TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC7SL02F, TC7SL02FU

2-INPUT NOR GATE

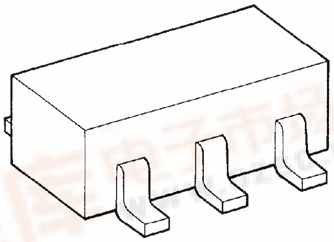
The TC7SL02 is a low voltage operative C^{2}MOS 2-INPUT NOR GATE fabricated with silicon gate C^{2}MOS technology.

Operating voltage ($V_{CC\,(opr)}$) is 1~3V equivalent to 1pc or 2pcs of dry cell battery and it achives low power dissipation.

The internal circuit is composed of 3 stages including buffer output, which enables high noise immunity and stable output.

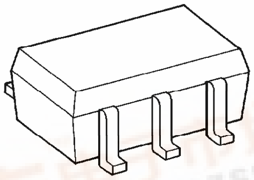
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

TC7SL02F



SSOP5-P-0.95

TC7SL02FU



SSOP5-P-0.65A

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

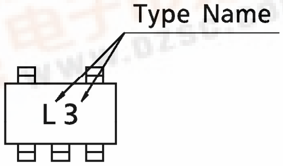
FEATURES

- High Speed ································ t_{pd} = 10ns (Typ.) at V_{CC} = 3V
- Low Power Dissipation ················· I_{CC} = 1μA (Max.) at Ta = 25°C
- High Noise Immunity ··················· $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Symmetrical Output Impedance ······ $|I_{OH}| = I_{OL}$ = 1mA
- Balanced Propagation Delay Time ··· $t_{pLH} \fallingdotseq t_{pHL}$
- Low Voltage Operating················ $V_{CC\,(opr)}$ = 1~3.6V

MAXIMUM RATINGS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage Range	V_{CC}	–0.5~5	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}	±12.5	mA
DC V_{CC} / Ground Current	I_{CC}	±25	mA
Power Dissipation	P_D	200	mW
Storage Temperature	T_{stg}	–65~150	°C
Lead Temperature (10s)	T_L	260	°C

MARKING



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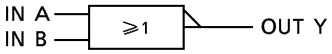
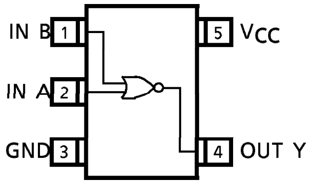
LOGIC DIAGRAM



PIN CONNECTION (TOP VIEW)



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	1~3.6	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} = 1.0V)	ns
		0~ 500 (V_{CC} = 1.5V)	
		0~ 400 (V_{CC} = 3.0V)	

DC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		V_{CC}	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
High-Level Input Voltage	V_{IH}	—	—		1.0	0.75	—	—	0.75	—	V
					1.5	1.05	—	—	1.05	—	
					3.0	2.10	—	—	2.10	—	
Low-Level Input Voltage	V_{IL}	—	—		1.0	—	—	0.25	—	0.25	V
					1.5	—	—	0.45	—	0.45	
					3.0	—	—	0.90	—	0.90	
High-Level Output Voltage	V_{OH}	—	$V_{IN} = V_{IL}$	$I_{OH} = -20\mu A$	1.0	0.9	1.0	—	0.9	—	V
					1.5	1.4	1.5	—	1.4	—	
					3.0	2.9	3.0	—	2.9	—	
				$I_{OH} = -1mA$	1.5	1.07	1.23	—	0.99	—	
				$I_{OH} = -2.6mA$	3.0	2.61	2.68	—	2.55	—	
Low-Level Output Voltage	V_{OL}	—	$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 20\mu A$	1.0	—	0.0	0.1	—	0.1	V
					1.5	—	0.0	0.1	—	0.1	
					3.0	—	0.0	0.1	—	0.1	
				$I_{OL} = 1mA$	1.5	—	0.23	0.31	—	0.37	
				$I_{OL} = 2.6mA$	3.0	—	0.23	0.31	—	0.33	
Input Leakage Current	I_{IN}	—	$V_{IN} = V_{CC}$ or GND		3.6	—	—	±0.1	—	±1.0	μA
Quiescent Supply Current	I_{CC}	—	$V_{IN} = V_{CC}$ or GND		3.6	—	—	1.0	—	10.0	

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AC ELECTRICAL CHARACTERISTICS (C_L = 15pF, Input $t_r = t_f$ = 6ns, V_{CC} = 3.3 ± 0.3V)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}	—	—	—	5.0	9.0	ns
Propagation Delay Time	t_{PLH} t_{PHL}	—	—	—	7.5	13.0	ns

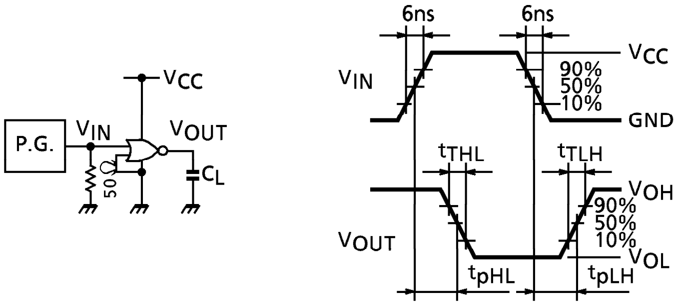
AC ELECTRICAL CHARACTERISTICS (C_L = 25pF, Input $t_r = t_f$ = 6ns)

CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	V_{CC}	Ta = 25°C MIN.	Ta = 25°C TYP.	Ta = 25°C MAX.	Ta = −40~85°C MIN.	Ta = −40~85°C MAX.	UNIT
Output Transition Time	t_{TLH} t_{THL}	—	—	1.0	—	70	170	—	240	ns
				1.5	—	25	45	—	55	
				3.0	—	10	15	—	20	
Propagation Delay Time	t_{PLH} t_{PHL}	—	—	1.0	—	70	170	—	210	ns
				1.5	—	25	45	—	55	
				3.0	—	10	15	—	20	
Input Capacitance	C_{IN}	—	—		—	5	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	—	Note (1)		—	10	—	—	—	

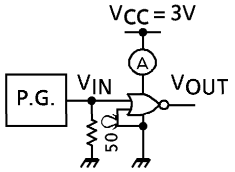
Note (1) : C_{PD} defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).
Average operating current can be obtained by the equation as follows.

