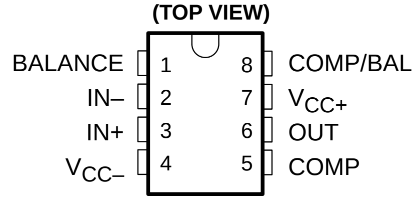
- **Equivalent Input Noise Voltage . . . 3.5 nV/√Hz**
- **Unity-Gain Bandwidth . . . 10 MHz Typ**
- **Common-Mode Rejection Ratio . . . 100 dB Typ**
- **High DC Voltage Gain . . . 100 V/mV Typ**
- **Peak-to-Peak Output Voltage Swing 32 V Typ With $V_{CC\pm}$ = ±18 V and R_L = 600 Ω**
- **High Slew Rate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

NE5534 . . . D, P, OR PS PACKAGE
NE5534A . . . D OR P PACKAGE
(TOP VIEW)



description/ordering information

The NE5534 and NE5534A are 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.

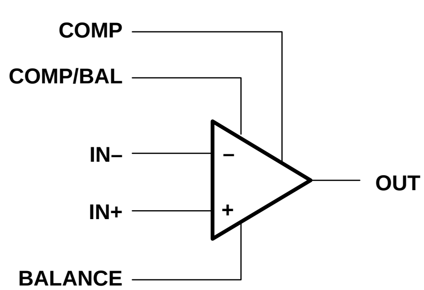
For the NE5534A, a maximum limit is specified for equivalent input noise voltage.

ORDERING INFORMATION

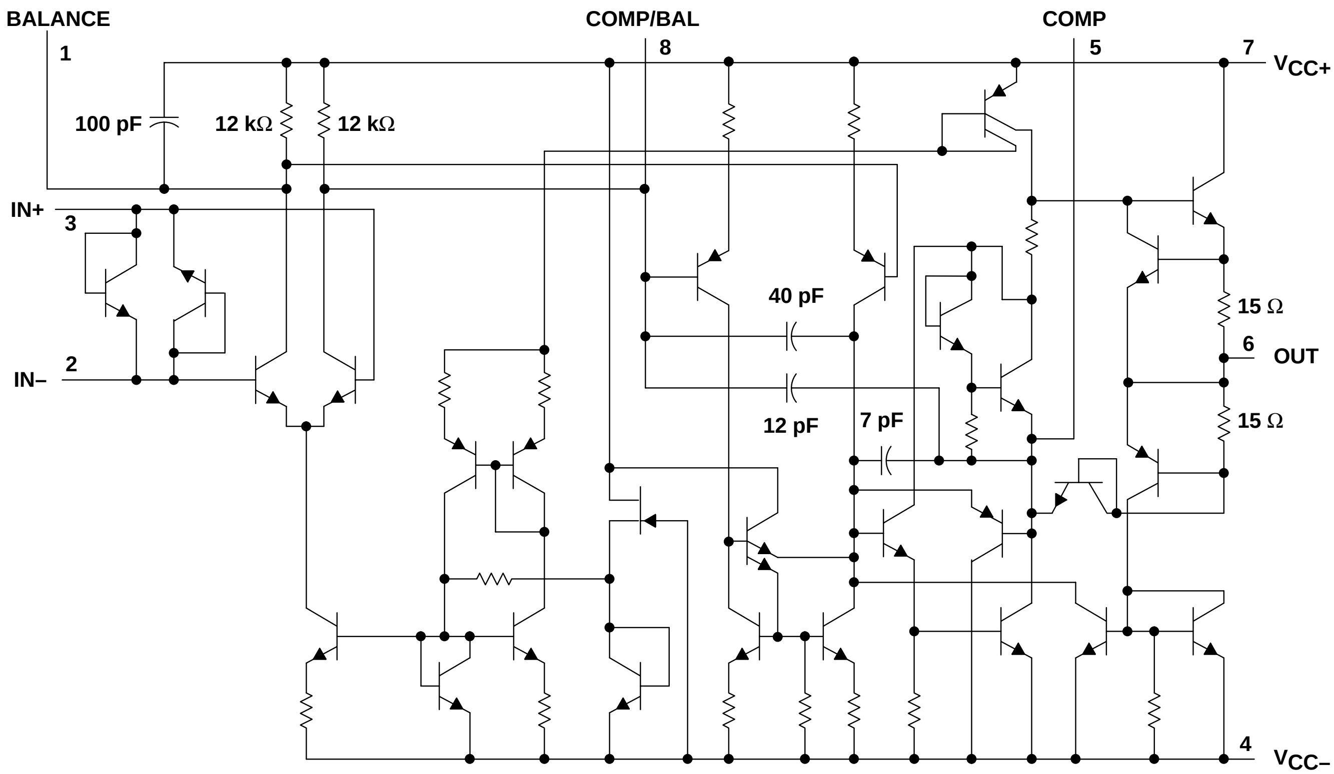
T_A	V_{IO}max AT 25°C	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	4 mV	PDIP (P)	Tube of 50	NE5534P	NE5534P
			Tube of 50	NE5534AP	NE5534AP
		SOIC (D)	Tube of 75	NE5534D	NE5534
			Reel of 2500	NE5534DR	
			Tube of 75	NE5534AD	5534A
			Reel of 2500	NE5534ADR	
		SOP (PS)	Reel of 2000	NE5534PS	N5534

