

ISL8036ACRSHEVAL1Z

Current Sharing 6A Low Quiescent Current High Efficiency Synchronous Buck Regulator

AN1615
Rev 0.00
Nov 29, 2010

Description

The ISL8036ACRSHEVAL1Z kit is intended for use by individuals with requirements for Point-of-Load applications sourcing from 2.85V to 6V. The ISL8036ACRSHEVAL1Z evaluation board is used to demonstrate the performance of the ISL8036A low quiescent current mode converter in current sharing configuration.

The ISL8036A is offered in a 4mmx4mm 24 Ld QFN package with 1mm maximum height. The complete converter occupies less than 5.46cm² area.

Key Features

- Current Sharing 6A High Efficiency Synchronous Buck Regulator with up to 95% Efficiency
- 180° Out-of-Phase Providing Low Output Noise
- Power-Goods (PG) Output with 1ms Delay
- 2.85V to 6V Supply Voltage
- 2% Output Accuracy Over-temperature/Load/Line
- Start-up with Pre-biased Output
- Externally Adjustable Soft-Start Time
- Soft-Stop Output Discharge During Disabled
- External Synchronization up to 6MHz
- Typical 8µA Logic Controlled Shutdown Current
- 100% Maximum Duty Cycle for Lowest Dropout
- External 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 7A source current capability or 5V battery
- Electronic Loads capable of sinking current up to 7A
- 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 VIN1, the plus terminal to VIN1 and the negative return to PGND1.
3. Verify that position is ON for SW2 and SW3.
4. Turn on the power supply.
5. Verify the output voltage is 1.8V for V_{OUT1}, V_{OUT2}.

Evaluating the Other Output Voltage

The ISL8036ACRSHEVAL1Z kit output is preset to 1.8V (V_{OUT1} = V_{OUT2}); however, output voltage can be adjusted from 0.8V to 3.3V. The output voltage programming resistor, RF22, 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 RF21 = 100kΩ, then RF22 will be:

$$RF22 = RF21 \left(\frac{V_{OUT}}{V_{FB}} - 1 \right) \quad (\text{EQ. 1})$$

If the output voltage desired is 0.8V, then RF21 should be left unpopulated and RF22 should be shorted. For faster response performance, add 68pF in parallel to RF22.

Mode Control

The ISL8036A has a SYNC pin, which connects to logic high or input voltage VIN for PWM internal synchronization. Connect to an external function generator for external Synchronization. Negative edge trigger. Do not leave this pin floating. Do not tie this pin low (or to GND)

Enable Control

EN1 and EN2 pins should be tied together for current sharing operation.

