

High Voltage 4-CH LED Driver

General Description

The RT8577A is an 4-CH LED driver capable of delivering 200mA for each channel. The RT8577A is a current mode boost converter with an adjustable switching frequency via the RT pin from 200kHz to 2.1MHz and a wide VIN range from 5V to 40V.

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Performance Specification Summary

Summary of the RT8577A Evaluation Board performance specification is provided in Table 1. The ambient temperature is -40°C to 85°C .

Table 1. RT8577AGQW Evaluation Board Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
Input Voltage Range		5.5	--	40	V
LED1 to LED4 Regulation Voltage	$I_{\text{LED}} = 80\text{mA}$	0.75	0.86	1	V
Switching Frequency	$R_{\text{RT}} = 20\text{k}\Omega$	1.8	2.1	2.4	MHz
	$R_{\text{RT}} = \text{Open}$	50	200	250	kHz
LED Current Accuracy	$R_{\text{ISET}} = 15\text{k}\Omega, V_{\text{PWM}} > 1.2\text{V}$	76	80	84	mA
LED Current Matching	$I_{\text{LED}} = 80\text{mA}$ $\frac{I_{\text{LED}} \times I_{\text{LED_AVE}}}{I_{\text{LED_AVE}}} \times 100\%$	--	± 1.5	± 3	%
Maximum Duty Cycle		80	--	100	%
SEN Current Sense Limit		0.1	0.5	0.6	V
OVP Threshold		1.9	2	2.1	V
SCP Threshold	$\text{PWM freq} = 2\text{ kHz to } 4\text{kHz}$	6	7	8	V

Power-up Procedure

Suggestion Required Equipments

- RT8577A Evaluation Board
- DC power supply capable of at least 12V and 10A
- LED Load Board
- 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 ground ring directly across the last output capacitor.

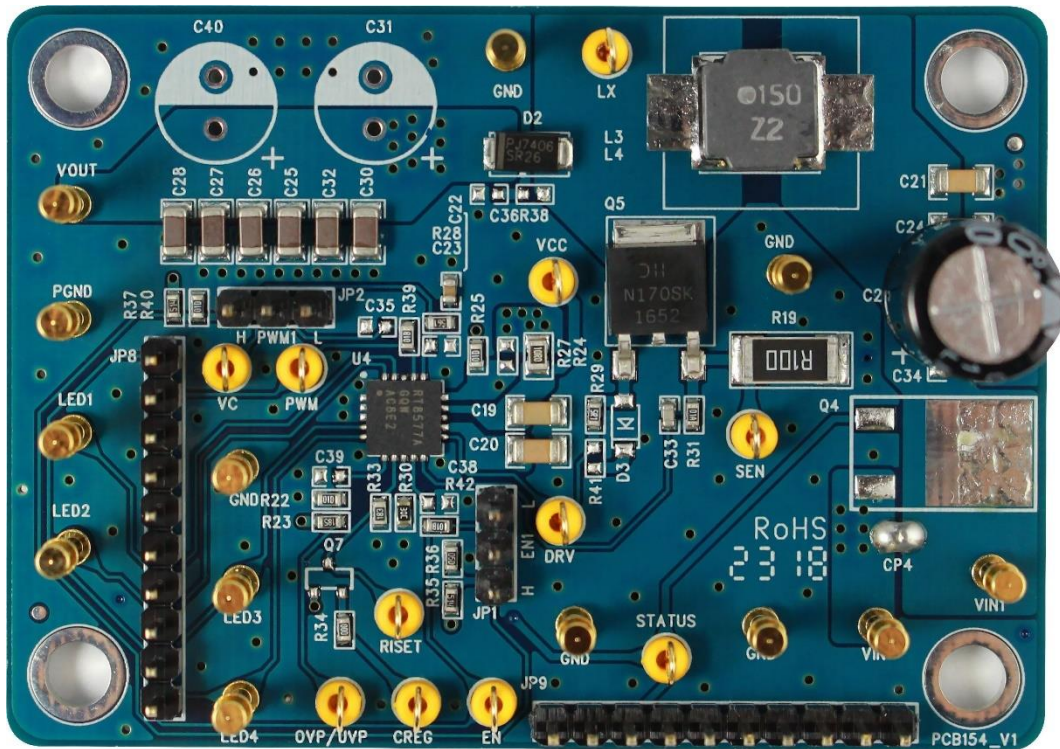
Proper measurement equipment setup and follow the procedure below.

