

## AM26LS31

### *Quad High Speed Differential Line Driver*

The AM26LS31 is a quad-differential line driver, designed for digital data transmission over balanced lines. The AM26LS31 meets all the requirements of EIA standard RS-422 and federal standard 1020. It is designed to provide unipolar differential drive to twisted-pair or parallel-wire transmission lines.

The circuit provides an enable and disable function common to all four drivers. The AM26LS31 features 3-state outputs and logical OR-ed complementary enable inputs. The inputs are all LS compatible and are all one unit load.

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#### **Rochester Electronics Manufactured Components**

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All re-creations are done with the approval of the Original Component Manufacturer. (OCM)

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

#### **Quality Overview**

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-35835
  - Class Q Military
  - Class V Space Level
- Qualified Suppliers List of Distributors (QSLD)
  - Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

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*The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OCM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.*

**FOR REFERENCE ONLY**



# Am26LS31

## Quad High Speed Differential Line Driver

### DISTINCTIVE CHARACTERISTICS

- Output skew – 2.0 ns typical
- Input to output delay – 12 ns
- Operation from single +5 V supply
- 16-pin hermetic and molded DIP package
- Outputs won't load line when  $V_{cc} = 0$
- Four line drivers in one package for maximum package density
- Output short-circuit protection
- Complementary outputs
- Meets the requirements of EIA standard RS-422
- High output drive capability for 100  $\Omega$  terminated transmission lines
- Available in military and commercial temperature range
- Advanced low-power Schottky processing

### GENERAL DESCRIPTION

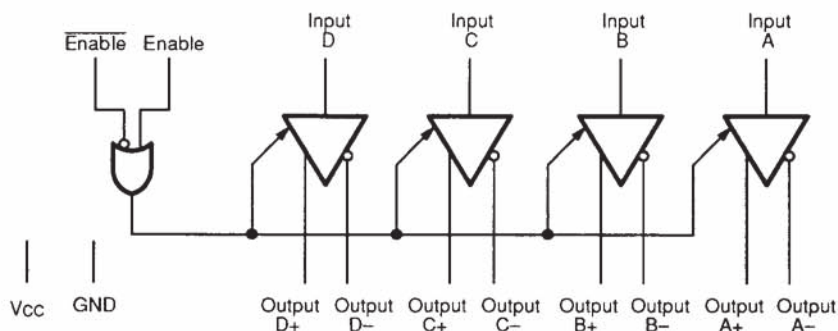
The Am26LS31 is a quad-differential line driver, designed for digital data transmission over balanced lines. The Am26LS31 meets all the requirements of EIA standard RS-422 and federal standard 1020. It is designed to provide unipolar differential drive to twisted-pair or parallel-wire transmission lines.

3-state outputs and logical OR-ed complementary enable inputs. The inputs are all LS compatible and are all one unit load.

The Am26LS31 is constructed using advanced low-power Schottky processing.

The circuit provides an enable and disable function common to all four drivers. The Am26LS31 features

### BLOCK DIAGRAM



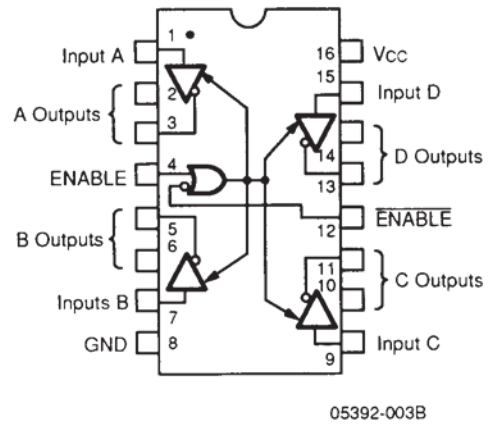
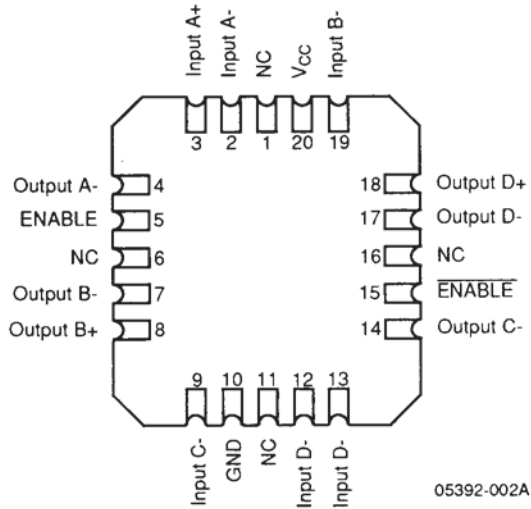
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### RELATED PRODUCTS

