NE592

Video Amplifier

The NE592 is a monolithic, two-stage, differential output, wideband video amplifier. It offers fixed gains of 100 and 400 without external components and adjustable gains from 400 to 0 with one external resistor. The input stage has been designed so that with the addition of a few external reactive elements between the gain select terminals, the circuit can function as a high-pass, low-pass, or band-pass filter. This feature makes the circuit ideal for use as a video or pulse amplifier in communications, magnetic memories, display, video recorder systems, and floppy disk head amplifiers. Now available in an 8-pin version with fixed gain of 400 without external components and adjustable gain from 400 to 0 with one external resistor.

Features

- 120 MHz Unity Gain Bandwidth
- Adjustable Gains from 0 to 400
- Adjustable Pass Band
- No Frequency Compensation Required
- Wave Shaping with Minimal External Components
- MIL-STD Processing Available

Applications

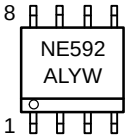
- Floppy Disk Head Amplifier
- Video Amplifier
- Pulse Amplifier in Communications
- Magnetic Memory
- Video Recorder Systems

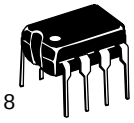
ON Semiconductor®

http://onsemi.com

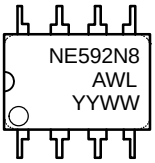
MARKING DIAGRAMS

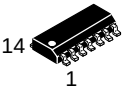
SOIC−8
D SUFFIX
CASE 751



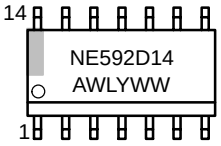


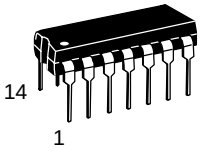
PDIP−8
N SUFFIX
CASE 626



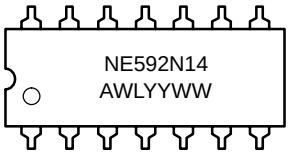


SOIC−14
D SUFFIX
CASE 751A





PDIP−14
N SUFFIX
CASE 646

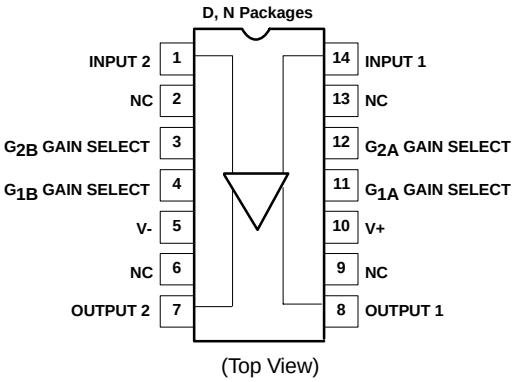


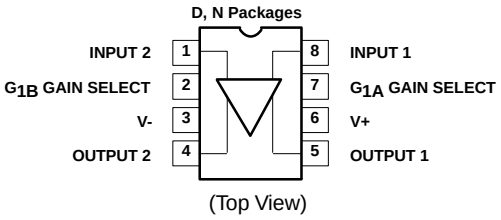
A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 9 of this data sheet.

PIN CONNECTIONS





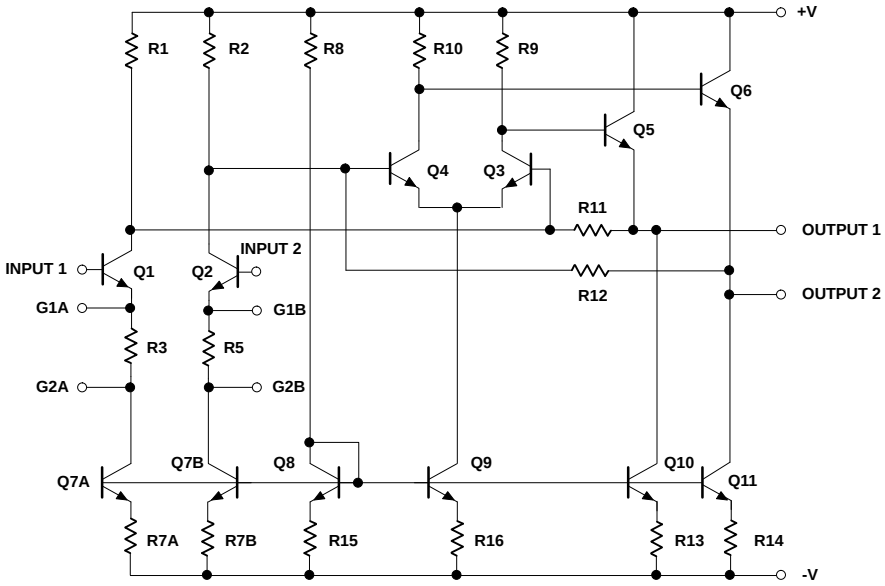


Figure 1. Block Diagram

MAXIMUM RATINGS (T_A = +25°C, unless otherwise noted.)

