

# ISL62882CEVAL2Z

Evaluation Board

AN1558  
Rev 0.00  
Apr 1, 2010

## Introduction

The ISL62882CEVAL2Z evaluation board demonstrates the performance of the ISL62882 multiphase synchronous-buck PWM  $V_{CORE}$  controller implementing Intel IMVP-6.5 protocol. The ISL62882 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
  - 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     | 60        | 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

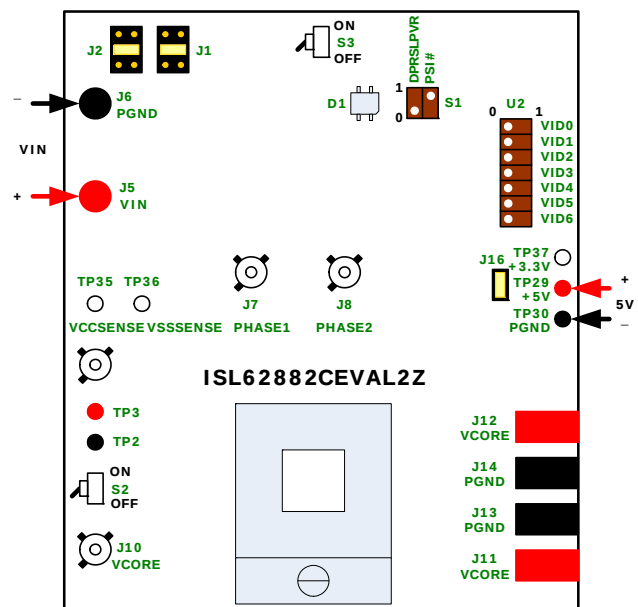


FIGURE 1. TEST SET-UP

## 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 ISL62882 is configured for 3- or 2-phase application. Tie ISEN2 to 5V when the ISL62882 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 ISL62882 is configured for 3-, 2-phase application. Leave ISEN1 floating when the ISL62882 is configured for 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   | 0.01μF  | 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                                                 | DNP |         |                    |                                       |                |           |
| C16, C2, C22, C23, C79                              | 5   | 1μF     | H1045-00105-16V20  | Multilayer Cap, 16V, 20%              | SM0603         | Generic   |
| C18                                                 | 1   | 0.33μF  | H1045-00334-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C19                                                 |     | DNP     |                    |                                       |                |           |
| C36, C37, C38, C8, C83                              | 5   | DNP     |                    |                                       |                |           |
| C20, C45, C58                                       | 3   | 0.1μF   | H1045-00104-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C21                                                 | 1   | 0.22μF  | H1045-00224-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C24, C25                                            | 2   | 56μF    | 25SP56M            | Radial SP Series Cap, 25V, 20%        | CASE-CC        | Sanyo     |
| C27, C28, C33, C34, C80                             | 5   | 10μF    | H1065-00106-25V20  | Multilayer Cap, 25V, 20%              | SM1206         | Generic   |
| C3                                                  | 1   | 150pF   | H1045-00151-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C39, C52, C57                                       | 3   | 270μF   | EEFSX0D271E4       | POSCAP, 2V, 4.5mΩ                     |                | Panasonic |
| C44                                                 |     | DNP     |                    |                                       |                |           |
| C4                                                  | 1   | 1000pF  | H1045-00102-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C40 to C43, C47 to C50, C53 to C56, C59 to C75, C78 | 30  | 10μF    | GRM21BR61C106KE15L | Multilayer Cap, 6.3V, 20%             | SM0805         | Murata    |
| C5                                                  | 1   | 22pF    | H1045-00220-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C6                                                  | 1   | 10pF    | H1045-00100-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C76, C77                                            |     | DNP     |                    |                                       |                |           |
| C26, C29, C32, C35, C7, C84, C85                    |     | DNP     |                    |                                       |                |           |
| C9, C10, C17, C30, C31                              | 5   | 0.22μF  | H1045-00224-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C81                                                 | 1   | 1200pF  | H1045-00122-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| C82                                                 | 1   | 0.047μF | H1045-00473-16V10  | Multilayer Cap, 16V, 10%              | SM0603         | Generic   |
| D1                                                  | 1   |         | SSL-LXA3025IGC     | 3mmx2.5mm Surface Mount Red/Green LED | LED_3x2_5MM    | Lumex     |
| J1, J2                                              | 2   |         | 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    |
| J16                                                 | 1   |         | 69190-202          | 2 Pin Header 2.54mm (0.100) Pitch     | CONN2          | Berg/FCI  |
| J3, J4                                              | 2   | DNP     |                    |                                       |                |           |

