

TC74VHC595F, TC74VHC595FN, TC74VHC595FT

8 - BIT SHIFT REGISTER / LATCH (3 - STATE)

The TC74VHC595 is an advanced high speed 8 - BIT SHIFT REGISTER / LATCH fabricated with silicon gate C²MOS technology.

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

The TC74VHC595 contains an 8 - bit static shift register which feeds an 8 - bit storage register.

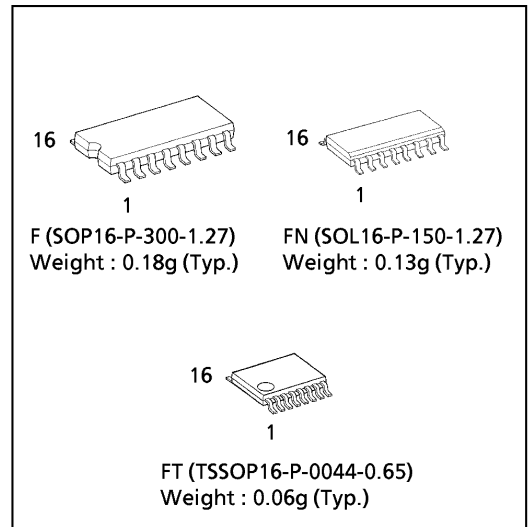
Shift operation is accomplished on the positive going transition of the SCK input. The output register is loaded with the contents of the shift register on the positive going transition of the RCK input. Since RCK and SCK signal are independent, parallel outputs can be held stable during the shift operation. And, since the parallel outputs are 3 - state, it can be directly connected to 8 - bit bus. This register can be used in serial - to - parallel conversion, data receivers, etc.

An input protection circuit ensures that 0 to 5.5V 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.

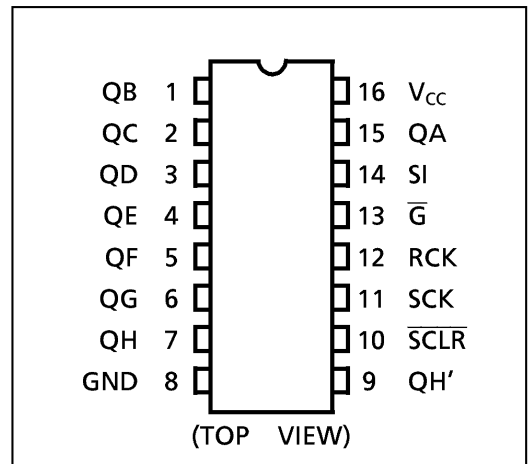
FEATURES :

- High Speed..... $f_{MAX} = 185\text{MHz}(\text{typ.})$
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..... $V_{NIH} = V_{NIL} = 28\% V_{CC} (\text{Min.})$
- Power Down Protection is provided on all inputs.
- Balanced Propagation Delays..... $t_{pLH} \approx t_{pHL}$
- Wide Operating Voltage Range..... $V_{CC} (\text{opr.}) = 2\text{V} \sim 5.5\text{V}$
- Low Noise..... $V_{OLP} = 1.0\text{V}(\text{Max.})$
- Pin and Function Compatible with 74ALS595

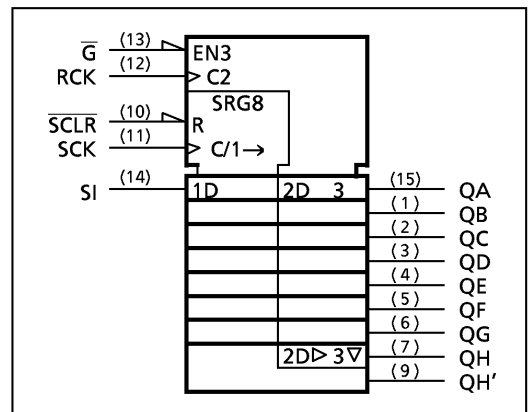
(Note) The JEDEC SOP (FN) is not available in Japan.








