

TC74VHC139FN

Dual 2-to-4 Line Decoder

The TC74VHC139 is an advanced high speed CMOS 2 to 4 LINE DECODER/DEMULTIPLEXER fabricated with silicon gate C2MOS technology.

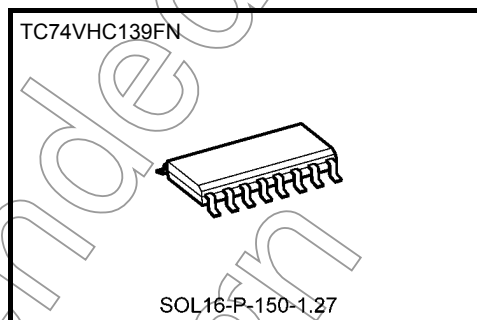
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

The active low enable input can be used for gating or it can be used as a data input for demultiplexing applications.

When the enable input is held High, all four outputs are fixed at a high logic level independent of the other inputs.

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.

Note: xxxFN (JEDEC SOP) is not available in Japan.

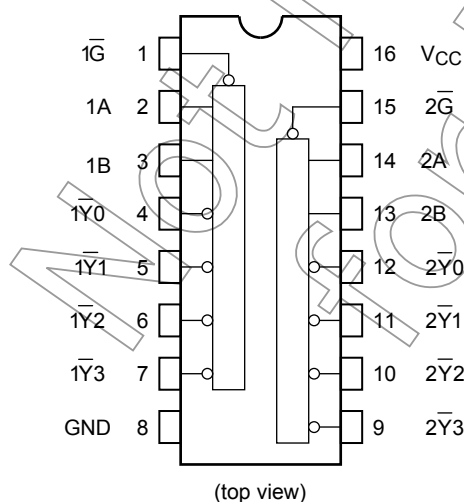


Weight
SOL16-P-150-1.27 : 0.13 g (typ.)

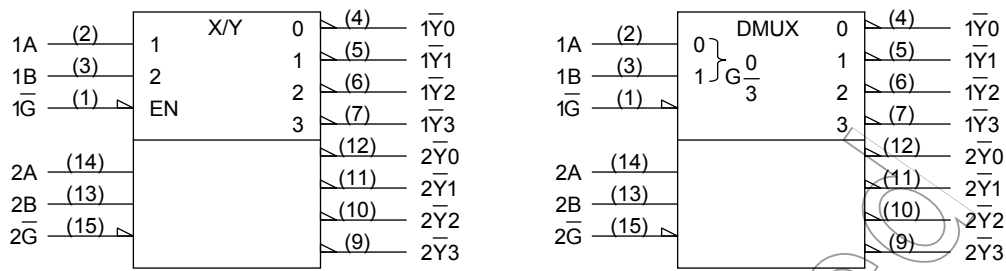
Features

- High speed: $t_{pd} = 5.0 \text{ ns}$ (typ.) at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- 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: $V_{CC}(\text{opr}) = 2 \text{ V}$ to 5.5 V
- Pin and function compatible with 74ALS139

Pin Assignment



IEC Logic Symbol

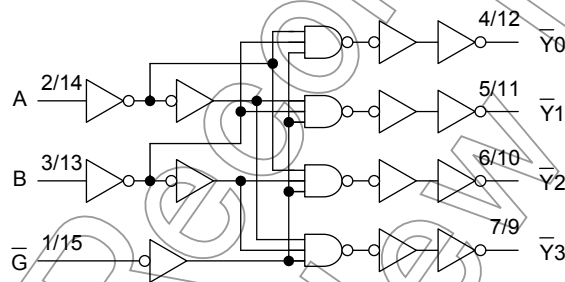


Truth Table

Inputs			Outputs				Selected Output
Enable	Select		Y0	Y1	Y2	Y3	
G	B	A					
H	X	X	H	H	H	H	None
L	L	L	L	H	H	H	Y0
L	L	H	H	L	H	H	Y1
L	H	L	H	H	L	H	Y2
L	H	H	H	H	H	L	Y3

X: Don't care

System Diagram



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V _{CC}	-0.5 to 7.0	V
DC input voltage	V _{IN}	-0.5 to 7.0	V
DC output voltage	V _{OUT}	-0.5 to 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}	±75	mA
Power dissipation	P _D	180	mW
Storage temperature	T _{stg}	-65 to 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 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to 85	°C
Input rise and fall time	dt/dv	0 to 100 ($V_{CC} = 3.3 \pm 0.3$ V) 0 to 20 ($V_{CC} = 5 \pm 0.5$ V)	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 Characteristics

Characteristics	Symbol	Test Condition	$T_a = 25^\circ\text{C}$				$T_a = -40^\circ\text{C to } 85^\circ\text{C}$		Unit
			V_{CC} (V)	Min	Typ.	Max	Min	Max	
High-level input voltage	V_{IH}	—	2.0	1.50	—	—	1.50	—	V
			3.0 to 5.5	$V_{CC} \times 0.7$	—	—	$V_{CC} \times 0.7$	—	
Low-level input voltage	V_{IL}	—	2.0	—	—	0.50	—	0.50	V
			3.0 to 5.5	—	—	$V_{CC} \times 0.3$	—	$V_{CC} \times 0.3$	
High-level output voltage	V_{OH}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -50 \mu\text{A}$	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	
Low-level output voltage	V_{OL}	$V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 50 \mu\text{A}$	2.0	—	0.0	0.1	—	V
				3.0	—	0.0	0.1	—	
				4.5	—	0.0	0.1	—	
			$I_{OL} = 4 \text{ mA}$	3.0	—	—	0.36	—	
Input leakage current	I_{IN}	$V_{IN} = 5.5 \text{ V or GND}$	0 to 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: $t_r = t_f = 3 \text{ ns}$)

