MAX17690 No-Opto Flyback Evaluation Kit

Evaluates: MAX17690 No-Opto Flyback with Secondary-Side Synchronous Rectification

General Description

The MAX17690A evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the operation of an isolated 5W no-opto flyback DC-DC converter with secondary-side synchronous rectification. This circuit is implemented using the MAX17690, a no-opto, flyback controller in a 16-pin TQFN package with an exposed pad. The synchronous rectification on the secondary-side is enabled by replacing the secondary diode with a MOSFET to achieve 90% efficiency. The circuit uses the MAX17606, a secondary-side synchronous rectifier driver in a 6-pin SOT23 package for driving the secondary-side MOSFET.

The EV kit output is configured for an isolated +5V and provides up to 1A of output current. The EV kit is programmed to operate at a 150kHz switching frequency. The transformer provides the galvanic isolation between input and output, up to $1875V_{RMS}$. The EV kit regulates the output voltage within ±5% over the line, load, and temperature without using the auxiliary winding/optocoupler for output voltage feedback.

Features

- 18V to 36V Input Range
- Isolated Output: 5V/1A DC
- Compact Design with High Frequency (150kHz) Switching
- No Optocoupler/Third Winding Required to Derive Feedback Signal
- 90% Peak Efficiency
- Galvanic Isolation up to $1875V_{RMS}$
- Proven PCB Layout
- Fully Assembled and Tested
- Minimum Load for ±5% Regulation: 1% of Full-Load

Ordering Information **appears at end of data sheet.**

Quick Start

Recommended Equipment

- One 18V–36V DC, 1A power supply
- 5W resistive load with 1A sink capacity
- Four digital multimeters (DMM)
- MAX17690EVKITA#

Warning

- Do not turn on the power supply until all connections are completed.
- Wear protective eye gear at all times.
- Do not touch any part of the circuit with bare hands/conductive materials when powered up.
- Make sure all high-voltage capacitors are fully discharged before handling. Allow 5 minutes after disconnecting input power source before touching circuit parts.

Equipment Setup and Test Procedure

1) Set the power supply to +24VDC. Disable the power supply output.
2) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the electronic load to the VOUT PCB pad and the negative terminal to the nearest GND0 PCB pad.
3) Connect the resistive load across the output terminals.
4) Connect a DMM configured in voltmeter mode across the VOUT PCB pad and the nearest GND0 PCB pad.
5) Enable the power supply.
6) Verify that the output voltmeter displays 5V and, if required, measure the output current using a DMM programmed in ammeter mode.
7) If required, vary the input voltage from 18V to 36V, and the load current from 10mA to 1A. Verify that the output voltage is 5V ±5%.

19-8394; Rev 0; 5/16

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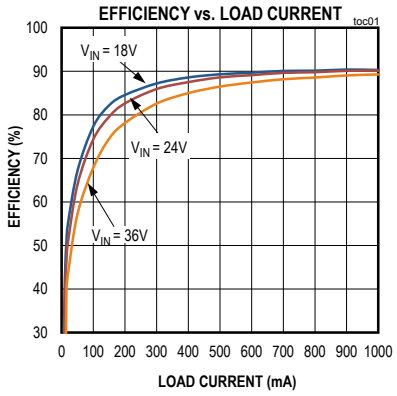
Detailed Description

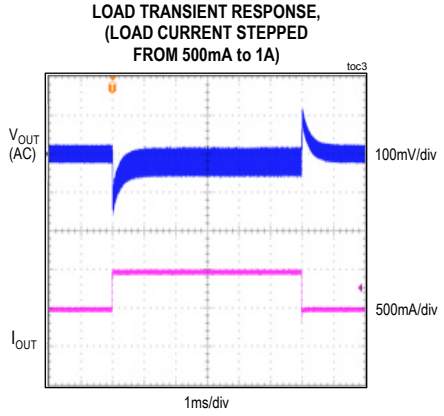
The MAX17690 EV kit provides a proven design to evaluate the MAX17690, a high-efficiency no-opto DC-DC flyback controller. The device uses a novel sampling technique to eliminate the optocoupler/third winding in sensing the output voltage across the isolation boundary. The MAX17606, a secondary-side synchronous driver, is used, along with the MAX17690, to improve the converter efficiency.

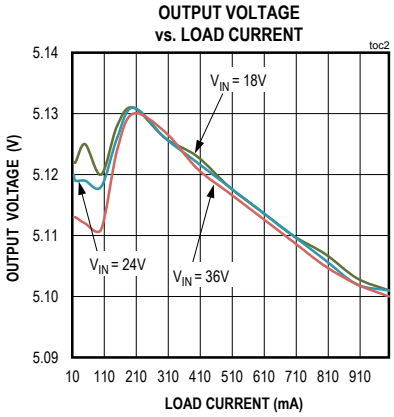
This EV kit provides the programmable soft-start feature to limit the inrush current. The EN/UVLO is used to start the converter at the desired input voltage. The OVI is used to turn-off the converter at the desired input overvoltage level. The MAX17690 provides overcurrent and thermal protection. The details of soft-start time programming, programming the output voltage, peak-current-limit setting, switching frequency setting, and the EN/UVLO, OVI settings are described in the MAX17690 IC data sheet.

