

# MAX17690B No-Opto Flyback Evaluation Kit

Evaluates: MAX17690

## General Description

The MAX17690B 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. This circuit uses a MAX17690 in a 16-pin TQFN package with an exposed pad. The data sheet must be read in conjunction with this quick start guide for demo circuit.

The EV kit output is configured for an isolated +5V and provides up to 1A of output current. The device switches at a 180kHz switching frequency. The transformer provides the galvanic isolation between input and output, up to 1875VAC.

## Features

- 18V to 36V Input Range
- Isolated Output: 5V/1A DC
- Compact Design with High-Frequency (180kHz) Switching
- Minimum Number of External Components
- 85.8% Peak Efficiency
- Low-Cost Flyback Design
- Galvanic Isolation up to 1875VAC
- Proven PCB Layout
- Fully Assembled and Tested

**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)
- MAX17690EVKITB#

### 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 or conductive materials when powered up.
- Make sure all high-voltage capacitors are fully discharged before handling. Allow 5 minutes after disconnecting the 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  $V_{IN}$  PCB pad and the negative terminal to the nearest PGND PCB pad. Connect the positive terminal of the electronic load to the  $V_{OUT}$  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  $V_{OUT}$  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 in Ammeter mode.
- 7) If required, vary the input voltage from 18V to 36V, the load current from 0mA to 1A, and verify that output voltage is 5V.

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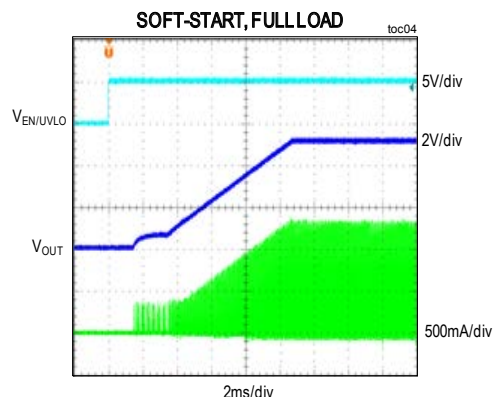
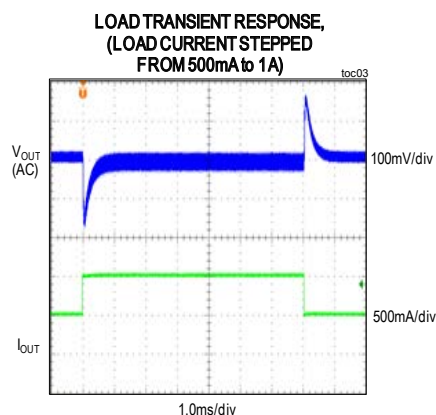
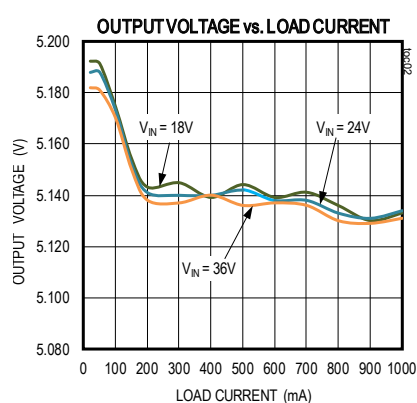
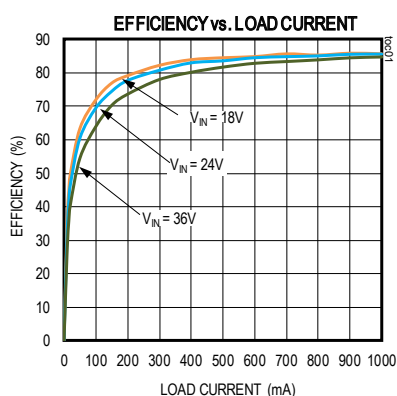
## Detailed Description

The MAX17690B EV kit provides a proven design to evaluate the MAX17690 high-efficiency DC-DC flyback converter. The device uses a novel sampling technique to eliminate the optocoupler in the output voltage sensing across the isolation boundary. The transformer design, as

well as the selection of different components, are detailed in the MAX17690 IC data sheet.

This EV kit provides the programmable soft-start time to limit the inrush current. The IC has overcurrent and thermal protection.

