



M74HC4351

ANALOG MULTIPLEXER/DEMULTIPLEXER WITH ADDRESS LATCH : SINGLE 8 CHANNEL

- LOGIC LEVEL TRANSLATION TO ENABLE 5V LOGIC SIGNAL TO COMMUNICATE WITH $\pm 5V$ ANALOG SIGNAL
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu A(\text{MAX.})$ at $T_A = 25^\circ C$
- LOW "ON" RESISTANCE:
 70Ω TYP. ($V_{CC} - V_{EE} = 4.5V$)
 50Ω TYP. ($V_{CC} - V_{EE} = 9V$)
- WIDE ANALOG INPUT VOLTAGE RANGE $\pm 6V$
- LOW CROSSTALK BETWEEN SWITCHES
- FAST SWITCHING
- SINE WAVE DISTORTION:
 0.02% (TYP.) at $V_{CC} - V_{EE} = 9V$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 4351



ORDER CODES

| PACKAGE | TUBE | T & R |
|---------|--------------|-----------------|
| DIP | M74HC4351B1R | |
| SOP | M74HC4351M1R | M74HC4351RM13TR |
| TSSOP | | M74HC4351TTR |

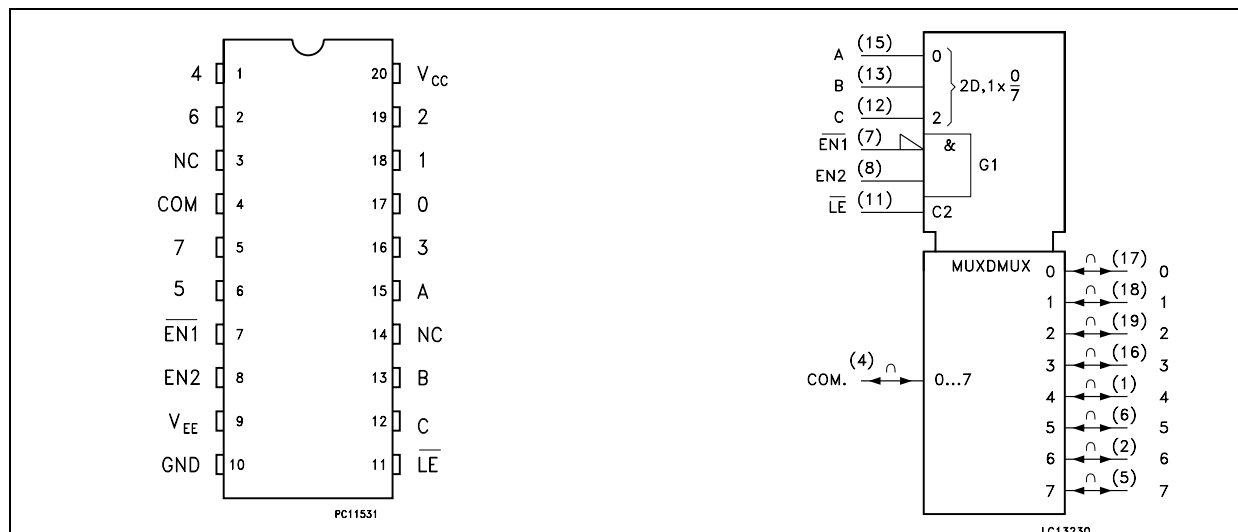
DESCRIPTION

The M74HC4351 is an high speed CMOS ANALOG MULTIPLEXER/DEMULTIPLEXER fabricated with silicon gate C²MOS technology. A built-in level shifting is included to allow an input range up to $\pm 6V$ (peak) for an analog signal with digital control signal of 0 to 6V.

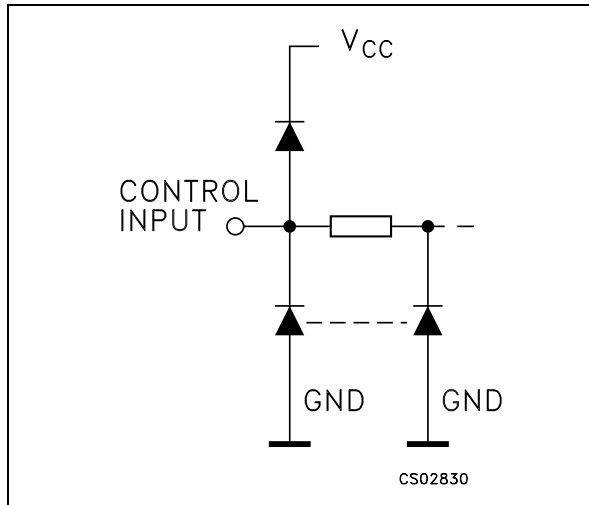
V_{EE} supply pin is provided for analog input signals. It has two enable inputs to enable all the switches when high (EN2) or low (EN1). For operation as a digital multiplexer/demultiplexer, V_{EE} is connected to GND.

The M74HC4351 is a single 8 channel multiplexer/demultiplexer having three binary control inputs A, B and C to select 1 of 8 to be turned on, and connected to the output.

