National Semiconductor

July 1992

DS3662
Quad High Speed Trapezoidal™ Bus Transceiver

General Description

The DS3662 is a quad high speed Schottky bus transceiver intended for use with terminated 120Ω impedance lines. It is specifically designed to reduce noise in unbalanced transmission systems. The open collector drivers generate precise trapezoidal waveforms with rise and fall times of 15 ns (typical), which are relatively independent of capacitive loading conditions on the outputs. This reduces noise coupling to the adjacent lines without any appreciable impact on the maximum data rate obtainable with high speed bus transceivers. In addition, the receivers use a low pass filter in conjunction with a high speed comparator, to further enhance the noise immunity. Tightly controlled threshold levels on the receiver provide equal rejection to both negative and positive going noise pulses on the bus.

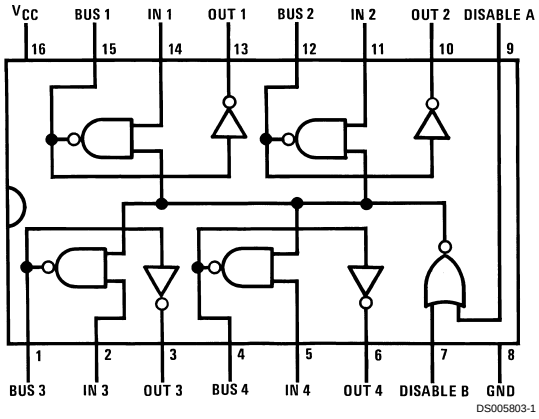
The external termination is intended to be a 180Ω resistor from the bus to 5V logic supply, together with a 390Ω resistor from the bus to ground. The bus can be terminated at one or both ends. A two input NOR gate is provided to disable all drivers in a package simultaneously.

Features

- Pin to pin functional replacement for DS8641
- Guaranteed AC specifications on noise immunity and propagation delay over the specified temperature and supply voltage range
- Temperature insensitive receiver thresholds track bus logic level
- Trapezoidal bus waveforms reduce noise coupling to adjacent lines
- Precision receiver thresholds provide maximum noise immunity and symmetrical response to positive and negative going pulses
- Open collector driver output allows wire-OR connection
- High speed Schottky technology
- 15 µA typical bus termination current with normal V_{CC} or with V_{CC} = 0V
- Glitch free power up/down protection on the driver output
- TTL compatible driver and disable inputs, and receiver outputs

Block and Connection Diagram

Dual-In-Line Package



Top View
Order Number DS3662J, DS3662N or DS3662WM
See NS Package Number J16A, N16A or M16B

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Absolute Maximum Ratings (Note 2)

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

Supply Voltage	7V
Input and Output Voltage	5.5V
Storage Temperature Range	−65˚C to +150˚C
Maximum Power Dissipation (Note 1) at 25˚C	
Cavity Package	1509 mW
Molded Package	1476 mW
Lead Temperature (Soldering, 4 sec.)	260˚C

Recommended Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	4.75	5.25	V
Temperature Range (T_A)	0	70	˚C

Note 1: Derate cavity package 10.1 mW/˚C above 25˚C; derate molded package 11.8 mW/˚C above 25˚C.

