Am26LS30

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

Advanced Micro Devices

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 I_{CC} and I_{EE} 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.

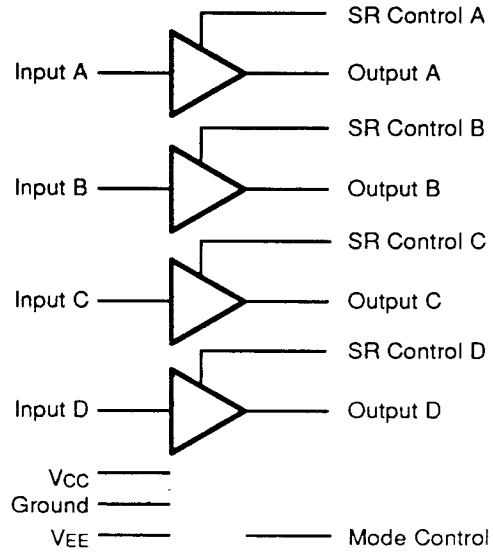
In the differential mode the outputs have individual three-state controls. In the hi-impedance state these outputs will not clamp the line over a common mode transmission line voltage of ±10 V. A typical full duplex system would be the Am26LS30 differential line driver and up to twelve Am26LS32 line 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)



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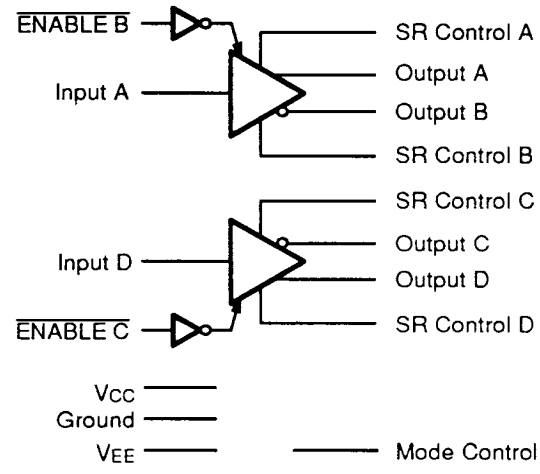
Logic for Am26LS30 with Mode Control LOW (RS-422)



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Publication# 04600 Rev. B Amendment/0
Issue Date: May 1991

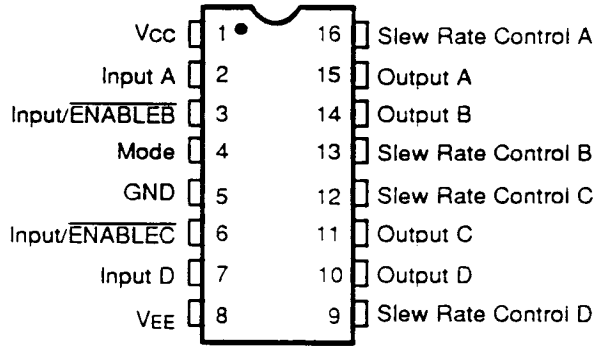
RELATED AMD PRODUCTS

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



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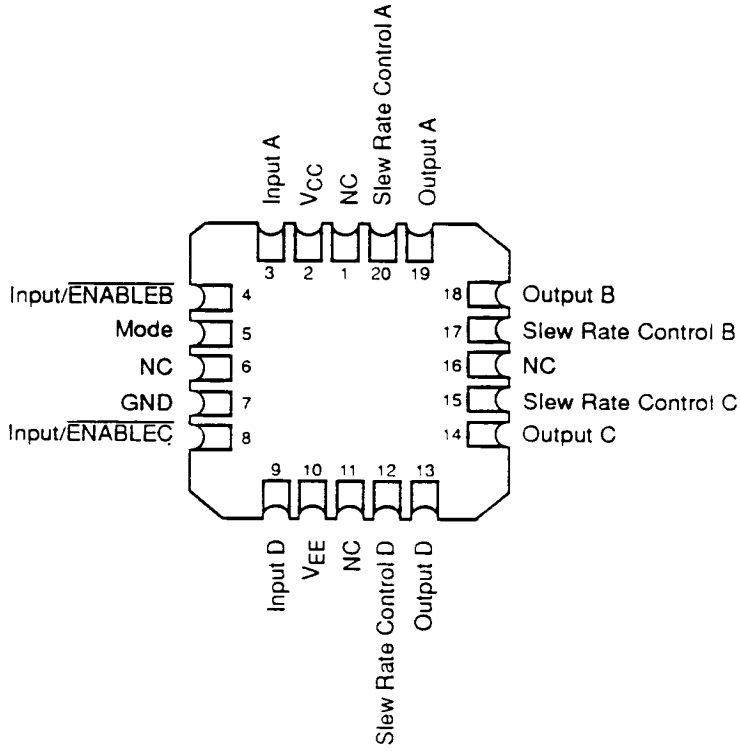
LCC



