Signetics

NE/SE530
High Slew Rate Operational Amplifier

Product Specification

Linear Products

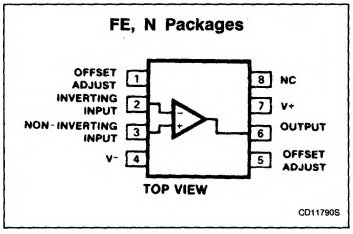
DESCRIPTION

The 530 is a new generation operational amplifier featuring a high slew rate combined with improved input characteristics. Internally compensated, the SE530 guarantees slew rates of 25V/μs with 2mV typical offset voltage. Industry standard pinout and internal compensation allow the user to upgrade system performance by directly replacing general purpose amplifiers such as the 741 and LF356 types.

FEATURES

- **Gain bandwidth product — 3MHz**
- **35V/μs slew rate (gain = −1)**
- **Internal frequency compensation**
- **Low input offset voltage 2mV typical**
- **Low input bias current — 65nA typical**
- **Short-circuit protection**
- **Offset null capability**
- **Large common-mode and differential voltage ranges**

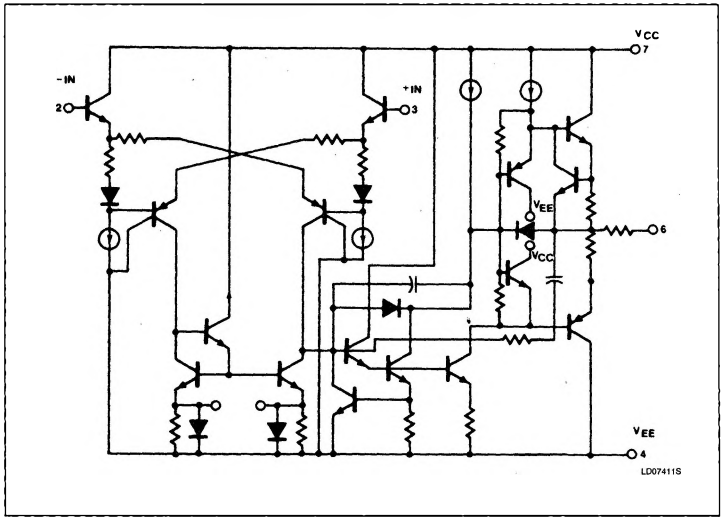
PIN CONFIGURATION



ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
8-Pin Plastic DIP	0 to +70°C	NE530N
8-Pin Ceramic DIP	0 to +70°C	NE530FE
8-Pin Plastic DIP	−55°C to +125°C	SE530N
8-Pin Ceramic DIP	−55°C to +125°C	SE530FE

EQUIVALENT SCHEMATIC EACH AMPLIFIER



ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{CC}	Supply voltage SE530 NE530	 ±22 ±18	 V V
$P_{D\ MAX}$	Maximum power dissipation T_A = 25°C (still air)[1] F package N package	 830 1200	 mW mW
V_{DIFF}	Differential input voltage	±30	V
V_{IN}	Input voltage	±15	V
T_A	Operating temperature range SE530 NE530	 −55 to +125 0 to +70	 °C °C
T_{STG}	Storage temperature range	−65 to +150	°C
T_{SOLD}	Lead soldering temperature (10sec max)	300	°C
I_{SC}	Output short circuit	Indefinite	

NOTE:
1. Derate above 25°C, at the following rates:
   F package at 6.7mW/°C
   N package at 9.6mW/°C

