

# Video amplifier

# NE592

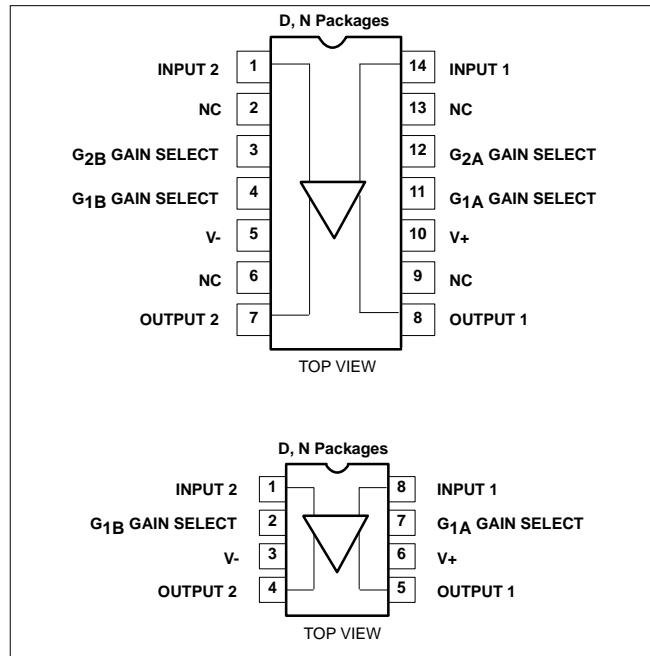
## DESCRIPTION

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

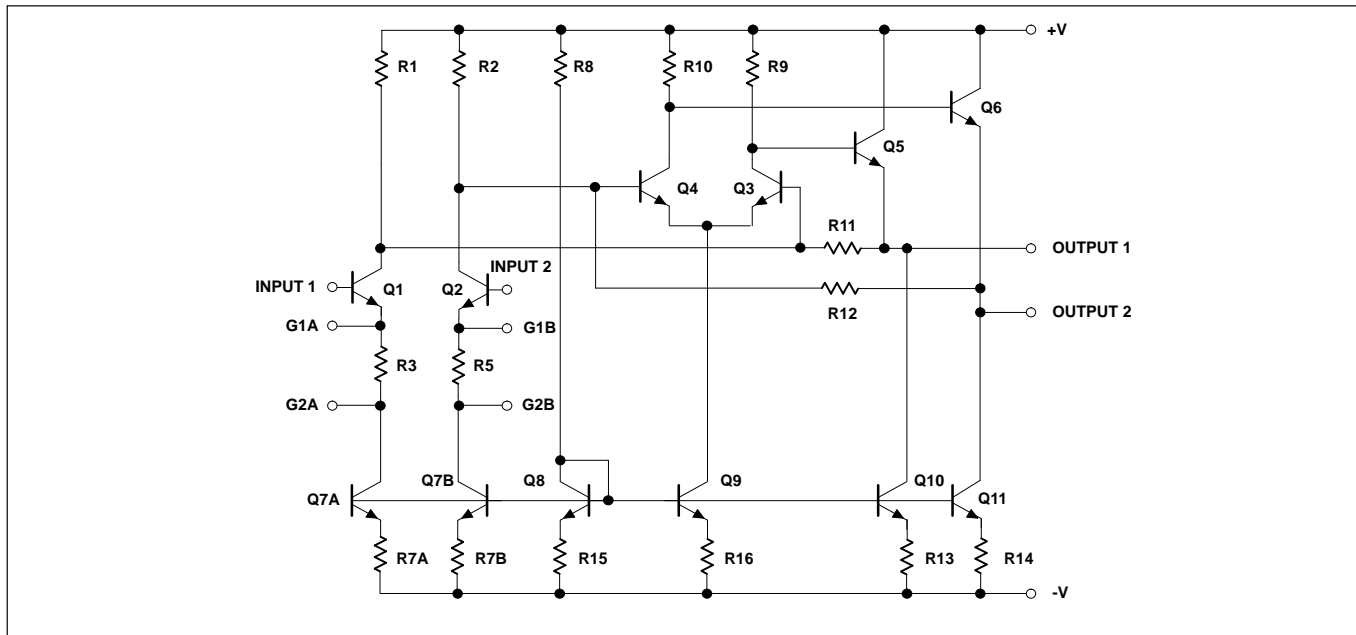
## PIN CONFIGURATIONS



## 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, $T_A = 25^\circ\text{C}$ (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, standard part Gain 1 <sup>1</sup> 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 Gain 1 <sup>1</sup> 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 Gain 2 <sup>4</sup> Gain 2 <sup>4</sup>	$V_{CM}\pm 1\text{V}$ , $f<100\text{kHz}$ $V_{CM}\pm 1\text{V}$ , $f=5\text{MHz}$	60	86		dB
				60		dB
PSRR	Supply voltage rejection ratio Gain 2 <sup>4</sup>	$\Delta V_S=\pm 0.5\text{V}$	50	70		dB
$V_{OS}$	Output offset voltage Gain 1 Gain 2 <sup>4</sup> 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 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, standard part	$R_L=2k\Omega$ , $V_{OUT}=3V_{P-P}$				
	Gain 1 <sup>1</sup>		250		600	V/V
	Gain 2 <sup>2, 4</sup>		80		120	V/V
$R_{IN}$	Input resistance 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 Gain 2 <sup>4</sup>	$V_{CM}\pm 1V$ , $f < 100kHz$	50			dB
PSRR	Supply voltage rejection ratio Gain 2 <sup>4</sup>	$\Delta V_S=\pm 0.5V$	50			dB
$V_{OS}$	Output offset voltage	$R_L=\infty$			1.5	V
	Gain 1				1.5	
	Gain 2 <sup>4</sup> Gain 3 <sup>3</sup>				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:**

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- 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 <sup>1</sup> Gain 2 <sup>2, 4</sup>			40 90		MHz MHz
$t_R$	Rise time	$V_{OUT}=1V_{P-P}$				
	Gain 1 <sup>1</sup> Gain 2 <sup>2, 4</sup>			10.5 4.5	12	ns ns
$t_{PD}$	Propagation delay	$V_{OUT}=1V_{P-P}$				
	Gain 1 <sup>1</sup> Gain 2 <sup>2, 4</sup>			7.5 6.0	10	ns ns