PIN CONNECTION AND IEC LOGIC SYMBOLS



CONTROL INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|----------------------------|-----------------|---------------------------------|
| 4 | COM | Common |
| 3, 14 | NC | Not Connected |
| 7 | EN1 | Enable Input (Active LOW) |
| 8 | EN2 | Enable Input (Active HIGH) |
| 9 | V _{EE} | Negative Supply Voltage |
| 11 | LE | Latch Enable Input (Active LOW) |
| 15, 13, 12 | A, B, C | Select Inputs |
| 17, 18, 19, 16, 1, 6, 2, 5 | 0 to 7 | Independent Inputs/Outputs |
| 10 | GND | Ground (0V) |
| 20 | V _{CC} | Positive Supply Voltage |

TRUTH TABLE

| CONTROL INPUTS | | | | | "ON" CHANNEL ($\overline{LE} = H$)** |
|----------------|-----|---|---|---|----------------------------------------|
| EN1 | EN2 | C | B | A | |
| L | H | L | L | L | 0 |
| L | H | L | L | H | 1 |
| L | H | L | H | L | 2 |
| L | H | L | H | H | 3 |
| L | H | H | L | L | 4 |
| L | H | H | L | H | 5 |
| L | H | H | H | L | 6 |
| L | H | H | H | H | 7 |
| H | X | X | X | X | NONE |
| X | L | X | X | X | NONE |

X : Don't Care

** : When latch Enable is low, the Channel Selection is latched and the Channel Address Latch does not change state.

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-------------------------------------|--------------------------------------|------------------------------------------------|------|
| V _{CC} | Supply Voltage | -0.5 to +7 | V |
| V _{CC} - V _{EE} | Supply Voltage Range | -0.5 to +13 | V |
| V _{IN} | DC Input Voltage | -0.5 to V _{CC} + 0.5 | V |
| V _{I/O} | DC Switch Input/Output Voltage | V _{EE} - 0.5 to V _{CC} + 0.5 | V |
| I _{IK} | Input Diode Current | ± 20 | mA |
| I _{OK} | I/O Diode Current | ± 20 | mA |
| I _{OUT} | 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 | °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

(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit | |
|-------------------|--------------------------|-----------------|-----------|----|
| V_{CC} | Supply Voltage | 2 to 12 | V | |
| V_{EE} | Supply Voltage | 2 to 12 | V | |
| $V_{CC} - V_{EE}$ | Supply Voltage | 2 to 12 | V | |
| V_I | Input Voltage | 0 to V_{CC} | V | |
| $V_{I/O}$ | Switch I/O 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 | |
| | | $V_{CC} = 6.0V$ | 0 to 400 | |

DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | Value | Unit | | | | | | | |
|-----------------|-------------------------------------------------------|-----------------|-----------------|---------------------------------------------------------------------------------------|------|--------------------|-----------|------|-----------------------|------|------------------------|---------|
| | | V_{CC} (V) | V_{EE} (V) | | | $T_A = 25^\circ C$ | | | -40 to $85^\circ C$ | | -55 to $125^\circ C$ | |
| | | | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. |
| V_{IHC} | High Level Control 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_{ILC} | Low Level Control 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 | | |
| R_{ON} | ON Resistance | 4.5 | GND | $V_I = V_{IHC}$ or V_{ILC} $V_{I/O} = V_{CC}$ to V_{EE} $I_{I/O} \leq 2$ mA | 85 | 180 | | 225 | | | Ω | |
| | | 4.5 | -4.5 | | 55 | 120 | | 150 | | | | |
| | | 6.0 | -6.0 | | 50 | 100 | | 125 | | | | |
| | | 2.0 | GND | 150 | | | | | | | | |
| | | 4.5 | GND | 70 | 150 | | 190 | | | | | |
| | | 4.5 | -4.5 | 50 | 100 | | 125 | | | | | |
| | | 6.0 | -6.0 | 45 | 80 | | 100 | | | | | |
| ΔR_{ON} | Difference of ON Resistance between switches | 4.5 | GND | $V_I = V_{IHC}$ or V_{ILC} $V_{I/O} = V_{CC}$ to V_{EE} $I_{I/O} \leq 2$ mA | 10 | 30 | | 35 | | | Ω | |
| | | 4.5 | -4.5 | | 5 | 12 | | 15 | | | | |
| | | 6.0 | -6.0 | | 5 | 10 | | 12 | | | | |
| I_{OFF} | Input/Output Leakage Current (SWITCH OFF) | 6.0 | -6.0 | $V_{OS} = V_{CC}$ or GND $V_{IS} = V_{CC}$ or GND $V_{IN} = V_{ILC}$ | | | ± 100 | | ± 1000 | | nA | |
| I_{IZ} | Switch Input Leakage Current (SWITCH ON, OUTPUT OPEN) | 6.0 | -6.0 | $V_{OS} = V_{CC}$ or GND $V_{INH} = V_{IHC}$ | | | ± 100 | | ± 1000 | | nA | |
| I_{IN} | Control Input Current | 6.0 | GND | $V_{IN} = V_{CC}$ or GND | | | ± 0.1 | | ± 1 | | μA | |
| I_{CC} | Quiescent Supply Current | 6.0 | GND | $V_{IN} = V_{CC}$ or GND | | | 4 | | 40 | | 80 | μA |
| | | 6.0 | -6.0 | | | | 8 | | 80 | | 160 | |

AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$, GND = 0)

| Symbol | Parameter | Test Condition | | | Value | | | | | | Unit | |
|------------------------|-------------------------------------------------|-----------------|-----------------|-------------------------|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
| | | V_{CC} (V) | V_{EE} (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. |
| $\Phi_{I/O}$ | Phase Difference Between Input and Output | 2.0 | GND | | | 25 | 60 | | 75 | | | ns |
| | | 4.5 | GND | | | 6 | 12 | | 15 | | | |
| | | 6.0 | GND | | | 5 | 10 | | 13 | | | |
| | | 4.5 | -4.5 | | | 4 | | | | | | |
| t_{PZL} t_{PZH} | Output Enable Time (E1, E2 - O) | 2.0 | GND | $R_L = 1\text{K}\Omega$ | | 80 | 200 | | 250 | | 300 | ns |
| | | 4.5 | GND | | | 20 | 40 | | 50 | | 60 | |
| | | 6.0 | GND | | | 16 | 34 | | 43 | | 51 | |
| | | 4.5 | -4.5 | | | 18 | | | | | | |
| t_{PZL} t_{PZH} | Output Enable Time (LE -I/O) | 2.0 | GND | $R_L = 1\text{K}\Omega$ | | 80 | 225 | | 280 | | 340 | ns |
| | | 4.5 | GND | | | 22 | 45 | | 56 | | 68 | |
| | | 6.0 | GND | | | 17 | 38 | | 48 | | 57 | |
| | | 4.5 | -4.5 | | | 18 | | | | | | |
| t_{PZL} t_{PZH} | Output Enable Time (A, B, C - I/O) | 2.0 | GND | $R_L = 1\text{K}\Omega$ | | 75 | 225 | | 280 | | 340 | ns |
| | | 4.5 | GND | | | 22 | 45 | | 56 | | 68 | |
| | | 6.0 | GND | | | 16 | 38 | | 48 | | 57 | |
| | | 4.5 | -4.5 | | | 17 | | | | | | |
| t_{PLZ} t_{PHZ} | Output Disable Time (E1, E2 - O) | 2.0 | GND | $R_L = 1\text{K}\Omega$ | | 120 | 275 | | 344 | | 415 | ns |
| | | 4.5 | GND | | | 38 | 55 | | 69 | | 83 | |
| | | 6.0 | GND | | | 33 | 47 | | 59 | | 71 | |
| | | 4.5 | -4.5 | | | 30 | | | | | | |
| t_{PLZ} t_{PHZ} | Output Disable Time (LE -I/O) | 2.0 | GND | $R_L = 1\text{K}\Omega$ | | 120 | 275 | | 344 | | 415 | ns |
| | | 4.5 | GND | | | 40 | 55 | | 69 | | 83 | |
| | | 6.0 | GND | | | 35 | 47 | | 59 | | 71 | |
| | | 4.5 | -4.5 | | | 34 | | | | | | |
| t_{PLZ} t_{PHZ} | Output Disable Time (A, B, C - I/O) | 2.0 | GND | $R_L = 1\text{K}\Omega$ | | 120 | 290 | | 363 | | 433 | ns |
| | | 4.5 | GND | | | 40 | 58 | | 73 | | 87 | |
| | | 6.0 | GND | | | 35 | 49 | | 61 | | 74 | |
| | | 4.5 | -4.5 | | | 35 | | | | | | |
| $t_{W(H)}$ | Minimum Pulse Width (LE) | 2.0 | GND | | | 75 | | 95 | | 110 | ns | |
| | | 4.5 | GND | | | 15 | | 19 | | 22 | | |
| | | 6.0 | GND | | | 13 | | 16 | | 19 | | |
| t_s | Minimum Set-Up Time | 2.0 | GND | | | 50 | | 60 | | 75 | ns | |
| | | 4.5 | GND | | | 10 | | 12 | | 15 | | |
| | | 6.0 | GND | | | 9 | | 11 | | 13 | | |
| t_h | Minimum Hold Time | 2.0 | GND | | | 5 | | 5 | | 5 | ns | |
| | | 4.5 | GND | | | 5 | | 5 | | 5 | | |
| | | 6.0 | GND | | | 5 | | 5 | | 5 | | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Test Condition | | | Value | | | | | | Unit | |
|------------------|----------------------------------------|------------------------|------------------------|--|-----------------------|------|------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | V _{EE} (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 | 10 | | 10 | | 10 | pF |
| C _{IS} | Common Terminal Capacitance | 5.0 | -5.0 | | | 36 | 70 | | 70 | | 70 | pF |
| C _{OS} | Switch Terminal Capacitance | 5.0 | -5.0 | | | 7 | 15 | | 15 | | 15 | pF |
| C _{IOS} | Feed Through Capacitance | 5.0 | -5.0 | | | 0.95 | 2 | | 2 | | 2 | pF |
| C _{PD} | Power Dissipation Capacitance (note 1) | 5.0 | GND | | | 23 | | | | | | 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. $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