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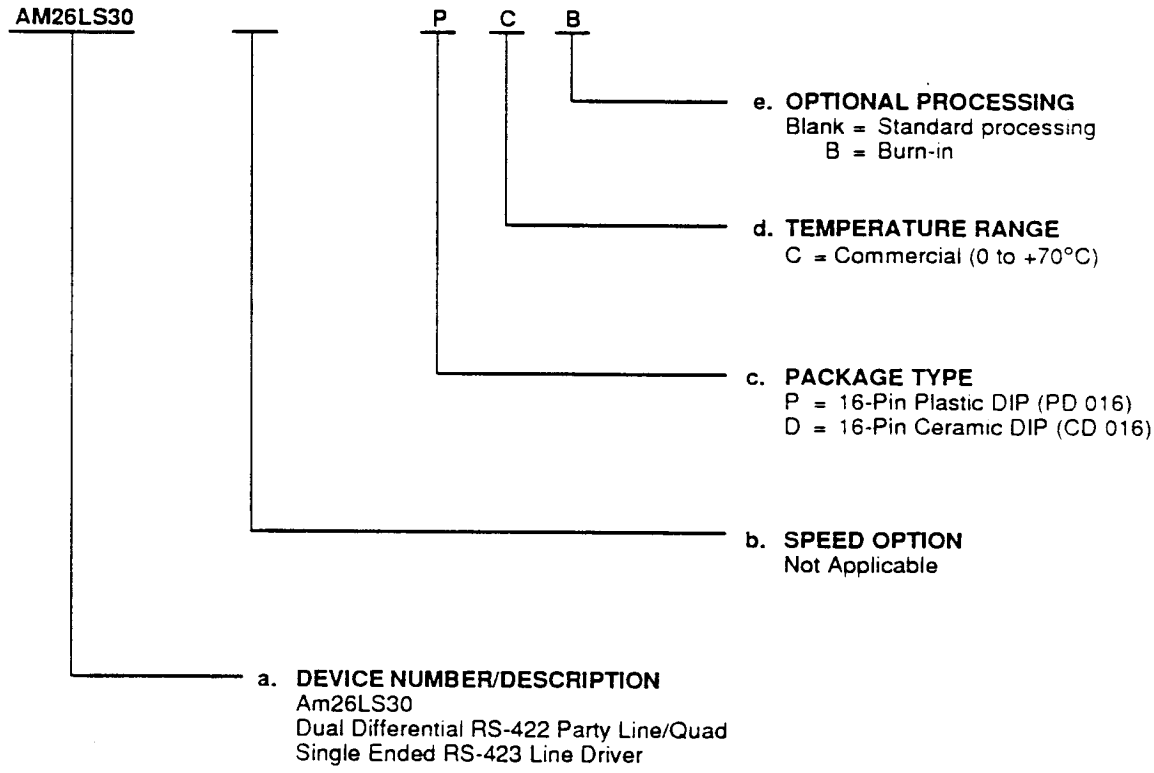
Note:
Pin 1 is marked for orientation.

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:

a. **Device Number**
b. **Speed Option (if applicable)**
c. **Package Type**
d. **Temperature Range**
e. **Optional Processing**



Valid Combinations	
AM26LS30	PC, PCB DC, DCB

Valid Combinations

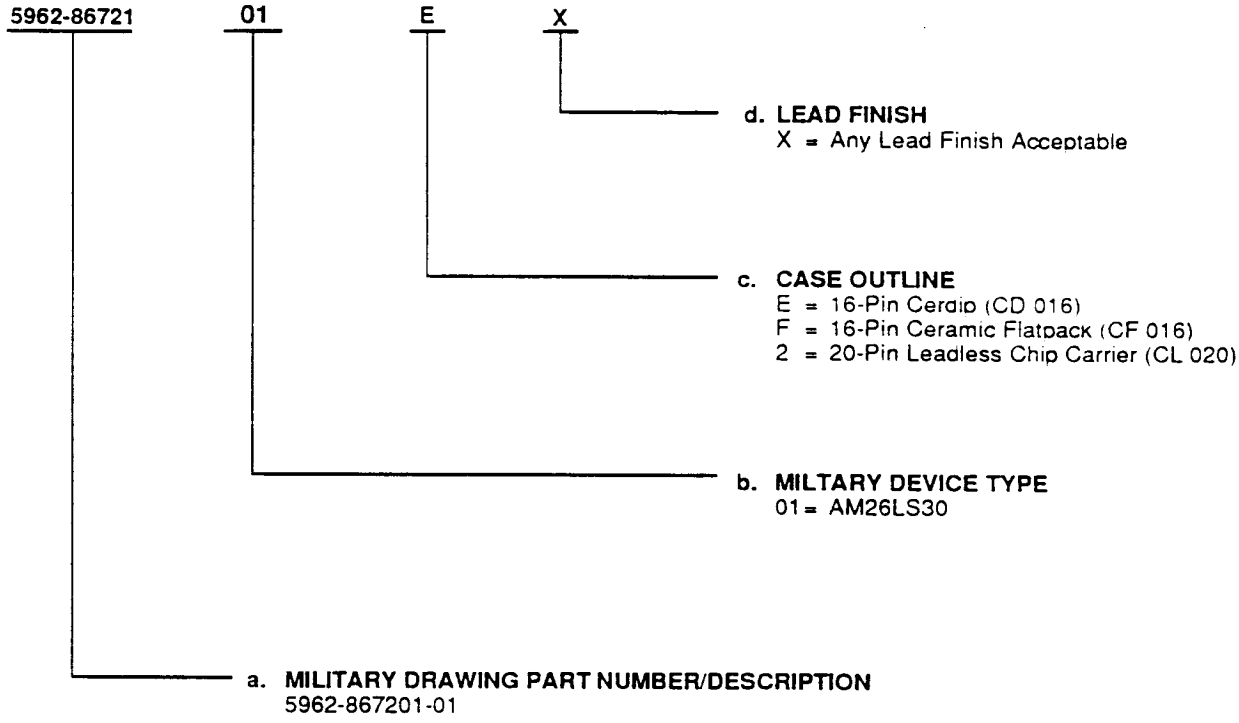
Valid Combinations list configurations planned to be supported in volume for this device. Consult the local AMD sales office to confirm availability of specific valid combinations or to check on newly released combinations, and to obtain additional data on AMD's standard military grade products.

