

# Internally-compensated dual low noise operational amplifier

NE/SE5532/5532A

## DESCRIPTION

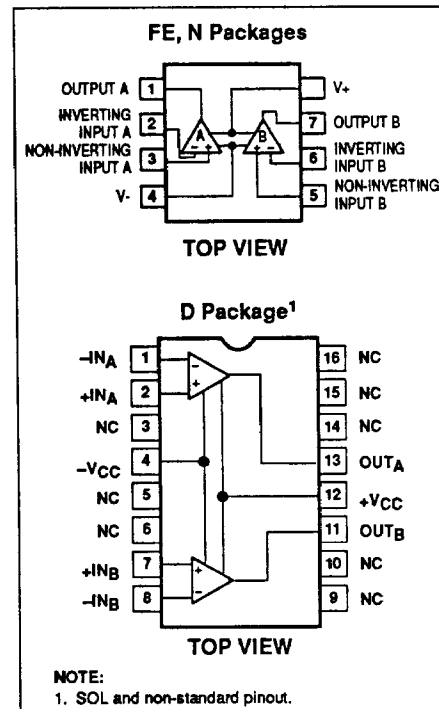
The 5532 is a dual high-performance low noise operational amplifier. Compared to most of the standard operational amplifiers, such as the 1458, it shows better noise performance, improved output drive capability and considerably higher small-signal and power bandwidths.

This makes the device especially suitable for application in high-quality and professional audio equipment, instrumentation and control circuits, and telephone channel amplifiers. The op amp is internally compensated for gains equal to one. If very low noise is of prime importance, it is recommended that the 5532A version be used because it has guaranteed noise voltage specifications.

