

USB Type-C 28V EPR Protector with CC and SBU Short to VBUS Overvoltage and IEC ESD Protection Evaluation Board

General Description

The Evaluation Board demonstrates the RT1735's capability to be designed for Type-C interface overvoltage protection IC. The RT1735 protects the high voltage shorted to VBUS to adjacent pins of CC/SBU up to 28V due to USB Power Delivery (PD), which allows VBUS from 3.3 to 28V sourcing.

The RT1735 is integrated with the protection against ESDs as per IEC61000-4-2 standards, with contact discharge of $\pm 8\text{kV}$ on CON_CC1/CON_CC2, D1/D2 and CON_SBU1/ CON_SBU2.

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Performance Specification Summary

Table 1 shows the summary of the RT1735 Evaluation Board performance specification. The ambient temperature is 25°C.

Table 1. RT1735 Evaluation Board Performance Specification Summary

Specification	Test Conditions	Min	Typ	Max	Unit
VDD Input Voltage Range		2.5	--	5.5	V
CC1/2 Switch Current		-1.25	--	1.25	A
SBU1/2 Switch Current		-100	--	100	mA
CON_CC1/2 & CON_SBU1/2 & D1/2 IEC 61000-4-2 Contact Discharge		-8k	--	8k	V
CON_CC1/2 & CON_SBU1/2 & D1/ IEC 61000-4-2 Air Discharge		-15k	--	15k	V
CON_CC1/2 & CON_SBU1/2 Short to VBUS		--	--	28	V

Power-up Procedure

Suggestion Required Equipments

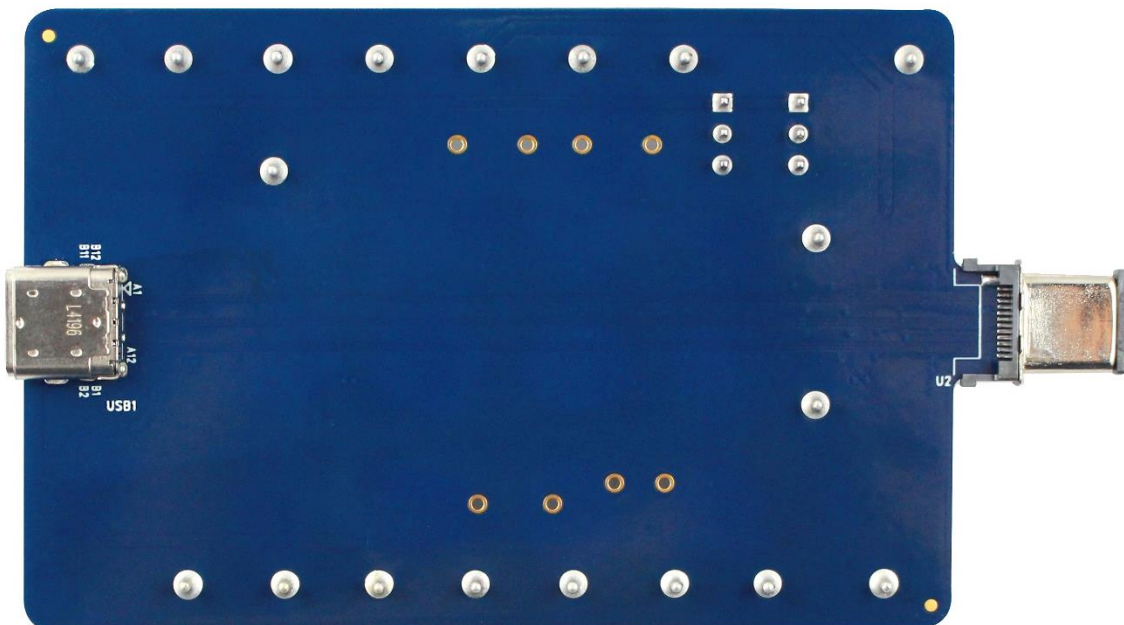
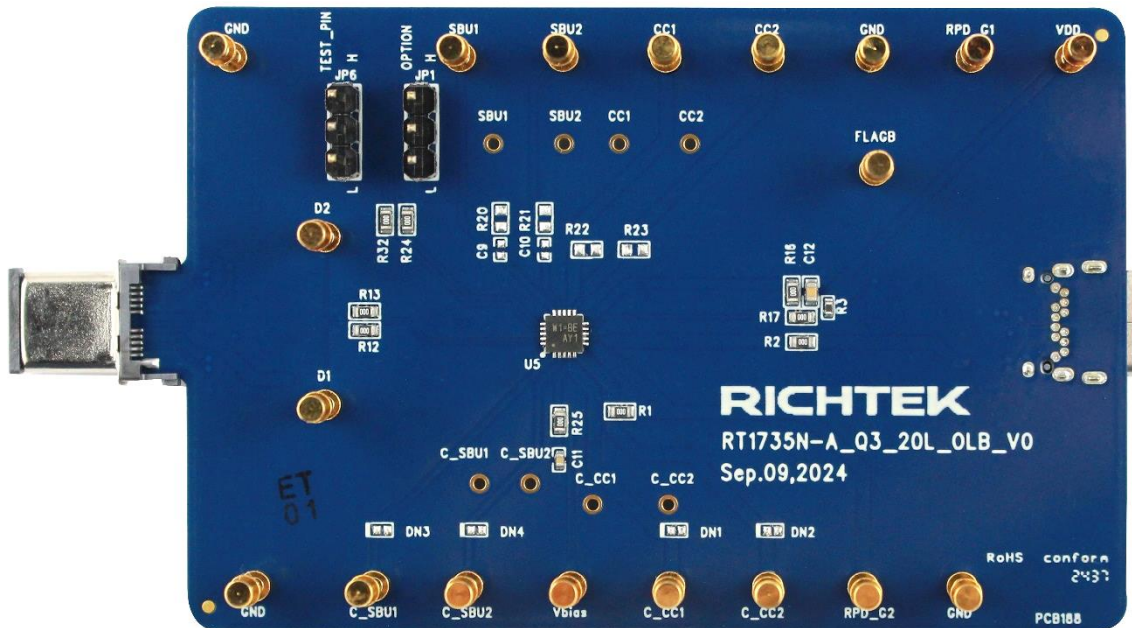
- RT1735 Evaluation Board
- DC power supply capable of at least 28V and 5A
- Oscilloscope

Proper measurement equipment setup and follow the procedure below.