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:

a. **Military Drawing Part Number**
b. **Military Device Type**
c. **Case Outline**
d. **Lead Finish**



Valid Combinations	
5962-86721-01	EX, FX, 2X

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

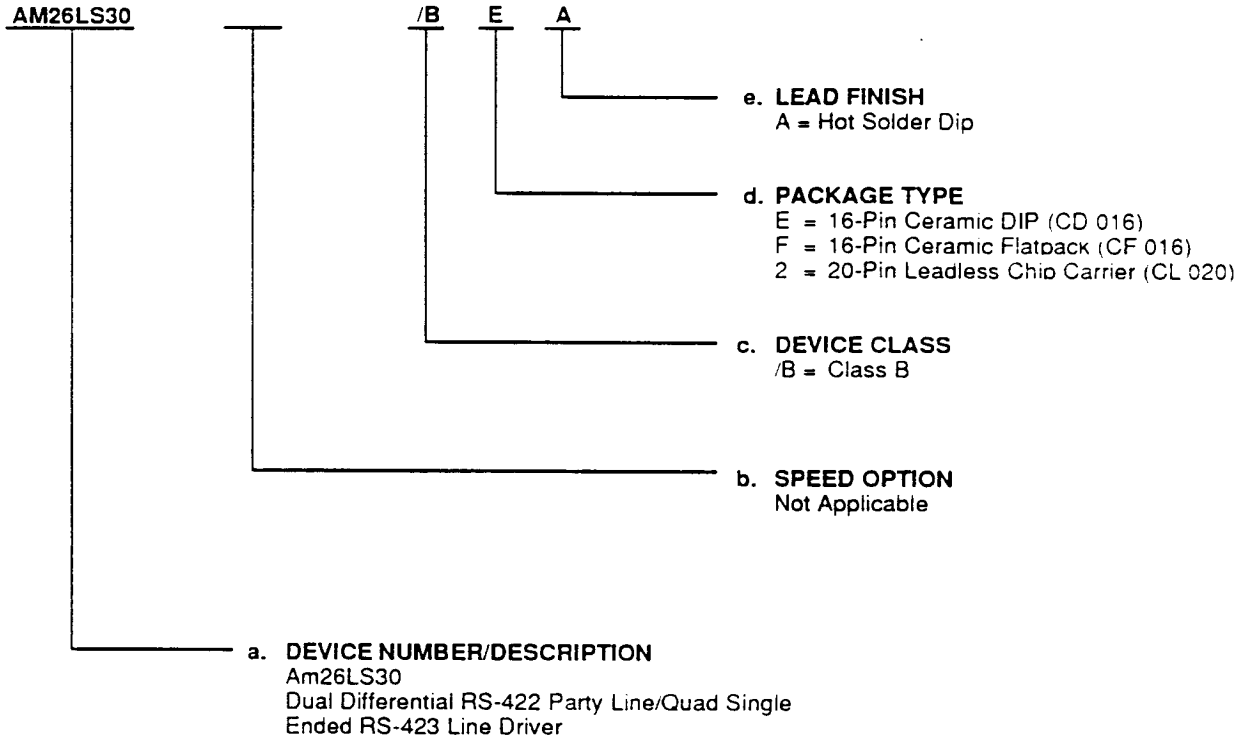
Group A tests consist of Subgroups 1, 2, 3, 7, 8, 9, 10, 11.

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:

a. **Device Number**
b. **Speed Option (if applicable)**
c. **Package Type**
d. **Temperature Range**
e. **Lead Finish**



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.

