LINEAR TECHNOLOGY

LM334S8

Constant Current Source and Temperature Sensor

FEATURES

- 1μA to 10mA Operation
- 0.02%/V Regulation
- 0.8V to 30V Operating Voltage
- Can Be Used as Linear Temperature Sensor
- Draws No Reverse Current

APPLICATIONS

- Current Mode Temperature Sensing
- Constant Current Source for Shunt References
- Cold Junction Compensation
- Constant-Gain Bias for Bipolar Differential Stage
- Micropower Bias Networks
- Buffer for Photoconductive Cell
- Current Limiter

DESCRIPTION

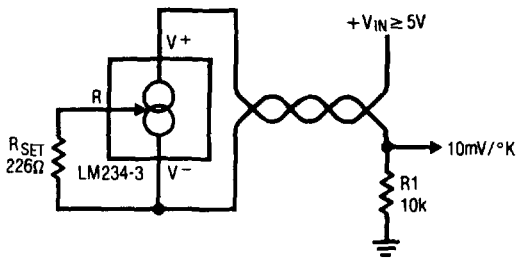
The LM334 is a three-terminal current source designed to operate at current levels from 1μA to 10mA, as set by an external resistor. The device operates as a true two-terminal current source, requiring no extra power connections or input signals. Regulation is typically 0.02%/V and terminal-to-terminal voltage can range from 800mV to 30V.

Because the operating current is *directly proportional to absolute temperature* in degrees Kelvin, the device will also find wide applications as a temperature sensor. The temperature dependence of the operating current is +0.336%/°C at room temperature. For example, a device operating at 298μA will have a temperature coefficient of +1μA/°C. The temperature dependence is extremely accurate and repeatable.

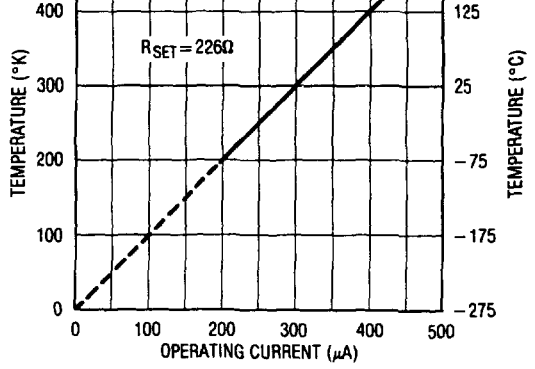
If a zero temperature coefficient current source is required, this is easily achieved by adding a diode and a resistor.

3

Remote Temperature Sensor with Voltage Output



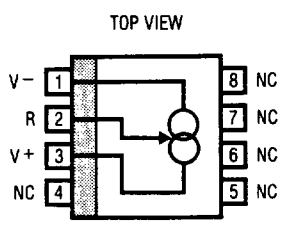
Operating Current vs Temperature



ABSOLUTE MAXIMUM RATINGS

V^+ to V^- Forward Voltage 30V
V^+ to V^- Reverse Voltage 20V
R Pin to V^- Voltage 5V
Set Current 10mA
Power Dissipation 200mW
Operating Temperature Range ..... 0°C to 70°C
Lead Temperature (Soldering, 10 sec.) ..... 300°C

PACKAGE/ORDER INFORMATION



ORDER PART NUMBER
LM334S8
PART MARKING
334

ELECTRICAL CHARACTERISTICS CURRENT SOURCE (Note 1)

SYMBOL	PARAMETER	CONDITIONS	LM334 MIN	LM334 TYP	LM334 MAX	UNITS
ΔI_{SET}	Set Current Error, $V^+ = 2.5V$ (Note 2)	$10\mu A \le I_{SET} \le 1mA$			6	%
		$1mA < I_{SET} \le 5mA$			8	%
		$2\mu A \le I_{SET} < 10\mu A$			12	%
	Ratio of Set Current to V^- Current	$10\mu A \le I_{SET} \le 1mA$	14	18	26	
		$1mA \le I_{SET} \le 5mA$		14		
		$2\mu A \le I_{SET} \le 10\mu A$		18	26	
V_{MIN}	Minimum Operating Voltage	$2\mu A \le I_{SET} \le 100\mu A$		0.8		V
		$100\mu A < I_{SET} \le 1mA$		0.9		V
		$1mA < I_{SET} \le 5mA$		1.0		V
$\frac{\Delta I_{SET}}{\Delta V_{IN}}$	Average Change in Set Current with Input Voltage	$1.5V \le V^+ \le 5V$ $2\mu A \le I_{SET} \le 1mA$		0.02	0.1	%/V
		$5V \le V^+ \le 30V$		0.01	0.05	%/V
		$1.5V \le V \le 5V$ $1mA < I_{SET} \le 5mA$		0.03		%/V
		$5V \le V \le 30V$		0.02		%/V
	Temperature Dependence of Set Current (Note 3)	$25\mu A \le I_{SET} \le 1mA$	0.96T	T	1.04T	
C_S	Effective Shunt Capacitance			15		pF

Note 1: Unless otherwise specified, tests are performed at $T_j = 25°C$ with pulse testing so that junction temperature does not change during test.

Note 2: Set current is the current flowing into the V^+ pin. It is determined by the following formula: $I_{SET} = 67.7mV/R_{SET}$ (@25°C). Set current error is expressed as a percent deviation from this amount. I_{SET} increases at 0.336%/°C@$T_j = 25°C$.

Note 3: I_{SET} is directly proportional to absolute temperature (°K). I_{SET} at any temperature can be calculated from: $I_{SET} = I_O (T/T_O)$ where I_O is I_{SET} measured at T_O (°K).