## ISL8088EVAL1Z

REVA Dual 800mA Low Quiescent Current 2.25MHz High Efficiency Synchronous Buck Regulator

# Description

The ISL8088EVAL1Z kit is intended for use by individuals with requirements for Point-of-Load applications sourcing from 2.75V to 5.5V. The ISL8088EVAL1Z evaluation board is used to demonstrate the performance of the ISL8088 low quiescent current mode converter.

The ISL8088 is offered in a 3mmx3mm 10 Ld DFN package with 1mm maximum height. The complete converter occupies less than 1.8cm$^2$ area.

# Key Features:

- Dual 800mA High Efficiency Synchronous Buck Regulator with up to 97% Efficiency
- 800mA Guaranteed Output Current per channel
- Power-Good (PG) output with 1ms Delay
- 2.75V to 5.5V Supply Voltage
- 3% Output Accuracy Over-Temperature/Load/Line
- Start-up with Pre-biased Output
- Internal Digital Soft-Start - 2ms
- Soft-Stop Output Discharge During Disabled
- 30µA Quiescent Supply Current in PFM Mode
- Selectable Forced PWM Mode and PFM Mode
- External Synchronization up to 4MHz
- Typical 6.5µA Logic Controlled Shutdown Current
- 100% Maximum Duty Cycle for Lowest Dropout
- Internal Current Mode Compensation
- Peak Current Limiting.
- Over-Temperature Protection
- Independent Enable

# Recommended Equipment

The following materials are recommended to perform testing:

- 0V to 10V Power Supply with at least 3A source current capability or 5V battery
- Electronic Loads capable of sinking current up to 3A
- Digital Multimeters (DMMs)
- 100MHz quad-trace oscilloscope
- Signal generator

# Quick Setup Guide

1. Ensure that the circuit is correctly connected to the supply and loads prior to applying any power.
2. Connect the bias supply to VIN. Plus terminal to VIN and negative return to PGND.
3. Verify that position is ON for SW2 and SW3.
4. Turn on the power supply.
5. Verify the output voltage is 2.5V for $V_{OUT1}$ and 1.8V for $V_{OUT2}$.

## Evaluating the Other Output Voltage

The ISL8088EVAL1Z kit output is preset to 2.5V for $V_{OUT1}$ and 1.8V for $V_{OUT2}$; however, output voltages can be adjusted from 0.6V to 3.3V. The output voltage programming resistor, R2 (or R5 in Channel 2), will depend on the desired output voltage of the regulator. The value for the feedback resistor is typically between 0Ω and 750kΩ as shown in Equation 1.

Let's set R3 = 100kΩ, then R2 will be:

$$R2 = R3\left(\frac{V_{OUT}}{V_{FB}} - 1\right) \tag{EQ. 1}$$

If the output voltage desired is 0.6V, then R3 is left unpopulated and short R2. For faster response performance, add 10pF in parallel to R2.
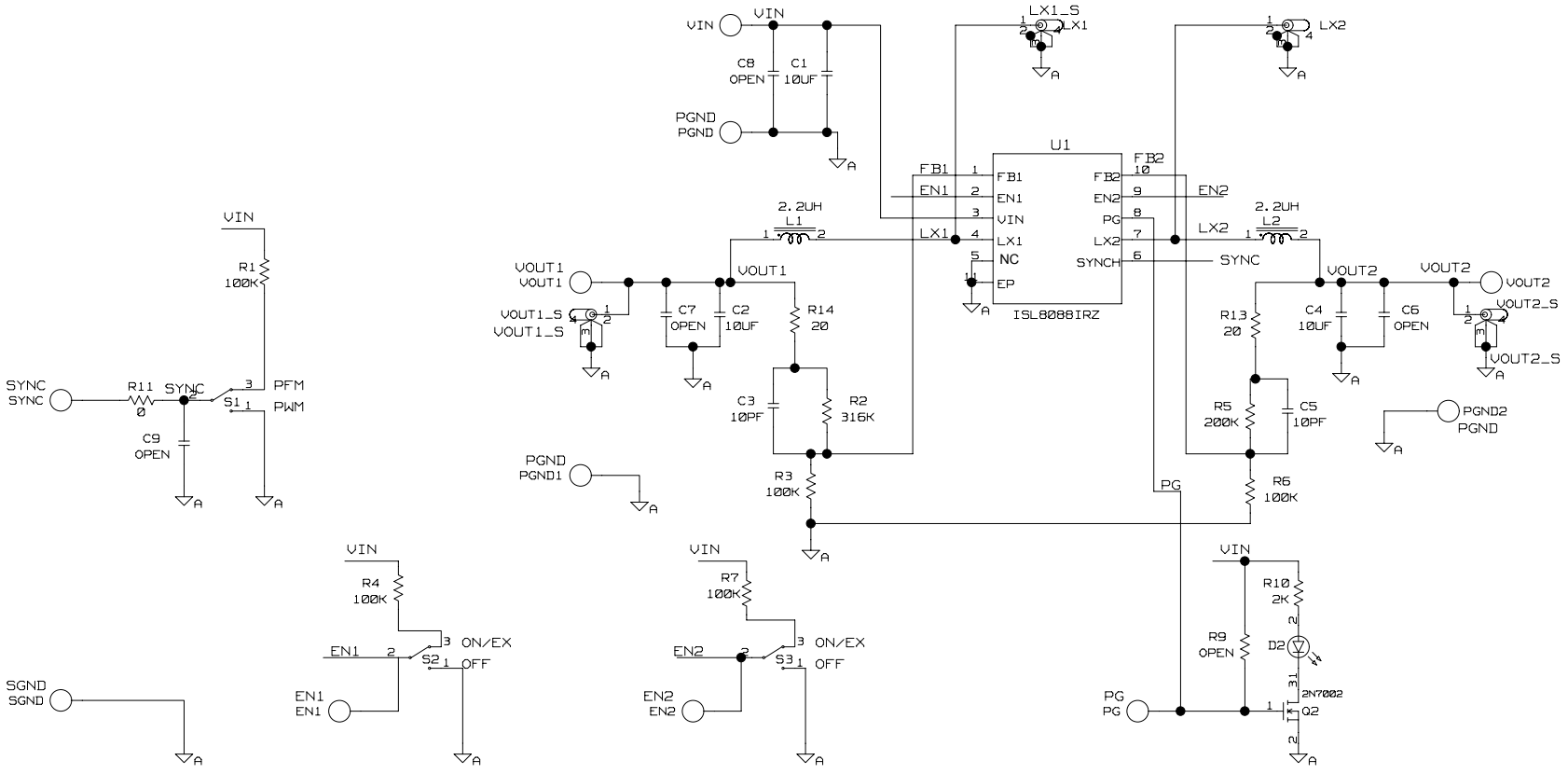
## Mode Control

The ISL8088 has a SYNC pin that controls the operation mode. SYNC pin connect to logic high or input voltage VIN for PFM mode; connect to logic low or ground for forced PWM mode. Connect to an external function generator for Synchronization. Negative edge trigger. Do not leave this pin floating.

TABLE 1. SWITCH SETTINGS

| SW2&3 | ENABLE | ON/OFF CONTROL |
|---|---|---|
| 1 | OFF | Disable $V_{OUT}$ |
| 3 | ON | Enable $V_{OUT}$ |

| SW1 | SKIP | FUNCTION |
|---|---|---|
| 1 | PWM | Fixed PWM frequency at light load |
| 3 | PFM | Force continuous mode |

# ISL8088EVAL1ZREVA Schematic

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VIN
VIN

LX1_S
LX1

LX2

C8
OPEN
C1
10UF

PGND
PGND

U1

| FB1 | 1 | FB1 | FB2 | FB2 | 10 | FB2 |
| EN1 | 2 | EN1 | EN2 | EN2 | 9 | EN2 |
| | 3 | VIN | PG | PG | 8 | PG |
| LX1 | 4 | LX1 | LX2 | LX2 | 7 | LX2 |
| | 5 | NC | SYNCH | 6 | SYNC | |
| | 11 | EP | | | | |

