

---

# 4-String White LED Drive with Boost Reulator Evaluation Board

## **General Description**

The Evaluation Board demonstrates the RT8575GQW's capability to be designed for a wide input range from a 12V to 24V and provide 120mA LED current at 280kHz switching frequency. The dimming range makes it suitable from 120Hz to 1kHz of input PWM signal for LED systems. The RT8575GQW provides complete protection functions such as input undervoltage lockout, Boost output overvoltage protection, Boost overcurrent protection, opened LED protection, shorted LED protection and thermal shutdown. Cycle-by-cycle current limit provides protection against shorted outputs, and soft-start eliminates input current surge during start-up.

## **Table of Contents**

General Description .....	1
Performance Sepcification Summary .....	2
Power-up Procedure .....	2
Detailed Description of Hardware .....	2
Bill of Materials.....	5
Typical Applications .....	6
Evaluation Board Layout.....	9
More Information.....	10
Important Notice for Richtek Evaluation Board.....	10

## Performance Specification Summary

Table 1 shows the summary of the RT8575GQW Evaluation Board performance specification. The ambient temperature is 25°C.

Table 1. RT8575GQW Evaluation Board Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
<b>Input Voltage Range</b>		12	--	24	V
<b>Maximum ILED Current</b>	R <sub>ISSET</sub> = 7.5kΩ	--	120	--	mA
<b>Boost Output Overvoltage</b>		--	51	--	V
<b>Boost Operation Frequency</b>		--	280	--	kHz
<b>LED Current Accuracy</b>	I <sub>LED</sub> = 120mA, V <sub>IN</sub> = 12V to 24V	--	±3	--	%
<b>LED Current Matching</b>	I <sub>LED</sub> = 120mA, V <sub>IN</sub> = 12V to 24V	--	±1	±3	%

## Power-up Procedure

### Suggestion Required Equipments

- RT8575GQW Evaluation Board
- DC power supply capable of at least 30V and 5A
- LED Load Board
- Function Generator
- Oscilloscope

### Quick Start Procedures

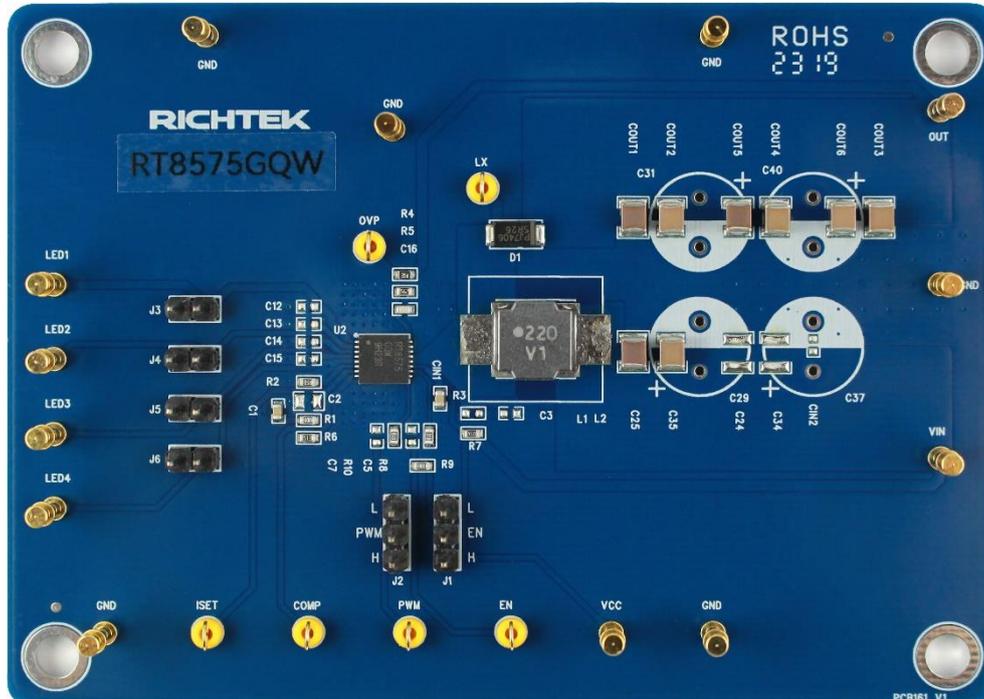
The Evaluation Board is fully assembled and tested. Follow the steps below to verify board operation. Do not turn on supplies until all connections are made. When measuring the output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the output voltage 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 input power supply to VIN and GND pins.
- 2) With power off, use jumper to pull high EN pin of J1.
- 3) With power off, connect the Function Generator to PWM pin, set up frequency range from 120Hz to 1kHz, 100% duty and amplitude does not exceed 5V
- 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 Genetator 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<sub>CHx</sub>, 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](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>	Input voltage.
<b>VOUT</b>	Output voltage.
<b>GND</b>	Ground.
<b>EN</b>	Enable test point.
<b>J1</b>	EN jumper. Connect EN to L to disable and H to enable.
<b>LX</b>	Switch node test point.
<b>PWM</b>	Dimming control input.
<b>COMP</b>	Compensation pin for error amplifier.

