VIDEO AMPLIFIER — NE5592

DESCRIPTION

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

FEATURES

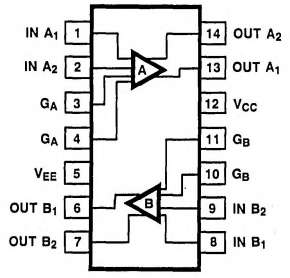
- 120MHz bandwidth
- Adjustable gains from 0 to 400
- Adjustable pass band
- No frequency compensation required
- Wave shaping with minimal external components

APPLICATIONS

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

PIN CONFIGURATION

D,N PACKAGE



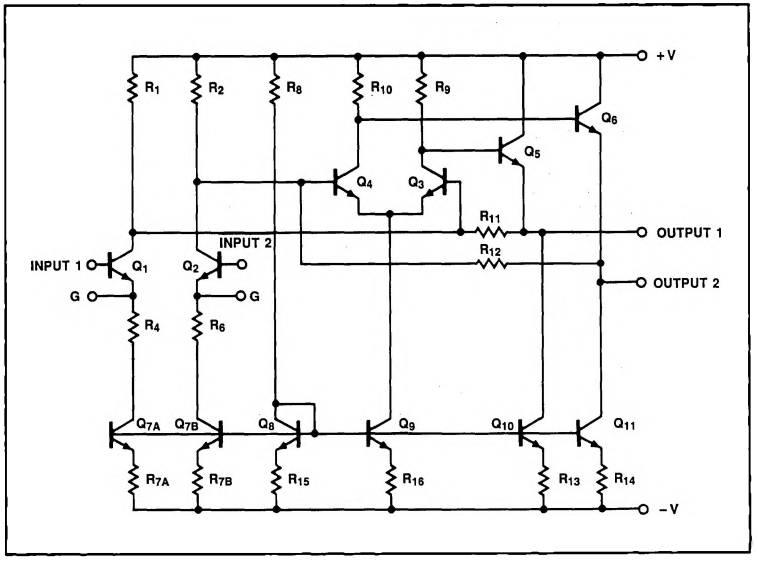
TOP VIEW

ORDER NUMBER
NE5592D, NE5592N

ABSOLUTE MAXIMUM RATINGS T_A = 25°C unless otherwise specified.

SYMBOL AND PARAMETER	RATING	UNIT
Supply voltage	±8	V
Differential input voltage	±5	V
Common mode		
Input voltage	±6	V
Output current	10	mA
Operating temperature range		
NE5592	0 to +70	°C
Storage temperature range	−65 to +150	°C
Power dissipation	500	mW

EQUIVALENT CIRCUIT

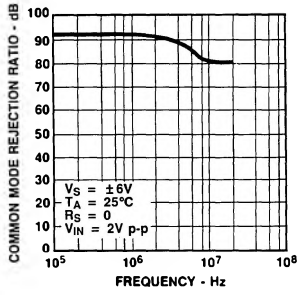


DC ELECTRICAL CHARACTERISTICS $T_A = +25°C, V_{SS} = \pm 6V$, $V_{CM} = 0$ unless otherwise specified. Recommended operating supply voltage $V_S = \pm 6.0V$. Gain select pins connected together.

