



**THE DATASHEET OF
SN74CBTS6800DW**



SN74CBTS6800

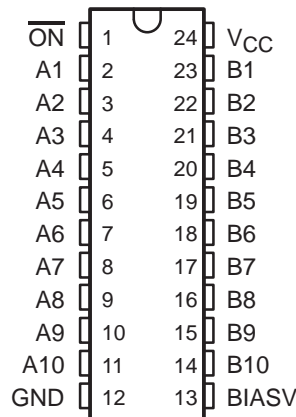
10-BIT FET BUS SWITCH

WITH PRECHARGED OUTPUTS AND SCHOTTKY DIODE CLAMPING

SCDS102C – JUNE 1999 – REVISED OCTOBER 2000

- 5-Ω Switch Connection Between Two Ports
- TTL-Compatible Input Levels
- Outputs Are Precharged by Bias Voltage to Minimize Signal Distortion During Live Insertion
- Schottky Diodes on the I/Os to Clamp Undershoots up to -2 V

DB, DBQ, DGV, DW, OR PW PACKAGE
(TOP VIEW)



description

The SN74CBTS6800 provides ten bits of high-speed TTL-compatible bus switching with Schottky diodes on the I/Os to clamp undershoots.

The low on-state resistance of the switch allows bidirectional connections to be made, while adding near-zero propagation delay. The device also precharges the B port to a user-selectable bias voltage (BIASV) to minimize live-insertion noise.

The SN74CBTS6800 is organized as one 10-bit switch with a single enable (\overline{ON}) input. When \overline{ON} is low, the switch is on, and port A is connected to port B. When \overline{ON} is high, the switch between port A and port B is open. When \overline{ON} is high or V_{CC} is 0 V, B port is precharged to BIASV through the equivalent of a 10-kΩ resistor.

ORDERING INFORMATION

| T _A | PACKAGE† | ORDERABLE PART NUMBER | TOP-SIDE MARKING | |
|----------------|-------------------|-----------------------|------------------|----------|
| -40°C to 85°C | SOIC – DW | Tube | SN74CBTS6800DW | |
| | | Tape and reel | SN74CBTS6800DWR | |
| | SSOP – DB | Tape and reel | SN74CBTS6800DBR | CS6800 |
| | SSOP (QSOP) – DBQ | Tape and reel | SN74CBTS6800DBQR | CBTS6800 |
| | TSSOP – PW | Tape and reel | SN74CBTS6800PWR | CS6800 |
| | TVSOP – DGV | Tape and reel | SN74CBTS6800DGVR | CS6800 |

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

FUNCTION TABLE

| \overline{ON} | B1–B10 | FUNCTION |
|-----------------|--------|-----------|
| L | A1–A10 | Connect |
| H | BIASV | Precharge |



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**TEXAS
INSTRUMENTS**

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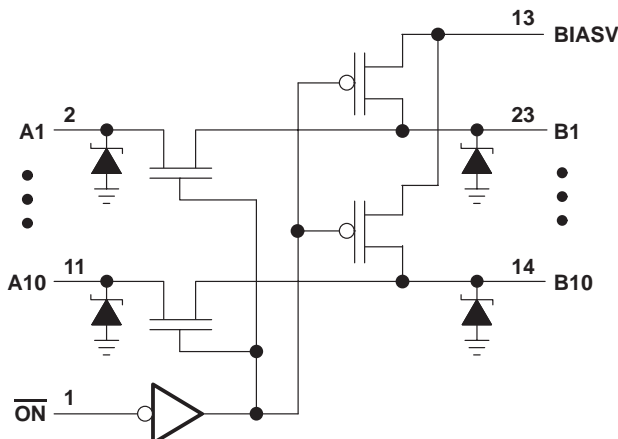
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logic diagram (positive logic)



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

| | | |
|--|-------|----------------|
| Supply voltage range, V_{CC} | ..... | -0.5 V to 7 V |
| Bias voltage range, BIASV | ..... | -0.5 V to 7 V |
| Input voltage range, V_I (see Note 1) | ..... | -0.5 V to 7 V |
| Continuous channel current | ..... | 128 mA |
| Input clamp current, I_{IK} ($V_I < 0$) | ..... | -50 mA |
| Package thermal impedance, θ_{JA} (see Note 2): | | |
| DB package | ..... | 63°C/W |
| DBQ package | ..... | 61°C/W |
| DGV package | ..... | 86°C/W |
| DW package | ..... | 46°C/W |
| PW package | ..... | 88°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 negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

| | | MIN | MAX | UNIT |
|----------|----------------------------------|-----|----------|------|
| V_{CC} | Supply voltage | 4 | 5.5 | V |
| BIASV | Supply voltage | 1.3 | V_{CC} | V |
| V_{IH} | High-level control input voltage | 2 | | V |
| V_{IL} | Low-level control input voltage | | 0.8 | V |
| T_A | Operating free-air temperature | -40 | 85 | °C |

