ISL6253EVAL1B Evaluation Board Setup Procedure

General Description

The ISL6253EVAL1B EV kit includes all the circuitry needed to demonstrate the capabilities of the ISL6253 Lithium-Ion battery-charger with integrated AC adapter current limit. The user can experiment with an extensive matrix of battery charge parameters, AC adapter current limit, monitor functions, and load switching.

The ISL6253 charger IC controls a high efficiency 300kHz fixed-frequency DC/DC synchronous-rectifier buck-converter. The battery charger employs a current-limited voltage-clamped regime while simultaneously protecting the system AC adapter power source from an overcurrent event. If the AC adapter output approaches the user selectable current limit, the battery charger output will automatically foldback to the extent that the AC adapter output current remains compliant. Once the demand on the AC adapter subsides, the battery charger output will resume normal operation.

The AC Adapter current limit (ACLIM), battery charger current limit (CHLIM), and output voltage limit (VADJ) are programmed by applying the appropriate voltage relative to the GND pin. Each of these three parameters may be independently programmed by connecting to one of the three built-in settings. The three built-in settings are chosen by connecting ACLIM, CHLIM, and VADJ to either VREF, GND, or floating.

The ISL6253 is capable of controlling two P-CH MOSFET isolation switches SGATE and BGATE, that replace diodes typically used for this purpose. The SGATE pin controls a switch that prevents the battery from back-feeding into the system input power source as is possible when an AC adapter remains connected to the system while de-energized. The BGATE pin controls a switch that provides a low impedance discharge path between the battery and the system power bus when the AC adapter is unavailable; otherwise the switch is open, isolating the battery from the input power source.

The ISL6253 has two general purpose 1.26V voltage comparator inputs DCSET and ACSET, that control open drain outputs $\overline{\text{DCPRN}}$ and $\overline{\text{ACPRN}}$. The ICM pin provides a 0V to 2V output signal that is proportional to the AC adapter output current.

Ordering Information

PART #	TEMP. RANGE (°C)	PACKAGE	PKG. DWG. #
ISL6253HRZ (Note 1)	-10 to 100	28 Ld 5x5 QFN (Pb-free)	L28.5x5

NOTE:

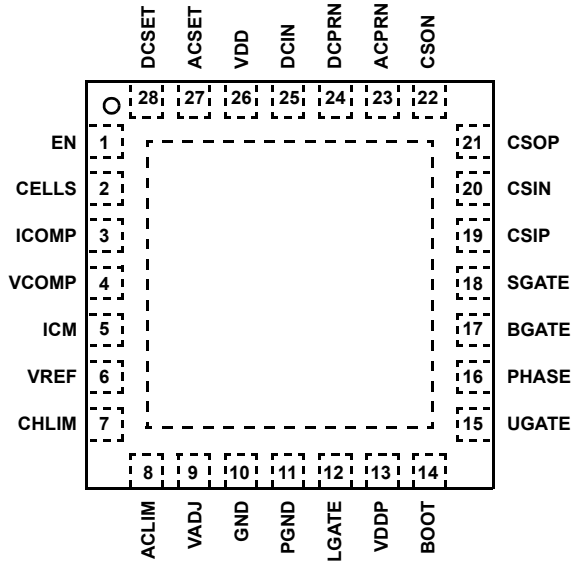
1. Intersil Pb-free products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which is compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J Std-020B.
2. Add “-T” for Tape and Reel.

Features

- ±0.5% Voltage Accuracy from -10°C to +100°C
- ±3% AC Adapter Current Limit Accuracy
- ±4% Battery Charger Current Limit Accuracy
- Selectable 2, 3, or 4 Series Cell Battery Packs
- Trickle Charge Mode 10% of Battery Charger Current Limit when Battery Voltage is Less than 3.0V per Cell
- Input Voltage Range 7V to 25V
- High Efficiency 300kHz Synchronous Buck Rectifier
- Efficient Light Load Diode Emulation Mode
- 150°C Thermal Shutdown Protection
- AC Adapter Output Current Monitor
- AC Adapter Present Indicator
- DC Adapter Present Indicator
- Controls P-CH MOSFET Power Source Isolation Switch
- Controls P-CH MOSFET Battery Isolation Switch
- Pb-free Available

Pinout

ISL6253HRZ (28 LD 5X5 QFN)
TOP VIEW



What's Inside

This Evaluation Board Kit contains the following materials:

- Qty(1) ISL6253EVAL1B Evaluation Board
- Qty(1) ISL6253EVAL1B Setup Procedure

What is Needed

The following materials are recommended to perform testing:

- One adjustable 25V 6A power supply
- Two adjustable 6A constant current electronic loads
- Two DVMs
- One 500MHz four channel oscilloscope
- Four passive oscilloscope voltage probes
- Two 10ADC Current Probes
- One Signal generator

Jumper Selection Guide

Step 1: Select the Number of Cells (Table 1)

The CELLS pin chooses the correct output voltage clamp for a given number of cells series-connected in the battery pack. Select the output voltage by placing a shunt jumper across the appropriate pins of JP1.

TABLE 1. JUMPER JP1 FUNCTIONS

SHUNT JUMPER LOCATION	CELLS PIN CONNECTED TO:	NUMBER OF CELLS CONNECTED IN SERIES	100% CONSTANT OUTPUT VOLTAGE
1-2	VDD	4	16.8
2-3	GND	3	12.6
Removed	Floating	2	8.4

Step 2: Select the Cell Trim Voltage (Table 2)

The VADJ pin trims the battery charger output voltage limit. Preset battery charger output voltage limits are selected by placing a shunt jumper across the appropriate pins of JP6. For other battery charger output voltage limits install a shunt jumper across pins 3 and 4 which connects the wiper of potentiometer R24 to VADJ. Potentiometer R24 may be removed and replaced with resistors R19 and R21. Resistor R20 limits the trim increase to 1%. Shorting R20 allows the trim to increase 5%. Decreasing trim range is unaffected.

