TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7SBD385AFU

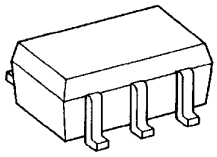
Single Bus Switch with Level Shifting

The TC7SBD385AFU 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 (OE) input. When OE is high, the switch is on and data can flow from port A to port B, or vice versa. When OE is low, 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.



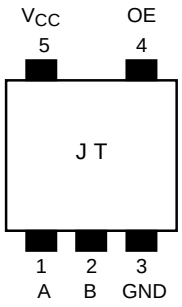
SSOP5-P-0.65A

Weight: 0.006 g (typ.)

Features

- Operating voltage: V_{CC} = 4.5~5.5 V
- High speed operation: t_{pd} = 0.32 ns (max)
- Low on resistance: R_{ON} = 5 Ω (typ.)
- ESD performance: Machine model > ±200 V
  Human body model > ±2000 V
- TTL level input (control input)
- Low Power Dissipation: Icc = 10 μA (max.)
- Package: USV

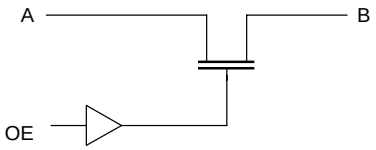
Pin Assignment (top view)



Truth Table

Input OE	Function
L	Disconnect
H	A port = B port

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	°C

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

Recommended Operating Conditions (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	°C
Input rise and fall time	dt/dv	0~10	ns/V

Note: The recommended operating conditions are required to ensure the normal operation of the device. Unused inputs must be tied to either VCC or GND.

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}	IOH=-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, OE= 0~5.5 V		0	—	—	±1.0	μA
Off-STATE leakage current (switch off)		I_{SZ}	A, B = 0~5.5 V, OE = GND		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		ICC	VIN = VCC 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 couses to drop a VOH 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)	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	—	5.0	ns

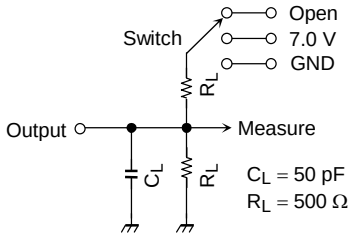
Note 4: The propagation delay time is calculated by the RC (on-resistance and load capacitance) time constant.

Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition		V_{CC} (V)	Typ.	Unit
Control pin input capacitance	C_{IN}		(Note 5)	5.0	3	pF
Switch terminal capacitance	$C_{I/O}$	OE = GND	(Note 5)	5.0	10	pF

Note 5: This parameter is guaranteed by design.

AC Test Circuit



Parameter	Switch
t_{pLH}, t_{pHL}	Open
t_{pLZ}, t_{pZL}	7.0 V
t_{pHZ}, t_{pZH}	GND

