

TC74HC4094AP, TC74HC4094AF, TC74HC4094AFN

8 - BIT SHIFT AND STORE REGISTER (3 - STATE)

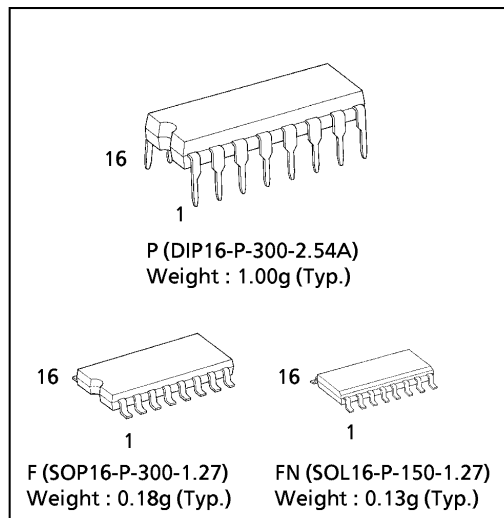
(Note) The JEDEC SOP (FN) is not available in Japan.

The TC74HC4094A is a high speed CMOS 8-BIT SHIFT AND STROBE REGISTER fabricated with silicon gate C²MOS technology.

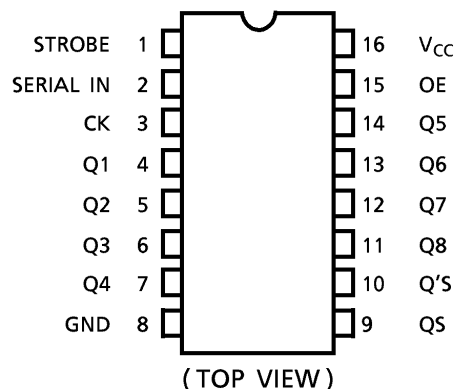
It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation. It consists of an 8-bit shift register and an 8-bit latch with 3-state output buffers. Data is shifted serially through the shift register on the positive going transition of the CK input. The output of the last stage (Q_s) can be used to cascade several devices. Data on the Q_s output is transferred to a second output (Q's) on the following negative transition of the CK input. The data in each stage of the shift register is provided to a corresponding latch, on the negative going transition of the STROBE input. When STROBE is held high, data propagates through the latch to a 3-state output buffer. This buffer is enabled when OUTPUT ENABLE input is set high. All inputs are equipped with protection circuits against static discharge or transient excess voltage.

FEATURES :

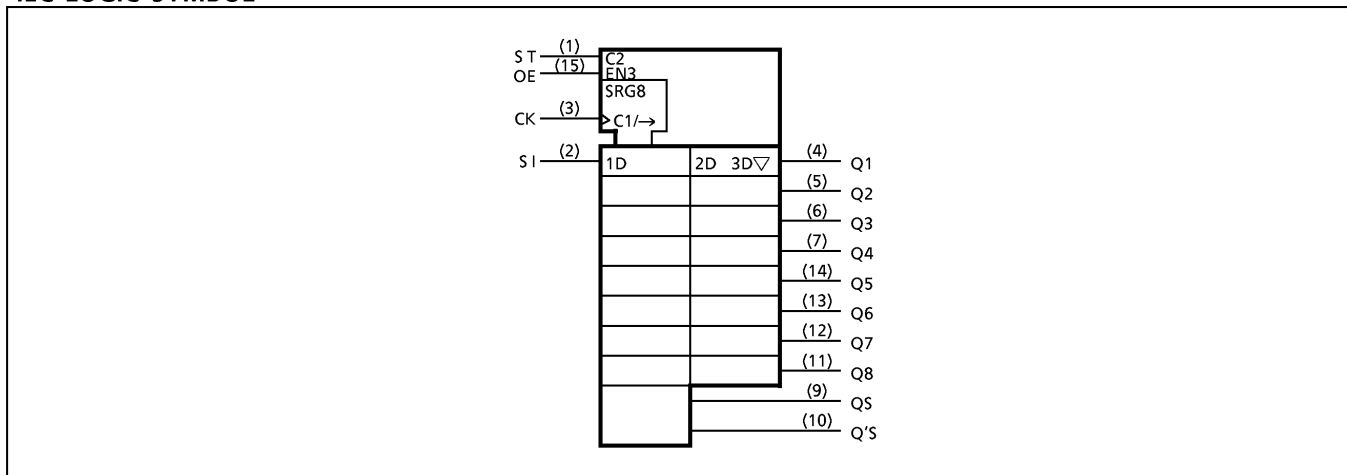
- High Speed..... $f_{MAX} = 73\text{MHz}(\text{typ.})$ at $V_{CC} = 5\text{V}$
- Low Power Dissipation..... $I_{CC} = 4\mu\text{A}(\text{Max.})$ at $T_a = 25^\circ\text{C}$
- High Noise Immunity..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (\text{Min.})$
- Output Drive Capability 10 LSTTL Loads
- Symmetrical Output Impedance... $|I_{OH}| = I_{OL} = 4\text{mA}(\text{Min.})$
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range... $V_{CC} (\text{opr.}) = 2\text{V} \sim 6\text{V}$
- Pin and Function Compatible with 4094B



