

## General Description

The ISL6253EVAL1Z 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, which control open drain outputs DCPRN and ACPRN. The ICM pin provides a 0V to 2V output signal that is proportional to the AC adapter output current.

## Features

- $\pm 0.5\%$  Voltage Accuracy from  $-10^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$
- $\pm 3\%$  AC Adapter Current Limit Accuracy
- $\pm 4\%$  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
- $+150^{\circ}\text{C}$  Thermal Shutdown Protection
- AC Adapter Output Current Monitor
- AC Adapter Present Indicator
- DC Adapter Present Indicator
- Controls P-Channel MOSFET Power Source Isolation Switch
- Controls P-Channel MOSFET Battery Isolation Switch
- Pb-Free Plus Anneal Available (RoHS Compliant)

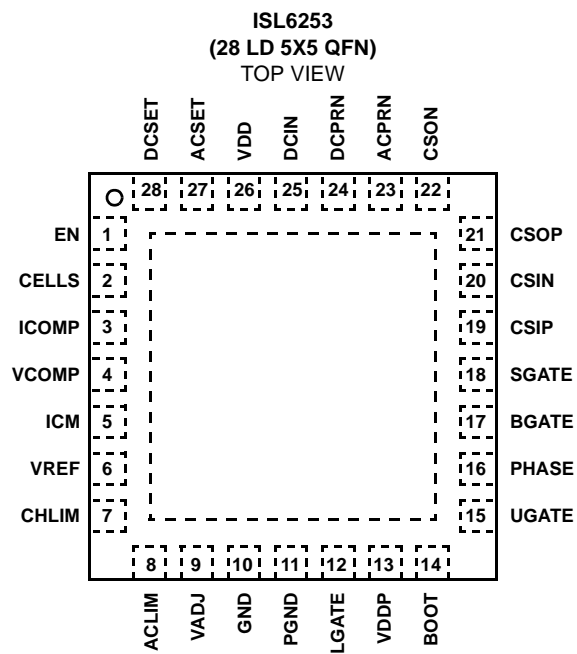
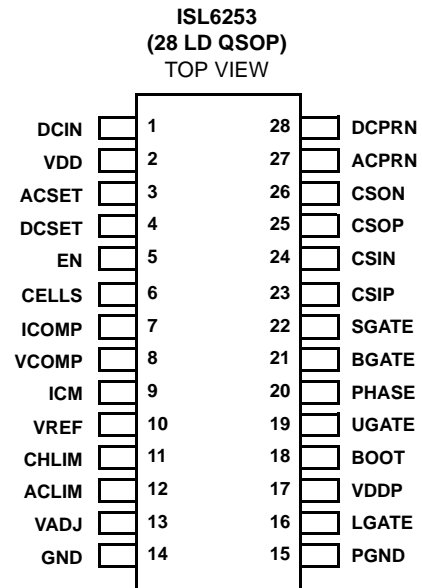
## Ordering Information

PART NUMBER (Notes 1, 2)	PART MARKING	TEMP. RANGE ( $^{\circ}\text{C}$ )	PACKAGE	PKG. DWG. #
ISL6253HRZ	ISL 6253HRZ	$-10$ to $+100$	28 Ld 5x5 QFN (Pb-free)	L28.5x5
ISL6253HR	ISL 6253HR	$-10$ to $+100$	28 Ld 5x5 QFN	L28.5x5
ISL6253HAZ	ISL 6253HAZ	$-10$ to $+100$	28 Ld QSOP (Pb-free)	M28.15

### 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.

## Pinouts



## What's Inside

This Evaluation Board Kit contains the following materials:

- Qty(1) ISL625XEVAL1Z Evaluation Board
- Qty(1) ISL6253EVAL1Z 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 to 2	VDD	4	16.8
2 to 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 R<sub>24</sub> to VADJ. Potentiometer R<sub>24</sub> may be removed and replaced with resistors R<sub>19</sub> and R<sub>21</sub>. Resistor R<sub>20</sub> limits the trim increase to 1%. Shorting R<sub>20</sub> 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	To VREF	+5%
3 to 5	To GND	-5%
5 to 6	Floating	None
3 to 4	R <sub>24</sub> Wiper or R <sub>19</sub> /R <sub>21</sub>	Adjustable between -5% to +5%

### 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 R<sub>22</sub> to CHLIM. Potentiometer R<sub>22</sub> may be removed and replaced with resistors R<sub>6</sub> and R<sub>7</sub>.

TABLE 3. JUMPER JP4 FUNCTIONS

SHUNT JUMPER LOCATION	CHLIM PIN CONNECTED TO:	100% CURRENT FEEDBACK CSOP TO CSIN	100% CONSTANT CURRENT
Removed	3.3V@TP10	127mV	5.08A
1 to 3	VREF	100mV	4.00A
Removed	Floating	65mV	2.60A
3 to 5	GND	30mV	1.20A
3 to 4	R <sub>22</sub> or R <sub>6</sub> /R <sub>7</sub>	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 R<sub>23</sub> to ACLIM. Potentiometer R<sub>23</sub> may be removed and replaced with resistors R<sub>17</sub> and R<sub>18</sub>.

