

# MAXIM

## MAX1620 Evaluation Kit

### General Description

The MAX1620 evaluation kit (EV kit) converts a +1.8V to +12V battery voltage to a +12.5V to +23.5V LCD backplane bias voltage for currents up to 20mA. Both the MAX1620 and MAX1621 include a 5-bit DAC, allowing digital software control of the bias voltage. The MAX1620 uses up/down digital signaling to adjust the DAC, and the MAX1621 uses the System Management Bus (SMBus™) 2-wire serial interface.

The MAX1620 EV kit is a fully assembled and tested surface-mount circuit board. It can also be used to evaluate the MAX1621.

### Component List

DESIGNATION	QTY	DESCRIPTION
C1, C6	2	22 $\mu$ F, 35V tantalum capacitors AVX TPSE226M035R0300 or Sprague 593D226X0035E2T
C2, C3	2	0.1 $\mu$ F ceramic capacitors
C5	1	100pF ceramic capacitor
D1	1	Schottky diode Motorola MBR0540T1
D4	1	Schottky diode Central Semiconductor CMPSH-3
L1	1	100 $\mu$ H inductor Sumida CD54-101
N1	1	N-channel MOSFET Motorola MMFT3055VL
Q1	1	2N2907A transistor Central Semiconductor CMPT2907A
R1	1	82k $\Omega$ , 5% resistor
R2, R8, R9, R10	4	100k $\Omega$ , 5% resistors
R3, R4	2	300k $\Omega$ , 5% resistors
R5	1	2.2M $\Omega$ , 5% resistor
R6, R7	2	56k $\Omega$ , 5% resistors
R11	1	10k $\Omega$ , 5% resistor
U1	1	MAX1620EEE (QSOP-16)
JU3	1	3-pin header
None	1	Shunt (JU3)
JU8	1	2-pin header
None	1	MAX1620/MAX1621 PC board
None	1	MAX1620/MAX1621 data sheet
<b>Additional components for negative output (included in the EV kit) but not installed:</b>		
C4	1	1 $\mu$ F ceramic capacitor
C7	1	22 $\mu$ F, 35V tantalum capacitor AVX TPSE226M035R0300 or Sprague 593D226X0035E2T
D2, D3	2	Schottky diodes Motorola MBR0540T1

SMBus is a trademark of Intel Corp.



Maxim Integrated Products 1

**For free samples & the latest literature: <http://www.maxim-ic.com>, or phone 1-800-998-8800.  
For small orders, phone 1-800-835-8769.**

### Features

- ◆ **+1.8V to +12V Battery Input Voltage**
- ◆ **+12.5V to +23.5V Adjustable Output**
- ◆ **20mA Output**
- ◆ **32-Level Internal DAC**
- ◆ **10 $\mu$ A Shutdown Current**
- ◆ **Surface-Mount Components**
- ◆ **Fully Assembled and Tested**

### Ordering Information

PART	TEMP. RANGE	BOARD TYPE
MAX1620EVKIT	0°C to +70°C	Surface Mount

Note: To evaluate the MAX1621, request a free MAX1621EEE sample with the MAX1620 EV kit.

### Component Suppliers

SUPPLIER*	PHONE	FAX
AVX	803-946-0690	803-626-3123
Central Semiconductor	516-435-1110	516-435-1824
Coilcraft	847-639-6400	847-639-1469
Coiltronics	561-241-7876	561-241-9339
Dale-Vishay	402-564-3131	402-563-6418
Motorola	602-303-5454	602-994-6430
Sprague	603-224-1961	603-224-1430
Sumida	847-956-0666	847-956-0702
Vishay/Vitramon	203-268-6261	203-452-5670

\* Please indicate that you are using the MAX1620 EV kit when contacting these component suppliers.

### Quick Start

The MAX1620 EV kit is fully assembled and tested. Follow these steps to verify board operation. **Do not turn on the power supply until all connections are completed.**

- 1) Connect a +1.8V to +12V power supply to the VBATT pad and a +3V to +5.5V supply to the VIN pad. Connect ground to the GND pad.
- 2) Connect a voltmeter and load, if any, to the VOUT pad.
- 3) Verify the JU3 shunt is across pins 1 and 2 (positive output).
- 4) Turn on the power supply and verify that the output voltage is typically +17.8V.
- 5) For other output voltages, refer to the *Output Adjustment* section in the MAX1620/MAX1621 data sheet for instructions on selecting the feedback resistors.