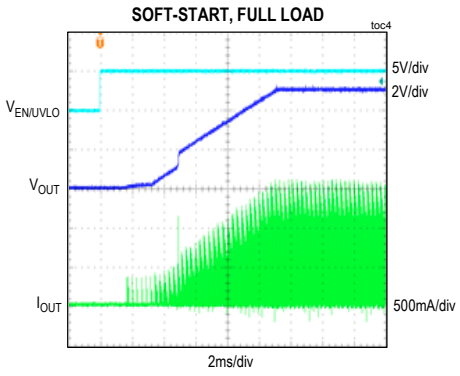
The MAX17606 has provision to program the turn-off trip point of the secondary synchronous rectifier. An external resistor (R18) connects the drain of the external MOSFET to IC's DRN pin. This resistor sets the turn-off trip point using the precise internal current source. After the synchronous rectifier is turned-off to avoid the false tripping due to DCM ringing, the MAX17606 programs the minimum turn-off time. The MAX17606 uses the resistor (R20) connected between TOFF pin to GND0 to program the minimum turn-off time. For selecting R18, R20 and other components related to MAX17606, refer the MAX17606 IC data sheet.

EV Kit Performance Report









Component Suppliers

SUPPLIER	WEBSITE
Wurth Elektronik	www.we-online.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com

Note: *Indicate that you are using the MAX17690A EV when contacting these component suppliers.*

Component Information, PCB Layout, and Schematic

See the following links for component information, PCB layout diagrams, and schematic.

