# DATA SHEET

## NE527
Voltage comparator

Product data
Supersedes data of 1994 Aug 31
File under Integrated Circuits, IC11 Handbook

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# Voltage comparator NE527

## DESCRIPTION

The NE527 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. The NE527 is similar in design to the Philips Semiconductors NE529 voltage comparator except that it incorporates an “Emitter-Follower” input stage for extremely low input currents. This opens the door to a whole new range of applications for analog voltage comparators.

## FEATURES

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

## PIN CONFIGURATIONS

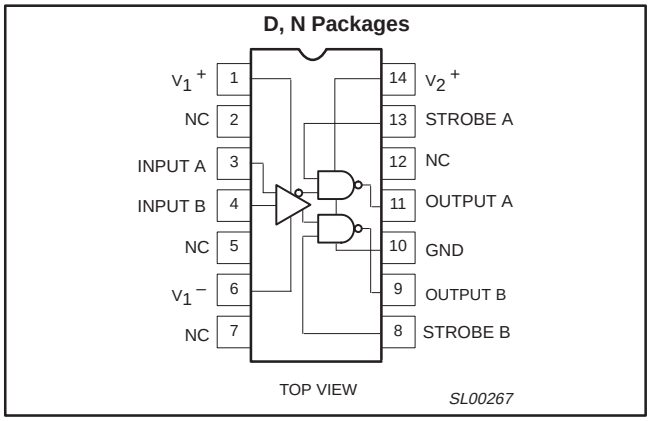



**Figure 1. Pin Configuration**

## APPLICATIONS

- A/D conversion
- ECL-to-TTL interface
- TTL-to-ECL interface
- Memory sensing
- Optical data coupling

## ORDERING INFORMATION

| DESCRIPTION | TEMPERATURE RANGE | ORDER CODE | DWG # |
|---|---|---|---|
| 14-Pin Plastic Dual In-Line Package (DIP) | 0 °C to +70 °C | NE527N | SOT27-1 |
| 14-Pin Small Outline (SO) Package | 0 °C to +70 °C | NE527D | SOT108-1 |

