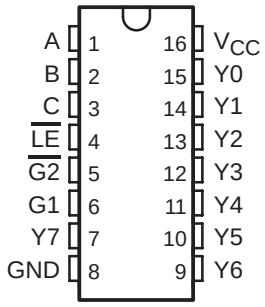
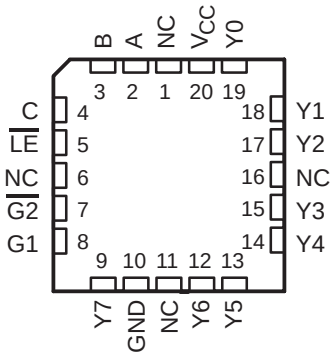
- **Combines Decoder and 3-Bit Address Latch**
- **Incorporates Two Output Enables to Simplify Cascading**
- **Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs**

**SN54ALS137A . . . J PACKAGE**
**SN74ALS137A, SN74AS137 . . . D OR N PACKAGE**
**(TOP VIEW)**




**SN54ALS137A . . . FK PACKAGE**
**(TOP VIEW)**




NC − No internal connection

## description

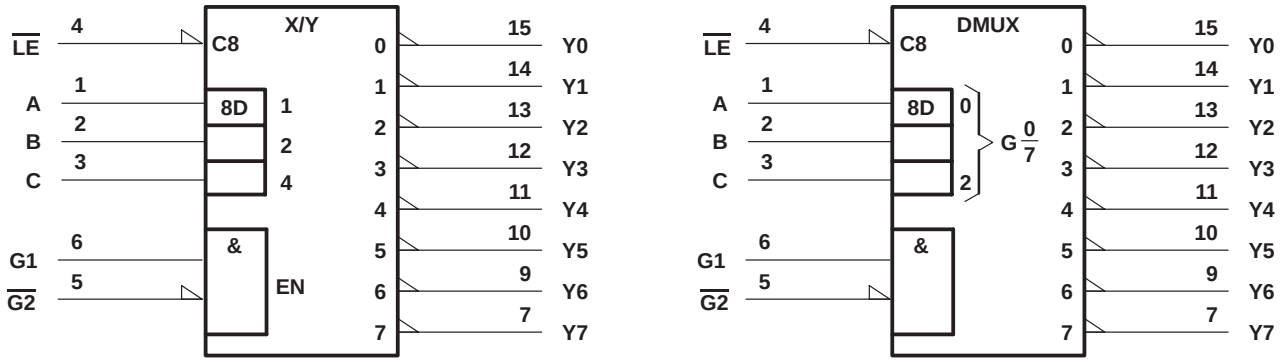
The SN54ALS137A, SN74ALS137A, and SN74AS137 are 3-line to 8-line decoders/demultiplexers with latches on the three address inputs. When the latch-enable ($\overline{LE}$) input is low, the devices act as decoders/demultiplexers. When $\overline{LE}$ goes from low to high, the address present at the select (A, B, and C) inputs is stored in the latches. Further address changes are ignored as long as $\overline{LE}$ remains high. The output-enable controls (G1 and $\overline{G2}$) control the outputs independently of the select or latch-enable inputs. All of the outputs are forced high if G1 is low or $\overline{G2}$ is high. These devices are ideally suited for implementing glitch-free decoders in strobed (stored-address) applications in bus-oriented systems.

The SN54ALS137A is characterized for operation over the full military temperature range of −55°C to 125°C. The SN74ALS137A and SN74AS137 are characterized for operation from 0°C to 70°C.

