*Click **here** for production status of specific part numbers.*

MAX17690EVKITE# No-Opto Flyback Evaluation Kit

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

General Description

The MAX17690E evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the operation of an isolated 16.5W 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 84.7% 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 +3.3V and provides up to 5A 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: 3.3V/5A DC
- Compact Design with High Frequency (200kHz) Switching
- No Optocoupler/Third Winding Required to Derive Feedback Signal
- 84.7% Peak Efficiency
- Galvanic Isolation up to 1500V_{RMS}
- Proven PCB Layout
- Fully Assembled and Tested

Quick Start

Recommended Equipment

- One 18V–36V DC, 1.5A power supply
- 16.5W resistive load with 5A sink capacity
- Four digital multimeters (DMM)
- MAX17690EVKITE#

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.

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

319-100210; Rev 0; 6/18

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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 3.3V 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 5A. Verify that the output voltage is 3.3V ±5%.

Detailed Description

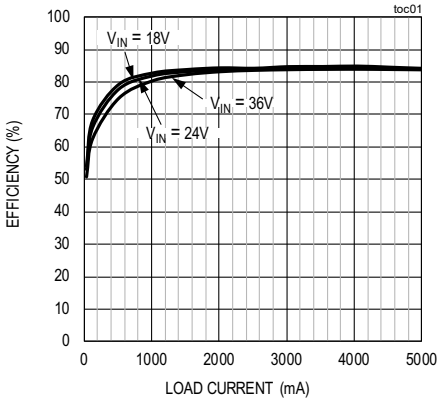
The MAX17690 EV kit provides a proven design to evaluate the MAX17690, a high-efficiency no-opto DC-DC flyback controller. The device uses a novel sampling technique to eliminate the optocoupler/third winding in sensing the output voltage across the isolation boundary. The MAX17606, a secondary-side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

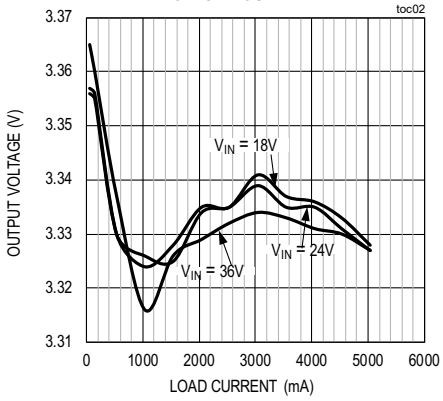
The MAX17606 has provision to program the turn-off trip point of the secondary synchronous rectifier. An external resistor (R18) connects the drain of the external MOSFET to IC's DRN pin. This resistor sets the turn-off trip point using the precise internal current source. After the synchronous rectifier 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

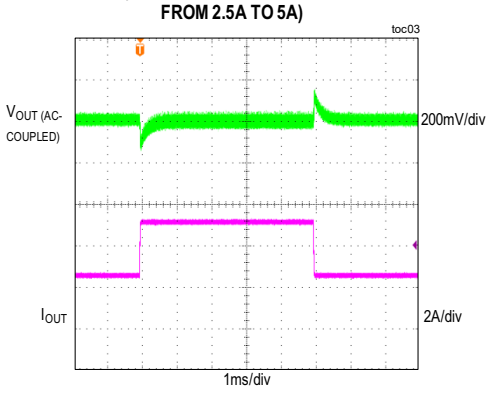
EFFICIENCY vs. LOAD CURRENT



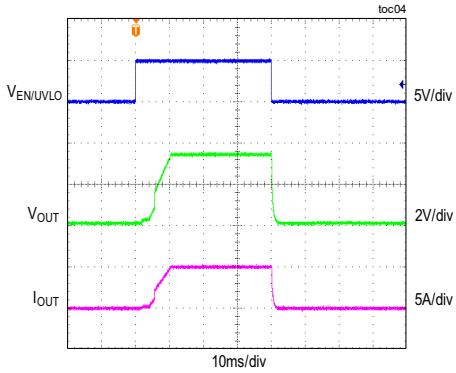
OUTPUT VOLTAGE vs. LOAD CURRENT



LOAD TRANSIENT RESPONSE (LOAD CURRENT STEPPED FROM 2.5A TO 5A)



SOFT-START



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 MAX17690E EV when contacting these component suppliers.*

Ordering Information

PART	TYPE
MAX17690EVKITE#	EV Kit

#Denotes RoHS compliant.

