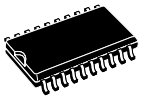
# 74LVC573A

## OCTAL D-TYPE LATCH HIGH PERFORMANCE

- 5V TOLERANT INPUTS
- HIGH SPEED: $t_{PD}$ = 6.8ns (MAX.) at $V_{CC}$ = 3V
- POWER DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE: $|I_{OH}| = I_{OL}$ = 24mA (MIN) at $V_{CC}$ = 3V
- PCI BUS LEVELS GUARANTEED AT 24 mA
- BALANCED PROPAGATION DELAYS: $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE: $V_{CC}$(OPR) = 1.65V to 3.6V (1.2V Data Retention)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 573
- LATCH-UP PERFORMANCE EXCEEDS 500mA (JESD 17)
- ESD PERFORMANCE: HBM > 2000V (MIL STD 883 method 3015); MM > 200V



SOP

TSSOP

**Table 1: Order Codes**

| PACKAGE | T & R |
|---|---|
| SOP | 74LVC573AMTR |
| TSSOP | 74LVC573ATTR |

### DESCRIPTION

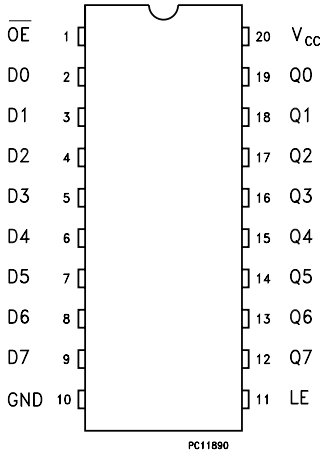
The 74LVC573A is a low voltage CMOS OCTAL D-TYPE LATCH fabricated with sub-micron silicon gate and double-layer metal wiring $C^2MOS$ technology. It is ideal for 1.65 to 3.6 $V_{CC}$ operations and low power and low noise applications.

These 8 bit D-Type latch are controlled by a latch enable input (LE) and an output enable input ($\overline{OE}$). While the LE inputs is held at a high level, the Q outputs will follow the data input precisely or inversely. When the LE is taken low, the Q outputs will be latched precisely or inversely at the logic level of D input data. While the ($\overline{OE}$) input is low, the 8 outputs will be in a normal logic state (high or low logic level) and while high level the outputs will be in a high impedance state.

This device is designed to interface directly High Speed CMOS systems with TTL and NMOS components. It has more speed performance at 3.3V than 5V AC/ACT family, combined with a lower power consumption.

All inputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

**Figure 1: Pin Connection And IEC Logic Symbols**



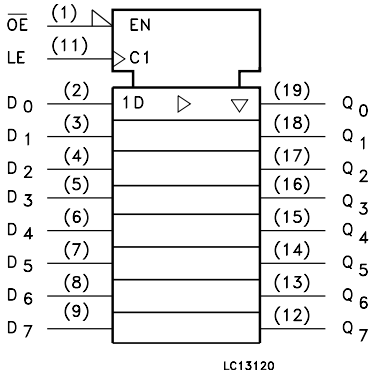



**Figure 2: Input And Output Equivalent Circuit**

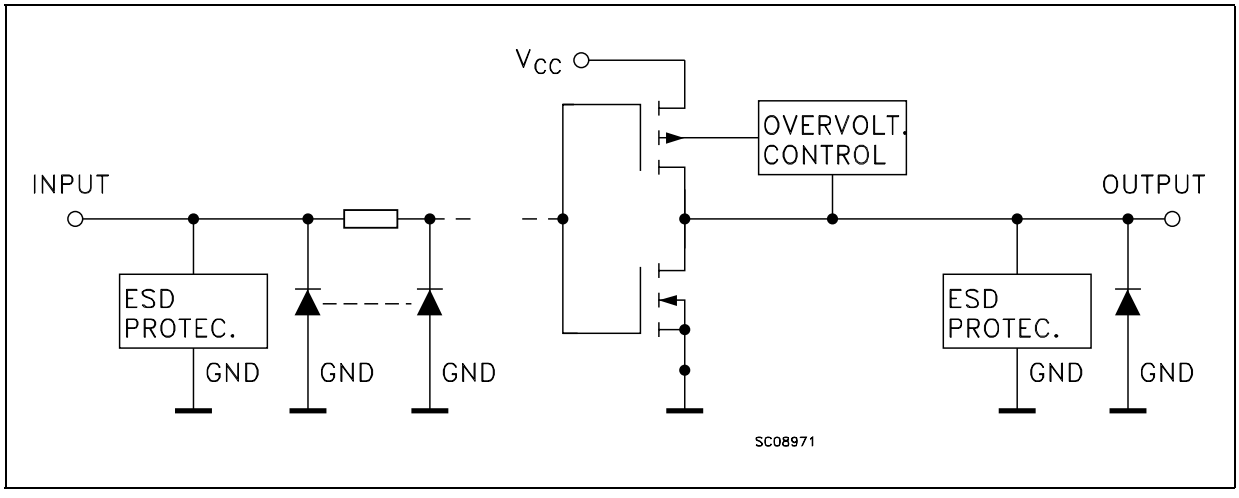



**Table 2: Pin Description**

| PIN N° | SYMBOL | NAME AND FUNCTION |
|---|---|---|
| 1 | $\overline{OE}$ | 3 State Output Enable Input (Active LOW) |
| 2, 3, 4, 5, 6, 7, 8, 9 | D0 to D7 | Data Inputs |
| 12, 13, 14, 15, 16, 17, 18, 19 | Q0 to Q7 | 3-State Latch Outputs |
| 11 | LE | Latch Enable Input |
| 10 | GND | Ground (0V) |
| 20 | $V_{CC}$ | Positive Supply Voltage |

