SN74CBTK6800 10-BIT FET BUS SWITCH WITH PRECHARGED OUTPUTS AND ACTIVE-CLAMP UNDERSHOOT-PROTECTION CIRCUIT

SCDS107E	- APR	IL 2000	- REVI	SED C	OCTOBER	2000

	Switch Connection Between Two Ports -Compatible Input Levels	, ,	, OR PW PACKAGE P VIEW)
	ver Off Disables Outputs, Permitting	ON [1	U 24] V _{CC}
	e Insertion	A1 [2	23] B1
Min	puts Are Precharged by Bias Voltage to	A2 [3	22] B2
	imize Signal Distortion During Live	A3 [4	21] B3
	ertion	A4 [5	20] B4
Circ	ive-Clamp Undershoot-Protection	A5 [6	19 B5
	cuit on the I/Os Clamps Undershoots	A6 [7	18 B6
	wn to –2 V	A7 [8	17 B7
	ch-Up Performance Exceeds 100 mA Per SD 78, Class II		· E
- 2 - 2	D Protection Exceeds JESD 22 000-V Human-Body Model (A114-A) 00-V Machine Model (A115-A) 000-V Charged-Device Model (C101)	A10 [11 GND [12	6

description

The SN74CBTK6800 device provides ten bits of high-speed TTL-compatible bus switching. 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 A and B ports have an active-clamp undershoot-protection circuit. When there is an undershoot, the active-clamp circuit is enabled and current from V_{CC} is supplied to clamp the output, preventing the pass transistor from turning on.

The SN74CBTK6800 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-k Ω resistor.

TA	PACKAG	Eţ	ORDERABLE PART NUMBER	TOP-SIDE MARKING
	SOIC – DW		SN74CBTK6800DW	CBTK6800
	3010 - DW	Tape and reel	SN74CBTK6800DWR	CBIR0000
–40°C to 85°C	SSOP (QSOP) – DBQ	Tape and reel	SN74CBTK6800DBQR	CBTK6800
	TSSOP – PW	Tape and reel	SN74CBTK6800PWR	BK6800
	TVSOP – DGV	Tape and reel	SN74CBTK6800DGVR	BK6800

ORDERING INFORMATION

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

FUNCTION	TABLE
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INPUT ON	FUNCTION
L	A port = B port
Н	A port = Z B port = BIASV



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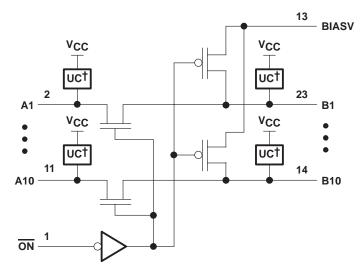
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logic diagram (positive logic)



[†] Undershoot clamp

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

Bias voltage range, BIASV	-0.5 V to 7 V -0.5 V to 7 V -0.5 V to 7 V
	-0.5 V to 7 V
Continuous channel current	128 mA
Input clamp current, I_{IK} (V _I < 0)	
Package thermal impedance, θ_{JA} (see Note 2):	DBQ package 61°C/W
	DGV package
	DW package 46°C/W
	PW package
Storage temperature range, T _{stg}	

[‡] 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
VCC	Supply voltage	4	5.5	V
BIASV	Supply voltage	1.3	VCC	V
VIH	High-level control input voltage	2		V
VIL	Low-level control input voltage		0.8	V
Τ _Α	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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electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIO	MIN	TYP [†]	MAX	UNIT	
VIK		V _{CC} = 4.5 V,	lı = -18 mA				-1.2	V
VIKU		V _{CC} = 5.5 V,	$0 \text{ mA} \ge I_I \ge -50 \text{ mA},$	<u>OE</u> = 5.5 V			-2	V
Ц		V _{CC} = 5.5 V,	$V_{I} = 5.5 V \text{ or GND}$				±5	μΑ
l _{off}		$V_{CC} = 0,$	$V_{I} \text{ or } V_{O} = 0 \text{ to } 5.5 \text{ V},$	BIASV = Open			20	μA
IO		V _{CC} = 4.5 V,	V _O = 0, BIASV = 2.4 V		0.25			mA
ICC		V _{CC} = 5.5 V,	$V_{I} = V_{CC} \text{ or } GND, \qquad I_{O} = 0$				20	μΑ
∆ICC [‡]	Control inputs	V _{CC} = 5.5 V,	One input at 3.4 V,	Other inputs at V_{CC} or GND			2.5	mA
Ci	Control inputs	V _I = 3 V or 0				3		pF
C _{o(OFF})	V _O = 3 V or 0,	Switch off			8.5		pF
		$V_{CC} = 4 V,$ TYP at $V_{CC} = 4 V$	V ₁ = 2.4 V,	l _l = 15 mA		11	20	
r _{on} §			$V_{I} = 0$	lı = 64 mA		3	7	Ω
		$V_{CC} = 4.5 V$	v] = 0	I _I = 30 mA		3	7	
			V _I = 2.4 V,	lj = 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 (unless otherwise noted) (see Figure 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	V _{CC} = 4 V	V _{CC} = 5 V ± 0.5 V		UNIT	
		(001F01)	CONDITIONS	MIN MAX	MIN	MAX		
tpd¶	A or B	B or A		0.35		0.25	ns	
^t PZH		A or B	BIASV = GND	6	2	5.1	ns	
tPZL	ON	AUID	BIASV = 3 V	6	2	5.6	115	
^t PHZ		A or B	BIASV = GND	5.5	1	5	ns	
^t PLZ		AOID	BIASV = 3 V	5.5	2	5.9	115	

