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
- These Devices are Pb−Free and are RoHS Compliant

Applications

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

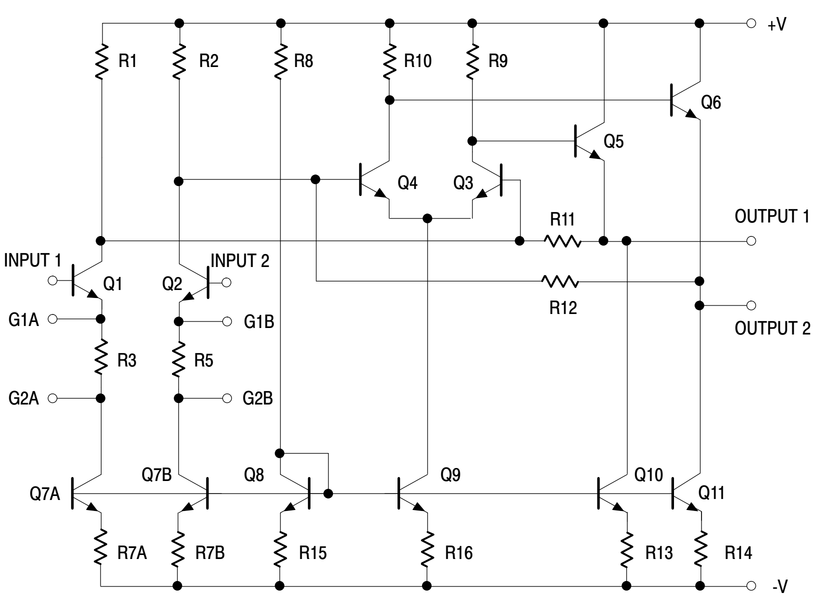

Figure 1. Block Diagram

ON Semiconductor®

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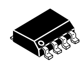
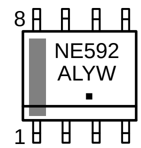
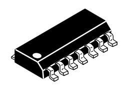
MARKING DIAGRAMS

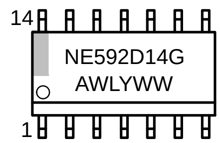


SOIC−8
D SUFFIX
CASE 751





SOIC−14
D SUFFIX
CASE 751A



A	= Assembly Location
L, WL	= Wafer Lot
Y	= Year
W, WW	= Work Week
▪ or G	= Pb−Free Package

ORDERING INFORMATION

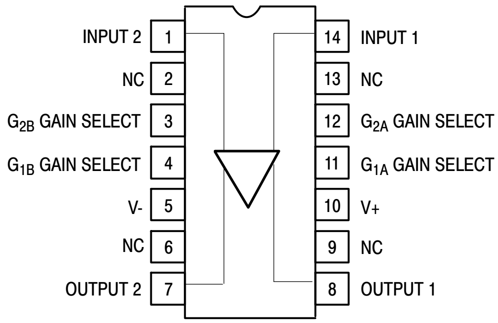
See detailed ordering and shipping information in the package dimensions section on page 8 of this data sheet.

March, 2016 − Rev. 5

Publication Order Number:
NE592/D

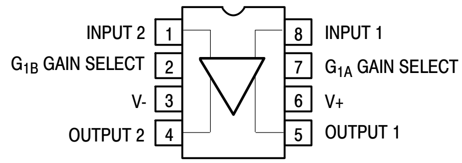
PIN CONNECTIONS

SOIC−14



(Top View)

SOIC−8



(Top View)

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) SOIC-14 Package SOIC-8 Package	$P_{D\ MAX}$	 0.98 0.79	W
Thermal Resistance, Junction−to−Ambient SOIC-14 Package SOIC-8 Package	$R_{\theta JA}$	 145 182	°C/W