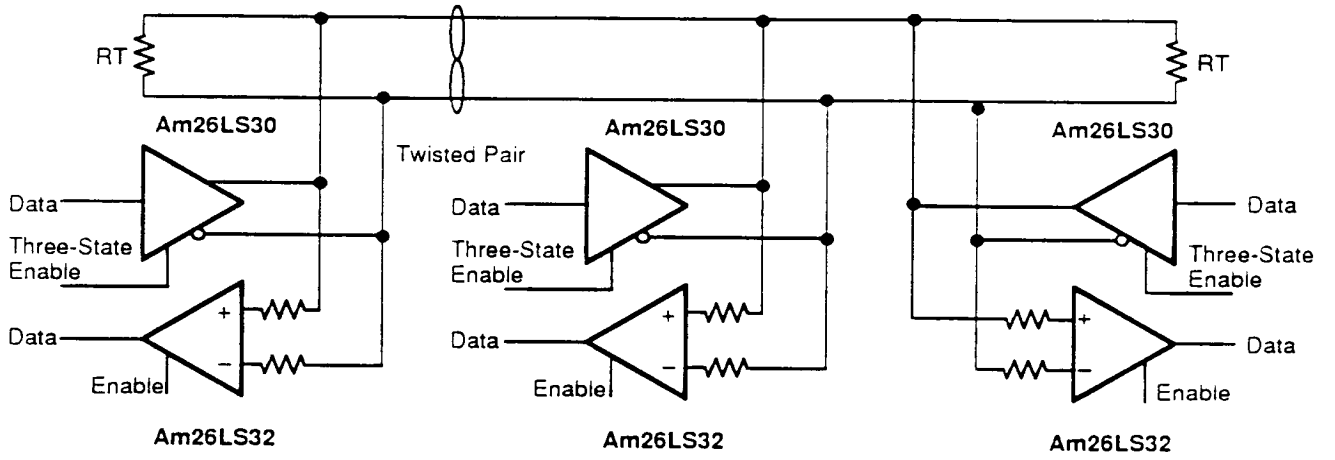
Group A Tests

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

Am26LS30 FUNCTION TABLE

Mode	Inputs		Outputs	
	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



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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 +5.25 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 = ∞	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 Ω	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 Ω			2.5	3.0	V
$\lvert V_T\rvert - \lvert\overline{V_T}\rvert$	Difference in Differential Output Voltage	R_L = 100 Ω			0.005	0.4	V
$\lvert V_{OS}\rvert - \lvert\overline{V_{OS}}\rvert$	Difference in Common Mode Offset Voltage	R_L = 100 Ω			0.005	0.4	V
V_{SS}	$\lvert V_T - \overline{V_T}\rvert$	R_L = 100 Ω		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

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

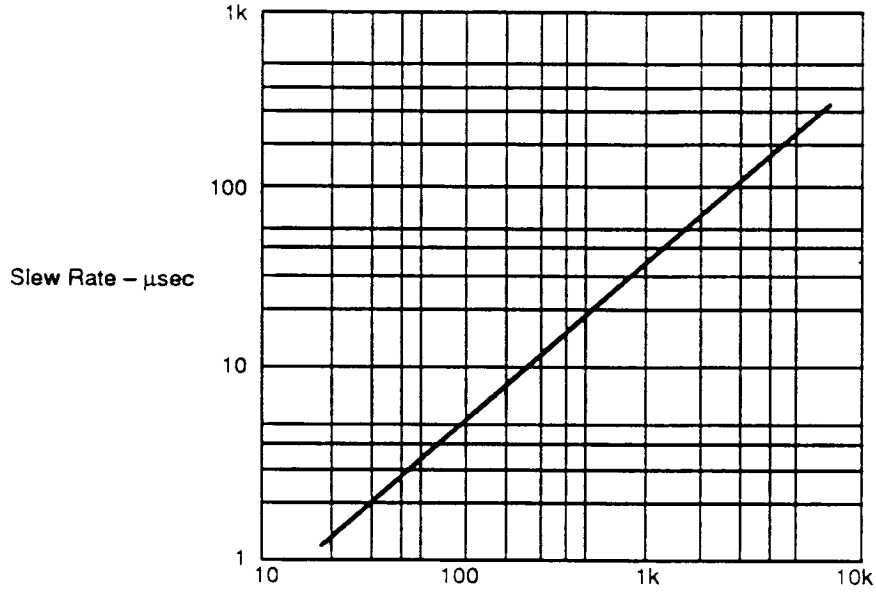
Parameter Symbol	Parameter Description	Test Conditions (Note 4)		Min.	Typ. (Note 1)	Max.	Unit
V_O	Output Voltage	$R_L = \infty$ (Note 3)	V_{IN} = 2.4 V	4.0	4.4	6.0	V
$\overline{V_O}$		$\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = 4.75 V	V_{IN} = 0.4 V	−4.0	−4.4	−6.0	
V_T	Output Voltage (Note 7)	R_L = 450 Ω	V_{IN} = 2.4 V	3.6	4.1		V
$\overline{V_T}$		$\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = 4.75 V	V_{IN} = 0.4 V	−3.6	−4.1		
$\lvert V_T\rvert - \lvert\overline{V_T}\rvert$	Output Unbalance (Note 7)	$\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = 4.75 V, R_L = 450 Ω			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, $\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = 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, $R_L = \infty$, $\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = Max.			18	30	mA
I_{EE}	Negative Supply Current	V_{IN} = 0.4 V, $R_L = \infty$, $\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = 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, $\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = 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, $\lvert V_{CC}\rvert = \lvert V_{EE}\rvert$ = 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



