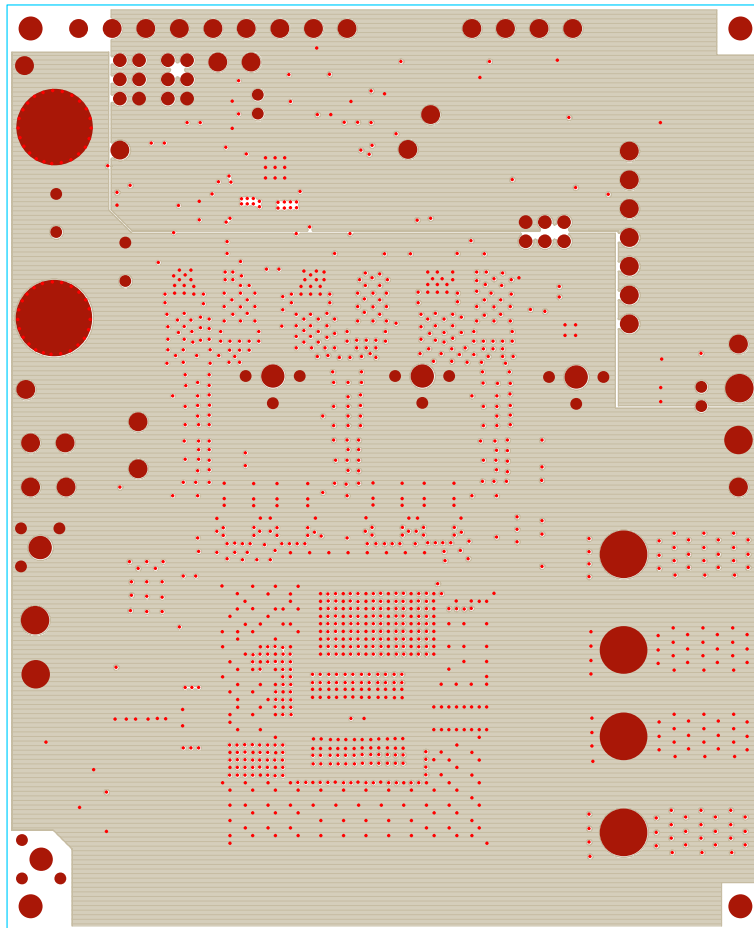


FIGURE 10. LAYER 2

**ISL62883EVAL2Z Evaluation Board Layout** (Continued)

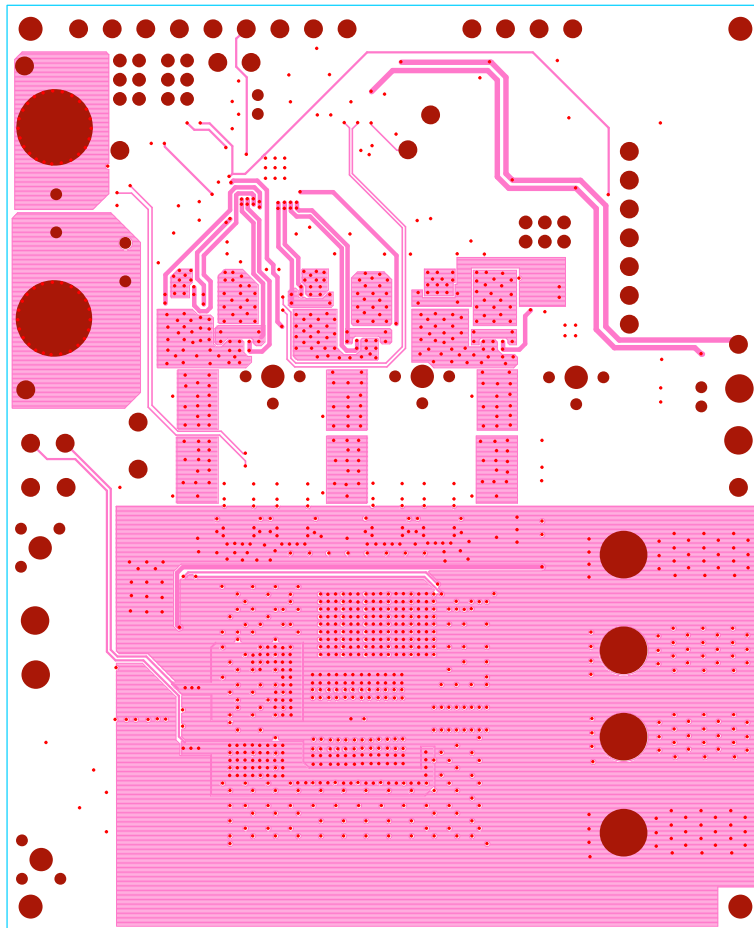


FIGURE 11. LAYER 3

