

The Line Driver and Line Receiver Data Book

for
Design Engineers

1977



TEXAS INSTRUMENTS
INCORPORATED

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Information contained herein supersedes previously published data on Line Driver and Line Receiver Interface Circuits, including data book CC-415.

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* Future product, to be announced

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*Future product, to be announced

INTERFACE CIRCUITS INTERCHANGEABILITY GUIDE (MANUFACTURERS ARRANGED ALPHABETICALLY)

Direct replacements were based on similarity of electrical and mechanical characteristics as shown in currently published data. Interchangeability in particular applications is not guaranteed. Before using a device as a substitute, the user should compare the specifications of the substitute device with the specifications of the original.

Texas Instruments makes no warranty as to the information furnished and buyer assumes all risk in the use thereof. No liability is assumed for damages resulting from the use of the information contained in this list.

ADVANCED MICRO DEVICES

EXAMPLE OF NOMENCLATURE

AM
Prefix

75325
Device Type

N
Package Type
N = Plastic DIP (second source designation for TI Plastic DIP)
P = Plastic DIP
J = Ceramic DIP (second source designation for TI Ceramic DIP)
D = Ceramic DIP

AMD	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT	AMD	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
AM0026C	SN75369		AM9614C	SN75114	
AM1488	SN75188		AM9614M	SN55114	
AM1489	SN75189		AM9615C	SN75115	
AM1489A	SN75189A		AM9615M	SN55115	
AM26S10C	AM26S10C		AM55107B	SN55107B	
AM26S10M	AM26S10M		AM55108B	SN55108B	
AM26S11C	AM26S11C		AM55109	SN55109A	
AM26S11M	AM26S11M		AM55110	SN55110A	
AM5520	SN5520		AM55234	SN55234	
AM5521	SN5520		AM55235	SN55234	
AM5524	SN5524		AM55238	SN55238	
AM5525	SN5524		AM55239	SN55238	
AM7520	SN7520		AM55325	SN55325	
AM7521	SN7520		AM75107B	SN75107B	
AM7524	SN7524		AM75108B	SN75108B	
AM7525	SN7524		AM75109	SN75109A	
AM7820A	SN55182		AM75110	SN75110A	
AM7830	SN55183		AM75207	SN75207	
AM7831	DS7831		AM75208	SN75208	
AM7832	DS7832		AM75234	SN75234	
AM8820A	SN75182		AM75235	SN75234	
AM8830	SN75183		AM75238	SN75238	
AM8831	DS8831		AM75239	SN75238	
AM8832	DS8832		AM75325	SN75325	
AM8T26A		SN75136			

FAIRCHILD

EXAMPLE OF NOMENCLATURE

75450B	D	C
Device Type	Package Type	Temperature Range
	D = Ceramic DIP P = Plastic DIP R = Ceramic Mini DIP T = Plastic Mini DIP H = Metal Can F = Flat Package	C = Commercial 0° C to 70° C or 75° C M = Military -55° C to 125° C

FAIRCHILD	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT	FAIRCHILD	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
μA8T13M	SN55121		9627C		SN75152
μA8T13C	SN75121		9634C		SN75159
μA8T14M	SN55122		9636C	uA9636C*	
μA8T14C	SN75122		9636M	uA9636M*	
μA8T23C	SN75123		9637C	uA9637C*	SN75157*
μA8T24C	SN75124		9637M	uA9637M*	SN55157*
μA1488C	SN75188		9638C	uA9638C*	SN75158
μA1489C	SN75189		9638M	uA9638M*	SN55158
μA1489AC	SN75189A		9640C	AM26S10C	
5524M	SN5524		9640M	AM26S10M	
5525M	SN5524		9641C	AM26S11C	
5528M	SN5528		9641M	AM26S11M	
5529M	SN5528		9643		{ SN75322
5534M		SN55232	9644C		{ SN75363
5535M		SN55232	9664C		{ SN75361A
5538M		SN55238	9665C	SN75492	
5539M		SN55238	9665AC	SN75466	
7524C	SN7524		9666C	ULN2001A	
7525C	SN7524		9666AC	SN75467	
7528C	SN7528		9666C	ULN2002A	
7529C	SN7528		9667AC	SN75468	
7534C		SN75232	9667C	ULN2003A	
7535C		SN75232	9668AC	SN75469	
7538C		SN75238	9668C	ULN2004A	
7539C		SN75238	55107AM	SN55107A	
9612C		SN75158	55107BM	SN55107B	
9614M	SN55114		55108AM	SN55108A	
9614C	SN75114		55108BM	SN55108B	
9615M	SN55115		55109M	SN55109A	
9615C	SN75115		55110M	SN55110A	
9616C		{ SN75188	55121M	SN55121	
		{ SN75150	55122M	SN55122	
		{ SN75152	55224M		SN55234
		{ SN75154	55225M		SN55234
9617C		{ SN75189	55232M	SN55232	
		{ SN75189A	55233M	SN55232	
		{ SN75136			
9626C					

*Future product

FAIRCHILD	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT	FAIRCHILD	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
55234M	SN55234		75208C	SN75208	
55235M	SN55234		75224C		SN75234
55238M	SN55238		75225C		SN75234
55239M	SN55238		75232C	SN75232	
55325M	SN55325		75233C	SN75232	
55326M	SN55326		75234C	SN75234	
55327M	SN55327		75235C	SN75234	
55450AM	SN55450B		75238C	SN75238	
55450BM	SN55450B		75239C	SN75238	
55451AM	SN55451B		75325C	SN75325	
55451BM	SN55451B		75326C	SN75326	
55452AM	SN55452B		75327C	SN75327	
55452BM	SN55452B		75430C	SN75430	
55453AM	SN55453B		75431C	SN75431	
55453BM	SN55453B		75432C	SN75432	
55454AM	SN55454B		75433C	SN75433	
55454BM	SN55454B		75434C	SN75434	
55460M	SN55460		75450AC	SN75450B	
55461M	SN55461		75450BC	SN75450B	
55462M	SN55462		75451AC	SN75451B	
55463M	SN55463		75451BC	SN75451B	
55464M	SN55464		75452AC	SN75452B	
55470M	SN55470		75452BC	SN75452B	
55471M	SN55471		75453AC	SN75453B	
55472M	SN55472		75453BC	SN75453B	
55473M	SN55473		75454AC	SN75454B	
55474M	SN55474		75454BC	SN75454B	
75107AC	SN75107A		75460C	SN75460	
75107BC	SN75107B		75461C	SN75461	
75108AC	SN75108A		75462C	SN75462	
75108BC	SN75108B		75463C	SN75463	
75109C	SN75109A		75464C	SN75464	
75110C	SN75110A		75470C	SN75470	
75112C	SN75112		75471C	SN75471	
75121C	SN75121		75472C	SN75472	
75122C	SN75122		75473C	SN75473	
75123C	SN75123		75474C	SN75474	
75124C	SN75124		75491C	SN75491	
75150C	SN75150		75491AC		SN75491
75154C	SN75154		75492C	SN75492	
75207C	SN75207		75492AC		SN75492

ITT

EXAMPLE OF NOMENCLATURE

ITT
Prefix

75450
Device Type

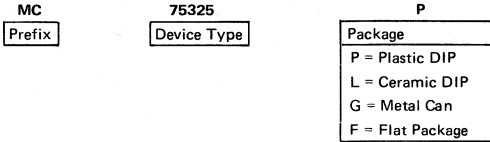
-5
Temperature Range
-1 = -55°C to 125°C
-5 = 0°C to 70°C

D
Package
D = Ceramic DIP
N = Plastic DIP

ITT	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT	ITT	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
ITT491	SN75491		ITT55235	SN55234	
ITT492	SN75492		ITT55324	SN55324	
ITT493	SN75493		ITT55325	SN55325	
ITT494	SN75494		ITT55450	SN55450B	
ITT1488	SN75188		ITT55451	SN55451B	
ITT1489	SN75189		ITT55452	SN55452B	
ITT1489A	SN75189A		ITT55453	SN55453B	
ITT5520	SN5520		ITT55454	SN55454B	
ITT5521	SN5520		ITT55460	SN55460	
ITT5522	SN5522		ITT55461	SN55461	
ITT5523	SN5522		ITT55462	SN55462	
ITT5524	SN5524		ITT55463	SN55463	
ITT5525	SN5524		ITT55464	SN55464	
ITT5528	SN5528		ITT75107A	SN75107A	
ITT5529	SN5528		ITT75107B	SN75107B	
ITT5534		SN55232	ITT75108A	SN75108A	
ITT5535		SN55232	ITT75108B	SN75108B	
ITT7520	SN7520		ITT75109	SN75109A	
ITT7521	SN7520		ITT75110	SN75110A	
ITT7522	SN7522		ITT75138	SN75138	
ITT7523	SN7522		ITT75207	SN75207	
ITT7524	SN7524		ITT75208	SN75208	
ITT7525	SN7524		ITT75234	SN75234	
ITT7528	SN7528		ITT75235	SN75234	
ITT7529	SN7528		ITT75322	SN75322	
ITT7534		SN75232	ITT75324	SN75324	
ITT7535		SN75232	ITT75325	SN75325	
ITT9614	SN75114		ITT75450	SN75450B	
ITT9615	SN75115		ITT75451	SN75451B	
ITT55107A	SN55107A		ITT75452	SN75452B	
ITT55107B	SN55107B		ITT75453	SN75453B	
ITT55108A	SN55108A		ITT75454	SN75454B	
ITT55108B	SN55108B		ITT75460	SN75460	
ITT55109	SN55109A		ITT75461	SN75461	
ITT55110	SN55110A		ITT75462	SN75462	
ITT55138	SN55138		ITT75463	SN75463	
ITT55234	SN55234		ITT75464	SN75464	

MOTOROLA

EXAMPLE OF NOMENCLATURE



MOTOROLA	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT	MOTOROLA	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
MMH0026C	SN75369		MC7528	SN7528	
MC8T13	SN75121		MC7529	SN7528	
MC8T14	SN75122		MC7534		SN75232
MC8T23	SN75123		MC7535		SN75232
MC8T24	SN75124		MC7538		SN75238
MC8T26		SN75136	MC7539		SN75238
MC1411	ULN2001A		MC55107	SN55107A	
MC1412	ULN2002A		MC55108	SN55108A	
MC1413	ULN2003A		MC55325	SN55325	
MC1416	ULN2004A		MC75107	SN75107A	
MC1488	SN75188		MC75108	SN75108A	
MC1489	SN75189		MC75109	SN75109A	
MC1489A	SN75189A		MC75110	SN75110A	
MC3443		SN75138	MC75140	SN75140	
MC3446	MC3446		MC75325	SN75325	
MC3453		SN75110A	MC75358	SN75368	
MC5522	SN5522		MC75365	SN75365	
MC5523	SN5522		MC75368	SN75368	
MC5524	SN5524		MC75450	SN75450B	
MC5525	SN5524		MC75451	SN75451B	
MC5528	SN5528		MC75452	SN75452B	
MC5529	SN5528		MC75453	SN75453B	
MC5534		SN55232	MC75454	SN75454B	
MC5535		SN55232	MC75460	SN75460	
MC5538		SN55238	MC75461	SN75461	
MC5539		SN55238	MC75462	SN75462	
MC7522	SN7522		MC75463	SN75463	
MC7523	SN7522		MC75464	SN75464	
MC7524	SN7524		MC75491	SN75491	
MC7525	SN7524		MC75492	SN75492	

NATIONAL

EXAMPLE OF NOMENCLATURE

DS
Prefix

75325
Device Type

N
Package
N = Plastic DIP
J = Ceramic DIP
W = Flat Package
H = Metal Can

NATIONAL	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT	NATIONAL	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
DS0026C	SN75369		DS7524A		SN7524
DS1488	SN75188		DS7525	SN7524	
DS1489	SN75189		DS7528	SN7528	
DS1489A	SN75189A		DS7528A		SN7528
DS1611		SN55471	DS7529	SN7528	
DS1612		SN55472	DS7534		SN75232
DS1613		SN55473	DS7534A		SN75232
DS1614		SN55474	DS7535		SN75232
DS3611		SN75471	DS7538		SN75238
DS3612		SN75472	DS7538A		SN75238
DS3613		SN75473	DS7539		SN75238
DS3614		SN75474	DS7800	SN55180	
DS3629		SN75324	DS7820	SN55182	
DS5520	SN5520		DS7820A	SN55182	
DS5520A		SN5520	DS7830	SN55183	
DS5521	SN5520		DS7831	DS7831	
DS5522	SN5522		DS7832	DS7832	
DS5522A		SN5522	DS8800	SN75180	
DS5523	SN5522		DS8820	SN75182	
DS5524	SN5524		DS8820A	SN75182	
DS5524A		SN5524	DS8830	SN75183	
DS5525	SN5524		DS8831	DS8831	
DS5528	SN5528		DS8832	DS8832	
DS5528A		SN5528	DS8880	SN75480	
DS5529	SN5528		DS55107	SN55107B	
DS5534		SN55232	DS55108	SN55108B	
DS5534A		SN55232	DS55109	SN55109A	
DS5535		SN55232	DS55110	SN55110A	
DS5538		SN55238	DS55121	SN55121	
DS5538A		SN55238	DS55122	SN55122	
DS5539		SN55238	DS55325	SN55325	
DS7520	SN7520		DS55450	SN55450B	
DS7520A		SN7520	DS55451	SN55451B	
DS7521	SN7520		DS55452	SN55452B	
DS7522	SN7522		DS55453	SN55453B	
DS7522A		SN7522	DS55454	SN55454B	
DS7523	SN7522		DS55460	SN55460	
DS7524	SN7524		DS55461	SN55461	

NATIONAL	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
DS55462	SN55462	
DS55463	SN55463	
DS55464	SN55464	
DS75107	SN75107B	
DS75108	SN75108B	
DS75109	SN75109A	
DS75110	SN75110A	
DS75121	SN75121	
DS75122	SN75122	
DS75123	SN75123	
DS75124	SN75124	
DS75150	SN75150	
DS75154	SN75154	
DS75207	SN75207B	
DS75208	SN75208B	
DS75322	SN75322	
DS75324	SN75324	
DS75325	SN75325	
DS75361	SN75361A	

NATIONAL	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
DS75362		SN75365
DS75364	SN75364	
DS75365	SN75365	
DS75450	SN75450B	
DS75451	SN75451B	
DS75452	SN75452B	
DS75453	SN75453B	
DS75454	SN75454B	
DS75460	SN75460	
DS75461	SN75461	
DS75462	SN75462	
DS75463	SN75463	
DS75464	SN75464	
DS75491	SN75491	
DS75492	SN75492	
DS75493	SN75493	
DS75494	SN75494	
DS78LS20		SN55182
DS88LS20		SN75182

SIGNETICS

EXAMPLE OF NOMENCLATURE

75454B

Device Type

V

Package

A = 14 pin Plastic DIP
 FH = 14 pin Ceramic DIP
 V = 8 pin Plastic DIP
 T = 8 pin Metal Can
 B = 16 pin Plastic DIP
 FJ = 16 pin Ceramic DIP

SIGNETICS	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
N8T13	SN75121	
N8T14	SN75122	
N8T15		SN75150
N8T16		SN75152
N8T23	SN75123	
N8T24	SN75124	
N8T26		SN75136
N8T26A		SN75136
S8T13	SN55121	
S8T14	SN55122	
DM7820	SN55182	
DM7830	SN55183	
DM8820	SN75182	
DM8830	SN75183	

SIGNETICS	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
DM8880	SN75480	
MC1488	SN75188	
MC1489	SN75189	
MC1489A	SN75189A	
3207A		SN75365
3207A-1		SN75365
7520	SN7520	
7521	SN7520	
7522	SN7522	
7523	SN7522	
7524	SN7524	
7525	SN7524	
55325	SN55325	
55450B	SN55450B	

SIGNETICS	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
55451B	SN55451B	
55452B	SN55452B	
55453B	SN55453B	
55454B	SN55454B	
75S107		SN75107A
75S108		SN75108A
75S207		SN75207
75S208		SN75208

SIGNETICS	TI DIRECT REPLACEMENT	TI CLOSEST REPLACEMENT
75324	SN75324	
75325	SN75325	
75361A	SN75361A	
75450B	SN75450B	
75451B	SN75451B	
75452B	SN75452B	
75453B	SN75453B	
75454B	SN75454B	

LINE TRANSCEIVERS SELECTION GUIDE

DIFFERENTIAL-LINE TRANSCEIVERS

COMMON FEATURES	RECEIVER CHARACTERISTICS		DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	ADDITIONAL FEATURES	PAGE NO.	
	STROBE OR ENABLE	TYPE†	COMMON-MODE RANGE	TEMPERATURE RANGE				
				OUTPUT				–55°C to 125°C	0°C to 70°C
<ul style="list-style-type: none"> • Single 5-V supply • Party-line operation • TTL-compatible driver inputs • Driver enable for 3-state driver output • Driver output current capability: 40 mA • Driver propagation delay time: 14 ns (typical) • Receiver propagation delay time: 20 ns (typical) • ±500 mV receiver input sensitivity • One transceiver per package 	STROBE	O-C or T-P	±15 V	SN55116	J	<ul style="list-style-type: none"> • Receiver frequency response control 	79	
		T-P	0 V to 6 V	SN55117	JG	<ul style="list-style-type: none"> • Driver and receiver connected internally 		
	ENABLE	O-C or T-P	±15 V	SN55118	J	<ul style="list-style-type: none"> • Same as '116 with 3-State receiver output 		
		T-P	0 V to 6 V	SN55119	JG, JG,P	<ul style="list-style-type: none"> • Same as '117 with 3-State receiver output 		

SINGLE-ENDED LINE TRANSCEIVERS

COMMON FEATURES	DRIVER CHARACTERISTICS		RECEIVER CHARACTERISTICS		DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	ADDITIONAL FEATURES	PAGE NO.	
	OUTPUT CURRENT CAPABILITY	tpD‡	STROBE OR ENABLE	tpD‡	STROBE OR ENABLE	TEMPERATURE RANGE				
						TYPICAL				–55°C to 125°C	0°C to 70°C
<ul style="list-style-type: none"> • Single 5-V supply • Party line operation • TTL-compatible driver inputs • Totem-pole receiver outputs • Four transceivers per package 	100 mA	10 ns	STROBE	10 ns	STROBE	AM26S10M	J	<ul style="list-style-type: none"> • Schottky circuitry • P-N-P inputs to minimize loading • Inverting driver (AM26S10) 	27	
	100 mA	12 ns	STROBE	10 ns	STROBE	AM26S11M	J,N	<ul style="list-style-type: none"> • 2.3 V receiver threshold for maximum system noise margin • Similar to N8T26 • 3-State driver and receiver outputs with Schottky circuitry 	113	
	100 mA	15 ns	STROBE	8 ns	STROBE	AM26S11C	J,N	<ul style="list-style-type: none"> • P-N-P inputs to minimize loading • Meets IEEE STD 488 		
	40 mA	16 ns	ENABLE	8 ns	ENABLE	SN75138	SN75138	J,N	<ul style="list-style-type: none"> • Receiver input hysteresis • Drivers also MOS compatible 	
48 mA	30 ns	STROBE	30 ns	STROBE	MC3446	MC3446	J,N		37	

† T, P ≡ Totem pole, O-C ≡ Open-collector, R ≡ Resistor pull-up

‡ tpD ≡ Propagation delay time

LINE DRIVERS SELECTION GUIDE

LINE DRIVERS WITH TTL-COMPATIBLE INPUTS

DESCRIPTION	OUTPUT CURRENT CAPABILITY	t _{PD} ¹ TYPICAL	S ¹ SINGLE ENDED D ¹ DIFFERENTIAL	PARTY-LINE OPERATION	STROBE	POWER SUPPLIES	DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	DRIVERS PER PACKAGE	COMPANION RECEIVERS	ADDITIONAL FEATURES	PAGE NO.
							-55°C TO 125°C	0°C TO 70°C					
GENERAL PURPOSE DRIVERS	300 mA	20 ns	S, D	YES	YES	5 V	SN55450B	SN75450B	J J,N	2	SN75122, SN75152, SN75115, SN75182, SN75140 series	See Note 1	87
	300 mA	20 ns	S	YES	YES	5 V	SN55451B	SN75451B	JG JG,P	2			
	100 mA	36 ns	S		YES	5 V		SN75361A	JG,P	2			
	100 mA	22 ns	S	YES	YES	5 V	SN55121	SN75121	J J,N	2	SN75122	61	
	40 mA	12 ns	D	YES	YES	5 V	SN55183	SN75183	J J,N	2		152	
	40 mA	15 ns	D	YES	YES	5 V	SN55114	SN75114	J J,N	2	SN75115, SN75182	61	
	40 mA	13 ns	D	YES	YES	5 V	SN55113	SN75113	J J,N	2		61	
	40 mA	15 ns	S, D	YES	YES	5 V	DS7831	DS8831	J J,N	2,4 [§]	SN75140 series, SN75115, SN75122, SN75124, SN75125, SN75127, SN75128, SN75129, SN75152, SN75182	31	
	40 mA	15 ns	S, D	YES	YES	5 V	DS7832	DS8832	J J,N	2,4 [§]			

[§] 4 for single-ended lines; 2 for differential lines

Note 1: For data sheet, see page 47 of "The Peripheral Driver Data Book for Design Engineers", LCC4280.

¹ t_{PD} = Propagation delay time.

LINE DRIVERS SELECTION GUIDE

LINE DRIVERS (continued) WITH TTL-COMPATIBLE INPUTS

DESCRIPTION	OUTPUT CURRENT CAPABILITY	t _{pd} ¹ TYPICAL	S = SINGLE ENDED D = DIFFERENTIAL	PARTY-LINE OPERATION	STROBE	POWER SUPPLIES	DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	DRIVERS PER PACKAGE	COMPANION RECEIVERS	ADDITIONAL FEATURES	PAGE NO.
							-55°C TO 125°C	0°C TO 70°C					
360/370 I/O INTERFACE	100 mA	20 ns	S	YES	YES	5 V	SN75123	J,N	2	SN75124, SN75125, SN75127, SN75128		93	
							*SN75126	J,N	4	CMOS [♦]	103		
DRIVERS MEETING EIA STANDARDS	40 mA	16 ns	D			5 V	SN55158	JG	2	uA9637, SN75157	RS-422Δ	143	
	10 mA	60 ns	S		YES	±12 V	SN75150	JG,P	2	SN75152, SN75154	RS-232C [#]	126	
	6 mA	220 ns	S		YES	±12 V	SN75188	J,N	4	SN75189, SN75189A	RS-232C [#]	163	
	75 mA		S			±12 V	*uA9636M	JG	2	uA9637, SN75157	CMOS [♦] , RS-423* RS-232C [#]	177	
CURRENT-MODE DRIVERS	50 mA	10 ns	D			5 V	*uA9638M	JG	2	uA9637, SN75157	CMOS [♦] , RS-422Δ	179	
	40 mA	16 ns	D	YES	YES	5 V	SN75159	J,N	2	uA9637, SN75157	3-State Output; RS-422Δ	147	
	18 mA	9 ns	D	YES	YES	±5 V	SN75112	J,N	2	SN75107A, SN75107B, SN75108A, SN75108B, SN75207, SN75207B, SN75208, SN75208B		53	
	6.5 mA	9 ns	D	YES	YES	±5 V	SN55110A	J	2				
	3.5 mA	9 ns	D	YES	YES	±5 V	SN55109A	J,N	2				

¹ t_{pd} ≡ Propagation delay time

* Future product

♦ Also CMOS input compatible

Satisfies requirements of EIA Standard RS-232C

▲ Satisfies requirements of EIA Standard RS-423

Δ Satisfies requirements of EIA Standard RS-422

LINE RECEIVERS SELECTION GUIDE

LINE RECEIVERS

● OUTPUT STROBE ● PARTY-LINE OPERATION

DESCRIPTION	TYPE OF OUTPUT†	t _{PD} ‡	INPUT SENSITIVITY	COMMON-MODE RANGE	POWER SUPPLIES	DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	RECEIVERS PER PACKAGE	COMPANION DRIVERS	ADDITIONAL FEATURES	PAGE NO.		
						-55° C to 125° C	0° C to 70° C							
DIFFERENTIAL-LINE RECEIVERS	T-P	17 ns	±10 mV	±3 V	±5 V	SN75207	J,N	J	2	SN75109A, SN75110A, SN75112	<ul style="list-style-type: none"> • "B" versions have input protection diodes for power off condition 	171		
	O-C	19 ns					J,N						J,N	
	T-P	17 ns	±25 mV			SN55107A	J,N	J	2					41
	O-C	19 ns	±25 mV			SN55107B	J,N	J	2					
						SN55108A	J,N	J	2					
						SN55108B	J,N	J	2					
SINGLE-ENDED LINE RECEIVERS	T-P	20 ns		5 V	SN55122	J,N	J	3	SN75121, DS8831, DS8832	<ul style="list-style-type: none"> • Hysteresis for improved noise immunity • Common reference voltage pin and strobe • Input protection diodes ("141") 	87			
				SN55140	JG	JG,P	2							
				SN55141	JG	JG,P	2		75450B series, SN75361A, SN75113, DS8831, DS8832	119				
	T-P	22 ns	±100 mV	5 V	SN55142	J,N	J	2						
					SN75143	J,N	J	2						
					SN55143	J,N	J,N	2						

†T-P = Totem pole, O-C = Open collector, R = Resistor pull-up

‡t_{PD} = Propagation delay time

LINE RECEIVERS SELECTION GUIDE

LINE RECEIVERS (continued)

DESCRIPTION	D = DIFFERENTIAL S = SINGLE ENDED	TYPE OF OUTPUT†	t _{pd} [‡] TYPICAL	PARTY-LINE OPERATION	STROBE	POWER SUPPLIES	DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	RECEIVERS PER PACKAGE	COMPANION DRIVERS	ADDITIONAL FEATURES	PAGE NO.
							-55°C to 125°C	0°C to 70°C					
RECEIVERS FOR 360/370 I/O INTERFACE	S	T-P	20 ns	YES	YES	5 V	SN75124	J,N	3	SN75123, SN75126	• Hysteresis	93	
				YES		5 V	SN75125	J,N	7	SN75123, SN75126	• Schottky Circuitry • Standard VCC Pinout (SN75127)	99	
				YES		5 V	SN75127	J,N	7	SN75123, SN75126	• Schottky Circuitry	105	
				YES		5 V or 12 V	SN75128 SN75129	J,N J,N	8 8	SN75123, SN75126	• Hysteresis	137	
RECEIVERS MEETING EIA STANDARD RS-232-C	S	R	25 ns			5 V	SN75189	J,N	4	SN75188	• Response Threshold Control • '189A has more hysteresis than '189	167	
						±12 V	SN75152	J,N	2	SN75150	• Also meets MIL-STD-188C • Hysteresis	130	
				YES		5 V	*SN55157 *SN75157 *UA9637M *UA9637C	JG JG,P JG JG,P	2 2 2	SN75158, SN75159, UA9636, UA9638	• Standard VCC Pinout ('157) • Schottky Circuitry	142 178	
RECEIVERS WITH RESPONSE TIME CONTROL	D	T-P	20 ns	YES	YES	5 V	SN55115	J	2	SN75113, SN75114, SN75183, DS8831, DS8832	• Input Sensitivity: ±500 mV • Common-Mode Range: ±15 V	61	
				YES	YES	5 V	SN55182	J,N	2				152

† T-P = Totem pole, O-C = Open collector, R = Resistor pull-up

‡ t_{pd} = Propagation delay time

* Future product

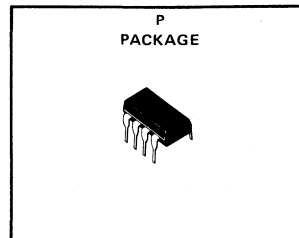
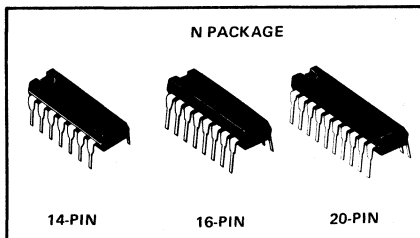
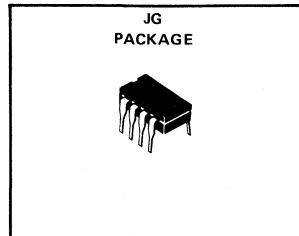
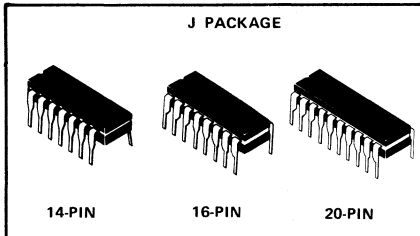
LINE CIRCUITS

THERMAL INFORMATION

THERMAL RESISTANCE

PACKAGE	PINS	JUNCTION-TO-CASE THERMAL RESISTANCE $R_{\theta JC}$ ($^{\circ}C/W$)	JUNCTION-TO-AMBIENT THERMAL RESISTANCE $R_{\theta JA}$ ($^{\circ}C/W$)
J ceramic dual-in-line (glass-mounted chips)	14 thru 20	60	122
J ceramic dual-in-line [†] (alloy-mounted chips)	14 thru 20	29 [†]	91 [†]
JG ceramic dual-in-line (glass-mounted chips)	8	45	135
JG ceramic dual-in-line [†] (alloy-mounted chips)	8	20 [†]	110 [†]
N plastic dual-in-line	14 thru 20	44	108
P plastic dual-in-line	8	45	125

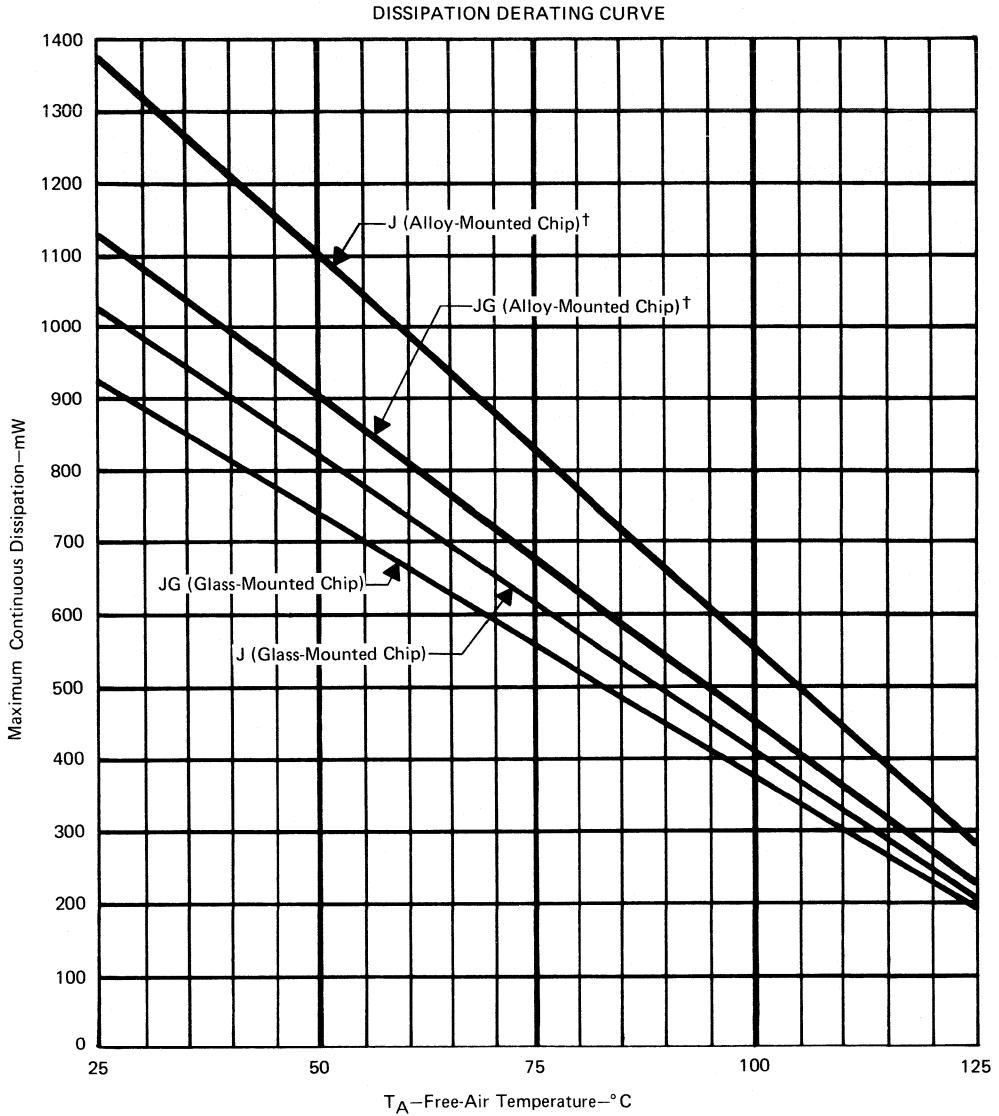
[†] In addition to those products so designated on their data sheets, all devices having a type number prefix of "SNC" or "SNM", or a suffix of "/883" have alloy-mounted chips.



LINE CIRCUITS THERMAL INFORMATION

CERAMIC DUAL-IN-LINE PACKAGES

These curves are for use with the continuous dissipation ratings specified on the individual data sheets. Those ratings apply up to the temperature at which the rated level intersects the appropriate derating curve or the maximum operating free-air temperature.

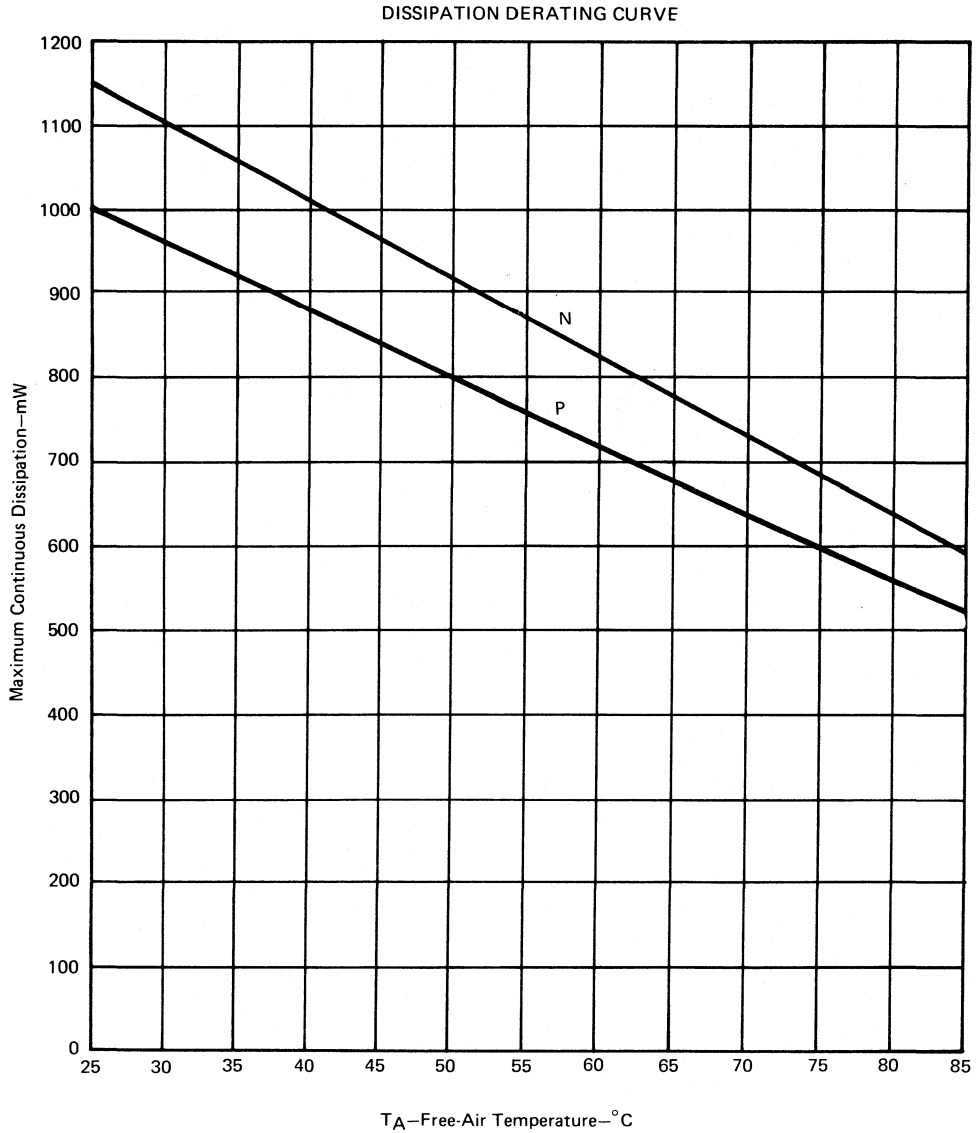


† In addition to those products so designated on their data sheets, all devices having a type number prefix of "SNC" or "SNM", or a suffix of "/883" have alloy-mounted chips.

LINE CIRCUITS THERMAL INFORMATION

PLASTIC DUAL-IN-LINE PACKAGES

These curves are for use with the continuous dissipation ratings specified on the individual data sheets. Those ratings apply up to the temperature at which the rated level intersects the appropriate derating curve or the maximum operating free-air temperature.



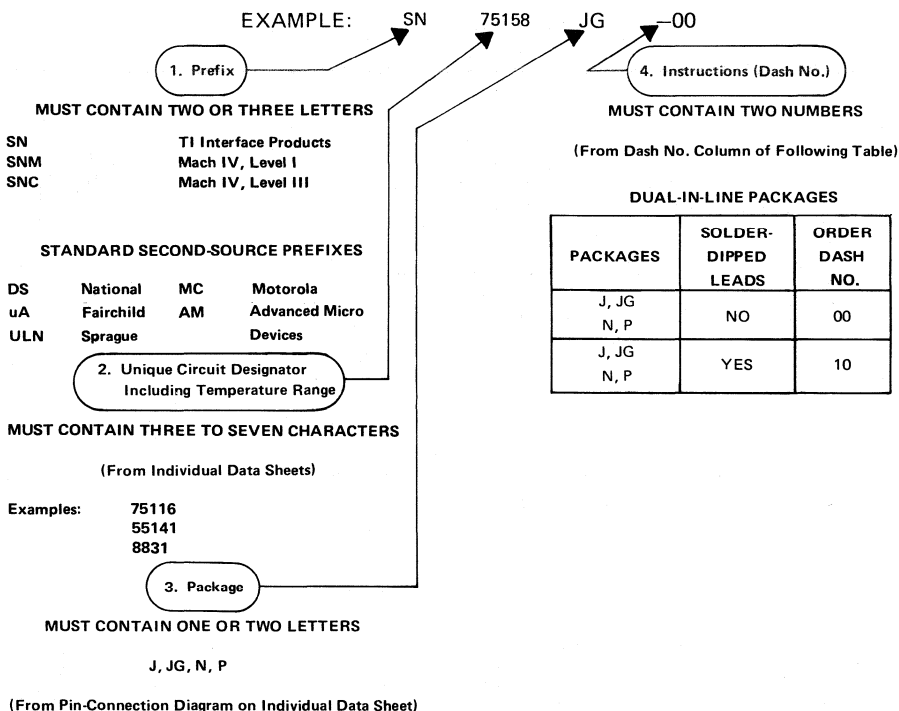
LINE CIRCUITS

ORDERING INSTRUCTIONS AND MECHANICAL DATA

ORDERING INSTRUCTIONS

Electrical characteristics presented in this data book apply for the circuit type(s) listed in the page heading, unless otherwise noted, regardless of package. The availability of a circuit function in a particular package is indicated by an alphabetical reference above the pin-connection diagram(s). These alphabetical references refer to mechanical outline drawings shown in this section.

Factory orders for circuits described in this data book should include a four-part type number as explained in the following example.



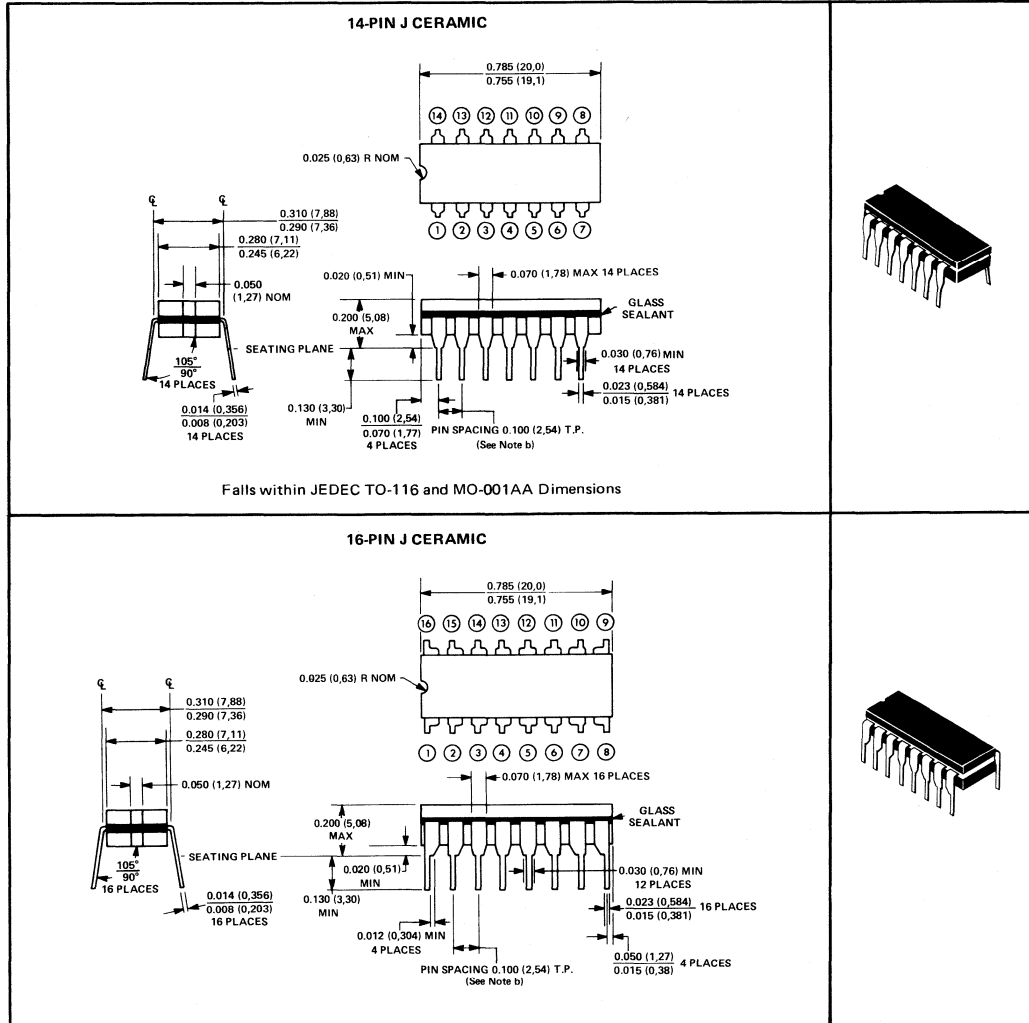
Circuits are shipped in one of the carriers shown below. Unless a specific method of shipment is specified by the customer (with possible additional costs), circuits will be shipped in the most practical carrier.

- Slide Magazines
- A-Channel Plastic Tubing
- Barnes Carrier
- Sectioned Cardboard Box
- Individual Plastic Box

LINE CIRCUITS ORDERING INSTRUCTIONS AND MECHANICAL DATA

J ceramic dual-in-line packages

These hermetically sealed dual-in-line packages consist of a ceramic base, ceramic cap, and a 14-, 16-, or 20-lead frame. Hermetic sealing is accomplished with glass. The packages are intended for insertion in mounting-hole rows on 0.300 (7,62) centers (see Note a). Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Tin-plated ("bright-dipped") leads (-00) require no additional cleaning or processing when used in soldered assembly.

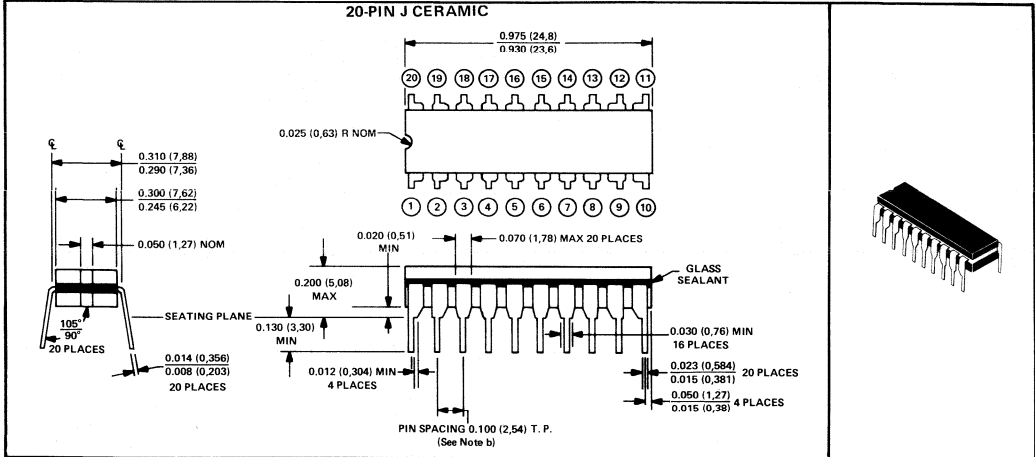


- NOTES: a. All dimensions are in inches and parenthetically in millimeters. Inch dimensions govern.
 b. Each pin centerline is located within 0.010 (0,26) of its true longitudinal position.

LINE CIRCUITS

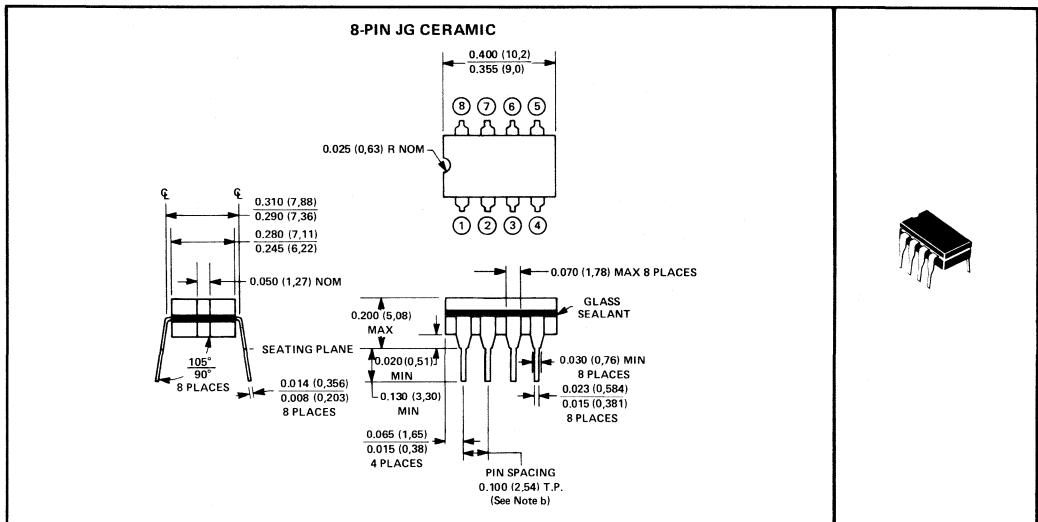
ORDERING INSTRUCTIONS AND MECHANICAL DATA

J ceramic dual-in-line packages (continued)



JG ceramic dual-in-line package

This hermetically sealed dual-in-line package consists of a ceramic base, ceramic cap, and 8-lead frame. The package is intended for insertion in mounting-hole rows on 0.300 (7,62) centers (see Note a). Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Tin-plated ("bright-dipped") leads require no additional cleaning or processing when used in soldered assembly.

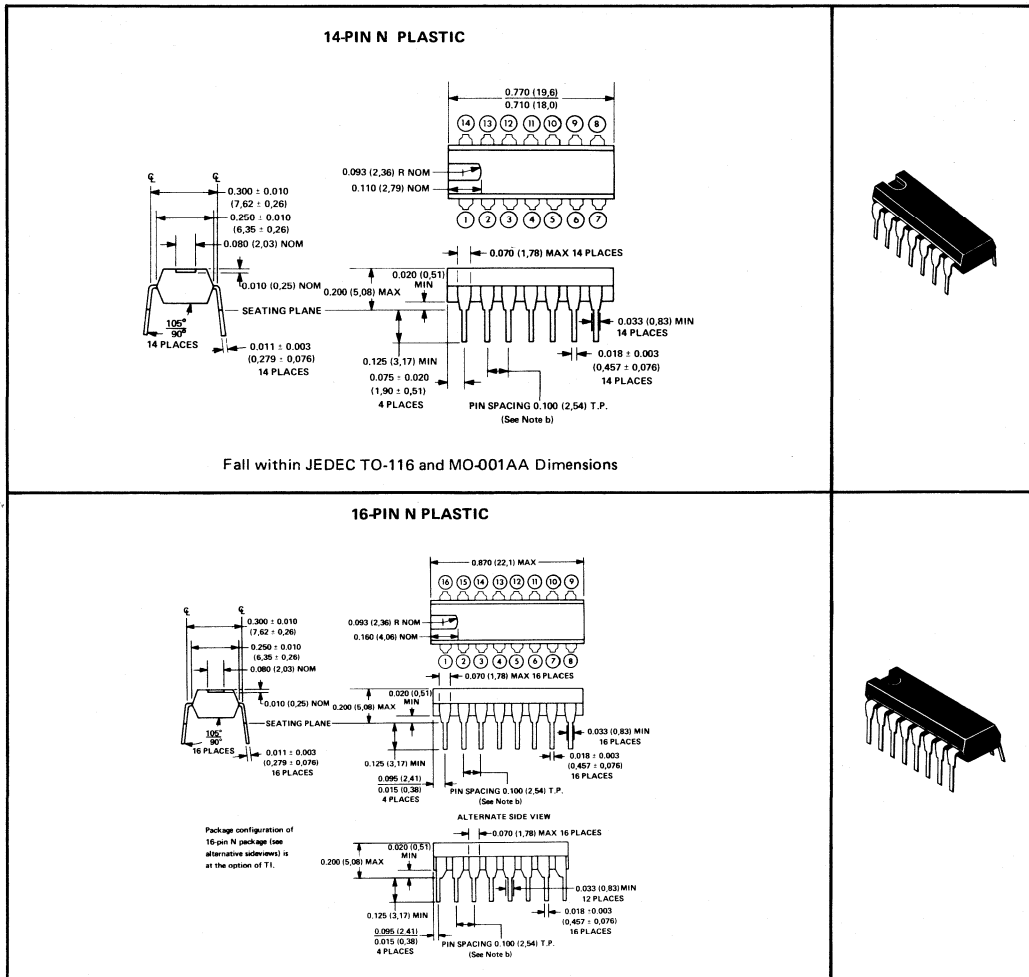


- NOTES: a. All dimensions are in inches and parenthetically in millimeters. Inch dimensions govern.
 b. Each pin centerline is located within 0.010 (0,26) of its true longitudinal position.

LINE CIRCUITS ORDERING INSTRUCTIONS AND MECHANICAL DATA

N plastic dual-in-line packages

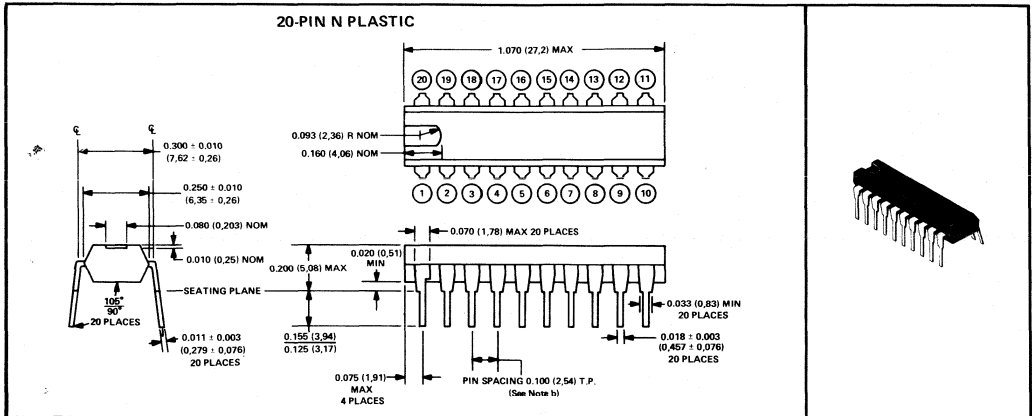
These dual-in-line packages consist of a circuit mounted on a 14-, 16-, or 20-lead frame and encapsulated within an electrically nonconductive plastic compound. The compound will withstand soldering temperature with no deformation and circuit performance characteristics remain stable when operated in high-humidity conditions. The packages are intended for insertion in mounting-hole rows on 0.300 (7,62) centers (see Note a). Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: a. All dimensions are in inches and parenthetically in millimeters. Inch dimensions govern.
 b. Each pin centerline is located within 0.010 (0,26) of its true longitudinal position.

LINE CIRCUITS ORDERING INSTRUCTIONS AND MECHANICAL DATA

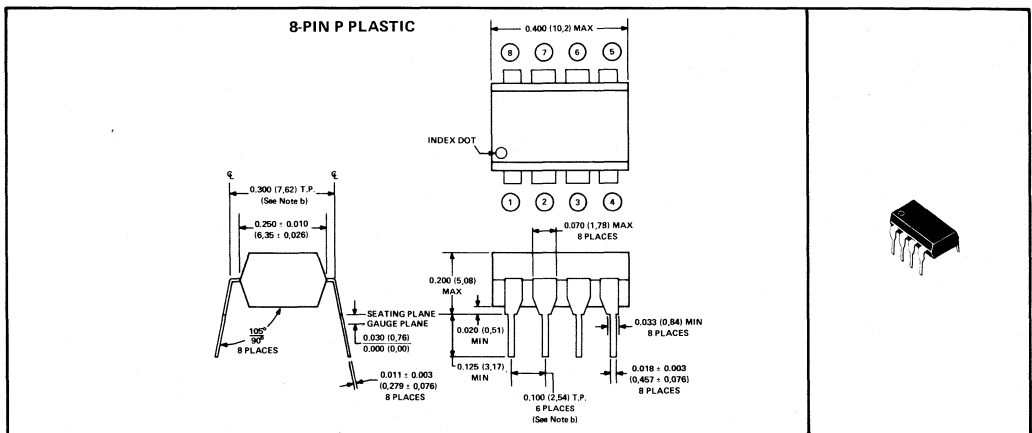
N dual-in-line plastic package (continued)



NOTES: a. All dimensions are in inches and parenthetically in millimeters. Inch dimensions govern.
b. Each pin centerline is located within 0.010(0,26) of its true longitudinal position.

P dual-in-line plastic package

This dual-in-line package consists of a circuit mounted on a 8-lead frame and encapsulated in an electrically, nonconductive plastic compound. The compound will withstand soldering temperature with no deformation and circuit performance characteristics remain stable when operated under high-humidity conditions. This package is intended for insertion in mounting hole rows on 0.300 (7,62) centers (see Note a). Once the leads are compressed and inserted, sufficient tension is provided to secure the package in the board during soldering. Silver-plated leads require no additional cleaning or processing when used in soldered assembly.



NOTES: a. All dimensions are in inches and parenthetically in millimeters. Inch dimensions govern.
b. Each pin centerline is within 0.005 (0,127) radius of true position at the gauge plane with maximum material condition and unit installed.

INTERFACE CIRCUITS

TYPES AM26S10, AM26S11 QUADRUPLE BUS TRANSCEIVERS

BULLETIN NO. DL-S 7712498, JANUARY 1977

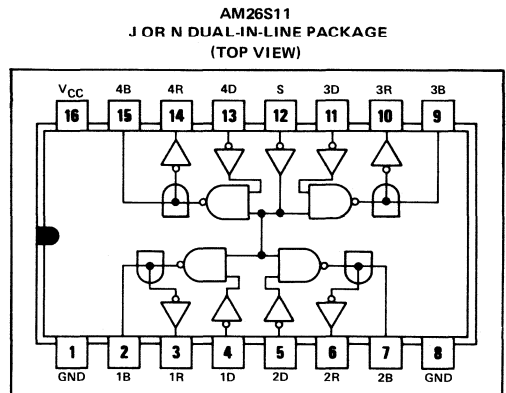
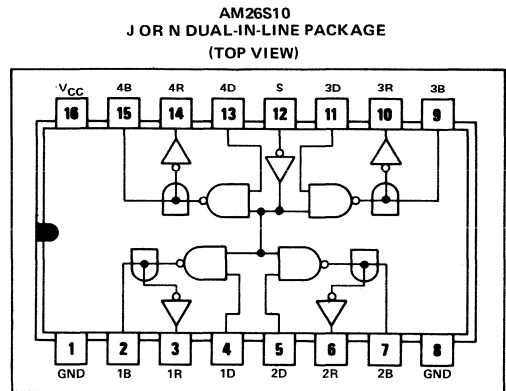
- Schottky Circuitry for High Speed, Typical Propagation Delay Time . . . 12 ns
- Drivers Feature Open-Collector Outputs for Party-Line (Data bus) Operation
- Driver Outputs Can Sink 100 mA at 0.8 V Maximum
- P-N-P Inputs for Minimal Input Loading
- Designed to be Interchangeable with Advanced Micro Devices AM26S10 and AM26S11

description

The AM26S10 and AM26S11 are quadruple bus transceivers utilizing Schottky-diode-clamped transistors† for high speed. The drivers feature open-collector outputs capable of sinking 100 mA at 0.8 V maximum. The driver and strobe inputs use p-n-p transistors to reduce the input loading.

The driver of the AM26S10 is inverting; the driver of the AM26S11 is noninverting. Each device has two ground connections, for improved ground current-handling capability. For proper operation, the ground pins should be tied together.

The AM26S10M and AM26S11M are characterized for operation over the full military temperature range of -55°C to 125°C . The AM26S10C and AM26S11C are characterized for operation over the temperature range of 0°C to 70°C .



AM26S10
FUNCTION TABLE
(TRANSMITTING)

INPUTS		OUTPUTS	
S	D	B	R
L	H	L	H
L	L	H	L

AM26S11
FUNCTION TABLE
(TRANSMITTING)

INPUTS		OUTPUTS	
S	D	B	R
L	H	H	L
L	L	L	H

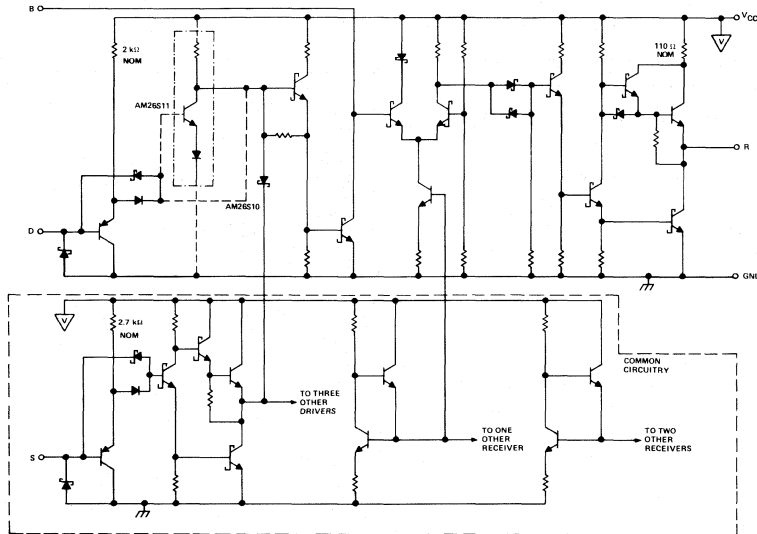
AM26S10 AND AM26S11
FUNCTION TABLE
(RECEIVING)

INPUTS			OUTPUT
S	B	D	R
H	H	X	L
H	L	X	H

h = high level, L = low level, X = irrelevant

TYPES AM26S10, AM26S11 QUADRUPLE BUS TRANSCEIVERS

schematic (each transceiver)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	...	-0.5 V to 7 V
Driver or strobe input voltage	...	-0.5 V to 5.5 V
Bus voltage, driver output off:	AM26S10M, AM26S11M	-0.5 V to 5.5 V
	AM26S10C, AM26S11C	-0.5 V to 5.25 V
Driver or strobe input current	...	-30 mA to 5 mA
Driver output current	...	200 mA
Receiver output current	...	30 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	...	800 mW
Operating free-air temperature range:	AM26S10M, AM26S11M	-55°C to 150°C
	AM26S11C, AM26S11C	0°C to 70°C
Storage temperature range	...	-65°C to 100°C
Lead temperature 1/16 inch from case for 60 seconds:	J package	300°C
Lead temperature 1/16 inch from case for 10 seconds:	N package	260°C

- NOTES: 1. Voltage values are with respect to network ground terminals connected together.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information Section, which starts on page 18. In the J package, AM26S10M and AM26S11M chips are alloy-mounted; AM26S10C and AM26S11C chips are glass-mounted.

recommended operating conditions

	AM26S10M AM26S11M			AM26S10C AM26S11C			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
Receiver high-level output current, I_{OH}							-1
Low-level output current, I_{OL}	Driver		100	Receiver		100	mA
	Receiver		20	Driver		20	mA
Operating free-air temperature, T_A	-55			125			0
							70
							°C

TENTATIVE DATA SHEET

TYPES AM26S10, AM26S11 QUADRUPLE BUS TRANSCEIVERS

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS [†]	AM26S10M AM26S11M		AM26S10C AM26S11C		UNIT
			MIN	TYP [‡] MAX	MIN	TYP [‡] MAX	
V _{IH}	High-level input voltage	D or S	2		2		V
		B	2.4		2.25		
V _{IL}	Low-level input voltage	D or S	0.8		0.8		V
		B	1.6		1.75		
V _{IK}	Input clamp voltage	D or S	V _{CC} = MIN, I _I = -18 mA		-1.2		V
V _{OH}	High-level output voltage	R	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = V _{IL} max, I _{OH} = -1 mA		2.5 3.4		V
V _{OL}	Low-level output voltage	R	V _{CC} = MIN, V _{IH} = V _{IH} min, V _{IL} = 0.8 V		I _{OL} = 20 mA 0.5		0.5
		B			I _{OL} = 40 mA		0.33 0.5
					I _{OL} = 70 mA		0.42 0.7
					I _{OL} = 100 mA		0.51 0.8
I _{O(off)}	Off-state output current	B	V _{IH} = 2 V, V _{IL} = 0.8 V	V _{CC} = MAX, V _O = 0.8 V		-50	
				V _{CC} = MAX, V _O = 4.5 V		200	
				V _{CC} = 0, V _O = 4.5 V		100	
I _{IH}	High-level input current	D	V _{CC} = MAX, V _I = 2.7 V		30		μA
		S			20		
I _I	Input current at maximum input voltage	D or S	V _{CC} = MAX, V _I = 5.5 V		100		μA
I _{IL}	Low-level input current	D	V _{CC} = MAX, V _I = 0.4 V		-0.54		mA
		S			-0.36		
I _{OS}	Short-circuit output current [§]	R	V _{CC} = MAX		-20 -55 -18 -60		mA
I _{CC}	Supply current	AM26S10	V _{CC} = MAX, Strobe at 0 V,		45 70 45 70		mA
		AM26S11	All driver outputs low		80		

[†] For conditions shown as MIN or MAX, use the appropriate value shown under recommended operating conditions.

[‡] All typical values are at T_A = 25°C and V_{CC} = 5 V.

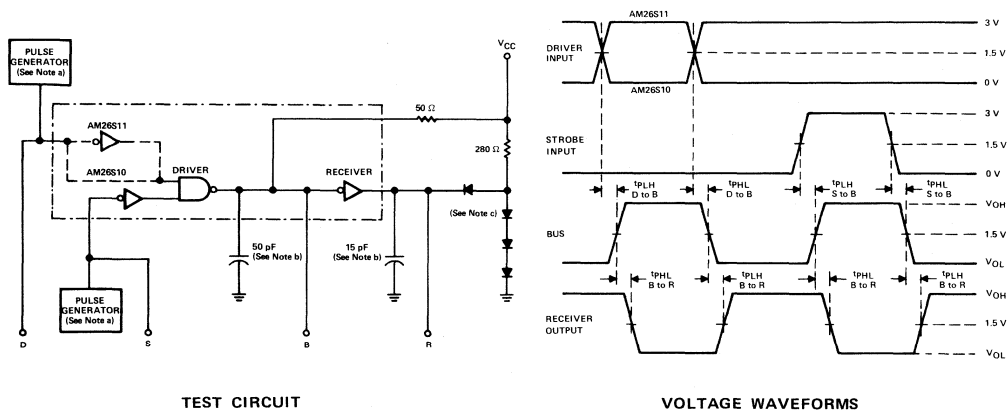
[§] Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER		FROM	TO	TEST CONDITIONS	AM26S10			AM26S11			UNIT
					MIN	TYP	MAX	MIN	TYP	MAX	
t _{PLH}	Propagation delay time, low-to-high-level output	D	B	See Figure 1	10	15		12	19	ns	
t _{PHL}	Propagation delay time, high-to-low-level output				10	15		12	19		
t _{PLH}	Propagation delay time, low-to-high-level output	S	B		14	18		15	20	ns	
t _{PHL}	Propagation delay time, high-to-low-level output				13	18		14	20		
t _{PLH}	Propagation delay time, low-to-high-level output	B	R		10	15		10	15	ns	
t _{PHL}	Propagation delay time, high-to-low-level output				10	15		10	15		
t _{TLH}	Transition time, low-to-high-level output		B		4	10		4	10	ns	
t _{THL}	Transition time, high-to-low-level output				2	4		2	4		

TYPES AM26S10, AM26S11 QUADRUPLE BUS TRANSCEIVERS

PARAMETER MEASUREMENT INFORMATION



- NOTES: a. The pulse generators have the following characteristics: $Z_{out} = 50 \Omega$, $t_r = 10 \pm 5$ ns.
 b. Includes probe and jig capacitance.
 c. All diodes are 1N916 or equivalent.

FIGURE 1

TYPICAL APPLICATION

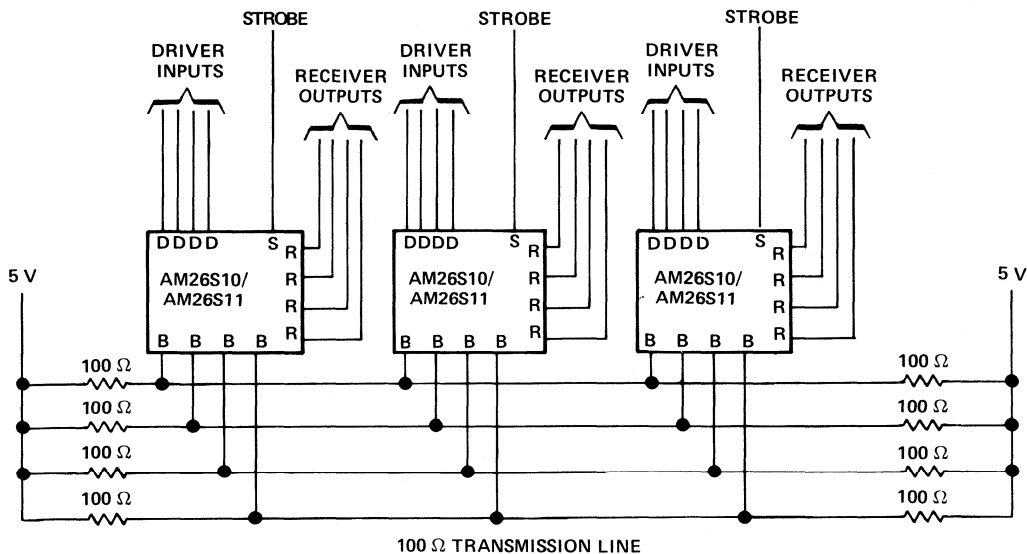


FIGURE 2—PARTY-LINE SYSTEM

INTERFACE CIRCUITS

TYPES DS7831, DS7832, DS8831, DS8832 LINE DRIVERS WITH 3-STATE OUTPUTS

BULLETIN NO. DL-S 7712496, JANUARY 1977

- TTL Compatible
- Propagation Delay Time . . . 15 ns Typ
- Very Low Output Impedance with High Drive Capability
- 40-mA Sink and Source Capability
- Gating Control to Allow Either Single-Ended or Differential Operation
- Three-State Outputs for Party-Line (Data-Bus) Operation

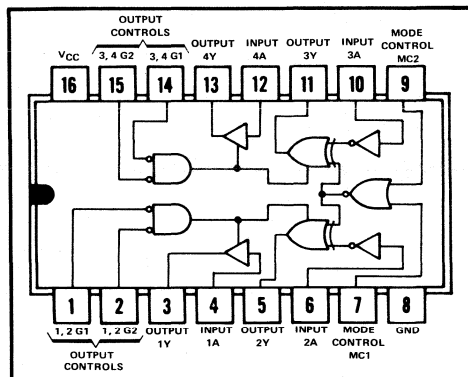
description

The DS7831, DS7832, DS8831, and DS8832 can be used as either quadruple single-ended line drivers or as dual differential line drivers. This multi-mode operation and simple logic control make these devices especially useful for party-line or bus-organized systems. The DS7831 and DS8831 have output clamp diodes to V_{CC} ; the DS7832 and DS8832 do not.

For one of these circuits to operate as four independent single-ended line drivers, both mode-control pins must be low. In this mode, no signal inversion takes place between inputs and outputs. To operate as a dual differential line driver, at least one of the mode control inputs must be high. Inputs 1A and 2A should be connected together as should 3A and 4A. Then signals applied to the inputs will appear noninverted at 1Y and 4Y and inverted at 2Y and 3Y, provided the output control pins are low.

While enabled, these outputs provide good drive capability for capacitive loads, and fast transitions from both low-to-high levels and high-to-low levels.

DS7831, DS7832.....J PACKAGE
DS8831, DS8832.....J OR N PACKAGE
(TOP VIEW)



Taking either of the associated output controls high disables the outputs. When disabled, these three-state outputs neither load nor drive a line and hundreds of these devices may be connected to a common bus line. Only one output should be enabled at a time.

The DS7831 and DS7832 are characterized for operation over the full military temperature range of -55°C to 125°C . The DS8831 and DS8832 are characterized for operation from 0°C to 70°C .

