MAX17690EVKITD# No-Opto Flyback Evaluation Kit

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

General Description

The MAX17690D evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the operation of an isolated 15W 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 89.6% 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 3A of output current. The EV kit is programmed to operate at a 200kHz switching frequency. The transformer provides the galvanic isolation between input and output, up to $1500V_{RMS}$. 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/3A DC
- Compact Design with High Frequency (200kHz) Switching
- No Optocoupler/Third Winding Required to Derive Feedback Signal
- 89.6% Peak Efficiency
- Galvanic Isolation up to $1500V_{RMS}$
- Proven PCB Layout
- Fully Assembled and Tested

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

Quick Start

Recommended Equipment

- One 18V–36V DC, 2A power supply
- 15W resistive load with 3A sink capacity
- Four digital multimeters (DMM)
- MAX17690EVKITD#

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 50mA to 3A. Verify that the output voltage is 5V ±5%.

319-100145; Rev 1; 5/18

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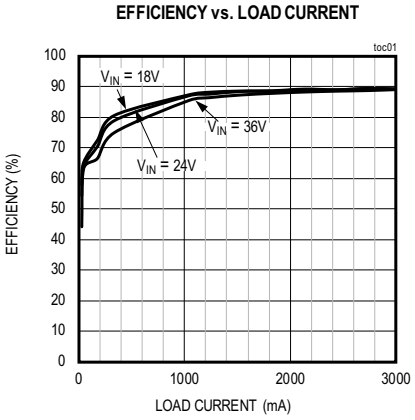
Detailed Description

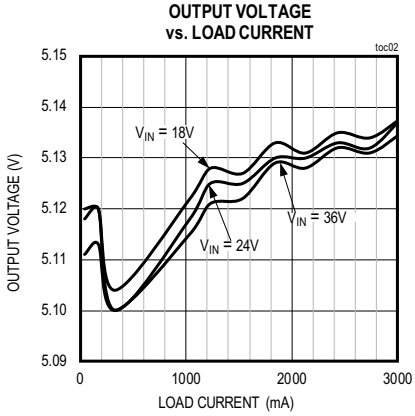
The MAX17690 EV kit provides a proven design to evaluate the MAX17690, a high-efficiency no-opto DC-DC flyback controller. The device uses a novel sampling technique to eliminate the optocoupler/third winding in sensing the output voltage across the isolation boundary. The MAX17606, a secondary-side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

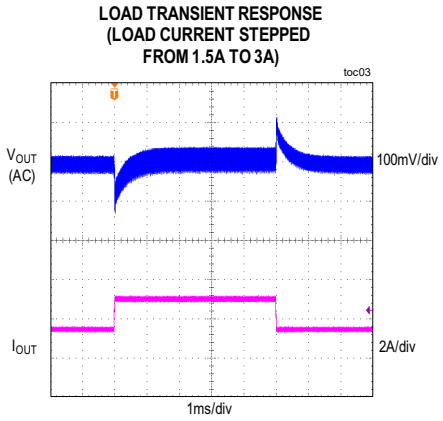
This EV kit provides the programmable soft-start feature to limit the inrush current. The EN/UVLO is used to start the converter at the desired input voltage. The OVI is used to turn-off the converter at the desired input overvoltage level. The MAX17690 provides overcurrent and thermal protection. The 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.

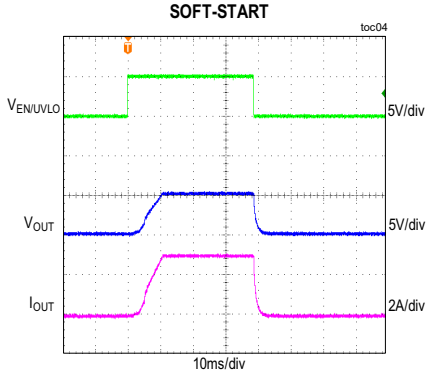
The MAX17606 has provision to program the turn-off trip point of the secondary synchronous rectifier. An external resistor (R18) connects the drain of the external MOSFET to IC's DRN pin. This resistor sets the turn-off trip point using the precise internal current source. After the synchronous rectifier 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
SUMIDA	www.sumida.com
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com

