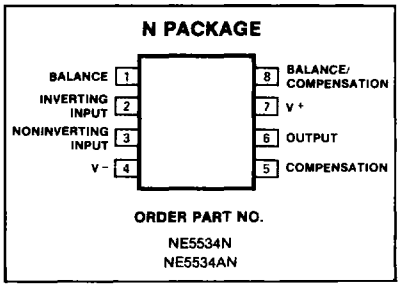
NE/SE5534, NE/SE5534A-N,T

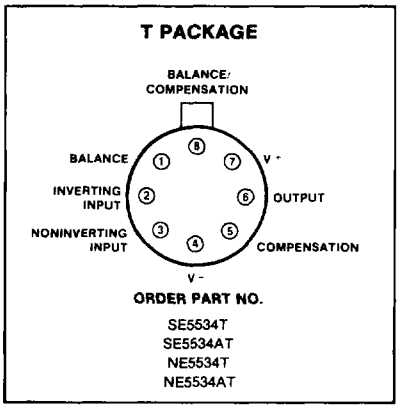
DESCRIPTION

The SE/NE5534 is a high-performance low noise operational amplifier. Compared to most of the standard operational amplifiers, such as 741 and 301A, it shows better noise performance, improved output drive capability and considerably higher small-signal and power bandwidths.

This makes the device especially suitable for application in high quality and professional audio equipment, in instrumentation and control circuits and telephone channel amplifiers. The op amp is internally compensated for gain equal to, or higher than, three. The frequency response can be optimized with an external compensation capacitor for various applications (unity gain amplifier, capacitive load, slew-rate, low overshoot, etc.) If very low noise is of prime importance, it is recommended that the SE/NE5534A version be used which has guaranteed noise specifications.