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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	

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}	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_{HZ}		R_L = 100 Ω, C_L = 500 pF, C_C = 0 pF see Rise Time Control for RS-422			400	ns
t_{ZL}		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

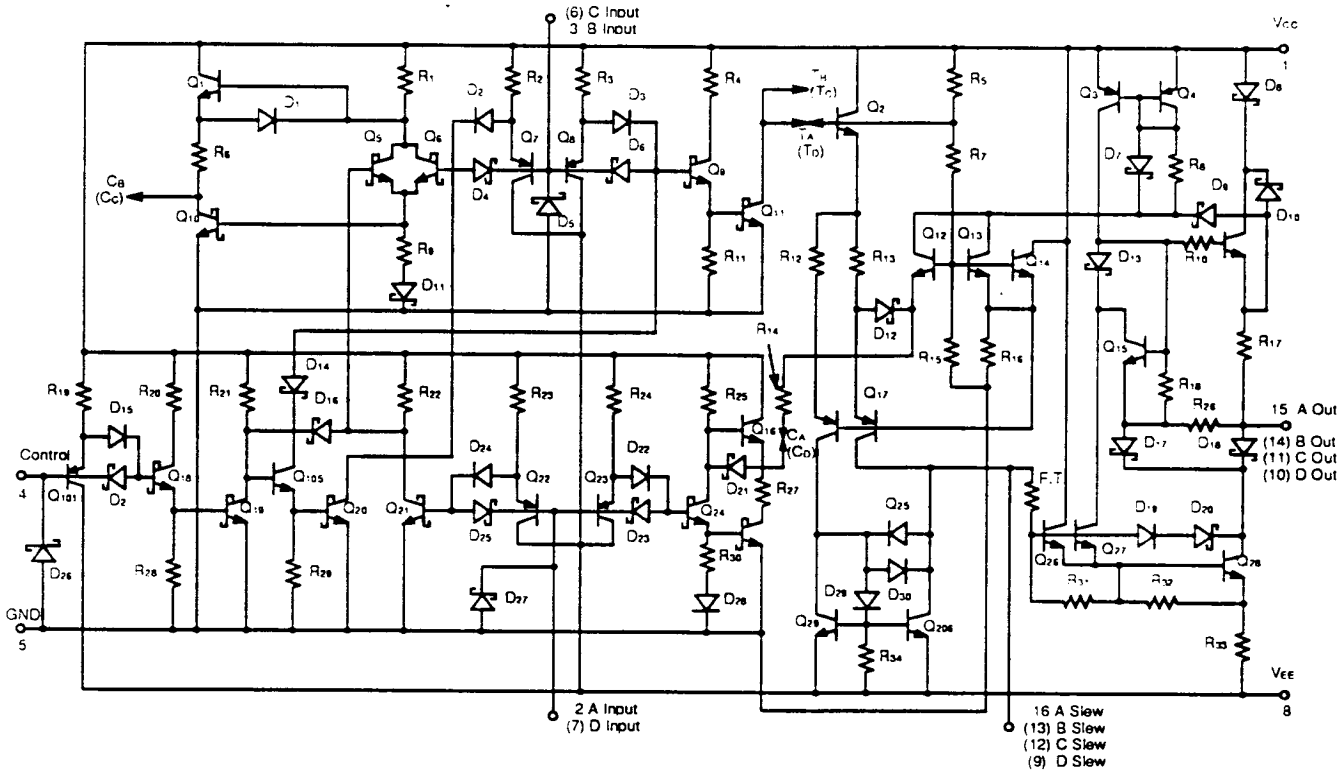
EIA RS-423 Connection, V_{CC} = 5.0 V, V_{EE} = –5.0 V, Mode = 2.4 V, T_A = 25°C

Parameter Symbol	Parameter Description	Test Conditions		Min.	Typ.	Max.	Unit
t_r	Rise Time	Fig. 1, R_L = 450 Ω,	C_C = 50 pF		3.0		µs
		C_L = 500 pF	C_C = 0		120	300	ns
t_f	Fall Time	Fig. 1, R_L = 450 Ω,	C_C = 50 pF		3.0		µs
		C_L = 500 pF	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



