

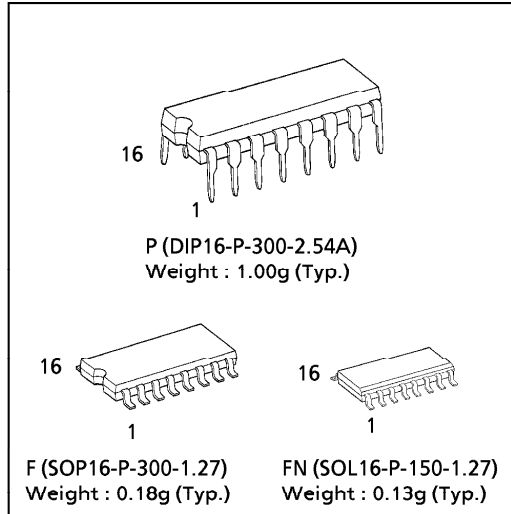
TOSHIBA CMOS DIGITAL INTEGRATED CIRCUIT SILICON MONOLITHIC

TC4049BP, TC4049BF, TC4049BFN
TC4050BP, TC4050BF, TC4050BFN

TC4049B HEX BUFFER / CONVERTER (Inverting Type)
TC4050B HEX BUFFER / CONVERTER (Non - Inverting Type)

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

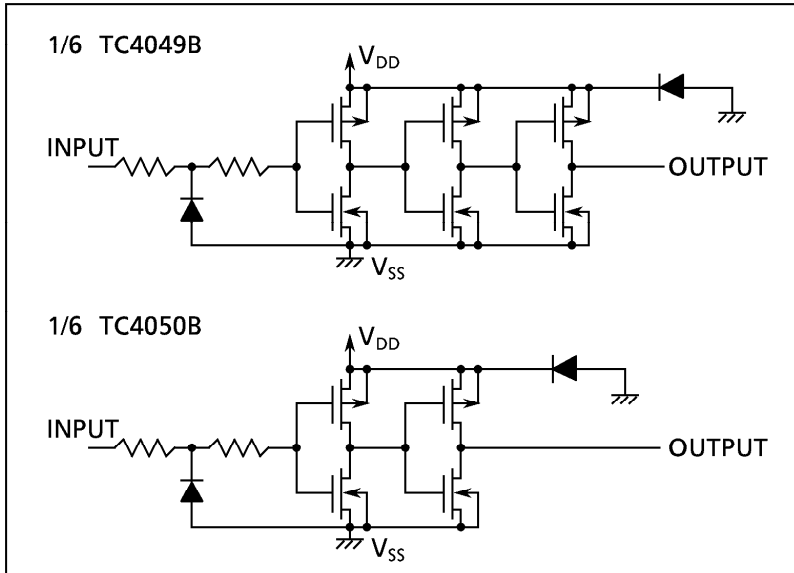
TC4049B, TC4050B contain six circuits of buffers. TC4049B is inverter type and TC4050B is non-inverter type. Since one TTL or DTL can be directly driven having large output current, these are useful for interfacing from CMOS to TTL or DTL. As voltage up to $V_{SS}+18$ volts can be applied to the input regardless of V_{DD} , these can be also used as the level converter IC's which converts CMOS logical circuits of 15 volts or 10 volts system to CMOS/TTL logical circuits of 5 volts system. Ideal switching characteristic has been obtained by the circuit diagram of three stage inverters for TC4049B and two stage inverters for TC4050B.



MAXIMUM RATINGS

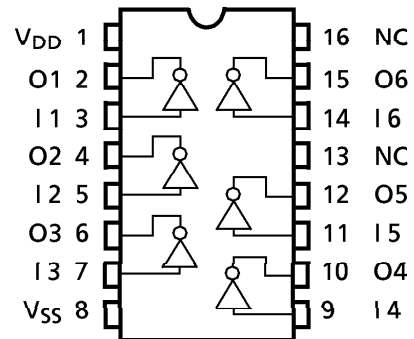
| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|-----------------------------|-----------|----------------------------------|-------------|
| DC Supply Voltage | V_{DD} | $V_{SS} - 0.5 \sim V_{SS} + 20$ | V |
| Input Voltage | V_{IN} | $V_{SS} - 0.5 \sim V_{SS} + 20$ | V |
| Output Voltage | V_{OUT} | $V_{SS} - 0.5 \sim V_{DD} + 0.5$ | V |
| DC Input Current | I_{IN} | ± 10 | mA |
| Power Dissipation | P_D | 300 (DIP) / 180 (SOIC) | mW |
| Operating Temperature Range | T_{opr} | $-40 \sim 85$ | $^{\circ}C$ |
| Storage Temperature Range | T_{stg} | $-65 \sim 150$ | $^{\circ}C$ |

