

## MAX17681A Evaluation Kit

## Evaluates: MAX17681A for Isolated $\pm 15\text{V}$ and $\pm 7.5\text{V}$ Output Configuration

### General Description

The MAX17681E evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX17681A high-efficiency, iso-buck, DC-DC converter. The EV kit operates over a wide input-voltage range of 17V to 36V and uses primary-side feedback to regulate the output voltage. The EV kit output is programmed to  $\pm 15\text{V}$ , 75mA each and  $\pm 7.5\text{V}$ , 75mA each with  $\pm 10\%$  regulation.

The EV kit comes installed with the MAX17681A in a 10-pin (3mm x 2mm) TDFN package.

### Features

- 17V to 36V Input Voltage Range
- $\pm 15\text{V}$ , 75mA Each and  $\pm 7.5\text{V}$ , 75mA Each Continuous Current
- EN/UVLO Input
- 200kHz Switching Frequency
- 86.9% Peak Efficiency
- Overcurrent Protection
- No Optocoupler
- Delivers Up to 3.4W Output Power
- Overtemperature Protection
- Proven PCB layout
- Provides robust primary and secondary output short-circuit protection

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

### Quick Start

#### Recommended Equipment

- One 15V–60V DC, 0.5A power supply
- Four resistive loads, each 75mA sink capacity
- Four digital multimeters (DMM)

**Caution: Do not turn on the power supply until all connections are completed.**

#### Test Procedure

- 1) Verify that J1 is open.
- 2) Set the power supply output to 24V. Disable the power supply.
- 3) Connect the positive terminal of the power supply to the  $V_{IN}$  PCB pad and the negative terminal to the nearest PGND PCB pad.
- 4) Connect the first resistive load across the +15V PCB pad and the GND0 PCB pad. Connect the second 75mA resistive load across the -15V PCB pad and the GND0 PCB pad.
- 5) Connect the third 75mA resistive load across the +7V PCB pad and the GND0 PCB pad. Connect the fourth 75mA resistive load across the -7V PCB pad and the GND0 PCB pad.
- 6) Connect two DMMs configured in voltmeter mode across the  $\pm 15\text{V}$  PCB pads and the nearest GND0 PCB pad. Also, connect another two DMMs configured in voltmeter mode across the  $\pm 7$  PCB pads and the nearest GND0 PCB pad.
- 7) Enable the input power supply.
- 8) Verify that output voltages are at  $\pm 15\text{V}$  and  $\pm 7.5\text{V}$  (with allowable tolerance of  $\pm 10\%$ ) with respect to GND0.
- 9) If required, vary the input voltage from 17V to 36V, and the load current from 0mA to 75mA and verify that output voltages are  $\pm 15\text{V}$  and  $\pm 7.5\text{V}$ .

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## Evaluates: MAX17681A for Isolated $\pm 15V$ and $\pm 7.5V$ Output Configuration

### Detailed Description

The MAX17681E EV kit is a fully assembled and tested circuit board that demonstrates the performance of the MAX17681A high-efficiency, iso-buck, DC-DC converter designed to provide an isolated power up to 3.4W. The EV kit generates either  $\pm 15V$  or  $\pm 7.5V$ , 75mA each output voltages, from a 17V to 36V input supply. The EV kit features a forced-PWM control scheme that provides constant switching-frequency of 200kHz operation at all load and line conditions.

The EV Kit includes an EN/UVLO PCB pad to monitor and program the EN/UVLO pin of the MAX17681A. The  $V_{PRI}$  PCB pad helps measure the regulated primary output voltage ( $V_{PRI}$ ). An additional  $\overline{RESET}$  PCB pad is available for monitoring the health of primary output voltage ( $V_{PRI}$ ).  $\overline{RESET}$  pulls low if FB voltage drops below 92.5% of its set value.  $\overline{RESET}$  goes high-impedance 1024 clock cycles after FB voltage rises above 95.5% of its set value. The programmable soft-start feature allows users to reduce the input inrush current.

