

DS3587/DS3487 Quad TRI-STATE® Line Driver

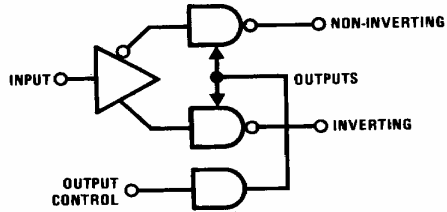
General Description

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.

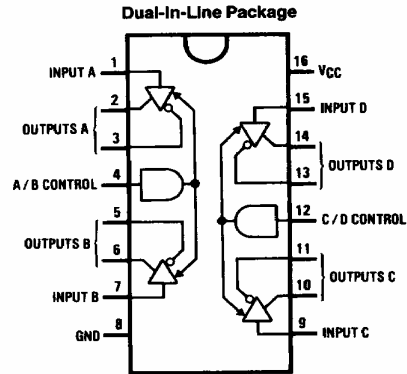
Features

- 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



TL/F/5780-1



TL/F/5780-2

Top View

Order Number DS3587J, DS3487J,
DS3487M or DS3487N
See NS Package Number J16A, M16A or N16A

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)

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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	8V
Input Voltage	5.5V
Storage Temperature	-65°C to +150°C
Maximum Power Dissipation* at 25°C	
Cavity Package	1509 mW
Molded DIP Package	1476 mW

*Derate cavity package 10.1 mW/°C above 25°C; derate DIP molded package 11.9 mW/°C above 25°C. Derate SO package 8.41 mW/°C above 25°C

SO Package	1051 mW
Lead Temperature (Soldering, 4 seconds)	260°C

Operating Conditions

	Min	Max	Units
Supply Voltage, V_{CC}			
DS3587	4.5	5.5	V
DS3487	4.75	5.25	V
Temperature (T_A)			
DS3587	-55	+125	°C
DS3487	0	+70	°C

Electrical Characteristics (Notes 2, 3, 4 and 5)

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	$V_{CC} = 0V$			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 $V_{CC} = 5V, T_A = 25^\circ C$

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 1: "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.

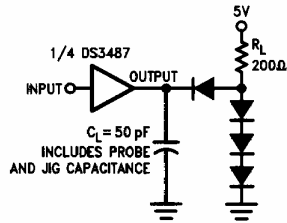
Note 2: Unless otherwise specified min/max limits apply across the 0°C to +70°C range for the DS3487. All typicals are given for $V_{CC} = 5V$ and $T_A = 25^\circ C$.

Note 3: 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 4: Only one output at a time should be shorted.

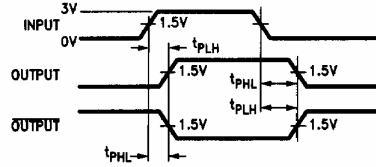
Note 5: Symbols and definitions correspond to EIA RS-422, where applicable.

AC Test Circuits and Switching Time Waveforms



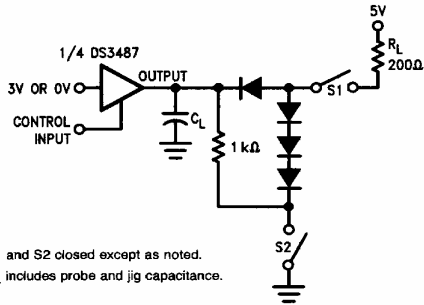
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FIGURE 1. Propagation Delays



TL/F/5780-4

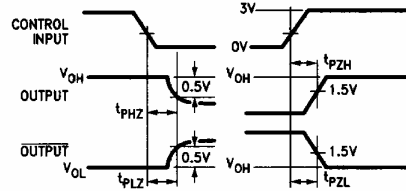
Input pulse: $f = \text{MHz}$, 50%; $t_r = t_f \leq 15 \text{ ns}$.



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

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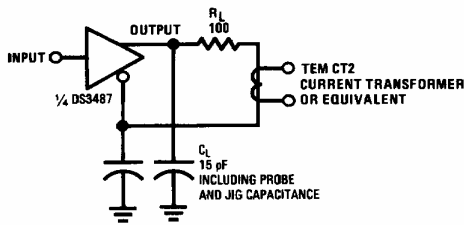
FIGURE 2. TRI-STATE Enable and Disable Delays



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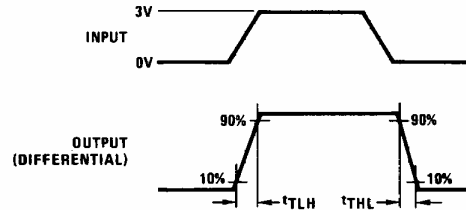
Input pulse: $f = \text{MHz}$, 50%; $t_r = t_f \leq 15 \text{ ns}$.

S1 = open for t_{PZH}
S2 = open for t_{PZL}



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FIGURE 3. Differential Rise and Fall Times



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

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