

SN54BCT623, SN74BCT623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS020A – SEPTEMBER 1988 – REVISED NOVEMBER 1993

- State-of-the-Art BiCMOS Design Significantly Reduces I_{CCZ}
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Plastic and Ceramic 300-mil DIPs (J, N)

description

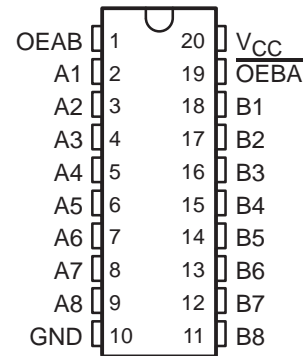
The 'BCT623 bus transceiver is designed for asynchronous communication between data buses. The control function implementation allows for maximum flexibility in timing. The 'BCT623 provides true data at its outputs.

This device allows 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.

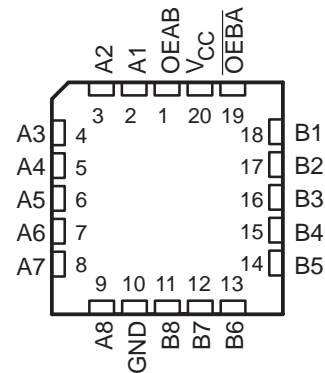
The output-enable inputs can be used to disable the device so that the buses are effectively isolated. The dual-enable configuration gives the transceivers the capability of storing data by simultaneously enabling OEAB and \overline{OEBA} . Each output reinforces its input in this configuration. When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

The SN54BCT623 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74BCT623 is characterized for operation from 0°C to 70°C .

SN54BCT623 . . . J OR W PACKAGE
SN74BCT623 . . . DW OR N PACKAGE
(TOP VIEW)



SN54BCT623 . . . FK PACKAGE
(TOP VIEW)



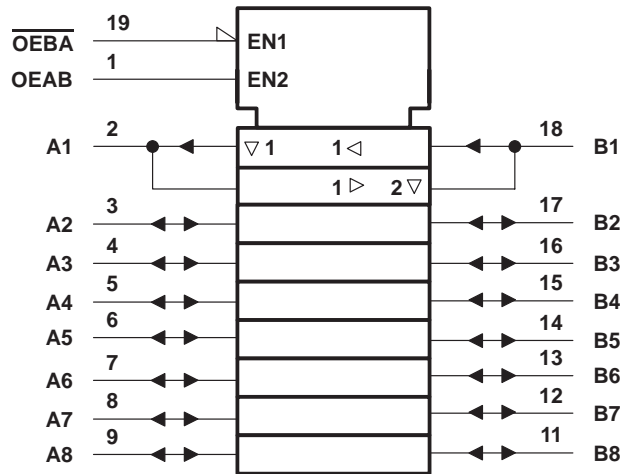
FUNCTION TABLE

| INPUTS | | OPERATION |
|-------------------|------|-------------------------------------|
| \overline{OEBA} | OEAB | |
| L | L | B data to A bus |
| L | H | B data to A bus, A data to B bus |
| H | L | Isolation |
| H | H | A data to B bus |

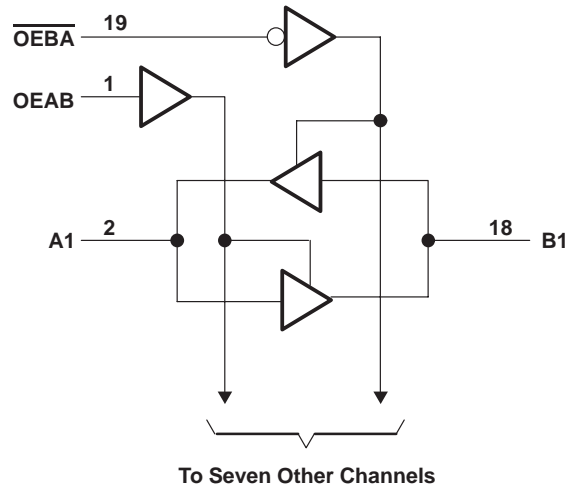
SN54BCT623, SN74BCT623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

