

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

# TC7SBD384FU

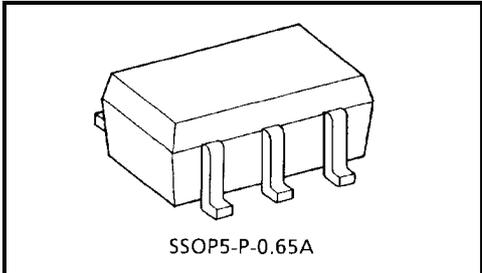
## Single Bus Switch with Level Shifting

The TC7SBD384FU provides single bit of high-speed TTL-compatible switching. The low on resistance of the switch allows connections to be made with minimal propagation delay.

The device is organized as just 1-bit low-impedance switch with output-enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is low, the switch is on and data can flow from port A to port B, or vice versa. When  $\overline{OE}$  is high, the switch is open and a high-impedance state exists between the two ports.

The internal diode which adds to power supply line is enable to realize the shift of signal level from 5 V to 3.3 V.

All inputs are equipped with protection circuits against static discharge.

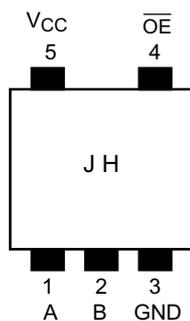


Weight: 0.006 g (typ.)

### Features

- Operating voltage:  $V_{CC} = 4.5\sim 5.5$  V
- High speed operation:  $t_{pd} = 0.25$  ns (max)
- Low on resistance:  $R_{ON} = 5 \Omega$  (typ.)
- ESD performance: Machine model  $> \pm 200$  V  
Human body model  $> \pm 2000$  V
- TTL level input (control input)
- Package: USV

### Pin Assignment (top view)



980910EBA1

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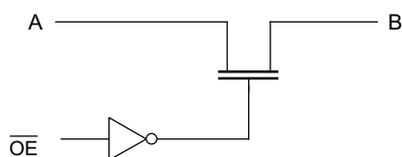
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## Truth Table

Input	Function
$\overline{\text{OE}}$	
L	A port = B port
H	Disconnect

## System Diagram



## Maximum Ratings

Characteristics	Symbol	Rating	Unit
Power supply range	$V_{CC}$	-0.5~7.0	V
DC input voltage	$V_{IN}$	-0.5~7.0	V
DC switch voltage	$V_S$	-0.5~7.0	V
Input diode current	$I_{IK}$	-50	mA
Continuous channel current	$I_S$	128	mA
Power dissipation	$P_D$	200	mW
DC $V_{CC}/GND$ current	$I_{CC}/I_{GND}$	$\pm 100$	mA
Storage temperature	$T_{stg}$	-65~150	$^{\circ}\text{C}$

## Recommended Operating Conditions

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	4.5~5.5	V
Input voltage	$V_{IN}$	0~5.5	V
Switch voltage	$V_S$	0~5.5	V
Operating temperature	$T_{opr}$	-40~85	$^{\circ}\text{C}$
Input rise and fall time	dt/dv	0~10	ns/V

## Electrical Characteristics

### DC Characteristics (Ta = -40~85°C)

Characteristics		Symbol	Test Condition		Min	Typ. (Note1)	Max	Unit
Input voltage	"H" level	V <sub>IH</sub>	—		2.0	—	—	V
	"L" level	V <sub>IL</sub>	—		—	—	0.8	
High-level output voltage		V <sub>OH</sub>	Figure 4		—	—	—	—
Input leakage current		I <sub>IN</sub>	V <sub>IN</sub> = 0~5.5 V		5.5	—	±1.0	μA
Off-state leakage current (switch off)		I <sub>SZ</sub>	A, B = 0~5.5 V, $\overline{OE} = V_{CC}$		5.5	—	±1.0	μA
ON resistance (Note2)	R <sub>ON</sub>	V <sub>IS</sub> = 0 V	I <sub>IS</sub> = 30 mA	4.5	—	5	7	Ω
			I <sub>IS</sub> = 64 mA	4.5	—	5	7	
		V <sub>IS</sub> = 2.4 V, I <sub>IS</sub> = 15 mA		4.5	—	35	50	
Quiescent supply current	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>OUT</sub> = 0	Switch ON	5.5	—	—	1.5	mA
			Switch OFF	5.5	—	—	10	μA
	ΔI <sub>CC</sub>	V <sub>IN</sub> = 3.4 V (one input)		5.5	—	—	2.5	mA

Note1: Typical values are at V<sub>CC</sub> = 5 V and Ta = 25°C.

Note2: Measured by the voltage drop between A and B pins at the indicated current through the switch. On resistance is determined by the lower of the voltages on the two (A or B) pins.