Figure 1

AC Waveform

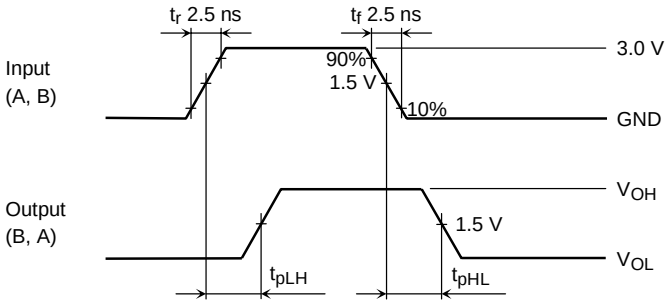


Figure 2 t_{pLH}, t_{pHL}

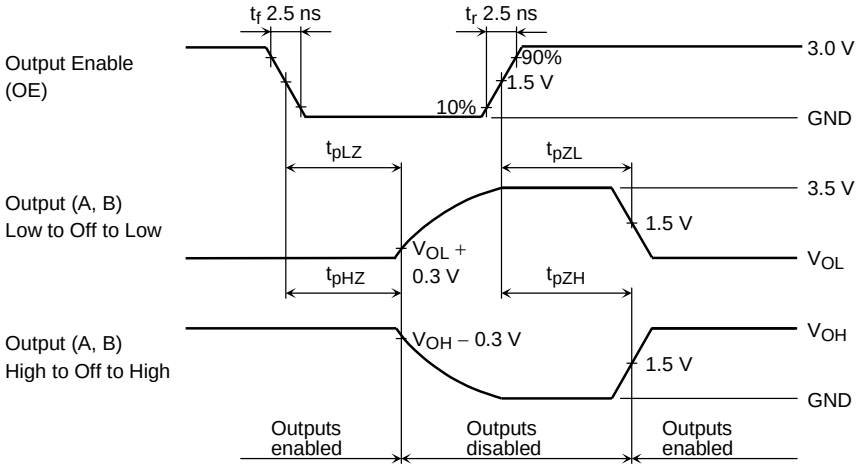
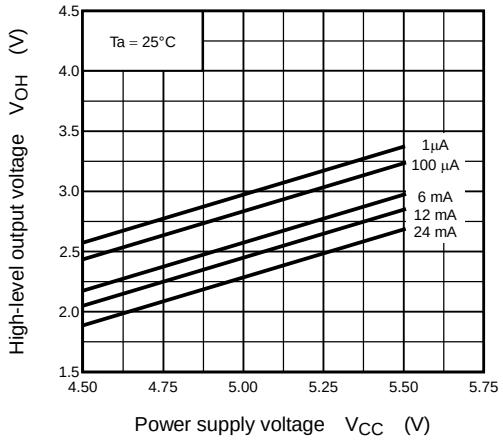
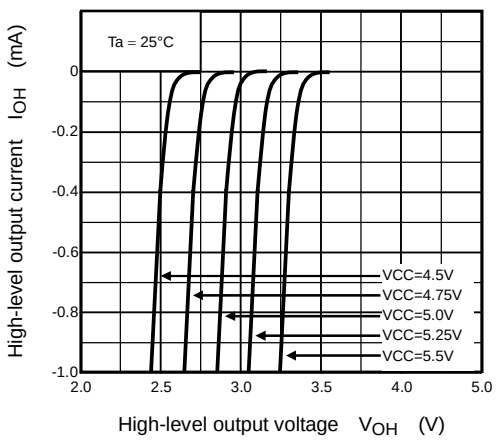
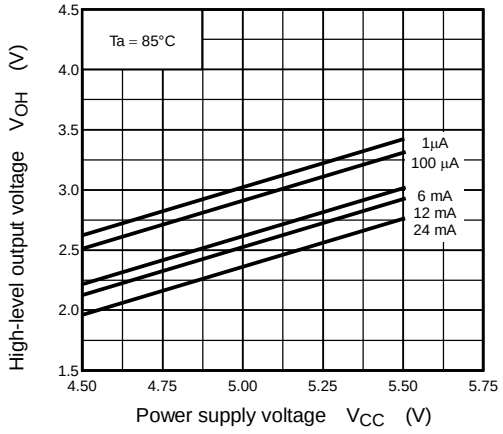


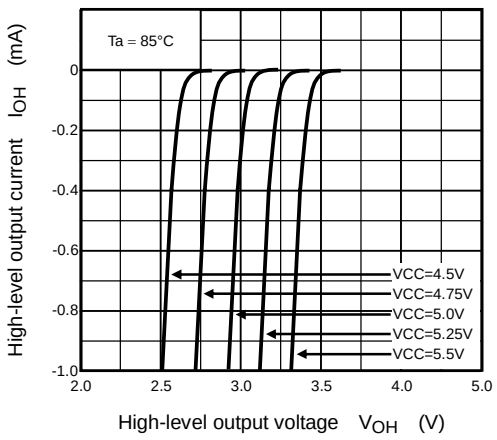
Figure 3 t_{pLZ}, t_{pHZ}, t_{pZL}, t_{pZH}

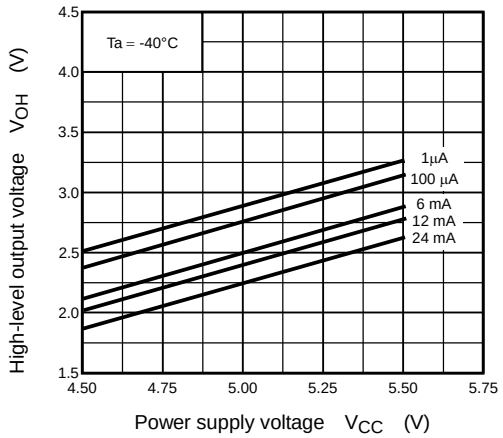
V_{OH} – V_{CC} Characteristics (typ.)











