

TC74VHC257F, TC74VHC257FN, TC74VHC257FT

QUAD 2 - CHANNEL MULTIPLEXER (3 - STATE)

The TC74VHC257 is an advanced high speed CMOS MULTIPLEXER fabricated with silicon gate C²MOS technology.

It achieves the high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation.

It is composed of four independent 2 - channel multiplexers with common SELECT and OUTPUTENABLE (OE).

If OE is set low, the outputs are held in a high-impedance state. When SELECT is set low, "A" data inputs are enabled. Conversely, when SELECT is high, "B" data inputs are enabled.

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 :

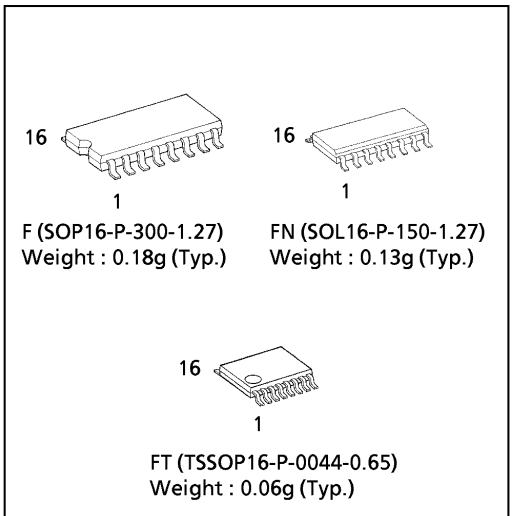
- High Speed..... $t_{pd} = 3.6ns(\text{typ.})$ at $V_{CC} = 5V$
- Low Power Dissipation..... $I_{CC} = 4\mu A(\text{Max.})$ at $T_a = 25^\circ C$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (\text{Min.})$
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range..... $V_{CC} (\text{opr}) = 2V \sim 5.5V$
- Low Noise..... $V_{OLP} = 0.8V (\text{Max.})$
- Pin and Function Compatible with 74ALS257

TRUTH TABLE

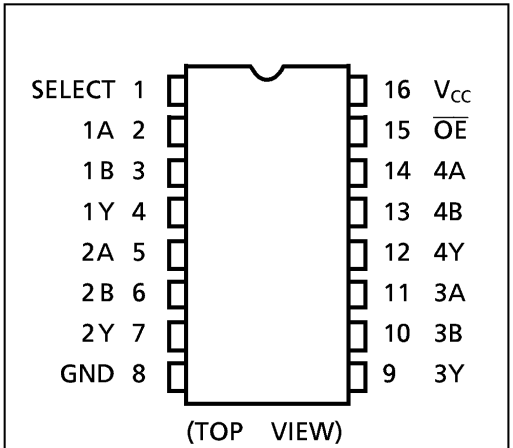
| INPUTS | | | | OUTPUTS |
|--------|--------|---|---|---------|
| OE | SELECT | A | B | |
| H | X | X | X | Z |
| L | L | L | X | L |
| L | L | H | X | H |
| L | H | X | L | L |
| L | H | X | H | H |

X : Don't Care
Z : High Impedance

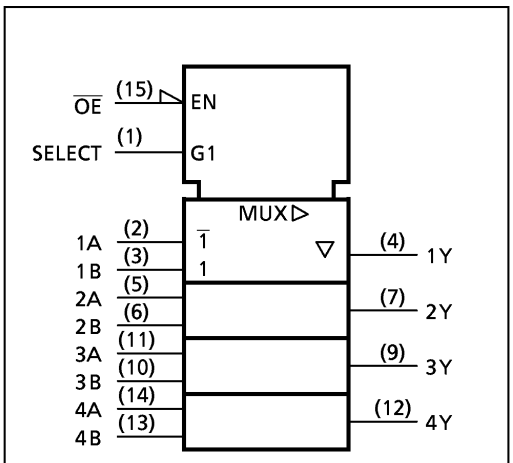
(Note) The JEDEC SOP (FN) is not available in Japan.