ISL8088IRZ

VIN
R1
100K

2.2UH
L1

2.2UH
L2

VOUT1
VOUT1

VOUT1

VOUT2
VOUT2

VOUT2

SYNC
SYNC
R11
0
SYNC
S1
3 PFM
1 PWM

C9
OPEN

VOUT1_S
VOUT1_S

C7
OPEN
C2
10UF
R14
20

R13
20
C4
10UF
C6
OPEN

VOUT2_S
VOUT2_S

C3
10PF
R2
316K

R5
200K
C5
10PF

PGND2
PGND

SGND
SGND

PGND
PGND1

R3
100K

R6
100K

PG

VIN
R4
100K
EN1
2
S2
3 ON/EX
1 OFF

VIN
R7
100K
EN2
2
S3
3 ON/EX
1 OFF

VIN
R10
2K
R9
OPEN
D2

PG
PG

2N7002
Q2

EN1
EN1

EN2
EN2

NOTE:

PLEASE KEEP FB1, FB2 PINS TRACES SHORT

**TABLE 2. BILL OF MATERIALS**

| PART NUMBER | QTY | UNIT | REFERENCE DESIGNATOR | DESCRIPTION | MANUFACTURER | MANUFACTURER PART |
|---|---|---|---|---|---|---|
| ISL8088EVAL1ZREVAPCB | 1 | ea | | PWB-PCB, ISL8088EVAL1Z, REVA, ROHS | TITAN | ISL8088EVAL1ZREVAPCB |
| H1045-00100-50V5-T | 2 | ea | C3, C5 | CAP, SMD, 0603, 10pF, 50V, 5%, COG, ROHS | YAGEO | CC0603JRNP09BN100 |
| | | | | | VENKEL | C0603COG500-100JNE |
| | | | | | KEMET | C0603C100J5GACTU |
| | | | | | MURATA | GRM1885C1H100JA01D |
| | | | | | AVX | 06035A100JAT2A |
| H1045-DNP | 0 | ea | C9 | CAP, SMD, 0603, DNP-PLACE HOLDER, ROHS | | |
| H1046-00106-6R3V10-T | 3 | ea | C1, C2, C4 | CAP, SMD, 0805, 10µF, 6.3V, 10%, X5R, ROHS | VENKEL | C0805X5R6R3-106KNE |
| | | | | | KEMET | C0805C106K9PACTU |
| | | | | | AVX | 08056D106KAT2A |
| | | | | | MURATA | GRM21BR60J106KE19L |
| | | | | | TAIYO YUDEN | JMK212BJ106KG |
| H1046-DNP | 0 | ea | C6 to C8 | CAP, SMD, 0805, DNP-PLACE HOLDER, ROHS | | |
| MDT2520-CR2R2M | 2 | ea | L1, L2 | COIL-PWR INDUCTOR, SMD, 2520, 2.2µH, 20%, 1.35A, ROHS | TOKO | MDT2520-CR2R2M |
| 1514-2 | 6 | ea | PGND, PGND1, PGND2, VIN, VOUT1,VOUT2 | CONN-TURRET, TERMINAL POST, TH, ROHS | KEYSTONE | 1514-2 |
| 5000 | 4 | ea | EN1, EN2, PG, SYNC | CONN-MINI TEST PT, VERTICAL, RED, ROHS | KEYSTONE | 5000 |
| 5001 | 1 | ea | SGND | CONN-MINI TEST PT, VERTICAL, BLK, ROHS | KEYSTONE | 5001 |
| LTST-C170CKT | 1 | ea | D2 | LED-GaAs RED, SMD, 2mmx1.25mm, 100mW, 40mA, 10mcd, ROHS | LITEON/VISHAY | LTST-C170CKT |
| | | | | | ROHM | SML-210LTT86 |
| | | | | | STANLEY ELEC. | BR112H-TR |
| ISL8088IRZ | 1 | ea | U1 | IC-DUAL SYNC. BUCK REGULATOR, 10P, DFN, 3X3, ROHS | INTERSIL | ISL8088IRZ |
| 2N7002-T | 1 | ea | Q2 | TRANSISTOR, N-CHANNEL, 3LD, SOT-23, 60V, 115mA | NAT'L SEMICNDTR | 2N7002 |
| | | | | | MOTOROLA | 2N7002LT1 |
| H2511-00200-1/10W1-T | 2 | ea | R13, R14 | RES, SMD, 0603, 20Ω, 1/10W, 1%, TF, ROHS | PANASONIC | ERJ-3EKF20R0V |
| | | | | | YAGEO | RC0603FR-0720RL |
| | | | | | VENKEL | CR0603-10W-20R0FT |
| H2511-00R00-1/10W-T | 1 | ea | R11 | RESISTOR, SMD, 0603, 0Ω, 1/10W, TF, ROHS | | |
| H2511-01003-1/10W1-T | 5 | ea | R1, R3, R4, R6, R7 | RES, SMD, 0603, 100k, 1/10W, 1%, TF, ROHS | | |
| H2511-02001-1/10W1-T | 1 | ea | R10 | RES, SMD, 0603, 2k, 1/10W, 1%, TF, ROHS | KOA | RK73H1JTTD2001F |
| | | | | | VENKEL | CR0603-10W-2001FT |

