

## ISL62882EVAL2Z

Evaluation Board

AN1461  
Rev 1.00  
Jul 13, 2009

The ISL62882EVAL2Z 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
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  - Schematic
  - Silk-screen plots
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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     | 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

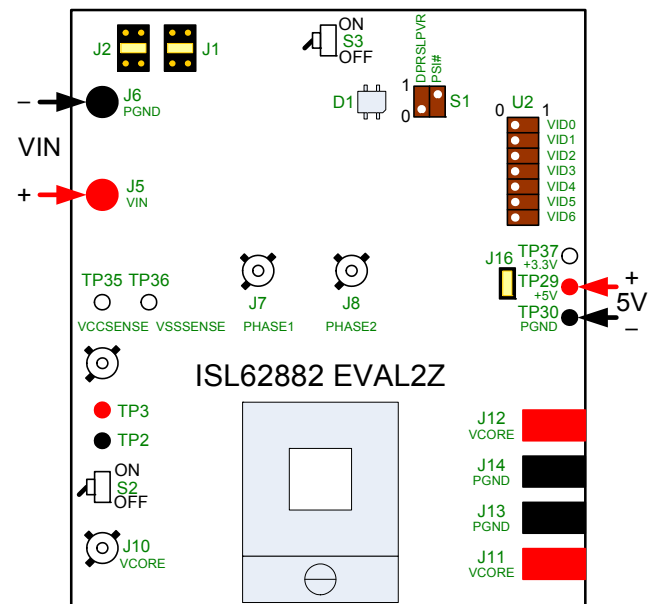


FIGURE 1. TEST SET-UP

### 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   | 0.01 $\mu$ 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, C79                                    | 5   | 1 $\mu$ F     | H1045-00105-16V20  | Multilayer Cap, 16V, 20%                 | SM0603         | Generic      |
| C18   | 1   | 0.33 $\mu$ F  | H1045-00334-16V10  | 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, C33, C34, C80                                   | 5   | 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, C52, C57   | 3   | 270 $\mu$ F   | EEFSX0D271E4       | POSCAP, 2V, 4.5m $\Omega$                |                | Panasonic    |
| C44   |     | DNP           |                    |  |                |              |
| C4  | 1   | 1000pF        | H1045-00102-16V10  | Multilayer Cap, 16V, 10%                 | SM0603         | Generic      |
| C40 to C43, C47 to C50,<br>C53 to C56, C59 to C75,<br>C78 | 30  | 10 $\mu$ F    | 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,<br>C84, C85                       |     | DNP           |                    |  |                |              |
| C9, C10, C17, C30, C31                                    | 5   | 0.22 $\mu$ F  | H1045-00224-16V10  | Multilayer Cap, 16V, 10%                 | SM0603         | Generic      |
| C81   | 1   | 1200pF        | H1045-00122-16V10  | Multilayer Cap, 16V, 10%                 | SM0603         | Generic      |
| C82   | 1   | 0.047 $\mu$ F | H1045-00473-16V10  | Multilayer Cap, 16V, 10%                 | SM0603         | Generic      |
| D1  | 1   |               | SSL-LXA3025IGC     | 3mmx2.5mm Surface Mount<br>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<br>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           |                    |  |                |              |
| 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   | 0.36 $\mu$ H  | MPCH1040LR36       | Inductor, Inductance 20%,<br>DCR 7%      |                | Nec-Tokin    |

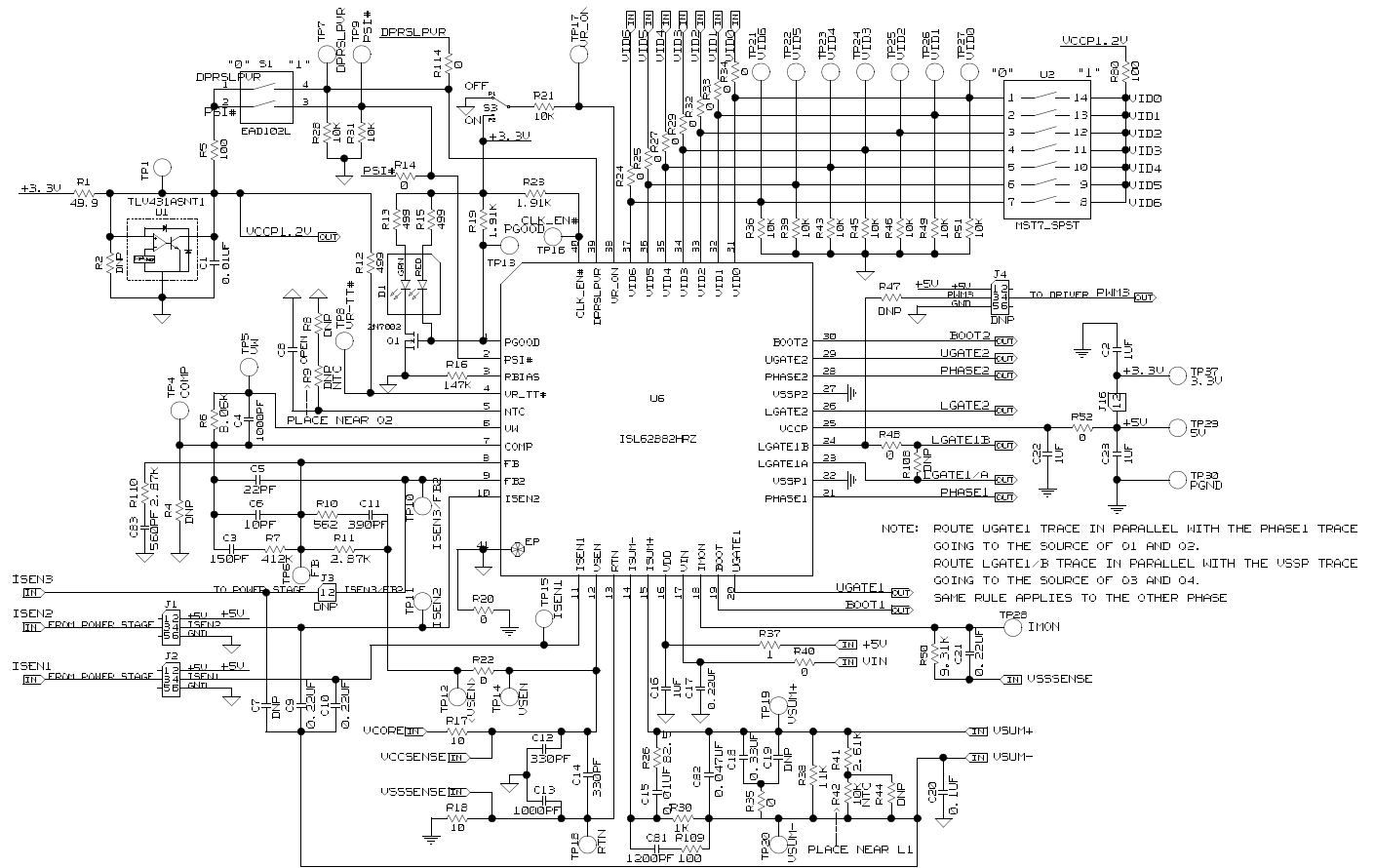
**Bill of Materials** (Continued)

