MAX17682 Evaluation Kit D

Evaluates: MAX17682 for Isolated ±15V Dual-Output Configuration

General Description

The MAX17682 EV kit is a fully assembled and tested circuit board that demonstrates the performance of the MAX17682 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 voltages. The EV kit has isolated dual output voltages programmed to ±15V at 150mA, along with a primary regulated +5V output voltage at 1A, with 10% output voltage regulation.

The EV kit comes installed with the MAX17682 in a 20-pin (4mm x 4mm) TDFN package.

Features

- 17V to 36V Input Voltage Range
- ±15V,150mA; +5V, 1A Continuous Current
- EN/UVLO Input
- 200kHz Switching Frequency
- 93% Peak Efficiency
- Overcurrent Protection
- No Optocoupler
- Delivers up to 10W Output Power
- Overtemperature Protection
- Proven PCB layout

***Ordering Information* appears at end of data sheet.**

Quick Start

Recommended Equipment

- One 15V - 60V DC, 1A Power Supply
- One resistive load of 5Ω,1A and two resistive loads of 100Ω,150mA sink capacity
- Three Digital Multimeters (DMM)

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

Procedure

1) Verify that J1 is open and J2 is connected to GND.
2) Set the power supply output to 24V. Disable the power supply.
3) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest PGND PCB pad.
4) Connect one DMM configured in voltmeter mode across the +5V PCB pad and the nearest PGND PCB pad, and two DMMs across the ±15V PCB pad and the corresponding nearest GND0 PCB pads.
5) Connect a 1A resistive load across the +5V PCB pad and the nearest PGND PCB pad, and two 150mA resistive loads across the ±15V PCB pads and the corresponding nearest GND0 PCB pad.
6) Enable the input power supply.
7) Verify that the secondary output voltage is at ±15V (with allowable tolerance of 10%) with respect to GND0 and the primary output voltage is +5V with respect to PGND.
8) If required, vary the input voltage from 17V to 36V, the primary load current form 100mA to 1A and the secondary load current from 15mA to 150mA, and verify that the output voltages are within the tolerance limit.

319-100185; Rev 0; 4/18

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Detailed Description

The MAX17682EVKITD evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX17682 high-efficiency, iso-buck, DC-DC converter designed to provide an isolated power up to 10W. The EV kit generates isolated dual output of ±15 V, 150mA and a primary output of +5V, 1A from a 17V to 36V input supply. The EV kit features a forced-PWM control scheme that provides constant switching-frequency of 200 kHz 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 MAX17682. The VPRI PCB pad helps measure the regulated primary output voltage (V_{PRI}). An additional RESETB PCB pad is available for monitoring the health of primary output voltage (V_{PRI}). RESETB pulls low if FB voltage drops below 92%(typ) of its set value and RESETB goes high impedance 1024 clock cycles after FB voltage rises above 95% 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 opto-coupler. 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 MAX17682 IC data sheet.

This EV Kit is protected against accidental primary and secondary output short-circuit conditions. When a short-circuit fault occurs at any of the secondary isolated output terminals, the condition induces a negative current in the primary winding of the transformer, which eventually causes the current to hit the negative current limit in MAX17682. The part enters hiccup mode after 16 consecutive events of hitting a negative current limit. If the short circuit happens across the primary output terminals, the MAX17682 enters HICCUP mode either when the high-side switch current hits runaway current limit or when the FB-pin voltage goes below 0.58V. In either case, the part attempts to recover after 32,768 clock cycles.

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 J1configures the EV kit's output for turn-on/turn-off control. Install a shunt across jumper J1 pins 2-3 to disable VOUT. See Table 1 for J1 jumper configurations.

External Synchronization (J2)

The SYNC pin on the device allows synchronization to an external clock. Jumper J2 configures the frequency of operation of the EV kit by selecting the internal clock with frequency decided by the RT resistor value or the external clock to synchronize. See Table 2 for J2 jumper configurations.