Note: *Indicate that you are using the MAX17690D EV when contacting these component suppliers.*

Ordering Information

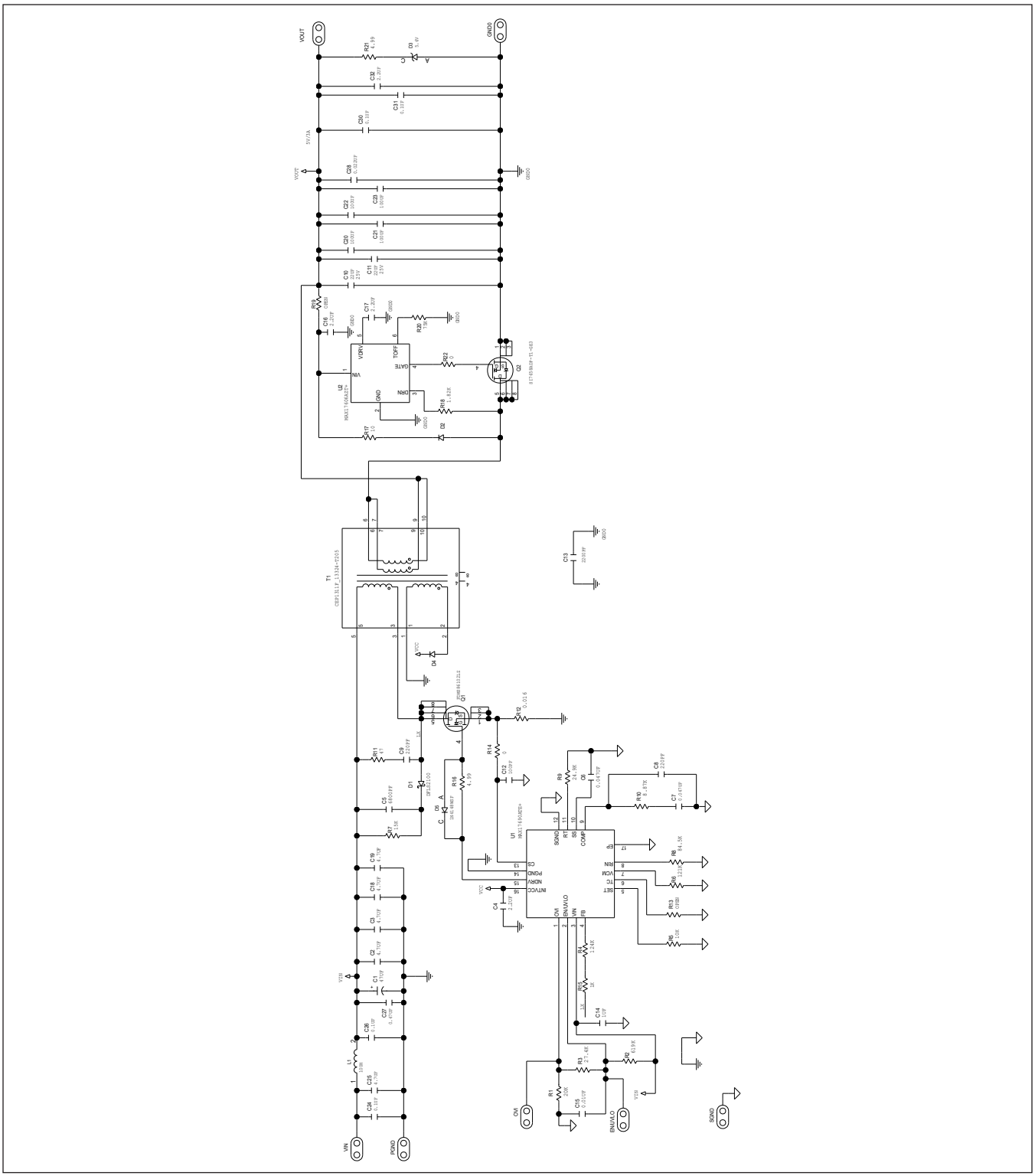
PART	TYPE
MAX17690EVKITD#	EV Kit

#Denotes RoHS compliant.