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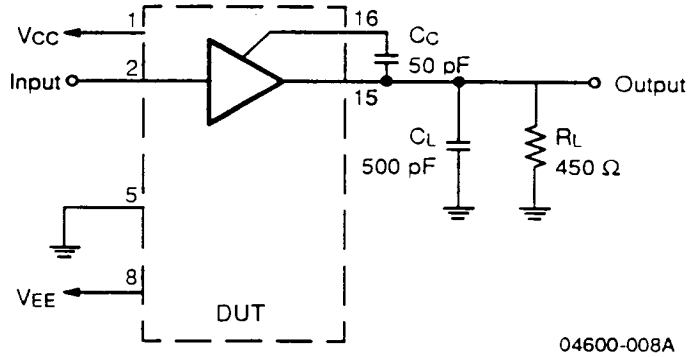
KEY TO SWITCHING WAVEFORMS

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

KS000010

EIA RS-423 CONNECTION

Switching Test Circuit
(Mode Control = 0)



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Switching Test Waveform

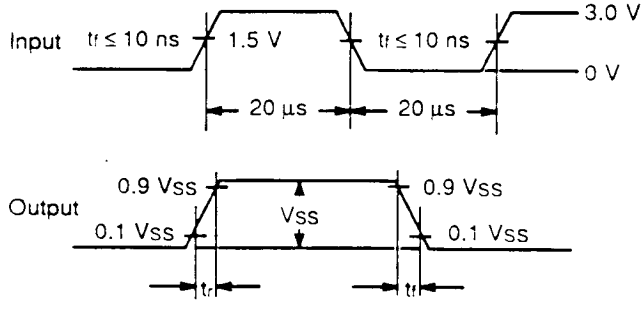

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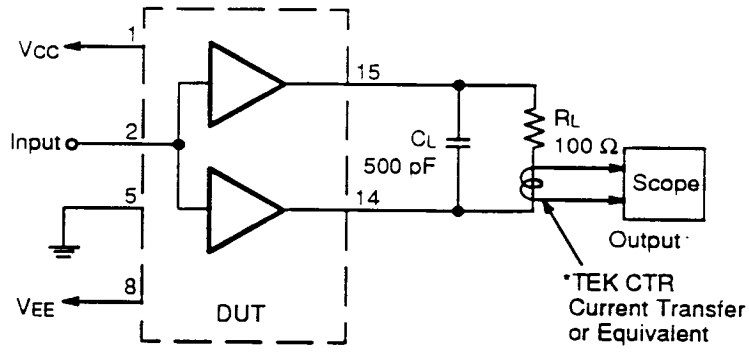
Figure 1. Rise Time Control for RS-423

RS-422 CONNECTION

Switching Test Circuit
(Mode Control = 0)



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Rise Time Control for RS-422

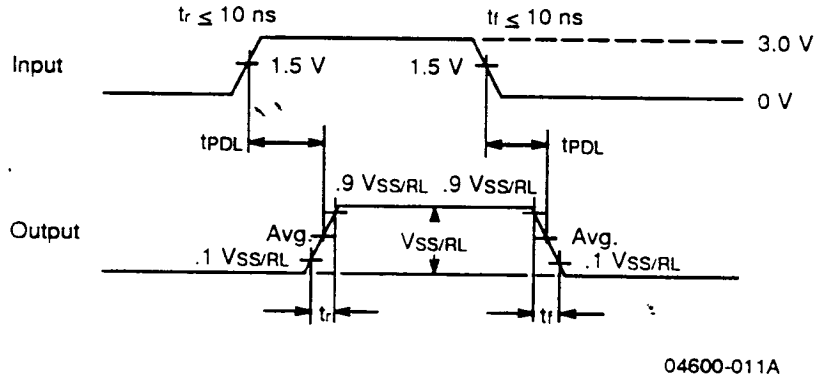

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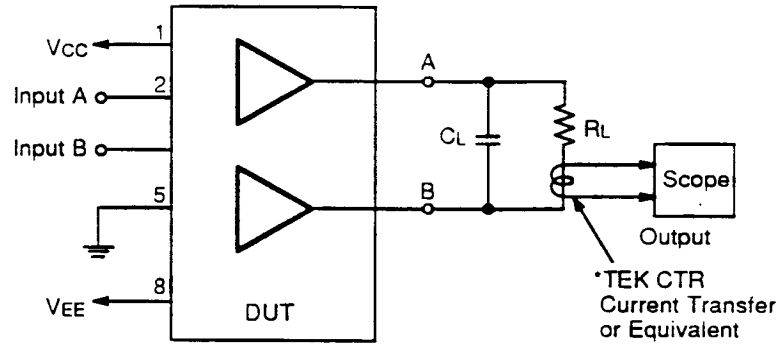
Figure 2.