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

symbol



schematic



All component values shown are nominal.

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

Supply voltage: V_{CC+} (see Note 1) . . . . 22 V
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
Package thermal impedance, θ_{JA} (see Notes 5 and 6): D package . . . . 97°C/W
P package . . . . 85°C/W
PS package . . . . 95°C/W
Operating virtual junction temperature, T_J . . . . 150°C
Lead temperature range 1,6 mm (1/16 inch) from case for 10 seconds . . . . 260°C
Storage temperature range, T_{stg} . . . . –65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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.
5. Maximum power dissipation is a function of T_J(max), θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
6. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

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

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

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

† 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.

operating characteristics, $V_{CC}\pm = \pm15$ V, $T_A = 25°C$

PARAMETER		TEST CONDITIONS	NE5534 TYP	NE5534A MIN	NE5534A TYP	NE5534A MAX	UNIT
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, $A_{VD} = 1$, $R_L = 600\ \Omega$, $C_C = 22$ pF, $C_L = 100$ pF	20		20		ns
	Overshoot factor		20		20		%
t_r	Rise time	$V_I = 50$ mV, $A_{VD} = 1$, $R_L = 600\ \Omega$, $C_C = 47$ 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†

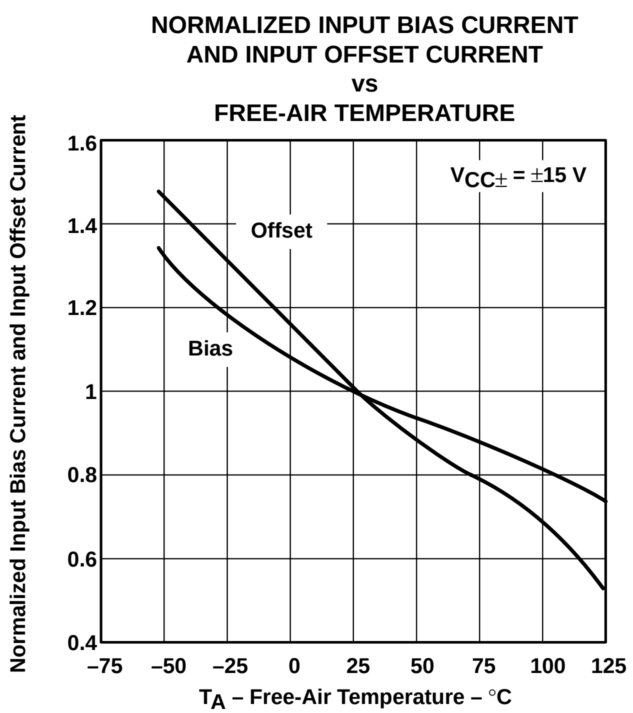


Figure 1

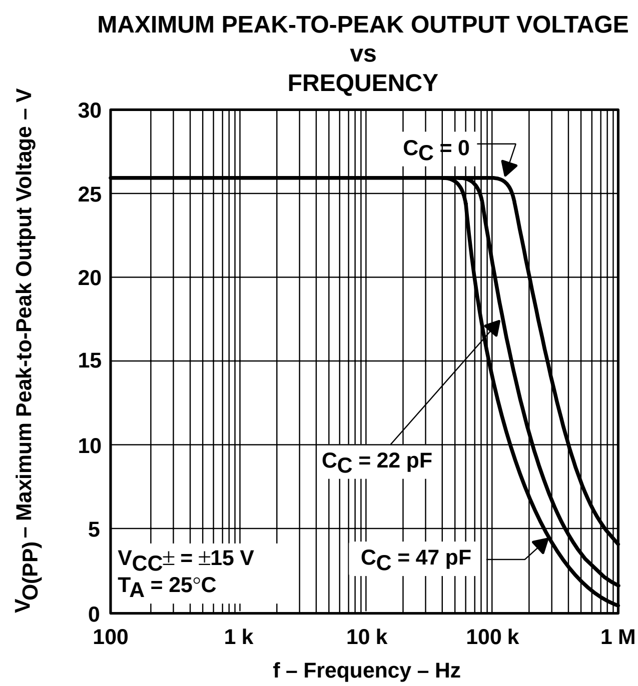


Figure 2

† 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

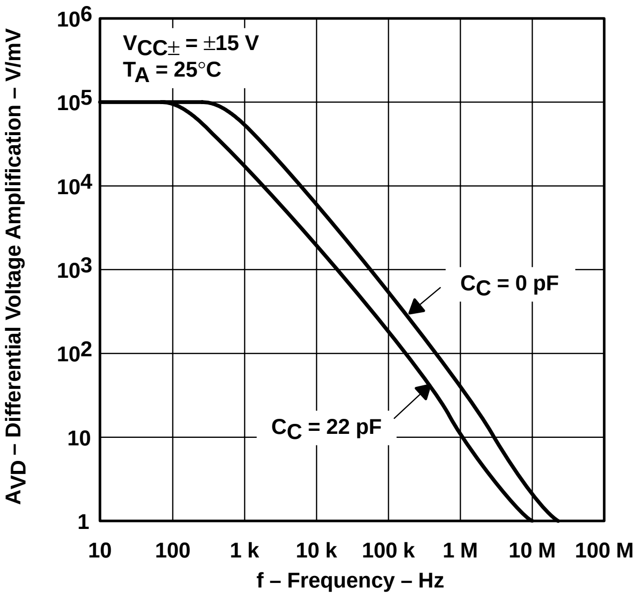


Figure 3

