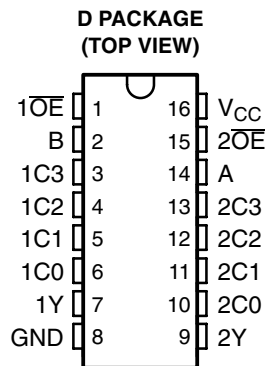


SN74HC253-Q1

DUAL 4-LINE TO 1-LINE DATA SELECTOR/MULTIPLEXER WITH 3-STATE OUTPUTS

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- **Qualified for Automotive Applications**
- **ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)**
- **3-State Version of 'HC153**
- **Wide Operating Voltage Range of 2 V to 6 V**
- **High-Current Inverting Outputs Drive Up To 15 LSTTL Loads**
- **Low Power Consumption, 80- μ A Max I_{CC}**
- **Typical t_{pd} = 9 ns**
- **\pm 6-mA Output Drive at 5 V**
- **Low Input Current of 1 μ A Max**
- **Permit Multiplexing From n Lines to One Line**
- **Perform Parallel-to-Serial Conversion**



description/ordering information

Each data selector/multiplexer contains inverters and drivers to supply full binary decoding data selection to the AND-OR gates. Separate output-control inputs are provided for each of the two 4-line sections.

The 3-state outputs can interface with and drive data lines of bus-organized systems. With all but one of the common outputs disabled (in the high-impedance state), the low impedance of the single enabled output drives the bus line to a high or low logic level. Each output has its own output-enable (\overline{OE}) input. The outputs are disabled when their respective \overline{OE} is high.

ORDERING INFORMATION[†]

| T _A | PACKAGE [‡] | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-----------------------------|-----------------------|------------------|
| -40°C to 125°C | SOIC – D Tape and reel | SN74HC253QDRQ1 | HC253Q1 |

[†] For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at <http://www.ti.com>.

[‡] Package drawings, thermal data, and symbolization are available at <http://www.ti.com/packaging>.



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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WITH 3-STATE OUTPUTS

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FUNCTION TABLE

| SELECT† | | DATA | | | | OE | OUTPUT Y |
|---------|---|------|----|----|----|----|-------------|
| B | A | C0 | C1 | C2 | C3 | | |
| X | X | X | X | X | X | H | Z |
| L | L | L | X | X | X | L | L |
| L | L | H | X | X | X | L | H |
| L | H | X | L | X | X | L | L |
| L | H | X | H | X | X | L | H |
| H | L | X | X | L | X | L | L |
| H | L | X | X | H | X | L | H |
| H | H | X | X | X | L | L | L |
| H | H | X | X | X | H | L | H |

