MAX17681 Evaluation Kit

Evaluates: MAX17681 for Isolated ±15V and ±7.5V Output Configuration

General Description

The MAX17681E 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. 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 ±15V, 75mA each and ±7.5V, 75mA each with ±10% 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
- ±15V, 75mA Each and ±7.5V, 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

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 ±15V PCB pads and the nearest GND0 PCB pad. Also, connect another two DMMs configured in voltmeter mode across the ±7 PCB pads and the nearest GND0 PCB pad.
7) Enable the input power supply.
8) Verify that output voltages are at ±15V and ±7.5V (with allowable tolerance of ±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 ±15V and ±7.5V.

19-7669; Rev 0; 5/16

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Detailed Description

The MAX17681E 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 3.4W. The EV kit generates either ±15V or ±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 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}). $\overline{RESET}$ 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.

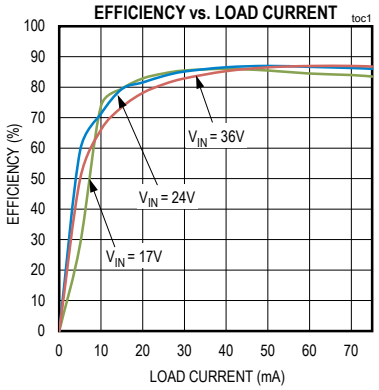
NOTE 2: The iso-buck converter typically needs 10% minimum load to regulate the output voltage. In this design when the +24V rail is healthy, the U2, U3 sinks the minimum load current required to regulate the output voltages within ±10% regulation.

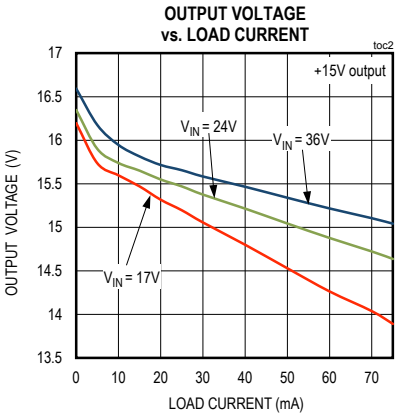
Table1. Enable Control (EN/UVLO) (J1) Jumper Settings

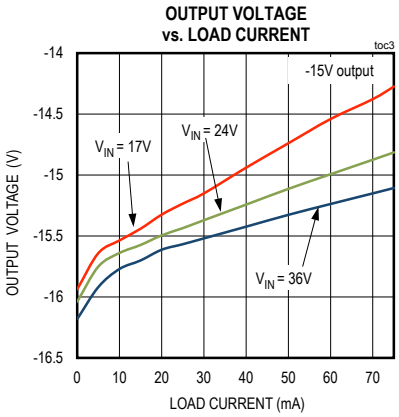
SHUNT POSITION	EN/UVLO PIN	VOUT OUTPUT
J1		
1-2	Connected to V_{IN}	Enabled
2-3	Connected to GND	Disabled
Open*	Connected to midpoint of R1, R2 resistor-divider	Enabled at $V_{IN} \geq 15.5V$

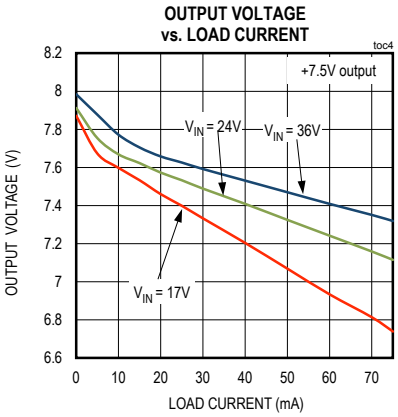
**Default position.*

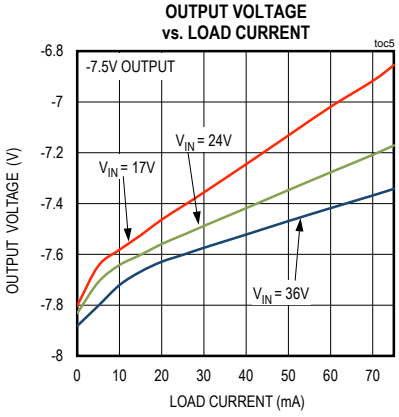
EV Kit Performance Report

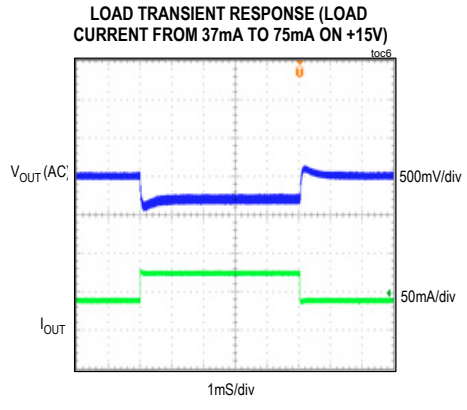












Component Suppliers

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.

