

ISL8130EVAL2Z

Evaluation Board

AN1909  
Rev 0.00  
December 20, 2013

Introduction

The ISL8130 is a wide input range, synchronous buck controller. It is designed to drive N-Channel MOSFETs in a synchronous rectified buck topology for up to 25A load current. The ISL8130 integrates control, output adjustment, monitoring and protection functions into a single package. All the necessary components are with a 2.125 inch by 1.25 inch PCB area.

The ISL8130EVAL2Z provides simple, voltage mode control with fast transient response. The 0.6V internal reference as well as external reference can be selected via the REFIN pin.

The ISL8130 is offered in a space saving 4x4 QFN and easy-to-use 20 Ld QSOP packages.

Evaluation Board Specifications

TABLE 1. EVALUATION BOARD ELECTRICAL SPECIFICATIONS

| SPEC   | DESCRIPTION                       | MIN  | TYP | MAX  | UNIT |
|--------|-----------------------------------|------|-----|------|------|
| VIN    | Input Voltage                     | 5.6  | 12  | 16   | V    |
| VOU    | Output Voltage                    | 4.75 | 5.0 | 5.25 | V    |
| IOUT   | Output Current                    |      | 25  |      | A    |
| Fsw    | Switching Frequency               |      | 280 |      | kHz  |
| $\eta$ | Efficiency, VIN = 12V, IOUT = 25A |      | 94  |      | %    |

TABLE 2. RECOMMENDED COMPONENT SELECTION FOR QUICK EVALUATION

| VOUT (V) | IOUT (A) | UPPER MOSFET     | LOWER MOSFET     | INDUCTOR      | FSW/RT (kHz/k $\Omega$ ) |
|----------|----------|------------------|------------------|---------------|--------------------------|
| 5        | 25       | 2 X BSC057N03 LS | 2 X BSC057N03 LS | SER2010-901ML | 280/52.3                 |
| 5        | 15       | 1 X BSC057N03 LS | 1 X BSC030N03 LS | SER2009-901ML | 500/31.6                 |
| 3.3      | 25       | 2 X BSC057N03 LS | 2 X BSC030N03 LS | SER2010-901ML | 280/52.3                 |
| 3.3      | 15       | 1 X BSC057N03 LS | 1 X BSC030N03 LS | SER2009-901ML | 500/31.6                 |

Please contact Intersil Sales for assistance.

Recommended Equipment

The following equipment are recommended for evaluation:

- 0V to 30V power supply with 30A source current capability
- Electronic load capable of sinking 25A
- Digital Multimeters (DMMs)
- 100MHz Quad-Trace Oscilloscope

Quick Test Setup

1. Ensure that the Eval board is correctly connected to the power supply and the electronic load prior to apply any power. Please refer to Figure 2 for proper set-up.
2. Connect jumpers J1 to the Internal Reference position; Connect jumper J8 to the Disable position.
3. Turn on the power supply, VIN = 12V. The PWM should be inhibited at this time.
4. Connect jumper J8 to the Enable position. Adjust input voltage VIN within the specified range and observe output voltage. The output voltage variation should be within 4.75V to 5.25V.
5. Adjust load current within 25A. The output voltage variation should be within 4.75V to 5.25V.
6. Use oscilloscope to observe output ripple voltage and phase node ringing. For accurate measurement, please refer to Figure 3 for proper probe set-up.
7. Optimization. Please refer to Table 2 for optimization recommendation.

NOTE: Test points: VOUT, GND, GND, VIN are for voltage measurement only. Do not allow high current through these test points.



