

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

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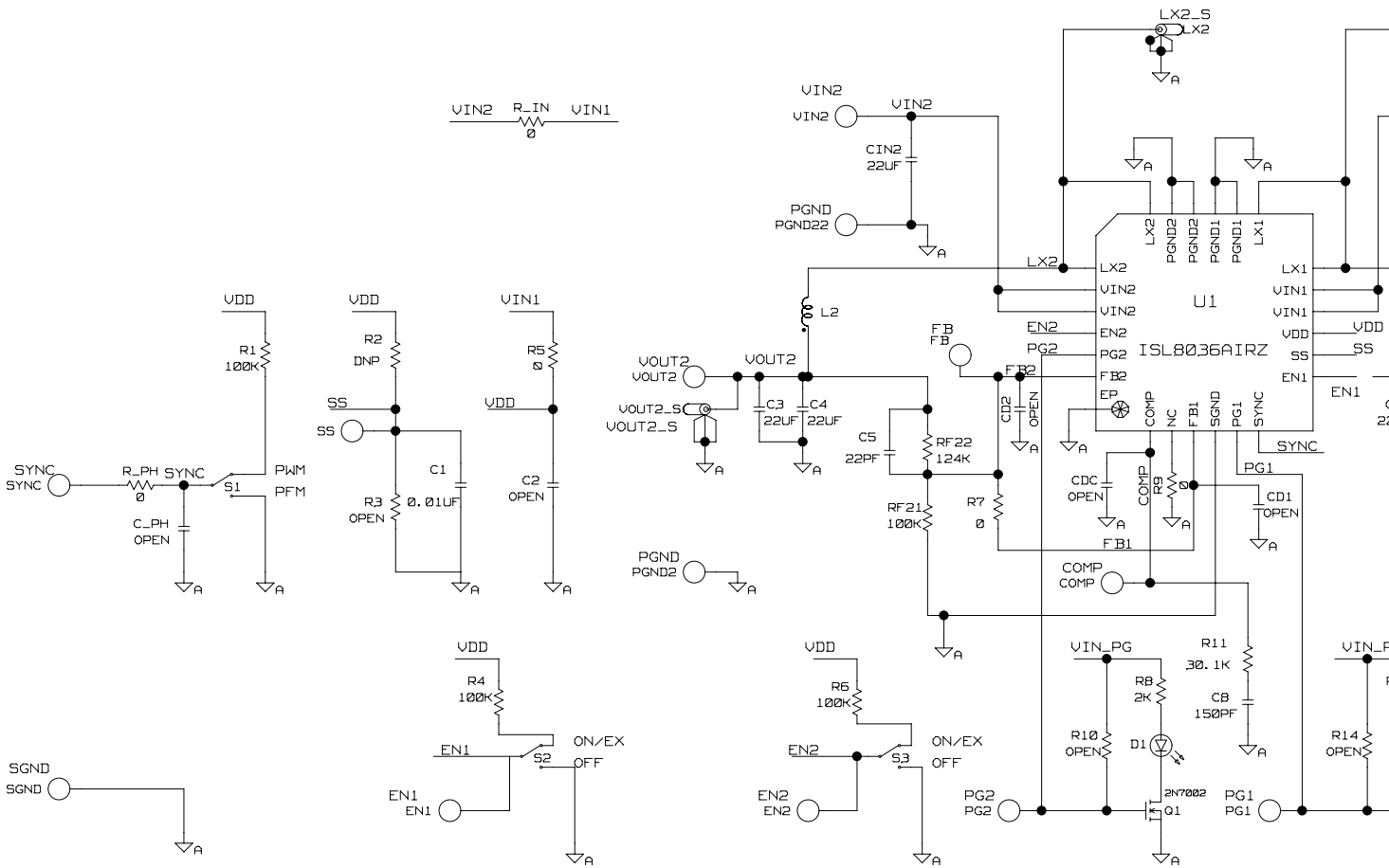


TABLE 2. BILL OF MATERIALS

| 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, 22 μ F, 6.3V, 20%, X5R, ROHS | TDK | C2012X5R0J226M |
| H1045-00103-50V5-T | 1 | ea | C1 | CAP, SMD, 0603, 0.01 μ F, 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, 0.6 μ H, 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

