

# ISL8022EVAL1Z Dual 2A/1.7A Low Quiescent Current 2.25MHz High Efficiency Synchronous Buck Regulator

## Description

The ISL8022EVAL1Z kit is intended for use by individuals with requirements for Point-of-Load applications sourcing from 2.8V to 5.5V. The ISL8022EVAL1Z evaluation board is used to demonstrate the performance of the ISL8022 low quiescent current mode converter.

The ISL8022 is offered in a 4mmx3mm 12 Ld DFN package with 1mm maximum height. The complete converter occupies less than 1.8cm<sup>2</sup> area.

## Key Features

- Dual 2A/1.7A High Efficiency Synchronous Buck Regulator with up to 97% Efficiency
- 180° Out-of-Phase
- Power-Goods (PG) Output with 1ms Delay
- 2.8V to 5.5V Supply Voltage
- 3% Output Accuracy Over-temperature/Load/Line
- Start-up with Pre-biased Output
- Internal Digital Soft-Start - 5ms
- Soft-Stop Output Discharge During Disabled
- 40µA Quiescent Supply Current in PFM Mode
- Selectable Forced PWM Mode and PFM Mode
- External Synchronization up to 8MHz
- Typical 6.5µA Logic Controlled Shutdown Current
- 100% Maximum Duty Cycle for Lowest Dropout
- Internal Current Mode Compensation
- Peak Current Limiting, Hiccup Mode Short Circuit Protection and Over-temperature Protection
- Negative Current Detection and Protection

## 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 VIN2, the plus terminal to VIN2 and the negative return to PGND2.
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<sub>OUT1</sub> and 1.8V for V<sub>OUT2</sub>.

## Evaluating the Other Output Voltage

The ISL8022EVAL1Z kit output is preset to 2.5V for V<sub>OUT1</sub> and 1.8V for V<sub>OUT2</sub>; 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/R6 = 100kΩ, then R2/R5 will be:

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

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.

