

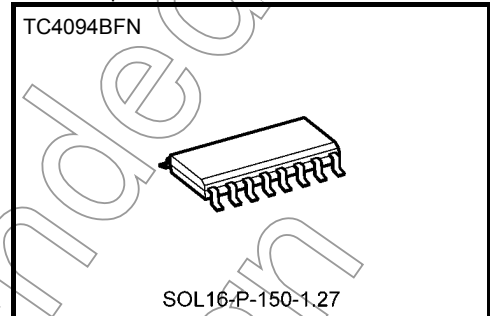
TC4094BFN

TC4094B 8-Stage Shift-and-Store Bus-Register

TC4094B is a SHIFT and STORE REGISTER that consists of an 8-bit shift register and an 8-bit latch. The read data in the shift register can be taken in the latch through the asynchronous STROBE input; therefore, the data transfer mode can hold output. And, since the parallel outputs is of 3-state construction, it can be directly connected to the 8-bit busline.

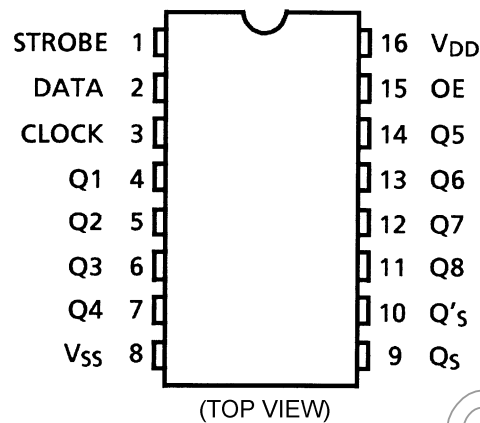
This register can be applied to Serial-to-parallel conversion, data receivers, etc.

Note: xxxFN (JEDEC SOP) is not available in Japan.

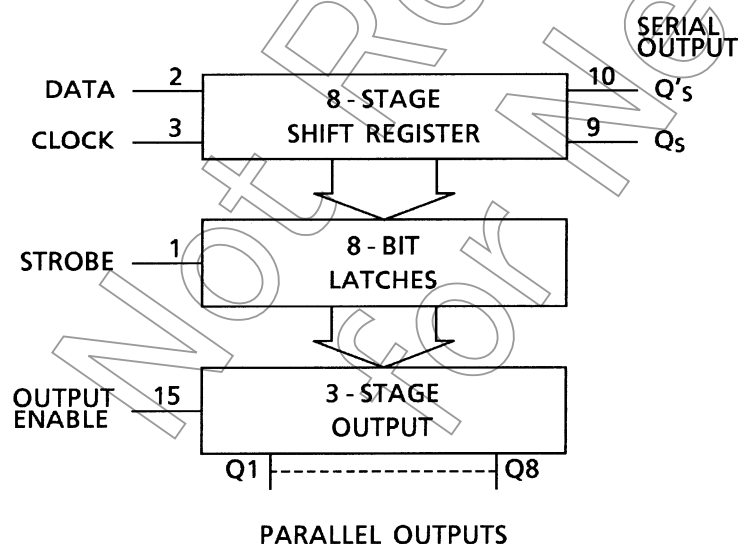


Weight
SOL16-P-150-1.27 : 0.13 g (typ.)







Pin Assignment



Block Diagram



Truth Table

| CL | OE | ST | D | PO | | SO | |
|---|----|----|---|----|--------|----|-----|
| | | | | Q1 | Qn | Qs | Q's |
|  | H | H | L | L | Qn - 1 | Q7 | NC |
|  | H | H | H | H | Qn - 1 | Q7 | NC |
|  | H | L | X | NC | NC | Q7 | NC |
|  | L | X | X | HZ | HZ | Q7 | NC |
|  | H | X | X | NC | NC | NC | Qs |
|  | L | X | X | HZ | HZ | NC | Qs |