- 1) With power off, connect the input power supply to the VDD and GND pins.
- 2) Turn on the power supply at VDD. Make sure that the CC/SBU Switch turn on.
- 3) Once the Switch is turn, test OVP threshold and OVP & ESD 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.

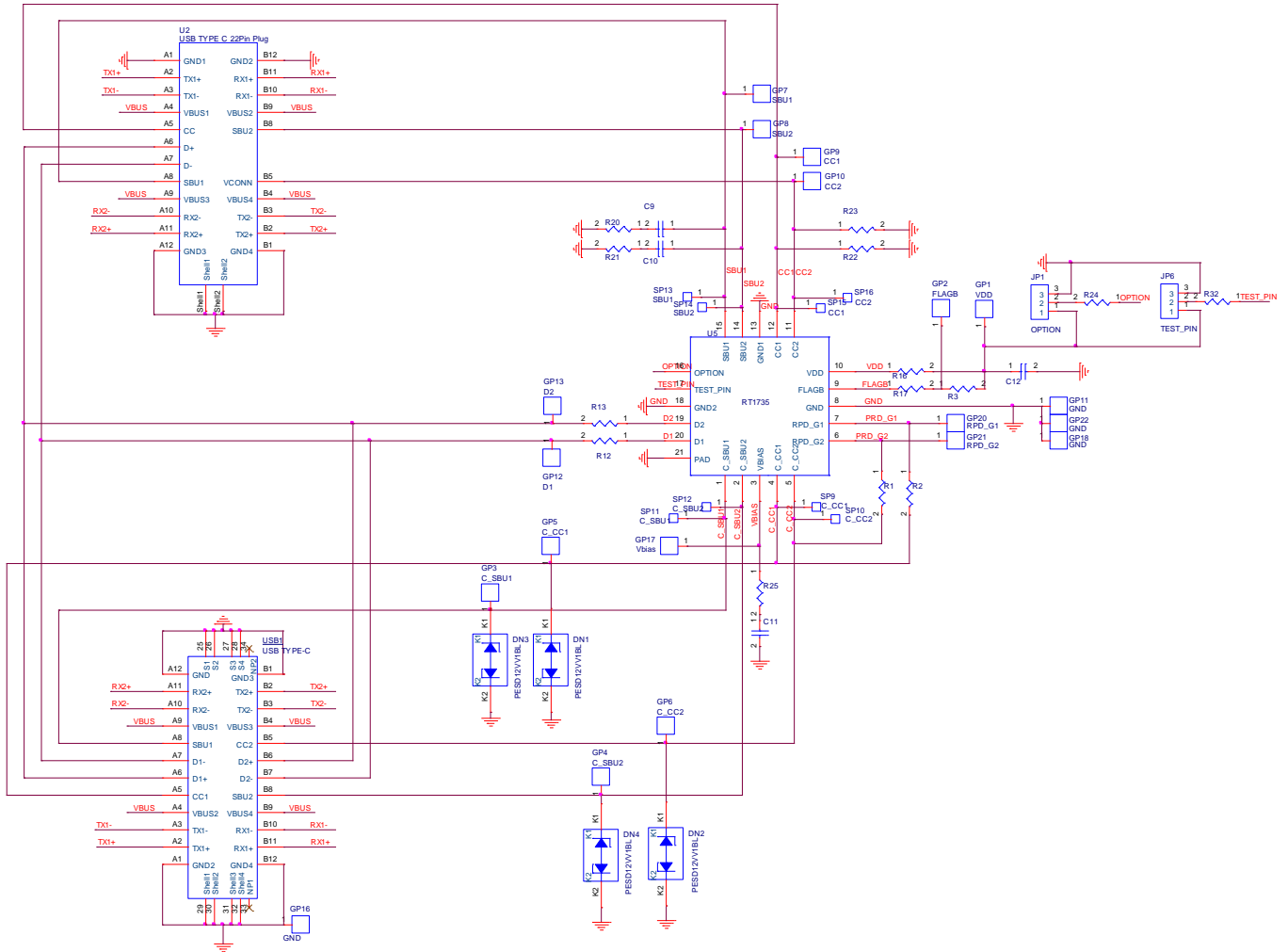
Test Point/ Pin Name	Function
VDD	Input voltage.
FLAGB	Open-drain output cautioning fault condition.
VBIAS	VBIAS pin connect capacitor for ESD protection. Put a 0.1 μ F capacitor on this pin to ground.
GND	Ground.
CON_CC1	Type-C connector side CC1 switch. Connect the CC1 pin of the USB Type-C connector.
CON_CC2	Type-C connector side CC2 switch. Connect the CC2 pin of the USB Type-C connector.
CON_SBU1	Type-C connector side SBU1 switch. Connect the SBU1 pin of the USB Type-C connector.
CON_SBU2	Type-C connector side SBU2 switch. Connect the SBU2 pin of the USB Type-C connector.
RPD_G1	If dead battery resistors are required, short pin to CON_CC1. If dead battery resistors are not required, short pin to GND.
RPD_G2	If dead battery resistors are required, short pin to CON_CC2. If dead battery resistors are not required, short pin to GND.
CC1	System side of the CC1 switch. Connect to the CC pin of the CC/PD controller.
CC2	System side of the CC2 switch. Connect to the CC pin of the CC/PD controller.
SBU1	System side of the SBU1 switch. Connect to the SBU pin of the SBU MUX.
SBU2	System side of the SBU2 switch. Connect to the SBU pin of the SBU MUX.
D1	USB2.0 IEC ESD protection. Connect to the USB2.0 pins of the USB Type-C connector.
D2	USB2.0 IEC ESD protection. Connect to the USB2.0 pins of the USB Type-C connector.