- 1) With power off, connect the power supply for VIN and GND pins.
- 2) With power off, use jumper to pull high for EN pin.
- 3) With power off, connect the Function Generator to PWM pin.
- 4) With power off, connect the LED Load Board to VOUT and LEDx pins.

- 5) Turn on the power supply at the input. Make sure that the input voltage does not exceeds 24V on the Evaluation Board.
- 6) Turn on the Function Generator at the PWM pin.
- 7) Check LED Load Board brightness.
- 8) Once the proper output voltage is established, adjust the PWM duty within the operating ranges and observe the output LED brightness , I_{LEDx} , efficiency 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.

Test Points

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

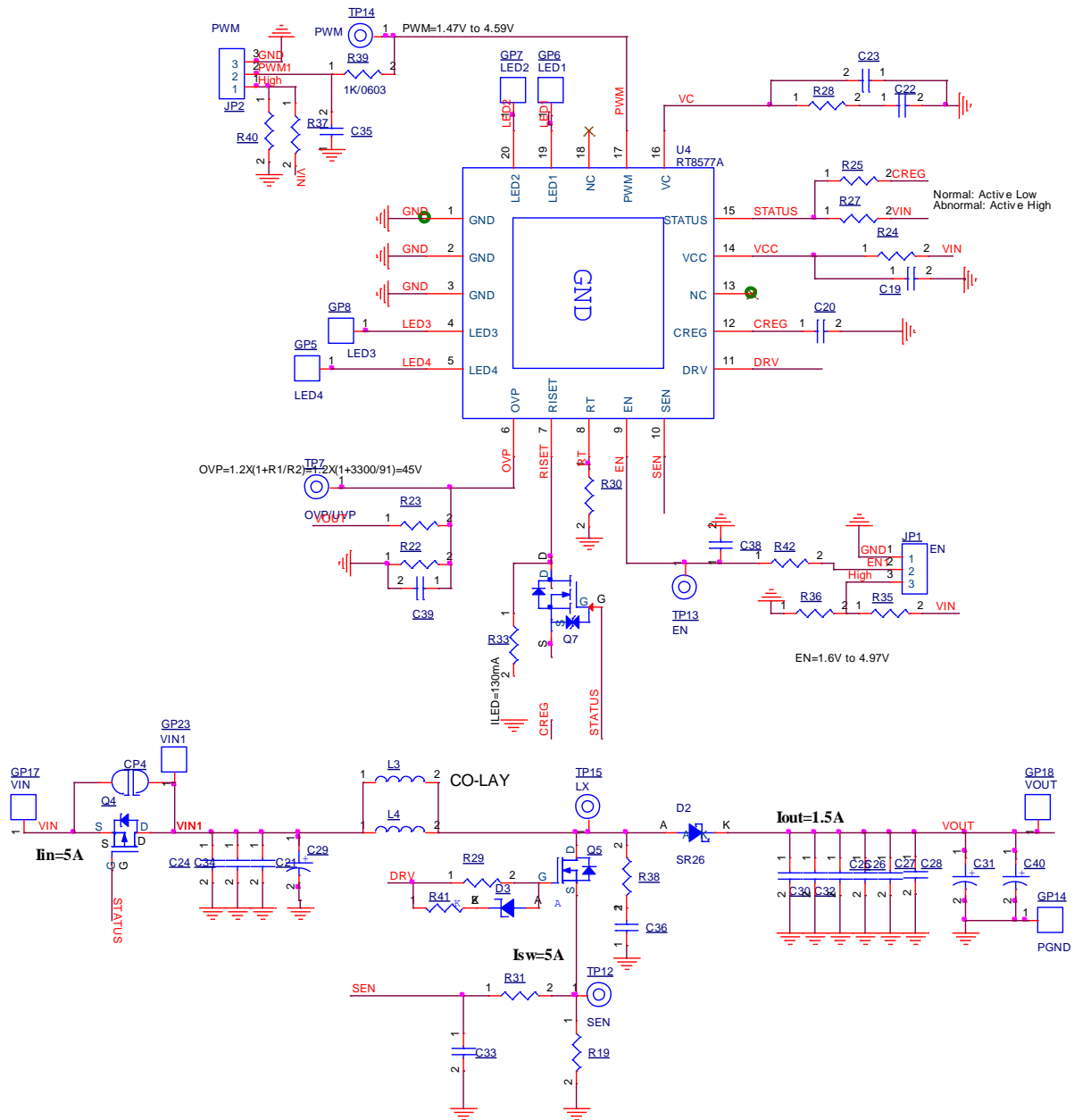
Test Point/ Pin Name	Comment (expected waveforms or voltage levels on test points)
VIN	Power input. Support 5.5V to 40V Input Voltage. Must bypass with a suitable large ceramic capacitor at this pin.
EN	High = Enable. Apply an external clock to adjust the switching frequency.
GND	Ground.
Vout	Bootstrap supply for high-side gate driver. Connect a 0.1 μ F ceramic capacitor between the Vout and LX pins.
LX	Connect this pin to an external L-C filter.
LED4	Current sink for LED4.
LED3	Current sink for LED3.
LED2	Current sink for LED2.
LED1	Current sink for LED1.

