Click here to ask an associate for production status of specific part numbers.

Evaluate: MAX22517–MAX22519

MAX22518 Evaluation Kit

General Description

The MAX22518 evaluation kit (EV kit) provides a proven design to evaluate the MAX22517–MAX22519 family of self-powered, dual-channel, 3.5kV$_{RMS}$ digital isolators. The EV kit allows easy access to both channels through either terminal blocks or test points. The isolated field-side supply V_{DDF} can also be accessed using the test points. The EV kit includes necessary external components to demonstrate the device's surge performance (1.2/50µs) up to ±1kV between input and field ground (differential), or up to ±2kV between inputs (common mode).

The MAX22518 EV kit is designed to support all three variants in the MAX22517–MAX22519 family. Jumpers on the logic-side outputs (OUT1L and OUT2L) allow to connect or disconnect the pullup resistors, depending on whether U1 has open-drain or push-pull outputs. The evaluation board comes with the wide-body 8-pin SOIC package type with 5.5mm creepage and clearance. See Table 1 for EV kit details.

The MAX22518 EV kit (MAX22518EVKIT#) is fully assembled and tested, and comes populated with the MAX22518AWA+ (Figure 1). The board also supports the MAX22517AWA+ and MAX22519AWA+, but requires the user to replace U1. See Table 1 and *Evaluate MAX22517 and MAX22519 on MAX22518EVKIT#* section for details.

The EV kit is powered from a single power supply on the logic side, V_{DDL}, in range from 3V to 5.5V. The field-side supply, V_{DDF}, is generated by the device and has a nominal voltage of 3.3V. The logic-side ground (GNDL) and field-side ground (GNDF) are isolated and can have continuous working voltage difference up to 445V$_{RMS}$. For evaluating the electrical parameters of the devices without any isolation between the two sides, a common ground can be shared between GNDL and GNDF.

Note: When ordering an EV kit, if the desired device is not the MAX22518AWA+, request samples of the desired MAX22517–MAX22519 IC that can be soldered to the PCB.

Features

- Self-Generated Isolated Field-Side Supply V_{DDF}
- 2 Unidirectional Channels with Input Charge Pumps (MAX22517 and MAX22518) and Open-Drain Outputs (MAX22518 and MAX22519)
- Surge and Short Protection with Onboard Components
  - 24VAC Short Protection
  - ±1kV Line-to-Ground and ±2kV Line-to-Line Surge Tolerance (1.2/50µs Waveform)
- Terminal Blocks and Test Points for Easy Connection to External Equipment
- Single Logic-Side Supply V_{DDL}, Range from 3V to 5.5V
- Guaranteed Up to 3.5kV$_{RMS}$ Isolation for 60s
- -40°C to +125°C Temperature Range
- Proven PCB Layout

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

319-100553; Rev 2; 8/20

© 2020 Analog Devices, Inc. All rights reserved. Trademarks and registered trademarks are the property of their respective owners.

One Analog Way, Wilmington, MA 01887 U.S.A. | Tel: 781.329.4700 | © 2021 Analog Devices, Inc. All rights reserved.

