XRP9711EVB-DEMO-1

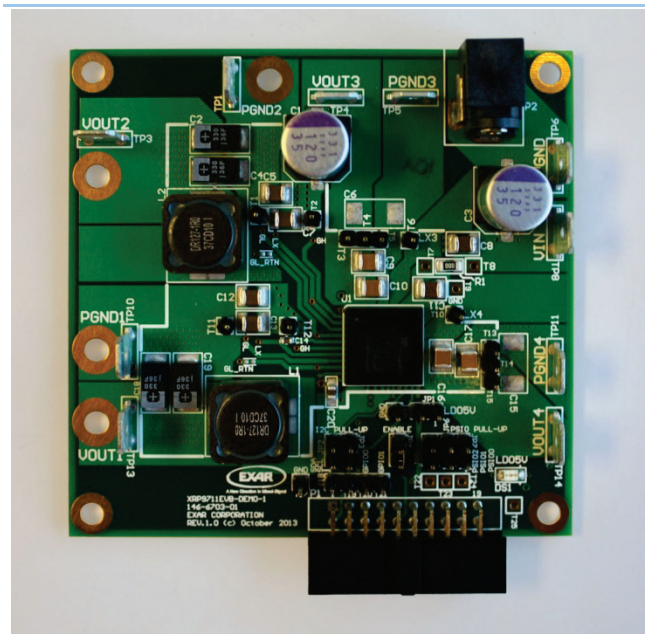
Quad Channel Digital PWM/PFM Demo Board
Programmable Power Management System

January 2014 Rev. 1.0.0

EVALUATION BOARD MANUAL

GENERAL DESCRIPTION

The XRP779711EVB-DEMO-1 board is a complete, four channel power system. It provides 1.5V, 1.2V 1.8V and 2.5V at maximum currents of 10A, 10A, 6A and 6A respectively. The 1.5V and 1.2V supplies can be adjusted in 2.5mV increments, the 1.8V and 2.5V supplies in 5mV increments. The order and ramp rates for each supply can be programmed to accommodate any sequencing requirement. All power supply operations can be controlled over an I^2C interface. Faults, output voltages and currents can also be monitored. Two GPIO and three PSIO signals are available and can be programmed to provide a variety of functions. Unused GPIO/PSIO pins can be programmed as I/O expansion for a microcontroller. The board is supported by PowerArchitect™ 5.1 and plugs directly onto the interposer board acting as an interface to Arduino controller.



XRP9711EVB-DEMO-1

FEATURES

- **XRP9711 Programmable Power Module**
  - Channels 1 and 2 driving external power stages
  - Channel 3 and 4 internal converters
- **4 Channel Power System**
- **Wide Input Voltage Range: 5.5V-22V**
- **I^2C Interface**
  - Programming
  - Monitoring
  - Control
- **Arduino GPIO, PSIO and ENABLE control**

