

# Video amplifier

# NE592

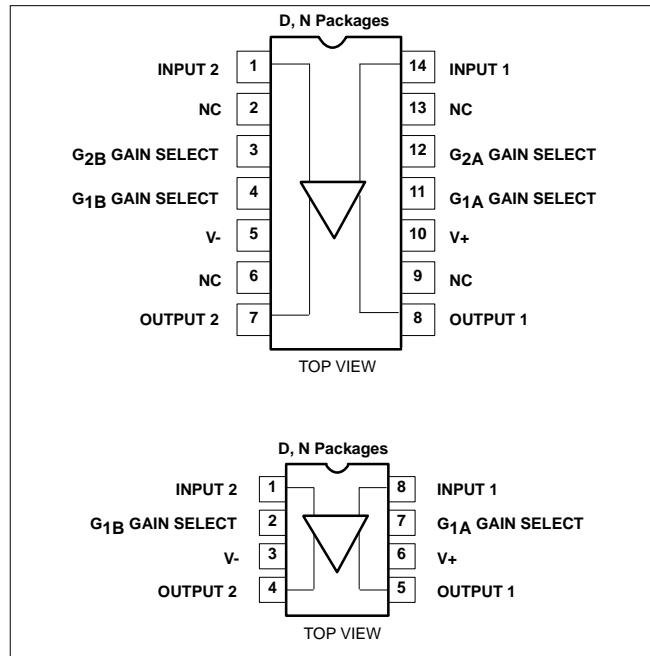
## DESCRIPTION

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

- 120MHz 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

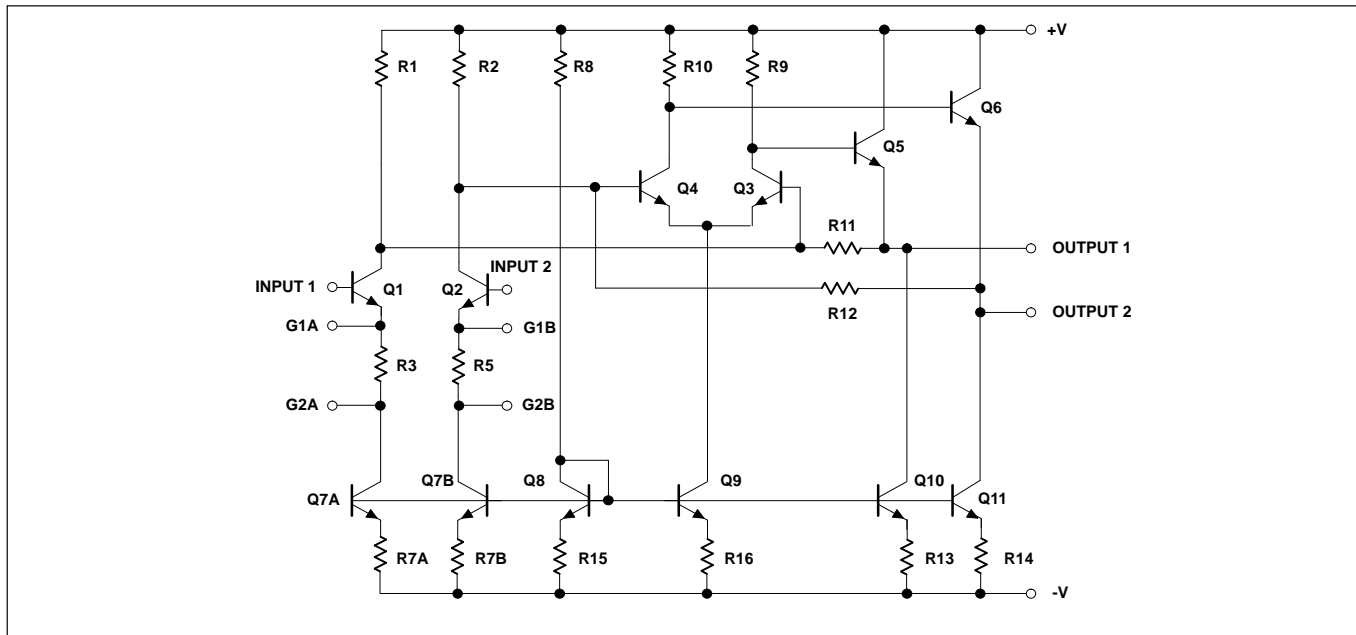
## PIN CONFIGURATIONS



## APPLICATIONS

- Floppy disk head amplifier
- Video amplifier
- Pulse amplifier in communications
- Magnetic memory
- Video recorder systems