RS-422 CONNECTION (Continued)

Switching Test Circuit
(Mode Control = 0)



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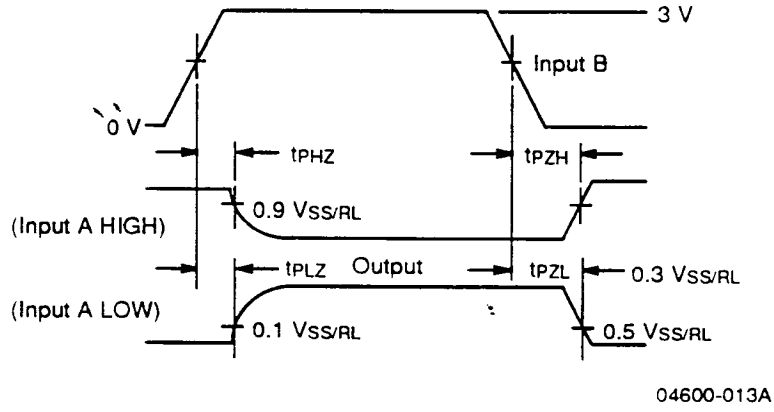
Switching Test Waveform



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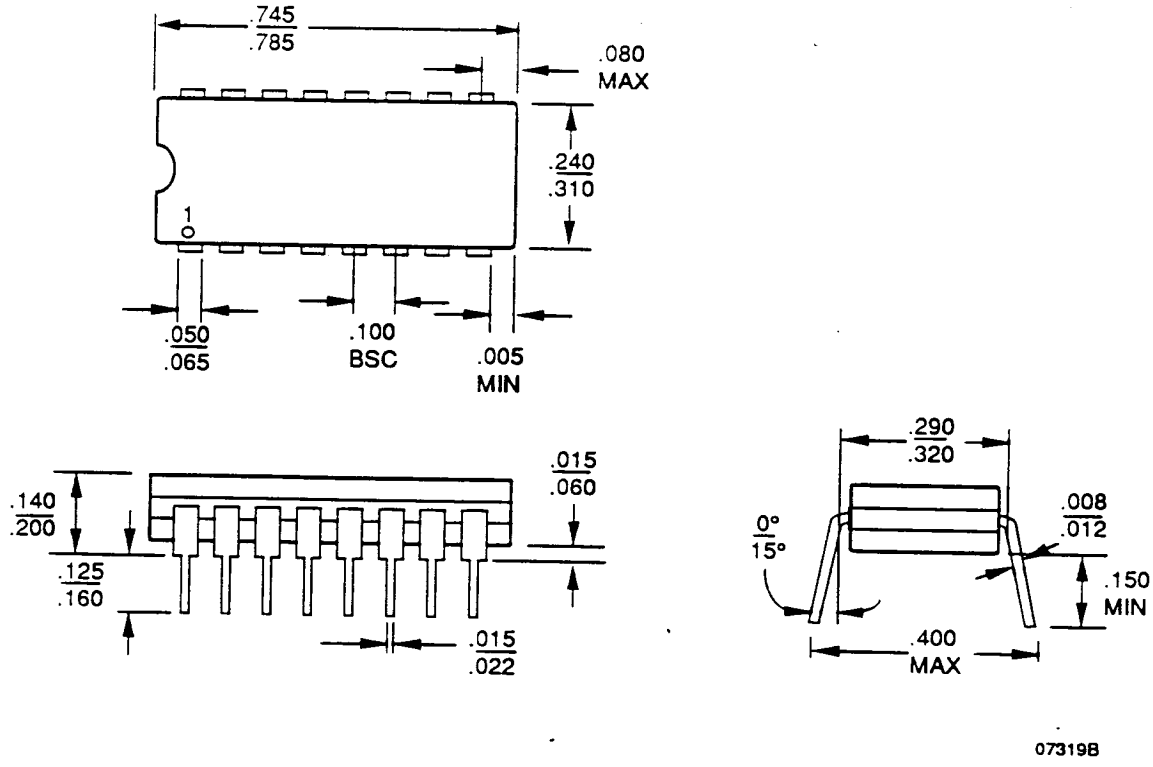
*Current probe is the easiest way to display a differential waveform