NORMALIZED SLEW RATE AND UNITY-GAIN BANDWIDTH vs SUPPLY VOLTAGE

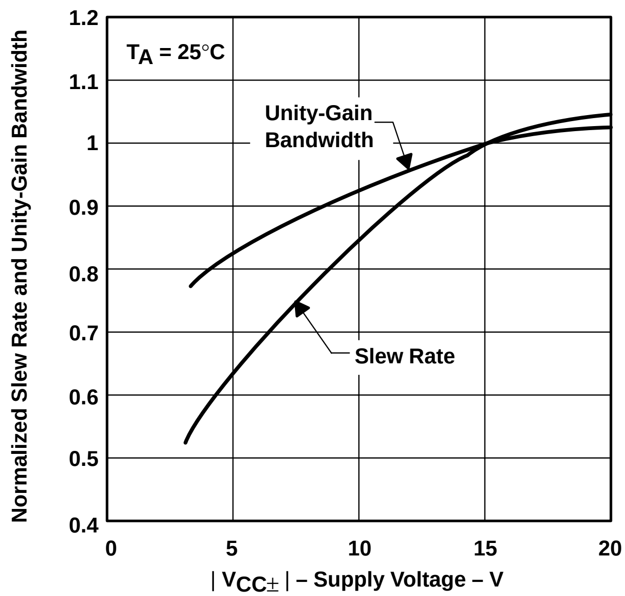


Figure 4

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

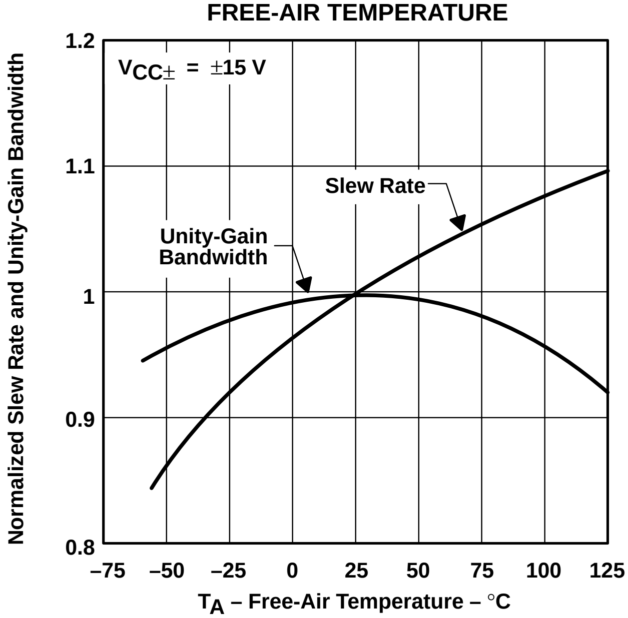


Figure 5

TOTAL HARMONIC DISTORTION vs FREQUENCY

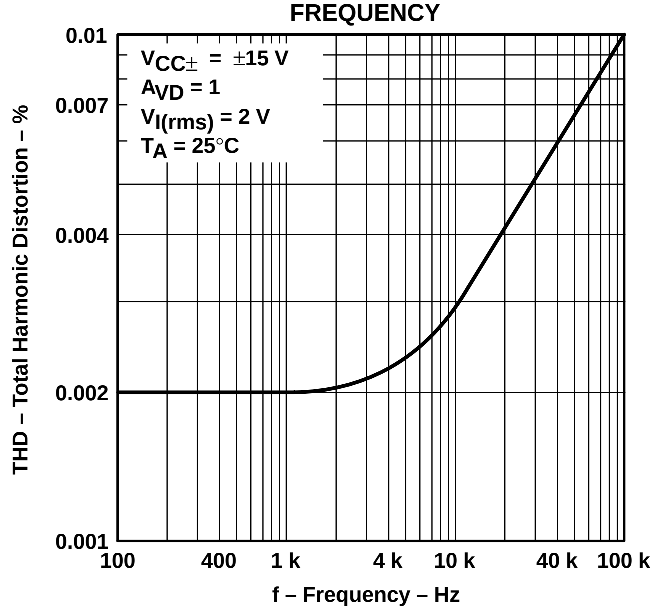


Figure 6

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

TYPICAL CHARACTERISTICS

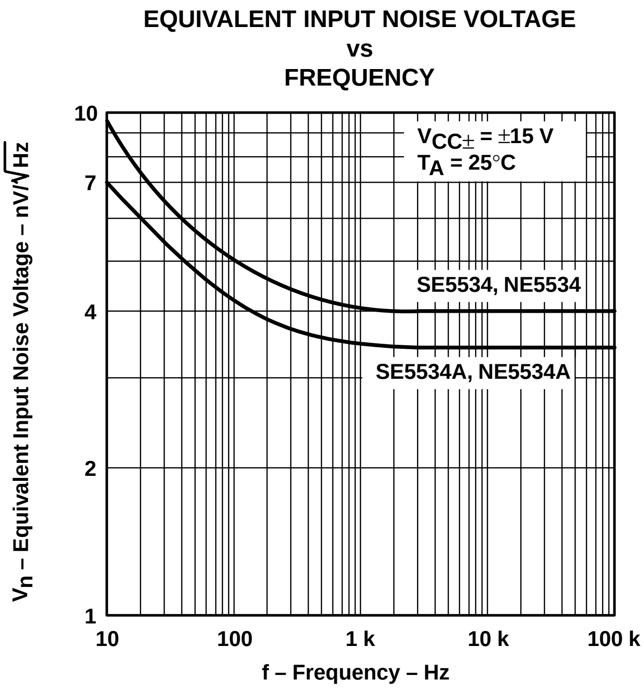


Figure 7

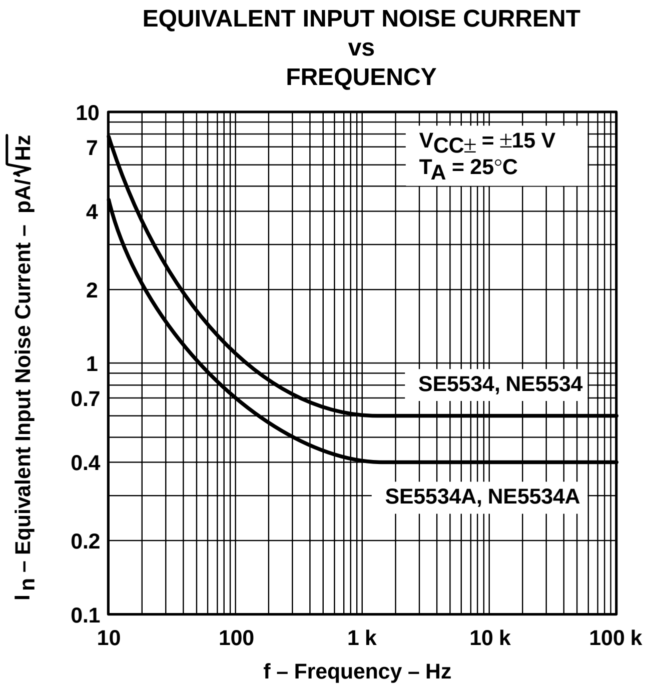


Figure 8

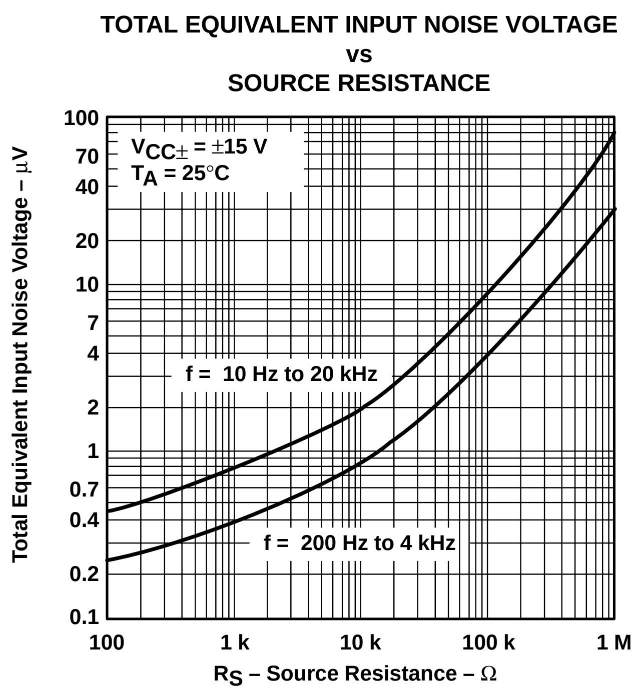
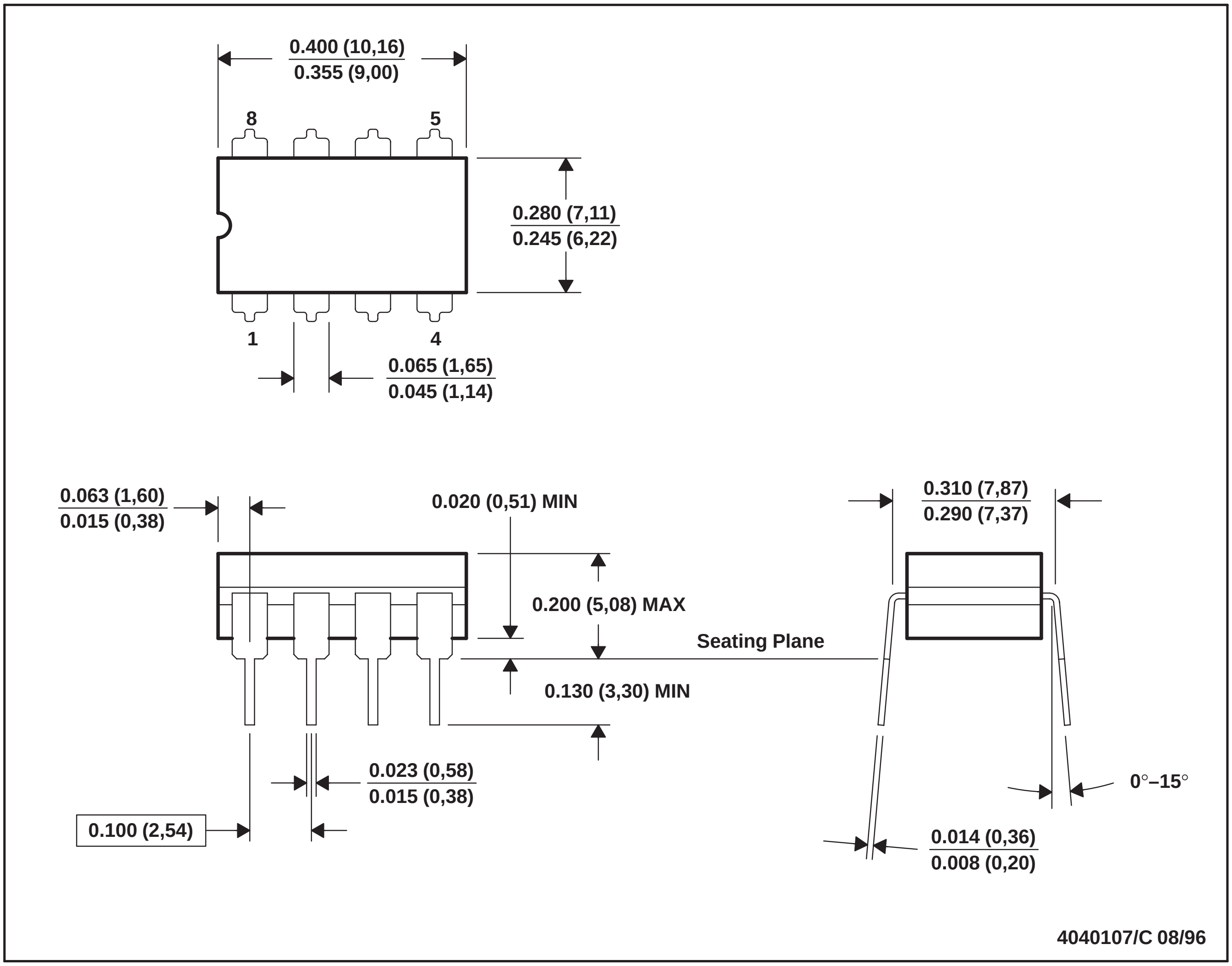


