AM26LS30

Dual Differential RS-422 Party Line/Quad Single Ended RS-423 Line Driver

The AM26LS30 is a line driver designed for digital data transmission. A mode control input provides a choice of operation either as two differential line drivers which meet all the requirements of EIA Standard RS-422 or four independent single-ended RS-423 line drivers.

In the differential mode the outputs have individual three-state controls. In the hi-impedance state these outputs will not clamp the line over a common mode transmission line voltage of ±10 V. A typical full duplex system would be the AM26LS30 differential line driver and up to twelve AM26LS32 line receivers or an AM26LS32 line receiver and up to thirty-two AM26LS30 differential drivers.

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.

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

Am26LS30

Dual Differential RS-422 Party Line/Quad Single Ended RS-423 Line Driver

DISTINCTIVE CHARACTERISTICS

- Dual RS-422 line driver or quad RS-423 line driver
- Driver outputs do not clamp line with power off or in hi-impedance state
- Independent output control in the differential mode
- Low Icc and Iεε power consumption
  RS-422 differential mode; 35 mW/driver typ.
  RS-423 single-ended mode; 26 mW/driver typ.

- Individual slew rate control for each output
- 50 Ω transmission line drive capability (RS-422 into virtual ground)
- Low current PNP inputs compatible with TTL, MOS and CMOS
- High capacitive load drive capability
- Exact replacement for DS16/3691
- Advanced low power Schottky processing

GENERAL DESCRIPTION

The Am26LS30 is a line driver designed for digital data transmission. A mode control input provides a choice of operation either as two differential line drivers which meet all of the requirements of EIA Standard RS-422 or four independent single-ended RS-423 line drivers.

In the differential mode the outputs have individual three-state controls. In the hi-impedance state these outputs will not clamp the line over a common mode transmission line voltage of ±10 V. A typical full duplex system would be the Am26LS30 differential line driver

and up to twelve Am26LS32 line receivers or a Am26LS32 line receiver and up to thirty-two Am26LS30 differential drivers.

A slew rate control pin allows the use of an external capacitor to control slew rate for suppression of near end cross talk to receivers in the cable.

The Am26LS30 is constructed using Advanced Low Power Schottky processing.

BLOCK DIAGRAM

Logic for Am26LS30 with Mode Control HIGH (RS-423)
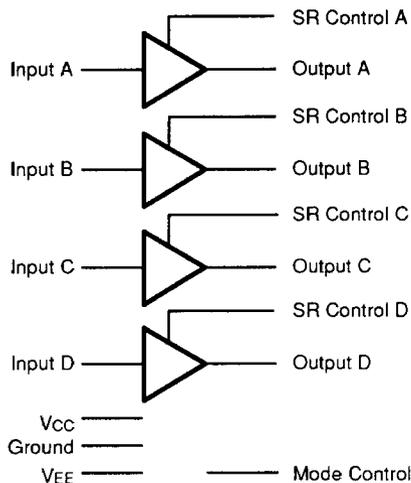
04600-001A

### Logic for Am26LS30 with Mode Control LOW (RS-422)
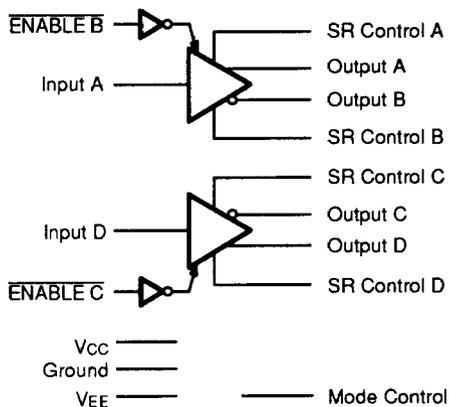
04600-002A

RELATED AMD PRODUCTS

| Part No.	Description
26LS29	Quad Three-State Single Ended RS-423 Line Driver
26LS32	Quad Differential Line Receiver
26LS33	Quad Differential Line Receiver