**Table 3: Truth Table**

| INPUTS | | | OUTPUT |
|---|---|---|---|
| $\overline{OE}$ | LE | D | Q |
| H | X | X | Z |
| L | L | X | NO CHANGE |
| L | H | L | L |
| L | H | H | H |

X : Don't Care

Z : High Impedance

**Table 4: Absolute Maximum Ratings**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CC}$ | Supply Voltage | -0.5 to +7.0 | V |
| $V_I$ | DC Input Voltage | -0.5 to +7.0 | V |
| $V_O$ | DC Output Voltage ($V_{CC}$ = 0V) | -0.5 to +7.0 | V |
| $V_O$ | DC Output Voltage (High or Low State) (note 1) | -0.5 to $V_{CC}$ + 0.5 | V |
| $I_{IK}$ | DC Input Diode Current | - 50 | mA |
| $I_{OK}$ | DC Output Diode Current (note 2) | - 50 | mA |
| $I_O$ | DC Output Current | ± 50 | mA |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current per Supply Pin | ± 100 | mA |
| $T_{stg}$ | Storage Temperature | -65 to +150 | °C |
| $T_L$ | Lead Temperature (10 sec) | 300 | °C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied
1) $I_O$ absolute maximum rating must be observed
2) $V_O$ < GND

### Table 5: Recommended Operating Conditions

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_{CC}$ | Supply Voltage (note 1) | 1.65 to 3.6 | V |
| $V_I$ | Input Voltage | 0 to 5.5 | V |
| $V_O$ | Output Voltage ($V_{CC}$ = 0V) | 0 to 5.5 | V |
| $V_O$ | Output Voltage (High or Low State) | 0 to $V_{CC}$ | V |
| $I_{OH}$, $I_{OL}$ | High or Low Level Output Current ($V_{CC}$ = 3.0 to 3.6V) | ± 24 | mA |
| $I_{OH}$, $I_{OL}$ | High or Low Level Output Current ($V_{CC}$ = 2.7 to 3.0V) | ± 12 | mA |
| $I_{OH}$, $I_{OL}$ | High or Low Level Output Current ($V_{CC}$ = 2.3 to 2.7V) | ± 8 | mA |
| $I_{OH}$, $I_{OL}$ | High or Low Level Output Current ($V_{CC}$ = 1.65 to 2.3V) | ± 4 | mA |
| $T_{op}$ | Operating Temperature | -55 to 125 | °C |
| dt/dv | Input Rise and Fall Time (note 2) | 0 to 10 | ns/V |

1) Truth Table guaranteed: 1.2V to 3.6V
2) $V_{IN}$ from 0.8V to 2V at $V_{CC}$ = 3.0V

### Table 6: DC Specifications

| Symbol | Parameter | Test Condition | | Value | | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | -40 to 85 °C | | -55 to 125 °C | | |
| | | | | Min. | Max. | Min. | Max. | |
| $V_{IH}$ | High Level Input Voltage | 1.65 to 1.95 | | 0.65$V_{CC}$ | | 0.65$V_{CC}$ | | V |
| | | 2.3 to 2.7 | | 1.7 | | 1.7 | | |
| | | 2.7 to 3.6 | | 2 | | 2 | | |
| $V_{IL}$ | Low Level Input Voltage | 1.65 to 1.95 | | | 0.35$V_{CC}$ | | 0.35$V_{CC}$ | V |
| | | 2.3 to 2.7 | | | 0.7 | | 0.7 | |
| | | 2.7 to 3.6 | | | 0.8 | | 0.8 | |
| $V_{OH}$ | High Level Output Voltage | 1.65 to 3.6 | $I_O$=-100 µA | $V_{CC}$-0.2 | | $V_{CC}$-0.2 | | V |
| | | 1.65 | $I_O$=-4 mA | 1.2 | | 1.2 | | |
| | | 2.3 | $I_O$=-8 mA | 1.7 | | 1.7 | | |
| | | 2.7 | $I_O$=-12 mA | 2.2 | | 2.2 | | |
| | | 3.0 | $I_O$=-18 mA | 2.4 | | 2.4 | | |
| | | 3.0 | $I_O$=-24 mA | 2.2 | | 2.2 | | |
| $V_{OL}$ | Low Level Output Voltage | 1.65 to 3.6 | $I_O$=100 µA | | 0.2 | | 0.2 | V |
| | | 1.65 | $I_O$=4 mA | | 0.45 | | 0.45 | |
| | | 2.3 | $I_O$=8 mA | | 0.7 | | 0.7 | |
| | | 2.7 | $I_O$=12 mA | | 0.4 | | 0.4 | |
| | | 3.0 | $I_O$=24 mA | | 0.55 | | 0.55 | |
| $I_I$ | Input Leakage Current | 3.6 | $V_I$ = 0 to 5.5V | | ± 5 | | ± 5 | µA |
| $I_{off}$ | Power Off Leakage Current | 0 | $V_I$ or $V_O$ = 5.5V | | 10 | | 10 | µA |
| $I_{OZ}$ | High Impedance Output Leakage Current | 3.6 | $V_I$ = $V_{IH}$ or $V_{IL}$<br>$V_O$ = 0 to 5.5V | | ± 5 | | ± 5 | µA |
| $I_{CC}$ | Quiescent Supply Current | 3.6 | $V_I$ = $V_{CC}$ or GND | | 10 | | 10 | µA |
| | | | $V_I$ or $V_O$ = 3.6 to 5.5V | | ± 10 | | ± 10 | |
| $\Delta I_{CC}$ | $I_{CC}$ incr. per Input | 2.7 to 3.6 | $V_{IH}$ = $V_{CC}$-0.6V | | 500 | | 500 | µA |

## Table 7: Dynamic Switching Characteristics

| Symbol | Parameter | Test Condition | | Value | | | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | $T_A$ = 25 °C | | | |
| | | | | Min. | Typ. | Max. | |
| $V_{OLP}$ | Dynamic Low Level Quiet Output (note 1) | 3.3 | $C_L$ = 50pF<br>$V_{IL}$ = 0V, $V_{IH}$ = 3.3V | | 0.8 | | V |
| $V_{OLV}$ | | | | | -0.8 | | |

1) Number of output defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the LOW state.