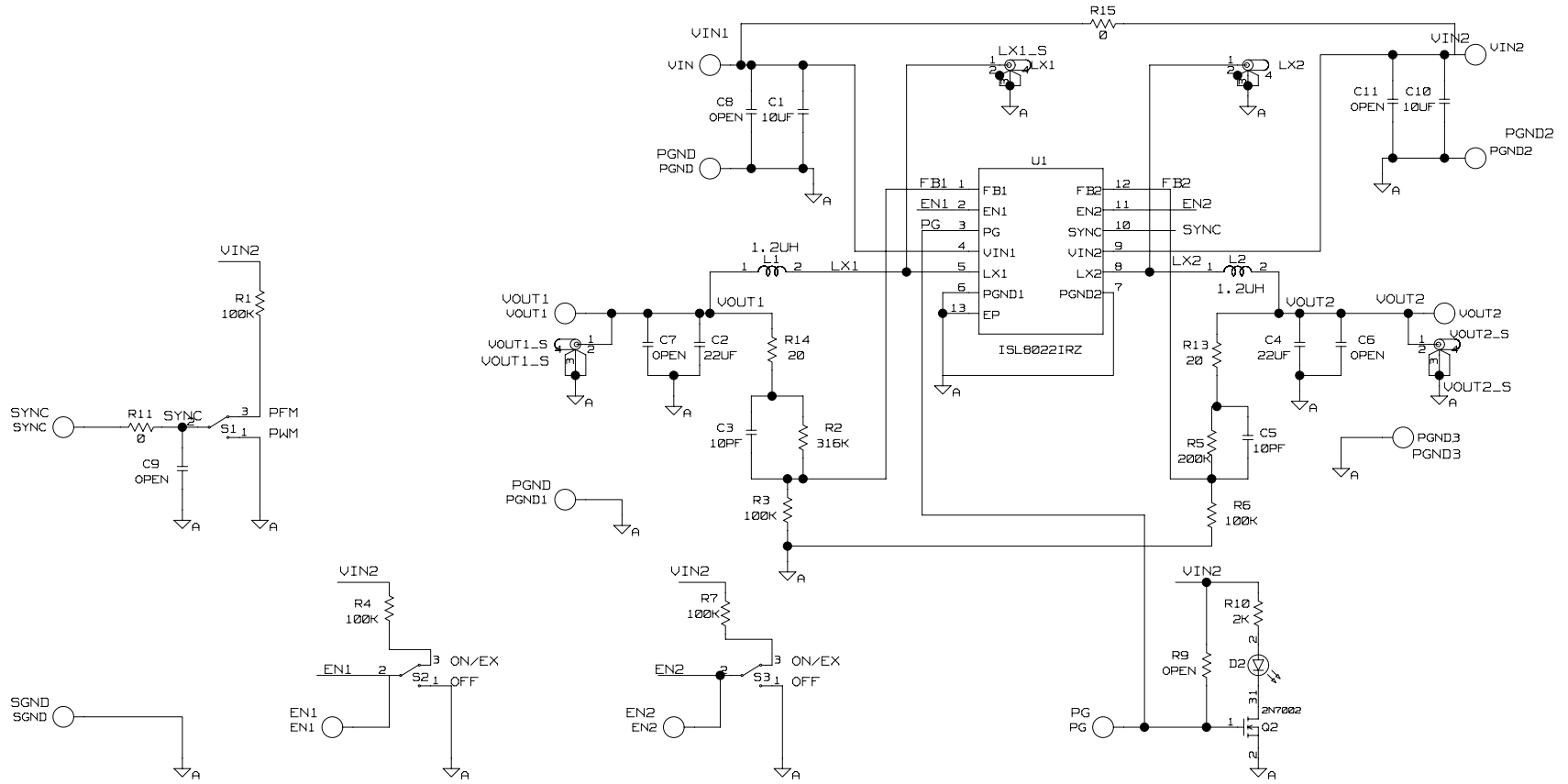
## Mode Control

The ISL8022 has a SYNC pin that controls the operation mode. The SYNC pin connects 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, SW3	ENABLE	ON/OFF CONTROL
1	OFF	Disable V <sub>OUT</sub>
3	ON	Enable V <sub>OUT</sub>
SW1	SKIP	FUNCTION
1	PWM	Fixed PWM frequency at light load
3	PFM	Force continuous mode

# ISL8022EVAL1Z Schematic



NOTE:

PLEASE KEEP FB1, FB2 PINS TRACES SHORT

## Application Note 1554

**TABLE 2. BILL OF MATERIALS**

PART NUMBER	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MANUFACTURER PART
ISL8022EVAL1ZREVAPCB	1	ea		PWB-PCB, ISL8022EVAL1Z, REVA, ROHS	TBD	ISL8022EVAL1ZREVAPCB
C2012X5R0J226M-T	2	ea	C2, C4	CAP, SMD, 0805, 22 $\mu$ F, 6.3V, 20%, X5R, ROHS	TDK	C2012X5R0J226M
H1045-00100-50V5-T	2	ea	C3, C5	CAP, SMD, 0603, 10pF, 50V, 5%, COG, ROHS	YAGEO	CC0603JRNPO9BN100
					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	2	ea	C1, C10	CAP, SMD, 0805, 10 $\mu$ F, 6.3V, 10%, X5R, ROHS	VENKEL	C0805X5R6R3-106KNE
					KEMET	C0805C106K9PACTU
					AVX	08056D106KAT2A
					MURATA	GRM21BR60J106KE19L
					TAIYO YUDEN	JMK212BJ106KD-T
					PANASONIC	ECJ-2FB0J106K
					TDK	C2012X5R0J106K
					JOHANSON DIELECTRICS INC	6R3R15X106KV4E
H1046-DNP	0	ea	C6-C8, C11	CAP, SMD, 0805, DNP-PLACE HOLDER, ROHS		
VLCF-4028T-1R2N2R7-2	2	ea	L1, L2	COIL-PWR INDUCTOR, WW, SMD, 4mm, 1.2 $\mu$ H, 30%, 2.7A, ROHS	TDK	VLCF4028T-1R2N2R7-2
131-4353-00	4	ea	LX1, LX2, VOUT1_S, VOUT2_S *(SEE ASSEMBLY NOTE)	CONN-SCOPE PROBE TEST PT, COMPACT, PCB MNT, ROHS	TEKTRONIX	131-4353-00
1514-2	8	ea	a) PGND, PGND1- PGND3, VIN, VIN2	CONN-TURRET, TERMINAL POST, TH, ROHS	KEYSTONE	1514-2
1514-2	0	ea	b) 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