The iso-buck is a synchronous-buck-converter-based topology, useful for generating isolated outputs at low power level without using an optocoupler. The detailed

procedure for setting the soft-start time, ENABLE/UVLO divider, primary output voltage ( $V_{PRI}$ ) selection, adjusting the primary output voltage, primary inductance selection, turns-ratio selection, output capacitor selection, output diode selection and external loop compensation are given in the MAX17681 IC data sheet.

### Enable Control (J1)

The EN/UVLO pin on the device serves as an on/off control while also allowing the user to program the input undervoltage lockout (UVLO) threshold. Jumper J1 configures the EV kit's output for turn-on/turn-off control. Install a shunt across jumper J1 pins 2-3 to disable  $V_{OUT}$ . See [Table1](#) for proper J1 jumper configurations.

**NOTE 1:** The secondary output diodes D1, D2, D3, and D4 are rated to carry short-circuit current only for few 100's of ms and is not rated to carry the continuous short-circuit current.

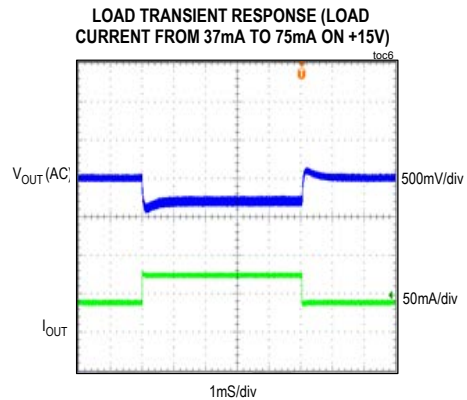
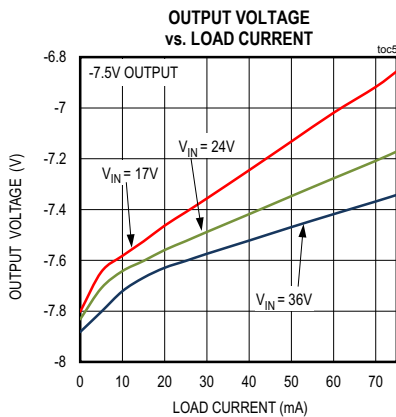
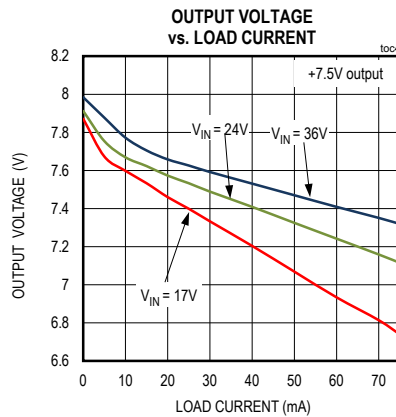
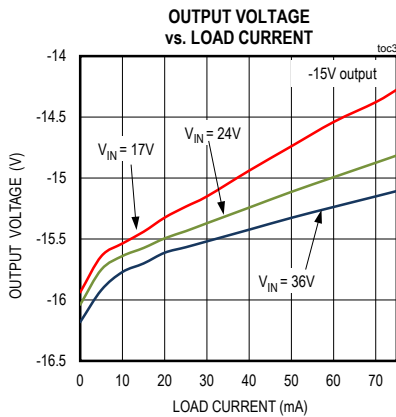
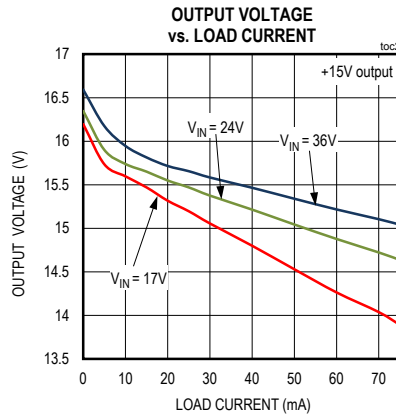
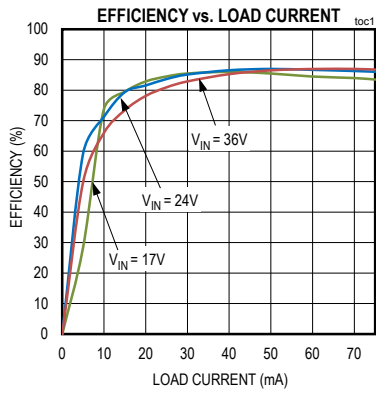
**NOTE 2:** The iso-buck converter typically needs 10% minimum load to regulate the output voltage. In this design when the +24V rail is healthy, the U2, U3 sinks the minimum load current required to regulate the output voltages within  $\pm 10\%$  regulation.

