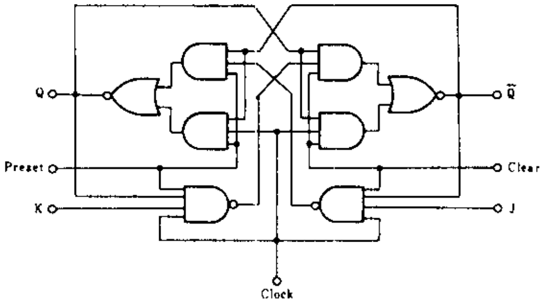
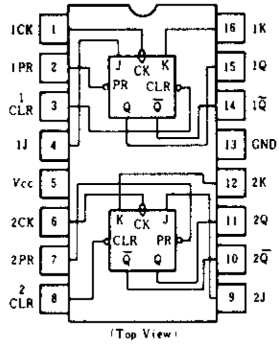
# HD74LS76A ●Dual J-K Flip-Flops (with Preset and Clear)

## ■BLOCK DIAGRAM(½)




## ■PIN ARRANGEMENT

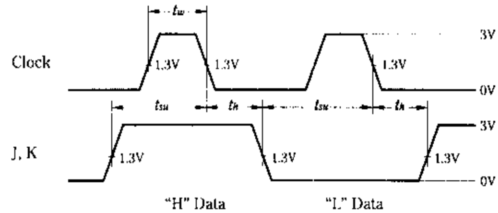



## ■RECOMMENDED OPERATING CONDITIONS

| Item | | Symbol | min | typ | max | Unit |
|---|---|---|---|---|---|---|
| Clock frequency | | $f_{clock}$ | 0 | – | 30 | MHz |
| Pulse width | Clock High | $t_w$ | 20 | – | – | ns |
| | Clear Preset Low | | 25 | – | – | |
| Setup time | "H" Data | $t_{su}$ | 20↓ | – | – | ns |
| | "L" Data | | 20↓ | – | – | |
| Hold time | | $t_h$ | 0↓ | – | – | ns |

Note) ↓; The arrow indicates the falling edge.

## ■TIMING DEFINITION




## ■ELECTRICAL CHARACTERISTICS ( $Ta = -20 \sim +75$℃ )

| Item | | Symbol | Test Conditions | | min | typ* | max | Unit |
|---|---|---|---|---|---|---|---|---|
| Input voltage | | $V_{IH}$ | | | 2.0 | – | – | V |
| | | $V_{IL}$ | | | – | – | 0.8 | V |
| Output voltage | | $V_{OH}$ | $V_{CC}=4.75V$, $V_{IH}=2V$, $V_{IL}=0.8V$, $I_{OH}=-400\mu A$ | | 2.7 | – | – | V |
| | | $V_{OL}$ | $V_{CC}=4.75V$, $V_{IH}=2V$, $V_{IL}=0.8V$ | $I_{OL}=8mA$ | – | – | 0.5 | V |
| | | | | $I_{OL}=4mA$ | – | – | 0.4 | |
| Input current | J, K | $I_{IH}$ | $V_{CC}=5.25V$, $V_I=2.7V$ | | – | – | 20 | μA |
| | Clear | | | | – | – | 60 | |
| | Preset | | | | – | – | 60 | |
| | Clock | | | | – | – | 80 | |
| | J, K | $I_{IL}$** | $V_{CC}=5.25V$, $V_I=0.4V$ | | – | – | −0.4 | mA |
| | Clear | | | | – | – | −0.8 | |
| | Preset | | | | – | – | −0.8 | |
| | Clock | | | | – | – | −0.8 | |
| | J, K | $I_I$ | $V_{CC}=5.25V$, $V_I=7V$ | | – | – | 0.1 | mA |
| | Clear | | | | – | – | 0.3 | |
| | Preset | | | | – | – | 0.3 | |
| | Clock | | | | – | – | 0.4 | |
| Short-circuit output current | | $I_{OS}$ | $V_{CC}=5.25V$ | | −20 | – | −100 | mA |
| Supply current *** | | $I_{CC}$ | $V_{CC}=5.25V$ | | – | 4 | 6 | mA |
| Input clamp voltage | | $V_{IK}$ | $V_{CC}=4.75V$, $I_{IN}=-18mA$ | | – | – | −1.5 | V |

* $V_{CC}=5V$, $Ta=25°C$

** $I_{IL}$ should not be measured when preset and clear inputs are low at same time.

*** With all outputs open, $I_{CC}$ is measured with the Q and Q̄ outputs high in turn. At the time of measurement, the clock input is grounded.