TABLE 2. JUMPER JP6 FUNCTIONS

SHUNT LOCATION	VADJ PIN	BATTERY VOLTAGE CHANGE PER CELL
1 to 3	Through R20 to VREF	+1%
3 to 5	To GND	-5%
5 to 6	Floating	None
3 to 4	Through R20 To R24 Wiper or R19/R21	Adjustable between -5% to +1%

Step 3: Select the Battery Charger Current Limit (Table 3)

The CHLIM pin chooses the desired battery charger current limit threshold. Preset battery charger current limit thresholds are selected by placing a shunt jumper across the appropriate pins of JP4. For other battery charger current limit thresholds install a shunt jumper across pins 3 and 4 which connects the wiper of potentiometer R22 to CHLIM. Potentiometer R22 may be removed and replaced with resistors R6 and R7.

TABLE 3. JUMPER JP4 FUNCTIONS

SHUNT JUMPER LOCATION	CHLIM PIN CONNECTED TO:	100% CURRENT FEEDBACK CSOP TO CSON	100% CONSTANT CURRENT
Removed	3.3V@TP10	127mV	5.08A
1-3	VREF	100mV	4.00A
Removed	Floating	65mV	2.60A
3-5	GND	30mV	1.20A
3-4	R22 or R6/R7	30mV to 127mV	1.20A to 5.08A

Step 4: Select the AC Adapter Current Limit (Table 4)

The ACLIM pin chooses the desired AC adapter current limit threshold. Preset AC adapter current limit thresholds are selected by placing a shunt jumper across the appropriate pins of JP5. For other AC adapter current limit thresholds install a shunt jumper across pins 3 and 4 which connects the wiper of potentiometer R23 to ACLIM. Potentiometer R23 may be removed and replaced with resistors R17 and R18.

TABLE 4. JUMPER JP5 FUNCTIONS

SHUNT JUMPER LOCATION	ACLIM PIN CONNECTED TO:	100% CURRENT FEEDBACK CSIP TO CSIN	100% ADAPTER CURRENT
1-3	VREF	103mV	5.15A
Removed	Floating	78mV	3.90A
3-5	GND	53mV	2.65A
3-4	R23 or R17/R18	53mV to 103mV	2.65A to 5.15A

Interface Connections

The input power source connects to header H1. Positive input power "+" connects to H1 pin 1, "+" SNS (if used) connects to H1 pin 2, "-" SNS (if used) connects to H1 pin 3, and "-" input power connects to H1 pin 4. The battery charger output connects to header H3. Positive battery charger output "+" connects to H3 pin 1, "+" SNS (if used) connects to H3 pin 2, "-" SNS (if used) connects to H3 pin 3, and "-" battery charger output connects to H3 pin 4. The system output connects to header H2. Positive system output "+" connects to H2 pin 1, "+" SNS (if used) connects to H2 pin 2, "-" SNS (if used) connects to H2 pin 3, and "-" system output connects to H2 pin 4.