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

SHUNT POSITION	EN/UVLO PIN	V_{OUT} OUTPUT
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} ≥ 15V

**Default position.*

Table 2. External Synchroniztaion (SYNC) (J2) Jumper Settings

SHUNT POSITION	SYNC PIN	CLOCK FREQUENCY
1-2	Connected to SYNC	Uses external clock
2-3*	Connected to GND	Uses Internal clock set according to RT resistor
Open	Unconnected	Not recommended

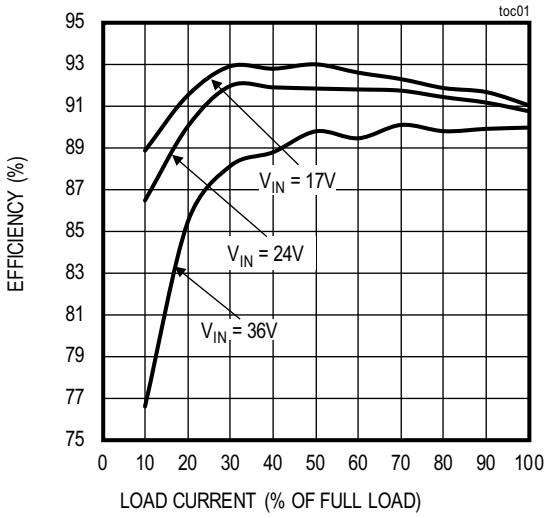
**Default position.*

Note 1: *The secondary output diodes are rated to carry short-circuit current only for few hundredths of a millisecond and are not rated to carry the continuous short-circuit current.*

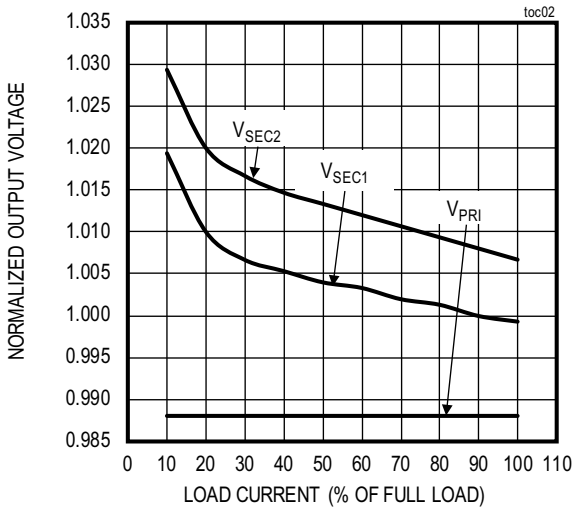
Note 2: *The iso-buck converter typically needs 10% minimum load to regulate the output voltage. In this design when the ±15V rails are healthy, U2 sinks the minimum load current required to regulate the output voltages within ±10% regulation.*

