

DS55113/DS75113 Dual TRI-STATE® Differential Line Driver

General Description

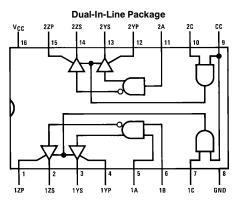
The DS55113/DS75113 dual differential line drivers with TRI-STATE outputs are designed to provide all the features of the DS55114/DS75114 line drivers with the added feature of driver output controls. There are individual controls for each output pair, as well as a common control for both output pairs. 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 partyline 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.

Features

- Each circuit offers a choice of open-collector or active pull-up (totem-pole) outputs
- Single 5V supply
- Differential line operation
- Dual channels
- TTL/LS compatibility
- 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 DS55114/DS75114 applications

Connection Diagram



Positive logic: Y = AI $Z = \overline{AI}$ Output is OFF when
C or CC is low

TL/F/5785-1

Top View
Order Number DS55113J, DS75113M or DS75113N
See NS Package Number J16A, M16A or N16A

For Complete Military 883 Specifications, see RETS Datasheet.

Order Number DS55113J/883

See NS Package Number J16A

Truth Table

	Inputs	Outputs				
Output	Output Control		ata	AND	NAND	
С	СС	Α	В*	Υ	z	
L	Х	Х	Х	Z	Z	
X	L	Х	X	Z	Z	
Н	Н	L	X	L	H*	
Н	Н	Х	L	L	Н	
Н	Н	Н	Н	Н	L	

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

driver number 1

Z = high impedance (OFF)*B input and 4th line of truth table applicable only to

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Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC}) (Note 1) Input Voltage 5.5V OFF-State Voltage Applied to Open-Collector Outputs 12V Maximum Power Dissipation* at 25°C Cavity Package 1433 mW Molded DIP Package 1362 mW SO Package 1002 mW Operating Free-Air Temperature Range DS55113 -55°C to +125°C

DS75113 0°C to +70°C

*Derate cavity package 9.6 mW/°C above 25°C; derate molded DIP package 10.9 mW/°C above 25°C; derate SO package 8.01 mW/°C above 25°C (Note 2).

Storage Temperature Range	-65°C to +150°C
Lead Temperature (1/16" from case for 60 seconds): J Package	300 °C
Lead Temperature (1/16" from case for 4 seconds): N Package	260°C

Operating Condition	าร		
-	Min	Max	Units
Supply Voltage (V _{CC})			
DS55113	4.5	5.5	V
DS75113	4.75	5.25	V
High Level Output Current (IOH)		-40	mA
Low Level Output Current (I _{OL})		40	mA
Operating Free-Air Temperature (T_A)		
DS55113	-55	125	°C
DS75113	0	70	°C

Electrical Characteristics Over recommended operating free-air temperature range (unless otherwise noted)