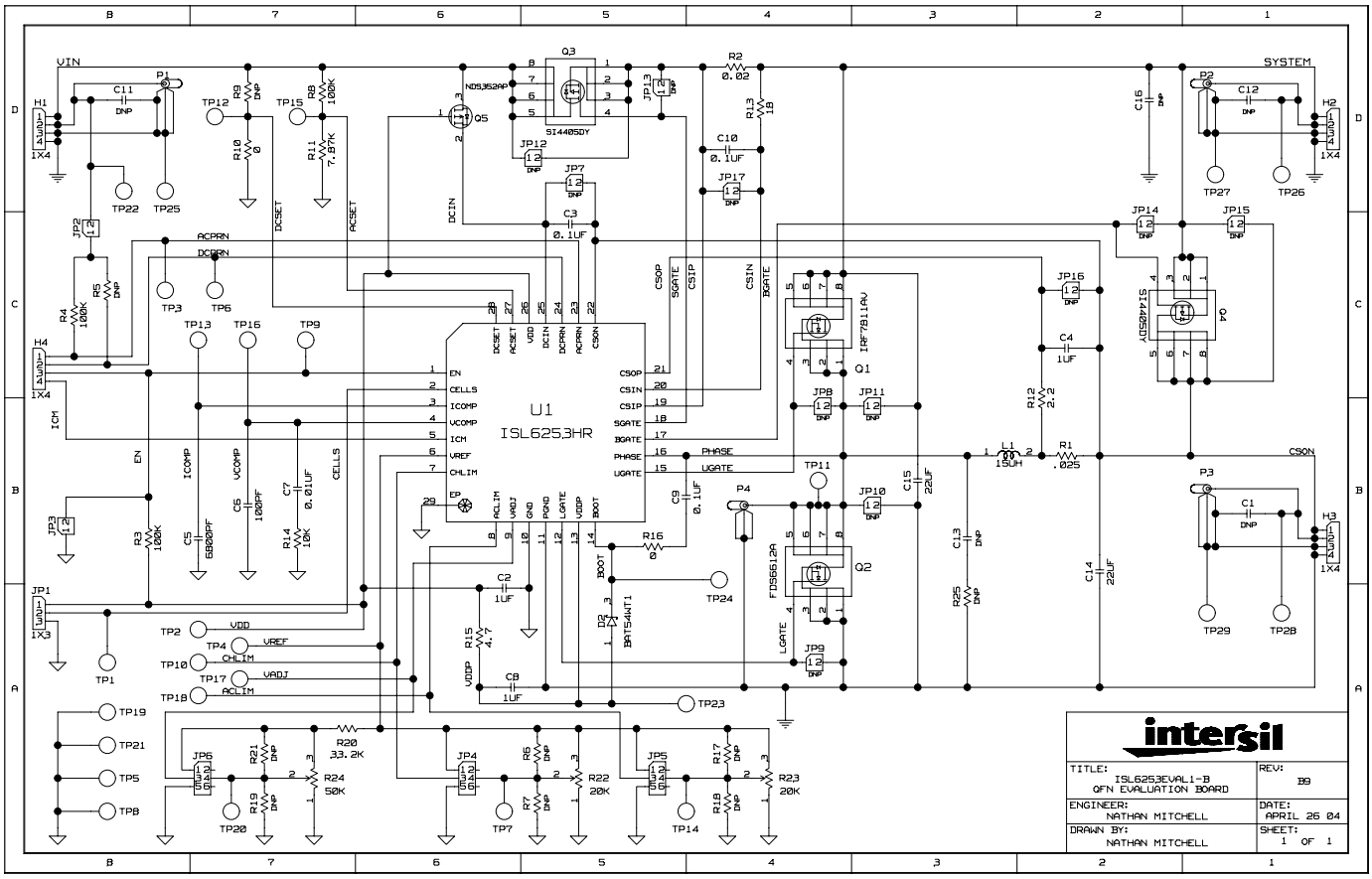


FIGURE 1. SCHEMATIC

TABLE 5. BILL OF MATERIALS

QTY	REF DES	DESCRIPTION	MFG NAME	PART NUMBER
1	C6	Capacitor, SMD, 0603, 100pF, 50V, 5%, COG	TDK	C1608COG1H101J
1	C7	Capacitor, SMD, 0805, 0.01µF, 50V, 5%, COG	TDK	C2012COG1H103J
1	C5	Capacitor, SMD, 0805, 6800pF, 50V, 5%, COG	TDK	C2012COG1H682J
3	C2, C4, C8	Capacitor, SMD, 0805, 1.0µF, 16V, 20%, X7R	TDK	C2012X7R1C105M
3	C3, C9, C10	Capacitor, SMD, 0805, 0.1µF, 50V, 10%, X7R	TDK	C2012X7R1H104K
2	C14, C15	Capacitor, SMD, 1812, 22µF, 25V, 20%, X5R	TDK	C4532X5R1E226M
1	L1	Choke, SMD, 8mm, 15µH, 20%, 5.65A, Shielded	Sumida	CDRH127/LD-150NC
1	U1	IC, Battery Charger, 28P, QFN, -10°C to +100°C	Intersil	ISL6253HR
1	Q2	MOSFET, N-CH, 8P, SOIC, 30V, 8.4A, 0.022Ω	Fairchild	FDS6612A
1	Q1	MOSFET, N-CH, 8P, SOIC, 30V, 10.8A, 0.011Ω	IR	IRF7811AV
1	Q5	MOSFET, P-CH, 3P, SOT23, -30V, -0.9A, 0.5Ω	Fairchild	NDS352AP
2	Q3, Q4	MOSFET, P-CH, 8P, SOIC, -30V, -17A, 0.0075Ω	Siliconix	SI4405DY
1	R2	Resistor, Shunt, SMD, 2010, 0.020Ω, 1W, 1%	IRC	LRC-LRF2010-01-R020-F
1	R1	Resistor, Shunt, SMD, 2010, 0.025Ω, 1W, 1%	IRC	LRC-LRF2010-01-R025-F
1	R13	Resistor, SMD, 0805, 18Ω, 0.125W, 5%	KOA	RK73B2AT180J
1	R12	Resistor, SMD, 0805, 2.2Ω, 0.125W, 5%	KOA	RK73B2AT2R2J
1	R15	Resistor, SMD, 0805, 4.7Ω, 0.125W, 5%	KOA	RK73B2AT4R7J
1	R14	Resistor, SMD, 0805, 10kΩ, 0.125W, 1%	KOA	RK73H2AT1002F
1	R11	Resistor, SMD, 0805, 7.87kΩ, 0.125W, 1%	KOA	RK73H2AT7871F
3	R3, R4, R8	Resistor, SMD, 0805, 100kΩ, 0.125W, 1%	KOA	RK73H2AT1003F
1	R20	Resistor, SMD, 0805, 33.2kΩ, 0.125W, 1%	KOA	RK73H2AT3322F
2	R10, R16	Resistor, SMD, 0805, 0Ω, 2A, 50mΩ Max	KOA	RK73Z2AT

