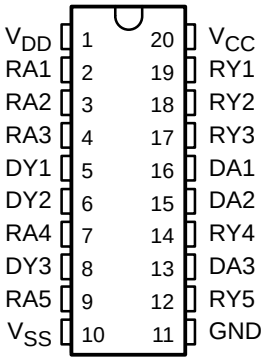
- **Single-Chip TIA/EIA-232-F Interface for IBM™ PC/AT™ Serial Port**
- **Designed to Transmit and Receive 4-μs Pulses (Equivalent to 256 kbit/s)**
- **Less Than 21-mW Power Consumption**
- **Wide Supply-Voltage Range . . . 4.75 V to 15 V**
- **Driver Output Slew Rates Are Internally Controlled to 30 V/μs Max**
- **Receiver Input Hysteresis . . . 1000 mV Typical**
- **TIA/EIA-232-F Bus-Pin ESD Protection Exceeds:**
  **– 15-kV, Human-Body Model**
- **Three Drivers and Five Receivers Meet or Exceed the Requirements of TIA/EIA-232-F and ITU V.28**
- **Complements the SN75LP196**
- **Designed to Replace the Industry-Standard SN75185 and SN75C185 With the Same Flow-Through Pinout**
- **Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Dual-In-Line (N) Packages**

**DB, DW, OR N PACKAGE**
**(TOP VIEW)**




## description

The SN75LP1185 is a low-power bipolar device containing three drivers and five receivers, with 15 kV of ESD protection on the bus pins with respect to each other. Bus pins are defined as those pins that tie directly to the serial-port connector, including GND. The pinout matches the flow-through design of the industry-standard SN75185 and SN75C185. The flow-through pinout of the SN75LP1185 allows easy interconnection of the UART and serial-port connector of the IBM PC/AT and compatibles. The SN75LP1185 provides a rugged, low-cost solution for this function with the combination of the bipolar processing and 15 kV of ESD protection.

The SN75LP1185 has internal slew-rate control to provide a maximum rate of change in the output signal of 30 V/μs. The driver output swing is nominally clamped at ±6 V to enable the higher data rates associated with this device and to reduce EMI emissions. Even though the driver outputs are clamped, they can handle voltages up to ±15 V without damage. All the logic inputs can accept 3.3-V or 5-V input signals.

The SN75LP1185 complies with the requirements of TIA/EIA-232-F and ITU V.28. These standards are for data interchange between a host computer and peripheral at signaling rates up to 20 kbit/s. The switching speeds of the SN75LP1185 support rates up to 256 kbit/s.

The SN75LP1185 is characterized for operation from 0°C to 70°C.

Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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**AVAILABLE OPTIONS**

| $T_A$ | PACKAGED DEVICES | | |
|---|---|---|---|
| | PLASTIC SHRINK SMALL-OUTLINE (DB) | PLASTIC SMALL OUTLINE (DW) | PLASTIC DIP (N) |
| 0°C to 70°C | SN75LP1185DBR | SN75LP1185DW | SN75LP1185N |

The DB package is only available taped and reeled. The DW package also is available taped and reeled. Add the suffix R to device type (e.g., SN75LP1185DWR).

## Function Tables

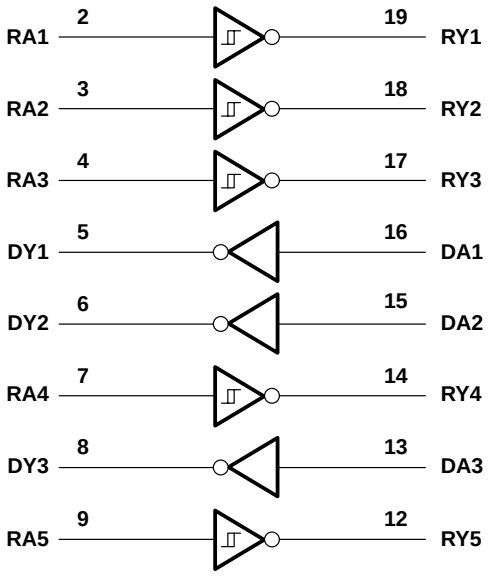
**DRIVER**

| INPUT DA | OUTPUT DY |
|---|---|
| H | L |
| L | H |
| Open | L |

**RECEIVER**

| INPUT RA | OUTPUT RY |
|---|---|
| H | L |
| L | H |
| Open | H |

## logic diagram (positive logic)



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

Positive supply-voltage range (see Note 1): $V_{CC}$ . . . . . –0.5 V to 7 V
$V_{DD}$ . . . . . –0.5 V to 15 V
Negative supply-voltage range, $V_{SS}$ (see Note 1) . . . . . 0.5 V to –15 V
Input-voltage range, $V_I$: Receiver (RA) . . . . . –30 V to 30 V
Driver (DA) . . . . . –0.5 V to $V_{CC}$ + 0.4 V
Output-voltage range, $V_O$: Receiver (RY) . . . . . –0.5 V to 6 V
Driver (DY) . . . . . –15 V to 15 V
Electrostatic discharge: Bus pins (human-body model) (see Note 2) . . . . . Class 3: 15 kV
Bus pins (machine model) . . . . . 500 V
All pins (human-body model) (see Note 2) . . . . . Class 3: 5 kV
All pins (machine model) . . . . . 400 V
Package thermal impedance, $\theta_{JA}$ (see Note 3): DB package . . . . . 70°C/W
DW package . . . . . 58°C/W
N package . . . . . 69°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C
Storage temperature range, $T_{stg}$ . . . . . 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.