EV Kit Performance Report

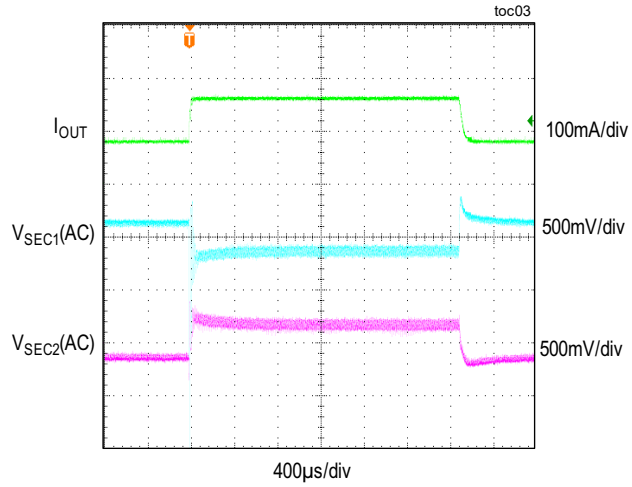
EFFICIENCY vs. LOAD CURRENT



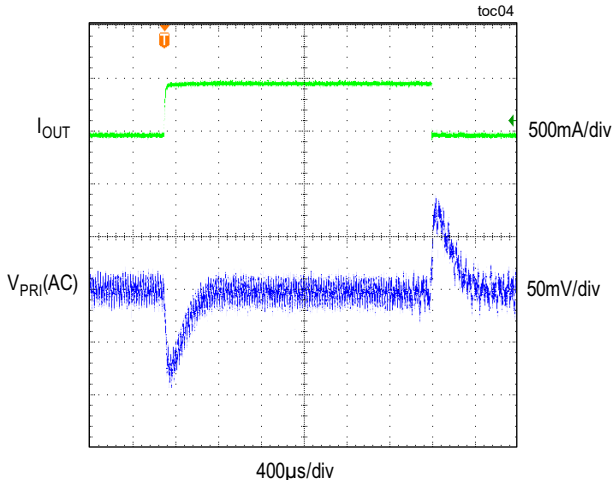
OUTPUT VOLTAGE vs. LOAD CURRENT



SECONDARY LOAD TRANSIENT RESPONSE (LOAD CURRENT STEPPED FROM 75mA TO 150mA)

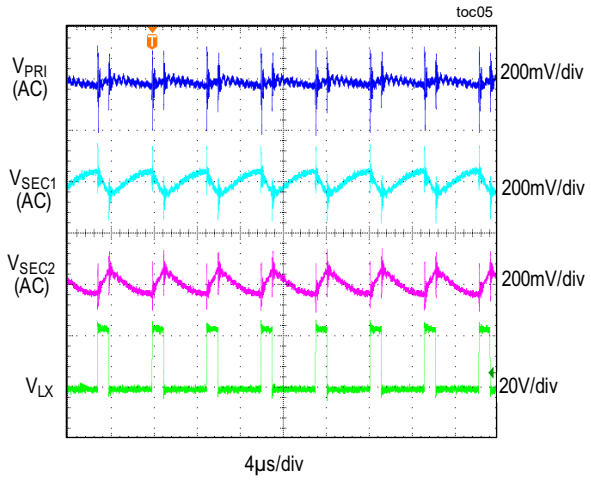


PRIMARY LOAD TRANSIENT RESPONSE (LOAD CURRENT STEPPED FROM 500mA TO 1A)

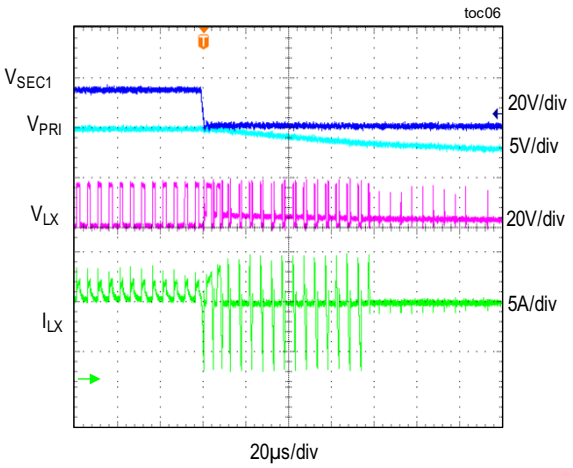


EV Kit Performance Report (continued)

