/VI/IXI/VI

MAX117 Evaluation Kit

_____General Description

The MAX117 evaluation kit (EV kit) is a fully assembled evaluation board for the 8-bit, 8-channel, +3V MAX117 analog-to-digital converter. Channel selection can be controlled by switches located on the board or by user-provided logic-level signals. An on-board oscillator provides continuous conversions, and the conversion results appear on the LED output display.

The MAX117 EV kit also evaluates the +5V MAX118. To evaluate the MAX118, order a MAX118 free sample, replace the MAX117 with the MAX118, and install the appropriate R9 resistor (see *Component List*).

_____Features

♦ **+3V (MAX117) or +5V (MAX118) Operation**

♦ **Fully Assembled and Tested**

♦ **On-Board Oscillator Generates Timing Signals**

♦ **LED Display of Conversion Results**

♦ **Low-Power Shutdown Mode**

_____Component List

DESIGNATION	QTY	DESCRIPTION
C1, C4	2	22µF, 10V electrolytic capacitors
C2, C5–C8	5	0.1µF, 50V ceramic capacitors
C3	1	1000pF, 50V ceramic capacitor
J1	1	20-pin ribbon-cable connector
JU1, JU4	2	3-pin jumper headers
JU2, JU3, JU5–JU8	6	2-pin jumper headers
LED1–LED8	8	Red LEDs
N1	1	Low-$R_{DS(ON)}$, N-channel FET International Rectifier IRML2402*
R1, R2, R3, R5, R6	5	100kΩ resistors
R4, R7, R8	3	10kΩ resistors
R9	1	330Ω, 10-pin SIP resistor (installed, used with MAX117)
		560Ω, 10-pin SIP resistor (not installed, used with MAX118)
R10	1	5.1kΩ resistor
SW1	1	4-position DIP switch
U1	1	MAX117CPI
U2	1	74HC564 inverting 8-bit latch
U3	1	74HC04 hex inverter
None	8	Shunts
None	1	Printed circuit board
None	4	Rubber feet

*International Rectifier: (310) 322-3331

_____Ordering Information

PART	TEMP. RANGE	BOARD TYPE
MAX117EVKIT-DIP	0°C to +70°C	Through Hole

Note: To evaluate the MAX118, request a MAX118CPI free sample.

_____Quick Start

Verify operation of the MAX117 evaluation board by configuring for continuous conversions using the on-board oscillator. Take the following steps:

1) Verify that the jumpers are configured as shown in Table 1.

2) Connect a +3V, 100mA supply to the VDD pad. A 20mA supply is sufficient if the LED output display is disabled. To evaluate the MAX118, use a +5V supply and replace the 330Ω, 10-pin SIP resistor (R9) with the 560Ω SIP resistor included in the kit.

3) Connect an input signal to the AIN1 input pad.

4) On switch SW1, set A0, A1, and A2 to the on position and set $\overline{PD}$ to the off position (Table 3).

5) Observe the conversion results on the LED display as the input voltage is varied between ground and the supply voltage.

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Table 1. Jumper Configuration for Continuous-Conversion Operation

JUMPER	CONNECTION	FUNCTION
JU1	1 & 2	Connects REF- to the drain of N1 (see the *Shutdown* section).
JU2	Open	Sets the MAX117 for READ mode operation (MODE = low).
JU3	Shorted	Enables the LED display.
JU4	2 & 3	Connects the $\overline{CS}$ pin to the on-board oscillator.
JU5	Shorted	Connects the MAX117's V_{DD} pin to the on-board EV kit's VDD pad.
JU6	Shorted	Connects the $\overline{RD}$ pin to the on-board oscillator.
JU7	Shorted	Connects the MAX117's REF+ pin to VDD.
JU8	Shorted	Connects a pull-up resistor to the $\overline{WR}$/RDY pin.

_____Detailed Description

MAX117 Reference Voltage

The MAX117 reference can be connected to any voltage between V_{DD} and ground ($V_{REF+} \geq V_{REF-}$). To use the power-supply rails as the reference voltage, short jumper JU7 and install a shunt on JU1 (in either position). When using an external reference, remove the shunts from JU1 and JU7, and apply your external reference source to the VREF+ and VREF- pads.

Continuous Conversions

A 74HC04, configured as a free-running oscillator, provides the continuous-conversion signals ($\overline{CS}$ and $\overline{RD}$) on the evaluation board. The oscillator output also clocks the MAX117 conversion results into a 74HC564 octal latch for display by eight LEDs.

