

MAX40661 Evaluation Kit

Evaluates: MAX40661

General Description

The MAX40661 evaluation kit (EV kit) is a fully assembled electrical demonstration kit that provides a proven design to evaluate the MAX40661 transimpedance amplifiers.

Note that the MAX40661 EV kit provides an electrical interface to the IC that is similar, but not the same as a photodiode.

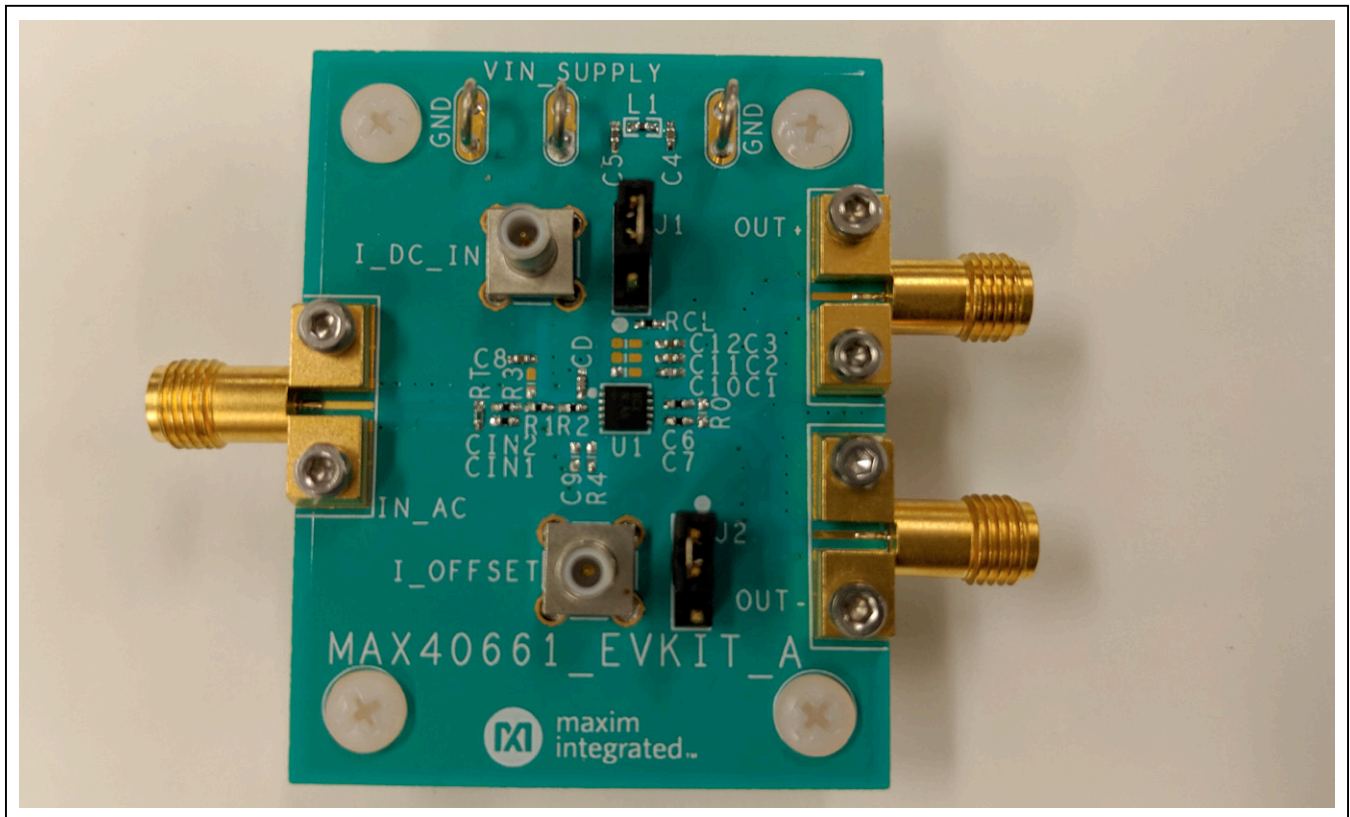
The MAX40661 EV kit PCB comes with a MAX40661ATB/VY+ installed.

Features

- Easy Electrical Evaluation of the MAX40661
- EV Kit Designed for 50Ω Interfaces
- -40°C to +125°C Temperature Range
- Tested 10-TDFN-EP MAX40661ATB/VY+ Device
- Accommodates Easy-to-Use Components
- Proven PCB Layout
- Fully Assembled and Tested

Ordering Information appears at end of data sheet.