EVALUATION BOARD SCHEMATICS

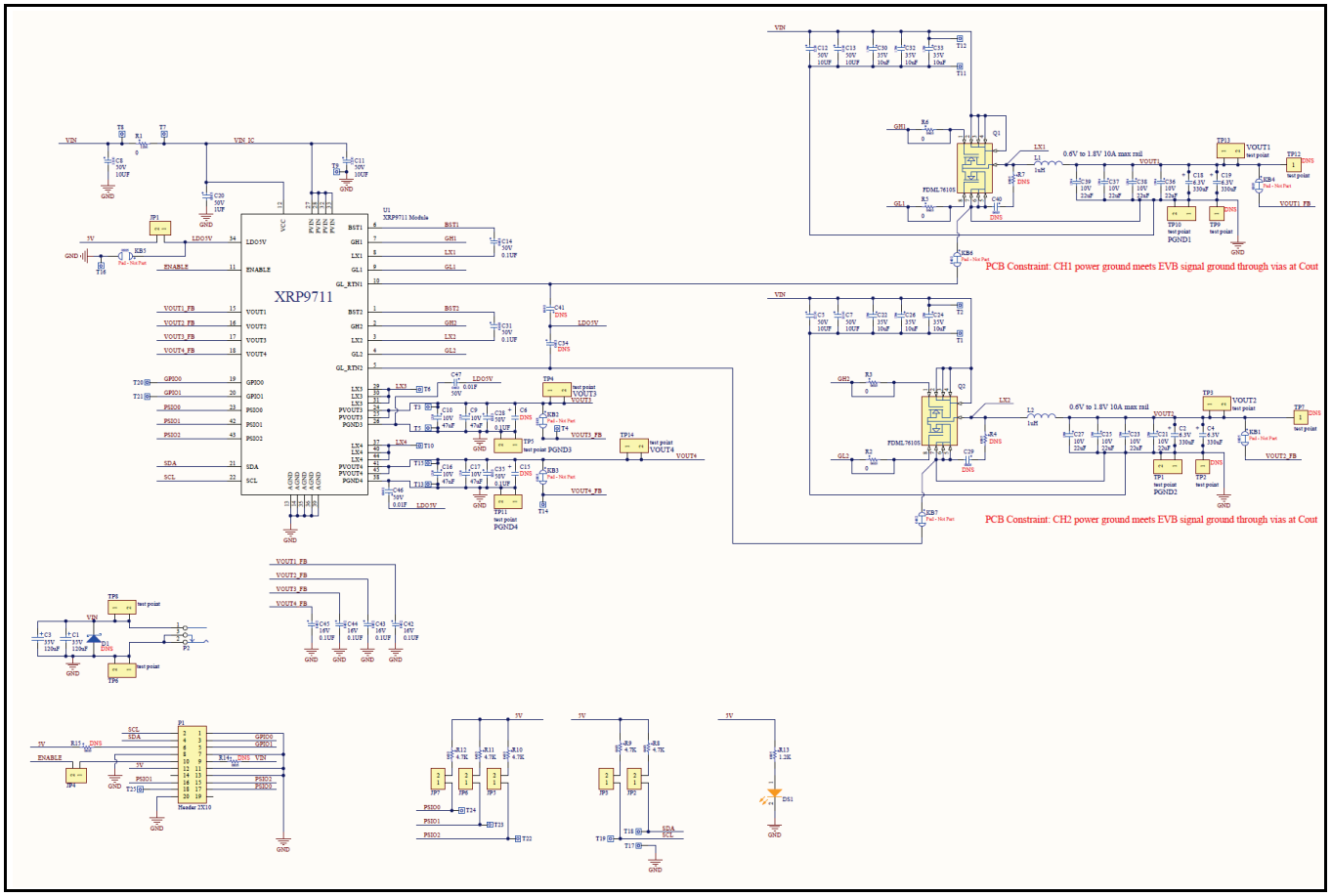


Figure 1 XRP9711 Evaluation Board Schematics

PIN ASSIGNMENT

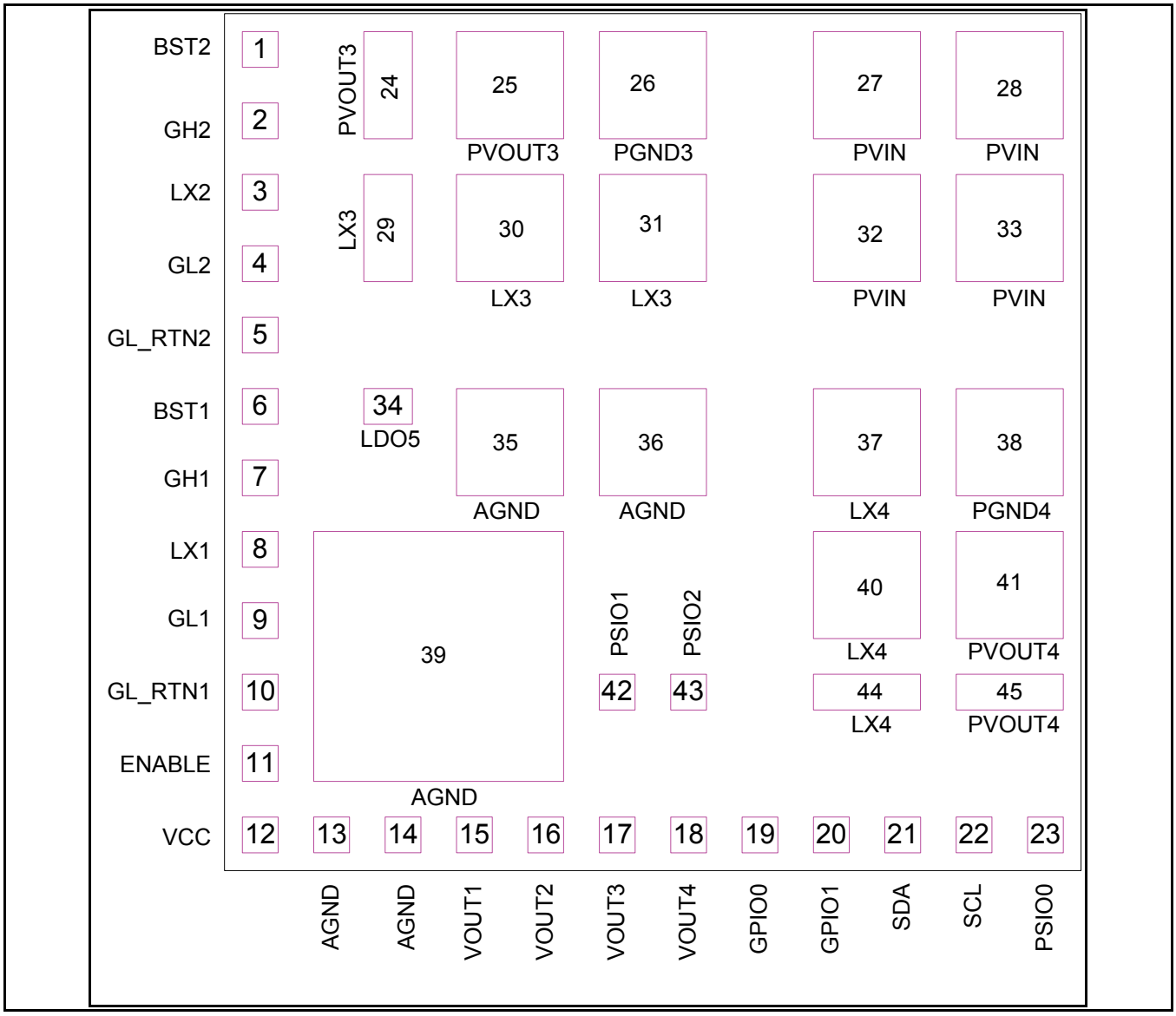


Figure 2 XRP9711 Pin Assignment

PIN DESCRIPTION

Pin #	Name	Description
1	BST2	**Boost pin.** High side driver supply input.
2	GH2	**High Side Gate Drive Out.** Connect directly to the gate of an external N-channel MOSFET.
3	LX2	**Switch Node.** Return for the high-side gate driver. Connect directly to the drain of the lower FET. Also used to measure voltage drop across bottom MOSFETs
4	GL2	**Low Side Gate Drive Out**. Connect directly to the gate of an external N-channel MOSFET.
5	GL_RTN2	**Low Side Gate Drive Return**. This should be routed as a differential trace with GL. Connect to the source of the low side MOSFET.
6	BST1	**Boost pin.** High side driver supply input.
7	GH1	**High Side Gate Drive Out.** Connect directly to the gate of an external N-channel MOSFET.
8	LX1	**Switch Node.** Return for the high-side gate driver. Connect directly to the drain of the lower FET. Also used to measure voltage drop across bottom MOSFETs
9	GL1	**Low Side Gate Drive Out**. Connect directly to the gate of an external N-channel MOSFET.
10	GL_RTN1	**Low Side Gate Drive Return**. This should be routed as a differential trace with GL. Connect to the source of the low side MOSFET.
11	ENABLE	**Enable.** If ENABLE is pulled high or allowed to float high, the chip is powered up. The pin must be held low for the XRP9711 to be placed into shutdown.
12	VCC	**Controller Supply Voltage.** Place a decoupling capacitor close to the controller IC. This input is used in UVLO fault generation.
13	AGND	**Analog Ground.** This is the small signal ground connection.
14	AGND	**Analog Ground.** This is the small signal ground connection.
15	VOUT1	**Feedback Pin.** Connect to the output of the corresponding power stage
16	VOUT2	**Feedback Pin.** Connect to the output of the corresponding power stage
17	VOUT3	**Feedback Pin.** Connect to the output of the corresponding power stage
18	VOUT4	**Feedback Pin.** Connect to the output of the corresponding power stage
19	GPIO0	**I/O Logic Signal.** Can be configured as input or output.
20	GPIO1	**I/O Logic Signal.** Can be configured as input or output.
21	SDA	**I^2C Data**. SMBus/I^2C serial interface communication.
22	SCL	**I^2C Clock.** SMBus/I^2C serial interface communication.
23	PSIO0	**I/O Logic Signal, HV.** Open drain, high voltage compliant. Can be configured as input or output.
24	PVOUT3	**Channel Output Power.** Output voltage for the internal channel.
25	PVOUT3	**Channel Output Power.** Output voltage for the internal channel.
26	PGND3	**Channel Output Ground.** Output ground for the internal channel.
27	PVIN	**Channel Input Power.** Internally connected to drain of upper switching MOSFET
28	PVIN	**Channel Input Power.** Internally connected to drain of upper switching MOSFET
29	LX3	**Switch Node.** Switch node of the internal channel.
30	LX3	**Switch Node.** Switch node of the internal channel.
31	LX3	**Switch Node.** Switch node of the internal channel.
32	PVIN	**Channel Input Power.** Internally connected to drain of upper switching MOSFET
33	PVIN	**Channel Input Power.** Internally connected to drain of upper switching MOSFET
34	LDO5	**5V LDO Output.** Used internally for power and may also be used for external power. LDO that can remain active while the rest of the IC is in standby mode.
35	AGND	**Analog Ground.** This is the small signal ground connection.
36	AGND	**Analog Ground.** This is the small signal ground connection.
37	LX4	**Switch Node.** Switch node of the internal channel.
38	PGND4	**Channel Output Ground.** Output ground for the internal channel.
39	AGND	**Analog Ground.** This is the small signal ground connection.

Pin #	Name	Description
40	LX4	**Switch Node.** Switch node of the internal channel.
41	PVOUT4	**Channel Output Power.** Output voltage for the internal channel.
42	PSIO1	**I/O Logic Signal, HV.** Open drain, high voltage compliant. Can be configured as input or output.
43	PSIO2	**I/O Logic Signal, HV.** Open drain, high voltage compliant. Can be configured as input or output.
44	LX4	**Switch Node.** Switch node of the internal channel.
45	PVOUT4	**Channel Output Power.** Output voltage for the internal channel.

ORDERING INFORMATION

Refer to XRP9711's datasheet and/or www.exar.com for exact and up to date ordering information.

USING THE EVALUATION BOARD

INPUT VOLTAGE RANGE

The input voltage range of XRP9711EVB-DEMo-1 board is from 5.5V to 22V. The power components have been optimized for a 12V input rail. When running the board at an input voltage other than 12V, use PowerArchitect™ 5.1 (PA5.1) to evaluate the system performance.

I²C INTERFACE

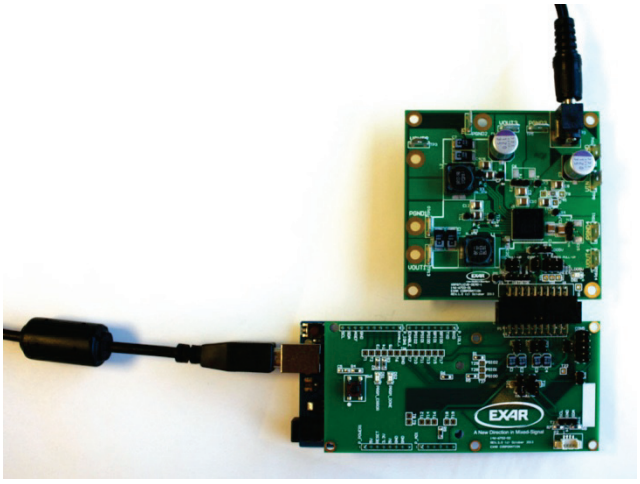
The XRP9711 programmable power module employs a standard I²C interface. Although the I²C signals can be pulled up to LDO5 on board by means of installing jumpers at the locations JP1, JP2 and JP3, the I²C bus signals are pulled up on the controller interface board by default (refer to Appendix – jumpers installed shorting pins 2 and 3 together at the locations JP6 and JP7).

OPERATING THE EVALUATION BOARD

The XRP9711EVB-DEMO-1 is designed to be powered from either an AC/DC wall wart (the output voltage must be in the range of 5.5V to 22V) connected to the barrel connector or a test bench DC power supply (the voltage must be in the range of 5.5V to 22V) connected to the V_{IN} connectors.