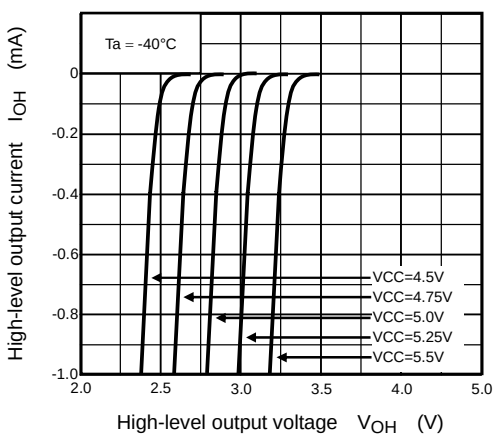
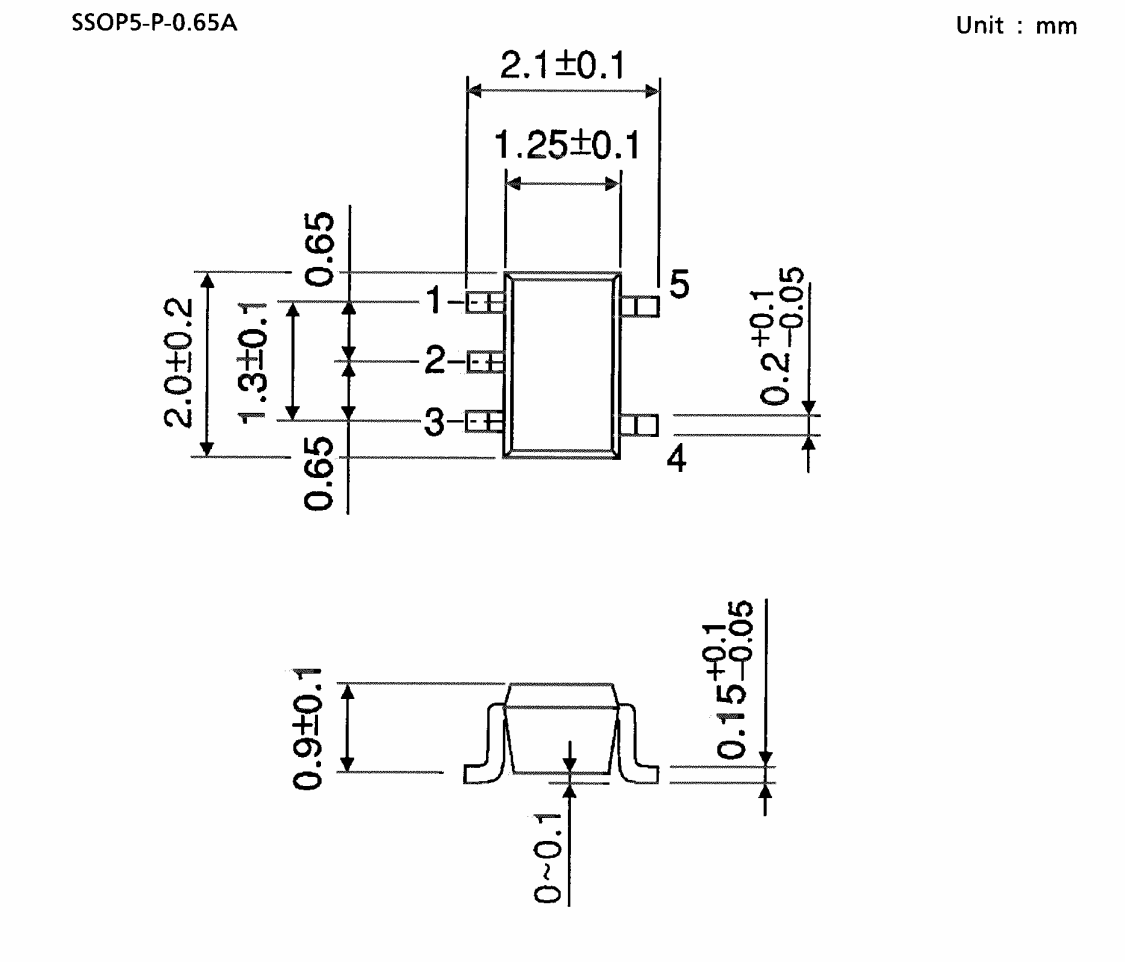


Figure 4

Package Dimensions

SSOP5-P-0.65A Unit : mm



Weight: 0.006 g (typ.)

RESTRICTIONS ON PRODUCT USE

060116EBA

- The information contained herein is subject to change without notice. 021023_D
- 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. 021023_A
- 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. 021023_B
- 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. 060106_Q
- 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 patent or patent rights of TOSHIBA or others. 021023_C
- The products described in this document are subject to the foreign exchange and foreign trade laws. 021023_E