

# 2A Ultra-Low Dropout Voltage LDO Regulators with Soft-Start Evaluation Board Guidance

## ***General Description***

The Evaluation Board user guide describes the operational use of the RTQ2522A evaluation board as a reference design for demonstration and evaluation of the RTQ2522A, an ultra-low dropout (LDO) linear regulator with soft-start. Included in this user guide are setup and operating instructions, thermal and layout guidelines, a printed circuit board (PCB) layout, a schematic diagram, and a bill of materials (BOM). For more detail information, please refer to the RTQ2522A datasheet

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## Performance Specification Summary

Summary of the RTQ2522A Evaluation Board performance specification is provided in Table 1. The ambient temperature is 25°C.

Table 1. RTQ2522A Evaluation Board Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
<b>Input Voltage Range</b>		$V_{OUT} + V_{drop}$	1.1	5.5	V
<b>VBIAS Pin Voltage</b>		2.7	--	5.5	V
<b>Output Voltage Range</b>	$V_{in} = 5V, I_{OUT} = 2A$	0.8	0.8	3.6	V
<b>Line Regulation</b>	$V_{OUT} \text{ (normal)} + 0.3V \leq V_{IN} \leq 5.5V$	--	0.03	--	%/V
<b>Load Regulation</b>	$50mA \leq I_{OUT} \leq 2A$	--	0.09	--	%/A
<b>VIN Dropout Voltage</b>	$I_{OUT} = 2A,$ $V_{BIAS} - V_{OUT} \text{ (normal)} \geq 3.25V$	--	100	150	mV
<b>VBIAS Dropout Voltage</b>	$V_{OUT} = 80\% \times V_{OUT} \text{ (normal)}$	--	1.55	1.8	V

## Power-up Procedure

### Suggestion Required Equipments

- RTQ2522A Evaluation Board
- DC power supply capable of at least 5.5V and 2A
- Electronic load capable of 2A
- Function Generator
- Oscilloscope

### Quick Start Procedures

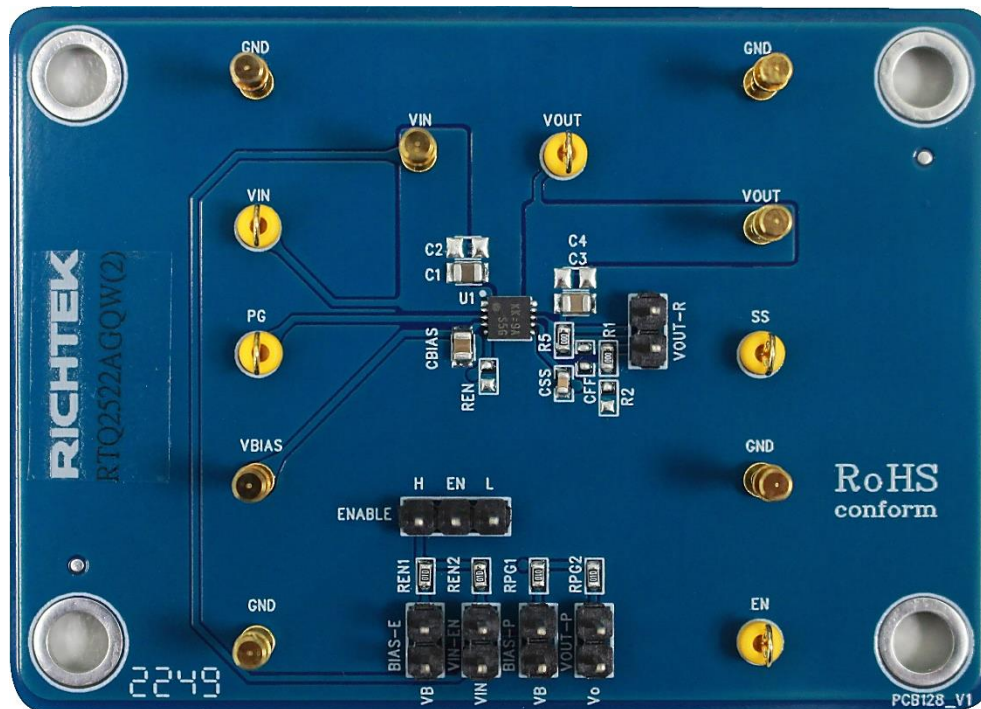
The Evaluation Board is fully assembled and tested. Follow the steps below to verify board operation. Do not turn on supplies until all connections are made. When measuring the output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip and grounding directly across the last output capacitor.

