Click here for production status of specific part numbers.

MAX17682 Evaluation Kit C

Evaluates: MAX17682 Three-Phase Inverter Gate Drive Power Supply

General Description

The MAX17682 EV kit C 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 four isolated, dual-output voltage rails which are programmed to +15V and -8V. Three of the dual voltage rails can deliver 75mA load current, whereas the fourth dual rail can deliver a load current of 225mA.

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

Features

- 17V to 36V Input Voltage Range
- Four isolated output rails
  - Three rails with +15V and -8V, 75mA continuous current
  - One rail with +15V and -8V, 225mA continuous current
- EN/UVLO Input
- 250kHz Switching Frequency
- 96% 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 100Ω, 6W (or more) and three resistive loads of 330Ω, 2W (or more) each sink capacity
- Digital Multimeters (DMM)

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

Procedure

1) Verify that the J1 is open.
2) Set the input 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 four DMMs configured in voltmeter mode across the +15V PCB pads and their corresponding REF PCB pads, and the rest of the four DMMs across the -8V PCB pads and their corresponding REF PCB pads.
5) Connect a 100Ω resistive load across the D output +15V and -8V PCB pads. Connect three 330Ω resistive loads across +15V and -8V A/B/C output PCB pads.
6) Enable the input power supply.
7) Verify that the secondary output voltage is at +15V/-8V (with allowable tolerance of 10%) with respect to the corresponding REF PCB pad.
8) If required, vary the input voltage from 17V to 36V, and the load currents from 10% to 100% (using adjustable load resistors) and verify that the output voltages are within the acceptable limits.

319-100196; Rev 0; 5/18

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Detailed Description

The MAX17682EVKITC evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX17682 high-efficiency, isobuck, DC-DC converter designed to provide multiple isolated power supplies for a three phase inverter gate drive application. The EV kit generates four isolated dual-rail +15/-8V outputs. Three of the isolated dual rail outputs are rated for 75mA full load current, useful to power the gate drive circuits of the top three power devices in a three phase inverter. The fourth isolated dual rail output rated for 225mA full load current is useful to power the bottom three gate drive circuits of the three phase inverter. The EV kit features a forced-PWM control scheme that provides constant switching-frequency of 250kHz 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 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. 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 J1 configures 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 $V_{IN} \geq 15.85V$

**Default position.*

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

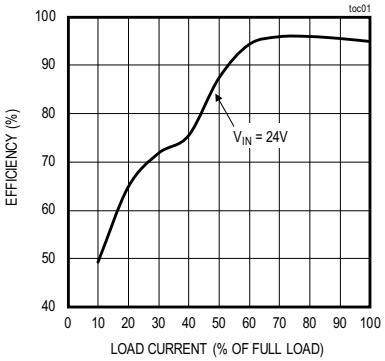
SHUNT POSITION	SYNC PIN	CLOCK FREQUENCY
1-2	Connected to SYNC	Uses external clock
2-3*	Connected to GND	Uses internal clock set according to RT resistor
Open	Unconnected	Not recommended

**Default position.*

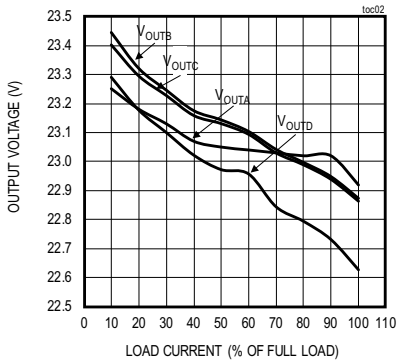
Note 1: *The secondary output diodes are rated to carry short-circuit current only for few hundredths of a millisecond and are not rated to carry the continuous short-circuit current.*