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	±8.0	V
Differential Input Voltage	V_{IN}	±5.0	V
Common-Mode Input Voltage	V_{CM}	±6.0	V
Output Current	I_{OUT}	10	mA
Operating Ambient Temperature Range	T_A	0 to +70	°C
Operating Junction Temperature	T_J	150	°C
Storage Temperature Range	T_{STG}	-65 to +150	°C
Maximum Power Dissipation, T_A = 25°C (Still Air) (Note 1) D-14 Package D-8 Package N-14 Package N-8 Package	$P_{D\ MAX}$	 0.98 0.79 1.44 1.17	W
Thermal Resistance, Junction−to−Ambient D-14 Package D-8 Package N-14 Package N-8 Package	$R_{\theta JA}$	 145 182 100 130	°C/W

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Derate above 25°C at the following rates:
   D-14 package at 6.9 mW/°C
   D-8 package at 5.5 mW/°C
   N-14 package at 10 mW/°C
   N-8 package at 7.7 mW/°C.

DC ELECTRICAL CHARACTERISTICS (V_{SS} = ±6.0 V, V_{CM} = 0, typicals at T_A = +25°C, min and max at 0°C ≤ T_A ≤ 70°C, unless otherwise noted. Recommended operating supply voltages V_S = ±6.0 V.)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Differential Voltage Gain Gain 1 (Note 2) Gain 2 (Notes 3 and 5)	A_{VOL}	R_L = 2.0 kΩ, V_{OUT} = 3.0 V_{P-P}	 250 80	 400 100	 600 120	V/V
Input Resistance Gain 1 (Note 2) Gain 2 (Notes 3 and 5)	R_{IN}	– T_A = 25°C 0°C ≤ T_A ≤ 70°C	 – 10 8.0	 4.0 30 –	 – – –	kΩ
Input Capacitance	C_{IN}	Gain 2 (Note 5)	–	2.0	–	pF
Input Offset Current	I_{OS}	T_A = 25°C 0°C ≤ T_A ≤ 70°C	– –	0.4 –	5.0 6.0	μA
Input Bias Current	I_{BIAS}	T_A = 25°C 0°C ≤ T_A ≤ 70°C	– –	9.0 –	30 40	μA
Input Noise Voltage	V_{NOISE}	BW 1.0 kHz to 10 MHz	–	12	–	μV_{RMS}
Input Voltage Range	V_{IN}	–	±1.0	–	–	V
Common-Mode Rejection Ratio Gain 2 (Note 5)	CMRR	V_{CM} ±1.0 V, f < 100 kHz, T_A = 25°C V_{CM} ±1.0 V, f < 100 kHz, 0°C ≤ T_A ≤ 70°C V_{CM} ±1.0 V, f < 5.0 MHz	60 50 –	86 – 60	– – –	dB
Supply Voltage Rejection Ratio Gain 2 (Note 5)	PSRR	ΔV_S = ±0.5 V	50	70	–	dB
Output Offset Voltage Gain 1 Gain 2 (Note 5) Gain 3 (Note 4) Gain 3 (Note 4)	V_{OS}	 R_L = ∞ R_L = ∞ R_L = ∞, T_A = 25°C R_L = ∞, 0°C ≤ T_A ≤ 70°C	 – – – –	 – – 0.35 –	 1.5 1.5 0.75 1.0	V
Output Common-Mode Voltage	V_{CM}	R_L = ∞, T_A = 25°C	2.4	2.9	3.4	V
Output Voltage Swing Differential	V_{OUT}	R_L = 2.0 kΩ, T_A = 25°C R_L = 2.0 kΩ, 0°C ≤ T_A ≤ 70°C	3.0 2.8	4.0 –	– –	V
Output Resistance	R_{OUT}	–	–	20	–	Ω
Power Supply Current	I_{CC}	R_L = ∞, T_A = 25°C R_L = ∞, 0°C ≤ T_A ≤ 70°C	– –	18 –	24 27	mA

