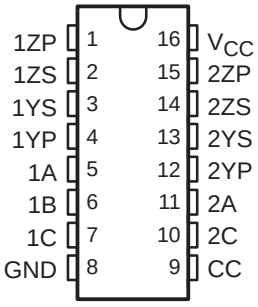
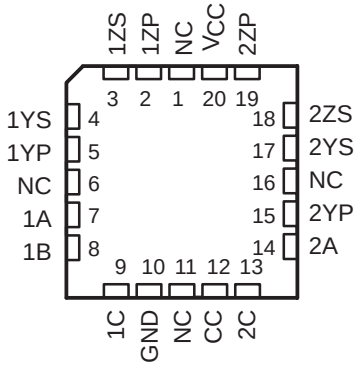
- **Choice of Open-Collector, Open-Emitter, or 3-State Outputs**
- **High-Impedance Output State for Party-Line Applications**
- **Single-Ended or Differential AND/NAND Outputs**
- **Single 5-V Supply**
- **Dual Channel Operation**
- **Compatible With TTL**
- **Short-Circuit Protection**
- **High-Current Outputs**
- **Common and Individual Output Controls**
- **Clamp Diodes at Inputs and Outputs**
- **Easily Adaptable to SN55114 and SN75114 Applications**
- **Designed for Use With SN55115 and SN75115**

SN55113 . . . J OR W PACKAGE
SN75113 . . . N PACKAGE
(TOP VIEW)



SN55113 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

The SN55113 and SN75113 dual differential line drivers with 3-state outputs are designed to provide all the features of the SN55114 and SN75114 line drivers with the added feature of driver output controls. Individual controls are provided for each output pair, as well as a common control for both output pairs. If any output 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 pullup terminals, YP and ZP, available on adjacent package pins.

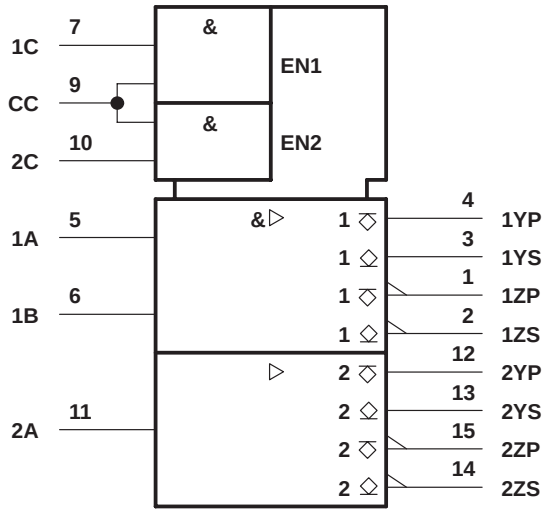
The SN55113 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN75113 is characterized for operation over the temperature range of 0°C to 70°C.

FUNCTION TABLE

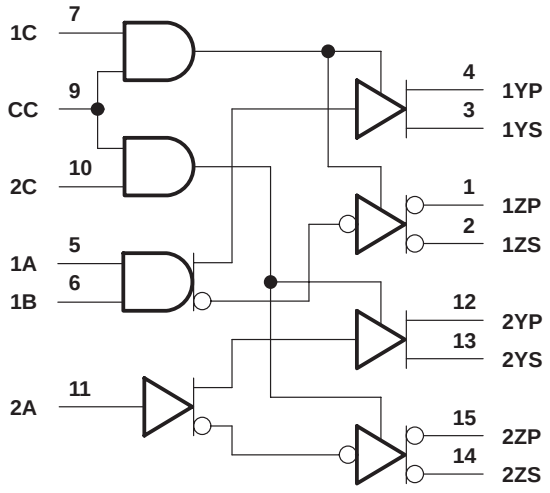
INPUTS				OUTPUTS	
OUTPUT C	CONTROL CC	DATA A	DATA B†	AND Y	NAND Z
L	X	X	X	Z	Z
X	L	X	X	Z	Z
H	H	L	X	L	H
H	H	X	L	L	H
H	H	H	H	H	L

H = high level, L = low level, X = irrelevant,
Z = high impedance (off)
† B input and 4th line of function table are applicable only to driver number 1.