MAX40661 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 MAX40661 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 on jumper J1 will force the TIA into low power disable mode.)
- 3) Install a shunt on 2-3 of jumper J2 to select low gain mode (25kΩ transimpedance). (Installing a shunt on 1-2 of jumper J2 selects 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 2.5μA_{p-p}. Set the frequency to 100MHz. 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 100MHz.

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 MAX40661 accepts AC and DC-coupled input from a high-speed photodiode. The EV kit facilitates evaluation of the MAX40661 TIA without a photodiode. The MAX40661 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 MAX40661 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 MAX40661 outputs are back terminated with 50Ω. When terminating the outputs to 50 Ω 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 MAX40661 EV kit features DC evaluation of IN input and OFFSET input.

When evaluating the MAX40661's IN input in DC mode at I_DC_IN (J3) using a calibrator with current 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 MAX40661'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 capacitors C8, CIN1 and CIN2 are removed. Resistor R1 and R2 sets the input resistance (Rs), and 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:

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

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

When evaluating the MAX40661'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 MAX40661'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:

$$I_{IN}(\mu A) = [V_{CAL-SET}(V) - V_{OFFSET}(V)] / R_4 - (2)$$

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 0Ωm 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, TOC10 in the data sheet. 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 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 are 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 MAX40661. 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, please refer to 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 Rs (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