- **MAX17681E EV BOM**
- **MAX17681E EV PCB Layout**
- **MAX17681E EV Schematic**

Ordering Information

PART	TYPE
MAX17681EVKITE#	EVKIT

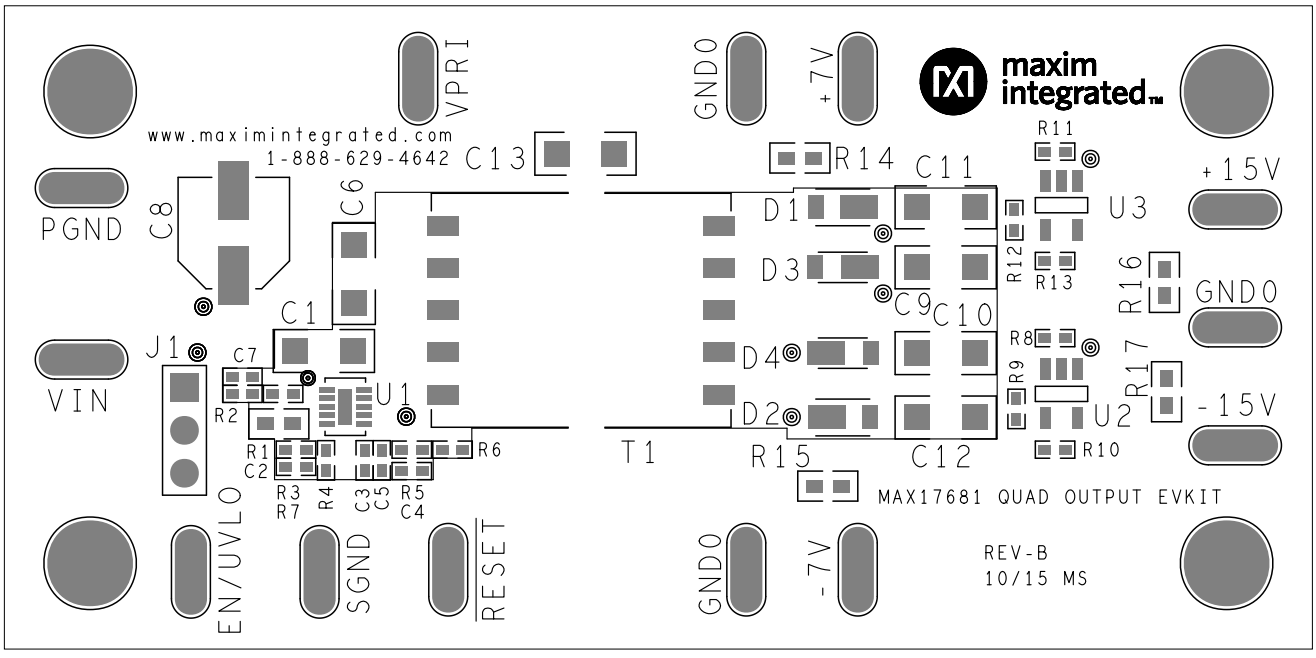
#Denotes RoHS compliant.

Revision History

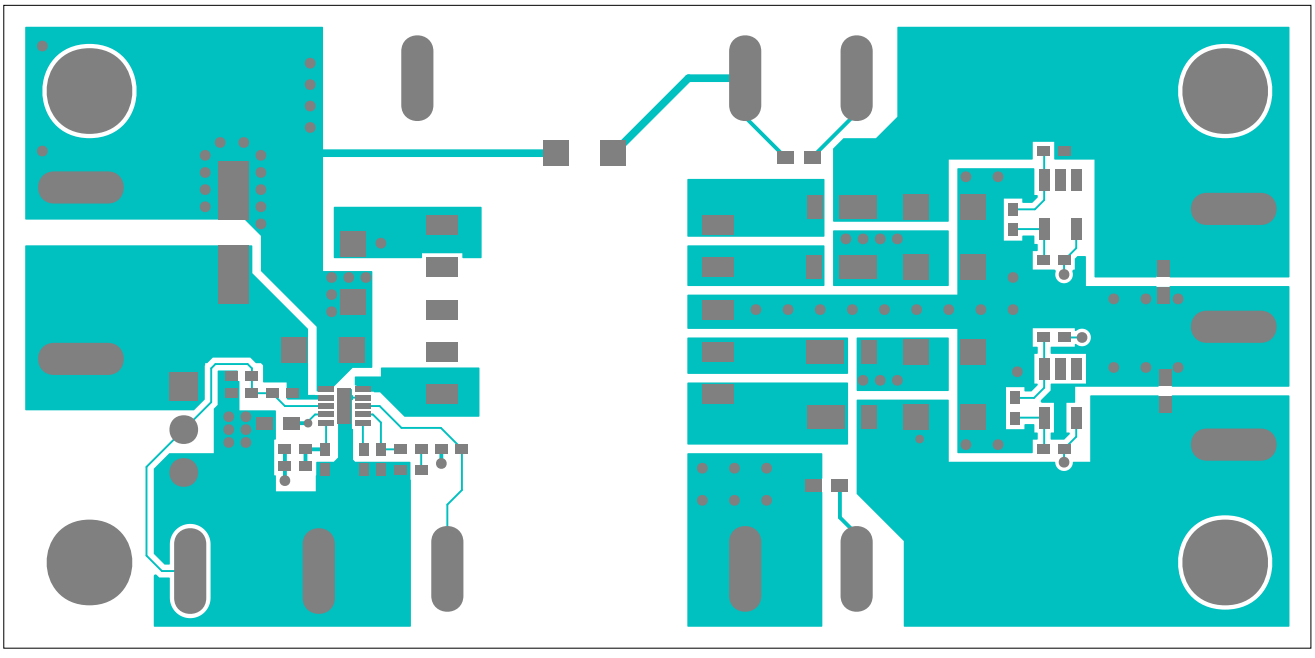
REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/16	Initial release	—