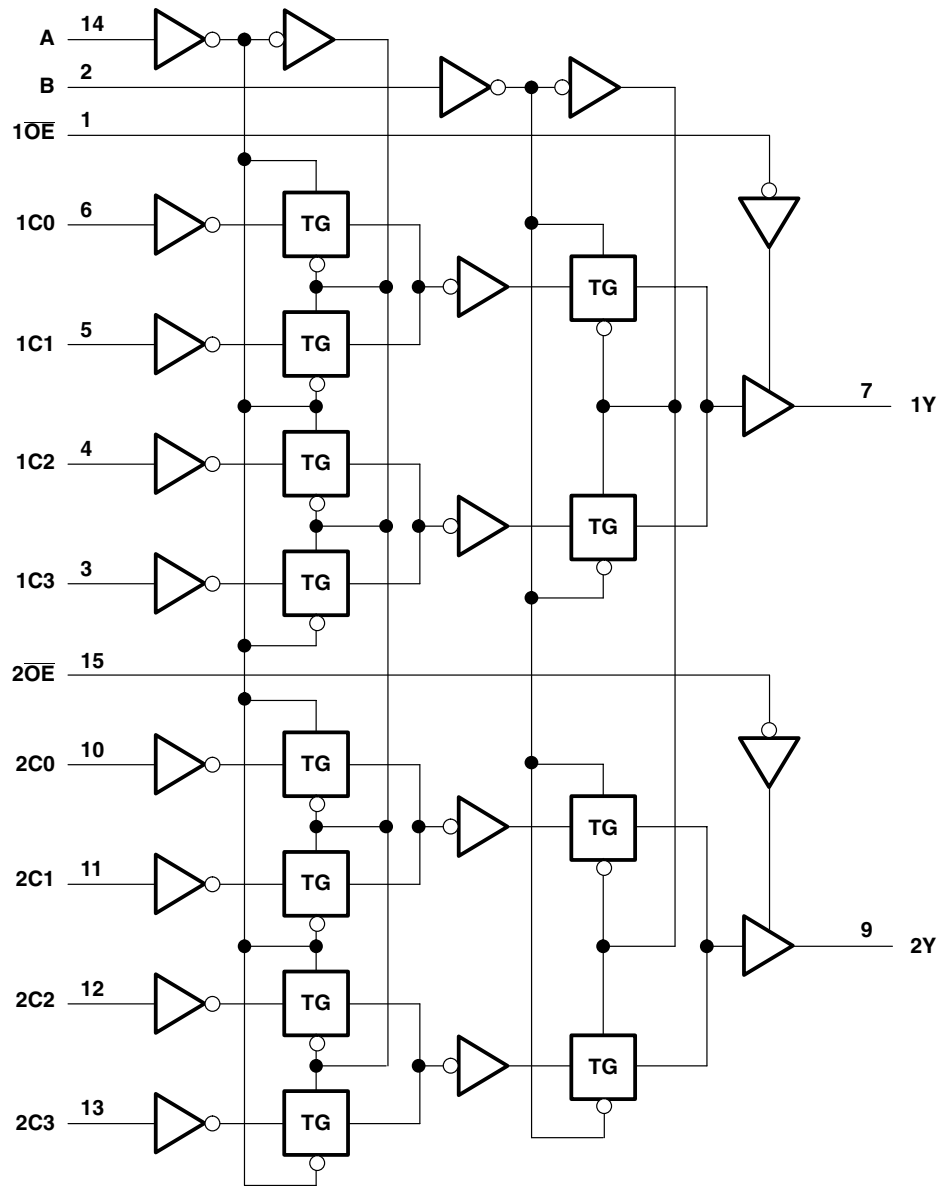
† Select inputs A and B are common to both sections.



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logic diagram (positive logic)



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

| | |
|---|----------------|
| Supply voltage range, V_{CC} | -0.5 V to 7 V |
| Input clamp current, I_{IK} ($V_I < 0$ or $V_I > V_{CC}$) (see Note 1) | ±20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) (see Note 1) | ±20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ±25 mA |
| Continuous current through V_{CC} or GND | ±50 mA |
| Package thermal impedance, θ_{JA} (see Note 2) | 73°C/W |
| 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. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

| | | MIN | NOM | MAX | UNIT |
|---------------------|---------------------------------|------------------|------|----------|------|
| V_{CC} | Supply voltage | 2 | 5 | 6 | V |
| V_{IH} | High-level input voltage | $V_{CC} = 2$ V | 1.5 | | V |
| | | $V_{CC} = 4.5$ V | 3.15 | | |
| | | $V_{CC} = 6$ V | 4.2 | | |
| V_{IL} | Low-level input voltage | $V_{CC} = 2$ V | | 0.5 | V |
| | | $V_{CC} = 4.5$ V | | 1.35 | |
| | | $V_{CC} = 6$ V | | 1.8 | |
| V_I | Input voltage | 0 | | V_{CC} | V |
| V_O | Output voltage | 0 | | V_{CC} | V |
| $\Delta t/\Delta v$ | Input transition rise/fall time | $V_{CC} = 2$ V | | 1000 | ns |
| | | $V_{CC} = 4.5$ V | | 500 | |
| | | $V_{CC} = 6$ V | | 400 | |
| T_A | Operating free-air temperature | -40 | | 125 | °C |

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



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DUAL 4-LINE TO 1-LINE DATA SELECTOR/MULTIPLEXER WITH 3-STATE OUTPUTS