FUNCTION TABLE

OUTPUT CONTROLS		MODE CONTROLS		DATA INPUT	OUTPUT	DATA INPUT	OUTPUT
G1	G2	MC1	MC2	1A/4A	1Y/4Y	2A/3A	2Y/3Y
L	L	L	L	H	H	H	H
L	L	L	L	L	L	L	L
L	L	X	H	H	H	H	L
L	L	H	X	L	L	L	H
H	X	X	X	X	Z	X	Z
X	H	X	X	X	Z	X	Z

H = high level, L = low level, X = irrelevant, Z = high impedance (off)

TYPES DS7831, DS7832, DS8831, DS8832

LINE DRIVERS WITH 3-STATE OUTPUTS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2): J package	1025 mW
N package	1150 mW
Operating free-air temperature range: DS78'	-55°C to 125°C
DS88'	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTES: 1. Voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, DS7831 and DS7832 chips are alloy-mounted; DS8831 and DS8832 chips are glass-mounted.

recommended operating conditions

	DS78'			DS88'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
Output voltage, V_O				5.5			V
High-level output current, I_{OH}				-40			mA
Low-level output current, I_{OL}				40			mA
Operating free-air temperature range, T_A	-55			125			°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	MIN	TYP‡	MAX	UNIT		
V_{IH} High-level input voltage		2			V		
V_{IL} Low-level input voltage		0.8			V		
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$	-1			-1.5	V	
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, I_{OH} = -2 \text{ mA}$	DS7831, DS7832	2.4	3.1	V		
	$V_{IH} = 2 \text{ V}, I_{OH} = -5.2 \text{ mA}$	DS8831, DS8832	2.4	3.0			
	$V_{IL} = 0.8 \text{ V}, I_{OH} = -40 \text{ mA}$		1.8	2.5			
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OL} = 32 \text{ mA}$		0.26	0.4	V		
	$V_{IL} = 0.8 \text{ V}, I_{OL} = 40 \text{ mA}$		0.3	0.5			
				1.5			
V_{OK} Output clamp voltage	$V_{CC} = 5 \text{ V}, T_A = 25^\circ \text{C}, I_O = -12 \text{ mA}$				-1.5		
	$I_O = 12 \text{ mA}$	DS7831, DS8831	$V_{CC} + 1.5$		V		
I_{OZ} Off-state (high-impedance-state) output current	$V_{CC} = \text{MAX}, T_A = 25^\circ \text{C}$	$V_O = 2.4 \text{ V}$	40		μA		
		$V_O = 0.4 \text{ V}$	-40				
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$				1	mA	
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$				40	μA	
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$				-1	-1.6	mA
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}, V_O = 0, T_A = \text{MAX}$	-40			-70	-120	mA
I_{CC} Supply current	$V_{CC} = \text{MAX}$	50			90	mA	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $T_A = 25^\circ \text{C}$ and $V_{CC} = 5 \text{ V}$.

§ Only one output should be shorted at a time.

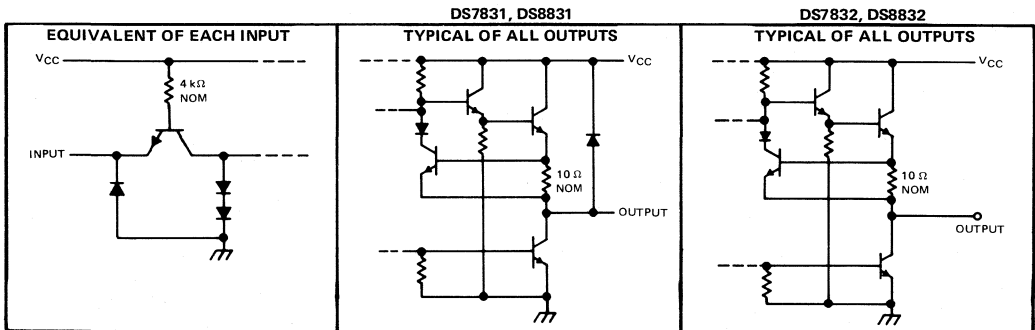
TYPES DS7831, DS7832, DS8831, DS8832 LINE DRIVERS WITH 3-STATE OUTPUTS

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{ C}$

PARAMETER [†]	FROM	TO	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	2A or 3A	2Y or 3Y (noninverting)	Mode controls low, See Figure 11		10	25	ns
t_{PHL}					12	25	
t_{PLH}	2A or 3A	2Y or 3Y (inverting)	Mode controls high, See Figure 11		12	25	ns
t_{PHL}					15	25	
t_{PLH}	1A or 4A	1Y or 4Y	See Figure 11		9	25	ns
t_{PHL}					11	25	
t_{PZH}	G1 or G2	Any Y	$C_L = 50\text{ pF}$, See Figure 13		12	22	ns
t_{PZL}					14	27	
t_{PHZ}	G1 or G2	Any Y	$C_L = 5\text{ pF}$, See Figure 13		6	12	ns
t_{PLZ}					15	22	

[†] t_{PLH} ≡ Propagation delay time, low-to-high-level output
 t_{PHL} ≡ Propagation delay time, high-to-low-level output
 t_{PZH} ≡ Output enable time to high level
 t_{PZL} ≡ Output enable time to low level
 t_{PHZ} ≡ Output disable time from high level
 t_{PLZ} ≡ Output disable time from low level

schematics of inputs and outputs



TYPICAL CHARACTERISTICS

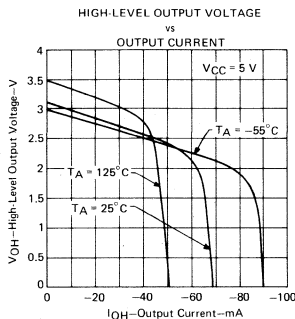


FIGURE 1

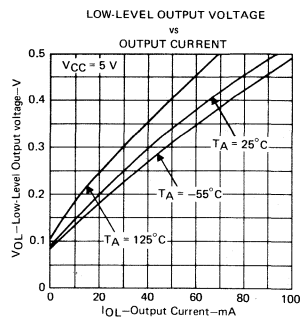


FIGURE 2

TYPES DS7831, DS7832, DS8831, DS8832 LINE DRIVERS WITH 3-STATE OUTPUTS

TYPICAL CHARACTERISTICS†

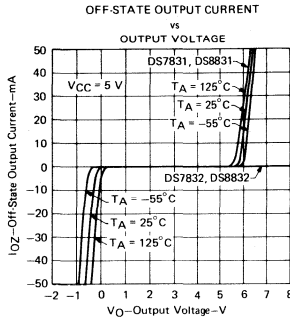


FIGURE 3

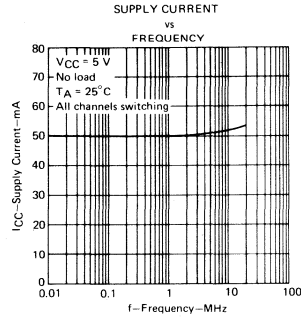


FIGURE 4

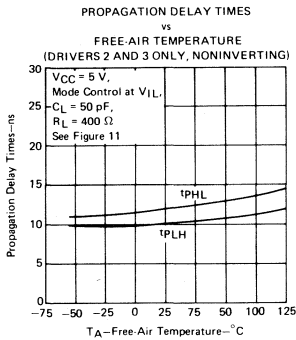


FIGURE 5

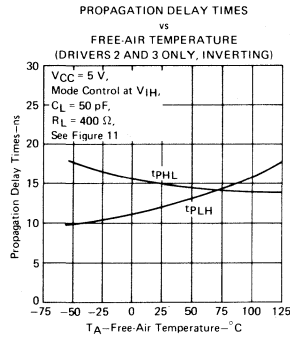


FIGURE 6

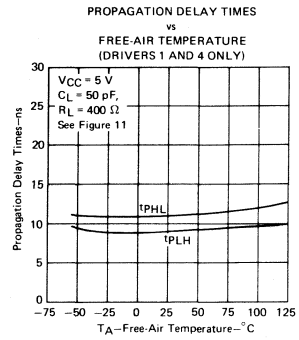


FIGURE 7

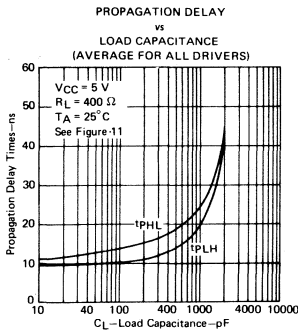


FIGURE 8

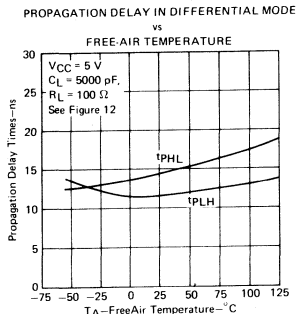


FIGURE 9

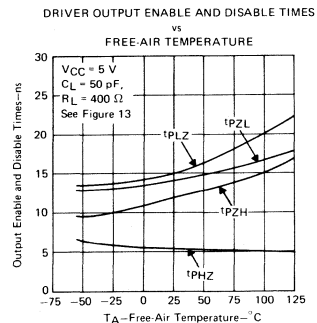
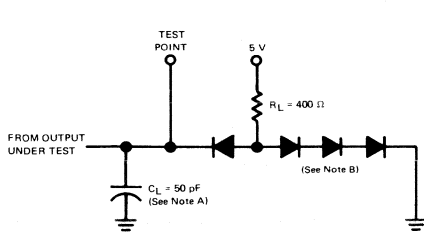


FIGURE 10

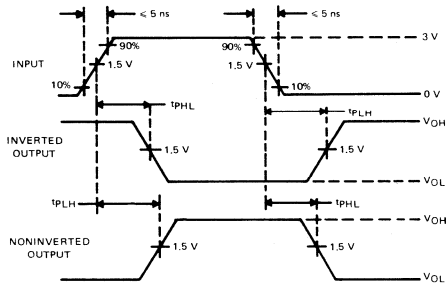
† Data for free-air temperature below 0°C and above 70°C are applicable to DS7831 and DS7832 circuits only.

TYPES DS7831, DS7832, DS8831, DS8832 LINE DRIVERS WITH 3-STATE OUTPUTS

PARAMETER MEASUREMENT INFORMATION

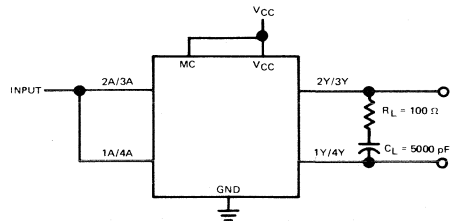


LOAD CIRCUIT

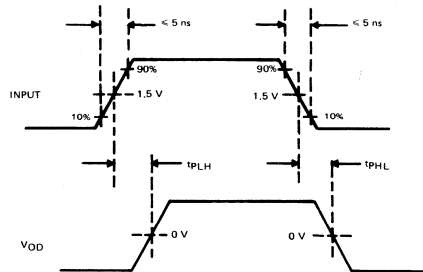


VOLTAGE WAVEFORMS

FIGURE 11— t_{PLH} and t_{PHL} , SINGLE-ENDED MODE

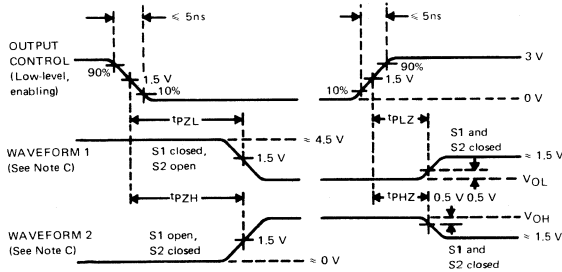


TEST CIRCUIT



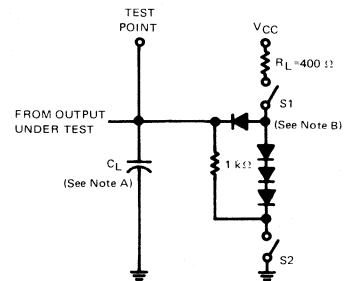
VOLTAGE WAVEFORMS

FIGURE 12— t_{PLH} and t_{PHL} , DIFFERENTIAL MODE



VOLTAGE WAVEFORMS

FIGURE 13—ENABLE AND DISABLE TIMES



LOAD CIRCUIT

NOTES: A. C_L includes probe and job capacitance.

B. All diodes are 1N916 or 1N3064.

C. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

TYPES DS7831, DS7832, DS8831, DS8832 LINE DRIVERS WITH 3-STATE OUTPUTS

TYPICAL APPLICATION DATA

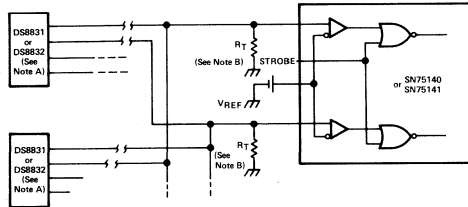


FIGURE 14—PARTY-LINE OPERATION UTILIZING THE SINGLE-ENDED CAPABILITY OF THE DEVICE

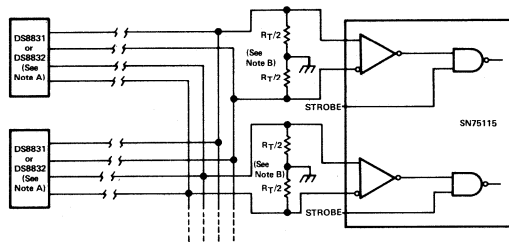


FIGURE 15—PARTY-LINE OPERATION UTILIZING THE DIFFERENTIAL CAPABILITY OF THE DEVICE

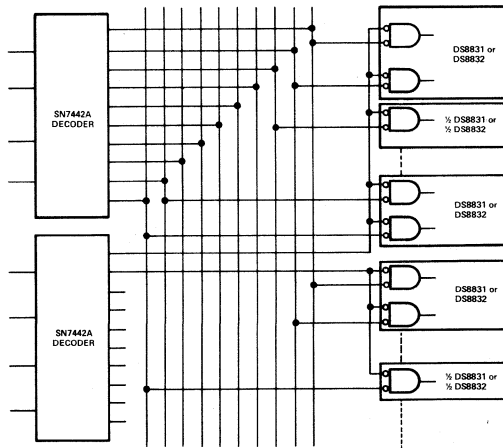


FIGURE 16—USING TWO 4-LINE-TO-10-LINE DECODERS TO CONTROL 100 DRIVER OUTPUTS

- NOTES: A. One device may be driving onto the bus lines, and all other devices should be in the high-impedance state.
B. The value of R_T should be approximately equal to the characteristic impedance of the transmission line.

INTERFACE CIRCUITS

TYPE MC3446 QUADRUPLE BUS TRANSCEIVER

BULLETIN NO. DL-S 7712492, JANUARY 1977

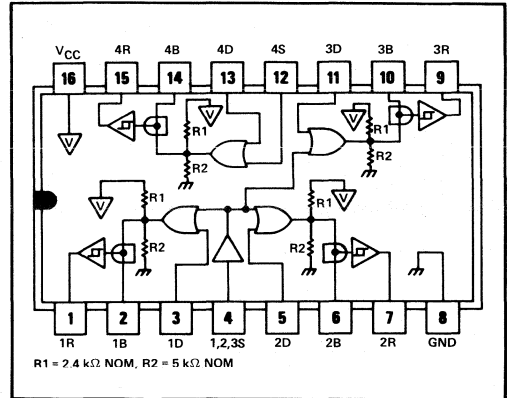
- Driver Inputs Compatible with TTL and MOS Circuitry
- Driver Outputs Stay Off During Power Up and Power Down
- Drivers Feature Open-Collector Outputs for Party-Line Operation
- Designed for Interchangeability with Motorola MC3446
- Meets IEEE Standard 488-1975

description

These circuits are quadruple, single-ended line transceivers designed for bidirectional flow of data and instructions. The bus terminal characteristic complies with paragraph 3.5.3 of IEEE Standard 488 (see Figure 3). Each driver output is tied to the junction of an internal voltage divider that sets the no-load output voltage and provides bus termination. The driver outputs are guaranteed to be "off" during power up and power down if either input is high. The receivers feature 950 millivolts typical hysteresis for noise immunity.

The MC3446 is characterized for operation from 0°C to 70°C.

J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



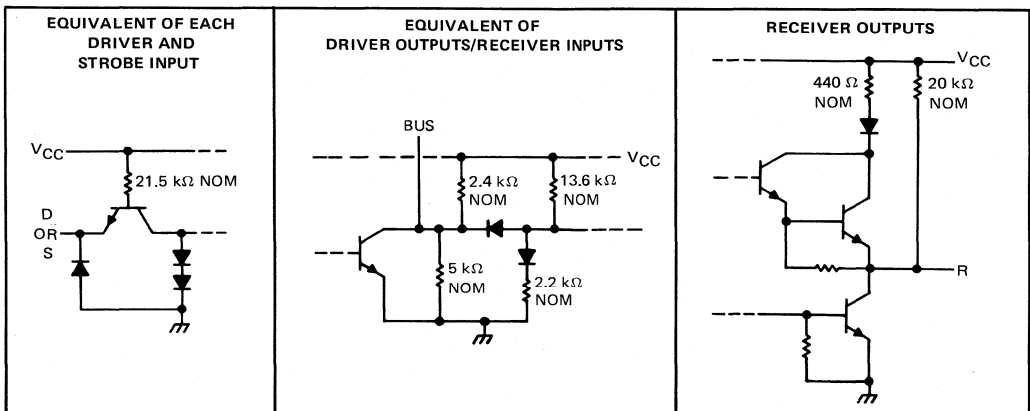
FUNCTION TABLE
(TRANSMITTING)

INPUTS		OUTPUT	
S	D	B	R
L	H	H	H
L	L	L	L

FUNCTION TABLE
(RECEIVING)

INPUTS			OUTPUT
S	B	D	R
H	H	X	H
H	L	X	L

schematics of inputs and outputs



TENTATIVE DATA SHEET

This page provides tentative information on a new product. Texas Instruments reserves the right to change specifications for this product in any manner without notice.

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TYPE MC3446

QUADRUPLE BUS TRANSCEIVER

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Driver output current	150 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	830 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J Package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N Package	260°C

- NOTES: 1. Voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, MC3446 chips are glass-mounted.

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
High-level output current, I_{OH}	Receiver				-0.4 mA
	Driver				48 mA
Low-level output current, I_{OL}	Receiver				8 mA
	Driver				
Operating free-air temperature range, T_A		0	70		°C

electrical characteristics over recommended ranges of V_{CC} and operating free-air temperature (unless otherwise noted)

PARAMETER			TEST CONDITIONS			MIN	TYP†	MAX	UNIT
V_{IH}	High-level input voltage	D or S				2			V
V_{IL}	Low-level input voltage	D or S						0.8	V
V_{IK}	Input clamp voltage	D or S	$I_I = -12$ mA					-1.5	V
V_{T+}	Positive-going input threshold voltage	B				1.5	1.8	2	V
V_{T-}	Negative-going input threshold voltage	B				0.6	0.85	1.1	V
$V_{T+} - V_{T-}$	Input hysteresis	B				400	950		mV
V_{OH}	High-level output voltage	B	$V_{IH} = 2.4$ V, $I_{OH} = 0$			2.5	3.3	3.7	V
		R	$V_{IH} = 2$ V, $I_{OH} = -400$ μ A			2.4			
V_{OL}	Low-level output voltage	B	$V_{IL} = 0.8$ V, $I_{OL} = 48$ mA			0.4			V
		R	$V_{IL} = 0.8$ V, $I_{OL} = 8$ mA			0.4			
$I_{O(bus)}$	Bus current	B	$V_{IH} = 2.4$ V, $V_O = 5.5$ V			2.5			mA
			$V_{IH} = 2.4$ V, $V_O = 5$ V			0.7			
			$V_{IH} = 2.4$ V, $V_O = 0.4$ V			-1.3 -3.2			
V_{OK}	Output clamp voltage	B	$I_O = -12$ mA			-1.5			V
I_I	Input current at maximum input voltage	D or S	$V_I = 5.5$ V			1			mA
I_{IH}	High-level input current	D or S	$V_{IH} = 2.4$ V			5			20 μ A
I_{IL}	Low-level input current	D or S	$V_{CC} = 5$ V, $V_{IL} = 0.4$ V, $T_A = 25^\circ$ C			0.2			0.36 mA
I_{OS}	Short-circuit output current	R	$V_{IH} = 2$ V			4			14 mA
I_{CCH}	Supply current, all outputs high		No load			10			15 mA
I_{CCL}	Supply current, all outputs low		No load			28			35 mA

† All typical values are at $V_{CC} = 5$ V, $T_A = 25^\circ$ C.

TENTATIVE DATA

38 This page provides tentative information on a new product. Texas Instruments reserves the right to change specifications for this product in any manner without notice.

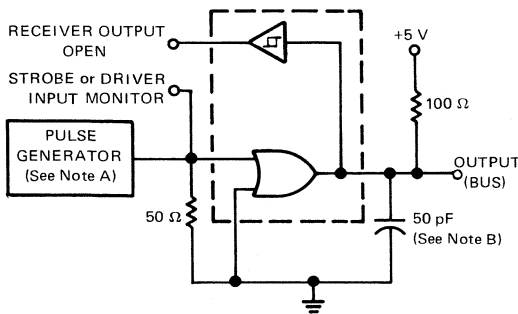
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TYPE MC3446 QUADRUPLE BUS TRANSCEIVER

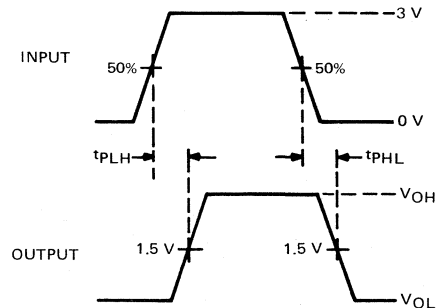
switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	FROM	TO	TEST CONDITIONS	MIN	MAX	UNIT	
t_{PLH} Propagation delay time, low-to-high-level output	D	B	See Figure 1		50	ns	
t_{PHL} Propagation delay time, high-to-low-level output					50		
t_{PLH} Propagation delay time, low-to-high-level output	S	B			50	ns	
t_{PHL} Propagation delay time, high-to-low-level output					50		
t_{PLH} Propagation delay time, low-to-high-level output	B	R		See Figure 2		50	ns
t_{PHL} Propagation delay time, high-to-low-level output						50	

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $t_w = 100\text{ ns}$, $\text{PRR} = 1\text{ MHz}$, $t_r \leq 10\text{ ns}$, $t_f \leq 10\text{ ns}$, $Z_{out} \approx 50\ \Omega$.
 B. This value includes probe and jig capacitance.

FIGURE 1

TENTATIVE DATA

177

This page provides tentative information on a new product. Texas Instruments reserves the right to change specifications for this product in any manner without notice.

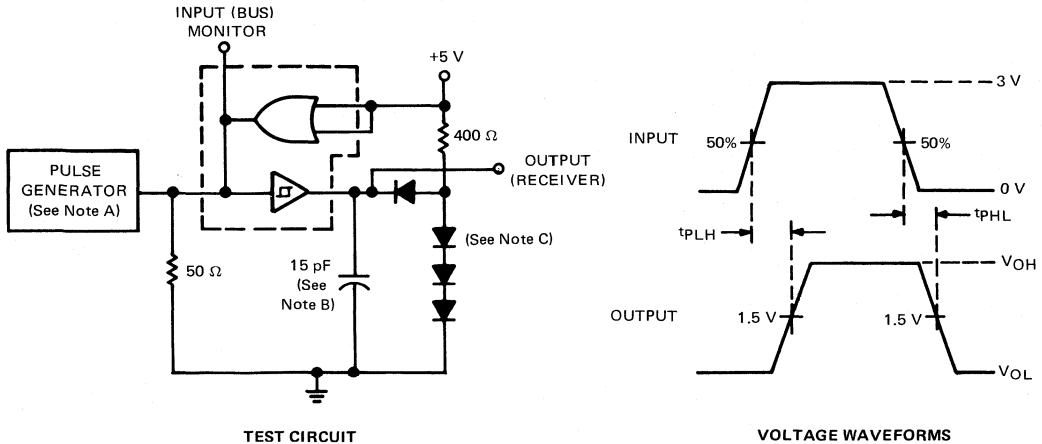
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TYPE MC3446

QUADRUPLE BUS TRANSCEIVER

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The input pulse is supplied by a generator having the following characteristics: $t_w = 100$ ns, PRR = 1 MHz, $t_r \leq 10$ ns, $t_f \leq 10$ ns, $Z_{out} \approx 50 \Omega$.
- B. This value includes probe and jig capacitance.
- C. All diodes are 1N916 or 1N3064.

FIGURE 2

TYPICAL CHARACTERISTICS

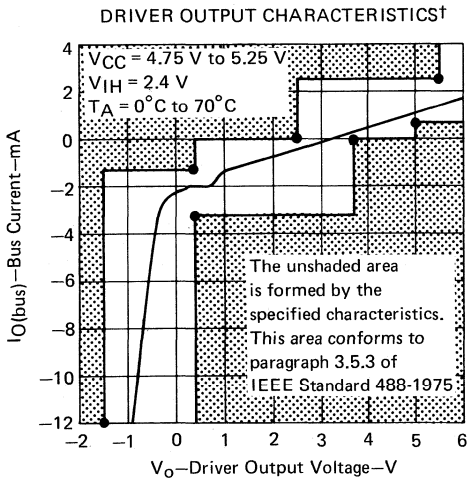


FIGURE 3

†Conditions for typical curve are $V_{CC} = 5$ V, $T_A = 25^\circ$ C.

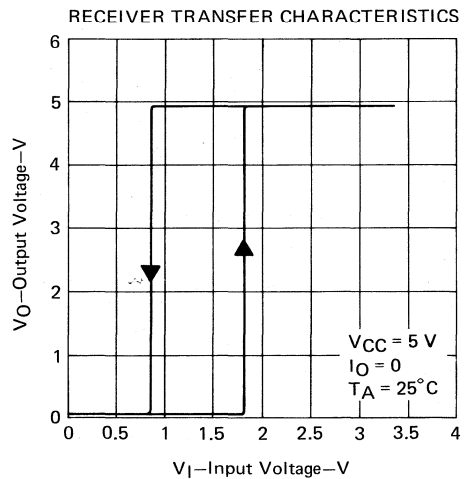


FIGURE 4

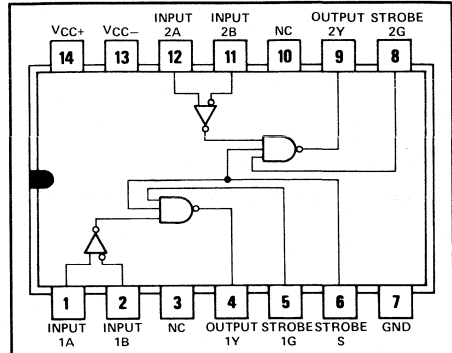
INTERFACE CIRCUITS

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

BULLETIN NO. DLS 7712493, JANUARY 1977

SN55107A, SN55107B, SN55108A,
SN55108B . . . J DUAL-IN-LINE PACKAGE
SN75107A, SN75107B, SN75108A,
SN75108B . . . J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)

- High Speed
- Standard Supply Voltages
- Dual Channels
- High Common-Mode Rejection Ratio
- High Input Impedance
- High Input Sensitivity
- Differential Input Common-Mode Range of ± 3 V
- Differential Input Common-Mode Range of More than ± 15 V Using External Attenuator
- Strobe Inputs For Receiver Selection
- Gate Inputs For Logic Versatility
- TTL or DTL Drive Capability
- High D-C Noise Margin
- '107A and '107B Have Totem-Pole Outputs
- '108A and '108B Have Open-Collector Outputs
- "B" Versions Have Diode-Protected Input Stage For Power-Off Condition



NC—No internal connection

FUNCTION TABLE

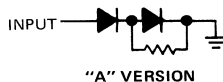
DIFFERENTIAL INPUTS A-B	STROBES		OUTPUT Y
	G	S	
$V_{ID} \geq 25$ mV	X	X	H
	X	L	H
	L	X	H
-25 mV $< V_{ID} < 25$ mV	H	H	INDETERMINATE
	X	L	H
$V_{ID} < -25$ mV	L	X	H
	H	H	L

H = high level, L = low level, X = irrelevant

description

These circuits are TTL/DTL compatible high-speed line receivers. Each is a monolithic dual circuit featuring two independent channels. They are designed for general use as well as such specific applications as data comparators and balanced, unbalanced, and party-line transmission systems. These devices are unilaterally interchangeable with and replace SN55107, SN55108, SN75107, and SN75108, but offer diode-clamped strobe inputs to simplify circuit design.

The essential difference between the "A" and "B" versions can be seen in the schematics. Input-protection diodes are in series with the collectors of the differential-input transistors of the "B" versions. These diodes are useful in certain "party-line" systems that may have multiple V_{CC+} power supplies and may be operated with some of the V_{CC+} supplies turned off. In such a system, if a supply is turned off and allowed to go to ground, the equivalent input circuit connected to that supply would be as follows:



This would be a problem in specific systems that might possibly have the transmission lines biased to some potential greater than 1.4 volts.

The SN55107A, SN55107B, SN55108A, and SN55108B, are characterized for operation over the full military temperature range of -55°C to 125°C . The SN75107A, SN75107B, SN75108A, and SN75108B are characterized for operation from 0°C to 70°C .

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

design characteristics

The '107A, '107B, '108A, and '108B line receivers are TTL-compatible dual circuits intended for use in high-speed data-transmission systems. They are designed to detect low-level differential signals in the presence of common-mode noise and variations of temperature and supplies. Dc specifications reflect worst-case conditions of temperature, supply voltages, and input voltages.

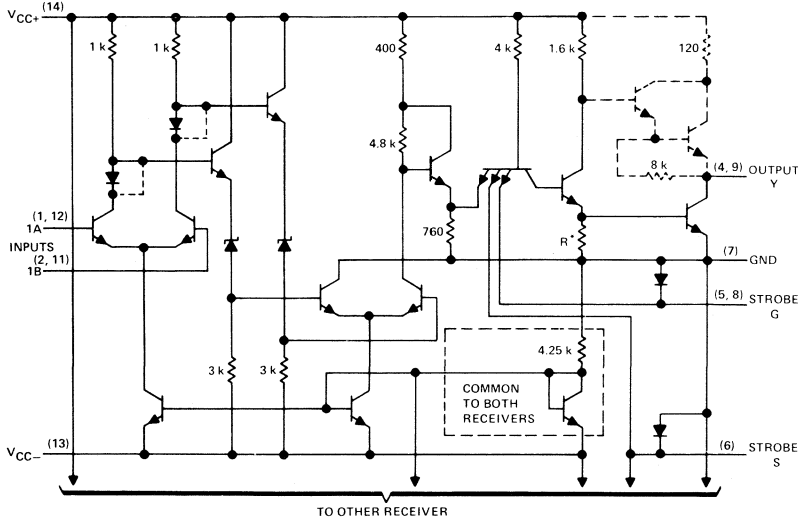
These receivers feature independent channels with common voltage supply and ground terminals. The '107A and '107B feature TTL-compatible active pull-up (totem-pole) outputs. The '108A and '108B are also TTL-compatible, but feature an open-collector output configuration that permits the wired-AND logic connection with similar outputs (such as the SN5401/SN7401 TTL gate or other '108A/'108B line receivers). This permits a level of logic to be implemented without extra delay. All other features of the line receivers are identical.

The input common-mode voltage range is ± 3 volts. This is adequate for application in most systems. In systems with requirements for greater common-mode voltage range, input attenuators may be used to decrease the noise to an acceptable level at the receiver-input terminals.

The receivers feature individual strobe inputs for each channel and a strobe input common to both channels for logic versatility. The strobe inputs are tested to guarantee 400 millivolts of dc noise margin when interfaced with Series 54/74 TTL.

The circuits feature high input impedance and low input currents, which induce very little loading on the transmission line. This makes these devices especially useful in party-line systems. The excellent input sensitivity is particularly important when data is to be detected at the end of a long transmission line and the amplitude of the data has deteriorated due to cable losses. These line receivers are designed to detect input signals of 25 millivolts (or greater) amplitude and convert the polarity of the signal into appropriate TTL-compatible output logic levels. For applications that require a greater sensitivity (± 10 mV), the SN75207, SN75207B, SN75208, and SN75208B are recommended.

schematic (each receiver)



* $R = 1$ k Ω for '107A and '107B, 750 Ω for '108A and '108B.

NOTES: A. Resistor values shown are nominal and in ohms.

B. Components shown with dashed lines in the output circuitry are applicable to the '107A and 107B only. Diodes in series with the collectors of the differential input transistors are short-circuited on '107A and '108A.

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage V_{CC+} (see Note 1)	7 V
Supply voltage V_{CC-}	-7 V
Differential input voltage (see Note 2)	± 6 V
Common-mode input voltage (see Note 3)	± 5 V
Strobe input voltage	5.5 V
Continuous total dissipation at (or below) 70°C free-air temperature (see Note 4)	600 mW
Operating free-air temperature range, Series 55	-55°C to 125°C
Series 75	0°C to 70°C
Storage temperature range	-65°C to 150°C

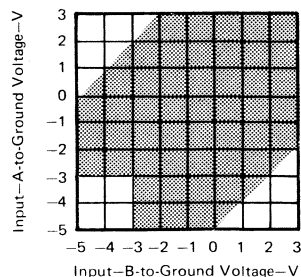
recommended operating conditions (see note 5)

	SN55107A, SN55107B			SN75107A, SN75107B			UNIT
	SN55108A, SN55108B			SN75108A, SN75108B			
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage V_{CC+}	4.5	5	5.5	4.75	5	5.25	V
Supply voltage V_{CC-}	-4.5	-5	-5.5	-4.75	-5	-5.25	V
Low-level output current, I_{OL}			-16			-16	mA
Differential input voltage, V_{ID} (see Note 6)	-5†		5	-5†		5	V
Common-mode input voltage, V_{IC} (see Notes 6 and 7)	-3†		3	-3†		3	V
Input voltage range, any differential input to ground (see Note 6)	-5†		3	-5†		3	V
Operating free-air temperature	-55		125	0		70	°C

†The algebraic convention where the more positive (less negative) limit is designated as maximum is used in this data sheet for logic voltage levels only.

- NOTES:
1. All voltage values, except differential voltages, are with respect to network ground terminal.
 2. Differential voltage values are at the noninverting (A) terminal with respect to the inverting (B) terminal.
 3. Common-mode input voltage is the average of the voltages at the A and B inputs.
 4. For operation of SN55107A, SN55107B, SN55108A, or SN55108B above 70°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, these Series 55 chips are alloy-mounted; Series 75 chips are glass-mounted.
 5. When using only one channel of the line receiver, the strobe G of the unused channel should be grounded and at least one of the differential inputs of the unused receiver should be terminated at some voltage between -3 V and 3 V.
 6. The recommended combinations of input voltages fall within the shaded area of the figure at the right.
 7. The common-mode voltage may be as low as -4 V provided that one of the two inputs is not more negative than -3 V.

RECOMMENDED COMBINATIONS
OF INPUT VOLTAGES



TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

definition of input logic levels†

		MIN	MAX	UNIT
V _{IDH}	High-level input voltage between differential inputs	0.025	5	V
V _{IDL}	Low-level input voltage between differential inputs	-5	-0.025	V
V _{IH(S)}	High-level input voltage at strobe inputs	2	5.5	V
V _{IL(S)}	Low-level input voltage at strobe inputs	0	0.8	V

† The algebraic convention where the more positive (less negative) limit is designated as maximum is used in this data sheet for logic voltage levels only.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS‡		'107A, '107B		'108A, '108B		UNIT	
				MIN	TYP§ MAX	MIN	TYP§ MAX		
I _{IH}	High-level input current	A	V _{CC±} = MAX	V _{ID} = 5 V	30	75	30	75	μA
		B		V _{ID} = -5 V	30	75	30	75	
I _{IL}	Low-level input current	A	V _{CC±} = MAX	V _{ID} = -5 V			-10	-10	μA
		B		V _{ID} = 5 V			-10	-10	
I _{IH}	High-level input current into 1G or 2G	V _{CC±} = MAX, V _{IH(S)} = 2.4 V			40		40	μA	
		V _{CC±} = MAX, V _{IH(S)} = MAX V _{CC+}			1		1	mA	
I _{IL}	Low-level input current into 1G or 2G	V _{CC±} = MAX, V _{IL(S)} = 0.4 V			-1.6		-1.6	mA	
I _{IH}	High-level input current into S	V _{CC±} = MAX, V _{IH(S)} = 2.4 V			80		80	μA	
		V _{CC±} = MAX, V _{IH(S)} = MAX V _{CC+}			2		2	mA	
I _{IL}	Low-level input current into S	V _{CC±} = MAX, V _{IL(S)} = 0.4 V			-3.2		-3.2	mA	
V _{OH}	High-level output voltage	V _{CC±} = MIN, V _{IL(S)} = 0.8 V, V _{IDH} = 25 mV I _{OH} = -400 μA, V _{IC} = -3 V to 3 V		2.4				V	
V _{OL}	Low-level output voltage	V _{CC±} = MIN, V _{IH(S)} = 2 V, V _{IDL} = -25 mV I _{OL} = 16 mA, V _{IC} = -3 V to 3 V			0.4		0.4	V	
I _{OH}	High-level output current	V _{CC±} = MIN, V _{OH} = MAX V _{CC+}					250	μA	
I _{OS}	Short-circuit output current¶	V _{CC±} = MAX		-18		-70		mA	
I _{CCH+}	Supply current from V _{CC+} , outputs high	V _{CC±} = MAX, T _A = 25°C		18	30	18	30	mA	
I _{CCH-}	Supply current from V _{CC-} , outputs high	V _{CC±} = MAX, T _A = 25°C		-8.4	-15	-8.4	-15	mA	

‡ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

§ All typical values are at V_{CC+} = 5 V, V_{CC-} = -5 V, T_A = 25°C.

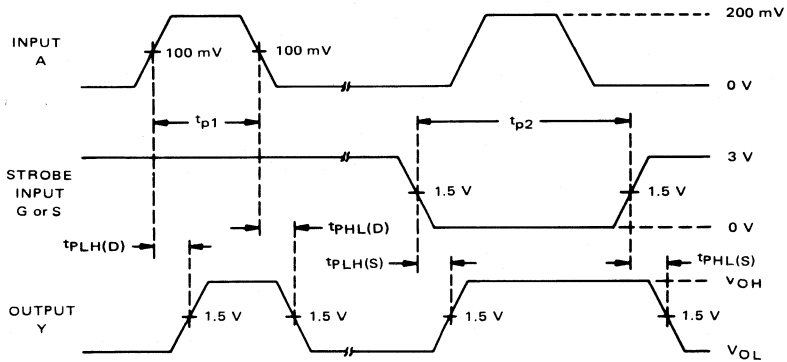
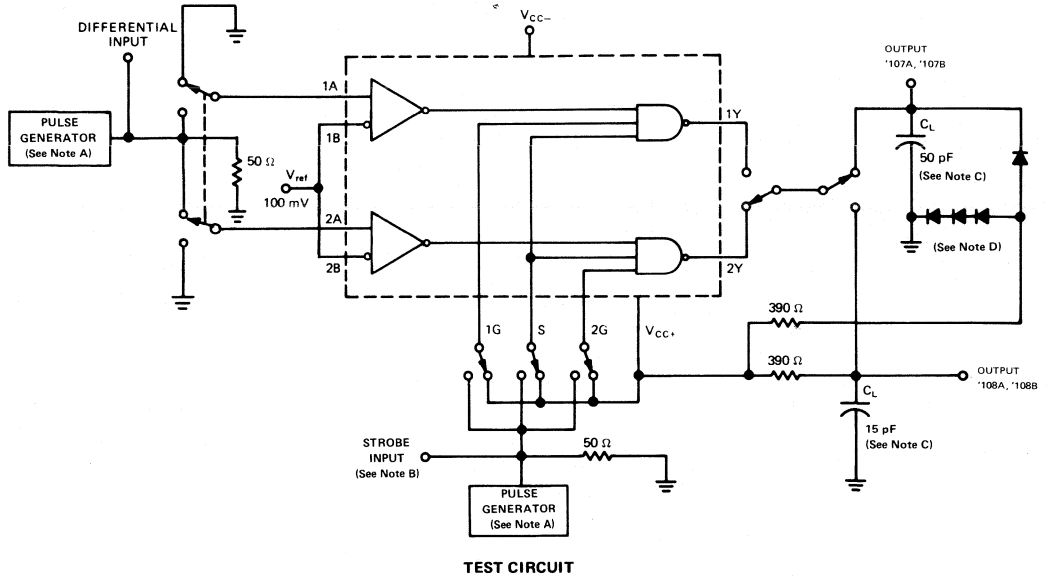
¶ Not more than one output should be shorted at a time.

switching characteristics, V_{CC±} = ±5 V, T_A = 25°C, see figure 1

PARAMETER		TEST CONDITIONS		'107A, '107B		'108A, '108B		UNIT
				MIN	TYP MAX	MIN	TYP MAX	
t _{PLH(D)}	Propagation delay time, low-to-high-level output, from differential inputs A and B	R _L = 390 Ω, C _L = 50 pF		17	25			ns
		R _L = 390 Ω, C _L = 15 pF				19	25	
t _{PHL(D)}	Propagation delay time, high-to-low-level output, from differential inputs A and B	R _L = 390 Ω, C _L = 50 pF		17	25			ns
		R _L = 390 Ω, C _L = 15 pF				19	25	
t _{PLH(S)}	Propagation delay time, low-to-high-level output, from strobe input G or S	R _L = 390 Ω, C _L = 50 pF		10	15			ns
		R _L = 390 Ω, C _L = 15 pF				13	20	
t _{PHL(S)}	Propagation delay time, high-to-low-level output, from strobe input G or S	R _L = 390 Ω, C _L = 50 pF		8	15			ns
		R _L = 390 Ω, C _L = 15 pF				13	20	

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The pulse generators have the following characteristics: $Z_{out} = 50 \Omega$, $t_r = t_f = 10 \pm 5$ ns, $t_{p1} = 500$ ns, $PRR = 1$ MHz, $t_{p2} = 1$ ms, $PRR = 500$ kHz.
- B. Strobe input pulse is applied to Strobe 1G when inputs 1A-1B are being tested, to Strobe S when inputs 1A-1B or 2A-2B are being tested, and to Strobe 2G when inputs 2A-2B are being tested.
- C. C_L includes probe and jig capacitance.
- D. All diodes are 1N916.

FIGURE 1—PROPAGATION DELAY TIMES

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

TYPICAL CHARACTERISTICS†

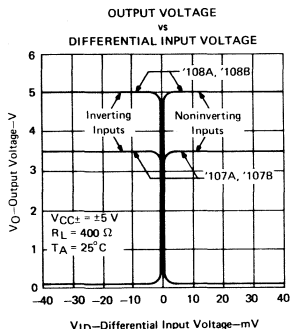


FIGURE 2

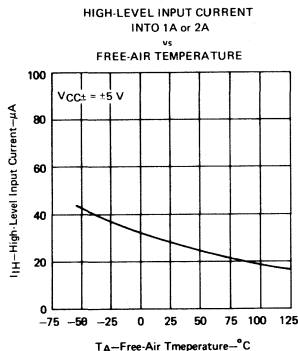


FIGURE 3

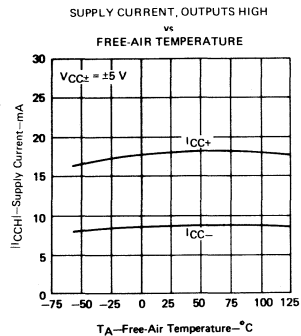


FIGURE 4

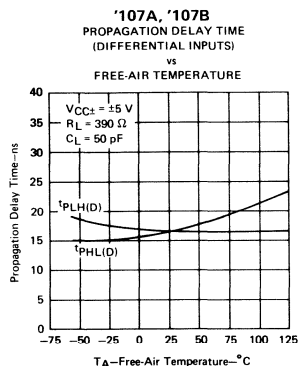


FIGURE 5

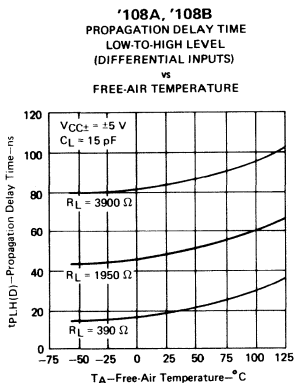


FIGURE 6

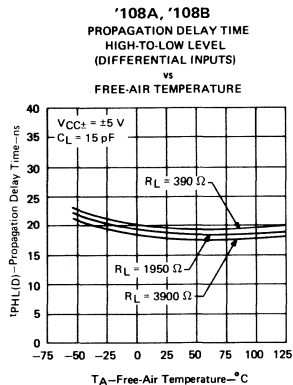


FIGURE 7

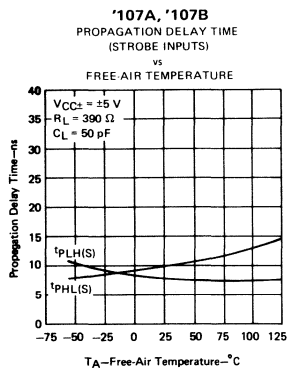


FIGURE 8

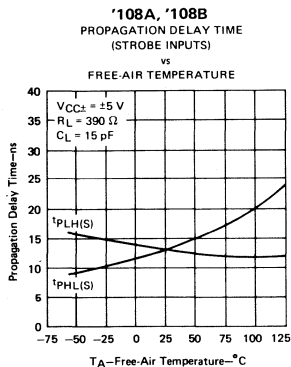


FIGURE 9

† Data for temperatures below 0°C and above 70°C are applicable for Series 55 devices only.

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

basic balanced-line transmission system

The '107A, '107B, '108A, and '108B dual line circuits are designed specifically for use in high-speed data transmission systems that utilize balanced, terminated transmission lines such as twisted-pair lines. The system operates in the balanced mode, so noise induced on one line is also induced on the other. The noise appears common-mode at the receiver input terminals where it is rejected. The ground connection between the line driver and receiver is not part of the signal circuit so that system performance is not affected by circulating ground currents.

The unique driver-output circuit allows terminated transmission lines to be driven at normal line impedances. High-speed system operation is ensured since line reflections are virtually eliminated when terminated lines are used. Crosstalk is minimized by low signal amplitudes and low line impedances.

The typical data delay in a system is approximately $(30 + 1.3 L)$ nanoseconds, where L is the distance in feet separating the driver and receiver. This delay includes one gate delay in both the driver and receiver.

Data is impressed on the balanced-line system by unbalancing the line voltages with the driver output current. The driven line is selected by appropriate driver-input logic levels. The voltage difference is approximately:

$$V_{DIFF} \approx 1/2 I_{O(on)} \cdot R_T$$

High series line resistance will cause degradation of the signal. The receivers, however, will detect signals as low as 25 mV (or less). For normal line resistances, data may be recovered from lines of several thousand feet in length.

Line-termination resistors (R_T) are required only at the extreme ends of the line. For short lines, termination resistors at the receiver only may prove adequate. The signal amplitude will then be approximately:

$$V_{DIFF} \approx I_{O(on)} \cdot R_T$$

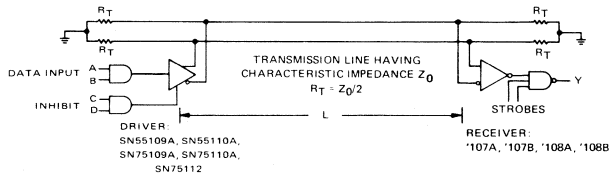


FIGURE 10

data-bus or party-line system

The strobe feature of the receivers and the inhibit feature of the drivers allow these dual line circuits to be used in data-bus or party-line systems. In these applications, several drivers and receivers may share a common transmission line. An enabled driver transmits data to all enabled receivers on the line while other drivers and receivers are disabled. Data is thus time-multiplexed on the transmission line. The device specifications allow widely varying thermal and electrical environments at the various driver and receiver locations. The data-bus system offers maximum performance at minimum cost.

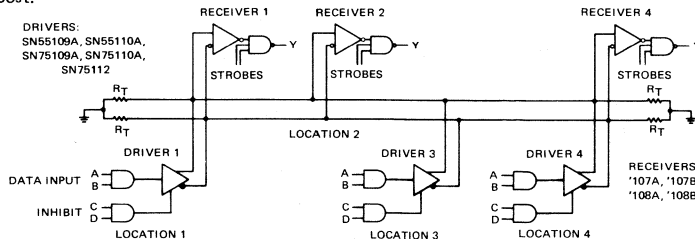


FIGURE 11

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

unbalanced or single-line systems

These dual line circuits may also be used in unbalanced or single-line systems. Although these systems do not offer the same performance as balanced systems for long lines, they are adequate for very short lines where environmental noise is not severe.

The receiver threshold level is established by applying a d-c reference voltage to one receiver input terminal. The signal from the transmission line is applied to the remaining input. The reference voltage should be optimized so that signal swing is symmetrical about it for maximum noise margin. The reference voltage should be in the range of -3 volts to $+3$ volts. It can be provided by a voltage supply or by a voltage divider from an available supply voltage.

A single-ended output from a driver may be used in single-line systems. Coaxial or shielded line is preferred for minimum noise and crosstalk problems. For large signal swings, the high output current (typically 27 mA) of the SN75112 is recommended. Drivers may be paralleled for higher current. When using only one channel of the line drivers, the other channel should be inhibited and/or have its outputs grounded.

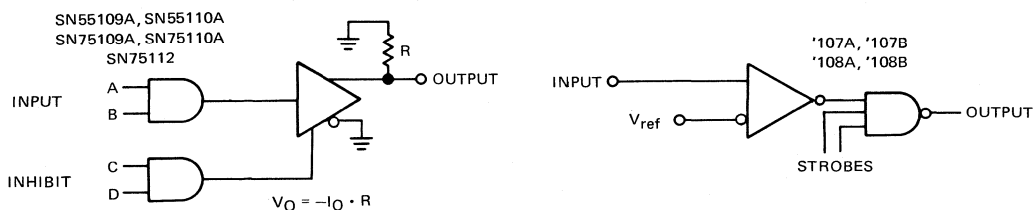


FIGURE 12

'108A, '108B dot-AND output connections

The '108A, '108B line receivers feature an open-collector-output circuit that can be connected in the dot-AND logic configuration with other similar open-collector outputs. This allows a level of logic to be implemented without additional logic delay.

For rules for such dot-AND connections, refer to the SN5401/SN7401 data sheet.

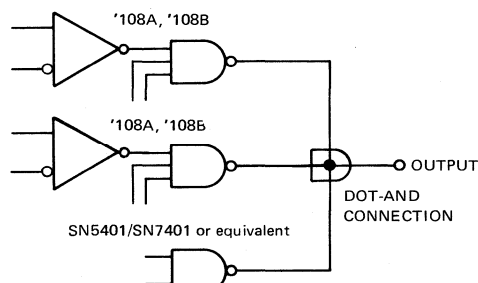


FIGURE 13

increasing common-mode input voltage range of receiver

The common-mode voltage range or CMVR is defined as the range of voltage applied simultaneously to both input terminals that if exceeded does not allow normal operation of the receiver.

The recommended operating CMVR is ± 3 volts, making it useful in all but the noisiest environments. In extremely noisy environments, common-mode voltage can easily reach ± 10 V to ± 15 V if some precautions are not taken to reduce ground and power supply noise, as well as crosstalk problems. When the receiver must operate in such conditions, input attenuators should be used to decrease the system common-mode noise to a tolerable level at the receiver inputs. Differential noise is also reduced by the same ratio.

These attenuators have been intentionally omitted from the receiver input terminals so the designer may select resistors that will be compatible with his particular application or environment. Furthermore, the use of attenuators adversely affects the input sensitivity, the propagation delay time, the power dissipation, and in some cases (depending on the selected resistor values) the input impedance, therefore reducing the versatility of the receiver.

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

increasing common-mode input voltage range of receiver, continued

The ability of the receiver to operate with approximately ± 15 volts common-mode voltage at the inputs has been checked using the circuit shown in Figure 14. The resistors R1 and R2 provide a voltage divider network. Dividers with three different values presenting a 5-to-1 attenuation were used so as to operate the differential inputs at approximately ± 3 volts common-mode voltage. Careful matching of the two attenuators is needed so as to balance the overdrive at the input stage. The resistors used are shown in Table A.

TABLE A

Attenuator 1: R1 = 2 k Ω , R2 = 0.5 k Ω
Attenuator 2: R1 = 6 k Ω , R2 = 1.5 k Ω
Attenuator 3: R1 = 12 k Ω , R2 = 3 k Ω

TABLE B – TYPICAL PROPAGATION DELAYS FOR
RECEIVER WITH ATTENUATOR TEST CIRCUIT
SHOWN IN FIGURE 14

DEVICE	PARAMETERS	INPUT ATTENUATOR	TYPICAL (ns)
'107A, '107B	t _{PLH}	1	20
		2	32
		3	42
	t _{PHL}	1	22
		2	31
		3	33
'108A, '108B	t _{PLH}	1	36
		2	47
		3	57
	t _{PHL}	1	29
		2	38
		3	41

Table B shows some of the typical switching results obtained under such conditions.

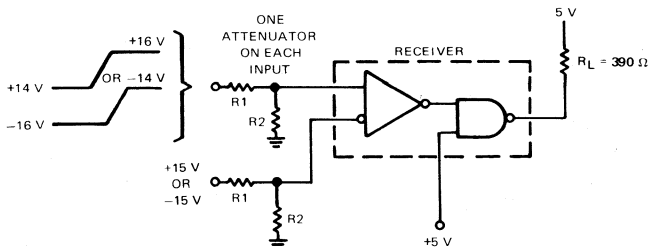


FIGURE 14—COMMON-MODE CIRCUIT FOR TESTING INPUT ATTENUATORS, WITH RESULTS SHOWN IN TABLE B

Two methods of terminating a transmission line to reduce reflections are:

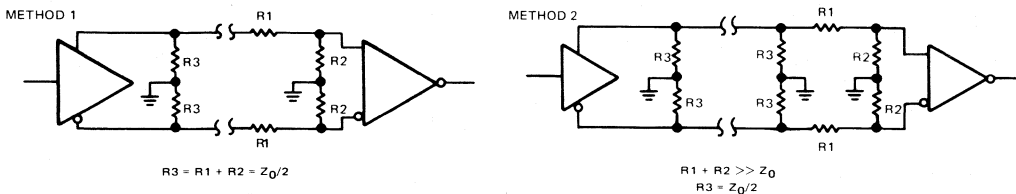


FIGURE 15

The first method uses the resistors as the attenuation network and line termination. The second method uses two additional resistors for the line terminations.

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

increasing common-mode input voltage range of receiver, continued

For party-line operation, method 2 should be used as follows:

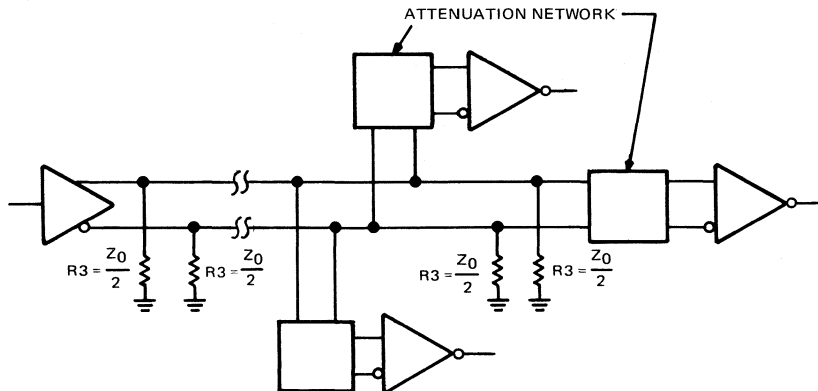


FIGURE 16

To minimize the loading, the values of R1 and R2 should be fairly large. Examples of possible values are shown in Table A.

furnace control using the SN75108A

The furnace control circuit in Figure 17 is an example of the possible use of the SN55107A Series in areas other than what would normally be considered electronic systems. Basically the operation of this control is as follows. When the room temperature is below the desired level, the resistance of the room temperature sensor is high and channel 1 noninverting input is below (less positive than) the reference level set on the input differential amplifier. This situation causes a low output, operating the "heat on" relay and turning on the heat. The channel 2 noninverting input is below the reference level when the bonnet temperature of the furnace reaches the desired level. This causes a low output, thus operating the blower relay. Normally the furnace is shut down when the room temperature reaches the desired level and the channel 1 output goes high, turning the heat off. The blower remains on as long as the bonnet temperature is high, even after the "heat on" relay is off. There is also a safety switch in the bonnet that shuts the furnace down if the temperature there exceeds desired limitations. The types of temperature-sensing devices and bias-resistor values used are determined by the particular operating conditions encountered.

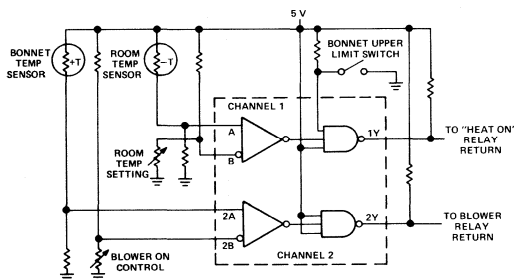


FIGURE 17—FURNACE CONTROL USING SN75108A

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

repeaters for long lines

In some cases, the driven line may be so long that the noise level on the line reaches the common-mode limits or the attenuation becomes too large and results in poor reception. In such a case, a simple application of a receiver and a driver as repeaters (shown in Figure 18a) restores the signal level and allows an adequate signal level at the receiving end. If multichannel operation is desired, then proper gating for each channel must be sent through the repeater station using another repeater set as in Figure 18b.

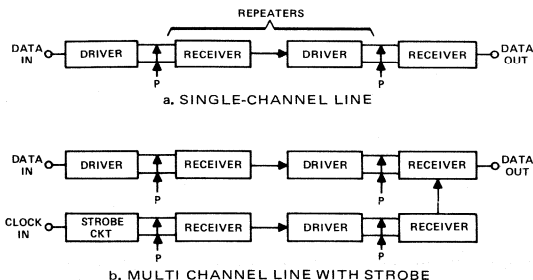


FIGURE 18—RECEIVER-DRIVER REPEATERS

receiver as dual differential comparator

There are many applications for differential comparators, such as voltage comparison, threshold detection, controlled Schmitt triggering, and pulse width control.

As a differential comparator, a '107A or '108A may be connected so as to compare the noninverting input terminal with the inverting input as shown in Figure 19. Thus the output will be high or low resulting from the A input being greater or less than the reference. The strobe inputs allow additional control over the circuit so that either output or both may be inhibited.

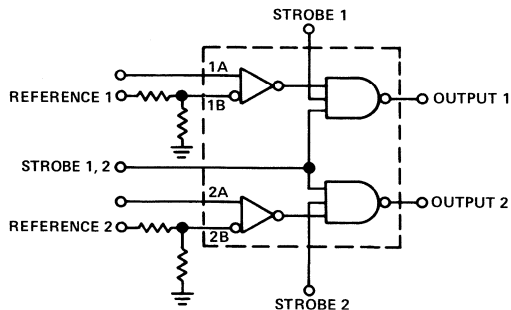
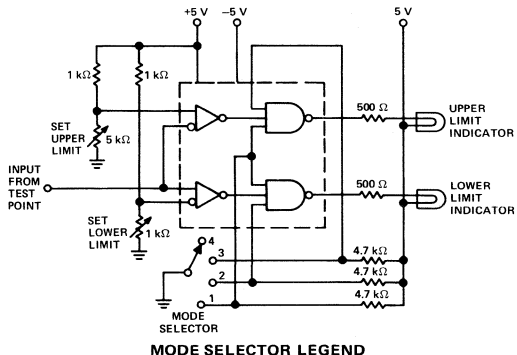


FIGURE 19—SN55107A SERIES RECEIVER AS A DUAL DIFFERENTIAL COMPARATOR

window detector

The window detector circuit in Figure 20 has a large number of applications in test equipment and in determining upper limits, lower limits, or both at the same time — such as detecting whether a voltage or signal has exceeded its limits or "window". Illumination of the upper-limit (lower-limit) indicator shows that the input voltage is above (below) the selected upper (lower) limit. A mode selector is provided for selecting the desired test. For window detecting, the "upper and lower limits" test position is used.



MODE SELECTOR LEGEND

POSITION	CONDITION
1	OFF
2	TEST FOR UPPER LIMIT
3	TEST FOR LOWER LIMIT
4	TEST FOR UPPER AND LOWER LIMITS

FIGURE 20—WINDOW DETECTOR USING SN75108A

TYPES SN55107A, SN55107B, SN55108A, SN55108B, SN75107A, SN75107B, SN75108A, SN75108B DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

temperature controller with zero-voltage switching

The circuit in Figure 21 switches an electric resistive heater on or off by providing negative-going pulses to the gate of a triac during the time interval when the line voltage is passing through zero. The pulse generator is the 2N5447 and four diodes. This portion of the circuit provides negative-going pulses during the short time (approximately 100 μ s) when the line voltage is near zero. These pulses are fed to the inverting input of one channel of the '108A. If the room temperature is below the desired level, the resistance of the thermistor is high and the noninverting input of channel 2 is above the reference level determined by the thermostat setting. This provides a high-level output from channel 2. This output is AND'ed with the positive-going pulses from the output of channel 1, which are reinverted in the 2N5449. This output is fed to the gate of a triac which switches the heater load.

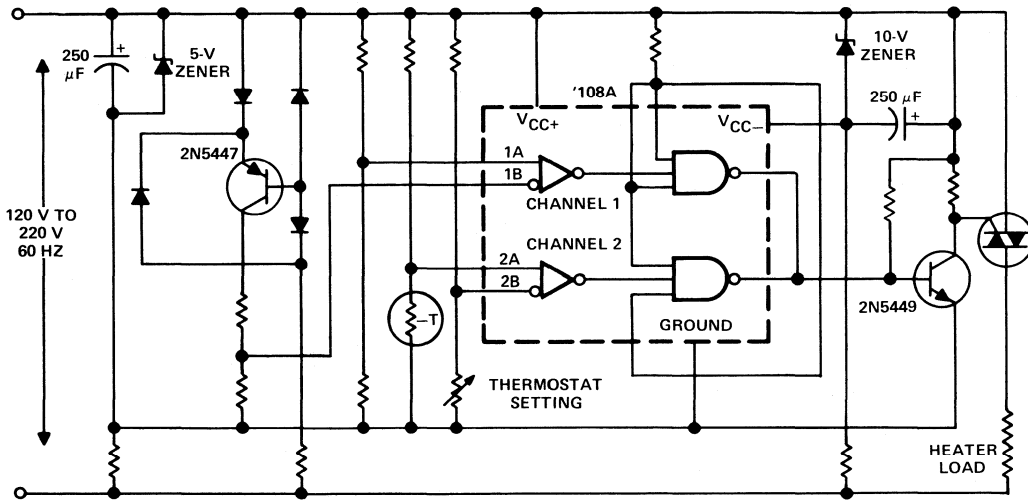


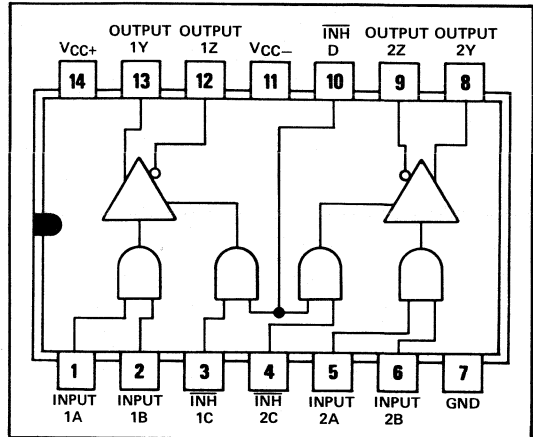
FIGURE 21—ZERO-VOLTAGE SWITCHING TEMPERATURE CONTROLLER

INTERFACE CIRCUITS

TYPES SN55109A, SN55110A, SN75109A, SN75110A, SN75112 DUAL LINE DRIVERS

BULLETIN NO. DLS 7712334, DECEMBER 1975—REVISED JANUARY 1977

SN55109A, SN55110A . . . J DUAL-IN-LINE PACKAGE
SN75109A, SN75110A, SN75112 . . . J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



- Improved Stability over Supply Voltage and Temperature Ranges
- Constant-Current Output
- High Speed
- Standard Supply Voltages
- High Output Impedance
- High Common-Mode Output Voltage Range (−3 V to 10 V)
- TTL Input Compatibility
- Inhibitor Available for Driver Selection

−55° C to 125° C J Package	0° C to 70° C J or N Package	OUTPUT FUNCTION
SN55109A	SN75109A	6-mA Current Switch
SN55110A	SN75110A	12-mA Current Switch
	SN75112	27-mA Current Switch

description

The SN55109A, SN55110A, SN75109A, SN75110A, and SN75112 have improved output current regulation with supply voltage and temperature variations. In addition the higher current of the SN75112 (27 mA) allows data to be transmitted over longer lines. These drivers offer optimum performance when used with the SN55107A, SN55108A, SN75107A, and SN75108A line receivers.

These drivers feature independent channels with common voltage supply and ground terminals. The significant difference between the three drivers is in the output current specification. The driver circuits feature a constant output current that is switched to either of two output terminals by the appropriate logic levels at the input terminals. The output current can be switched off (inhibited) by low logic levels on the inhibit inputs. The output current is nominally 6 milliamperes for the '109A, 12 milliamperes for the '110A, and 27 milliamperes for the SN75112.

The inhibit feature is provided so the circuits can be used in party-line or data-bus applications. A strobe or inhibitor, common to both drivers, is included for increased driver-logic versatility. The output current in the inhibited mode, $I_{O(off)}$, is specified so that minimum line loading is induced when the driver is used in a party-line system with other drivers. The output impedance of the driver in the inhibited mode is very high—the output impedance of a transistor biased to cutoff.

The driver outputs have a common-mode voltage range of −3 volts to 10 volts, allowing common-mode voltage on the line without affecting driver performance.

All inputs are diode clamped and are designed to satisfy TTL-system requirements. The inputs are tested at 2.0 volts for high-logic-level input conditions and 0.8 volt for low-logic-level input conditions. These tests guarantee 400 millivolts of noise margin when interfaced with Series 54/74 TTL.

FUNCTION TABLE

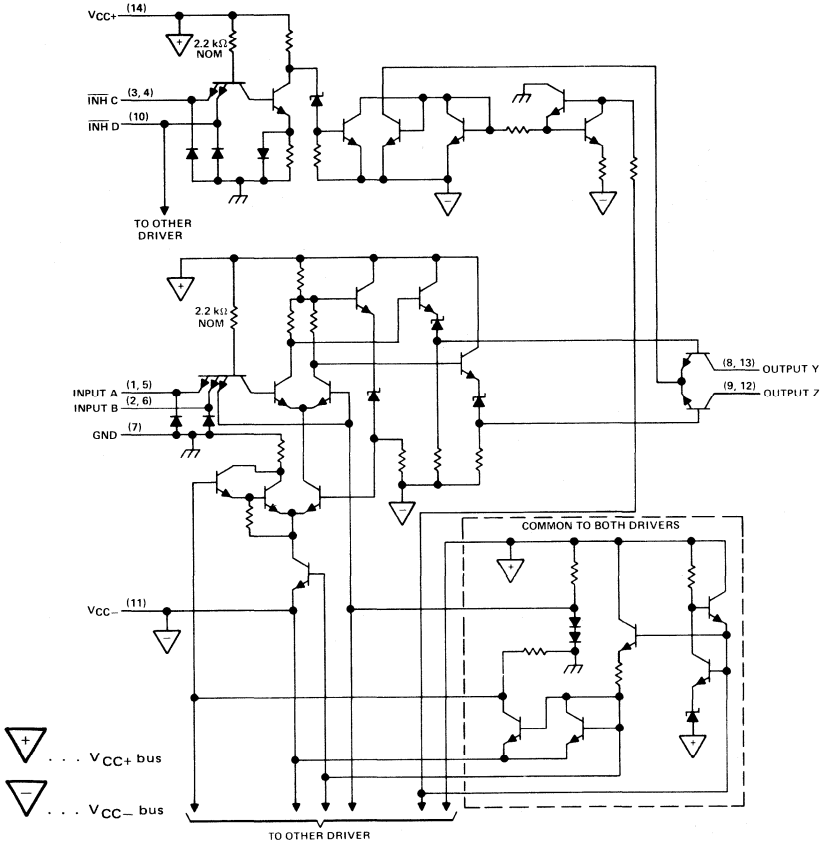
LOGIC INPUTS		INHIBITOR INPUTS		OUTPUTS	
A	B	C	D	Y	Z
X	X	L	X	OFF	OFF
X	X	X	L	OFF	OFF
L	X	H	H	ON	OFF
X	L	H	H	ON	OFF
H	H	H	H	OFF	ON

H = high level, L = low level, X = irrelevant.

TYPES SN55109A, SN55110A, SN75109A, SN75110A, SN75112

DUAL LINE DRIVERS

schematic (each driver)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC+} (see Note 1)	7 V
Supply voltage, V_{CC-}	-7 V
Input voltage (any input)	5.5 V
Output voltage (any output)	-5 V to 12 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2): J package	1025 mW
N package	1150 mW
Operating free-air temperature, Series 55	-55°C to 125°C
Series 75	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

- NOTES: 1. Voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55109A and SN55110A chips are alloy-mounted; SN75109A, SN75110A, and SN75112 chips are glass-mounted.

TYPES SN55109A, SN55110A, SN75109A, SN75110A, SN75112

DUAL LINE DRIVERS

recommended operating conditions (see note 3)

	SN55109A, SN55110A			SN75109A, SN75110A, SN75112			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage V_{CC+}	4.5	5	5.5	4.75	5	5.25	V
Supply voltage V_{CC-}	-4.5	-5	-5.5	-4.75	-5	-5.25	V
Positive common-mode output voltage	0	10	0	0	10	0	V
Negative common-mode output voltage	0	-3	0	0	-3	0	V
Operating free-air temperature range	-55	125	0	70	0	70	°C

NOTE 3: When using only one channel of the line drivers, the other channel should be inhibited and/or its outputs grounded.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	SN55109A, SN75109A		SN55110A, SN75110A		SN75112		UNIT
	MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IH}	2		0.8		2		V
V_{IL}			0.8				V
V_{IK}			-0.9	-1.5			0.8 V
I_O (on)			$V_{CC±} = \text{MIN}, I_I = -12 \text{ mA}$				-0.9 -1.5 V
I_O (off)			$V_{CC±} = \text{MAX}, V_O = 10 \text{ V}$				6 7 12 15 27 36 mA
I_I			$V_{CC±} = \text{MIN}, V_O = -3 \text{ V}$				3.5 6 6.5 12 18 27 mA
I_{IH}			$V_{CC±} = \text{MIN}, V_O = 10 \text{ V}$				100 100 100 µA
I_{IL}			$V_{CC±} = \text{MAX}, V_I = 5.5 \text{ V}$				1 1 1 mA
I_{CC+} (on)			$V_{CC±} = \text{MAX}, V_I = 2.4 \text{ V}$				2 2 2 mA
I_{CC-} (on)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				40 40 40 µA
I_{CC+} (off)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				80 80 80 µA
I_{CC-} (off)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				-3 -3 -3 mA
I_{CC+} (on)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				-6 -6 -6 mA
I_{CC-} (on)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				18 30 23 35 25 40 mA
I_{CC+} (off)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				-18 -30 -34 -50 -65 -100 mA
I_{CC-} (off)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				18 21 30 30 mA
I_{CC+} (off)			$V_{CC±} = \text{MAX}, V_I = 0.4 \text{ V}$				-10 -17 -32 mA

†For conditions shown as MIN or MAX, use appropriate value specified under recommended operating conditions.

‡All typical values are at $V_{CC+} = 5 \text{ V}, V_{CC-} = -5 \text{ V}, T_A = 25^\circ\text{C}$.

