

### General Description

The MAX18002 evaluation kit (EV kit) is a fully assembled and tested printed circuit board (PCB) that demonstrates the MAX18002 series of boost converters. The MAX18002 series has an input range of 0.5V to 5.5V, with a switch current limit of 3.6A and output voltage adjustable between 2.5V and 5.5V (ultrasonic mode (USM) and nanopower mode disabled for  $V_{OUT} > 5V$ ).

The EV kit can be ordered with MAX18000AWT+ (nanopower version) and MAX18002AWT+ (USM version). It is equipped with test points and jumpers for testing most of the functionality of the device. There are probing holes on critical nodes (OUT and LX) for precise measurements.

### Quick Start

#### Required Equipment

- MAX18002 Evaluation Kit (with MAX18000AWT+ or MAX18002AWT+)
- Adjustable DC Power Supply
- Digital Multimeter (x4)
- Electronic Load

#### Features and Benefits

- 1.8V to 5.5V Input Voltage
- Test Points for INS, OUTS, and GNDS
- Sense Sockets at LX and OUT
- Output Voltage Adjustable Between 2.5V to 5.5V (in 100mV steps)

### EV Kit Specification

**Table 1. EV Kit Specification**

SPECIFICATION	TEST CONDITION	MIN	TYP	MAX	UNIT
Startup Voltage		1.8		5.5	V
Output Voltage	Configured using RSEL resistor	2.5		5.5	V
Maximum Inductor Current			3.6		A

**Table 2. Default Jumper Positions**

JUMPER	NODE OR FUNCTION	SHUNT POSITION	FEATURE
JU1	EN	1-2*	Connects EN to $V_{IN}$
		2-3	Connects EN to GND
JU2	SEL	1-2*	Connects RSEL pin to an on-board potentiometer

\*Default position.

[Ordering Information](#) appears at end of data sheet.

## Procedure

The simplified EV kit circuit is shown below in [Figure 1](#) and a typical bench setup for MAX18002 EV kit is shown in [Figure 4](#). The same bench setup and typical application circuit are applicable when evaluating the MAX18000.

