

TC7SBD384AFU

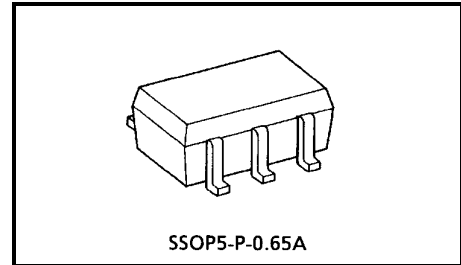
Single Bus Switch with Level Shifting

The TC7SBD384AFU 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 device 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.

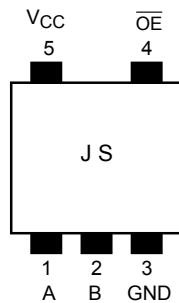


Weight: 0.006 g (typ.)

Features

- Operating voltage: $V_{CC} = 4.5\sim 5.5$ V
- High speed operation: $t_{pd} = 0.32$ ns (max)
- Low on resistance: $R_{ON} = 5 \Omega$ (typ.)
- ESD performance: Machine model $\geq \pm 200$ V
Human body model $\geq \pm 2000$ V
- TTL level input (control input)
- Low Power Dissipation: $I_{cc} = 10 \mu A$ (max.)
- Package: USV

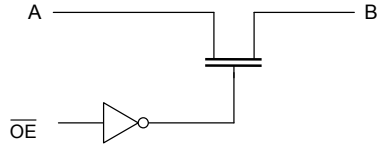
Pin Assignment (top view)



Truth Table

Input	Function
OE	
L	A port = B port
H	Disconnect

System Diagram



Absolute Maximum Ratings (Note)

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}	± 100	mA
Storage temperature	T_{stg}	-65~150	$^{\circ}C$

Note: Exceeding any of the absolute maximum ratings, even briefly, 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)

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	$^{\circ}C$
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)

Characteristics		Symbol	Test Condition	V _{CC} (V)	Min	Typ. (Note 1)	Max	Unit	
Input voltage	"H" level	V _{IH}	—	4.5~5.5	2.0	—	—	V	
	"L" level	V _{IL}	—	4.5~5.5	—	—	0.8		
High-level output voltage (Note 2)	V _{OH}	I _{OH} =-1μA V _{IS} = V _{CC}		4.75	2.3	2.8	3.2	V	
				5.0	2.5	3.0	3.4		
				5.25	2.7	3.2	3.6		
Input leakage current	I _{IN}	V _{IN} = 0~5.5 V		4.5~5.5	—	—	±1.0	μA	
Power off leakage current	I _{OFF}	A, B, \overline{OE} = 0~5.5 V		0	—	—	±1.0	μA	
Off-STATE leakage current (switch off)	I _{SZ}	A, B = 0~5.5 V, \overline{OE} = V _{CC}		4.5~5.5	—	—	±1.0	μA	
ON resistance (Note 3)	R _{ON}	V _{IS} = 0 V		I _{IS} = 64 mA	4.5	—	5	9	Ω
					4.75	—	5	8	
				I _{IS} = 30 mA	4.5	—	5	9	
					4.75	—	5	8	
				V _{IS} = 2.3 V, I _{IS} = 15 mA	4.5	—	35	65	
					4.75	—	35	50	
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND, I _{OUT} = 0		5.5	—	—	10	μA	
Increase in I _{CC} per input	ΔI _{CC}	V _{IN} = 3.4 V (one input)		5.5	—	—	2.5	mA	

Note 1: Typical values are at V_{CC} = 5 V, Ta = 25°C.

Note 2: It recommends that this device uses Pull-up resistance when adding and using resistance for an output terminal. Since it causes to drop a V_{OH} voltage level when using Pull-down resistance for an output terminal.

Note 3: 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	V _{CC} (V)	Min	Max	Unit
Propagation delay time (bus to bus)	t _{pLH} t _{pHL}	Figure 1, Figure 2 (Note)	4.5	—	0.32	ns
Output enable time	t _{pZL} t _{pZH}	Figure 1, Figure 3	4.5	—	4.5	ns
Output disable time	t _{pLZ} t _{pHZ}	Figure 1, Figure 3	4.5	—	4.5	ns

Note: The propagation delay time is calculated by the RC (on-resistance and load capacitance) time constant.

Capacitive Characteristics (Ta = 25°C)

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

Note: This parameter is guaranteed by design.