## EV Kit Performance Report



## Component Suppliers

| SUPPLIER         | WEBSITE                                                  |
|------------------|----------------------------------------------------------|
| Würth Elektronik | <a href="http://www.we-online.com">www.we-online.com</a> |
| Murata Americas  | <a href="http://www.murata.com">www.murata.com</a>       |
| Panasonic Corp.  | <a href="http://www.panasonic.com">www.panasonic.com</a> |

**Note:** Indicate that you are using the MAX17690B when contacting these component suppliers.

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## MAX17690 EV Kit Bill of Materials

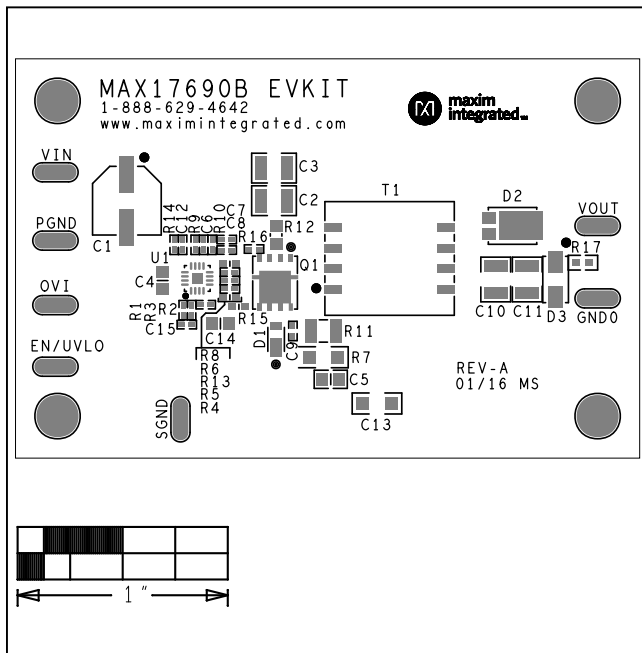
| S NO | Des      | Qty | Description                                               | Manufacturer Partnumber-1            | Manufacturer Partnumber-2            |
|------|----------|-----|-----------------------------------------------------------|--------------------------------------|--------------------------------------|
| 1    | C1       | 1   | 47uF±20%, 50V, ALUMINUM-ELECTROLYTIC SMT(CASE_D8)         | PANASONIC EEEFK1H470P                |                                      |
| 2    | C2, C3   | 2   | 4.7uF±10% 50V X7R Ceramic capacitor (1210)                | Murata GRM32ER71H475KA88K            | KEMET C1210C475K5RAC                 |
| 3    | C4       | 1   | 2.2uF±10%, 50V, X7R ceramic capacitor (0805)              | TDK C2012X7R1H225K                   |                                      |
| 4    | C5       | 1   | 6800pF, 10%, 100V, X7R ceramic capacitor (0805)           | KEMET C0805C682K1RAC                 |                                      |
| 5    | C6, C7   | 2   | 0.047uF±10%, 16V, X7R ceramic capacitor (0402)            | Murata GRM155R71C473KA01             |                                      |
| 7    | C8       | 1   | 470pF ±10%, 50V, X7R ceramic capacitor (0402)             | Murata GRM155R71H471K                | KEMET C0402S471K5RAC                 |
| 8    | C9       | 1   | 220pF ±10%, 100V, X7R ceramic capacitor (0402)            | Murata GRM155R72A221KA01             |                                      |
| 9    | C10, C11 | 2   | 100uF±20%, 6.3V, X7S ceramic capacitor(1210)              | Murata GRM32EC70J107ME15             |                                      |
| 10   | C12      | 1   | OPEN (0402)                                               |                                      |                                      |
| 11   | C13      | 1   | 1000PF±10%, 1500V, 7R ceramic capacitor (1206)            | AVX 1206SC102KAT                     |                                      |
| 12   | C14      | 1   | 1uF±10%, 50V, X7R ceramic capacitor(0805)                 | Murata GRM21BR71H105KA12             | SAMSUNG ELECTRONICS CL21B105KBFNNNIE |
| 13   | C15      | 1   | 0.01uF±10%, 50V, X7R ceramic capacitor(0402)              | Murata GRM155R71H103KA88             | KEMET C0402C103K5RAC                 |
| 14   | D1       | 1   | 100V/2A, (POWERDI-123), DIODE                             | DIODES INCORPORATED DFLS2100         |                                      |
| 15   | D2       | 1   | 0.53V/8A, (POWERDI-5), DIODE                              | DIODES INCORPORATED SBR8U60P5        |                                      |
| 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 SIR98DP-T1-GE3      |                                      |
| 18   | R1, R5   | 2   | 10kΩ ±1% resistor (0402)                                  | VISHAY DALE CRCW040210K0FK           | YAGEO PHICOMP RC0402FR-0710K         |
| 19   | R2       | 1   | 280kΩ ±1% resistor (0402)                                 | PANASONIC ERJ-2RK2803X               |                                      |
| 20   | R3       | 1   | 10.7kΩ ±1% resistor (0402)                                | VISHAY DALE CRCW040210K7FK           |                                      |
| 21   | R4       | 1   | 255kΩ ±1% resistor (0603)                                 | VISHAY DALE CRCW0603255KFK           | PANASONIC ERJ-3EKF2553V              |
| 22   | R6       | 1   | 124kΩ ±1% resistor (0402)                                 | VISHAY DALE CRCW0402124KFK           |                                      |
| 23   | R7       | 1   | 15kΩ ±1% resistor (1206)                                  | VISHAY DALE CRCW120615K0FK           |                                      |
| 24   | R8       | 1   | 150kΩ ±1% resistor (0603)                                 | VISHAY DALE CRCW0603150KFK           |                                      |
| 25   | R9       | 1   | 27.4kΩ ±1% resistor (0402)                                | VISHAY DALE CRCW040227K4FK           |                                      |
| 26   | R10      | 1   | 4.42kΩ ±1% resistor (0402)                                | VENKEL LTD CR0402-16W-4421FT         | VISHAY DALE D1004020B4421F           |
| 27   | R11      | 1   | 47Ω ±5% resistor (1210)                                   | VISHAY DRALORIC CRCW121047R0JNEAHP   |                                      |
| 28   | R12      | 1   | 0.056Ω ±1% resistor (0805)                                | PANASONIC ERJ6BWF056                 |                                      |
| 29   | R13      | 1   | 100kΩ ±1% resistor (0402)                                 | VISHAY DALE CRCW0402100KFK           | YAGEO PHICOMP RC0402FR-07100KL       |
| 30   | R14      | 1   | 0Ω ±0% resistor (0402)                                    | PANASONIC ERJ-2GE0R00X               |                                      |
| 31   | R15      | 1   | 0Ω ±5% resistor (0603)                                    | SAMSUNG ELECTRONICS RC1608J000CS     | BOURNS CR0603-J-0000ELF              |
| 32   | R16      | 1   | 2.2Ω ±1% resistor (0402)                                  | VISHAY DALE CRCW04022R20FK           |                                      |
| 33   | R17      | 1   | 49.9Ω ±1% resistor (0603)                                 | VISHAY DALE CRCW060349R9FK           |                                      |
| 34   | T1       | 1   | EPI0.8-pin SMT, 36uH ±10%, 1.6A, (1-4), (5-8) = 4.5:1 ±1% | WURTH ELECTRONICS INC. 750343444     |                                      |
| 35   | U1       | 1   | MAX17690, TQFN16-EP, Flyback converters                   | MAX17690ATE+                         |                                      |