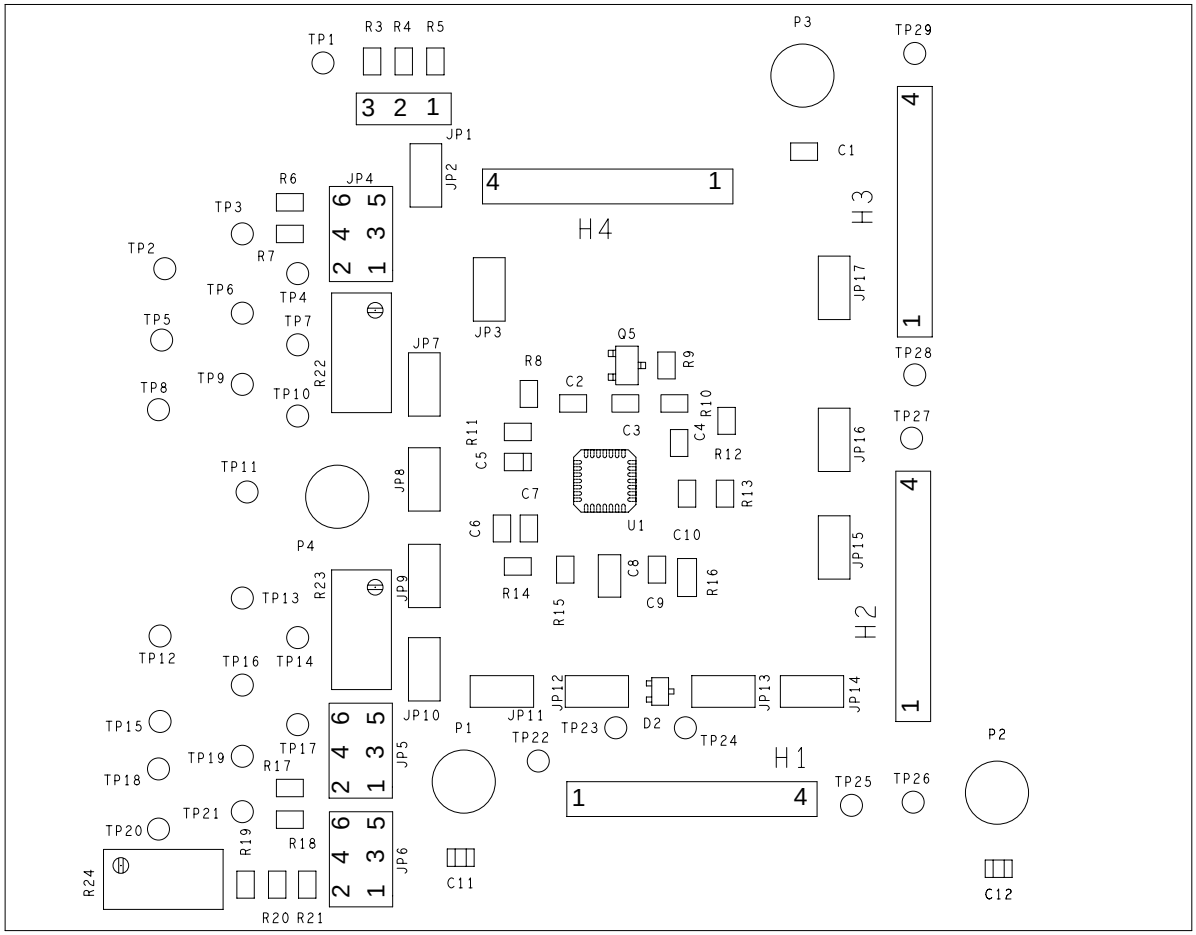


FIGURE 2. TOP SILK AND ASSEMBLY

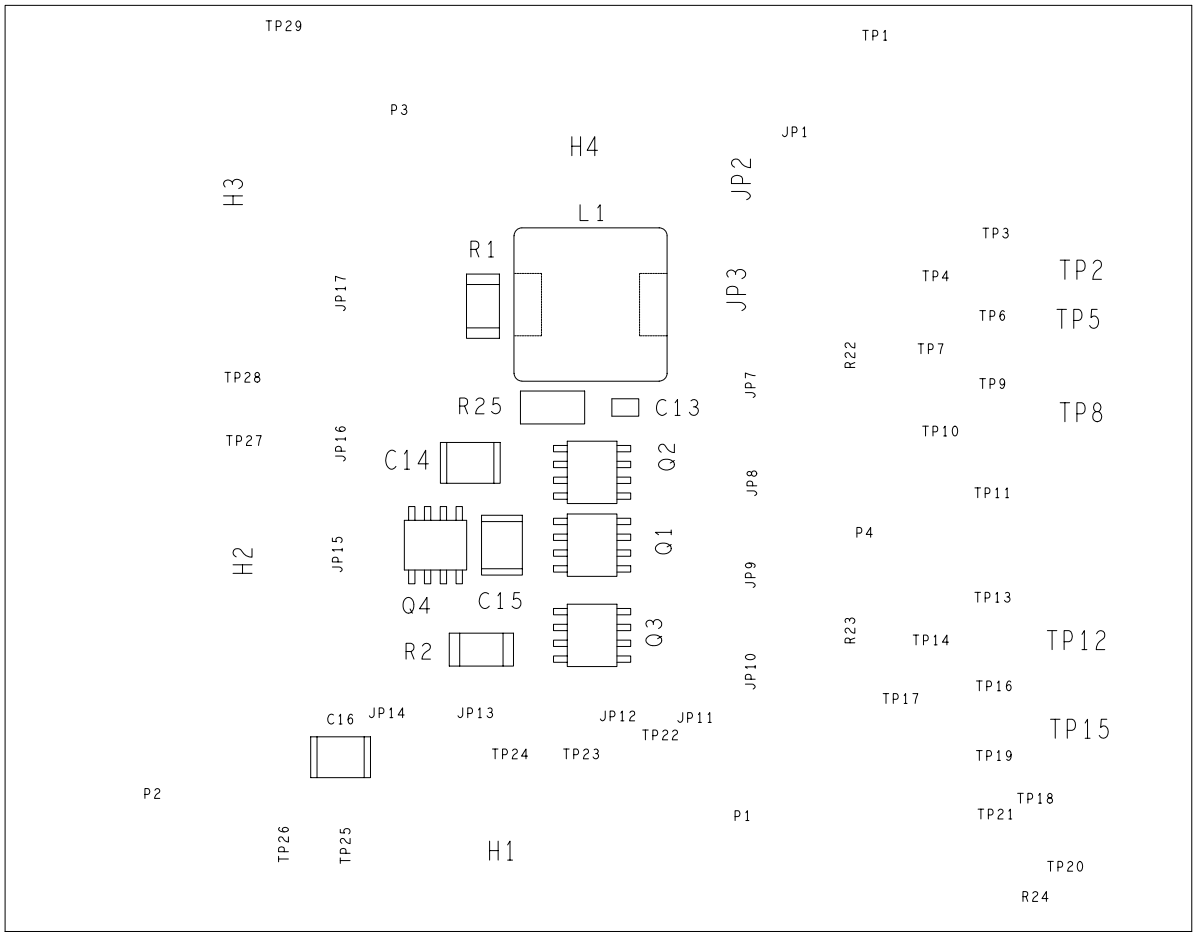


