

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC7W139F, TC7W139FU

2-to-4 Line Decoder

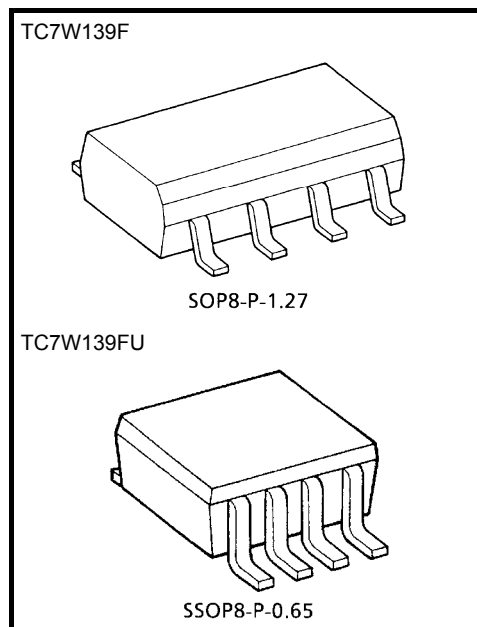
The TC7W139 is a high speed C²MOS 2 to 4 Line Decoder/Demultiplexer fabricated with silicon gate C²MOS technology.

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: $I_{CC} = 2 \text{ } \mu\text{A (max)}$ at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- 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: $V_{CC} \text{ (opr)} = 2 \text{ to } 6 \text{ V}$



Weight

SOP8-P-1.27: 0.05 g (typ.)

SSOP8-P-0.65: 0.02 g (typ.)

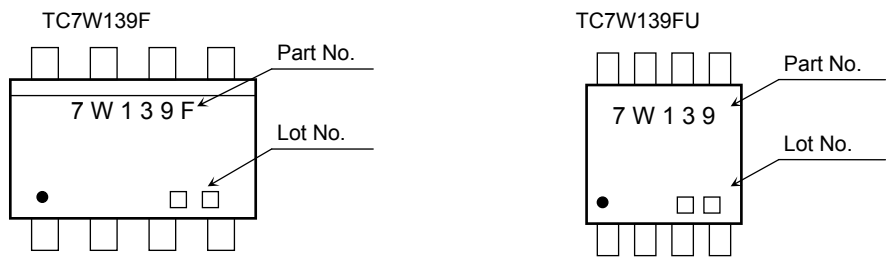
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7	V
DC input voltage	V_{IN}	-0.5 to $V_{CC} + 0.5$	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 VCC/ground current	I_{CC}	± 25	mA
Power dissipation	P_D	300	mW
Storage temperature range	T_{stg}	-65 to 150	$^\circ\text{C}$
Lead temperature 10 s	T_L	260	$^\circ\text{C}$

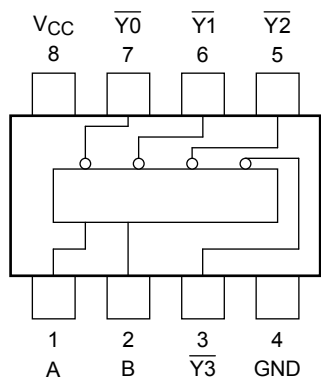
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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).

Marking



Pin Configuration (top view)



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	$\overline{Y3}$

Operating Ranges

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2 to 6	V
Input voltage	V_{IN}	0 to V_{CC}	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature range	T_{opr}	-40 to 85	°C
Input rise and fall time	t_r, t_f	0 to 1000 ($V_{CC} = 2.0\text{ V}$)	ns
		0 to 500 ($V_{CC} = 4.5\text{ V}$)	
		0 to 400 ($V_{CC} = 6.0\text{ V}$)	

Electrical Characteristics

DC Electrical Characteristics

Characteristics		Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit				
					V _{CC} (V)	Min	Typ.	Max	Min		Max			
Input voltage	High level	V _{IH}	—		2.0	1.5	—	—	1.5	V				
					4.5	3.15	—	—	3.15		—			
					6.0	4.2	—	—	4.2		—			
	Low level	V _{IL}	—		2.0	—	—	0.5	—		0.5			
					4.5	—	—	1.35	—		1.35			
					6.0	—	—	1.8	—		1.8			
Output voltage	High level	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -20 μA	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} = -4 mA	4.5	4.18	4.31	—	4.13		—			
					I _{OH} = -5.2 mA	6.0	5.68	5.80	—		5.63	—		
						Low level	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 20 μA		2.0	—	0	0.1
	4.5	—	0	0.1							—	0.1		
	6.0	—	0	0.1	—						0.1			
	I _{OL} = 4 mA	4.5	—	0.17	0.26				—		0.33			
		I _{OL} = 5.2 mA	6.0	—	0.18				0.26		—	0.33		
			Input leakage current		I _{IN}				V _{IN} = V _{CC} or GND		6.0	—	—	±0.1
	Quiescent supply current		I _{CC}	V _{IN} = V _{CC} or GND		6.0	—	—	2.0		—	20.0	μA	

