Click here for production status of specific part numbers.

MAX17686 Evaluation Kit

Evaluates: MAX17686 for Isolated +24V Output Configuration

General Description

The MAX17686EVKITA# is a fully assembled and tested circuit board that demonstrates the performance of the MAX17686 high-efficiency, iso-buck DC-DC Converter. The EV kit operates over a wide input-voltage range of 17V to 60V 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 MAX17686 in a 10-pin (3mm x 2mm) TDFN package.

Features

- 17V to 60V 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
- Provides robust primary and secondary output short-circuit protection
- Complies with CISPR22(EN55022) Class B Conducted and Radiated Emissions

***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) 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. Connect a 100mA resistive load across the +24V PCB pad and the GND0 PCB pad.
4) Connect a DMM configured in voltmeter mode across the +24V PCB pad and the nearest GND0 PCB pad.
5) Connect a DMM configured in voltmeter mode across the VPRI PCB pad and the nearest PGND PCB pad.
6) Enable the input power supply.
7) Verify that primary voltage is at +10.3V with respect to PGND.
8) Verify that output voltage is at +24V (with allowable tolerance of ±8%) with respect to GND0.
9) If required, vary the input voltage from 17V to 60V, and the load current from 0mA to 100mA and verify that output voltage is at +24V (with allowable tolerance of ±8%).

319-100301; Rev 0; 1/19

maxim integrated™

Detailed Description

The MAX17686EVKITA evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX17686 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 60V 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 MAX17686. 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 MAX17686 IC data sheet.

Electro-Magnetic Interference (EMI)

Compliance to conducted emissions (CE) standards requires an EMI filter at the input of a switching power converter. The EMI filter attenuates high-frequency currents drawn by the switching power converter and limits the noise injected back into the input power source.

Use of EMI filter components as shown in Figure 1 results in lower conducted emissions, below CISPR22 Class B limits. The MAX17686 EV kit PCB layout is also designed to limit radiated emissions from the switching nodes of the power converter resulting in radiated emissions below CISPR22 Class B limits.

Hot-Plug-In and Long Input Cables

The MAX17686 EV kit PCB provides an electrolytic capacitor (C2, 22µF/100V) to dampen input voltage peaks and oscillations that can arise during hot-plug-in and/or due to long input cables. This capacitor limits the peak voltage at the input of the MAX17686 IC, when the EV kit is powered directly from a precharged capacitive source or an industrial backplane PCB. Long input cables between input power source and the EV kit circuit can cause input-voltage oscillations due to the inductance of the cables. The equivalent series resistance (ESR) of the electrolytic capacitor helps damp out the oscillations caused by long input cables. Further, capacitor C1 (0.1µF/100V), placed near the input of the board, helps in attenuating high frequency noise.

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 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.

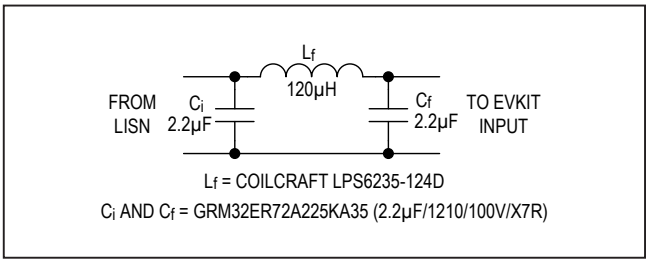


Figure 1. EMI Filter Components

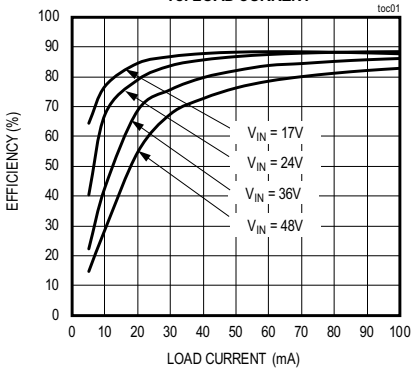
Table 1. Enable Control (EN/UVLO) (J1) Jumper Settings

