

8 BIT LATCH/SHIFT REGISTER

- HIGH SPEED :
 $f_{MAX} = 50 \text{ MHz (TYP.) at } V_{CC} = 6V$
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu\text{A (MAX.) at } T_A = 25^\circ\text{C}$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28 \% V_{CC} \text{ (MIN.)}$
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 4\text{mA (MIN)}$
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- PIN AND FUNCTION COMPATIBLE WITH
 74 SERIES 597



ORDER CODES

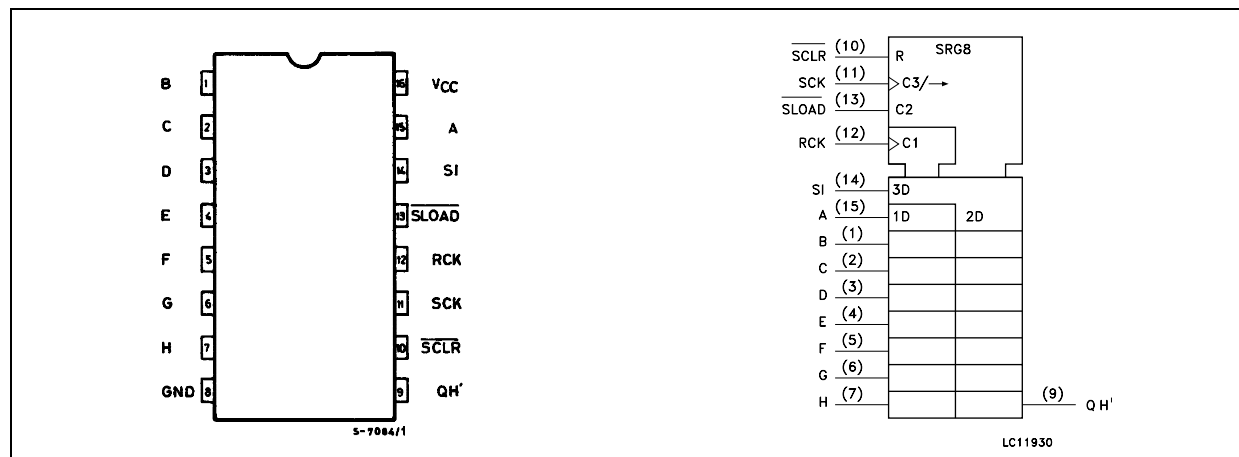
| PACKAGE | TUBE | T & R |
|---------|-------------|----------------|
| DIP | M74HC597B1R | |
| SOP | M74HC597M1R | M74HC597RM13TR |
| TSSOP | | M74HC597TTR |

DESCRIPTION

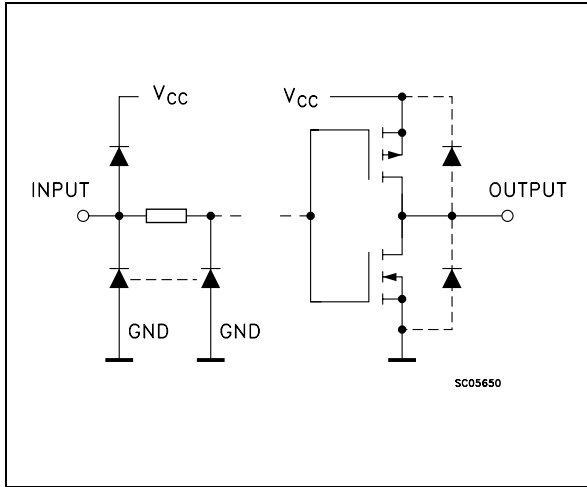
The M74HC597 is an high speed CMOS 8 BIT PIPO SHIFT REGISTER fabricated with silicon gate C²MOS technology. This devices comes in a 16-pin package and consist of an 8-bit storage latch feeding a parallel in, serial out 8-bit shift register. Both the storage

register and shift register have positive edge triggered clocks. The shift register also has direct load (from storage) and clear inputs. 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

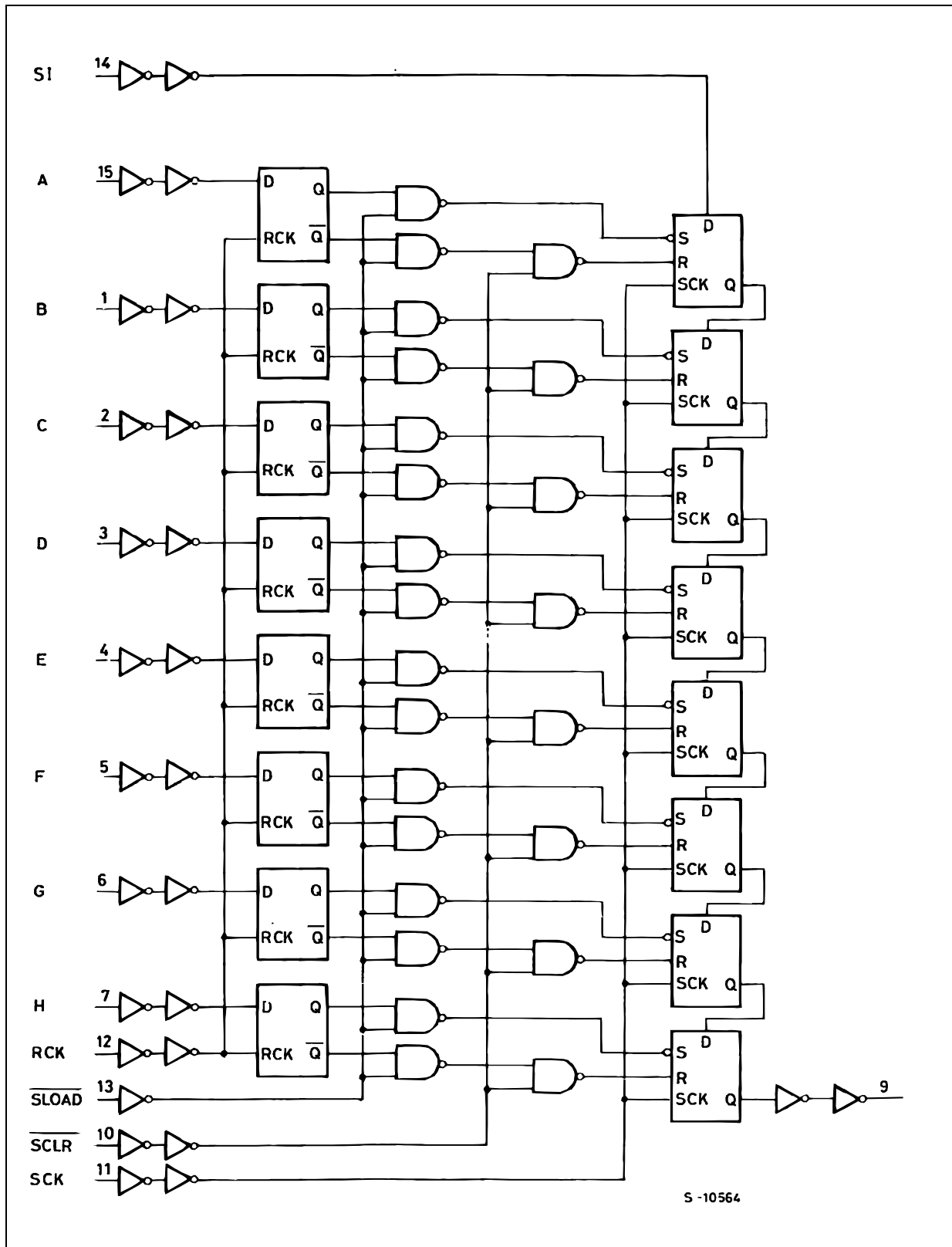
| PIN No | SYMBOL | NAME AND FUNCTION |
|-------------------------|---------------------------|--|
| 9 | QH' | Serial Data Outputs |
| 10 | $\overline{\text{SCLR}}$ | Asynchronous Reset Input (Active LOW) |
| 11 | SCK | Shift Clock Input (LOW to HIGH Edge-triggered) |
| 12 | RCK | Storage Clock Input (LOW to HIGH Edge-triggered) |
| 13 | $\overline{\text{SLOAD}}$ | Parallel Data Input (Active Low) |
| 10 | SI | Serial Data Input |
| 15, 1, 2, 3, 4, 5, 6, 7 | A to H | Parallel Data Inputs |
| 8 | GND | Ground (0V) |
| 16 | Vcc | Positive Supply Voltage |

