

Video amplifier

NE592

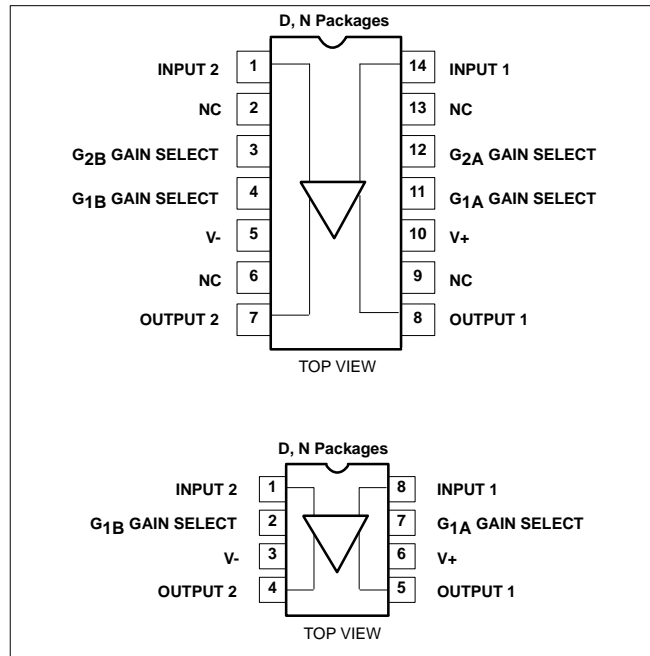
DESCRIPTION

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

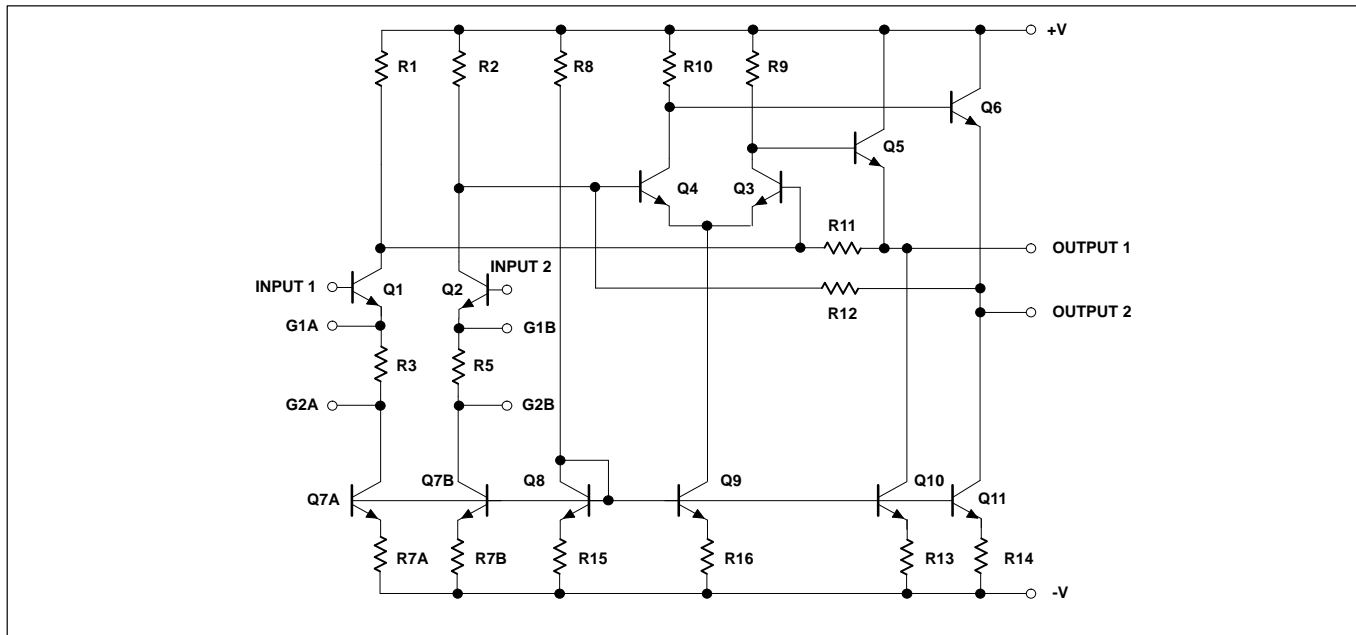
PIN CONFIGURATIONS



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 | ± 8 | V |
| V_{IN} | Differential input voltage | ± 5 | V |
| V_{CM} | Common-mode input voltage | ± 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, $T_A = 25^\circ\text{C}$ (still air) ¹ | | |
| | 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, standard part Gain 1 ¹ Gain 2 ^{2, 4} | $R_L=2\text{k}\Omega$, $V_{OUT}=3V_{P-P}$ | 250 | 400 | 600 | V/V |
| | | | 80 | 100 | 120 | V/V |
| R_{IN} | Input resistance Gain 1 ¹ Gain 2 ^{2, 4} | | | 4.0 | | k Ω |
| | | | 10 | 30 | | k Ω |
| C_{IN} | Input capacitance ² | Gain 2 ⁴ | | 2.0 | | pF |
| I_{OS} | Input offset current | | | 0.4 | 5.0 | μA |
| I_{BIAS} | Input bias current | | | 9.0 | 30 | μA |
| V_{NOISE} | Input noise voltage | BW 1kHz to 10MHz | | 12 | | μV_{RMS} |
| V_{IN} | Input voltage range | | ± 1.0 | | | V |
| CMRR | Common-mode rejection ratio Gain 2 ⁴ Gain 2 ⁴ | $V_{CM}\pm 1\text{V}$, $f<100\text{kHz}$ $V_{CM}\pm 1\text{V}$, $f=5\text{MHz}$ | 60 | 86 | | dB |
| | | | | 60 | | dB |
| PSRR | Supply voltage rejection ratio Gain 2 ⁴ | $\Delta V_S=\pm 0.5\text{V}$ | 50 | 70 | | dB |
