

ISL8003xDEM01Z Demonstration Boards User Guide

Description

The ISL80030DEM01Z and ISL80031DEM01Z boards are intended for use by individuals with requirements for point-of-load applications sourcing from 2.7V to 5.5V. The ISL8003xDEM01Z boards are used to demonstrate the performance of the [ISL80030](#), [ISL80031](#) low quiescent current mode converter.

These devices are offered in an 8 Ld 2mmx2mm DFN package with 1mm maximum height. The complete converter occupies less than 64mm² area.

Specifications

These boards have been configured and optimized for the following operating conditions:

- V_{IN} = 2.7V to 5.5V
- V_{OUT} = 1.8V
- I_{OUT} = 3A (maximum)
- Switching frequency is 1MHz
- Up to 95% peak efficiency

Key Features

- Small, compact design
- V_{IN} range of 2.7V to 5.5V
- I_{OUT} maximum is 3A
- Switching frequency is 1MHz
- Negative current protection
- Internal soft-start and soft-stop
- Overcurrent and short-circuit protection
- Over-temperature/thermal protection

References

[ISL80030](#), [ISL80030A](#), [ISL80031](#), [ISL80031A](#) Datasheet

Ordering Information

| PART NUMBER | DESCRIPTION |
|----------------|-----------------------------------|
| ISL80030DEM01Z | 3A, PWM, 1MHz demonstration board |
| ISL80031DEM01Z | 3A, PFM, 1MHz demonstration board |

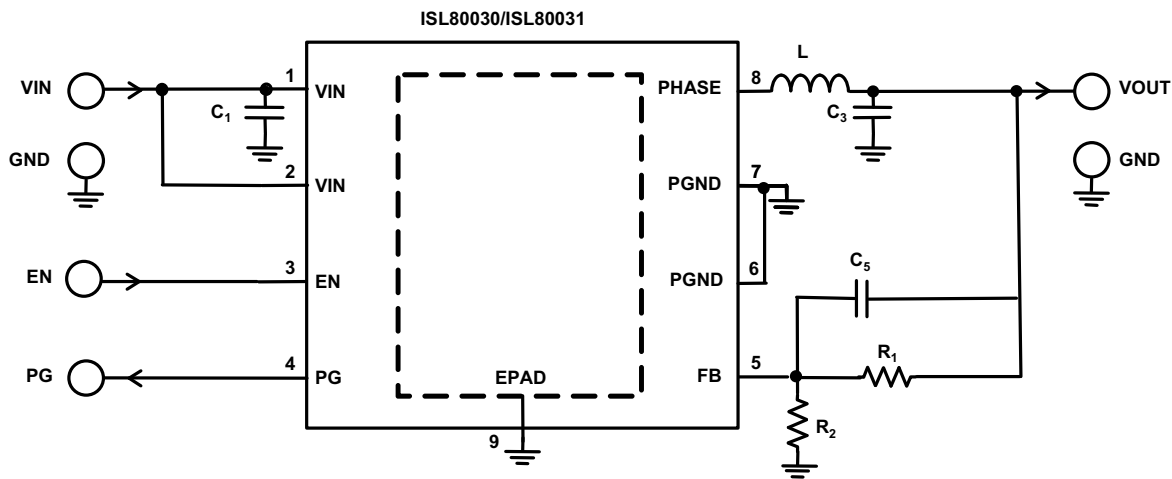


FIGURE 1. BLOCK DIAGRAM

Test Steps

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, the plus terminal to VIN (TP1) and negative return to PGND (TP2).
3. Connect the output load to VO (TP3) and the negative return to PGND (TP4).
4. Turn on the power supply.
5. Verify the output voltage is 1.8V for V_{OUT} .

Functional Description

The ISL8003xDEMO1Z boards provide a simple platform to evaluate performance of the ISL80030, ISL80031.

These devices are highly efficient, monolithic, synchronous step-down DC/DC converters that can deliver up to 3A of continuous output current from a 2.7V to 5.5V input supply. They use peak current mode control architecture to allow very low duty cycle operation. The devices operate at 1MHz switching frequency, thereby providing superior transient response and allowing for the use of a small inductor.