TYPES SN55109A, SN55110A, SN75109A, SN75110A, SN75112

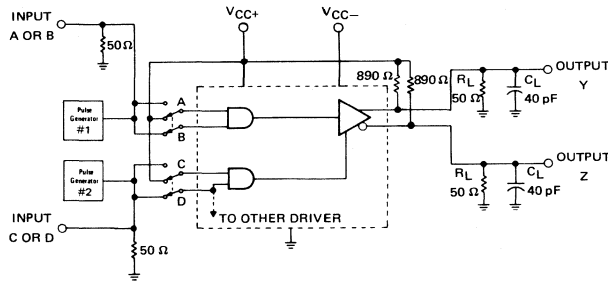
DUAL LINE DRIVERS

switching characteristics, $V_{CC+} = 5\text{ V}$, $V_{CC-} = -5\text{ V}$, $T_A = 25^\circ\text{C}$

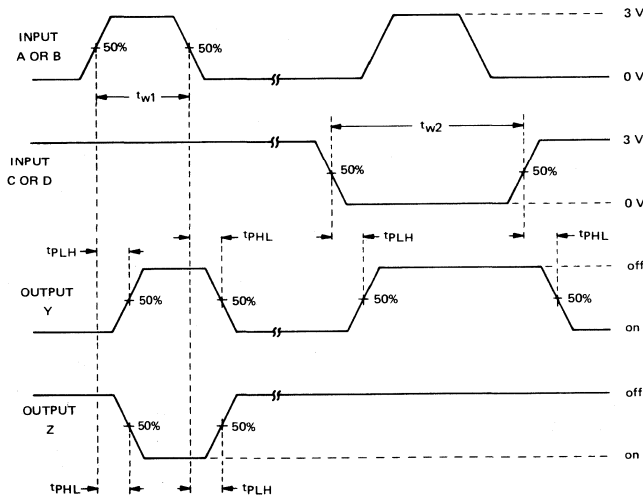
PARAMETER §	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	A or B	Y or Z	$C_L = 40\text{ pF}$, $R_L = 50\ \Omega$, See Figure 1		9	15	ns
t_{PHL}					9	15	ns
t_{PLH}	C or D	Y or Z			16	25	ns
t_{PHL}					13	25	ns

§ t_{PLH} \equiv Propagation delay time, low-to-high-level output.
 t_{PHL} \equiv Propagation delay time, high-to-low-level output.

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. The pulse generators have the following characteristics: $Z_{out} = 50\ \Omega$, $t_r = t_f = 10 \pm 5\text{ ns}$, $t_{w1} = 500\text{ ns}$, $PRR = 1\text{ MHz}$, $t_{w2} = 1\text{ ms}$, $PRR = 500\text{ kHz}$.
 B. C_L includes probe and jig capacitance.
 C. For simplicity, only one channel and the inhibitor connections are shown.

FIGURE 1—PROPAGATION DELAY TIMES

TYPES SN55109A, SN55110A, SN75109A, SN75110A, SN75112 DUAL LINE DRIVERS

TYPICAL CHARACTERISTICS

ON-STATE OUTPUT CURRENT vs NEGATIVE SUPPLY VOLTAGE

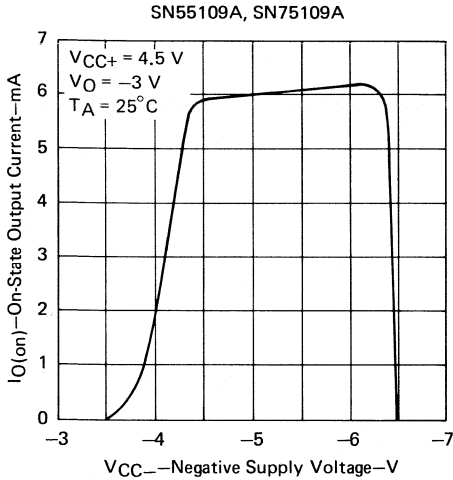


FIGURE 2

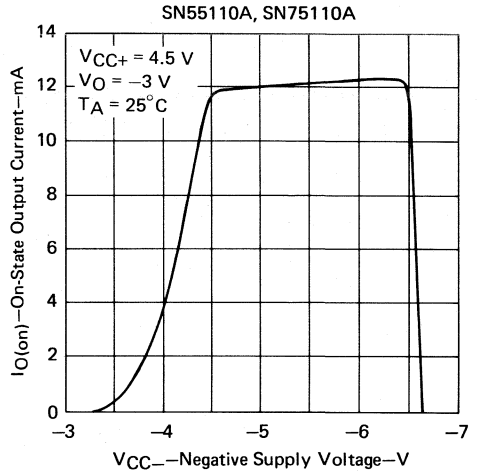


FIGURE 3

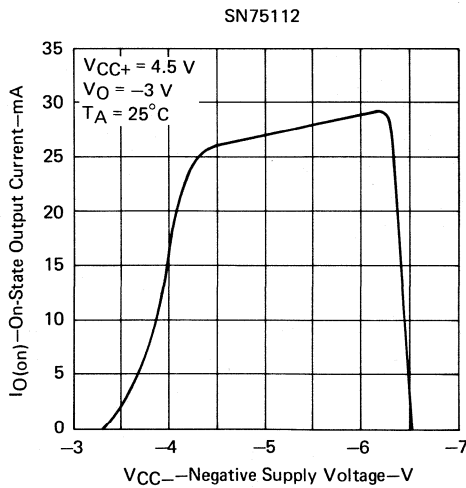


FIGURE 4

TYPES SN55109A, SN55110A, SN75109A, SN75110A, SN75112 DUAL LINE DRIVERS

TYPICAL APPLICATION INFORMATION

basic balanced-line transmission system

The '109A, '110A, and SN75112 dual line drivers are designed specifically for use in high-speed data transmission systems that utilize balanced, terminated transmission lines such as twisted-pair lines. The system operates in the balanced mode, so that noise induced on one line is also induced on the other. The noise appears common-mode at the receiver input terminals, where it is rejected. The ground connection between the line driver and receiver is not part of the signal circuit so that system performance is not affected by circulating ground currents.

The unique driver-output circuit allows terminated transmission lines to be driven at normal line impedances. High-speed system operation is ensured since line reflections are virtually eliminated when terminated lines are used. Crosstalk is minimized by low signal amplitudes and low line impedances.

The typical data delay in a system is approximately $(30 + 1.3L)$ nanoseconds, where L is the distance in feet

separating the driver and receiver. This delay includes one gate delay in both the driver and receiver.

Data is impressed on the balanced-line system by unbalancing the line voltages with the driver output current. The driven line is selected by appropriate driver-input logic levels. The voltage difference is approximately: $V_{DIFF} \approx 1/2 I_{O(on)} \cdot R_T$

High series line resistance will cause degradation of the signal. However, line receivers such as the SN55107A, SN55108A, SN75107A, and SN75108A will detect signal as low as 25 mV (or less). For normal line resistances, data may be recovered from lines of several thousand feet in length.

Line-termination resistors (R_T) are required only at the extreme ends of the line. For short lines, termination resistors at the receiver only may prove adequate. The signal amplitude will then be approximately: $V_{DIFF} \approx I_{O(on)} \cdot R_T$

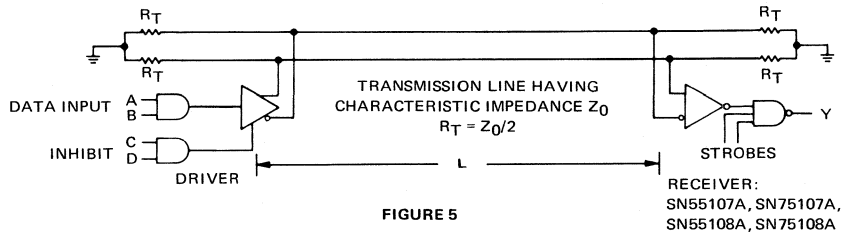


FIGURE 5

data-bus or party-line system

The strobe feature of the '109A, '110A, and SN75112 line drivers allow these circuits to be used in data-bus or party-line systems. In these applications, several drivers and receivers may share a common transmission line. An enabled driver transmits data to all enabled receivers on the

line while other drivers are disabled. This series of drivers has been designed to allow widely varying thermal and electrical environments at the various terminal locations. The data-bus system offers maximum performance at minimum cost.

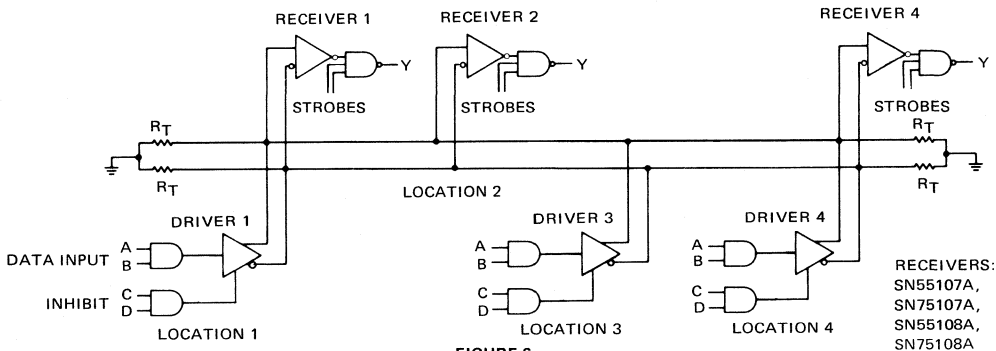


FIGURE 6

TYPES SN55109A, SN55110A, SN75109A, SN75110A, SN75112 DUAL LINE DRIVERS

TYPICAL APPLICATION DATA

special pulse-control circuit

Figure 7 shows a circuit that may be used as a pulse generator output or in many other testing applications.

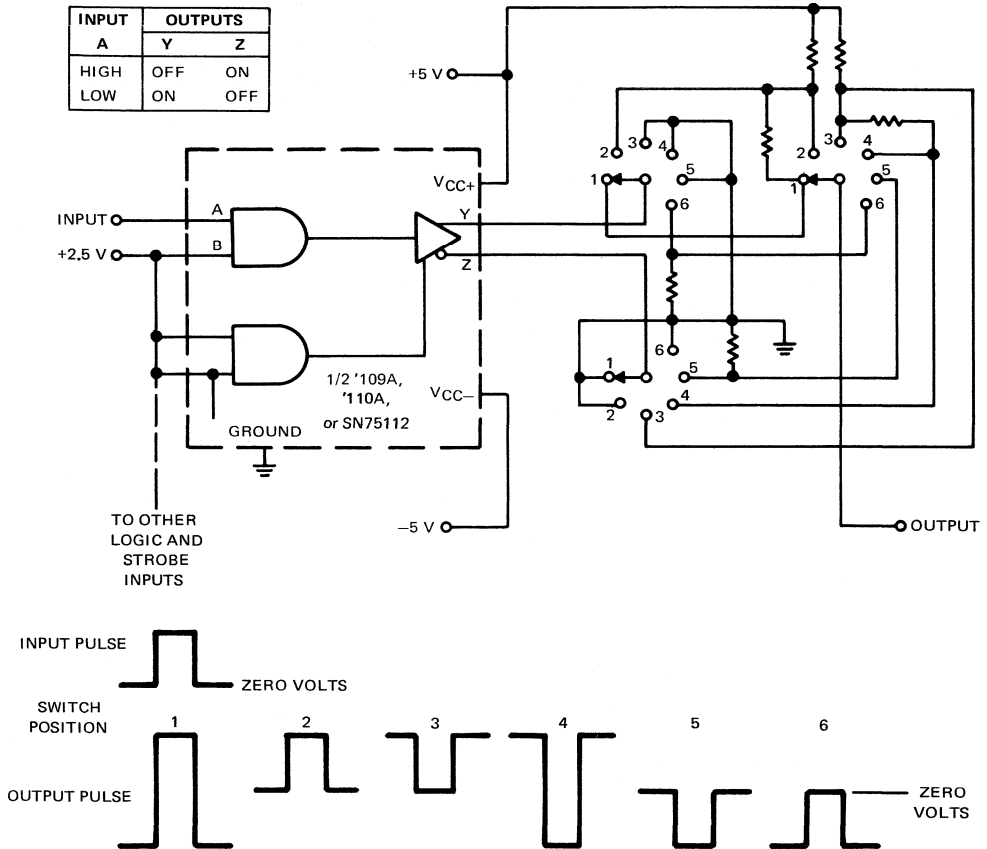


FIGURE 7—PULSE CONTROL CIRCUIT

INTERFACE TYPES SN55113, SN55114, SN55115, SN75113, SN75114, SN75115 CIRCUITS DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

BULLETIN NO. DL-S 7711910, SEPTEMBER 1973—REVISED JANUARY 1977

LINE CIRCUITS featuring

- Each Circuit Offers Choice of Open-Collector or Active Pull-Up (Totem-Pole) Outputs
- Single 5-V Supply
- Differential Line Operation
- Dual Channels
- TTL/DTL Compatibility

additional features of SN55113 and SN75113 line drivers with three-state outputs

- High-Impedance Output State for Party-Line Applications
- Short-Circuit Protection
- High-Current Outputs
- Single-Ended or Differential AND/NAND Outputs
- Common and Individual Output Controls
- Clamp Diodes at Inputs
- Easily Adaptable to SN55114 and SN75114 Applications

additional features of SN55114 and SN75114 line drivers

- Designed to be Interchangeable with Fairchild 9614 Line Drivers
- Short-Circuit Protection of Outputs
- High-Current Outputs
- Clamp Diodes at Inputs and Outputs to Terminate Line Transients
- Single-Ended or Differential AND/NAND Outputs
- Triple Inputs

additional features of SN55115 and SN75115 line receivers

- Designed to be interchangeable with Fairchild 9615 Line Receivers
- ± 15 V Common-Mode Input Voltage Range
- Optional-Use Built-In 130- Ω Line-Terminating Resistor
- Individual Frequency Response Controls
- Individual Channel Strobes

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TYPES SN55113, SN75113

DUAL DIFFERENTIAL LINE DRIVERS WITH 3-STATE OUTPUTS

description

The SN55113 and SN75113 dual differential line drivers with three-state outputs are designed to provide all the features of the SN55114 and SN75114 line drivers with the added feature of driver output controls. There are individual controls for each output pair, as well as a common control for both output pairs. When an output control is low, the associated output is in a high-impedance state and the output can neither drive nor load the bus. This permits many devices to be connected together on the same transmission line for party-line applications.

The output stages are similar to TTL totem-pole outputs, but with the sink outputs, YS and ZS, and the corresponding active pull-up terminals, YP and ZP, available on adjacent package pins.

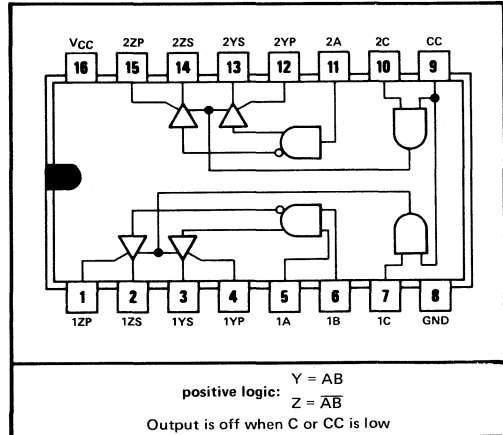
FUNCTION TABLE

INPUTS		DATA		OUTPUTS	
OUTPUT CONTROL	CC	A	B†	Y	Z
L	X	X	X	Z	Z
X	L	X	X	Z	Z
H	H	L	X	L	H
H	H	X	L	L	H
H	H	H	H	H	L

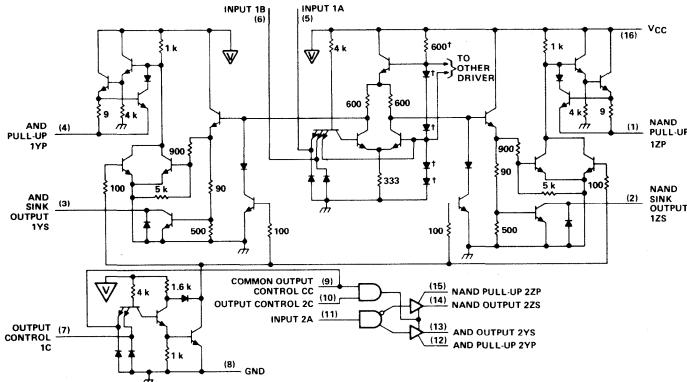
H = high level, L = low level, X = irrelevant, Z = high impedance (off)

†B input and 4th line of function table applicable only to driver number 1.

J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



schematic



▽ ... V_{CC} bus

Resistor values shown are nominal and in ohms.

† These components common to both drivers.

absolute maximum ratings over operating free-air temperature (unless otherwise noted)

Supply voltage, V _{CC} (see Note 1)	7 V
Input voltage	5.5 V
Off-state voltage applied to open-collector outputs	12 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range: SN55113	-55°C to 125°C
SN75113	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTES: 1. All voltage values are with respect to network ground terminal.

2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55113 chips are alloy-mounted; SN75113 chips are glass-mounted.

TYPES SN55113, SN75113

DUAL DIFFERENTIAL LINE DRIVERS WITH 3-STATE OUTPUTS

recommended operating conditions

	SN55113			SN75113			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-40			-40	mA
Low-level output current, I_{OL}			40			40	mA
Operating free-air temperature, T_A	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		SN55113			SN75113			UNIT		
				MIN	TYP‡	MAX	MIN	TYP‡	MAX			
V_{IH}	High-level input voltage					2				V		
V_{IL}	Low-level input voltage							0.8		V		
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}$,	$I_I = -12 \text{ mA}$			-0.9	-1.5	-0.9	-1.5	V		
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$	$V_{IH} = 2 \text{ V}$, $I_{OH} = -10 \text{ mA}$ $I_{OH} = -40 \text{ mA}$			2.4	3.4	2.4	3.4	V		
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}$, $V_{IL} = 0.8 \text{ V}$	$V_{IH} = 2 \text{ V}$, $I_{OL} = 40 \text{ mA}$			0.23	0.4	0.23	0.4	V		
V_{OK}	Output clamp voltage	$V_{CC} = \text{MAX}$,	$I_O = -40 \text{ mA}$			-1.1	-1.5	-1.1	-1.5	V		
$I_{O(\text{off})}$	Off-state open-collector output current	$V_{CC} = \text{MAX}$	$V_{OH} = 12 \text{ V}$ $V_{OH} = 5.25 \text{ V}$	$T_A = 25^\circ\text{C}$		1	10			μA		
				$T_A = 125^\circ\text{C}$			200					
				$T_A = 25^\circ\text{C}$				1	10			
				$T_A = 70^\circ\text{C}$					20			
I_{OZ}	Off-state (high-impedance-state) output current	$V_{CC} = \text{MAX}$, Output controls at 0.8 V	$T_A = 25^\circ\text{C}$, $T_A = \text{MAX}$	$V_O = 0 \text{ to } V_{CC}$		± 10	± 10			μA		
				$V_O = 0$		-150	-20					
				$V_O = 0.4 \text{ V}$		± 80	± 20					
				$V_O = 2.4 \text{ V}$		± 80	± 20					
				$V_O = V_{CC}$		80	20					
I_I	Input current at maximum input voltage	A, B, C CC	$V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$			1	1			mA		
						2	2					
I_{IH}	High-level input current	A, B, C CC	$V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$			40	40			μA		
						80	80					
I_{IL}	Low-level input current	A, B, C CC	$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$			-1.6	-1.6			mA		
						-3.2	-3.2					
I_{OS}	Short-circuit output current§		$V_{CC} = \text{MAX}$, $V_O = 0$			-40	-90	-120	-40	-90	-120	mA
I_{CC}	Supply current (both drivers)	All inputs at 0 V, No load, $T_A = 25^\circ\text{C}$	$V_{CC} = \text{MAX}$			47	65	47	65		mA	
			$V_{CC} = 7 \text{ V}$			65	85	65	85			

† All parameters with the exception of off-state open-collector output current are measured with the active pull-up connected to the sink output.

‡ All typical values are at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5 \text{ V}$, with the exception of I_{CC} at 7 V.

§ Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

TYPES SN55113, SN75113

DUAL DIFFERENTIAL LINE DRIVERS WITH 3-STATE OUTPUTS

switching characteristics, $V_{CC} = 5\text{ V}$, $C_L = 30\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	SN55113			SN75113			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH} Propagation delay time, low-to-high-level output	See Figure 1	13	20		13	30		ns
t_{PHL} Propagation delay time, high-to-low-level output		12	20		12	30		ns
t_{PZH} Output enable time to high level	$R_L = 180\ \Omega$, See Figure 2	7	15		7	20		ns
t_{PZL} Output enable time to low level	$R_L = 250\ \Omega$, See Figure 3	14	30		14	40		ns
t_{PHZ} Output disable time from high level	$R_L = 180\ \Omega$, See Figure 2	10	20		10	30		ns
t_{PLZ} Output disable time from low level	$R_L = 250\ \Omega$, See Figure 3	17	35		17	35		ns

PARAMETER MEASUREMENT INFORMATION

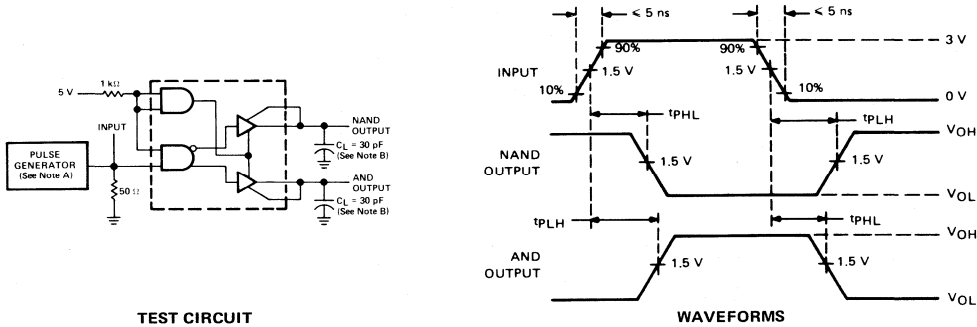


FIGURE 1— t_{PLH} and t_{PHL}

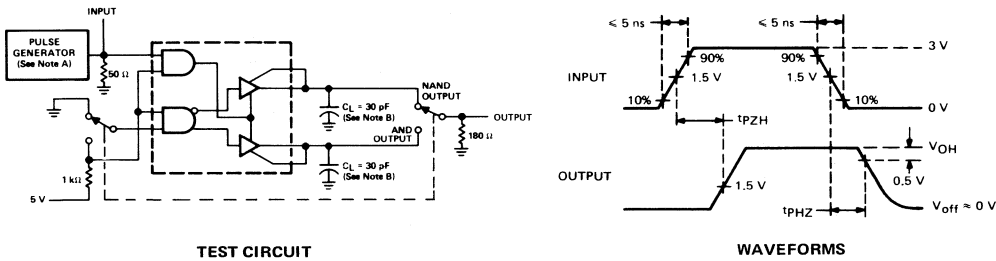


FIGURE 2— t_{PZH} and t_{PHZ}

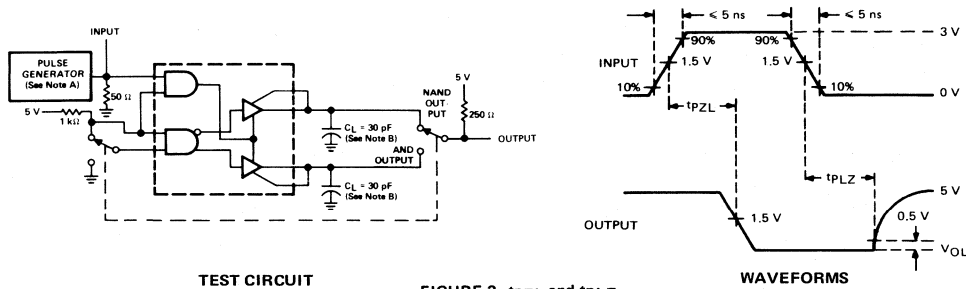


FIGURE 3— t_{PZL} and t_{PLZ}

NOTES: A. The pulse generator has the following characteristics: $Z_{out} = 50\ \Omega$, $PRR = 500\text{ kHz}$, $t_w = 100\text{ ns}$.
B. C_L includes probe and jig capacitance.

TYPES SN55113, SN75113 DUAL DIFFERENTIAL LINE DRIVERS WITH 3-STATE OUTPUTS

TYPICAL CHARACTERISTICS†

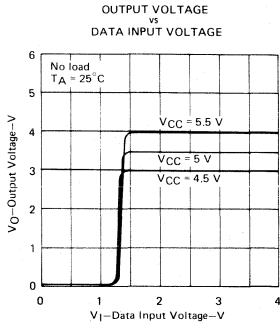


FIGURE 4

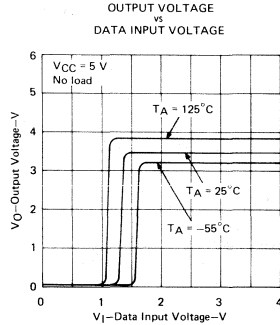


FIGURE 5

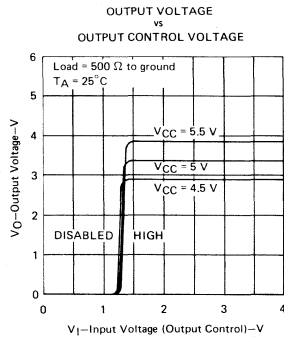


FIGURE 6

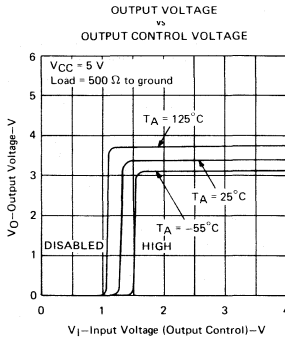


FIGURE 7

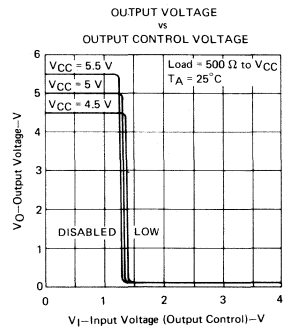


FIGURE 8

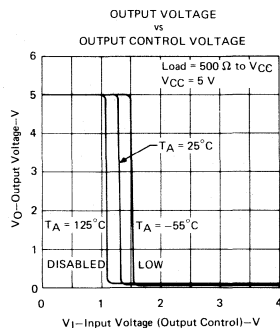


FIGURE 9

†Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55113 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55113, SN75113

DUAL DIFFERENTIAL LINE DRIVERS WITH 3-STATE OUTPUTS

TYPICAL CHARACTERISTICS†

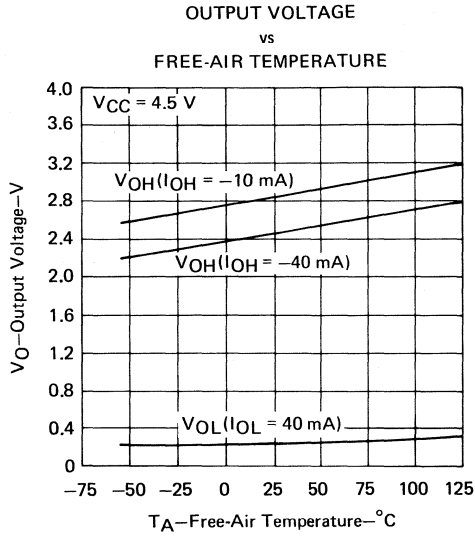


FIGURE 10

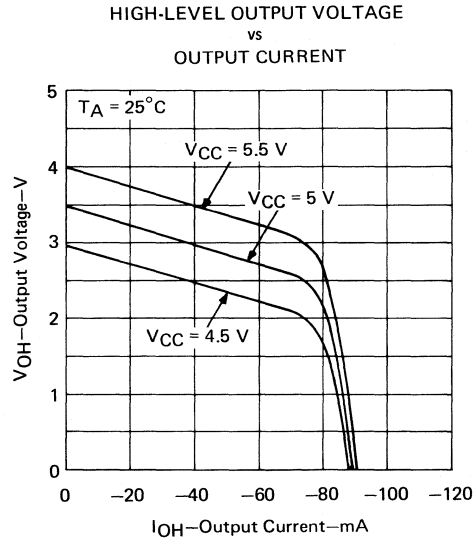


FIGURE 11

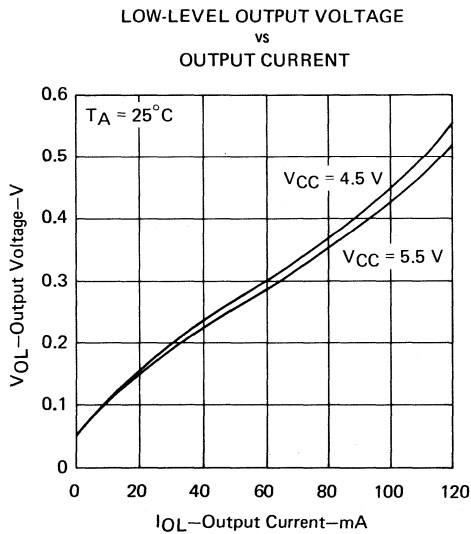


FIGURE 12

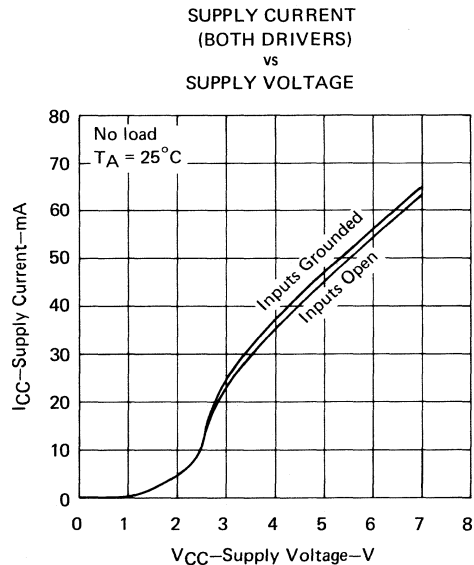


FIGURE 13

† Data for temperature below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55113 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55113, SN75113

DUAL DIFFERENTIAL LINE DRIVERS WITH 3-STATE OUTPUTS

TYPICAL CHARACTERISTICS†

SUPPLY CURRENT
(BOTH DRIVERS)
vs
FREE-AIR TEMPERATURE

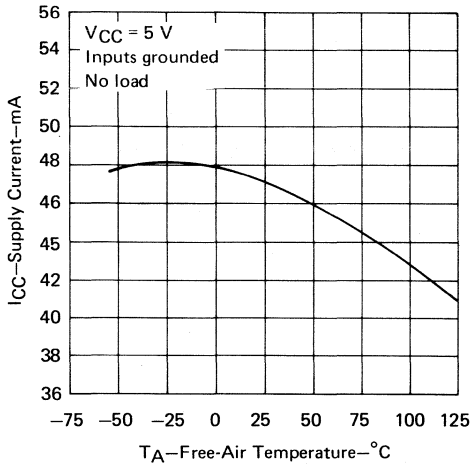


FIGURE 14

SUPPLY CURRENT
(BOTH DRIVERS)
vs
FREQUENCY

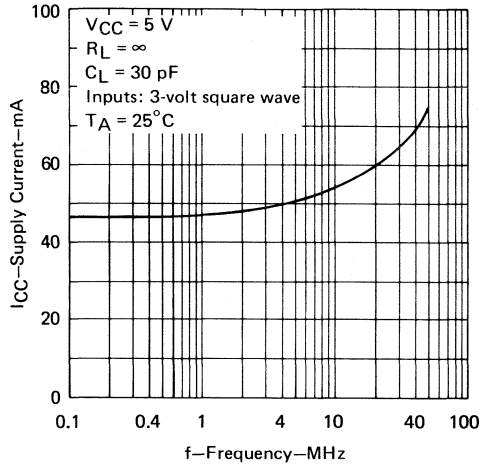


FIGURE 15

PROPAGATION DELAY TIMES
FROM DATA INPUTS
vs
FREE-AIR TEMPERATURE

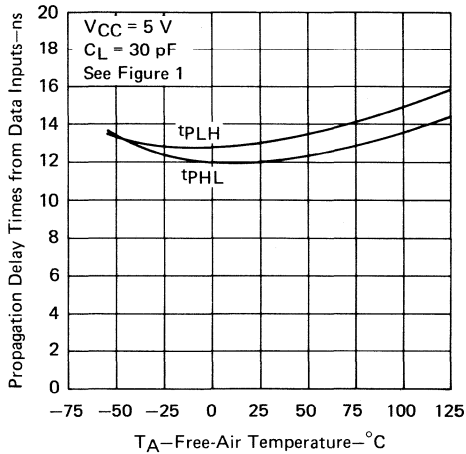


FIGURE 16

OUTPUT ENABLE and DISABLE TIMES
vs
FREE-AIR TEMPERATURE

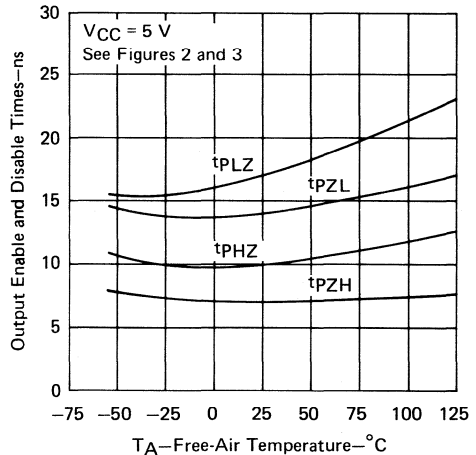


FIGURE 17

† Data for temperature below 0 °C and above 70 °C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55113 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55114, SN75114

DUAL DIFFERENTIAL LINE DRIVERS

description

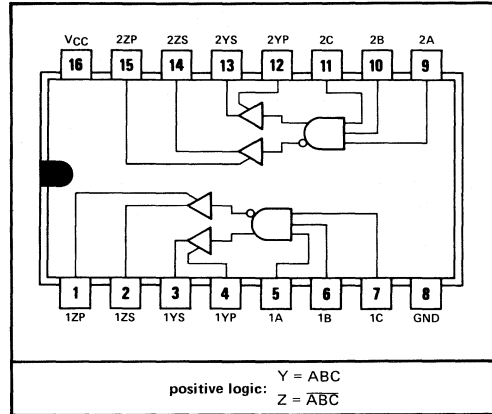
The SN55114 and SN75114 dual differential line drivers are designed to provide differential output signals with high current capability for driving balanced lines, such as twisted-pair at normal line impedances, without high power dissipation. The output stages are similar to TTL totem-pole outputs, but with the sink outputs, YS and ZS, and the corresponding active pull-up terminals, YP and ZP, available on adjacent package pins. Since the output stages provide TTL compatible output levels, these devices may also be used as TTL expanders or phase splitters.

FUNCTION TABLE

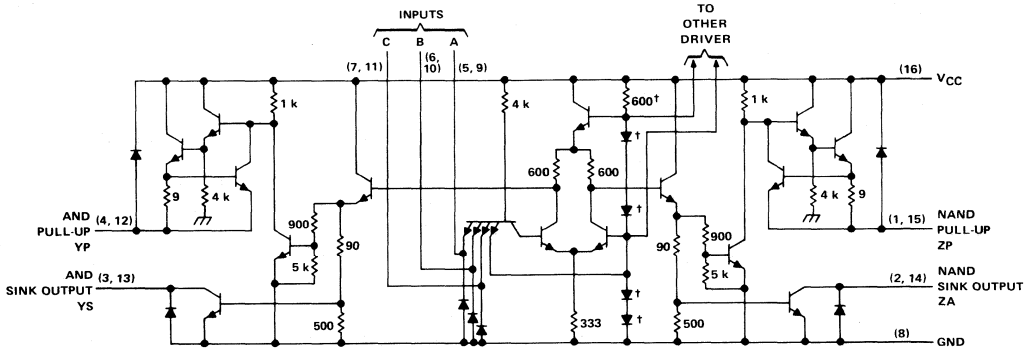
INPUTS			OUTPUTS	
A	B	C	Y	Z
H	H	H	H	L
ALL OTHER INPUT COMBINATIONS			L	H

H = high level, L = low level

J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



schematic (each driver)



† These components common to both drivers.
Resistor values shown are nominal and in ohms.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Off-state voltage applied to open-collector outputs	12 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range: SN55114	-55°C to 125°C
SN75114	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTES: 1. All voltage values are with respect to network ground terminal.
2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55114 chips are alloy-mounted; SN75114 chips are glass-mounted.

TYPES SN55114, SN75114 DUAL DIFFERENTIAL LINE DRIVERS

recommended operating conditions

	SN55114			SN75114			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-40			-40	mA
Low-level output current, I_{OL}			40			40	mA
Operating free-air temperature, T_A	-55		125	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	SN55114			SN75114			UNIT	
		MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V_{IH} High-level input voltage		2			2			V	
V_{IL} Low-level input voltage		0.8			0.8			V	
V_{IK} Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$	-0.9	-1.5		-0.9	-1.5		V	
V_{OH} High-level output voltage	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, I_{OH} = -10 \text{ mA}$ $I_{OH} = -40 \text{ mA}$	2.4	3.4		2.4	3.4		V	
V_{OL} Low-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, V_{IL} = 0.8 \text{ V}, I_{OL} = 40 \text{ mA}$	0.2	0.4		0.2	0.45		V	
V_{OK} Output clamp voltage	$V_{CC} = 5 \text{ V}, I_O = 40 \text{ mA}, T_A = 25^\circ\text{C}$ $V_{CC} = \text{MAX}, I_O = -40 \text{ mA}, T_A = 25^\circ\text{C}$	6.1	6.5		6.1	6.5		V	
$I_{O(\text{off})}$ Off-state open-collector output current	$V_{CC} = \text{MAX}$	$V_{OH} = 12 \text{ V}$	$T_A = 25^\circ\text{C}$	1	100			μA	
			$T_A = 125^\circ\text{C}$		200				
		$V_{OH} = 5.25 \text{ V}$	$T_A = 25^\circ\text{C}$			1	100		
			$T_A = 70^\circ\text{C}$				200		
I_I Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$			1			1	mA	
I_{IH} High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$			40			40	μA	
I_{IL} Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-1.1	-1.6		-1.1	-1.6		mA	
I_{OS} Short-circuit output current§	$V_{CC} = \text{MAX}, V_O = 0$	-40	-90	-120	-40	-90	-120	mA	
I_{CC} Supply current (both drivers)	Inputs grounded, No load, $T_A = 25^\circ\text{C}$	$V_{CC} = \text{MAX}$	37	50		37	50	mA	
		$V_{CC} = 7 \text{ V}$	47	65		47	70		

† All parameters, with the exception of off-state open-collector output current, are measured with the active pull-up connected to the sink output.

‡ All typical values are at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5 \text{ V}$, with the exception of I_{CC} at 7 V.

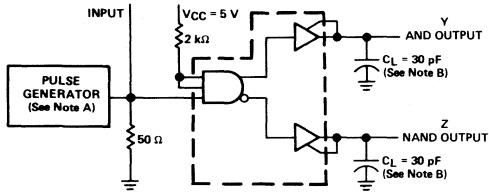
§ Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

switching characteristics, $V_{CC} = 5 \text{ V}, T_A = 25^\circ\text{C}$

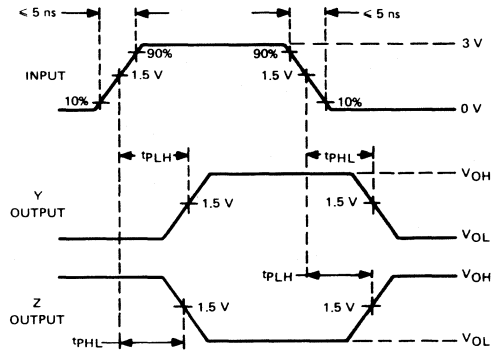
PARAMETER	TEST CONDITIONS	SN55114			SN75114			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_{pLH} Propagation delay time, low-to-high-level output	$C_L = 30 \text{ pF}$	15	20		15	30		ns
t_{pHL} Propagation delay time, high-to-low-level output	See Figure 18	11	20		11	30		ns

TYPES SN55114, SN75114 DUAL DIFFERENTIAL LINE DRIVERS

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generator has the following characteristics: $Z_{out} = 50 \Omega$, $t_w = 100 \text{ ns}$, $PRR = 500 \text{ kHz}$.
B. C_L includes probe and jig capacitance.

FIGURE 18—PROPAGATION DELAY TIMES

TYPICAL CHARACTERISTICS†

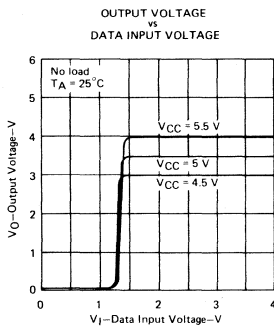


FIGURE 19

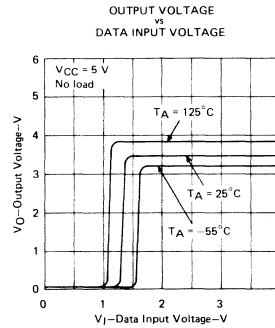


FIGURE 20

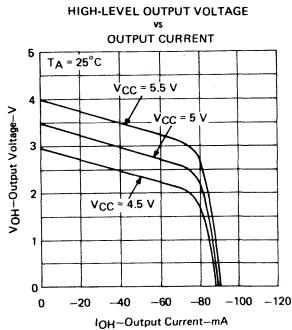


FIGURE 21

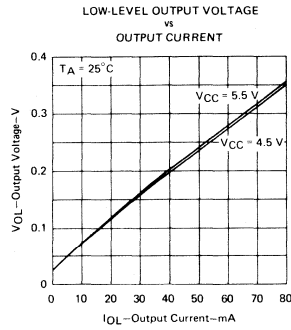


FIGURE 22

†Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55114 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55114, SN75114 DUAL DIFFERENTIAL LINE DRIVERS

TYPICAL CHARACTERISTICS†

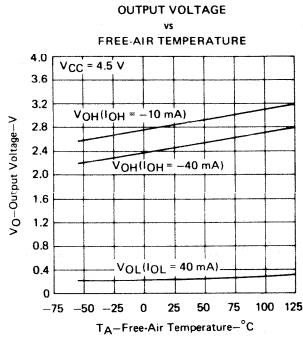


FIGURE 23

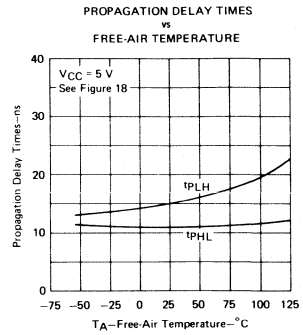


FIGURE 24

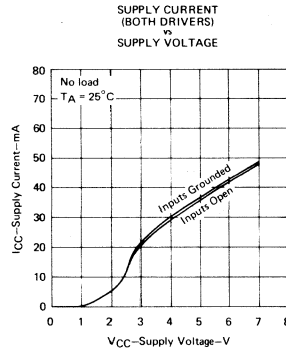


FIGURE 25

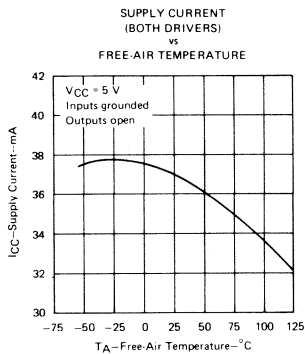


FIGURE 26

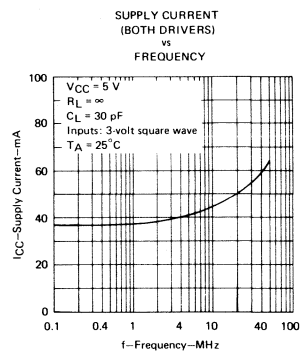


FIGURE 27

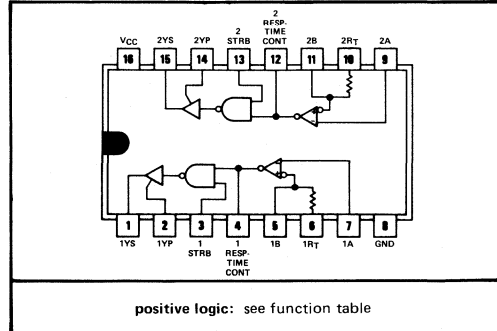
† Data for temperatures below 0°C and above 70°C are applicable to SN55114 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55115, SN75115 DUAL DIFFERENTIAL LINE RECEIVERS

description

The SN55115 and SN75115 dual differential line receivers are designed to sense small differential signals in the presence of large common-mode noise. These devices give TTL-compatible output signals as a function of the polarity of the differential input voltage. The open-collector output configuration permits the wire-AND connection with similar outputs (such as SN5401/SN7401 TTL gates or other SN55115/SN75115 line receivers). This permits a level of logic to be implemented without extra delay. The output stages are similar to TTL totem-pole outputs, but with the sink outputs, 1YS and 2YS, and the corresponding active pull-up terminals, 1YP and 2YP, available on adjacent package pins. The frequency response of each channel may be easily controlled by a single external capacitor to provide immunity to differential noise spikes. A strobe input is provided for each channel. With the strobe in the low level, the receiver is disabled and the outputs are forced to a high level.

J OR N DUAL IN-LINE PACKAGE
(TOP VIEW)



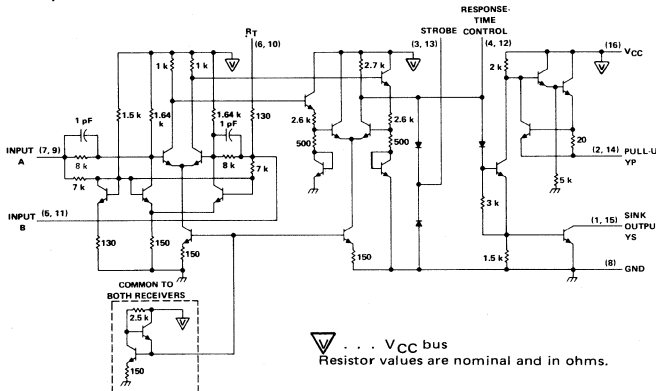
positive logic: see function table

FUNCTION TABLE

STROBE	DIFF INPUT	OUTPUT
L	X	H
H	L	H
H	H	L

H = $V_I \geq V_{IH \text{ min}}$ or V_{ID} more positive than $V_{TH \text{ max}}$
L = $V_I \leq V_{IL \text{ max}}$ or V_{ID} more negative than $V_{TL \text{ max}}$
X = irrelevant

schematic (each receiver)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage at A, B, and R_T inputs	± 25 V
Input voltage at strobe input	5.5 V
Off-state voltage applied to open-collector outputs	14 V
Continuous total dissipation at (or below 25°C free-air temperature (see Note 2))	1 W
Operating free-air temperature range: SN55115	-55°C to 125°C
SN75115	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

- NOTES: 1. All voltage values, except differential input voltage, are with respect to network ground terminal.
2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55115 chips are alloy-mounted; SN75115 chips are glass-mounted.

TYPES SN55115, SN75115 DUAL DIFFERENTIAL LINE RECEIVERS

recommended operating conditions

	SN55115			SN75115			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}	-5			-5			mA
Low-level output current, I_{OL}	15			15			mA
Operating free-air temperature, T_A	-55	125		0	70		°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	SN55115			SN75115			UNIT	
		MIN	TYP‡	MAX	MIN	TYP‡	MAX		
V_{TH} §	Differential input high-threshold voltage $V_O = 0.4$ V, $I_{OL} = 15$ mA, $V_{IC} = 0$	500			500			mV	
V_{TL} §	Differential input low-threshold voltage $V_O = 2.4$ V, $I_{OH} = -5$ mA, $V_{IC} = 0$	-500			-500			mV	
V_{ICR}	Common-mode input voltage range $V_{ID} = \pm 1$ V	+15 -15	+24 -19		+15 -15	+24 -19		V	
$V_{IH(strobe)}$	High-level strobe input voltage	2.4			2.4			V	
$V_{IL(strobe)}$	Low-level strobe input voltage	0.4			0.4			V	
V_{OH}	High-level output voltage $V_{CC} = \text{MIN}$, $V_{ID} = -0.5$ V, $I_{OH} = -5$ mA	$T_A = \text{MIN}$	2.2		2.4			V	
		$T_A = 25^\circ\text{C}$	2.4	3.4	2.4	3.4			
		$T_A = \text{MAX}$	2.4		2.4				
V_{OL} †	Low-level output voltage $V_{CC} = \text{MIN}$, $V_{ID} = 0.5$ V, $I_{OL} = 15$ mA	0.22 0.4		0.22 0.45			V		
I_{IL}	Low-level input current $V_{CC} = \text{MAX}$, $V_I = 0.4$ V, Other Input at 5.5 V	$T_A = \text{MIN}$	-0.9		-0.9			mA	
		$T_A = 25^\circ\text{C}$	-0.5	-0.7	-0.5	-0.7			
		$T_A = \text{MAX}$	-0.7		-0.7				
I_{SH}	High-level strobe current $V_{CC} = \text{MIN}$, $V_{ID} = -0.5$ V, $V_{strobe} = 4.5$ V	$T_A = 25^\circ\text{C}$	2		5			μA	
		$T_A = \text{MAX}$	5		10				
I_{SL}	Low-level strobe current $V_{CC} = \text{MAX}$, $V_{ID} = 0.5$ V, $V_{strobe} = 0.4$ V	$T_A = 25^\circ\text{C}$	-1.15	-2.4	-1.15	-2.4	mA		
I_4, I_{12}	Response-time-control current (Pin 4 or Pin 12) $V_{CC} = \text{MAX}$, $V_{ID} = 0.5$ V, $V_{RC} = 0$	$T_A = 25^\circ\text{C}$	-1.2	-3.4	-1.2	-3.4	mA		
$I_{O(off)}$	Off-state open-collector output current $V_{CC} = \text{MIN}$, $V_{OH} = 12$ V, $V_{ID} = -4.5$ V	$T_A = 25^\circ\text{C}$	100					μA	
		$T_A = \text{MAX}$	200						
		$T_A = 25^\circ\text{C}$			100				
		$T_A = \text{MAX}$			200				
R_T	Line-terminating resistance $V_{CC} = 5$ V	$T_A = 25^\circ\text{C}$	77	130	167	74	130	179	Ω
I_{OS}	Short-circuit output current¶ $V_{CC} = \text{MAX}$, $V_O = 0$, $V_{ID} = -0.5$ V	$T_A = 25^\circ\text{C}$	-15	-40	-80	-14	-40	-100	mA
I_{CC}	Supply current (both receivers) $V_{CC} = \text{MAX}$, $V_{ID} = 0.5$ V, $V_{IC} = 0$	$T_A = 25^\circ\text{C}$	32 50		32 50			mA	

† Unless otherwise noted $V_{strobe} = 2.4$ V. All parameters with the exception of off-state open-collector output current are measured with the active pull-up connected to the sink output.

‡ All typical values are at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$, and $V_{IC} = 0$.

§ Differential voltages are at the B input terminal with respect to the A input terminal.

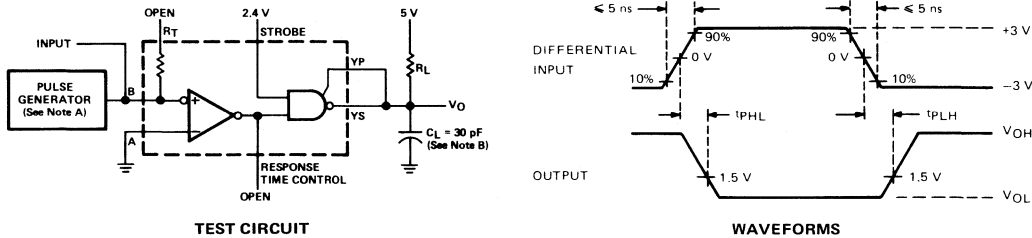
¶ Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

TYPES SN55115, SN75115 DUAL DIFFERENTIAL LINE RECEIVERS

switching characteristics, $V_{CC} = 5\text{ V}$, $C_L = 30\text{ pF}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	SN55115			SN75115			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH} Propagation delay time, low-to-high-level output	$R_L = 3.9\text{ k}\Omega$, See Figure 28		18	50		18	75	ns
t_{PHL} Propagation delay time, high-to-low-level output	$R_L = 390\ \Omega$, See Figure 28		20	50		20	75	ns

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The pulse generator has the following characteristics: $Z_{out} = 50\ \Omega$, $PRR = 500\text{ kHz}$, $t_w = 100\text{ ns}$.
B. C_L includes probe and jig capacitance.

FIGURE 28—PROPAGATION DELAY TIMES

TYPICAL CHARACTERISTICS†

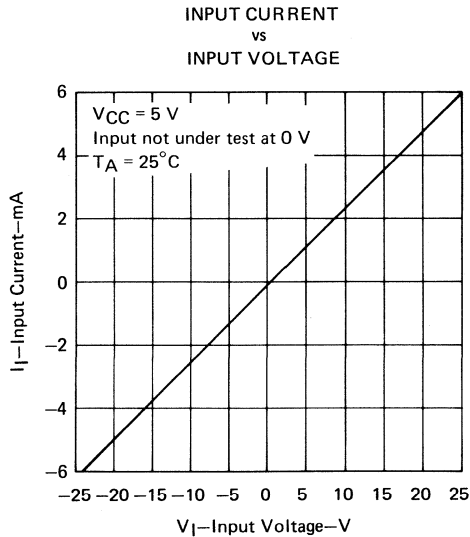


FIGURE 29

† Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55115 circuits only.

TYPES SN55115, SN75115 DUAL DIFFERENTIAL LINE RECEIVERS

TYPICAL CHARACTERISTICS†

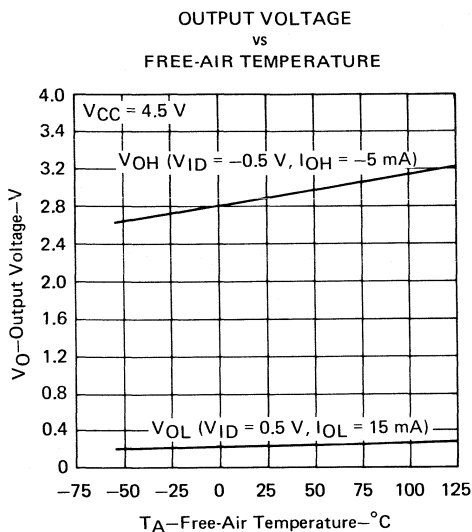


FIGURE 30

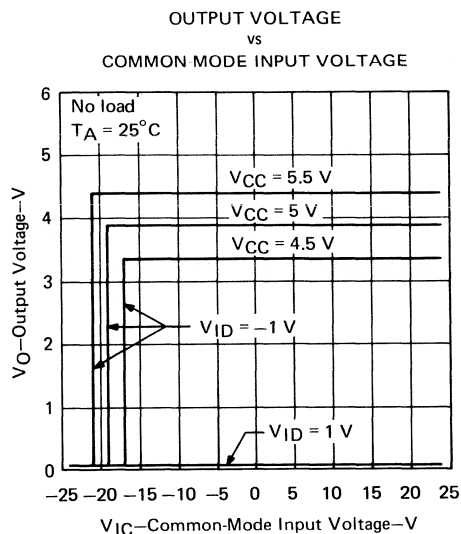


FIGURE 31

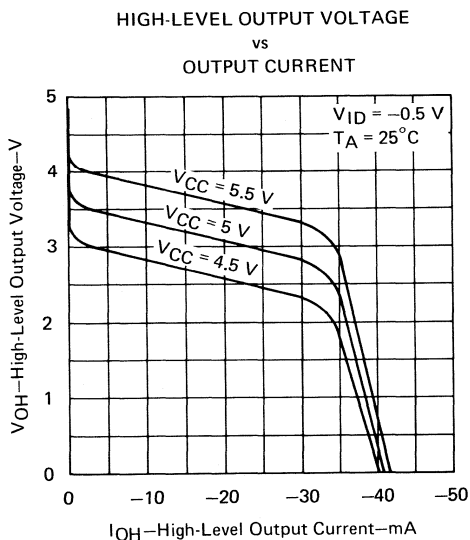


FIGURE 32

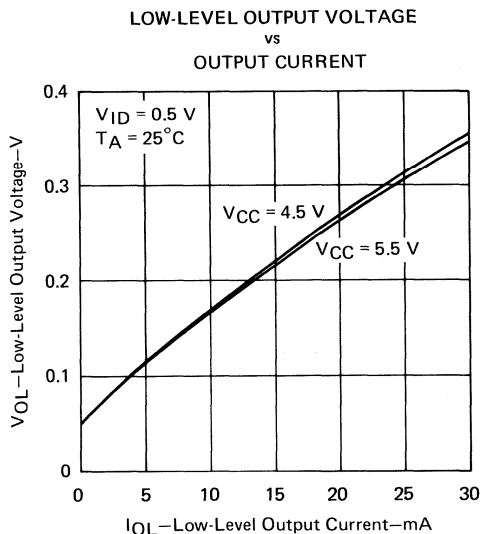


FIGURE 33

† Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55115 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55115, SN75115

DUAL DIFFERENTIAL LINE RECEIVERS

TYPICAL CHARACTERISTICS†

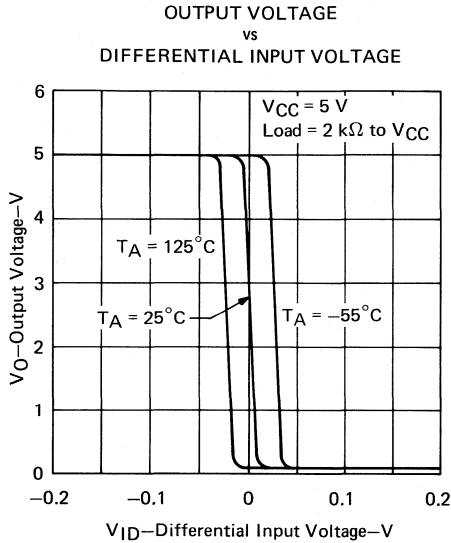


FIGURE 34

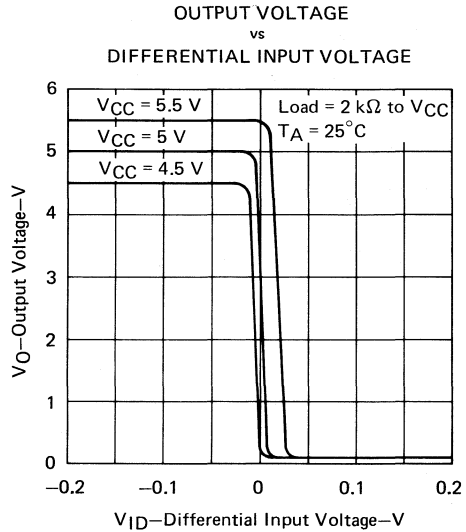


FIGURE 35

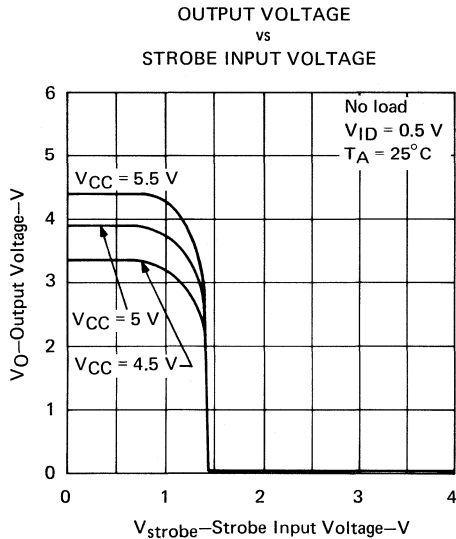


FIGURE 36

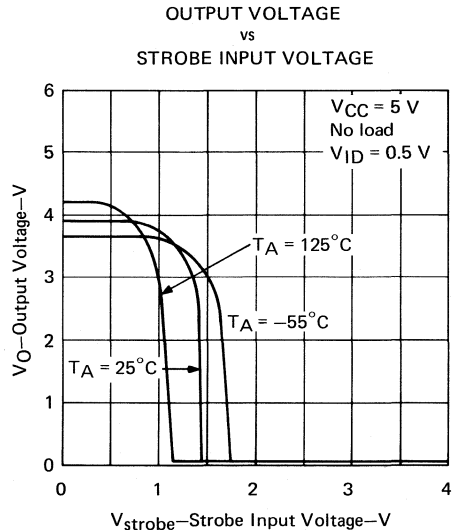
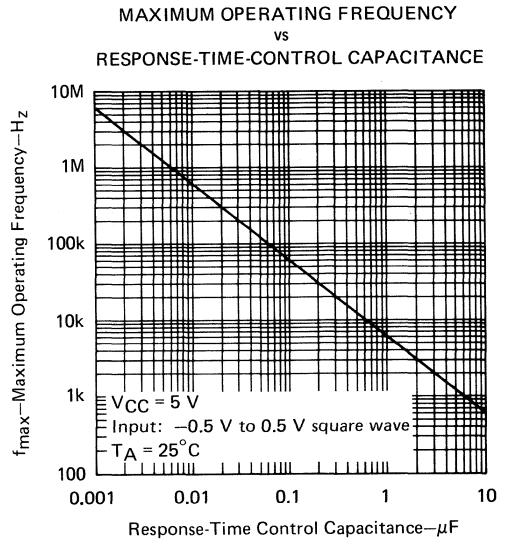
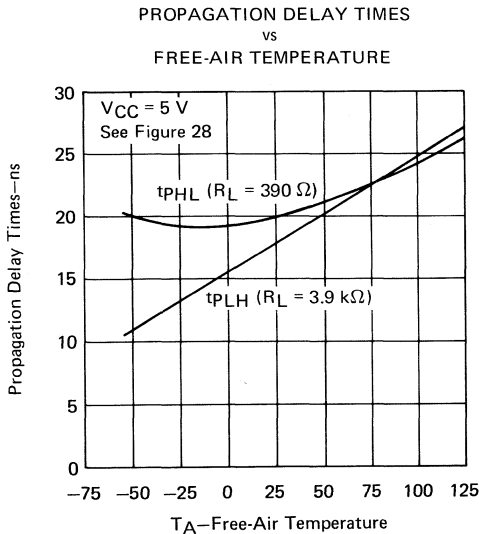
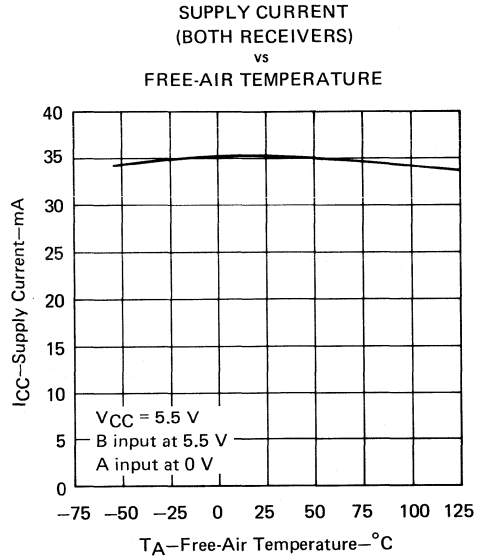
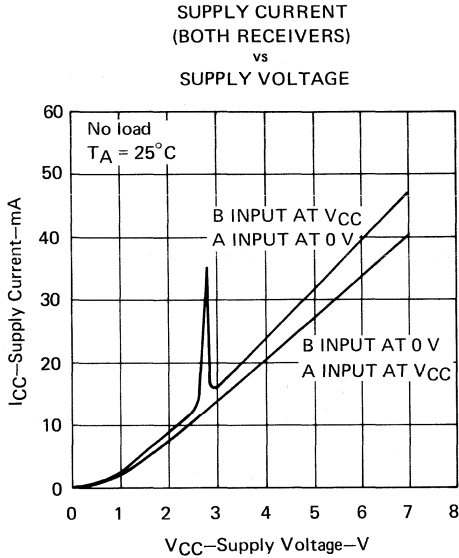


FIGURE 37

† Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55115 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55115, SN75115 DUAL DIFFERENTIAL LINE RECEIVERS

TYPICAL CHARACTERISTICS†

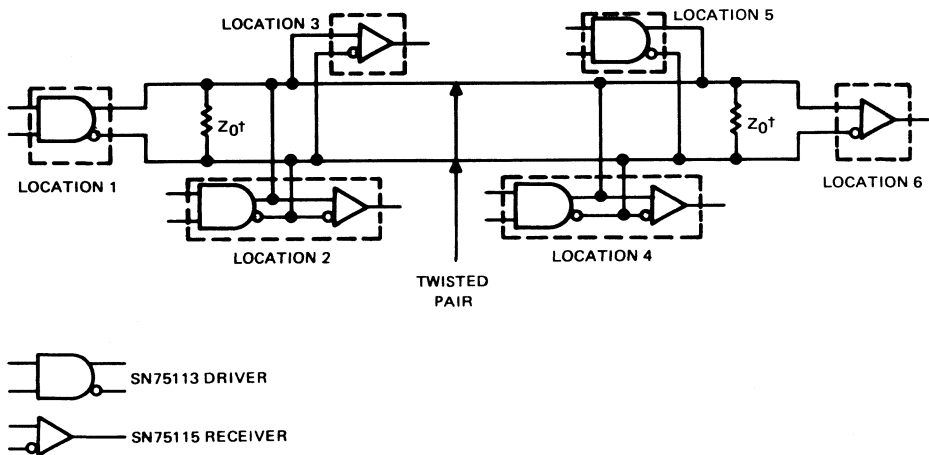


†Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable to SN55115 circuits only. These parameters were measured with the active pull-up connected to the sink output.

TYPES SN55113, SN55114, SN55115, SN75113, SN75114, SN75115

DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

TYPICAL APPLICATION DATA



† A capacitor may be connected in series with Z_0 to reduce power dissipation.

FIGURE 42—BASIC PARTY-LINE OR DATA-BUS DIFFERENTIAL DATA TRANSMISSION

INTERFACE CIRCUITS

TYPES SN55116 THRU SN55119, SN75116 THRU SN75119 DIFFERENTIAL LINE TRANSCEIVERS

BULLETIN NO. DL-S 7712376, MAY 1976 — REVISED JANUARY 1977

features common to all types

- Single 5-V Supply
- 3-State Driver Output Circuitry
- TTL-Compatible Driver Inputs
- TTL-Compatible Receiver Output
- Differential Line Operation
- Receiver Output Strobe ('116, '117) or Enable ('118, '119)
- Designed for Party-Line (Data-Bus) Applications
- Choice of Ceramic or Plastic Packages

additional features of the SN55116/SN55116

- Independent Driver and Receiver
- Choice of Open-Collector or Totem-Pole Outputs on Both Driver and Receiver
- Dual Data Inputs on Driver
- Optional Line-Termination Resistor in Receiver
- ± 15 -V Receiver Common-Mode Capability
- Receiver Frequency Response Control

additional features of the SN55117/SN75117

- Driver Output Internally Connected to Receiver Input

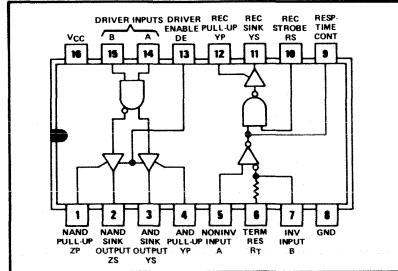
The SN55118/SN75118 is an SN55116/SN75116 with 3-State Receiver Output Circuitry

The SN55119/SN75119 is an SN55117/SN75117 with 3-State Receiver Output Circuitry

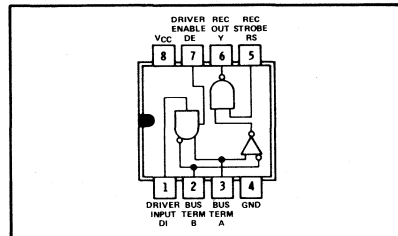
description

These integrated circuits are designed for use in interfacing between TTL-type digital systems and differential data transmission lines. They are especially useful for party-line (data-bus) applications. Each of these circuit types combine in one package a three-state differential line driver and a differential-input line receiver, both of which operate from a single 5-volt power supply. The driver inputs and receiver outputs are TTL compatible. The driver employed is similar to the SN55113/SN75113 three-state line driver, and the receiver is similar to the SN55115/SN75115 line receiver.

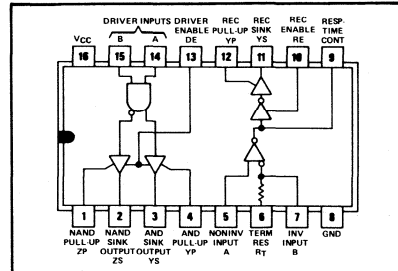
SN55116, SN75116
J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



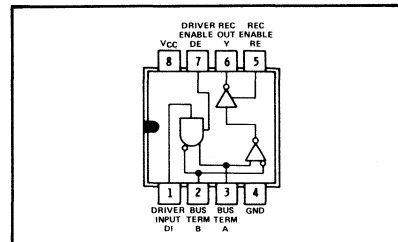
SN55117, SN75117
JG OR P DUAL-IN-LINE PACKAGE (TOP VIEW)



SN55118, SN75118
J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



SN55119, SN75119
JG OR P DUAL-IN-LINE PACKAGE (TOP VIEW)



TYPES SN55116 THRU SN55119, SN75116 THRU SN75119

DIFFERENTIAL LINE TRANSCEIVERS

description (continued)

The '116 and '118 circuits offer all the features of the SN55113/SN75113 driver and the SN55115/SN75115 receiver. The driver performs the dual input AND and NAND functions when enabled, or presents a high impedance to the load when in the disabled state. The driver output stages are similar to the TTL totem-pole outputs, but have the current-sink portion separated from the current-sourcing portion and both are brought out to adjacent package pins. This feature allows the user the option of using the driver in the open-collector output configuration, or, by connecting the adjacent source and sink pins together, of using the driver in the normal totem-pole output configuration.

The receiver portion of the '116 and '118 features a differential-input circuit having a common-mode voltage range of ± 15 volts. An internal 130-ohm resistor is also provided, which may optionally be used for terminating the transmission line. A frequency response control pin allows the user to reduce the speed of the receiver or to improve differential noise immunity. The receiver of the '116 also has an output strobe and a split totem-pole output. The receiver of the '118 has an output-enable for the three-state split totem-pole output. The receiver section of either circuit is independent of the driver section except for the V_{CC} and ground pins.

The '117 and '119 circuits provide the basic driver and receiver functions of the '116 and '118, but use a package that is only half as large. The '117 and '119 are intended primarily for party-line or bus-organized systems as the driver outputs are internally connected to the receiver inputs. The driver has a single data input and a single enable input, and the '117 receiver has an output strobe while the '119 receiver has a three-state-output enable. These devices do not, however, provide output connection options, line termination resistors, or receiver frequency response controls.

The SN55116, SN55117, SN55118, and SN55119 are characterized for operation over the full military temperature range of -55°C to 125°C ; the SN75116, SN75117, SN75118, and SN75119 are characterized for operation from 0°C to 70°C .