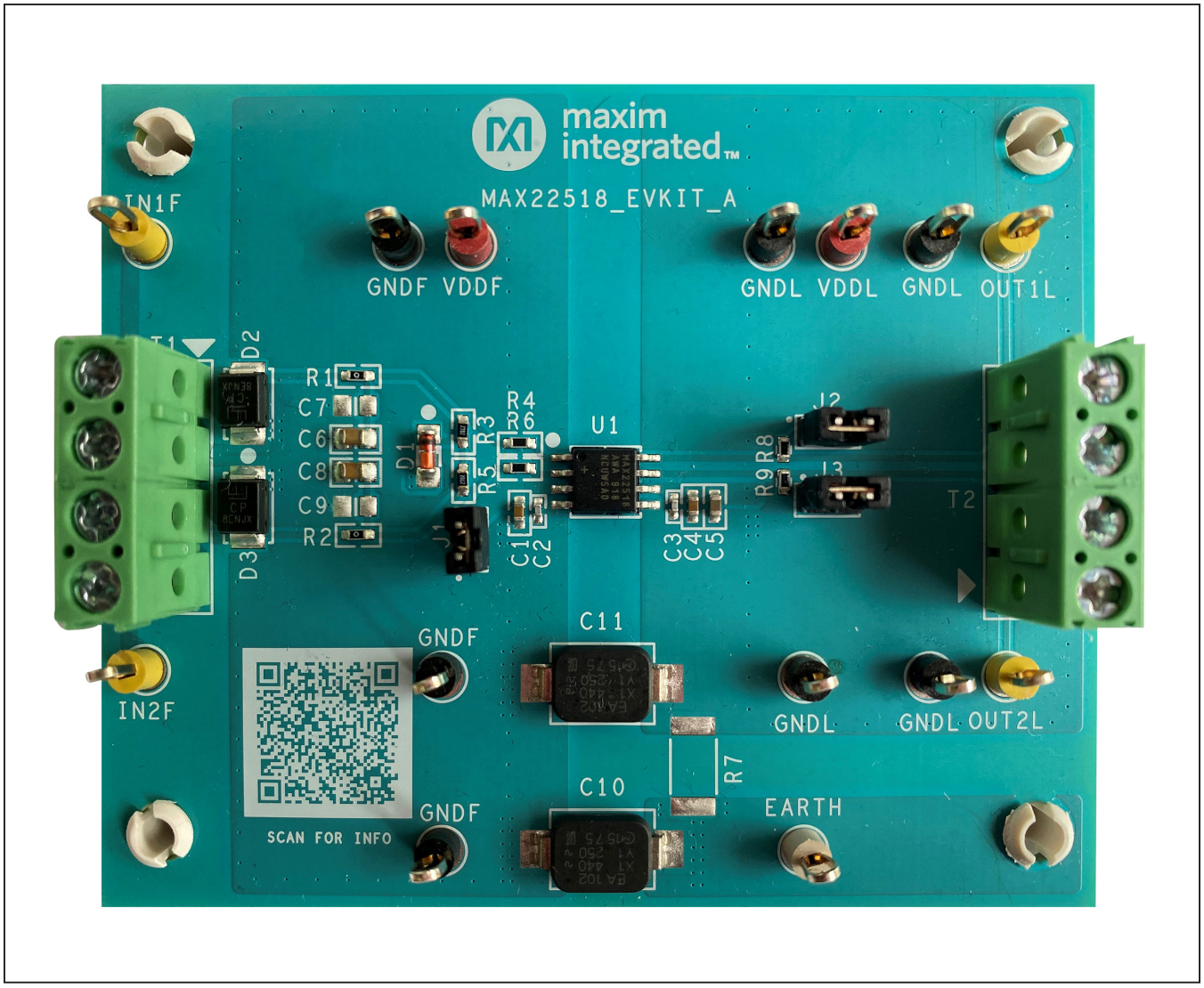


Figure 1. MAX22518EVKIT#

Table 1. EV Kit Information

EVKIT PART #	DEFAULT DEVICE	PACKAGE TYPE	POPULATED IC
MAX22518EVKIT#	MAX22518AWA+	8-SOIC Wide Body	With Input Charge Pumps and Open-Drain Outputs

Quick Start

Required Equipment

- MAX22518EVKIT#
- One DC power supply with an output range up to 5.5V
- Digital Multimeter
- Signal/function generator
- Oscilloscope

Procedure

The MAX22518 EV kit is fully assembled and ready for evaluation. Use the following steps to verify board functionality:

1) Verify jumper settings. All jumpers are closed by default. See Table 2 for all shunt positions.
2) Connect a DC power supply between the EV kit VDDL and GNDL test points. Set the output between 3V and 5.5V, and enable the power supply.
3) The field-side supply V_{DDF} is generated by U1. Connect a DMM between the EV kit VDDF and GNDF test points. Verify that the V_{DDF} voltage is about 3.3V.
4) Connect the signal/function generator output to IN1F test point and the generator ground to GNDF test point. Set the function generator output to be a square wave with the amplitude of 3.3V, 10kHz frequency, and 50% duty cycle. Enable the function generator output.
5) Observe the logic-side output voltage on the OUT1L test point to be a square wave with the amplitude of V_{DDL}, 10kHz frequency, and 50% duty cycle. Note that the MAX22518 has open-drain outputs and the EV kit has a 2kΩ pullup resistor on both outputs.
6) Repeat step 4 and step 5 to verify the functionality of IN2F and OUT2L channel.

