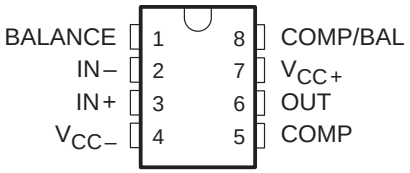
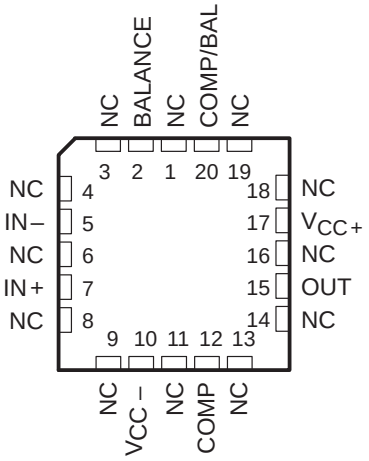
SLOS070 – JULY 1979 – REVISED SEPTEMBER 1990

- **Equivalent Input Noise Voltage 3.5 nV/√Hz**
- **Unity-Gain Bandwidth . . . 10 MHz Typ**
- **Common-Mode Rejection Ratio 100 dB Typ**
- **High DC Voltage Gain . . . 100 V/mV Typ**
- **Peak-to-Peak Output Voltage Swing 32 V Typ With $V_{CC\pm}$ = ±18 V and R_L = 600 Ω**
- **High Slew Rate . . . 13 V/μs Typ**
- **Wide Supply Voltage Range ±3 V to ±20 V**
- **Low Harmonic Distortion**
- **Designed to Be Interchangeable With Signetics NE5534, NE5534A, SE5534, and SE5534A**

NE5534, NE5534A . . . D OR P PACKAGE
SE5534, SE5534A . . . JG PACKAGE
(TOP VIEW)



SE5534, SE5534A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

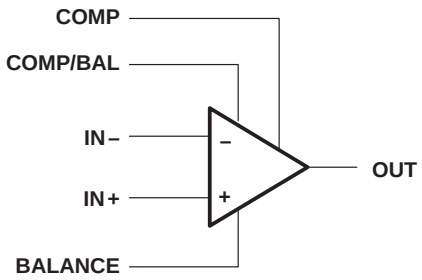
The NE5534, NE5534A, SE5534, and SE5534A are monolithic high-performance operational amplifiers combining excellent dc and ac characteristics. Some of the features include very low noise, high output drive capability, high unity-gain and maximum-output-swing bandwidths, low distortion, and high slew rate.

These operational amplifiers are internally compensated for a gain equal to or greater than three. Optimization of the frequency response for various applications can be obtained by use of an external compensation capacitor between COMP and COMP/BAL. The devices feature input-protection diodes, output short-circuit protection, and offset-voltage nulling capability.

For the NE5534A, a maximum limit is specified for equivalent input noise voltage.

The NE5534 and NE5534A are characterized for operation from 0°C to 70°C. The SE5534 and SE5534A are characterized for operation over the full military temperature range of – 55°C to 125°C.