**Bill of Materials** (Continued)

| REFERENCE                                                                  | QTY | VALUE   | PART NUMBER        | DESCRIPTION                               | PACKAGE      | VENDOR       |
|----------------------------------------------------------------------------|-----|---------|--------------------|-------------------------------------------|--------------|--------------|
| 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                                                                     | 2   | 0.36μH  | 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, Q8, Q10                                                            | 4   |         | IRF7821            | N-Channel Power MOSFET Power Switching    | PWRPAK_SO8   | IR           |
| Q3, Q5, Q9, Q11                                                            | 4   |         | IRF7832            | N-Channel Power MOSFET Power Switching    | PWRPAK_SO8   | IR           |
| Q6, Q7, Q12, Q13                                                           |     | DNP     |                    |                                           |              |              |
| R1                                                                         | 1   | 49.9    | H2511-049R9-1/16W1 | Thick Film Chip Resistor, 1%              | SM0603       | Generic      |
| R10                                                                        | 1   | 562     | H2511-05620-1/16W1 | 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                                                                       |     | DNP     | 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   | 2.87k   | H2511-02871-1/16W1 | 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                 | 12  | 10k     | H2511-01002-1/16W1 | Thick Film Chip Resistor, 1%              | SM0603       | Generic      |
| R2, R8, R9, R26, R55, R74, R75, R76, R78, R81, R83, R84, R85, R86, R110    |     | DNP     |                    |                                           |              |              |
| R14, R20, R22, R24, R25, R27, R29, R32, R33, R34, R40, R52, R56, R57, R112 | 18  | 0       | H2511-00R00-1/16W1 | Thick Film Chip Resistor, 1%              | SM0603       | Generic      |
| R30                                                                        | 1   | 1k      | H2511-01001-1/16W1 | Thick Film Chip Resistor, 1%              | SM0603       | Generic      |
| R35                                                                        | 1   | 0       | H2511-00R00-1/16W1 | Thick Film Chip Resistor, 1%              | SM0603       | Generic      |
| R37, R88, R90                                                              | 3   | 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    |

**Bill of Materials** (Continued)

| REFERENCE                                        | QTY | VALUE | PART NUMBER        | DESCRIPTION                                         | PACKAGE     | VENDOR   |
|--------------------------------------------------|-----|-------|--------------------|-----------------------------------------------------|-------------|----------|
| R44                                              | 1   | DNP   |                    |                                                     |             |          |
| R47                                              | 1   | DNP   |                    |                                                     |             |          |
| R48                                              | 1   | 0     | H2511-00R00-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0603      | Generic  |
| R5, R80                                          | 2   | 100   | H2511-01000-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0603      | Generic  |
| R50                                              | 1   | 9.31k | H2511-09311-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0603      | Generic  |
| R59, R60                                         | 2   |       |                    | Solder Joint (Heavy Duty)                           |             |          |
| R6                                               | 1   | 8.06k | H2511-08061-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0603      | Generic  |
| R62, R64, R87, R89                               | 4   | 0     | H2511-00R00-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0603      | Generic  |
| R63, R65                                         | 2   | 3.65k | H2512-03651-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0805      | Generic  |
| R68, R69, R70, R77,<br>R79, R82                  | 6   | DNP   |                    |                                                     |             |          |
| R7                                               | 1   | 412k  | H2511-04123-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0603      | Generic  |
| R93, R94, R95, R99,<br>R100, R101, R111,<br>R113 |     | DNP   |                    |                                                     |             |          |
| R96, R97                                         | 2   |       |                    | Solder Joint (Heavy Duty)                           |             |          |
| S1                                               | 1   |       | SD02H0SK           | SD Series Low Profile Dip Switch                    | DIPSWSMT-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<br>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                    | DIPSWSMT-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   |       | ISL62882HRZ        | IMVP-6.5 PWM Controller                             | QFN-40      | Intersil |