## ■FUNCTION TABLE

| Inputs | | | | | Outputs | |
|---|---|---|---|---|---|---|
| Preset | Clear | Clock | J | K | Q | $\bar{Q}$ |
| L | H | × | × | × | H | L |
| H | L | × | × | × | L | H |
| L | L | × | × | × | H* | H* |
| H | H | ↓ | L | L | $Q_0$ | $\bar{Q}_0$ |
| H | H | ↓ | H | L | H | L |
| H | H | ↓ | L | H | L | H |
| H | H | ↓ | H | H | Toggle | |
| H | H | H | × | × | $Q_0$ | $\bar{Q}_0$ |

Notes) H; high level, L; low level, X; irrelevant
↓; transition from high to low level
$Q_0$; level of Q before the indicated steady-state input conditions were established.
$\bar{Q}_0$; complement of $Q_0$ or level of $\bar{Q}$ before the indicated steady-state input conditions were established.
Toggle; each output changes to the complement of its previous level on each active transition indicated by ↓.
*; This configuration is nonstable; that is, it will not persist when preset and clear inputs return to their inactive (high) level.

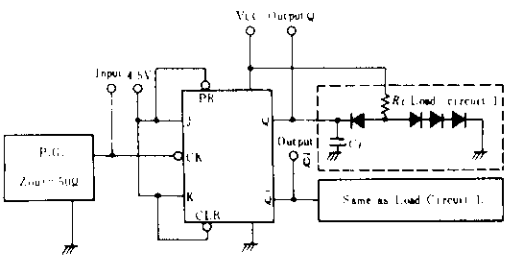
## ■SWITCHING CHARACTERISTICS ( $V_{CC}$=5V, $Ta$=25℃ )

| Item | Symbol | Inputs | Outputs | Test Conditions | min | typ | max | Unit |
|---|---|---|---|---|---|---|---|---|
| Maximum clock frequency | $f_{max}$ | | | $C_L$=15pF, $R_L$=2kΩ | 30 | 45 | – | MHz |
| Propagation delay time | $t_{PLH}$ | Clear Preset Clock | Q, $\bar{Q}$ | | – | 15 | 20 | ns |
| | $t_{PHL}$ | | | | | 15 | 20 | ns |

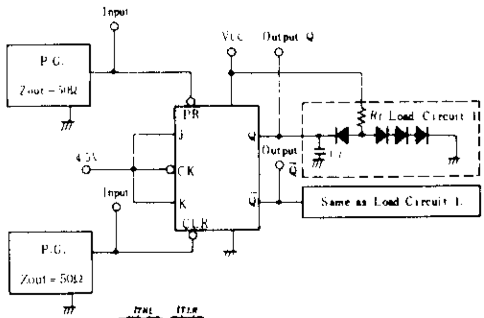
## ■TESTING METHOD

1) Test Circuit

1.1) $f_{max}$, $t_{PLH}$, $t_{PHL}$ (Clock→Q, $\bar{Q}$)

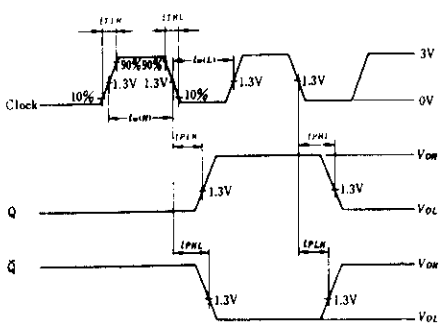



1.2) $t_{PHL}$, $t_{PLH}$ (Clear, Preset→Q, $\bar{Q}$)

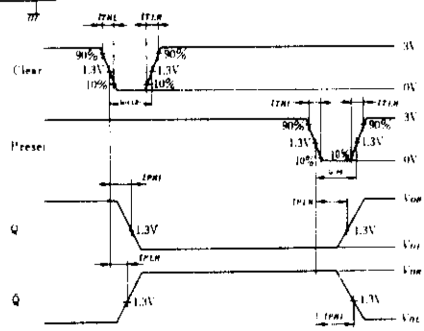



Notes) 1. Test is put into the each flip-flop
2. All diodes are 1S2074 Ⓗ.
3. $C_L$ includes probe and jig capacitance.