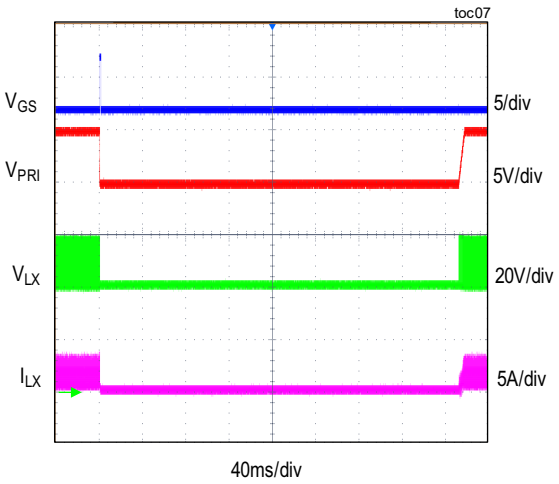
FULL LOAD SWITCHING WAVEFORMS



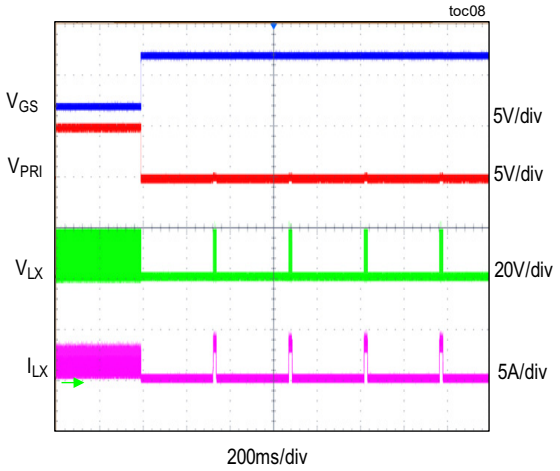
OUTPUT SHORT WAVEFORMS



RECOVERY AFTER MOMENTARY OUTPUT SHORT



PERMANANT OUTPUT SHORT WAVEFORMS



Component Suppliers

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

Note: *Indicate that you are using the MAX17682 when contacting these component suppliers.*