symbol



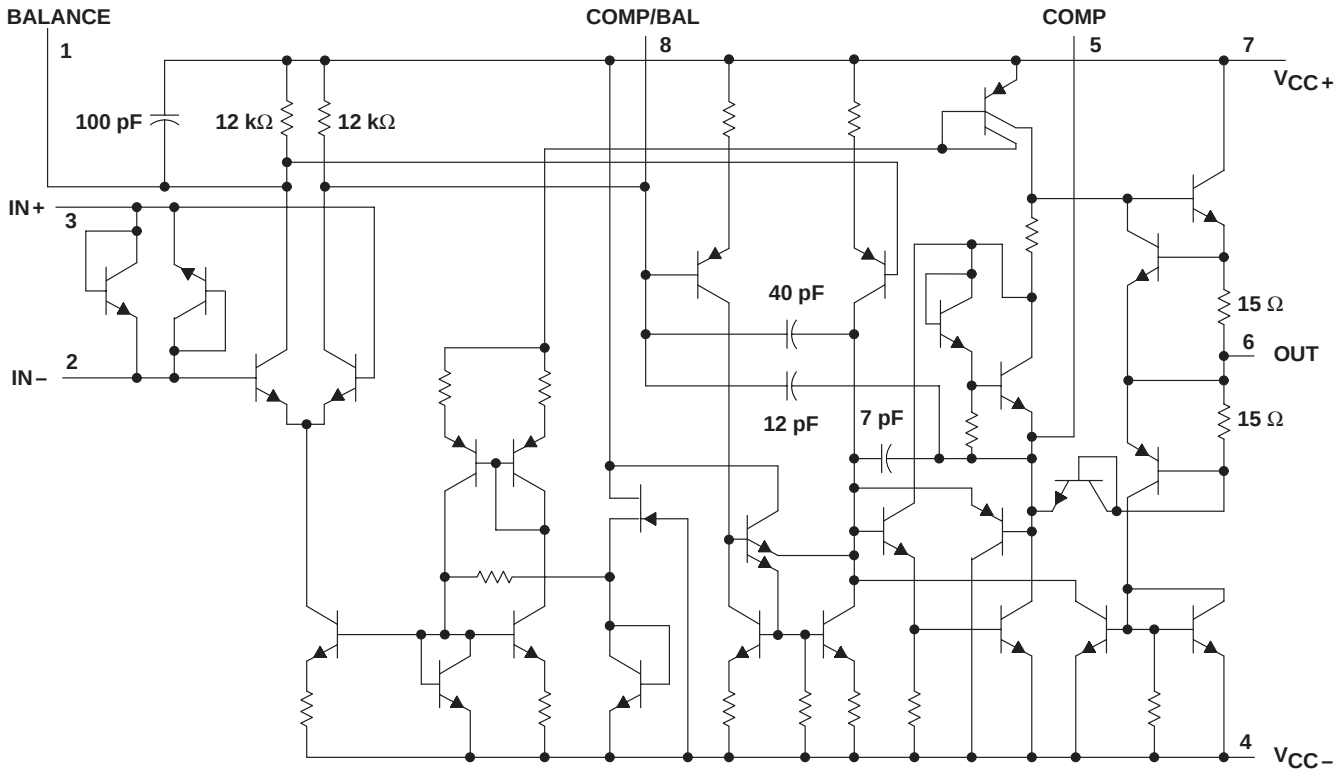
SE5534A FROM TI NOT RECOMMENDED FOR NEW DESIGNS

AVAILABLE OPTIONS

T_A	V_{IO} max AT 25°C	PACKAGE			
		SMALL OUTLINE (D)	CERAMIC (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)
0°C to 70°C	4 mV	NE5534D NE5534AD	— —	— —	NE5534P NE5534AP
– 55°C to 125°C	2 mV	— —	SE5534FK SE5534AFK	SE5534JG SE5534AJG	— —

The D package is available taped and reeled. Add the suffix R to the device type (e.g., NE5534DR).

schematic



All component values shown are nominal.
Pin numbers shown are for D, JG, and P packages.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC+} (see Note 1) . . . . . 22 V
Supply voltage, V_{CC-} (see Note 1) . . . . . – 22 V
Input voltage either input (see Notes 1 and 2) . . . . . V_{CC+}
Input current (see Note 3) . . . . . ±10 mA
Duration of output short circuit (see Note 4) . . . . . unlimited
Continuous total power dissipation . . . . . See Dissipation Rating Table
Operating free-air temperature range: NE5534, NE5534A . . . . . 0°C to 70°C
SE5534, SE5534A . . . . . – 55°C to 125°C
Storage temperature range . . . . . – 65°C to 150°C
Case temperature for 60 seconds: FK package . . . . . 260°C
Lead temperature range 1,6 mm (1/16 inch) from case for 60 seconds: JG package . . . . . 300°C
Lead temperature range 1,6 mm (1/16 inch) from case for 10 seconds: D or P package . . . . . 260°C

NOTES: 1. All voltage values, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC-}.
2. The magnitude of the input voltage must never exceed the magnitude of the supply voltage.
3. Excessive current will flow if a differential input voltage in excess of approximately 0.6 V is applied between the inputs unless some limiting resistance is used.
4. The output may be shorted to ground or to either power supply. Temperature and/or supply voltages must be limited to ensure the maximum dissipation rating is not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
D	725 mW	5.8 mW/°C	464 mW	N/A
FK (see Note 5)	1375 mW	11.0 mW/°C	880 mW	275 mW
JG	1050 mW	8.4 mW/°C	672 mW	210 mW
P	1000 mW	8.0 mW/°C	640 mW	N/A