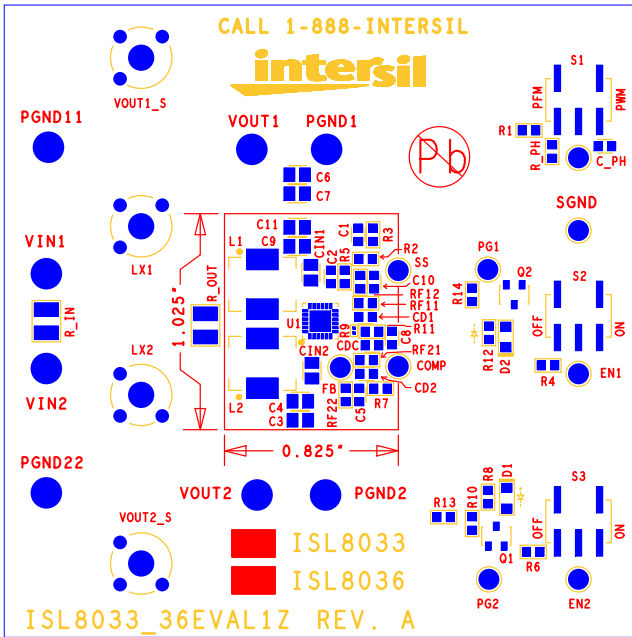


FIGURE 1. TOP COMPONENTS

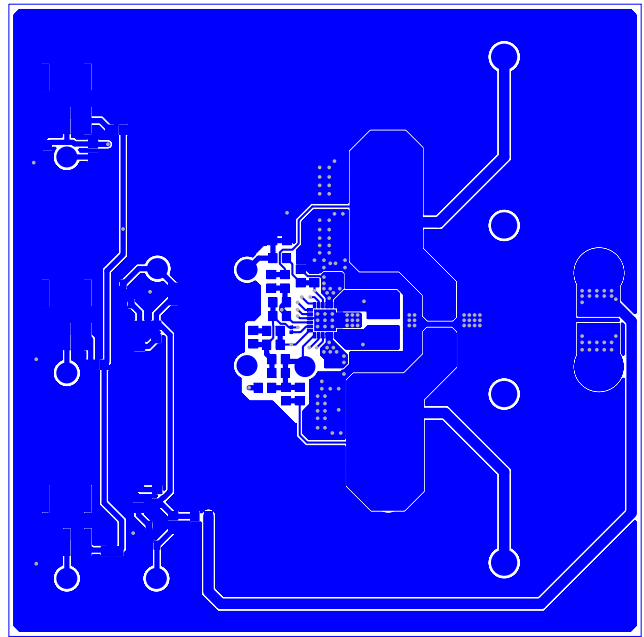


FIGURE 2. TOP LAYER ETCH

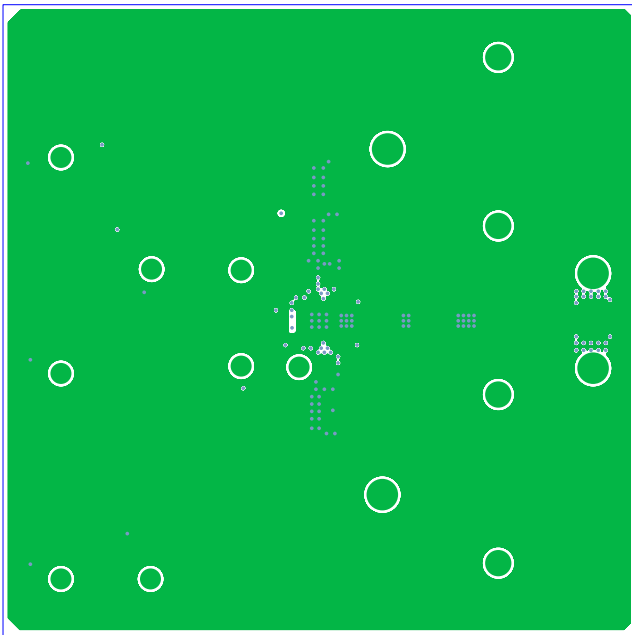


FIGURE 3. 2ND LAYER ETCH

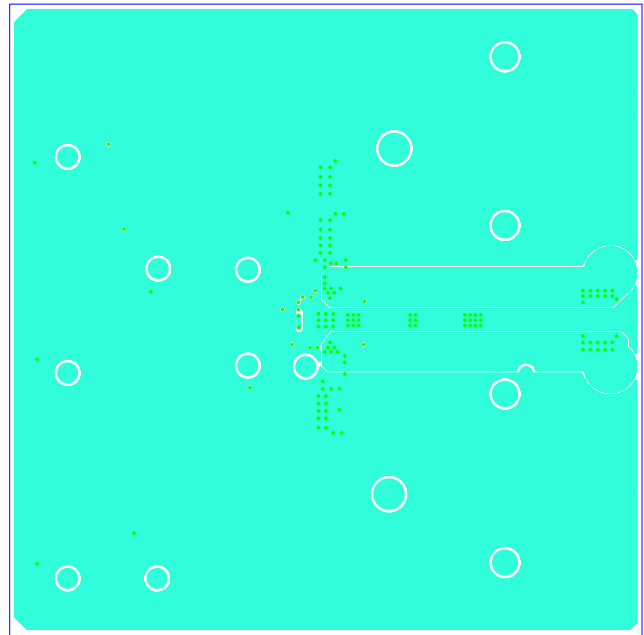


FIGURE 4. 3RD LAYER ETCH

