The ISL8009 is an integrated power controller rate for 1.5A, 1.6MHz step-down regulator that is ideal for any low power, low-voltage applications. It is optimized for generating low output voltages down to 0.8V. The supply voltage range is from 2.7V to 5.5V, allowing for the use of a single Li+ cell, three NiMH cells or a regulated 5V input. It has a guaranteed minimum output current of 1.5A. 1.6MHz pulse-width modulation (PWM) switching frequency allows for using small external components. It has flexible operation mode selection of forced PWM mode and PFM mode with as low as 17µA quiescent current for highest light load efficiency to maximize battery life.

The ISL8009 includes a pair of low on-resistance P-Channel and N-Channel internal MOSFETs to maximize efficiency and minimize external component count. 95% duty-cycle operation allows less than 400mV dropout voltage at 1.5A.

The ISL8009 offers a 200ms Power-On-Reset (POR) timer at power-up. The timer output can be reset by RSI. When shutdown, ISL8009 soft discharges the output capacitor thru 100Ω resistor. Other features include internal digital soft-start, enable for power sequence, overcurrent protection, and thermal shutdown.

The ISL8009 is offered in a 2mmx3mm 8 Ld DFN package with 1mm maximum height. The complete converter occupies less than 1cm^2 area.

Ordering Information

PART NUMBER (Note)	PART MARKING	TEMP. RANGE (°C)	PACKAGE (Pb-free)	PKG. DWG. #
ISL8009IRZ-T	009	-40 to +85	8 Ld 2x3 DFN	L8.2x3

NOTE: Intersil Pb-free plus anneal products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which are RoHS compliant and compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.

Features

- High Efficiency Synchronous Buck Regulator With Up To 95% Efficiency
- 200ms Reset Timer
- Soft Discharge Output Cap During Disable
- 2.7V to 5.5V Supply Voltage
- 3% Output Accuracy Over-Temperature/Load/Line
- 1.5A Guaranteed Output Current
- 17µA Quiescent Supply Current in PFM Mode
- Selectable Forced PWM Mode and PFM Mode
- Less Than 1µA Logic Controlled Shutdown Current
- 90% Maximum Duty Cycle for Lowest Dropout
- Internal Current Mode Compensation
- Internal Digital Soft-Start
- Peak Current Limiting, Short Circuit Protection
- Over-Temperature Protection
- Enable
- Small 8 Ld 2mmx3mm DFN
- Pb-Free Plus Anneal Available (RoHS Compliant)

Applications

- DC/DC POL Modules
- µC/µP, FPGA and DSP Power
- Plug-in DC/DC Modules for Routers and Switchers
- Portable Instruments
- Test and Measurement Systems

Pinout

ISL8009
(8 LD DFN)
TOP VIEW

VIN 1 | 8 LX
EN 2 | 7 GND
POR 3 | 6 VFB
SKIP 4 | 5 RSI
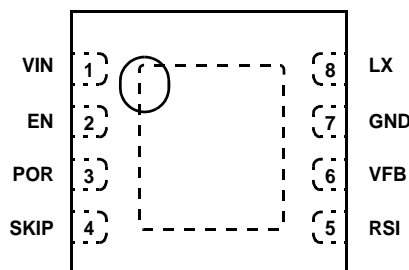
What's Inside

The Evaluation Board Kit contains the following materials:

• The ISL8009EVAL1Z Rev D board

• The ISL8009 datasheet

• This EVAL KIT document

Recommended Equipment

The following materials are recommended to perform testing:

• 0V to 10V power supply with at least 5A source current capability, battery, notebook AC adapter

• Two Electronic Loads capable of sinking current up to 5A

• 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 P4(VIN) and negative return to P5(GND).
3. Verify that position is ON for SW1.
4. Turn on the power supply.
5. Verify the output voltages is 1.8V for V_{OUT}

Evaluating the Other Output Voltage

The ISL8009EVAL kit output is preset to 1.8V; however, output voltages can be adjusted from 0.8V to 3.3V by Equations 1 and 2:

$$V_{OUT} = 0.8\left(1 + \frac{R_1}{R_2}\right) \tag{EQ. 1}$$

Let's set $R_1 = 124k\Omega$

$$R_2 = \frac{(R_1)}{\left(\frac{V_{OUT}}{0.8}\right) - 1} \tag{EQ. 2}$$

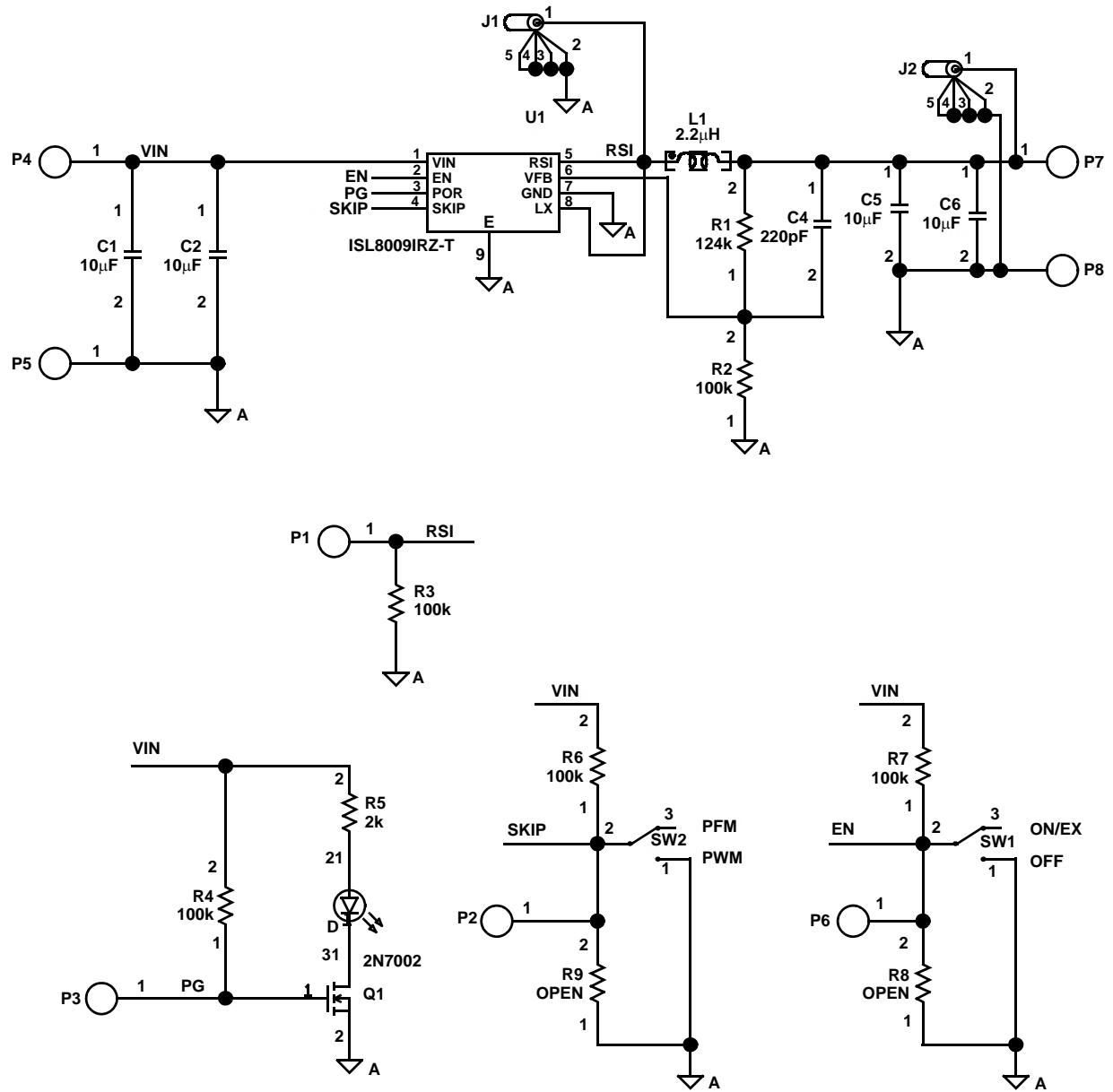*If desire output is 0.8V then short R_1 and open R_2.*

Mode Control

The ISL8009 has a SKIP pin that controls the operation mode. When the SKIP pin is driven to low or shorted to ground, the regulator operates in a forced PWM mode. The forced PWM mode remains the fixed PWM frequency at light load instead of entering the skip mode.

TABLE 1. SWITCH 1 SETTINGS

SW1	SKIP	FUNCTION
1	PWM	Fixed PWM frequency at light load
3	PFM	Force continous mode
SW2	ENABLE	ON/OFF CONTROL
1	OFF	Disable V_{OUT}
3	ON	Enable V_{OUT}