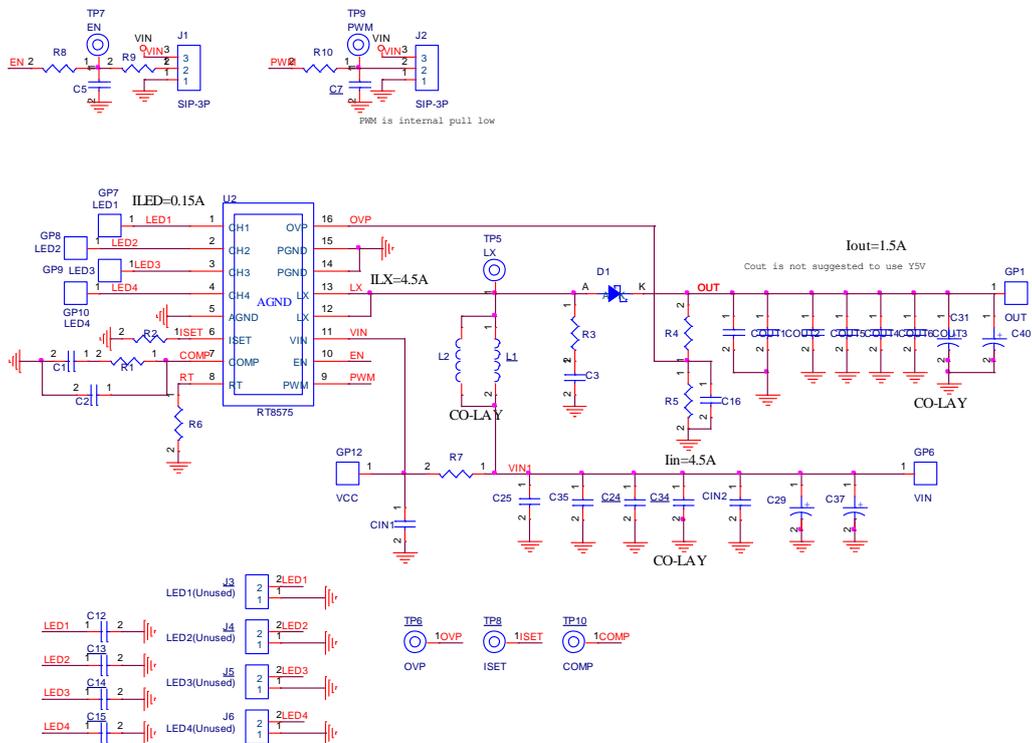
Test Point/ Pin Name	Function
<b>ISET</b>	LED current is set by the value of the resistor $R_{ISET}$ connected from the ISET pin to ground. Do not short the ISET pin. $V_{ISET}$ is typically 1V.
<b>OVP</b>	Overvoltage protection for boost converter. The detecting threshold is 1.2V.
<b>LEDx</b>	Current Sink for LED. (Connect to GND, if not used.)

