National Semiconductor

February 1996

DS7833/DS8833/DS7835/DS8835 Quad TRI-STATE® Bus Transceivers

General Description

This family of TRI-STATE bus transceivers offers extreme versatility in bus organized data transmission systems. The data bus may be unterminated, or terminated DC or AC, at one or both ends. Drivers in the third (high impedance) state load the data bus with a negligible leakage current. The receiver input current is low allowing at least 100 driver/receiver pairs to utilize a single bus. The bus loading is unchanged when $V_{CC} = 0V$. The receiver incorporates hysteresis to provide greater noise immunity. All devices utilize a high current TRI-STATE output driver. The DS7833/DS8833 and DS7835/DS8835 employ TRI-STATE outputs on the receiver also.

The DS7833/DS8833 are non-inverting quad transceivers with a common inverter driver disable control and common inverter receiver disable control.

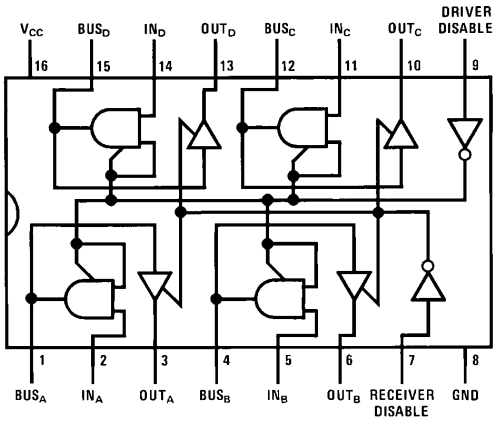
The DS7835/DS8835 are inverting quad transceivers with a common inverter driver disable control and a common inverter receiver disable control.

Features

- Receiver hysteresis — 400 mV typ
- Receiver noise immunity — 1.4V typ
- Bus terminal current for normal V_{CC} or $V_{CC} = 0V$ — 80 μA max
- Receivers
  - Sink — 16 mA at 0.4V max
  - Source — 2.0 mA (Mil) at 2.4V min; 5.2 mA (Com) at 2.4V min
- Drivers
  - Sink — 50 mA at 0.5V max; 32 mA at 0.4V max
  - Source — 10.4 mA (Com) at 2.4V min; 5.2 mA (Mil) at 2.4V min
- Drivers have TRI-STATE outputs
- DS7833/DS8833, DS7835/DS8835 receivers have TRI-STATE outputs
- Capable of driving 100Ω DC—terminated buses
- Compatible with Series 54/74

Connection Diagram

Dual-In-Line Package



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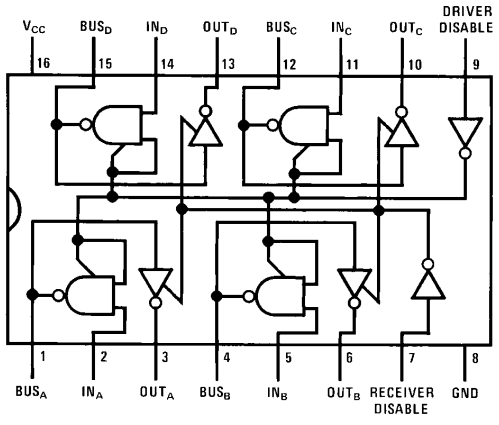
Top View

Order Number DS7833J or DS8833N
See NS Package Number J16A or N16A

Dual-In-Line Package



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Top View

Order Number DS7835J or DS8835N
See NS Package Number J16A or N16A

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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	7.0V
Input Voltage	5.5V
Output Voltage	5.5V
Storage Temperature	−65°C to +150°C
Maximum Power Dissipation* at 25°C	
Cavity Package	1509 mW
Molded Package	1476 mW
Lead Temperature (Soldering, 4 sec.)	260°C

*Derate cavity package 10.1 mW/°C above 25°C; derate molded package 11.8 mW/°C above 25°C.

