

TC74LCX157F, TC74LCX157FN, TC74LCX157FT

LOW VOLTAGE QUAD 2-CHANNEL MULTIPLEXER WITH 5V TOLERANT INPUTS AND OUTPUTS

The TC74LCX157 is a high performance CMOS MULTIPLEXER. Designed for use in 3.3 Volt systems, it achieves high speed operation while maintaining the CMOS low power dissipation.

The device is designed for low-voltage (3.3V) V_{CC} applications, but it could be used to interface to 5V supply environment for inputs.

It consists of four 2-input digital multiplexers with common select and strobe inputs.

When the \overline{STROBE} input is held "H" level, selection of data is inhibited and all the outputs become "L" level.

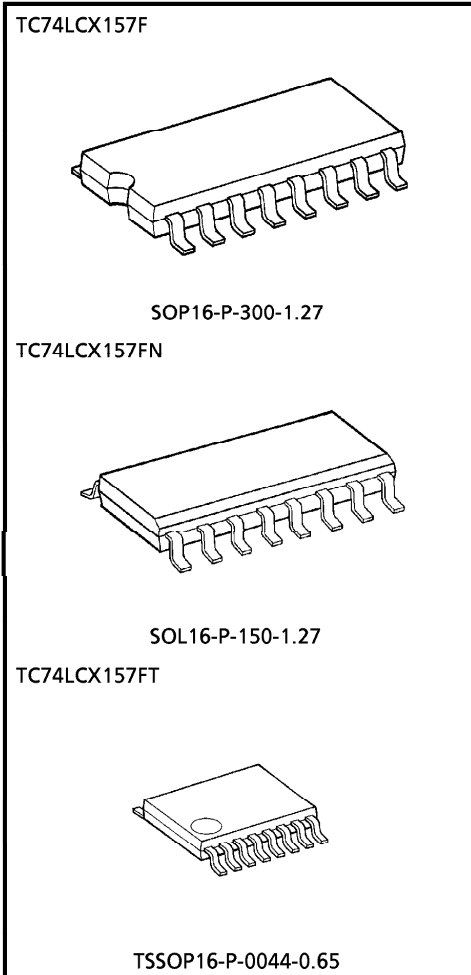
The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs.

All inputs are equipped with protection circuits against static discharge.

FEATURES

- Low voltage operation : $V_{CC} = 2.0 \sim 3.6V$
- High speed operation : $t_{pd} = 6.0ns$ (Max.)
($V_{CC} = 3.0 \sim 3.6V$)
- Output current : $|I_{OH}| / I_{OL} = 24mA$ (Min.)
($V_{CC} = 3.0V$)
- Latch-up performance : $\pm 500mA$
- Available in JEDEC SOP, EIAJ SOP and TSSOP
- Power down protection is provided on all inputs and outputs.
- Pin and function compatible with the 74 series (74AC/VHC/HC/F/ALS/LS etc.) 157 type.