**Bill of Materials**

VIN = 12V, ILED = 120mA, fsw = 280kHz						
Reference	Count	Part Number	Value	Description	Package	Manufacturer
U2	1	RT8575GQW	RT8575GQW	LED Driver	WDFN-16L 5x5	RICHTEK
C1	1	0603B104K500CT	100nF	Capacitor, Ceramic 50V/X7R	0603	WALSIN
C16	1	0603N101J500CT	100pF	Capacitor, Ceramic 50V/X7R	0603	WALSIN
CIN1	1	0603X105K250CT	1μF	Capacitor, Ceramic 25V/X5R	0603	WALSIN
C25, C35, COUT1, COUT2, COUT3, COUT4, COUT5, COUT6,	8	GRM32ER71H106KA12L	10μF	Capacitor, Ceramic 50V/X7R	1210	MURATA
D1	1	SR26	Schottky Diode 60V/2A	Schottky Diode 60V/2A	SMA/DO-214AC	PANJIT
L1	1	NRS8040T220MJGJ	22μH	Inductor, Isat = 2.4A, 66mΩ	8x8	TAIYO YUDEN
R1, R9	2	WR06X000 PTL	0	Resistor, Chip, 1/10W, 1%	0603	WALSIN
R2	1	WR06X7501FTL	7.5k	Resistor, Chip, 1/10W, 1%	0603	WALSIN
R4	1	RTT032263FTP	226k	Resistor, Chip, 1/10W, 1%	0603	RALEC
R5	1	WR06X5601FTL	5.6k	Resistor, Chip, 1/10W, 1%	0603	WALSIN
R6	1	WR06X5102FTL	51k	Resistor, Chip, 1/10W, 1%	0603	WALSIN
R7	1	WR06X10R0FTL	10	Resistor, Chip, 1/10W, 1%	0603	WALSIN
R8, R10	2	WR06X1001FTL	1k	Resistor, Chip, 1/10W, 1%	0603	WALSIN

