MAX40660 Evaluation Kit

Evaluates: MAX40660

General Description

The MAX40660 evaluation kit (EV kit) is a fully assembled electrical demonstration kit that provides a proven design to evaluate the MAX40660 trans-impedance amplifiers.

Note that the MAX40660 EV kit provides an electrical interface to the IC that is similar, but not the same as a photodiode.

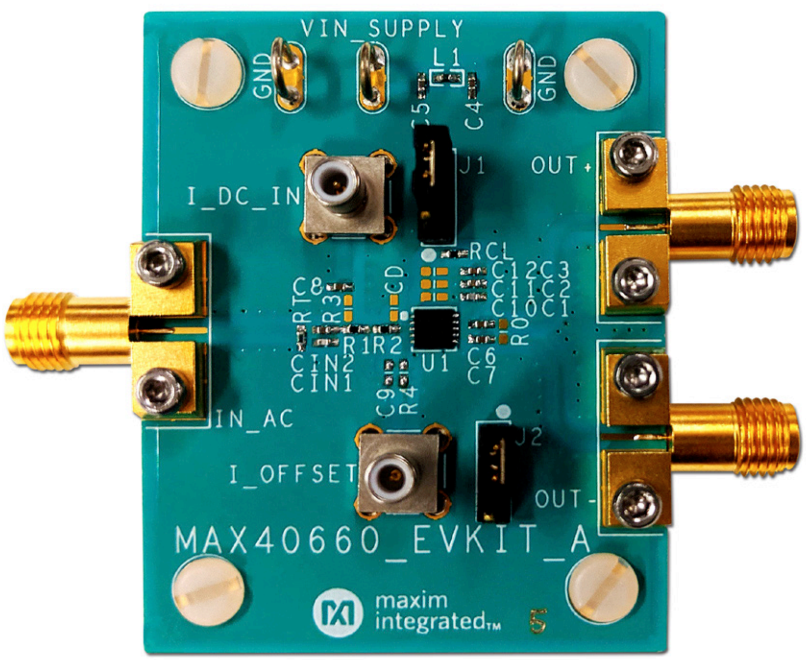
The MAX40660 EV kit PCB comes with a MAX40660ATB/VY+ installed.

Features

- Easy Electrical Evaluation of the MAX40660
- EV Kit Designed for 50Ω Interfaces
- -40°C to +125°C Temperature Range
- Tested 10-TDFN-EP MAX40660ATB/VY+ device
- Accommodates Easy-to-Use components
- Proven PCB Layout
- Fully Assembled and Tested

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

MAX40660 EV Kit Photo



Quick Start

Required Equipment

- +3.6V, 100mA DC Power Supply
- Signal Source Up to 1GHz
- 500MHz to 2.5GHz Oscilloscope

Procedure

The MAX40660 EV kit is fully assembled and tested. Follow the below to verify board operation:

Caution: Do not turn on the power supply or the electronic load until all the connections are complete.

1) Connect a +3.3V supply and ground to VIN_SUPPLY connector and GND return pad of the EV kit, respectively. Disable the output of the power supply.
2) Install a shunt on 2-3 of jumper J1 to enable the TIA. (Installing a shunt on 1-2 of jumper J1 will force the TIA into low-power disable mode.)
3) Install a shunt on 2-3 of jumper J2 to selects the low gain mode (25kΩ transimpedance) (Installing a shunt on 1-2 of jumper J2) selects the high gain mode (50kΩ transimpedance)).
4) Connect a signal source to IN_AC (J4) edge-mount SMA input. Set the signal amplitude to 12.5mV_{P-P} (4.4mV_{RMS} or -34dBm), which corresponds to 5μA_{P-P}. Set the frequency to 300MHz. Disable the signal generator output.
5) Connect OUT1+ (J7) and OUT- (J6) edge-mount SMA outputs to the 50Ω inputs of a high-speed oscilloscope.
6) Verify all the shunts are in default positions, as shown in Table 1.
7) Enable the power supply and signal generator output. Observe for outputs from OUT+ and OUT- on the oscilloscope.
8) The differential signal at the oscilloscope should be approximately 62.5mV_{P-P} at 300MHz.
9) Enable the power supply and signal generator output. Observe for outputs from OUT+ and OUT- on the oscilloscope.
10) The differential signal at the oscilloscope should be approximately 125mV_{P-P} at 300MHz.