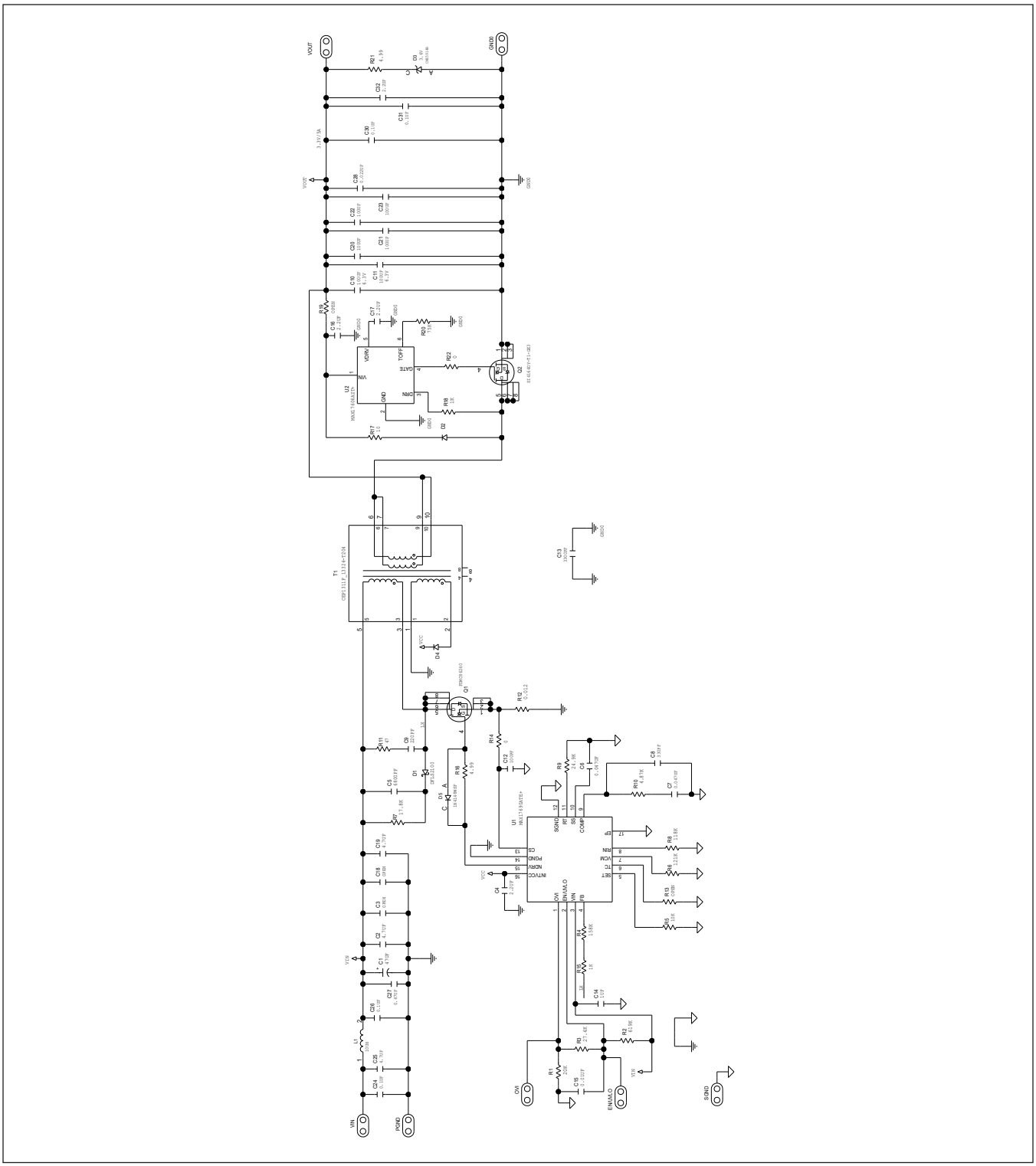
MAX17690E EV Kit Bill of Materials

Designation	Qty	Description
C1	1	47uF±20%, 50V, ALUMINUM-ELECTROLYTIC SMT (CASE_E) PANASONIC EEE-FK1H470P
C2, C19, C25	3	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	330pF±10%, 50V, X7R Ceramic capacitor (0402) MURATA GRM155R71H331KA01
C9	1	220pF±10%, 100V, X7R Ceramic capacitor (0402) MURATA GRM155R72A221KA01
C10, C11, C20-C23	6	100uF±20%, 6.3V, X7U Ceramic capacitor (1210) MURATA GRM32EE70J107ME15L
C12	1	100pF±10%, 50V, X7R Ceramic capacitor (0402) PANASONIC ECJ-0EB1H101K
