General Description

The MAX30034 evaluation kit (EV Kit) provides a convenient way to evaluate the MAX30034 defibrillation/surge/ESD protector. The MAX30034 is designed to absorb repetitive defibrillation and other high-energy pulses to protect sensitive electronic circuitry in ECG and other medical/industrial equipment.

Features

- Low On-Voltage 3.9V (typ)
- Low Leakage Current 3pA (typ)
- Fast Turn-On < 2ns
- High Peak Current in Excess of 4A
- Withstands Over 100k Defibrillation Pulses Without Failure

Safety Consideration

Testing of the MAX30034 with high-energy pulses (400 Joules) can cause serious injury or death if preformed incorrectly. The testing described in this data sheet should only be performed by a qualified technician. Adhere to all safety precautions in the defibrillation surge generator manual.

The MAX30034 EV kit board is designed to receive a full-power IEC60601-2-27 pulse at the rate of once every 20 seconds. Pulsing at a faster rate will exceed the power ratings of the installed resistors. In accordance with IEC60601-2-27, the EV kit board has been designed for voltages up to 5000V. Higher voltages are not recommended.

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

Test Configuration

Required Equipment

- MAX30034 EV kit PCB
- Defibrillation surge generator
- High-voltage test leads and connectors
- Oscilloscope
- Current probe
- Source meter with picoamp accuracy.

Configuration for Defibrillation Tester with Internal Human Body Model

Customers using a normal IEC60601-2-27 test set as their defibrillation surge generator will not need resistors R4 through R12 installed on the MAX30034 EV Kit. These test sets have an internal human body model (Internal 100Ω resistor from HV output to ground) and R4 through R12 should be left unpopulated.

High-voltage output and ground terminals of the defibrillation surge generator should be connected to the VIN (TP1) and ground (TP2), respectively, using wire and connectors rated for voltages greater than 5KV. These input connectors are to be provided by the customer. Resistors R1A through R1K are 10KΩ resistors connected in parallel to give a 1K resistance between the high-voltage node and TP4. A high-voltage jumper wire is then connected from TP4 to one of the 4 inputs (VIN1_TP through VIN4_TP) of the MAX300034 DUT (U1). This jumper wire must be able to handle more than 5A of current.

