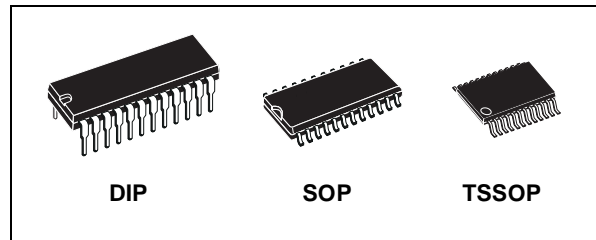




M74HC4515

4 TO 16 LINE DECODER/LATCH (INV.)

- HIGH SPEED:
 $t_{PD} = 20 \text{ ns}$ (TYP.) at $V_{CC} = 6V$
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu A$ (MAX.) at $T_A = 25^\circ C$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 4mA$ (MIN)
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
 V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH
 74 SERIES 4515



ORDER CODES

| PACKAGE | TUBE | T & R |
|---------|--------------|-----------------|
| DIP | M74HC4515B1R | |
| SOP | M74HC4515M1R | M74HC4515RM13TR |
| TSSOP | | M74HC4515TTR |

DESCRIPTION

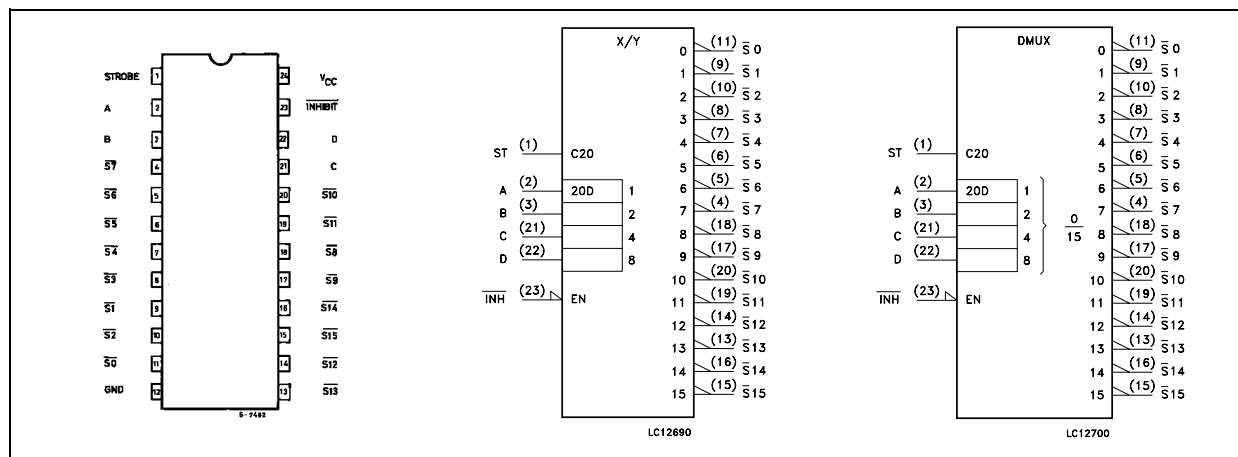
The M74HC4515 is an high speed CMOS 4 LINE TO 16 LINE SEGMENT DECODER WITH LATCHED INPUTS fabricated with silicon gate C²MOS technology.

A binary code stored in the four input latches (A to D) provides a low level at the selected one of sixteen outputs excluding the other fifteen outputs, when the inhibit input (INHIBIT) is held low. When the inhibit input (INHIBIT) is held high, all outputs are kept high level, while the latch function is

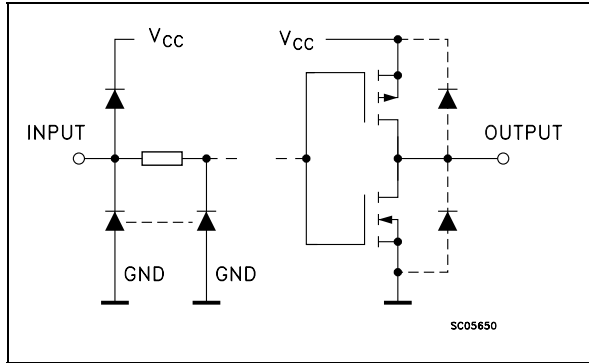
available. The data applied to the data inputs are transferred to the Q outputs of latches when the strobe input is held high. When the strobe input is taken low, the information data applied to the data input at a time is retained at the output of the latches.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

