MAX17681 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 ±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–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 V_{IN} 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 ±8%) 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 +24V (with allowable tolerance of ±8%).

19-8438; Rev 1; 4/16

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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 primary output voltage (V_{PRI}). $\overline{RESET}$ is pulled 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 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 V_{OUT}. See Table 1 for proper J1 configurations.

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

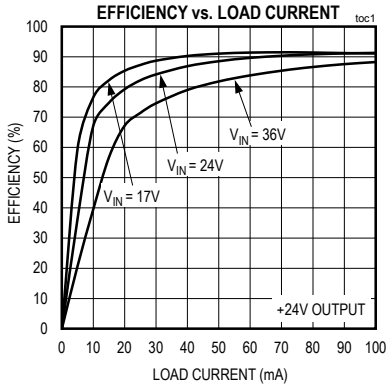
NOTE 2: The iso-buck converter typically needs 10% minimum load to regulate the output voltage. In this design when the +24V rail is healthy, the U2 sinks the minimum load current required to regulate the output voltages within ±8% regulation.

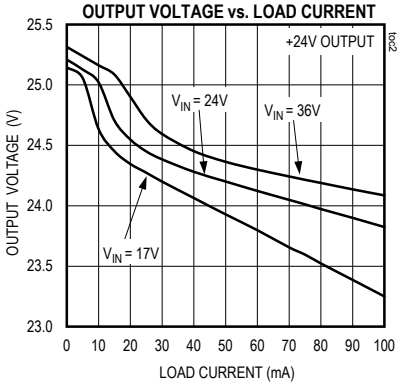
Table 1. Enable Control (EN/UVLO) (J1) Jumper Settings

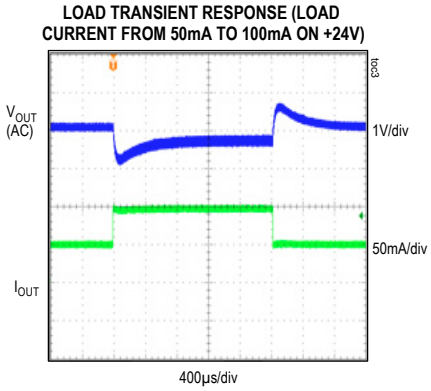
SHUNT POSITION	EN/UVLO PIN	V_{OUT}
J1		
1-2	Connected to V_{IN}	Always Enabled
2-3	Connected to GND	Always Disabled
Open*	Connected to midpoint of R1, R2 resistor-divider	Enabled at $V_{IN} \geq 15.5V$

**Default position.*

EV Kit Performance Report







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 MAX17681 when contacting these component suppliers.*

Component Information, PCB Layout, and Schematic

See the following links for component information, PCB layout diagrams, and schematic.

- **MAX17681F EV BOM**
- **MAX17681F EV PCB Layout**
- **MAX17681F EV Schematic**