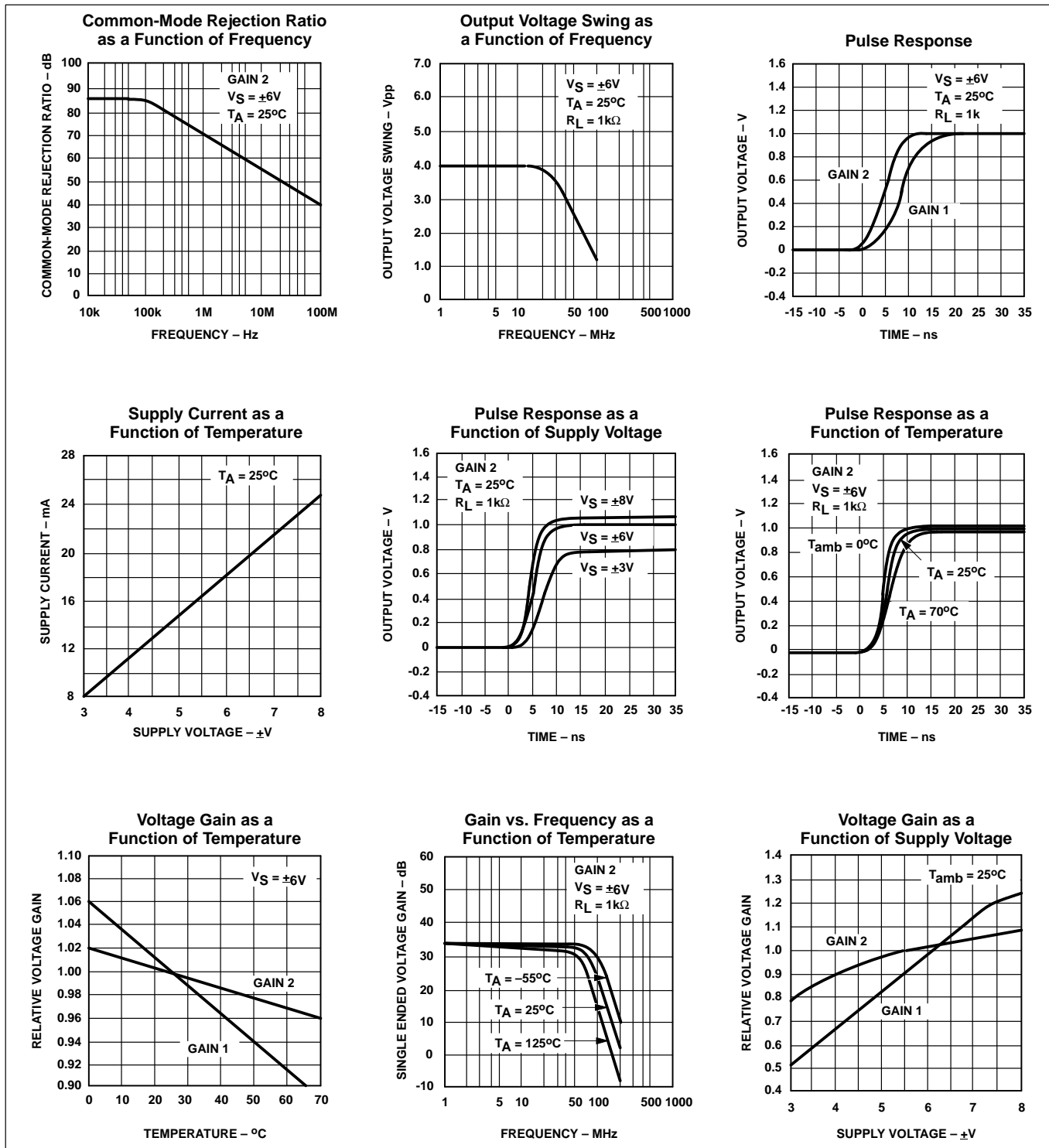
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