

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

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 OUTPUTENABLE (OE).

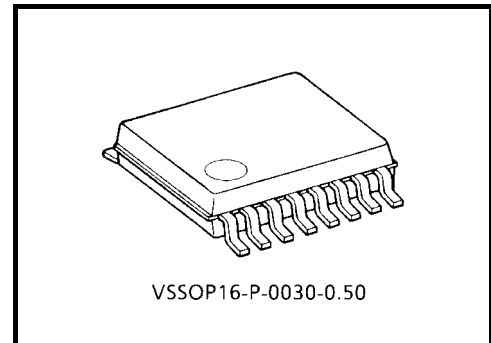
If OE is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled.

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.

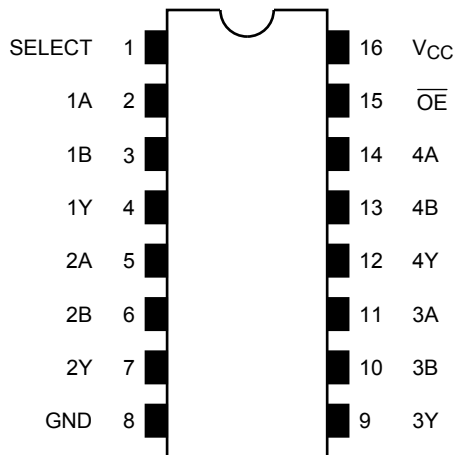


Weight: 0.02 g (typ.)

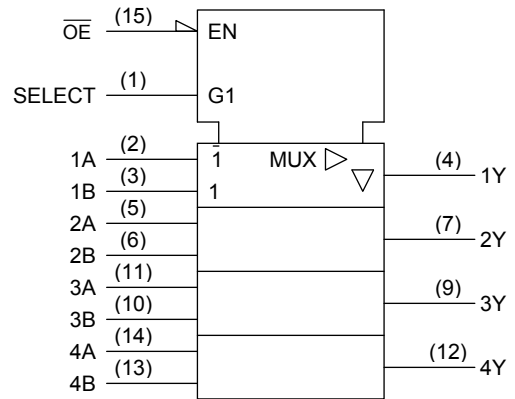
Features

- High speed: $t_{pd} = 3.6 \text{ ns (typ.) (} V_{CC} = 5 \text{ V)}$
- Low power dissipation: $I_{CC} = 4 \text{ }\mu\text{A (max) (} T_a = 25^\circ\text{C)}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range: $V_{CC} \text{ (opr)} = 2\sim 5.5 \text{ V}$
- Low noise: $V_{OLP} = 0.8 \text{ V (max)}$
- Pin and function compatible with 74ALS257

Pin Assignment (top view)



IEC Logic Symbol



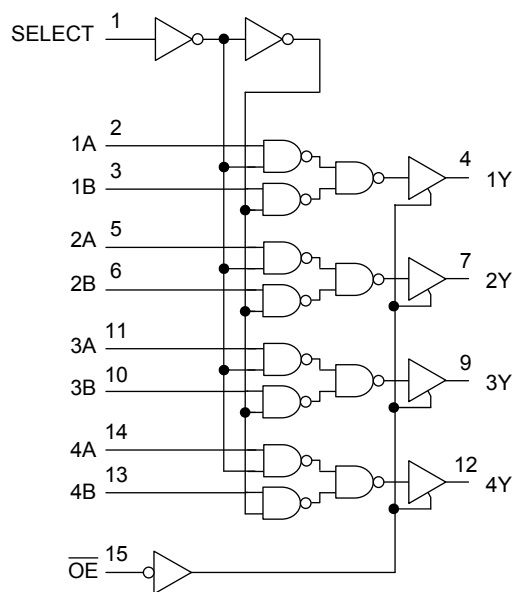
Truth Table

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 ($V_{CC} = 3.3 \pm 0.3$ 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 VCC 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	—	
	I _{OH} = -8 mA	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	
						4.5	—	0	0.1	—	0.1	
I _{OL} = 4 mA					3.0	—	—	0.36	—	0.44		
I _{OL} = 8 mA	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
			V _{CC} (V)	C _L (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}	R _L = 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}	R _L = 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	C _{IN}	—	—	—	4	10	—	10	pF	
Output capacitance	C _{OUT}	—	—	—	6	—	—	—	pF	
Power dissipation capacitance	C _{PD}	—	(Note)	—	23	—	—	—	pF	

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

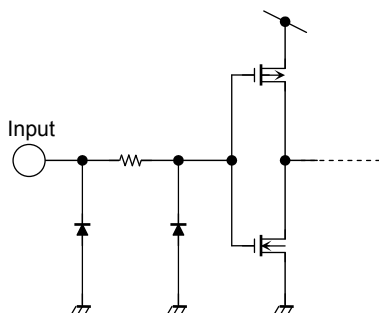
Average operating current can be obtained by the equation:

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

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

Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			V _{CC} (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

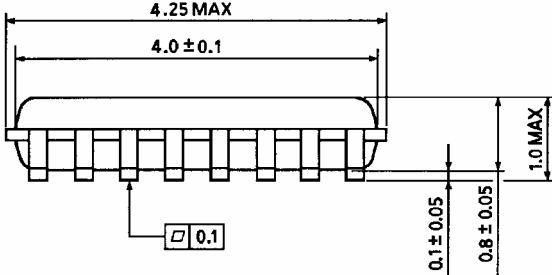
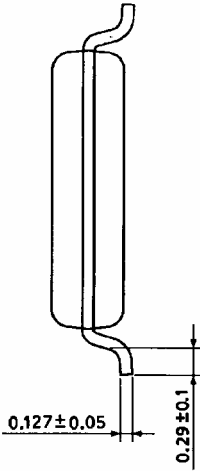
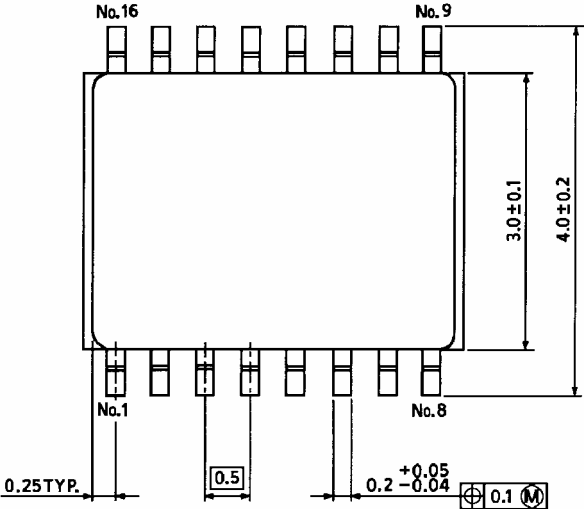
Input Equivalent Circuit



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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