## ISL62882CEVAL2Z Schematic

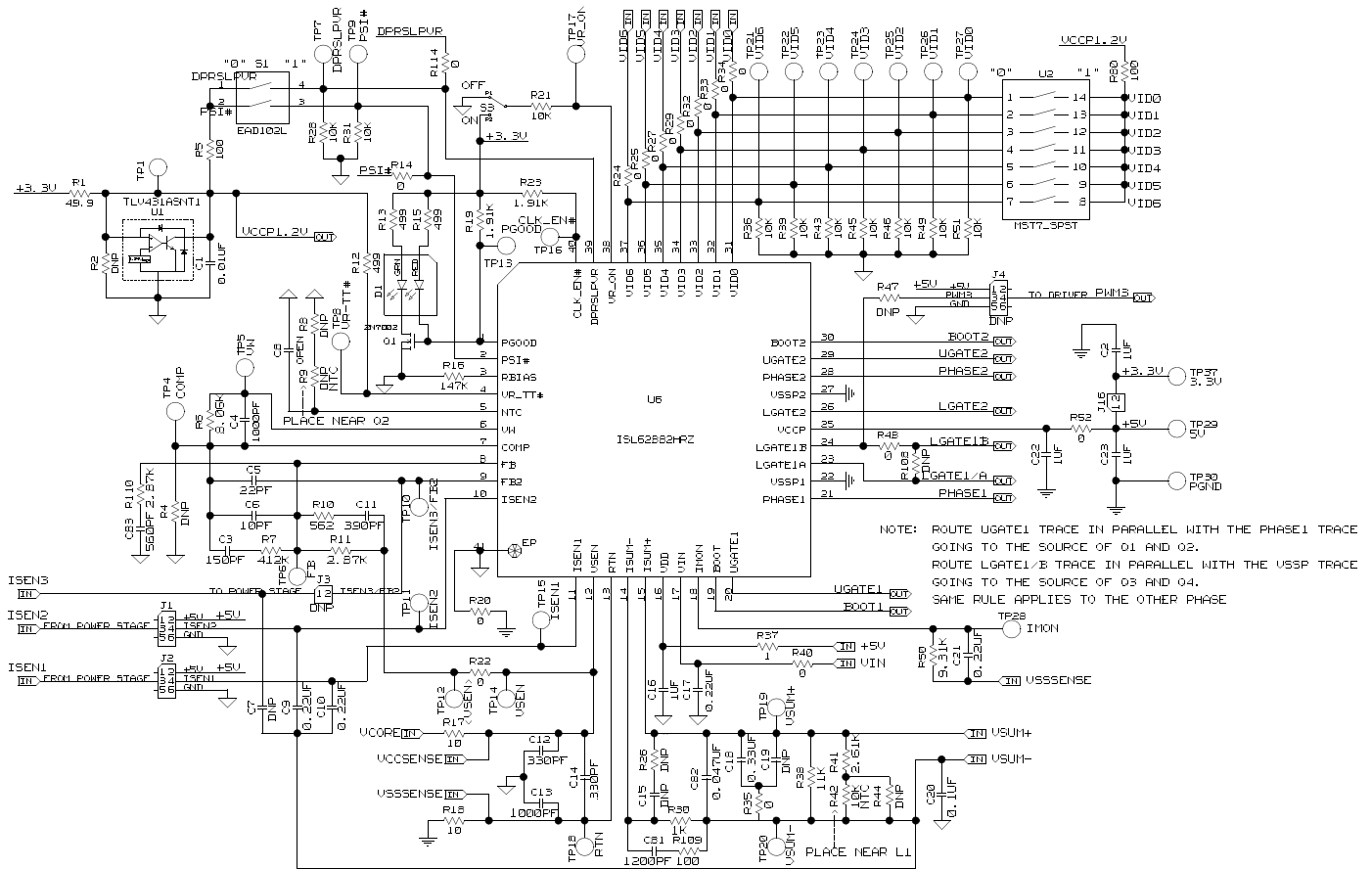
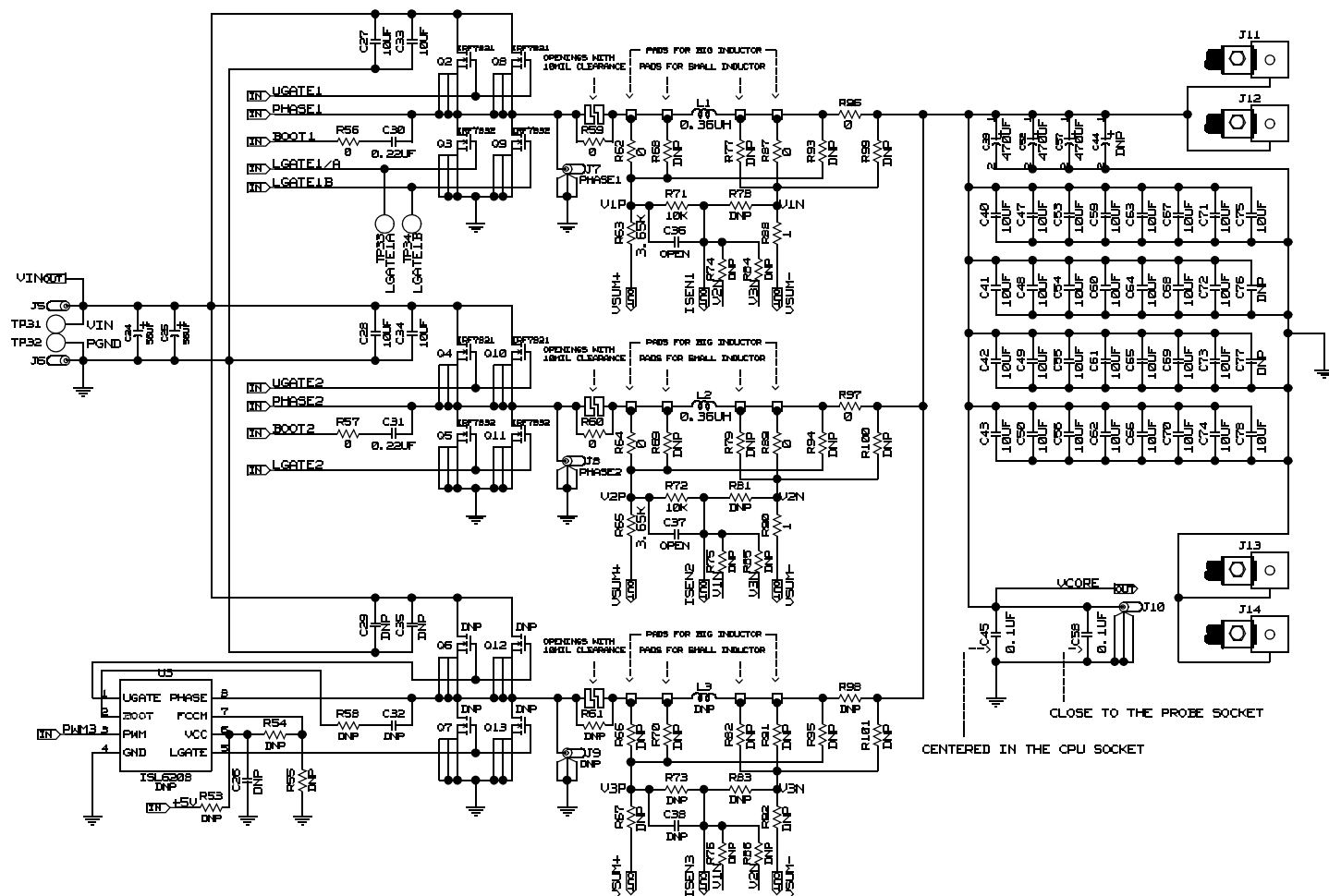