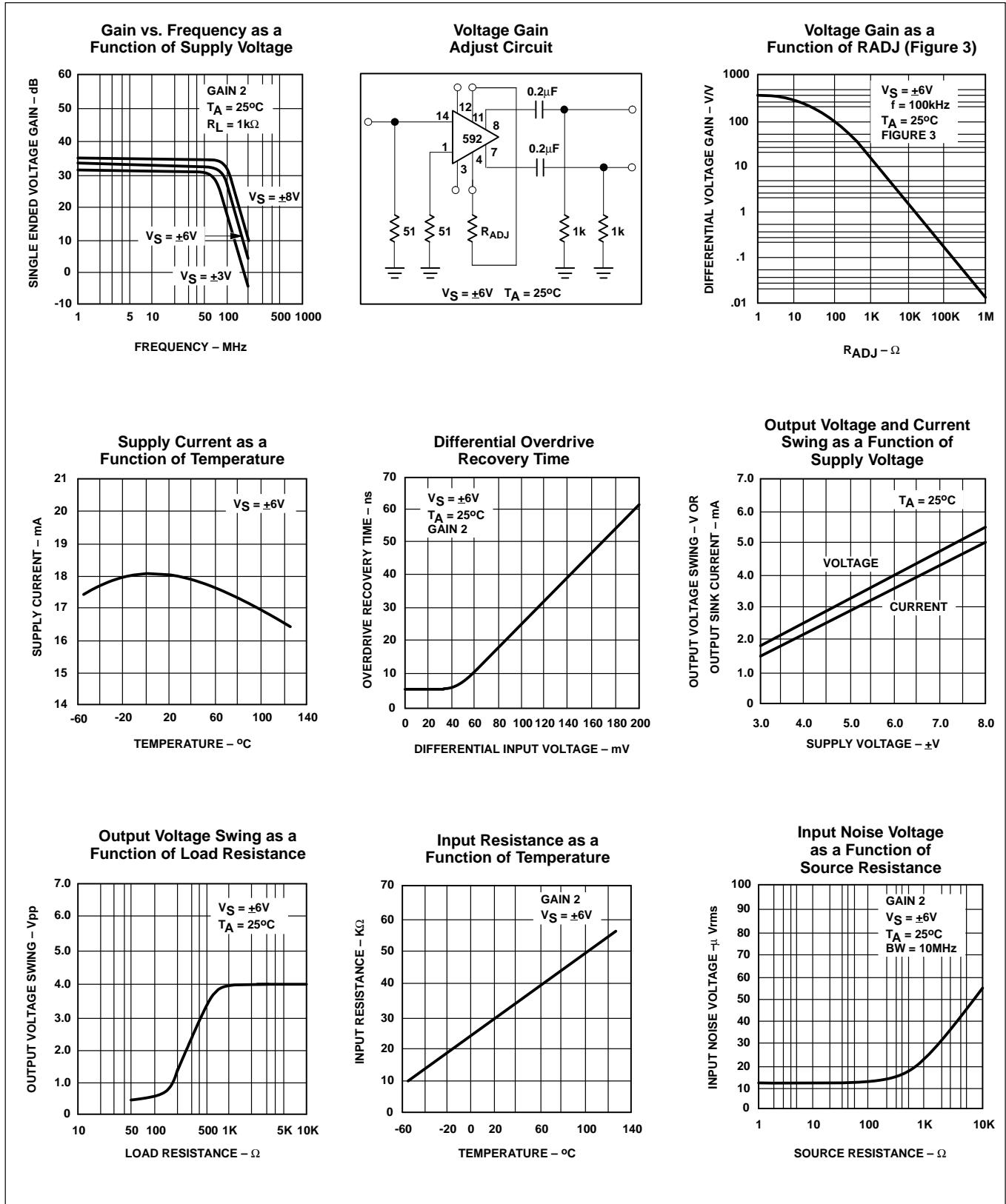
## TYPICAL PERFORMANCE CHARACTERISTICS



