

# Video amplifier

# NE5592

## DESCRIPTION

The NE5592 is a dual monolithic, two-stage, differential output, wideband video amplifier. It offers a fixed gain of 400 without external components and an adjustable gain 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.

## FEATURES

- 110MHz unity gain bandwidth
- Adjustable gain from 0 to 400
- Adjustable pass band
- No frequency compensation required
- Wave shaping with minimal external components

## PIN CONFIGURATION

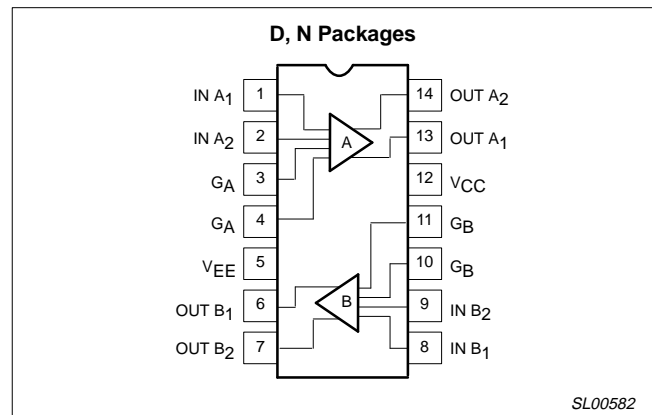


Figure 1. Pin Configuration

## APPLICATIONS

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

## ORDERING INFORMATION

| DESCRIPTION                               | TEMPERATURE RANGE | ORDER CODE | DWG #    |
|---|-------------------|------------|----------|
| 14-Pin Plastic Dual In-Line Package (DIP) | 0 to 70°C         | NE5592N    | SOT27-1  |
| 14-Pin Small Outline (SO) package         | 0 to 70°C         | NE5592D    | SOT108-1 |