### TABLE 2. BILL OF MATERIALS (Continued)

| PART NUMBER | QTY | UNIT | REFERENCE DESIGNATOR | DESCRIPTION | MANUFACTURER | MANUFACTURER PART |
|---|---|---|---|---|---|---|
| H2511-02003-1/10W1-T | 1 | ea | R5 | RES, SMD, 0603, 200k, 1/10W, 1%, TF, ROHS | VENKEL | CR0603-10W-2003FT |
| | | | | | YAGEO | RC0603FR-07200KL |
| | | | | | VISHAY/DALE | CRCW0603200KFKEA |
| | | | | | PANASONIC | ERJ-3EKF2003V |
| | | | | | ROHM | MCR03EZPFX2003 |
| H2511-03163-1/10W1-T | 1 | ea | R2 | RES, SMD, 0603, 316k, 1/10W, 1%, TF, ROHS | PANASONIC | ERJ-3EKF3163V |
| | | | | | VENKEL | CR0603-10W-3163FT |
| | | | | | ROHM | MCR03EZPFX3163 |
| | | | | | YAGEO | RC0603FR-07316KL |
| | | | | | VISHAY/DALE | CRCW0603316KFKEA |
| H2511-DNP | 0 | ea | R9 | RES, SMD, 0603, DNP-PLACE HOLDER, ROHS | | |
| GT11MSCBE-T | 3 | ea | S1 to S3 | SWITCH-TOGGLE, SMD, ULTRAMINI, 1P, SPST MINI | C&K COMPONENTS | GT11MSCKE |