Ordering Information

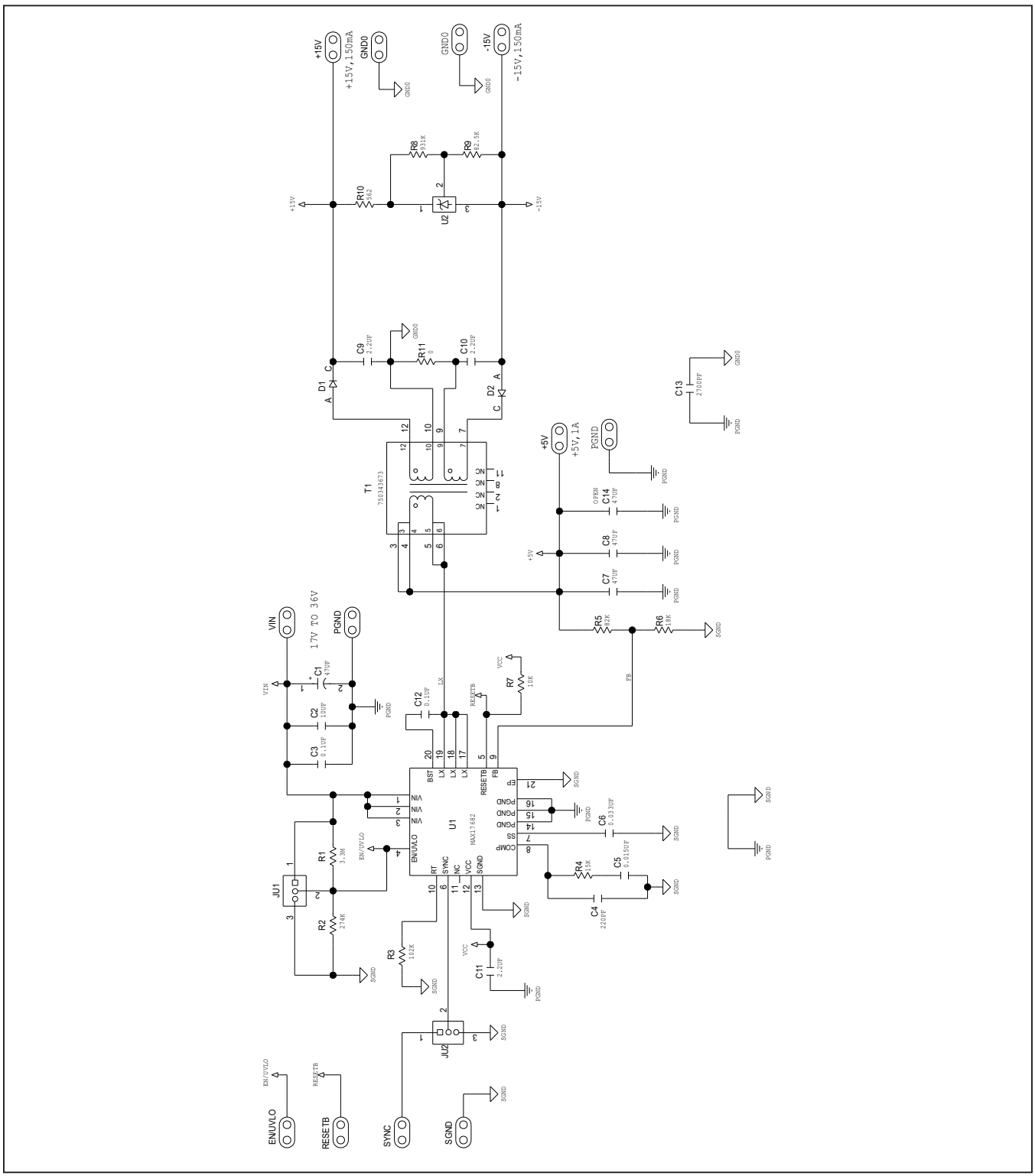
PART	TYPE
MAX17682EVKITD#	EVKIT

#Denotes RoHS compliant.