CIRCUIT DIAGRAM

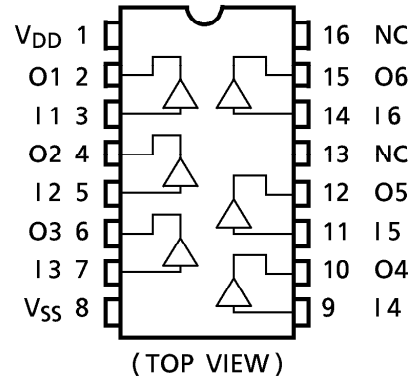


PIN ASSIGNMENT

TC4049B



TC4050B



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RECOMMENDED OPERATING CONDITIONS (V_{SS} = 0V)

| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|-------------------|-----------------|----------------|------|------|------|------|
| DC Supply Voltage | V _{DD} | | 3 | — | 18 | V |
| Input Voltage | V _{IN} | | 0 | — | 18 | V |

STATIC ELECTRICAL CHARACTERISTICS (V_{SS} = 0V)

| CHARACTERISTIC | SYM-BOL | TEST CONDITION | V _{DD} (V) | - 40°C | | 25°C | | | 85°C | | UNIT | |
|---------------------------|-----------------|--|------------------------|--------|------|-------|-------|-------------------|-------|------|------|----|
| | | | | MIN. | MAX. | MIN. | TYP. | MAX. | MIN. | MAX. | | |
| High-Level Output Voltage | V _{OH} | I _{OUT} < 1μA V _{IN} = V _{SS} , V _{DD} | 5 | 4.95 | — | 4.95 | 5.00 | — | 4.95 | — | V | |
| | | | 10 | 9.95 | — | 9.95 | 10.00 | — | 9.95 | — | | |
| | | | 15 | 14.95 | — | 14.95 | 15.00 | — | 14.95 | — | | |
| Low-Level Output Voltage | V _{OL} | I _{OUT} < 1μA V _{IN} = V _{SS} , V _{DD} | 5 | — | 0.05 | — | 0.00 | 0.05 | — | 0.05 | V | |
| | | | 10 | — | 0.05 | — | 0.00 | 0.05 | — | 0.05 | | |
| | | | 15 | — | 0.05 | — | 0.00 | 0.05 | — | 0.05 | | |
| Output High Current | I _{OH} | V _{OH} = 4.6V V _{OH} = 2.5V V _{OH} = 9.5V V _{OH} = 13.5V V _{IN} = V _{SS} , V _{DD} | 5 | -0.73 | — | -0.65 | -1.2 | — | -0.58 | — | mA | |
| | | | 5 | -2.40 | — | -2.10 | -3.9 | — | -1.90 | — | | |
| | | | 10 | -1.80 | — | -1.65 | -2.5 | — | -1.35 | — | | |
| | | | 15 | -4.80 | — | -4.30 | -8.0 | — | -3.50 | — | | |
| Output Low Current | I _{OL} | V _{OL} = 0.4V V _{OL} = 0.5V V _{OL} = 1.5V V _{IN} = V _{SS} , V _{DD} | 5 | 3.8 | — | 3.2 | 6.4 | — | 2.9 | — | mA | |
| | | | 10 | 9.6 | — | 8.0 | 16.0 | — | 6.6 | — | | |
| | | | 15 | 28.0 | — | 24.0 | 48.0 | — | 20.0 | — | | |
| | | | — | — | — | — | — | — | — | — | | |
| Input High Voltage | V _{IH} | V _{OUT} = 0.5V, 4.5V V _{OUT} = 1.0V, 9.0V V _{OUT} = 1.5V, 13.5V I _{OUT} < 1μA | 5 | 3.5 | — | 3.5 | 2.75 | — | 3.5 | — | V | |
| | | | 10 | 7.0 | — | 7.0 | 5.50 | — | 7.0 | — | | |
| | | | 15 | 11.0 | — | 11.0 | 8.25 | — | 11.0 | — | | |
| | | | — | — | — | — | — | — | — | — | | |
| Input Low Voltage | V _{IL} | V _{OUT} = 0.5V, 4.5V V _{OUT} = 1.0V, 9.0V V _{OUT} = 1.5V, 13.5V I _{OUT} < 1μA | 5 | — | 1.5 | — | 2.25 | 1.5 | — | 1.5 | V | |
| | | | 10 | — | 3.0 | — | 4.50 | 3.0 | — | 3.0 | | |
| | | | 15 | — | 4.0 | — | 6.75 | 4.0 | — | 4.0 | | |
| | | | — | — | — | — | — | — | — | — | | |
| Input Current | "H" Level | I _{IH} | V _{IH} = 18V | 18 | — | 0.1 | — | 10 ⁻⁵ | 0.1 | — | 1.0 | μA |
| | "L" Level | I _{IL} | V _{IL} = 0V | 18 | — | -0.1 | — | -10 ⁻⁵ | -0.1 | — | -1.0 | |
| Quiescent Supply Current | I _{DD} | V _{IN} = V _{SS} , V _{DD} * | 5 | — | 1 | — | 0.002 | 1 | — | 30 | μA | |
| | | | 10 | — | 2 | — | 0.004 | 2 | — | 60 | | |
| | | | 15 | — | 4 | — | 0.008 | 4 | — | 120 | | |