Table 1. Jumper Function

JUMPER LABEL	POSITION	FUNCTIONS
J1	2-3*	Enables U1. Active Mode
	1-2	Disables U1 or Low Power Disable Mode
J2	2-3*	Low Gain Mode Selected (25kΩ Transimpedance)
	1-2	High Gain Mode Selected (50kΩ Transimpedance)

**Default position*

Detailed Description of Hardware

The MAX40660 accepts AC and DC-coupled input from a high-speed photodiode. The EV kit facilitates evaluation of the MAX40660 TIA without a photodiode. The MAX40660 TIA is designed to be used with optical transceiver systems when the detector's (APD, PIN diodes) cathode connected to the IN input of the IC. The device is to be used when AC input currents are flowing out of the device at IN input of the IC.

When an APD with negative bias voltage is connected to the TIA input the signal current flows out of the amplifier's summing node. The input current flows through an internal load resistor to develop a voltage that is then applied to the input of the second stage. An internal clamp circuit protects against input currents up to 100mA up to 100ns and up to 2A for 10ns pulses at low duty cycles. For more information about the device, please refer to the IC data sheet.

Theory of Operation

The MAX40660 EV kit provides photodiode emulation using a simplified electrical photodiode model. The model provides a 50Ω electrical input termination, and resistors that convert the high-speed input voltage to high-speed current. A DC path is provided to model the average photodiode current.

Test Interface

The MAX40660 outputs are back terminated with 50Ω. When terminating the outputs to 50Ω oscilloscope, the ac-coupling capacitors C6 and C7 are present and resistor R0 is not installed. When interfacing with subsequent amplifiers or LVDS- capable devices, ac-coupling capacitors (C6,C7) and 100Ω resistor (R0) are installed when the subsequent device has internal bias. Replace C6 and C7 ac coupling capacitors with 0Ω resistors in case of DC coupling into the device.

Input and OFFSET Input DC Evaluation

The MAX40660 EV kit features DC evaluation of IN input and OFFSET input.

When evaluating the MAX40660's IN input in DC mode at I_DC_IN (J3) using a calibrator with voltage output option, 0Ω is installed at resistor R3, capacitors CIN1 and CIN2 are removed. Current value set in microamperes will provide a differential voltage output function of transimpedance selected.

When evaluating the MAX40660's IN input in DC mode at I_DC_IN (J3) using a calibrator with voltage output option, 0Ω is installed at resistor R3, and capacitor C8, CIN1 and CIN2 are removed. Resistors R1 and R2 sets the input resistance (R_S), the bias voltage at IN (V_{IN}) is 855mV. The voltage value set at the calibrator will dictate the input current by the following equation:

$$I_{IN}(\mu A) = [V_{CAL\text{-}SET}(V) - V_{IN(V)}]/R_S \text{ - (1)}$$

Current value in microamperes will provide a differential voltage output function of transimpedance selected.

When evaluating the MAX40660's IN input in DC mode at I_OFFSET(J5) using a calibrator with current output option, resistor R4 is replaced with 0Ω. Current value set in microamperes will provide a differential voltage output function of transimpedance selected.

When evaluating the MAX40660's IN input in DC mode at I_DC_IN (J3) using a calibrator with voltage output option, capacitor C9 is removed. Resistor R4 sets the input resistance and the bias voltage at OFFSET (V_{OFFSET}) is 855mV. The voltage value set at the calibrator will dictate the input current by the following equation:

$$I_{IN(\mu A)} = [V_{CAL\text{-}SET}(V) – V_{OFFSET}(V)]/R4 \text{ - (2)}$$

Current value in microamperes will provide a differential voltage output function of transimpedance selected.

The outputs are observed with ac-coupling capacitors C6 and C7 replaced with 0Ω and resistor R0 with 100Ω installed. The transimpedance is measured with ac-coupled setup, hence with the above method the transimpedance observed will seem to be twice as what it is.

More information about the transfer function curve for IN and OFFSET input can be referred to TOC9 and TOC10 in datasheet. This is useful in determining the load line curve for optimized performance for a given diode.

