19-2871; Rev 0; 5/03

MAX1536 Evaluation Kit

Evaluates: MAX1536

General Description

The MAX1536 evaluation kit (EV kit) provides dynamically adjustable 1.5V/1.8V output voltages from a 3.0V to 5.5V input voltage source. It delivers up to 3.6A output current with up to 93% efficiency.

The MAX1536 EV kit includes the MAX1536 step-down switching regulator with an internal synchronous rectifier to increase efficiency and reduce the number of external components. The resistor-programmable fixed-off-time, current-mode architecture allows an optimum response to load-and-line transients. This EV kit, as configured, operates at approximately 570kHz and is optimized for 3.3V input and 1.8V output.

The EV kit is a fully assembled and tested circuit board. It also allows the evaluation of other output voltages in the 0.7V to VIN range.

Features

- **3.0V to 5.5V Input Voltage Range**
- **Dynamically Selectable 1.5V/1.8V Output Voltage**
- **Adjustable Output Voltage from 0.7V to VIN**
- **Up to 3.6A Output Current**
- **Up to 1.4MHz Switching Frequency**
- **<0.2µA (typ) IC Shutdown Supply Current**
- **No External Schottky Diode Required**
- **Power-Good Output**
- **Surface-Mount Construction**
- **Fully Assembled and Tested**

Ordering Information

PART	TEMP RANGE	IC PACKAGE
MAX1536EVKIT	0°C to +70°C	28 Thin QFN 5mm × 5mm-EP*

**EP = Exposed paddle.*

Component List

DESIGNATION	QTY	DESCRIPTION
C1, C2	2	10µF ±20%, 6.3V X5R ceramic capacitors (1206) TDK C3216X5RDJ106M or Taiyo Yuden JMK316BJ106ML
C3	1	100µF ±20%, 6.3V, 18mΩ-ESR POSCAP capacitor (D2E) Sanyo 6TPE100MI
C4, C7	2	470pF ±10%, 50V X7R ceramic capacitors (0603) TDK C1608X7R1H471K or equivalent
C5	1	2.2µF ±10%, 6.3V X5R ceramic capacitor (0603) TDK C1608X5R0J225K
C6	1	0.22µF ±20%, 10V X7R ceramic capacitor (0603) Taiyo Yuden LMK107BJ224MA
C8	1	1µF ±20%, 6.3V X5R ceramic capacitor (0603) Taiyo Yuden JMK107BJ105MA
D1	0	Not installed, Schottky diode

DESIGNATION	QTY	DESCRIPTION
JU1, JU2, JU3	3	3-pin headers
JU4	1	4-pin header
L1	1	1.2µH inductor Sumida CDR7D28MN-1R2 or 1.0µH inductor Sumida CDRH8D28-1R0NC
R1	1	10Ω ±5% resistor (0603)
R2	1	100kΩ ±5% resistor (0603)
R3	1	75kΩ ±1% resistor (0603)
R4	0	Not installed, resistor (0603) (shorted by PC trace)
R5, R8	0	Not installed, resistor (0603)
R6	1	20kΩ ±1% resistor (0603)
R7	1	90.9kΩ ±1% resistor (0603)
R9	1	182kΩ ±1% resistor (0603)
U1	1	MAX1536ETI (28-pin thin QFN 5mm × 5mm)
None	4	Shunts
None	1	MAX1536 PC board

Component Suppliers

SUPPLIER	PHONE	FAX	WEBSITE
Sanyo	619-661-6322	619-661-1055	www.sanyo.com
Sumida	847-545-6700	847-545-6720	www.sumida.com
Taiyo Yuden	800-348-2496	847-925-0899	www.t-yuden.com
TDK	847-803-6100	847-390-4405	www.component.tdk.com

Note: *Please indicate that you are using the MAX1536 when contacting these component suppliers.*

Quick Start

The MAX1536 EV kit is a fully assembled and tested surface-mount board. Follow the steps below for proper board operation. **Do not turn on the power supply until all connections are completed:**

1) Connect a voltmeter and load (if any) from VOUT to GND.
2) Verify that the shunts are across JU1 ($\overline{SHDN}$) pins 1 and 2, JU2 ($\overline{SKIP}$) pins 1 and 2, JU3 (GATE) pins 2 and 3, and JU4 (FBLANK) pins 1 and 2.
3) Connect a 3.0V to 5.5V supply to the pads marked VIN and GND.
4) Turn on the power supply and verify that the output voltage is 1.8V.

