

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7SH86F, TC7SH86FU

EXCLUSIVE OR GATE

The TC7SH86 is an advanced high speed CMOS EXCLUSIVE OR GATE fabricated with silicon gate CMOS technology.

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

The internal circuit includes an output buffer, which provides high noise immunity and stable output.

An input protection circuit ensures that 0V 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 system and two supply system such as battery back up.

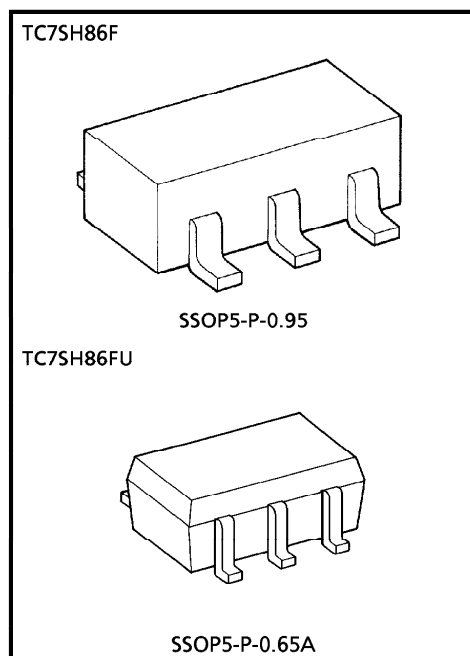
This circuit prevents device destruction due to mismatched supply and input voltages.

FEATURES

- High Speed $t_{pd} = 4.8\text{ns}$ (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.)
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays $t_{pLH} \approx t_{pHL}$
- Wide Operation Voltage Range ... $V_{CC}(\text{opr}) = 2\text{V} \sim 5.5\text{V}$

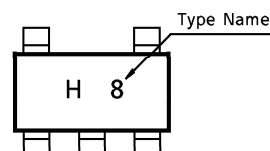
MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	$-0.5 \sim 7.0$	V
DC Input Voltage	V_{IN}	$-0.5 \sim 7.0$	V
DC Output Voltage	V_{OUT}	$-0.5 \sim V_{CC} + 0.5$	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	200	mW
Storage Temperature	T_{stg}	$-65 \sim 150$	$^\circ\text{C}$
Lead Temperature (10 s)	T_L	260	$^\circ\text{C}$



Weight SSOP5-P-0.95 : 0.016g (Typ.)
SSOP5-P-0.65A : 0.006g (Typ.)

MARKING



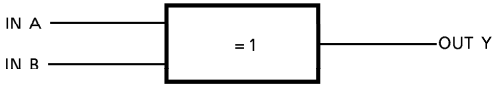
TRUTH TABLE

A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

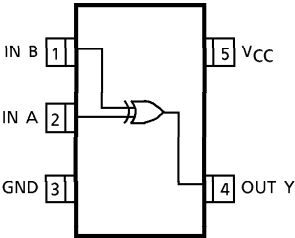
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LOGIC DIAGRAM



PIN ASSIGNMENT (TOP VIEW)



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	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 ($V_{CC} = 3.3 \pm 0.3V$)	ns / V
		0~20 ($V_{CC} = 5 \pm 0.5V$)	

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CONDITION		Ta = 25°C				Ta = - 40~85°C		UNIT
				V _{CC}	MIN.	TYP.	MAX.	MIN.	MAX.	
High-Level Input Voltage	V _{IH}			2.0	1.50	—	—	1.50	—	V
				3.0~5.5	V _{CC} × 0.7	—	—	V _{CC} × 0.7	—	
Low-Level Input Voltage	V _{IL}			2.0	—	—	0.50	—	0.50	V
				3.0~5.5	—	—	V _{CC} × 0.3	—	V _{CC} × 0.3	
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	—	—	2.0	—	20.0	μA	

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AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3\text{ns}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION		Ta = 25°C			Ta = -40~85°C		UNIT
		VCC (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	tpLH tpHL	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	—	4.8	6.8	1.0	8.0	
			50	—	6.3	8.8	1.0	10.0	
Input Capacitance	CIN			—	4	10	—	10	pF
Power Dissipation Capacitance	CpD	(Note 1)		—	18	—	—	—	pF

(Note 1) : CpD 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 :
 $I_{CC (opr)} = C_{pD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

INPUT EQUIVALENT CIRCUIT