Bill of Materials

VIN = 12V, VOUT = LED Load Board , IOUT = 80mA						
Reference	Count	Part Number	Value	Description	Package	Manufacturer
U4	1	RT8577AGQW	RT8577A	LED Driver	WQFN-20L 5x5	RICHTEK
C19, C20, C21	3	1206B105K500CT	1 μ F	Capacitor, Ceramic 50V/X7R	1206	WALSIN
C22	1	0603B224K250CT	0.22 μ F	Capacitor, Ceramic 50V/X7R	0603	WALSIN
C24, C34	2	GRM32ER71H106KA12L	10 μ F	Capacitor, Ceramic 50V/X7R	1210	muRata
C25, C26, C27, C28, C30, C32	6	UMK316AB7475KL-T	4.7 μ F	Capacitor, Ceramic 50V/X7R	1206	TAIYO YUDEN
C29	1	LHK221M50V1015	220 μ F	Capacitor, Ceramic 50V	EC-2P/10	JACKCON
C33	1	0603B121K500CT	120pF	Capacitor, Ceramic 50V/X7R	0603	WALSIN
D2	1	SR26	2A/60V	Schottky Diode	SMA	PANJIT
L4	1	NR8040T150M	15 μ H	Power Inductor	L-D12_5	TAIYO YUDEN
Q5	1	DMN10H170SK3-13	59A/60V	MOSFET	TO-252	DIODES
R19	1	CR2512FR100E04Z	150mR	Resistor	2512	EVER OHMS
R22, R25, R40	3	WR06X1003FTL	100k	Resistor	0603	WALSIN
R23	1	WR06W1804FTL	1.8M	Resistor	0603	WALSIN
R24	1	WR08X10R0FTL	10R	Resistor	CP-0805C	WALSIN
R28	1	WR06X5600FTL	560R	Resistor	0603	WALSIN
R29	1	WR06W5R10FTL	5.1R	Resistor	0603	WALSIN
R30	1	RTT032002FTP	20k	Resistor	0603	WALSIN
R31	1	WR06X1000FTL	100R	Resistor	0603	WALSIN
R33	1	WR06X1802FTL	18k	Resistor	0603	WALSIN
R34	1	WR06X000 PTL	0R	Resistor	0603	WALSIN
R35, R37	2	WR06X5103FTL	510k	Resistor	0603	WALSIN
R36	1	WR06X1103FTL	110k	Resistor	0603	WALSIN
R39, R42	2	WR06X1001FTL	1k	Resistor	0603	WALSIN