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



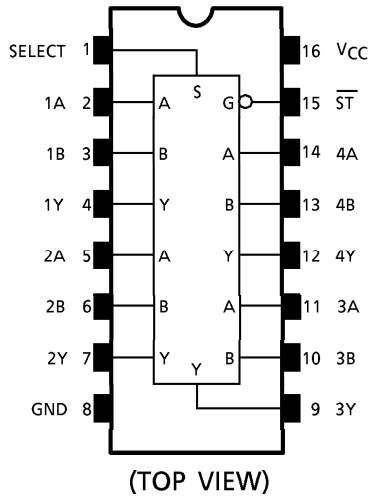
Weight

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

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PIN ASSIGNMENT

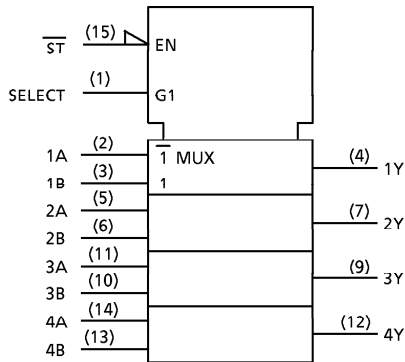


TRUTH TABLE

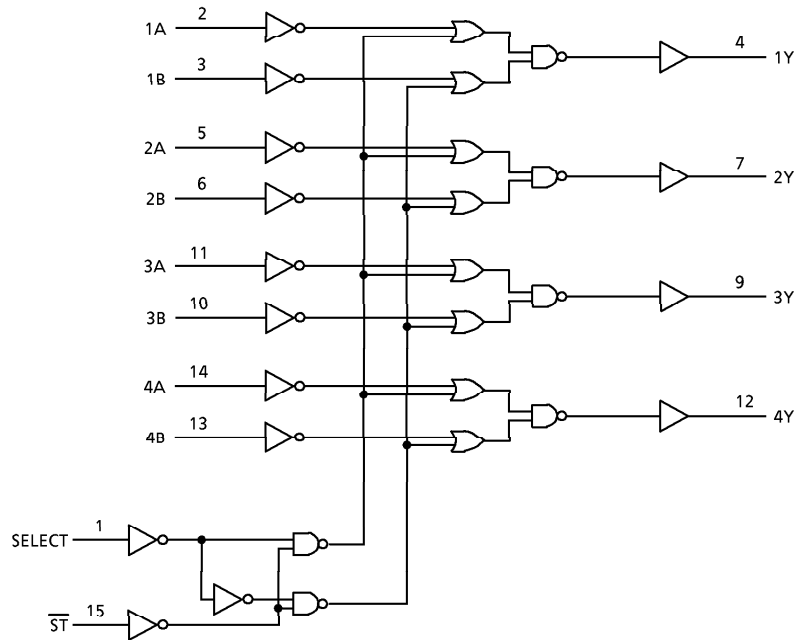
| INPUTS | | | | OUTPUTS |
|-----------------|--------|---|---|---------|
| \overline{ST} | SELECT | A | B | Y |
| H | X | X | X | L |
| L | L | L | X | L |
| L | L | H | X | H |
| L | H | X | L | L |
| L | H | X | H | H |

X : Don't Care

IEC LOGIC SYMBOL



SYSTEM DIAGRAM



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- 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.

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} | -0.5~7.0 (Note 1) | V |
| | | -0.5~ V_{CC} +0.5 (Note 2) | |
| Input Diode Current | I_{IK} | -50 | mA |
| Output Diode Current | I_{OK} | ±50 (Note 3) | mA |
| DC Output Current | I_{OUT} | ±50 | mA |
| Power Dissipation | P_D | 180 | mW |
| DC V_{CC} /Ground Current | I_{CC}/I_{GND} | ±100 | mA |
| Storage Temperature | T_{stg} | -65~150 | °C |

(Note 1) $V_{CC} = 0V$

(Note 2) High or Low State. I_{OUT} absolute maximum rating must be observed.

(Note 3) $V_{OUT} < GND$, $V_{OUT} > V_{CC}$

RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | RATING | UNIT |
|--------------------------|-----------------|----------------------|------|
| Supply Voltage | V_{CC} | 2.0~3.6 | V |
| | | 1.5~3.6 (Note 4) | |
| Input Voltage | V_{IN} | 0~5.5 | V |
| Output Voltage | V_{OUT} | 0~5.5 (Note 5) | V |
| | | 0~ V_{CC} (Note 6) | |
| Output Current | I_{OH}/I_{OL} | ±24 (Note 7) | mA |
| | | ±12 (Note 8) | |
| Operating Temperature | T_{opr} | -40~85 | °C |
| Input Rise And Fall Time | dt/dv | 0~10 (Note 9) | ns/V |

(Note 4) Data Retention Only

(Note 5) $V_{CC} = 0V$

(Note 6) High or Low State

(Note 7) $V_{CC} = 3.0\sim 3.6V$

(Note 8) $V_{CC} = 2.7\sim 3.0V$

(Note 9) $V_{IN} = 0.8\sim 2.0V$, $V_{CC} = 3.0V$

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (Ta = -40~85°C)