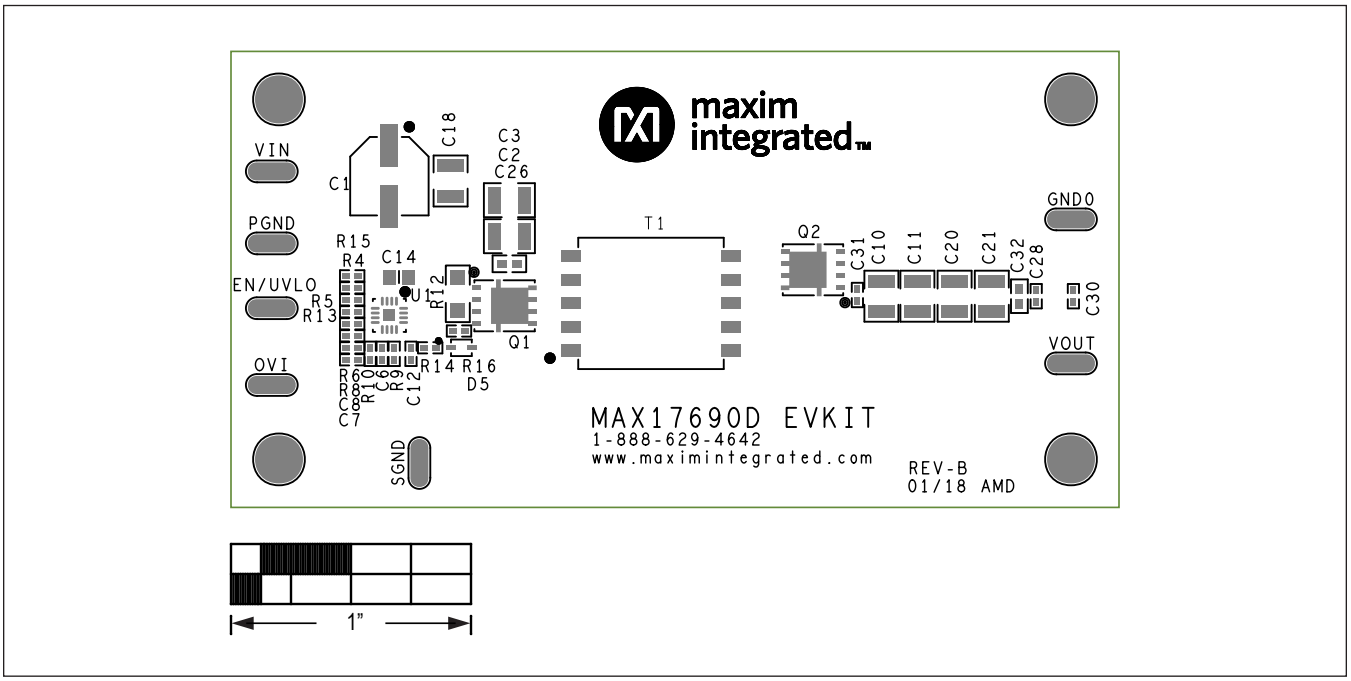
MAX17690D EV Bill of Materials

Designation	Qty	Description
C1	1	47uF±20%, 50V, ALUMINUM-ELECTROLYTIC SMT (CASE_E) PANASONIC EEE-FK1H470P
C2, C3, C18, C19, C25	5	4.7uF±10%, 50V, X7R Ceramic capacitor (1210) KEMET C1210C475K5RAC; MURATA GRM32ER71H475KA88K
C4, C16, C17	3	2.2uF±10%, 50V, X7R Ceramic capacitor (0805) TDK C2012X7R1H225K
C5	1	6800pF±10%, 100V, X7R Ceramic capacitor (0805) KEMET C0805C682K1RAC
C6	1	0.047uF±10%, 16V, X7R Ceramic capacitor (0402) MURATA GRM155R71C473KA01
C7	1	0.047uF±10%, 50V, X7R Ceramic capacitor (0402) MURATA GRM155R71H473KE14
C8	1	220pF±10%, 50V, X7R Ceramic capacitor (0402) MURATA GRM155R71H221KA01
C9	1	220pF±10%, 100V, X7R Ceramic capacitor (0402) MURATA GRM155R72A221KA01
C10, C11	2	22uF±10%, 25V, X7R Ceramic capacitor (1210) MURATA GRM32ER71E226KE15
C12	1	100pF±10%, 50V, X7R Ceramic capacitor (0402) PANASONIC ECJ-0EB1H101K
C13	1	2200pF±10%, 2000V, X7R Ceramic capacitor (1206) KEMET C1206X222KGRAC7800
C14	1	1uF±10%, 50V, X7R Ceramic capacitor (0805) MURATA GRM21BR71H105KA12
C15	1	0.01uF±10%, 50V, X7R Ceramic capacitor (0402) KEMET C0402C103K5RAC
C20-C23	4	100uF±20%, 6.3V, X7U Ceramic capacitor (1210) MURATA GRM32EE70J107ME15L
C24, C26	2	0.1uF±10%, 50V, X7R Ceramic capacitor (0603) KEMET C0603C104K5RAC
C27	1	0.47uF±10%, 50V, X7R Ceramic capacitor (0805) KEMET C0805C474K5RAC
C28	1	0.022uF±10%, 16V, X7R Ceramic capacitor (0402) MURATA GRM155R71C223KA01
C30, C31	2	0.1uF±10%, 16V, X7R Ceramic capacitor (0402) TDK C1005X7R1C104K050BC
C32	1	2.2uF±10%, 16V, X7S Ceramic capacitor (0603) MURATA GRM188C71C225KE11D
D1	1	100V/2A, (POWERDI-123), DIODE; DIODES INCORPORATED DFLS2100
D2, D4	2	100V/0.3A, (SOD-123), DIODE; DIODES INCORPORATED 1N4148W-7-F