logic symbol‡

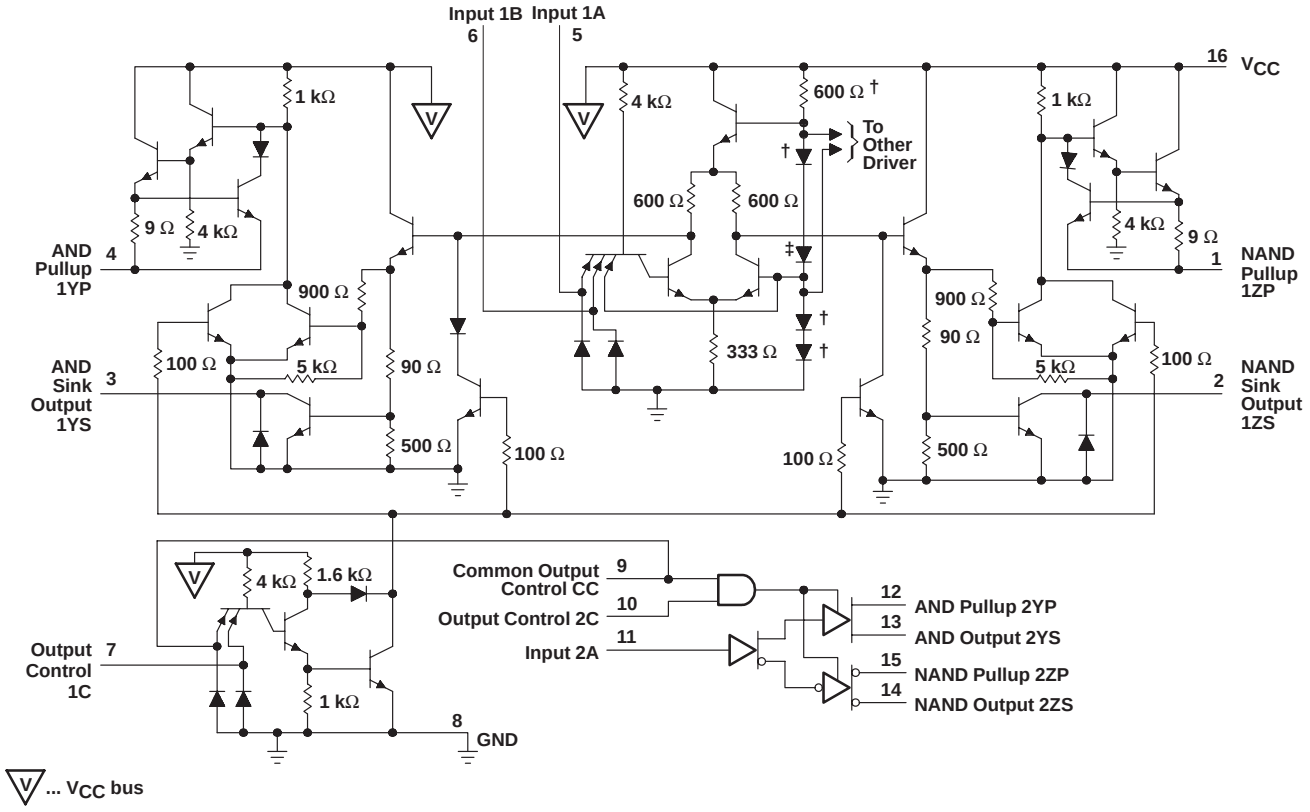


logic diagram (positive logic)



‡ This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the J, N, and W packages.

schematic



† These components are 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, V_I . . . . . 5.5 V
Off-state voltage applied to open-collector outputs . . . . . 12 V
Continuous total power dissipation (see Note 2) . . . . . See Dissipation Rating Table
Operating free-air temperature range, T_A: SN55113 . . . . . –55°C to 125°C
SN75113 . . . . . 0°C to 70°C
Storage temperature range, T_{stg} . . . . . –65°C to 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: N package . . . . . 260°C
Case temperature for 60 seconds: FK package . . . . . 260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J or W package . . . . . 300°C

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

DISSIPATION RATING TABLE

PACKAGE	$T_A \le 25°C$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25°C$	$T_A = 70°C$ POWER RATING	$T_A = 125°C$ POWER RATING
FK	1375 mW	11.0 mW/°C	880 mW	275 mW
J	1375 mW	11.0 mW/°C	880 mW	275 mW
N	1150 mW	9.2 mW/°C	736 mW	N/A
W	1000 mW	8.0 mW/°C	640 mW	200 mW

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 input voltage, V_{IH}	2			2			V
Low-level input voltage, V_{IL}			0.8			0.8	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)

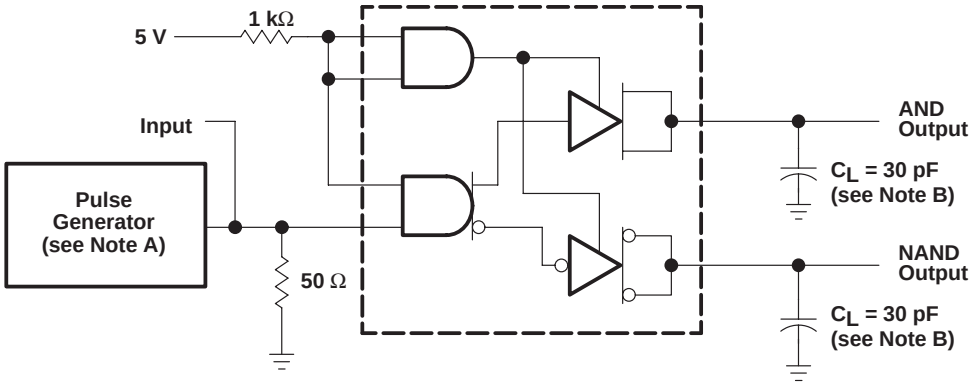
PARAMETER			TEST CONDITIONS†			SN55113			SN75113			UNIT
						MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IK}	Input clamp voltage		V_{CC} = MIN, I_I = –12 mA				–0.9	–1.5		–0.9	–1.5	V
V_{OH}	High-level output voltage		V_{CC} = MIN, V_{IL} = 0.8 V, V_{IH} = 2 V,		I_{OH} = –10 mA	2.4	3.4		2.4	3.4		V
					I_{OH} = –40 mA	2	3.0		2	3.0		
V_{OL}	Low-level output voltage		V_{CC} = MIN, I_{OL} = 40 mA, V_{IH} = 2 V,		V_{IL} = 0.8 V,		0.23	0.4		0.23	0.4	V
V_{OK}	Output clamp voltage		V_{CC} = MAX, I_O = – 40 mA				–1.1	–1.5		–1.1	–1.5	V
$I_{O(off)}$	Off-state open-collector output current		V_{CC} = MAX	V_{OH} = 12 V	T_A = 25°C		1	10				µA
					T_A = 125°C			200				
				V_{OH} = 5.25 V	T_A = 25°C					1	10	
					T_A = 70°C						20	
I_{OZ}	Off-state (high-impedance-state) output current		V_{CC} = MAX, Output controls at 0.8 V	T_A = 25°C, V_O = 0 to V_{CC}				±10			±10	µA
				T_A = MAX	V_O = 0			–150			–20	
					V_O = 0.4 V			±80			±20	
					V_O = 2.4 V			±80			±20	
					V_O = V_{CC}			80			20	
I_I	Input current at maximum input voltage	A, B, C	V_{CC} = MAX, V_I = 5.5 V					1			1	mA
		CC						2			2	
I_{IH}	High-level input current	A, B, C	V_{CC} = MAX, V_I = 2.4 V					40			40	µA
		CC						80			80	
I_{IL}	Low-level input current	A, B, C	V_{CC} = MAX, V_I = 0.4 V					–1.6			–1.6	mA
		CC						–3.2			–3.2	
I_{OS}	Short-circuit output current§		V_{CC} = MAX, V_O = 0,		T_A = 25°C	–40	–90	–120	–40	–90	–120	mA
I_{CC}	Supply current (both drivers)		All inputs at 0 V, No load, T_A = 25°C		V_{CC} = MAX		47	65		47	65	mA
					V_{CC} = 7 V		65	85		65	85	