See the *Evaluating Other Output Voltages* section for different output voltages.

Detailed Description

Jumper Selection

In shutdown mode, the MAX1536 reduces the supply current to 0.2µA (typ). Jumper JU1 controls the MAX1536's shutdown function. Table 1 lists jumper JU1 functions.

The MAX1536 has two modes of operation: low-noise, constant-off-time, forced-PWM mode and automatic PWM/PFM mode. Jumper JU2 controls the MAX1536's operation function. Table 2 lists jumper JU2 functions.

The MAX1536 EV kit is preset to a dynamically selectable 1.5V/1.8V output. The EV kit incorporates jumper JU3 to control the dynamic outputs. Table 3 lists jumper JU3 functions.

Jumper JU4 controls the fault blanking control input (FBLANK). The FBLANK input determines how long the MAX1536 maintains forced-PWM operation and forces PGOOD high impedance when a transition is detected on the GATE pin. Table 4 lists jumper JU4 functions.

Table 1. Jumper JU1 Functions ($\overline{SHDN}$)

SHUNT LOCATION	$\overline{SHDN}$ PIN	MAX1536 OUTPUT
1 and 2 (default)	Connected to VCC	MAX1536 enabled, VOUT = 1.8V
2 and 3	Connected to GND	MAX1536 disabled
Not installed	$\overline{SHDN}$ must be driven by an external signal	MAX1536 output depends on external $\overline{SHDN}$ signal levels

Table 2. Jumper JU2 Functions ($\overline{SKIP}$)

SHUNT LOCATION	$\overline{SKIP}$ PIN	MODE OF OPERATION
1 and 2 (default)	Connected to VCC	Constant-off-time forced-PWM mode
2 and 3	Connected to GND	Automatic PWM/PFM mode, high-efficiency idle mode under light loads, and PWM mode under heavy loads

Table 3. Jumper JU3 Functions (GATE)

SHUNT LOCATION	GATE PIN	MAX1536 OUTPUT
1 and 2	Connected to VCC	VOUT = 1.5V
2 and 3 (default)	Connected to GND	VOUT = 1.8V
Not installed	GATE must be driven by an external signal	V_{OUT} depends on external GATE signal levels

Table 4. Jumper JU4 Functions (FBLANK)

SHUNT LOCATION	FBLANK PIN	FAULT-BLANKING FUNCTION	TYPICAL FORCED-PWM TIME (µs)
1 and 2 (default)	Connected to REF	Enabled	50
1 and 3	Connected to GND	Disabled	100
1 and 4	Connected to VCC	Enabled	150
Not installed	Open	Enabled	100

Evaluating Other Output Voltages

Evaluating Dynamic Output Voltages

The MAX1536 EV kit is preset to 1.5V/1.8V. When GATE is high (JU3, 1-2), V_{OUT} = 1.5V. When GATE is low (JU3, 2-3), VOUT = 1.8V.

- To evaluate output voltages from 0.7V to 2V, change resistors R6 and R9. Select R9 in the 10kΩ to 100kΩ range, then use equations 1 and 2 to calculate R6 and R7:

  $$VOUT_{(HIGH)} = V_{FB(HIGH)} = V_{REF} [R9 / (R6 + R9)] \quad (Eq\ 1)$$

  where V_{REF} = 2V.

  $$VOUT_{(LOW)} = V_{FB(LOW)} = V_{REF} [(R7//R9) / (R6 + R7//R9)] \quad (Eq\ 2)$$

- To evaluate output voltages greater than 2V, change resistors R6, R7, and R9, cut the trace shorting R4, and install feedback resistors R4 and R5. Select R5 and R9 in the 10kΩ to 100kΩ range, and use the following equations to calculate R4:

  $$VOUT_{(HIGH)} = V_{FB\ (HIGH)} [(R4 + R5) / R5]VO$$

  $$VOUT_{(LOW)} = V_{FB\ (LOW)} [(R4 + R5) / R5]$$

  where $V_{FB(HIGH)}$ and $V_{FB(LOW)}$ are calculated from equations (1) and (2), respectively.