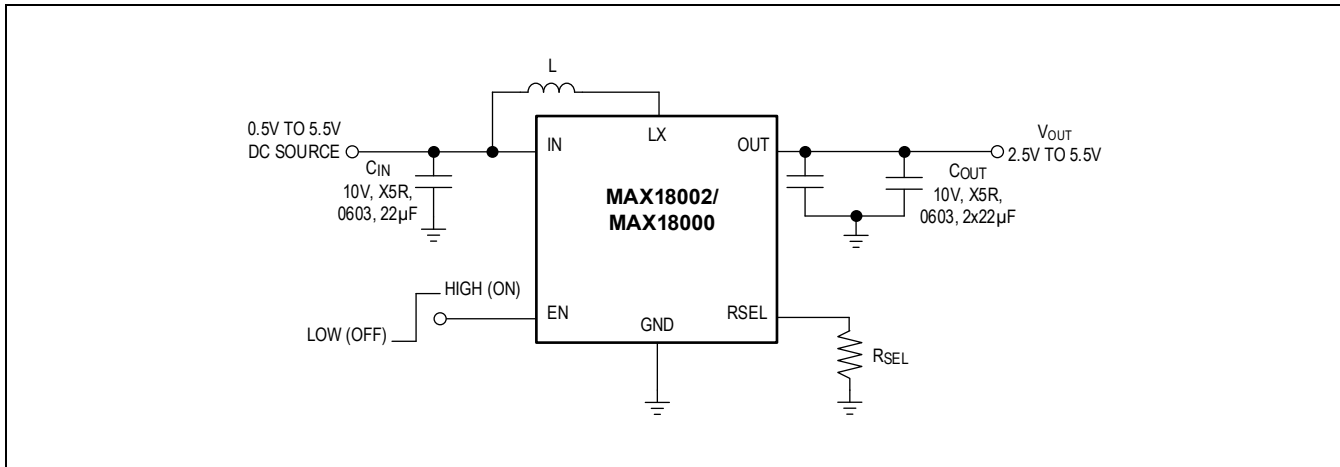


Figure 1. Typical Application Circuit

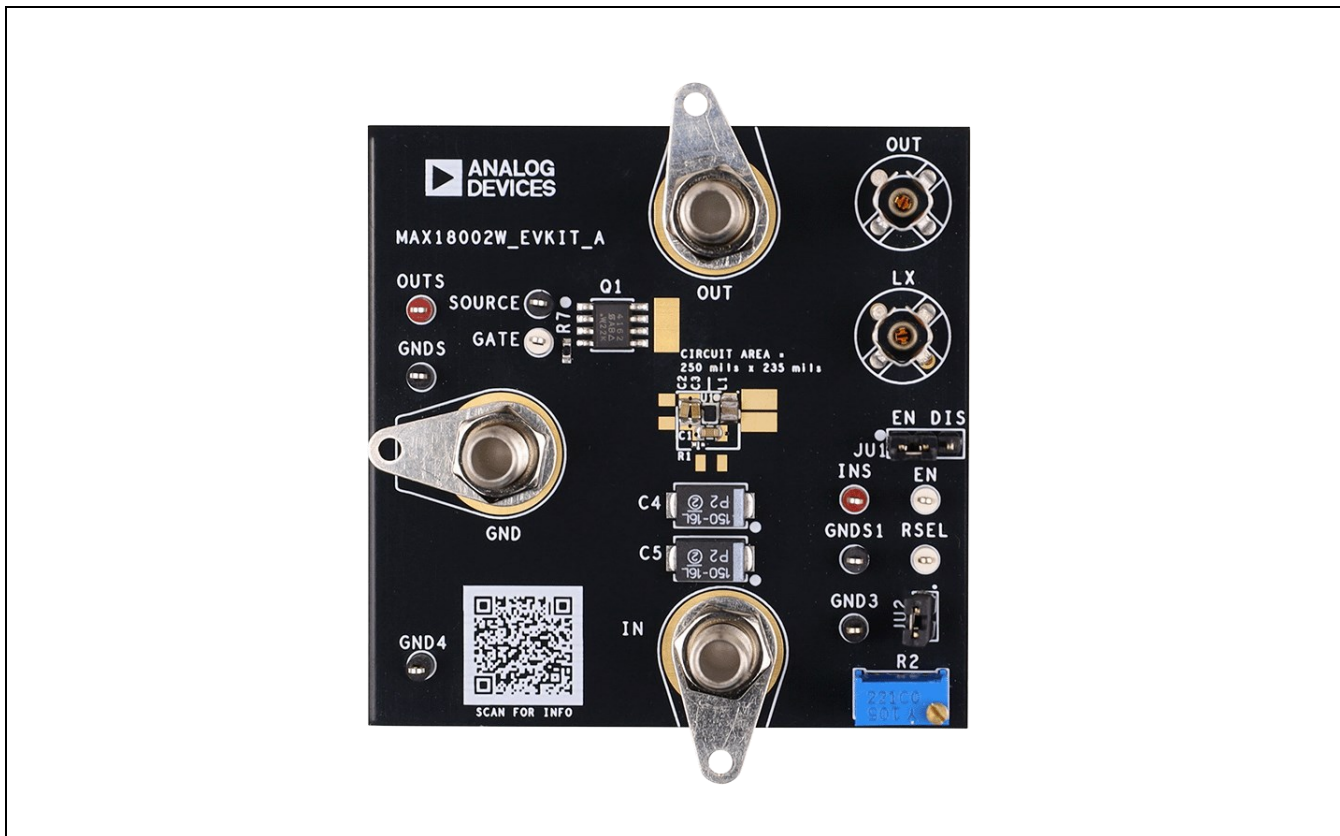


Figure 2. MAX18002 Evaluation Board

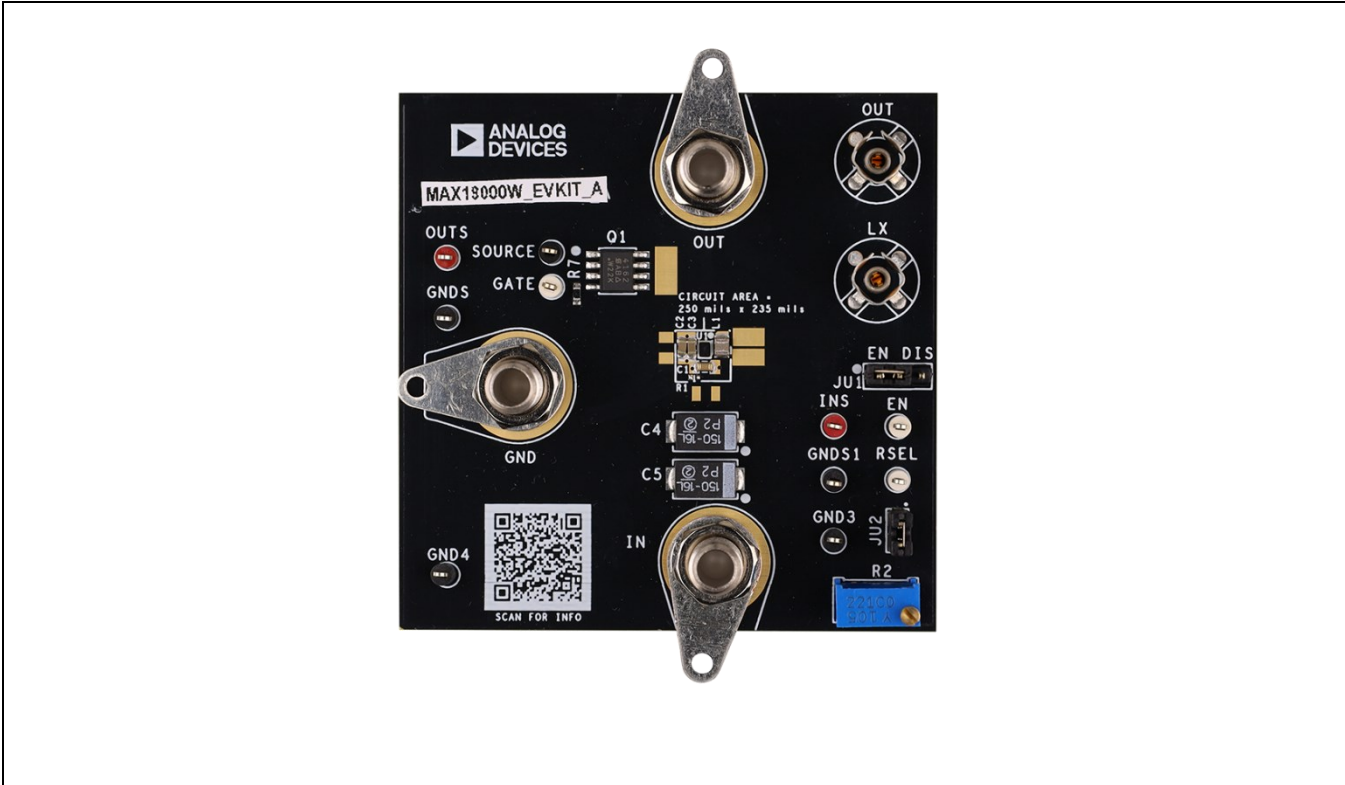


Figure 3. MAX18000 Evaluation Board

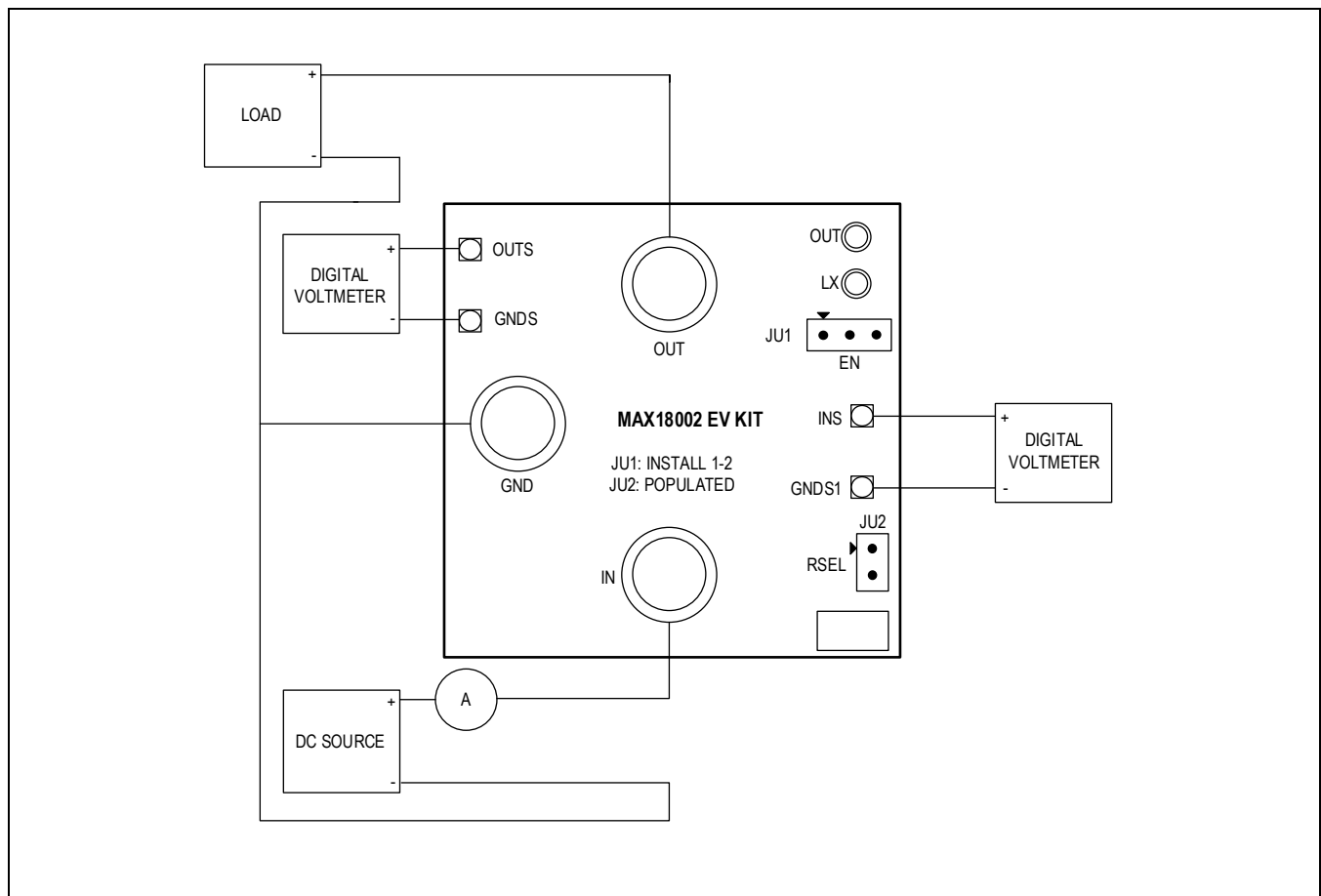


Figure 4. EV Kit Connection Block Diagram

The EV kit is fully assembled and tested. Follow the steps below to verify board operation. Use twisted wires of appropriate gauge that are as short as possible to connect the load and power sources.

1. Identify the connections and test points shown in [Figure 4](#). Ensure that the EV kit has the correct jumper settings, as shown in [Table 2](#).
2. Connect a DVM to the INS and GNDS1 pins to measure input voltage.
3. Connect a DVM to the OUTS and GNDS pins to measure output voltage.
4. Set RSEL to 10kΩ (OUT = 5V). See the [Output-Voltage Selection](#) section for more information on how to select the RSEL values.
5. Set the power supply to 3.6V (100mA current limit) across the IN and GND terminals of the EV kit. Turn on the power supply.
6. Confirm the DVM connected to OUTS and GNDS reads (5.23V for the MAX18002 and 5.14V for the MAX18000). Confirm the ammeter reads the expected input supply current, which is shown in [Table 3](#).

**Table 3. Input Current Measurement**

IC VERSION	INPUT CURRENT