CONNECTION DIAGRAMS Top View

DIP

04600-003A
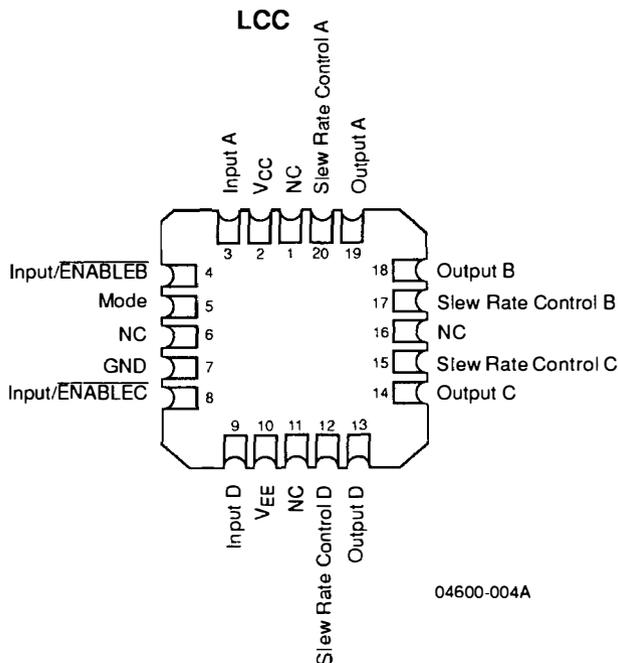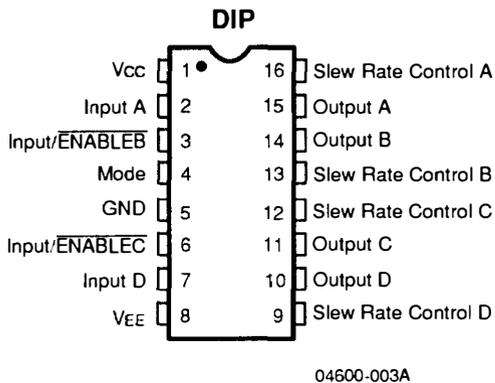
Note:

Pin 1 is marked for orientation.

LCC

04600-004A

MC26LS30
PACKAGE DIMENSIONS

SO–16 D SUFFIX
CASE 751B–05 ISSUE J
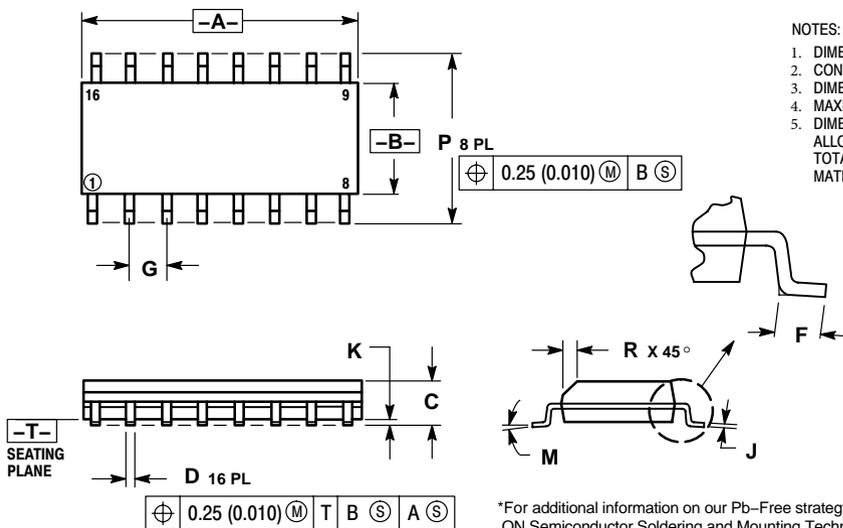
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0 °	7 °	0 °	7 °
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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:

```
AM26LS30        __ __    P   C   B
```

OPTIONAL PROCESSING
Blank = Standard processing
B = Burn-in

TEMPERATURE RANGE
C = Commercial (0 to +70°C)
I = Industrial (-40 to +85°C)

PACKAGE TYPE
P = 16-Pin Plastic DIP (PD 016)
D = 16-Pin Ceramic DIP (CD 016)
S = 16-Pin Plastic SO-16 (Pb-free) Case 751B-05

SPEED OPTION
Not Applicable

DEVICE NUMBER/DESCRIPTION
Am26LS30
Dual Differential RS-422 Party Line/Quad
Single Ended RS-423 Line Driver
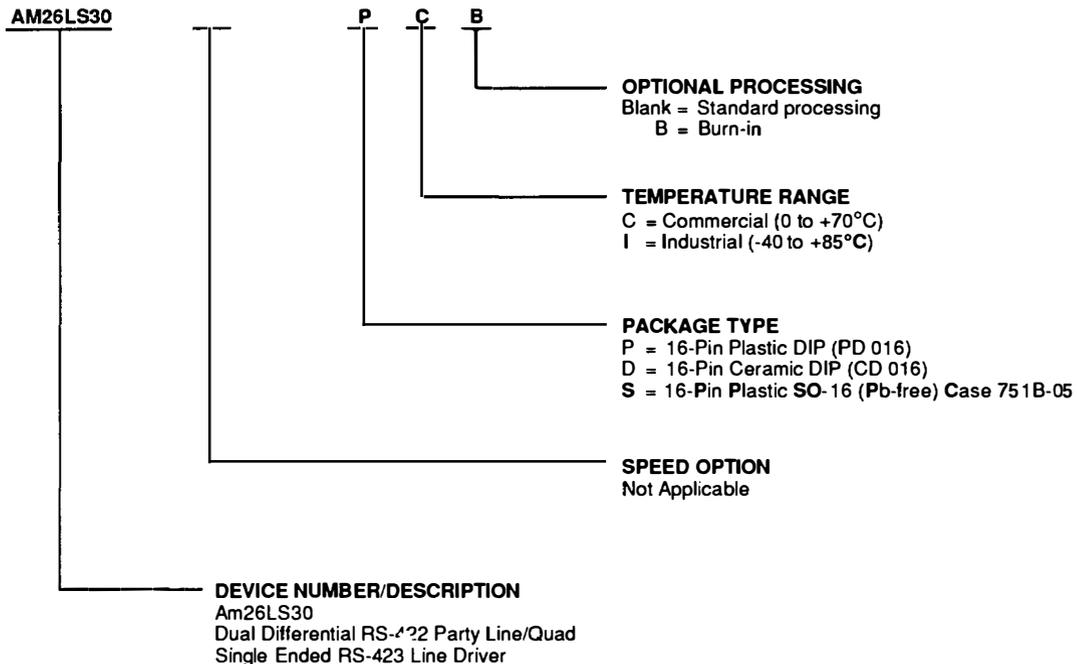
| Valid Combinations	
AM26LS30	PC, PCB DC, DCB