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Derate above 25°C at the following rates:
   SOIC-14 package at 6.9 mW/°C
   SOIC-8 package at 5.5 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	Test Conditions	Symbol	Min	Typ	Max	Unit
Differential Voltage Gain Gain 1 (Note 2) Gain 2 (Notes 3 and 4)	R_L = 2.0 kΩ, V_{OUT} = 3.0 V_{P-P}	A_{VOL}	 250 80	 400 100	 600 120	V/V
Input Resistance Gain 1 (Note 2) Gain 2 (Notes 3 and 4)	 – T_A = 25°C 0°C ≤ T_A ≤ 70°C	R_{IN}	 – 10 8.0	 4.0 30 –	 – – –	kΩ
Input Capacitance	Gain 2 (Note 4)	C_{IN}	–	2.0	–	pF
Input Offset Current	T_A = 25°C 0°C ≤ T_A ≤ 70°C	I_{OS}	– –	0.4 –	5.0 6.0	μA
Input Bias Current	T_A = 25°C 0°C ≤ T_A ≤ 70°C	I_{BIAS}	– –	9.0 –	30 40	μA
Input Noise Voltage	BW 1.0 kHz to 10 MHz	V_{NOISE}	–	12	–	$μV_{RMS}$
Input Voltage Range	–	V_{IN}	±1.0	–	–	V
Common-Mode Rejection Ratio Gain 2 (Note 4)	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	CMRR	60 50 –	86 – 60	– – –	dB
Supply Voltage Rejection Ratio Gain 2 (Note 4)	ΔV_S = ±0.5 V	PSRR	50	70	–	dB
Output Offset Voltage Gain 1 Gain 2 (Note 4) Gain 3 (Note 5) Gain 3 (Note 5)	 R_L = ∞ R_L = ∞ R_L = ∞, T_A = 25°C R_L = ∞, 0°C ≤ T_A ≤ 70°C	V_{OS}	 – – – –	 – – 0.35 –	 1.5 1.5 0.75 1.0	V
Output Common-Mode Voltage	R_L = ∞, T_A = 25°C	V_{CM}	2.4	2.9	3.4	V
Output Voltage Swing Differential	R_L = 2.0 kΩ, T_A = 25°C R_L = 2.0 kΩ, 0°C ≤ T_A ≤ 70°C	V_{OUT}	3.0 2.8	4.0 –	– –	V
Output Resistance	–	R_{OUT}	–	20	–	Ω
Power Supply Current	R_L = ∞, T_A = 25°C R_L = ∞, 0°C ≤ T_A ≤ 70°C	I_{CC}	– –	18 –	24 27	mA

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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	Test Conditions	Symbol	Min	Typ	Max	Unit
Bandwidth Gain 1 (Note 2) Gain 2 (Notes 3 and 4)	–	BW	 – –	 40 90	 – –	MHz
Rise Time Gain 1 (Note 2) Gain 2 (Notes 3 and 4)	V_{OUT} = 1.0 V_{P-P}	t_R	 – –	 10.5 4.5	 12 –	ns
Propagation Delay Gain 1 (Note 2) Gain 2 (Notes 3 and 4)	V_{OUT} = 1.0 V_{P-P}	t_{PD}	 – –	 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. Applies to 14-pin version only.
5. All gain select pins open.

