



May 1998

## DS3487 Quad TRI-STATE® Line Driver

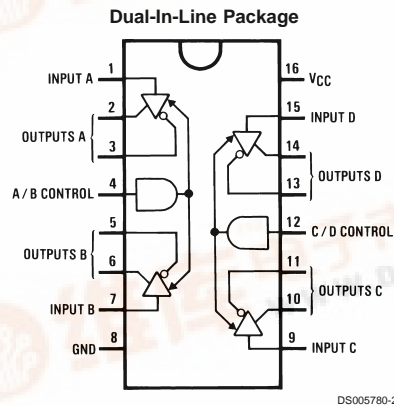
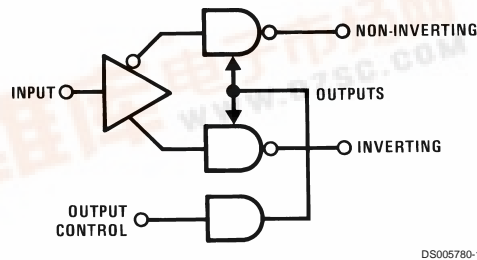
### General Description

National's quad RS-422 driver features four independent drivers which comply with EIA Standards for the electrical characteristics of balanced voltage digital interface circuits. The outputs are TRI-STATE structures which are forced to a high impedance state when the appropriate output control pin reaches a logic zero condition. All input pins are PNP buffered to minimize input loading for either logic one or logic zero inputs.

### Features

- Four independent drivers
- TRI-STATE® outputs
- Fast propagation times (typ 10 ns)
- TTL compatible
- 5V supply
- Output rise and fall times less than 15 ns
- Pin compatible with DS8924 and MC3487

### Block and Connection Diagrams



Top View  
Order Number DS3487M or DS3487N  
See NS Package Number M16A or N16E

### Truth Table

Input	Control Input	Non-Inverting Output	Inverting Output
H	H	H	L
L	H	L	H
X	L	Z	Z

L = Low logic state  
H = High logic state  
X = Irrelevant  
Z = TRI-STATE (high impedance)



## Absolute Maximum Ratings (Note 2)

(Soldering, 4 seconds)

260°C

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

Supply Voltage	8V
Input Voltage	5.5V
Storage Temperature	-65°C to +150°C
Maximum Power Dissipation (Note 1) at 25°C	
Molded DIP Package	1476 mW
SO Package	1051 mW
Lead Temperature	

## Operating Conditions

	Min	Max	Units
Supply Voltage, $V_{CC}$			
DS3487	4.75	5.25	V
Temperature ( $T_A$ )			
DS3487	0	+70	°C

**Note 1:** Derate DIP molded package 11.9 mW/°C above 25°C. Derate SO package 8.41 mW/°C above 25°C.

## Electrical Characteristics (Notes 3, 4, 5, 6)

Symbol	Parameter	Conditions	Min	Typ	Max	Units		
$V_{IL}$	Input Low Voltage				0.8	V		
$V_{IH}$	Input High Voltage		2.0			V		
$I_{IL}$	Input Low Current	$V_{IL} = 0.5V$			-200	µA		
$I_{IH}$	Input High Current				$V_{IH} = 2.7V$	50	µA	
					$V_{IH} = 5.5V$	100	µA	
$V_{CL}$	Input Clamp Voltage	$I_{CL} = -18 mA$			-1.5	V		
$V_{OL}$	Output Low Voltage	$I_{OL} = 48 mA$			0.5	V		
$V_{OH}$	Output High Voltage	$I_{OH} = -20 mA$	2.5			V		
$I_{OS}$	Output Short-Circuit Current		-40		-140	mA		
$I_{OZ}$	Output Leakage Current (TRI-STATE)				$V_O = 0.5V$	-100	µA	
					$V_O = 5.5V$	100	µA	
$I_{OFF}$	Output Leakage Current Power OFF	$V_{CC} = 0V$			$V_O = 6V$	100	µA	
					$V_O = -0.25V$	-100	µA	
$ V_{OS} - \bar{V}_{os} $	Difference in Output Offset Voltage				0.4	V		
$V_T$	Differential Output Voltage		2.0			V		
$ V_T  - \bar{V}_T $	Difference in Differential Output Voltage				0.4	V		
$I_{CC}$	Power Supply Current				Active	50	80	mA
					TRI-STATE®	35	60	mA