TABLE 4. JUMPER JP5 FUNCTIONS

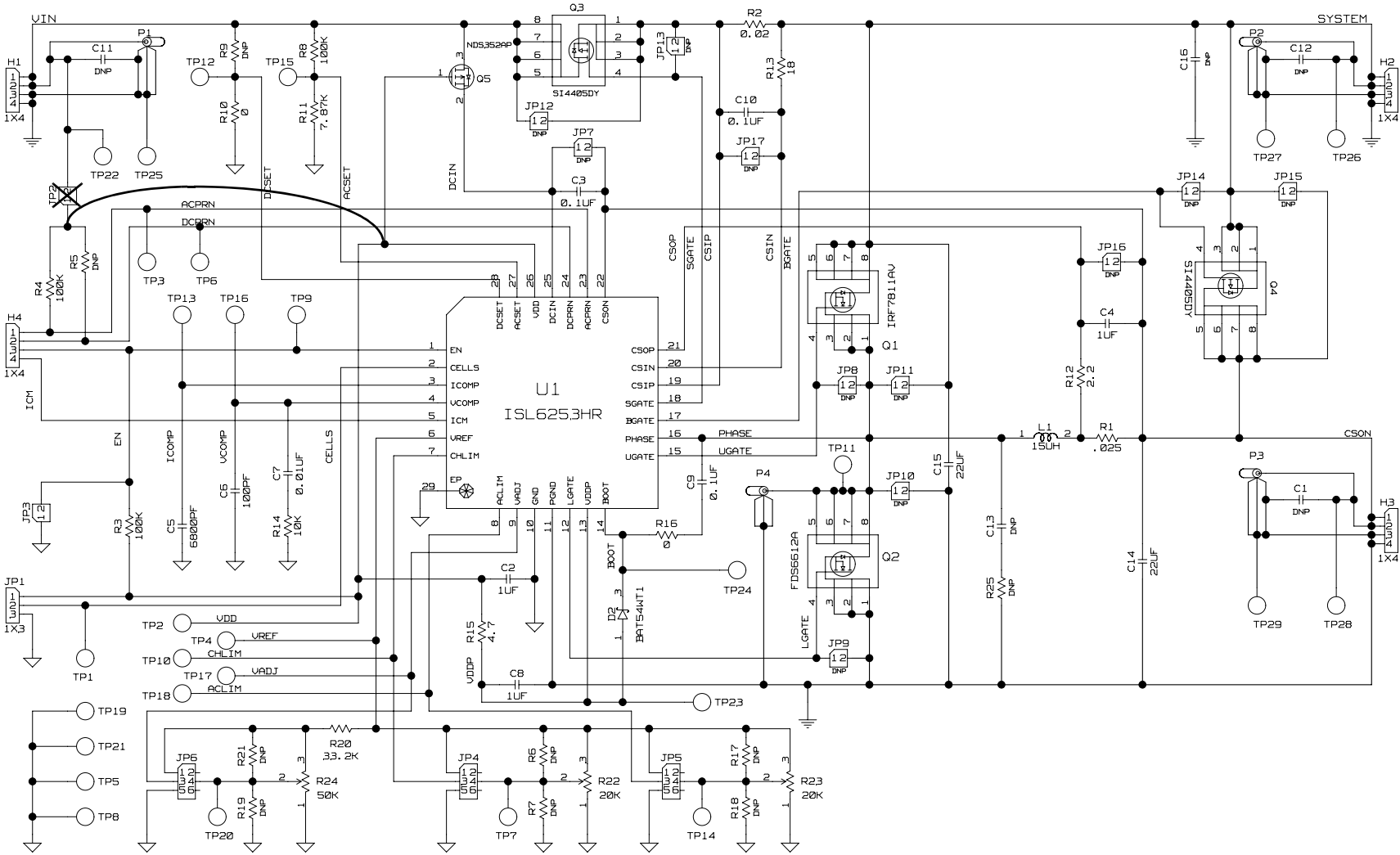
SHUNT JUMPER LOCATION	ACLIM PIN CONNECTED TO:	100% CURRENT FEEDBACK CSIP TO CSIN	100% ADAPTER CURRENT
1 to 3	VREF	103mV	5.15A
Removed	Floating	78mV	3.90A
3 to 5	GND	53mV	2.65A
3 to 4	R <sub>23</sub> or R <sub>17</sub> /R <sub>18</sub>	50mV to 100mV	2.65A to 5.15A

## Interface Connections

TABLE 5.

HEADER	PIN#	CONNECT TO
H1 INPUT POWER	1	"+" INPUT POWER
	2	"+" SENSE (if used)
	3	"-" SENSE (if used)
	4	"-" INPUT POWER
H2 SYSTEMLOAD OUTPUT	1	"+" SYSTEM LOAD OUTPUT
	2	"+" SENSE (if used)
	3	"-" SENSE (if used)
	4	"-" SYSTEM LOAD OUTPUT
H3 BATTERY CHARGER OUTPUT	1	"+" BATTERY CHARGER OUTPUT
	2	"+" SENSE (if used)
	3	"-" SENSE (if used)
	4	"-" BATTERY CHARGER OUTPUT

# ISL6253EVAL1Z Schematic



## Application Note 1294

**TABLE 6. 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	D2	SURFACE MOUNT SCHOTTKY BARRIER DIODE	Diodes Inc	BAT54WT1
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

