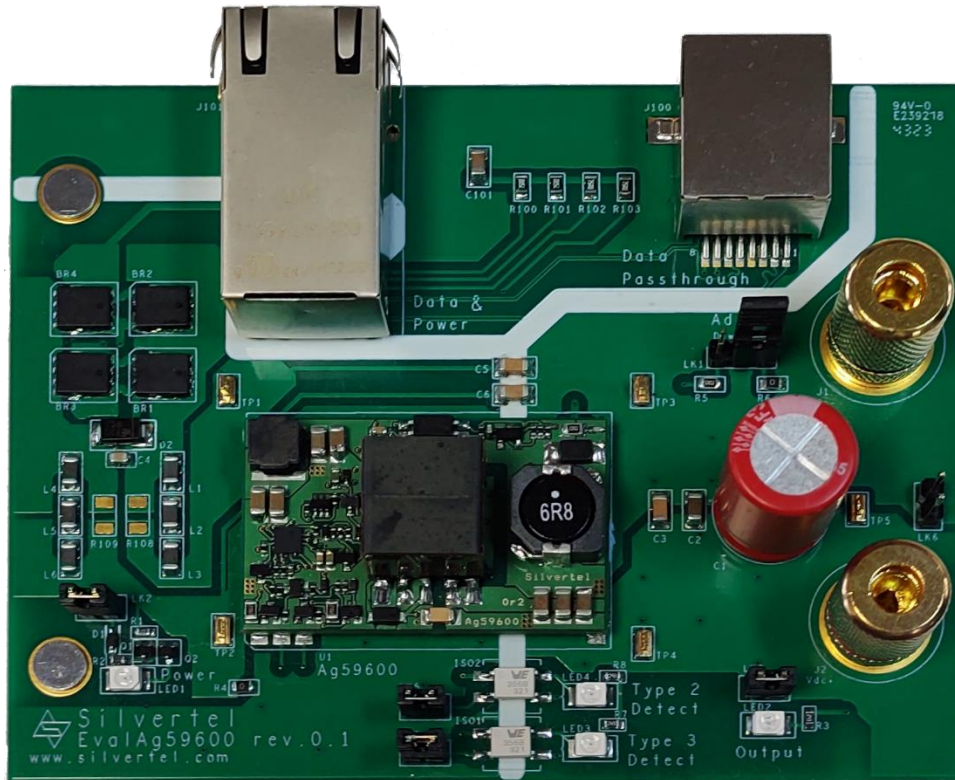




# Evaluation Board User Manual



## EvalAg59600 Evaluation Board User Manual

Version 1.0 – March 2024

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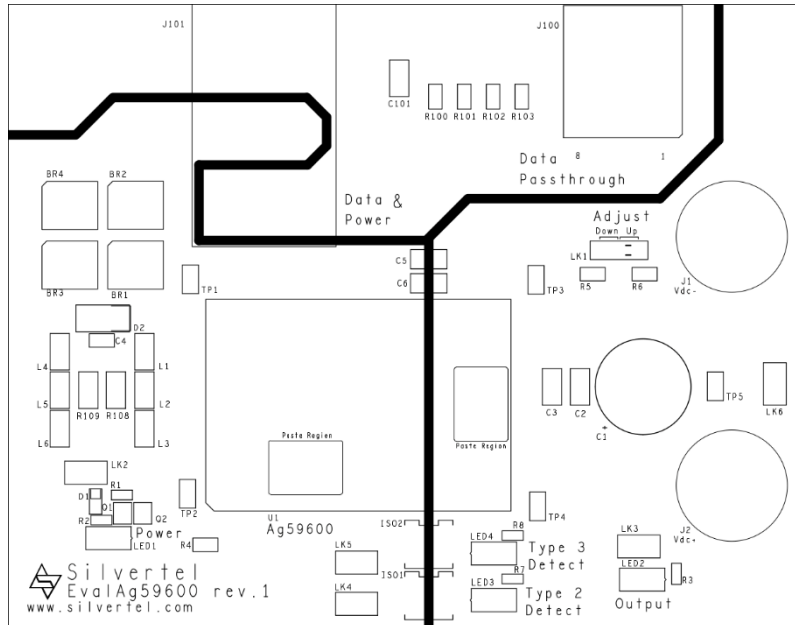
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## 1 Kit Contents