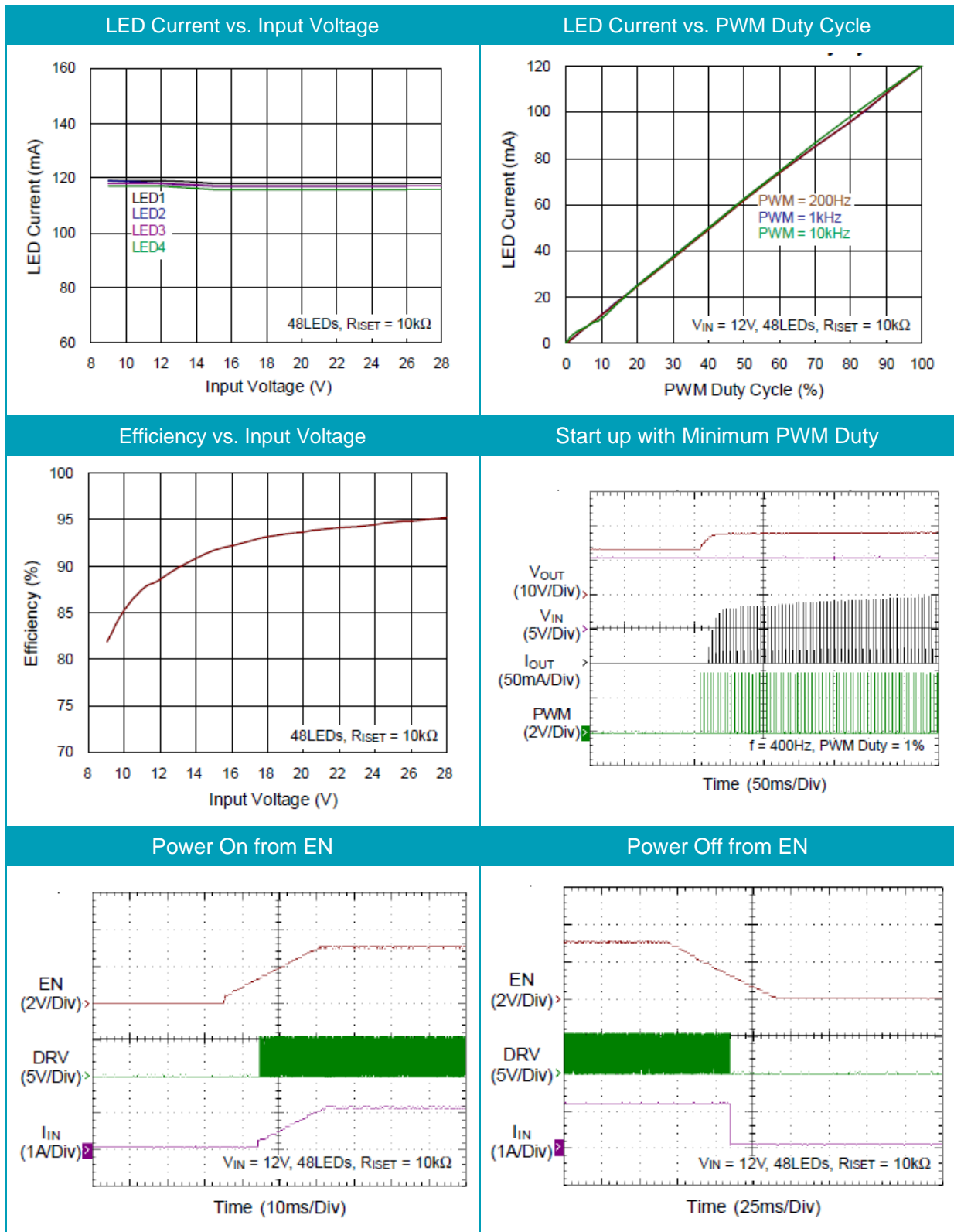
Typical Applications

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



Evaluation Board Layout

Figure 1 to Figure 4 are RT8577A Evaluation Board layout. This board size is 70mm x 50mm and is constructed on four-layer PCB, outer layers with 2 oz. Cu and inner layers with 1 oz. Cu.

