Features



# Low-Cost, Micropower, Precision 3-Terminal, 1.2V Voltage Reference

#### \_General Description

The MAX6120 is the lowest-power 1.2V, precision, three-terminal voltage reference offered in a SOT-23 package. Ideal for 3V battery-powered equipment where power conservation is critical, the MAX6120 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 MAX6120 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 MAX6120 operates from a supply voltage as low as 2.4V, and initial accuracy is  $\pm 1\%$  for the SOT-23 package. Output voltage temperature coefficient is typically only 30ppm/°C, and is guaranteed to be less than 100ppm/°C in the SOT-23 package.

**Applications** 

Battery-Powered Systems

Portable and Hand-Held Equipment

Data Acquisition Systems

Instrumentation and Process Control

- ♦ 3-Pin SOT-23 Package
- Supply Current Independent of Input Voltage Over Temperature
- ♦ 50µA Supply Current
- ♦ 2.4V to 11V Input Voltage Range
- ♦ 30ppm/°C Typical Tempco (SOT-23)
- ♦ ±1% Initial Accuracy (SOT-23)

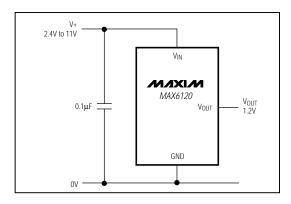
#### \_Ordering Information

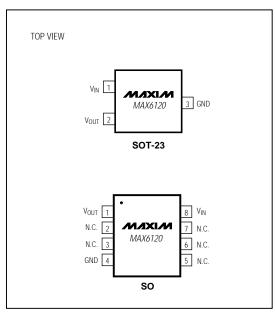
PART	TEMP. RANGE	PIN-PACKAGE		
MAX6120ESA*	-40°C to +85°C	8 SO		
MAX6120EUR	-40°C to +85°C	3 SOT-23		

<sup>\*</sup> Contact factory for availability.

### \_\_\_\_\_Pin Configurations

## Typical Operating Circuit





MIXIM

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#### **ABSOLUTE MAXIMUM RATINGS**

$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	Operating Temperature Range40°C to +85°C Storage Temperature Range65°C to +160°C Lead Temperature (soldering, 10sec)+300°C
Continuous Power Dissipation (T <sub>A</sub> = +70°C)	
SOT-23 (derate 4mW/°C above +70°C)320mW	

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

( $V_{IN} = 2.4V$ ,  $I_{LOAD} = 0mA$ ,  $T_A = +25$ °C, unless otherwise noted.)

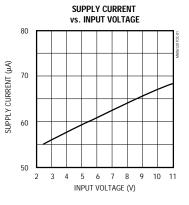
PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Output Voltage	\/a=	MAX6120EUR (SOT-23)	$T_A = +25^{\circ}C$	1.188	1.200	1.212	V
Output Voltage	V <sub>OUT</sub>	WAX012UEUR (SU1-23)	T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub> (Note 2)	1.176		1.224	V
Output Voltage Temperature Coefficient	TCVout	MAX6120EUR (SOT-23), TA = T <sub>MIN</sub> to T <sub>MAX</sub> (Note 2)			30	100	ppm/°C
Output Voltage Noise	e <sub>n</sub>	0.1Hz to 10Hz			10		µVp-р
Output voltage Noise		10Hz to 10kHz			400		
Line Regulation	Vout/Vin	V <sub>IN</sub> = 2.4V to 11V, T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub> (Note 1)			2	30	μV/V
Load Regulation	V <sub>OUT</sub> /I <sub>OUT</sub>	I <sub>LOAD</sub> = -50μA to 400μA (Note 1)			0.1	1	μV/μΑ
Quiescent Supply Current	IQ	$T_A = +25$ °C			50	58	
Quiescent Supply Current		TA = T <sub>MIN</sub> to T <sub>MAX</sub> (Note 1)				70	μΑ
Change in Supply Current vs. Input Voltage	I <sub>Q</sub> /V <sub>IN</sub>	V <sub>IN</sub> = 2.4V to 11V			1.5	5	μΑ/V
Short-Circuit Output Current	Isc	V <sub>OUT</sub> shorted to GND			4.3		mA
Short-Circuit Output Current		V <sub>OUT</sub> shorted to V <sub>IN</sub>			400		μΑ

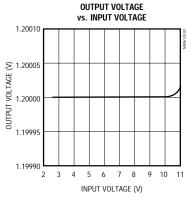
Note 1: Production testing done at TA = +25°C, over temperature limits guaranteed by parametric correlation data.

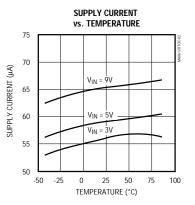
Note 2: Contact factory for availability of a higher-grade, lower-TC option in a SOT-23 package.