Evaluating Fixed Output Voltages

The MAX1536 EV kit can also be used to evaluate fixed output voltages. For fixed output voltage applications, OD and $\overline{OD}$ are not used, and GATE should be connected to GND. Remove R7 and R8. Verify that the shunt is across jumper JU3 pins 2 and 3:

- To evaluate output voltages from 0.7V to 2V, change resistors R6 and R9. Select R9 in the 10kΩ to 100kΩ range. Calculate R6 using equation 1.

If VOUT equals 2V, short R6 and remove R9:

- To evaluate output voltages from 2V to VIN, short R6, remove R9, and install feedback resistors R4 and R5. Select R5 in the 10kΩ to 100kΩ range:

  $$VOUT = V_{FB}[(R4 + R5)/R5]$$

  where $V_{FB} = V_{REF}$ = 2V.

For other output voltages, refer to the MAX1536 IC data sheet to recalculate the inductor and output capacitor.

MAX1536 Evaluation Kit

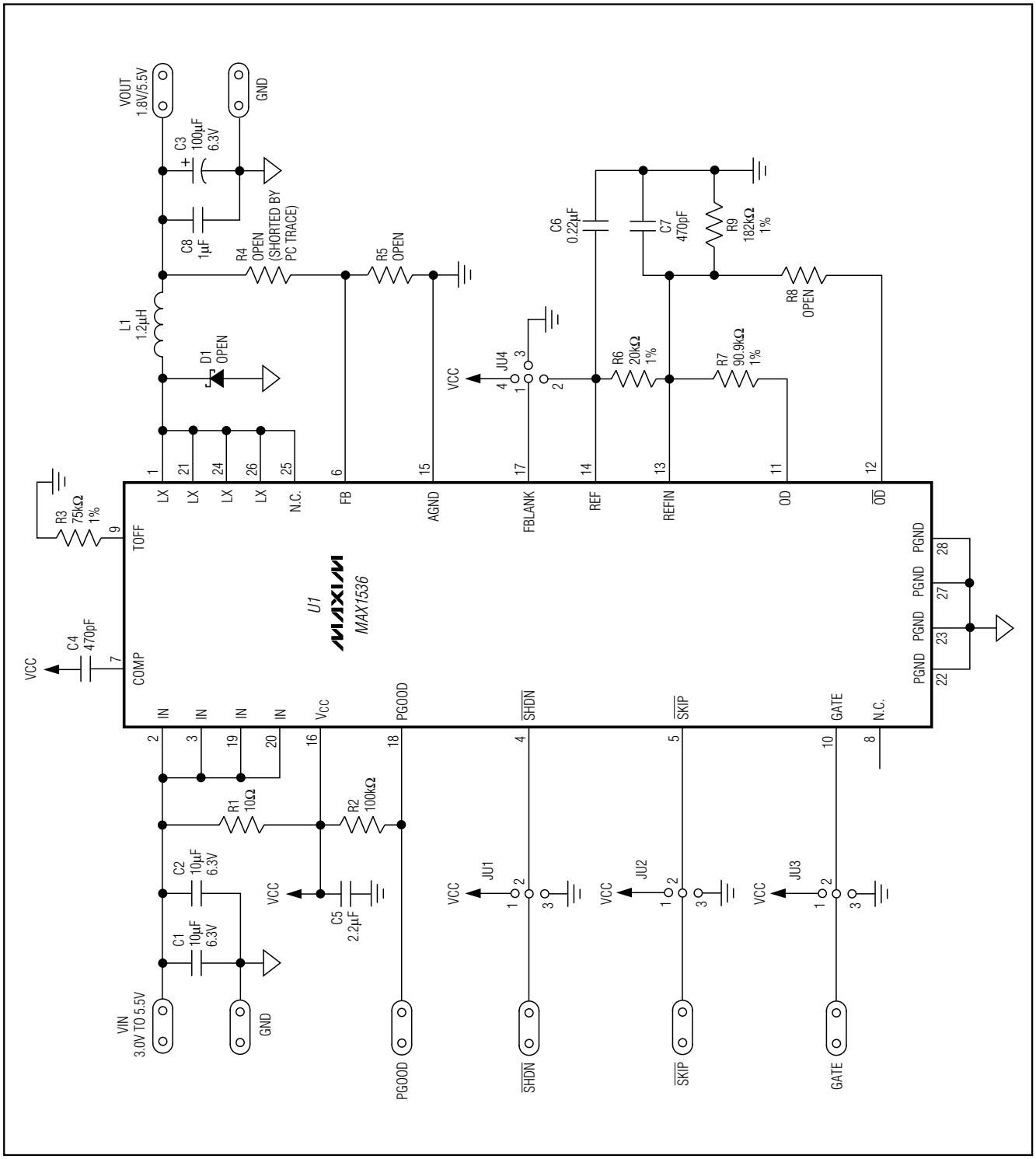

Figure 1. MAX1536 EV Kit Schematic

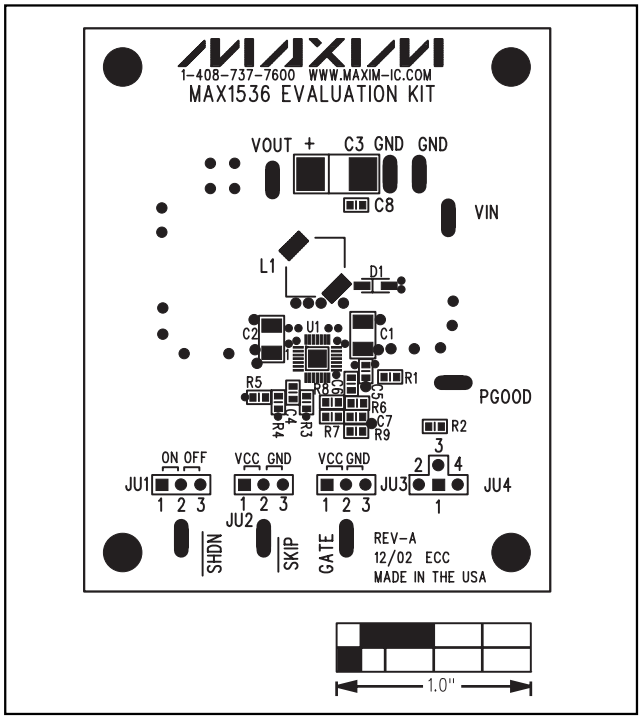