FIGURE 1. PHOTOGRAPH OF THE ISL8130EVAL2Z EVALUATION BOARD

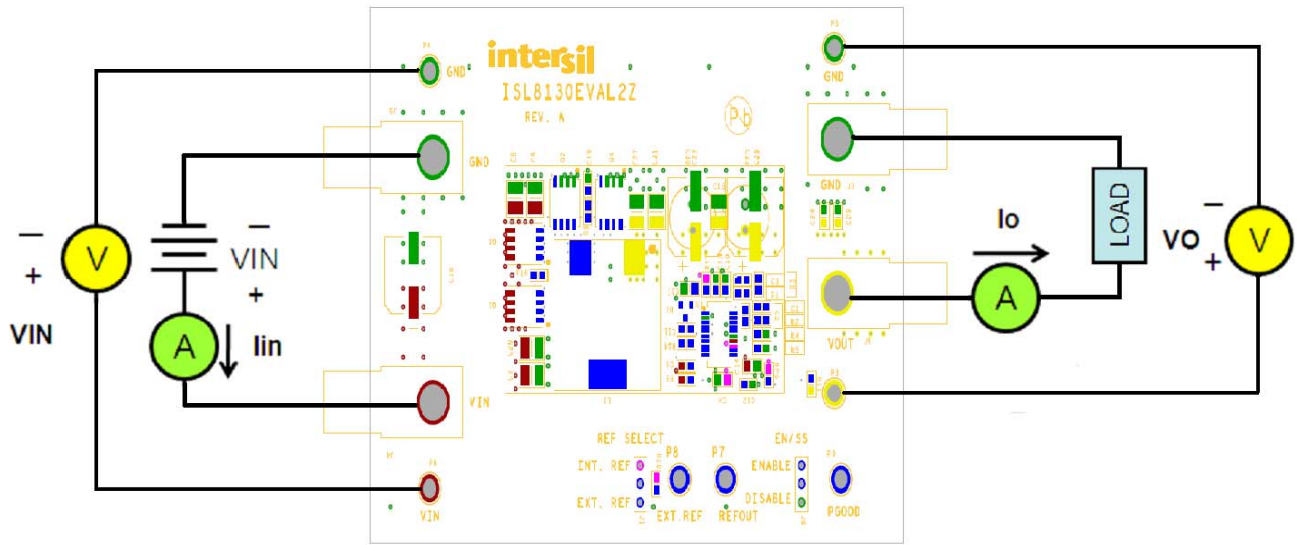


FIGURE 2. ISL8130EVAL2Z TEST SET-UP

## Probe Set-up

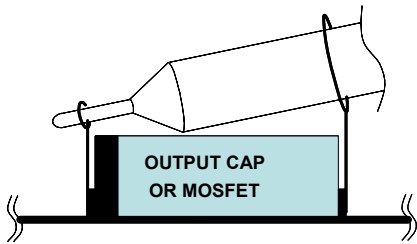


FIGURE 3. OSCILLOSCOPE PROBE SET-UP

## External Reference

If REF<sub>IN</sub> pin is tied to VCC<sub>5</sub>, then the internal 0.6V reference is used as the error amplifier non-inverting input. If the REF<sub>IN</sub> is connected to an external voltage source between 0.6V to 1.25V, then this external voltage is used as the reference voltage at the positive input of the error amplifier.

# Typical Performance Curves

Input voltage is 12V and output voltage is 5V unless otherwise specified.