PIN ASSIGNMENT



IEC LOGIC SYMBOL



980508EBA2

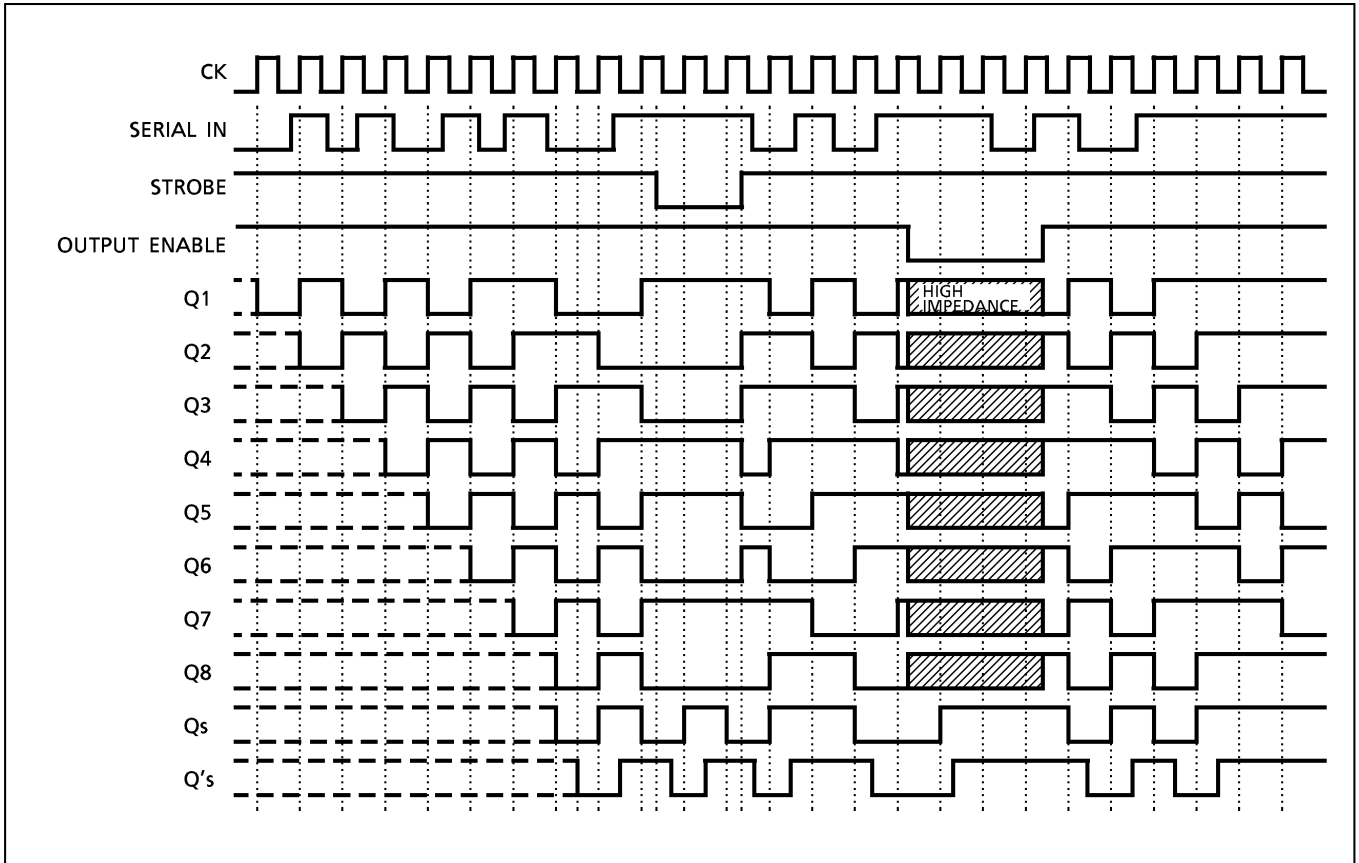
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TRUTH TABLE