* All valid input combinations.

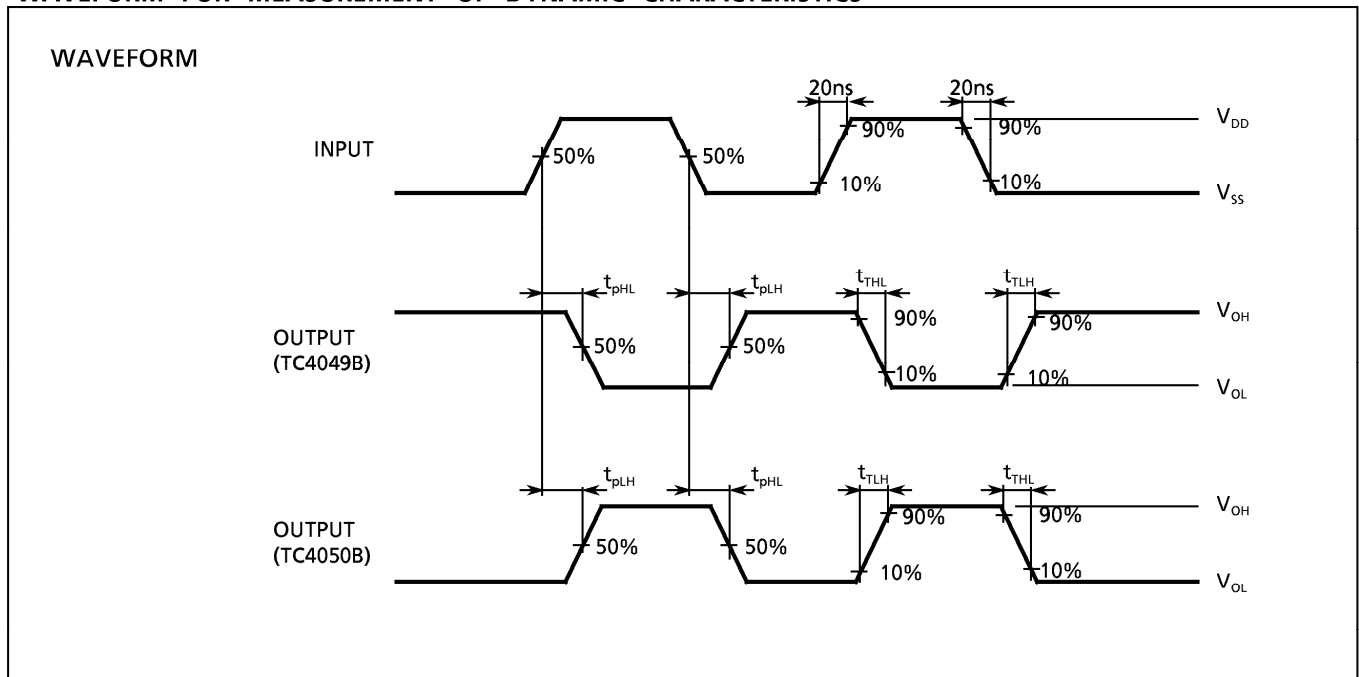
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DYNAMIC ELECTRICAL CHARACTERISTICS (Ta = 25°C, Vss = 0V, CL = 50pF)