TYPICAL PERFORMANCE CHARACTERISTICS

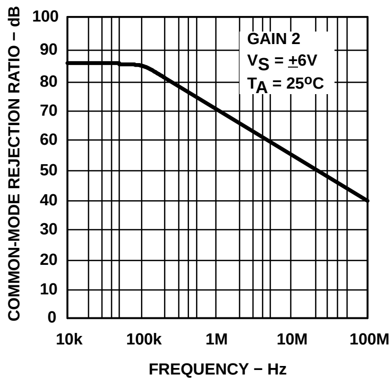


Figure 2. Common−Mode Rejection Ratio as a Function of Frequency

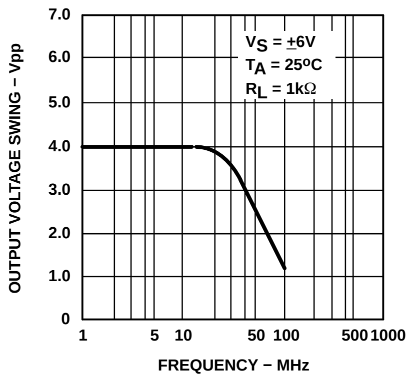


Figure 3. Output Voltage Swing as a Function of Frequency

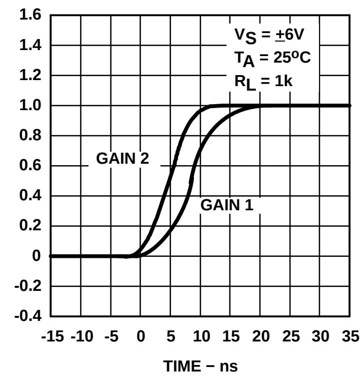


Figure 4. Pulse Response

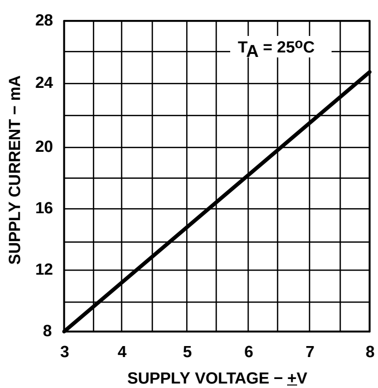


Figure 5. Supply Current as a Function of Temperature

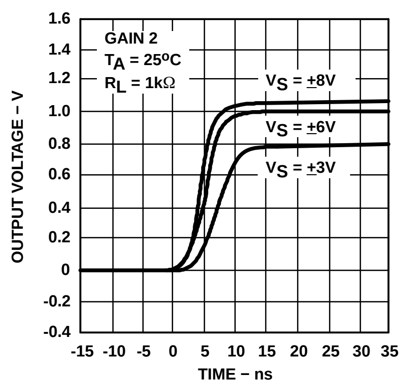


Figure 6. Pulse Response as a Function of Supply Voltage

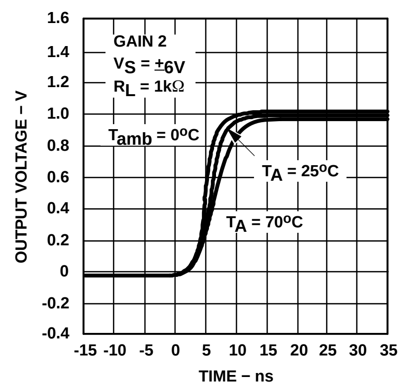


Figure 7. Pulse Response as a Function of Temperature

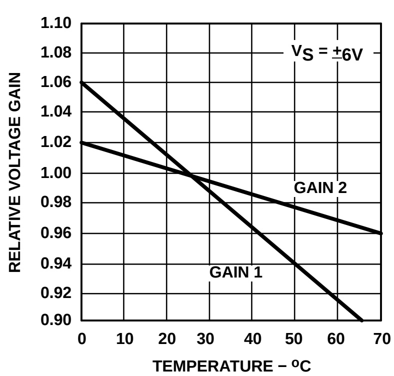


Figure 8. Voltage Gain as a Function of Temperature

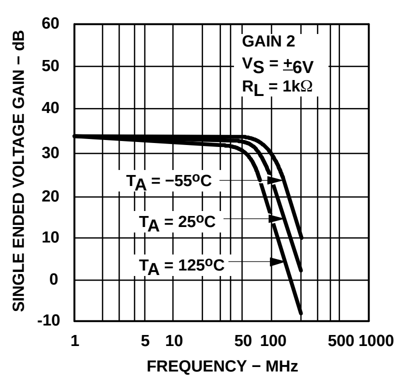


Figure 9. Gain vs. Frequency as a Function of Temperature

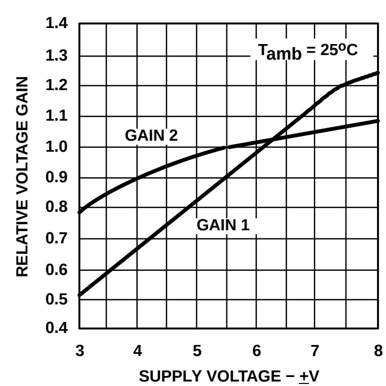


Figure 10. Voltage Gain as a Function of Supply Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