PCB Layout Guidelines

The PCB layout is a very important converter design step to make sure the designed converter works well. The power loop is composed of the output inductor L's, the output capacitor C_{OUT} , the PHASE pins and the PGND pin. It is necessary to make the power loop as small as possible and the connecting traces among them should be direct, short and wide. The switching node of the converter, the PHASE pins and the traces connected to the node are very noisy, so keep the voltage feedback trace away from these noisy traces. The input capacitor should be placed as close as possible to the VIN pin and the ground of the input and output capacitors should be connected as close as possible. The heat of the IC is mainly dissipated through the thermal pad. Maximizing the copper area connected to the thermal pad is preferable. In addition, a solid ground plane is helpful for better EMI performance. It is recommended to add at least 4 vias ground connection within the pad for the best thermal relief.



FIGURE 2. ISL80030DEMO1Z TOP SIDE



FIGURE 3. ISL80030DEMO1Z BOTTOM SIDE

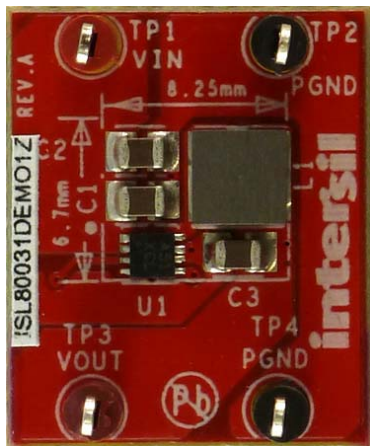


FIGURE 4. ISL80031DEMO1Z TOP SIDE



FIGURE 5. ISL80031DEMO1Z BOTTOM SIDE

ISL8003xDEMO1Z Schematic

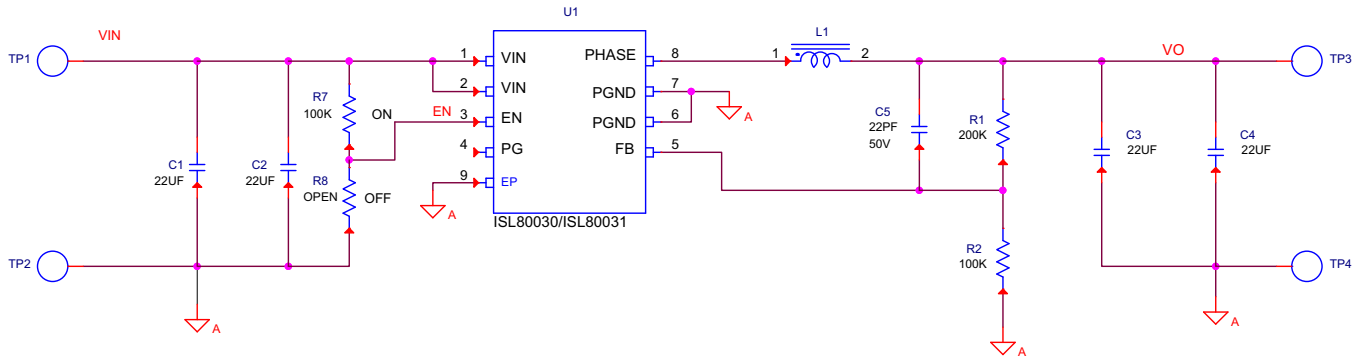


FIGURE 6. ISL8003xDEMO1Z SCHEMATIC

Bill of Materials

| QTY | UNITS | REFERENCE DESIGNATOR | DESCRIPTION | MANUFACTURER | MANUFACTURER PART |
|-----|-------|----------------------|---|-----------------------------|-----------------------------------|
| 4 | ea. | C1-C4 | CAP, SMD, 0805, 22μF, 6.3V, 20%, X5R, ROHS | TDK | C2012X5R0J226M |
| 1 | ea. | C5 | CAP, SMD, 0402, 22pF, 50V, 5%, NPO, ROHS | MURATA | GRM36COG220J050AQ |
| 1 | ea. | L1 | COIL-PWR INDUCTOR, SMD, 4.1mm ² , 1.0μH, 20%, 7.2A, ROHS | WE (Note 1) TDK (Note 1) | 744-383560 10 SPM4020T-1R0M-LR |
| 2 | ea. | TP1, TP3 | CONN-MINI TEST PT, VERTICAL, RED, ROHS | KEYSTONE | 5000 |
| 2 | ea. | TP2, TP4 | CONN-MINI TEST PT, VERTICAL, BLK, ROHS | KEYSTONE | 5001 |
| 1 | ea. | U1 | IC-3A, PWM, 1MHz BUCK REGULATOR, 8P, DFN, 2x2, ROHS | INTERSIL | ISL80030FRZ (ISL80030DEMO1Z) |
| | | | IC-3A, PFM, 1MHz BUCK REGULATOR, 8P, DFN, 2x2, ROHS | INTERSIL | ISL80031FRZ (ISL80031DEMO1Z) |
| 2 | ea. | R2, R7 | RES, SMD, 0402, 100k, 1/16W, 1%, TF, ROHS | PANASONIC | ERJ2RKF1003 |
| 1 | ea. | R1 | RES, SMD, 0402, 200k, 1/16W, 1%, TF, ROHS | ROHM | MCR01MZPF2003 |
| 0 | ea. | R8 | RES, SMD, 0402, DNP, DNP, DNP, TF, ROHS | | |

NOTE:

- Two manufacturers are provided as options for the inductor.