EV Kit C Performance Report

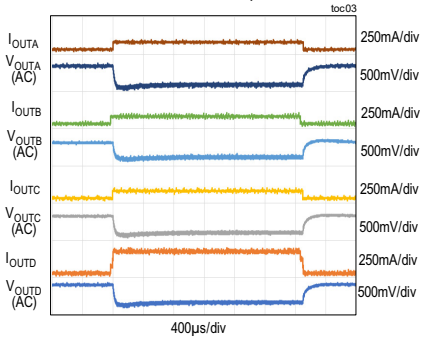
EFFICIENCY vs. LOAD CURRENT



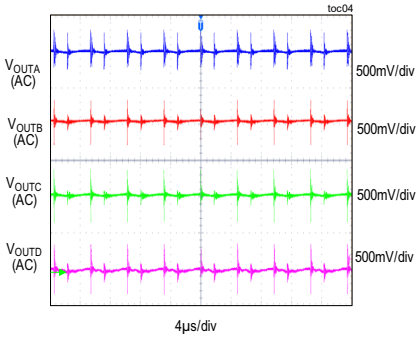
OUTPUT VOLTAGE vs. LOAD CURRENT



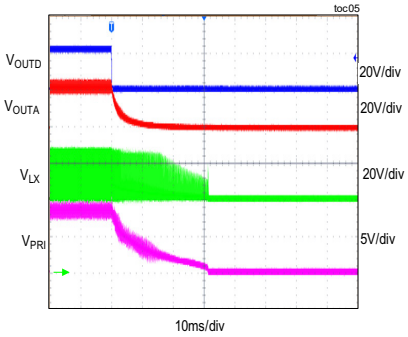
SECONDARY LOAD TRANSIENT RESPONSE (LOAD CURRENT STEPPED FROM 10% TO 100%)