## EQUIVALENT SCHEMATIC

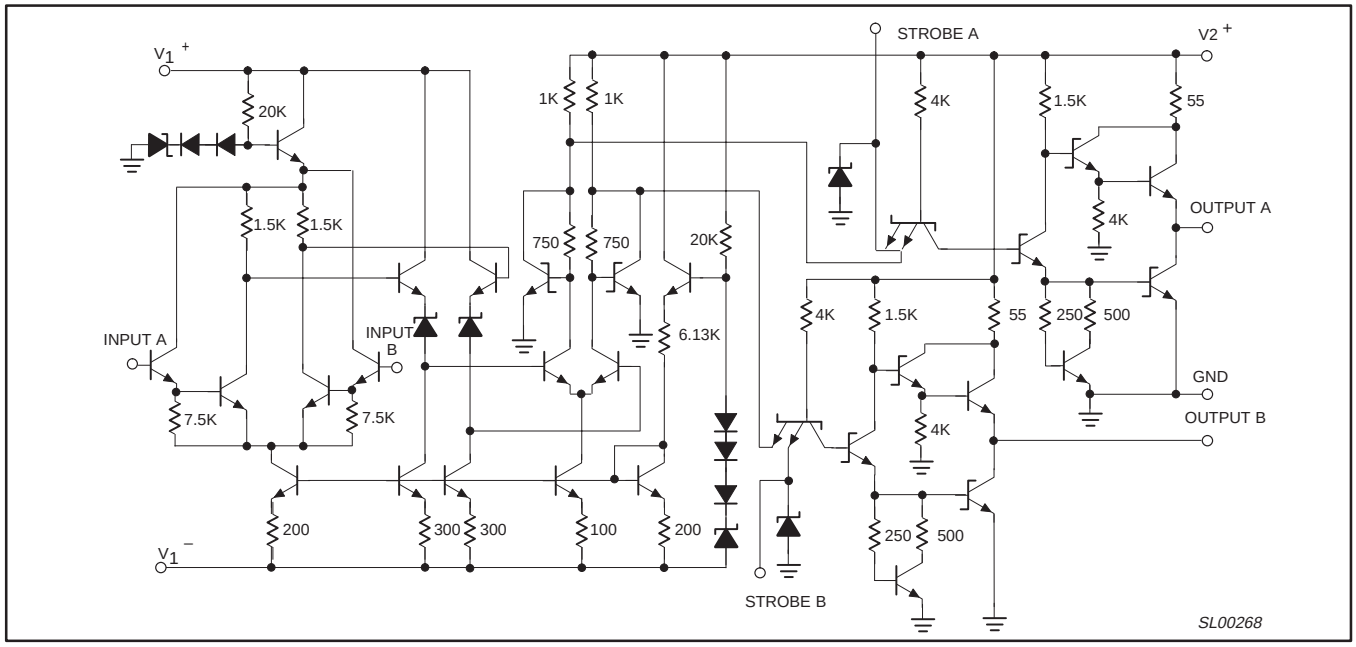



**Figure 2. Equivalent Schematic**

## 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 | ±5 | V |
| $V_{CM}$ | Input common mode voltage | ±6 | V |
| $P_D$ | Max power dissipation[1]<br>25 °C ambient (still air)<br>N package<br>D package | <br><br>1420<br>1040 | <br><br>mW<br>mW |
| $T_{amb}$ | Operating temperature range | 0 to +70 | °C |
| $T_{stg}$ | Storage temperature range | –65 to +150 | °C |
| $T_{sld}$ | Lead soldering temperature (10sec max) | +230 | °C |

**NOTES:**
1. Derate above 25 °C, at the following rates:
   N package 11.4 mW/°C
   D package 8.3 mW/°C

## BLOCK DIAGRAM

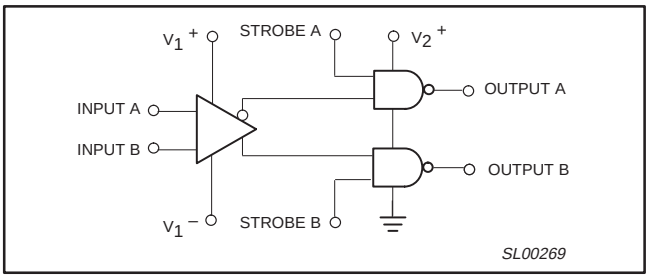



**Figure 3. Block Diagram**

## DC ELECTRICAL CHARACTERISTICS

$V_1+$ = 10V; $V_1-$ = –10 V; $V_2+$ = +5.0 V; unless otherwise specified.

| SYMBOL | PARAMETER | TEST CONDITIONS | NE527 | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| **Input characteristics** | | | | | | |
| $V_{OS}$ | Input offset voltage @ 25 °C | | | | 6 | mV |
| | over temperature range | | | | 10 | |
| $I_{BIAS}$ | Input bias current @ 25 °C | | | | 2 | µA |
| | over temperature range | | | | 4 | |
| $I_{OS}$ | Input offset current @ 25 °C | | | | 0.75 | µA |
| | over temperature range | $V_{IN}$ = 0 V | | | 1 | µA |
| $V_{CM}$ | Common-mode voltage range | | –5 | | +5 | V |
| **Gate characteristics** | | | | | | |
| $V_{OUT}$ | Output Voltage | | | | | |
| | "1" State | $V_2+$ = 4.75 V; $I_{SOURCE}$ = –1 mA | 2.7 | 3.3 | | V |
| | "0" State | $V_2+$ = 4.75 V; $I_{SINK}$ = 10 mA | | | 0.5 | V |
| | Strobe inputs | | | | | |
| | "0" Input current[1] | $V_2+$ = 5.25 V; $V_{STROBE}$ = 0.5 V | | | –2 | mA |
| | "1" Input current @ 25 °C[1] | $V_2+$ = 5.25 V; $V_{STROBE}$ = 2.7 V | | | 100 | µA |
| | Over temperature range | $V_2+$ = 5.25 V; $V_{STROBE}$ = 2.7 V | | | 200 | µA |
| | "0" Input voltage | $V_2+$ = 4.75 V | | | 0.8 | V |
| | "1" Input voltage | $V_2+$ = 4.75 V | 2.0 | | | V |
| $I_{SC}$ | Short-circuit output current | $V_2+$ = 5.25 V;$V_{OUT}$ = 0 V | –18 | | –70 | mA |
| **Power supply requirements** | | | | | | |
| | Supply voltage | | | | | |
| $V_1+$ | | | 5 | | 10 | V |
| $V_1-$ | | | –6 | | –10 | V |
| $V_2+$ | | | 4.75 | 5 | 5.25 | V |
| | Supply current | $V_1+$ = 10 V; $V_1-$ = –10 V | | | | |
| | | $V_2+$ = 5.25 V | | | | |
| $I_1+$ | | Over temp. | | | 5 | mA |
| $I_1-$ | | Over temp. | | | 10 | mA |
| $I_2+$ | | Over temp. | | | 20 | mA |

