

MAX17681EVKITF# Evaluation Kit

Evaluates: MAX17681 for Isolated +24V Output Configuration

General Description

The MAX17681EVKITF is a fully assembled and tested circuit board that demonstrates the performance of the MAX17681 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 +24V at 100mA, with $\pm 8\%$ output voltage regulation.

The EV kit comes installed with the MAX17681 in a 10-pin (3mm x 2mm) TDFN package.

Features

- 17V to 36V Input-Voltage Range
- +24V, 100mA Continuous Current
- EN/UVLO Input
- 200kHz Switching Frequency
- Overcurrent Protection
- No Optocoupler
- Delivers up to 2.4W Output Power
- Overtemperature Protection
- Proven PCB Layout

Ordering Information appears at end of data sheet.

Quick Start

Recommended Equipment

- One 15V to 60V DC, 0.5A power supply
- One resistive load 100mA sink capacity
- Two digital multimeters (DMM)

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

Test Procedure

The EV kit comes with the default output configuration programmed to +24V.

- 1) Verify that J1 is open.
- 2) Verify that R7 is not installed.
- 3) Set the power supply output to 24V. Disable the power supply.
- 4) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest PGND PCB pad. Connect a 100mA resistive load across the +24V PCB pad and the GND0 PCB pad.
- 5) Connect a DMM configured in voltmeter mode across the +24V PCB pad and the nearest GND0 PCB pad.
- 6) Enable the input power supply.
- 7) Verify that output voltage is at +24V (with allowable tolerance of $\pm 8\%$) with respect to GND0.
- 8) If required, vary the input voltage from 17V to 36V, the load current from 0mA to 100mA, and verify that output voltage is at +24V (with allowable tolerance of $\pm 8\%$).

Detailed Description

The MAX17681EVKITF evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX17681 high efficiency, iso-buck DC-DC converter designed to provide an isolated power up to 2.4W. The EV kit generates +24V, 100mA 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 MAX17681. 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 the primary output voltage (V_{PRI}). \overline{RESET} is pulled low if the FB voltage drops below 92.5% of its set value. \overline{RESET} goes high impedance 1024 clock cycles after the 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. J1 configures the EV kit's output for turn-on/turn-off control. Install a shunt across J1 pins 2-3 to disable VOUT. See [Table 1](#) for proper J1 configurations.

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

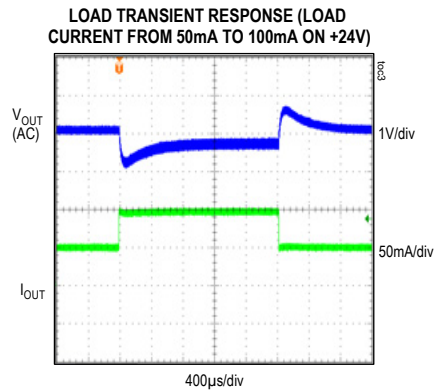
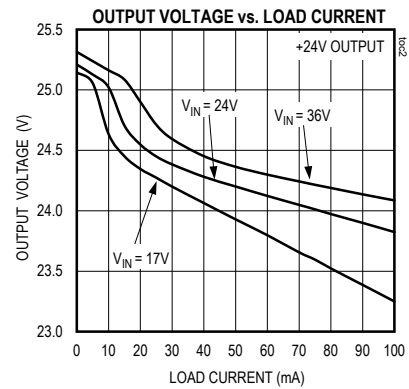
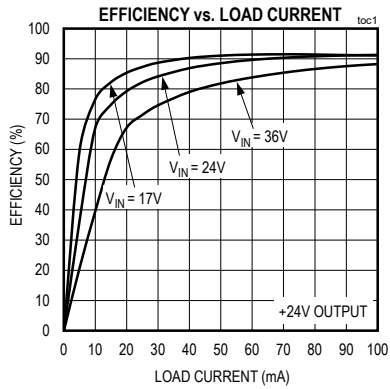
NOTE 2: The iso-buck converter typically needs 10% minimum load to regulate the output voltage. In this design when the +24V rail is healthy, the U2 sinks the minimum load current required to regulate the output voltages within $\pm 8\%$ regulation.