Operating Conditions

	Min	Max	Units
Supply Voltage, V_{CC}			
DS7833/DS7835	4.5	5.5	V
DS8833/DS8835	4.75	5.25	V
Temperature (T_A)			
DS7833/DS7835	−55	+125	°C
DS8833/DS8835	0	+70	°C

Electrical Characteristics (Notes 2 and 3)

Symbol	Parameter	Conditions			Min	Typ	Max	Units
DISABLE/DRIVER INPUT								
V_{IH}	High Level Input Voltages	V_{CC} = Min			2.0			V
V_{IL}	Low Level Input Voltage	V_{CC} = Min	DS7833, DS8833, DS8835				0.8	V
			DS7835				0.7	
I_{IH}	High Level Input Current	V_{CC} = Max	V_{IN} = 2.4V				40	μA
			V_{IN} = 5.5V				1.0	mA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_{IN} = 0.4V				−1.0	−1.6	mA
V_{CL}	Input Clamp Diode	V_{CC} = 5.0V, I_{IN} = −12 mA, T_A = 25°C				−0.8	−1.5	V
I_{IT}	Driver Low Level Disabled Input Current	Driver Disable Input = 2.0V, V_{IN} = 0.4V					−40	μA
RECEIVER INPUT/BUS OUTPUT								
V_{TH}	High Level Threshold Voltage			DS7833, DS7835	1.4	1.75	2.1	V
				DS8833, DS8835	1.5	1.75	2.0	V
V_{TL}	Low Level Threshold Voltage			DS7833, DS7835	0.8	1.35	1.6	V
				DS8833, DS8835	0.8	1.35	1.5	V
I_S	Bus Current, Output Disabled or High	V_{BUS} = 4.0V	V_{CC} = Max			25	80	μA
			V_{CC} = 0V			5.0	80	μA
		V_{CC} = Max, V_{BUS} = 0.4V				−2.0	−40	μA
V_{OH}	Logic "1" Output Voltage	V_{CC} = Min	I_{OUT} = −5.2 mA	DS7833, DS7835	2.4	2.75		V
			I_{OUT} = −10.4 mA	DS8833, DS8835	2.4	2.75		V
V_{OL}	Logic "0" Output Voltage	V_{CC} = Min	I_{OUT} = 50 mA			0.28	0.5	V
			I_{OUT} = 32 mA				0.4	V
I_{OS}	Output Short Circuit Current	V_{CC} = Max, (Note 4)			−40	−62	−120	mA
RECEIVER OUTPUT								
V_{OH}	Logic "1" Output Voltage	V_{CC} = Min	I_{OUT} = −2.0 mA	DS7833, DS7835	2.4	3.0		V
			I_{OUT} = −5.2 mA	DS8833, DS8835	2.4	2.9		V
V_{OL}	Logic "0" Output Voltage	V_{CC} = Min, I_{OUT} = 16 mA				0.22	0.4	V
I_{OT}	Output Disabled Current	V_{CC} = Max, Disable Inputs = 2.0V	V_{OUT} = 2.4V				40	μA
			V_{OUT} = 0.4V				−40	μA

Electrical Characteristics (Notes 2 and 3) (Continued)

Symbol	Parameter	Conditions		Min	Typ	Max	Units
RECEIVER OUTPUT (Continued)							
I_{OS}	Output Short Circuit Current	V_{CC} = Max, (Note 4)	DS7833, DS7835	28	−40	−70	mA
			DS8833, DS8835	−30		−70	mA
I_{CC}	Supply Current	V_{CC} = Max	DS7833, DS8833		84	116	mA
			DS7835, DS8835		75	95	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 actual device operation.

Note 2: Unless otherwise specified min/max limits apply across the −55°C to +125°C temperature range for the DS7833, DS7835 and across the 0°C to +70°C range for the DS8833, DS8835. All typicals are given for V_{CC} = 5.0V and T_A = 25°C.

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.

