

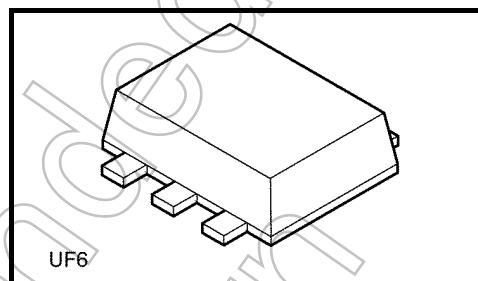
# TC7PB53TU

## Single 1-of-2 Demultiplexer with N-channel pull-down MOSFET

The TC7PB53TU is a single 1-of-2 high-speed CMOS demultiplexer designed for low-voltage applications. The low ON-resistance of the switch allows the input (COM) to be connected to the outputs (Ch0 and Ch1) while maintaining CMOS low power dissipation. The device uses P-channel MOSFETs for the switch block between the input and output pins.

When the control input (A) is Low, the data (High-level) in the COM pin is routed to the Ch0 pin. When the control input (A) is High, the data (High-level) in the COM pin is routed to the Ch1 pin. The unused pin is clamped to ground using an N-channel MOSFET.

All inputs are equipped with protection circuits against static discharge.

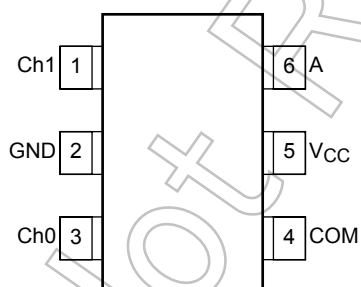


Weight: 0.007g (typ.)

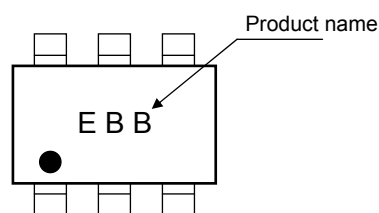
### Features

- Operating voltage range :  $V_{CC} = 2$  to  $3.6$  V
- High-speed operation :  $t_{pd} = 50$  ns (max) @  $2.7$  V
- Very low ON-resistance :  $R_{ON} = 3\Omega$  (max) @  $2.7$  V
- High latch-up immunity :  $\pm 300$  mA
- ESD performance : Machine model  $\geq \pm 200$  V  
Human body model  $\geq \pm 2000$  V
- Package : UF6

### Pin Assignment (top view)



### Marking

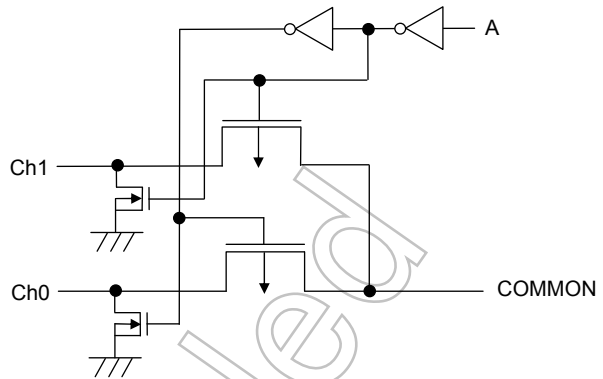


Start of commercial production  
2004-05

## Truth Table

Input	Function	
A	Ch0	Ch1
L	COM	L
H	L	COM

## Logic Diagram



## Absolute Maximum Ratings (Note 1)

Characteristics	Symbol	Rating	Unit
Power supply voltage	$V_{CC}$	-0.5 to 4.6	V
DC input voltage (A)	$V_{IN}$	-0.5 to 4.6	V
DC switch voltage (COM and Ch)	$V_S$	-0.5 to $V_{CC} + 0.5$	V
Input diode current (A)	$I_{IK}$	-25	mA
Output diode current (COM and Ch)		$\pm 25$	mA
Switch I/O current (COM to Ch)	$I_S$	128	mA
N-channel MOSFET current (Note 2)	$I_{OUT}$	25	mA
Power dissipation	$P_D$	200	mW
DC $V_{CC}$ /ground current	$I_{CC}/I_{GND}$	$\pm 50$	mA
Storage temperature	$T_{stg}$	-65 to 150	$^{\circ}\text{C}$

Note 1: 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.).

Note 2: N-channel MOSFET allowable current to clamp the unused pin to ground.