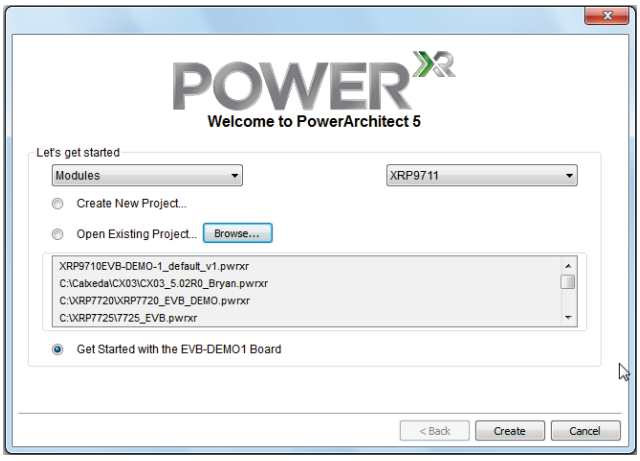
BRING UP PROCEDURE

Plug the XRP9711EVB-DEMO-1 evaluation board to the controller interface board as shown below.



Load the PowerArchitect™ 5.1 software and run it.

After selecting the proper family (Modules) and the device (XRP9711), select the "Get Started with the EVB-DEMO-1" option when prompted as shown below.



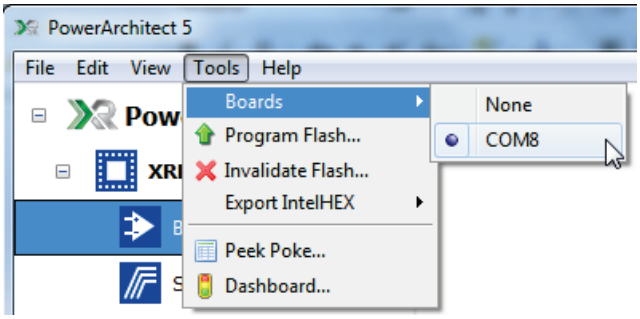
When done, click "Create". PA 5.1 will load the default XRP9711EVB-DEMO-1 configuration automatically.

Apply power to the board. Please refer to the sections above on how to properly supply power to the board and what voltage range to use.

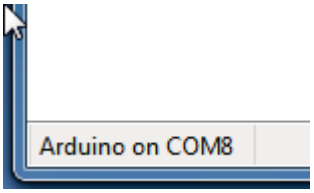
Turn on the Power supply.

Use USB cable to connect the computer (type A) and the Arduino controller board (type B).

Go to the Tools tab in PA 5.1 and select Boards. The software will identify communication ports where it found the Arduino controller board. Select the port.

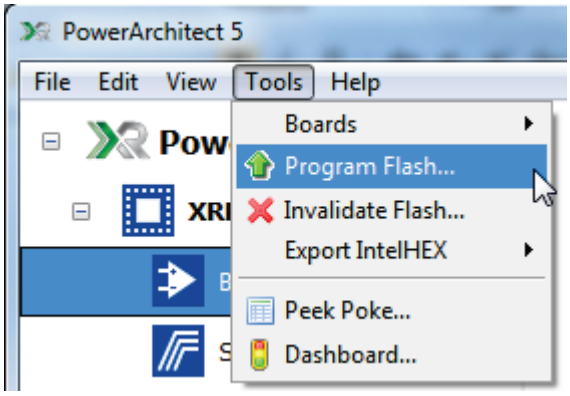


PA 5.1 is now communicating with the Arduino controller board which is indicated in the lower left corner.

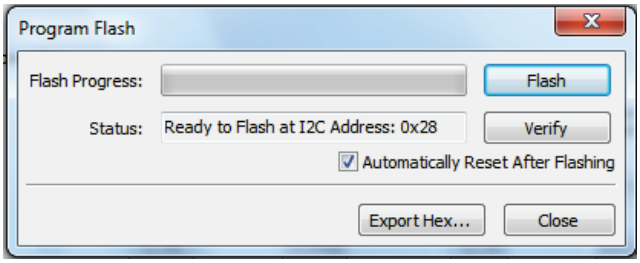


Programming the Configuration onto XRP9711

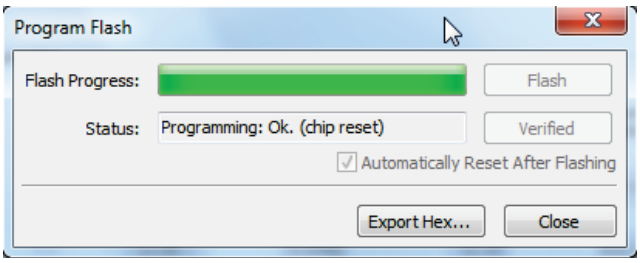
To program a configuration go to the Tools tab in PA 5.1 and select Program Flash.



The program Flash window will appear.



Click the Flash button.



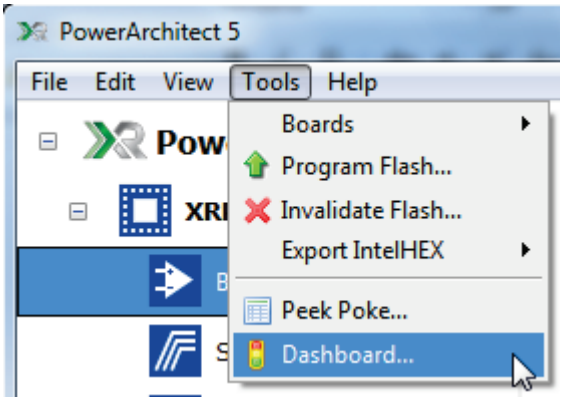
PA 5.1 will go through the process of loading configuration in the flash. Once it has successfully completed the task, it will report the outcome as seen above and reset the device if "Automatically Reset After Flashing" box checked (default option).

Close the window.

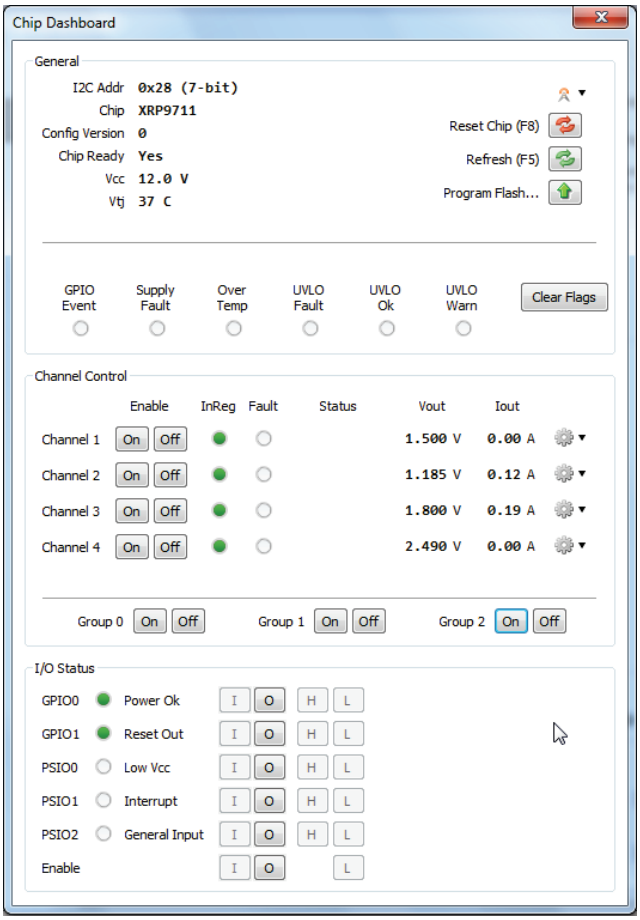
Note that XRP9711EVB-DEMO-1 boards will be pre-loaded with the default configuration.

Regulation

To enable channel regulation go to the Tools tab in PA 5.1 and select Dashboard.



In Dashboard turn Group 1 and Group 2 on. The configuration groups the channels 1 and 2 into the group 1, and the channels 3 and 4 into the group 2. The channels are now in regulation as indicated by V_{OUT} readings as well as the in-regulation indicators.



Channels can be turned on individually if desired.

GPIO and PISO interface

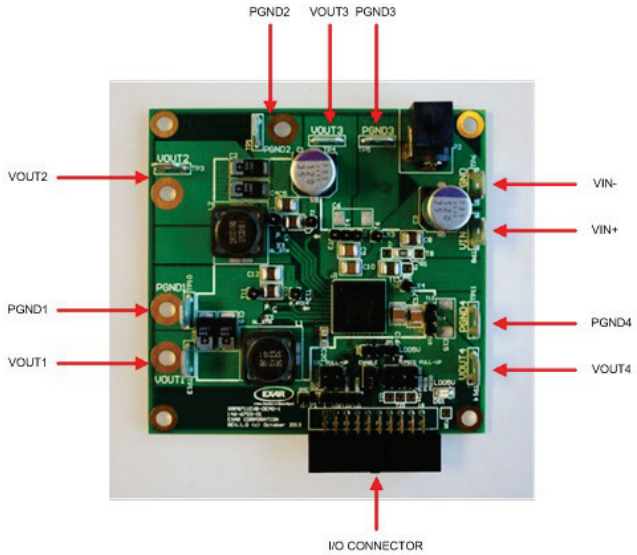
The GPIOs, PSIOs and ENABLE can be controlled from the Arduino controller dynamically in the dashboard.