DC ELECTRICAL CHARACTERISTICS T_A = 25°C, V_{CC} = ±15V, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	SE530			NE530			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Input offset voltage	$R_S \leq 10k\Omega$ Over temperature		0.7	4.0 5.0		2.0	6.0 7.0	mV mV
ΔV_{OS}	Temperature coefficient of input offset voltage	Over temperature		3	15		6		µV/°C
I_{OS}	Input offset current Input offset current	 Over temperature Over temperature		5 25	20 40		15 40	40 80	nA nA pA/°C
I_{BIAS}	Input bias current Input current	 Over temperature Over temperature		45 50	80 200		65 80	150 200	nA nA pA/°C
R_{IN}	Input resistance		3	10		1	6		MΩ
V_{CM}	Input common mode voltage range		±12	±13		±12	±13		V
A_{VOL}	Large signal voltage gain	$R_L \geq 2k\Omega$, $V_O = \pm 10V$ Over temperature	50 25	200		50 25	200		V/mV V/mV
V_{OUT}	Output voltage swing	$R_L \geq 10k\Omega$ $R_L \geq 2k\Omega$	±12 ±10	±14 ±13		±12 ±10	±14 ±13		V V
I_{SC}	Output short-circuit current		10	25	50	10	25	50	mA
R_{OUT}	Output resistance			100			100		Ω
I_{CC}	Supply current Over temperature			2.0 2.2	3.0 3.6		2.0 2.2	3.0	mA mA
CMRR	Common-mode rejection ratio	$R_S \leq 10k\Omega$ Over temperature	70	90		70	90		dB
PSRR	Power supply rejection ratio	$R_S \leq 10k\Omega$ Over temperature		30	150		30	150	µV/V

AC ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_{CC} = \pm 15V$, unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	SE530			NE530			UNIT
			Min	Typ	Max	Min	Typ	Max	
	Transient Response								
t_R	Small-signal rise time			0.06			0.06		μs
	Small-signal overshoot			13			13		%
t_S	Settling time	To 0.1% (10V step)		0.9			0.9		μs
SR	Slew rate	± 15V supply, $V_O = \pm 10V$, $R_L \geq 2k\Omega$							
	Unity gain inverting		25	35		20	35		V/μs
	Unity gain non-inverting		18	25		12	25		V/μs
BW	Power bandwidth	5% THD, $V_O = \pm 10V$, $R_L \geq 2k\Omega$	360	500		280	500		kHz
	Small-signal bandwidth	Open-loop		3			3		MHz
V_{NOISE}	Input noise voltage	f = 1kHz		30			30		$nV/\sqrt{Hz}$

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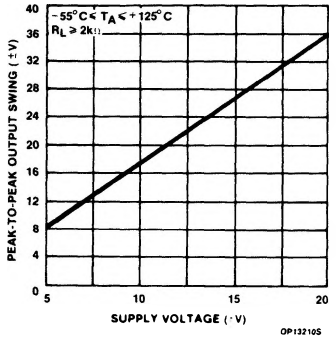
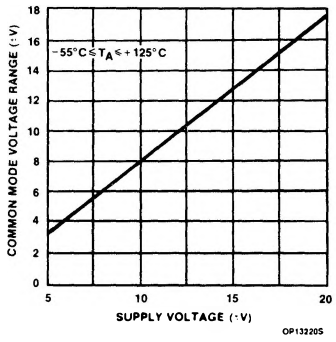
TYPICAL PERFORMANCE CHARACTERISTICS

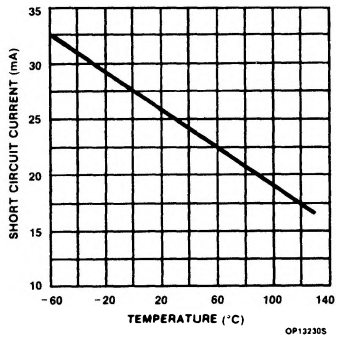
Output Voltage Swing as a Function of Supply Voltage



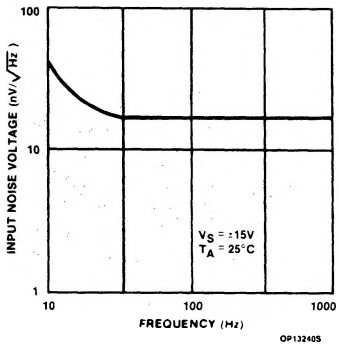
Input Common-Mode Voltage Range as a Function of Supply Voltage



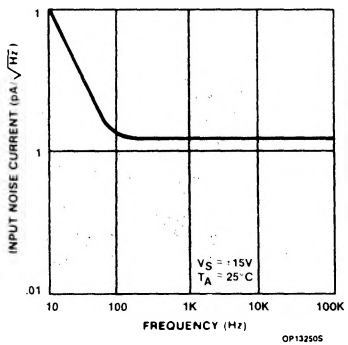
Output Short-Circuit Current as a Function of Ambient Temperature