† All parameters with the exception of off-state open-collector output current are measured with the active pullup 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, with the exception of V_{CC} at 7 V.
§ Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

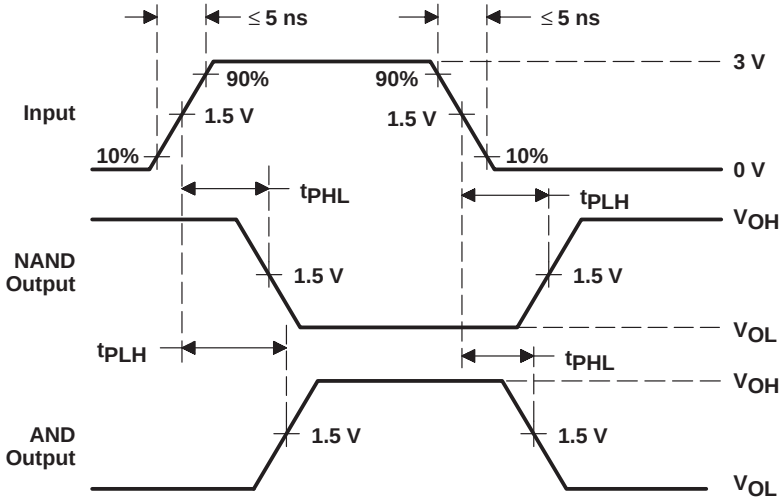
switching characteristics, V_{CC} = 5 V, C_L = 30 pF, T_A = 25°C

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 Ω, See Figure 2		7	15		7	20	ns
t_{PZL}	Output enable time to low level	R_L = 250 Ω, See Figure 3		14	30		14	40	ns
t_{PHZ}	Output disable time from high level	R_L = 180 Ω, See Figure 2		10	20		10	30	ns
t_{PLZ}	Output disable time from low level	R_L = 250 Ω, See Figure 3		17	35		17	35	ns