**FUNCTION TABLE**

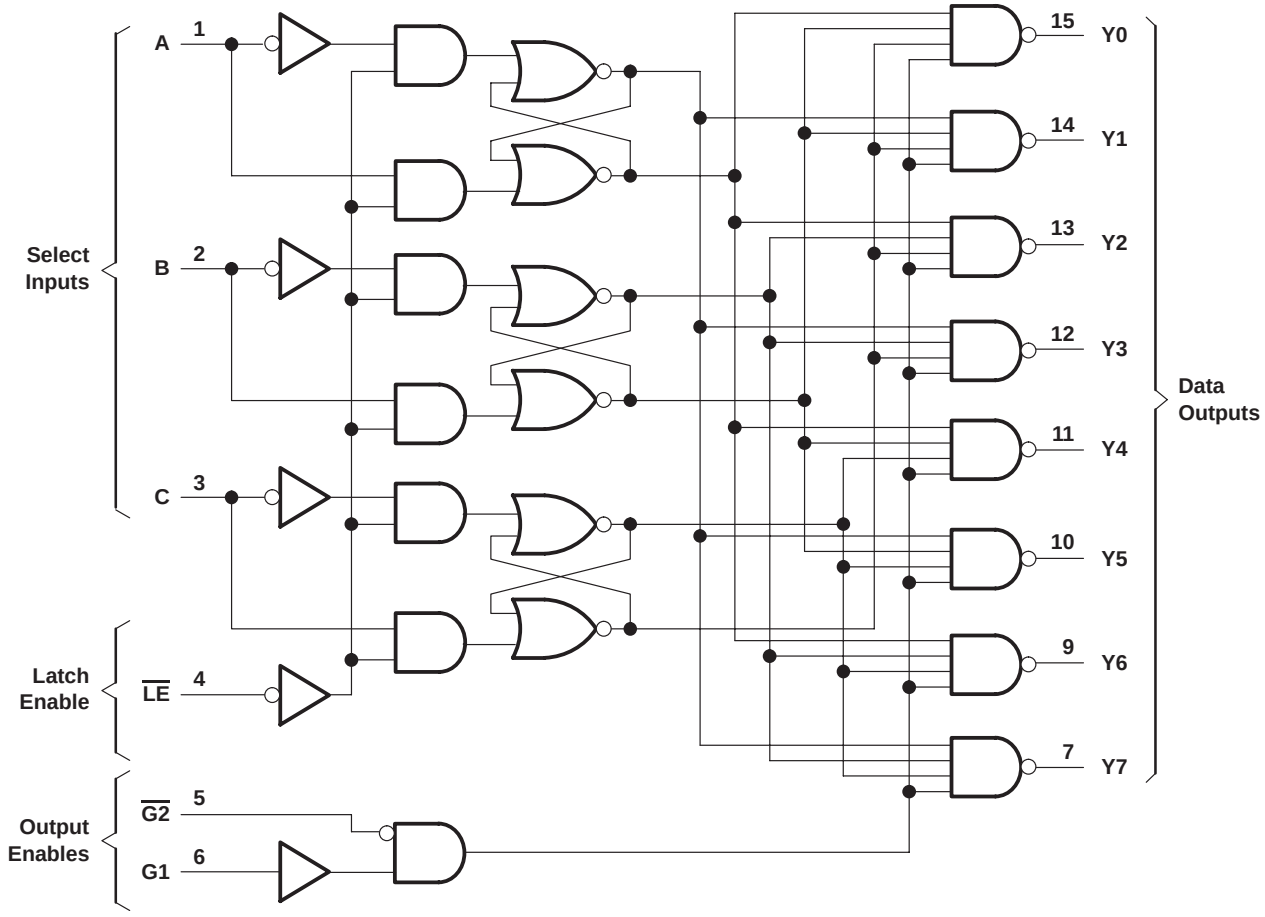
| INPUTS | | | | | | OUTPUTS | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENABLE | | | SELECT | | | | | | | | | | |
| $\overline{LE}$ | G1 | $\overline{G2}$ | C | B | A | Y0 | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| X | X | H | X | X | X | H | H | H | H | H | H | H | H |
| X | L | X | X | X | X | H | H | H | H | H | H | H | H |
| L | H | L | L | L | L | L | H | H | H | H | H | H | H |
| L | H | L | L | L | H | H | L | H | H | H | H | H | H |
| L | H | L | L | H | L | H | H | L | H | H | H | H | H |
| L | H | L | L | H | H | H | H | H | L | H | H | H | H |
| L | H | L | H | L | L | H | H | H | H | L | H | H | H |
| L | H | L | H | L | H | H | H | H | H | H | L | H | H |
| L | H | L | H | H | L | H | H | H | H | H | H | L | H |
| L | H | L | H | H | H | H | H | H | H | H | H | H | L |
| H | H | L | X | X | X | Outputs corresponding to stored address = L; all others = H | | | | | | | |

## logic symbols (alternatives)†




† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D, J, and N packages.