S NO	Designation	Qty	Description	Mfg Part #1	Mfg Part #2	Mfg Part #3	Mfg Part #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	0.033µFnF±10%,25V, X7R ceramic capacitor (0402)	Murata GRM155R71E333KA88			
4	C4	1	0.047µFnF±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 6.60*6.60mm,	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	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 CRCW040224K9FKEDHP			
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, 50μ,(5-1):(6-7) :(7-8):(8-9):(9-10)=1:1	WURTH ELECTRONICS INC 750342864			
30	U1	1	MAX17681 TDFN10 3*2mm Iso buck DC-DC converter	MAX17681ATB+			
31	U2,U3	2	Shunt regulator SOT25	DIODES INCORPORATED TL431BW5			



TOP SILKSCREEN



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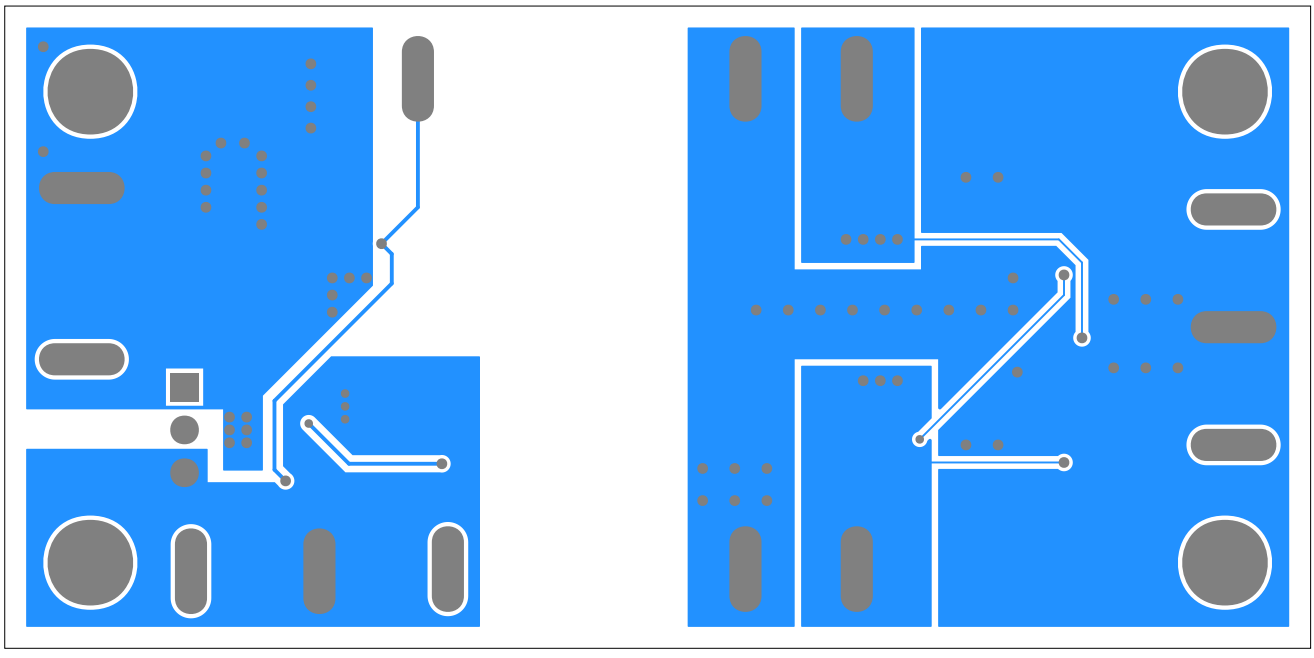

