

# NE592, SE592 DIFFERENTIAL VIDEO AMPLIFIERS

D2667, FEBRUARY 1984—REVISED NOVEMBER 1991

- 90-MHz Bandwidth
- Adjustable Gain to 400
- No Frequency Compensation Required
- Adjustable Pass Band
- Designed to Be Interchangeable With Signetics SE592 and NE592

DEVICE TYPE	TEMPERATURE RANGE	A <sub>VD</sub> RANGE (GAIN OPTION 1)
NE592	0°C to 70°C	250–600
SE592	–55°C to 125°C	300–500

## description

These devices are monolithic two-stage video amplifiers with differential inputs and differential outputs.

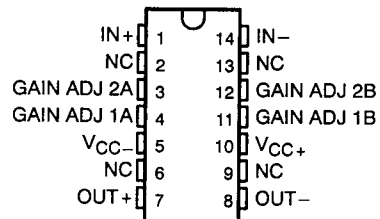
Internal series-shunt feedback provides wide bandwidth, low phase distortion, and excellent gain stability. Emitter-follower outputs enable the device to drive capacitive loads, and all stages are current-source biased to obtain high common-mode and supply-voltage rejection ratios.

Fixed differential amplification of nominally 100 or 400 may be selected without external components, or amplification may be adjusted from 0 to 400 by the use of a single external resistor connected between the gain-adjustment pins 1A and 1B. External frequency-compensating components are required for any gain option.

The devices are particularly useful in magnetic-tape or disk-file systems using phase or NRZ encoding and in high-speed thin-film or plated-wire memories. Other applications include general-purpose video and pulse amplifiers where wide bandwidth, low phase shift, and excellent gain stability are required.

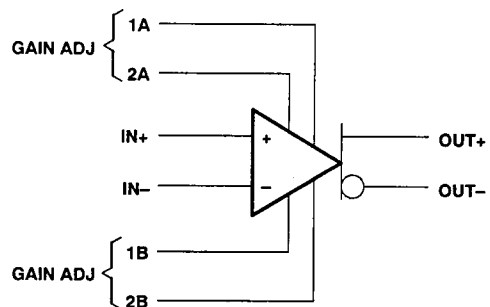
The NE592 is characterized for operation from 0°C to 70°C. The SE592 is characterized for operation over the full military temperature range of –55°C to 125°C.

NE592 . . . D OR N PACKAGE  
SE592 . . . J PACKAGE  
(TOP VIEW)



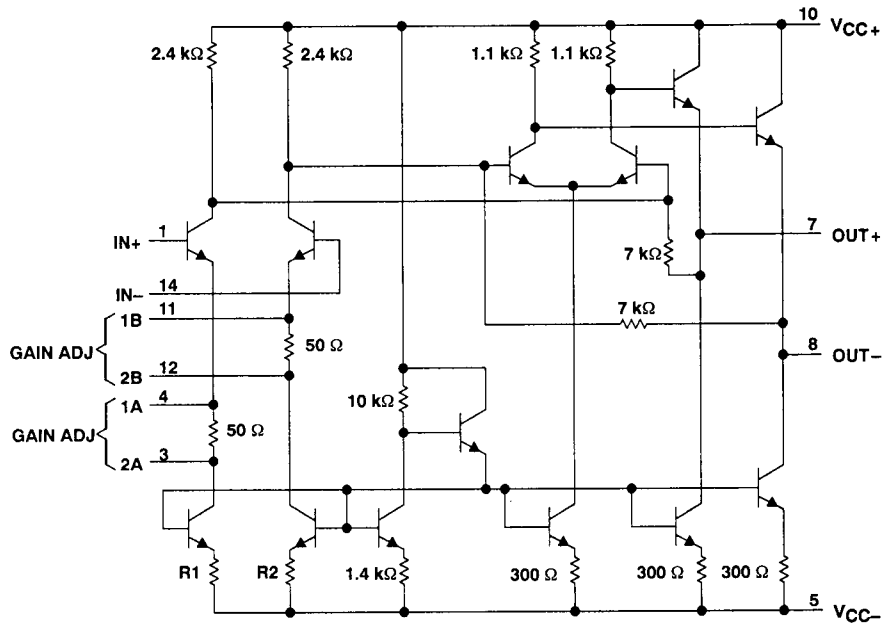
NC—No internal connection

## symbol



# NE592, SE592 DIFFERENTIAL VIDEO AMPLIFIERS

schematic



All resistor values shown are in ohms and nominal.  
In NE592 or SE592, R1 = 500 Ω, R2 = 500 Ω.