Current Pulse Measurements

To perform pulse measurements, the current pulses are created by providing a voltage pulse at the J4 input. The input series resistance combination (R1+R2) respectively determines the amplitude of the current pulse.

Both AC and DC coupling at the IN input may be used for this test. When using DC blocking capacitors, C1 and C2 is used in conjunction with the test. When providing the input voltage pulse at IN_AC edge mount SMA , the DC blocking capacitors C1 and C2 are replaced with 0Ω short to DC couple the input to the MAX40660. Make sure resistor R3 is not installed.

The following resistor settings R_S = (R1 + R2) is shown in Table 2 to create the large signal current amplitude pulses.

To generate < 100µA small signal currents, see Equation 1.

Noise measurements

Remove the input resistors and shunt capacitor before attempting noise measurement. With the input resistors and shunt capacitor removed, the total capacitance at the IN-input is equal to 0.5pF.

Table 2. Different Values of R_S (R1+R2) for Different Input Current Pulse Amplitudes.

INPUT SERIES RESISTANCE R_S (Ω)	GENERATOR INPUT HIGH VOLTAGE (V)	GENERATOR INPUT LOW VOLTAGE (V)	GENERATED INPUT CURRENT STEP FROM IN (mA)
1	0.855	0.65	1
	0.855	0.15	10
	0.855	-1.06	50
	0.855	-2.46	100