**ISL62883EVAL2Z Evaluation Board Layout** (Continued)

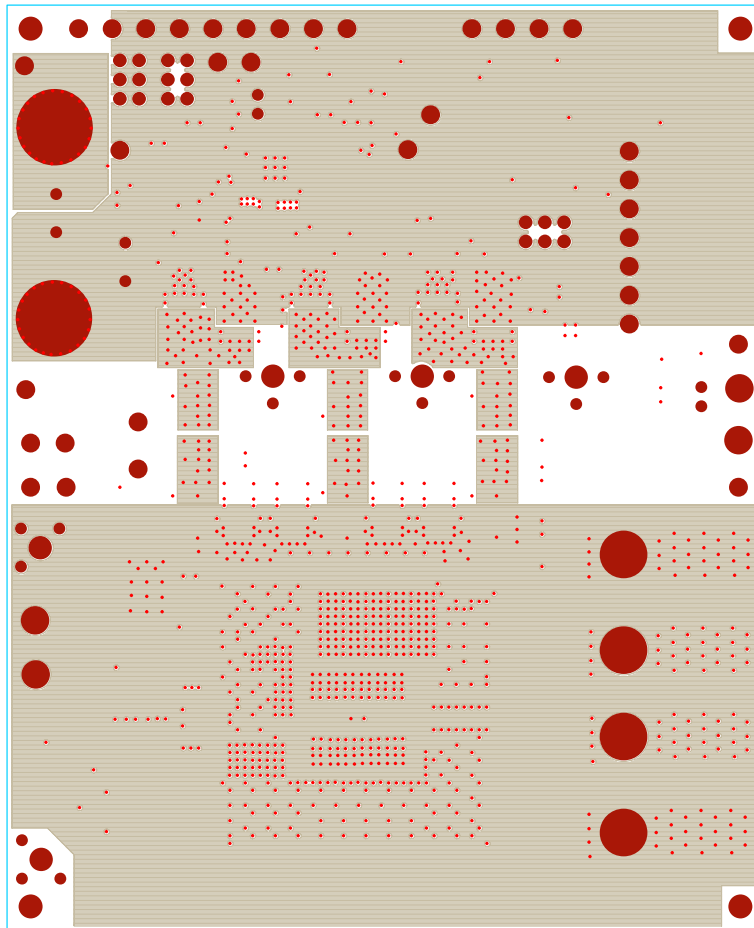


FIGURE 12. LAYER 4



**ISL62883EVAL2Z Evaluation Board Layout** (Continued)

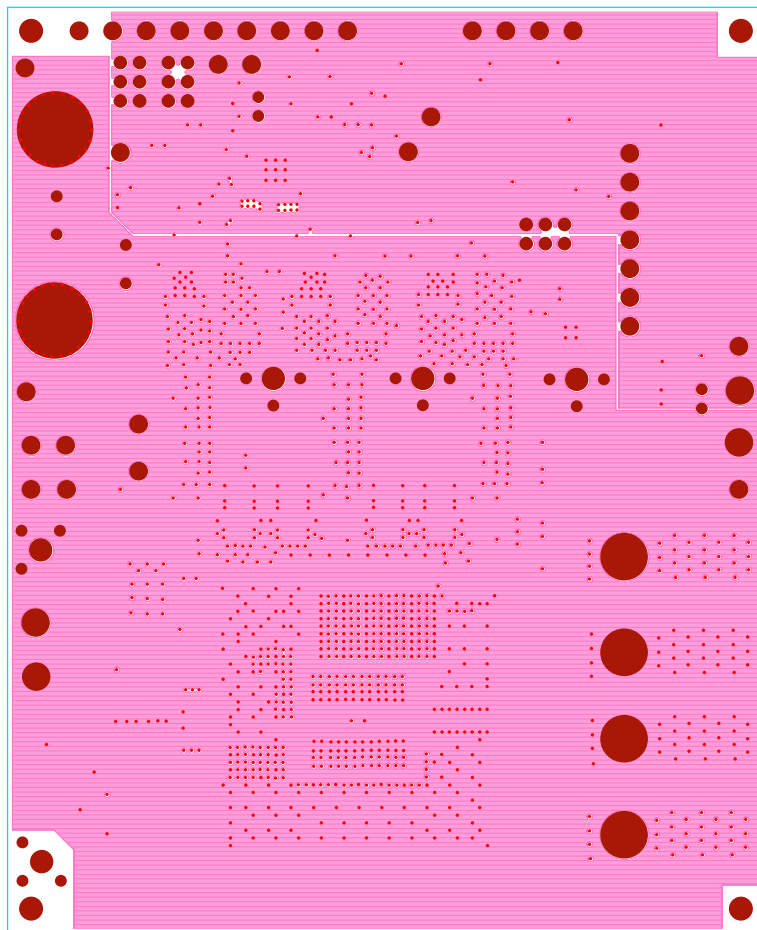