### Proper measurement equipment setup and follow the procedure below.

- 1) With power off, connect the input power supply to VIN and GND pins.
- 2) With power off, connect the electronic load between the VOUT and nearest GND pins.
- 3) Turn on the power supply at the input. Make sure that the input voltage does not exceeds 6V on the Evaluation Board.
- 4) Check for the proper output voltage using a voltmeter.
- 5) Once the proper output voltage is established, adjust the load within the operating ranges and observe the output voltage regulation, quiescent current, dropout voltage, PSRR, noise and other performance.

## Detailed Description of Hardware

### Headers Description and Placement



Carefully inspect all the components used in the EVB according to the following Bill of Materials table, and then make sure all the components are undamaged and correctly installed. If there is any missing or damaged component, which may occur during transportation, please contact our distributors or e-mail us at [evb\\_service@richtek.com](mailto:evb_service@richtek.com).

### Test Points

The EVB is provided with the test points and pin names listed in the table below.

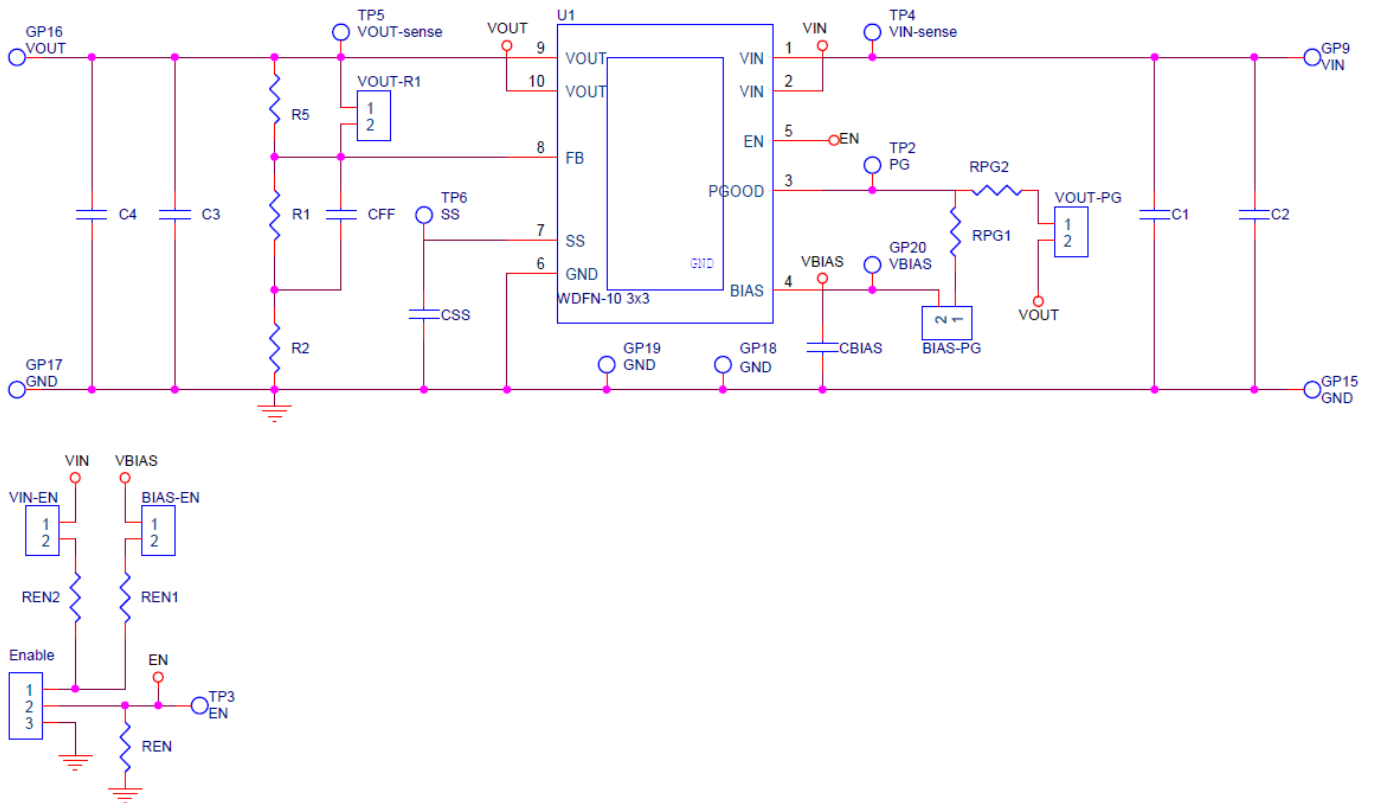
Test Point/ Pin Name	Function
<b>VIN</b>	Supply input pin.
<b>VOUT</b>	Output of the regulator.
<b>PG</b>	Power good sense pin.
<b>VBIAS</b>	Input pin of bias voltage.
<b>EN</b>	Enable sense pin.
<b>GND</b>	System ground pin.
<b>SS</b>	Soft-start capacitor waveform sense pin.
<b>ENABLE</b>	User can decide EN pin connected to high or low.
<b>BIAS-EN/VIN-EN</b>	Decision of EN pin pull-high voltage source.
<b>BIAS-PG/VOUT-PG</b>	Decision of PG pull-high voltage source.