## Switching Characteristics

$V_{CC} = 5V, T_A = 25°C$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{PHL}$	Input to Output			10	15	ns
$t_{PLH}$	Input to Output			10	15	ns
$t_{THL}$	Differential Fall Time			10	15	ns
$t_{TLH}$	Differential Rise Time			10	15	ns
$t_{PHZ}$	Enable to Output	$R_L = 200\Omega, C_L = 50 pF$		17	25	ns
$t_{PLZ}$	Enable to Output	$R_L = 200\Omega, C_L = 50 pF$		15	25	ns
$t_{PZH}$	Enable to Output	$R_L = \infty, C_L = 50 pF, S1 Open$		11	25	ns
$t_{PZL}$	Enable to Output	$R_L = 200\Omega, C_L = 50 pF, S2 Open$		15	25	ns

**Note 2:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. 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.

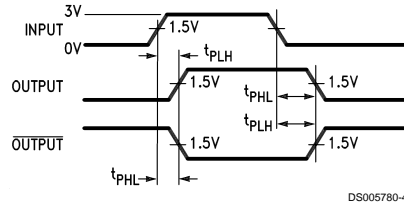
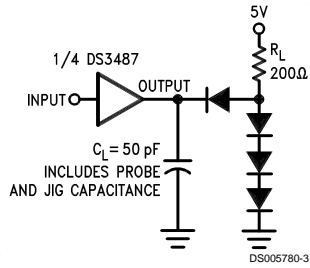
**Note 3:** Unless otherwise specified min/max limits apply across the 0°C to +70°C range for the DS3487. All typicals are given for  $V_{CC} = 5V$  and  $T_A = 25°C$ .

**Note 4:** All currents into device pins are positive, all currents out of device pins as negative. All voltages are referenced to ground unless otherwise specified.

**Note 5:** Only one output at a time should be shorted.

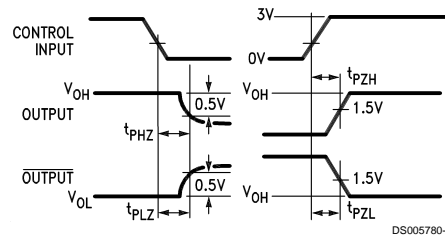
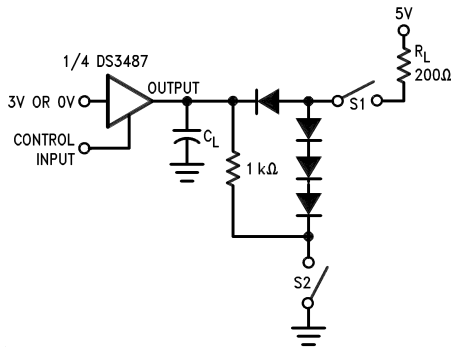
**Note 6:** Symbols and definitions correspond to EIA RS-422, where applicable.

## AC Test Circuits and Switching Time Waveforms



Input pulse:  $f = \text{MHz}$ , 50%;  $t_r = t_f \leq 15 \text{ ns}$ .