TRUTH TABLE

| INPUTS | | | | | OUTPUT |
|--------|-----|--------------------------|---------------------------|-----|---|
| SI | SCK | $\overline{\text{SCLR}}$ | $\overline{\text{SLOAD}}$ | RCK | |
| X | X | L | H | X | S.R. IS CLEARED TO "L" |
| X | X | H | L | X | INPUT REGISTER DATA IS STORED INTO S.R. |
| L | | H | H | X | FIRST STAGE OF S.R. BECOMES "L" OTHER STAGES STORE THE DATA OF PREVIOUS STAGE, RESPECTIVELY |
| H | | H | H | X | FIRST STAGE OF S.R. BECOMES "H" OTHER STAGES STORE THE DATA OF PREVIOUS STAGE, RESPECTIVELY |
| X | | H | H | X | STATE OF S.R. IS NOT CHANGED |
| X | X | X | X | | INPUT DATA ON A ~ H LINE IS STORED INTO INPUT REGISTER |
| X | X | X | X | | STORAGE REGISTER STATE IS NOT CHANGED |

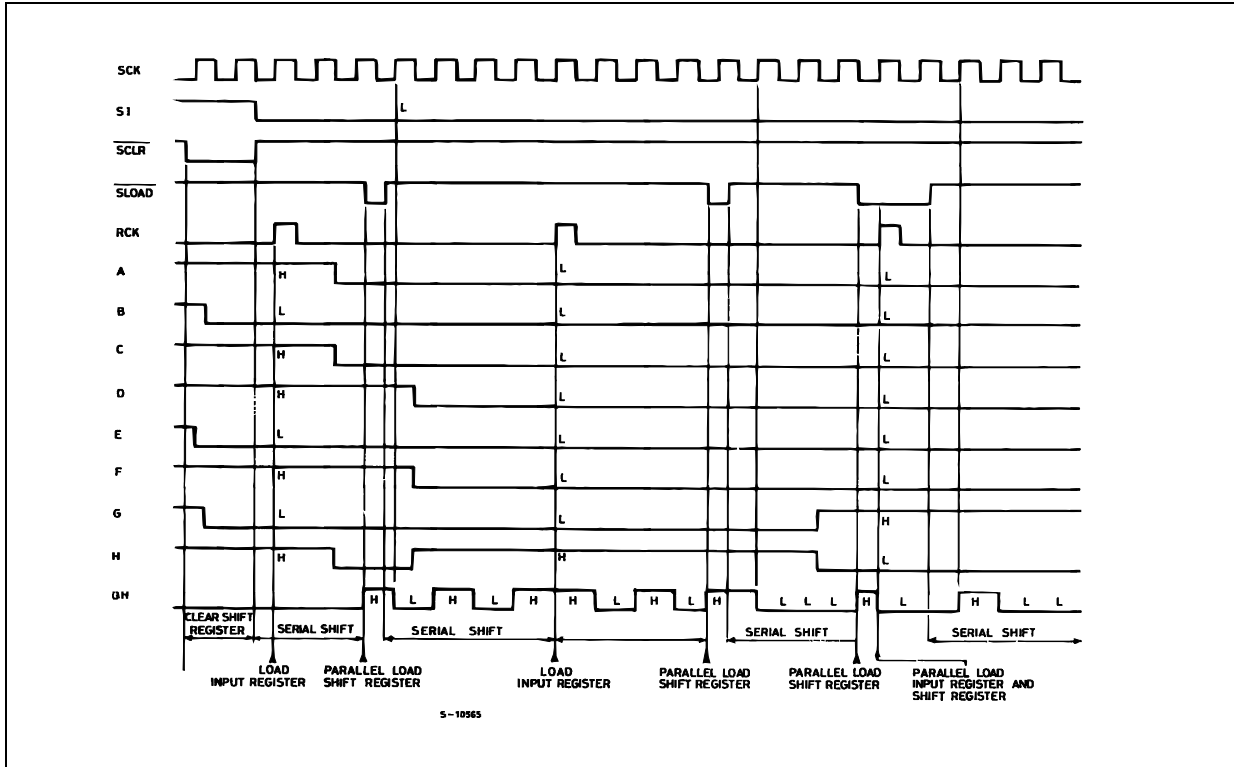
X : Don't Care

LOGIC DIAGRAM



This logic diagram has not been used to estimate propagation delays

TIMING CHART



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) | | $T_A = 25^\circ C$ | | | -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 | $I_O = -20 \mu A$ | 1.9 | 2.0 | | 1.9 | | 1.9 | | V |
| | | 4.5 | $I_O = -20 \mu A$ | 4.4 | 4.5 | | 4.4 | | 4.4 | | |
| | | 6.0 | $I_O = -20 \mu A$ | 5.9 | 6.0 | | 5.9 | | 5.9 | | |
| | | 4.5 | $I_O = -4.0 mA$ | 4.18 | 4.31 | | 4.13 | | 4.10 | | |
| | | 6.0 | $I_O = -5.2 mA$ | 5.68 | 5.8 | | 5.63 | | 5.60 | | |
| V_{OL} | Low Level Output Voltage | 2.0 | $I_O = 20 \mu A$ | | 0.0 | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 | $I_O = 20 \mu A$ | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | 6.0 | $I_O = 20 \mu A$ | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | 4.5 | $I_O = 4.0 mA$ | | 0.17 | 0.26 | | 0.33 | | 0.40 | |
| | | 6.0 | $I_O = 5.2 mA$ | | 0.18 | 0.26 | | 0.33 | | 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 pF, Input t_r = t_f = 6ns)

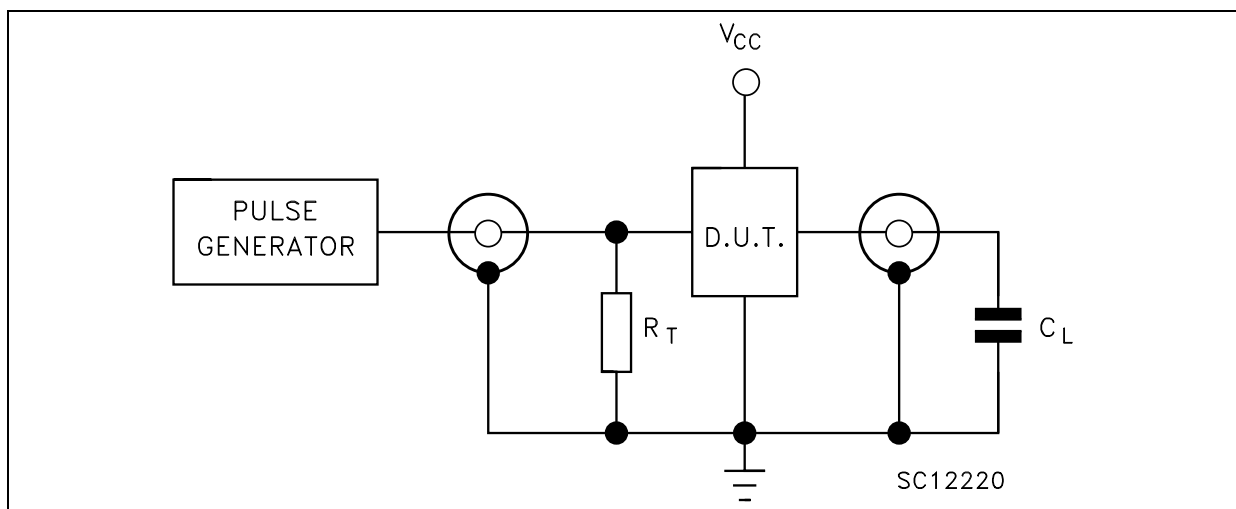
| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|--|--------------------------------------|------------------------|-------------|-----------------------|------|------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| t _{TLH} t _{THL} | Output Transition Time | 2.0 | | | 30 | 75 | | 95 | | 115 | ns |
| | | 4.5 | | | 8 | 15 | | 19 | | 23 | |
| | | 6.0 | | | 7 | 13 | | 16 | | 20 | |
| t _{PLH} t _{PHL} | Propagation Delay Time (SCK - QH') | 2.0 | | | 78 | 145 | | 180 | | 220 | ns |