'116, '118
FUNCTION TABLE
OF DRIVER

INPUTS			OUTPUTS	
DE	A	B	Y	Z
L	X	X	Z	Z
H	L	X	L	H
H	X	L	L	H
H	H	H	H	L

'116, '118
FUNCTION TABLE OF RECEIVER

STROBE OR ENABLE	DIFF INPUT	OUTPUT Y	
		'116	'118
L	X	H	Z
H	L	H	H
H	H	L	L

'117, '119
FUNCTION TABLE
(TRANSMITTING)

INPUTS				OUTPUTS			
DE	RS/RE	DI	A	B	Y		
					'117	'119	
H	H	H	H	L	H	H	
H	H	L	L	H	L	L	
H	L	H	H	L	H	Z	
H	L	L	L	H	H	Z	
L	H	X	Z	Z	?	?	
L	L	X	Z	Z	H	Z	

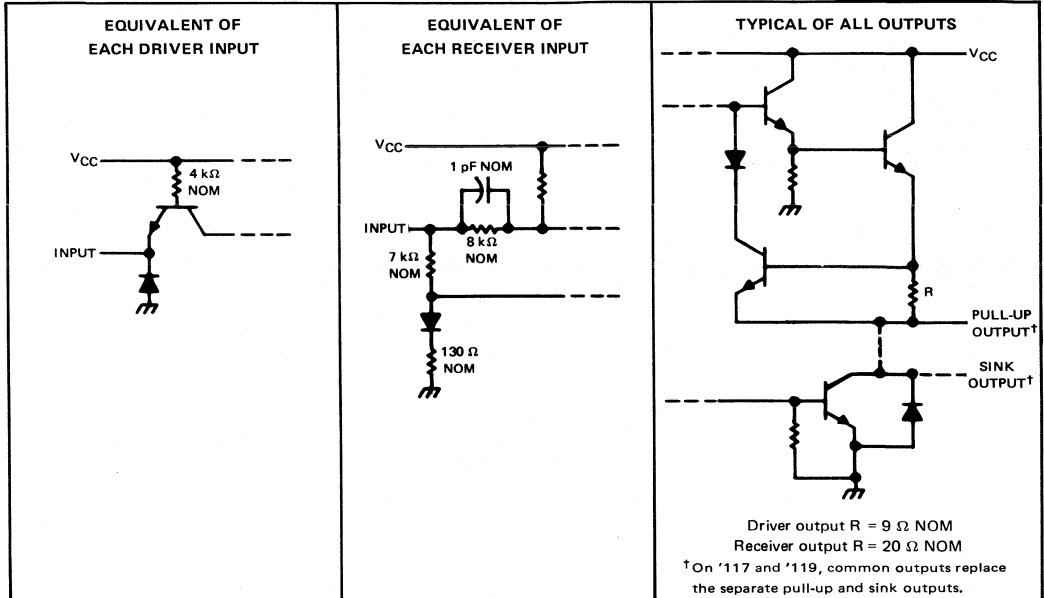
'117, '119
FUNCTION TABLE (RECEIVING)

INPUTS					OUTPUT Y	
DE	RS/RE	A	B	D1	'117	'119
L	H	H	L	X	H	H
L	H	L	H	X	L	L
L	L	X	X	X	H	Z

H = high level ($V_I \geq V_{IH}$ min or V_{ID} more positive than V_{TH} max)
 L = low level ($V_I \leq V_{IL}$ max or V_{ID} more negative than V_{TL} max)
 X = irrelevant
 Z = high impedance (off)
 ? = indeterminate

TYPES SN55116 THRU SN55119, SN75116 THRU SN75119 DIFFERENTIAL LINE TRANSCEIVERS

schematics of inputs and outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage at data, enable, and strobe inputs	5.5 V
Input voltage at receiver and termination inputs: '116 and '118	± 25 V
Input voltage at receiver inputs: '117 and '119	0 to 6 V
Off-state voltage applied to open-collector outputs: '116 and '118	12 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range: SN55'	-55°C to 125°C
SN75'	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J or JG package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N or P package	260°C

- NOTES: 1. Voltage values are with respect to network ground terminal unless otherwise specified.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55116 through SN55119 chips are alloy-mounted; SN75116 through SN75119 chips are glass-mounted.

recommended operating conditions

	SN55'			SN75'			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}	Drivers		-40			-40	mA
	Receivers		-5			-5	
Low-level output current, I_{OL}	Drivers		40			40	mA
	Receivers		15			15	
Receiver common-mode input voltage, V_{IC}	'116		± 15			± 15	V
	'117	0	6	0		6	
Operating free-air temperature range, T_A		-55	125		0	70	°C

TYPES SN55116 THRU SN55119, SN75116 THRU SN75119

DIFFERENTIAL LINE TRANSCEIVERS

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

driver section

PARAMETER		TEST CONDITIONS†	'116, '118			'117, '119			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V _{IH}	High-level input voltage		2			2			V
V _{IL}	Low-level input voltage		0.8			0.8			V
V _{IK}	Input clamp voltage	V _{CC} = MIN, I _I = -12 mA	-0.9			-1.5			V
V _{OH}	High-level output voltage	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V	I _{OH} = -10 mA		2.4	3.4		V	
			I _{OH} = -40 mA		2	3.0			
V _{OL}	Low-level output voltage	V _{CC} = MIN, V _{IH} = 2 V, V _{IL} = 0.8 V, I _{OL} = 40 mA	0.4			0.4			V
V _{OK}	Output clamp voltage	V _{CC} = MAX, I _O = -40 mA, DE at 0.8 V	-1.5			-1.5			V
I _{O(off)}	Off-state open-collector output current	V _{CC} = MAX, V _O = 12 V	T _A = 25°C		1		10		µA
			T _A = MAX	SN55'		200			
				SN75'		20			
I _{OZ}	Off-state (high-impedance-state) output current	V _{CC} = MAX, V _O = 0 to V _{CC} , DE at 0.8 V		±10				µA	
		T _A = 25°C							
		V _{CC} = MAX, V _O = 0	SN55'		-150				
		DE at 0.8 V, V _O = 0.4 V to V _{CC}	SN55'		±80				
		T _A = MAX, V _O = 0 to V _{CC}	SN75'		±20				
I _I	Input current at maximum input voltage	Driver or enable input V _{CC} = MAX, V _I = 5.5 V	1			1			mA
I _{IH}	High-level input current		40			40			µA
I _{IL}	Low-level input current		-1.6			-1.6			mA
I _{OS}	Short-circuit output current§	V _{CC} = MAX, V _O = 0	-40	-120	-40	-120		mA	
I _{CC}	Supply current (driver and receiver combined)	V _{CC} = MAX	42 60		42 60			mA	

† All parameters with the exception of off-state open-collector output current are measured with the active pull-up connected to the sink output. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at T_A = 25°C and V_{CC} = 5 V.

§ Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, C_L = 30 pF, T_A = 25°C

driver section

PARAMETER		TEST CONDITIONS	SN55'			SN75'			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
t _{PLH}	Propagation delay time, low-to-high-level output	See Figure 13	14	20	14	30	ns		
t _{PHL}	Propagation delay time, high-to-low-level output		12	20	12	30			
t _{PZH}	Output enable time to high level	R _L = 180 Ω, See Figure 14	8	15	8	20	ns		
t _{PZL}	Output enable time to low level	R _L = 250 Ω, See Figure 15	17	30	17	40	ns		
t _{PHZ}	Output disable time from high level	R _L = 180 Ω, See Figure 14	16	20	16	30	ns		
t _{PLZ}	Output disable time from low level	R _L = 250 Ω, See Figure 15	20	35	20	35	ns		

TYPES SN55116 THRU SN55119, SN75116 THRU SN75119 DIFFERENTIAL LINE TRANSCEIVERS

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)
receiver section

PARAMETER		TEST CONDITIONS†		'116, '118		'117, '119		UNIT
				MIN	TYP‡ MAX	MIN	TYP‡ MAX	
V _{TH} ♦	Differential input high-threshold voltage¶	V _O = 0.4 V, I _{OL} = 15 mA	V _{IC} = 0	0.5	0.5			V
			V _{IC} = MAX	1	1			
V _{TL} ♦	Differential input low-threshold voltage¶	V _O = 2.4 V, I _{OH} = -5 mA	V _{IC} = 0	-0.5	-0.5			V
			V _{IC} = MAX	-1	-1			
V _{ICR}	Common-mode input voltage range¶	V _{CC} = 5 V, V _{ID} = -1 V or 1 V		+15 to -15	+6 to 0			V
V _{IH}	High-level strobe or enable input voltage			2	2			V
V _{IL}	Low-level strobe or enable input voltage			0.8	0.8			V
V _{OH}	High-level output voltage¶	V _{CC} = MIN, I _{OH} = -5 mA	V _{ID} = -0.5 V, V _{IC} = 0	2.4	2.4			V
			V _{ID} = -1 V, V _{IC} = MAX	2.4	2.4			
V _{OL}	Low-level output voltage¶	V _{CC} = MIN, I _{OL} = 15 mA	V _{ID} = 0.5 V, V _{IC} = 0	0.4	0.4			V
			V _{ID} = 1 V, V _{IC} = MAX	0.4	0.4			
I _{I(rec)}	Receiver input current¶	V _{CC} = MAX	V _I = 0 V, Other input at 0 V	-0.5	-0.9	-0.5	-1	mA
			V _I = 0.4 V, Other input at 2.4 V	-0.4	-0.7	-0.4	-0.8	
			V _I = 2.4 V, Other input at 0.4 V	0.1	0.3	0.1	0.4	
I _I	Input current at maximum input voltage	Strobe V _{CC} = MIN, V _{ID} = -0.5 V, V _{strobe} = 4.5 V	'116, '117	5	5			µA
			Enable V _{CC} = MAX, V _I = 5.5 V	'118, '119	1	1		
I _{IH}	High-level input current	Enable V _{CC} = MAX, V _I = 2.4 V	'118, '119	40	40			µA
I _{IL}	Low-level input current	Strobe V _{CC} = MAX, V _{ID} = 0.5 V, V _{strobe} = 0.4 V	'116, '117	-2.4	-2.4			mA
			Enable V _{CC} = MAX, V _I = 0.4 V	'118, '119	-1.6	-1.6		
I _(RC)	Response-time-control current (Pin 9)	V _{CC} = MAX, V _{ID} = 0.5 V, RC at 0 V	T _A = 25°C	-1.2				mA
I _{O(off)}	Off-state open-collector output current	V _{CC} = MAX, V _O = 12 V, V _{ID} = -1 V	T _A = 25°C	1	10			µA
			T _A = MAX	SN55†	200			
				SN75†	20			
I _{OZ}	Off-state (high-impedance state) output current	V _{CC} = MAX, V _O = 0 to V _{CC} , RE at 0.4 V	T _A = 25°C	'118, '119	±10	±10		µA
			T _A = MAX	SN55118	±40			
				SN55119		±40		
				SN75118	±20			
				SN75119		±20		
R _T	Line-terminating resistance	V _{CC} = 5 V	T _A = 25°C	77	167			Ω
I _{OS}	Short-circuit output current §	V _{CC} = MAX, V _O = 0, V _{ID} = -0.5 V	T _A = 25°C	-15	-80	-15	-80	mA
I _{CC}	Supply current (driver and receiver combined)	V _{CC} = MAX, V _{ID} = 0.5 V, V _{IC} = 0	T _A = 25°C	42	60	42	60	mA

† Unless otherwise noted V_{strobe} = 2.4 V. All parameters with the exception of off-state open-collector output current are measured with the active pull-up connected to the sink output. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at V_{CC} = 5 V, T_A = 25°C, and V_{IC} = 0.

♦ Differential voltages are at the B input terminal with respect to the A input terminal.

¶ Measurement of these characteristics on the '117 and '119 requires the driver to be disabled with the driver enable at 0.8 V.

§ Not more than one output should be shorted at a time.

TYPES SN55116 THRU SN55119, SN75116 THRU SN75119 DIFFERENTIAL LINE TRANSCEIVERS

switching characteristics, $V_{CC} = 5\text{ V}$, $C_L = 30\text{ pF}$, $T_A = 25^\circ\text{C}$

receiver section

PARAMETER	TEST CONDITIONS	SN55'			SN75'			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
tPLH Propagation delay time, low-to-high-level output	$R_L = 400\ \Omega$, See Figure 16	20	50	20	75	ns		
tPHL Propagation delay time, high-to-low-level output		17	50	17	75	ns		
tpZH Output enable time to high level	'118 $R_L = 480\ \Omega$, See Figure 14	9	15	9	20	ns		
tpZL Output enable time to low level	and $R_L = 250\ \Omega$, See Figure 15	16	25	16	35	ns		
tpHZ Output disable time from high level	'119 $R_L = 480\ \Omega$, See Figure 14	12	20	12	30	ns		
tpLZ Output disable time from low level	only $R_L = 250\ \Omega$, See Figure 15	17	25	17	35	ns		

TYPICAL CHARACTERISTICS

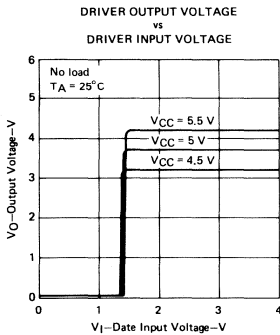


FIGURE 1

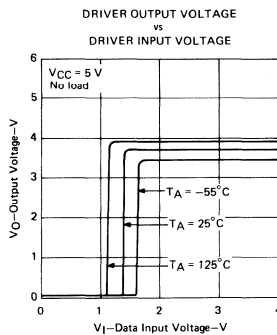


FIGURE 2

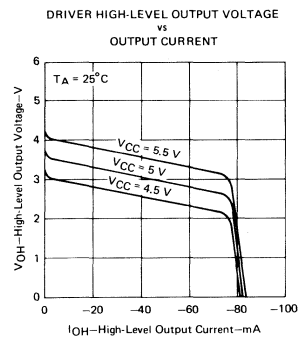


FIGURE 3

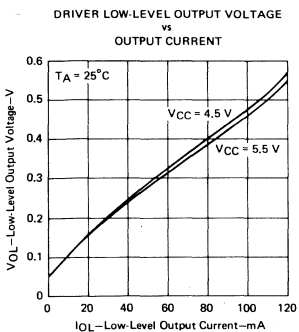


FIGURE 4

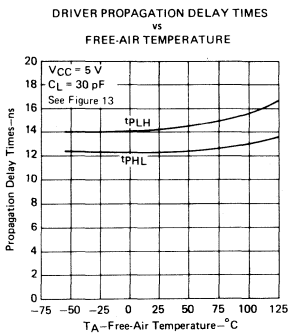


FIGURE 5

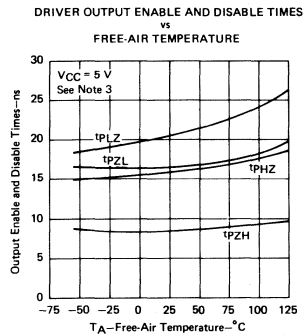


FIGURE 6

NOTE 3: For tp_{ZH} and tp_{HZ} : $R_L = 180\ \Omega$, see Figure 14. For tp_{ZL} and tp_{LZ} : $R_L = 250\ \Omega$, see Figure 15.

TYPES SN55116 THRU SN55119, SN75116 THRU SN75119 DIFFERENTIAL LINE TRANSCEIVERS

TYPICAL CHARACTERISTICS

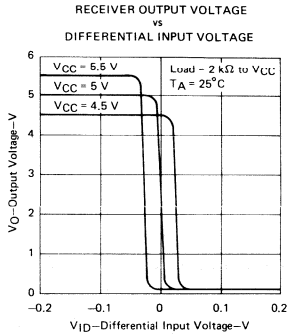


FIGURE 7

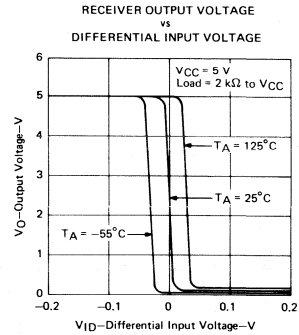


FIGURE 8

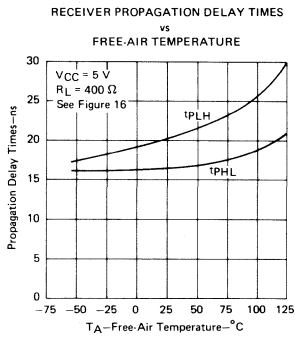


FIGURE 9

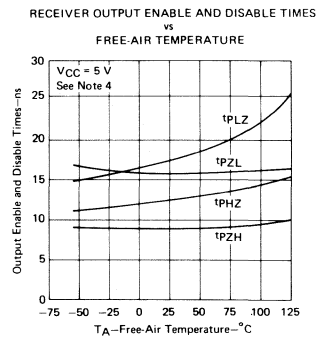


FIGURE 10

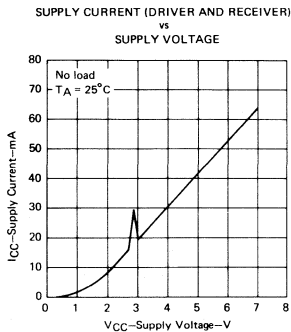


FIGURE 11

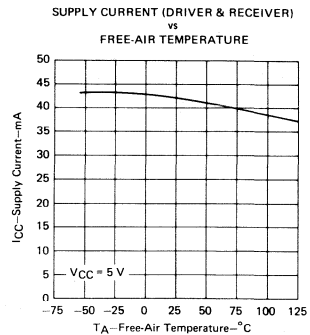


FIGURE 12

NOTE 4: For t_{pZH} and t_{pHZ} : $R_L = 480\ \Omega$, see Figure 14. For t_{pZL} and t_{pLZ} : $R_L = 250\ \Omega$, see Figure 15.

TYPES SN55116 THRU SN55119, SN75116 THRU SN75119 DIFFERENTIAL LINE TRANSCEIVERS

PARAMETER MEASUREMENT INFORMATION

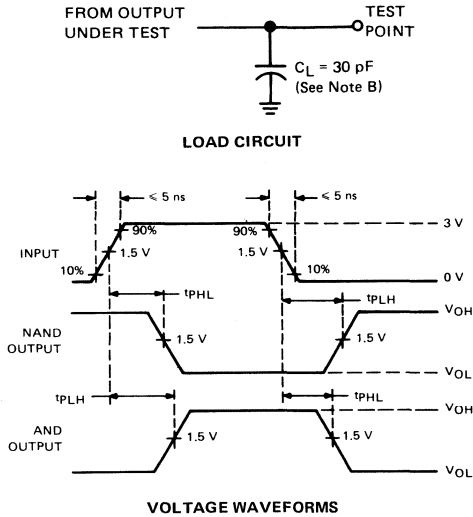


FIGURE 13— t_{PLH} and t_{PHL} (DRIVERS ONLY)

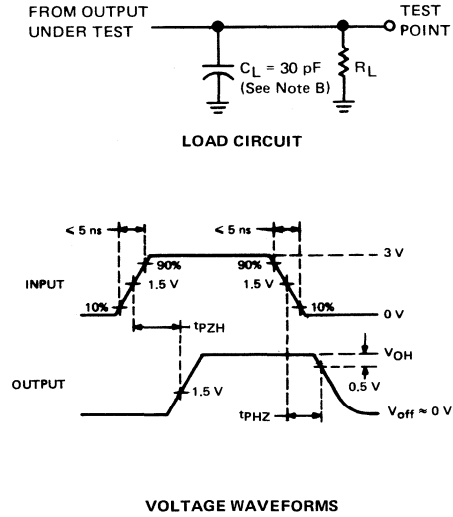
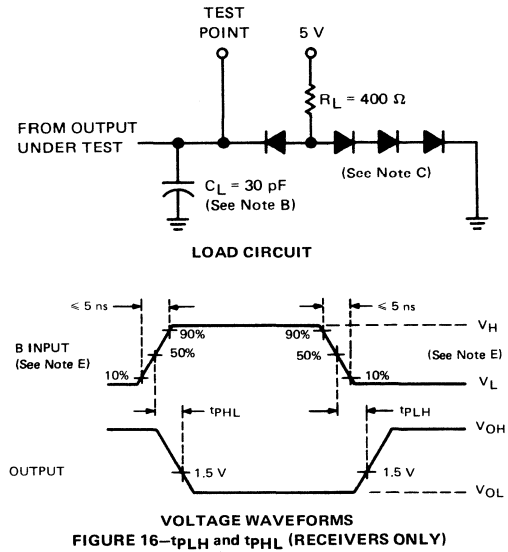
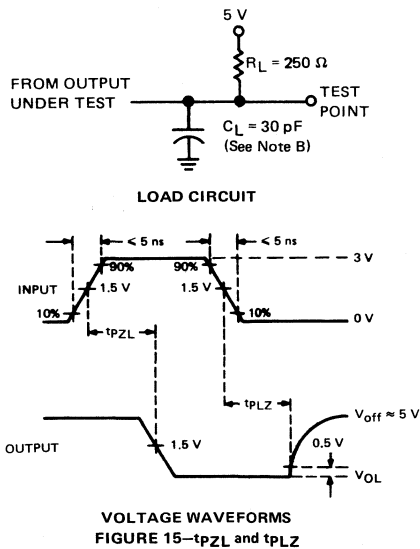


FIGURE 14— t_{pZH} and t_{pZH}



- NOTES: A. Input pushes are supplied by generators having the following characteristics: $Z_{out} = 50 \Omega$, $PRR = 500 \text{ kHz}$, $t_w = 100 \text{ ns}$.
B. C_L includes probe and jig capacitance.
C. All diodes are 1N3064 or equivalent.
D. When testing the '116 and '118 receiver sections, the response-time control and the termination resistor pins are left open.
E. For '116 and '118, $V_H = 3 \text{ V}$, $V_L = -3 \text{ V}$, the A input is at 0 V.
For '118 and '119, $V_H = 3 \text{ V}$, $V_L = 0 \text{ V}$, the A input is at 1.5 V.

INTERFACE CIRCUITS

TYPES SN55121, SN55122, SN75121, SN75122 DUAL LINE DRIVERS AND TRIPLE LINE RECEIVERS

BULLETIN NO. DL-S 7412049, SEPTEMBER 1973—REVISED APRIL 1974

LINE CIRCUITS

- Designed for Digital Data Transmission over Coaxial Cable, Strip Line, or Twisted Pair
- Designed for Operation with 50-Ω to 500-Ω Transmission Lines
- TTL Compatible with Single 5-V Supply

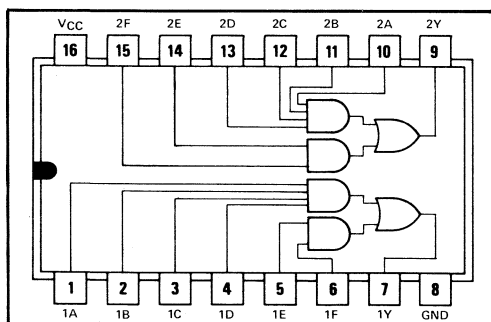
additional features of SN55121, SN75121 line drivers

- Plug-In Replacement for Signetics 8T13
- 2.4-V Output at $I_{OH} = -75$ mA
- Uncommitted Emitter-Follower Output Structure for Party-Line Operation
- Short-Circuit Protection
- AND-OR Logic Configuration
- High Speed . . . Maximum Propagation Delay Time = 20 ns

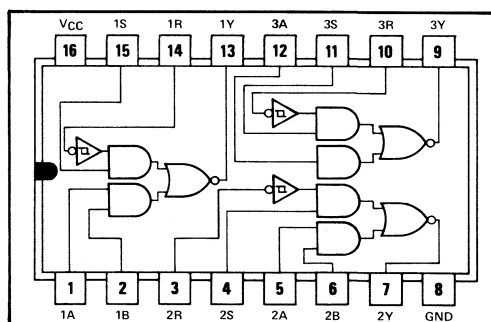
additional features of SN55122, SN75122 line receivers

- Plug-In Replacement for Signetics 8T14
- Built-In Input Threshold Hysteresis
- High Speed . . . Typical Propagation Delay Time = 20 ns
- Independent Channel Strobes
- Input Gating Increases Application Flexibility
- Fanout to 10 Series 54/74 Standard Loads

SN55121, SN75121
J OR N
DUAL-IN-LINE PACKAGE (TOP VIEW)



SN55122, SN75122
J OR N
DUAL-IN-LINE PACKAGE (TOP VIEW)



description

The SN55121, SN75121 dual line drivers and the SN55122, SN75122 triple line receivers are designed for digital data transmission over lines having impedances from 50 to 500 ohms. They are also compatible with standard TTL logic and supply voltage levels.

The low-impedance emitter-follower outputs of the SN55121, SN75121 will drive terminated lines such as coaxial cable or twisted pair. Having the outputs uncommitted allows wired-OR logic to be performed in party-line applications. Output short-circuit protection is provided by an internal clamping network which turns on when the output voltage drops below approximately 1.5 volts. All of the inputs are in conventional TTL configuration and the gating can be used during power-up and power-down sequences to ensure that no noise is introduced to the line.

The SN55122, SN75122 have receiver inputs with built-in hysteresis to provide increased noise margin for single-ended systems. The high impedance of this input presents a minimum load to the driver and allows termination of the transmission line in its characteristic impedance to minimize line reflection. An open line will affect the receiver input as would a low-level input voltage and the receiver input can withstand a level of -0.15 volt with power on or off. The other inputs are in TTL configuration. The S input must be high to enable the receiver input. Two of the line receivers have A and B inputs which, if both are high, will hold the output low. The third receiver has only an A input which, if high, will hold the output low.

TYPES SN55121, SN55122, SN75121, SN75122

DUAL LINE DRIVERS AND TRIPLE LINE RECEIVERS

SN55121, SN75121 FUNCTION TABLE

INPUTS						OUTPUT
A	B	C	D	E	F	Y
H	H	H	H	X	X	H
X	X	X	X	H	H	H
ALL OTHER INPUT COMBINATIONS						L

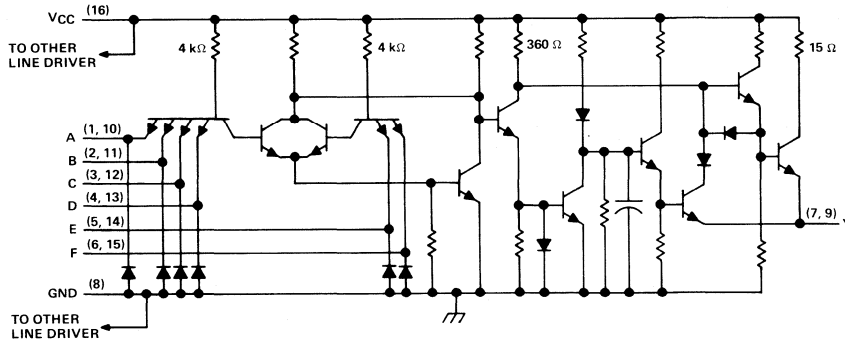
H = high level
L = low level
X = irrelevant

SN55122, SN75122 FUNCTION TABLE

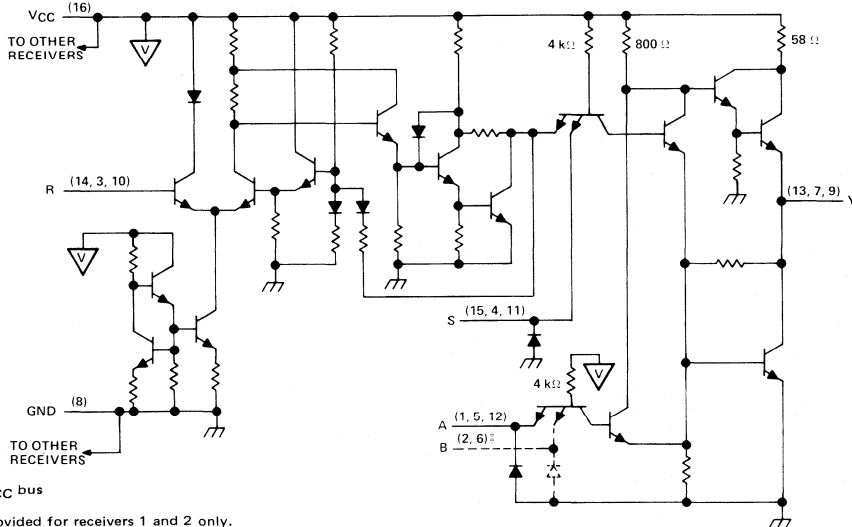
INPUTS				OUTPUT
A	B†	R	S	Y
H	H	X	X	L
X	X	L	H	L
L	X	H	X	H
L	X	X	L	H
X	L	H	X	H
X	L	X	L	H

†B input and last two lines of the function table are applicable to receivers 1 and 2 only.

SN55121, SN75121 schematic (each driver)



SN55122, SN75122 schematic (each receiver)



▽ . . . VCC bus

†B input is provided for receivers 1 and 2 only.
Resistor values shown are nominal.

TYPES SN55121, SN75121 DUAL LINE DRIVERS

SN55121, SN75121 absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	6 V
Input voltage	6 V
Output voltage	6 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range: SN55121	-55°C to 125°C
SN75121	0°C to 75°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

SN55121, SN75121 recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			-75	mA
Operating free-air temperature, T_A : SN55121	-55		125	°C
SN75121	0		75	°C

SN55121, SN75121 electrical characteristics over recommended operating free-air temperature range, $V_{CC} = 4.75$ V to 5.25 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	MAX	UNIT
V_{IH}	High-level input voltage		2		V
V_{IL}	Low-level input voltage			0.8	V
V_{IK}	Input clamp voltage	$V_{CC} = 5$ V, $I_I = -12$ mA		-1.5	V
$V_{(BR)I}$	Input breakdown voltage	$V_{CC} = 5$ V, $I_I = 10$ mA	5.5		V
V_{OH}	High-level output voltage	$V_{IH} = 2$ V, $I_{OH} = -75$ mA, See Note 3	2.4		V
I_{OH}	High-level output current	$V_{CC} = 5$ V, $V_{IH} = 4.5$ V, $V_{OH} = 2$ V, $T_A = 25^\circ$ C, See Note 3	-100	-250	mA
I_{OL}	Low-level output current	$V_{IL} = 0.8$ V, $V_{OL} = 0.4$ V, See Note 3		-800	μ A
$I_{O(off)}$	Off-state output current	$V_{CC} = 0$, $V_O = 3$ V		500	μ A
I_{IH}	High-level input current	$V_I = 4.5$ V		40	μ A
I_{IL}	Low-level input current	$V_I = 0.4$ V	-0.1	-1.6	mA
I_{OS}	Short-circuit output current [‡]	$V_{CC} = 5$ V, $T_A = 25^\circ$ C		-30	mA
I_{CCH}	Supply current, outputs high	$V_{CC} = 5.25$ V, All inputs at 2 V, Outputs open		28	mA
I_{CCL}	Supply current, outputs low	$V_{CC} = 5.25$ V, All inputs at 0.8 V, Outputs open		60	mA

[‡]Not more than one output should be shorted at a time.

SN55121, SN75121 switching characteristics, $V_{CC} = 5$ V, $T_A = 25^\circ$ C

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	$R_L = 37 \Omega$, $C_L = 15$ pF,		11	20	ns
t_{PHL}	Propagation delay time, high-to-low-level output	See Figure 1		8	20	
t_{PLH}	Propagation delay time, low-to-high-level output	$R_L = 37 \Omega$, $C_L = 1000$ pF,		22	50	ns
t_{PHL}	Propagation delay time, high-to-low-level output	See Figure 1		20	50	

- NOTES: 1. Voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to the Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55121 chips are alloy-mounted; SN75121 chips are glass-mounted.
 3. The output voltage and current limits are guaranteed for any appropriate combination of high and low inputs specified by the function table for the desired output.

TYPES SN55122, SN75122

TRIPLE LINE RECEIVERS

SN55122, SN75122 absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	6 V
Input voltage: R input	6 V
A, B, or S input	5.5 V
Output voltage	6 V
Output current	± 100 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 6)	1 W
Operating free-air temperature range: SN55122	-55°C to 125°C
SN75122	0°C to 75°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

SN55122, SN75122 recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			-500	μ A
Low-level output current, I_{OL}			16	mA
Operating free-air temperature, T_A : SN55122	-55		125	°C
SN75122	0		75	°C

SN55122, SN75122 electrical characteristics over recommended operating free-air temperature range, $V_{CC} = 4.75$ V to 5.25 V (unless otherwise noted)

PARAMETER			TEST CONDITIONS		MIN	TYP	MAX	UNIT
V_{IH}	High-level input voltage	A, B, R, or S			2			V
V_{IL}	Low-level input voltage	A, B, R, or S					0.8	V
$V_{T+} - V_{T-}$	Hysteresis [†]	R	$V_{CC} = 5$ V,	$T_A = 25^\circ$ C	0.3	0.6		V
V_{IK}	Input clamp voltage	A, B, or S	$V_{CC} = 5$ V,	$I_I = -12$ mA			-1.5	V
$V_{(BR)I}$	Input breakdown voltage	A, B, or S	$V_{CC} = 5$ V,	$I_I = 10$ mA	5.5			V
V_{OH}	High-level output voltage		$V_{IH} = 0$ V,	$V_{IL} = 0.8$ V, $I_{OH} = -500$ μ A,	2.6			V
			See Note 3					
V_{OL}	Low-level output voltage		$V_{I(A)} = 0$ V,	$V_{I(B)} = 0$ V, $V_{I(S)} = 2$ V,	2.6			V
			$V_{I(R)} = 1.45$ V (See Note 4),	$I_{OH} = -500$ μ A				
V_{OL}	Low-level output voltage		$V_{IH} = 2$ V,	$V_{IL} = 0.8$ V, $I_{OL} = 16$ mA,			0.4	V
			See Note 3					
			$V_{I(A)} = 0$ V,	$V_{I(B)} = 0$ V, $V_{I(S)} = 2$ V,			0.4	
			$V_{I(R)} = 1.45$ V (See Note 5),	$I_{OL} = 16$ mA				
I_{IH}	High-level input current	A, B, or S	$V_I = 4.5$ V				40	μ A
		R	$V_I = 3.8$ V				170	
I_{IL}	Low-level input current	A, B, or S	$V_I = 0.4$ V		-0.1		-1.6	mA
I_{OS}	Short-circuit output current [‡]		$V_{CC} = 5$ V,	$T_A = 25^\circ$ C	-50		-100	mA
I_{CC}	Supply current		$V_{CC} = 5.25$ V				72	mA

[†]Hysteresis is the difference between the positive-going input threshold voltage, V_{T+} , and the negative-going input threshold voltage, V_{T-} . See Figure 4.

[‡]Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second.

NOTES: 1. Voltage values are with respect to network ground terminal.

3. The output voltage limits are guaranteed for any appropriate combination of high and low inputs specified by the function table for the desired output.

4. Receiver input was at a high level immediately before being reduced to 1.45 V.

5. Receiver input was at a low level immediately before being raised to 1.45 V.

6. For operation above 25°C free-air temperature, refer to the Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55122 chips are alloy-mounted; SN75122 chips are glass-mounted.

TYPES SN55121, SN55122, SN75121, SN75122 DUAL LINE DRIVERS AND TRIPLE LINE RECEIVERS

SN55122, SN75122 switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output from R input	See Figure 2		20	30	ns
t_{PHL} Propagation delay time, high-to-low-level output from R input			20	30	

PARAMETER MEASUREMENT INFORMATION

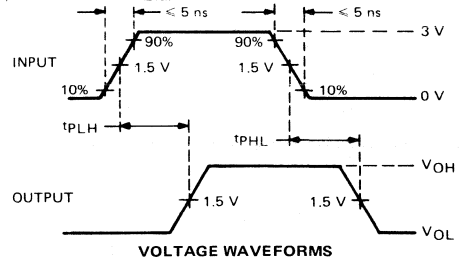
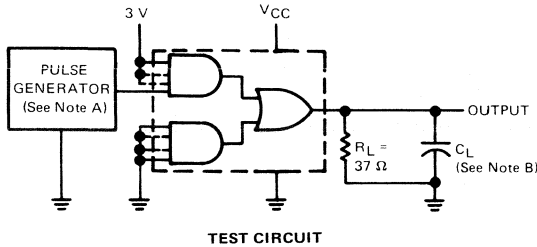


FIGURE 1—SN55121, SN75121 SWITCHING TIMES

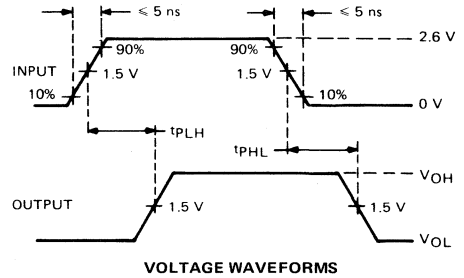
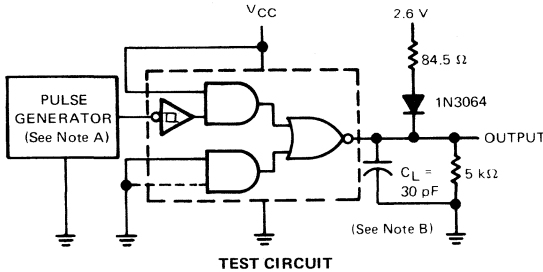


FIGURE 2—SN55122, SN75122 SWITCHING TIMES

NOTES: A. The pulse generators have the following characteristics: $Z_{out} \approx 50\ \Omega$, $t_w = 200\text{ ns}$, duty cycle = 50%.
B. C_L includes probe and jig capacitance.

TYPICAL CHARACTERISTICS

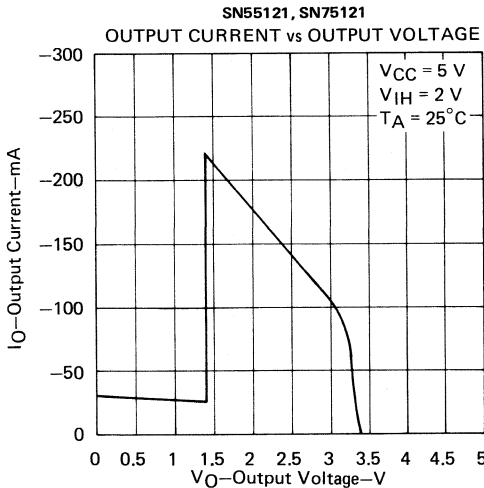


FIGURE 3

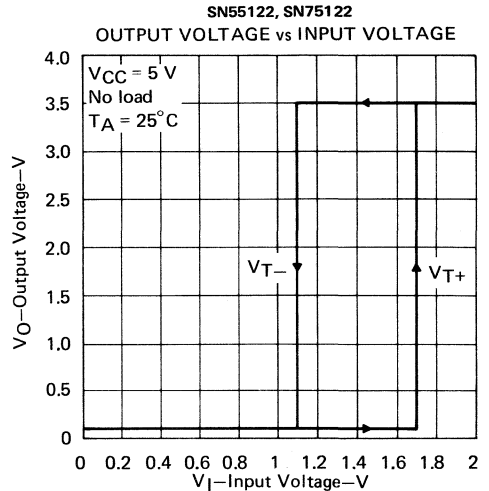


FIGURE 4

TYPES SN55121, SN55122, SN75121, SN75122 DUAL LINE DRIVERS AND TRIPLE LINE RECEIVERS

TYPICAL APPLICATION DATA

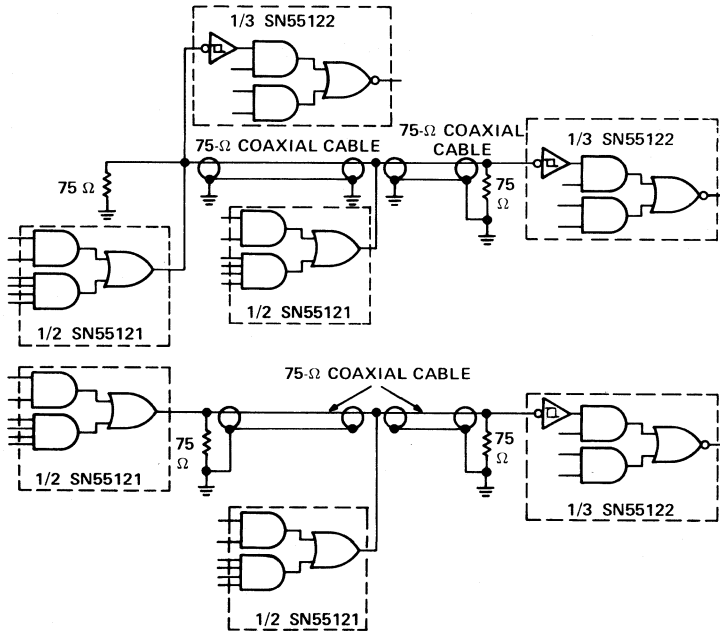
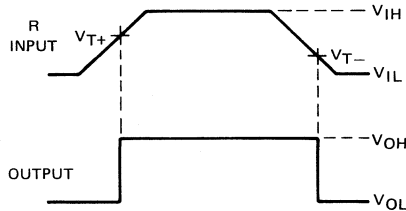


FIGURE 5—SINGLE-ENDED PARTY LINE CIRCUITS



The high gain and built-in hysteresis of the SN55122 and SN75122 line receivers enable them to be used as Schmitt triggers in squaring up pulses.

FIGURE 6—PULSE SQUARING

INTERFACE CIRCUITS

TYPES SN75123, SN75124 DUAL LINE DRIVER AND TRIPLE LINE RECEIVER

BULLETIN NO. DL-S 7412043, SEPTEMBER 1973—REVISED APRIL 1974

LINE CIRCUITS

- Meet IBM System 360 Input/Output Interface Specifications
- Operate from Single 5-V Supply
- TTL Compatible

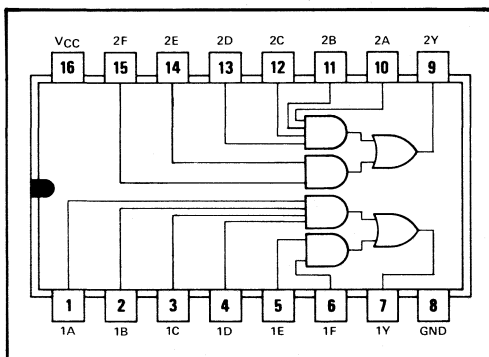
additional features of SN75123 line driver

- Plug-In Replacement for Signetics 8T23
- 3.11-V Output at $I_{OH} = -59.3$ mA
- Uncommitted Emitter-Follower Output Structure for Party-Line Operation
- Short-Circuit Protection
- AND-OR Logic Configuration

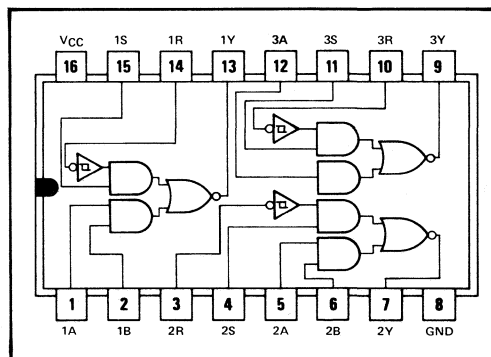
additional features of SN75124 line receiver

- Plug-In Replacement for Signetics 8T24
- Built-In Input Threshold Hysteresis
- High Speed . . . Typical Propagation Delay Time = 20 ns
- Independent Channel Strobes
- Input Gating Increases Application Flexibility

SN75123
J OR N
DUAL-IN-LINE PACKAGE (TOP VIEW)



SN75124
J OR N
DUAL-IN-LINE PACKAGE (TOP VIEW)



description

The SN75123 dual line driver and the SN75124 triple line receiver are both specifically designed to meet the input/output interface specifications for IBM System 360. They are also compatible with standard TTL logic and supply voltage levels.

The low-impedance emitter-follower outputs of the SN75123 will drive terminated lines such as coaxial cable or twisted pair. Having the outputs uncommitted allows wired-OR logic to be performed in party-line applications. Output short-circuit protection is provided by an internal clamping network which turns on when the output voltage drops below approximately 1.5 volts. All of the inputs are in conventional TTL configuration and the gating can be used during power-up and power-down sequences to ensure that no noise is introduced to the line.

The SN75124 has receiver inputs with built-in hysteresis to provide increased noise margin for single-ended systems. An open line will affect the receiver input as would a low-level input voltage and the receiver input can withstand a level of -0.15 volt with power on or off. The other inputs are in TTL configuration. The S input must be high to enable the receiver input. Two of the line receivers have A and B inputs which, if both are high, will hold the output low. The third receiver has only an A input which, if high, will hold the output low.

TYPES SN75123, SN75124

DUAL LINE DRIVER AND TRIPLE LINE RECEIVER

SN75123 FUNCTION TABLE

INPUTS						OUTPUT
A	B	C	D	E	F	Y
H	H	H	H	X	X	H
X	X	X	X	H	H	H
ALL OTHER INPUT COMBINATIONS						L

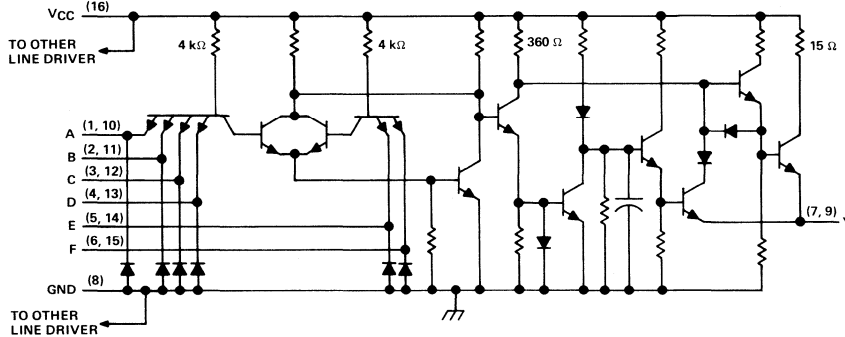
H = high level
L = low level
X = irrelevant

SN75124 FUNCTION TABLE

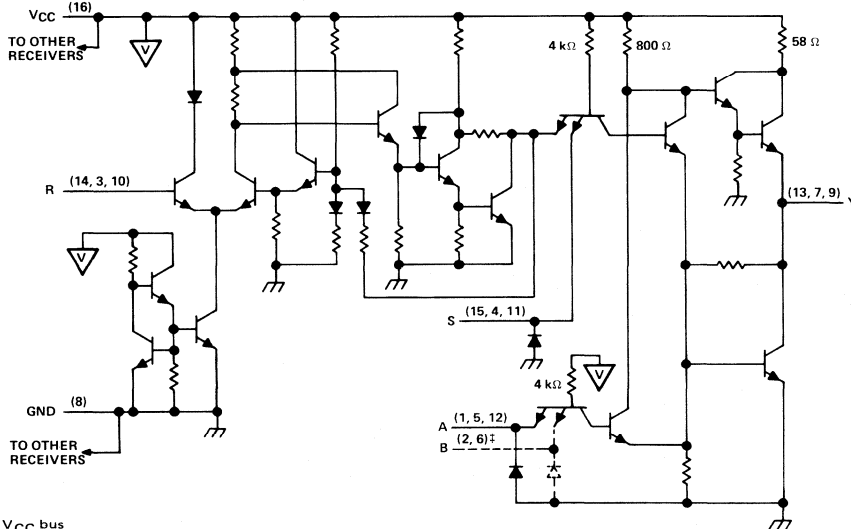
INPUTS				OUTPUT
A	B†	R	S	Y
H	H	X	X	L
X	X	L	H	L
L	X	H	X	H
L	X	X	L	H
X	L	H	X	H
X	L	X	L	H


† B input and last two lines of the function table are applicable to receivers 1 and 2 only.

SN75123 schematic (each driver)



SN75124 schematic (each receiver)



 . . . V_{CC} bus

† B input is provided on receivers 1 and 2 only

Resistor values shown are nominal

SN75123 DUAL LINE DRIVER

SN75123 absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Output voltage	7 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range	0°C to 75°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

SN75123 recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			-100	mA
Operating free-air temperature, T_A	0		75	°C

SN75123 electrical characteristics, $V_{CC} = 4.75\text{ V to }5.25\text{ V}$, $T_A = 0^\circ\text{C to }75^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{IH} High-level input voltage		2			V
V_{IL} Low-level input voltage				0.8	V
V_{IK} Input clamp voltage	$V_{CC} = 5\text{ V}$, $I_I = -12\text{ mA}$			-1.5	V
$V_{(BR)I}$ Input breakdown voltage	$V_{CC} = 5\text{ V}$, $I_I = 10\text{ mA}$	5.5			V
V_{OH} High-level output voltage	$V_{CC} = 5\text{ V}$, $V_{IH} = 2\text{ V}$, $I_{OH} = -59.3\text{ mA}$, See Note 3	$T_A = 25^\circ\text{C}$		3.11	V
		$T_A = 0^\circ\text{C to }75^\circ\text{C}$		2.9	
I_{OH} High-level output current	$V_{CC} = 5\text{ V}$, $V_{IH} = 4.5\text{ V}$, $V_{OH} = 2\text{ V}$, $T_A = 25^\circ\text{C}$, See Note 3	-100		-250	mA
V_{OL} Low-level output voltage	$V_{IL} = 0.8\text{ V}$, $I_{OL} = -240\text{ }\mu\text{A}$, See Note 3			0.15	V
$I_{O(off)}$ Off-state output current	$V_{CC} = 0$, $V_O = 3\text{ V}$			40	μA
I_{IH} High-level input current	$V_I = 4.5\text{ V}$			40	μA
I_{IL} Low-level input current	$V_I = 0.4\text{ V}$	-0.1		-1.6	mA
I_{OS} Short-circuit output current ‡	$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$			-30	mA
I_{CCH} Supply current, outputs high	$V_{CC} = 5.25\text{ V}$, Outputs open All inputs at 2 V,			28	mA
I_{CCL} Supply current, outputs low	$V_{CC} = 5.25\text{ V}$, Outputs open All inputs at 0.8 V,			60	mA

‡ Not more than one output should be shorted at a time.

SN75123 switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output	$R_L = 50\text{ }\Omega$, $C_L = 15\text{ pF}$,		12	20	ns
t_{PHL} Propagation delay time, high-to-low-level output	See Figure 1		12	20	
t_{PLH} Propagation delay time, low-to-high-level output	$R_L = 50\text{ }\Omega$, $C_L = 100\text{ pF}$,		20	35	ns
t_{PHL} Propagation delay time, high-to-low-level output	See Figure 1		15	25	

- NOTES: 1. Voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to the Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN75123 chips are glass-mounted.
 3. The output voltage and current limits are guaranteed for any appropriate combination of high and low inputs specified by the function table for the desired output.

TYPE SN75124

TRIPLE LINE RECEIVER

SN75124 absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage: R input with V_{CC} applied	7 V
R input with V_{CC} not applied	6 V
A, B, or S input	5.5 V
Output voltage	7 V
Output current	± 100 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 4)	1 W
Operating free-air temperature range	0°C to 75°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

SN75124 recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			-800	μ A
Low-level output current, I_{OL}			16	mA
Operating free-air temperature, T_A	0		75	°C

SN75124 electrical characteristics, $V_{CC} = 4.75$ V to 5.25 V, $T_A = 0^\circ$ C to 75°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
V_{IH}	High-level input voltage	A, B, or S	2			V	
		R	1.7				
V_{IL}	Low-level input voltage	A, B, or S	0.8			V	
		R	0.7				
$V_{T+}-V_{T-}$	Hysteresis [†]	R $V_{CC} = 5$ V, $T_A = 25^\circ$ C	0.2	0.4		V	
V_{IK}	Input clamp voltage	A, B, or S $V_{CC} = 5$ V, $I_I = -12$ mA				-1.5	V
$V_{(BR)I}$	Input breakdown voltage	A, B, or S $V_{CC} = 5$ V, $I_I = 10$ mA	5.5			V	
V_{OH}	High-level output voltage	$V_{IH} = V_{IH\ min}$, $V_{IL} = V_{IL\ max}$, $I_{OH} = -800$ μ A, See Note 3	2.6			V	
V_{OL}	Low-level output voltage	$V_{IH} = V_{IH\ min}$, $V_{IL} = V_{IL\ max}$, $I_{OL} = 16$ mA, See Note 3	0.4			V	
I_I	Input current at maximum input voltage	R	$V_I = 7$ V			mA	
			$V_I = 6$ V, $V_{CC} = 0$				
I_{IH}	High-level input current	A, B, or S	$V_I = 4.5$ V			μ A	
		R	$V_I = 3.11$ V				
I_{IL}	Low-level input current	A, B, or S	$V_I = 0.4$ V			mA	
I_{OS}	Short-circuit output current [‡]	$V_{CC} = 5$ V, $T_A = 25^\circ$ C	-50			-100	mA
I_{CC}	Supply current	$V_{CC} = 5.25$ V	72			mA	

[†] Hysteresis is the difference between the positive-going input threshold voltage, V_{T+} , and the negative-going input threshold voltage, V_{T-} . See Figure 4.

[‡] Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

SN75124 switching characteristics, $V_{CC} = 5$ V, $T_A = 25^\circ$ C

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output from R input	See Figure 2		20	30	ns
t_{PHL} Propagation delay time, high-to-low-level output from R input			20	30	

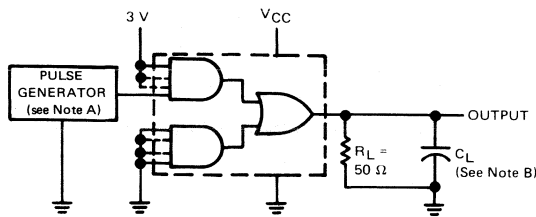
NOTES: 1. Voltage values are with respect to network ground terminal.

3. The output voltage and current limits are guaranteed for any appropriate combination of high and low inputs specified by the function table for the desired output.

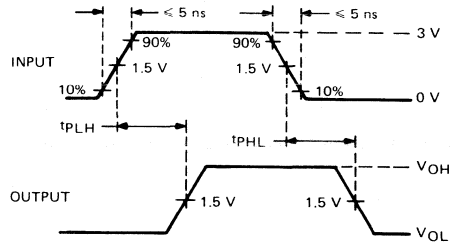
4. For operation above 25°C free-air temperature, refer to the Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN75124 chips are glass-mounted

TYPES SN75123, SN75124 DUAL LINE DRIVER AND TRIPLE LINE RECEIVER

PARAMETER MEASUREMENT INFORMATION

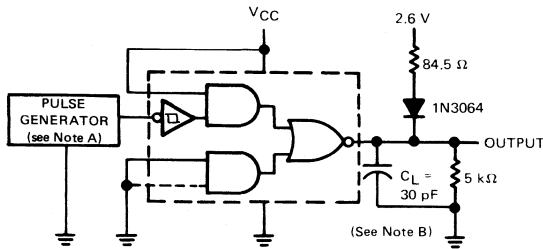


TEST CIRCUIT

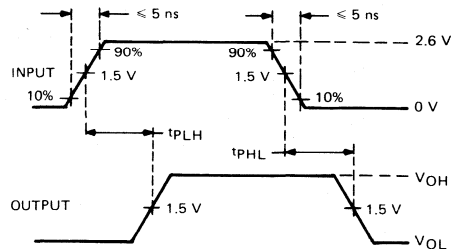


VOLTAGE WAVEFORMS

FIGURE 1—SN75123 SWITCHING TIMES



TEST CIRCUIT



VOLTAGE WAVEFORMS

FIGURE 2—SN75124 SWITCHING TIMES

- NOTES: A. The pulse generator has the following characteristics: $Z_{out} \approx 50 \Omega$, $t_w = 200 \text{ ns}$, duty cycle = 50%.
 B. C_L includes probe and jig capacitance.

TYPES SN75123, SN75124 DUAL LINE DRIVER AND TRIPLE LINE RECEIVER

TYPICAL CHARACTERISTICS

SN75123
OUTPUT CURRENT
vs
OUTPUT VOLTAGE

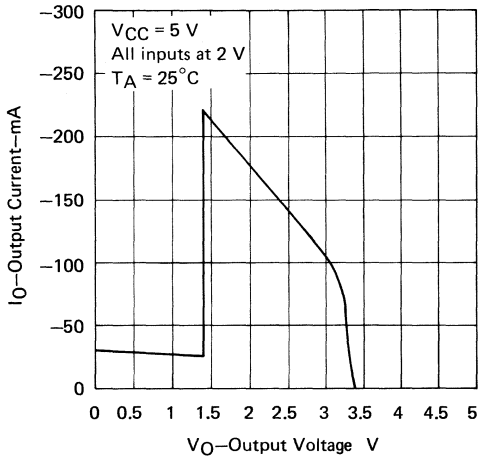


FIGURE 3

SN75124
OUTPUT VOLTAGE
vs
RECEIVER INPUT VOLTAGE

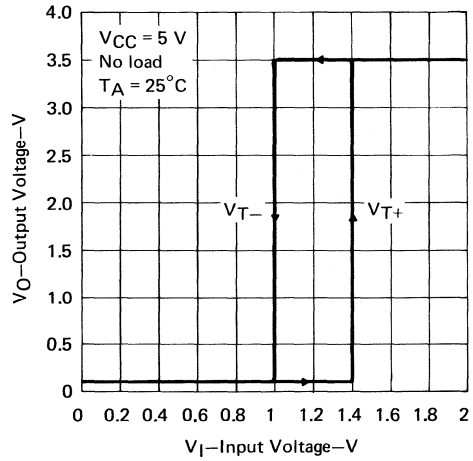


FIGURE 4

TYPICAL APPLICATION DATA

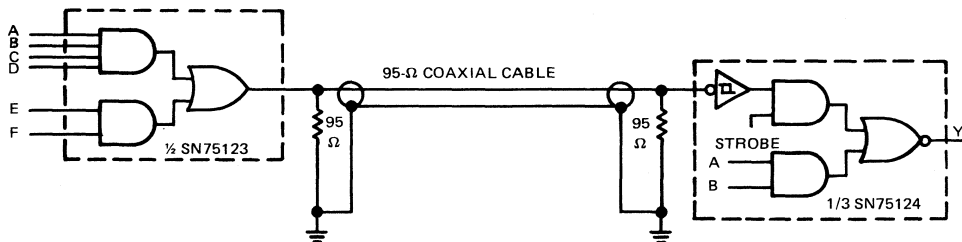


FIGURE 5—UNBALANCED LINE COMMUNICATION USING '123 AND '124

INTERFACE CIRCUITS

TYPES SN75125, SN75127 SEVEN-CHANNEL LINE RECEIVERS

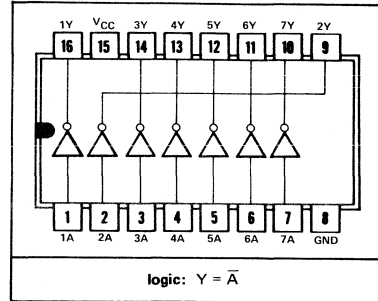
BULLETIN NO. DL-S 7712457, JANUARY 1977

- Meets IBM 360/370 I/O Specification
- Input Resistance . . . 7 k Ω to 20 k Ω
- Output Compatible with DTL or TTL
- Schottky-Clamped Transistors†
- Operates from Single 5-V Supply
- High Speed . . . Low Propagation Delay
- Ratio Specification for Propagation Delay Time, Low-to-High/High-to-Low
- Seven Channels in one 16-Pin Package
- Standard V_{CC} and Ground Positioning on SN75127

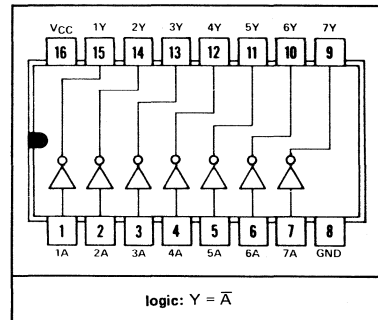
description

The SN75125 and SN75127 are monolithic seven-channel line receivers designed to satisfy the requirements of the IBM System 360/370 input/output interface specifications. Special low-power design and Schottky clamped transistors allow for low supply-current requirements while maintaining fast switching speeds and high-current TTL outputs. The SN75125 and SN75127 are characterized for operation from 0°C to 70°C.

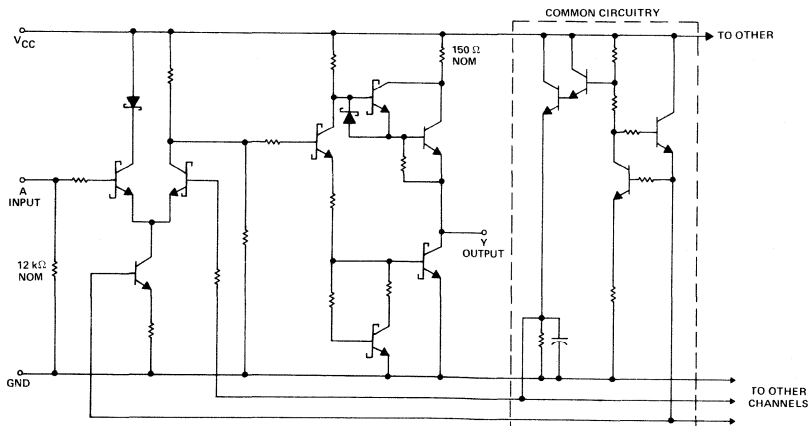
SN75125
J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



SN75127
J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



schematic (each receiver)



TYPES SN75125, SN75127

SEVEN-CHANNEL LINE RECEIVERS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage range: SN75125	-0.15 V to 7 V
SN75127	-2 V to 7 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	800 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

- NOTES: 1. All voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information Section, which starts on page 18. In the J package, SN75125 and SN75127 chips are glass-mounted.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.5	5	5.5	V
High-level output current, I_{OH}			-0.4	mA
Low-level output current, I_{OL}			16	mA
Operating free-air temperature, T_A	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
V_{IH}	High-level input voltage	1.7			V
V_{IL}	Low-level input voltage			0.7	V
V_{OH}	High-level output voltage	$V_{CC} = 4.5\text{ V}$, $V_{IL} = 0.7\text{ V}$, $I_{OH} = -0.4\text{ mA}$	2.4	3.1	V
V_{OL}	Low-level output voltage	$V_{CC} = 4.5\text{ V}$, $V_{IH} = 1.7\text{ V}$, $I_{OL} = 16\text{ mA}$	0.4	0.5	V
I_{IH}	High-level input current	$V_{CC} = 5.5\text{ V}$, $V_I = 3.11\text{ V}$	0.3	0.42	mA
I_{IL}	Low-level input current	$V_{CC} = 5.5\text{ V}$, $V_I = 0.15\text{ V}$		-0.24	mA
I_{OS}	Short-circuit output current [‡]	$V_{CC} = 5.5\text{ V}$, $V_O = 0$	-18	-60	mA
r_i	Input resistance	$V_{CC} = 4.5\text{ V}$, 0 V, or open, $\Delta V_I = 0.15\text{ V}$ to 4.15 V	7	20	k Ω
I_{CC}	Supply current	$V_{CC} = 5.5\text{ V}$, $I_{OH} = -0.4\text{ mA}$, All inputs at 0.7 V	15	25	mA
		$V_{CC} = 5.5\text{ V}$, $I_{OL} = 16\text{ mA}$, All inputs at 4 V	28	47	mA

[†]All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

[‡]Not more than one output should be shorted at a time.

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output	7	14	25	ns
t_{PHL}	Propagation delay time, high-to-low-level output	10	18	30	ns
$\frac{t_{PLH}}{t_{PHL}}$	Ratio of propagation delay times	0.5	0.8	1.3	ns
t_{TLH}	Transition time, low-to-high-level output	1	7	12	ns
t_{THL}	Transition time, high-to-low-level output	1	3	12	ns

$R_L = 400\ \Omega$, $C_L = 50\ \text{pF}$,
See Figure 1

TYPES SN75125, SN75127 SEVEN-CHANNEL LINE RECEIVERS

PARAMETER MEASUREMENT INFORMATION

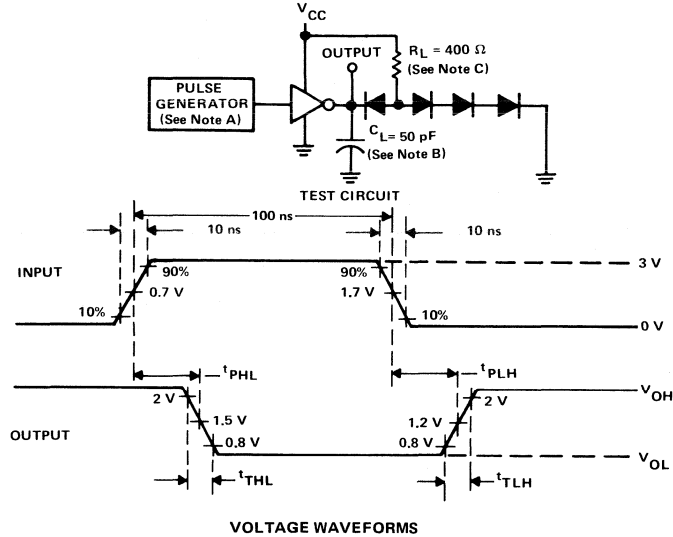
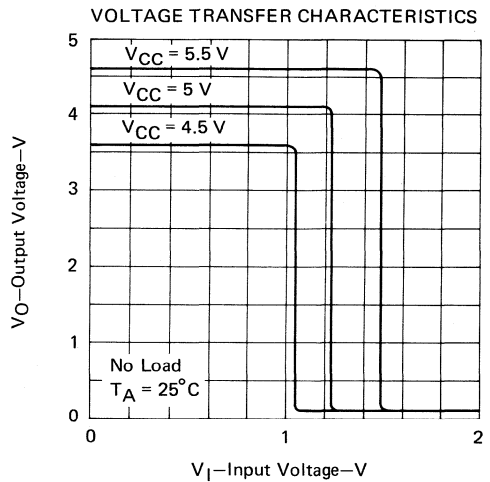
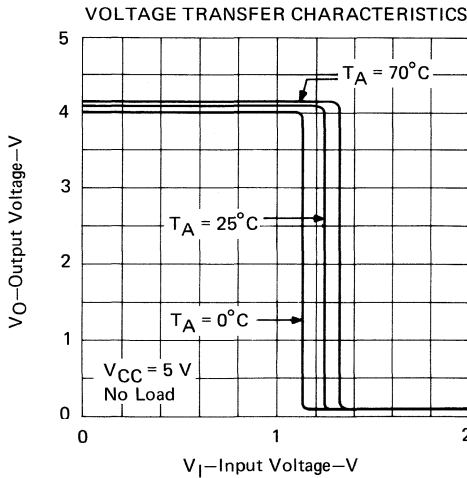


FIGURE 1

- NOTES: A. The pulse generator has the following characteristics: $Z_{out} \approx 50 \Omega$, PRR = 5 MHz.
 B. C_L includes probe and jig capacitance.
 C. All diodes are 1N3064 or equivalent.

TYPICAL CHARACTERISTICS



TYPES SN75125, SN75127 SEVEN-CHANNEL LINE RECEIVERS

TYPICAL CHARACTERISTICS

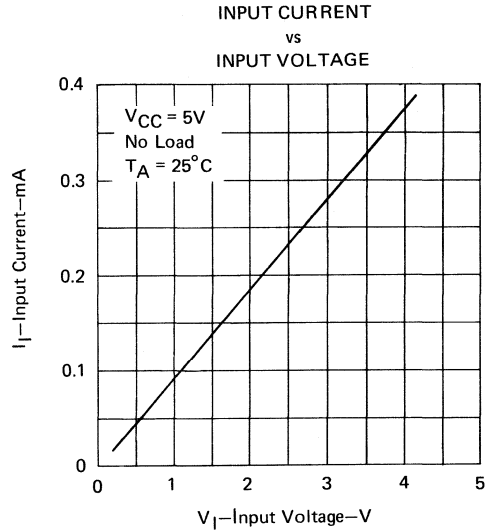


FIGURE 4

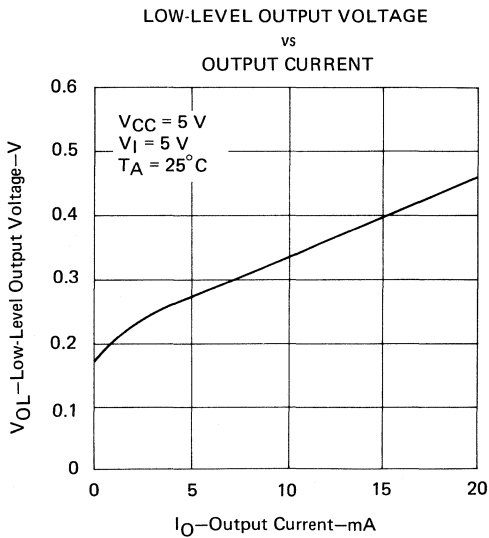


FIGURE 5

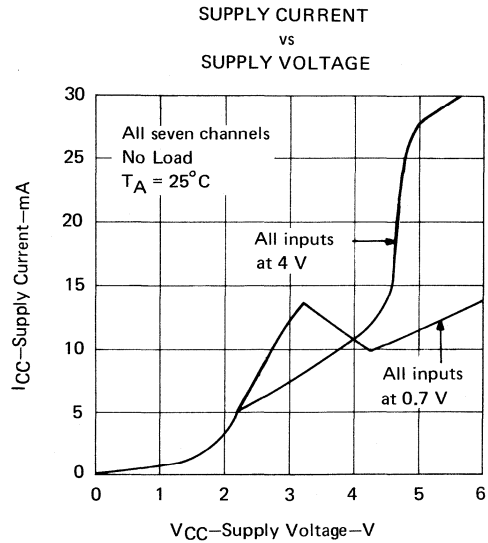


FIGURE 6

**FUTURE PRODUCT
TO BE ANNOUNCED**

**TYPE SN75126
SINGLE-ENDED LINE DRIVER**

JANUARY 1977

- Meets IBM System 360/370 Input/Output Interface Specifications (GA22-6974-3)
- TTL and CMOS Input Compatibility
- Party-Line Operation
- 3.11-V Min Output at $I_{OH} = -60$ mA
- Schottky Circuitry

description

The SN75126 is a line driver that meets IBM System 360/370 I/O Specification GA22-6974-3. Schottky-diode-clamped transistors[†] are used for fast switching speeds. It has a guaranteed output of 3.11 volts minimum at an I_{OH} of -60 mA.

The SN75126 will be characterized for operation from 0°C to 70°C .

packages: J or N dual-in-line package

INTERFACE CIRCUITS

TYPES SN75128, SN75129 EIGHT-CHANNEL LINE RECEIVERS

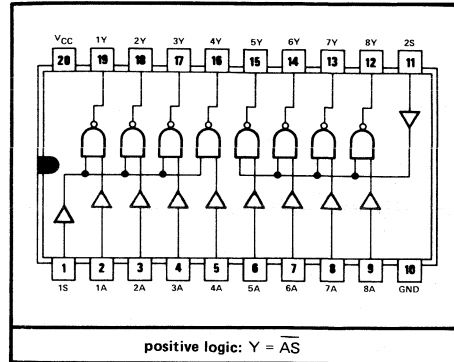
BULLETIN NO. DL-S 7712457, JANUARY 1977

- Meets IBM 360/370 I/O Specification
- Input Resistance $7\text{ k}\Omega$ to $20\text{ k}\Omega$
- Output Compatible with DTL or TTL
- Schottky-Clamped Transistors†
- Operates from a Single 5-Volt Supply
- High-Speed . . . Low Propagation Delay
- Ratio Specification . . . t_{PLH}/t_{PHL}
- Common Strobe for Each Group of Four Receivers
- SN75128 Strobe . . . Active-High
SN75129 Strobe . . . Active-Low

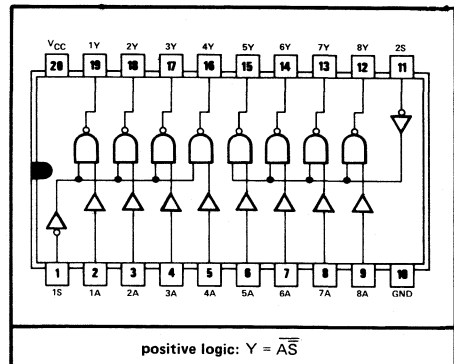
description

The SN75128 and SN75129 are eight-channel line receivers designed to satisfy the requirements of the input-output interface specification for IBM 360/370. Both devices feature common strobes for each group of four receivers. The SN75128 has an active-high strobe; the SN75129 has an active-low strobe. Special low-power design and Schottky-diode-clamped transistors† allow low supply-current requirements while maintaining fast switching speeds and high-current TTL outputs. The SN75128 and SN75129 are characterized for operation from 0°C to 70°C .