Bill of Materials

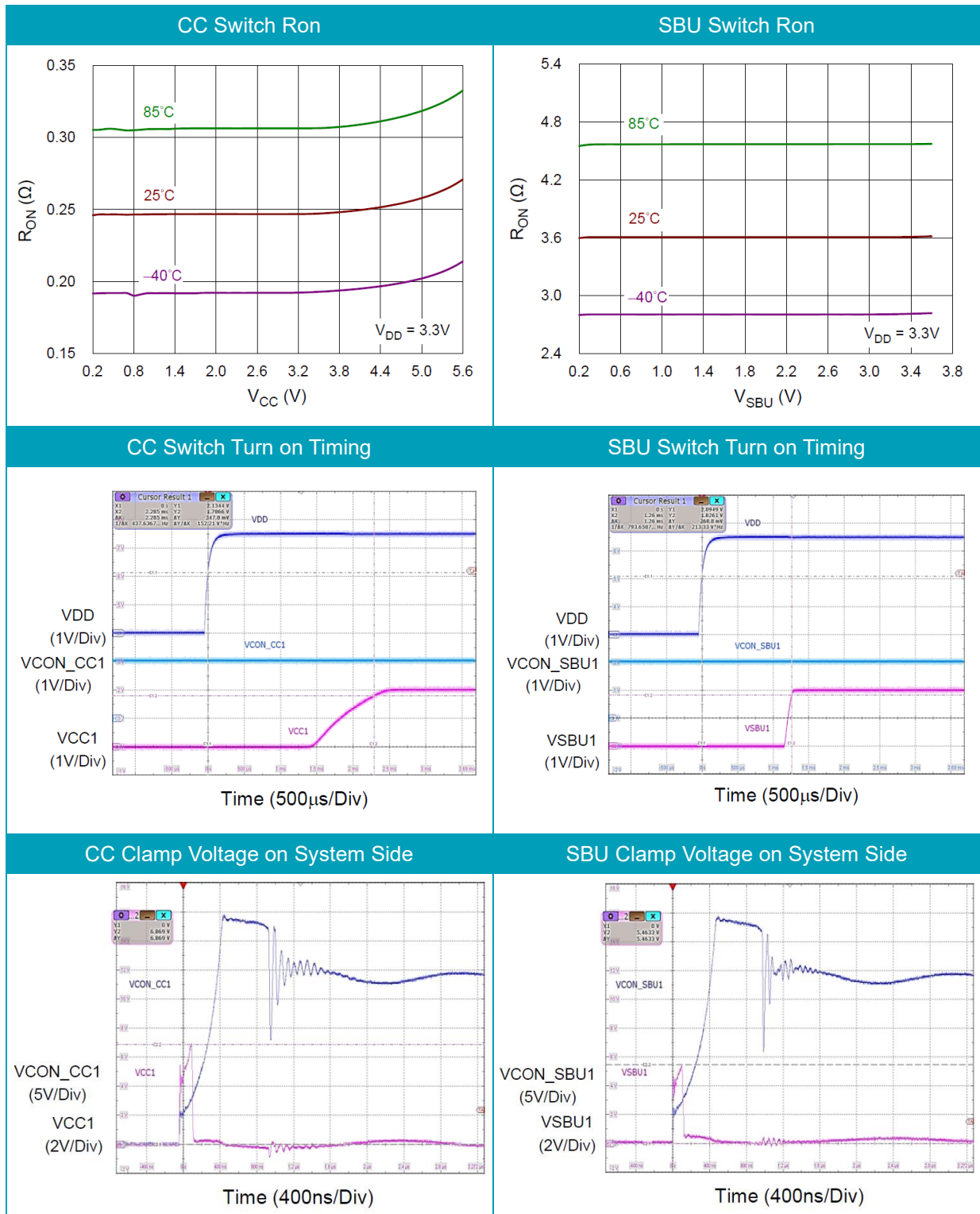
Reference	Count	Part Number	Value	Description	Package	Manufacturer
U5	1	RT1735N-A	RT1735N-A	OVP Switch	WQFN-20L 3x3	RICHTEK
U2	1	121U-AC2C-0XXT	USB TYPE C Plug Conntecter	USB TYPE C Plug Conntecter	12.6x10.6x4.1 mm	JEM
USB1	1	C-NBR2L-00-00	USB TYPE-C Female Conntecter	USB TYPE-C Female Conntecter	9.24x9.1mm	ADVANCED- CONNECTEK
C9, C10, C11	3	0402B104K500CT	100nF	Capacitor, Ceramic, 50V, X7R	0402	WALSIN
C12	1	0603X105K250CT	1 μ F	Capacitor, Ceramic, 25V, X5R	0603	WALSIN
R1, R2, R12, R13, R16, R17, R24, R25, R32	9	WR06X000 PTL	0 Ω	Resistor, Chip, 1/10W, 1%	0603	WALSIN
R3	1	RTT021003FTH	100k Ω	Resistor, Chip, 1/16W, 1%	0402	RALEC
R20, R21	2	WR06X30R1FTL	30.1 Ω	Resistor, Chip, 1/10W, 1%	0603	WALSIN
R22, R23	2	WR06X30R0FTL	30 Ω	Resistor, Chip, 1/10W, 1%	0603	WALSIN

Typical Applications

EVB Schematic Diagram



Measurement Result



Evaluation Board Layout

Figure 1 to Figure 8 are RT1735 Evaluation Board layout. This board size is 82mm x 51mm and is constructed on eight-layer PCB, outer layers with 1 oz. Cu and inner layers with 1 oz. Cu.