PIN ASSIGNMENT



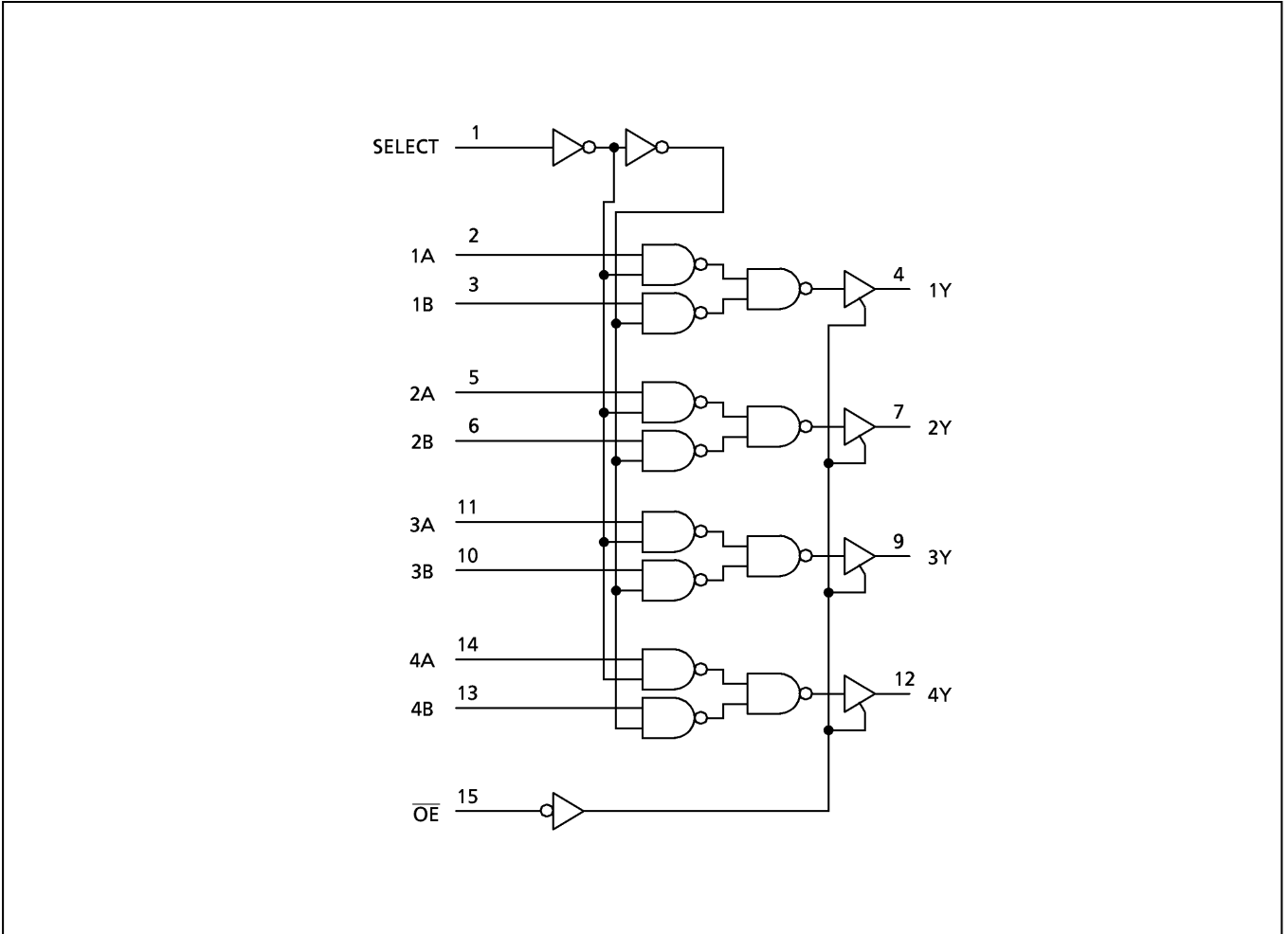
IEC LOGIC



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SYSTEM DIAGRAM



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ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | VALUE | 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 | $^{\circ}C$ |

RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | VALUE | UNIT |
|--------------------------|-----------|---|-------------|
| Supply Voltage | V_{CC} | 2.0~5.5 | V |
| Input Voltage | V_{IN} | 0~5.5 | V |
| Output Voltage | V_{OUT} | 0~ V_{CC} | V |
| Operating Temperature | T_{opr} | -40~85 | $^{\circ}C$ |
| Input Rise and Fall Time | dt / dv | 0~100 ($V_{CC} = 3.3 \pm 0.3V$) 0~20 ($V_{CC} = 5 \pm 0.5V$) | ns / V |