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 $V_{IN} \geq 16V$

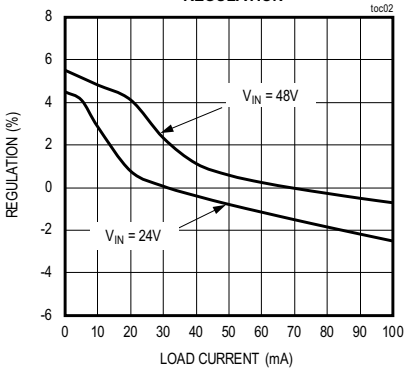
**Default position.*

EV Kit Performance Report

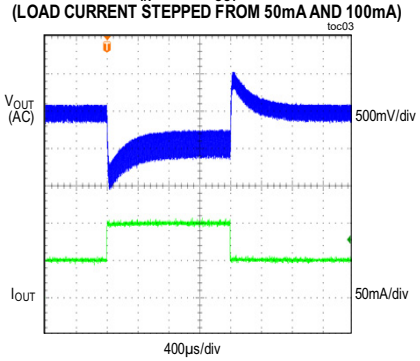
EFFICIENCY vs. LOAD CURRENT



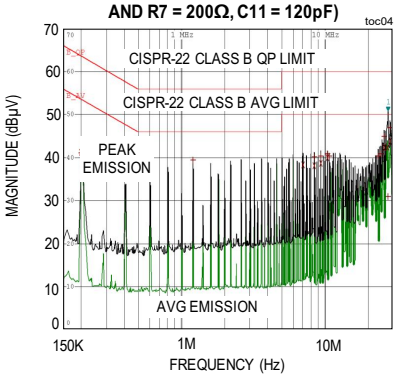
OUTPUT VOLTAGE REGULATION



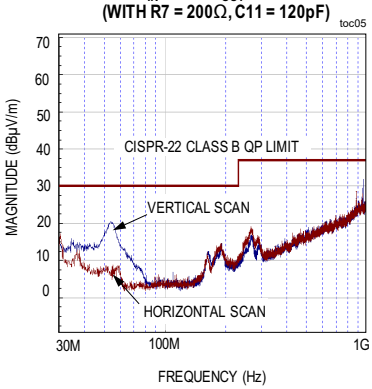
LOAD TRANSIENT RESPONSE
V_{IN} = 24V, V_{OUT} = 24V
(LOAD CURRENT STEPPED FROM 50mA AND 100mA)



CONDUCTED EMISSION PLOT
V_{IN} = 24V, V_{OUT} = 24V
(WITH FILTER C_i = C_f = 2.2µF, L_f = 120µH AND R7 = 200Ω, C11 = 120pF)



RADIATED EMISSION PLOT
V_{IN} = 24V, V_{OUT} = 24V
(WITH R7 = 200Ω, C11 = 120pF)



Component Suppliers

SUPPLIER	WEBSITE
Murata Americas	www.murata.com
Panasonic Corp.	www.panasonic.com
TDK Corp.	www.component.tdk.com
ON Semiconductor	www.onsemi.com
Vishay Intertechnology	www.vishay.com
Yageo	www.yageo.com
Wurth Electronics	www.we-online.com

Note: *Indicate that you are using the MAX17686 when contacting these component suppliers.*