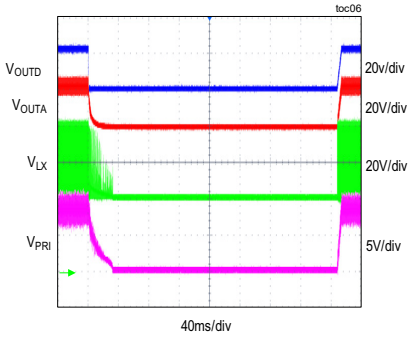
FULL LOAD SWITCHING WAVEFORMS



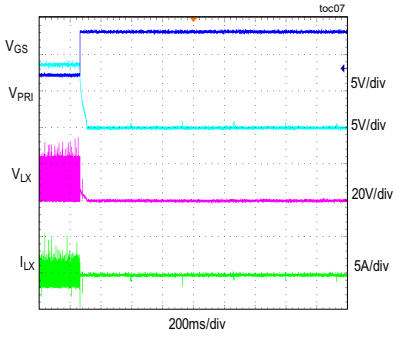
OUTPUT SHORT-CIRCUIT PERFORMANCE



RECOVERY AFTER MOMENTARY OUTPUT SHORT



PERMANANT OUTPUT SHORT PERFORMANCE



Component Suppliers

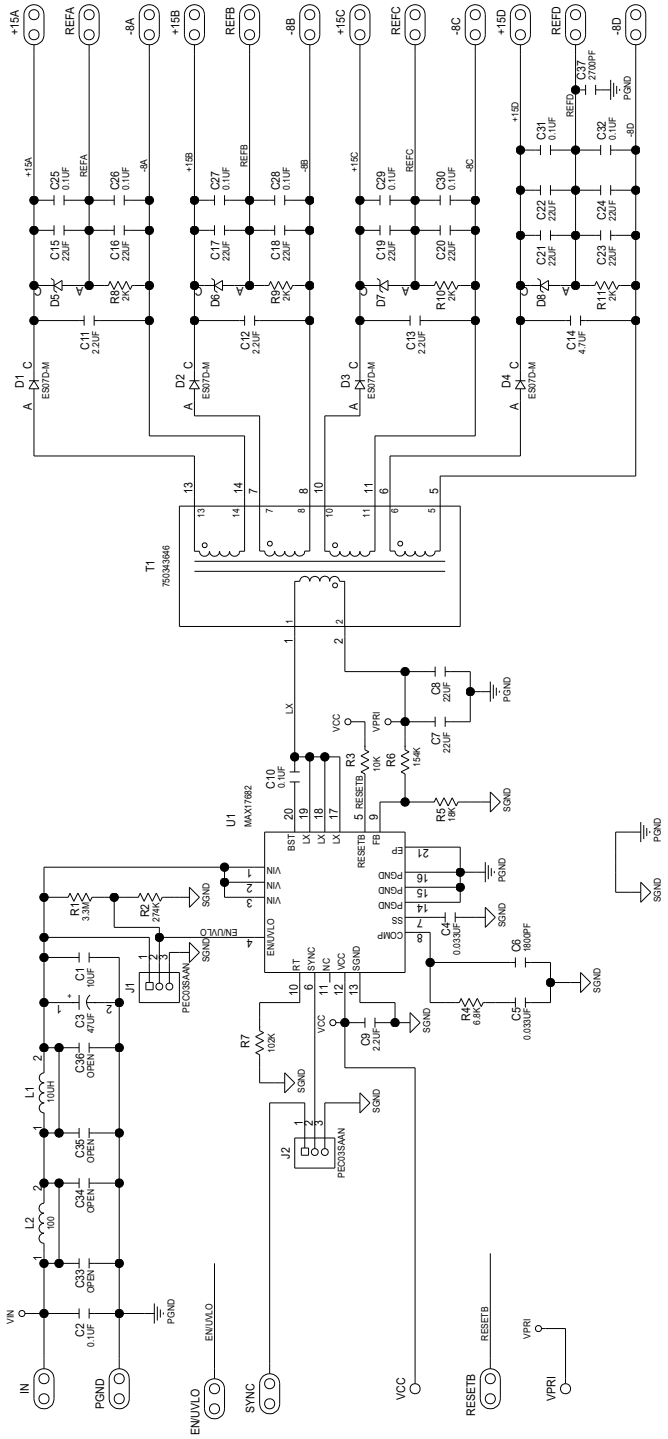
SUPPLIER	WEBSITE
Wurth Electronik	www.we-online.com
Murata Americas	www.murataamericas.com
Panasonic Corp.	www.panasonic.com