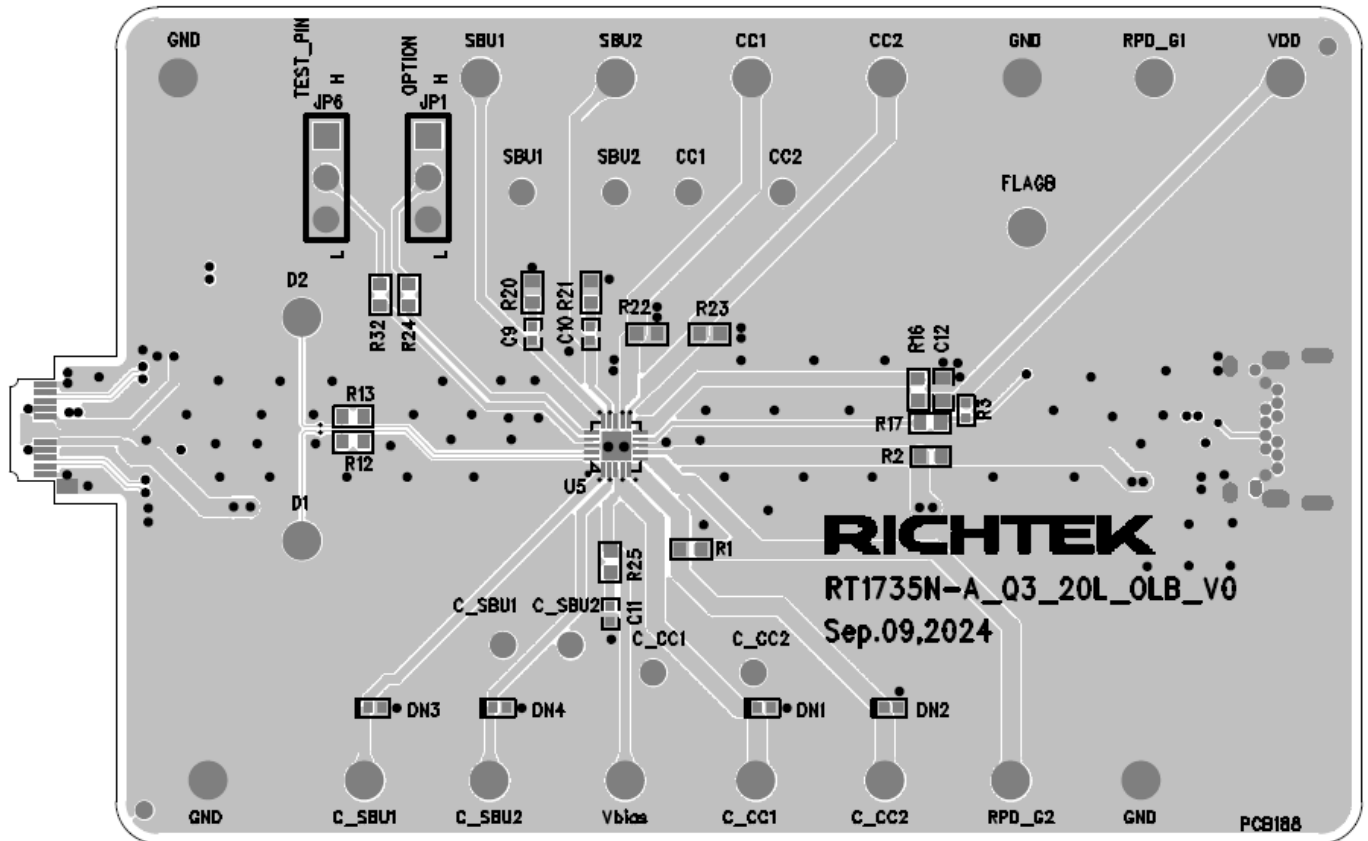


Figure 1. Top View (1st layer)