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

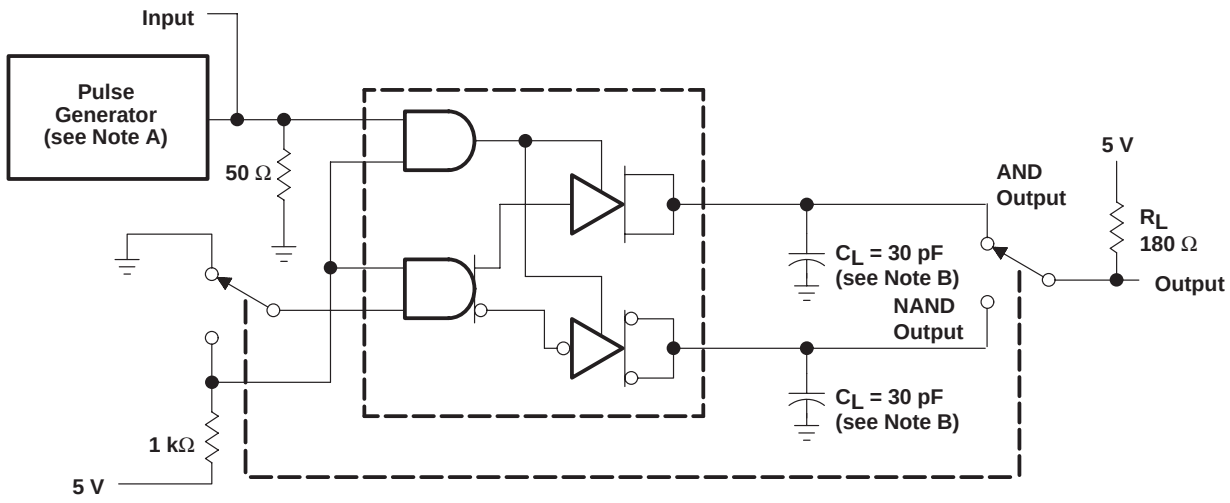


VOLTAGE WAVEFORMS

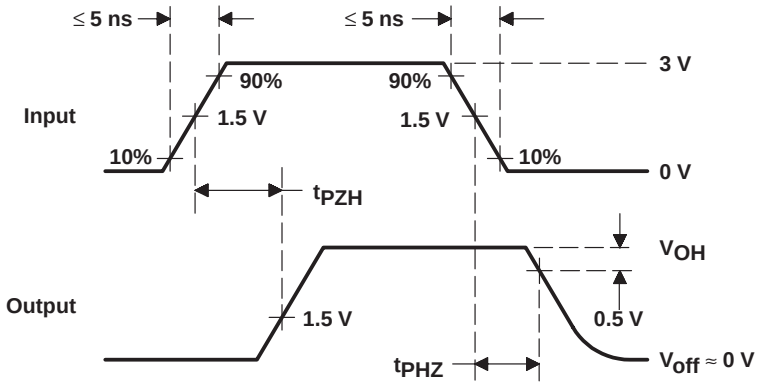
NOTES: A. The pulse generator has the following characteristics: Z_O = 50 Ω, PRR ≤ 500 kHz, t_W = 100 ns.
B. C_L includes probe and jig capacitance.

Figure 1. Test Circuit and Voltage Waveforms t_{PLH} and t_{PHL}

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT

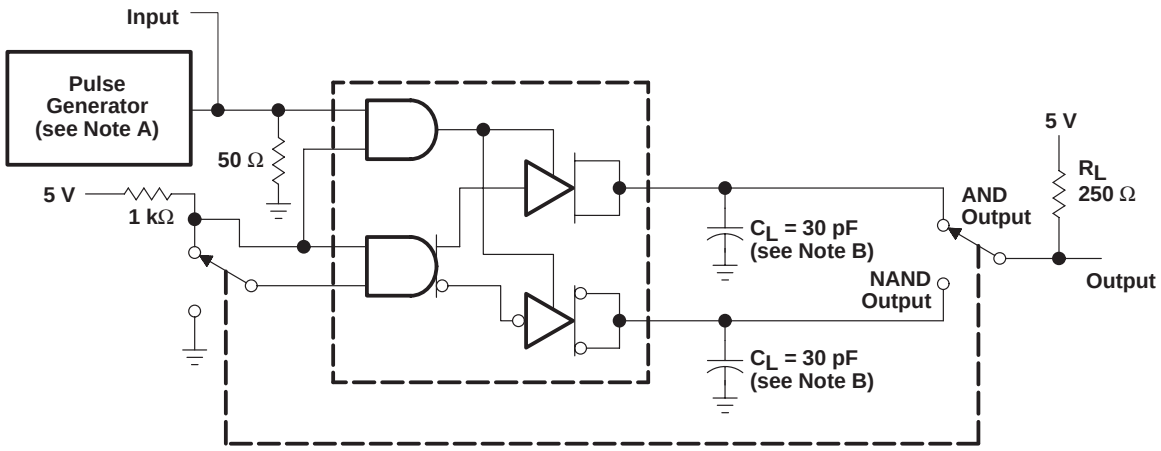


VOLTAGE WAVEFORMS

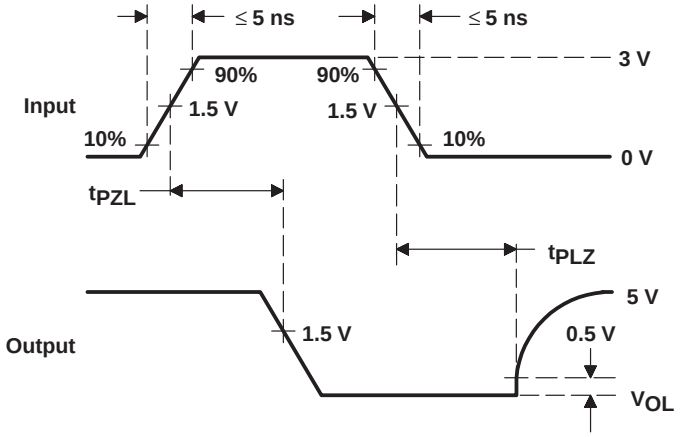
NOTES: A. The pulse generator has the following characteristics: Z_O = 50 Ω, PRR ≤ 500 kHz, t_W = 100 ns.
B. C_L includes probe and jig capacitance.

Figure 2. Test Circuit and Voltage Waveforms t_{PZH} and t_{PHZ}

PARAMETER MEASUREMENT INFORMATION



TEST CIRCUIT



VOLTAGE WAVEFORMS

NOTES: A. The pulse generator has the following characteristics: Z_O = 50 Ω, PRR ≤ 500 kHz, t_W = 100 ns.
B. C_L includes probe and jig capacitance.