Ordering Information

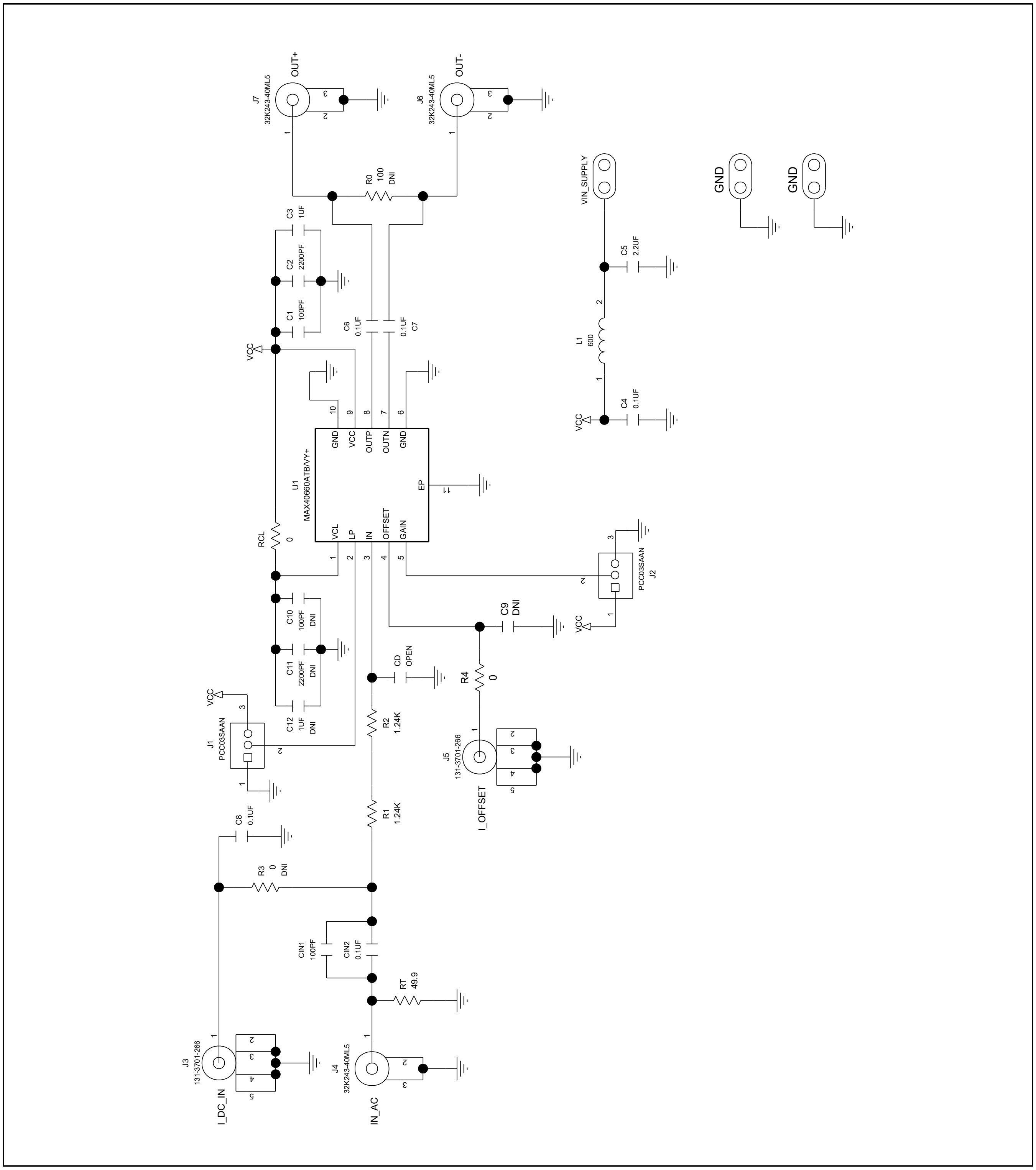
PART	TYPE
MAX40660EVKIT#	EV kit

#Denotes RoHS compliant

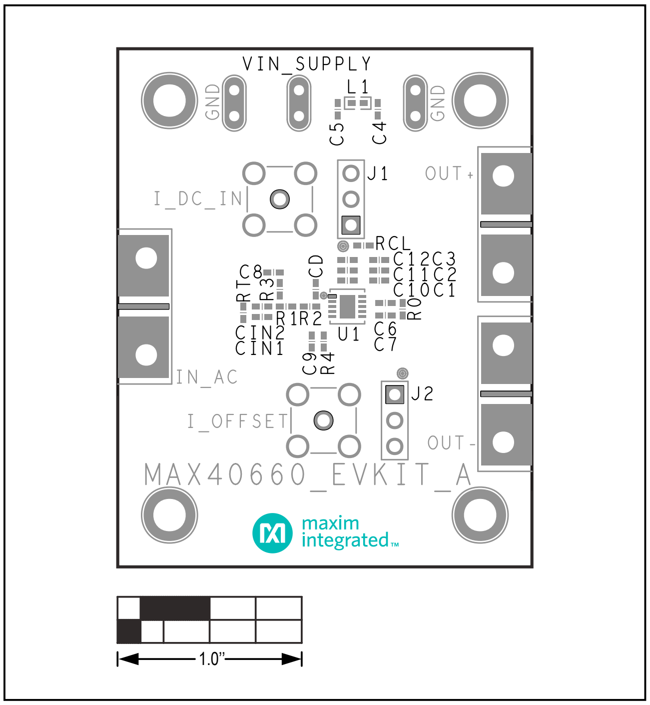
MAX40660 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION
1	C1, CIN1	—	2	C0402C101J5GAC; NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005C0G1H101J050BA; CGA2B2C0G1H101J050BA	KEMET; NIC COMPONENTS CORP.; YAGEO PHICOMP; MURATA;TDK;TDK	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL = 5%; TG = -55°C TO +125°C; TC = C0G
2	C2	—	1	C0402X7R500-222KNE; GRM155R71H222KA01	VENKEL LTD.;MURATA	2200PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 2200PF; 50V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
3	C3	—	1	C0402X5R100-105KNE; GRM155R61A105KE15	VENKEL LTD.;MURATA	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 10V; TOL = 10%; MODEL =; TG = -55°C TO +85°C; TC = X5R
4	C4, C6-C8	—	4	GRM155R61C104KA88	MURATA	0.1UF	CAPACITOR; SMT (0402); CERAMIC; 0.1UF; 16V; TOL = 10%; MODEL = GRM SERIES; TG = -55°C to +85°C; TC = X5R
5	C5	—	1	C0402X5R6R3-225MNP; C0402C225M9PAC; GRM155R60J225ME15; \JMK105BJ225MV	VENKEL;KEMET;MURATA; TAIYO YUDEN	2.2UF	CAPACITOR; SMT; 0402; CERAMIC; 2.2µF; 6.3V; 20%; X5R; -55°C to + 85°C; 0 ±15% °C MAX.
6	CIN2	—	1	CGA2B3X7R1H104K050BB; C1005X7R1H104K050BB; GRM155R71H104KE14; GCM155R71H104KE02; C1005X7R1H104K050BE; UMK105B7104KV-FR; CGA2B3X7R1H104K050BE	TDK;TDK;MURATA;MURATA; TDK;TAIYO YUDEN;TDK	0.1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 0.1UF; 50V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
7	GND1, GND2, VIN_SUPPLY	—	3	9020 BUSS	WEICO WIRE	MAXIMPAD	EVK KIT PARTS; MAXIM PAD; WIRE; NATURAL; SOLID; WEICO WIRE; SOFT DRAWN BUS TYPE-S; 20AWG
8	J1, J2	—	2	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65°C TO +125°C
9	J3, J5	—	2	131-3701-266	JOHNSON COMPONENTS	131-3701-266	CONNECTOR; MALE; THROUGH HOLE; SMB JACK VERTICAL PCB MOUNT; STRAIGHT; 5PINS