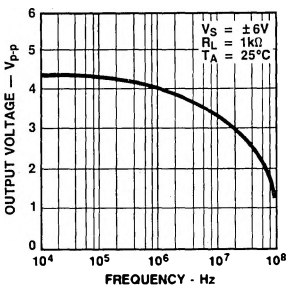
PARAMETER	TEST CONDITIONS	NE5592			UNITS
		Min	Typ	Max	
Differential voltage gain	$R_L = 2k\Omega$, $V_{OUT} = 3V$ p-p	400	480	600	V/V
Bandwidth	$V_{OUT} = 1V$ p-p		25		MHz
Rise time			15	20	ns
Propagation delay	$V_{OUT} = 1V$ p-p		7.5	12	ns
Input resistance		3	14		kΩ
Input capacitance			2.5		pF
Input offset current			0.3	3	μA
Input bias current			5	20	μA
Input noise voltage	BW 1kHz to 10MHz		4		$nV/\sqrt{Hz}$
Input voltage range				±1.0	V
Common mode rejection ratio	$V_{CM} \pm 1V$, f <100kHz	60	93		dB
	$V_{CM} \pm 1V$, f = 5MHz		87		dB
Supply voltage rejection ratio	$\Delta V_S = \pm 0.5V$	50	85		dB
Channel separation	$V_{OUT} = 1V$ p-p; f = 100kHz (output referenced) $R_L = 1k\Omega$	65	75		dB
Output offset voltage	$R_L = \infty$		0.5	1.5	V
Gain select pins open	$R_L = \infty$		0.25	0.75	V
Output common mode voltage	$R_L = \infty$	2.4	3.1	3.4	V
Output differential voltage swing	$R_L = 2k\Omega$	3.0	4.0		V
Output resistance			20		Ω
Power supply current (Total for both sides)	$R_L = \infty$		35	44	mA
THE FOLLOWING SPECS APPLY OVER TEMPERATURE		**0°C ≤ T_A ≤ 70°C**			
Differential voltage gain	$R_L = 2k\Omega$, $V_{OUT} = 3V$ p-p	350	430	600	V/V
Input resistance		1	11		kΩ
Input offset current				5	μA
Input bias current				30	μA
Input voltage range				±1.0	V
Common mode rejection ratio	$V_{CM} \pm 1V$, f <100kHz	55			dB
	$R_S = \phi$				
Supply voltage rejection ratio	$\Delta V_S = \pm 0.5V$	50			dB
Channel separation	$V_{OUT} = 1V$ p-p; f = 100kHz (output referenced) $R_L = 1k\Omega$		75		dB
Output offset voltage					
Gain select pins connected together	$R_L = \infty$			1.5	V
Gain select pins open	$R_L = \infty$			1.0	V
Output differential voltage swing	$R_L = 2k\Omega$	2.8			V
Power supply current (Total for both sides)	$R_L = \infty$			47	mA

TYPICAL PERFORMANCE CHARACTERISTICS

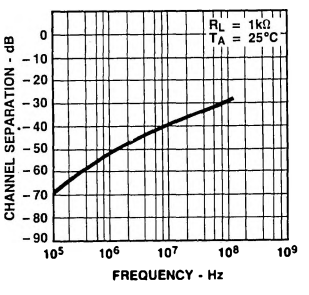
COMMON MODE REJECTION RATIO AS A FUNCTION OF FREQUENCY



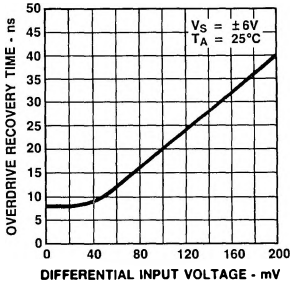
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



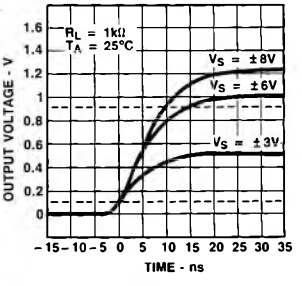
CHANNEL SEPARATION AS A FUNCTION OF FREQUENCY



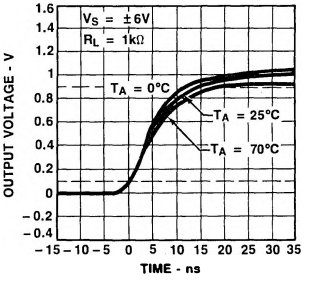
DIFFERENTIAL OVERDRIVE RECOVERY TIME



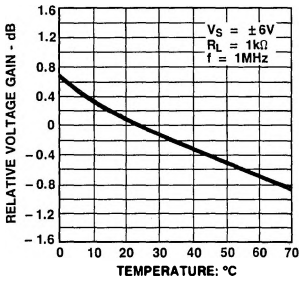
PULSE RESPONSE AS A FUNCTION OF SUPPLY VOLTAGE



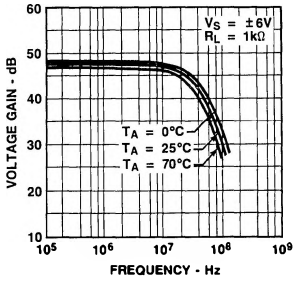
PULSE RESPONSE AS A FUNCTION OF TEMPERATURE



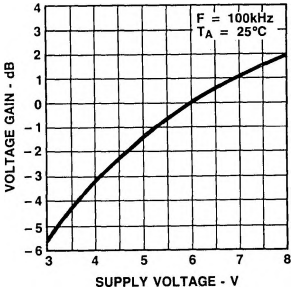
VOLTAGE GAIN AS A FUNCTION OF TEMPERATURE