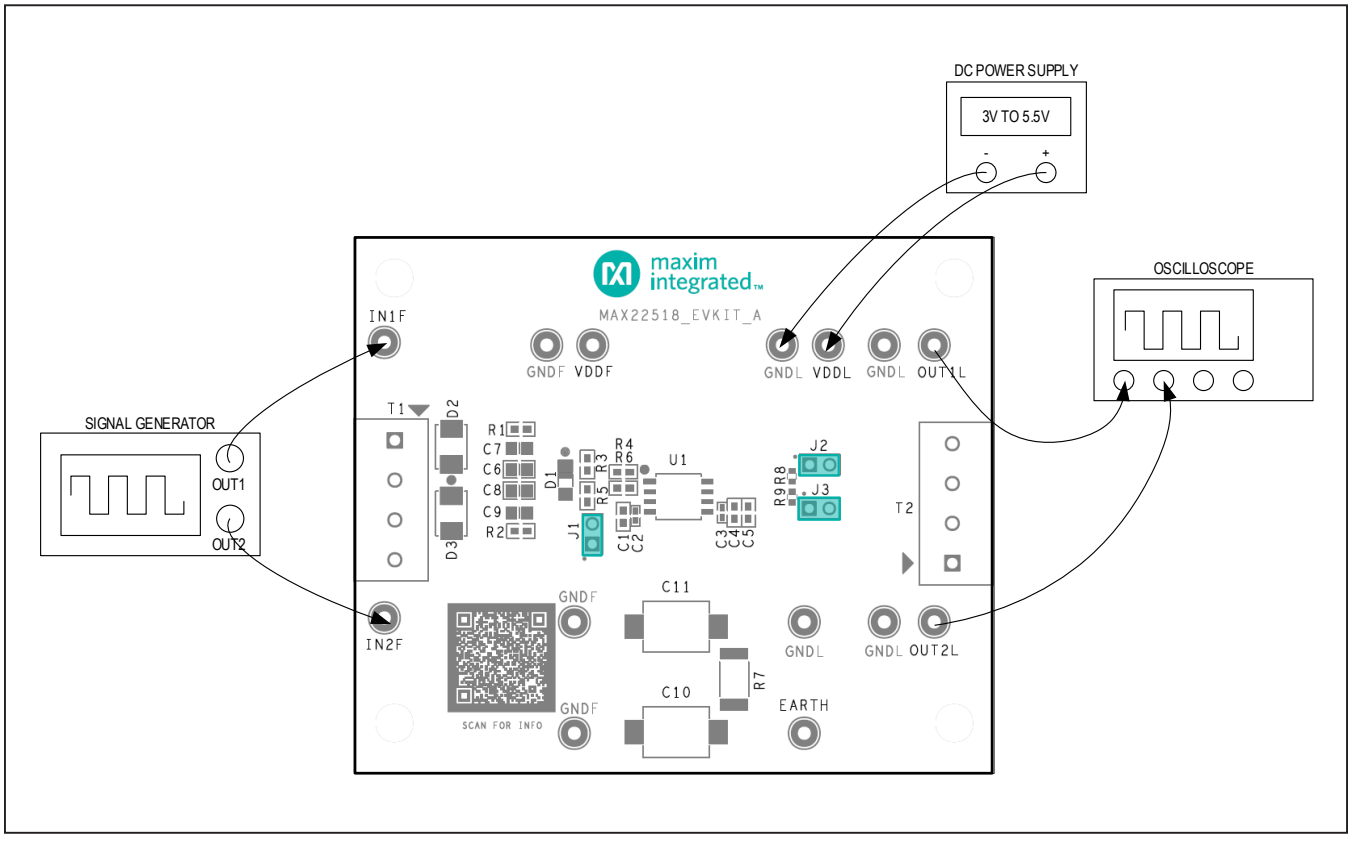


Figure 2. MAX22518 EV Kit Typical Test Setup

Table 2. MAX22518 EV Kit Connectors and Shunt Positions

CONNECTOR	SHUNT POSITION	DESCRIPTION
FIELD SIDE		
J1	1-2*	Connect U1 V_{DDF} to field-side inputs through 27kΩ resistors
	Open	Disconnect U1 V_{DDF} from field-side inputs through 27kΩ resistors
T1	1	Connector or test point for U1 field-side input IN1F; same as IN1F test point
	2	Connector or test point for U1 field-side ground GNDF; same as GNDF test point
	3	Connector or test point for U1 field-side input IN2F; same as IN2F test point
	4	Connector or test point for U1 field-side ground GNDF; same as GNDF test point
VDDF	N/A	Test point for U1 field-side supply V_{DDF}
GNDF	N/A	Test point for U1 field-side ground GNDF
IN1F	N/A	Test point for U1 field-side input IN1F
IN2F	N/A	Test point for U1 field-side input IN2F
LOGIC SIDE		
J2	1-2*	Connect the 2kΩ pullup resistor to U1 logic-side output OUT1L; required when U1 is MAX22518AWA+ or MAX22519AWA+
	Open	Disconnect the 2kΩ pullup resistor from U1 logic-side output OUT1L; Used when U1 is MAX22517AWA+
J3	1-2*	Connect the 2kΩ pullup resistor to U1 logic-side output OUT2L; required when U1 is MAX22518AWA+ or MAX22519AWA+
	Open	Disconnect the 2kΩ pullup resistor from U1 logic-side output OUT2L; Used when U1 is MAX22517AWA+
T2	1	Connector or test point for U1 logic-side ground GNDL; same as GNDL test point
	2	Connector or test point for U1 logic-side output OUT2L; same as OUT2L test point
	3	Connector or test point for U1 logic-side ground GNDL; same as GNDL test point
	4	Connector or test point for U1 logic-side output OUT1L; same as OUT1L test point
VDDL	N/A	Test point for U1 logic-side supply V_{DDL}
GNDL	N/A	Test point for U1 logic-side ground GNDL
OUT1L	N/A	Test point for U1 logic-side output OUT1L
OUT2L	N/A	Test point for U1 logic-side output OUT2L
EARTH	N/A	Test point for protective earth on the EV kit

**Default configuration*

Detailed Description of Hardware

The MAX22518 EV kit provides a proven layout for the MAX22517–MAX22519 self-powered 2-channel digital isolators, and allows the user to evaluate the features of the devices.

External Power Supply

The EV kit is powered from a single external low-voltage supply on the logic-side, V_{DDL}, which can be between 3V and 5.5V. The isolated field-side supply V_{DDF} is generated by the integrated DC-DC converter and has a nominal 3.3V output voltage. Connect the external power source between VDDL and GNDL test points. The isolated field-side supply V_{DDF} can be measured using a DMM connected between VDDF and GNDF test points.

Decoupling Capacitors

The logic-side supply V_{DDL} is decoupled with 1000pF, 0.1µF, and 1µF low-ESR and low-ESL ceramic capacitors, which are placed close to the V_{DDL} pin of the device and are in parallel with each other.

The isolated field-side supply V_{DDF} is decoupled with 1000pF and 0.1µF low-ESR and low-ESL ceramic capacitors which are placed close to the V_{DDF} pin of the device and are in parallel with each other. See the *MAX22518 EV Kit PCB Layout Diagrams* for details.

I/O Connections

Two test points and a terminal block on each side of the EV kit allow easy connections to benchtop equipment such as signal generator and oscilloscope, or application circuits such as relay contact. A typical test setup is shown in Figure 2.

On the field side, terminal block T1 has four positions, pin 1 and pin 2 are channel 1 field-side input (IN1F) and ground (GNDF), and pin 3 and pin 4 are channel 2 field-side input (IN2F) and ground (GNDF). Similarly, terminal block T2 has four positions for both channels, pin 4 and pin 3 are channel 1 logic-side output (OUT1L) and ground (GNDL), and pin 2 and pin 1 are channel 2 logic-side output (OUT2L) and ground (GNDL). Note due to the connector placement orientation, pin 1 of T2 is located at the bottom position of the connector while pin 1 of T1 is the top position of the connector. See Table 2 for detailed connector positions.

Shunt Positions

On the MAX22518 EV kit, jumper J1 is provided to connect the field-side supply V_{DDF} to field inputs through a 27kΩ resistor on each channel. This is useful in relay contact monitoring applications. The field-side supply V_{DDF} quickly charges the input capacitors on each channel (C6 and C7 on IN1F, C8 and C9 on IN2F) when the relay is in the open position. The charge stored in the capacitors provides enough energy to clean the oxidation growth on the relay contact when the relay is switched from the opened to the closed position. Diode D1 is included to prevent any field input reverse current from flowing into the V_{DDF} pin of the device. C7 on IN1F and C9 on IN2F are not installed and the user can choose to install them if larger discharging capacitors are desired. Refer to the *MAX22517–MAX22519* IC data sheet for more details.

Jumper J2 and J3 are provided to connect a 2kΩ pullup resistor to each logic-side output. The MAX22517–MAX22519 family has two output driver options, open-drain or push-pull. The MAX22518 and MAX22519 feature open-drain outputs. Install jumpers on both J2 and J3 when the MAX22518 or MAX22519 is installed as U1. The MAX22517 has push-pull outputs, thus J2 and J3 are open when the MAX22517 is installed as U1. By default, the MAX22518EVKIT# has the MAX22518AWA+ installed as U1. See Table 2 for all shunt positions.

IEC 61000-4 Transient Immunity

The typical application for the MAX22517–MAX22519 requires them to pass basic transient immunity standards as defined by IEC 61000-4-x, covering -2 for Electrostatic Discharge (ESD), -4 for Electrical Fast Transient/Burst (EFT), and -5 for surge immunity (1.2/50µs pulse). The MAX22518 EV kit includes circuitry to support testing to these standards up to:

- ±1kV IN_F to GNDF surge with 10kΩ input series resistor.
- ±2kV IN_F to IN_F surge with 10kΩ input series resistor.
- ±10kV IN_F to Earth surge with 10kΩ input series resistor, and a Y capacitor between GNDF and Earth.
- ±4kV EFT with criterion A performance with 10kΩ input series resistor.
- ±8kV IN_F to GNDF ESD contact discharge with 10kΩ input series resistor.
- ±15kV IN_F to GNDF ESD air-gap discharge with 10kΩ input series resistor.