D3	1	5.6V/500mW, (SOD-123), DIODE, ZNR; CENTRAL SEMICONDUCTOR CMHZ4690; CMHZ5232B
D5	1	100V/0.25A, (SOD-323F), DIODE; DIODES INCORPORATED 1N4148WSF
L1	1	10uH±20%, 3.1A inductor; COILCRAFT XAL4040-103ME
Q1	1	100V/22A/69W, 8-PowerTDFN, POWER TRANSISTOR ON SEMICONDUCTOR FDMS86102LZ
Q2	1	30V/36A/83W, SO-8, POWER TRANSISTOR; VISHAY SILICONIX SI7658ADP-T1-GE3
R1	1	20kΩ±1% resistor, 0402; VISHAY DALE CRCW040220K0FKEDC
R2	1	619kΩ±1% resistor, 0402; PANASONIC ERJ-2RKF6193X
R3	1	27.4kΩ±1% resistor, 0402; VISHAY DALE CRCW040227K4FKED
R4	1	124kΩ±1% resistor, 0402; VISHAY DALE CRCW0402124KFKED
R5	1	10kΩ±1% resistor, 0402; VISHAY DALE CRCW040210K0FK
R6	1	121kΩ±1% resistor, 0402; PANASONIC ERJ-2RKF1213
R7	1	15kΩ±1% resistor, 1206; VISHAY DALE CRCW120615K0FK
R8	1	84.5kΩ±1% resistor, 0402; VISHAY DALE CRCW040284K5FK
R9	1	24.9kΩ±1% resistor, 0402; VISHAY DALE CRCW040224K9FKEDC
R10	1	8.87kΩ±1% resistor, 0402; VISHAY DALE CRCW04028K87FK
R11	1	47Ω±1% resistor, 1210; VISHAY DRALORIC CRCW121047R0JNEAHP
R12	1	0.016Ω±1% resistor, 1206; ROHM UCR18EVHFSR016
R13, R19	2	OPEN
R14, R22	2	0Ω resistor, 0402; PANASONIC ERJ-2GE0R00X
R15	1	1kΩ±1% resistor, 0402; VISHAY DALE CRCW04021K00FK
R16, R21	2	4.99Ω±1% resistor, 0402; VISHAY DALE CRCW04024R99FKED
R17	1	10Ω±1% resistor, 0402; VISHAY DALE CRCW040210R0FK
R18	1	1.82kΩ±1% resistor, 0402; PANASONIC ERJ-2RKF1821X
R20	1	75kΩ±1% resistor, 0402; VISHAY DALE CRCW040275K0FK
T1	1	10-pin SMT, 7uH, 8A, (3-5):(9,10-6,7) = 1:0.4; SUMIDA CEP1311F_13324-T205
U1	1	MAX17690, TQFN16-EP, NO-OPTO ISOLATED FLYBACK CONTORLLER IC MAXIM MAX17690ATE+
U2	1	MAX17606, TSOT23-6, SECONDARY-SIDE SYNCHRONOUS MOSFET DRIVER FOR FLYBACK CONVERTER MAXIM MAX17606AZT+