Figure 3. Test Circuit and Voltage Waveforms, t_{PZL} and t_{PLZ}

TYPICAL CHARACTERISTICS†

OUTPUT VOLTAGE vs DATA INPUT VOLTAGE

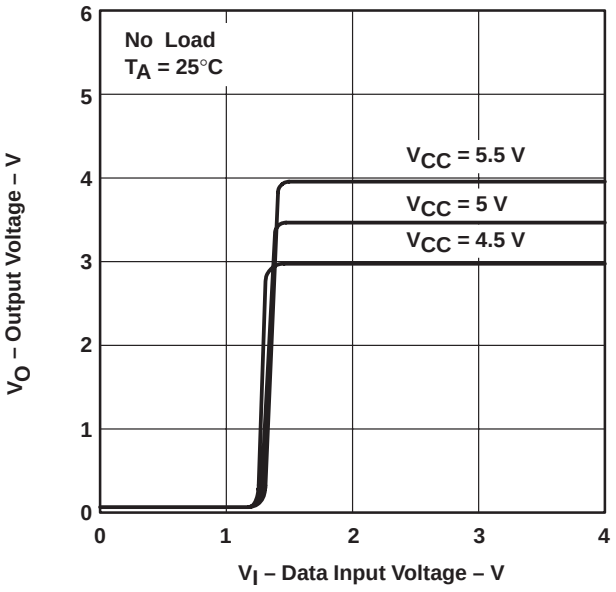


Figure 4

OUTPUT VOLTAGE vs DATA INPUT VOLTAGE

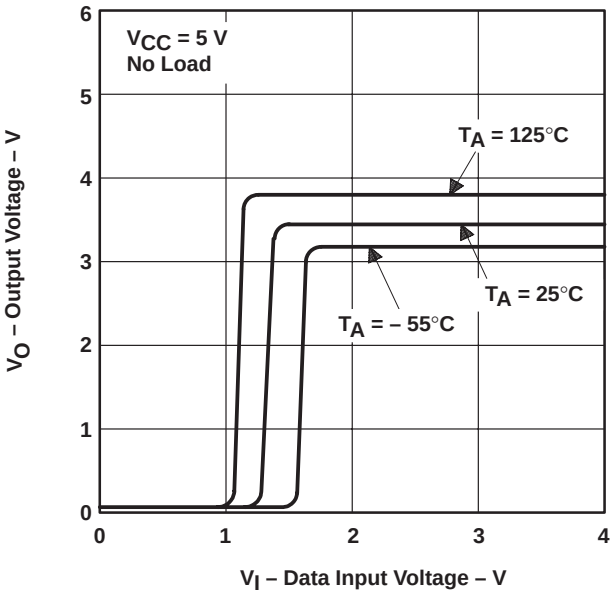


Figure 5

OUTPUT VOLTAGE vs INPUT VOLTAGE (OUTPUT CONTROL)

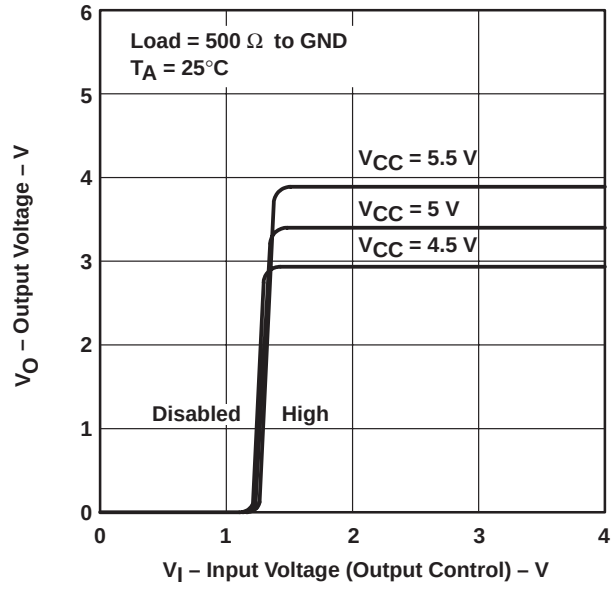


Figure 6

OUTPUT VOLTAGE vs INPUT VOLTAGE (OUTPUT CONTROL)

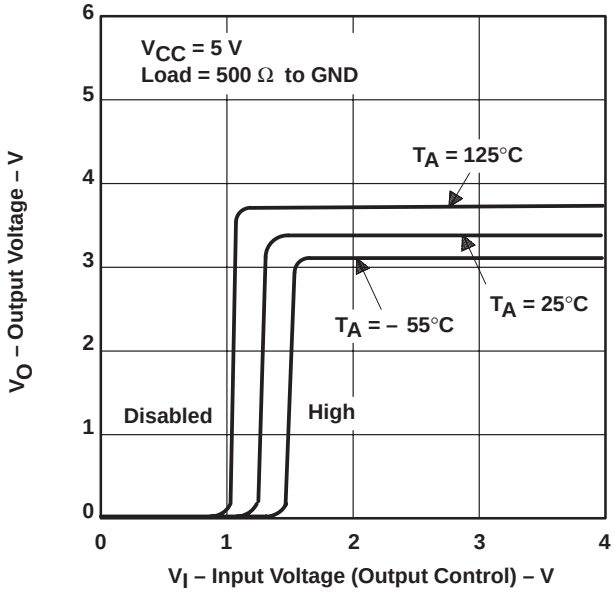


Figure 7

† 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 pullup connected to the sink output.