| V_{OS} | Output offset voltage Gain 1 Gain 2 ⁴ Gain 3 ³ | $R_L=\infty$ | | | 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 differential | $R_L=2\text{k}\Omega$ | 3.0 | 4.0 | | V |
| R_{OUT} | Output resistance | | | 20 | | Ω |
| 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, standard part Gain 1 ¹ Gain 2 ^{2, 4} | $R_L=2k\Omega$, $V_{OUT}=3V_{P-P}$ | 250 | | 600 | V/V |
| | | | 80 | | 120 | V/V |
| R_{IN} | Input resistance Gain 2 ^{2, 4} | | 8.0 | | | k Ω |
| I_{OS} | Input offset current | | | | 6.0 | μA |
| I_{BIAS} | Input bias current | | | | 40 | μA |
| V_{IN} | Input voltage range | | ± 1.0 | | | V |
| CMRR | Common-mode rejection ratio Gain 2 ⁴ | $V_{CM}\pm 1V$, $f<100kHz$ | 50 | | | dB |
| PSRR | Supply voltage rejection ratio Gain 2 ⁴ | $\Delta V_S=\pm 0.5V$ | 50 | | | dB |
| V_{OS} | Output offset voltage Gain 1 Gain 2 ⁴ Gain 3 ³ | $R_L=\infty$ | | | 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 Gain 1 ¹ Gain 2 ^{2, 4} | | | 40 | | MHz MHz |
| | | | | 90 | | |
| t_R | Rise time Gain 1 ¹ Gain 2 ^{2, 4} | $V_{OUT}=1V_{P-P}$ | | 10.5 | 12 | ns ns |
| | | | | 4.5 | | |
| t_{PD} | Propagation delay Gain 1 ¹ Gain 2 ^{2, 4} | $V_{OUT}=1V_{P-P}$ | | 7.5 | 10 | ns ns |
| | | | | 6.0 | | |

