

## DS16149/DS36149, DS16179/DS36179 Hex MOS Drivers

### General Description

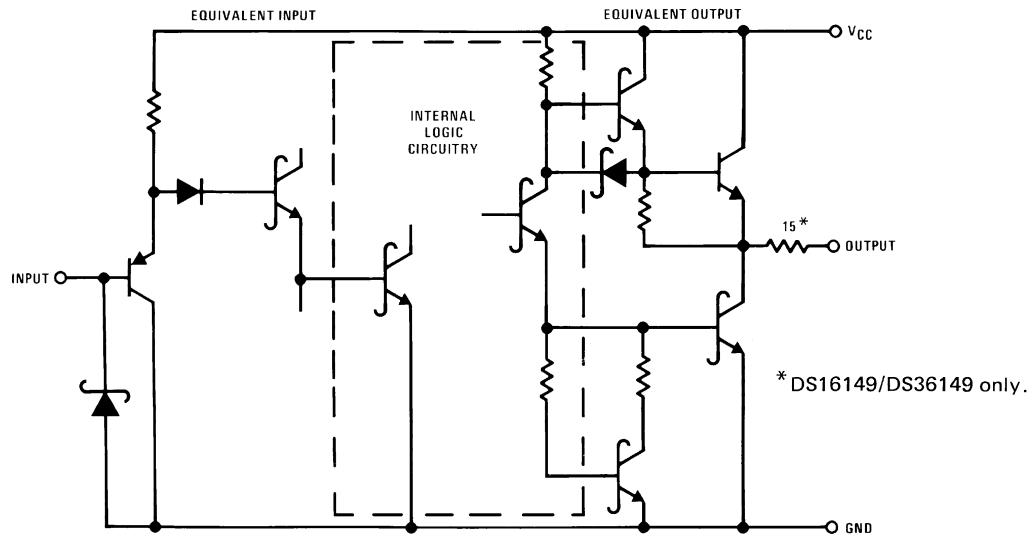
The DS16149/DS36149 and DS16179/DS36179 are Hex MOS drivers with outputs designed to drive large capacitive loads up to 500 pF associated with MOS memory systems. PNP input transistors are employed to reduce input currents allowing the large fan-out to these drivers needed in memory systems. The circuit has Schottky-clamped transistor logic for minimum propagation delay, and a disable control that places the outputs in the logic "1" state (see truth table). This is especially useful in MOS RAM applications where a set of address lines has to be in the logic "1" state during refresh.

The DS16149/DS36149 has a 15 Ω resistor in series with the outputs to dampen transients caused by the fast-switching output. The DS16179/DS36179 has a direct low impedance output for use with or without an external resistor.

### Features

- High speed capabilities
  - Typ 9 ns driving 50 pF
  - Typ 29 ns driving 500 pF
- Built-in 15 Ω damping resistor (DS16149/DS36149)
- Same pin-out as DM8096 and DM74366

### Schematic Diagram



### Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7.0V
Logical "1" Input Voltage	7.0V
Logical "0" Input Voltage	-1.5V
Storage Temperature Range	-65°C to +150°C
Maximum Power Dissipation* at 25°C	
Cavity Package	1371 mW
Molded Package	1280 mW
Lead Temperature (Soldering 10 seconds)	300°C

\*Derate cavity package 9.1 mW/°C above 25°C; derate molded package 10.2 mW/°C above 25°C.

### Operating Conditions

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	4.5	5.5	V
Temperature ( $T_A$ )			