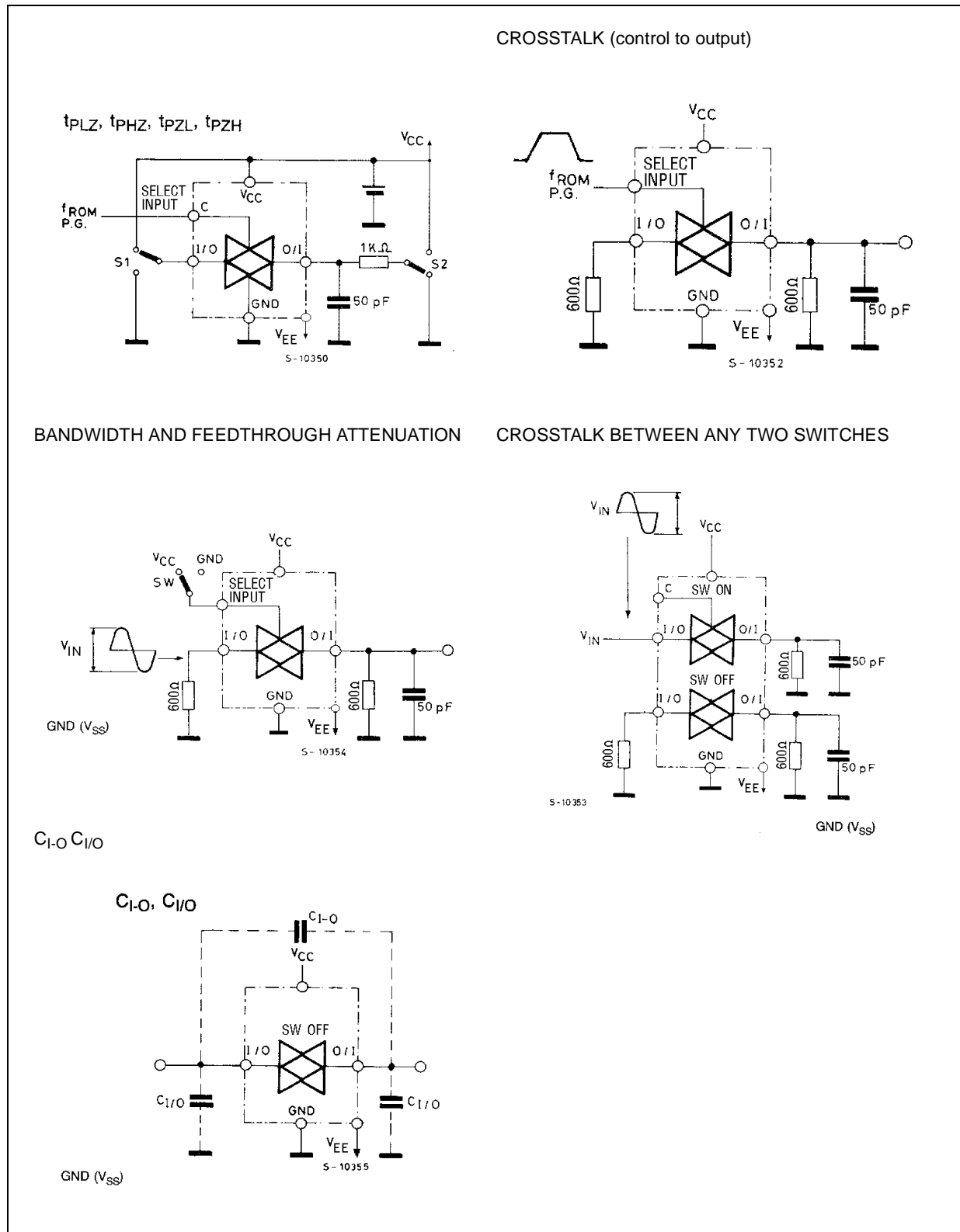
ANALOG SWITCH CHARACTERISTICS (GND = 0V; T_A = 25°C)