Figure 2. MAX1536 EV Kit Component Placement Guide—Top Silkscreen

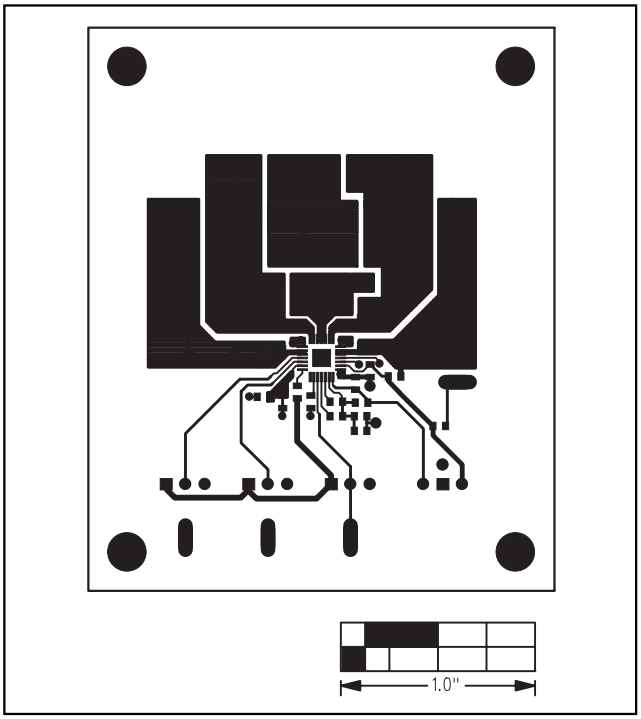

Figure 3. MAX1536 EV Kit PC Board Layout—Component Side

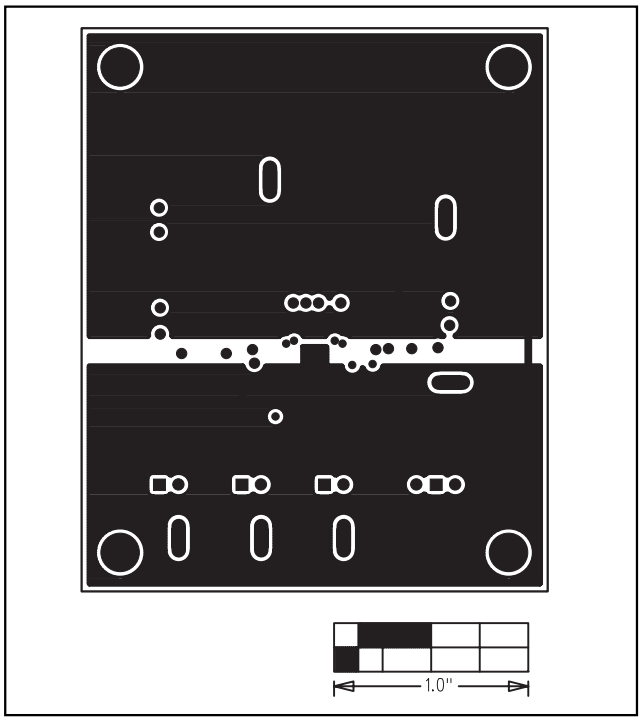

Figure 4. MAX1536 EV Kit PC Board Layout—Layer 2 (PGND and AGND)

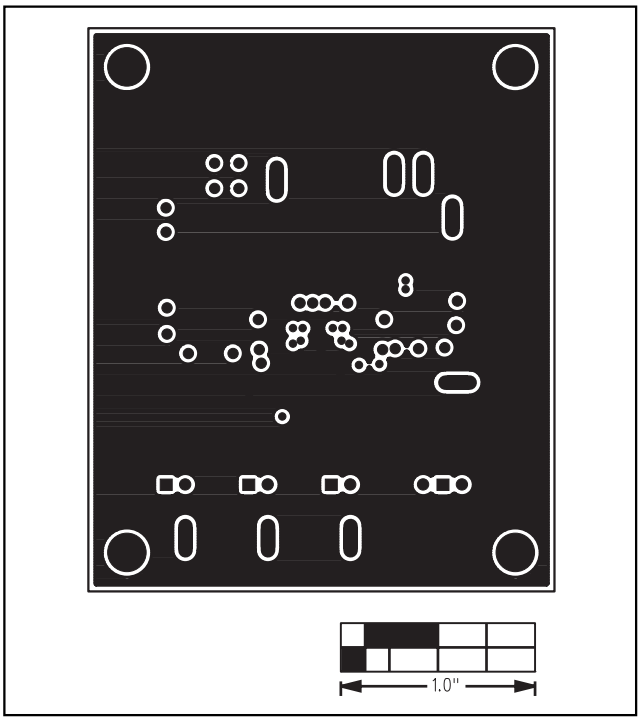

Figure 5. MAX1536 EV Kit PC Board Layout—Layer 3 (AGND)

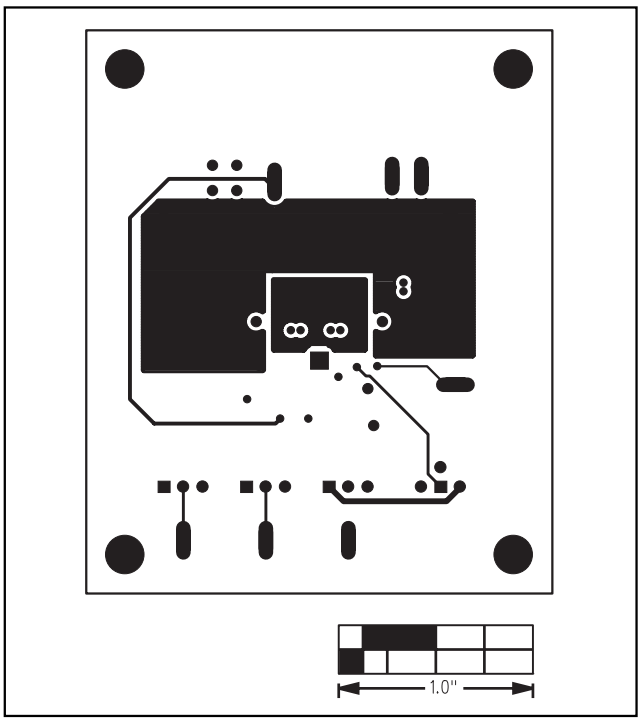

Figure 6. MAX1536 EV Kit PC Board Layout—Solder Side (AGND)