**General Description**

The MAX6520 is the lowest-power 1.2V, precision, three-terminal voltage reference offered in a SOT23-3 package. Ideal for 3V battery-powered equipment where power conservation is critical, the MAX6520 is a low-power alternative to existing two-terminal shunt references. Unlike two-terminal references that throw away battery current and require an external series resistor, the MAX6520 has a 70µA maximum supply current (typically only 50µA) that is independent of the input voltage. This feature translates to maximum efficiency at all battery voltages.

The MAX6520 operates from a supply voltage as low as 2.4V, and initial accuracy is ±1% for the SOT23 package. Output voltage temperature coefficient is typically only 25ppm/°C, and is guaranteed to be less than 50ppm/°C in the SOT23 package.

**Applications**

- Battery-Powered Systems
- Portable and Hand-Held Equipment
- Data-Acquisition Systems
- Instrumentation and Process Control

**Features**

- 3-Pin SOT23 Package
- 50ppm/°C max Tempco
- Supply Current Independent of Input Voltage Over Temperature
- 50µA Supply Current
- 2.4V to 11V Input Voltage Range
- ±1% Initial Accuracy

**Ordering Information**

<table>
<thead>
<tr>
<th>PART</th>
<th>TEMP RANGE</th>
<th>PIN-PACKAGE</th>
<th>TOP MARK</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX6520EUR-T</td>
<td>-40°C to +85°C</td>
<td>3 SOT23-3</td>
<td>EFAA</td>
</tr>
</tbody>
</table>

*Contact factory for availability.

**Typical Operating Circuit**

![Typical Operating Circuit Diagram]

**Pin Configuration**

![Pin Configuration Diagram]
50ppm/°C, SOT23, 3-Terminal, 1.2V Voltage Reference

ABSOLUTE MAXIMUM RATINGS

Supply Voltage (VIN) .............................................-0.3V to +12V  
Operating Temperature Range ...................................-40°C to +85°C  
VOUT .............................................-0.3V to (VIN + 0.3V)  
Storage Temperature Range .....................................-65°C to +160°C  
Output Short-Circuit Duration ...........Continuous to Either Supply  
Continuous Power Dissipation (TA = +70°C)  
SOT23 (derate 4mW/°C above +70°C) .........................320mW  
Lead Temperature (soldering, 10s) .........................+300°C  

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

(VIN = 2.4V, ILOAD = 0mA, TA = +25°C, unless otherwise noted.)

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>CONDITIONS</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage</td>
<td>VOUT</td>
<td>MAX6520EUR</td>
<td>TA = +25°C</td>
<td>1.188</td>
<td>1.200</td>
<td>1.212</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TA = TMIN to TMAX</td>
<td>1.176</td>
<td>1.200</td>
<td>1.224</td>
</tr>
<tr>
<td>Output Voltage Temperature Coefficient</td>
<td>TCVOUT</td>
<td>MAX6520EUR, TA = TMIN to TMAX</td>
<td>25</td>
<td>50</td>
<td>ppm/°C</td>
<td></td>
</tr>
<tr>
<td>Output Voltage Noise</td>
<td>en</td>
<td>0.1Hz to 10Hz</td>
<td>10</td>
<td></td>
<td>µVp-p</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>10Hz to 10kHz</td>
<td>400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line Regulation</td>
<td>VOUT/VIN</td>
<td>VIN = 2.4V to 11V, TA = TMIN to TMAX (Note 1)</td>
<td>1.5</td>
<td>2</td>
<td>µV/V</td>
<td></td>
</tr>
<tr>
<td>Load Regulation</td>
<td>VOUT/IOUT</td>
<td>ILOAD = -50µA to 400µA (Note 1)</td>
<td>0.1</td>
<td>1</td>
<td>µV/µA</td>
<td></td>
</tr>
<tr>
<td>Quiescent Supply Current</td>
<td>IQ</td>
<td>TA = +25°C</td>
<td>50</td>
<td>58</td>
<td>µA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TA = TMIN to TMAX (Note 1)</td>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in Supply Current vs. Input Voltage</td>
<td>IQ/VIN</td>
<td>VIN = 2.4V to 11V</td>
<td>1.5</td>
<td>5</td>
<td>µAV</td>
<td></td>
</tr>
<tr>
<td>Short-Circuit Output Current</td>
<td>ISC</td>
<td>VOUT shorted to GND</td>
<td>4.3</td>
<td></td>
<td>mA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VOUT shorted to VIN</td>
<td>400</td>
<td></td>
<td>µA</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Production testing done at TA = +25°C, over temperature limits guaranteed by parametric correlation data.

Typical Operating Characteristics

(VIN = 3V, ILOAD = 0mA, TA = +25°C, unless otherwise noted.)
**50ppm/°C, SOT23, 3-Terminal, 1.2V Voltage Reference**

*Typical Operating Characteristics (continued)*

(V_{IN} = 3V, I_{LOAD} = 0mA, T_A = +25°C, unless otherwise noted.)

---

**Load Regulation vs. Temperature**

**Output Voltage vs. Source Current**

**Power-Supply Rejection Ratio vs. Frequency**

---

**0.1Hz TO 100Hz Noise**

**Load-Transient Response**

**Line-Transient Response**

---

A = OUTPUT CURRENT, 50µA/div, I_{LOAD} = 0µA TO -50µA
B = OUTPUT VOLTAGE, 100mV/div

A = OUTPUT CURRENT, 500µA/div, I_{LOAD} = 0µA TO 50µA
B = OUTPUT VOLTAGE, 100mV/div

A = INPUT VOLTAGE, 100mV/div, V_{IN} = 3V ± 50mV
B = OUTPUT VOLTAGE, 10mV/div
**Applications Information**

**Input Bypassing**

For the best line-transient performance, decouple the input with a 0.1µF ceramic capacitor as shown in the Typical Operating Circuit. Locate the capacitor as close to the device pin as possible. Where transient performance is less important, no capacitor is necessary.

**Output Bypass**

The MAX6520 performs well without an output decoupling capacitor. If your application requires an output charge reservoir (e.g., to decouple the reference from the input of a DAC), then make sure that the total output capacitive load does not exceed 10nF.

**Chip Information**

TRANSISTOR COUNT: 39
50ppm/°C, SOT23, 3-Terminal, 1.2V Voltage Reference

Tape-and-Reel Information

NOTE: DIMENSIONS ARE IN MM. AND FOLLOW EIA481-1 STANDARD.
MAX6520

50ppm/°C, SOT23, 3-Terminal, 1.2V Voltage Reference

Package Information

(The package drawing(s) in this data sheet may not reflect the most current specifications. For the latest package outline information go to www.maxim-ic.com/packages.)

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.

© 2005 Maxim Integrated Products

Maxim Integrated Products, 120 San Gabriel Drive, Sunnyvale, CA 94086 (408) 737-7600

Printed USA

MAXIM is a registered trademark of Maxim Integrated Products, Inc.