MAX18002WEVKIT#	3.2mA
MAX18000WEVKIT#	25µA

When the EV kit operation is verified, increase the current limit on the power supply connected across IN and PGND. Connect an electronic load across OUT and GND terminals to evaluate the performance of the boost regulator.

## EV Kit Hardware

The MAX18002 EV kit demonstrates the MAX18000 or MAX18002 boost converter. The IC can regulate the output voltage between 2.5V and 5.5V from an input supply of 0.5V to 5.5V. The output voltage is set using a single resistor connected at the RSEL pin. See the jumper configuration in [Table 2](#) to configure the EV kit for initial operation.

## Evaluating Different Versions

The EV kit can be ordered with the MAX18000 or the MAX18002 preinstalled. A label on the EV kit denotes the part number populated as U1. A brief description of each of the IC versions is given below for more details regarding the individual version refer to the respective IC datasheets.

- **MAX18000AWT+:** This is a nano power boost converter with 512nA quiescent current. This version operates in low-power mode at low loads to ensure high efficiency in all load conditions. For this version,  $V_{OUT} - V_{IN} > 0.2V$ . (The part is always in boost mode).
- **MAX18002AWT+:** This is an ultrasonic boost converter that operates in ultrasonic mode ( $F_{SW} > 22kHz$ ) at low loads to stay away from acoustic audible noise interference.

## Output-Voltage Selection

The resistor connected between the RSEL pin and GND is used to select an output voltage level between 2.5V and 5.5V in 100mV steps. See [Table 4](#) to select the resistor for each output voltage.

**Table 4. RSEL Selection**

OUTPUT VOLTAGE (V)	RSEL (kΩ)
2.5	768
2.6	634
2.7	536
2.8	452
2.9	383
3.0	324
3.1	267
3.2	226
3.3	191
3.4	162
3.5	133
3.6	113
3.7	95.3
3.8	80.6
3.9	66.5
4.0	56.2
4.1	47.5
4.2	40.2
4.3	34
4.4	28

OUTPUT VOLTAGE (V)	RSEL (kΩ)
4.5	23.7
4.6	20
4.7	16.9
4.8	14
4.9	11.8
5.0	10.0
5.1*	8.45
5.2*	7.15
5.3*	5.9
5.4*	4.99
5.5*	Short to Ground

\*USM and nanopower mode disabled for  $V_{OUT} > 5V$ .

\*\*Use a standard 1% resistor at the RSEL pin.

**Test Points and Critical Node Measurement**

The EV kit comes with holes on the board where a Tektronics miniature probe can be populated for measuring the critical nodes OUT and LX. Populate the OUT and LX pins on the board with the 131-4353-00 Tektronics probe and use the probe to measure OUT and LX if the user wants a very clean measurement with low noise. Following these guidelines will give the most accurate results when measuring parameters like output voltage ripple, switching waveforms, and load transient response.