PIN CONFIGURATIONS

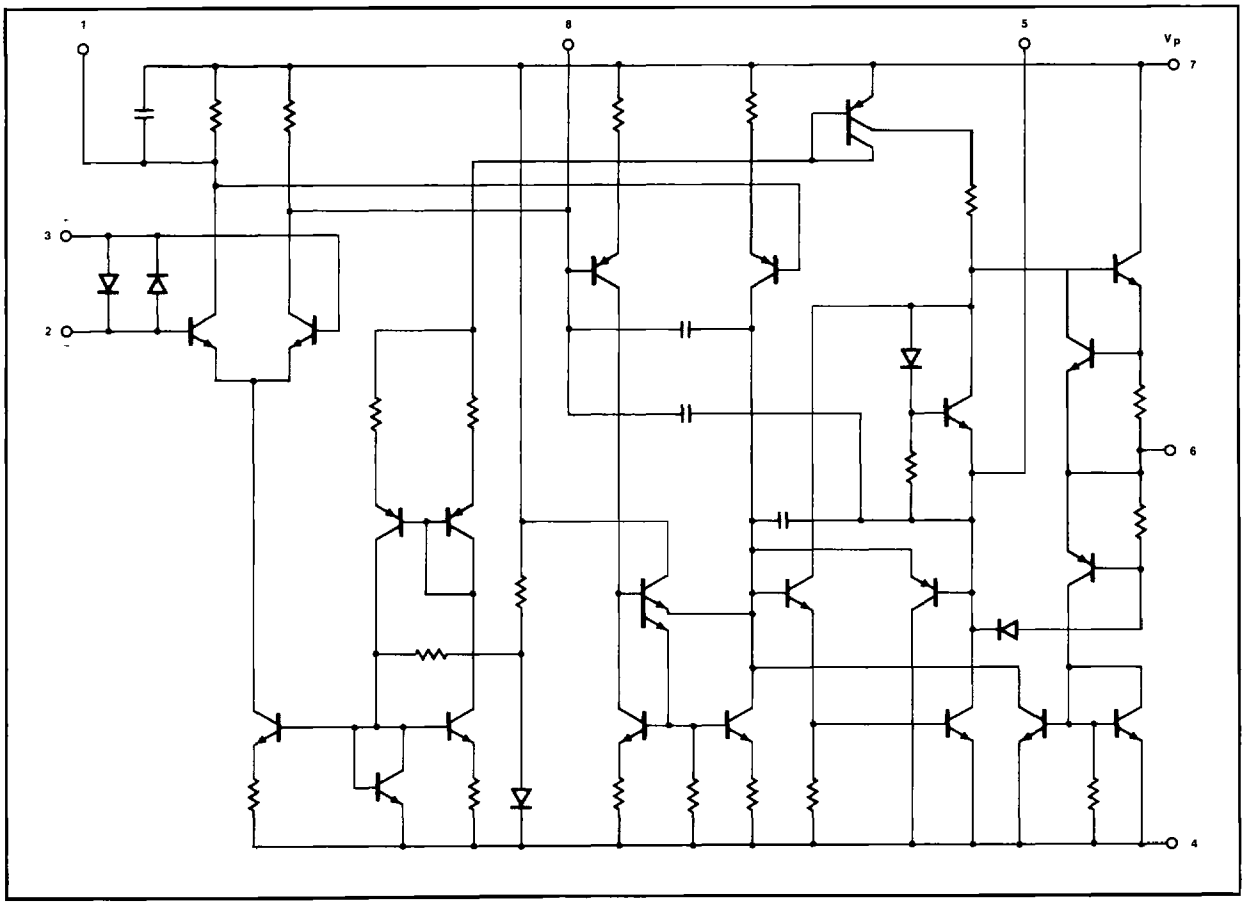




FEATURES

- **Small-signal bandwidth: 10MHz**
- **Output drive capability: 600Ω, 10V (rms) at $V_S = \pm 18V$**
- **Input noise voltage: 4nV/$\sqrt{Hz}$**
- **DC voltage gain: 100000**
- **AC voltage gain: 6000 at 10kHz**
- **Power bandwidth: 200kHz**
- **Slew-rate: 13V/μs**
- **Large supply voltage range: ±3 to ±20V**

EQUIVALENT SCHEMATIC



ABSOLUTE MAXIMUM RATINGS

PARAMETER		RATING	UNIT
V_S	Supply voltage	±22	V
V_{IN}	Input voltage	±V supply	V
V_{DIFF}	Differential input voltage	±.5	V
T_A	Operating temperature range[1]		
	SE	-55 to +125	°C
	NE	0 to 70	°C
T_{STG}	Storage temperature	-65 to +150	°C
T_J	Junction temperature	150	°C
P_D	Power dissipation		
	5534T	680	mW
	5534N	500	mW
	Output short circuit duration [2]	indefinite	
	Lead temperature (soldering 10 sec)[3]	300	°C

NOTES

1. Diodes protect the inputs against over-voltage. Therefore, unless current-limiting resistors are used, large currents will flow if the differential input voltage exceeds 0.6V. Maximum current should be limited to ±10mA.
2. For operation at elevated temperature T package must be derated based on a thermal resistance of 150°C/W junction to ambient, 45° C/W junction to case. Thermal resistance of the N package is 240° C/W.
3. Output may be shorted to ground at $V_S = \pm 15V$, $T_A = 25°C$. Temperature and/or supply voltages must be limited to ensure dissipation rating is not exceeded

DC ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_S = \pm 15V$ unless otherwise specified.[1,2]

PARAMETER		TEST CONDITIONS	SE5534/5534A			NE5534/5534A			UNIT
			Min	Typ	Max	Min	Typ	Max	
V_{OS}	Offset voltage			.5	2		.5	4	mV
		Over temperature			3			5	mV
I_{OS}	Offset current			10	200		20	300	nA
		Over temperature			500			400	nA
I_B	Input current			400	800		500	1500	nA
		Over temperature			1500			2000	nA
I_{CC}	Supply current			4	6.5		4	8	mA
		Over temperature			9				mA
V_{CM}	Common mode input range		±12	±13		±12	±13		V
CMRR	Common mode rejection ratio		80	100		70	100		dB
PSRR	Power supply rejection ratio			10	50		10	100	μV/V
A_{VOL}	Large signal voltage gain	$R_L \geq 600\Omega$, $V_O = \pm 10V$	50	100		25	100		V/mV
		Over temperature	25			15			V/mV
V_{OUT}	Output swing	$R_L \geq 600\Omega$	±12	±13		±12	±13		V
		$R_L \geq 600\Omega$ $V_S = \pm 18V$	±15	±16		±15	±16		V
R_{IN}	Input resistance		50	100		30	100		KΩ
I_{SC}	Output short circuit current			38			38		mA

NOTES

1. For NE5534, NE5534A, $T_{MIN} = 0°C$, $T_{MAX} = 70°C$
2. For SE5534, SE5534A, $T_{MIN} = -55°C$, $T_{MAX} = +125°C$

AC ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_S = \pm 15V$ unless otherwise specified.