DS16149, DS16179 -55 +125 °C

DS36149, DS36179 0 +70 °C

### DC Electrical Characteristics (Notes 2 and 3)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
$V_{IN(1)}$	Logical "1" Input Voltage			2.0			V
$V_{IN(0)}$	Logical "0" Input Voltage					0.8	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{CC} = 5.5V, V_{IN} = 5.5V$			0.1	40	$\mu A$
$I_{IN(0)}$	Logical "0" Input Current	$V_{CC} = 5.5V, V_{IN} = 0.5V$			-50	-250	$\mu A$
$V_{CLAMP}$	Input Clamp Voltage	$V_{CC} = 4.5V, I_{IN} = -18mA$			-0.75	-1.2	V
$V_{OH}$	Logical "1" Output Voltage (No Load)	$V_{CC} = 4.5V, I_{OH} = -10\mu A$	DS16149/DS16179	3.4	4.3		V
			DS36149/DS36179	3.5	4.3		V
$V_{OL}$	Logical "0" Output Voltage (No Load)	$V_{CC} = 4.5V, I_{OL} = 10\mu A$	DS16149/DS16179		0.25	0.4	V
			DS36149/DS36179		0.25	0.35	V
$V_{OH}$	Logical "1" Output Voltage (With Load)	$V_{CC} = 4.5V, I_{OH} = -1.0mA$	DS16149	2.4	3.5		V
			DS16179	2.5	3.5		V
			DS36149	2.6	3.5		V
			DS36179	2.7	3.5		V
$V_{OL}$	Logical "0" Output Voltage (With Load)	$V_{CC} = 4.5V, I_{OL} = 20mA$	DS16149		0.6	1.1	V
			DS16179		0.4	0.5	V
			DS36149		0.6	1.0	V
			DS36179		0.4	0.5	V
$I_{ID}$	Logical "1" Drive Current	$V_{CC} = 4.5V, V_{OUT} = 0V, (\text{Note 4})$			-250		mA
$I_{OD}$	Logical "0" Drive Current	$V_{CC} = 4.5V, V_{OUT} = 4.5V, (\text{Note 4})$			150		mA
$I_{CC}$	Power Supply Current	$V_{CC} = 5.5V$	Disable Inputs = 0V All Other Inputs = 3V		33	60	mA
			All Inputs = 0V	14		20	mA

### Switching Characteristics ( $V_{CC} = 5V, T_A = 25^\circ C$ ) (Note 4)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
$t_{S\pm}$	Storage Delay Negative Edge	<i>(Figure 1)</i>	$C_L = 50\text{ pF}$		4.5	7	ns
			$C_L = 500\text{ pF}$		7.5	12	ns
$t_{S\mp}$	Storage Delay Positive Edge	<i>(Figure 1)</i>	$C_L = 50\text{ pF}$		5	8	ns
			$C_L = 500\text{ pF}$		8	13	ns
$t_F$	Fall Time	<i>(Figure 1)</i>	$C_L = 50\text{ pF}$		5	8	ns
			$C_L = 500\text{ pF}$		22	35	ns

## Switching Characteristics ( $V_{CC} = 5V$ , $T_A = 25^\circ C$ ) (Note 4) (Continued)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_R$	Rise Time	(Figure 1)	$C_L = 50 \text{ pF}$	6	9	ns
			$C_L = 500 \text{ pF}$	26	35	ns
$t_{LH}$	Delay from Disable Input to Logical "1"	$R_L = 2 \text{ k}\Omega$ to Gnd, $C_L = 50 \text{ pF}$ , (Figure 2)		15	22	ns
$t_{HL}$	Delay from Disable Input to Logical "0"	$R_L = 2 \text{ k}\Omega$ to $V_{CC}$ , $C_L = 50 \text{ pF}$ , (Figure 3)		11	18	ns

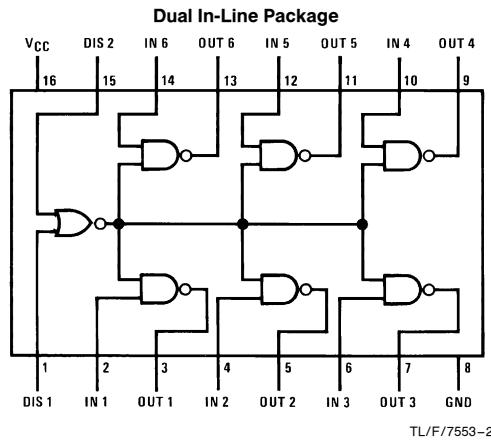
**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for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

**Note 2:** Unless otherwise specified min/max limits apply across the  $-55^\circ C$  to  $+125^\circ C$  temperature range for the DS16149 and DS16179 and across the  $0^\circ C$  to  $+70^\circ C$  range for the DS36149 and DS36179. All typical values are for  $T_A = 25^\circ C$  and  $V_{CC} = 5V$ .

**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:** When measuring output drive current and switching response for the DS16179 and DS36179 a  $15 \Omega$  resistor should be placed in series with each output. This resistor is internal to the DS16149/DS36149 and need not be added.