To measure  $V_{IN}$  and  $V_{OUT}$  voltage levels it is recommended to connect the voltage measurement probes between INS and GNDS for  $V_{IN}$  measurement and OUTS and GNDS for  $V_{OUT}$  measurement. This ensures that the user is measuring the voltage levels at the input and output capacitor after the drop across the PCB traces.

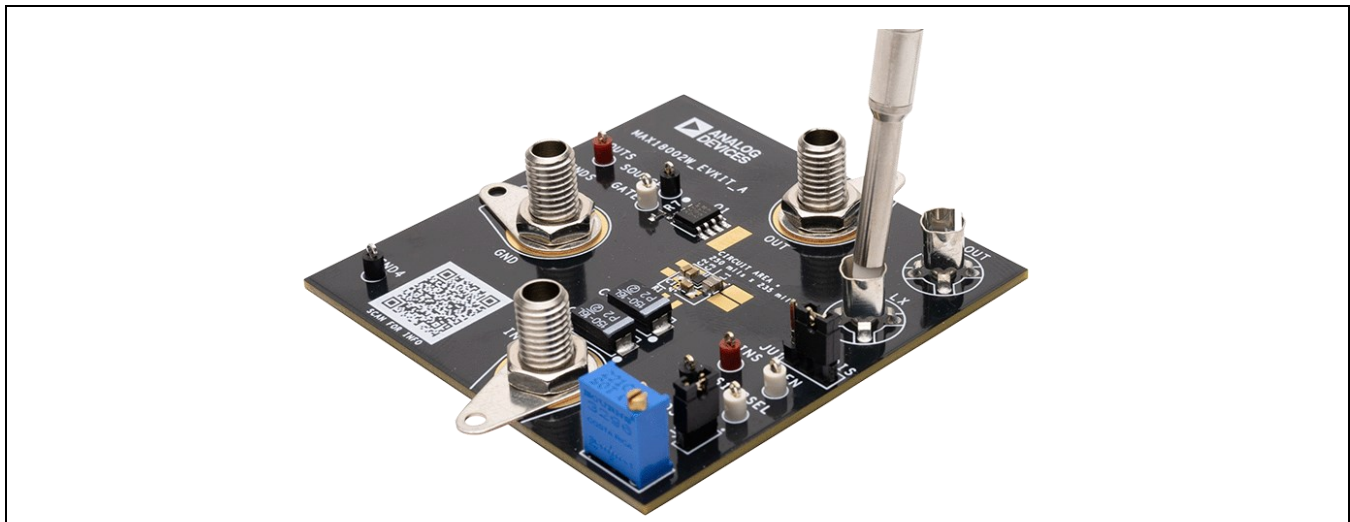


Figure 5. Probing Critical Nodes

**Onboard Load**

To facilitate easy use of the MAX18002 EV kit, there is an onboard FET (Q1, SI4160DY) with a gate-to-source threshold voltage of approximately 2.4V. The drain of the FET is not connected to the OUT rail by default. To use the onboard FET,

## MAX18002 Evaluation Kit

## Evaluates: MAX18000 and MAX18002 in WLP Package

the pad below the OUT terminal should be connected to terminals 5, 6, 7, and 8 of Q1 as shown in [Figure 6](#). A voltage higher than the gate threshold voltage can be applied between the gate and source terminals to load the MAX18002 EV kit. There are test points provided on the MAX18002 EV kit, to access the gate and source terminals.

