

# NE/SE529 Voltage Comparator

## Product Specification

### Linear Products

### DESCRIPTION

The NE/SE529 is a high-speed analog voltage comparator which, for the first time, mates state-of-the-art Schottky diode technology with the conventional linear process. This allows simultaneous fabrication of high-speed TTL gates with a precision linear amplifier on a single monolithic chip.

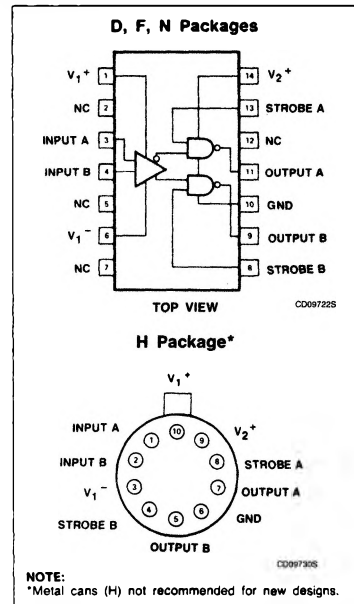
### FEATURES

- 10ns propagation delay
- Complementary output gates
- TTL or ECL compatible outputs
- Wide common-mode and differential voltage range
- Typical gain 5000

### APPLICATIONS

- A/D conversion
- ECL-to-TTL interface
- TTL-to-ECL interface
- Memory sensing
- Optical data coupling
- MIL-STD-883A, B, C available

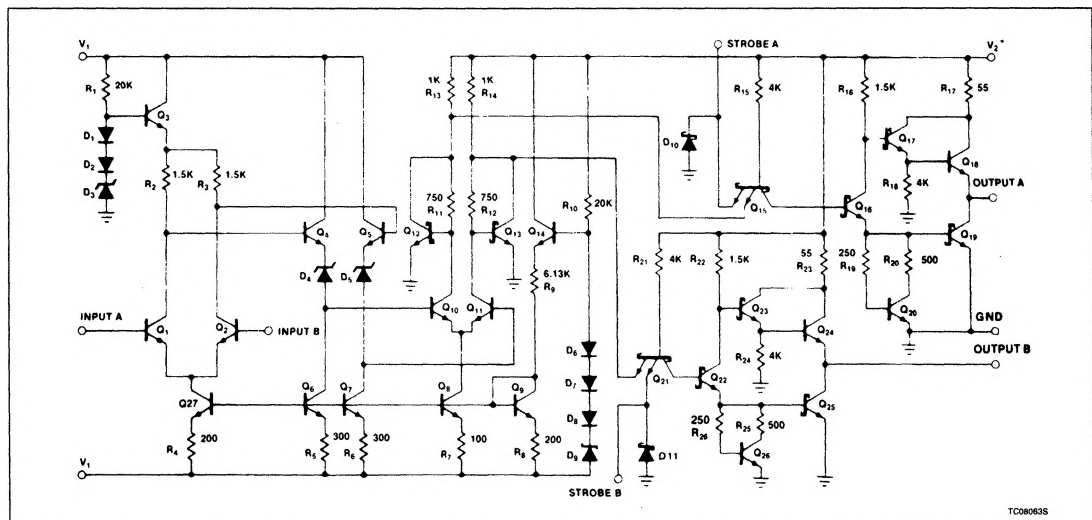
### PIN CONFIGURATIONS



### ORDERING INFORMATION

| DESCRIPTION        | TEMPERATURE RANGE | ORDER CODE |
|--------------------|-------------------|------------|
| 14-Pin Plastic DIP | 0 to +70°C        | NE529N     |
| 14-Pin Cerdip      | 0 to +70°C        | NE529F     |
| 14-Pin Cerdip      | -55°C to +125°C   | SE529F     |
| 14-Pin SO          | 0 to +70°C        | NE529D     |
| 10-Lead Metal Can  | 0 to +70°C        | NE529H     |
| 10-Lead Metal Can  | -55°C to +125°C   | SE529H     |