Table 1. Enable Control (EN/UVLO) (J1) Jumper Settings

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

*Default position.

EV Kit Performance Report



MAX17681EVKITF# Evaluation Kit

Evaluates: MAX17681 for Isolated
+24V Output Configuration

Component Suppliers

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

Note: Indicate that you are using the MAX17681 when contacting these component suppliers.

Ordering Information

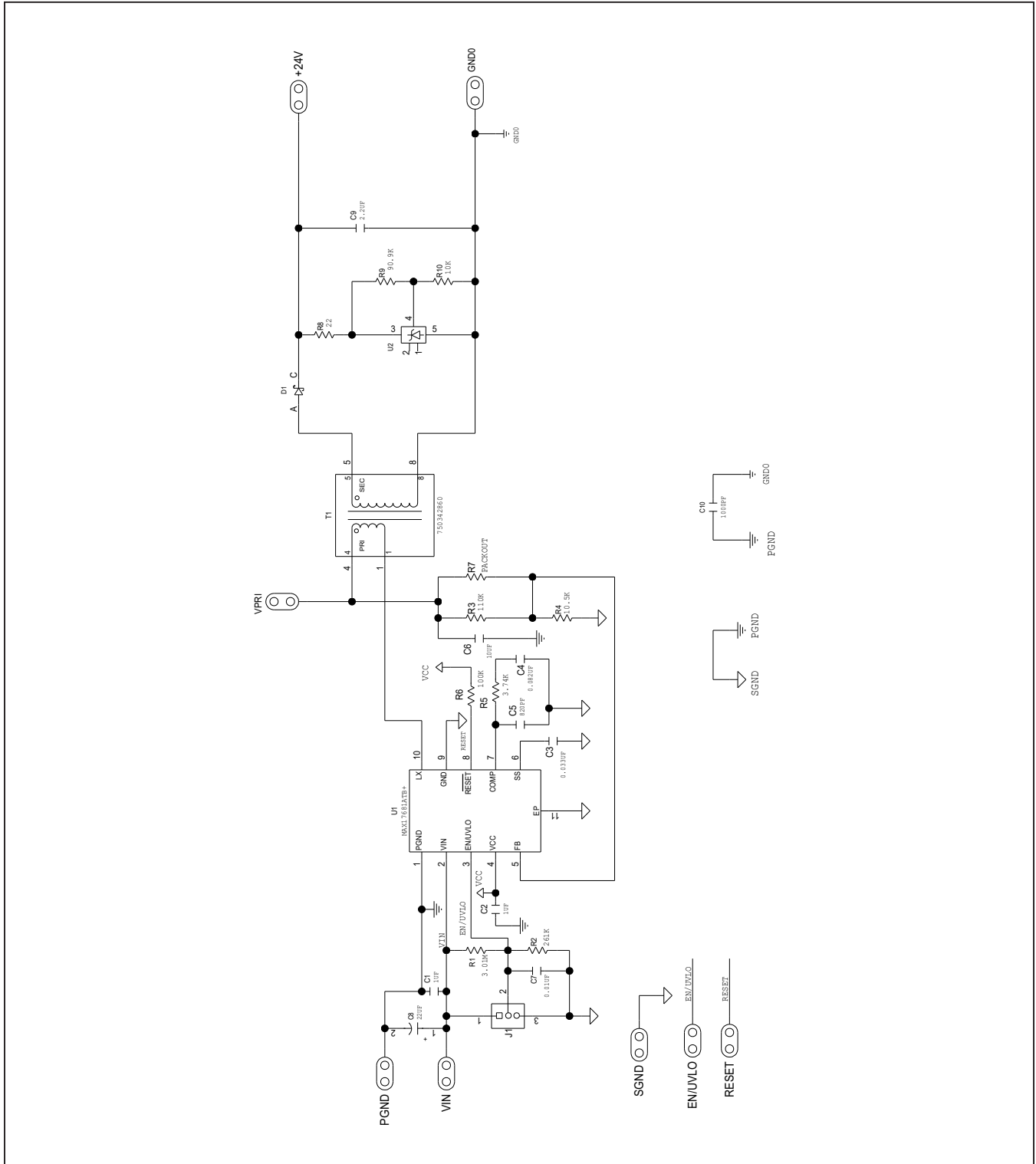
| PART | TYPE |
|-----------------|-------|
| MAX17681EVKITF# | EVKIT |