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | MIN | MAX | UNIT |
|-----------------|---|---------------------------|-----------------------|-------|-------|-----|-----|------|
| | | | MIN | TYP | MAX | | | |
| V _{OH} | V _I = V _{IH} or V _{IL} | I _{OH} = -20 μA | 2 V | 1.9 | 1.998 | 1.9 | V | |
| | | | 4.5 V | 4.4 | 4.499 | 4.4 | | |
| | | | 6 V | 5.9 | 5.999 | 5.9 | | |
| | | I _{OH} = -6 mA | 4.5 V | 3.98 | 4.3 | 3.7 | | |
| | | I _{OH} = -7.8 mA | 6 V | 5.48 | 5.8 | 5.2 | | |
| V _{OL} | V _I = V _{IH} or V _{IL} | I _{OL} = 20 μA | 2 V | 0.002 | 0.1 | 0.1 | V | |
| | | | 4.5 V | 0.001 | 0.1 | 0.1 | | |
| | | | 6 V | 0.001 | 0.1 | 0.1 | | |
| | | I _{OL} = 6 mA | 4.5 V | 0.17 | 0.26 | 0.4 | | |
| | | I _{OL} = 7.8 mA | 6 V | 0.15 | 0.26 | 0.4 | | |
| I _I | V _I = V _{CC} or 0 | 6 V | ±0.1 | ±100 | ±1000 | nA | | |
| I _{OZ} | V _O = V _{CC} or 0 | 6 V | ±0.01 | ±0.5 | ±10 | μA | | |
| I _{CC} | V _I = V _{CC} or 0, I _O = 0 | 6 V | | 8 | 160 | μA | | |
| C _i | | 2 V to 6 V | 3 | 10 | 10 | pF | | |

switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} | T _A = 25°C | | | MIN | MAX | UNIT |
|------------------|--------------|-------------|-----------------|-----------------------|-----|-----|-----|-----|------|
| | | | | MIN | TYP | MAX | | | |
| t _{pd} | A or B | Any Y | 2 V | 62 | 150 | 225 | ns | | |
| | | | 4.5 V | 19 | 30 | 45 | | | |
| | | | 6 V | 16 | 26 | 38 | | | |
| | Data (Any C) | Y | 2 V | 54 | 126 | 210 | | | |
| | | | 4.5 V | 16 | 28 | 42 | | | |
| | | | 6 V | 13 | 23 | 36 | | | |
| t _{en} | OE | Y | 2 V | 28 | 100 | 150 | ns | | |
| | | | 4.5 V | 11 | 20 | 30 | | | |
| | | | 6 V | 9 | 17 | 26 | | | |
| t _{dis} | OE | Y | 2 V | 21 | 135 | 203 | ns | | |
| | | | 4.5 V | 14 | 30 | 45 | | | |
| | | | 6 V | 12 | 35 | 38 | | | |
| t _t | | Y | 2 V | 28 | 60 | 90 | ns | | |
| | | | 4.5 V | 8 | 12 | 18 | | | |
| | | | 6 V | 6 | 10 | 15 | | | |



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switching characteristics over recommended operating free-air temperature range, $C_L = 150 \text{ pF}$ (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V_{CC} | $T_A = 25^\circ\text{C}$ | | | MIN | MAX | UNIT |
|-----------|-----------------|-------------|----------|--------------------------|-----|-----|-----|-----|------|
| | | | | MIN | TYP | MAX | | | |
| t_{pd} | A or B | Any Y | 2 V | | 76 | 235 | | 355 | ns |
| | | | 4.5 V | | 23 | 47 | | 71 | |
| | | | 6 V | | 20 | 41 | | 60 | |
| | Data (Any C) | Y | 2 V | | 68 | 220 | | 335 | |
| | | | 4.5 V | | 20 | 44 | | 67 | |
| | | | 6 V | | 17 | 38 | | 57 | |
| t_{en} | \overline{OE} | Y | 2 V | | 44 | 185 | | 280 | ns |
| | | | 4.5 V | | 16 | 37 | | 56 | |
| | | | 6 V | | 14 | 32 | | 48 | |
| t_t | | Y | 2 V | | 45 | 210 | | 315 | ns |
| | | | 4.5 V | | 17 | 42 | | 63 | |
| | | | 6 V | | 13 | 36 | | 53 | |

operating characteristics, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|-----------------|-----|------|
| C_{pd} Power dissipation capacitance per multiplexer | No load | 45 | pF |