**Table1. Enable Control (EN/UVLO) (J1) Jumper Settings**

| SHUNT POSITION | EN/UVLO PIN                                      | VOUT OUTPUT                    |
|----------------|--|--------------------------------|
| J1             |  |                                |
| 1-2            | Connected to $V_{IN}$                            | Enabled                        |
| 2-3            | Connected to GND                                 | Disabled                       |
| Open*          | Connected to midpoint of R1, R2 resistor-divider | Enabled at $V_{IN} \geq 15.5V$ |

\*Default position.

EV Kit Performance Report



## MAX17681A Evaluation Kit

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 $\pm 15V$  and  $\pm 7.5V$  Output Configuration

### 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 MAX17681A when contacting these component suppliers.

### Ordering Information

| PART             | TYPE  |
|------------------|-------|
| MAX17681AEVKITE# | EVKIT |

#Denotes RoHS compliant.

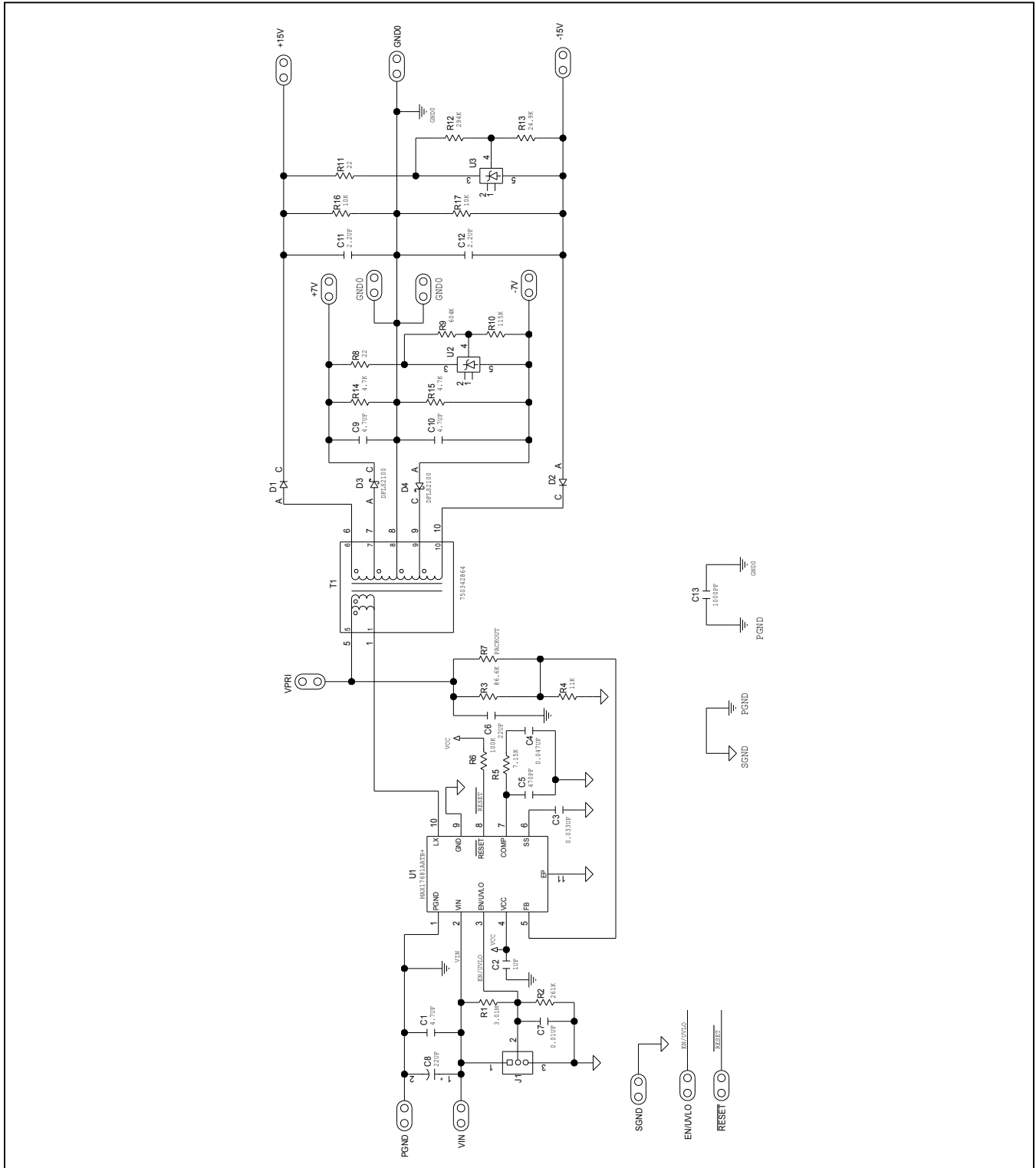
# MAX17681A Evaluation Kit

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## MAX17681A EV Kit Bill of Materials