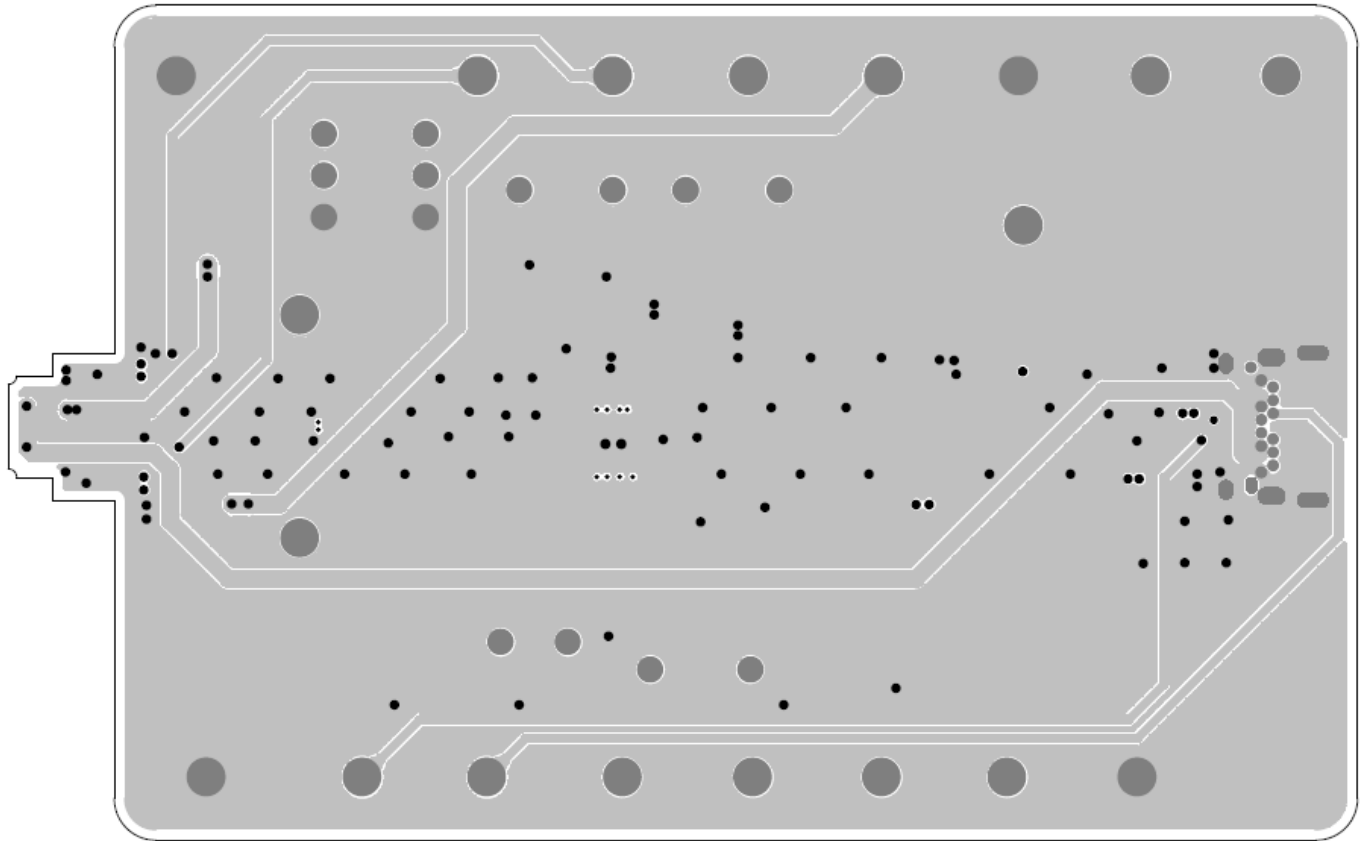


Figure 2. PCB Layout—Inner Side (2nd Layer)

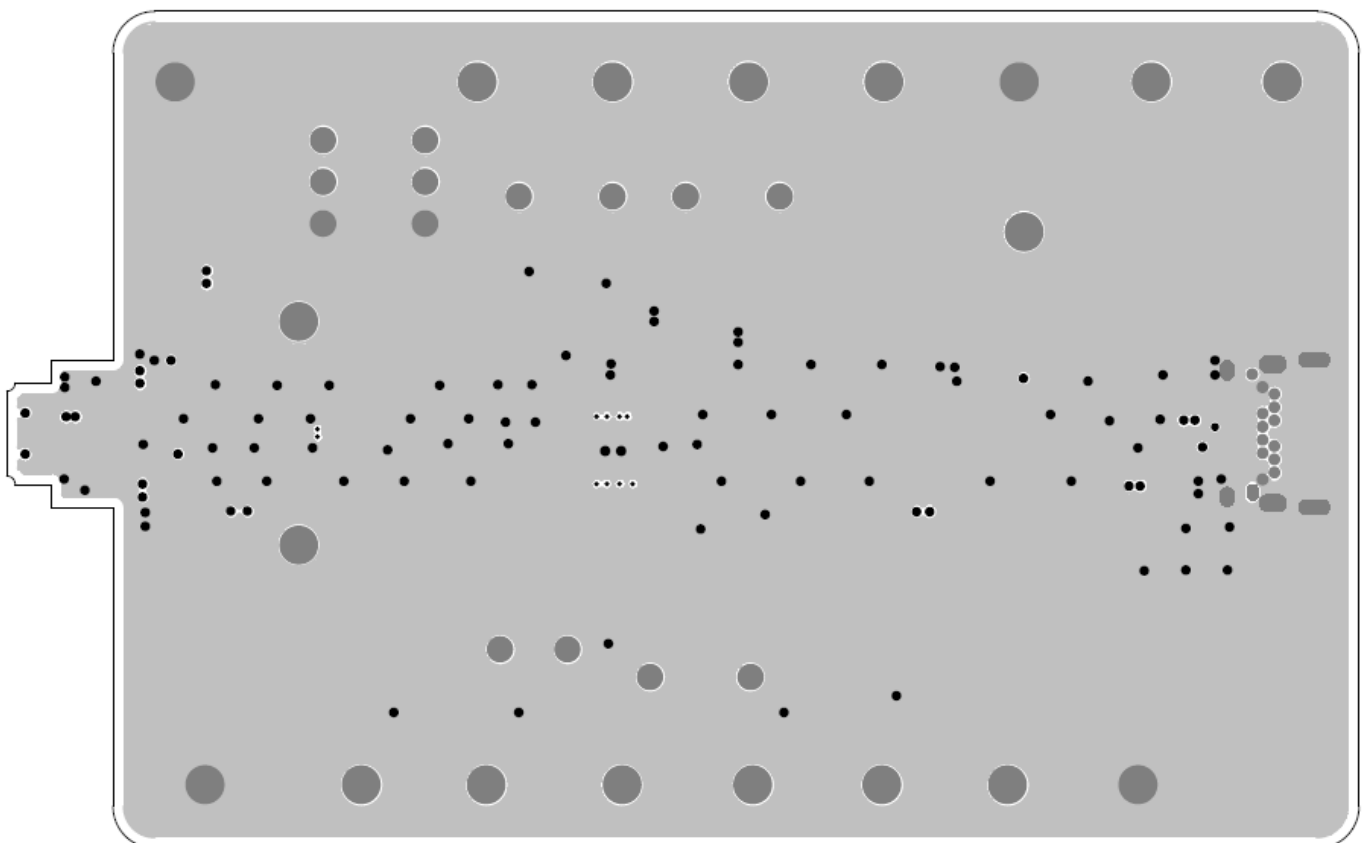


Figure 3. PCB Layout—Inner Side (3rd Layer)