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logic symbol†



logic diagram (positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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

| | |
|---|---------------------|
| Supply voltage range, V_{CC} | – 0.5 V to 7 V |
| Input voltage range: Control inputs (see Note 1) | – 0.5 V to 7 V |
| I/O ports (see Note 1) | – 0.5 V to 5.5 V |
| Voltage range applied to any output in the disabled or power-off state, V_O | – 0.5 V to 5.5 V |
| Voltage range applied to any output in the high state, V_O | – 0.5 V to V_{CC} |
| Input clamp current, I_{IK} | –30 mA |
| Current into any output in the low state: SN54BCT623 | 96 mA |
| SN74BCT623 | 128 mA |
| Operating free-air temperature range: SN54BCT623 | – 55°C to 125°C |
| SN74BCT623 | 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.

NOTE 1: The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

recommended operating conditions

| | | SN54BCT623 | | | SN74BCT623 | | | 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 | | | 0.8 | | | 0.8 | V |
| I_{IK} | Input clamp current | | | –18 | | | –18 | mA |
| I_{OH} | High-level output current | A port | | –3 | | | –3 | mA |
| | | B port | | –12 | | | –15 | |
| I_{OL} | Low-level output current | A port | | 20 | | | 24 | mA |
| | | B port | | 48 | | | 64 | |
| T_A | Operating free-air temperature | –55 | | 125 | 0 | | 70 | °C |



SN54BCT623, SN74BCT623
OCTAL BUS TRANSCEIVERS
WITH 3-STATE OUTPUTS

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

| PARAMETER | | TEST CONDITIONS | | SN54BCT623 | | SN74BCT623 | | UNIT |
|-------------------|--------------|---------------------------|--|------------|------|------------|------|---------------|
| | | | | MIN | TYP† | MAX | MIN | |
| V_{IK} | | $V_{CC} = 4.5\text{ V}$, | $I_I = -18\text{ mA}$ | -1.2 | | -1.2 | | V |
| V_{OH} | A port | $V_{CC} = 4.5\text{ V}$ | $I_{OH} = -1\text{ mA}$ | 2.5 | 3.4 | 2.5 | 3.4 | V |
| | | | $I_{OH} = -3\text{ mA}$ | 2.4 | 3.3 | 2.4 | 3.3 | |
| | B port | $V_{CC} = 4.5\text{ V}$ | $I_{OH} = -3\text{ mA}$ | 2.4 | 3.3 | 2.4 | 3.3 | |
| | | | $I_{OH} = -12\text{ mA}$ | 2 | 3.2 | | | |
| | | | $I_{OH} = -15\text{ mA}$ | | | 2 | 3.1 | |
| V_{OL} | A port | $V_{CC} = 4.5\text{ V}$ | $I_{OL} = 20\text{ mA}$ | 0.3 0.5 | | | | V |
| | | | $I_{OL} = 24\text{ mA}$ | | | 0.35 | 0.5 | |
| | B port | $V_{CC} = 4.5\text{ V}$ | $I_{OL} = 48\text{ mA}$ | 0.38 0.55 | | | | |
| | | | $I_{OL} = 64\text{ mA}$ | | | 0.42 | 0.55 | |
| I_I | A or B port | $V_{CC} = 5.5\text{ V}$, | $V_I = 5.5\text{ V}$ | 1 | | 1 | | mA |
| | OEAB or OEBA | | | 0.1 | | 0.1 | | |
| I_{IH}^\ddagger | A or B port | $V_{CC} = 5.5\text{ V}$, | $V_I = 2.7\text{ V}$ | 70 | | 70 | | μA |
| | OEAB or OEBA | | | 20 | | 20 | | |
| I_{IL}^\ddagger | A or B port | $V_{CC} = 5.5\text{ V}$, | $V_I = 0.5\text{ V}$ | -0.65 | | -0.65 | | mA |
| | OEAB or OEBA | | | -0.6 | | -0.6 | | |
| I_{OS}^\S | A port | $V_{CC} = 5.5\text{ V}$, | $V_O = 0$ | -60 | -150 | -60 | -150 | mA |
| | B port | | | -100 | -225 | -100 | -225 | |
| I_{CCL} | A to B | $V_{CC} = 5.5\text{ V}$ | | 58 | 92 | 58 | 92 | mA |
| I_{CCH} | A to B | $V_{CC} = 5.5\text{ V}$ | | 33 | 53 | 33 | 53 | mA |
| I_{CCZ} | | $V_{CC} = 5.5\text{ V}$ | | 6 | 11 | 6 | 11 | mA |
| C_i | OEAB or OEBA | $V_{CC} = 5\text{ V}$, | $V_I = 2.5\text{ V}$ or 0.5 V | 5 | | 5 | | pF |
| C_{io} | A to B | $V_{CC} = 5\text{ V}$, | $V_O = 2.5\text{ V}$ or 0.5 V | 9 | | 9 | | pF |
| | B to A | | | 12 | | 12 | | |