AC ELECTRICAL CHARACTERISTICS (T_A = +25°C V_{SS} = ±6.0 V, V_{CM} = 0, unless otherwise noted. Recommended operating supply voltages V_S = ±6.0 V.)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Bandwidth Gain 1 (Note 2) Gain 2 (Notes 3 and 5)	BW	–	 – –	 40 90	 – –	MHz
Rise Time Gain 1 (Note 2) Gain 2 (Notes 3 and 5)	t_R	V_{OUT} = 1.0 V_{P-P}	 – –	 10.5 4.5	 12 –	ns
Propagation Delay Gain 1 (Note 2) Gain 2 (Notes 3 and 5)	t_{PD}	V_{OUT} = 1.0 V_{P-P}	 – –	 7.5 6.0	 10 –	ns

2. Gain select Pins G_{1A} and G_{1B} connected together.
3. Gain select Pins G_{2A} and G_{2B} connected together.
4. All gain select pins open.
5. Applies to 14-pin version only.

TYPICAL PERFORMANCE CHARACTERISTICS

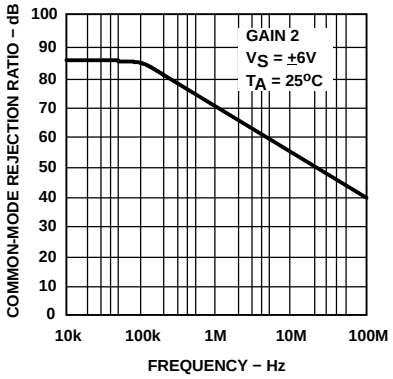


Figure 2. Common−Mode Rejection Ratio as a Function of Frequency

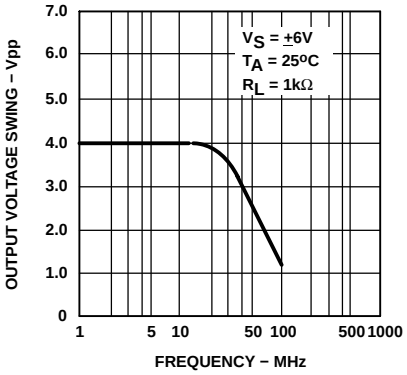


Figure 3. Output Voltage Swing as a Function of Frequency

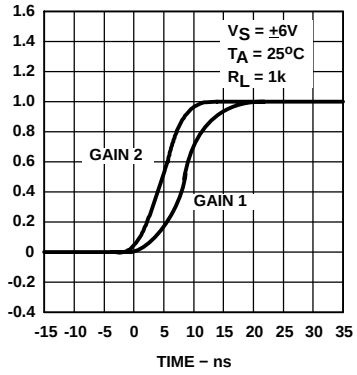