SN75128
J OR N DUAL IN-LINE PACKAGE
(TOP VIEW)

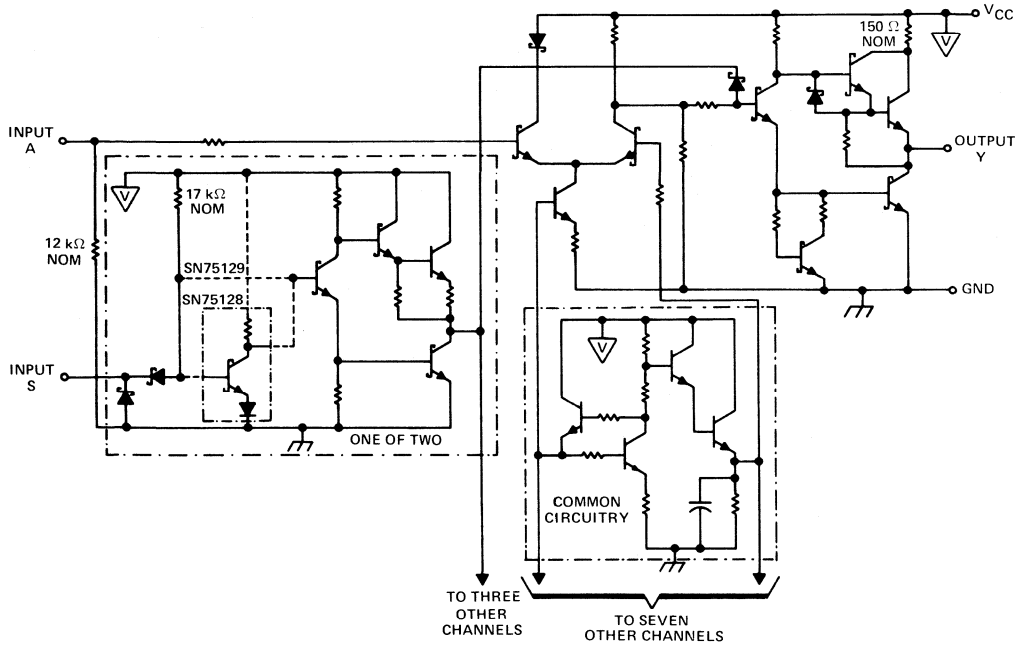


SN75129
J OR N DUAL IN-LINE PACKAGE
(TOP VIEW)



TYPES SN75128, SN75129 EIGHT-CHANNEL LINE RECEIVERS

schematic (each receiver)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
A input voltage range	-0.15 V to 7 V
Strobe input voltage	7 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	800 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

- NOTES: 1. All voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN75128 and SN75129 chips are glass-mounted.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.5	5.5	5.5	V
High-level output current, I_{OH}			-0.4	mA
Low-level output current, I_{OL}			16	mA
Operating free-air temperature, T_A	0		70	°C

TENTATIVE DATA SHEET

106 This document provides tentative information on a new product. Texas Instruments reserves the right to change specifications for this product in any manner without notice.

TEXAS INSTRUMENTS
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TYPES SN75128, SN75129 EIGHT-CHANNEL LINE RECEIVERS

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V _{IH}	High-level input voltage	A	1.7			V
		S	2			
V _{IL}	Low-level input voltage	A	0.7			V
		S	0.7			
V _{OH}	High-level output voltage	V _{CC} = 4.5 V, V _{IL} = 0.7 V, I _{OH} = -0.4 mA	2.4	3.1		V
V _{OL}	Low-level output voltage	V _{CC} = 4.5 V, V _{IH} = 1.7 V, I _{OL} = 16 mA	0.4	0.5		V
V _{IK}	Input clamp voltage	S V _{CC} = 4.5 V, I _I = -18 mA			-1.5	V
I _{IH}	High-level input current	A V _{CC} = 5.5 V, V _I = 3.11 V	0.3	0.42		mA
		S V _{CC} = 5.5 V, V _I = 2.7 V			20		μA
I _{IL}	Low-level input current	A V _{CC} = 5.5 V, V _I = 0.15 V			-0.24	mA
		S V _{CC} = 5.5 V, V _I = 0.4 V			-0.4	
I _{OS}	Short-circuit output current‡	V _{CC} = 5.5 V, V _O = 0	-18		-60	mA
r _I	Input resistance	V _{CC} = 4.5 V, 0 V, or open; ΔV _I = 0.15 V to 4.15 V	7		20	kΩ
I _{CC}	Supply current	SN75128 V _{CC} = 5.5 V, Strobe at 2.4 V, All A inputs at 0.7 V		19	31	mA
		SN75129 V _{CC} = 5.5 V, Strobe at 0.4 V, All A inputs at 0.7 V		19	31	
		SN75128 V _{CC} = 5.5 V, Strobe at 2.4 V, All A inputs at 4 V		32	53	
		SN75129 V _{CC} = 5.5 V, Strobe at 0.4 V, All A inputs at 4 V		32	53	

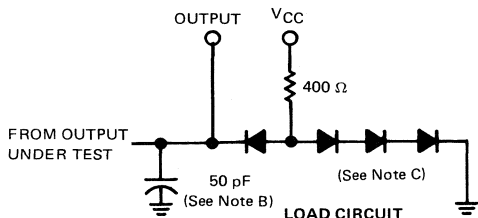
† All typical values are at V_{CC} = 5 V, T_A = 25°C.

‡ Not more than one output should be shorted at a time.

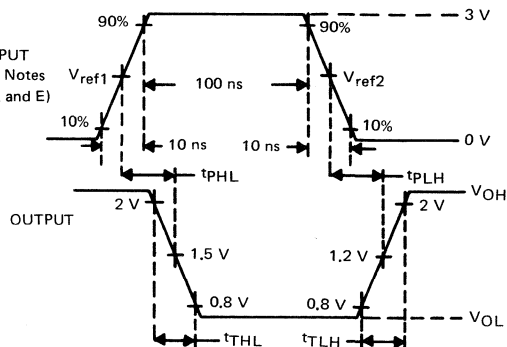
switching characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	FROM	TEST CONDITIONS	SN75128			SN75129			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
t _{PLH}	A	R _L = 400 Ω, C _L = 50 pF, See Figure 1	7	14	25	7	14	25	ns
t _{PHL}			10	18	30	10	18	30	
t _{PLH}	S		26	40		20	35		ns
t _{PHL}			22	35		16	30		
t _{PLH} t _{PHL}	A		0.5	0.8	1.3	0.5	0.8	1.3	
t _{TLH}			1	7	12	1	7	12	ns
t _{THL}		1	3	12	1	3	12	ns	

PARAMETER MEASUREMENT INFORMATION



- NOTES: A. Input pulses are supplied by a generator having the following characteristics: Z_o = 50 Ω, PRR = 5 MHz.
 B. Includes probe and jig capacitance.
 C. All diodes are 1N3064 or equivalent.
 D. The strobe inputs of SN75129 are in-phase with the output.
 E. V_{ref1} = 0.7 V and V_{ref2} = 1.7 V for testing data (A) inputs, V_{ref1} = V_{ref2} = 1.3 V for strobe inputs.



VOLTAGE WAVEFORMS

TYPES SN75128, SN75129

EIGHT-CHANNEL LINE RECEIVERS

TYPICAL CHARACTERISTICS

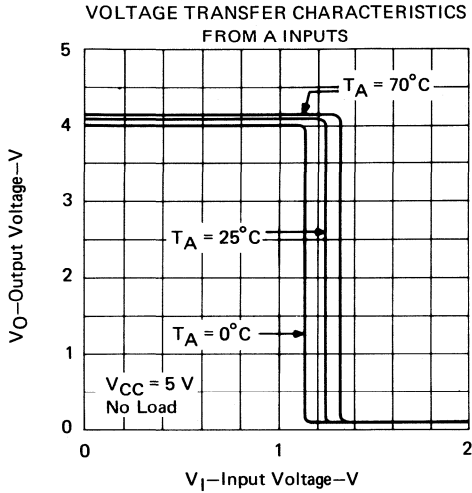


FIGURE 2

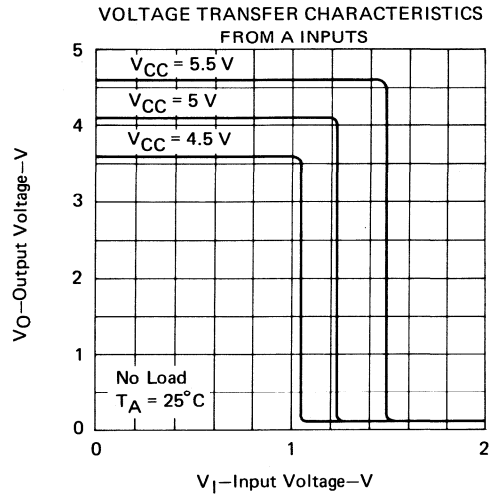


FIGURE 3

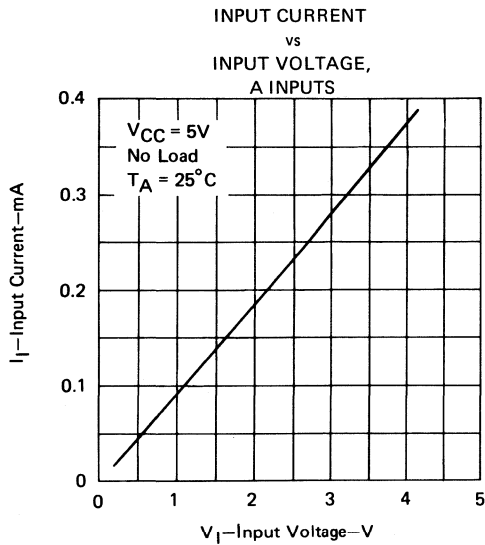


FIGURE 4

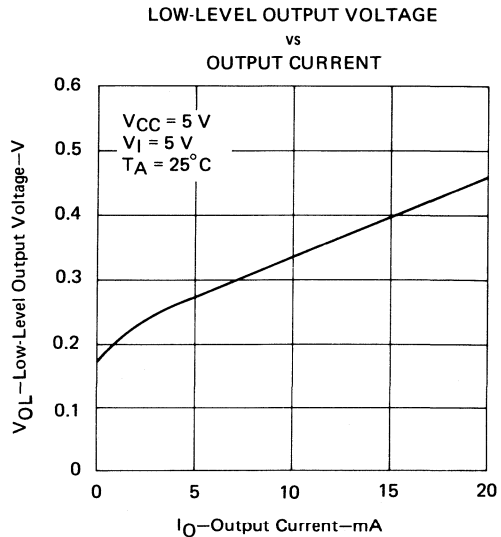


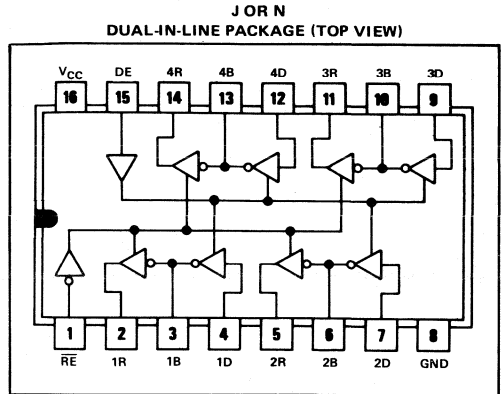
FIGURE 5

INTERFACE CIRCUITS

TYPE SN75136 QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUTS

BULLETIN NO. DL-S 7712485, JANUARY 1977

- P-N-P Inputs for Minimal Input Loading (200 μ A Maximum)
- High-Speed Schottky Circuitry[†]
- 3-State Outputs for Driver and Receiver
- Party-Line (Data-Bus) Operation
- Single 5-V Supply
- 40-mA Current Sink Capability (Driver)
- Designed to be Functionally Interchangeable with Signetics N8T26

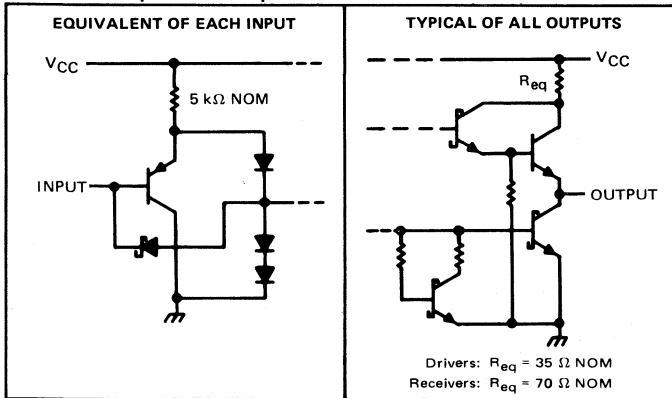


description

The SN75136 is a quadruple transceiver utilizing Schottky-diode-clamped transistors.[†] Both the driver and receiver have three-state outputs. With p-n-p inputs, the input loading is minimized to a maximum input current of 200 μ A.

The SN75136 is characterized for operation from 0°C to 70°C.

schematics of inputs and outputs



FUNCTION TABLE (DRIVER)

INPUT		OUTPUT
D	DE	B
L	H	H
H	H	L
X	L	Z

FUNCTION TABLE (RECEIVER)

INPUT		OUTPUT
B	RE	R
L	L	H
H	L	L
X	H	Z

H = high level, L = low level,
X = irrelevant, Z = high impedance

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2):	
N package	1150 mW
J package	1025 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTES: 1. Voltage values are with respect to network ground terminal.

2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information Section, which starts on page 18. In the J package, SN75136 chips are glass-mounted.

This document provides tentative information on a new product. Texas Instruments reserves the right to change specifications for this product in any manner without notice.

[†]Integrated Schottky-Barrier diode-clamped transistor is patented by Texas Instruments. U.S. Patent Number 3,463,975.

TYPE SN75136

QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUTS

recommended operating conditions

		MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}		4.75	5	5.25	V
High-level output current, I_{OH}	Driver	-10			mA
	Receiver	-2			
Low-level output current, I_{OL}	Driver	40			mA
	Receiver	16			
Operating free-air temperature, T_A		0		70	°C

electrical characteristics over recommended operating free-air temperature and supply voltage ranges (unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IH}	High-level input voltage	B, D, DE, \overline{RE}		2			V
V_{IL}	Low-level input voltage	B, D, DE, \overline{RE}				0.85	V
V_{IK}	Input clamp voltage	B, D, DE, \overline{RE}	$I_I = -5$ mA			-1	V
V_{OH}	High-level output voltage	B	$V_{IH} = 2$ V, $V_{IL} = 0.85$ V, $I_{OH} = -10$ mA	2.6	3.1		V
		R	$V_{IL} = 0.85$ V, $I_{OH} = -2$ mA	2.6	3.1		
V_{OL}	Low-level output voltage	B	$V_{IH} = 2$ V, $I_{OL} = 40$ mA			0.5	V
		R	$V_{IH} = 2$ V, $V_{IL} = 0.85$ V, $I_{OL} = 16$ mA			0.5	
I_{OZ}	Off-state (high-impedance state) output current	B, R	DE at 0.85 V, \overline{RE} at 2 V, $V_O = 2.6$ V			100	μA
		R	\overline{RE} at 2 V, $V_O = 0.5$ V			-100	
I_{IH}	High-level input current	D, DE, \overline{RE}	$V_I = 5.25$ V			25	μA
I_{IL}	Low-level input current	B, D, DE, \overline{RE}	$V_I = 0.4$ V			-200	μA
I_{OS}	Short-circuit output current §	B	$V_{CC} = 5.25$ V	-50		-150	mA
		R		-30		-75	
I_{CC}	Supply current		$V_{CC} = 5.25$ V, No load			87	mA

† All typical values are at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5$ V.

§ Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

switching characteristics, $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$

PARAMETER	FROM	TO	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	B	R	$C_L = 30$ pF, See Figure 1	8	18		ns
t_{PHL}				7	14		
t_{PLH}	D	B	$C_L = 300$ pF, See Figure 2	11	20		ns
t_{PHL}				16	24		
t_{PLZ}	\overline{RE}	R	$C_L = 30$ pF, See Figure 3	16	24		ns
t_{PZL}				15	30		
t_{PLZ}	DE	B	$C_L = 300$ pF, See Figure 4	9	24		ns
t_{PZL}				31	38		

TENTATIVE DATA SHEET

TYPE SN75136 QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUTS

PARAMETER MEASUREMENT INFORMATION

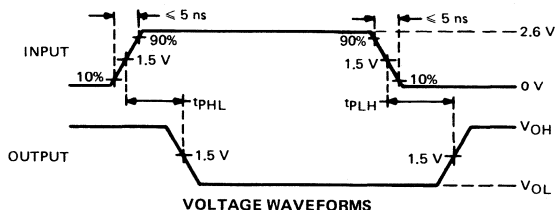
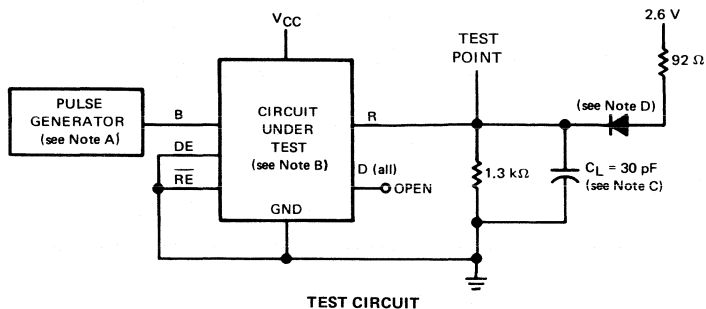


FIGURE 1—PROPAGATION DELAY TIMES FROM BUS TO RECEIVER OUTPUT

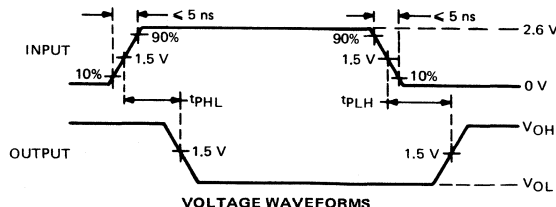
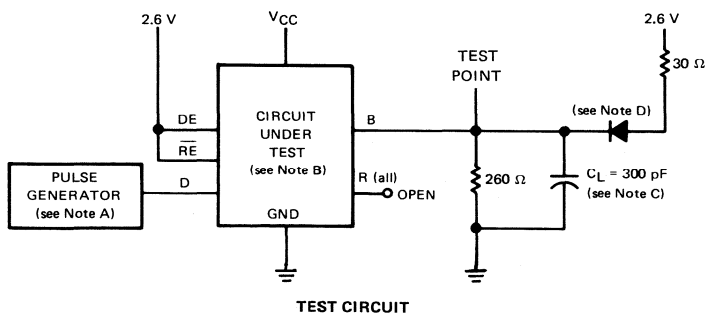


FIGURE 2—PROPAGATION DELAY TIMES FROM DRIVER INPUT TO BUS

- NOTES: A. The pulse generator in Figures 1 and 2 has the following characteristics: PRR = 10 MHz, duty cycle = 50%, $Z_{out} \approx 50 \Omega$.
 B. All inputs and outputs not shown are open.
 C. C_L includes probe and jig capacitance.
 D. All diodes are 1N916 or 1N3064.

TYPE SN75136 QUADRUPLE BUS TRANSCEIVER WITH 3-STATE OUTPUTS

PARAMETER MEASUREMENT INFORMATION

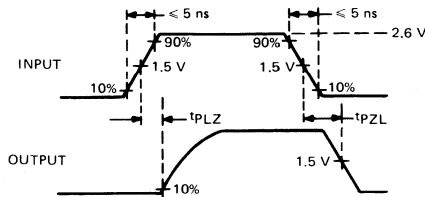
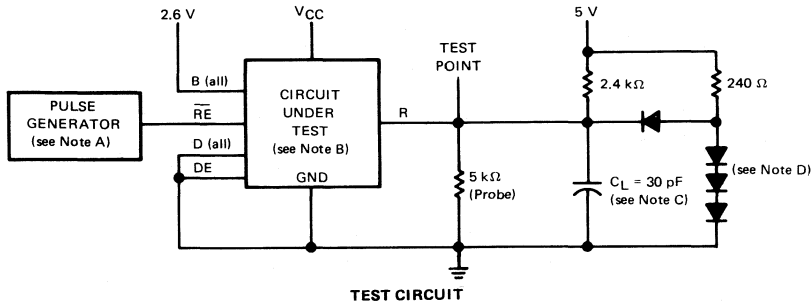


FIGURE 3—RECEIVER ENABLE AND DISABLE TIMES

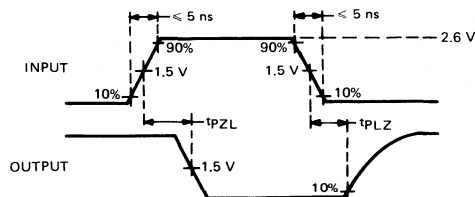
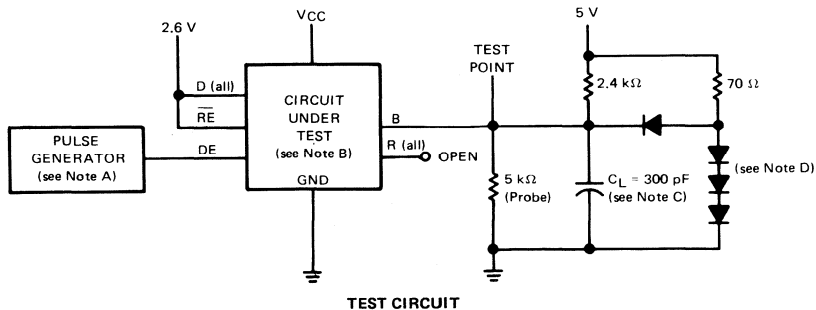


FIGURE 4—DRIVER ENABLE AND DISABLE TIMES

- NOTES: A. The pulse generator in Figures 3 and 4 has the following characteristics: PRR = 5 MHz, duty cycle = 50%, $Z_{out} \approx 50 \Omega$.
 B. All inputs and outputs not shown are open.
 C. C_L includes probe and jig capacitance.
 D. All diodes are 1N916 or 1N3064.

INTERFACE CIRCUITS

TYPES SN55138, SN75138 QUADRUPLE BUS TRANSCEIVERS

BULLETIN NO. DL-S 7712046, SEPTEMBER 1973 — REVISED JANUARY 1977

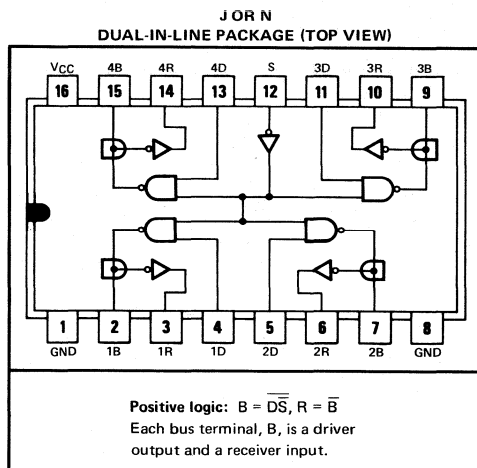
- Single 5-V Supply
- High-Input-Impedance, High-Threshold Receivers
- Common Driver Strobe
- TTL/DTL Compatible Driver and Strobe Inputs with Clamp Diodes

- High-Speed Operation
- 100-mA Open-Collector Driver Outputs
- Four Independent Channels
- TTL Compatible Receiver Output
- Available in Plastic or Ceramic 16-Pin Dual-In-Line Packages

description

The SN55138 and SN75138 quad bus transceivers are designed for two-way data communication over single-ended transmission lines. Each of the four identical channels consists of a driver with TTL inputs and a receiver with a TTL output. The driver output is of the open-collector type, and is designed to handle loads of up to 100 milliamperes (50 ohms to 5 volts). The receiver input is internally connected to the driver output, and has a high impedance to minimize loading of the transmission line. Because of the high driver-output current and the high receiver-input impedance, a very large number (typically hundreds) of transceivers may be connected to a single data bus.

The receiver design also features a threshold of 2.3 volts (typical), providing a wider noise margin than would be possible with a receiver having the usual TTL threshold. A strobe turns off all drivers (high impedance) but does not affect receiver operation. These circuits are designed for operation from a single five-volt supply and include a provision to minimize loading of the data bus when the power-supply voltage is zero. The SN55138 is characterized for operation over the full military temperature range of -55°C to 125°C ; the SN75138 is characterized for operation from 0°C to 70°C .



FUNCTION TABLE
(TRANSMITTING)

INPUTS		OUTPUTS	
S	D	B	R
L	H	L	H
L	L	H	L

FUNCTION TABLE
(RECEIVING)

INPUTS			OUTPUT
S	B	D	R
H	H	X	L
H	L	X	H

H = high level, L = low level, X = irrelevant

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

	SN55138	SN75138	UNIT
Supply voltage, V_{CC} (see Note 1)	7	7	V
Input voltage	5.5	5.5	V
Low-level output current into the driver output	150	150	mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	J package	1375	mW
	N package	1150	
Operating free-air temperature range	-55 to 125	0 to 70	$^{\circ}\text{C}$
Storage temperature range	-65 to 150	-65 to 150	$^{\circ}\text{C}$
Lead temperature 1/16 inch from case for 60 seconds: J package	300	300	$^{\circ}\text{C}$
Lead temperature 1/16 inch from case for 10 seconds: N package		260	$^{\circ}\text{C}$

- NOTES: 1. Voltage values are with respect to both ground terminals connected together.
2. For operation above 25°C free-air temperature, refer to the Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN55138 chips are alloy-mounted; SN75138 chips are glass-mounted.

TYPES SN55138, SN75138

QUADRUPLE BUS TRANSCEIVERS

recommended operating conditions

		SN55138			SN75138			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}		4.5	5	5.5	4.75	5	5.25	V
Low-level output current, I_{OL}	Driver output	100			100			mA
	Receiver output	16			16			
High-level output current, I_{OH}		-400			-400			μ A
Operating free-air temperature, T_A		-55	125		0	70		$^{\circ}$ C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER			TEST CONDITIONS [†]	SN55138			SN75138			UNIT
				MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX	
V_{IH}	High-level input voltage	Driver or strobe	2			2			V	
		Receiver	3.2			2.9				
V_{IL}	Low-level input voltage	Driver or strobe	0.8			0.8			V	
		Receiver	1.5			1.8				
V_{IK}	Input clamp voltage	Driver or strobe	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$	-1.5			-1.5			V
V_{OH}	High-level output voltage	Receiver	$V_{CC} = \text{MIN}, V_{IH(S)} = 2 \text{ V}, V_{IL(R)} = V_{IL} \text{ max}, I_{OH} = -400 \mu\text{A}$	2.4	3.5	2.4	3.5	V		
V_{OL}	Low-level output voltage	Driver	$V_{CC} = \text{MIN}, V_{IH(D)} = 2 \text{ V}, V_{IL(S)} = 0.8 \text{ V}, I_{OL} = 100 \text{ mA}$	0.45			0.45			V
		Receiver	$V_{CC} = \text{MIN}, V_{IH(R)} = V_{IH} \text{ min}, V_{IH(S)} = 2 \text{ V}, I_{OL} = 16 \text{ mA}$	0.4			0.4			
I_I	Input current at maximum input voltage	Driver or strobe	$V_{CC} = \text{MAX}, V_I = V_{CC}$	1			1			mA
I_{IH}	High-level input current	Driver or strobe	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$	40			40			μ A
		Receiver	$V_{CC} = 5 \text{ V}, V_I(S) = 2 \text{ V}, V_I(R) = 4.5 \text{ V}$	25	300	25	300			
I_{IL}	Low-level input current	Driver or strobe	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$	-1	-1.6	-1	-1.6	mA		
		Receiver	$V_{CC} = \text{MAX}, V_I(S) = 2 \text{ V}, V_I(R) = 0.45 \text{ V}$	-50			-50			μ A
	Input current with power off	Receiver	$V_{CC} = 0, V_I = 4.5 \text{ V}$	1.1	1.5	1.1	1.5	mA		
I_{OS}	Short-circuit output current [§]	Receiver	$V_{CC} = \text{MAX}$	-20	-55	-18	-55	mA		
I_{CC}	Supply current	All driver outputs low	$V_{CC} = \text{MAX}, V_I(S) = 0.8 \text{ V}, V_I(D) = 2 \text{ V}$	50	65	50	65	mA		
		All driver outputs high	$V_{CC} = \text{MAX}, V_I(S) = 2 \text{ V}, V_I(R) = 3.5 \text{ V}, \text{Receiver outputs open}$	42	55	42	55			

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions. Parenthetical letters D, R, and S used with V_I refer to the driver input, receiver input, and strobe input, respectively.

[‡] All typical values are at $V_{CC} = 5 \text{ V}, T_A = 25^{\circ}\text{C}$.

[§] Not more than one output should be shorted at a time.

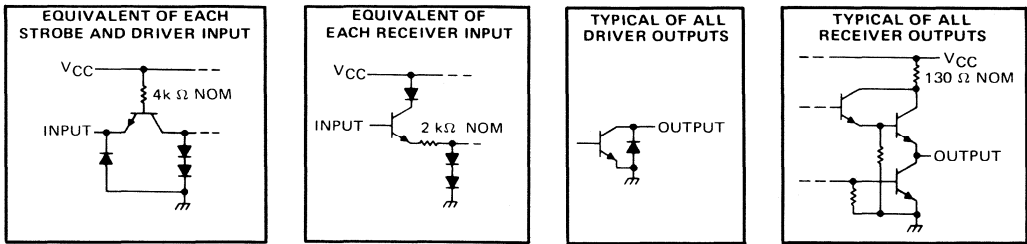
TYPES SN55138, SN75138 QUADRUPLE BUS TRANSCEIVERS

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER [¶]	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Driver	Driver	$C_L = 50\text{ pF}$, $R_L = 50\ \Omega$, See Figure 1	15	24	ns	
t_{PHL}				14	24		
t_{PLH}	Strobe	Driver		18	28	ns	
t_{PHL}				22	32		
t_{PLH}	Receiver	Receiver	$C_L = 15\text{ pF}$, $R_L = 400\ \Omega$, See Figure 2	7	15	ns	
t_{PHL}				8	15		

[¶] t_{PLH} = propagation delay time, low-to-high-level output
 t_{PHL} = propagation delay time, high-to-low-level output

schematics of inputs and outputs



PARAMETER MEASUREMENT INFORMATION

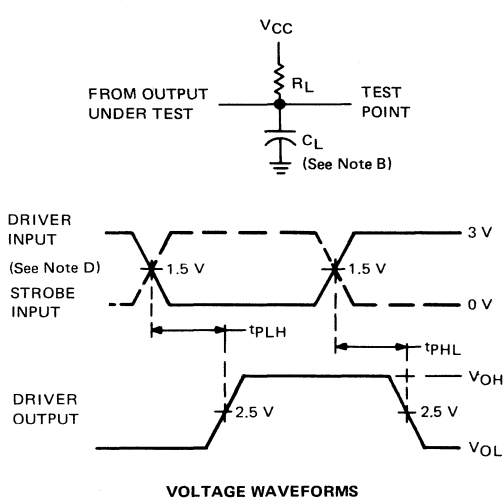


FIGURE 1—PROPAGATION DELAY TIMES FROM DATA AND STROBE INPUTS

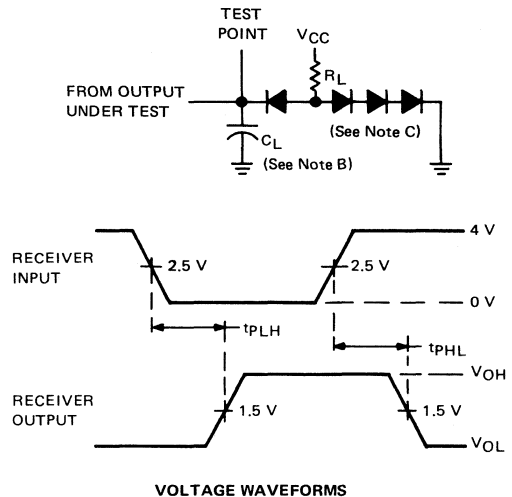
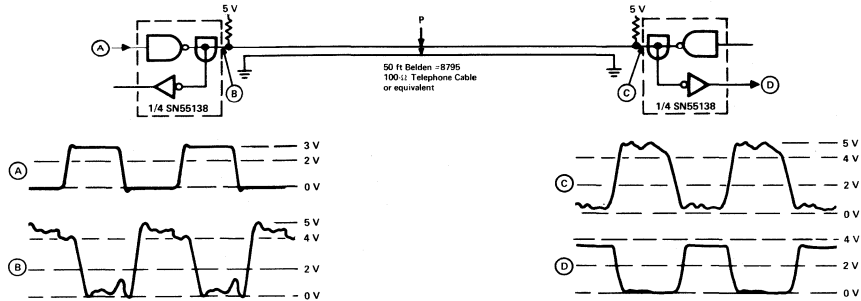


FIGURE 2—PROPAGATION DELAY TIMES FROM RECEIVER INPUT

- NOTES: A. Input pulses are supplied by generators having the following characteristics: $t_w = 100\text{ ns}$, $\text{PRR} = 1\text{ MHz}$, $t_r \leq 10\text{ ns}$, $t_f \leq 10\text{ ns}$, $Z_{out} \approx 50\ \Omega$.
 B. C_L includes probe and jig capacitance.
 C. All diodes are 1N916 or 1N3064.
 D. When testing driver input (solid line) strobe must be low; when testing strobe input (dashed line) driver input must be high.

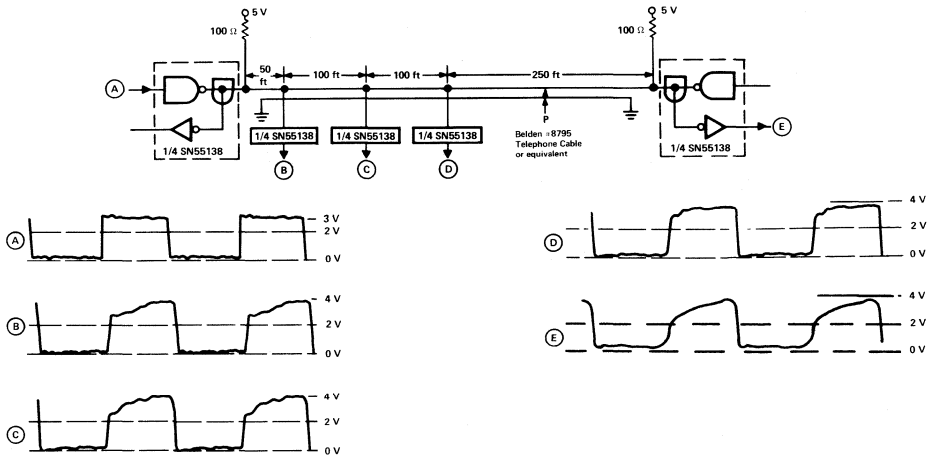
TYPES SN55138, SN75138 QUADRUPLE BUS TRANSCEIVERS

TYPICAL APPLICATION DATA



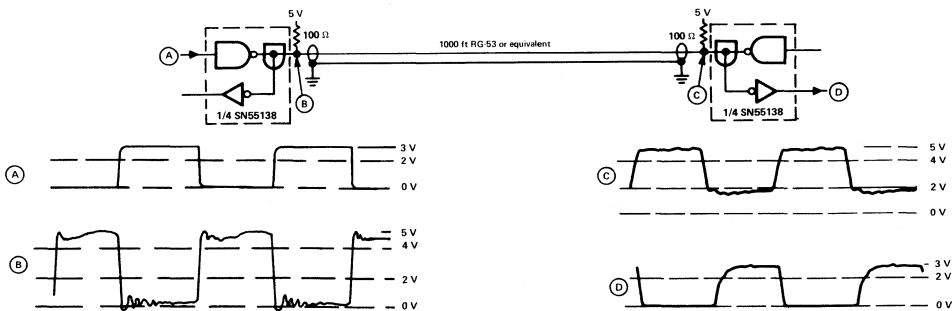
TYPICAL VOLTAGE WAVEFORMS

FIGURE 3—POINT-TO-POINT COMMUNICATION OVER 50 FEET OF TWISTED PAIR AT 5 MHz



TYPICAL VOLTAGE WAVEFORMS

FIGURE 4—PARTY-LINE COMMUNICATION ON 500 FEET OF TWISTED PAIR AT 1 MHz



TYPICAL VOLTAGE WAVEFORMS

FIGURE 5—POINT-TO-POINT COMMUNICATION OVER 1000 FEET OF COAX AT 1 MHz

TYPES SN55138, SN75138 QUADRUPLE BUS TRANSCEIVERS

TYPICAL CHARACTERISTICS†

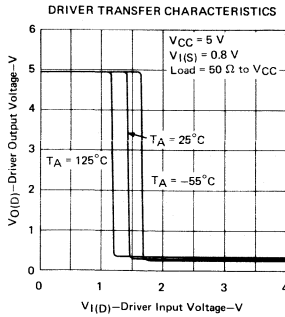


FIGURE 6

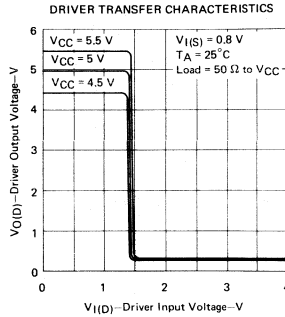


FIGURE 7

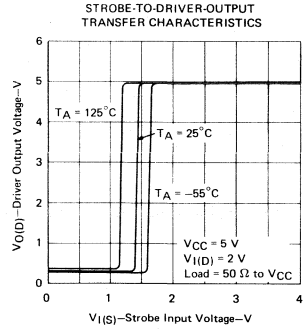


FIGURE 8

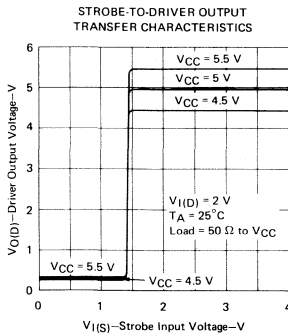


FIGURE 9

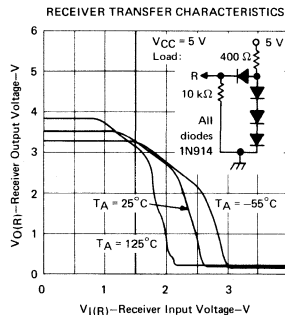


FIGURE 10

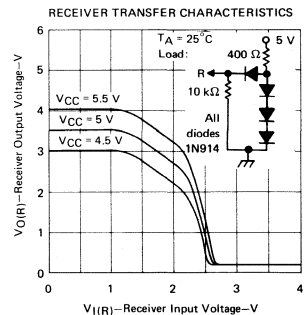


FIGURE 11

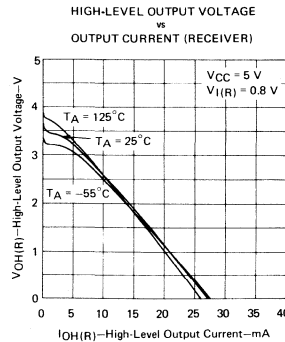


FIGURE 12

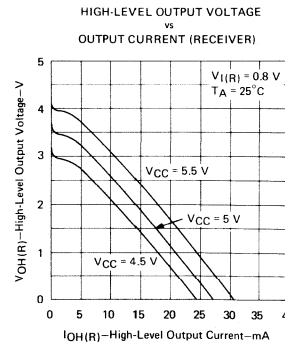


FIGURE 13

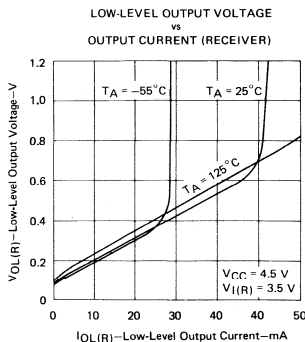
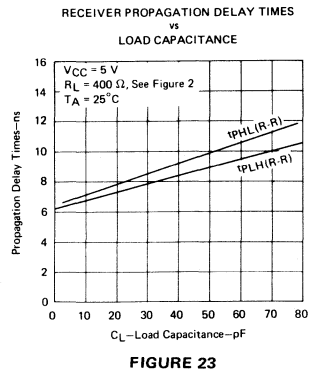
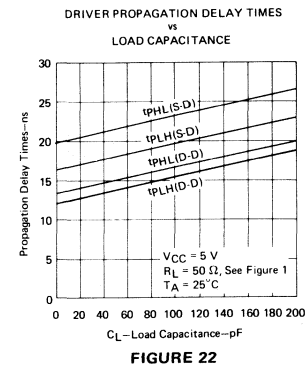
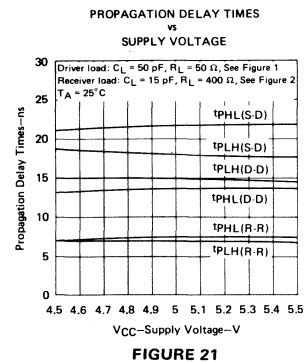
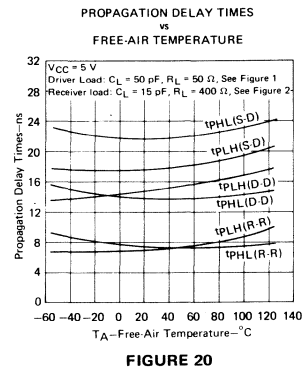
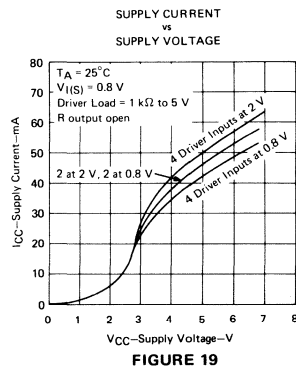
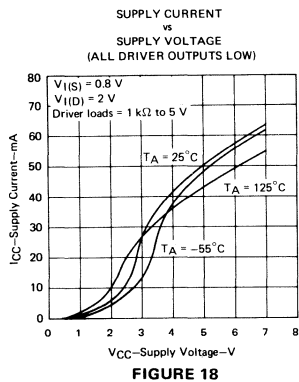
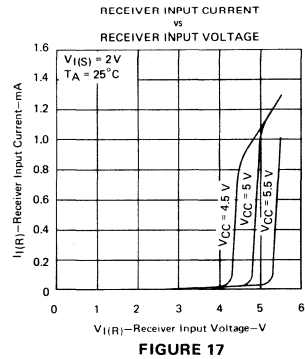
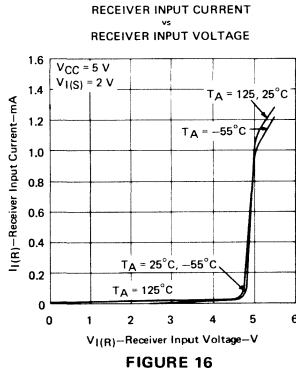
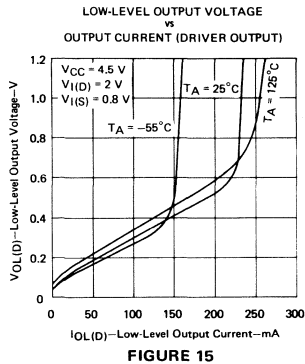


FIGURE 14

†Data for temperatures below 0°C and above 70°C is applicable to SN55138 circuits only.

TYPES SN55138, SN75138 QUADRUPLE BUS TRANSCEIVERS

TYPICAL CHARACTERISTICS†



†Data for temperatures below 0°C and above 70°C is applicable to SN55138 circuits only.

INTERFACE CIRCUITS

TYPES SN55140, SN55141, SN55142, SN55143, SN75140, SN75141, SN75142, SN75143 DUAL LINE RECEIVERS

BULLETIN NO. DLS 7712456, JANUARY 1977

features common to all eight types

- Single 5-V Supply
- ± 100 mV Sensitivity
- For Applications As:
Single-Ended Line Receiver
Gated Oscillator
Level Comparator
- Adjustable Reference Voltage
- TTL Outputs
- TTL-Compatible Strobe
- Designed for Party-Line
(Data-Bus) Applications

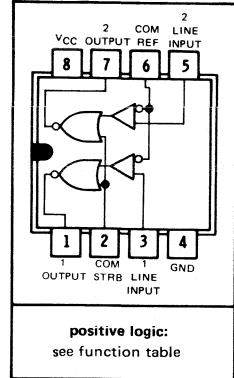
features of '140 and '141

- Common Reference Pin
- Common Strobe
- '141 Has Diode-Protected
Input Stage for Power-Off
Condition

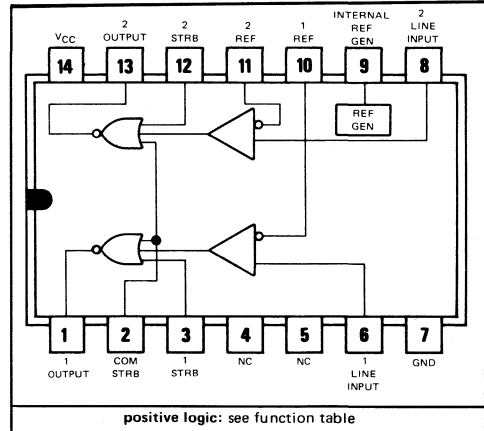
features of '142 and '143

- Individual Reference Pins
- Common and Individual
Strobes
- Internal 2.5-Volt Reference
Available
- '143 Has Diode-Protected
Input Stage for Power-Off
Condition

SN55140, SN55141 . . .
JG DUAL-IN-LINE PACKAGE
SN75140, SN75141 . . .
JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



SN55142, SN55143 . . . J DUAL-IN-LINE PACKAGE
SN75142, SN75143 . . . J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



NC—No internal connection

'142, '143 FUNCTION TABLE
(EACH RECEIVER)

LINE INPUT	INDIVIDUAL STROBE	COMMON STROBE	OUTPUT
$\leq V_{ref} - 100$ mV	L	L	H
$\geq V_{ref} + 100$ mV	X	X	L
X	H	X	L
X	X	H	L

H = high level, L = low level, X = irrelevant

description

Each of these devices consists of a dual single-ended line receiver with TTL-compatible strobes and outputs. The reference voltage (switching threshold) is applied externally and can be adjusted from 1.5 volts to 3.5 volts, making it possible to optimize noise immunity for a given system design. A 2.5-volt internal reference is available for use on the '142 and '143. Due to its low input current (less than 100 microamperes), it is ideally suited for party-line (bus-organized) systems.

The '140 has a common reference voltage pin and a common strobe. The '141 is the same as the '140 except that the input stage is diode protected. Each receiver of the '142 has an individual reference voltage pin and an individual strobe, and the dual receiver has a common strobe as well. The '143 is the same as the '142 except that the input stage is diode protected. The internal reference voltage of the '142 and '143 can be externally adjusted with a single resistor from 1.5 volts to 3.5 volts.

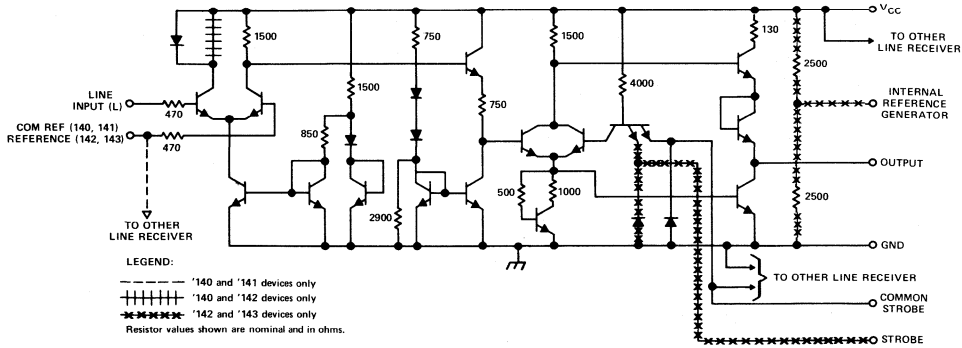
'140, '141 FUNCTION TABLE
(EACH RECEIVER)

LINE INPUT	STROBE	OUTPUT
$\leq V_{ref} - 100$ mV	L	H
$\geq V_{ref} + 100$ mV	X	L
X	H	L

H = high level, L = low level, X = irrelevant

TYPES SN55140, SN55141, SN55142, SN55143, SN75140, SN75141, SN75142, SN75143 DUAL LINE RECEIVERS

schematic (each receiver)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Reference input voltage, V_{ref}	5.5 V
Line input voltage with respect to ground	-2 V to 5.5 V
Line input voltage with respect to V_{ref}	± 5 V
Strobe input voltage	5.5 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	600 mW
Operating free-air temperature range: SN55' Circuits	-55°C to 125°C
SN75' Circuits	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J or JG package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N or P package	260°C

- NOTES: 1. Unless otherwise specified, voltage values are with respect to network ground terminal.
 2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J and JG packages, these chips are glass-mounted.

recommended operating conditions

	SN55' CIRCUITS			SN75' CIRCUITS			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.5	5	5.5	V
Reference input voltage, V_{ref}	1.5		3.5	1.5		3.5	V
Input voltage, line or strobe, V_I	0		5.5	0		5.5	V
Operating free-air temperature, T_A	-55		125	0		70	°C

TYPES SN55140, SN55141, SN55142, SN55143, SN75140, SN75141, SN75142, SN75143 DUAL LINE RECEIVERS

electrical characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5\text{ V} \pm 10\%$, $V_{ref} = 1.5\text{ V to } 3.5\text{ V}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT	
$V_{IH(L)}$	High-level line input voltage		$V_{ref} + 100$			mV	
$V_{IL(L)}$	Low-level line input voltage				$V_{ref} - 100$	mV	
$V_{IH(S)}$	High-level strobe input voltage		2			V	
$V_{IL(S)}$	Low-level strobe input voltage				0.8	V	
V_{OH}	High-level output voltage	$V_{IL(L)} = V_{ref} - 100\text{ mV}$, $V_{IL(S)} = 0.8\text{ V}$, $I_{OH} = -400\text{ }\mu\text{A}$	2.4			V	
V_{OL}	Low-level output voltage	$V_{IH(L)} = V_{ref} + 100\text{ mV}$, $V_{IL(S)} = 0.8\text{ V}$, $I_{OL} = 16\text{ mA}$			0.4	V	
		$V_{IL(L)} = V_{ref} - 100\text{ mV}$, $V_{IH(S)} = 2\text{ V}$, $I_{OL} = 16\text{ mA}$			0.4		
$V_{IK(S)}$	Strobe input clamp voltage	$I_I(S) = -12\text{ mA}$			-1.5	V	
$I_I(S)$	Strobe input current at maximum input voltage	Strobe	$V_I(S) = 5.5\text{ V}$		1	mA	
		Com strb			2		
I_{IH}	High-level input current	Strobe	$V_I(S) = 2.4\text{ V}$		40	μA	
		Com strb			80		
		Line input	$V_I(L) = V_{CC}$, $V_{ref} = 1.5\text{ V}$		35		100
		Reference			35		100
		Com ref	$V_I(L) = 0\text{ V}$, $V_{ref} = 3.5\text{ V}$		70		200
I_{IL}	Low-level input current	Strobe	$V_I(S) = 0.4\text{ V}$		-1.6	mA	
		Com strb			-3.2		
		Line input	$V_I(L) = 0\text{ V}$, $V_{ref} = 1.5\text{ V}$		-10		
		Reference			-10		
		Com ref	$V_I(L) = 1.5\text{ V}$, $V_{ref} = 0\text{ V}$		-20		
V_{gen}	Internal reference Generator voltage	'142, '143	$V_{CC} = 5\text{ V}$, $I_{gen} = 0$	2.3	2.5	2.7	V
			$V_{CC} = 5\text{ V}$, $I_{gen} = 70\text{ }\mu\text{A}$	2.4			
I_{OS}	Short-circuit output current [‡]	$V_{CC} = 5.5\text{ V}$	-18		-55	mA	
I_{CCH}	Supply current, output high	$V_I(S) = 0\text{ V}$, $V_I(L) = V_{ref} - 100\text{ mV}$			18	30	mA
I_{CCL}	Supply current, output low	$V_I(S) = 0\text{ V}$, $V_I(L) = V_{ref} + 100\text{ mV}$			20	35	mA

[†]All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

[‡]Only one output should be shorted at a time.

switching characteristics, $V_{CC} = 5\text{ V}$, $V_{ref} = 2.5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT	
$t_{PLH(L)}$	Propagation delay time, low-to-high-level output from line input	$C_L = 15\text{ pF}$, $R_L = 400\text{ }\Omega$, See Figure 1			22	35	ns
$t_{PHL(L)}$	Propagation delay time, high-to-low-level output from line input				22	30	
$t_{PLH(S)}$	Propagation delay time, low-to-high-level output from strobe input				12	22	ns
$t_{PHL(S)}$	Propagation delay time, high-to-low-level output from strobe input				8	15	

TYPES SN55140, SN55141, SN55142, SN55143, SN75140, SN75141, SN75142, SN75143 DUAL LINE RECEIVERS

PARAMETER MEASUREMENT INFORMATION

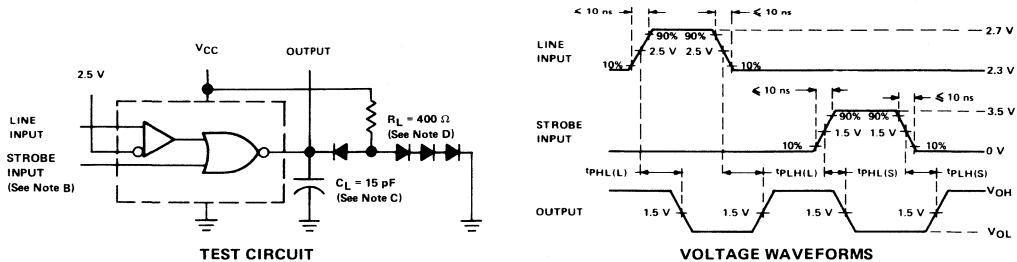


FIGURE 1

- NOTES: A. Input pulses are supplied by generators having the following characteristics: PRR = 1 MHz, duty cycle $\leq 50\%$, $Z_{out} \approx 50\ \Omega$.
B. Unused strobe is to be open or high.
C. C_L includes probe and jig capacitance.
D. All diodes are 1N3064.

TYPICAL CHARACTERISTICS

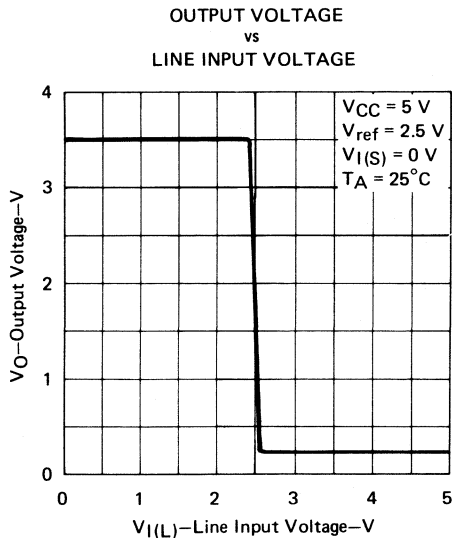
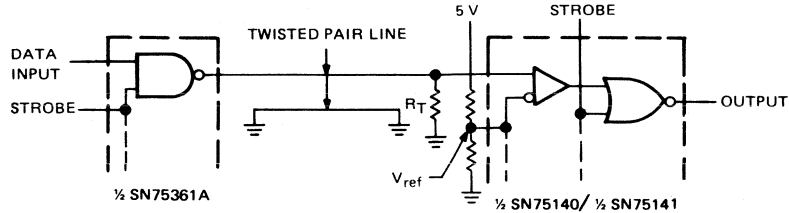


FIGURE 2

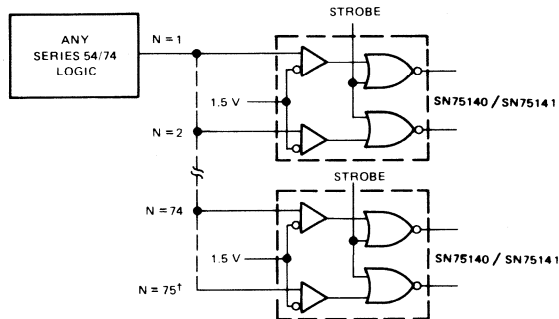
TYPES SN55140, SN55141, SN55142, SN55143, SN75140, SN75141, SN75142, SN75143 DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

line receiver

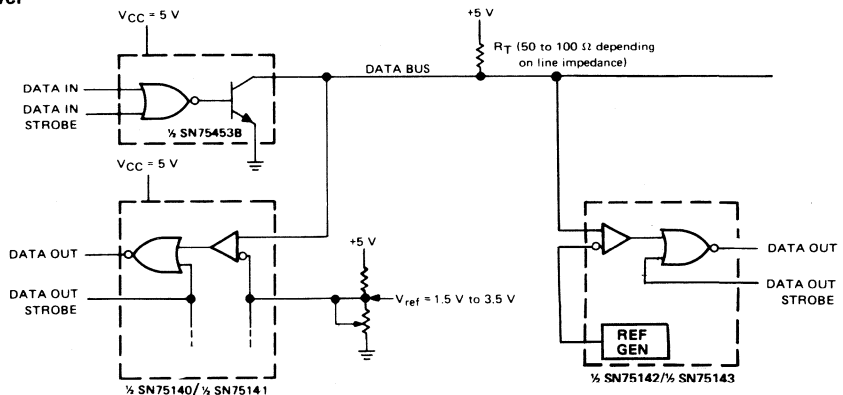


high fan-out from standard TTL gate



¹ Although most Series 54/74 circuits have a guaranteed 2.4-V output at 400 μ A, they are typically capable of maintaining a 2.4-V output level under a load of 7.5 mA.

dual bus transceiver

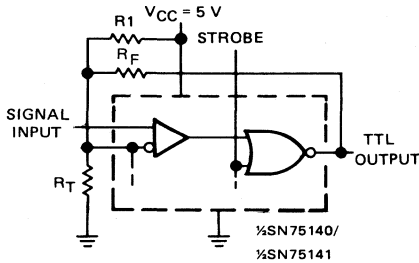


Using this arrangement, as many as 100 transceivers can be connected to a single data bus. The adjustable reference voltage feature allows the noise margin to be optimized for a given system. The complete dual bus transceiver (SN75453B driver and SN75140 receiver) can be assembled in approximately the same space required by a single 16-pin package, and only one power supply is required (+5 V). Data In and Data Out terminals are TTL compatible.

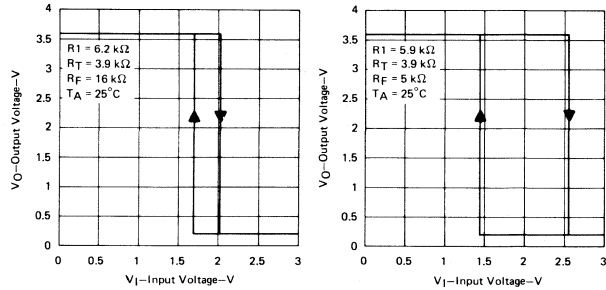
TYPES SN55140, SN55141, SN55142, SN55143, SN75140, SN75141, SN75142, SN75143 DUAL LINE RECEIVERS

TYPICAL APPLICATION DATA

Schmitt trigger

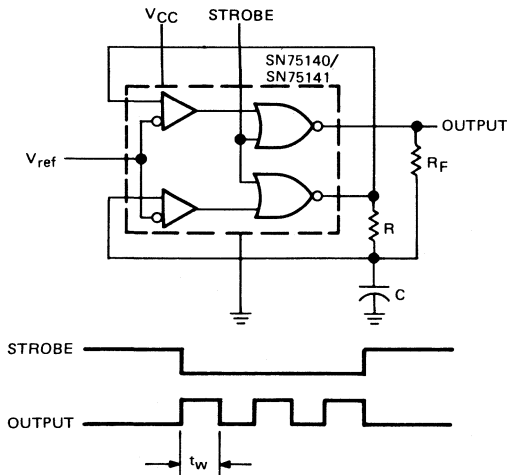


EXAMPLES OF TRANSFER CHARACTERISTICS

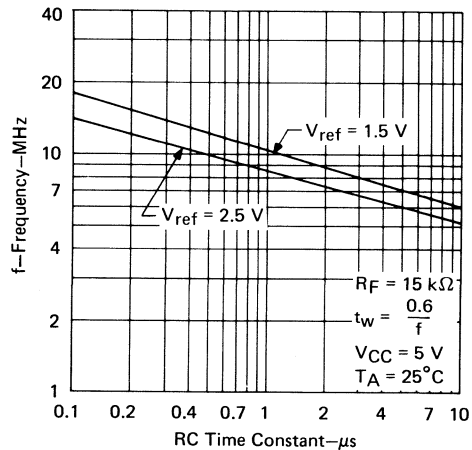


Slowly changing input levels from data lines, optical detectors, and other types of transducers may be converted to standard TTL signals with this Schmitt trigger circuit. R_1 , R_F and R_T may be adjusted for the desired hysteresis and trigger levels.

gated oscillator



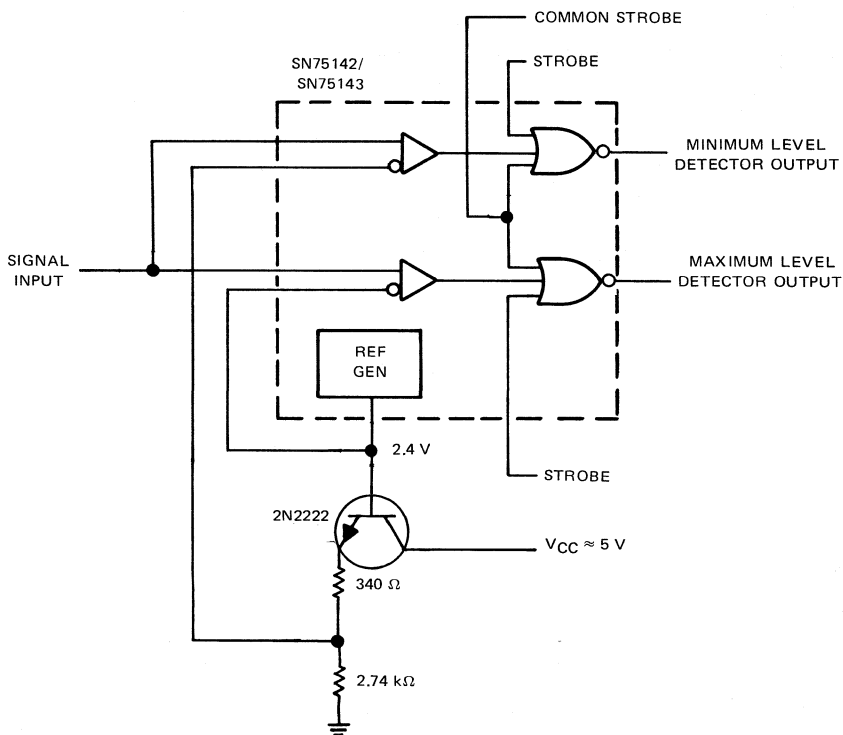
OSCILLATOR FREQUENCY vs RC TIME CONSTANT



**TYPES SN55140, SN55141, SN55142, SN55143,
SN75140, SN75141, SN75142, SN75143
DUAL LINE RECEIVERS**

TYPICAL APPLICATION DATA

level detector



INTERFACE CIRCUITS

TYPE SN75150 DUAL LINE DRIVER

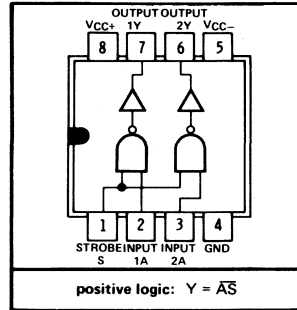
BULLETIN NO. DL-S 7711428, JANUARY 1971—REVISED JANUARY 1977

- Satisfies Requirements of EIA Standard RS-232-C
- Withstands Sustained Output Short-Circuit to any Low-Impedance Voltage between -25 V and 25 V
- $2\ \mu\text{s}$ Max Transition Time through the $+3\text{ V}$ to -3 V Transition Region under Full 2500-pF Load
- Inputs Compatible with Most TTL and DTL Families
- Common Strobe Input
- Common Strobe Input
- Inverting Output
- Slew Rate can be Controlled with an External Capacitor at the Output
- Standard Supply Voltages . . . $\pm 12\text{ V}$

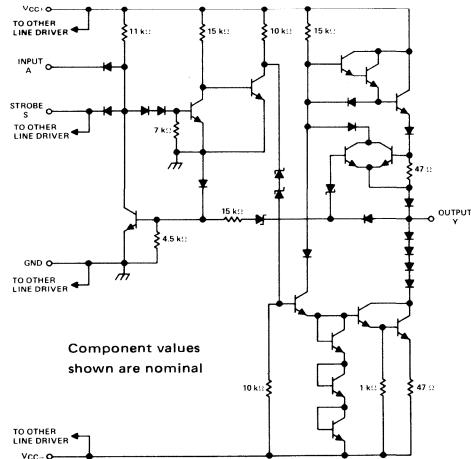
description

The SN75150 is a monolithic dual line driver designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by EIA Standard RS-232-C. A rate of 20,000 bits per second can be transmitted with a full 2500-pF load. Other applications are in data-transmission systems using relatively short single lines, in level translators, and for driving MOS devices. The logic input is compatible with most TTL and DTL families. Operation is from $+12\text{-volt}$ and -12-volt power supplies. The SN75150 is characterized for operation from 0°C to 70°C .

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



schematic (each line driver)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage V_{CC+} (see Note 1)	. . . . .	15 V
Supply voltage V_{CC-}	. . . . .	-15 V
Input voltage	. . . . .	15 V
Applied output voltage	. . . . .	$\pm 25\text{ V}$
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2): JG package	. . . . .	925 mW
	P package	1000 mW
Operating free-air temperature range	. . . . .	0°C to 70°C
Storage temperature range	. . . . .	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: JG package	. . . . .	300°C
Lead temperature 1/16 inch from case for 10 seconds: P package	. . . . .	260°C

- NOTES: 1. Voltage values are with respect to network ground terminal.
2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the JG package, SN75150 chips are glass-mounted.

TYPE SN75150 DUAL LINE DRIVER

REVISED JANUARY 1977

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage V_{CC+}	10.8	12	13.2	V
Supply voltage V_{CC-}	-10.8	-12	-13.2	V
Input voltage, V_I	0		5.5	V
Applied output voltage, V_O			±15	V
Operating free-air temperature, T_A	0		70	°C

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST FIGURE	TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT	
V_{IH} High-level input voltage	1		2			V	
V_{IL} Low-level input voltage	2				0.8	V	
V_{OH} High-level output voltage	2	$V_{CC+} = 10.8$ V, $V_{CC-} = -13.2$ V, $V_{IL} = 0.8$ V, $R_L = 3$ k Ω to 7 k Ω	5	8		V	
V_{OL} Low-level output voltage	1	$V_{CC+} = 10.8$ V, $V_{CC-} = -10.8$ V, $V_{IH} = 2$ V, $R_L = 3$ k Ω to 7 k Ω		-8	-5	V	
I_{IH} High-level input current	3	$V_{CC+} = 13.2$ V, $V_{CC-} = -13.2$ V, $V_I = 2.4$ V	Data input	1	10	μ A	
			Strobe input	2	20		
I_{IL} Low-level input current	3	$V_{CC+} = 13.2$ V, $V_{CC-} = -13.2$ V, $V_I = 0.4$ V	Data input	-1	-1.6	mA	
			Strobe input	-2	-3.2		
I_{OS} Short-circuit output current [‡]	4	$V_{CC+} = 13.2$ V, $V_{CC-} = -13.2$ V	$V_O = 25$ V	2	8	mA	
			$V_O = -25$ V		-3		-8
			$V_O = 0$ V, $V_I = 3$ V	10	15		30
			$V_O = 0$ V, $V_I = 0$ V	-10	-15		-30
I_{CCH+} Supply current from V_{CC+} , high-level output	5	$V_{CC+} = 13.2$ V, $V_I = 0$ V, $T_A = 25^\circ$ C	$V_{CC-} = -13.2$ V, $R_L = 3$ k Ω ,	10	22	mA	
-1				-10	mA		
I_{CCL+} Supply current from V_{CC+} , low-level output	5	$V_{CC+} = 13.2$ V, $V_I = 3$ V, $T_A = 25^\circ$ C	$V_{CC-} = -13.2$ V, $R_L = 3$ k Ω ,	8	17	mA	
I_{CCL-} Supply current from V_{CC-} , low-level output				-9	-20	mA	

NOTE 3: The algebraic convention where the more positive (less negative) limit is designated as maximum is used in this data sheet for logic levels only, e.g., when -5 V is the maximum, the typical value is a more negative voltage.

[†]All typical values are at $V_{CC+} = 12$ V, $V_{CC-} = -12$ V, $T_A = 25^\circ$ C.

[‡]Not more than one output should be shorted at a time.

switching characteristics, $V_{CC+} = 12$ V, $V_{CC-} = -12$ V, $T_A = 25^\circ$ C

PARAMETER	TEST FIGURE	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{TLH} Transition time, low-to-high-level output	6	$C_L = 2500$ pF, $R_L = 3$ k Ω to 7 k Ω	0.2	1.4	2	μ s
t_{THL} Transition time, high-to-low-level output			0.2	1.5	2	μ s
t_{TLH} Transition time, low-to-high-level output	6	$C_L = 15$ pF, $R_L = 7$ k Ω		40		ns
t_{THL} Transition time, high-to-low-level output				20		ns
t_{PLH} Propagation delay time, low-to-high-level output	6	$C_L = 15$ pF, $R_L = 7$ k Ω		60		ns
t_{PHL} Propagation delay time, high-to-low-level output				45		ns

TYPE SN75150

DUAL LINE DRIVER

PARAMETER MEASUREMENT INFORMATION

d-c test circuits[‡]

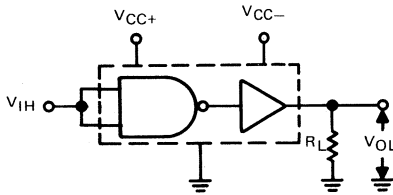
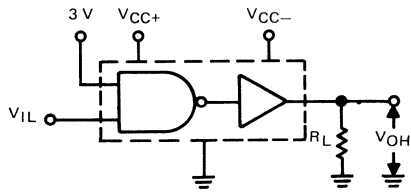
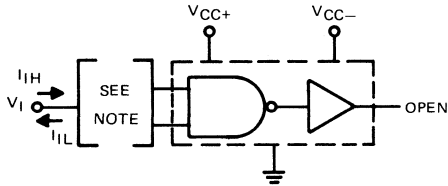


FIGURE 1— V_{IH} , V_{OL}



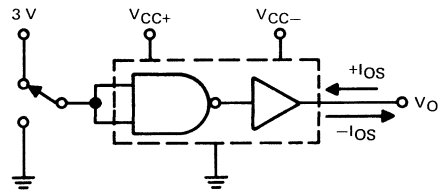
Each input is tested separately.

FIGURE 2— V_{IL} , V_{OH}



NOTE: When testing I_{IH} , the other input is at 3 V; when testing I_{IL} , the other input is open.

FIGURE 3— I_{IH} , I_{IL}



I_{OS} is tested for both input conditions at each of the specified output conditions.