NOTE 5: For the FK package, power rating and derating factor will vary with actual mounting technique used. The values stated here are believed to be conservative.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC+}	5		15	V
Supply voltage, V_{CC-}	– 5		– 15	V

electrical characteristics, $V_{CC\pm} = \pm 15$ V, $T_A = 25°C$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		NE5534, NE5534A			SE5534, SE5534A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO}	Input offset voltage	$V_O = 0$, $R_S = 50\ \Omega$	$T_A = 25°C$		0.5	4		0.5	2	mV
			T_A = Full range			5			3	
I_{IO}	Input offset current	$V_O = 0$	$T_A = 25°C$		20	300		10	200	nA
			T_A = Full range			400			500	
I_{IB}	Input bias current	$V_O = 0$	$T_A = 25°C$		500	1500		400	800	nA
			T_A = Full range			2000			1500	
V_{ICR}	Common-mode input voltage range			±12	±13		±12	±13		V
$V_{O(PP)}$	Maximum peak-to-peak output voltage swing	$R_L \ge 600\ \Omega$	$V_{CC\pm} = \pm 15$ V	24	26		24	26		V
			$V_{CC\pm} = \pm 18$ V	30	32		30	32		
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm 10$ V, $R_L \ge 600\ \Omega$	$T_A = 25°C$	25	100		50	100		V/mV
			T_A = Full range	15			25			
A_{vd}	Small-signal differential voltage amplification	f = 10 kHz	$C_C = 0$		6			6		V/mV
			$C_C = 22$ pF		2.2			2.2		
B_{OM}	Maximum-output-swing bandwidth	$V_O = \pm 10$ V,	$C_C = 0$		200			200		kHz
		$V_O = \pm 10$ V,	$C_C = 22$ pF		95			95		
		$V_{CC\pm} = \pm 18$ V, $R_L \ge 600\ \Omega$,	$V_O = \pm 14$ V, $C_C = 22$ pF		70			70		
B_1	Unity-gain bandwidth	$C_C = 22$ pF,	$C_L = 100$ pF		10			10		MHz
r_i	Input resistance			30	100		50	100		kΩ
z_o	Output impedance	$A_{VD} = 30$ dB, $C_C = 22$ pF,	$R_L \ge 600\ \Omega$, f = 10 kHz		0.3			0.3		Ω
CMRR	Common-mode rejection ratio	$V_O = 0$, $R_S = 50\ \Omega$	$V_{IC} = V_{ICR}$min,	70	100		80	100		dB
k_{SVR}	Supply voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	$V_{CC+} = \pm 9$ V to ± 15 V, $V_O = 0$,	$R_S = 50\ \Omega$	80	100		86	100		dB
I_{OS}	Output short-circuit current				38			38		mA
I_{CC}	Supply current	$V_O = 0$, No load	$T_A = 25°C$		4	8		4	6.5	mA
			T_A = Full range						9	

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. Full range is $T_A = 0°C$ to 70°C for NE5534 and NE5534A and – 55°C to 125°C for SE5534 and SE5534A.

operating characteristics, $V_{CC\pm}$ = ±15 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	SE5534, NE5534			SE5534A, NE5534A			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain	C_C = 0		13			13		V/μs
		C_C = 22 pF		6			6		
t_r	Rise time	V_I = 50 mV, A_{VD} = 1, R_L = 600 Ω, C_C = 22 pF, C_L = 100 pF		20			20		ns
	Overshoot factor			20%			20%		
t_r	Rise time	V_I = 50 mV, A_{VD} = 1, R_L = 600 Ω, C_C = 47 pF, C_L = 500 pF		50			50		ns
	Overshoot factor			35%			35%		
V_n	Equivalent input noise voltage	f = 30 Hz		7			5.5	7	nV/√Hz
		f = 1 kHz		4			3.5	4.5	
I_n	Equivalent input noise current	f = 30 Hz		2.5			1.5		pA/√Hz
		f = 1 kHz		0.6			0.4		
$\overline{F}$	Average noise figure	R_S = 5 kΩ, f = 10 Hz to 20 kHz					0.9		dB