Figure 4. Pulse Response

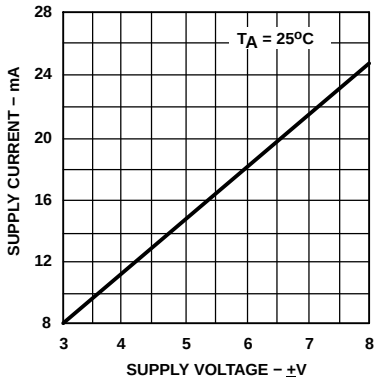


Figure 5. Supply Current as a Function of Temperature

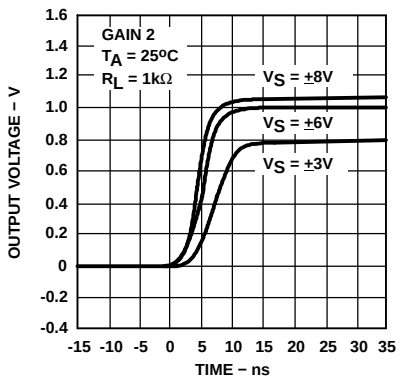


Figure 6. Pulse Response as a Function of Supply Voltage

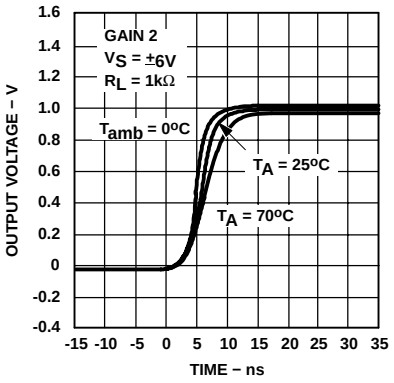


Figure 7. Pulse Response as a Function of Temperature

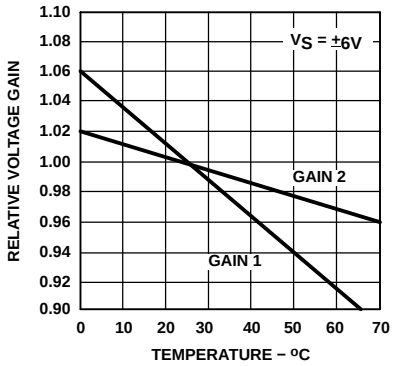


Figure 8. Voltage Gain as a Function of Temperature

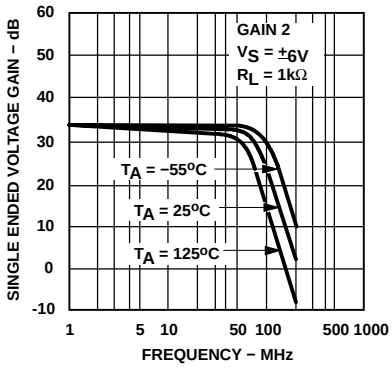


Figure 9. Gain vs. Frequency as a Function of Temperature

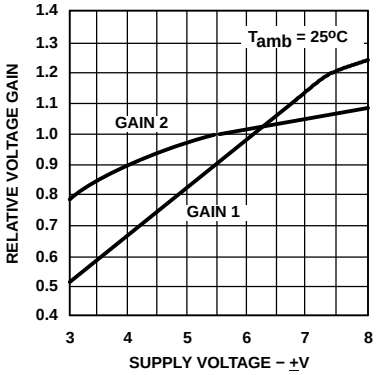


Figure 10. Voltage Gain as a Function of Supply Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

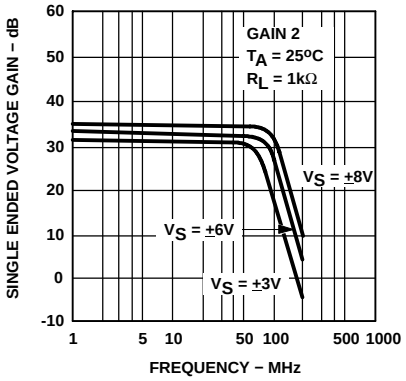


Figure 11. Gain vs. Frequency as a Function of Supply Voltage

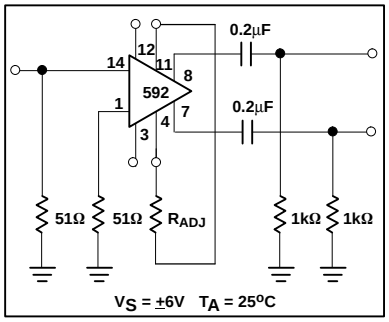


Figure 12. Voltage Gain Adjust Circuit

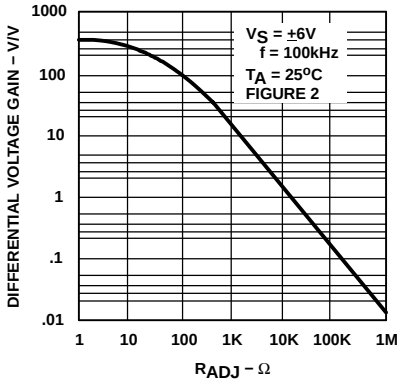


Figure 13. Voltage Gain as a Function of RADJ (Figure 2)