NOTES: 1. All voltage values are with respect to network ground terminal, unless otherwise noted.
2. Per MIL-STD-883, Method 3015.7
3. The package thermal impedance is calculated in accordance with JESD 51-7.

### recommended operating conditions

| | | | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage (see Note 4) | | 4.75 | 5 | 5.25 | V |
| $V_{DD}$ | Supply voltage (see Note 5) | | 9 | 12 | 15 | V |
| $V_{SS}$ | Supply voltage (see Note 5) | | –9 | –12 | –15 | V |
| $V_{IH}$ | High-level input voltage | DA | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | DA | | | 0.8 | V |
| $V_I$ | Receiver input voltage | RA | –25 | | 25 | V |
| $I_{OH}$ | High-level output current | RY | | | –1 | mA |
| $I_{OL}$ | Low-level output current | RY | | | 2 | mA |
| $T_A$ | Operating free-air temperature | | 0 | | 70 | °C |

NOTES: 4. $V_{CC}$ cannot be greater than $V_{DD}$.
5. The device operates down to $V_{DD} = V_{CC}$ and $|V_{SS}| = V_{CC}$, but supply currents increase and other parameters may vary slightly from the data sheet limits.

### supply currents over the recommended operating conditions (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| Supply current for $V_{CC}$, $I_{CC}$ | No load, All inputs at minimum $V_{OH}$ or maximum $V_{OL}$ | $V_{DD}$ = 9 V, | $V_{SS}$ = –9 V | | | 1000 | µA |
| | | $V_{DD}$ = 12 V, | $V_{SS}$ = –12 V | | | 1000 | |
| Supply current for $V_{DD}$, $I_{DD}$ | | $V_{DD}$ = 9 V, | $V_{SS}$ = –9 V | | | 800 | |
| | | $V_{DD}$ = 12 V, | $V_{SS}$ = –12 V | | | 800 | |
| Supply current for $V_{SS}$, $I_{SS}$ | | $V_{DD}$ = 9 V, | $V_{SS}$ = –9 V | | | –625 | |
| | | $V_{DD}$ = 12 V, | $V_{SS}$ = –12 V | | | –625 | |

### driver electrical characterisitics over the recommended operating conditions (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| $V_{OH}$ | High-level output voltage | $V_{IL}$ = 0.8 V, $R_L$ = 3 kΩ, See Figure 1 | $V_{DD}$ = 9 V, | $V_{SS}$ = –9 V | | 5 | 5.8 | 6.6 | V |
| | | | $V_{DD}$ = 12 V, | $V_{SS}$ = –12 V, | See Note 6 | 5 | 5.8 | 6.6 | |
| $V_{OL}$ | Low-level output voltage | $V_{IH}$ = 2 V, $R_L$ = 3 kΩ, See Figure 1 | $V_{DD}$ = 9 V, | $V_{SS}$ = –9 V | | –5 | –5.8 | –6.9 | V |
| | | | $V_{DD}$ = 12 V, | $V_{SS}$ = –12 V, | See Note 6 | –5 | –5.9 | –6.9 | |
| $I_{IH}$ | High-level input current | $V_I$ at $V_{CC}$ | | | | | | 1 | µA |
| $I_{IL}$ | Low-level input current | $V_I$ at GND | | | | | | –1 | µA |
| $I_{OS(H)}$ | Short-circuit high-level output current | $V_O$ = GND or $V_{SS}$, | | See Figure 2 and Note 7 | | | –30 | –55 | mA |
| $I_{OS(L)}$ | Short-circuit low-level output current | $V_O$ = GND or $V_{DD}$, | | See Figure 2 and Note 7 | | | 30 | 55 | mA |
| $r_o$ | Output resistance | $V_{DD}$ = $V_{SS}$ = $V_{CC}$ = 0, | | $V_O$ = 2 V | | 300 | | | Ω |

NOTES: 6. Maximum output swing is clamped nominally at ±6 V to enable the higher data rates associated with this device and to reduce EMI emissions. The driver outputs may slightly exceed the maximum output voltage over the full $V_{CC}$ and temperature ranges.
7. Not more than one output should be shorted at one time.