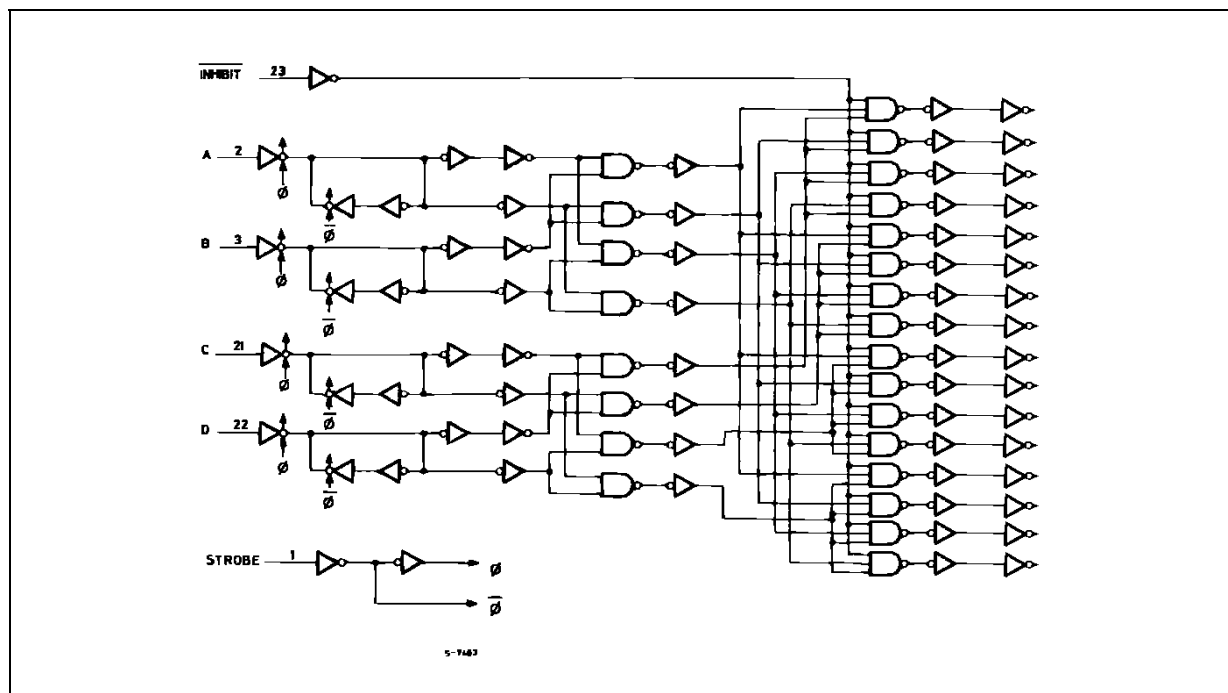
| PIN No | SYMBOL | NAME AND FUNCTION |
|--|-----------------------------|-----------------------------------|
| 1 | STROBE | Strobe Input |
| 2, 3, 21, 22 | A to D | Address Inputs |
| 11, 9, 10, 8, 7, 6, 5, 4, 18, 17, 20, 19, 14, 13, 16, 15 | S0 to S15 | Multiplexer Outputs (Active HIGH) |
| 23 | $\overline{\text{INHIBIT}}$ | Enable Input |
| 12 | GND | Ground (0V) |
| 24 | V _{CC} | Positive Supply Voltage |

TRUTH TABLE

| INPUTS | | | | | STROBE | SELECT OUTPUT |
|-----------------------------|---|---|---|---|--|---------------|
| $\overline{\text{INHIBIT}}$ | A | B | C | D | | |
| L | L | L | L | L | STROBE = "H" Refer to truth table STROBE = "L" Data at the negative going transition of strobe shall be provided on the each output while strobe is held low. | S0 |
| L | H | L | L | L | | S1 |
| L | L | H | L | L | | S2 |
| L | H | H | L | L | | S3 |
| L | L | L | H | L | | S4 |
| L | H | L | H | L | | S5 |
| L | L | H | H | L | | S6 |
| L | H | H | H | L | | S7 |
| L | L | L | L | H | | S8 |
| L | H | L | L | H | | S9 |
| L | L | H | L | H | | S10 |
| L | H | H | L | H | | S11 |
| L | L | L | H | H | | S12 |
| L | H | L | H | H | | S13 |
| L | L | H | H | H | | S14 |
| L | H | H | H | H | | S15 |
| H | X | X | X | X | ALL OUTPUTS "H" | |

X : Don't Care

LOGIC DIAGRAM



This logic diagram has not be used to estimate propagation delays

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-----------------------|-------------------------------|------------------------|-------------|
| V_{CC} | Supply Voltage | -0.5 to +7 | V |
| V_I | DC Input Voltage | -0.5 to $V_{CC} + 0.5$ | V |
| V_O | DC Output Voltage | -0.5 to $V_{CC} + 0.5$ | V |
| I_{IK} | DC Input Diode Current | ± 20 | mA |
| I_{OK} | DC Output Diode Current | ± 20 | mA |
| I_O | DC Output Current | ± 25 | mA |
| I_{CC} or I_{GND} | DC V_{CC} or Ground Current | ± 50 | mA |
| P_D | Power Dissipation | 500(*) | mW |
| T_{stg} | Storage Temperature | -65 to +150 | $^{\circ}C$ |
| T_L | Lead Temperature (10 sec) | 300 | $^{\circ}C$ |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

(*) 500mW at 65 $^{\circ}C$; derate to 300mW by 10mW/ $^{\circ}C$ from 65 $^{\circ}C$ to 85 $^{\circ}C$

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit | |
|------------|--------------------------|-----------------|-----------|----|
| V_{CC} | Supply Voltage | 2 to 6 | V | |
| V_I | Input Voltage | 0 to V_{CC} | V | |
| V_O | Output Voltage | 0 to V_{CC} | V | |
| T_{op} | Operating Temperature | -55 to 125 | °C | |
| t_r, t_f | Input Rise and Fall Time | $V_{CC} = 2.0V$ | 0 to 1000 | ns |
| | | $V_{CC} = 4.5V$ | 0 to 500 | ns |
| | | $V_{CC} = 6.0V$ | 0 to 400 | ns |

DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|----------|---------------------------|-----------------|-------------------------|--------------------------|------|-----------|-------------|---------|--------------|---------|---------------|
| | | V_{CC} (V) | | $T_A = 25^\circ\text{C}$ | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| V_{IH} | High Level Input Voltage | 2.0 | | 1.5 | | | 1.5 | | 1.5 | | V |
| | | 4.5 | | 3.15 | | | 3.15 | | 3.15 | | |
| | | 6.0 | | 4.2 | | | 4.2 | | 4.2 | | |
| V_{IL} | Low Level Input Voltage | 2.0 | | | | 0.5 | | 0.5 | | 0.5 | V |
| | | 4.5 | | | | 1.35 | | 1.35 | | 1.35 | |
| | | 6.0 | | | | 1.8 | | 1.8 | | 1.8 | |
| V_{OH} | High Level Output Voltage | 2.0 | $I_O = -20 \mu\text{A}$ | 1.9 | 2.0 | | 1.9 | | 1.9 | | V |
| | | 4.5 | $I_O = -20 \mu\text{A}$ | 4.4 | 4.5 | | 4.4 | | 4.4 | | |
| | | 6.0 | $I_O = -20 \mu\text{A}$ | 5.9 | 6.0 | | 5.9 | | 5.9 | | |
| | | 4.5 | $I_O = -4.0 \text{ mA}$ | 4.18 | 4.31 | | 4.13 | | 4.10 | | |
| | | 6.0 | $I_O = -5.2 \text{ mA}$ | 5.68 | 5.8 | | 5.63 | | 5.60 | | |
| V_{OL} | Low Level Output Voltage | 2.0 | $I_O = 20 \mu\text{A}$ | | 0.0 | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 | $I_O = 20 \mu\text{A}$ | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | 6.0 | $I_O = 20 \mu\text{A}$ | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | 4.5 | $I_O = 4.0 \text{ mA}$ | | 0.17 | 0.26 | | 0.37 | | 0.40 | |
| | | 6.0 | $I_O = 5.2 \text{ mA}$ | | 0.18 | 0.26 | | 0.37 | | 0.40 | |
| I_I | Input Leakage Current | 6.0 | $V_I = V_{CC}$ or GND | | | ± 0.1 | | ± 1 | | ± 1 | μA |
| I_{CC} | Quiescent Supply Current | 6.0 | $V_I = V_{CC}$ or GND | | | 4 | | 40 | | 80 | μA |

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

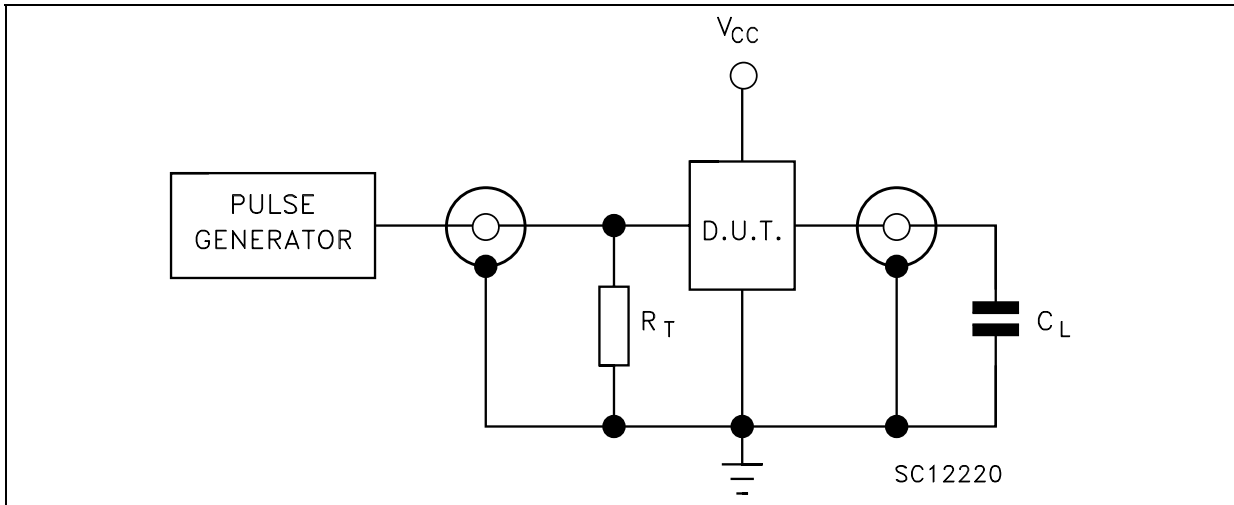
| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|---------------------|--|-----------------|--|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
| | | V_{CC} (V) | | $T_A = 25^\circ\text{C}$ | | | $-40 \text{ to } 85^\circ\text{C}$ | | $-55 \text{ to } 125^\circ\text{C}$ | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| t_{TLH} t_{THL} | Output Transition Time | 2.0 | | | 30 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | | 8 | 15 | | 19 | | 25 | |
| | | 6.0 | | | 7 | 13 | | 16 | | 23 | |
| t_{PLH} t_{PHL} | Propagation Delay Time (DATA, $\overline{\text{Sn}}$) | 2.0 | | | 65 | 175 | | 220 | | 230 | ns |
| | | 4.5 | | | 22 | 35 | | 44 | | 56 | |
| | | 6.0 | | | 19 | 30 | | 37 | | 45 | |
| t_{PLH} t_{PHL} | Propagation Delay Time (STROBE, $\overline{\text{Sn}}$) | 2.0 | | | 75 | 175 | | 220 | | 260 | ns |
| | | 4.5 | | | 24 | 35 | | 44 | | 56 | |
| | | 6.0 | | | 20 | 30 | | 37 | | 45 | |
| t_{PLH} t_{PHL} | Propagation Delay Time (INHIBIT, $\overline{\text{Sn}}$) | 2.0 | | | 60 | 175 | | 220 | | 260 | ns |
| | | 4.5 | | | 20 | 35 | | 44 | | 56 | |
| | | 6.0 | | | 17 | 30 | | 37 | | 45 | |
| $t_{W(L)}$ | Minimum Pulse Width (STROBE) | 2.0 | | | 14 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | | 6 | 15 | | 19 | | 26 | |
| | | 6.0 | | | 6 | 13 | | 16 | | 23 | |
| t_s | Minimum Set Up Time (DATA) | 2.0 | | | 10 | 50 | | 65 | | 80 | ns |
| | | 4.5 | | | 2 | 10 | | 13 | | 20 | |
| | | 6.0 | | | 1 | 9 | | 11 | | 17 | |
| t_h | Minimum Hold Time (DATA) | 2.0 | | | | 5 | | 5 | | 5 | ns |
| | | 4.5 | | | | 5 | | 5 | | 5 | |
| | | 6.0 | | | | 5 | | 5 | | 5 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|----------|--|-----------------|--|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
| | | V_{CC} (V) | | $T_A = 25^\circ\text{C}$ | | | $-40 \text{ to } 85^\circ\text{C}$ | | $-55 \text{ to } 125^\circ\text{C}$ | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| C_{IN} | Input Capacitance | | | | 5 | 10 | | 10 | | 10 | pF |
| C_{PD} | Power Dissipation Capacitance (note 1) | | | | 61 | | | | | | pF |