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

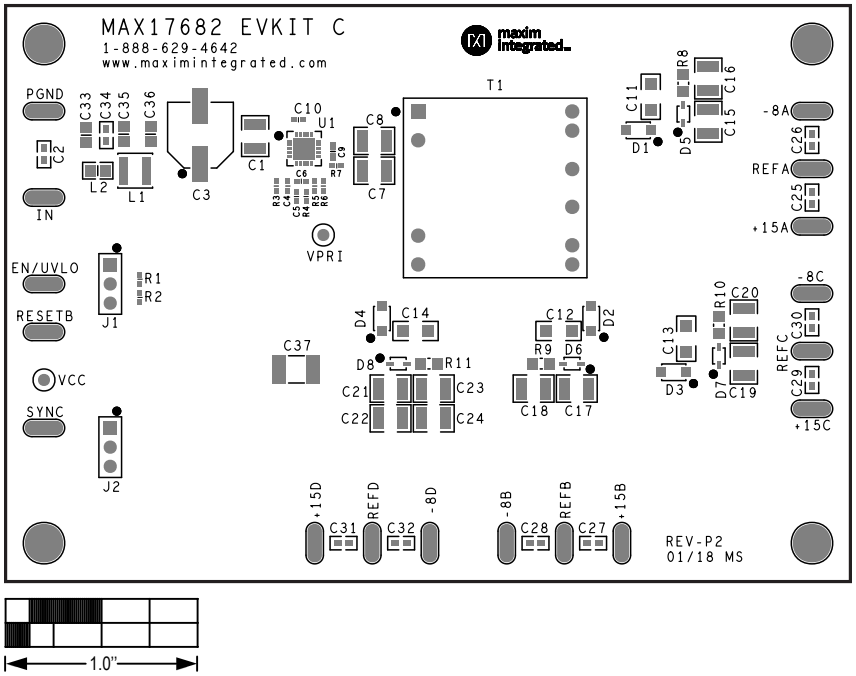
MAX17682 EV Kit C Bill of Materials

S. No.	Designation	Qty	Manufacturer Part #1	Manufacturer Part #2	Description
1	C1	1	MURATA GRM32ER71H106KA12	SAMSUNG ELECTRONICS CL32B106KBJNNN	10µF±10%, 50V X7R ceramic capacitor(1210)
2	C2, C25-C32	9	PANASONIC ECJ-1VB1H104K	MURATA GRM188R71H104KA93	0.1µF±10%, 50V X7R ceramic capacitor(0603)
3	C3	1	PANASONIC EEE-TG1H470UP		47µF±20%, 50V X7R Aluminium electrolytic capacitor(CASE_F)
4	C4, C5	2	MURATA GRM155R71E333KA88		0.033µF±10%, 25V X7R ceramic capacitor(0402)
5	C6	1	MURATA GRM155R71H182JA01		1800pF±5%, 50V X7R ceramic capacitor(0402)
6	C7, C8	2	MURATA GRJ32ER71A226KE11		22µF±10%, 10V X7R ceramic capacitor(1210)
7	C9	1	MURATA GRM188R71A225ME15		2.2µF±20%, 10V X7R ceramic capacitor(0603)
8	C10	1	TDK C1005X7R1C104K050BC	AMERICAN TECHNICAL CERAMICS ATC530L104KT16	0.1µF±10%, 16V X7R ceramic capacitor(0402)
9	C11-C13	3	MURATA GRM31CR71H225KA88	TAIYO YUDEN UMK316B7225K	2.2µF±10%, 50V X7R ceramic capacitor(1206)
10	C14	1	MURATA GRM31CR71H475KA12		4.7µF±10%, 50V X7R ceramic capacitor(1206)
11	C15-C24	10	MURATA GRM32ER71E226KE15	SAMSUNG ELECTRO-MECHANICS CL32B226KAJNFN	22µF±10%, 25V X7R ceramic capacitor(1210)
12	C37	1	AVX 1812HC272KAZ1A		2700pF±10%, 3kV X7R ceramic capacitor(1812)
13	D1-D4	4	VISHAY SEMICONDUCTORS ES07D-M		Diode 200V/1A, SMT
14	D5-D8	4	NEXPERIA TDZ15J		Diode Zener, 15V, SMT
15	R1	1	SAMSUNG ELECTRONICS RC1005F335		3.3MΩ±1% resistor(0402)
16	R2	1	PANASONIC ERJ-2RKF2743		274kΩ±1% resistor(0402)
17	R3	1	VISHAY DALE CRCW040210K0FK	YAGEO PHICOMP RC0402FR-0710K	10kΩ±1% resistor(0402)
18	R4	1	PANASONIC ERJ-2RKF6801X	SAMSUNG ELECTRONICS RC1005F682	6.8kΩ±1% resistor(0402)
19	R5	1	PANASONIC ERJ-2GEJ183		18kΩ±1% resistor(0402)
20	R6	1	VISHAY DALE CRCW0402154KFK		154kΩ±1% resistor(0402)
21	R7	1	VISHAY DALE CRCW0402102KFK		102kΩ±1% resistor(0402)
22	R8-R11	4	VISHAY DALE CRCW08052K00JN		2kΩ±1% resistor(0805)
23	T1	1	WURTH ELECTRONICS INC. 750343646		EVKit Part Transformer; Through Hole; 1:2.75:2.75:2.75:2.75
24	U1	1	MAXIM MAX17682		MAX17682 TQFN10 4*4mm Iso buck DC-DC converter
25	VCC, VPRI	2	KEYSTONE 5000		
26	PCB	1	MAXIM MAX17682C		
27	J1, J2	2	SULLINS PEC03SAAN	Jumper Headers	
28	IN, -8A, -8B, -8C, -8D, +15A, +15B, +15C+B2, +15D, PGND, REFA, REFB, REFC, REFD, SYNC, RESETB, EN/UVLO	17	WEICO WIRE 9020 BUSS	Test Loops	