AC Test Circuit

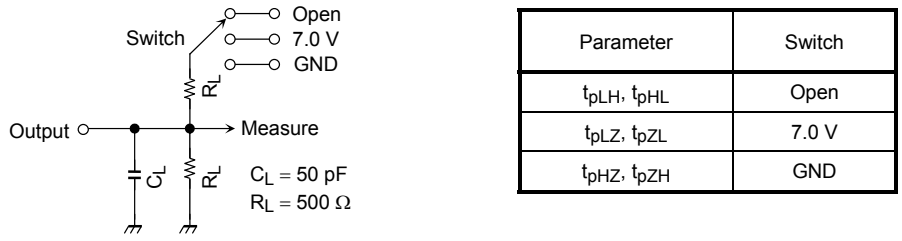


Figure 1

AC Waveform

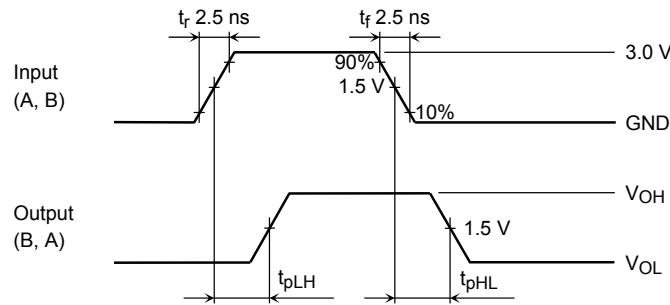


Figure 2 t_{pLH} , t_{pHL}

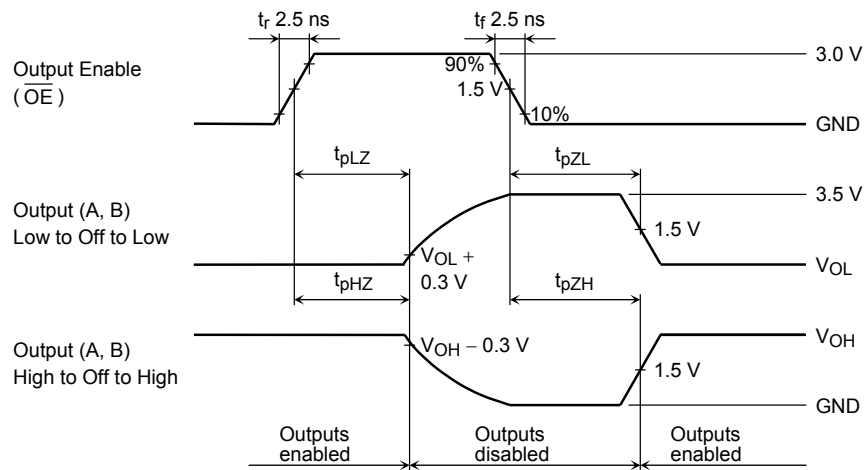


Figure 3 t_{pLZ} , t_{pHZ} , t_{pZL} , t_{pZH}

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

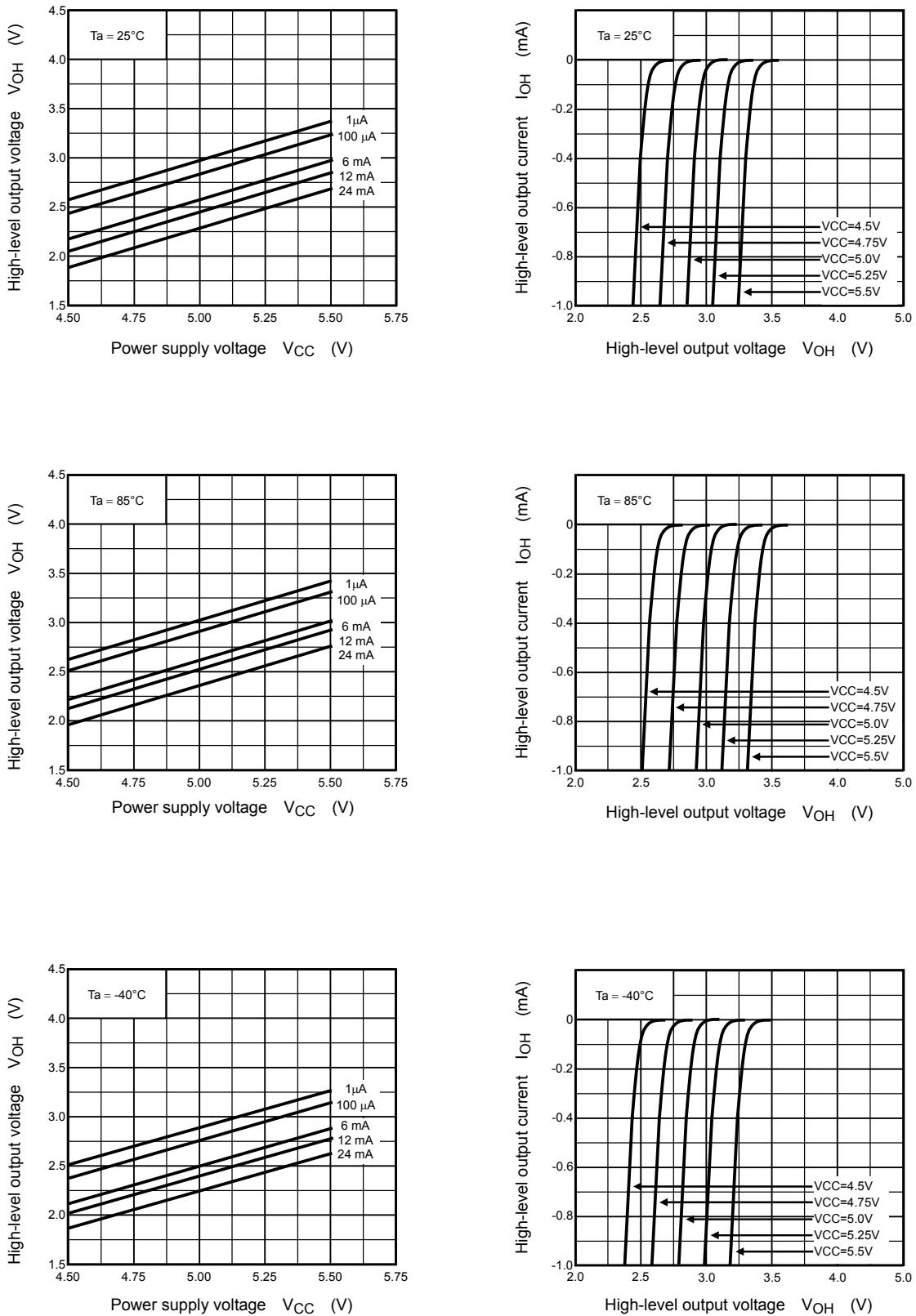
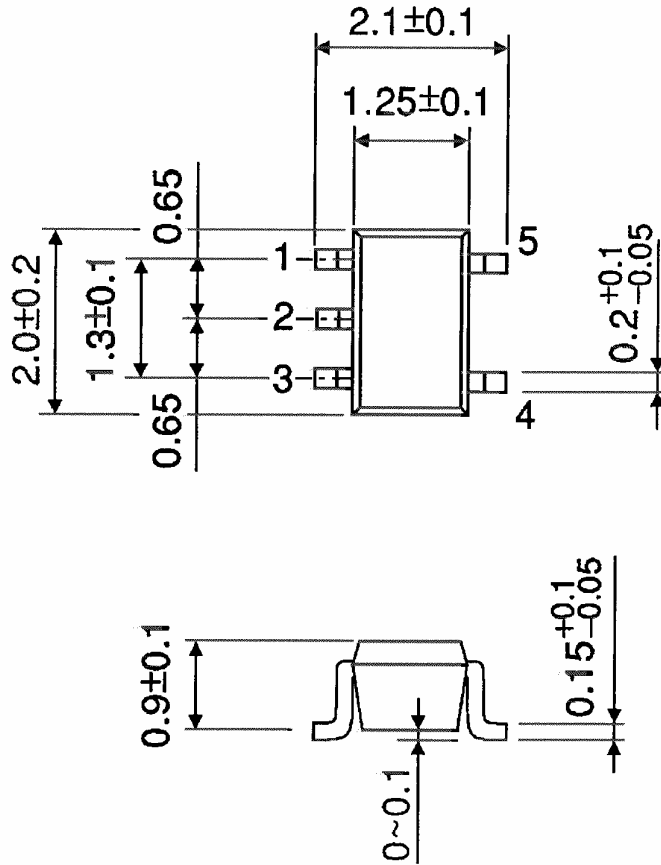


Figure 4

Package Dimensions

SSOP5-P-0.65A

Unit : mm



Weight: 0.006 g (typ.)

RESTRICTIONS ON PRODUCT USE

20070701-EN GENERAL

- The information contained herein is subject to change without notice.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc.
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document shall not be used or embedded to any downstream products of which manufacture, use and/or sale are prohibited under any applicable laws and regulations.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA for any infringements of patents or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any patents or other rights of TOSHIBA or the third parties.
- Please contact your sales representative for product-by-product details in this document regarding RoHS compatibility. Please use these products in this document in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances. Toshiba assumes no liability for damage or losses occurring as a result of noncompliance with applicable laws and regulations.