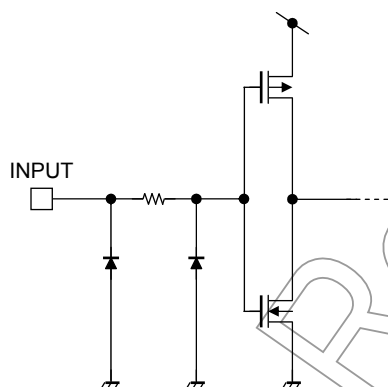
Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = -40 to 85°C		Unit
			V _{CC} (V)	C _L (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time (A, B-Y)	t _{pLH}	—	3.3 ± 0.3	15	—	7.2	11.0	1.0	13.0	ns
				50	—	9.7	14.5	1.0	16.5	
	t _{pHL}		5.0 ± 0.5	15	—	5.0	7.2	1.0	8.5	
				50	—	6.5	9.2	1.0	10.5	
Propagation delay time (\overline{G} -Y)	t _{pLH}	—	3.3 ± 0.3	15	—	6.4	9.2	1.0	11.0	ns
				50	—	8.9	12.7	1.0	14.5	
	t _{pHL}		5.0 ± 0.5	15	—	4.4	6.3	1.0	7.5	
				50	—	5.9	8.3	1.0	9.5	
Input capacitance	C _{IN}	—			—	4	10	—	10	pF
Power dissipation capacitance	C _{PD}	(Note)			—	26	—	—	—	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:

$$I_{CC(\text{opr})} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2 \text{ (per decoder)}$$

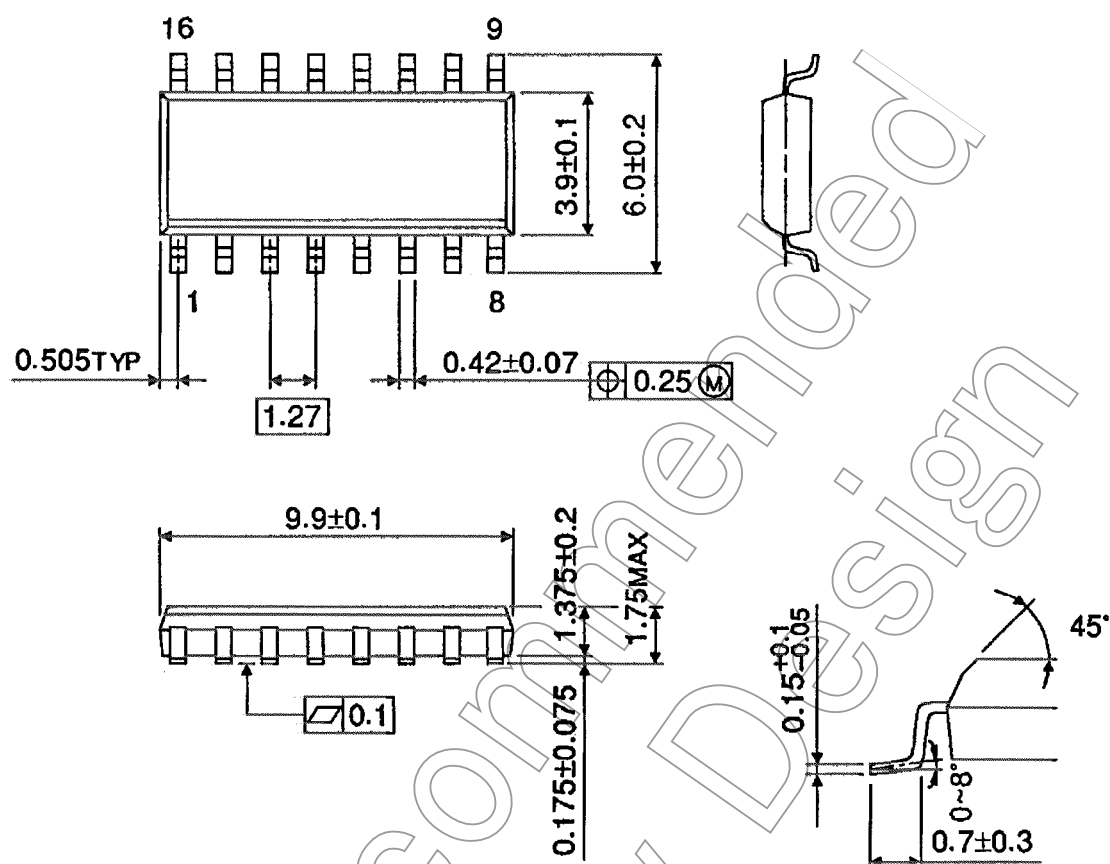
Input Equivalent Circuit



Package Dimensions (Note)

SOL16-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.13 g (typ.)

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