TYPICAL CHARACTERISTICS†

NORMALIZED INPUT BIAS CURRENT AND INPUT OFFSET CURRENT vs FREE-AIR TEMPERATURE

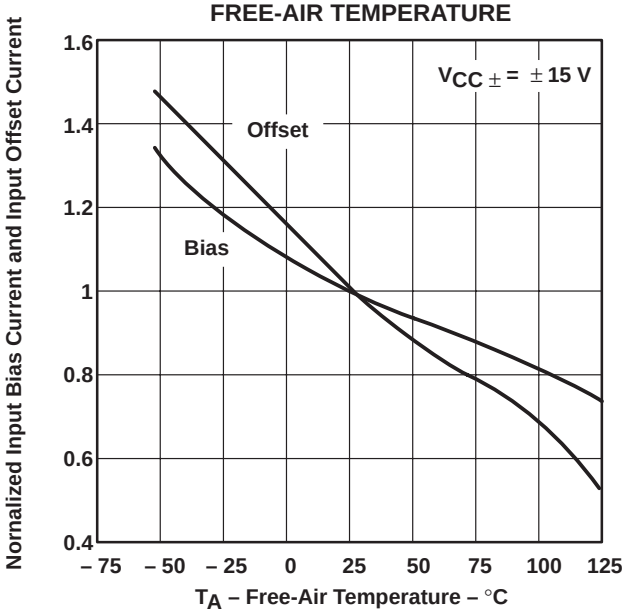


Figure 1

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY

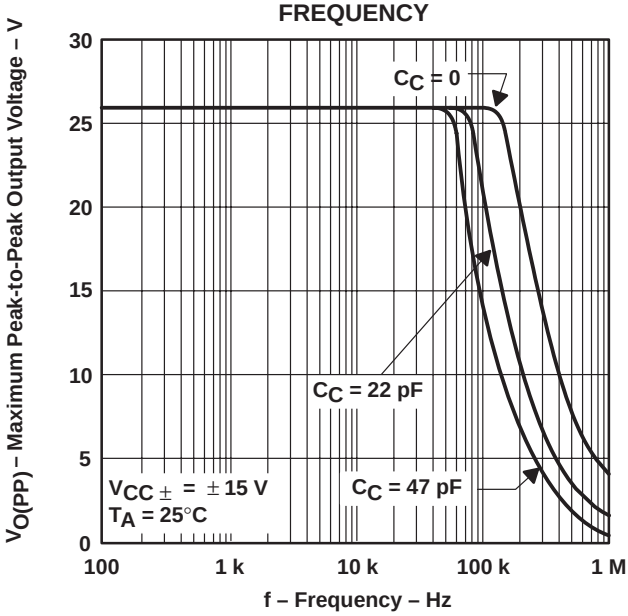


Figure 2

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREQUENCY

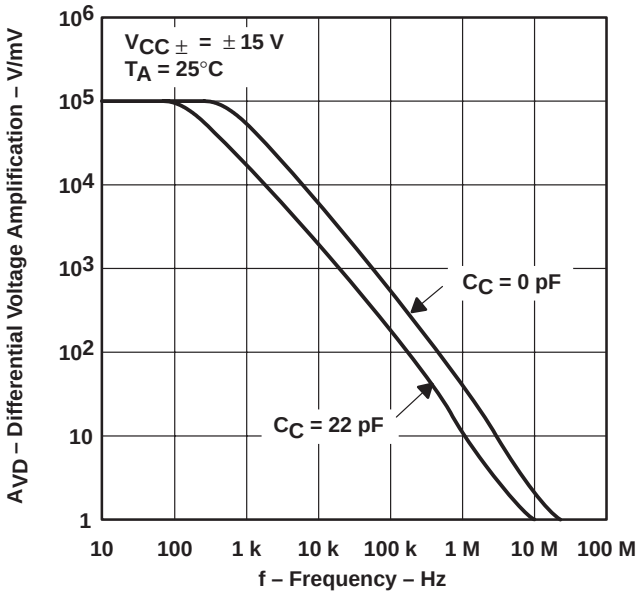


