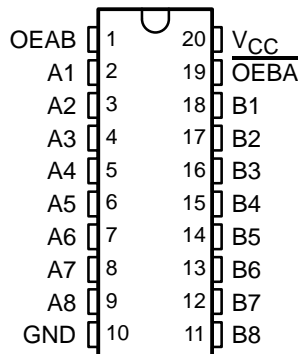


SN54HCT623, SN74HCT623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

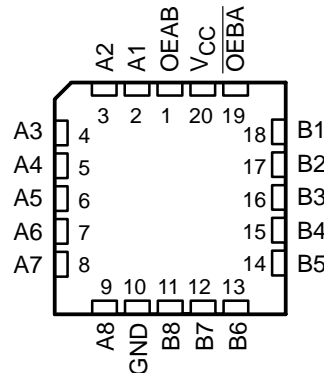
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- Operating Voltage Range of 4.5 V to 5.5 V
- Low Power Consumption, 80- μ A Max I_{CC}
- Typical $t_{pd} = 11$ ns
- ± 6 -mA Output Drive at 5 V
- Low Input Current of 1 μ A Max
- Inputs Are TTL-Voltage Compatible
- Lock Bus-Latch Capability
- True Logic
- High-Current 3-State Outputs Can Drive Up To 15 LSTTL Loads

SN54HCT623 . . . J OR W PACKAGE
SN74HCT623 . . . DW OR N PACKAGE
(TOP VIEW)



SN54HCT623 . . . FK PACKAGE
(TOP VIEW)



description/ordering information

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation allows for maximum flexibility in timing.

The 'HCT623 devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic levels at the output-enable (OEAB and \overline{OEBA}) inputs.

The output-enable inputs disable the device so that the buses are effectively isolated. The dual-enable configuration gives the transceivers the capability to store data by simultaneously enabling OEAB and \overline{OEBA} . Each output reinforces its input in this transceiver configuration. When both OEAB and \overline{OEBA} are enabled and all other data sources to the two sets of bus lines are in the high-impedance state, both sets of bus lines (16 total) remain at their last states. The 8-bit codes appearing on the two sets of buses are identical.

To ensure the high-impedance state during power up or power down, \overline{OEBA} should be tied to V_{CC} through a pullup resistor and OEAB should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sinking/current-sourcing capability of the driver.

ORDERING INFORMATION

| T _A | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-----------|------|-----------------------|------------------|
| -40°C to 85°C | PDIP – N | Tube | SN74HCT623N | SN74HCT623N |
| | SOIC – DW | Tube | SN74HCT623DW | HCT623 |
| -55°C to 125°C | CDIP – J | Tube | SNJ54HCT623J | SNJ54HCT623J |
| | CFP – W | Tube | SNJ54HCT623W | SNJ54HCT623W |
| | LCCC – FK | Tube | SNJ54HCT623FK | SNJ54HCT623FK |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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 **TEXAS
INSTRUMENTS**

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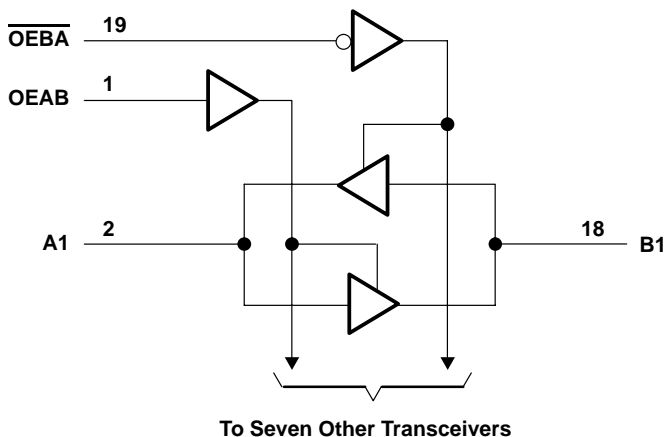
SN54HCT623, SN74HCT623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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FUNCTION TABLE

| INPUTS | | OPERATION |
|--------|------|-------------------------------------|
| OEBA | OEAB | |
| L | L | B data to A bus |
| H | H | A data to B bus |
| H | L | Isolation |
| L | H | B data to A bus, A data to B bus |

logic diagram (positive logic)



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}) | ± 35 mA |
| Continuous current through V_{CC} or GND | ± 70 mA |
| Package thermal impedance, θ_{JA} (see Note 2): DW package | 58°C/W |
| N package | 69°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.