The 10kΩ input series resistors on the IN1F and IN2F pins help limit the surge and ESD current into the device. The TVS diodes D1 and D2 are included in case higher surge or ESD levels are desired by the user application. C10 and C11 are 1000pF safety rated Y capacitors placed between protective earth (PE) and field ground (GNDF), and between logic ground (GNDL) and field

ground (GNDF) to improve the surge and ESD performance between the field side and Earth. For systems where Earth and GNDL are bonded together, the user can choose to install the resistor R7. See the *MAX22518 EV Kit Schematic Diagram* for details.

Radiated Emission

The MAX22518 EV kit can meet CISPR 22 Class B emission standard in an unshielded environment with proper PCB layout design. The radiated emission results measured in a 3-meter anechoic chamber with CISPR 22 standard test setup are shown in Figure 3 and Figure 4.

The MAX22518 EV kit has a typical 70pF stitching capacitance between GNDL and GNDF ground planes, formed by the internal 2nd and 3rd PCB layers, as shown in the *MAX22518 EV Kit PCB Layout Diagrams.* This stitching capacitor provides a return current path between the logic side and the field side, thus reducing the emission caused by the high-frequency signals crossing the isolation barrier. These high-frequency signals mainly come from the integrated DC-DC converter. The peak emission falls at the switching frequency of the DC-DC converter, which is around 750MHz. The Y capacitors (C10 and C11) are uninstalled, and other PCB techniques such as edge guarding vias and supply decoupling with multiple ground vias are implemented in the MAX22518 EV kit to further improve the radiated emission performance. Refer to the *MAX22517–MAX22519* IC data sheet for more details.

Evaluate MAX22517 and MAX22519 on MAX22518EVKIT#

The MAX22518EVKIT# is designed to evaluate all devices in the MAX22517–MAX22519 family. By default, the MAX22518EVKIT# comes populated with the MAX22518AWA+.

To evaluate the MAX22517, U1 needs to be replaced with the MAX22517AWA+. Jumper J2 and J3 should be set to open since the MAX22517 has push-pull outputs. To evaluate the MAX22519, U1 needs to be replaced with the MAX22519AWA+, and jumper J2 and J3 should be in the closed position due to MAX22519's open-drain outputs.

When installing U1, make sure pin 1 of the device is mounted onto pin 1 of U1 on the PCB. Pin 1 is located at the upper left corner of U1, denoted by a white dot on the silkscreen.

See the *MAX22518 EV Kit Schematic Diagram* and the *MAX22518 EV Kit PCB Layout Diagrams* for details.