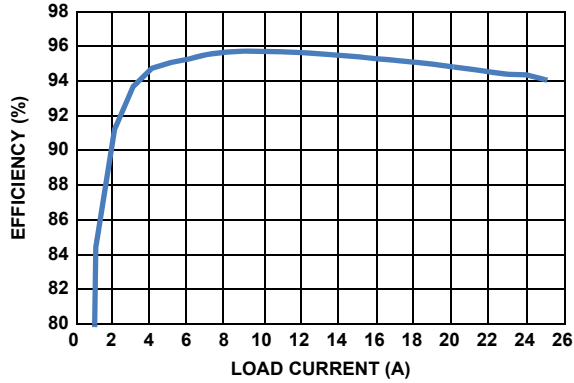


FIGURE 4. EFFICIENCY vs LOAD CURRENT

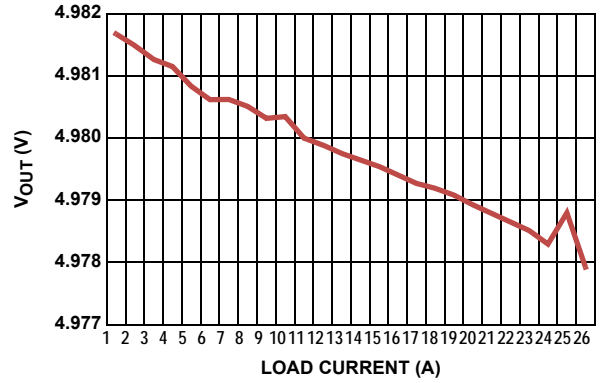


FIGURE 5. LOAD REGULATION, ( $V_{IN} = 12V$ ,  $I_{MAX} = 25A$ )

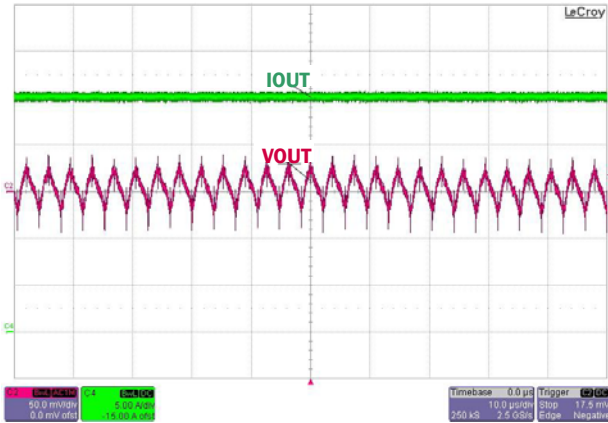


FIGURE 6. OUTPUT RIPPLE ( $V_O = 5V$ ,  $LOAD = 25A$ )

