

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 $\pm 7\text{V}$ 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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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 $\pm 15\text{V}$ or $\pm 7.5\text{V}$, 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 $\overline{\text{RESET}}$ PCB pad is available for monitoring the health of primary output voltage (V_{PRI}). $\overline{\text{RESET}}$ pulls low if FB voltage drops below 92.5% of its set value. $\overline{\text{RESET}}$ 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

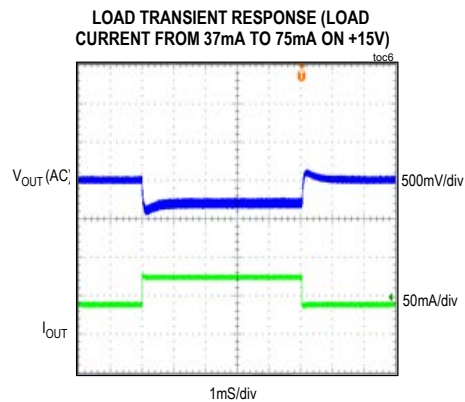
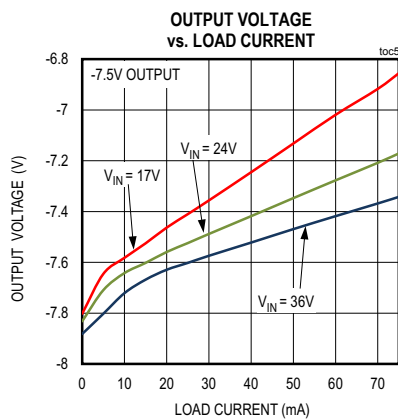
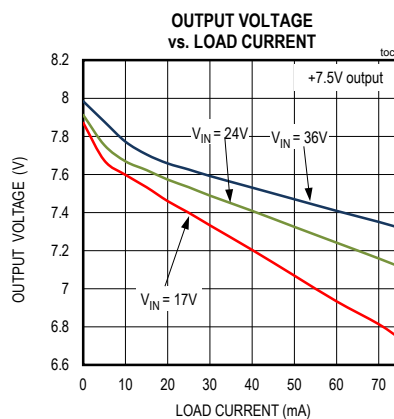
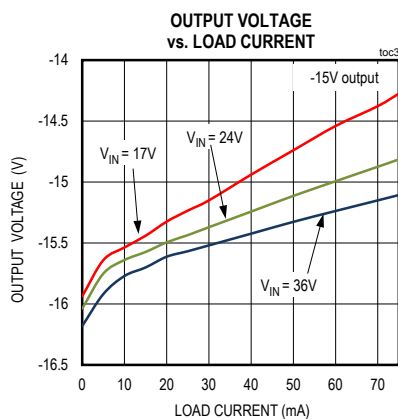
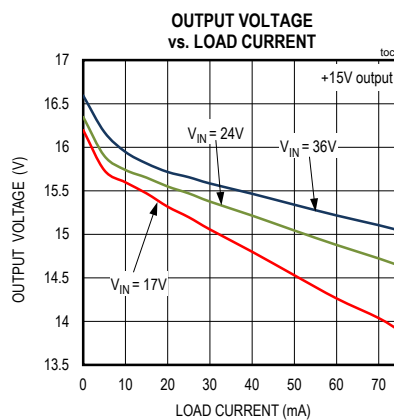
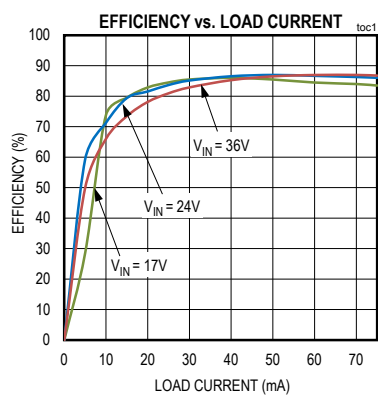
SHUNT POSITION	EN/UVLO PIN	VOUT OUTPUT
J1		
1-2	Connected to V_{IN}	Enabled
2-3	Connected to GND	Disabled
Open*	Connected to midpoint of R1, R2 resistor-divider	Enabled at $V_{IN} \geq 15.5\text{V}$

*Default position.

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EV Kit Performance Report



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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 MAX17681A when contacting these component suppliers.

Ordering Information

PART	TYPE
MAX17681AEVKITE#	EVKIT

#Denotes RoHS compliant.