Switching Characteristics V_{CC} = 5.0V, T_A = 25°C

Symbol	Parameter	Conditions		Min	Typ	Max	Units
t_{pd0}	Propagation Delay to a Logic "0" from Input to Bus	*(Figure 1)*	DS7833/DS8833		14	30	ns
			DS7835/DS8835		10	20	ns
t_{pd1}	Propagation Delay to a Logic "1" from Input to Bus	*(Figure 1)*	DS7833/DS8833		14	30	ns
			DS7835/DS8835		11	30	ns
t_{pd0}	Propagation Delay to a Logic "0" from Bus to Input	*(Figure 2)*	DS7833/DS8833		24	45	ns
			DS7835/DS8835		16	35	ns
t_{pd1}	Propagation Delay to a Logic "1" from Bus to Input	*(Figure 2)*	DS7833/DS8833		12	30	ns
			DS7835/DS8835		18	30	ns
t_{PHZ}	Delay from Disable Input to High Impedance State (from Logic "1" Level)	C_L = 5.0 pF, (*Figures 1* and *2*)	Driver		8.0	20	ns
			Receiver		6.0	15	ns
t_{PLZ}	Delay from Disable Input to High Impedance State (from Logic "0" Level)	C_L = 5.0 pF, (*Figures 1* and *2*)	Driver		20	35	ns
			Receiver		13	25	ns
t_{PZH}	Delay from Disable Input to Logic "1" Level (from High Impedance State)	C_L = 5.0 pF, (*Figures 1* and *2*)	Driver		24	40	ns
			Receiver		16	35	ns
t_{PZL}	Delay from Disable Input to Logic "0" Level (from High Impedance State)	C_L = 5.0 pF, (*Figures 1* and *2*)	Driver		19	35	ns
			Receiver DS7833/DS8833		15	30	ns
			Receiver DS7835/DS8835		33	50	ns

AC Test Circuits

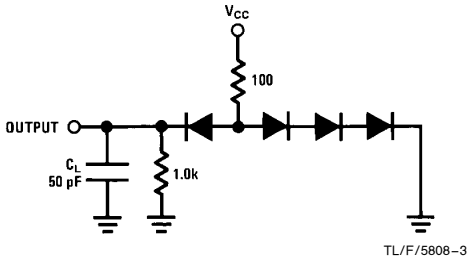


FIGURE 1. Driver Output Load

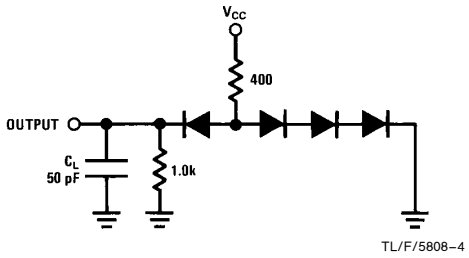
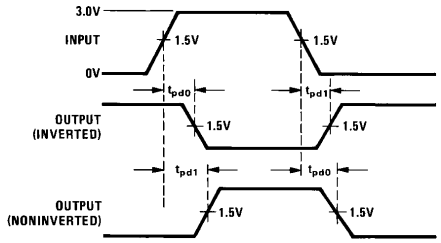


FIGURE 2. Receiver Output Load

Switching Time Waveforms

t_{pd1} & t_{pd0}



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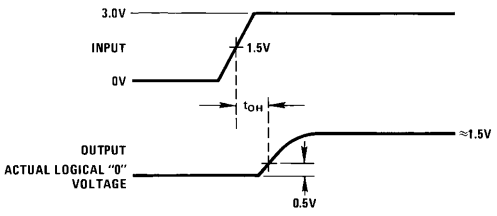
t_{PLZ}



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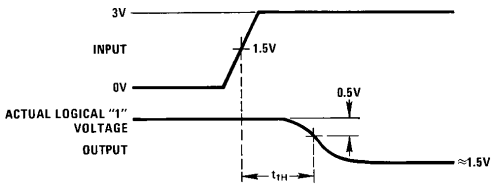
f = 1 MHz

$t_r = t_f \leq 10$ ns (10% to 90%)

DUTY CYCLE = 50%

t_{PHZ}



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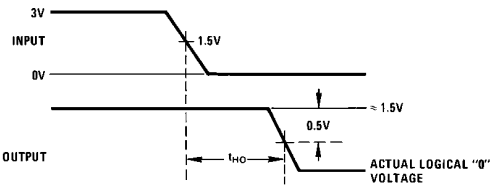
t_{PZL}