## EQUIVALENT CIRCUIT

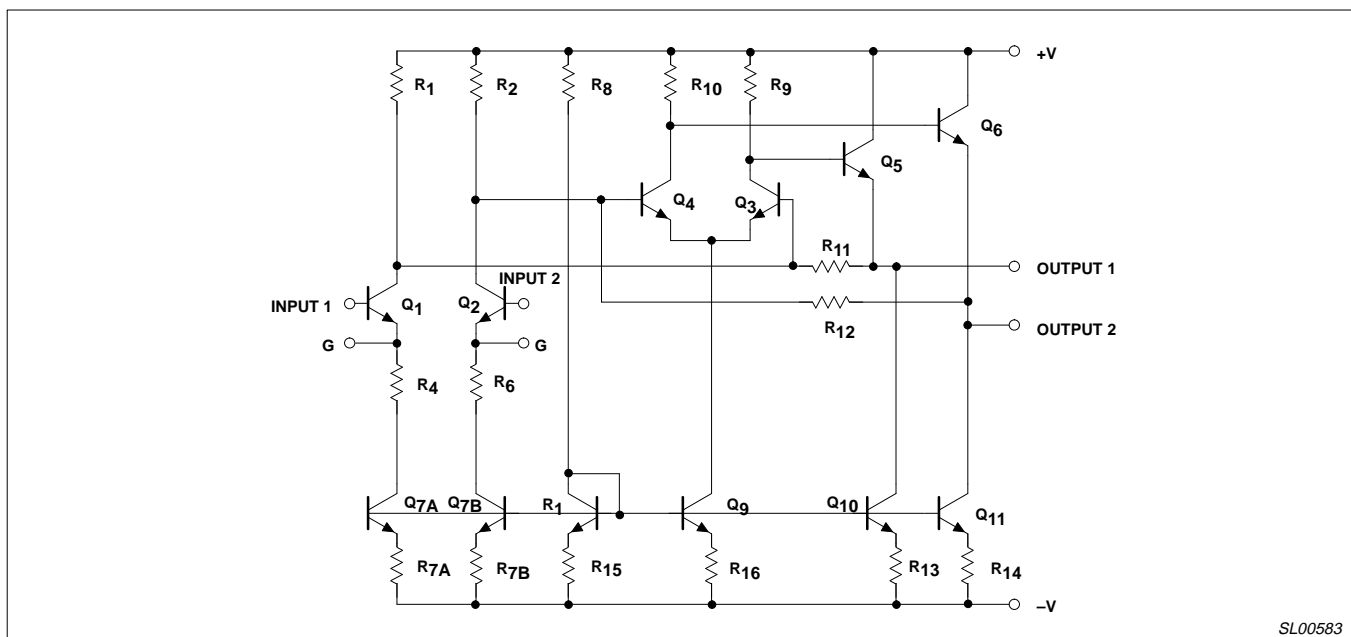


Figure 2. Equivalent Circuit

## Video amplifier

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## 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 temperature range<br>NE5592   | 0 to +70    | $^{\circ}\text{C}$ |
| $T_{STG}$          | Storage temperature range   | -65 to +150 | $^{\circ}\text{C}$ |
| $P_{D\text{ MAX}}$ | Maximum power dissipation,<br>$T_A=25^{\circ}\text{C}$ (still air) <sup>1</sup> |             |                    |
|                    | D package   | 1.03        | W                  |
|                    | N package   | 1.48        | W                  |

## NOTES:

- Derate above  $25^{\circ}\text{C}$  at the following rates:  
D package  $8.3\text{mW}/^{\circ}\text{C}$   
N package  $11.9\text{mW}/^{\circ}\text{C}$

## DC ELECTRICAL CHARACTERISTICS

$T_A=+25^{\circ}\text{C}$ ,  $V_{SS}=\pm 6\text{V}$ ,  $V_{CM}=0$ , unless otherwise specified. Recommended operating supply voltage is  $V_S = \pm 6.0\text{V}$ , and gain select pins are connected together.

| SYMBOL     | PARAMETER                                      | TEST CONDITIONS  | LIMITS    |             |             | UNITS                        |
|------------|--|--|-----------|-------------|-------------|------------------------------|
|            |  |  | Min       | Typ         | Max         |                              |
| $A_{VOL}$  | Differential voltage gain                      | $R_L=2\text{k}\Omega$ , $V_{OUT}=3V_{P-P}$   | 400       | 480         | 600         | V/V                          |
| $R_{IN}$   | Input resistance                               |  | 3         | 14          |             | $\text{k}\Omega$             |
| $C_{IN}$   | Input capacitance                              |  |           | 2.5         |             | pF                           |
| $I_{OS}$   | Input offset current                           |  |           | 0.3         | 3           | $\mu\text{A}$                |
| $I_{BIAS}$ | Input bias current                             |  |           | 5           | 20          | $\mu\text{A}$                |
|            | Input noise voltage                            | BW 1kHz to 10MHz   |           | 4           |             | $\text{nV}/\sqrt{\text{Hz}}$ |
| $V_{IN}$   | Input voltage range                            |  | $\pm 1.0$ |             |             | V                            |
| $CMRR$     | Common-mode rejection ratio                    | $V_{CM} \pm 1\text{V}$ , $f < 100\text{kHz}$<br>$V_{CM} \pm 1\text{V}$ , $f = 5\text{MHz}$ | 60        | 93<br>87    |             | dB<br>dB                     |
| $PSRR$     | Supply voltage rejection ratio                 | $\Delta V_S = \pm 0.5\text{V}$   | 50        | 85          |             | dB                           |
|            | Channel separation                             | $V_{OUT}=1V_{P-P}$ ; $f=100\text{kHz}$<br>(output referenced) $R_L=1\text{k}\Omega$        | 65        | 70          |             | dB                           |
| $V_{OS}$   | Output offset voltage<br>gain select pins open | $R_L=\infty$<br>$R_L=\infty$   |           | 0.5<br>0.25 | 1.5<br>0.75 | V<br>V                       |
| $V_{CM}$   | Output common-mode voltage                     | $R_L=\infty$   | 2.4       | 3.1         | 3.4         | V                            |
| $V_{OUT}$  | Output differential voltage swing              | $R_L=2\text{k}\Omega$  | 3.0       | 4.0         |             | V                            |
| $R_{OUT}$  | Output resistance                              |  |           | 20          |             | $\Omega$                     |
| $I_{CC}$   | Power supply current<br>(total for both sides) | $R_L=\infty$   |           | 35          | 44          | mA                           |

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## 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 voltage is  $V_S = \pm 6.0V$ , and gain select pins are connected together.