Figure 3

NORMALIZED SLEW RATE AND UNITY-GAIN BANDWIDTH vs SUPPLY VOLTAGE

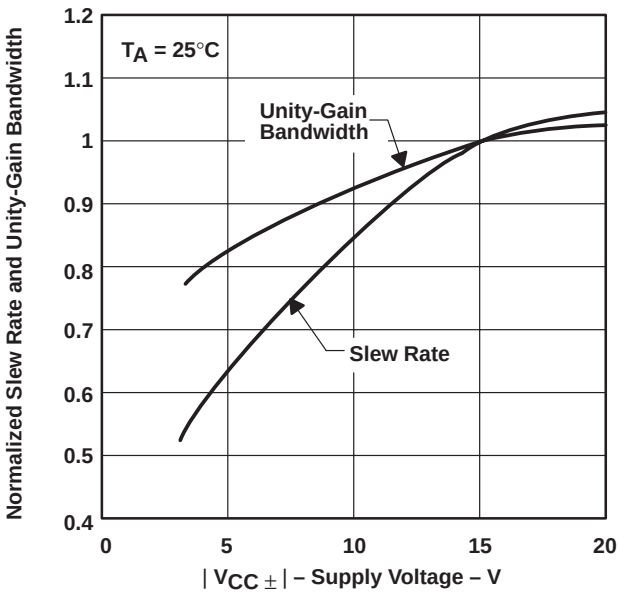


Figure 4

NORMALIZED SLEW RATE AND UNITY-GAIN BANDWIDTH vs FREE-AIR TEMPERATURE

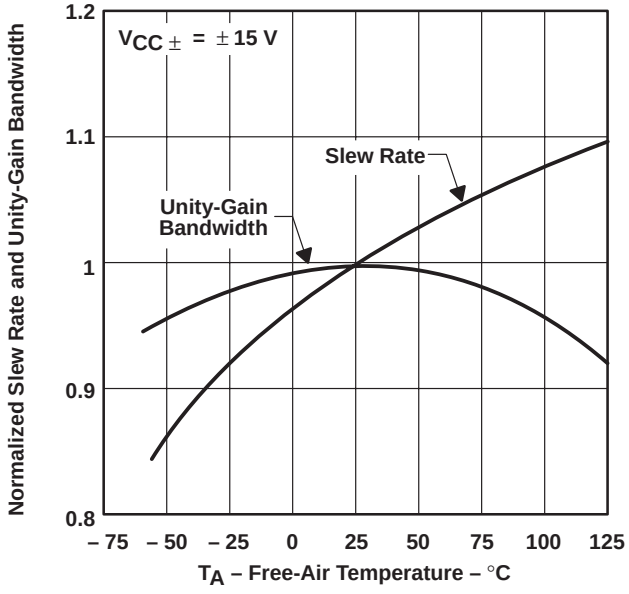


Figure 5

TOTAL HARMONIC DISTORTION vs FREQUENCY

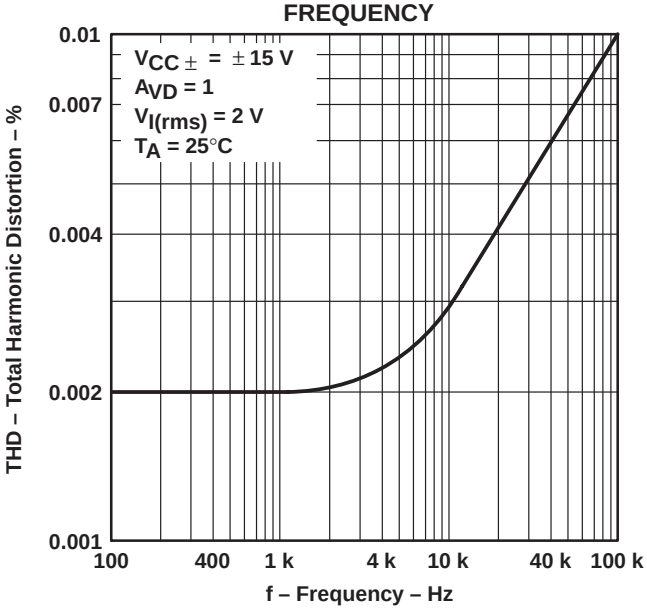


Figure 6

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

