

TOSHIBA CMOS Digital Integrated Circuit Silicon Monolithic

TC74HC153AFN TC74HC253AFN

TC74HC153AFN

Dual 4-Channel Multiplexer

TC74HC253AFN

Dual 4-Channel
Multiplexer with 3-State
Output

Note: xxxFN (JEDEC SOP) is not available in Japan.

The TC74HC153A and TC74HC253A are high speed CMOS DUAL 4-CHANNEL MULTIPLEXERS fabricated with silicon gate C²MOS technology.

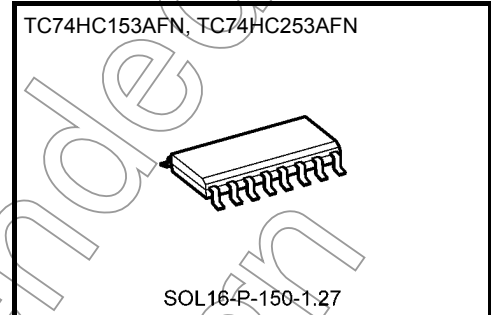
They achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

The TC74HC153A has standard outputs, while the TC74HC253A has 3-state outputs.

Input data (1C0~1C2, 2C0~2C3) are selected by the two address inputs, A and B.

Separate strobe inputs (1 \bar{G} , 2 \bar{G}) are provided for each of the two four-line sections. They can be used to inhibit the data outputs. The output of the HC153A is set low, and the HC253A output is set to the high impedance state, when the strobe inputs are low.

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

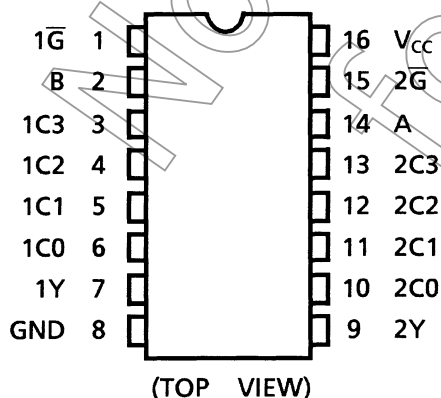


Weight
SOL16-P-150-1.27 : 0.13 g (typ.)

Features

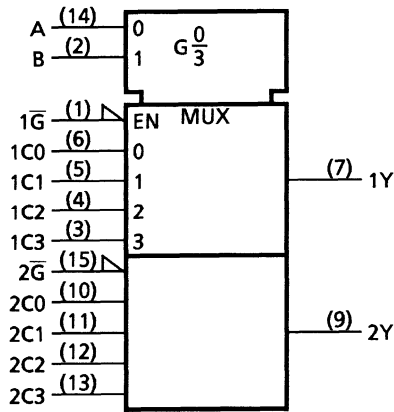
- High speed: $t_{pd} = 12 \text{ ns}$ (typ.) at $V_{CC} = 5 \text{ V}$
- Low power dissipation: $I_{CC} = 4 \mu\text{A}$ (max) at $T_a = 25^\circ\text{C}$
- High noise immunity: $V_{NIH} = V_{NHL} = 28\% V_{CC}$ (min)
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance: $|I_{OH}| = I_{OL} = 4 \text{ mA}$ (min)
- Balanced propagation delays: $t_{PLH} \approx t_{PHL}$
- Wide operating voltage range: $V_{CC} (\text{opr}) = 2 \text{ to } 6 \text{ V}$
- Pin and function compatible with 74LS153, 74LS253

