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

Evaluates: MAX17651 (TDFN)

MAX17651EVKITA# Evaluation Kit

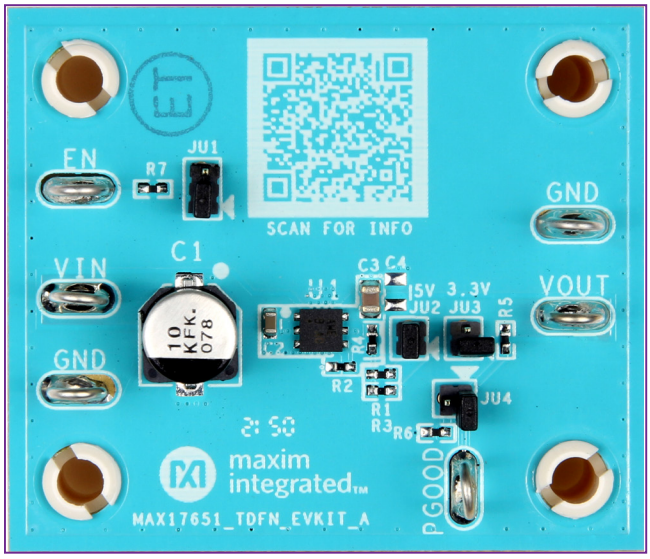
General Description

The MAX17651EVKITA# evaluation kit (EV kit) is a fully assembled and tested circuit board that demonstrates the performance of the MAX17651 high-voltage, ultra-low quiescent current linear regulator in a 6-pin TDFN package. The EV kit operates over a wide input voltage range of 4V to 60V and provides up to 100mA load current. It draws only 8µA supply current under no-load conditions. The EV kit is simple to use and easily configurable with minimal external components. It features overload current protection and thermal shutdown. The EV kit comes installed with the MAX17651ATT+ in a 6-pin, (3mm x 3mm) TDFN package.

Features

- Wide 4V to 60V Input Voltage Range
- Jumper Configurable 12V, 5V, and 3.3V Outputs
- Up to 100mA Load Current Capability
- 8µA No Load Supply Current
- Active-High, Enable Input
- PGOOD Output for Regulator Output Voltage Monitoring
- Overload Protection
- Overtemperature Protection
- Proven PCB Layout
- Fully Assembled and Tested

MAX17651 EV Kit (TDFN) Photo



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

Quick Start

Required Equipment

- MAX17651EVKITA# EV kit
- 60V, 0.2A DC power supply
- Electronic load up to 100mA
- Digital Multimeter (DMM)

Procedure

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

Caution: Do not turn on the power supply until all connections are completed.

1) Set the input voltage to 6.1V or higher for the default configuration of 5V output and see Table 2 for setting the minimum input voltage for 3.3V or 12V outputs. Disable the power supply.
2) Set the electronic load to constant-current mode, 100mA, and disable the electronic load.
3) Connect the positive terminal of the power supply to the VIN PCB pad and the negative terminal to the nearest GND PCB pad.
4) Connect the positive terminal of the load to the VOUT PCB pad and the negative terminal to the nearest GND PCB pad.
5) Connect the DMM across VOUT PCB pad and the nearest GND PCB pad.
6) Verify that shunts are installed between pins 1 and 2 of jumper JU1 (EN).
7) Place a shunt on JU2, JU3, or JU4, depending on the desired output voltage (see Table 2 for details).
8) Turn on the input power supply and enable the load.
9) Verify that the DMM across the output terminals displays 5V, 3.3V, or 12V.
10) Vary the input voltage between minimum input voltage and 60V and vary the load current from 0mA to available maximum load current (from thermal dissipation calculation, see the *Available Output Current Calculation* section for more details) and verify that the output voltage is 5V, 3.3V, or 12V with respect to GND.
11) Reduce the load current to 0mA and reduce the input voltage to 3V.
12) Verify that the DMM displays 0V.
13) Disable the input power supply.

319-100896; Rev 0; 3/22

Detailed Description

The MAX17651EVKITA# kit is a fully assembled and tested circuit board that demonstrates the performance of the MAX17651 high-voltage, ultra-low quiescent current linear regulator in a 6-pin TDFN package. The EV kit operates over a wide input-voltage range of 4V to 60V and provides up to 100mA load current. It draws only 8µA supply current under no-load conditions. The EV kit is simple to use and easily configurable with minimal external components. It features overload current protection and thermal shutdown.