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

SWITCHING CHARACTERISTICS TEST CIRCUIT



$I_{CC\,(opr)}$ TEST CIRCUIT

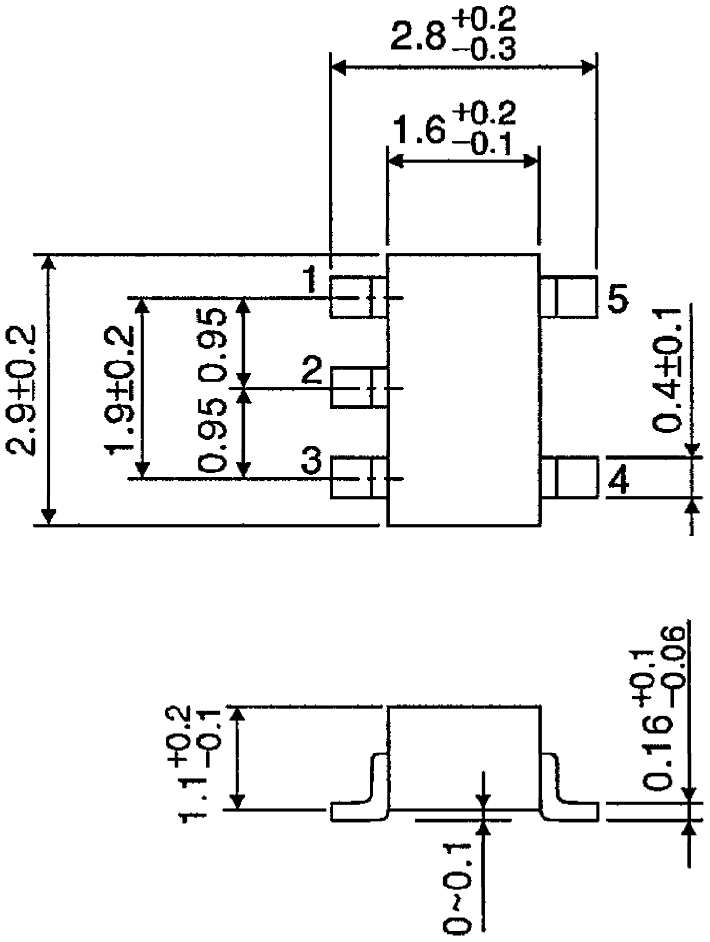


Input waveform is the same as that in case of switching characteristics test.

OUTLINE DRAWING

SSOP5-P-0.95

Unit : mm

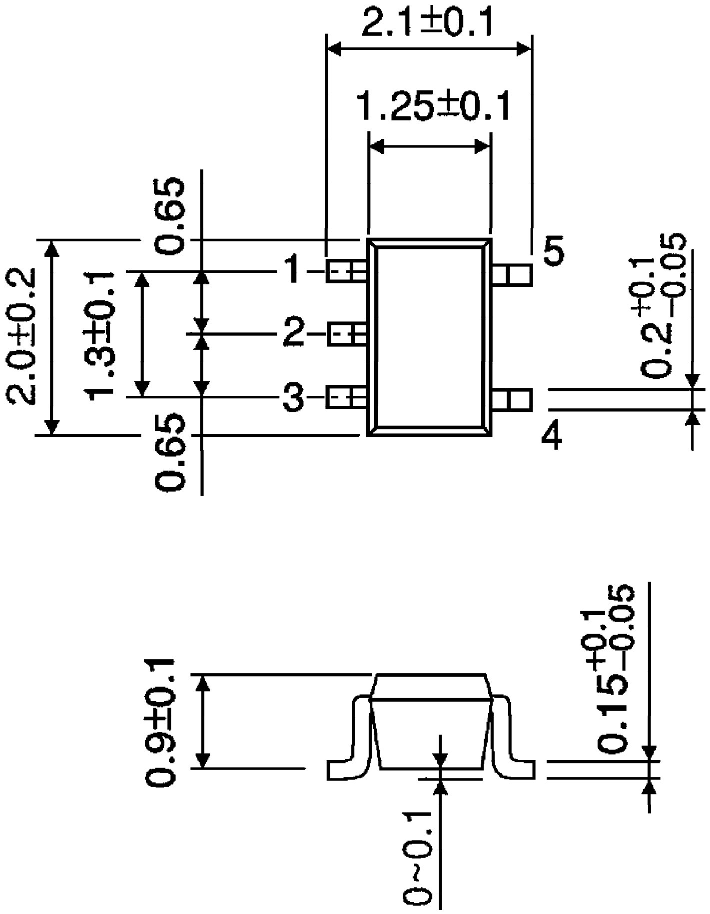


Weight : 0.016g (Typ.)

OUTLINE DRAWING

SSOP5-P-0.65A

Unit : mm



Weight : 0.006g (Typ.)