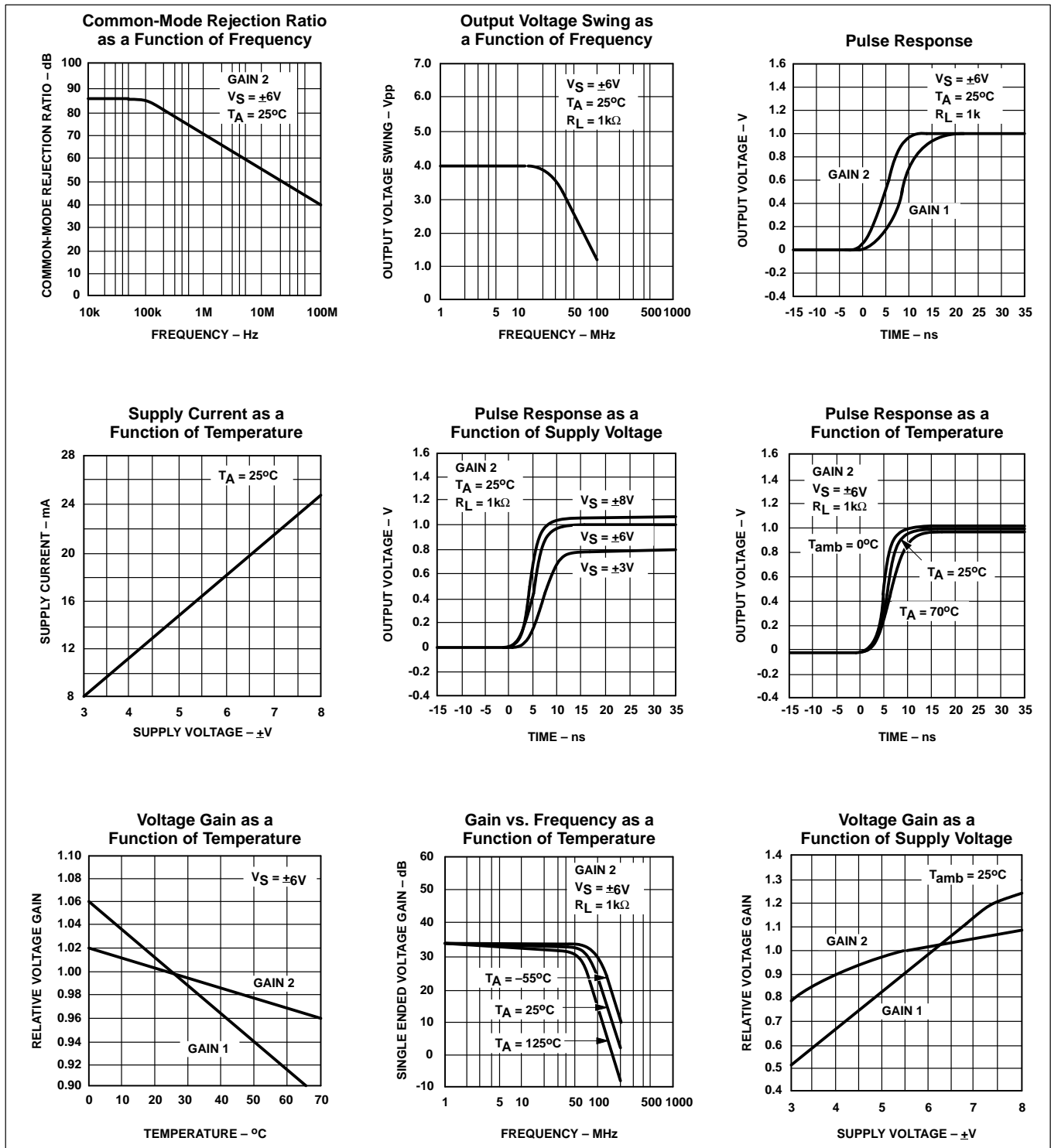
NOTES:

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

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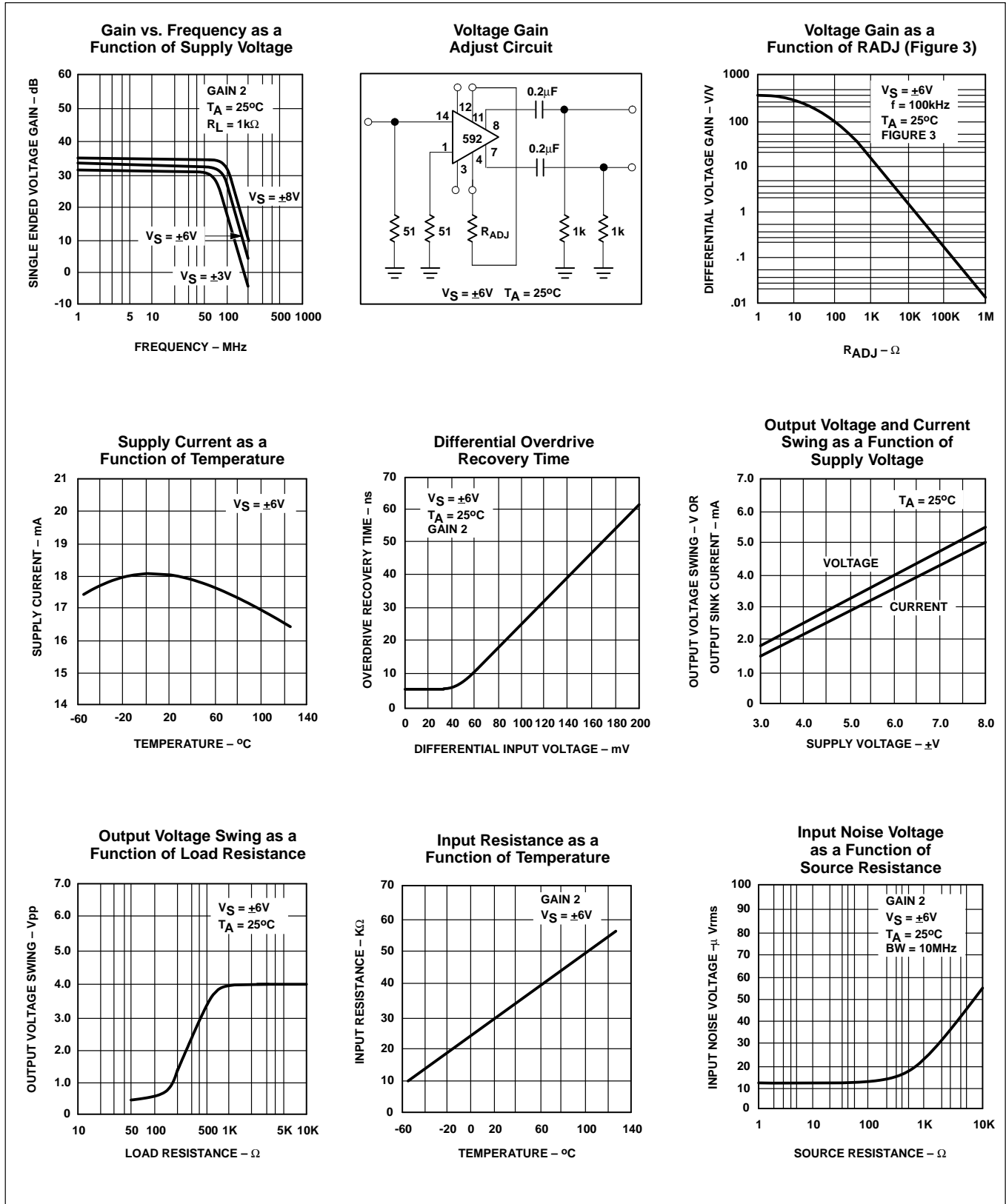
TYPICAL PERFORMANCE CHARACTERISTICS