#Denotes RoHS compliant.

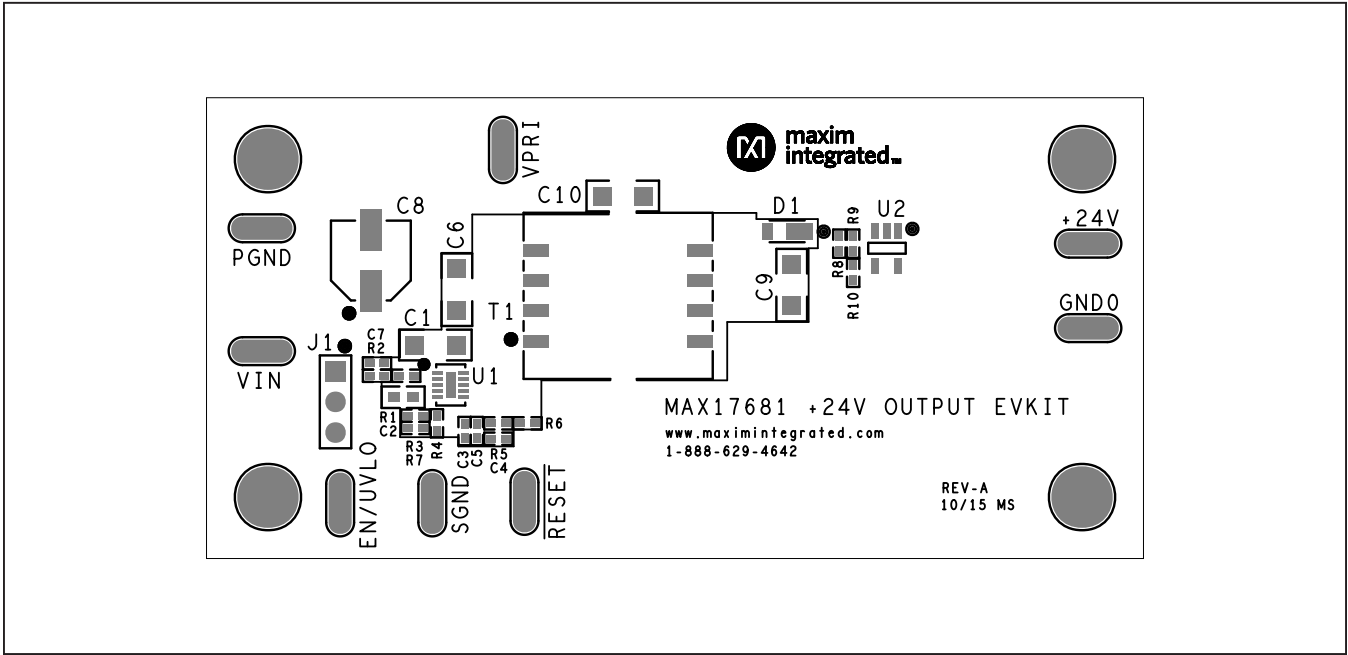
MAX17681 EV Kit Bill of Materials

| S NO | Designation | Qty | Description | Manufacturer Partnumber-1 | Manufacturer Partnumber-2 | Manufacturer Partnumber-3 | Manufacturer Partnumber-4 |
|------|-------------|-----|--|---------------------------------------|---------------------------|---------------------------|---------------------------|
| 1 | C1 | 1 | 1µF±10%, 50V, X7R Ceramic capacitor (1206) | Murata GRM31CR71H105KA61 | KEMET C1206C105K5RAC | Murata GRM31MR71H105KA88 | |
| 2 | C2 | 1 | 1µF±10%, 16V X7R Ceramic capacitor (0603) | Murata GRM188R71C105KA12 | KEMET C0603C105K4RAC | TDK C1608X7R1C105K | TAIYO YUDEN EMK107B7105KA |
| 3 | C3 | 1 | 0.033µF±10%, 25V, X7R ceramic capacitor (0402) | Murata GRM155R71E333KA88 | | | |
| 4 | C4 | 1 | 0.082µF±10%, 16V, X7R ceramic capacitor (0402) | Murata GRM155R71C823K | KEMET C0402C823K4RAC | | |
| 5 | C5 | 1 | 820pF±5%, 50V, X7R ceramic capacitor (0402) | Murata GRM155R71H821K | KEMET C0402C821K5RAC | | |
| 6 | C6 | 1 | 100µF±10%, 16V, X7R ceramic capacitor (1206) | Murata GRM31CR71C106KAC7 | | | |
| 7 | C7 | 1 | 0.01µF±10%, 50V, X7R ceramic capacitor (0402) | Murata GRM155R71H103KA88 | KEMET C0402C103K5RAC | | |
| 8 | C8 | 1 | 22µF, 20%, 50V, ALUMINUM ELECTROLYTIC CAPACITOR 6.60*6.60mm, | Panasonic EEEFK1H220P | | | |