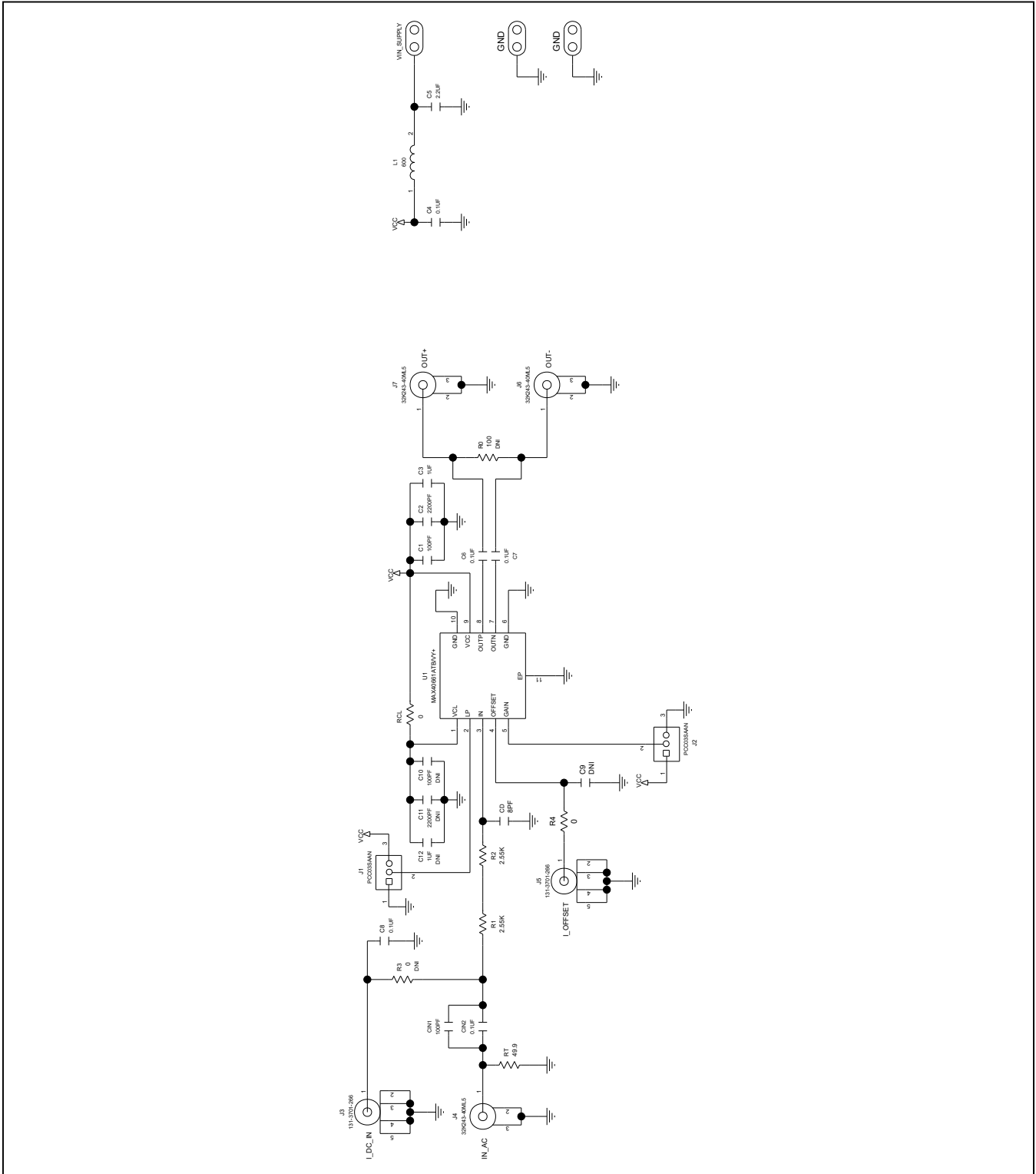
PART	TYPE
MAX40661EVKIT#	EV kit

#Denotes RoHS compliant.