| REFERENCE  | QTY | VALUE   | PART NUMBER        | DESCRIPTION                               | PACKAGE    | VENDOR    |
|--|-----|---------|--------------------|---|------------|-----------|
| 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, R55, R74, R75, R76, R78, R81, R83, R84, R85, R86, R110         |     | DNP     |                    |   |            |           |
| R26  | 1   | 82.5    | H2511-082R5-1/16W1 | Thick Film Chip Resistor, 1%              | SM0603     | Generic   |
| 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 |
| 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   |

**Bill of Materials** (Continued)

| REFERENCE                                  | QTY | VALUE | PART NUMBER        | DESCRIPTION   | PACKAGE     | VENDOR   |
|--|-----|-------|--------------------|---|-------------|----------|
| 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, R79, R82               | 6   | DNP   |                    |   |             |          |
| R7   | 1   | 412k  | H2511-04123-1/16W1 | Thick Film Chip Resistor, 1%                        | SM0603      | Generic  |
| R93, R94, R95, R99, R100, R101, R111, R113 |     | DNP   |                    |   |             |          |
| R96, R97                                   | 2   |       |                    | Solder Joint (Heavy Duty)                           |             |          |
| S1   | 1   |       | SD02H0SK           | SD Series Low Profile Dip Switch                    | DIPSW5MT-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                    | DIPSW5MT-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 |

**ISL62882EVAL2Z Schematic**



**FIGURE 2. ISL62882EVAL2Z SCHEMATICS, 1 OF 5**

ISL62882EVAL2Z Schematic (Continued)

