

Constant Current Source and Temperature Sensor

FEATURES

- 1 μ A 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

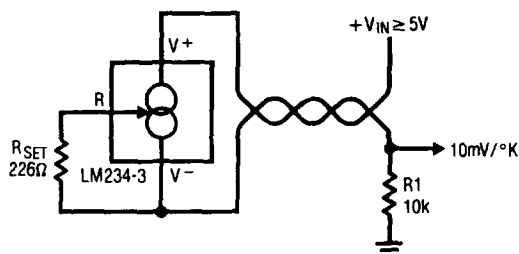
The LM334 is a three-terminal current source designed to operate at current levels from 1 μ A to 10mA, as set by an external resistor. The device operates as a true two-terminal current source, requiring no extra power connections or input signals. Regulation is typically 0.02%/V and terminal-to-terminal 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 298 μ A will have a temperature coefficient of +1 μ A/°C. The temperature dependence is extremely accurate and repeatable.

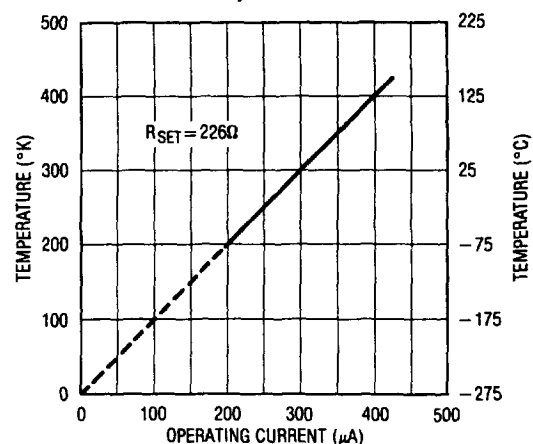
If a zero temperature coefficient current source is required, this is easily achieved by adding a diode and a resistor.

3

**Remote Temperature Sensor
with Voltage Output**



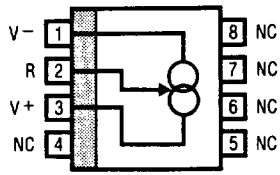
**Operating Current vs
Temperature**



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

 <p>TOP VIEW</p> <p>S8 PACKAGE PLASTIC SO</p>	ORDER PART NUMBER
	LM334S8
	PART MARKING
	334

ELECTRICAL CHARACTERISTICS CURRENT SOURCE (Note 1)

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

Note 1: Unless otherwise specified, tests are performed at $T_J = 25^\circ C$ 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: $I_{SET} = 67.7mV/R_{SET}$ (@ $25^\circ C$). Set current error is expressed as a percent deviation from this amount. I_{SET} increases at $0.336\%/^\circ C$ @ $T_J = 25^\circ C$.

Note 3: I_{SET} is directly proportional to absolute temperature ($^\circ K$). I_{SET} at any temperature can be calculated from: $I_{SET} = I_0 (T/T_0)$ where I_0 is I_{SET} measured at T_0 ($^\circ K$).