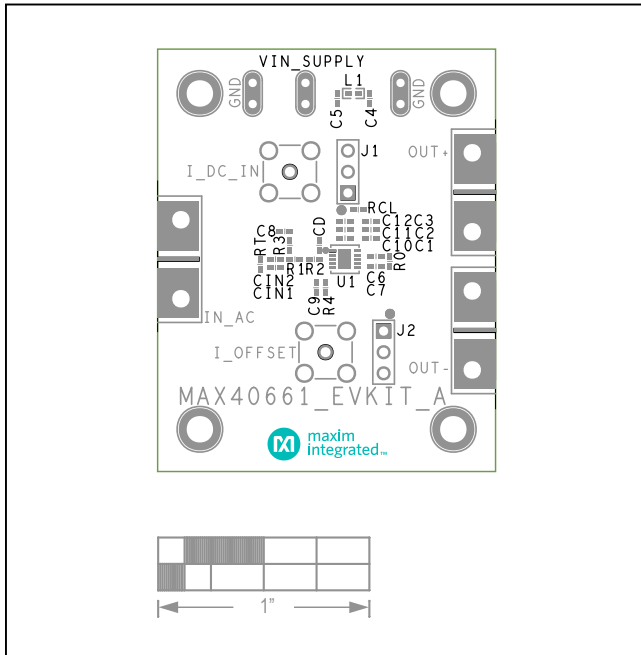
MAX40661 EV Kit Bill of Materials

ITEM	REF_DES	DNI/DNP	QTY	MFG PART #	MANUFACTURER	VALUE	DESCRIPTION	COMMENTS
1	C1, CIN1	-	2	C0402C101J5GAC; NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005COG1H101J050BA; CGA2B2C0G1H101J050BA	KEMET;NIC COMPONENTS CORP.; YAGEO PHICOMP;MURATA;TDK;TDK	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL=5%; TG=-55 DEGC TO +125 DEGC; TC=C0G	
2	C2	-	1	C0402X7R500-222KNE; GRM155R71H222KA01	VENKEL LTD.;MURATA	2200PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 2200PF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
3	C3	-	1	C0402X5R100-105KNE; GRM155R61A105KE15	VENKEL LTD.;MURATA	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 10V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; 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 DEGC to +85 DEGC; TC=X5R	
5	C5	-	1	C0402X5R6R3-225MNP; C0402C225M9PAC; GRM155R60J225ME15; JMK105BJ225MV	VENKEL;KEMET;MURATA; TAIYO YUDEN	2.2UF	CAPACITOR; SMT; 0402; CERAMIC; 2.2uF; 6.3V; 20%; X5R; -55degC to + 85degC; 0 +/-15% degC MAX.	
6	CD	-	1	CGA2B2NP01H080D050BA	TDK	8PF	CAP; SMT (0402); 8PF; +/-0.5PF; 50V; C0G; CERAMIC CHIP	
7	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 DEGC TO +125 DEGC; TC=X7R	
8	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	
9	J1, J2	-	2	PCC03SAAN	SULLINS	PCC03SAAN	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 3PINS; -65 DEGC TO +125 DEGC	
10	J3, J5	-	2	131-3701-266	JOHNSON COMPONENTS	131-3701-266	CONNECTOR; MALE; THROUGH HOLE; SMB JACK VERTICAL PCB MOUNT; STRAIGHT; 5PINS	
11	J4, J6, J7	-	3	32K243-40ML5	ROSENBERGER	32K243-40ML5	CONNECTOR; FEMALE; SMT; SMA JACK PCB; RIGHT ANGLE; 2PINS	
12	L1	-	1	BLM15BD601SN1	MURATA	600	INDUCTOR; SMT (0402); FERRITE-BEAD; 600; TOL=+-25%; 0.2A	
13	MH1-MH4	-	4	P440.375	GENERIC PART	N/A	MACHINE SCREW; SLOTTED; PAN; 4-40IN; 3/8IN; NYLON	
14	MH1-MH4	-	4	1902B	GENERIC PART	N/A	STANDOFF; FEMALE-THREADED; HEX; 4-40IN; 3/8IN; NYLON	
15	R1, R2	-	2	CRCW04022K55FK	VISHAY DALE	2.55K	RESISTOR, 0402, 2.55K OHM, 1%, 100PPM, 0.0625W, THICK FILM	
16	R4, RCL	-	2	ERJ-2GE0R00	PANASONIC	0	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM	
17	RT	-	1	TNPW040249R9BE; RG1005P-49R9-B-T; ERA-2AEB49R9	SUSUMU CO LTD.; PANASONIC;VISHAY	49.9	RESISTOR; 0402; 49.9 OHM; 0.1%; 25PPM; 0.063W; THICK FILM	
18	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	
19	U1	-	1	MAX40661ATB/VY+	MAXIM	MAX40661ATB/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	
20	PCB	-	1	MAX40661	MAXIM	PCB	PCB:MAX40661	-
21	C9, C12	DNP	0	C0402X5R100-105KNE; GRM155R61A105KE15	VENKEL LTD.;MURATA	1UF	CAPACITOR; SMT (0402); CERAMIC CHIP; 1UF; 10V; TOL=10%; MODEL=; TG=-55 DEGC TO +85 DEGC; TC=X5R	
22	C10	DNP	0	C0402C101J5GAC; NMC0402NPO101J; CC0402JRNPO9BN101; GRM1555C1H101JA01; C1005COG1H101J050BA; CGA2B2C0G1H101J050BA	KEMET;NIC COMPONENTS CORP.; YAGEO PHICOMP;MURATA;TDK;TDK	100PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 100PF; 50V; TOL=5%; TG= 55 DEGC TO +125 DEGC; TC=C0G	
23	C11	DNP	0	C0402X7R500-222KNE; GRM155R71H222KA01	VENKEL LTD.;MURATA	2200PF	CAPACITOR; SMT (0402); CERAMIC CHIP; 2200PF; 50V; TOL=10%; TG=-55 DEGC TO +125 DEGC; TC=X7R	
24	R0	DNP	0	ERJ-2RKF1000	PANASONIC	100	RESISTOR; 0402; 100 OHM; 1%; 100PPM; 0.10W; THICK FILM	
25	R3	DNP	0	ERJ-2GE0R00	PANASONIC	0	RESISTOR; 0402; 0 OHM; 0%; JUMPER; 0.10W; THICK FILM	
TOTAL			39					