Video amplifier

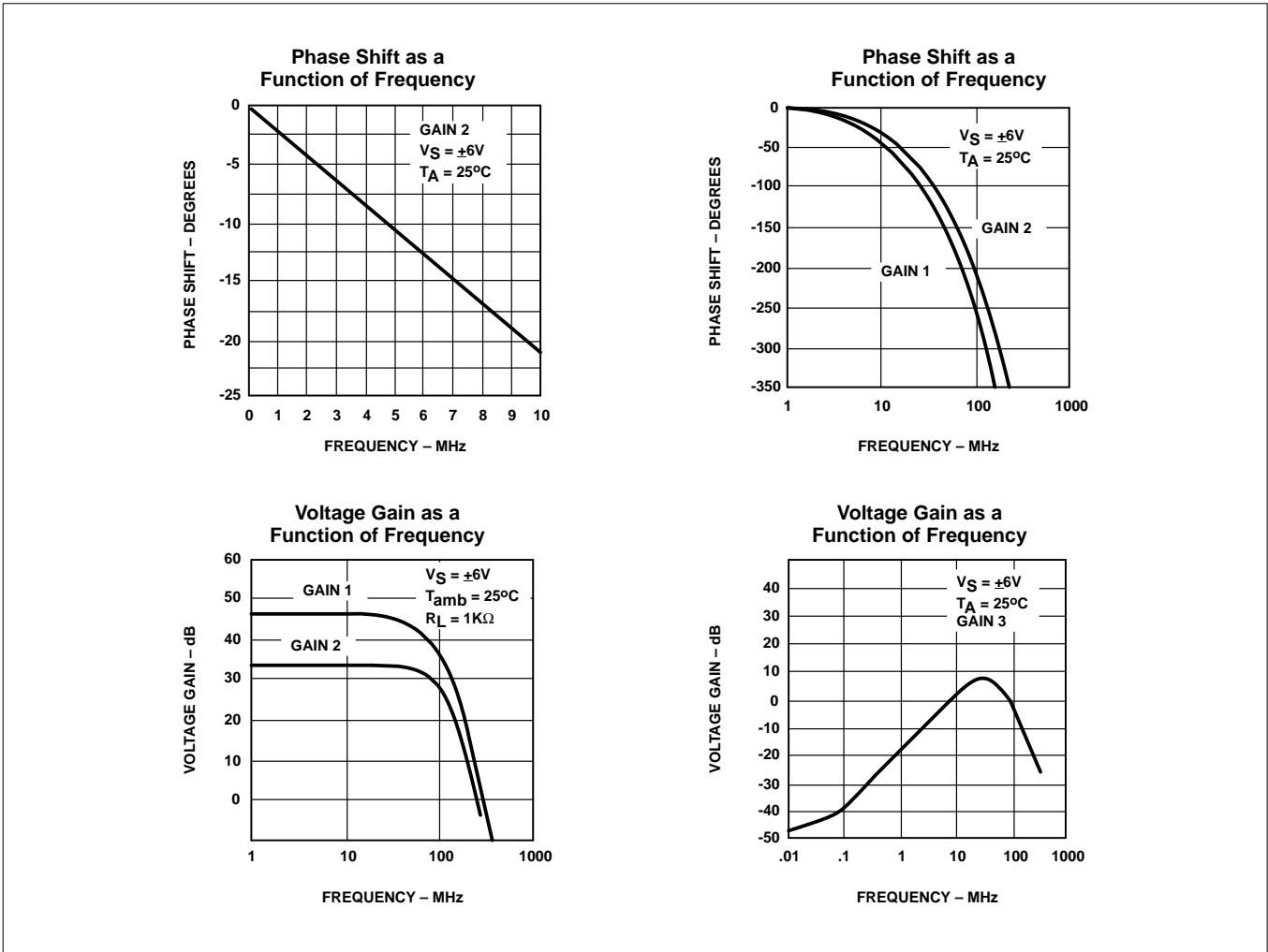
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TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

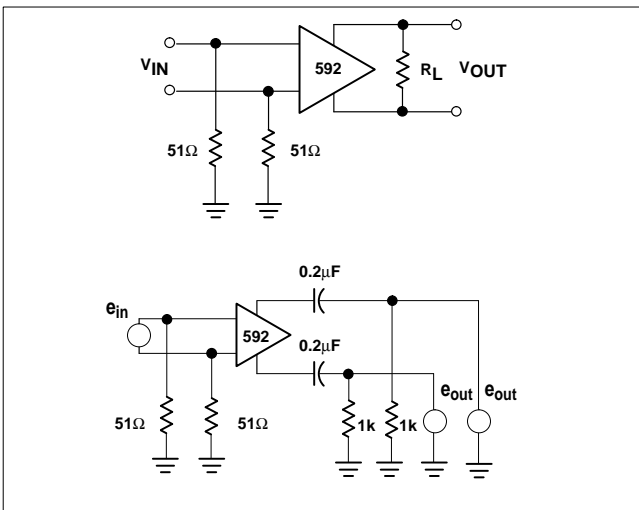


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TEST CIRCUITS TA = 25°C, unless otherwise specified.



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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 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 = jω
ω = 2πf