| PARAMETER | | SYMBOL | TEST CONDITION | V _{CC} (V) | MIN. | MAX. | UNIT | |
|---------------------------------------|-----------|------------------|--|--------------------------|---------|-----------------------|------|---|
| Input Voltage | "H" Level | | | V _{IH} | | | | |
| | "L" Level | V _{IL} | | 2.7~3.6 | — | 0.8 | | |
| Output Voltage | "H" Level | V _{OH} | V _{IN} = V _{IH} or V _{IL} | I _{OH} = -100μA | 2.7~3.6 | V _{CC} - 0.2 | — | V |
| | | | | I _{OH} = -12mA | 2.7 | 2.2 | — | |
| | | | | I _{OH} = -18mA | 3.0 | 2.4 | — | |
| | | | | I _{OH} = -24mA | 3.0 | 2.2 | — | |
| | "L" Level | V _{OL} | V _{IN} = V _{IH} or V _{IL} | I _{OL} = 100μA | 2.7~3.6 | — | 0.2 | |
| | | | | I _{OL} = 12mA | 2.7 | — | 0.4 | |
| | | | | I _{OL} = 16mA | 3.0 | — | 0.4 | |
| | | | | I _{OL} = 24mA | 3.0 | — | 0.55 | |
| Input Leakage Current | | I _{IIN} | V _{IN} = 0~5.5V | 2.7~3.6 | — | ±5.0 | μA | |
| Power Off Leakage Current | | I _{OFF} | V _{IN} / V _{OUT} = 5.5V | 0 | — | 10.0 | μA | |
| Quiescent Supply Current | | I _{CC} | V _{IN} = V _{CC} or GND | 2.7~3.6 | — | 10.0 | μA | |
| | | | V _{IN} / V _{OUT} = 3.6~5.5V | 2.7~3.6 | — | ±10.0 | | |
| Increase In I _{CC} Per Input | | ΔI _{CC} | V _{IH} = V _{CC} - 0.6V | 2.7~3.6 | — | 500 | μA | |

AC CHARACTERISTICS (Ta = -40~85°C)

| PARAMETER | SYMBOL | TEST CONDITION | V _{CC} (V) | MIN. | MAX. | UNIT |
|--|--|----------------|---------------------------------|------|------|------|
| | | | Propagation Delay Time (A, B-Y) | | | |
| 3.3 ± 0.3 | 1.5 | 5.8 | | | | |
| Propagation Delay Time (SELECT-Y) | t _{pLH} t _{pHL} | (Fig.1, 2) | 2.7 | — | 8.0 | ns |
| | | | 3.3 ± 0.3 | 1.5 | 7.0 | |
| Propagation Delay Time (S _T -Y) | t _{pLH} t _{pHL} | (Fig.1, 2) | 2.7 | — | 8.0 | ns |
| | | | 3.3 ± 0.3 | 1.5 | 7.0 | |
| Output To Output Skew | t _{osLH} t _{osHL} | (Note 10) | 2.7 | — | — | ns |
| | | | 3.3 ± 0.3 | — | 1.0 | |

(Note 10) Parameter guaranteed by design.
 (t_{osLH} = |t_{pLHm} - t_{pLHn}|, t_{osHL} = |t_{pHLm} - t_{pHLn}|)

DYNAMIC SWITCHING CHARACTERISTICS ($T_a = 25^\circ\text{C}$, Input $t_r = t_f = 2.5\text{ns}$, $C_L = 50\text{pF}$, $R_L = 500\Omega$)

| PARAMETER | SYMBOL | TEST CONDITION | V _{CC} (V) | TYP | UNIT |
|---|------------------|--|---------------------|-----|------|
| | | | | | |
| Quiet Output Maximum Dynamic V _{OL} | V _{OLP} | V _{IH} = 3.3V, V _{IL} = 0V | 3.3 | 0.8 | V |
| Quiet Output Minimum Dynamic V _{OL} | V _{OLV} | V _{IH} = 3.3V, V _{IL} = 0V | 3.3 | 0.8 | V |

CAPACITIVE CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

| PARAMETER | SYMBOL | TEST CONDITION | V _{CC} (V) | TYP. | UNIT |
|----------------------------------|------------------|-----------------------------------|---------------------|------|------|
| | | | | | |
| Input Capacitance | C _{IN} | — | 3.3 | 7 | pF |
| Output Capacitance | C _{OUT} | — | 0 | 8 | pF |
| Power Dissipation Capacitance | C _{PD} | f _{IN} = 10MHz (Note 11) | 3.3 | 25 | pF |

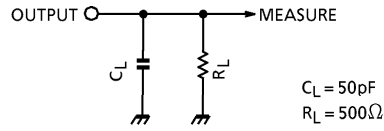
(Note 11) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