The EV kit includes an EN PCB pad and JU1 to enable control of the converter output. Jumpers JU2 and JU3 are provided for selecting the output voltage of the converter. PGOOD PCB pad is available for monitoring the PGOOD output.

Enable Control (JU1)

The EN PCB pad of the EV kit serves as an on/off control. See Table 1 to configure JU1.

PGOOD Output for Regulator Output Voltage Monitoring

The EV kit provides a PCB pad to monitor the status of the PGOOD output. PGOOD goes high when the output voltage rises above 92% (typ) of its nominal regulated output voltage. PGOOD goes low when the output voltage falls below 89.5% (typ) of its nominal regulated voltage. The voltage on the PGOOD pin should not exceed 5V. If the output voltage is greater than 5V, install a shunt on JU4. Calculate the value of resistance R6 from the following equation:

$$R6 = \frac{500}{V_{OUT} - 5}\ k\Omega$$

Output Voltage Setting

The output voltage can be programmed from 0.6V to 58V. See Table 2 to configure the EV kit to either 5V, 3.3V, or 12V. To program the output voltage other than 5V, 3.3V, or 12V, replace the resistor R4. Calculate the value of resistor R4 using the following equation.

$$R4 = 98.3 \times (V_{OUT} - 0.6)\ k\Omega$$

Output Capacitor Selection

The voltage rating of the output capacitor (C3) installed on the board is 16V. If the programmed output voltage is greater than 12V, an output capacitor with a higher voltage rating should be installed.

Available Output Current Calculation

Ensure that the junction temperature of the MAX17651 does not exceed +125°C under the operating conditions specified for the regulator.

At a particular operating condition, the power loss that led to the temperature rise of the part is estimated as follows:

$$P_{LOSS} = (V_{IN} - V_{OUT}) \times I_{LOAD}$$

where, V_{IN} is the input voltage, V_{OUT} is the output voltage, and I_{LOAD} is the load current.

MAX17651ATT+ Package Thermal resistance measured on the MAX17651EVKITA# EV kit with no airflow is:

$$\theta_{JA} = 42°C/W$$

The junction temperature of the MAX17651 can be estimated at any given maximum ambient temperature (T_{A_MAX}) from the equation below:

$$T_J = T_{A\_MAX} + (\theta_{JA} \times P_{LOSS})$$

Calculate the maximum allowable output current in mA using the following formula:

$$I_{LOAD(MAX)} = \frac{(125 - T_{A\_MAX})}{0.042 \times (V_{IN} - V_{OUT})}$$

Example: T_{A_MAX} = +70°C, V_{IN} = 24V, V_{OUT} = 5V.

$$I_{LOAD(MAX)} = \frac{(125 - 70)}{0.042 \times (24 - 5)} \cong 69mA$$

Table 1. Enable Control (EN)

JU1 SHUNT POSITION	EN PIN	OUTPUT
1-2*	Connected to VIN	Enabled
2-3	Connected to GND	Disabled

**Default position.*

Table 2. Output Voltage Configuration Settings

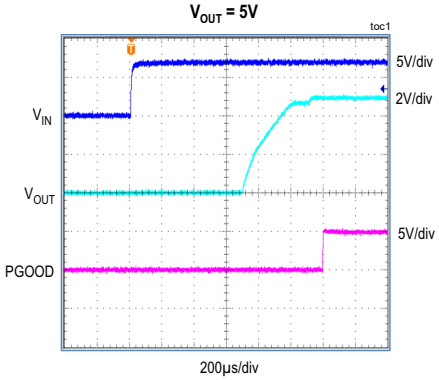
OUTPUT VOLTAGE (V_{OUT})	INSTALL SHUNT ON	MINIMUM INPUT VOLTAGE
5V	JU2*	6.1V
3.3V	JU3	4.4V
12V	JU4	13.1V

**Default position.*

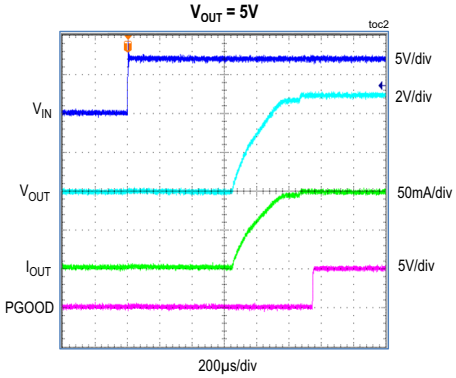
EV Kit Performance

(V_{IN} = 7V, T_A = +25°C, unless otherwise noted.)

