Video amplifier NE592

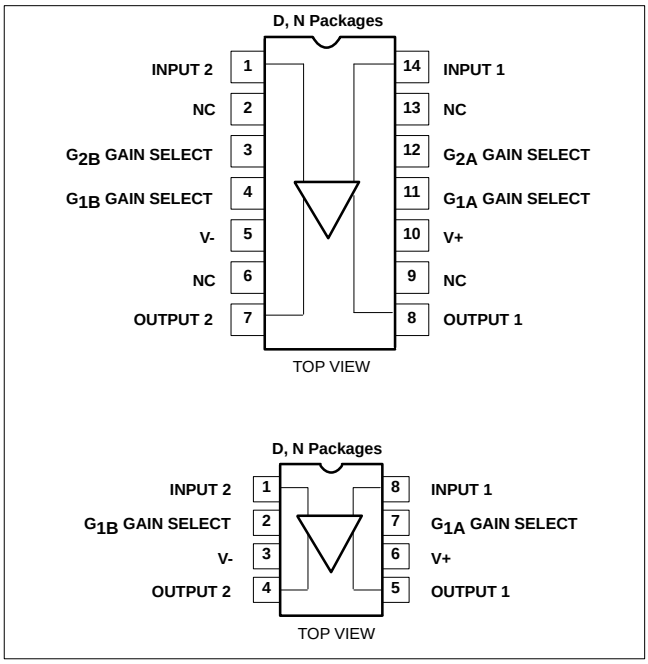
DESCRIPTION

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

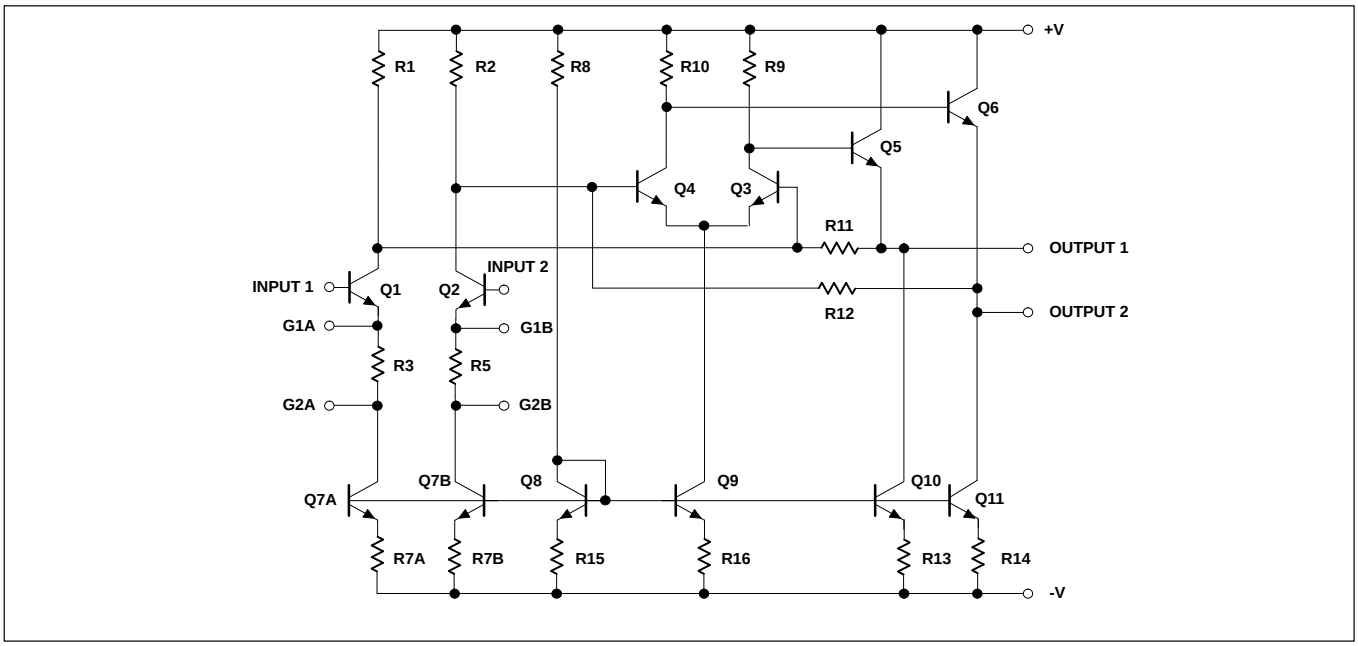
PIN CONFIGURATIONS



APPLICATIONS

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

BLOCK DIAGRAM



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**°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°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:
1. 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

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.