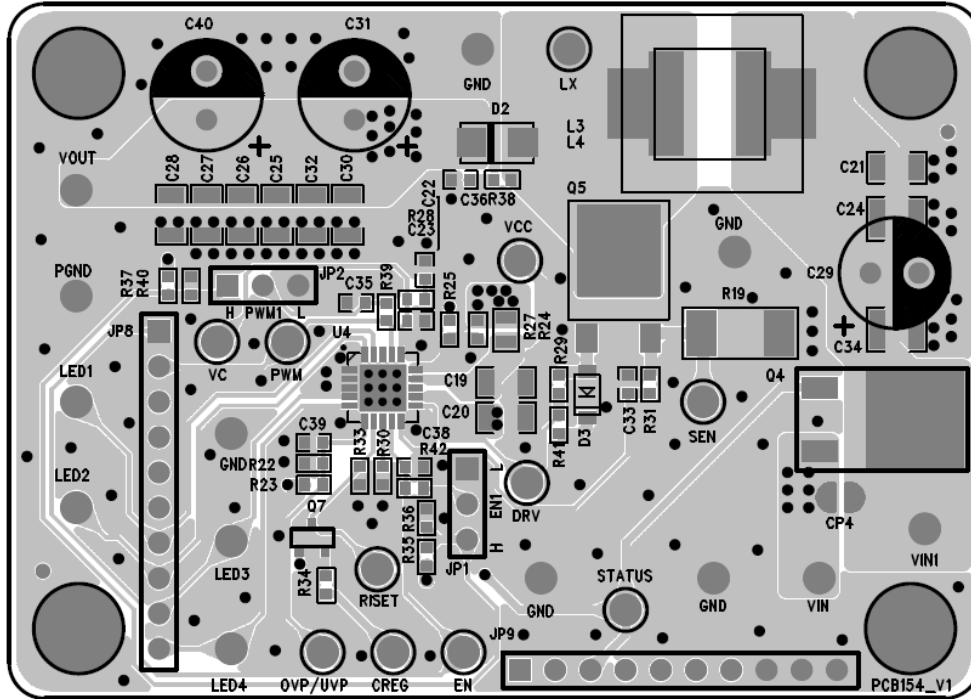


Figure 1. Top View (1st layer)

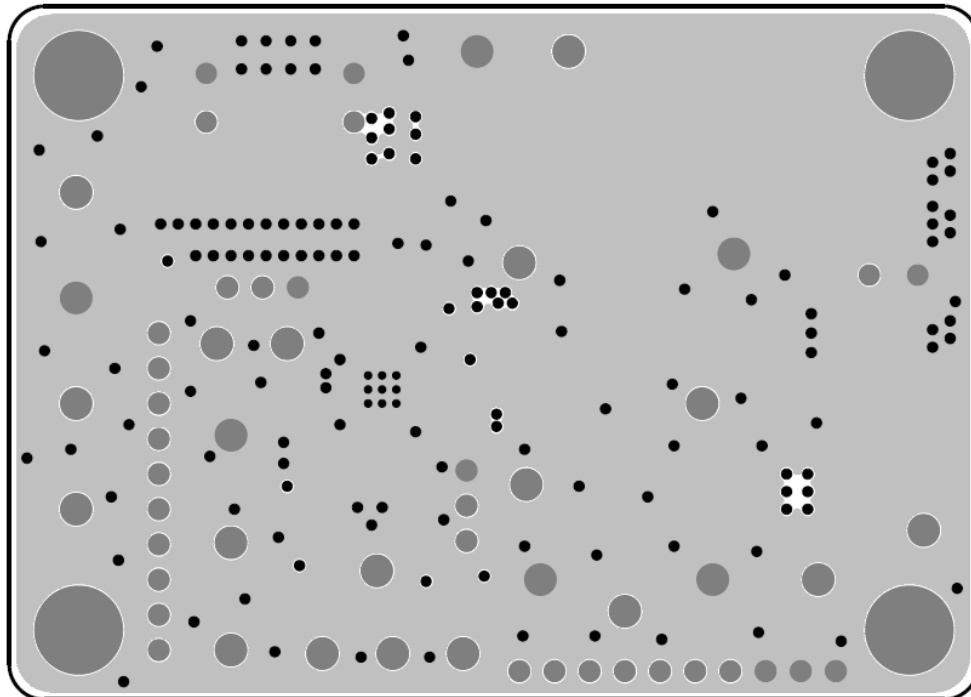


Figure 2. PCB Layout—Inner Side (2nd Layer)