ENABLE signal is connected to the Arduino controller board by default (JP4 header is shorted). Arduino drives the ENABLE pin low to place XRP9711 into the shutdown mode. It releases the ENABLE pin to enable the device. If leaving the ENABLE pin floating is desired, the jumper at JP4 shall be removed.

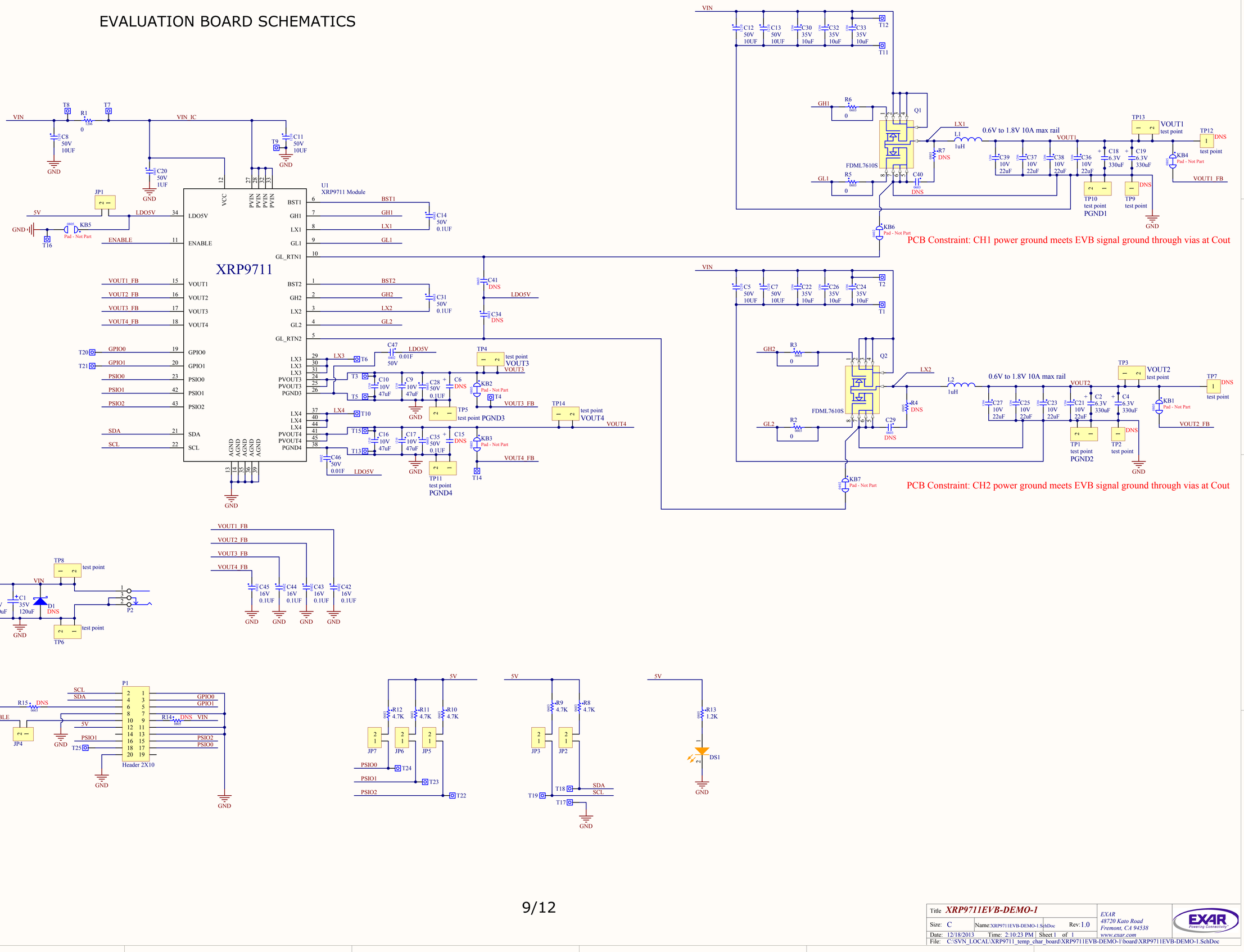
The PSIOs are not pulled up on XRP9711EVB-DEMO-1 by default. There is a loading option to pull PSIOs up to LDO5 if desired. To do this, one will need to short JP1, JP5, JP6 and JP7 headers by means of installing jumpers.

Evaluation Board Connections

The following picture illustrates how V_{IN} supplied from a test bench DC power supply and instruments attached to the outputs would be connected to the XRP9711EVB-DEMO-1 board.



EVALUATION BOARD SCHEMATICS



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BILL OF MATERIAL

Ref.	Qty	Manufacturer	Part Number	Size	Component
	1	Exar Corporation	146-6703-01	3.15x3.05in	PCB
U1	1	Exar Corporation	XRP9711	12x12mm LGA	Dual 6A Programmable Power Module
Q1,Q2	2	Fairchild	FDML7610S	MLP 3x4.5	Dual N-Channel Power Trench MOSFET
DS1	1	Wurth Elektronik	150120AS75000	1206	SMD Amber Chip LED
L1,L2	2	Cooper Bussmann	DR127-1R0-R	12.5x12.5mm	Inductor 1µH, 3mΩ, 15.5A
C1,C3	2	Panasonic/Sanyo	35SVPF120M	F12	OSCON Capacitor 120µF, 35V
C2, C4, C18, C19	4	Panasonic/Sanyo	6TPF330M9L	7343 D3L	POSCAP Capacitor 330µF, 6.3V, 9mΩ
C5, C7, C8, C11, C12, C13	6	Murata Corporation	GRM32ER71H106KA12L	1210	Ceramic Capacitor 10µF, 50V, X7R
C9, C10, C16, C17	4	Murata Corporation	GRM32ER71A476KE15L	1210	Ceramic Capacitor 47µF, 10V, X7R
C14, C28, C31, C35	4	Murata Corporation	GRM188R71H104KA93D	0603	Ceramic Capacitor 0.1µF, 50V, X7R
C20	1	Murata Corporation	GRM21BR71H105KA12L	0805	Ceramic Capacitor 1µF, 50V, X7R
C21, C23, C25, C27, C36, C37, C38, C39	8	Murata Corporation	GRM31CR71A226KE15L	1206	Ceramic Capacitor 22µF, 10V, X7R
C22, C24, C26, C30, C32, C33	6	TDK Corporation	C3216X7R1V106K160AC	1206	Ceramic Capacitor 10µF, 35V, X7R
C42, C43, C44, C45	4	Murata Corporation	GRM155R71C104KA88D	0402	Ceramic Capacitor 0.1µF, 16V, X7R
C46, C47	2	Murata Corporation	GRM155R71H103KA88D	0402	Ceramic Capacitor 0.01µF, 50V, X7R
R1	1	Vishay Dale	CRCW12060000Z0EAHP	1206	RES 0 Ω, 1/2W, SMD
R8, R9, R10, R11, R12	5	Panasonic	ERJ-3EKF4701V	0603	RES 4.7kΩ, 1/10W, 5%, SMD
R13	1	Panasonic	ERJ-6GEYJ122V	0805	RES 1.2kΩ, 1/8W, 5%, SMD
JP1, JP2, JP3, JP4, JP5, JP6, JP7	7	Wurth Elektronik	61300211121	0.20x0.10in	Connector, Male Header, 2 Positions, 100mil Spacing, Vertical, TH

Ref.	Qty	Manufacturer	Part Number	Size	Component
P1	1	Sullins Connector Solutions	SFH11-PBPC-D10-RA-BK	1.20x0.55in	Connector, Female Header, 20 Positions, 100mil Spacing, RA, TH
P2	1	Switchcraft	RAPC722X	0.60x0.40in	Connector, Power Jack Mini R/A, T/H
T1, T2, T3, T4, T5, T6, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21	18	Wurth Elektronik	61300111121	0.10x0.10in	Square Test Posts, TH
TP1, TP3, TP4, TP5, TP6, TP8, TP10, TP11, TP13, TP14	10	Wurth Elektronik	7471287	0.32x0.10in	Mounting Tabs