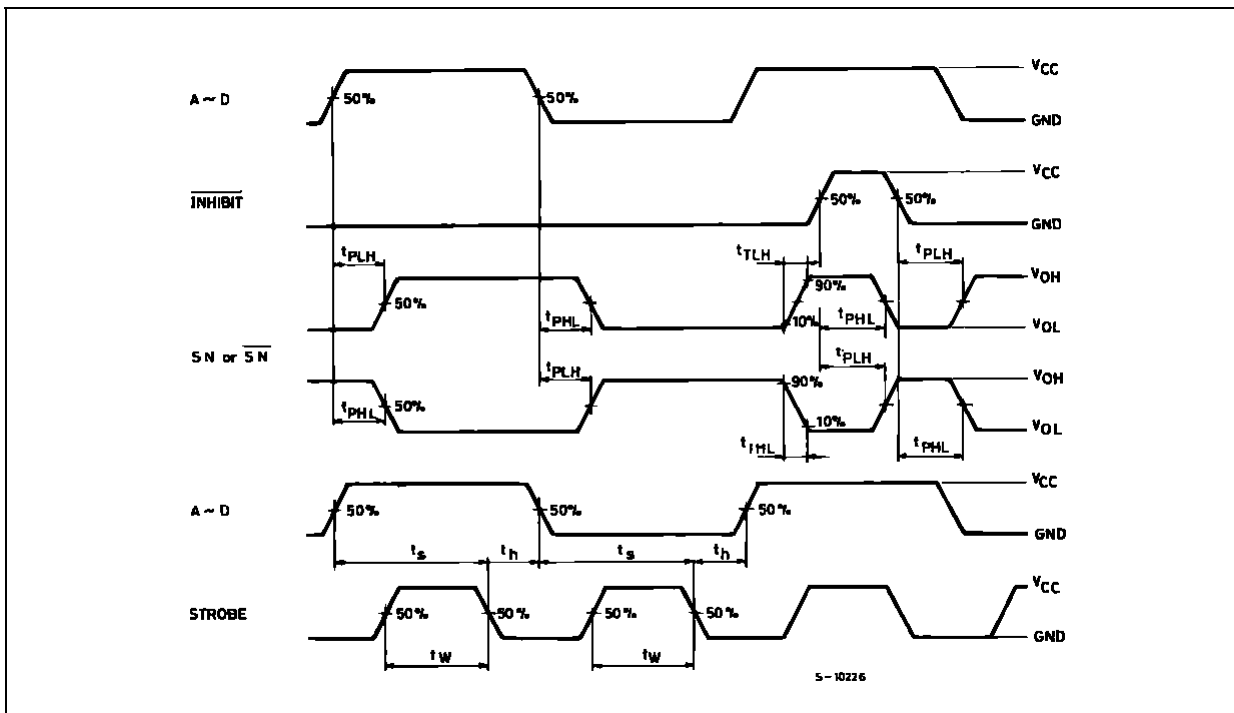
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