19-8625; Rev 0; 8/16

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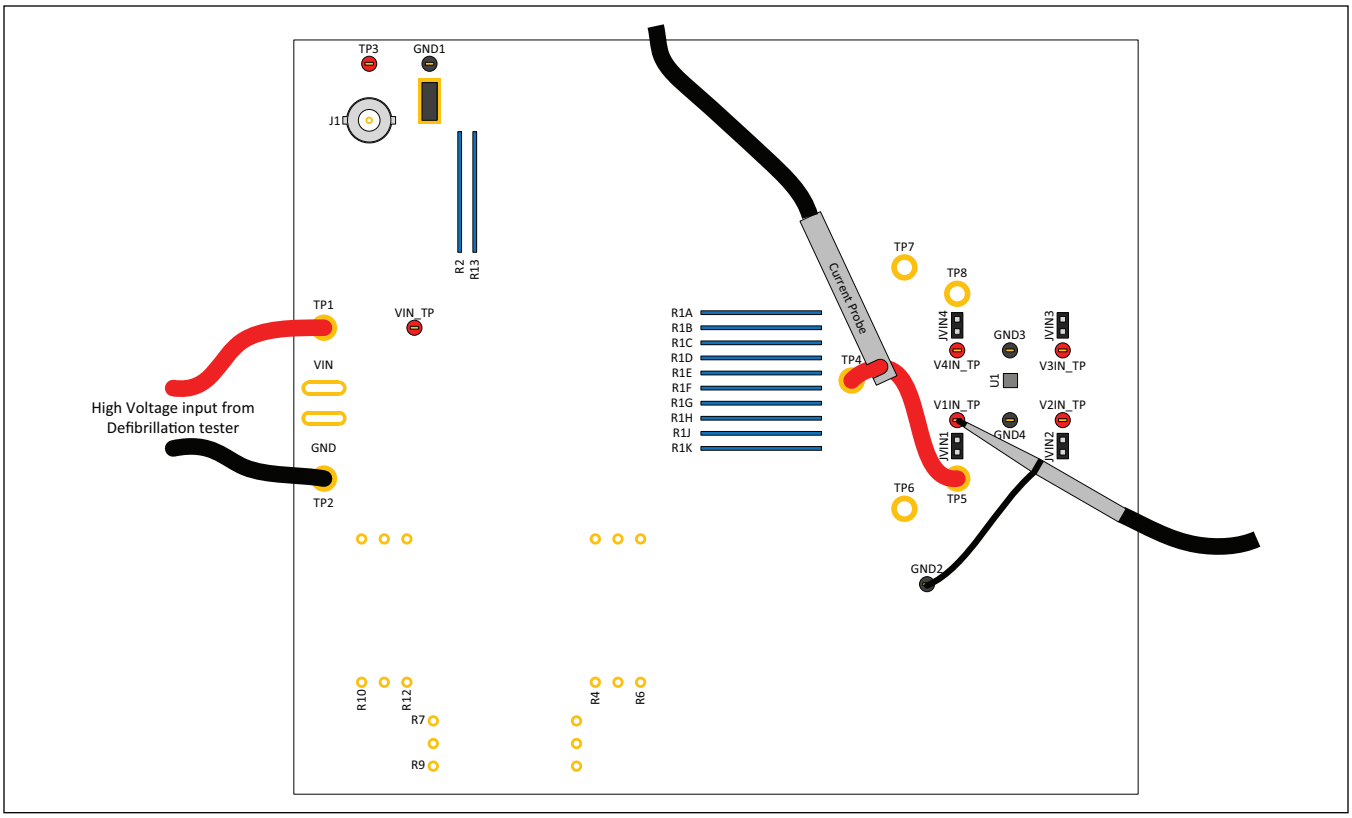


Figure 1. MAX30034 EV Kit Typical Configuration

To measure the current which flows into the DUT an inductive current probe is placed around the high-voltage jumper wire which connects TP4 to one of the DUT inputs. The voltage waveform at the input of the DUT is measured by connecting an oscilloscope probe to the DUT input being tested. In this configuration a shorting jumper is required on JVIN1 to connect TP5 to V1IN_TP. The length of time for a complete high-energy defibrillation pulse event to dissipate is typically about 35ms. The oscilloscope time base should be set accordingly. The high-voltage waveform can be measured at TP3 or by using a BNC cable connected between J1 and an oscilloscope input. Figure 2 shows the clamped voltage and current at the input of the MAX30034 during a defibrillation surge event.

Table 1. Typical Defibrillation Tester Settings

High Voltage	5000V
Inductor	500µH, 10Ω
Polarity	Postive or Negative
Output Resistance	50Ω

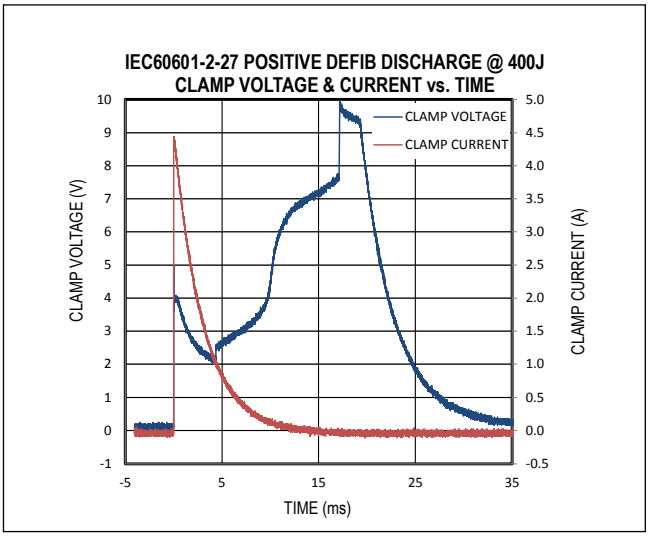


Figure 2. Clamp Voltage and Current vs. Time.

