NE/SE531-N,T

DESCRIPTION

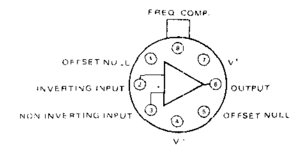
The 531 is a fast slewing high performance operational amplifier which retains dc performance equal to the best general purpose types while providing far superior large signal ac performance. A unique input stage design allows the amplifier to have a large signal response nearly identical to its small signal response. The amplifier is compensated for truly negligible overshoot with a single capacitor. In applications where fast settling and superior large signal bandwidths are required, the amplifier out performs conventional designs which have much better small signal response. Also, because the small signal response is not extended, no special precautions need be taken with circuit board layout to achieve stability. The high gain, simple compensation and excellent stability of this amplifier allow its use in a wide variety of instrumentation applications.

FEATURES

- **35V/μsec slew rate at unity gain**
- **Pin for pin replacement for μA709, μA748 or LM101**
- **Compensated with a single capacitor**
- **Same low drift offset null circuitry as μA741**
- **Small signal bandwidth 1MHz**
- **Large signal bandwidth 500KHz**
- **True op amp dc characteristics make the 531 the ideal answer to all slew rate limited operational amplifier applications.**

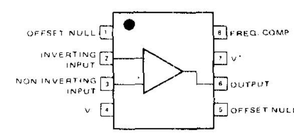
PIN CONFIGURATIONS

T PACKAGE
(Top View)