Evaluates: MAX1620/MAX1621

# MAX1620 Evaluation Kit

## Detailed Description

The MAX1620 EV kit converts a +1.8V to +12V battery voltage to a +12.5V to +23.5V LCD backplane bias voltage for currents up to 20mA. The output voltage can be adjusted with the on-chip DAC, allowing digital software control of the bias voltage. Up/down digital signaling adjusts the DAC.

### Output Voltage Control

The output voltage is set with a voltage divider to the feedback pin (FB). It can be adjusted with an internal DAC summing current into FB through an external resistor. The 5-bit DAC is controlled with a user-programmable up/down counter. The MAX1620 controls the DAC counter with the UP and DN pins. A rising edge on UP increases the output voltage; a rising edge on DN decreases the output voltage. Holding both UP and DN high resets the output voltage to mid-range. Refer to the *Output Voltage Control* section in the MAX1620/MAX1621 data sheet for more information on controlling the MAX1620/MAX1621 output voltage.

### Controlling the LCD Using POK and $\overline{\text{LCDON}}$

POK can be used to turn off a positive LCD bias voltage when  $V_{\text{BATT}}$  is too low. A resistor-divider (R1-R2) from  $V_{\text{BATT}}$  to POK controls the open-drain output,  $\overline{\text{LCDON}}$ , which pulls low when  $V_{\text{POK}} > 1\text{V}$ .

$\overline{\text{LCDON}}$  drives an external PNP transistor, Q1, switching a positive  $V_{\text{OUT}}$  to the LCD. Choose a PNP with low saturation voltage at the required load current. R6 limits the base current in Q1. R7 is used to turn off Q1 when  $\overline{\text{LCDON}}$  is floating. R6 and R7 can be the same value. Refer to the *Controlling the LCD Using POK and  $\overline{\text{LCDON}}$*  section in the MAX1620/MAX1621 data sheet for instructions on selecting resistors R1, R2, R6, and R7.

### Jumper Selection

#### Shutdown Mode

The MAX1620 EV kit features a shutdown mode that reduces the MAX1620 quiescent current to 14 $\mu\text{A}$  to preserve battery life. The two-pin header JU8 selects the shutdown mode. Table 1 lists the selectable jumper options.

#### Positive Output Voltage

This EV kit is shipped with the MAX1620's polarity pin (POL) tied to  $V_{\text{IN}}$  for converting to a positive output voltage. A boost topology is used, and the feedback regulation point is 1.5V. Refer to the *Output Adjustment* section in the MAX1620/MAX1621 data sheet for instructions on selecting the feedback resistors.

**Table 1. Jumper JU8 Settings**

SHUNT LOCATION	$\overline{\text{SHDN}}$ PIN	MAX1620 OUTPUT
On	Connected to GND	Shutdown mode, $V_{\text{OUT}} = V_{\text{BATT}}$ , $V_{\text{OUTSW}} = \text{float}$
Off	Connected to $V_{\text{IN}}$	MAX1620 enabled, $V_{\text{OUT}} = +17.8\text{V}$

#### Negative Output Voltage

If a negative output voltage is desired, connect the MAX1620's POL pin to ground using jumper JU3. In this configuration, the error amplifier's output is inverted to provide the correct feedback polarity. The feedback regulation point is 0V. To modify the EV kit for a negative output voltage:

- 1) Cut the PC board trace to open jumpers JU1, JU4, and JU5.
- 2) Short jumpers JU2, JU6, and JU7 with a piece of wire.
- 3) Place the JU3 shunt across pins 2 and 3 (Table 2)
- 4) Install supplied components D2, D3, C4, and C7.

Table 3 summarizes jumper JU1–JU7 settings.

#### Evaluating the MAX1621

To evaluate the MAX1621, remove the MAX1620 IC and resistors R8, R9, and R10.