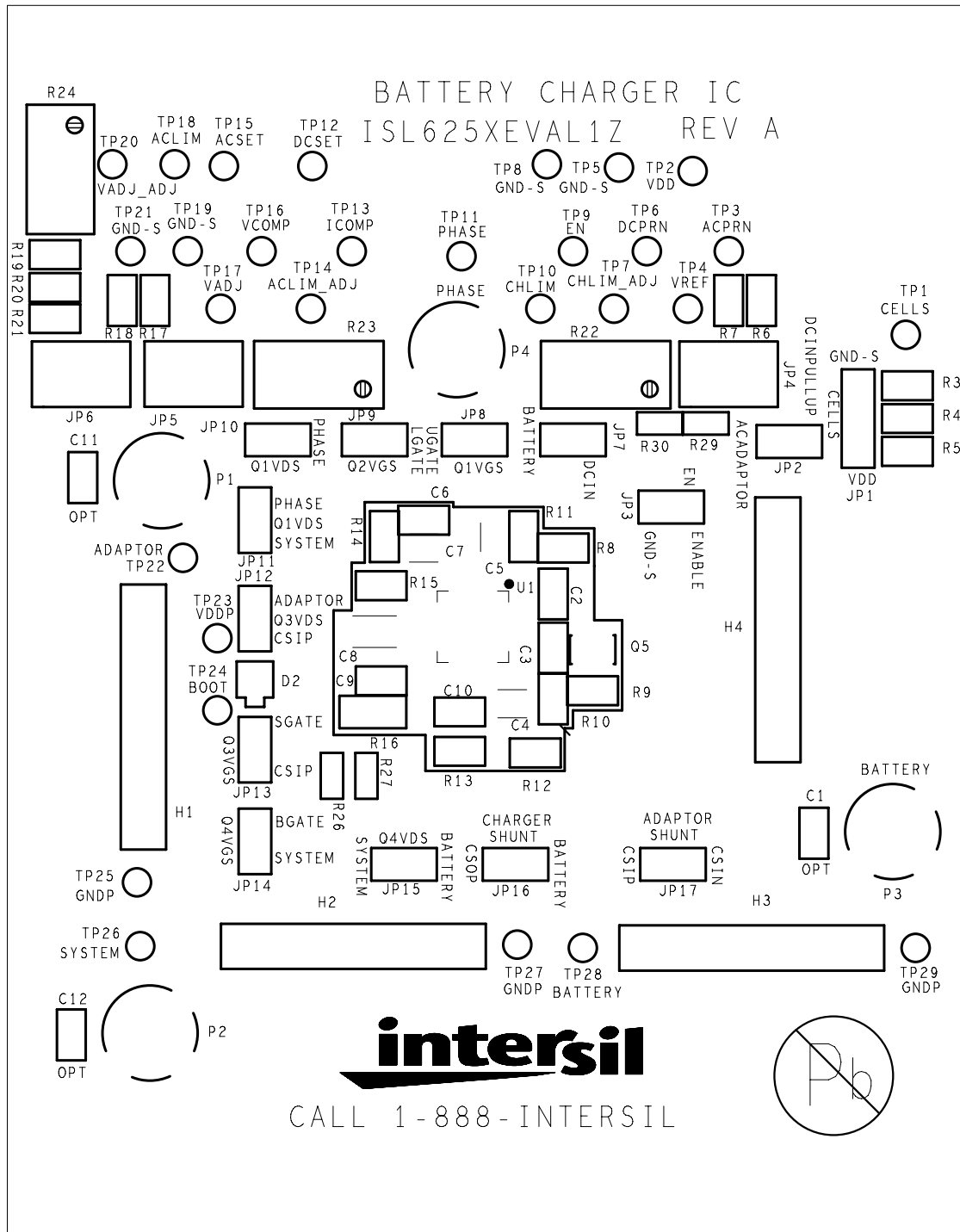


FIGURE 1. TOP SILK

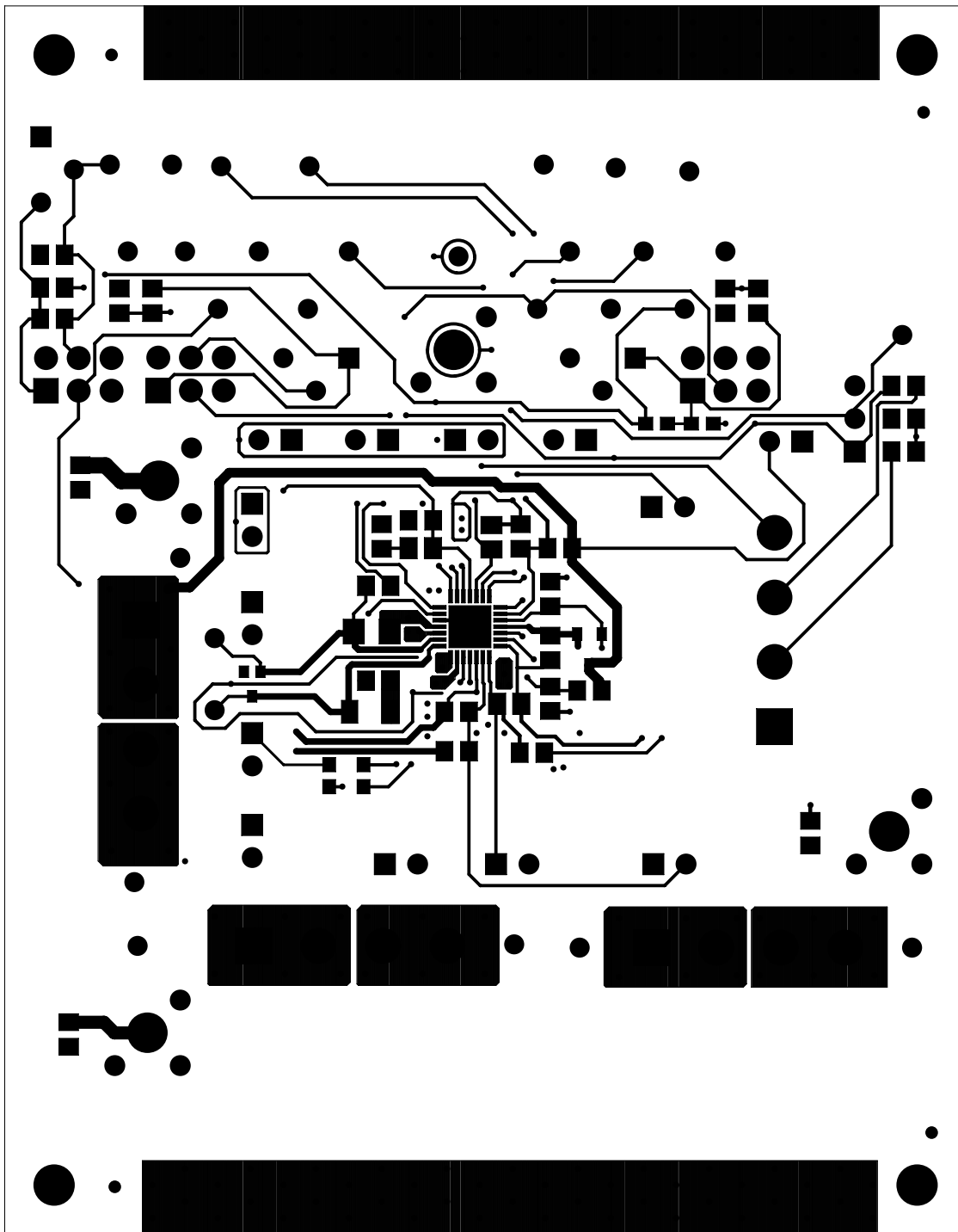