Configuration for Defibrillation Tester without Internal Human Body Model

To use the MAX300034 EV kit with a defibrillation tester that does not have an internal human body model, one must be implemented using R4 through R12. For example, a customer may choose to use an Automated External Defibrillator (AED) to generate the defibrillation surge pulse. In this configuration, 400 joules will be delivered to the test board in about 5ms. The R4 through R12 resistor network, when implemented correctly, will safely dissipate the energy delivered by the defibrillation tester. The resistor network allows for up to 9 resistors to equally share the load and dissipate the generated heat before the next pulse occurs. For a typical implementation, consider the use of nine 100Ω, non-inductive, high-voltage resistors. The first triplet (R4–R6) forms a 33Ω resistance between the high voltage node and first intermediate node. The second triplet (R7–R9) and the third triplet (R10–R12) each form another 33Ω of resistance between the first to second node and second to ground node respectively. This network of nine 100Ω resistors combines to form a 100Ω resistance between the high-voltage node and ground node.

Assuming a maximum pulse rate of one pulse every 20 seconds the 400 Joules dissipated in each pulse requires the resistor network to be able to dissipate (400J) x (1/20 sec) = 20 Watts or 2.2 Watts in each of the nine resistors. For a 5000V pulse the voltage between each node will be 1667V and resistors rated for 2000V or greater should be used.