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

Characteristics	Symbol	Test Condition	Ta = 25°C			Unit
			Min	Typ.	Max	
Output transition time	t _{TLH} t _{THL}	—	—	4	8	ns
Propagation delay time (A, B- $\bar{Y}$)	t _{pLH} t _{pHL}	—	—	12	22	ns

AC Electrical Characteristics ($C_L = 50 \text{ pF}$, input $t_r = t_f = 6 \text{ ns}$)

Characteristics	Symbol	Test Condition	Ta = 25°C			Ta = -40 to 85°C		Unit
			V _{CC} (V)	Min	Typ.	Max	Min	Max
Output transition time	t_{TLH} t_{THL}	—	2.0	—	30	75	—	95
			4.5	—	8	15	—	19
			6.0	—	7	13	—	16
Propagation delay time (A, B-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
Power dissipation capacitance	C _{PD}	(Note)	—	—	46	—	—	—

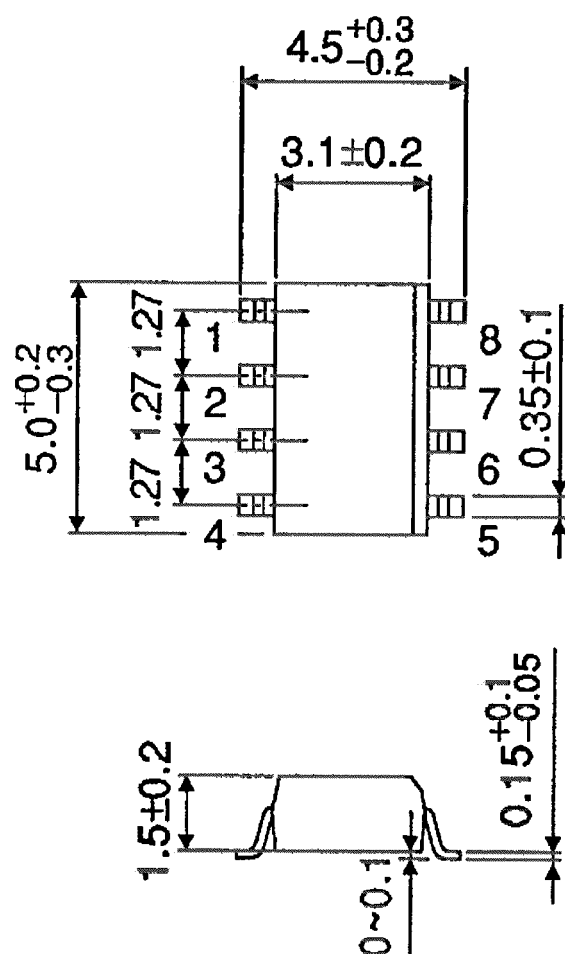
Note: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation.

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

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Unit : mm

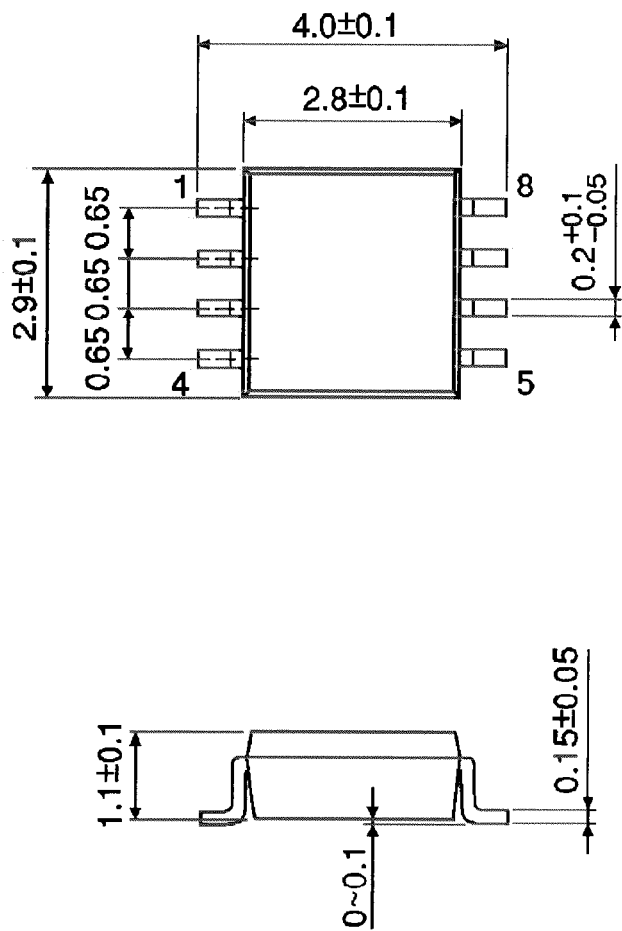


Weight: 0.05 g (typ.)

Package Dimensions

SSOP8-P-0.65

Unit : mm



Weight: 0.02 g (typ.)

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