FIGURE 1. Propagation Delays

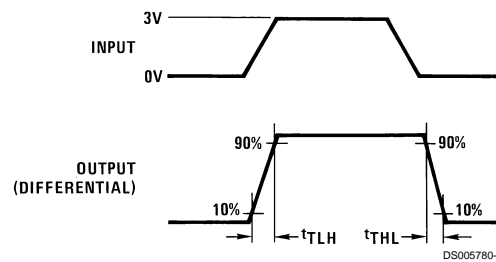
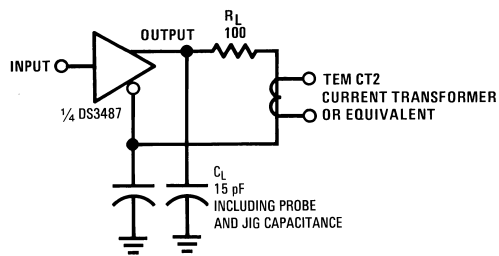


Input pulse:  $f = \text{MHz}$ , 50%;  $t_r = t_f \leq 15 \text{ ns}$ .

S1 = open for  $t_{PHZ}$   
 S2 = open for  $t_{PLZ}$

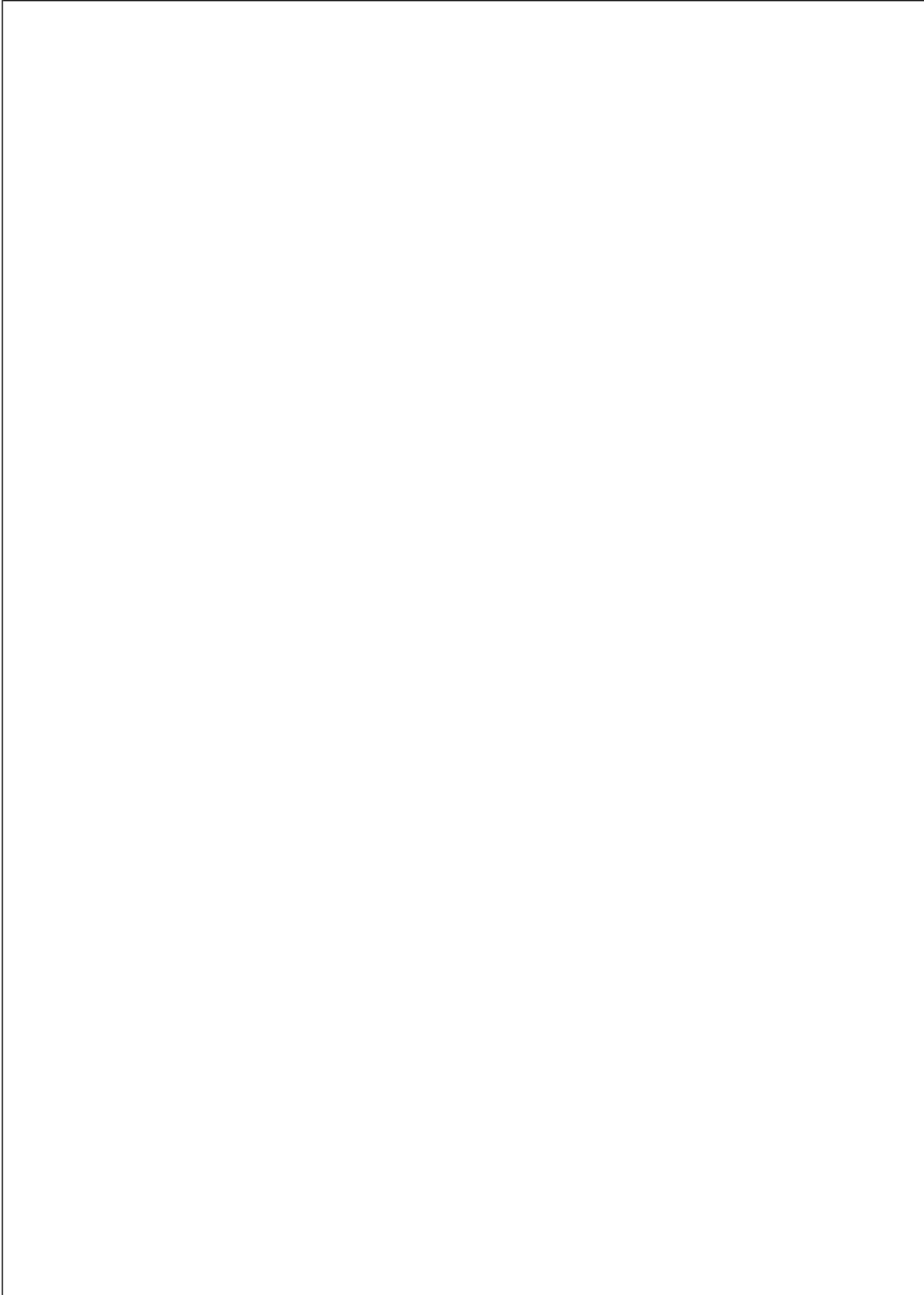
S1 and S2 closed except as noted.  
 $C_L$  includes probe and jig capacitance.