| SYMBOL     | PARAMETER                                      | TEST CONDITIONS   | LIMITS    |     |     | UNITS      |
|------------|--|---|-----------|-----|-----|------------|
|            |  |   | Min       | Typ | Max |            |
| $A_{VOL}$  | Differential voltage gain                      | $R_L=2k\Omega$ , $V_{OUT}=3V_{P-P}$                                   | 350       | 430 | 600 | V/V        |
| $R_{IN}$   | Input resistance                               |   | 1         | 11  |     | k $\Omega$ |
| $I_{OS}$   | Input offset current                           |   |           |     | 5   | $\mu A$    |
| $I_{BIAS}$ | Input bias current                             |   |           |     | 30  | $\mu A$    |
| $V_{IN}$   | Input voltage range                            |   | $\pm 1.0$ |     |     | V          |
| CMRR       | Common-mode rejection ratio                    | $V_{CM} \pm 1V$ , $f < 100kHz$<br>$R_S = \phi$                        | 55        |     |     | dB         |
| PSRR       | Supply voltage rejection ratio                 | $\Delta V_S = \pm 0.5V$   | 50        |     |     | dB         |
|            | Channel separation                             | $V_{OUT}=1V_{P-P}$ ; $f=100kHz$<br>(output referenced) $R_L=1k\Omega$ |           | 70  |     | dB         |
| $V_{OS}$   | Output offset voltage                          |   |           |     |     |            |
|            | gain select pins connected together            | $R_L = \infty$  |           |     | 1.5 | V          |
|            | gain select pins open                          | $R_L = \infty$  |           |     | 1.0 | V          |
| $V_{OUT}$  | Output differential voltage swing              | $R_L=2k\Omega$  | 2.8       |     |     | V          |
| $I_{CC}$   | Power supply current<br>(total for both sides) | $R_L = \infty$  |           |     | 47  | mA         |

## AC ELECTRICAL CHARACTERISTICS

$T_A=+25^{\circ}C$ ,  $V_{SS}=\pm 6V$ ,  $V_{CM}=0$ , unless otherwise specified. Recommended operating supply voltage  $V_S = \pm 6.0V$ . Gain select pins connected together.

| SYMBOL   | PARAMETER         | TEST CONDITIONS    | LIMITS |     |     | UNITS |
|----------|-------------------|--------------------|--------|-----|-----|-------|
|          |                   |                    | Min    | Typ | Max |       |
| BW       | Bandwidth         | $V_{OUT}=1V_{P-P}$ |        | 25  |     | MHz   |
| $t_R$    | Rise time         |                    |        | 15  | 20  | ns    |
| $t_{PD}$ | Propagation delay | $V_{OUT}=1V_{P-P}$ |        | 7.5 | 12  | ns    |

## TEST CIRCUITS $T_A=25^{\circ}C$ unless otherwise specified.

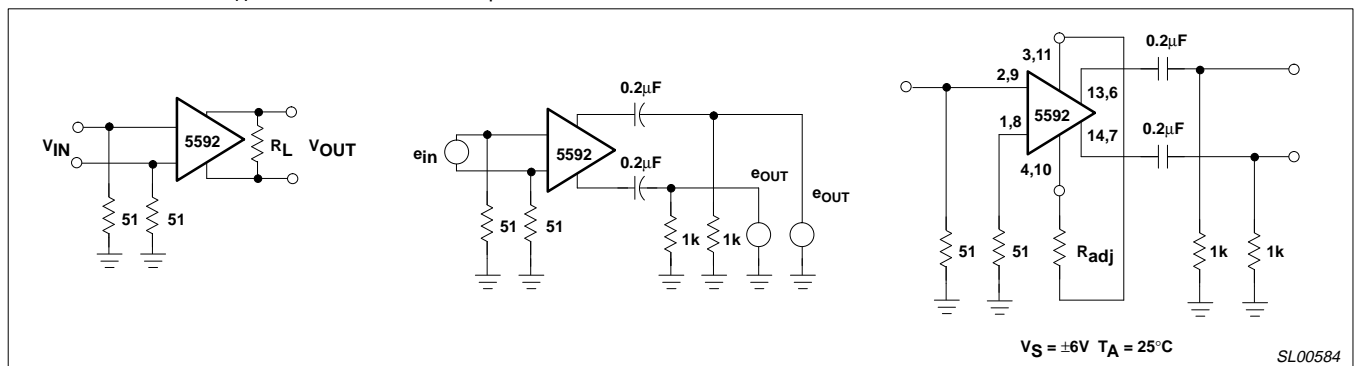


Figure 3. Test Circuits

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## TYPICAL PERFORMANCE CHARACTERISTICS