GAIN vs FREQUENCY AS A FUNCTION OF TEMPERATURE

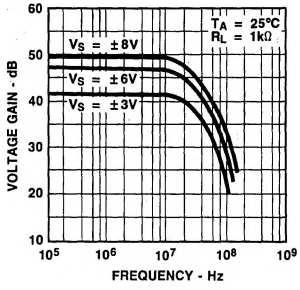


VOLTAGE GAIN AS A FUNCTION OF SUPPLY VOLTAGE

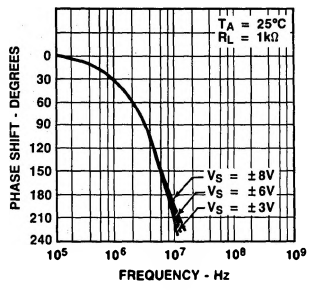


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

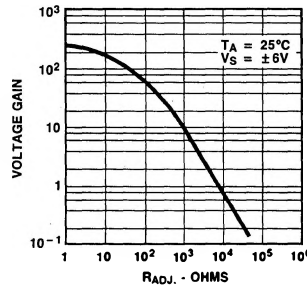
GAIN vs FREQUENCY AS A FUNCTION OF SUPPLY VOLTAGE



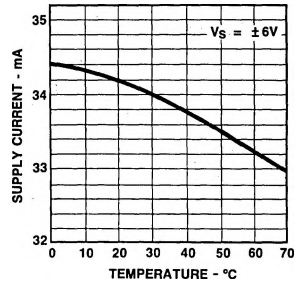
PHASE vs FREQUENCY AS A FUNCTION OF SUPPLY VOLTAGE



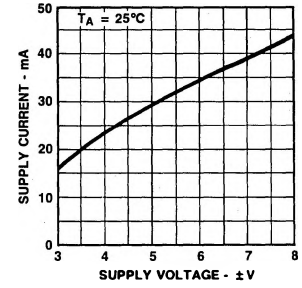
VOLTAGE GAIN AS A FUNCTION OF $R_{ADJ.}$



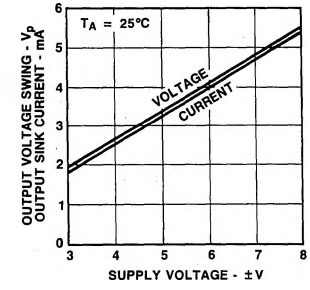
SUPPLY CURRENT AS A FUNCTION OF TEMPERATURE



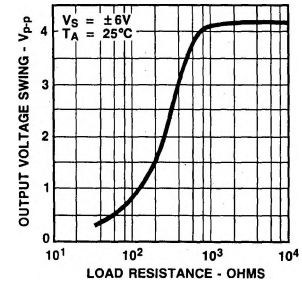
SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



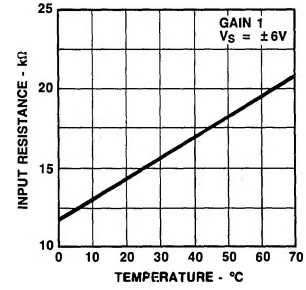
OUTPUT VOLTAGE SWING AND SINK CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