	Parameter Conditions (Note				DS55113			DS75113				
Symbol			e 3)	Min	Typ (Note 4)	Max	Min	Typ (Note 4)	Max	Units		
V _{IH}	High Level Input Voltage				2			2			٧	
V _{IL}	Low Level Input Voltage						0.8			0.8	V	
V _{IK}	Input Clamp Vol	tage	$V_{CC} = Min, I_I =$	-12 mA			-0.9	-1.5		-0.9	-1.5	٧
V _{OH}	High Level			= 2V,	$I_{OH} = -10 \text{ mA}$	2.4	3.4		2.4	3.4		V
	Output Voltage		$V_{IL} = 0.8V$		$I_{OH} = -40 \text{ mA}$	2	3.0		2	3.0		ľ
V _{OL}	Low Level Output Voltage		$V_{CC} = Min, V_{IH} = 2V, V_{IL} = 0.8V, I_{OL} = 40 \text{ mA}$			0.23	0.4		0.23	0.4	٧	
V _{OK}	Output Clamp V	oltage	$V_{CC} = Max, I_O = -40 \text{ mA}$			-1.1	-1.5		-1.1	-1.5	٧	
Ope	Off-State		$V_{CC} = Max$ $V_{OH} = 1$	V _{OH} = 12V	T _A = 25°C		1	10				
	Open-Collector Output Current				T _A = 125°C		200				μΑ	
	Output Current	V _{OH} = 5.25\	V _{OH} = 5.25V	T _A = 25°C					1	10	μ, (
					T _A = 70°C						20	
I_{OZ}	Off-State (High-	, •		$T_A = 25^{\circ}C, V_0$	$_{\rm O}=0$ to $V_{\rm CC}$			±10			±10	1
	Impedance-State) Output Current		Output Controls at 0.8V	T _A = May	$V_O = 0V$			-150			-20	
			at 0.0 V		$V_O = 0.4V$			±80			±20	μΑ
					V _O = 2.4V			±80			±20	
					$V_O = V_{CC}$			80			20	
II			$V_{CC} = Max, V_I$	$V_{CC} = Max, V_{I} = 5.5V$				1			1	mA
	Maximum Input Voltage	CC						2			2	
I _{IH}	High Level	A, B, C	$V_{CC} = Max, V_I = 2.4V$					40			40	μΑ
	Input Current	CC						80			80	
I _{IL}	Low Level	A, B, C	$V_{CC} = Max, V_I$	$V_{CC} = Max, V_I = 0.4V$				-1.6			-1.6	mA
	Input Current CC						-3.2			-3.2		

Electrical CharacteristicsOver recommended operating free-air temperature range (unless otherwise noted) (Continued)

			DS55113			DS75113				
Symbol	Parameter	Conditions (Note 3)			Typ (Note 4)	Max	Min	Typ (Note 4)	Max	Units
los	Short-Circuit Output Current (Note 5)	$V_{CC} = Max, V_O = 0V$		-40	-90	-120	-40	-90	-120	mA
Icc	Supply Current	All Inputs at 0V, No Load	V _{CC} = Max		47	65		47	65	mA
	(Both Drivers) $T_A = 25^{\circ}C$		$V_{CC} = 7V$		65	85		65	85	

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

Note 2: For operation above 25°C free-air temperature, refer to Dissipation Derating Curves in the Thermal information section.

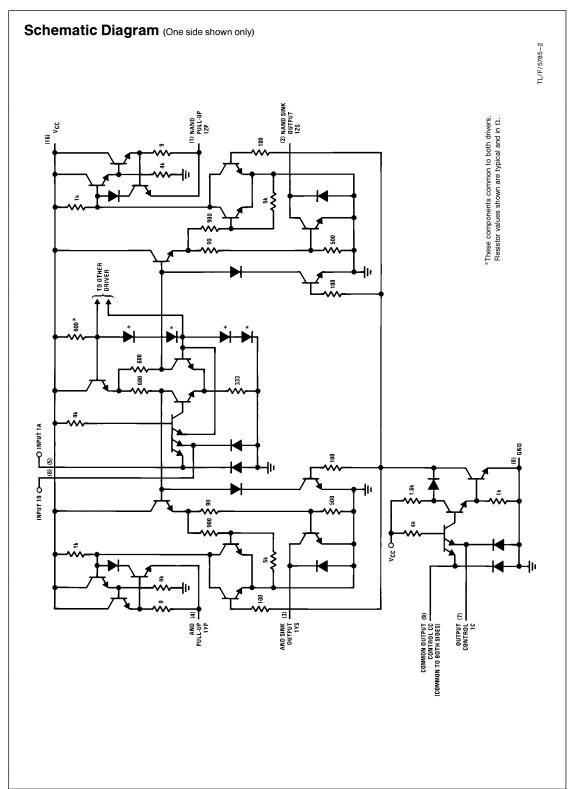
Note 3: All parameters with the exception of OFF-state open-collector output current are measured with the active pull-up connected to the sink output.

Note 4: All typical values are at $T_A = 25^{\circ}C$ and $V_{CC} = 5V$, with the exception of I_{CC} at 7V.

