

TC7MH157FK

Quad 2-Channel Multiplexer

The TC7MH157FK is an advanced high speed CMOS quad 2-channel multiplexer fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent bipolar schottky TTL while maintaining the CMOS low power dissipation.

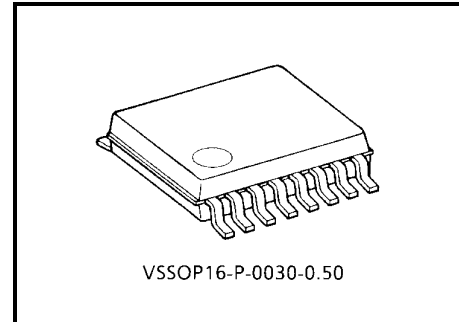
It consists of four 2-input digital multiplexers with common select and strobe inputs.

When the strobe input (\overline{ST}) is held "H" level, selection of data is inhibited and all the outputs become "L" level.

The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs.

An Input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage.

This device can be used to interface 5 V to 3 V systems and on two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

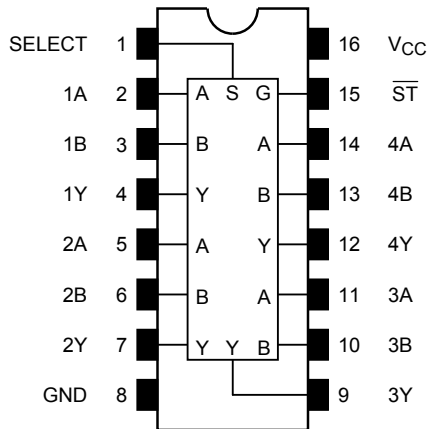


Weight: 0.02 g (typ.)

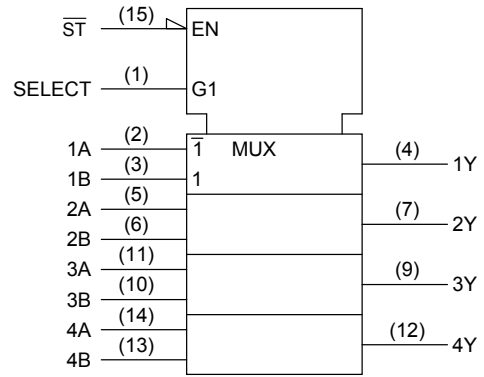
Features

- High speed: $t_{pd} = 4.1$ ns (typ.) ($V_{CC} = 5$ V)
- Low power dissipation: $I_{CC} = 4$ μ A (max) ($T_a = 25^\circ$ C)
- High noise immunity: $V_{NIH} = V_{NIL} = 28\%$ V_{CC} (min)
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC(opr)} = 2\sim 5.5$ V
- Low noise: $V_{OLP} = 0.8$ V (max)
- Pin and function compatible with 74ALS157

Pin Assignment (top view)



