

# ISL8036ADUALEVAL1Z

Dual 3A Low Quiescent Current High Efficiency Synchronous Buck Regulator

AN1618 Rev 0.00 January 3, 2011

# **Description**

The ISL8036ADUALEVAL1Z kit is intended for use by individuals with requirements for Point-of-Load applications sourcing from 2.85V to 6V. The ISL8036ADUALEVAL1Z evaluation board is used to demonstrate the performance of the ISL8036A low quiescent current mode converter.

The ISL8036A is offered in a 4mmx4mm 24 Ld QFN package with 1mm maximum height. The complete converter occupies less than 5.46cm<sup>2</sup> area.

# **Key Features**

- Dual 3A High Efficiency Synchronous Buck Regulator with up to 95% Efficiency
- 180° Out-of-Phase
- 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
- · Internal Digital Soft-Start 1.5ms
- Soft-Stop Output Discharge During Disabled
- External Synchronization up to 6MHz
- Typical 8µA 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:

- OV 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.
- 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.
- Verify the output voltage is 1.8V for V<sub>OUT1</sub> and 1.8V for V<sub>OUT2</sub>.

## **Evaluating the Other Output Voltage**

The ISL8036ADUALEVAL1Z kit outputs are preset to 1.8V for V<sub>OUT1</sub> and 1.8V for V<sub>OUT2</sub>; however, output voltages can be adjusted from 0.8V to 3.3V. The output voltage programming resistor, RF12 (or RF22 in Channel 2), will depend on the desired output voltage of the regulator. The value for the feedback resistor is typically between  $0\Omega$  and  $750k\Omega$ , as shown in Equations 1 and 2.

Let's set RF11/RF21 = 100k $\Omega$ , then RF12/RF22 will be:

$$RF12 = RF11 \left( \frac{VOUT1}{VFB} - 1 \right)$$
 (EQ. 1)

$$RF22 = RF21 \left( \frac{VOUT2}{VFB} - 1 \right)$$
 (EQ. 2)

If the output voltage desired is 0.8V, then RF11 and RF21 should be left unpopulated and RF12 and RF22 should be shorted. For faster response performance, add 47pF in parallel to RF12 and RF22.

#### **Mode Control**

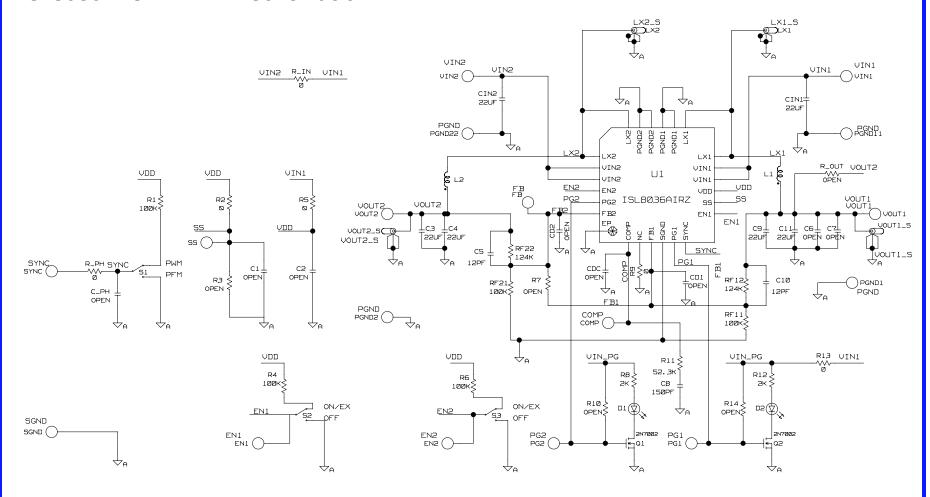
The ISL8036A has a SYNC pin, which connects to logic high or input voltage VIN for PWM internal synchronization. Connect to an external function generator for external Synchronization. Negative edge trigger. Do not leave this pin floating. Do not tie this pin low (or to GND).

**TABLE 1. SWITCH SETTINGS** 

| SW2, SW3 | ENABLE | ON/OFF CONTROL              |
|----------|--------|-----------------------------|
| 1        | OFF    | Disable V <sub>OUT1,2</sub> |
| 3        | ON     | Enable V <sub>OUT1,2</sub>  |