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

| PARAMETER | | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_{PHL}$ | Propagation delay time, high- to low-level output | $R_L$ = 3 kΩ to 7 kΩ, $C_L$ = 15 pF, See Figure 1 | | 300 | 800 | 1600 | ns |
| $t_{PLH}$ | Propagation delay time, low- to high-level output | $R_L$ = 3 kΩ to 7 kΩ, $C_L$ = 15 pF, See Figure 1 | | 300 | 800 | 1600 | ns |
| $t_{TLH}$ | Transition time, low- to high-level output | $V_{CC}$ = 5 V, $V_{DD}$ = 12 V, $V_{SS}$ = –12 V, $R_L$ = 3 kΩ to 7 kΩ, See Figure 1 and Note 9 | Using $V_{TR}$ = 10%-to-90% transition region, Driver speed = 250 kbit/s, $C_L$ = 15 pF, See Note 8 | 375 | | 2240 | ns |
| | | | Using $V_{TR}$ = ±3 V transition region, Driver speed = 250 kbit/s, $C_L$ = 15 pF | 200 | | 1500 | |
| | | | Using $V_{TR}$ = ±2 V transition region, Driver speed = 250 kbit/s, $C_L$ = 15 pF | 133 | | 1000 | |
| | | | Using $V_{TR}$ = ±3 V transition region, Driver speed = 125 kbit/s, $C_L$ = 2500 pF | | | 2750 | |
| $t_{THL}$ | Transition time, high- to low-level output | $V_{CC}$ = 5 V, $V_{DD}$ = 12 V, $V_{SS}$ = –12 V, $R_L$ = 3 kΩ to 7 kΩ, See Figure 1 and Note 9 | Using $V_{TR}$ = 10%-to-90% transition region, Driver speed = 250 kbit/s, $C_L$ = 15 pF, See Note 8 | 375 | | 2240 | ns |
| | | | Using $V_{TR}$ = ±3 V transition region, Driver speed = 250 kbit/s, $C_L$ = 15 pF | 200 | | 1500 | |
| | | | Using $V_{TR}$ = ± 2 V transition region, Driver speed = 250 kbit/s, $C_L$ = 15 pF | 133 | | 1000 | |
| | | | Using $V_{TR}$ = ±3 V transition region, Driver speed = 125 kbit/s, $C_L$ = 2500 pF | | | 2750 | |
| SR | Output slew rate | $V_{CC}$ = 5 V, $V_{DD}$ = 12 V, $V_{SS}$ = –12 V | Using $V_{TR}$ = ±3 V transition region, Driver speed = 0 to 250 kbit/s, $C_L$ = 15 pF | 4 | 20 | 30 | V/µs |

NOTES: 8. Equivalent to the SN75C185. The SN75LP1185 output-voltage swing is clamped to about 70% of the typical SN75C185 output-voltage swing, and the specified limits reflect the reduced output swing.
9. Maximum output swing is limited to ±6 V to enable the higher data rates associated with this device and to reduce EMI emissions.

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

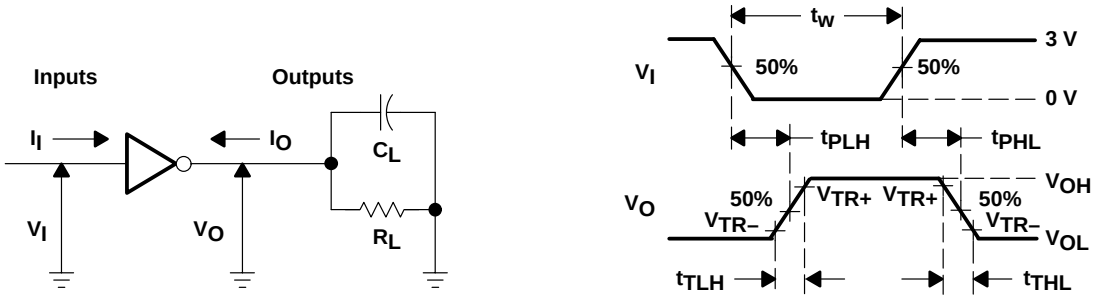
| PARAMETER | | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $V_{IT+}$ | Positive-going input threshold voltage | See Figure 3 | | 1.6 | 2 | 2.55 | V |
| $V_{IT–}$ | Negative-going input threshold voltage | See Figure 3 | | 0.6 | 1 | 1.45 | V |
| $V_{HYS}$ | Input hysteresis, $V_{IT+}$ $V_{IT–}$ | See Figure 3 | | 600 | 1000 | | mV |
| $V_{OH}$ | High-level output voltage | $I_{OH}$ = –1 mA | | 2.5 | 3.9 | | V |
| $V_{OL}$ | Low-level output voltage | $I_{OL}$ = 2 mA | | | 0.33 | 0.5 | V |
| $I_{IH}$ | High-level input current | $V_I$ = 3 V | | 0.43 | 0.6 | 1 | mA |
| | | $V_I$ = 25 V | | 3.6 | 5.1 | 8.3 | |
| $I_{IL}$ | Low-level input current | $V_I$ = –3 V | | –0.43 | –0.6 | –1 | mA |
| | | $V_I$ = –25 V | | –3.6 | –5.1 | –8.3 | |
| $I_{OS(H)}$ | Short-circuit high-level output current | $V_O$ = 0, | See Figure 5 and Note 7 | | | –20 | mA |
| $I_{OS(L)}$ | Short-circuit low-level output current | $V_O$ = $V_{CC}$, | See Figure 5 and Note 7 | | | 20 | mA |
| $R_{IN}$ | Input resistance | $V_I$ = ±3 V to ±25 V | | 3 | 5 | 7 | kΩ |

NOTE 7: Not more than one output should be shorted at one time.

