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## NTE894M & NTE894SM Integrated Circuit Low Noise Operational Amplifier

### **Description:**

The NTE894M and NTE894SM are single, high-performance, low noise operational amplifiers. Compared to other operational amplifier, these devices show better noise performance, improved output drive capability and considerably higher small-signal and power bandwidths.

This makes the devices especially suitable for applications in high quality and professional audio equipment, in instrumentation and control circuits and telephone channel amplifiers. The OP amps are internally compensated for gain equal to, or higher than, three.

### **Features:**

- Small-Signal Bandwidth
- Large Supply Voltage Range
- Available in 8-Lead Mini DIP (NTE894M) and Surface Mount SOIC-8 (NTE894SM)

### **Applications:**

- Audio Equipment
- Instrumentation and Control Circuits
- Telephone Channel Amplifiers
- Medical Equipment

### **Absolute Maximum Ratings:**

Supply Voltage, $V_S$ .....	$\pm 22V$
Differential Input Voltage (Note 1), $V_{DIFF}$ .....	$\pm 0.5V$
Input Voltage, $V_{IN}$ .....	$\pm V$ supply V
Power Dissipation ( $T_A = +25^\circ C$ , Note 2), $P_D$ .....	1150mW
Output Short-Circuit Duration (Note 3) .....	Indefinite
Operating Temperature Range, $T_{opr}$ .....	$0^\circ$ to $+70^\circ C$
Storage Temperature Range, $T_{stg}$ .....	$-65^\circ$ to $+150^\circ C$
Lead Soldering Temperature (10 seconds), $T_L$ .....	$+300^\circ C$

Note 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  $\pm 10mA$ .

Note 2. For operation at elevated temperature, derate packages based on the following junction-to-ambient thermal resistance: NTE894M  $105^\circ C/W$ ; NTE894SM  $160^\circ C/W$ .

Note 3. Output may be shorted to GND at  $V_S = 15V$ ,  $T_A = +25^\circ C$ . Temperature and/or supply voltages must be limited to ensure dissipation rating is not exceeded.

**DC Electrical Characteristics:** ( $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$ , unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit	
Input Offset Voltage	$V_{OS}$		-	0.5	4	mV	
		$T_A = 0^\circ$ to $+70^\circ\text{C}$	-	-	5	mV	
	$\Delta V_{OS}/\Delta T$		-	5	-	$\mu\text{V}/^\circ\text{C}$	
Input Offset Current	$I_{OS}$		-	20	300	nA	
		$T_A = 0^\circ$ to $+70^\circ\text{C}$	-	-	400	nA	
	$\Delta I_{OS}/\Delta T$		-	200	-	$\text{pA}/^\circ\text{C}$	
Input Bias Current	$I_B$		-	500	1500	nA	
		$T_A = 0^\circ$ to $+70^\circ\text{C}$	-	-	2000	nA	
	$\Delta I_B/\Delta T$		-	5	-	$\text{nA}/^\circ\text{C}$	
Supply Current	$I_{CC}$		-	4	8	mA	
		$T_A = 0^\circ$ to $+70^\circ\text{C}$	-	-	10	mA	
Input Common-Mode Range	$V_{CM}$		$\pm 12$	$\pm 13$	-	V	
Common-Mode Rejection Ratio	CMRR		70	100	-	dB	
Power Supply Rejection Ratio	PSRR		-	10	100	$\mu\text{V}/\text{V}$	
Large-Signal Voltage Gain	$A_{VOL}$	$R_L \geq 600\Omega$ , $V_O = \pm 10\text{V}$	25	100	-	V/mV	
		$T_A = 0^\circ$ to $+70^\circ\text{C}$	15	-	-	V/mV	
Output Voltage Swing	$V_{OUT}$	$R_L \geq 600\Omega$		$\pm 12$	$\pm 13$	-	V
			$T_A = 0^\circ$ to $+70^\circ\text{C}$	$\pm 10$	$\pm 12$	-	V
		$R_L \geq 600\Omega$ , $V_O = \pm 18\text{V}$		$\pm 15$	$\pm 16$	-	V
		$R_L \geq 2\text{k}\Omega$		$\pm 13$	$\pm 13.5$	-	V
			$T_A = 0^\circ$ to $+70^\circ\text{C}$	$\pm 12$	$\pm 12.5$	-	V
Input Resistance	$R_{IN}$		50	100	-	$\text{k}\Omega$	
Output Short-Circuit Current	$I_{SC}$		-	38	-	mA	