TEST CIRCUIT



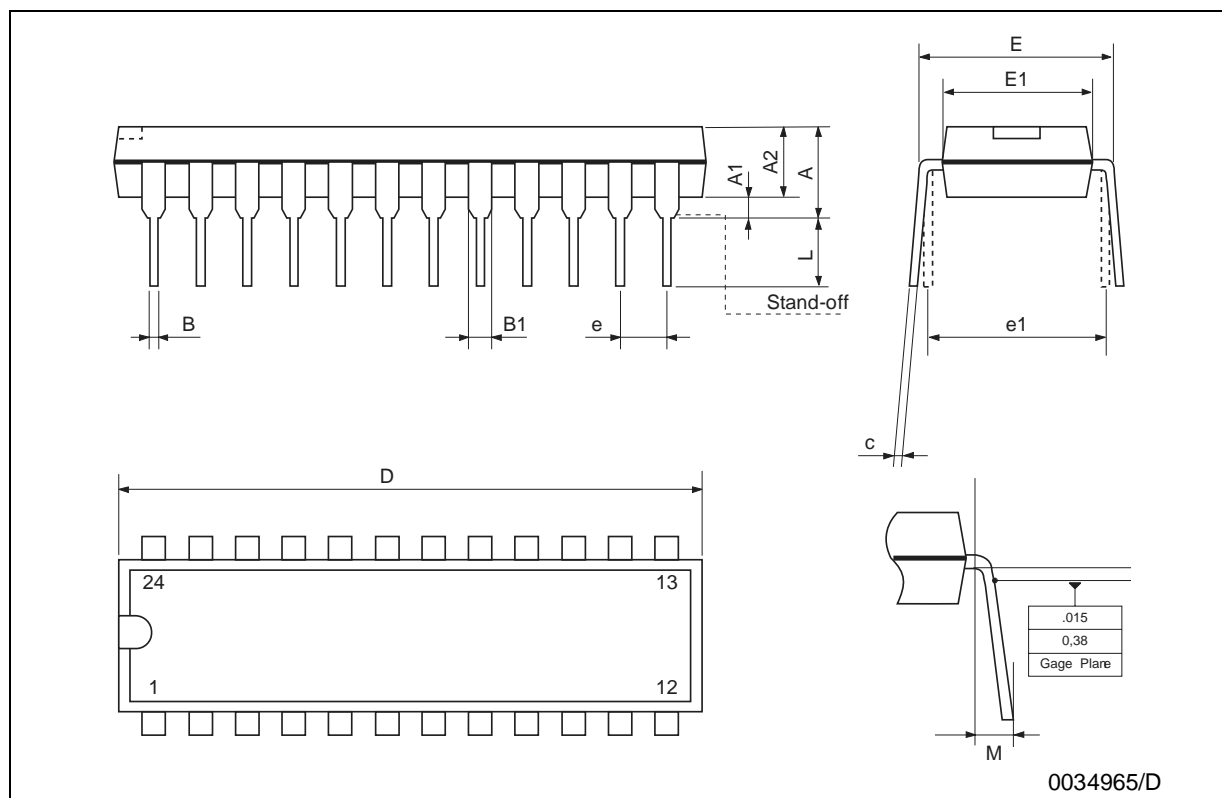
$C_L = 50\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

SWITCHING CHARACTERISTICS TEST WAVEFORM ($f=1\text{MHz}$; 50% duty cycle)



