

TC7MH257FK

Quad 2-Channel Multiplexer (3-State)

The TC7MH257FK is an advanced high speed CMOS multiplexer fabricated with silicon gate C²MOS technology.

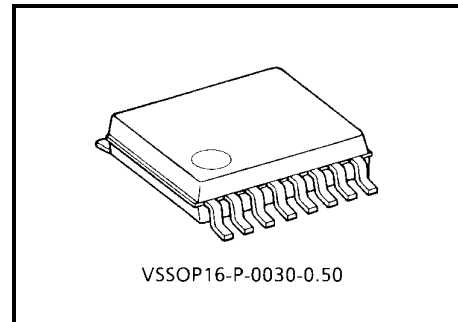
It achieves the high speed operation similar to equivalent bipolar schottky TTL while maintaining the CMOS low power dissipation.

It is composed of four independent 2-channel multiplexers with common SELECT and $\overline{\text{OUTPUTENABLE}}$ ($\overline{\text{OE}}$).

If $\overline{\text{OE}}$ is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled.

Conversely, when SELECT is high, "B" data inputs are enabled.

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 two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

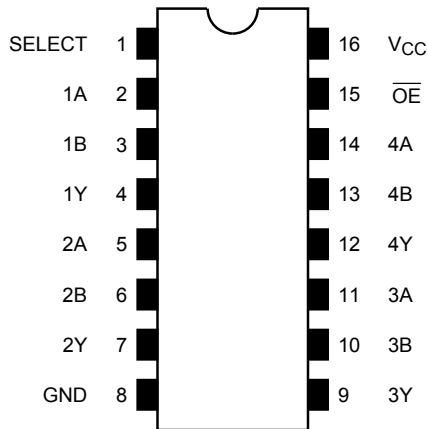


Weight: 0.02 g (typ.)

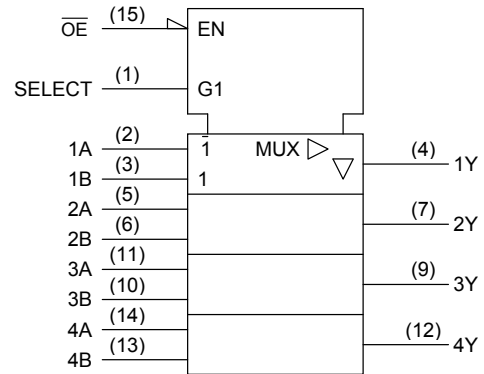
Features

- High speed: $t_{pd} = 3.6$ ns (typ.) ($V_{CC} = 5$ V)
- Low power dissipation: $I_{CC} = 4$ μ A (max) ($T_a = 25^\circ\text{C}$)
- 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: $V_{CC(\text{opr})} = 2\sim 5.5$ V
- Low noise: $V_{OLP} = 0.8$ V (max)
- Pin and function compatible with 74ALS257

Pin Assignment (top view)