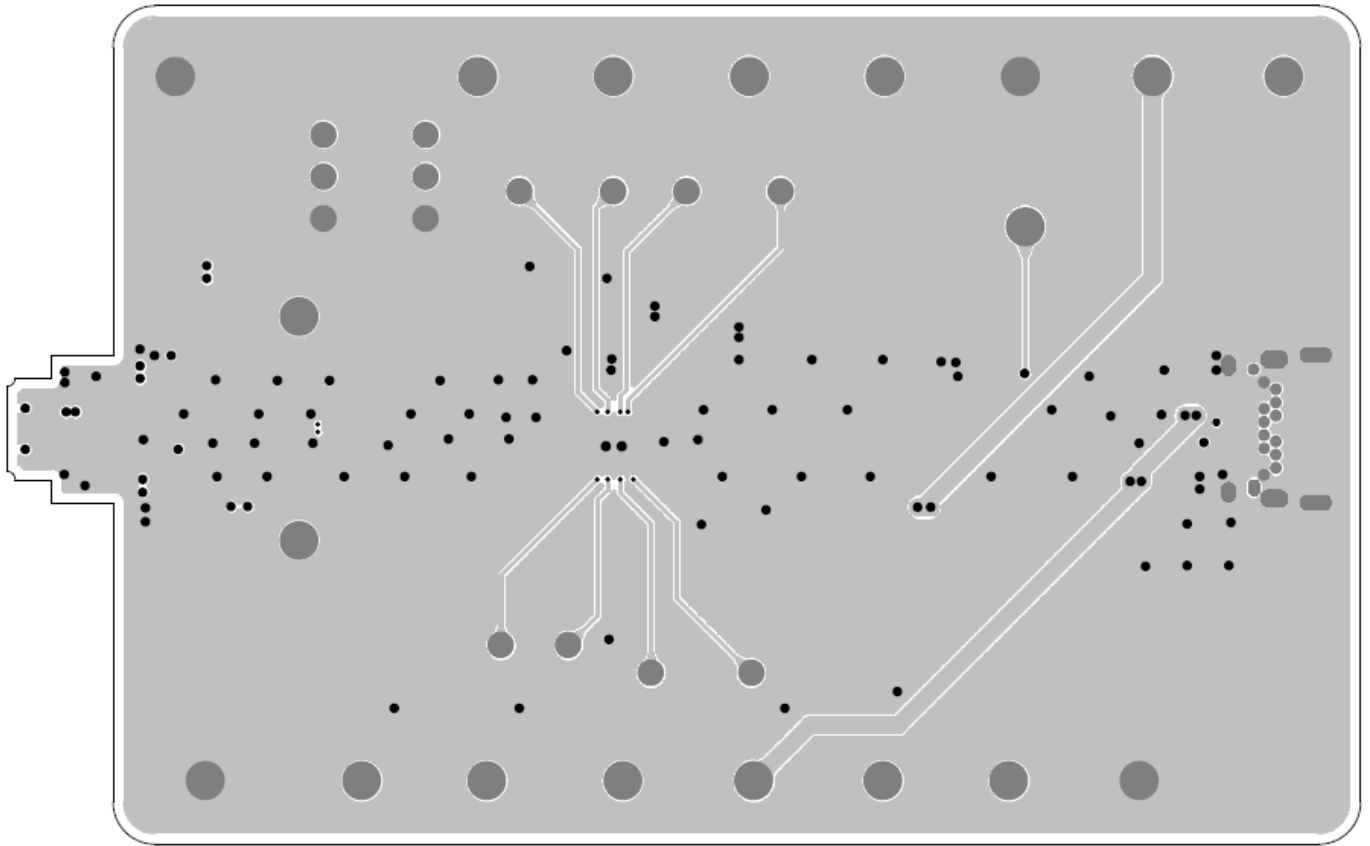


Figure 4. PCB Layout—Inner Side (4th Layer)