CL = Clock

X = Don't care

OE = Output enable

NC = No change

ST = Strobe

HZ = High impedance

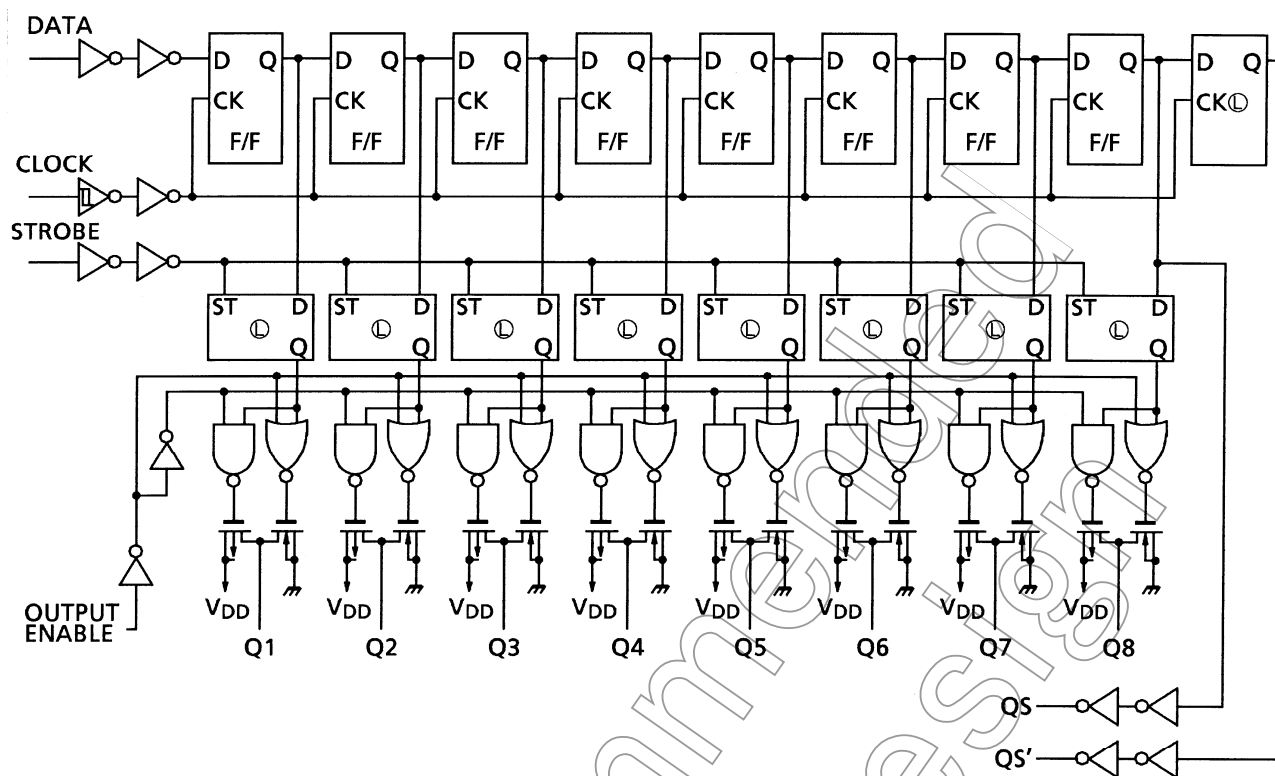
D = Data

PO = Parallel outputs

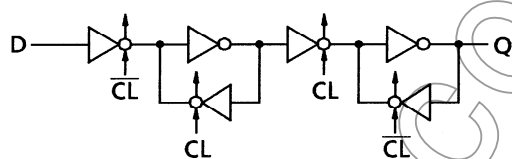
SO = Serial outputs

Not Recommended for New Design

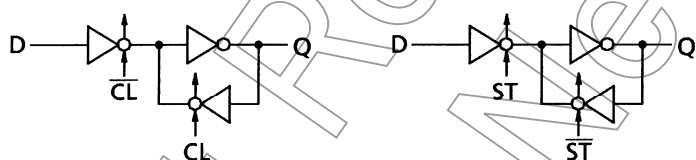
Logic Diagram



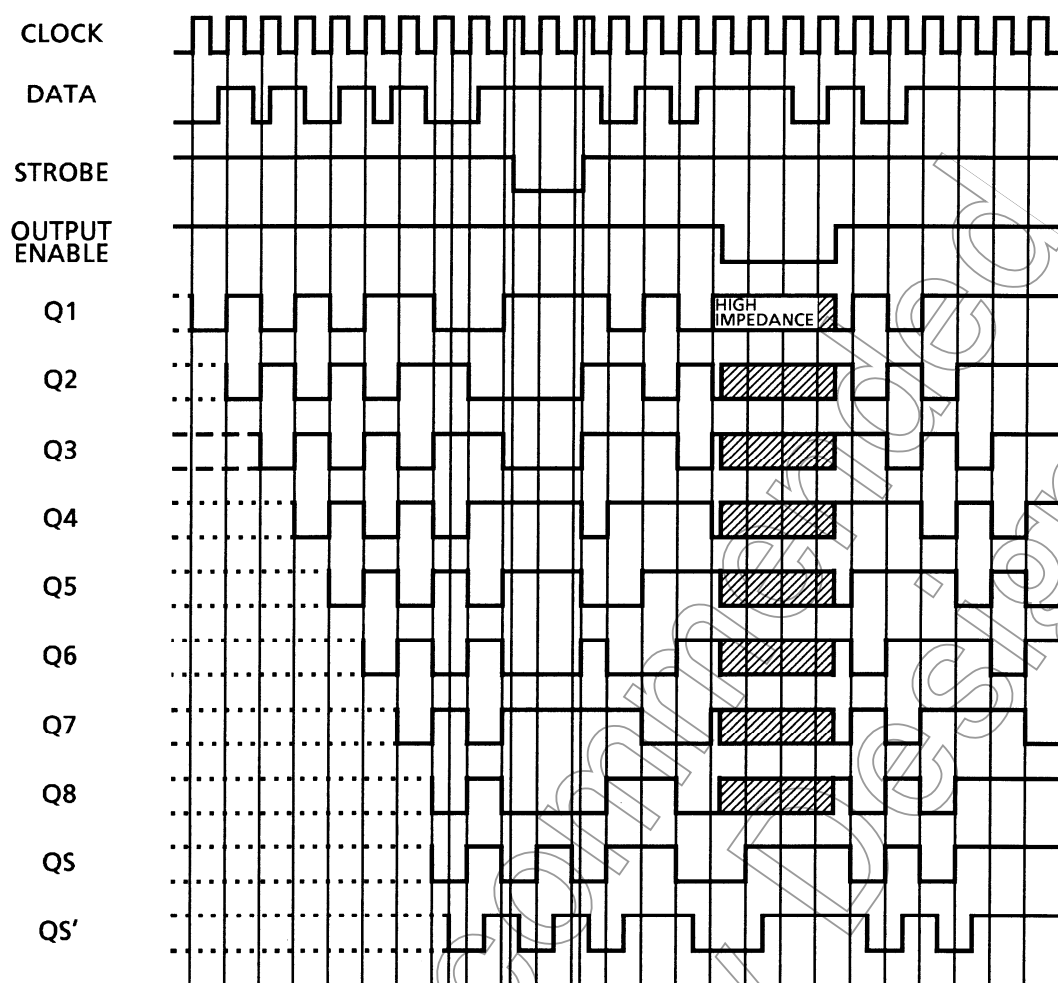
F/F



LATCH



Timing Chart



Absolute Maximum Ratings (Note)

| Characteristics | Symbol | Rating | Unit |
|-----------------------------|-----------|----------------------------------|------|
| DC supply voltage | V_{DD} | $V_{SS} - 0.5$ to $V_{SS} + 20$ | V |
| Input voltage | V_{IN} | $V_{SS} - 0.5$ to $V_{DD} + 0.5$ | V |
| Output voltage | V_{OUT} | $V_{SS} - 0.5$ to $V_{DD} + 0.5$ | V |
| DC input current | I_{IN} | ± 10 | mA |
| Power dissipation | P_D | 180 | mW |
| Operating temperature range | T_{opr} | -40 to 85 | °C |
| Storage temperature range | T_{stg} | -65 to 150 | °C |

Note: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

Operating Ranges ($V_{SS} = 0$ V) (Note)

| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------|----------|----------------|-----|------|----------|------|
| DC supply voltage | V_{DD} | — | 3 | — | 18 | V |
| Input voltage | V_{IN} | — | 0 | — | V_{DD} | V |

Note: The operating ranges must be maintained to ensure the normal operation of the device.
Unused inputs must be tied to either V_{DD} or V_{SS} .