MAX17690D EV Kit Schematic



MAX17690D EV Kit PCB Layout



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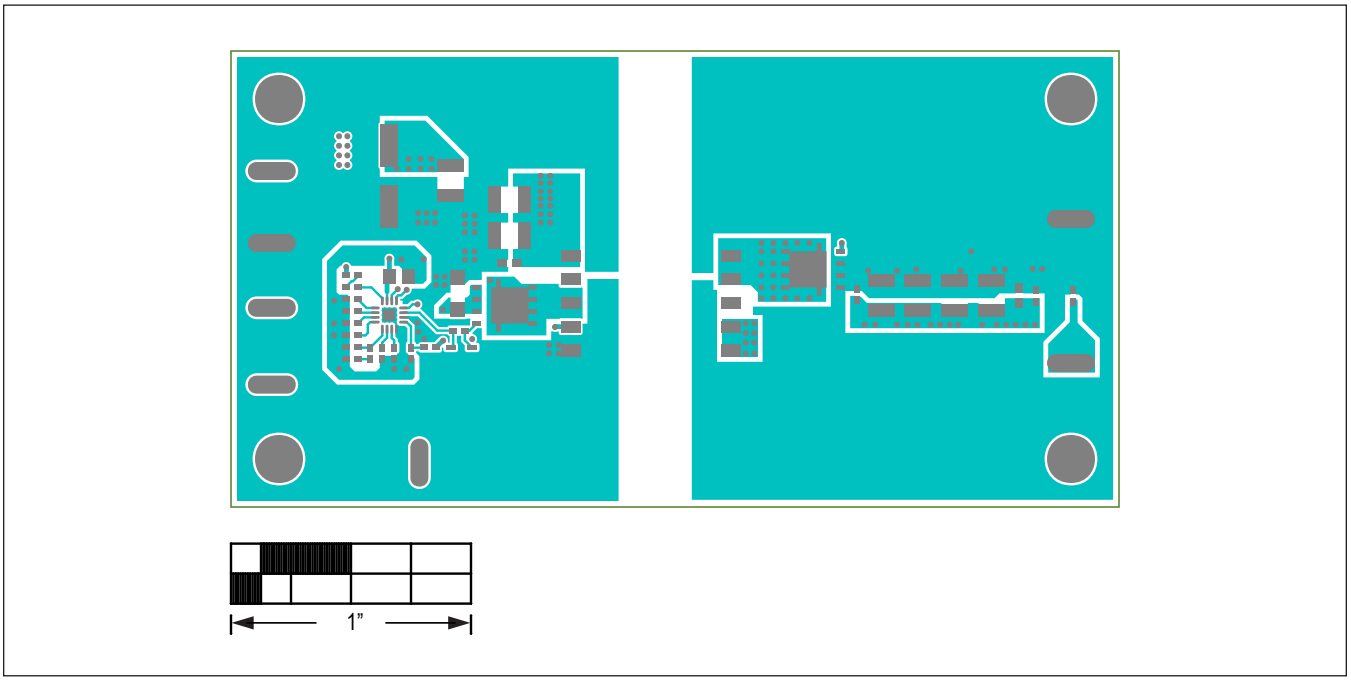
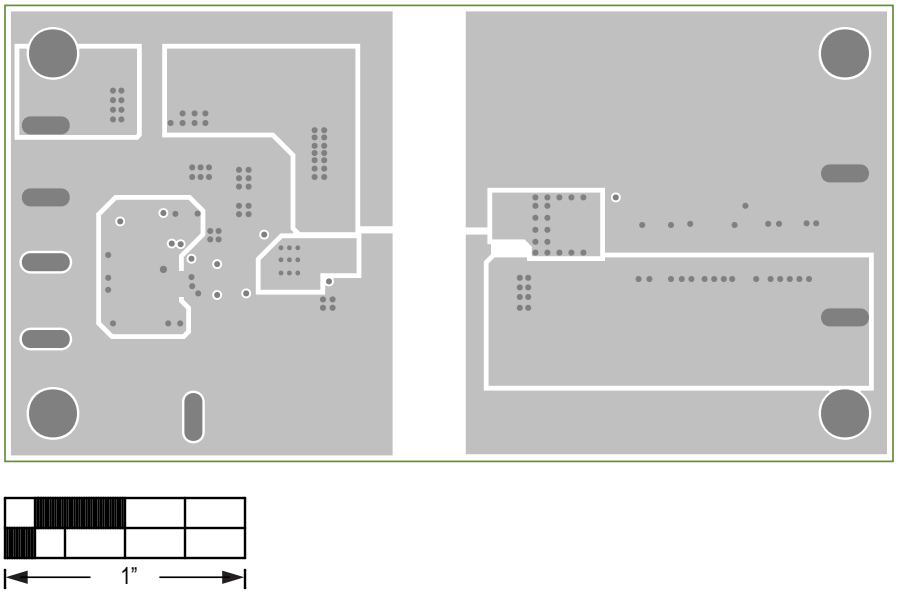


