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 C^2MOS 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 ($1\overline{G}$, $2\overline{G}$) are provided for each of the two four-line sections.

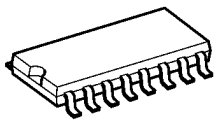
The strobe input ($\overline{G}$) can be used to inhibit the data output; the output is fixed in low level while the strobe input is held high.

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

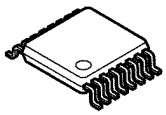
- High speed: t_{pd} = 5.0 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 4 μA (max) at Ta = 25°C
- High noise immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min)
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: $V_{CC\ (opr)}$ = 2 to 5.5 V
- Pin and function compatible with 74ALS153

TC74VHC153F



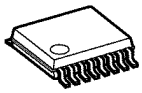
SOP16-P-300-1.27A

TC74VHC153FT



TSSOP16-P-0044-0.65A

TC74VHC153FK



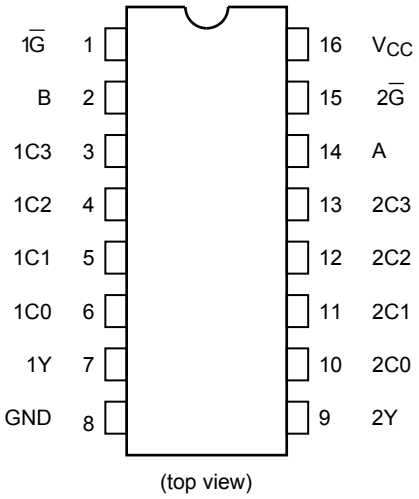
VSSOP16-P-0030-0.50

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.)

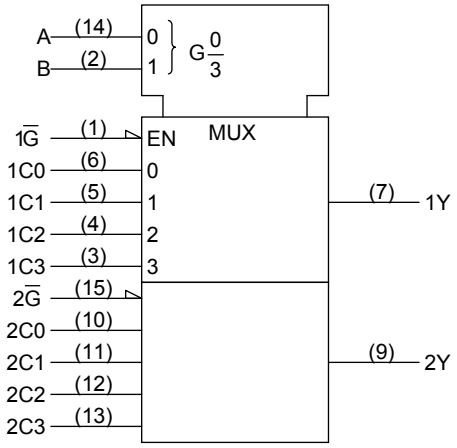
Start of commercial production
1992-05

Pin Assignment



(top view)