FIGURE 2. TOP LAYER

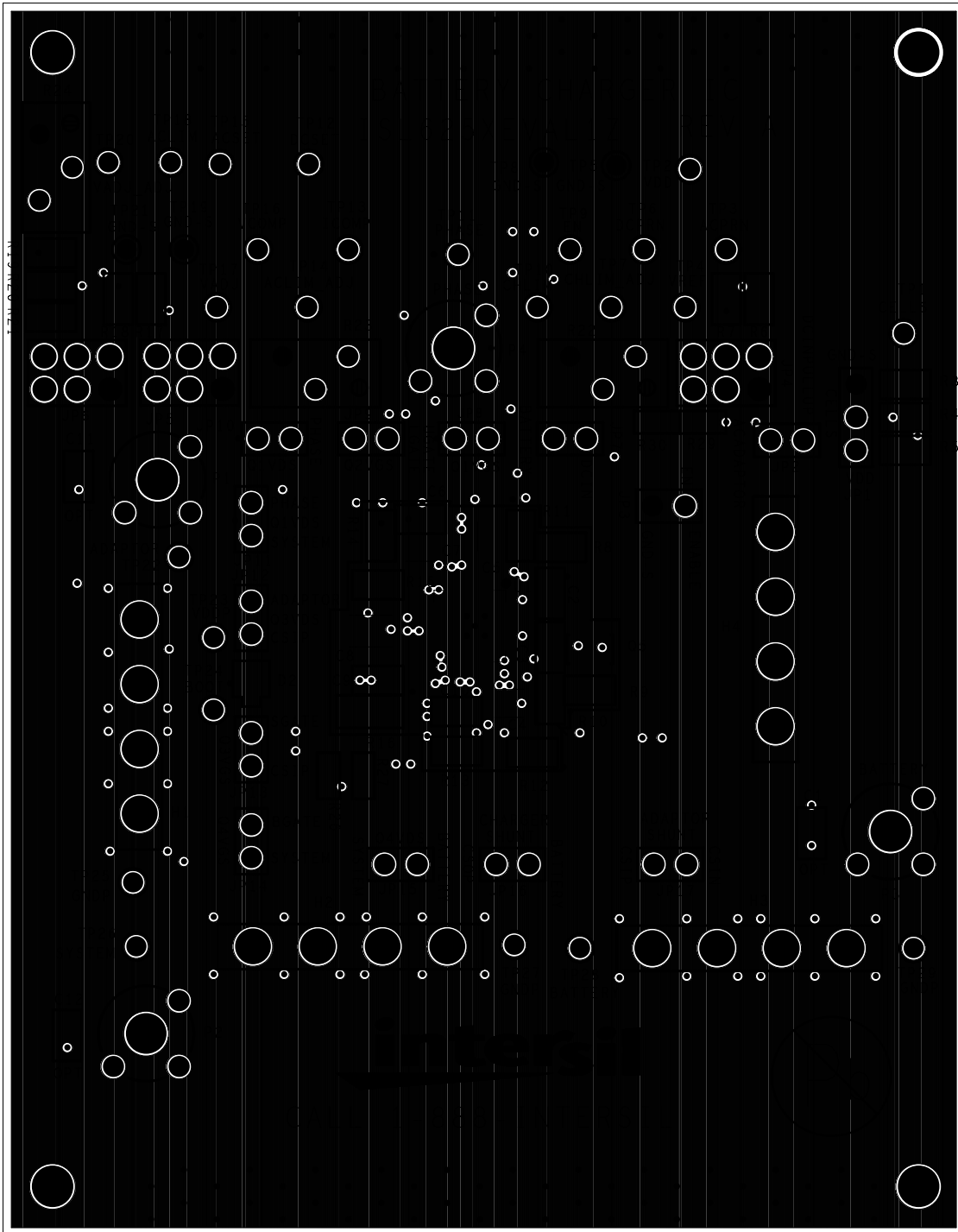


FIGURE 3. LAYER 2 GROUND