FIGURE 2. ISL62882CEVAL2Z SCHEMATICS, 1 OF 5







ISL62882CEVAL2Z Schematic (Continued)

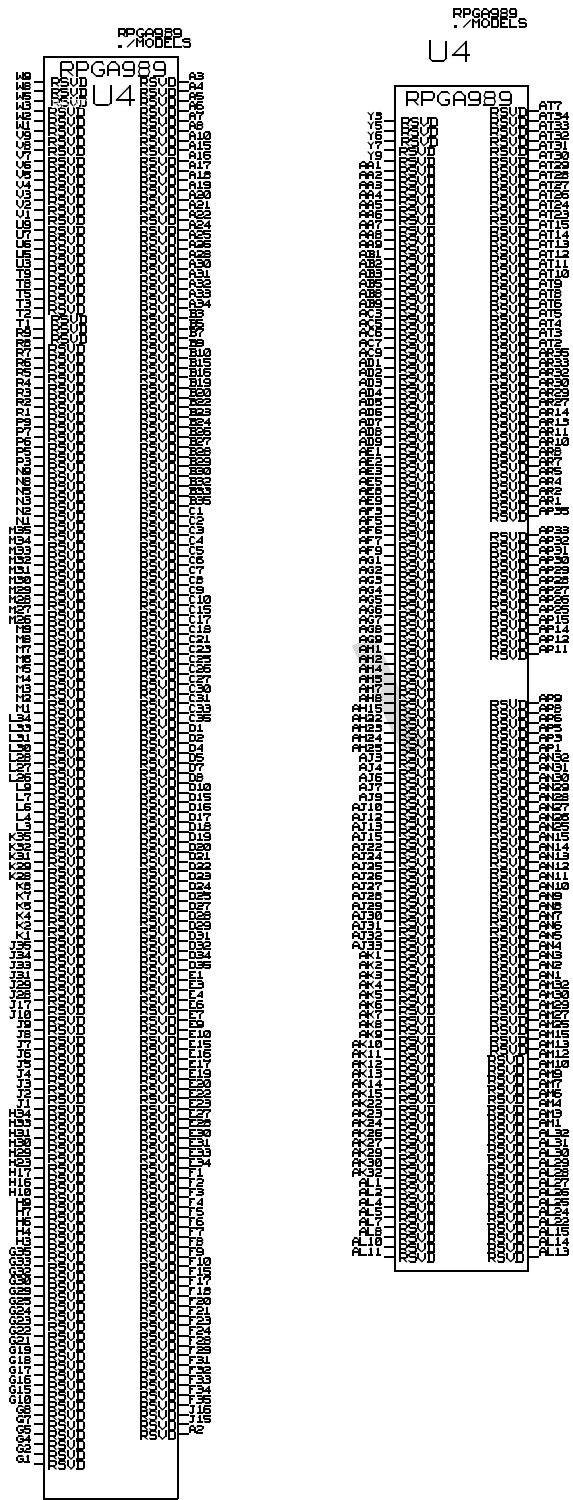


