TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

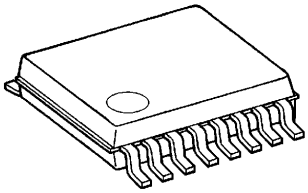
TC7MH139FK

Dual 2-To-4 Line Decoder

The TC7MH139 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 7V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5V to 3V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

Features:

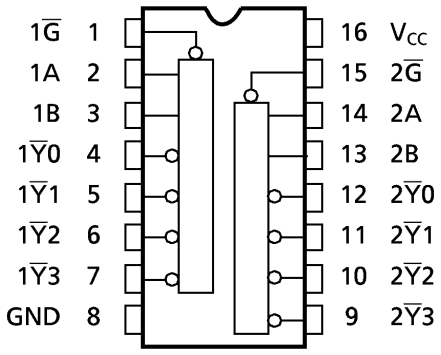
- High Speed····· t_{pd} = 5.0ns(typ.) at V_{CC} = 5V
- Low Power Dissipation····· I_{CC} = 4μA(max) at Ta = 25°C
- High Noise Immunity····· $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min)
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays····· $t_{pLH} \simeq t_{pHL}$
- Wide Operating Voltage Range···· V_{CC} (opr) = 2V~5.5V
- Pin and Function Compatible with 74ALS139



VSSOP16-P-0030-0.50

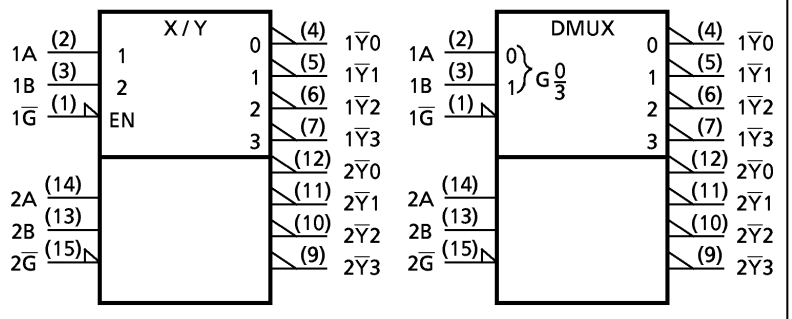
Weight: 0.02g (Typ.)

Pin Assignment



(TOP VIEW)

IEC Logic Symbol

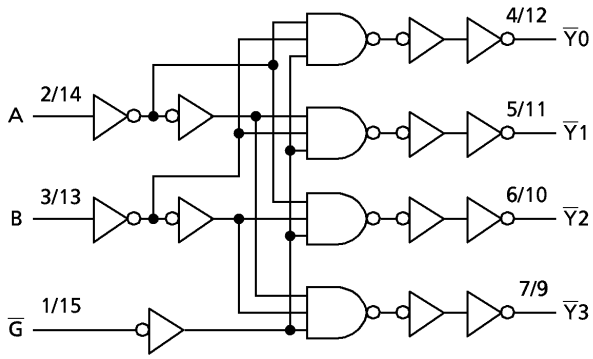


INPUTS			OUTPUTS				SELECTED OUTPUT
ENABLE	SELECT						
G̅	B	A	Y̅0	Y̅1	Y̅2	Y̅3	
H	X	X	H	H	H	H	NONE
L	L	L	L	H	H	H	Y̅0
L	L	H	H	L	H	H	Y̅1
L	H	L	H	H	L	H	Y̅2
L	H	H	H	H	H	L	Y̅3

X: Don't Care

980910EBA2

System Diagram



Absolute Maximum Ratings

PARAMETER	SYMBOL	VALUE	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}	±75	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	−65~150	°C

Recommended Operating Conditions

PARAMETER	SYMBOL	VALUE	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 ± 0.3V) 0~20 (V_{CC} = 5 ± 0.5V)	ns / V

DC Electrical Characteristics

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	Ta = 25°C			Ta = −40~85°C		UNIT
					Min	Typ.	Max	Min	Max	
High - Level Input Voltage	V_{IH}			2.0	1.50	—	—	1.50	—	V
				3.0~5.5	$V_{CC}\times0.7$	—	—	$V_{CC}\times0.7$	—	
Low - Level Input Voltage	V_{IL}			2.0	—	—	0.50	—	0.50	V
				3.0~5.5	—	—	$V_{CC}\times0.3$	—	$V_{CC}\times0.3$	
High - Level Output Voltage	V_{OH}	V_{IN} = V_{IH} or V_{IL}	I_{OH} = −50μA	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} = −4mA	3.0	2.58	—	—	2.48	—	
			I_{OH} = −8mA	4.5	3.94	—	—	3.80	—	
Low - Level Output Voltage	V_{OL}	V_{IN} = V_{IH} or V_{IL}	I_{OL} = 50μA	2.0	—	0.0	0.1	—	0.1	V
				3.0	—	0.0	0.1	—	0.1	
				4.5	—	0.0	0.1	—	0.1	
			I_{OL} = 4mA	3.0	—	—	0.36	—	0.44	
			I_{OL} = 8mA	4.5	—	—	0.36	—	0.44	
Input Leakage Current	I_{IN}	V_{IN} = 5.5V 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	