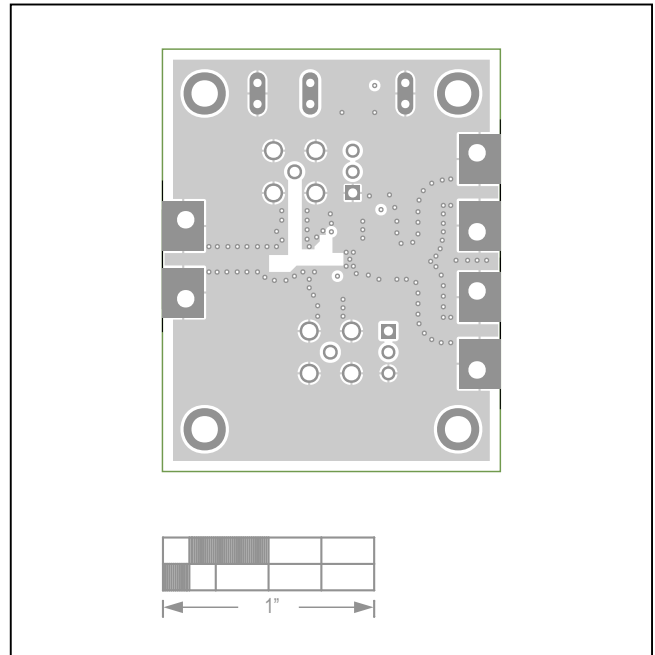
MAX40661 EV Kit Schematics



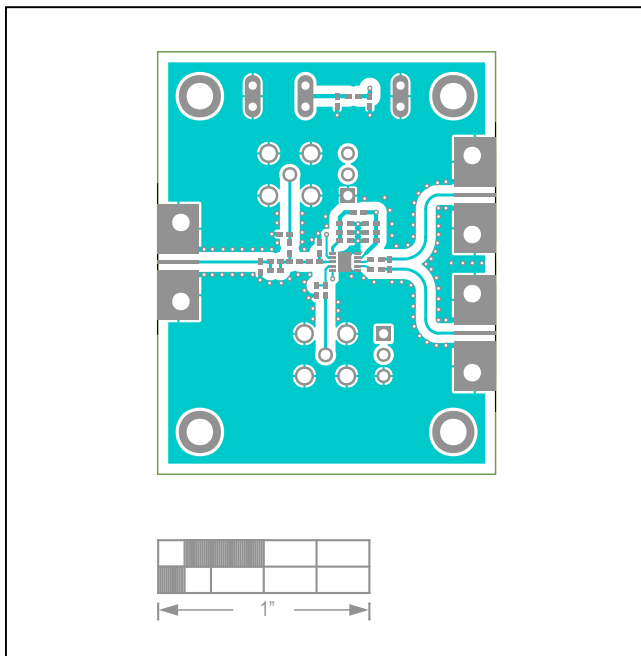
MAX40661 EV Kit PCB Layout Diagrams



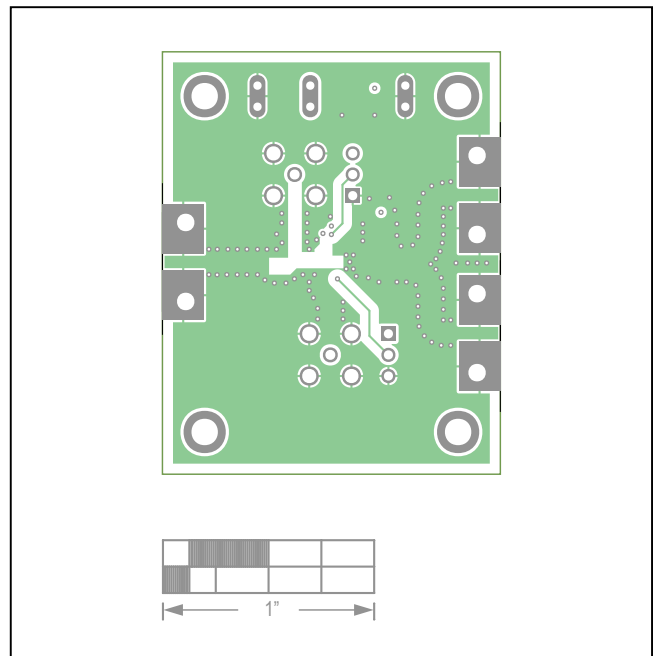
MAX40661 EV Kit—Top Silkscreen



MAX40661 EV Kit—GND 2

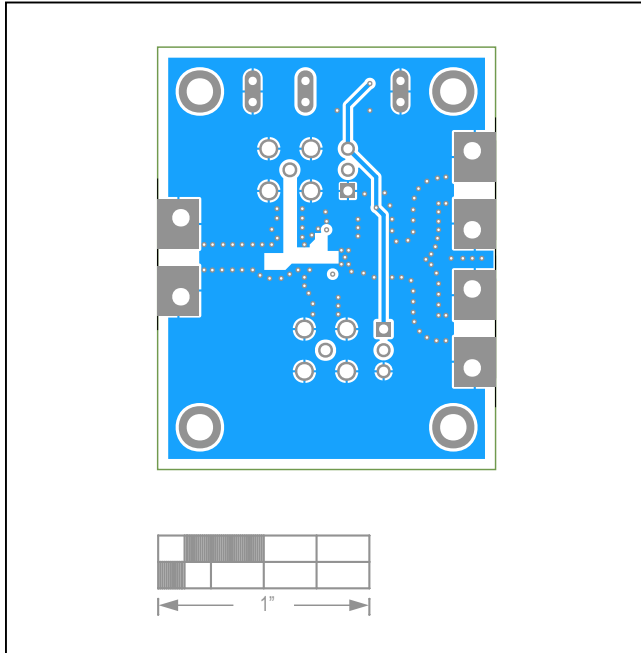


MAX40661 EV Kit—Top

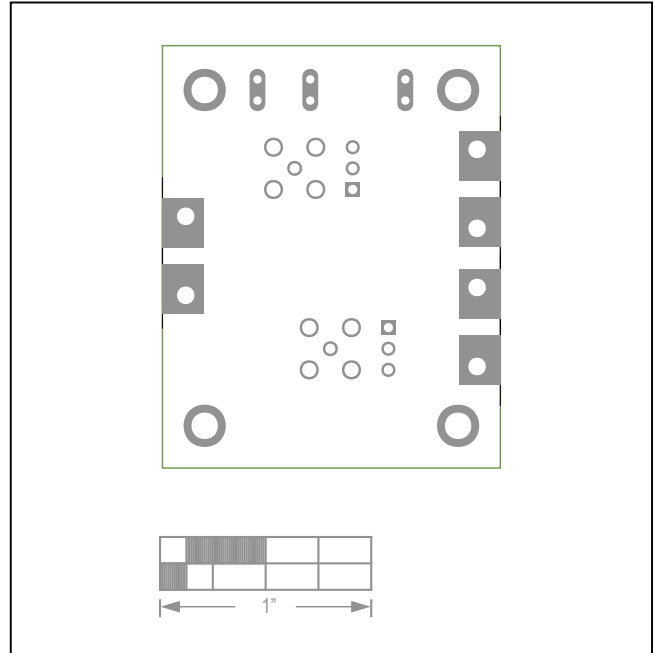


MAX40661 EV Kit—GND 3

MAX40661 EV Kit PCB Layout Diagrams (continued)



MAX40661 EV Kit—Bottom



MAX40661 EV Kit—Bottom Silkscreen

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	7/19	Initial release	—

For pricing, delivery, and ordering information, please visit Maxim Integrated's online storefront at <https://www.maximintegrated.com/en/storefront/storefront.html>.

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MAXESSENTIAL01+

Description

The Essential Analog toolkit contains a unique collection of Maxim's high-performance, analog building block products. This curated group of parts represent a selection of Maxim's vast product lines, specific to 20 product categories, from key performance areas including power efficiency, precise measurement, reliable connectivity, and robust protection.

The ICs in the toolkit offer the breadth of each product category: low power, low noise, multi-channel, high resolution, high accuracy, and high speed. All these features empower your designs and bring value to your systems.