- EvalAg59600 Evaluation Board
- Ag596xx Module Soldered to Evaluation Board

## 2 Board Layout



**Figure 1: EvalAg7010 Board Layout**

### 2.1 Link Settings

- LK1 – Output voltage Adjust
- LK2 – Input Power LED Enable
- LK3 – Output Power LED Enable
- LK4 – Type 2 Detect LED Enable
- LK5 – Type 3 Detect LED Enable

### 2.2 Input Output Connections

- J1 & J2 – Load Output Binding Posts
- J101 – PoE Enabled RJ45
- J100 – Data Passthrough RJ45

## 3 Introduction

This Manual is a guide to using the EvalAg59600 evaluation board fitted with a Silvertel Ag59612 or Ag59624 miniaturised high efficiency Class 6 surface mount Power over Ethernet (PoE) module.

This board has been designed to assist with evaluating the use of Silvertel's module in an application; as such it has been designed to pass through Ethernet data signals (10/100/1000BASE-T) from the Midspan PSE (Power Sourcing Equipment) or PoE enabled switch connected to J101, onto the system connected to J100.

While this evaluation board has been designed following Silvertel's recommendations, it should not be considered as a reference design as it features circuitry included solely for the purposes of evaluation that are not be required for proper operation.

## 4 Input

The EvalAg59600 board will extract the power from the data pairsets using the RJ45 connector with integrated magnetics, J101. The data is passively passed on to any peripheral equipment via J100, while the power is provided to the Ag59600 module in the correct polarity via the Schottky rectifier diodes BR1, BR2, BR3 and BR4.

### 4.1 Operation

To ensure that the PSE does not apply power to a non-PoE enabled device the output port first checks for a valid PoE signature. If the PSE does not see a valid signature, then it will disconnect, wait approximately 2 seconds then try again.

Once a valid signature has been detected the PSE may then perform classification to determine the power requirement of the PD, only after this has occurred will the PSE supply power to the powered device.

The module will provide the 25K signature followed by a class 6 power level request to be powered by an IEEE compliant PSE.

If PSE is not capable of supplying the Class 6 power level requested by the Ag59600, if using an IEEE802.3af or IEEE802.3at PSE for example, it should supply the highest power level it is capable of supplying.

If the PSE does not detect a valid signature on both pairsets of the ethernet cable, the power will be limited to Class 4 power levels.

### 4.2 Input Power LED

LED1 illuminates when the module is being supplied with greater than 36V. This can be disabled by removing the jumper link LK2, removing this link does not affect the power being delivered to the Ag59600.

### 4.3 PSE Detect

When the Ag59600 module fitted has detected it is being powered by an IEEE802.3 type 3 (PoE++) or greater PSE, the 'TYP3-DET' pin will be pulled low, and this will cause LED4 to become illuminated on the EvalAg59600 board. LED3 will not be illuminated.

When the Ag59600 module fitted has detected it is being powered by an IEEE802.3 type 2 (PoE+) PSE, the 'TYP2-DET' pin will be pulled low, and this will cause LED4 to become illuminated on the EvalAg59600 board. LED3 will not be illuminated.

If an IEEE802.3 Type 1 PSE is detected, neither LED3 nor LED4 will be illuminated.

## 5 Output

The Ag59600 output voltage will be present on the two binding post terminations J1 and J2. These can be connected to with 4mm Banana connectors, bare wire, or fork connectors.

### 5.1 Output Power LED

LED2 illuminates when the module is outputting. This can be disabled by removing the jumper link LK3, removing this link does not affect the power being supplied by the Ag59600.