| CK | OE | ST | SI | PARA. OUT | | SERI. OUT | |
|----|----|----|----|----------------|------------------|----------------|-----------------|
| | | | | Q ₁ | Q _n | Q _s | Q' _s |
| | H | H | L | L | Q _{n-1} | Q ₇ | NC |
| | H | H | H | H | Q _{n-1} | Q ₇ | NC |
| | H | L | * | NC | NC | Q ₇ | NC |
| | L | * | * | Z | Z | Q ₇ | NC |
| | H | * | * | NC | NC | NC | Q _s |
| | L | * | * | Z | Z | NC | Q _s |

X : DON'T CARE
 NC : NO CHANGE
 Z : HIGH IMPEDANCE

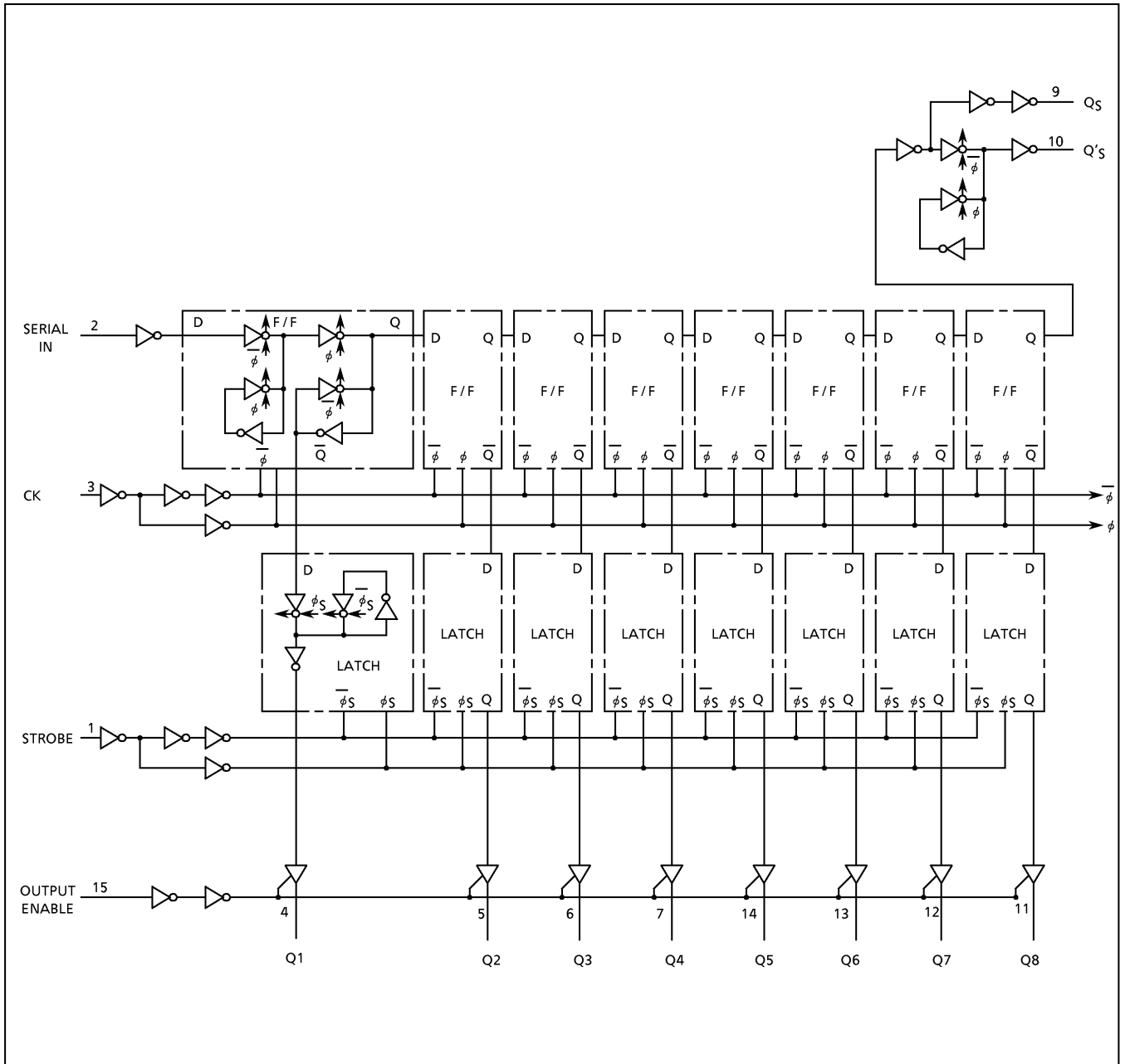
TIMING CHART



980508EBA2'

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SYSTEM DIAGRAM



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} | ± 25 | mA |
| DC V_{CC} /Ground Current | I_{CC} | ± 50 | mA |
| Power Dissipation | P_D | 500 (DIP)* / 180 (SOP) | mW |
| Storage Temperature | T_{stg} | -65~150 | °C |

*500mW in the range of $T_a = -40^{\circ}\text{C} \sim 65^{\circ}\text{C}$. From $T_a = 65^{\circ}\text{C}$ to 85°C a derating factor of $-10\text{mW}/^{\circ}\text{C}$ shall be applied until 300mW.

RECOMMENDED OPERATING CONDITIONS

| PARAMETER | SYMBOL | VALUE | 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 | 0~1000 ($V_{CC} = 2.0\text{V}$) 0~500 ($V_{CC} = 4.5\text{V}$) 0~400 ($V_{CC} = 6.0\text{V}$) | ns |

DC ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITION | V_{CC} (V) | $T_a = 25^{\circ}\text{C}$ | | | $T_a = -40 \sim 85^{\circ}\text{C}$ | | UNIT | |