**receiver switching characteristics over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Figure 4)**

| PARAMETER | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| $t_{PHL}$ | Propagation delay time, high- to low-level output | | 400 | 900 | ns |
| $t_{PLH}$ | Propagation delay time, low- to high-level output | | 400 | 900 | ns |
| $t_{TLH}$ | Transition time, low- to high-level output | | 200 | 500 | ns |
| $t_{THL}$ | Transition time, high- to low-level output | | 200 | 400 | ns |
| $t_{SK(p)}$ | Pulse skew $\lvert t_{PLH} - t_{PHL} \rvert$ | | 200 | 425 | ns |

## PARAMETER MEASUREMENT INFORMATION




NOTES: A. The pulse generator has the following characteristics:
For $C_L$ < 1000 pF: $t_W$ = 4 µs, PRR = 250 kbit/s, $Z_O$ = 50 Ω, $t_r$ and $t_f$ < 50 ns.
For $C_L$ = 2500 pF: $t_W$ = 8 µs, PRR = 125 kbit/s, $Z_O$ = 50 Ω, $t_r$ and $t_f$ < 50 ns.
B. $C_L$ includes probe and jig capacitance.

**Figure 1. Driver Parameter Test Circuit and Waveform**

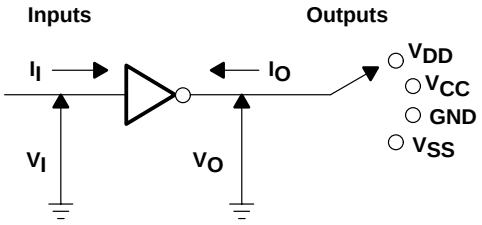



**Figure 2. Driver $I_{OS}$ Test**

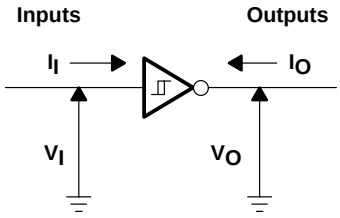
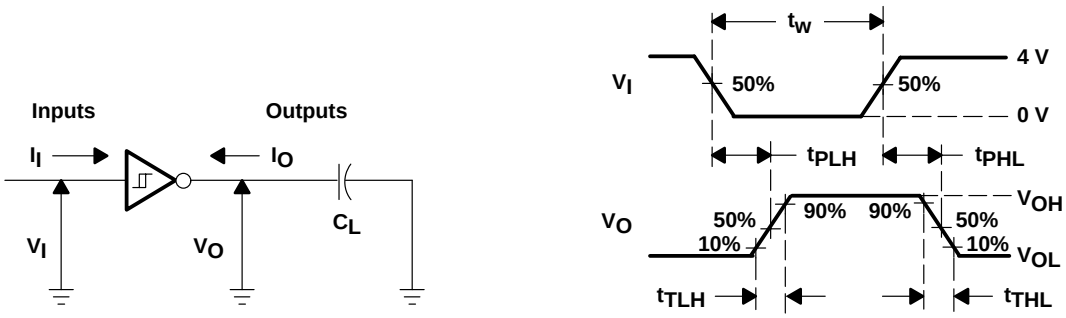



**Figure 3. Receiver $V_{IT}$ Test**

## PARAMETER MEASUREMENT INFORMATION




NOTES: A. The pulse generator has the following characteristics: $t_W$ = 4 µs, PRR = 250 kbit/s, $Z_O$ = 50 Ω, $t_r$ and $t_f$ < 50 ns.
B. $C_L$ includes probe and jig capacitance.

**Figure 4. Receiver Parameter Test Circuit and Waveform**

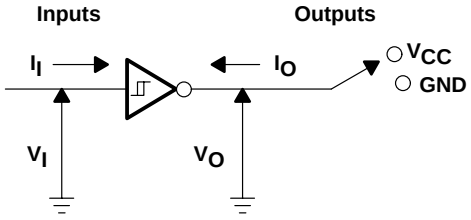



**Figure 5. Receiver $I_{OS}$ Test**

## APPLICATION INFORMATION

Diodes placed in series with the $V_{DD}$ and $V_{SS}$ leads protect the SN75LP1185 in the fault condition when the device outputs are shorted to ±15 V and the power supplies are at low voltage and provide low-impedance paths to ground (see Figure 6).

