

SN74SSTL16837A
**20-BIT SSTL_3 INTERFACE UNIVERSAL BUS DRIVER
 WITH 3-STATE OUTPUTS**

SCBS675G – SEPTEMBER 1996 – REVISED SEPTEMBER 1998

- Member of the Texas Instruments *Widebus™ Family*
- Supports SSTL_3 Signal Inputs and Outputs
- Flow-Through Architecture Optimizes PCB Layout
- Meets SSTL_3 Class I and Class II Specifications
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- Packaged in Plastic Thin Shrink Small-Outline Package

description

This 20-bit universal bus driver is designed for 3-V to 3.6-V V_{CC} operation and SSTL_3 or LVTTL I/O levels.

Data flow from A to Y is controlled by the output-enable (\overline{OE}) input. The device operates in the transparent mode when latch enable (LE) is high. The A data is latched if LE is low and clock (CLK) is held at a high or low logic level. If LE is low, the A data is stored in the latch/flip-flop on the low-to-high transition of CLK. When OE is high, the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, OE should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN74SSTL16837A is characterized for operation from 0°C to 70°C.

**DGG PACKAGE
 (TOP VIEW)**

Y1	1	64	A1
Y2	2	63	A2
GND	3	62	GND
Y3	4	61	A3
Y4	5	60	A4
V_{DDQ}	6	59	V_{CC}
Y5	7	58	A5
Y6	8	57	A6
GND	9	56	GND
Y7	10	55	A7
Y8	11	54	A8
V_{DDQ}	12	53	V_{CC}
Y9	13	52	A9
Y10	14	51	A10
GND	15	50	GND
OE	16	49	CLK
V_{REF}	17	48	LE
GND	18	47	GND
Y11	19	46	A11
Y12	20	45	A12
V_{DDQ}	21	44	V_{CC}
Y13	22	43	A13
Y14	23	42	A14
GND	24	41	GND
Y15	25	40	A15
Y16	26	39	A16
V_{DDQ}	27	38	V_{CC}
Y17	28	37	A17
Y18	29	36	A18
GND	30	35	GND
Y19	31	34	A19
Y20	32	33	A20



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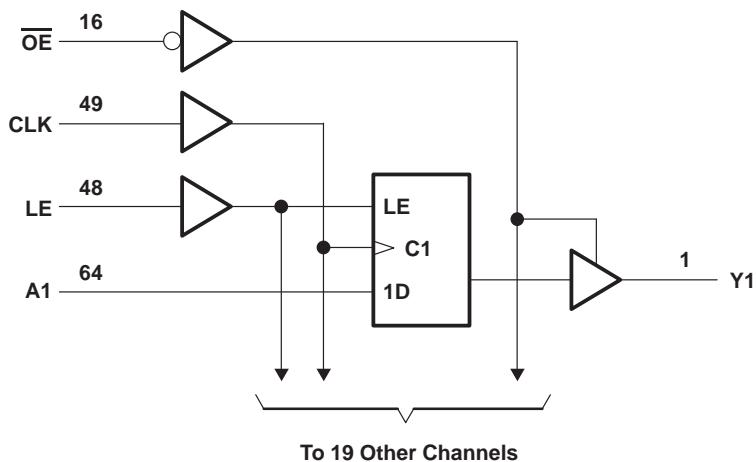
FUNCTION TABLE

INPUTS				OUTPUT
OE	LE	CLK	A	Y
L	H	X	H	H
L	H	X	L	L
L	L	↑	H	H
L	L	↑	L	L
L	L	H	X	Y_0^\dagger
L	L	L	X	Y_0^\ddagger
H	X	X	X	Z

† Output level before the indicated steady-state input conditions were established, provided that CLK was high before LE went low

‡ Output level before the indicated steady-state input conditions were established

logic diagram (positive logic)



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

Supply voltage range, V_{CC} or V_{DDQ}	–0.5 V to 4.6 V
Input voltage range, V_I (see Note 1)	–0.5 V to V_{CC} + 0.5 V
Output voltage range, V_O (see Notes 1 and 2)	–0.5 V to V_{DDQ} + 0.5 V
Input clamp current, I_{IK} ($V_I < 0$)	–50 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Continuous output current, I_O ($V_O = 0$ to V_{DDQ})	±50 mA
Continuous current through each V_{CC} , V_{DDQ} , or GND	±100 mA
Package thermal impedance, θ_{JA} (see Note 3)	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 negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 2. This current flows only when the output is in the high state and $V_O > V_{DDQ}$.
 3. The package thermal impedance is calculated in accordance with JEDEC 51.

