ISL6251EVAL1Z

Evaluation Board

AN1292
Rev 0.00
April 10, 2007

Low Cost Multi-Chemistry Battery Charger Controller

The ISL6251, ISL6251A is a highly integrated battery charger controller for Li-Ion/Li-Ion polymer batteries and NiMH batteries. High Efficiency is achieved by a synchronous buck topology and the use of a MOSFET, instead of a diode, for selecting power from the adapter or battery. The low side MOSFET emulates a diode at light loads to improve the light load efficiency and prevent system bus boosting.

The constant output voltage can be selected for 2, 3 and 4 series Li-Ion cells with 0.5% accuracy over-temperature. It can be also programmed between 4.2V + 5%/cell and 4.2V - 5%/cell to optimize battery capacity. When supplying the load and battery charger simultaneously, the input current limit for the AC adapter is programmable to within 3% accuracy to avoid overloading the AC adapter, and to allow the system to make efficient use of available adapter power for charging. It also has a wide range of programmable charging current. The ISL6251, ISL6251A provides outputs that are used to monitor the current drawn from the AC adapter, and monitor for the presence of an AC adapter. The ISL6251, ISL6251A automatically transitions from regulating current mode to regulating voltage mode.

Ordering Information

PART NUMBER (Notes 1, 2)	PART MARKING	TEMP RANGE (°C)	PACKAGE (Pb-Free)	PKG. DWG. #
ISL6251HRZ	ISL 6251HRZ	-10 to +100	28 Ld 5x5 QFN	L28.5×5
ISL6251HAZ	ISL 6251HAZ	-10 to +100	24 Ld QSOP	M24.15
ISL6251AHRZ	ISL6251 AHRZ	-10 to +100	28 Ld 5x5 QFN	L28.5×5
ISL6251AHAZ	ISL6251 AHAZ	-10 to +100	24 Ld QSOP	M24.15

NOTES:

1. Intersil Pb-free plus anneal products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which are RoHS compliant and 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-020.
2. Add "-T" for Tape and Reel.

Features

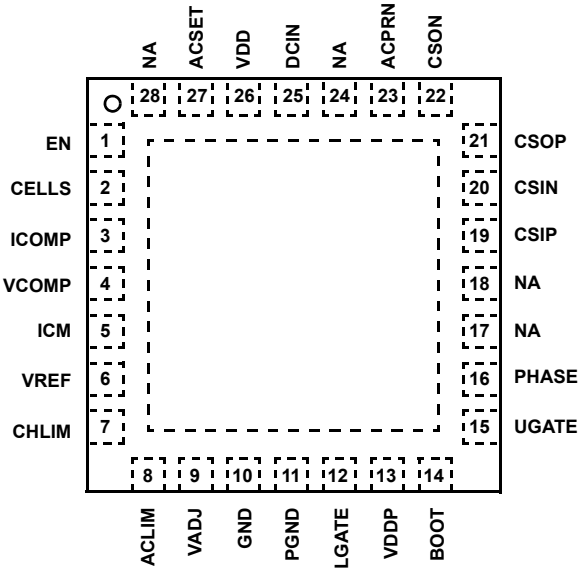
- ±0.5% Charge Voltage Accuracy (-10°C to +100°C)
- ±3% Accurate Input Current Limit
- ±3% Accurate Battery Charge Current Limit
- ±25% Accurate Battery Trickle Charge Current Limit (ISL6251A)
- Programmable Charge Current Limit, Adapter Current Limit and Charge Voltage
- Fixed 300kHz PWM Synchronous Buck Controller with Diode Emulation at Light Load
- Output for Current Drawn from AC Adapter
- AC Adapter Present Indicator
- Fast Input Current Limit Response
- Input Voltage Range 7V to 25V
- Support 2, 3 and 4 Cells Battery Pack
- Up to 17.64V Battery-Voltage Set Point
- Thermal Shutdown
- Support Pulse Charging
- Less than 10µA Battery Leakage Current
- Charge Any Battery Chemistry: Li-Ion, NiCd, NiMH, etc.
- Pb-Free Plus Anneal Available (RoHS Compliant)

Applications

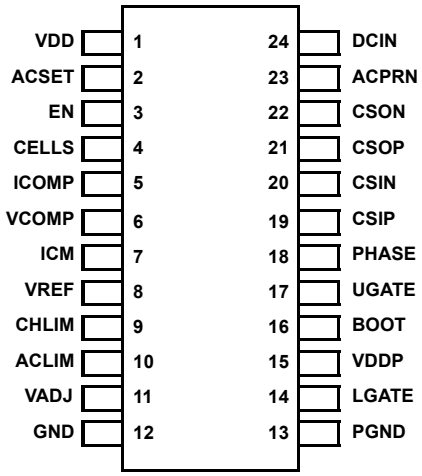
- Notebook, Desknote and Sub-notebook Computers
- Personal Digital Assistant

Pinouts

ISL6251, ISL6251A
(28 LD QFN)
TOP VIEW



ISL6251, ISL6251A
(24 LD QSOP)
TOP VIEW



What's Inside

This Evaluation Board Kit contains the following materials:

- Qty(1) ISL625xEVAL1Z REV B Evaluation Board
- Qty(1) ISL6251EVAL1Z REV B 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_{24} to VADJ. Potentiometer R_{24} may be removed and replaced with resistors R_{19} and R_{21}. Resistor R_{20} limits the trim increase to 1%. Shorting R_{20} 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_{24} Wiper or R_{19}/R_{21}	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_{22} to CHLIM. Potentiometer R_{22} may be removed and replaced with resistors R_6 and R_7.