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SN54HCT623, SN74HCT623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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recommended operating conditions (see Note 3)

| | | SN54HCT623 | | | SN74HCT623 | | | 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 | V _{CC} = 4.5 V to 5.5 V | | | 2 | | | V |
| V _{IL} | Low-level input voltage | V _{CC} = 4.5 V to 5.5 V | | | 0.8 | | | V |
| V _I | Input voltage | 0 | | | V _{CC} | | | V |
| V _O | Output voltage | 0 | | | V _{CC} | | | V |
| t _t | Input transition (rise and fall) time | 500 | | | 500 | | | ns |
| T _A | Operating free-air temperature | -55 | | | 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.

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

| PARAMETER | TEST CONDITIONS | | V _{CC} | T _A = 25°C | | | SN54HCT623 | | SN74HCT623 | | UNIT |
|--------------------|---|---|-----------------|-----------------------|-------|-------|------------|-------|------------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | V _I = V _{IH} or V _{IL} | I _{OH} = -20 μA | 4.5 V | 4.4 | 4.499 | 4.4 | 4.4 | | V | | |
| | | I _{OH} = -6 mA | | 3.98 | 4.3 | | 3.7 | 3.84 | | | |
| V _{OL} | V _I = V _{IH} or V _{IL} | I _{OL} = 20 μA | 4.5 V | 0.001 | | 0.1 | 0.1 | | V | | |
| | | I _{OL} = 6 mA | | 0.17 | 0.26 | 0.4 | 0.33 | | | | |
| I _I | OEAB or OEBA | V _I = V _{CC} or 0 | 5.5 V | ±0.1 | ±100 | ±1000 | | ±1000 | nA | | |
| I _{OZ} | A or B | V _O = V _{CC} or GND | 5.5 V | ±0.01 | ±0.5 | ±10 | | ±5 | μA | | |
| I _{CC} | | V _I = V _{CC} or 0, I _O = 0 | 5.5 V | 8 | | 160 | | 80 | μA | | |
| ΔI _{CC} † | | One input at 0.5 V or 2.4 V, Other inputs at 0 or V _{CC} | 5.5 V | 1.4 | 2.4 | 3 | | 2.9 | mA | | |
| C _i | OEAB or OEBA | | 4.5 V to 5.5 V | 3 | 10 | 10 | | 10 | pF | | |

† This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

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 | | | SN54HCT623 | | SN74HCT623 | | UNIT |
|------------------|--------------|-------------|-----------------|-----------------------|-----|-----|------------|-----|------------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{pd} | A or B | B or A | 4.5 V | 15 | 22 | 33 | | 28 | | ns | |
| | | | 5.5 V | 13 | 20 | 30 | | 25 | | | |
| t _{en} | OEBA | A | 4.5 V | 30 | | 42 | | 63 | | ns | |
| | | | 5.5 V | 23 | 38 | 57 | | 48 | | | |
| t _{dis} | OEBA | A | 4.5 V | 18 | | 30 | | 45 | | ns | |
| | | | 5.5 V | 16 | 28 | 42 | | 35 | | | |
| t _{en} | OEAB | B | 4.5 V | 30 | | 42 | | 63 | | ns | |
| | | | 5.5 V | 23 | 38 | 57 | | 48 | | | |
| t _{dis} | OEAB | B | 4.5 V | 18 | | 30 | | 45 | | ns | |
| | | | 5.5 V | 16 | 28 | 42 | | 35 | | | |
| t _t | | A or B | 4.5 V | 9 | 12 | 18 | | 15 | | ns | |
| | | | 5.5 V | 8 | 11 | 16 | | 14 | | | |

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



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**SN54HCT623, SN74HCT623
OCTAL BUS TRANSCEIVERS
WITH 3-STATE OUTPUTS**