| | | 4.5 | | | 20 | 29 | | 36 | | 44 | |
| | | 6.0 | | | 16 | 25 | | 31 | | 37 | |
| t _{PLH} t _{PHL} | Propagation Delay Time (SCLR - QH') | 2.0 | | | 90 | 175 | | 220 | | 265 | ns |
| | | 4.5 | | | 24 | 35 | | 44 | | 53 | |
| | | 6.0 | | | 20 | 30 | | 37 | | 45 | |
| t _{PLH} t _{PHL} | Propagation Delay Time (SLOAD - QH') | 2.0 | | | 80 | 175 | | 220 | | 265 | ns |
| | | 4.5 | | | 22 | 35 | | 44 | | 53 | |
| | | 6.0 | | | 18 | 30 | | 37 | | 45 | |
| t _{PLH} t _{PHL} | Propagation Delay Time (RCK - QH') | 2.0 | SLOAD = "L" | | 112 | 210 | | 265 | | 315 | ns |
| | | 4.5 | | | 30 | 42 | | 53 | | 63 | |
| | | 6.0 | | | 24 | 36 | | 45 | | 54 | |
| f _{MAX} | Maximum Clock Frequency | 2.0 | | 6.0 | 12 | | 4.8 | | 4.0 | | MHz |
| | | 4.5 | | 30 | 48 | | 24 | | 20 | | |
| | | 6.0 | | 35 | 50 | | 28 | | 24 | | |
| t _{W(H)} t _{W(L)} | Minimum Pulse Width (SCK, RCK) | 2.0 | | | 20 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | | 7 | 15 | | 19 | | 22 | |
| | | 6.0 | | | 4 | 13 | | 16 | | 19 | |
| t _{W(L)} | Minimum Pulse Width (SCLR, SLOAD) | 2.0 | | | 25 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | | 7 | 15 | | 19 | | 22 | |
| | | 6.0 | | | 5 | 13 | | 16 | | 19 | |
| t _s | Minimum Set-up Time (RCK - SLOAD) | 2.0 | | | 48 | 100 | | 125 | | 150 | ns |
| | | 4.5 | | | 12 | 20 | | 25 | | 30 | |
| | | 6.0 | | | 10 | 17 | | 21 | | 26 | |
| t _s | Minimum Set-up Time (SI, SCK) | 2.0 | | | 20 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | | 5 | 15 | | 19 | | 22 | |
| | | 6.0 | | | 4 | 13 | | 16 | | 19 | |
| t _s | Minimum Set-up Time (PI, RCK) | 2.0 | | | 20 | 75 | | 95 | | 110 | ns |
| | | 4.5 | | | 5 | 15 | | 19 | | 22 | |
| | | 6.0 | | | 4 | 13 | | 16 | | 19 | |
| t _h | Minimum Hold Time | 2.0 | | | | 0 | | 0 | | 0 | ns |
| | | 4.5 | | | | 0 | | 0 | | 0 | |
| | | 6.0 | | | | 0 | | 0 | | 0 | |
| t _{REM} | Minimum Removal Time | 2.0 | | | 12 | 75 | | 95 | | 115 | ns |
| | | 4.5 | | | 4 | 15 | | 19 | | 23 | |
| | | 6.0 | | | 3 | 13 | | 16 | | 20 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|-----------------|--|------------------------|--|-----------------------|------|------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| C _{IN} | Input Capacitance | 5.0 | | | 5 | 10 | | 10 | | 10 | pF |
| C _{PD} | Power Dissipation Capacitance (note 1) | 5.0 | | | 60 | | | | | | pF |