NOTE 3: All unused control 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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SCDS102C – JUNE 1999 – REVISED OCTOBER 2000

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

| PARAMETER | | TEST CONDITIONS | | MIN | TYP† | MAX | UNIT |
|-----------------------|--|----------------------------|---|------|------|------|------|
| V _{IK} | A or B inputs | V _{CC} = 4.5 V, | I _I = -18 mA | | | -0.7 | V |
| | Control inputs | | | | | -1.2 | |
| I _{IL} | | V _{CC} = 5.5 V, | V _I = GND | | | -5 | μA |
| I _{IH} | | V _{CC} = 5.5 V, | V _I = 5.5 V | | | 150 | μA |
| I _O | | V _{CC} = 4.5 V, | BIASV = 2.4 V, V _O = 0 | 0.25 | | | mA |
| I _{CC} | | V _{CC} = 5.5 V, | I _O = 0, V _I = V _{CC} or GND | | | 3 | μA |
| ΔI _{CC} ‡ | Control inputs | V _{CC} = 5.5 V, | One input at 3.4 V, Other inputs at V _{CC} or GND | | | 2.5 | mA |
| C _i | Control inputs | V _I = 3 V or 0 | | | 3.5 | | pF |
| C _{io} (OFF) | | V _O = 3 V or 0, | $\overline{\text{ON}} = V_{CC}$ | | 4.5 | | pF |
| r _{on} § | V _{CC} = 4 V, TYP at V _{CC} = 4 V | V _I = 2.4 V, | I _I = 15 mA | | 11 | 20 | Ω |
| | | V _I = 0 | I _I = 64 mA | | 3 | 7 | |
| | V _{CC} = 4.5 V | V _I = 0 | I _I = 30 mA | | 3 | 7 | |
| | | V _I = 2.4 V, | I _I = 15 mA | | 6 | 15 | |

† All typical values are at V_{CC} = 5 V (unless otherwise noted), T_A = 25°C.

‡ This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

§ Measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

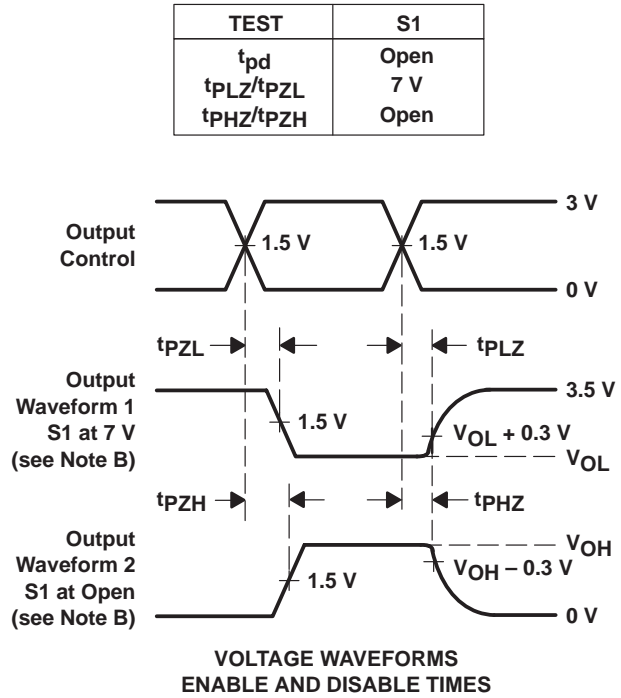
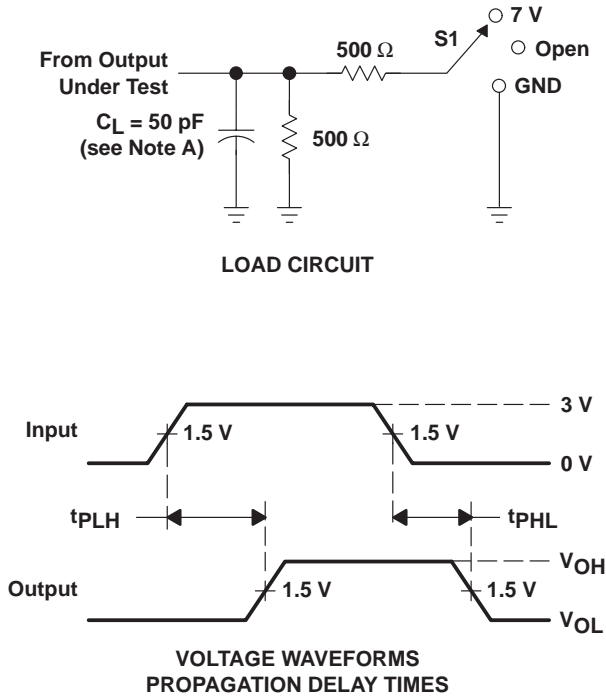
switching characteristics over recommended operating free-air temperature range, C_L = 50 pF (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | V _{CC} = 4 V | | V _{CC} = 5 V ± 0.5 V | | UNIT |
|-------------------|------------------------|-------------|-----------------|-----------------------|------|-------------------------------|------|------|
| | | | | MIN | MAX | MIN | MAX | |
| t _{pd} ¶ | A or B | B or A | | | 0.35 | | 0.25 | ns |
| t _{PZH} | $\overline{\text{ON}}$ | A or B | BIASV = GND | | 6 | 2 | 5.1 | ns |
| t _{PZL} | | | BIASV = 3 V | | 6 | 2 | 5.6 | |
| t _{PHZ} | $\overline{\text{ON}}$ | A or B | BIASV = GND | | 5.5 | 1 | 5 | ns |
| t _{PLZ} | | | BIASV = 3 V | | 5.5 | 2 | 5.9 | |