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.

AM26LS30SI equivalent to **MC26LS30DG** (OnSemi)

MILITARY ORDERING INFORMATION
Standard Military Drawing (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) for SMD/DESC products is formed by a combination of:

5962-86721 01 E A

LEAD FINISH
A = Solder Dip

CASE OUTLINE
E = 16-Pin Cerdip (CD 016)
F = 16-Pin Ceramic Flatpack (CF 016)
2 = 20-Pin Leadless Chip Carrier (CL 020)

MILTARY DEVICE TYPE
01 = AM26LS30

MILITARY DRAWING PART NUMBER/DESCRIPTION
5962-86720101
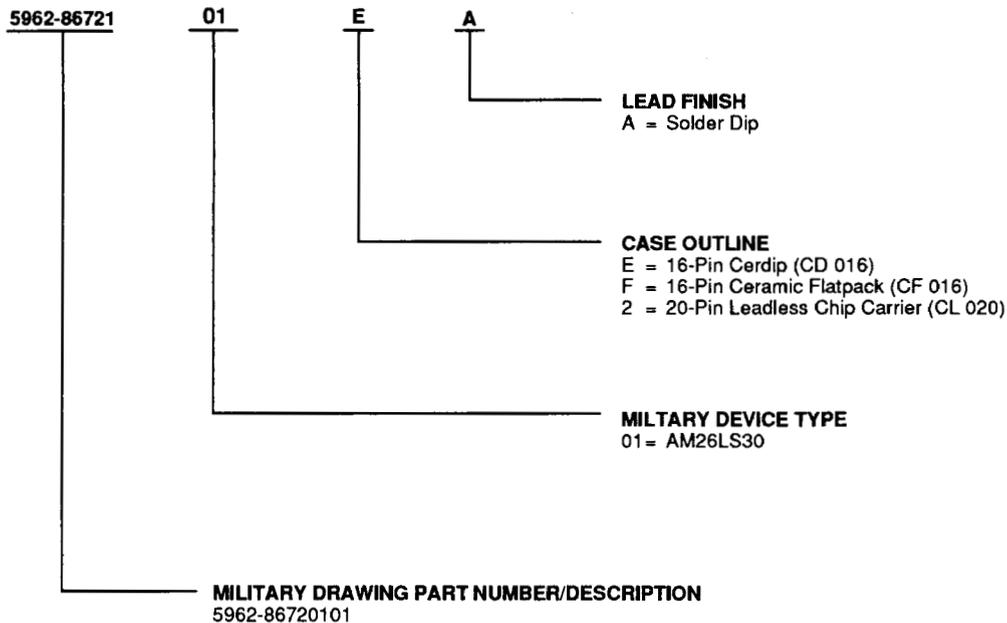
Valid Combinations	
5962-8672101	EA, FA, 2A

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:

```
AM26LS30 ___ /B  E  A
```

LEAD FINISH
A = Hot Solder Dip

PACKAGE TYPE
E = 16-Pin Ceramic DIP (CD 016)
F = 16-Pin Ceramic Flatpack (CF 016)
2 = 20-Pin Leadless Chip Carrier (CL 020)