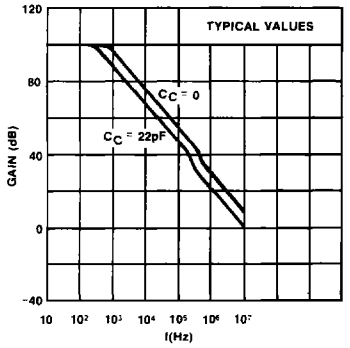
PARAMETER		TEST CONDITIONS	SE5534/5534A			NE5534/5534A			UNIT
			Min	Typ	Max	Min	Typ	Max	
R_{OUT}	Output resistance	A_V = 30dB closed loop f = 10kHz, $R_L = 600\Omega$, $C_C = 22pF$		0.3			0.3		Ω
Transient response		Voltage follower, V_{IN} = 50mV $R_L = 600\Omega$, $C_C = 22pF$, $C_L = 100pF$							
T_R	Rise time			20			20		ns
	Overshoot			20			20		%
Transient response		V_{IN} = 50mv, $R_L = 600\Omega$ $C_C = 47pF$, $C_L = 500pF$							
T_R	Rise time			50			50		ns
	Overshoot			35			35		%
AC	Gain	f = 10kHz, C_C = 0		6			6		V/mV
		f = 10kHz, C_C = 22pF		2.2			2.2		V/mV
	Gain bandwidth product	$C_C = 22pF$, $C_L = 100pF$		10			10		mHz
	Slew rate	C_C = 0		13			13		V/μS
		$C_C = 22pF$		6			6		V/μS
	Power bandwidth	$V_{OUT} = \pm 10V$, C_C = 0		200			200		kHz
		$V_{OUT} = \pm 10V$, $C_C = 22pF$		95			95		kHz
		$V_{OUT} = \pm 14V$, $R_L = 600\Omega$		70			70		kHz
		$C_C = 22pF$, $V_{CC} = \pm 18V$							

ELECTRICAL CHARACTERISTICS $T_A = 25°C$, $V_S = \pm 15V$ unless otherwise specified.

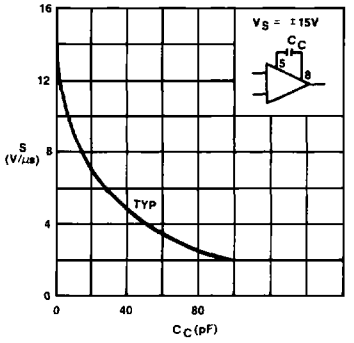
PARAMETER	TEST CONDITIONS	SE5534/NE5534			SE5534A/NE5534A			UNIT
		Min	Typ	Max	Min	Typ	Max	
Input noise voltage	f_o = 30Hz		7			5.5	7	$nV/\sqrt{Hz}$
	f_o = 1kHz		4			3.5	4.5	$nV/\sqrt{Hz}$
Input noise current	f_o = 30Hz		2.5			1.5		$pA/\sqrt{Hz}$
	f_o = 1kHz		0.6			0.4		$pA/\sqrt{Hz}$
Broadband noise figure	f = 10Hz - 20kHz, $R_S = 5k\Omega$		-			0.9		dB

