TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74VHC125F,TC74VHC125FT,TC74VHC125FK
TC74VHC126F,TC74VHC126FT,TC74VHC126FK

TC74VHC125F/FT/FK Quad Bus Buffer

TC74VHC126F/FT/FK Quad Bus Buffer

The TC74VHC125/126 are high speed CMOS QUAD BUS BUFFERs fabricated with silicon gate C^2MOS technology.

They achieve the high speed operation similar to equivalent Bipolar Shottky TTL while maintaining the CMOS low power dissipation.

The TC74VHC125 requires the 3-state control input $\overline{G}$ to be set high to place the output into the high impedance state, whereas the TC74VHC126 requires the control input G to be set low to place the output into high impedance.

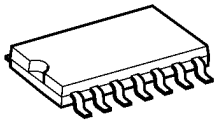
An input protection circuit ensures that 0 to 5.5 V can be applied to the input pins without regard to the supply voltage. This device can be used to interface 5 V to 3 V systems and two supply systems such as battery back up.

This circuit prevents device destruction due to mismatched supply and input voltages.

Features

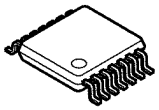
- High speed: t_{pd} = 3.8 ns (typ.) at V_{CC} = 5 V
- Low power dissipation: I_{CC} = 4 μA (max) at Ta = 25°C
- High noise immunity: $V_{NIH} = V_{NIL}$ = 28% V_{CC} (min)
- Power down protection is provided on all inputs.
- Balanced propagation delays: $t_{pLH} \simeq t_{pHL}$
- Wide operating voltage range: $V_{CC\ (opr)}$ = 2 to 5.5 V
- Low noise: V_{OLP} = 0.8 V (max)
- Pin and function compatible with 74ALS125/126

TC74VHC125F, TC74VHC126F



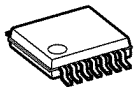
SOP14-P-300-1.27A

TC74VHC125FT, TC74VHC126FT



TSSOP14-P-0044-0.65A

TC74VHC125FK, TC74VHC126FK

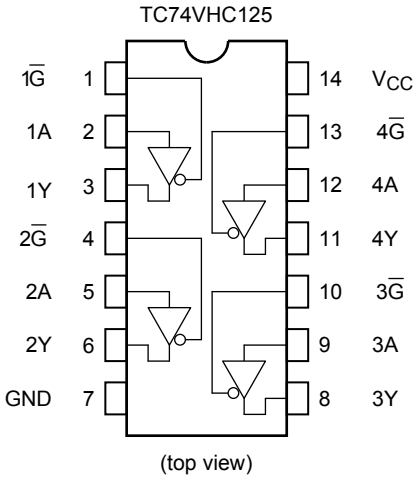


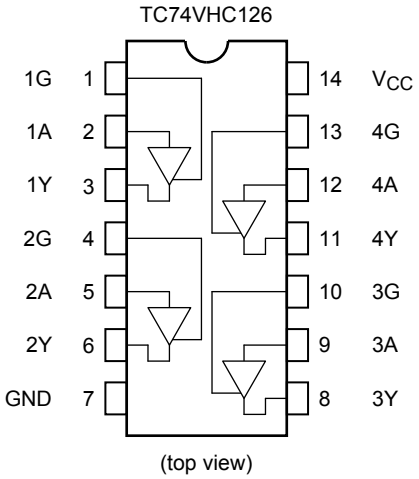
VSSOP14-P-0030-0.50

Weight

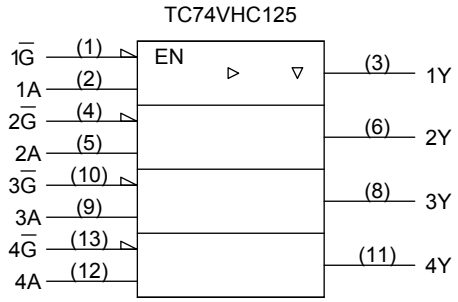
SOP14-P-300-1.27A	: 0.18 g (typ.)
TSSOP14-P-0044-0.65A	: 0.06 g (typ.)
VSSOP14-P-0030-0.50	: 0.02 g (typ.)