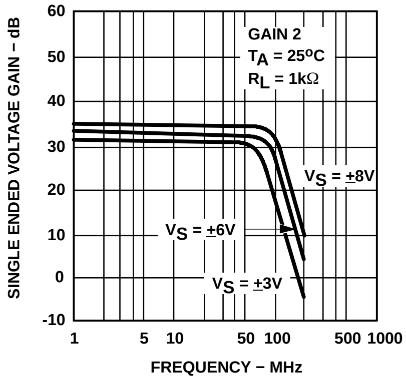


Figure 11. Gain vs. Frequency as a Function of Supply Voltage

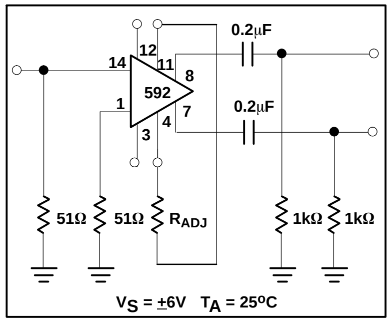


Figure 12. Voltage Gain Adjust Circuit

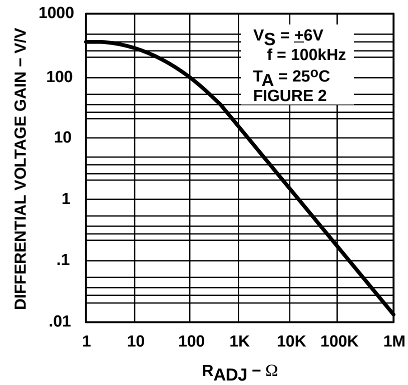


Figure 13. Voltage Gain as a Function of RADJ (Figure 2)