| Symbol | Parameter | Test Condition | | | Value | Unit | |
|------------------|---------------------------------------|------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-------|-----|
| | | V _{CC} (V) | V _{EE} (V) | V _{IN} (V _{p-p}) | | | |
| | Sine Wave Distortion (THD) | 2.25 | -2.25 | 4 | f _{IN} = 1 KHz R _L = 10 KΩ, C _L = 50 pF | 0.025 | % |
| | | 4.5 | -4.5 | 8 | | 0.020 | |
| f _{MAX} | Frequency Response (Switch ON) | 4.5 | -4.5 | Adjust f _{IN} voltage to obtain 0 dBm at V _{OS} . Increase f _{IN} Frequency until dB meter reads -3dB R _L = 50Ω, C _L = 10 pF(*) | | 200 | MHz |
| | Feed through Attenuation (Switch OFF) | 2.25 | -2.25 | V _{IN} is centered at (V _{CC} - V _{EE}) / 2. Adjust input for 0 dBm R _L = 600Ω, C _L = 50 pF, f _{IN} = 1MHz sine wave | | -50 | dB |
| | | 4.5 | -4.5 | | | -50 | |
| | | 6.0 | -6.0 | | | -50 | |
| | Crosstalk Control to Switch | 2.25 | -2.25 | t _r = t _f = 6ns R _L = 600Ω, C _L = 50 pF f _{IN} = 1MHz square wave | | 110 | mV |
| | | 4.5 | -4.5 | | | 225 | |
| | | 6.0 | -6.0 | | | 310 | |
| | Crosstalk (Between Any Switches) | 2.25 | -2.25 | Adjust V _{IN} to Obtain 0 dBm at input R _L = 600Ω, C _L = 50 pF, f _{IN} = 1MHz sine wave | | -50 | dB |
| | | 4.5 | -4.5 | | | -50 | |
| | | 6.0 | -6.0 | | | -50 | |

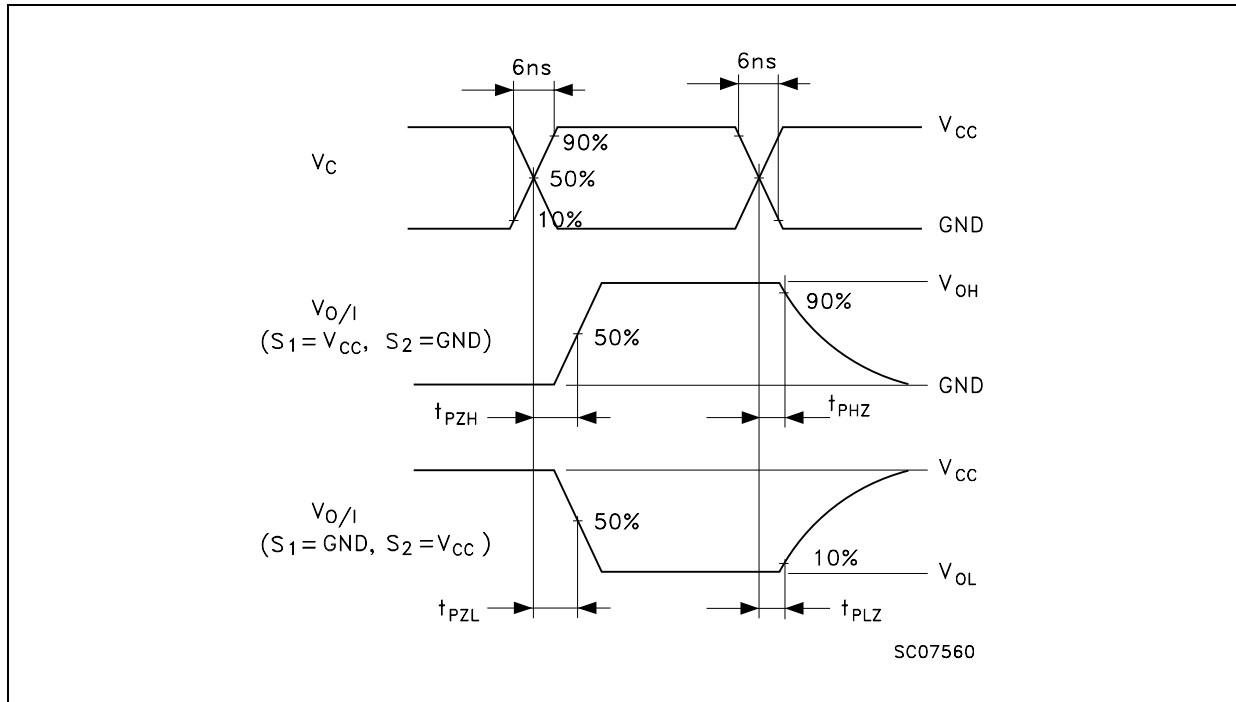
(*) : Input COMMON Terminal, and measured at SWITCH Terminal.

NOTE : These Characteristics are determined by design of device.