### \_Typical Operating Characteristics

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



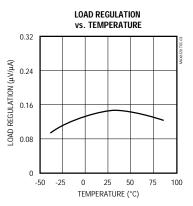


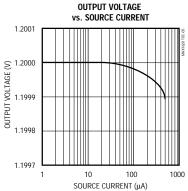


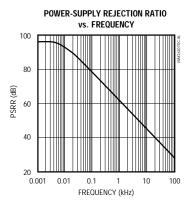
# Low-Cost, Micropower, Precision 3-Terminal, 1.2V Voltage Reference

\_Typical Operating Characteristics (continued)

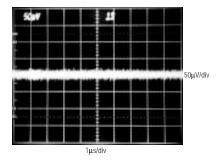
 $(V_{IN} = 3V, I_{LOAD} = 0mA, T_A = +25^{\circ}C, unless otherwise noted.)$ 



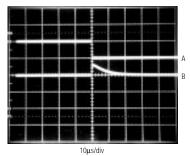




#### 0.1Hz TO 100Hz NOISE

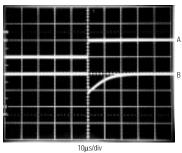


#### LOAD-TRANSIENT RESPONSE



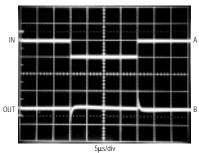
A = OUTPUT CURRENT,  $50\mu A/div$ ,  $I_{LOAD}$  =  $0\mu A$  TO  $-50\mu A$  B = OUTPUT VOLTAGE, 100mV/div

#### LOAD-TRANSIENT RESPONSE



A = OUTPUT CURRENT,  $500\mu A/div$ ,  $I_{LOAD}$  =  $0\mu A$  TO  $500\mu A$  B = OUTPUT VOLTAGE, 100mV/div

#### LINE-TRANSIENT RESPONSE



A = INPUT VOLTAGE, 100 mV/div,  $V_{\text{IN}} = 3 \text{V} \pm 50 \text{mV}$ B = 0 UTPUT VOLTAGE, 10 mV/div

# Low-Cost, Micropower, Precision 3-Terminal, 1.2V Voltage Reference

#### Pin Description

PIN		NAME	FUNCTION		
SOT-23	so	NAME	FUNCTION		
1	8	VIN	Input Voltage		
2	1	Vout	Reference Output		
3	4	GND	Ground		
_	2, 3, 5, 6, 7	N.C.	No Connect—not internally connected		

## MIXLM 0.1µF 0.01µF REFAB 12 REFC OUTA OUTB DAC LATCH B 16-BIT SHIFT REGIST DAC DAC C 10 MAXIM MAX512 CONTROL MAX513 LOUT LATCH 6I GND RESET $V_{DD}$

Figure 1. 3V, Triple, 8-Bit Serial DAC

### \_Applications Information

#### Input Bypassing

For the best line-transient performance, decouple the input with a  $0.1\mu F$  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 MAX6120 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.

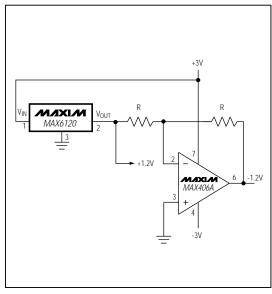


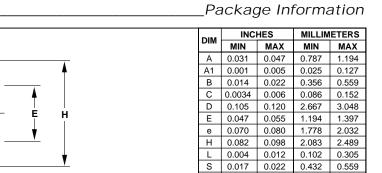
Figure 2. Low-Power ±1.2V Reference

\_\_\_\_\_Chip Information

**TRANSISTOR COUNT: 39** 

21-0051B

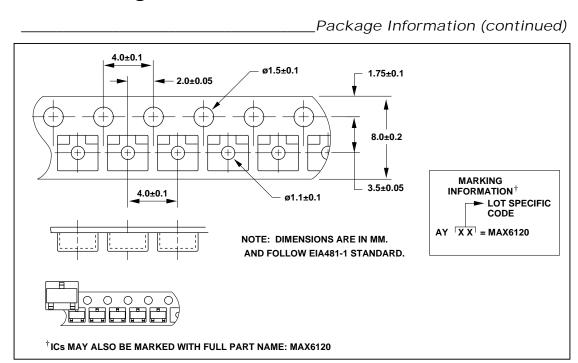
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3-PIN SOT-23 SMALL-OUTLINE TRANSISTOR PACKAGE

NIXIN

# Low-Cost, Micropower, Precision 3-Terminal, 1.2V Voltage Reference



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