## Operating Ranges (Note)

Characteristics	Symbol	Value	Unit
Power supply voltage	$V_{CC}$	2.0 to 3.6	V
Input voltage (A)	$V_{IN}$	0 to 3.6	V
DC switch voltage (COM and Ch)	$V_S$	0 to $V_{CC} + 0.3$	V
Operating temperature	$T_{opr}$	-40 to 85	$^{\circ}\text{C}$
Input rise and fall time	$d_t/d_v$	0 to 10	ns/V

Note: The operating ranges must be maintained to ensure the normal operation of the device.  
Unused inputs must be tied to either  $V_{CC}$  or GND.

## Electrical Characteristics

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

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Typ.	Max	Unit
High-level input voltage	V <sub>IH</sub>	—	2.0 to 3.6	$0.7 \times V_{CC}$	—	—	V
Low-level input voltage	V <sub>IL</sub>	—	2.0 to 3.6	—	—	$0.3 \times V_{CC}$	
Input leakage current (A)	I <sub>IN</sub>	A = 0 to 3.6 V	2.0 to 3.6	—	—	±1.0	μA
Off-state leakage current	I <sub>IZ</sub>	COM, Ch = 0 to V <sub>CC</sub>	2.0 to 3.6	—	—	±1.0	μA
Output diode current (COM and Ch) (Note 1)	I <sub>IK</sub>	COM, Ch = V <sub>CC</sub> to V <sub>CC</sub> + 0.3 V	2.0 to 3.6	—	—	100	μA
Switch ON resistance (Note 2)	R <sub>ON</sub>	V <sub>IS</sub> = 3.0 V, I <sub>IS</sub> = 3 mA	3.0	—	1.6	3	Ω
		V <sub>IS</sub> = 2.7 V, I <sub>IS</sub> = 3 mA	2.7	—	1.7	3	
		V <sub>IS</sub> = 2.3 V, I <sub>IS</sub> = 3 mA	2.3	—	2.1	5	
		V <sub>IS</sub> = 3.0 V, I <sub>IS</sub> = 30 mA	3.0	—	1.6	3	
		V <sub>IS</sub> = 2.7 V, I <sub>IS</sub> = 30 mA	2.7	—	1.7	3	
		V <sub>IS</sub> = 2.3 V, I <sub>IS</sub> = 30 mA	2.3	—	2.1	5	
N-ch MOSFET ON resistance	R <sub>ON</sub> (Nch)	I <sub>OL</sub> = 5 mA, V <sub>IN</sub> = 0 V	2.7	—	—	50	Ω
		I <sub>OL</sub> = 4 mA, V <sub>IN</sub> = 0 V	2.3	—	—	75	
Increase in I <sub>CC</sub> per Input	I <sub>CC</sub>	V <sub>IN</sub> = V <sub>CC</sub> or GND	3.6	—	—	10	μA

Note 1: Output diode current at the COM pin measured with the Ch pin open.  
Output diode current at the Ch pin measured with the COM pin open.

Note 2: Measured by the voltage drop between the COM and Ch pins at the indicated current through the switch.  
On resistance is determined by the lower of the voltages on the two (COM or Ch) pins.

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

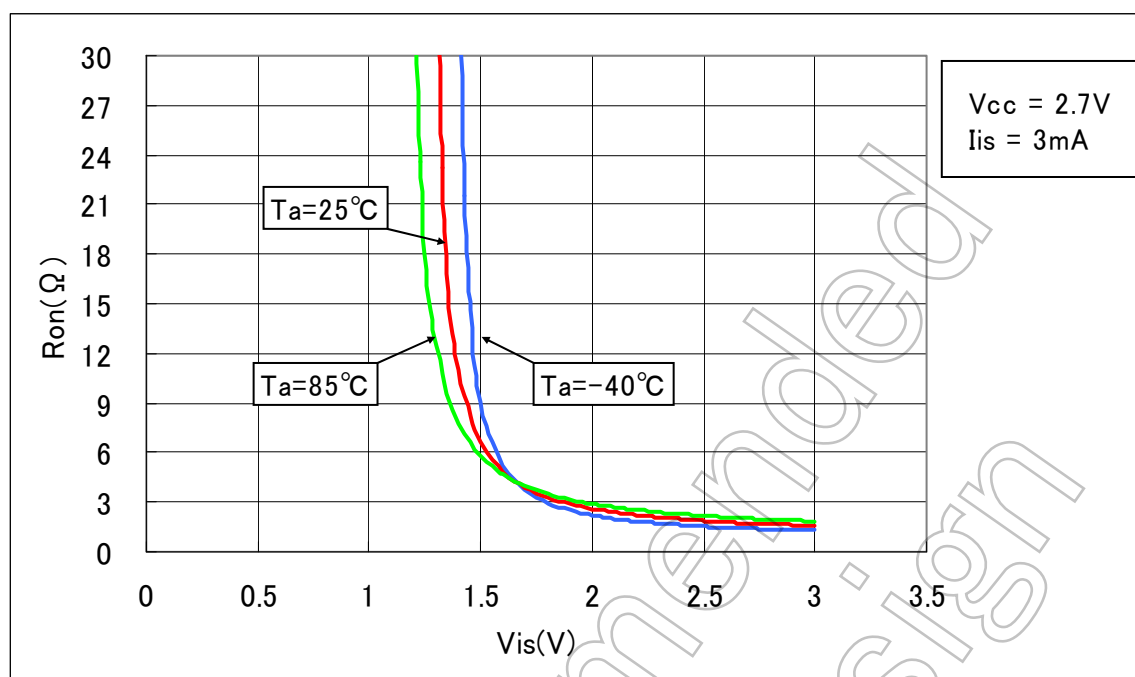
Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Min	Max	Unit
Propagation delay time (A to Ch)	t <sub>pLH</sub>	(Figures 1 and 2)	3.0 ± 0.3	—	50	ns
	t <sub>pHL</sub>		2.5 ± 0.2	—	65	