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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} | $T_A = 25^\circ\text{C}$ | | | SN54HCT623 | | SN74HCT623 | | UNIT |
|-----------|-------------------|-------------|----------|--------------------------|-----|-----|------------|-----|------------|-----|------|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t_{pd} | A or B | B or A | 4.5 V | 18 | 38 | 58 | 47 | ns | | | |
| | | | 5.5 V | 11 | 34 | 52 | 42 | | | | |
| t_{en} | \overline{OEBA} | A | 4.5 V | 36 | 59 | 89 | 74 | ns | | | |
| | | | 5.5 V | 30 | 53 | 80 | 67 | | | | |
| | OEAB | B | 4.5 V | 36 | 59 | 89 | 74 | | | | |
| | | | 5.5 V | 30 | 53 | 80 | 67 | | | | |
| t_t | | A or B | 4.5 V | 17 | 42 | 63 | 53 | ns | | | |
| | | | 5.5 V | 14 | 38 | 57 | 48 | | | | |

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

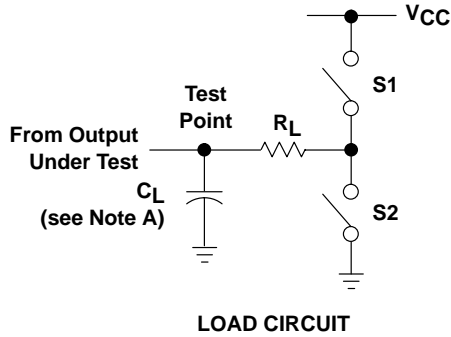
| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|-----------------|-----|------|
| C_{pd} Power dissipation capacitance per transceiver | No load | 40 | pF |

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.

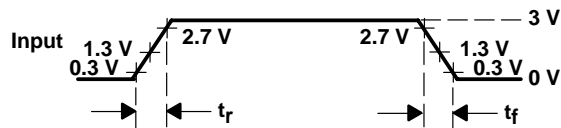


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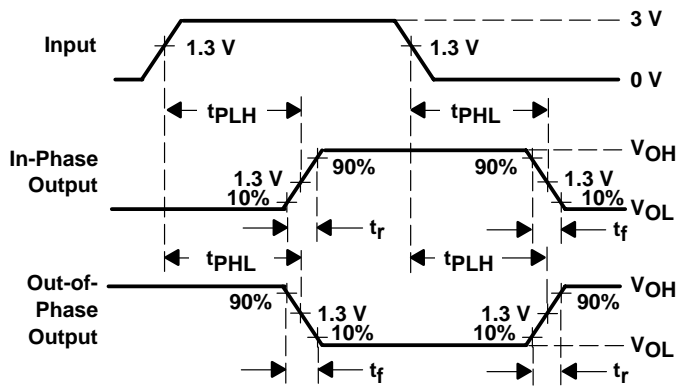
PARAMETER MEASUREMENT INFORMATION



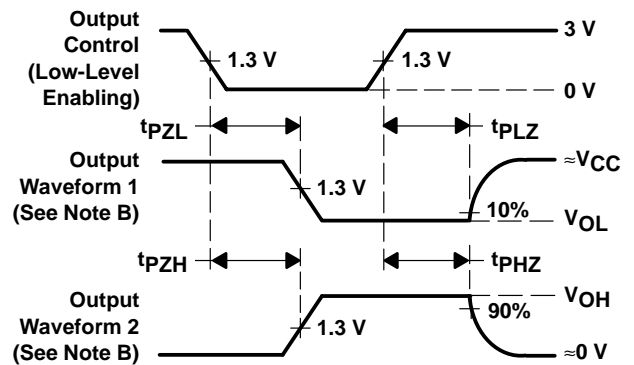
| PARAMETER | | R_L | C_L | S_1 | S_2 |
|-------------------|-----------|--------------|-----------------|--------|--------|
| t_{en} | t_{PZH} | 1 k Ω | 50 pF or 150 pF | Open | Closed |
| | t_{PZL} | | | Closed | Open |
| t_{dis} | t_{PHZ} | 1 k Ω | 50 pF | Open | Closed |
| | t_{PLZ} | | | Closed | Open |
| t_{pd} or t_t | | — | 50 pF or 150 pF | Open | Open |



VOLTAGE WAVEFORM
 INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
 PROPAGATION DELAY AND OUTPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS
 ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

- 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 | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74HCT623DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74HCT623DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74HCT623DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74HCT623DWR | OBSOLETE | SOIC | DW | 20 | | TBD | Call TI | Call TI |
| SN74HCT623N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74HCT623NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |

⁽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.