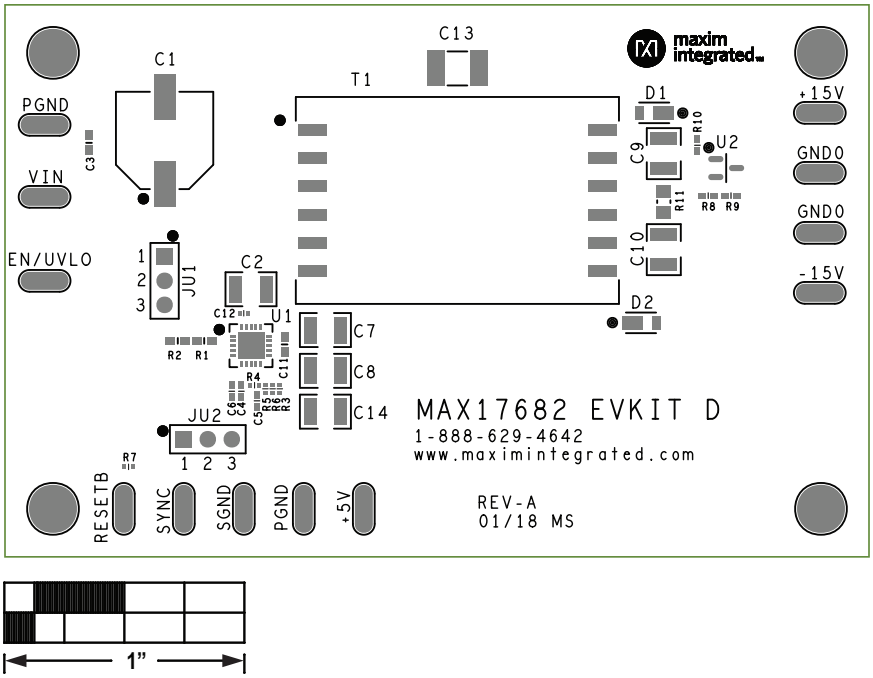
MAX17682 EV Kit D Bill of Materials

S. No.	Designation	Qty	Description	Maufacturer Par#1	Maufacturer Par#2
1	C1	1	47µF±20%, 80V, Aluminium electrolytic cappacitor	PANASONIC EEE-FK1K470P	
2	C2	1	10µF±10%, 50V X7R ceramic capacitor(1210)	MURATA GRM32ER71H106KA12L	SAMSUNG ELECTRONICS CL32B106KBJNNN
3	C3	1	0.1µF±10%, 100V X7R ceramic capacitor(0603)	MURATA GRM188R72A104KA35	TDK CC0603KRX7R0BB104
4	C4	1	470pF±5%, 25V X7R ceramic capacitor(0402)	KEMET C0402C393K3RAC7867	
5	C5	1	0.039µF±10%, 25V X7R cermaic capacitor(0402)	YAGEO AC0402KRX7R8BB471	
6	C6	1	.033µF±10%, 25V X7R ceramic capacitor(0402)	MURATA GRM155R71E333KA88	
7	C7, C8	2	47µF±10%, 10V X7R ceramic capacitor(1210)	MURATA GRM32ER71A476KE15	
8	C9, C10	2	2.2µF±10%, 25V X7R ceramic capacitor(1210)	MURATA GRM32RR71E225KC01L	
9	C11	1	2.2µF±20%, 10V X7R ceramic capacitor(0603)	MURATA GRM188R71A225ME15	
10	C12	1	0.1µF±10%, 16V X7R ceramic capacitor(0402)	TDK C1005X7R1C104K050BC	AMERICAN TECHNICAL CERAMICS ATC530L104KT16
11	C13	1	2700pF±10%, 3kV X7R ceramic capacitor(1812)	AVX 1812HC272KAZ1A	
12	C14	0	47µF±10%, 10V X7R ceramic capacitor(1210)	MURATA GRM32ER71A476KE15	
13	D1, D2	2	Diode, 400V/1A, SMT	DIODES INCORPORATED DFLU1400	
14	R1	1	3.3MΩ±1% resistor(0603)	VISHAY DALE CRCW06033M30FK	
15	R2	1	274kΩ±1% resistor(0603)	PANASONIC ERJ-3EKF2743V	
16	R3	1	102kΩ±1% resistor(0402)	VISHAY DALE CRCW0402102KFK	
17	R4	1	4.42kΩ±1% resistor(0402)	PANASONIC ERJ-2RKF4421X	
18	R5	1	82kΩ±1% resistor(0402)	VISHAY DALE CRCW040282K0FK	ROHM MCR01MZPF8202
19	R6	1	18kΩ±1% resistor(0402)	VISHAY DALE CRCW040218K0FK	
20	R7	1	10kΩ±1% resistor(0402)	VISHAY DALE CRCW040210K0FK	YAGEO PHICOMP RC0402FR-0710K
21	R8	1	931kΩ±1% resistor(0402)	VISHAY DALE CRCW0402931KFK	
22	R9	1	82.5kΩ±1% resistor(0402)	VISHAY DALE CRCW040282K5FK	BOURNS CR0402-FX-8252GLF
23	R10	1	562Ω±1% resistor(0402)	PANASONIC ERJ-2RKF5620X	
24	R11	1	0Ω±1% resistor(0805)	VISHAY DALE CRCW080500000ZS	PANASONIC ERJ-6GEY0R00V
25	T1	1	EVKIT PART-TRANSFORMER; SMT-12; 3.2:1	WURTH ELECTRONICS INC 750343673	
26	U1	1	MAX17682 TQFN10 4*4mm Iso buck DC-DC converter	MAXIM MAX17682	
27	U2	1	Shunt regulator SOT-23	DIODES INCORPORATED TL431BSA	
28	JU1, JU2	2	Jumper Headers	SULLINS ELECTRONICS CORP. PEC03SAAN	
29	SU1, SU2	2	Jumper pins	SULLINS ELECTRONICS CORP. STC02SYAN	
30	VIN, +5V, +15V, -15V, GND0, PGND, SGND, SYNC, PGND1, GND0_1, RESETB, EN/UVLO	12	Test Loops	WEICO WIRE 9020 BUSS	