C13	1	3300pF±10%, 2000V, X7R Ceramic capacitor (1210) AVX 1210GC332KAT1A
C14	1	1uF±10%, 50V, X7R Ceramic capacitor (0805) MURATA GRM21BR71H105KA12
C15	1	0.01uF±10%, 50V, X7R Ceramic capacitor (0402) KEMET C0402C103K5RAC
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	3.6V/1.5W, (DO-214AC), DIODE, ZNR CENTRAL SEMICONDUCTOR CMZ5914B VISHAY BZG05C3V6-M3-08
D5	1	100V/0.25A, (SOD-323F), DIODE DIODES INCORPORATED 1N4148WSF

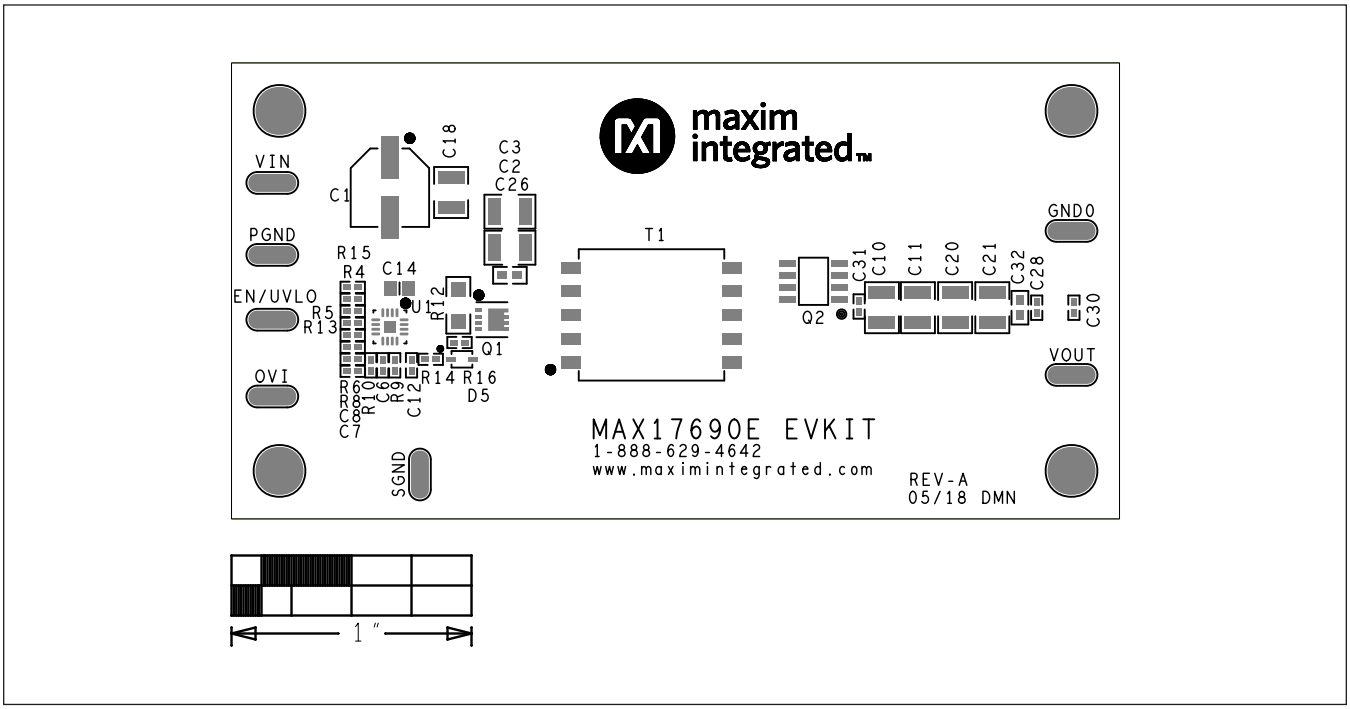
MAX17690E EV Kit Bill of Materials (continued)