**NOTE:**
1. See Logic Function Table.

## AC ELECTRICAL CHARACTERISTICS

$T_{amb}$ = 25 °C, unless otherwise specified. (See AC test circuit)

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | |
| | Transient response propagation delay time | | | | | |
| $t_{PLH}$ | Low-to-High | $V_{IN}$ = ±100 mV step | | 16 | 26 | ns |
| $t_{PHL}$ | High-to-Low | | | 14 | 24 | ns |
| | Delay between output A and B | | | 2 | 5 | ns |
| | Strobe delay time | | | | | |
| $t_{ON}$ | Turn-on time | | | 6 | | ns |
| $t_{OFF}$ | Turn-off time | | | 6 | | ns |

## TYPICAL PERFORMANCE CHARACTERISTICS

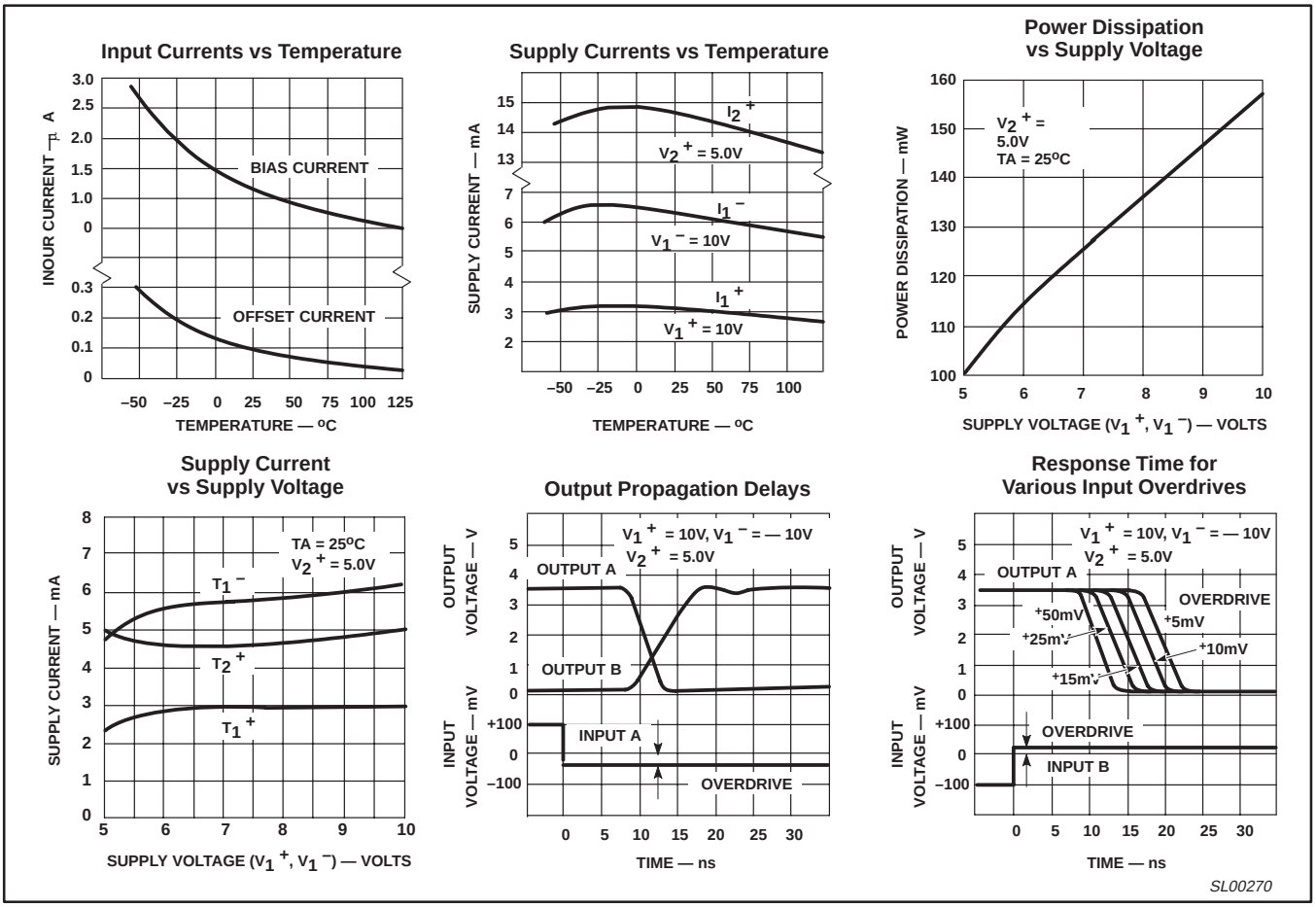