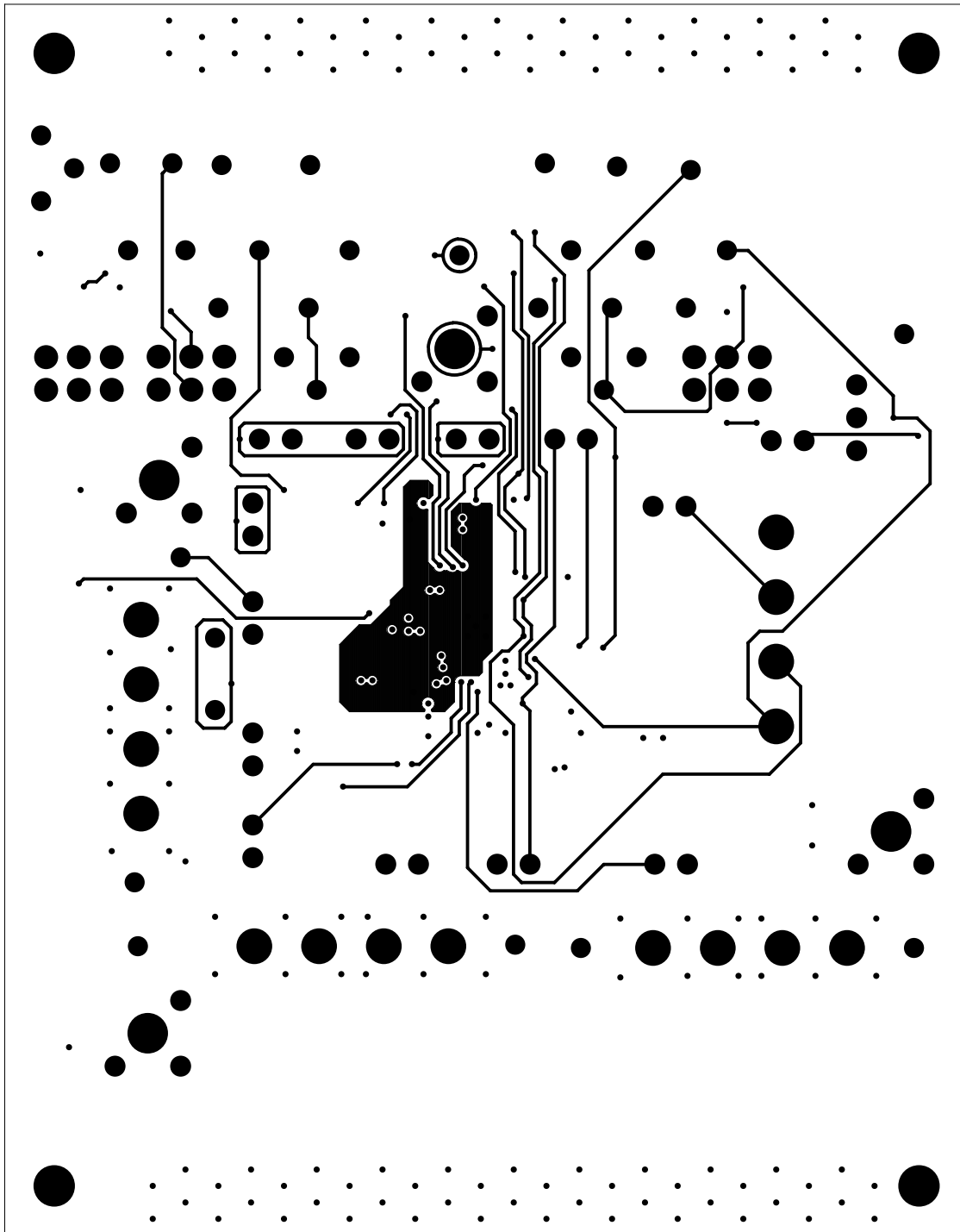


FIGURE 4. LAYER 3 SIGNAL

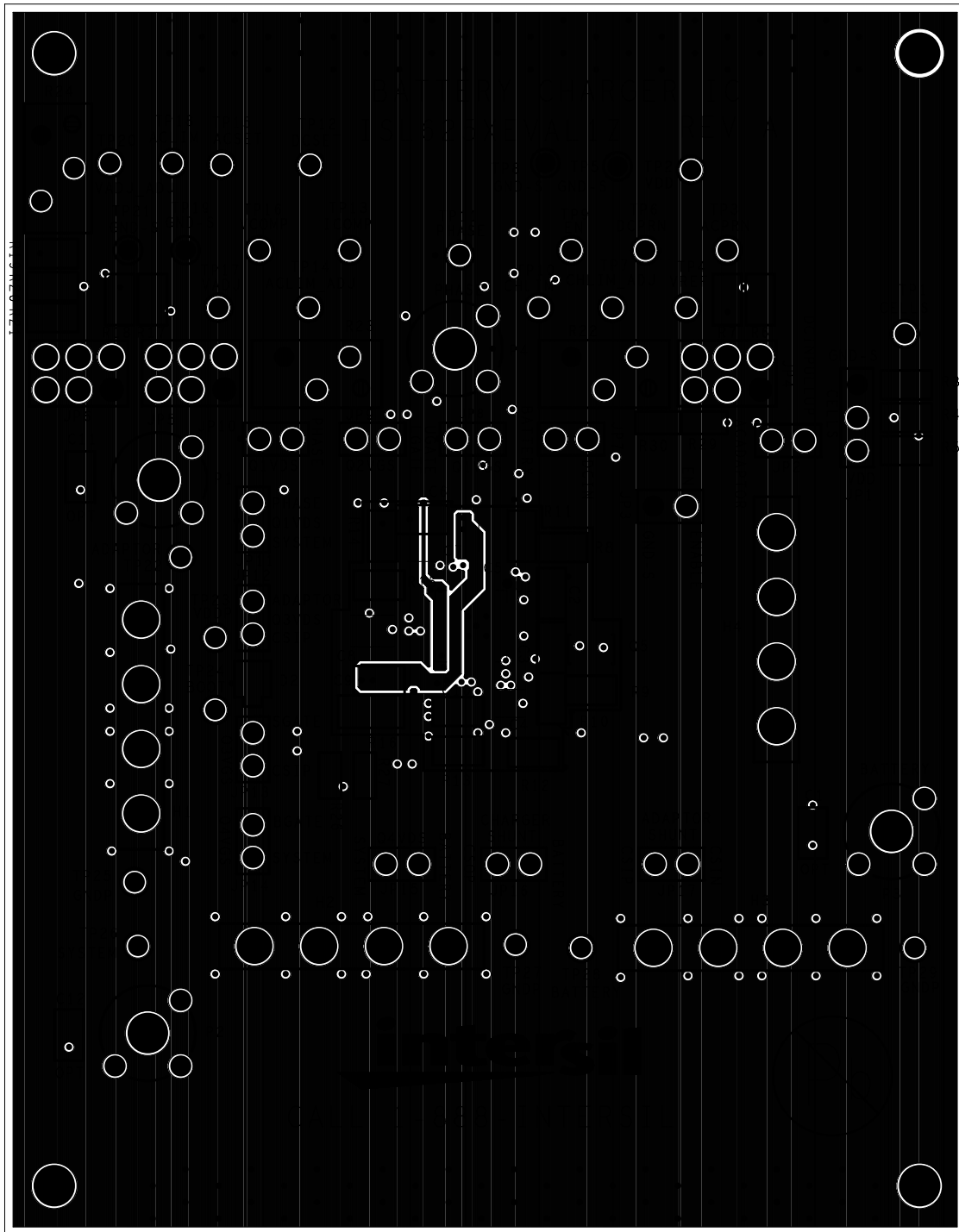