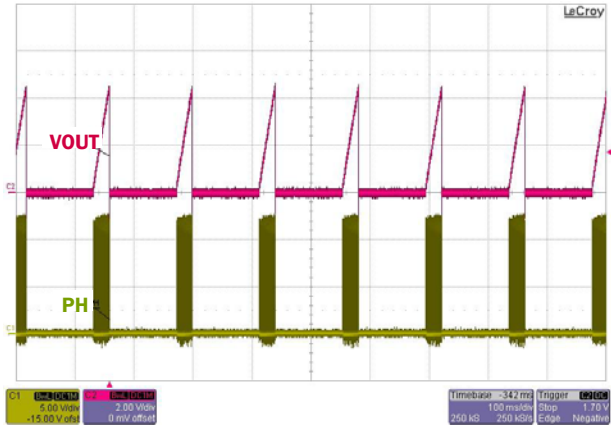


FIGURE 7. OVERCURRENT PROTECTION ( $V_O = 5V$ ,  $LOAD = 40A$ )

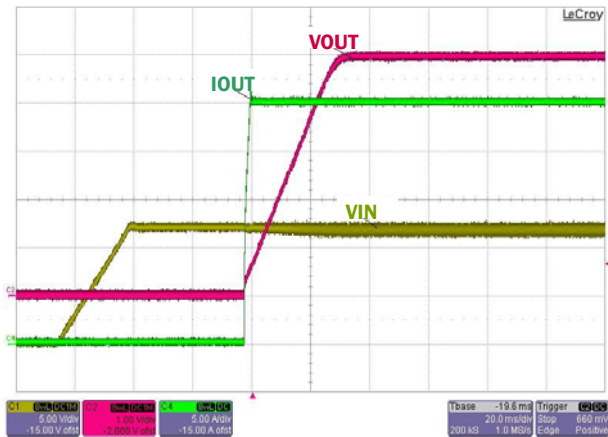


FIGURE 8. SOFT-START AT FULL LOAD

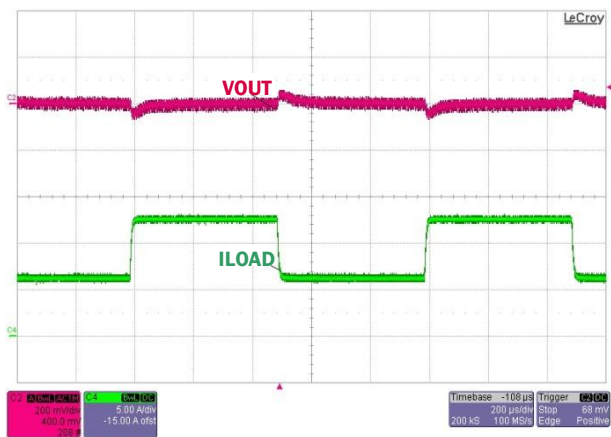


FIGURE 9. LOAD TRANSIENT (25% TO 50% AT  $2A/\mu s$ )