- **MAX17690 EV BOM**
- **MAX17690 EV PCB Layout**
- **MAX17690 EV Schematic**

Ordering Information

PART	TYPE
MAX17690EVKITA#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/16	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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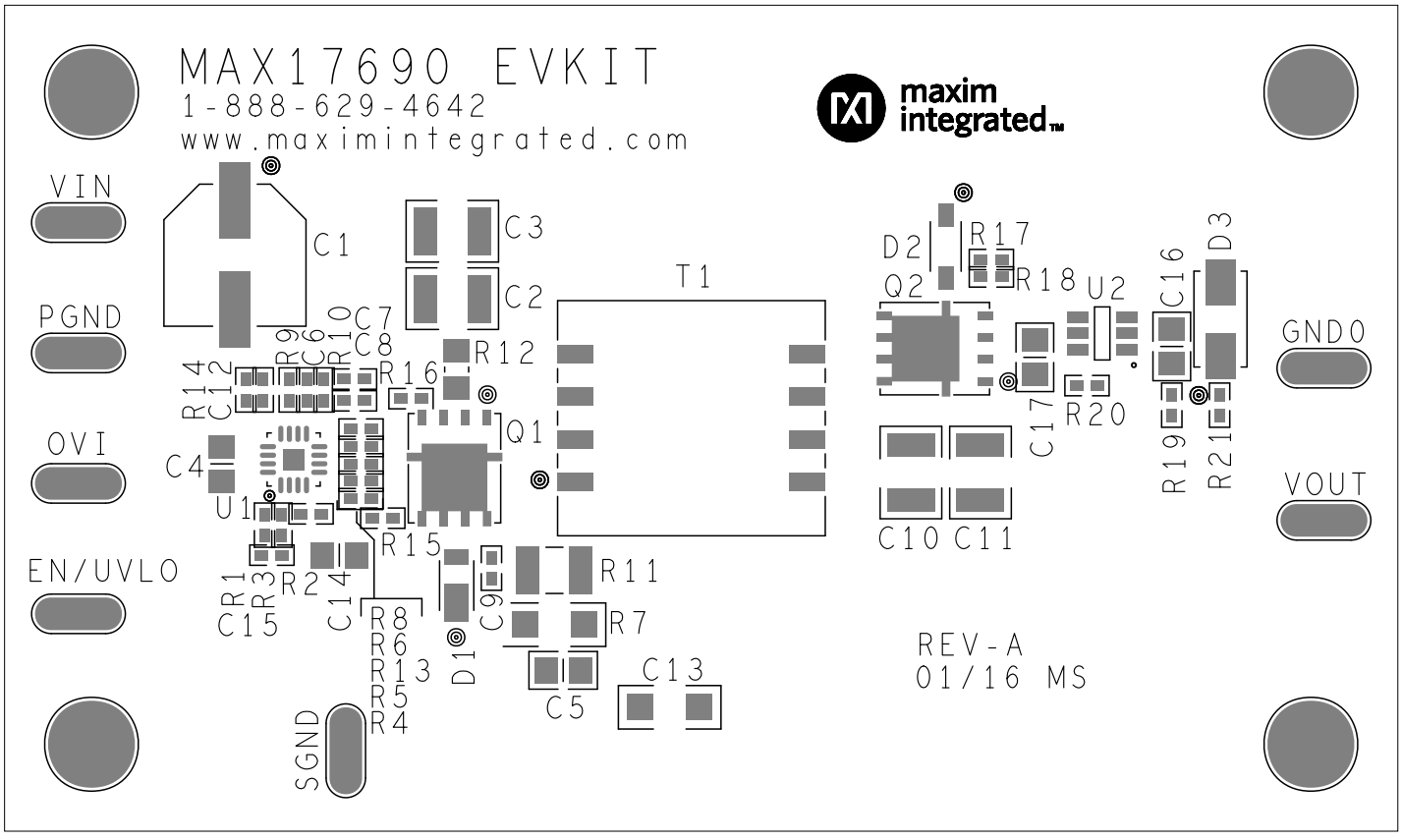
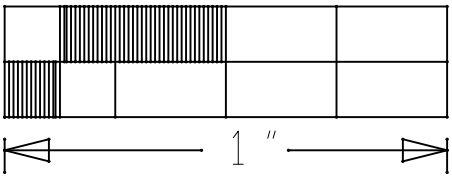
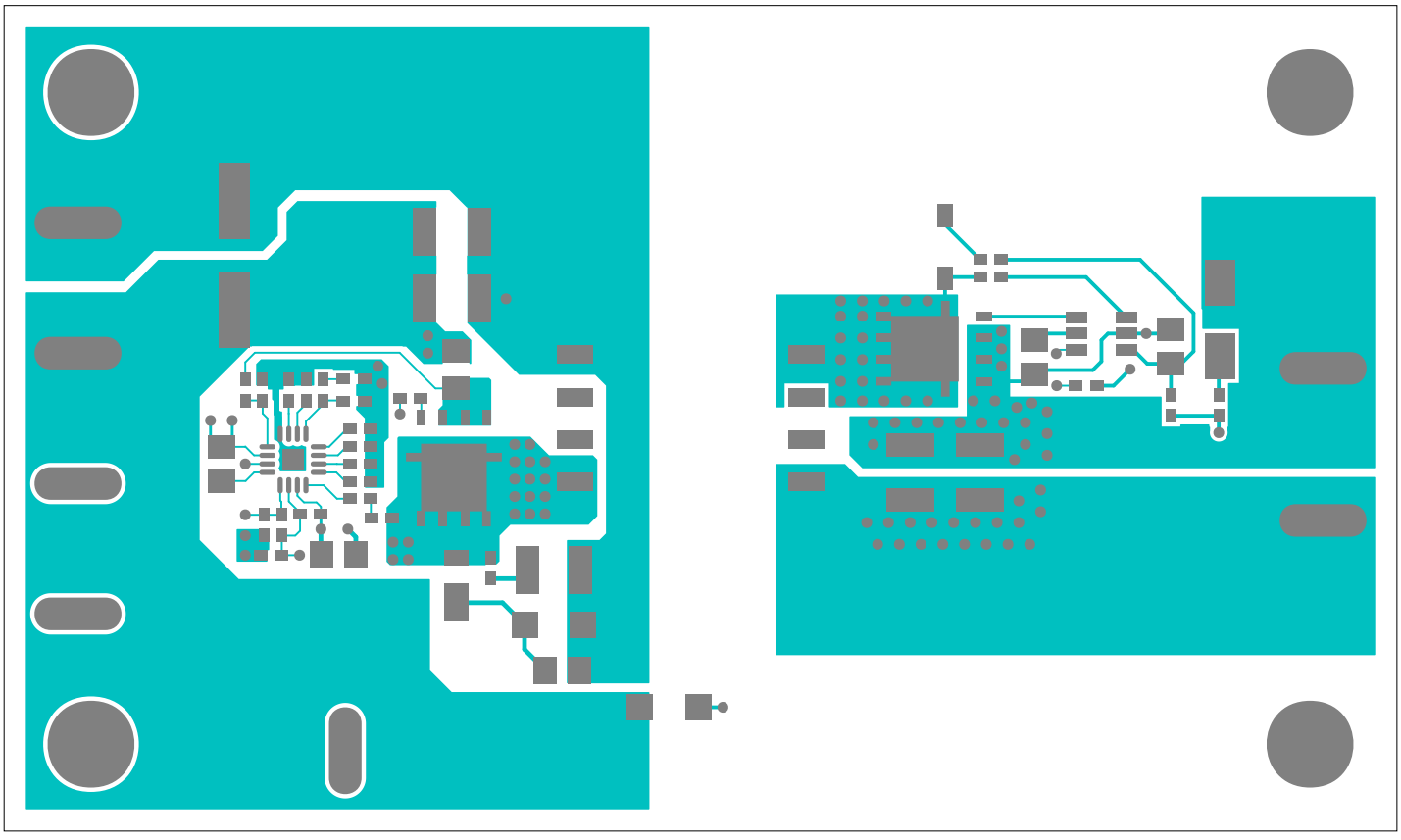
S NO	Designation	Qty	Description	Mnfctr Part# 1	Mnfctr Part# 2
1	C1	1	47µF±20%, 50V,ALUMINUM-ELECTROLYTIC SMT(CASE_D8)	PANASONIC EEEFK1H470P	
2	C2, C3	2	4.7µF±10% 50V X7R Ceramic capacitor (1210)	Murata GRM32ER71H475KA88K	KEMET C1210C475K5RAC
3	C4,C16,C17	3	2.2µF±10%,50V, X7R ceramic capacitor (0805)	TDK C2012X7R1H225K	
4	C5	1	6800pF, 10%, 100V, X7R ceramic capacitor (0805)	KEMET C0805C682K1RAC	
5	C6	1	0.047uF±10%,16V, X7R ceramic capacitor (0402)	Murata GRM155R71C473KA01	
6	C7	1	0.033uF±10%,10V, X7R ceramic capacitor 0402)	Murata GRM155R71A333KA01	
7	C8	1	220pF ±10%,50V, X7R ceramic capacitor (0402)	Murata GRM155R71H221KA01	
8	C9	1	220pF ±10%,100V, X7R ceramic capacitor (0402)	Murata GRM155R72A221KA01	
9	C10, C11	2	100µF±20%, 6.3V, X7U ceramic capacitor(1210)	Murata GRM32EE70J107ME15	
10	C12	1	OPEN (0402)		
11	C13	1	1000PF±10%, 1500V, X7R ceramic capacitor (1206)	AVX 1206SC102KAT	
12	C14	1	1uF±10%, 50V, X7R ceramic capacitor(0805)	Murata GRM21BR71H105KA12	SAMSUNG ELECTRONICS CL21B105KBFNNNE
