



# DS8924 Quad TRI-STATE® Differential Line Driver

## General Description

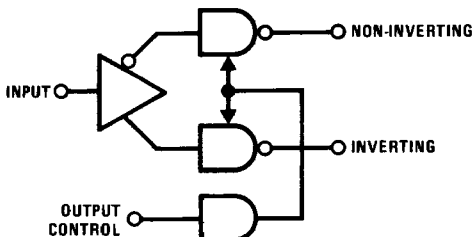
The DS8924 is a quad differential line driver designed for digital data transmission over balanced lines. The outputs are TRI-STATE® structures which are forced to a high impedance state when the appropriate output control pin reaches a logic zero condition. All input pins are PNP buffered to minimize input loading for either logic one or logic zero inputs. In addition, internal circuitry assures a high impedance output state during the transition between power up and power down.

The DS8924 is pin and functionally compatible with DS3487. It features improved performance over 3487-type circuit as outputs can source and sink 48 mA. In addition, outputs are not significantly affected by negative line reflections that can occur when the transmission line is unterminated at the receiver end.

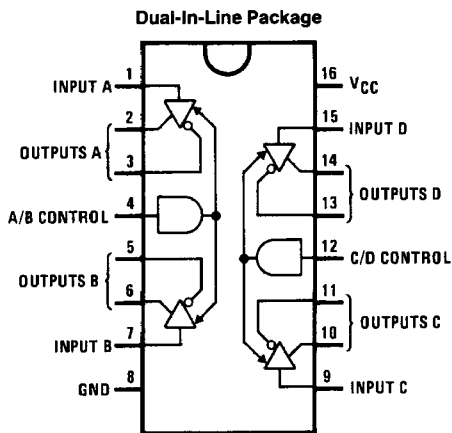
## Features

- Four independent driver chains
- TRI-STATE outputs
- PNP high impedance inputs
- Power up/down protection
- Fast propagation times (typ 12 ns)
- TTL compatible
- Single 5V supply voltage
- Output rise and fall times less than 20 ns (typ 10 ns)
- Pin compatible with DS3487 and MC3487
- Output skew—2 ns typ

## Block and Connection Diagrams



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TL/F/8507-2

Top View

Order Number DS8924J or N  
See NS Package J16A or N16A

## Truth Table

Input	Control Input	Non-inverter Output	Inverter 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 1)

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

Supply Voltage	7V
Input Voltage	5.5V
Storage Temperature	-65°C to +150°C
Lead Temperature (Soldering, 4 sec.)	260°C

Maximum Power Dissipation\* at 25°C

Cavity Package	1550 mW
Molded Package	1560 mW

\*Derate cavity package 10.3 mW/°C above 25°C; derate molded package 12.5 mW/°C above 25°C.

## Operating Conditions

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )			
DS8924	4.75	5.25	V
Temperature ( $T_A$ )			
DS8924	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	$\mu A$
$I_{IH}$	Input High Current	$V_{IH} = 2.7V$			50	$\mu A$
		$V_{IH} = 5.5V$			100	$\mu A$
$V_{CL}$	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
$V_{OH}$	Output High Voltage	$I_{OH} = -48 mA$	2.0			V
$I_{OS}$	Output Short-Circuit Current		-80		-260	mA
$I_{OZ}$	Output Leakage Current (TRI-STATE)	$V_O = 0.5V$			-100	$\mu A$
		$V_O = 5.5V$			100	$\mu A$
$I_{OFF}$	Output Leakage Current Power OFF	$V_{CC} = 0V$			100	$\mu A$
		$V_O = 6V$			-100	$\mu A$
		$V_O = -0.25V$			-100	$\mu A$
$ 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			12	20	ns
$t_{PLH}$	Input to Output			12	20	ns
Skew	Output to Output	$C_L = 50 pF$		2.0	5.0	ns
$t_{THL}$	Differential Fall Time			10	20	ns
$t_{TLH}$	Differential Rise Time			10	20	ns
$t_{PHZ}$	Enable to Output	$R_L = 200\Omega, C_L = 50 pF$		17	25	ns
$t_{PLZ}$	Enable to Output	$R_L = 200\Omega, C_L = 50 pF$		20	30	ns
$t_{PZH}$	Enable to Output	$R_L = \infty, C_L = 50 pF, S1 Open$		13	25	ns
$t_{PZL}$	Enable to Output	$R_L = 200\Omega, C_L = 50 pF, S2 Open$		17	30	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 tables of "Electrical Characteristics" provide conditions for actual device operation.