Note 5: Only one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

Switching Characteristics $V_{CC}=5V,\,C_L=30~pF,\,T_A=25^{\circ}C$

Symbol	Parameter	Conditions		DS5511	3	DS75113			Unit
Oymboi	T drameter	Conditions	Min	Тур	Max	Min	Тур	Max	O.III
t _{PLH}	Propagation Delay Time, Low-to High-Level Output	(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	$R_L = 180\Omega$, (Figure 2)		7	15		7	20	ns
t _{PZL}	Output Enable Time to Low Level	$R_L = 250\Omega$, (Figure 3)		14	30		14	40	ns
t _{PHZ}	Output Disable Time from High Level	$R_L = 180\Omega$, (Figure 2)		10	20		10	30	ns
t _{PLZ}	Output Disable Time from Low Level	$R_L = 250\Omega$, (Figure 3)		17	35		17	35	ns



AC Test Circuits and Switching Time Waveforms

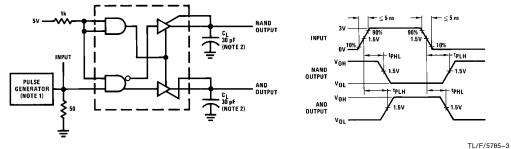


FIGURE 1. $t_{\mbox{\scriptsize PLH}}$ and $t_{\mbox{\scriptsize PHL}}$

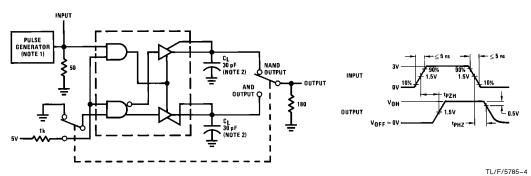


FIGURE 2. $t_{\mbox{\scriptsize PZH}}$ and $t_{\mbox{\scriptsize PHZ}}$

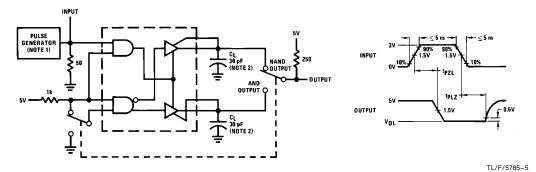
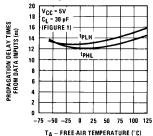
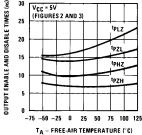


FIGURE 3. $t_{\mbox{\scriptsize PZL}}$ and $t_{\mbox{\scriptsize PLZ}}$

Note 1: The pulse generator has the following characteristics: $Z_{OUT}=50\Omega$, PRR = 500 kHz, $t_W=100$ ns. Note 2: C_L includes probe and jig capacitance.

Typical Performance Characteristics* **Output Voltage vs Output Output Voltage vs Output Output Voltage vs Output** Control Voltage Control Voltage **Control Voltage** LOAD = 5000 TO GROUND LOAD = 5000 TO VCC VCC = 5.5V VCC = 5V V_{CC} = 5V · OUTPUT VOLTAGE (V) V₀ - OUTPUT VOLTAGE (V) VCC = 5V OUTPUT VOLTAGE (V) = 25°C T_A = 125°C T_A = 25° HIGH 2 T_A = 25°C DISABLE $V_{I} = INPUT VOLTAGE (OUTPUT CONTROL) (V)$ V_I - INPUT VOLTAGE (OUTPUT CONTROL) (V) V_I – INPUT VOLTAGE (OUTPUT CONTROL) (V) **High Level Output Low Level Output** Output Voltage vs Free-Air Voltage vs Output Voltage vs Output **Temperature** Current Current T_A = 25°C T_A = 25°C 3.6 VOH - OUTPUT VOLTAGE (V) · DUTPUT VOLTAGE (V) - OUTPUT VOLTAGE (V) 3.2 V_{CC} = 5V 2.8 2 0.3 VOH (IO 1.6 0.2 1.2 0.8 ģ 0.4 -75 -50 -25 0 25 50 75 100 125 -40 -60 -80 -100 -120 40 60 80 IOH - OUTPUT CURRENT (mA) IOL - OUTPUT CURRENT (mA) TA - FREE-AIR TEMPERATURE (°C) Supply Current (Both **Supply Current (Both** Drivers) vs Free-Air **Supply Current (Both Drivers) vs Supply Voltage** Temperature **Drivers) vs Frequency** NO LOAD V_{CC} = 5V INPUTS GROUNDED NO LOAD V_{CC} = 5V ICC - SUPPLY CURRENT (mA) SUPPLY CURRENT (mA) SUPPLY CURRENT (mA) 52 C_L = 30 pF INPUTS: 3V 60 50 INPUTS GRO 50 T_A = 25°C 60 46 40 44 30 40 42 20 8 40 9 20 38 _75 _50 _25 0 25 50 75 100 125 3 4 5 6 7 2 0.1 0.4 4 10 V_{CC} - SUPPLY VOLTAGE (V) TA - FREE-AIR TEMPERATURE (°C) f - FREQUENCY (MHz) **Propagation Delay Times** from Data Inputs vs Free-Air **Output Enable and Disable Temperature** Times vs Free-Air Temperature