## Table 8: AC Electrical Characteristics

| Symbol | Parameter | Test Condition | | | | Value | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | $C_L$ (pF) | $R_L$ (Ω) | $t_s = t_r$ (ns) | -40 to 85 °C | | -55 to 125 °C | | |
| | | | | | | Min. | Max. | Min. | Max. | |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time D to Q | 1.65 to 1.95 | 30 | 1000 | 2.0 | | TBD | | TBD | ns |
| | | 2.3 to 2.7 | 30 | 500 | 2.0 | | TBD | | TBD | |
| | | 2.7 | 50 | 500 | 2.5 | 1.5 | 7.8 | 1.5 | 9.4 | |
| | | 3.0 to 3.6 | 50 | 500 | 2.5 | 1 | 6.8 | 1 | 8.2 | |
| $t_{PLH}$ $t_{PHL}$ | Propagation Delay Time LE to Q | 1.65 to 1.95 | 30 | 1000 | 2.0 | | TBD | | TBD | ns |
| | | 2.3 to 2.7 | 30 | 500 | 2.0 | | TBD | | TBD | |
| | | 2.7 | 50 | 500 | 2.5 | 1.5 | 7.8 | 1.5 | 9.4 | |
| | | 3.0 to 3.6 | 50 | 500 | 2.5 | 1 | 6.8 | 1 | 8.2 | |
| $t_{PZL}$ $t_{PZH}$ | Output Enable Time | 1.65 to 1.95 | 30 | 1000 | 2.0 | | TBD | | TBD | ns |
| | | 2.3 to 2.7 | 30 | 500 | 2.0 | | TBD | | TBD | |
| | | 2.7 | 50 | 500 | 2.5 | 1 | 8.7 | 1 | 10.4 | |
| | | 3.0 to 3.6 | 50 | 500 | 2.5 | 1 | 7.7 | 1 | 9.2 | |
| $t_{PLZ}$ $t_{PHZ}$ | Output Disable Time | 1.65 to 1.95 | 30 | 1000 | 2.0 | | TBD | | TBD | ns |
| | | 2.3 to 2.7 | 30 | 500 | 2.0 | | TBD | | TBD | |
| | | 2.7 | 50 | 500 | 2.5 | 2 | 7.6 | 2 | 9.1 | |
| | | 3.0 to 3.6 | 50 | 500 | 2.5 | 2 | 7.0 | 2 | 8.4 | |
| $t_W$ | LE Pulse Width HIGH | 1.65 to 1.95 | 30 | 1000 | 2.0 | TBD | | TBD | | ns |
| | | 2.3 to 2.7 | 30 | 500 | 2.0 | TBD | | TBD | | |
| | | 2.7 | 50 | 500 | 2.5 | 3.3 | | 3.3 | | |
| | | 3.0 to 3.6 | 50 | 500 | 2.5 | 3.3 | | 3.3 | | |
| $t_s$ | Setup Time D to LE, (HIGH to LOW) | 1.65 to 1.95 | 30 | 1000 | 2.0 | TBD | | TDB | | ns |
| | | 2.3 to 2.7 | 30 | 500 | 2.0 | TBD | | TBD | | |
| | | 2.7 | 50 | 500 | 2.5 | 2 | | 2 | | |
| | | 3.0 to 3.6 | 50 | 500 | 2.5 | 2 | | 2 | | |
| $t_h$ | Hold Time LE (HIGH to LOW) to D | 1.65 to 1.95 | 30 | 1000 | 2.0 | TBD | | TBD | | ns |
| | | 2.3 to 2.7 | 30 | 500 | 2.0 | TBD | | TBD | | |
| | | 2.7 | 50 | 500 | 2.5 | 1.5 | | 1.5 | | |
| | | 3.0 to 3.6 | 50 | 500 | 2.5 | 1.5 | | 1.5 | | |
| $t_{OSLH}$ $t_{OSHL}$ | Output To Output Skew Time (note1, 2) | 2.7 to 3.6 | | | | | 1 | | 1 | ns |