DEVICE CLASS
/B = Class B

SPEED OPTION
Not Applicable

DEVICE NUMBER/DESCRIPTION
Am26LS30
Dual Differential RS-422 Party Line/Quad Single
Ended RS-423 Line Driver
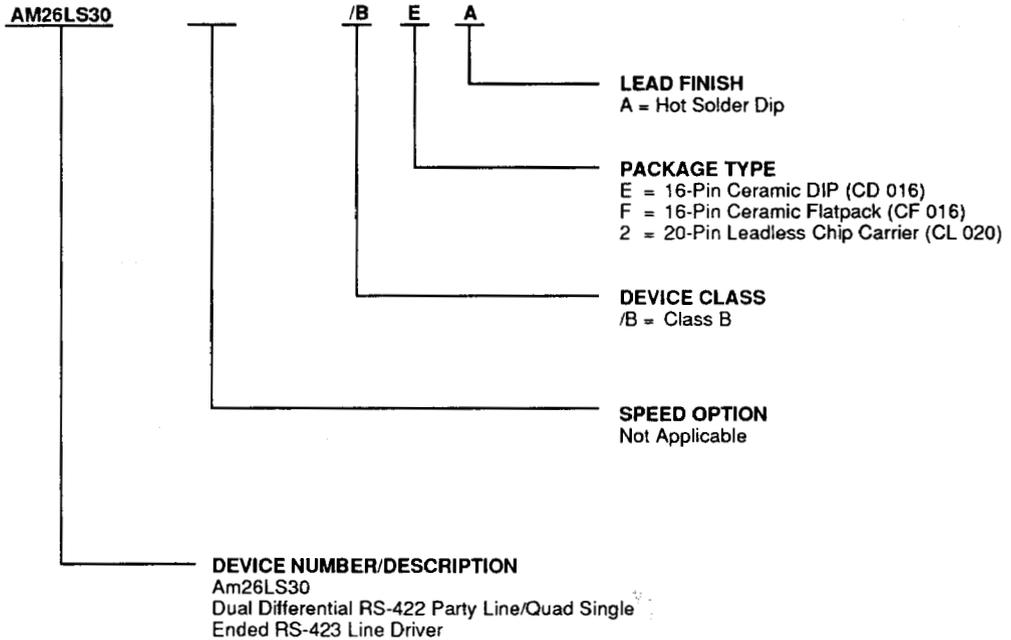
Valid Combinations	
AM26LS30	/BEA, /BFA, /B2A

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.

Am26LS30 FUNCTION TABLE

	Inputs		Outputs	
Mode	A(D)	B(C)	A(D)	B(C)
0	0	0	0	1
0	0	1	Z	Z
0	1	0	1	0
0	1	1	Z	Z
1	0	0	0	0
1	0	1	0	1
1	1	0	1	0
1	1	1	1	1

TYPICAL APPLICATION
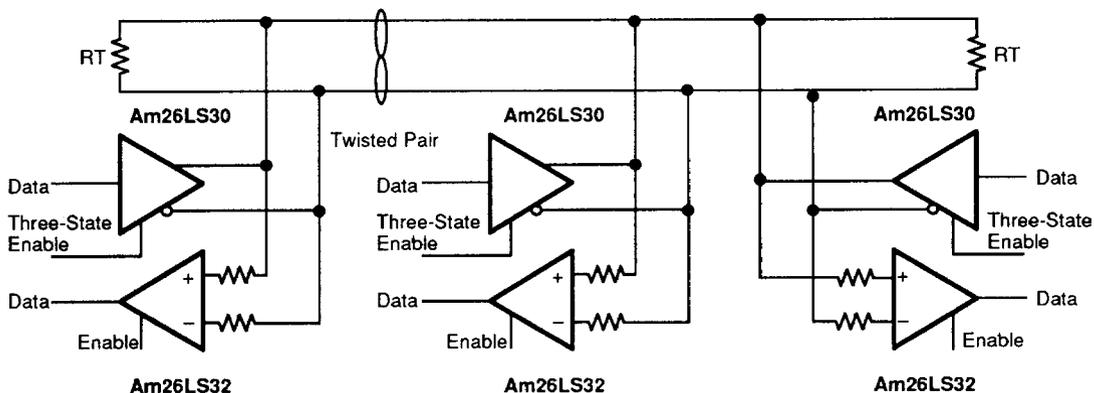
04600-005A

ABSOLUTE MAXIMUM RATINGS

Storage Temperature Range	−65 to +150°C
Supply Voltage	
V+	7.0 V
V−	−7.0 V
Power Dissipation	600 mW
Input Voltage	−1.5 to +15.0 V
Output Voltage (Power Off)	±15 V
Lead Soldering Temperature (10 seconds)	300°C

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

Temperature	0 to +70°C
Supply Voltage (V_{CC})	+4.75 V to +5.25 V
Supply Voltage (V_{EE}) RS422	GND
Supply Voltage (V_{EE}) RS423	−4.75 V to −5.25 V

Military (M) Devices

Temperature	−55 to +125°C
Supply Voltage (V_{CC})	+4.5 V to +5.5 V
Supply Voltage (V_{EE}) RS422	GND
Supply Voltage (V_{EE}) RS423	−4.75 V to −5.25 V

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

DC CHARACTERISTICS over operating ranges unless otherwise specified
EIA RS-422 Connection, Mode Voltage ≤ 0.8 V, V_{CC} = +4.75 V to +5.5 V, V_{EE} = GND