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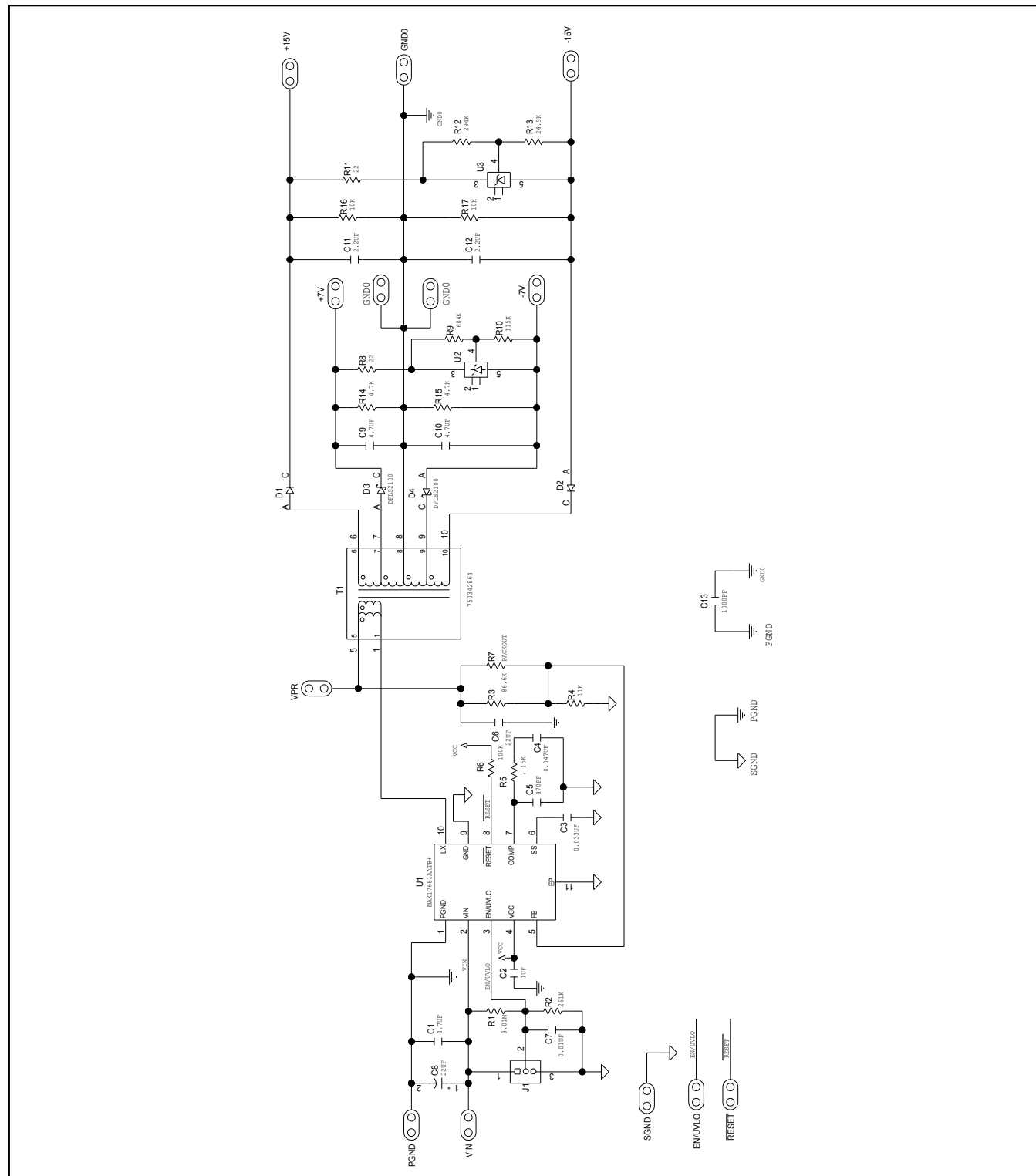
MAX17681A EV Kit Bill of Materials

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	KEMET C0603C105K4RAC	TDK C1608X7R1C105K	TAIYO YUDEN EMK107B7105KA
3	C3	1	0.033µF±10%, 25V, X7R ceramic capacitor (0402)	Murata GRM155R71E333KA88			
4	C4	1	0.047µF±10%, 25V, X7R ceramic capacitor (0402)	TDK C1005X7R1E473K	Murata GRM155R71E473K		
5	C5	1	470pF±5%, 50V, COG ceramic capacitor (0402)	Murata GCM1555C1H471JA16	KEMET GRM1555C1H471JA01		
6	C6	1	22µF±10%, 25V, X5R ceramic capacitor (1206)	Murata GRM31CR61E226K			
7	C7	1	0.01µF±10%, 50V, X7R ceramic capacitor (0402)	Murata GRM155R71H103KA88	KEMET C0402C103K5RAC		
8	C8	1	22µF, 20%, 50V, ALUMINUM ELECTROLYTIC CAPACITOR	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	1000pF±10%, 1500V, X7R ceramic capacitor (1206)	AVX 1206SC102KAT			
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 CRCW0402261KFK			
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			
27	R14,R15	2	4.7KΩ ±5% resistor (0603)	CRCW040224K9FKEDHP			
28	R16,R17	2	10KΩ ±5% resistor (0603)	PANASONIC ERJ-3GEYJ47ZV	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			