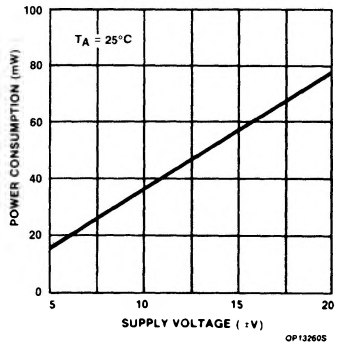
Input Noise Voltage as a Function of Frequency



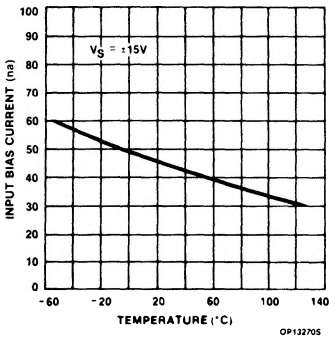
Input Noise Current as a Function of Frequency



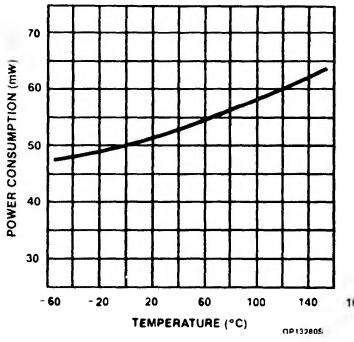
Power Consumption as a Function of Supply Voltage (Each Amplifier)



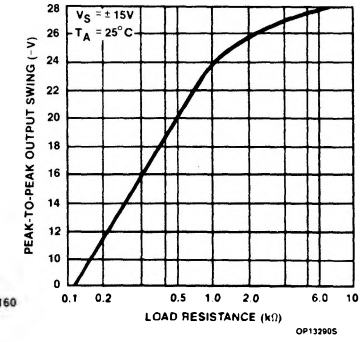
Input Bias Current as a Function of Ambient Temperature



Power Consumption as a Function of Ambient Temperature (Each Amplifier)

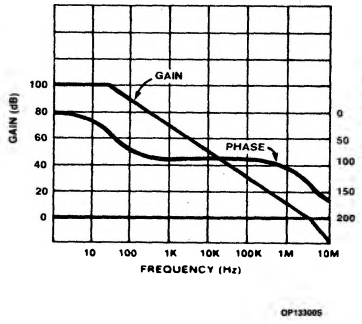


Output Voltage Swing as a Function of Load Resistance

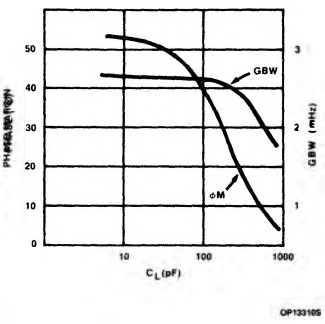


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

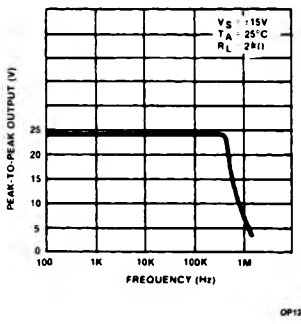
NE530 Open-Loop Gain and Phase vs Frequency



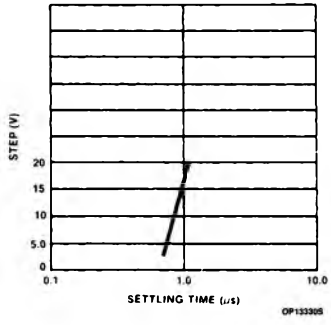
Gain Bandwidth Product and Phase Margin vs Load Capacity



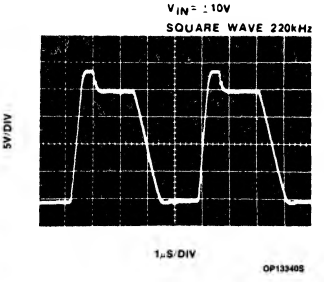
Power Bandwidth



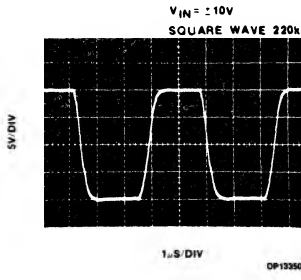
Input Voltage Step vs Settling Time to 10mV