Part No.	Description
26LS30	Dual Differential RS-422 Party Line/Quad Single Ended RS-423 Line Driver
26LS32	Quad Differential RS-422 Line Receiver

CONNECTION DIAGRAMS

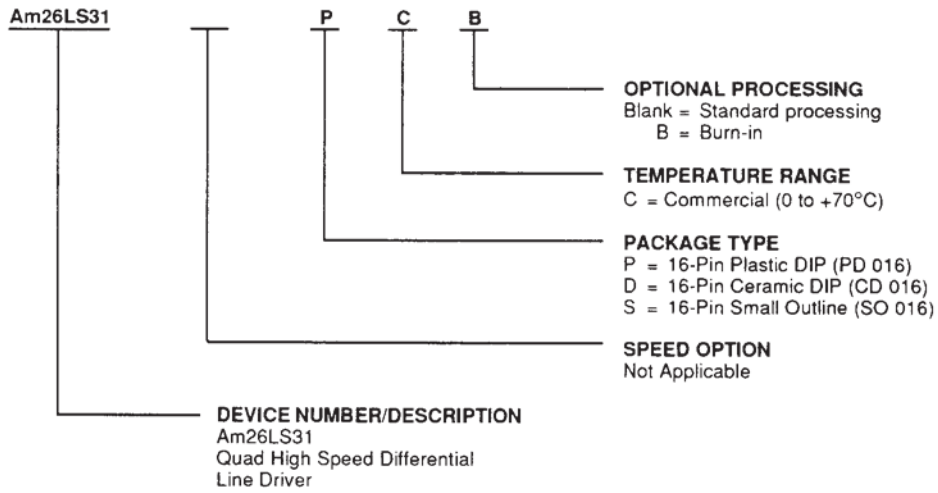
Top View



**ORDERING INFORMATION**

**Standard Products**

AMD standard products are available in several packages and operating ranges. The order number (Valid Combination) is formed by a combination of:



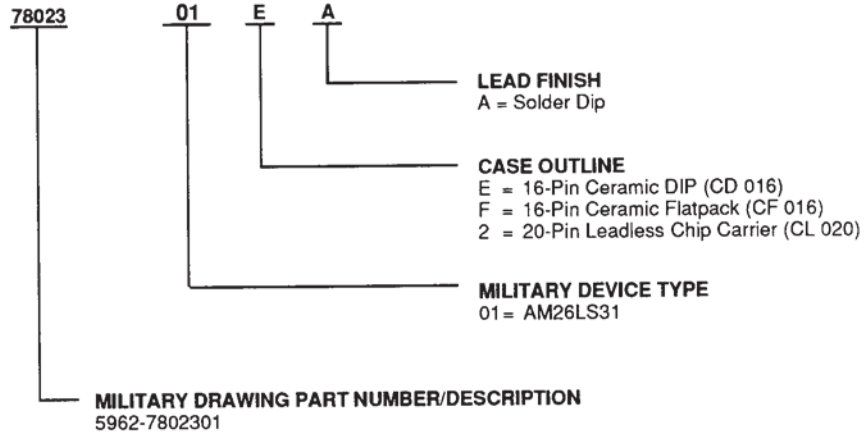
Valid Combinations	
AM26LS31	PC, PCB DC, DCB SC

**Valid Combinations**

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations or to check on newly released combinations, and to obtain additional data on AMD's standard military grade products.