### EQUIVALENT SCHEMATIC



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## ABSOLUTE MAXIMUM RATINGS

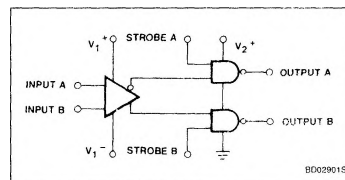
| SYMBOL     | PARAMETER                                  | RATING      | UNIT             |
|------------|--------------------------------------------|-------------|------------------|
| $V_{1+}$   | Positive supply voltage                    | + 15        | V                |
| $V_{1-}$   | Negative supply voltage                    | - 15        | V                |
| $V_{2+}$   | Gate supply voltage                        | + 7         | V                |
| $V_{OUT}$  | Output voltage                             | + 7         | V                |
| $V_{IN}$   | Differential input voltage                 | $\pm 5$     | V                |
| $V_{CM}$   | Input common mode voltage                  | $\pm 6$     | V                |
| $P_D$      | Maximum power dissipation <sup>1</sup>     |             |                  |
|            | $T_A = 25^\circ\text{C}$ (still-air)       |             |                  |
|            | F package                                  | 1190        | mW               |
|            | N package                                  | 1420        | mW               |
| $T_A$      | Operating temperature range                |             |                  |
|            | NE529                                      | 0 to +70    | $^\circ\text{C}$ |
| $T_A$      | SE529                                      | -55 to +125 | $^\circ\text{C}$ |
| $T_{STG}$  | Storage temperature range                  | -65 to +150 | $^\circ\text{C}$ |
| $T_{SOLD}$ | Lead soldering temperature<br>(10 sec max) | +300        | $^\circ\text{C}$ |

## NOTE:

1. Derate above  $25^\circ\text{C}$  at the following rates:

- F package at 9.5mW/ $^\circ\text{C}$ .
- N package at 11.5mW/ $^\circ\text{C}$ .
- D package at 8.3mW/ $^\circ\text{C}$ .

## BLOCK DIAGRAM



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**DC ELECTRICAL CHARACTERISTICS**  $V_{1+} = +10V$ ,  $V_{2+} = +5.0V$ ,  $V_{1-} = -10V$ , unless otherwise specified.

| SYMBOL                                                | PARAMETER                                                                                                                                                    | TEST CONDITIONS                                                                                                                                                                                                                  | SE529          |        |                               | NE529           |        |                         | UNIT                     |
|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------|-------------------------------|-----------------|--------|-------------------------|--------------------------|
|                                                       |                                                                                                                                                              |                                                                                                                                                                                                                                  | Min            | Typ    | Max                           | Min             | Typ    | Max                     |                          |
| Input characteristics                                 |                                                                                                                                                              |                                                                                                                                                                                                                                  |                |        |                               |                 |        |                         |                          |
| V <sub>OS</sub>                                       | Input offset voltage @ 25°C<br>Over temperature range                                                                                                        |                                                                                                                                                                                                                                  |                |        | 4<br>6                        |                 |        | 6<br>10                 | mV<br>mV                 |
| I <sub>BIAS</sub>                                     | Input bias current @ 25°C<br>Over temperature range                                                                                                          | V <sub>IN</sub> = 0V                                                                                                                                                                                                             |                | 5      | 12<br>36                      |                 | 5      | 20<br>50                | μA<br>μA                 |
| I <sub>OS</sub>                                       | Input offset current @ 25°C<br>Over temperature range<br>Common-mode voltage range                                                                           | V <sub>IN</sub> = 0V                                                                                                                                                                                                             |                | 2<br>0 | 3<br>9<br>± 5                 |                 | 2<br>0 | 5<br>15<br>± 5          | μA<br>μA<br>V            |
| Gate characteristics                                  |                                                                                                                                                              |                                                                                                                                                                                                                                  |                |        |                               |                 |        |                         |                          |
| V <sub>OUT</sub>                                      | Output voltage<br>"1" state<br>"0" state                                                                                                                     | V <sub>2+</sub> = 4.75V,<br>I <sub>SOURCE</sub> = -1mA<br>V <sub>2+</sub> = 4.75V, I <sub>SINK</sub> = 10mA                                                                                                                      | 2.5            | 3.3    |                               | 2.7             | 3.3    |                         | V<br>V                   |
|                                                       | Strobe inputs<br>"0" Input current <sup>1</sup><br>"1" Input current @ 25°C <sup>1</sup><br>Over temperature range<br>"0" input voltage<br>"1" input voltage | V <sub>2+</sub> = 5.25V,<br>V <sub>STROBE</sub> = 0.5V<br>V <sub>2+</sub> = 5.25V,<br>V <sub>STROBE</sub> = 2.7V<br>V <sub>2+</sub> = 5.25V,<br>V <sub>STROBE</sub> = 2.7V<br>V <sub>2+</sub> = 4.75V<br>V <sub>2+</sub> = 4.75V |                |        | -2<br>50<br>200<br>0.8<br>2.0 |                 |        | -2<br>100<br>200<br>0.8 | mA<br>μA<br>μA<br>V<br>V |
| I <sub>SC</sub>                                       | Short-circuit output current                                                                                                                                 | V <sub>2+</sub> = 5.25V, V <sub>OUT</sub> = 0V                                                                                                                                                                                   | -18            |        | -70                           | -18             |        | -70                     | mA                       |
| Power supply requirements                             |                                                                                                                                                              |                                                                                                                                                                                                                                  |                |        |                               |                 |        |                         |                          |
| V <sub>1+</sub><br>V <sub>1-</sub><br>V <sub>2+</sub> | Supply voltage                                                                                                                                               |                                                                                                                                                                                                                                  | 5<br>-6<br>4.5 |        | 10<br>-10<br>5.5              | 5<br>-6<br>4.75 |        | 10<br>-10<br>5.25       | V<br>V<br>V              |
| I <sub>1+</sub><br>I <sub>1-</sub><br>I <sub>2+</sub> | Supply current                                                                                                                                               | V <sub>1+</sub> = 10V, V <sub>1-</sub> = -10V<br>V <sub>2+</sub> = 5.25V<br>Over temp.<br>Over temp.<br>Over temp.                                                                                                               |                |        | 5<br>10<br>20                 |                 |        | 5<br>10<br>20           | mA<br>mA<br>mA           |