10	J4, J6, J7	—	3	32K243-40ML5	ROSENBERGER	32K243-40ML5	CONNECTOR; FEMALE; SMT; SMA JACK PCB; RIGHT ANGLE; 2PINS
11	L1	—	1	BLM15BD601SN1	MURATA	600	INDUCTOR; SMT (0402); FERRITE-BEAD; 600; TOL = ±25%; 0.2A
12	MH1-MH4	—	4	P440.375	GENERIC PART	N/A	MACHINE SCREW; SLOTTED; PAN; 4-40IN; 3/8IN; NYLON
13	MH1-MH4	—	4	1902B	GENERIC PART	N/A	STANDOFF; FEMALE-THREADED; HEX; 4-40IN; 3/8IN; NYLON
14	R1, R2	—	2	ERJ-2RKF1241	PANASONIC	1.24K	RESISTOR; 0402; 1.24K ; 1%; 100PPM; 0.10W; THICK FILM
15	R4, RCL	—	2	ERJ-2GE0R00	PANASONIC	0	RESISTOR; 0402; 0Ω; 0%; JUMPER; 0.10W; THICK FILM
16	RT	—	1	TNPW040249R9BE; RG1005P-49R9-B-T; ERA-2AEB49R9	SUSUMU CO LTD.; PANASONIC;VISHAY	49.9	RESISTOR; 0402; 49.9Ω; 0.1%; 25PPM; 0.063W; THICK FILM
17	SU1, SU2	—	2	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
18	U1	—	1	MAX40660ATB/VY+	MAXIM	MAX40660ATB/VY+	EVKIT PART - IC; TRANSIMPEDANCE AMPLIFIER WITH 100 MILLI-AMPERE INPUT CURRENT CLAMP FOR AUTOMOTIVE LIDAR; PACKAGE OUTLINE DRAWING: 21-100317; PACKAGE CODE: T1033Y+4C
19	PCB	—	1	MAX40660	MAXIM	PCB	PCB:MAX40660
20	C9, C12	DNP	0	C0402X5R100-105KNE; GRM155R61A105KE15	VENKEL LTD.;MURATA	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1µF; 10V; TOL = 10%; MODEL = ; TG = -55°C TO +85°C; TC = X5R
21	C10	DNP	0	C0402C101J5GAC; NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005C0G1H101J050BA; CGA2B2C0G1H101J050BA	KEMET; NIC COMPONENTS CORP.; YAGEO PHICOMP; MURATA;TDK;TDK	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL = 5%; TG = -55°C TO +125°C; TC = C0G
22	C11	DNP	0	C0402X7R500-222KNE; GRM155R71H222KA01	VENKEL LTD.;MURATA	2200PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 2200PF; 50V; TOL = 10%; TG = -55°C TO +125°C; TC = X7R
23	R0	DNP	0	ERJ-2RKF1000	PANASONIC	100	RESISTOR; 0402; 100 ; 1%; 100PPM; 0.10W; THICK FILM
24	R3	DNP	0	ERJ-2GE0R00	PANASONIC	0	RESISTOR; 0402; 0Ω; 0%; JUMPER; 0.10W; THICK FILM
25	CD	DNP	0	N/A	N/A	OPEN	PACKAGE OUTLINE 0402 NON-POLAR CAPACITOR
TOTAL			38				