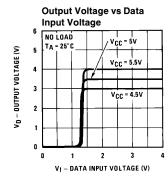


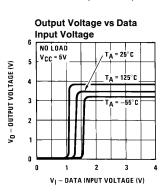


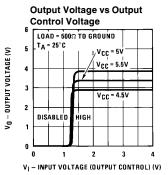
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*Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75V and above 5.25V are applicable to DS55113 circuits only. These parameters were measured with the active pull-up connected to the sink output.

Typical Performance Characteristics* (Continued)

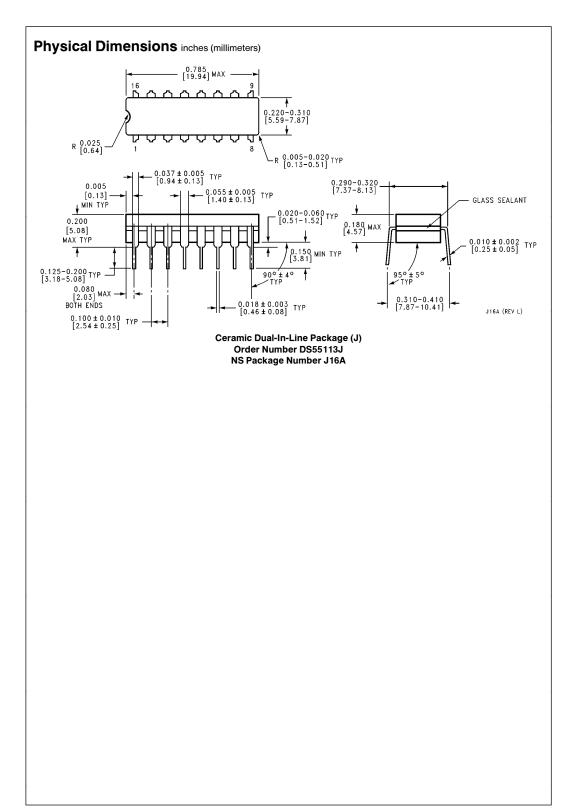




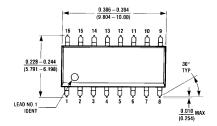


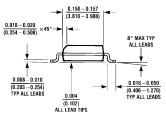
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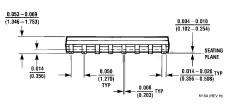
^{*}Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75V and above 5.25V are applicable to DS55113 circuits only. These parameters were measured with the active pull-up connected to the sink output.



Physical Dimensions inches (millimeters) (Continued)

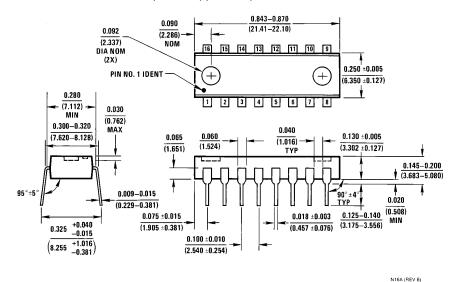






SO Package (M) Order Number DS75113M NS Package Number M16A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N) Order Number DS75113N NS Package Number N16A

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