Board Layout

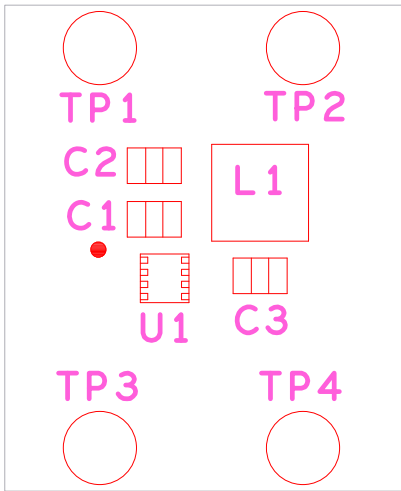


FIGURE 7. SILKSCREEN TOP

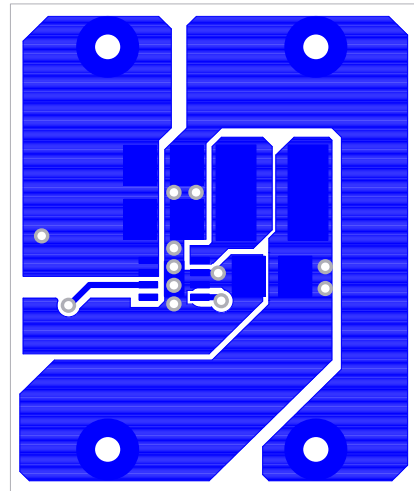


FIGURE 8. LAYER 1

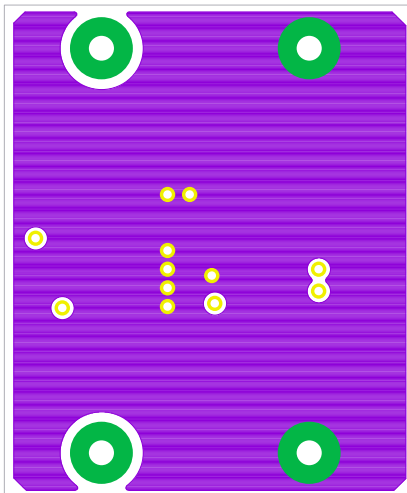


FIGURE 9. LAYER 2

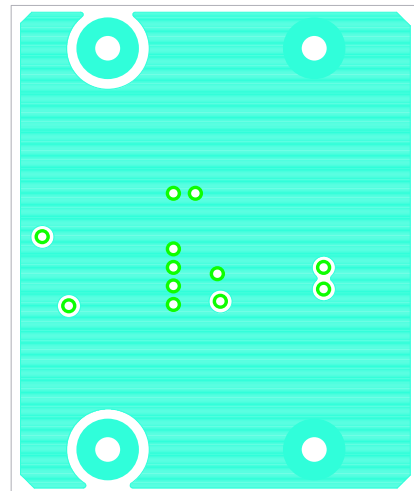


FIGURE 10. LAYER 3

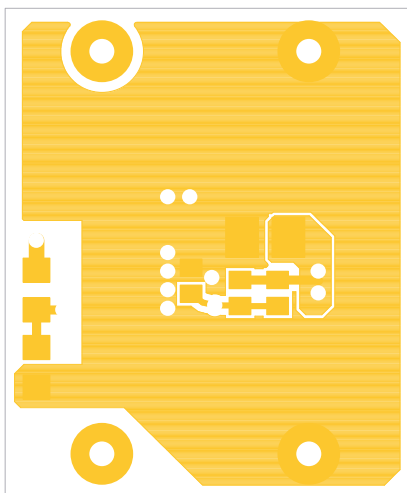


FIGURE 11. LAYER 4

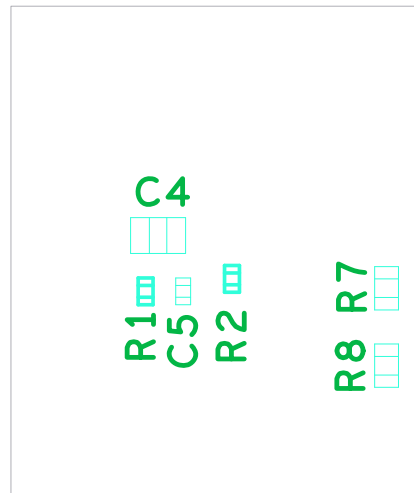


FIGURE 12. SILKSCREEN BOTTOM

Typical Performance Curves

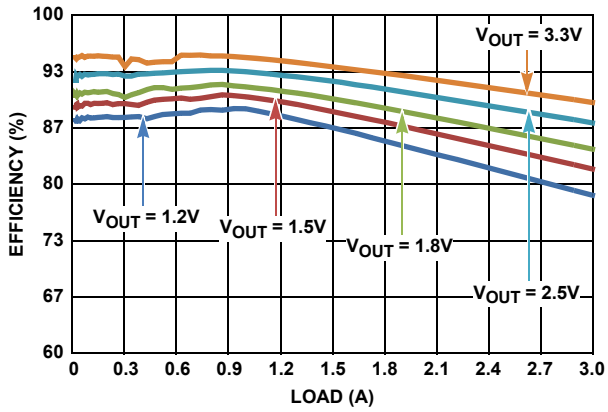


FIGURE 13. EFFICIENCY vs LOAD