## BLOCK DIAGRAM



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## ORDERING INFORMATION

| DESCRIPTION                               | TEMPERATURE RANGE | ORDER CODE | DWG # |
|---|-------------------|------------|-------|
| 14-Pin Plastic Dual In-Line Package (DIP) | 0 to +70°C        | NE592N14   | 0405B |
| 14-Pin Small Outline (SO) package         | 0 to +70°C        | NE592D14   | 0175D |
| 8-Pin Plastic Dual In-Line Package (DIP)  | 0 to +70°C        | NE592N8    | 0404B |
| 8-Pin Small Outline (SO) package          | 0 to +70°C        | NE592D8    | 0174C |

## NOTES:

N8, N14, D8 and D14 package parts also available in "High" gain version by adding "H" before package designation, i.e., NE592HDB

## ABSOLUTE MAXIMUM RATINGS

$T_A = +25^\circ\text{C}$ , unless otherwise specified.

| SYMBOL       | PARAMETER   | RATING      | UNIT |
|--------------|---|-------------|------|
| $V_{CC}$     | Supply voltage  | $\pm 8$     | V    |
| $V_{IN}$     | Differential input voltage  | $\pm 5$     | V    |
| $V_{CM}$     | Common-mode input voltage   | $\pm 6$     | V    |
| $I_{OUT}$    | Output current  | 10          | mA   |
| $T_A$        | Operating ambient temperature range   | 0 to +70    | °C   |
| $T_{STG}$    | Storage temperature range   | -65 to +150 | °C   |
| $P_{D\ MAX}$ | Maximum power dissipation,<br>$T_A = 25^\circ\text{C}$ (still air) <sup>1</sup> |             |      |
|              | D-14 package  | 0.98        | W    |
|              | D-8 package   | 0.79        | W    |
|              | N-14 package  | 1.44        | W    |
|              | N-8 package   | 1.17        | W    |

## NOTES:

- Derate above 25°C at the following rates:
  - D-14 package at 7.8mW/°C
  - D-8 package at 6.3mW/°C
  - N-14 package at 11.5mW/°C
  - N-8 package at 9.3mW/°C

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**DC ELECTRICAL CHARACTERISTICS**

$T_A=+25^{\circ}\text{C}$ ,  $V_{SS}=\pm 6\text{V}$ ,  $V_{CM}=0$ , unless otherwise specified. Recommended operating supply voltages  $V_S=\pm 6.0\text{V}$ . All specifications apply to both standard and high gain parts unless noted differently.