FIGURE 3. BOTTOM SILK AND ASSEMBLY

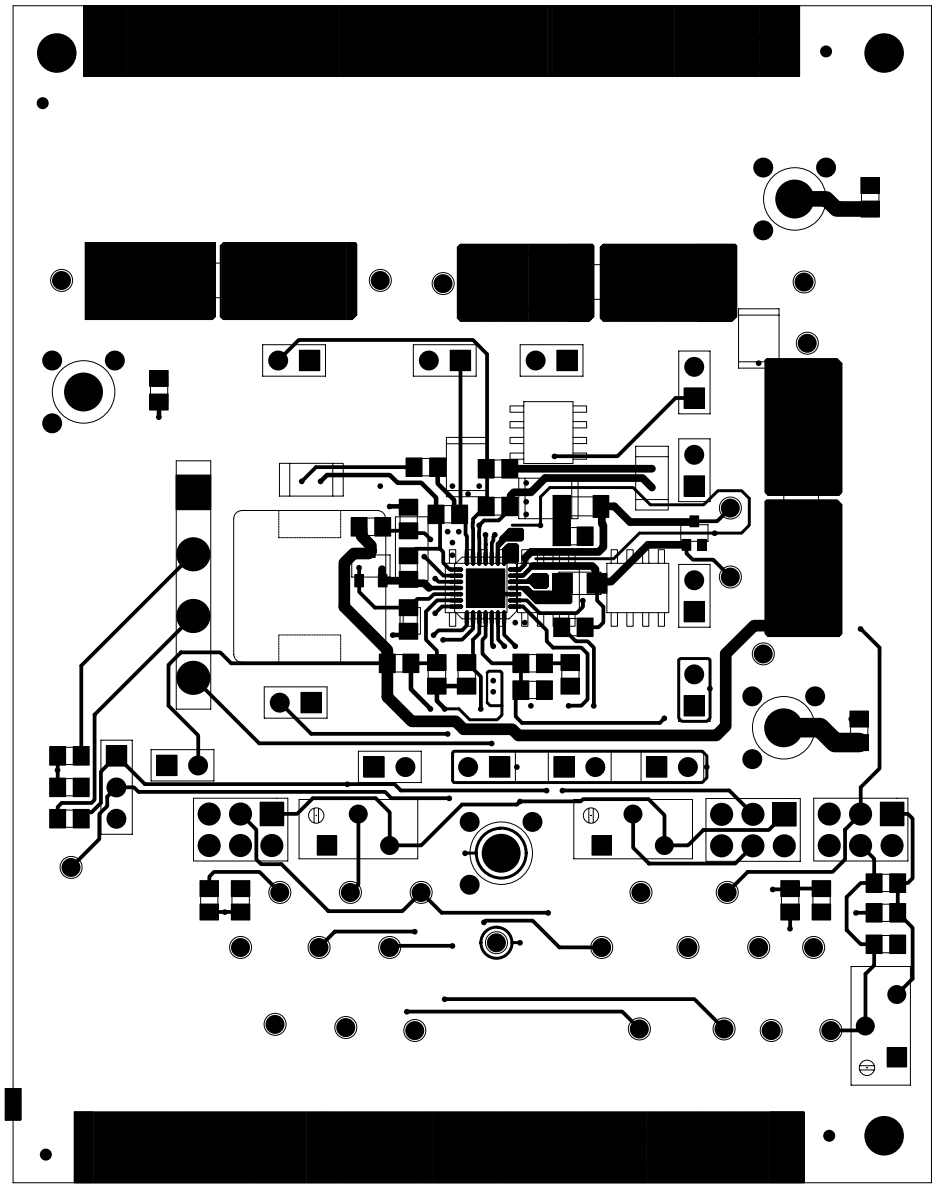


FIGURE 4. TOP