13	C15	1	0.01uF±10%, 50V, X7R ceramic capacitor(0402)	Murata GRM155R71H103KA88	TDK C0402C103K5RAC
14	D1	1	100V/2A, (POWERDI-123), DIODE	DIODES INCORPORATED DFLS2100	
15	D2	1	100V/0.3A, (SOD-123), DIODE	DIODES INCORPORATED 1N4148W-7-F	
16	D3	1	5.6V/1W, (SMA,DO-214AC), ZENER DIODE	DIODES INCORPORATED SMAZ5V6-FDITR-ND	CENTRAL SEMICONDUCTOR CMZ5919B
17	Q1	1	100V/7.5A/23W, (SO-8), MOSFET: NCH	VISHAY SILICONIX SIR698DP-T1-GE3	
18	Q2	1	40V/21A/15.6W, (PG-TSDSON-8), MOSFET: NCH	VISHAY SILICONIX SIR836DP-T1-GE3	
19	R1, R5	2	10kΩ ±1% resistor (0402)	VISHAY DALE CRCW040210K0FK	YAGEO PHICOMP RC0402FR-0710K
20	R2	1	280kΩ ±1% resistor (0402)	PANASONIC ERJ-2RKF2803X	
21	R3	1	10.7kΩ ±1% resistor (0402)	VISHAY DALE CRCW040210K7FK	
22	R4	1	150kΩ ±1% resistor (0402)	VISHAY DALE CRCW0402150KFK	
23	R6	1	124kΩ ±1% resistor (0402)	VISHAY DALE CRCW0402124KFK	
24	R7	1	15kΩ ±1% resistor (1206)	VISHAY DALE CRCW120615K0FK	
25	R8	1	90.9kΩ ±1% resistor (0402)	VISHAY DALE ERJ-2RKF9092X	
26	R9	1	33.2kΩ ±1% resistor (0402)	VISHAY DALE CRCW04023322FK	
27	R10	1	7.5kΩ ±1% resistor (0402)	PANASONIC ERJ-2RKF7501	
28	R11	1	47Ω ±5% resistor (1210)	VISHAY DRALORIC CRCW121047R0JNEAHP	
29	R12	1	0.05Ω ±5% resistor (0805)	PANASONIC ERJ-L06KF50MV	
30	R13,R19	2	OPEN (0402)		
31	R14	1	0Ω ±0% resistor (0402)	PANASONIC ERJ-2GE0R00X	
32	R15	1	1kΩ ±1% resistor (0402)	VISHAY DALE CRCW04021K00FK	YAGEO PHICOMP RC0402FR-071KL
33	R16	1	2.2Ω ±1% resistor (0402)	VISHAY DALE CRCW04022R20FK	