¶ The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

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PARAMETER MEASUREMENT INFORMATION



- 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. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r ≤ 2.5 ns, t_f ≤ 2.5 ns.
 D. The outputs are measured one at a time with one transition per measurement.
 E. t_{PZL} 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 finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74CBTS6800DGVR | ACTIVE | TVSOP | DGV | 24 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | CS6800 | Samples |
| SN74CBTS6800PWR | ACTIVE | TSSOP | PW | 24 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | CS6800 | 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.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(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 finish/Ball material - Orderable Devices 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.

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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 |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74CBTS6800DGVR | TVSOP | DGV | 24 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74CBTS6800PWR | TSSOP | PW | 24 | 2000 | 330.0 | 16.4 | 6.95 | 8.3 | 1.6 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74CBTS6800DGVR | TVSOP | DGV | 24 | 2000 | 367.0 | 367.0 | 35.0 |
| SN74CBTS6800PWR | TSSOP | PW | 24 | 2000 | 356.0 | 356.0 | 35.0 |

EXAMPLE BOARD LAYOUT

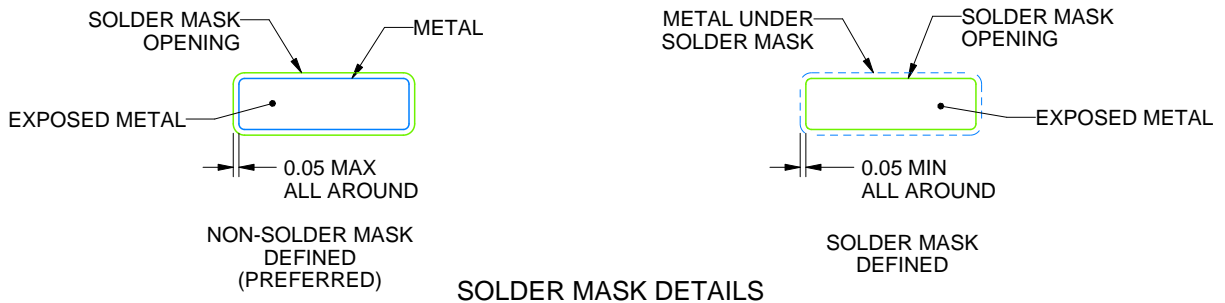
PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



SOLDER MASK DETAILS

4220208/A 02/2017

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



4073251/E 08/00

- 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 per side.
 D. Falls within JEDEC: 24/48 Pins – MO-153
 14/16/20/56 Pins – MO-194

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