National Semiconductor

January 1996

DS75115/DS9615 Dual Differential Line Receiver

General Description

The DS75115/DS9615 is a dual differential line receiver designed to sense differential signals from data transmission lines. Designed for operation over military and commercial temperature ranges, the DS75115/DS9615 can typically receive ±500 mV differential data with ±15V common-mode noise. Outputs are open-collector and give TTL compatible signals which are a function of the polarity of the differential input signal. Active output pull-ups are also available, offering the option of an active TTL pull-up through an external connection.

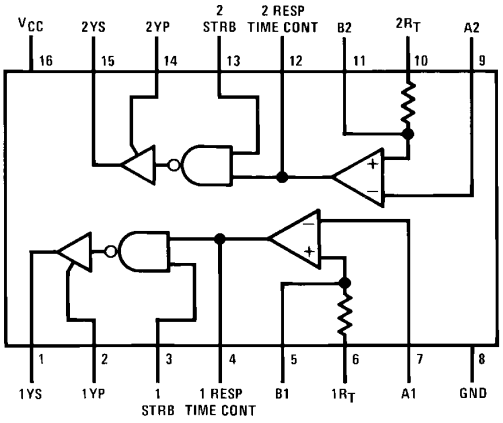
Response time may be controlled with the use of an external capacitor. Each channel may be independently controlled and optional input termination resistors are also available.

Features

- Single 5V supply
- High common-mode voltage range
- Each channel individually strobed
- Independent response time control
- Uncommitted collector or active pull-up option
- TTL compatible output
- Optional 130Ω termination resistors
- Direct replacement for 9615

Connection Diagram

Dual-In-Line Package



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Top View

Order Number DS75115N
See NS Package Number N16A

For Complete Military 883 Specifications, See RETS Datasheet.
Order Number DS9615MJ/883, DS9615ME/883

Function Table

Strobe	Diff. Input	Output
L	X	H
H	L	H
H	H	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

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)	7V
Input Voltage at A, B and R_T Inputs	±25V
Input Voltage at Strobe Input	5.5V
Off-State Voltage Applied to Open-Collector Outputs	14V
Maximum Power Dissipation* at 25°C	
Cavity Package	1433 mW
Molded Package	1362 mW
Operating Free-Air Temperature Range	
DS9615M	−55°C to +125°C
DS57115	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature ($1/16$ inch from case for 4 seconds)	260°C

*Derate cavity package 9.6 mW/°C above 25°C; derate molded package 10.9 mW/°C above 25°C.

Operating Conditions

	Min	Max	Units
Supply Voltage, (V_{CC})			
DS9615M	4.5	5.5	V
DS75115	4.75	5.25	V
High Level Output Current (I_{OH})		−5	mA
Low Level Output Current (I_{OL})		15	mA
Operating Temperature (T_A)			
DS9615M	−55	125	°C
DS75115	0	70	°C

Electrical Characteristics (Notes 2, 3 and 5)

Symbol	Parameter	Conditions		DS75115			Units
				Min	Typ	Max	
V_{TH}	Differential Input High-Threshold Voltage	V_O = 0.4V, I_{OL} = 15 mA, V_{IC} = 0V			200	500	mV
V_{TL}	Differential Input Low-Threshold Voltage	V_O = 2.4V, I_{OH} = −5 mA, V_{IC} = 0V			−200	−500	mV
V_{ICR}	Common-Mode Input Voltage Range	V_{ID} = ±1V		15 to −15	24 to −19		V
$V_{IH(STROBE)}$	High-Level Strobe Input Voltage			2.4			V
$V_{IL(STROBE)}$	Low-Level Strobe Input Voltage					0.4	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, V_{ID} = −0.5V, I_{OH} = −5 mA	T_A = Min	2.4			V
			T_A = 25°C	2.4	3.4		
			T_A = Max	2.4			
V_{OL}	Low Level Output Voltage	V_{CC} = Min, V_{ID} = 0.5V, I_{OL} = 15 mA			0.22	0.45	V
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V, Other Input at 5.5V	T_A = Min			−0.9	mA
			T_A = 25°C		−0.5	−0.7	
			T_A = Max			−0.7	
I_{SH}	High Level Strobe Current	V_{CC} = Min, V_{ID} = −0.5V, V_{STROBE} = 4.5V	T_A = 25°C		0.5	5	μA
			T_A = Max			10	
I_{SL}	Low Level Strobe Current	V_{CC} = Max, V_{ID} = 0.5V, V_{STROBE} = 0.4V	T_A = 25°C		−1.15	−2.4	mA
I_4, I_{12}	Response Time Control Current (Pin 4 or Pin 12)	V_{CC} = Max. V_{ID} = 0.5V, V_{RC} = 0V	T_A = 25°C	−1.2	−3.4		mA
$I_{O(OFF)}$	Off-State Open-Collector Output Current	V_{CC} = Min, V_{OH} = 12V, V_{ID} = −4.5V	T_A = 25°C				μA
			T_A = Max				
		V_{CC} = Min, V_{OH} = 5.25V, V_{ID} = −4.75V	T_A = 25°C			100	
			T_A = Max			200	