**Table 2. Jumper JU3 Settings**

SHUNT LOCATION	POL PIN	MAX1620 OUTPUT
1 and 2	Connected to $V_{\text{IN}}$	Positive output, $V_{\text{OUT}} = +17.8\text{V}$
2 and 3	Connected to GND	Negative output, $V_{\text{OUT}} = -16.7\text{V}$

**Table 3. Jumper JU1–JU7 Settings**

JUMPER	POSITIVE OUT	NEGATIVE OUT
JU1	Short	Open
JU2	Open	Short
JU3	Short 1 and 2	Short 2 and 3
JU4	Short	Open
JU5	Short	Open
JU6	Open	Short
JU7	Open	Short

# MAX1620 Evaluation Kit

Evaluates: MAX1620/MAX1621

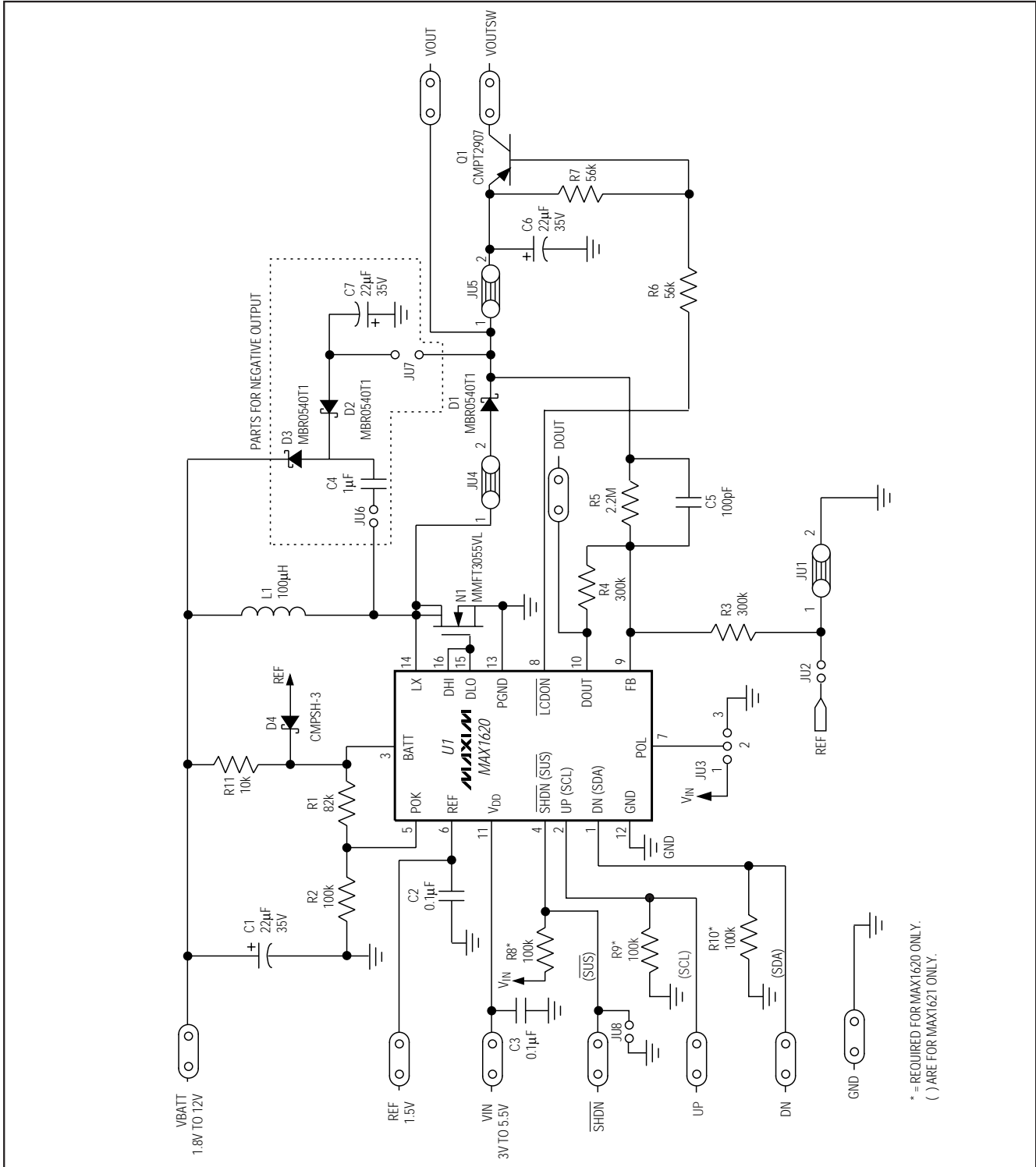


Figure 1. MAX1620 EV Kit Main Circuit Schematic

# MAX1620 Evaluation Kit

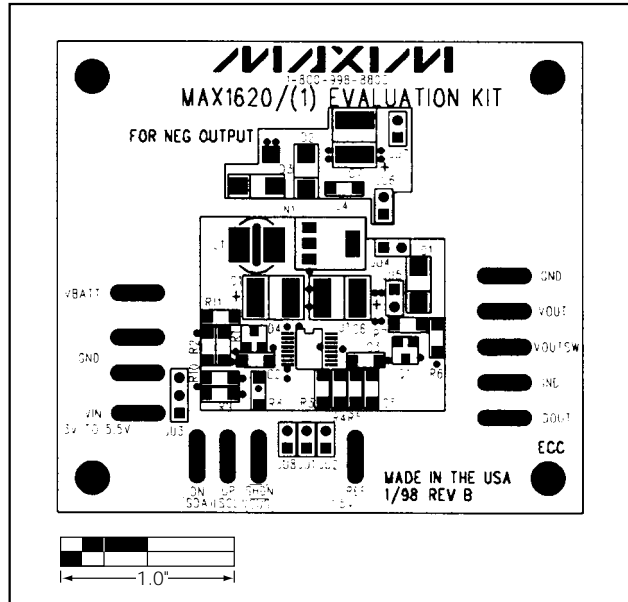


Figure 2. MAX1620 EV Kit Component Placement Guide