TABLE 1. SWITCH SETTINGS

SW2, SW3	ENABLE	ON/OFF CONTROL
1	OFF	Disable V _{OUT}
3	ON	Enable V _{OUT}

ISL8036ACRSHEVAL1Z Schematic

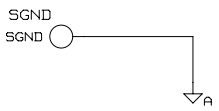
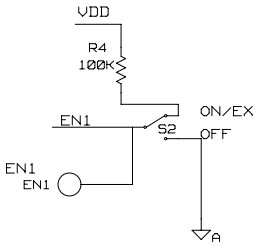
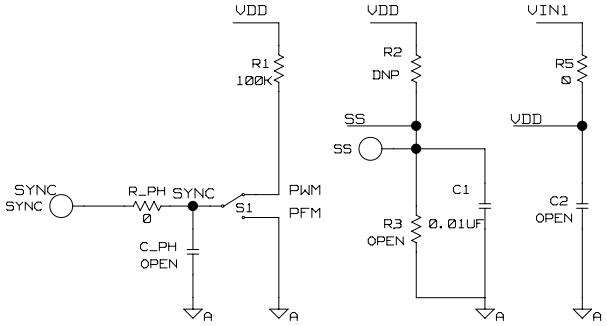
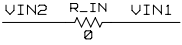
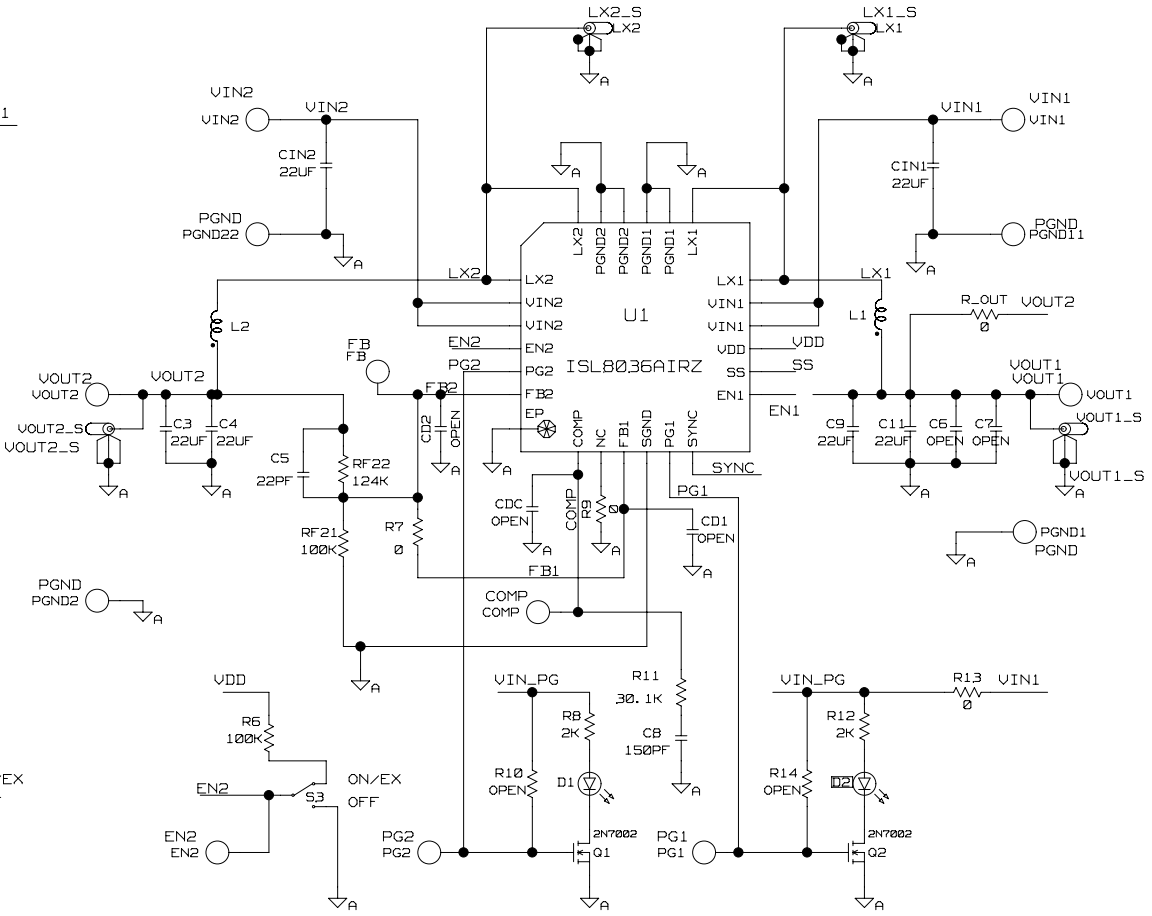