## Capacitive Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Typ.	Unit
Control input capacitance (A)	C <sub>IN</sub>	(Note)	3.0	5	pF
COM-Ch I/O capacitance	C <sub>I/O</sub>	(Note)	3.0	50	pF

Note: Capacitance quoted is not tested.

**$R_{ON}$ - $V_{IN}$  Characteristic Curves**  $V_{CC} = 2.7\text{ V}$ ,  $I_{IS} = 3\text{ mA}$ ,  $T_a = -40/25/85^\circ\text{C}$



AC Test Circuit

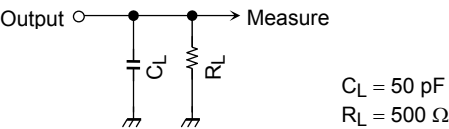


Figure 1

AC Waveforms

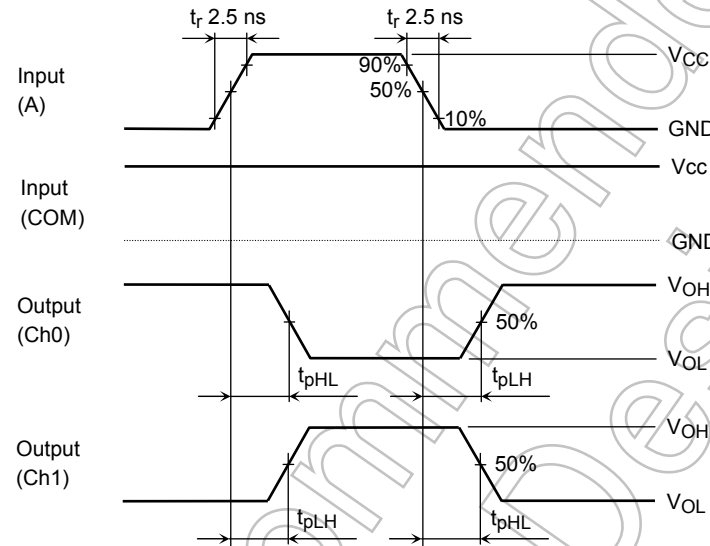
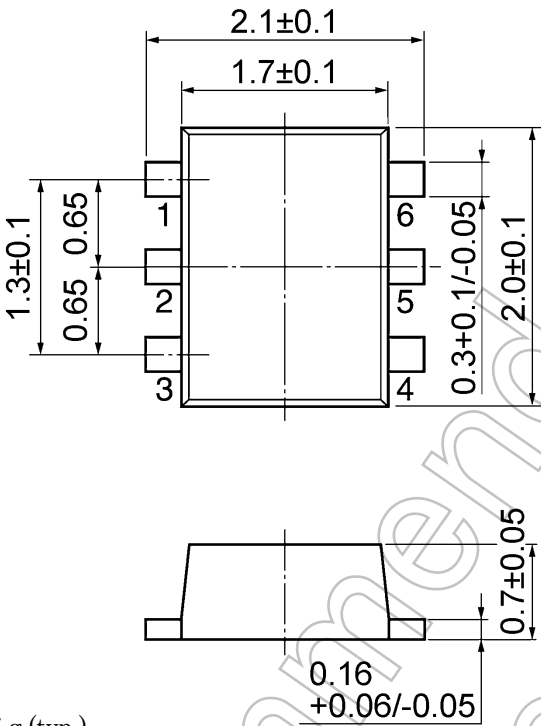


Figure 2  $t_{pLH}$   $t_{pHL}$

Package Dimensions

UF6

Unit:mm



Weight: 0.007 g (typ.)

Not Recommended for New Design

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