Electrical Characteristics (Notes 3, 4)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DRIVER AND DISABLE INPUTS						
V_{IH}	Logical “1” Input Voltage		2.0			V
V_{IL}	Logical “0” Input Voltage				0.8	V
I_I	Logical “1” Input Current	V_{IN} = 5.5V			1	mA
I_{IH}	Logical “1” Input Current	V_{IN} = 2.4V			40	µA
I_{IL}	Logical “0” Input Current	V_{IN} = 0.4V		−1	−1.6	mA
V_{CL}	Input Diode Clamp Voltage	I_{CLAMP} = −12 mA		−0.8	−1.5	V
DRIVER OUTPUT/RECEIVER INPUT						
V_{OLB}	Low Level Bus Voltage	V_{DIS} = 0.8V, V_{IN} = 2V, I_{BUS} = 100 mA		0.6	0.9	V
I_{IHB}	Maximum Bus Current	V_{IN} = 0.8V, V_{BUS} = 4V, V_{CC} = 5.25V		10	100	µA
I_{ILB}	Maximum Bus Current	V_{IN} = 0.8V, V_{BUS} = 4V, V_{CC} = 0V			100	µA
V_{IH}	High Level Receiver Threshold	V_{IN} = 0.8V, V_{OL} = 16 mA	1.90	1.70		V
V_{IL}	Low Level Receiver Threshold	V_{IN} = 0.8V, I_{OH} = −400 µA		1.70	1.50	V
RECEIVER OUTPUT						
V_{OH}	Logical “1” Output Voltage	V_{IN} = 0.8V, V_{BUS} = 0.5V, I_{OH} = −400 µA	2.4	3.2		V
V_{OL}	Logical “0” Output Voltage	V_{IN} = 0.8V, V_{BUS} = 4V, I_{OL} = 16 mA		0.35	0.5	V
I_{OS}	Output Short Circuit Current	V_{DIS} = 0.8V, V_{IN} = 0.8V, V_{BUS} = 0.5V, V_{OS} = 0V, V_{CC} = 5.25V, (Note 5)	−40	−70	−100	mA
I_{CC}	Supply Current	V_{DIS} = 0V, V_{IN} = 2V		50	90	mA

Switching Characteristics (Notes 3, 4)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
PROPAGATION DELAYS						
t_{PLHD}	Disable to Bus “1”	*Figure 1*		25	35	ns
t_{PHLD}	Disable to Bus “0”			25	35	ns
t_{PLHB}	Driver Input to Bus “1”	*Figure 2*		20	30	ns
t_{PHLB}	Driver Input to Bus “0”			20	30	ns
t_{PLHR}	Bus to Logical “1” Receiver Output	*Figure 3*		25	40	ns
t_{PHLR}	Bus to Logical “0” Receiver Output			25	40	ns
NOISE IMMUNITY						
t_{rB}, t_{fB}	Rise and Fall Times (10%–90%) of the Driver Output	*Figure 2*	10	15	20	ns
t_{nR}	Receiver Noise Rejection Pulse Width	No Response at Receiver Output as per *Figure 4*		20	10	ns

Note 2: “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the devices should be operated at these limits. The tables of “Electrical Characteristics” and “Recommended Operating Conditions” provide conditions for actual device operation.

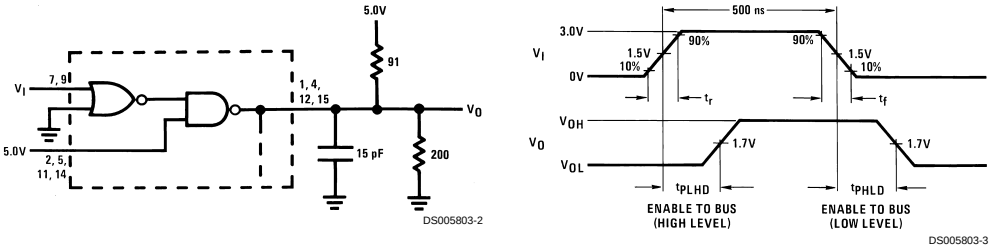
Note 3: Unless otherwise specified min/max limits apply across the supply and temperature range listed in the table of “Recommended Operating Conditions”. All typical values are for T_A = 25˚C and V_{CC} = 5V.

Note 4: 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.

Switching Characteristics (Notes 3, 4) (Continued)

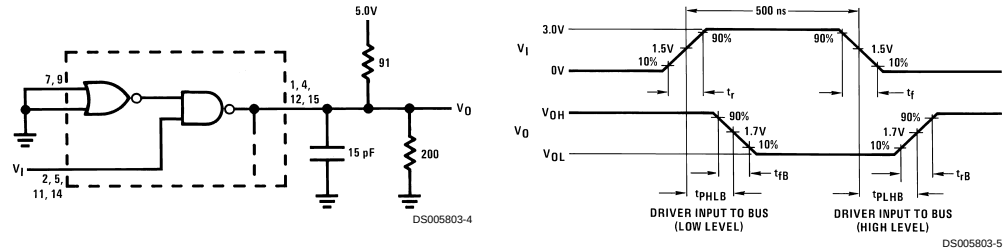
Note 5: Only one output at a time should be shorted.