Electrical Characteristics (Notes 2, 3 and 5) (Continued)

Symbol	Parameter	Conditions		DS75115			Units
				Min	Typ	Max	
R_T	Line Terminating Resistance	V_{CC} = 5V	T_A = 25°C	74	130	179	Ω
I_{OS}	Short-Circuit Output Current	V_{CC} = Max, V_O = 0V, V_{ID} = −0.5V, (Note 4)	T_A = 25°C	−14	−40	−100	mA
I_{CC}	Supply Current (Both Receivers)	V_{CC} = Max, V_{ID} = 0.5V, V_{IC} = 0V	T_A = 25°C		32	50	mA

Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for the actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the −55°C to +125°C temperature range for the DS9615M and across the 0°C to +70°C range for the DS75115. All typical values are for T_A = 25°C, V_{CC} = 5V and V_{CM} = 0V.

Note 3: All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

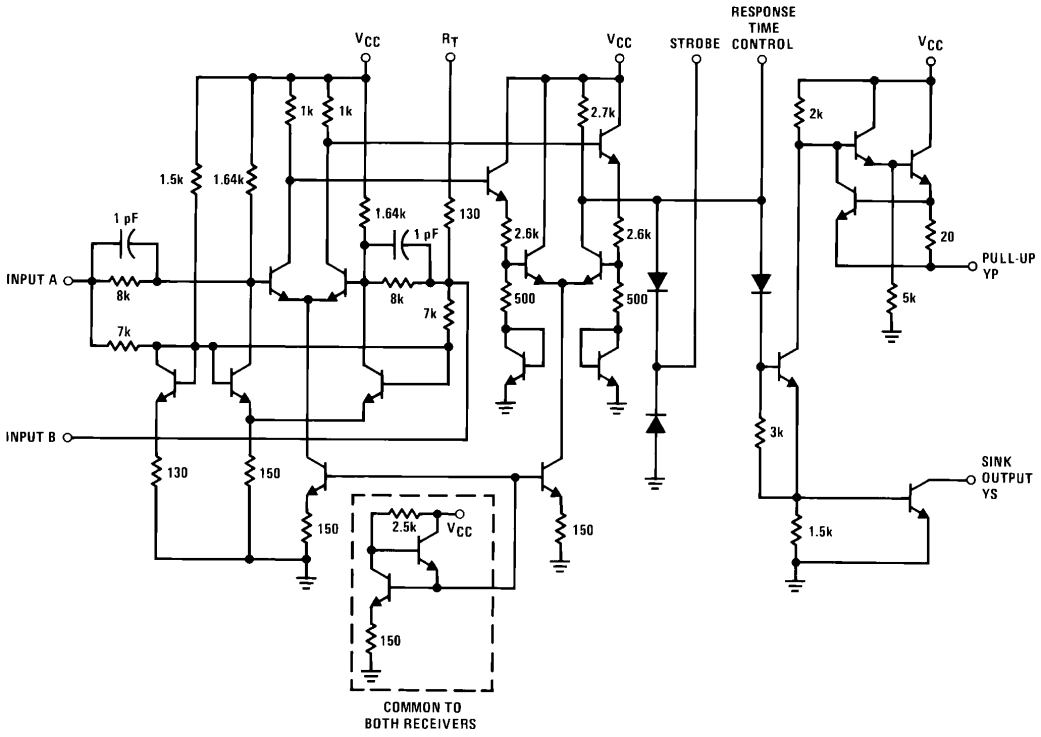
Note 4: Only one output at a time should be shorted.

Note 5: Unless otherwise noted, V_{STROBE} = 2.4V. All parameters with the exception of off-state open-collector output current are measured with the active pull-up connected to the sink output.

Switching Characteristics V_{CC} = 5V, C_L = 30 pF, T_A = 25°C

Symbol	Parameter	Conditions	DS75115			Units
			Min	Typ	Max	
t_{PLH}	Propagation Delay Time, Low-to-High Level Output	R_L = 3.9 kΩ, *(Figure 1)*		18	75	ns
t_{PHL}	Propagation Delay Time, High-to-Low Level Output	R_L = 390Ω, *(Figure 1)*		20	75	ns