PIN ASSIGNMENT



IEC LOGIC SYMBOL

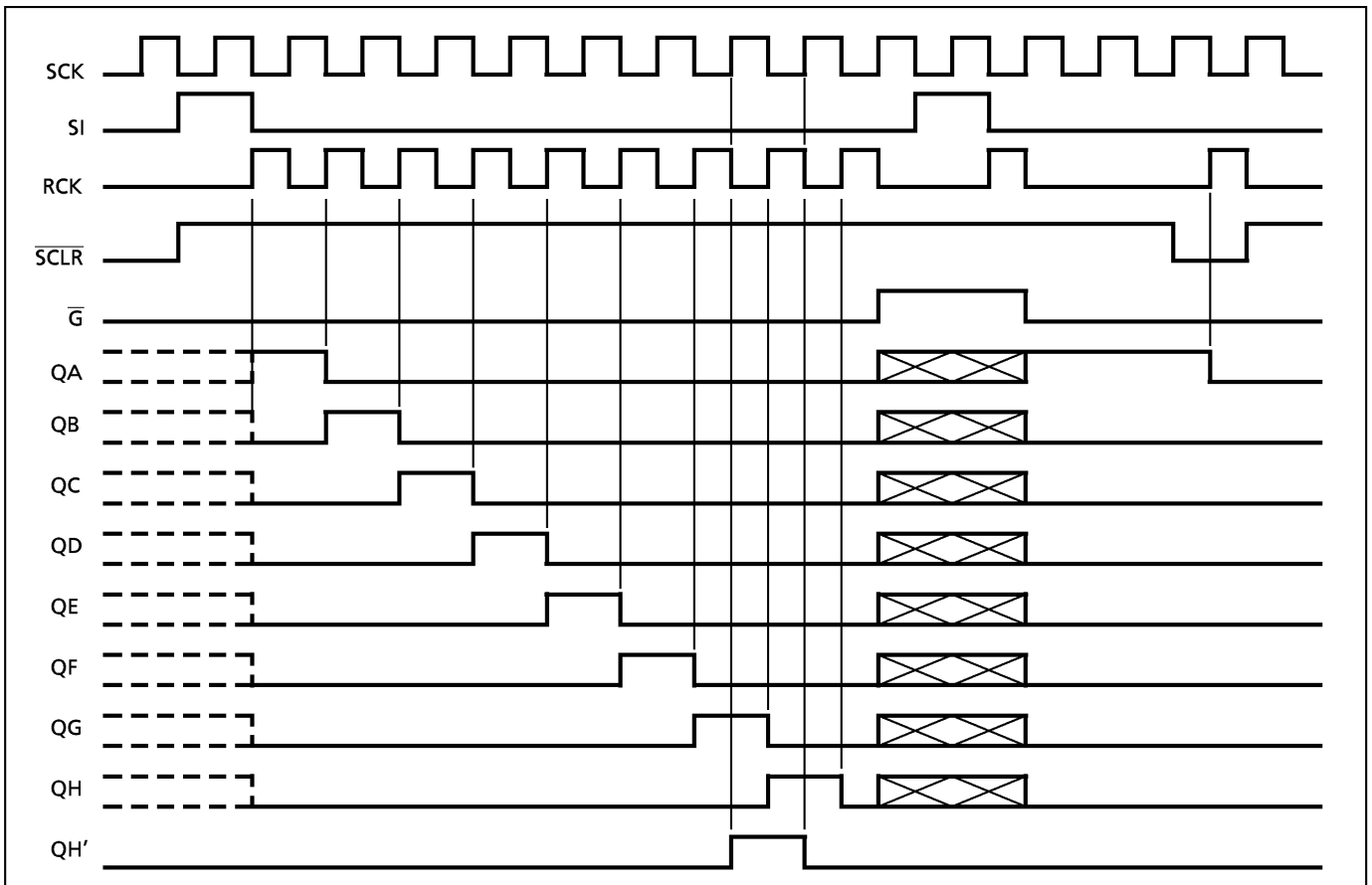


TRUTH TABLE

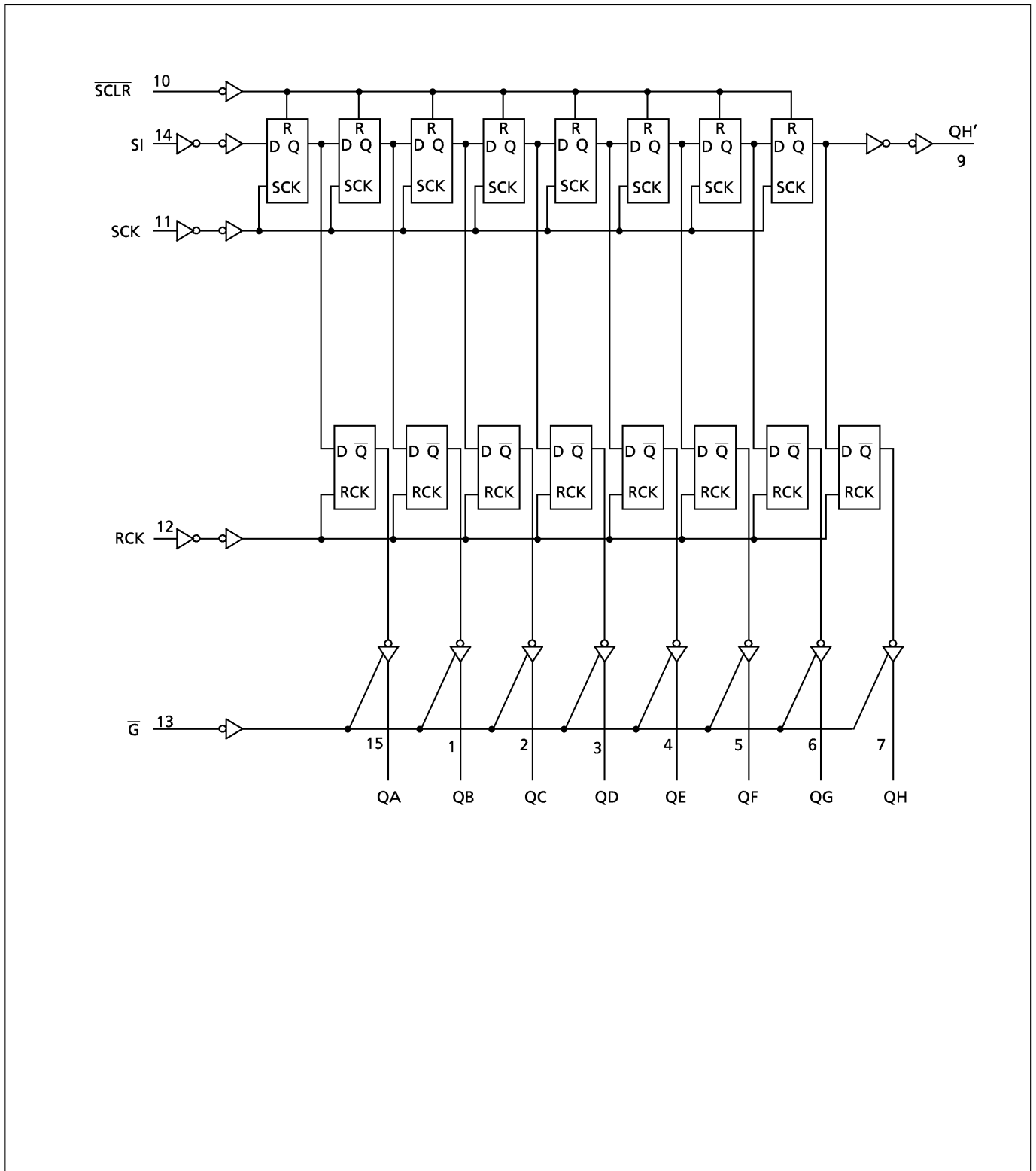
| INPUTS | | | | | FUNCTION |
|--------|-----------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------|
| SI | SCK | $\overline{\text{SCLR}}$ | RCK | $\overline{\text{G}}$ | |
| X | X | X | X | H | QA thru QH outputs disable |
| X | X | X | X | L | QA thru QH outputs enable |
| X | X | L | X | X | Shift register is cleared. |
| L |  | H | X | X | First stage of S. R. becomes "L". Other stages store the data of previous stage, respectively. |
| H |  | H | X | X | First stage of S. R. becomes "H". Other stages store the data of previous stage, respectively. |
| X |  | H | X | X | State of S. R. is not changed. |
| X | X | X |  | X | S.R. data is stored into storage register. |
| X | X | X |  | X | Storage register stage is not changed. |