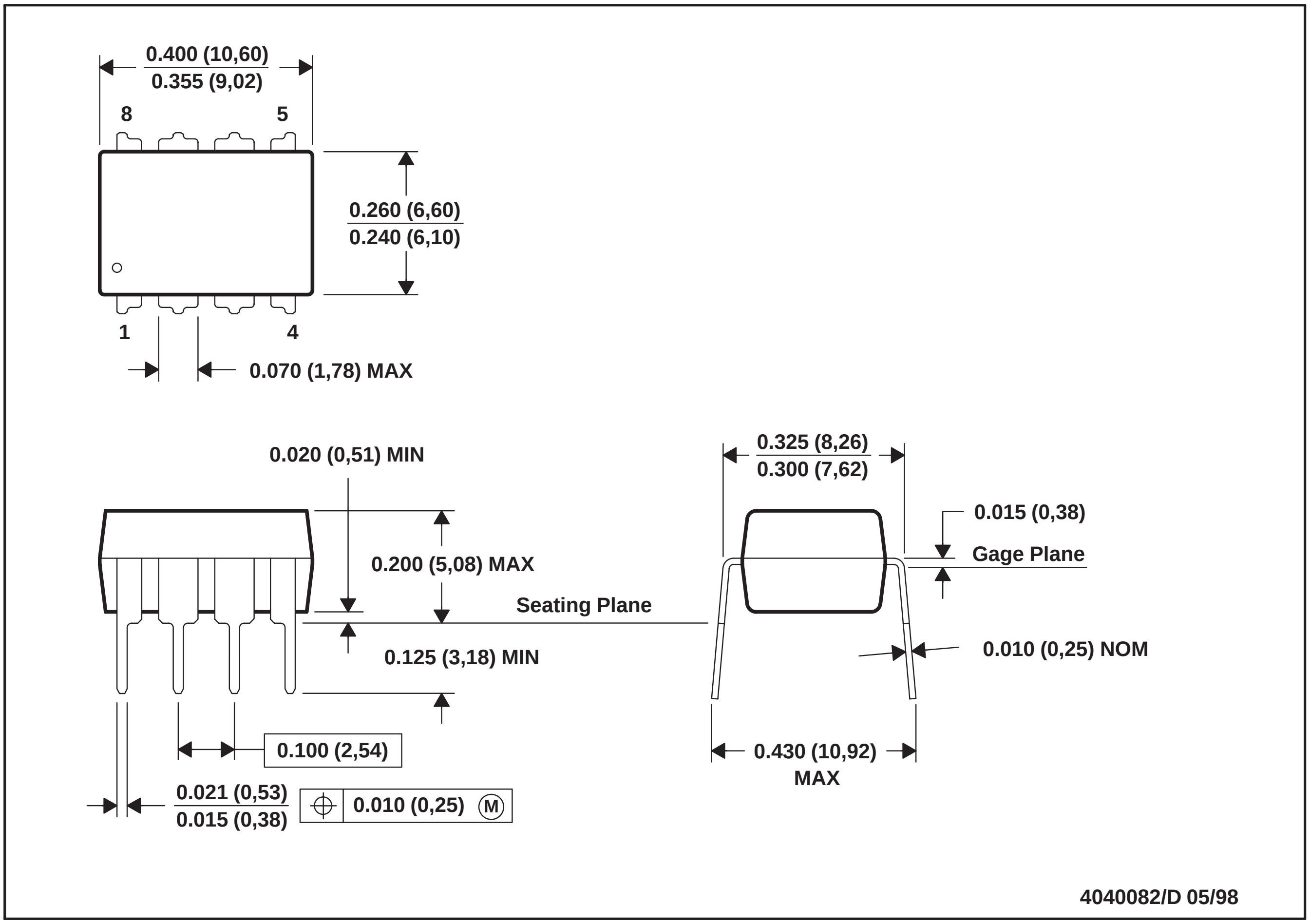
Figure 9

JG (R-GDIP-T8) **CERAMIC DUAL-IN-LINE**



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification.
E. Falls within MIL STD 1835 GDIP1-T8

P (R-PDIP-T8) **PLASTIC DUAL-IN-LINE**