EVALUATION BOARD LAYOUT

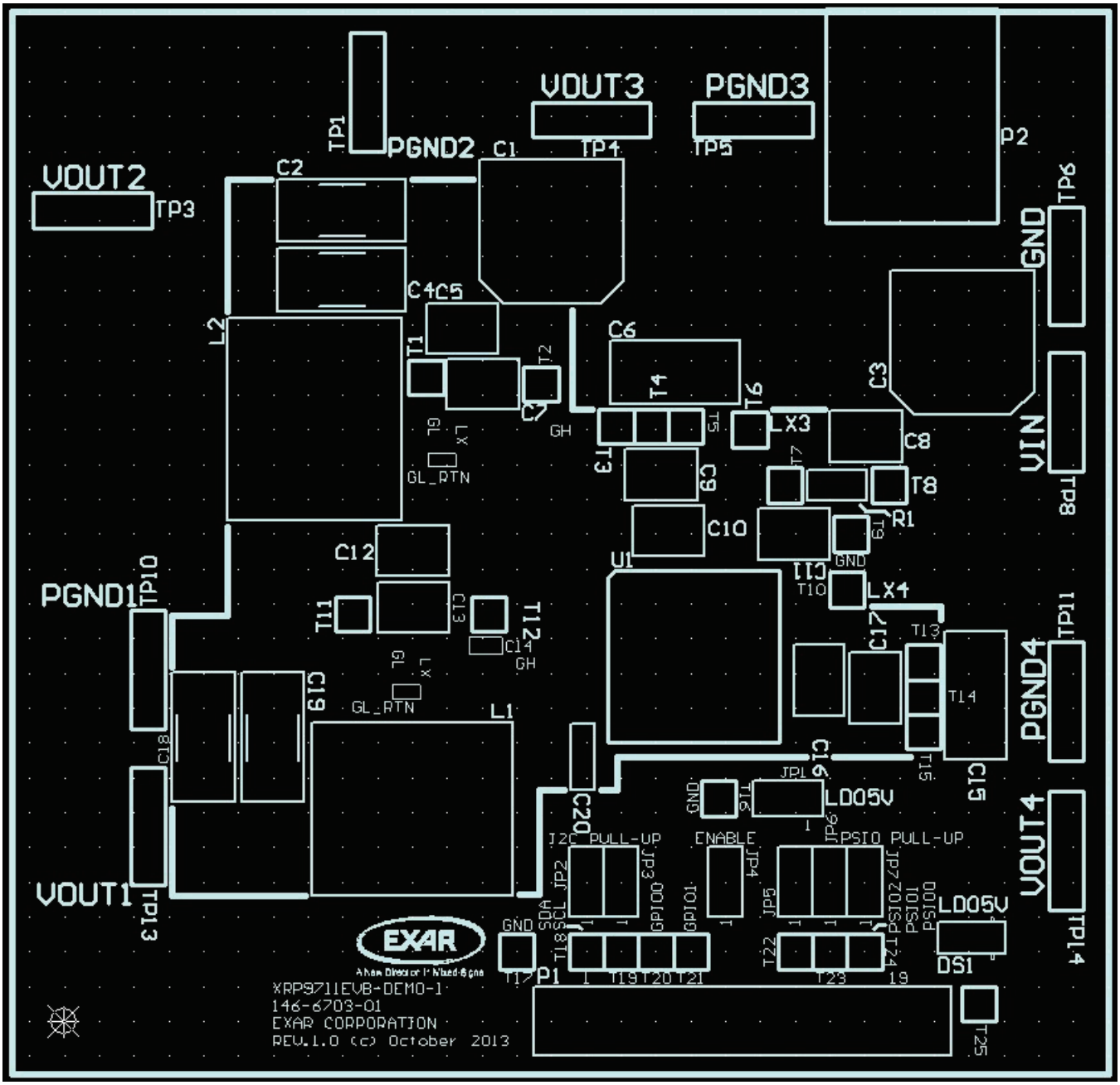


Figure 3 Component Placement – Top Side

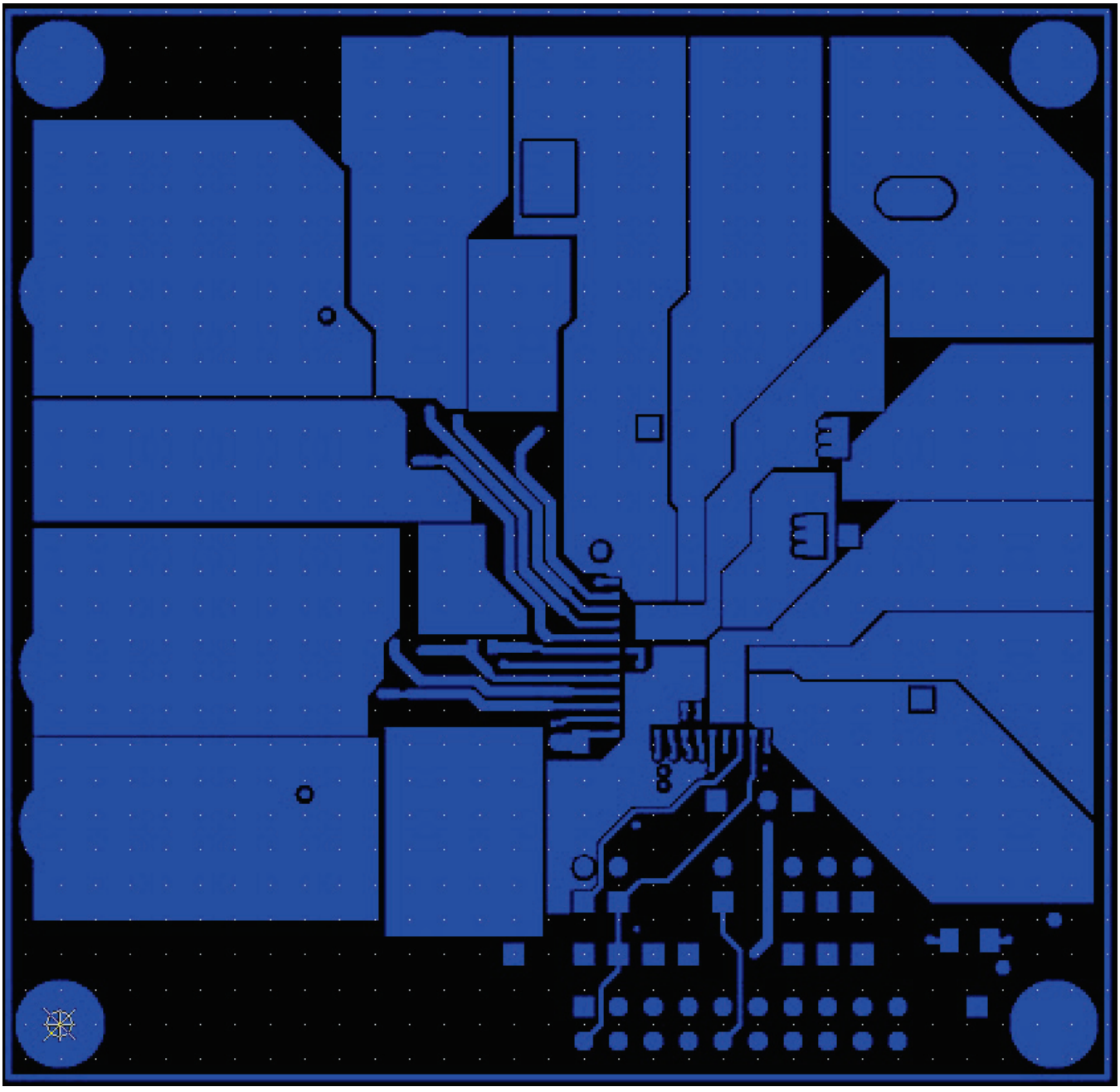


Figure 4 Layout – Top Layer

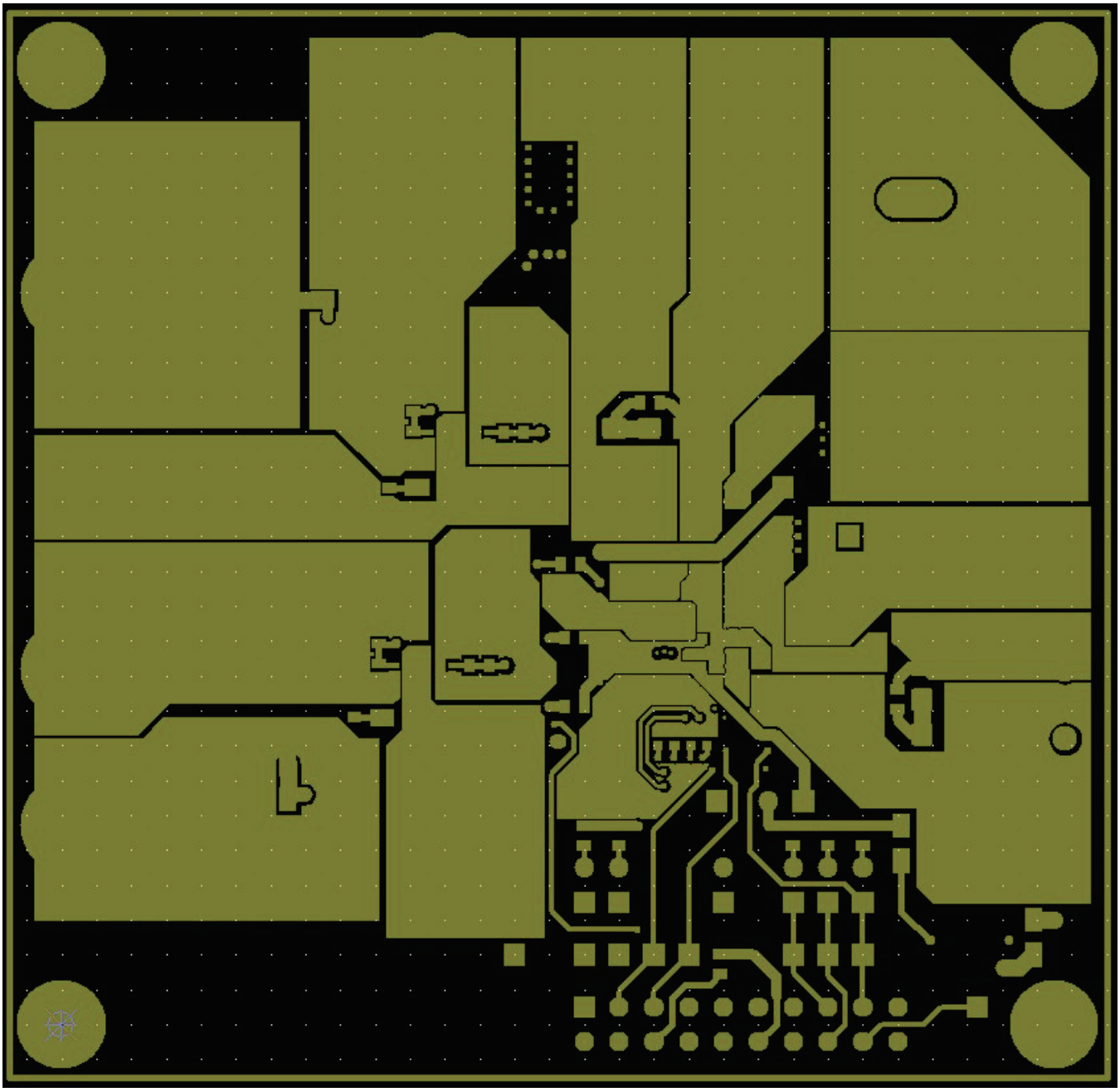


Figure 5 Layout – Bottom Layer

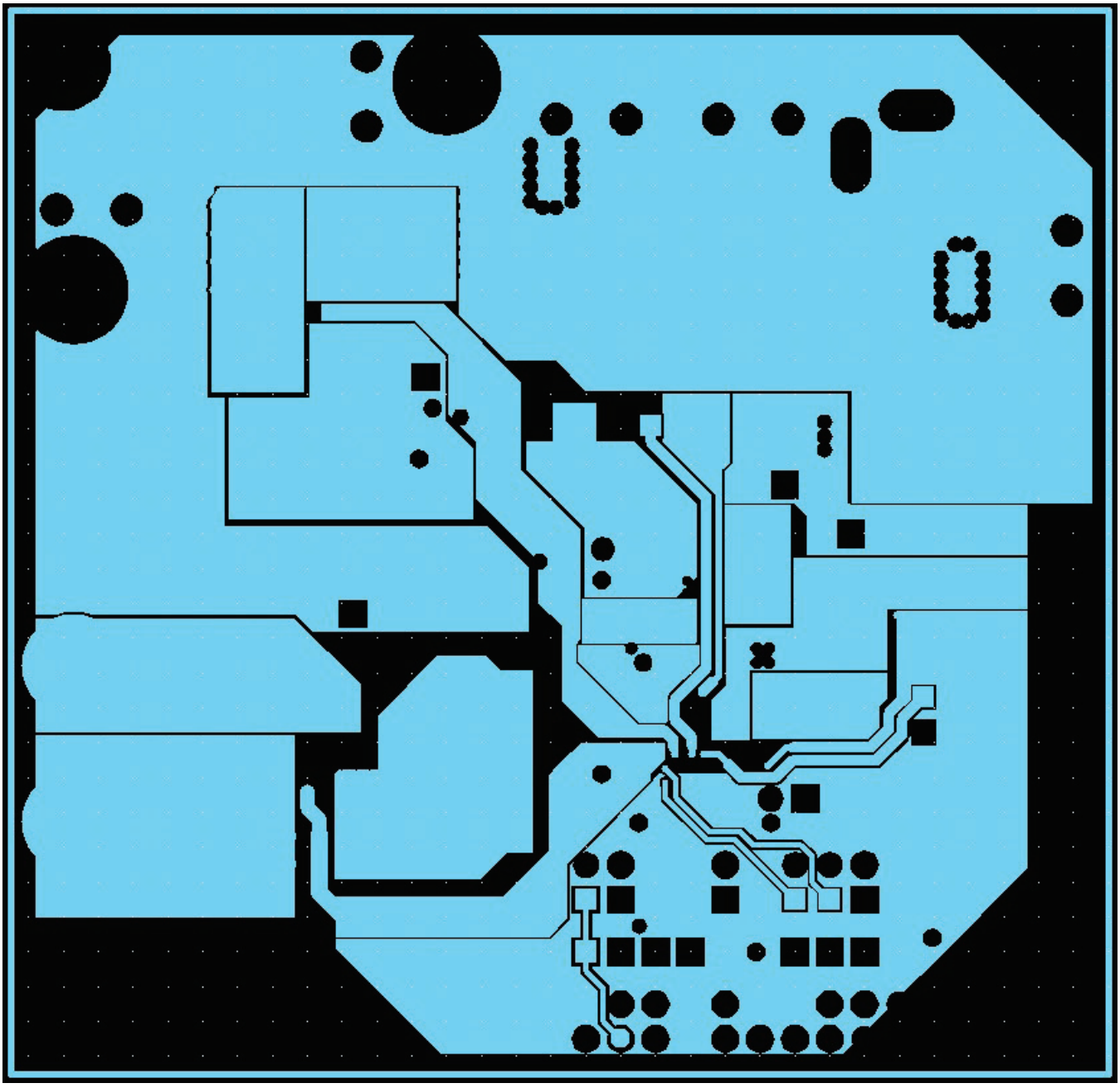


Figure 6 Layout – Middle Layer 1

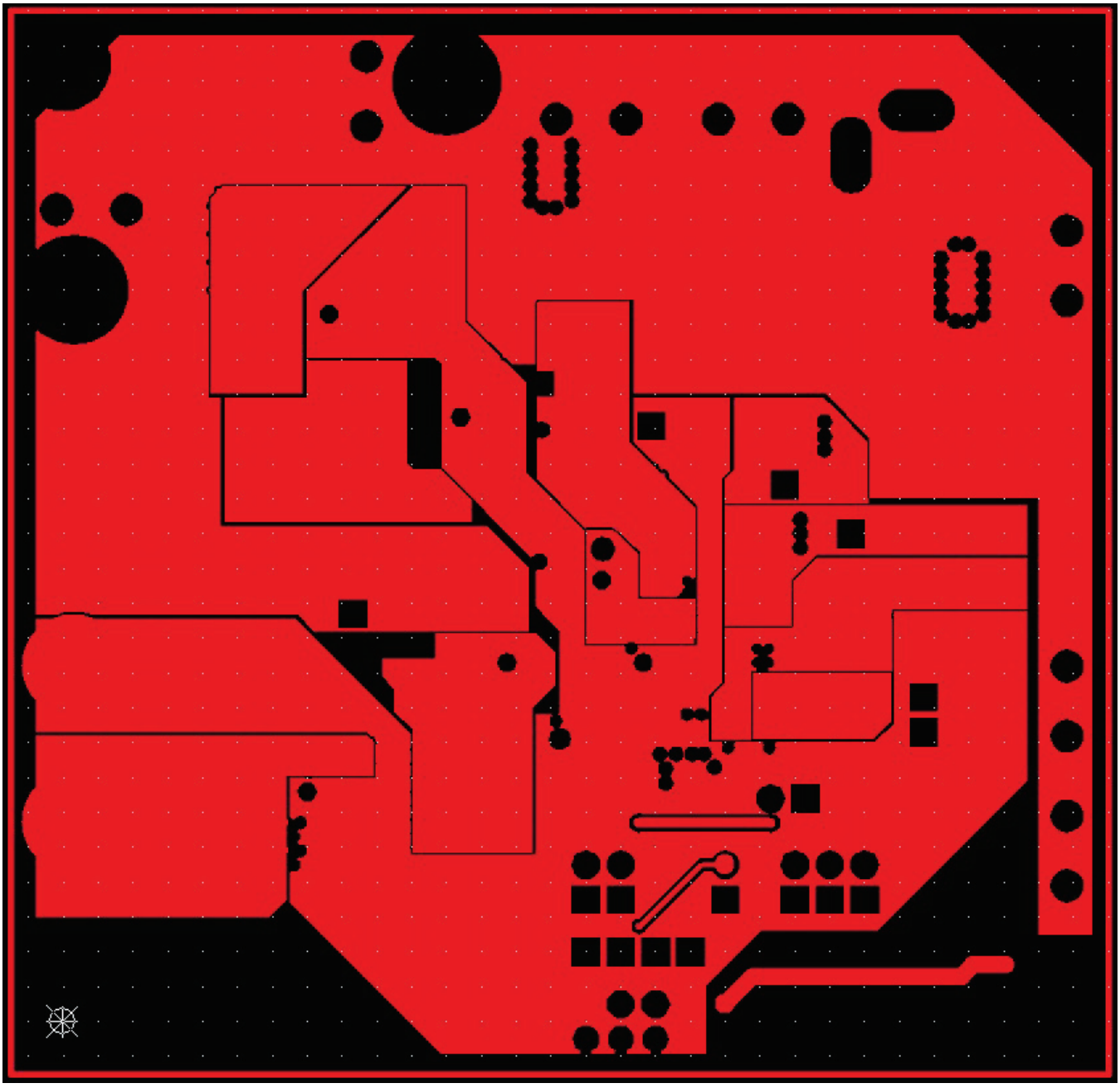


Figure 7 Layout – Middle Layer 2

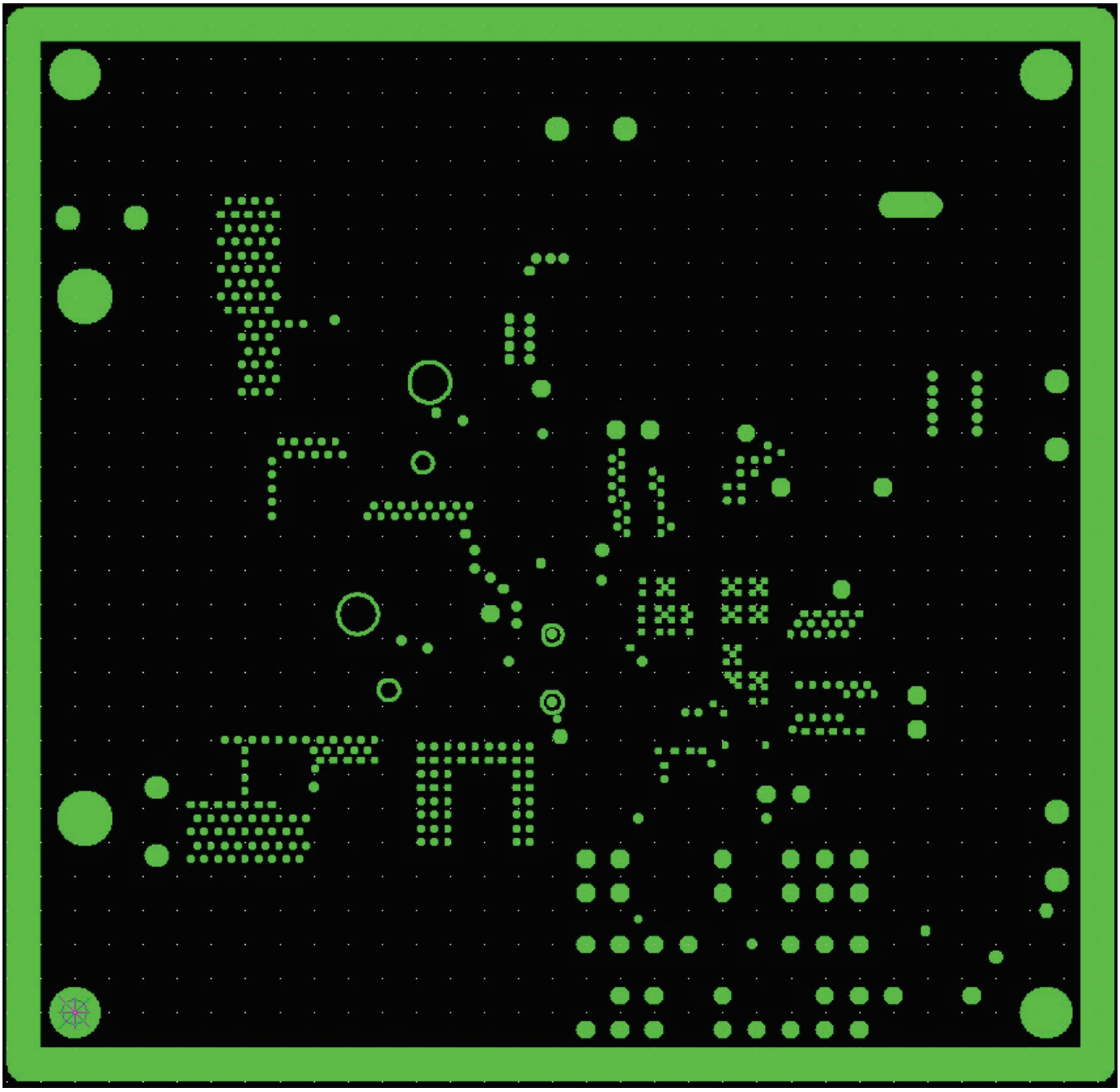


Figure 8 Layout – Signal Ground Plane

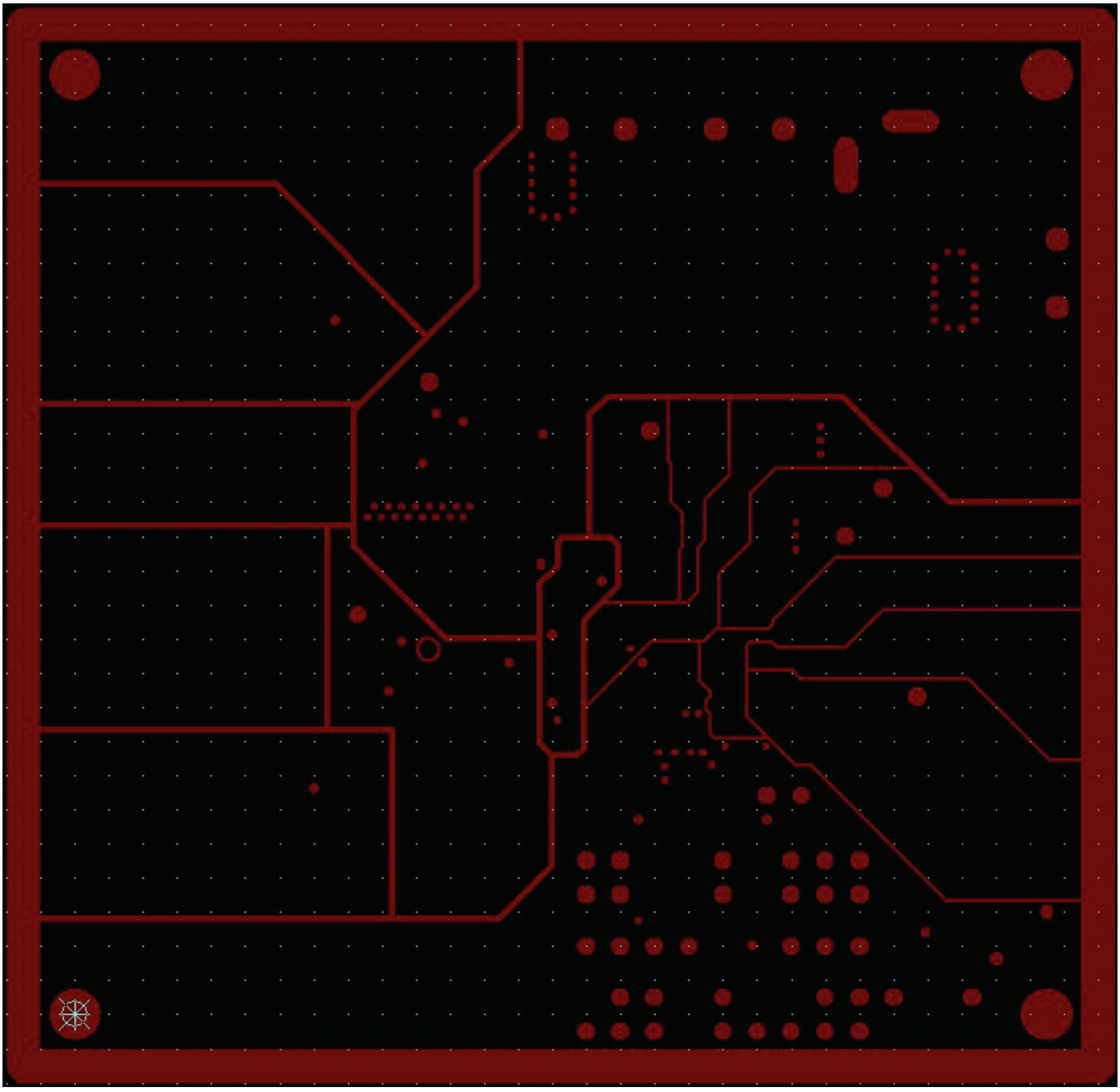
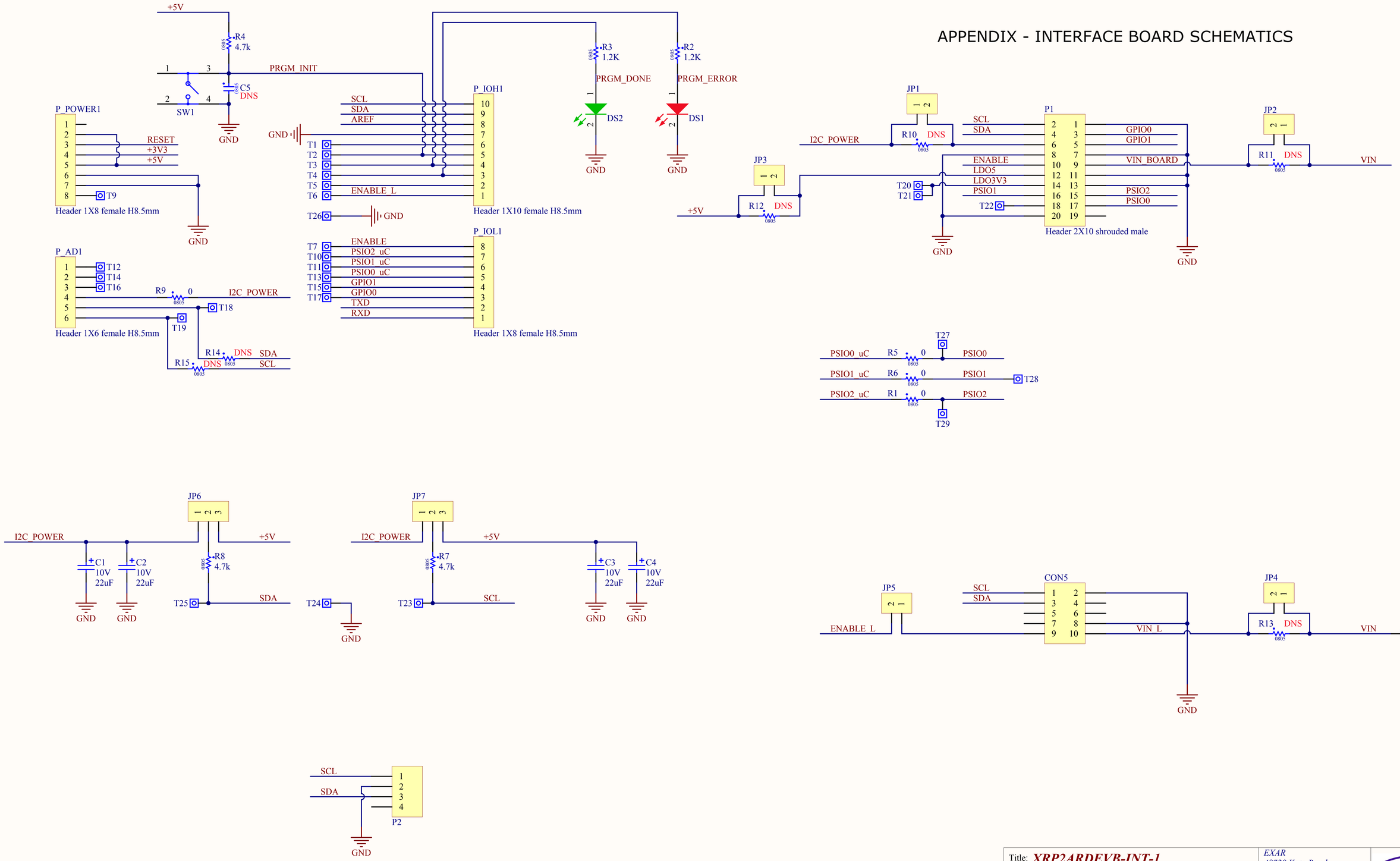


Figure 9 Layout – Internal Plane

APPENDIX - INTERFACE BOARD SCHEMATICS



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BILL OF MATERIAL

Ref.	Qty	Manufacturer	Part Number	Size	Component
	1	Exar Corporation	146-6703-01	4.40x2.10	PCB
DS1	1	Wurth Elektronik	150120RS75000	1206	SMD Red Chip LED
DS2	1	Wurth Elektronik	150120VS75000	1206	SMD Green Chip LED