SYMBOL	PARAMETER	TEST CONDITIONS	NE592			UNIT
			Min	Typ	Max	
A_{VOL}	Differential voltage gain, standard part					
	Gain 1[1]	R_L=2kΩ, V_{OUT}=3V_{P-P}	250	400	600	V/V
	Gain 2[2, 4]		80	100	120	V/V
R_{IN}	Input resistance					
	Gain 1[1]			4.0		kΩ
	Gain 2[2, 4]		10	30		kΩ
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]	V_{CM}±1V, f<100kHz	60	86		dB
	Gain 2[4]	V_{CM}±1V, f=5MHz		60		dB
PSRR	Supply voltage rejection ratio					
	Gain 2[4]	ΔV_S=±0.5V	50	70		dB
V_{OS}	Output offset voltage					
	Gain 1	R_L=∞			1.5	V
	Gain 2[4]	R_L=∞			1.5	V
	Gain 3[3]	R_L=∞		0.35	0.75	V
V_{CM}	Output common-mode voltage	R_L=∞	2.4	2.9	3.4	V
V_{OUT}	Output voltage swing differential	R_L=2kΩ	3.0	4.0		V
R_{OUT}	Output resistance			20		Ω
I_{CC}	Power supply current	R_L=∞		18	24	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.

DC ELECTRICAL CHARACTERISTICS

DC Electrical CharacteristicsV_{SS}=±6V, V_{CM}=0, 0°C ≤T_A≤70°C, unless otherwise specified. Recommended operating supply voltages V_S=±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]	R_L=2kΩ, V_{OUT}=3V_{P-P}	250		600	V/V
	Gain 2[2, 4]		80		120	V/V
R_{IN}	Input resistance					
	Gain 2[2, 4]		8.0			kΩ
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}±1V, f<100kHz	50			dB
PSRR	Supply voltage rejection ratio					
	Gain 2[4]	ΔV_S=±0.5V	50			dB
V_{OS}	Output offset voltage					
	Gain 1	R_L=∞			1.5	V
	Gain 2[4]				1.5	
	Gain 3[3]				1.0	
V_{OUT}	Output voltage swing differential	R_L=2kΩ	2.8			V
I_{CC}	Power supply current	R_L=∞			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 versions only.

AC ELECTRICAL CHARACTERISTICS

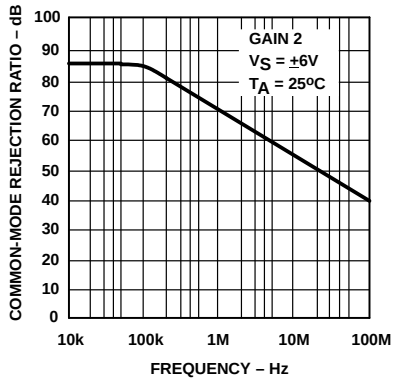
T_A=+25°C V_{SS}=±6V, V_{CM}=0, unless otherwise specified. Recommended operating supply voltages V_S=±6.0V. All specifications apply to both standard and high gain parts unless noted differently.

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

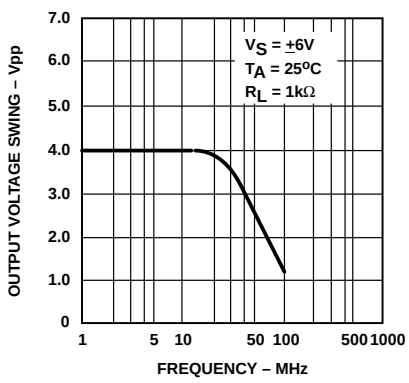
NOTES:
1. Gain select Pins G_{1A} and G_{1B} connected together.
2. Gain select Pins G_{2A} and G_{2B} connected together.
3. All gain select pins open.
4. Applies to 14-pin versions only.