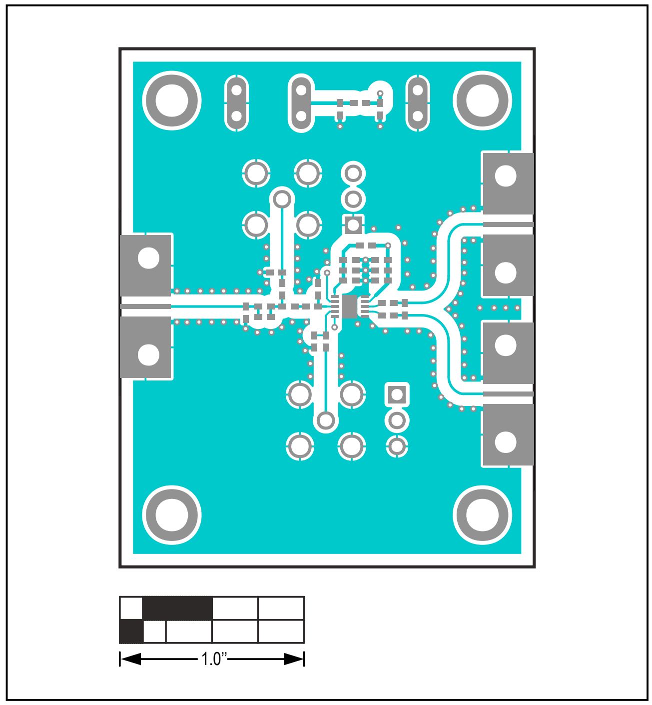
MAX40660 EV Kit Schematic



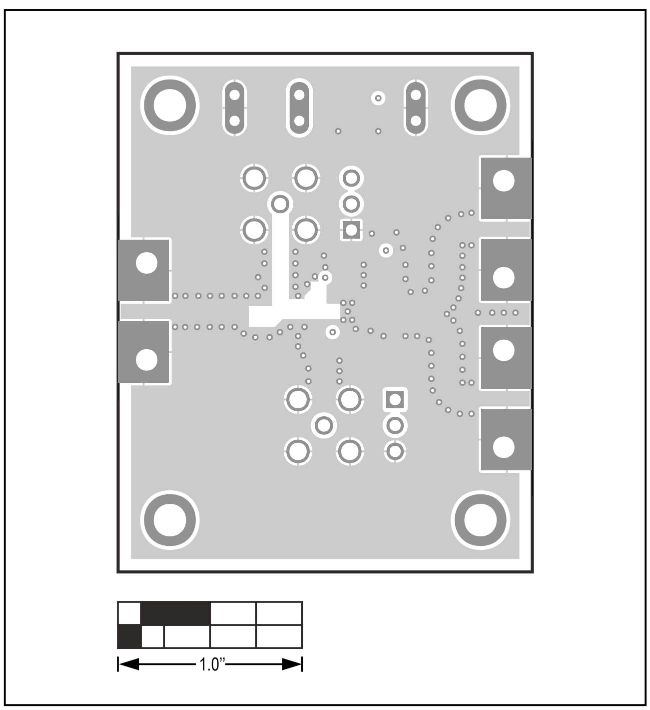
MAX40660 EV Kit PCB Layout Diagrams



MAX40660 EV Kit PCB Layout—Top Silkscreen

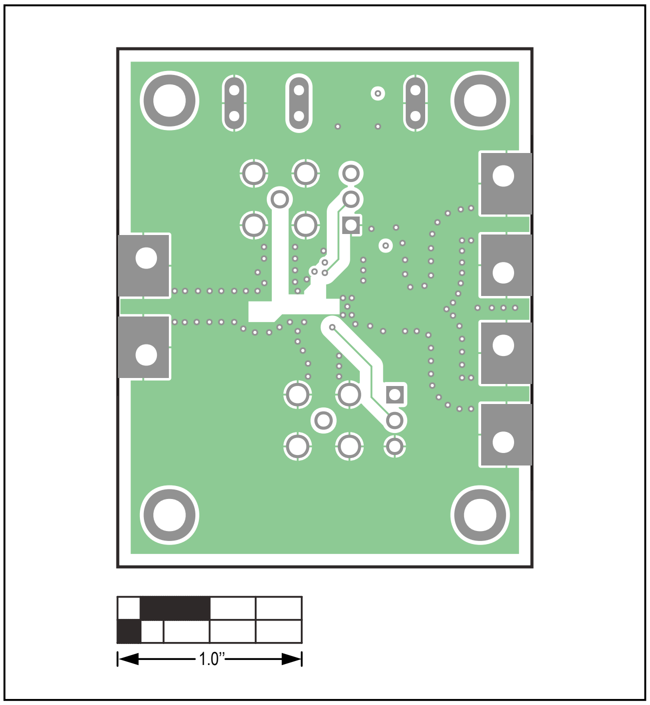


MAX40660 EV Kit PCB Layout—Top Layer

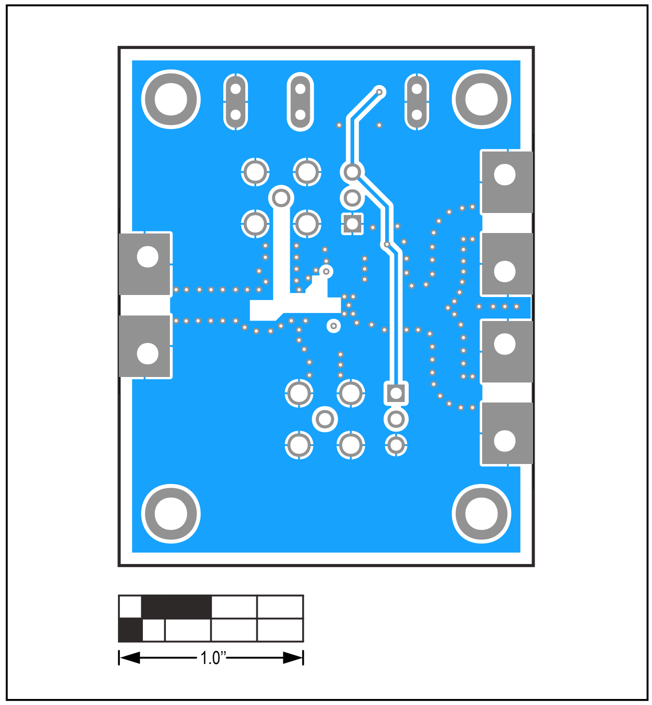