## Connection Diagram



## Truth Table

Disable Input		Input	Output
DIS 1	DIS2		
0	0	0	1
0	0	1	0
0	1	X	1
1	0	X	1
1	1	X	1

X = Don't care

## AC Test Circuits and Switching Time Waveforms

$t_{S\pm}$ ,  $t_{S\pm}$ ,  $t_R$ ,  $t_F$

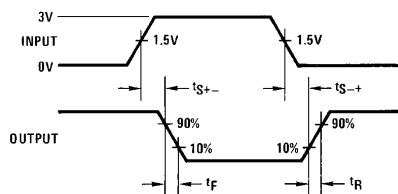
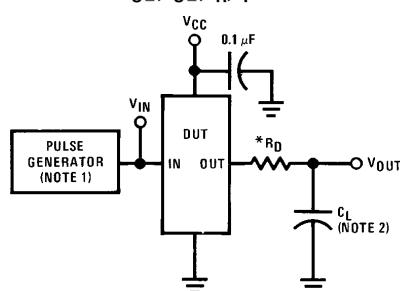


FIGURE 1

## AC Test Circuits and Switching Time Waveforms (Continued)

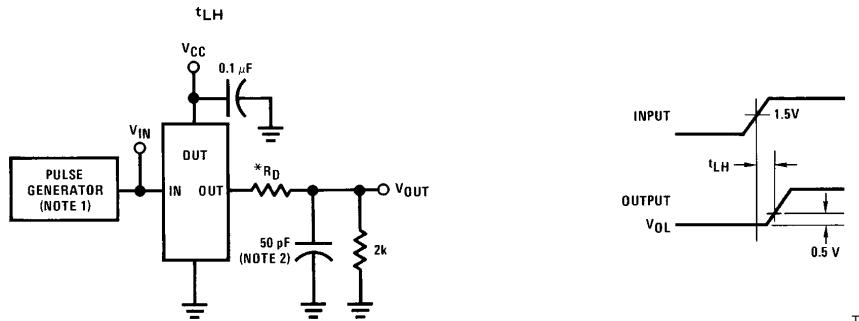


FIGURE 2

TL/F/7553-4

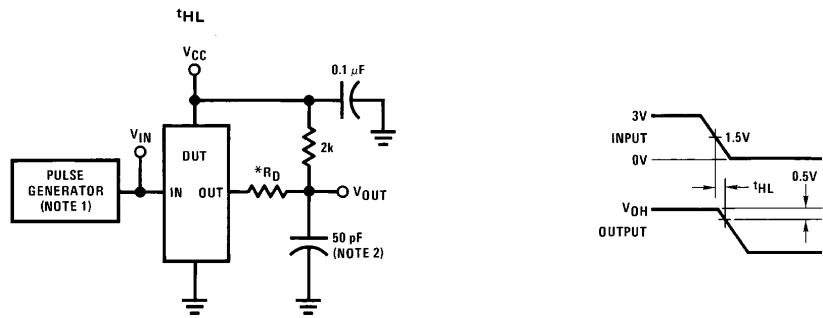


FIGURE 3

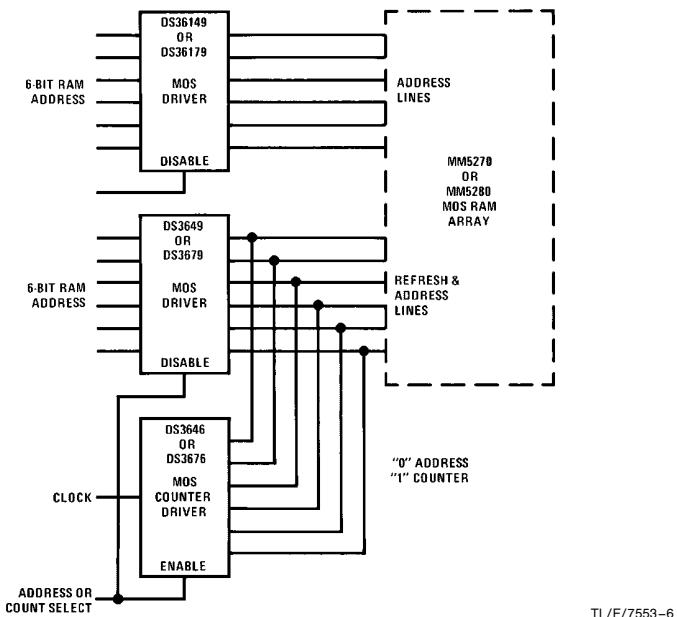
TL/F/7553-5

\*Internal on DS16149 and DS36149

Note 1: The pulse generator has the following characteristics:  $Z_{OUT} = 50 \Omega$  and  $PRR \leq 1 \text{ MHz}$ . Rise and fall times between 10% and 90% points  $\leq 5 \text{ ns}$ .