## logic diagram (positive logic)




Pin numbers shown are for the D, J, and N packages.

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

Supply voltage, $V_{CC}$ . . . . . 7 V
Input voltage, $V_I$ . . . . . 7 V
Operating free-air temperature range, $T_A$: SN54ALS137A . . . . . −55°C to 125°C
SN74ALS137A . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

### recommended operating conditions

| | | SN54ALS137A | | | SN74ALS137A | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | 0.7 | | | 0.8 | V |
| $I_{OH}$ | High-level output current | | | −0.4 | | | −0.4 | mA |
| $I_{OL}$ | Low-level output current | | | 4 | | | 8 | mA |
| $t_w$ | Pulse duration, $\overline{LE}$ low | 15 | | | 10 | | | ns |
| $t_{su}$ | Setup time at A, B, and C before $\overline{LE}\uparrow$ | 15 | | | 10 | | | ns |
| $t_h$ | Hold time at A, B, and C after $\overline{LE}\uparrow$ | 5 | | | 5 | | | ns |
| $T_A$ | Operating free-air temperature | −55 | | 125 | 0 | | 70 | °C |

### electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | SN54ALS137A | | | SN74ALS137A | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −0.4 mA | $V_{CC}$ −2 | | | $V_{CC}$ −2 | | | V |
| $V_{OL}$ | $V_{CC}$ = 4.5 V | $I_{OL}$ = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | $I_{OL}$ = 8 mA | | | | | 0.35 | 0.5 | |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | µA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | −0.1 | | | −0.1 | mA |
| $I_O$§ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −20 | | −112 | −30 | | −112 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V | | | 5 | 11 | | 5 | 11 | mA |

‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, $I_{OS}$.

## switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = MIN to MAX† | | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | SN54ALS137A | | SN74ALS137A | | |
| | | | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | A, B, C | Y | 5 | 25 | 5 | 20 | ns |
| $t_{PHL}$ | | | 6 | 25 | 6 | 20 | |
| $t_{PLH}$ | $\overline{G2}$ | Y | 4 | 15 | 3 | 12 | ns |
| $t_{PHL}$ | | | 5 | 18 | 4 | 15 | |
| $t_{PLH}$ | G1 | Y | 5 | 21 | 4 | 17 | ns |
| $t_{PHL}$ | | | 5 | 19 | 4 | 15 | |
| $t_{PLH}$ | $\overline{LE}$ | Y | 7 | 27 | 6 | 22 | ns |
| $t_{PHL}$ | | | 7 | 25 | 7 | 20 | |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

Supply voltage, $V_{CC}$ . . . . . 7 V
Input voltage, $V_I$ . . . . . 7 V
Operating free-air temperature range, $T_A$: SN74AS137 . . . . . 0°C to 70°C
Storage temperature range . . . . . −65°C to 150°C

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

## recommended operating conditions

| | | SN74AS137 | | | UNIT |
|---|---|---|---|---|---|
| | | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | 0.8 | V |
| $I_{OH}$ | High-level output current | | | −2 | mA |
| $I_{OL}$ | Low-level output current | | | 20 | mA |
| $t_w$ | Pulse duration, $\overline{LE}$ low | 6.5 | | | ns |
| $t_{su}$ | Setup time at A, B, and C before $\overline{LE}\uparrow$ | 4 | | | ns |
| $t_h$ | Hold time at A, B, and C after $\overline{LE}\uparrow$ | 1 | | | ns |
| $T_A$ | Operating free-air temperature | 0 | | 70 | °C |