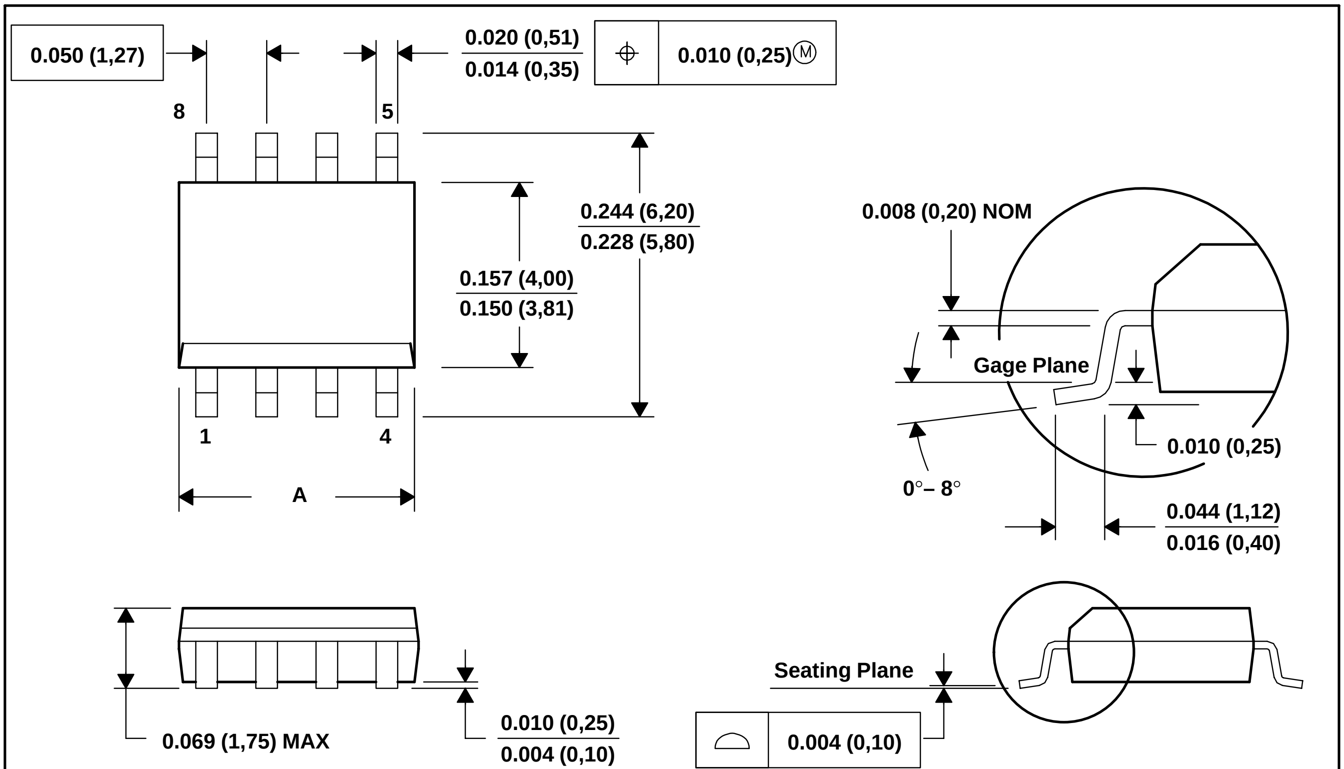


NOTES: A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS-001

For the latest package information, go to http://www.ti.com/sc/docs/package/pkg_info.htm