### AC Characteristics (Ta = -40~85°C)

Characteristics		Symbol	Test Condition		Min	Max	Unit
Propagation delay time (bus to bus)	t <sub>pLH</sub>	Figure 1, Figure 2	(Note3)	4.5	—	0.25	ns
	t <sub>pHL</sub>						
Output enable time	t <sub>pZL</sub>	Figure 1, Figure 3		4.5	—	4.5	ns
	t <sub>pZH</sub>						
Output disable time	t <sub>pLZ</sub>	Figure 1, Figure 3		4.5	—	4.5	ns
	t <sub>pHZ</sub>						

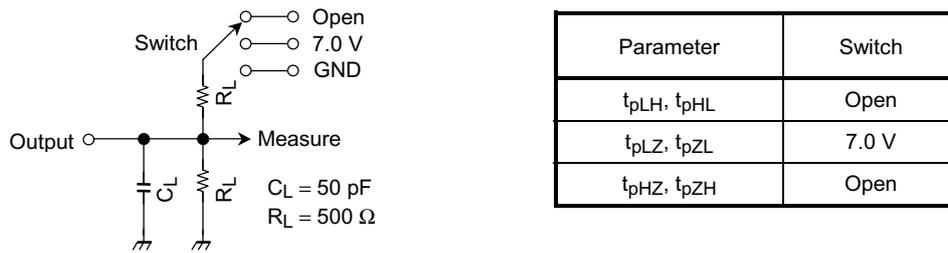
Note3: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical on resistance of the switch and the 50 pF load capacitance, when driven by an ideal voltage the source (zero output impedance).

### Capacitive Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition		Typ.	Unit		
							V <sub>CC</sub> (V)	
Control pin input capacitance		C <sub>IN</sub>	(Note4)		5.0	3	pF	
Switch terminal capacitance		C <sub>I/O</sub>	$\overline{OE} = V_{CC}$		(Note4)	5.0	10	pF

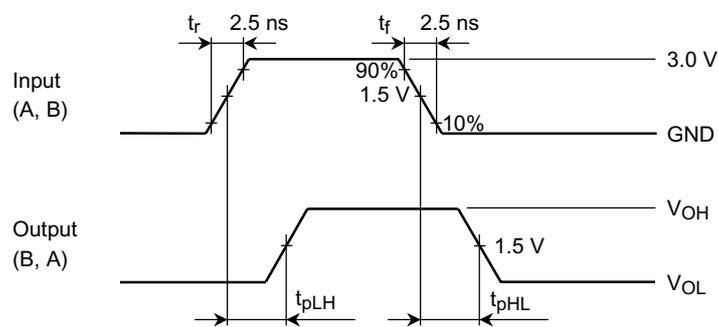
Note4: This item is guaranteed by design.