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## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | SN74AS137 | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN | TYP† | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = −18 mA | | | −1.2 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V to 5.5 V, | $I_{OH}$ = −2 mA | $V_{CC}$−2 | | | V |
| $V_{OL}$ | $V_{CC}$ = 4.5 V, | $I_{OL}$ = 20 mA | | 0.35 | 0.5 | V |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | µA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.4 V | | | −1 | mA |
| $I_O$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.25 V | −30 | | − 112 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V | | | 15 | 24 | mA |

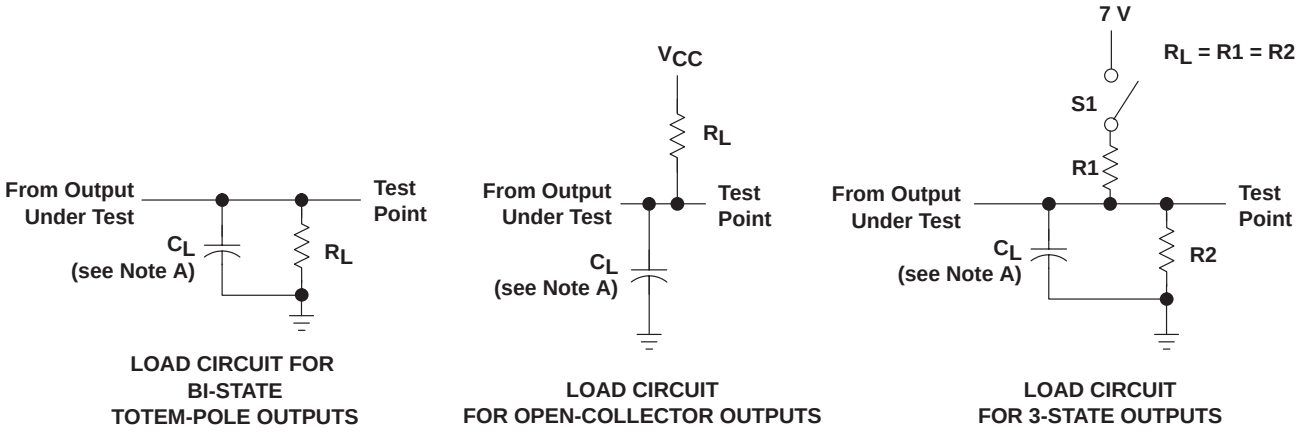
† All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, $I_{OS}$.

## switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = MIN to MAX§ | | UNIT |
|---|---|---|---|---|---|
| | | | SN74AS137 | | |
| | | | MIN | MAX | |
| $t_{PLH}$ | A, B, C | Y | 2 | 12.5 | ns |
| $t_{PHL}$ | | | 2 | 12.5 | |
| $t_{PLH}$ | $\overline{G2}$ | Y | 2 | 8 | ns |
| $t_{PHL}$ | | | 2 | 8.5 | |
| $t_{PLH}$ | G1 | Y | 2 | 10 | ns |
| $t_{PHL}$ | | | 2 | 9 | |
| $t_{PLH}$ | $\overline{LE}$ | Y | 3 | 13.5 | ns |
| $t_{PHL}$ | | | 3 | 14 | |

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

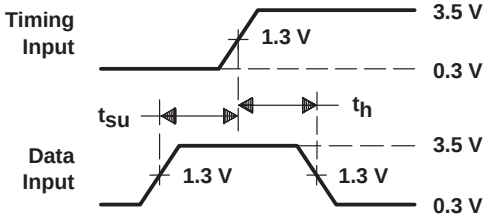
## PARAMETER MEASUREMENT INFORMATION
## SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