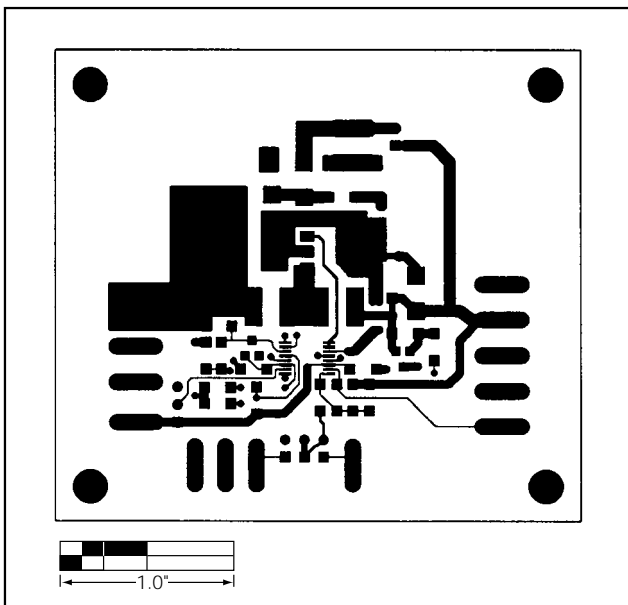


Figure 3. MAX1620 EV Kit Component Placement Guide—Component Side

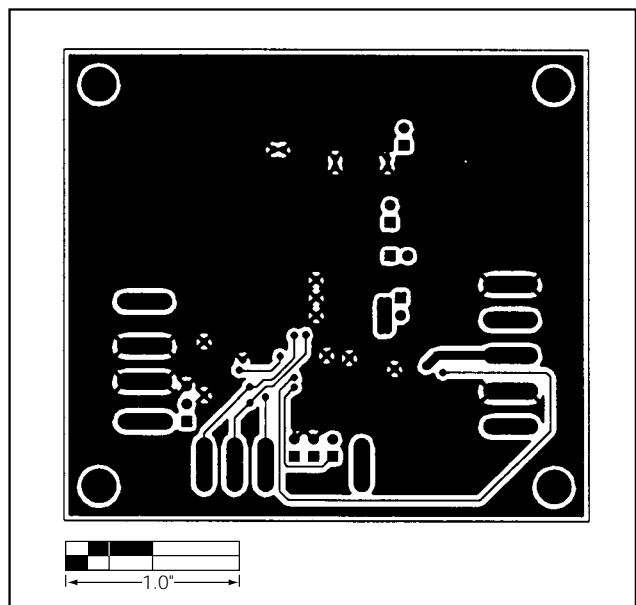


Figure 4. MAX1620 EV Kit Component Placement Guide—Solder Side

Maxim cannot assume responsibility for use of any circuitry other than circuitry entirely embodied in a Maxim product. No circuit patent licenses are implied. Maxim reserves the right to change the circuitry and specifications without notice at any time.

4 \_\_\_\_\_ Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 408-737-7600

© 1998 Maxim Integrated Products

Printed USA

**MAXIM** is a registered trademark of Maxim Integrated Products.