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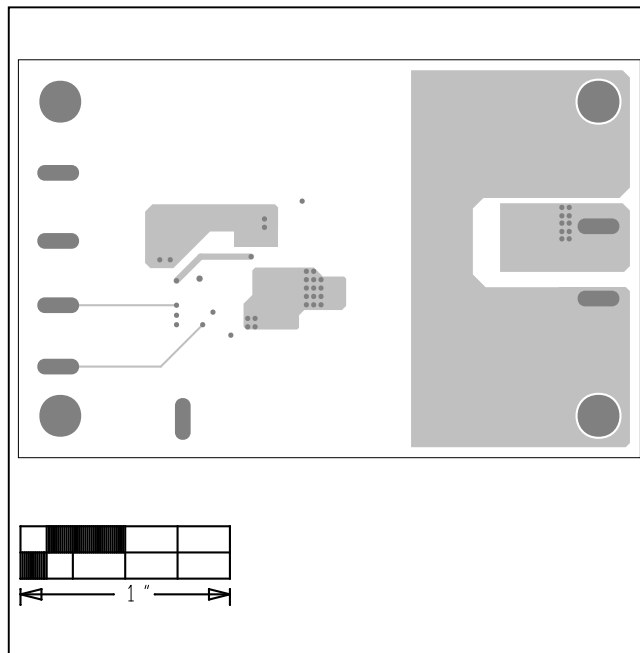
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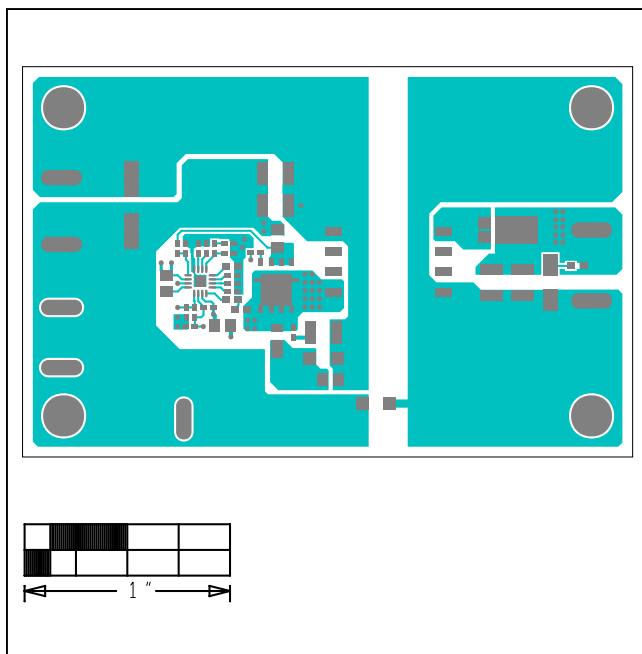
## MAX17690 EV Kit PCB Layout Diagrams