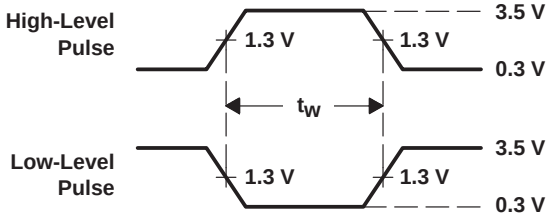

LOAD CIRCUIT FOR BI-STATE TOTEM-POLE OUTPUTS

LOAD CIRCUIT FOR OPEN-COLLECTOR OUTPUTS

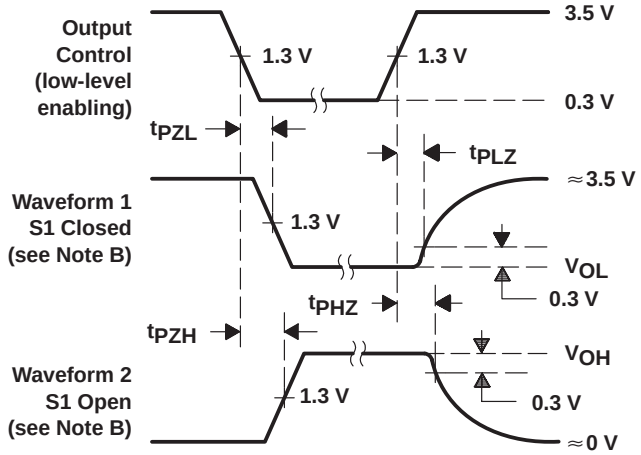
LOAD CIRCUIT FOR 3-STATE OUTPUTS



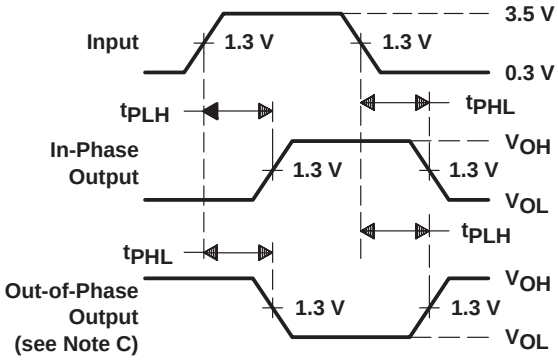

VOLTAGE WAVEFORMS SETUP AND HOLD TIMES




VOLTAGE WAVEFORMS PULSE DURATIONS




VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS




VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES

NOTES: A. $C_L$ includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. When measuring propagation delay items of 3-state outputs, switch S1 is open.
D. All input pulses have the following characteristics: PRR ≤ 1 MHz, $t_r = t_f$ = 2 ns, duty cycle = 50%.
E. The outputs are measured one at a time with one transition per measurement.

**Figure 1. Load Circuits and Voltage Waveforms**



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## PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package \| Pins | Package qty \| Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|---|---|---|---|---|---|---|---|---|---|
| SN74ALS137AD | Obsolete | Production | SOIC (D) \| 16 | - | - | Call TI | Call TI | 0 to 70 | ALS137A |
| SN74ALS137AN | Active | Production | PDIP (N) \| 16 | 25 \| TUBE | Yes | NIPDAU | N/A for Pkg Type | 0 to 70 | SN74ALS137AN |
| SN74ALS137AN.A | Active | Production | PDIP (N) \| 16 | 25 \| TUBE | Yes | NIPDAU | N/A for Pkg Type | 0 to 70 | SN74ALS137AN |

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

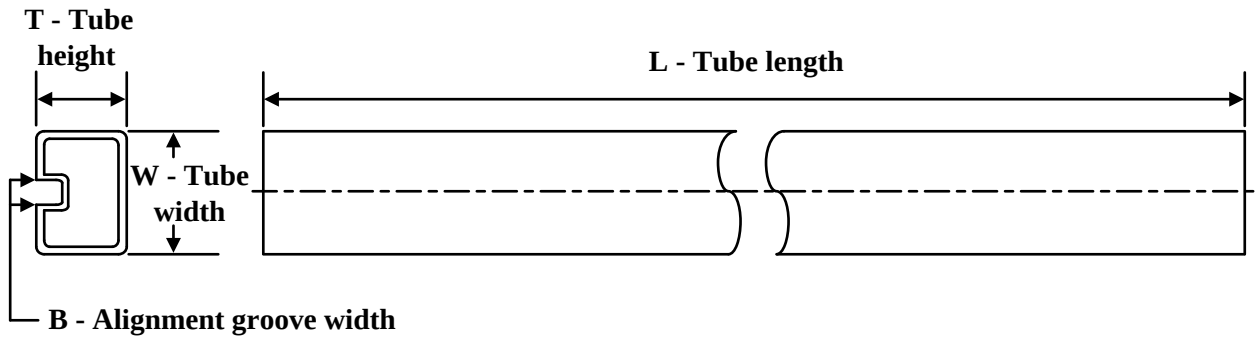
(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