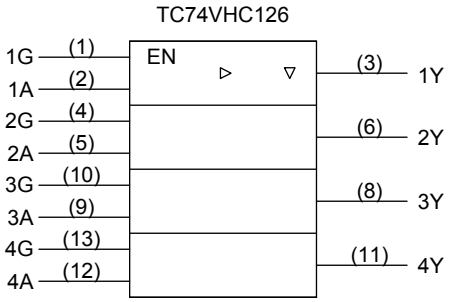
Pin Assignment





IEC Logic Symbol





Truth Table

TC74VHC125

Inputs		Output
$\overline{G}$	A	Y
H	X	Z
L	L	L
L	H	H

X: Don’t care

Z: High impedance

TC74VHC126

Inputs		Output
G	A	Y
L	X	Z
H	L	L
H	H	H

X: Don’t care

Z: High impedance

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 Ranges (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 ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either VCC 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	
3-state output off-state current	I_{OZ}	V_{IN} = V_{IH} or V_{IL} V_{OUT} = V_{CC} or GND		5.5	—	—	±0.25	—	±2.50	μA
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
			V_{CC} (V)	C_L (pF)	Min	Typ.	Max	Min	Max	
Propagation delay time	t_{pLH} t_{pHL}	—	3.3 ± 0.3	15	—	5.6	8.0	1.0	9.5	ns
				50	—	8.1	11.5	1.0	13.0	
			5.0 ± 0.5	15	—	3.8	5.5	1.0	6.5	
				50	—	5.3	7.5	1.0	8.5	
Output enable time	t_{pZL} t_{pZH}	R_L = 1 kΩ	3.3 ± 0.3	15	—	5.4	8.0	1.0	9.5	ns
				50	—	7.9	11.5	1.0	13.0	
			5.0 ± 0.5	15	—	3.6	5.1	1.0	6.0	
				50	—	5.1	7.1	1.0	8.0	
Output disable time	t_{pLZ} t_{pHZ}	R_L = 1 kΩ	3.3 ± 0.3	50	—	9.5	13.2	1.0	15.0	ns
			5.0 ± 0.5	50	—	6.1	8.8	1.0	10.0	
Output to output skew	t_{osLH} t_{osHL}	(Note 1)	3.3 ± 0.3	50	—	—	1.5	—	1.5	ns
			5.0 ± 0.5	50	—	—	1.0	—	1.0	
Input capacitance	C_{IN}	—			—	4	10	—	10	pF
Output capacitance	C_{OUT}	—			—	6	—	—	—	pF
Power dissipation capacitance (Note 2)	C_{PD}	TC74VHC125			—	14	—	—	—	pF
		TC74VHC126			—	15	—	—	—	

Note 1: Parameter guaranteed by design.

$$t_{osLH} = |t_{pLHm} - t_{pLHn}|,\ t_{osHL} = |t_{pHLm} - t_{pHLn}|$$

Note 2: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

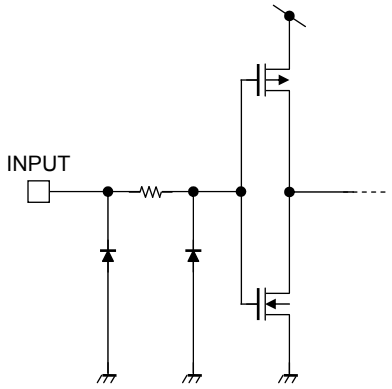
Average operating current can be obtained by the equation:

$$I_{CC\ (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/4 \text{ (per gate)}$$