# ISL8130EVAL2Z Schematic

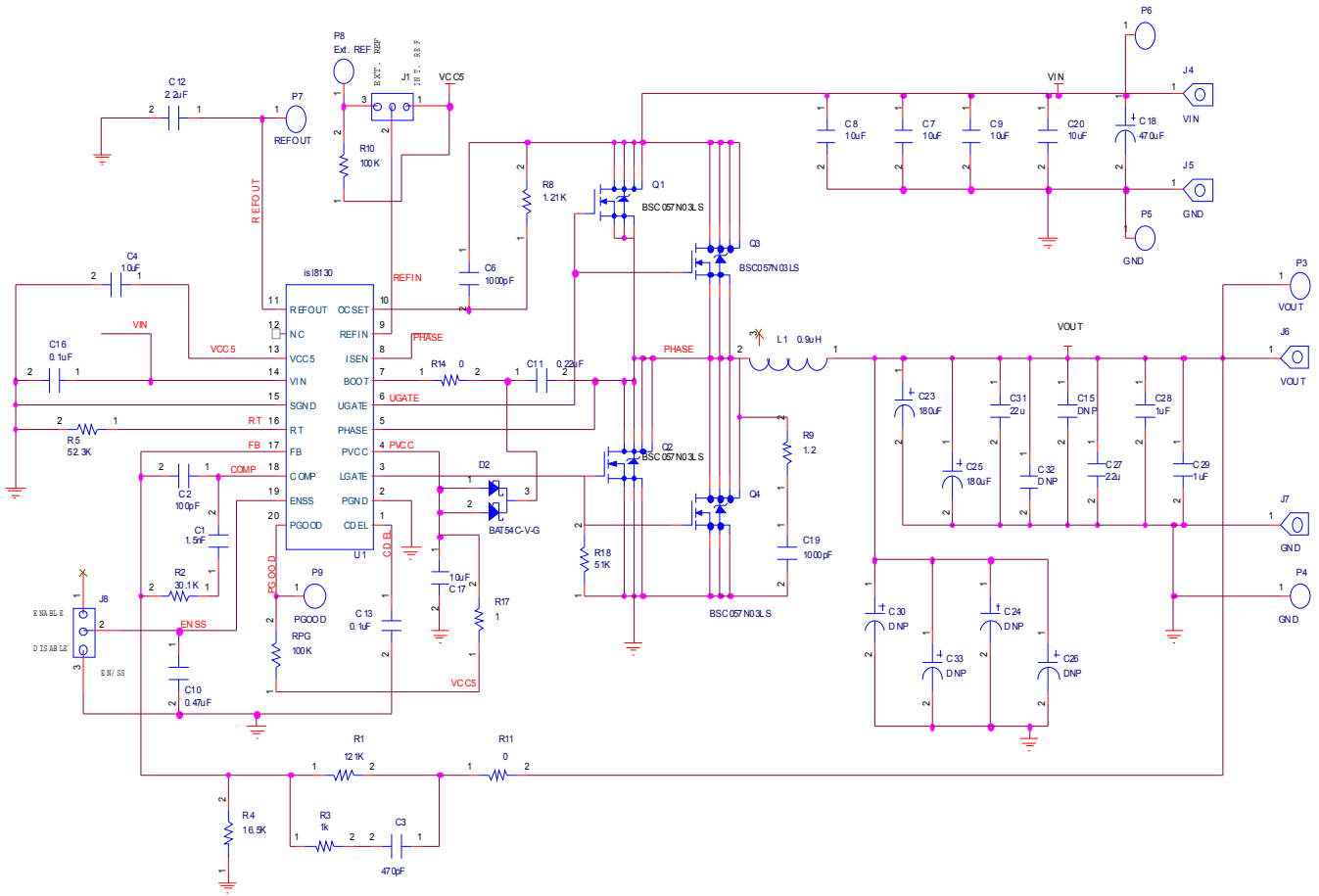


TABLE 3. ISL8130EVAL2Z BILL OF MATERIALS

| ITEM                        | QTY | PART REFERENCE               | VALUE           | DESCRIPTION   | PART NUMBER   | MANUFACTURER |
|-----------------------------|-----|------------------------------|-----------------|---|---------------|--------------|
| <b>ESSENTIAL COMPONENTS</b> |     |                              |                 |   |               |              |
| 1                           | 1   | C3                           | 470pF           | Ceramic CAP, NPO or COG, sm0603                         | GENERIC       | GENERIC      |
| 2                           | 2   | C13, C16                     | 0.1μF           | Ceramic CAP, X5R, 50V, sm0603                           | GENERIC       | GENERIC      |
| 3                           | 2   | C4, C17                      | 10μF            | Ceramic CAP, X5R, 10V, sm0805                           | GENERIC       | GENERIC      |
| 4                           | 1   | C10                          | 0.47μF          | Ceramic CAP, X5R, 16V, sm0603                           | GENERIC       | GENERIC      |
| 5                           | 3   | C27, C31                     | 22μF            | Ceramic CAP, X5R, 25V, sm1210                           | GENERIC       | GENERIC      |
| 6                           | 1   | C12                          | 2.2μF           | Ceramic CAP, X5R, 16V, sm0603                           | GENERIC       | GENERIC      |
| 7                           | 2   | C6, C19                      | 1000pF          | Ceramic CAP, NPO or COG, sm0603                         | GENERIC       | GENERIC      |
| 8                           | 2   | C23, C25                     | 180μF           | OSCON, 16V, Radial 8x9                                  | 16SEPC180MX   | SANYO        |
| 9                           | 4   | C7, C8, C9, C20              | 10μF            | Ceramic CAP, X5R, 25V, sm1210                           | GENERIC       | GENERIC      |
| 10                          | 1   | C2                           | 100pF           | Ceramic CAP, NPO or COG, sm0603                         | GENERIC       | GENERIC      |
| 11                          | 2   | C28, C29                     | 1μF             | Ceramic CAP, X5R, 25V, sm0603                           | GENERIC       | GENERIC      |
| 12                          | 1   | C1                           | 1500pF          | Ceramic CAP, NPO or COG, sm0603                         | GENERIC       | GENERIC      |
| 13                          | 1   | C11                          | 0.22μF          | Ceramic CAP, X5R, 16V, sm0603                           | GENERIC       | GENERIC      |
| 14                          | 1   | C18                          | 470μF           | Alum. Cap, 50V  | 16SVPE470M    | SANYO        |
| 15                          | 1   | D2                           |                 | Schottky Diode, 30V, SOT23                              | BAT54C        | Fairchild    |