The oscillator must be disconnected when the MAX117 is controlled by external circuitry. Remove the shunts from jumpers JU4, JU6, and JU8 to disconnect the on-board oscillator. For additional flexibility, the digital signals and data outputs are available at the 20-pin connector, J1.

Shutdown

When switch $\overline{PD}$ is set to the on position, the MAX117 enters shutdown mode. In shutdown mode, the supply current drops below 1µA (excluding the reference current). The internal resistance from REF+ to REF- is typically 2kΩ, and current will flow through it even when the MAX117 is shut down. The evaluation kit uses a low-$R_{DS(ON)}$, N-channel MOSFET (N1) to disconnect REF- from ground when the MAX117's $\overline{PWRDN}$ pin is driven low. This MOSFET has less than 1Ω of on-resistance at 2.7V V_{GS} to prevent an excessive offset error from appearing at REF-. Jumper JU1 allows the user to remove N1 from the circuit to evaluate user-specific circuit configurations.

Current Measurement

The current supplied to the board includes the current drawn by the MAX117, the on-board oscillator, the output latch, and the LED display. Jumper JU5 is in series with the MAX117 V_{DD} pin to facilitate MAX117 supply-current measurements. Measure the MAX117 supply current or shutdown current by removing the shunt that normally shorts JU5, and connecting an ammeter across the two jumper pins. Refer to Table 2 for the appropriate jumper/switch settings.

Table 2. Jumper/Switch Settings for MAX117 Current Measurements

CURRENT MEASUREMENT	JUMPERS		SWITCH $\overline{PD}$
	JU1	JU7	
Supply Current, $V_{REF} = V_{DD}$ (including reference current)	2 & 3 or 1 & 2	Shorted	Off
Supply Current (excluding reference current	Open	Open	Off
Power-Down Current	1 & 2	N/A	On

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Table 3. Jumper Functions

JUMPER	POSITION	FUNCTION
JU1	1 & 2	Connects REF- pin to the drain of MOSFET N1 (see the *Shutdown* section).
	2 & 3	Connects REF- pin to ground.
JU2	Open	The MODE pin is pulled low internally or can be driven by external circuitry.
	Shorted	Connects the MODE pin to V_{DD}.
JU3	Open	Disables the LED display.
	Shorted	Enables the LED display.
JU4	1 & 2	Connects the $\overline{CS}$ pin to ground.
	2 & 3	Connects the $\overline{CS}$ pin to the on-board oscillator.
	Open	The $\overline{CS}$ pin must be controlled by external logic.
JU5	Open	Connects an ammeter across the pins to measure the supply current.
	Shorted	Connects the MAX117's V_{DD} pin to the VDD pad.
JU6	Open	The $\overline{RD}$ pin must be controlled by external logic.
	Shorted	Connects the $\overline{RD}$ pin to the on-board oscillator.
JU7	Open	An external source must be connected to the REF+ pad.
	Shorted	REF+ pin connected to V_{DD}.
JU8	Open	No pull-up connected to the $\overline{WR}$/RDY pin.
	Shorted	Connects a 5.1kΩ pull-up resistor to the $\overline{WR}$/RDY pin.

Jumper Selections

Jumpers JU1–JU8 allow the user various configuration options for the EV kit. Table 3 lists the various jumper functions.

Switch Selections

The four-position DIP switch (SW1) is used to select an input channel and to enable/disable power-down mode. The address pins (A0–A2) and the power-down pin ($\overline{PWRDN}$) are pulled up to V_{DD} through a 100kΩ resistor. These pins are connected to ground when the associated switch (A0, A1, A2, or $\overline{PD}$) is in the on position. The switches must be in the off position for external logic to control input-channel selection or power-down mode.

Table 4. SW1 DIP Switch Selections

A0	A1	A2	$\overline{PD}$	INPUT CHANNEL
On	On	On	Off	IN1
Off	On	On	Off	IN2
On	Off	On	Off	IN3
Off	Off	On	Off	IN4
On	On	Off	Off	IN5
Off	On	Off	Off	IN6
On	Off	Off	Off	IN7
Off	Off	Off	Off	IN8, analog input internally connected to REF+; or channel selection controlled externally.
X	X	X	On	The MAX117 is in shutdown ($\overline{PWRDN}$ grounded).