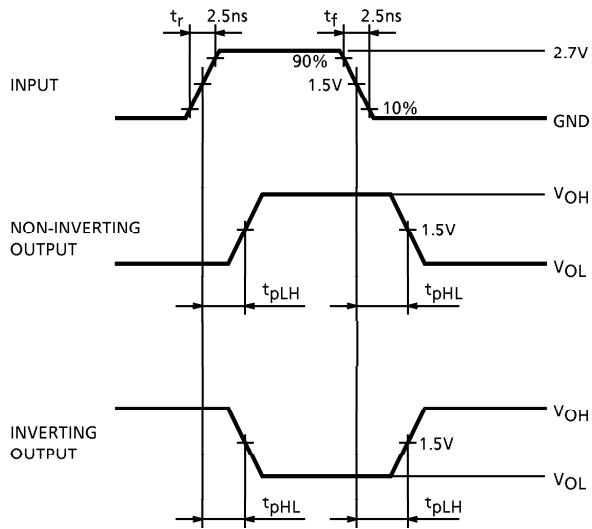
TEST CIRCUIT

Fig.1



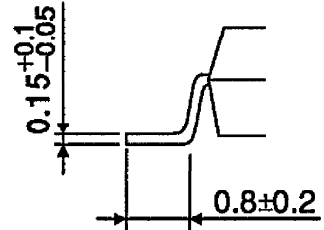
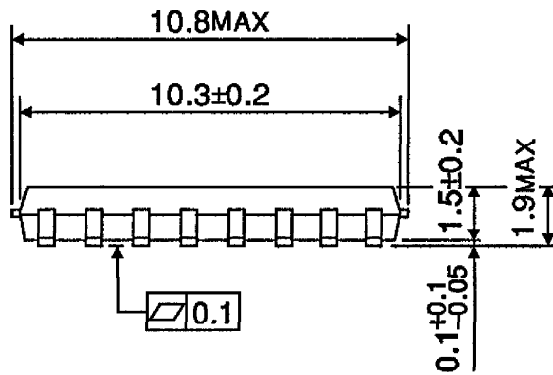
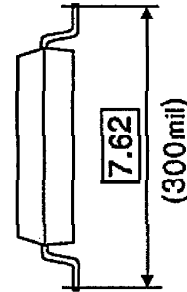
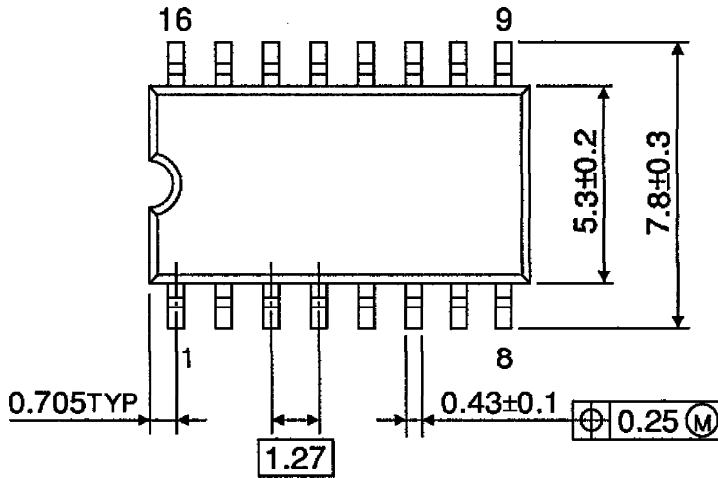
AC WAVEFORM