| SYMBOL      | PARAMETER  | TEST CONDITIONS  | NE592     |      |      | UNIT                |
|-------------|--|--|-----------|------|------|---------------------|
|             |  |  | Min       | Typ  | Max  |                     |
| $A_{VOL}$   | Differential voltage gain,<br>standard part<br>Gain 1 <sup>1</sup><br>Gain 2 <sup>2, 4</sup> | $R_L=2\text{k}\Omega$ , $V_{OUT}=3V_{P-P}$   | 250       | 400  | 600  | V/V                 |
|             |  |  | 80        | 100  | 120  | V/V                 |
| $R_{IN}$    | Input resistance<br>Gain 1 <sup>1</sup><br>Gain 2 <sup>2, 4</sup>                            |  |           | 4.0  |      | k $\Omega$          |
|             |  |  | 10        | 30   |      | k $\Omega$          |
| $C_{IN}$    | Input capacitance <sup>2</sup>   | Gain 2 <sup>4</sup>  |           | 2.0  |      | pF                  |
| $I_{OS}$    | Input offset current   |  |           | 0.4  | 5.0  | $\mu\text{A}$       |
| $I_{BIAS}$  | Input bias current   |  |           | 9.0  | 30   | $\mu\text{A}$       |
| $V_{NOISE}$ | Input noise voltage  | BW 1kHz to 10MHz   |           | 12   |      | $\mu\text{V}_{RMS}$ |
| $V_{IN}$    | Input voltage range  |  | $\pm 1.0$ |      |      | V                   |
| CMRR        | Common-mode rejection ratio<br>Gain 2 <sup>4</sup><br>Gain 2 <sup>4</sup>                    | $V_{CM}\pm 1\text{V}$ , $f<100\text{kHz}$<br>$V_{CM}\pm 1\text{V}$ , $f=5\text{MHz}$ | 60        | 86   |      | dB                  |
|             |  |  |           | 60   |      | dB                  |
| PSRR        | Supply voltage rejection ratio<br>Gain 2 <sup>4</sup>  | $\Delta V_S=\pm 0.5\text{V}$   | 50        | 70   |      | dB                  |
| $V_{OS}$    | Output offset voltage<br>Gain 1<br>Gain 2 <sup>4</sup><br>Gain 3 <sup>3</sup>                | $R_L=\infty$   |           |      | 1.5  | V                   |
|             |  |  |           |      | 1.5  | V                   |
|             |  |  |           | 0.35 | 0.75 | V                   |
| $V_{CM}$    | Output common-mode voltage   | $R_L=\infty$   | 2.4       | 2.9  | 3.4  | V                   |
| $V_{OUT}$   | Output voltage swing<br>differential   | $R_L=2\text{k}\Omega$  | 3.0       | 4.0  |      | V                   |
| $R_{OUT}$   | Output resistance  |  |           | 20   |      | $\Omega$            |
| $I_{CC}$    | Power supply current   | $R_L=\infty$   |           | 18   | 24   | mA                  |

**NOTES:**

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

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**DC ELECTRICAL CHARACTERISTICS**

DC Electrical Characteristics  $V_{SS}=\pm 6V$ ,  $V_{CM}=0$ ,  $0^{\circ}C \leq T_A \leq 70^{\circ}C$ , unless otherwise specified. Recommended operating supply voltages  $V_S=\pm 6.0V$ . All specifications apply to both standard and high gain parts unless noted differently.

| SYMBOL     | PARAMETER  | TEST CONDITIONS                     | NE592     |     |     | UNIT       |
|------------|--|-------------------------------------|-----------|-----|-----|------------|
|            |  |                                     | Min       | Typ | Max |            |
| $A_{VOL}$  | Differential voltage gain,<br>standard part<br>Gain 1 <sup>1</sup><br>Gain 2 <sup>2, 4</sup> | $R_L=2k\Omega$ , $V_{OUT}=3V_{P-P}$ | 250       |     | 600 | V/V        |
|            |  |                                     | 80        |     | 120 | V/V        |
| $R_{IN}$   | Input resistance<br>Gain 2 <sup>2, 4</sup>   |                                     | 8.0       |     |     | k $\Omega$ |
| $I_{OS}$   | Input offset current   |                                     |           |     | 6.0 | $\mu A$    |
| $I_{BIAS}$ | Input bias current   |                                     |           |     | 40  | $\mu A$    |
| $V_{IN}$   | Input voltage range  |                                     | $\pm 1.0$ |     |     | V          |
| CMRR       | Common-mode rejection ratio<br>Gain 2 <sup>4</sup>   | $V_{CM}\pm 1V$ , $f<100kHz$         | 50        |     |     | dB         |
| PSRR       | Supply voltage rejection ratio<br>Gain 2 <sup>4</sup>  | $\Delta V_S=\pm 0.5V$               | 50        |     |     | dB         |
| $V_{OS}$   | Output offset voltage<br>Gain 1<br>Gain 2 <sup>4</sup><br>Gain 3 <sup>3</sup>                | $R_L=\infty$                        |           |     | 1.5 | V          |
|            |  |                                     |           |     | 1.5 |            |
|            |  |                                     |           |     | 1.0 |            |
| $V_{OUT}$  | Output voltage swing differential  | $R_L=2k\Omega$                      | 2.8       |     |     | V          |
| $I_{CC}$   | Power supply current   | $R_L=\infty$                        |           |     | 27  | mA         |