ISL8036ACRSHEVAL1Z Board Layout (Continued)

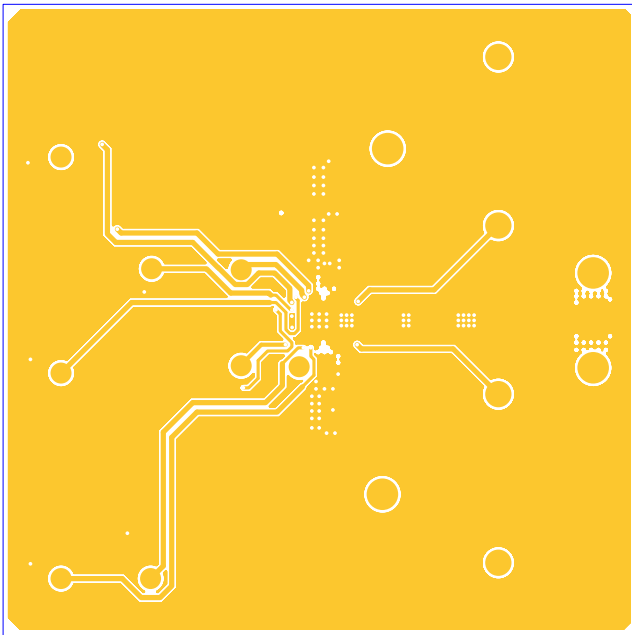


FIGURE 5. BOTTOM LAYER ETCH

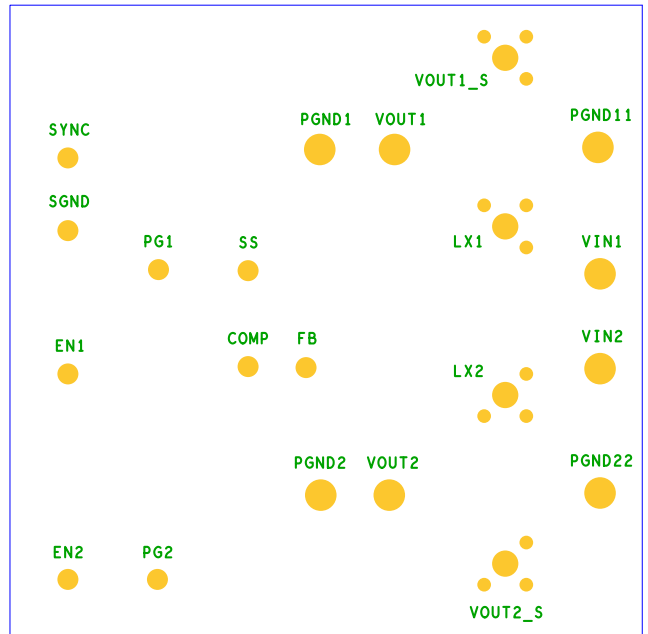


FIGURE 6. BOTTOM COMPONENTS (MIRROR)

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