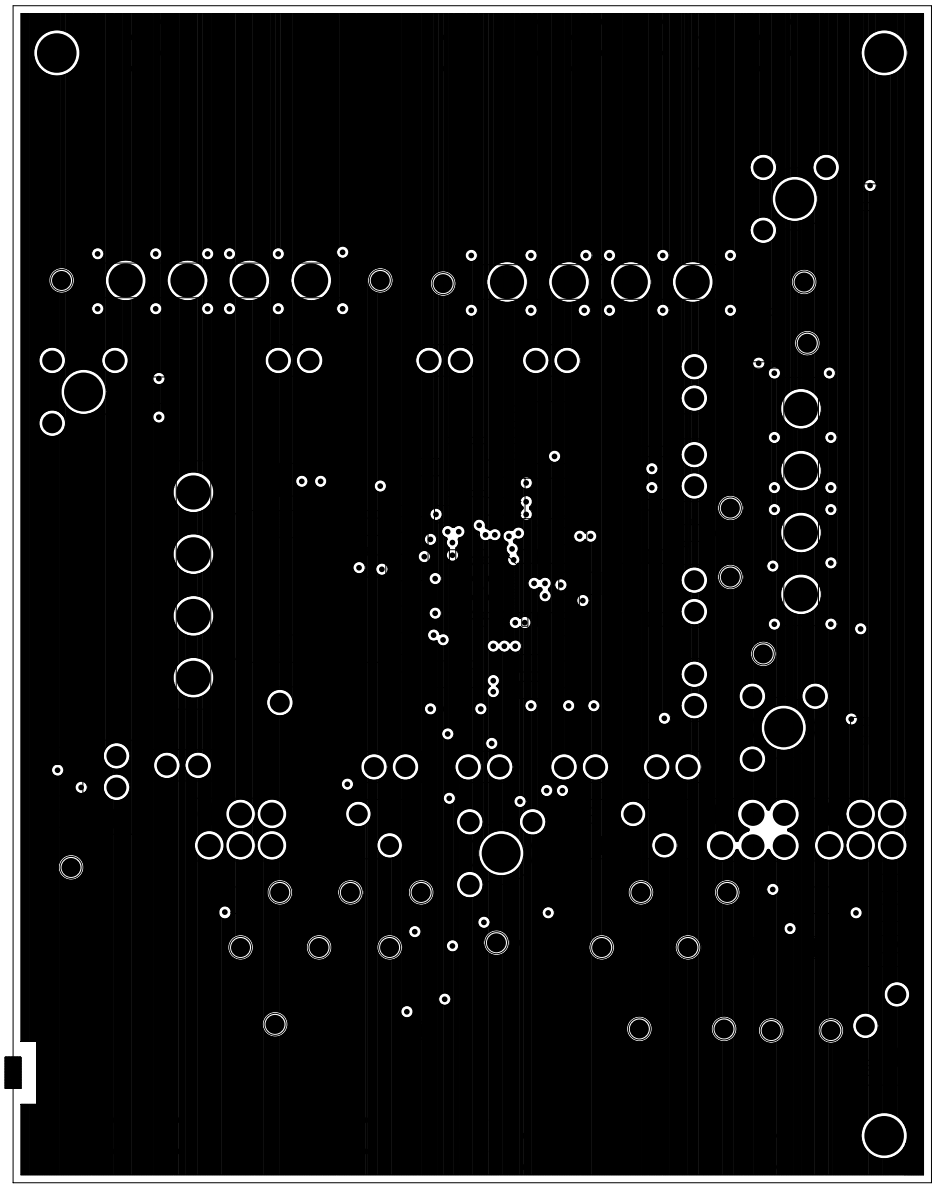


FIGURE 5. L2 GND

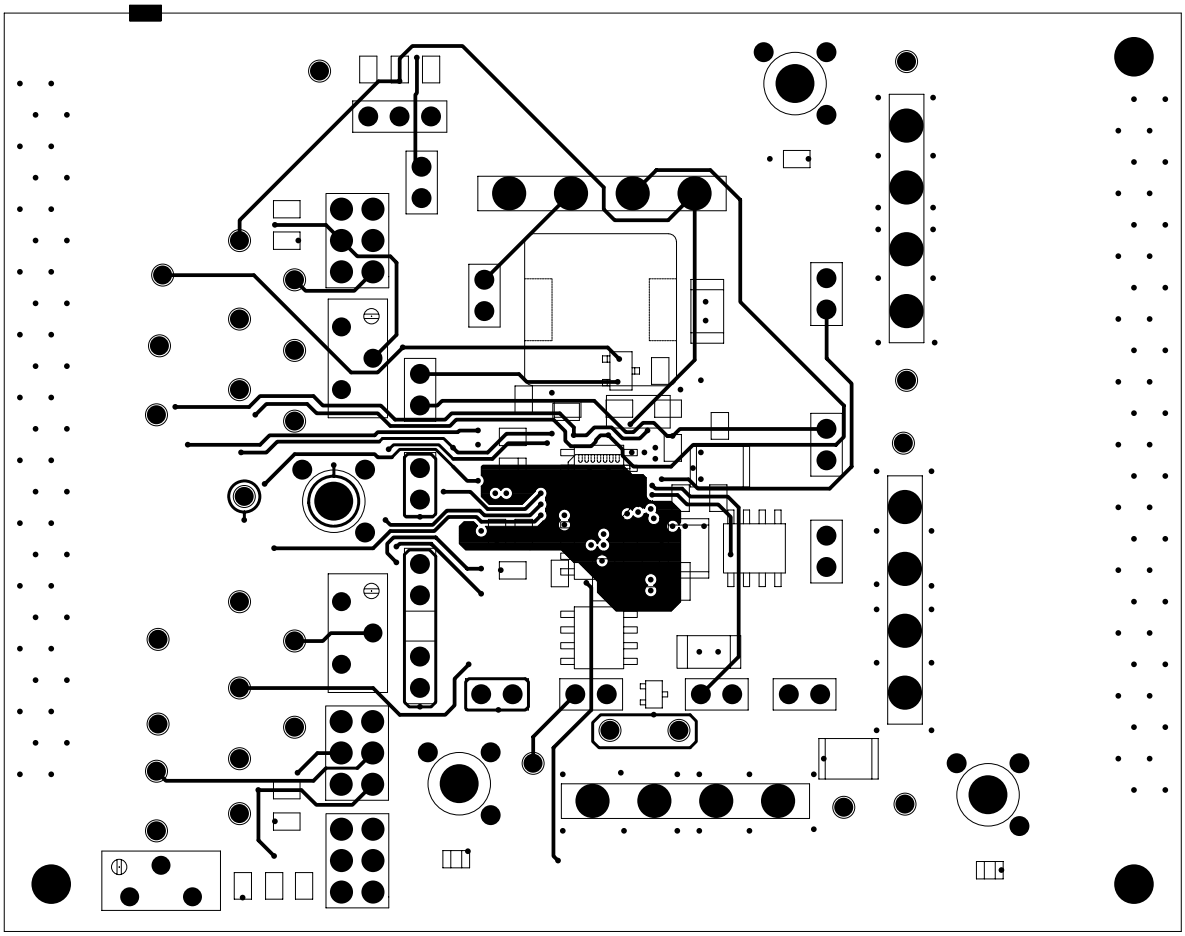