Parameter Symbol	Parameter Description	Test Conditions (Note 3)		Min.	Typ. (Note 1)	Max.	Unit
V_O	Differential Output Voltage,	$R_L = \infty$	$V_{IN} = 2.0$ V		3.6	6.0	V
$\overline{V_O}$	$V_{A, B}$		$V_{IN} = 0.8$ V		−3.6	−6.0	
V_T	Differential Output Voltage,	$R_L = 100\ \Omega$	$V_{IN} = 2.0$ V	2.0	2.4		V
$\overline{V_T}$	$V_{A, B}$		$V_{IN} = 0.8$ V	−2.0	−2.4		
$V_{OS}, \overline{V_{OS}}$	Common Mode Offset Voltage	$R_L = 100\ \Omega$			2.5	3.0	V
$|V_T|-|\overline{V_T}|$	Difference in Differential Output Voltage	$R_L = 100\ \Omega$			0.005	0.4	V
$|V_{OS}|-|\overline{V_{OS}}|$	Difference in Common Mode Offset Voltage	$R_L = 100\ \Omega$			0.005	0.4	V
V_{SS}	$|V_T - \overline{V_T}|$	$R_L = 100\ \Omega$		4.0	4.8		V
V_{CMR}	Output Voltage Common Mode Range	$V_{\overline{ENABLE}} = 2.4$ V		±10			V
I_{XA}	Output Leakage Current	$V_{CC} = 0$ V	$V_{CMR} = 10$ V			100	µA
I_{XB}			$V_{CMR} = -10$ V			−100	
I_{OX}	Off State (High Impedance) Output Current	V_{CC} = Max.	$V_{CMR} = 10$ V			100	µA
			$V_{CMR} = -10$ V			−100	
I_{SA}, I_{SB}	Output Short Circuit Current	V_{CC} = Max.	$V_{OA} = 6.0$ V	20	80	150	mA
		$V_{IN} = 2.4$ V	$V_{OB} = 0$ V	−20	−80	−150	
		V_{CC} = Max.	$V_{OA} = 0$ V	−20	−80	−150	mA
		$V_{IN} = 0.4$ V	$V_{OB} = 6.0$ V	20	80	150	
I_{CC}	Supply Current	V_{IN} = .4 V, V_{CC} = Max.			18	30	mA
V_{IH}	High Level Input Voltage			2.0			V
V_{IL}	Low Level Input Voltage					0.8	V
I_{IH}	High Level Input Current	V_{CC} = Max.	$V_{IN} = 2.4$ V			40	µA
			$V_{IN} = 15$ V			100	
I_{IL}	Low Level Input Current	V_{CC} = Max.	$V_{IN} = 0.4$ V		−30	−200	µA
V_{IC}	Input Clamp Voltage	V_{CC} = Min.	$I_{IN} = -12$ mA			−1.5	V

Am26LS30

DC CHARACTERISTICS over operating ranges unless otherwise specified
EIA RS-423 Connection, Mode Voltage ≥ 2.0 V

Parameter Symbol	Parameter Description	Test Conditions (Note 4)		Min.	Typ. (Note 1)	Max.	Unit
V_O	Output Voltage	$R_L = \infty$ (Note 3)	$V_{IN} = 2.4$ V	4.0	4.4	6.0	V
$\overline{V_O}$		$|V_{CC}|=|V_{EE}|=4.75$ V	$V_{IN} = 0.4$ V	−4.0	−4.4	−6.0	
V_T	Output Voltage (Note 7)	$R_L = 450\ \Omega$	$V_{IN} = 2.4$ V	3.6	4.1		V
$\overline{V_T}$		$|V_{CC}|=|V_{EE}|=4.75$ V	$V_{IN} = 0.4$ V	−3.6	−4.1		
$|V_T|-|\overline{V_T}|$	Output Unbalance (Note 7)	$|V_{CC}|=|V_{EE}|=4.75$ V, $R_L = 450\ \Omega$			0.02	0.4	V
I_{x+}	Output Leakage Power Off	$V_{CC} = V_{EE} = 0$ V	$V_O = 6.0$ V			100	μA
I_{x-}			$V_O = -6.0$ V			−100	
I_{S+}	Output Short Circuit Current	$V_O = 0$ V $|V_{CC}|=|V_{EE}|=$Max. (Note 5)	$V_{IN} = 2.4$ V	−20	−80	−150	mA
I_{S-}			$V_{IN} = 0.4$ V	20	80	150	
I_{SLEW}	Slew Control Current	$V_{SLEW} = V_{EE}$	$V_{IN} = 2.7$ V		−230		μA
I_{CC}	Positive Supply Current	$V_{IN} = 0.4$ V, $R_L = \infty$,$|V_{CC}|=|V_{EE}|=$Max.			18	30	mA
I_{EE}	Negative Supply Current	$V_{IN} = 0.4$ V, $R_L = \infty$,$|V_{CC}|=|V_{EE}|=$Max.			−10	−22	mA
V_{IH}	High Level Input Voltage	Note 6		2.0			V
V_{IL}	Low Level Input Voltage	Note 6				0.8	V
I_{IH}	High Level Input Current	$V_{IN} = 2.4$ V, $|V_{CC}|=|V_{EE}|=$Max.				40	μA
		$V_{IN} = 15$ V, $V_{CC} = 5.5$ V, $V_{EE} = -5.0$ V				100	
I_{IL}	Low Level Input Current	$V_{IN} = 0.4$ V, $|V_{CC}|=|V_{EE}|=$Max.			−30	−200	μA
V_{IC}	Input Clamp Voltage	$I_{IN} = -12$ mA, $V_{CC} = $ Min., $V_{EE} = $ Max.				−1.5	V