FIGURE 13. LAYER 5

**ISL62883EVAL2Z Evaluation Board Layout** (Continued)

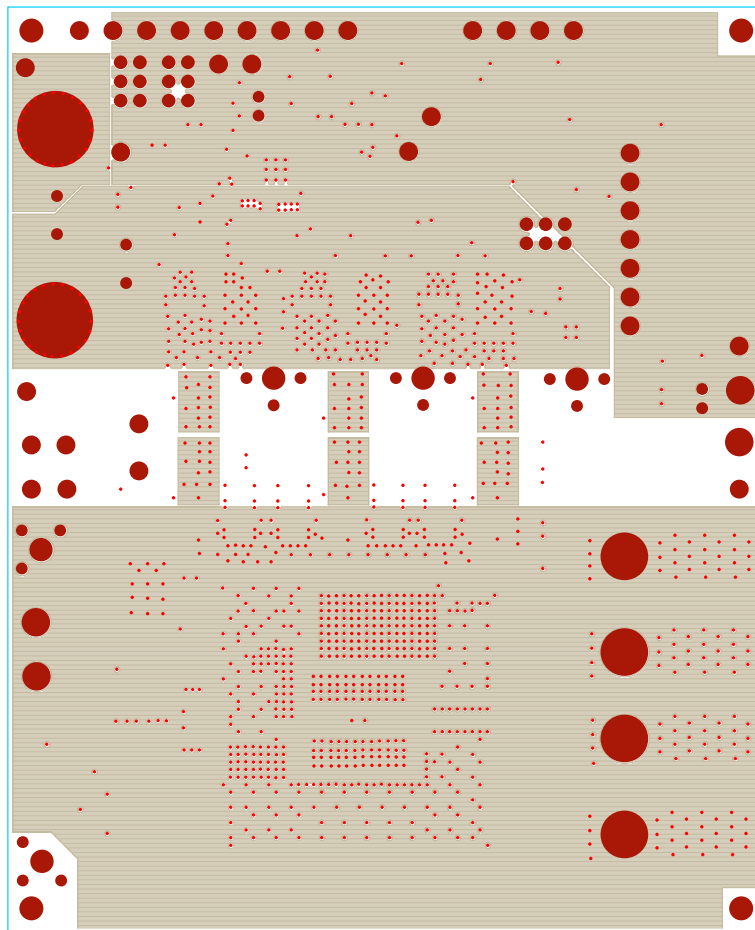


FIGURE 14. LAYER 6

**ISL62883EVAL2Z Evaluation Board