EQUIVALENT INPUT NOISE VOLTAGE vs FREQUENCY

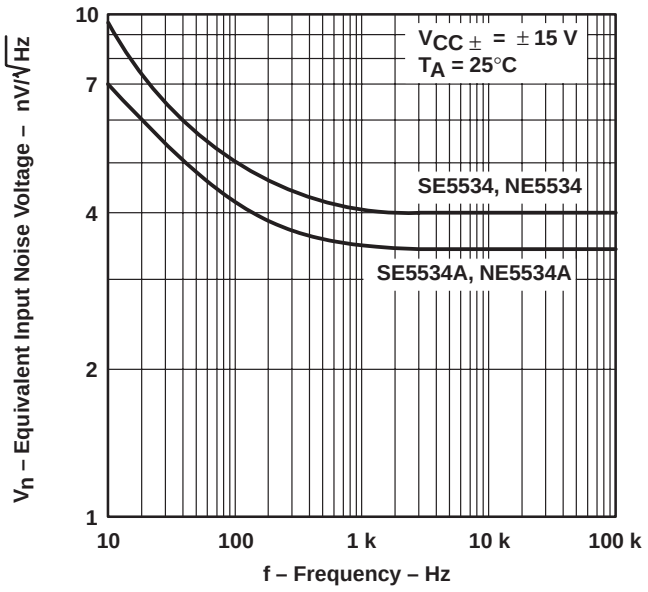


Figure 7

EQUIVALENT INPUT NOISE CURRENT vs FREQUENCY

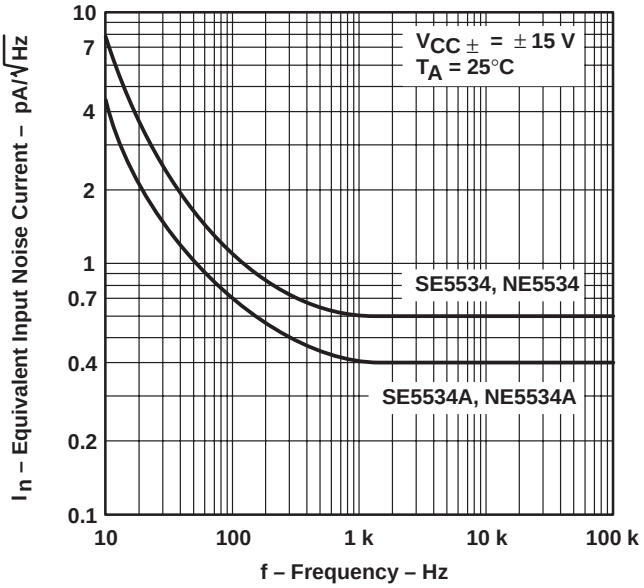


Figure 8

TOTAL EQUIVALENT INPUT NOISE VOLTAGE vs SOURCE RESISTANCE

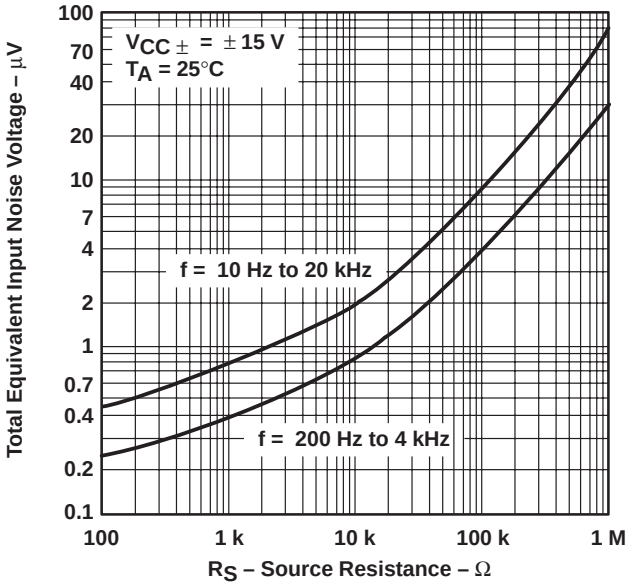


Figure 9

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