Ordering Information

PART	TYPE
MAX17681EVKITF#	EVKIT

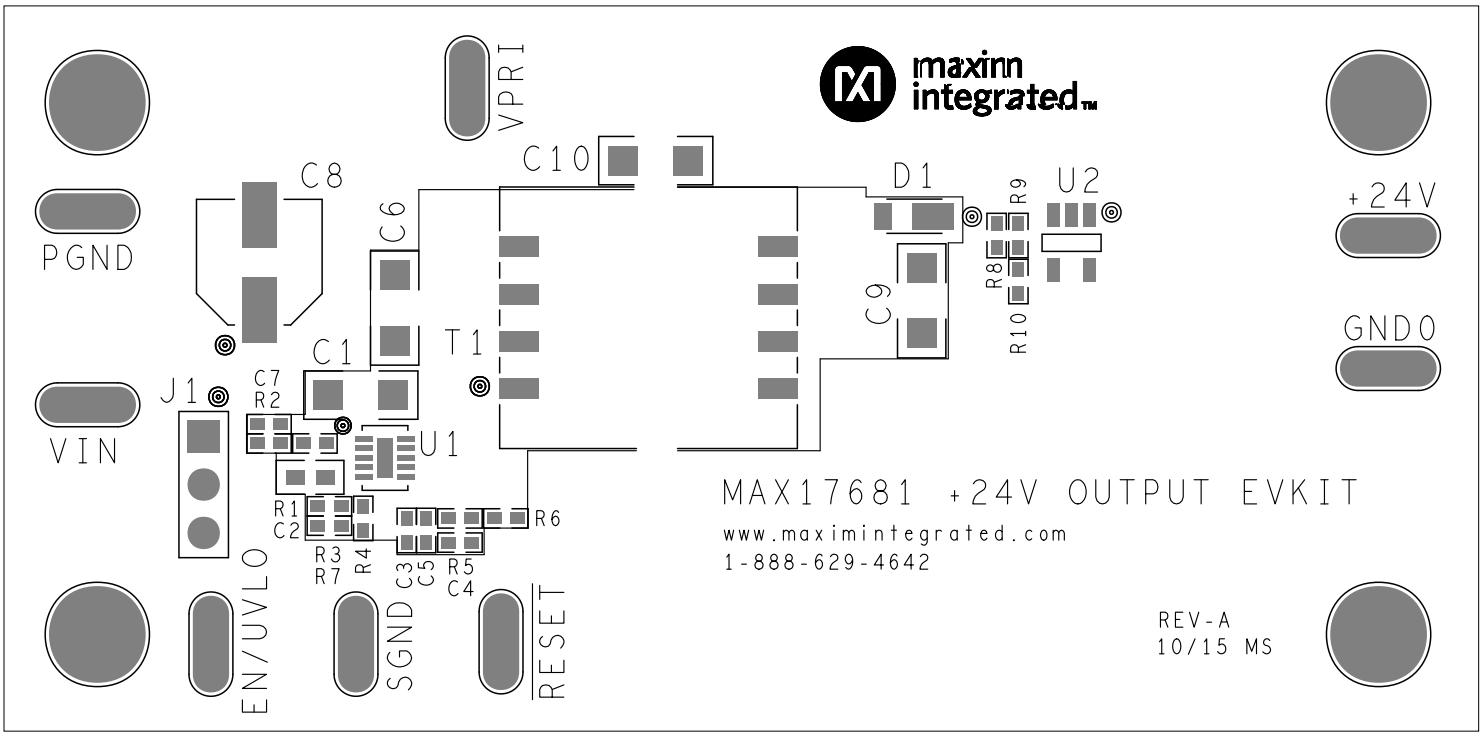
#Denotes RoHS compliant.