FIGURE 6. ISL62882CEVAL2Z SCHEMATICS, 5 OF 5

# ISL62882CEVAL2Z Evaluation Board Layout

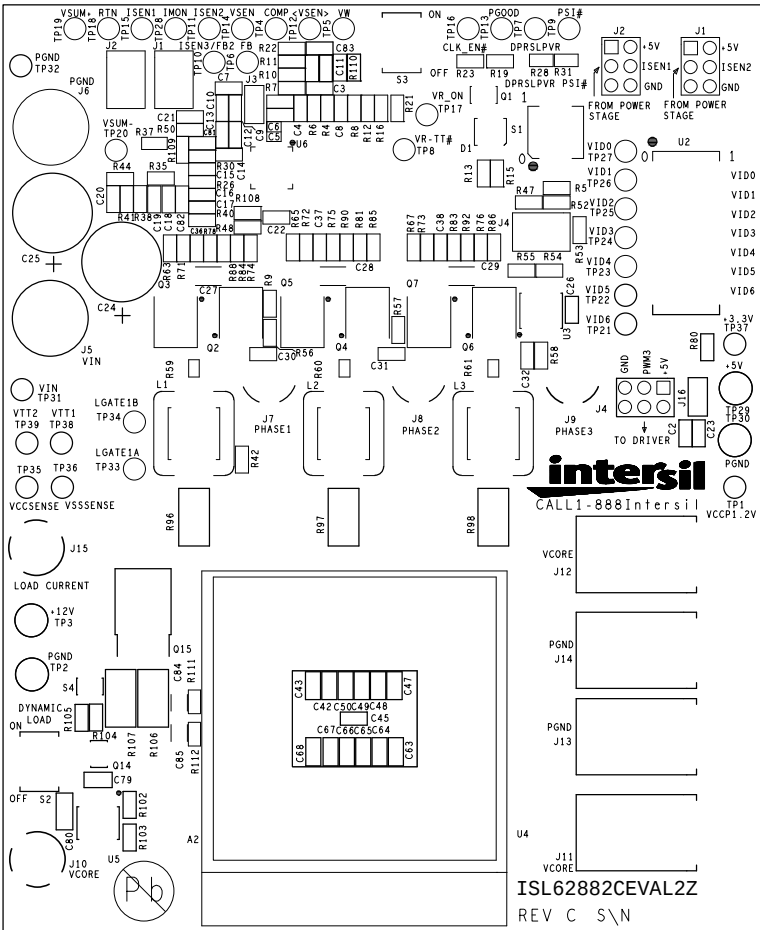
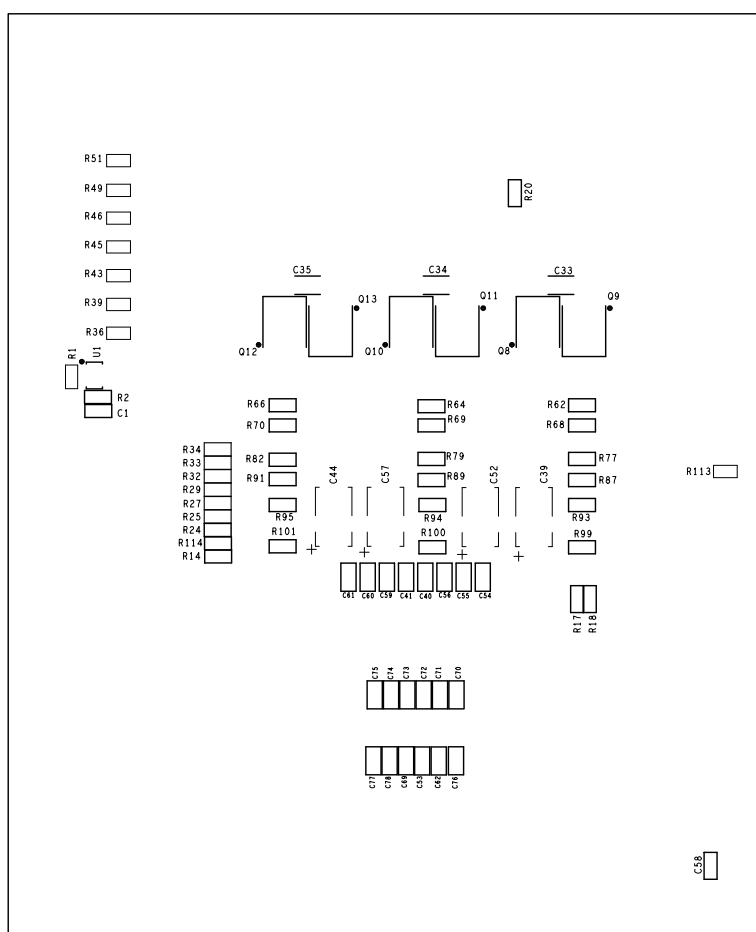