FIGURE 2. TRI-STATE Enable and Disable Delays

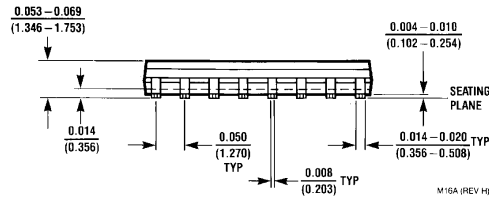
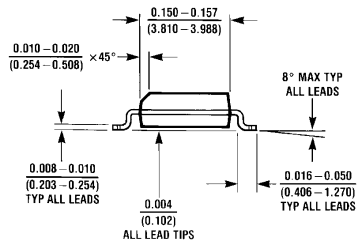
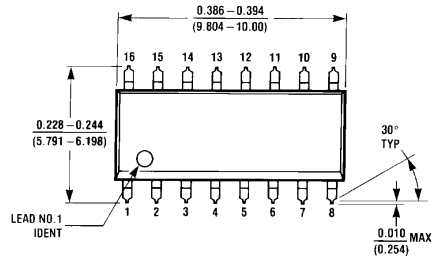


Input pulse:  $f = \text{MHz}$ , 50%;  $t_r = t_f \leq 15 \text{ ns}$ .

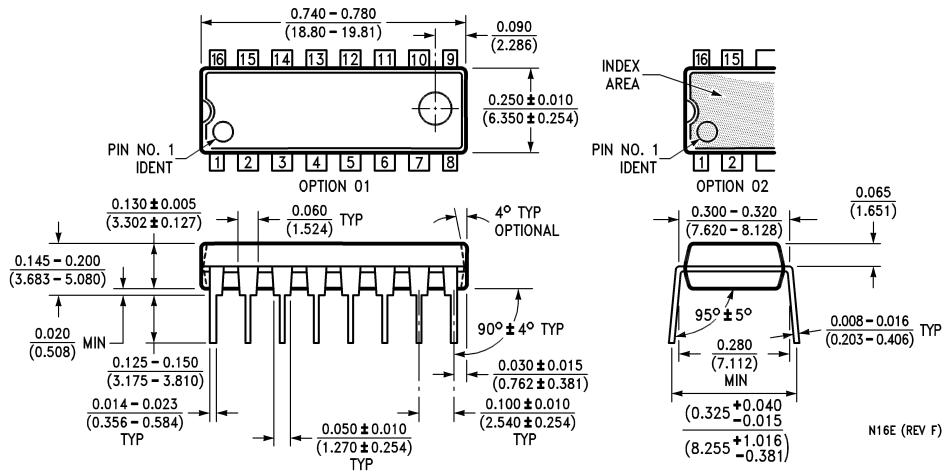
FIGURE 3. Differential Rise and Fall Times



**Physical Dimensions** inches (millimeters) unless otherwise noted



**Small Outline Package (M)**  
**Order Number DS3487M**  
**NS Package Number M16A**



**Molded Dual-In-Line Package (N)**  
**Order Number DS3487N**  
**NS Package Number N16E**

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