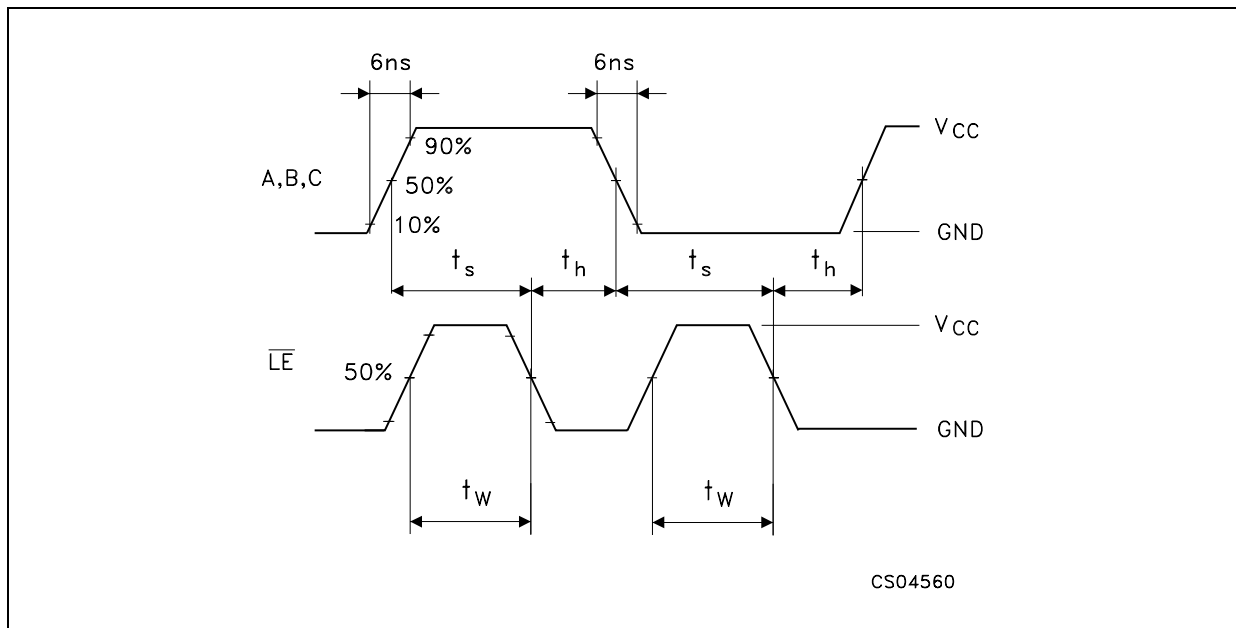
SWITCHING CHARACTERISTICS TEST CIRCUIT



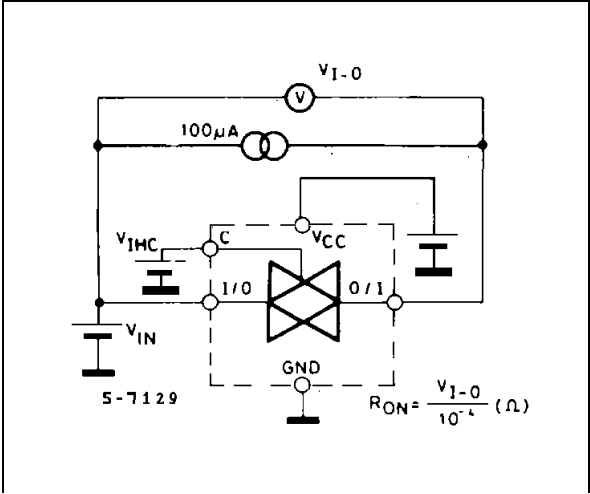
WAVEFORM 1 : OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



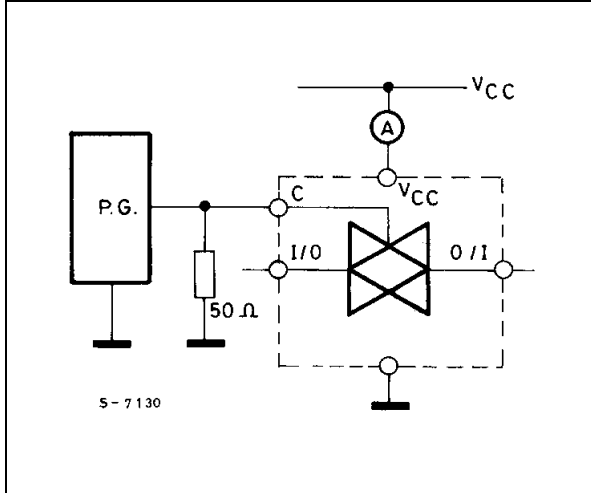
WAVEFORM 2 : MINIMUM PULSE WIDTH, SETUP AND HOLD TIME (f=1MHz; 50% duty cycle)



CHANNEL RESISTANCE (R_{ON})