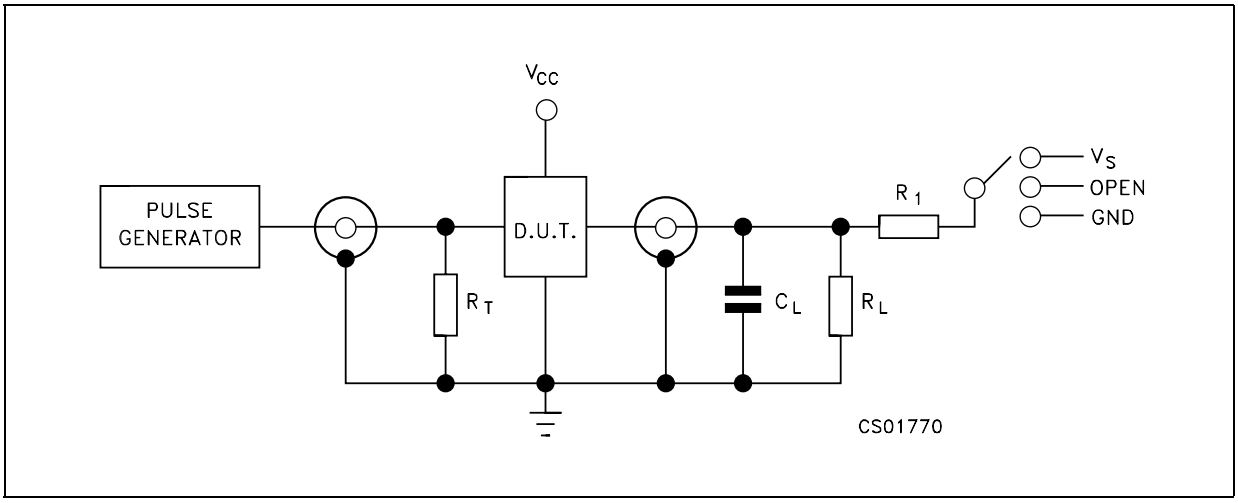
1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW ($t_{OSLH}$ = | $t_{PLHm}$ - $t_{PLHn}$|, $t_{OSHL}$ = | $t_{PHLm}$ - $t_{PHLn}$|
2) Parameter guaranteed by design

### Table 9: Capacitive Characteristics

| Symbol | Parameter | Test Condition | | Value | | | Unit |
|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | $T_A$ = 25 °C | | | |
| | | | | Min. | Typ. | Max. | |
| $C_{IN}$ | Input Capacitance | | | | 4 | | pF |
| $C_{PD}$ | Power Dissipation Capacitance (note 1) | 1.8 | $f_{IN}$ = 10MHz | | 28 | | pF |
| | | 2.5 | | | 30 | | |
| | | 3.3 | | | 34 | | |

1) $C_{PD}$ is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/n$ (per circuit)

### Figure 3: Test Circuit




$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

### Table 10: Test Circuit And Waveform Symbol Value

| Symbol | $V_{CC}$ | | | |
|---|---|---|---|---|
| | 1.65 to 1.95V | 2.3 to 2.7V | 2.7V | 3.0 to 3.6V |
| $C_L$ | 30pF | 30pF | 50pF | 50pF |
| $R_L = R_1$ | 1000Ω | 500Ω | 500Ω | 500Ω |
| $V_S$ | 2 x $V_{CC}$ | 2 x $V_{CC}$ | 6V | 7V |
| $V_{IH}$ | $V_{CC}$ | $V_{CC}$ | 2.7V | 3.0V |
| $V_M$ | $V_{CC}/2$ | $V_{CC}/2$ | 1.5V | 1.5V |
| $V_{OH}$ | $V_{CC}$ | $V_{CC}$ | 3.0V | 3.5V |
| $V_X$ | $V_{OL}$ + 0.15V | $V_{OL}$ + 0.15V | $V_{OL}$ + 0.3V | $V_{OL}$ + 0.3V |
| $V_Y$ | $V_{OH}$ - 0.15V | $V_{OH}$ - 0.15V | $V_{OH}$ - 0.3V | $V_{OH}$ - 0.3V |
| $t_r = t_r$ | <2.0ns | <2.0ns | <2.5ns | <2.5ns |