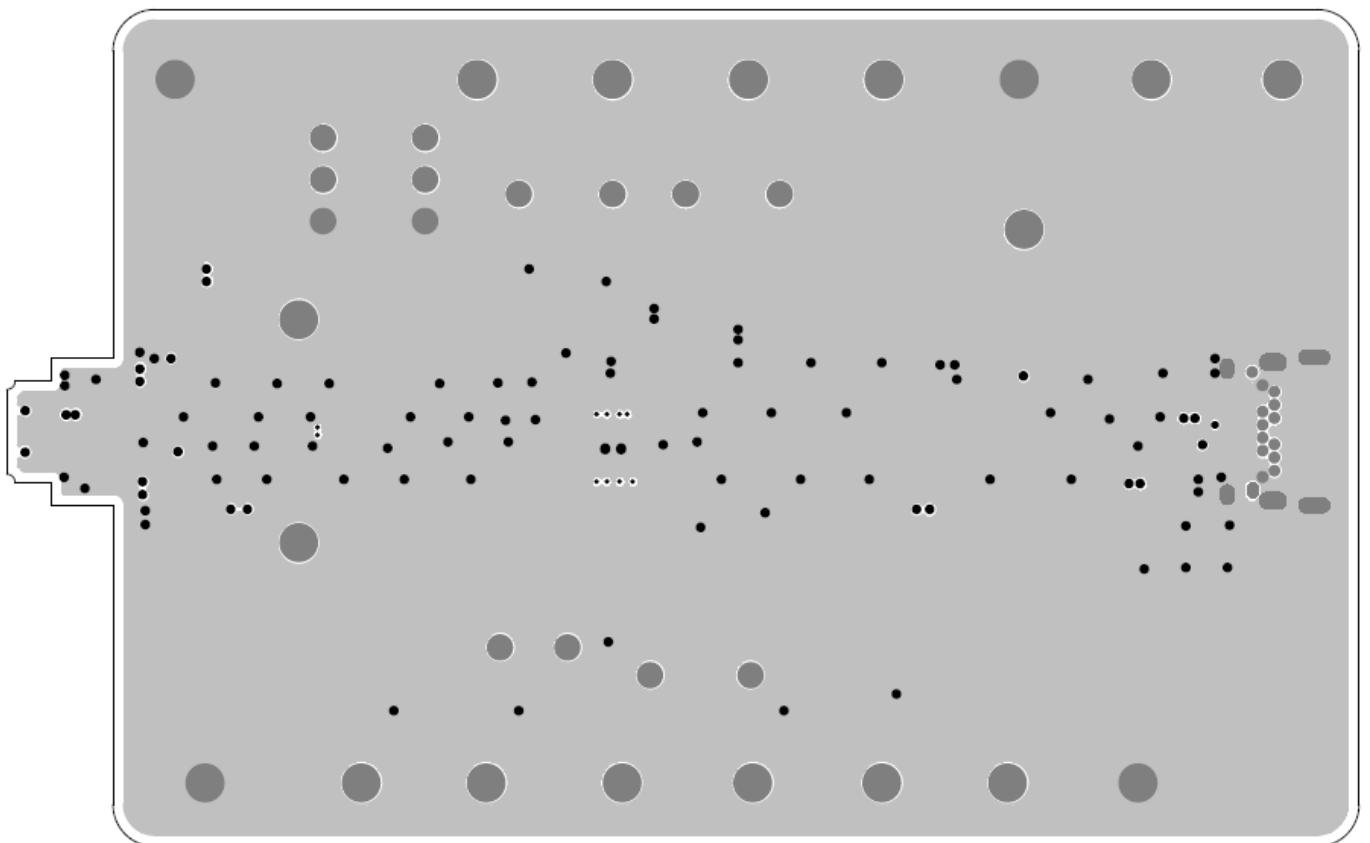


Figure 5. PCB Layout—Inner Side (5th Layer)

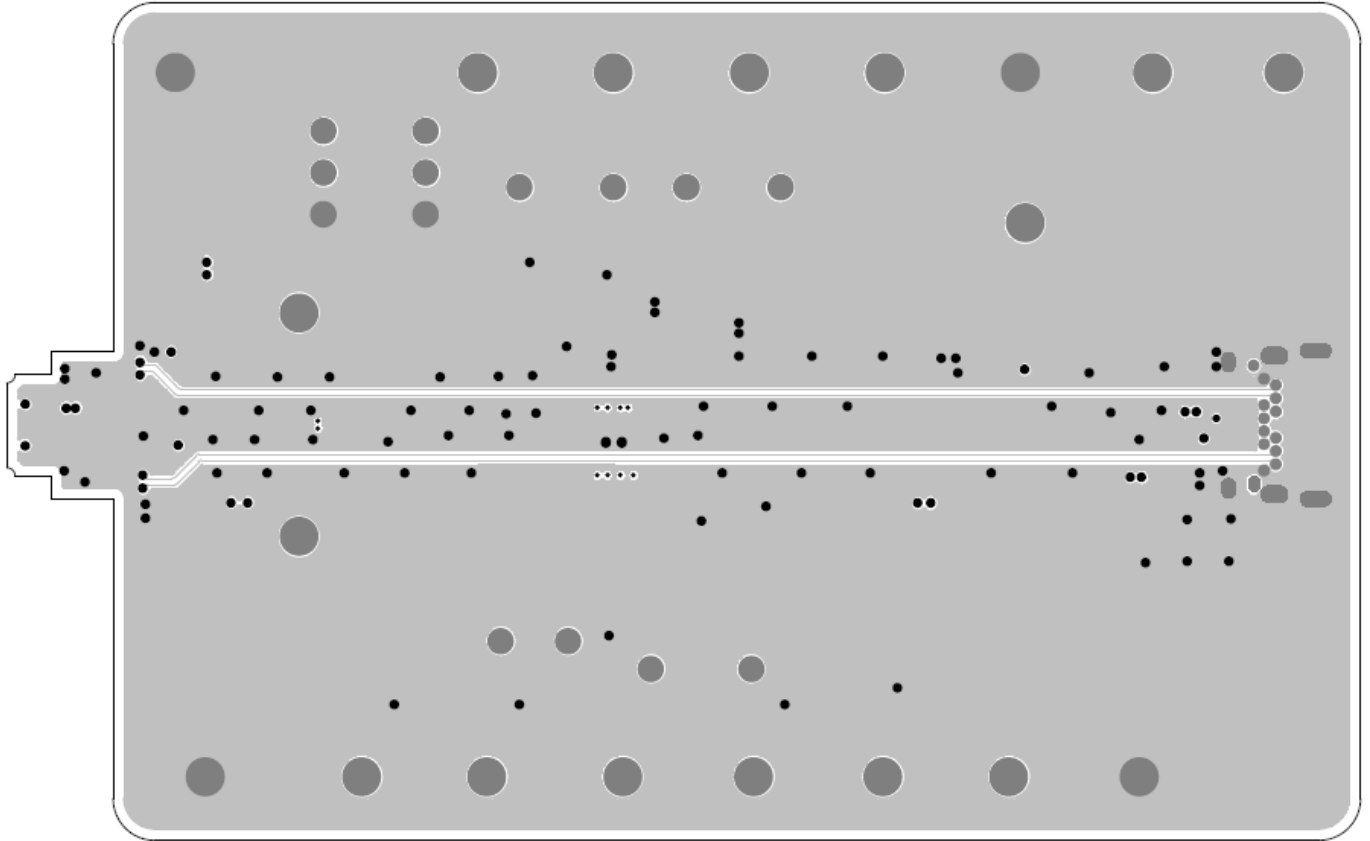


Figure 6. PCB Layout—Inner Side (6th Layer)