Top

MAX17690D EV Kit PCB Layout (continued)



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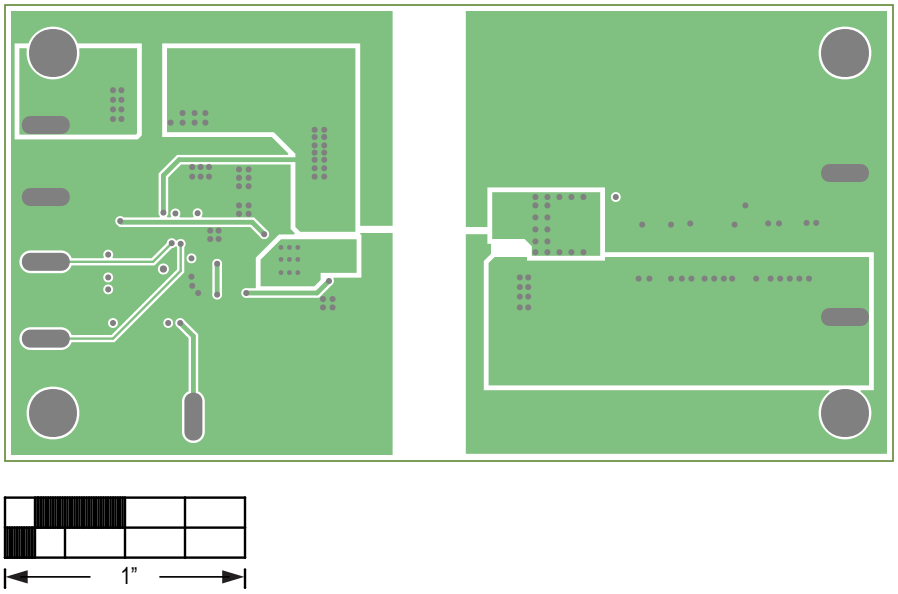