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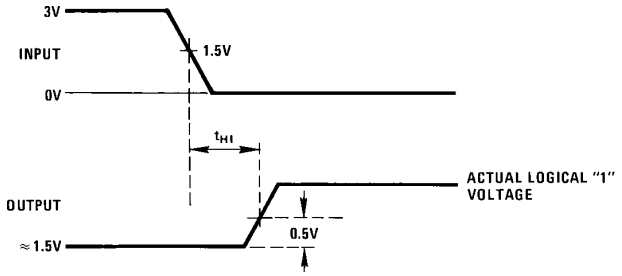
t_{PZH}



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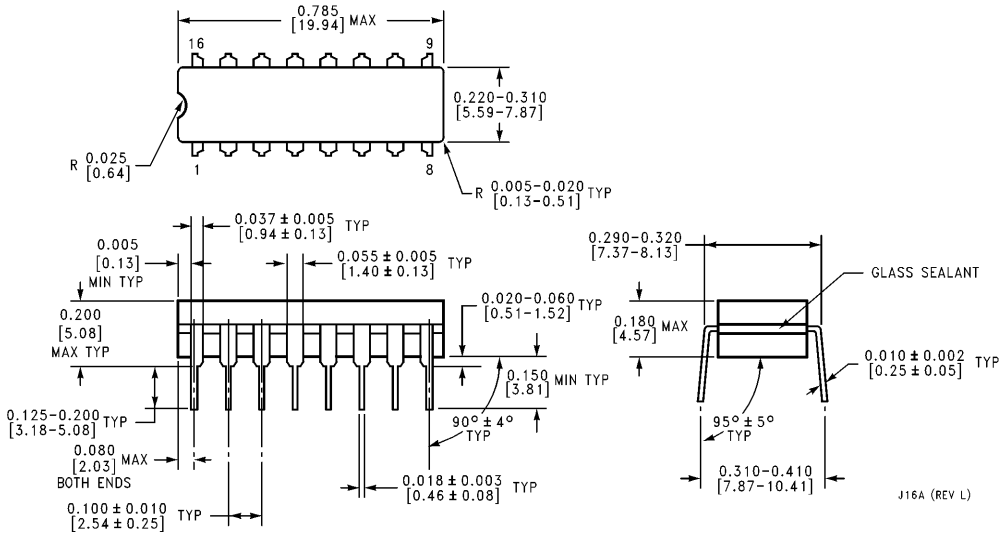
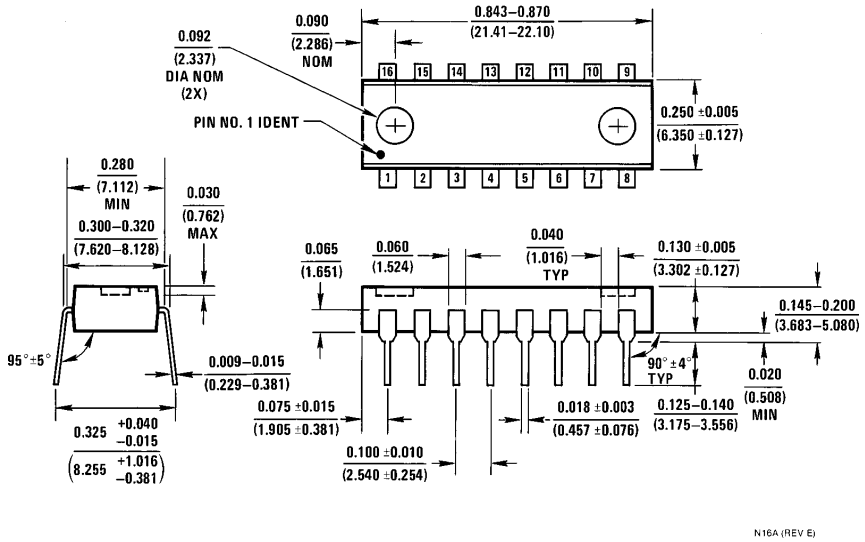
Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number DS7833J or DS7835J
NS Package Number J16A

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number DS8833N or DS8835N
NS Package Number N16A

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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