**AC Test Circuit**

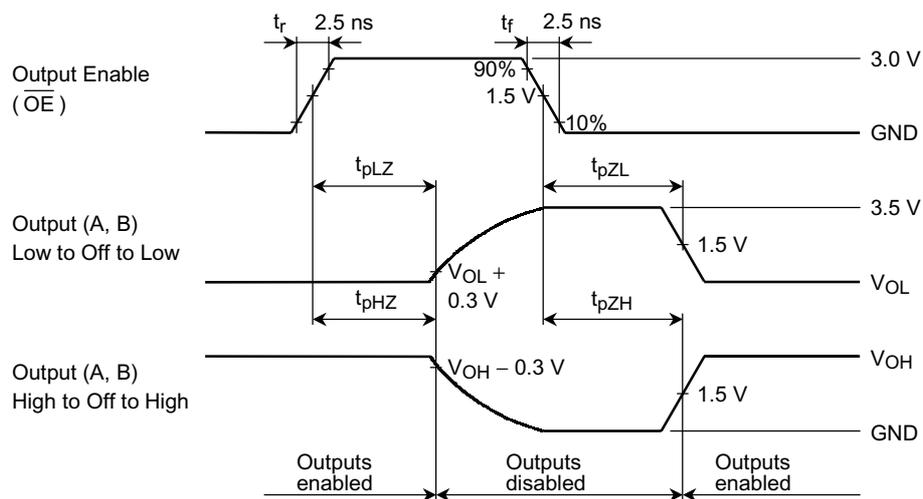


**Figure 1**

**AC Waveform**

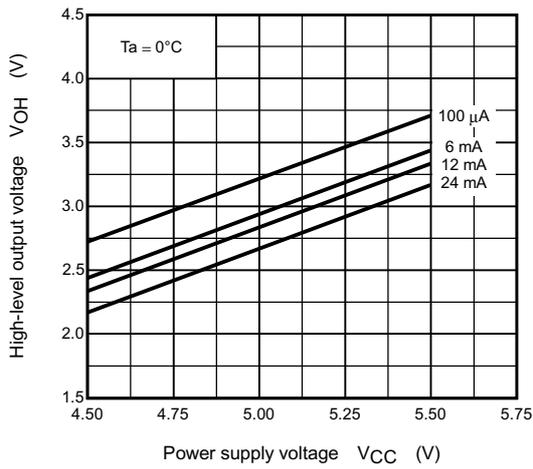
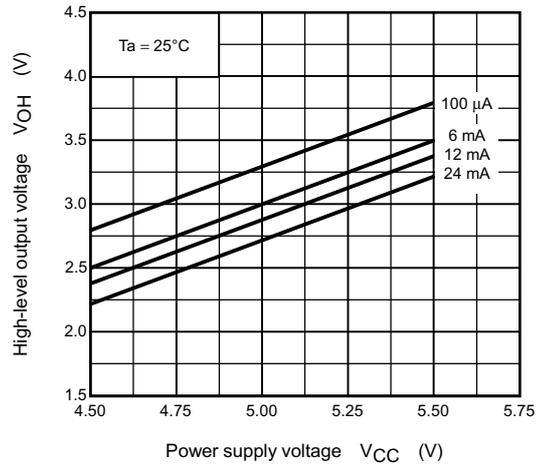
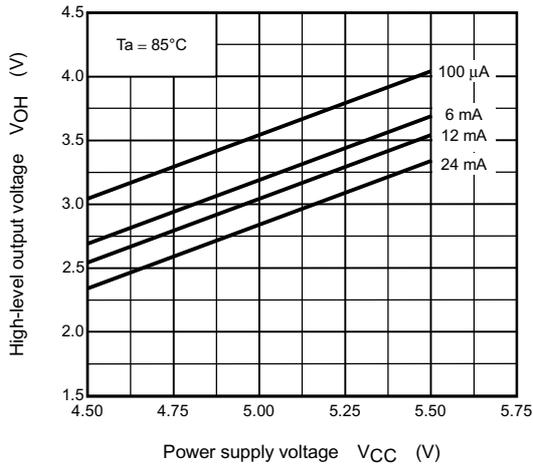


**Figure 2  $t_{pLH}$ ,  $t_{pHL}$**



**Figure 3  $t_{pLZ}$ ,  $t_{pHZ}$ ,  $t_{pZL}$ ,  $t_{pZH}$**

**$V_{OH} - V_{CC}$  Characteristics (typ.)**

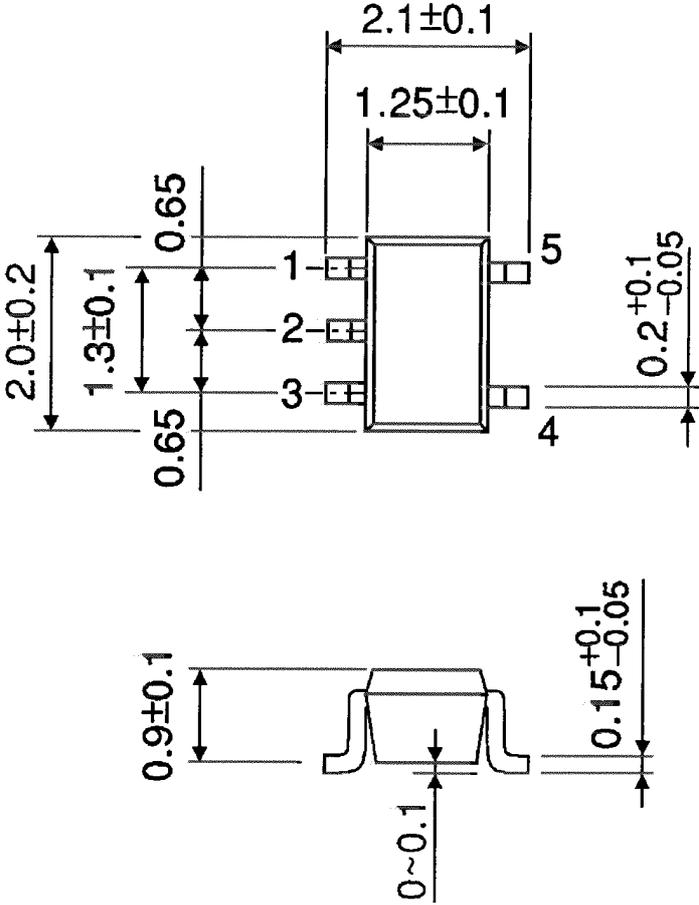


**Figure 4**

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)