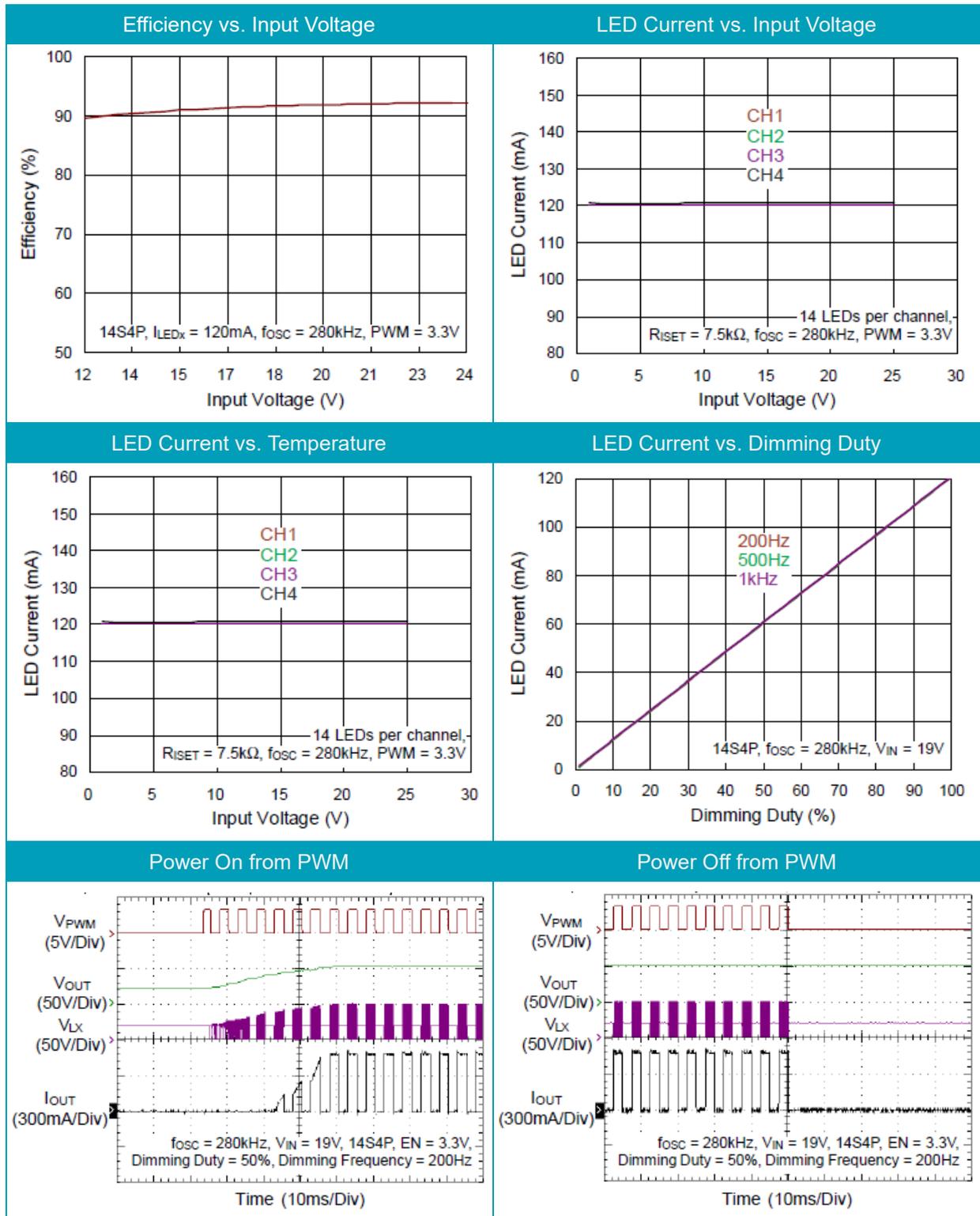
**Typical Applications**

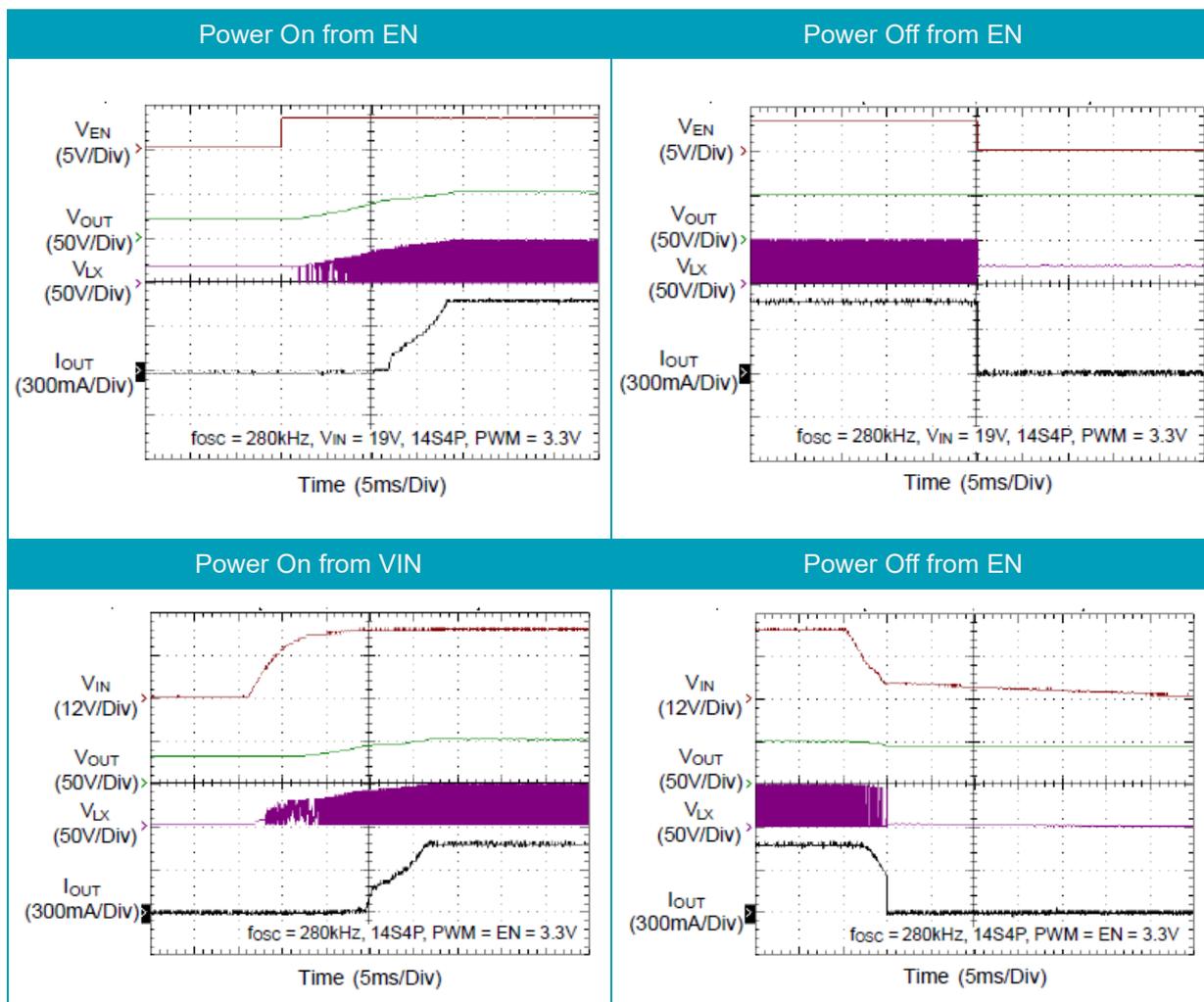
**EVB Schematic Diagram**



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.

**Measurement Result**





**Evaluation Board Layout**

Figure 1 and Figure 2 are RT8575GQW Evaluation Board layout. This board size is 100mm x 72mm and is constructed on two-layer PCB, top and bottom layers with 1 oz.