TYPICAL PERFORMANCE CHARACTERISTICS

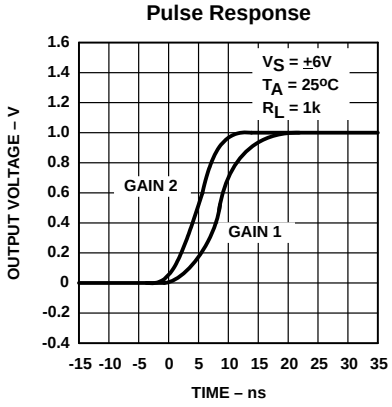
Common-Mode Rejection Ratio as a Function of Frequency



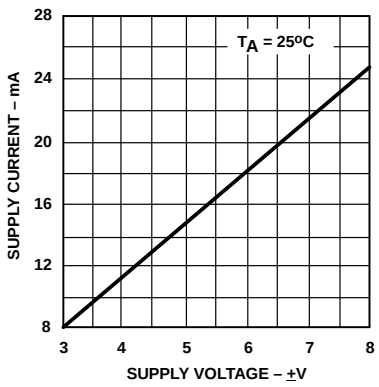
Output Voltage Swing as a Function of Frequency



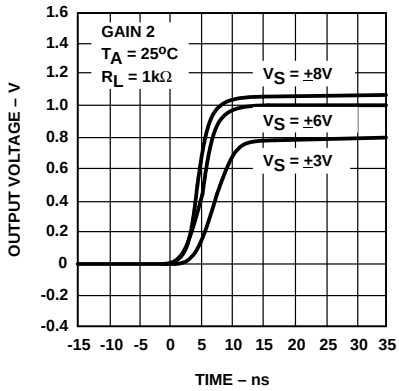
Pulse Response



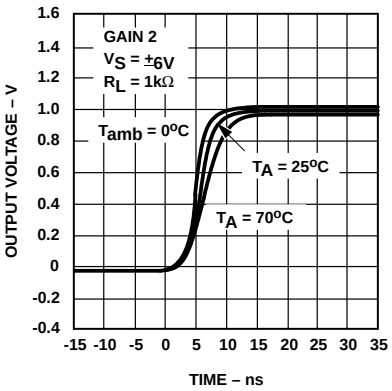
Supply Current as a Function of Temperature



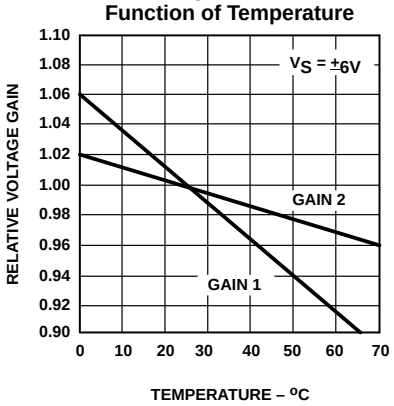
Pulse Response as a Function of Supply Voltage



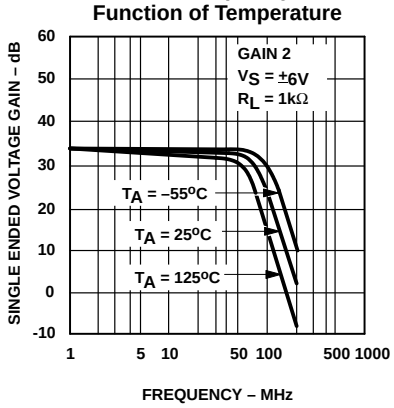
Pulse Response as a Function of Temperature