 $f_{SW} = 1\text{MHz}$, $V_{IN} = 5\text{V}$, PFM, $T_A = +25^\circ\text{C}$

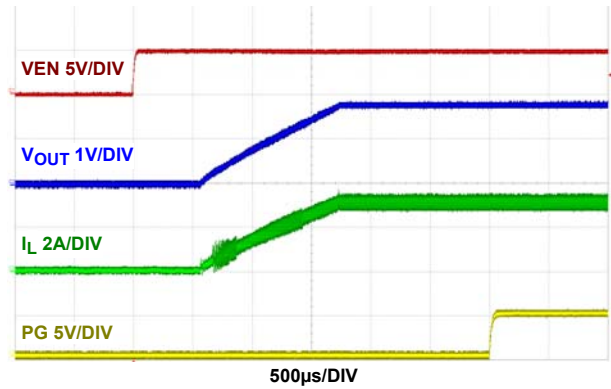


FIGURE 14. START-UP AT 3A LOAD
 $V_{IN} = 5\text{V}$, PWM, $T_A = +25^\circ\text{C}$

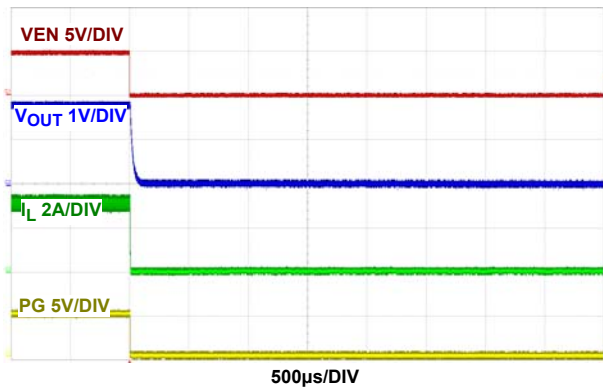


FIGURE 15. SHUTDOWN AT 3A LOAD
 $V_{IN} = 5\text{V}$, PWM, $T_A = +25^\circ\text{C}$

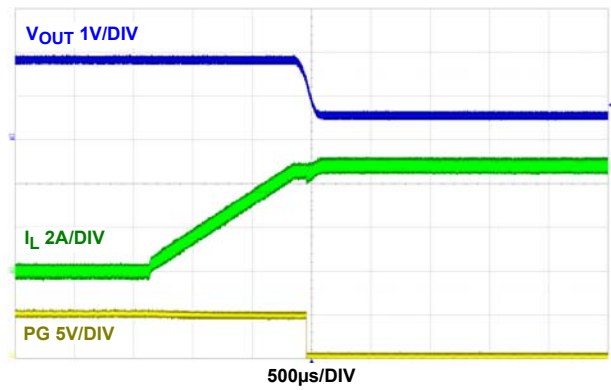


FIGURE 16. OVERCURRENT PROTECTION
 $V_{IN} = 5\text{V}$, PWM, $T_A = +25^\circ\text{C}$

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