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

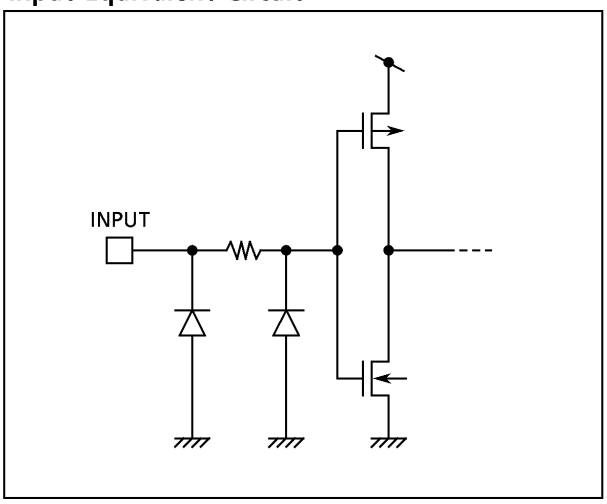
PARAMETER	SYMBOL	TEST CONDITION			Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC} (V)	CL (pF)	Min	Typ.	Max	Min	Max	
Propagation Delay Time (A,B - $\overline{Y}$)	t_{pLH} t_{pHL}		3.3 ± 0.3	15	—	7.2	11.0	1.0	13.0	ns
				50	—	9.7	14.5	1.0	16.5	
			5.0 ± 0.5	15	—	5.0	7.2	1.0	8.5	
				50	—	6.5	9.2	1.0	10.5	
Propagation Delay Time ($\overline{G}$ - $\overline{Y}$)	t_{pLH} t_{pHL}		3.3 ± 0.3	15	—	6.4	9.2	1.0	11.0	
				50	—	8.9	12.7	1.0	14.5	
			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 1)			—	26	—	—	—	

(Note 1): 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:

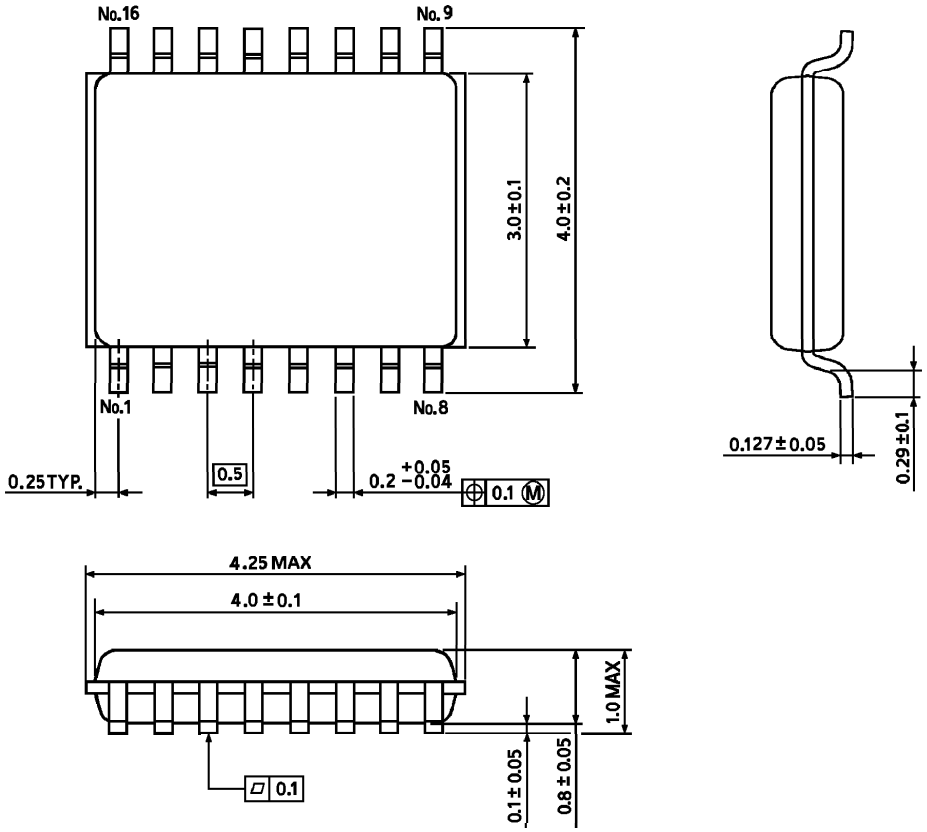
$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 2 \text{ (per decoder)}$$

Input Equivalent Circuit



Outline Drawing

VSSOP16-P-0030-0.50 Unit: mm



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