## 5.2 Output Voltage Adjust

The output voltage of the Ag59600 module can be adjusted by changing the location of the jumper LK1. The EvalAg59600 is fitted with two adjust resistors. The down adjust resistor R5, is fitted with a 68k $\Omega$  resistor. And the up adjust resistor R6, which is fitted with a 0 $\Omega$  resistor to allow for the maximum adjust change of the Ag59600 module.

To increase the output voltage, insert the jumper to LK1 in the left position, so that the link is between the middle and leftmost pin.

To reduce the output voltage, insert a jumper to LK1 in the right position, so that the link is between the middle and rightmost pin.

If the output voltage needs to be set to a different value (within the adjustment range) then connect different value resistors in place of R5 (68K) or R6 (0 $\Omega$ ) and connect the jumper into the corresponding link setting.

Note: ensure that the down adjust resistor is not shorted when connecting a module that has a higher stated resistance in the datasheet, as this could cause damage to the module.

## 5.1 Data Output

Any data that is provided over the PI (Ethernet cable) connected to the Data & Power port, J100 will be transposed onto the Data output port, J101 via the data transformer.

The data traces on the evaluation board have been designed to pass through 10/100/1000BASE-T Ethernet data signals. No processing or amplification of this signal will be performed on the evaluation board.

## 6 EMI

The EvalAg59600 contains the recommended components for EMI filtering, see ANX-POE-EMI for more details.

The board is fitted with ferrite beads, L1-6; if these are not required, they can be effectively removed from the circuit by fitting R108 and R109 with 0 $\Omega$  resistors.

## 7 Test Setup

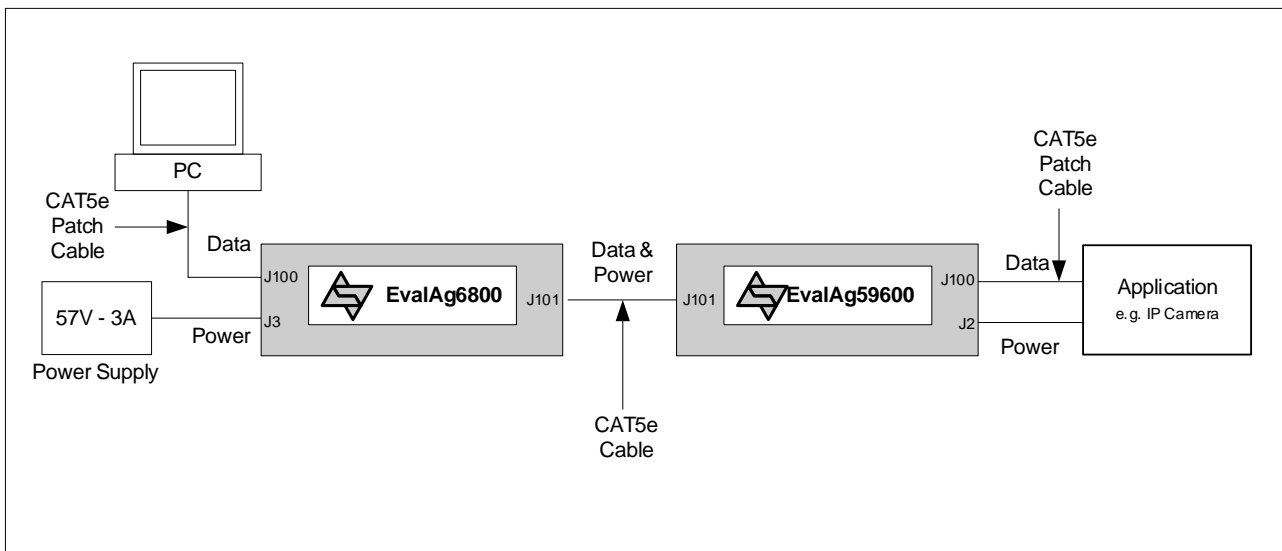
Figure 2 shows the basic set up using the EvalAg59600 evaluation board powered by Silvertel's EvalAg6120 PSE.