IEC Logic Symbol

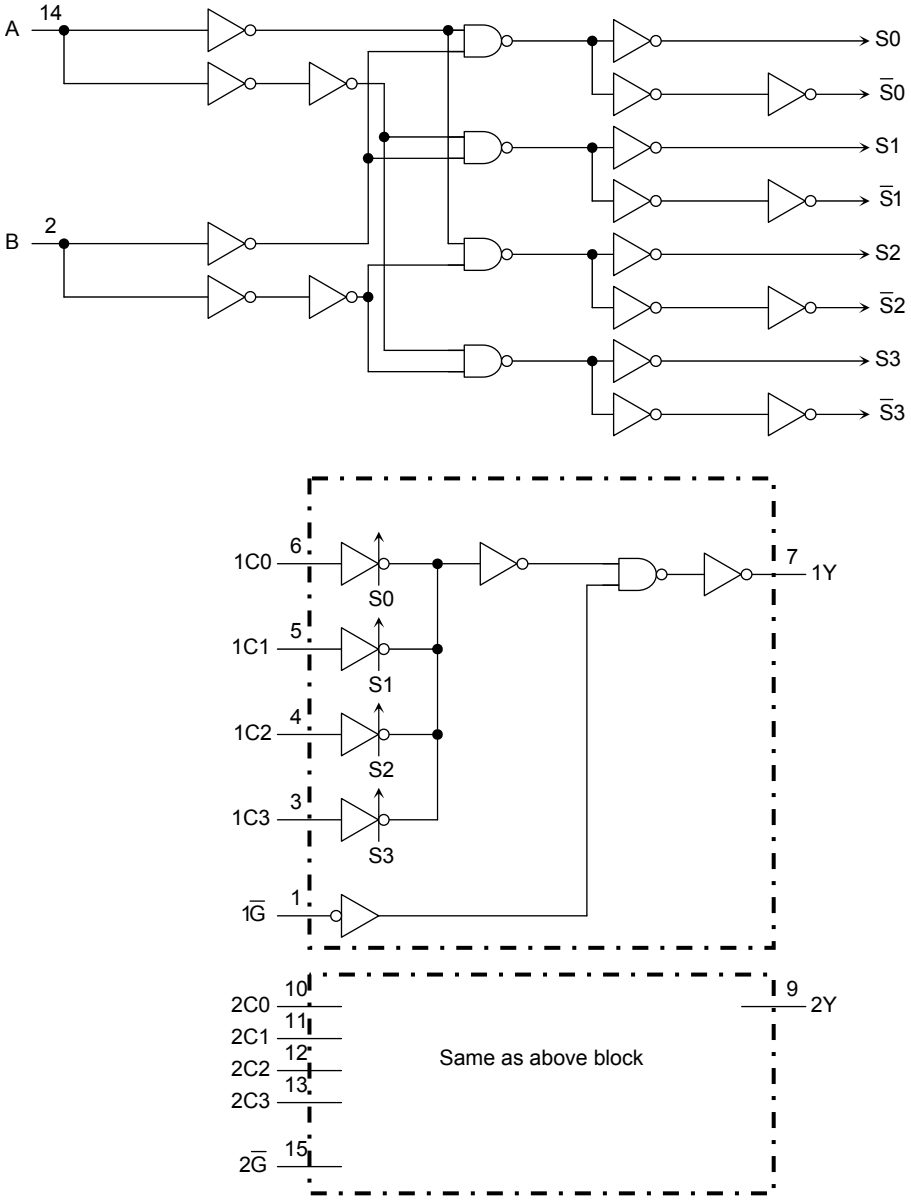


Truth Table

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	°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	°C
Input rise and fall time	dt/dv	0 to 100 (V_{CC} = 3.3 ± 0.3 V) 0 to 20 (V_{CC} = 5 ± 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		V_{CC} (V)	Ta = 25°C Min	Typ.	Max	Ta = −40 to 85°C Min	Max	Unit
High-level input voltage	V_{IH}	—		2.0	1.50	—	—	1.50	—	V
				3.0 to 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 to 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} = −50 μA	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} = −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	—	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} = 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

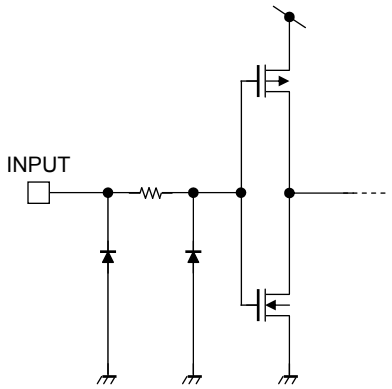
AC Characteristics (input: $t_r = t_f = 3$ ns)

Characteristics	Symbol	Test Condition	V_{CC} (V)	C_L (pF)	Ta = 25°C Min	Typ.	Max	Ta = −40 to 85°C Min	Max	Unit
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 ($\overline{G}$-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:

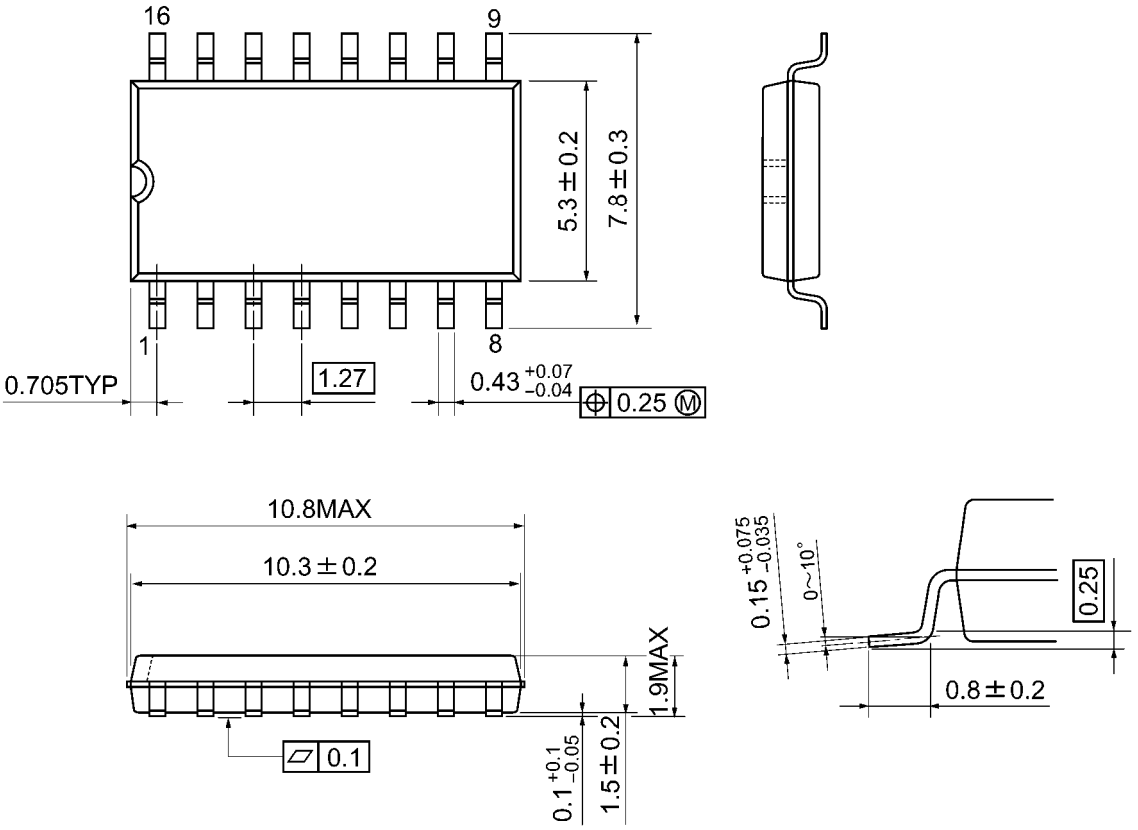
$$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Input Equivalent Circuit



Package Dimensions

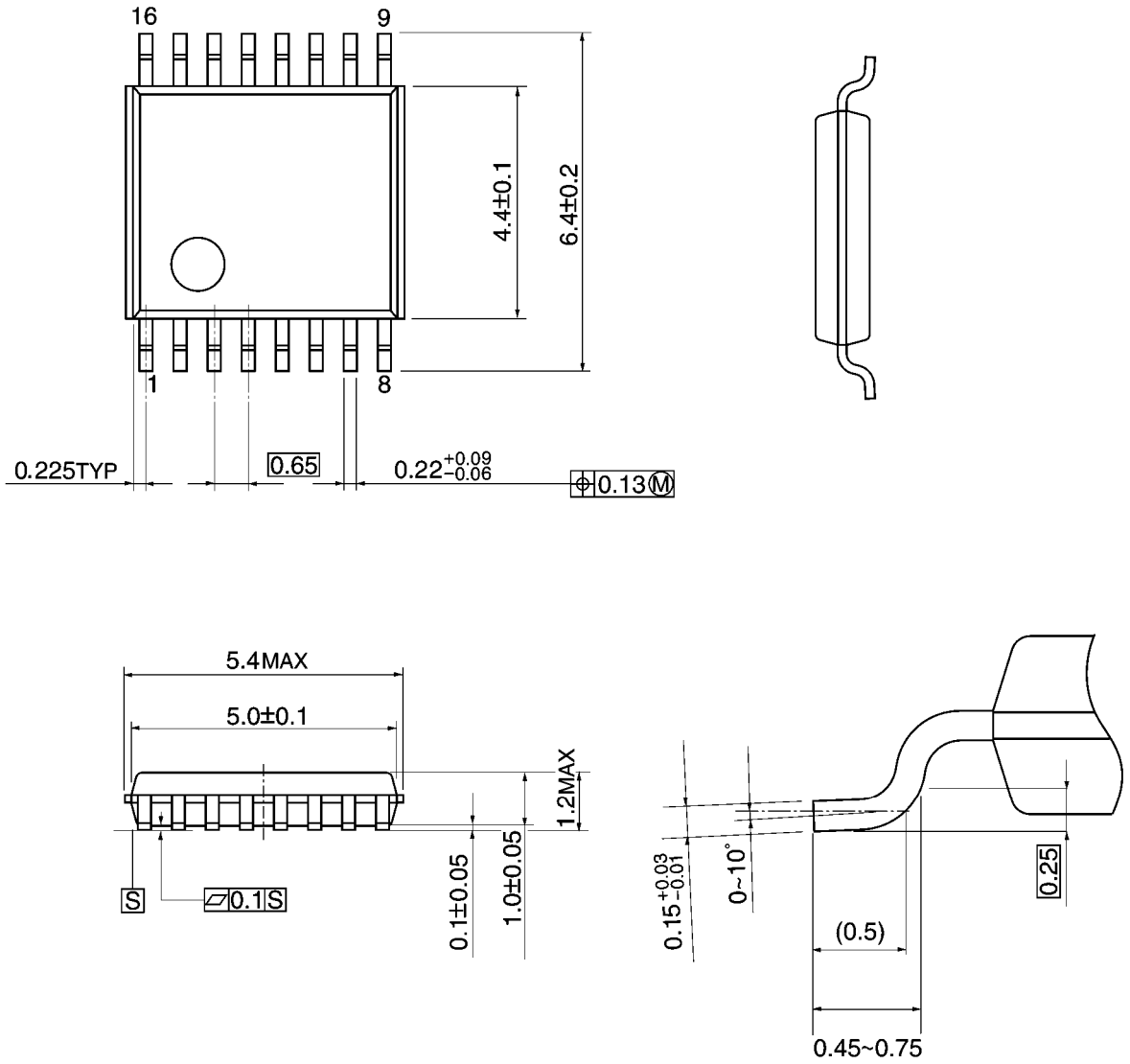
SOP16-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