# ISL8088EVAL1Z Board Layout
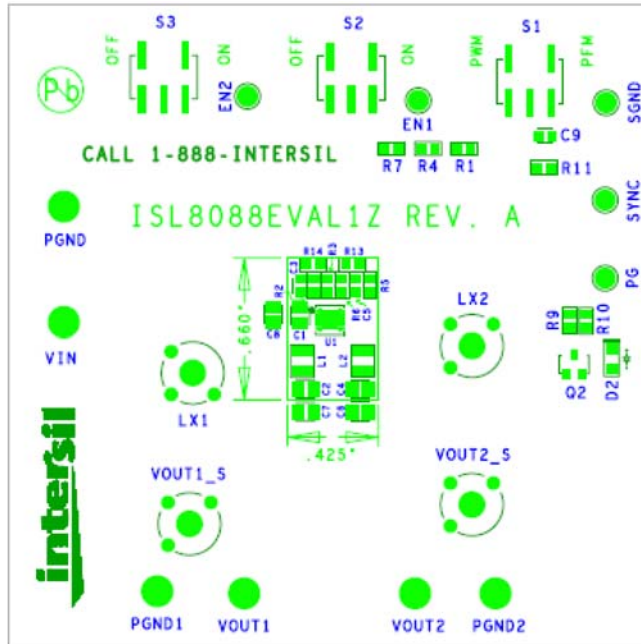


**FIGURE 1. TOP COMPONENTS**
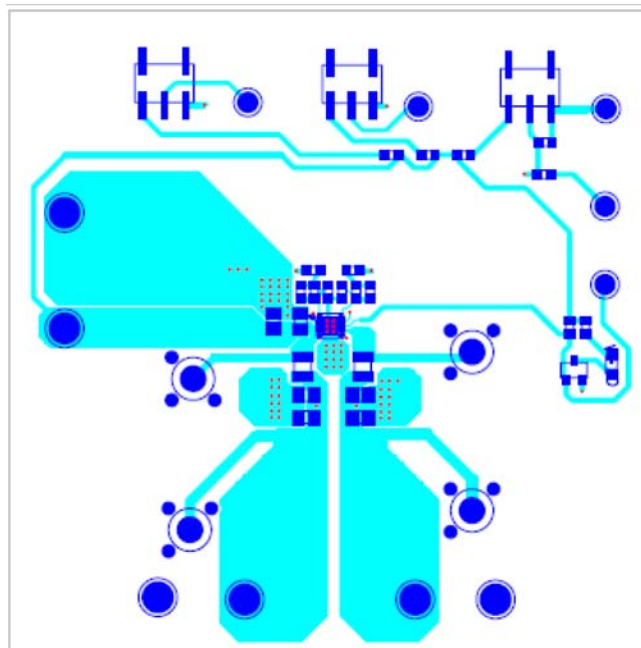


**FIGURE 2. TOP LAYER ETCH**

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## ISL8088EVAL1Z Board Layout (Continued)



**FIGURE 3. 2ND LAYER ETCH**
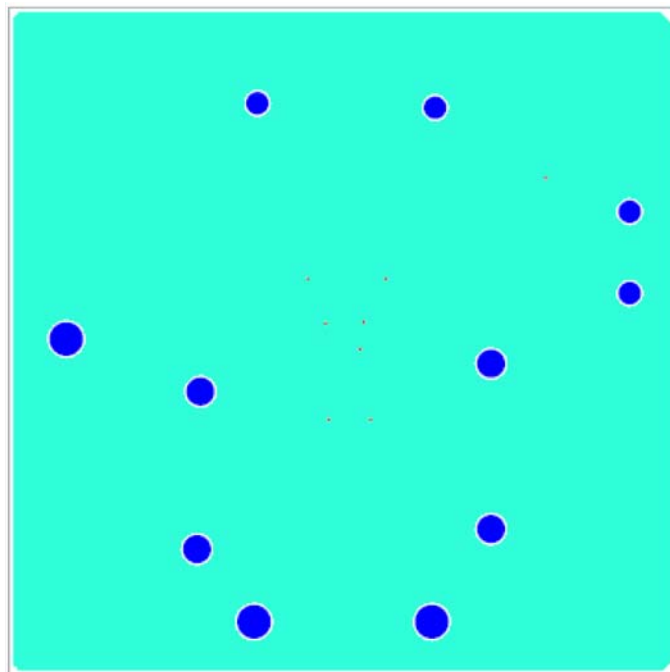


**FIGURE 4. 3RD LAYER ETCH**

## ISL8088EVAL1Z Board Layout (Continued)
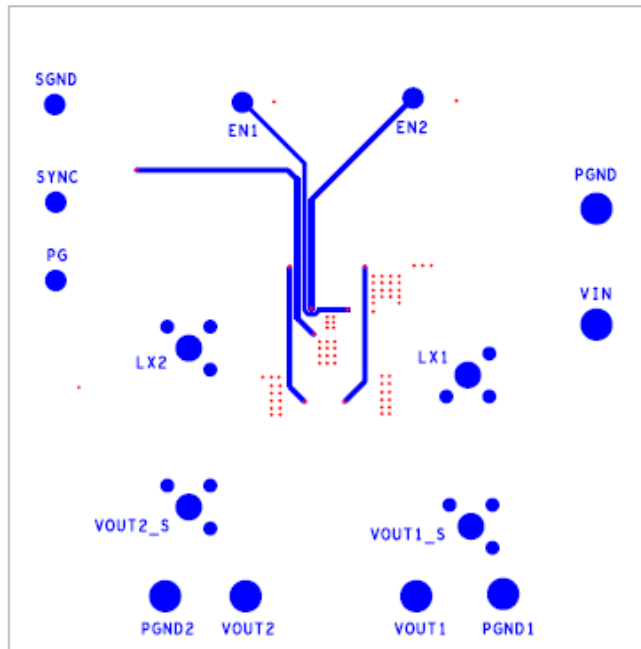


FIGURE 5. BOTTOM LAYER COMPONENTS (MIRRORS)

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