## TUBE



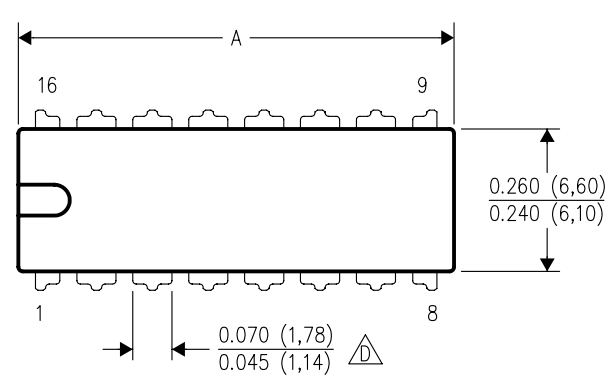

*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|---|---|---|---|---|---|---|---|---|
| SN74ALS137AN | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74ALS137AN | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74ALS137AN.A | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74ALS137AN.A | N | PDIP | 16 | 25 | 506 | 13.97 | 11230 | 4.32 |

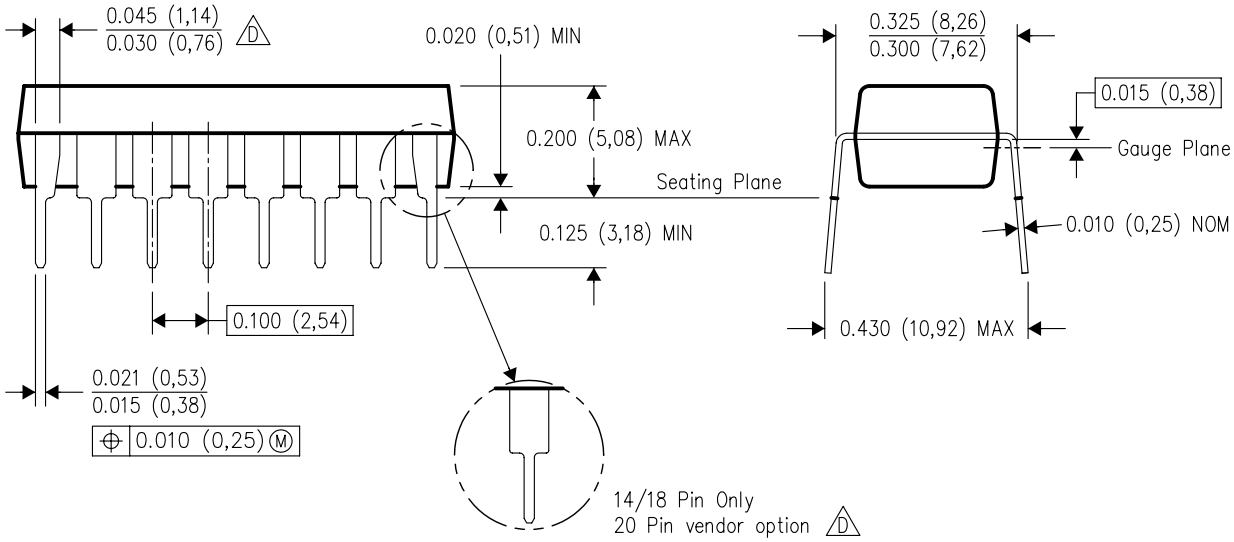
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