FIGURE 6. L3 SIGNAL

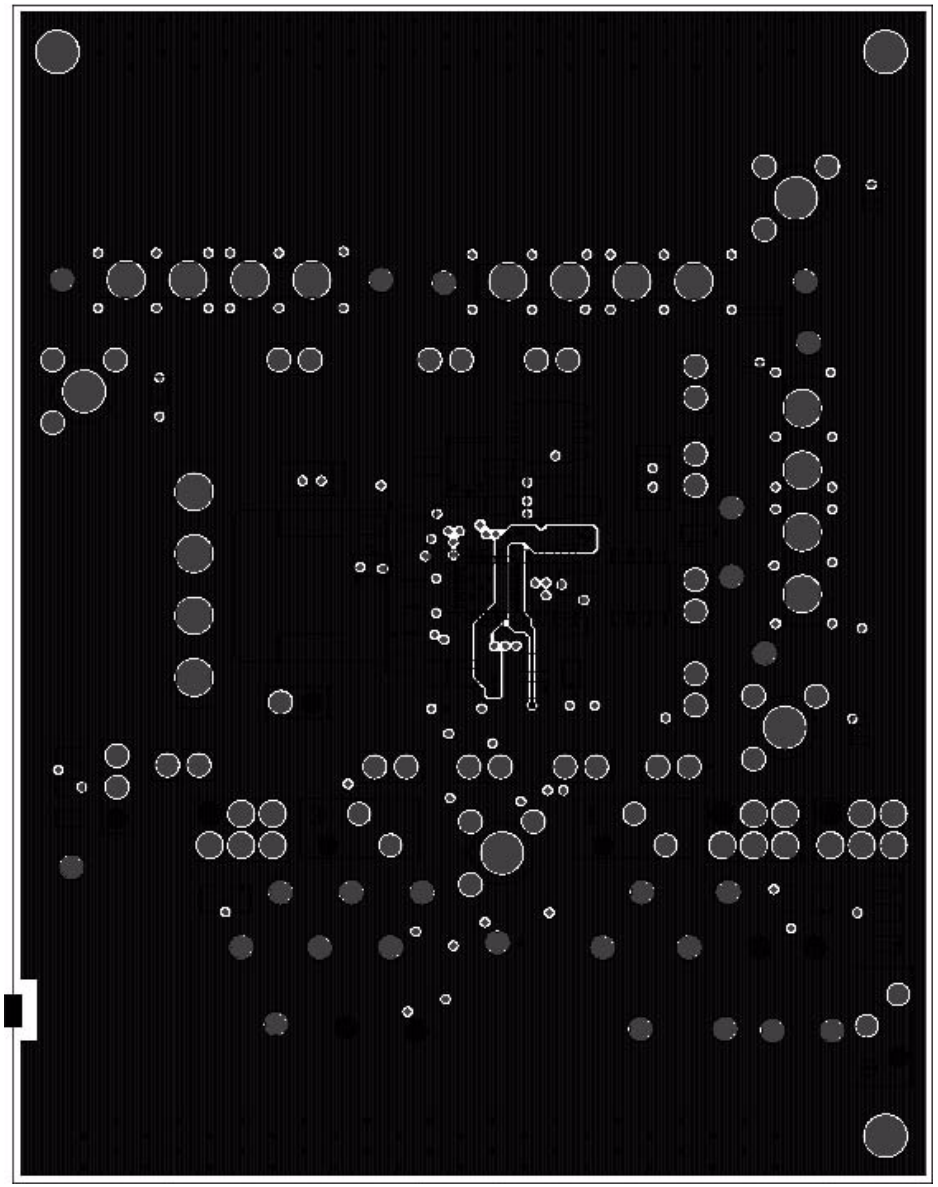


FIGURE 7. L4 GND