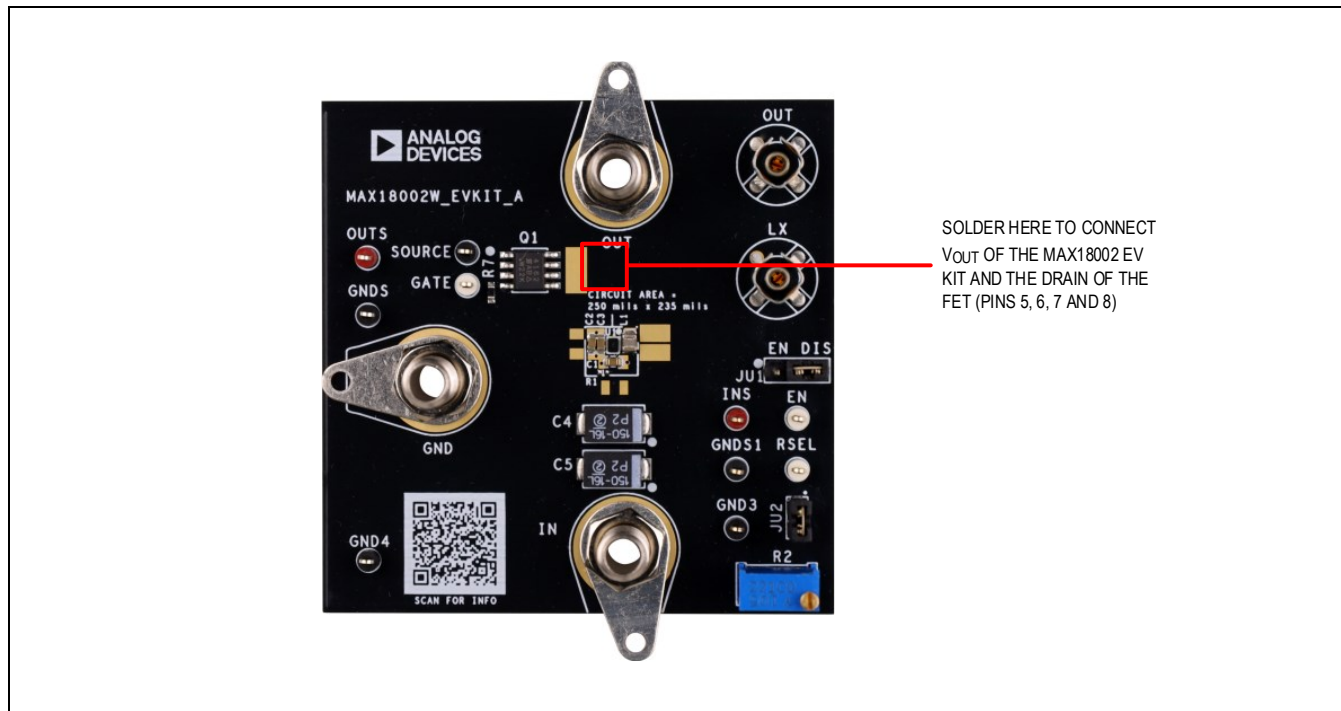


Figure 6. Connecting the Onboard Load

### Ordering Information

PART	U1 IC	TYPE
MAX18002WEVKIT#	MAX18002AWT+T	Ultrasonic Version
MAX18000WEVKIT#	MAX18000AWT+T	Nanopower Version

# Denotes an RoHS-compliant device.

+ Denotes lead(Pb)-free/RoHS-compliant package.

T = Tape-and-reel.

**MAX18002 EV Kit Bill of Materials**

PART	QTY	MFG PART #	MANUFACTURER	DESCRIPTION
C1-C3	3	C1608X5R1A226M080AC; GRM188R61A226ME15; CL10A226MPCNUBE; CL10A226MPMNUB; GRM187R61A226ME15	TDK; MURATA; SAMSUNG; SAMSUNG; MURATA	22µF; 20%; 10V; X5R; CERAMIC CAPCITOR (0603)
L1	1	DFE201612E-R47M	MURATA	470nH; 20%; 4.5A; INDUCTOR (0806)
U1	1	MAX18002AWT+ or MAX18000AWT+	MAXIM	MAX1800xAWT+; 3A NANO-POWER BOOST WITH PASS-THRU AND SHORT CIRCUIT PROTECTION;
R1	1	--	--	PLACEHOLDER FOR RSEL RESISTOR (DNI)
Components below this are outside of the immediate MAX18002 evaluation circuit and solution silkscreen				
C4, C5	2	TR3D157K016C0150	VISHAY	150µF; 10%; 16V; TANTALUM CAPCITOR (7343)
EN, GATE, RSEL	3	5002	KEYSTONE	TEST POINT; BOARD HOLE=0.04IN; WHITE; PHOSPHOR BRONZE WIRE SILVER
GND, IN, OUT	3	108-0740-001	EMERSON NETWORK POWER	CONNECTOR; MALE; PANELMOUNT; BANANA JACK; STRAIGHT; 1PIN
GND3, GND4, GNDS, GNDS1, SOURCE	5	5001	KEYSTONE	TEST POINT; BOARD HOLE=0.04IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH
INS, OUTS	2	5000	KEYSTONE	TEST POINT; BOARD HOLE=0.04IN; RED; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH
JU1	1	PEC03SAAN	SULLINS	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 3PINS
JU2	1	PCC02SAAN	SULLINS	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT THROUGH; 2PINS; -65 DEGC TO +125 DEGC
LX, OUT	2	131-4353-00	TEKTRONICS	CONNECTOR; WIREMOUNT; CIRCUIT BOARD TEST POINT MINIATURE PROBE; STRAIGHT; 4PINS (DNI)