## FEATURES

- Small-signal bandwidth: 10MHz
- Output drive capability: 600Ω, 10VRMS
- Input noise voltage:  $5nV/\sqrt{Hz}$  (typical)
- DC voltage gain: 50000
- AC voltage gain: 2200 at 10kHz
- Power bandwidth: 140kHz
- Slew rate: 9V/μs
- Large supply voltage range: ±3 to ±20V
- Compensated for unity gain

## PIN CONFIGURATIONS



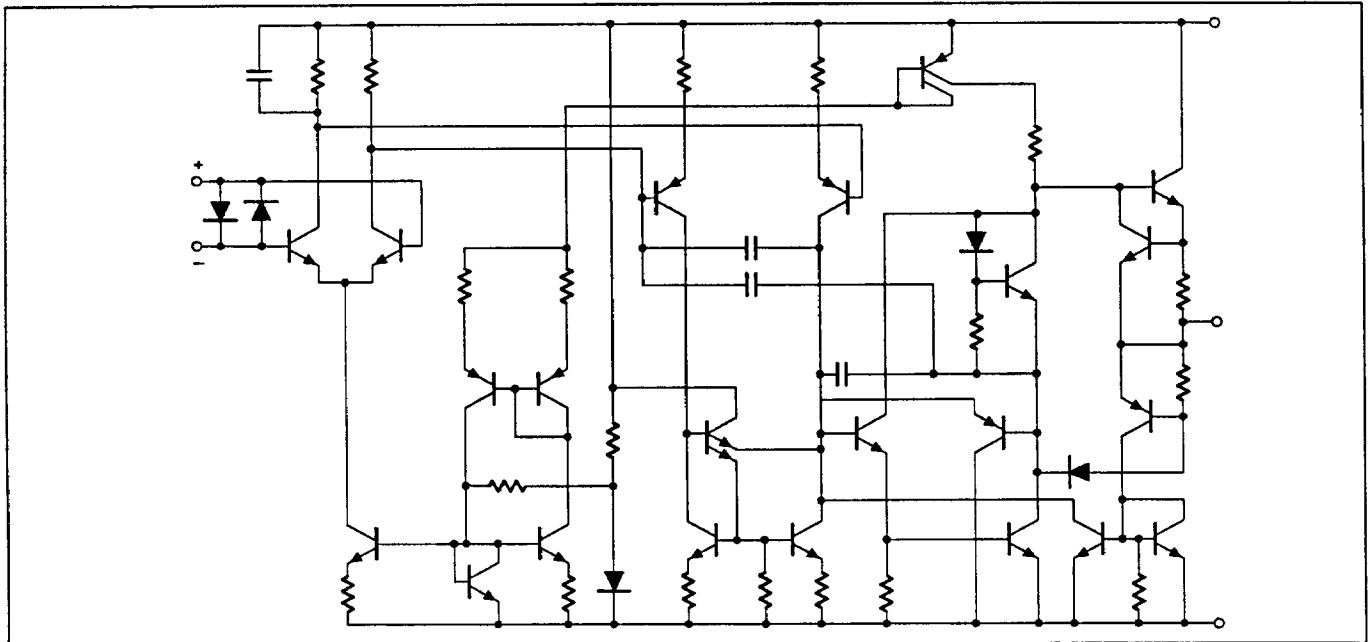
## ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
8-Pin Plastic DIP	0 to 70°C	NE5532N
8-Pin Ceramic DIP	0 to 70°C	NE5532FE
8-Pin Plastic DIP	0 to 70°C	NE5532AN
8-Pin Ceramic DIP	0 to 70°C	NE5532AF
8-Pin Ceramic DIP	-55°C to +125°C	SE5532FE
8-Pin Ceramic DIP	-55°C to +125°C	SE5532AF
16-Pin Plastic SOL	0 to 70°C	NE5532D