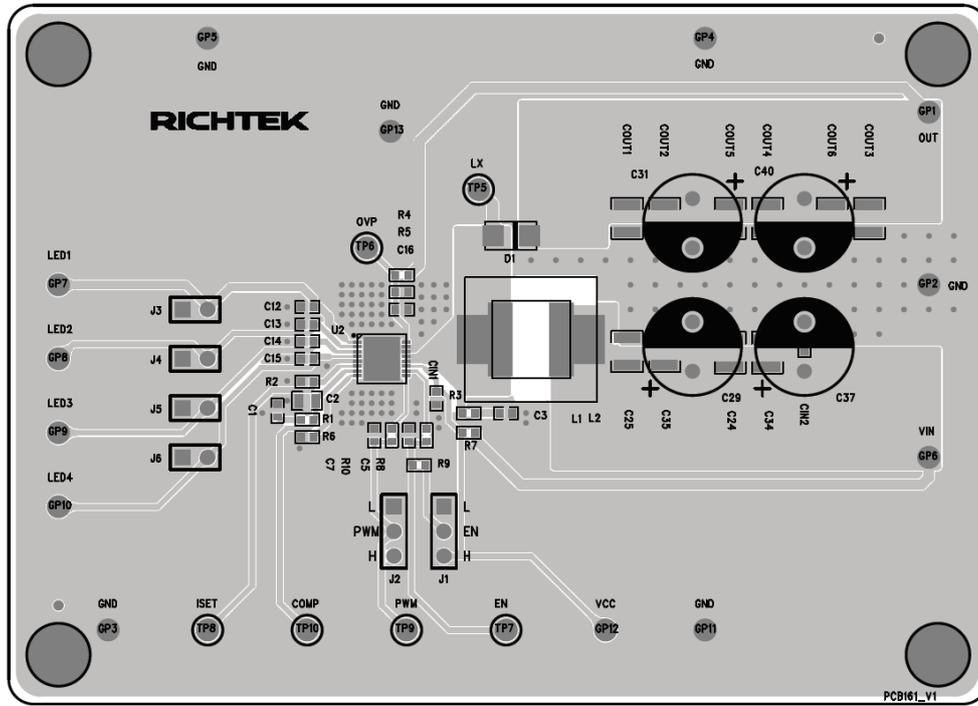


Figure 1. Top View (1<sup>st</sup> layer)

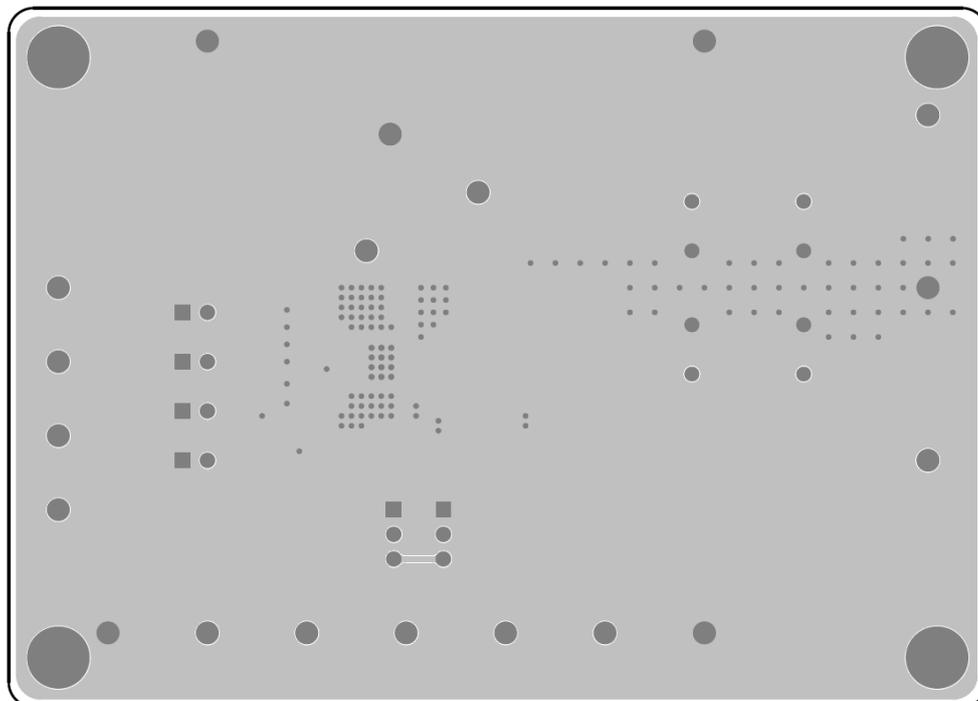


Figure 2. Bottom View (2<sup>th</sup> Layer)

## ***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***

THIS DOCUMENT IS FOR REFERENCE ONLY, NOTHING CONTAINED IN THIS DOCUMENT SHALL BE CONSTRUED AS RICHTEK'S WARRANTY, EXPRESS OR IMPLIED, UNDER CONTRACT, TORT OR STATUTORY, WITH RESPECT TO THE PRESENTATION HEREIN. IN NO EVENT SHALL RICHTEK BE LIABLE TO BUYER OR USER FOR ANY AND ALL DAMAGES INCLUDING WITHOUT LIMITATION TO DIRECT, INDIRECT, SPECIAL, PUNITIVE OR CONSEQUENTIAL DAMAGES.