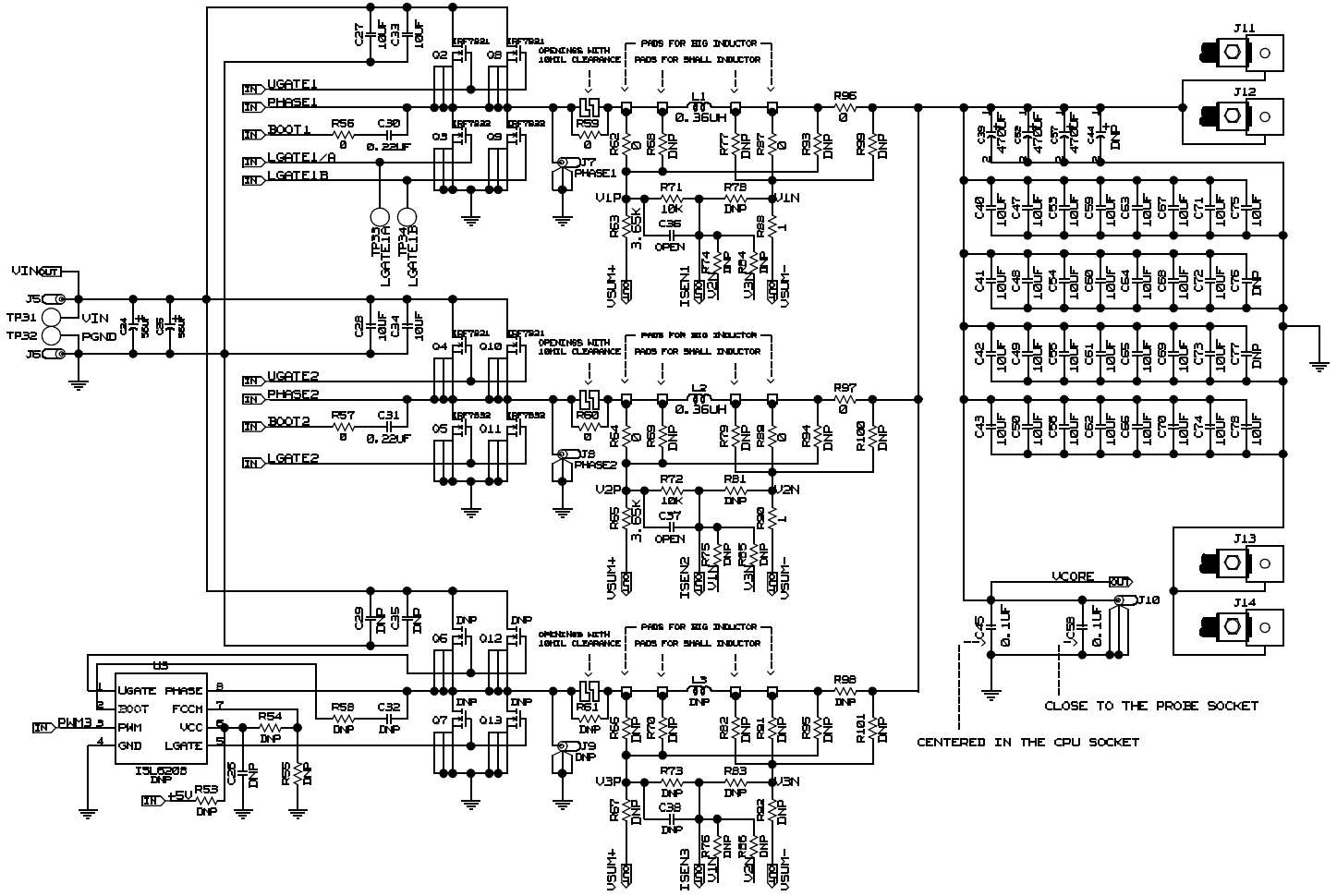


FIGURE 3. ISL62882EVAL2Z SCHEMATICS, 2 OF 5

ISL62882EVAL2Z Schematic (Continued)

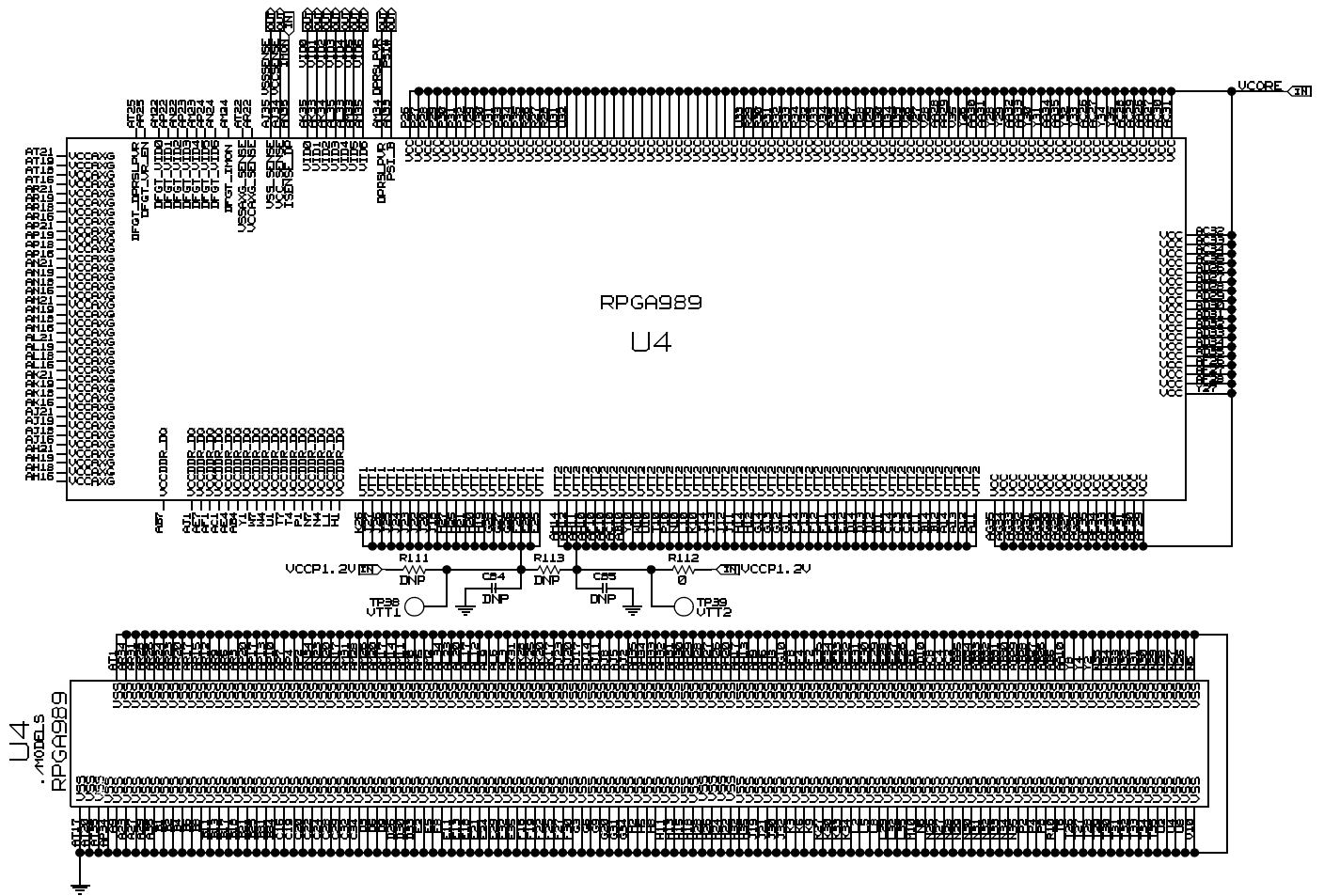


FIGURE 4. ISL62882EVAL2Z SCHEMATICS, 3 OF 5

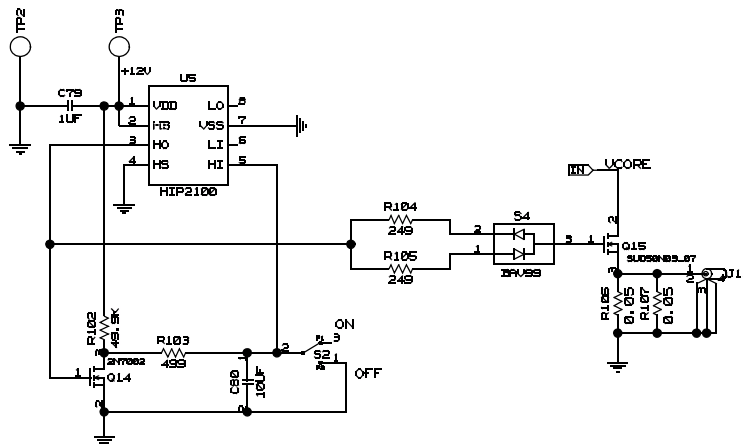


FIGURE 5. ISL62882EVAL2Z SCHEMATICS, 4 OF 5



ISL62882EVAL2Z Schematic (Continued)

