

TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC74LVX157F, TC74LVX157FN, TC74LVX157FT**QUAD 2-CHANNEL MULTIPLEXER**

The TC74LVX157 is a high speed CMOS QUAD 2-CHANNEL MULTIPLEXER fabricated with silicon gate C²MOS technology.

Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation. This device is suitable for low voltage and battery operated systems.

This device consist of four 2-input digital multiplexers with common select and strobe inputs.

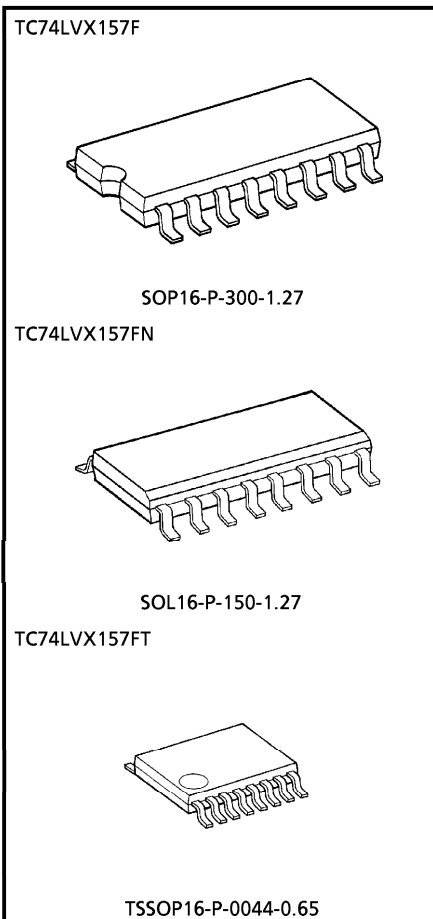
When the $\overline{\text{STROBE}}$ input is held "H" level, selection of data is inhibited and all the outputs become "L" level. The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs.

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 : $t_{pd} = 5.1\text{ns}$ (Typ.) ($V_{CC} = 3.3\text{V}$)
- Low power dissipation : $I_{CC} = 4\mu\text{A}$ (Max.) ($T_a = 25^\circ\text{C}$)
- Input voltage level : $V_{IL} = 0.8\text{V}$ (Max.) ($V_{CC} = 3\text{V}$)
 $V_{IH} = 2.0\text{V}$ (Min.) ($V_{CC} = 3\text{V}$)
- Power down protection is provided on all inputs.
- Balanced propagation delays
: $t_{pLH} \approx t_{pHL}$
- Low noise : $V_{OLP} = 0.5\text{V}$ (Max.)
- Pin and function compatible with 74HC157

(Note) The JEDEC SOP (FN) is not available in Japan.

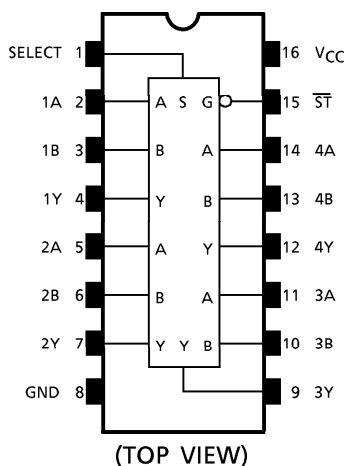


Weight
 SOP16-P-300-1.27 : 0.18g (Typ.)
 SOL16-P-150-1.27 : 0.12g (Typ.)
 TSSOP16-P-0044-0.65 : 0.06g (Typ.)

961001EBA2

● TOSHIBA is continually working to improve the quality and the reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to observe standards of safety, and to avoid situations in which a malfunction or failure of a TOSHIBA product could cause loss of human life, bodily injury or damage to property. In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent products specifications. Also, please keep in mind the precautions and conditions set forth in the TOSHIBA Semiconductor Reliability Handbook.