## absolute maximum ratings over operating free-air temperature (unless otherwise noted)

Supply voltage, $V_{CC+}$ (see Note 1)	8 V
Supply voltage, $V_{CC-}$ (see Note 1)	-8 V
Differential input voltage	±5 V
Common-mode input voltage	±6 V
Output current	10 mA
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range: NE592	0°C to 70°C
SE592	-55°C to 125°C
Storage temperature range	-65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package	300°C

NOTE 1: All voltage values except differential input voltages are with respect to the midpoint between  $V_{CC+}$  and  $V_{CC-}$ .

DISSIPATION RATING TABLE

PACKAGE	$T_A = 25^\circ\text{C}$ POWER RATING	DERATING FACTOR	DERATE ABOVE $T_A$	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
D	500 mW	N/A	N/A	500 mW	
J	500 mW	11 mW/°C	105°C	500 mW	275 mW
N	500 mW	N/A	N/A	500 mW	



# NE592, SE592 DIFFERENTIAL VIDEO AMPLIFIERS

## recommended operating conditions

	NE592			SE592			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, $V_{CC+}$	3	6	8	3	6	8	V
Supply voltage, $V_{CC-}$	-3	-6	-8	-3	-6	-8	V
Operating free-air temperature, $T_A$	0		70	-55		125	°C

## electrical characteristics, $V_{CC\pm} = \pm 6\text{ V}$ , $T_A = 25^\circ\text{C}$

PARAMETER	TEST FIGURE	TEST CONDITIONS	GAIN OPTION†	MIN	TYP	MAX	UNIT
AVD Large-signal differential voltage amplification	1	$V_{O(PP)} = 3\text{ V}$ , $R_L = 2\text{ k}\Omega$	1	300	400	500	V/V
			2	90	100	110	
BW Bandwidth (-3 dB)	2	$V_{O(PP)} = 1\text{ V}$	1	40			MHz
			2	90			
$I_{IO}$ Input offset current			1, 2, or 3	0.4		3	$\mu\text{A}$
$I_{IB}$ Input bias current			1, 2, or 3	9		20	$\mu\text{A}$
$V_{ICR}$ Common-mode input voltage range	3		1, 2, or 3	$\pm 1$			V
$V_{OC}$ Common-mode output voltage	1	$R_L = \infty$	1, 2, or 3	2.4	2.9	3.4	V
$V_{OO}$ Output offset voltage	1	$V_{IO} = 0$ , $R_L = \infty$	1	1.5			V
			2	1			
			3	0.35	0.75		
$V_{O(PP)}$ Maximum peak-to-peak output voltage swing	1	$R_L = 2\text{ k}\Omega$	1, 2, or 3	3	4		V
$r_i$ Input resistance			1	4			$\text{k}\Omega$
			2	20	30		
$r_o$ Output resistance				20			$\Omega$
$C_i$ Input capacitance				2			pF
CMRR Common-mode rejection ratio	3	$V_{IC} = \pm 1\text{ V}$ , $f = 100\text{ kHz}$	2	60	86		dB
	3	$V_{IC} = \pm 1\text{ V}$ , $f = 5\text{ MHz}$	2	60			
$k_{SVR}$ Supply-voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )	4	$\Delta V_{CC+} = \pm 0.5\text{ V}$ , $\Delta V_{CC-} = \pm 0.5\text{ V}$	2	50	70		dB
$V_n$ Broadband equivalent input noise voltage	4	$\text{BW} = 1\text{ kHz to } 10\text{ MHz}$	1, 2, or 3	12			$\mu\text{V}$
$t_{pd}$ Propagation delay time	2	$\Delta V_O = 1\text{ V}$	1	7.5			ns
			2	6	10		
$t_r$ Rise time	2	$\Delta V_O = 1\text{ V}$	1	10.5			ns
			2	4.5	10		
$I_{\text{sink(max)}}$ Maximum output sink current			1, 2, or 3	3	4		mA
$I_{CC}$ Supply current		No load, No signal	1, 2, or 3	18		24	mA

† The gain option is selected as follows:

Gain Option 1 . . . Gain Adjust pin 1A is connected to pin 1B, pins 2A and 2B are open.

Gain Option 2 . . . Gain Adjust pin 2A is connected to pin 2B, pins 1A and 1B are open.