X : Don't Care

TIMING CHART



SYSTEM DIAGRAM



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} | ±75 | mA |
| Power Dissipation | P_D | 180 | mW |
| Storage Temperature | T_{stg} | -65~150 | °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 | °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 3.0~ 5.5 | 1.50 $V_{CC} \times 0.7$ | — — | — — | 1.50 $V_{CC} \times 0.7$ | — — | V | |
| Low - Level Input Voltage | V_{IL} | | 2.0 3.0~ 5.5 | — — | — — | 0.50 $V_{CC} \times 0.3$ | — $V_{CC} \times 0.3$ | 0.50 $V_{CC} \times 0.3$ | V | |
| 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 | — | |
| | | | | 4.5 | 3.94 | — | — | 3.80 | — | |
| | | | | Low - Level Output Voltage | V_{OL} | $V_{IN} = V_{IH}$ or V_{IL} | $I_{OL} = 50 \mu A$ | 2.0 | — | 0.0 |
| 3.0 | — | 0.0 | 0.1 | | | | | — | 0.1 | |
| | | | | 4.5 | — | 0.0 | 0.1 | — | 0.1 | |
| | | | | | | $I_{OL} = 4mA$ $I_{OL} = 8mA$ | 3.0 | — | — | 0.36 |
| 4.5 | — | — | 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 | |
| Input Leakage Current | I_{IN} | $V_{IN} = 5.5V$ or GND | 0~5.5 | — | — | ±0.1 | — | ±1.0 | | |
| Quiescent Supply Current | I_{CC} | $V_{IN} = V_{CC}$ or GND | 5.5 | — | — | 4.0 | — | 40.0 | | |

TIMING REQUIREMENTS (Input $t_r = t_f = 3ns$)

| PARAMETER | SYMBOL | TEST CONDITION | V _{CC} (V) | Ta = 25°C | | Ta = -40~85°C | UNIT |
|--------------------------------------------------|--------------------------|----------------|------------------------|-----------|------------|---------------|------|
| | | | | TYP. | LIMIT | LIMIT | |
| Minimum Pulse Width (SCK, RCK) | $t_{W(H)}$ $t_{W(L)}$ | | 3.3 ± 0.3 | — | 5.0 | 5.0 | ns |
| | | | 5.0 ± 0.5 | — | 5.0 | 5.0 | |
| Minimum Pulse Width (\overline{SCLR}) | $t_{W(L)}$ | | 3.3 ± 0.3 5.0 ± 0.5 | — — | 5.0 5.0 | 5.0 5.0 | |
| Minimum Set-up Time (SI-SCK) | t_s | | 3.3 ± 0.3 | — | 3.5 | 3.5 | |
| | | | 5.0 ± 0.5 | — | 3.0 | 3.0 | |
| Minimum Set-up Time (SCK-RCK) | t_s | | 3.3 ± 0.3 | — | 8.0 | 8.5 | |
| | | | 5.0 ± 0.5 | — | 5.0 | 5.0 | |
| Minimum Set-up Time (\overline{SCLR} -RCK) | t_s | | 3.3 ± 0.3 | — | 8.0 | 9.0 | |
| | | | 5.0 ± 0.5 | — | 5.0 | 5.0 | |
| Minimum Hold Time (SI-SCK) | t_h | | 3.3 ± 0.3 | — | 1.5 | 1.5 | |
| | | | 5.0 ± 0.5 | — | 2.0 | 2.0 | |
| Minimum Hold Time (SCK-RCK) | t_h | | 3.3 ± 0.3 | — | 0 | 0 | |
| | | | 5.0 ± 0.5 | — | 0 | 0 | |
| Minimum Hold Time (\overline{SCLR} -RCK) | t_h | | 3.3 ± 0.3 | — | 0 | 0 | |
| | | | 5.0 ± 0.5 | — | 0 | 0 | |
| Minimum Removal Time (\overline{SCLR}) | t_{rem} | | 3.3 ± 0.3 | — | 3.0 | 3.0 | |
| | | | 5.0 ± 0.5 | — | 2.5 | 2.5 | |

AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3ns$)

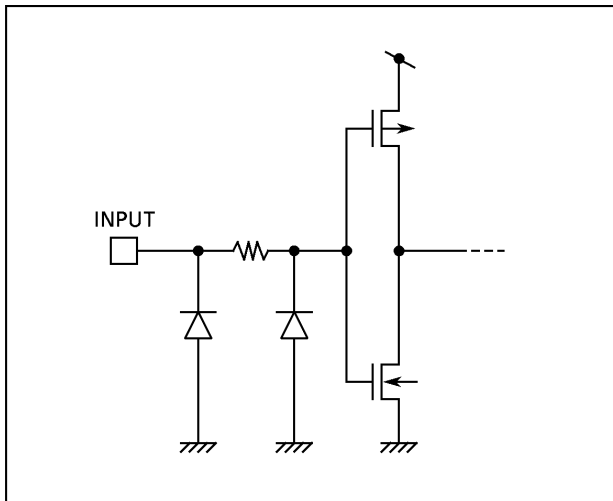
| PARAMETER | SYMBOL | TEST CONDITION | Ta = 25°C | | | Ta = -40~85°C | | UNIT | | |
|-------------------------------------------------|------------------|----------------------|---------------------|---------|------|---------------|------|------|------|------|
| | | | V _{CC} (V) | CL (pF) | MIN. | TYP. | MAX. | | MIN. | MAX. |
| Propagation Delay Time (SCK-QH') | t _{pLH} | | 3.3 ± 0.3 | 15 | — | 8.8 | 13.0 | 1.0 | 15.0 | ns |
| | | | | 50 | — | 11.3 | 16.5 | 1.0 | 18.5 | |
| | 5.0 ± 0.5 | | 15 | — | 6.2 | 8.2 | 1.0 | 9.4 | | |
| | | | 50 | — | 7.7 | 10.2 | 1.0 | 11.4 | | |
| Propagation Delay Time (SCLR-QH') | t _{pHL} | | 3.3 ± 0.3 | 15 | — | 8.4 | 12.8 | 1.0 | 13.7 | |
| | | | | 50 | — | 10.9 | 16.3 | 1.0 | 17.2 | |
| | 5.0 ± 0.5 | | 15 | — | 5.9 | 8.0 | 1.0 | 9.1 | | |
| | | | 50 | — | 7.4 | 10.0 | 1.0 | 11.1 | | |
| Propagation Delay Time (RCK-Q _n) | t _{pLH} | | 3.3 ± 0.3 | 15 | — | 7.7 | 11.9 | 1.0 | 13.5 | |
| | | | | 50 | — | 10.2 | 15.4 | 1.0 | 17.0 | |
| | 5.0 ± 0.5 | | 15 | — | 5.4 | 7.4 | 1.0 | 8.5 | | |
| | | | 50 | — | 6.9 | 9.4 | 1.0 | 10.5 | | |
| Output Enable time | t _{pZL} | R _L = 1kΩ | 3.3 ± 0.3 | 15 | — | 7.5 | 11.5 | 1.0 | 13.5 | |
| | | | | 50 | — | 9.0 | 15.0 | 1.0 | 17.0 | |
| | 5.0 ± 0.5 | | 15 | — | 4.8 | 8.6 | 1.0 | 10.0 | | |
| | | | 50 | — | 8.3 | 10.6 | 1.0 | 12.0 | | |
| Output Disable time | t _{pLZ} | R _L = 1kΩ | 3.3 ± 0.3 | 50 | — | 12.1 | 15.7 | 1.0 | 16.2 | |
| | | | | 50 | — | 7.6 | 10.3 | 1.0 | 11.0 | |
| | 5.0 ± 0.5 | | 15 | 80 | 150 | — | 70 | — | | |
| | | | 50 | 55 | 130 | — | 50 | — | | |
| Maximum Clock Frequency | f _{MAX} | | 3.3 ± 0.3 | 15 | 135 | 185 | — | 115 | — | |
| | | | | 50 | 95 | 155 | — | 85 | — | |
| Input Capacitance | C _{IN} | | | | — | 4 | 10 | — | 10 | pF |
| Output Capacitance | C _{OUT} | | | | — | 6 | — | — | — | |
| Power Dissipation Capacitance | C _{PD} | Note(1) | | — | 87 | — | — | — | | |