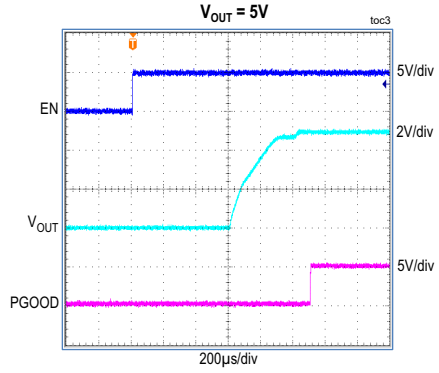
STARTUP RESPONSE WITH NO LOAD
V_{OUT} = 5V



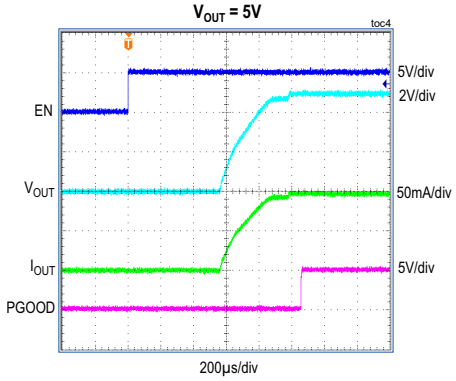
STARTUP RESPONSE WITH 100mA LOAD
V_{OUT} = 5V



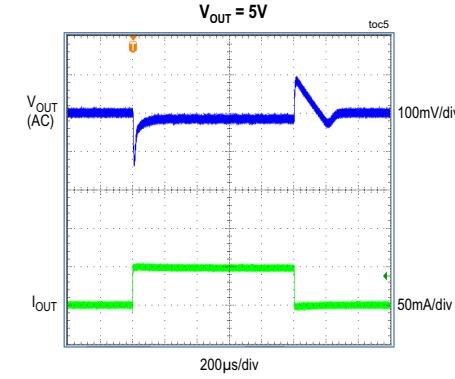
STARTUP RESPONSE WITH ENABLE
NO LOAD
V_{OUT} = 5V



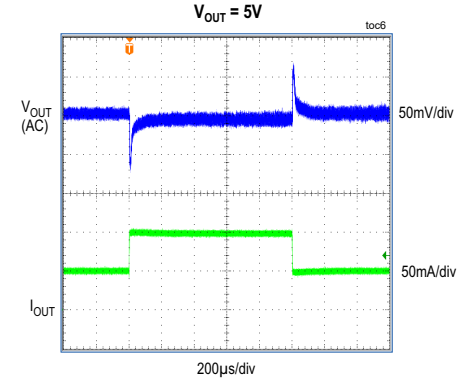
STARTUP RESPONSE WITH ENABLE
AND 100mA LOAD
V_{OUT} = 5V



LOAD TRANSIENT BETWEEN 1mA AND 100mA
V_{OUT} = 5V



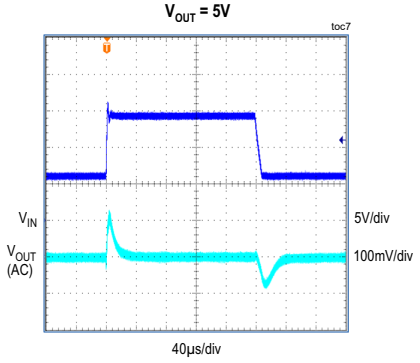
LOAD TRANSIENT BETWEEN 50mA AND 100mA
V_{OUT} = 5V



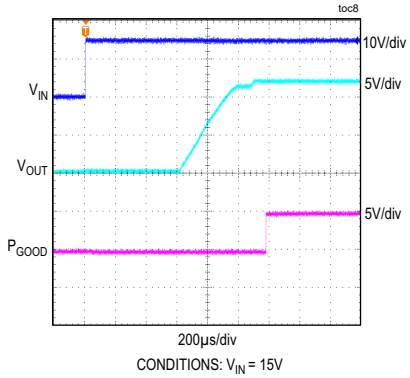
EV Kit Performance (continued)

(V_{IN} = 7V, T_A = +25°C, unless otherwise noted.)