FIGURE 4— I_{OS}

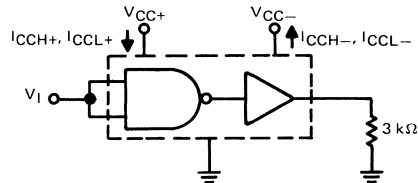


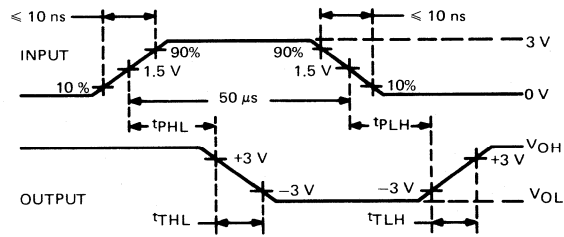
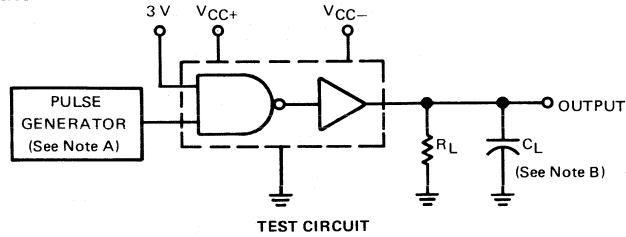
FIGURE 5— I_{CCH+} , I_{CCH-} , I_{CCL+} , I_{CCL-}

[‡]Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

TYPE SN75150 DUAL LINE DRIVER

PARAMETER MEASUREMENT INFORMATION

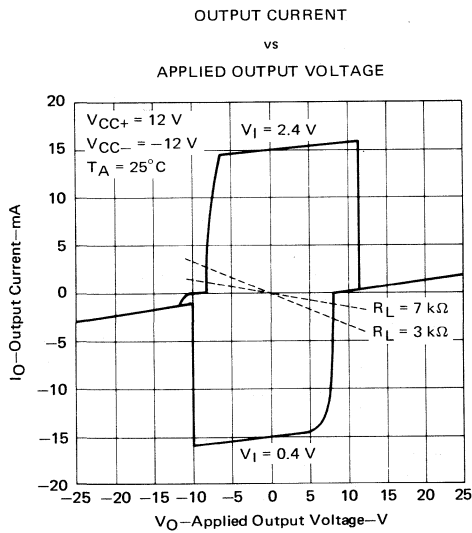
switching characteristics



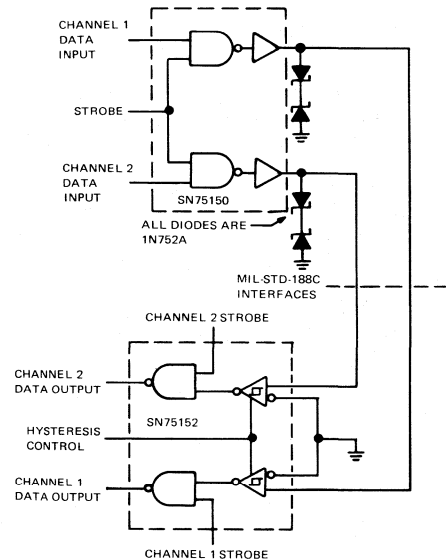
NOTES: A. The pulse generator has the following characteristics: duty cycle $\leq 50\%$, $Z_{out} \approx 50 \Omega$.
B. C_L includes probe and jig capacitance.

FIGURE 6—SWITCHING CHARACTERISTICS

TYPICAL CHARACTERISTICS



TYPICAL APPLICATION DATA



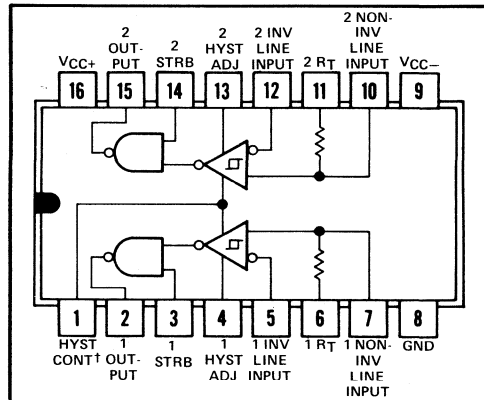
Meets Specifications of EIA RS-232-C or MIL-STD-188C†

- Dual Differential Receiver with Independent Strobes
- Common-Mode Input Voltage Range . . . ± 25 V
- Differential Input Capability with One Input Grounded . . . ± 25 V
- Continuously Adjustable Hysteresis with External Resistors
- Standard Supply Voltages . . . +12 V and -12 V
- Input Hysteresis (Double Thresholds) Remain Approximately Fixed for Power Supply and/or Temperature Variations

description

The SN75152 is a dual differential line receiver designed to meet the requirements of EIA standard RS-232-C or MIL-STD-188 interfaces. A single control (pin 1) sets the input hysteresis for the required operation. An added feature is the capability of adjusting the hysteresis to any voltage between ± 0.3 volt typical and ± 5 volts typical by means of the hysteresis adjust terminals (pin 4 and 13) making the SN75152 useful for a wide variety of line receiver and Schmitt trigger applications. The large common-mode input voltage range and differential input voltage (± 25 volts) give the circuit added versatility. The SN75152 is designed for operation from standard ± 12 -volt supplies with $\pm 10\%$ variation. Each receiver has an output strobe that is TTL compatible.

J O R N
DUAL-IN-LINE PACKAGE (TOP VIEW)



†To meet the specifications of EIA Standard RS-232-C, connect Hysteresis Control (Pin 1) to V_{CC-} (Pin 9). Also, connect pin 6 to pin 5 and pin 11 to pin 12. To meet the specifications of MIL-STD-188, leave Hysteresis Control (pin 1) and termination resistors (pin 6 and 11) open.

FUNCTION TABLE
(EACH RECEIVER)

LINE INPUT	STROBE	OUTPUT
H	H	H
L	H	L
X	L	H

Definition of logic levels:

For the strobe: H (high) is any voltage between V_{IH} min and V_{CC} .

L (low) is any voltage between ground and V_{IL} max.

For the line input: H (high) is any differential input voltage (V_{ID})‡ more positive than V_{T-} , once the level of V_{T+} has been reached.

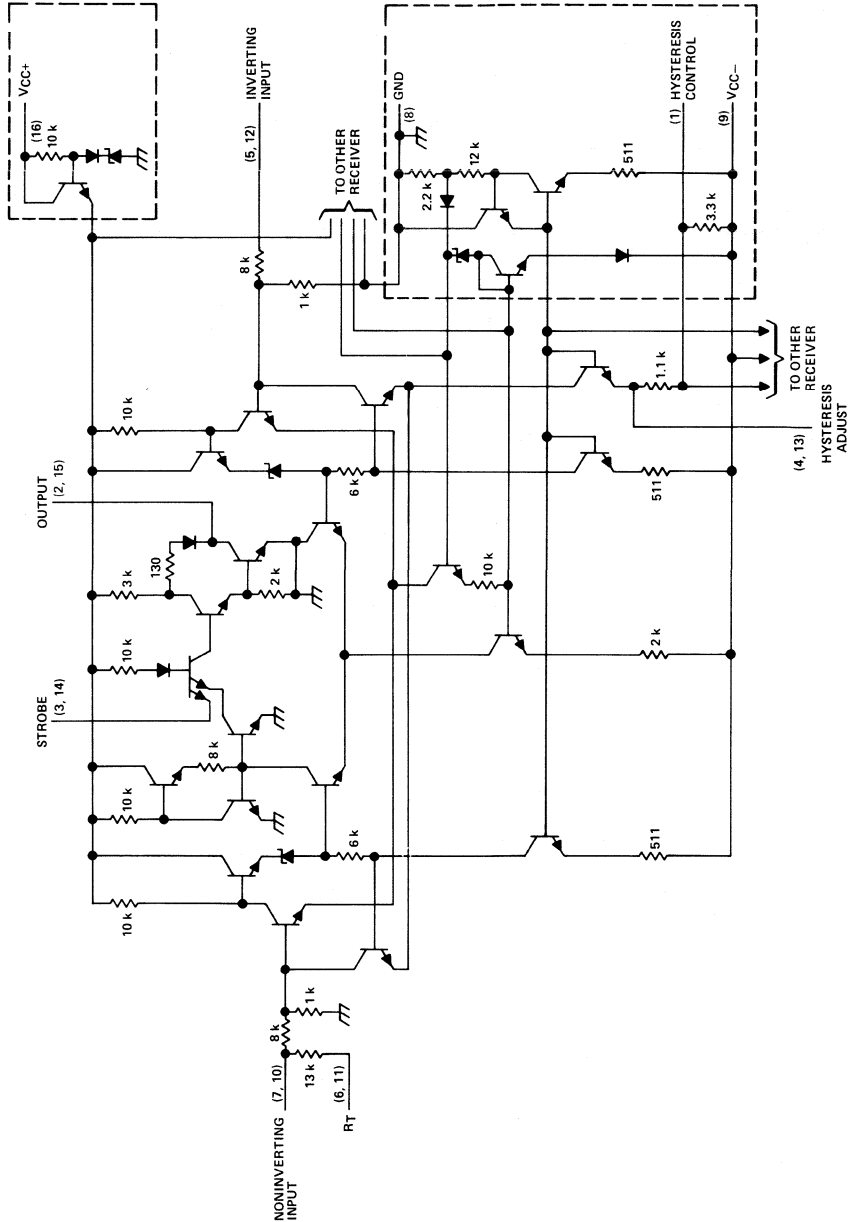
L (low) is any differential input voltage (V_{ID})‡ more negative than V_{T+} , once the level of V_{T-} has been reached.

X (irrelevant) is any input voltage permitted by maximum ratings.

‡Differential input voltages (V_T and V_{ID}) are at the noninverting input terminal with respect to the inverting input terminal.

TYPE SN75152 DUAL LINE RECEIVER

schematic (each receiver)



Portions of circuit within dashed lines are common to both receivers.
Resistor values shown are nominal and in ohms.

TYPE SN75152

DUAL LINE RECEIVER

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage V_{CC+} (see Note 1)	15 V
Supply voltage V_{CC-} (see Note 1)	-15 V
Voltage at any line input with respect to other line input, ground, or R_T terminal	± 25 V
R_T terminal voltage (see Note 1)	± 25 V
Strobe input voltage (see Note 1)	5.5 V
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTE 1: These voltage values are with respect to network ground terminal.

electrical characteristics over operating free-air temperature range, $V_{CC+} = 12\text{ V} \pm 10\%$, $V_{CC-} = -12\text{ V} \pm 10\%$ (unless otherwise noted)

PARAMETER		TEST FIGURE	TEST CONDITIONS [‡]	MIN	TYP [§]	MAX	UNIT	
V_{T+}	Positive-going threshold voltage	1	MIL-STD-188 Conditions	0.1	0.3	0.5	V	
V_{T-}	Negative-going threshold voltage			-0.5	-0.3	-0.1		
V_{T+}	Positive-going threshold voltage	2	EIA RS-232-C Conditions	1.5	2.2	3	V	
V_{T-}	Negative-going threshold voltage			-3	-2.2	-1.5		
V_{IH}	High-level input voltage at strobe	1		2			V	
V_{IL}	Low-level input voltage at strobe	1				0.8	V	
V_{OH}	High-level output voltage	1 and 2	$V_{ID} = V_{T+} \text{ max,}$ $I_{OH} = -500\text{ }\mu\text{A}$	$V_{I(\text{strobe})} = 2\text{ V,}$	3	4.1	6	V
		1 and 2	$V_{ID} = V_{T-} \text{ min,}$ $I_{OH} = -500\text{ }\mu\text{A}$	$V_{I(\text{strobe})} = 0.8\text{ V,}$	3	4.1	6	
V_{OL}	Low level output voltage	1 and 2	$V_{ID} = V_{T-} \text{ min,}$ $I_{OL} = 6.4\text{ mA}$	$V_{I(\text{strobe})} = 2\text{ V,}$	0	0.15	0.4	V
I_I	Input current into strobe at maximum strobe voltage	3	$V_{I(\text{strobe})} = 5.5\text{ V}$	0.1		1	mA	
I_{IH}	High-level strobe current	3	$V_{I(\text{strobe})} = 2.4\text{ V}$	30		80	μA	
I_{IL}	Low-level strobe current	3	$V_{I(\text{strobe})} = 0.4\text{ V}$	-0.5		-1.5	mA	
r_I	Input resistance	MIL-STD-188	$V_{ID} = 0\text{ V to } 25\text{ V,}$ R_T open	6		9	$k\Omega$	
		EIA RS-232-C	$|V_{ID}| = 3\text{ V to } 25\text{ V,}$ R_T connected to inverting line input	3		5		7
$V_{I(\text{open})}$	Open-circuit input voltage	5		+1		± 2	V	
I_{OS}	Short-circuit output current	6	$V_{ID} = 3\text{ V}$	-1.9		-4	mA	
I_{CC+}	Supply current from V_{CC+}	1	$V_{ID} = -3\text{ V,}$ $V_{I(\text{strobe})} = 2.4\text{ V}$	10		16	mA	
I_{CC-}	Supply current from V_{CC-}	1	$V_{ID} = -3\text{ V,}$ $V_{I(\text{strobe})} = 2.4\text{ V}$	-7		-13	mA	

[‡]Differential input voltages (V_T and V_{ID}) are at the noninverting line input terminal with respect to the inverting line input terminal.

[§]Typical values are at $V_{CC+} = 12\text{ V,}$ $V_{CC-} = -12\text{ V,}$ $T_A = 25^\circ\text{C.}$

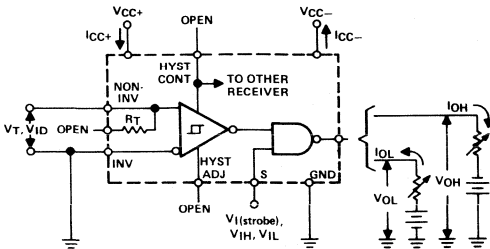
NOTE 2: The algebraic convention where the most-positive (least-negative) limit is designated as maximum is used in this data sheet for threshold levels only, e.g., when -0.1 V is the maximum, the minimum limit is a more-negative voltage.

switching characteristics, $V_{CC+} = 12\text{ V,}$ $V_{CC-} = -12\text{ V,}$ $T_A = 25^\circ\text{C}$

PARAMETER	TEST FIGURE	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	7	$C_L = 15\text{ pF}$	40			ns
t_{PHL}			60			ns

TYPE SN75152 DUAL LINE RECEIVER

PARAMETER MEASUREMENT INFORMATION



NOTE: Output is open for testing I_{CC+} and I_{CC-}

FIGURE 1—MIL-STD-188 CONDITION

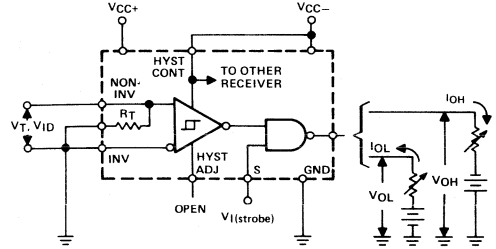


FIGURE 2—EIA RS-232-C CONDITION

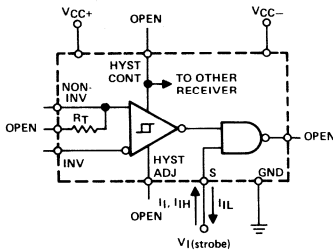


FIGURE 3

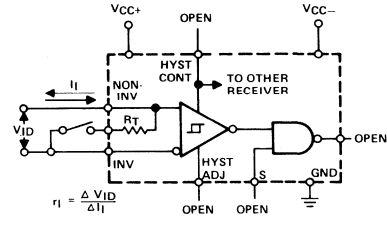


FIGURE 4

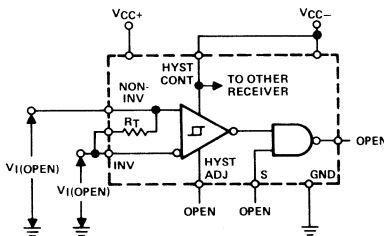


FIGURE 5

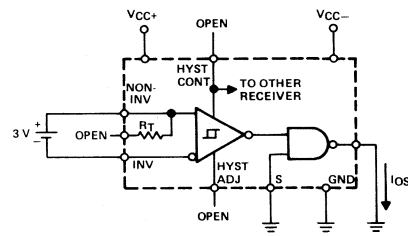
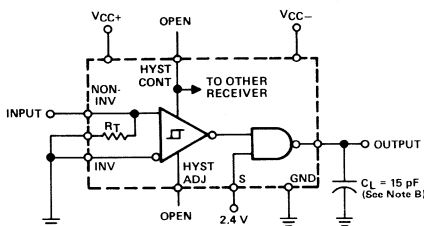
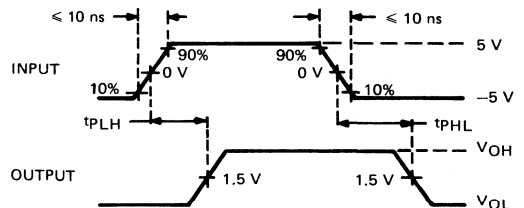


FIGURE 6



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The input pulse is supplied by a generator having the following characteristics: $t_w = 500\text{ ns}$, $\text{PRR} = 1\text{ MHz}$, $Z_{out} \approx 50\ \Omega$.
B. C_L includes probe and jig capacitance.

FIGURE 7—PROPAGATION DELAY TIMES

TYPE SN75152

DUAL LINE RECEIVER

TYPICAL CHARACTERISTICS

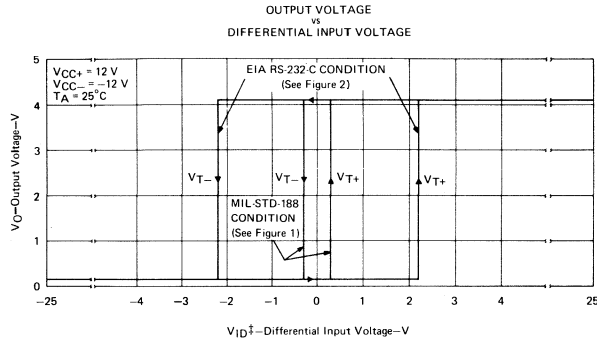


FIGURE 8

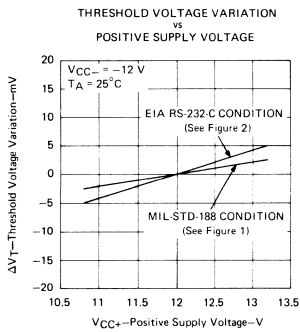


FIGURE 9

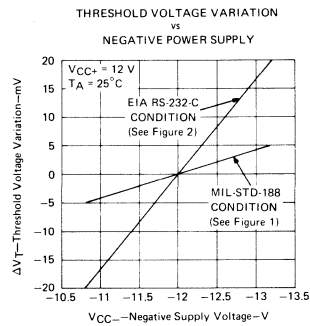


FIGURE 10

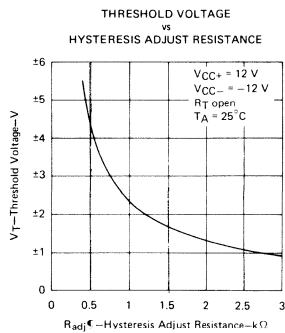


FIGURE 11

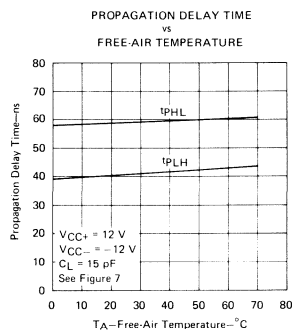


FIGURE 12

‡ Differential input voltages (V_T and V_{ID}) are at the noninverting input terminal with respect to the inverting input terminal.

¶ R_{adj} is connected between Hysteresis Adjust terminal and V_{CC-} .

TYPE SN75152 DUAL LINE RECEIVER

TYPICAL APPLICATIONS

Some typical applications of the SN75152 are as follows:

- MIL-STD-188 Interface Receiver
- EIA RS-232-C Interface Receiver
- Single-Ended Line Receiver
- Differential Line Receiver
- High-Noise-Immunity Line Receiver
- Schmitt Trigger
- High-Voltage-Logic-to-TTL Translator
- MOS to TTL Converter
- Pulse Generator
- Threshold detector
- Pulse Shaper

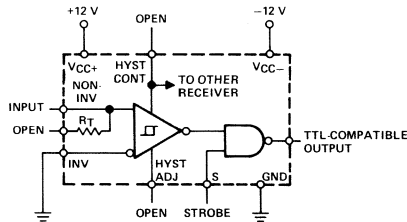


FIGURE 13—MIL-STD-188 SINGLE-ENDED LINE RECEIVER

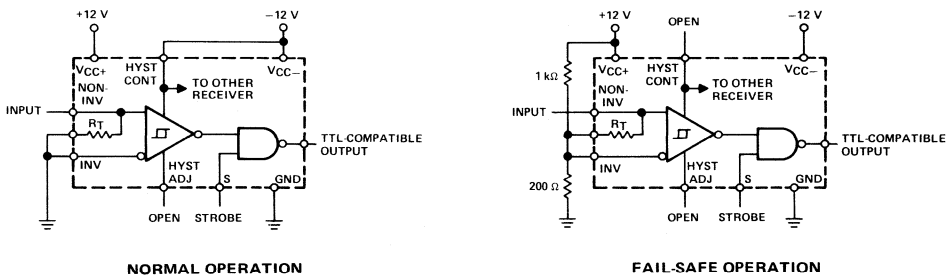


FIGURE 14—EIA RS-232-C SINGLE-ENDED RECEIVER

TYPE SN75152 DUAL LINE RECEIVER

TYPICAL APPLICATIONS

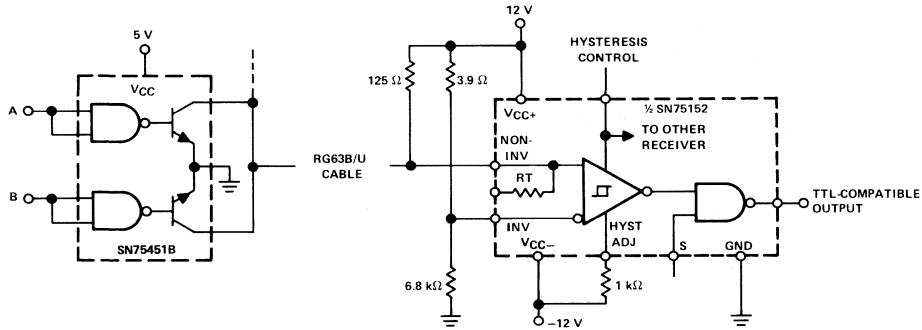
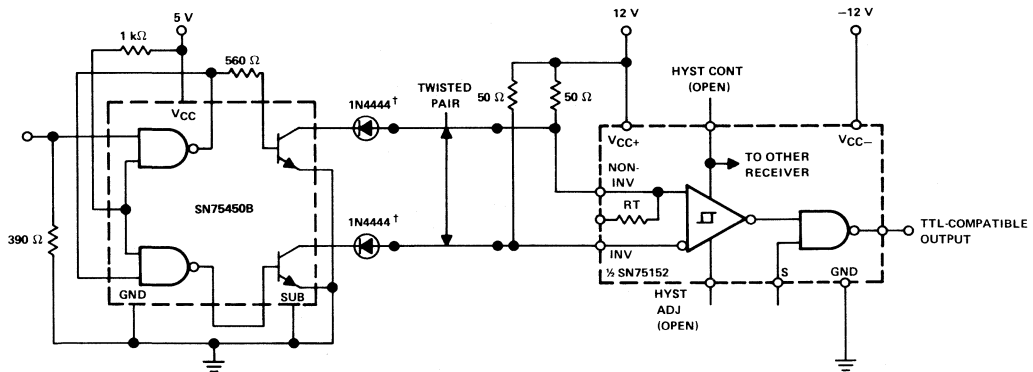


FIGURE 15—SINGLE-ENDED TRANSMITTER WITH DRIVER "OR" CAPABILITY AND RECEIVER WITH ADJUSTABLE NOISE IMMUNITY



Frequency to 0.5 MHz
Common-Mode Voltage . . . -12 V to +10 V

† The 1N4444 diodes are required only for negative common-mode protection at the driver outputs.

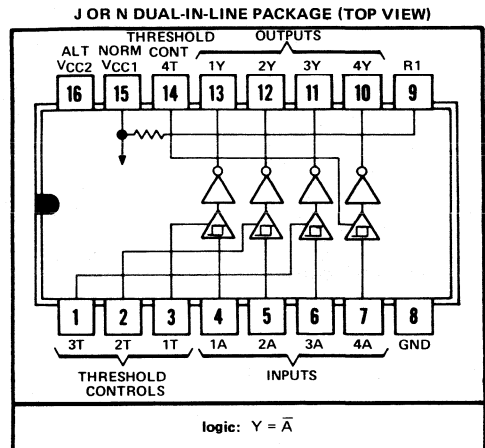
FIGURE 16—BALANCED LINE OPERATION WITH HIGH COMMON-MODE-VOLTAGE CAPABILITY

INTERFACE CIRCUITS

TYPE SN75154 QUADRUPLE LINE RECEIVER

BULLETIN NO. DL-S 7711389, NOVEMBER 1970—REVISED JANUARY 1977

- Satisfies Requirements of EIA Standard RS-232-C
- Input Resistance . . . 3 k Ω to 7 k Ω over Full RS-232-C Voltage Range
- Input Threshold Adjustable to Meet "Fail-Safe" Requirements Without Using External Components
- Built-In Hysteresis for Increased Noise Immunity
- Inverting Output Compatible with DTL or TTL
- Output with Active Pull-Up for Symmetrical Switching Speeds
- Standard Supply Voltages . . . 5 V or 12 V



description

The SN75154 is a monolithic quadruple line receiver designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by EIA Standard RS-232C. Other applications are for relatively short, single-line, point-to-point data transmission and for level translators. Operation is normally from a single five-volt supply; however, a built-in option allows operation from a 12-volt supply without the use of additional components. The output is compatible with most TTL and DTL circuits when either supply voltage is used.

In normal operation, the threshold-control terminals are connected to the VCC1 terminal, pin 15, even if power is being supplied via the alternate VCC2 terminal, pin 16. This provides a wide hysteresis loop which is the difference between the positive-going and negative-going threshold voltages. See typical characteristics. In this mode of operation, if the input voltage goes to zero, the output voltage will remain at the low or high level as determined by the previous input.

For fail-safe operation, the threshold-control terminals are open. This reduces the hysteresis loop by causing the negative-going threshold voltage to be above zero. The positive-going threshold voltage remains above zero as it is unaffected by the disposition of the threshold terminals. In the fail-safe mode, if the input voltage goes to zero or an open-circuit condition, the output will go to the high level regardless of the previous input condition.

For fail-safe operation, the threshold-control terminals are open. This reduces the hysteresis loop by causing the negative-going threshold voltage to be above zero. The positive-going threshold voltage remains above zero as it is unaffected by the disposition of the threshold terminals. In the fail-safe mode, if the input voltage goes to zero or an open-circuit condition, the output will go to the high level regardless of the previous input condition.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Normal supply voltage (pin 15), VCC1 (see Note 1)	7 V
Alternate supply voltage (pin 16), VCC2	14 V
Input voltage	± 25 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2):	
J package	1025 mW
N package	1150 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

- NOTES: 1. Voltage values are with respect to the network ground terminal.
2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information Section, which starts on page 18. In the J package, SN75154 chips are glass-mounted.

recommended operating conditions

	MIN	NOM	MAX	UNIT
Normal supply voltage (pin 15), VCC1	4.5	5	5.5	V
Alternate supply voltage (pin 16), VCC2	10.8	12	13.2	V
Input voltage			± 15	V
Normalized fan-out from each output, N			10	
Operating free-air temperature, T _A	0		70	°C

TYPE SN75154 QUADRUPLE LINE RECEIVER

REVISED JANUARY 1977

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST FIGURE	TEST CONDITIONS	MIN	TYP [‡]	MAX	UNIT	
V _{IH}	High-level input voltage	1		3			V	
V _{IL}	Low-level input voltage	1		-3			V	
V _{T+}	Positive-going threshold voltage	Normal operation		0.8	2.2	3	V	
		Fail-safe operation		0.8	2.2	3	V	
V _{T-}	Negative-going threshold voltage	Normal operation		-3	-1.1	0	V	
		Fail-safe operation		0.8	1.4	3	V	
V _{T+} -V _{T-}	Hysteresis	1		0.8	3.3	6	V	
				0			0.8	2.2
V _{OH}	High-level output voltage	1	I _{OH} = -400 μA	2.4	3.5		V	
V _{OL}	Low-level output voltage	1	I _{OL} = 16 mA	0.23		0.4	V	
r _I	Input resistance	2	ΔV _I = -25 V to -14 V	3	5	7	kΩ	
			ΔV _I = -14 V to -3 V	3	5	7		
			ΔV _I = -3 V to 3 V	3	6	8		
			ΔV _I = 3 V to 14 V	3	5	7		
			ΔV _I = 14 V to 25 V	3	5	7		
V _{I(open)}	Open-circuit input voltage	3	I _I = 0	0	0.2	2	V	
I _{OS}	Short-circuit output current [†]	4	V _{CC1} = 5.5 V, V _I = -5 V	-10	-20	-40	mA	
I _{CC1}	Supply current from V _{CC1}	5	V _{CC1} = 5.5 V, T _A = 25°C	20		35	mA	
I _{CC2}	Supply current from V _{CC2}		V _{CC2} = 13.2 V, T _A = 25°C	23		40		

[†]Not more than one output should be shorted at a time.

[‡]All typical values are at V_{CC1} = 5 V, T_A = 25°C.

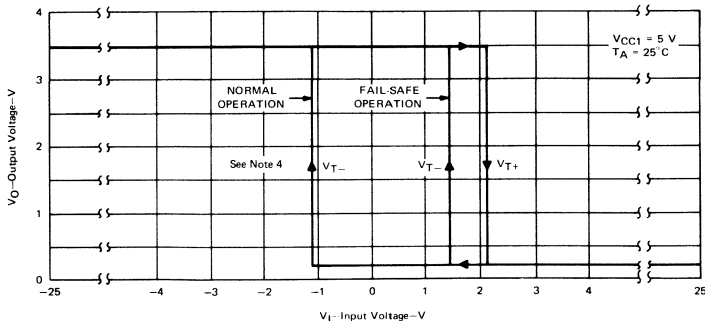
NOTE 3: The algebraic convention where the more positive (less negative) limit is designated as maximum is used in this data sheet for logic and threshold levels only, e.g., when -3 V is the maximum, the minimum limit is a more negative voltage.

switching characteristics, V_{CC1} = 5 V, T_A = 25°C, N = 10

PARAMETER	TEST FIGURE	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH}	6	C _L = 50 pF, R _L = 390 Ω	22		ns	
t _{PHL}			20			
t _{TLH}			9			
t _{THL}			6			

TYPICAL CHARACTERISTICS

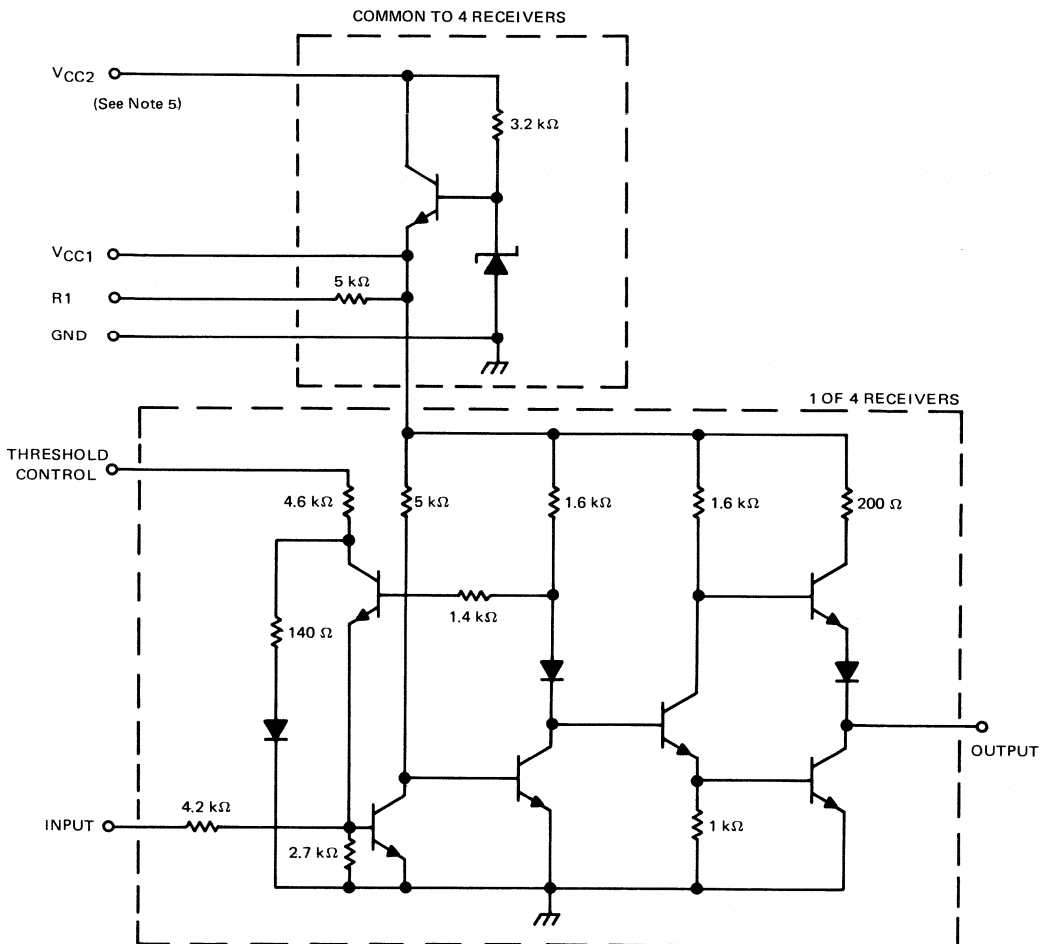
OUTPUT VOLTAGE vs INPUT VOLTAGE




NOTE 4: For normal operation, the threshold controls are connected to V_{CC1}, pin 15. For fail safe operation, the threshold controls are open.

TYPE SN75154 QUADRUPLE LINE RECEIVER

schematic



Component values shown are nominal

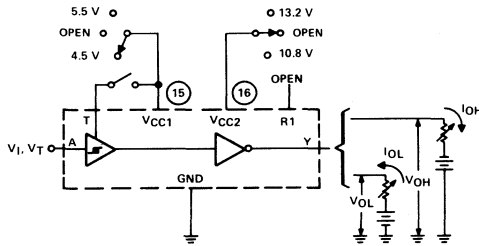
 . . . Substrate

NOTE 5: When using V_{CC1} (pin 15), V_{CC2} (pin 16) may be left open or shorted to V_{CC1} . When using V_{CC2} , V_{CC1} must be left open or connected to the threshold control pins.

TYPE SN75154 QUADRUPLE LINE RECEIVER

PARAMETER MEASUREMENT INFORMATION

d-c test circuits†

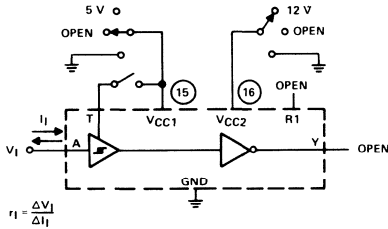


NOTES: A. Momentarily apply -5 V , then 0.8 V .
B. Momentarily apply 5 V , then ground.

TEST TABLE

TEST	MEASURE	A	T	Y	VCC1 (PIN 15)	VCC2 (PIN 16)
Open-circuit input (fail safe)	V _{OH}	Open	Open	I _{OH}	4.5 V	Open
	V _{OH}	Open	Open	I _{OH}	Open	10.8 V
V _{T+} min,	V _{OH}	0.8 V	Open	I _{OH}	5.5 V	Open
V _{T-} min (fail safe)	V _{OH}	0.8 V	Open	I _{OH}	Open	13.2 V
V _{T+} min (normal)	V _{OH}	Note A	Pin 15	I _{OH}	5.5 V and T	Open
	V _{OH}	Note A	Pin 15	I _{OH}	T	13.2 V
V _{IL} max,	V _{OH}	-3 V	Pin 15	I _{OH}	5.5 V and T	Open
V _{T-} min (normal)	V _{OH}	-3 V	Pin 15	I _{OH}	T	13.2 V
V _{IH} min, V _{T+} max,	V _{OL}	3 V	Open	I _{OL}	4.5 V	Open
	V _{OL}	3 V	Open	I _{OL}	Open	10.8 V
V _{IH} max, V _{T+} max (normal)	V _{OL}	3 V	Pin 15	I _{OL}	4.5 V and T	Open
	V _{OL}	3 V	Pin 15	I _{OL}	T	10.8 V
V _{T-} max (normal)	V _{OL}	Note B	Pin 15	I _{OL}	5.5 V and T	Open
	V _{OL}	Note B	Pin 15	I _{OL}	T	13.2 V

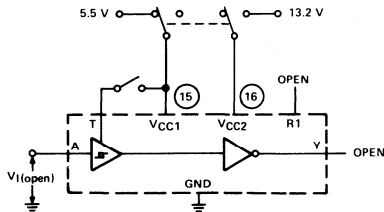
FIGURE 1 – V_{IH}, V_{IL}, V_{T+}, V_{T-}, V_{OH}, V_{OL}.



TEST TABLE

T	VCC1 (PIN 15)	VCC2 (PIN 16)
Open	5 V	Open
Open	GND	Open
Open	Open	Open
Pin 15	T and 5 V	Open
GND	GND	Open
Open	Open	12 V
Open	Open	GND
Pin 15	T	12 V
Pin 15	T	GND
Pin 15	T	Open

FIGURE 2—r_i



TEST TABLE

T	VCC1 (PIN 15)	VCC2 (PIN 16)
Open	5.5 V	Open
Pin 15	5.5 V	Open
Open	Open	13.2 V
Pin 15	T	13.2 V

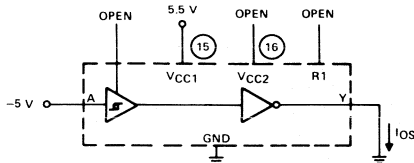
FIGURE 3—V_{I(open)}

† Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

TYPE SN75154 QUADRUPLE LINE RECEIVER

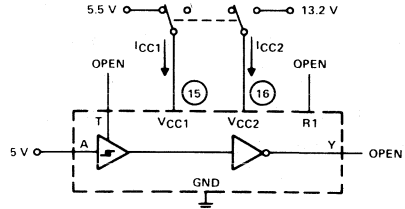
PARAMETER MEASUREMENT INFORMATION

d-c test circuits† (continued)



Each output is tested separately.

FIGURE 4-IOS

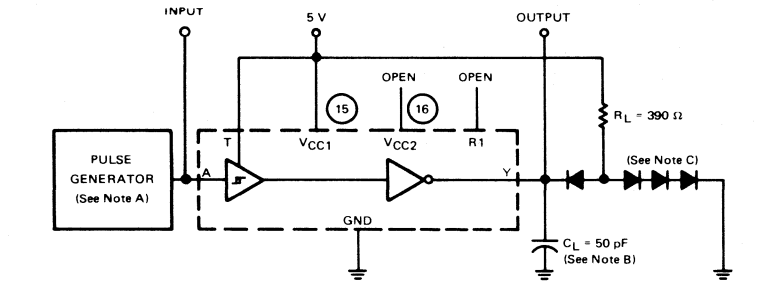


All four line receivers are tested simultaneously.

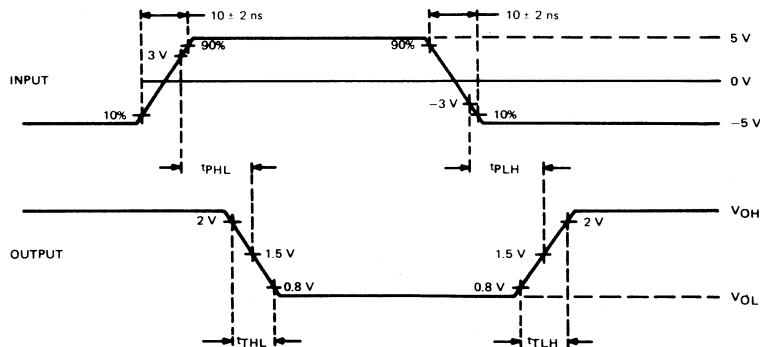
FIGURE 5-ICC

† Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

switching characteristics



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. The pulse generator has the following characteristics: $Z_{out} = 50 \Omega$, $t_w = 200 \text{ ns}$, duty cycle $\leq 20\%$.
 B. C_L includes probe and jig capacitance.
 C. All diodes are 1N3064.

FIGURE 6-SWITCHING TIMES

**FUTURE PRODUCT
TO BE ANNOUNCED**

**TYPES SN55157, SN75157
DUAL DIFFERENTIAL LINE RECEIVERS**

JANUARY 1977

- Meet EIA Standards RS-422 and RS-423
- Operates from a Single 5-V Supply
- Wide Common-Mode Voltage . . . ± 15 V
- Standard V_{CC} and Ground Pin Positions
- Withstands EIA Standard RS-232-C Single Levels

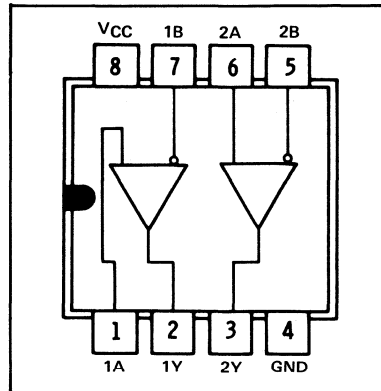
description

The SN55157 and SN75157 are dual differential line receivers that meet EIA Standards RS-422 and RS-423. They have the same features as the μ A9637 but with standard V_{CC} and ground pin positioning.

The SN55157 will be characterized for operation over the full military temperature range of -55°C to 125°C . The SN75157 will be characterized for operation from 0°C to 70°C .

supply voltage: 5 V nominal

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



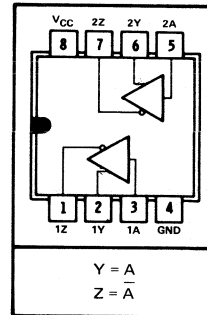
INTERFACE CIRCUITS

TYPES SN55158, SN75158 DUAL DIFFERENTIAL LINE DRIVERS

BULLETIN NO. DL-S 7712497, JANUARY 1977

- Meets EIA Standard RS-422
- Single 5-V Supply
- Balanced-Line Operation
- TTL-, DTL-Compatible
- High Output Impedance in Power-Off Condition
- High-Current Active-Pull-Up Outputs
- Short-Circuit Protection
- Dual Channels
- Input Clamp Diodes

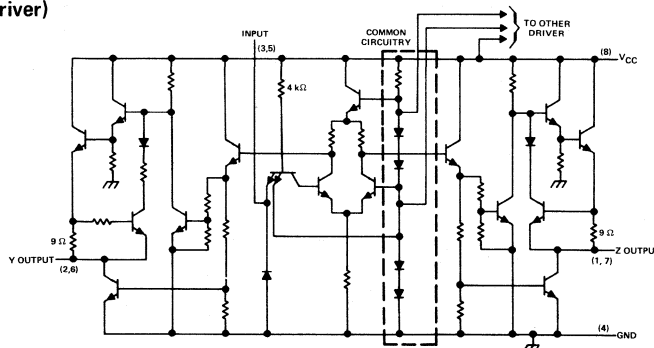
SN55158 . . . JG DUAL-IN-LINE PACKAGE
SN75158 . . . JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



description

The SN55158 and SN75158 are dual complementary-output line drivers designed to satisfy the requirements set by the EIA RS-422 standard interface specifications. The inputs are standard TTL. The outputs provide complementary signals with high-current capability for driving balanced lines, such as twisted-pair, at normal line impedance without high power dissipation. The output stages are TTL totem-pole outputs providing a high-impedance state in the power-off condition.

schematic (each driver)



Components within the dashed box are common to both drivers. Resistor values shown are nominal.

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range: SN55158	-55°C to 125°C
SN75158	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: JG package	300°C
Lead temperature 1/16 inch from case for 10 seconds: P package	260°C

- NOTES: 1. All voltage values are with respect to network ground terminal.
2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the JG package, SN55158 chips are alloy-mounted; SN75158 chips are glass-mounted.

TYPES SN55158, SN75158

DUAL DIFFERENTIAL LINE DRIVERS

recommended operating conditions

	SN55158			SN75158			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I_{OH}			-40			-40	mA
Low-level output current, I_{OL}			40			40	mA
Operating free-air temperature, T_A	-55		125	0		70	$^{\circ}$ C

electrical characteristics over operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS [†]	SN55158			SN75158			UNIT	
		MIN	TYP [‡]	MAX	MIN	TYP [‡]	MAX		
V_{IH}	High-level input voltage	2			2			V	
V_{IL}	Low-level input voltage			0.8			0.8	V	
V_{IK}	Input clamp voltage	$V_{CC} = \text{MIN}, I_I = -12 \text{ mA}$		-0.9	-1.5	-0.9	-1.5	V	
V_{OH}	High-level output voltage	$V_{CC} = \text{MIN}, V_{IH} = 2 \text{ V}, I_{OH} = -40 \text{ mA}$		2	3.0	2.4	3.0	V	
V_{OL}	Low-level output voltage	$V_{CC} = \text{MIN}, V_{IL} = 0.8 \text{ V}, V_{IH} = 2 \text{ V}, I_{OL} = 40 \text{ mA}$		0.2	0.4	0.2	0.4	V	
V_{OD1}	Differential output voltage	$V_{CC} = \text{MAX}, I_O = 0$		3.5	$2V_{OD2}$	3.5	$2V_{OD2}$	V	
V_{OD2}	Differential output voltage	$V_{CC} = \text{MIN}$	$R_L = 100 \Omega,$ See Figure 1	2	3.0	2	3.0	V	
$\Delta|V_{OD}|$	Change in magnitude of differential output voltage \S	$V_{CC} = \text{MIN}$		0.01	0.4	0.01	0.4	V	
V_{OC}	Common-mode output voltage \P	$V_{CC} = \text{MAX}$		1.9	3	1.8	3	V	
		$V_{CC} = \text{MIN}$		1.4	3	1.5	3	V	
$\Delta|V_{OC}|$	Change in magnitude of common-mode output voltage \S	$V_{CC} = \text{MIN or MAX}$		0.02	0.4	0.02	0.4	V	
I_O	Output current with power off	$V_{CC} = 0$	$V_O = 6 \text{ V}$	0.1	100	0.1	100	μA	
			$V_O = -0.25 \text{ V}$	-0.1	-100	-0.1	-100		
			$V_O = -0.25 \text{ V to } 6 \text{ V}$		± 100		± 100		
I_I	Input current at maximum input voltage	$V_{CC} = \text{MAX}, V_I = 5.5 \text{ V}$		1		1	mA		
I_{IH}	High-level input current	$V_{CC} = \text{MAX}, V_I = 2.4 \text{ V}$		40		40	μA		
I_{IL}	Low-level input current	$V_{CC} = \text{MAX}, V_I = 0.4 \text{ V}$		-1	-1.6	-1	-1.6	mA	
I_{OS}	Short-circuit output current #	$V_{CC} = \text{MAX}$	-40	-90	-150	-40	-90	-150	mA
I_{CC}	Supply current (both drivers)	$V_{CC} = \text{MAX},$ No load, $T_A = 25^{\circ}\text{C}$	Inputs grounded,	37	50	37	50	mA	

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[‡] All typical values are at $T_A = 25^{\circ}\text{C}$ and $V_{CC} = 5 \text{ V}$ except for V_{OC} , for which V_{CC} is as stated under test conditions.

\S $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ are the changes in magnitudes of V_{OD} and V_{OC} , respectively, that occur when the input is changed from a high level to a low level.

\P In EIA Standard RS-422, V_{OC} , which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS} .

Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

TYPES SN55158, SN75158 DUAL DIFFERENTIAL LINE DRIVERS

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	SN55158			SN75158			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
t_{PLH} Propagation delay time, low-to-high-level output	See Figure 2,	16	25		16	25	ns	
t_{PHL} Propagation delay time, high-to-low-level output	Termination A	10	20		10	20	ns	
t_{PLH} Propagation delay time, low-to-high-level output	See Figure 2,	13	20		13	20	ns	
t_{PHL} Propagation delay time, high-to-low-level output	Termination B	9	15		9	15	ns	
t_{TLH} Transition time, low-to-high-level output	See Figure 2,	4	20		4	20	ns	
t_{THL} Transition time, high-to-low-level output	Termination A	4	20		4	20	ns	
Overshoot factor	See Figure 2, Termination C		10			10	%	

PARAMETER MEASUREMENT INFORMATION

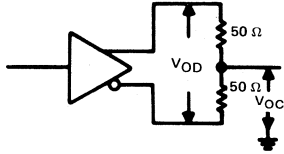
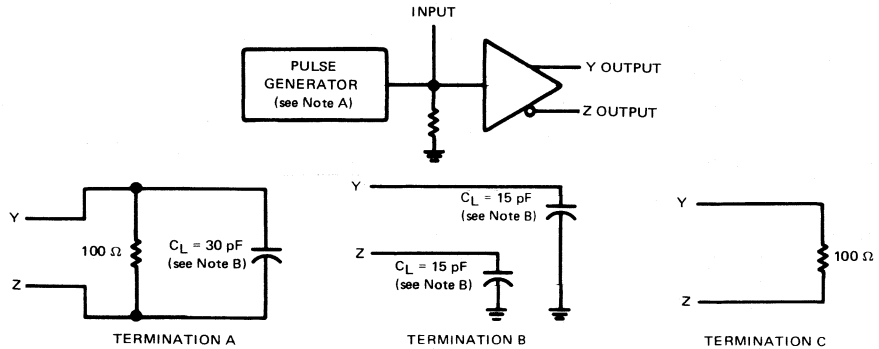
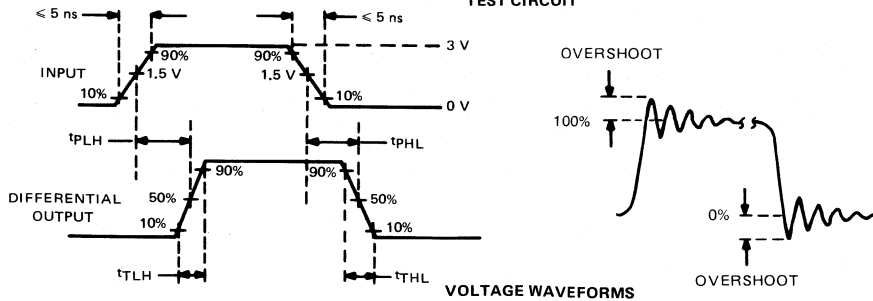


FIGURE 1—DIFFERENTIAL AND COMMON-MODE OUTPUT VOLTAGES



TEST CIRCUIT



NOTES: A. The pulse generator has the following characteristics: $Z_{out} = 50\ \Omega$, $t_w = 25\text{ ns}$, $PRR = 10\text{ MHz}$.
B. C_L includes probe and jig capacitance.

FIGURE 2—SWITCHING TIMES

TYPES SN55158, SN75158 DUAL DIFFERENTIAL LINE DRIVERS

TYPICAL CHARACTERISTICS†

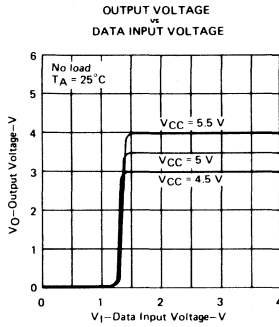


FIGURE 3

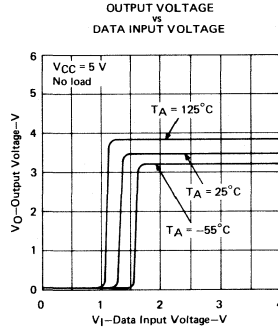


FIGURE 4

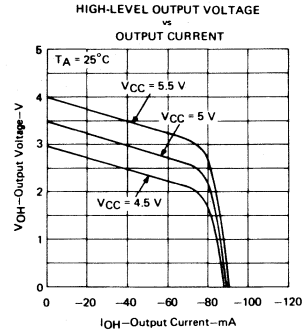


FIGURE 5

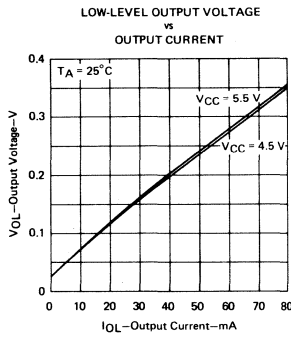


FIGURE 6

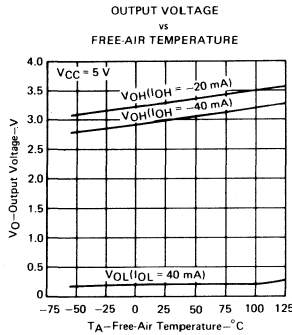


FIGURE 7

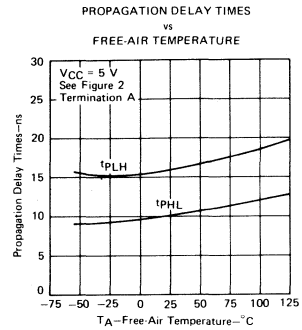


FIGURE 8

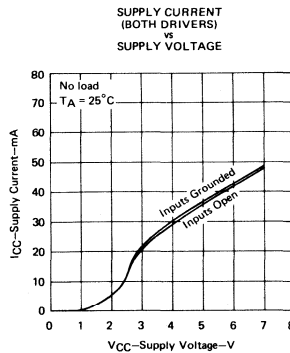


FIGURE 9

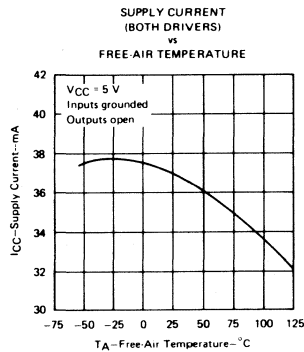


FIGURE 10

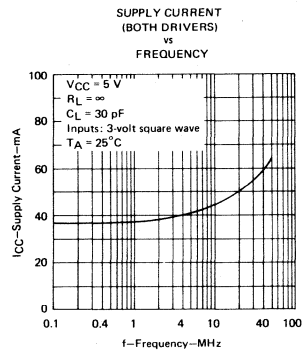


FIGURE 11

† Data for temperatures below 0°C and above 70°C are applicable to SN55158 circuits only.

INTERFACE CIRCUITS

TYPE SN75159 DUAL DIFFERENTIAL LINE DRIVER WITH 3-STATE OUTPUTS

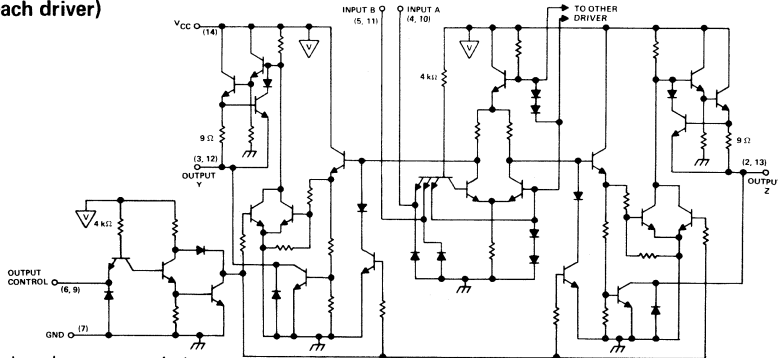
BULLETIN NO. DL-S 7712501, JANUARY 1977

- Meets EIA Standard RS-422
- Single 5-V Supply
- Balanced Line Operation
- TTL and DTL Compatible
- High-Impedance Output State for Party-Line Applications
- High-Current Active-Pull-Up Outputs
- Short-Circuit Protection
- Dual Channels
- Clamp Diodes at Inputs

description

The SN75159 dual differential line driver with three-state outputs is designed to provide all the features of the SN75158 line driver with the added feature of driver output controls. There is an individual control for each driver. When the output control is low, the associated outputs are in a high-impedance state and the outputs can neither drive nor load the bus. This permits many devices to be connected together on the same transmission line for party-line applications.

schematic (each driver)



Resistor values shown are nominal.

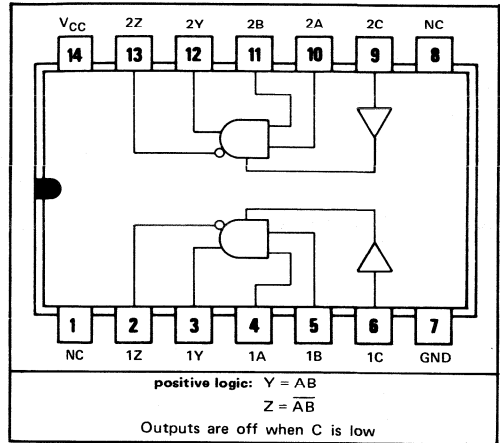
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage	5.5 V
Off-state voltage applied to open-collector outputs	12 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2):	
J package	1025 mW
N package	1150 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTES: 1. All voltage values are with respect to network ground terminal.

2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN75159 chips are glass-mounted.

J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



TYPE SN75159 DUAL DIFFERENTIAL LINE DRIVER WITH 3-STATE OUTPUTS

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level output current, I_{OH}			-40	mA
Low-level output current, I_{OL}			40	mA
Operating free-air temperature, T_A	0		70	°C

electrical characteristics over operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT	
V_{IH}	High-level input voltage		2			V	
V_{IL}	Low-level input voltage				0.8	V	
V_{IK}	Input clamp voltage		$V_{CC} = \text{MIN}$, $I_I = -12 \text{ mA}$		-0.9 -1.5	V	
V_{OH}	High-level output voltage		$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OH} = -40 \text{ mA}$		2.4 3.0	V	
V_{OL}	Low-level output voltage		$V_{CC} = \text{MIN}$, $V_{IH} = 2 \text{ V}$, $I_{OL} = 40 \text{ mA}$		0.25 0.4	V	
V_{OK}	Output clamp voltage		$V_{CC} = \text{MAX}$, $I_O = -40 \text{ mA}$		-1.1 -1.5	V	
V_{OD1}	Differential output voltage		$V_{CC} = \text{MAX}$, $I_O = 0$		3.5 $2V_{OD2}$	V	
V_{OD2}	Differential output voltage		$V_{CC} = \text{MIN}$		2 3.0	V	
ΔV_{OD1}	Change in magnitude of differential output voltage §		$V_{CC} = \text{MIN}$		0.02 0.4	V	
V_{OC}	Common-mode output voltage ¶	$R_L = 100 \Omega$, See Figure 1	$V_{CC} = \text{MAX}$		1.8 3	V	
			$V_{CC} = \text{MIN}$		1.5 3		
ΔV_{OC1}	Change in magnitude of common-mode output voltage §		$V_{CC} = \text{MIN or MAX}$		0.01 0.4	V	
I_O	Output current with power off	$V_{CC} = 0$	$V_O = 6 \text{ V}$		0.1 100	μA	
			$V_O = -0.25 \text{ V}$		-0.1 -100		
			$V_O = -0.25 \text{ V to } 6 \text{ V}$		± 100		
I_{OZ}	Off-state (high-impedance-state) output current	$V_{CC} = \text{MAX}$, Output controls at 0.8 V	$T_A = 25^\circ\text{C}$, $T_A = 70^\circ\text{C}$	$V_O = 0 \text{ to } V_{CC}$		± 10	μA
				$V_O = 0$		-20	
				$V_O = 0.4 \text{ V}$		± 20	
				$V_O = 2.4 \text{ V}$		± 20	
				$V_O = V_{CC}$		20	
I_I	Input current at maximum input voltage		$V_{CC} = \text{MAX}$, $V_I = 5.5 \text{ V}$		1	mA	
I_{IH}	High-level input current		$V_{CC} = \text{MAX}$, $V_I = 2.4 \text{ V}$		40	μA	
I_{IL}	Low-level input current		$V_{CC} = \text{MAX}$, $V_I = 0.4 \text{ V}$		-1 -1.6	mA	
I_{OS}	Short-circuit output current #		$V_{CC} = \text{MAX}$		-40 -90 -150	mA	
I_{CC}	Supply current (both drivers)		$V_{CC} = \text{MAX}$, $T_A = 25^\circ\text{C}$ Inputs grounded, No load,		47 65	mA	

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ All typical values are at $T_A = 25^\circ\text{C}$ and $V_{CC} = 5 \text{ V}$ except for V_{OC} , for which V_{CC} is as stated under test conditions.

§ ΔV_{OD1} and ΔV_{OC1} are the changes in magnitudes of V_{OD} and V_{OC} , respectively, that occur when the input is changed from a high level to a low level.

¶ In EIA Standard RS-422, V_{OC} , which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS} .

Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

TYPE SN75159 DUAL DIFFERENTIAL LINE DRIVER WITH 3-STATE OUTPUTS

switching characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output	$C_L = 30\text{ pF}$, $R_L = 100\ \Omega$, See Figure 2, Termination A	16	25	ns	
t_{PHL} Propagation delay time, high-to-low-level output		11	20	ns	
t_{PLH} Propagation delay time, low-to-high-level output	$C_L = 15\text{ pF}$, See Figure 2, Termination B	13	20	ns	
t_{PHL} Propagation delay time, high-to-low-level output		9	15	ns	
t_{TLH} Transition time, low-to-high-level output	$C_L = 30\text{ pF}$, $R_L = 100\ \Omega$, See Figure 2, Termination A	4	20	ns	
t_{THL} Transition time, high-to-low-level output		4	20	ns	
t_{PZH} Output enable time to high level	$C_L = 30\text{ pF}$, $R_L = 180\ \Omega$, See Figure 3	7	20	ns	
t_{PZL} Output enable time to low level	$C_L = 30\text{ pF}$, $R_L = 250\ \Omega$, See Figure 4	14	40	ns	
t_{PHZ} Output disable time from high level	$C_L = 30\text{ pF}$, $R_L = 180\ \Omega$, See Figure 3	10	30	ns	
t_{PLZ} Output disable time from low level	$C_L = 30\text{ pF}$, $R_L = 250\ \Omega$, See Figure 4	17	35	ns	
Overshoot factor	$R_L = 100\ \Omega$, See Figure 2, Termination C	10		%	

PARAMETER MEASUREMENT INFORMATION

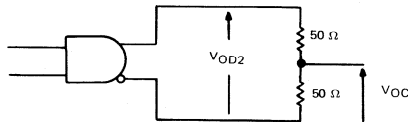


FIGURE 1—DIFFERENTIAL AND COMMON-MODE OUTPUT VOLTAGES

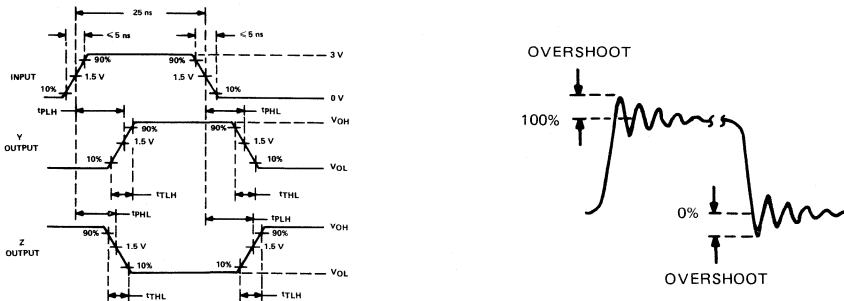
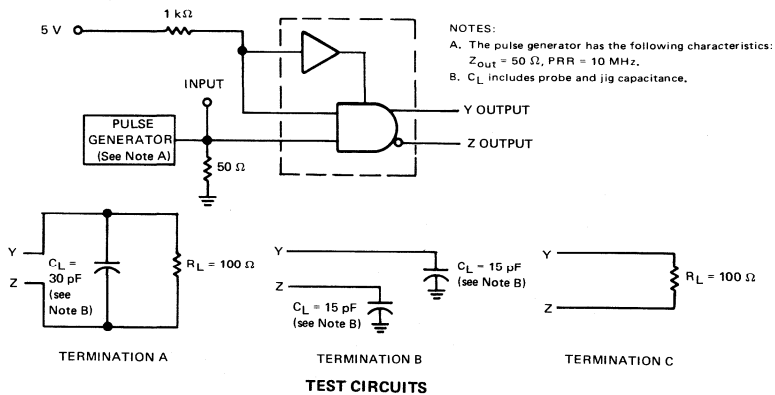
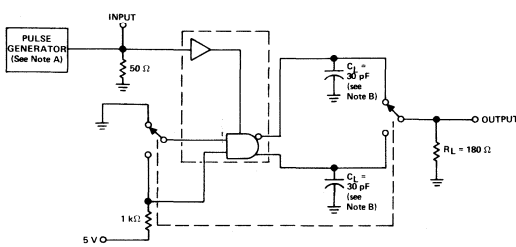


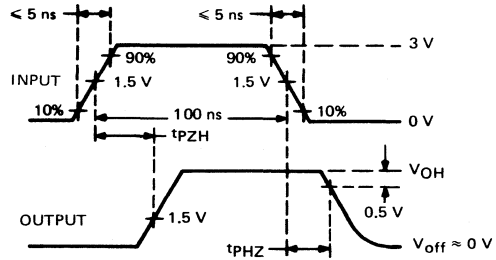
FIGURE 2— t_{PLH} , t_{PHL} , t_{TLH} , t_{THL} , AND OVERSHOOT FACTOR

TYPE SN75159 DUAL DIFFERENTIAL LINE DRIVER WITH 3-STATE OUTPUTS

PARAMETER MEASUREMENT INFORMATION

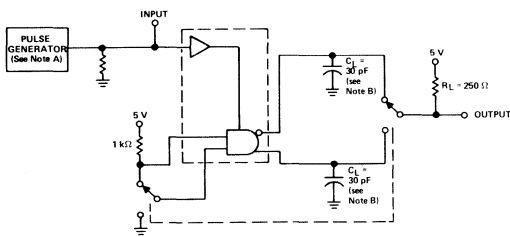


TEST CIRCUIT

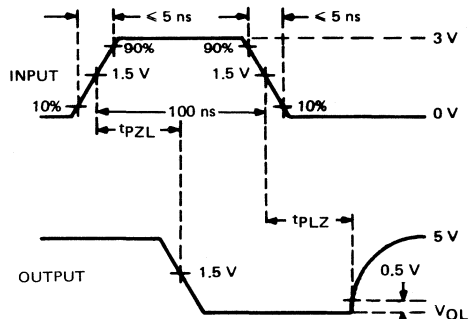


VOLTAGE WAVEFORMS

FIGURE 3— t_{pZH} AND t_{pHZ}



TEST CIRCUIT



VOLTAGE WAVEFORMS

FIGURE 4— t_{pZL} AND t_{pLZ}

NOTES: A. The pulse generators have the following characteristics: $Z_{out} = 50 \Omega$, PRR = 500 kHz
B. C_L includes probe and jig capacitance.

TYPICAL CHARACTERISTICS

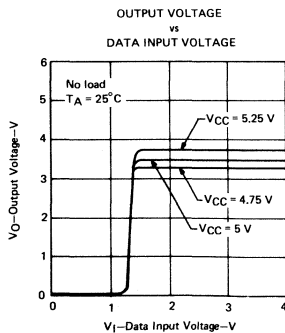


FIGURE 5

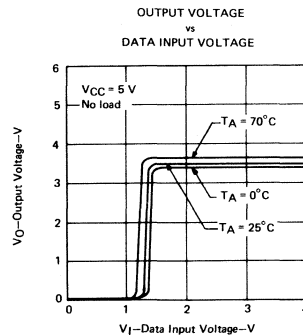


FIGURE 6

TYPE SN75159 DUAL DIFFERENTIAL LINE DRIVER WITH 3-STATE OUTPUTS

TYPICAL CHARACTERISTICS

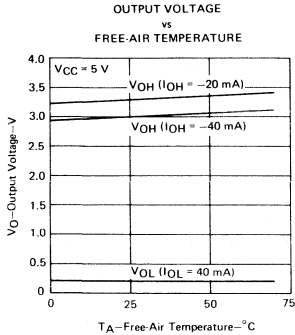


FIGURE 7

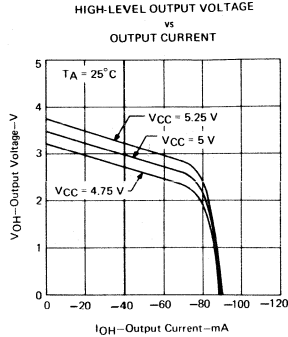


FIGURE 8

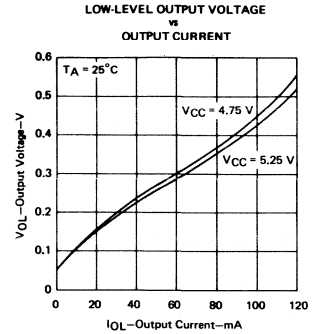


FIGURE 9

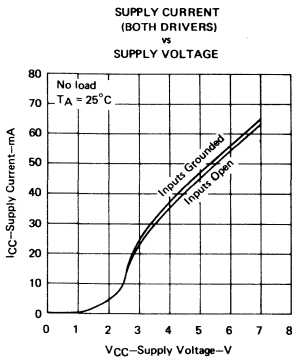


FIGURE 10

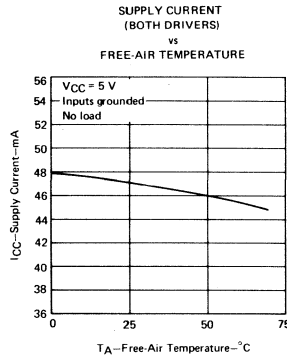


FIGURE 11

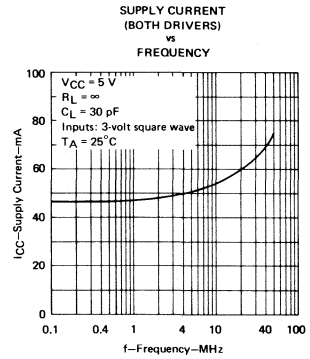


FIGURE 12

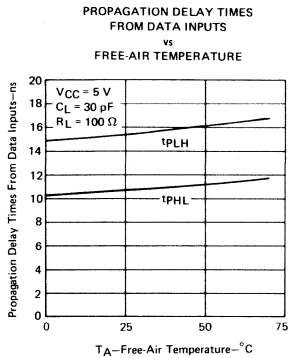


FIGURE 13

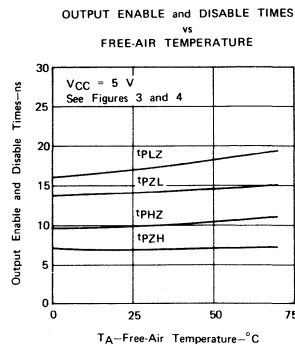


FIGURE 14

**LINE CIRCUITS
featuring**

- Single 5-V Supply
- Differential Line Operation
- Dual Channels
- TTL/DTL Compatibility

**additional features of SN55182 and
SN75182 line receivers**

- Designed to be Interchangeable with National Semiconductor DS7820A and DS8820A
- ± 15 V Common-Mode Input Voltage Range
- ± 15 V Differential Input Voltage Range
- Individual Channel Strobes
- Built-In Optional Line-Termination Resistor
- Individual Frequency Response Controls

**additional features of SN55183 and
SN75183 line drivers**

- Designed to be Interchangeable with National Semiconductor DS7830 and DS8830
- Short-circuit Protection of Outputs
- Output Clamp Diodes to Terminate Line Transients
- High-Current Outputs
- Quad Inputs
- Single-Ended or Differential AND/NAND Outputs

description

The SN55182 and SN75182 dual differential line receivers are designed to sense small differential signals in the presence of large common-mode noise. These devices give TTL compatible output signals as a function of the polarity of the differential input voltage. The frequency response of each channel may be easily controlled by a single external capacitor to provide immunity to differential noise spikes. The output goes to a high level when the inputs are open-circuited. A strobe input is provided which, when in the low level, disables the receiver and forces the output to a high level.

The SN55183 and SN75183 dual differential line drivers are designed to provide differential output signals with high-current capability for driving balanced lines, such as twisted-pair, at normal line impedances without high power dissipation. These devices may be used as TTL expander/phase splitters as the output stages are similar to TTL totem-pole outputs.