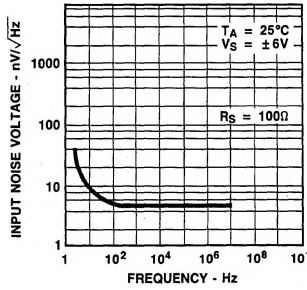
OUTPUT VOLTAGE SWING AS A FUNCTION OF LOAD RESISTANCE



INPUT RESISTANCE AS A FUNCTION OF TEMPERATURE

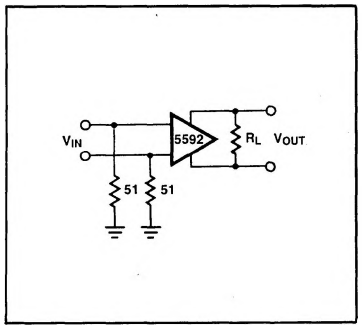


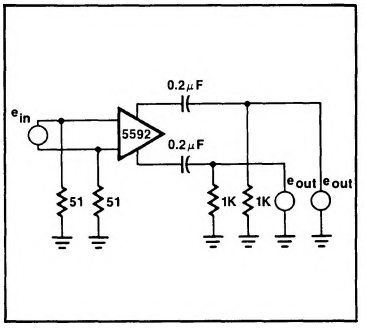
INPUT NOISE VOLTAGE AS A FUNCTION OF FREQUENCY

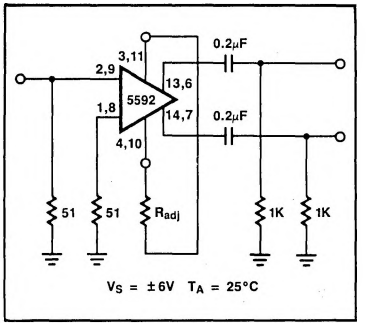


VIDEO AMPLIFIER NE5592

TEST CIRCUITS $T_A = 25°C$ unless otherwise specified







VIDEO AMPLIFIER — SE/NE592

DESCRIPTION

The SE/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

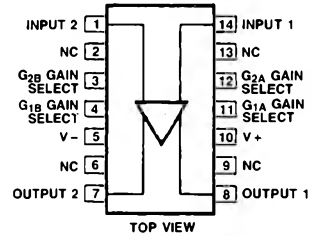
- **120MHz bandwidth**
- **Adjustable gains from 0 to 400**
- **Adjustable pass band**
- **No frequency compensation required**
- **Wave shaping with minimal external components**

APPLICATIONS

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

PIN CONFIGURATION

D14, F14, N14 PACKAGE

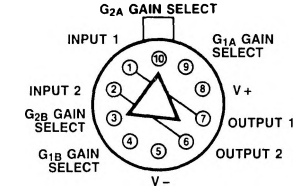


TOP VIEW

ORDER NUMBERS

NE592D14 NE592N14
NE592F14 SE592F14

H PACKAGE*



NOTE
Pin 5 connected to case

ORDER NUMBERS

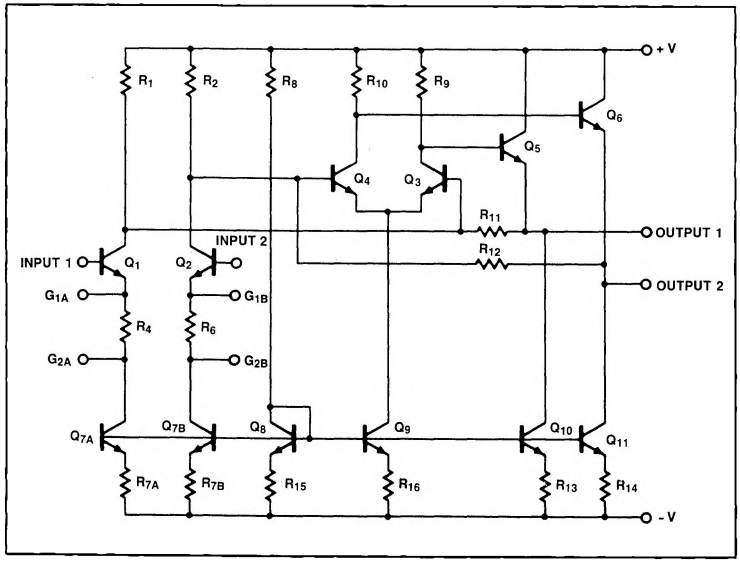
NE592H SE592H

*Metal cans (H) not recommended for new designs.

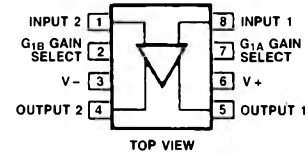
ABSOLUTE MAXIMUM RATINGS T_A = +25°C unless otherwise specified.

SYMBOL AND PARAMETER	RATING	UNIT
Supply voltage	±8	V
Differential input voltage	±5	V
Common mode		
Input voltage	±6	V
Output current	10	mA
Operating temperature range		
SE592	−55 to +125	°C
NE592	0 to +70	°C
Storage temperature range	−65 to +150	°C
Power dissipation	500	mW

EQUIVALENT CIRCUIT



D8, F8, N8 PACKAGE



TOP VIEW

ORDER NUMBERS

NE592D8 NE592N8
NE592F8 SE592F8

Also N8, N14, D8 and D14 package parts available in "High" gain version by adding "H" before package designation, as: NE592HD8.