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).

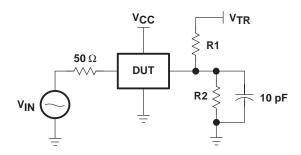


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undershoot characteristics

	PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
	νουτυ	See Figures 1 and 2, and Table 1	2	V _{OH} -0.3		V
1						

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



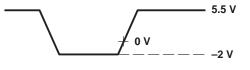


Figure 1. Device Test Setup

Figure 2. Transient Input Voltage Waveform

VALUE	UNIT
See Figure 1	
See Figure 2	V
20	ns
2	ns
2	ns
100	kΩ
11	V
5.5	V
Open	
	See Figure 1 See Figure 2 20 2 2 100 11 5.5

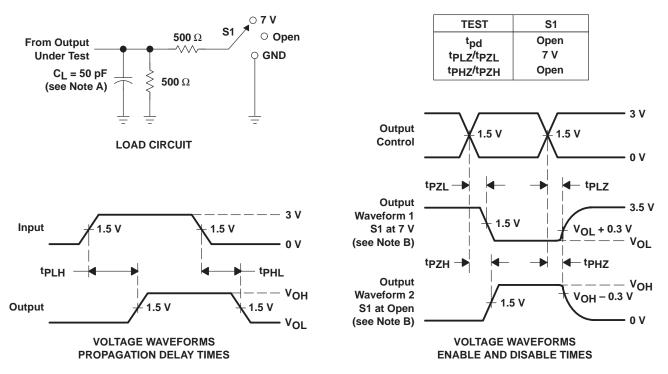
Table 1. Device Test Conditions

[‡]Other B-port outputs are open.



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PARAMETER MEASUREMENT INFORMATION

NOTES: A. CL 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 \leq 10 MHz, Z_Q = 50 Ω , t_f \leq 2.5 ns, t_f \leq 2.5 ns. D. The outputs are measured one at a time with one transition per measurement.
- E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
- F. tPZL and tPZH are the same as ten.
- G. tPLH and tPHL are the same as tpd.

Figure 3. Load Circuit and Voltage Waveforms





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PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/ Ball Finish	MSL Peak Temp ⁽³⁾	Samples (Requires Login)
74CBTK6800DBQRE4	ACTIVE	SSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	
74CBTK6800DBQRG4	ACTIVE	SSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	
74CBTK6800DGVRE4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
74CBTK6800DGVRG4	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800DBQR	ACTIVE	SSOP	DBQ	24	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	
SN74CBTK6800DGVR	ACTIVE	TVSOP	DGV	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800DWR	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800DWRE4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800DWRG4	ACTIVE	SOIC	DW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800PW	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800PWE4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800PWG4	ACTIVE	TSSOP	PW	24	60	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800PWR	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800PWRE4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	
SN74CBTK6800PWRG4	ACTIVE	TSSOP	PW	24	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	

⁽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.