**Figure 4: Waveform - Propagation Delay, Setup And Hold Times** (f=1MHz; 50% duty cycle)

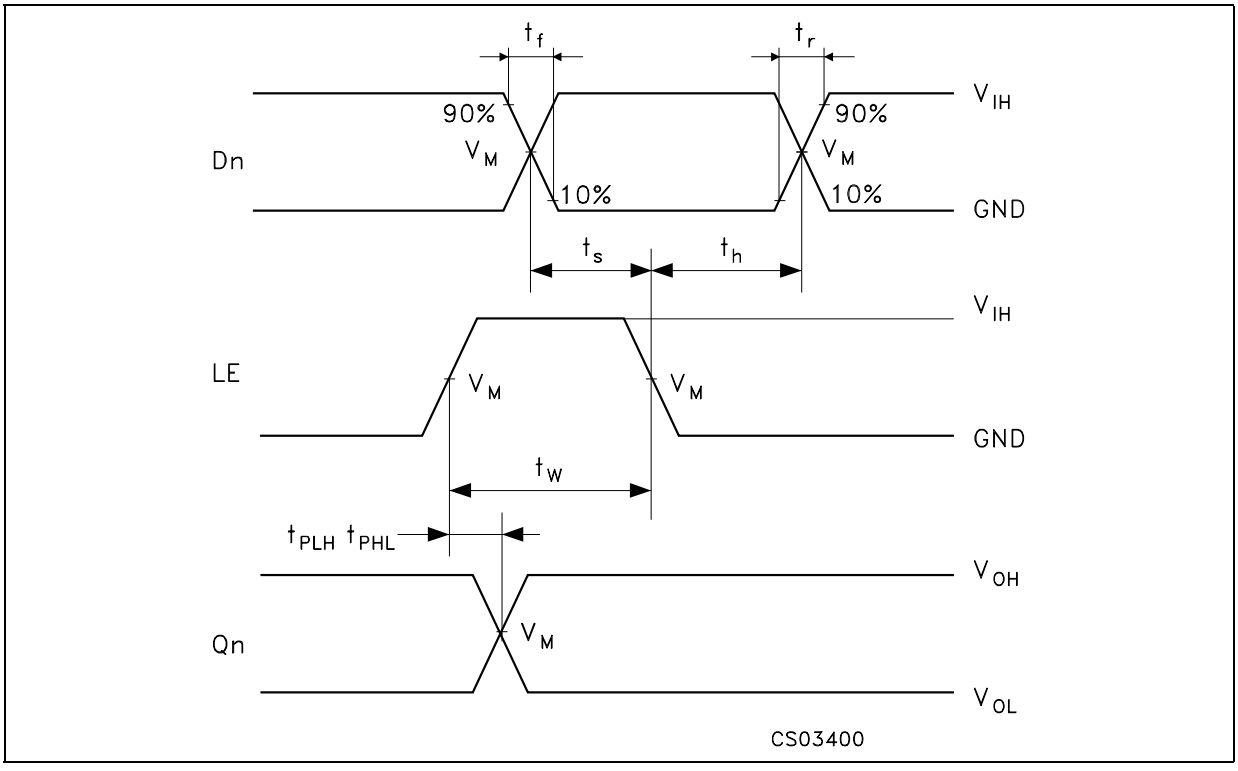



**Figure 5: Waveform - Output Enable