**NOTES:**

1. See logic function table.

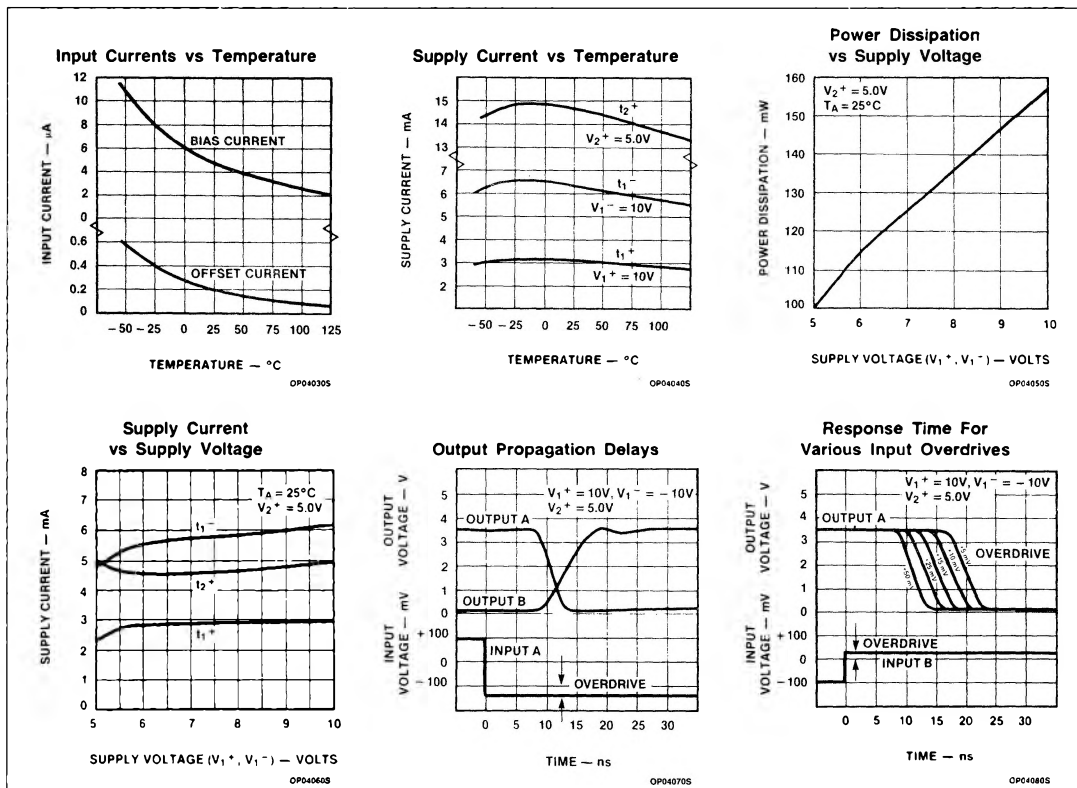
**AC ELECTRICAL CHARACTERISTICS**  $T_A = 25^\circ C$  (See AC test circuit).