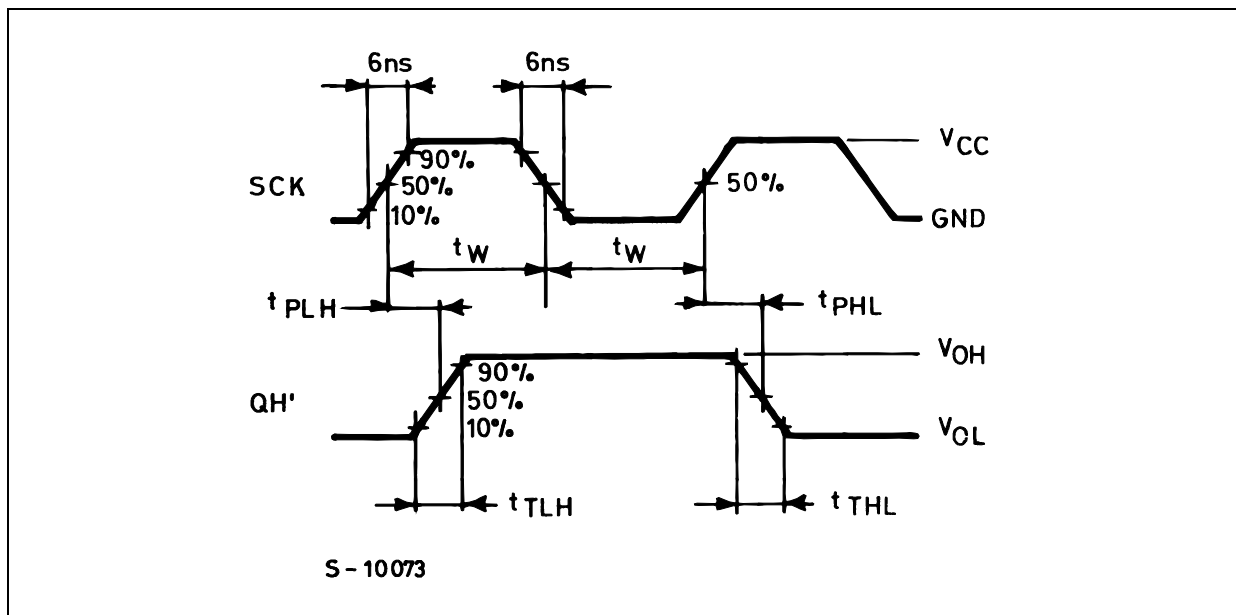
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

TEST CIRCUIT

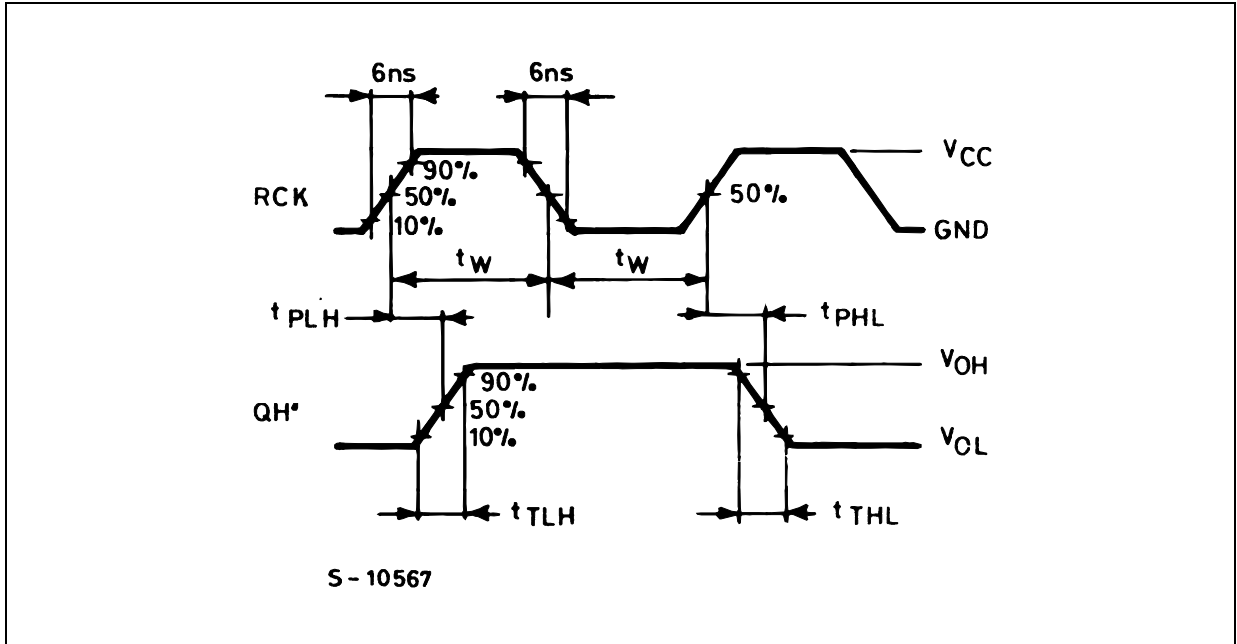


C_L = 50pF or equivalent (includes jig and probe capacitance)
 R_T = Z_{OUT} of pulse generator (typically 50Ω)