D (R-PDSO-G)** **PLASTIC SMALL-OUTLINE PACKAGE**

8 PINS SHOWN

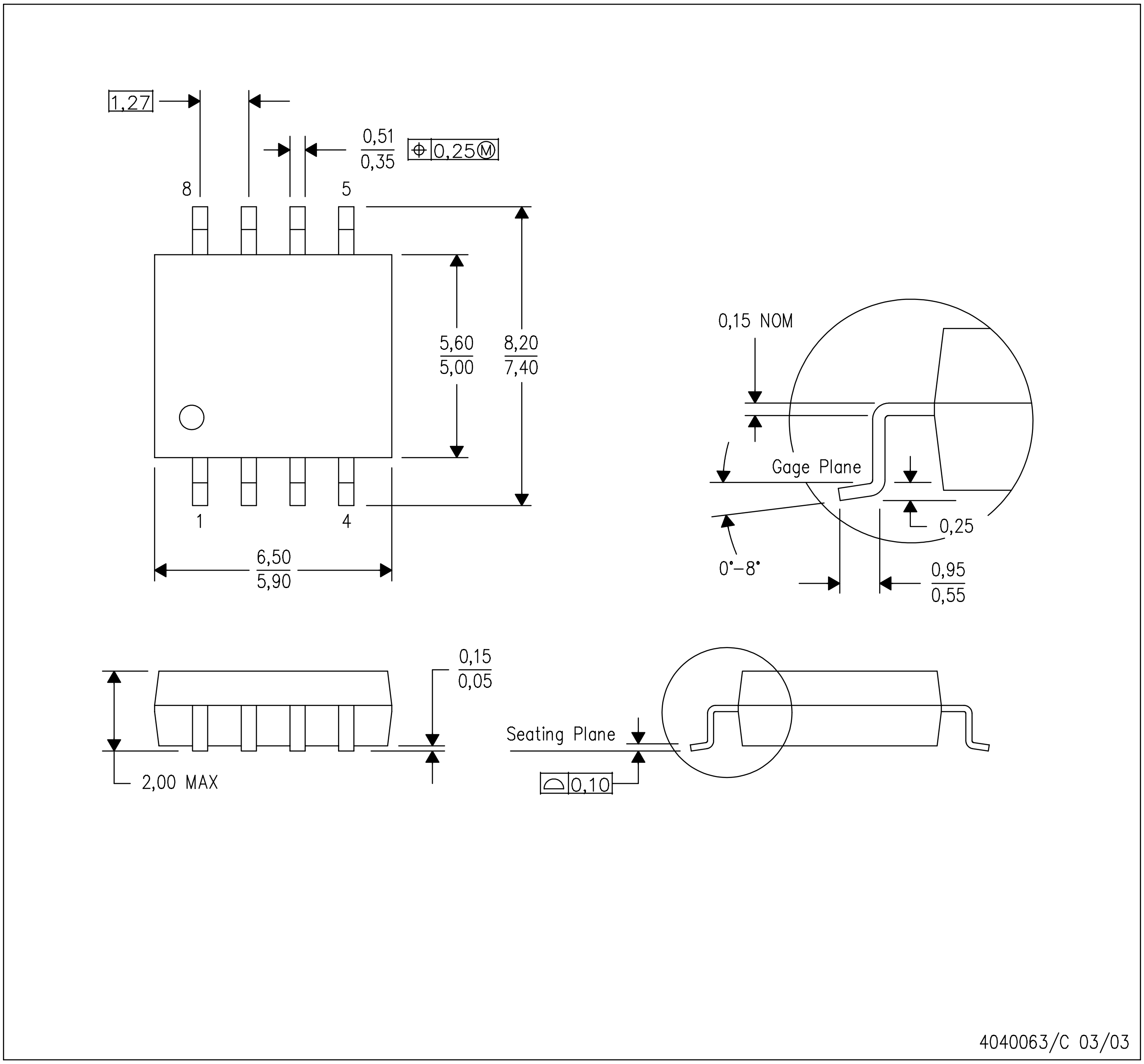


PINS ** / DIM	8	14	16
A MAX	0.197 (5,00)	0.344 (8,75)	0.394 (10,00)
A MIN	0.189 (4,80)	0.337 (8,55)	0.386 (9,80)

4040047/E 09/01

NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0.006 (0,15).
- D. Falls within JEDEC MS-012

PS (R-PDSO-G8) PLASTIC SMALL-OUTLINE PACKAGE



NOTES:
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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