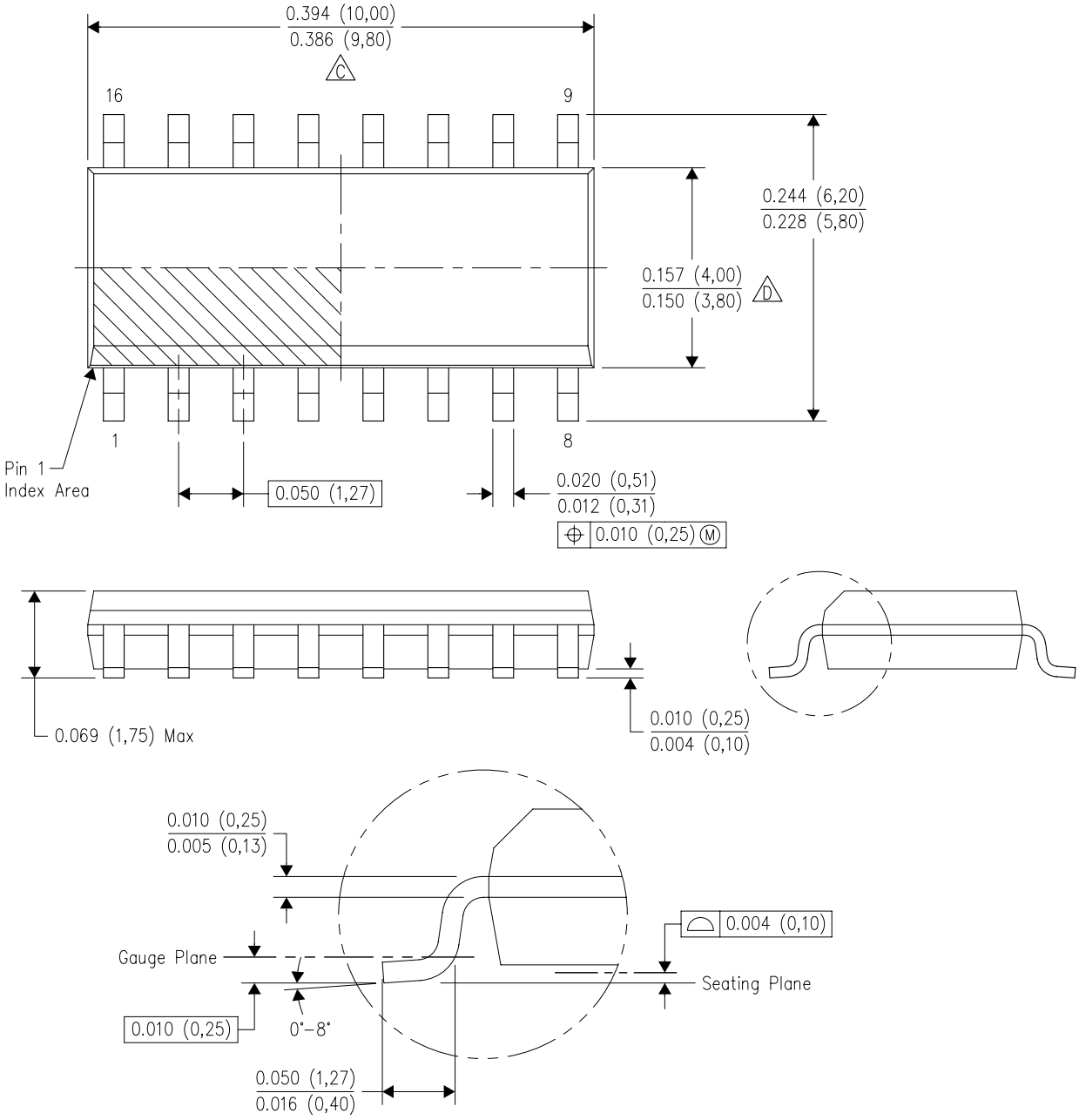

| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |




4040049/E 12/2002

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R–PDSO–G16) PLASTIC SMALL OUTLINE




NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
E. Reference JEDEC MS–012 variation AC.

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