

TC7SBL384AFU

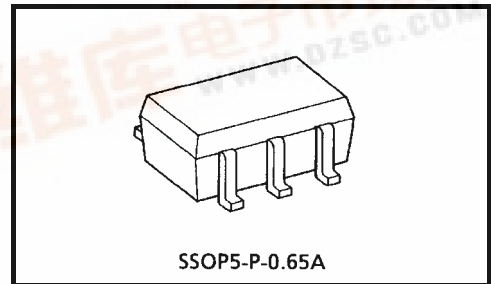
Single Low-Voltage Bus Switch

The TC7SBL384AFU is a low ON-resistance, high-speed CMOS 1-bit bus switch with low-voltage operation. The low ON-resistance of the switch allows connections to be made with minimal propagation delay.

The device comprises a single-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.

P-MOS and N-MOS channel blocks also render the device suitable for analog signal transmission.

All inputs are equipped with protection circuits to guard against static discharge.

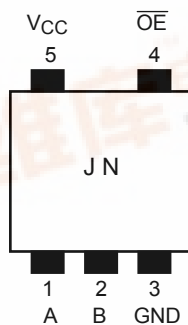


Weight: 0.006 g (typ.)

Features

- Operating voltage: $V_{CC} = 2\sim 3.6\text{ V}$
- High speed operation: $t_{pd} = 0.31\text{ ns (max) @3 V}$
- Low ON-resistance: $R_{ON} = 5\ \Omega\text{ (typ.) @3 V}$
- ESD performance: Machine model $\geq \pm 200\text{ V}$
Human body model $\geq \pm 2000\text{ V}$
- Power-down protection for inputs. (\overline{OE} input only)
- Package: USV

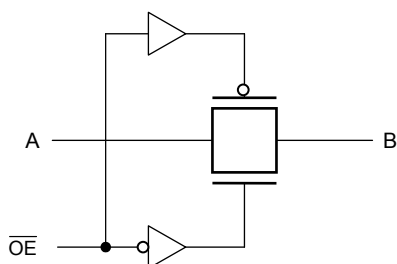
Pin Assignment (top view)



Truth Table

Input	Function
OE	
L	A port = B port
H	Disconnect

System Diagram



Absolute Maximum Ratings (Note)

Characteristic		Symbol	Rating	Unit
Power supply range		V_{CC}	-0.5~4.6	V
Control pin input voltage		V_{IN}	-0.5~4.6	V
Switch terminal I/O voltage		V_S	-0.5~ $V_{CC}+0.5$	V
Clump diode current	Control input pin	I_{IK}	-50	mA
	Switch terminal		±50	
Switch I/O current		I_S	128	mA
Power dissipation		P_D	200	mW
DC V_{CC}/GND current		I_{CC}/I_{GND}	±100	mA
Storage temperature		T_{stg}	-65~150	°C

Note: Exceeding any of the absolute maximum ratings, even briefly, may lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Operating Ranges (Note)

Characteristic	Symbol	Rating	Unit
Power supply voltage	V_{CC}	2.0~3.6	V
Control pin input voltage	V_{IN}	0~3.6	V
Switch I/O voltage	V_S	0~ V_{CC}	V
Operating temperature	T_{opr}	-40~85	°C
Input rise and fall time	dt/dv	0~10	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.

Electrical Characteristics

DC Characteristics (Ta = -40~85°C)

Characteristic		Symbol	Test Condition	V _{CC} (V)	Min	Typ.	Max	Unit
Control pin input voltage	"H" level	V _{IH}	—	2.0~3.6	0.7 × V _{CC}	—	—	V
	"L" level	V _{IL}	—	2.0~3.6	—	—	0.3 × V _{CC}	
Control pin Input leakage current		I _{IN}	V _{IN} = 0 to 3.6 V	2.0~3.6	—	—	±1.0	μA
Power off leakage current		I _{OFF}	$\overline{OE} = 0$ to 3.6 V	0	—	—	±1.0	μA
Off-state leakage current (switch off)		I _{SZ}	A, B = 0 to V _{CC} , $\overline{OE} = V_{CC}$	2.0~3.6	—	—	±1.0	μA
ON resistance (Note 2)	R _{ON}	V _{IS} = 0 V, I _{IS} = 30 mA (Note 1)	3.0	—	3	7	Ω	
		V _{IS} = 3.0 V, I _{IS} = 30 mA (Note 1)	3.0	—	4	9		
		V _{IS} = 2.4 V, I _{IS} = 15 mA (Note 1)	3.0	—	5	15		
		V _{IS} = 0 V, I _{IS} = 24 mA (Note 1)	2.3	—	4	10		
		V _{IS} = 2.3 V, I _{IS} = 24 mA (Note 1)	2.3	—	5	15		
		V _{IS} = 2.0 V, I _{IS} = 15 mA (Note 1)	2.3	—	6	25		
Quiescent supply current		I _{CC}	V _{IN} = V _{CC} or GND, I _{OUT} = 0	3.6	—	—	10	μA

Note 1: The typical values are at Ta = 25°C.

Note 2: 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 pins (A or B).