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N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



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

DW (R-PDSO-G20)

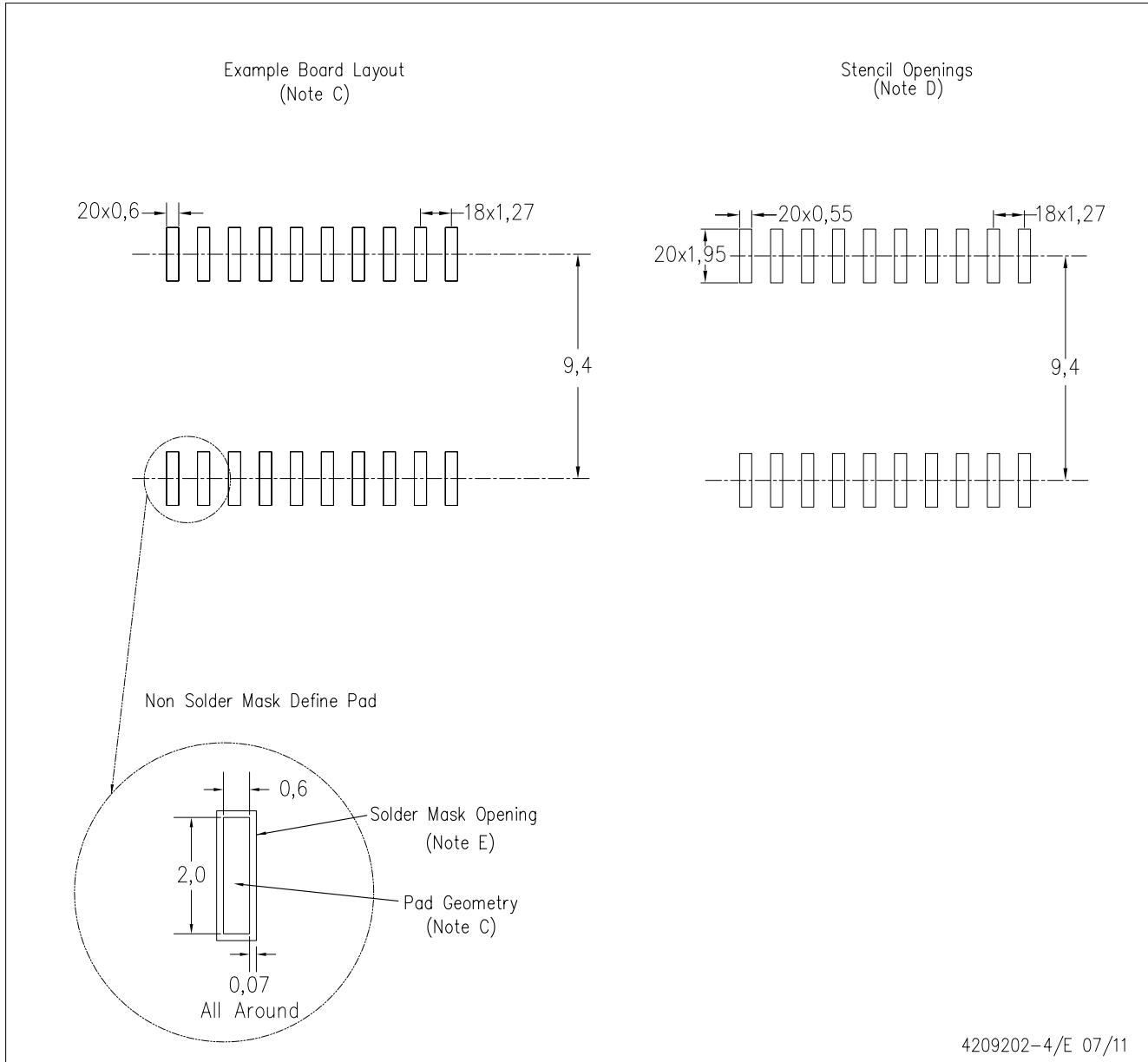
PLASTIC SMALL OUTLINE



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

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4209202-4/E 07/11

- 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.

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