## ISL8112EVAL1Z Evaluation Board

The ISL8112 is a dual-output Synchronous Buck controller with 2A integrated driver. It features high light load efficiency which is especially preferred in systems concerned with high efficiency in wide load range, like the battery powered system. The ISL8112 includes two constant on-time PWM controllers.

Either of the 2 outputs can operate in output fixed mode or adjustable mode. In fixed mode, one output can be 5V or 3.3V and the other can output 1.5V or 1.05V. In output adjustable mode, one output can be 0.7V to 5.5V, and the other output can range from 0V to 2.5V (sensing output voltage directly) or up to 5V (using resistor divider voltage for voltage sensing). This device also features a linear regulator providing 3.3V/5V, or adjustable from 0.7V to 4.5V via LDOREF. The linear regulator provides up to 100mA output current with automatic linear-regulator bootstrapping to the BYP input. When in switchover, the LDO output can source up to 200mA. The ISL8112 includes on-board power-up sequencing, the power-good (PGOOD_) outputs, digital soft-start, and internal soft-stop output discharge that prevents negative voltages on shutdown.

The ISL8112 is implemented with constant on-time PWM control scheme, which needs no sense resistors and provides 100ns response to load transients while maintaining a relatively constant switching frequency. The unique ultrasonic pulse skipping mode maintains the switching frequency above 25kHz, eliminating undesired audible noises in low frequency operation at light load. Other features include pulse skipping, which maximizes efficiency in light-load applications, and fixed-frequency PWM mode, which reduces RF interference in sensitive applications.

## Recommended Equipment

- 0V to 25V power supply with at least 20A source current capability, battery, or notebook AC-adapter.

- Two Electronic Loads capable of sinking current up to 15A.

- Dummy loads for the LDO's.

- Digital multimeters (DMMs).

- 100MHz quad-trace oscilloscope.

- Signal generator.

### Quick Start

1. Ensure that the circuit is correctly connected to the supply and loads prior to applying any power.
2. Verify that position 2's are ON for SW1, SW2, SW3, SW4, and SW5. Make sure that no other position of each switch is ON at the same time.
3. Turn on the input power supply.
4. Verify the outputs voltages are correct.
5. Verify the LDOs outputs voltages are correct.

### Evaluating the Other Output Voltage

The ISL8112EVAL1Z kit outputs are preset to 5V/7A, 3.3V/7A and 5V/200mA on LDO. The VOUT1 can also be adjusted between 0.7V to 5.5V by changing the value of R9 and R10 or R11 and R12 given by Equation 1:

$$R12 = \frac{R11}{(V_{OUT}/V_{FB}) - 1} \qquad \text{where } V_{FB} = 0.7V \qquad \text{(EQ. 1)}$$

