

MAX17681A Evaluation Kit

Evaluates: MAX17681A for Isolated +15V or +12V Output Configuration

General Description

The MAX17681AEVKITC 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 has two output configurations. In the first configuration, the output is programmed to +15V at 200mA, with $\pm 8\%$ output voltage regulation. The second configuration uses a post regulator (MAX17651) to produce +12V at 100mA with better than $\pm 3\%$ regulation.

The EV kit comes installed with the MAX17681A in a 10-pin (3mm x 2mm) TDFN package and MAX17651 in a 6-lead Thin-SOT (TSOT) package.

Features

- 17V to 36V Input Voltage Range
- +15V, 200mA or +12V, 100mA Continuous Current
- EN/UVLO Input
- 200kHz Switching Frequency
- 89.5% Peak Efficiency
- Overcurrent Protection
- No Optocoupler
- Delivers up to 3W 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
- Two resistive loads of 200mA sink capacity
- Four digital multimeters (DMM)

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

Procedure

The EV kit comes with the default output configuration programmed to +15V.

Test Procedure for +15V Output

- 1) Verify that the J1 is open
- 2) Verify that the R7 and R14 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 V_{IN} PCB pad and the negative terminal to the nearest PGND PCB pad. Connect a 200mA resistive load across the +15V PCB pad and the GND0 PCB pad.
- 5) Connect a DMM configured in voltmeter mode across the +15V PCB pad and the nearest GND0 PCB pad.
- 6) Enable the input power supply.
- 7) Verify that output voltage is at +15V (with allowable tolerance of $\pm 8\%$) with respect to GND0.
- 8) If required, vary the input voltage from 17V to 36V, and the load current from 0mA to 200mA and verify that output voltage is at +15V (with allowable tolerance of $\pm 8\%$).

Test Procedure for +12V Output

- 1) Verify that the J1 is open
- 2) Place 0Ω resistors in R7, Place a 681k pack-out resistor (comes with EV kit package) in R14.
- 3) Set the input power supply output to 24V. Disable the power supply
- 4) 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 a 100mA resistive load across the +12V PCB pad and the GND0 PCB pad.
- 5) Connect a DMM configured in voltmeter mode across the +12V PCB pad and the nearest GND0 PCB pad.
- 6) Enable the input power supply.
- 7) Verify that output voltage is at +12V (with allowable tolerance of ±3%) with respect to GND0.
- 8) If required, vary the input voltage from 17V to 36V, and the load current from 0mA to 100mA and verify that output voltage is at +12V (with allowable tolerance of ±3%).

Detailed Description

The MAX17681AEVKITC 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 designed to provide an isolated power up to 3W. The EV kit generates either +15V, 200mA or +12V, 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 MAX17681A. The

V_{PR1} PCB pad helps measure the regulated primary output voltage (V_{PR1}). An additional RESE_T PCB pad is available for monitoring the health of primary output voltage (V_{PR1}). RESE_T is pulled low if FB voltage drops below 92.5% of its set value. RESE_T goes high 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_{PR1}) 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 MAX17681 IC data sheet. The MAX17651's output voltage setting, and related additional information, are detailed in MAX17651 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 diode (D1) is rated to carry the short-circuit current only for few 100's of ms and is not rated to carry the continuous short-circuit current.