Static Electrical Characteristics (V_{SS} = 0 V)

| Characteristics | | Sym- bol | Test Condition | -40°C | | | 25°C | | | 85°C | | Unit |
|--------------------------------|-----------|-----------------|--|------------------------|-------|------|-------|-------------------|------|-------|------|------|
| | | | | V _{DD} (V) | Min | Max | Min | Typ. | Max | Min | Max | |
| High-level output voltage | | V _{OH} | I _{OUT} < 1 μA 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} < 1 μA 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} = 4.6 V | 5 | -0.61 | — | -0.51 | -1.0 | — | -0.42 | — | mA |
| | | | V _{OH} = 2.5 V | 5 | -2.50 | — | -2.10 | -4.0 | — | -1.70 | — | |
| | | | V _{OH} = 9.5 V | 10 | -1.50 | — | -1.30 | -2.2 | — | -1.10 | — | |
| | | | V _{OH} = 13.5 V | 15 | -4.00 | — | -3.40 | -9.0 | — | -2.80 | — | |
| | | | V _{IN} = V _{SS} , V _{DD} | | | | | | | | | |
| Output low current | | I _{OL} | V _{OL} = 0.4 V | 5 | 0.61 | — | 0.51 | 1.2 | — | 0.42 | — | mA |
| | | | V _{OL} = 0.5 V | 10 | 1.50 | — | 1.30 | 3.2 | — | 1.10 | — | |
| | | | V _{OL} = 1.5 V | 15 | 4.00 | — | 3.40 | 12.0 | — | 2.80 | — | |
| | | | V _{IN} = V _{SS} , V _{DD} | | | | | | | | | |
| | | | | | | | | | | | | |
| Input high voltage | | V _{IH} | V _{OUT} = 0.5 V, 4.5 V | 5 | 3.5 | — | 3.5 | 2.75 | — | 3.5 | — | V |
| | | | V _{OUT} = 1.0 V, 9.0 V | 10 | 7.0 | — | 7.0 | 5.50 | — | 7.0 | — | |
| | | | V _{OUT} = 1.5 V, 13.5 V | 15 | 11.0 | — | 11.0 | 8.25 | — | 11.0 | — | |
| | | | I _{OUT} < 1 μA | | | | | | | | | |
| Input low voltage | | V _{IL} | V _{OUT} = 0.5 V, 4.5 V | 5 | — | 1.5 | — | 2.25 | 1.5 | — | 1.5 | V |
| | | | V _{OUT} = 1.0 V, 9.0 V | 10 | — | 3.0 | — | 4.50 | 3.0 | — | 3.0 | |
| | | | V _{OUT} = 1.5 V, 13.5 V | 15 | — | 4.0 | — | 6.75 | 4.0 | — | 4.0 | |
| | | | I _{OUT} < 1 μA | | | | | | | | | |
| Input current | "H" level | I _{IH} | V _{IH} = 18 V | 18 | — | 0.1 | — | 10 ⁻⁵ | 0.1 | — | 1.0 | μA |
| | "L" level | I _{IL} | V _{IL} = 0 V | 18 | — | -0.1 | — | -10 ⁻⁵ | -0.1 | — | -1.0 | |
| 3-state output leakage current | "H" level | I _{DH} | V _{out} = 18 V | 18 | — | 0.4 | — | 10 ⁻⁴ | 0.4 | — | 12 | μA |
| | "L" level | I _{DL} | V _{out} = 0 V | 18 | — | -0.4 | — | -10 ⁻⁴ | -0.4 | — | -12 | |
| Quiescent supply current | | I _{DD} | V _{IN} = V _{SS} , V _{DD} (Note) | 5 | — | 5 | — | 0.005 | 5 | — | 150 | μA |
| | | | | 10 | — | 10 | — | 0.010 | 10 | — | 300 | |
| | | | | 15 | — | 20 | — | 0.015 | 20 | — | 600 | |

Note: All valid input combinations.