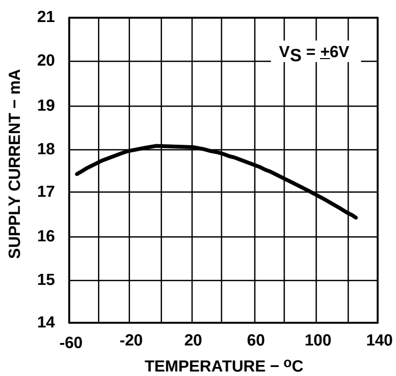


Figure 14. Supply Current as a Function of Temperature

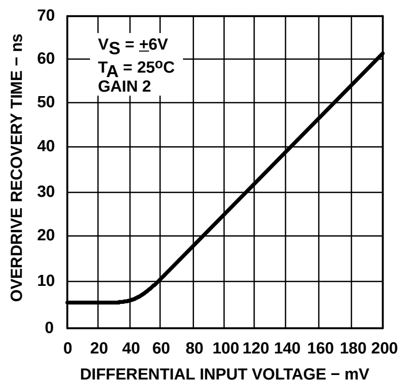


Figure 15. Differential Overdrive Recovery Time

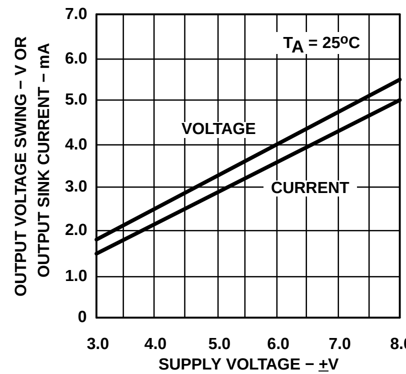


Figure 16. Output Voltage and Current Swing as a Function of Supply Voltage

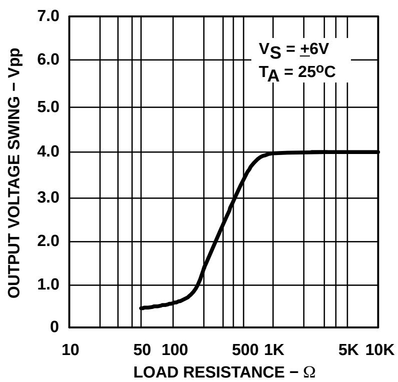


Figure 17. Output Voltage Swing as a Function of Load Resistance

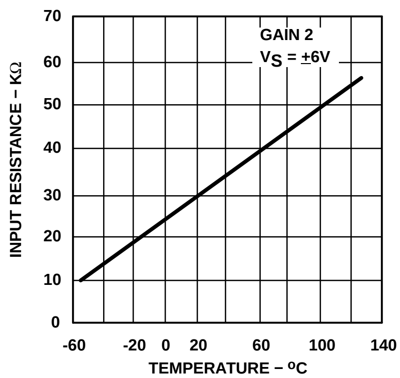


Figure 18. Input Resistance as a Function of Temperature

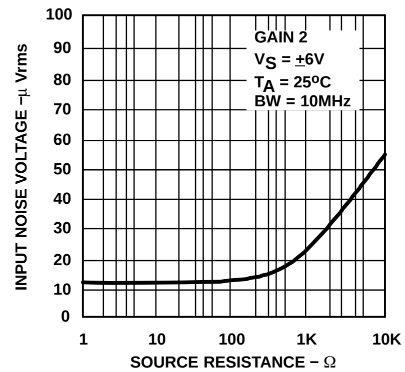


Figure 19. Input Noise Voltage as a Function of Source Resistance

TYPICAL PERFORMANCE CHARACTERISTICS

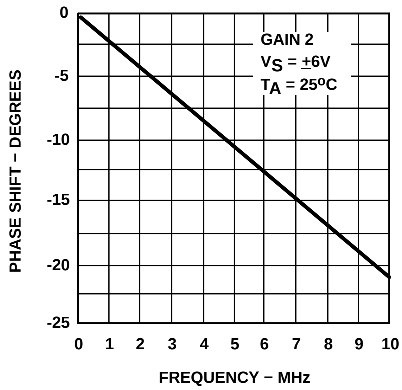


Figure 20. Phase Shift as a Function of Frequency

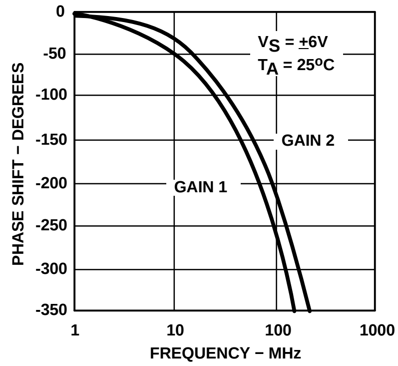


Figure 21. Phase Shift as a Function of Frequency

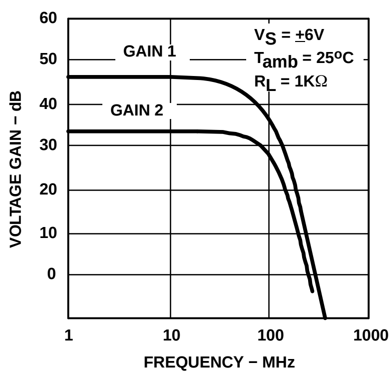


Figure 22. Voltage Gain as a Function of Frequency

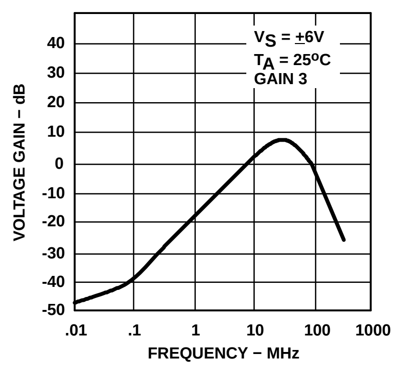


Figure 23. Voltage Gain as a Function of Frequency

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

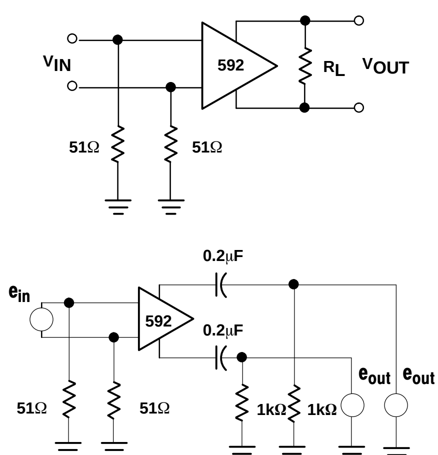
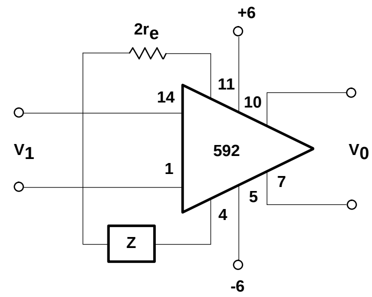