AC Test Circuits and Switching Waveforms



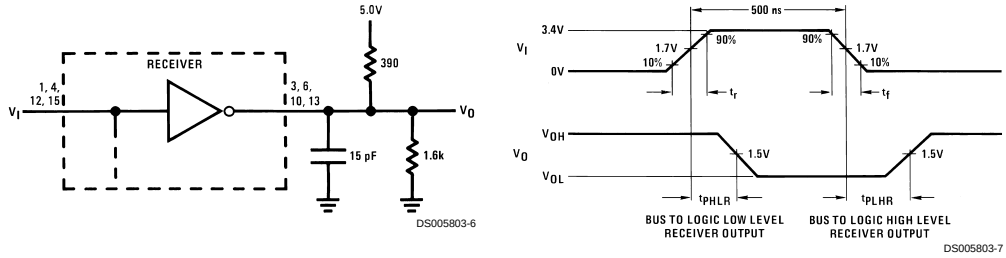
Note: $t_r = t_f = 2.5$ ns. Pulse width = 500 ns measured between 1.5V levels. f = 1 MHz.

FIGURE 1. Disable Delays



Note: $t_r = t_f = 2.5$ ns. Pulse width = 500 ns measured between 1.5V levels. f = 1 MHz.

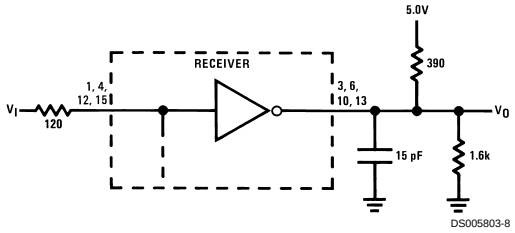
FIGURE 2. Driver Propagation Delays



Note: $t_r = t_f = 15$ ns. Pulse width = 500 ns measured between 1.7V levels. f = 1 MHz.

FIGURE 3. Receiver Propagation Delays

AC Test Circuits and Switching Waveforms (Continued)



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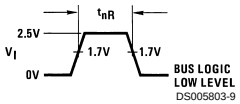

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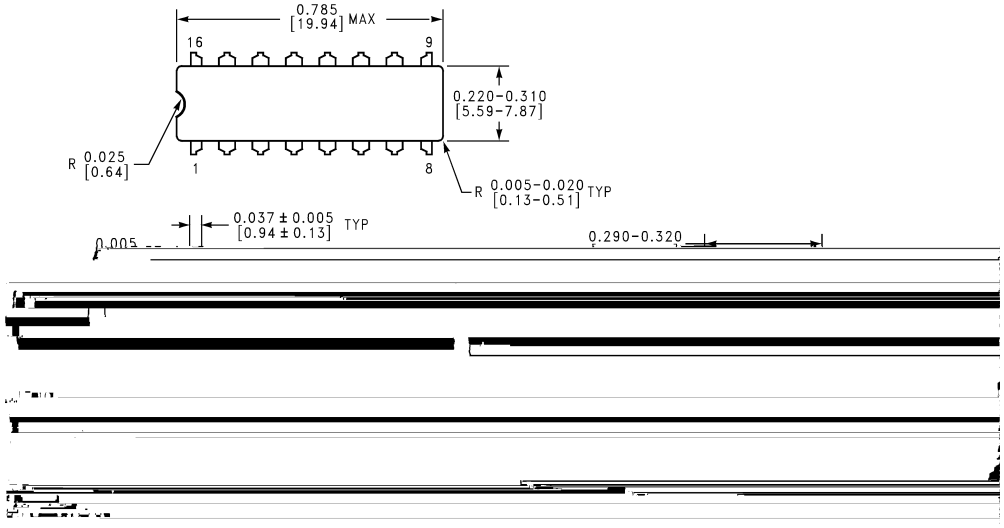
$t_r = t_f = 2.5$ ns