TABLE 3. JUMPER JP4 FUNCTIONS

SHUNT JUMPER LOCATION	CHLIM PIN CONNECTED TO:	100% CURRENT FEEDBACK CSOP TO CSON	100% CONSTANT CURRENT
1 to 3	VREF	120mV	4.80A
Removed	Floating	0V	0A
3 to 5	GND	0V	0A
3 to 4	R_{22} or R_6/R_7	0mV to 120mV	0A to 4.8A

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_{23} to ACLIM. Potentiometer R_{23} may be removed and replaced with resistors R_{17} and R_{18}.

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	100mV	5.15A
Removed	Floating	75mV	3.90A
3 to 5	GND	50mV	2.65A
3 to 4	R_{23} or R_{17}/R_{18}	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 SYSTEM LOAD 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

ISL6251EVAL1Z Schematic

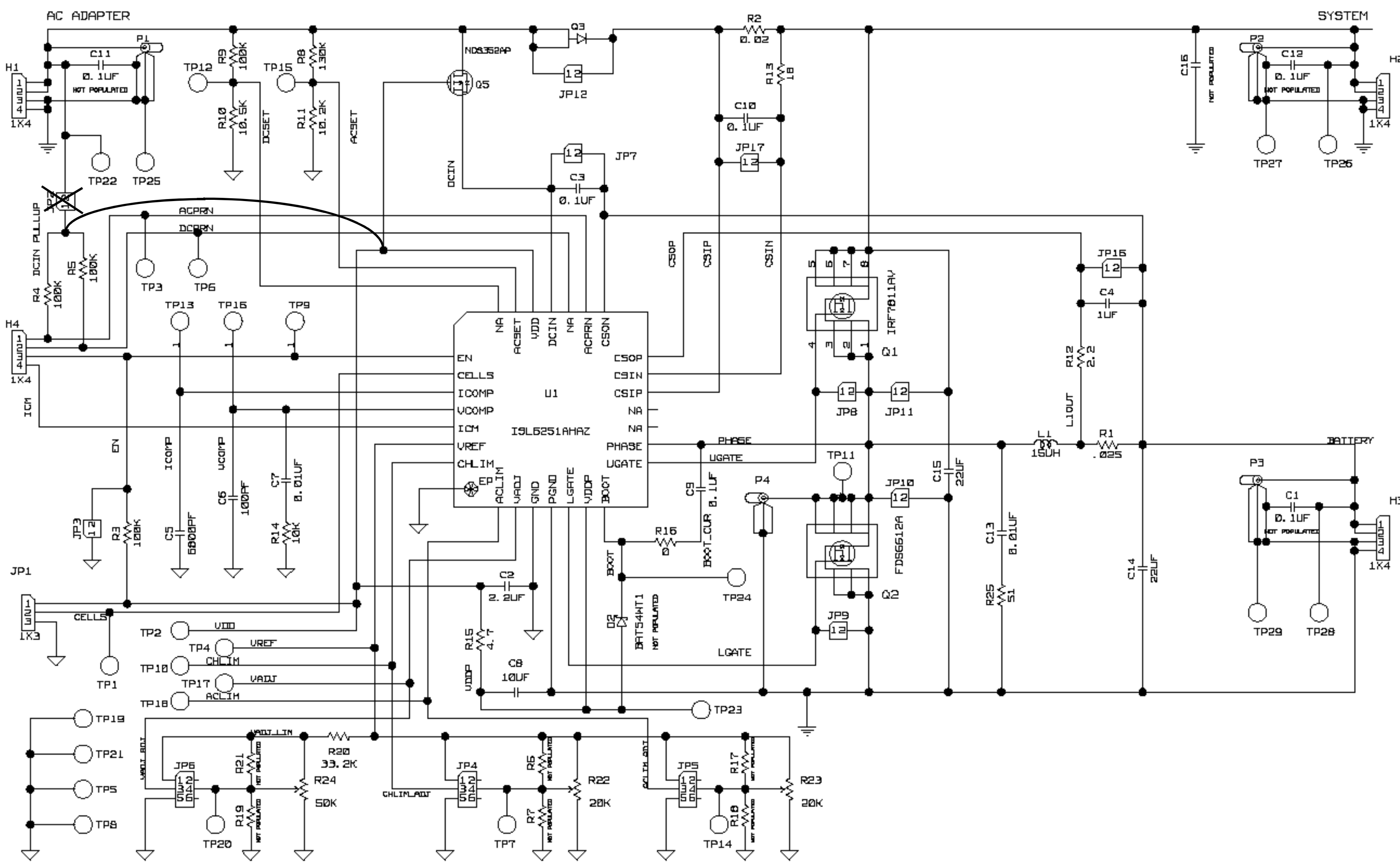


TABLE 6. BILL OF MATERIALS

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	ISL6251HR
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	D1	POWER SCOTTKY DIODE, 10A, 40V	DIODES INC	PDS1040
1	D2	SURFACE MOUNT SCHOTTKY BARRIER DIODE	Diodes Inc	BAT54WT1
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

