



# 3523 SERIES

**NOT RECOMMENDED  
FOR NEW DESIGNS**

## Ultra-Low Bias Current FET OPERATIONAL AMPLIFIERS

### FEATURES

- BIAS CURRENT, 0.1pA, max
- OFFSET VOLTAGE, 500 $\mu$ V, max
- VOLTAGE DRIFT, 25 $\mu$ V/ $^{\circ}$ C, max
- INPUT IMPEDANCE,  $10^{13}\Omega$
- Noise (10Hz), 0.003pA, p-p

### DESCRIPTION

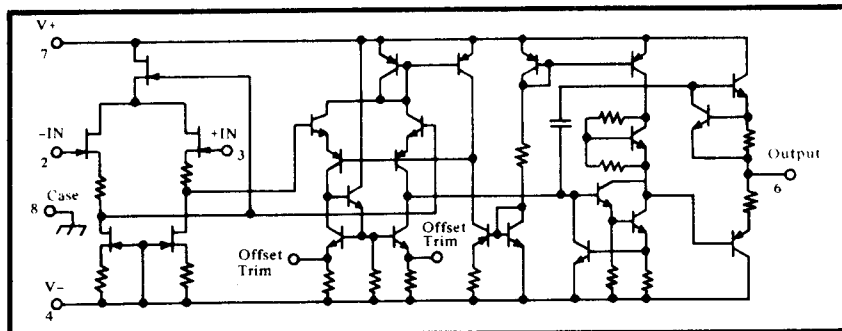
The Burr-Brown 3523 Series amplifiers are the first IC operational amplifiers to achieve sub-picoampere input currents without exhibiting excessive offset voltage, voltage drift and voltage noise. The high common-mode rejection, ultra-low bias current, and  $10^{13}\Omega$  input impedance of the 3523 make it the best choice for a variety of buffer and electrometer applications. These include pH measurement, photo-current amplification, long term integration, and low droop sample/hold or track/hold applications. Because its input offset voltage is laser-trimmed to less than 500 $\mu$ V, the 3523 can usually be used without

offset nulling. This is a distinct advantage in applications where it is desired to locate the 3523 near the signal source (e.g., in a signal probe).

The package of the 3523 is designed to preserve its ability to measure ultra-low currents and to avoid noise pickup. The case guard (pin no. 8) may be connected to a point which is at signal potential. This minimizes leakage current input from pins to case. Also, it shields the amplifier's sensitive input circuitry from power line frequency "hum", switching transients, and other sources of electrical noise.

Bias current specifications of the 3523 are guaranteed after warm-up in ambient air with no heat sink. Thus, the ultra-low bias current specifications become even more significant since internal power dissipation can easily raise case temperature by 20 $^{\circ}$ C in many applications.

The bias current on many FET amplifiers is a strong function of applied common-mode voltage. This is not the case with the 3523. The input stage design of the 3523 make the input bias current virtually independent of the common-mode voltage over its full range.

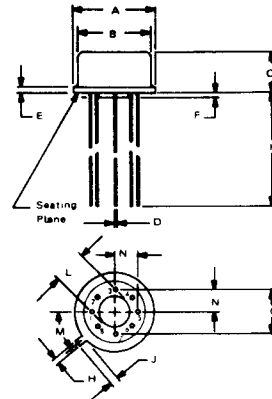


# ELECTRICAL SPECIFICATIONS

Specifications typical at 25°C and ±15VDC power supply unless otherwise noted.

MODELS	3523J	3523K	3523L
<b>OPEN-LOOP GAIN, DC no load</b> 1kΩ, load, min		100dB 94dB	
<b>RATED OUTPUT</b> Voltage, min Current min Output Impedance		±10V ±10mA 100Ω	
<b>FREQUENCY RESPONSE</b> Unity Gain, Open-Loop Full Power Response, min Slew Rate, min		1MHz 10kHz 0.6V/μsec	
<b>INPUT OFFSET VOLTAGE</b> Initial Offset, 25°C, max vs. Temp (0°C to 70°C), max vs. Supply Voltage vs. Time	±1mV ±50μV/°C	±500μV ±25μV/°C ±25μV/V ±5μV/mo	±500μV ±25μV/°C
<b>INPUT BIAS CURRENT</b> Initial bias, 25°C, max (doubles every +10°C) vs. Supply Voltage	-0.5pA	-0.25pA ±0.01pA/V	-0.1pA
<b>INPUT DIFFERENCE CURRENT</b> Initial difference, 25°C	±0.2pA	±0.1pA	±0.05pA
<b>INPUT IMPEDANCE</b> Differential Common-mode		10 <sup>12</sup> Ω 10 <sup>11</sup> Ω	
<b>INPUT NOISE</b> Voltage, .01Hz to 10Hz, p-p 10Hz to 10kHz, rms Current, .01Hz to 10Hz, p-p 10Hz to 10kHz, rms		4μV 2μV .003pA 0.01pA	
<b>INPUT VOLTAGE RANGE</b> Common-mode Voltage Common-mode Rejection at 10V Max. Safe Input Voltage		±(V <sub>J</sub> -2)V 80dB ±Supply	
<b>POWER SUPPLY</b> Rated Voltage Voltage Range, derated Current, quiescent		±15VDC ±5VDC to ±20VDC ±4mA	
<b>TEMPERATURE RANGE</b> Specification Operating Storage		0°C to +70°C -55°C to +125°C -65°C to +150°C	

# MECHANICAL



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.335	.370	8.51	9.40
B	.305	.335	7.75	8.51
C	.165	.185	4.19	4.70
D	.016	.021	0.41	0.53
E	.010	.040	0.25	1.02
F	.010	.040	0.25	1.02
G	.200 BASIC		5.08 BASIC	
H	.028	.034	0.71	0.86
J	.029	.045	0.74	1.14
K	.500	--	12.7	--
L	.110	.160	2.79	4.06
M	45° BASIC		45° BASIC	
N	.095	.105	2.41	2.67

Dimensions in inches are in parentheses.  
Pin material and plating composition conform to Method 2003 (solderability) of Mil-Std-883 [except paragraph 3.2].

### NOTE:

Leads in true position within .010" (.25mm) R @ MMC at seating plane.

Pin numbers shown for reference only.

Numbers may not be marked on package.

# CONNECTION DIAGRAM