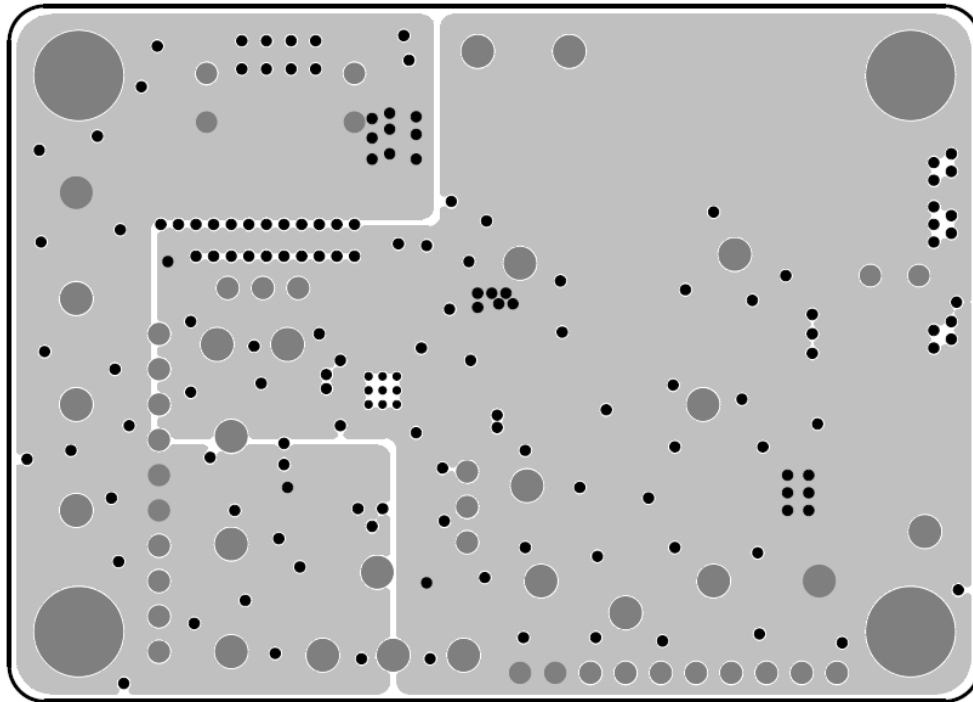


Figure 3. PCB Layout—Inner Side (3rd Layer)

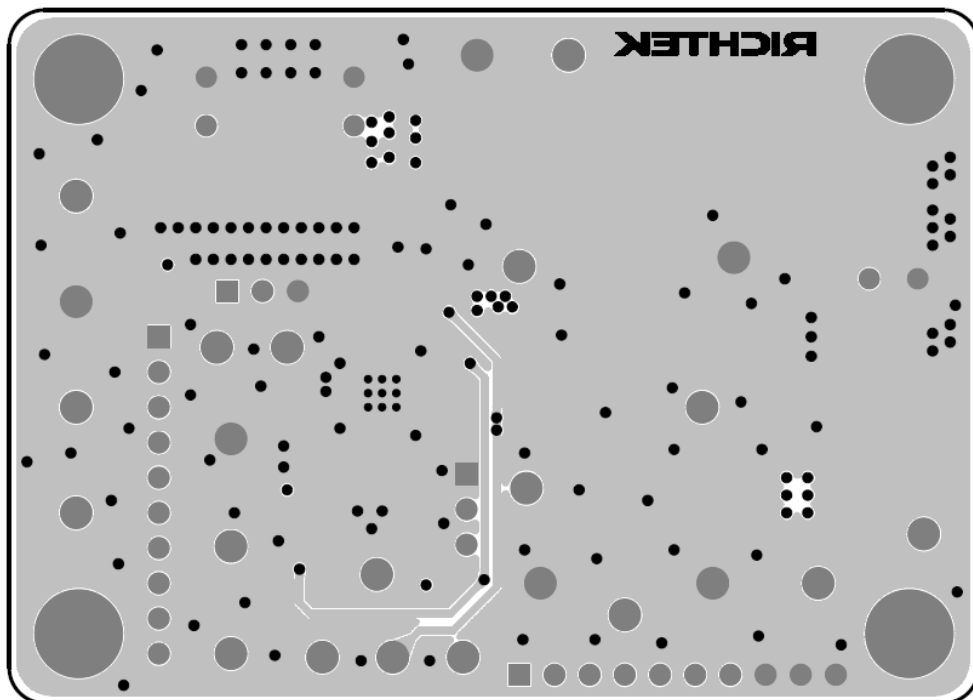


Figure 4. Bottom View (4th Layer)

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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