The equipment required: -

- EvalAg59600 fitted with Silvertel's Ag59612 or Ag59624 PD Module.
- EvalAg6800 or other IEEE802.3 compliant PSE
- Power supply unit, +52-57V output e.g. 60V bench power supply
- CAT5e or greater cables
- Application Circuit

Optional equipment: -

Data source e.g. PC



**Figure 2: Basic Test Setup**

## 8 Additional information

Full operating conditions and feature set can be found in the Ag59600 product datasheet, available from [www.silvertel.com](http://www.silvertel.com).

### 9 Schematic

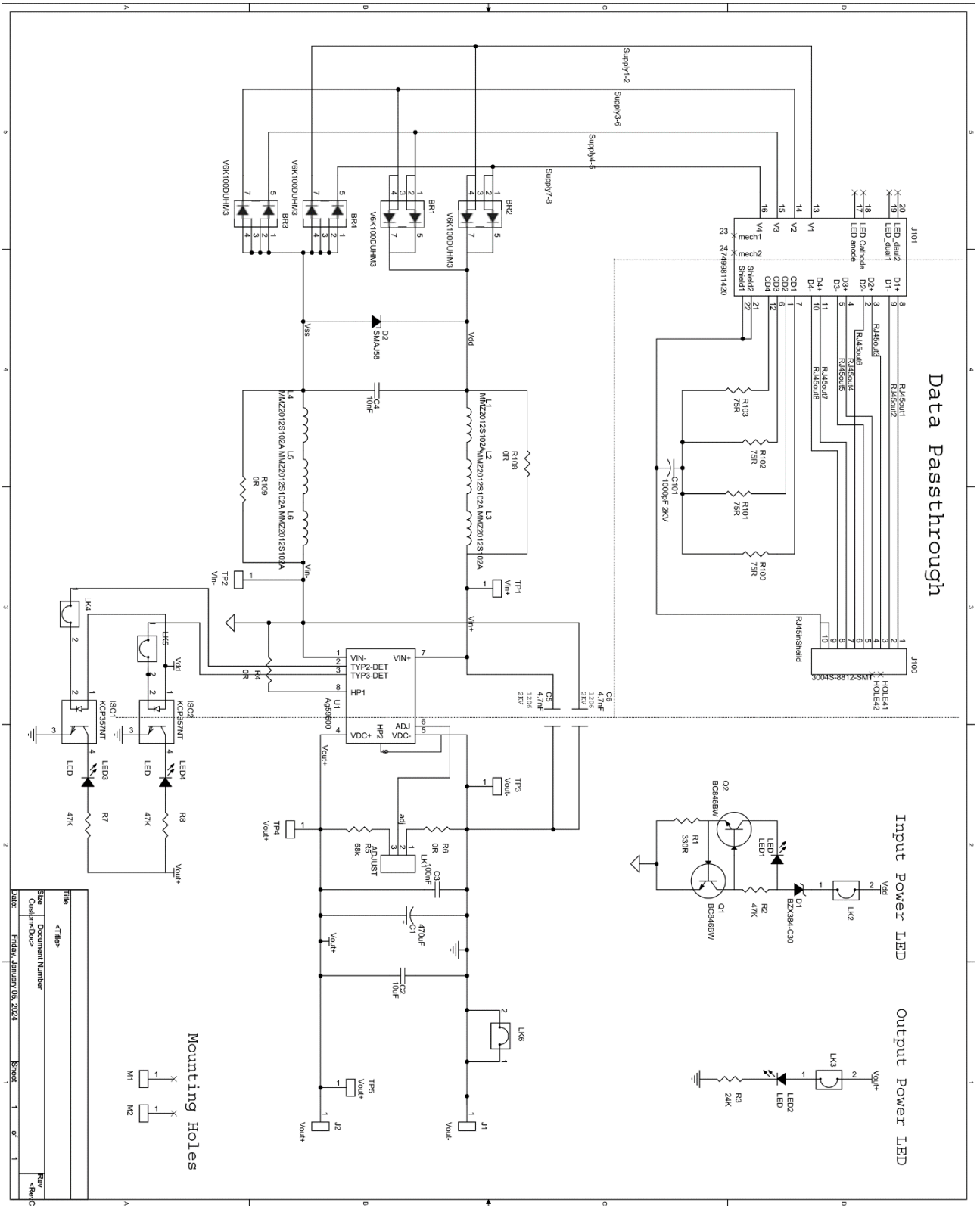


Figure 3: Schematic

### 10 Bill of Materials

Silver Part No.	Description	Value	Location:	Qty:	Package:	Rating:	Tol:	Supplier Pt. NO.:	Comments:
	PD Module	Ag59600	U1	1	Custom	-	-	Silver Telecom Part	
	Zener Diode	BZX384-C30	D1	1	SOD323	-	-	Vishay	
	Protection Diode	SMAJ58A	D2	1	SMA	-	-	Wurth - 824 500 581, Vishay, ST Micro, Diodes Inc	
	Bridge Rectifiers	V6K100DUHM3	BR1-BR4	4	FlapPAK 5x6	-	-	Vishay	
	SMD LED	RED LED	LED1-LED4	4	SMT	-	-	Wurth -150 141 RST 310 0	
	Ferrite Chip	±1000µ@100MHz	L1-6	6	1206	≥ 1A	25%	TDK WPE22012S102A, Wurth 742792096	
	NPN Transistor	BC846BW	Q1, Q2	2	SOT1323	60V	-	Infinion, ON-Semi, NXP, Diodes Inc.	
	Opto-Isolator	140386148200, KPC357NT	ISO1, ISO2	2	SMT	-	-	Wurth, Cosmo Electronics Corp	
	Capacitor Electrolytic	470µF	C1	1	Through Hole	25V	20%	Kemet A750MS477M1EAE015, Wurth 860040475008	
	Ceramic multi-layer	10µF	C2	1	1206	25V	20%	Multicomp MC1206F106Z250CT	