**Figure 4. Typical Performance Characteristics**

## RESPONSE TIME TEST CIRCUIT

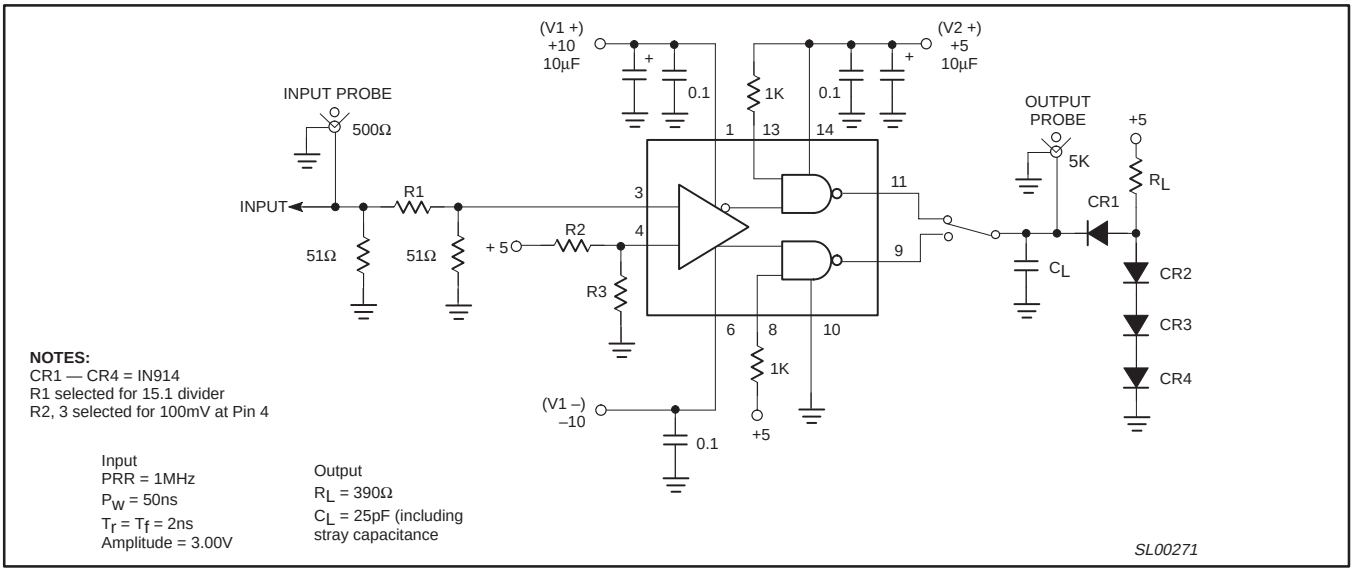



**Figure 5. Response Time Test Circuit**

## APPLICATIONS

One of the main features of the device is that supply voltages ($V_1$+, $V_1$–) need not be balanced, as in the following diagrams. For proper operation, however, negative supply ($V_1$–) should always be at least 6 V more than the ground terminal (Pin 6). Input common-mode range should be limited to values of 2 V less than the supply voltages ($V_1$+ and $V_1$–) up to a maximum of ±5 V 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

