

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74VHC153F, TC74VHC153FT, TC74VHC153FK

Dual 4-Channel Multiplexer

The TC74VHC153 is an advanced high speed CMOS DUAL 4-CHANNEL MULTIPLEXERS fabricated with silicon gate C²MOS technology.

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

Each of these data (1C0-1C3, 2C0-2C3) is selected by the two address inputs A and B.

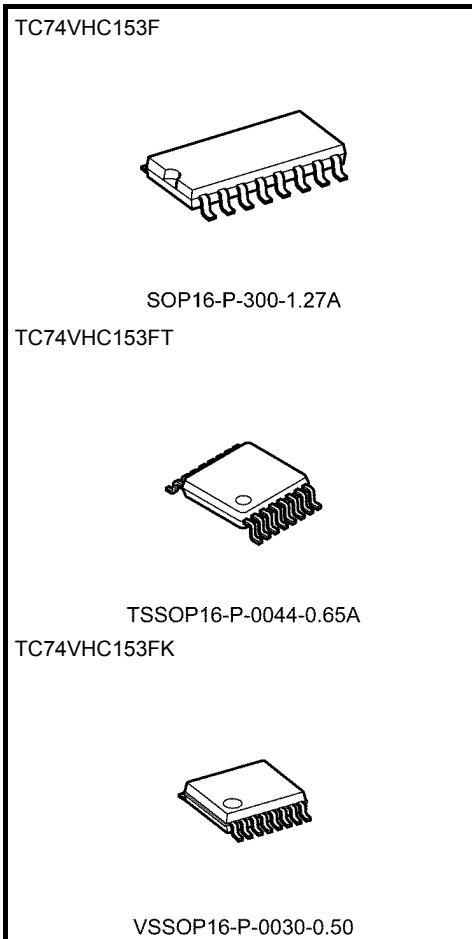
Separate strobe inputs ($\overline{1G}$, $\overline{2G}$) are provided for each of the two four-line sections.

The strobe input (\overline{G}) can be used to inhibit the data output; the output is fixed in low level while the strobe input is held high.

An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up. This circuit prevents device destruction due to mismatched supply and input voltages.

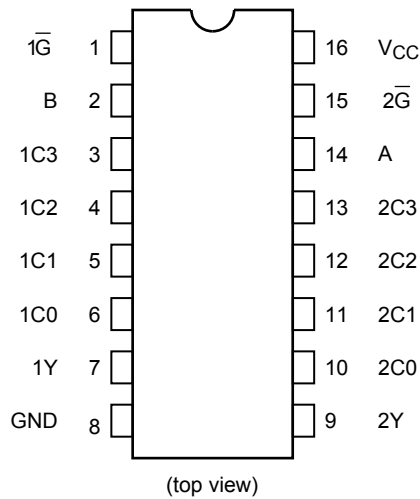
Features

- High speed: $t_{pd} = 5.0$ ns (typ.) at $V_{CC} = 5$ V
- Low power dissipation: $I_{CC} = 4$ μ A (max) at $T_a = 25^\circ$ 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 operating voltage range: $V_{CC(opr)} = 2$ to 5.5 V
- Pin and function compatible with 74ALS153

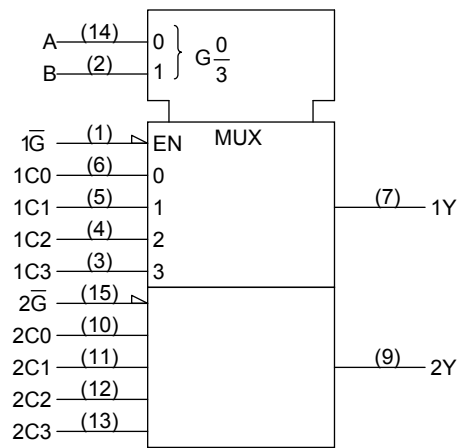


Weight	
SOP16-P-300-1.27A	: 0.18 g (typ.)
TSSOP16-P-0044-0.65A	: 0.06 g (typ.)
VSSOP16-P-0030-0.50	: 0.02 g (typ.)