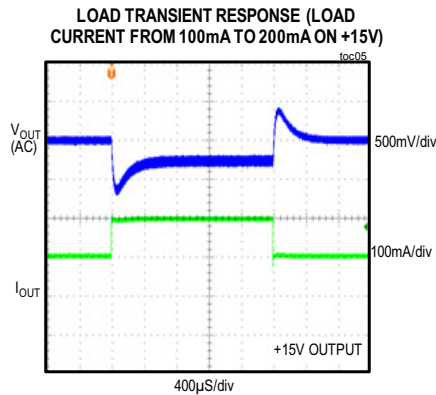
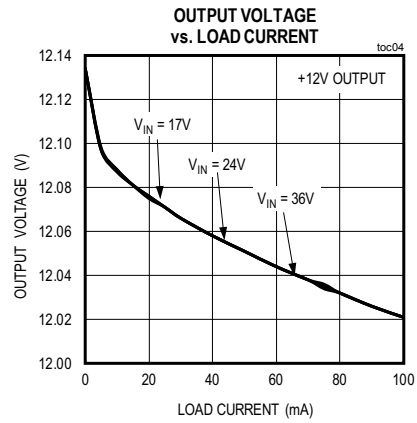
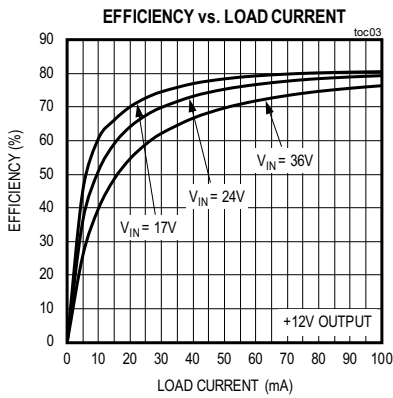
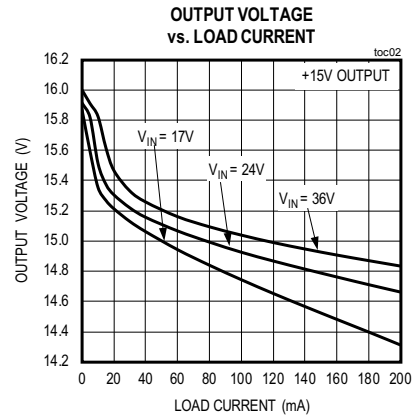
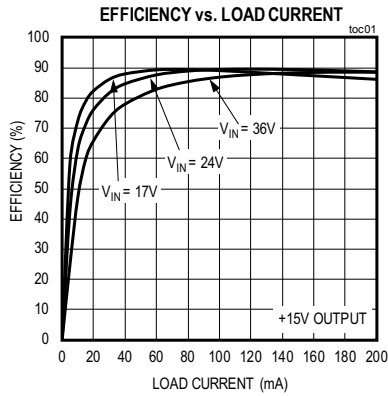
NOTE 2: The iso-buck converter typically needs 10% minimum load to regulate the output voltage. In this design, when the +15V rail is healthy, the U3 sinks the minimum load current required to regulate the output voltages within ±8% regulation.

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} ≥ 15.5V |

*Default position.

EV Kit Performance Report



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Component Suppliers

| SUPPLIER | WEBSITE |
|------------------|-------------------|
| Wurth Electronik | www.we-online.com |
| Murata Americas | www.murata.com |
| Panasonic Corp. | www.panasonic.com |

Note: Indicate that you are using the MAX17681A when contacting these component suppliers.

Ordering Information

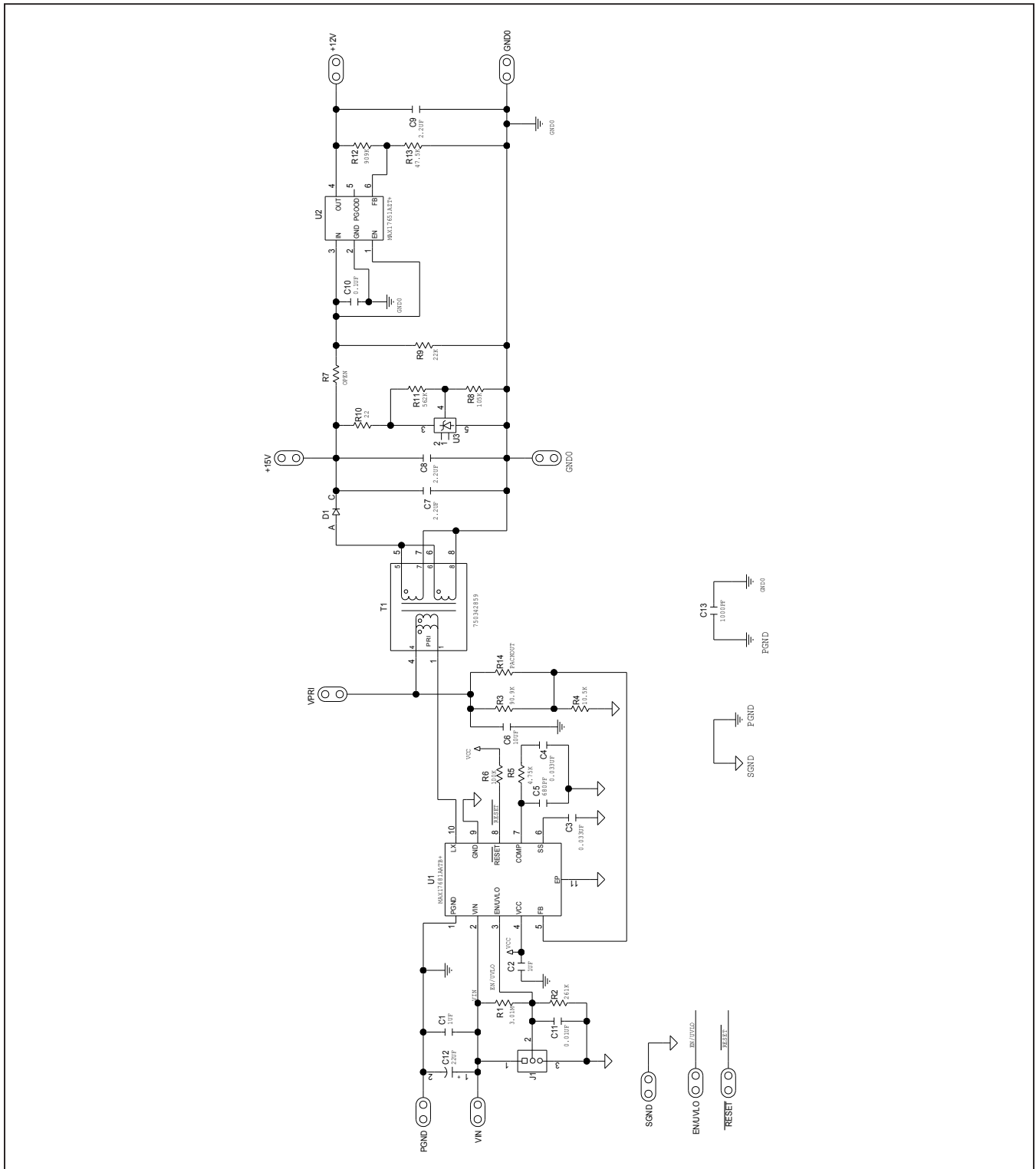
| PART | TYPE |
|------------------|-------|
| MAX17681AEVKITC# | EVKIT |