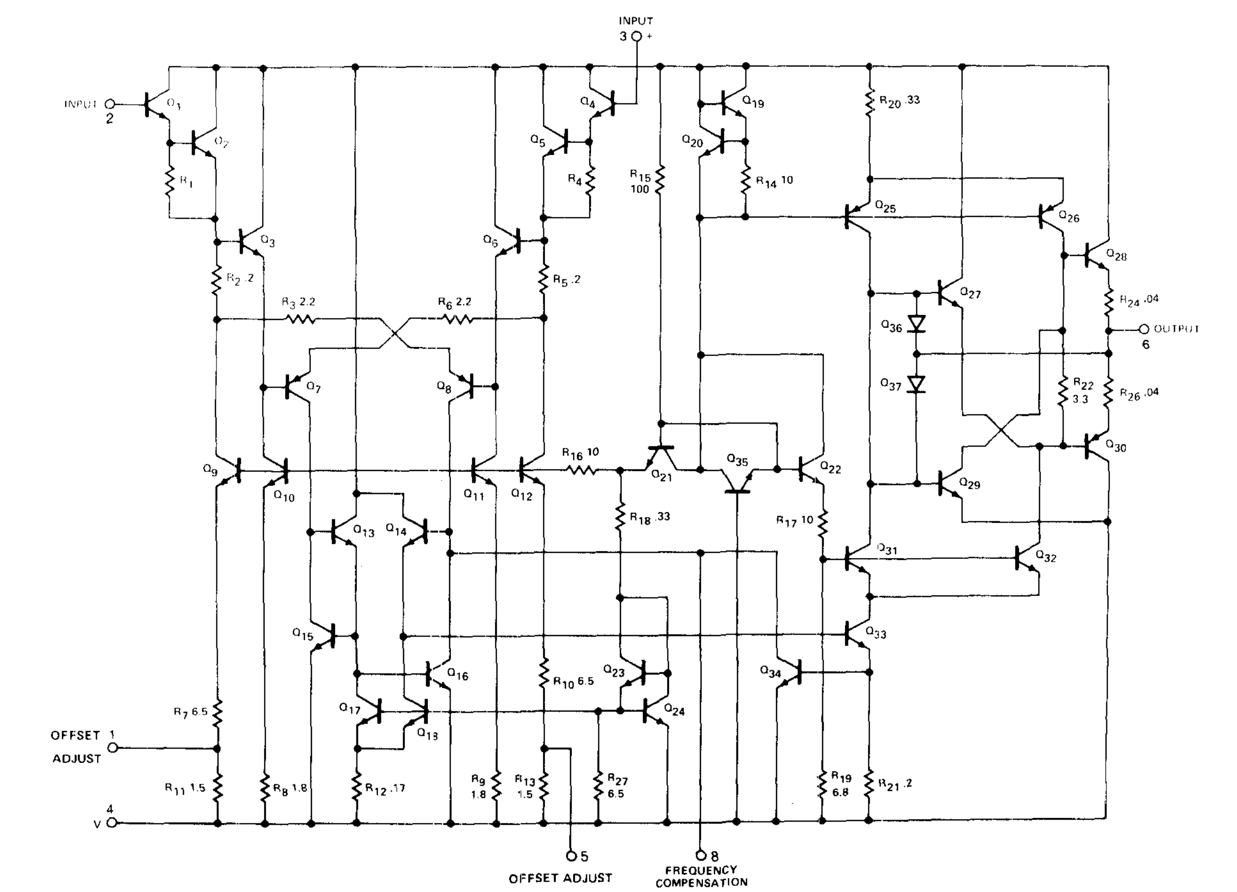
ORDER PART NO.
SE531T/NE531T

N PACKAGE



ORDER PART NO.
NE531N

EQUIVALENT SCHEMATIC



ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Supply voltage	±22	V
Internal power dissipation[1]	300	mW
Differential input voltage	±15	V
Common mode input voltage[2]	±15	V
Voltage between offset null and V-	±0.5	V
Operating temperature range		
NE531	0 to +70	°C
SE531	-55 to +125	°C
Storage temperature range	-65 to +150	°C
Lead temperature (soldering, 60 sec)	300	°C
Output short circuit duration[3]	indefinite	

NOTES

1. Rating applies for case temperature to 125°C, derate linearly at 6.5mW/°C for ambient temperatures above +75°C.
2. For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or to +75°C ambient temperature.

DC ELECTRICAL CHARACTERISTICS $V_S = \pm15V$ unless otherwise specified.

	PARAMETER	TEST CONDITIONS	SE531			NE531			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage	$R_S \le 10k\Omega$, $T_A = 25°C$		2.0	5.0		2.0	6.0	mV
		$R_S \le 10k\Omega$, over temp			6.0			7.5	mV
I_{OS}	Offset current	$T_A = 25°C$		30	200		50	200	nA
		T_A = HIGH			200			200	nA
		T_A = LOW			500			300	nA
I_{BIAS}	Input current	$T_A = 25°C$		300	500		400	1500	nA
		T_A = HIGH			500			1500	nA
		T_A = LOW			1500			2000	nA
V_{CM}	Common mode voltage range	$T_A = 25°C$	±10			±10			V
CMRR	Common mode rejection ratio	$T_A = 25°C$, $R_S \le 10k\Omega$				70	100		dB
		Over temp $R_S \le 10k\Omega$	70	90					dB
R_{IN}	Input resistance	$T_A = 25°C$		20			20		MΩ
V_{OUT}	Output voltage swing	$R_L \ge 2k\Omega$, over temp	±10	±13		±10	±13		V
I_{CC}	Supply current	$T_A = 25°C$			7.0			10	mA
		T_{MAX}			5.5			10	mA
P_D	Power consumption	$T_A = 25°C$			210			300	mW
P_{SRR}	Power supply rejection ratio	$R_S \le 10k\Omega$, $T_A = 25°C$					10	150	μV/V
		$R_S \le 10k\Omega$, over temp		10	150				μV/V
R_{OUT}	Output resistance	$T_A = 25°C$		75			75		Ω
A_{VOL}	Large signal voltage gain	$T_A = 25°C$, $R_L \ge 2k\Omega$, $V_{OUT} = \pm10V$	50	100		20	60		V/mV
		$R_L \ge 2k\Omega$, $V_{OUT} = \pm10V$, over temp.	25			15			V/mV

NOTE

1. Temperature range:
   SE531 $-55°C \le T_A \le 125°C$
   NE531 $0°C \le T_A \le 70°C$

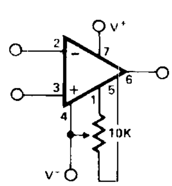
AC ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_S = \pm15V$ unless otherwise specified.