IEC Logic Symbol



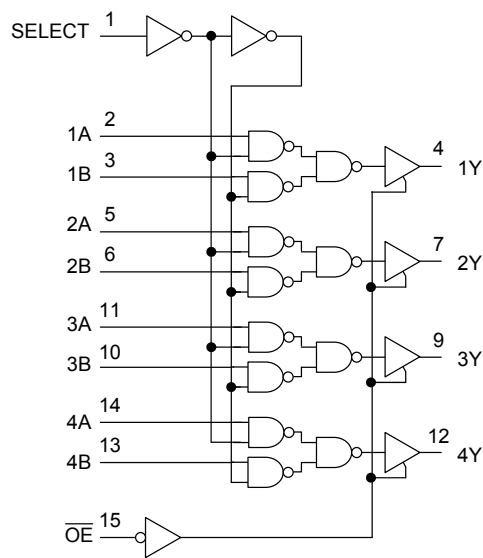
Truth Table

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

X: Don't care

Z: High impedance

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 ± 0.3 V)	ns/V
		0~20 (V _{CC} = 5 ± 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	Ta = 25°C			Ta = -40~85°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} × 0.7	—	—	V _{CC} × 0.7		—	
	Low level	V _{IL}	—	2.0	—	—	0.50	—		0.50	
				3.0~5.5	—	—	V _{CC} × 0.3	—		V _{CC} × 0.3	
Output voltage	High level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 μA	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 mA	3.0	2.58	—	—	2.48		—
					4.5	3.94	—	—	3.80		—
					—	—	—	—	—		—
	Low level	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50 μA	2.0	—	0	0.1	—		0.1
					3.0	—	0	0.1	—		0.1
				I _{OL} = 4 mA	3.0	—	—	0.36	—		0.44
					4.5	—	—	0.36	—		0.44
3-state output off-state current		I _{OZ}	V _{IN} = V _{IH} or V _{IL} V _{OUT} = V _{CC} or GND	5.5	—	—	±0.25	—	±2.50	μA	
Input leakage current		I _{IN}	V _{IN} = 5.5 V or GND	0~5.5	—	—	±0.1	—	±1.0	μA	
Quiescent supply current		I _{CC}	V _{IN} = V _{CC} 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	—	5.8	9.3	1.0	11.0	ns
				50	—	8.3	12.8	1.0	14.5	
			5.0 ± 0.5	15	—	3.6	5.9	1.0	7.0	
				50	—	5.1	7.9	1.0	9.0	
Propagation delay time (SELECT-Y)	t_{pLH} t_{pHL}	—	3.3 ± 0.3	15	—	7.0	11.0	1.0	13.0	ns
				50	—	9.5	14.5	1.0	16.5	
			5.0 ± 0.5	15	—	4.0	6.8	1.0	8.0	
				50	—	5.5	8.8	1.0	10.0	
3-state output enable time	t_{pZL} t_{pZH}	RL = 1 kΩ	3.3 ± 0.3	15	—	6.7	10.5	1.0	12.5	ns
				50	—	9.2	14.0	1.0	16.0	
			5.0 ± 0.5	15	—	3.6	6.8	1.0	8.0	
				50	—	5.1	8.8	1.0	10.0	
3-state output disable time	t_{pLZ} t_{pHZ}	RL = 1 kΩ	3.3 ± 0.3	50	—	8.6	12.0	1.0	13.5	ns
			5.0 ± 0.5	50	—	5.7	7.9	1.0	9.0	
Input capacitance	CIN	—	—	—	4	10	—	10	pF	
Output capacitance	COU	—	—	—	6	—	—	—	pF	
Power dissipation capacitance	CPD	—	(Note)	—	23	—	—	—	pF	

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

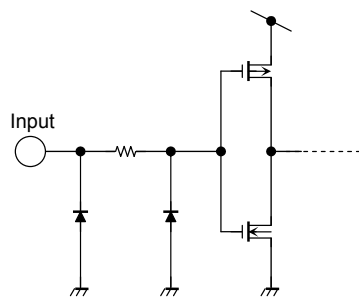
Average operating current can be obtained by the equation:

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

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 VOL	VOLP	CL = 50 pF	5.0	0.3	0.8	V
Quiet output minimum dynamic VOL	VOLV	CL = 50 pF	5.0	-0.3	-0.8	V
Minimum high level dynamic input voltage VIH	VIHD	CL = 50 pF	5.0	—	3.5	V
Maximum low level dynamic input voltage VIL	VILD	CL = 50 pF	5.0	—	1.5	V

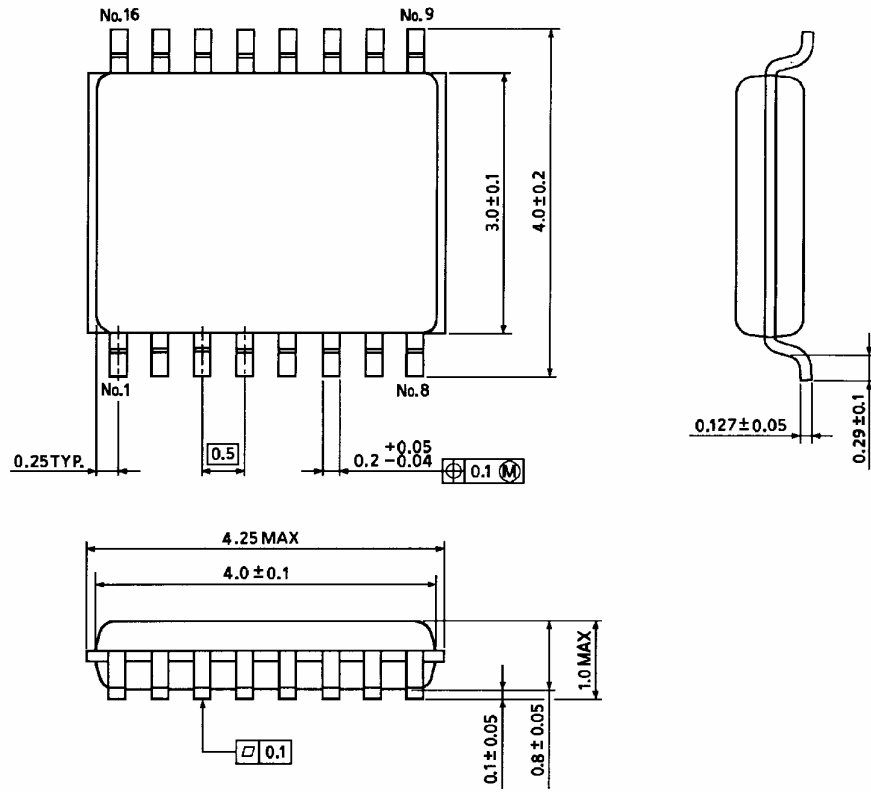
Input Equivalent Circuit



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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