Dynamic Electrical Characteristics (Ta = 25°C, V_{SS} = 0 V, C_L = 50 pF)

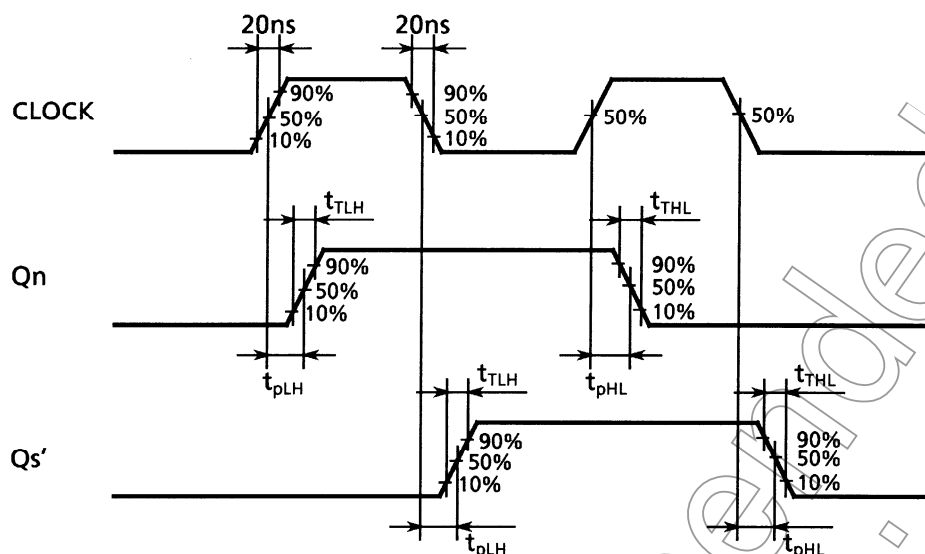
| Characteristics | Symbol | Test Condition | V _{DD} (V) | Min | Typ. | Max | Unit |
|---|--------------------------------------|-----------------------|---------------------|------|------|-----|------|
| | | | | | | | |
| Output transition time (low to high) | t _{TLH} | — | 5 | — | 70 | 200 | ns |
| | | | 10 | — | 35 | 100 | |
| | | | 15 | — | 30 | 80 | |
| Output transition time (high to low) | t _{THL} | — | 5 | — | 70 | 200 | ns |
| | | | 10 | — | 35 | 100 | |
| | | | 15 | — | 30 | 80 | |
| Propagation delay time (CLOCK-Q _S) | t _{PLH} t _{pHL} | — | 5 | — | 150 | 600 | ns |
| | | | 10 | — | 75 | 250 | |
| | | | 15 | — | 55 | 190 | |
| Propagation delay time (CLOCK-Q _S ') | t _{PLH} t _{pHL} | — | 5 | — | 155 | 460 | ns |
| | | | 10 | — | 75 | 220 | |
| | | | 15 | — | 55 | 150 | |
| Propagation delay time (CLOCK-Q _n) | t _{PLH} t _{pHL} | — | 5 | — | 190 | 840 | ns |
| | | | 10 | — | 90 | 390 | |
| | | | 15 | — | 65 | 270 | |
| Propagation delay time (STROBE-Q _n) | t _{PLH} t _{pHL} | — | 5 | — | 150 | 580 | ns |
| | | | 10 | — | 70 | 290 | |
| | | | 15 | — | 50 | 200 | |
| Three state disable time (OUTPUT ENABLE-Q _n) | t _{PHZ} t _{PZH} | R _L = 1 kΩ | 5 | — | 60 | 200 | ns |
| | | | 10 | — | 35 | 100 | |
| | | | 15 | — | 30 | 80 | |
| Three state disable time (OUTPUT ENABLE-Q _n) | t _{PLZ} t _{PZL} | R _L = 1 kΩ | 5 | — | 70 | 200 | ns |
| | | | 10 | — | 40 | 100 | |
| | | | 15 | — | 35 | 80 | |
| Min clock pulse width | t _w | — | 5 | — | 45 | 200 | ns |
| | | | 10 | — | 20 | 100 | |
| | | | 15 | — | 15 | 80 | |
| Min pulse width (STROBE) | t _{WH} | — | 5 | — | 40 | 200 | ns |
| | | | 10 | — | 20 | 80 | |
| | | | 15 | — | 15 | 70 | |
| Max clock frequency | f _{CL} | — | 5 | 1.25 | 6 | — | MHz |
| | | | 10 | 2.50 | 12 | — | |
| | | | 15 | 3.00 | 16 | — | |
| Min set-up time (DATA-CLOCK) | t _{SU} | — | 5 | — | 0 | 120 | ns |
| | | | 10 | — | 0 | 55 | |
| | | | 15 | — | 0 | 35 | |
| Min hold time (DATA-CLOCK) | t _H | — | 5 | — | 10 | 40 | ns |
| | | | 10 | — | 10 | 20 | |
| | | | 15 | — | 5 | 15 | |
| Min set-up time (CLOCK-STROBE) | t _{SU} | — | 5 | — | 90 | 200 | ns |
| | | | 10 | — | 40 | 100 | |
| | | | 15 | — | 30 | 80 | |