TABLE 2. BILL OF MATERIALS

PART NUMBER	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MANUFACTURER PART
ISL8033_36EVAL1ZREVAPCB	1	ea	SEE LABEL-RENAME BOARD	PWB-PCB, ISL8033_36EVAL1Z, REVA, ROHS	TBD	ISL8033_36EVAL1ZREVAPCB
C2012X5R0J226M-T	6	ea	C3, C4, C9, C11, CIN1, CIN2	CAP, SMD, 0805, 22μF, 6.3V, 20%, X5R, ROHS	TDK	C2012X5R0J226M
H1045-00103-50V5-T	1	ea	C1	CAP, SMD, 0603, 0.01μF, 50V, 5%, X7R, ROHS	VENKEL	C0603X7R500-103JNE
					KEMET	C0603C103J5RACTU
					AVX	06035C103JAT2A
					TDK	C1608X7R1H103J
H1045-00151-50V5-T	1	ea	C8	CAP, SMD, 0603, 150pF, 50V, 5%, NPO, ROHS	PANASONIC VENKEL	ECJ-1VC1H151J C0603C0G500-151JNE
H1045-00220-50V5-T	1	ea	C5	CAP, SMD, 0603, 22pF, 50V, 5%, COG, ROHS	VENKEL	C0603C0G500-220JNE
					KEMET	C0603C220J5GACTU
					TDK	C1608C0G1H220J
					MURATA	GRM1885C1H220JA01D
ROHM						MCH185A220JK
H1045-DNP	0	ea	C2, C10, CD1, CD2, CDC, C_PH	CAP, SMD, 0603, DNP-PLACE HOLDER, ROHS		
H1046-DNP	0	ea	C6, C7	CAP, SMD, 0805, DNP-PLACE HOLDER, ROHS		
FDV0630-R60M	2	ea	L1,L2	COIL-PWR INDUCTOR, SMD, 7.4X6.7, 0.6μH, 20%, ROHS	TOKO	FDV0630-R60M
131-4353-00	4	ea	LX1, LX2, VOUT1_S, VOUT2_S	CONN-SCOPE PROBE TEST PT, COMPACT, PCB MNT, ROHS	TEKTRONIX	131-4353-00
1514-2	8	ea	a) PGND1, PGND2, PGND11, PGND22, VIN1, 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	6	ea	a) EN1, EN2, PG1, PG2, SS, SYNC	CONN-MINI TEST PT, VERTICAL, RED, ROHS	KEYSTONE	5000
5000	0	ea	b) SYNC located left of C_PH	CONN-MINI TEST PT, VERTICAL, RED, ROHS	KEYSTONE	5000
5001	1	ea	SGND	CONN-MINI TEST PT, VERTICAL, BLK, ROHS	KEYSTONE	5001
5002	2	ea	COMP, FB	CONN-MINI TEST POINT, VERTICAL, WHITE, ROHS	KEYSTONE	5002
LTST-C170CKT	2	ea	D1, D2	LED-GaAs RED, SMD, 2mmX1.25mm, 100mW, 40mA, 10mcd, ROHS	LITEON/VISHAY	LTST-C170CKT
					ROHM	SML-210LTT86
					STANLEY ELECTRIC	BR112H-TR
ISL8036AIRZ	1	ea	U1	IC-DUAL 3A CONTROLLER, 2.5MHz, 24P, QFN ,4X4, ROHS	INTERSIL	ISL8036AIRZ

TABLE 2. BILL OF MATERIALS (Continued)