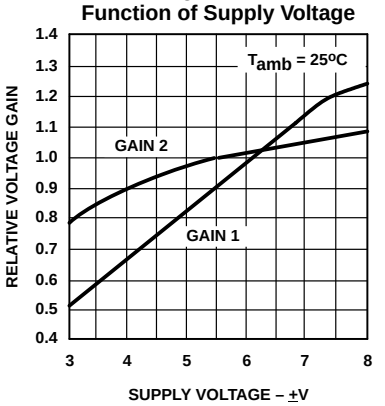
Voltage Gain as a Function of Temperature



Gain vs. Frequency as a Function of Temperature

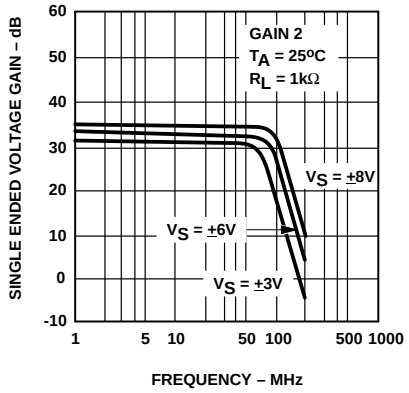


Voltage Gain as a Function of Supply Voltage

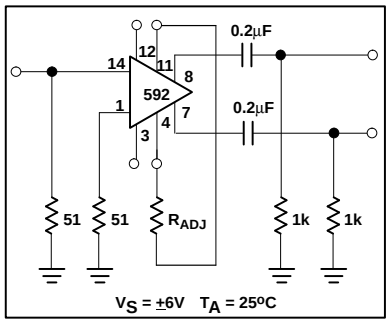


TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

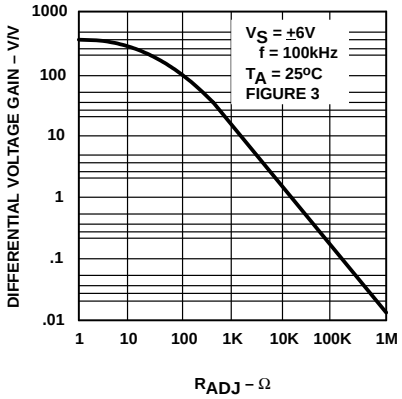
Gain vs. Frequency as a Function of Supply Voltage



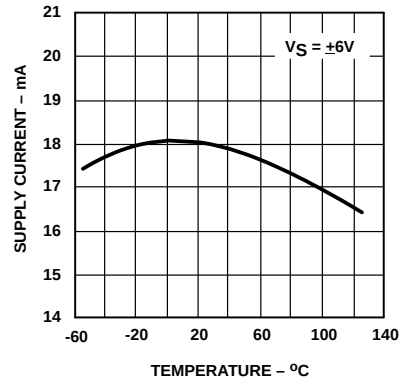
Voltage Gain Adjust Circuit



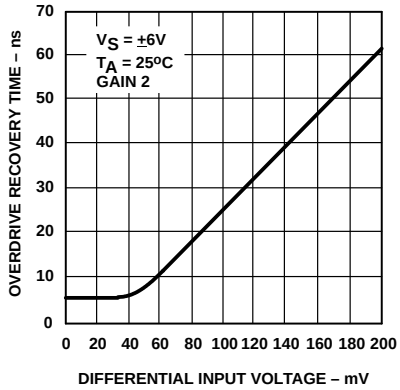
Voltage Gain as a Function of RADJ (Figure 3)



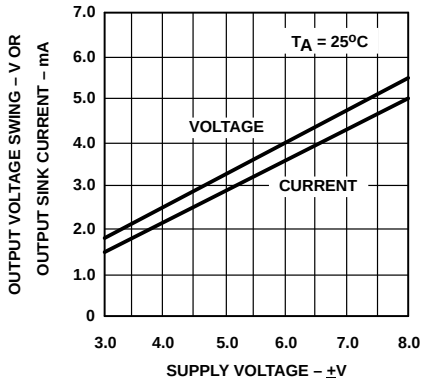
Supply Current as a Function of Temperature