- The VOUT2 can track OUT2REF at 1:1 ratio with input voltage range from 0.7V to 2.5V. Likewise, the LDO output can also track LDOREF at 1:2 with voltage range from 0.35V to 2.25V.
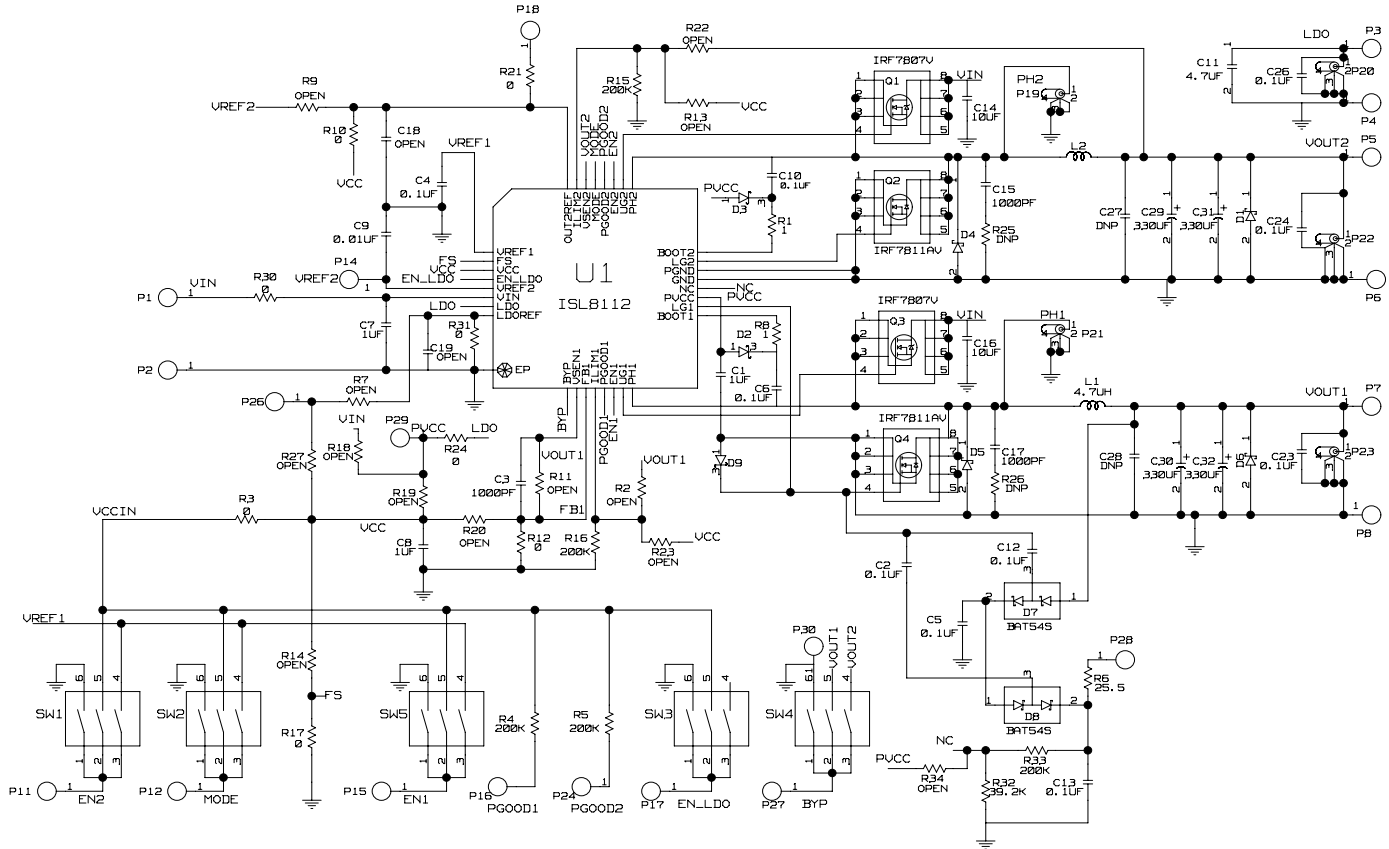
**FIGURE 1. ISL8112EVAL1Z REV A KIT SCHEMATIC**

| SW1 | EN2 | VOUT2 OUTPUT CONTROL |
|---|---|---|
| 1 | Connect to GND | VOUT2 output shutdown. |
| 2 | Connect to VCC | VOUT2 output active. |
| 3 | Connect to VREF1 | VOUT2 sequence to VOUT1 output. |

NOTE: Only toggle one position at a time.

| SW2 | MODE | OPERATING MODE |
|---|---|---|
| 1 | Connect to GND | Normal operation mode, allow automatic PWM/PFM switchover for pulse-skipping at light load. |
| 2 | Connect to VCC | Low noise, fixed-frequency PWM mode. |
| 3 | Connect to VREF1 | Ultrasonic pulse-skipping mode (20kHz min.) |

NOTE: Only toggle one position at a time.

| SW3 | EN_LDO | LDO CONTROL |
|---|---|---|
| 1 | Connect to GND. | LDO output shutdown. |
| 2 | Connect to VCC. | LDO output active. |
| 3 | N/C | No Connect. |

NOTE: Only toggle one position at a time.

| SW4 | BYP | OPERATING MODE |
|---|---|---|
| 1 | Connect to GND | Set BYP to 0V. No LDO switchover. |
| 2 | Connect to VOUT1 | SET BYP to VOUT1. |
| 3 | Connect to VOUT2 | SET BYP to VOUT2. |

NOTE: Only toggle one position at a time.

| SW5 | EN1 | VOUT1 OUTPUT CONTROL |
|---|---|---|
| 1 | Connect to GND | VOUT1 output shutdown. |
| 2 | Connect to VCC | VOUT1 output active. |
| 3 | Connect to VREF1 | VOUT1 sequence to VOUT2 output. |

NOTE: Only toggle one position at a time.