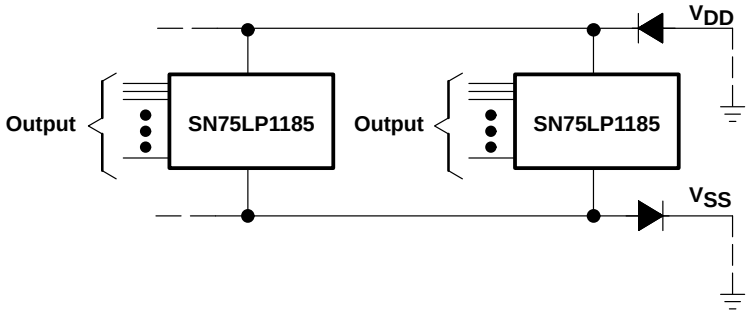



**Figure 6. Power-Supply Protection to Meet Power-Off Fault Conditions of TIA/EIA-232-F**

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) | Op Temp (°C) | Top-Side Markings (4) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SN75LP1185DBR | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 5LP1185 | Samples |
| SN75LP1185DBRE4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 5LP1185 | Samples |
| SN75LP1185DBRG4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 5LP1185 | Samples |
| SN75LP1185DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 75LP1185 | Samples |
| SN75LP1185DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 75LP1185 | Samples |
| SN75LP1185DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 75LP1185 | Samples |
| SN75LP1185DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 75LP1185 | Samples |
| SN75LP1185DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 75LP1185 | Samples |
| SN75LP1185DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | 0 to 70 | 75LP1185 | Samples |
| SN75LP1185N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN75LP1185N | Samples |
| SN75LP1185NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | 0 to 70 | SN75LP1185N | Samples |

(1) The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
**TBD:** The Pb-Free/Green conversion plan has not been defined.
**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

**(3)** MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

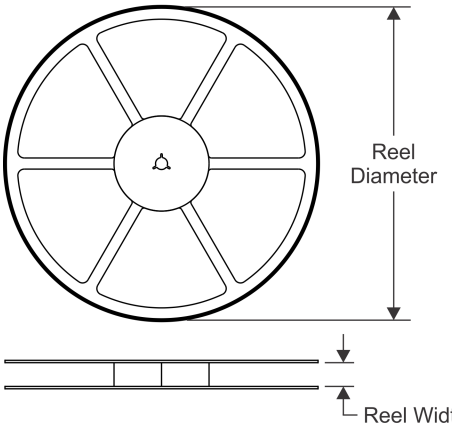
**(4)** Only one of markings shown within the brackets will appear on the physical device.

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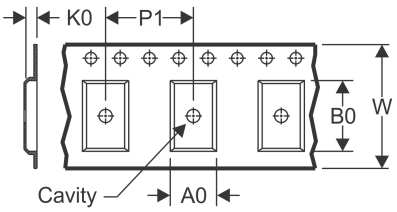
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## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

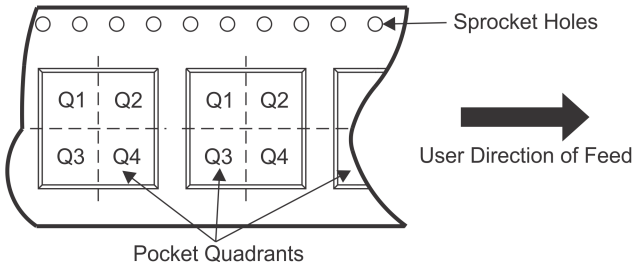



**TAPE DIMENSIONS**




| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

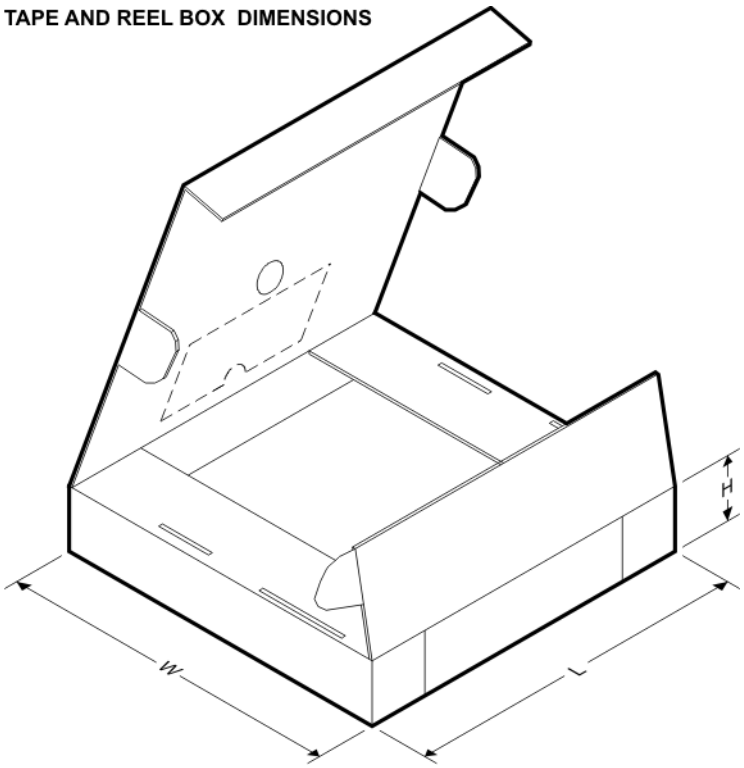
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN75LP1185DBR | SSOP | DB | 20 | 2000 | 330.0 | 16.4 | 8.2 | 7.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN75LP1185DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



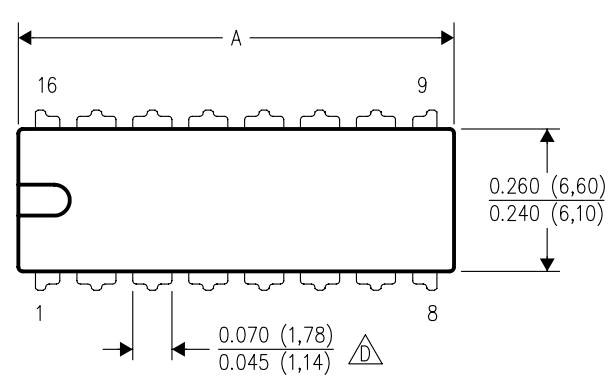

*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| SN75LP1185DBR | SSOP | DB | 20 | 2000 | 367.0 | 367.0 | 38.0 |
| SN75LP1185DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |

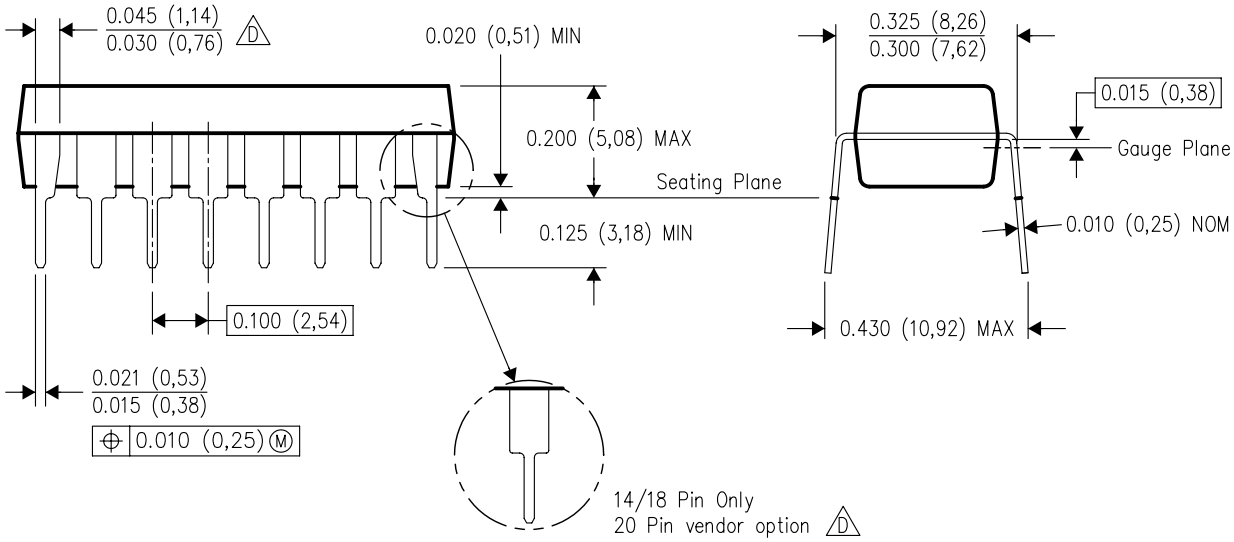
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