INPUT VOLTAGE STEP RESPONSE WITH 100mA LOAD CURRENT
V_{OUT} = 5V

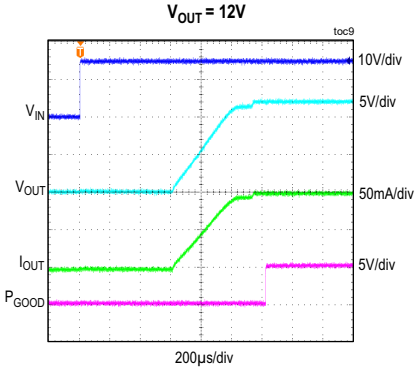


STARTUP RESPONSE WITH NO LOAD
V_{OUT} = 12V



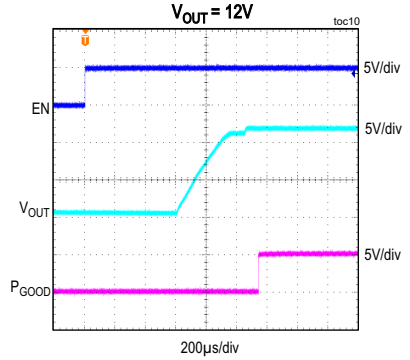
CONDITIONS: V_{IN} = 15V

STARTUP RESPONSE WITH 100mA LOAD
V_{OUT} = 12V



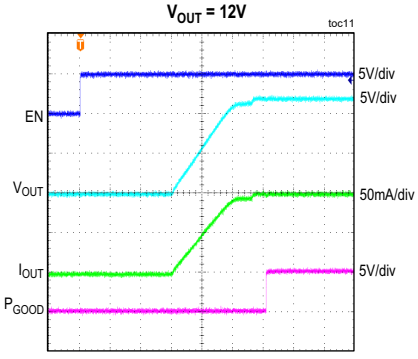
CONDITIONS: V_{IN} = 15V

STARTUP RESPONSE WITH ENABLE NO LOAD
V_{OUT} = 12V



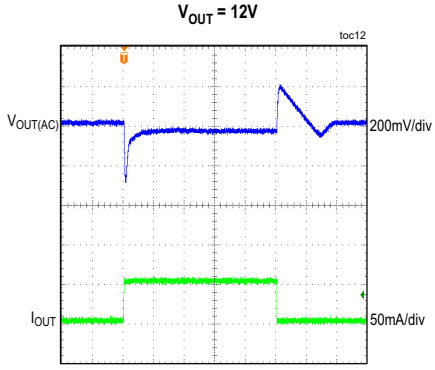
CONDITIONS: V_{IN} = 15V

STARTUP RESPONSE WITH ENABLE AND 100mA LOAD
V_{OUT} = 12V



CONDITIONS: V_{IN} = 15V

LOAD TRANSIENT BETWEEN 1mA AND 50mA
V_{OUT} = 12V

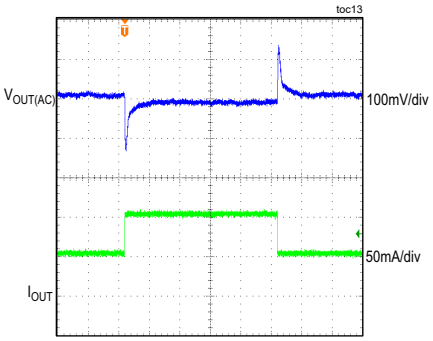


CONDITIONS: V_{IN} = 15V

EV Kit Performance (continued)

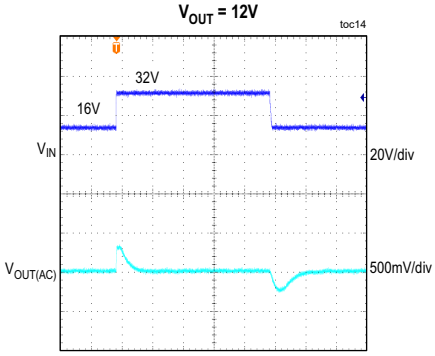
(V_{IN} = 7V, T_A = +25°C, unless otherwise noted)