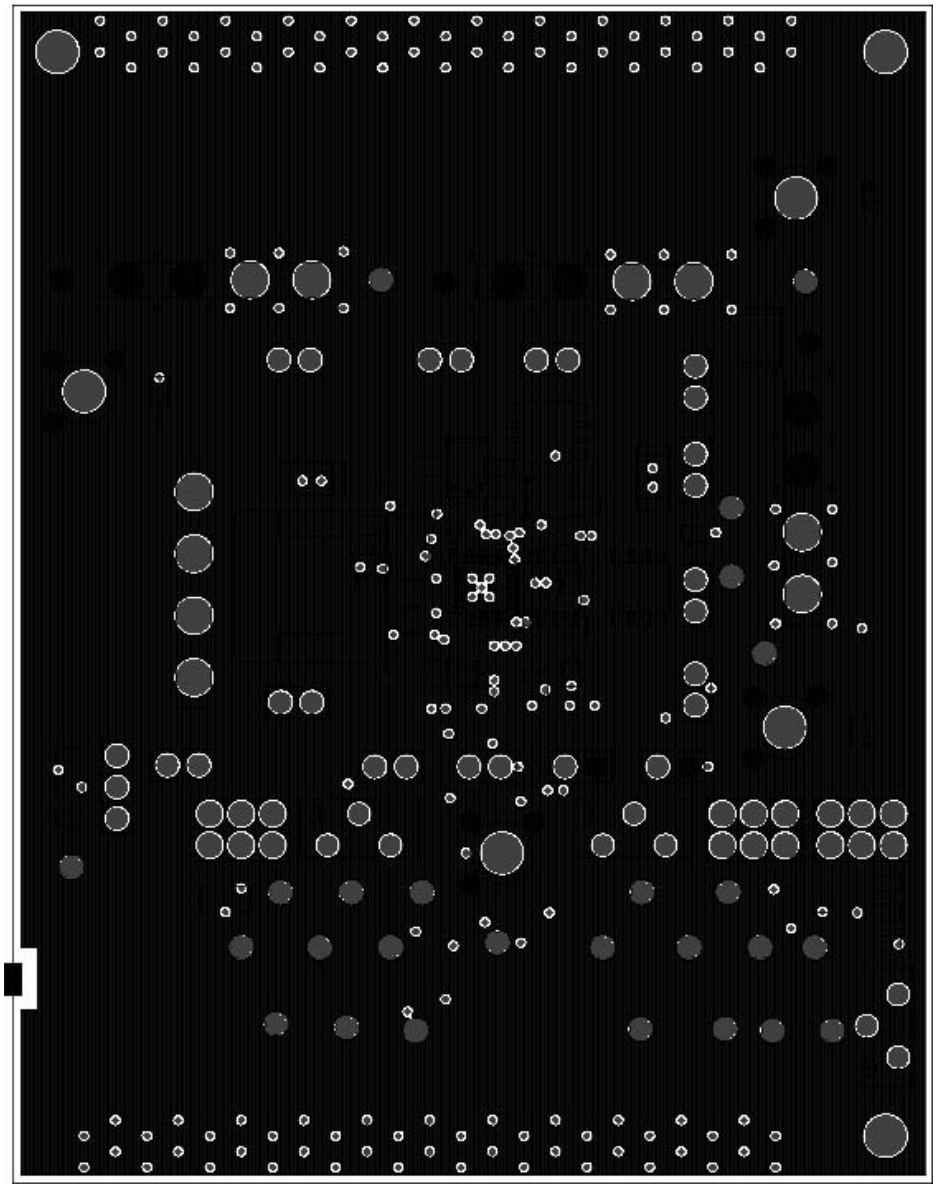


FIGURE 8. L5 GND

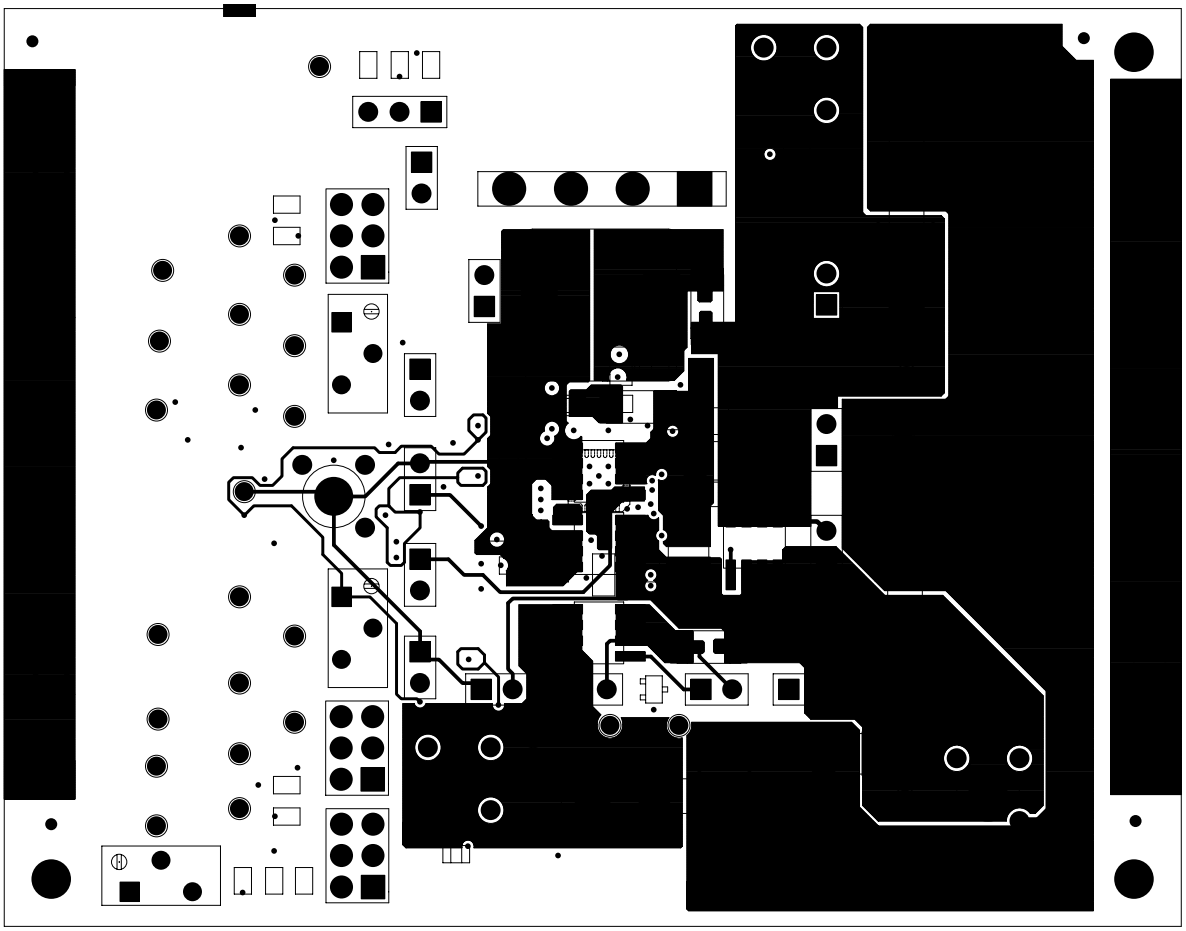


FIGURE 9. BOTTOM