

19-0416; Rev 0; 7/95

# MAXIM

## MAX866 Evaluation Kit

### General Description

The MAX866 evaluation kit (EV kit) is a fully assembled and tested surface-mount printed circuit board. It can also evaluate the adjustable-output MAX867.

The MAX866/MAX867 are CMOS, step-up, DC-DC switching regulators for small, low input voltage or battery-powered systems. The MAX866 accepts a positive input voltage between 0.8V and  $V_{OUT}$  and converts it to a higher, pin-selectable output voltage of 3.3V or 5V. The MAX867 adjustable version accepts 0.8V to 6V input voltages and generates a higher, adjustable output voltage in the 2.7V to 6V range. Typical full-load efficiencies for the MAX866/MAX867 are greater than 80%.

A movable jumper on the EV kit selects either a 3.3V or 5.0V output voltage. Additional pads on the board's solder side accommodate resistors for the LBI/LBO low battery detector or MAX867 output adjustment.

### Component List

DESIGNATION	QTY	DESCRIPTION
C1	1	0.1 $\mu$ F ceramic capacitor
C2, C3	2	47 $\mu$ F, 16V, low-ESR tantalum capacitors; Sprague 593D476X0016D2W or AVXTPSD476M016R0150
R1, R2, R3, R4, R5	0	Open
L1	1	330 $\mu$ H inductor; CoilCraft D01608-334
D1	1	20V, 500mA Schottky diode; Motorola MBR0520LTI
U1	1	MAX866CUA (8-pin $\mu$ MAX)
J1, J2	2	3-pin headers
None	2	Shunts
None	1	PC board
None	1	MAX866 data sheet

To contact Sprague, phone (603) 224-1961 or fax (603) 224-1430. To contact Murata Erie, phone (404) 436-1300. Refer to the MAX866/MAX867 data sheet for other component suppliers' phone numbers.

### Features

- ♦ Low 0.8V to 6V Input Supply Voltage
- ♦ 0.9V Guaranteed Start-Up Supply Voltage
- ♦ 27 $\mu$ A Quiescent Current
- ♦ 1 $\mu$ A Shutdown Mode
- ♦ Up to 250kHz Switching Frequency
- ♦  $\pm 1.5\%$  Reference Tolerance
- ♦ Low-Battery Detector (LBI/LBO)
- ♦ Ultra-Small 8-Pin  $\mu$ MAX Package (1.11mm High)
- ♦ Surface-Mount Construction
- ♦ Fully Assembled and Tested

### Ordering Information

PART	TEMP. RANGE	BOARD TYPE
MAX866EVKIT-MM	0°C to +70°C	Surface Mount

### Quick Start

The MAX866 EV kit is a fully assembled and tested surface-mount board. Follow the steps below to verify board operation. **Do not turn on the power supply until all connections are completed.**

- 1) Connect a 1.5V supply to the pad marked VIN. The ground connects to the GND pad.
- 2) Connect a voltmeter and load (if any) to the VOUT pad.
- 3) Place the shunt on J1 across pins 1 and 2.
- 4) Place the shunt on J2 across pins 1 and 2 for a 5V output voltage, or across pins 2 and 3 for a 3.3V output (input voltage less than 3.6V).
- 5) Turn on the power and verify that the output voltage is 5V.
- 6) Refer to the section *Evaluating the MAX867* to modify the board for different output voltages.

Evaluates: MAX866/MAX867

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## MAX866 Evaluation Kit

### Detailed Description

#### Input Source

In normal operation, the input source for the MAX866 evaluation board must be greater than 0.9V for start-up and less than the output voltage plus 0.3V. A typical input voltage range would be the 1.2V to 1.8V range of a 1-cell NiCd battery. An input voltage greater than the selected output voltage (but less than 7V) will not damage the circuit. However, the MAX866 output will equal the input voltage minus the 0.3V drop of the Schottky diode, D1.

