

# 1339

## LOW COST OPERATIONAL AMPLIFIER

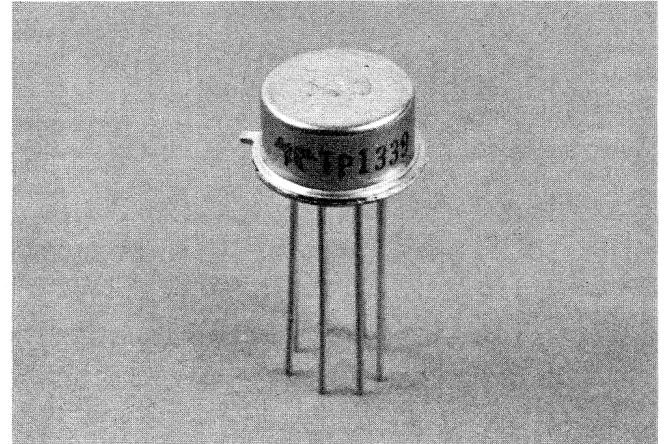
Teledyne Philbrick Models 1339, 1339-01, 1339-02 operational amplifiers are designed to be superior to, and directly interchangeable with the popular 1439 types. Key parameters such as output current, open loop gain, input offset voltage, offset current, slew rate, CMRR, and thermal stability have been optimized for high performance.

Model 1339-01 has tighter specifications for output current, open loop gain, thermal stability, bias current and offset current. Model 1339-02 is the highest performance version with an extended temperature range of  $-55$  to  $+125$  °C. Included in the 1339-02 specifications is a low initial offset voltage that eliminates the need for offset trimming in many dc applications.

All versions are "latch-up" proof with high slew rate for reliable operation in applications such as comparators. The amplifier's design incorporates input and output protection for added reliability.

For maximum versatility in applications, the 1339 series uses optional three component frequency compensation for "tailoring" optimum stability and slew rate.

For reliable operation, the use of highly stable power supplies is always recommended. Teledyne Philbrick manufactures a comprehensive line of power supplies designed for microcircuit operation. Models 2210 or 2403 are recommended.

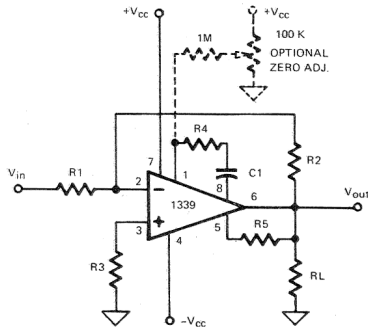


### FEATURES

- Latch-up Proof
- High Slew Rate –  $34 \text{ V}/\mu\text{sec}$
- Input/Output Protection
- Premium Versions Available

### APPLICATIONS

- Adder/Subtractor
- Voltage Follower
- Comparator
- Sample-and-Hold



Curve Number	Voltage Gain	Test Conditions					
		R <sub>1</sub> (Ω)	R <sub>2</sub> (Ω)	R <sub>3</sub> (Ω)	R <sub>4</sub> (Ω)	R <sub>5</sub> (Ω)	C <sub>1</sub> (pF)
1	1	10k	10k	5k	390	10k	2200
2	10	1k	10k	1k	1k	10k	2200
3	100	1k	100k	1k	10k	10k	2200
4	1000	1k	1M	1k	30k	10k	1000
5	1000	1k	1M	1k	0	10k	10
6	Open Loop	0	∞	0	∞	10k	0