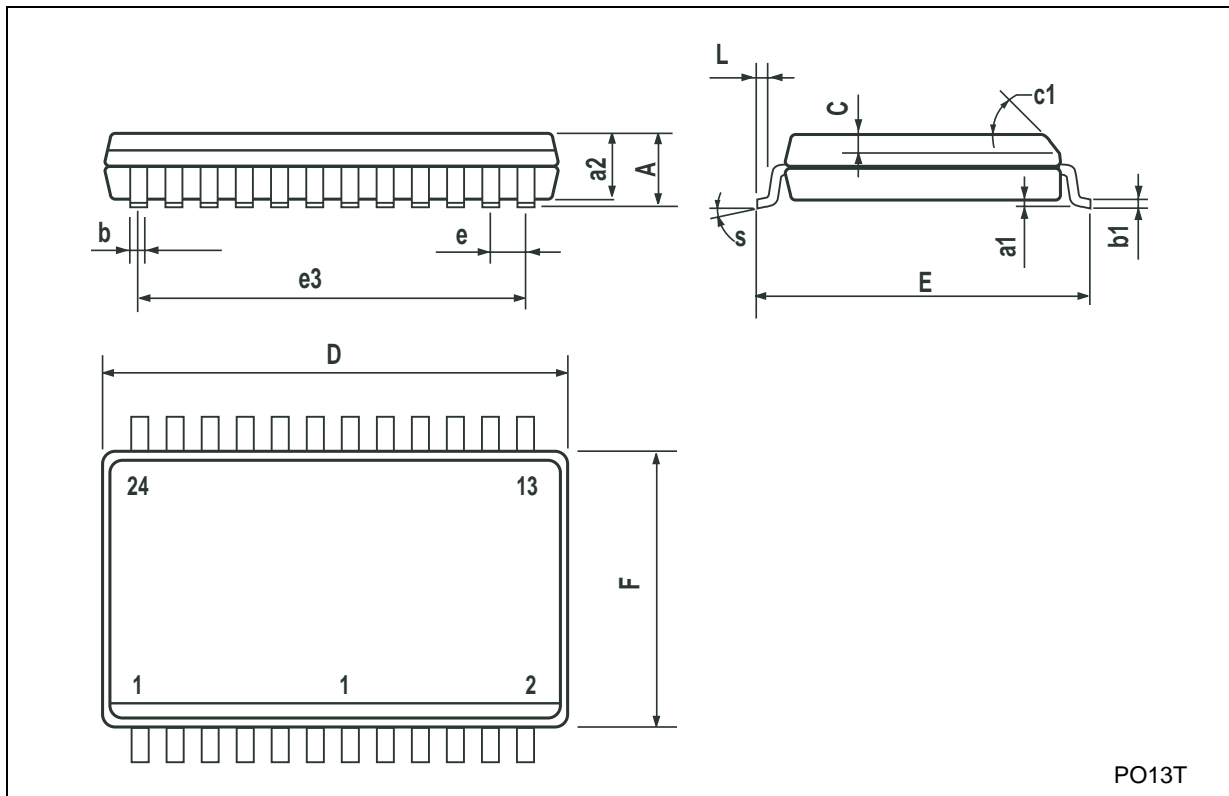
Plastic DIP-24 (0.25) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|-------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 4.32 | | | 0.170 |
| A1 | 0.38 | | | 0.015 | | |
| A2 | | 3.3 | | | 0.130 | |
| B | 0.41 | 0.46 | 0.51 | 0.016 | 0.018 | 0.020 |
| B1 | 1.40 | 1.52 | 1.65 | 0.055 | 0.060 | 0.065 |
| c | 0.20 | 0.25 | 0.30 | 0.008 | 0.010 | 0.012 |
| D | 31.62 | 31.75 | 31.88 | 1.245 | 1.250 | 1.255 |
| E | 7.62 | | 8.26 | 0.300 | | 0.325 |
| E1 | 6.35 | 6.60 | 6.86 | 0.250 | 0.260 | 0.270 |
| e | | 2.54 | | | 0.100 | |
| E1 | | 7.62 | | | 0.300 | |
| L | 3.18 | | 3.43 | 0.125 | | 0.135 |
| M | 0° | | 15° | 0° | | 15° |



SO-24 MECHANICAL DATA

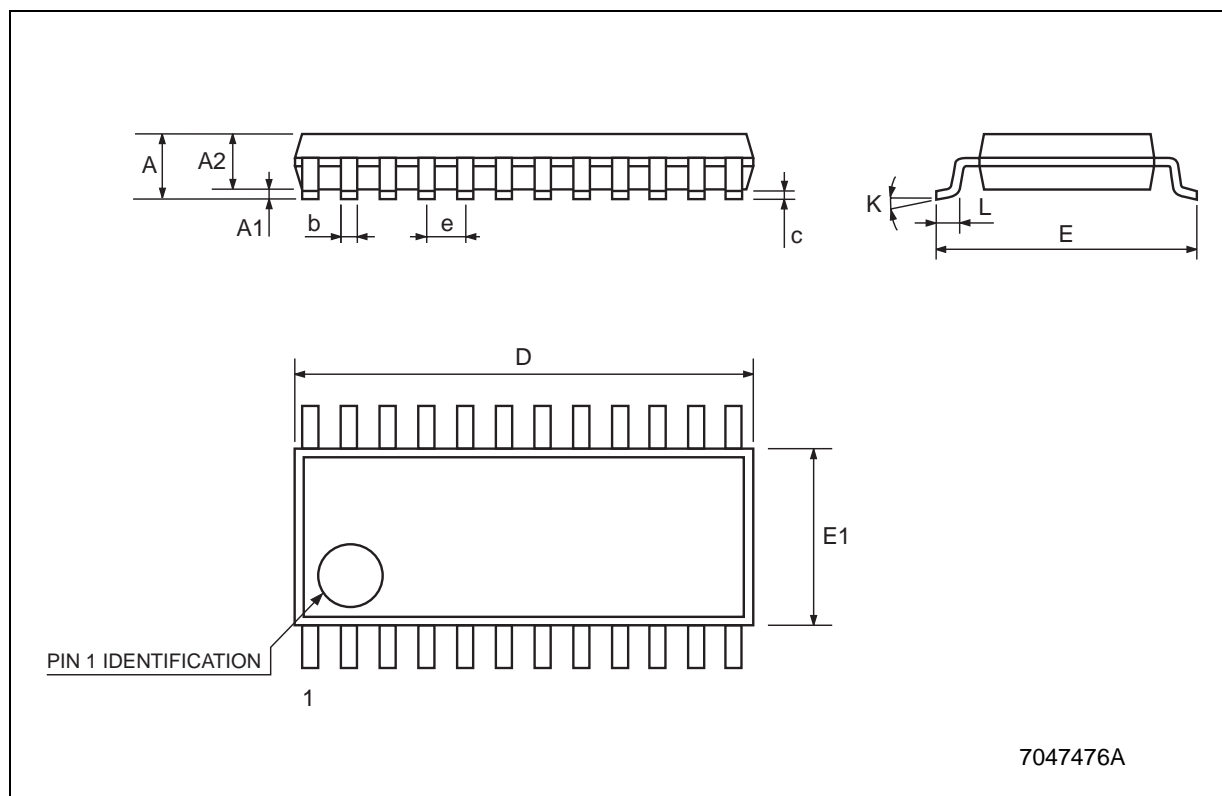
| DIM. | mm. | | | inch | | |
|------|------------|-------|-------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | | 2.65 | | | 0.104 |
| a1 | 0.1 | | 0.2 | 0.004 | | 0.008 |
| a2 | | | 2.45 | | | 0.096 |
| b | 0.35 | | 0.49 | 0.014 | | 0.019 |
| b1 | 0.23 | | 0.32 | 0.009 | | 0.012 |
| C | | 0.5 | | | 0.020 | |
| c1 | 45° (typ.) | | | | | |
| D | 15.20 | | 15.60 | 0.598 | | 0.614 |
| E | 10.00 | | 10.65 | 0.393 | | 0.419 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 13.97 | | | 0.550 | |
| F | 7.40 | | 7.60 | 0.291 | | 0.300 |
| L | 0.50 | | 1.27 | 0.020 | | 0.050 |
| S | 8° (max.) | | | | | |