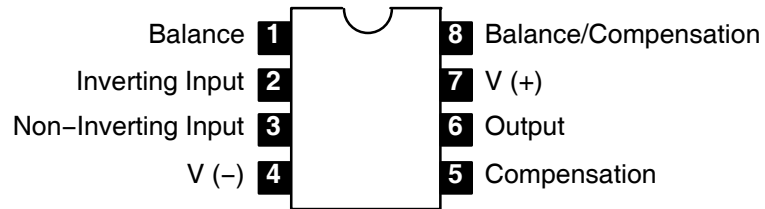
**AC Electrical Characteristics:** ( $T_A = +25^\circ\text{C}$ ,  $V_S = \pm 15\text{V}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Resistance	$R_{OUT}$	$A_V = 30\text{dB}$ , Closed-Loop, $f = 10\text{kHz}$ , $R_L = 600\Omega$ , $C_C = 22\text{pF}$	-	0.3	-	$\Omega$
Transient Response		Voltage Follower, $V_{IN} = 50\text{mV}$ , $R_L = 600\Omega$ , $C_C = 22\text{pF}$ , $C_L = 100\text{pF}$				
Rise Time	$t_R$		-	20	-	ns
Overshoot			-	20	-	%
Transient Response		$V_{IN} = 50\text{mV}$ , $R_L = 600\Omega$ , $C_C = 47\text{pF}$ , $C_L = 500\text{pF}$				
Rise Time	$t_R$		-	50	-	ns
Overshoot			-	35	-	%
Gain	$A_V$	$f = 10\text{kHz}$ , $C_C = 0$	-	6	-	V/mV
		$f = 10\text{kHz}$ , $C_C = 22\text{pF}$	-	2.2	-	V/mV
Gain Bandwidth Product	GBW	$C_C = 22\text{pF}$ , $C_L = 100\text{pF}$	-	10	-	MHz
Slew Rate	SR	$C_C = 0$	-	13	-	$\text{V}/\mu\text{s}$
		$C_C = 22\text{pF}$	-	6	-	$\text{V}/\mu\text{s}$
Power Bandwidth		$V_{OUT} = \pm 10\text{V}$ , $C_C = 0$	-	200	-	kHz
		$V_{OUT} = \pm 10\text{V}$ , $C_C = 22\text{pF}$	-	95	-	kHz
		$V_{OUT} = \pm 14\text{V}$ , $R_L = 600\Omega$ , $C_C = 22\text{pF}$ , $V_{CC} = \pm 18\text{V}$	-	70	-	kHz

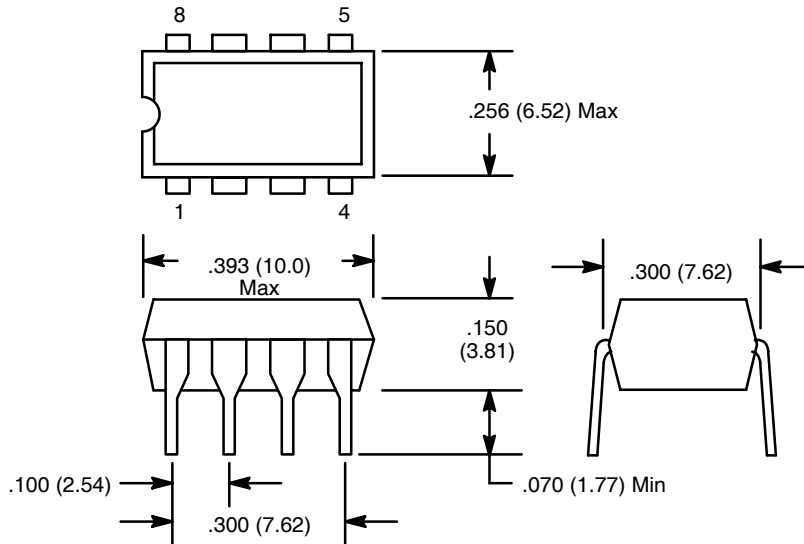
**Electrical Characteristics:** ( $T_A = +25^\circ\text{C}$ ,  $V_S = 15\text{V}$  unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Input Noise Voltage	$V_{\text{NOISE}}$	$f_O = 30\text{Hz}$	-	5.5	7.0	$\text{nV}/\sqrt{\text{Hz}}$
		$f_O = 1\text{kHz}$	-	3.5	4.5	$\text{nV}/\sqrt{\text{Hz}}$
Input Noise Current	$I_{\text{NOISE}}$	$f_O = 30\text{Hz}$	-	1.5	-	$\text{pA}/\sqrt{\text{Hz}}$
		$f_O = 1\text{kHz}$	-	0.4	-	$\text{pA}/\sqrt{\text{Hz}}$
Broadband Noise Figure		$f = 10\text{Hz to } 20\text{kHz}$ , $R_S = 5\text{k}\Omega$	-	0.9	-	dB
Channel Separation		$f = 1\text{kHz}$ , $R_S = 5\text{k}\Omega$	-	110	-	dB

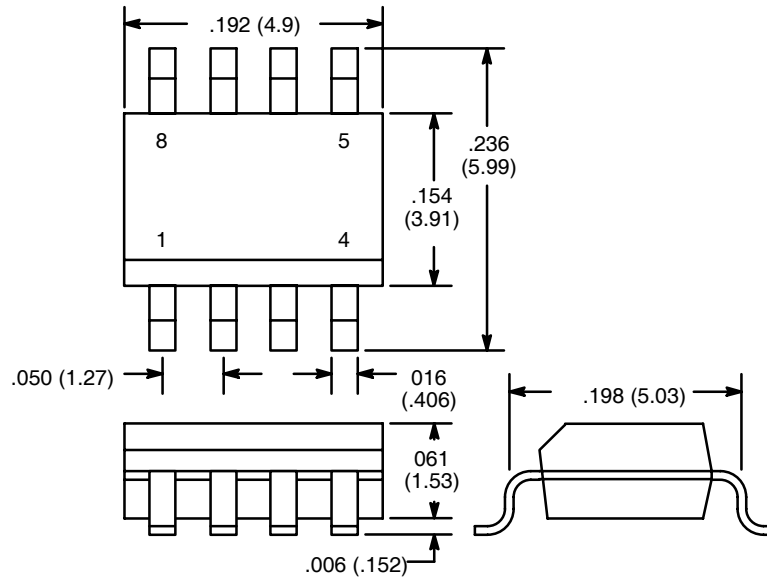
**Pin Connection Diagram**



**NTE894M**



**NTE894SM**



NOTE: Pin1 on Beveled Edge