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

§ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

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switching characteristics (see Note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC} = 5\text{ V},$ $C_L = 50\text{ pF},$ $R_1 = 500\ \Omega,$ $R_2 = 500\ \Omega,$ $T_A = 25^\circ\text{C}$ | | | $V_{CC} = 4.5\text{ V to }5.5\text{ V},$ $C_L = 50\text{ pF},$ $R_1 = 500\ \Omega,$ $R_2 = 500\ \Omega,$ $T_A = \text{MIN to MAX}^\dagger$ | | | | UNIT |
|-----------|-------------------|----------------|---|-----|-----|--|------|------------|------|------|
| | | | 'BCT623 | | | SN54BCT623 | | SN74BCT623 | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | A | B | 0.5 | 3.1 | 4.7 | 0.5 | 5.3 | 0.5 | 5.2 | ns |
| t_{PHL} | | | 1.7 | 4.9 | 6.9 | 1.7 | 7.6 | 1.7 | 7.4 | |
| t_{PLH} | B | A | 0.9 | 4.1 | 5.9 | 0.9 | 6.8 | 0.9 | 6.7 | ns |
| t_{PHL} | | | 1.8 | 5.3 | 7.6 | 1.8 | 8.3 | 1.8 | 8 | |
| t_{PZH} | \overline{OEBA} | A | 3.1 | 6.8 | 9.1 | 3.1 | 10.7 | 3.1 | 10.6 | ns |
| t_{PZL} | | | 3.3 | 7.2 | 9.6 | 3.3 | 11.3 | 3.3 | 10.7 | |
| t_{PHZ} | \overline{OEBA} | A | 1.9 | 6.1 | 8.3 | 1.9 | 10.6 | 1.9 | 9.8 | ns |
| t_{PLZ} | | | 1.1 | 4.6 | 7 | 1.1 | 8.1 | 1.1 | 7.8 | |
| t_{PZH} | OEAB | B | 2 | 5 | 6.8 | 2 | 7.8 | 2 | 7.6 | ns |
| t_{PZL} | | | 2.7 | 6.2 | 8 | 2.7 | 9.3 | 2.7 | 8.9 | |
| t_{PHZ} | OEAB | B | 1.1 | 4.6 | 6.5 | 1.1 | 8 | 1.1 | 7.7 | ns |
| t_{PLZ} | | | 0.3 | 3.2 | 6.3 | 0.3 | 7.2 | 0.3 | 7.1 | |

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

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| 5962-9094001M2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| 5962-9094001MRA | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| 5962-9094001MSA | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | N / A for Pkg Type |
| SN74BCT623DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74BCT623NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74BCT623NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74BCT623NSRG4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SNJ54BCT623FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type |
| SNJ54BCT623J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 SNPB | N / A for Pkg Type |
| SNJ54BCT623W | ACTIVE | CFP | W | 20 | 1 | TBD | Call TI | 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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TAPE AND REEL INFORMATION



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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74BCT623DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74BCT623NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.2 | 13.0 | 2.5 | 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) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74BCT623DWR | SOIC | DW | 20 | 2000 | 346.0 | 346.0 | 41.0 |
| SN74BCT623NSR | SO | NS | 20 | 2000 | 346.0 | 346.0 | 41.0 |

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---------------|------------------------|------------------------|------------------------|------------------------|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |



4040083/F 03/03

- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
 - Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a metal lid.
 - D. The terminals are gold plated.
 - E. Falls within JEDEC MS-004

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- 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.