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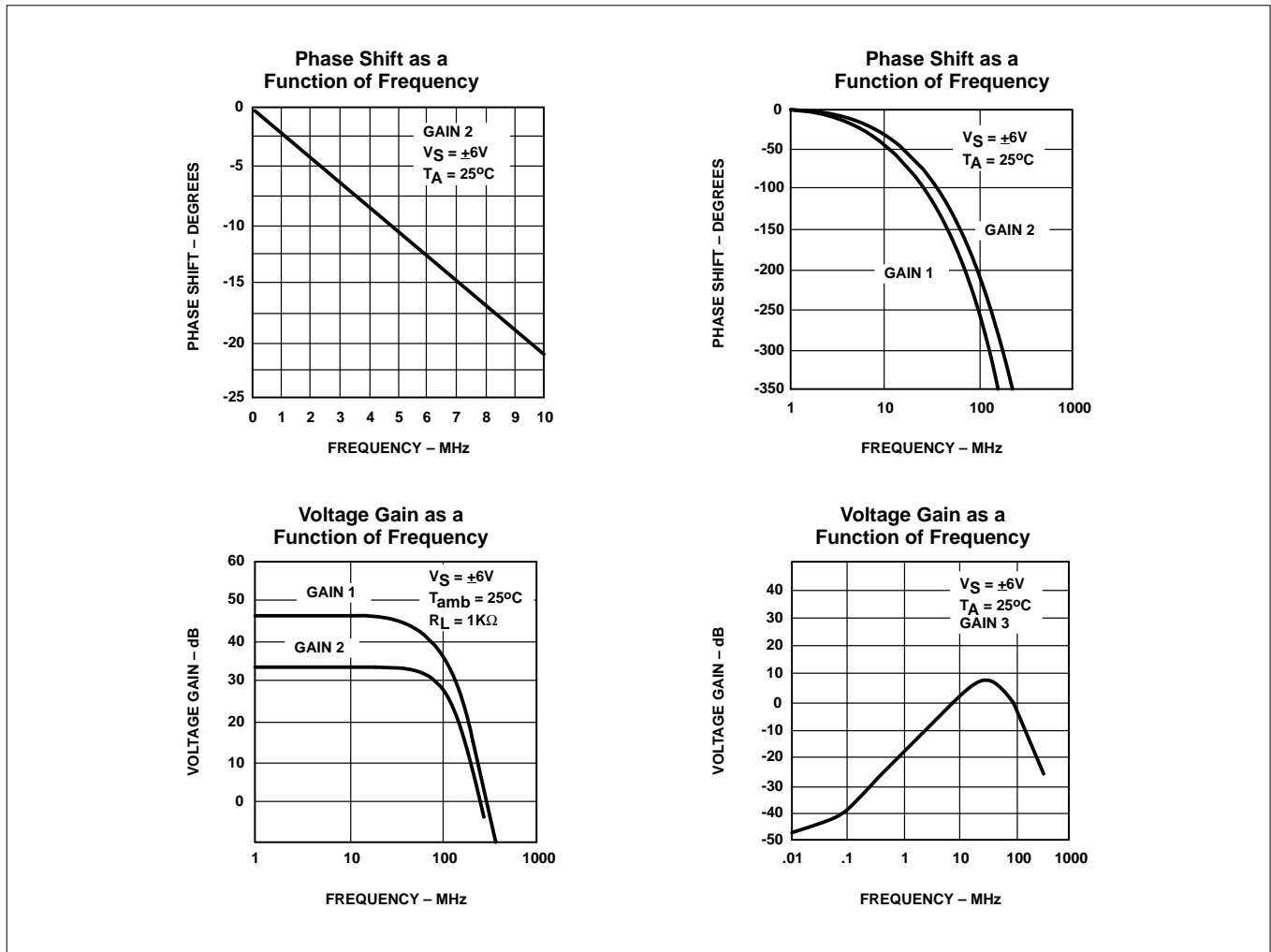
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TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