| S NO | Des     | Qty | Description   | Mfctr PN-1                         | Mfctr PN-2                  | Mfctr PN-3         | Mfctr PN-4                |
|------|---------|-----|---|------------------------------------|-----------------------------|--------------------|---------------------------|
| 1    | C1      | 1   | 4.7µF±10%, 50V, X7R Ceramic capacitor (1206)                | Murata GRM31CR71H475KA12           |                             |                    |                           |
| 2    | C2      | 1   | 1µF±10% 16V X7R Ceramic capacitor (0603)                    | Murata GRM188R71C105KA12           | KEIEMT C0603C105K4RAC       | TDK C1608X7R1C105K | TAIYO YUDEN EMK107B7105KA |
| 3    | C3      | 1   | 0.033µF±10%±10%±25V, X7R ceramic capacitor (0402)           | Murata GRM155R71E333KA88           |                             |                    |                           |
| 4    | C4      | 1   | 0.047µF±10%±10%±25V, X7R ceramic capacitor (0402)           | TDK C1005X7R1E473K                 |                             |                    |                           |
| 5    | C5      | 1   | 470pF±5%±50V, COG ceramic capacitor (0402)                  | Murata GCM1555C1H471JA16           | Murata GRM1555R71E473K      |                    |                           |
| 6    | C6      | 1   | 22µF±10%±25V, X5R ceramic capacitor (1206)                  | Murata GRM31CR61E226K              | KEIEMT GRM1555C1H471JA01    |                    |                           |
| 7    | C7      | 1   | 10.0µF±10%, 50V, X7R ceramic capacitor (0402)               | Murata GRM155R71H103KA88           | KEIEMT C0402C103K5RAC       |                    |                           |
| 8    | C8      | 1   | 22µF, 20%, 50V, ALUMINUM ELECTROLYTIC CAPACITOR 6.60x6.60mm | Panasonic EEEFK1H220P              |                             |                    |                           |
| 9    | C9,C10  | 2   | 4.7µF±10%, 16V, X7R ceramic capacitor (1206)                | Murata GRM31CR71C475K              |                             |                    |                           |
| 10   | C11,C12 | 2   | 2.2µF±10%, 50V, X7R ceramic capacitor (1206)                | Murata GRM31CR71H225KA88           | TAIYO YUDEN UMK316B7225K    |                    |                           |
| 11   | C13     | 1   | 1000µF±10%, 1500V, X7R ceramic capacitor (1206)             | AVX 12065C102KAT                   |                             |                    |                           |
| 12   | D1,D2   | 2   | 200V/1A, PowerDI@123  | DIODES INCORPORATED DFLS1200       |                             |                    |                           |
| 13   | D3,D4   | 2   | 100V/2A, PowerDI@123  | DIODES INCORPORATED DFLS2100       |                             |                    |                           |
| 14   | J1      | 1   | 3-pin headers   | SULLINS ELECTRONICS CORP PEC03SAAN |                             |                    |                           |
| 15   | R1      | 1   | 3.01M Ohm±1% resistor (0402)                                | VISHAY DALE CRCW04023M01FK         |                             |                    |                           |