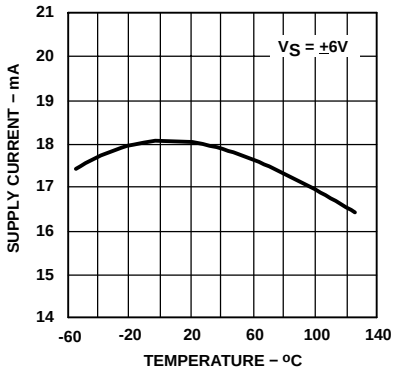


Figure 14. Supply Current as a Function of Temperature

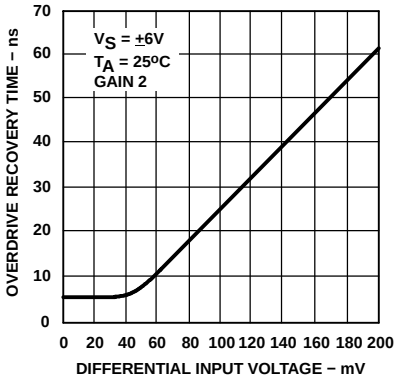


Figure 15. Differential Overdrive Recovery Time

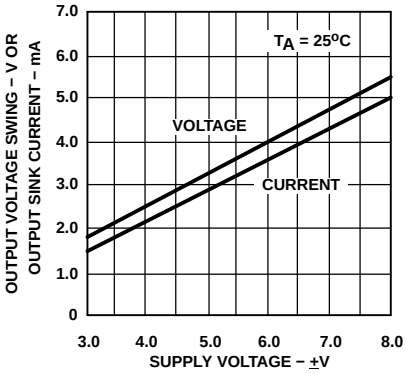


Figure 16. Output Voltage and Current Swing as a Function of Supply Voltage

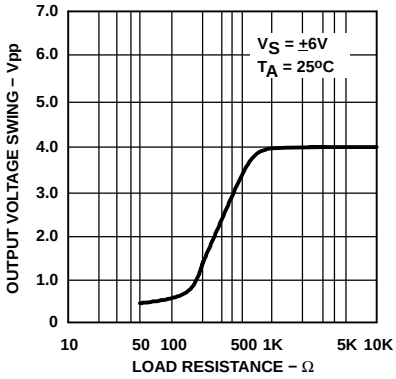


Figure 17. Output Voltage Swing as a Function of Load Resistance

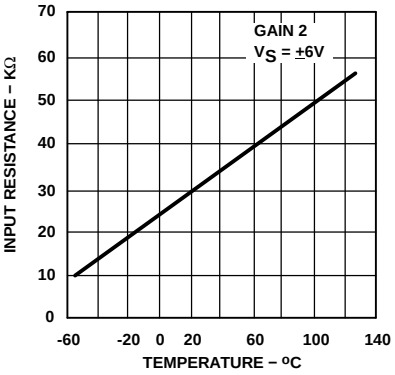


Figure 18. Input Resistance as a Function of Temperature

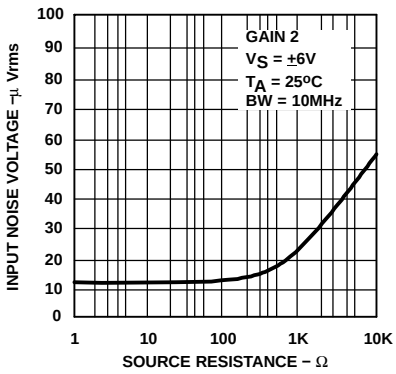


Figure 19. Input Noise Voltage as a Function of Source Resistance

TYPICAL PERFORMANCE CHARACTERISTICS

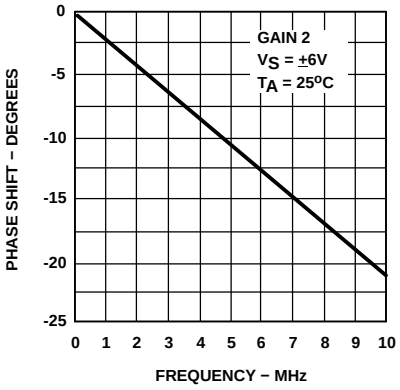


Figure 20. Phase Shift as a Function of Frequency

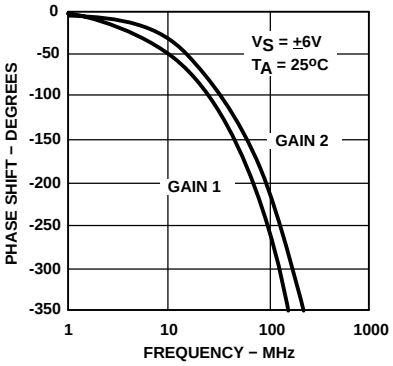


Figure 21. Phase Shift as a Function of Frequency

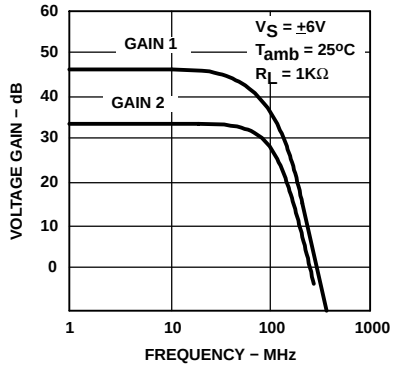


Figure 22. Voltage Gain as a Function of Frequency

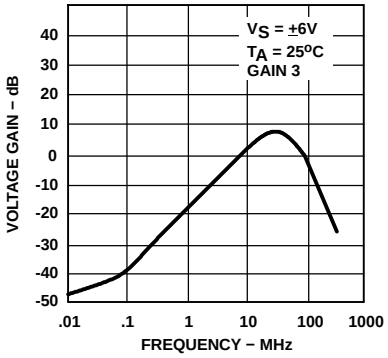


Figure 23. Voltage Gain as a Function of Frequency

TEST CIRCUITS (T_A = 25°C, unless otherwise noted.)

