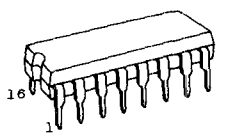
TC74HC257P QUAD 2-CHANNEL MULTIPLEXER (3-STATE)

TC74HC258P QUAD 2-CHANNEL MULTIPLEXER (3-STATE, INVERTING)

The TC74HC257 and the TC74HC258 are high speed CMOS MULTIPLEXER's fabricated with silicon gate C$^2$MOS technology.
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.
These IC's are composed of independent 2-channel multiplexer with common SELECT and ENABLE INPUT.
The TC74HC158 is an inverting multiplexer while the TC74HC157 is a non-inverting multiplexer.
If ENABLE INPUT is held "H", outputs of both IC's become high-impedance state.
SELECT INPUT is held "L", A data is chosen, while "H", B data is chosen.
All inputs are equipped with protection circuits against static discharge or transient excess voltage.

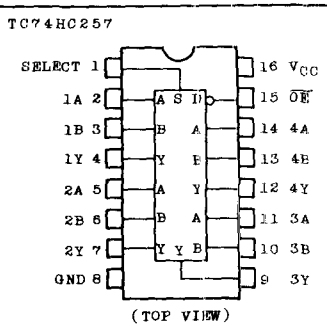
FEATURES:

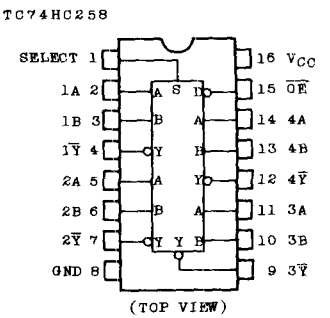
- High Speed.....$t_{pd}$=12ns(Typ.) at $V_{CC}$=5V
- Low Power Dissipation.....$I_{CC}$=4$\mu$A(Max.) at Ta=25°C
- High Noise Immunity.....$V_{NIH}$=$V_{NIL}$=28% $V_{CC}$(Min.)
- Output Drive Capability.....15 LSTTL Loads
- Symmetrical Output Impedance..$|I_{OH}|$=$I_{OL}$=6mA
- Balanced Propagation Delays...$t_{pLH} \fallingdotseq t_{pHL}$
- Wide Operating Voltage Range..$V_{CC(opr)}$=2V~6V
- Pin and Function Compatible with 74LS257/258.



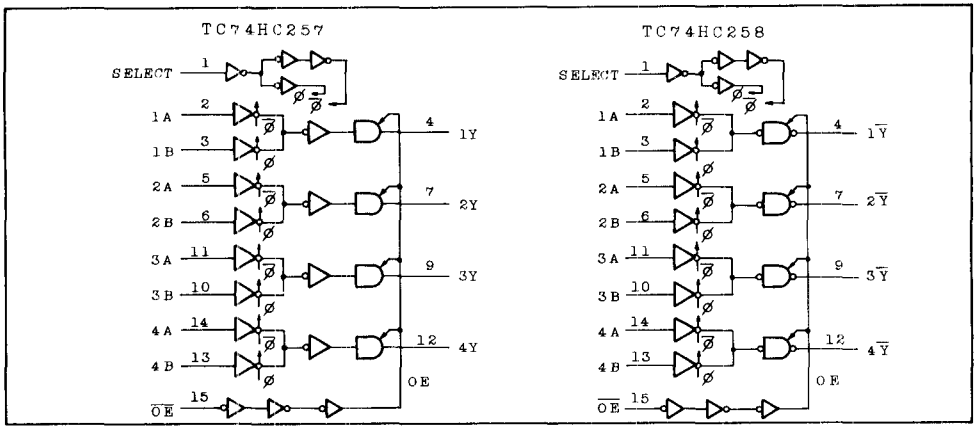

DIP (5-22E)

PIN ASSIGNMENT



LOGIC DIAGRAM




TRUTH TABLE

| INPUTS | | | | OUTPUTS | |
|---|---|---|---|---|---|
| $\overline{OE}$ | SELECT | A | B | Y (257) | $\overline{Y}$ (258) |
| H | * | * | * | Z | Z |
| L | L | L | * | L | H |
| L | L | H | * | H | L |
| L | H | * | L | L | H |
| L | H | * | H | H | L |