FIGURE 7. TOP SILKSCREEN



## ISL62882CEVAL2Z Evaluation Board Layout (Continued)

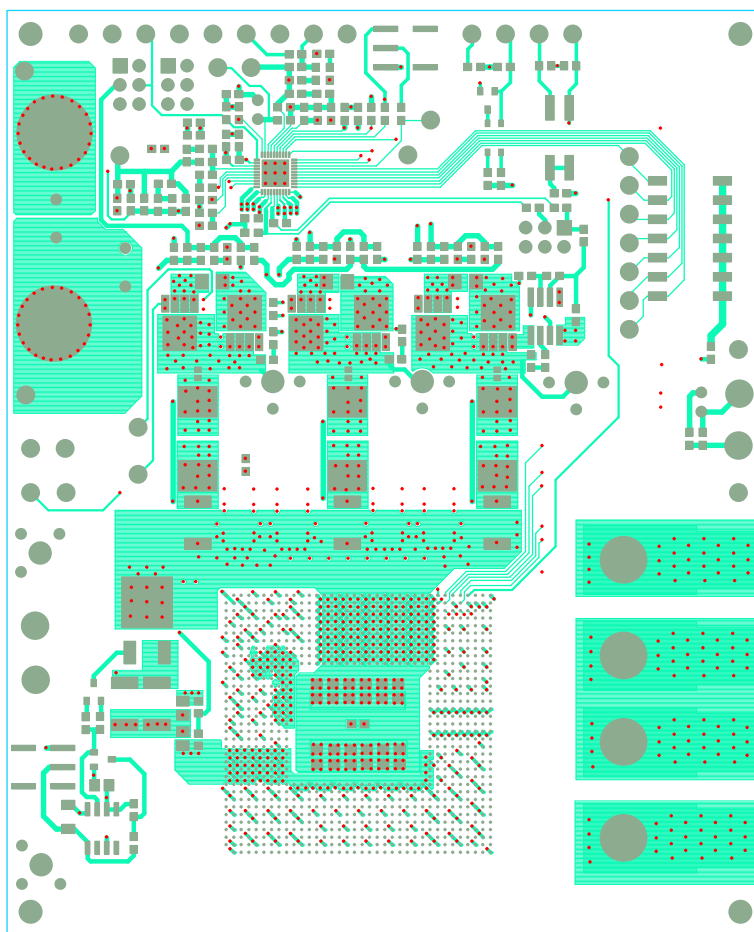


FIGURE 9. LAYER 1

## ISL62882CEVAL2Z Evaluation Board Layout (Continued)

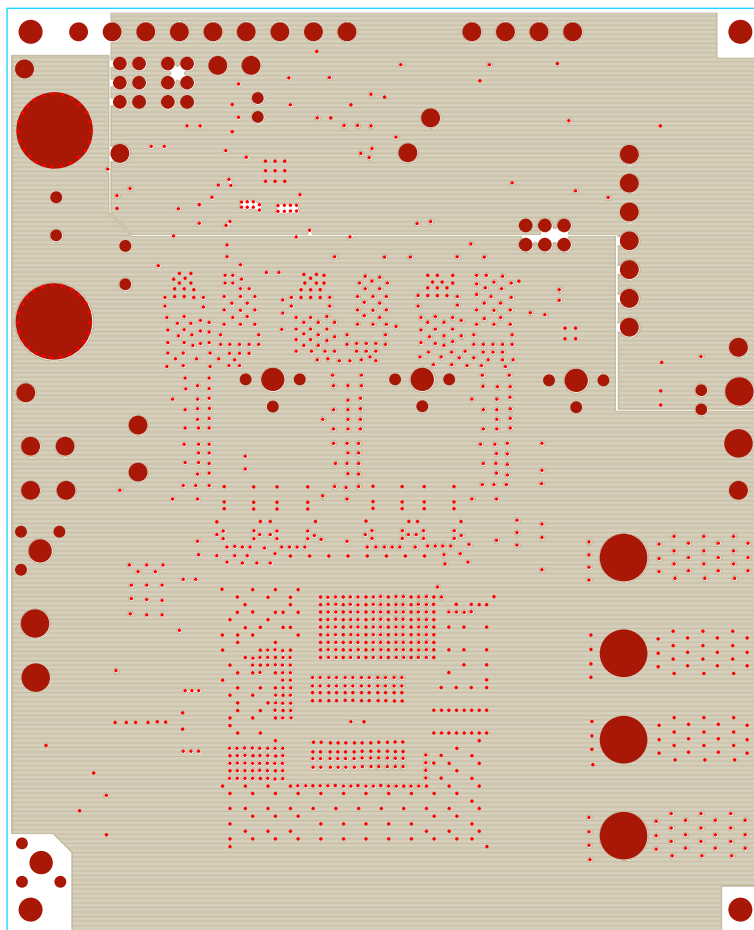