Test Circuit Configuration for Figures 1 and 2

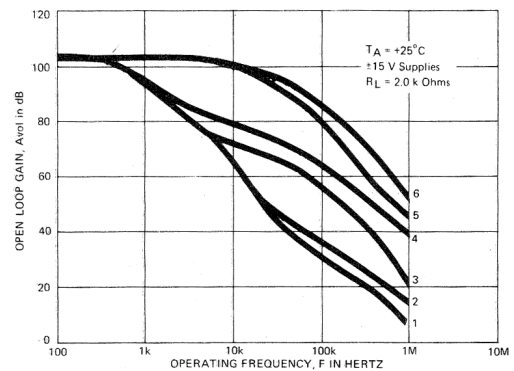


Figure 1. Open Loop Voltage Gain as a Function of Operating Frequency

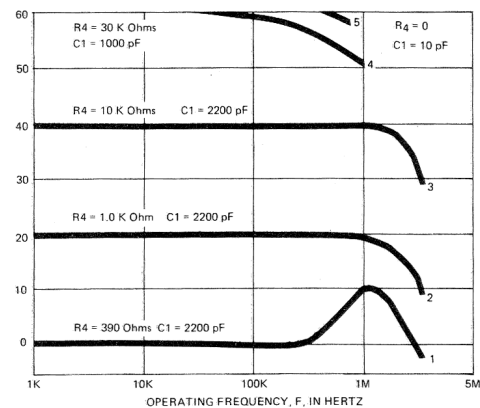


Figure 2. Closed Loop Voltage Gain as a Function of Operating Frequency

**SPECIFICATIONS @ 25°C, Vcc = ±15V, Rated Load**

	1339		1339-01		1339-02	
	Typical	Guaranteed	Typical	Guaranteed	Typical	Guaranteed
<b>Output Range</b>						
Voltage	±13 V	±10 V	±13 V	±10 V	±13 V	±10 V
Current	10 mA	5 mA	15 mA	10 mA	15 mA	10 mA
<b>Voltage Gain (dc Open Loop)</b>						
Rated Load	100,000	15,000	100,000	40,000	120,000	50,000
<b>Frequency Response (Inverting)</b>						
Small Signal (Unity Gain, Open Loop)	1 MHz	-----	1 MHz	-----	1 MHz	-----
Large Signal: Full Output (Peak-to-Peak)	50 kHz	10 kHz	50 kHz	10 kHz	50 kHz	10 kHz
Slew Rate	34 V/μsec ①	-----	34 V/μsec ①	-----	34 V/μsec ①	-----
<b>Input Voltage Range</b>						
Common Mode (dc Linear Operation)	±12 V	±11 V	±12 V	±11 V	±12 V	±11 V
Differential (Between Inputs)	-----	20 V	-----	20 V	-----	20 V
Common Mode Rejection Ratio (dc)	100,000	10,000	100,000	10,000	100,000	10,000
<b>Input Voltage Offset</b>						
Initial (Without External Trim) @ 25°C	±2.0 mV	±7.5 mV	±2 mV	±7.5 mV	±1 mV	±3 mV
Zero Adjustment	-----	100 kΩ Pot	-----	100 kΩ Pot	-----	100 kΩ Pot
Vs Temperature	±12 μV/°C②	-----	±5 μV/°C ②	-----	±5 μV/°C ②	-----
Vs Power Supply	30 μV/V	-----	30 μV/V	-----	30 μV/V	-----
<b>Input Bias Current</b>						
Initial at 25°C	150 nA	1 μA	150 nA	600 nA	150 nA	500 nA
Offset (Tracking)	20 nA	100 nA	20 nA	60 nA	20 nA	60 nA
Offset vs Temperature	±100 pA/°C②	±200 pA/°C②	±100 pA/°C②	±200 pA/°C②	±100 pA/°C②	±200 pA/°C②
<b>Input Impedance</b>						
Differential	300 kΩ	100 kΩ	300 kΩ	100 kΩ	300 kΩ	100 kΩ
<b>Noise (Referred to Input)</b>						
Voltage rms (10 Hz to 10 kHz)	2 μV	-----	2 μV	-----	2 μV	-----
<b>Power Requirements</b>						
Nominal Supply Voltage	-----	±15 V	-----	±15 V	-----	±15 V
Voltage Range	-----	±12 to ±18 V	-----	±12 to ±18 V	-----	±12 to ±18 V
Current: Quiescent	±6 mA	±7 mA	±4 mA	±7 mA	±4 mA	±7 mA
Current: Full Load	-----	±12 mA	-----	±17 mA	-----	±17 mA
<b>Temperature Range</b>						
Operating	-----	0 to 70°C	-----	0 to 70°C	-----	-55 to +125°C
Storage	-----	-65 to +150°C	-----	-65 to +150°C	-----	-65 to +150°C

NOTES ① At a gain of 100, 4.2 V/μsec at A = 1 ② 0 to +70°C ③ -55 to +125°C

The input circuits of these units are protected to ±Vcc. Output circuits are short-circuit protected to ground.

Recommended Power Supply: Teledyne Philbrick Model 2210

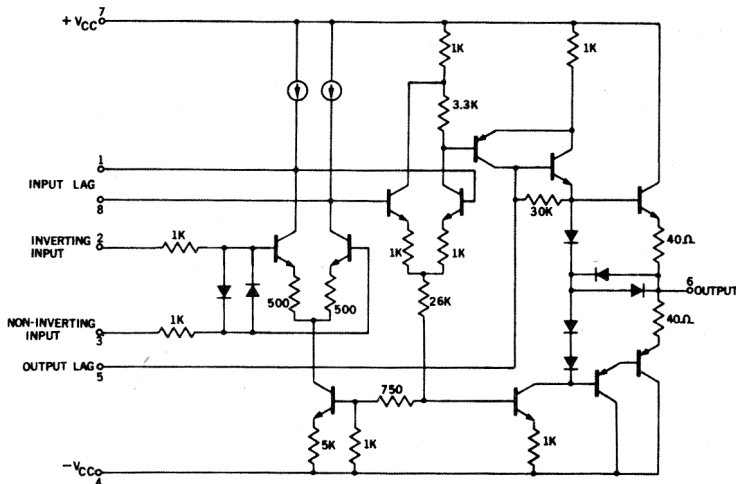
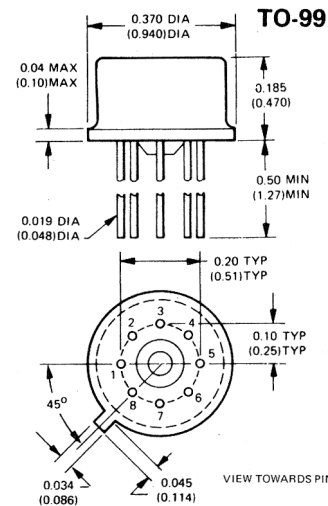


Figure 3. Model 1339 Schematic Diagram



DIMENSIONS IN PARENTHESES ARE EXPRESSED IN CENTIMETERS

- Pin 1 Input Lag
- Pin 2 -In
- Pin 3 +In
- Pin 4 -Vcc
- Pin 5 Output Lag
- Pin 6 Out
- Pin 7 +Vcc
- Pin 8 Input Lag