

**DS3605, DS3606, DS3607, DS3608 Hex TRI-STATE<sup>®</sup>  
MOS Sense Amplifiers (MOS to TTL Converters)**
**General Description**

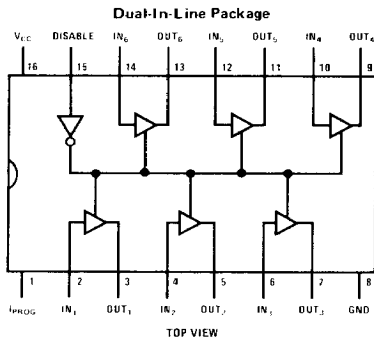
The DS3605 series are programmable hex MOS sense amplifiers featuring high speed direct MOS sense capability with high impedance states to allow use of a common bus line. The DS3605 and DS3606 have TRI-STATE outputs. The DS3607 and DS3608 have both TRI-STATE inputs and outputs. High impedance states are controlled by an enable input.

Input current threshold (the level at which the output changes state) is determined by the current at the programming pin. The current threshold is 100 $\mu$ A with the programming pin grounded and 250 $\mu$ A with the pin unconnected. The threshold can be set from 100 $\mu$ A to 300 $\mu$ A by connecting a resistor from the pin to ground, and set above 300 $\mu$ A by connecting a resistor from the pin to the positive supply.

Outputs are high current drivers capable of sinking 50 mA in the low state and sourcing 5 mA in the high state.

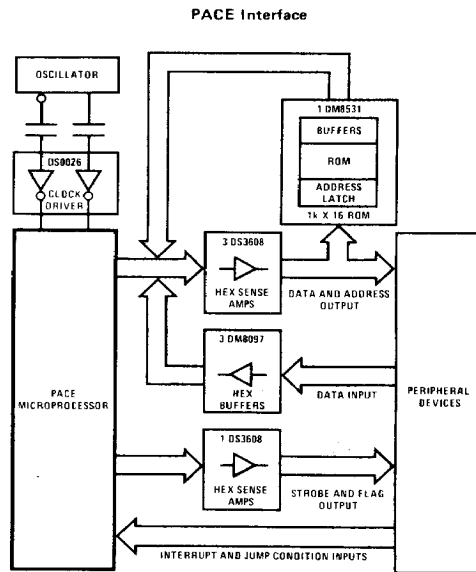
**Features**

- Non-inverting inputs (DS3605, DS3607)
- Inverting inputs (DS3606, DS3608)
- No external components required (direct MOS sensing)
- Programmable input thresholds
- Current sensing—100 $\mu$ A minimum
- 50 mA drive capability
- TRI-STATE control
- Single 5V supply
- 15 ns typical propagation delay (DS3605)

**Connection Diagram**

**Ordering Information**

ORDER NUMBERS	PACKAGE
DS3605J, DS3606J, DS3607J, DS3608J	Cavity DIP (J)
DS3605N, DS3606N, DS3607N, DS3608N	Molded DIP (N)

See NS Package J16A or N16A

**Typical Application**


DS3608 shown as an interface between the PACE microprocessor and TTL data bus and I/O bus.

### Absolute Maximum Ratings (Note 1)

Supply Voltage	7V
Input Voltage	5.5V
Output Voltage	5.5V
Input Drive Current per Input	25 mA
Storage Temperature Range	-65° C to 150° C
Lead Temperature (Soldering, 10 seconds)	300° C

### Operating Conditions

	MIN	MAX	UNITS
Supply Voltage, V <sub>CC</sub> DS3605/DS3606, DS3607/DS3608	4.75	5.25	V
Temperature, T <sub>A</sub> DS3605/DS3606, DS3607/DS3608	0	+70	°C