DC ELECTRICAL CHARACTERISTICS: T_A = +25°C, V_{SS} = ±6V, V_{CM} = 0 unless otherwise specified. Recommended operating supply voltages V_S = ±6.0V. All specifications apply to both standard and high gain parts unless noted differently.

PARAMETER	TEST CONDITIONS	NE592			SE592			UNIT
		Min	Typ	Max	Min	Typ	Max	
Differential voltage gain, standard part								
Gain 1[1]	R_L = 2kΩ, V_{OUT} = 3V p-p	250	400	600	300	400	500	V/V
Gain 2[2,4]		80	100	120	90	100	110	V/V
High gain part		400	500	600				V/V
Bandwidth								
Gain 1[1]			40			40		MHz
Gain 2[2,4]			90			90		MHz
Rise time								
Gain 1[1]	V_{OUT} = 1V p-p		10.5			10.5		ns
Gain 2[2,4]			4.5	12		4.5	10	ns
Propagation delay								
Gain 1[1]	V_{OUT} = 1V p-p		7.5			7.5		ns
Gain 2[2,4]			6.0	10		6.0	10	ns
Input resistance								
Gain 1[1]			4.0			4.0		kΩ
Gain 2[2,4]		10	30		20	30		kΩ
Input capacitance[2]	Gain 2[4]		2.0			2.0		pF
Input offset current			0.4	5.0		0.4	3.0	μA
Input bias current			9.0	30		9.0	20	μA
Input noise voltage	BW 1kHz to 10MHz		12			12		μVrms
Input voltage range				±1.0			±1.0	V
Common mode rejection ratio								
Gain 2[4]	V_{CM} ± 1V, f<100kHz	60	86		60	86		dB
Gain 2[4]	V_{CM} ± 1V, f = 5MHz		60			60		dB
Supply voltage rejection ratio								
Gain 2[4]	ΔV_S = ±0.5V	50	70		50	70		dB
Output offset voltage								
Gain 1	R_L = ∞			1.5			1.5	V
Gain 2[4]	R_L = ∞			1.5			1.0	V
Gain 3[3]	R_L = ∞		0.35	0.75		0.35	0.75	V
Output common mode voltage	R_L = ∞	2.4	2.9	3.4	2.4	2.9	3.4	V
Output voltage swing differential	R_L = 2kΩ	3.0	4.0		3.0	4.0		V
Output resistance			20			20		Ω
Power supply current	R_L = ∞		18	24		18	24	mA
THE FOLLOWING SPECS APPLY OVER TEMPERATURE		**0°C ≤ T_A ≤ 70°C**			**−55°C ≤ T_A ≤ 125°C**			
Differential voltage gain, standard part								
Gain 1[1]	R_L = 2kΩ, V_{OUT} = 3V p-p	250		600	200		600	V/V
Gain 2[2,4]		80		120	80		120	V/V
High gain part		400	500	600				V/V
Input resistance								
Gain 2[2,4]		8.0			8.0			kΩ
Input offset current				6.0			5.0	μA
Input bias current				40			40	μA
Input voltage range		±1.0			±1.0			V

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

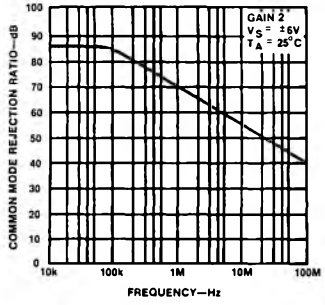
DC ELECTRICAL CHARACTERISTICS: (cont.) T_A = +25°C, V_{SS} = ±6V, V_{CM} = 0 unless otherwise specified. Recommended operating supply voltages V_S = ±6.0V. All specifications apply to both standard and high gain parts unless noted differently.