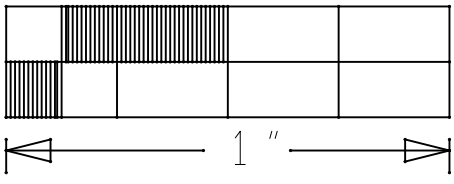
34	R17	1	10Ω ±1% resistor (0402)	VISHAY DALE CRCW040210R0FK	YAGEO 9C04021A10R0FL
35	R18	1	1.82kΩ ±1% resistor (0402)	PANASONIC ERJ-2RKF1821X	
36	R20	1	75kΩ ±1% resistor (0402)	VISHAY DALE CRCW040275K0FK	
37	R21	1	49.9Ω ±1% resistor (0402)	VISHAY DALE ERJ-2RKF49R9X	
38	T1	1	EP10,8-pin SMT, 27μH,1.8A,(1-4):(5-8)=3:1	WURTH ELECTRONICS INC. 750343122	
39	U1	1	MAX17690, TQFN16-EP, Flyback converters	MAX17690ATE+	
40	U2	1	MAX17606, TSOT23-6, Flyback converters	MAX17606AZT+	





TOP SILKSCREEN





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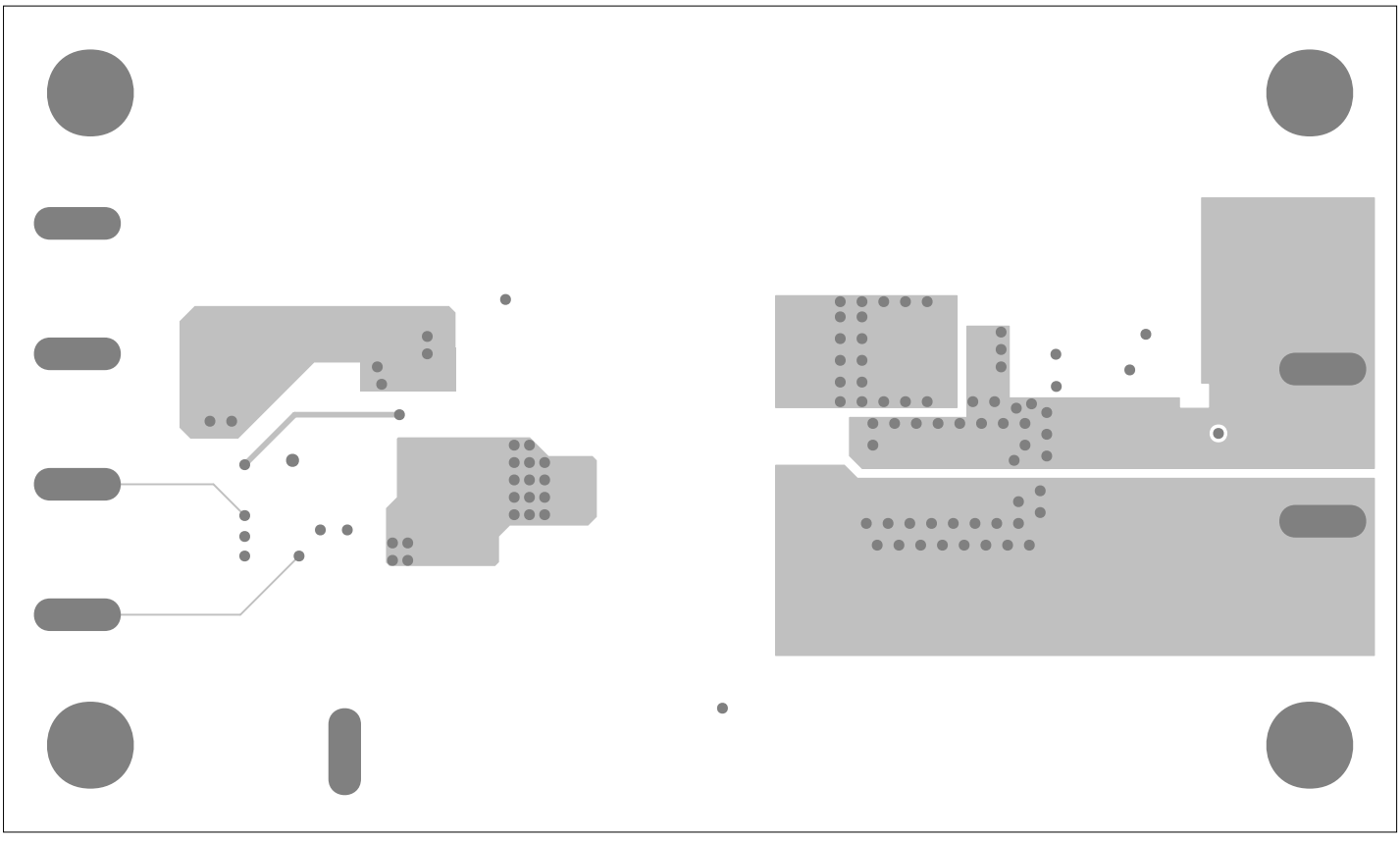
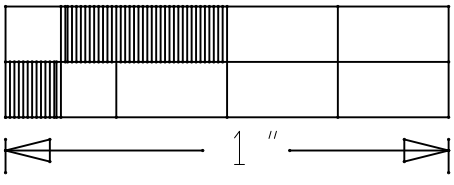
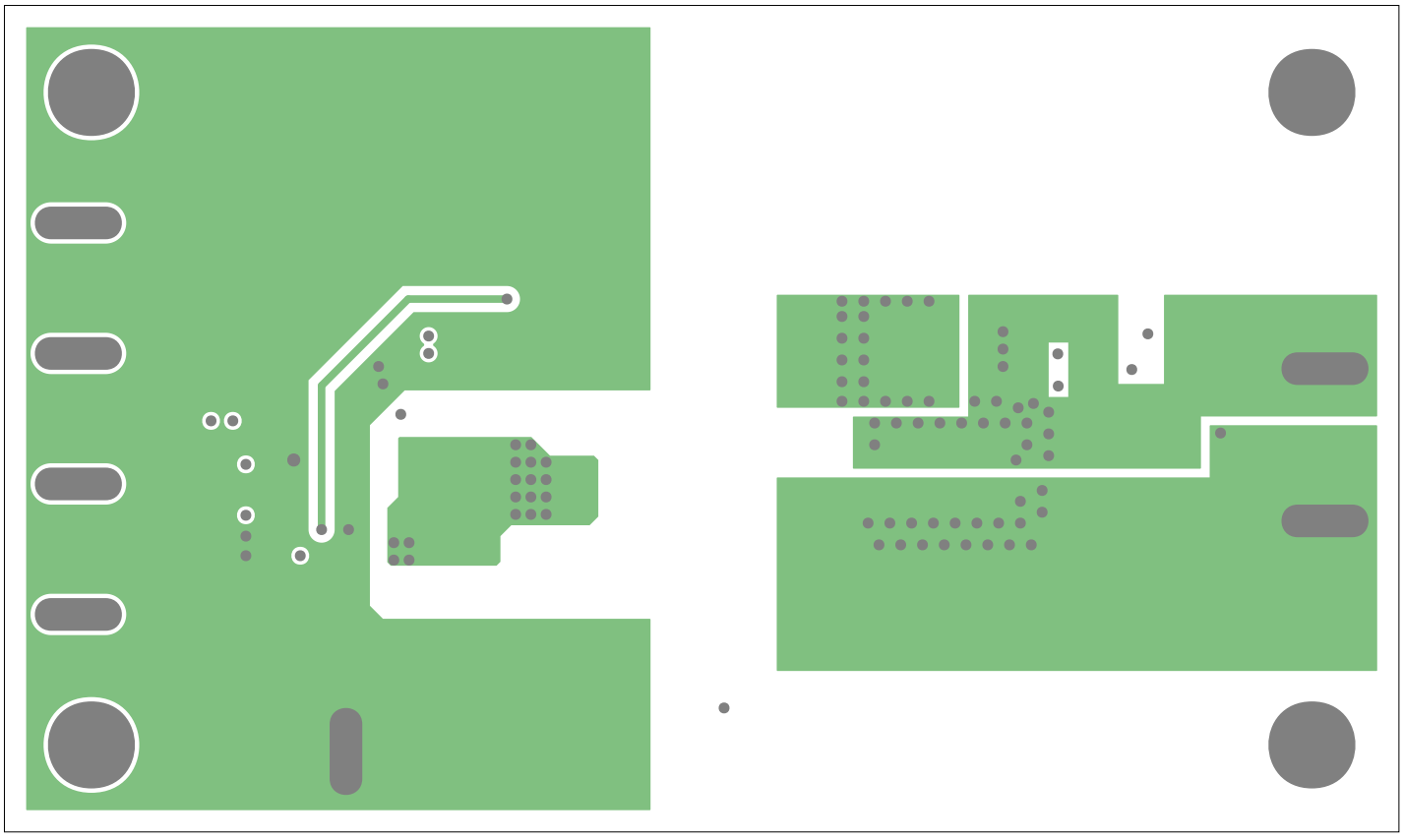
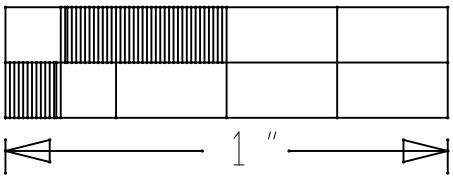