* : Don't care

Z : High impedance

ABSOLUTE MAXIMUM RATINGS

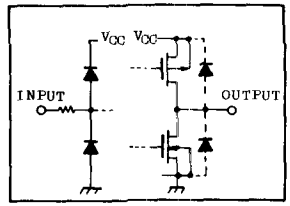
| PARAMETER | SYMBOL | VALUE | UNIT |
|---|---|---|---|
| Supply Voltage Range | $V_{CC}$ | -0.5 ~ 7 | V |
| DC Input Voltage | $V_{IN}$ | -0.5 ~ $V_{CC}$+0.5 | V |
| DC Output Voltage | $V_{OUT}$ | -0.5 ~ $V_{CC}$+0.5 | V |
| Input Diode Current | $I_{IK}$ | ±20 | mA |
| Output Diode Current | $I_{OK}$ | ±20 | mA |
| DC Output Current | $I_{OUT}$ | ±35 | mA |
| DC $V_{CC}$/Ground Current | $I_{CC}$ | ±70 | mA |
| Power Dissipation | $P_D$ | 500* | mW |
| Storage Temperature | $T_{stg}$ | -65 ~ 150 | °C |
| Lead Temperature 10sec | $T_L$ | 300 | °C |

* 500mW in the range of Ta=-40°C ~ 65°C. and from Ta=65°C up to 85°C derating factor of -10mW/°C shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | LIMIT | UNIT |
|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 2 ~ 6 | V |
| Input Voltage | $V_{IN}$ | 0 ~ $V_{CC}$ | V |
| Output Voltage | $V_{OUT}$ | 0 ~ $V_{CC}$ | V |
| Operating Temperature | $T_{opr}$ | -40 ~ 85 | °C |
| Input Rise and Fall Time | $t_r, t_f$ | 0 ~ 500 | ns |

INPUT and OUTPUT EQUIVALENT CIRCUIT




DC ELECTRICAL CHARACTERISTICS

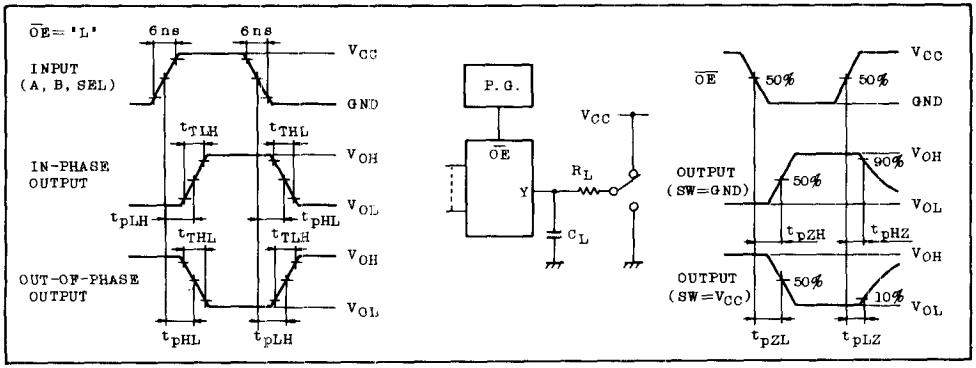
| PARAMETER | SYMBOL | TEST CONDITION | | $V_{CC}$ | Ta=25°C MIN. | Ta=25°C TYP. | Ta=25°C MAX. | Ta=-40~85°C MIN. | Ta=-40~85°C MAX. | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| High-Level Input Voltage | $V_{IH}$ | | | 2.0 | 1.5 | - | - | 1.5 | - | V |
| | | | | 4.5 | 3.15 | - | - | 3.15 | - | |
| | | | | 6.0 | 4.2 | - | - | 4.2 | - | |
| Low-Level Input Voltage | $V_{IL}$ | | | 2.0 | - | - | 0.5 | - | 0.5 | V |
| | | | | 4.5 | - | - | 1.35 | - | 1.35 | |
| | | | | 6.0 | - | - | 1.8 | - | 1.8 | |
| High-Level Output Voltage | $V_{OH}$ | $V_{IN}$= $V_{IH}$ or $V_{IL}$ | $I_{OH}$=-20μA | 2.0 | 1.9 | 2.0 | - | 1.9 | - | V |
| | | | | 4.5 | 4.4 | 4.5 | - | 4.4 | - | |
| | | | | 6.0 | 5.9 | 6.0 | - | 5.9 | - | |
| | | | $I_{OH}$=-6mA | 4.5 | 4.18 | 4.31 | - | 4.13 | - | |
| | | | $I_{OH}$=-7.8mA | 6.0 | 5.68 | 5.80 | - | 5.63 | - | |
| Low-Level Output Voltage | $V_{OL}$ | $V_{IN}$= $V_{IH}$ or $V_{IL}$ | $I_{OL}$=20μA | 2.0 | - | 0.0 | 0.1 | - | 0.1 | V |
| | | | | 4.5 | - | 0.0 | 0.1 | - | 0.1 | |
| | | | | 6.0 | - | 0.0 | 0.1 | - | 0.1 | |
| | | | $I_{OL}$=6mA | 4.5 | - | 0.17 | 0.32 | - | 0.37 | |
| | | | $I_{OL}$=7.8mA | 6.0 | - | 0.18 | 0.32 | - | 0.37 | |
| 3-State Output Off-State Current | $I_{OZ}$ | $V_{IN}$=$V_{IH}$ or $V_{IL}$<br>$V_{OUT}$=$V_{CC}$ or GND | | 6.0 | - | - | ±0.5 | - | ±5.0 | μA |
| Input Leakage Current | $I_{IN}$ | $V_{IN}$=$V_{CC}$ or GND | | 6.0 | - | - | ±0.1 | - | ±1.0 | |
| Quiescent Supply Current | $I_{CC}$ | $V_{IN}$=$V_{CC}$ or GND | | 6.0 | - | - | 4.0 | - | 40.0 | |