Ordering Information

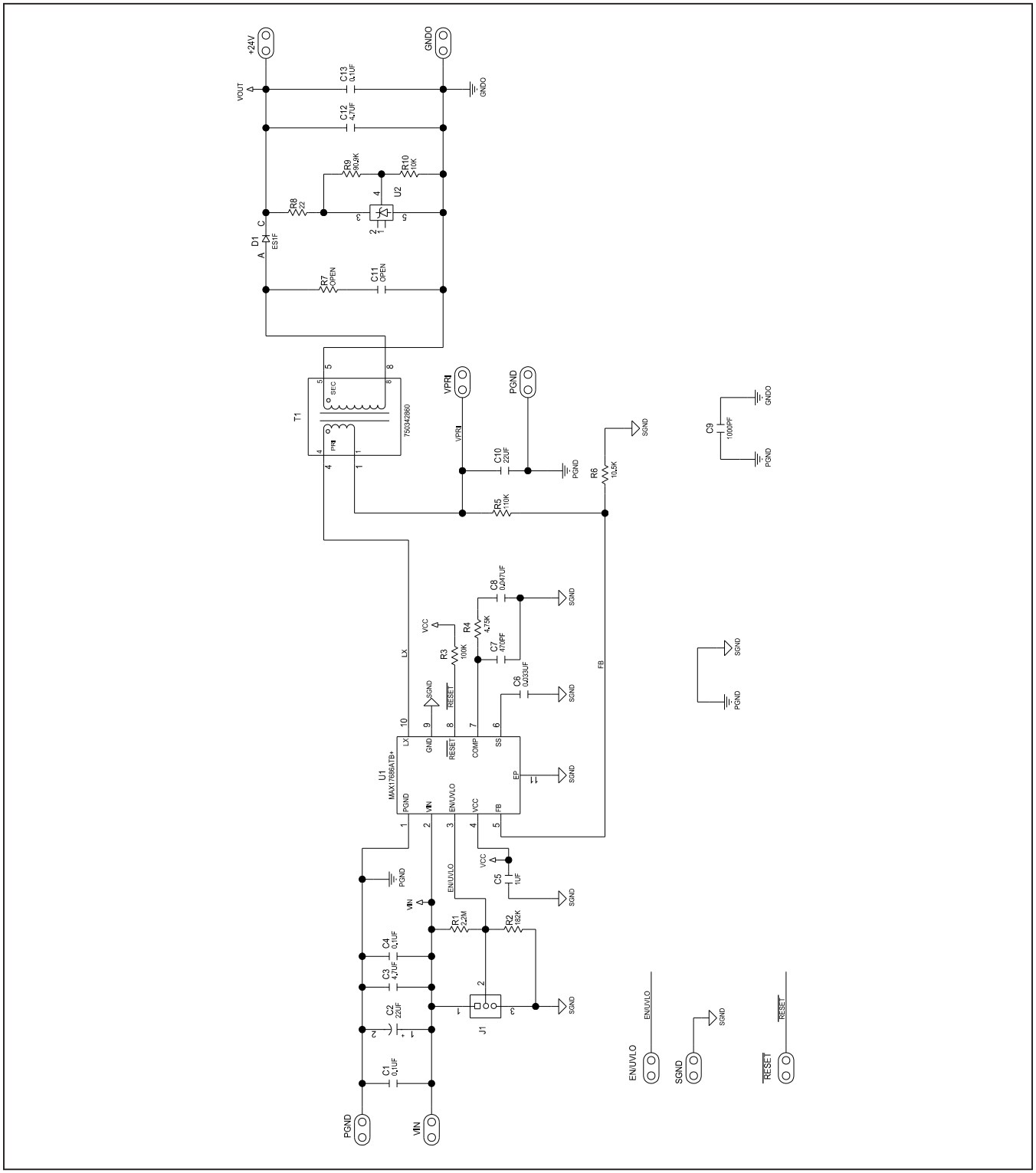
PART	TYPE
MAX17686EVKITA#	EVKIT

#Denotes RoHS compliant.