### Electrical Characteristics (Notes 2 and 3)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V <sub>IH</sub> Logical "1" Input Voltage Disable	V <sub>CC</sub> = Min	2			V
I <sub>IH</sub> Logical "1" Input Current Disable	V <sub>CC</sub> = Max, V <sub>IN</sub> = 2.4V			40	μA
V <sub>IL</sub> Logical "0" Input Voltage Disable	V <sub>CC</sub> = Min			0.8	V
I <sub>IL</sub> Logical "0" Input Current Disable	V <sub>IN</sub> = 0.4V			-1.6	mA
V <sub>CD</sub> Input Clamp Voltage Disable	V <sub>CC</sub> = Min, I <sub>IN</sub> = 12 mA		-1	-1.5V	V
V <sub>OH</sub> Logical "1" Output Voltage	V <sub>CC</sub> = Min, I <sub>OUT</sub> = -5 mA	2.4			V
I <sub>OS</sub> Output Short Circuit Current	V <sub>CC</sub> = Max, V <sub>OUT</sub> = 0V (Note 4)	-20	-50	-90	mA
V <sub>OL</sub> Logical "0" Output Voltage	V <sub>CC</sub> = Min, I <sub>OUT</sub> = 50 mA		0.3	0.4	V
I <sub>OL</sub> Logical "0" Output Current	V <sub>CC</sub> = Min, V <sub>OL</sub> = 0.4	50			mA
I <sub>OUT</sub> TRI-STATE Output Current	V <sub>CC</sub> = Max, 0.4V ≤ V <sub>OUT</sub> ≤ 2.4V	-40		40	μA
I <sub>IN</sub> TRI-STATE Input Current	V <sub>CC</sub> = Max, 0.4V ≤ V <sub>IN</sub> ≤ 5V	-40		40	μA
I <sub>TH</sub> Input Threshold Current	V <sub>CC</sub> = 5V, T <sub>A</sub> = 25° C, I <sub>P</sub> = 0μA	100	250	400	μA
	V <sub>CC</sub> = 5V, T <sub>A</sub> = 25° C, I <sub>P</sub> = 1 mA	1000	1250	1500	μA
I <sub>MAX</sub> Maximum Input Driver Per Input	V <sub>CC</sub> = Max		15	8	mA
I <sub>CC</sub> Supply Current	V <sub>CC</sub> = Max	DS3605	80	115	mA
		DS3606/DS3607	90	130	mA
		DS3608	80	115	mA

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**Note 2:** Unless otherwise specified min/max limits apply across the 0° C to +70° C range for the DS3605, DS3606, DS3607 and DS3608. All typicals are given for V<sub>CC</sub> = 5.0V and T<sub>A</sub> = 25° C.

**Note 3:** All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

**Note 4:** Only one output at a time should be shorted.

**Switching Characteristics** Unless otherwise specified,  $T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5\text{V}$

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
$t_{PD0}$ Propagation Delay	$C_L = 50\text{ pF}$ , $R_L = 80\Omega$ , $I_P = 750\mu\text{A}$ , $I_{IN} = 2\text{ mA}$	DS3605	15	22	ns
		DS3606	26	39	ns
		DS3607	24	35	ns
		DS3608	20	30	ns
$t_{PD1}$ Propagation Delay	$C_L = 50\text{ pF}$ , $R_L = 80\Omega$ , $I_P = 750\mu\text{A}$ , $I_{IN} = 2\text{ mA}$	DS3605	15	22	ns
		DS3606	19	29	ns
		DS3607	19	29	ns
		DS3608	14	21	ns
$t_{OH}$ TRI-STATE Delays (Input/Output)	$C_L = 5\text{ pF}$ , $R_L = 80\Omega$ , $I_P = 750\mu\text{A}$ , $I_{IN} = 2\text{ mA}$	DS3605	18	32	ns
		DS3606	18	32	ns
		DS3607	20	35	ns
		DS3608	20	35	ns
$t_{1H}$ TRI-STATE Delays (Input/Output)	$C_L = 5\text{ pF}$ , $R_L = 80\Omega$ , $I_P = 750\mu\text{A}$ , $I_{IN} = 2\text{ mA}$	DS3605	8	14	ns
		DS3606	8	14	ns
		DS3607	10	18	ns
		DS3608	10	18	ns
$t_{HO}$ TRI-STATE Delays (Input/Output)	$C_L = 50\text{ pF}$ , $R_L = 80\Omega$ , $I_P = 750\mu\text{A}$ , $I_{IN} = 2\text{ mA}$	DS3605	22	40	ns
		DS3606	20	35	ns
		DS3607	45	80	ns
		DS3608	45	80	ns
$t_{H1}$ TRI STATE Delays (Input/Output)	$C_L = 50\text{ pF}$ , $R_L = 80\Omega$ , $I_P = 750\mu\text{A}$ , $I_{IN} = 2\text{ mA}$	DS3605	25	45	ns
		DS3606	26	45	ns
		DS3607	35	60	ns
		DS3608	35	60	ns

\*Data valid only after this delay.

**Truth Tables**

DS3605 (Note 1)

$I_{IN}$	DIS	OUT
X	H	Hi-Z
$>I_T$	L	H
$<I_T$	L	L

DS3606 (Note 2)

$I_{IN}$	DIS	OUT
X	H	Hi-Z
$>I_T$	L	L
$<I_T$	L	H

DS3607 (Note 1)

$I_{IN}$	DIS	OUT
X	H	Hi-Z
$>I_T$	L	L
$<I_T$	L	H

DS3608 (Note 2)

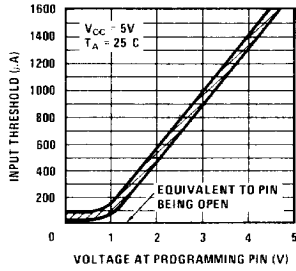
$I_{IN}$	DIS	OUT
X	H	Hi-Z
$>I_T$	L	H
$<I_T$	L	L