AC ELECTRICAL CHARACTERISTICS ($C_L$=50pF, Input $t_r=t_f$=6ns)

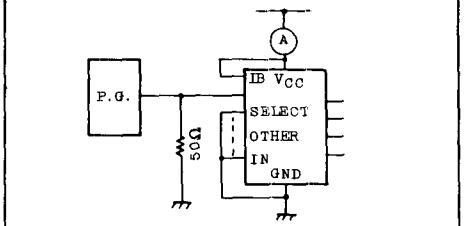
| PARAMETER | SYMBOL | TEST CONDITION | | Ta=25°C | | | Ta=-40~85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | $V_{CC}$ | MIN. | TYP. | MAX. | MIN. | MAX. | |
| Output Transition Time | $t_{TLH}$ $t_{THL}$ | | 2.0 | - | 23 | 60 | - | 75 | ns |
| | | | 4.5 | - | 7 | 12 | - | 15 | |
| | | | 6.0 | - | 6 | 10 | - | 13 | |
| TC74HC257 Propagation Delay Time A,B - Y | $t_{pLH}$ $t_{pHL}$ | | 2.0 | - | 50 | 125 | - | 150 | |
| | | | 4.5 | - | 15 | 25 | - | 30 | |
| | | | 6.0 | - | 13 | 22 | - | 27 | |
| SELECT -Y | $t_{pLH}$ $t_{pHL}$ | | 2.0 | - | 80 | 165 | - | 200 | |
| | | | 4.5 | - | 22 | 33 | - | 40 | |
| | | | 6.0 | - | 19 | 29 | - | 35 | |
| TC74HC258 Propagation Delay Time A,B - $\overline{Y}$ | $t_{pLH}$ $t_{pHL}$ | | 2.0 | - | 50 | 125 | - | 150 | |
| | | | 4.5 | - | 15 | 25 | - | 30 | |
| | | | 6.0 | - | 13 | 22 | - | 27 | |
| SELECT - $\overline{Y}$ | $t_{pLH}$ $t_{pHL}$ | | 2.0 | - | 80 | 165 | - | 200 | |
| | | | 4.5 | - | 22 | 33 | - | 40 | |
| | | | 6.0 | - | 19 | 29 | - | 35 | |
| Output Enable Time | $t_{pZL}$ $t_{pZH}$ | $R_L$=1kΩ | 2.0 | - | 60 | 125 | - | 150 | |
| | | | 4.5 | - | 15 | 25 | - | 30 | |
| | | | 6.0 | - | 13 | 22 | - | 27 | |
| Output Disable Time | $t_{pLZ}$ $t_{pHZ}$ | $R_L$=1kΩ | 2.0 | - | 44 | 150 | - | 180 | |
| | | | 4.5 | - | 21 | 32 | - | 39 | |
| | | | 6.0 | - | 20 | 31 | - | 37 | |
| Input Capacitance | $C_{IN}$ | | | - | 5 | 10 | - | 10 | pF |
| Output Capacitance | $C_{OUT}$ | | | - | 10 | - | - | - | |
| Power Dissipation Capacitance | $C_{PD}$(1) | TC74HC257 | | - | 60 | - | - | - | |
| | | TC74HC258 | | - | 59 | - | - | - | |

Note (1) $C_{PD}$ is defined as the value of internal equivalent capacitance of IC which is calculated from the operating current consumption without load (refer to Test Circuit).
Average operating current can be obtained by the equation hereunder.
$I_{CC(opr)}=C_{PD}\cdot V_{CC}\ f_{IN}+I_{CC}/4$ (per Channel)

## SWITCHING CHARACTERISTICS TEST WAVEFORM




## $I_{CC(opr)}$ TEST CIRCUIT



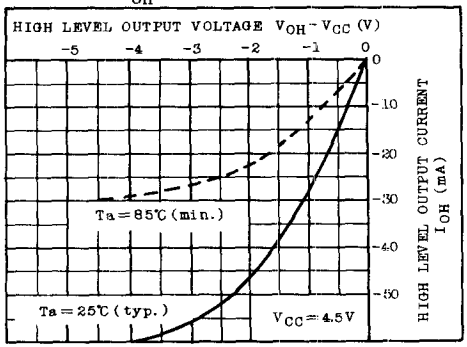

Input waveform is the same as that in case of switching characteristics test.