|--------------------------------------|----------|--|--|----------------------------|------|-------|-------------------------------------|-------|---------------|---|
| | | | | MIN. | TYP. | MAX. | MIN. | MAX. | | |
| High - Level Input Voltage | V_{IH} | | 2.0 | 1.50 | — | — | 1.50 | — | V | |
| | | | 4.5 | 3.15 | — | — | 3.15 | — | | |
| | | | 6.0 | 4.20 | — | — | 4.20 | — | | |
| Low - Level Input Voltage | V_{IL} | | 2.0 | — | — | 0.50 | — | 0.50 | V | |
| | | | 4.5 | — | — | 1.35 | — | 1.35 | | |
| | | | 6.0 | — | — | 1.80 | — | 1.80 | | |
| High - Level Output Voltage | V_{OH} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OH} = -20\mu\text{A}$ | 2.0 | 1.9 | 2.0 | — | 1.9 | — | V |
| | | | | 4.5 | 4.4 | 4.5 | — | 4.4 | — | |
| | | | $I_{OH} = -4\text{ mA}$ $I_{OH} = -5.2\text{ mA}$ | 4.5 | 4.18 | 4.31 | — | 4.13 | — | |
| | | | | 6.0 | 5.68 | 5.80 | — | 5.63 | — | |
| Low - Level Output Voltage | V_{OL} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OL} = 20\mu\text{A}$ | 2.0 | — | 0.0 | 0.1 | — | 0.1 | V |
| | | | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | $I_{OL} = 4\text{ mA}$ $I_{OL} = 5.2\text{ mA}$ | 4.5 | — | 0.17 | 0.26 | — | 0.33 | |
| | | | | 6.0 | — | 0.18 | 0.26 | — | 0.33 | |
| 3 - State Output Off - State Current | I_{OZ} | $V_{IN} = V_{IH}$ or V_{IL} $V_{OUT} = V_{CC}$ 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 | | |

