National Semiconductor

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DS3862
Octal High Speed Trapezoidal Bus Transceiver

General Description

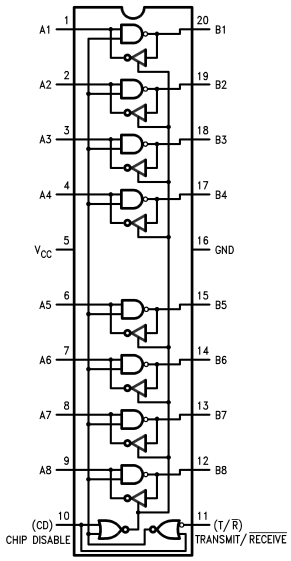
The DS3862 is an octal high speed schottky bus transceiver intended for use with terminated 120Ω impedance lines. It is specifically designed to reduce noise in unbalanced transmission systems. The open collector drivers generate precise trapezoidal waveforms with rise and fall times of 9 ns (typical), 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.

Features

- Guaranteed A.C. specifications on noise immunity and propagation delay over the specified temperature and supply voltage range
- Temperature insensitive receiver thresholds track bus logic level and respond symmetrically to positive and negative going pulses
- Trapezoidal bus waveforms reduce noise coupling to adjacent lines
- Open collector driver output allows wire-or connection
- Advanced low power schottky technology
- Glitch free power up/down protection on driver and receiver outputs
- TTL compatible driver and control inputs, and receiver outputs
- Control logic is the same as the DS3896

Logic and Connection Diagram



DS008539-1

Order Number DS3862J, DS3862N or DS3862WM
See NS Package Number J20A, N20A or M20B

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	6V
Control Input Voltage	5.5V
Driver Input and Receiver Output	5.5V
Receiver Input and Driver Output	5.5V
Power Dissipation	1400 mW
Storage Temperature Range	−65˚C to +150˚C
Lead Temperature (Soldering, 4 seconds)	260˚C

Recommended Operating Conditions

	Min	Max	Units
Supply Voltage, V_{CC}	4.75	5.25	V
Operating Free Air Temperature	0	70	˚C

Electrical Characteristics (Notes 2, 3)

0˚C ≤ T_A ≤ 70˚C, 4.75V ≤ V_{CC} ≤ 5.25V unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Driver and Control 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	An = V_{CC}			1	mA
I_{IH}	Logical “1” Input Current	An = 2.4V			40	µA
I_{IHC}	Logical “1” Input Current	CD = T/$\overline{R}$ = 2.4V			80	µA
I_{IL}	Logical “0” Input Current	An = 0.4V		−1	−1.6	mA
I_{ILC}	CD & T/$\overline{R}$ Logical “0” Input Current	CD = T/$\overline{R}$ = 0.4V		−180	−400	µA
V_{CL}	Input Diode Clamp Voltage	Iclamp = −12 mA		−0.9	−1.5	V
Driver Output/Receiver Input						
V_{OLB}	Low Level Bus Voltage	An = T/$\overline{R}$ = 2V, Ibus = 100 mA		0.6	0.9	V
I_{IHB}	Logical “1” Bus Current	An = 0.8V, Bn = 4V, V_{CC} = 5.25V and 0V		10	100	µA
I_{ILB}	Logical “0” Bus Current	An = 0.8V, Bn = 0V, V_{CC} = 5.25V and 0V			100	µA
V_{TH}	Input Threshold	V_{CC} = 5V	1.5	1.7	1.9	V
Receiver Output						
V_{OH}	Logical “1” Output Voltage	Bn = 0.9V, I_{oh} = − 400µA	2.4	3.2		V
V_{OL}	Logical “0” Output Voltage	Bn = 4V, I_{ol} = 16 mA		0.35	0.5	V
I_{OS}	Output Short Circuit Current	Bn = 0.9V	−20	−70	−100	mA
I_{CC}	Supply Current	V_{CC} = 5.25V		90	135	mA

Note 1: “Absolute Maximum Ratings” are those beyond which the safety of the device cannot be guaranteed. They are not meant to imply that device should be operated at these limits. The table of “Electrical Characteristics” provide conditions for actual device operation.