TYPICAL CHARACTERISTICS†

OUTPUT VOLTAGE vs INPUT VOLTAGE (OUTPUT CONTROL)

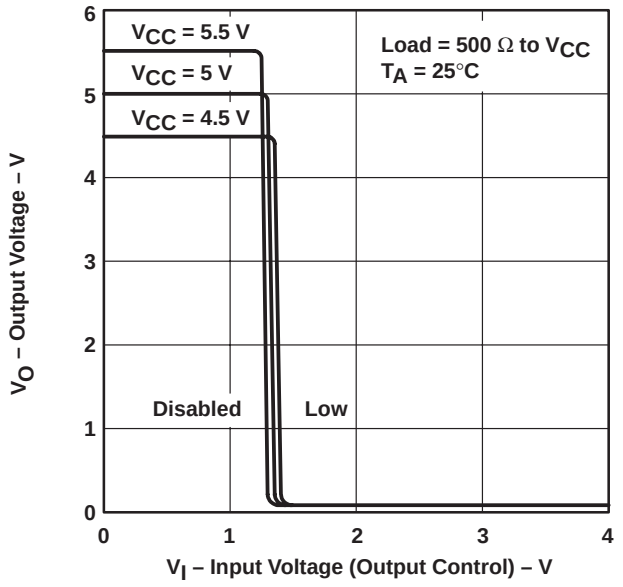


Figure 8

OUTPUT VOLTAGE vs INPUT VOLTAGE (OUTPUT CONTROL)

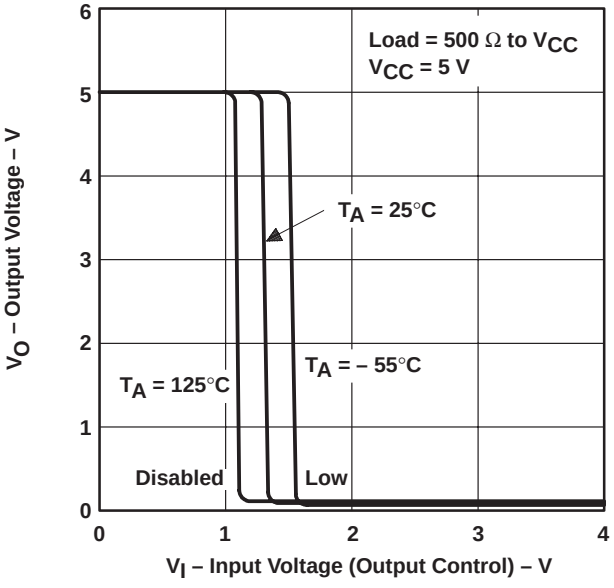


Figure 9

OUTPUT VOLTAGE vs FREE-AIR TEMPERATURE

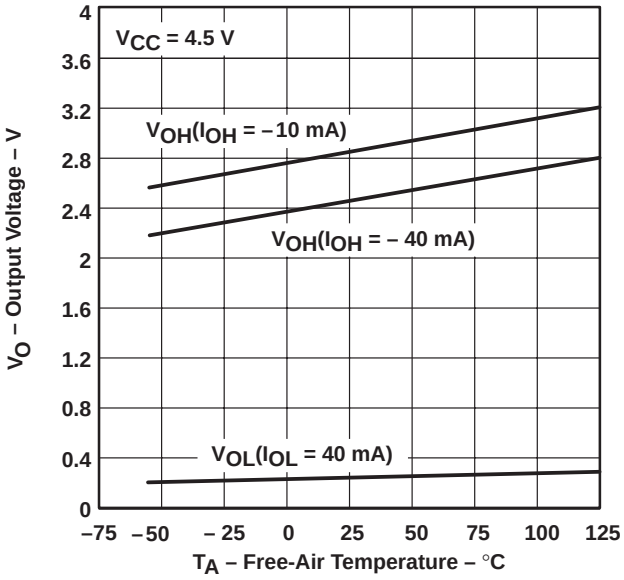


Figure 10

HIGH-LEVEL OUTPUT VOLTAGE vs OUTPUT CURRENT

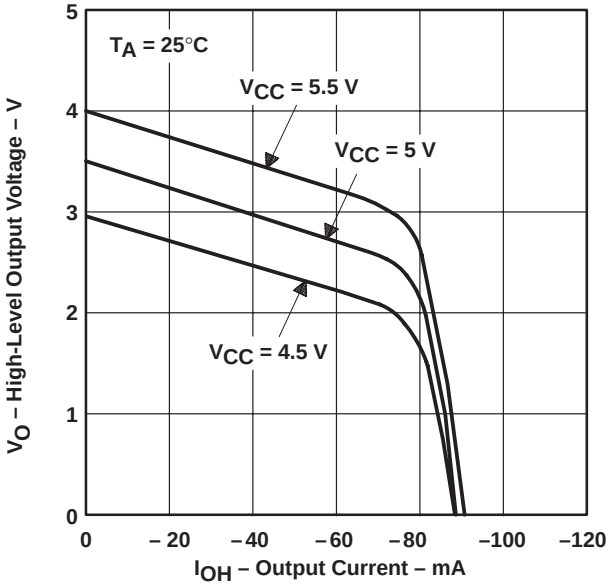


Figure 11

† 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 pullup connected to the sink output.