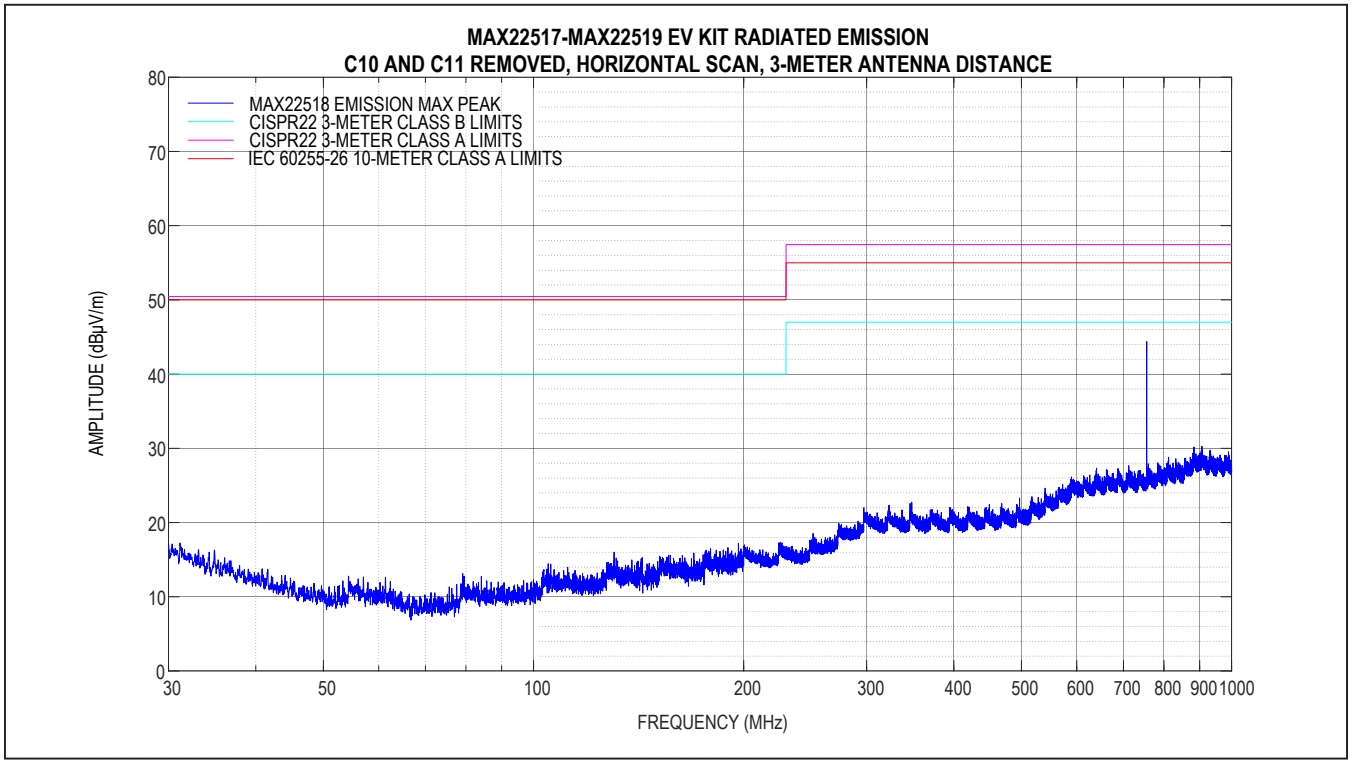


Figure 3. MAX22518 EV Kit Radiated Emission, Horizontal Scan

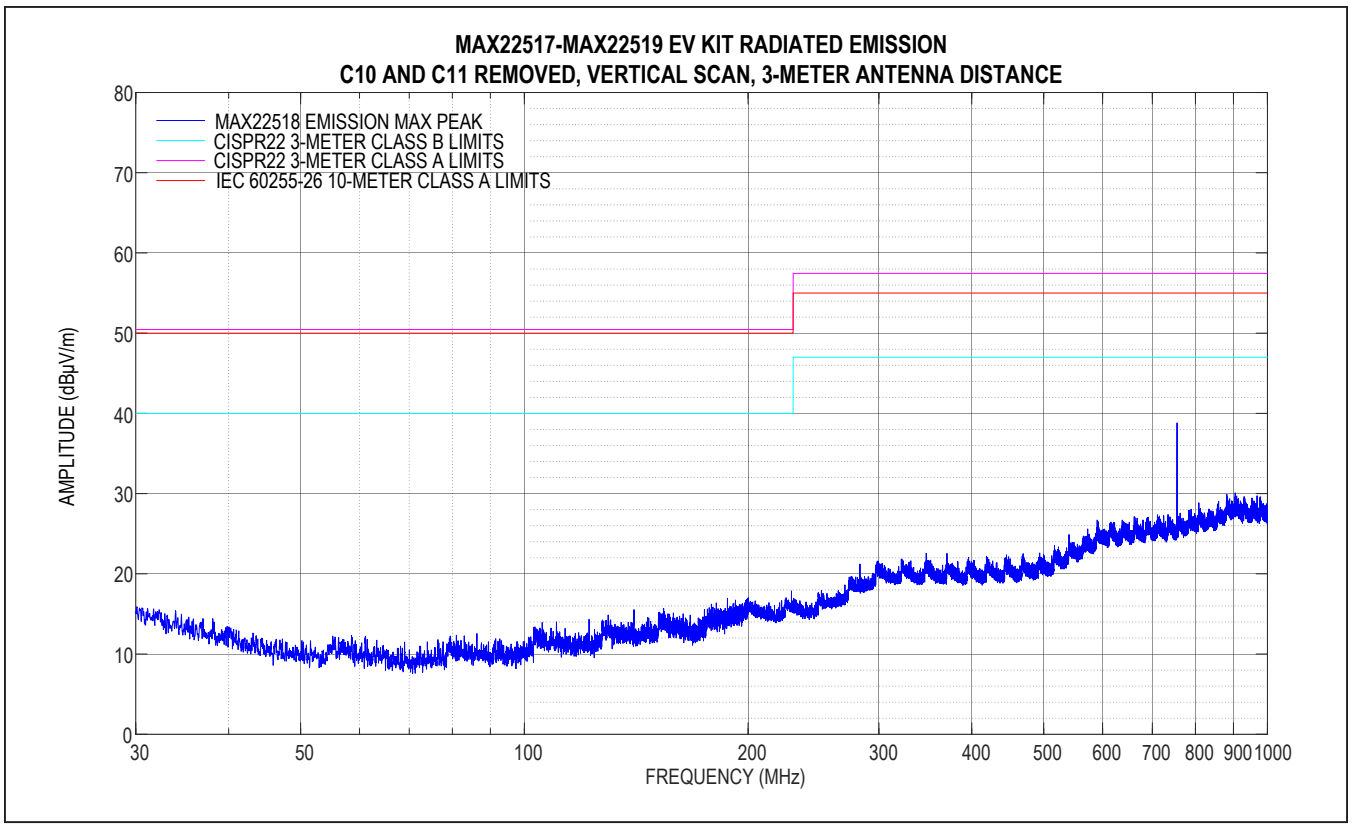


Figure 4. MAX22518 EV Kit Radiated Emission, Vertical Scan

Ordering Information

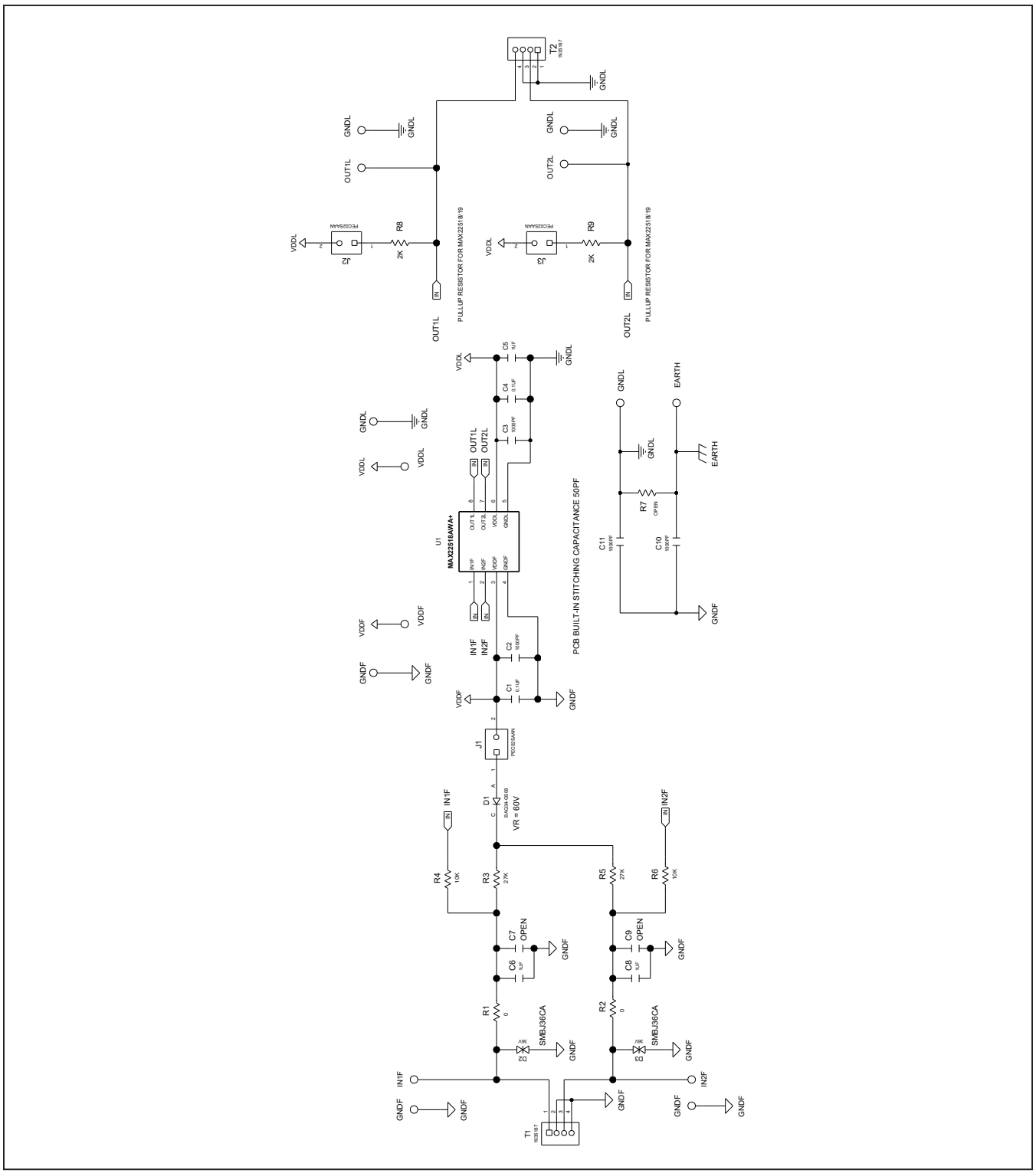
PART	TYPE
MAX22518EVKIT#	EV Kit with installed MAX22518AWA+