Note 1: Non-inverting inputs

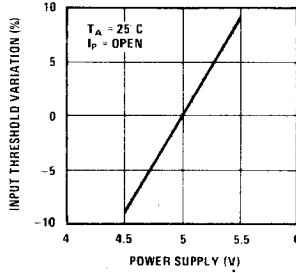
Note 2: Inverting inputs

# Typical Performance Characteristics

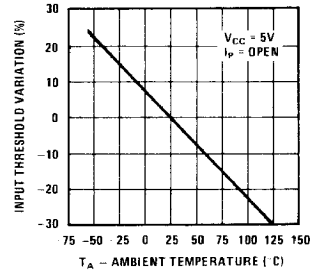
Typical Input Threshold vs Voltage at Programming Pin



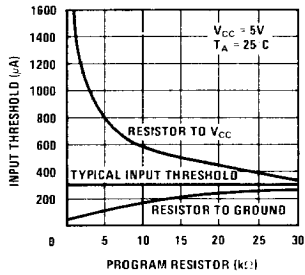
Input Threshold vs Power Supply Variation



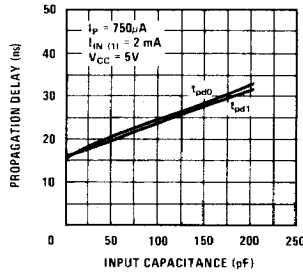
Input Threshold vs Temperature



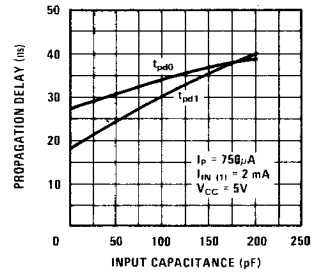
Typical Input Threshold Current vs Program Resistor DS3605 Series



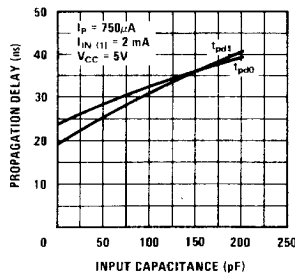
Typical Propagation Delay vs Input Capacitance DS3605



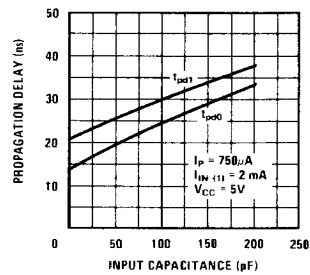
Typical Propagation Delay vs Input Capacitance DS3606



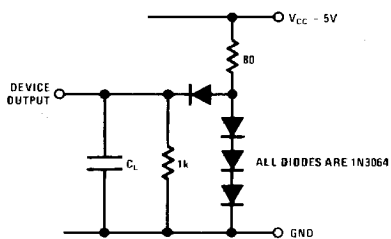
Typical Propagation Delay vs Input Capacitance DS3607



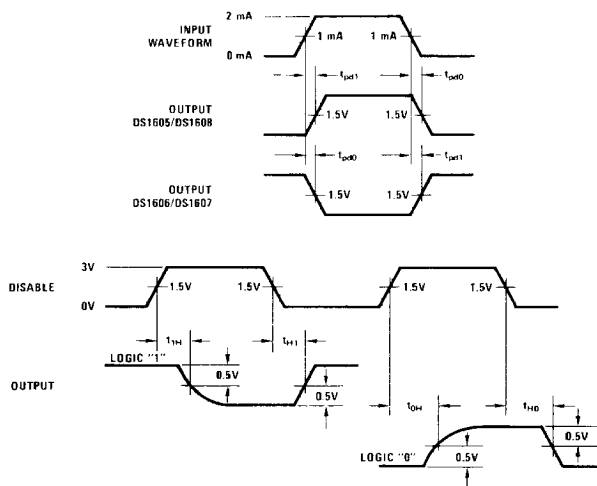
Typical Propagation Delay vs Input Capacitance DS3608



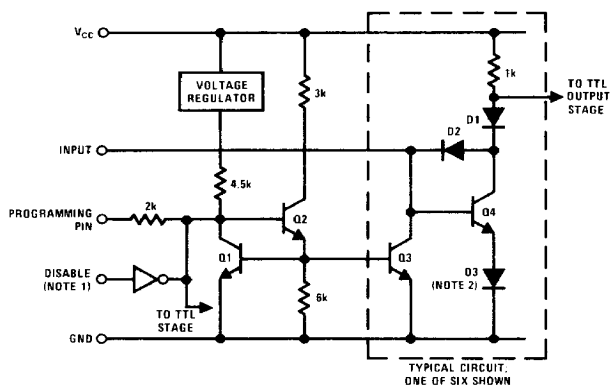
## AC Test Circuit



## Switching Time Waveforms



## Equivalent Circuit



Note 1: On the DS3605 and DS3606, the disable is only connected to the output stage. On the DS3607 and DS3608, it is connected to both the input and output.  
 Note 2: Diode D3 is used in the DS3607 and DS3608 only. In the DS3605 and DS3606, the emitter of Q4 is connected directly to ground.