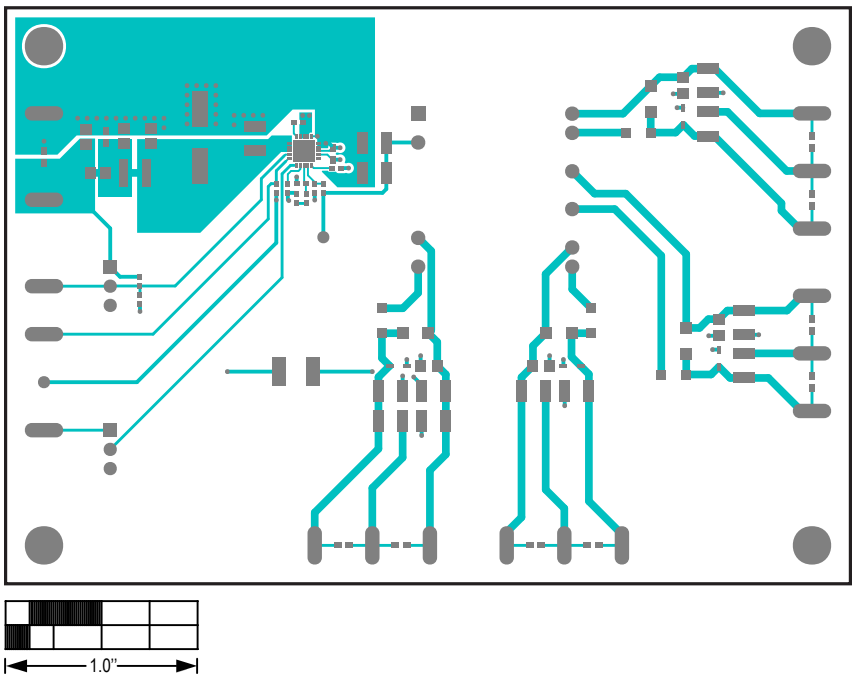
MAX17682 EV Kit C Schematics



MAX17682 EV Kit C PCB Layout Diagrams

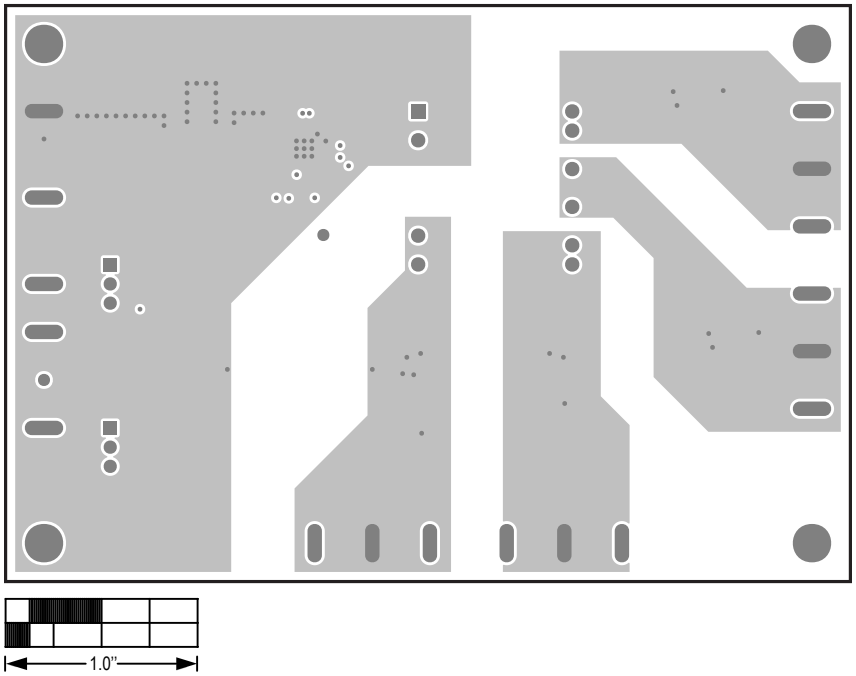


MAX17682 EV Kit C—Top Silkscreen

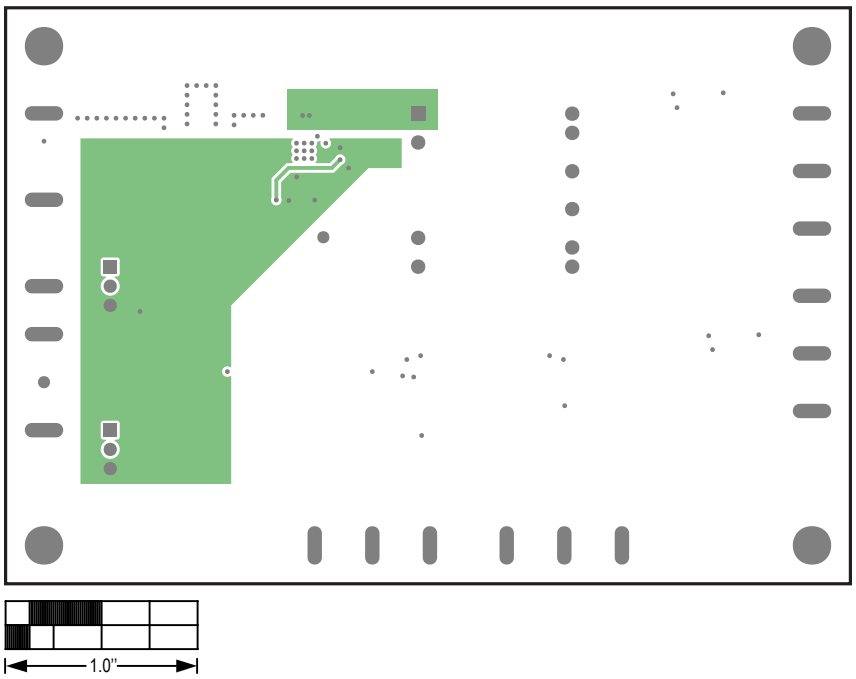


MAX17682 EV Kit C—Top

MAX17682 EV Kit C PCB Layout Diagrams (continued)