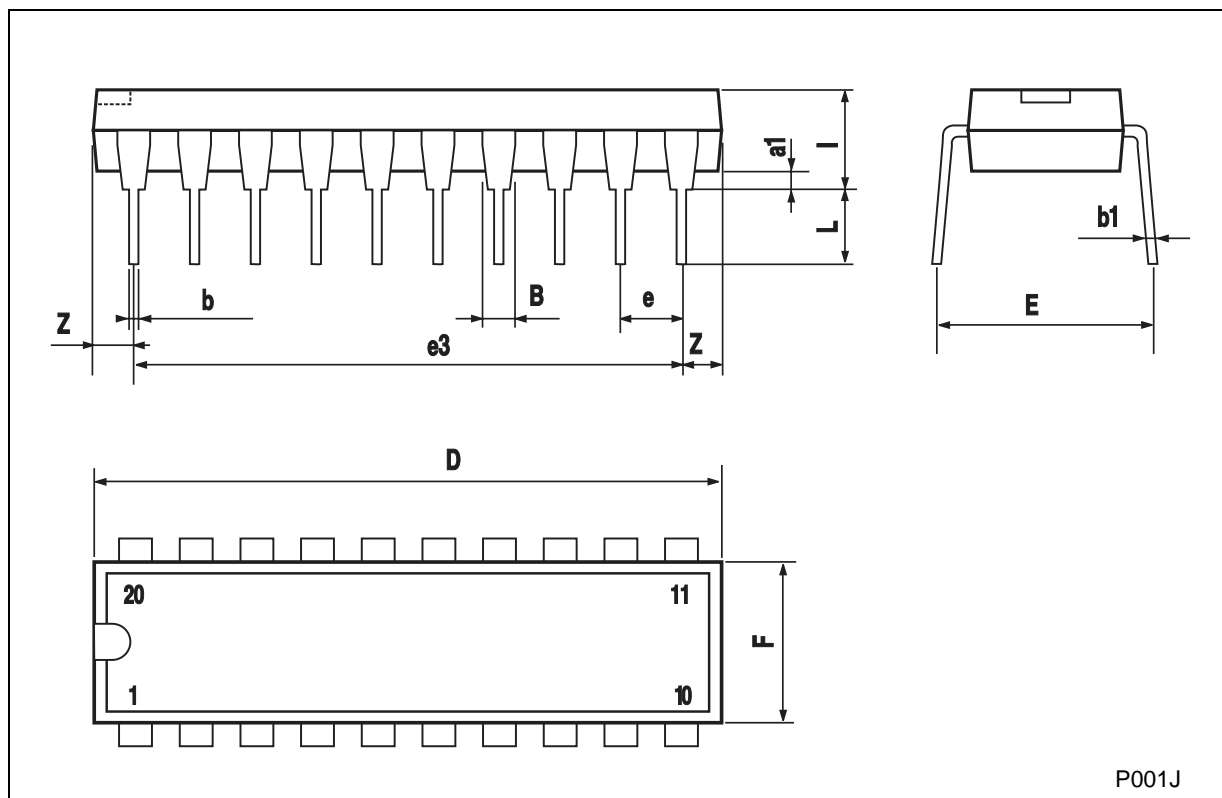


I_{CC} (Opr.)



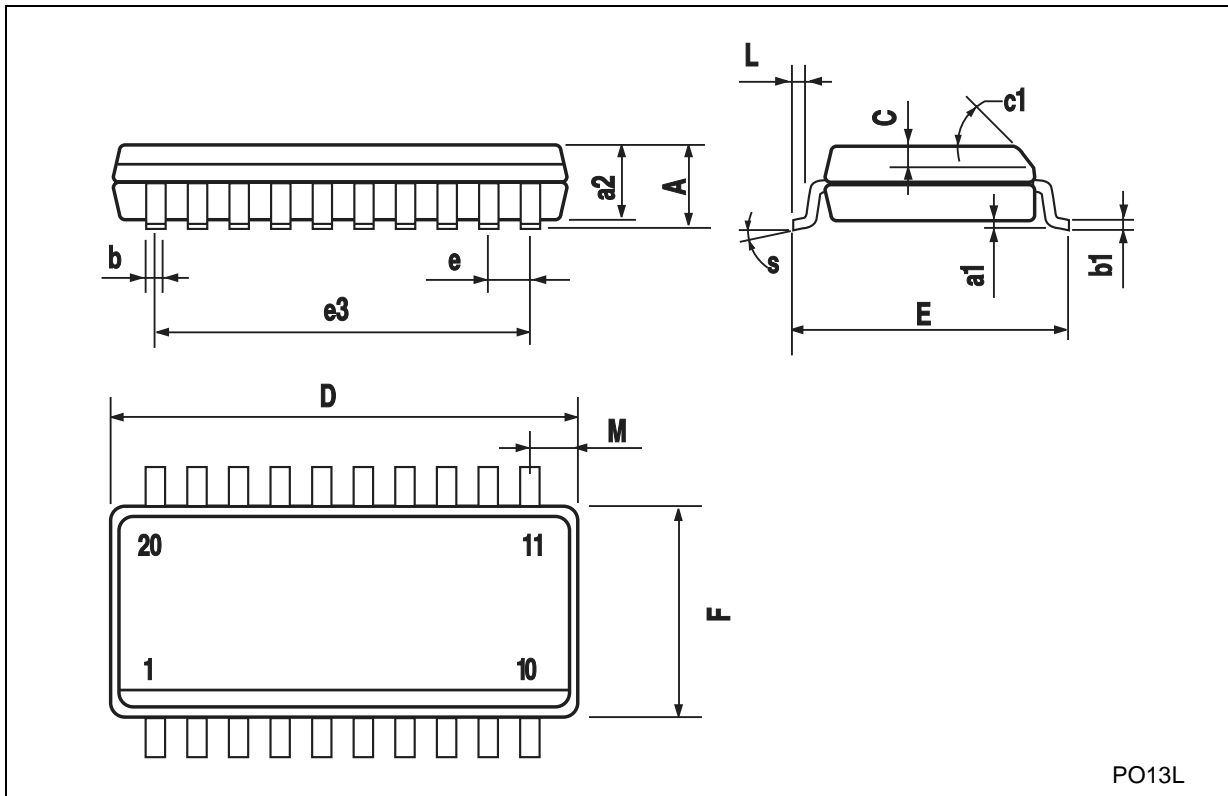
Plastic DIP-20 (0.25) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|-------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.254 | | | 0.010 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.45 | | | 0.018 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 25.4 | | | 1.000 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 22.86 | | | 0.900 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 3.93 | | | 0.155 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.34 | | | 0.053 |