FIGURE 10. LAYER 2

## ISL62882CEVAL2Z Evaluation Board Layout (Continued)

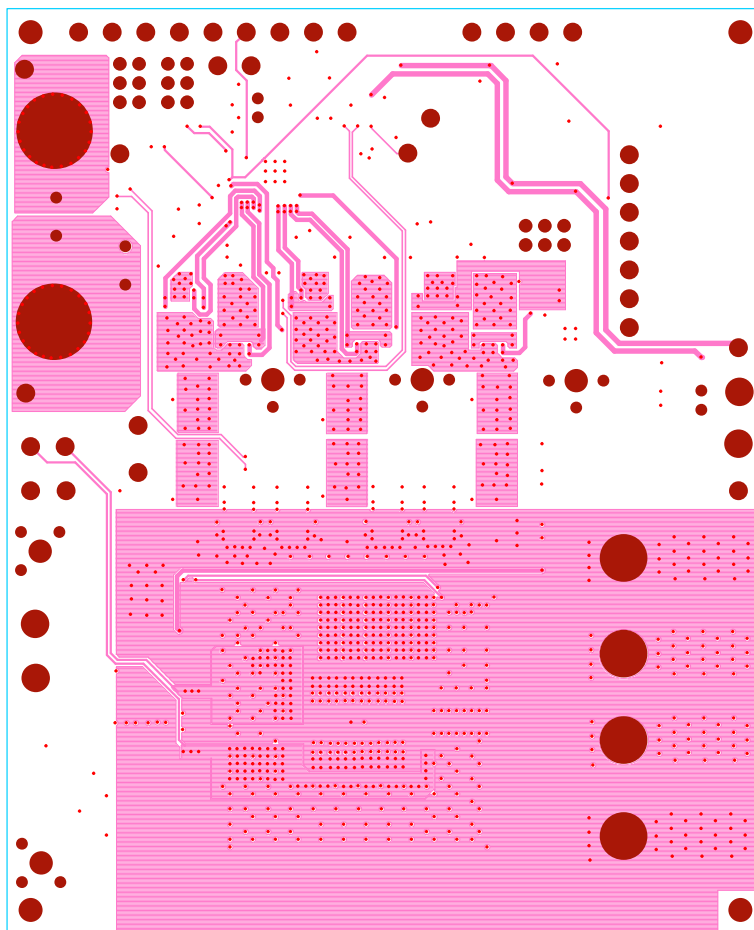
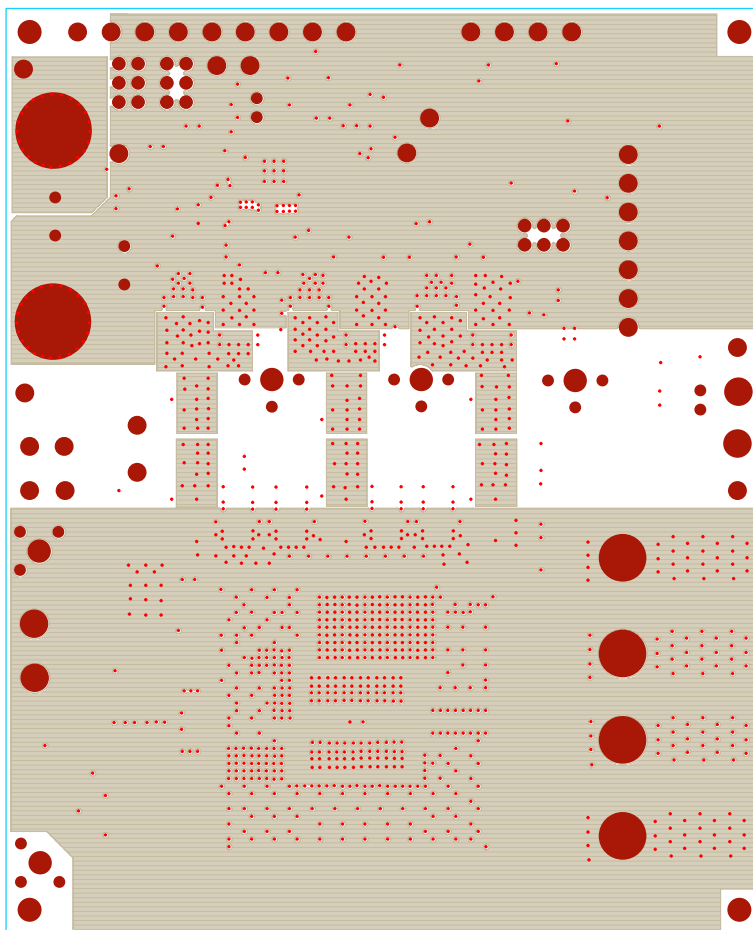
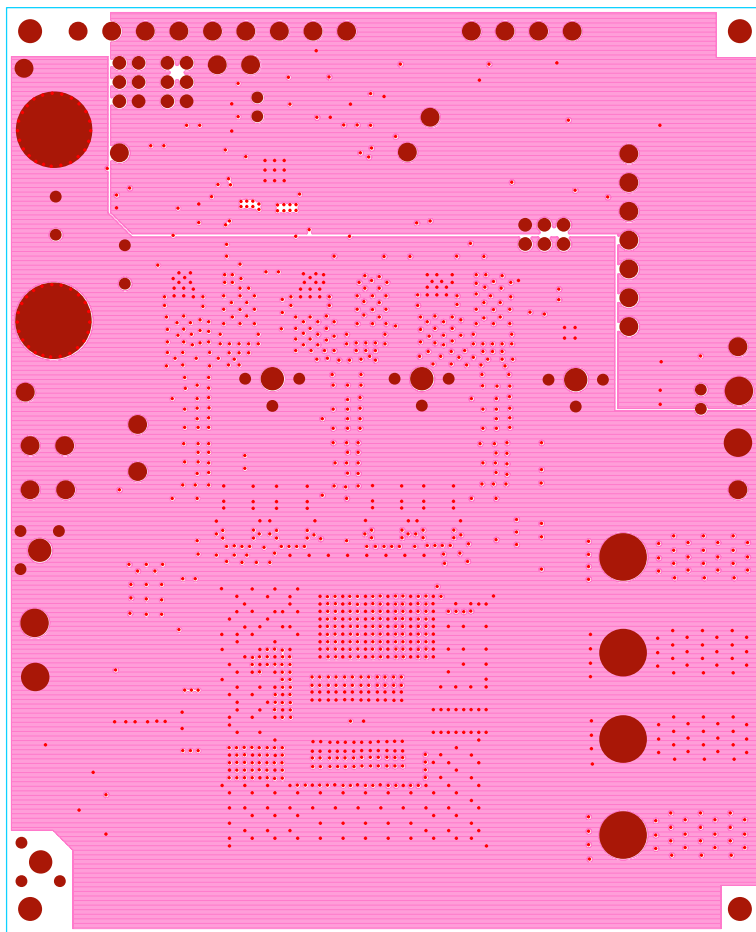