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} · V_{CC} · f_{IN} + I_{CC}

NOISE CHARACTERISTICS (Input $t_r = t_f = 3ns$)

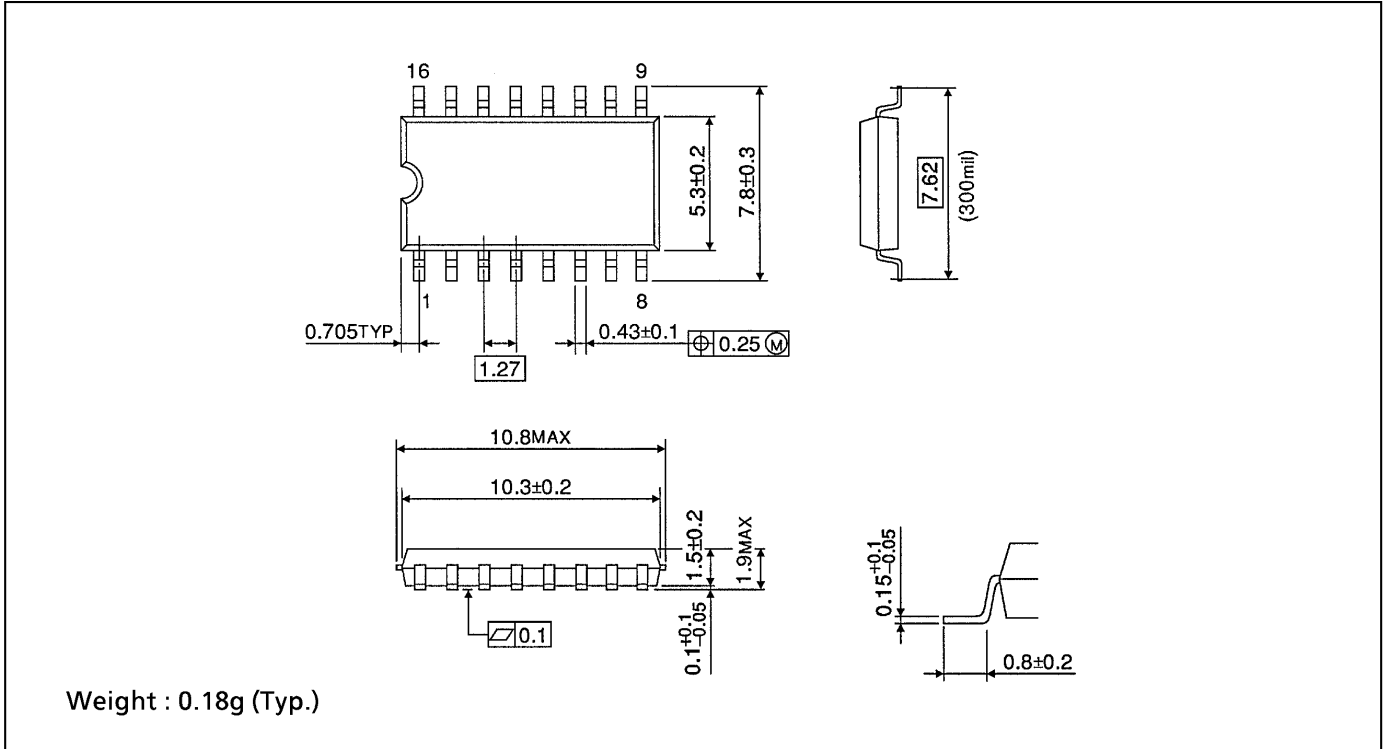
| PARAMETER | SYMBOL | TEST CONDITION | Ta = 25°C | | UNIT |
|-------------------------------------------------|------------------|-----------------------|---------------------|--------------|------|
| | | | V _{CC} (V) | TYP. / LIMIT | |
| Quiet Output Maximum Dynamic V _{OL} | V _{OLP} | C _L = 50pF | 5.0 | 0.8 / 1.0 | V |
| Quiet Output Minimum Dynamic V _{OL} | V _{OLV} | C _L = 50pF | 5.0 | -0.8 / -1.0 | 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) PACKAGE DIMENSIONS (SOP16-P-300-1.27)