#Denotes RoHS compliance.

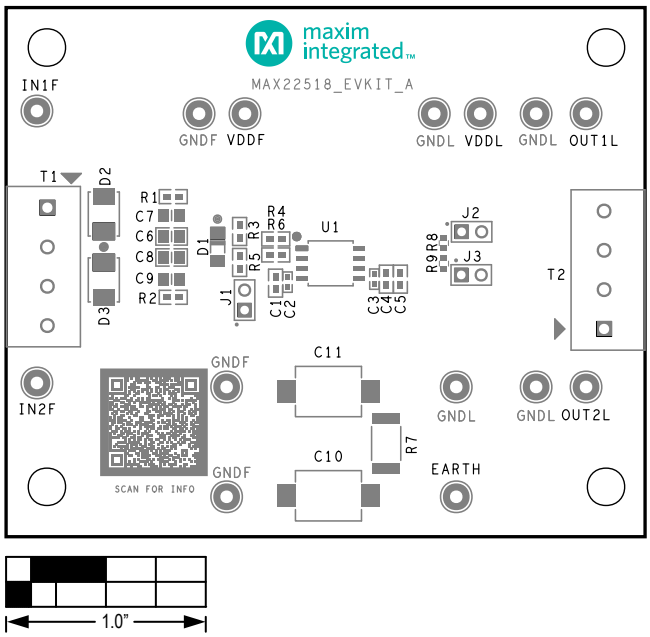
MAX22518 EV Kit Bill of Materials

ITEM	REF_DES		QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, C4		2	CC0603KRX7R0BB104; GRM188R72A104KA35; GCJ188R72A104KA01; HMK107B7104KA; 06031C104KAT2A; GRM188R72A104K	YAGEO; MURATA; MURATA; TAIYO YUDEN; AVX; MURATA	0.1µF	CAPACITOR; SMT (0603); CERAMIC CHIP; 0.1µF; 100V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
2	C2, C3		2	GRM1555C1H102JA01; C1005C0G1H102J050	MURATA;TDK	1000PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1000PF; 50V; TOL = 5%; TG = -55°C TO +125°C
3	C5		1	UMK107AB7105KA; CC0603KRX7R9BB105	TAIYO YUDEN; YAGEO	1µF	CAPACITOR; SMT (0603); CERAMIC CHIP; 1µF; 50V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
4	C6, C8		2	C2012X7S2A105K125AB; GRJ21BC72A105KE11; CGA4J3X7S2A105K125AB; GRM21BC72A105KE01	TDK;MURATA;TDK	1µF	CAPACITOR; SMT (0805); CERAMIC CHIP; 1µF; 100V; TOL = 10%; TG = -55°C TO +125°C; TC = X7S
5	C10, C11		2	DK1E3EA102M86RAH01	MURATA	1000PF	CAP; SMT; 1000PF; 20%; 250V; E; CERAMIC CHIP
6	D1		1	BAQ34-GS08	VISHAY	BAQ34-GS08	DIODE; SS; SMT (MINIMELF); PIV = 70V; IF = 0.2A
7	D2, D3		2	SMBJ36CA	FAIRCHILD SEMICONDUCTOR	36V	DIODE; TVS; SMB (DO-214AA); VRM = 36V; IPP = 10.3A
8	EARTH		1	5012	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; WHITE; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
9	GNDF_TP1-GNDF_TP3, GNDL_TP1-GNDL_TP4		7	5011	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
10	IN1F, IN2F, OUT1L, OUT2L		4	5014	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; YELLOW; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH;
11	J1-J3		3	PEC02SAAN	SULLINS	PEC02SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
12	R1, R2		2	CRCW06030000ZS; MCR03EZPJ000; ERJ-3GEY0R00	VISHAY DALE; ROHM;PANASONIC	0	RESISTOR; 0603; 0Ω; 0%; JUMPER; 0.10W; THICK FILM
13	R3, R5		2	CRCW060327K0FK	VISHAY DALE	27K	RESISTOR, 0603, 27KΩ, 1%, 100PPM, 0.10W, THICK FILM
14	R4, R6		2	CRCW060310K0FK; ERJ-3EKF1002	VISHAY DALE; PANASONIC	10K	RESISTOR; 0603; 10K; 1%; 100PPM; 0.10W; THICK FILM
15	R8, R9		2	CRCW06032K0FK; ERJ-3EKF2001; RC0603FR-072KL	VISHAY DALE; PANASONIC; YAGEO	2K	RESISTOR, 0603, 2KΩ, 1%, 100PPM, 0.10W, THICK FILM
16	SU1-SU3		3	S1100-B;SX1100-B; STC02SYAN	KYCON;KYCON; SULLINS ELECTRONICS CORP.	SX1100-B	TEST POINT; JUMPER; STR; TOTAL LENGTH = 0.24IN; BLACK; INSULATION = PBT; PHOSPHOR BRONZE CONTACT = GOLD PLATED
17	T1, T2		2	1935187	PHOENIX CONTACT	1935187	CONNECTOR; FEMALE; THROUGH HOLE; GREEN TERMINAL BLOCK; STRAIGHT; 4PINS
18	U1		1	MAX22518AWA+	MAXIM	MAX22518AWA+	EVKIT PART - IC; 2-CHANNEL MICRO-POWERED DIGITAL ISOLATOR; PACKAGE OUTLINE DRAWING: 21-0262; PACKAGE LAND PATTERN: 90-0258
19	VDDF, VDDL		2	5010	KEYSTONE	N/A	TEST POINT; PIN DIA = 0.125IN; TOTAL LENGTH = 0.445IN; BOARD HOLE = 0.063IN; RED; PHOSPHOR BRONZE WIRE SIL;
20	PCB		1	MAX22518	MAXIM	PCB	PCB:MAX22518
21	MTH1-MTH4	DNI	4	9032	KEYSTONE	9032	MACHINE FABRICATED; ROUND-THRU HOLE SPACER; NO THREAD; M3.5; 5/8IN; NYLON
22	R7	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 2512 RESISTOR
23	C7, C9	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0805 NON-POLAR CAPACITOR
TOTAL			48				