PARAMETER	TEST CONDITIONS	NE592			SE592			UNITS
		Min	Typ	Max	Min	Typ	Max	
THE FOLLOWING SPECS APPLY OVER TEMPERATURE		**0°C ≤ T_A ≤ 70°C**			**−55°C ≤ T_A ≤ 125°C**			
Common mode rejection ratio Gain 2^4	V_{CM} ± 1V, f <100kHz	50			50			dB
Supply voltage rejection ratio Gain 2^4	ΔV_S = ±0.5V	50			50			dB
Output offset voltage								
Gain 1	R_L = ∞			1.5			1.5	V
Gain 2^4	R_L = ∞			1.5			1.2	V
Gain 3^3	R_L = ∞			1.0			1.0	V
Output voltage swing differential	R_L = 2kΩ	2.8			2.5			V
Power supply current	R_L = ∞			27			27	mA

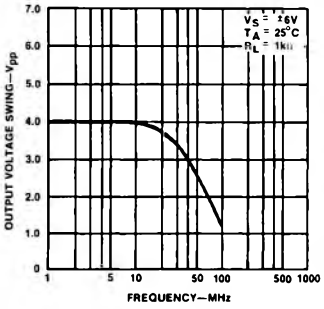
NOTES:
1. Gain select pins G_{1A} and G_{1B} connected together.
2. Gain select pins G_{2A} and G_{2B} connected together.
3. All gain select pins open.
4. Applies to 14-pin version only.

TYPICAL PERFORMANCE CHARACTERISTICS

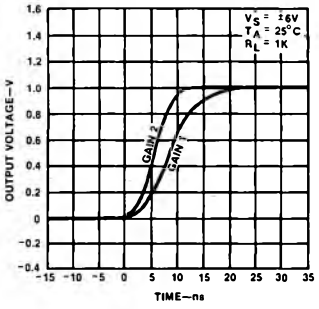
COMMON MODE REJECTION RATIO AS A FUNCTION OF FREQUENCY



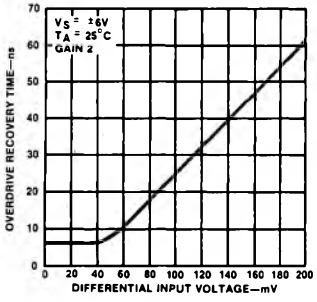
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



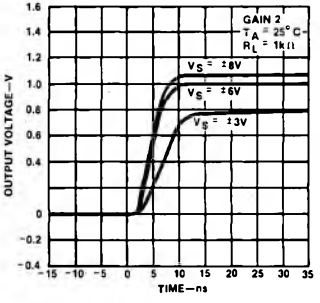
PULSE RESPONSE



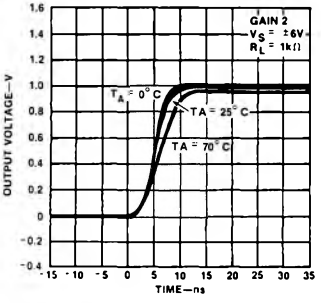
DIFFERENTIAL OVERDRIVE RECOVERY TIME



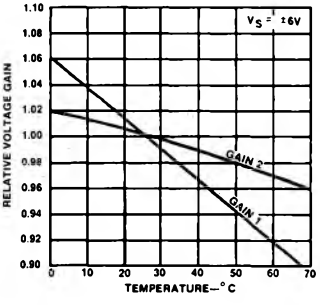
PULSE RESPONSE AS A FUNCTION OF SUPPLY VOLTAGE



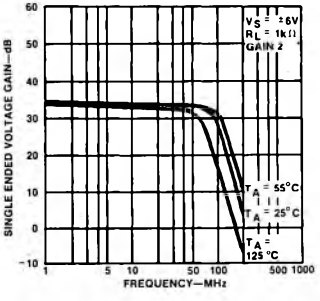
PULSE RESPONSE AS A FUNCTION OF TEMPERATURE



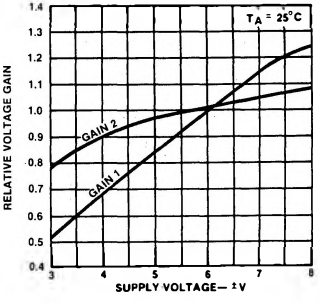
VOLTAGE GAIN AS A FUNCTION OF TEMPERATURE