TIMING REQUIREMENTS (Input $t_r = t_f = 6\text{ns}$)

| PARAMETER | SYMBOL | TEST CONDITION | V_{CC} (V) | $T_a = 25^\circ\text{C}$ | | $T_a = -40\sim 85^\circ\text{C}$ | UNIT |
|---------------------------------|--------------------------|----------------|--------------|--------------------------|-------|----------------------------------|------|
| | | | | TYP. | LIMIT | LIMIT | |
| Minimum Pulse Width (CK) | $t_{W(H)}$ $t_{W(L)}$ | | 2.0 | — | 75 | 95 | ns |
| | | | 4.5 | — | 15 | 19 | |
| | | | 6.0 | — | 13 | 16 | |
| Minimum Pulse Width (STROBE) | $t_{W(H)}$ | | 2.0 | — | 75 | 95 | |
| | | | 4.5 | — | 15 | 19 | |
| | | | 6.0 | — | 13 | 16 | |
| Minimum Set-up Time (SERIAL) | t_s | | 2.0 | — | 75 | 95 | |
| | | | 4.5 | — | 15 | 19 | |
| | | | 6.0 | — | 13 | 16 | |
| Minimum Set-up Time (STROBE) | t_s | | 2.0 | — | 100 | 125 | |
| | | | 4.5 | — | 20 | 25 | |
| | | | 6.0 | — | 17 | 21 | |
| Minimum Hold Time (SERIAL) | t_h | | 2.0 | — | 0 | 0 | |
| | | | 4.5 | — | 0 | 0 | |
| | | | 6.0 | — | 0 | 0 | |
| Minimum Hold Time (STROBE) | t_h | | 2.0 | — | 0 | 0 | |
| | | | 4.5 | — | 0 | 0 | |
| | | | 6.0 | — | 0 | 0 | |
| Clock Frequency | f | | 2.0 | — | 6 | 5 | MHz |
| | | | 4.5 | — | 30 | 24 | |
| | | | 6.0 | — | 35 | 28 | |

AC ELECTRICAL CHARACTERISTICS ($C_L = 15\text{pF}$, $V_{CC} = 5\text{V}$, $T_a = 25^\circ\text{C}$, Input $t_r = t_f = 6\text{ns}$)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--|------------------------|-------------------------|------|------|------|------|
| Output Transition Time | t_{TLH} t_{THL} | | — | 4 | 8 | ns |
| Propagation Delay Time (CK—Qn) | t_{pLH} t_{pHL} | | — | 22 | 35 | |
| Propagation Delay Time (CK—QS, Q'S) | t_{pLH} t_{pHL} | | — | 16 | 25 | |
| Propagation Delay Time (STROBE—Qn) | t_{pLH} t_{pHL} | | — | 16 | 27 | |
| 3-State Output Enable Time | t_{pZL} t_{pZH} | $R_L = 1\text{K}\Omega$ | — | 13 | 25 | |
| Maximum Clock Frequency | f_{MAX} | | 33 | 73 | — | MHz |

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

| PARAMETER | SYMBOL | TEST CONDITION | $T_a = 25^\circ\text{C}$ | | | $T_a = -40\sim 85^\circ\text{C}$ | | UNIT | |
|--|------------------------|-------------------------|--------------------------|------|------|----------------------------------|------|------|------|
| | | | V_{CC} (V) | MIN. | TYP. | MAX. | MIN. | | MAX. |
| Output Transition Time | t_{TLH} t_{THL} | | 2.0 | — | 30 | 75 | — | 95 | ns |
| | | | 4.5 | — | 8 | 15 | — | 19 | |
| | | | 6.0 | — | 7 | 13 | — | 16 | |
| Propagation Delay Time (CK—Qn) | t_{pLH} t_{pHL} | | 2.0 | — | 92 | 200 | — | 250 | |
| | | | 4.5 | — | 26 | 40 | — | 50 | |
| | | | 6.0 | — | 20 | 34 | — | 43 | |
| Propagation Delay Time (CK—QS, Q'S) | t_{pLH} t_{pHL} | | 2.0 | — | 65 | 150 | — | 190 | |
| | | | 4.5 | — | 19 | 30 | — | 38 | |
| | | | 6.0 | — | 15 | 26 | — | 32 | |
| Propagation Delay Time (STROBE—Qn) | t_{pLH} t_{pHL} | | 2.0 | — | 75 | 160 | — | 200 | |
| | | | 4.5 | — | 20 | 32 | — | 40 | |
| | | | 6.0 | — | 16 | 27 | — | 34 | |
| 3-State Output Enable Time | t_{pZL} t_{pZH} | $R_L = 1\text{K}\Omega$ | 2.0 | — | 58 | 150 | — | 190 | |
| | | | 4.5 | — | 16 | 30 | — | 38 | |
| | | | 6.0 | — | 13 | 26 | — | 32 | |
| 3-State Output Disable Time | t_{pLZ} t_{pHZ} | $R_L = 1\text{K}\Omega$ | 2.0 | — | 35 | 150 | — | 190 | |
| | | | 4.5 | — | 16 | 30 | — | 38 | |
| | | | 6.0 | — | 13 | 26 | — | 32 | |
| Maximum Clock Frequency | f_{MAX} | | 2.0 | 6 | 16 | — | 5 | — | MHz |
| | | | 4.5 | 30 | 66 | — | 24 | — | |
| | | | 6.0 | 35 | 80 | — | 28 | — | |
| Input Capacitance | C_{IN} | | — | 5 | 10 | — | 10 | pF | |
| Bus Input Capacitance | C_{OUT} | | — | 10 | — | — | — | | |
| Power Dissipation Capacitance | C_{PD} (1) | | — | 140 | — | — | — | | |