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## EQUIVALENT SCHEMATIC (EACH AMPLIFIER)



## ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V <sub>S</sub>	Supply voltage	±22	V
V <sub>IN</sub>	Input voltage	±V <sub>SUPPLY</sub>	V
V <sub>DIFF</sub>	Differential input voltage <sup>1</sup>	±0.5	V
T <sub>A</sub>	Operating temperature range	NE5532/A	0 to 70 °C
		SE5532/A	-55 to +125 °C
T <sub>STG</sub>	Storage temperature	-65 to +150	°C
T <sub>J</sub>	Junction temperature	150	°C
P <sub>D</sub>	Maximum power dissipation, T <sub>A</sub> =25°C (still-air) <sup>2</sup>	N package	1200 mW
		F package	1000 mW
		D package	1200 mW
T <sub>SOLD</sub>	Lead soldering temperature (10sec max)	300	°C

### NOTES:

- 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.
- Thermal resistances of the above packages are as follows:  
 N package at 100°C/W  
 F package at 135°C/W  
 D package at 105°C/W

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## DC ELECTRICAL CHARACTERISTICS

 $T_A=25^\circ\text{C}$   $V_S=\pm 15\text{V}$ , unless otherwise specified. 1, 2, 3

SYMBOL	PARAMETER	TEST CONDITIONS	SE5532/5532A			NE5532/5532A			UNIT
			Min	Typ	Max	Min	Typ	Max	
$V_{OS}$	Offset voltage	Over temperature		0.5	2		0.5	4	mV
$\Delta V_{OS}/\Delta T$				5			5	5	$\mu\text{V}/^\circ\text{C}$
$I_{OS}$	Offset current	Over temperature			100		10	150	nA
$\Delta I_{OS}/\Delta T$				200		200	200	200	nA
$I_B$	Input current	Over temperature		200	400		200	800	nA
$\Delta I_B/\Delta T$				5	700		5	1000	nA
$I_{CC}$	Supply current	Over temperature		8	10.5		8	16	mA
						13			mA
$V_{CM}$	Common-mode input range		$\pm 12$	$\pm 13$		$\pm 12$	$\pm 13$		V
CMRR	Common-mode rejection ratio		80	100		70	100		dB
PSRR	Power supply rejection ratio			10	50		10	100	$\mu\text{V}/\text{V}$
$A_{VOL}$	Large-signal voltage gain	$R_L \geq 2\text{k}\Omega$ , $V_O = \pm 10\text{V}$	50	100		25	100		V/mV
		Over temperature	25			15			V/mV
		$R_L \geq 600\Omega$ , $V_O = \pm 10\text{V}$	40	50		15	50		V/mV
		Over temperature	20			10			V/mV
$V_{OUT}$	Output swing	$R_L \geq 600\Omega$	$\pm 12$	$\pm 13$		$\pm 12$	$\pm 13$		V
		Over temperature	$\pm 10$	$\pm 12$		$\pm 10$	$\pm 12$		V
		$R_L \geq 600\Omega$ , $V_S = \pm 18\text{V}$	$\pm 15$	$\pm 16$		$\pm 15$	$\pm 16$		V
		Over temperature	$\pm 12$	$\pm 14$		$\pm 12$	$\pm 14$		V
		$R_L \geq 2\text{k}\Omega$	$\pm 13$	$\pm 13.5$		$\pm 13$	$\pm 13.5$		V
		Over temperature	$\pm 12$	$\pm 12.5$		$\pm 10$	$\pm 12.5$		V
$R_{IN}$	Input resistance		30	300		30	300		k $\Omega$
$I_{SC}$	Output short circuit current		10	38	60	10	38	60	mA

## NOTES:

- Diodes protect the inputs against overvoltage. 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  $\pm 10\text{mA}$ .
- For operation at elevated temperature, derate packages based on the package thermal resistance.
- Output may be shorted to ground at  $V_S = \pm 15\text{V}$ ,  $T_A = 25^\circ\text{C}$  Temperature and/or supply voltages must be limited to ensure dissipation rating is not exceeded.

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**AC ELECTRICAL CHARACTERISTICS** $T_A=25^\circ\text{C}$   $V_S=\pm 15\text{V}$ , unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	NE/SE5532/5532A			UNIT
			Min	Typ	Max	
$R_{\text{OUT}}$	Output resistance	$A_V=30\text{dB}$ Closed-loop $f=10\text{kHz}$ , $R_L=600\Omega$		0.3		$\Omega$
	Overshoot	Voltage-follower $V_{IN}=100\text{mV}_{\text{p-p}}$ $C_L=100\text{pF}$ , $R_L=600\Omega$		10		%
$A_V$	Gain	$f=10\text{kHz}$		2.2		V/mV
GBW	Gain bandwidth product	$C_L=100\text{pF}$ , $R_L=600\Omega$		10		MHz
SR	Slew rate			9		V/ $\mu\text{s}$
	Power bandwidth	$V_{\text{OUT}}=\pm 10\text{V}$		140		kHz
		$V_{\text{OUT}}=\pm 14\text{V}$ , $R_L=600\Omega$ , $V_{\text{CC}}=\pm 18\text{V}$		100		kHz