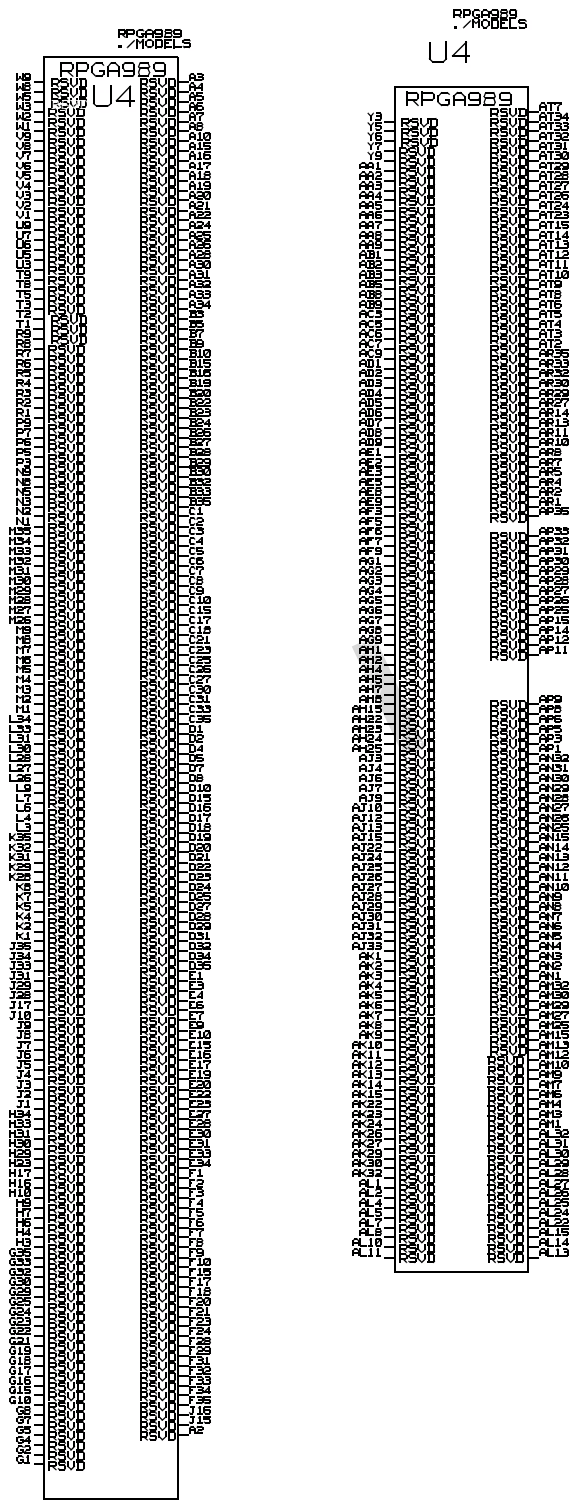
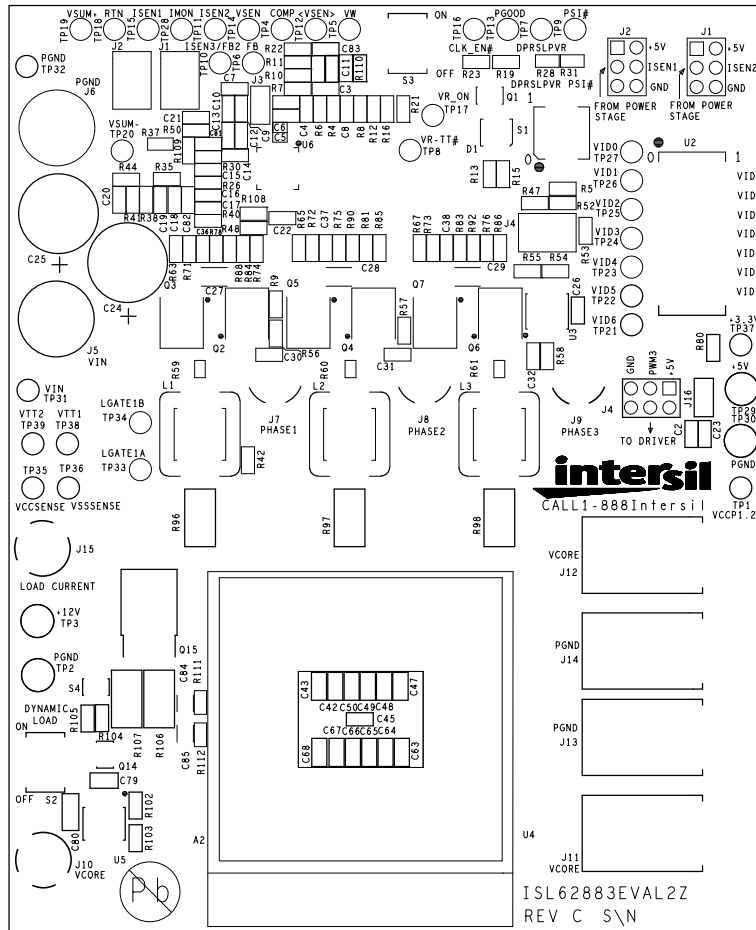