## Application Note 1554

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

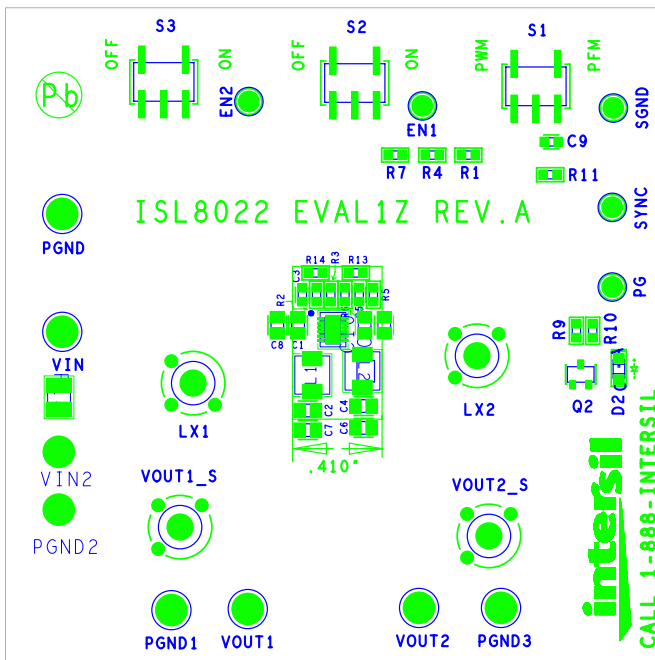
PART NUMBER	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MANUFACTURER PART
LTST-C170CKT	1	ea	D2	LED-GaAs RED, SMD, 2mmX1.25mm, 100mW, 40mA, 10mcd, ROHS	LITEON/VISHAY	LTST-C170CKT
					ROHM	SML-210LTT86
					STANLEY ELECTRIC	BR112H-TR
ISL8022IRZ	1	ea	U1	IC-2A/1.7A BUCK REGULATOR, 12P, DFN, 4X3, ROHS	INTERSIL	ISL8022IRZ
2N7002-7-F-T	1	ea	Q2	TRANSISTOR, N-CHANNEL, 3LD, SOT-23, 60V, 115mA, ROHS	DIODES, INC.	2N7002-7-F
					ON SEMICONDUCTOR	2N7002LT1G
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	RES, SMD, 0603, 0Ω, 1/10W, TF, ROHS	VENKEL	CR0603-10W-000T
					KOA	RK73Z1JTDD-T
					ROHM	MCR03EZPJ000
					PANASONIC	ERJ-3GEY0R00V
					YAGEO	RC0603JR-070RL
					VISHAY/DALE	CRCW06030000Z0EA
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	RK73H1JTDD2001F
					VENKEL	CR0603-10W-2001FT
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		
H2514-00R00-1/4W-T	1	ea	R15	RES, SMD, 1210, 0Ω, 1/4W, TF, ROHS	VENKEL	CR1210-4W-000
GT11MSCBE-T	3	ea	S1-S3	SWITCH-TOGGLE, SMD, 6PIN, SPDT, 2POS, ON-ON, ROHS	ITT INDUSTRIES/C&K DIVISION	GT11MSCBE

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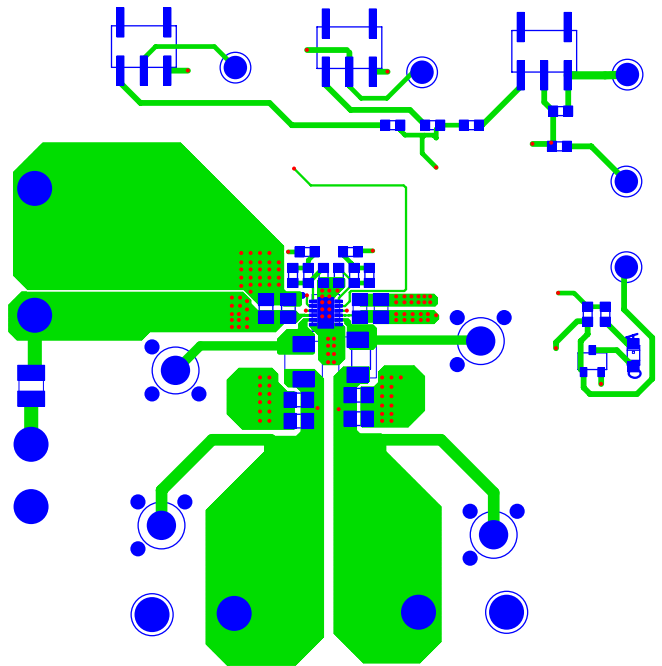
**TABLE 2. BILL OF MATERIALS (Continued)**

PART NUMBER	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MANUFACTURER PART
SJ-5003-BLACK	4	ea	Bottom four corners	BUMPONS, 0.44' W x 0.20' H, DOMETOP, BLACK	3M	SJ-5003SPBL
5X8-STATIC-BAG	1	ea	Place assy in bag	BAG, STATIC, 5X8, ZIP LOC	INTERSIL	212403-013
ASSEMBLY-NOTE	1	ea	a) LX1, LX2, VOUT1_S, VOUT2_S - Install	ASSEMBLY NOTE		
ASSEMBLY-NOTE	0	ea	b) on bottom of PCB	ASSEMBLY NOTE		