C1, C2, C3, C4	4	Vishay Sprague	293D226X9010B2TE3	B	Tantalum Capacitor 22µF, 10V, 10%
R1, R5, R6, R9	4	Panasonic	ERJ-6GEY0R00V	0805	RES 0 Ω, 1/8W, 5% SMD
R2, R3	2	Panasonic	ERJ-6GEYJ122V	0805	RES 1.2kΩ, 1/8W, 5%, SMD
R4, R7, R8	3	Panasonic	ERJ-6GEYJ472V	0805	RES 4.7kΩ, 1/8W, 5%, SMD
SW1	1	Wurth Elektronik	430182050816	6x6mm	Tact Switch, SMD
CON5	1	Wurth Elektronik	61301021121	0.50x0.20in	Connector, Male Header, 10 Positions, Dual Row, 100mil Spacing, Vertical, TH
JP1, JP2, JP3, JP4, JP5	5	Wurth Elektronik	61300211121	0.20x0.10in	Connector, Male Header, 2 Positions, 100mil Spacing, Vertical, TH
JP6, JP7	2	Wurth Elektronik	61300311121	0.30x0.10in	Connector, Male Header, 3 Positions, 100mil Spacing, Vertical, TH
P1	1	Wurth Elektronik	612020235221	1.20x0.55in	Connector, Male Header, 20 Positions, Dual Row, 100mil Spacing, Shrouded, RA, TH
P2	1	Wurth Elektronik	653104124022	11x6mm	Wire-to-Board Connector, Male, 4 Positions, 1.25mm Spacing, Shrouded, SMT