| 16                          | 1   | L1                           | 0.9μH           | Inductor  | SER2010-901ML | Coilcraft    |
| 17                          | 4   | Q1, Q2, Q3, Q4               |                 | Single Channel NFET, 30V                                | BSC057N03LS G | Infineon     |
| 18                          | 1   | R5                           | 52.3k           | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 19                          | 1   | R9                           | 1.2             | Resistor, sm0603, 10%                                   | GENERIC       | GENERIC      |
| 20                          | 1   | R2                           | 30.1k           | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 21                          | 2   | R11, R14                     | 0               | Resistor, sm0603, 10%                                   | GENERIC       | GENERIC      |
| 22                          | 1   | R4                           | 16.5k           | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 23                          | 1   | R17                          | 1               | Resistor, sm0603, 10%                                   | GENERIC       | GENERIC      |
| 24                          | 1   | R18                          | 51k             | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 25                          | 1   | R1                           | 121k            | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 26                          | 1   | R8                           | 1.21k           | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 27                          | 1   | R3                           | 1k              | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 28                          | 2   | R10, RPG                     | 100k            | Resistor, sm0603, 1%                                    | GENERIC       | GENERIC      |
| 29                          | 1   | U1                           |                 | PWM CONTROLLER, 20 Ld QSOP                              | ISL8130IAZ    | INTERSIL     |
| <b>OPTIONAL COMPONENTS</b>  |     |                              |                 |   |               |              |
| 30                          | 6   | C15, C24, C26, C30, C32, C33 | DO NOT POPULATE |   |               |              |
| <b>EVALUATION HARDWARE</b>  |     |                              |                 |   |               |              |
| 31                          | 4   | J4, J5, J6, J7               |                 | HARDWARE, MTG, CABLE TERMINAL, 6-14AWG, LUG&SCRE , ROHS | KPA8CTP       | BERG/FCI     |
| 32                          | 2   | J1, J8                       |                 | 1x3 Header  | GENERIC       | GENERIC      |
| 33                          | 7   | P3, P4, P5, P6, P7, P8, P9   |                 | Test Points   | 1514-2        | Keystone     |