Note 2: All currents into device pins are positive; all currents out of device pins are negative. All voltages are referenced to device ground unless otherwise specified.

Note 3: All typicals are given for V_{CC} = 5V and T_A = 25˚C.

Switching Characteristics

0˚C ≤ T_A ≤ 70˚C, 4.75V ≤ V_{CC} ≤ 5.25V unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Driver:						
t_{DLH}	An to Bn	CD = 0.8V, T/$\overline{R}$ = 2.0V, VL = 5V (*Figure 1*)		12	20	ns
t_{DHL}				12	20	ns
t_{DLHC}	CD to Bn	An = T/$\overline{R}$ = 2.0V, VL = 5V, (*Figure 1*)		12	20	ns
t_{DHLC}				15	25	ns
t_{DLHT}	T/$\overline{R}$ to Bn	VCI = An, VC = 5V, (*Figure 2*)		20	30	ns
t_{DHLT}		CD = 0.8V, RC = 390Ω, CL = 30 pF RL1 = 91Ω, RL2 = 200Ω, VL = 5V		25	40	ns
t_R	Driver Output Rise Time	CD = 0.8V, T/$\overline{R}$ = 2V, VL = 5V (*Figure 1*)	4	9	20	ns
t_F	Driver Output Fall Time		4	9	20	ns

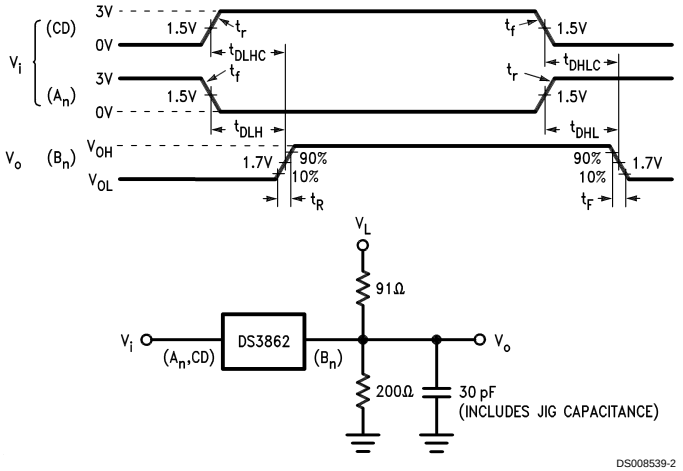
Switching Characteristics (Continued)

$0^{\circ}C \le T_A \le 70^{\circ}C$, $4.75V \le V_{CC} \le 5.25V$ unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Receiver:						
t_{RLH}	Bn to An	CD = 0.8V, T/$\overline{R}$ = 0.8V (*Figure 3*)		15	25	ns
t_{RHL}				15	25	ns
t_{RLZC}	CD to An	Bn = 2.0V, T/$\overline{R}$ = 0.8V, CL = 5 pF RL1 = 390Ω, RL2 = NC, VL = 5V (*Figure 4*)		15	25	ns
t_{RZLC}		Bn = 2.0V, T/$\overline{R}$ = 0.8V, CL = 30 pF RL1 = 390Ω, RL2 = 1.6K, VL = 5V (*Figure 4*)		10	20	ns
t_{RHZC}		Bn = 0.8V, T/$\overline{R}$ = 0.8V, VL = 0V, RL1 = 390Ω, RL2 = NC, CL = 5 pF (*Figure 4*)		5	10	ns
t_{RZHC}		Bn = 0.8V, T/$\overline{R}$ = 0.8V, VL = 0V, RL1 = NC, RL2= 1.6K, CL = 30 pF (*Figure 4*)		8	15	ns
t_{RLZT}	T/$\overline{R}$ to An	VCI = Bn, VC = 3.4V, RC = 39Ω CD = 0.8V, VL = 5V, RL1 = 390Ω, RL2 = NC, CL = 5 pF (*Figure 2*)		20	30	ns
t_{RZLT}		VCI = Bn, VC = 3.4V, RC = 39Ω, CD = 0.8V, VL = 5V, RL1 = 390Ω, RL2 = 1.6K, CL = 30 pF (*Figure 2*)		30	45	ns
t_{RHZT}		VCI = Bn, VC = 0V, RC = 39Ω CD = 0.8V, VL = 0V, RL1 = 390Ω, RL2 = NC, CL = 5 pF (*Figure 2*)		5	10	ns
t_{RZHT}		VCI = Bn, VC = 0V, RC = 39Ω, CD = 0.8V, VL = 0V, RL1 = NC RL2 = 1.6K, CL = 30 pF (*Figure 2*)		10	20	ns
t_{NR}	Receiver Noise Rejection Pulse Width	(*Figure 5*)	9	12		ns