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recommended operating conditions (see Note 4)

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	V_{DDQ}		3.6	V
V_{DDQ}	Output supply voltage	3		3.6	V
V_{REF}	Reference voltage ($V_{REF} = 0.45 \times V_{DDQ}$)	1.3	1.5	1.7	V
V_{TT}	Termination voltage ($V_{REF} = V_{TT} = 0.45 \times V_{DDQ}$)	$V_{REF}-50\text{mV}$	V_{REF}	$V_{REF}+50\text{mV}$	V
V_I	Input voltage	0	V_{CC}		V
V_{IH}	AC high-level input voltage	All inputs	$V_{REF}+400\text{mV}$		V
V_{IL}	AC low-level input voltage	All inputs		$V_{REF}-400\text{mV}$	V
V_{IH}	DC high-level input voltage	All inputs	$V_{REF}+200\text{mV}$		V
V_{IL}	DC low-level input voltage	All inputs		$V_{REF}-200\text{mV}$	V
I_{OH}	High-level output current			-20	mA
I_{OL}	Low-level output current			20	
T_A	Operating free-air temperature	0		70	°C

NOTE 4: 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}	MIN	TYP†	MAX	UNIT	
V_{IK}	$I_I = -18 \text{ mA}$		3 V		-1.2		V	
V_{OH}	$I_{OH} = -100 \mu\text{A}$		3 V to 3.6 V	$V_{CC}-0.2$			V	
	$I_{OH} = -16 \text{ mA}$		3 V	2.2				
	$I_{OH} = -20 \text{ mA}$			2.1				
V_{OL}	$I_{OL} = 100 \mu\text{A}$		3 V to 3.6 V		0.2		V	
	$I_{OL} = 16 \text{ mA}$		3 V		0.5			
	$I_{OL} = 20 \text{ mA}$				0.55			
I_I	LE	$V_I = 2.1 \text{ V or } 0.9 \text{ V}$	$V_{REF} = 1.3 \text{ V or } 1.7 \text{ V}$	3.6 V		± 40	μA	
		$V_I = 3.6 \text{ V or } 0$				± 1.2	mA	
	Data inputs, \overline{OE}	$V_I = 2.1 \text{ V or } 0.9 \text{ V}$	$V_{REF} = 1.3 \text{ V or } 1.7 \text{ V}$	3.6 V		± 5	μA	
		$V_I = 3.6 \text{ V or } 0$				± 5		
	CLK	$V_I = 2.1 \text{ V or } 0.9 \text{ V}$	$V_{REF} = 1.3 \text{ V or } 1.7 \text{ V}$	3.6 V		± 150	mA	
		$V_I = 3.6 \text{ V or } 0$				± 4		
I_{OZ}	V_{REF}	$V_{REF} = 1.3 \text{ V or } 1.7 \text{ V}$		3.6 V		± 150	μA	
		$V_O = 0.9 \text{ V or } 2.1 \text{ V}$		3.6 V		± 10	μA	
	$V_O = 0$	$V_O = 0 \text{ or } 3.6 \text{ V}$				± 10		
I_{CC}	$V_I = 2.1 \text{ V or } 0.9 \text{ V}$	$I_O = 0$	3.6 V		90		mA	
					90			
	$V_I = 3.6 \text{ V or } 0$							
C_i	Control inputs			3.3 V	2.5		pF	
		$V_I = 2.1 \text{ V or } 0.9 \text{ V}$			2			
C_o	Y port	$V_O = 2.1 \text{ V or } 0.9 \text{ V}$		3.3 V	3		pF	

† All typical values are at $V_{CC} = 3.3 \text{ V}$, $T_A = 25^\circ\text{C}$.

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timing requirements over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

				$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	UNIT
		MIN	MAX		
f_{clock}	Clock frequency			200	MHz
t_w	Pulse duration	LE high	2.5	ns	
		CLK high or low	2.5		
t_{su}	Setup time	A before CLK↑	LE low	1.5	ns
		A before LE↓	CLK high	1.5	
			CLK low	2	
t_h	Hold time	A after CLK↑	LE low	1	ns
		A after LE↓		1	