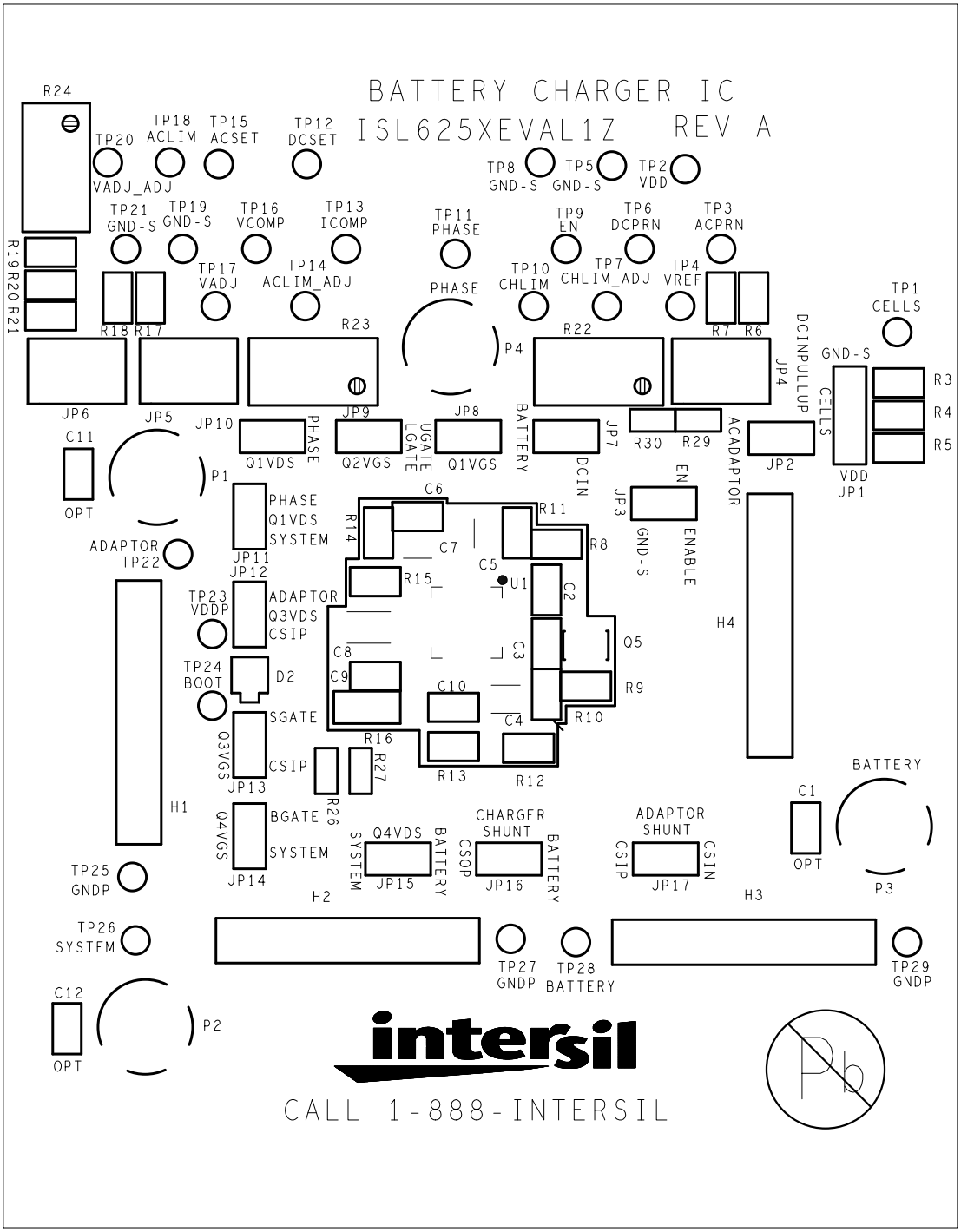


FIGURE 1. TOP SILK

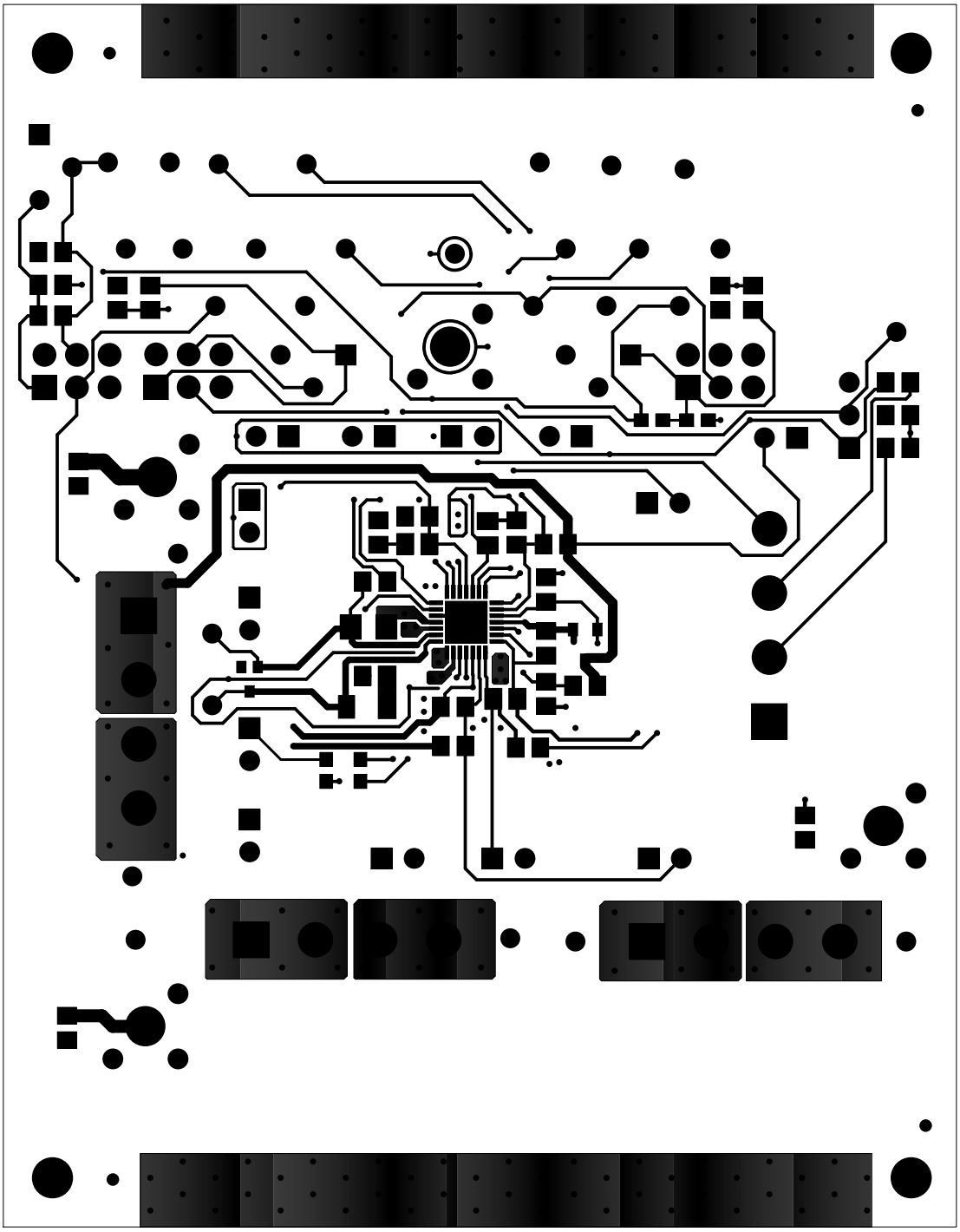


FIGURE 2. TOP LAYER

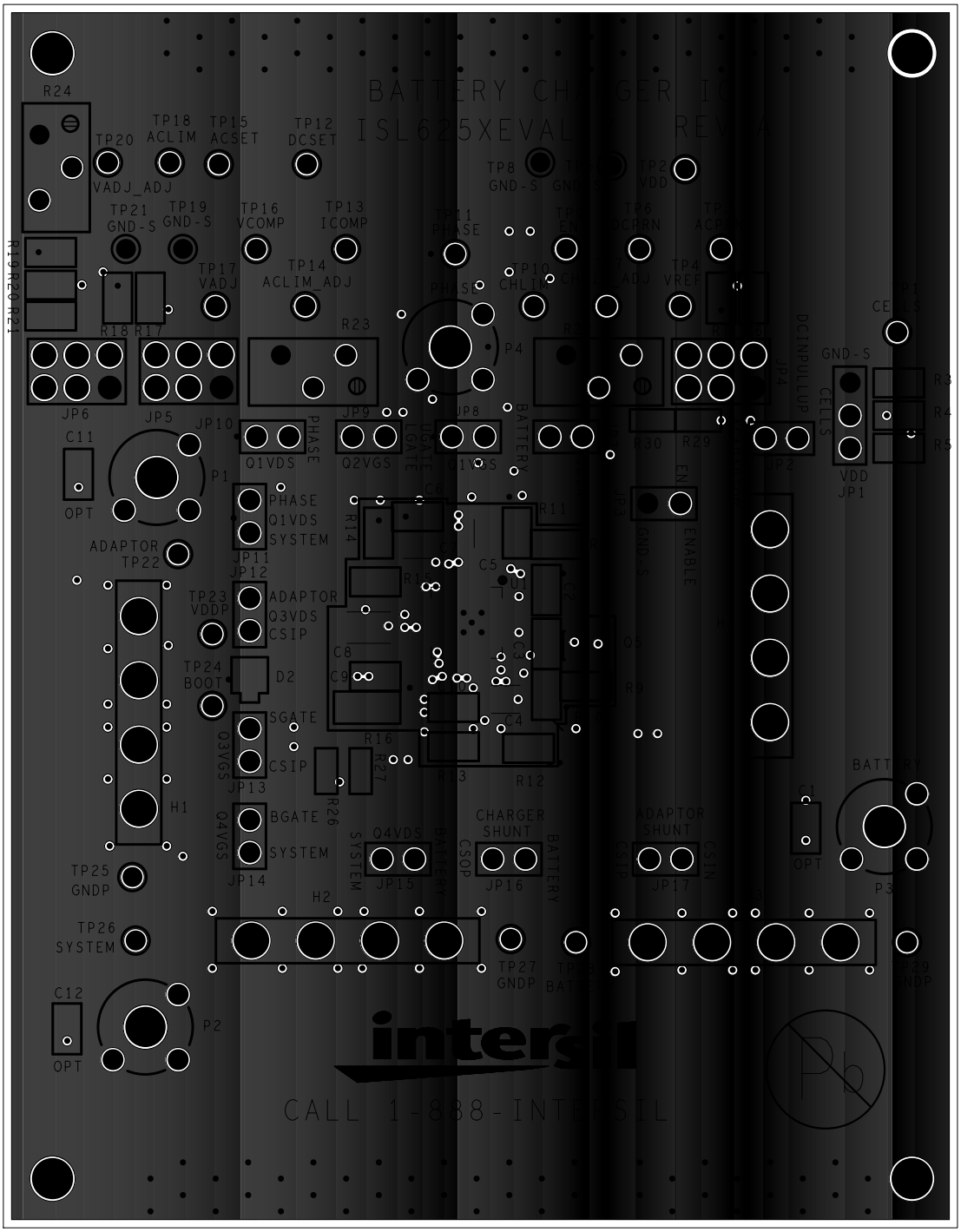


FIGURE 3. LAYER 2 GROUND

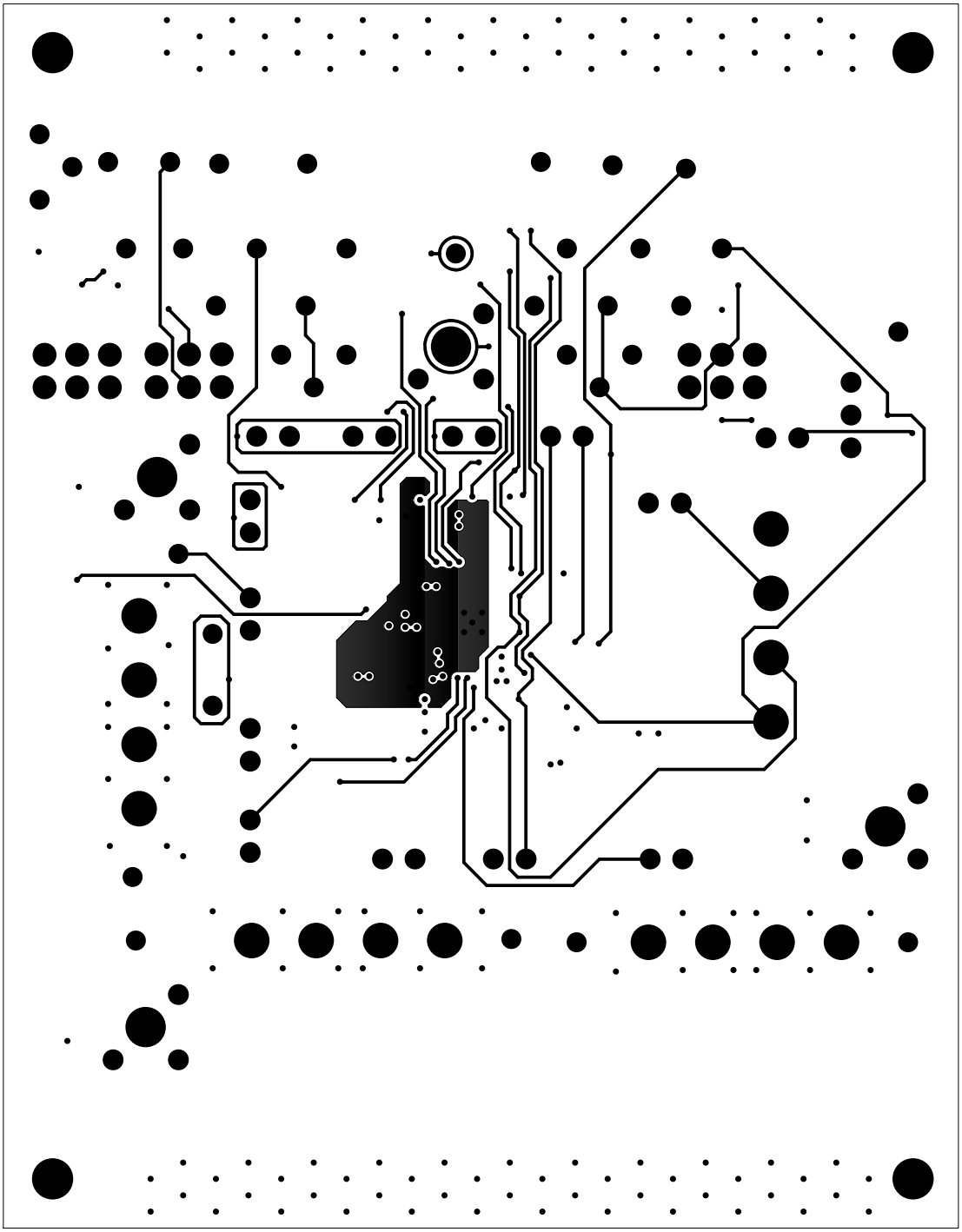