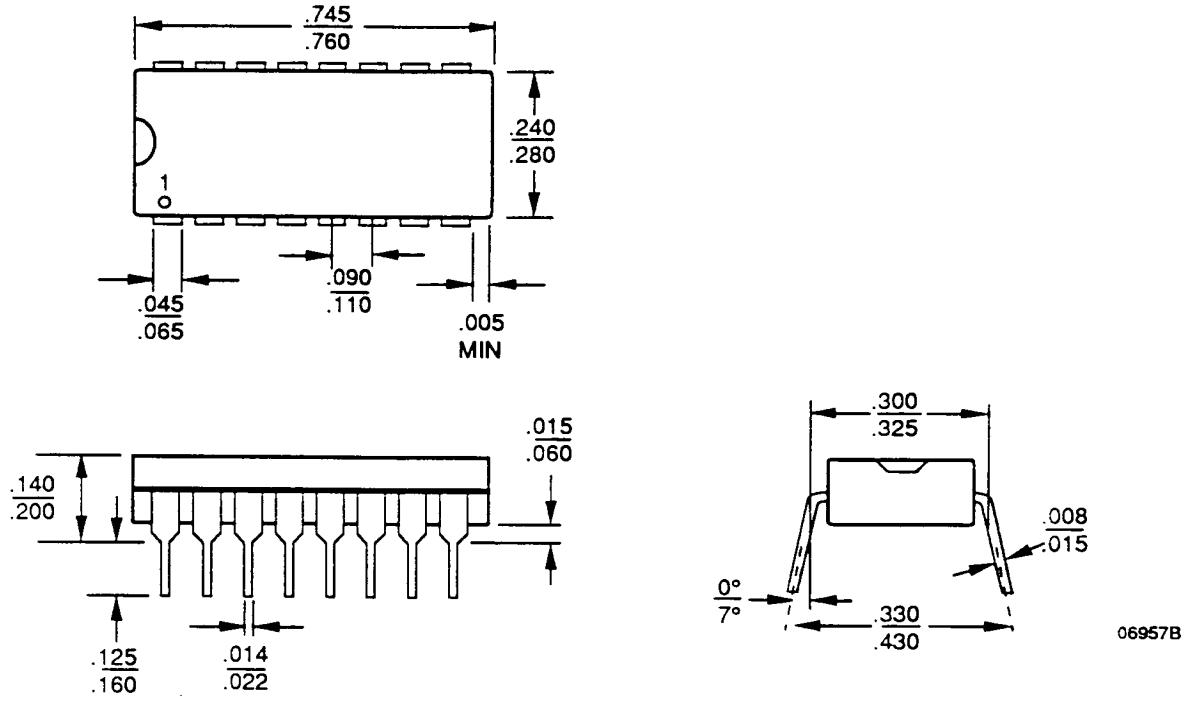
Figure 3. Three-State Delays

PHYSICAL DIMENSIONS*

CD 016

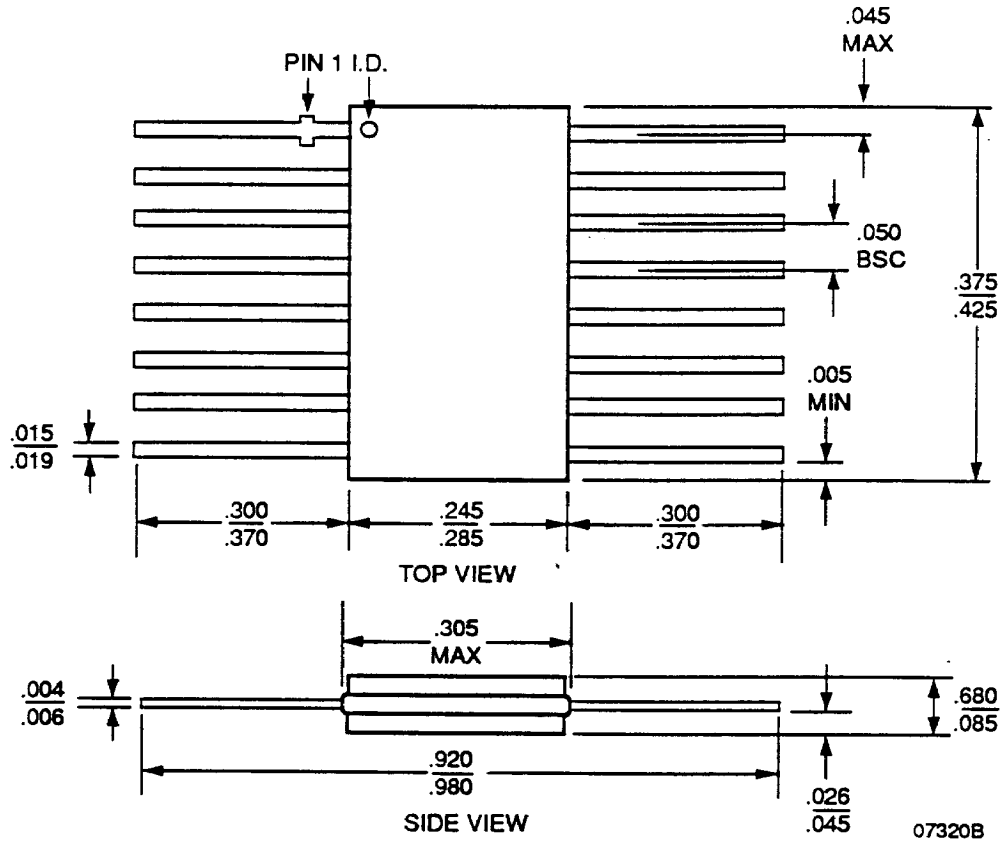


PD 016



*For reference only. All dimensions measured in inches, unless otherwise noted. BSC is an ANSI standard for Basic Space Centering.

PHYSICAL DIMENSIONS*
CF 016



PHYSICAL DIMENSIONS*
CL 020