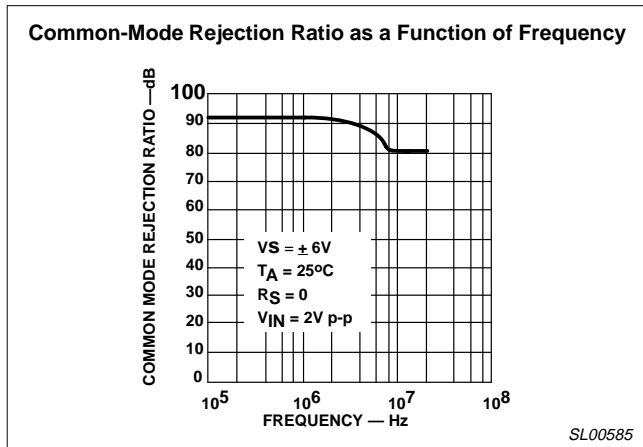


Figure 4.

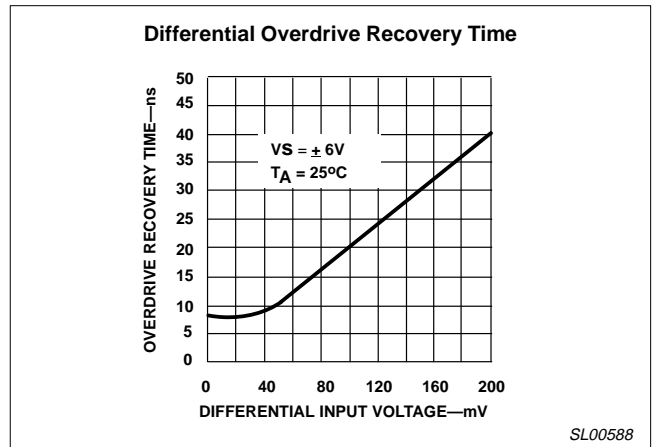


Figure 7.

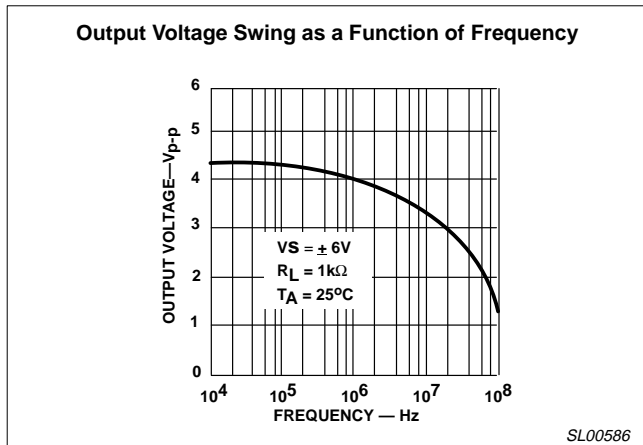


Figure 5.

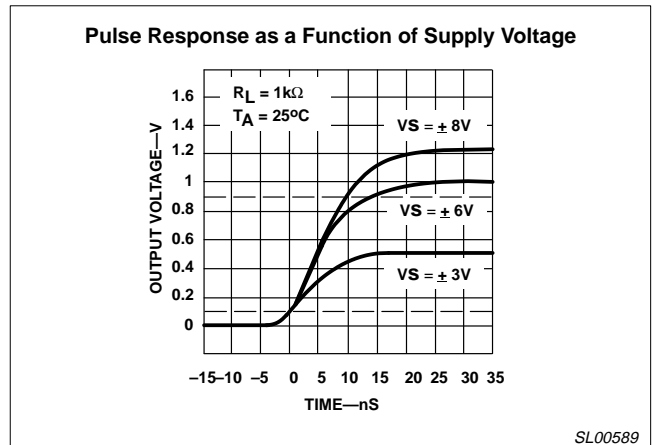


Figure 8.