Waveform

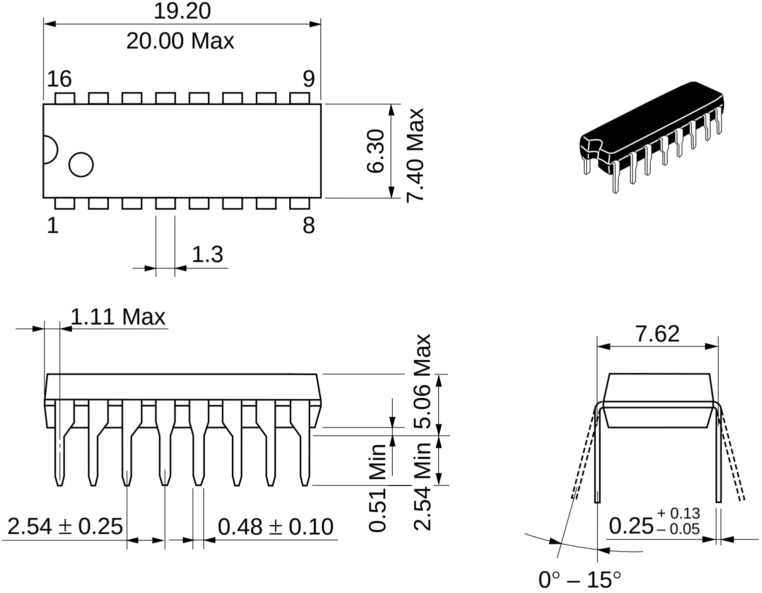



Note) Clock input pulse; $t_{TLH} \leq 15$ns, $t_{THL} \leq 6$ns, $PRR$=1MHz, duty cycle=50% and: for $f_{max}$, $t_{TLH}=t_{THL} \leq 2.5$ns.



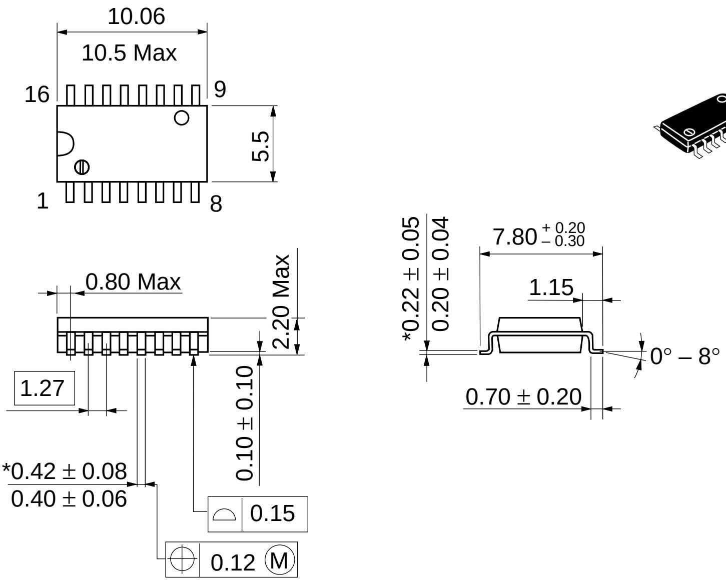

Note) Clear and preset input pulse; $t_{TLH} \leq 15$ns, $t_{THL} \leq 6$ns, $PRR$=1MHz

Unit: mm




| | |
|---|---|
| Hitachi Code | DP-16 |
| JEDEC | Conforms |
| EIAJ | Conforms |
| Weight (reference value) | 1.07 g |

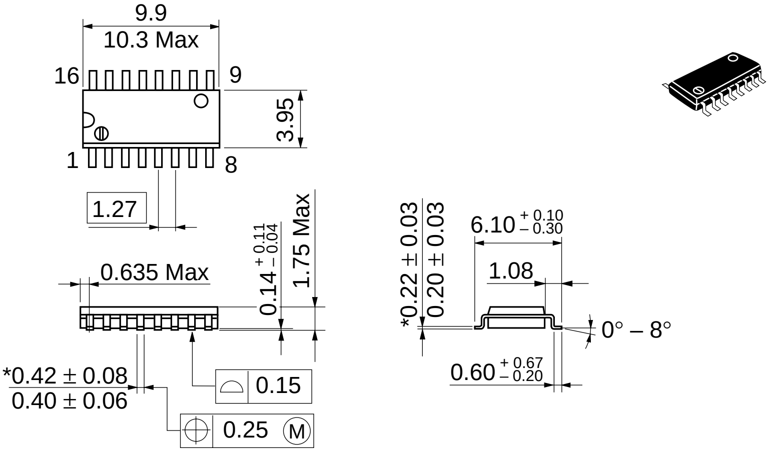
Unit: mm




| | |
|---|---|
| Hitachi Code | FP-16DA |
| JEDEC | — |
| EIAJ | Conforms |
| Weight (reference value) | 0.24 g |

*Dimension including the plating thickness
Base material dimension

Unit: mm




| | |
|---|---|
| Hitachi Code | FP-16DN |
| JEDEC | Conforms |
| EIAJ | Conforms |
| Weight (reference value) | 0.15 g |

*Dimension including the plating thickness
Base material dimension

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