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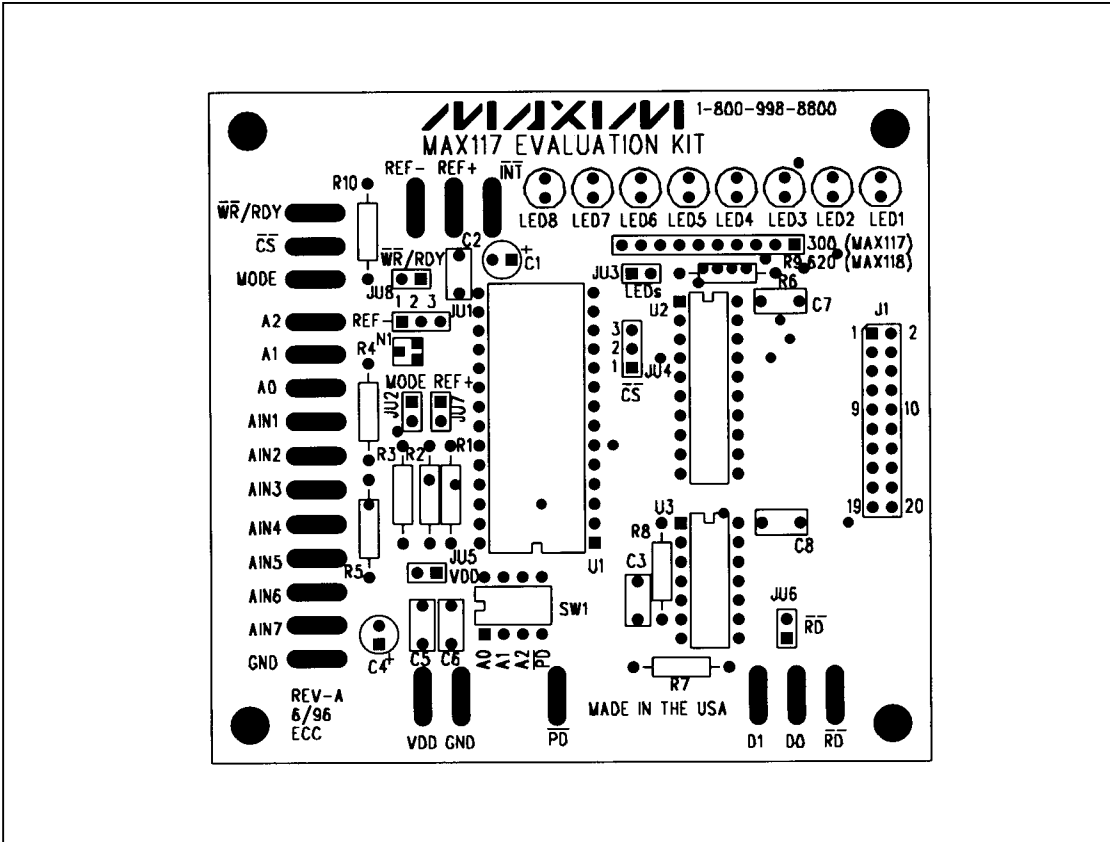**Evaluates: MAX117/MAX118**

Figure 1. MAX117 EV Kit Schematic

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Figure 2. MAX117 EV Kit Component Placement Guide—Component Side