Schematic Diagram



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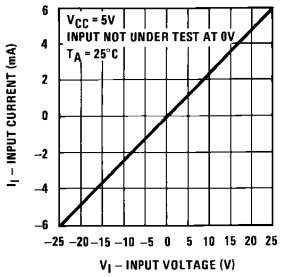
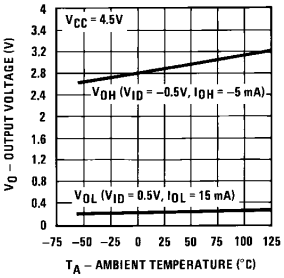
Typical Performance Characteristics (Note 3)

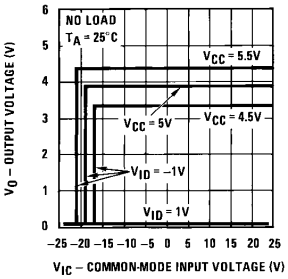
Input Current vs Input Voltage



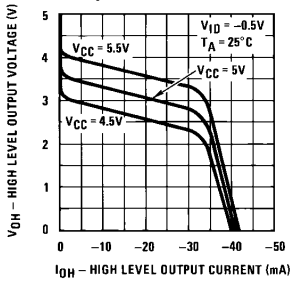
Output Voltage vs Temperature



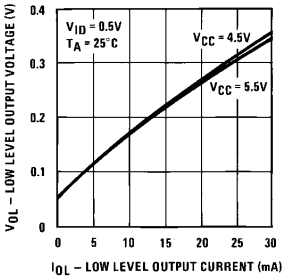
Output Voltage vs Common-Mode Input Voltage



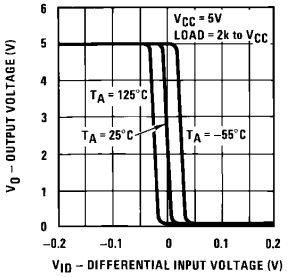
High Level Output Voltage vs Output Current



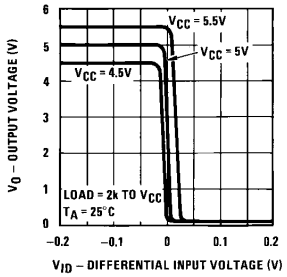
Low Level Output Voltage vs Output Current



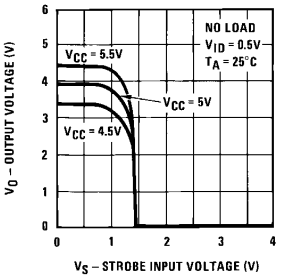
Output Voltage vs Differential Input Voltage



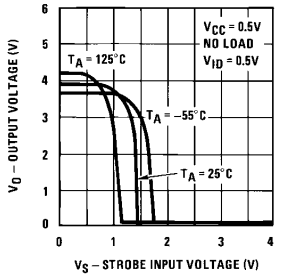
Output Voltage vs Differential Input Voltage



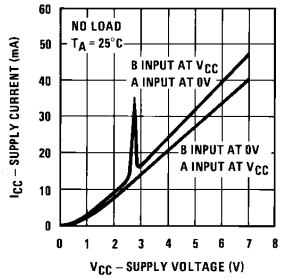
Output Voltage vs Strobe Input Voltage



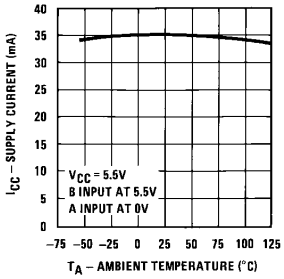
Output Voltage vs Strobe Input Voltage



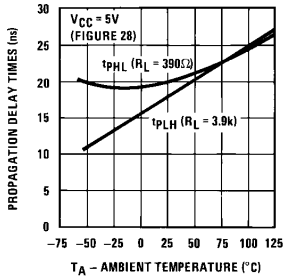
Supply Current (Both Receivers) vs Supply Voltage



Supply Current (Both Receivers) vs Temperature



Propagation Delay Times vs Temperature



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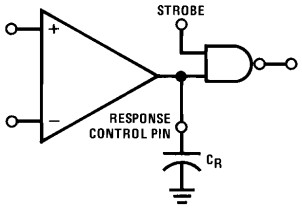
Frequency Response Control



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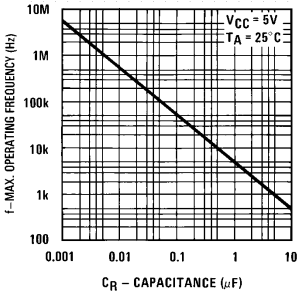
Note: C_R (response control) > 0.01 μF may cause slowing of rise and fall times of the output.