| Characteristics | Symbol | Test Condition | | Min | Typ. | Max | Unit |
|---------------------------------|------------------|----------------|---------------------|----------|------|-----|------|
| | | | V _{DD} (V) | | | | |
| Min hold time (CLOCK-STROBE) | t _H | — | 5 | — | — | 0 | ns |
| | | | 10 | — | — | 0 | |
| | | | 15 | — | — | 0 | |
| Max clock input rise time | t _{rCL} | — | 5 | No limit | | | μs |
| Max clock input fall time | t _{fCL} | | 10 | | | | |
| | | | 15 | | | | |
| Input capacitance | C _{IN} | — | | — | 5 | 7.5 | pF |

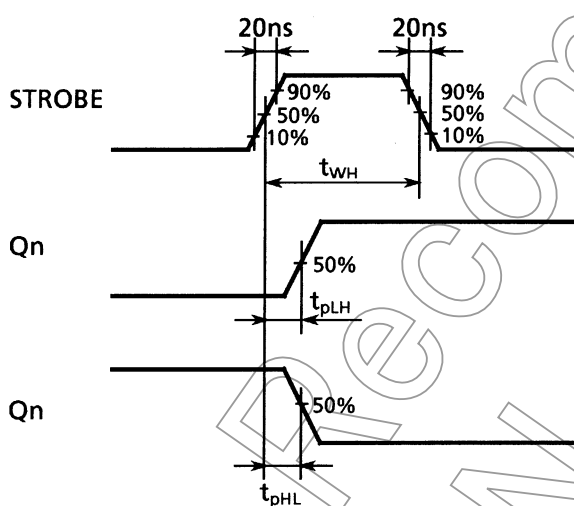
Not Recommended
for New Design

Waveforms for Measurement of Dynamic Characteristics

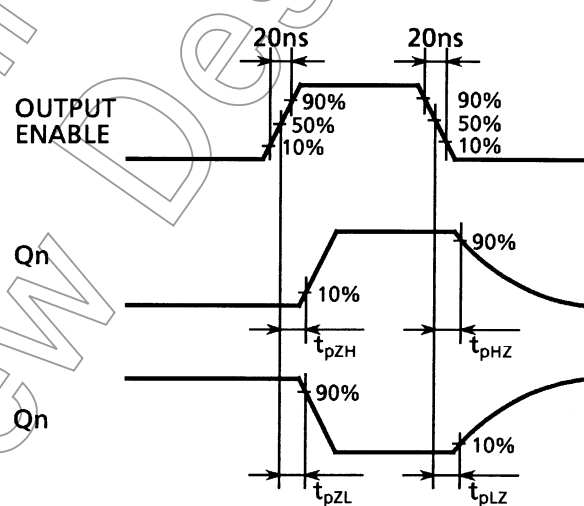
Waveform 1



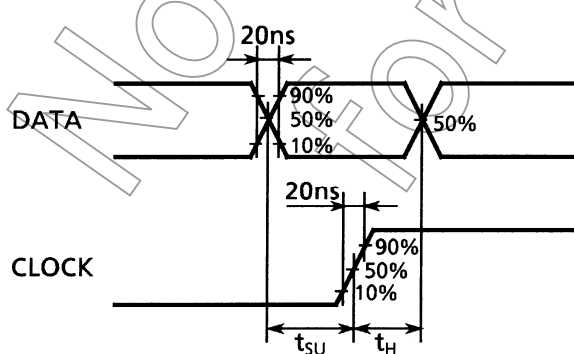
Waveform 2



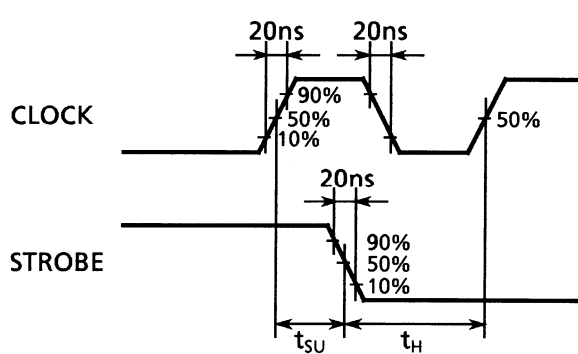
Waveform 3



Waveform 4



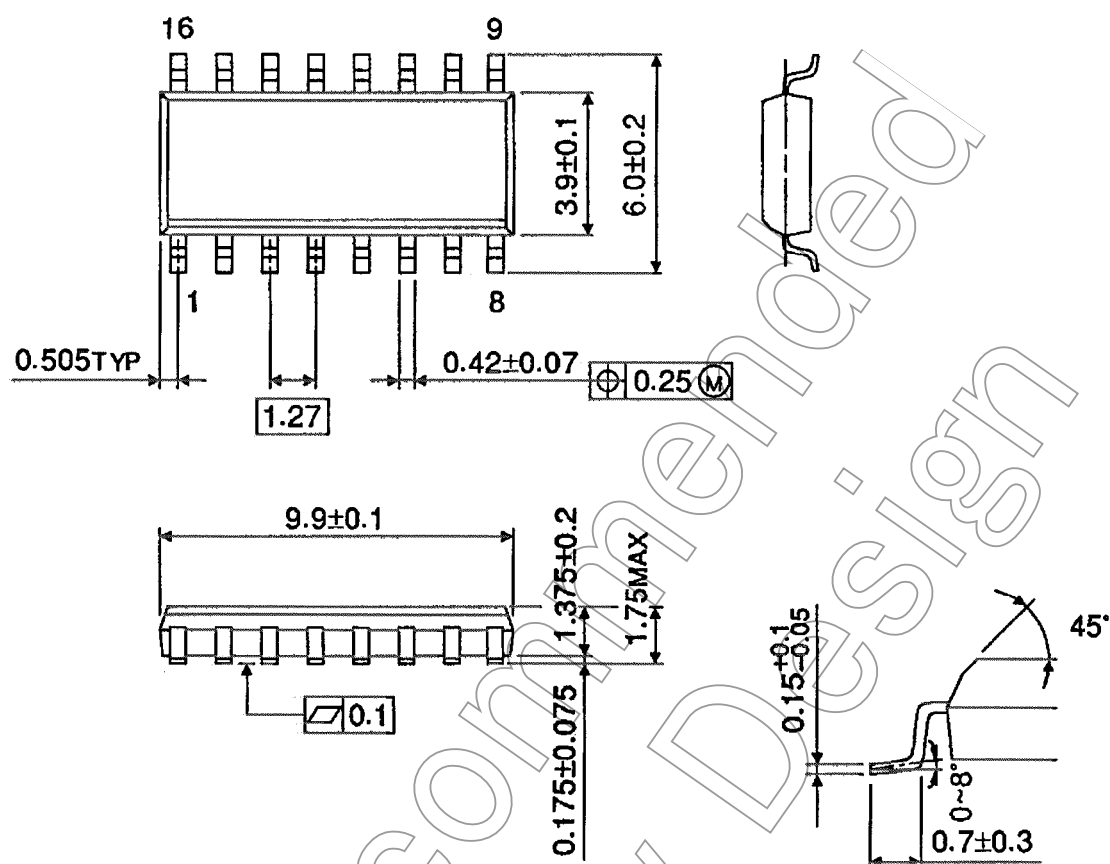
Waveform 5



Package Dimensions (Note)

SOL16-P-150-1.27

Unit : mm



Note: This package is not available in Japan.

Weight: 0.13 g (typ.)

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