PARAMETER	TEST CONDITIONS	NE531			SE531			UNIT
		Min	Typ	Max	Min	Typ	Max	
Full power bandwidth			500			500		kHz
Settling time (1%)	$A_V = +1$, $V_{IN} = \pm10V$		1.5			1.5		µs
(.01%)			2.5			2.5		µs
Large signal overshoot	$A_V = +1$, $V_{IN} = \pm10V$		2			2		%
Small signal overshoot	$A_V = +1$, $V_{IN} = 400mV$		5			5		%
Small signal risetime	$A_V = +1$, $V_{IN} = 400mV$		300			300		ns
Slew rate	$A_V = 100$		35			35		V/µs
	$A_V = 10$		35			35		V/µs
	$A_V = 1$ (noninverting)		30		20	30		V/µs
	$A_V = 1$ (inverting)		35		25	35		V/µs

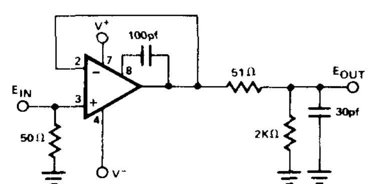
NOTE
1. All AC testing is performed in the transient response test circuit.

TEST LOAD CIRCUITS

OFFSET NULL CIRCUIT

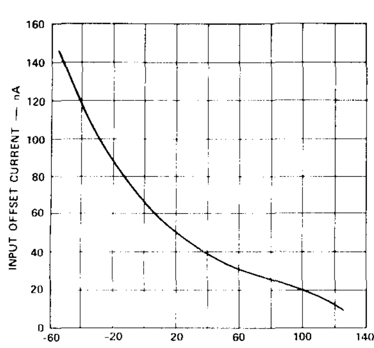


TRANSIENT RESPONSE CIRCUIT

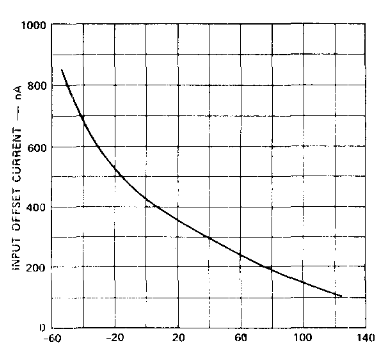


TYPICAL PERFORMANCE CHARACTERISTICS ($V_S = \pm15V$, $T_A = +25°C$, unless otherwise specified.)

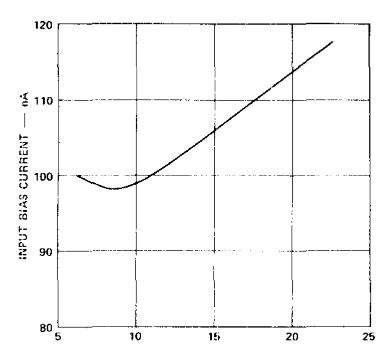
INPUT OFFSET CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE



INPUT BIAS CURRENT AS A FUNCTION OF AMBIENT TEMPERATURE

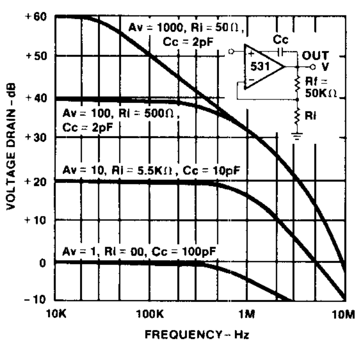


INPUT BIAS CURRENT AS A FUNCTION OF SUPPLY VOLTAGE

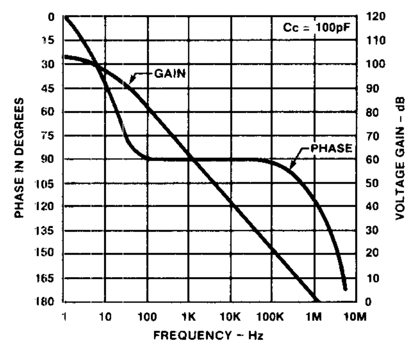


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

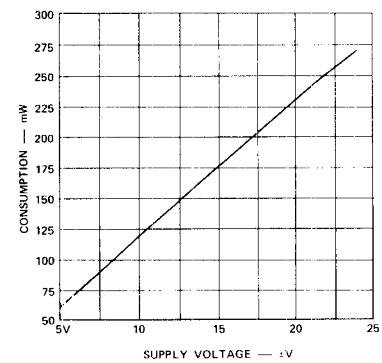
CLOSED LOOP NON-INVERTING VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