| $V_{ID}$ ($A^+$, $B^-$) | STROBE A | STROBE B | OUTPUT A | OUTPUT B | COMMENT |
|---|---|---|---|---|---|
| $V_{ID} \leq -V_{OS}$ | H | X | L | H | Read $I_{IHA}$, $I_{ILB}$ |
| $-V_{OS} < V_{ID} < V_{OS}$ | H | H | Undefined | Undefined | |
| $V_{ID} \geq V_{OS}$ | X | H | H | L | Read $I_{ILA}$, $I_{IHB}$ |
| X | L | L | H | H | |

## TYPICAL APPLICATIONS

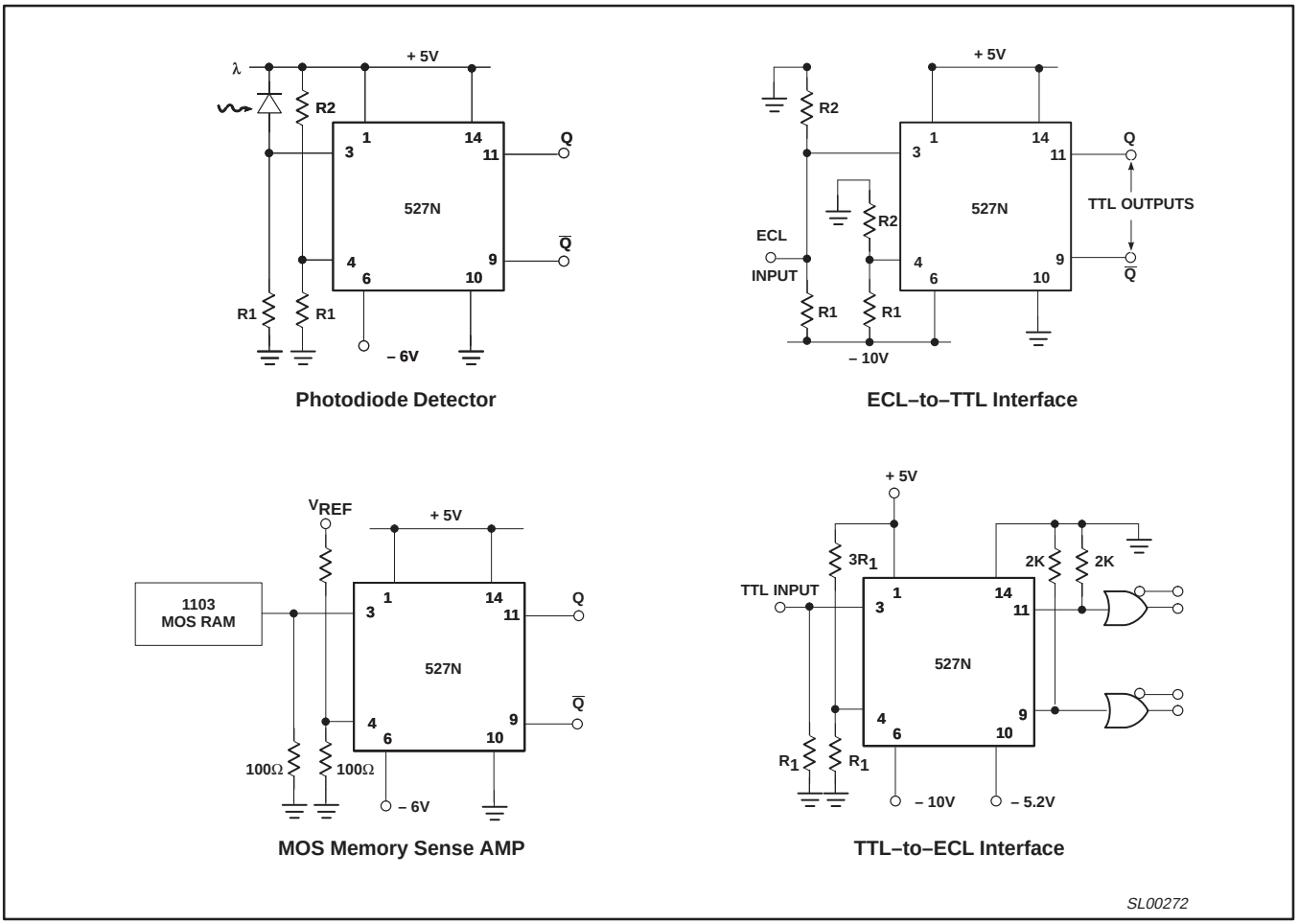
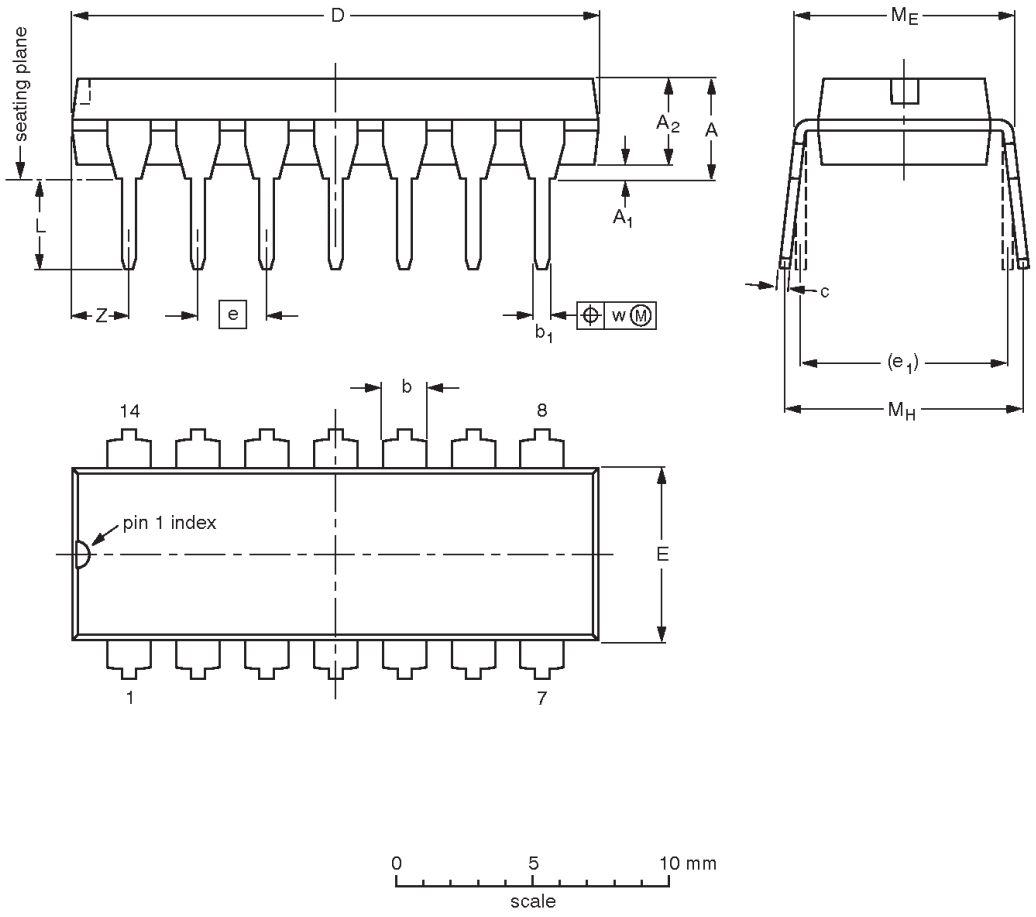



**Figure 6. Typical Applications**

**DIP14: plastic dual in-line package; 14 leads (300 mil)** **SOT27-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