Note: NC means open

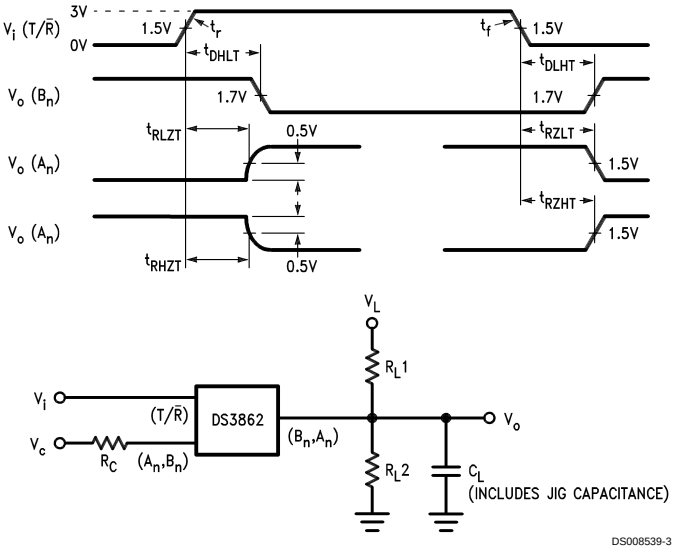
Switching Waveforms



Note: $t_r = t_f \le 5$ ns from 10% to 90%

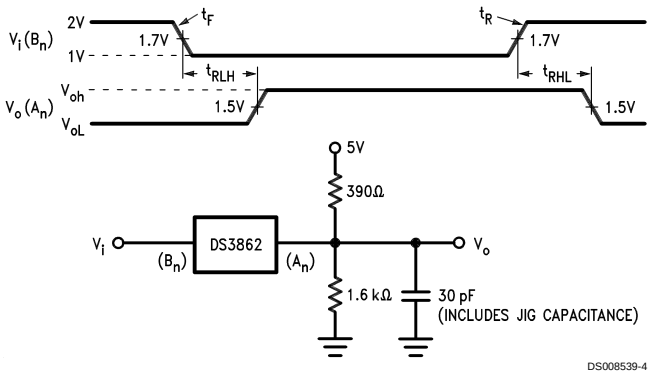
FIGURE 1. Driver Propagation Delays

Switching Waveforms (Continued)



Note: $t_r = t_f \leq 5$ ns from 10% to 90%

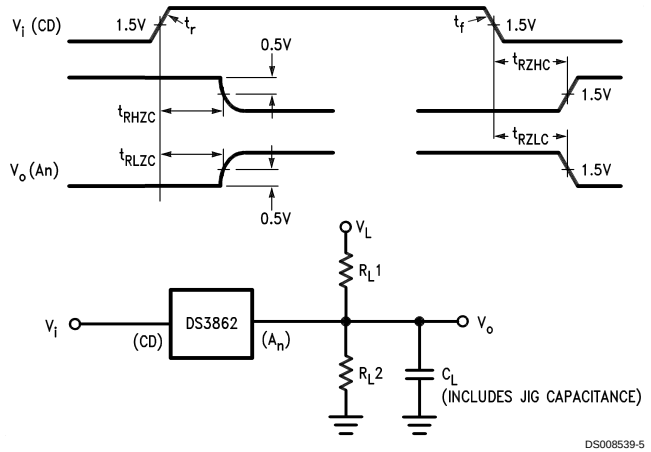
FIGURE 2. Propagation Delay From T/$\overline{R}$ Pin to An or Bn.