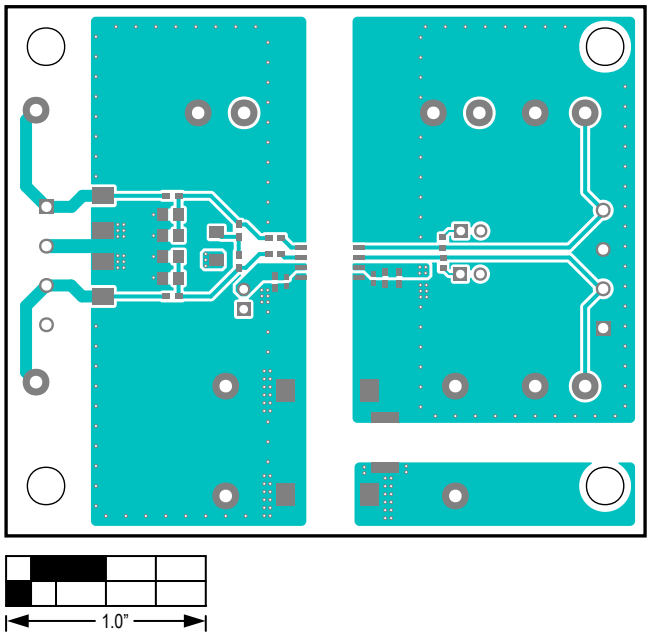
MAX22518 EV Kit Schematic Diagram



MAX22518 EV Kit PCB Layout Diagrams

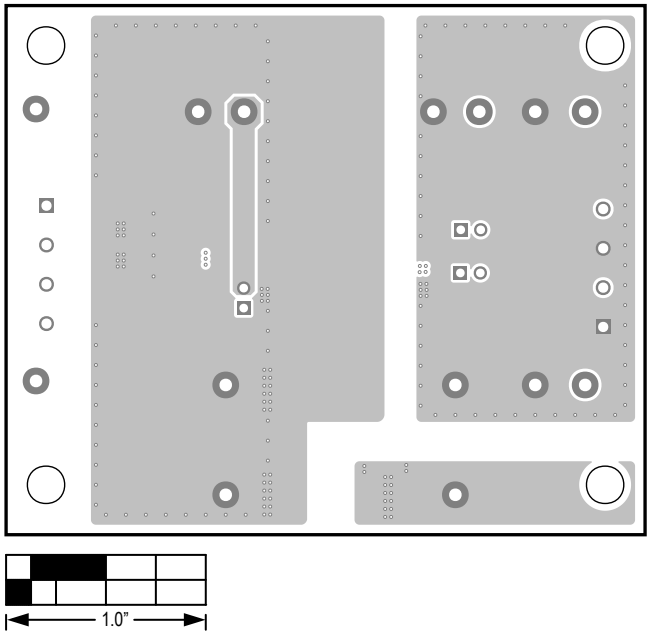


MAX22518 EV Kit Component Placement Guide—Top Silkscreen

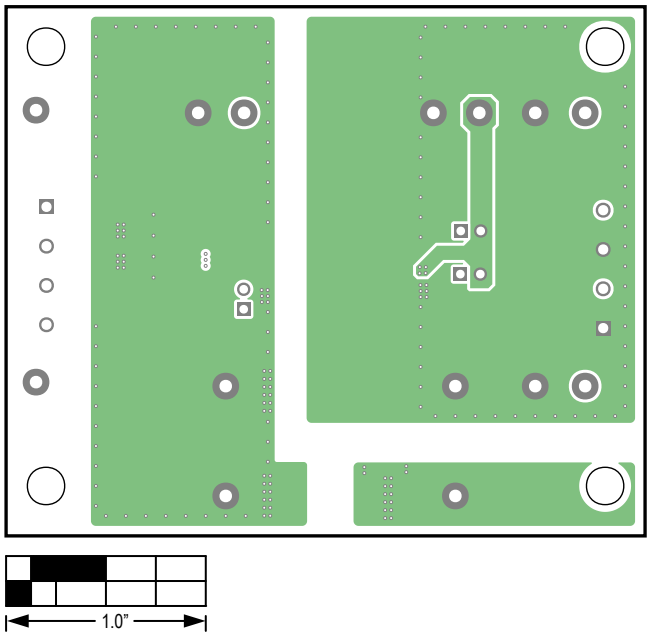


MAX22518 EV Kit PCB Layout—Top Layer

MAX22518 EV Kit PCB Layout Diagrams (continued)