Fig.2 t_{pLH} , t_{pHL}



OUTLINE DRAWING
SOP16-P-300-1.27

Unit : mm

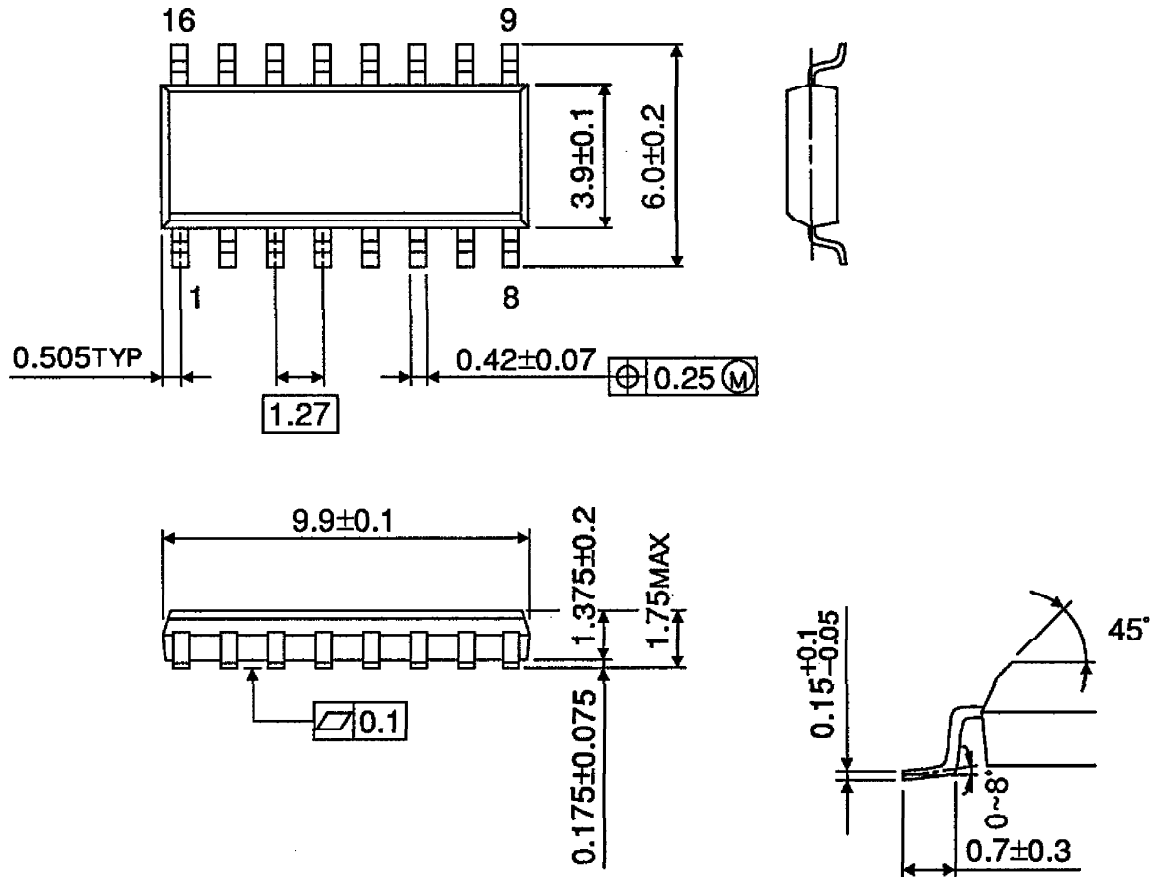


Weight : 0.18g (Typ.)

OUTLINE DRAWING
SOL16-P-150-1.27

Unit : mm

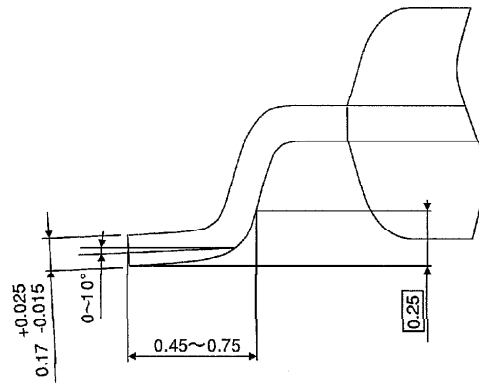
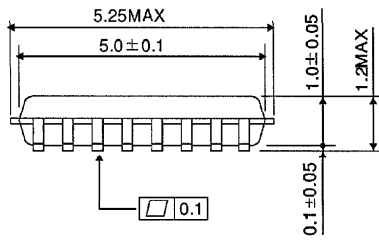
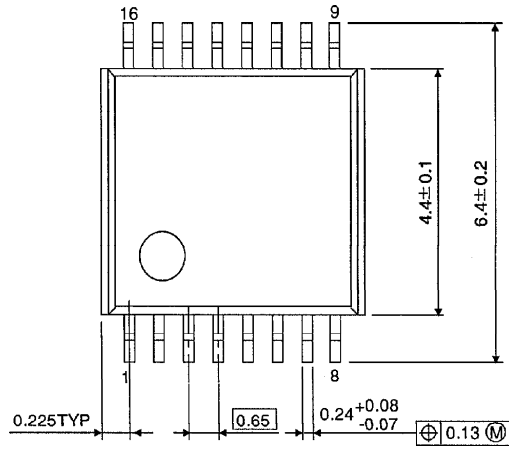
(Note) This package is not available in Japan.



Weight : 0.12g (Typ.)

OUTLINE DRAWING
TSSOP16-P-0044-0.65

Unit : mm



Weight : 0.06g (Typ.)