LOAD TRANSIENT BETWEEN 50mA AND 100mA
V_{OUT} = 12V

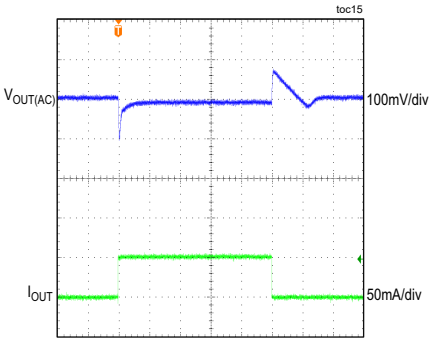


CONDITIONS: V_{IN} = 15V

INPUT VOLTAGE STEP RESPONSE
WITH 100mA LOAD CURRENT
V_{OUT} = 12V

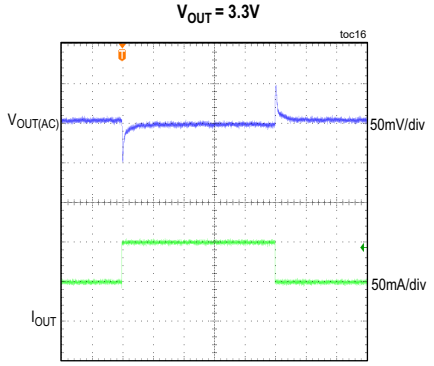


LOAD TRANSIENT BETWEEN 1mA AND 50mA
V_{OUT} = 3.3V



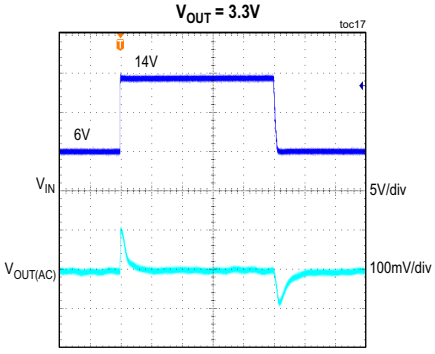
CONDITIONS: V_{IN} = 6V

LOAD TRANSIENT BETWEEN 50mA AND 100mA
V_{OUT} = 3.3V



CONDITIONS: V_{IN} = 6V

INPUT VOLTAGE STEP RESPONSE
WITH 100mA LOAD CURRENT
V_{OUT} = 3.3V



Component Suppliers

SUPPLIER	WEBSITE
Murata Americas	www.murata.com
Panasonic	www.industrial.panasonic.com

