

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

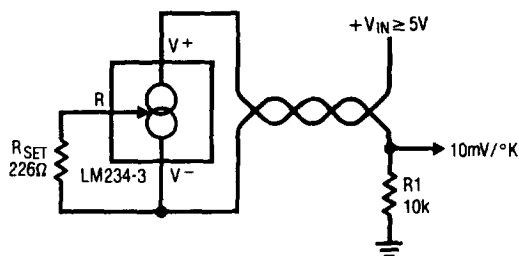
The LM334 is a three-terminal current source designed to operate at current levels from 1 μ A to 10mA, as set by an external resistor. The device operates as a true two-terminal current source, requiring no extra power connections or input signals. Regulation is typically 0.02%/V and terminal-to-terminal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

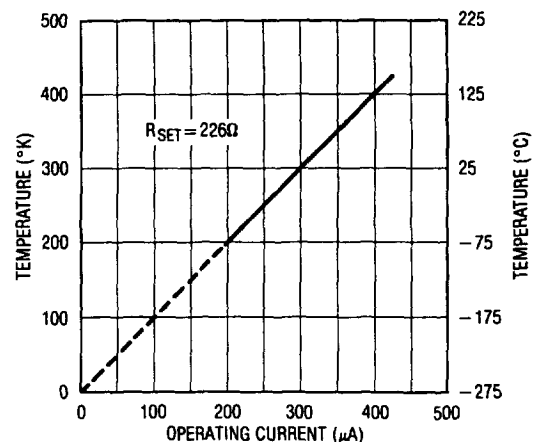
If a zero temperature coefficient current source is required, this is easily achieved by adding a diode and a resistor.

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**Remote Temperature Sensor
with Voltage Output**



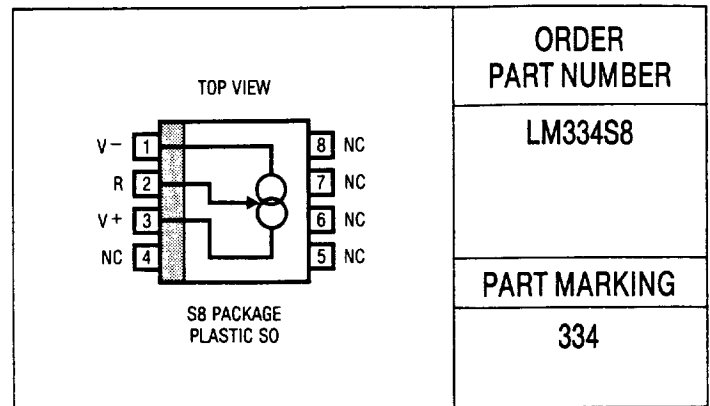
**Operating Current vs
Temperature**



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



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 μ A \leq I _{SET} \leq 1mA 1mA $<$ I _{SET} \leq 5mA 2 μ A \leq I _{SET} $<$ 10 μ A			6 8 12	% % %
	Ratio of Set Current to V ⁻ Current	10 μ A \leq I _{SET} \leq 1mA 1mA \leq I _{SET} \leq 5mA 2 μ A \leq I _{SET} \leq 10 μ A	14	18 14 18	26 26	
V _{MIN}	Minimum Operating Voltage	2 μ A \leq I _{SET} \leq 100 μ A 100 μ 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 μ A \leq I _{SET} \leq 1mA 5V \leq V ⁺ \leq 30V		0.02 0.01	0.1 0.05	%/V %/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 μ 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°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} = I₀ (T/T₀) where I₀ is I_{SET} measured at T₀ (°K).