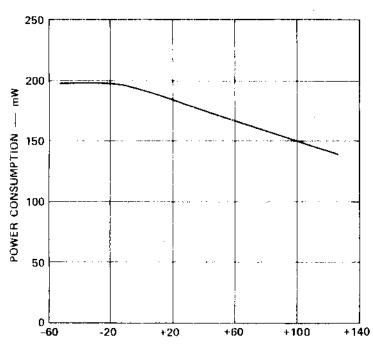
OPEN LOOP PHASE RESPONSE AND VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



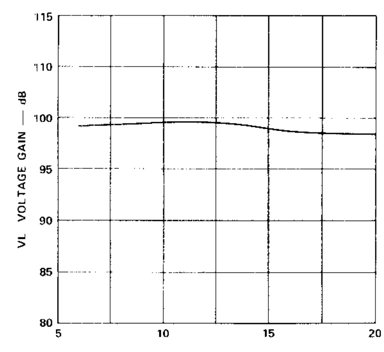
POWER CONSUMPTION AS A FUNCTION OF SUPPLY VOLTAGE



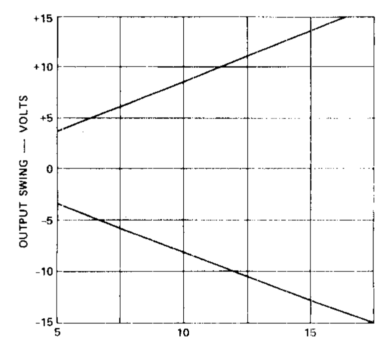
POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE



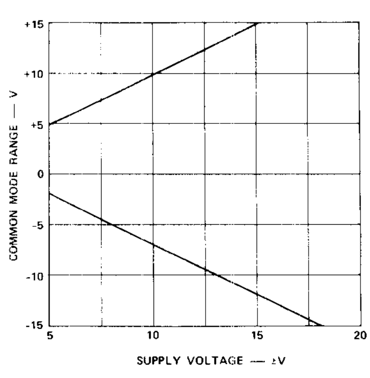
OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF SUPPLY VOLTAGE