Ordering Information

PART	TYPE
MAX17651EVKITA#	EV Kit

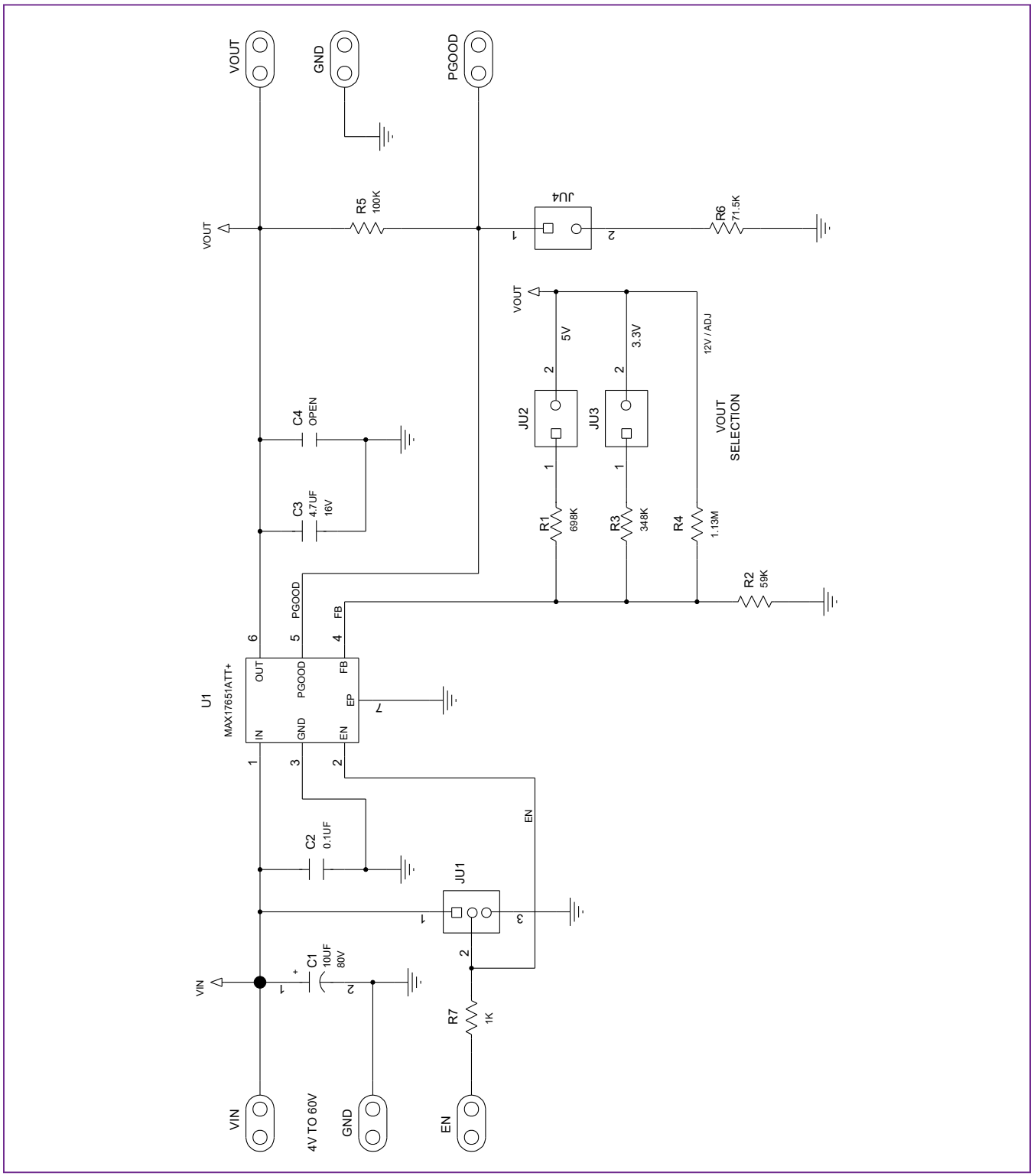
#Denotes RoHS compliance

MAX17651 EV Kit (TDFN) Bill of Materials

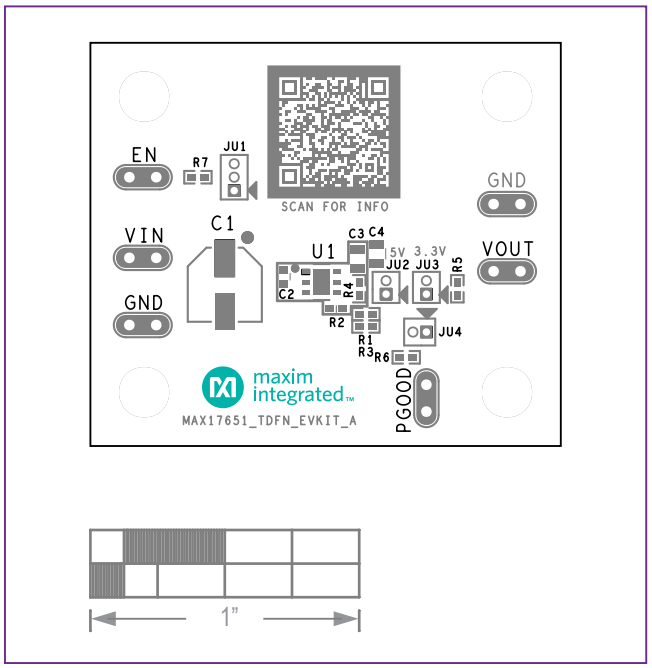
S.No	DESIGNATOR	DESCRIPTION	QUANTITY	MANUFACTURER PART NUMBER
1	C1	10µF, 80V Electrolytic Capacitor (6.6mm x 6.6mm)	1	PANASONIC EEE-FK1K100XP
2	C2	0.1µF±10%; 100V; X7R; Ceramic Capacitor (0603)	1	MURATA GRM188R72A104KA35
3	C3	4.7µF±10%; 16V; X7R; Ceramic Capacitor (0805)	1	MURATA GRM21BR71C475KA73
4	JU1	3-Pin Headers	1	SULLINS GRPB031VWVN RC
5	JU2-JU4	2-Pin Headers	3	SULLINS GRPB021VWVN RC
6	R1	698kΩ ±1%; 0.1W, Resistor (0402)	1	
7	R2	59kΩ ±1%; 0.063W, Resistor (0402)	1	
8	R3	348kΩ ±1%; 0.063W, Resistor (0402)	1	
9	R4	1.13MΩ ±1%; 0.063W, Resistor (0402)	1	
10	R5	100kΩ ±1%; 0.1W, Resistor (0402)	1	
11	R6	71.5kΩ ±1%; 0.1W, Resistor (0402)	1	
12	R7	1kΩ ±1%; 0.063W, Resistor (0402)	1	
12	U1	4V to 60V, 100mA, ultra-small Quiescent Current, Linear Regulator (6-pin TDFN-EP*)	1	MAXIM INTEGRATED MAX17651ATT+
13	C4	Open: Capacitor (0805)	0	