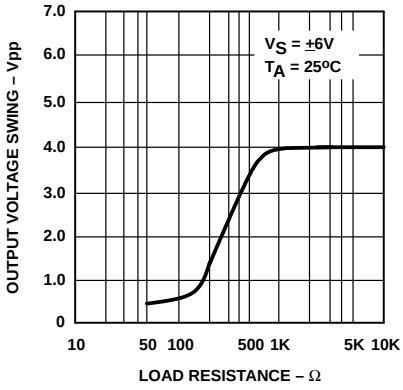
Differential Overdrive Recovery Time



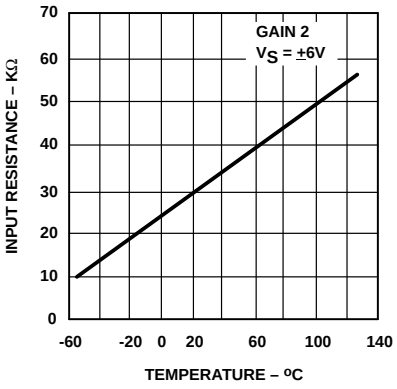
Output Voltage and Current Swing as a Function of Supply Voltage



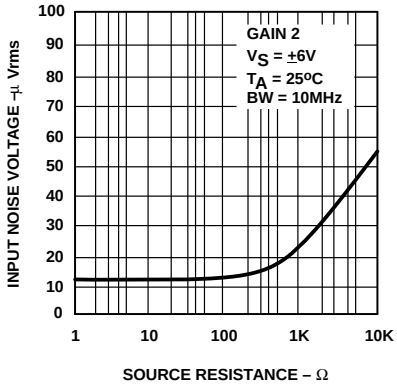
Output Voltage Swing as a Function of Load Resistance

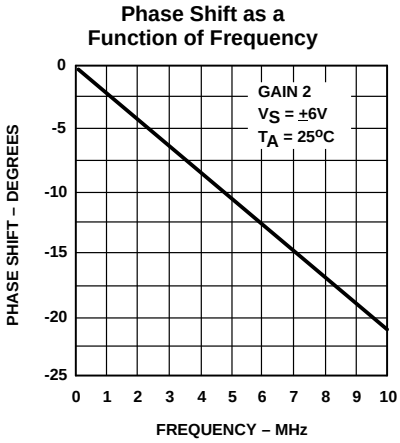


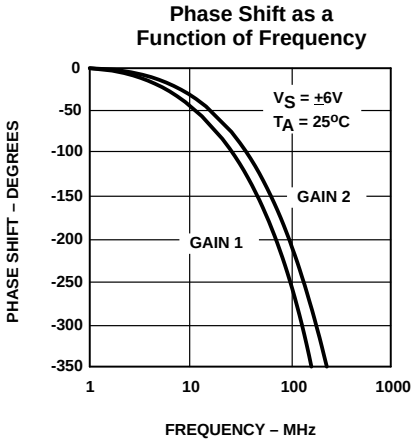
Input Resistance as a Function of Temperature

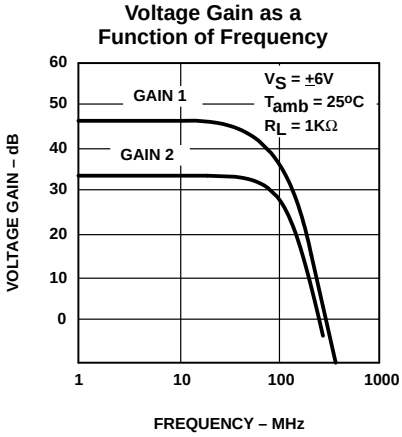


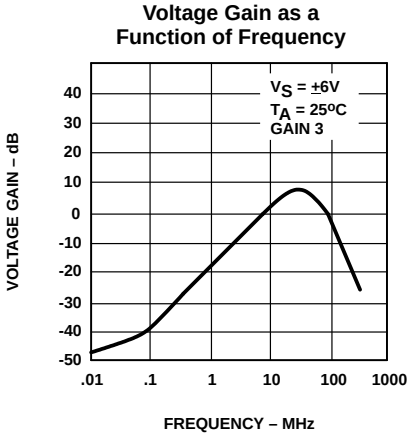
Input Noise Voltage as a Function of Source Resistance