| 16   | R2      | 1   | 261K Ohm±1% resistor (0402)                                 | VISHAY DALE CRCW0402261FK          |                             |                    |                           |
| 17   | R3      | 1   | 86.6K Ohm±1% resistor (0402)                                | VISHAY DALE CRCW040286K6FK         |                             |                    |                           |
| 18   | R4      | 1   | 11KΩ ±1% resistor (0402)                                    | VISHAY DALE CRCW040211K0FK         |                             |                    |                           |
| 19   | R5      | 1   | 7.15KΩ ±1% resistor (0402)                                  | VISHAY DALE CRCW04027K15FK         |                             |                    |                           |
| 20   | R6      | 1   | 100KΩ ±5% resistor (0402)                                   | PANASONIC ERJ-2GEJ104X             |                             |                    |                           |
| 21   | R7      | 1   | OPEN (0402)   |                                    |                             |                    |                           |
| 22   | R8,R11  | 2   | 22Ω ±1% resistor (0402)                                     | VISHAY DALE CRCW040222R0FK         |                             |                    |                           |
| 23   | R9      | 1   | 604KΩ ±1% resistor (0402)                                   | PANASONIC ERJ-2RKF6043X            |                             |                    |                           |
| 24   | R10     | 1   | 115KΩ ±1% resistor (0402)                                   | VISHAY DALE CRCW0402115KFK         |                             |                    |                           |
| 25   | R12     | 1   | 294KΩ ±1% resistor (0402)                                   | VISHAY DALE CRCW0402294KFK         |                             |                    |                           |
| 26   | R13     | 1   | 24.9KΩ ±1% resistor (0402)                                  | VISHAY DALE CRCW0402249KFK         |                             |                    |                           |
| 27   | R14,R15 | 2   | 4.7KΩ ±5% resistor (0603)                                   | PANASONIC ERJ-3GEYJ472V            |                             |                    |                           |
| 28   | R16,R17 | 2   | 10KΩ ±5% resistor (0603)                                    | VISHAY DALE CRCW060310K0JN         | PANASONIC ERJ-3GEYJ103V     |                    |                           |
| 29   | T1      | 1   | EP13, 10-pin SMT, 50µH, 1:1                                 | WURTH ELECTRONICS INC 750342864    | SUMIDA CEP1311F-13324-T 146 |                    |                           |
| 30   | U1      | 1   | MAX17681A TDFN10 3*2mm Iso buck DC-DC converter             | MAX17681AATB+                      |                             |                    |                           |
| 31   | U2,U3   | 2   | Shunt regulator SOT25                                       | DIODES INCORPORATED TL431BW5       |                             |                    |                           |