**Bill of Materials**

VIN = 1.1V to 6.5V, VOUT = 0.8V to 5.5V, IOUT = 2A						
Reference	Count	Part Number	Value	Description	Package	Manufacturer
U1	1	RTQ2522AGQW(2)	RTQ2522A	LDO	WDFN-10L 3x3	RICHTEK
C1	1	TMK212BJ475KG-T	4.7μF	Capacitor, ceramic, 25V, X5R	0805	TAIYO YUDEN
C3	1	GRM21BR71A106KE51L	10μF	Capacitor, ceramic, 10V, X7R	0805	MURATA
CBIAS	1	0805B105K250CT	1μF	Capacitor, ceramic, 25V, X7R	0805	WALSIN
CSS	1	0603B102K500CT	1nF	Capacitor, ceramic, 50V, X7R	0603	WALSIN
R1, R5	2	WR06X000 PTL	0	Resistor, chip	0603	WALSIN
REN1, REN2, RPG1, RPG2	4	WR06X1003FTL	100k	Resistor, chip	0603	WALSIN

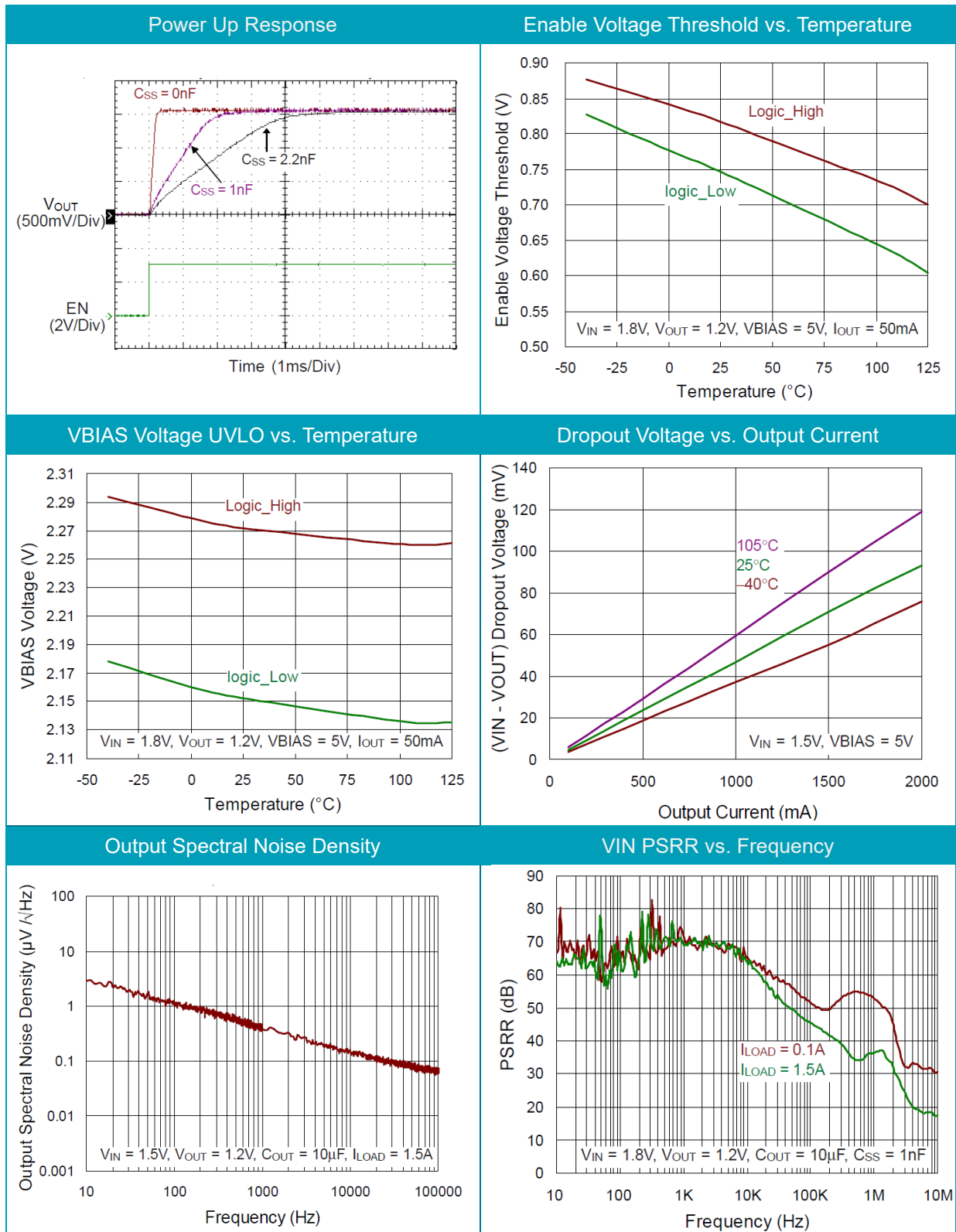
## Typical Applications

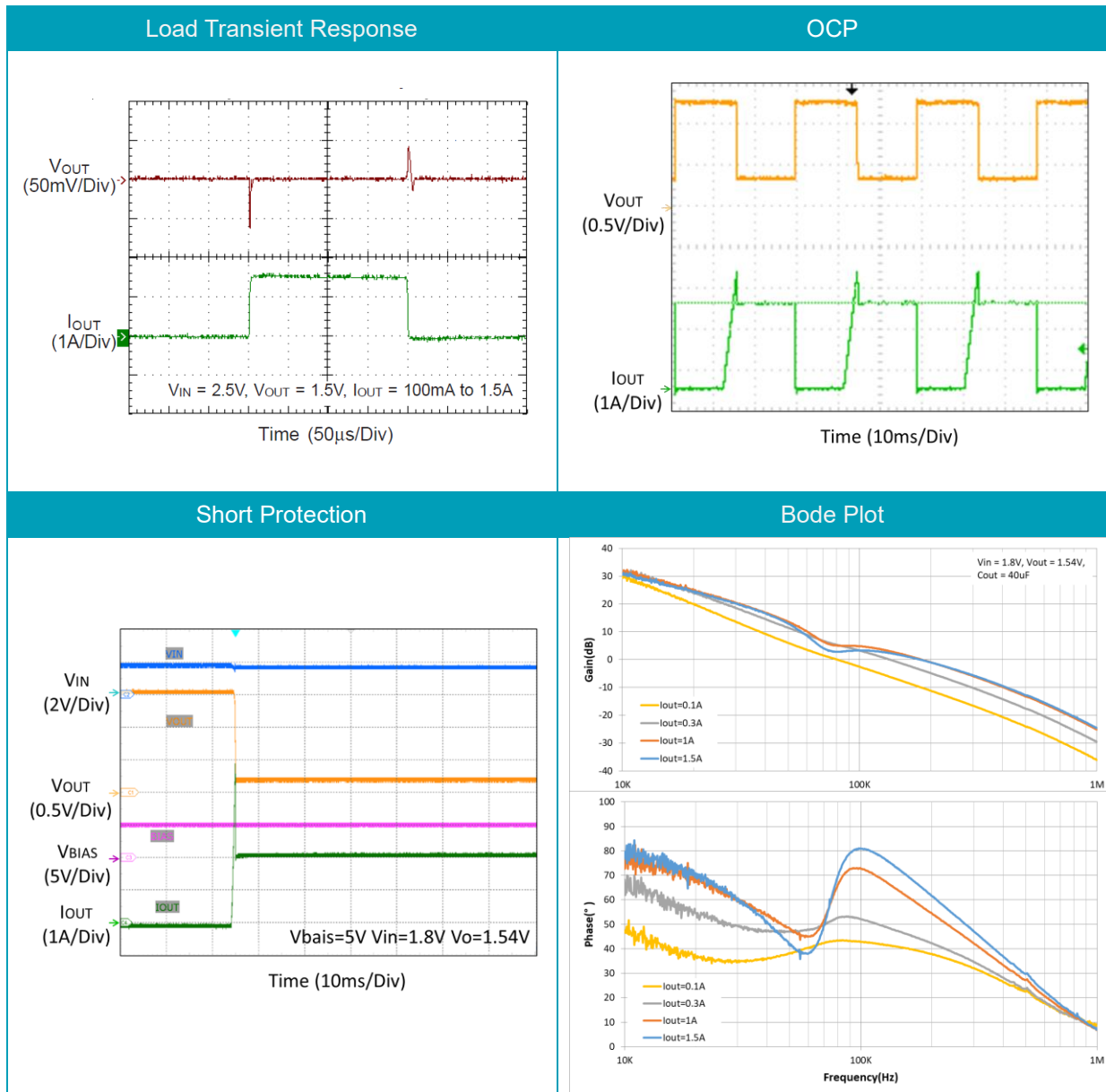
### EVB Schematic Diagram



1. The capacitance values of the input and output capacitors will influence the input and output voltage ripple.
2. MLCC capacitors have degrading capacitance at DC bias voltage, and especially smaller size MLCC capacitors will have much lower capacitance.

Measure Result





Note: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage ripple by touching the probe tip directly across the output capacitor.

**Evaluation Board Layout**

Figure 1 to Figure 4 are RTQ2522A Evaluation Board layout. This board is constructed on four-layer PCB, outer layers with 1 oz. Cu and inner layers with 1 oz. Cu.