## Components List

| REF DES | PART NUMBER | QTY | MANUFACTURER | DESCRIPTION |
|---|---|---|---|---|
| C1, C7, C8 | 08053D105KAT2A | 3 | AVX | 1µF, 25V, X7R, 0805 |
| C11 | H1065-00475-10V10 | 1 | GENERIC | 4.7µF, 10V X5R 1206 |
| C14, C16 | TMK432BJ106KM | 2 | TAIYO-YUDEN | 10µF, 25V X5R 1210 |
| C2, C4, C5, C6, C10, C12, C13, C23, C24, C26 | H1046-00104-50V10 | 10 | GENERIC | 0.1µF, 50V, X7R, 0805 |
| C27, C28 | OPEN | 0 | | |
| C29, C30 | 6TPD330M | 2 | POSCAP SANYO | 330µF, 6.3V, POS CAP 9m$\Omega$, D size |
| C3, C9, C15, C17, C18, C19 | OPEN | 0 | | |
| C31, C32 | OPEN | 0 | POSCAP | |
| D1, D4-D6 | OPEN | 0 | DIODES-INC | |
| D2, D3 | OPEN | 0 | ON-SEMI | |
| D7, D8 | OPEN | 0 | DIODES | |
| D9 | OPEN | 0 | ON-SEMI | 0.3A, 30V, Schottky SOT23 |
| L1, L2 | DR125-4R7-R | 2 | COOPER/COILTRONICS | 4.7µH,10.5m$\Omega$, 12.5mmx12.5mm Shielded |
| P1, P2, P5-P8 | 1514-2 | 6 | KEYSTONE | Test Point Turret 0.150 Pad 0.100 Thole |
| P19-P23 | 131-4353-00 | 5 | TEKTRONIX | Scope Probe Test Point PCB Mount |
| P3, P11, P12, P14-P18, P24, P26-P29 | 5000 | 13 | KEYSTONE | Miniature Red Test Point 0.100 Pad 0.040 Thole |
| P4, P30 | 5001 | 2 | KEYSTONE | Miniature Black Test Point 0.100 Pad 0.040 Thole |
| Q1 | IRF7821 | 1 | IR | 30V 13.6A HEXFET Power MOSFET |
| Q2 | IRF7832 | 1 | IR | 30V 20A HEXFET Power MOSFET |
| Q3 | IRF7807V | 1 | IR | 30V 8.3A N-Channel Power MOSFET |
| Q4 | IRF7811AV | 1 | IR | 30V 10.8A N-Channel Power MOSFET |
| R1, R8 | H2512-01R00-1/10W | 2 | GENERIC | 1$\Omega$, 1%, 0805 |
| R15 | H2512-01503-1/10W1 | 1 | GENERIC | 150k$\Omega$, 1%, 0805 |
| R2, R7, R9, R11, R13, R14, R18, R19, R20, R22, R23, R27, R34 | OPEN | 0 | | |

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## Components List (Continued)

| REF DES | PART NUMBER | QTY | MANUFACTURER | DESCRIPTION |
|---|---|---|---|---|
| R25, R26 | OPEN | 0 | | |
| R3, R10, R12, R17, R21, R24, R30, R31 | H2512-00R00-1/10W | 8 | GENERIC | 0Ω, 1%, 0805 |
| R32 | H2512-03922-1/10W1 | 1 | GENERIC | 39.2kΩ, 1%, 0805 |
| R4, R5, R16, R33 | H2512-02003-1/10W1 | 4 | GENERIC | 200kΩ, 1%, 0805 |
| R6 | H2512-025R5-1/10W1 | 1 | GENERIC | 25.5Ω, 1%, 0805 |
| SW1-SW5 | 78B03S | 5 | GRAYHILL | Dip Switch SPST (Raised Slide) |
| U1 | ISL8112IRZ | 1 | INTERSIL | High-Efficiency, Quad Output Controller |