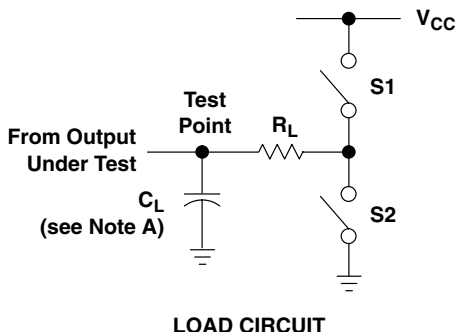


SN74HC253-Q1

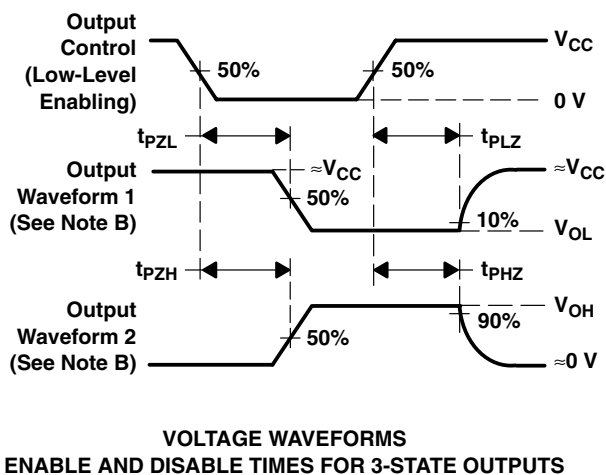
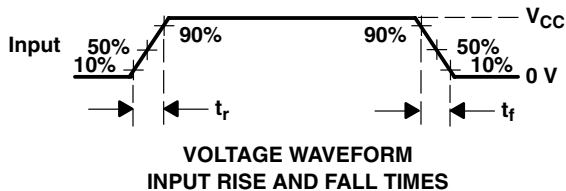
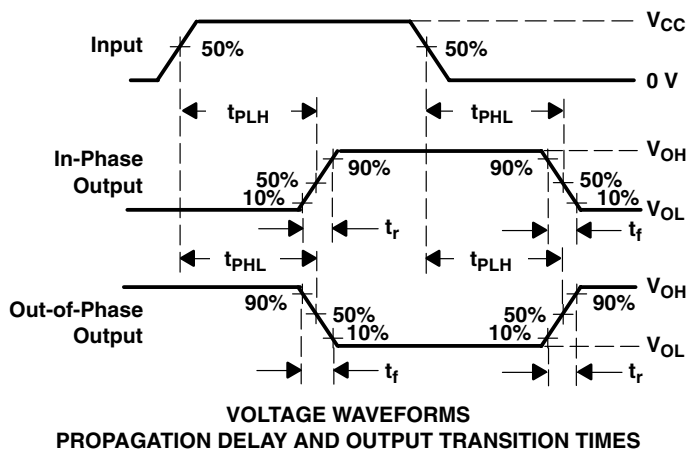
DUAL 4-LINE TO 1-LINE DATA SELECTOR/MULTIPLEXER WITH 3-STATE OUTPUTS

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PARAMETER MEASUREMENT INFORMATION



| PARAMETER | R_L | C_L | S1 | S2 |
|-------------------|--------------|-----------------------|--------|--------|
| t_{en} | 1 k Ω | 50 pF or 150 pF | Open | Closed |
| | | | Closed | Open |
| t_{dis} | 1 k Ω | 50 pF | Open | Closed |
| | | | Closed | Open |
| t_{pd} or t_t | -- | 50 pF or 150 pF | Open | Open |



- NOTES:
- A. C_L includes probe and test-fixture 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. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O = 50 \Omega$, $t_r = 6$ ns, $t_f = 6$ ns.
 - D. The outputs are measured one at a time with one input transition per measurement.
 - E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - F. t_{PZL} and t_{PZH} are the same as t_{en} .
 - G. t_{PLH} and t_{PHL} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|-------------------------|----------------------|--------------|-------------------------|---------|
| SN74HC253QDRG4Q1 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | -40 to 125 | HC253QQ1 | 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) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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