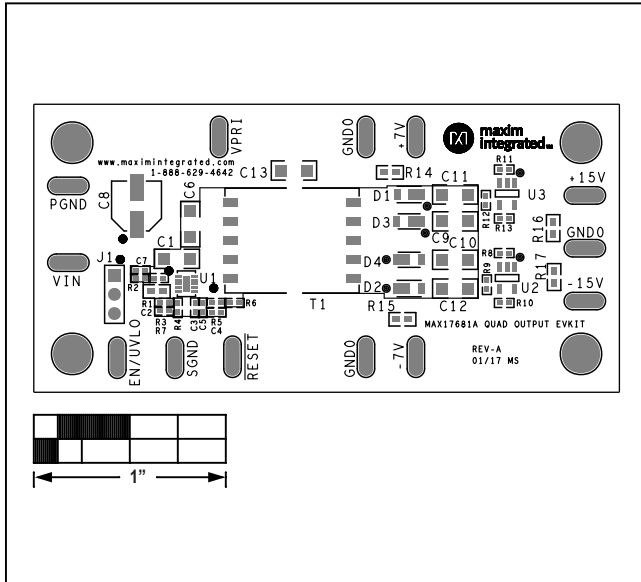
MAX17681A EV Kit Schematic



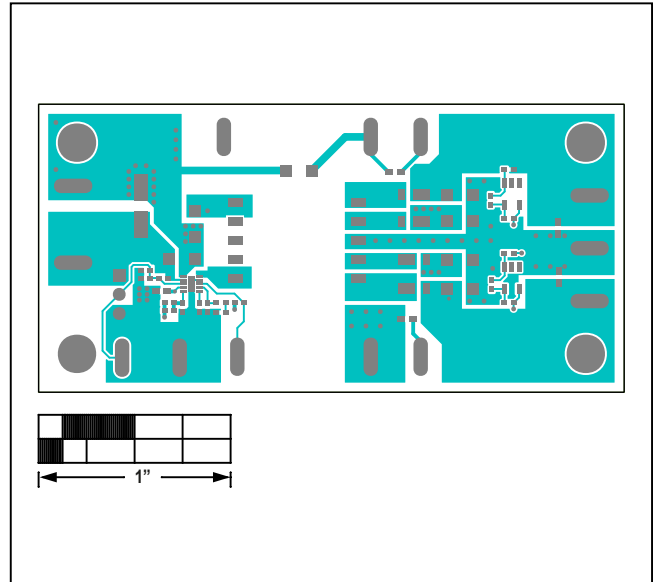
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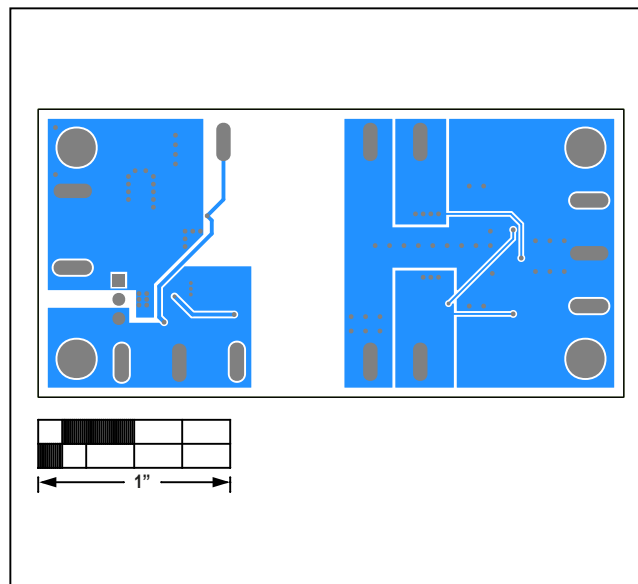
## MAX17681A EV Kit PCB Layout Diagrams



MAX17681A EV Kit—Top Silkscreen



MAX17681A EV Kit—Top



MAX17681A EV Kit—Bottom

### Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION     | PAGES CHANGED |
|-----------------|---------------|-----------------|---------------|
| 0               | 3/17          | Initial release | —             |

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