SO-20 MECHANICAL DATA

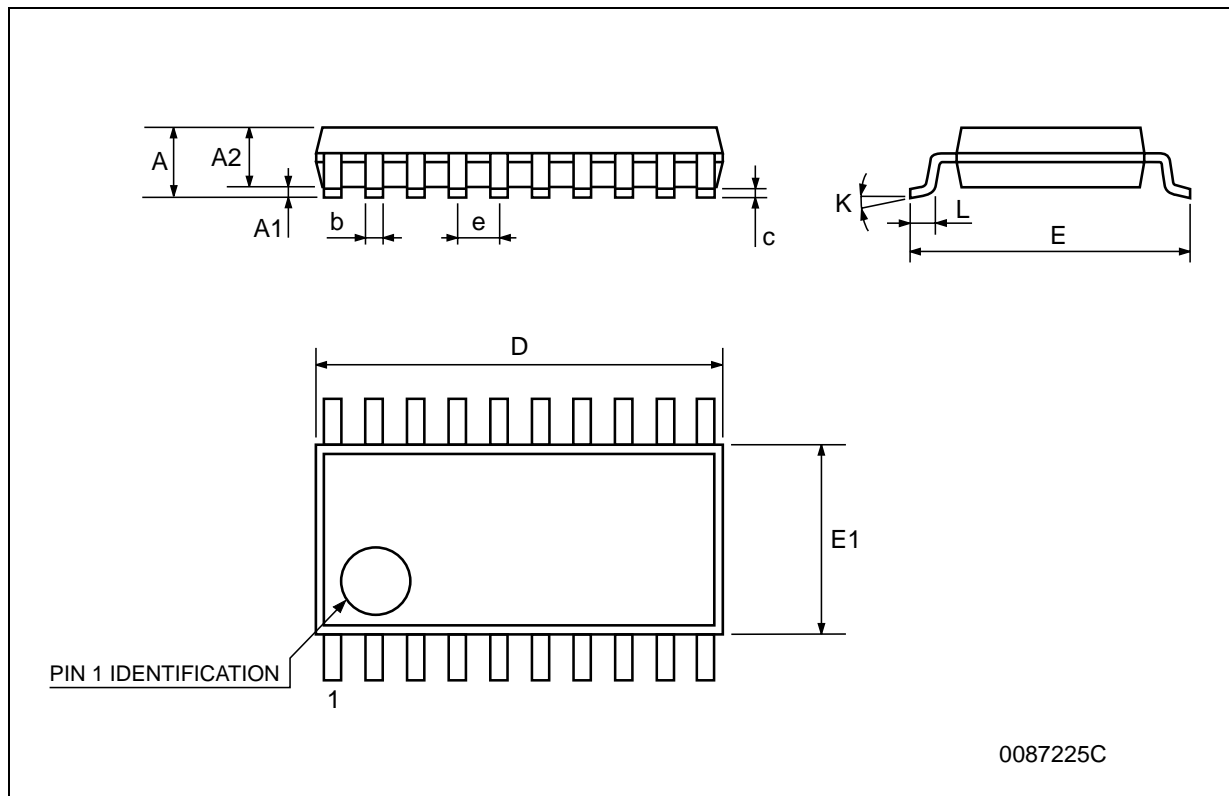
| DIM. | mm. | | | inch | | |
|------|------------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 2.65 | | | 0.104 |
| a1 | 0.1 | | 0.2 | 0.004 | | 0.008 |
| a2 | | | 2.45 | | | 0.096 |
| b | 0.35 | | 0.49 | 0.014 | | 0.019 |
| b1 | 0.23 | | 0.32 | 0.009 | | 0.012 |
| C | | 0.5 | | | 0.020 | |
| c1 | 45° (typ.) | | | | | |
| D | 12.60 | | 13.00 | 0.496 | | 0.512 |
| E | 10.00 | | 10.65 | 0.393 | | 0.419 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 11.43 | | | 0.450 | |
| F | 7.40 | | 7.60 | 0.291 | | 0.300 |
| L | 0.50 | | 1.27 | 0.020 | | 0.050 |
| M | | | 0.75 | | | 0.029 |
| S | 8° (max.) | | | | | |



PO13L

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 | | 0.0089 |
| 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 |



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2001 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom

© <http://www.st.com>

This datasheet has been download from:

www.datasheetcatalog.com

Datasheets for electronics components.