

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 _{VD} 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.

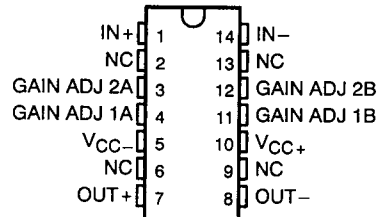
Internal series-shunt feedback provides wide bandwidth, low phase distortion, and excellent gain stability. Emitter-follower outputs enable the device to drive capacitive loads, and all stages are current-source biased to obtain high common-mode and supply-voltage rejection ratios.

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.

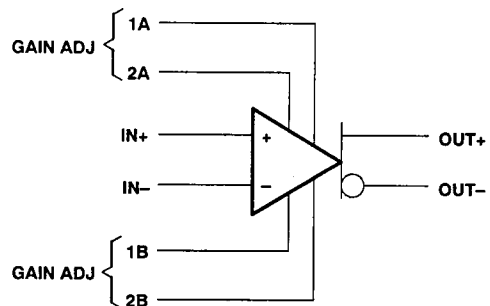
The NE592 is characterized for operation from 0°C to 70°C. The SE592 is characterized for operation over the full military temperature range of –55°C to 125°C.

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



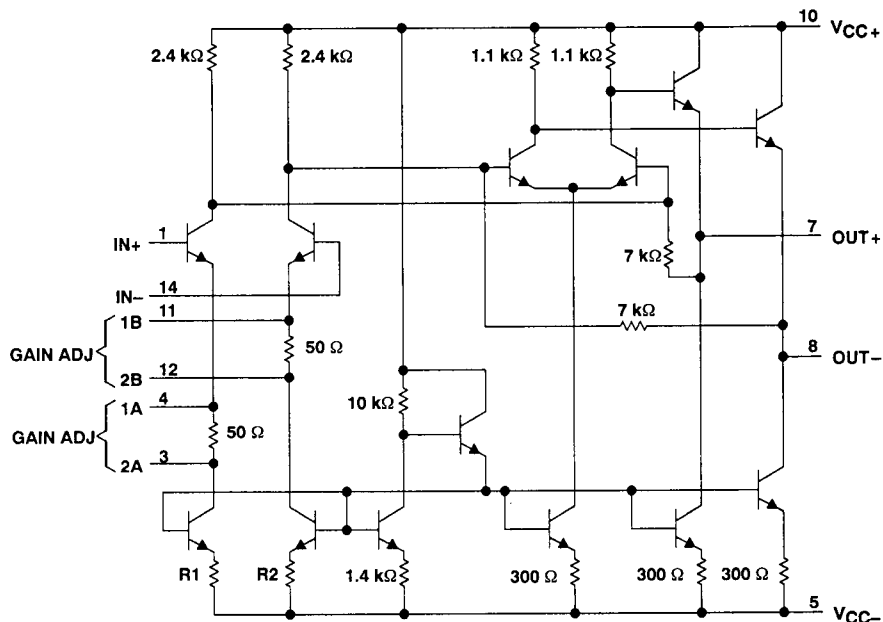
NC—No internal connection

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	



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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	μA
I_{IB} Input bias current			1, 2, or 3	9		20	μA
V_{ICR} Common-mode input voltage range	3		1, 2, or 3	± 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		k Ω	
			2	20	30		
r_o Output resistance				20		Ω	
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	BW = 1 kHz to 10 MHz	1, 2, or 3	12		μV	
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		
$I_{sink(max)}$ 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.

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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 _{VD}	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 _{IO}	Input offset current		$V_{IC} = 0$	1, 2, or 3	0.4		5	μA	
I _{IB}	Input bias current		$V_{IC} = 0$	1, 2, or 3	9		30	μA	
V _{ICR}	Common-mode input voltage range	3		1, 2, or 3	± 1			V	
V _{OC}	Common-mode output voltage	1	$R_L = \infty$		2.4	2.9	3.4	V	
V _{OO}	Output offset voltage	1	$V_{IO} = 0$, $R_L = \infty$	1 or 2	1.5			V	
				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			k Ω	
				2	10	30			
r _o	Output resistance				20			Ω	
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	BW = 1 kHz to 10 MHz	1, 2, or 3	12			μV	
t _{pd}	Propagation delay time	2	$\Delta V_O = 1\text{ V}$	1	7.5			ns	
				2	6				
t _r	Rise time	2	$\Delta V_O = 1\text{ V}$	1	10.5			ns	
				2	4.5	12			
I _{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.

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 _{VD}	Large-signal differential voltage amplification	1	V _{O(PP)} = 3 V	1	250		600	V/V
				2	80		120	
I _{IO}	Input offset current			1 or 2			6	μA
I _{IB}	Input bias current			1 or 2			40	μA
V _{ICR}	Common-mode input voltage range	3		1 or 2	±1			V
V _{OO}	Output offset voltage	1	V _{IO} = 0, R _L = ∞	1 or 2			1.5	V
				3			1	
V _{O(PP)}	Maximum output voltage peak-to-peak swing	1	R _L = 2 kΩ	1 or 2	2.8			V
r _i	Input resistance			2	8			kΩ
CMRR	Common-mode rejection ratio	3	V _{IC} = ±1 V, f = 100 kHz	2	50			dB
k _{SVR}	Supply-voltage rejection ratio (ΔV _{CC} /ΔV _{IO})	4	ΔV _{CC} ⁺ = ±0.5 V, ΔV _{CC} ⁻ = ±0.5 V	2	50			dB
I _{sink(max)}	Maximum output sink current			1, 2, or 3				mA
I _{CC}	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
A _{VD}	Large-signal differential voltage amplification	1	$V_{O(PP)} = 3\text{ V}$	1	250		600	V/V
				2	80		120	
I _{IO}	Input offset current			1 or 2			5	μA
I _{IB}	Input bias current			1 or 2			40	μA
V _{ICR}	Common-mode input voltage range	3		1 or 2	±1			V
V _{OO}	Output offset voltage	1	$V_{ID} = 0, R_L = \infty$	1			1.5	V
				2			1.2	
				3			1	
V _{O(PP)}	Maximum output voltage peak-to-peak swing	1	$R_L = 2\text{ k}\Omega$	1 or 2	2.5			V
r _i	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 _{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			dB
I _{sink(max)}	Maximum output sink current			1, 2, or 3	2.5			mA
I _{CC}	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

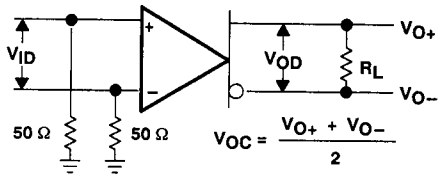


Figure 1

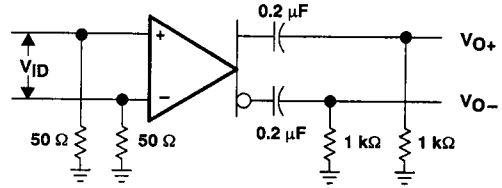


Figure 2

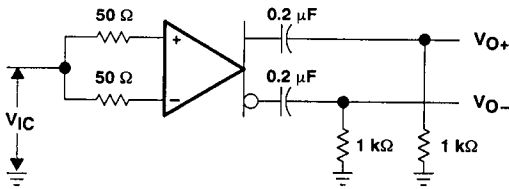


Figure 3

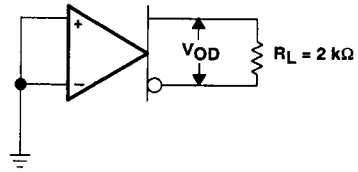


Figure 4