## Layout
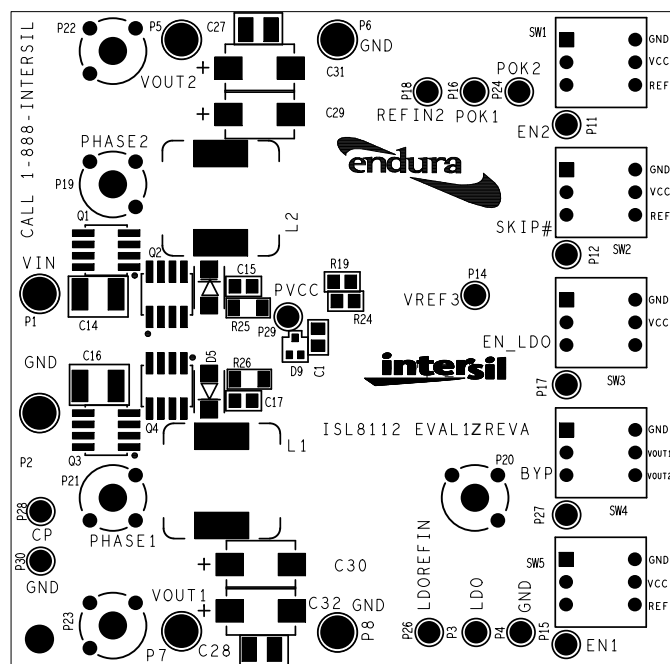


**FIGURE 2. TOP COMPONENTS**
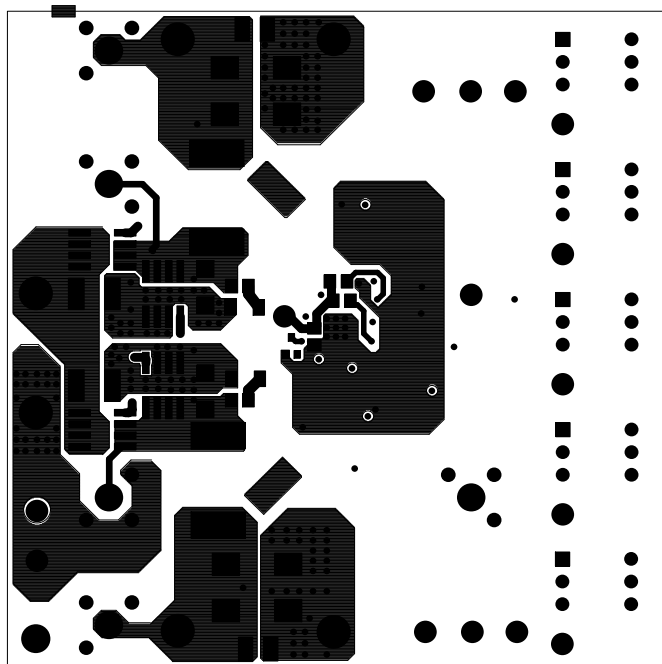


**FIGURE 3. TOP ETCH**
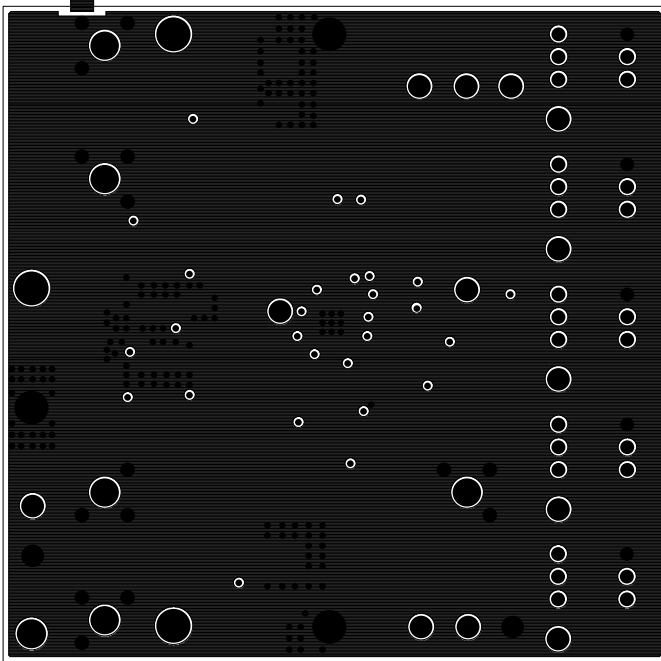
**FIGURE 4. SECOND LAYER**
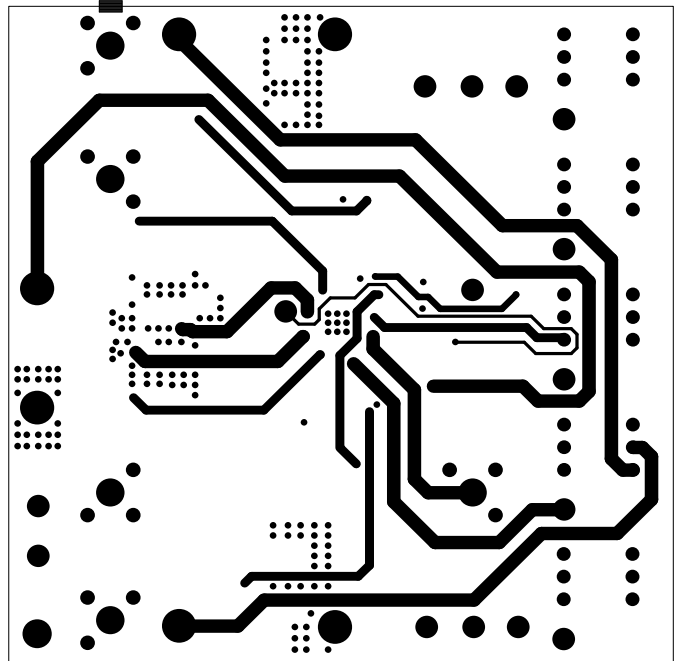