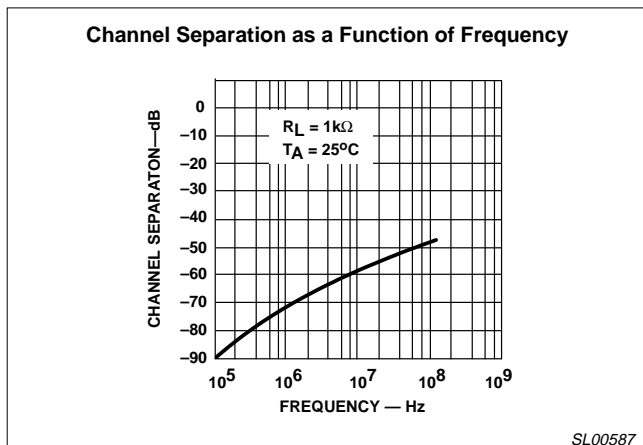


Figure 6.

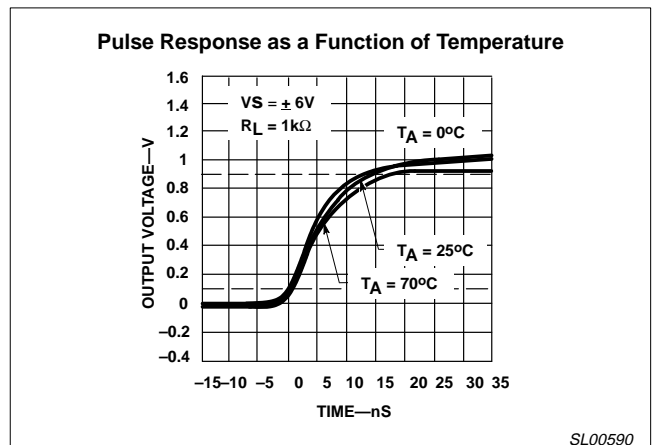


Figure 9.

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TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

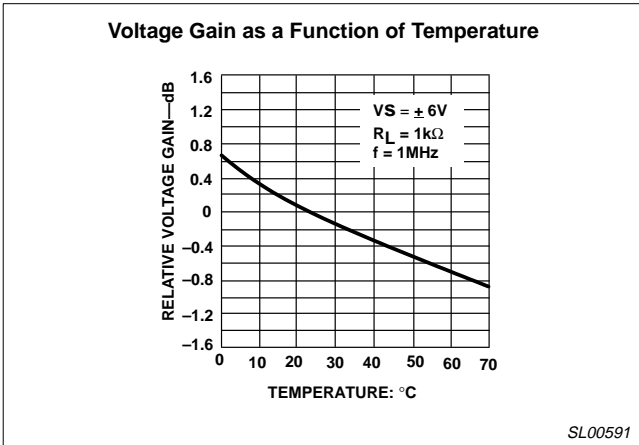


Figure 10.

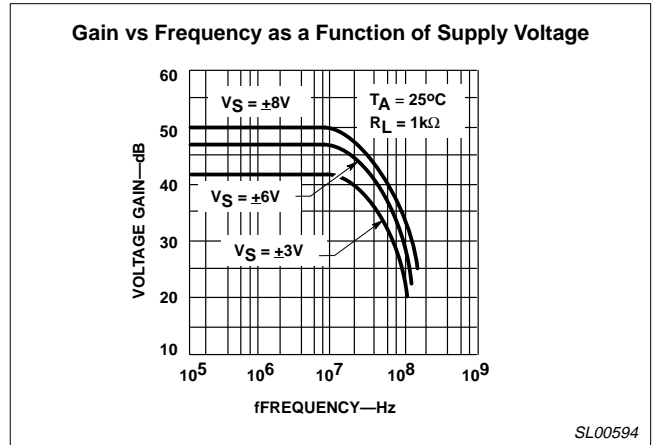


Figure 13.

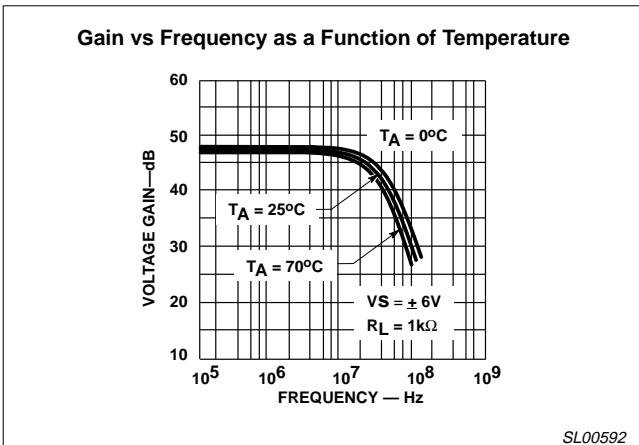


Figure 11.