AC Characteristics (Ta = -40~85°C)

Characteristic	Symbol	Test Condition	V _{CC} (V)	Min	Max	Unit
Propagation delay time (bus to bus)	t _{pLH}	Figure 1, Figure 2 (Note)	3.3±0.3	—	0.31	ns
	t _{pHL}		2.5±0.2	—	0.52	
Output enable time	t _{pZL}	Figure 1, Figure 3	3.3±0.3	—	5	ns
	t _{pZH}		2.5±0.2	—	7	
Output disable time	t _{pLZ}	Figure 1, Figure 3	3.3±0.3	—	6	ns
	t _{pHZ}		2.5±0.2	—	7	

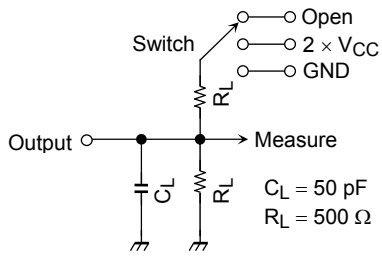
Note: This parameter is guaranteed by design but is not tested. The bus switch contributes no propagation delay other than the RC delay of the typical ON-resistance of the switch and the 50 pF load capacitance when driven by an ideal voltage from the source (zero output impedance).

Capacitive Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	V _{CC} (V)	Typ.	Unit	
Control pin input capacitance	C _{IN}	(Note)	3.3	3	pF	
Switch terminal capacitance	C _{I/O}	$\overline{OE} = V_{CC}$	(Note)	3.3	17	pF

Note: This parameter is guaranteed by design.

AC Test Circuit



Parameter	Switch
t_{pLH} , t_{pHL}	Open
t_{pLZ} , t_{pZL}	$2 \times V_{CC}$
t_{pHZ} , t_{pZH}	GND

Figure 1

AC Waveform

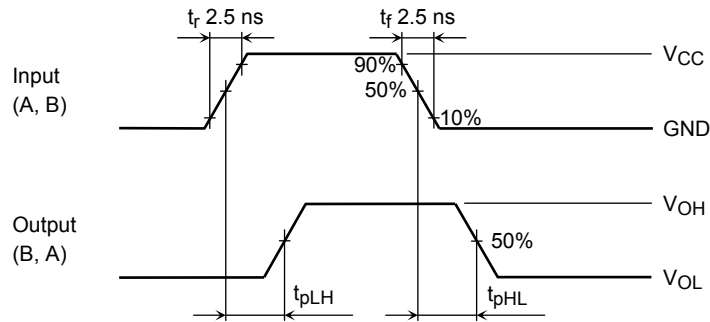


Figure 2 t_{pLH} , t_{pHL}

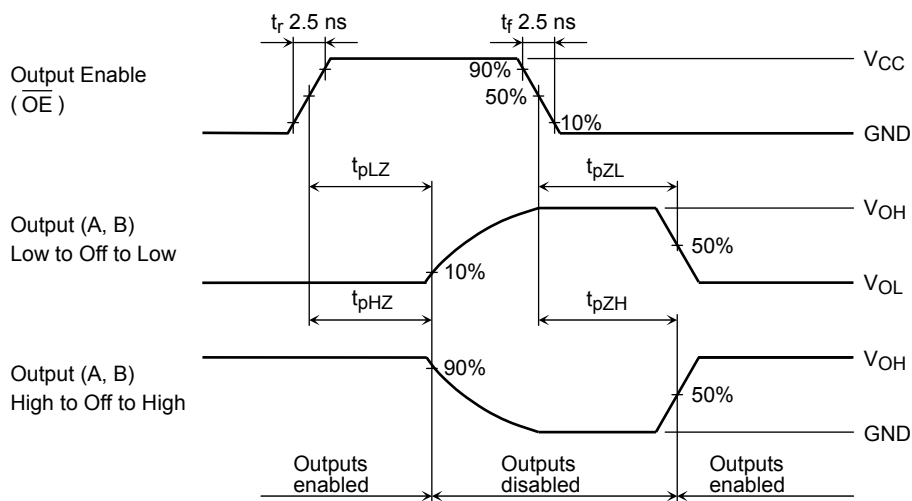
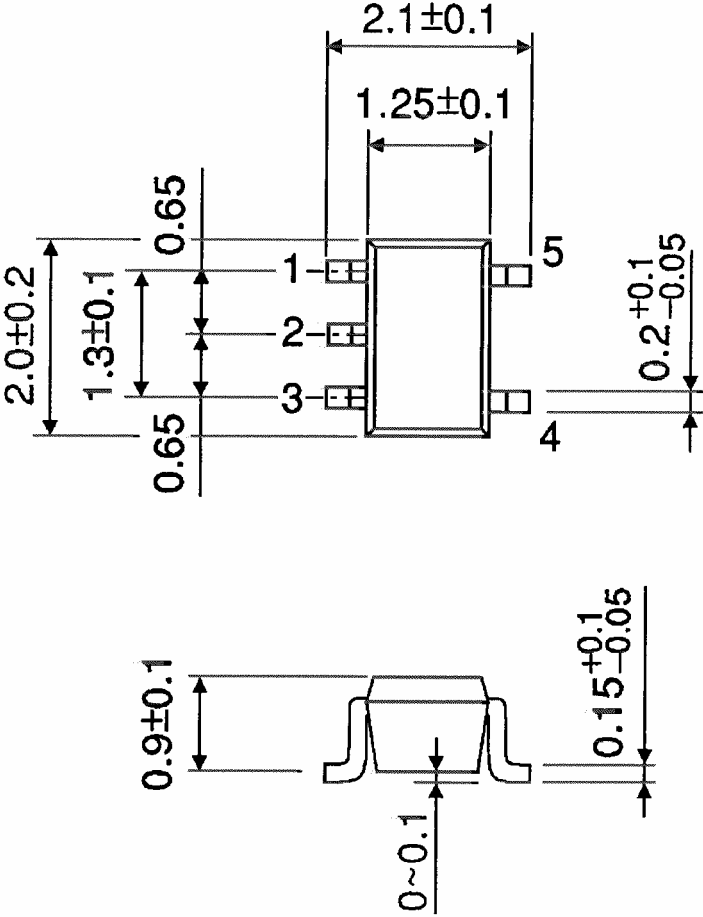


Figure 3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

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