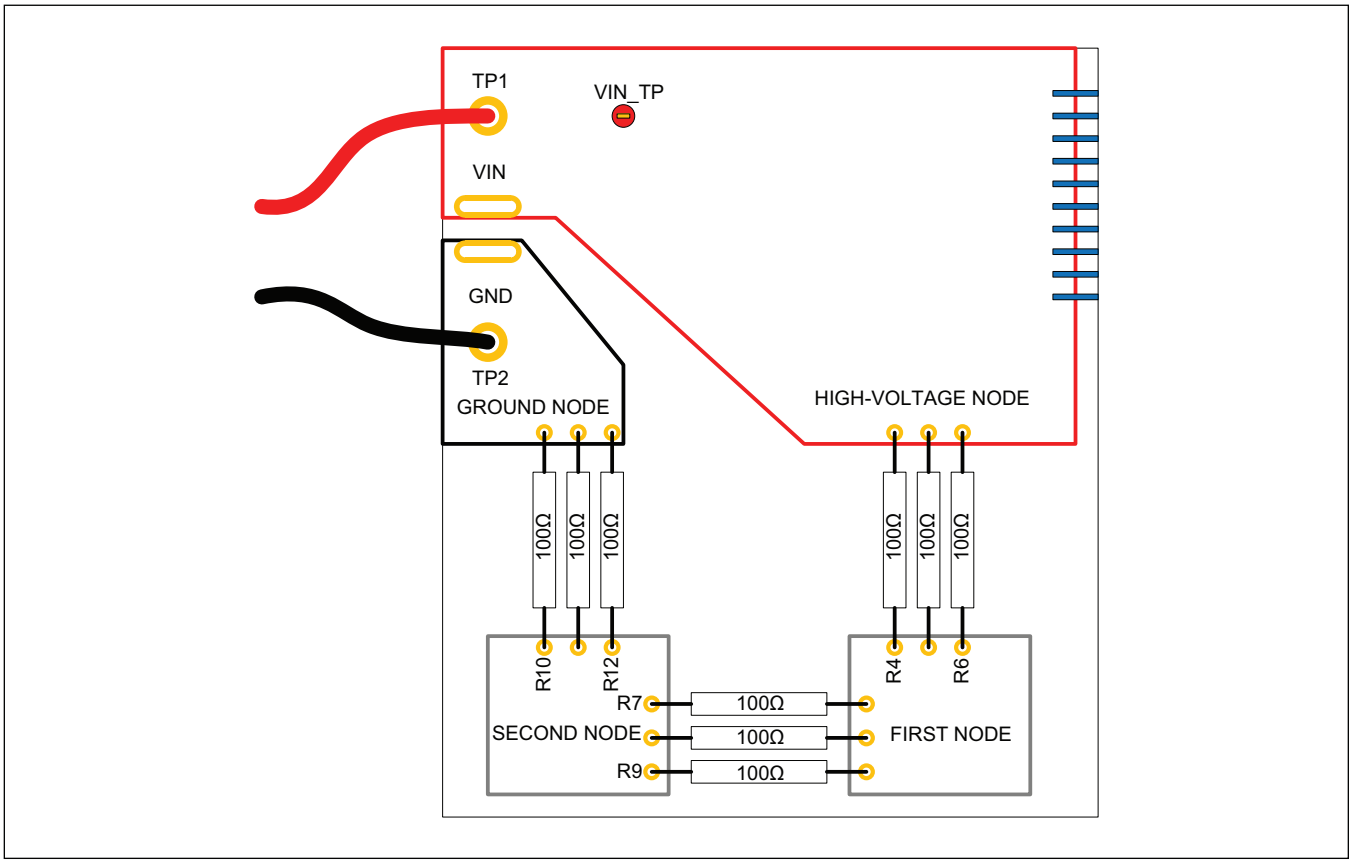


Figure 3. MAX30034 EV Kit Human Body Model Resistor Network

Note: *Applying a 400J pulse directly to the MAX30034 EV Kit without a 100Ω human body model in the circuit is not recommended.*

MAX30034 Leakage Current Measurement.

One purpose of this EV Kit is to demonstrate that after many high energy pulses the MAX30034 will maintain its very low leakage current. To properly measure the leakage current of MAX30034, the DUT is disconnect from the high voltage source. Leaving the high voltage source connected will result in incorrect (larger) leakage current measurements. It is necessary to remove the JVIN1 jumper between TP5 and V1IN_TP to remove the 51KΩ path to ground through the high voltage resistors. Connect the low (-) terminal of a source meter to the ground of the test board and the high (+) terminal to one of the MAX30034 input test points (V1IN_TP – V4IN_TP). Set the source meter output voltage to +5.000V and read the leakage current indicated on the meter. The leakage current is typically about 3pA at this voltage. If the voltage is set to -5.000V, the leakage current will also be about 3pA. There is usually a 1 or 2pA difference in leakage current when changing polarity across the input.

When making leakage current measurement immediately after a high-energy pulse, the leakage current can be 50 to 100pA. After a few minutes, the device will recover to it typical leakage current of about 3pA.