Layout** (Continued)

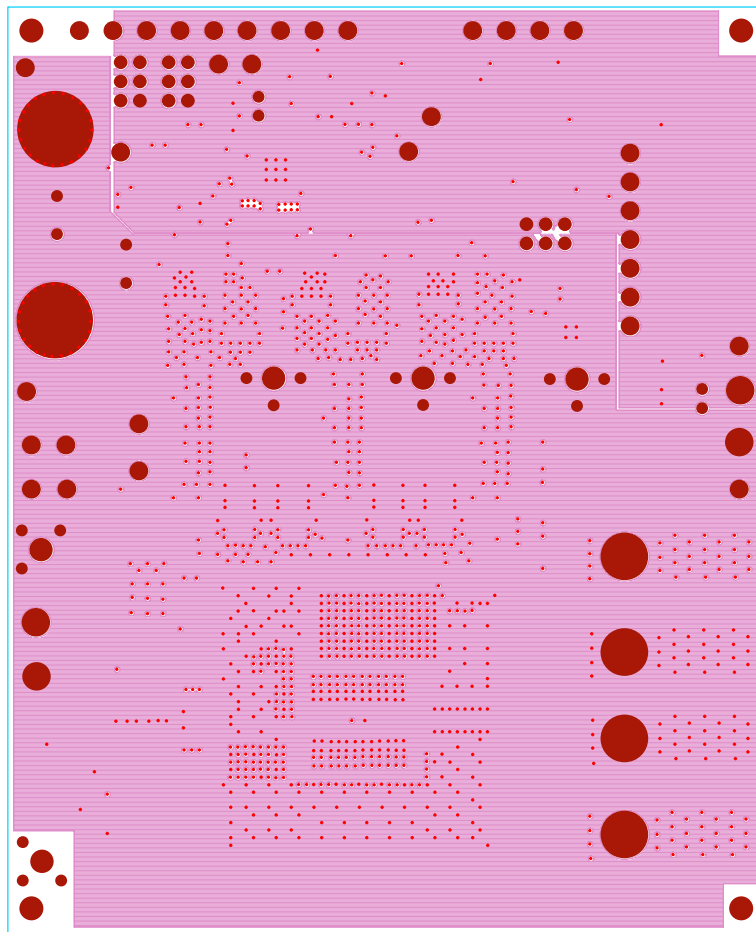


FIGURE 15. LAYER 7

**ISL62883EVAL2Z Evaluation Board Layout** (Continued)

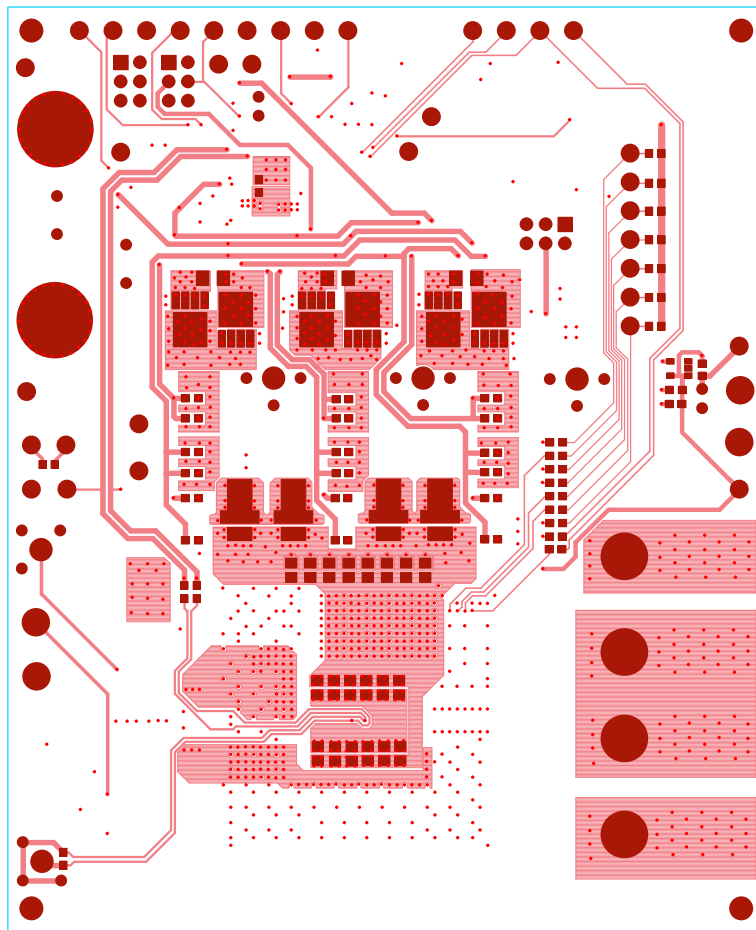


FIGURE 16. LAYER 8