Designation	Qty	Description
L1	1	10uH±20%, 3.1A inductor COILCRAFT XAL4040-103ME
Q1	1	150V/16A/40W, 8-PowerWDFN, POWER TRANSISTOR ON SEMICONDUCTOR FDMC86240
Q2	1	30V/30A/6W, SO-8, POWER TRANSISTOR VISHAY SILICONIX SI4164DY-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	158kΩ±1% resistor, 0402 PANASONIC ERJ-2RKF1583X
R5	1	10kΩ±1% resistor, 0402 VISHAY DALE CRCW040210K0FK
R6	1	121kΩ±1% resistor, 0402 PANASONIC ERJ-2RKF1213
R7	1	17.8kΩ±1% resistor, 2010 PANASONIC ERJ-12SF1782
R8	1	118kΩ±1% resistor, 0402 PANASONIC ERJ-2RKF1183
R9	1	24.9kΩ±1% resistor, 0402 VISHAY DALE CRCW040224K9FKEDC
R10	1	4.87kΩ±1% resistor, 0402 VISHAY DALE CRCW04024K87FK
R11	1	47Ω±1% resistor, 1210 VISHAY DRALORIC CRCW121047R0JNEAHP
R12	1	0.012Ω±1% resistor, 1206 PANASONIC ERJ-8CWFR012V
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	1kΩ±1% resistor, 0402 PANASONIC ERJ-2RKF1001X
R20	1	75kΩ±1% resistor, 0402 VISHAY DALE CRCW040275K0FK
T1	1	10-pin SMT, 8.2uH, 8A, (3-5):(9,10-6,7) = 1:0.2 SUMIDA CEP1311F_13324-T204
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+