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- Catalog: [SN74HC253](#)
- Enhanced Product: [SN74HC253-EP](#)
- Military: [SN54HC253](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

D (R-PDSO-G16)

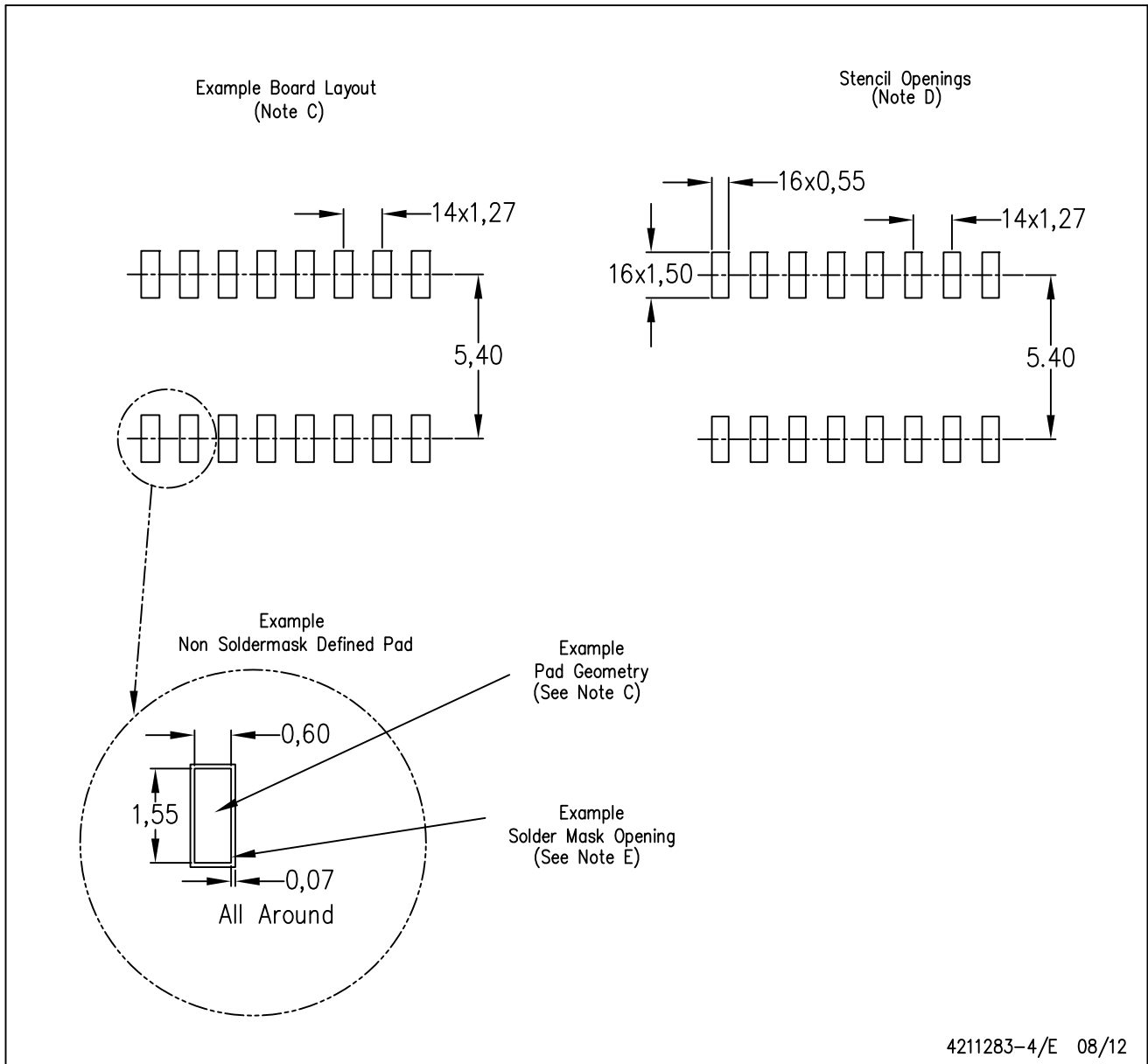
PLASTIC SMALL OUTLINE



- 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.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - 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 for other stencil recommendations.
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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