Frequency Response as a Function of Capacitance



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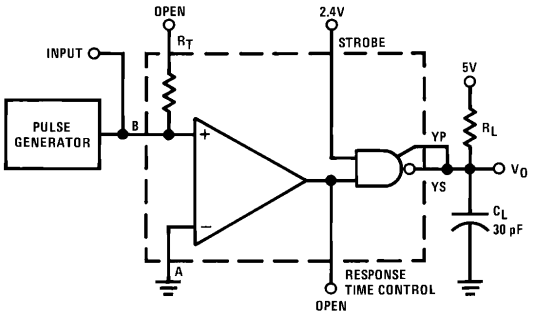
AC Test Circuit and Switching Time Waveforms



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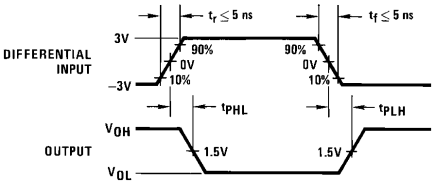

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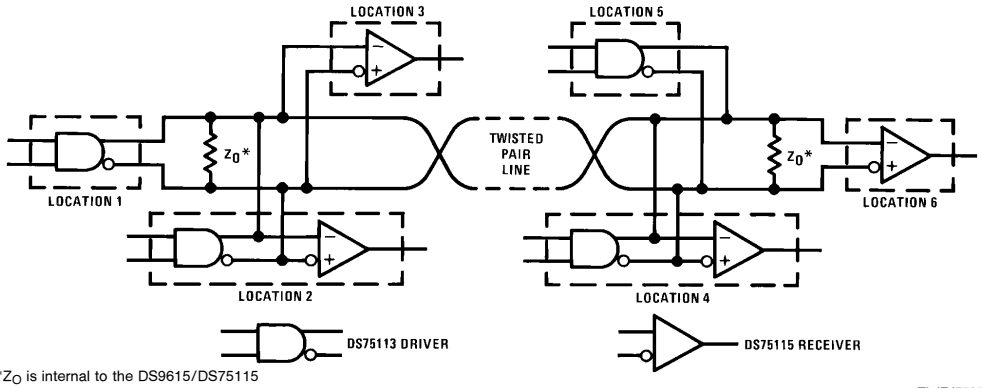
FIGURE 1. Propagation Delay Time (Notes 1, 2)

Note 1: The pulse generator has the following characteristics: Z_{OUT} = 50Ω, PRR = 500 kHz/t_W = 100 ns

Note 2: C_L includes probe and test fixture capacitance

Typical Application

Basic Party-Line or Data-Bus Differential Data Transmission



*Z_O is internal to the DS9615/DS75115

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

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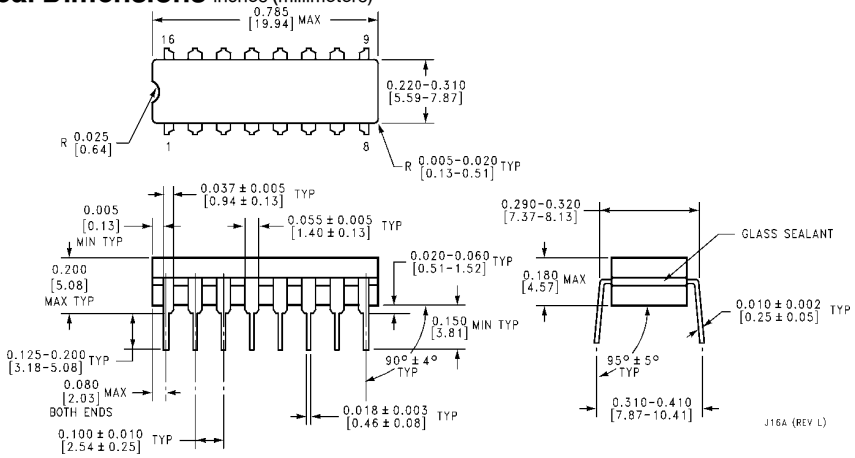
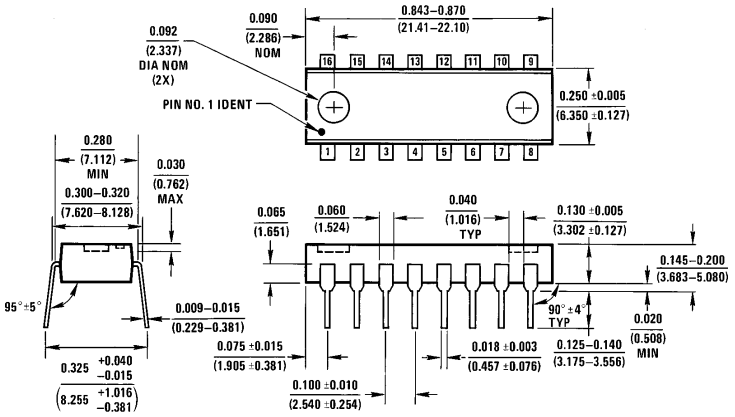
Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number DS55115J or DS75115J
NS Package Number J16A



Molded Dual-In-Line Package (N)
Order Number DS75115N
NS Package Number N16A

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