Pin Assignment

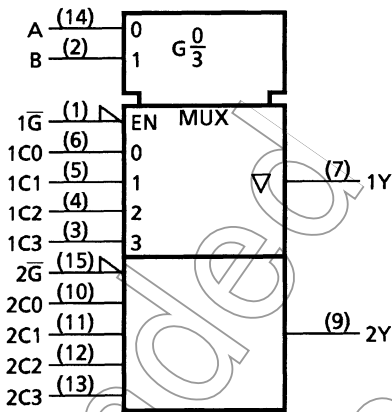


IEC Logic Symbol

TC74HC153A



TC74HC253A



Truth Table

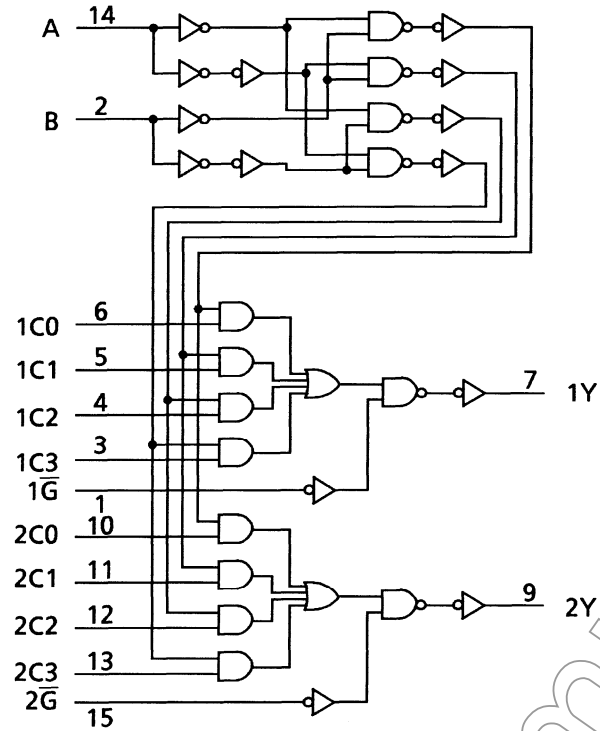
| Select Inputs | | Data Inputs | | | | Strobe | Outputs Y | |
|---------------|---|-------------|----|----|----|----------------|-----------|--------|
| B | A | C0 | C1 | C2 | C3 | \overline{G} | HC153A | HC253A |
| X | X | X | X | X | X | H | L | Z |
| L | L | L | X | X | X | L | L | L |
| L | L | H | X | X | X | L | H | H |
| L | H | X | L | X | X | L | L | L |
| L | H | X | H | X | X | L | H | H |
| H | L | X | X | L | X | L | L | L |
| H | L | X | X | H | X | L | H | H |
| H | H | X | X | X | L | L | L | L |
| H | H | X | X | X | H | L | H | H |

X: Don't care

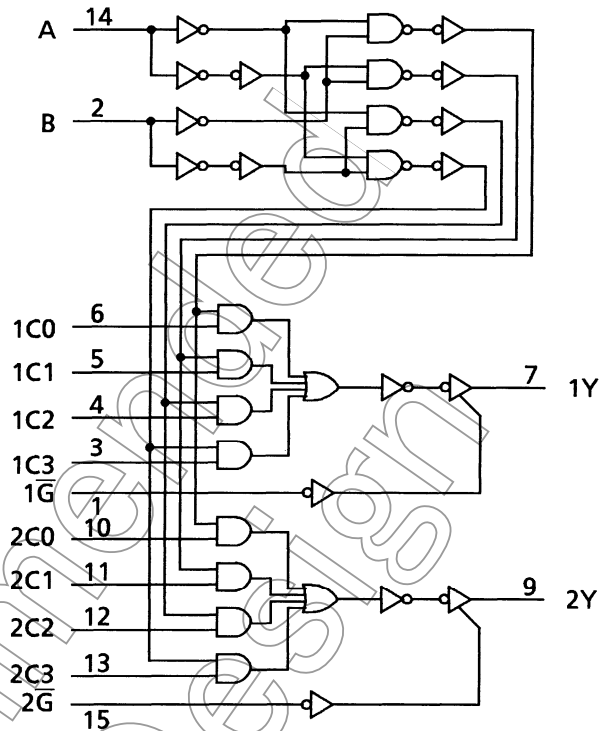
Z: High impedance

System Diagram

TC74HC153A



TC74HC253A



Absolute Maximum Ratings (Note)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|------------------------|------|
| Supply voltage range | V_{CC} | -0.5 to 7 | V |
| DC input voltage | V_{IN} | -0.5 to $V_{CC} + 0.5$ | 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 to 6 | V |
| Input voltage | V_{IN} | 0 to V_{CC} | V |
| Output voltage | V_{OUT} | 0 to V_{CC} | V |
| Operating temperature | T_{opr} | -40~85 | °C |
| Input rise and fall time | t_r, t_f | 0 to 1000 ($V_{CC} = 2.0$ V) 0 to 500 ($V_{CC} = 4.5$ V) 0 to 400 ($V_{CC} = 6.0$ V) | ns |