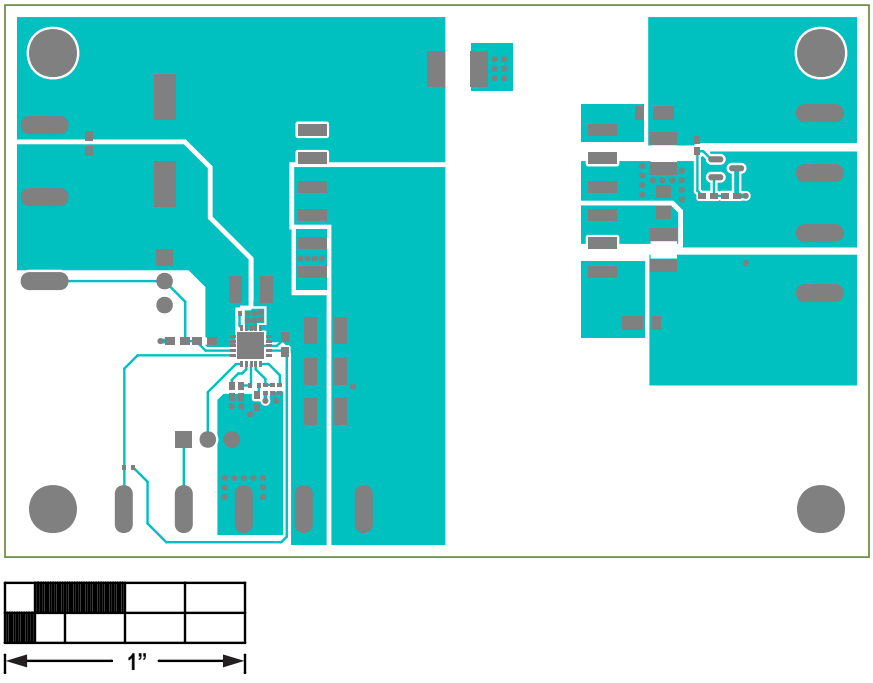
MAX17682 EV Kit D Schematics



MAX17682 EV Kit D PCB Layout Diagrams

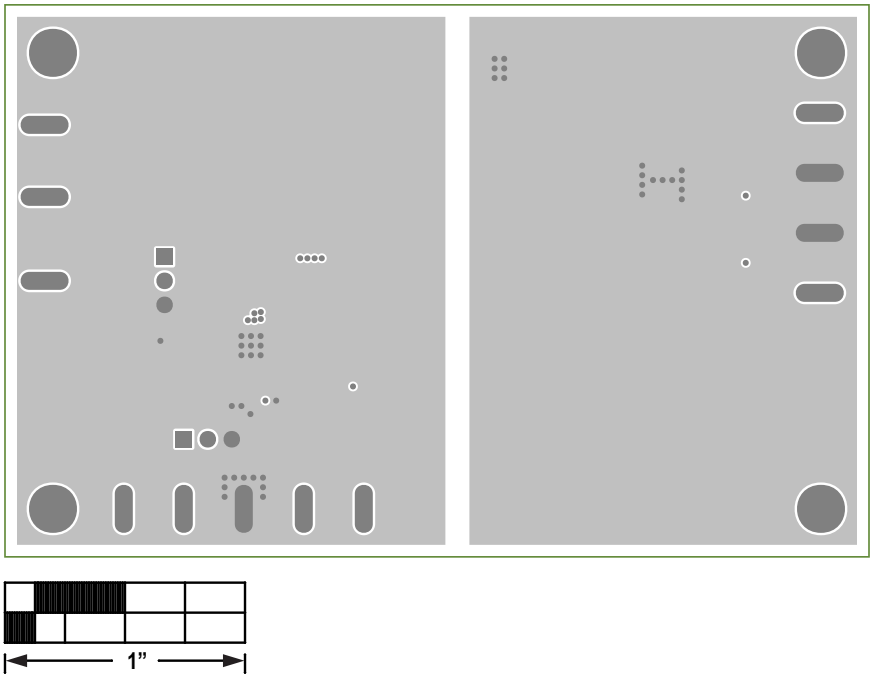


MAX17682 EV Kit D—Top Silkscreen

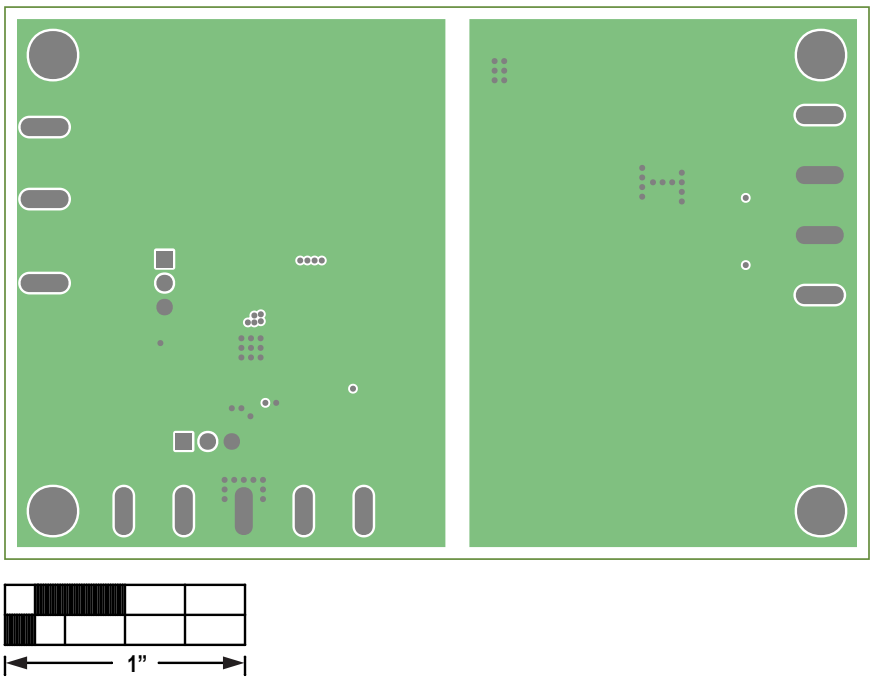


MAX17682 EV Kit D—Top

MAX17682 EV Kit D PCB Layout Diagrams (continued)