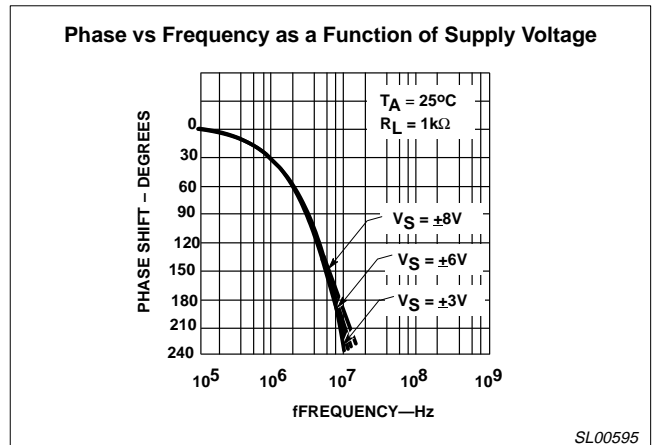


Figure 14.

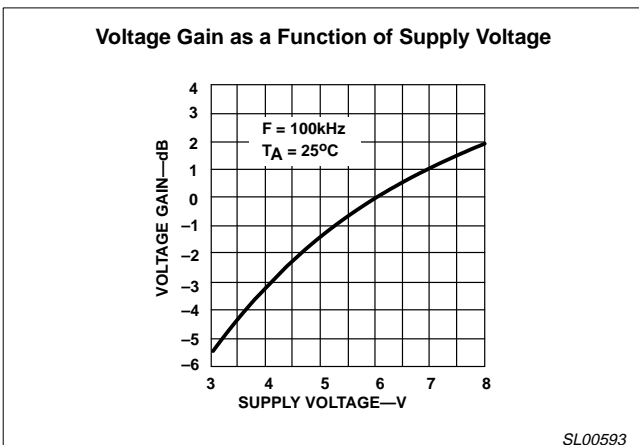


Figure 12.

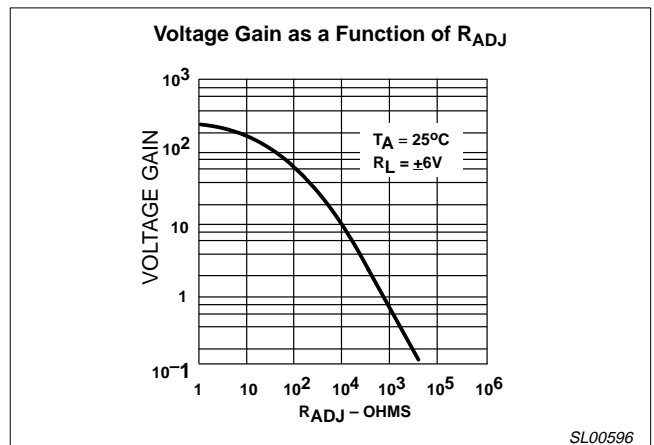


Figure 15.

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## TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

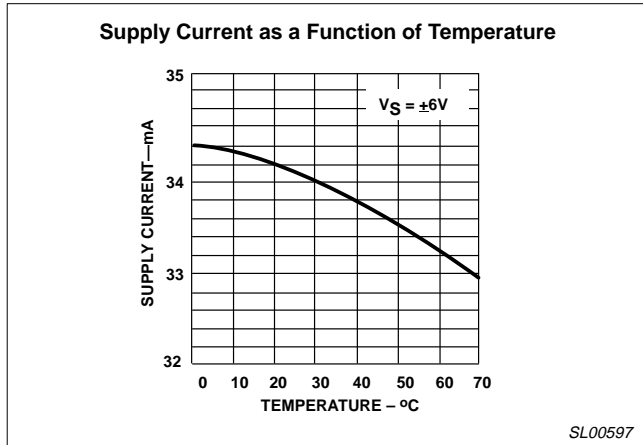


Figure 16.