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

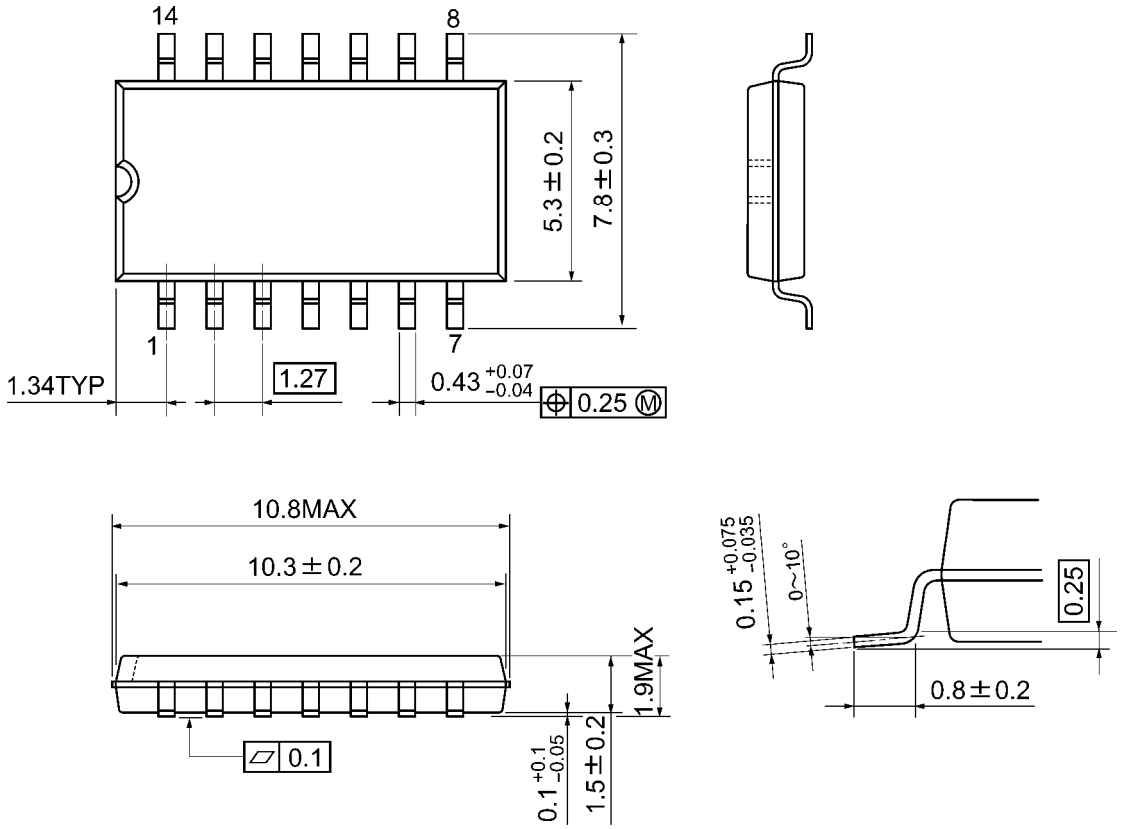
Characteristics	Symbol	Test Condition		Ta = 25°C		Unit
			V_{CC} (V)	Typ.	Limit	
Quiet output maximum dynamic V_{OL}	V_{OLP}	C_L = 50 pF	5.0	0.3	0.8	V
Quiet output minimum dynamic V_{OL}	V_{OLV}	C_L = 50 pF	5.0	−0.3	−0.8	V
Minimum high level dynamic input voltage	V_{IHD}	C_L = 50 pF	5.0	—	3.5	V
Maximum low level dynamic input voltage	V_{ILD}	C_L = 50 pF	5.0	—	1.5	V