# ISL8036ADUALEVAL1Z Schematic



### TABLE 2. BILL OF MATERIALS

| PART                    |     |       | REFERENCE MANUFACTURER                            |   |                   |                         |  |
|-------------------------|-----|-------|---|---|-------------------|-------------------------|--|
| NUMBER                  | QTY | UNITS | DESIGNATOR  | DESCRIPTION   | MANUFACTURER      | PART                    |  |
| ISL8033_36EVAL1ZREVAPCB | 1   | ea    | a) PUT "X" IN ISL8036<br>BOX ON PCB               | PWB-PCB,<br>ISL8033_36EVAL1Z, REVA,<br>ROHS                   | IMAGINEERING INC. | ISL8033_36EVAL1ZREVAPCB |  |
| ISL8033_36EVAL1ZREVAPCB | 0   | ea    | b) SEELABEL-RENAME<br>BOARD                       | PWB-PCB,<br>ISL8033_36EVAL1Z, REVA,<br>ROHS                   | IMAGINEERING INC. | ISL8033_36EVAL1ZREVAPCB |  |
| C2012X5R0J226M-T        | 6   | ea    | C3, C4, C9, C11, CIN1,<br>CIN2                    | CAP, SMD, 0805, 22μF, 6.3V, 20%, X5R, ROHS                    | TDK               | C2012X5R0J226M          |  |
| H1045-00120-50V5-T      | 2   | ea    | C5, C10   | CAP, SMD, 0603, 12pF, 50V, 5%, COG, ROHS                      | AVX               | 06035A120JAT2A          |  |
| H1045-00151-50V5-T      | 1   |       | C8  | CAP, SMD, 0603, 150pF, 50V, 5%, NPO, ROHS                     | PANASONIC         | ECJ-1VC1H151J           |  |
| H1045-DNP               | 0   | ea    | C1, C2, C8, CD1, CD2,<br>CDC, C_PH                | CAP, SMD, 0603, DNP-PLACE<br>HOLDER, ROHS                     |                   |                         |  |
| H1046-DNP               | 0   | ea    | C6, C7  | CAP, SMD, 0805, DNP-PLACE<br>HOLDER, ROHS                     |                   |                         |  |
| FDV0630-R60M            | 2   | ea    | L1, L2  | COIL-PWR INDUCTOR, SMD,<br>7.4X6.7,0.6µH, 20%, ROHS           | токо              | FDV0630-R60M            |  |
| 131-4353-00             | 4   | ea    | LX1, LX2, VOUT1_S,<br>VOUT2_S                     | CONN-SCOPE PROBE TEST<br>PT, COMPACT, PCB MNT,<br>ROHS        | TEKTRONIX         | 131-4353-00             |  |
| 1514-2                  | 8   | ea    | a) PGND1, PGND2,<br>PGND11, PGND22,<br>VIN1, VIN2 | CONN-TURRET, TERMINAL<br>POST, TH, ROHS                       | KEYSTONE          | 1514-2                  |  |
| 1514-2                  | 0   | ea    | b) VOUT1, VOUT2                                   | CONN-TURRET, TERMINAL<br>POST, TH, ROHS                       | KEYSTONE          | 1514-2                  |  |
| 5000                    | 6   | ea    | a) EN1, EN2, PG1,<br>PG2, SS, SYNC                | CONN-MINI TEST PT,<br>VERTICAL, RED, ROHS                     | KEYSTONE          | 5000                    |  |
| 5000                    | 0   | ea    | b) SYNC located left of C_PH                      | CONN-MINI TEST PT,<br>VERTICAL, RED, ROHS                     | KEYSTONE          | 5000                    |  |
| 5001                    | 1   | ea    | SGND  | CONN-MINI TEST PT,<br>VERTICAL, BLK, ROHS                     | KEYSTONE          | 5001                    |  |
| 5002                    | 2   | ea    | COMP, FB  | CONN-MINI TEST PT,<br>VERTICAL, WHITE, ROHS                   | KEYSTONE          | 5002                    |  |
| LTST-C170CKT            | 2   | ea    | D1, D2  | LED-GaAs RED, SMD,<br>2mmX1.25mm, 100mW,<br>40mA, 10mcd, ROHS | LITEON/VISHAY     | LTST-C170CKT            |  |
| ISL8036AIRZ             | 1   | ea    | U1  | IC-DUAL 3A BUCK<br>REGULATOR, 2.5MHz, 24P,<br>QFN, 4X4, ROHS  | INTERSIL          | ISL8036AIRZ             |  |
| 2N7002-7-F-T            | 2   | ea    | Q1, Q2  | TRANSISTOR, N-CHANNEL, 3<br>LD, SOT-23, 60V, 115mA,<br>ROHS   | DIODES, INC.      | 2N7002-7-F              |  |
| H2509-DNP               | 1   | ea    | R9  | RES, SMD, 0201, $0\Omega$ , 1/20W, 0%, TF                     | PANASONIC         | H2509-00R00-1/20W-T     |  |
| H2511-00R00-1/10W-T     | 4   | ea    | R2, R5, R13, R_PH                                 | RES, SMD, 0603, $0\Omega$ , 1/10W, TF, ROHS                   | VENKEL            | CR0603-10W-000T         |  |
| H2511-01003-1/10W1-T    | 5   | ea    | R1, R4, R6, RF11,<br>RF21                         | RES, SMD, 0603, 100k,<br>1/10W, 1%, TF, ROHS                  |                   |                         |  |