**MILITARY ORDERING INFORMATION**  
**SMD/DESC Products**

AMD products for Aerospace and Defense applications are available in several packages and operating ranges. Standard Military Drawing (SMD)/DESC products are fully compliant with MIL-STD-883C requirements. The order number (Valid Combination) is formed by a combination of:



Valid Combinations	
5962-7802301	MEA, MFA, M2A

**Valid Combinations**

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations, or to check on newly released combinations.

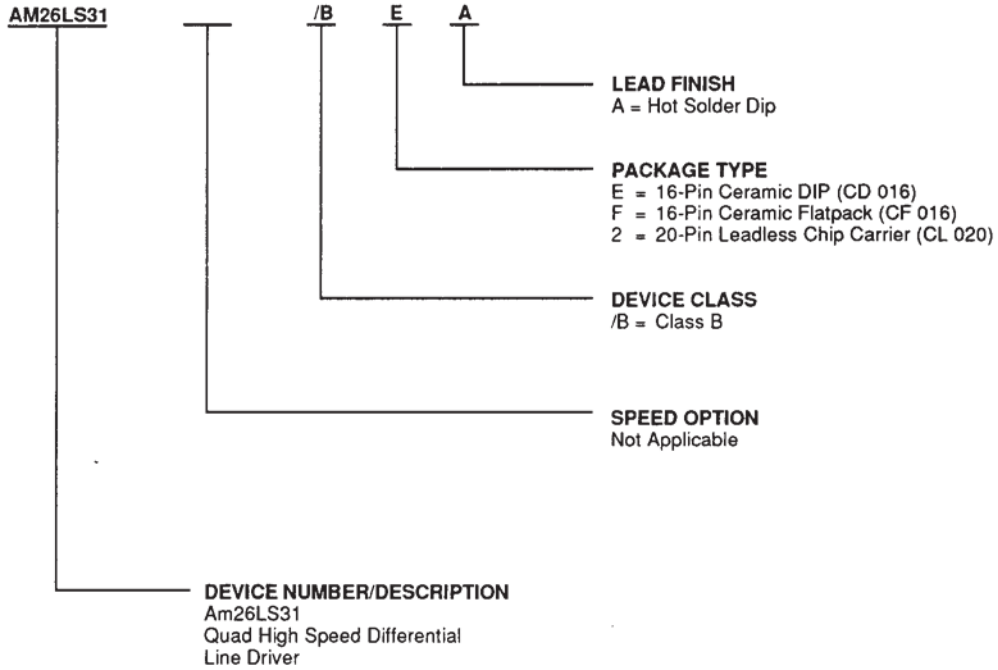
**Group A Tests**

Group A tests consist of Subgroups 1, 2, 3, 7, 8, 9, 10, 11.

**MILITARY ORDERING INFORMATION**

**APL Products**

AMD products for Aerospace and Defense applications are available in several packages and operating ranges. APL (Approved Products List) products are fully compliant with MIL-STD-883C requirements. The order number (Valid Combination) is formed by a combination of:



Valid Combinations	
Am26LS31	/BEA, /BFA, /B2A

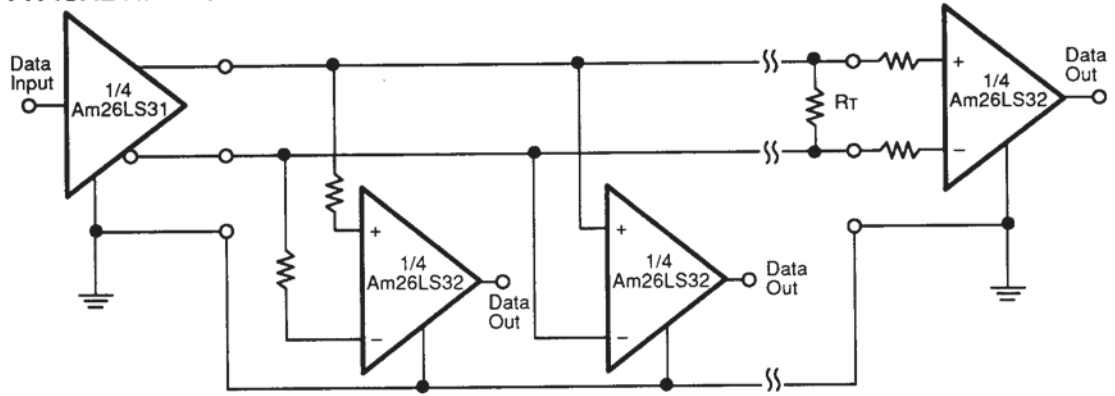
**Valid Combinations**

Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations, or to check on newly released combinations.

**Group A Tests**

Group A tests consist of Subgroups 1, 2, 3, 7, 8, 9, 10, 11.

TYPICAL APPLICATION



Shield or Common Ground Return

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**ABSOLUTE MAXIMUM RATINGS**

Storage Temperature	-65 to +150°C
Supply Voltage	-0.5 to 7.0 V
DC Input Voltage	-1.5 to 7.0 V
DC Output Voltage	-0.5 to V <sub>CC</sub> max

Stresses above those listed under Absolute Maximum Ratings may cause permanent device failure. Functionality at or above these limits is not implied. Exposure to absolute maximum ratings for extended periods may affect device reliability.

**OPERATING RANGES**

**Commercial (C) Devices**

Ambient Temperature (T <sub>A</sub> )	0 to +70°C
Supply Voltage (V <sub>CC</sub> )	+4.75 to +5.25 V

**Military (M) Devices**

Temperature	-55 to +125°C
Supply Voltage (V <sub>CC</sub> )	+4.5 to +5.5 V

Operating ranges define those limits between which the functionality of the device is guaranteed.

**DC CHARACTERISTICS over operating ranges unless otherwise specified**

Parameter Symbol	Parameter Description	Test Conditions (Note 2)	Min.	Typ. (Note 1)	Max.	Unit
V <sub>OH</sub>	Output HIGH Voltage	V <sub>CC</sub> = Min; I <sub>OH</sub> = -20 mA	2.5	3.2		V
V <sub>OL</sub>	Output LOW Voltage	V <sub>CC</sub> = Min; I <sub>OL</sub> = 20 mA		0.32	0.5	V
V <sub>IH</sub>	Input HIGH Voltage	V <sub>CC</sub> = Min; (Note 3)	2.0			V
V <sub>IL</sub>	Input LOW Voltage	V <sub>CC</sub> = Max. (Note 3)			0.8	V
I <sub>IL</sub>	Input LOW Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = 0.4 V		-0.20	-0.36	mA
I <sub>IH</sub>	Input HIGH Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = 2.7 V		0.5	20	μA
I <sub>I</sub>	Input Reverse Current	V <sub>CC</sub> = Max., V <sub>IN</sub> = 7.0 V			0.1	mA
I <sub>O</sub>	Off-State (High-Impedance) Output Current	V <sub>CC</sub> = Max. V <sub>O</sub> = 2.5 V V <sub>O</sub> = 0.5 V			20 -20	μA
V <sub>I</sub>	Input CLAMP Voltage	V <sub>CC</sub> = Min., I <sub>IN</sub> = -18 mA		-0.8	-1.5	V
I <sub>OFF</sub>	Power off leakage Current	V <sub>CC</sub> = 0 V V <sub>OUT</sub> = 6 V V <sub>OUT</sub> = -.25 V			100 -100	μA
I <sub>SC</sub>	Output Short Circuit Current	V <sub>CC</sub> = Max., (Note 4)	-30	-60	-150	mA
I <sub>CC</sub>	Power Supply Current	V <sub>CC</sub> = Max., all outputs disabled		60	80	mA