Note: $t_R = t_F \leq 10$ ns from 10% to 90%

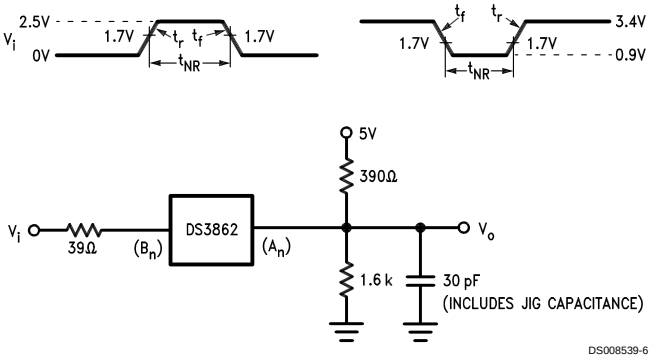
FIGURE 3. Receiver Propagation Delays

Switching Waveforms (Continued)



Note: $t_r = t_f \leq 5$ ns from 10% to 90%

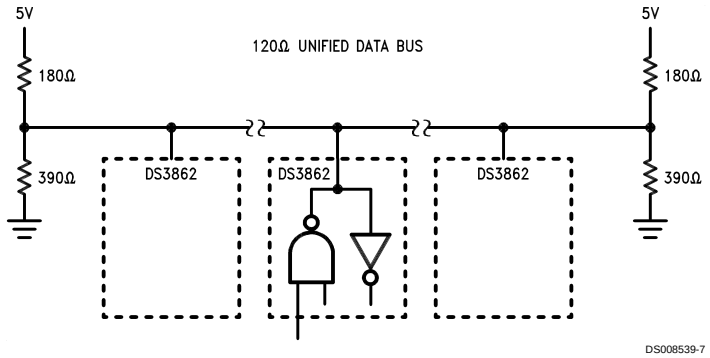
FIGURE 4. Propagation Delay From CD Pin to An



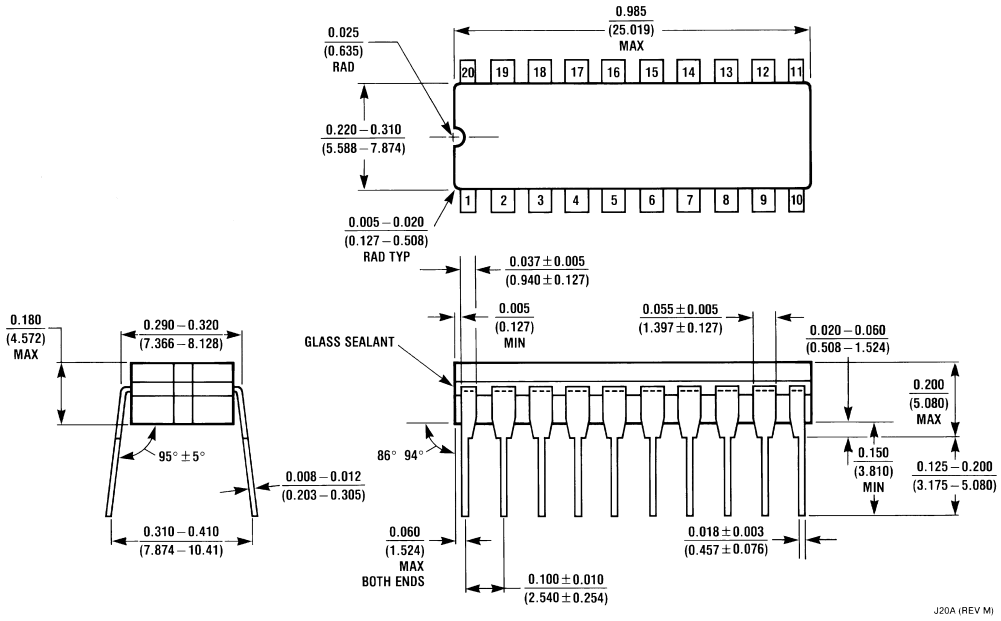
Note: $t_r = t_f = 2$ ns from 10% to 90%

FIGURE 5. Receiver Noise Immunity: No Response at Output Input Waveform.