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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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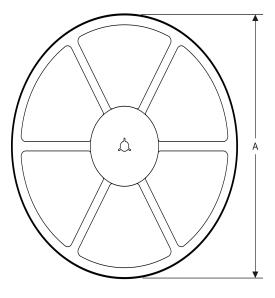
PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION

REEL DIMENSIONS

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TAPE AND REEL INFORMATION

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

*All dimensions are nominal												
Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74CBTK6800DBQR	SSOP	DBQ	24	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CBTK6800DGVR	TVSOP	DGV	24	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74CBTK6800DWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74CBTK6800PWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

TEXAS INSTRUMENTS

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PACKAGE MATERIALS INFORMATION

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*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CBTK6800DBQR	SSOP	DBQ	24	2500	367.0	367.0	38.0
SN74CBTK6800DGVR	TVSOP	DGV	24	2000	367.0	367.0	35.0
SN74CBTK6800DWR	SOIC	DW	24	2000	367.0	367.0	45.0
SN74CBTK6800PWR	TSSOP	PW	24	2000	367.0	367.0	38.0

MECHANICAL DATA

PLASTIC SMALL-OUTLINE

MPDS006C - FEBRUARY 1996 - REVISED AUGUST 2000

DGV (R-PDSO-G**)

24 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 per side.
- D. Falls within JEDEC: 24/48 Pins MO-153

14/16/20/56 Pins – MO-194



DW (R-PDSO-G24)

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 AD.



DBQ (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



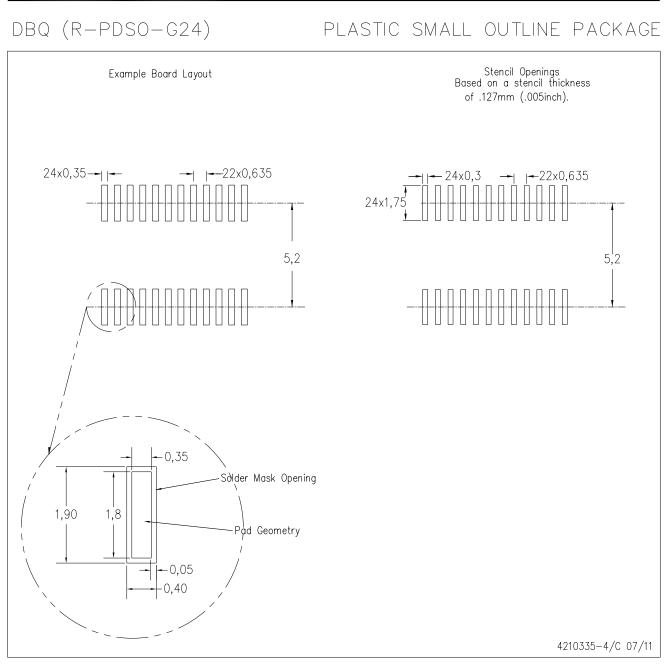
NOTES: A. All linear dimensions are in inches (millimeters).

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) per side.

D. Falls within JEDEC MO-137 variation AE.





NOTES:

- A. All linear dimensions are in millimeters.B. This drawing is subject to change without notice.
- C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
- D. Publication IPC-7351 is recommended for alternate designs.
- E. 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. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.



PW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



NOTES:

A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 B. This drawing is subject to change without notice.

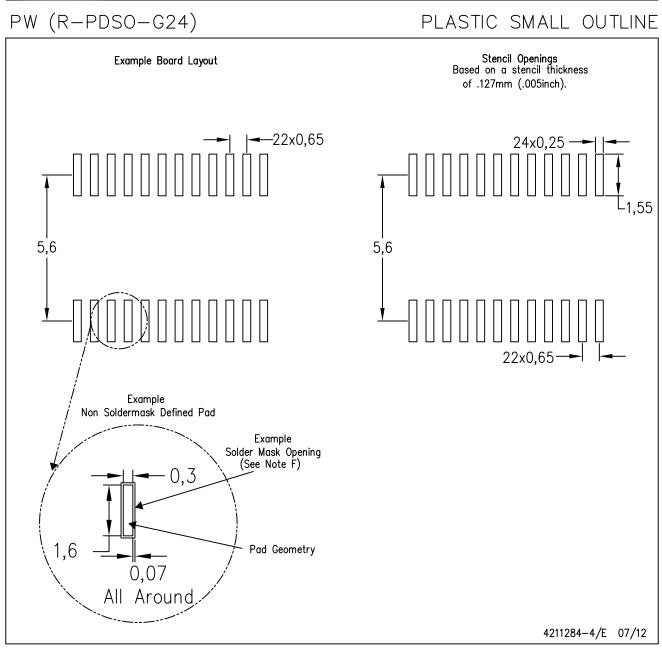
Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.

Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.

E. Falls within JEDEC MO-153



LAND PATTERN DATA



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 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 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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