PIN ASSIGNMENT

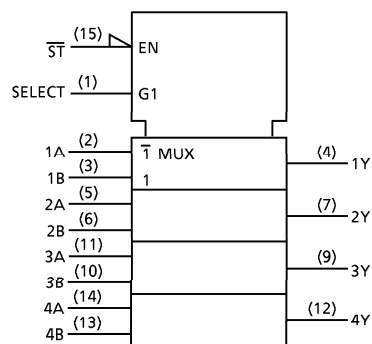


TRUTHTH TABLE

| INPUTS | | | | OUTPUTS |
|--------|--------|---|---|---------|
| ST-bar | SELECT | A | B | |
| H | X | X | X | L |
| L | L | L | X | L |
| L | L | H | X | H |
| L | H | X | L | L |
| L | H | X | H | H |

X : Don't Care

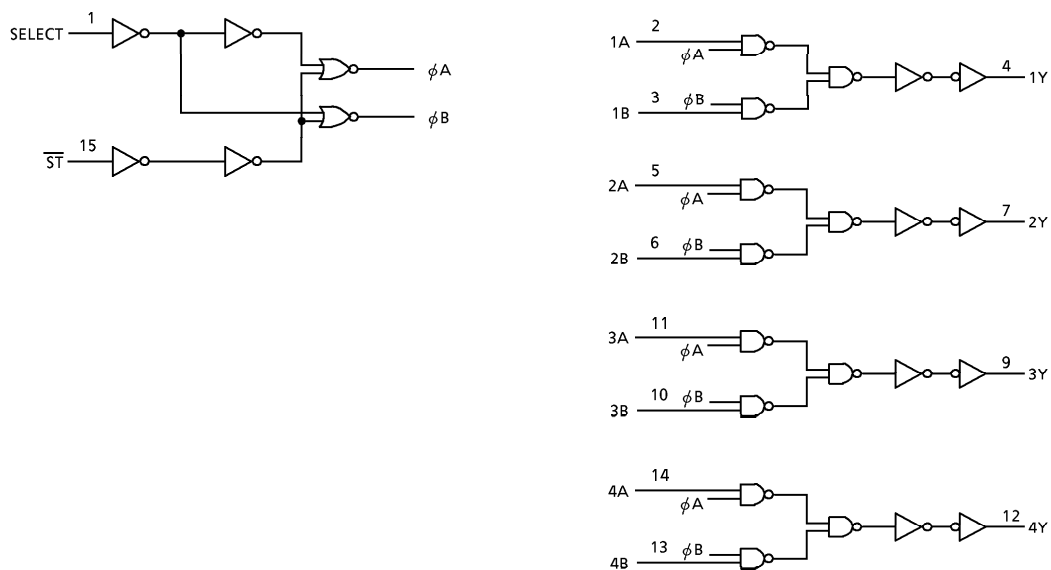
IEC LOGIC SYMBOL



961001EBA2'

- The products described in this document are subject to foreign exchange and foreign trade control laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

SYSTEM DIAGRAM



MAXIMUM RATINGS

| PARAMETER | SYMBOL | RATING | 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 | RATING | UNIT |
|--------------------------|-----------|-------------|------|
| Supply Voltage | V_{CC} | 2.0~3.6 | 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 | ns/V |

ELECTRICAL CHARACTERISTICS

DC characteristics

| PARAMETER | | SYM-BOL | TEST CONDITION | | V _{CC} (V) | Ta = 25°C | | | Ta = -40~85°C | | UNIT | | | |
|--------------------------|-----------------|--|---|---|---|-----------|------------------------|------|---------------|------|------|---|---|------|
| | | | | | | MIN. | TYP. | MAX. | MIN. | MAX. | | | | |
| Input Voltage | "H" Level | V _{IH} | | | 2.0 | 1.5 | — | — | 1.5 | — | V | | | |
| | | | | | 3.0 | 2.0 | — | — | 2.0 | — | | | | |
| | | | | | 3.6 | 2.4 | — | — | 2.4 | — | | | | |
| | "L" Level | V _{IL} | | | 2.0 | — | — | 0.5 | — | 0.5 | | | | |
| | | | | | 3.0 | — | — | 0.8 | — | 0.8 | | | | |
| | | | | | 3.6 | — | — | 0.8 | — | 0.8 | | | | |
| Output Voltage | "H" Level | V _{OH} | V _{IN} = V _{IH} or V _{IL} | | I _{OH} = -50μA | 2.0 | 1.9 | 2.0 | — | 1.9 | — | V | | |
| | | | | | I _{OH} = -50μA | 3.0 | 2.9 | 3.0 | — | 2.9 | — | | | |
| | | | | | I _{OH} = -4mA | 3.0 | 2.58 | — | — | 2.48 | — | | | |
| | "L" Level | V _{OL} | | | V _{IN} = V _{IH} or V _{IL} | | I _{OL} = 50μA | 2.0 | — | 0.0 | 0.1 | | — | 0.1 |
| | | | | | | | I _{OL} = 50μA | 3.0 | — | 0.0 | 0.1 | | — | 0.1 |
| | | | | | | | I _{OL} = 4mA | 3.0 | — | — | 0.36 | | — | 0.44 |
| Input Leakage Current | I _{IN} | V _{IN} = 5.5V or GND | 3.6 | — | | | — | ±0.1 | — | ±1.0 | μA | | | |
| Quiescent Supply Current | I _{CC} | V _{IN} = V _{CC} or GND | 3.6 | — | | | — | 4.0 | — | 40.0 | μA | | | |