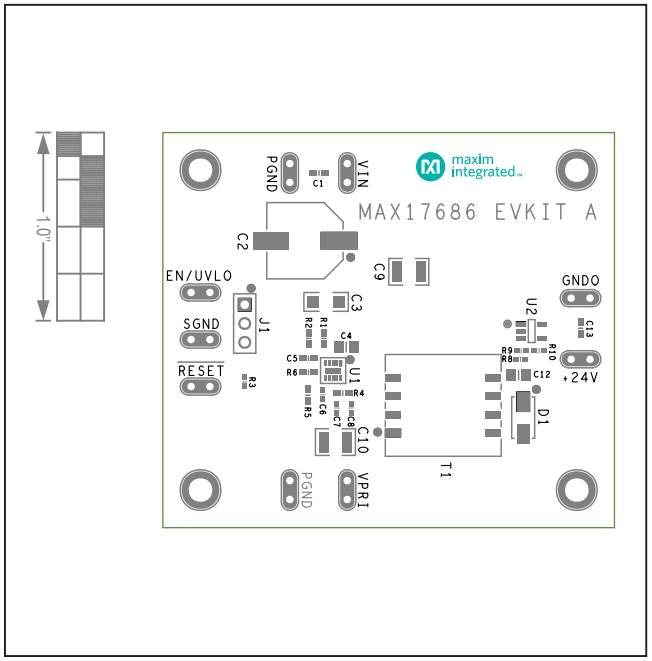
MAX17686 EV Kit Bill of Materials

SL. NO	DESIGNATION	QTY	DESCRIPTION	MANUFACTURER PN-1	MANUFACTURER PN-2
1	C1, C13	2	0.1µF±10%, 100V,X7R ceramic capacitor (0603)	Murata GCJ188R72A104KA01	
2	C2	1	22µF±20%; 100V; Aluminium Electrolytic Capacitor	Panasonic EEE-TG2A220P	
3	C3	1	4.7µF±10%, 100V,X7R ceramic capacitor (1206)	Murata GRM31CZ72A475KE11	
4	C4	1	0.1µF±10%, 100V,X7R ceramic capacitor (0805)	Murata GCM21BR72A104KA37	TDK CGA4J2X7R2A104K125AA
5	C5	1	1µF±10%, 25V,X7R ceramic capacitor (0603)	Murata GCM188R71E105KA64	
6	C6	1	0.033µF±10%, 25V,X7R ceramic capacitor (0402)	Murata GCM155R71E333KA55	
7	C7	1	470pF±5%, 50V,C0G ceramic capacitor (0603)	Murata GCM1555C1H471JA16	
8	C8	1	0.047µF±10%, 25V,X7R ceramic capacitor (0402)	Murata GCM155R71E473KA55	TDK C1005X7R1E473K050BC
9	C9	1	1000pF±10%, 1000V,X7R ceramic capacitor (1210)	Vishay Vitramon VJ1210Y102KXGAT5Z	
10	C10	1	22µF±10%, 25V,X7R ceramic capacitor (1210)	Murata GRM32ER71E226KE15	
11	C12	1	4.7µF±10%, 50V,X7R ceramic capacitor (0805)	Murata GRM21BZ71H475KE15	
12	D1	1	300V /1A DIODE, SMA (DO-214AC)	ON Semiconductor ES1F	ON SEMICONDUCTOR
13	R1	1	2.2MΩ±1% resistor (0603)	Vishay Dale CRCW06032M20FK	
14	R2	1	182KΩ±1% resistor (0603)	Vishay Dale CRCW0603182KFK	
15	R3	1	100KΩ±1% resistor (0402)	Panasonic ERJ-2GEJ104	
16	R4	1	4.75KΩ±1% resistor (0603)	Vishay Dale CRCW06034K75FK	Panasonic ERJ-3EKF4751
17	R5	1	110KΩ±1% resistor (0603)	Vishay Dale CRCW0603110KFK	
18	R6	1	10.5KΩ±1% resistor (0603)	Vishay Dale CRCW060310K5FK	
19	R8	1	22Ω±1% resistor (0402)	Vishay Dale CRCW040222R0FK	
20	R9	1	90.9KΩ±1% resistor (0402)	Panasonic ERJ-2RKF9092	
21	R10	1	10KΩ±1% resistor (0402)	Vishay Dale CRCW040210K0FK	Yageo Phicomp RC0402FR-0710KL
22	T1	1	EP10, 8-pin SMT, 80µH, 1.2A, 2.4:1	Wurth Electronics inc. 750342860	
23	U1	1	MAX17686 TDFN10 3x2mm Iso buck DC-DC converter	Maxim Integrated MAX17686ATB+	
24	U2	1	Shunt regulator SOT25	Diodes Inc TL431BW5	
25	R7	0	OPEN(1210)		
26	C11	0	OPEN(0805)		