FIGURE 5. LAYER 4 GROUND

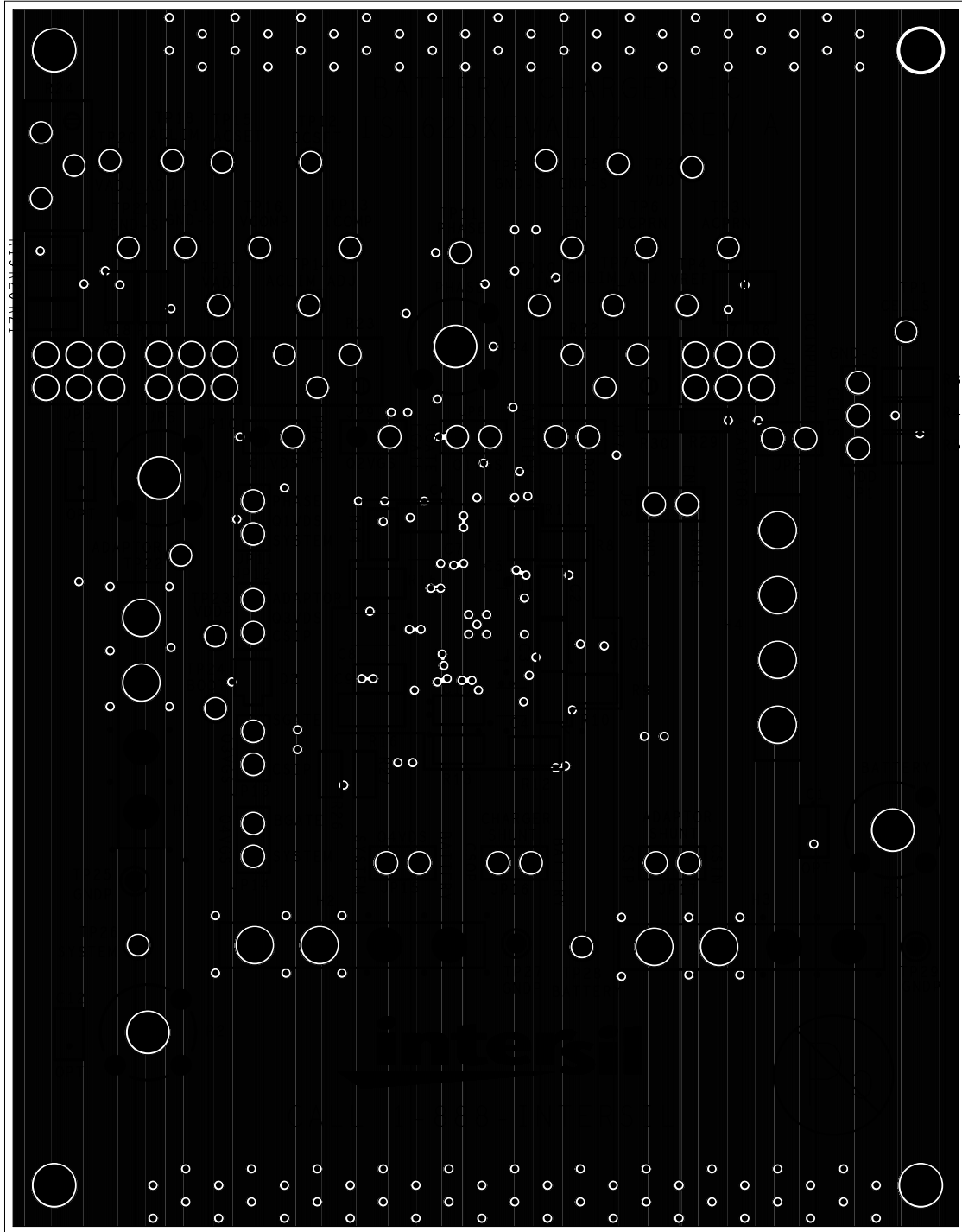


FIGURE 6. LAYER 5 GND