| SYMBOL    | PARAMETER                             | TEST CONDITIONS           | LIMITS |     |     | UNIT |
|-----------|---------------------------------------|---------------------------|--------|-----|-----|------|
|           |                                       |                           | Min    | Typ | Max |      |
| $t_R$     | Transient response                    | $V_{IN} = \pm 100mV$ step |        |     |     |      |
| $t_{PLH}$ | Propagation delay time<br>Low-to-high |                           |        | 12  | 22  | ns   |
| $t_{PHL}$ | High-to-low                           |                           |        | 10  | 20  | ns   |
|           | Delay between output A and B          |                           |        | 2   | 5   | ns   |
| $t_{ON}$  | Strobe delay time<br>turn-on time     |                           |        | 6   |     | ns   |
| $t_{OFF}$ | turn-off time                         |                           |        | 6   |     | ns   |

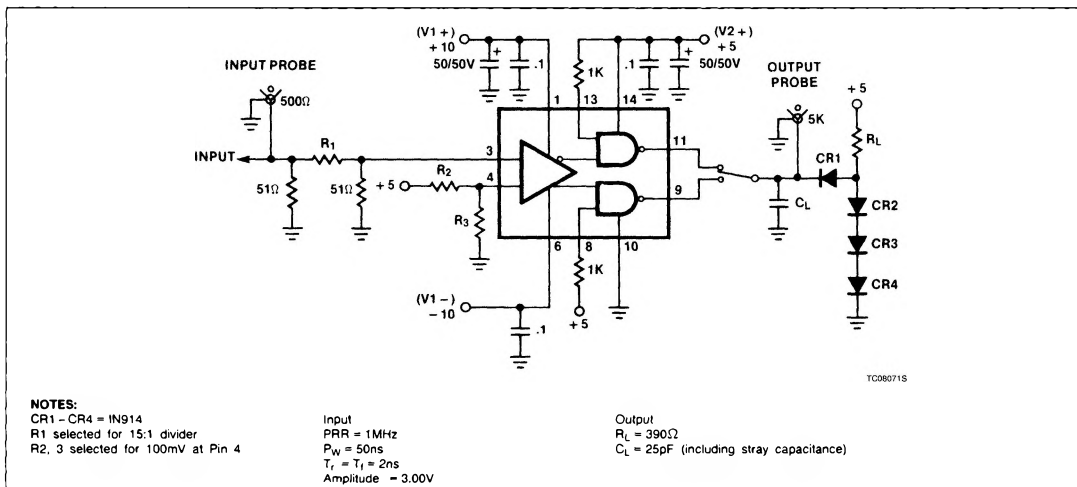
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## TYPICAL PERFORMANCE CHARACTERISTICS



## RESPONSE TIME TEST CIRCUIT



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APPLICATIONS

One of the main features of the device is that supply voltages ( $V+$ ,  $V-$ ) need not be balanced, as in the following diagrams. For proper operation, however, negative supply ( $V-$ ) should always be at least 6V more than the ground terminal (pin 6). Input Common-Mode range should be limited to values of 2V less than the supply voltages ( $V+$  and  $V-$ ) up to a maximum of  $\pm 6V$  as supply voltages are increased.

It is also important to note that Output A is in phase with Input A and Output B is in phase with input B.

LOGIC FUNCTION

| $V_{ID}$<br>( $A^+$ , $B^-$ ) | STROBE A | STROBE B | OUTPUT A  | OUTPUT B  |
|-------------------------------|----------|----------|-----------|-----------|
| $V_{ID} \leq -V_{OS}$         | H        | X        | L         | H         |
| $-V_{OS} < V_{ID} < V_{OS}$   | H        | H        | Undefined | Undefined |
| $V_{ID} \geq V_{OS}$          | X        | H        | H         | L         |
| X                             | L        | L        | H         | H         |

TYPICAL APPLICATIONS