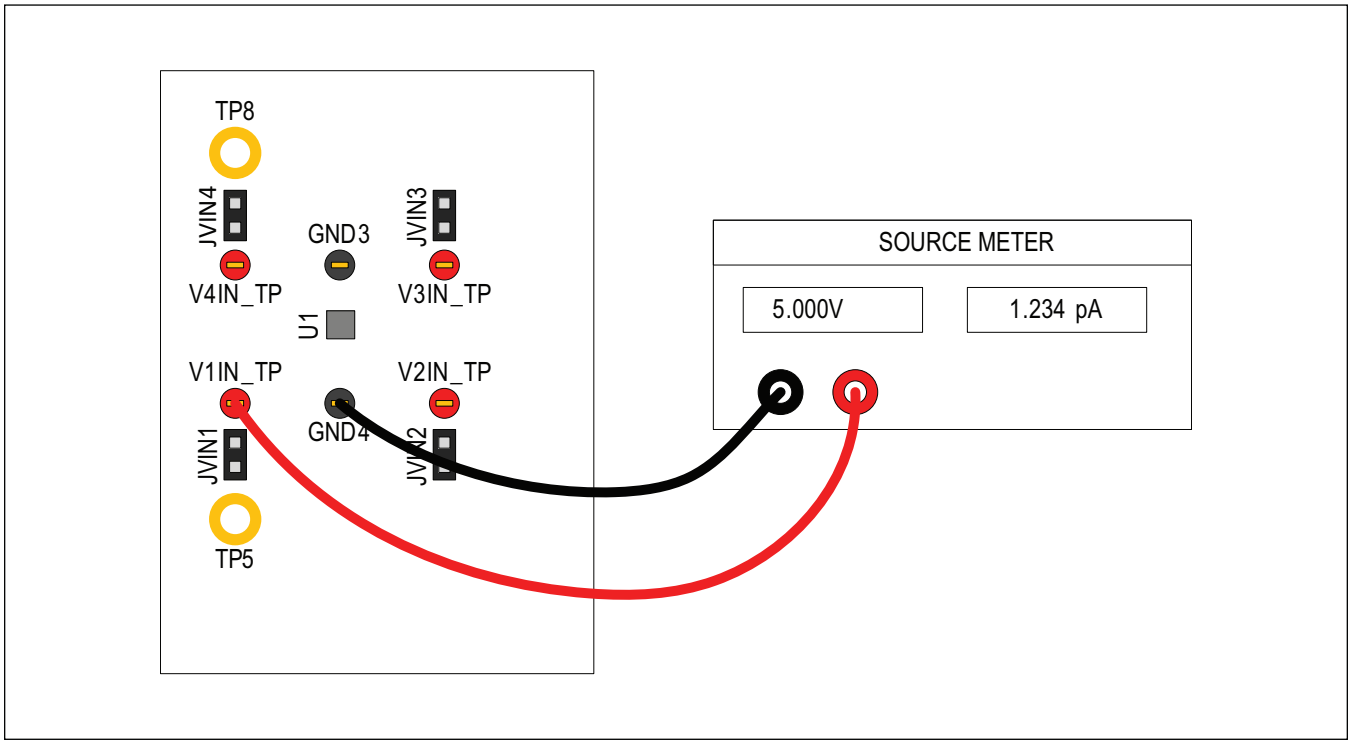


Figure 4. MAX30034 EV Kit Leakage Current Measurement.

Note: *Board cleanliness is paramount, both to protect against failures and to get the correct leakage values. If in doubt, clean, and bake the board to dry it completely. Entire board may be immersed in sonic sink for both wash and rinse cycles, bake completely dry. Handle by edges or with clean gloves.*

Table 2. Connectors

NAME	DESCRIPTION
J1	1000:1 high voltage output. 1V = 1000V
JVIN1	Jumper to connect TP5 to VIN1
JVIN2	Jumper to connect TP6 to VIN2
JVIN3	Jumper to connect TP7 to VIN3
JVIN4	Jumper to connect TP8 to VIN4