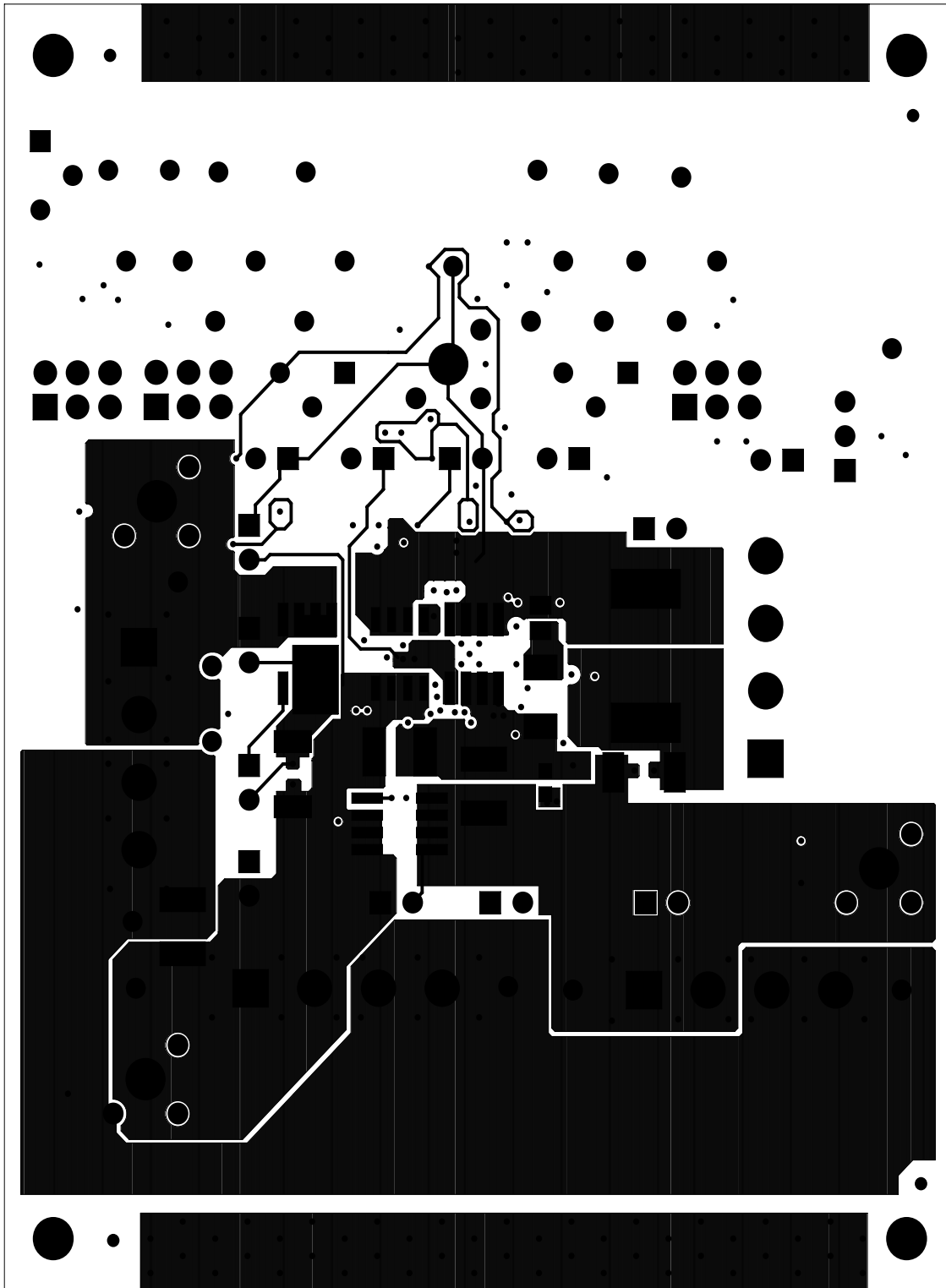


FIGURE 7. BOTTOM COPPER

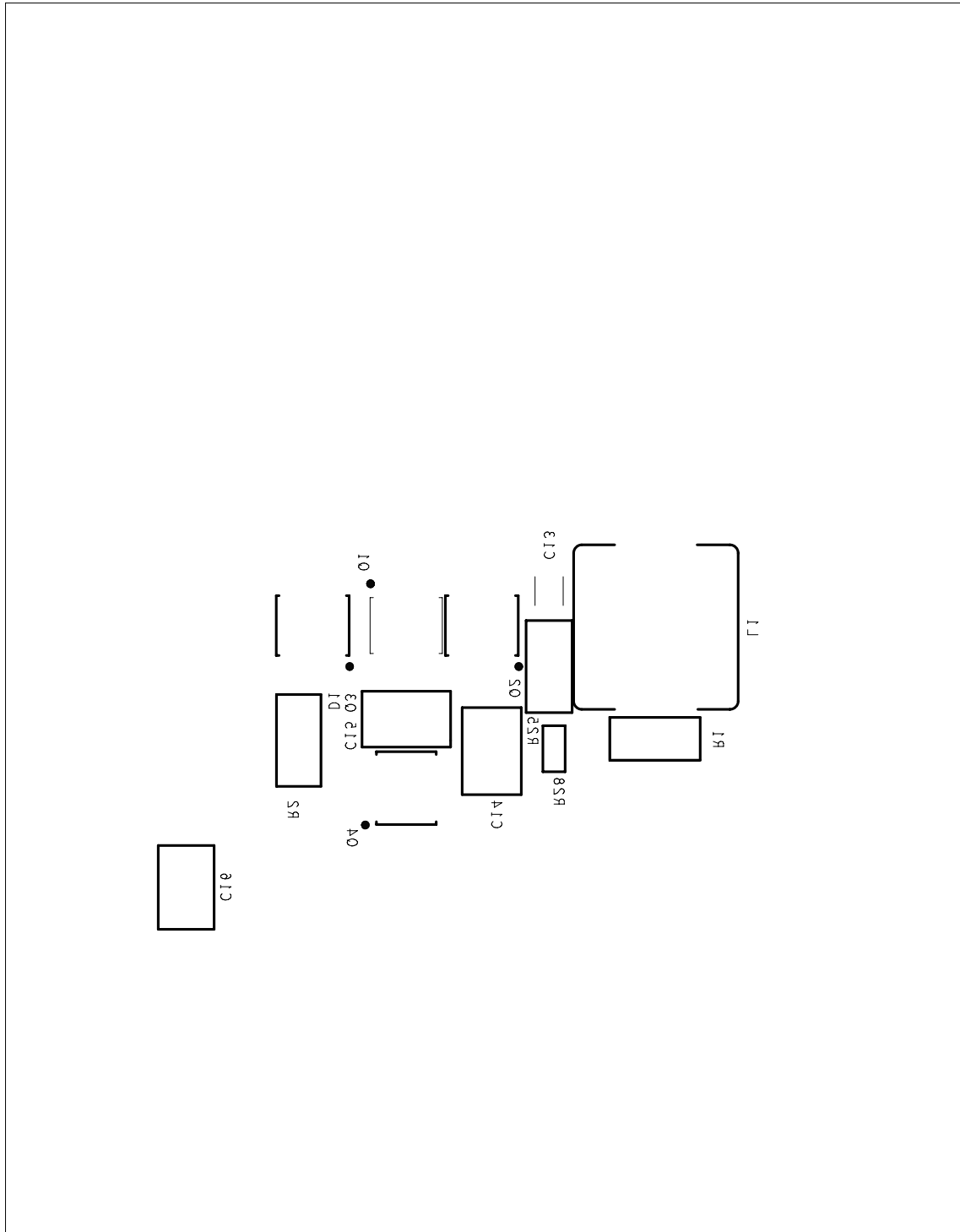


FIGURE 8. BOTTOM SILK

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