## ISL8022EVAL1Z Board Layout



**FIGURE 1. TOP COMPONENTS**



**FIGURE 2. TOP LAYER ETCH**

ISL8022EVAL1Z Board Layout (Continued)

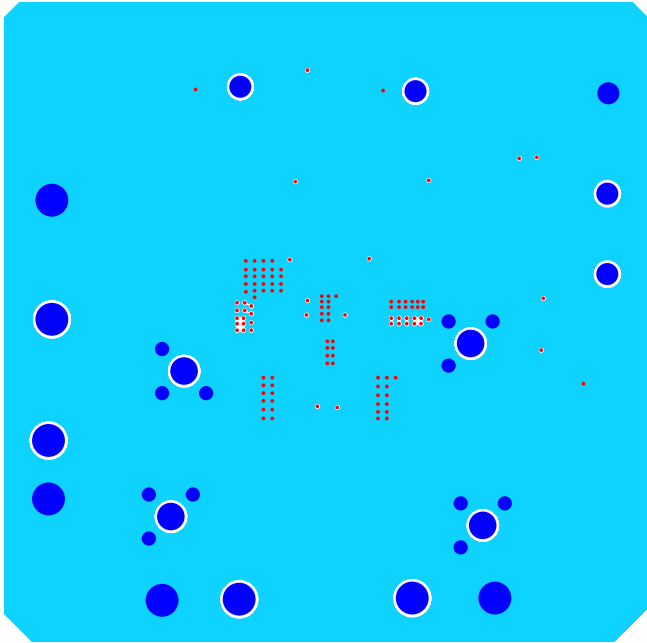


FIGURE 3. 2ND LAYER ETCH

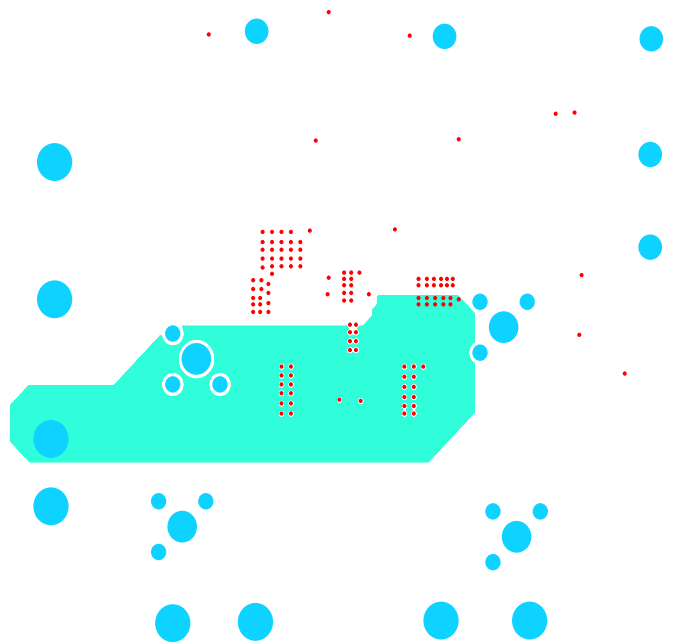


FIGURE 4. 3RD LAYER ETCH

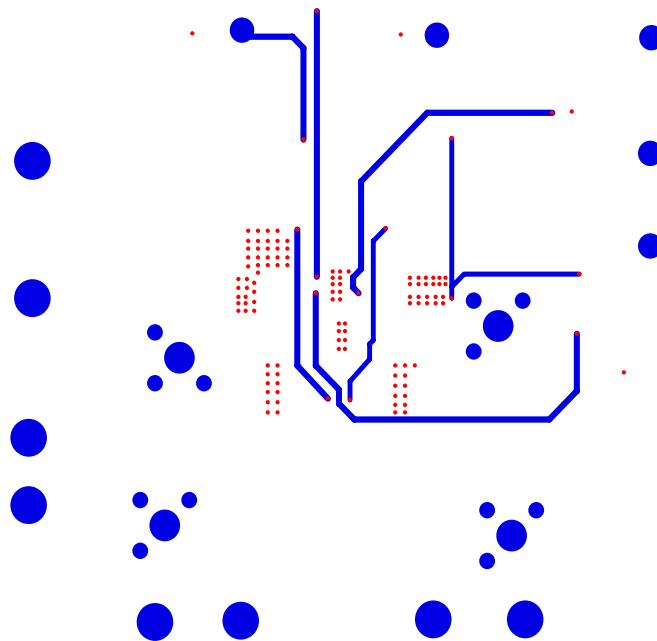


FIGURE 5. BOTTOM LAYER COMPONENTS (MIRRORS)

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