And Disable Times** (f=1MHz; 50% duty cycle)

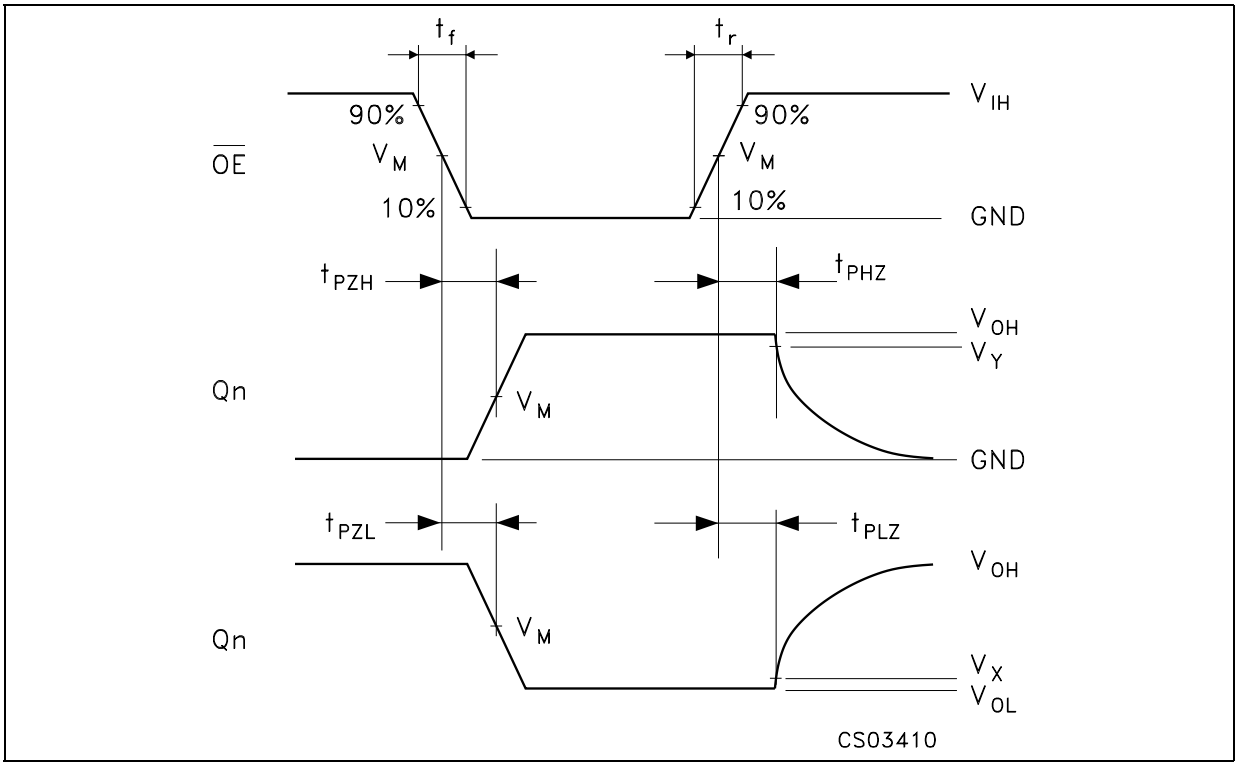
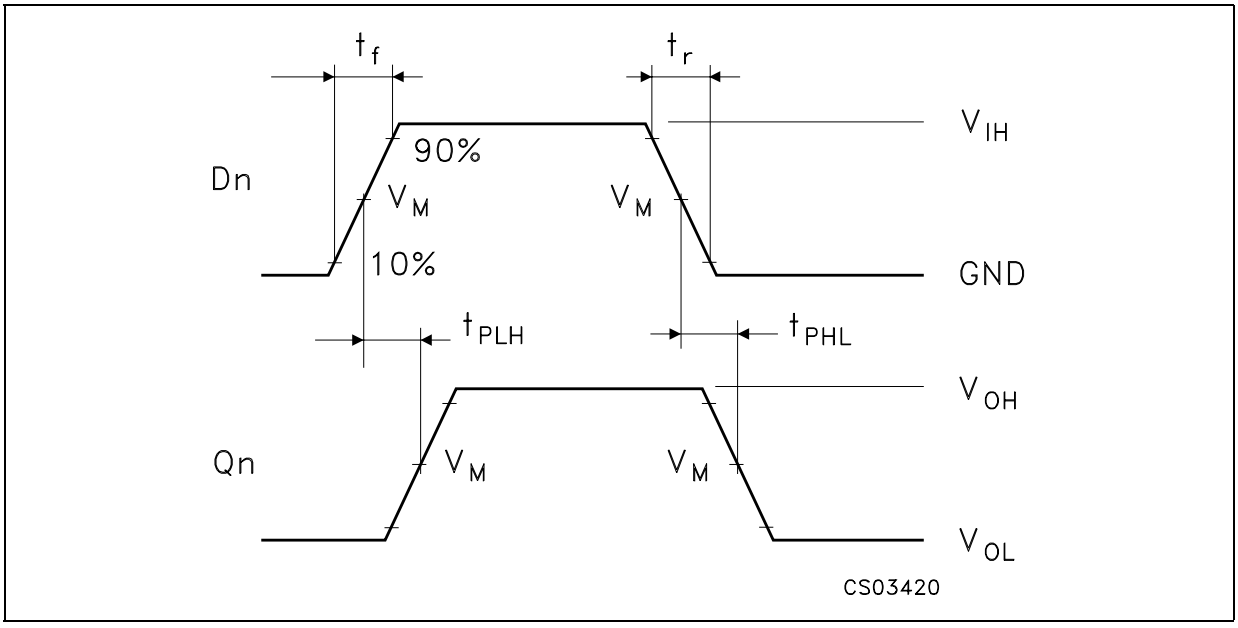
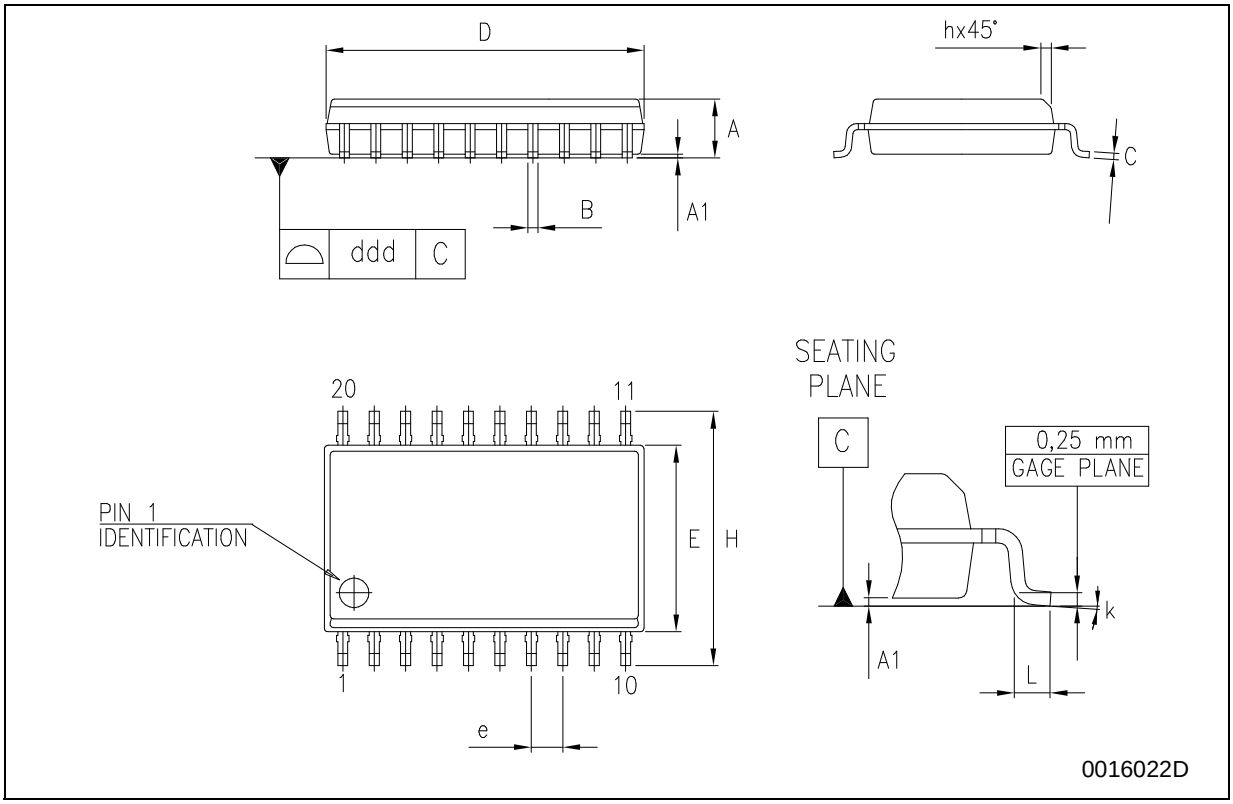