Input Equivalent Circuit



Package Dimensions

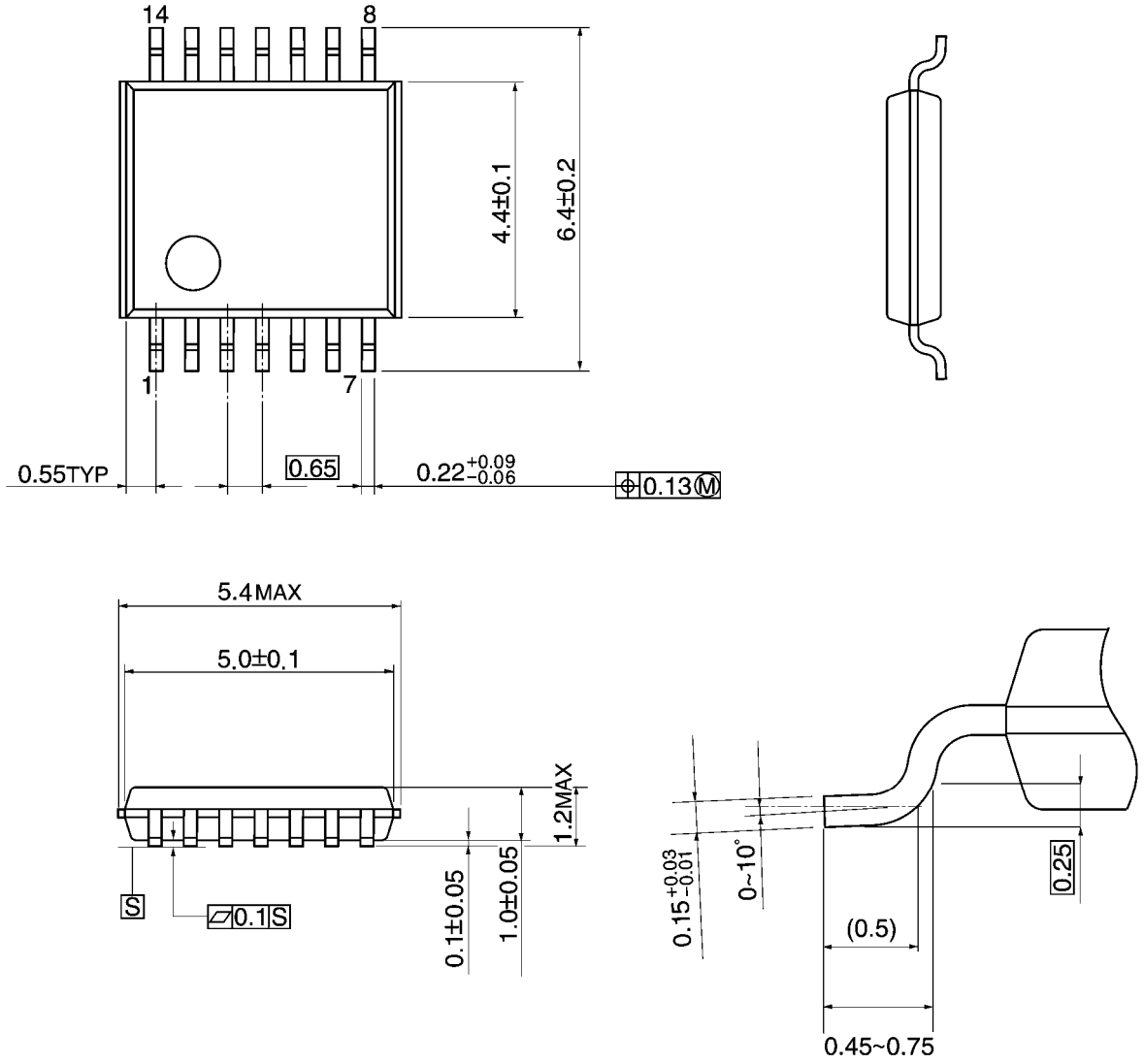
SOP14-P-300-1.27A Unit: mm



Weight: 0.18 g (typ.)

Package Dimensions

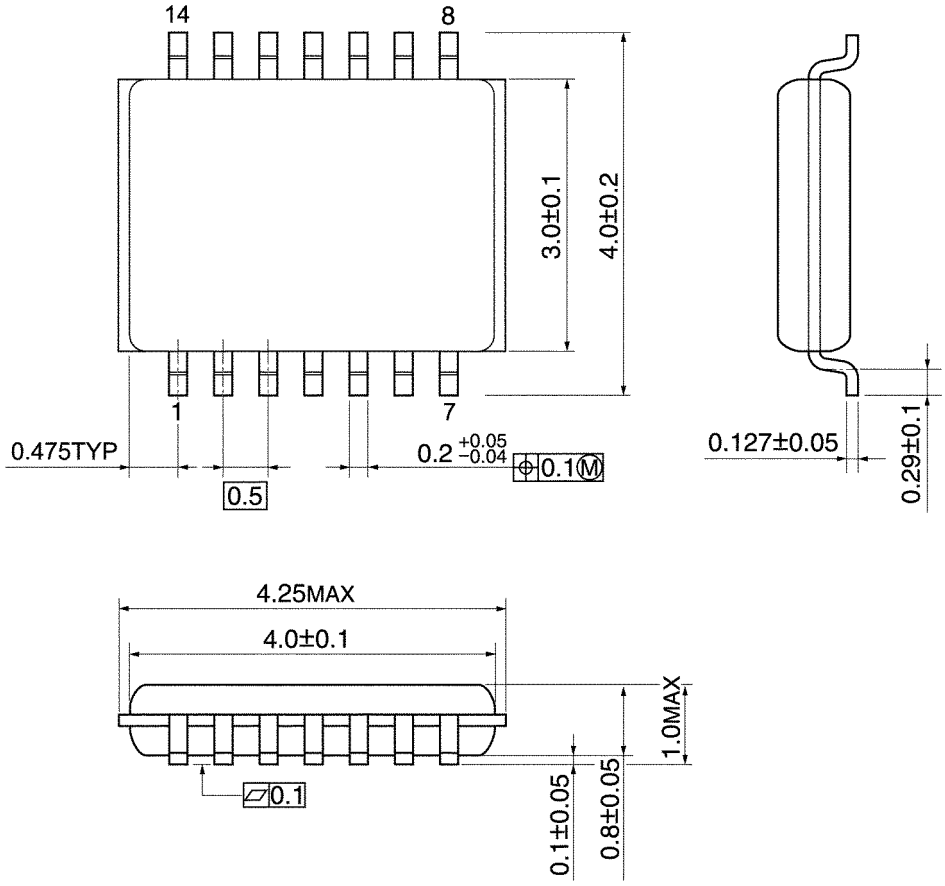
TSSOP14-P-0044-0.65A Unit: mm



Weight: 0.06 g (typ.)

Package Dimensions

VSSOP14-P-0030-0.50 Unit: mm



Weight: 0.02 g (typ.)

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