Pin Assignment



IEC Logic Symbol

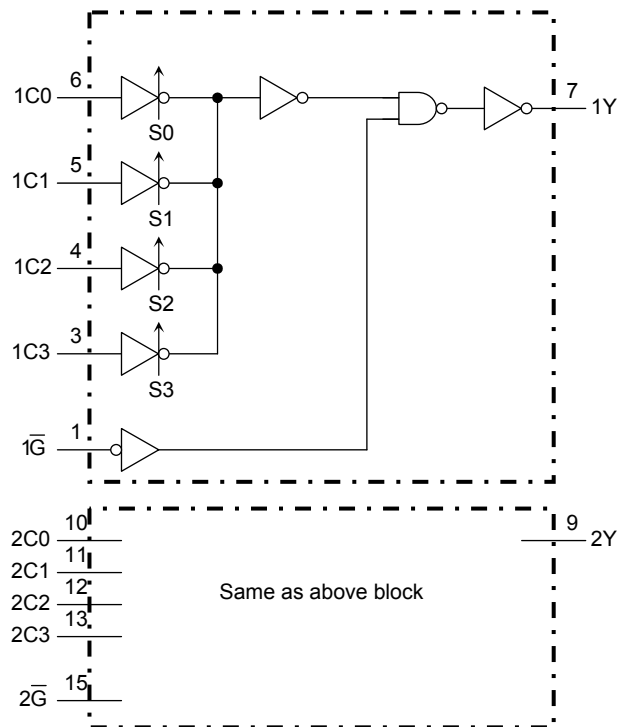
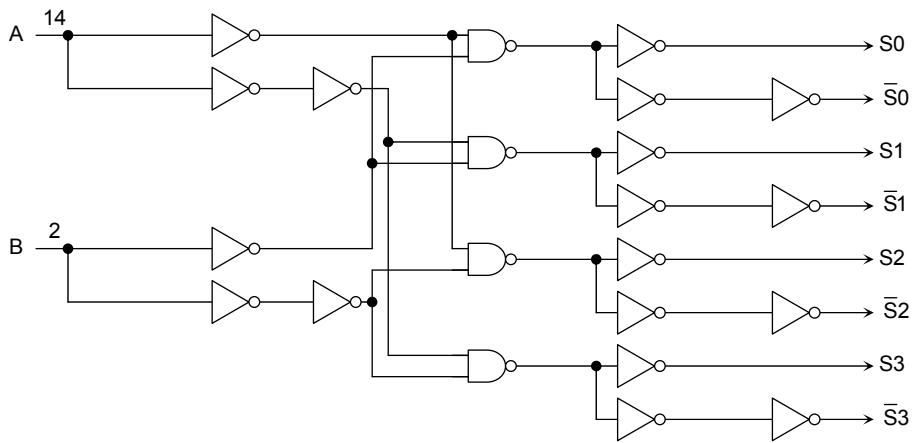


Truth Table

Select Inputs		Data Inputs				Strobe	Output
B	A	C0	C1	C2	C3	\overline{G}	Y
X	X	X	X	X	X	H	L
L	L	L	X	X	X	L	L
L	L	H	X	X	X	L	H
L	H	X	L	X	X	L	L
L	H	X	H	X	X	L	H
H	L	X	X	L	X	L	L
H	L	X	X	H	X	L	H
H	H	X	X	X	L	L	L
H	H	X	X	X	H	L	H

X: Don't care

System Diagram



Absolute Maximum Ratings (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage range	V_{CC}	-0.5 to 7.0	V
DC input voltage	V_{IN}	-0.5 to 7.0	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 V_{CC} /ground current	I_{CC}	± 50	mA
Power dissipation	P_D	180	mW
Storage temperature	T_{stg}	-65 to 150	$^{\circ}C$

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

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).