**Note 2:** Unless otherwise specified, min/max limits apply across the 0°C to +70°C range for the DS8924. 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 are 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

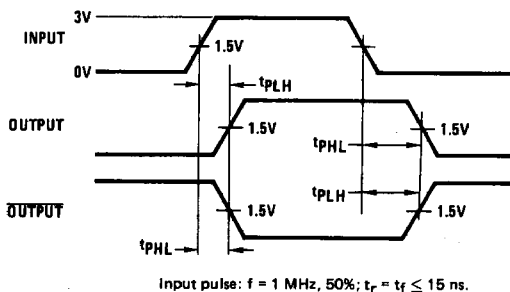
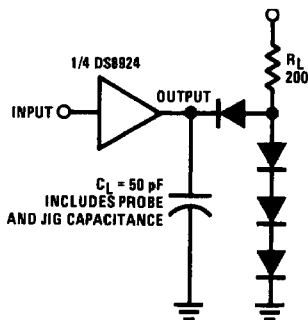


FIGURE 1. Propagation Delays

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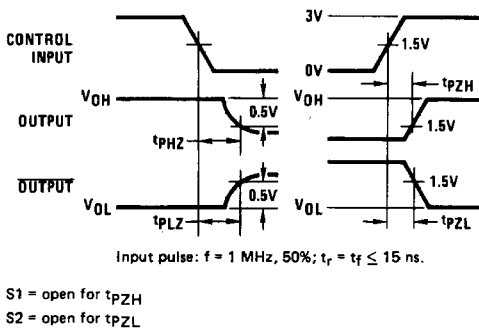
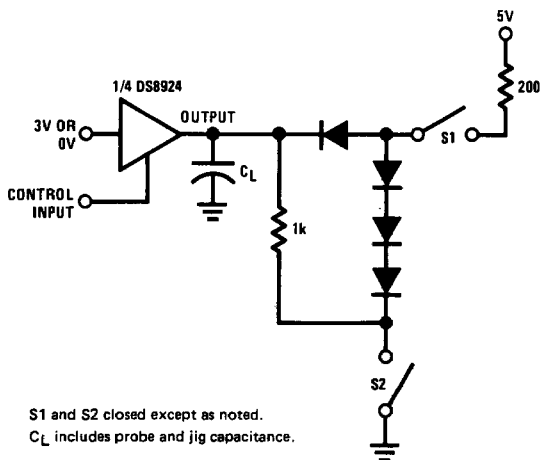


FIGURE 2. TRI-STATE Enable and Disable Delays

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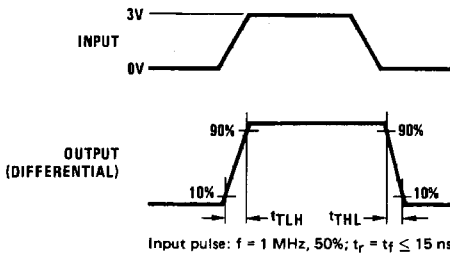
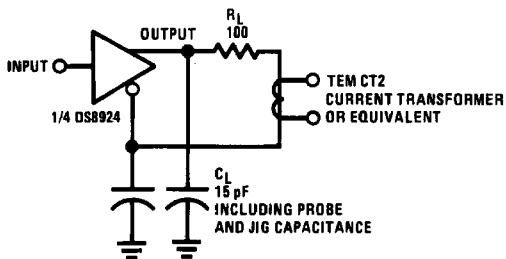


FIGURE 3. Differential Rise and Fall Times

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