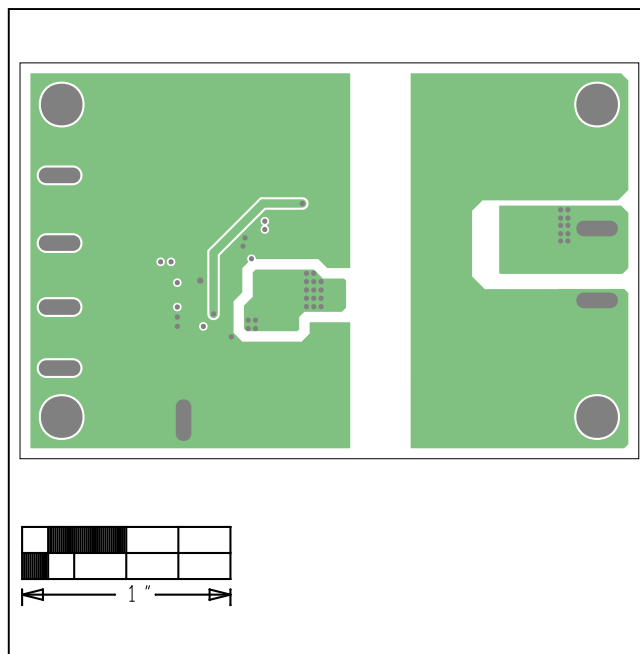
MAX17690 EV Kit—Top Silkscreen



MAX17690 EV Kit—Layer 2



MAX17690 EV Kit—Top

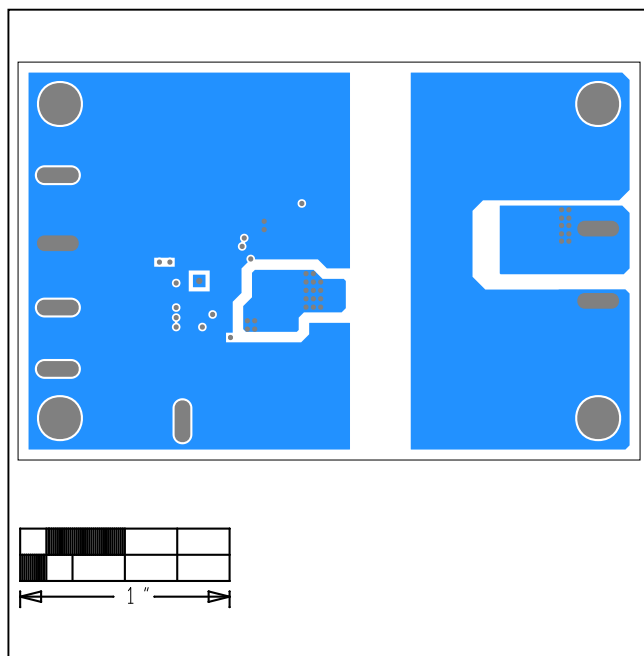


MAX17690 EV Kit—Layer 3

## MAX17690B No-Opto Flyback Evaluation Kit

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### MAX17690 EV Kit PCB Layout Diagrams (continued)



MAX17690 EV Kit—Bottom

### Ordering Information

| PART            | TYPE   |
|-----------------|--------|
| MAX17690EVKITB# | EV Kit |

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## Revision History

| REVISION<br>NUMBER | REVISION<br>DATE | DESCRIPTION                                                                                                                     | PAGES<br>CHANGED |
|--------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------|
| 0                  | 2/16             | Initial release                                                                                                                 | —                |
| 1                  | 8/16             | Updated <i>Typical Operating Characteristics</i> , <i>Bill of Materials</i> , <i>Ordering Information</i> table, and schematic. | 2–6              |
| 2                  | 1/17             | Updated TOCs, <i>Bill of Materials</i> , and schematic for 180kHz switching frequency                                           | 1–7              |

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](http://www.maximintegrated.com).

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