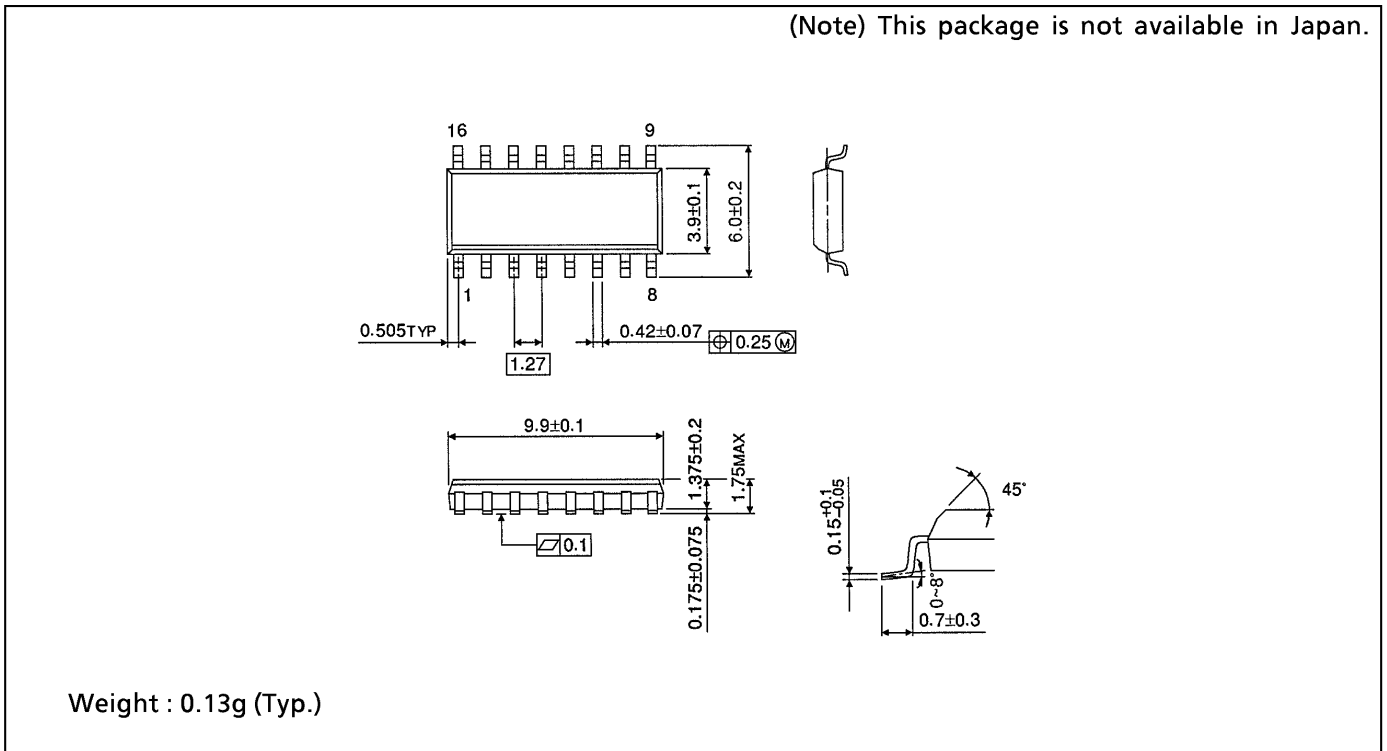
Unit in mm



SOP 16PIN (150mil BODY) PACKAGE DIMENSIONS (SOP16-P-150-1.27)