**FIGURE 5. THIRD LAYER**
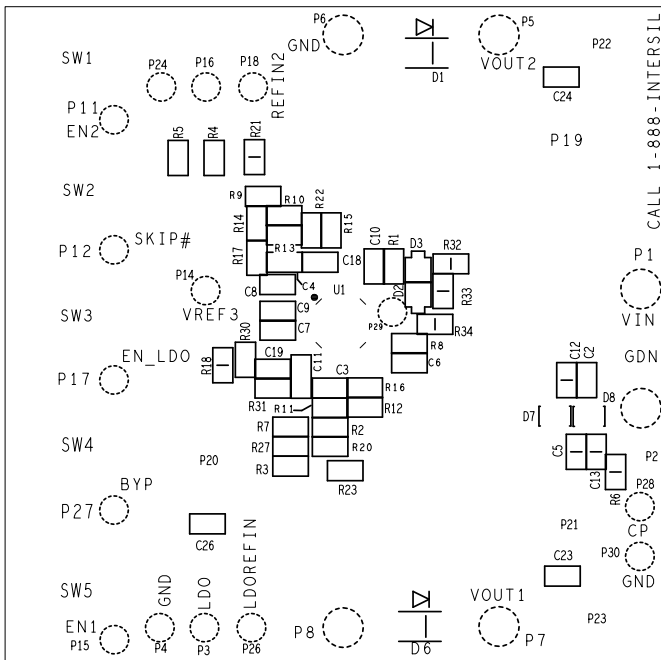


**FIGURE 6. BOTTOM COMPONENTS (MIRRORED)**



**FIGURE 7. BOTTOM ETCH**

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