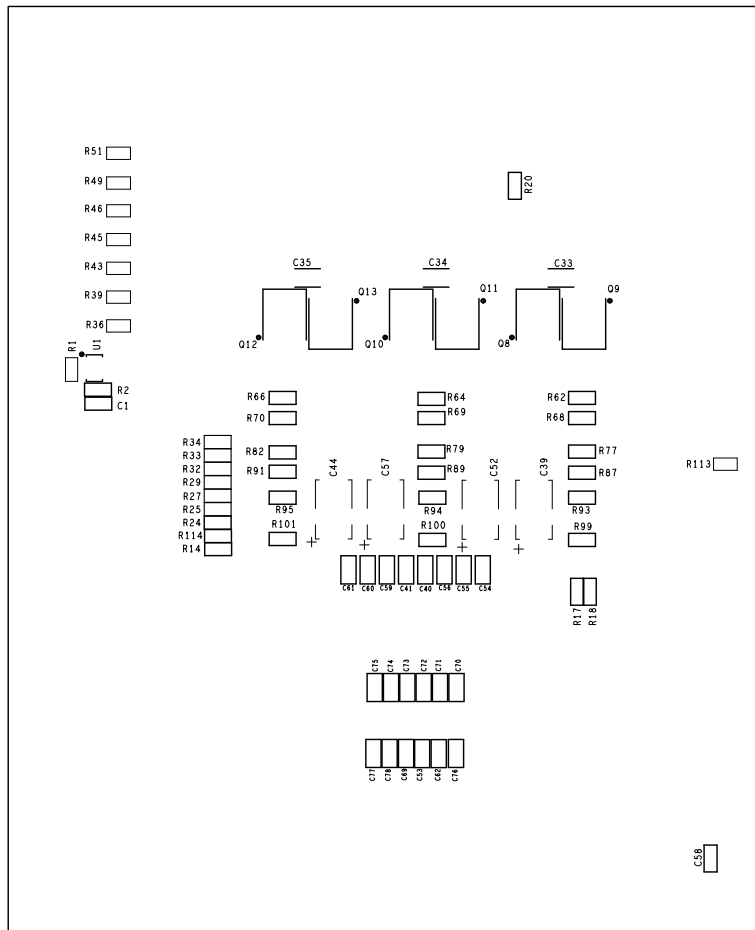
FIGURE 6. ISL62882EVAL2Z SCHEMATICS, 5 OF 5