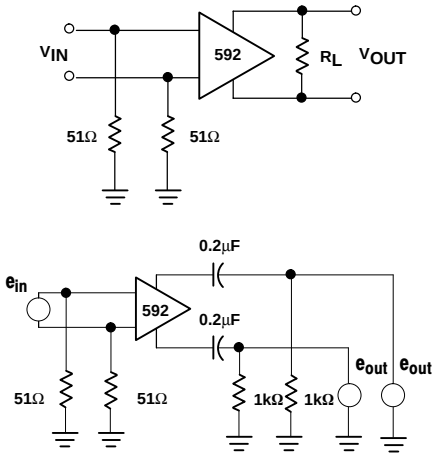


Figure 24. Test Circuits

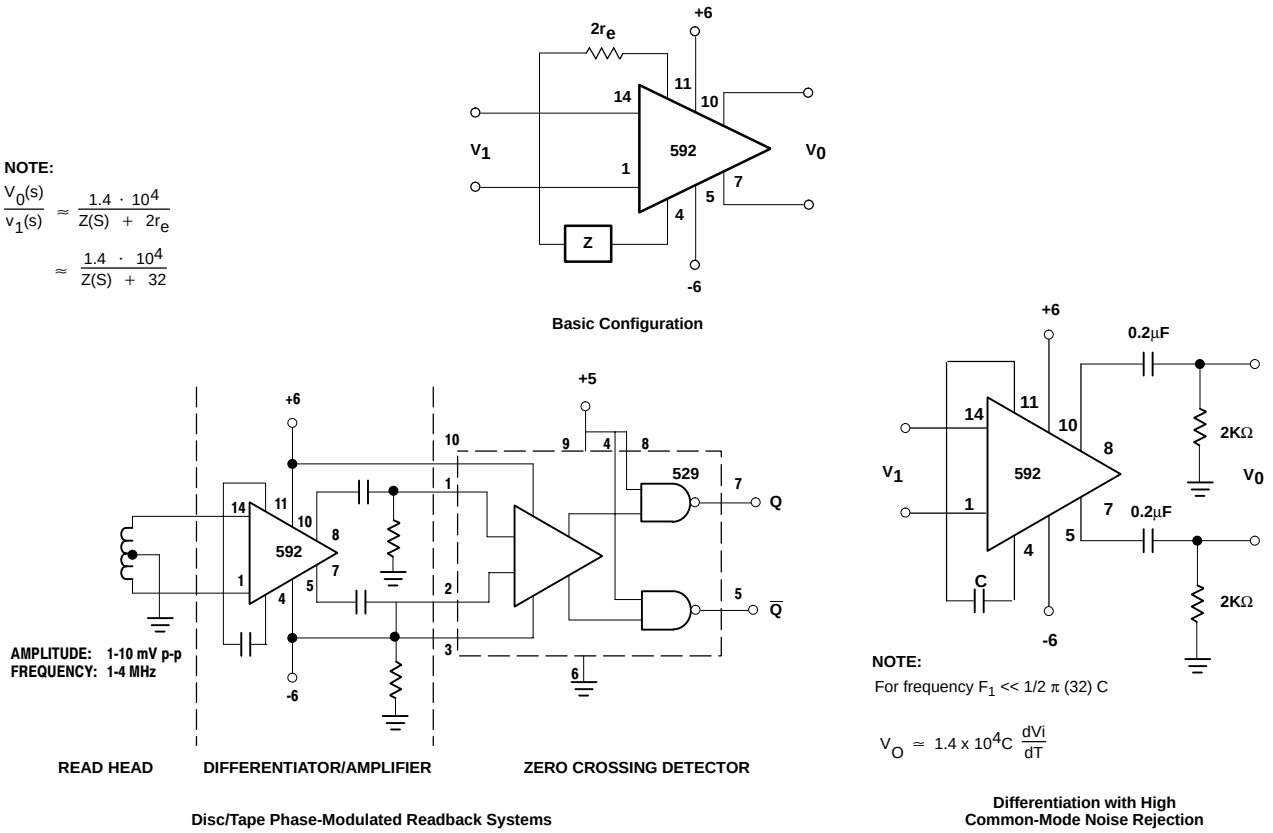
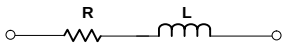
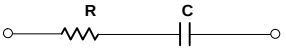
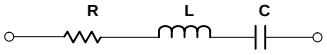
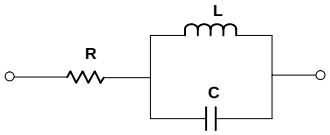