**AC Parameters V<sub>CC</sub> = 5.0 V, T<sub>A</sub> = 25°C**

t <sub>PLH</sub>	Input to Output	V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25°C, Load = Note 2		12	20	ns
t <sub>PHL</sub>	Input to Output	V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25°C, Load = Note 2		12	20	ns
SKEW	Output to Output	V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25°C, Load = Note 2		2.0	6.0	ns
t <sub>LZ</sub>	Enable to Output	V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25°C, C <sub>L</sub> = 10 pF R <sub>L1</sub> = 180 Ω, R <sub>L2</sub> = 75 Ω		23	35	ns
t <sub>HZ</sub>	Enable to Output	V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25°C, C <sub>L</sub> = 10 pF R <sub>L1</sub> = 180 Ω, R <sub>L2</sub> = 75 Ω		17	30	ns
t <sub>ZL</sub>	Enable to Output	V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25°C, Load = Note 2		35	45	ns
t <sub>ZH</sub>	Enable to Output	V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25°C, Load = Note 2		30	40	ns

**Notes:**

1. All typical values are V<sub>CC</sub> = 5.0 V, T<sub>A</sub> = 25°C.
2. C<sub>L</sub> = 30 pF, V<sub>IN</sub> = 1.3 V to V<sub>OUT</sub> = 1.3 V, V<sub>PULSE</sub> = 0 V to +3.0 V, R<sub>L1</sub> = 180 Ω, R<sub>L2</sub> = 75 Ω.
3. Input thresholds are tested during DC tests and may be done in combination with testing of other DC parameters.
4. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

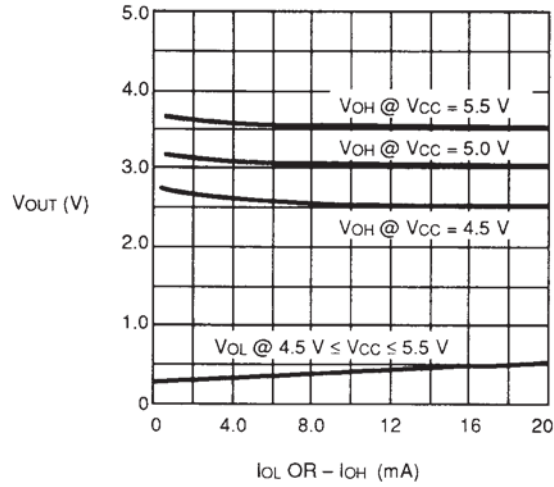


**SWITCHING CHARACTERISTICS**

Parameter Symbol	Parameter Description	Test Conditions	Min.	Typ. (Note 1)	Max.	Unit
<b>AC Parameters (Commercial)</b> $V_{CC} = 4.75\text{ V} - 5.25\text{ V}$ ; $T_A = 0^\circ\text{C} - 70^\circ\text{C}$						
t <sub>PLH</sub>	Propagation Delay from Input to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		18	30	ns
t <sub>PHL</sub>	Propagation Delay from Input to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		18	30	ns
t <sub>SKEW</sub>	Output to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		3.0	9.0	ns
t <sub>PLZ</sub>	Propagation Delay from Enable to Output	$C_L = 10\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		35	53	ns
t <sub>PHZ</sub>	Propagation Delay from Enable to Output	$C_L = 10\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		25	45	ns
t <sub>PZL</sub>	Propagation Delay from Enable to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		53	68	ns
t <sub>PZH</sub>	Propagation Delay from Enable to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		45	60	ns
<b>AC Parameters (Military)</b> $V_{CC} = 4.75\text{ V} - 5.25\text{ V}$ ; $T_A = -55^\circ\text{C} - +125^\circ\text{C}$						
t <sub>PLH</sub>	Propagation Delay from Input to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		18	30	ns
t <sub>PHL</sub>	Propagation Delay from Input to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		18	30	ns
t <sub>SKEW</sub>	Output to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		3.0	9.0	ns
t <sub>PLZ</sub>	Propagation Delay from Enable to Output	$C_L = 10\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		35	53	ns
t <sub>PHZ</sub>	Propagation Delay from Enable to Output	$C_L = 10\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		25	45	ns
t <sub>PZL</sub>	Propagation Delay from Enable to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		53	68	ns
t <sub>PZH</sub>	Propagation Delay from Enable to Output	$C_L = 30\text{ pF}$ , $R_{L1} = 180\ \Omega$ , $R_{L2} = 75\ \Omega$		45	60	ns