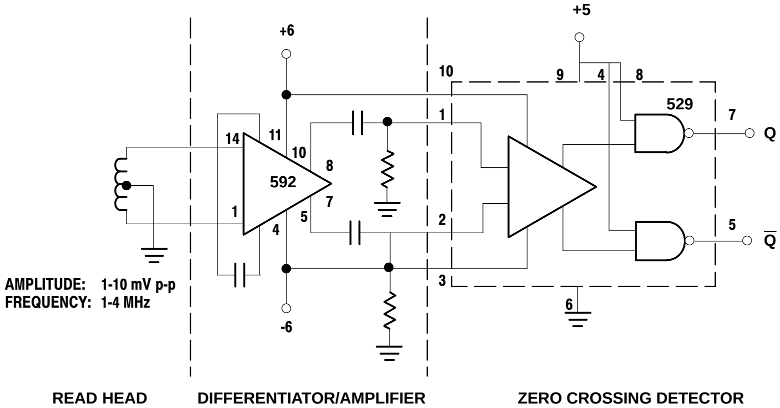
Figure 24. Test Circuits

NOTE:

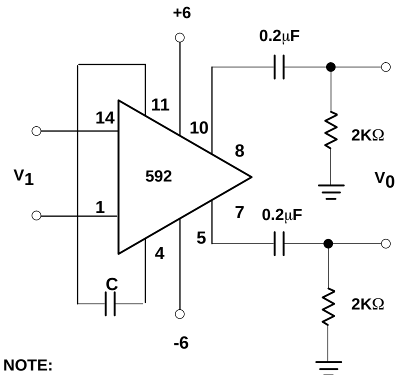
$$\frac{V_0(s)}{v_1(s)} \approx \frac{1.4 \cdot 10^4}{Z(S) + 2r_e} \approx \frac{1.4 \cdot 10^4}{Z(S) + 32}$$



Basic Configuration



Disc/Tape Phase-Modulated Readback Systems

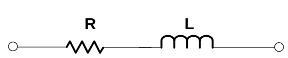
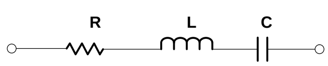
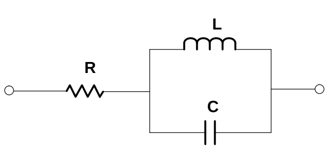


NOTE:
For frequency $F_1 << 1/2\ \pi\ (32)\ C$

$$V_O \approx 1.4 \times 10^4 C\ \frac{dVi}{dT}$$

Differentiation with High Common-Mode Noise Rejection

Figure 25. Typical Applications

Z NETWORK	FILTER TYPE	$\frac{V_0\ (s)}{V_1\ (s)}$ TRANSFER 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

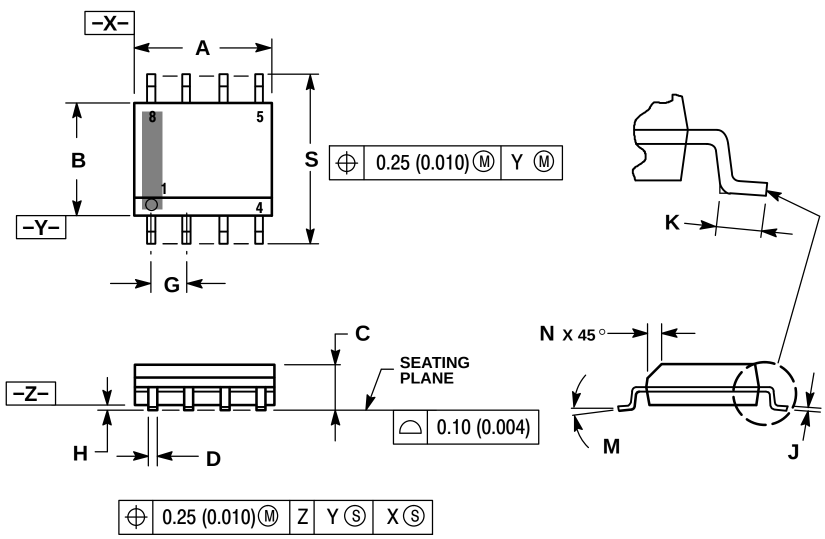
ORDERING INFORMATION

Device	Temperature Range	Package	Shipping†
NE592D8G	0 to +70°C	SOIC−8 (Pb−Free)	98 Units/Rail
NE592D8R2G			2500 / Tape & Reel
NE592D14G		SOIC−14 (Pb−Free)	55 Units/Rail
NE592D14R2G			2500 / Tape & Reel