Figure 25. Typical Applications

Z NETWORK	FILTER TYPE	V_0 (s) TRANSFER V_1 (s) FUNCTION
	LOW PASS	$\frac{1.4 \times 10^4}{L} \left[\frac{1}{s + R/L}\right]$
	HIGH PASS	$\frac{1.4 \times 10^4}{R} \left[\frac{s}{s + 1/RC}\right]$
	BAND PASS	$\frac{1.4 \times 10^4}{L} \left[\frac{s}{s^2 + R/Ls + 1/LC}\right]$
	BAND REJECT	$\frac{1.4 \times 10^4}{R} \left[\frac{s^2 + 1/LC}{s^2 + 1/LC + s/RC}\right]$

NOTES:
In the networks above, the R value used is assumed to include $2r_e$, or approximately 32Ω.
$S = j\omega$
$\omega = 2\pi f$

Figure 26. Filter Networks

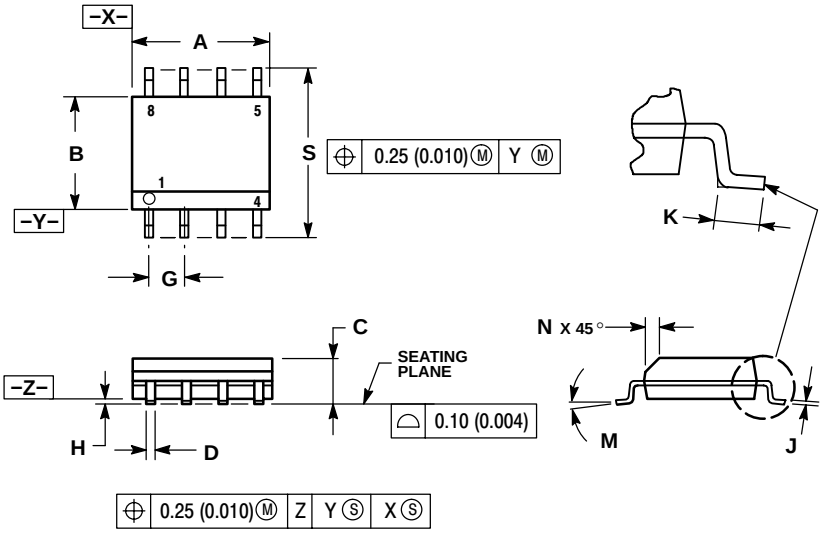
ORDERING INFORMATION

Device	Description	Temperature Range	Shipping†
NE592D8	8−Pin Small Outline Package	0 to +70°C	98 Units/Rail
NE592D8R2	8−Pin Small Outline Package	0 to +70°C	2500 Tape & Reel
NE592N8	8−Pin Plastic Dual In−Line Package	0 to +70°C	50 Units/Rail
NE592D14	14−Pin Small Outline Package	0 to +70°C	55 Units/Rail
NE592D14R2	14−Pin Small Outline Package	0 to +70°C	2500 Tape & Reel
NE592N14	14−Pin Plastic Dual In−Line Package	0 to +70°C	25 Units/Rail