**NOTES:**

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

**AC ELECTRICAL CHARACTERISTICS**

$T_A=+25^{\circ}C$   $V_{SS}=\pm 6V$ ,  $V_{CM}=0$ , unless otherwise specified. Recommended operating supply voltages  $V_S=\pm 6.0V$ . All specifications apply to both standard and high gain parts unless noted differently.

| SYMBOL   | PARAMETER  | TEST CONDITIONS    | NE/SA592 |      |     | UNIT       |
|----------|--|--------------------|----------|------|-----|------------|
|          |  |                    | Min      | Typ  | Max |            |
| BW       | Bandwidth<br>Gain 1 <sup>1</sup><br>Gain 2 <sup>2, 4</sup>         |                    |          | 40   |     | MHz<br>MHz |
|          |  |                    |          | 90   |     |            |
| $t_R$    | Rise time<br>Gain 1 <sup>1</sup><br>Gain 2 <sup>2, 4</sup>         | $V_{OUT}=1V_{P-P}$ |          | 10.5 | 12  | ns<br>ns   |
|          |  |                    |          | 4.5  |     |            |
| $t_{PD}$ | Propagation delay<br>Gain 1 <sup>1</sup><br>Gain 2 <sup>2, 4</sup> | $V_{OUT}=1V_{P-P}$ |          | 7.5  | 10  | ns<br>ns   |
|          |  |                    |          | 6.0  |     |            |

