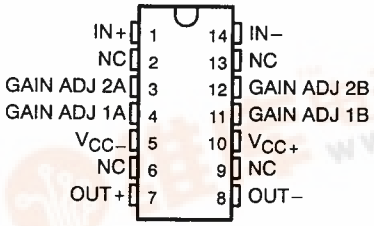
NE592, SE592
DIFFERENTIAL VIDEO AMPLIFIERS

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

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



NC–No internal connection

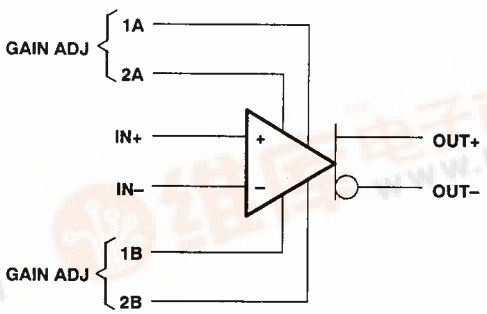
description

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.

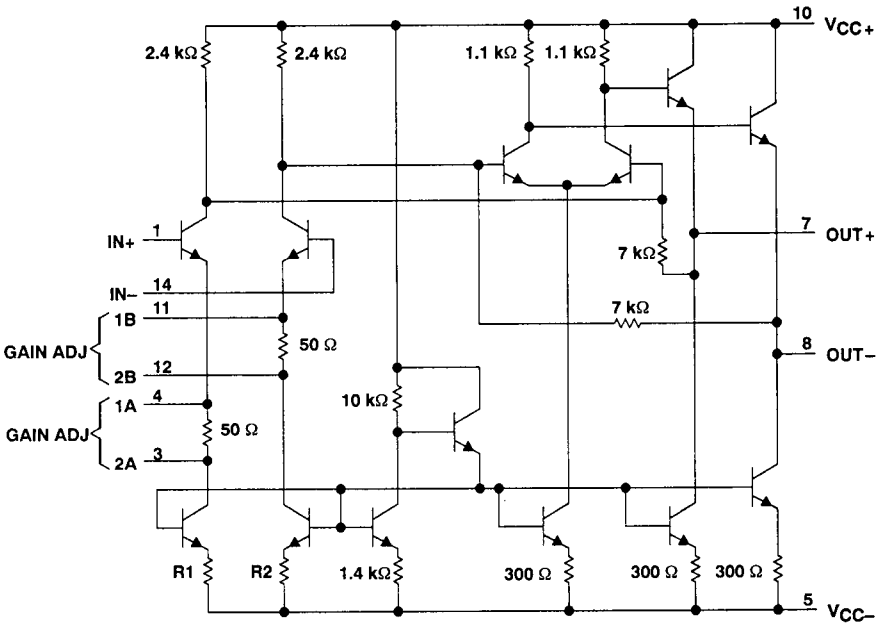
symbol



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.

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	$T_A \le 25°C$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_A	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ 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	

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, $V_{CC\pm}$ = ±6 V, T_A = 25°C

PARAMETER		TEST FIGURE	TEST CONDITIONS	GAIN OPTION†	MIN	TYP	MAX	UNIT
A_{VD}	Large-signal differential voltage amplification	1	$V_{O(PP)}$ = 3 V, R_L = 2 kΩ	1	300	400	500	V/V
				2	90	100	110	
BW	Bandwidth (−3 dB)	2	$V_{O(PP)}$ = 1 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 = ∞	1, 2, or 3	2.4	2.9	3.4	V
V_{OO}	Output offset voltage	1	V_{IO} = 0, R_L = ∞	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 kΩ	1, 2, or 3	3	4		V
r_i	Input resistance			1		4		kΩ
				2	20	30		
r_o	Output resistance					20		Ω
C_i	Input capacitance					2		pF
CMRR	Common-mode rejection ratio	3	V_{IC} = ±1 V, f = 100 kHz	2	60	86		dB
		3	V_{IC} = ±1 V, f = 5 MHz	2		60		
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	4	ΔV_{CC+} = ±0.5 V, ΔV_{CC-} = ±0.5 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	ΔV_O = 1 V	1		7.5		ns
				2		6	10	
t_r	Rise time	2	ΔV_O = 1 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.

electrical characteristics, $V_{CC\pm}$ = ±6 V, T_A = 25°C

PARAMETER		TEST FIGURE	TEST CONDITIONS	GAIN OPTION†	MIN	TYP	MAX	UNIT
A_{VD}	Large-signal differential voltage amplification	1	$V_{O(PP)}$ = 3 V, R_L = 2 kΩ	1	250	400	600	V/V
				2	80	100	120	
BW	Bandwidth (−3 dB)	2	$V_{O(PP)}$ = 1 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 = ∞		2.4	2.9	3.4	V
V_{OO}	Output offset voltage	1	V_{IO} = 0, R_L = ∞	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 kΩ	1, 2, or 3	3	4		V
r_i	Input resistance			1		4		kΩ
				2	10	30		
r_o	Output resistance					20		Ω
C_i	Input capacitance					2		pF
CMRR	Common-mode rejection ratio	3	V_{IC} = ±1 V, f = 100 kHz	2	60	86		dB
		3	V_{IC} = ±1 V, f = 5 MHz	2		60		
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)	4	$\Delta V_{CC}+$ = ±0.5 V, $\Delta V_{CC}-$ = ±0.5 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	ΔV_O = 1 V	1		7.5		ns
				2		6	10	
t_r	Rise time	2	ΔV_O = 1 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

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electrical characteristics over recommended operating free-air temperature range, $V_{CC\pm}$ = ±6 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 ($\Delta V_{CC}/\Delta V_{IO}$)	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.

electrical characteristics over recommended operating free-air temperature range, $V_{CC\pm}$ = ±6 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			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 = ∞	1			1.5	V
				2			1.2	
				3			1	
$V_{O(PP)}$	Maximum output voltage peak-to-peak swing	1	R_L = 2 kΩ	1 or 2	2.5			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 ($\Delta V_{CC}/\Delta V_{IO}$)	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	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:
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PARAMETER MEASUREMENT INFORMATION

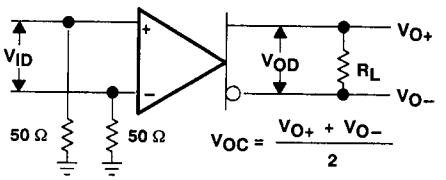

Figure 1

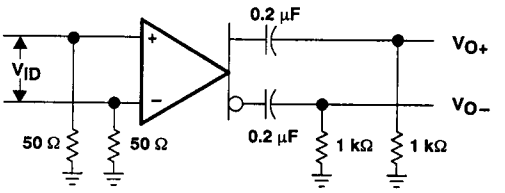

Figure 2

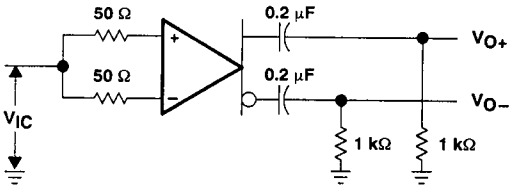

Figure 3

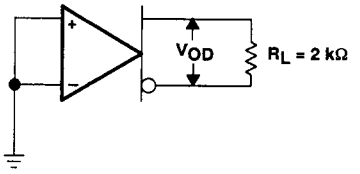

Figure 4