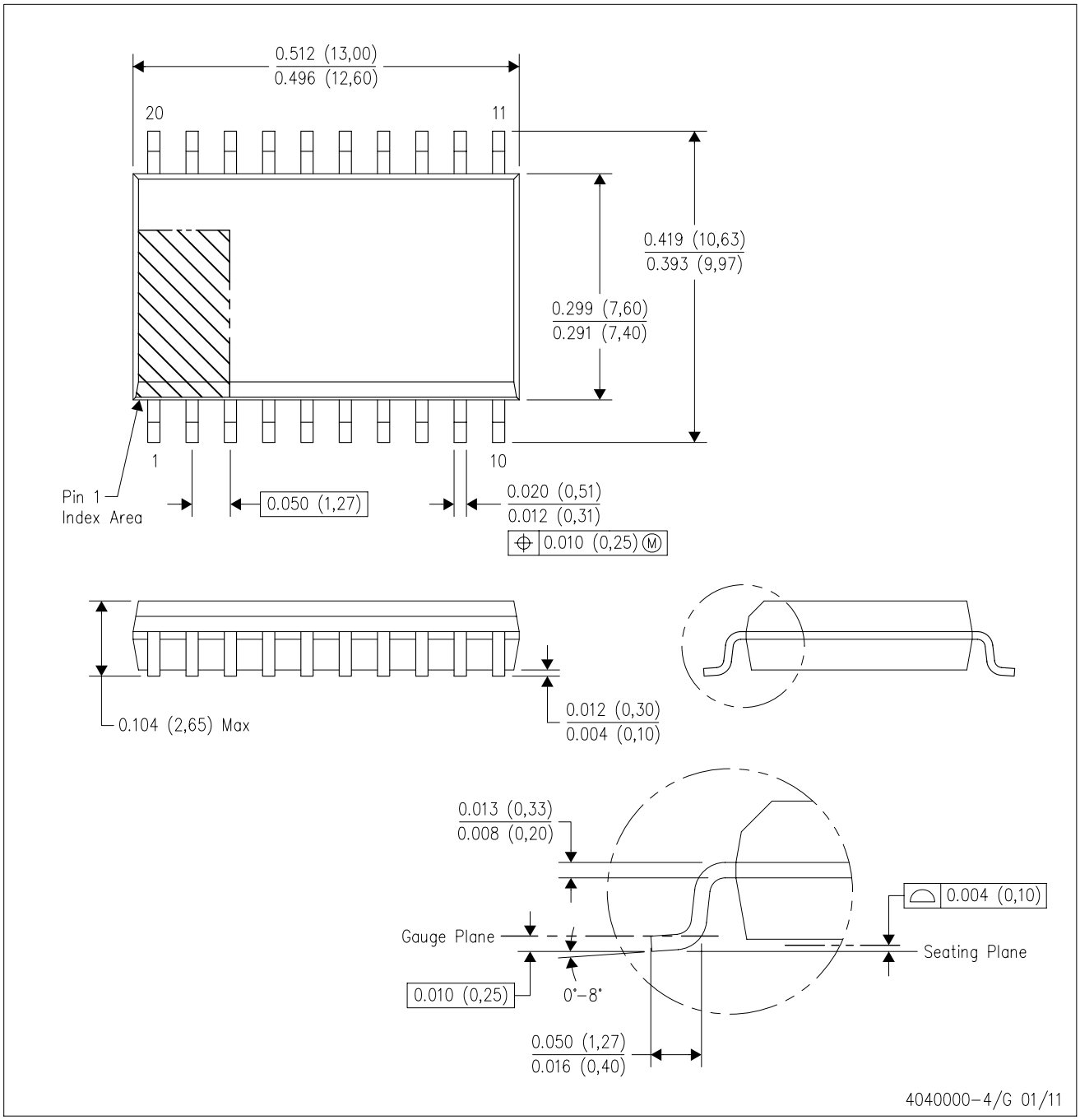

| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |




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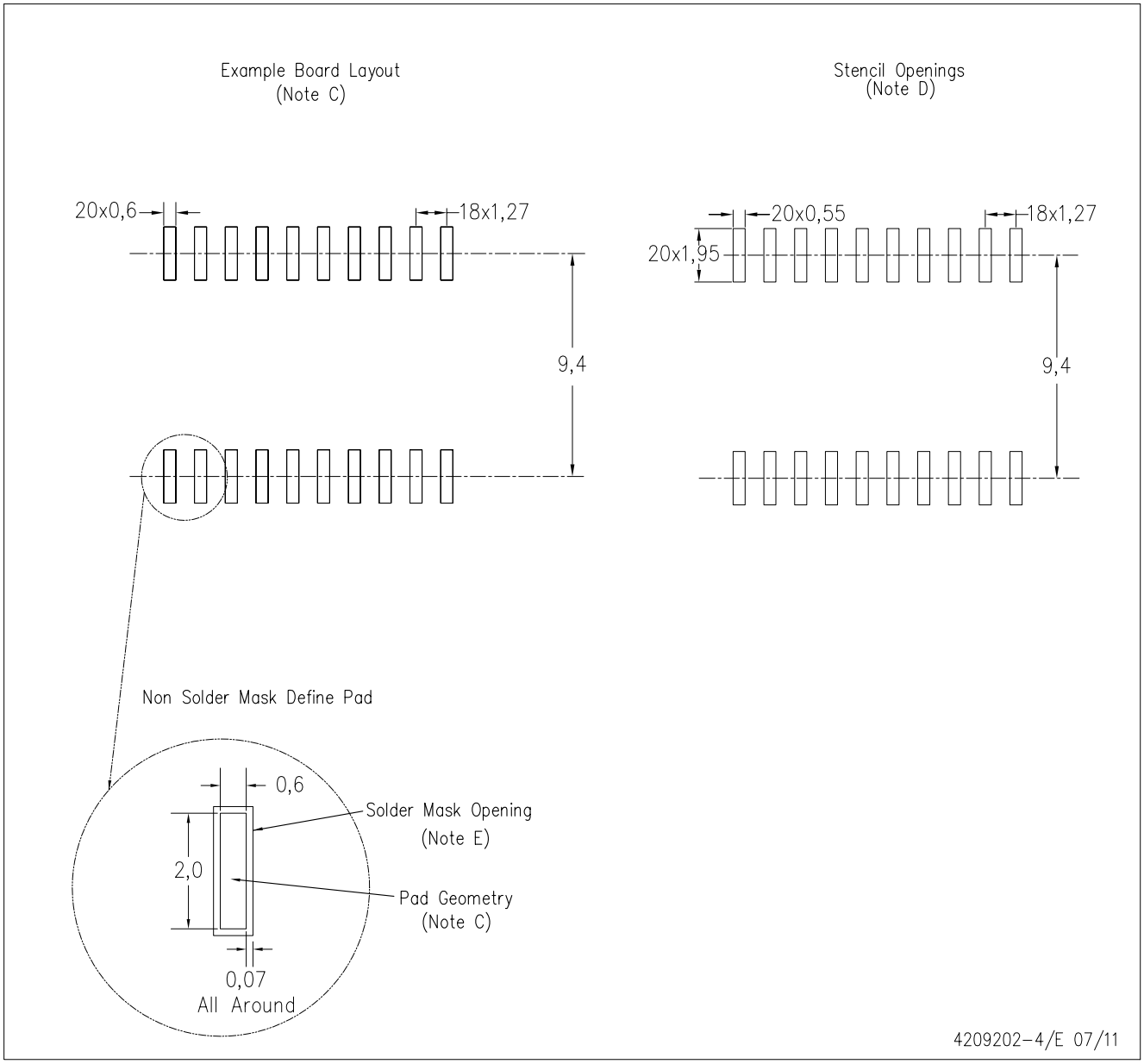
NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001, except 18 and 20 pin minimum body length (Dim A).
D. The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R–PDSO–G20) PLASTIC SMALL OUTLINE




NOTES:
A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–013 variation AC.