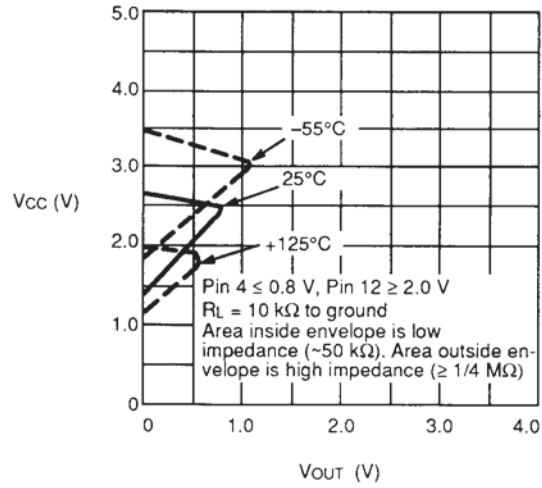
PERFORMANCE CURVES

Guaranteed  $V_{OH}$  and  $V_{OL}$   
( $T_A = -55^\circ\text{C}$  to  $+125^\circ\text{C}$ )



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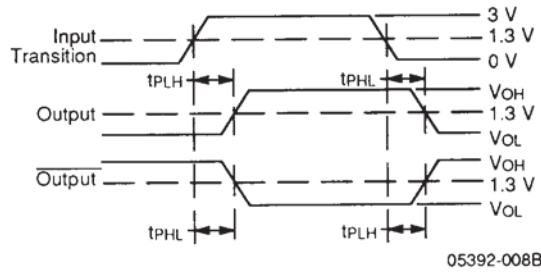
$V_{OUT}$  Versus  $V_{CC}$



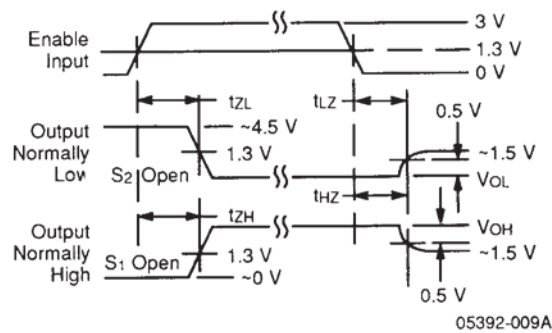
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**KEY TO SWITCHING WAVEFORMS**

WAVEFORM	INPUTS	OUTPUTS
	Must Be Steady	Will Be Steady
	May Change from H to L	Will Be Changing from H to L
	May Change from L to H	Will Be Changing from L to H
	Don't Care, Any Change Permitted	Changing State Unknown
	Does Not Apply	Center Line is High Impedance "Off" State



**Propagation Delay**  
(Notes 1 and 3)

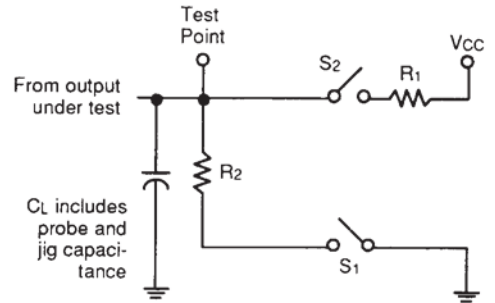


**Enable and Disable Times**  
(Notes 2 and 3)

**Notes:**

1. Diagram shown for  $\bar{\text{Enable}}$  LOW.
2.  $S_1$  and  $S_2$  of Load Circuit are closed except where shown.
3. Pulse Generator for All Pulses: Rate  $\leq 1.0$  MHz;  $Z_0 = 50 \Omega$ ;  $t_r \leq 15$  ns;  $t_f \leq 6.0$  ns.