†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

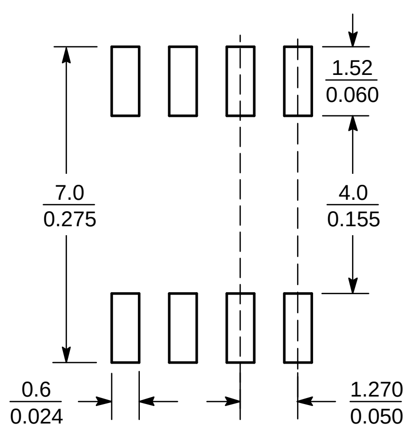
SOIC−8 NB
CASE 751−07
ISSUE AK



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

SOLDERING FOOTPRINT*

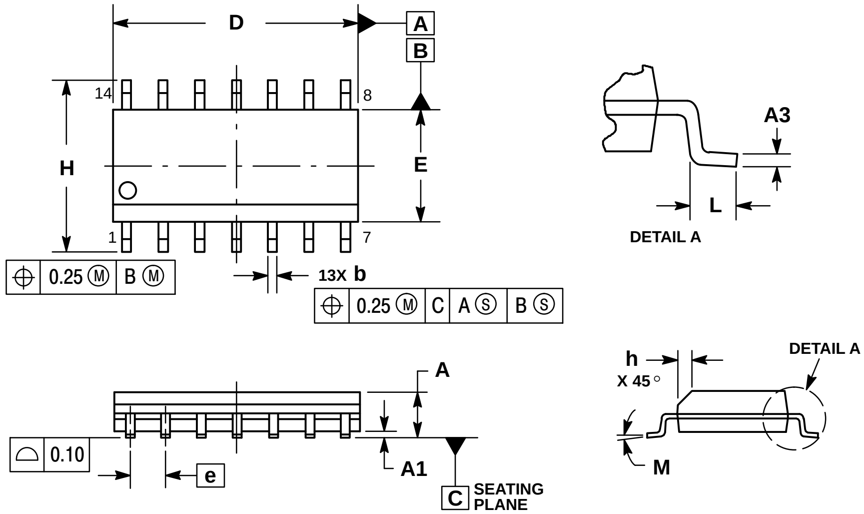


SCALE 6:1 (mm / inches)

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PACKAGE DIMENSIONS

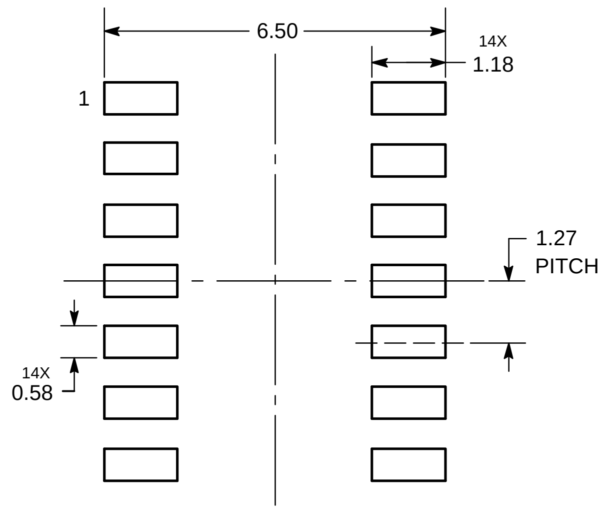
SOIC−14
CASE 751A−03
ISSUE L



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF AT MAXIMUM MATERIAL CONDITION.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSIONS.
5. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	1.35	1.75	0.054	0.068
A1	0.10	0.25	0.004	0.010
A3	0.19	0.25	0.008	0.010
b	0.35	0.49	0.014	0.019
D	8.55	8.75	0.337	0.344
E	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
H	5.80	6.20	0.228	0.244
h	0.25	0.50	0.010	0.019
L	0.40	1.25	0.016	0.049
M	0°	7°	0°	7°

SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
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