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

| PART<br>NUMBER       | QTY | UNITS | REFERENCE<br>DESIGNATOR              | DESCRIPTION   | MANUFACTURER                   | MANUFACTURER<br>PART |
|----------------------|-----|-------|--------------------------------------|---|--------------------------------|----------------------|
| H2511-01243-1/10W1-T | 2   | ea    | RF12, RF22                           | RES, SMD, 0603, 124k,<br>1/10W, 1%, TF, ROHS          | YAGEO                          | 9C06031A1243FKHFT    |
| H2511-02001-1/10W1-T | 2   | ea    | R8, R12                              | RES, SMD, 0603, 2k, 1/10W, 1%, TF, ROHS               | КОА                            | RK73H1JTTD2001F      |
| H2511-05232-1/10W1-T | 1   | ea    | R11                                  | RES,SMD,0603, 52.3k,<br>1/10W, 1%, TF, ROHS           | VENKEL                         | CR0603-10W-5232FT    |
| H2511-DNP            | 0   | ea    | R3, R7, R10, R14                     | RES, SMD, 0603, DNP-PLACE<br>HOLDER, ROHS             |                                |                      |
| H2514-00R00-1/4W-T   | 1   | ea    | R_IN                                 | RES, SMD, 1210, $0\Omega$ , 1/4W, TF, ROHS            | VENKEL                         | CR1210-4W-000        |
| H2514-DNP            | 0   | ea    | R_OUT                                | RES, SMD, 1210, DNP, DNP,<br>DNP, TF, ROHS            |                                |                      |
| GT11MSCBE-T          | 3   | ea    | S1-S3                                | SWITCH-TOGGLE, SMD, 6 PIN,<br>SPDT, 2POS, ON-ON, ROHS | ITT INDUSTRIES/C&K<br>DIVISION | GT11MSCBE            |
| SJ-5003-BLACK        | 4   | ea    | Bottom four corners                  | BUMPONS, 0.44"Wx0.20"H,<br>DOMETOP, BLACK             | 3M                             | SJ-5003SPBL          |
| 5X8-STATIC-BAG       | 1   | ea    | Place assy in bag                    | BAG, STATIC, 5X8, ZIP LOC                             | INTERSIL                       | 212403-013           |
| LABEL-RENAME BOARD   | 1   | ea    | RENAME PCB TO:<br>ISL8036ADUALEVAL1Z | LABEL, TO RENAME BOARD                                | INTERSIL                       | LABEL-RENAME BOARD   |
| LABEL-SERIAL NUMBER  | 1   | ea    |                                      | LABEL, FOR SERIAL NUMBER<br>AND BOM REV #             |                                |                      |

# **ISL8036DUALEVAL1Z Board Layout**

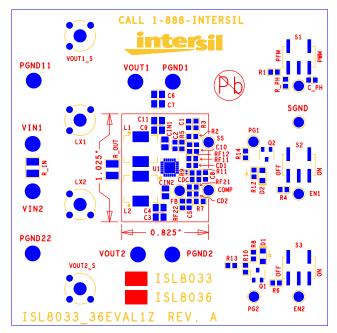


FIGURE 1. TOP COMPONENTS

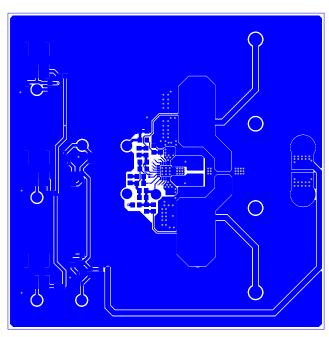


FIGURE 2. TOP LAYER ETCH

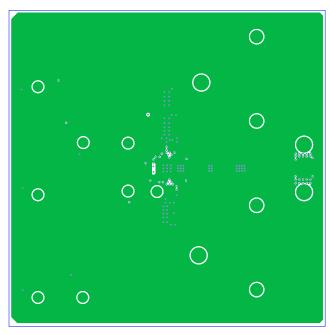


FIGURE 3. 2ND LAYER ETCH

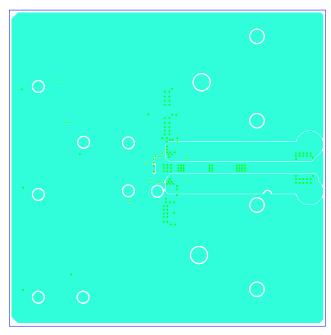


FIGURE 4. 3RD LAYER ETCH

# ISL8036DUALEVAL1Z Board Layout (Continued)

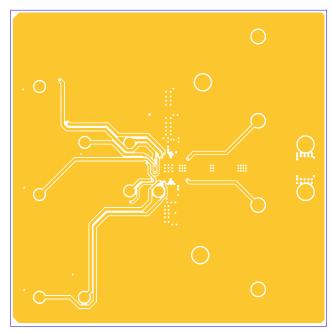


FIGURE 5. BOTTOM LAYER ETCH

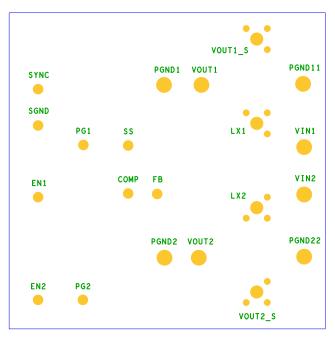


FIGURE 6. BOTTOM COMPONENTS (MIRROR)

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