DC ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITION | V_{CC} (V) | $T_a = 25^{\circ}C$ | | | $T_a = -40 \sim 85^{\circ}C$ | | UNIT | |
|---|----------|--|---------------------|---------------------|------|---------------------|------------------------------|---------------------|---------|---|
| | | | | MIN. | TYP. | MAX. | MIN. | MAX. | | |
| High - Level Input Voltage | V_{IH} | | 2.0 | 1.50 | — | — | 1.50 | — | V | |
| | | | 3.0~ 5.5 | $V_{CC} \times 0.7$ | — | — | $V_{CC} \times 0.7$ | — | | |
| Low - Level Input Voltage | V_{IL} | | 2.0 | — | — | 0.50 | — | 0.50 | V | |
| | | | 3.0~ 5.5 | — | — | $V_{CC} \times 0.3$ | — | $V_{CC} \times 0.3$ | | |
| High - Level Output Voltage | V_{OH} | $V_{IN} =$ V_{IH} or V_{IL} | $I_{OH} = -50\mu A$ | 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 | — | |
| | | | | 3.0 | 2.58 | — | — | 2.48 | — | |
| Low - Level Output Voltage | V_{OL} | $V_{IN} =$ V_{IH} or V_{IL} | $I_{OL} = 50\mu A$ | 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 | |
| | | | | 3.0 | — | — | 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 | |
| | | | 0~5.5 | — | — | ± 0.1 | — | ± 1.0 | | |
| Input Leakage Current | I_{IN} | $V_{IN} = 5.5V$ or GND | 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 ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3\text{ns}$)

| PARAMETER | SYMBOL | TEST CONDITION | Ta = 25°C | | | Ta = -40~85°C | | UNIT | | |
|--------------------------------------|--------------------------------------|----------------|---------------------|---------|------|---------------|------|------|------|------|
| | | | V _{CC} (V) | CL (pF) | MIN. | TYP. | MAX. | | MIN. | MAX. |
| Propagation Delay Time (A,B-Y) | t _{pLH} | | 3.3 ± 0.3 | 15 | — | 5.8 | 9.3 | 1.0 | 11.0 | ns |
| | | | | 50 | — | 8.3 | 12.8 | 1.0 | 14.5 | |
| | 5.0 ± 0.5 | | 15 | — | 3.6 | 5.9 | 1.0 | 7.0 | | |
| | | | 50 | — | 5.1 | 7.9 | 1.0 | 9.0 | | |
| Propagation Delay Time (SELECT-Y) | t _{pLH} | | 3.3 ± 0.3 | 15 | — | 7.0 | 11.0 | 1.0 | 13.0 | |
| | | | | 50 | — | 9.5 | 14.5 | 1.0 | 16.5 | |
| | 5.0 ± 0.5 | | 15 | — | 4.0 | 6.8 | 1.0 | 8.0 | | |
| | | | 50 | — | 5.5 | 8.8 | 1.0 | 10.0 | | |
| 3-State Output Enable Time | t _{pZL} | RL = 1kΩ | 3.3 ± 0.3 | 15 | — | 6.7 | 10.5 | 1.0 | 12.5 | |
| | | | | 50 | — | 9.2 | 14.0 | 1.0 | 16.0 | |
| | 5.0 ± 0.5 | | 15 | — | 3.6 | 6.8 | 1.0 | 8.0 | | |
| | | | 50 | — | 5.1 | 8.8 | 1.0 | 10.0 | | |
| 3-State Output Disable Time | t _{pLZ} t _{pHZ} | RL = 1kΩ | 3.3 ± 0.3 | 50 | — | 8.6 | 12.0 | 1.0 | 13.5 | |
| | | | 5.0 ± 0.5 | 50 | — | 5.7 | 7.9 | 1.0 | 9.0 | |
| Input Capacitance | C _{IN} | | | | — | 4 | 10 | — | 10 | pF |
| Output Capacitance | C _{OUT} | | | | — | 6 | — | — | — | |
| Power Dissipation Capacitance | C _{pd} | Note (1) | | — | 23 | — | — | — | | |

Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

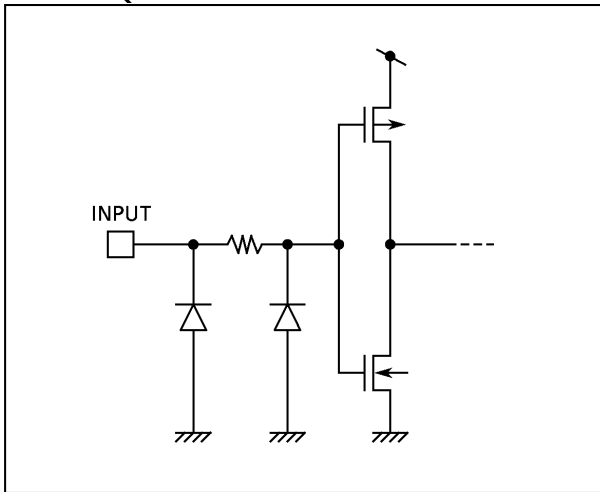
Average operating current can be obtained by the equation :

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

NOISE CHARACTERISTICS (Input $t_r = t_f = 3\text{ns}$)

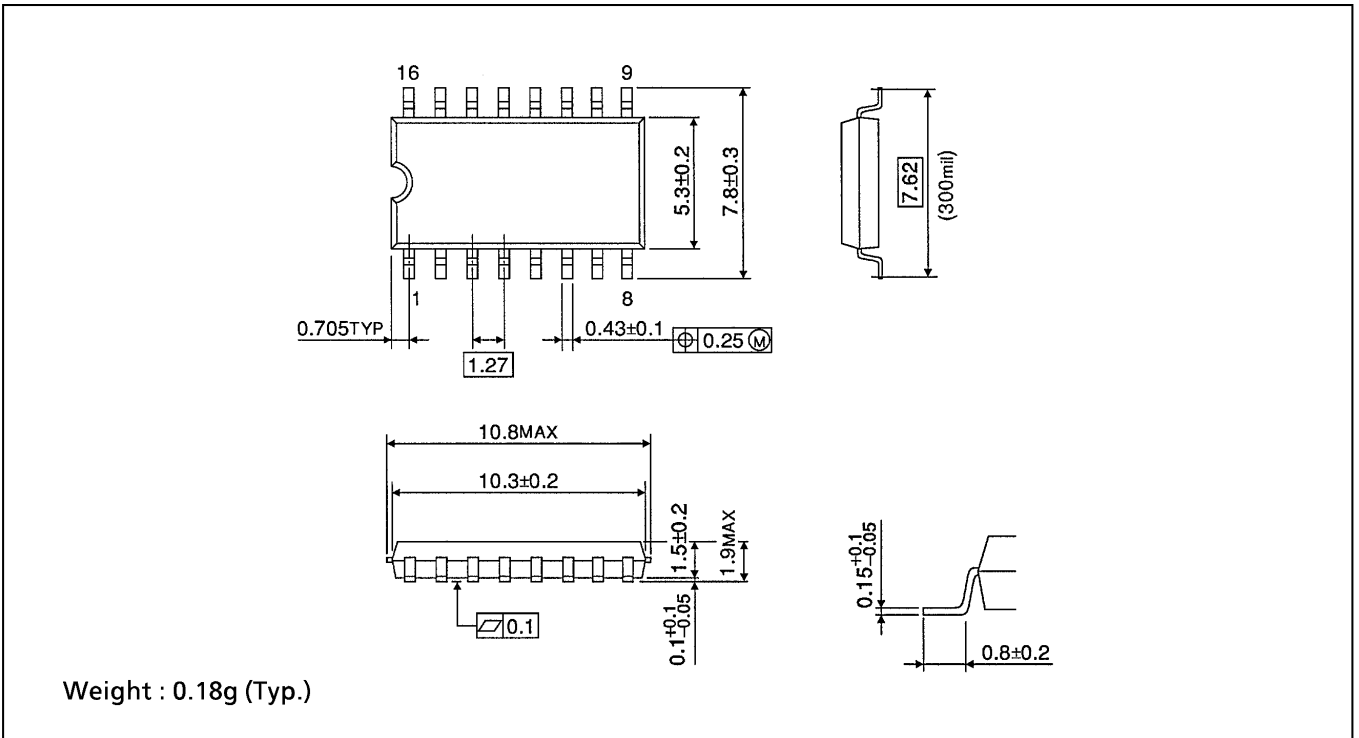
| PARAMETER | SYMBOL | TEST CONDITION | Ta = 25°C | | | UNIT |
|---|------------------|-----------------------|---------------------|------|------|------|
| | | | V _{CC} (V) | TYP. | MAX. | |
| Quiet Output Maximum Dynamic V _{OL} | V _{OLP} | C _L = 50pF | 5.0 | 0.3 | 0.8 | V |
| Quiet Output Minimum Dynamic V _{OL} | V _{OLV} | C _L = 50pF | 5.0 | -0.3 | -0.8 | V |
| Minimum High Level Dynamic Input Voltage | V _{IHD} | C _L = 50pF | 5.0 | — | 3.5 | V |
| Maximum Low Level Dynamic Input Voltage | V _{ILD} | C _L = 50pF | 5.0 | — | 1.5 | V |