| 9 | C9 | 1 | 2.2µF±10%, 50V, X7R ceramic capacitor (1206) | Murata GRM31CR71H225KA88 | TAIYO YUDEN UMK316B7225K | | |
| 10 | C10 | 1 | 1000pF±10%, 1500V, X7R ceramic capacitor (1206) | AVX 1206SC102KAT | | | |
| 11 | D1 | 1 | 200V/1A, PowerDI®123 | Diode Inc. DFLS2100-7 | | | |
| 12 | J1 | 1 | 3-pin headers | SULLINS ELECTRONICS CORP PEC03SAAN | | | |
| 13 | R1 | 1 | 3.01M Ohm±1% resistor (0402) | VISHAY DALE CRCW04023M01FK | | | |
| 14 | R2 | 1 | 261K Ohm±1% resistor (0402) | VISHAY DALE CRCW0402261KFK | | | |
| 15 | R3 | 1 | 110K Ohm±1% resistor (0402) | VISHAY DALE CRCW0402110KFK | | | |
| 16 | R4 | 1 | 10.5kΩ ±1% resistor (0402) | PANASONIC ERJ-2RKF1052 | | | |
| 17 | R5 | 1 | 3.74kΩ ±1% resistor (0402) | PANASONIC ERJ2RKF3741 | | | |
| 18 | R6 | 1 | 100kΩ ±5% resistor (0402) | PANASONIC ERJ-2GE104X | | | |
| 19 | R7 | 1 | OPEN (0402) | | | | |
| 20 | R8 | 1 | 22Ω ±1% resistor (0402) | VISHAY DALE CRCW040222R0FK | | | |
| 21 | R9 | 1 | 90.9kΩ ±1% resistor (0402) | PANASONIC ERJ-2RKF9092X | | | |
| 22 | R10 | 1 | 10kΩ ±1% resistor (0402) | VISHAY DALE CRCW040210K0JN | | | |
| 23 | T1 | 1 | EP10, 8-pin SMT, 80µH, 1.2A, 2.4:1 | WURTH ELECTRONICS INC. 750342860 | | | |
| 24 | U1 | 1 | MAX17681 TDFN10 3*2mm Iso buck-DC converter | MAX17681ATB+ | | | |
| 25 | U2 | 1 | Shunt regulator SOT25 | Diode Inc. TL431BW5 | | | |