	Ceramic multi-layer	100µF	C3	1	1206	25V	20%		
	Ceramic multi-layer	10µF	C4	1	0805	100V	20%		
	Ceramic multi-layer	4.7µF	C5, C6	2	1206	1KV	20%		
	Ceramic multi-layer	1000µF 2KV	C101	1	1206	2KV	20%	Multicomp MC1206B42K102CT, Wurth 885342208020	
	Resistor - 0603	330R	R1	1	0603	63mW	1%	Samsung, N/C, TDK, Murata, Kemet & AVX, Wurth-885342208024	
	Resistor - 0603	47K	R2	1	0603	63mW	1%	Royal Ohm, Eurohm & Yageo	
	Resistor - 0603	24K	R3	1	0603	63mW	1%	Royal Ohm, Eurohm & Yageo	
	Resistor - 0603	2.4K	R7, R8	2	0603	63mW	1%	Royal Ohm, Eurohm & Yageo	
	Resistor - 0805	0R	R4, R6	2	0805	63mW	1%	Royal Ohm, Eurohm & Yageo	
	Resistor - 0805	68K	R5	1	0805	63mW	1%	Royal Ohm, Eurohm & Yageo	
	Resistor - 0805	75R	R100-103	4	0805	125mW	1%	Royal Ohm, Eurohm & Yageo	
	Resistor - 1206	0R	R108, R109	0	1206	250mW	1%	Royal Ohm, Eurohm & Yageo	
	Black Connector	Binding Post	J1	1	Screw Mount	-	-	Switch Electronics 354146	
	Red Connector	Binding Post	J2	1	Screw Mount	-	-	Switch Electronics 354147	
	Test Point	HK-1-G	TP1-TP5	5	SMT	-	-	Mac 8	
	Ethernet Connector	RJ45	J100	1	SMT	-	-	Toby 3004S-8821-SMT	
	Ethernet Connector With Magnetics	7499811420	J101	1	SMT	-	-	Wurth - 7499811420	
	Link	2Way	LK2-LK6	5	Through Hole	-	-	Toby LHCS-02S-R-060-034, Wurth 61300211121	
	Link	3 Way	M1	1	Through Hole	-	-	Toby LHCS-03S-R-060-034, Wurth 61300311121	
	PCB Standoff	Rev.0 1 - 105.38mm x 82.56mmmm	M1, M2	2		-	-	Essentra	
	Feet	M4 Stud	M1, M2, J1, J2	4		-	-		
	Jumper Links	GRF24006A Links	LK1-5	5		-	-		
			Total	67					