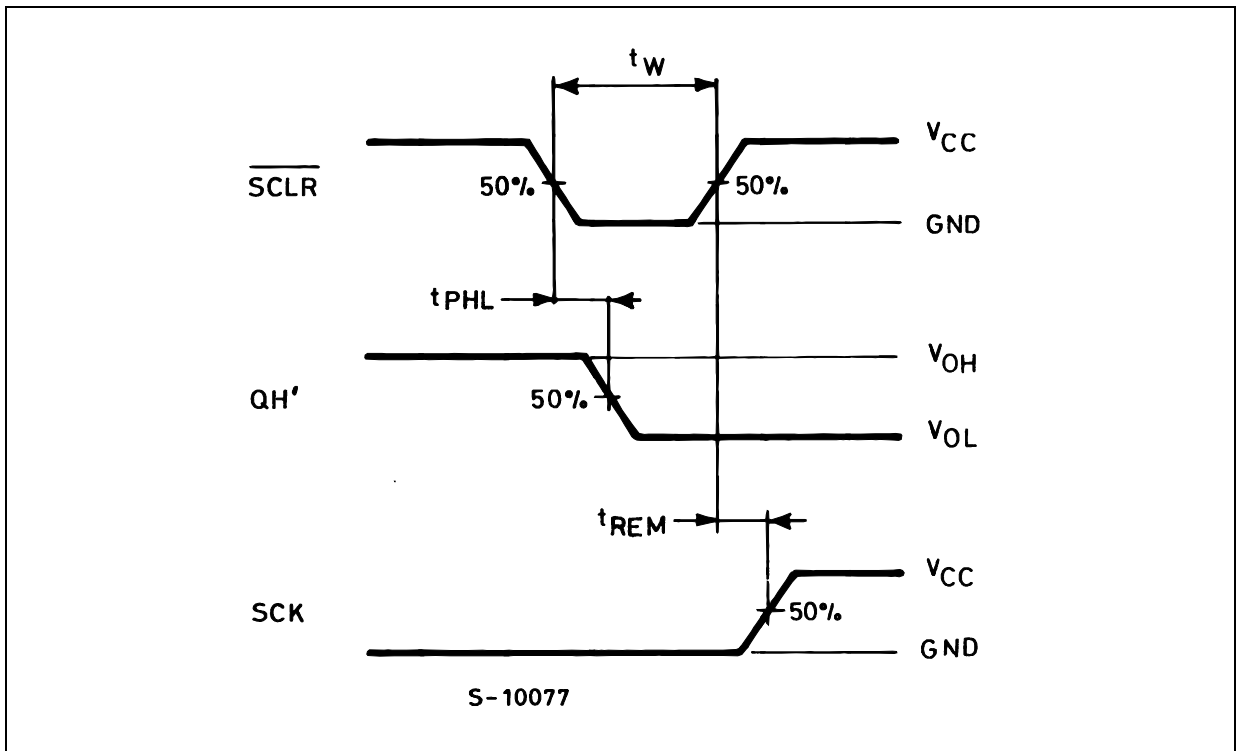
WAVEFORM 1 : MINIMUM PULSE WIDTH, PROPAGATION DELAY TIME(f=1MHz; 50% duty cycle)

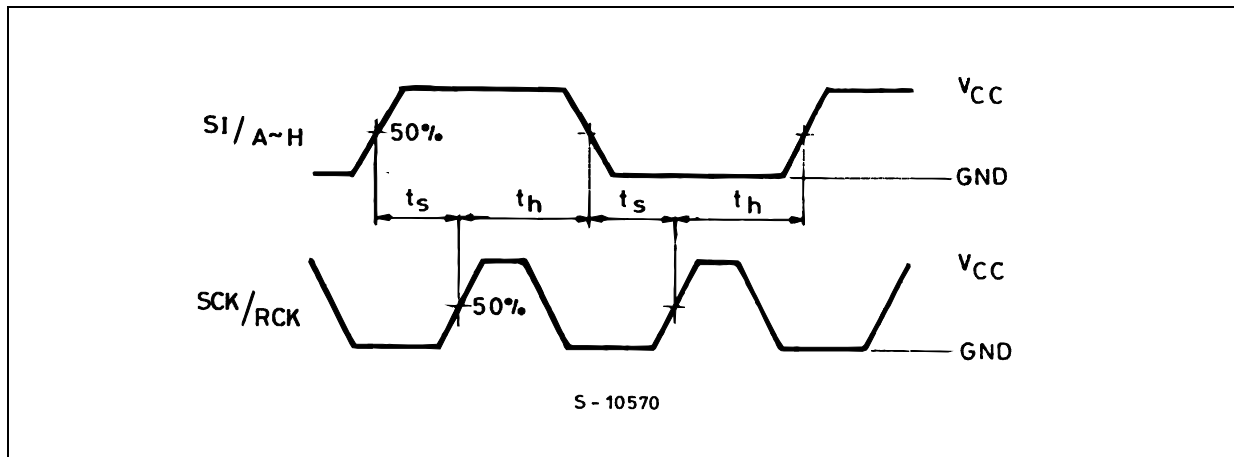
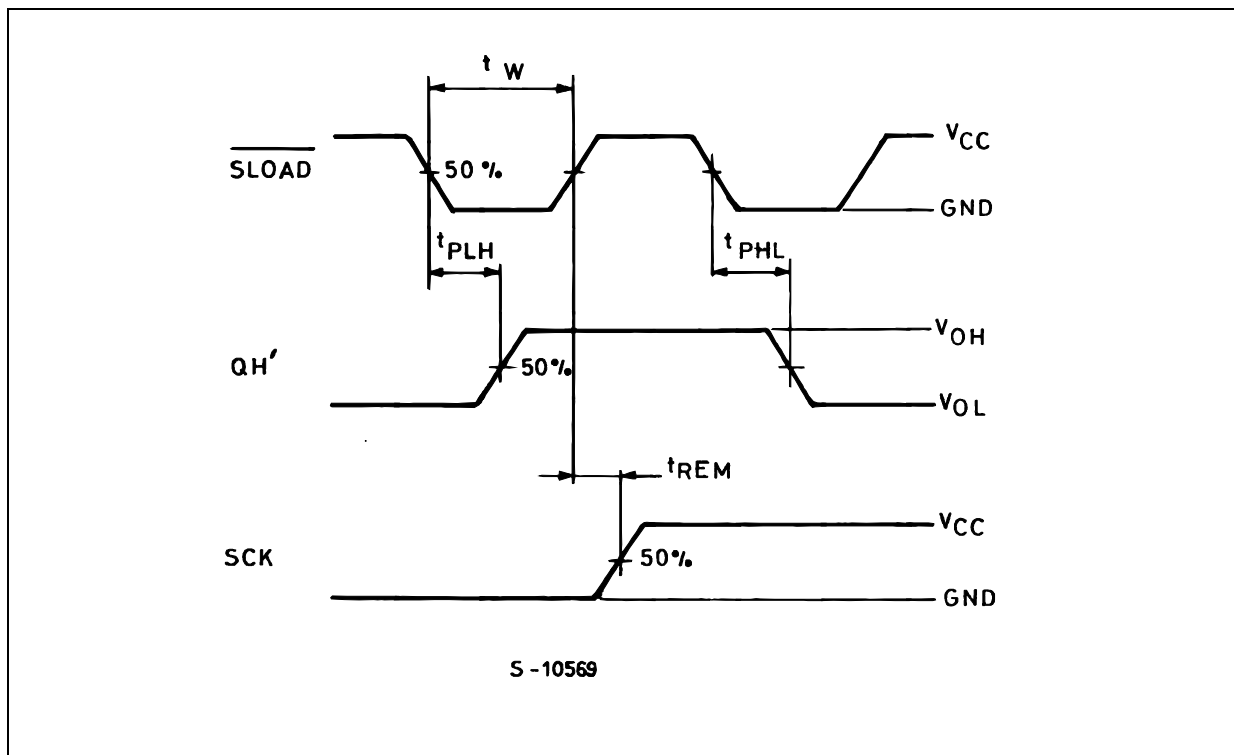