GAIN vs FREQUENCY AS A FUNCTION OF TEMPERATURE

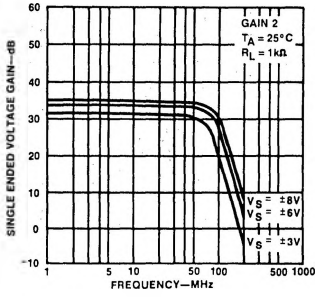


VOLTAGE GAIN AS A FUNCTION OF SUPPLY VOLTAGE

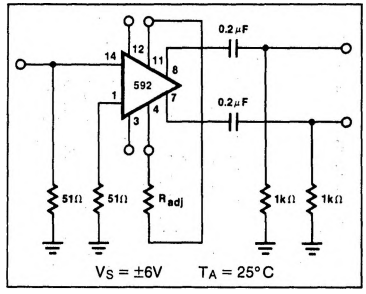


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

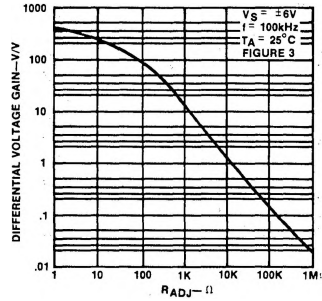
GAIN vs FREQUENCY AS A FUNCTION OF SUPPLY VOLTAGE



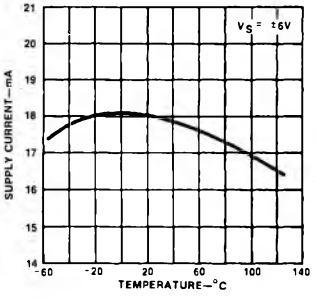
VOLTAGE GAIN ADJUST CIRCUIT



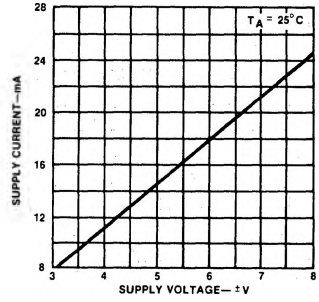
VOLTAGE GAIN AS A FUNCTION OF RADJ (FIGURE 3)



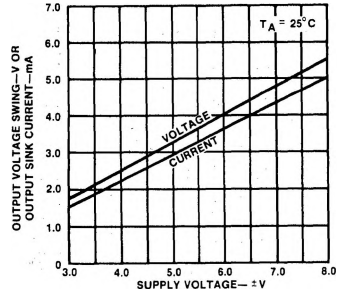
SUPPLY CURRENT AS A FUNCTION OF TEMPERATURE



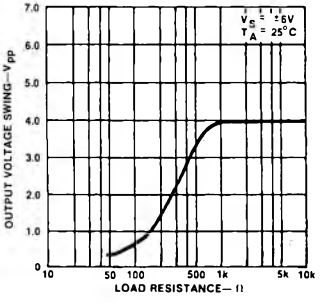
SUPPLY CURRENT AS A FUNCTION OF SUPPLY VOLTAGE