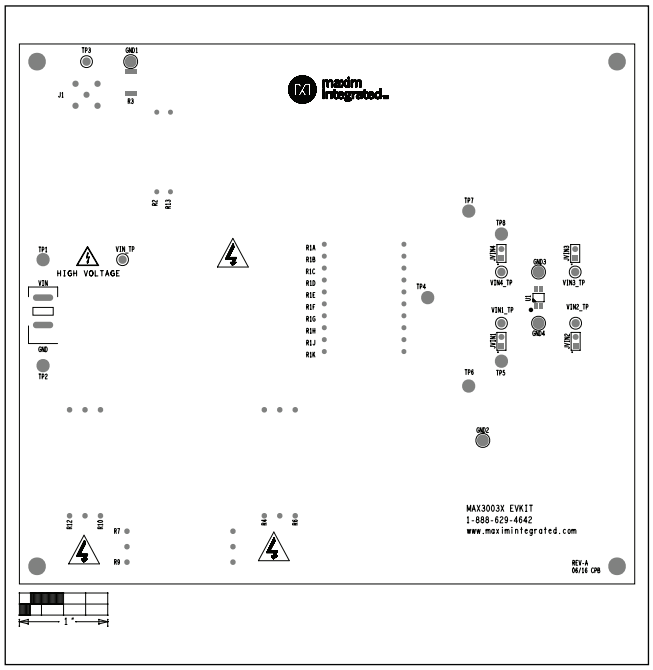
Table 3. Test Points

NAME	DESCRIPTION
TP1	High-voltage input from high-voltage pulse generator
TP2	Ground return to high-voltage pulse generator
TP3	1000:1 high voltage output. 1V = 1000V
TP4	IEC60601-2-27 compliant input to DUT
TP5	Clamp input 1 when JVIN1 jumper installed
TP6	Clamp input 2 when JVIN2 jumper installed
TP7	Clamp input 3 when JVIN3 jumper installed
TP8	Clamp input 4 when JVIN4 jumper installed
VIN_TP	High voltage node test point
VIN1_TP	MAX30034 clamp 1 input, U1-P1
VIN2_TP	MAX30034 clamp 2 input, U1-P4
VIN3_TP	MAX30034 clamp 3 input, U1-P5
VIN4_TP	MAX30034 clamp 4 input, U1-P8

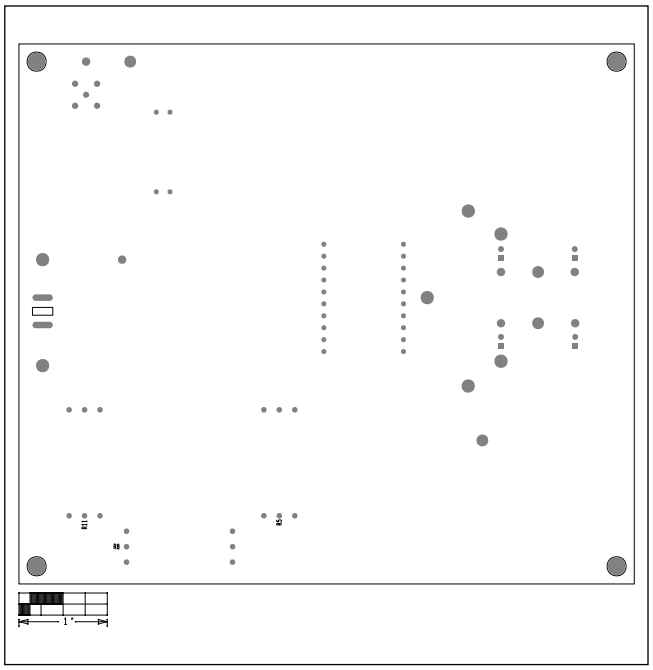
MAX30034 EV Bill of Materials

PART	QTY	DESCRIPTION
GND, VIN	2	CONNECTOR; MALE; THROUGH HOLE; HIGH POWER PCB SERIES 45AMP; STRAIGHT; 1PIN
GND1-GND4	4	TEST POINT; PIN DIA=0.125IN; TOTAL LENGTH=0.445IN; BOARD HOLE=0.063IN; BLACK; PHOSPHOR BRONZE WIRE SILVER PLATE FINISH
J1	1	CONNECTOR; FEMALE; THROUGH HOLE; BNC JACK; STRAIGHT; 5PINS
JVIN1-JVIN4	4	CONNECTOR; MALE; THROUGH HOLE; BREAKAWAY; STRAIGHT; 2PINS
R1A, R1B, R1C, R1D, R1E, R1F, R1G, R1H, R1J, R1K	10	RESISTOR; THROUGH HOLE-RADIAL LEAD; 10K OHM; 1%; 100PPM; 1W; THICK FILM
R2, R13	2	RESISTOR; THROUGH HOLE-RADIAL LEAD; 100K OHM; 1%; 100PPM; 1W; THICK FILM
R3	1	RESISTOR; 2512; 49.9 OHM; 0.1%; 25PPM; 2.5W; THIN FILM
TP3, VIN_TP, VIN1_TP-VIN4_TP	6	TESTPOINT WITH 1.80MM HOLE DIA, RED, MULTIPURPOSE;
HOUSING1	1	CONNECTOR; FEMALE; RED; THROUGH HOLE; POWERPOLE CONNECTOR; STRAIGHT; 1PIN
HOUSING2	1	CONNECTOR; FEMALE; WHITE; THROUGH HOLE; POWERPOLE CONNECTOR; STRAIGHT; 1PIN
MTH1-MTH4	4	KIT; ASSY-STANDOFF 3/8IN; 1PC. STANDOFF/FEM/HEX/4-40IN/(3/8IN)/NYLON; 1PC. SCREW/SLOT/PAN/4-40IN/(3/8IN)/NYLON
R4-R12	0	RESISTOR; THROUGH HOLE-AXIAL LEAD; 100 OHM; 10%; -1300PPM; 2W; CERAMIC COMPOSITION
PCB	1	PCB Board:MAX3003X EVALUATION KIT