#Denotes RoHS compliant.

MAX17681A EV Kit Bill of Materials

| S NO | Designation | Qty | Description | Mfctr PN-1 | Mfctr PN-2 | Mfctr PN-3 | Mfctr PN-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,C4 | 2 | 0.033µF±10%, 25V, X7R ceramic capacitor (0402) | Murata GRM155R71E333KA88 | | | |
| 4 | C5 | 1 | 680pF±5%, 50V, COG ceramic capacitor (0402) | Murata GRM1555C1H681JA01 | VENKEL LTD C0402C0G500-681JNP | | |
| 5 | C6 | 1 | 10µF±10%, 16V, X7R ceramic capacitor (1206) | Murata GRM31CR71C106KAC7 | | | |
| 6 | C7, C8,C9 | 3 | 2.2µF±10%, 50V, X7R ceramic capacitor (1206) | Murata GRM31CR71H225KA88 | TAIYO YUDEN UMK316B7225K | | |
| 7 | C10 | 1 | 0.1µF±10%, 25V, X7R ceramic capacitor(0402) | Murata GRM155R71E104KE14 | | | |
| 8 | C11 | 1 | 0.01µF±10%, 50V, X7R ceramic capacitor (0402) | Murata GRM155R71H103KA88 | KEMET C0402C103K5RAC | | |
| 9 | C12 | 1 | 22µF, 20%, 50V, ALUMINUM ELECTROLYTIC CAPACITOR 6.60*6.60mm, | Panasonic EEEFK1H220P | | | |
| 10 | C13 | 1 | 1000pF±10%, 1500V, X7R ceramic capacitor (1206) | AVX 1206SC102KAT | | | |
| 11 | D1 | 1 | 200V/1A, PowerD®123 | Diode Inc. DFLS1200 | | | |
| 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 | 90.9K Ohm±1% resistor (0402) | PANASONIC ERJ-2RKF9092X | | | |
| 16 | R4 | 1 | 10.5kΩ ±1% resistor (0402) | PANASONIC ERJ-2RKF1052 | | | |
| 17 | R5 | 1 | 4.75kΩ ±1% resistor (0402) | VISHAY DALE CRCW04024K75FK | | | |
| 18 | R6 | 1 | 100kΩ ±5% resistor (0402) | PANASONIC ERJ-2GEJ104X | | | |
| 19 | R7 | 1 | OPEN (0402) | | | | |
| 20 | R8 | 1 | 105kΩ ±1% resistor (0402) | VISHAY DALE CRCW0402105KFK | | | |
| 21 | R9 | 1 | 22kΩ ±1% resistor (0402) | VISHAY DALE CRCW040222K0FK | | | |
| 22 | R10 | 1 | 22Ω ±1% resistor (0402) | VISHAY DALE CRCW040222R0FK | | | |
| 23 | R11 | 1 | 562kΩ ±1% resistor (0402) | VISHAY DALE CRCW0402562KFK | | | |
| 24 | R12 | 1 | 909kΩ ±1% resistor (0402) | VISHAY DALE CRCW0402909KFK | | | |
| 25 | R13 | 1 | 47.5kΩ ±1% resistor (0402) | VISHAY DALE CRCW04024752FK | VISHAY DALE 9C04021A4752FLHF3 | VISHAY DALE CRCW040247K5FK | |
| 26 | R14 | 1 | 0402 | PACKOUT | | | |
| 27 | T1 | 1 | EP10,8 pinSMT,50µH,1.4A,(6-7):(5-8):(4-1)=1.81:1.81:1 | WURTH ELECTRONICS INC. 750342859 | SUMIDA CEP1110-12387-T090 | | |
| 28 | U1 | 1 | MAX17681A TDFN10 3*2mm Iso buck DC-DC converter | MAX17681AATB+ | | | |
| 29 | U2 | 1 | MAX17651 TSOT LDO | MAX17651AZT+ | | | |
| 30 | U3 | 1 | Shunt regulator SOT25 | Diode Inc. TL431BW5 | | | |