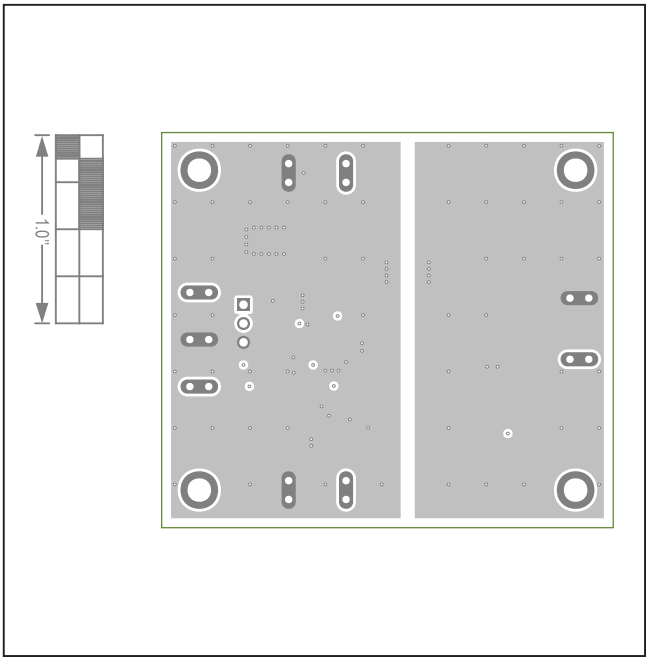
MAX17686 EV Kit Schematic



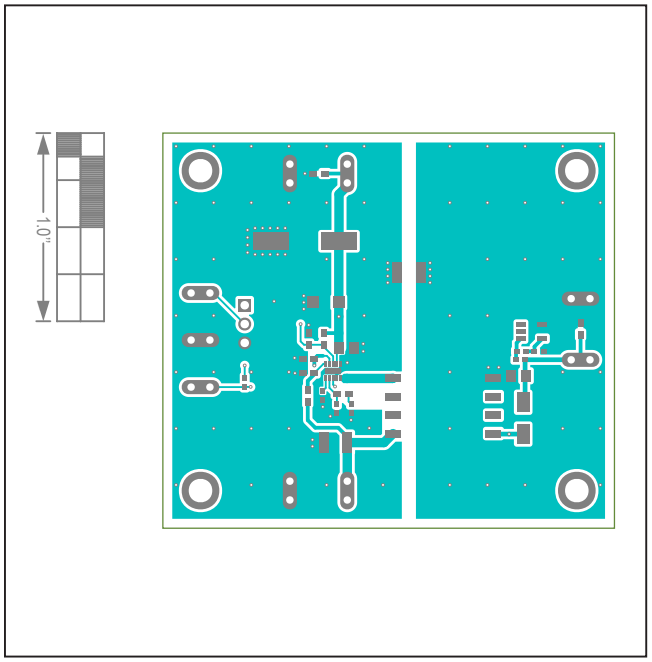
MAX17686 EV Kit PCB Layout Diagrams



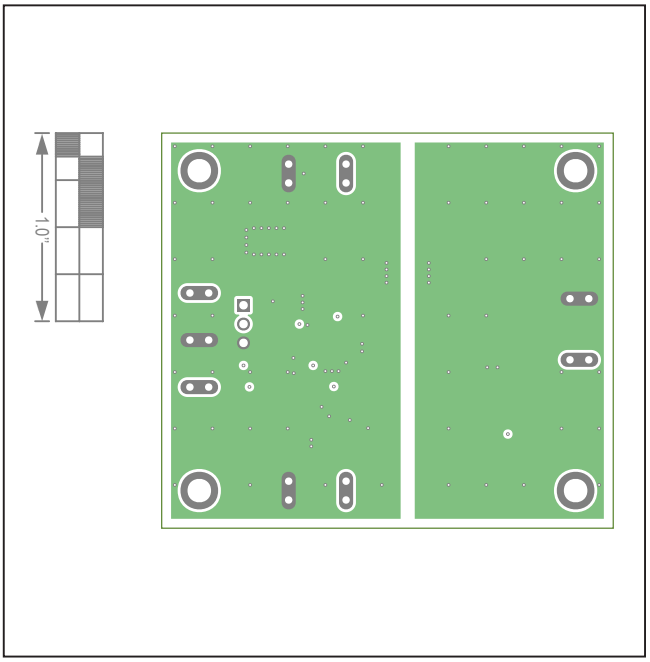
MAX17686EVKITA# - Top Silkscreen



MAX17686EVKITA# - L2 GND

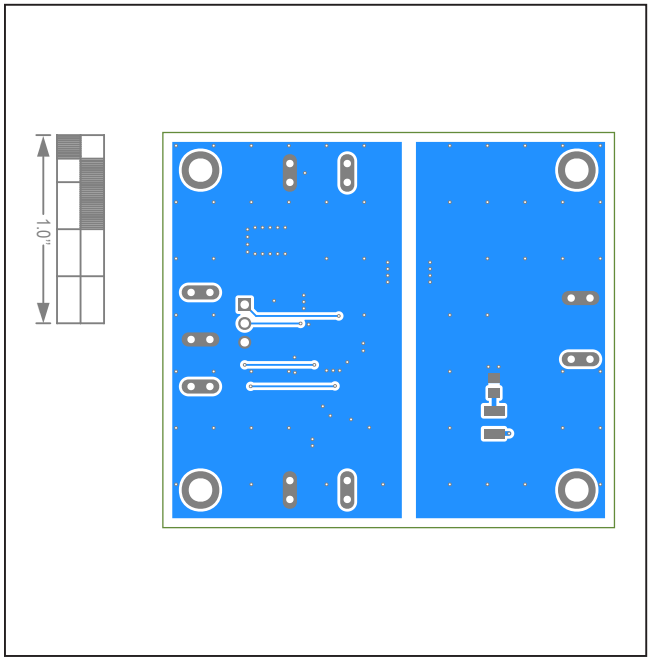


MAX17686EVKITA# - Top

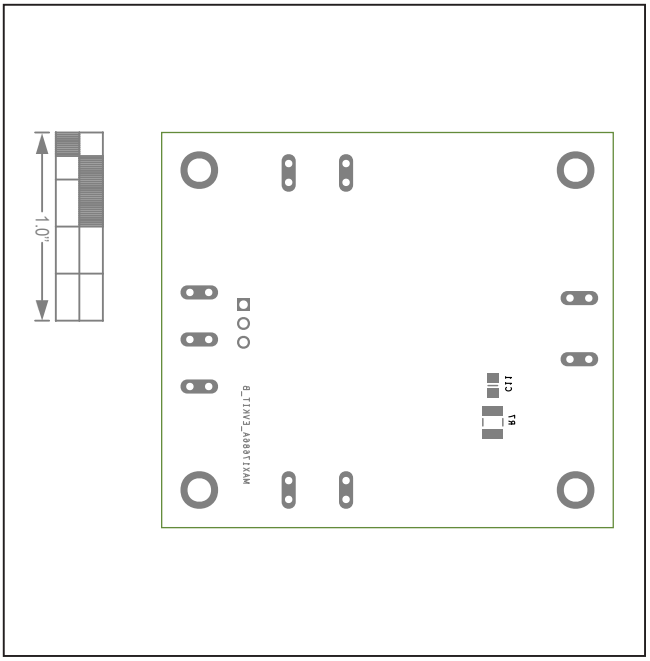


MAX17686EVKITA# - L3 GND

MAX17686 EV Kit PCB Layout Diagrams (continued)



MAX17686EVKITA# - Bottom



MAX17686EVKITA# - Silk Bottom

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	1/19	Initial release	—

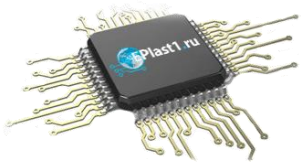
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

Телефон: 8 (812) 309 58 32 (многоканальный)
Факс: 8 (812) 320-02-42
Электронная почта: org@eplast1.ru
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.