Note: The operating ranges 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 |
|----------------------------------|---------------------------|---------------------------------------|---------------|-------------------|----------------------|-------------------|----------------------|----------------------|----------------------|------|
| | | | | VCC (V) | Min | Typ. | Max | Min | Max | |
| High-level input voltage | VIH | — | | 2.0 4.5 6.0 | 1.50 3.15 4.20 | — — — | — — — | 1.50 3.15 4.20 | — — — | V |
| Low-level input voltage | VIL | — | | 2.0 4.5 6.0 | — — — | — — — | 0.50 1.35 1.80 | — — — | 0.50 1.35 1.80 | V |
| High-level output voltage | VOH | VIN = VIH or VIL | IOH = -20 μA | 2.0 4.5 6.0 | 1.9 4.4 5.9 | 2.0 4.5 6.0 | — — — | 1.9 4.4 5.9 | — — — | V |
| | | | IOH = -4 mA | 4.5 | 4.18 | 4.31 | — | 4.13 | — | |
| | | | IOH = -5.2 mA | 6.0 | 5.68 | 5.80 | — | 5.63 | — | |
| | | | | | | | | | | |
| Low-level output voltage | VOL | VIN = VIH or VIL | IOL = 20 μA | 2.0 4.5 6.0 | — — — | 0.0 0.0 0.0 | 0.1 0.1 0.1 | — — — | 0.1 0.1 0.1 | V |
| | | | IOL = 4 mA | 4.5 | — | 0.17 | 0.26 | — | 0.33 | |
| | | | IOL = 5.2 mA | 6.0 | — | 0.18 | 0.26 | — | 0.33 | |
| | | | | | | | | | | |
| 3-state output off-state current | I _{OZ} (Note) | VIN = VIH or VIL VOUT = VCC or GND | | 6.0 | — | — | ±0.5 | — | ±5.0 | μA |
| Input leakage current | IIN | VIN = VCC or GND | | 6.0 | — | — | ±0.1 | — | ±1.0 | μA |
| Quiescent supply current | ICC | VIN = VCC or GND | | 6.0 | — | — | 4.0 | — | 40.0 | μA |

Note: TC74HC253A only

AC Characteristics (CL = 15 pF, VCC = 5 V, Ta = 25°C, input: tr = tf = 6 ns)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|--------------------------------------|-----------------------|-----|------|-----|------|
| Output transition time | t _{TLH} t _{THL} | — | — | 4 | 8 | ns |
| Propagation delay time (Cn-Y) | t _{pLH} t _{pHL} | — | — | 12 | 19 | ns |
| Propagation delay time (A, B-Y) | t _{pLH} t _{pHL} | — | — | 17 | 26 | ns |
| Propagation delay time (\bar{G} -Y) (Note 1) | t _{pLH} t _{pHL} | — | — | 8 | 16 | ns |
| 3-state output enable time (\bar{G} -Y) (Note 2) | t _{pZL} t _{pZH} | R _L = 1 kΩ | — | 9 | 16 | ns |

Note 1: For TC74HC153A only

Note 2: For TC74HC253A only

AC Characteristics ($C_L = 50 \text{ pF}$, input: $t_r = t_f = 6 \text{ ns}$)

| Characteristics | Symbol | Test Condition | $V_{CC} \text{ (V)}$ | $T_a = 25^\circ\text{C}$ | | | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit |
|--|------------------------|---------------------------|----------------------|--------------------------|------|-----|--|-----|------|
| | | | | Min | Typ. | Max | Min | Max | |
| Output transition time | t_{TLH} t_{THL} | — | 2.0 | — | 30 | 75 | — | 95 | ns |
| | | | 4.5 | — | 8 | 15 | — | 19 | |
| | | | 6.0 | — | 7 | 13 | — | 16 | |
| Propagation delay time (Cn-Y) | t_{pLH} t_{pHL} | — | 2.0 | — | 48 | 115 | — | 145 | ns |
| | | | 4.5 | — | 15 | 23 | — | 29 | |
| | | | 6.0 | — | 12 | 20 | — | 25 | |
| Propagation delay time (A, B-Y) | t_{pLH} t_{pHL} | — | 2.0 | — | 68 | 150 | — | 190 | ns |
| | | | 4.5 | — | 20 | 30 | — | 38 | |
| | | | 6.0 | — | 16 | 26 | — | 33 | |
| Propagation delay time (\bar{G} -Y) (Note 2) | t_{pLH} t_{pHL} | — | 2.0 | — | 31 | 95 | — | 120 | ns |
| | | | 4.5 | — | 11 | 19 | — | 24 | |
| | | | 6.0 | — | 9 | 16 | — | 20 | |
| 3-state output enable time (\bar{G} -Y) (Note 3) | t_{pZL} t_{pZH} | $R_L = 1 \text{ k}\Omega$ | 2.0 | — | 36 | 100 | — | 125 | ns |
| | | | 4.5 | — | 12 | 20 | — | 25 | |
| | | | 6.0 | — | 9 | 17 | — | 21 | |
| 3-state output disable time (\bar{G} -Y) (Note 3) | t_{pLZ} t_{pHZ} | $R_L = 1 \text{ k}\Omega$ | 2.0 | — | 22 | 115 | — | 145 | ns |
| | | | 4.5 | — | 13 | 23 | — | 29 | |
| | | | 6.0 | — | 11 | 20 | — | 25 | |
| Input capacitance | C_{IN} | — | — | — | 5 | 10 | — | 10 | pF |
| Power dissipation capacitance | C_{PD} (Note 1) | TC74HC153A | — | — | 58 | — | — | — | pF |
| | | TC74HC253A | — | — | 59 | — | — | — | |