At 6.4cm x 8.9cm x 1.3cm, the box itself is small, lightweight, and easy to carry. Products are guarded from ESD using a gel and ESD-protected box.

A guide that labels each of the part types inside the box supports the toolkit. Go to the Maxim website to find more information for the individual part numbers.

When planning your next design, pick up an Essential Analog toolkit to review Maxim's high-performance analog products.

Key Features

- Small, 6.4cm x 8.9cm x 1.3cm Package
- ESD Protection-Lined Package
- Accelerate Your Design with Quick Access



What's Included in the Box?

Efficient Power				
Buck	Boost	Buck-Boost	LDO	Continua
MAX38640 MAX15026	MAX17225 MAX668	MAX77827 MAX77816	MAX38902B MAX1510	MAX38888
Precision Measurement				
ADC	DAC	Audio Amp	Op Amp	CSA
MAX11410 MAX11168	MAX5541 MAX5715	MAX98357A MAX98390	MAX40075 MAX40100	MAX44284 MAX40201
Reliable Connectivity				
RS-485	RS-232	CAN	BTR Switch	Wireless
MAX14780E MAX3485AE	MAX13235E MAX33250E	MAX13054A MAX33054E	MAX14778 MAX14763	MAX41460 MAX7034
Robust Protection				
Supervisor	Temp Sensor	Isolator	Ideal Diode/V _{REF}	RTC
MAX16150 MAX16140	MAX6680 MAX31875	MAX12930 MAX22445	MAX40203 MAX6078A	MAX31341B DS3231MZ