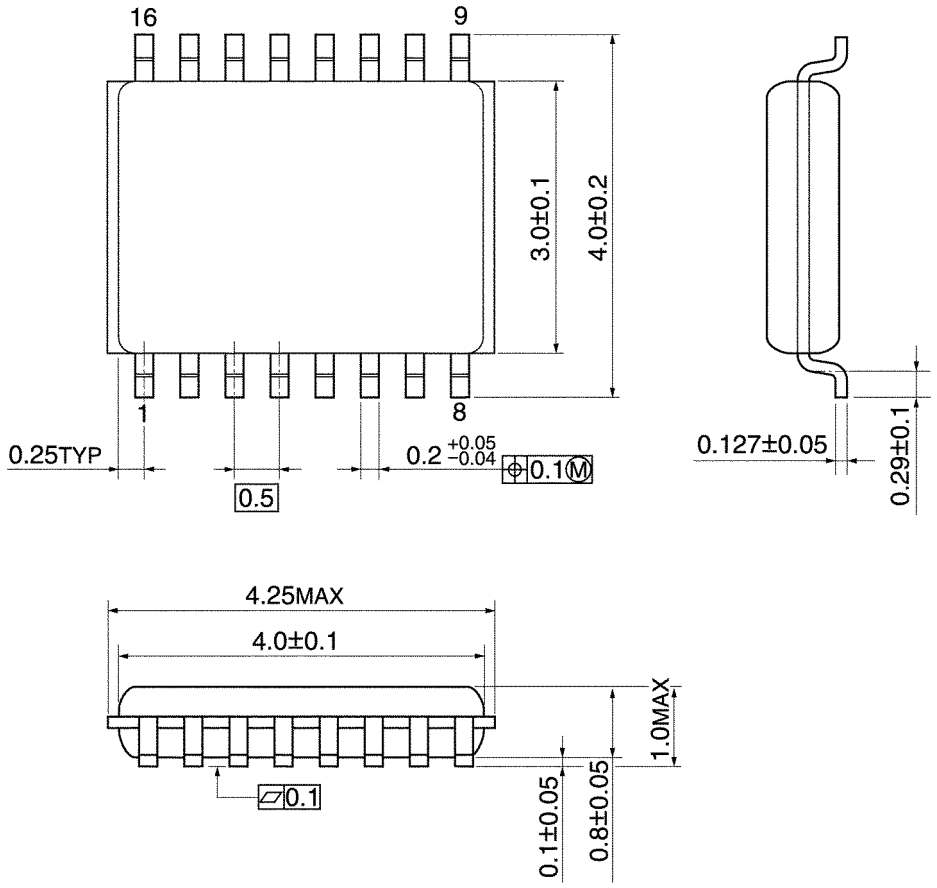
TSSOP16-P-0044-0.65A Unit: mm



Weight: 0.06 g (typ.)

Package Dimensions

VSSOP16-P-0030-0.50 Unit: mm



Weight: 0.02 g (typ.)

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