MAX17690E EV Kit Schematic



MAX17690E EV Kit PCB Layouts



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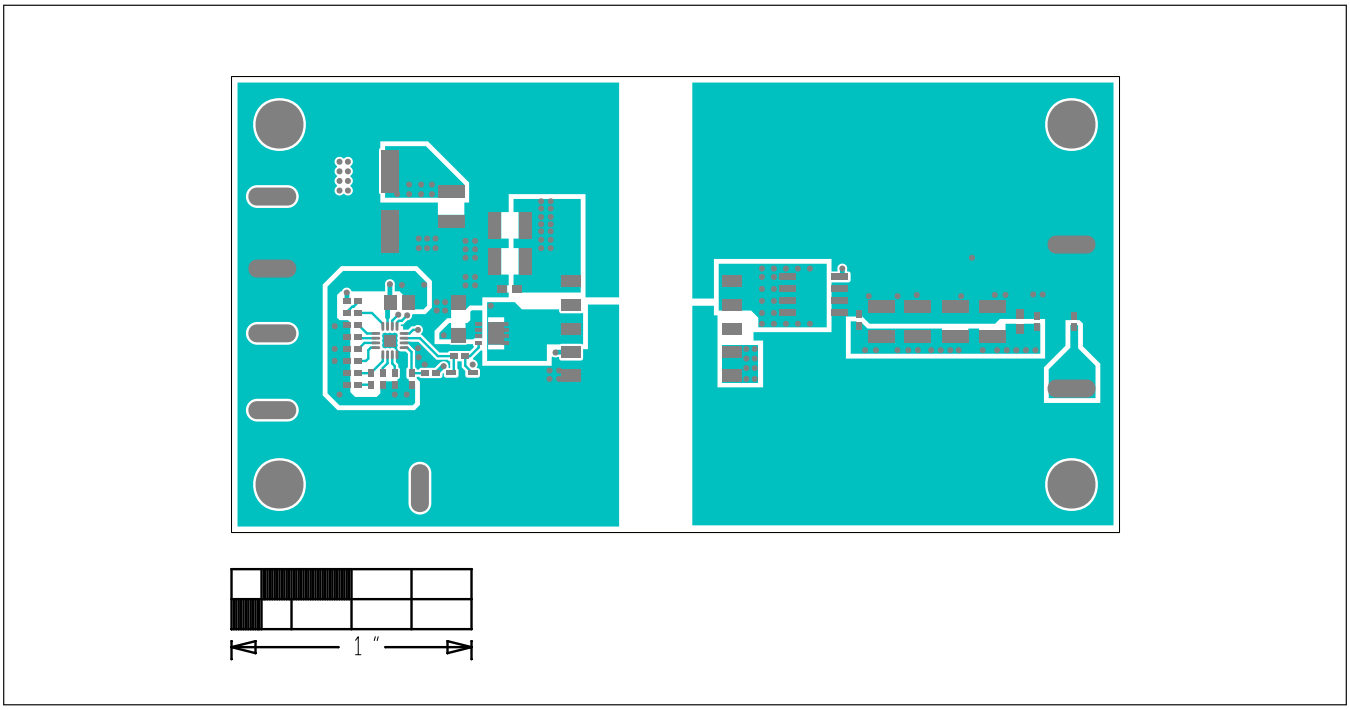
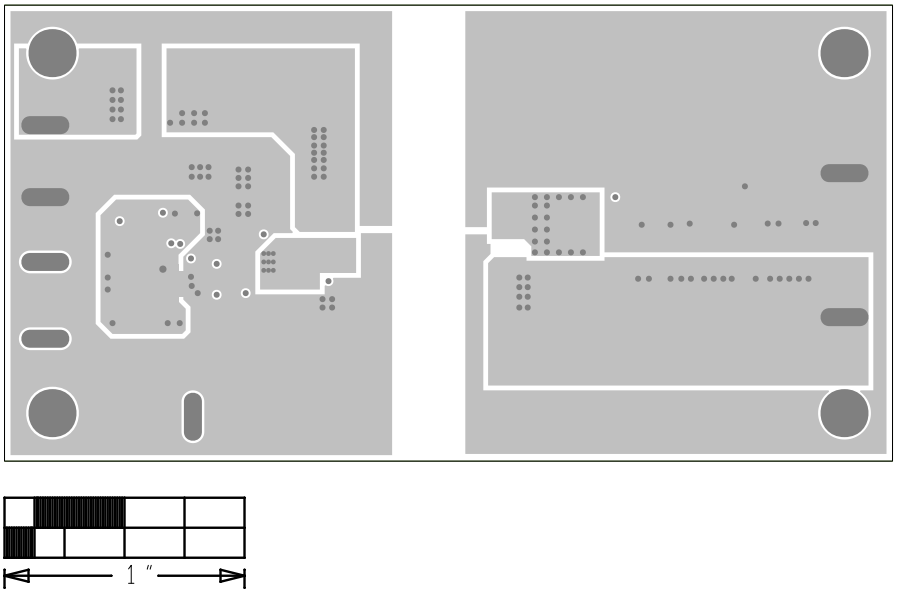
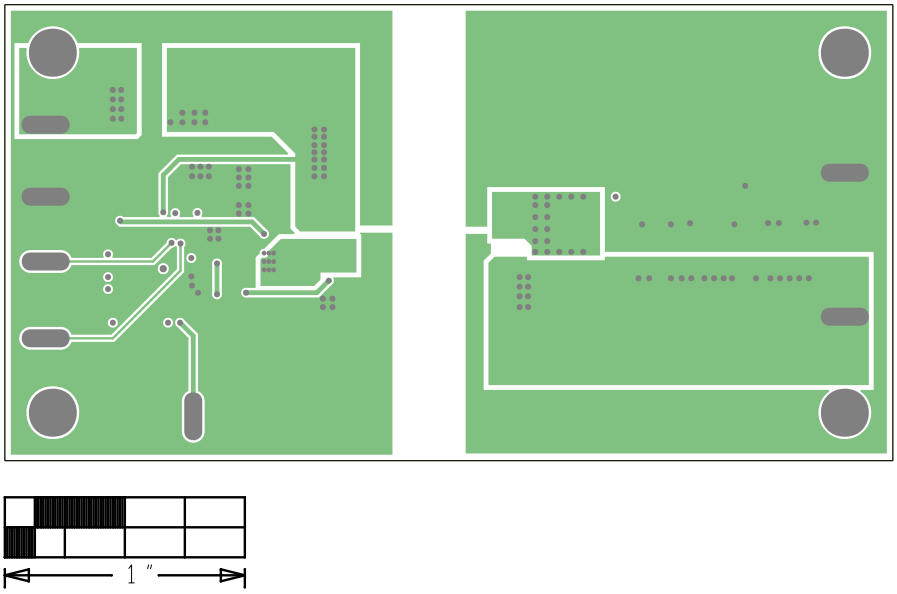