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:

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

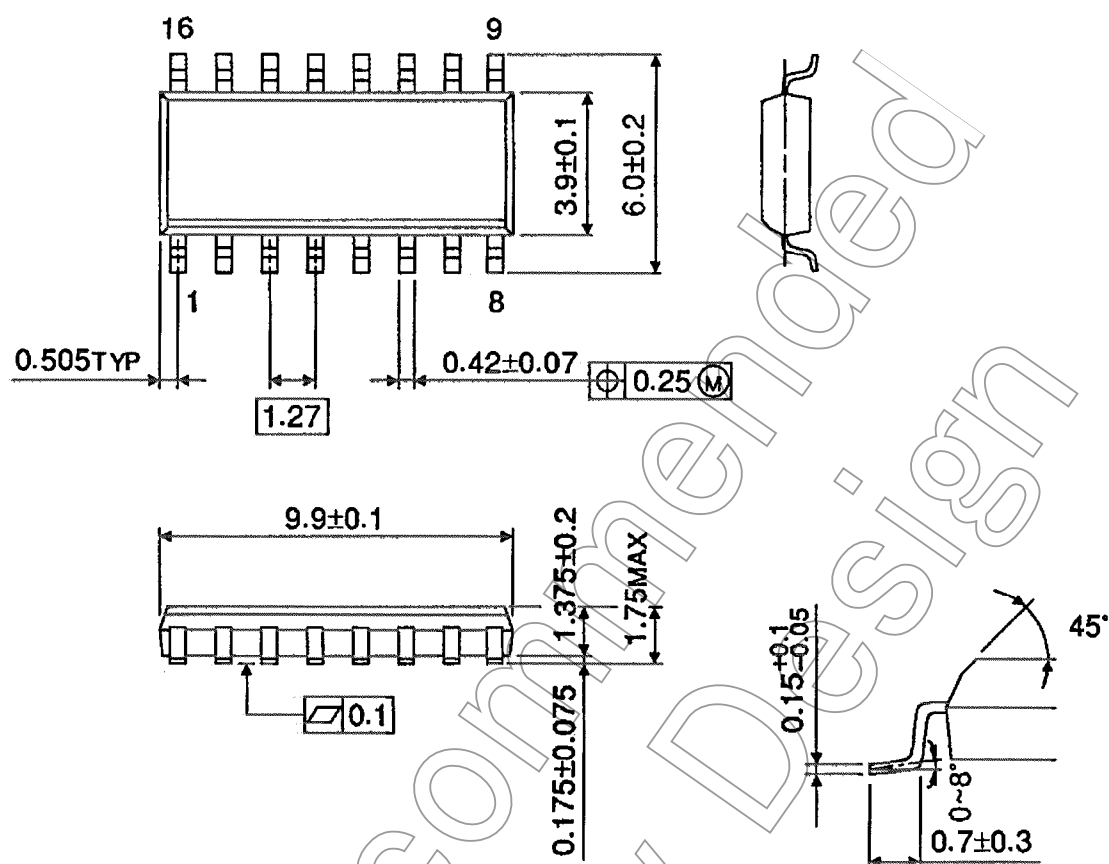
Note 2: For TC74HC153A only

Note 3: For TC74HC253A only

Package Dimensions (Note)

SOL16-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.13 g (typ.)

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