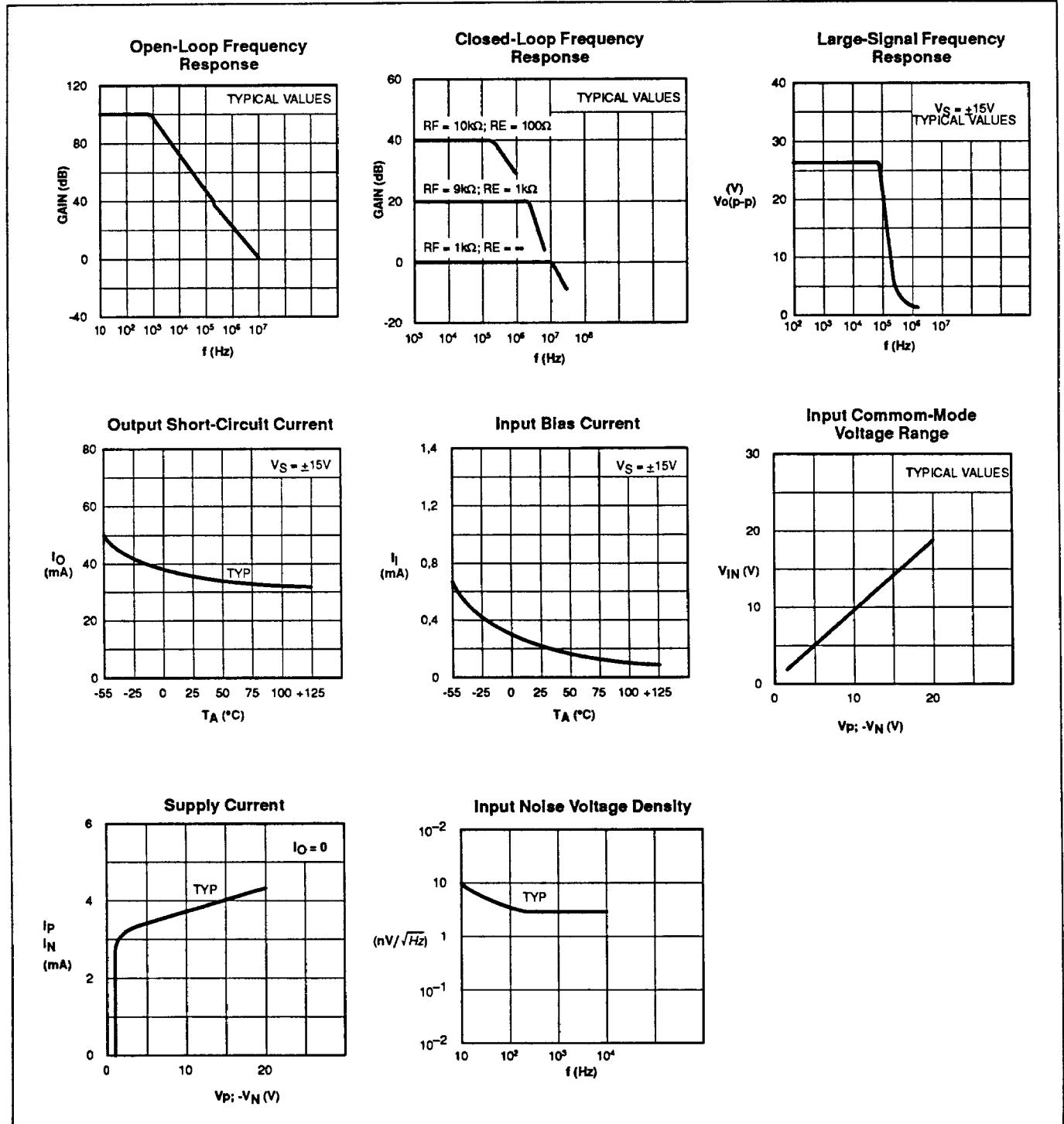
**ELECTRICAL CHARACTERISTICS** $T_A=25^\circ\text{C}$   $V_S=\pm 15\text{V}$ , unless otherwise specified.

SYMBOL	PARAMETER	TEST CONDITIONS	NE/SE5532			NE/SE5532A			UNIT
			Min	Typ	Max	Min	Typ	Max	
$V_{\text{NOISE}}$	Input noise voltage	$f_0=30\text{Hz}$		8			8	12	$\text{nV}/\sqrt{\text{Hz}}$
		$f_0=1\text{kHz}$		5			5	6	$\text{nV}/\sqrt{\text{Hz}}$
$I_{\text{NOISE}}$	Input noise current	$f_0=30\text{Hz}$		2.7			2.7		$\text{pA}/\sqrt{\text{Hz}}$
		$f_0=1\text{kHz}$		0.7			0.7		$\text{pA}/\sqrt{\text{Hz}}$
	Channel separation	$f=1\text{kHz}$ , $R_S=5\text{k}\Omega$		110			110		dB

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## TYPICAL PERFORMANCE CHARACTERISTICS



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## TEST CIRCUITS