INPUT EQUIVALENT CIRCUIT



SOP 16PIN (200mil BODY) OUTLINE DRAWING (SOP16-P-300-1.27)

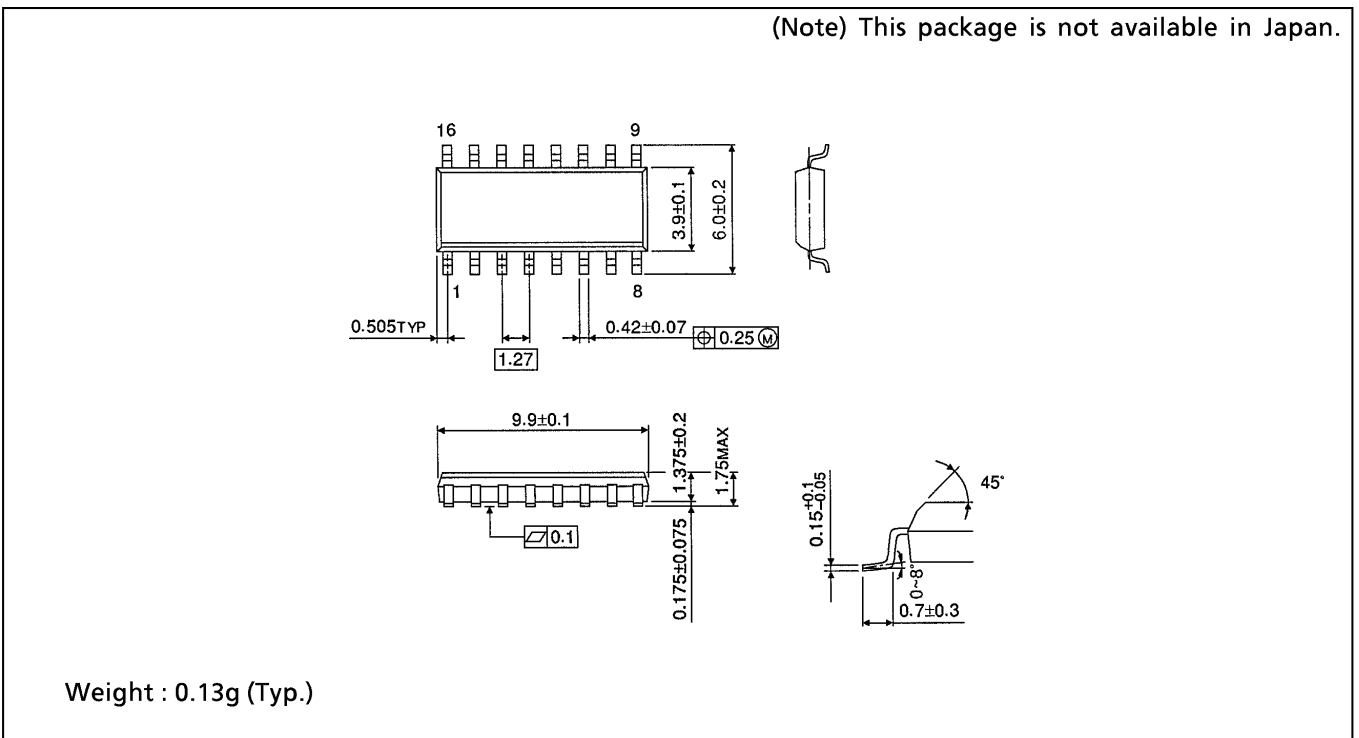
Unit in mm



SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOP16-P-150-1.27)

Unit in mm

(Note) This package is not available in Japan.



TSSOP 16PIN OUTLINE DRAWING (TSSOP16-P-0044-0.65)

Unit in mm