PART NUMBER	QTY	UNITS	REFERENCE DESIGNATOR	DESCRIPTION	MANUFACTURER	MANUFACTURER PART
2N7002-7-F-T	2	ea	Q1, Q2	TRANSISTOR,N-CHANNEL, 3 LD, SOT-23, 60V, 115mA, ROHS	DIODES, INC.	2N7002-7-F
					ON SEMICONDUCTOR	2N7002LT1G
H2509-00R00-1/20W-T	1	ea	R9	RESISTOR, SMD, 0201, 0Ω, 1/20W, 0%, TF	PANASONIC	H2509-00R00-1/20W-T
H2511-00R00-1/10W-T	4	ea	R7, R5, R13, R_PH	RES, SMD, 0603, 0Ω, 1/10W, TF, ROHS	VENKEL	CR0603-10W-000T
					ROHM	MCR03EZPJ000
					PANASONIC	ERJ-3GEYOR00V
					YAGEO	RC0603JR-070RL
					VISHAY/DALE	CRCW06030000Z0EA
H2511-01003-1/10W1-T	3	ea	R1, R4, R6	RES, SMD, 0603, 100k, 1/10W, 1%, TF, ROHS	VENKEL	CR0603-10W-1003FT
					PANASONIC	ERJ-3EKF1003V
					ROHM	MCR03EZPFX1003
					YAGEO	RC0603FR-07100KL
					STACKPOLE	RMCF 1/16 100K 1% R
					VISHAY/DALE	CRCW0603100KFKEA
H2511-01003-1/10W1-T	1	ea	RF21	RES, SMD, 0603, 100k, 1/10W, 1%, TF, ROHS	VENKEL	CR0603-10W-1003FT
					PANASONIC	ERJ-3EKF1003V
					ROHM	MCR03EZPFX1003
					YAGEO	RC0603FR-07100KL
					STACKPOLE	RMCF 1/16 100K 1% R
					VISHAY/DALE	CRCW0603100KFKEA
H2511-01243-1/10W1-T	1	ea	RF22	RES, SMD, 0603, 124k, 1/10W, 1%, TF, ROHS	YAGEO	9C06031A1243FKHFT
					PANASONIC	ERJ-3EK1243V
H2511-02001-1/10W1-T	2	ea	R8, R12	RES, SMD, 0603, 2k, 1/10W, 1%, TF, ROHS	KOA VENKEL	RK73H1JT2D2001F CR0603-10W-2001FT
H2511-03012-1/10W1-T	1	ea	R11	RESISTOR, SMD, 0603, 30.1k, 1/10W, 1%, TF, ROHS	VENKEL	CR0603-10W-3012FT
					YAGEO	RC0603FR-0730K1L
H2511-DNP	0	ea	R2, R3, R10, R14, RF11, RF12	RES, SMD, 0603, DNP-PLACE HOLDER, ROHS		
H2514-00R00-1/4W-T	2	ea	R_IN, R_OUT	RES, SMD, 1210, 0Ω, 1/4W, TF, ROHS	VENKEL	CR1210-4W-000
GT11MSCBE-T	3	ea	S1-S3	SWITCH-TOGGLE, SMD, 6 PIN, SPDT, 2POS, ON-ON, ROHS	ITT INDUSTRIES/ C&K DIVISION	GT11MSCBE
SJ-5003-BLACK	4	ea	Bottom four corners	BUMPONS, 0.44"Wx0.20"H, DOMETOP, BLACK	3M	SJ-5003SPBL
5X8-STATIC-BAG	1	ea	Place assy in bag	BAG, STATIC, 5X8, ZIPLOC, ROHS	INTERSIL	212403-013
LABEL-RENAME BOARD	1	ea	RENAME PCB TO: ISL8036ACRSHEVAL1Z	LABEL, TO RENAME BOARD	INTERSIL	LABEL-RENAME BOARD
LABEL-SERIAL NUMBER	1	ea		LABEL-FOR SERIAL NUMBER AND BOM REV #	INTERSIL	LABEL-SERIAL NUMBER