W (R-GDFP-F20)

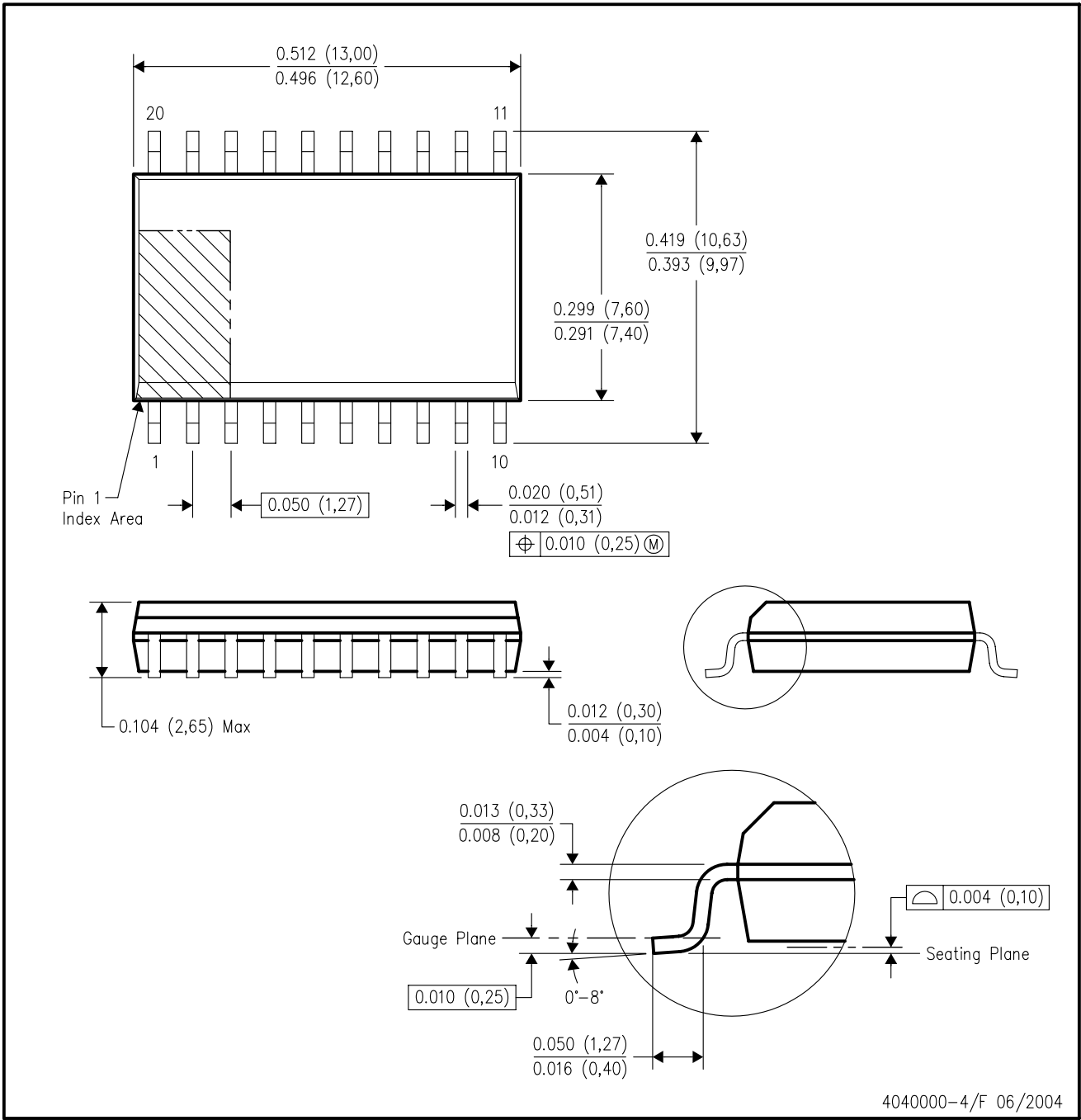
CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within Mil-Std 1835 GDFP2-F20

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - 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.

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.

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| | |
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| Military | www.ti.com/military |
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