P_IOH1	1	Wurth Elektronik	61301011121	1.00x0.10in	Connector, Male Header, 10 Positions, 100mil Spacing, Vertical, TH
P_POWER1, P_IOL1	2	Wurth Elektronik	61300811121	0.80x0.10in	Connector, Male Header, 8 Positions, 100mil Spacing, Vertical, TH
P_AD1	1	Wurth Elektronik	61300611121	0.60x0.10in	Connector, Male Header, 6 Positions, 100mil Spacing, Vertical, TH
T23, T24, T25	3	Wurth Elektronik	61300111121	0.10x0.10in	Square Test Posts, TH

DOCUMENT REVISION HISTORY

Revision	Date	Description
1.0.0	01/07/2014	Initial release of document

BOARD REVISION HISTORY

Board Revision	Date	Description
XRP9711EVB-DEMO-1-01	12/20/13	Initial release of evaluation board

FOR FURTHER ASSISTANCE

Email: customersupport@exar.com
powertechsupport@exar.com

Exar Technical Documentation: http://www.exar.com/TechDoc/default.aspx?

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ООО «ЛайфЭлектроникс» **“LifeElectronics” LLC**

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- *Конкурентоспособные цены и скидки постоянным клиентам.*
- *Специальные условия для постоянных клиентов.*
- *Подбор аналогов.*
- *Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.*

- *Приемлемые сроки поставки, возможна ускоренная поставка.*
- *Доставку товара в любую точку России и стран СНГ.*
- *Комплексную поставку.*
- *Работу по проектам и поставку образцов.*
- *Формирование склада под заказчика.*

- *Сертификаты соответствия на поставляемую продукцию (по желанию клиента).*
- *Тестирование поставляемой продукции.*
- *Поставку компонентов, требующих военную и космическую приемку.*
- *Входной контроль качества.*
- *Наличие сертификата ISO.*

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- *Регистрацию проекта у производителя компонентов.*
- *Техническую поддержку проекта.*
- *Защиту от снятия компонента с производства.*
- *Оценку стоимости проекта по компонентам.*
- *Изготовление тестовой платы монтаж и пусконаладочные работы.*

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