WAVEFORM 2 : MINIMUM PULSE WIDTH, PROPAGATION DELAY TIME (f=1MHz; 50% duty cycle)

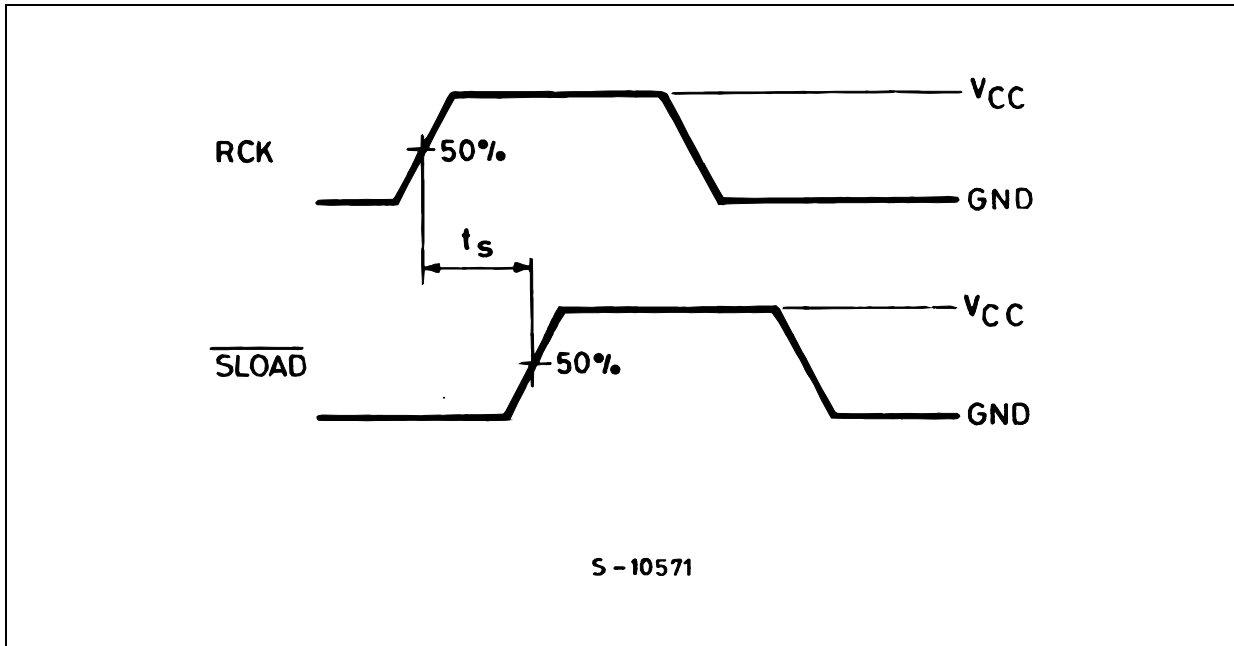


WAVEFORM 3 : MINIMUM PULSE WIDTH AND REMOVAL TIME (f=1MHz; 50% duty cycle)