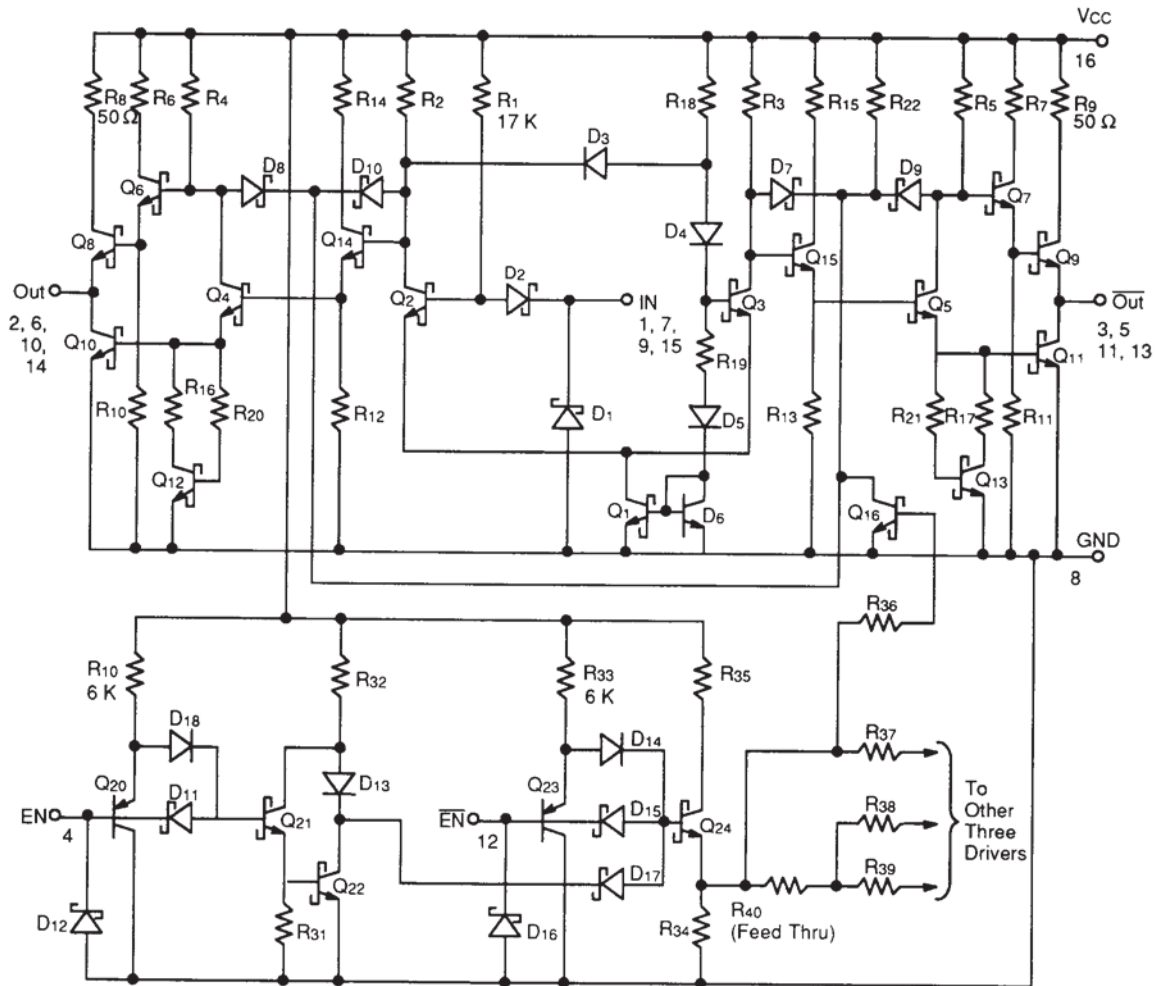
SWITCHING TEST CIRCUIT



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Three-State Outputs

EQUIVALENT CIRCUIT (1/4 Am26LS31)



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