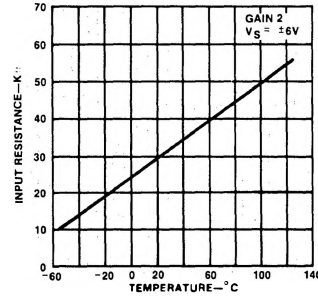
OUTPUT VOLTAGE AND CURRENT SWING AS A FUNCTION OF SUPPLY VOLTAGE



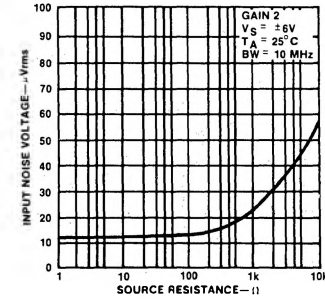
OUTPUT VOLTAGE SWING AS A FUNCTION OF LOAD RESISTANCE



INPUT RESISTANCE AS A FUNCTION OF TEMPERATURE

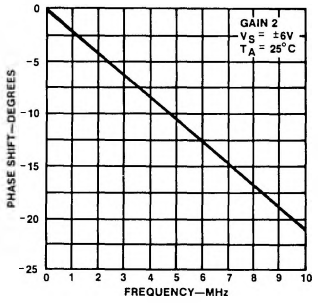


INPUT NOISE VOLTAGE AS A FUNCTION OF SOURCE RESISTANCE

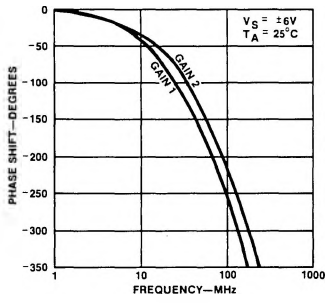


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

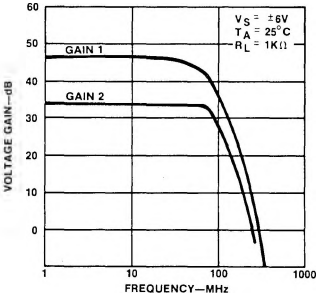
PHASE SHIFT AS A FUNCTION OF FREQUENCY



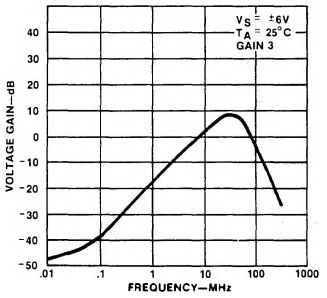
PHASE SHIFT AS A FUNCTION OF FREQUENCY



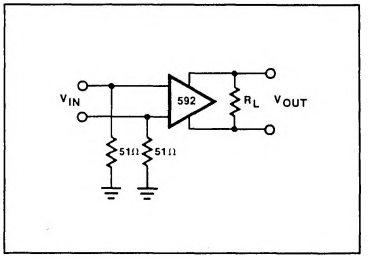
VOLTAGE GAIN AS A FUNCTION OF FREQUENCY

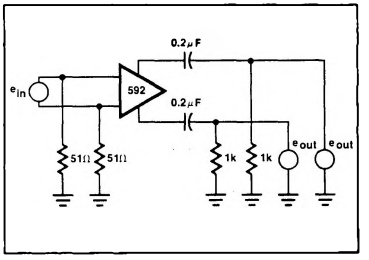


VOLTAGE GAIN AS A FUNCTION OF FREQUENCY (ALL GAIN SELECT PINS OPEN)



TEST CIRCUITS T_A = 25°C unless otherwise specified

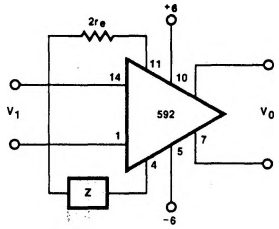




VIDEO AMPLIFIER — SE/NE592

TYPICAL APPLICATIONS

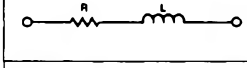
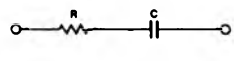
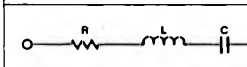
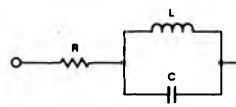
FILTER NETWORKS



$$\frac{V_0(s)}{V_1(s)} \cong \frac{1.4 \times 10^4}{Z(s) + 2r_e}$$

$$\cong \frac{1.4 \times 10^4}{Z(s) + 32}$$

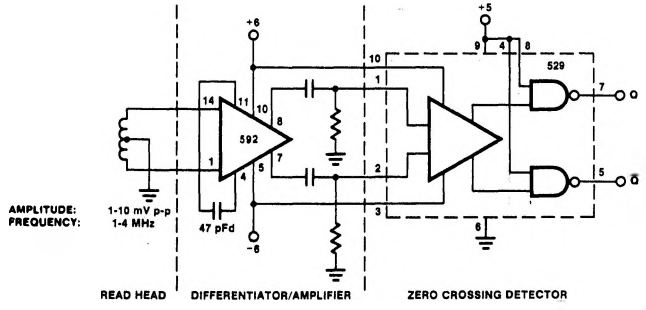
BASIC CONFIGURATION

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	$\frac{1.4 \times 10^4}{L}\left[\frac{s}{s^2 + R/L\ s + 1/LC}\right]$
	BAND REJECT	$\frac{1.4 \times 10^4}{R}\left[\frac{s^2 + 1/LC}{s^2 + 1/LC + s/RC}\right]$

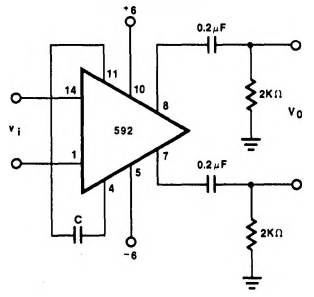
NOTE

In the networks above, the R value used is assumed to include $2r_e$, or approximately 32Ω.

DISC/TAPE PHASE MODULATED READBACK SYSTEMS



DIFFERENTIATION WITH HIGH COMMON MODE NOISE REJECTION



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

$V_0 \cong 1.4 \times 10^4 C \frac{dV_i}{dT}$