Notes:

1. Typical limits are at $V_{CC} = 5.0$ V, $V_{EE} = -5.0$ V, 25°C ambient and maximum loading.

2. Symbols and definitions correspond to EIA RS-423 where applicable.

3. Output voltage is +3.9 V minimum and −3.9 V minimum at −55°C.

4. R_L connected between each output and its complement.

5. Not more than one output should be shorted at a time. Duration of the short circuit test should not exceed one second.

6. Input thresholds are tested during DC tests and may be done in combination with testing of other DC parameters.

7. This parameter is tested by forcing an equivalent current.

PERFORMANCE CURVE

**Slew Rate (Rise or Fall Time)
Versus External Capacitor**

Slew Rate – μsec

Capacitance – pF
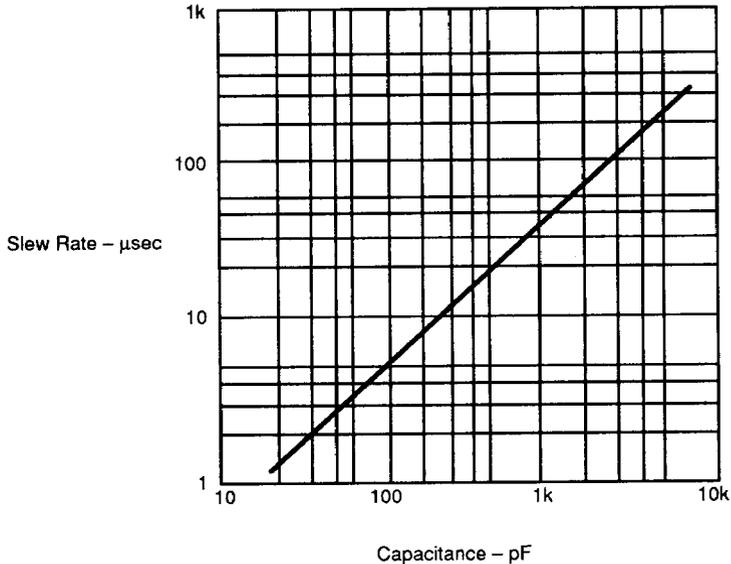
04600-006A

SWITCHING CHARACTERISTICS
EIA RS-422 Connection, V_{CC} = 5.0 V, V_{EE} = GND, Mode = 0.4 V, T_A = 25°C

Parameter Symbol	Parameter Description	Test Conditions	Min.	Typ.	Max.	Unit
t_r	Differential Output Rise Time	Fig. 2, R_L = 100 Ω, C_L = 500 pF		120	200	ns
t_f	Differential Output Fall Time	Fig. 2, R_L = 100 Ω, C_L = 500 pF		120	200	ns
t_{PDH}	Output Propagation Delay	Fig. 2, R_L = 100 Ω, C_L = 500 pF		120	200	ns
t_{PDL}	Output Propagation Delay	Fig. 2, R_L = 100 Ω, C_L = 500 pF		120	200	ns
t_{LZ}	Output Enable to Output	R_L = 100 Ω, C_L = 500 pF, C_C = 0 pF, Fig. 3		180	300	ns
t_{HZ}				200	300	
t_{ZL}		R_L = 100 Ω, C_L = 500 pF, C_C = 0 pF, Fig. 3		200	300	
t_{ZH}				180	300	

Am26LS30

SWITCHING CHARACTERISTICS (Continued)
EIA RS-422 Connection, V_{CC} = 4.5 V to 5.5 V, V_{EE} = GND, Mode = 0.4 V, T_A = 55°C to 125°C

| Parameter Symbol	Parameter Description	Test Conditions	Min.	Typ.	Max.	Unit
t_r	Differential Output Rise Time	R_L = 100 Ω, C_L = 500 pF see Rise Time Control for RS-422			300	ns
t_f	Differential Output Fall Time	R_L = 100 Ω, C_L = 500 pF see Rise Time Control for RS-422			300	ns
t_{PDH}	Output Propagation Delay	R_L = 100 Ω, C_L = 500 pF see Rise Time Control for RS-422			300	ns
t_{PDL}	Output Propagation Delay	R_L = 100 Ω, C_L = 500 pF see Rise Time Control for RS-422			300	ns
t_{LZ}		R_L = 100 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-422			400	ns
t_{HZ}		R_L = 100 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-422			400	ns
t_{ZL}	Output Enable to Output	R_L = 100 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-422			400	ns
t_{ZH}		R_L = 100 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-422			400	ns