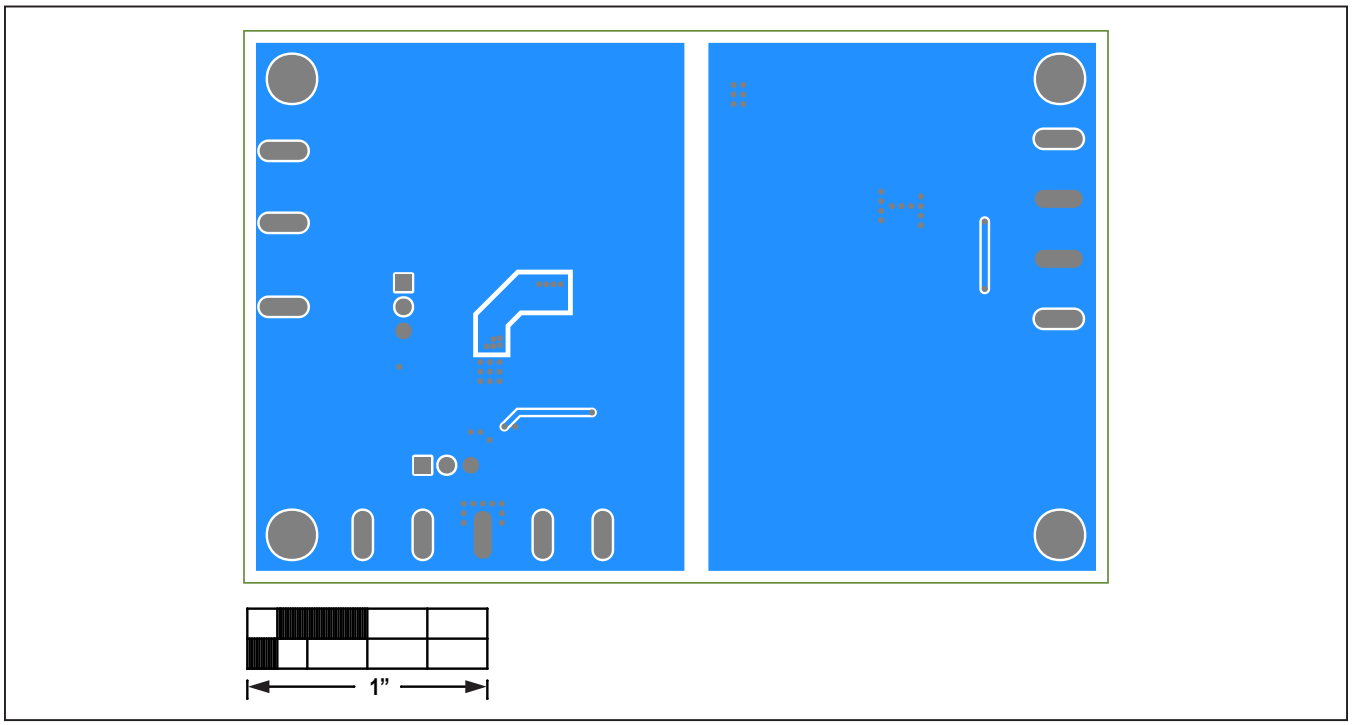


MAX17682 EV Kit D—Level 2 SGND



MAX17682 EV Kit D—Level 3 SGND

MAX17682 EV Kit D PCB Layout Diagrams (continued)



MAX17682EV Kit D—Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	4/18	Initial release	—

LifeElectronics
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