Schematic

J1
1
5 4 3 2
U1
A

J2
1
5 4 3 2

L1
2.2µH

P4 1 VIN

ISL8009IRZ-T

1 VIN   RSI 5   RSI
2 EN   VFB 6
3 PG POR GND 7
4 SKIP SKIP LX 8
E
9
A

EN
PG
SKIP

C1
10µF
1
2

C2
10µF
1
2

P5 1

A

R1
124k
1
2

C4
220pF
1
2

R2
100k
1
2
A

C5
10µF
1
2

C6
10µF
1
2

P7 1

P8 1

A

P1 1   RSI

R3
100k
2
A

VIN

R4
100k
2
1

P3 1 PG

R5
2k
2
21

D

31
Q1
2N7002
2
A

VIN
2

R6
100k
1

SKIP 2

SW2
3 PFM
1 PWM

P2 1
2

R9
OPEN
1
A

VIN
2

R7
100k
1

EN 2

SW1
3 ON/EX
1 OFF

P6 1
2

R8
OPEN
1
A

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TABLE 2. COMPONENT LIST

| REF DES	QTY	VALUE	TOL.	VOLTAGE	PACKAGE	PART NUMBER	MANUFACTURER	DESCRIPTION
C1, C2, C5, C6	4	10μF	10%	10V	1206	GRM31CR71A106KA01L-T	MURATA	CAP, SMD, 1206, 10μF, 10V, 10%, X7R, ROHS, MONOLITHIC
C4	1	220pF	5%	50V	0603	H1045-00221-50V5-T	VENKEL	CAP, SMD, 0603, 220pF, 50V, 5%, C0G, ROHS
L1	1	2.2μH	20%		7.6x6	DR73-2R2-R	COOPER ELECTRONIC TECH.	COIL-PWR INDUCTOR, SMD, 7.6x6, 2.2μH, 20%, 4.15A, ROHS
D1	1				2mmx1.25mm	LTST-C170CKT	LITEON/VISHAY	LED-GaAs RED, SMD, 2mmx1.25mm, 100mW, 40mA, 10mcd, ROHS
U1	1				2x3	ISL8009IRZ	INTERSIL	IC-1.5A SYNC BUCK REGULATOR, 8P, DFN, 2x3, ROHS
Q1	1		-	60V	N-CHANNEL	2N7002-7-F-T	DIODES, INC.	TRANSISTOR, N-CHANNEL, 3 LD SOT-23, 60V, 115mA, ROHS
R2-R4, R6, R7	5	100k	1%	100V	0603	H2511-01003-1/10W1-T		RES, SMD, 0603, 100k, 1/10W, 1%, TF, ROHS
R1	1	124k	1%	100V	0603	H2511-01243-1/10W1-T	YAGEO	RES,SMD,0603, 124K,1/10W,1%, TF,ROHS
R5	1	2k	1%	100V	0603	H2511-02001-1/10W1-T	KOA	RES, SMD, 0603, 2k, 1/10W, 1%, TF, ROHS
R8, R9	0			100V	0603	H2511-DNP		RES, SMD, 0603, DNP-PLACE HOLDER, ROHS
SW1, SW2	2	-	-	-	-	GT11MSCBE-T	C&K COMPONENTS	SWITCH-TOGGLE, SMD, ULTRAMINI, 1P, SPST MINI

ISL8009EVAL1Z Board Layout
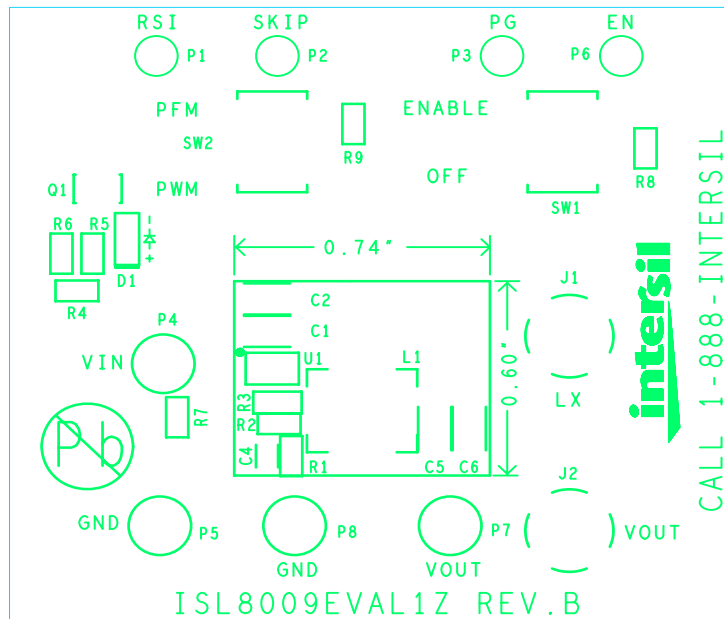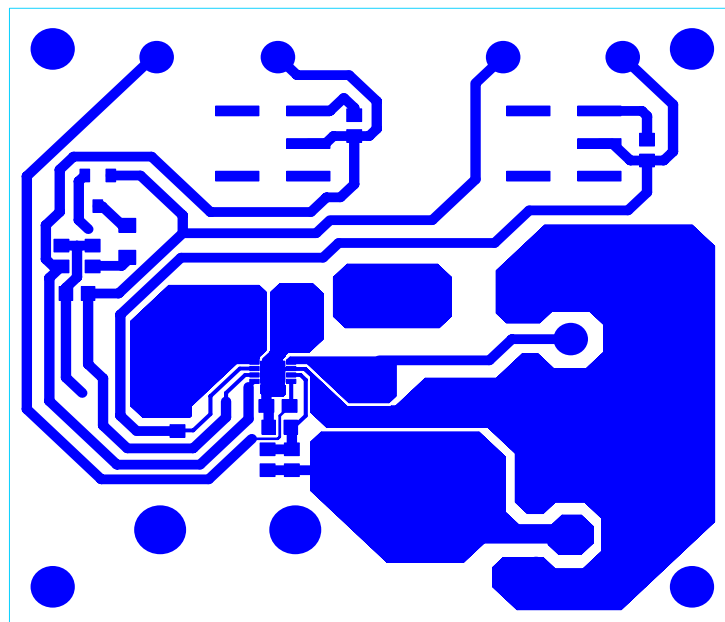