**ISL62882EVAL2Z Evaluation Board Layout**



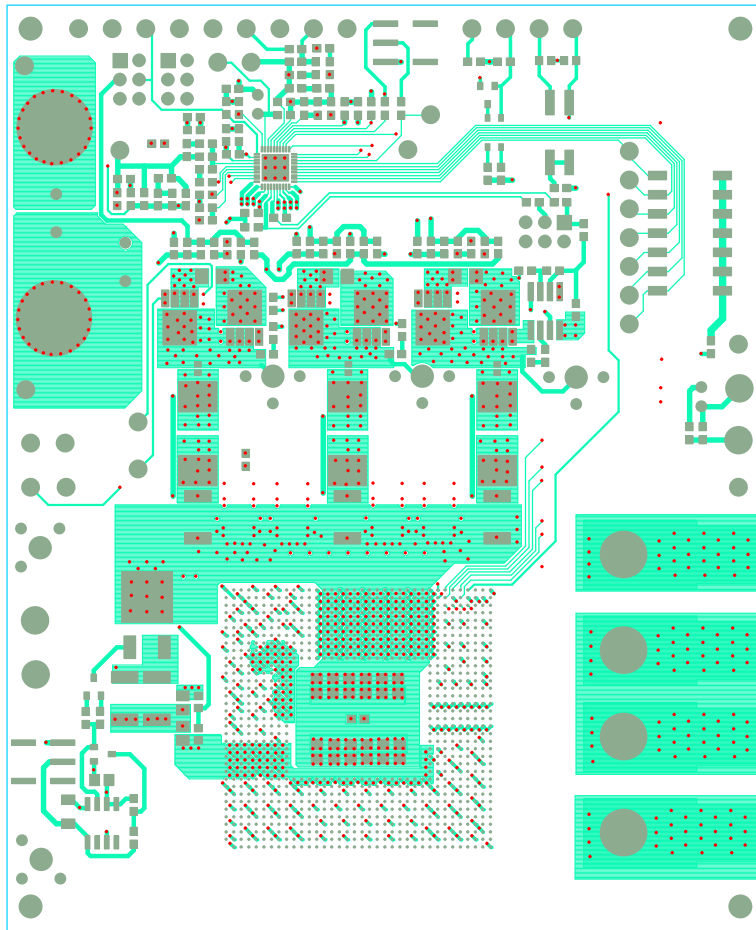
**FIGURE 7. TOP SILKSCREEN**

**ISL62882EVAL2Z Evaluation Board Layout (Continued)**



**FIGURE 8. BOTTOM SILKSCREEN**

**ISL62882EVAL2Z Evaluation Board Layout (Continued)**



**FIGURE 9. LAYER 1**

**ISL62882EVAL2Z Evaluation Board Layout** (Continued)

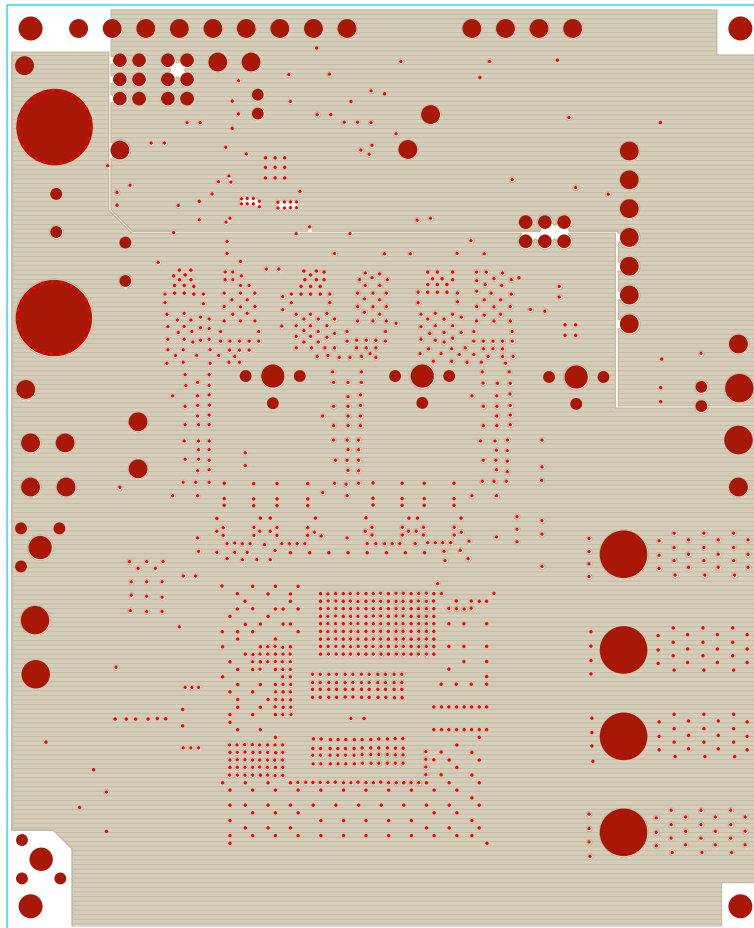


FIGURE 10. LAYER 2

**ISL62882EVAL2Z Evaluation Board Layout** (Continued)

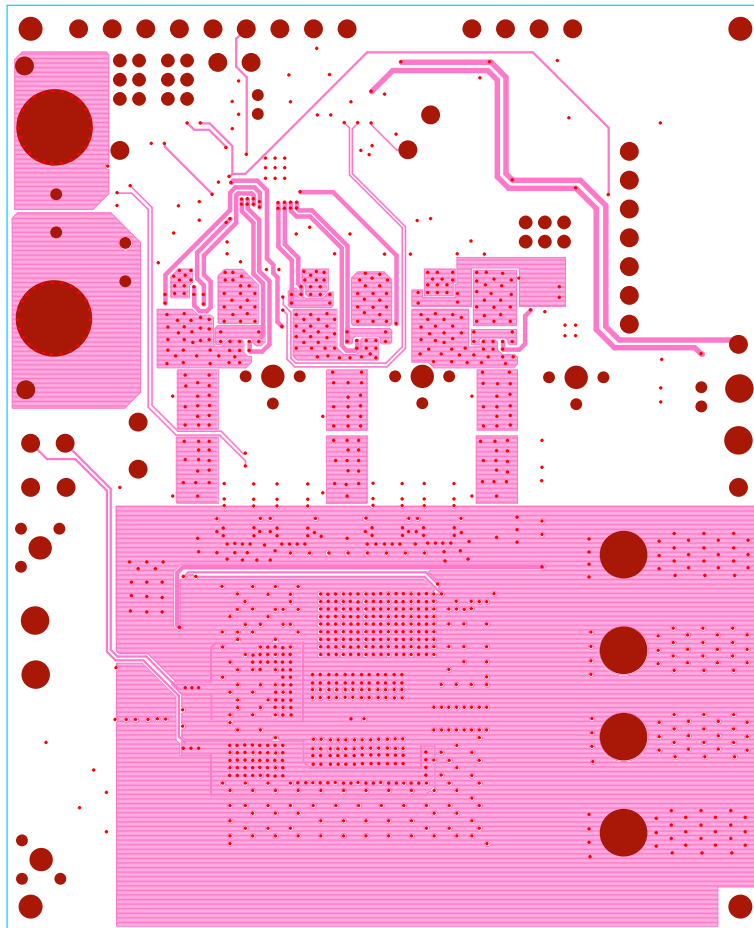


FIGURE 11. LAYER 3

**ISL62882EVAL2Z Evaluation Board Layout** (Continued)

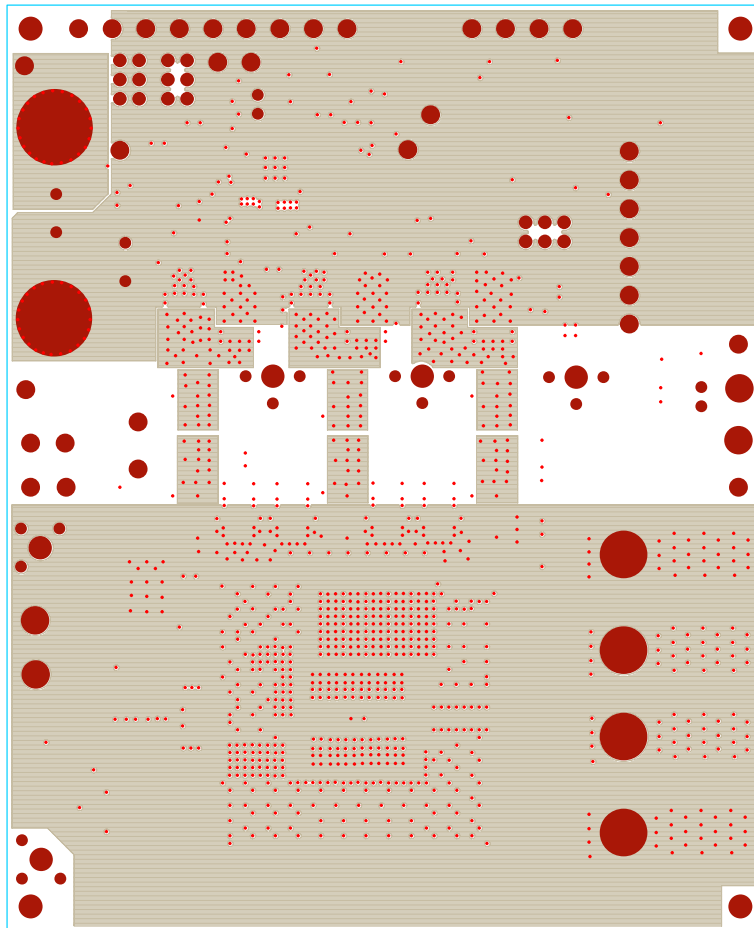


FIGURE 12. LAYER 4

**ISL62882EVAL2Z Evaluation Board Layout** (Continued)

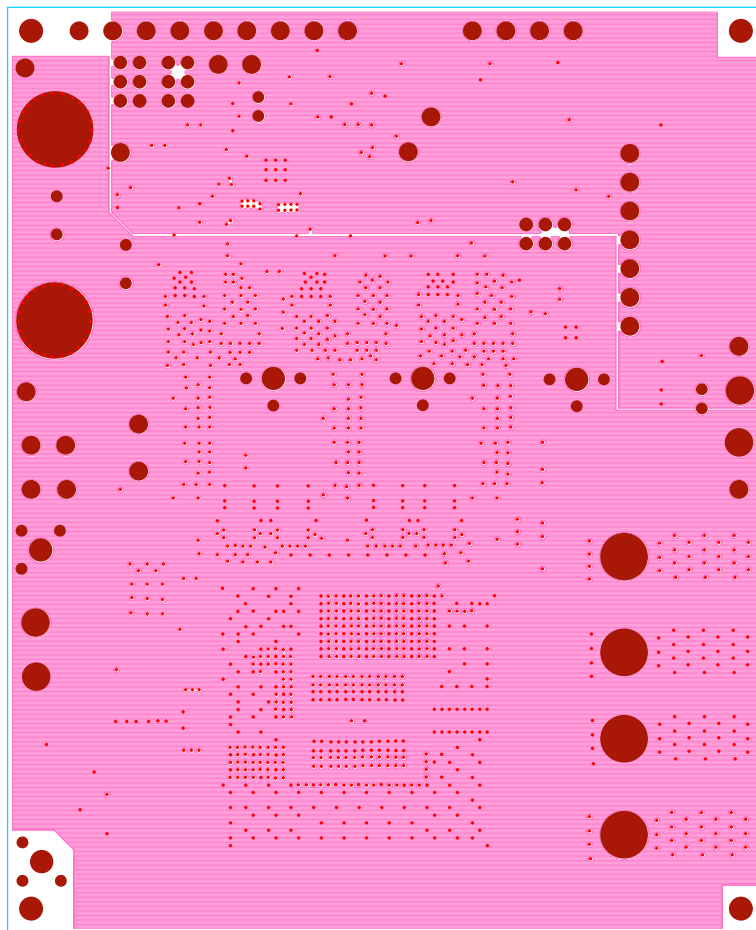


FIGURE 13. LAYER 5



**ISL62882EVAL2Z Evaluation Board Layout** (Continued)

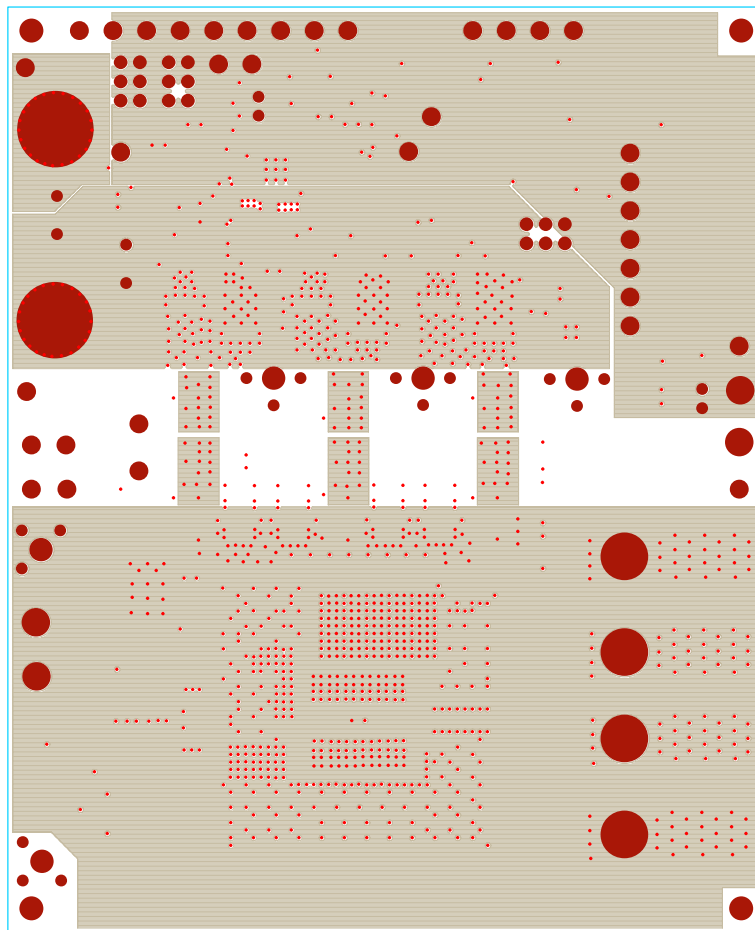


FIGURE 14. LAYER 6

**ISL62882EVAL2Z Evaluation Board Layout** (Continued)

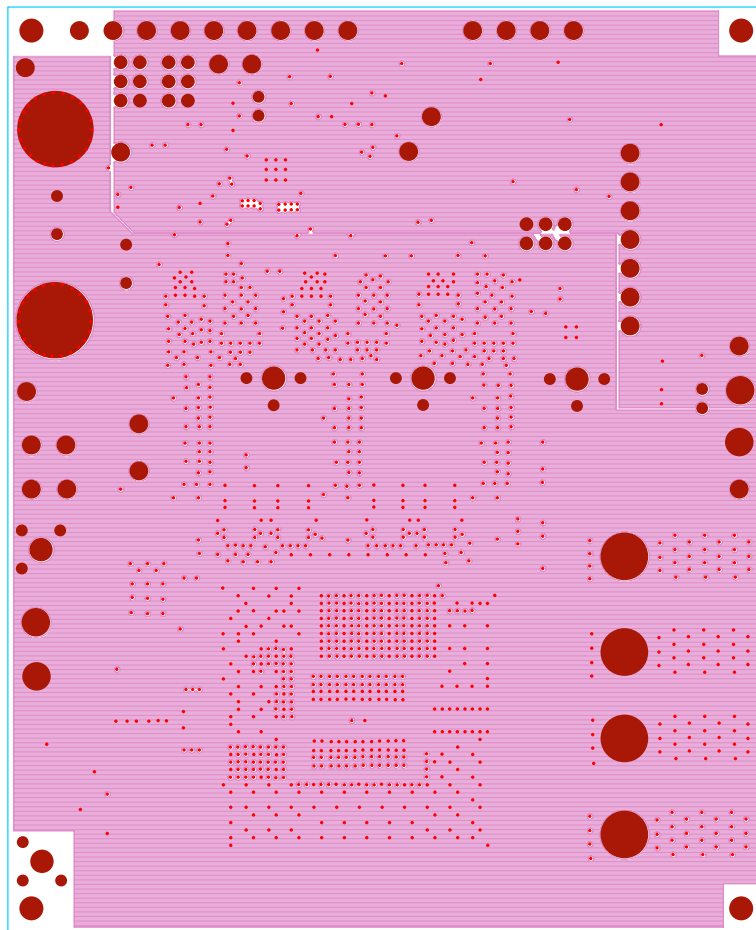