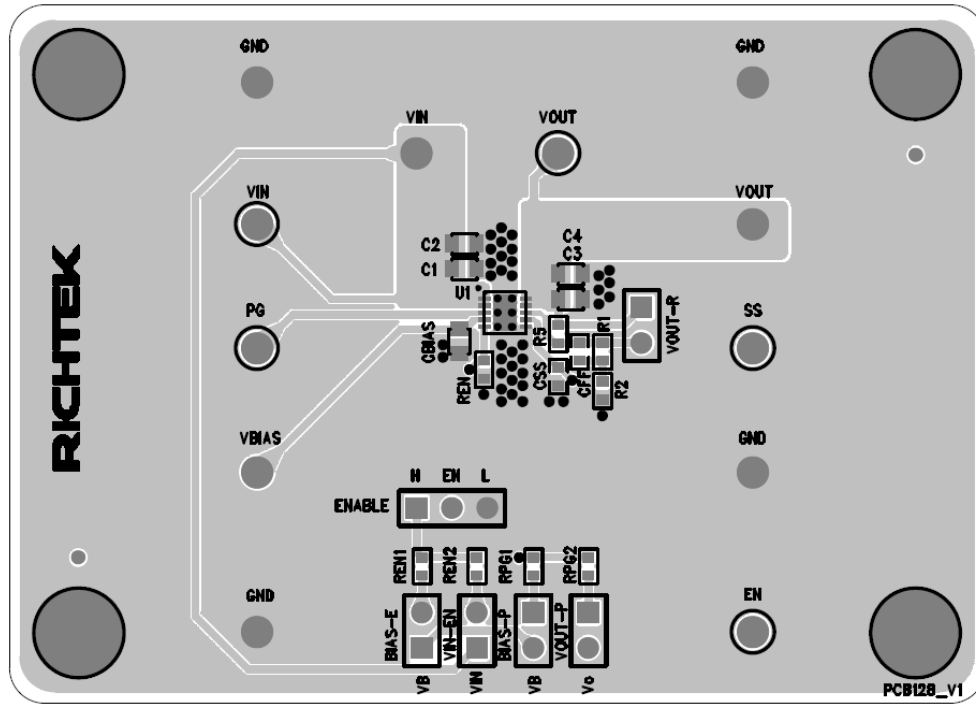


Figure 1. Top View (1<sup>st</sup> layer)

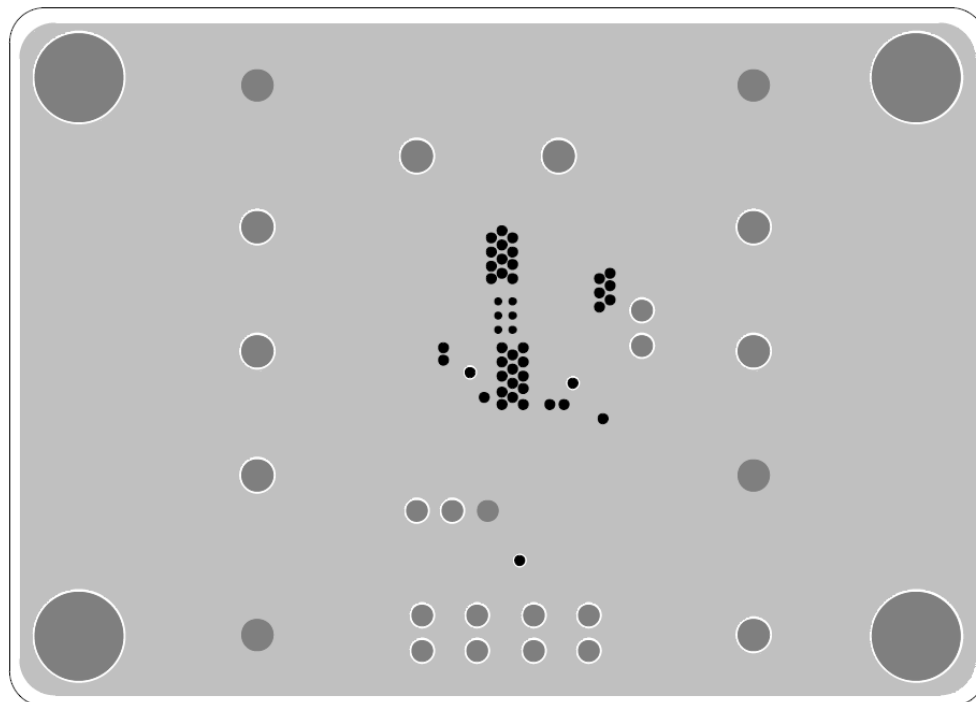


Figure 2. PCB Layout—Inner Side (2<sup>nd</sup> Layer)