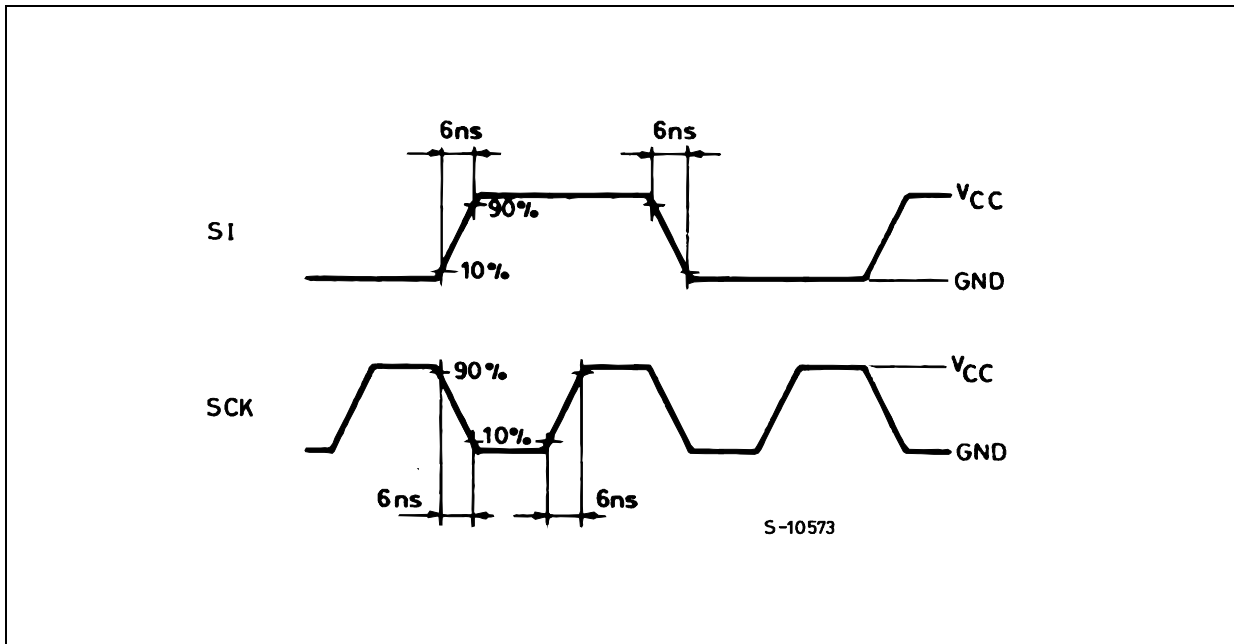


WAVEFORM 4 : MINIMUM SETUP AND HOLD TIME ($f=1\text{MHz}$; 50% duty cycle)**WAVEFORM 5 : PROPAGATION DELAY, MINIMUM PULSE WIDTH, REMOVAL TIME**
($f=1\text{MHz}$; 50% duty cycle)

WAVEFORM 6: MINIMUM SETUP TIME (f=1MHz; 50% duty cycle)

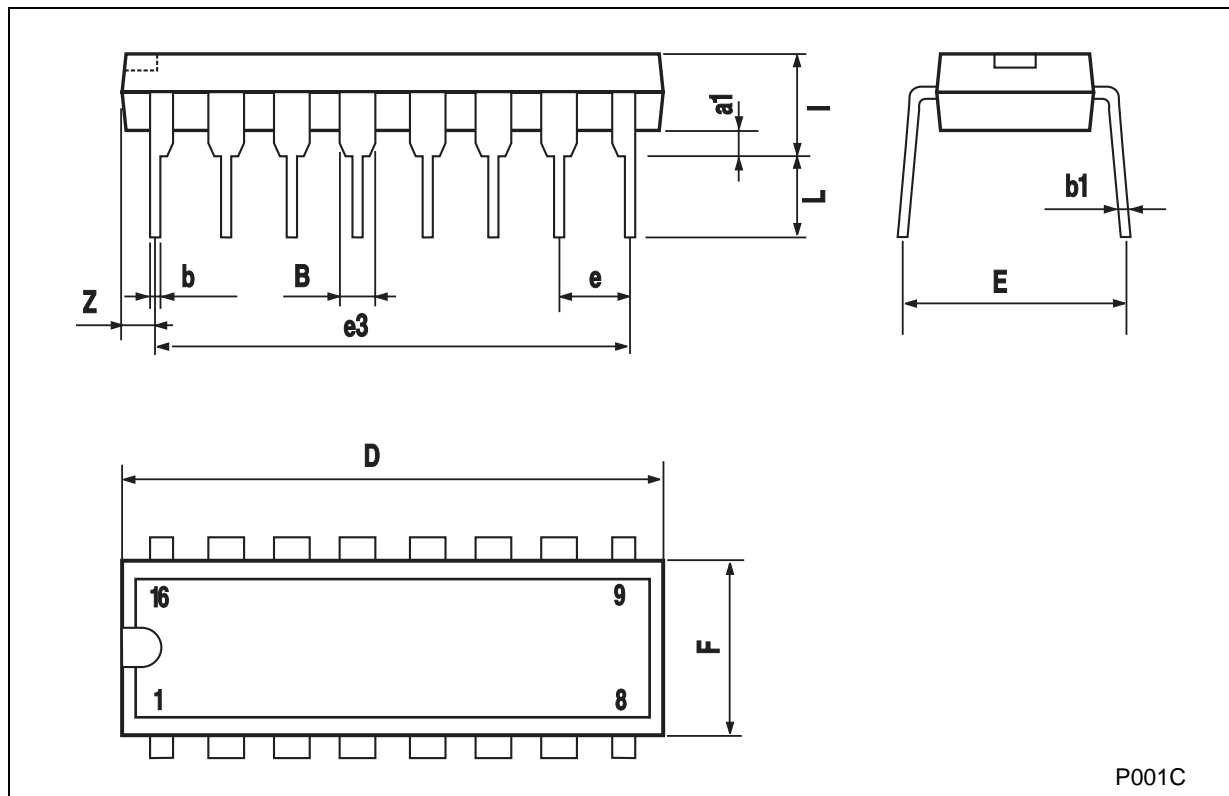


WAVEFORM 7: INPUT WAVEFORM (f=1MHz; 50% duty cycle)