ISL8036ACRSHEVAL1Z Board Layout

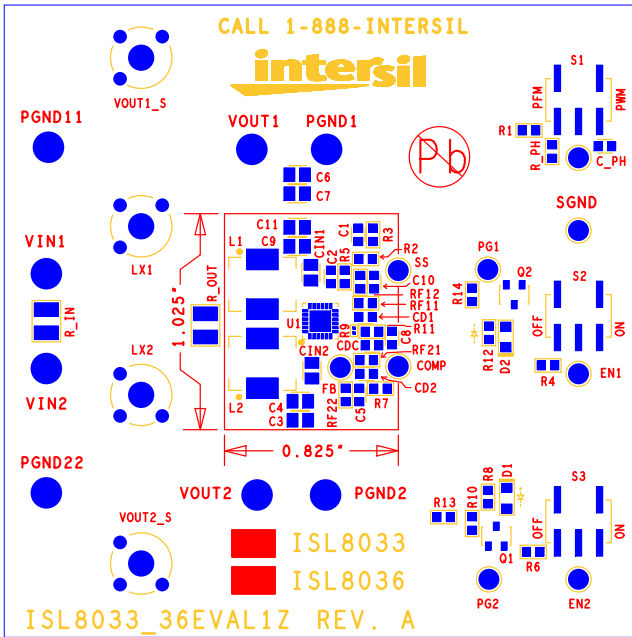


FIGURE 1. TOP COMPONENTS

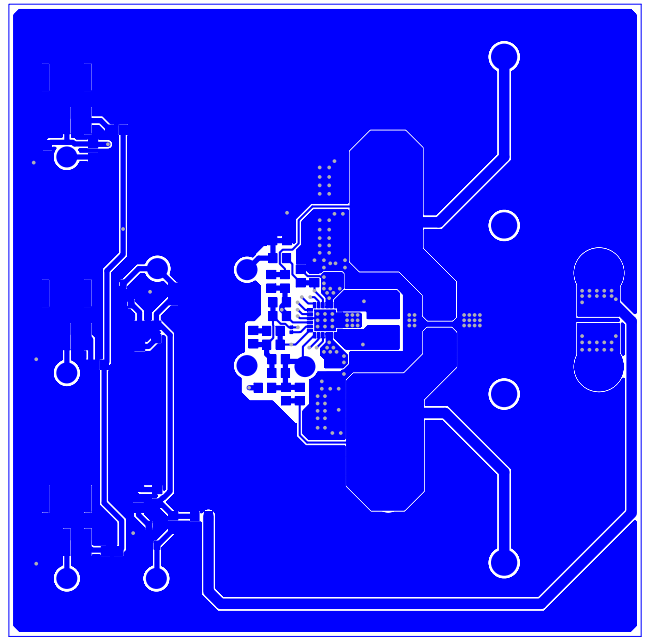


FIGURE 2. TOP LAYER ETCH

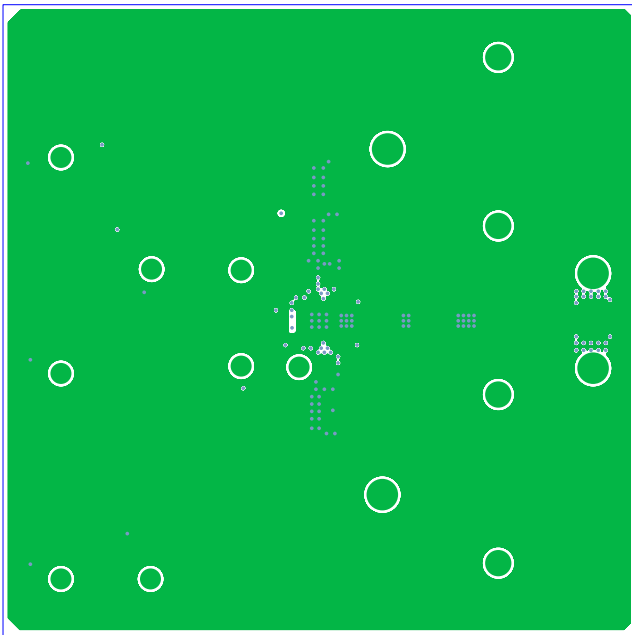


FIGURE 3. 2ND LAYER ETCH

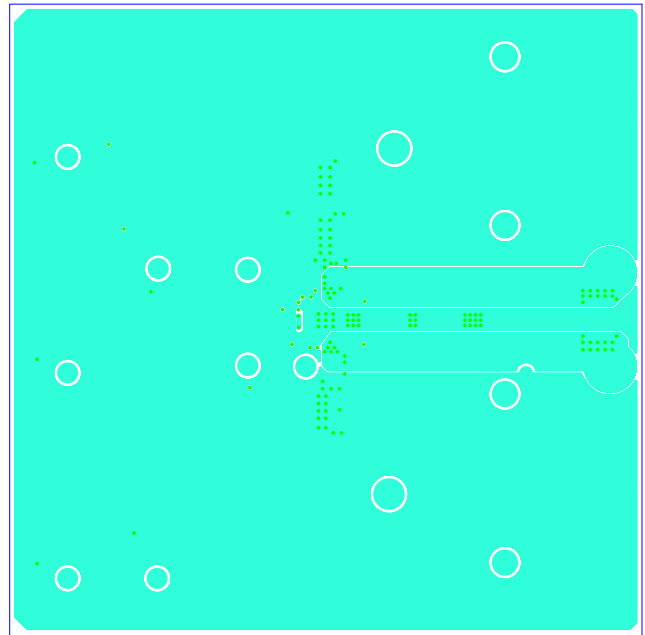