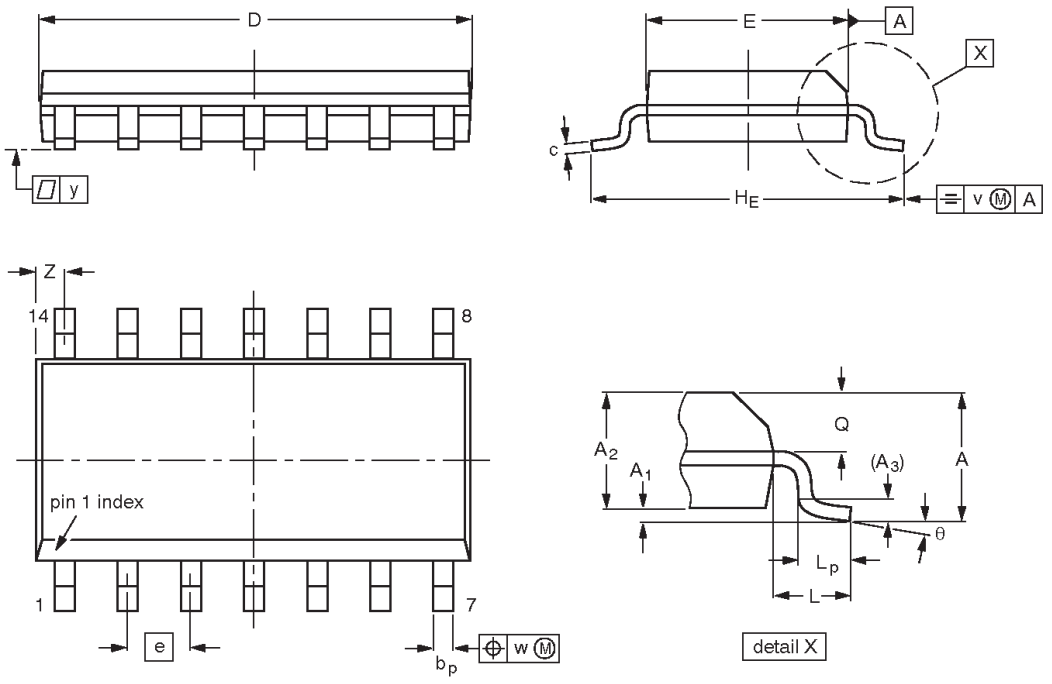
| UNIT | A max. | $A_1$ min. | $A_2$ max. | b | $b_1$ | c | D (1) | E (1) | e | $e_1$ | L | $M_E$ | $M_H$ | w | Z (1) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.2 | 0.51 | 3.2 | 1.73<br>1.13 | 0.53<br>0.38 | 0.36<br>0.23 | 19.50<br>18.55 | 6.48<br>6.20 | 2.54 | 7.62 | 3.60<br>3.05 | 8.25<br>7.80 | 10.0<br>8.3 | 0.254 | 2.2 |
| inches | 0.17 | 0.020 | 0.13 | 0.068<br>0.044 | 0.021<br>0.015 | 0.014<br>0.009 | 0.77<br>0.73 | 0.26<br>0.24 | 0.10 | 0.30 | 0.14<br>0.12 | 0.32<br>0.31 | 0.39<br>0.33 | 0.01 | 0.087 |

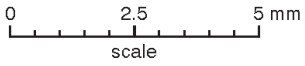
**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT27-1 | 050G04 | MO-001 | SC-501-14 | | | ~~95-03-11~~<br>99-12-27 |

**SO14: plastic small outline package; 14 leads; body width 3.9 mm** **SOT108-1**




**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.75 | 0.25<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 8.75<br>8.55 | 4.0<br>3.8 | 1.27 | 6.2<br>5.8 | 1.05 | 1.0<br>0.4 | 0.7<br>0.6 | 0.25 | 0.25 | 0.1 | 0.7<br>0.3 | $8^o$<br>$0^o$ |
| inches | 0.069 | 0.010<br>0.004 | 0.057<br>0.049 | 0.01 | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.35<br>0.34 | 0.16<br>0.15 | 0.050 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012 | |

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT108-1 | 076E06 | MS-012 | | | | ~~97-05-22~~<br>99-12-27 |

**NOTES**

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|---|---|---|
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