

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7W139F, TC7W139FU

2-TO-4 LINE DECODER

The TC7W139 is a high speed C²MOS 2 to 4 LINE DECODER/DEMULTIPLEXER fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the C²MOS low power dissipation.

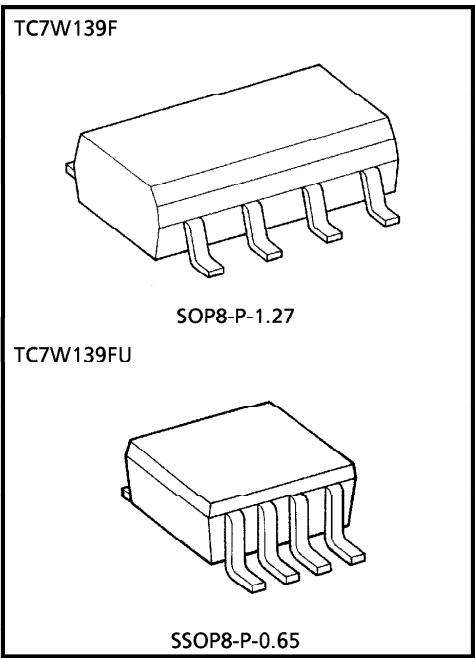
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES

- High Speed $t_{pd} = 6\text{ns}$ (Typ.) at $V_{CC} = 5\text{V}$
- Low Power Dissipation $I_{CC} = 2\mu\text{A}$ (Max.) at $T_a = 25^\circ\text{C}$
- High Noise Immunity $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min.)
- Output Drive Capability 10 LSTTL Loads
- Symmetrical Output Impedance ... $|I_{OH}| = I_{OL} = 4\text{mA}$
- Balanced Propagation Delays $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range ... $V_{CC}(\text{opr}) = 2\text{V} \sim 6\text{V}$

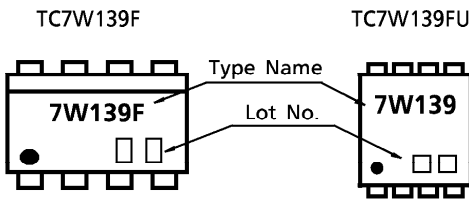
TRUTH TABLE

INPUTS		OUTPUTS				SELECTED OUTPUT
SELECT		$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$	
B	A					
L	L	L	H	H	H	$\overline{Y0}$
L	H	H	L	H	H	$\overline{Y1}$
H	L	H	H	L	H	$\overline{Y2}$
H	H	H	H	H	L	$\overline{Y3}$

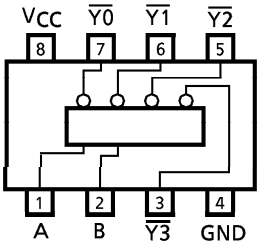


Weight SOP8-P-1.27 : 0.05g (Typ.)
SSOP8-P-0.65 : 0.02g (Typ.)

MARKING



PIN ASSIGNMENT (TOP VIEW)



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● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	V _{CC}	-0.5~7	V
DC Input Voltage	V _{IN}	-0.5~V _{CC} + 0.5	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}	± 25	mA
Power Dissipation	P _D	300	mW
Storage Temperature	T _{stg}	-65~150	°C
Lead Temperature 10s	T _L	260	°C

RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{CC}	2~6	V
Input Voltage	V _{IN}	0~V _{CC}	V
Output Voltage	V _{OUT}	0~V _{CC}	V
Operating Temperature	T _{opr}	-40~85	°C
Input Rise and Fall Time	t _r , t _f	0~1000 (V _{CC} = 2.0V) 0~ 500 (V _{CC} = 4.5V) 0~ 400 (V _{CC} = 6.0V)	ns

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DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION		V _{CC}	Ta = 25°C			Ta = - 40~85°C		UNIT
					MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Input Voltage	V _{IH}	—		2.0 4.5 6.0	1.5 3.15 4.2	— — —	— — —	1.5 3.15 4.2	— — —	V
Low-Level Input Voltage	V _{IL}	—		2.0 4.5 6.0	— — —	— — —	0.5 1.35 1.8	— — —	0.5 1.35 1.8	V
High-Level Output Voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = - 20μA	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
			6.0	5.9	6.0	—	5.9	—		
			I _{OH} = - 4mA I _{OH} = - 5.2mA		4.5 6.0	4.18 5.68	4.31 5.80	— —	4.13 5.63	
Low-Level Output Voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20μA	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
			6.0	—	0.0	0.1	—	0.1		
			I _{OL} = 4mA I _{OL} = 5.2mA		4.5 6.0	— —	0.17 0.18	0.26 0.26	— —	
Input Leakage Current	I _{IN}	V _{IN} = V _{CC} or GND		6.0	—	—	± 0.1	—	± 1.0	μA
Quiescent Supply Current	I _{CC}	V _{IN} = V _{CC} or GND		6.0	—	—	2.0	—	20.0	

AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, V_{CC} = 5V, Ta = 25°C)

PARAMETER	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Output Transition Time	t _{TLH} t _{THL}	—	—	4	8	ns
Propagation Delay Time (A, B- $\bar{Y}$)	t _{pLH} t _{pHL}	—	—	12	22	

AC ELECTRICAL CHARACTERISTICS ($C_L = 50\text{pF}$, Input $t_r = t_f = 6\text{ns}$)

PARAMETER	SYMBOL	TEST CONDITION	Ta = 25°C				Ta = -40~85°C		UNIT
			V _{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
Output Transition Time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95	ns
			4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation Delay Time (A, B- $\bar{Y}$)	t_{pLH} t_{pHL}	—	2.0	—	45	130	—	165	
			4.5	—	15	26	—	33	
			6.0	—	13	22	—	28	
Input Capacitance	C _{IN}	—		—	5	10	—	10	pF
Power Dissipation Capacitance	C _{PD}	(Note 1)		—	46	—	—	—	

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.

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