AC characteristics (Input $t_r = t_f = 3\text{ns}$)

| PARAMETER | SYM-BOL | TEST CONDITION | | | Ta = 25°C | | | Ta = -40~85°C | | UNIT |
|--|-------------------|----------------|---------------------|---------------------|-----------|------|------|---------------|------|------|
| | | | V _{CC} (V) | C _L (pF) | MIN. | TYP. | MAX. | MIN. | MAX. | |
| Propagation Delay Time (A, B-Y) | t _{pLH} | | 2.7 | 15 | — | 6.6 | 12.5 | 1.0 | 15.5 | ns |
| | | | | 50 | — | 9.1 | 16.0 | 1.0 | 19.0 | |
| | 3.3 ± 0.3 | | 15 | — | 5.1 | 7.9 | 1.0 | 9.5 | | |
| | | | 50 | — | 7.6 | 11.4 | 1.0 | 13.0 | | |
| Propagation Delay Time (SELECT-Y) | t _{pLH} | | 2.7 | 15 | — | 8.9 | 16.9 | 1.0 | 20.5 | ns |
| | | | | 50 | — | 11.4 | 20.4 | 1.0 | 24.0 | |
| | 3.3 ± 0.3 | | 15 | — | 7.0 | 11.0 | 1.0 | 13.0 | | |
| | | | 50 | — | 9.5 | 14.5 | 1.0 | 16.5 | | |
| Propagation Delay Time (\overline{S} -Y) | t _{pLH} | | 2.7 | 15 | — | 9.1 | 17.6 | 1.0 | 20.5 | ns |
| | | | | 50 | — | 11.6 | 21.1 | 1.0 | 24.0 | |
| | 3.3 ± 0.3 | | 15 | — | 7.2 | 11.5 | 1.0 | 13.5 | | |
| | | | 50 | — | 9.7 | 15.0 | 1.0 | 17.0 | | |
| Output To Output Skew | t _{osLH} | (Note 1) | 2.7 | 50 | — | — | 1.5 | — | 1.5 | ns |
| | t _{osHL} | | 3.3 ± 0.3 | 50 | — | — | 1.5 | — | 1.5 | |
| Input Capacitance | C _{IN} | (Note 2) | | | — | 4 | 10 | — | 10 | pF |
| Power Dissipation Capacitance | C _{PD} | (Note 3) | | | — | 20 | — | — | — | pF |

(Note 1) Parameter guaranteed by design.

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

(Note 2) Parameter guaranteed by design.

(Note 3) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption.

Average operating current can be obtained by the equation :

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

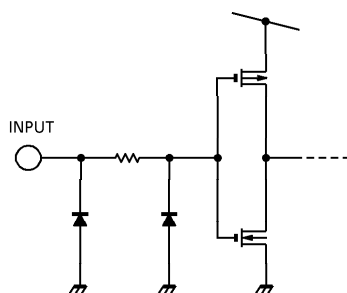
And the total C_{PD} when n pcs. of gate operate can be gained by the following equation :

$$C_{PD} \text{ (total)} = 13 + 7 \cdot n$$

Noise characteristics ($T_a = 25^\circ\text{C}$, Input $t_r = t_f = 3\text{ns}$, $C_L = 50\text{pF}$)