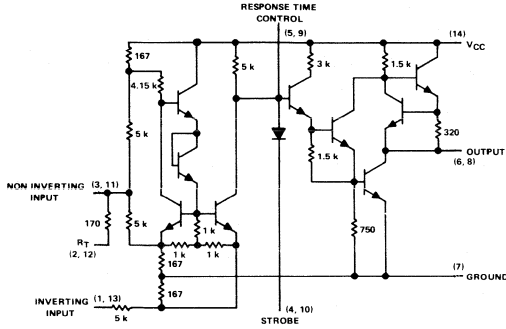
Both the driver and receiver are of monolithic single-chip construction, and both halves of the dual circuits use common power supply and ground terminals.

The SN55182 and SN55183 are characterized for operation over the full military temperature range of -55°C to 125°C and the SN75182 and SN75183 are characterized for operation from 0°C to 70°C . Both devices are available in either the ceramic (J) or plastic (N) dual-in-line package.

CONTENTS	
Line Receivers	Page
Schematic, Maximum Ratings, and Recommended Operating Conditions	153
Electrical Characteristics and Switching Characteristics	154
Parameter Measurement Information	155
Typical Characteristics	155
Line Drivers	
Schematic, Maximum Ratings, and Recommended Operating Conditions	158
Electrical Characteristics and Switching Characteristics	159
Parameter Measurement Information	160
Typical Characteristics	160
Typical Application Data	162

TYPES SN55182, SN75182 DUAL DIFFERENTIAL LINE RECEIVERS

schematic (each receiver)



Resistor values shown are nominal and in ohms.

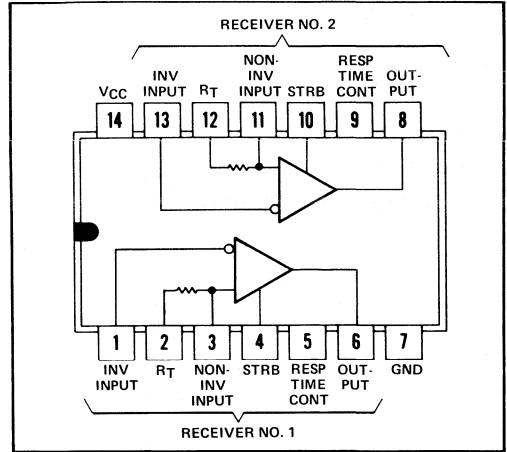
logic

FUNCTION TABLE

STROBE	DIFF INPUT	OUTPUT
L	X	H
H	H	H
H	L	L

H = $V_I \geq V_{IH}$ min or V_{ID} more positive than V_{TH} max
 L = $V_I \leq V_{IL}$ max or V_{ID} more negative than V_{TL} max
 X = irrelevant

J OR N DUAL-IN-LINE PACKAGE
(TOP VIEW)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	8 V
Common-mode input voltage	± 20 V
Differential input voltage (see Note 2)	± 20 V
Strobe input voltage	8 V
Output sink current	50 mA
Continuous total dissipation at (or below) 70°C free-air temperature (see Note 3)	600 mW
Operating free-air temperature range: SN55182	-55°C to 125°C
SN75182	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

- NOTES: 1. All voltage values, except differential voltages, are with respect to the network terminal.
 2. Differential voltage values are at the noninverting terminal with respect to the inverting terminal.
 3. For operation of SN55182 above 70°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, these chips are glass-mounted.

recommended operating conditions

	SN55182			SN75182			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V_{CC}	4.5	5	5.5	4.5	5	5.5	V
Common-mode input voltage, V_{IC}			± 15			± 15	
High-level output current, I_{OH}			-400			-400	μA
Low-level output current, I_{OL}			16			16	mA
Operating free-air temperature, T_A	-55		125	0		70	$^{\circ}\text{C}$

TYPES SN55182, SN75182

DUAL DIFFERENTIAL LINE RECEIVERS

electrical characteristics over recommended ranges of V_{CC} , V_{IC} , and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		MIN	TYP‡	MAX	UNIT
V_{TH}	Differential input high-threshold voltage	$V_O = 2.5 \text{ V}$, $I_{OH} = -400 \mu\text{A}$	$V_{IC} = -3 \text{ V to } 3 \text{ V}$ $V_{IC} = -15 \text{ V to } 15 \text{ V}$			0.5 1	V
V_{TL}	Differential input low-threshold voltage	$V_O = 0.4 \text{ V}$, $I_{OL} = 16 \text{ mA}$	$V_{IC} = -3 \text{ V to } 3 \text{ V}$ $V_{IC} = -15 \text{ V to } 15 \text{ V}$			-0.5 -1	V
$V_{IH(\text{strobe})}$	High-level strobe input voltage			2.1		5.5	V
$V_{IL(\text{strobe})}$	Low-level strobe input voltage			0		0.9	V
V_{OH}	High-level output voltage	$V_{ID} = 1 \text{ V}$, $I_{OH} = -400 \mu\text{A}$	$V_{\text{strobe}} = 2.1 \text{ V}$	2.5	4.2	5.5	V
		$V_{ID} = -1 \text{ V}$, $I_{OH} = -400 \mu\text{A}$	$V_{\text{strobe}} = 0.4 \text{ V}$	2.5	4.2	5.5	
V_{OL}	Low-level output voltage	$V_{ID} = -1 \text{ V}$, $I_{OL} = 16 \text{ mA}$	$V_{\text{strobe}} = 2.1 \text{ V}$	0.25		0.4	V
I_I	Input current	Inverting input	$V_{IC} = 15 \text{ V}$		3	4.2	mA
			$V_{IC} = 0 \text{ V}$		0	0.5	
			$V_{IC} = -15 \text{ V}$		-3	-4.2	
		Noninverting input	$V_{IC} = 15 \text{ V}$		5	7	mA
			$V_{IC} = 0 \text{ V}$		-1	-1.4	
			$V_{IC} = -15 \text{ V}$		-7	-9.8	
I_{SH}	High-level strobe current	$V_{\text{strobe}} = 5.5 \text{ V}$			5	μA	
I_{SL}	Low-level strobe current	$V_{\text{strobe}} = 0$			-1	-1.4	mA
r_i	Input resistance	Inverting input		3.6	5		k Ω
		Noninverting input		1.8	2.5		k Ω
R_T	Line terminating resistance	$T_A = 25^\circ\text{C}$		120	170	250	Ω
I_{OS}	Short-circuit output current	$V_{CC} = 5.5 \text{ V}$, $V_O = 0$		-2.8	-4.5	-6.7	mA
I_{CC}	Supply current (average per receiver)	$V_{IC} = 15 \text{ V}$, $V_{ID} = -1 \text{ V}$		4.2	6		mA
		$V_{IC} = 0$, $V_{ID} = -0.5 \text{ V}$		6.8	10.2		
		$V_{IC} = -15 \text{ V}$, $V_{ID} = -1 \text{ V}$		9.4	14		

† Unless otherwise noted, $V_{\text{strobe}} \geq 2.1 \text{ V}$ or open.

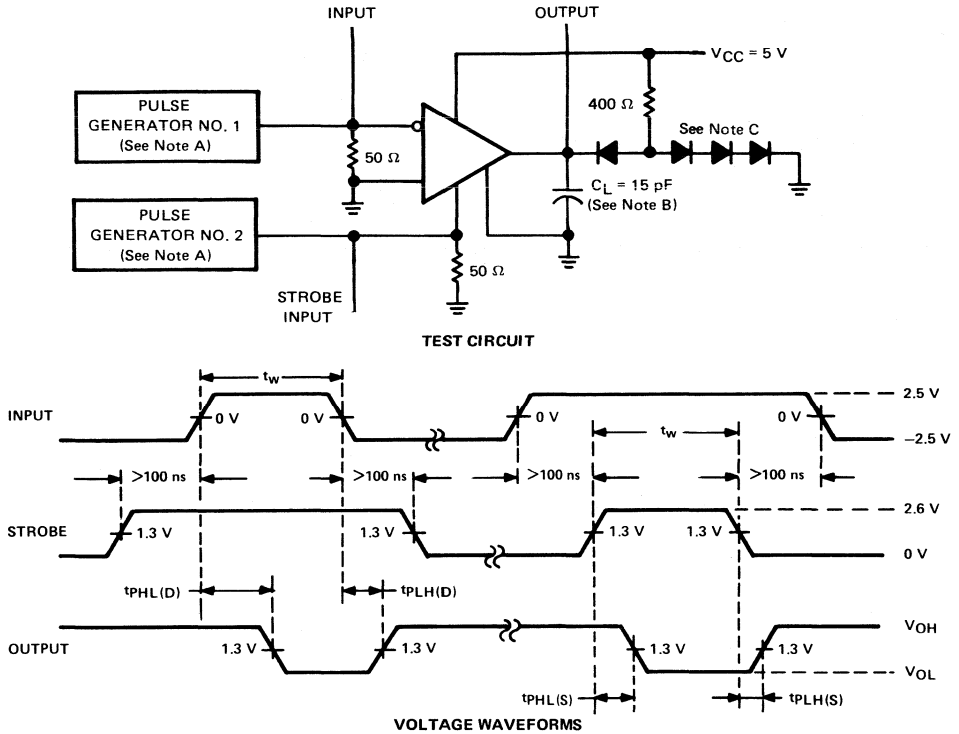
‡ All typical values are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$, and $V_{IC} = 0$.

switching characteristics, $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS		MIN	TYP	MAX	UNIT
$t_{PLH(D)}$	Propagation delay time, low-to-high-level output from differential input	$R_L = 400 \Omega$, $C_L = 15 \text{ pF}$, See Figure 1			18	40	ns
$t_{PHL(D)}$	Propagation delay time, high-to-low-level output from differential input				31	45	ns
$t_{PLH(S)}$	Propagation delay time, low-to-high-level output from strobe input				9	30	ns
$t_{PHL(S)}$	Propagation delay time, high-to-low-level output from strobe input				15	25	ns

TYPES SN55182, SN75182 DUAL DIFFERENTIAL LINE RECEIVERS

PARAMETER MEASUREMENT INFORMATION



NOTES: A. The pulse generators have the following characteristics: Z_O = 50 Ω, t_r = 10 ns, t_f = 10 ns, t_w = 0.5 ± 0.1 μs, PRR = 1 MHz.
B. C_L includes probe and jig capacitance.
C. All diodes are 1N3064 or equivalent.

FIGURE 1—PROPAGATION DELAY TIMES

TYPICAL CHARACTERISTICS

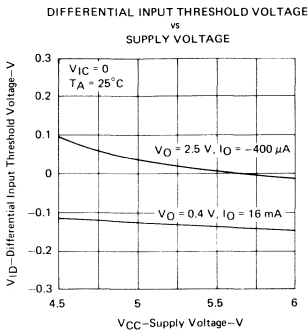


FIGURE 2

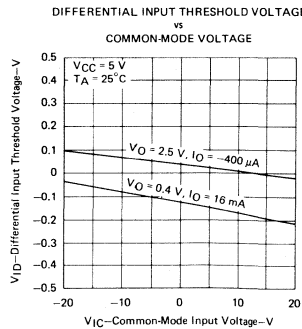


FIGURE 3

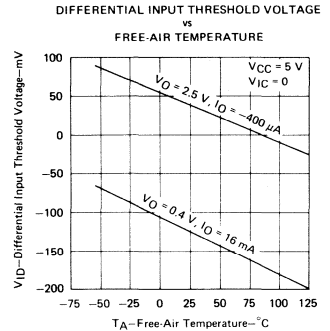


FIGURE 4

TYPES SN55182, SN75182 DUAL DIFFERENTIAL LINE RECEIVERS

TYPICAL CHARACTERISTICS

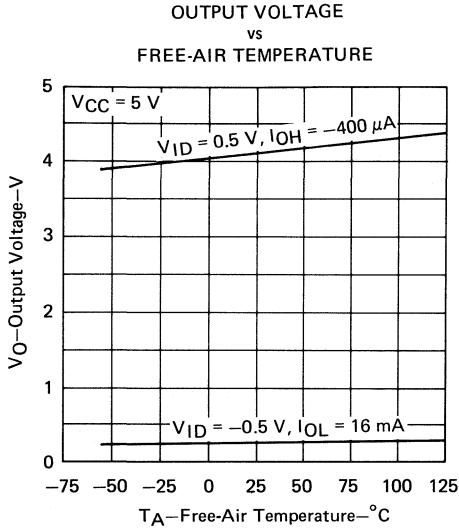


FIGURE 5

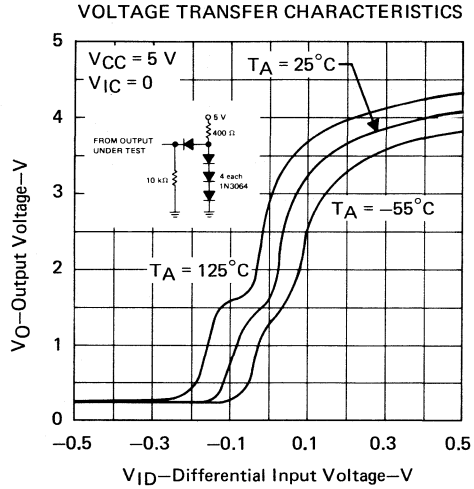


FIGURE 6

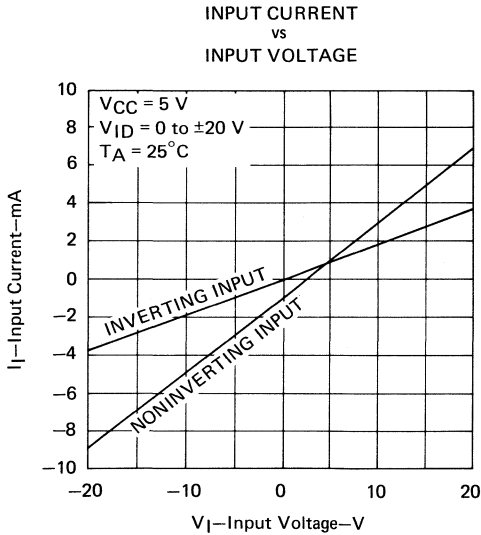


FIGURE 7

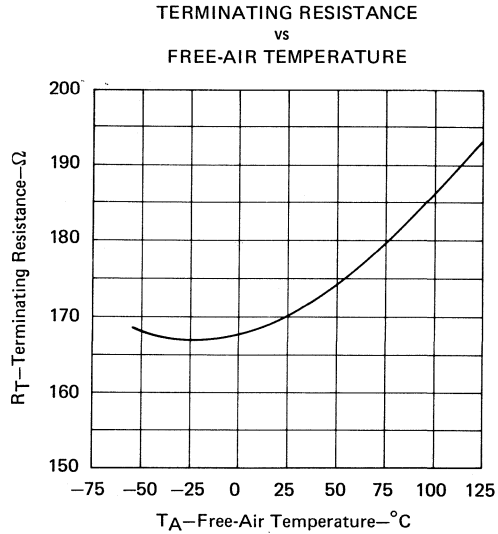


FIGURE 8

TYPES SN55182, SN75182 DUAL DIFFERENTIAL LINE RECEIVERS

TYPICAL CHARACTERISTICS

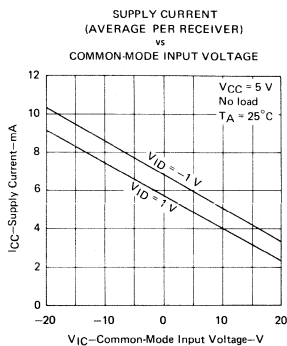


FIGURE 9

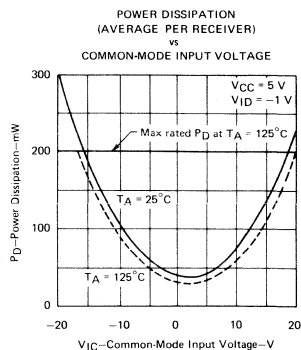


FIGURE 10

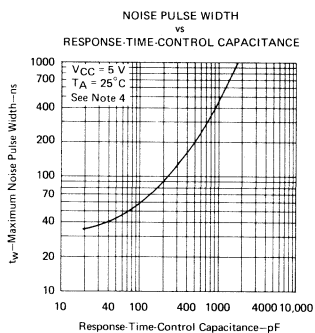
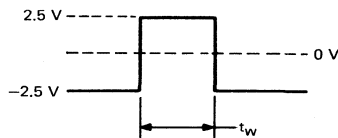


FIGURE 11



INPUT PULSE FOR FIGURE 11

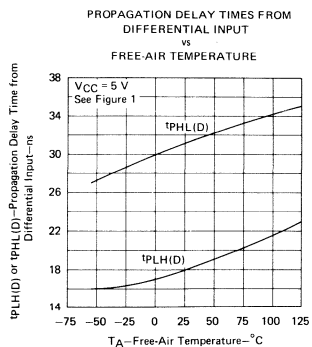


FIGURE 12

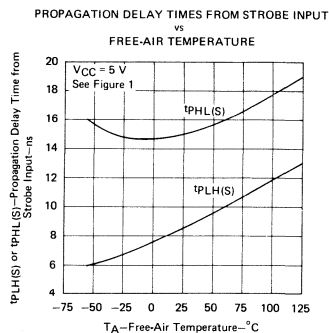
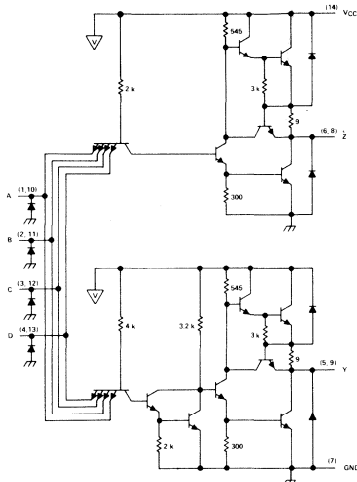


FIGURE 13

NOTE 4: Figure 11 shows the maximum width of the illustrated pulse that can be applied differentially without the output changing from the low to high level.

TYPES SN55183, SN75183 DUAL DIFFERENTIAL LINE DRIVERS

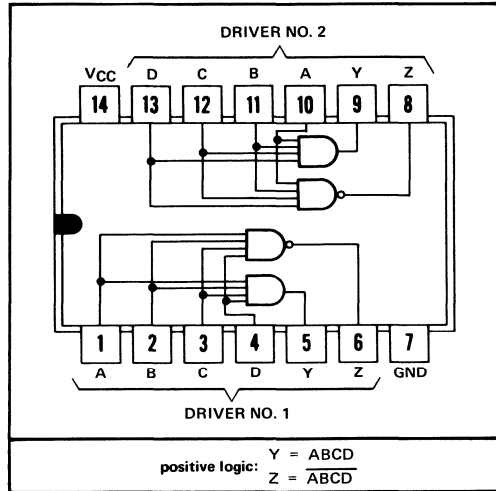
schematic (each driver)



Resistor values shown are nominal and in ohms.

∇ . . . V_{CC} bus

J OR N DUAL-IN-LINE PACKAGE (TOP VIEW)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, V _{CC} (see Note 1)	7 V
Input voltage	5.5 V
Duration of output short-circuit (see Note 2)	1 s
Continuous total power dissipation at (or below) 70°C free-air temperature (see Note 3)	600 mW
Operating free-air temperature range, SN55183	-55°C to 125°C
SN75183	0°C to 70°C
Storage temperature range	-65°C to 150°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

- NOTES: 1. All voltage values, except differential voltages, are with respect to network ground terminal.
 2. Not more than one output should be shorted to ground at a time.
 3. For operation of SN55183 above 70°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, these chips are glass-mounted.

recommended operating conditions

	SN55183			SN75183			UNIT
	MIN	NOM	MAX	MIN	NOM	MAX	
Supply voltage, V _{CC}	4.5	5	5.5	4.75	5	5.25	V
High-level output current, I _{OH}			-40			-40	mA
Low-level output current, I _{OL}			40			40	mA
Operating free-air temperature, T _A	-55		125	0		70	°C

TYPES SN55183, SN75183 DUAL DIFFERENTIAL LINE DRIVERS

electrical characteristics over recommended ranges of V_{CC} and operating free-air temperature (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP [†]	MAX	UNIT
V_{IH}	High-level input voltage		2			V
V_{IL}	Low-level input voltage				0.8	V
V_{OH}	High-level output voltage	$V_{IH} = 2\text{ V}, I_{OH} = -0.8\text{ mA}$ $V_{IH} = 2\text{ V}, I_{OH} = -40\text{ mA}$	2.4			V
V_{OL}	Low-level output voltage				0.2	
V_{OH}	High-level output voltage	$V_{IL} = 0.8\text{ V}, I_{OL} = 32\text{ mA}$ $V_{IL} = 0.8\text{ V}, I_{OL} = 40\text{ mA}$			0.22	V
V_{OL}	Low-level output voltage				0.4	
V_{OH}	High-level output voltage	$V_{IL} = 0.8\text{ V}, I_{OH} = -0.8\text{ mA}$ $V_{IL} = 0.8\text{ V}, I_{OH} = -40\text{ mA}$	2.4			V
V_{OL}	Low-level output voltage				0.2	
V_{OH}	High-level output voltage	$V_{IH} = 2\text{ V}, I_{OL} = 32\text{ mA}$ $V_{IH} = 2\text{ V}, I_{OL} = 40\text{ mA}$			0.22	V
V_{OL}	Low-level output voltage				0.4	
I_{IH}	High-level input current	$V_{IH} = 2.4\text{ V}$			120	μA
I_I	Input current at maximum input voltage	$V_{IH} = 5.5\text{ V}$			2	mA
I_{IL}	Low-level input current	$V_{IL} = 0.4\text{ V}$			-4.8	mA
I_{OS}	Short-circuit output current [§]	$V_{CC} = 5\text{ V}, T_A = 125^\circ\text{C}$	-40	-100	-120	mA
I_{CC}	Supply current (average per driver)	$V_{CC} = 5\text{ V},$ All inputs at 5 V, No load	10		18	mA

[†]All typical values are at $V_{CC} = 5\text{ V}, T_A = 25^\circ\text{C}$.

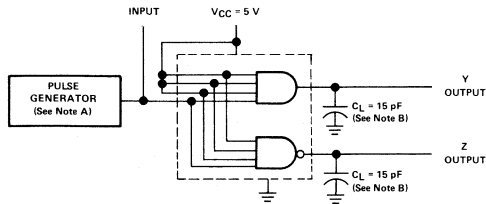
[§]Not more than one output should be shorted to ground at a time, and duration of the short-circuit should not exceed one second.

switching characteristics, $V_{CC} = 5\text{ V}, T_A = 25^\circ\text{C}$

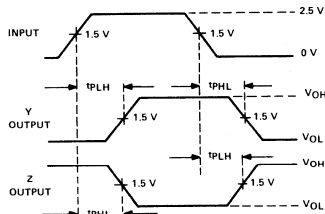
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level Y output	$C_L = 15\text{ pF},$ See Figure 14(a)	8		12	ns
t_{PHL}	Propagation delay time, high-to-low-level Y output		12		18	
t_{PLH}	Propagation delay time, low-to-high-level Z output	$C_L = 15\text{ pF},$ See Figure 14(a)	6		12	ns
t_{PHL}	Propagation delay time, high-to-low-level Z output		6		8	
t_{PLH}	Propagation delay time, low-to-high-level differential output	$Z_L = 100\ \Omega$ in series with 500 pF, See Figure 14(b)	9		16	ns
t_{PHL}	Propagation delay time, high-to-low-level differential output		8		16	

TYPES SN55183, SN75183 DUAL DIFFERENTIAL LINE DRIVERS

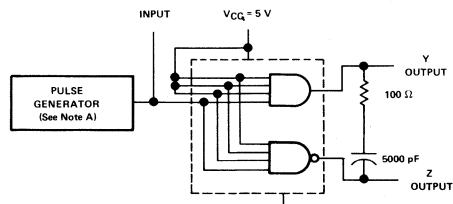
PARAMETER MEASUREMENT INFORMATION



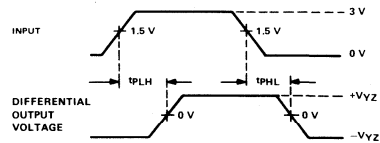
TEST CIRCUIT



VOLTAGE WAVEFORMS
(a)—OUTPUTS Y AND Z



TEST CIRCUIT



VOLTAGE WAVEFORMS
(b)—DIFFERENTIAL OUTPUT

- NOTES: A. The pulse generator has the following characteristics: $Z_0 = 50 \Omega$, $t_r = 10 \text{ ns}$, $t_f = 10 \text{ ns}$, $t_w = 0.5 \mu\text{s}$, $\text{PRR} = 1 \text{ MHz}$.
 B. C_L includes probe and jig capacitance.
 C. Waveforms are monitored on an oscilloscope with $R_{in} \geq 1 \text{ M}\Omega$.

FIGURE 14—PROPAGATION DELAY TIMES

TYPICAL CHARACTERISTICS

THRESHOLD VOLTAGE
vs
FREE-AIR TEMPERATURE

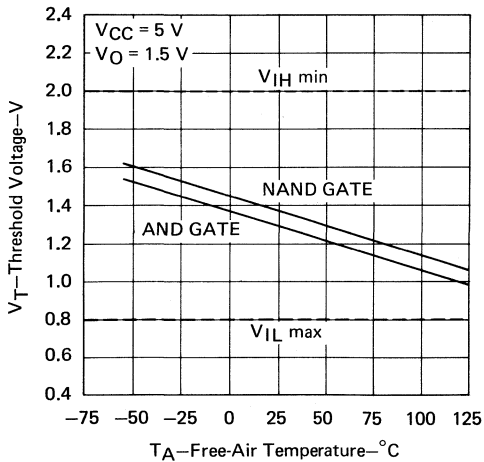


FIGURE 15

HIGH-LEVEL OUTPUT VOLTAGE
vs
OUTPUT CURRENT

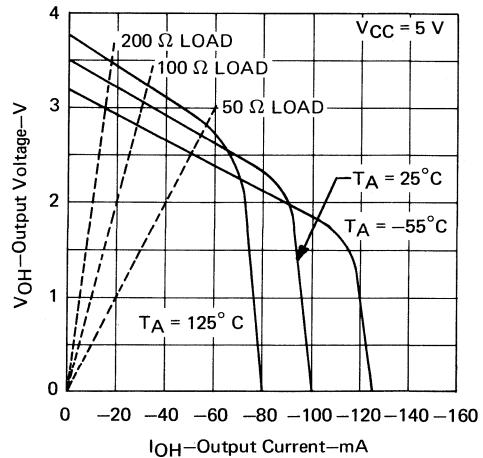
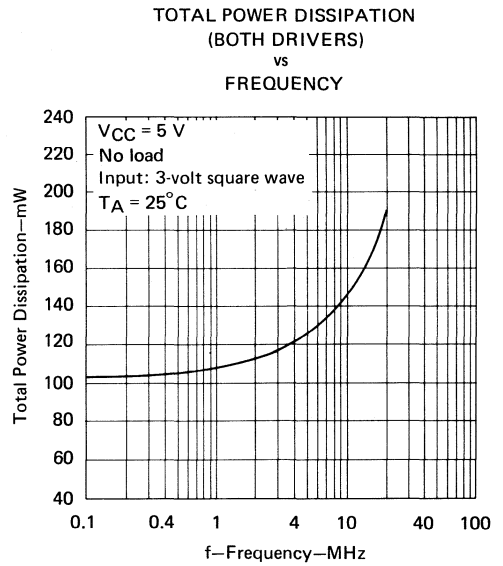
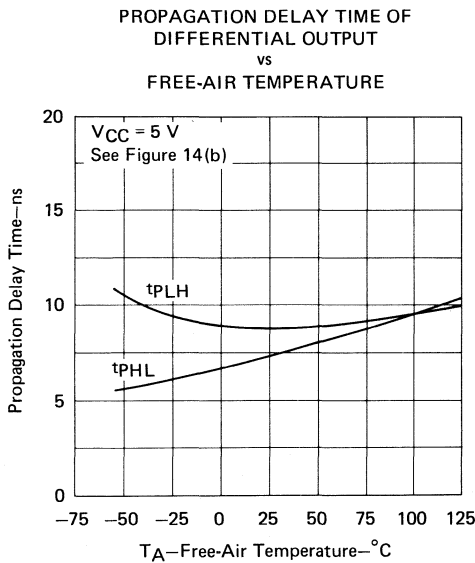
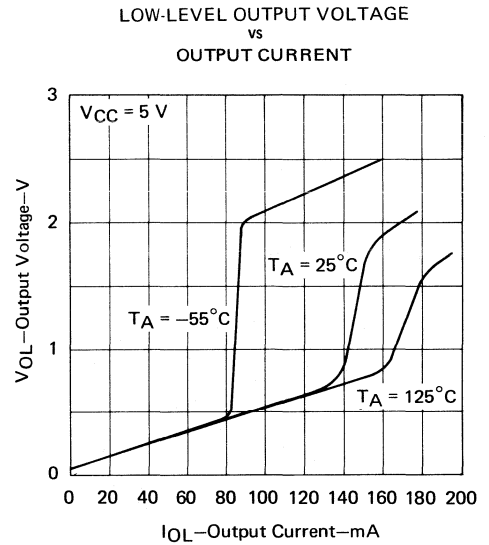
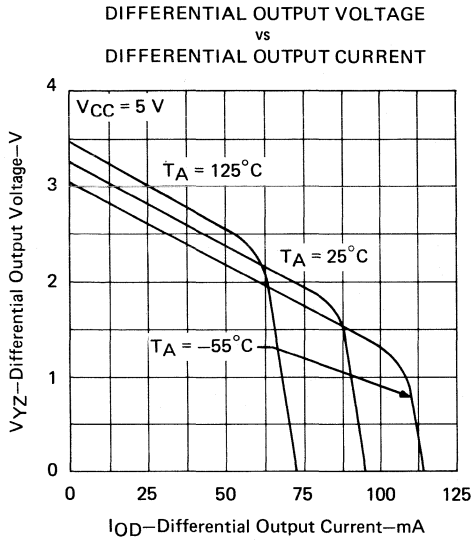


FIGURE 16

TYPES SN55183, SN75183 DUAL DIFFERENTIAL LINE DRIVERS

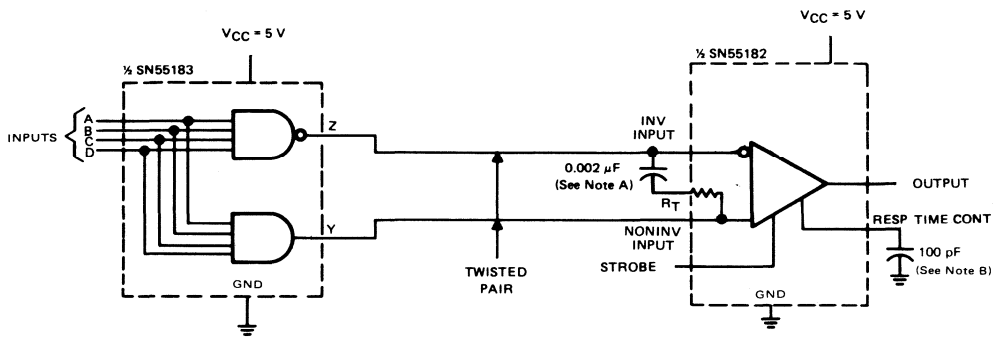
TYPICAL CHARACTERISTICS



TYPES SN55182, SN75182, SN55183, SN75183

DUAL DIFFERENTIAL RECEIVERS AND DRIVERS

TYPICAL APPLICATION DATA



NOTES: A. When the inputs are open-circuited, the output will be high. A capacitor may be used for dc isolation of the line-terminating resistor. At the frequency of operation, the impedance of the capacitor should be relatively small.

Example: let $f = 5 \text{ MHz}$
 $C = 0.002 \mu\text{F}$

$$Z_C = \frac{1}{2\pi f C} = \frac{1}{2\pi (5 \times 10^6) (0.002 \times 10^{-6})}$$

$$Z_C \approx 16 \Omega$$

B. Use of a capacitor to control response time is optional.

FIGURE 21—TRANSMISSION OF DIGITAL DATA OVER TWISTED-PAIR LINE

INTERFACE CIRCUITS

TYPE SN75188 QUADRUPLE LINE DRIVER

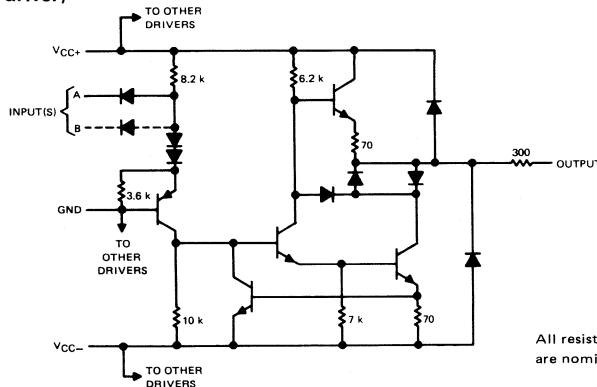
BULLETIN NO. DLS 7711874, SEPTEMBER 1973—REVISED JANUARY 1977

- Meets Specifications of EIA RS-232C
- Designed to be Interchangeable with Motorola MC1488
- Current-Limited Output . . . 10 mA Typical
- Power-Off Output Impedance . . . 300 Ω Min
- Slew Rate Control by Load Capacitor
- Flexible Supply Voltage Range
- Input Compatible with Most TTL and DTL Circuits

description

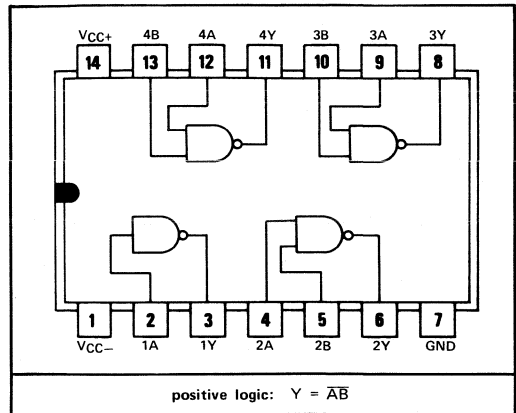
The SN75188 is a monolithic quadruple line driver designed to interface data terminal equipment with data communications equipment in conformance with the specifications of EIA Standard RS-232C with a diode in series with each supply-voltage terminal as shown under typical applications. The device is characterized for operation from 0°C to 75°C.

schematic (each driver)



All resistor values shown are nominal and in ohms.

J OR N
DUAL-IN-LINE PACKAGE
(TOP VIEW)



FUNCTION TABLE

A	B	Y
H	H	L
L	X	H
X	L	H

H = high level, L = low level, X = irrelevant

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage V_{CC+} at (or below) 25°C free-air temperature (see Notes 1 and 2)	15 V
Supply voltage V_{CC-} at (or below) 25°C free-air temperature (see Notes 1 and 2)	-15 V
Input voltage range	-15 V to 7 V
Output voltage range	-15 V to 15 V
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range	0°C to 75°C
Storage temperature range	-65°C to 175°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTES: 1. All voltage values are with respect to the network ground terminal.

2. For operation above 25°C free-air temperature, refer to the Maximum Supply Voltage Curve, Figure 6, and the Dissipation Derating Curves in the Thermal Information Section, which begins on page 18. In the J package, SN75188 chips are glass-mounted.

TYPE SN75188

QUADRUPLE LINE DRIVER

REVISED JANUARY 1977

electrical characteristics over operating free-air temperature range, $V_{CC+} = 9\text{ V}$, $V_{CC-} = -9\text{ V}$
(unless otherwise noted)

PARAMETER		TEST CONDITIONS		MIN	TYP [†]	MAX	UNIT
V_{IH}	High-level input voltage			1.9			V
V_{IL}	Low-level input voltage					0.8	V
V_{OH}	High-level output voltage	$V_{IL} = 0.8\text{ V}$, $R_L = 3\text{ k}\Omega$	$V_{CC+} = 9\text{ V}$, $V_{CC-} = -9\text{ V}$	6	7		V
			$V_{CC+} = 13.2\text{ V}$, $V_{CC-} = -13.2\text{ V}$	9	10.5		
V_{OL}	Low-level output voltage	$V_{IH} = 1.9\text{ V}$, $R_L = 3\text{ k}\Omega$	$V_{CC+} = 9\text{ V}$, $V_{CC-} = -9\text{ V}$		-7	-6	V
			$V_{CC+} = 13.2\text{ V}$, $V_{CC-} = -13.2\text{ V}$		-10.5	-9	
I_{IH}	High-level input current	$V_I = 5\text{ V}$				10	μA
I_{IL}	Low-level input current	$V_I = 0$			-1	-1.6	mA
$I_{OS(H)}$	Short-circuit output current at high level ♦	$V_I = 0.8\text{ V}$,	$V_O = 0$	-6	-10	-12	mA
$I_{OS(L)}$	Short-circuit output current at low level ♦	$V_I = 1.9\text{ V}$,	$V_O = 0$	6	10	12	mA
r_o	Output resistance, power off	$V_{CC+} = 0$, $V_{CC-} = 0$, $V_O = -2\text{ V to } 2\text{ V}$		300			Ω
I_{CC+}	Supply current from V_{CC+}	No load	$V_{CC+} = 9\text{ V}$, All inputs at 1.9 V	15		20	mA
			$V_{CC+} = 12\text{ V}$, All inputs at 0.8 V	4.5		6	
			$V_{CC+} = 12\text{ V}$, All inputs at 1.9 V	19		25	
			$V_{CC+} = 15\text{ V}$, All inputs at 0.8 V	5.5		7	
I_{CC-}	Supply current from V_{CC-}	No load	$V_{CC-} = -9\text{ V}$, All inputs at 1.9 V	-13		-17	mA
			$V_{CC-} = -12\text{ V}$, All inputs at 0.8 V	-0.015			
			$V_{CC-} = -12\text{ V}$, All inputs at 1.9 V	-18		-23	
			$V_{CC-} = -15\text{ V}$, All inputs at 0.8 V	-0.015			
P_D	Total power dissipation	No load	$V_{CC+} = 9\text{ V}$, $V_{CC-} = -9\text{ V}$	333			mW
			$V_{CC+} = 12\text{ V}$, $V_{CC-} = -12\text{ V}$	576			

[†]All typical values are at $T_A = 25^\circ\text{C}$.

♦Not more than one output should be shorted at a time.

NOTE 4: The algebraic convention where the more positive (less negative) limit is designated as maximum is used in this data sheet for logic voltage levels only, e.g., if -6 V is a maximum, the typical value is a more negative voltage.

switching characteristics, $V_{CC+} = 9\text{ V}$, $V_{CC-} = -9\text{ V}$, $T_A = 25^\circ\text{C}$

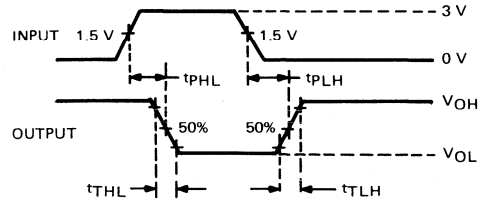
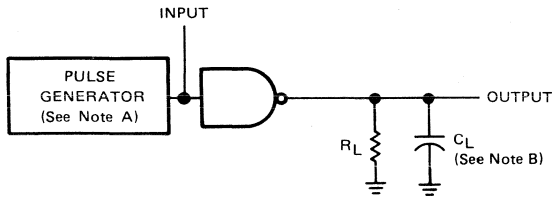
PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
t_{PLH}	Propagation delay time, low-to-high-level output		220	350		ns
t_{PHL}	Propagation delay time, high-to-low-level output		100	175		ns
t_{TLH}	Transition time, low-to-high-level output [‡]		55	100		ns
t_{THL}	Transition time, high-to-low-level output [‡]		45	75		ns
t_{TLH}	Transition time, low-to-high-level output [§]		2.5			μs
t_{THL}	Transition time, high-to-low-level output [§]		3.0			μs

[‡]Measured between 10% and 90% points of output waveform.

[§]Measured between $+3\text{ V}$ and -3 V points on the output waveform (EIA RS-232C conditions)

TYPE SN75188 QUADRUPLE LINE DRIVER

PARAMETER MEASUREMENT INFORMATION



NOTE: A. The pulse generator has the following characteristics: $t_w = 0.5 \mu s$, PRR = 1 MHz, $Z_O = 50 \Omega$.
B. C_L includes probe and jig capacitance.

FIGURE 1—PROPAGATION AND TRANSITION TIMES

TYPICAL CHARACTERISTICS

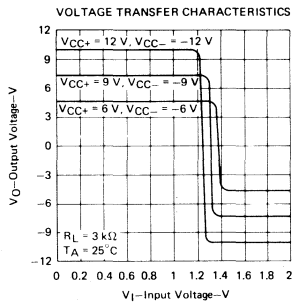


FIGURE 2

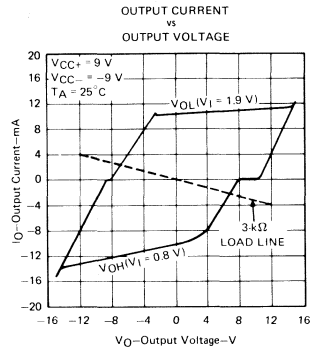


FIGURE 3

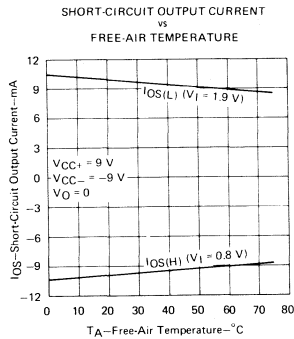


FIGURE 4

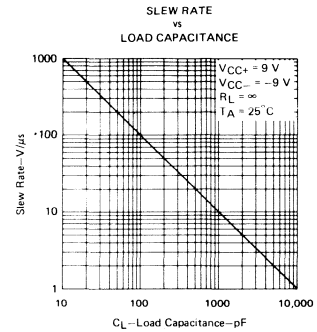


FIGURE 5

TYPE SN75188 QUADRUPLE LINE DRIVER

THERMAL INFORMATION MAXIMUM SUPPLY VOLTAGE vs FREE-AIR TEMPERATURE

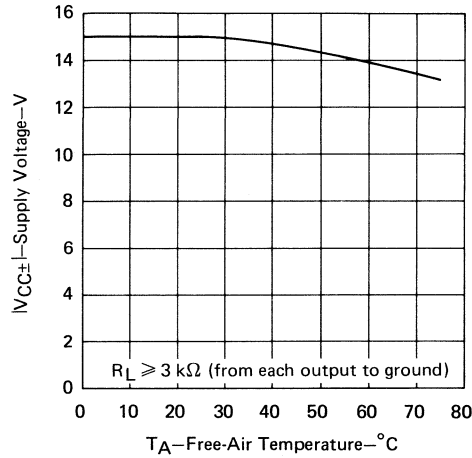


FIGURE 6

TYPICAL APPLICATION DATA

Diodes placed in series with the V_{CC+} and V_{CC-} leads will protect the SN75188 in the fault condition where the device outputs are shorted to ± 15 V and the power supplies are at low voltage and provide low-impedance paths to ground.

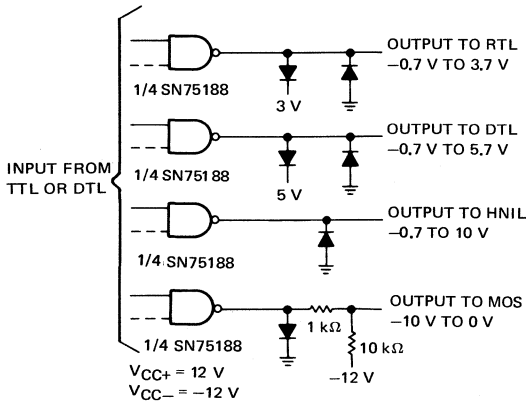


FIGURE 7—LOGIC TRANSLATOR APPLICATIONS

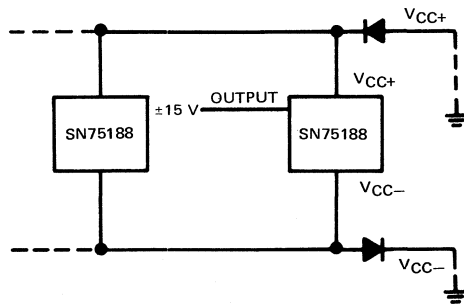


FIGURE 8—POWER SUPPLY PROTECTION TO MEET POWER-OFF FAULT CONDITIONS OF EIA STANDARD RS-232C

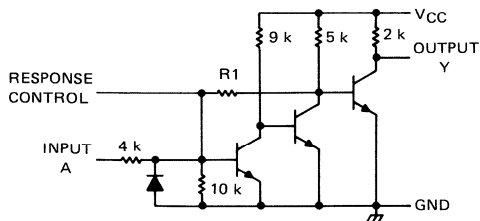
INTERFACE CIRCUITS

TYPES SN75189, SN75189A QUADRUPLE LINE RECEIVERS

BULLETIN NO. DL-S 7312035, SEPTEMBER 1973

- Input Resistance . . . 3 k Ω to 7 k Ω
- Input Signal Range . . . ± 30 V
- Fully Interchangeable with Motorola MC1489, MC1489A
- Operates From Single 5-V Supply
- Built-in Input Hysteresis (Double Thresholds)
- Response Control Provides:
 - Input Threshold Shifting
 - Input Noise Filtering
- Satisfies Requirements of EIA RS-232-C

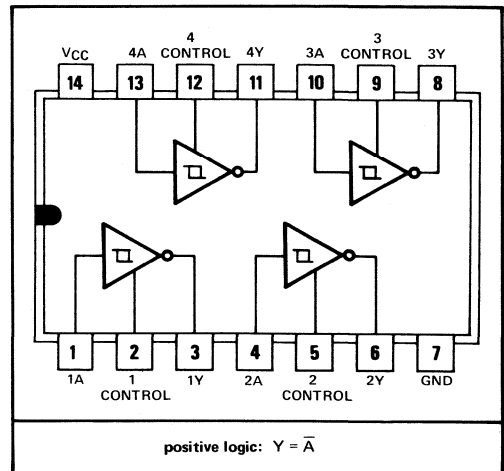
schematic (each receiver)



	SN75189	SN75189A
R1	10 k	2 k

Resistor values shown are nominal and in ohms.

J OR N
DUAL-IN-LINE PACKAGE (TOP VIEW)



description

The SN75189 and SN75189A are monolithic quadruple line receivers designed to satisfy the requirements of the standard interface between data terminal equipment and data communication equipment as defined by EIA Standard RS-232C. A separate response control terminal is provided for each receiver. A resistor or a resistor and bias voltage can be connected between this terminal and ground to shift the input threshold voltage levels. An external capacitor can be connected from this terminal to ground to provide input noise filtering.

absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

Supply voltage, V_{CC} (see Note 1)	10 V
Input voltage	± 30 V
Output current	20 mA
Continuous total dissipation at (or below) 25°C free-air temperature (see Note 2)	1 W
Operating free-air temperature range	0°C to 75°C
Storage temperature range	-65°C to 175°C
Lead temperature 1/16 inch from case for 60 seconds: J package	300°C
Lead temperature 1/16 inch from case for 10 seconds: N package	260°C

NOTES: 1. Voltage values are with respect to the network ground terminal.

2. For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal Information section, which starts on page 18. In the J package, SN75189 and SN75189A chips are glass-mounted.

TYPES SN75189, SN75189A QUADRUPLE LINE RECEIVERS

electrical characteristics over operating free-air temperature range, $V_{CC} = 5V \pm 1\%$, (unless otherwise noted)

PARAMETER	TEST FIGURE	TEST CONDITIONS†	SN75189			SN75189A			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{T+} Positive-going threshold voltage	1		1		1.5	1.75	1.9	2.25	V
V_{T-} Negative-going threshold voltage	1		0.75		1.25	0.75	0.97	1.25	V
V_{OH} High-level output voltage	1	$V_I = 0.75V$, $I_{OH} = -0.5mA$ Input open, $I_{OH} = -0.5mA$	2.6	4	5	2.6	4	5	V
V_{OL} Low-level output voltage	1	$V_I = 3V$, $I_{OL} = 10mA$	0.2	0.45		0.2	0.45		V
I_{IH} High-level input current	2	$V_I = 25V$ $V_I = 3V$	3.6	8.3		3.6	8.3		mA
I_{IL} Low-level input current	2	$V_I = -25V$ $V_I = -3V$	-3.6	-8.3		-3.6	-8.3		mA
I_{OS} Short-circuit output current	3			-3			-3		mA
I_{CC} Supply current	2	$V_I = 5V$, Outputs open	20	26		20	26		mA

† All characteristics are measured with the response control terminal open.

‡ All typical values are at $V_{CC} = 5V$, $T_A = 25^\circ C$.

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

PARAMETER	TEST FIGURE	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t_{PLH} Propagation delay time, low-to-high-level output	4	$C_L = 15pF$, $R_L = 3.9k\Omega$		25	85	ns
t_{PHL} Propagation delay time, high-to-low-level output		$C_L = 15pF$, $R_L = 390\Omega$		25	50	
t_{TLH} Transition time, low-to-high-level output		$C_L = 15pF$, $R_L = 3.9k\Omega$		120	175	ns
t_{THL} Transition time, high-to-low-level output		$C_L = 15pF$, $R_L = 390\Omega$		10	20	

PARAMETER MEASUREMENT INFORMATION §

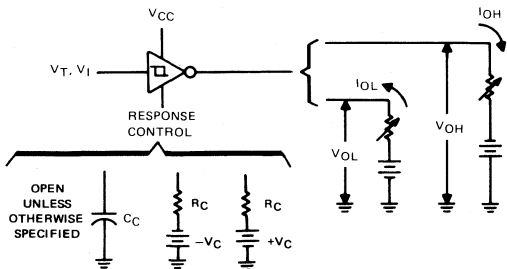


FIGURE 1— V_{T+} , V_{T-} , V_{OH} , V_{OL}

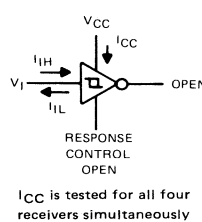


FIGURE 2— I_{IH} , I_{IL} , I_{CC}

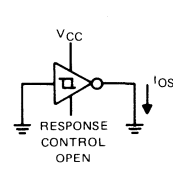
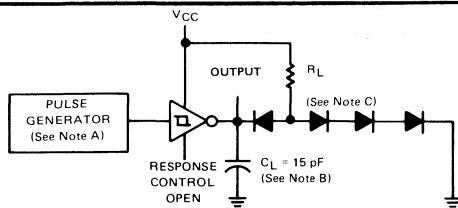
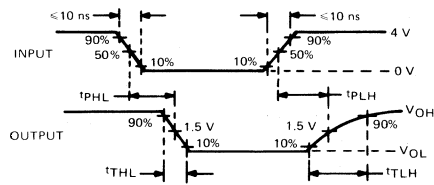


FIGURE 3— I_{OS}



TEST CIRCUIT

- NOTES: A. The pulse generator has the following characteristics: $Z_{out} \approx 50\Omega$, $t_w = 500ns$.
 B. C_L includes probe and jig capacitance.
 C. All diodes are 1N3064 or equivalent.



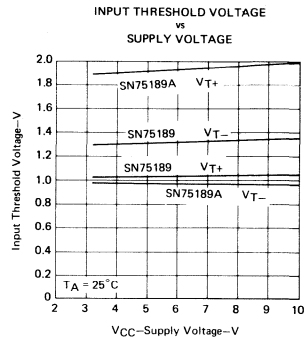
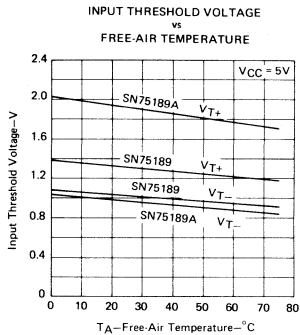
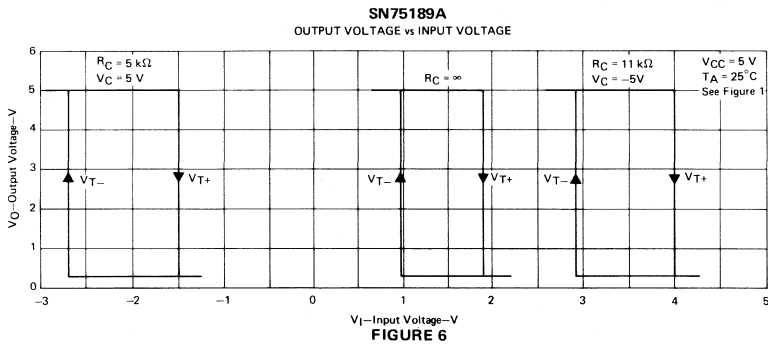
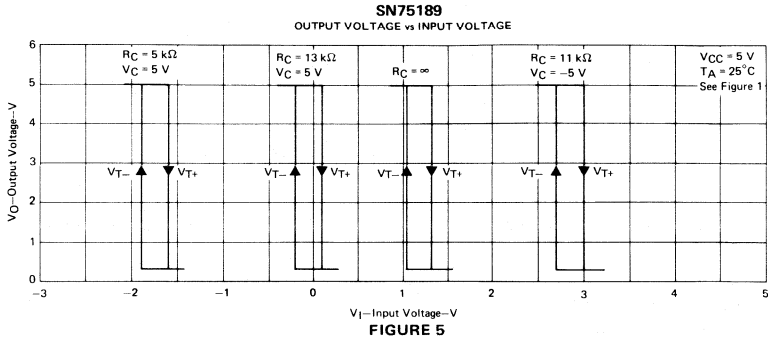
VOLTAGE WAVEFORMS

FIGURE 4—SWITCHING TIMES

§ Arrows indicate actual direction of current flow. Current into a terminal is a positive value.

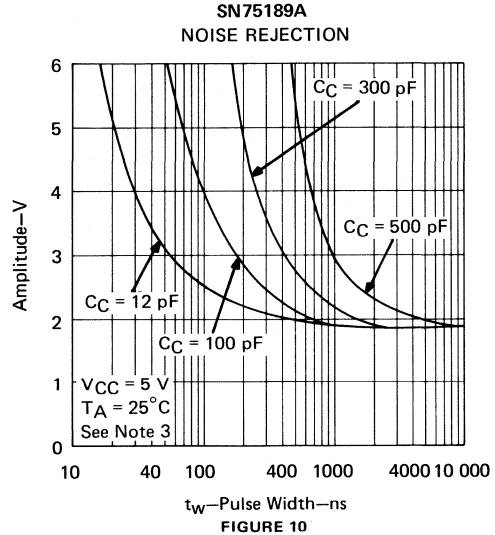
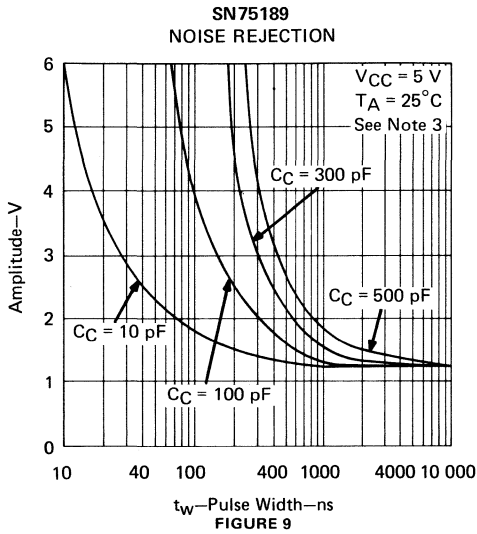
TYPES SN75189, SN75189A QUADRUPLE LINE RECEIVERS

TYPICAL CHARACTERISTICS

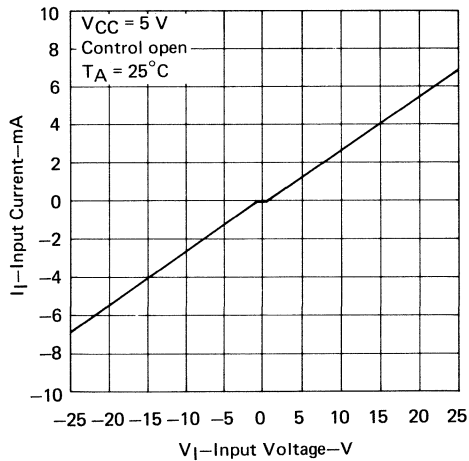


TYPES SN75189, SN75189A QUADRUPLE LINE RECEIVERS

TYPICAL CHARACTERISTICS



INPUT CURRENT vs INPUT VOLTAGE



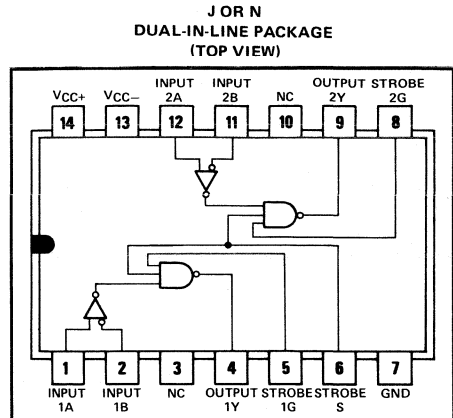
NOTE 3: This figure shows the maximum amplitude of a positive-going pulse that, starting from zero volts, will not cause a change of the output level.

INTERFACE CIRCUITS

TYPES SN75207, SN75207B, SN75208, SN75208B DUAL SENSE AMPLIFIERS FOR MOS MEMORIES OR DUAL HIGH-SENSITIVITY LINE RECEIVERS

BULLETIN NO. DL-S 7711793, JULY 1973—REVISED JANUARY 1977

- Plug-in Replacement for SN75107A, SN75107B, SN75108A, SN75108B with Improved Characteristics
- ± 10 mV Guaranteed Input Sensitivity
- TTL Compatible
- Standard Supply Voltages . . . ± 5 V
- Differential Input Common-Mode Voltage Range of ± 3 V
- Strobe Inputs for Channel Selection
- '207 and '207B Have Totem-Pole Outputs
- '208 and '208B Have Open-Collector Outputs
- "B" Versions Have Diode-Protected Input Stage for Power-Off Condition
- Sense Amplifier for MOS Memories
- Dual Comparator
- High-Sensitivity Line Receiver



NC—No internal connection

description

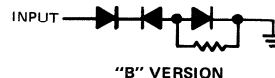
The SN75207, SN75207B, SN75208, and SN75208B are pin-for-pin replacements for the SN75107A, SN75107B, SN75108A, and SN75108B, respectively. The improved input sensitivity makes them more suitable for MOS memory sense amplifiers and can result in faster memory cycles. Improved sensitivity also makes them more useful in line receiver applications by allowing use of longer transmission line lengths. The '207 and '207B each features a TTL-compatible active-pull-up output. The '208 and '208B each features an open-collector output that permits wired-AND logic connections with similar output configurations. These devices are designed for operation from 0°C to 70°C and are available in the ceramic dual-in-line (J) package or in the plastic dual-in-line (N) package.

FUNCTION TABLE

DIFFERENTIAL INPUTS A-B	STROBES		OUTPUT Y
	G	S	
$V_{ID} \geq 10$ mV	X	X	H
	X	L	H
-10 mV $< V_{ID} < 10$ mV	L	X	H
	H	H	INDETERMINATE
$V_{ID} \leq -10$ mV	X	L	H
	L	X	H
	H	H	L

H = high level, L = low level, X = irrelevant

The essential difference between the unaffixed and "B" versions can be seen in the schematics. Input-protection diodes are in series with the collectors of the differential-input transistors of the "B" versions. These diodes are useful in certain "party-line" systems that may have multiple V_{CC+} power supplies and may be operated with some of the V_{CC+} supplies turned off. In such a system, if a supply is turned off and allowed to go to ground, the equivalent input circuit connected to that supply would be as follows:



This would be a problem in specific systems that might possibly have the transmission lines biased to some potential greater than 1.4 volts.

TYPES SN75207, SN75207B, SN75208, SN75208B DUAL SENSE AMPLIFIERS FOR MOS MEMORIES OR DUAL HIGH-SENSITIVITY LINE RECEIVERS

design characteristics

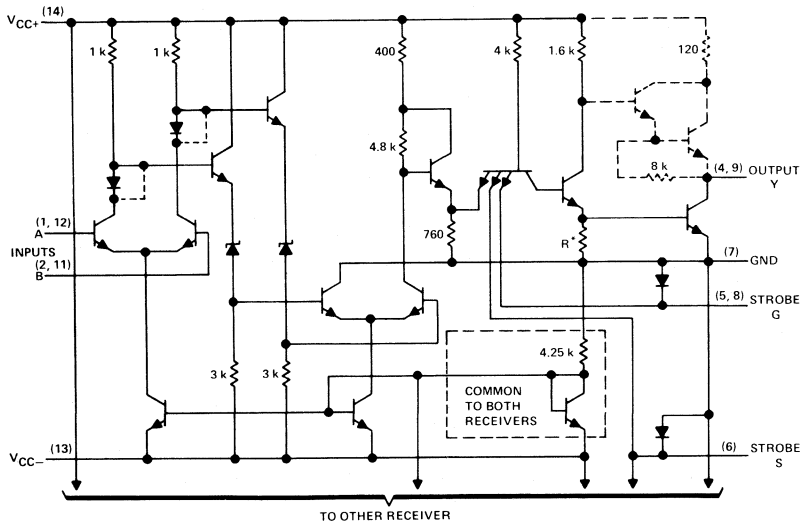
The '207, '207B, '208, and '208B line receivers/sense amplifiers are TTL-compatible dual circuits intended for use in high-speed data-transmission systems or MOS memory systems. They are designed to detect low-level differential signals in the presence of common-mode noise and variations of temperature and supplies. Dc specifications reflect worst-case conditions of temperature, supply voltages, and input voltages.

The input common-mode voltage range is ± 3 volts. This is adequate for application in most systems. In systems with requirements for greater common-mode voltage range, input attenuators may be used to decrease the noise to an acceptable level at the receiver-input terminals.

The circuits feature individual strobe inputs for each channel and a strobe input common to both channels for logic versatility. The strobe inputs are tested to guarantee 400 millivolts of dc noise margin when interfaced with Series 54/74 TTL.

The circuits feature high input impedance and low input currents, which induce very little loading on the transmission line. This makes these devices especially useful in party-line systems. The excellent input sensitivity (3 millivolts typical) is particularly important when data is to be detected at the end of a long transmission line and the amplitude of the data has deteriorated due to cable losses. The circuits are designed to detect input signals of 10 millivolts (or greater) amplitude and convert the polarity of the signal into appropriate TTL-compatible output logic levels.

schematic (each receiver)



*R = 1 k Ω for '207 and '207B, 750 Ω for '208 and '208B.

NOTES: A. Resistor values shown are nominal and in ohms.

B. Components shown with dashed lines in the output circuitry are applicable to the '207 and '207B only. Diodes in series with the collectors of the differential input transistors are short-circuited on '207 and '208.

TYPES SN75207, SN75207B, SN75208, SN75208B DUAL SENSE AMPLIFIERS FOR MOS MEMORIES OR DUAL HIGH-SENSITIVITY LINE RECEIVERS

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage V_{CC+} (see Note 1)	7 V
Supply voltage V_{CC-}	-7 V
Differential input voltage (see Note 2)	± 6 V
Common-mode input voltage (see Note 3)	± 5 V
Strobe input voltage	5.5 V
Continuous total dissipation	600 mW
Operating free-air temperature range	0°C to 70°C
Storage temperature range	-65°C to 150°C

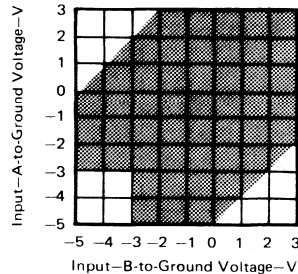
recommended operating conditions (see note 4)

	MIN	NOM	MAX	UNIT
Supply voltage V_{CC+}	4.75	5	5.25	V
Supply voltage V_{CC-}	-4.75	-5	-5.25	V
Low-level output current, I_{OL}			-16	mA
Differential input voltage, V_{ID} (see Note 5)	-5 [†]		5	V
Common-mode input voltage, V_{IC} (see Notes 5 and 6)	-3 [†]		3	V
Input voltage range, any differential input to ground (see Note 5)	-5 [†]		3	V
Operating free-air temperature	0		70	°C

[†]The algebraic convention where the more positive (less negative) limit is designated as maximum is used in this data sheet for logic voltage levels only.

- NOTES:
- All voltage values, except differential voltages, are with respect to network ground terminal.
 - Differential voltage values are at the noninverting (A) terminal with respect to the inverting (B) terminal.
 - Common-mode input voltage is the average of the voltages at the A and B inputs.
 - When using only one channel of the line receiver, the strobe G of the unused channel should be grounded and at least one of the differential inputs of the unused receiver should be terminated at some voltage between -3 V and 3 V.
 - The recommended combinations of input voltages fall within the shaded area of the figure at the right.
 - The common-mode voltage may be as low as -4 V provided that one of the two inputs is not more negative than -3 V.

RECOMMENDED COMBINATIONS
OF INPUT VOLTAGES



TYPES SN75207, SN75207B, SN75208, SN75208B DUAL SENSE AMPLIFIERS FOR MOS MEMORIES OR DUAL HIGH-SENSITIVITY LINE RECEIVERS

definition of input logic levels[†]

		MIN	MAX	UNIT
V _{IDH}	High-level input voltage between differential inputs	0.01	5	V
V _{IDL}	Low-level input voltage between differential inputs	-5	-0.01	V
V _{IH(S)}	High-level input voltage at strobe inputs	2	5.5	V
V _{IL(S)}	Low-level input voltage at strobe inputs	0	0.8	V

[†]The algebraic convention, where the more positive (less negative) limit is designated maximum, is used in this data sheet with logic input voltage levels only.

electrical characteristics over recommended free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS [‡]		'207, '207B		'208, '208B		UNIT
			MIN	TYP [§] MAX	MIN	TYP [§] MAX	
I _{IH} High-level input current	A	V _{CC±} = MAX	V _{ID} = 5 V		30	75	μA
	B		V _{ID} = -5 V		30	75	
I _{IL} Low-level input current	A	V _{CC±} = MAX	V _{ID} = -5 V		-10	-10	μA
	B		V _{ID} = 5 V		-10	-10	
I _{IH} High-level input current into 1G or 2G	V _{CC±} = MAX, V _{IH(S)} = 2.4 V				40	40	μA
	V _{CC±} = MAX, V _{IH(S)} = MAX V _{CC±}				1	1	
I _{IL} Low-level input current into 1G or 2G	V _{CC±} = MAX, V _{IL(S)} = 0.4 V				-1.6	-1.6	mA
	V _{CC±} = MAX, V _{IH(S)} = 2.4 V				80	80	
I _{IH} High-level input current into S	V _{CC±} = MAX, V _{IH(S)} = MAX V _{CC±}				2	2	mA
	V _{CC±} = MAX, V _{IL(S)} = 0.4 V				-3.2	-3.2	
V _{OH} High-level output voltage	V _{CC±} = MIN, V _{IL(S)} = 0.8 V, V _{IDH} = 10 mV, I _{OH} = -400 μA, V _{IC} = -3 V to 3 V		2.4				V
	V _{CC±} = MIN, V _{IH(S)} = 2 V, V _{IDL} = -10 mV, I _{OL} = 16 mA, V _{IC} = -3 V to 3 V				0.4	0.4	
I _{OH} High-level output current	V _{CC±} = MIN, V _{OH} = MAX V _{CC±}					250	μA
I _{OS} Short-circuit output current [¶]	V _{CC±} = MAX				-18	-70	mA
I _{CCH+} Supply current from V _{CC+} , outputs high	V _{CC±} = MAX, T _A = 25°C				18	30	mA
I _{CCH-} Supply current from V _{CC-} , outputs high	V _{CC±} = MAX, T _A = 25°C				-8.4	-15	mA

[‡]For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

[§]All typical values are at V_{CC+} = 5 V, V_{CC-} = -5 V, T_A = 25°C.

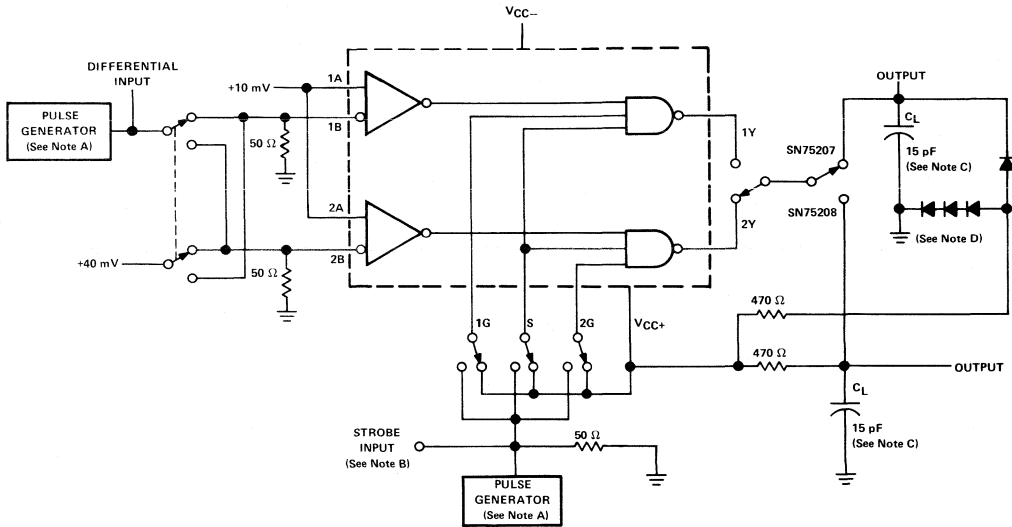
[¶]Not more than one output should be shorted at a time.

switching characteristics, V_{CC+} = 5 V, V_{CC-} = -5 V, T_A = 25°C

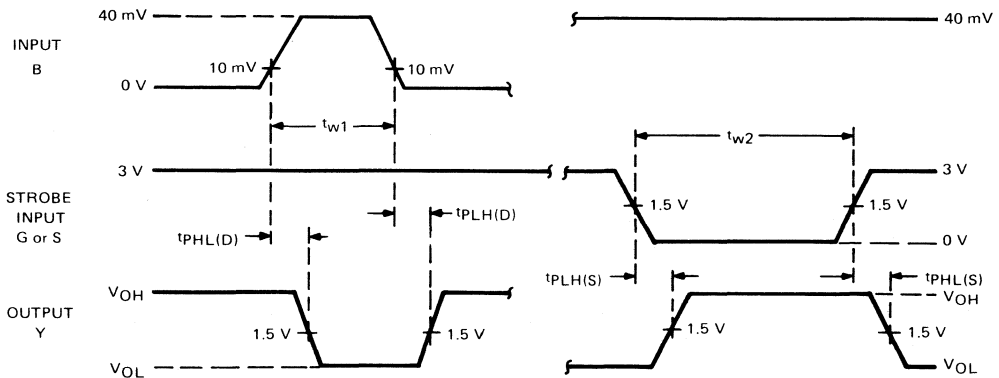
PARAMETER	TEST CONDITIONS	'207, '207B		'208, '208B		UNIT
		MIN	TYP MAX	MIN	TYP MAX	
t _{PLH(D)} Propagation delay time, low-to-high-level output, from differential inputs A and B	R _L = 470 Ω, C _L = 15 pF, See Figure 1	35		35		ns
t _{PHL(D)} Propagation delay time, high-to-low-level output, from differential inputs A and B		20		20		ns
t _{PLH(S)} Propagation delay time, low-to-high-level output, from strobe input G or S		17		17		ns
t _{PHL(S)} Propagation delay time, high-to-low-level output, from strobe input G or S		17		17		ns

TYPES SN75207, SN75207B, SN75208, SN75208B DUAL SENSE AMPLIFIERS FOR MOS MEMORIES OR DUAL HIGH-SENSITIVITY LINE RECEIVERS

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. The pulse generators have the following characteristics: $Z_{out} = 50 \Omega$, $t_r \leq 5 \text{ ns}$, $t_f \leq 5 \text{ ns}$, $t_{w1} = 500 \text{ ns}$ with $\text{PRR} = 1 \text{ MHz}$, $t_{w2} = 1 \text{ ms}$ with $\text{PRR} = 500 \text{ kHz}$.
- B. Strobe input pulse is applied to Strobe 1G when inputs 1A-1B are being tested, to Strobe S when inputs 1A-1B or 2A-2B are being tested, and to Strobe 2G when inputs 2A-2B are being tested.
- C. C_L includes probe and jig capacitance.
- D. All diodes are 1N916.