SWITCHING CHARACTERISTICS
EIA RS-423 Connection, V_{CC} = 5.0 V, V_{EE} = −5.0 V, Mode = 2.4 V, T_A = 25°C

Parameter Symbol	Parameter Description	Test Conditions		Min.	Typ.	Max.	Unit
t_r	Rise Time	Fig. 1, R_L = 450 Ω, C_L = 500 pF	C_C = 50 pF		3.0		µs
			C_C = 0		120	300	ns
t_f	Fall Time	Fig. 1, R_L = 450 Ω, C_L = 500 pF	C_C = 50 pF		3.0		µs
			C_C = 0		120	300	ns
Src	Slew Rate Coefficient	Fig. 1, R_L = 450 Ω, C_L = 500 pF			.06		µs/pF
t_{PDH}	Output Propagation Delay	Fig. 1, R_L = 450 Ω, C_L = 500 pF, C_C = 0			180	300	ns
t_{PDL}	Output Propagation Delay	Fig. 1, R_L = 450 Ω, C_L = 500 pF, C_C = 0			180	300	ns

EIA RS-423 Connection, V_{CC} = 4.75 V to 5.5 V, V_{EE} = −4.75 V to −5.5 V, Mode = 2.4 V, T_A = −55°C to 125°C

| Parameter Symbol	Parameter Description	Test Conditions	Min.	Typ.	Max.	Unit
t_r	Rise Time	R_L = 450 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-423			450	ns
t_f	Fall Time	R_L = 450 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-423			450	ns
t_{PDH}	Output Propagation Delay	R_L = 450 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-423			450	ns
t_{PDL}	Output Propagation Delay	R_L = 450 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-423			450	ns

Am26LS30 EQUIVALENT CIRCUIT
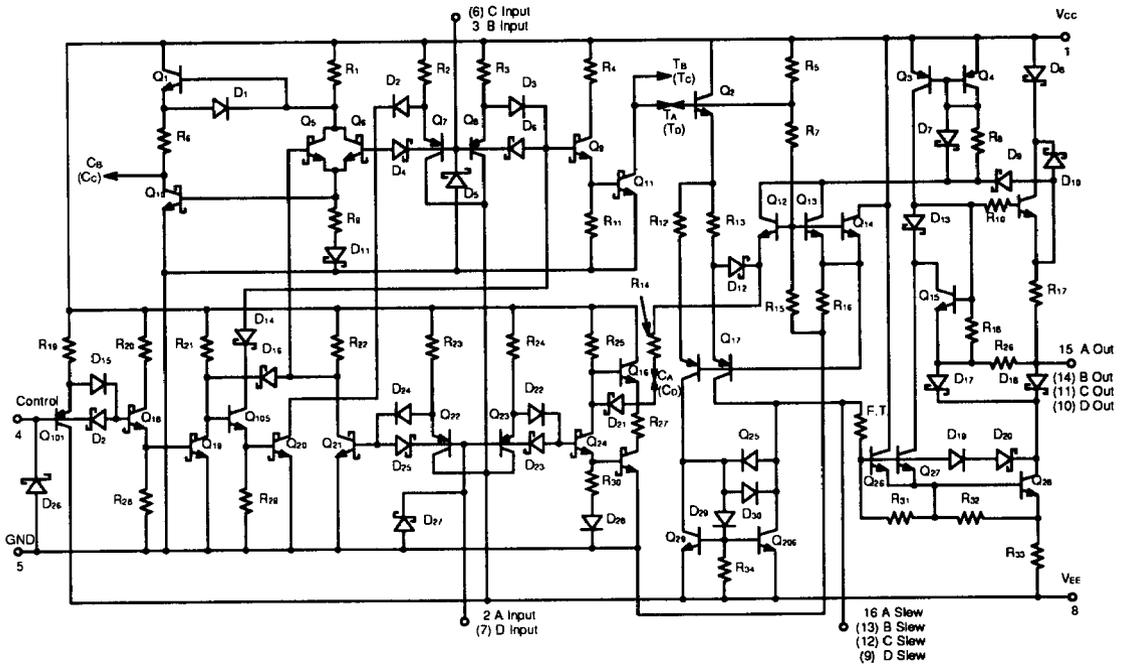
04600-007A

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
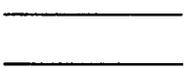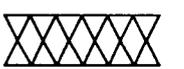
KS000010