The input current depends on the power delivered to the load. The following equations show how to calculate the expected input current requirement.

$$\text{Input Power} = \text{Output Power} / \text{Efficiency}$$

and

$$\text{Input Current} = \text{Input Power} / \text{Input Voltage}$$

To calculate the input current for a typical operating circuit, assume a 2V input voltage, a 5V output voltage, and a 5mA load. The expected efficiency can be taken from the graphs on the MAX866/MAX867 data sheet. Under the above conditions, the MAX866 delivers 85% efficiency.

$$\text{Input Power} = (5.0\text{V} \times 5\text{mA}) / 85\%$$

$$\text{Input Power} = 29.41\text{mW}$$

and

$$\text{Input Current} = 29.41\text{mW} / 2.0\text{V}$$

$$\text{Input Current} = 14.71\text{mA}$$

Once started, the MAX866 actually operates from the regulated output voltage. This means that the input voltage can fall below the 0.9V minimum start-up voltage. Typically, the regulated output will be maintained even if the input voltage drops to 0.5V. See the Efficiency and Start-Up Voltage vs. Load Current graphs in the *Typical Operating Characteristics* section of the MAX866/MAX867 data sheet.

### Jumper Selection

Two 3-pin headers select the shutdown mode and output voltage. Table 1 lists the selectable jumper options.

**Table 1. Jumper Selection**

J1 Shunt Location	J2 Shunt Location	SHDN Pin Connection	3V/5V Pin Connection	MAX866 Output
1 & 2	1 & 2	VOUT	GND	5.0V
1 & 2	2 & 3	VOUT	VOUT	3.3V
2 & 3	1 & 2	GND	GND	VIN - 0.3V
2 & 3	2 & 3	GND	VOUT	VIN - 0.3V

### Using the Low-Battery Indicator

The MAX866 has an additional comparator useful for monitoring the input source's voltage level. Resistor locations R3 and R4 on the bottom of the printed circuit board are connected as a voltage divider between the LBI pad and the MAX866 LBI pin. Note that a printed circuit board trace across R4 shorts the LBI pin to ground when this function is not used. Cut the trace before installing R4. Refer to the *Low-Battery Detection* section of the MAX866/MAX867 data sheet for instructions on selecting values for resistors R3 and R4.

Another location on the board facilitates the addition of a pull-up resistor on the LBO output. LBO is an open-drain output that can sink 2mA. Install resistor R5 if an external circuit is to be driven from LBO.

## MAX866 Evaluation Kit

### Evaluating the MAX867

The MAX866 EV kit can also evaluate the MAX867, which generates output voltages in the 2.7V to 6.0V range using external resistors. Besides replacing the IC, the only other modifications required are to remove

the shunt on J2 and to add the output voltage-divider resistors R1 and R2 (located on the board's solder side). The *Output Voltage Selection* section of the MAX866/MAX867 data sheet gives instructions for calculating R1 and R2 values.