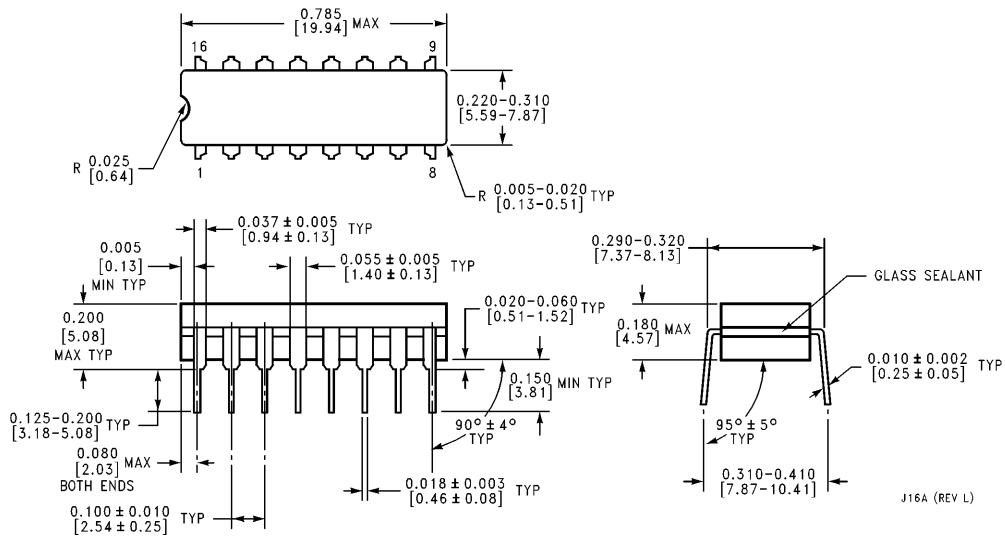
Note 2:  $C_L$  includes probe and jig capacitance.

## Typical Applications



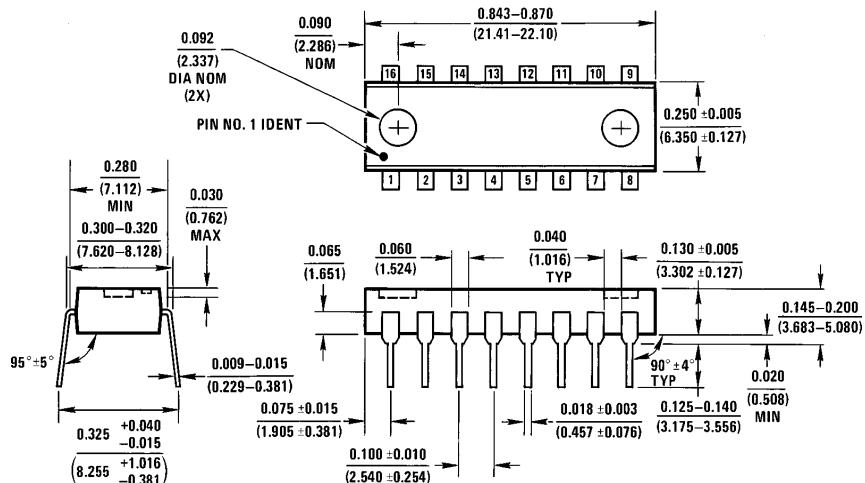
TL/F/7553-6

## Physical Dimensions inches (millimeters)



**Ceramic Dual-In-Line Package (J)  
Order Number DS16149J, DS36149J  
DS16179J or DS36179J  
NS Package Number J16A**

## **Physical Dimensions** inches (millimeters) (Continued)



N16A (REV E)

**Molded Dual-In-Line Package (N)**  
**Order Number DS36149N, DS36149N**  
**NS Package Number N16A**

## **LIFE SUPPORT POLICY**

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

<b>National Semiconductor Corporation</b> 1111 West Bardin Road Arlington, TX 76017 Tel: (800) 272-9959 Fax: (800) 737-7018	<b>National Semiconductor Europe</b> Fax: (+49) 0-180-530 85 86 Email: <a href="mailto:cniwge@tevm2.nsc.com">cniwge@tevm2.nsc.com</a>	<b>National Semiconductor Hong Kong Ltd.</b> 13th Floor, Straight Block, Ocean Centre, 5 Canton Rd. Tsimshatsui, Kowloon Hong Kong Tel: (852) 2737-1600 Fax: (852) 2736-9960	<b>National Semiconductor Japan Ltd.</b> Tel: 81-043-299-2309 Fax: 81-043-299-2408
Deutsch Tel: (+49) 0-180-530 85 85 English Tel: (+49) 0-180-532 78 32 Français Tel: (+49) 0-180-532 93 58 Italiano Tel: (+49) 0-180-534 16 80			