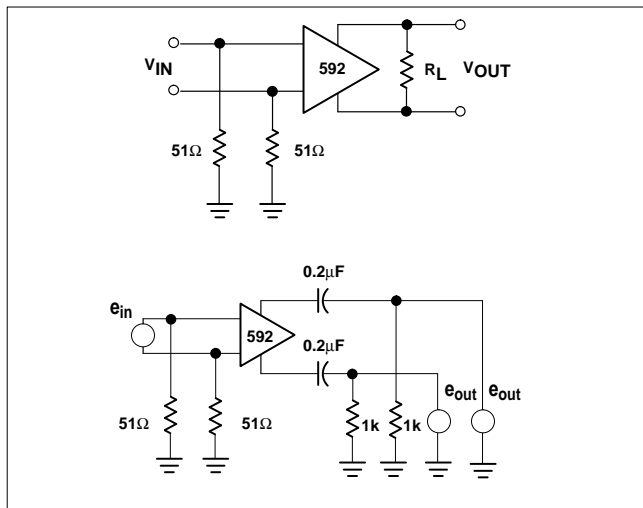


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**TEST CIRCUITS** TA = 25°C, unless otherwise specified.



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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  $F_1 \ll 1/2 \pi (32) C$

$$V_0 \approx 1.4 \times 10^4 C \frac{dV_i}{dt}$$

**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 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