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

PACKAGE DIMENSIONS

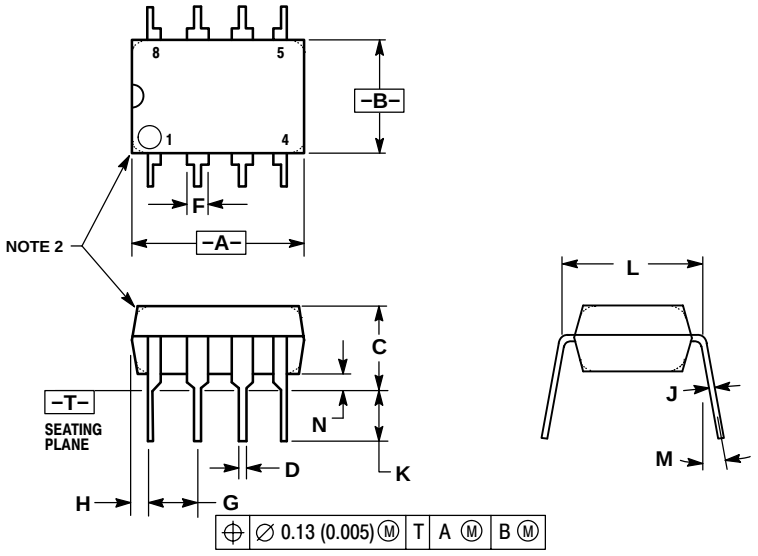
SOIC−8 NB
D SUFFIX
CASE 751−07
ISSUE AC



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751−01 THRU 751−06 ARE OBSOLETE. NEW STANDARD IS 751−07.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0 °	8 °	0 °	8 °
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

PDIP−8
N SUFFIX
CASE 626−05
ISSUE L

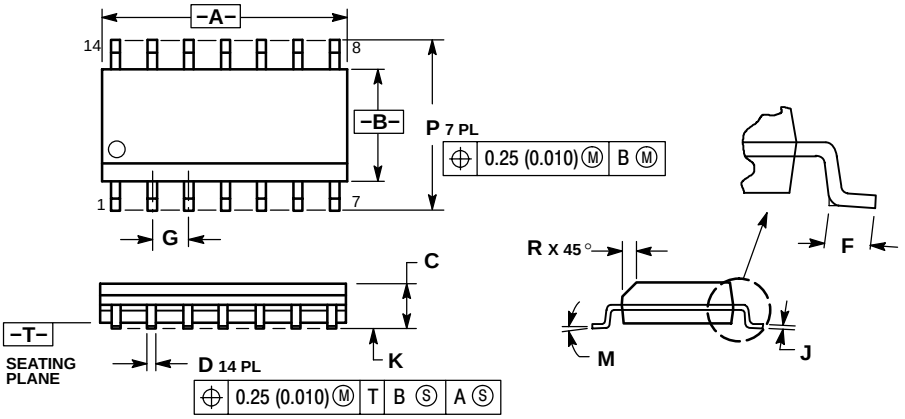


NOTES:
1. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL.
2. PACKAGE CONTOUR OPTIONAL (ROUND OR SQUARE CORNERS).
3. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.40	10.16	0.370	0.400
B	6.10	6.60	0.240	0.260
C	3.94	4.45	0.155	0.175
D	0.38	0.51	0.015	0.020
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	0.76	1.27	0.030	0.050
J	0.20	0.30	0.008	0.012
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	---	10°	---	10°
N	0.76	1.01	0.030	0.040

PACKAGE DIMENSIONS

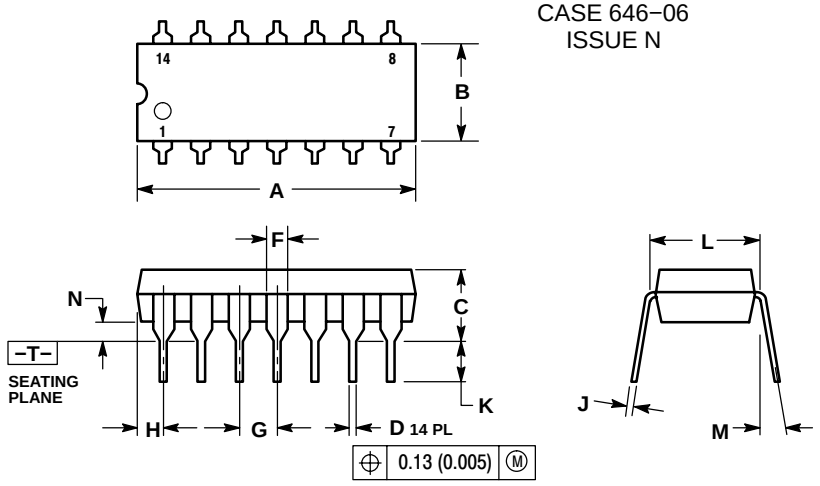
SOIC−14
D SUFFIX
CASE 751A−03
ISSUE G



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7 °	0 °	7 °
P	5.80	6.20	0.228	0.244
R	0.25	0.50	0.010	0.019

PDIP−14
N SUFFIX
CASE 646−06
ISSUE N



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	18.80
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	−−−	10 °	−−−	10 °
N	0.015	0.039	0.38	1.01

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