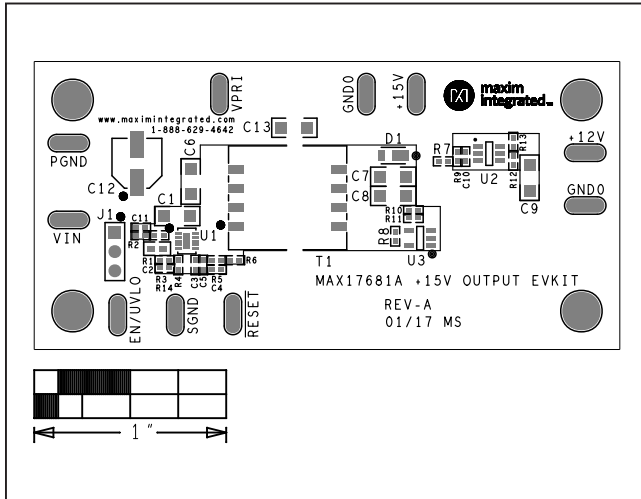
MAX17681A EV Kit System Schematic



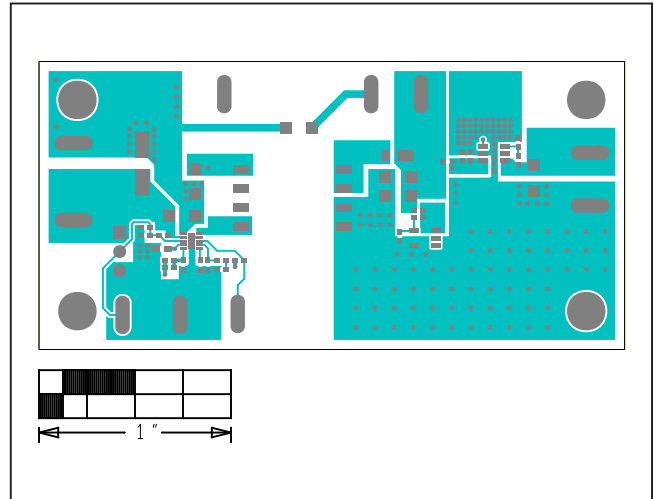
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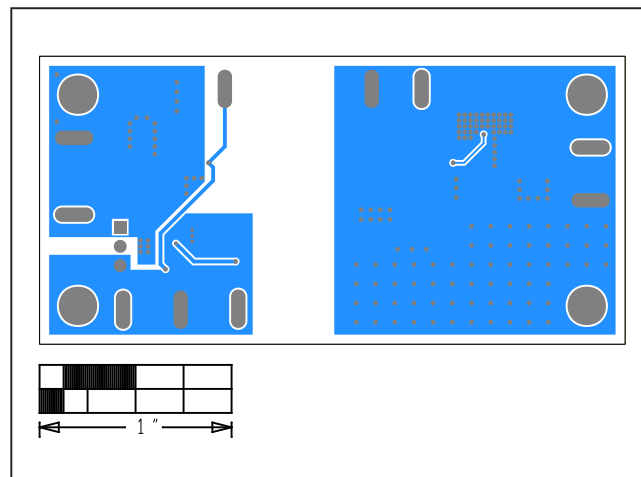
MAX17681A EV Kit System PCB Layout Diagrams



MAX17681A EV Kit—Top Silkscreen



MAX17681A EV Kit—Top



MAX17681A EV Kit—Bottom