Gain Option 3 . . . All Gain Adjust pins are open.

# NE592 DIFFERENTIAL VIDEO AMPLIFIER

electrical characteristics,  $V_{CC\pm} = \pm 6\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER		TEST FIGURE	TEST CONDITIONS	GAIN OPTION†	MIN	TYP	MAX	UNIT	
A <sub>VD</sub>	Large-signal differential voltage amplification	1	$V_{O(PP)} = 3\text{ V}$ , $R_L = 2\text{ k}\Omega$	1	250	400	600	V/V	
				2	80	100	120		
BW	Bandwidth (-3 dB)	2	$V_{O(PP)} = 1\text{ V}$	1	40			MHz	
				2	90				
I <sub>IO</sub>	Input offset current		$V_{IC} = 0$	1, 2, or 3	0.4		5	$\mu\text{A}$	
I <sub>IB</sub>	Input bias current		$V_{IC} = 0$	1, 2, or 3	9		30	$\mu\text{A}$	
V <sub>ICR</sub>	Common-mode input voltage range	3		1, 2, or 3	$\pm 1$			V	
V <sub>OC</sub>	Common-mode output voltage	1	$R_L = \infty$		2.4	2.9	3.4	V	
V <sub>OO</sub>	Output offset voltage	1	$V_{IO} = 0$ , $R_L = \infty$	1 or 2	1.5			V	
				3	0.35	0.75			
V <sub>O(PP)</sub>	Maximum peak-to-peak output voltage swing	1	$R_L = 2\text{ k}\Omega$	1, 2, or 3	3	4		V	
r <sub>i</sub>	Input resistance			1	4			k $\Omega$	
				2	10	30			
r <sub>o</sub>	Output resistance				20			$\Omega$	
C <sub>i</sub>	Input capacitance				2			pF	
CMRR	Common-mode rejection ratio	3	$V_{IC} = \pm 1\text{ V}$ , $f = 100\text{ kHz}$	2	60	86		dB	
		3	$V_{IC} = \pm 1\text{ V}$ , $f = 5\text{ MHz}$	2	60				
k <sub>SVR</sub>	Supply-voltage rejection ratio ( $\Delta V_{CC+}/\Delta V_{IO}$ )	4	$\Delta V_{CC+} = \pm 0.5\text{ V}$ , $\Delta V_{CC-} = \pm 0.5\text{ V}$	2	50	70		dB	
V <sub>n</sub>	Broadband equivalent input noise voltage	4	BW = 1 kHz to 10 MHz	1, 2, or 3	12			$\mu\text{V}$	
t <sub>pd</sub>	Propagation delay time	2	$\Delta V_O = 1\text{ V}$	1	7.5			ns	
				2	6				
t <sub>r</sub>	Rise time	2	$\Delta V_O = 1\text{ V}$	1	10.5			ns	
				2	4.5	12			
I <sub>sink(max)</sub>	Maximum output sink current			1, 2, or 3	3	4		mA	
I <sub>CC</sub>	Supply current		No load, No signal	1, 2, or 3	18			24	mA

† The gain option is selected as follows:

- Gain Option 1 . . . Gain Adjust pin 1A is connected to pin 1B, pins 2A and 2B are open.
- Gain Option 2 . . . Gain Adjust pin 2A is connected to pin 2B, pins 1A and 1B are open.
- Gain Option 3 . . . All Gain Adjust pins are open.

**electrical characteristics over recommended operating free-air temperature range,  $V_{CC\pm} = \pm 6\text{ V}$**

PARAMETER		TEST FIGURE	TEST CONDITIONS	GAIN OPTION†	MIN	TYP	MAX	UNIT
A <sub>VD</sub>	Large-signal differential voltage amplification	1	V <sub>O(PP)</sub> = 3 V	1	250		600	V/V
				2	80		120	
I <sub>IO</sub>	Input offset current			1 or 2			6	μA
I <sub>IB</sub>	Input bias current			1 or 2			40	μA
V <sub>ICR</sub>	Common-mode input voltage range	3		1 or 2	±1			V
V <sub>OO</sub>	Output offset voltage	1	V <sub>IO</sub> = 0, R <sub>L</sub> = ∞	1 or 2			1.5	V
				3			1	
V <sub>O(PP)</sub>	Maximum output voltage peak-to-peak swing	1	R <sub>L</sub> = 2 kΩ	1 or 2	2.8			V
r <sub>i</sub>	Input resistance			2	8			kΩ
CMRR	Common-mode rejection ratio	3	V <sub>IC</sub> = ±1 V, f = 100 kHz	2	50			dB
k <sub>SVR</sub>	Supply-voltage rejection ratio (ΔV <sub>CC</sub> /ΔV <sub>IO</sub> )	4	ΔV <sub>CC</sub> <sup>+</sup> = ±0.5 V, ΔV <sub>CC</sub> <sup>-</sup> = ±0.5 V	2	50			dB
I <sub>sink(max)</sub>	Maximum output sink current			1, 2, or 3				mA
I <sub>CC</sub>	Supply current	1	No load, No signal	1, 2, or 3			27	mA