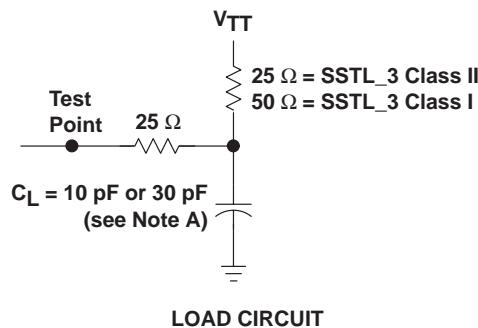
switching characteristics over recommended operating free-air temperature range, Class I, $V_{REF} = V_{TT} = V_{DDQ} \times 0.45$ and $C_L = 10 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	UNIT	
			MIN		
f_{max}			200	MHz	
t_{pd}	A	Y	1.1	ns	
	LE		1.5		
	CLK		1		
t_{en}	\overline{OE}	Y	1.8	5.5	ns
t_{dis}	\overline{OE}	Y	1.8	6	ns

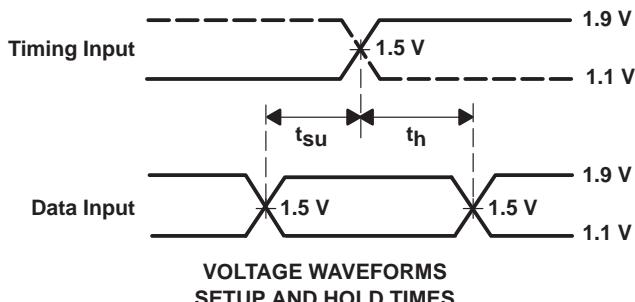
switching characteristics over recommended operating free-air temperature range, Class II, $V_{REF} = V_{TT} = V_{DDQ} \times 0.45$ and $C_L = 30 \text{ pF}$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	UNIT	
			MIN		
f_{max}			200	MHz	
t_{pd}	A	Y	1.1	ns	
	LE		1.5		
	CLK		1		
t_{en}	\overline{OE}	Y	1.8	5.5	ns
t_{dis}	\overline{OE}	Y	1.8	6	ns

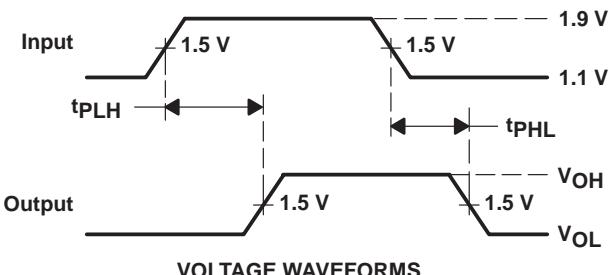
PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

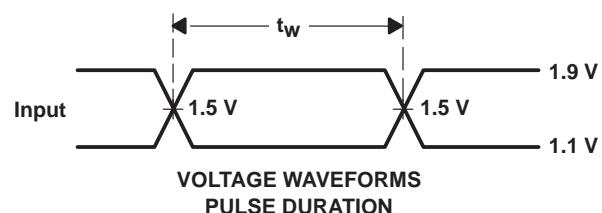


VOLTAGE WAVEFORMS SETUP AND HOLD TIMES

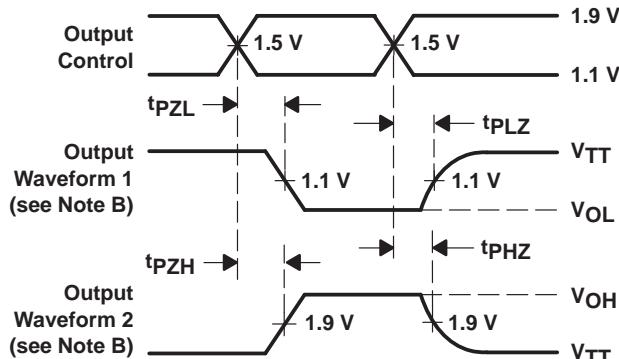


VOLTAGE WAVEFORMS PROPAGATION DELAY TIMES

INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS PULSE DURATION



VOLTAGE WAVEFORMS ENABLE AND DISABLE TIMES LOW- AND HIGH-LEVEL ENABLING

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: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r \leq 1$ ns, $t_f \leq 1$ ns.

D. The outputs are measured one at a time with one transition per measurement.

E. $V_{TT} = V_{REF} = V_{CC} \times 0.45$

F. t_{PLZ} and t_{PHZ} are the same as t_{dis} .

G. t_{PZL} and t_{PZH} are the same as t_{en} .

H. t_{PHI} and t_{PFI} are the same as t_{pd} .

Figure 1. Load Circuit and Voltage Waveforms

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