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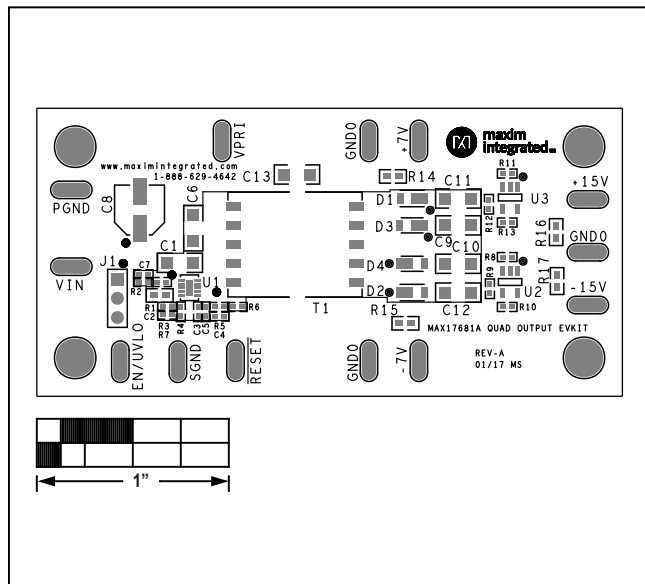
MAX17681A EV Kit Schematic



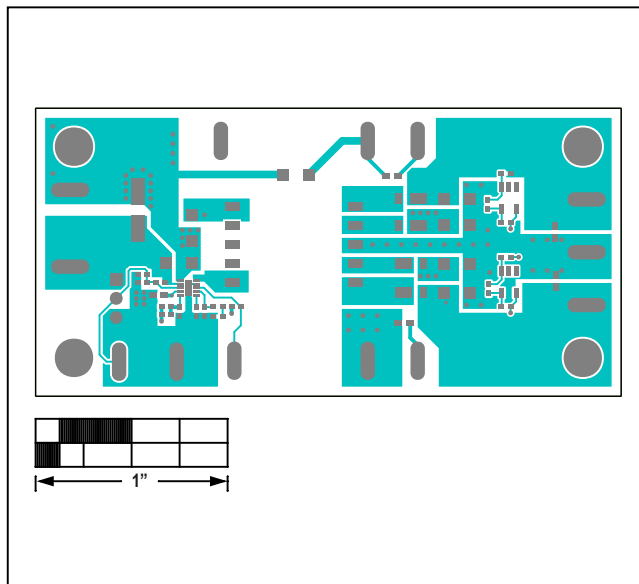
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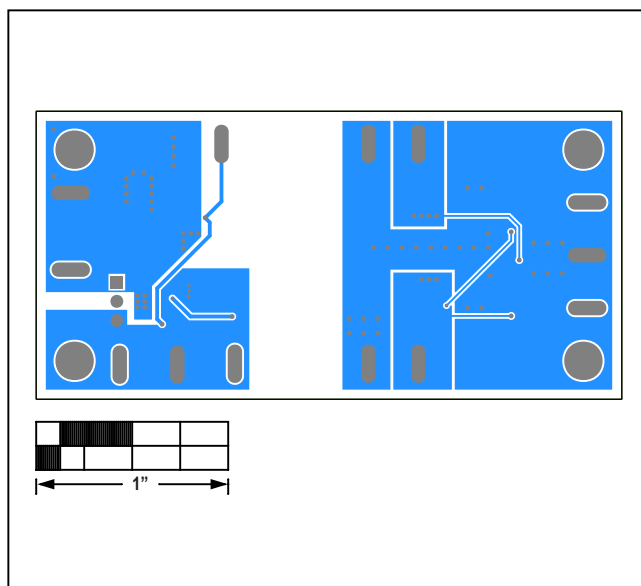
MAX17681A EV Kit PCB Layout Diagrams



MAX17681A EV Kit—Top Silkscreen



MAX17681A EV Kit—Top



MAX17681A EV Kit—Bottom

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Revision History

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

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