EIA RS-423 CONNECTION

Switching Test Circuit
(Mode Control = 0)

Vcc 1
Input 2
Cc 50 pF
15
Output
CL 500 pF
RL 450 Ω
5
VEE 8
DUT

04600-008A

Switching Test Waveform

Input tr ≤ 10 ns 1.5 V tr ≤ 10 ns 3.0 V 0 V
20 µs 20 µs

Output 0.9 Vss 0.9 Vss Vss 0.1 Vss 0.1 Vss
tr tf

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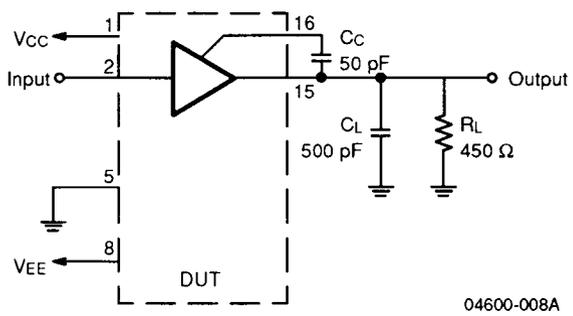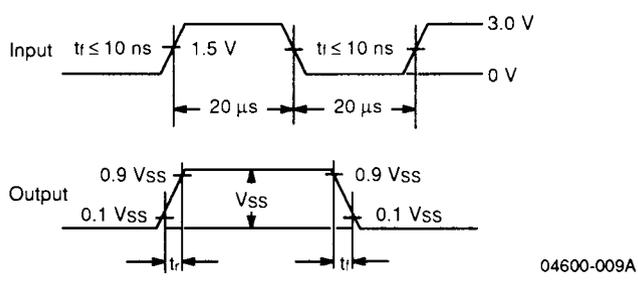
Figure 1. Rise Time Control for RS-423

RS-422 CONNECTION

Switching Test Circuit
### (Mode Control = 0)
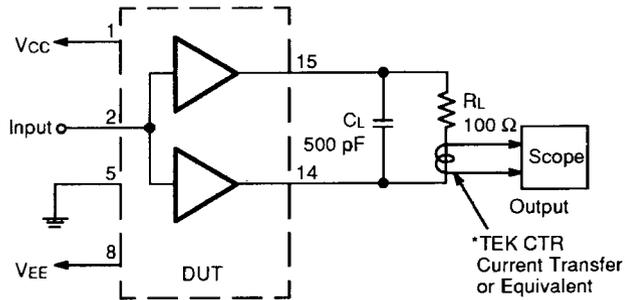
04600-010A

Rise Time Control for RS-422
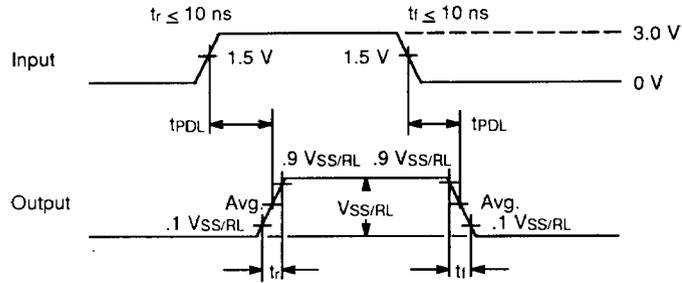
04600-011A

Figure 2.

RS-422 CONNECTION (Continued)

Switching Test Circuit
(Mode Control = 0)
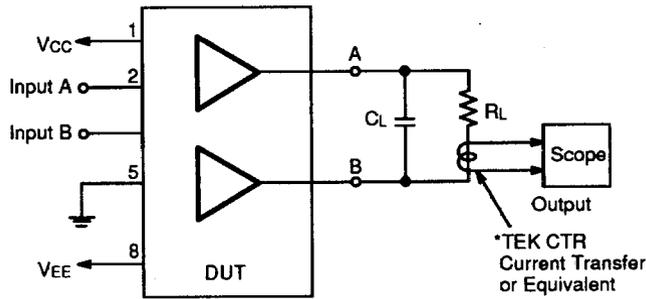
04600-012A

Switching Test Waveform
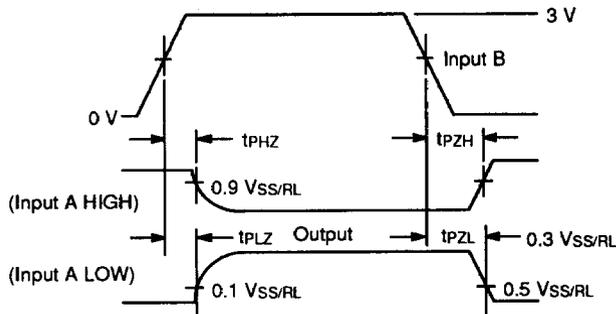
04600-013A

*Current probe is the easiest way to display a differential waveform

Figure 3. Three-State Delays