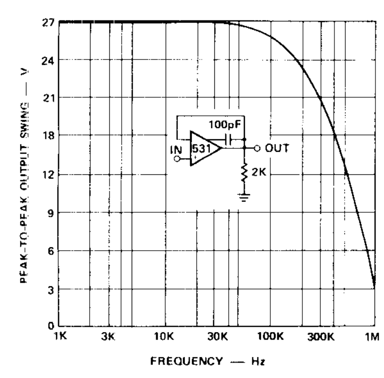
OUTPUT VOLTAGE SWING AS A FUNCTION OF SUPPLY VOLTAGE



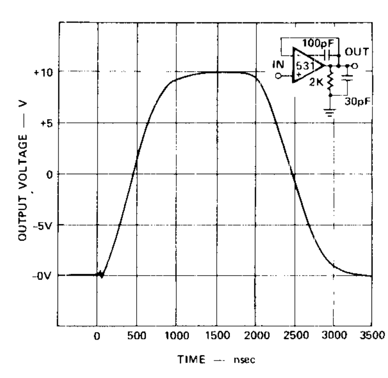
INPUT VOLTAGE RANGE AS A FUNCTION OF SUPPLY VOLTAGE



OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY

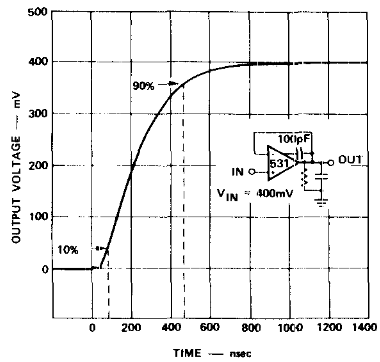


VOLTAGE FOLLOWER LARGE SIGNAL RESPONSE

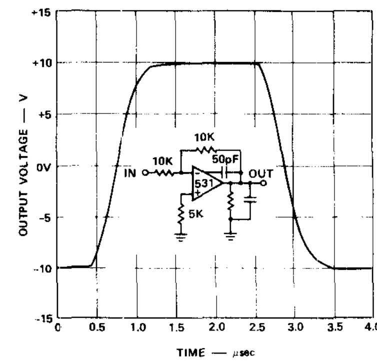


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

VOLTAGE FOLLOWER TRANSIENT RESPONSE

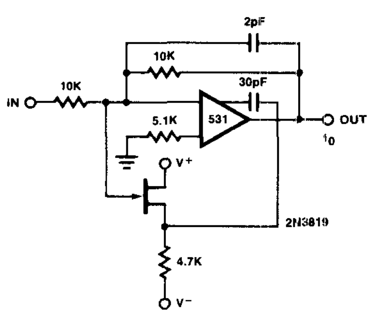


UNITY GAIN INVERTING AMPLIFIER LARGE SIGNAL RESPONSE

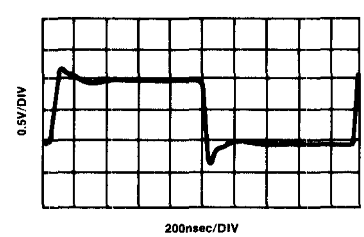


TYPICAL APPLICATIONS

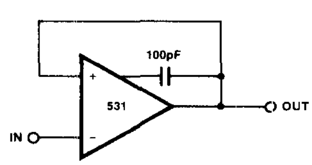
HIGH SPEED INVERTER (10MHz BANDWIDTH)



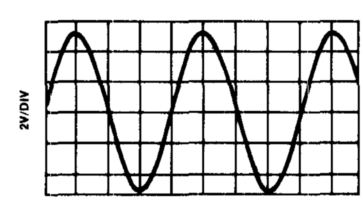
PULSE RESPONSE HIGH SPEED INVERTER



FAST SETTLING VOLTAGE FOLLOWER

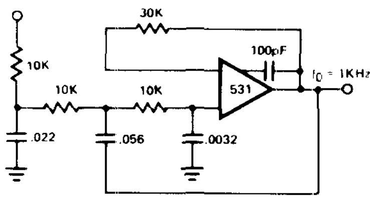


LARGE SIGNAL RESPONSE VOLTAGE FOLLOWER

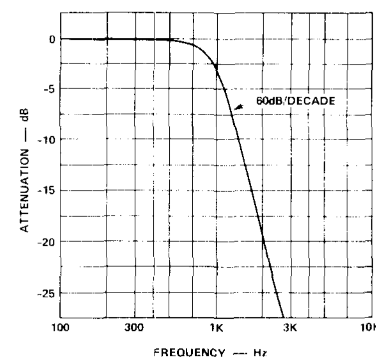


TYPICAL APPLICATIONS (Cont'd)

POLE ACTIVE LOW PASS FILTER BUTTERWORTH MAXIMALLY FLAT RESPONSE*



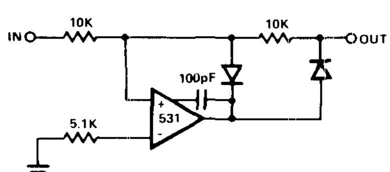
RESPONSE OF 3-POLE ACTIVE BUTTERWORTH MAXIMALLY FLAT FILTER



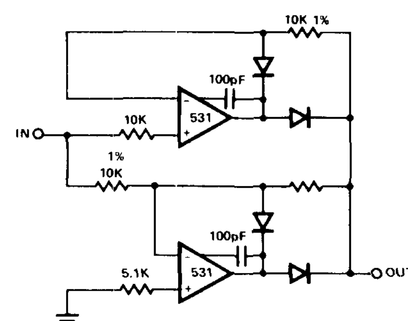
*Reference—EDN Dec. 15, 1970
Simplify 3-Pole Active Filter Design
A. Paul Brokow

PRECISION RECTIFIERS

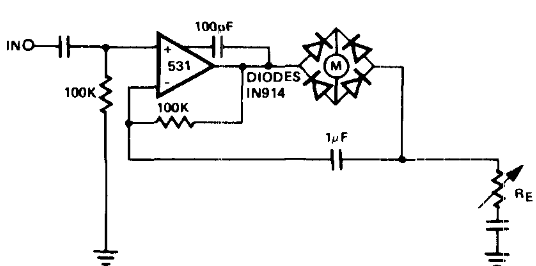
(a) HALF WAVE



(b) FULL WAVE



AC MILLIVOLTMETER



SAMPLE AND HOLD