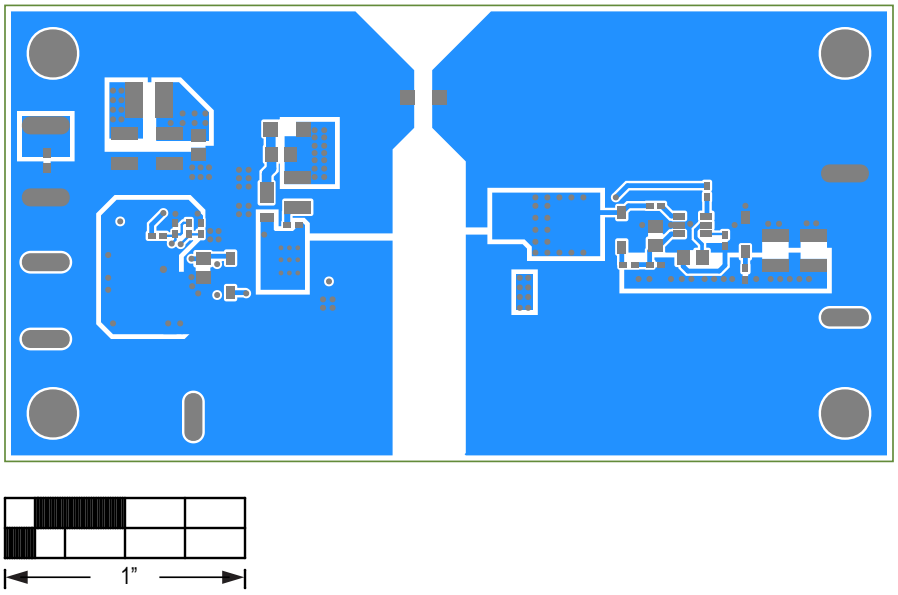
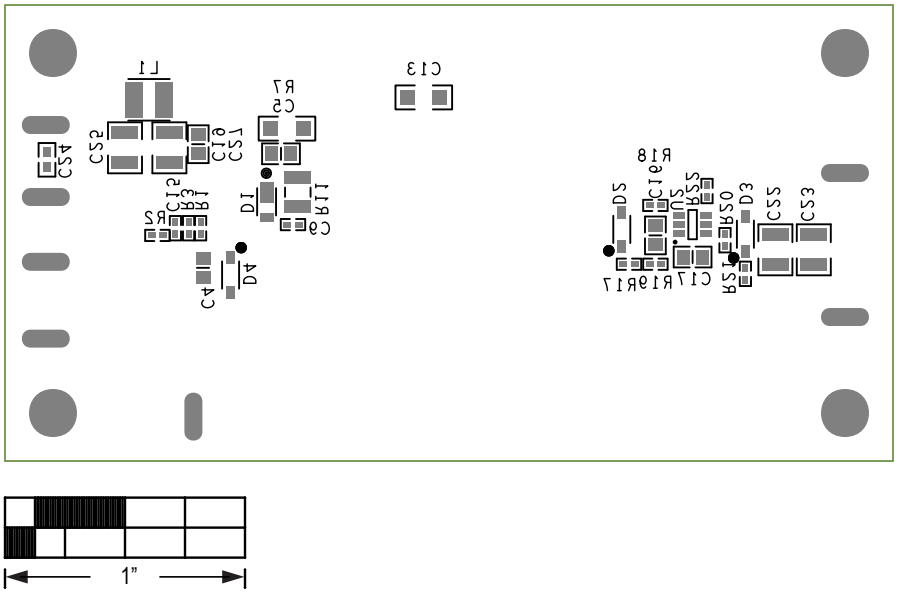


INNERLAYER3

MAX17690D EV Kit PCB Layout (continued)



Bottom



Silk Bottom