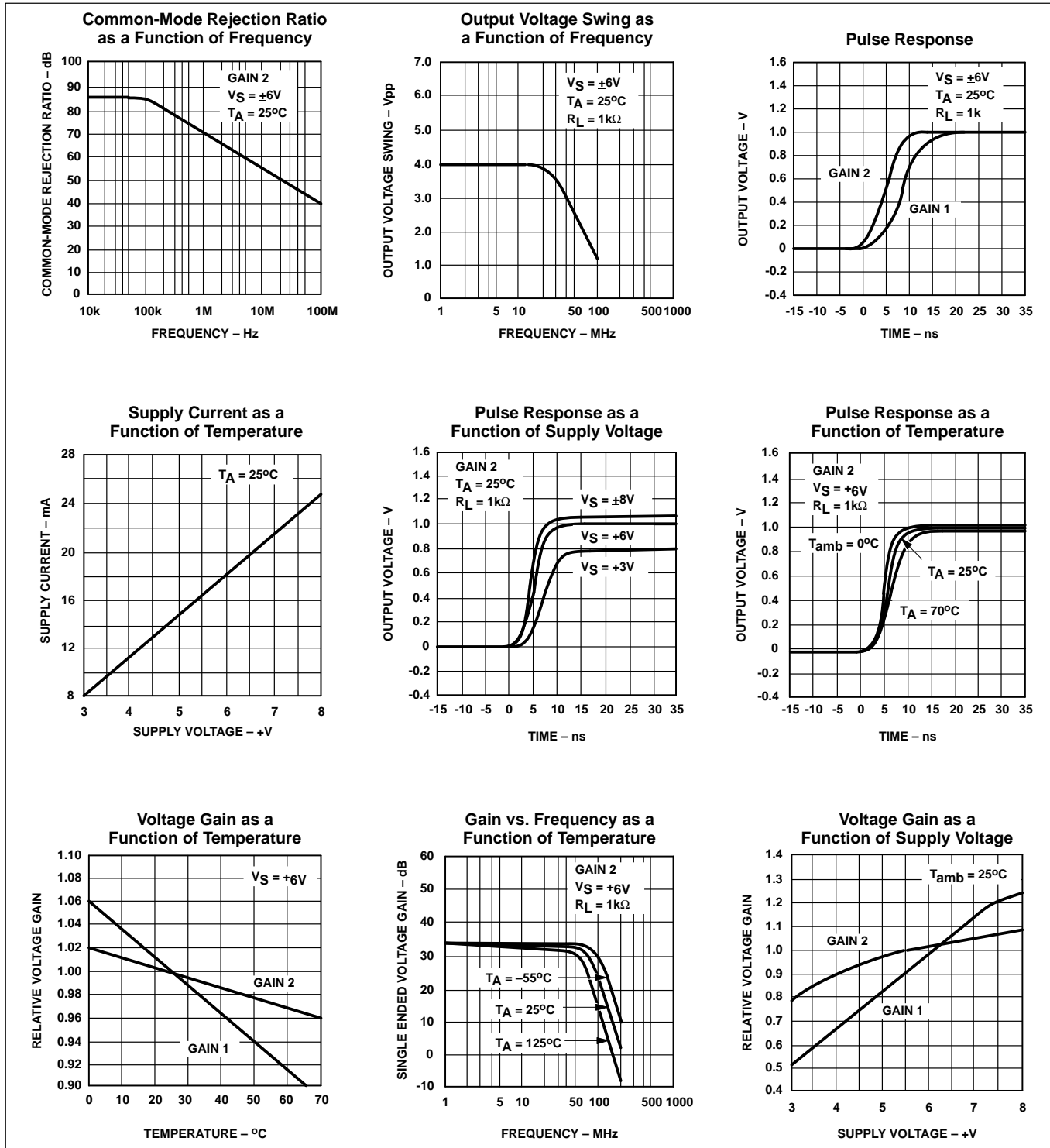
**NOTES:**

- Gain select Pins  $G_{1A}$  and  $G_{1B}$  connected together.
- Gain select Pins  $G_{2A}$  and  $G_{2B}$  connected together.
- All gain select pins open.
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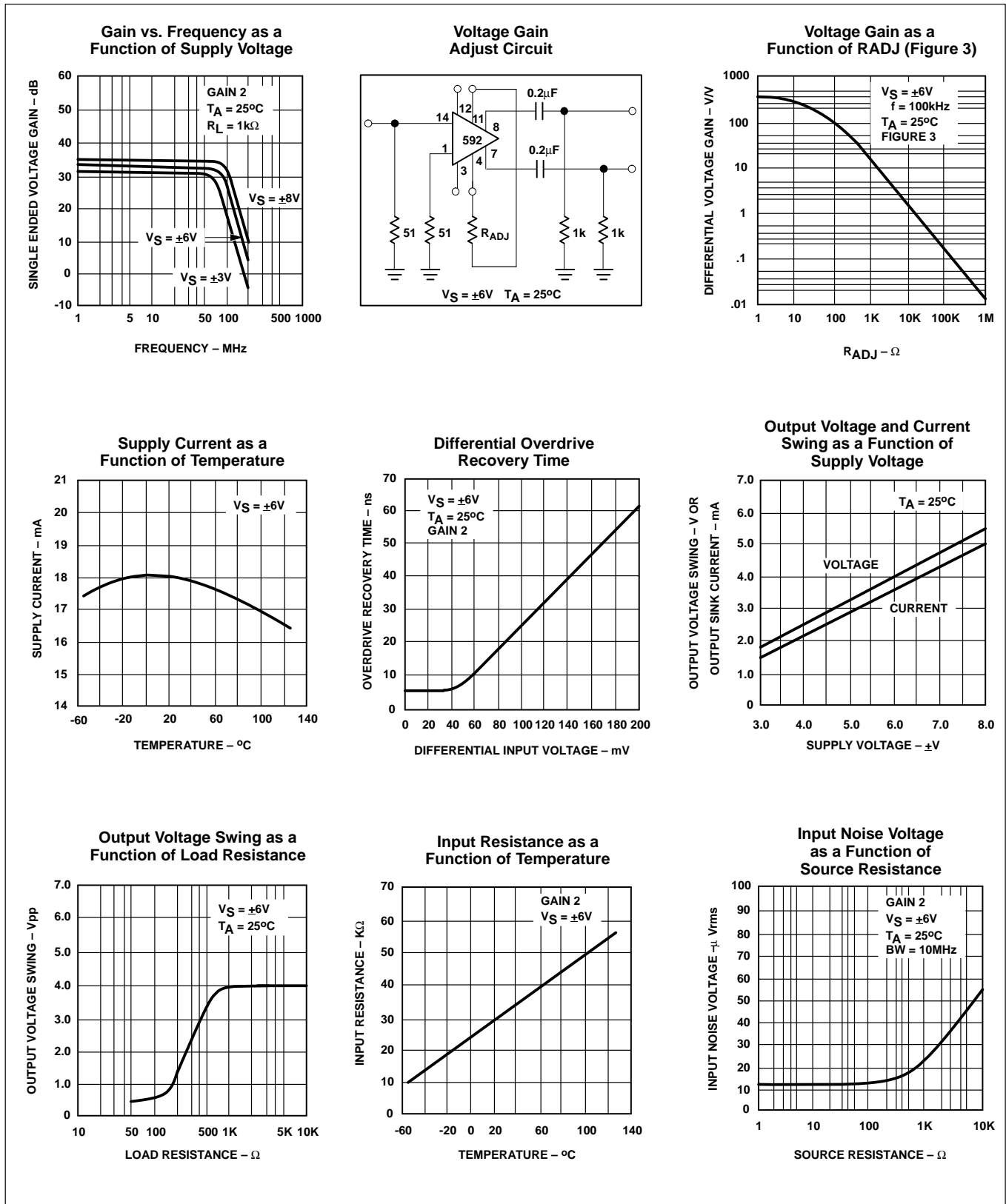
## TYPICAL PERFORMANCE CHARACTERISTICS