TYPICAL CHARACTERISTICS†

LOW-LEVEL OUTPUT VOLTAGE
vs
OUTPUT CURRENT

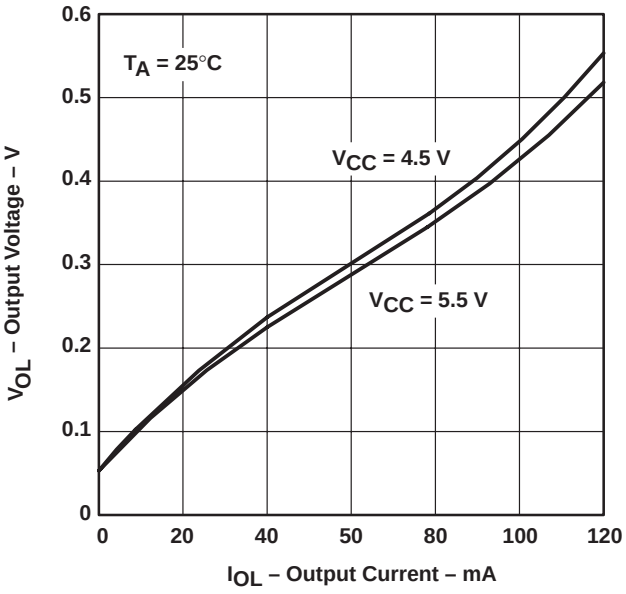


Figure 12

SUPPLY CURRENT
(BOTH DRIVERS)
vs
SUPPLY VOLTAGE

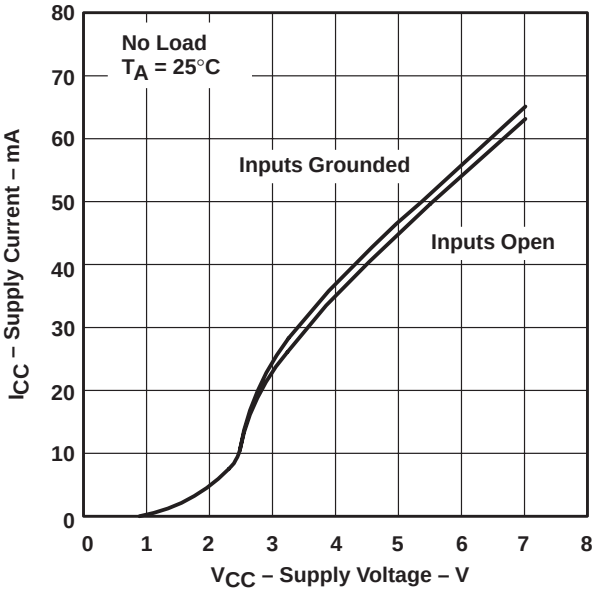


Figure 13

SUPPLY CURRENT
(BOTH DRIVERS)
vs
OUTPUT CURRENT

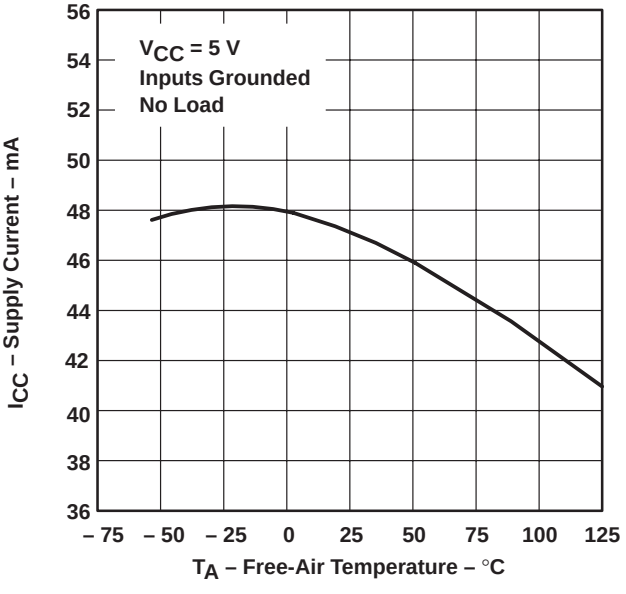


Figure 14

SUPPLY CURRENT
(BOTH DRIVERS)
vs
SUPPLY VOLTAGE

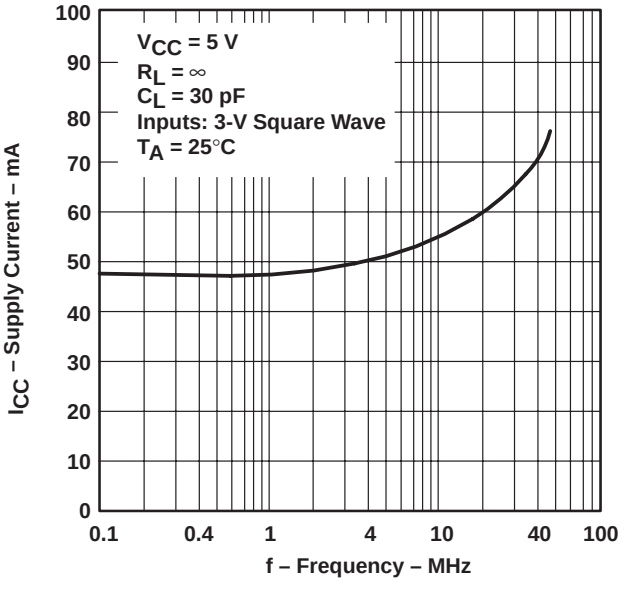


Figure 15

† 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 pullup connected to the sink output.