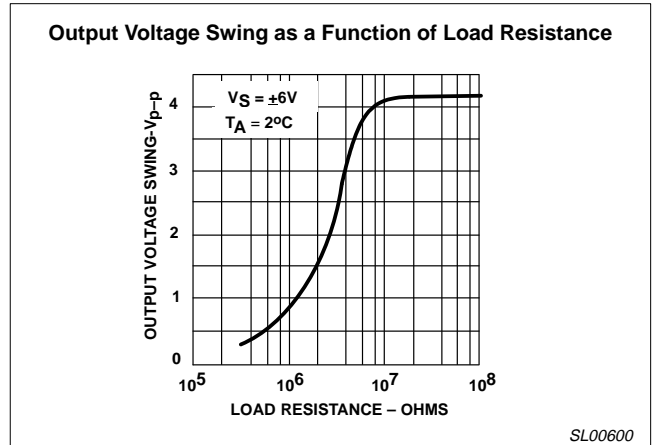


Figure 19.

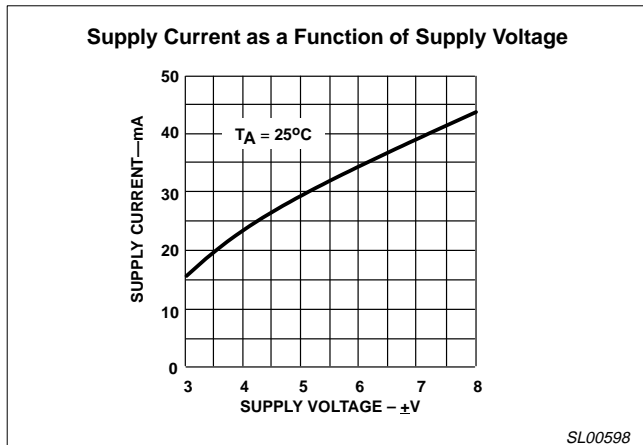


Figure 17.

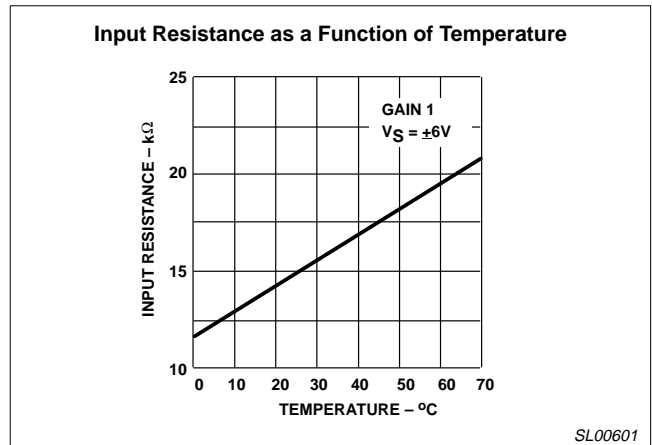


Figure 20.

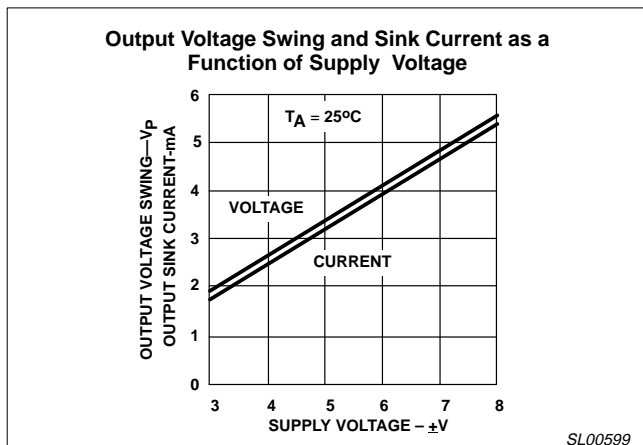


Figure 18.

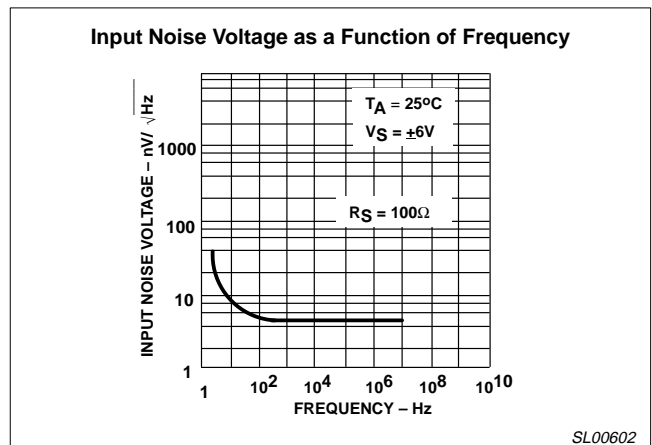


Figure 21.