FIGURE 11. LAYER 3

**ISL62882CEVAL2Z Evaluation Board Layout** (Continued)**FIGURE 12. LAYER 4**

**ISL62882CEVAL2Z Evaluation Board Layout** (Continued)**FIGURE 13. LAYER 5**



## ISL62882CEVAL2Z Evaluation Board Layout (Continued)

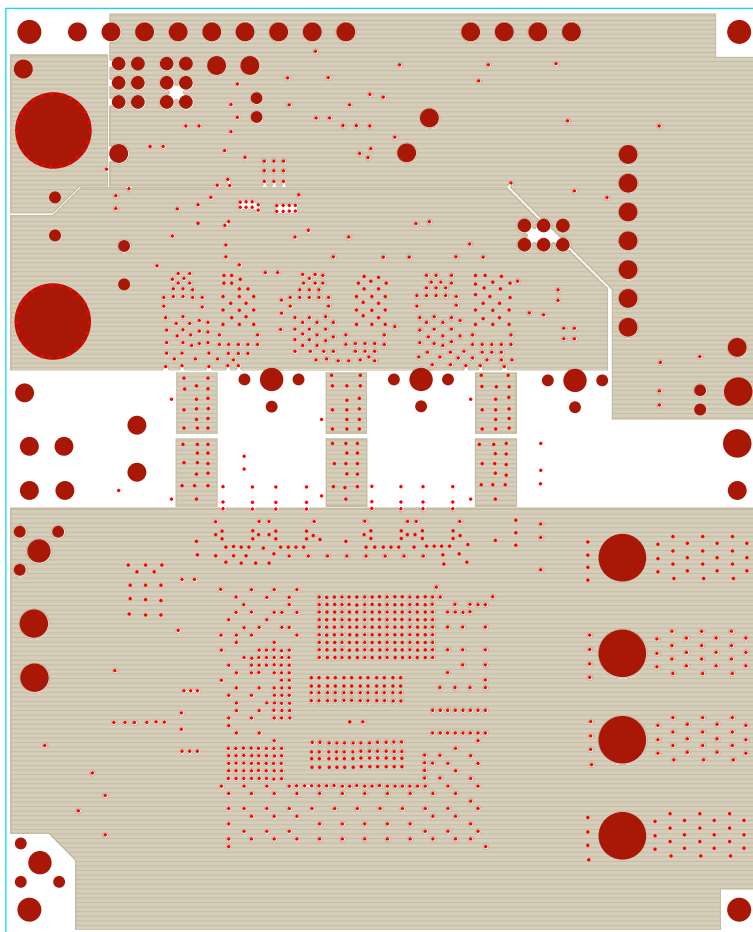


FIGURE 14. LAYER 6

## ISL62882CEVAL2Z Evaluation Board Layout (Continued)

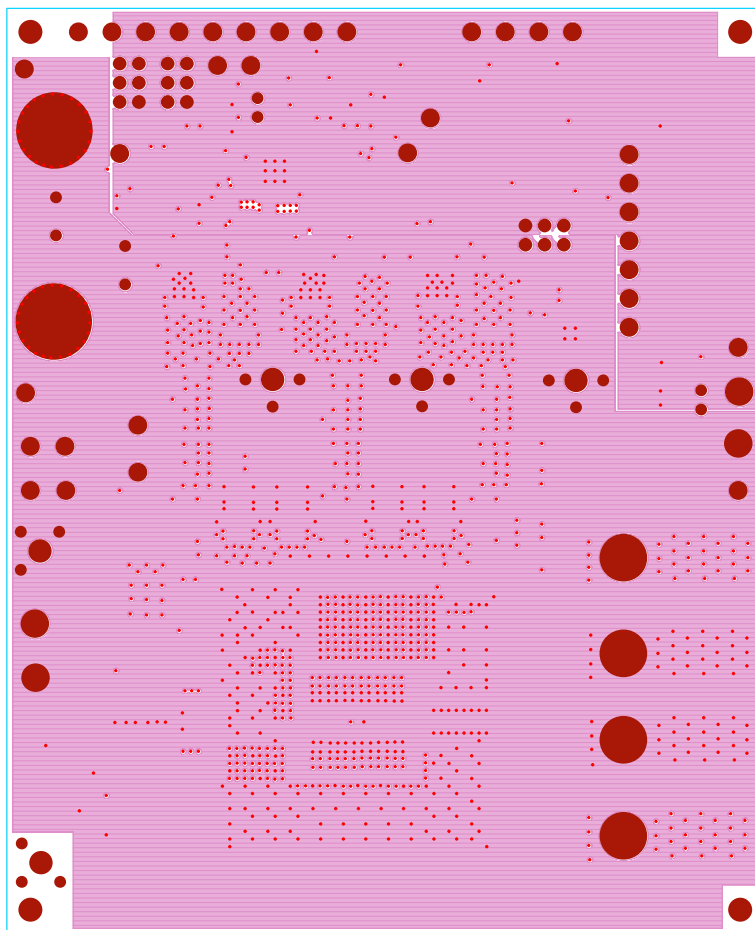


FIGURE 15. LAYER 7

## ISL62882CEVAL2Z Evaluation Board Layout (Continued)

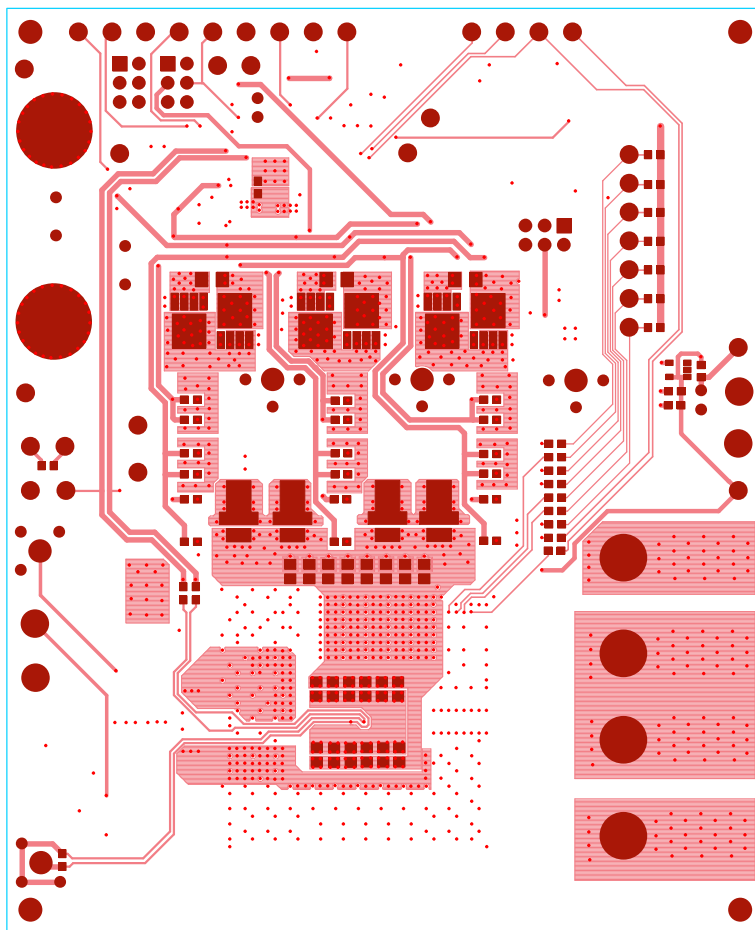


FIGURE 16. LAYER 8

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(Rev.4.0-1 November 2017)



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