EvalAg59600 Eval Board - Rev.1.0

Date: 4th March, 2024

Figure 4: Bill of Materials



## 11 Layer Routing

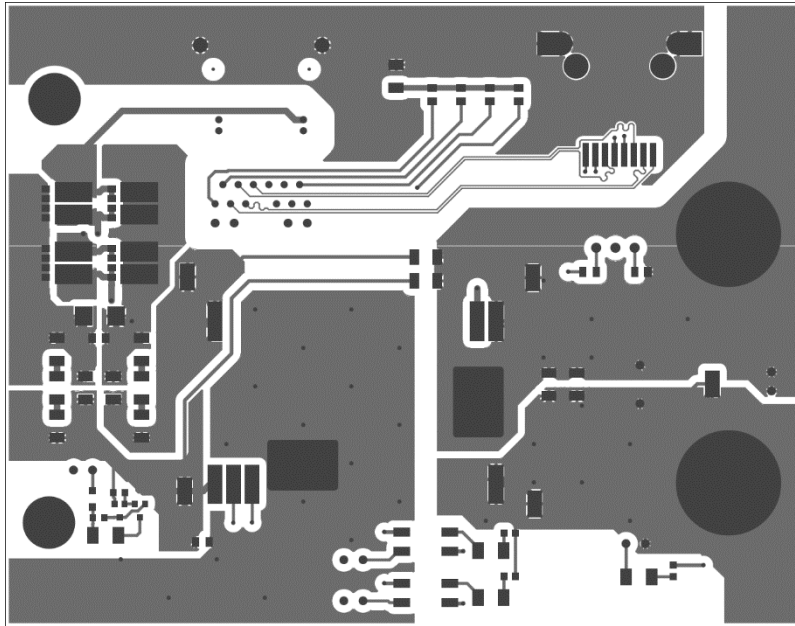


Figure 5: Top Layer Routing

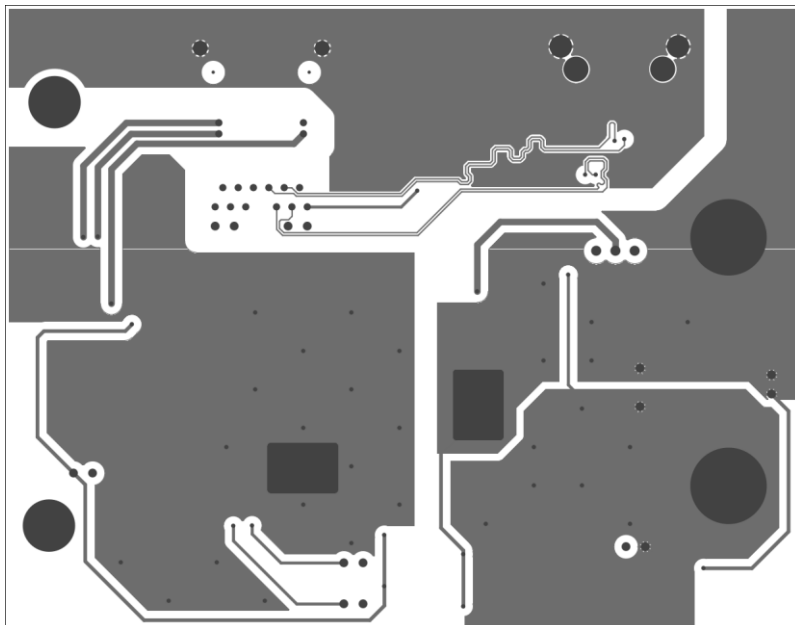


Figure 6: Bottom Layer Routing

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