FIGURE 4. LAYER 3 SIGNAL

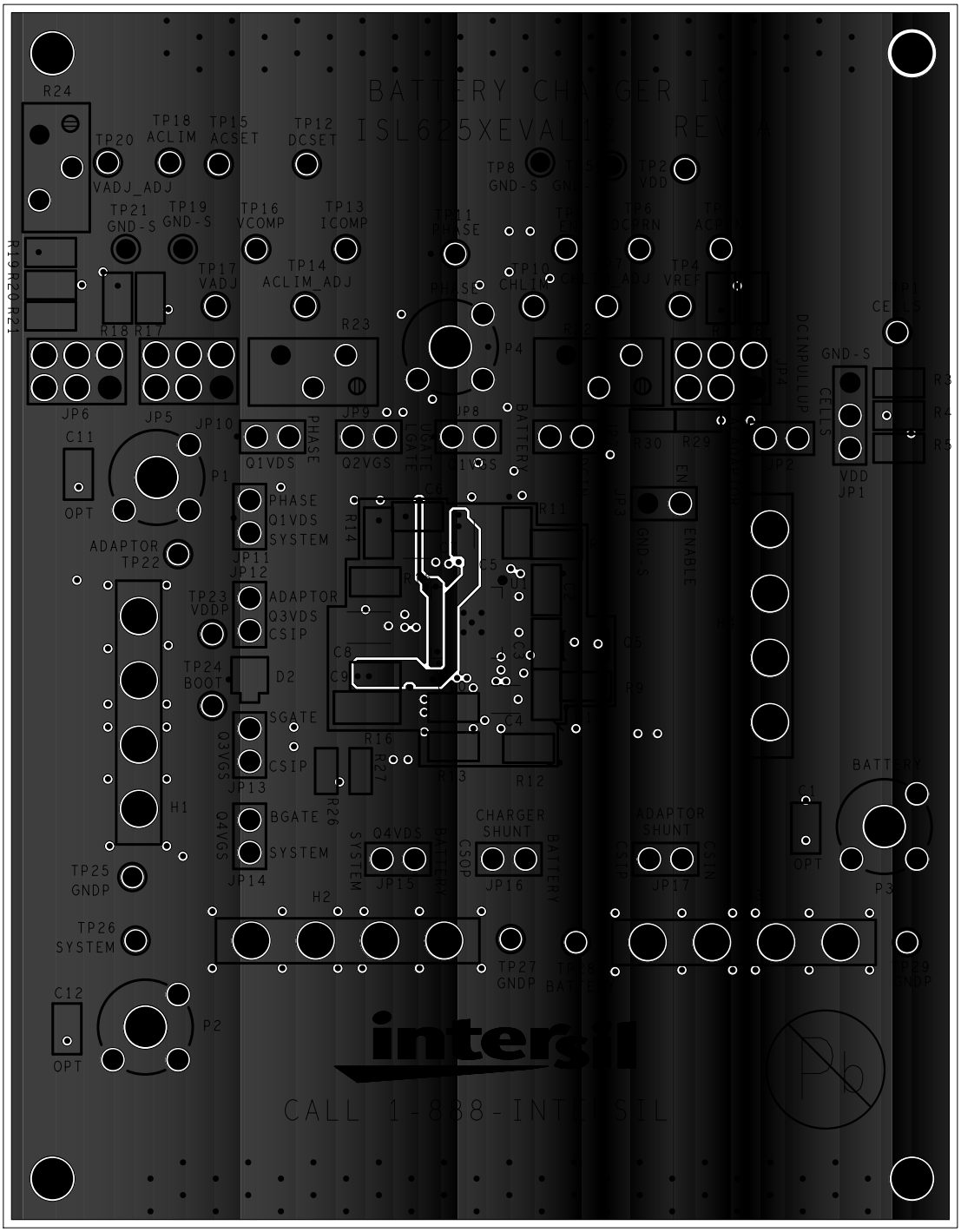


FIGURE 5. LAYER 4 GROUND

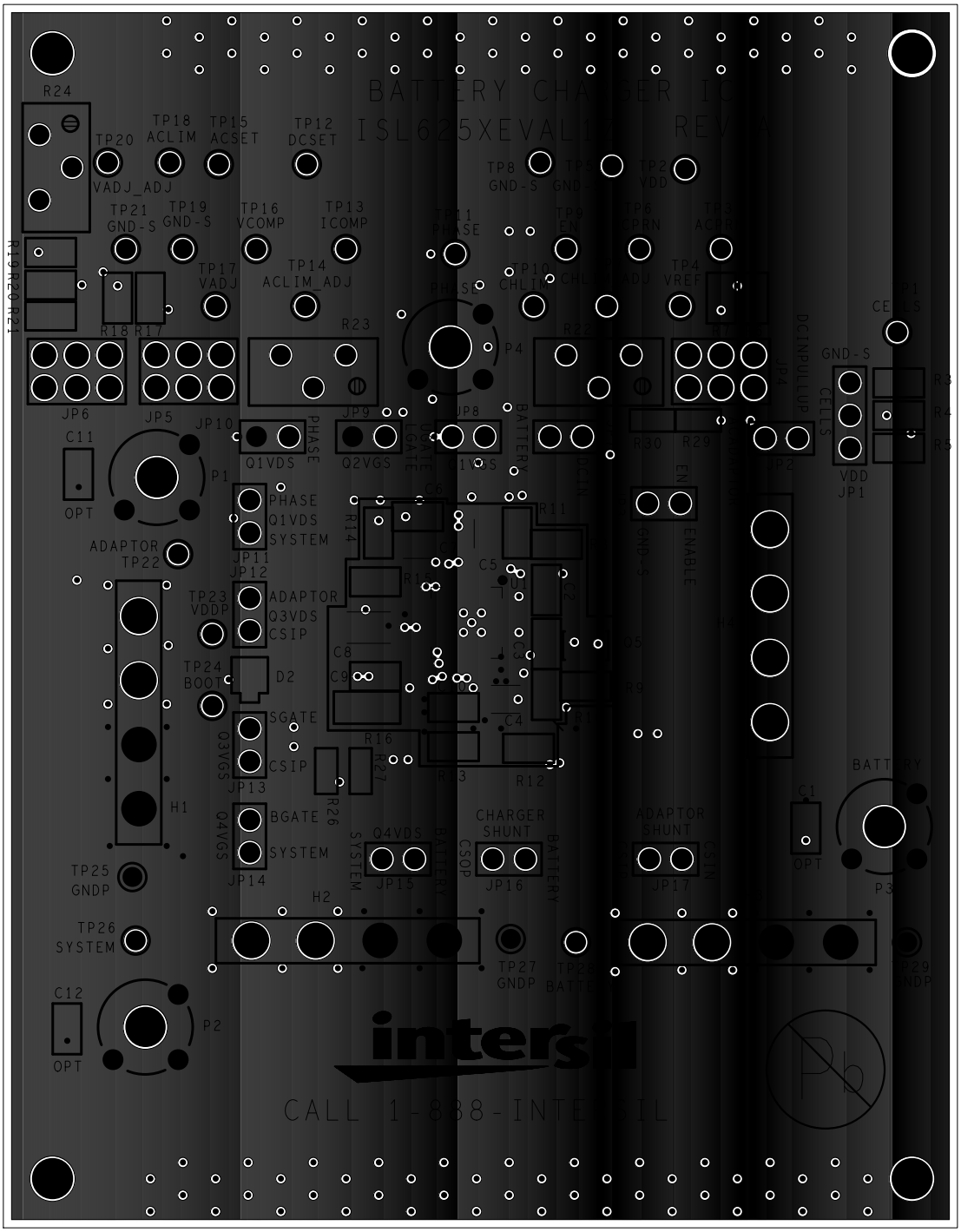


FIGURE 6. LAYER 5 GROUND

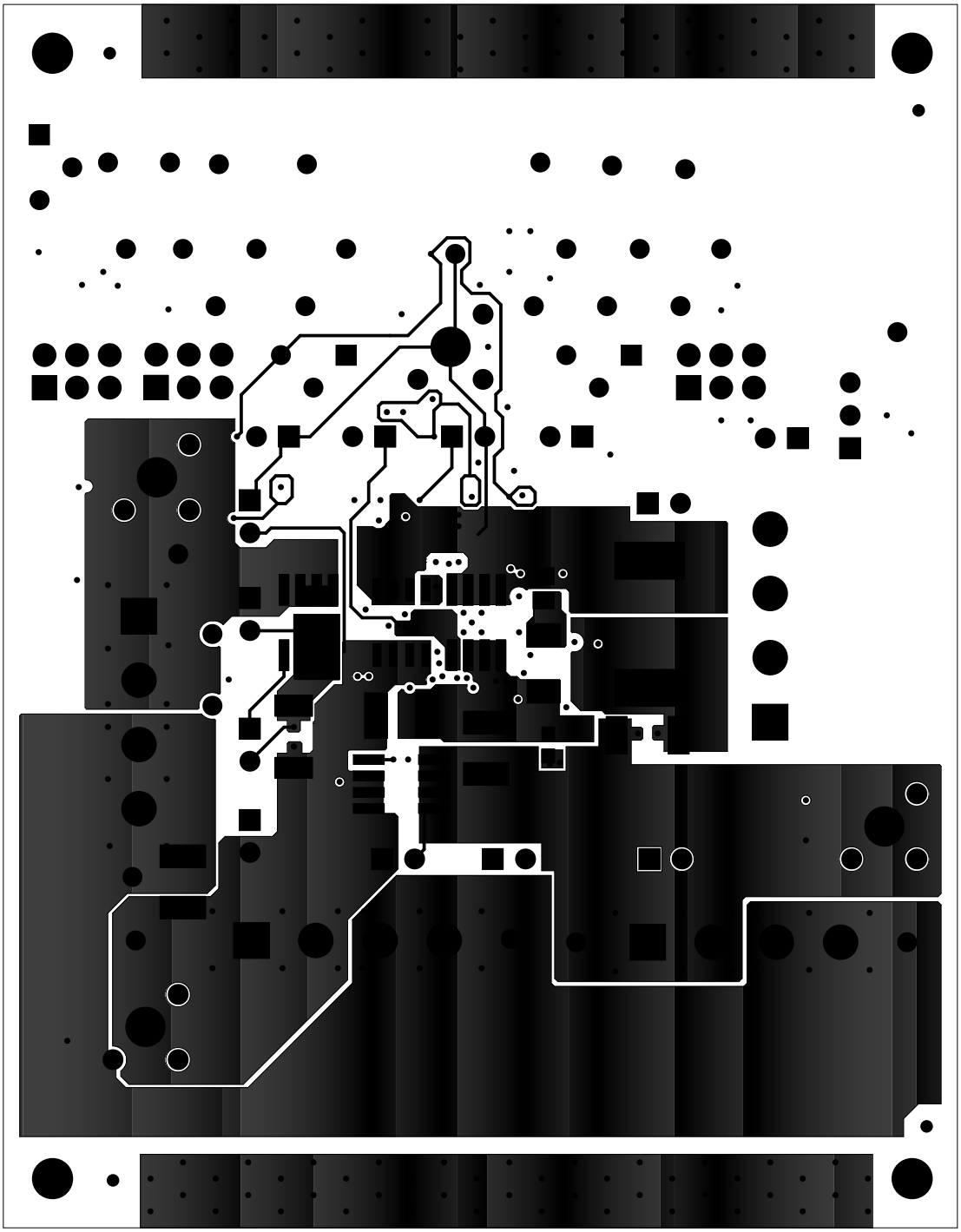