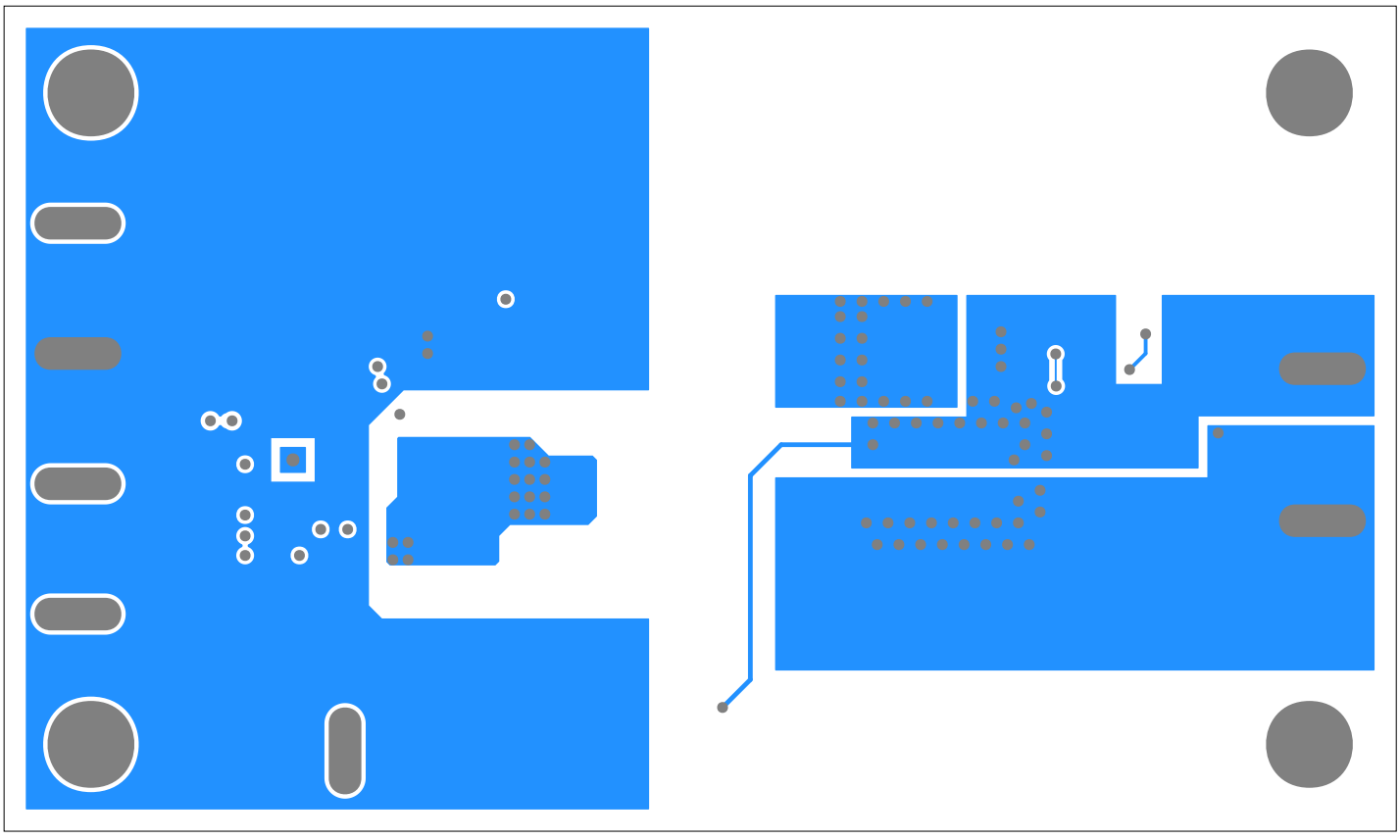


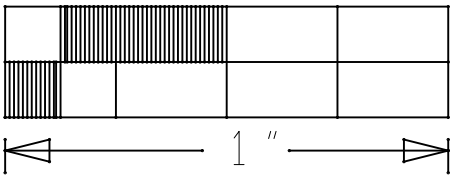
GND





PWR





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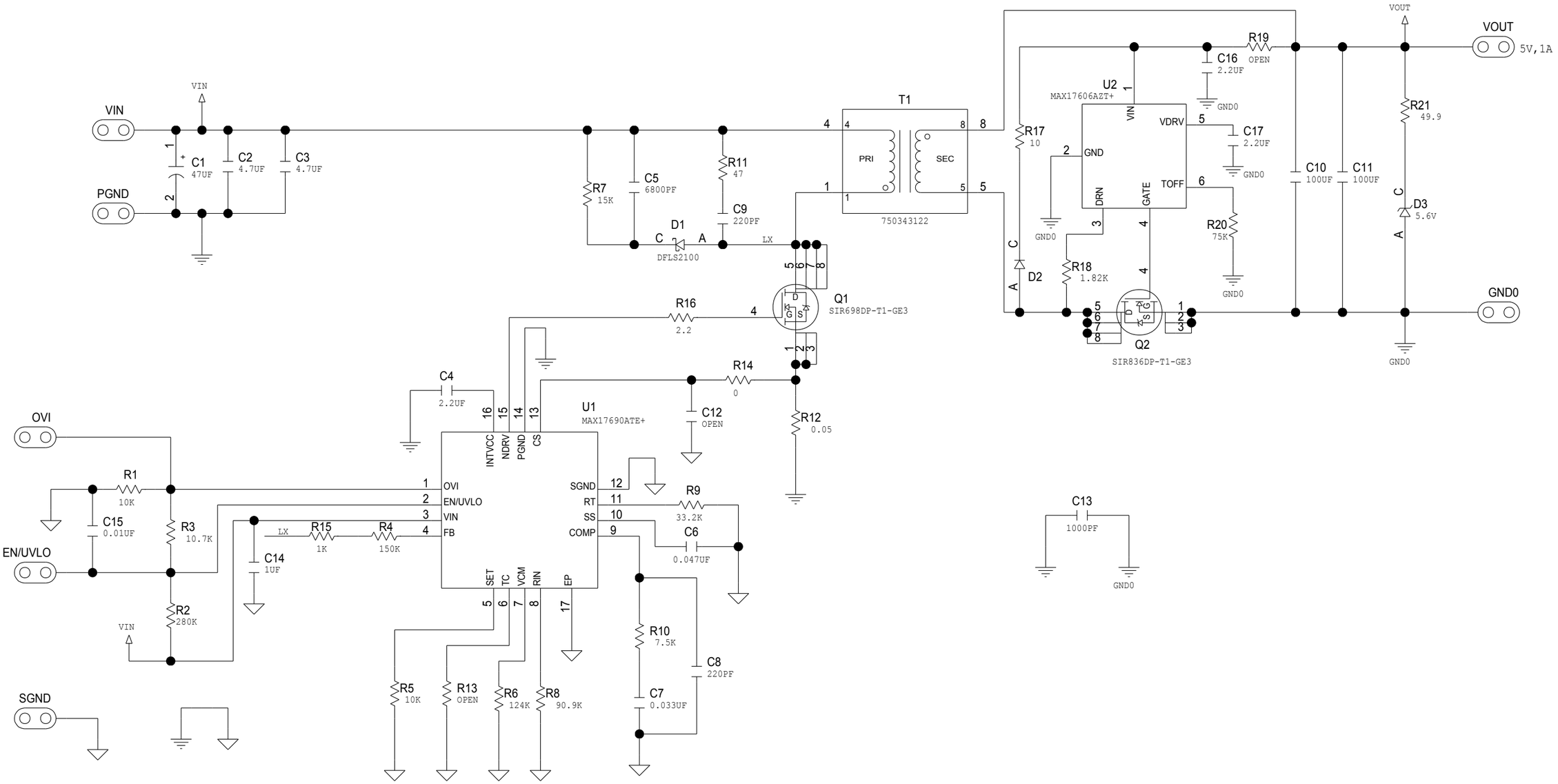
VIN
PGND
C1
47UF
C2
4.7UF
C3
4.7UF
R7
15K
C5
6800PF
R11
47
C9
220PF
D1
DFLS2100
LX
T1
PRI
SEC
750343122
R17
10
R16
2.2
Q1
SIR698DP-T1-GE3
C4
2.2UF
U1
MAX17690ATE+
INTVCC
NDRV
PGND
CS
R14
0
C12
OPEN
R12
0.05
OVI
EN/UVLO
VIN
FB
SGND
RT
SS
COMP
SET
TC
VCM
RIN
EP
R1
10K
C15
0.01UF
R3
10.7K
R15
1K
R4
150K
C14
1UF
R2
280K
R5
10K
R13
OPEN
R6
124K
R8
90.9K
R9
33.2K
C6
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R10
7.5K
C8
220PF
C7
0.033UF
U2
MAX17606AZT+
VDRV
GND
DRN
GATE
TOFF
C16
2.2UF
C17
2.2UF
R19
OPEN
R18
1.82K
R20
75K
D2
Q2
SIR836DP-T1-GE3
C10
100UF
C11
100UF
R21
49.9
D3
5.6V
VOUT
5V,1A
GND0
C13
1000PF