FIGURE 1—PROPAGATION DELAY TIMES

TYPES SN75207, SN75207B, SN75208, SN75208B DUAL SENSE AMPLIFIERS FOR MOS MEMORIES OR DUAL HIGH-SENSITIVITY LINE RECEIVERS

TYPICAL APPLICATION DATA

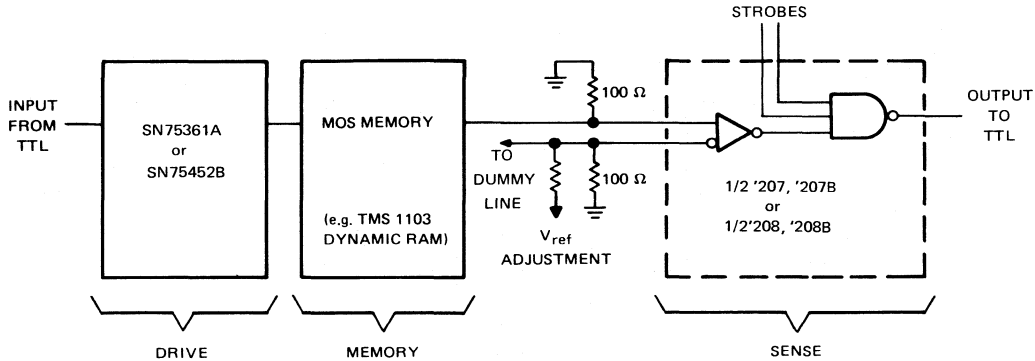
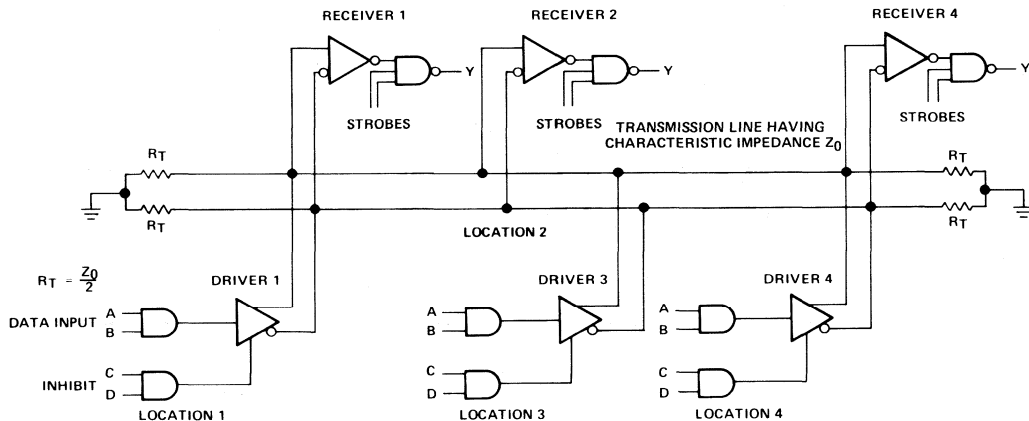


FIGURE 2—MOS MEMORY SENSE AMPLIFIER



Receivers are '207, '207B, '208, or '208B; drivers are SN55109A, SN75109A, SN55110A, SN75110A, or SN75112.

FIGURE 3—DATA-BUS OR PARTY-LINE SYSTEM

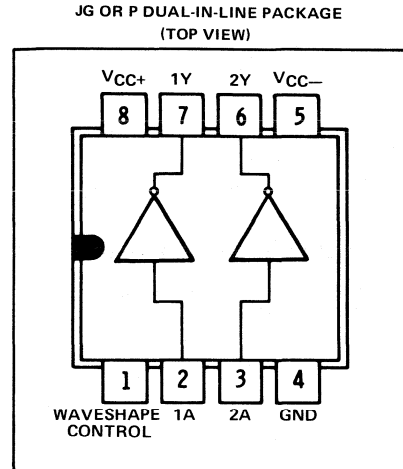
PRECAUTIONS: When only one receiver in a package is being used, at least one of the differential inputs of the unused receiver should be terminated at some voltage between -3 volts and $+3$ volts, preferably at ground. Failure to do so will cause improper operation of the unit being used because of common bias circuitry for the current sources of the two receivers. Strobe G of the unused channel should be grounded.

**FUTURE PRODUCT
TO BE ANNOUNCED**

**TYPE μ A9636
DUAL SINGLE-ENDED LINE DRIVER**

JANUARY 1977

- Meets EIA Standards RS-423 and RS-232-C
- Output Short-Circuit Current Limiting
- Adjustable Slew Rate Limiting
- TTL and CMOS Input Compatibility
- Wide Supply Voltage Range (± 9 V to ± 15 V)
- Designed To Be Interchangeable With Fairchild 9636



description

The μ A9636 is a dual single-ended line driver specifically designed to satisfy the requirements of EIA Standards RS-423 and RS-232-C in addition to the requirements of CCITT X.26, X.28, and Federal Standard FIPS 1030. By use of an external resistor, the output slew rate is adjustable over two orders of magnitude. The μ A9636 supply voltage can be operated over a wide range from ± 9 V to ± 15 V.

The μ A9636M will be characterized for operation over the full military temperature range of -55°C to 125°C . The μ A9636C will be characterized for operation from 0°C to 70°C .

supply voltage: Variable from ± 9 V to ± 15 V

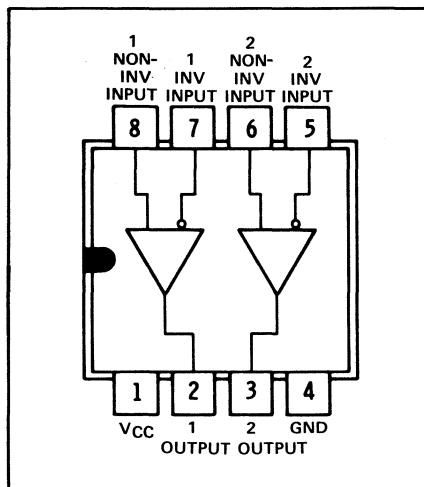
**FUTURE PRODUCT
TO BE ANNOUNCED**

**TYPE μ A9637
DUAL DIFFERENTIAL LINE RECEIVER**

JANUARY 1977

- Meets Specifications of EIA Standards RS-422 and RS-423
- Operates From a Single 5-V Supply
- High-Speed Schottky Circuitry
- Withstands EIA Standard RS-232-C Signal Levels
- Wide Common-Mode Range . . . ± 15 V
- Designed To Be Interchangeable With Fairchild 9637

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



description

The μ A9637 is a dual differential line receiver utilizing Schottky-diode-clamped transistors[†] for high speed. It is designed to meet EIA Standards RS-422 and RS-423. It has a common-mode input voltage range of ± 15 volts and the inputs can withstand ± 25 volts either differentially or to ground.

The μ A9637M will be characterized for operation over the full military temperature range of -55°C to 125°C . The μ A9637C will be characterized for operation from 0°C to 70°C .

supply voltage: 5 V nominal

**FUTURE PRODUCT
TO BE ANNOUNCED**

**TYPE μ A9638
DUAL DIFFERENTIAL LINE DRIVER**

JANUARY 1977

- Meets EIA Standard RS-422
- Operates From a Single 5-V Supply
- TTL and CMOS Input Compatibility
- Output Short-Circuit Protection
- Schottky Circuitry
- Designed to be Interchangeable With Fairchild 9638

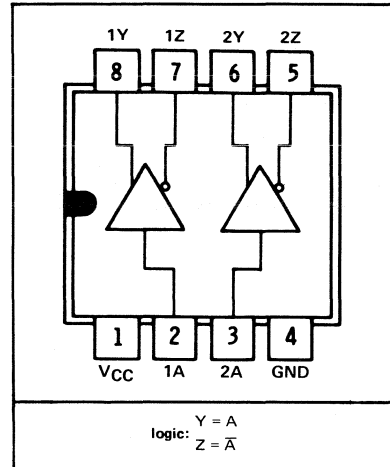
description

The μ A9638 is a dual differential line driver that meets EIA Standard RS-422. The inputs are TTL and CMOS compatible and have input clamp diodes. Schottky-diode-clamped transistors[†] are used to minimize the propagation delay time.

The μ A9638M will be characterized for operation over the full military temperature range of -55°C to 125°C . The μ A9638C will be characterized for operation from 0°C to 70°C .

supply voltage: 5 V nominal

JG OR P DUAL-IN-LINE PACKAGE
(TOP VIEW)



LINE CIRCUITS APPLICATION INFORMATION

introduction

The systems designer is constantly faced with the problem of interfacing subsystems and of transmitting data over a distance, whether it is a few inches on a circuit board or many feet to another unit in the system. The quality of the signal reproduced in the receiving unit is dependent on:

- A. Transmission line characteristics
 - 1. Length and attenuation
 - 2. Geometry (single wire, coaxial, parallel wires, twisted pair, shielded or unshielded, etc.)
 - a. Characteristic impedance and line termination
 - b. Distributed capacitance and inductance
- B. General layout and noise environment
- C. Receiver characteristics
 - 1. Input impedance
 - 2. Sensitivity, hysteresis, and input threshold
 - 3. Frequency response (switching time)
- D. Driver characteristics
 - 1. Output impedance
 - 2. Output peak current capability
 - 3. Frequency response
- E. Bit rate and pulse duration $\left(\text{bit rate} = \frac{2}{\text{period}} \right)$

The impact of many of these factors is discussed on the following pages and in several data sheets. Other applications where line circuit characteristics can be used to advantage are also discussed. For convenient access to all the application information in this data book, a topical index is provided on the next page.

additional circuit design information

Bulletin CA-130, *Line Drivers and Receivers: SN55107 Series*, and Bulletin CA-146, *Data Transmission with SN55107 Series*, are available from Texas Instruments upon request.

The Texas Instruments videotape course "Linear and Interface Integrated Circuits" is available for a nominal fee.

LINE CIRCUITS APPLICATION INFORMATION

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LINE CIRCUITS APPLICATION INFORMATION

line terminations

The voltage across an impedance terminating a transmission line is a function of the real and imaginary components of the impedance, the characteristic impedance of the line, and the incident power. When the impedance is a pure resistance (see Note 1) and the transmission line is ideal, then:

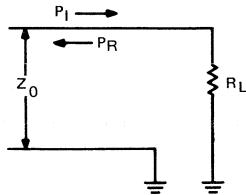


FIGURE 1

$$P_R = P_I \left(\frac{R_L - Z_0}{R_L + Z_0} \right)^2 \quad (1)$$

$$P_L = P_I - P_R = P_I \left[1 - \left(\frac{R_L - Z_0}{R_L + Z_0} \right)^2 \right] \quad (2)$$

$$V_L = \sqrt{P_L R_L} = \sqrt{I_L^2 R_L^2} \quad (3)$$

where

P_I = incident power P_L = power delivered to R_L

P_R = reflected power Z_0 = line characteristic impedance

R_L = load resistance

When $R_L = Z_0$, the numerators of the fractional terms in Equations 1 and 2 become zero and the reflected power is zero. With reflections reduced to zero, one source of signal distortion and noise is eliminated. Equation 3 shows the relationship between P_L , R_L , V_L , and I_L .

In line circuit design R_L is a lumped value representing the combination of a termination resistor and the input resistance of a line receiver.

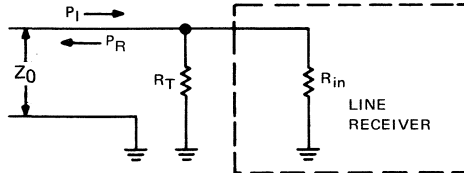


FIGURE 2

$$V_L = \sqrt{P_L \frac{R_{in} \times R_T}{R_{in} + R_T}} \quad (4)$$

When $R_{in} \gg R_T$, the incoming signal power and noise power are shunted to ground by R_T , decreasing the effective power to the input of the receiver.

NOTE 1: The assumption that the terminating impedance is a pure resistance simplifies this discussion. In practice, the reactive components of impedance can usually be neglected.

LINE CIRCUITS APPLICATION INFORMATION

line terminations (continued)

Figure 3 illustrates how much the line length versus bit rate boundary for acceptable TTL signals was affected by variation of the termination resistor values. Case A clearly provides the best capability for high bit rates and long transmission lines, while Cases B and C show irregularities primarily due to reflected signals.

	R1	R2
Case A	100 Ω	100 Ω
Case B	∞	100 Ω
Case C	∞	122 Ω
Case D	∞	205 Ω

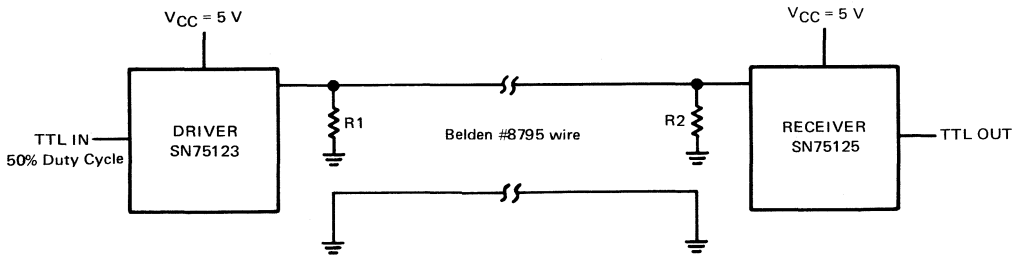
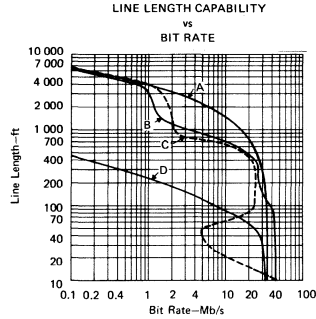
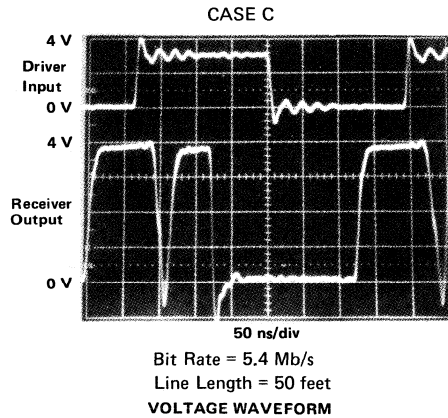


FIGURE 3

The voltage waveform for Case C at a line length of 50 feet shows a large negative transient in the receiver output due to a reflection. At 10 feet, the bit rate capability (see Figure 3) has increased to 45 Mb/s compared to 47 Mb/s for Case B.

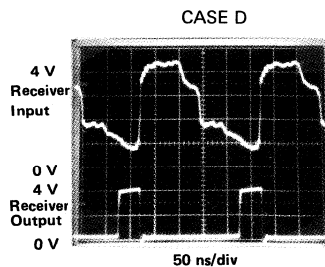
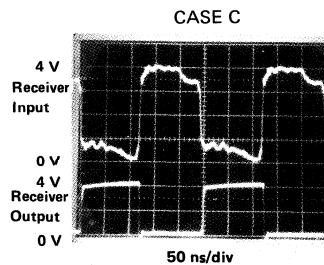
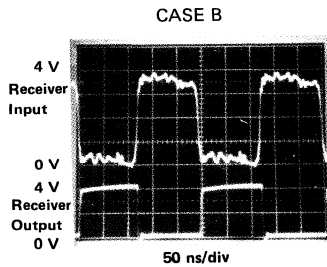
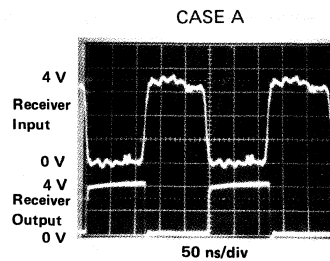
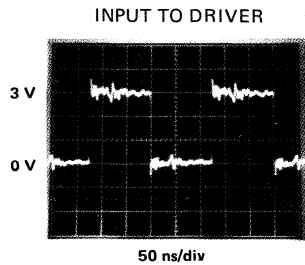


LINE CIRCUITS APPLICATION INFORMATION

line terminations (continued)

The waveforms below offer an interesting comparison of the driver input signal to the resulting signals that appear at the receiver input and at the receiver output. The circuit of Figure 3 with 100 feet of line and a bit rate of 2 Mb/s was used. Note that the pulse duration for Case D receiver output is much shorter than the apparent duration of the input pulse. Case C, with somewhat less distortion, produces input and output pulse widths of about the same value.

VOLTAGE WAVEFORMS



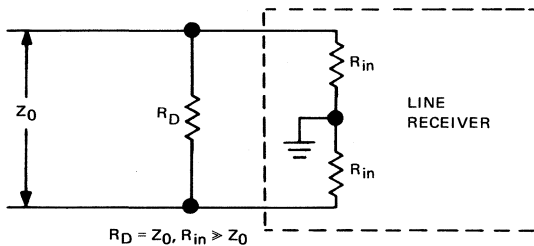
LINE CIRCUITS

APPLICATION INFORMATION

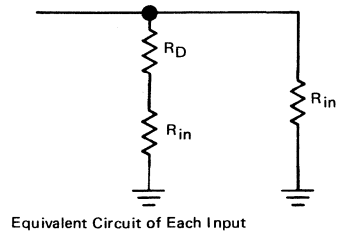
noise

The environment of any transmission line will produce noise from many sources. That noise will be transmitted to the input of the line receiver and can cause severe signal distortion. The familiar differential-line technique has provided a means of reducing the effect of common-mode noise on low-level signals in linear, digital, and rf transmission for some time, and is thoroughly discussed in the literature. One method of reducing the common-mode noise on balanced lines will be presented in this topic.

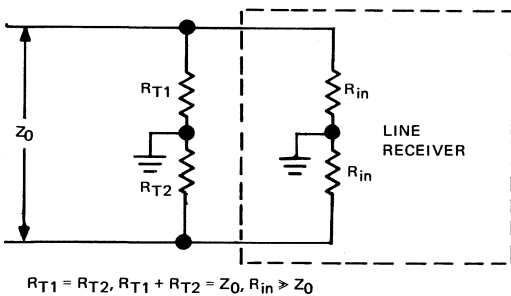
The noise power present on a line terminated in a resistance will act in the same manner as the signal power in Equations 1 through 4 under Line Terminations. Specifically, the noise will be shunted to ground and will not provide power to the receiver input if the line is terminated in a low-value resistor to ground. Examples 1 and 2 below show two typical means of terminating differential lines at the receiver.



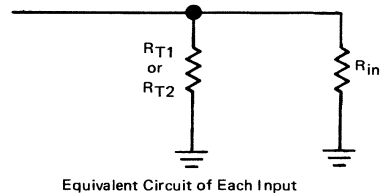
EXAMPLE 1



Since the shunting resistance, $R_D + R_{in}$, is high, most of the noise on each conductor will appear at the receiver input.



EXAMPLE 2



Most of the noise power on each conductor of the balanced line will be shunted to ground by R_{T1} or R_{T2} because of their low value compared to R_{in} .

LINE CIRCUITS APPLICATION INFORMATION

noise (continued)

Figure 1 below illustrates the effectiveness of the differential-line technique in rejecting noise from an external source.

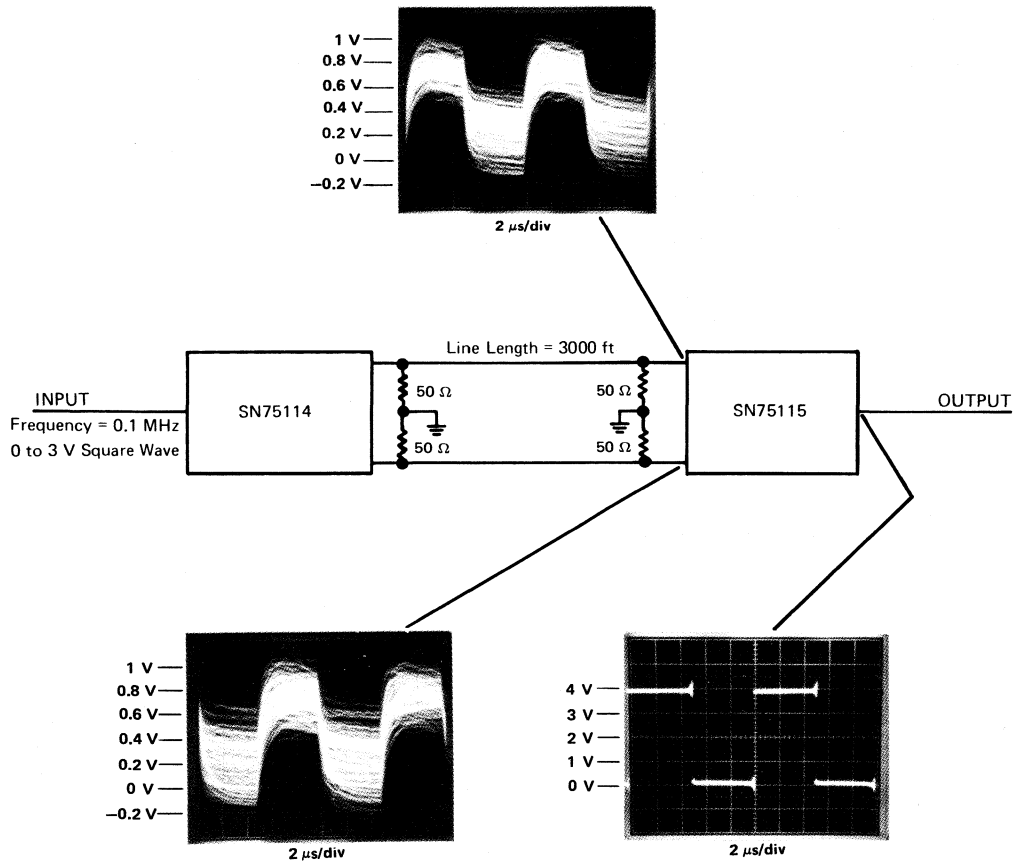


FIGURE 1

LINE CIRCUITS

APPLICATION INFORMATION

line length capability vs bit rate

The data presented in this section is intended to assist the designer who must choose a combination of line driver and receiver to meet line length and bit rate requirements. It does not represent the complete set of available options, but offers a means of comparison for many device types in typical applications. Each graph is associated with a specific line termination scheme, and all measurements utilized Belden #8795 wire as transmission line (see Note 1).

The duty cycle value refers to the time at TTL high level divided by the period length.

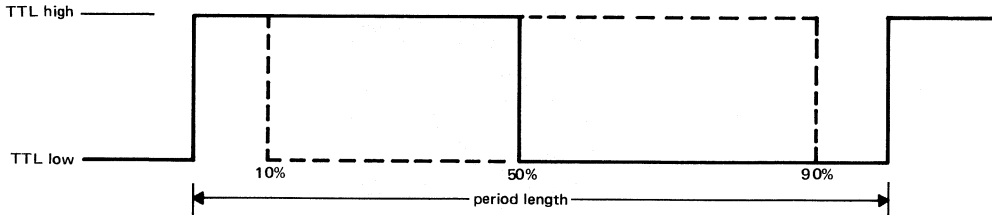


FIGURE 1—PERIOD AND DUTY CYCLE

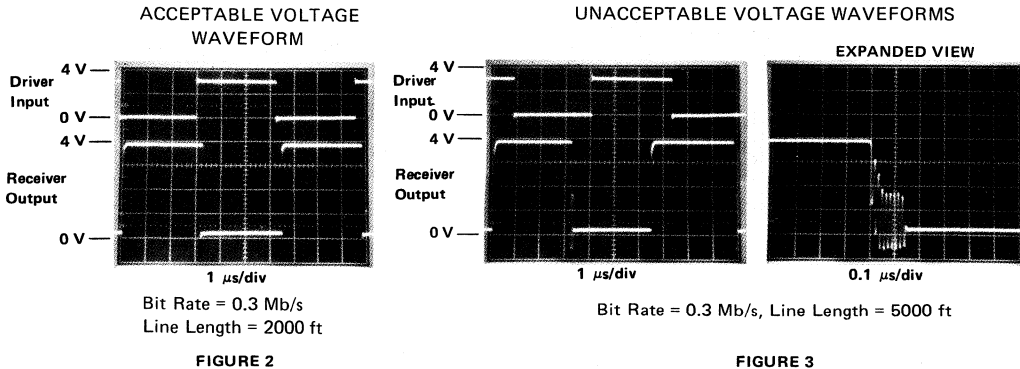
Duty cycle and bit rate values will yield the high-level pulse duration by means of the formula:

$$\text{Pulse duration} = \text{period} \times \text{duty cycle} = \frac{2}{\text{bit rate}} \times \text{duty cycle}$$

The data on the following pages was obtained in each case by monitoring the output of the receiver. Acceptable waveforms exhibited:

1. TTL low level less than 0.4 V
2. TTL high level greater than 2.4 V
3. No oscillations

Figures 2 and 3 show examples of acceptable and unacceptable voltage waveforms with regard to oscillations of the SN75112 driver and SN75207 receiver.



NOTE 1: Belden #8795 twisted-pair wire is 22 AWG and exhibits the following characteristics: $Z_0 \approx 100 \Omega$, $C \approx 15 \text{ pF/ft}$, propagation delay $\approx 1.3 \text{ ns/ft}$.

LINE CIRCUITS APPLICATION INFORMATION

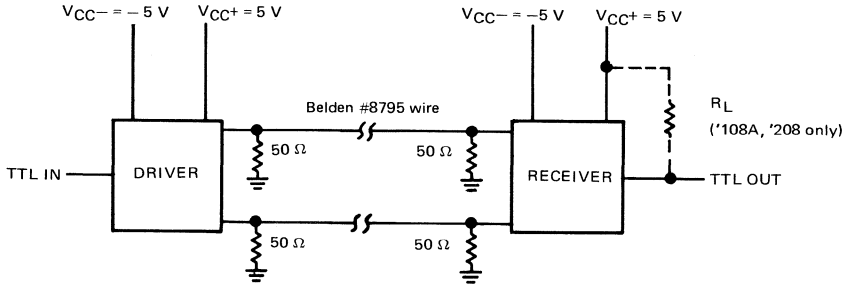
LINE LENGTH CAPABILITY vs BIT RATE

INDEX TO DATA

DRIVER APPLICATIONS		RECEIVER APPLICATIONS	
TYPE	FIGURE NUMBERS	TYPE	FIGURE NUMBERS
SN75109A	4, 7	SN75107A	4, 5, 6
SN75110A	5, 8	SN75108A	7, 8, 9
SN75112	6, 9	SN75115	13, 14, 15, 16, 21
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SN75114	10, 13	SN75117	43
SN75116	42	SN75122	17, 22, 26, 31
SN75117	43	SN75124	27, 32
SN75121	31	SN75125	28, 33
SN75123	32, 33	SN75127	28, 33
SN75138	34	SN75138	34
SN75150	37, 38	SN75140	18, 23, 29
SN75158	41	SN75152	19, 24, 30, 38, 44
SN75183	11, 14	SN75154	37
SN75188	35, 36, 39, 40	SN75182	10, 11, 12, 20, 25
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SN75451B	16, 17, 18, 19, 20	SN75189A	36, 40
SN75361A	21, 22, 23, 24, 25	SN75207	4, 5, 6
DS8831	12, 15, 26, 27, 28, 29, 30	SN75208	7, 8, 9, 41
DS8832	12, 15, 26, 27, 28, 29, 30		

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 4 THRU 9

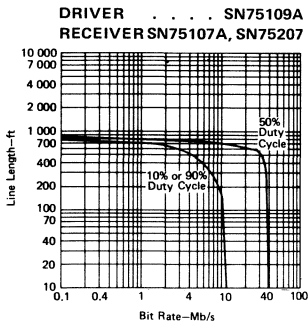


FIGURE 4

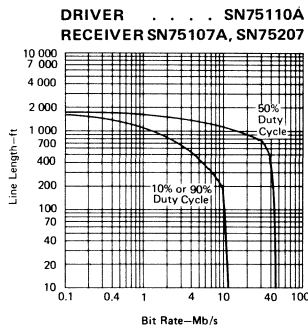


FIGURE 5

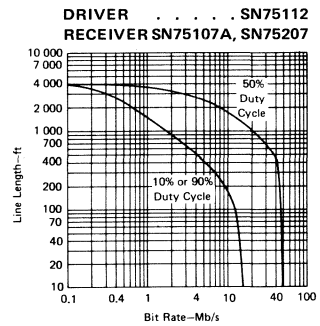


FIGURE 6

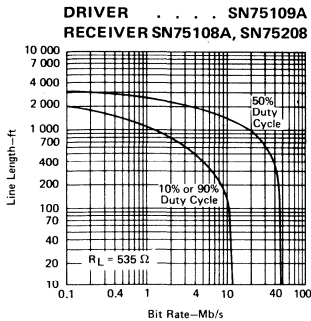


FIGURE 7

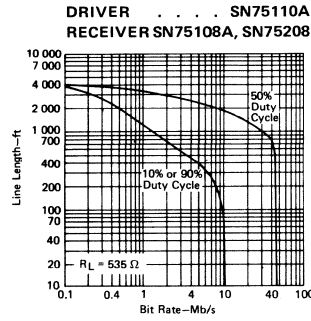


FIGURE 8

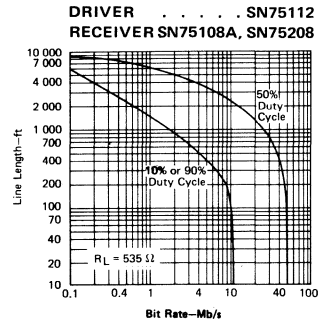
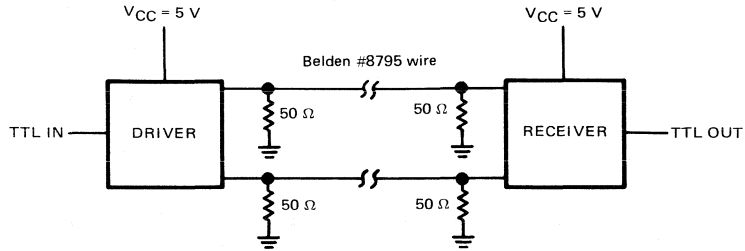


FIGURE 9

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 10 THRU 15

DRIVER . . .SN75113, SN75114
RECEIVERSN75182

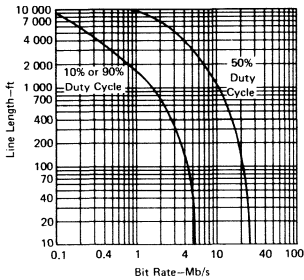


FIGURE 10

DRIVERSN75183
RECEIVERSN75182

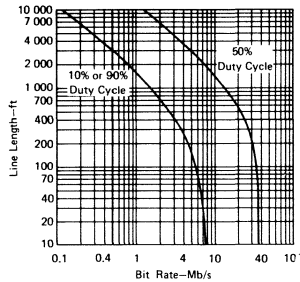


FIGURE 11

DRIVERDS8831, DS8832
RECEIVERSN75182

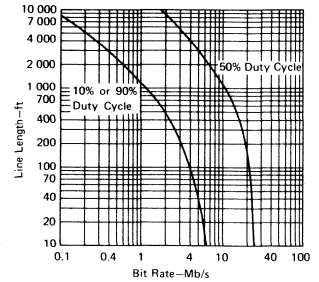


FIGURE 12

DRIVER . . .SN75113, SN75114
RECEIVERSN75115

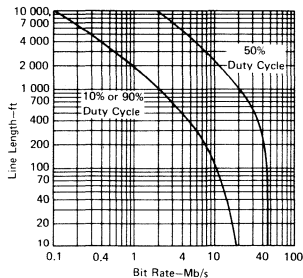


FIGURE 13

DRIVERSN75183
RECEIVERSN75115

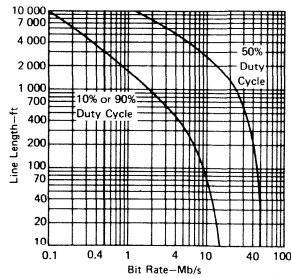


FIGURE 14

DRIVERDS8831, DS8832
RECEIVERSN75115

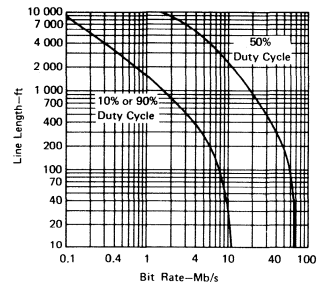
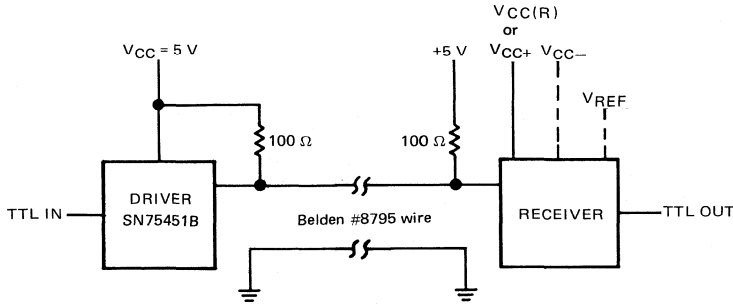


FIGURE 15

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 16 THRU 20

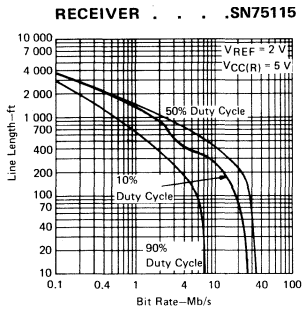


FIGURE 16

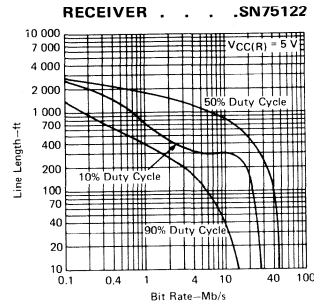


FIGURE 17

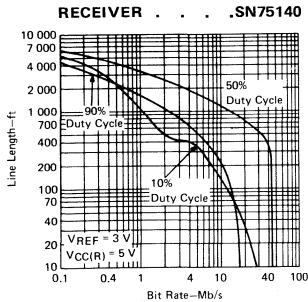


FIGURE 18

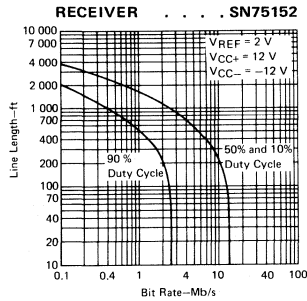


FIGURE 19

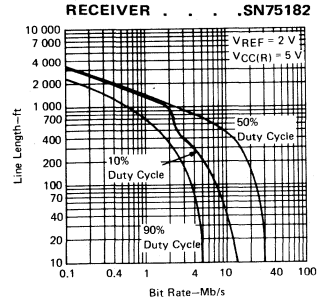
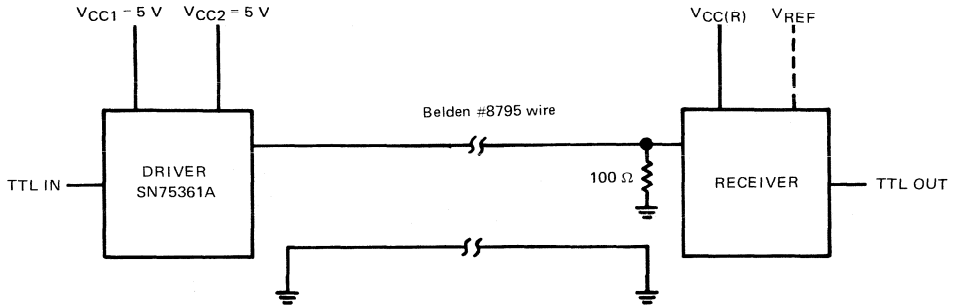


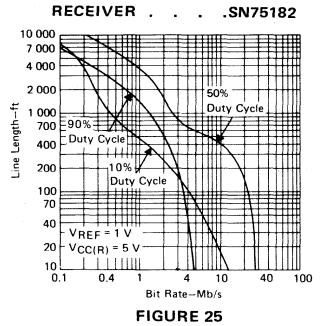
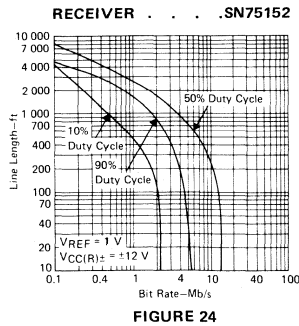
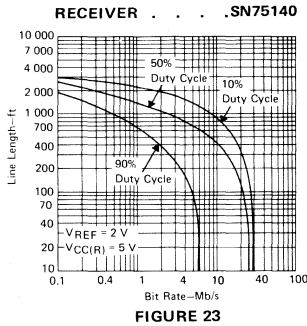
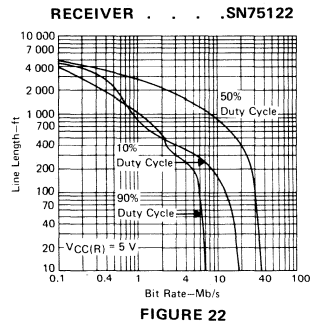
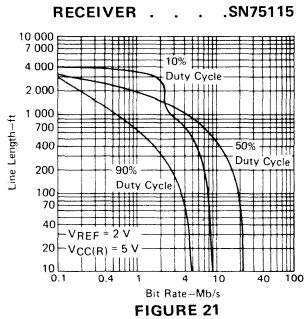
FIGURE 20

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE

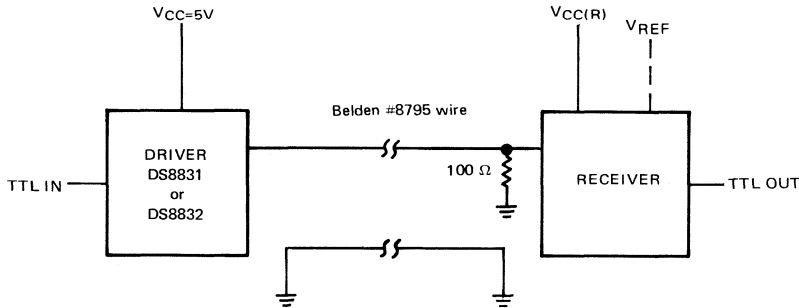


MEASUREMENT INFORMATION FOR FIGURES 21 THRU 25



LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 26 THRU 30

RECEIVER . . . SN75122

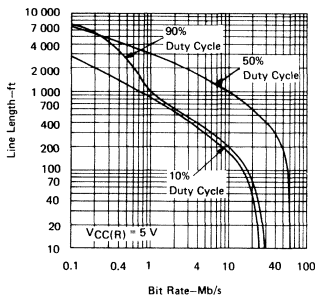


FIGURE 26

RECEIVERSN75124

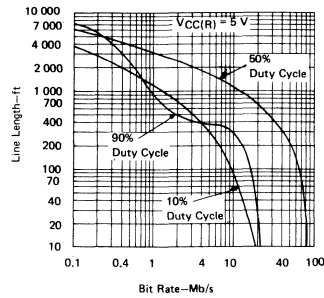


FIGURE 27

RECEIVER SN75125, SN75127

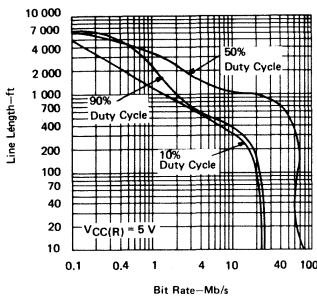


FIGURE 28

RECEIVERSN75140

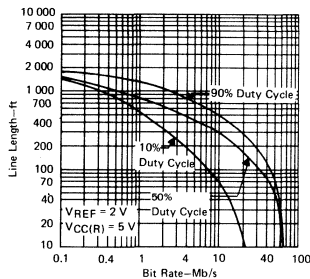


FIGURE 29

RECEIVERSN75152

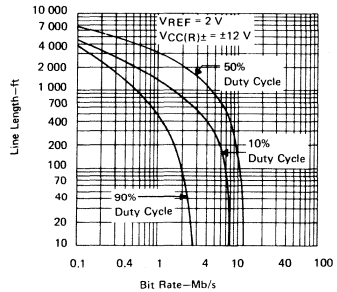
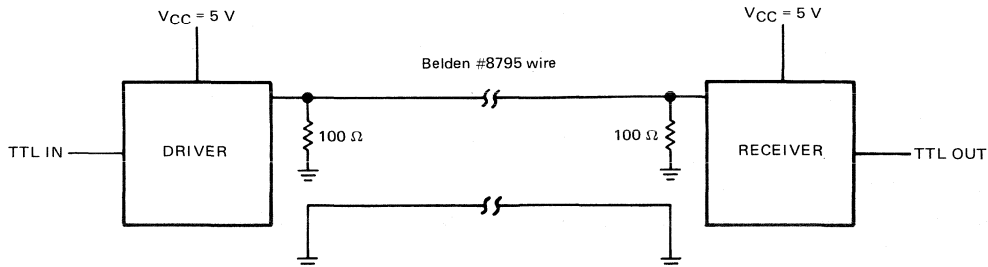


FIGURE 30

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 31 THRU 33

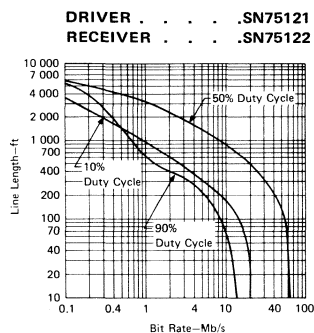


FIGURE 31

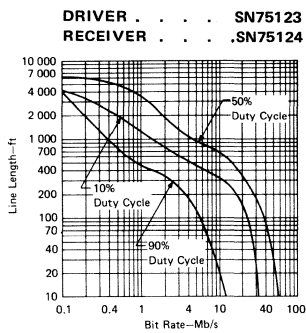


FIGURE 32

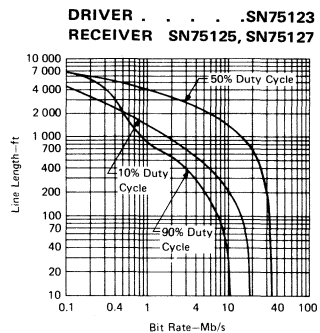
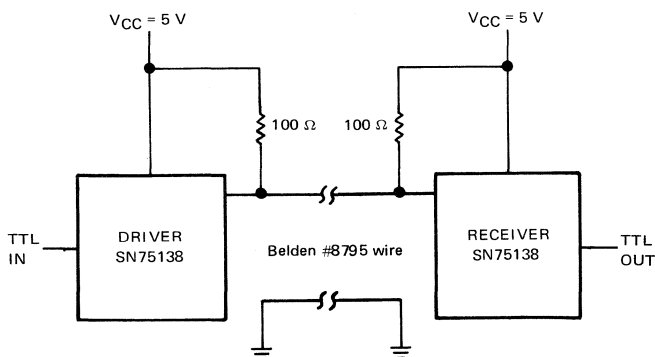


FIGURE 33



MEASUREMENT INFORMATION FOR FIGURE 34

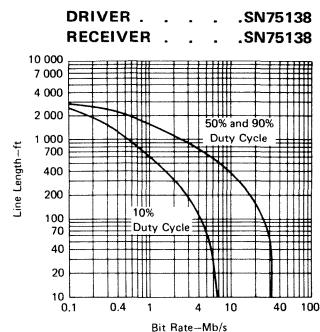
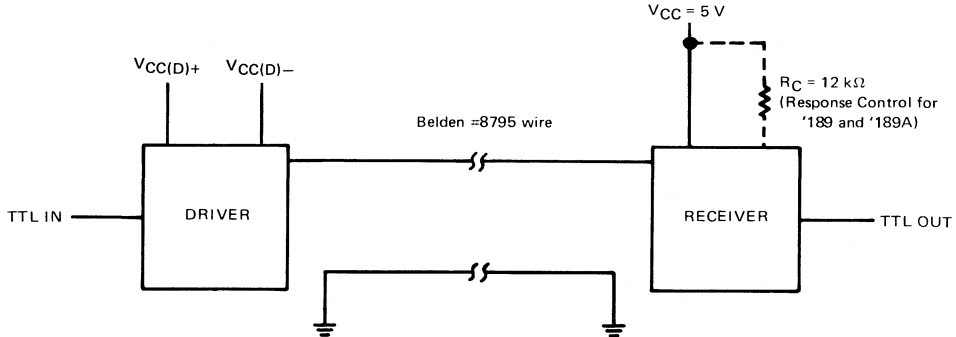


FIGURE 34

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 35 thru 37

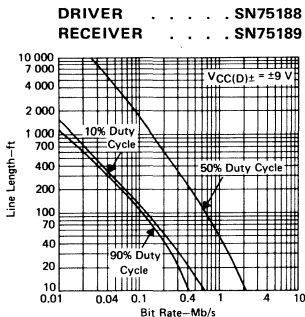


FIGURE 35

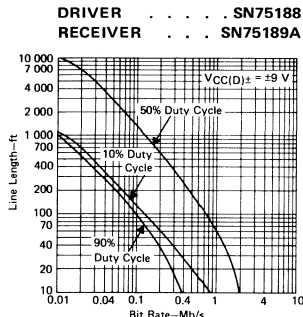


FIGURE 36

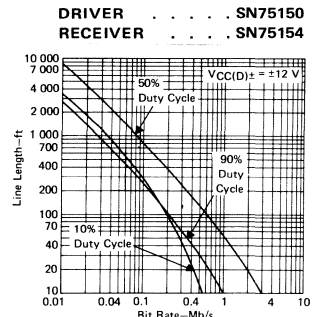


FIGURE 37

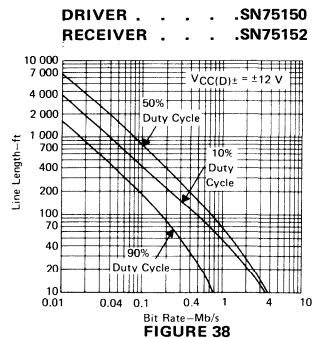
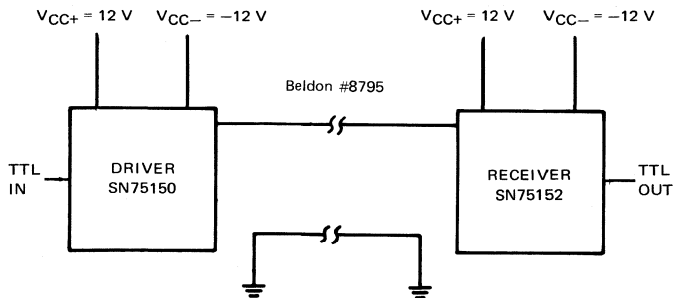
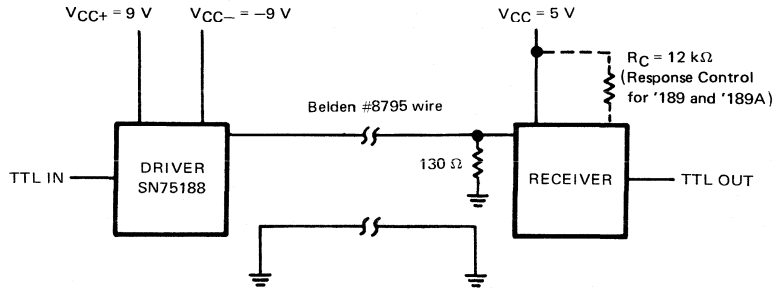


FIGURE 38

MEASUREMENT INFORMATION FOR FIGURE 38

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 39 AND 40

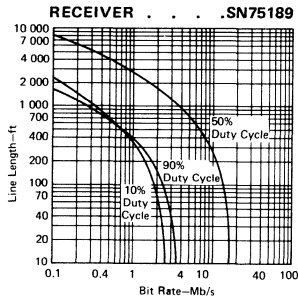


FIGURE 39

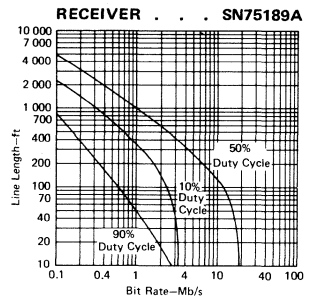
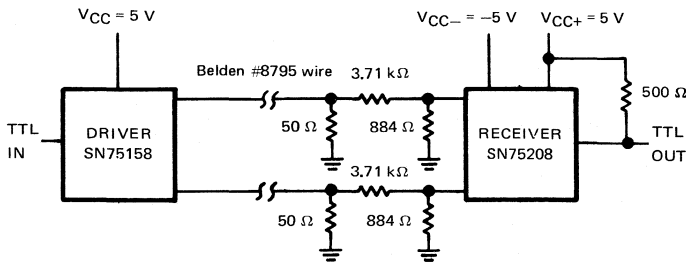


FIGURE 40



MEASUREMENT INFORMATION FOR FIGURE 41

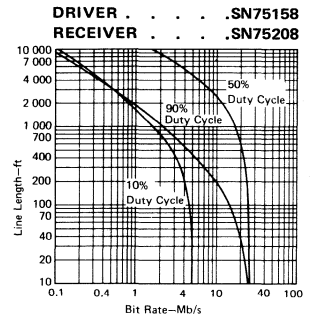
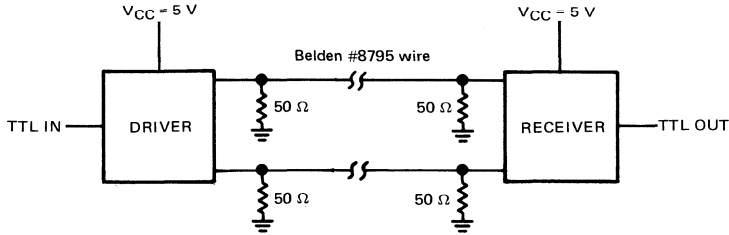


FIGURE 41

LINE CIRCUITS APPLICATION INFORMATION

LINE LENGTH CAPABILITY vs BIT RATE



MEASUREMENT INFORMATION FOR FIGURES 42 AND 43

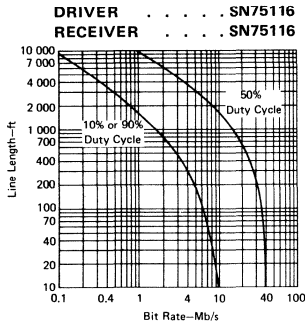


FIGURE 42

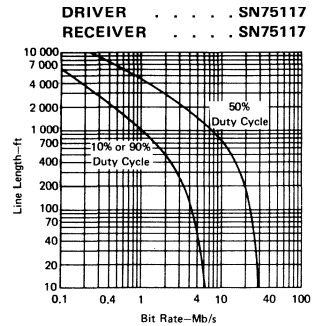
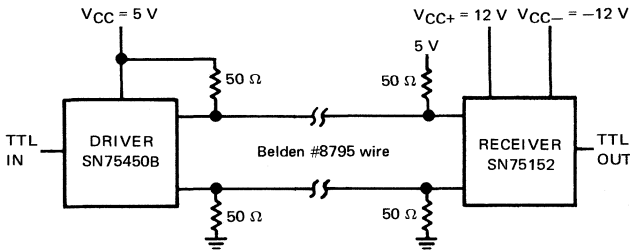


FIGURE 43



MEASUREMENT INFORMATION FOR FIGURE 44

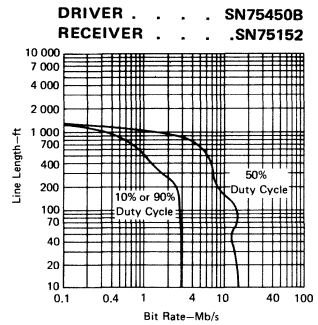


FIGURE 44

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS SENSE AMPLIFIERS

SENSE AMPLIFIERS

DESCRIPTION	THRESHOLD SENSITIVITY	COMMON-MODE RANGE	TYPE† OF OUTPUT	tpd‡ TYPICAL	DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	UNITS PER PACKAGE	ADDITIONAL FEATURES
					-55°C to 125°C	0°C to 70°C			
CORE-MEMORY SENSE AMPLIFIERS	±4 mV	±2.5 V	R	35 ns	SN5520	J	1	<ul style="list-style-type: none"> Provides memory data register Complementary outputs 	
			O-C or R	30 ns	SN5522	J, J,N	1	<ul style="list-style-type: none"> Dual input channels Single-ended output 	
			R	25 ns	SN5524	J, J,N	2	<ul style="list-style-type: none"> Independent strobes 	
			R	25 ns	SN5528	J, J,N	2	<ul style="list-style-type: none"> Independent strobes Test points for strobe timing adjustment 	
			O-C	25 ns	SN55232	J, J,N	2	<ul style="list-style-type: none"> Independent strobes Internally compensated reference amplifier 	
			R	25 ns	SN55234	J, J,N	2	<ul style="list-style-type: none"> Independent strobes Internally compensated reference amplifier 	
HIGH-PERFORMANCE CORE-MEMORY SENSE AMPLIFIERS	±3 mV	±1.5 V	R	25 ns	SN55238	J, J,N	2	<ul style="list-style-type: none"> Independent strobes Internally compensated reference amplifier Test points for strobe timing adjustment 	
			T-P	28 ns	SN55236	W, W	2	<ul style="list-style-type: none"> Built-in data buffer and data register Reference amplifier inherently stable 	
MOS-MEMORY SENSE AMPLIFIERS	±4 mV	±2.5 V	T-P	30 ns	SN7526	J,N	1	<ul style="list-style-type: none"> Dual Input Channels Complete memory data register Internally compensated reference amplifier 	
			T-P	17 ns	SN55107A	J, J,N	2	<ul style="list-style-type: none"> Independent strobes 	
			O-C	19 ns	SN75108A	J, J,N	2	<ul style="list-style-type: none"> Independent strobes 	
I/O INTERFACE	±10 mV	±3 V	T-P	17 ns	SN75207	J,N	2	<ul style="list-style-type: none"> Independent strobes 	
			O-C	19 ns	SN75208	J,N	2	<ul style="list-style-type: none"> Combined driver and sense amplifier Read enable and write enable controls 	
	±50 µA		R	25 ns	SN75370	J,N	2		

† T-P ≡ Totem Pole, O-C ≡ Open Collector, R ≡ Resistor Pull-Up

‡ tpd = Propagation Delay Time

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS

PERIPHERAL DRIVERS

PERIPHERAL DRIVERS

MAXIMUM OFF-STATE VOLTAGE	MINIMUM LATCH-UP VOLTAGE	MAXIMUM RECOMMENDED OUTPUT CURRENT	t _{PD} ¹ TYPICAL	OUTPUT CLAMP DIODES	DRIVERS PER PACKAGE	INPUT COMPATIBILITY	DEVICE TYPE AND PACKAGE		LOGIC FUNCTION
							0° C TO 70° C		
							-55° C TO 125° C		
15 V	15 V	300 mA	15 ns		2	TTL, DTL		SN75430 J,N SN75431 JG,P SN75432 JG,P SN75433 JG,P	AND* AND NAND OR
30 V	20 V	100 mA	22 ns		2	ECL		SN75434 JG,P SN75441 J,N	NOR OR
30 V	20 V	300 mA	21 ns		2	TTL, DTL		SN55450B J SN55451B JG SN55452B JG SN55453B JG SN55454B JG	AND* AND NAND OR NOR
35 V	30 V	300 mA	33 ns		2	TTL, DTL		SN55460 J SN55461 JG SN55462 JG SN55463 JG SN55464 JG	AND* AND NAND OR NOR
35 V	30 V	500 mA	33 ns		2	TTL, DTL		SN75401 NE SN75402 NE SN75403 NE SN75404 NE	AND NAND OR NOR
50 V	50 V	350 mA	1 μs	YES	7	TTL, DTL, CMOS, P-MOS 14-V to 25-V P-MOS TTL and 5-V CMOS 6-V to 15-V P-MOS, CMOS		ULN2001A† J,N ULN2002A† J,N ULN2003A† J,N ULN2004A† J,N	INVERTING BUFFER

* With output transistor base connected externally to output of gate.

¹ 0° C to 85° C

† t_{PD} = Propagation delay time

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS PERIPHERAL DRIVERS

PERIPHERAL DRIVERS (continued)

MAXIMUM OFF-STATE VOLTAGE	MINIMUM LATCH-UP VOLTAGE	MAXIMUM RECOMMENDED OUTPUT CURRENT	t _{PD} [†] TYPICAL	OUTPUT CLAMP DIODES	DRIVERS PER PACKAGE	INPUT COMPATIBILITY	DEVICE TYPE AND PACKAGE		LOGIC FUNCTION		
							-55°C TO 125°C	0°C TO 70°C			
70 V	55 V	300 mA	33 ns		2	TTL, DTL	SNS5470	J	SN75470	J,N	AND*
							SNS5471	JG	SN75471	JG,P	AND
							SNS5472	JG	SN75472	JG,P	NAND
							SNS5473	JG	SN75473	JG,P	OR
							SNS5474	JG	SN75474	JG,P	NOR
70 V	55 V	300 mA	100 ns	YES	2	TTL, DTL, MOS		SN75475	JG,P	NAND	
70 V	55 V	300 mA	100 ns	YES	2	TTL, DTL, MOS			SN75476	JG,P	AND
									SN75477	JG,P	NAND
									SN75478	JG,P	OR
									SN75479	JG,P	NOR
									SN75411	NE	AND
70 V	55 V	500 mA	33 ns		2	TTL, DTL			SN75412	NE	NAND
									SN75413	NE	OR
									SN75414	NE	NOR
70 V	55 V	500 mA	100 ns	YES	2	TTL, DTL, MOS			SN75416	NE	AND
									SN75417	NE	NAND
									SN75418	NE	OR
100 V	60 V	350 mA	130 ns	YES	7	TTL, DTL, CMOS, P-MOS 14-V to 25-V P-MOS TTL and 5-V CMOS 6-V to 15-V P-MOS, CMOS			SN75419	NE	NOR
									SN75466 [†]	J,N	
									SN75467 [†]	J,N	INVERTING
									SN75468 [†]	J,N	BUFFER
								SN75469 [†]	J,N		

* With output transistor base connected externally to output of gate.
† 0°C to 85°C

[†]t_{PD} = Propagation delay time.

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS DISPLAY DRIVERS

DISPLAY DRIVERS FOR COMMERCIAL TEMPERATURE RANGE

DISPLAY TYPE	DESCRIPTION	INPUT COMPATIBILITY	POWER SUPPLIES	DRIVERS PER PACKAGE	DEVICE TYPE	PACKAGE TYPE	ADDITIONAL FEATURES		
AC PLASMA DISPLAYS	AXIS DRIVER	CMOS	V _{CC1} = 12 V	4	SN75426	J,N	<ul style="list-style-type: none"> Independent addressing of each gate for serial and parallel applications High input impedance (typically 1 megohm) 30-mA clamp diodes on output Switches 70 V in 1.2 μs AND driver (SN75426); NAND driver (SN75427) High-speed serially shifted data input operation (4 MHz max) Fast output transitions (less than 200 ns) 25-mA output current capability Output short-circuit protection Latches on all SN75501 driver outputs X-axis driver — SN75500 Y-axis driver — SN75501 (performs Y-axis sustaining function) 		
			V _{CC2} variable from 40 V to 90 V		SN75427	J,N			
LED DISPLAYS	SEGMENT DRIVERS	MOS	V _{CC1} = 12 V	32	*SN75500	N	<ul style="list-style-type: none"> 50-mA source/sink capability 50-mA regulated source capability Display blanking provisions 250-mA sink capability 250-mA sink capability Display blanking provisions 100-mA sink capability Input threshold . . . 2.7 V max Low voltage saturating outputs (0.5 V maximum) 100-mA sink capability Input threshold . . . 2.7 V max 		
			V _{CC2} variable to 100 V		*SN75501	N			
			10 V		SN75491	N			
	DIGIT DRIVERS	MOS, TTL	Variable from 3.2 V to 8.8 V	4	6	SN75493	N	<ul style="list-style-type: none"> 50-mA source/sink capability 50-mA regulated source capability Display blanking provisions 250-mA sink capability 250-mA sink capability Display blanking provisions 100-mA sink capability Input threshold . . . 2.7 V max Low voltage saturating outputs (0.5 V maximum) 100-mA sink capability Input threshold . . . 2.7 V max 	
						10 V	SN75492		N
						Variable from 3.2 V to 8.8 V	SN75494		N
DIGIT DRIVERS	MOS, TTL	Variable from 2.7 V to 6.6 V	7	9	SN75497	N	<ul style="list-style-type: none"> 50-mA source/sink capability 50-mA regulated source capability Display blanking provisions 250-mA sink capability 250-mA sink capability Display blanking provisions 100-mA sink capability Input threshold . . . 2.7 V max Low voltage saturating outputs (0.5 V maximum) 100-mA sink capability Input threshold . . . 2.7 V max 		
					Variable from 2.7 V to 6.6 V	SN75498		N	

*Future product

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS DISPLAY DRIVERS

**DISPLAY DRIVERS
FOR COMMERCIAL TEMPERATURE RANGE (continued)**

DISPLAY TYPE	DESCRIPTION	INPUT COMPATIBILITY	POWER SUPPLIES	DRIVERS PER PACKAGE	DEVICE TYPE	PACKAGE TYPE	ADDITIONAL FEATURES
GAS DISCHARGE DISPLAYS	HIGH-VOLTAGE BCD-TO-SEVEN-SEGMENT DECODER/CATHODE DRIVERS	TTL	5 V	7	SN75480	N	<ul style="list-style-type: none"> • Outputs regulated to insure constant brightness • Blanking and ripple-blanking provisions • High off-state breakdown voltage (120 V typical) • Designed for seven segment displays such as Beckman and Panaplex II[◊].
		TTL, MOS, CMOS	Variable from 4.75 V to 15 V	7½	*SN75484	N	<ul style="list-style-type: none"> • same features as the SN75480 plus: • Decimal point provided • Latches to hold BCD information • Lower supply power requirements • Higher output voltage breakdown capability
THERMAL PRINT DISPLAYS	ANODE DRIVER THERMAL-PRINT-HEAD DRIVER	MOS	VEE = -55 V, VBB = -18 V	6	SN75481	N	<ul style="list-style-type: none"> • 13-mA output capability • Designed for time-multiplexed displays such as Panaplex II[◊]
		TTL, CMOS	±5 V	6	SN75490	J,N	<ul style="list-style-type: none"> • Common strobe • 40-mA source, 60-mA sink capability
		MOS	5 V	7	SN75270	J,N	<ul style="list-style-type: none"> • Single ended, noninverting operation

*Future Product

◊Trademark of the Burroughs Corporation

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS

MOS DRIVERS

MOS DRIVERS

INPUT COMPATIBILITY	POWER SUPPLIES (Nominal)	t _{PD} TYPICAL	V _{OH} (MIN)	V _{OL} (MAX)	DEVICE TYPE	PACKAGE TYPE	DRIVERS PER PACKAGE	ADDITIONAL FEATURES
ECL 10K	V _{CC1} = 5 V, V _{CC2} = 20 V, V _{CC3} = 24 V, V _{EE} = -5.2 V	33 ns	V _{CC2} - 0.3 V	0.3 V	SN75368	J,N	2	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs including the TMS 1103, TMS 1103-1, TMS 4030, and '7001. ECL to MOS/TTL driver
	V _{CC1} = 5 V, V _{CC2} = 12 V, V _{EE} = -5.2 V, V _{BB} = -1.3 V	44 ns	V _{CC2} - 0.4 V	0.5 V	SN75320 SN75321	J,N J,N	2	<ul style="list-style-type: none"> Compatible with the TMS 4030 4K RAM and other popular MOS RAMs Fixed ECL input reference voltage (SN75321) External reference voltage (SN75320) Requires two external P-N-P transistors for operation
TTL	V _{CC1} = 5 V, V _{CC2} = 12 V	20 ns	V _{CC2} - 1.6 V	0.5 V	SN75367	J,N	4	<ul style="list-style-type: none"> CMOS applications 3-state output Separate address and enable/disable inputs for each driver
	V _{CC1} = 5 V, V _{CC2} = 12 V	25 ns	V _{CC2} - 1.6 V	1.3 V	*SN75367	J,N	4	<ul style="list-style-type: none"> CMOS applications Very low transient current during switching 3-state output Separate address and enable/disable inputs for each driver
	V _{CC1} = 5 V, V _{CC2} = 20 V	31 ns	V _{CC2} - 0.3 V	0.3 V	*SN75375	J,N	4	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs Individual V_{CC2} supplies for each driver Two drivers have single inputs; two have dual inputs
	V _{CC1} = 5 V, V _{CC2} = 20 V, V _{CC3} = 24 V	31 ns	V _{CC2} - 0.3 V	0.3 V	SN75365	J,N	4	<ul style="list-style-type: none"> Compatible with many MOS RAMs including the TMS 1103, TMS 4062, and TMS 4070 16K RAM V_{CC2} variable from 5 V to 24 V
	V _{CC1} = 5 V, V _{CC2} = 12 V	31 ns	V _{CC2} - 0.4 V	0.5 V	SN75322	J,N	2	<ul style="list-style-type: none"> Compatible with most popular MOS RAMs Separate driver address inputs with common strobe Requires two external P-N-P transistors for operation Low standby power

t_{PD} = Propagation delay time

* Future product

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS

MOS DRIVERS

MOS DRIVERS (continued)

INPUT COMPATIBILITY	POWER SUPPLIES (Nominal)	t_{PD}^{\dagger} TYPICAL	V_{OH} (MIN)	V_{OL} (MAX)	DEVICE TYPE	PACKAGE TYPE	DRIVERS PER PACKAGE	ADDITIONAL FEATURES
TTL	$V_{CC1} = 5\text{ V}$, $V_{CC2} = 15\text{ V}$	31 ns	$V_{CC2} - 1\text{ V}$	0.3 V	SN75350	JG,P	2	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs Lower-voltage, high-speed version of the SN75361A V_{CC2} variable from 5 V to 18 V
	$V_{CC1} = 5\text{ V}$, $V_{CC2} = 15\text{ V}$, $V_{CC3} = 18\text{ V}$	32 ns	$V_{CC2} - 0.3\text{ V}$	0.3 V	SN75355	J,N	4	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs Low-voltage version of the SN75365 V_{CC2} variable from 5 V to 18 V
	$V_{CC1} = 5\text{ V}$, $V_{CC2} = 20\text{ V}$, $V_{CC3} = 24\text{ V}$	33 ns	$V_{CC2} - 0.3\text{ V}$	0.3 V	SN75366	J,N	4	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs Equivalent to the SN75365 with internal output damping resistor
	$V_{CC1} = 5\text{ V}$, $V_{CC2} = 12\text{ V}$, $V_{CC3} = 15\text{ V}$	33 ns	$V_{CC2} - 0.3\text{ V}$	0.5 V	SN75363	J,N	2	<ul style="list-style-type: none"> Compatible with many MOS RAMs including the TMS 4030 4K RAM and TMS 4070 16K RAM Separate driver address inputs with common strobe V_{CC2} variable from 5 V to 15 V
	$V_{CC1} = 20\text{ V}$, $V_{CC2} = 24\text{ V}$	34 ns	$V_{CC2} - 0.3\text{ V}$	0.3 V	SN75364	JG,P	2	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs and shift registers Single-ended inverting drivers
	$V_{CC} = 20\text{ V}$	35 ns	$V_{CC1} - 1\text{ V}$	0.3 V	SN75369	JG,P	2	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs and MOS shift registers Single-ended inverting drivers
	$V_{CC1} = 5\text{ V}$, $V_{CC2} = 20\text{ V}$	36 ns	$V_{CC2} - 1\text{ V}$	0.3 V	SN75361A	JG,P	2	<ul style="list-style-type: none"> Compatible with many popular MOS RAMs including the TMS 1103, TMS 4062, and TMS 4070 16K RAM V_{CC2} variable from 5 V to 24 V
	$V_{SS} = 20\text{ V}$, $V_{REF} = 7\text{ V}$	80 ns			SN75370	J,N	2	<ul style="list-style-type: none"> Dual read/write amplifier that is designed to interface with I/O terminals of the TMS 4062 and similar type MOS RAMs
	$V_{CC1} = 5\text{ V}$, See features for V_{CC2} and V_{CC3}	85 ns	$V_{CC3} - 0.2\text{ V}$	$V_{CC2} + 2\text{ V}$	SN65180 SN75180	L L	2	<ul style="list-style-type: none"> Compatible with all MOS devices 31 V maximum output swing V_{CC2} variable from -8 V to -25 V V_{CC3} variable from -20 V to 25 V

$^{\dagger}t_{PD}$ = Propagation delay time

SELECTION GUIDE FOR OTHER INTERFACE CIRCUITS MEMORY DRIVERS

MEMORY DRIVERS

- TTL-COMPATIBLE INPUTS
- CORE MEMORY APPLICATIONS

DESCRIPTION	MAXIMUM OUTPUT CURRENT	t _{PD} † TYPICAL	POWER SUPPLIES	DEVICE TYPE FOR TEMPERATURE RANGE		PACKAGE TYPE	ADDITIONAL FEATURES
				-55° C TO 125° C	0° C TO 70° C		
DUAL SINK/SOURCE MEMORY DRIVERS	400 mA	75 ns	V _{CC} = 14 V		SN75324	J,N	<ul style="list-style-type: none"> • Internal decoding and timing circuitry • Output short-circuit protection • Source output terminals swing between 14 V and ground
	600 mA	35 ns	V _{CC1} = 5 V, V _{CC2} variable to 24 V	SN55325	SN75325	J, J,N	<ul style="list-style-type: none"> • Also used for high-voltage, high-current driver applications • Output transient voltage protection • Source output terminals swing between V_{CC2} and ground
QUADRUPLE MEMORY DRIVERS		35 ns	V _{CC1} = 5 V, V _{CC2} variable to 24 V	SN55327	SN75327	J, J,N	<ul style="list-style-type: none"> • Also used for high speed magnetic memory applications • Output transient voltage protection • Output capable of swinging between V_{CC2} and ground
	600 mA	40 ns	V _{CC1} = 5 V, V _{CC2} variable to 24 V		SN75328 SN75330	J,N	<ul style="list-style-type: none"> • Also used for bubble memory applications • Output transient voltage protection • Output capable of swinging between V_{CC2} and ground • Uncommitted collectors and emitters • Common external base drive control (SN75238) • Individual external base drive control (SN75330)
QUADRUPLE SINK MEMORY DRIVER	600 mA	30 ns	V _{CC} = 5 V	SN55326	SN75326	J, J,N	<ul style="list-style-type: none"> • Also used for high-voltage, high-current driver applications • Output transient voltage protection • 24 V output capability
EIGHT-CHANNEL MEMORY DRIVER	350 mA	85 ns	V _{CC1} = 5 V, V _{CC2} = 12 V	SN55329		RA	<ul style="list-style-type: none"> • Bipolar output currents controlled to within 5% • 3-state outputs • Internal power control — does not require power supply sequencing • Contains 3-line to 8-line decoder • 24-pin ceramic flat package • Temperature range: -55° C to 110° C

† t_{PD} = Propagation Delay Time

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