FIGURE 4. 3RD LAYER ETCH

ISL8036ACRSHEVAL1Z Board Layout (Continued)

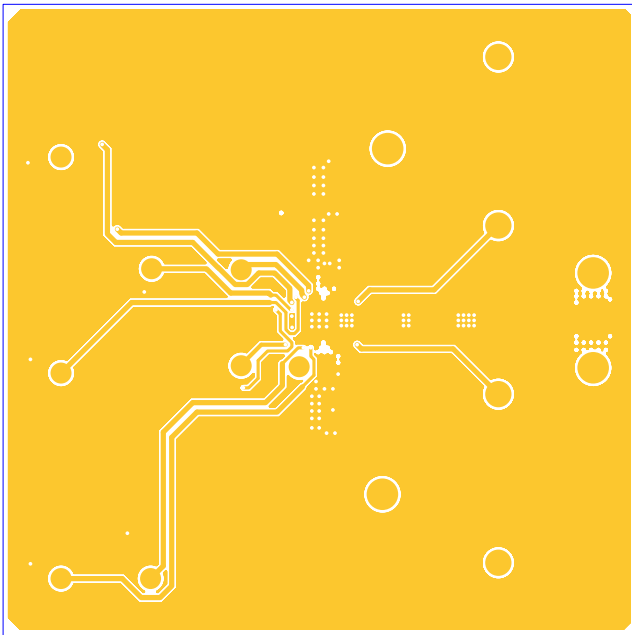


FIGURE 5. BOTTOM LAYER ETCH

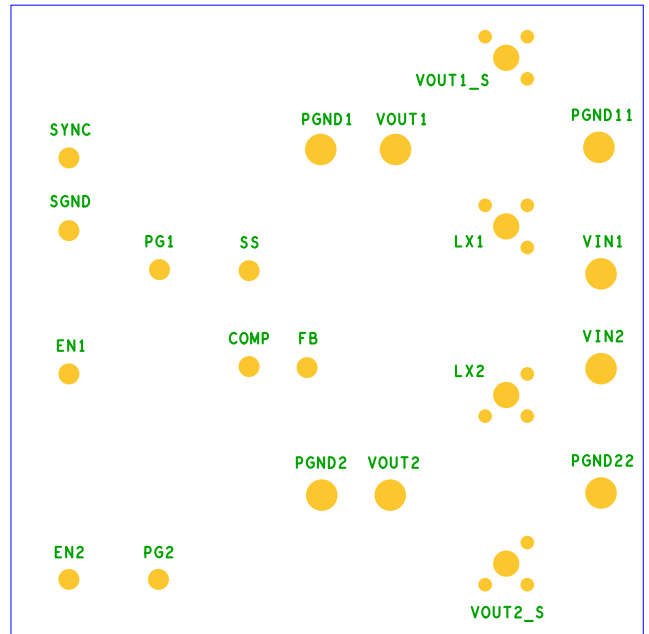


FIGURE 6. BOTTOM COMPONENTS (MIRROR)

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