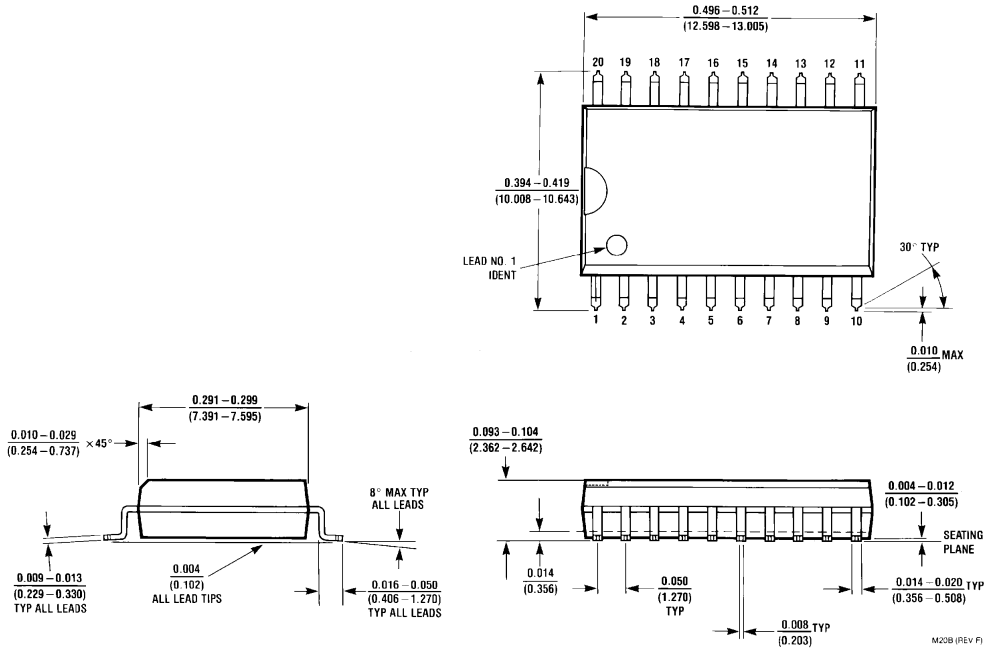
Typical Application



Physical Dimensions inches (millimeters) unless otherwise noted

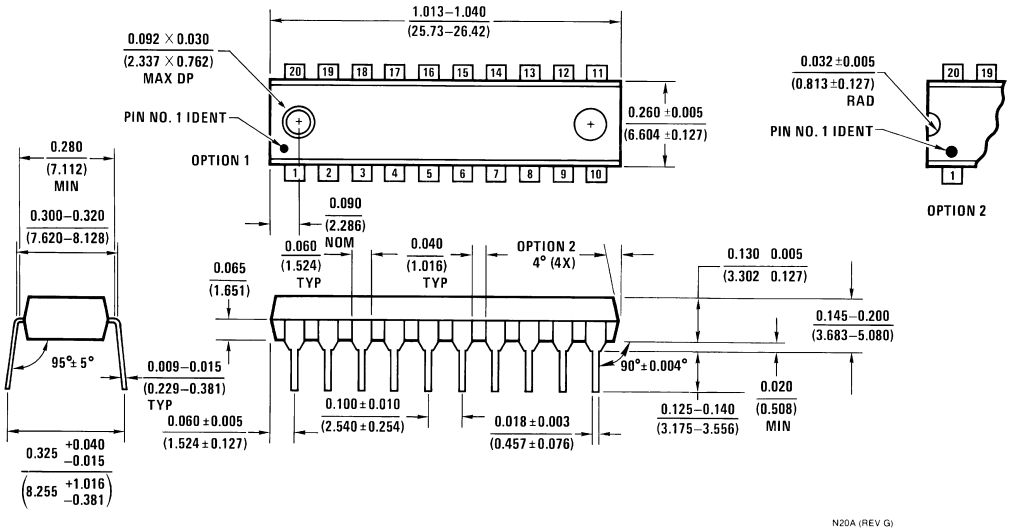


Ceramic Dual-In-Line Package (J)
Order Number DS3862J
NS Package J20A



20-Lead Molded Small Outline Package (M)
Order Number DS3862WM
NS Package M20B

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



Molded Dual-In-Line Package (N)
Order Number DS3862N
NS Package N20A

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