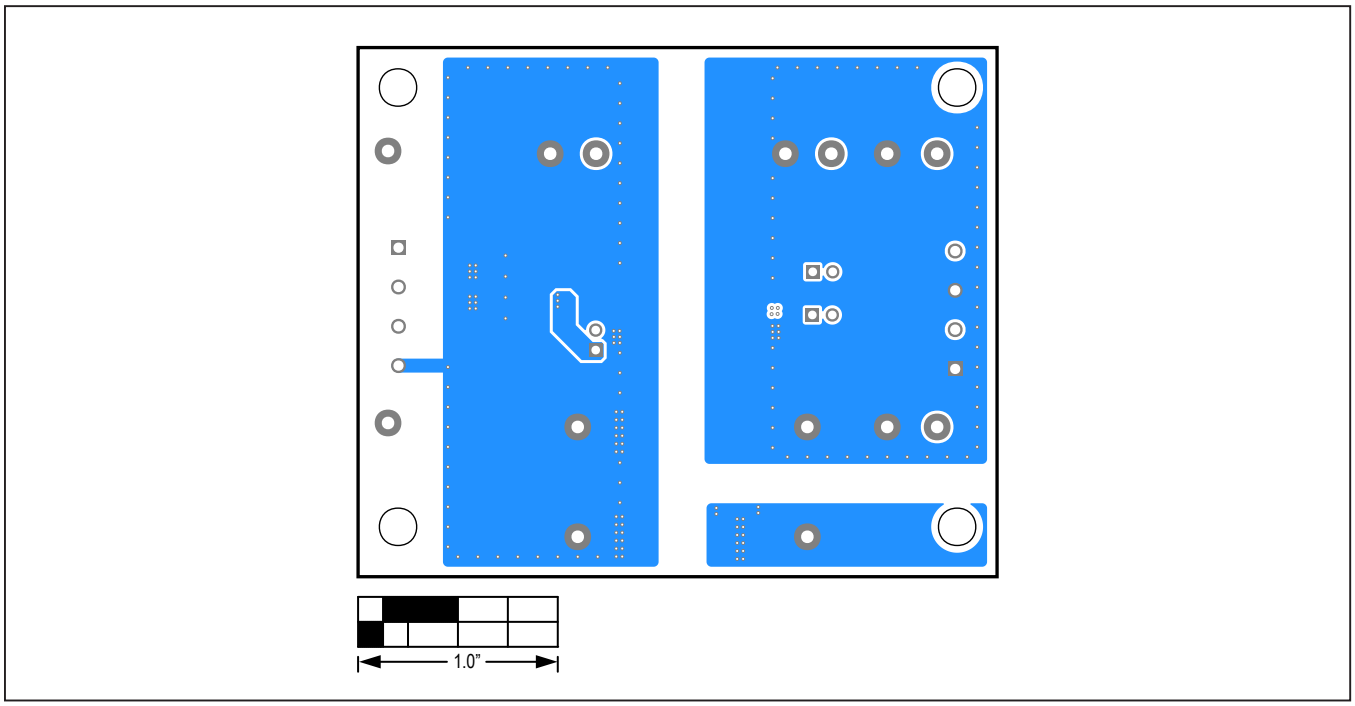


MAX22518 EV Kit PCB Layout—L2 GND

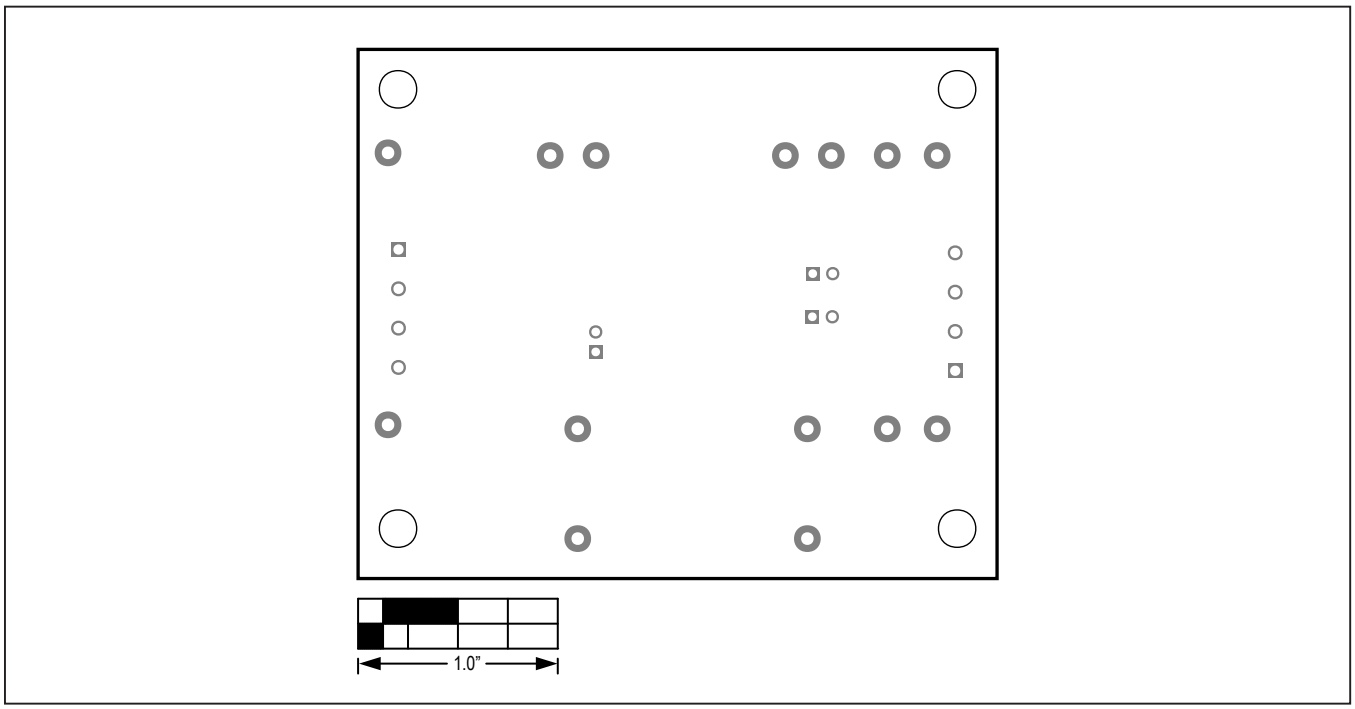


MAX22518 EV Kit PCB Layout—L3 GND

MAX22518 EV Kit PCB Layout Diagrams (continued)



MAX22518 EV Kit PCB Layout—Bottom Layer



MAX22518 EV Kit Component Placement Guide—Bottom Silkscreen