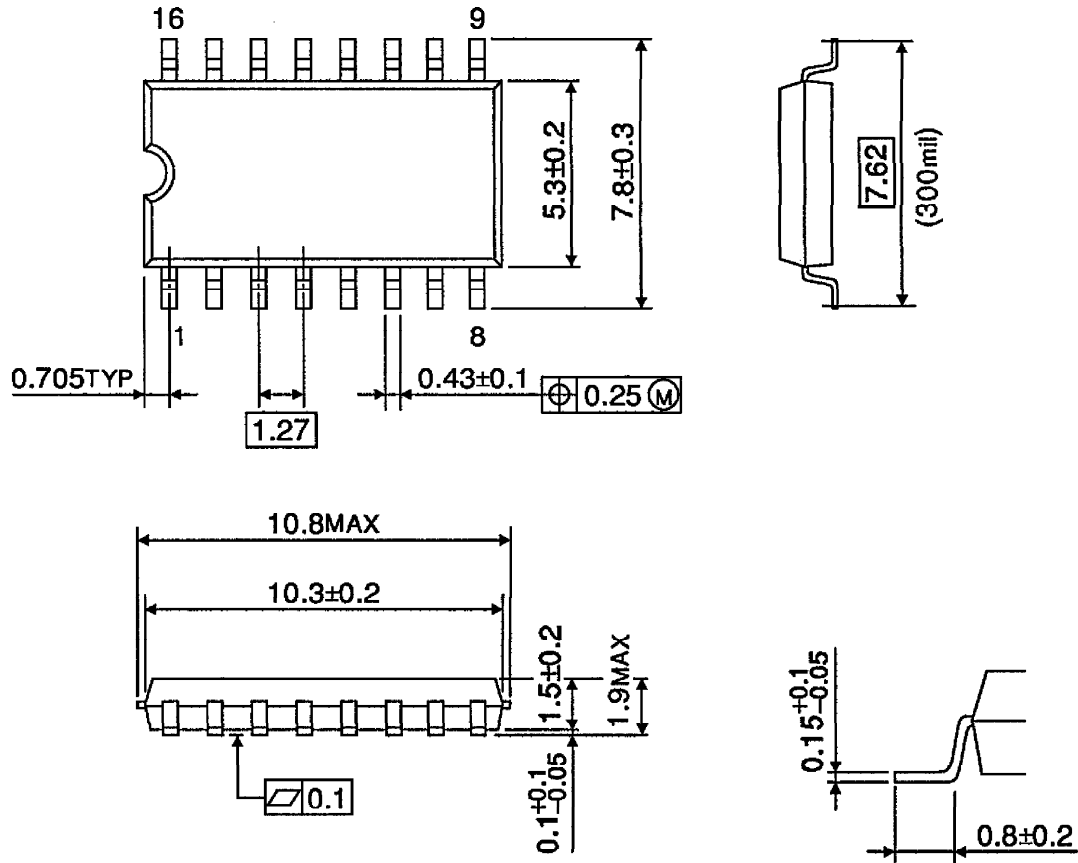
| PARAMETER | SYMBOL | TEST CONDITION | V_{CC} (V) | TYP. | LIMIT | UNIT |
|--|-----------|----------------|--------------|------|-------|------|
| | | | | | | |
| Quiet Output Maximum Dynamic V_{OL} | V_{OLP} | | 3.3 | 0.3 | 0.5 | V |
| Quiet Output Minimum Dynamic V_{OL} | V_{OLV} | | 3.3 | -0.3 | -0.5 | V |
| Minimum High Level Dynamic Input Voltage | V_{IHD} | | 3.3 | — | 2.0 | V |
| Maximum Low Level Dynamic Input Voltage | V_{ILD} | | 3.3 | — | 0.8 | V |