## $C_{PD}$ CALCULATION

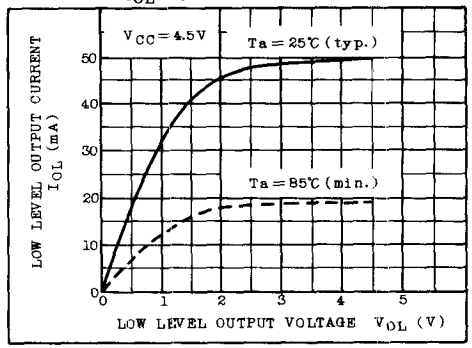
$C_{PD}$ is to be calculated with the formula hereunder by using the measured value of $I_{CC(opr)}$ in the test circuit drawn left side.

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

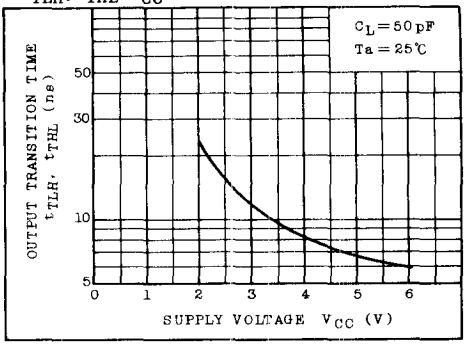
## $I_{OH}$ CHARACTERISTICS



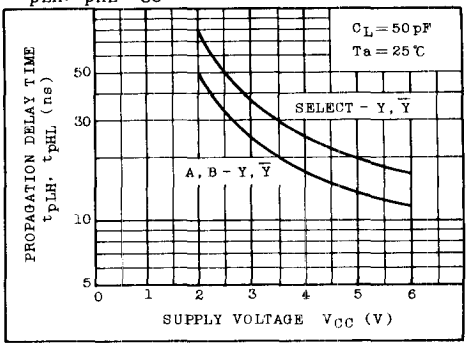

## $I_{OL}$ CHARACTERISTICS



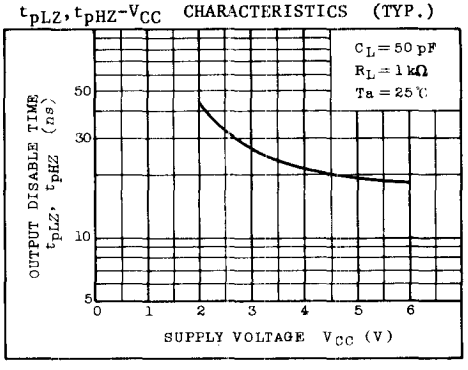
$t_{TLH}, t_{THL}$-$V_{CC}$ CHARACTERISTICS (TYP.)



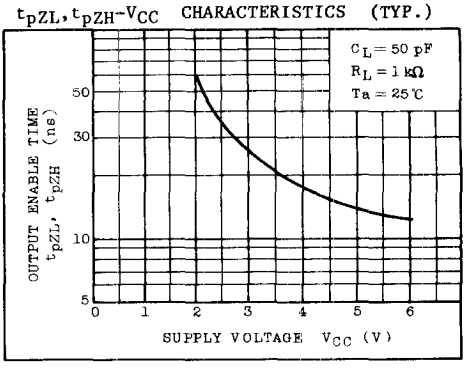

$t_{pLH}, t_{pHL}$-$V_{CC}$ CHARACTERISTICS (TYP.)



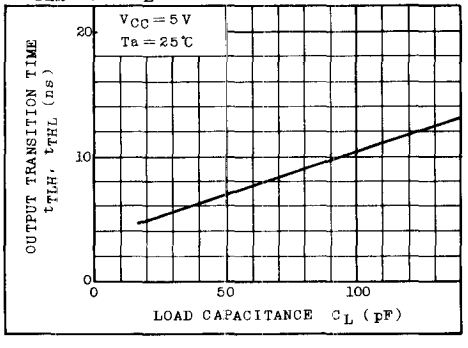

$t_{pLZ}, t_{pHZ}$-$V_{CC}$ CHARACTERISTICS (TYP.)




$t_{pZL}, t_{pZH}$-$V_{CC}$ CHARACTERISTICS (TYP.)




$t_{TLH}, t_{THL}$-$C_L$ CHARACTERISTICS (TYP.)




$t_{pLH}, t_{pHL}$-$C_L$ CHARACTERISTICS (TYP.)