**Figure 6: Waveform - Propagation Delay Time** (f=1MHz; 50% duty cycle)



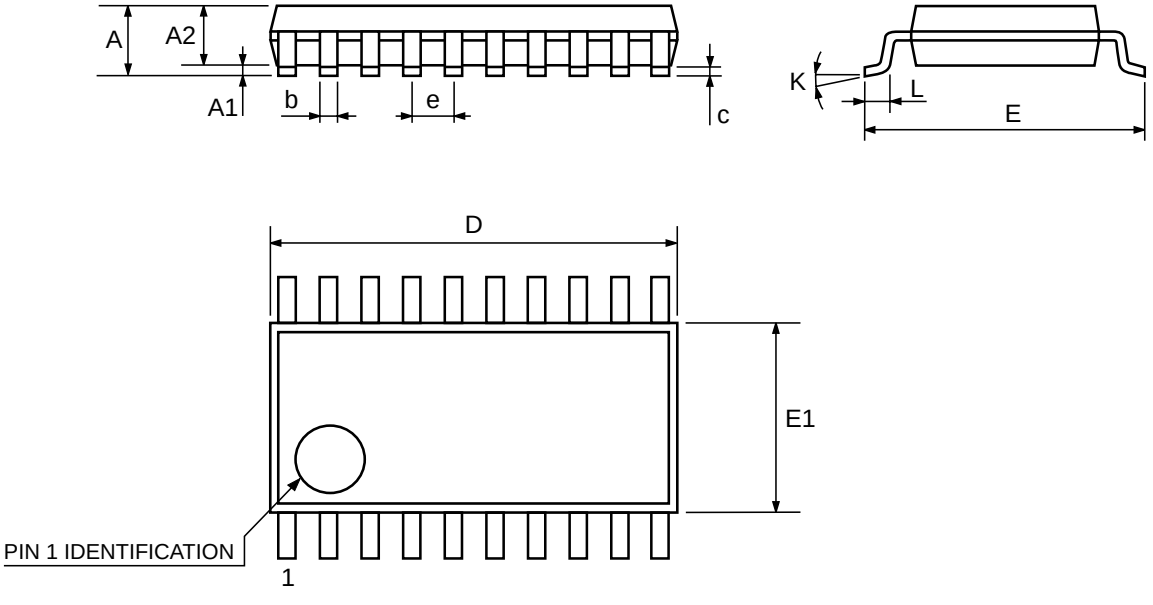
## SO-20 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 2.35 | | 2.65 | 0.093 | | 0.104 |
| A1 | 0.1 | | 0.30 | 0.004 | | 0.012 |
| B | 0.33 | | 0.51 | 0.013 | | 0.020 |
| C | 0.23 | | 0.32 | 0.009 | | 0.013 |
| D | 12.60 | | 13.00 | 0.496 | | 0.512 |
| E | 7.4 | | 7.6 | 0.291 | | 0.299 |
| e | | 1.27 | | | 0.050 | |
| H | 10.00 | | 10.65 | 0.394 | | 0.419 |
| h | 0.25 | | 0.75 | 0.010 | | 0.030 |
| L | 0.4 | | 1.27 | 0.016 | | 0.050 |
| k | 0° | | 8° | 0° | | 8° |
| ddd | | | 0.100 | | | 0.004 |



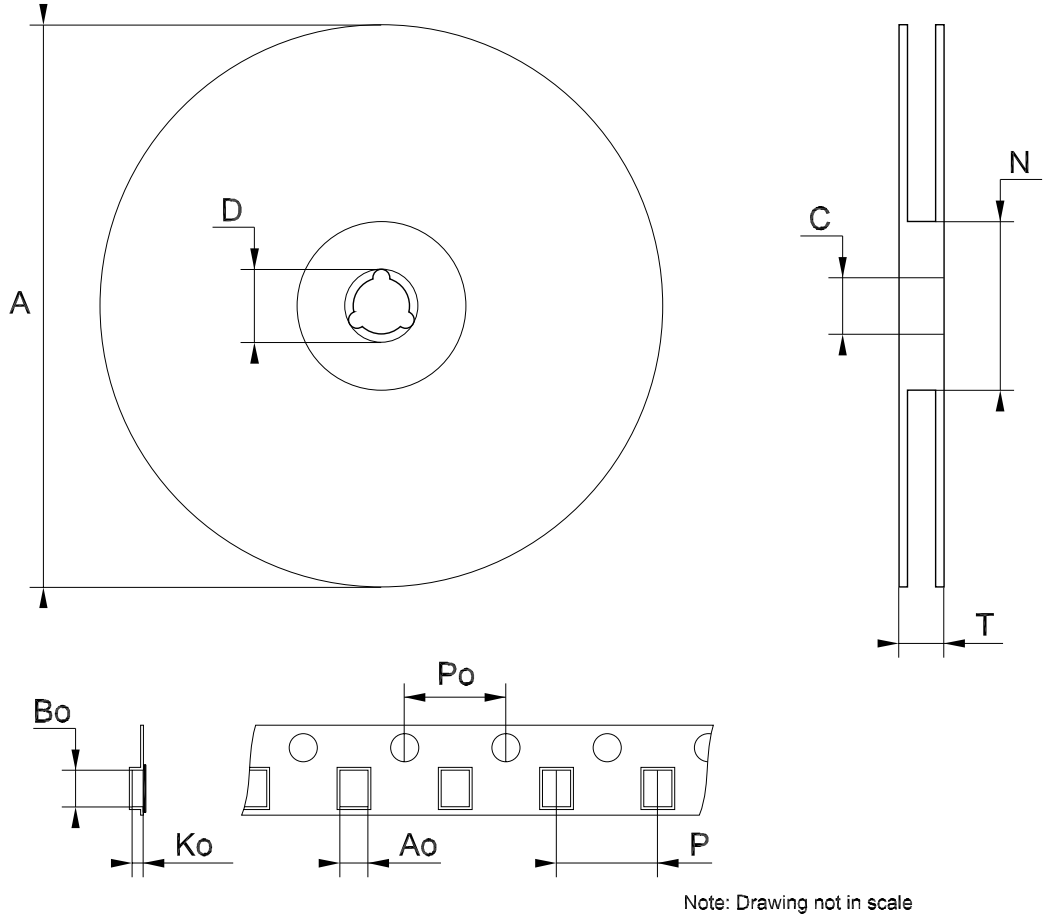
# TSSOP20 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.2 | | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | 0.004 | 0.006 |
| A2 | 0.8 | 1 | 1.05 | 0.031 | 0.039 | 0.041 |
| b | 0.19 | | 0.30 | 0.007 | | 0.012 |
| c | 0.09 | | 0.20 | 0.004 | | 0.0079 |
| D | 6.4 | 6.5 | 6.6 | 0.252 | 0.256 | 0.260 |
| E | 6.2 | 6.4 | 6.6 | 0.244 | 0.252 | 0.260 |
| E1 | 4.3 | 4.4 | 4.48 | 0.169 | 0.173 | 0.176 |
| e | | 0.65 BSC | | | 0.0256 BSC | |
| K | 0° | | 8° | 0° | | 8° |
| L | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |



## Tape & Reel SO-20 MECHANICAL DATA

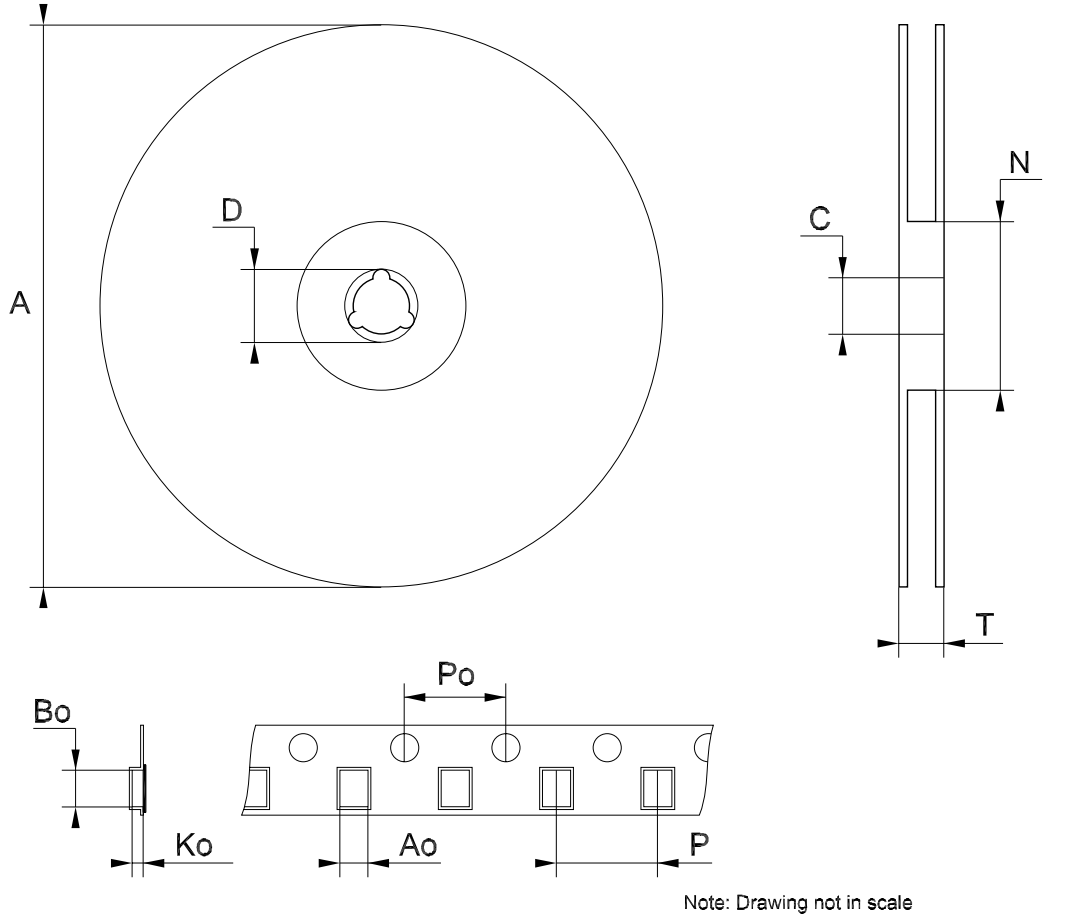
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 330 | | | 12.992 |
| C | 12.8 | | 13.2 | 0.504 | | 0.519 |
| D | 20.2 | | | 0.795 | | |
| N | 60 | | | 2.362 | | |
| T | | | 30.4 | | | 1.197 |
| Ao | 10.8 | | 11 | 0.425 | | 0.433 |
| Bo | 13.2 | | 13.4 | 0.520 | | 0.528 |
| Ko | 3.1 | | 3.3 | 0.122 | | 0.130 |
| Po | 3.9 | | 4.1 | 0.153 | | 0.161 |
| P | 11.9 | | 12.1 | 0.468 | | 0.476 |




Note: Drawing not in scale

## Tape & Reel TSSOP20 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 330 | | | 12.992 |
| C | 12.8 | | 13.2 | 0.504 | | 0.519 |
| D | 20.2 | | | 0.795 | | |
| N | 60 | | | 2.362 | | |
| T | | | 22.4 | | | 0.882 |
| Ao | 6.8 | | 7 | 0.268 | | 0.276 |
| Bo | 6.9 | | 7.1 | 0.272 | | 0.280 |
| Ko | 1.7 | | 1.9 | 0.067 | | 0.075 |
| Po | 3.9 | | 4.1 | 0.153 | | 0.161 |
| P | 11.9 | | 12.1 | 0.468 | | 0.476 |




Note: Drawing not in scale

**Table 11: Revision History**

| Date | Revision | Description of Changes |
|---|---|---|
| 26-Jul-2004 | 3 | Ordering Codes Revision - pag. 1. |