DW (R–PDSO–G20) PLASTIC SMALL OUTLINE

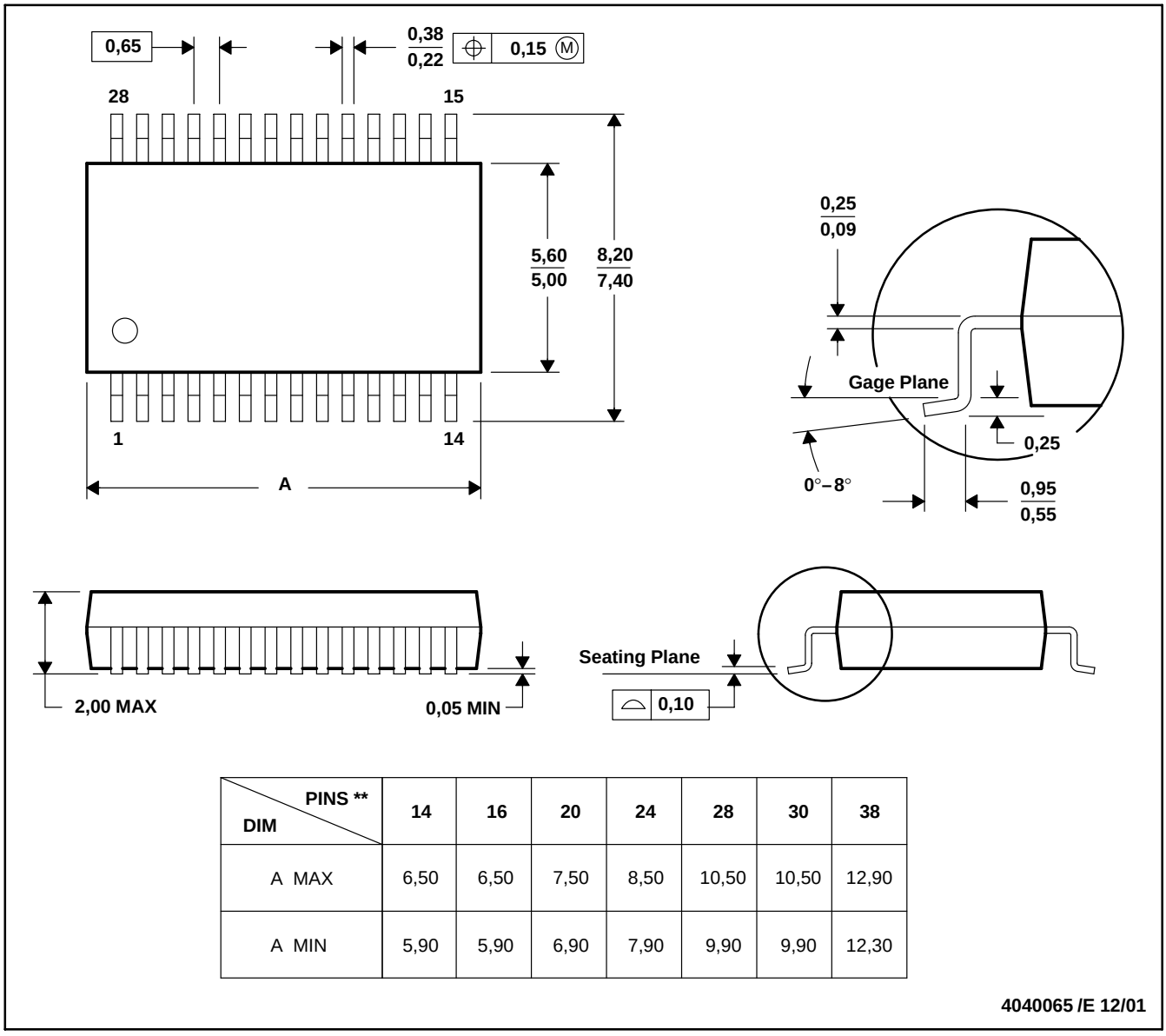



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Refer to IPC7351 for alternate board design.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC–7525
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

MSSO002E – JANUARY 1995 – REVISED DECEMBER 2001

**DB (R-PDSO-G**)** **PLASTIC SMALL-OUTLINE**

**28 PINS SHOWN**




| DIM \ PINS ** | 14 | 16 | 20 | 24 | 28 | 30 | 38 |
|---|---|---|---|---|---|---|---|
| A MAX | 6,50 | 6,50 | 7,50 | 8,50 | 10,50 | 10,50 | 12,90 |
| A MIN | 5,90 | 5,90 | 6,90 | 7,90 | 9,90 | 9,90 | 12,30 |

**4040065 /E 12/01**

NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
D. Falls within JEDEC MO-150

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