Revision History

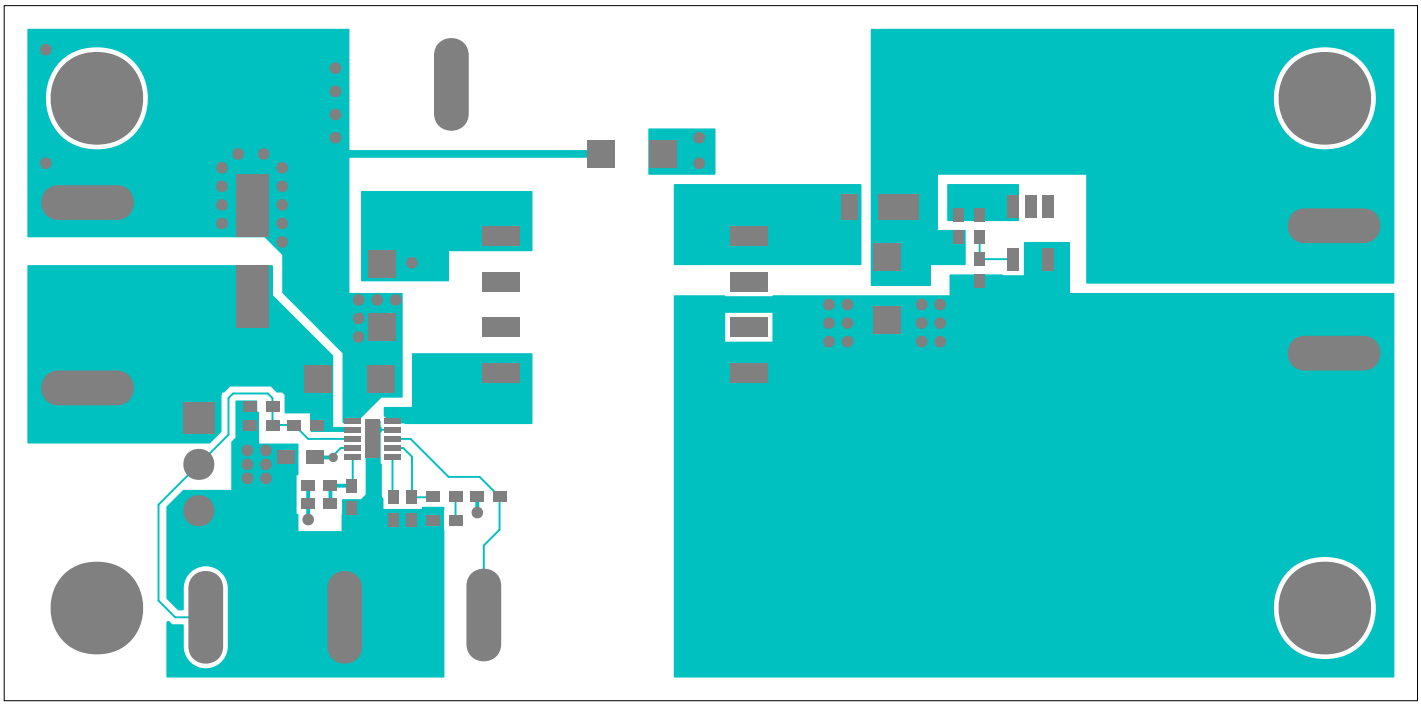
REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/16	Initial release	—
1	4/16	Updated *General Description* section and *Bill of Materials*	1–2

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	0.033UFnF±10%,25V, X7R ceramic capacitor (0402)	Murata GRM155R71E333KA88			
4	C4	1	0.082UFnF±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	10uF±10%,16V, X7R ceramic capacitor (1206)	Murata GRM31CR71C106KAC7			
7	C7	1	0.01uF±10%, 50V, X7R ceramic capacitor (0402)	Murata GRM155R71H103KA88	KEMET C0402C103K5RAC		
8	C8	1	22uF, 20%, 50V, ALUMINUM ELECTROLYTIC CAPACITOR 6.60*6.60mm,	Panasonic EEEFK1H220P			
9	C9	1	2.2uF±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	100V/1A, PowerDI®123	Diode Inc. DFLS1100-7			
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-2GEJ104X			
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, (5-8):(4-1)=2.4:1	WURTH ELECTRONICS INC. 750342860			
24	U1	1	MAX17681 TDFN10 3*2mm Iso buck DC-DC converter	MAX17681ATB+			
25	U2	1	Shunt regulator SOT25	Diode Inc. TL431BW5			