PO13T

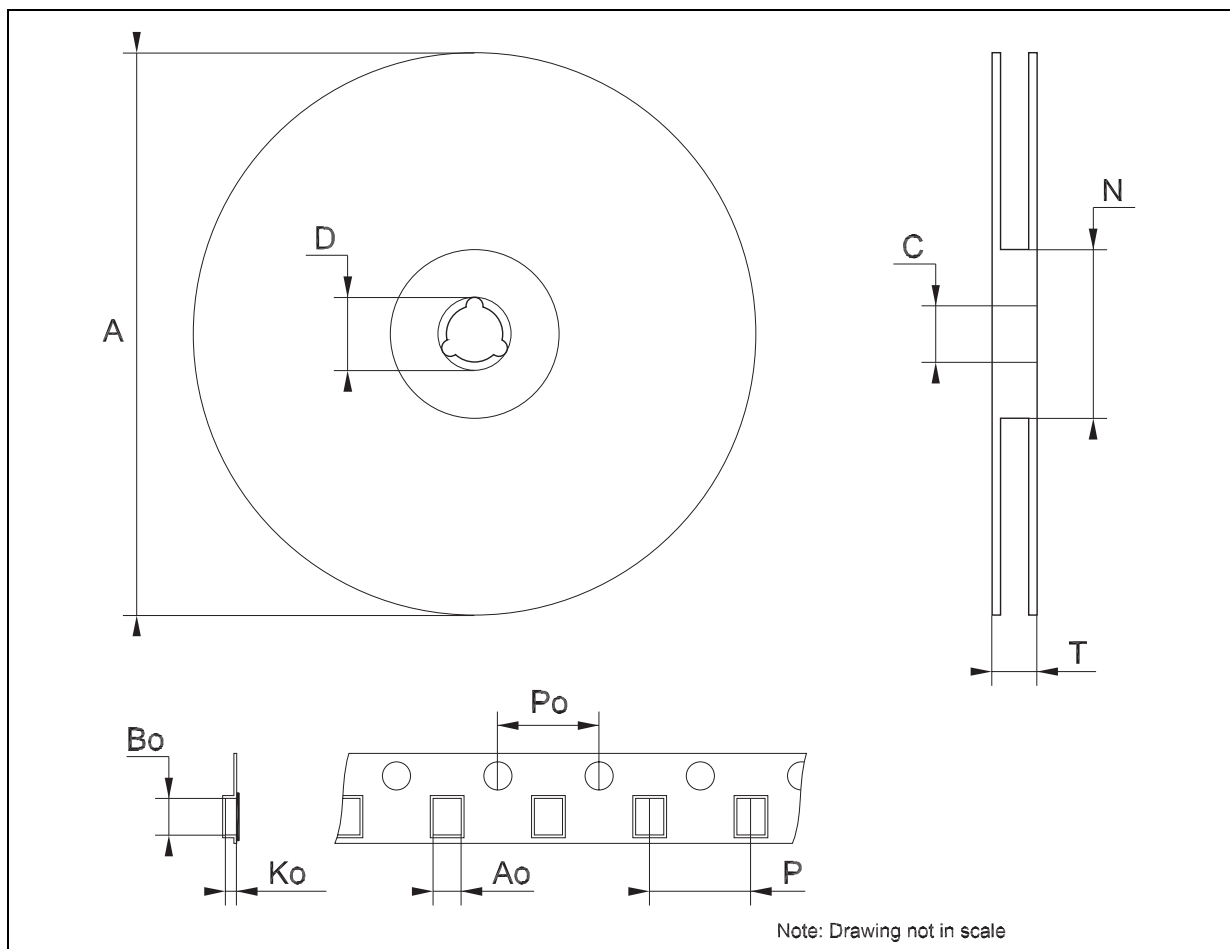
TSSOP24 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|----------|------|--------|------------|--------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.1 | | | 0.043 |
| A1 | 0.05 | | 0.15 | 0.002 | | 0.006 |
| A2 | | 0.9 | | | 0.035 | |
| b | 0.19 | | 0.30 | 0.0075 | | 0.0118 |
| c | 0.09 | | 0.20 | 0.0035 | | 0.0079 |
| D | 7.7 | | 7.9 | 0.303 | | 0.311 |
| E | 6.25 | | 6.5 | 0.246 | | 0.256 |
| E1 | 4.3 | | 4.5 | 0.169 | | 0.177 |
| e | | 0.65 BSC | | | 0.0256 BSC | |
| K | 0° | | 8° | 0° | | 8° |
| L | 0.50 | | 0.70 | 0.020 | | 0.028 |