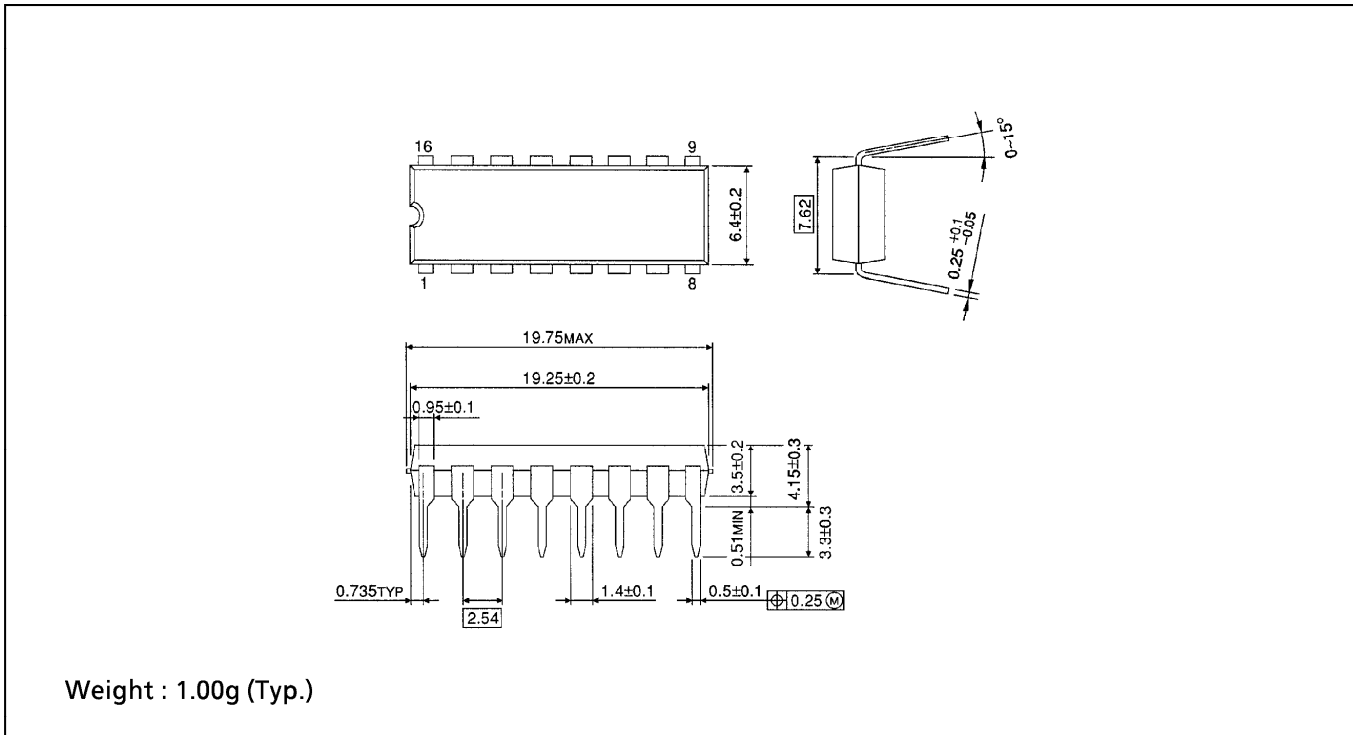
| CHARACTERISTIC | SYMBOL | TEST CONDITION | V _{DD} (V) | MIN. | TYP. | MAX. | UNIT |
|--------------------------------------|--------------------------------------|----------------|---------------------|------|------|------|------|
| | | | | | | | |
| Output Transition Time (Low to High) | t _{TLH} | | 5 | — | 60 | 160 | ns |
| | | | 10 | — | 30 | 80 | |
| | | | 15 | — | 25 | 60 | |
| Output Transition Time (High to Low) | t _{THL} | | 5 | — | 120 | 60 | ns |
| | | | 10 | — | 10 | 40 | |
| | | | 15 | — | 8 | 30 | |
| TC4049B | Propagation Delay Time (Low to High) | | 5 | — | 60 | 120 | ns |
| | | | 10 | — | 35 | 65 | |
| 15 | | | — | 30 | 50 | | |
| TC4049B | Propagation Delay Time (High to Low) | | 5 | — | 40 | 60 | ns |
| | | | 10 | — | 20 | 30 | |
| | | | 15 | — | 15 | 20 | |
| TC4050B | Propagation Delay Time (Low to High) | | 5 | — | 50 | 130 | ns |
| | | | 10 | — | 30 | 70 | |
| 15 | | | — | 25 | 55 | | |
| TC4050B | Propagation Delay Time (High to Low) | | 5 | — | 30 | 70 | ns |
| | | | 10 | — | 17 | 35 | |
| | | | 15 | — | 14 | 25 | |
| Input Capacitance | C _{IN} | | | — | 5 | 7.5 | pF |