IEC Logic Symbol

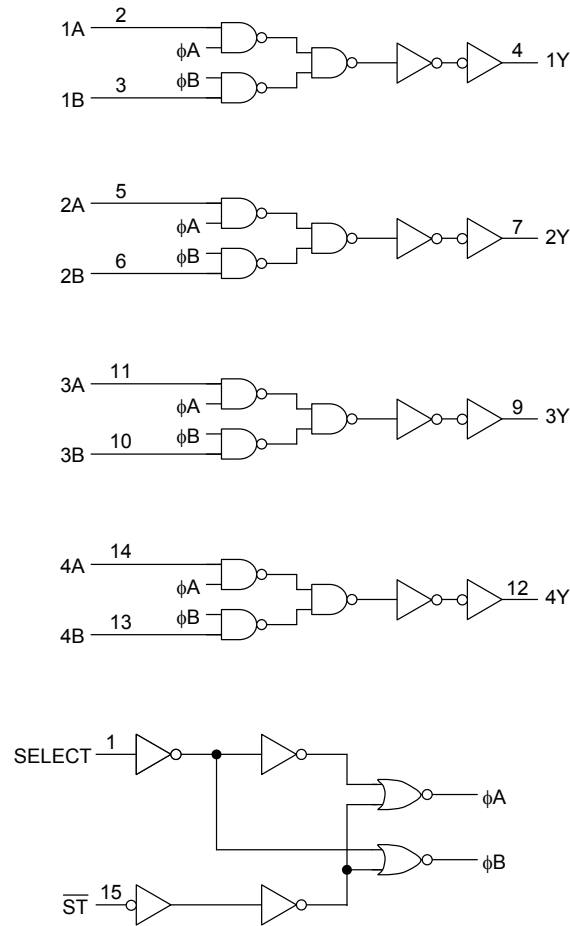


Truth Table

Inputs				Outputs
\overline{ST}	Select	A	B	
H	X	X	X	L
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

X: Don't care

System Diagram



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5~7.0	V
DC input voltage	V_{IN}	-0.5~7.0	V
DC output voltage	V_{OUT}	-0.5~ $V_{CC} + 0.5$	V
Input diode current	I_{IK}	-20	mA
Output diode current	I_{OK}	±20	mA
DC output current	I_{OUT}	±25	mA
DC V_{CC} /ground current	I_{CC}	±50	mA
Power dissipation	P_D	180	mW
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.

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}	2.0~5.5	V
Input voltage	V_{IN}	0~5.5	V
Output voltage	V_{OUT}	0~ V_{CC}	V
Operating temperature	T_{opr}	-40~85	°C
Input rise and fall time	dt/dv	0~100 ($V_{CC} = 3.3 \pm 0.3$ V)	ns/V
		0~20 ($V_{CC} = 5 \pm 0.5$ 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 Characteristics

Characteristics		Symbol	Test Condition	$T_a = 25^\circ\text{C}$				$T_a = -40\sim 85^\circ\text{C}$		Unit	
				V_{CC} (V)	Min	Typ.	Max	Min	Max		
Input voltage	High level	V_{IH}	—	2.0	1.50	—	—	1.50	—	V	
				3.0~5.5	$V_{CC} \times 0.7$	—	—	$V_{CC} \times 0.7$	—		
	Low level	V_{IL}		2.0	—	—	0.50	—	0.50		
				3.0~5.5	—	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$		
Output voltage	High level	V_{OH}	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -50 \mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
					3.0	2.9	3.0	—	2.9	—	
					4.5	4.4	4.5	—	4.4	—	
				$I_{OH} = -4 \text{ mA}$	3.0	2.58	—	—	2.48	—	
					4.5	3.94	—	—	3.80	—	
					—	—	—	—	—	—	
	Low level	V_{OL}		$I_{OL} = 50 \mu\text{A}$	2.0	—	0	0.1	—	0.1	
					3.0	—	0	0.1	—	0.1	
					4.5	—	0	0.1	—	0.1	
					$I_{OL} = 4 \text{ mA}$	3.0	—	—	0.36	—	
4.5	—	—	0.36	—		0.44					
Input leakage current		I_{IN}	$V_{IN} = 5.5 \text{ V or GND}$	0~5.5	—	—	± 0.1	—	± 1.0	μA	
Quiescent supply current		I_{CC}	$V_{IN} = V_{CC} \text{ or GND}$	5.5	—	—	4.0	—	40.0	μA	

AC Characteristics (Input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40~85°C		Unit		
			VCC (V)	CL (pF)	Min	Typ.	Max		Min	Max
Propagation delay time (A, B-Y)	t_{pLH} t_{pHL}	—	3.3 ± 0.3	15	—	6.2	9.7	1.0	11.5	ns
				50	—	8.7	13.2	1.0	15.0	
			5.0 ± 0.5	15	—	4.1	6.4	1.0	7.5	
				50	—	5.6	8.4	1.0	9.5	
Propagation delay time (SELECT-Y)	t_{pLH} t_{pHL}	—	3.3 ± 0.3	15	—	8.4	13.2	1.0	15.5	ns
				50	—	10.9	16.7	1.0	19.0	
			5.0 ± 0.5	15	—	5.3	8.1	1.0	9.5	
				50	—	6.8	10.1	1.0	11.5	
Propagation delay time (\overline{ST} -Y)	t_{pLH} t_{pHL}	—	3.3 ± 0.3	15	—	8.7	13.6	1.0	16.0	ns
				50	—	11.2	17.1	1.0	19.5	
			5.0 ± 0.5	15	—	5.6	8.6	1.0	10.0	
				50	—	7.1	10.6	1.0	12.0	
Input capacitance	C_{IN}	—	—	4	10	—	10	pF		
Power dissipation capacitance	C_{PD}	(Note)	—	20	—	—	—	pF		

Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

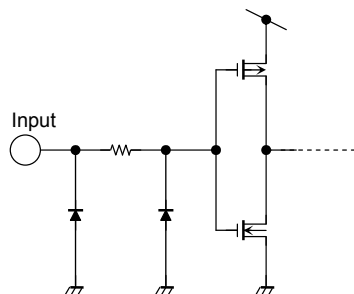
Average operating current can be obtained by the equation:

$$I_{CC (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per bit)}$$

Noise Characteristics (Input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			VCC (V)	Typ.	Limit	
Quiet output maximum dynamic V_{OL}	V_{OLP}	$C_L = 50$ pF	5.0	0.3	0.8	V
Quiet output minimum dynamic V_{OL}	V_{OLV}	$C_L = 50$ pF	5.0	-0.3	-0.8	V
Minimum high level dynamic input voltage V_{IH}	V_{IHD}	$C_L = 50$ pF	5.0	—	3.5	V
Maximum low level dynamic input voltage V_{IL}	V_{ILD}	$C_L = 50$ pF	5.0	—	1.5	V

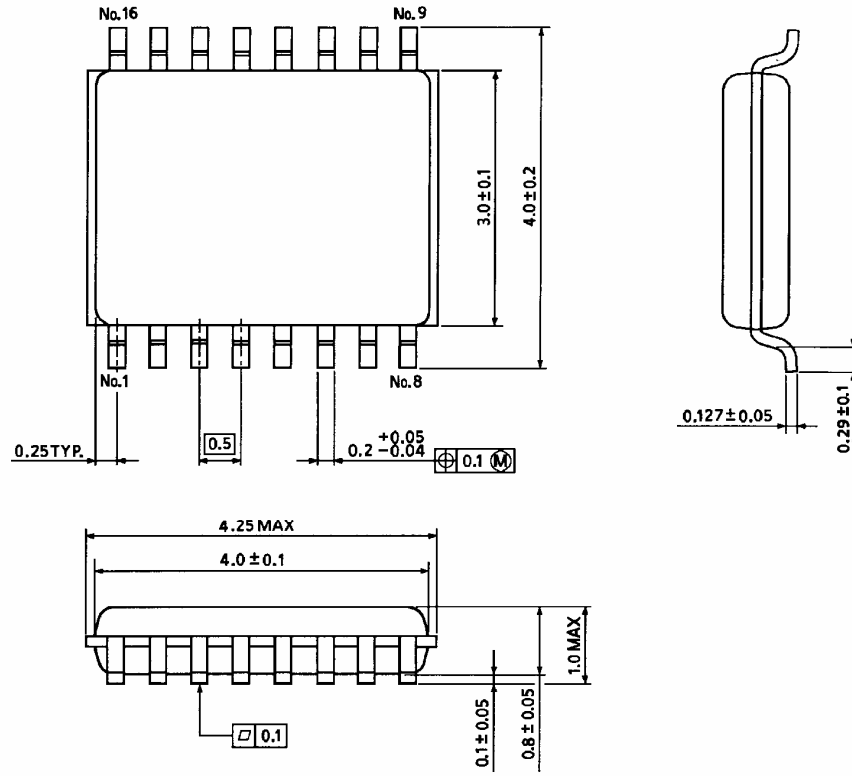
Input Equivalent Circuit



Package Dimensions

VSSOP16-P-0030-0.50

Unit : mm



Weight: 0.02 g (typ.)

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20070701-EN GENERAL

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