MAX30034 EV PCB Layout



Top Silkscreen



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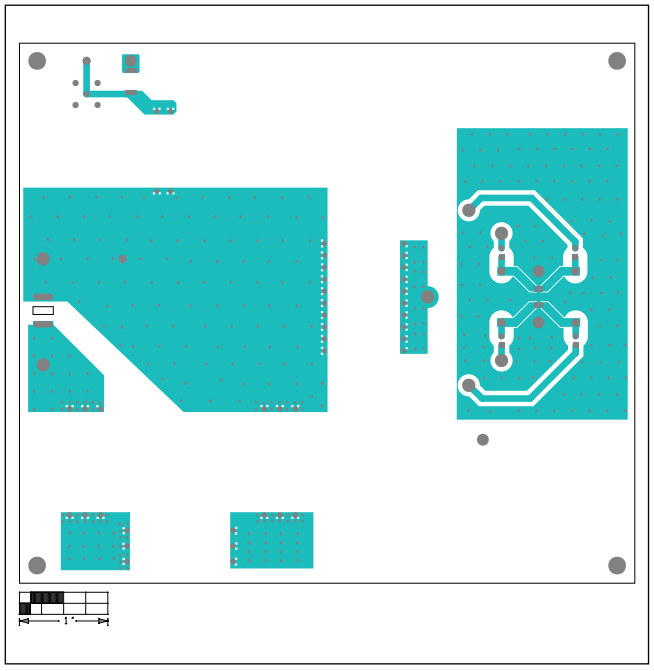

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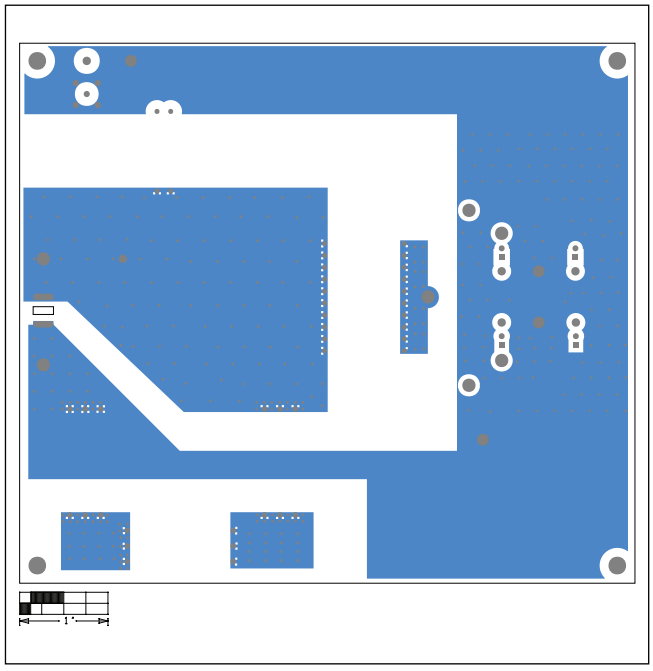