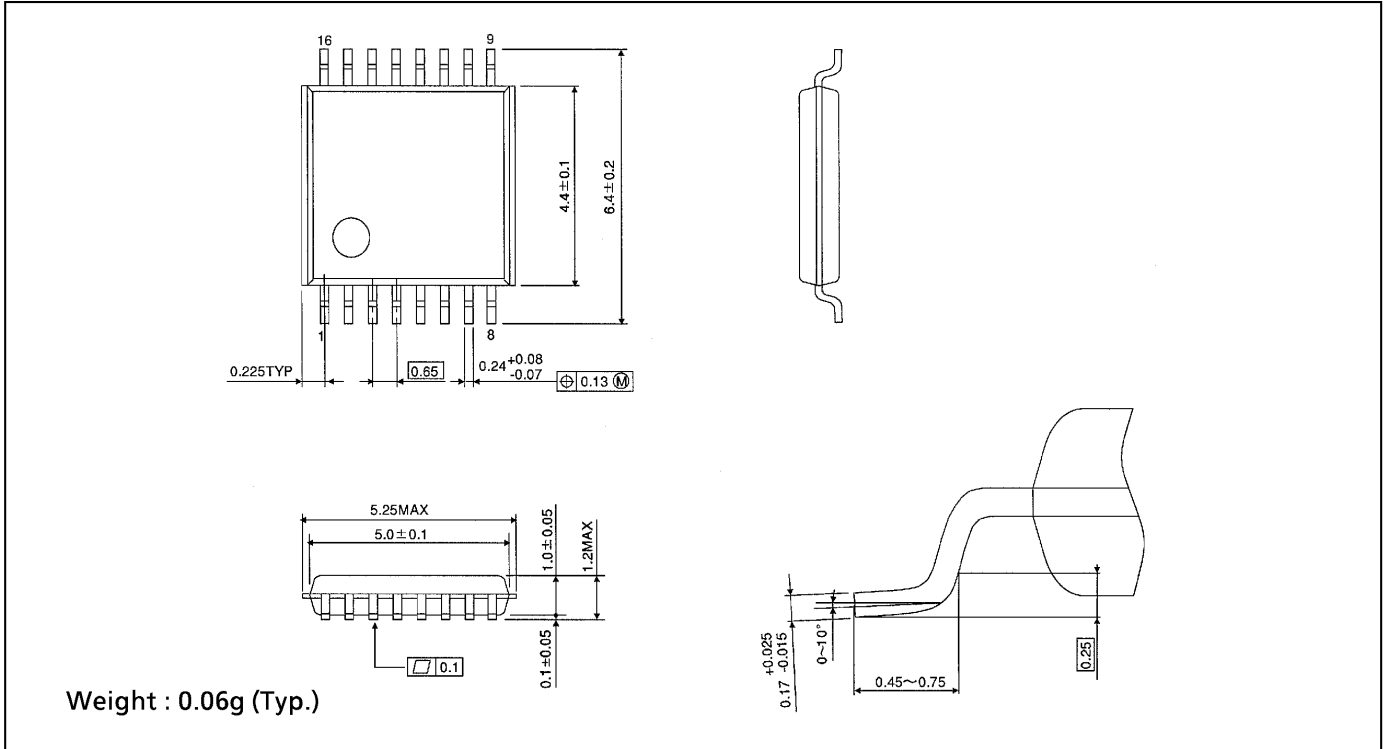
Unit in mm

(Note) This package is not available in Japan.



TSSOP 16PIN PACKAGE DIMENSIONS (TSSOP16-P-0044-0.65)

Unit in mm



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000707EBA

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