FIGURE 7. BOTTOM COPPER

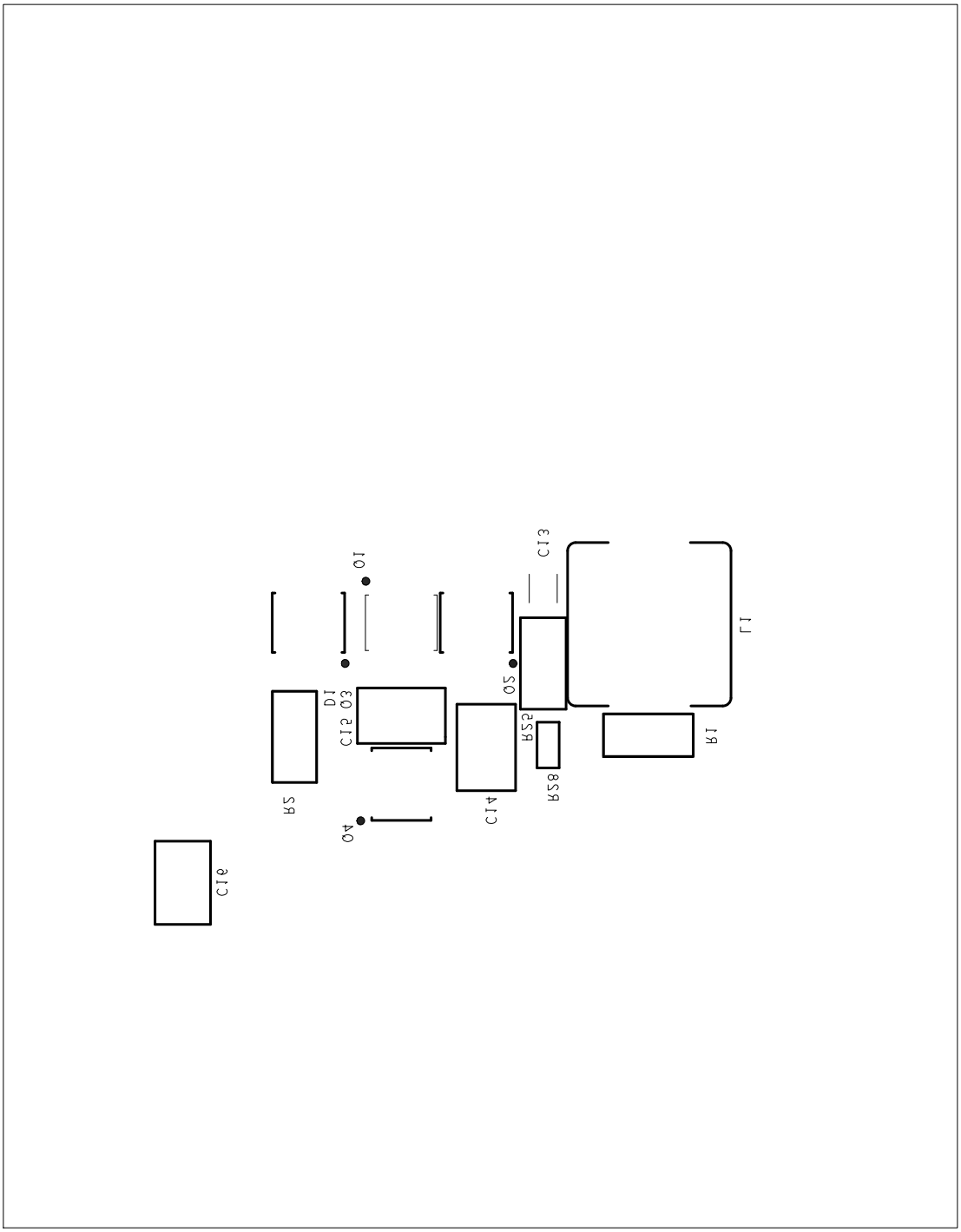


FIGURE 8. BOTTOM SILK

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(Rev.4.0-1 November 2017)

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Renesas Electronics America Inc.
1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited
9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.
Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.
Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited
Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.
13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.
80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.
Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.
No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.
17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338

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