† The gain option is selected as follows:

Gain Option 1 . . . Gain Adjust pin 1A is connected to pin 1B, pins 2A and 2B are open.

Gain Option 2 . . . Gain Adjust pin 2A is connected to pin 2B, pins 1A and 1B are open.

Gain Option 3 . . . All Gain Adjust pins are open.

# SE592 DIFFERENTIAL VIDEO AMPLIFIER

electrical characteristics over recommended operating free-air temperature range,  $V_{CC\pm} = \pm 6\text{ V}$

PARAMETER		TEST FIGURE	TEST CONDITIONS	GAIN OPTION†	MIN	TYP	MAX	UNIT
AVD	Large-signal differential voltage amplification	1	$V_{O(PP)} = 3\text{ V}$	1	250		600	V/V
				2	80		120	
I <sub>IO</sub>	Input offset current			1 or 2			5	μA
I <sub>IB</sub>	Input bias current			1 or 2			40	μA
V <sub>ICR</sub>	Common-mode input voltage range	3		1 or 2	±1			V
V <sub>OO</sub>	Output offset voltage	1	$V_{ID} = 0, R_L = \infty$	1			1.5	V
				2			1.2	
				3			1	
V <sub>O(PP)</sub>	Maximum output voltage peak-to-peak swing	1	$R_L = 2\text{ k}\Omega$	1 or 2	2.5			V
r <sub>i</sub>	Input resistance			2	8			kΩ
CMRR	Common-mode rejection ratio	3	$V_{IC} = \pm 1\text{ V}, f = 100\text{ kHz}$	2	50			dB
k <sub>SVR</sub>	Supply-voltage rejection ratio ( $\Delta V_{CC}/\Delta V_{IO}$ )	4	$\Delta V_{CC+} = \pm 0.5\text{ V}, \Delta V_{CC-} = \pm 0.5\text{ V}$	2	50			dB
I <sub>sink(max)</sub>	Maximum output sink current			1, 2, or 3	2.5			mA
I <sub>CC</sub>	Supply current	1	No load, No signal	1, 2, or 3			27	mA

† The gain option is selected as follows:

Gain Option 1 . . . Gain Adjust pin 1A is connected to pin 1B, pins 2A and 2B are open.

Gain Option 2 . . . Gain Adjust pin 2A is connected to pin 2B, pins 1A and 1B are open.

Gain Option 3 . . . All Gain Adjust pins are open.

PARAMETER MEASUREMENT INFORMATION

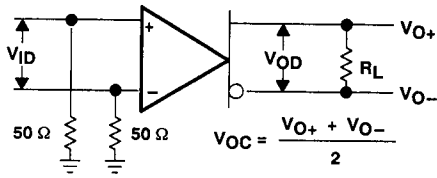


Figure 1

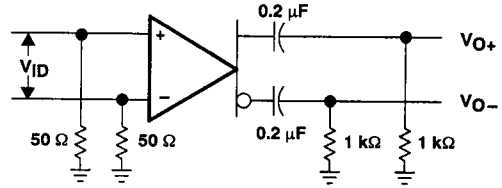


Figure 2

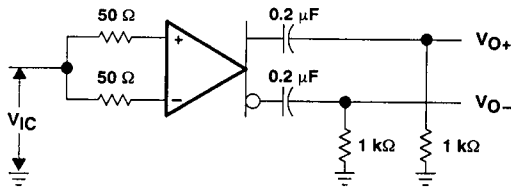


Figure 3

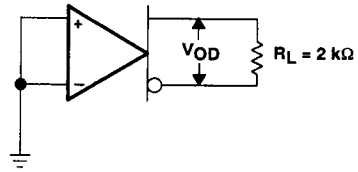


Figure 4