TYPICAL PERFORMANCE CHARACTERISTICS

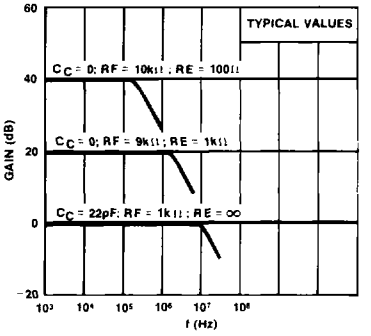
OPEN LOOP FREQUENCY RESPONSE



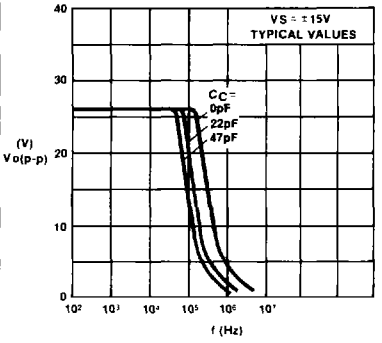
SLEW-RATE AS A FUNCTION OF COMPENSATION CAPACITANCE



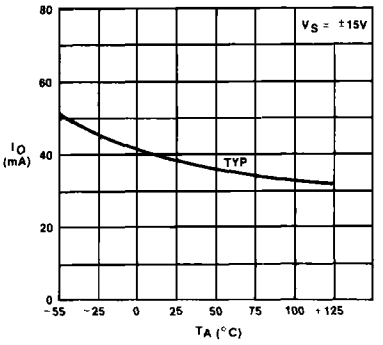
CLOSED LOOP FREQUENCY RESPONSE



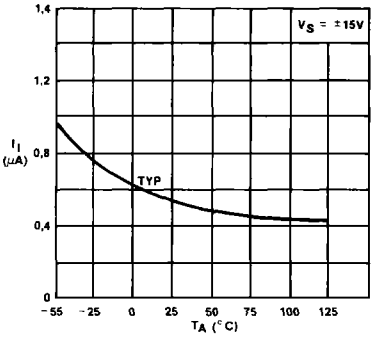
LARGE-SIGNAL FREQUENCY RESPONSE



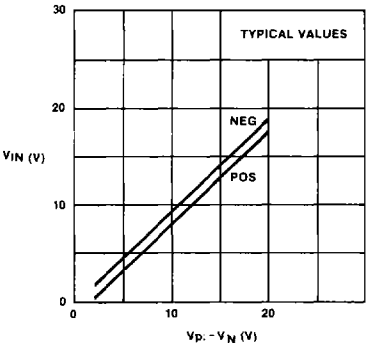
OUTPUT SHORT-CIRCUIT CURRENT



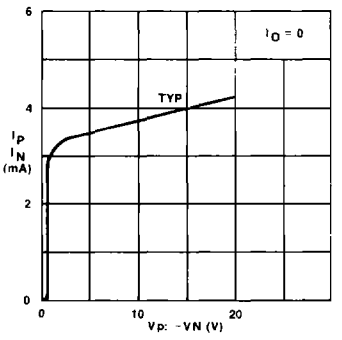
INPUT BIAS CURRENT



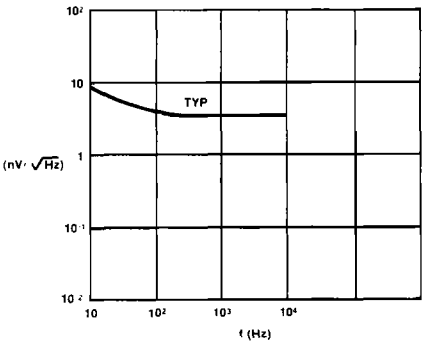
INPUT COMMON MODE VOLTAGE RANGE



SUPPLY CURRENT

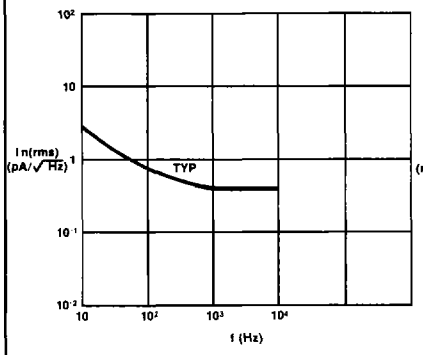


INPUT NOISE VOLTAGE DENSITY

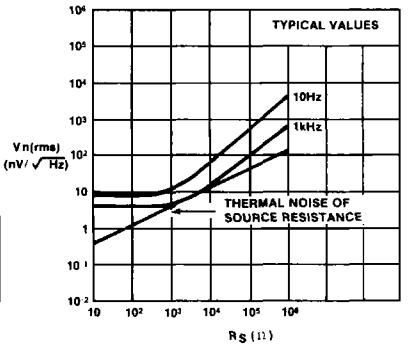


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

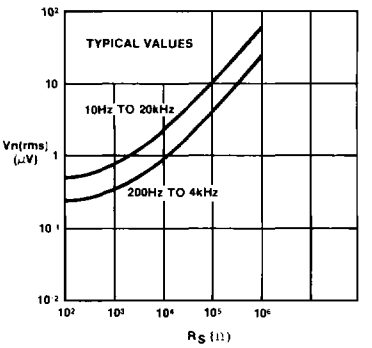
INPUT NOISE CURRENT DENSITY



TOTAL INPUT NOISE DENSITY

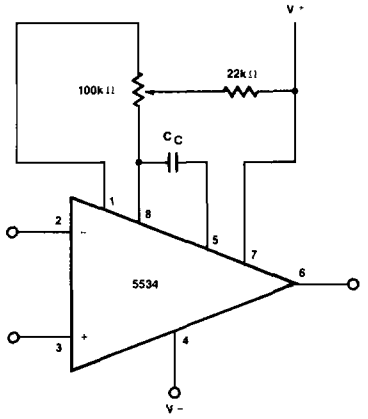


BROADBAND INPUT NOISE VOLTAGE



TEST LOAD CIRCUITS

FREQUENCY COMPENSATION AND OFFSET VOLTAGE ADJUSTMENT CIRCUIT



CLOSED LOOP FREQUENCY RESPONSE