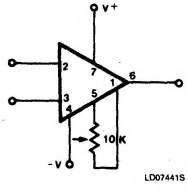
Slew Rate — Voltage-Follower



Slew Rate (−1 Amplifier)

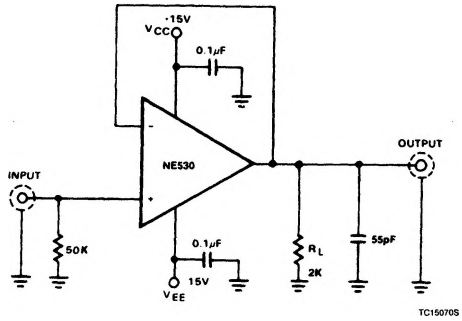


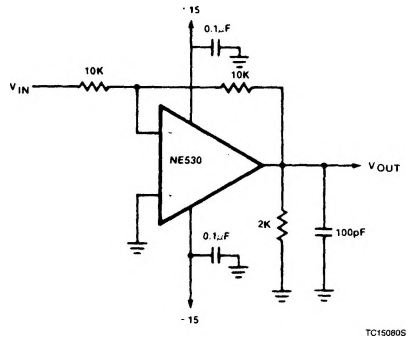
TYPICAL CIRCUIT CONNECTION



Offset Adjust Circuit

TEST LOAD CIRCUITS

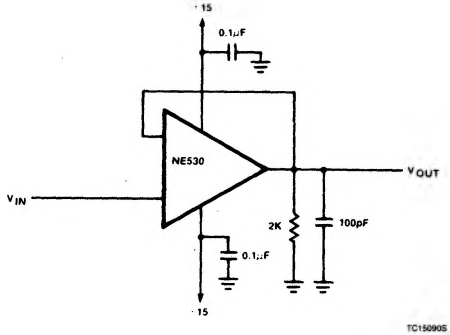


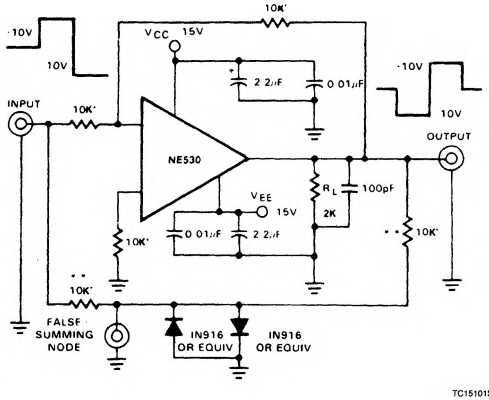


NOTES:
Pins not shown are not connected.
All resistor values are typical and in ohms.

Slew Rate and Settling Time

High Slew Rate — Inverting Amplifier



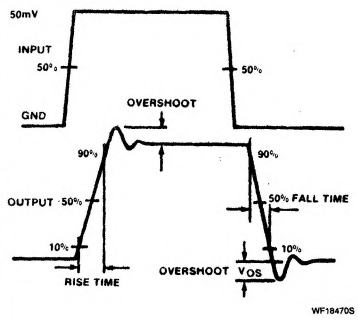


NOTES:
Pins not shown are not connected.
All resistor values are typical and in ohms.
*Match to within 0.01%.
**Open for slew rate.

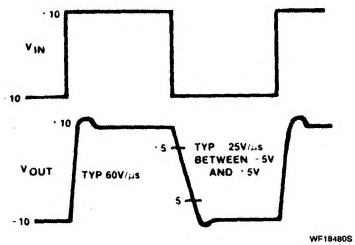
High Slew Rate — Voltage-Follower

Testing Slew Rate and Settling Time

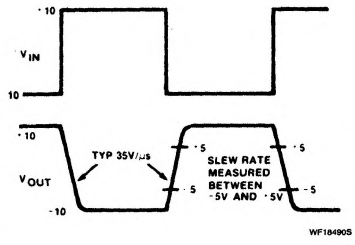
VOLTAGE WAVEFORMS



Small-Signal Transient Response Definitions



Slew Rate — Voltage-Follower



Slew Rate — Inverting Amplifier