TYPICAL CHARACTERISTICS†

PROPAGATION DELAY TIMES FROM DATA INPUTS vs FREE-AIR TEMPERATURE

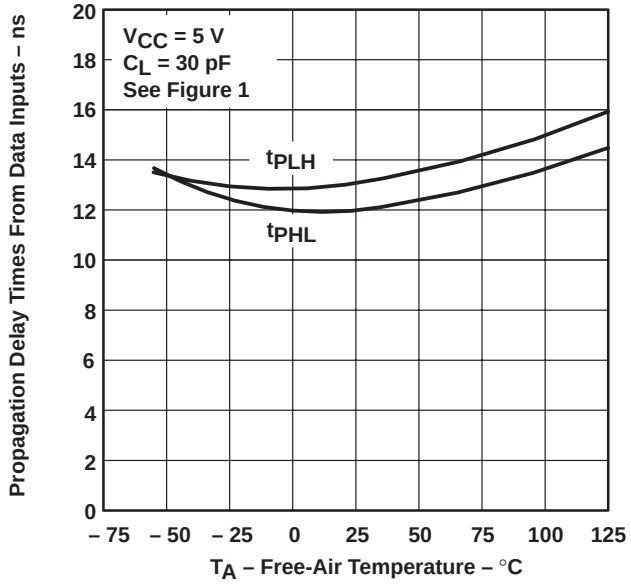


Figure 16

OUTPUT ENABLE AND DISABLE TIMES vs FREE-AIR TEMPERATURE

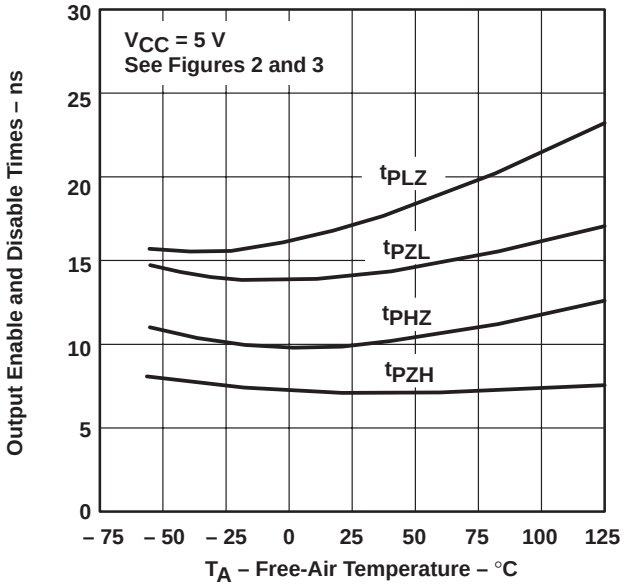
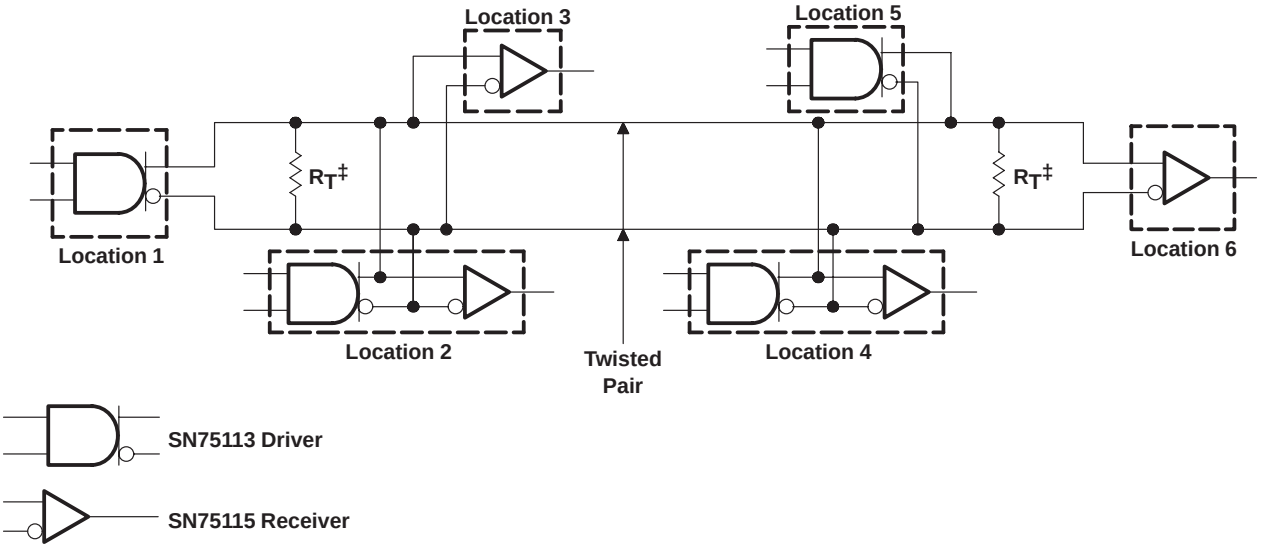


Figure 17

† Data for 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 pullup connected to the sink output.

APPLICATION INFORMATION



‡ $R_T = Z_O$. A capacitor may be connected in series with R_T to reduce power dissipation.

Figure 18. Basic Party-Line or Data-Bus Differential Data Transmission

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