FIGURE 1. TOP COMPONENTS

FIGURE 2. TOP LAYER ETCH
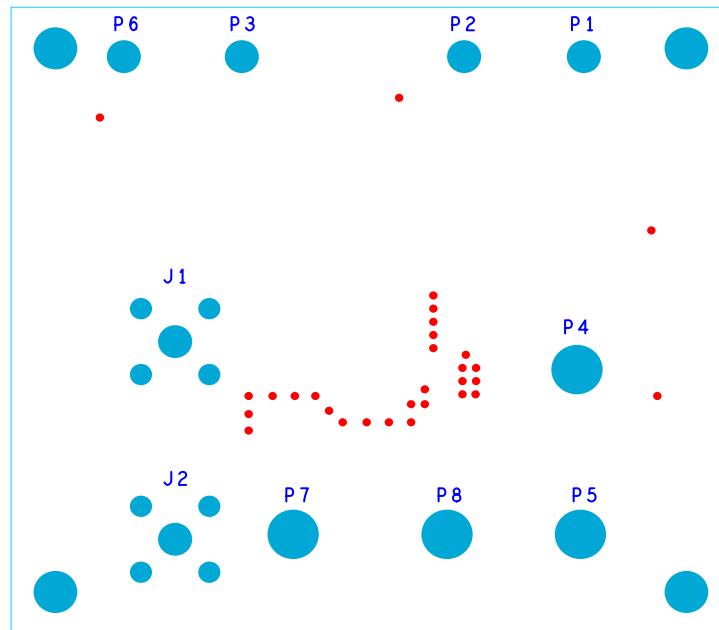
ISL8009EVAL1Z Board Layout (Continued)
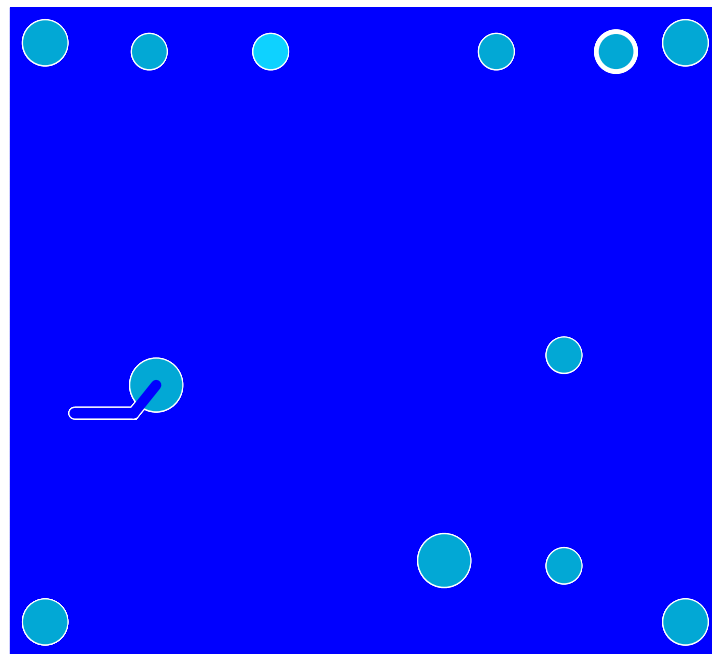

FIGURE 3. BOTTOM LAYER COMPONENTS (MIRRORED)

FIGURE 4. BOTTOM LAYER ETCH (MIRRORED)

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