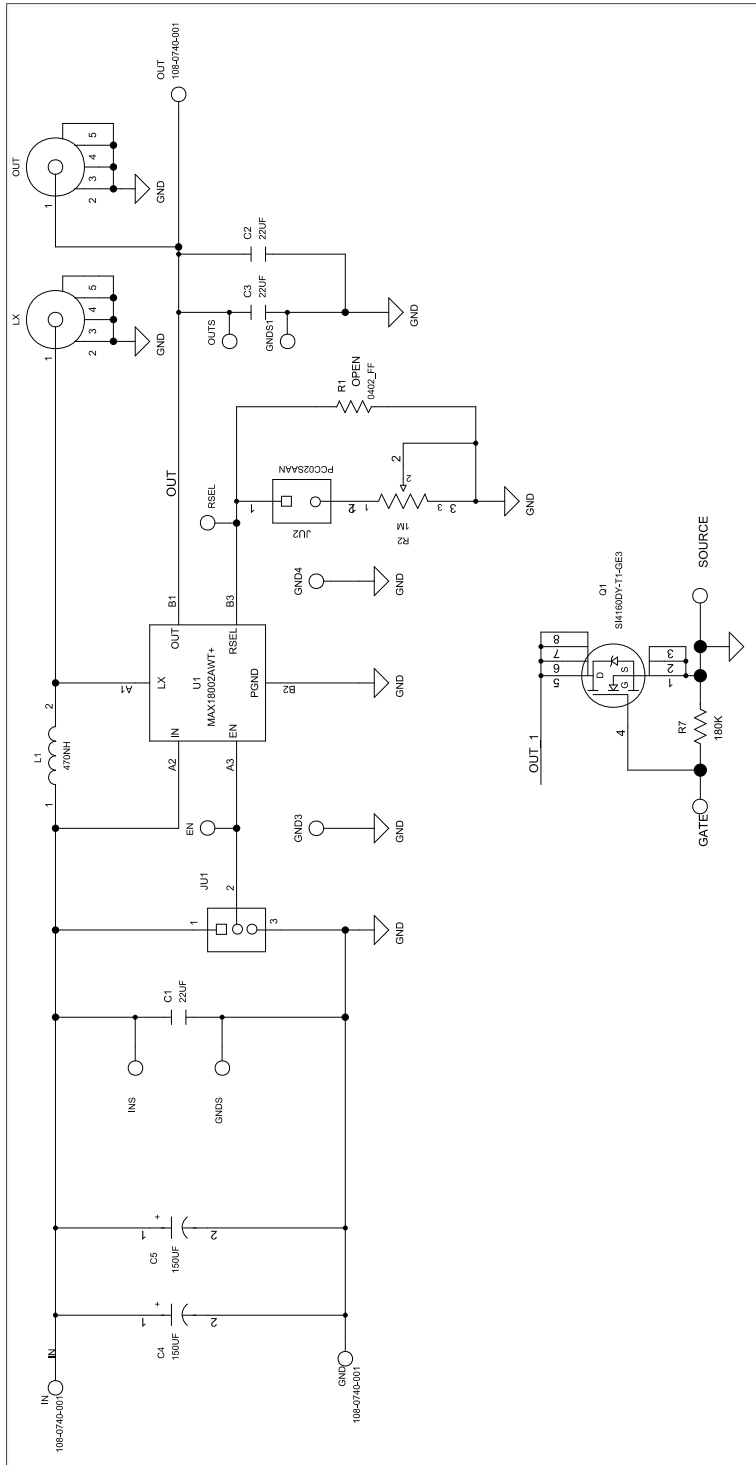


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Q1	1	SI4160DY-T1-GE3	VISHAY	N-CHANNEL MOSFET; NCH; 5.7W; 25.4A; 30V
R2	1	3296Y-1-105LF	BOURNS	THROUGH HOLE POT; 1MΩ; 10%; +/- 100PPM/DEGC; 0.5W
R7	1	CRCW0603180KFK	VISHAY DALE	RES; SMT (0603); 180KΩ; 1%; +/-100PPM/DEGC; 0.1000W
SU1, SU2	2	S1100-B; SX1100-B; STC02SYAN	KYCON; KYCON; SULLINS ELECTRONICS CORP.	TEST POINT; JUMPER; STR; TOTAL LENGTH=0.24IN; BLACK; PHOSPHOR BRONZE CONTACT=GOLD PLATED
PCB	1	MAX18002W	MAXIM	PCB:MAX18002W