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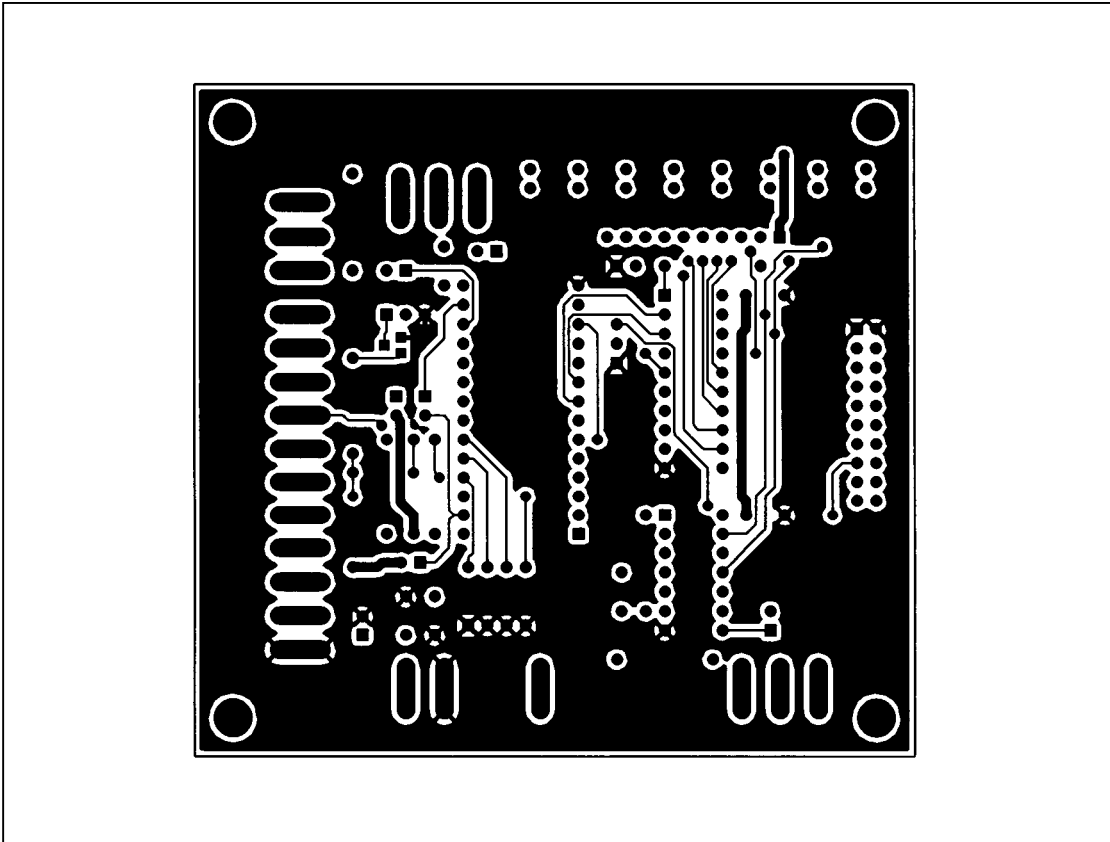
Figure 3. MAX117 EV Kit PC Board Layout—Component Side
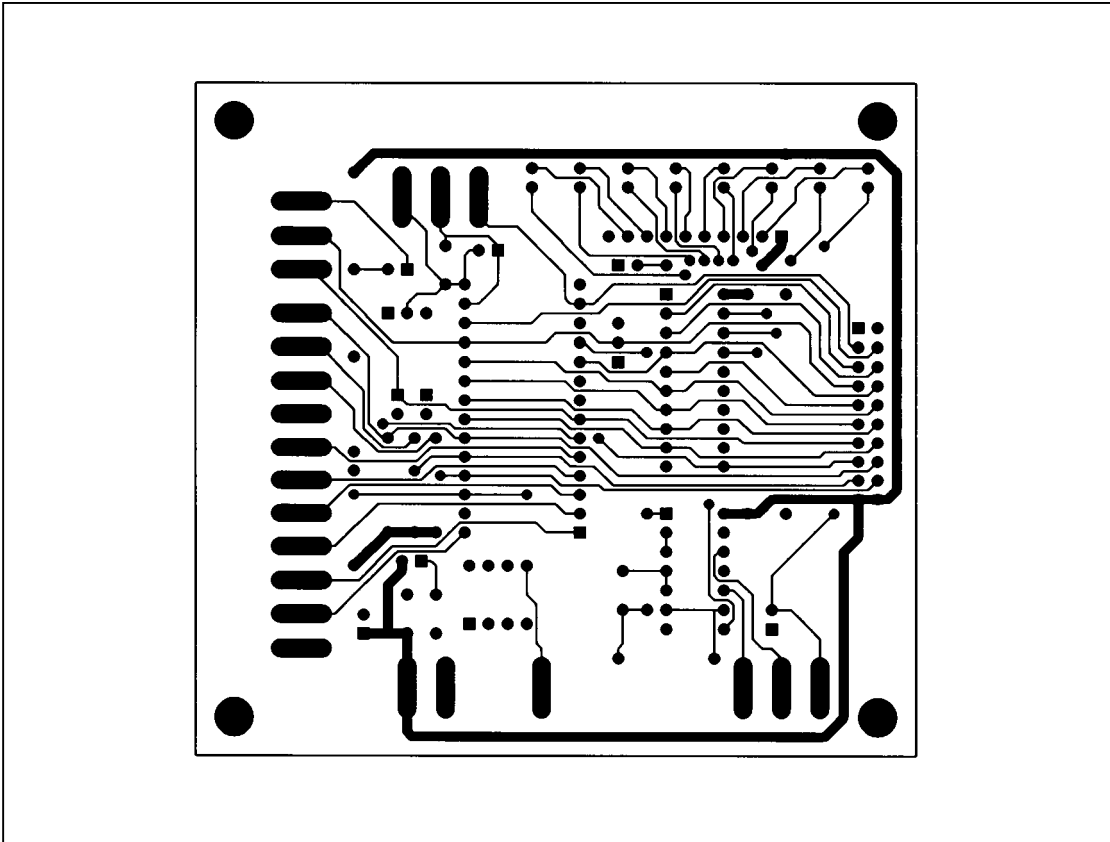
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Figure 4. MAX117 EV Kit PC Board Layout—Solder Side

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