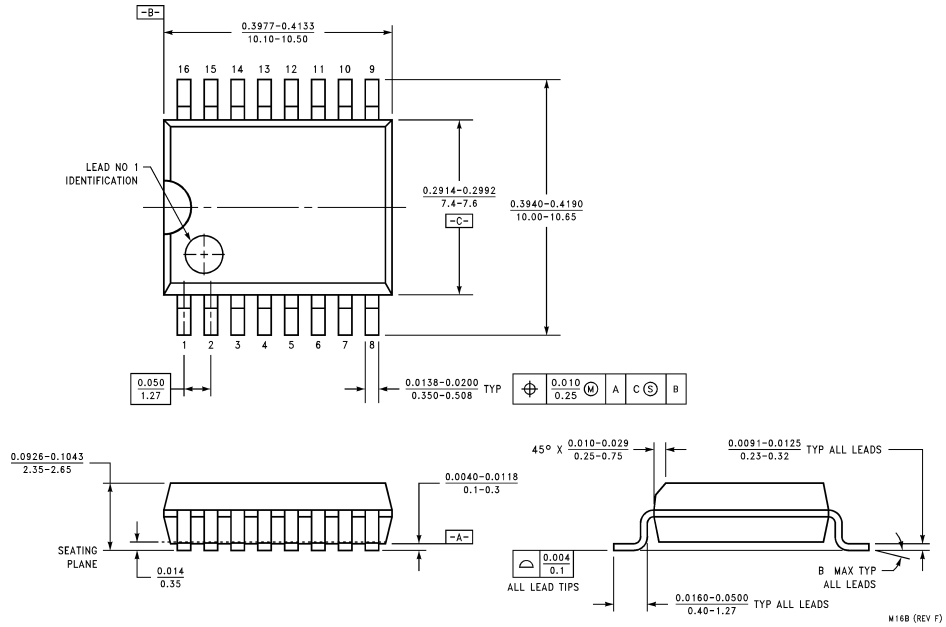
(a) Receiver Output (V_O

Typical Application

Physical Dimensions inches (millimeters) unless otherwise noted

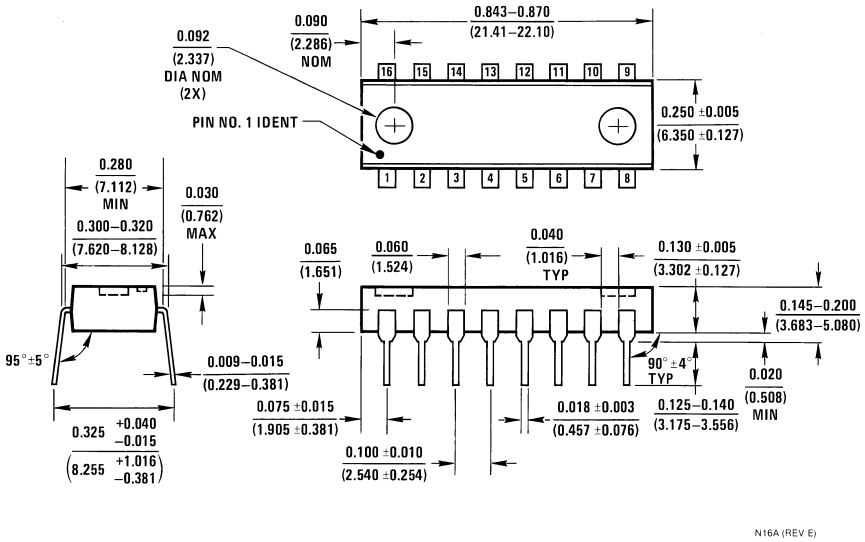


Ceramic Dual-In-Line Package (J)
Order Number DS3662J
NS Package Number J16A



16-Lead Molded Small Outline Package (M)
Order Number DS3662WM
NS Package Number M16B

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



Molded Dual-In-Line Package (N)
Order Number DS3662N
NS Package Number N16A

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