



# Ultra-Precision, High-Side Current-Sense Amplifier

MAX9922/MAX9923

## General Description

The MAX9922/MAX9923 ultra-precision, high-side current-sense amplifiers feature ultra-low offset voltage ( $V_{OS}$ ) of  $25\mu\text{V}$  (max) and laser-trimmed gain accuracy better than 0.5%. The combination of low  $V_{OS}$  and high-gain accuracy allows precise current measurements even at very small sense voltages.

The MAX9922/MAX9923 are capable of both unidirectional and bidirectional operation. For unidirectional operation, connect REF to GND. For bidirectional operation, connect REF to  $V_{DD}/2$ .

The MAX9922 has adjustable gain set with two external resistors. The MAX9923 T/H/F uses an internal laser-trimmed resistor for fixed gain of 25V/V, 100V/V, and 250V/V, respectively. The devices operate from a +2.85V to +5.5V single supply, independent of the input common-mode voltage, and draw only 700 $\mu\text{A}$  operating supply current and less than 1 $\mu\text{A}$  in shutdown.

The +1.9V to +28V current-sense input common-mode voltage range makes the MAX9922/MAX9923 ideal for current monitoring in applications where high accuracy, large common-mode measurement range, and minimum full-scale  $V_{SENSE}$  voltage is critical.

The MAX9922/MAX9923 use a patented spread-spectrum autozeroing technique that constantly measures and cancels the input offset voltage, eliminating drift over time and temperature, and the effect of 1/f noise. This, in conjunction with the indirect current-feedback technique, achieves less than  $25\mu\text{V}$  (max) offset voltage.

The MAX9922/MAX9923 are available in a small 10-pin  $\mu\text{MAX}$ ® package and are specified over the -40°C to +85°C extended temperature range.

## Applications

Notebook/Desktop Power Management  
Handheld Li+ Battery Current Monitoring  
Precision Current Sources

Typical Operating Circuits appear at end of data sheet.

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## Features

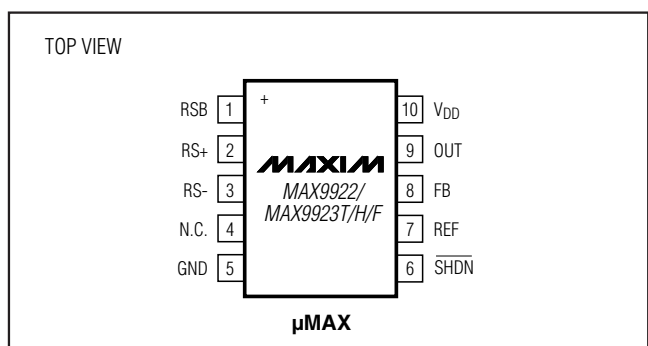
- ◆ Ultra-Precision  $V_{OS}$  Over Temperature
  - MAX9922:  $\pm 10\mu\text{V}$  (max)
  - MAX9923T:  $\pm 25\mu\text{V}$  (max)
  - MAX9923H:  $\pm 20\mu\text{V}$  (max)
  - MAX9923F:  $\pm 10\mu\text{V}$  (max)
- ◆  $\pm 0.5\%$  (max) Full-Scale Gain Accuracy
- ◆ Bidirectional or Unidirectional ISENSE
- ◆ Multiple Gains Available
  - Adjustable (MAX9922)
  - +25V/V (MAX9923T)
  - +100V/V (MAX9923H)
  - +250V/V (MAX9923F)
- ◆ 1.9V to 28V Input Common-Mode Voltage, Independent of  $V_{DD}$
- ◆ Supply Voltage: +2.85V to +5.5V
- ◆ 700 $\mu\text{A}$  Supply Current, 1 $\mu\text{A}$  Shutdown Current
- ◆ Extended Temperature Range (-40°C to +85°C)
- ◆ Available in Space-Saving 10-Pin  $\mu\text{MAX}$

## Ordering Information

PART	PIN-PACKAGE	TEMP RANGE	GAIN (V/V)
MAX9922EUB+	10 $\mu\text{MAX}$	-40°C to +85°C	Adjustable
MAX9923TEUB+	10 $\mu\text{MAX}$	-40°C to +85°C	25
MAX9923HEUB+	10 $\mu\text{MAX}$	-40°C to +85°C	100
MAX9923FEUB+	10 $\mu\text{MAX}$	-40°C to +85°C	250

+Denotes a lead(Pb)-free/RoHS-compliant package.

## Pin Configuration



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For pricing, delivery, and ordering information, please contact Maxim Direct at 1-888-629-4642, or visit Maxim's website at [www.maxim-ic.com](http://www.maxim-ic.com).