# ISL8130EVAL2Z PCB Layout

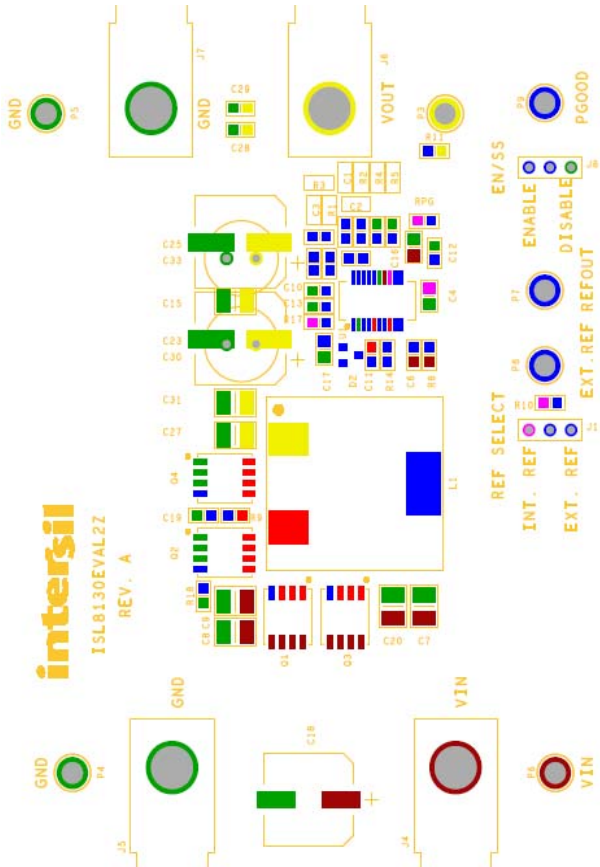


FIGURE 10. TOP SILKSCREEN

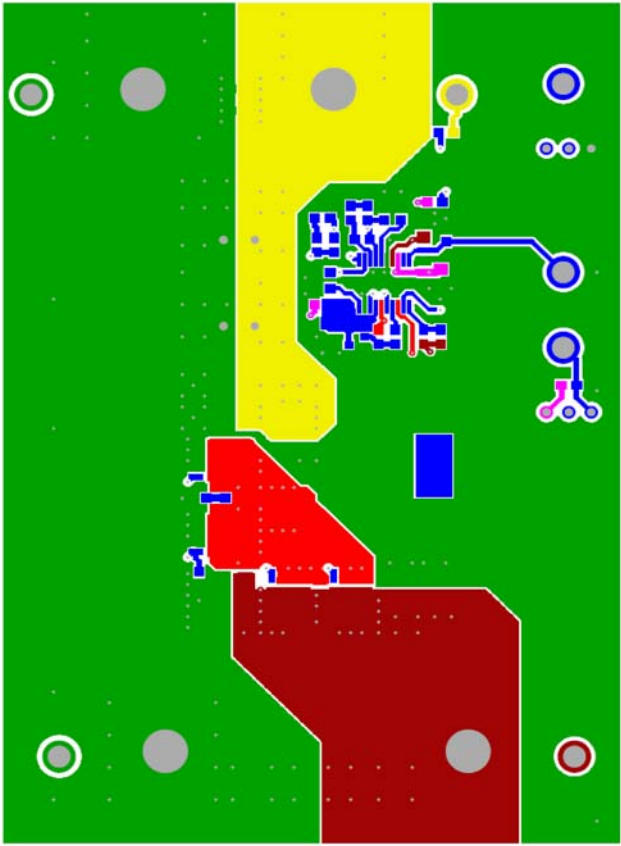


FIGURE 11. TOP LAYER

## ISL8130EVAL2Z PCB Layout (Continued)

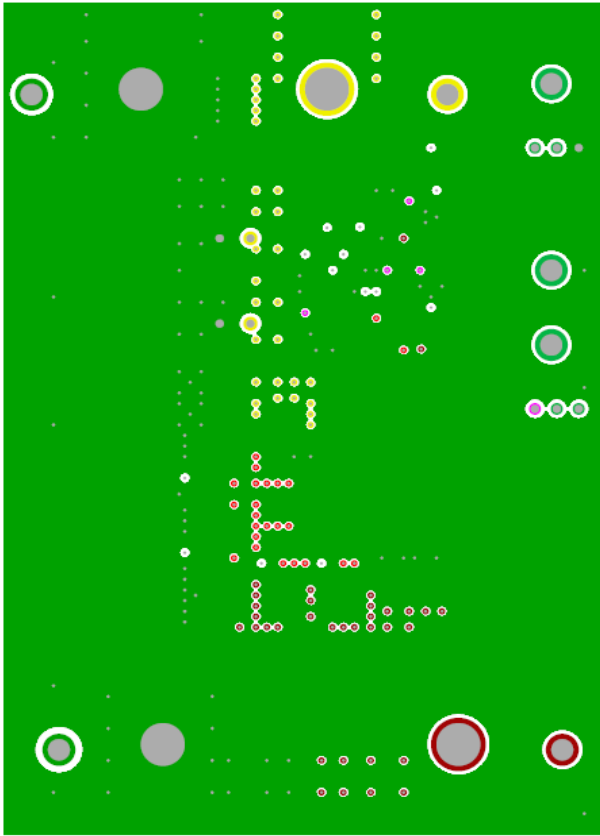


FIGURE 12. SECOND LAYER(SOLID GROUND)