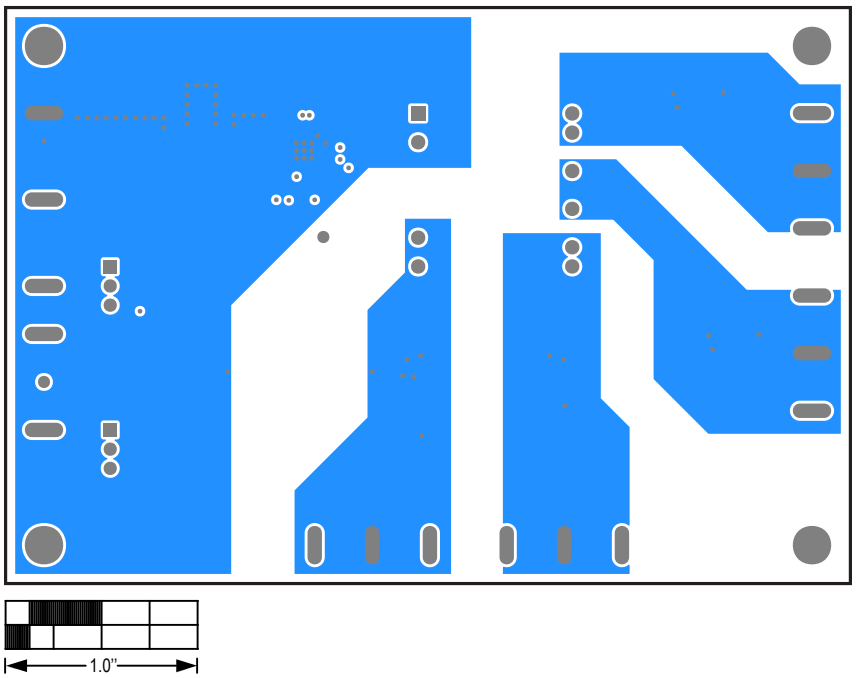


MAX17682 EV Kit C—Level 2 SGND



MAX17682 EV Kit C—Level 3 SGND

MAX17682 EV Kit C PCB Layout Diagrams (continued)



MAX17682EV Kit C—Bottom

Ordering Information

PART	TYPE
MAX17682EVKITC#	EVKIT

#Denotes RoHS compliant.