Plastic DIP-16 (0.25) MECHANICAL DATA

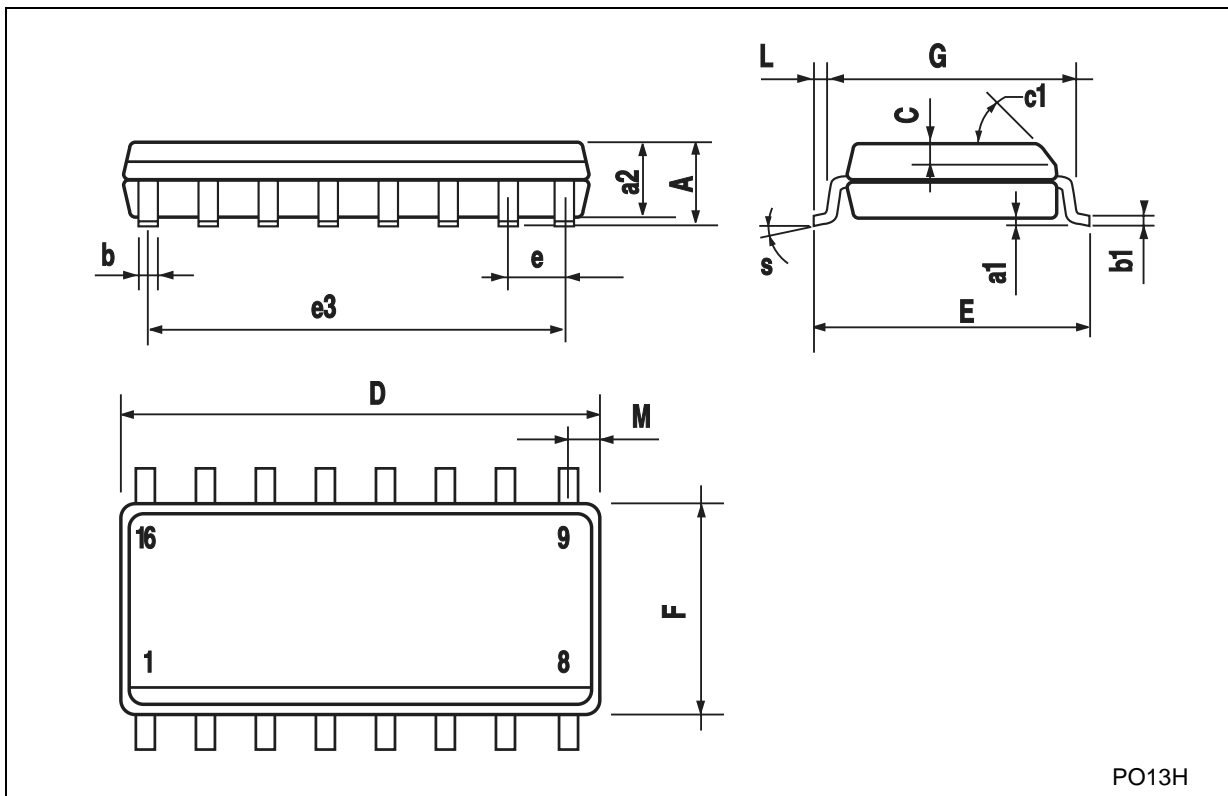
| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.77 | | 1.65 | 0.030 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |



P001C

SO-16 MECHANICAL DATA

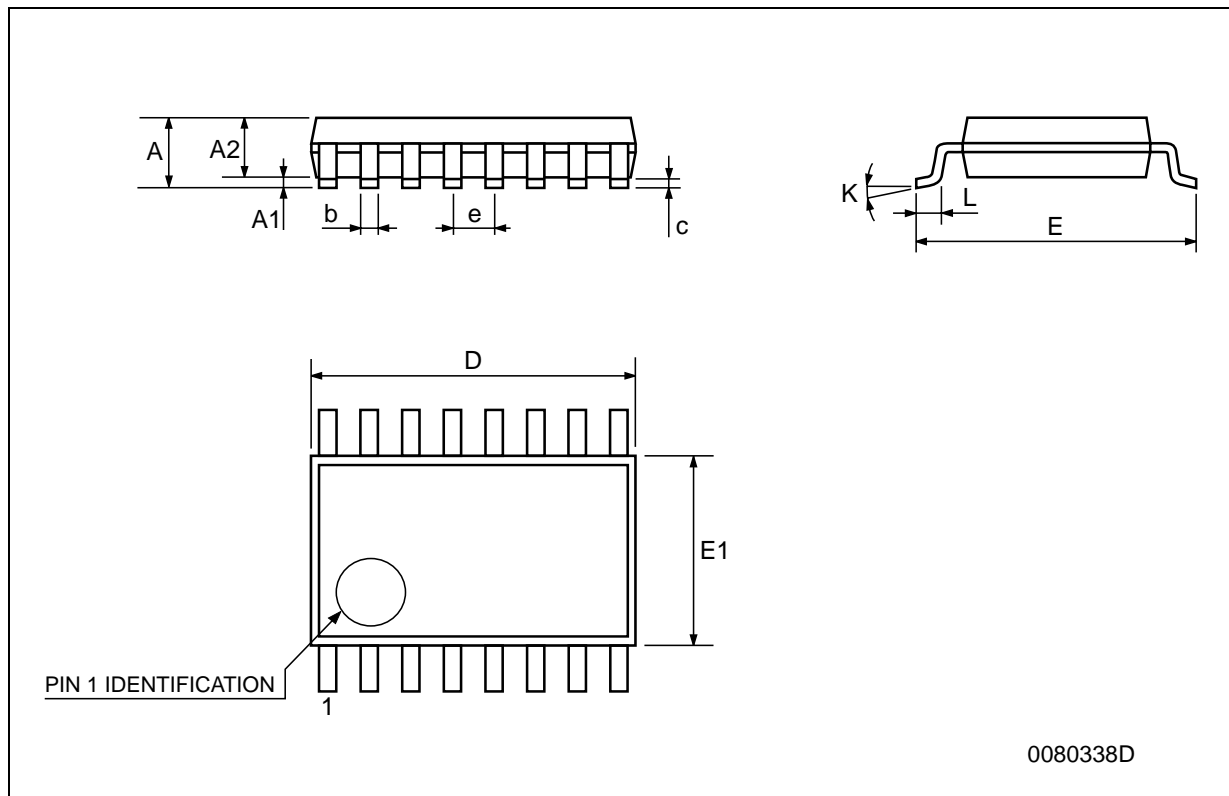
| DIM. | mm. | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.003 | | 0.007 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | | 0.5 | | | 0.019 | |
| c1 | 45° (typ.) | | | | | |
| D | 9.8 | | 10 | 0.385 | | 0.393 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 8.89 | | | 0.350 | |
| F | 3.8 | | 4.0 | 0.149 | | 0.157 |
| G | 4.6 | | 5.3 | 0.181 | | 0.208 |
| L | 0.5 | | 1.27 | 0.019 | | 0.050 |
| M | | | 0.62 | | | 0.024 |
| S | 8° (max.) | | | | | |



PO13H

TSSOP16 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 | | 0.0089 |
| D | 4.9 | 5 | 5.1 | 0.193 | 0.197 | 0.201 |
| 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 |



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