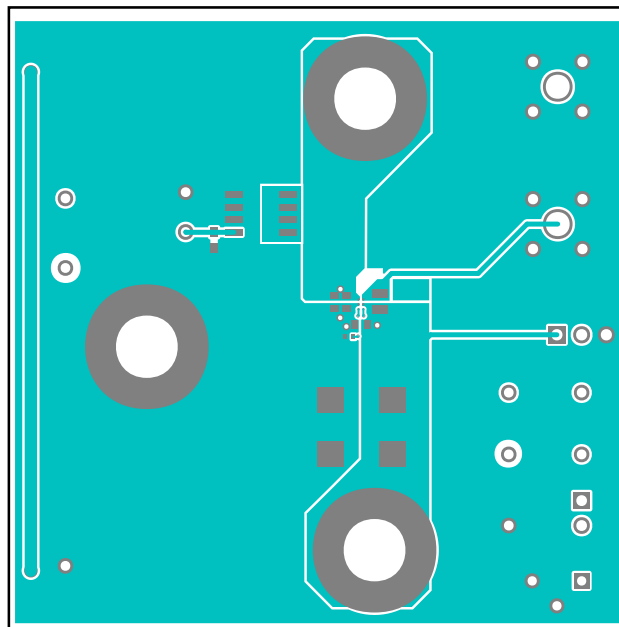
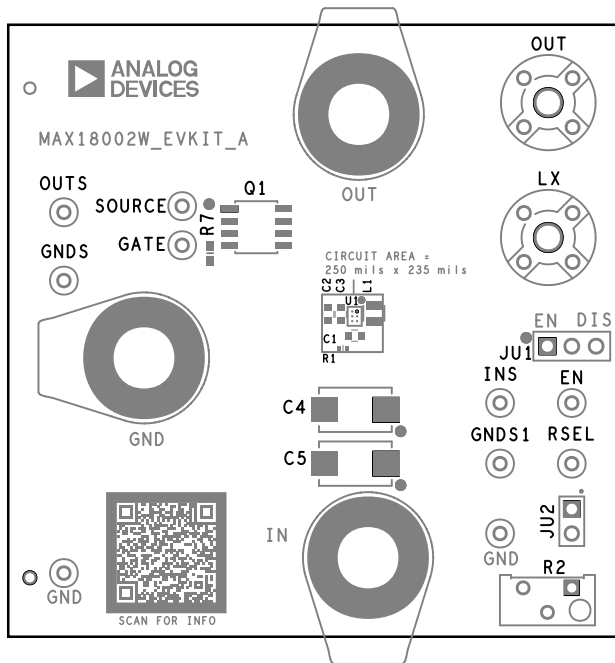
MAX18002 EV Kit Schematic



# MAX18002 Evaluation Kit

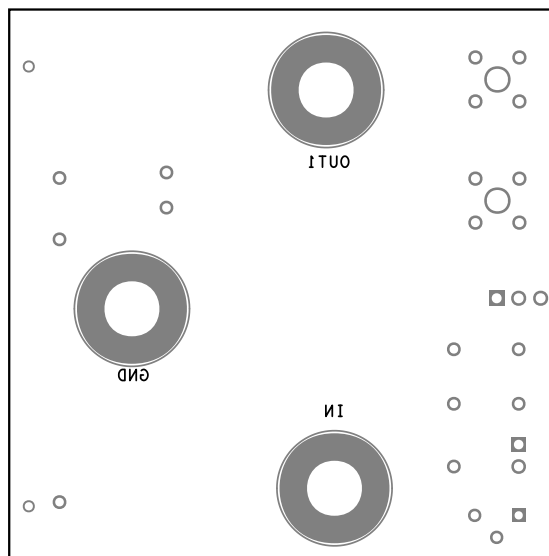
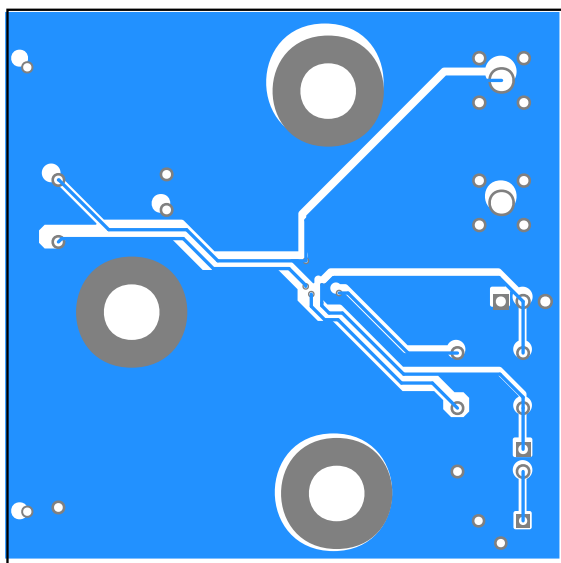
Evaluates: MAX18000 and  
MAX18002 in WLP Package

## MAX18002 EV Kit Component Placement



EV Kit Component Placement—Top Side

EV Kit Component Placement—Top Layer



EV Kit Component Placement—Bottom Layer

EV Kit Component Placement—Bottom Side

**Revision History**

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	2/23	Initial release	—