# Video amplifier

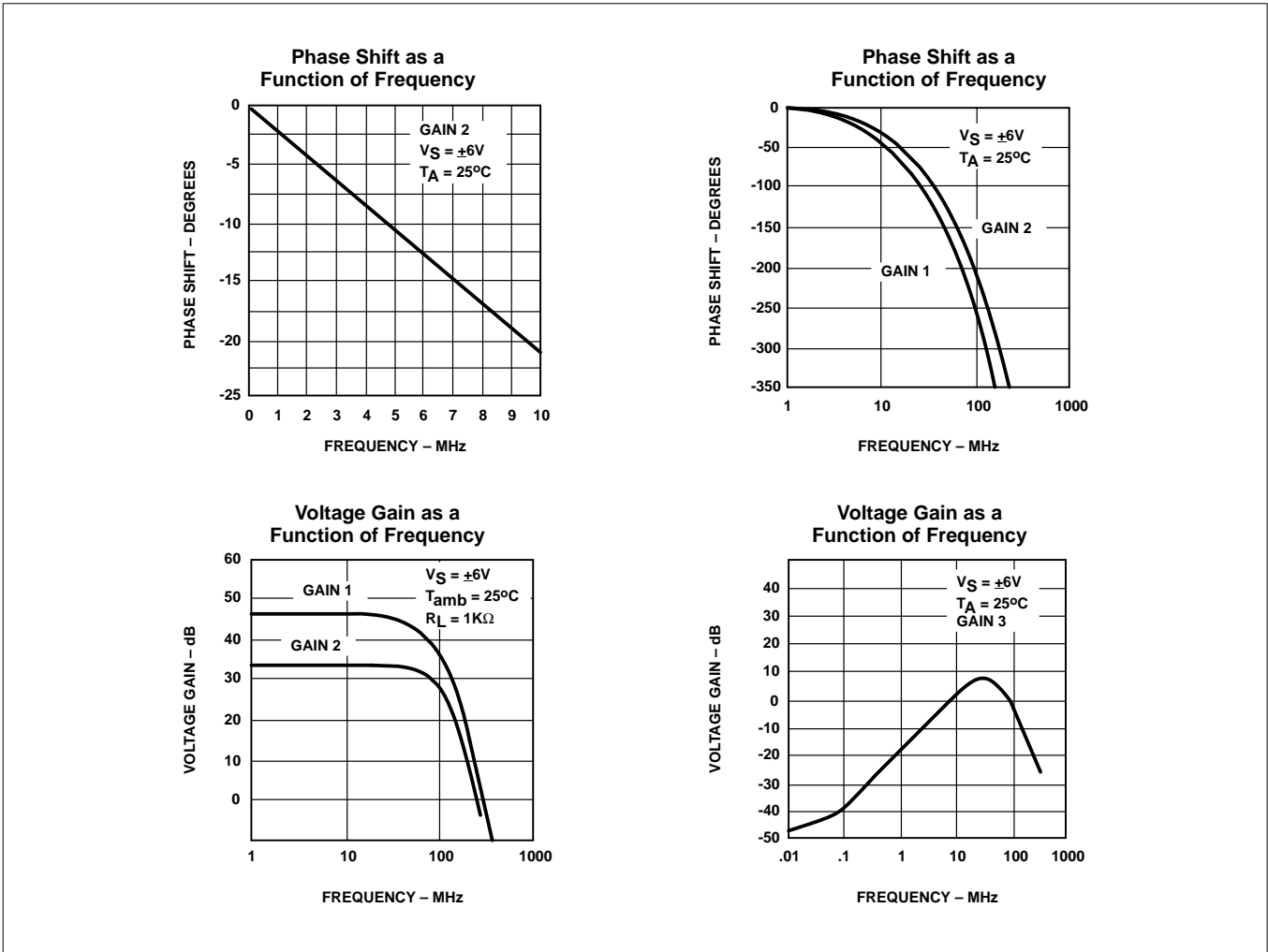
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## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