TOP SILKSCREEN



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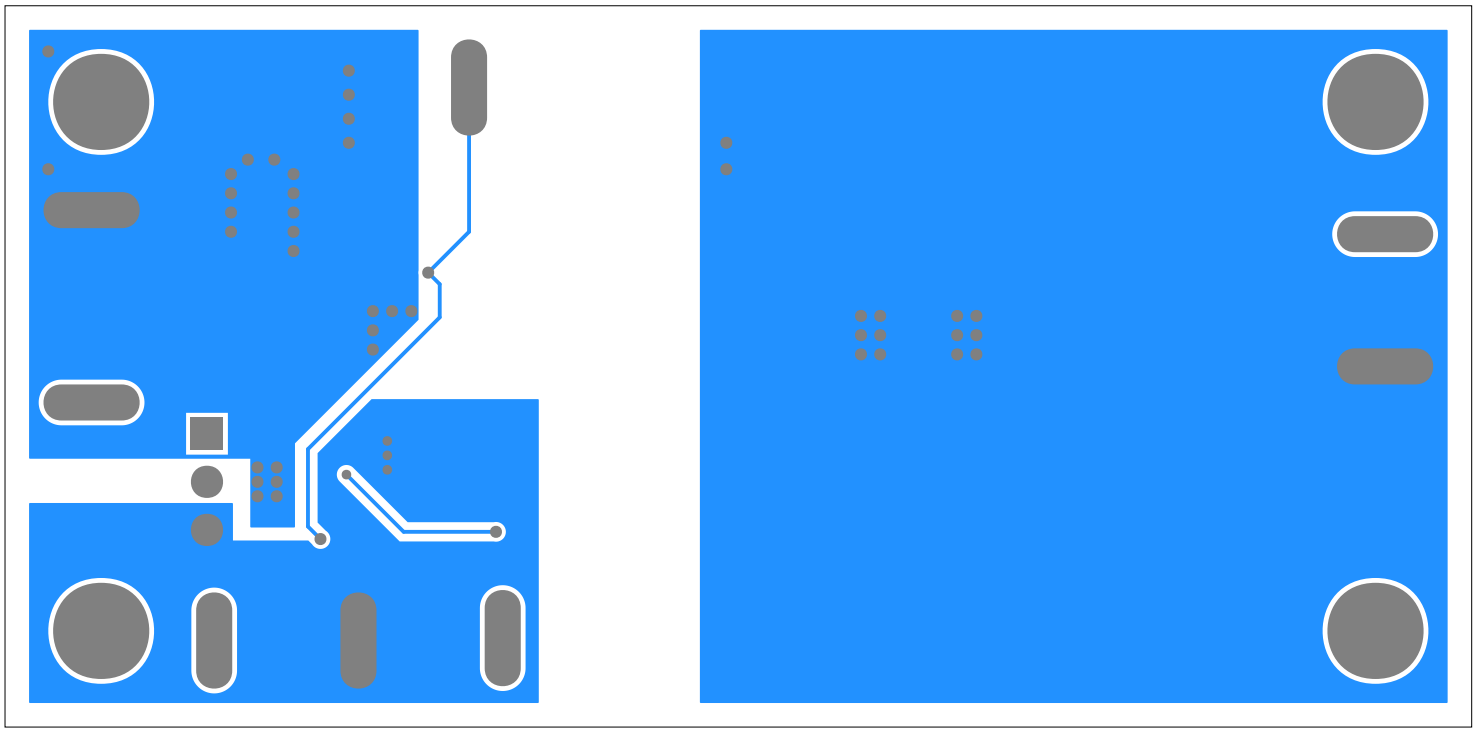
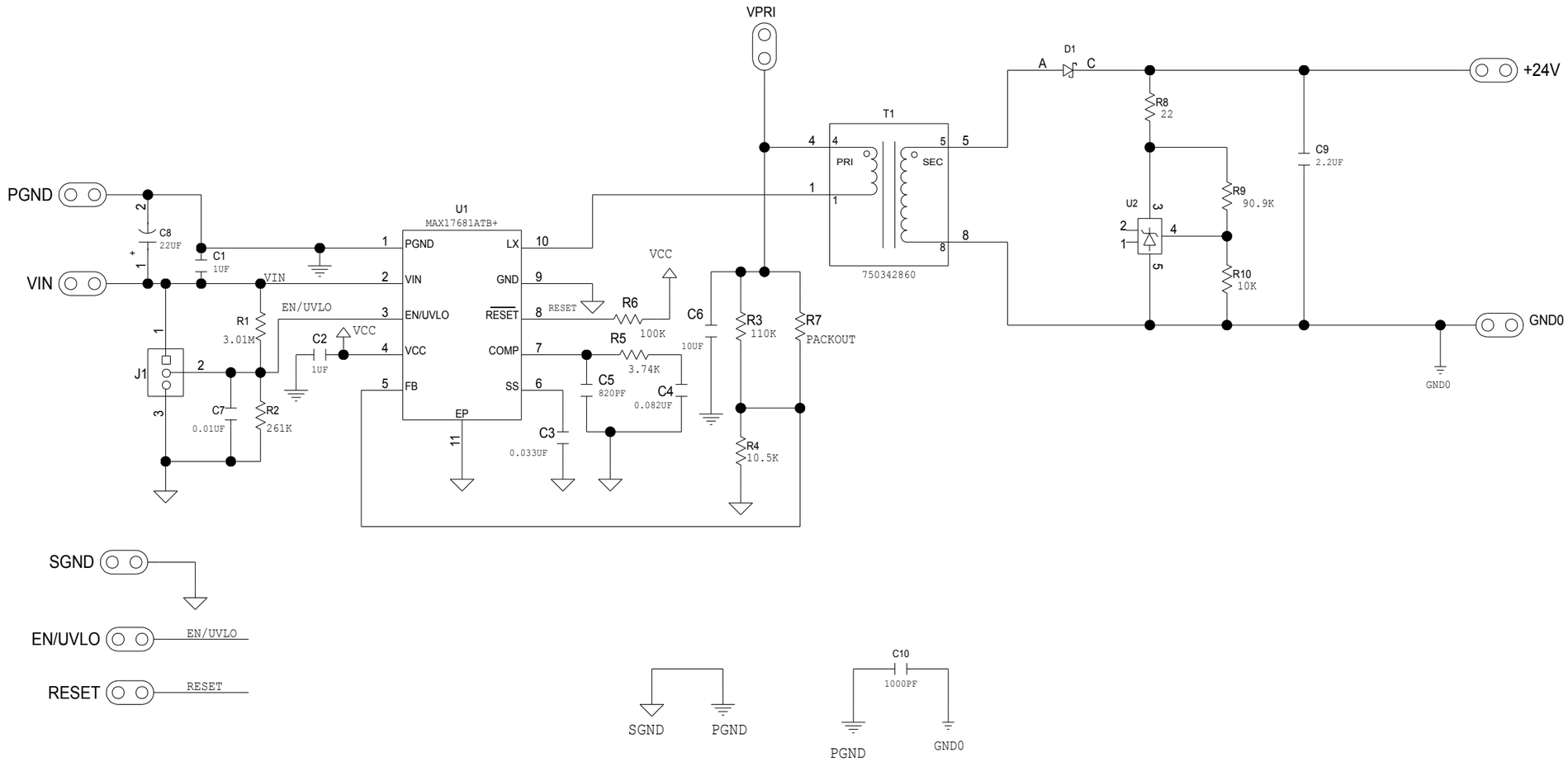


BOTTOM


VPRI
PGND
VIN
SGND
EN/UVLO
RESET
U1
MAX17681ATB+
PGND
VIN
EN/UVLO
VCC
FB
LX
GND
RESET
COMP
SS
EP
C8
22UF
C1
1UF
C2
1UF
C7
0.01UF
C3
0.033UF
C5
820PF
C4
0.082UF
C6
10UF
R1
3.01M
R2
261K
R3
110K
R4
10.5K
R5
3.74K
R6
100K
R7
PACKOUT
J1
T1
PRI
SEC
750342860
D1
A
C
R8
22
R9
90.9K
R10
10K
U2
C9
2.2UF
+24V
GND0
C10
1000PF