Evaluates: MAX866/MAX867

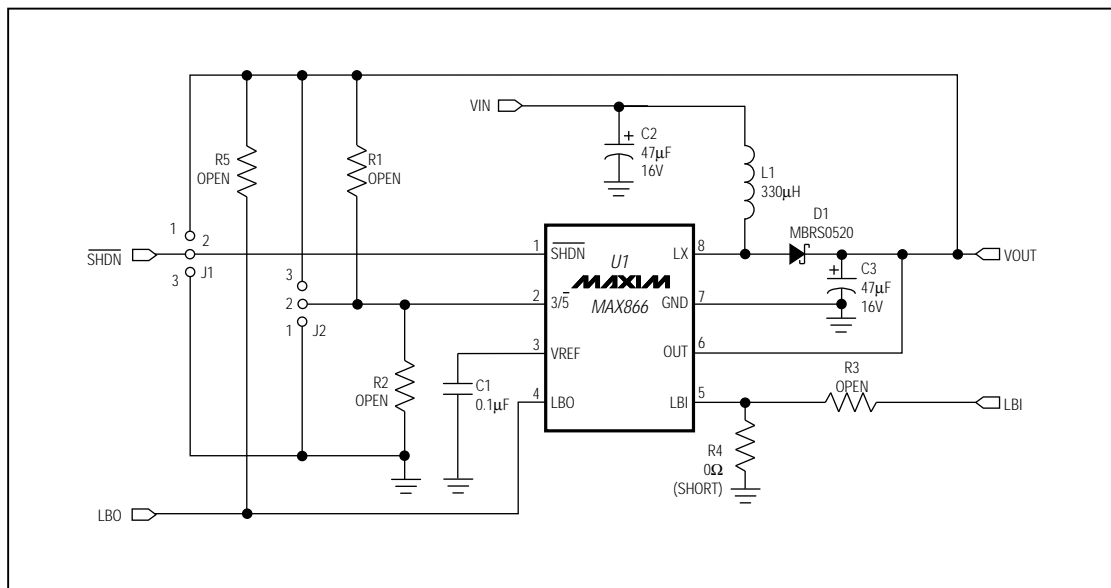


Figure 1. MAX866 EV Kit Schematic

## MAX866 Evaluation Kit

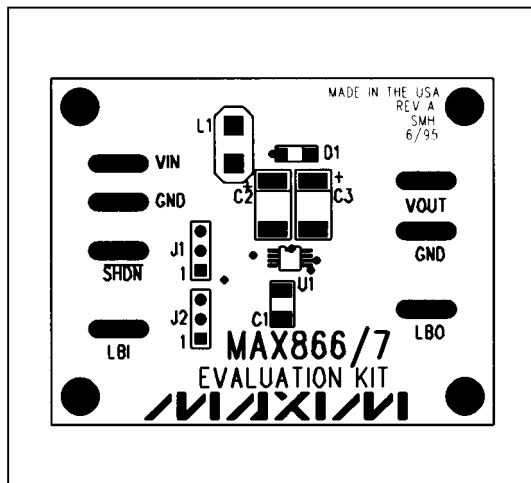


Figure 2. MAX866 EV Kit Component Placement Guide—Component Side

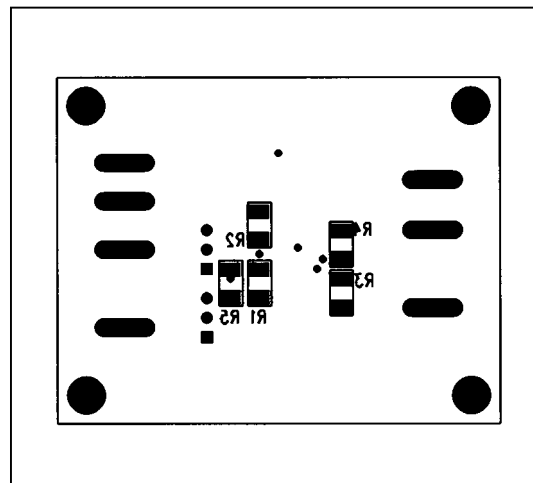


Figure 3. MAX866 EV Kit Component Placement Guide—Solder Side

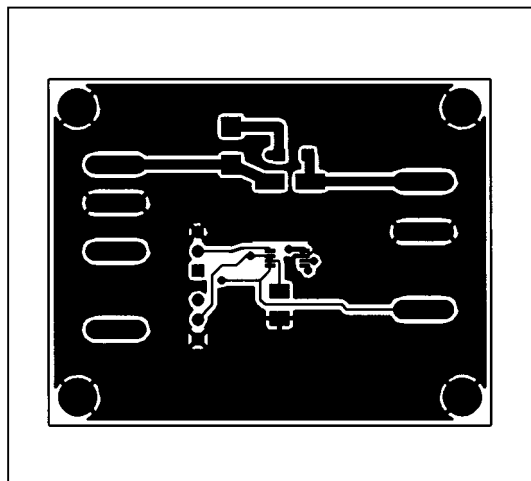


Figure 4. MAX866 EV Kit PC Board Layout—Component Side

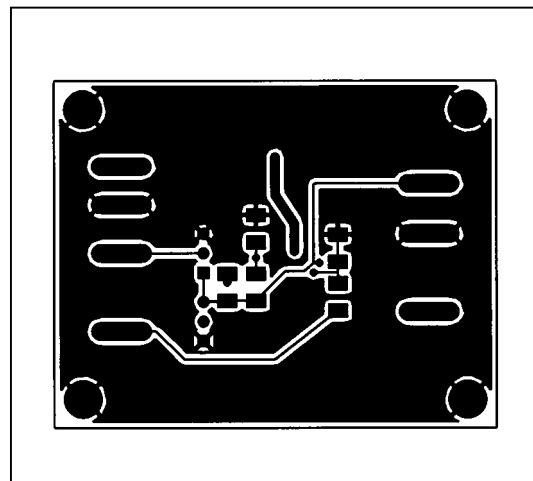


Figure 5. MAX866 EV Kit PC Board Layout—Solder Side

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