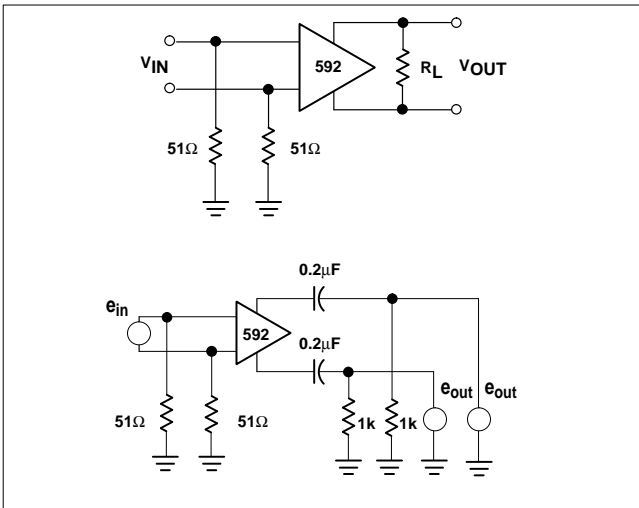


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**TEST CIRCUITS** TA = 25°C, unless otherwise specified.



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## TYPICAL APPLICATIONS

**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**

**Differentiation with High Common-Mode Noise Rejection**

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

$$V_O \approx 1.4 \times 10^4 C \frac{dV_i}{dt}$$

**Disc/Tape Phase-Modulated Readback Systems**

**AMPLITUDE:** 1-10 mV p-p  
**FREQUENCY:** 1-4 MHz

## FILTER NETWORKS

| Z NETWORK | FILTER TYPE        | V <sub>0</sub> (s) TRANSFER<br>V <sub>1</sub> (s) FUNCTION                      |
|-----------|--------------------|---|
|           | <b>LOW PASS</b>    | $\frac{1.4 \times 10^4}{L} \left[ \frac{1}{s + R/L} \right]$                    |
|           | <b>HIGH PASS</b>   | $\frac{1.4 \times 10^4}{R} \left[ \frac{s}{s + 1/RC} \right]$                   |
|           | <b>BAND PASS</b>   | $\frac{1.4 \times 10^4}{L} \left[ \frac{s}{s^2 + R/Ls + 1/LC} \right]$          |
|           | <b>BAND REJECT</b> | $\frac{1.4 \times 10^4}{R} \left[ \frac{s^2 + 1/LC}{s^2 + 1/LC + s/RC} \right]$ |

**NOTES:**  
In the networks above, the R value used is assumed to include 2r<sub>e</sub>, or approximately 32Ω.  
S = jω  
ω = 2πf