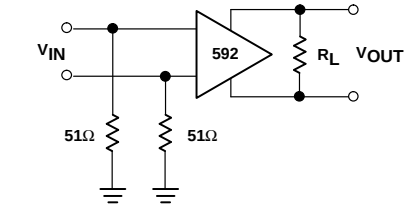


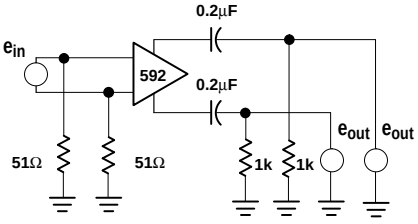






TEST CIRCUITS T_A = 25°C, unless otherwise specified.

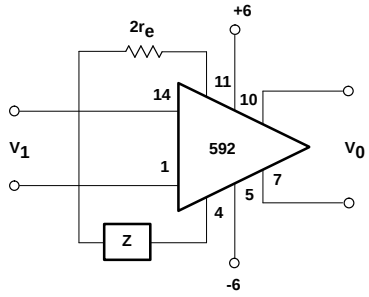




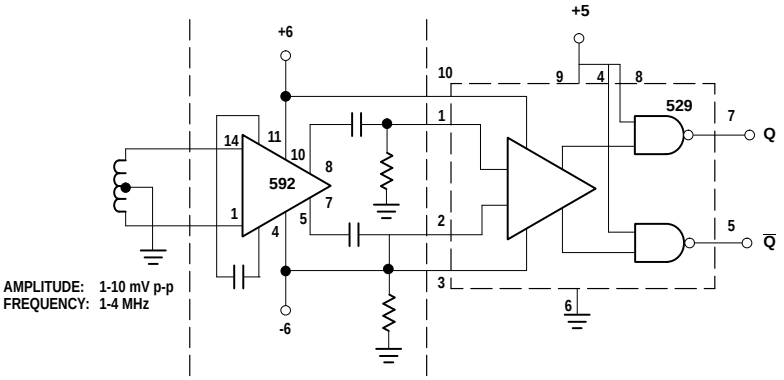
TYPICAL APPLICATIONS

NOTE:

$$\frac{V_0(s)}{V_1(s)} \approx \frac{1.4 \cdot 10^4}{Z(S) + 2r_e} \approx \frac{1.4 \cdot 10^4}{Z(S) + 32}$$

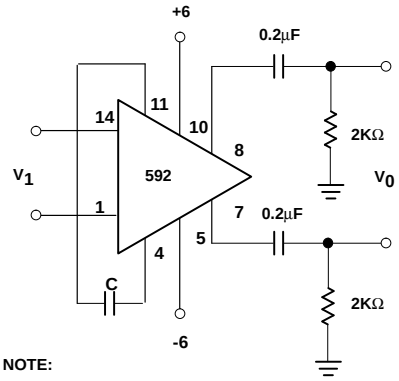


Basic Configuration



READ HEAD **DIFFERENTIATOR/AMPLIFIER** **ZERO CROSSING DETECTOR**

Disc/Tape Phase-Modulated Readback Systems



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

$$V_O \simeq 1.4 \times 10^4 C \frac{dVi}{dT}$$

Differentiation with High Common-Mode Noise Rejection

FILTER NETWORKS

Z NETWORK	FILTER TYPE	V_0 (s) TRANSFER V_1 (s) FUNCTION
R L	LOW PASS	$\frac{1.4 \times 10^4}{L} \left[\frac{1}{s + R/L}\right]$
R C	HIGH PASS	$\frac{1.4 \times 10^4}{R} \left[\frac{s}{s + 1/RC}\right]$
R L C	BAND PASS	$\frac{1.4 \times 10^4}{L} \left[\frac{s}{s^2 + R/Ls + 1/LC}\right]$
R, L, C	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.
$S = j\omega$
$\omega = 2\pi f$