MAX40660 EV Kit PCB Layout—Layer 2 Ground

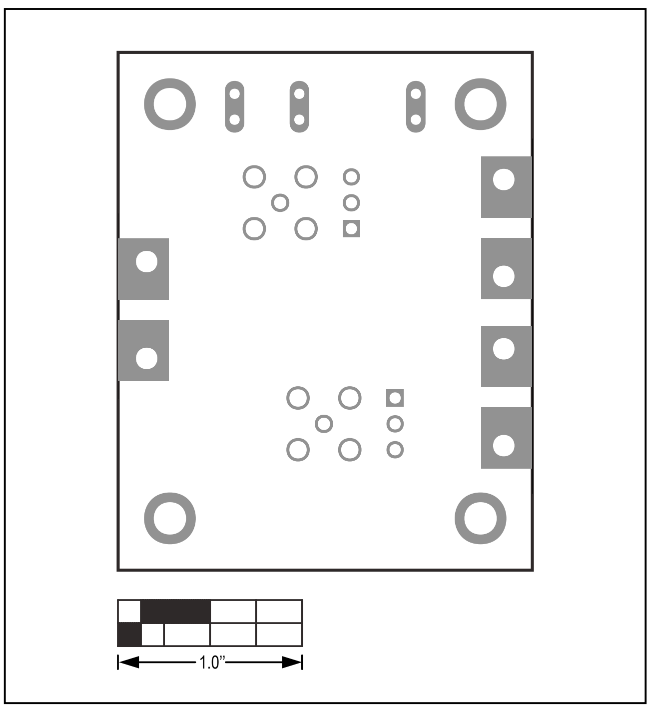
MAX40660 EV Kit PCB Layout Diagrams (continued)



MAX40660 EV Kit PCB Layout—Layer 3 Power



MAX40660 EV Kit PCB Layout—Bottom Layer



MAX40660 EV Kit PCB Layout—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	5/19	Initial release	—