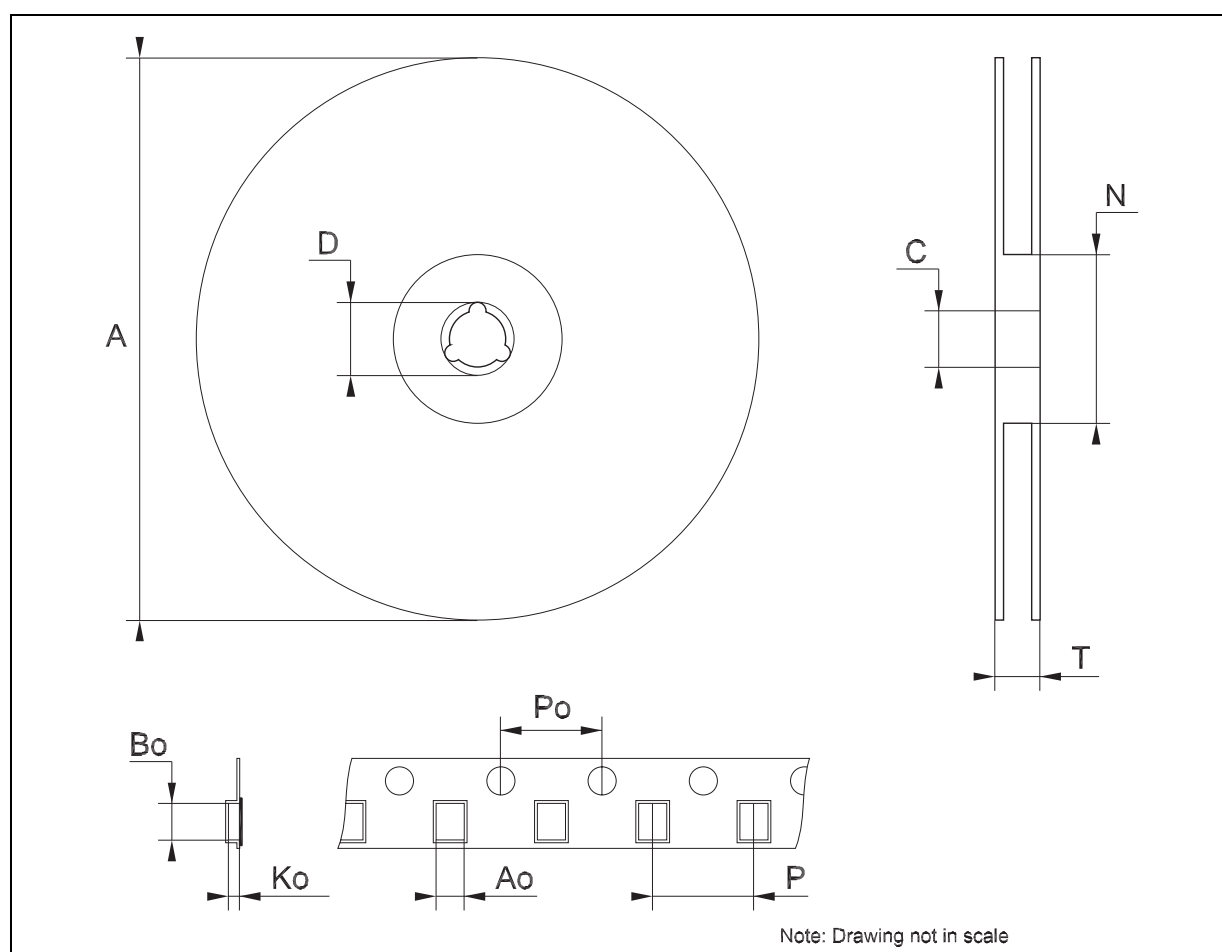
Tape & Reel SO-24 MECHANICAL DATA

| 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 | 0.425 | | 0.433 |
| Bo | 15.7 | | 15.9 | 0.618 | | 0.626 |
| Ko | 2.9 | | 3.1 | 0.114 | | 0.122 |
| Po | 3.9 | | 4.1 | 0.153 | | 0.161 |
| P | 11.9 | | 12.1 | 0.468 | | 0.476 |



Tape & Reel TSSOP24 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 | 8.2 | | 8.4 | 0.323 | | 0.331 |
| 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 |



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