TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

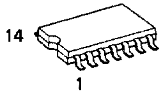
TC74VHC27F, TC74VHC27FN, TC74VHC27FS, TC74VHC27FT

TRIPLE 3-INPUT NOR GATE

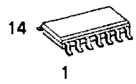
The TC74VHC27 is an advanced high speed CMOS 3-INPUT NOR GATE fabricated with silicon gate C^2MOS technology.
It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.
The internal circuit is composed of 3 stages including buffer output, which provide high noise immunity and stable output.
An input protection circuit ensures that 0 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 systems and two supply systems such as battery back up.
This circuit prevents device destruction due to mismatched supply and input voltages.

FEATURES:

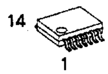
- High Speed··········t_{pd} = 4.1ns(typ.) at V_{CC} = 5V
- Low Power Dissipation··········I_{CC} = 2μA(Max.) at Ta = 25°C
- High Noise Immunity··········$V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays·····$t_{pLH} \simeq t_{pHL}$
- Wide Operating Voltage Range····V_{CC} (opr) = 2V ~ 5.5V
- Pin and Function Compatible with 74ALS27



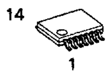
F (SOP14-P-300-1.27)
Weight : 0.18g (TYP.)



FN (SOL14-P-150-1.27)
Weight : 0.12g (TYP.)

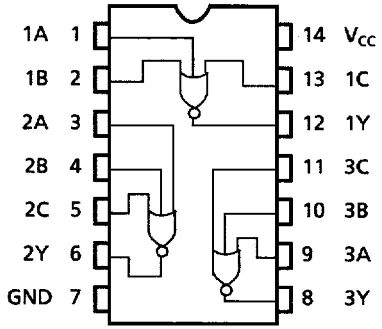


FS (SSOP14-P-225-0.65)
Weight : 0.07g (TYP.)



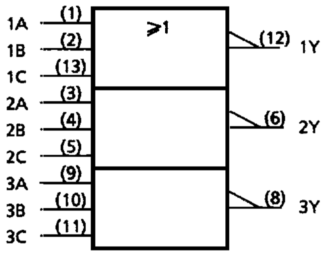
FT (TSSOP14-P-0044-0.65)
Weight : 0.06g (TYP.)

PIN ASSIGNMENT



(TOP VIEW)

IEC LOGIC SYMBOL



TRUTH TABLE

A	B	C	Y
H	X	X	L
X	H	X	L
X	X	H	L
L	L	L	H

X : Don't Care

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ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage Range	V_{CC}	−0.5~7.0	V
DC Input Voltage	V_{IN}	−0.5~7.0	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}	±50	mA
Power Dissipation	P_D	180	mW
Storage Temperature	T_{stg}	−65~150	°C

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	VALUE	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±0.3V) 0~20 (V_{CC}= 5±0.5V)	ns/V

DC ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITION		V_{CC} (V)	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}			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_{IL}	I_{OH}=−50μA	2.0 3.0 4.5	1.9 2.9 4.4	2.0 3.0 4.5	− − −	1.9 2.9 4.4	− − −	V
			I_{OH}=−4mA I_{OH}=−8mA	3.0 4.5	2.58 3.94	− −	− −	2.48 3.80	− −	
Low-Level Output Voltage	V_{OL}	V_{IN}= V_{IH} or V_{IL}	I_{OL}=50μA	2.0 3.0 4.5	− − −	0.0 0.0 0.0	0.1 0.1 0.1	− − −	0.1 0.1 0.1	V
			I_{OL}=4mA I_{OL}=8mA	3.0 4.5	− −	− −	0.36 0.36	− −	0.44 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 $t_r = t_f = 3ns$)

PARAMETER	SYMBOL	TEST CONDITION			Ta = 25°C			Ta = −40~85°C		UNIT
			V_{CC} (V)	CL (pF)	MIN.	TYP.	MAX.	MIN.	MAX.	
Propagation Delay Time	t_{pLH} t_{pHL}		3.3 ± 0.3	15	—	6.2	8.8	1.0	10.5	ns
				50	—	8.7	12.3	1.0	14.0	
			5.0 ± 0.5	15	—	4.1	5.9	1.0	7.0	
				50	—	5.6	7.9	1.0	9.0	
Input Capacitance	C_{IN}				—	4	10	—	10	pF
Power Dissipation Capacitance	C_{PD}	(Note 1)			—	20	—	—	—	

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:

$$I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC} / 3 \text{ (per Gate)}$$

INPUT EQUIVALENT CIRCUIT