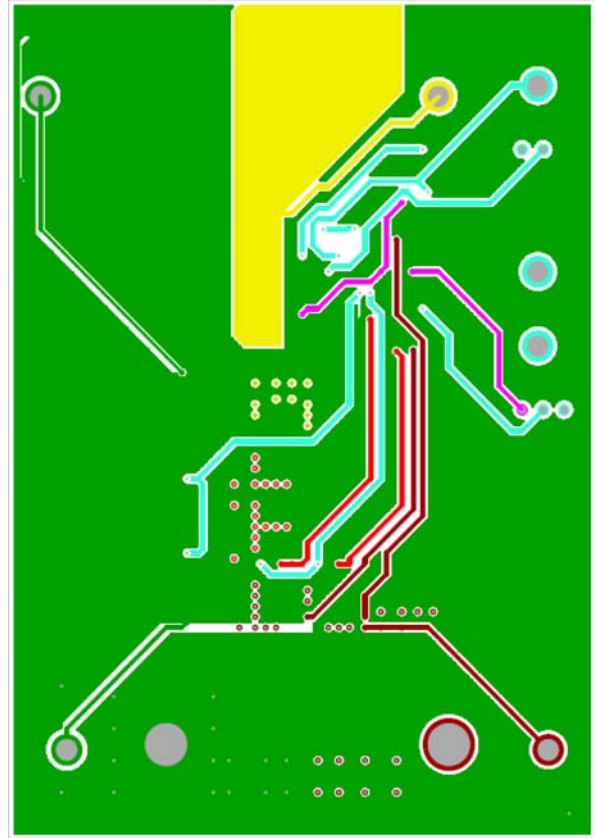


FIGURE 13. THIRD LAYER

# ISL8130EVAL2Z PCB Layout (Continued)

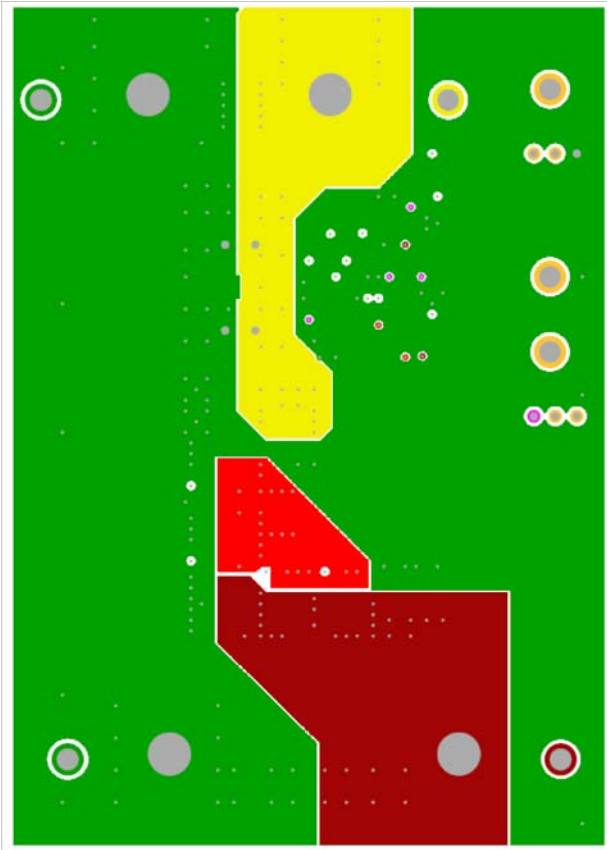


FIGURE 14. BOTTOM LAYER

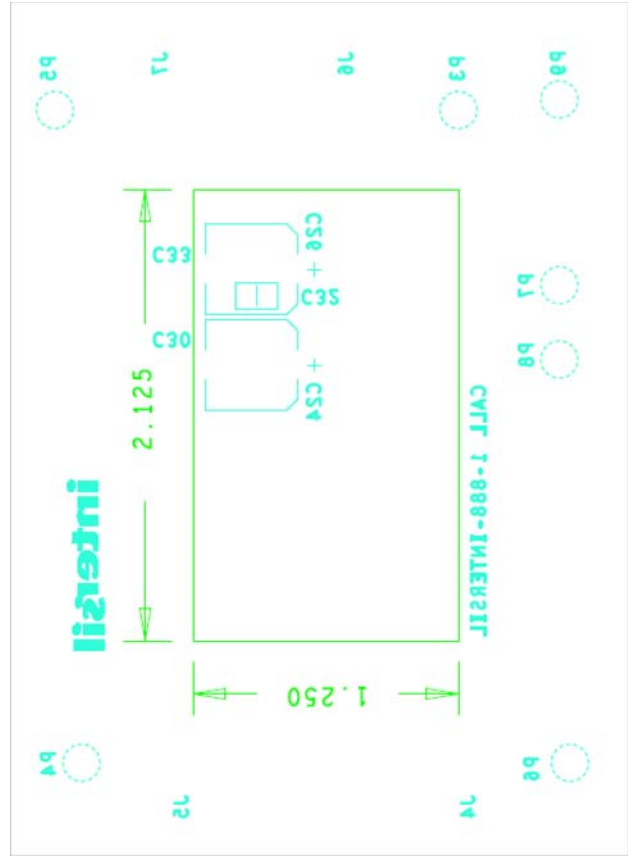


FIGURE 15. BOTTOM SILKSCREEN



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