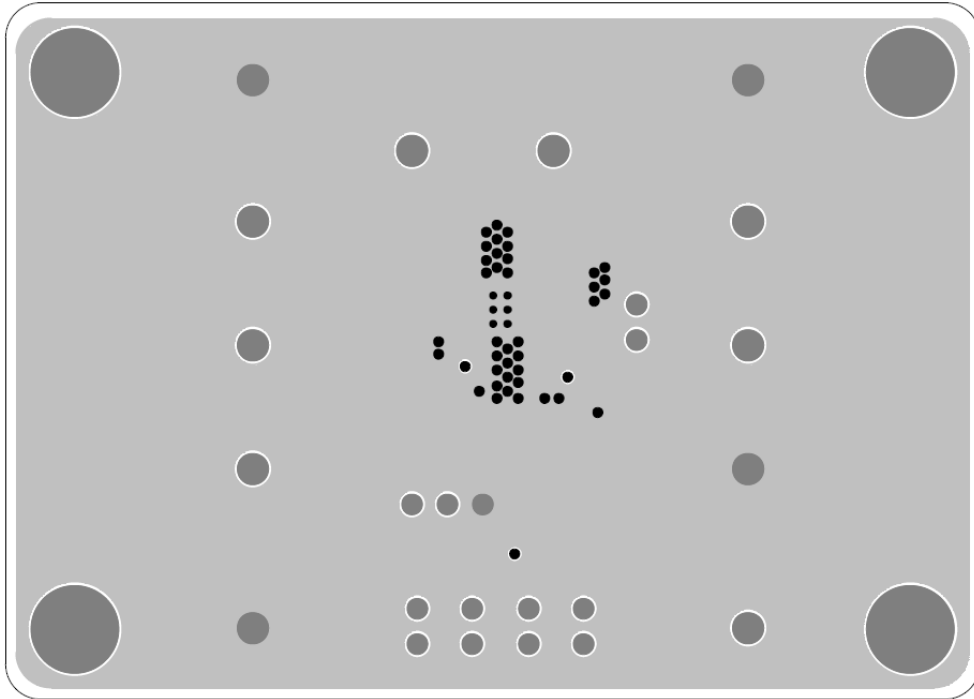


Figure 3. PCB Layout—Inner Side (3<sup>rd</sup> Layer)

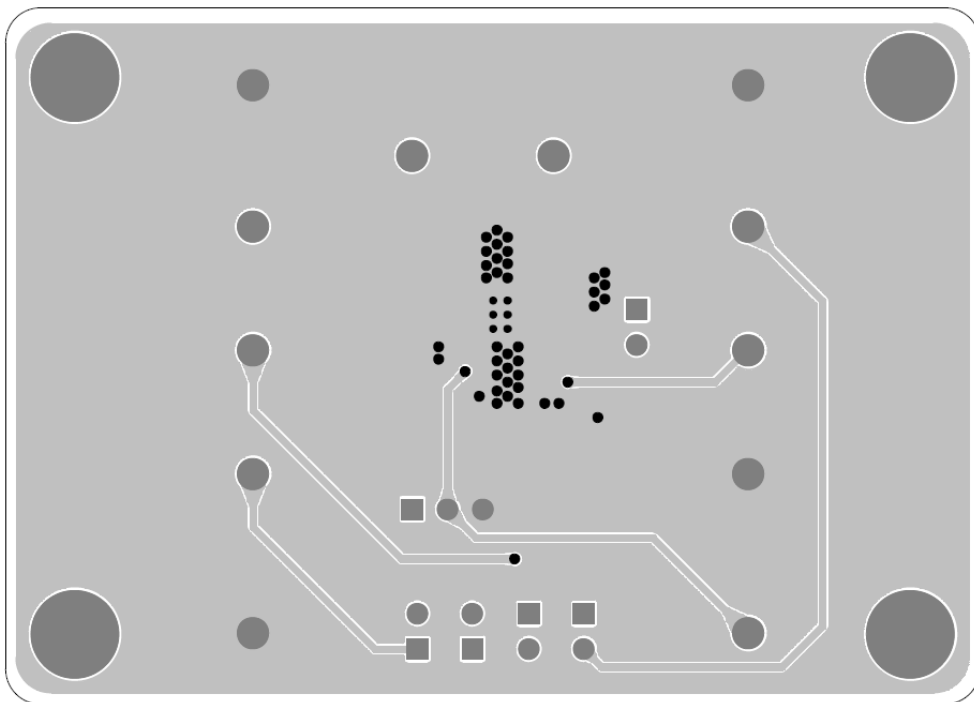


Figure 4. Bottom View (4<sup>th</sup> Layer)

### ***More Information***

For more information, please find the related datasheet or application notes from Richtek website  
<http://www.richtek.com>.

### ***Important Notice for Richtek Evaluation Board***

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