Top

MAX17690E EV Kit PCB Layouts (continued)

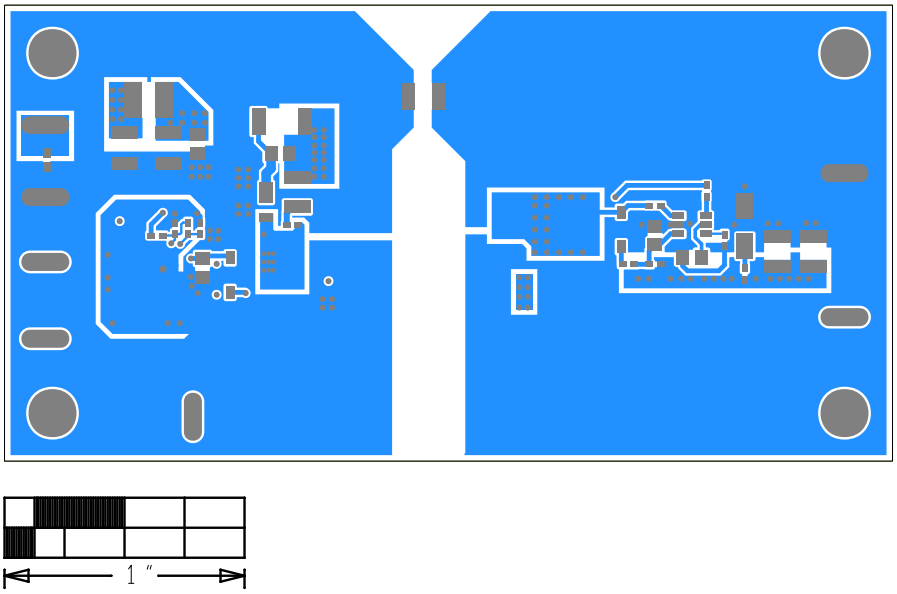


INNERLAYER2

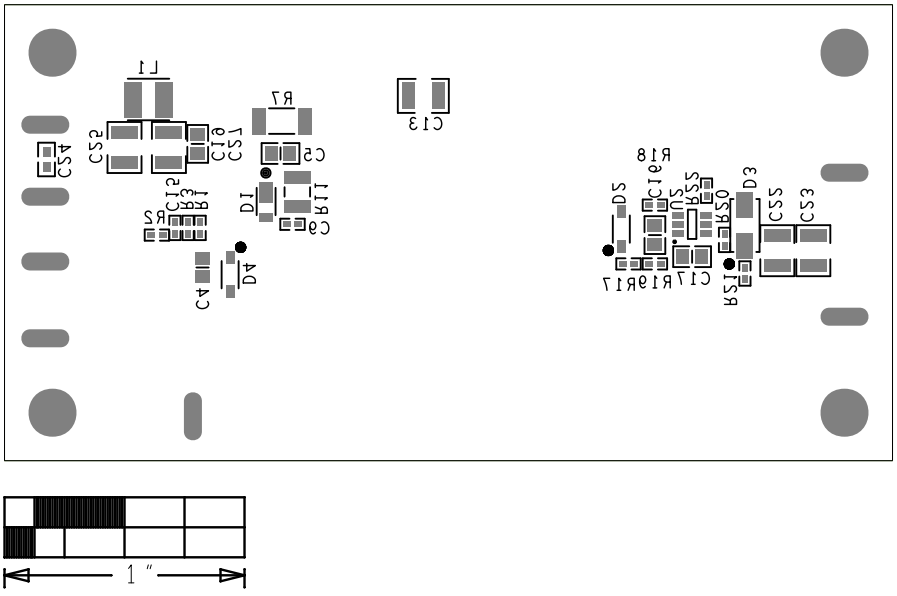


INNERLAYER3

MAX17690E EV Kit PCB Layouts (continued)



Bottom



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Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	6/18	Initial release	—

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