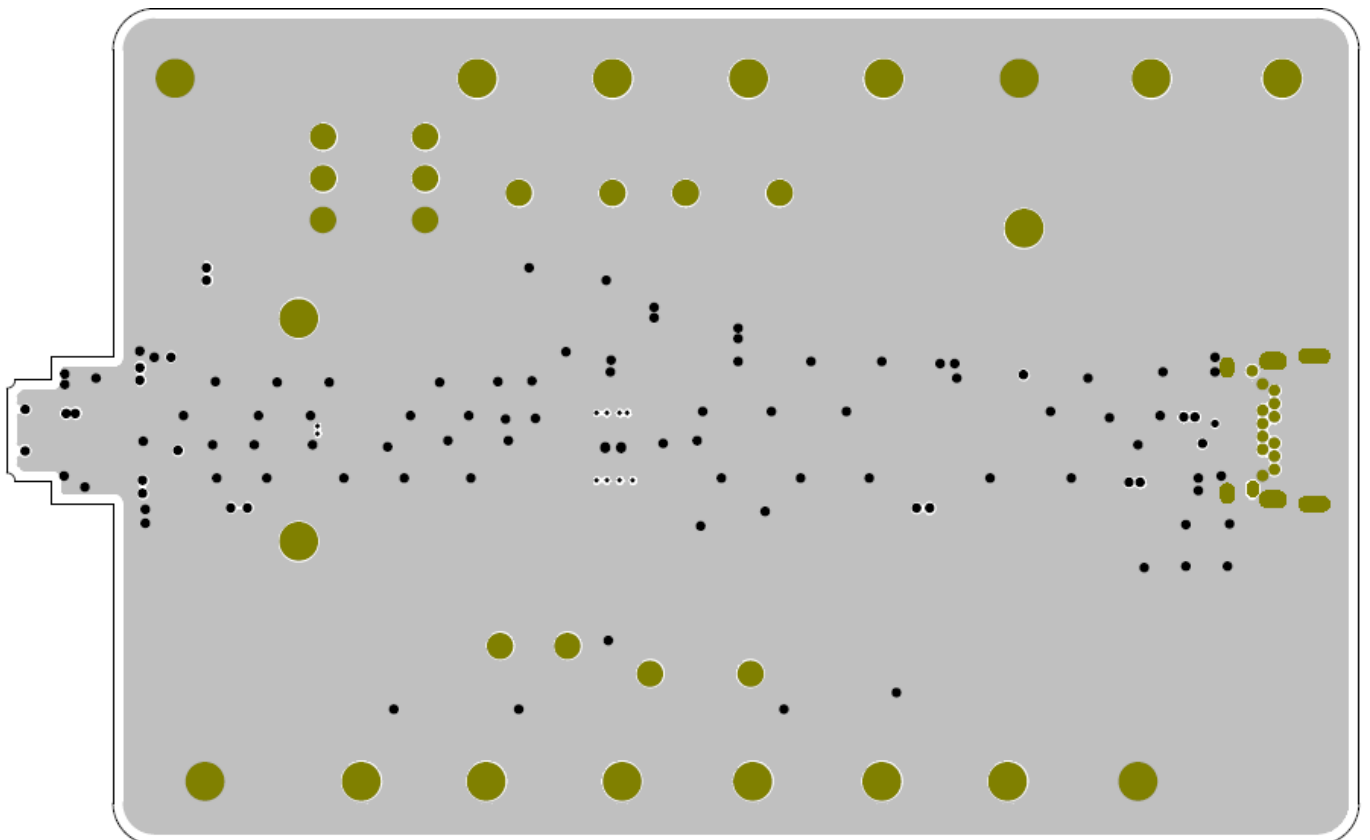


Figure 7. PCB Layout—Inner Side (7th Layer)

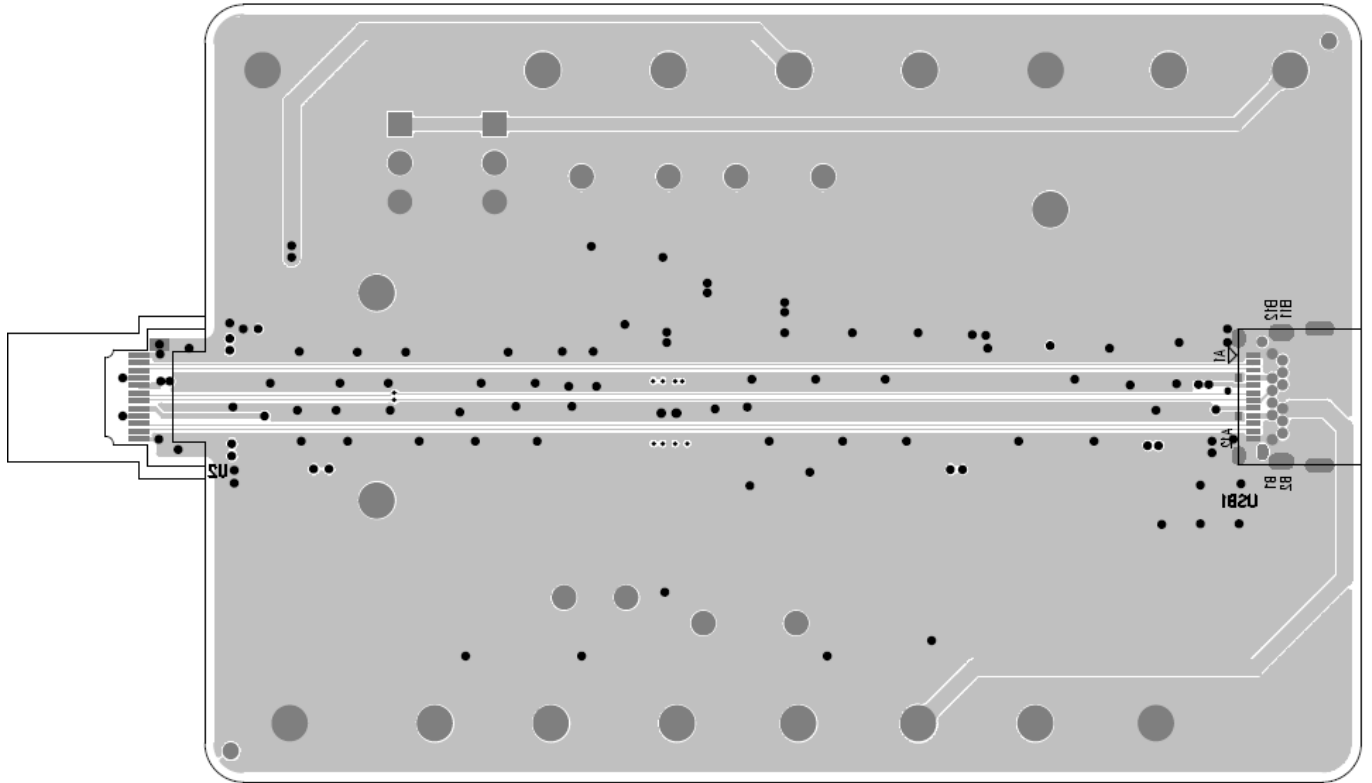


Figure 8. Bottom View (8th Layer)

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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