

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

**TC7S86F, TC7S86FU****EXCLUSIVE OR GATE**

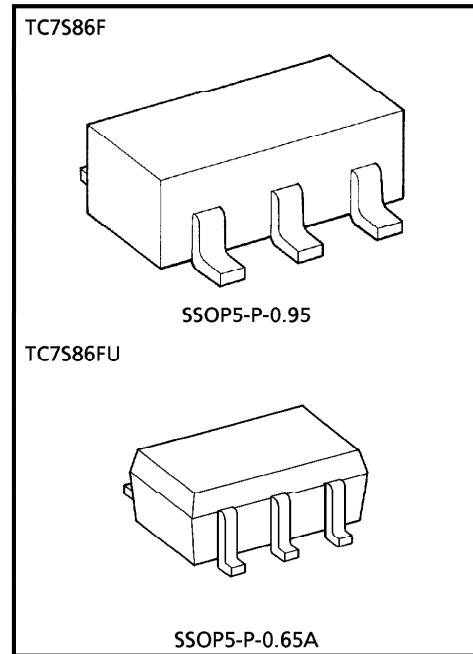
The TC7S86 is a high speed C<sup>2</sup>MOS EXCLUSIVE OR GATE fabricated with silicon gate C<sup>2</sup>MOS technology. It achieves the high speed operation similar to equivalent LSTTL while maintaining the C<sup>2</sup>MOS low power dissipation.

Input and output buffers are provided which offer high noise immunity and stable output. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

Output current are 1/2 compared to TC74HC series models.

**FEATURES**

- High Speed .....  $t_{pd} = 10\text{ns}$  (Typ.) at  $V_{CC} = 5\text{V}$
- Low Power Dissipation .....  $I_{CC} = 1\mu\text{A}$  (Max.) at  $T_a = 25^\circ\text{C}$
- High Noise Immunity .....  $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (Min.)
- Output Drive Capability ..... 5 LSTTL Loads
- Symmetrical Output Impedance ...  $|I_{OH}| = I_{OL} = 2\text{mA}$  (Min.)
- Balanced Propagation Delays .....  $t_{pLH} = t_{pHL}$
- Wide Operating Voltage Range ...  $V_{CC(\text{opr})} = 2\sim 6\text{V}$



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

**MAXIMUM RATINGS**

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	$V_{CC}$	$-0.5\sim 7$	V
DC Input Voltage	$V_{IN}$	$-0.5\sim V_{CC} + 0.5$	V
DC Output Voltage	$V_{OUT}$	$-0.5\sim V_{CC} + 0.5$	V
Input Diode Current	$I_{IK}$	$\pm 20$	mA
Output Diode Current	$I_{OK}$	$\pm 20$	mA
DC Output Current	$I_{OUT}$	$\pm 12.5$	mA
DC $V_{CC}$ / Ground Current	$I_{CC}$	$\pm 25$	mA
Power Dissipation	$P_D$	200	mW
Storage Temperature	$T_{stg}$	$-65\sim 150$	°C
Lead Temperature (10s)	$T_L$	260	°C

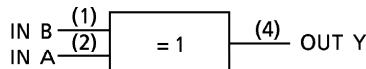
**TRUTH TABLE**

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

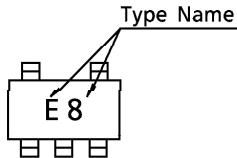
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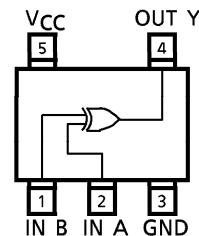
## LOGIC DIAGRAM



## MARKING



## PIN ASSIGNMENT (TOP VIEW)



## RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	$V_{CC}$	2~6	V
Input Voltage	$V_{IN}$	$0 \sim V_{CC}$	V
Output Voltage	$V_{OUT}$	$0 \sim V_{CC}$	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

## 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	1.5	—	—	1.5	—	V
				4.5	3.15	—	—	3.15	—	
				6.0	4.2	—	—	4.2	—	
Low-Level Input Voltage	$V_{IL}$	—		2.0	—	—	0.5	—	0.5	V
				4.5	—	—	1.35	—	1.35	
				6.0	—	—	1.8	—	1.8	
High-Level Output Voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20\mu A$	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	—	
			$I_{OH} = -2mA$	4.5	4.18	4.31	—	4.13	—	
			$I_{OH} = -2.6mA$	6.0	5.68	5.80	—	5.63	—	
Low-Level Output Voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20\mu A$	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	
			$I_{OL} = 2mA$	4.5	—	0.17	0.26	—	0.33	
			$I_{OL} = 2.6mA$	6.0	—	0.18	0.26	—	0.33	
Input Leakage Current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND		6.0	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu A$
Quiescent Supply Current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND		6.0	—	—	1.0	—	10.0	$\mu A$

Output currents are 1/2 compared to TC74HC series models.

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AC ELECTRICAL CHARACTERISTICS ( $C_L = 15\text{pF}$ ,  $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ , Input  $t_r = t_f = 6\text{ns}$ )

CHARACTERISTIC	SYMBOL	TEST CONDITION	Ta = 25°C			UNIT
			MIN.	TYP.	MAX.	
Output Transition Time	$t_{TLH}$ $t_{THL}$	—	—	4	8	ns
Propagation Delay Time	$t_{pLH}$ $t_{pHL}$	—	—	10	17	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	$V_{CC}$	Ta = 25°C		Ta = -40~85°C		UNIT
				MIN.	TYP.	MAX.	MIN.	
Output Transition Time	$t_{TLH}$ $t_{THL}$	—	2.0	—	50	125	—	155
			4.5	—	14	25	—	31
			6.0	—	12	21	—	26
Propagation Delay Time	$t_{pLH}$ $t_{pHL}$	—	2.0	—	48	100	—	125
			4.5	—	12	20	—	25
			6.0	—	9	17	—	21
Input Capacitance	$C_{IN}$	—	—	—	5	10	—	10
Power Dissipation Capacitance	$C_{PD}$	(Note 1)	—	18	—	—	—	pF

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.

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