FIGURE 15. LAYER 7

**ISL62882EVAL2Z Evaluation Board Layout** (Continued)

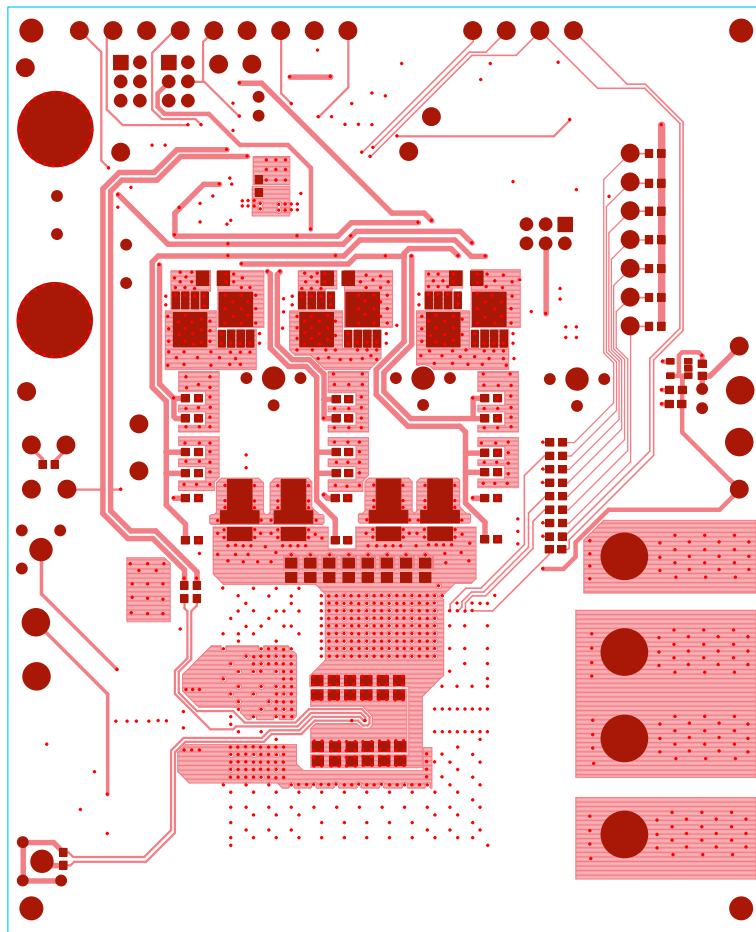


FIGURE 16. LAYER 8

## Notice

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#### **Renesas Electronics America Inc.**

1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.  
Tel: +1-408-432-8888, Fax: +1-408-434-5351

#### **Renesas Electronics Canada Limited**

9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3  
Tel: +1-905-237-2004

#### **Renesas Electronics Europe Limited**

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K  
Tel: +44-1628-651-700, Fax: +44-1628-651-804

#### **Renesas Electronics Europe GmbH**

Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

#### **Renesas Electronics (China) Co., Ltd.**

Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

#### **Renesas Electronics (Shanghai) Co., Ltd.**

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China  
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

#### **Renesas Electronics Hong Kong Limited**

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong  
Tel: +852-2265-6688, Fax: +852 2886-9022

#### **Renesas Electronics Taiwan Co., Ltd.**

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan  
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

#### **Renesas Electronics Singapore Pte. Ltd.**

80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949  
Tel: +65-6213-0200, Fax: +65-6213-0300

#### **Renesas Electronics Malaysia Sdn.Bhd.**

Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia  
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

#### **Renesas Electronics India Pvt. Ltd.**

No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India  
Tel: +91-80-67208700, Fax: +91-80-67208777

#### **Renesas Electronics Korea Co., Ltd.**

17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea  
Tel: +82-2-558-3737, Fax: +82-2-558-5338