MAX17681 EV Kit Schematic



MAX17681 EV Kit PCB Layout Diagrams

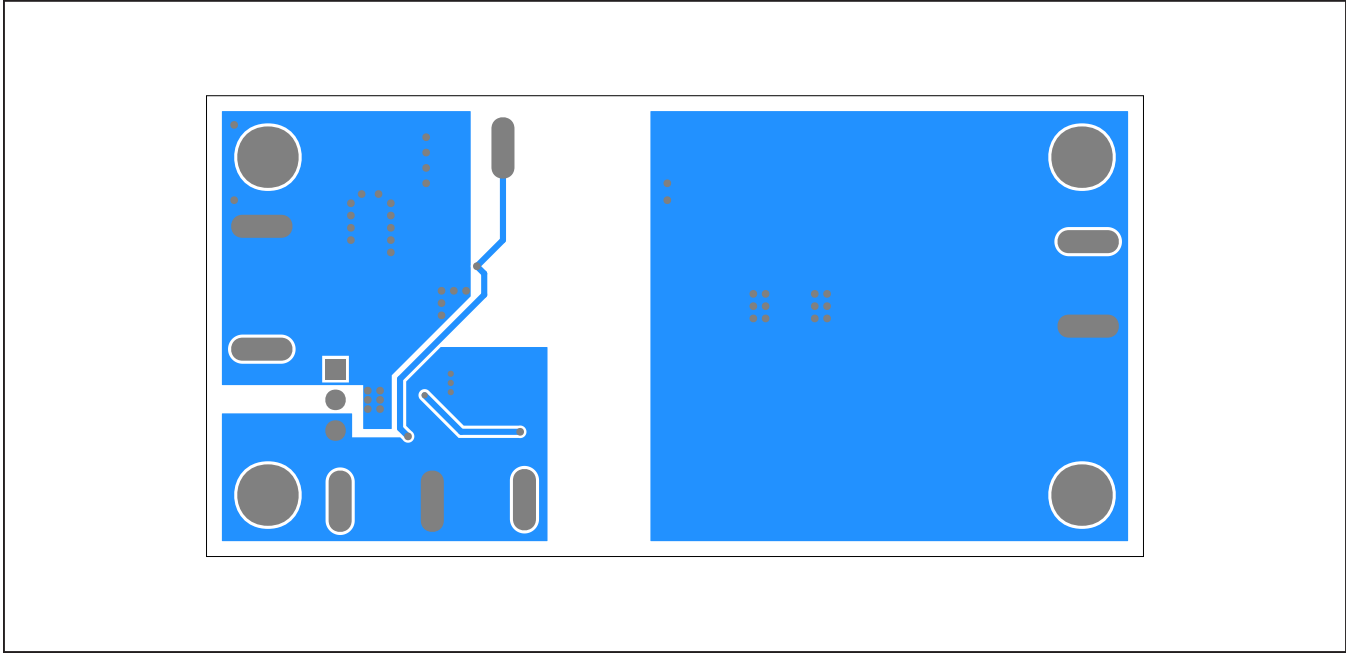


MAX17681 EV Kit—Top Silkscreen



MAX17681 EV Kit—Top

MAX17681 EV Kit PCB Layout Diagrams (continued)



MAX17681 EV Kit—Bottom

Revision History

| REVISION NUMBER | REVISION DATE | DESCRIPTION | PAGES CHANGED |
|-----------------|---------------|--|---------------|
| 0 | 3/16 | Initial release | — |
| 1 | 4/16 | Updated <i>General Description</i> , <i>Test Procedure</i> , <i>Detailed Description</i> , and <i>Enable Control (J1)</i> sections, and <i>Bill of Materials</i> | 1–2 |
| 2 | 5/18 | Updated title and the <i>Bill of Materials</i> | 1–9 |

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