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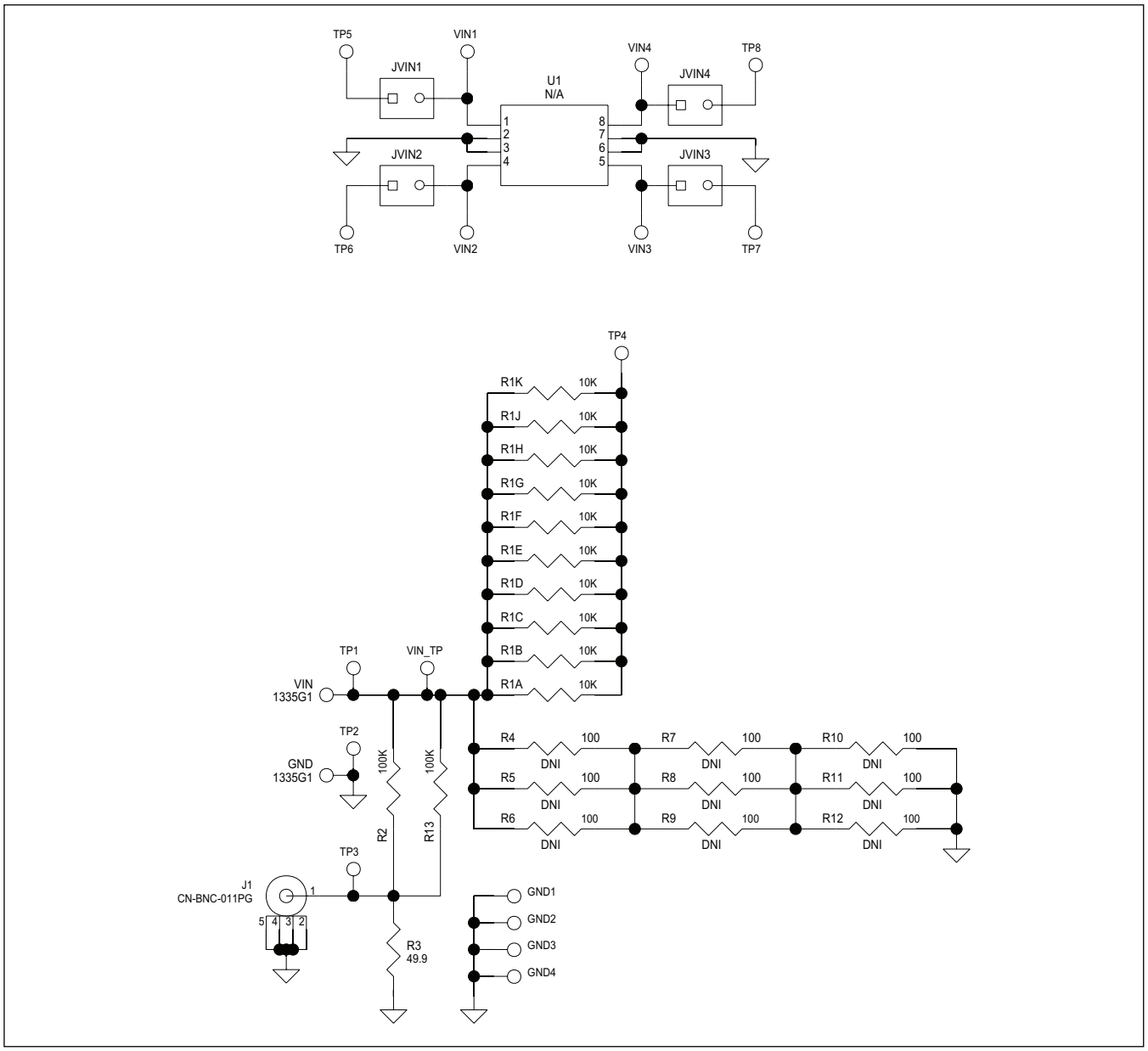
MAX30034 EV Schematic



Ordering Information

PART	TYPE
MAX30034EVKIT#	EV Kit

#Denotes RoHS compliant.

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	8/16	Initial release	—

For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim Integrated's website at www.maximintegrated.com.

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