INPUT EQUIVALENT CIRCUIT



OUTLINE DRAWING
SOP16-P-300-1.27

Unit : mm

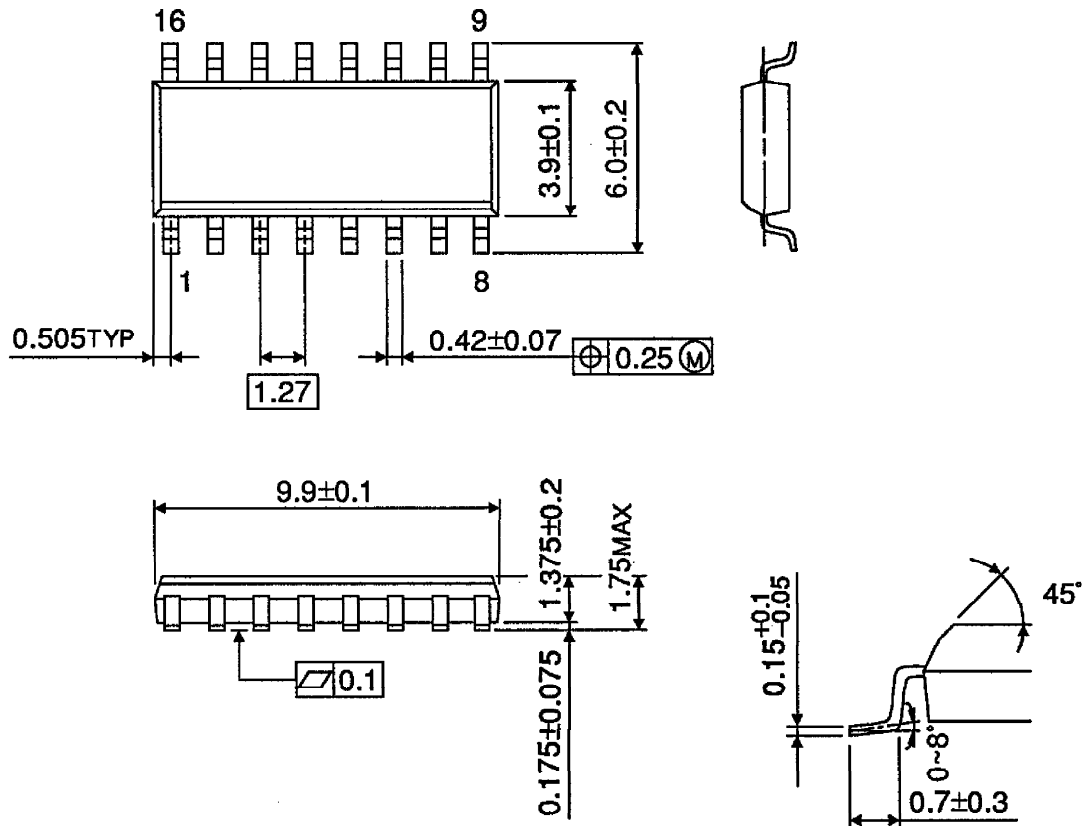


Weight : 0.18g (Typ.)

OUTLINE DRAWING
SOL16-P-150-1.27

Unit : mm

(Note) This package is not available in Japan.

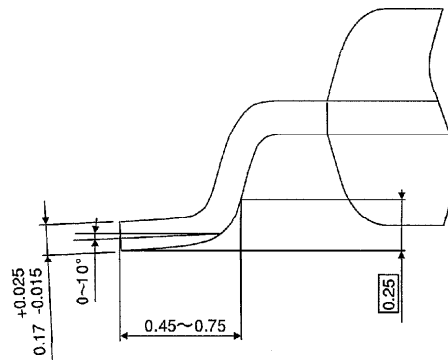
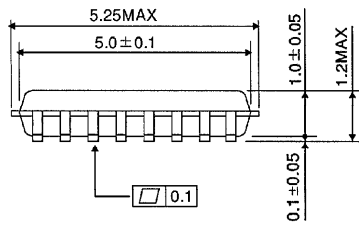
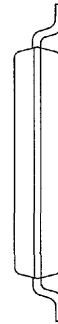
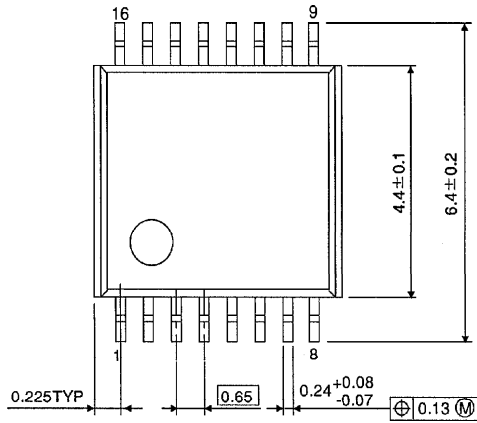


Weight : 0.12g (Typ.)

OUTLINE DRAWING

TSSOP16-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)