DEFAULT JUMPER TABLE	
JUMPER	**SHUNT POSITION**
JU1, JU2	1-2
JU3	Open
JU4	Open

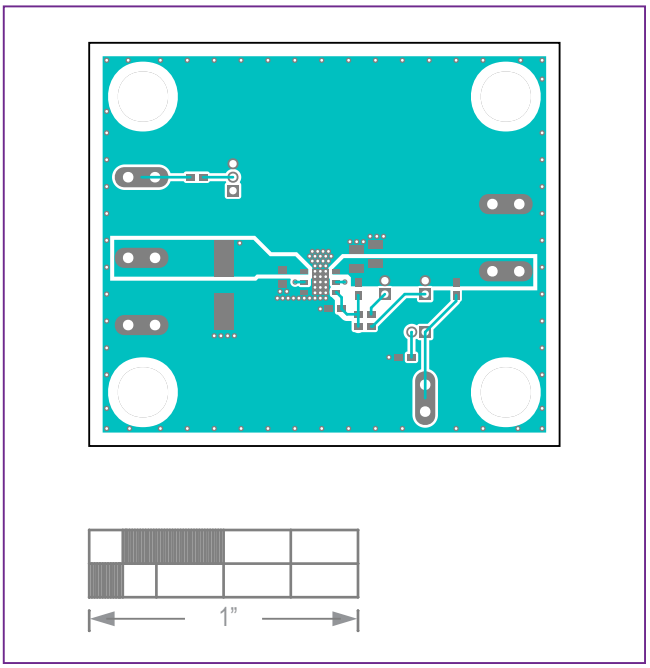
MAX17651 EV Kit (TDFN) Schematic



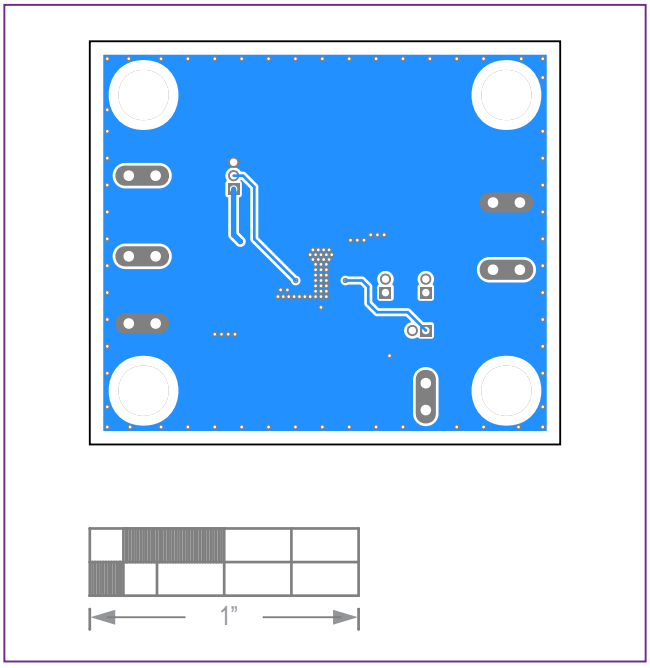
MAX17651 EV Kit (TDFN) PCB Layout



MAX17651 EV Kit (TDFN) PCB Layout—Top Silk-screen



MAX17651 EV Kit (TDFN) PCB Layout—Top Layer



MAX17651 EV Kit (TDFN) PCB Layout—Bottom Layer

Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	3/22	Initial Release	—