WAVEFORM FOR MEASUREMENT OF DYNAMIC CHARACTERISTICS



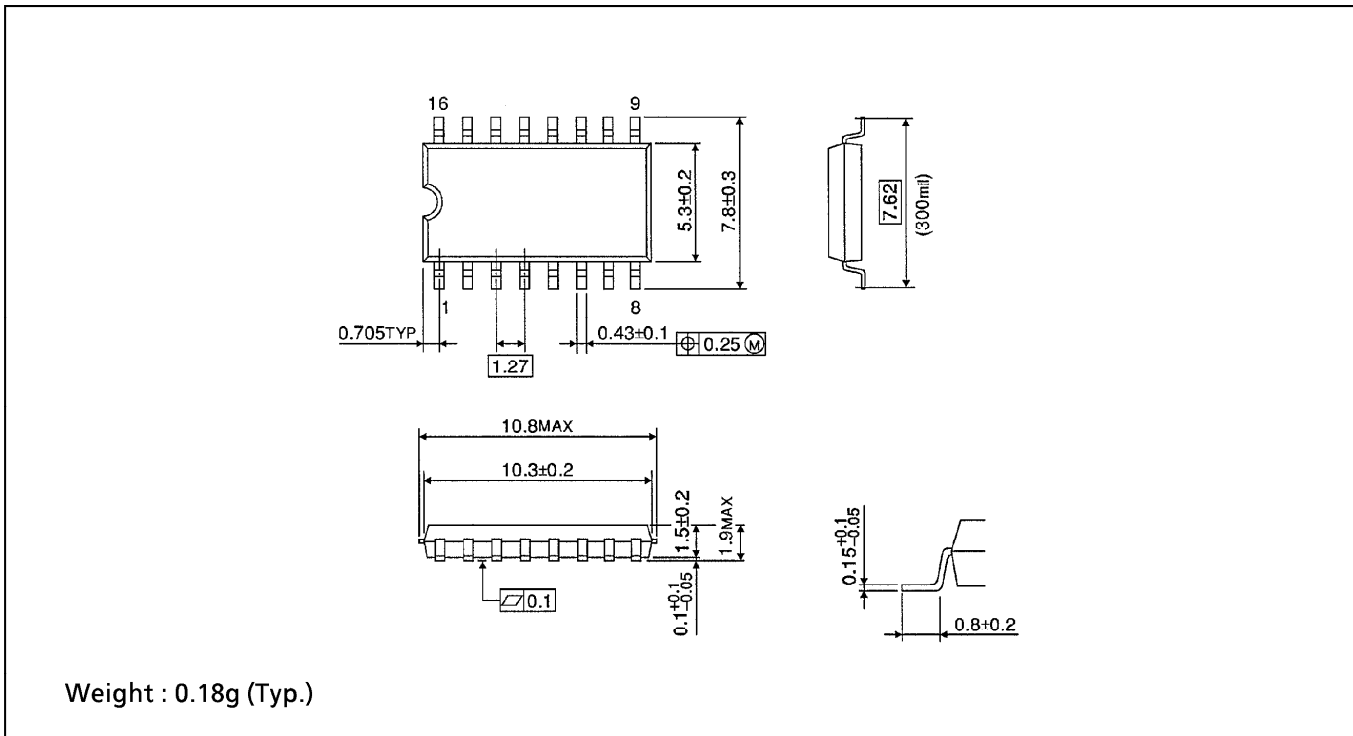
DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A)

Unit in mm



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

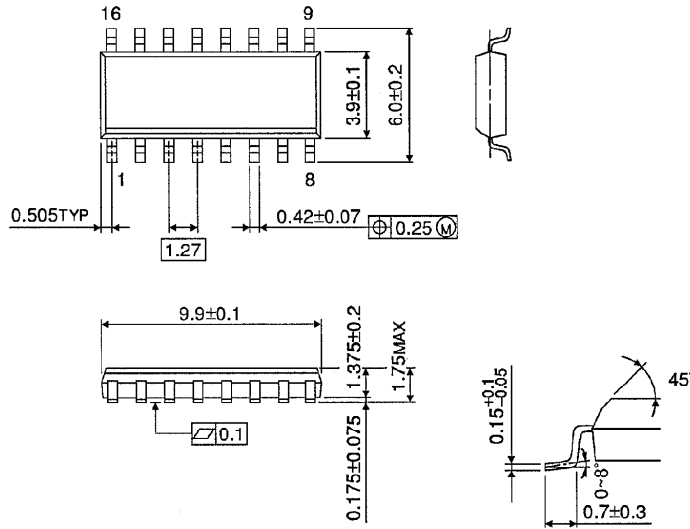
Unit in mm



SOP 16PIN (150mil BODY) OUTLINE DRAWING (SOL16-P-150-1.27)

Unit in mm

(Note) This package is not available in Japan.



Weight : 0.13g (Typ.)