Operating Range (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{CC}	2.0 to 5.5	V
Input voltage	V_{IN}	0 to 5.5	V
Output voltage	V_{OUT}	0 to V_{CC}	V
Operating temperature	T_{opr}	-40 to 85	$^{\circ}C$
Input rise and fall time	dt/dv	0 to 100 ($V_{CC} = 3.3 \pm 0.3$ V) 0 to 20 ($V_{CC} = 5 \pm 0.5$ V)	ns/V

Note : The operating range must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either V_{CC} or GND.

Electrical Characteristics

DC Characteristics

Characteristics	Symbol	Test Condition		Ta = 25°C			Ta = -40 to 85°C		Unit	
				Min	Typ.	Max	Min	Max		
High-level input voltage	V _{IH}	—		2.0 3.0 to 5.5	1.50 V _{CC} × 0.7	— —	— —	1.50 V _{CC} × 0.7	— —	V
Low-level input voltage	V _{IL}	—		2.0 3.0 to 5.5	— —	— —	— —	0.50 V _{CC} × 0.3	0.50 V _{CC} × 0.3	V
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL}	I _{OH} = -50 μA	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} = -4 mA	3.0	2.58	—	—	2.48	—	
			I _{OH} = -8 mA	4.5	3.94	—	—	3.80	—	
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL}	I _{OL} = 50 μA	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} = 4 mA	3.0	—	—	0.36	—	0.44	
			I _{OL} = 8 mA	4.5	—	—	0.36	—	0.44	
Input leakage current	I _{IN}	V _{IN} = 5.5 V or GND		0 to 5.5	—	—	±0.1	—	±1.0	μA
Quiescent supply current	I _{CC}	V _{IN} = V _{CC} or GND		5.5	—	—	4.0	—	40.0	μA

AC Characteristics (input: t_r = t_f = 3 ns)

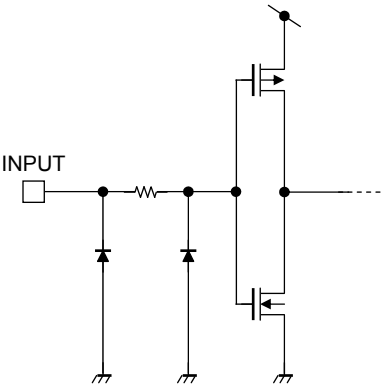
Characteristics	Symbol	Test Condition			Ta = 25°C			Ta = -40 to 85°C		Unit
					Min	Typ.	Max	Min	Max	
Propagation delay time (Cn-Y)	t _{pLH} t _{pHL}	—	3.3 ± 0.3	15	—	7.7	11.9	1.0	14.0	ns
				50	—	10.2	15.4	1.0	17.5	
	5.0 ± 0.5	15	—	5.0	7.7	1.0	9.0			
		50	—	6.5	9.7	1.0	11.0			
Propagation delay time (A, B-Y)	t _{pLH} t _{pHL}	—	3.3 ± 0.3	15	—	10.8	16.7	1.0	19.5	ns
				50	—	13.3	20.2	1.0	23.0	
	5.0 ± 0.5	15	—	6.8	9.9	1.0	11.5			
		50	—	8.3	11.9	1.0	13.5			
Propagation delay time (\bar{G} -Y)	t _{pLH} t _{pHL}	—	3.3 ± 0.3	15	—	6.3	10.1	1.0	12.0	ns
				50	—	8.8	13.6	1.0	15.5	
	5.0 ± 0.5	15	—	4.4	6.4	1.0	7.5			
		50	—	5.9	8.4	1.0	9.5			
Input capacitance	C _{IN}	—			—	4	10	—	10	pF
Power dissipation capacitance	C _{PD}	(Note)			—	20	—	—	—	pF

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:

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

Input Equivalent Circuit



Package Dimensions

SOP16-P-300-1.27A

Unit: mm

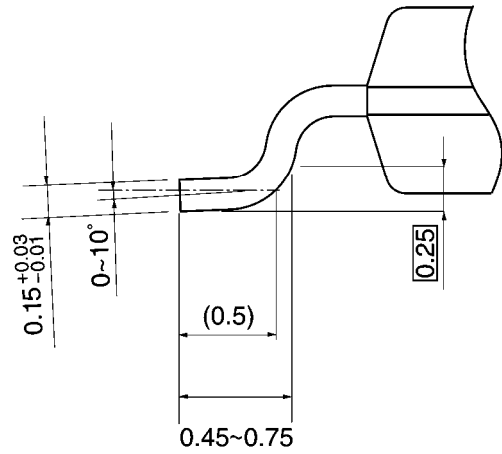
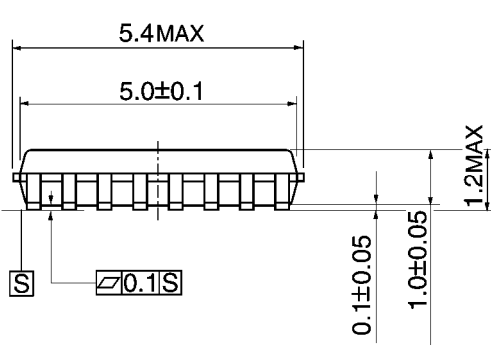


Weight: 0.18 g (typ.)

Package Dimensions

TSSOP16-P-0044-0.65A

Unit: mm

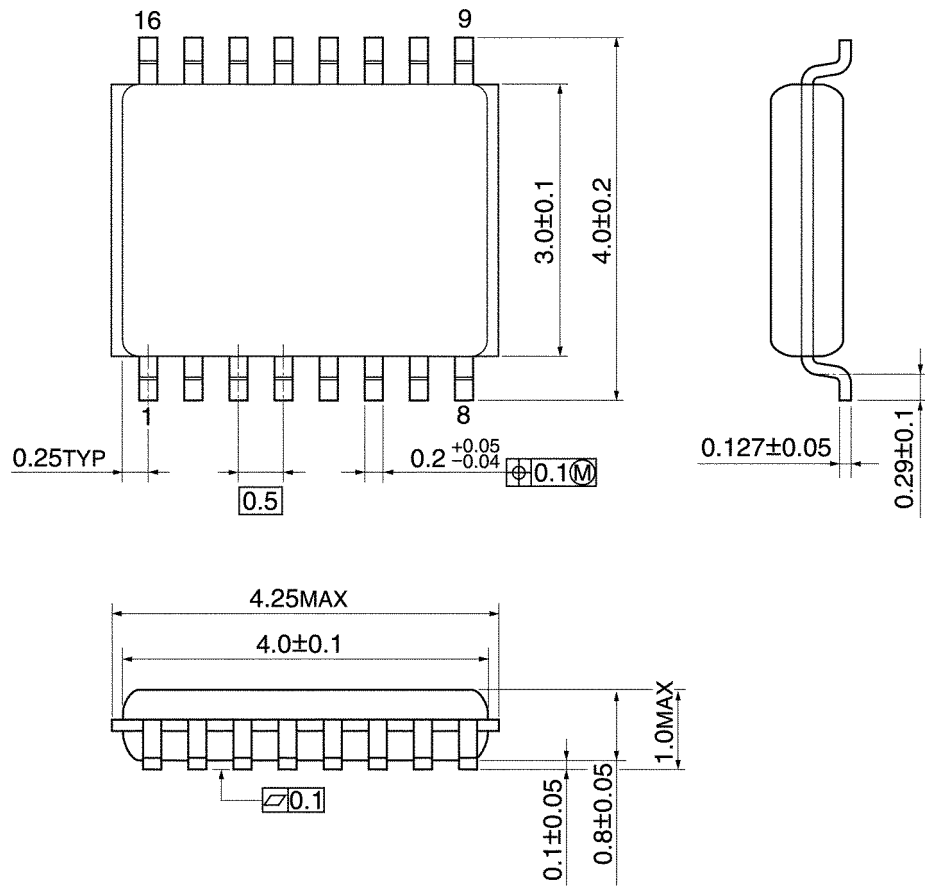


Weight: 0.06 g (typ.)

Package Dimensions

VSSOP16-P-0030-0.50

Unit: mm



Weight: 0.02 g (typ.)

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