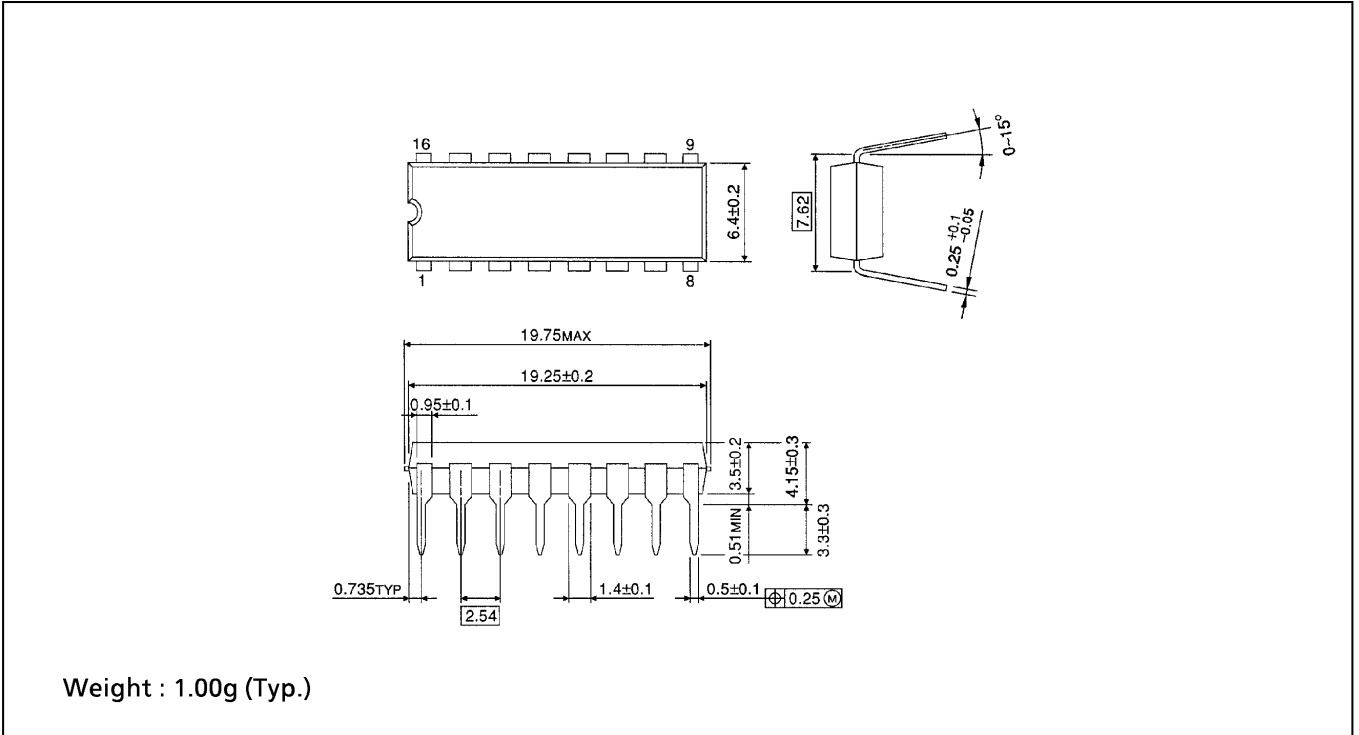
Note (1) C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation :

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

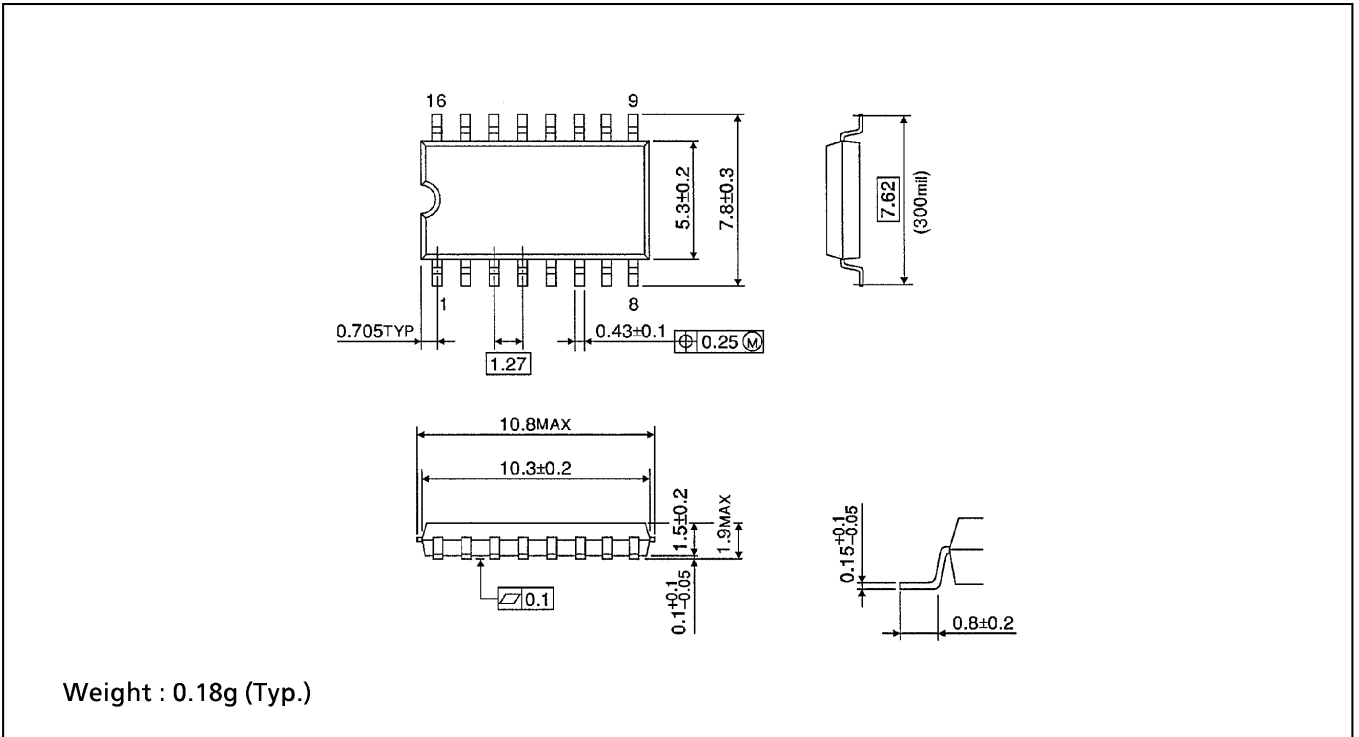
DIP 16PIN OUTLINE DRAWING (DIP16-P-300-2.54A)

Unit in mm



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

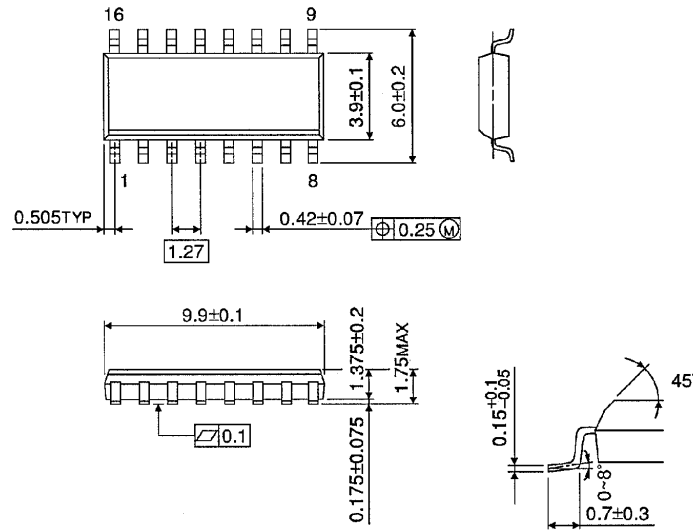
Unit in mm



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.)