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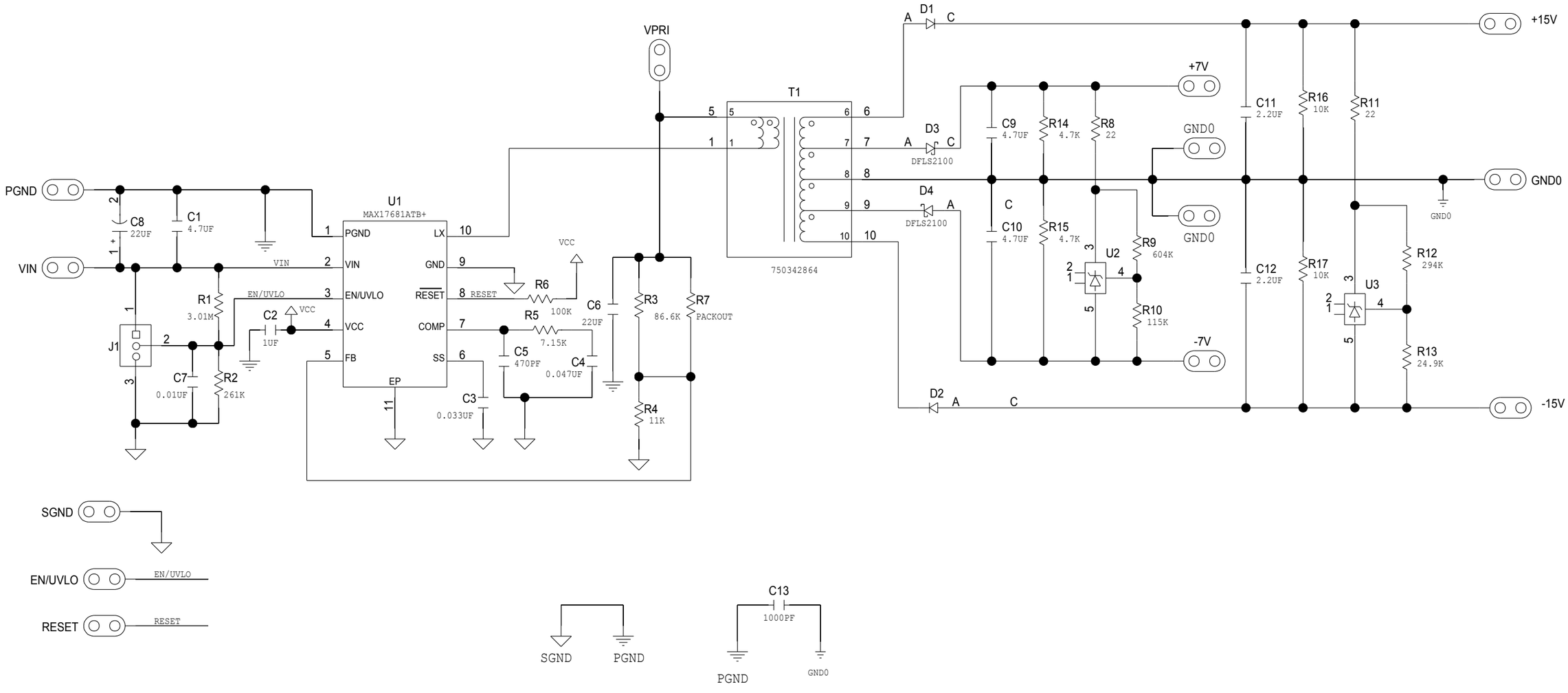
PGND
VIN
C8
22UF
C1
4.7UF
U1
MAX17681ATB+
PGND
VIN
EN/UVLO
VCC
FB
EP
LX
GND
RESET
COMP
SS
VPRI
T1
750342864
D1
D3
DFLS2100
D4
DFLS2100
D2
+15V
+7V
GND0
-7V
-15V
C9
4.7UF
C10
4.7UF
C11
2.2UF
C12
2.2UF
R14
4.7K
R15
4.7K
R8
22
R9
604K
R10
115K
R16
10K
R17
10K
R11
22
R12
294K
R13
24.9K
U2
U3
R1
3.01M
R2
261K
C7
0.01UF
C2
1UF
J1
R6
100K
R5
7.15K
C6
22UF
C5
470PF
C4
0.047UF
C3
0.033UF
R3
86.6K
R7
PACKOUT
R4
11K
SGND
EN/UVLO
RESET
C13
1000PF