𝒩 *National Semiconductor*

February 1996

# DS7834/DS8834 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. Both devices utilize a high current TRI-STATE output driver. The DS7834/DS8834 employs TTL outputs on the receiver.

The DS7834/DS8834 are inverting quad transceivers with two common inverter driver disable controls.

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
- Receivers have TRI-STATE outputs
- Capable of driving 100Ω DC-terminated Buses
- Compatible with Series 54/74

Connection Diagram

Dual-In-Line Package
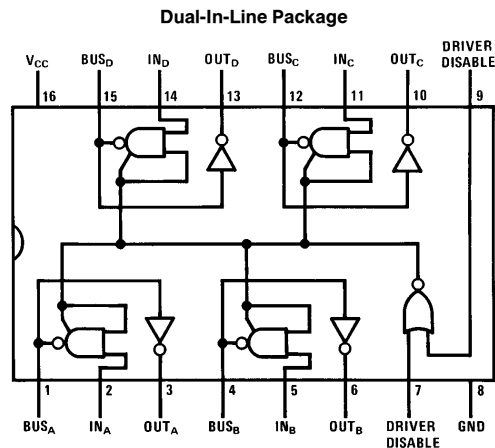
Top View

Order Number DS7834J, or DS8834N
See NS Package Number J16A or N16A

TL/F/5809–1

TRI-STATE® is a registered trademark of National Semiconductor Corp.

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
Maximum Power Dissipation* at 25°C	
Cavity Package	1509 mW
Molded Package	1476 mW

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

Storage Temperature	−65°C to +150°C
Lead Temperature (Soldering, 4 seconds)	260°C

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})			
DS7834	4.5	5.5	V
DS8834	4.75	5.25	V
Temperature (T_A)			
DS7834	−55	+125	°C
DS8834	0	+70	°C

Electrical Characteristics (Notes 2 and 3)

Symbol	Parameter	Conditions			Min	Typ	Max	Units
DISABLE/DRIVER INPUT								
V_{IH}	High Level Input Voltage	V_{CC} = Min			2.0			V
V_{IL}	Low Level Input Voltage	V_{CC} = Min					0.8	V
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
I_{IND}	Driver Diasbled Input Low Current	Driver Disable Input = 2.0V, V_{IN} = 0.4V					−40	μA
V_{CL}	Input Clamp Diode	V_{CC} = 5.0V, I_{IN} = −12 mA, T_A = 25°C				−0.8	−1.5	V
RECEIVER INPUT/BUS OUTPUT								
V_{TH}	High Level Threshold Voltage	V_{CC} = Max		DS7834	1.4	1.75	2.1	V
				DS8834	1.5	1.75	2.0	V
V_{TL}	Low Level Threshold Voltage	V_{CC} = Min		DS7834	0.8	1.35	1.6	V
				DS8834	0.8	1.35	1.5	V
I_{BH}	Bus Current, Output Disabled or High	V_{BUS} = 4.0V	V_{CC} = Max, Disable Input = 2.0V			25	80	μA
			V_{CC} = 0V			5.0	80	μA
		V_{CC} = Max, V_{SUS} = 0.4V, Disable Input = 2.0V					−40	μA
V_{OH}	Logic "1" Output Voltage	V_{CC} = Min	I_{OUT} = −5.2 mA	DS7834	2.4	2.75		V
			I_{OUT} = −10.4 mA	DS7834	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	DS7834	2.4	3.0		V
			I_{OUT} = −5.2 mA	DS8834	2.4	2.9		V
V_{OL}	Logic "0" Output Voltage	V_{CC} = Min, I_{OUT} = 16 mA				0.22	0.4	V
I_{OS}	Output Short Circuit Current	V_{CC} = Max, (Note 4)		DS7834	−28	−40	−70	mA
				DS8834	−30		−70	mA
I_{CC}	Supply Current	V_{CC} = Max				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 DS7834 and across the 0°C to +70°C range for the DS8834. 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 $V_{CC} = 5.0V$, $T_A = 25°C$

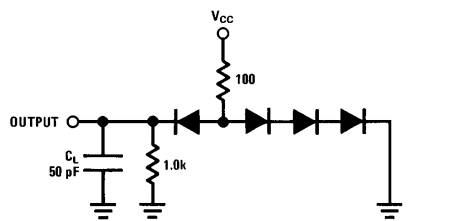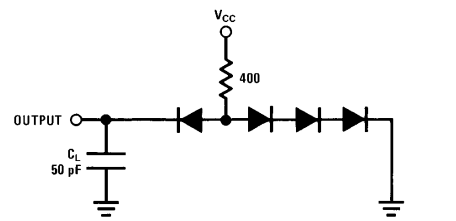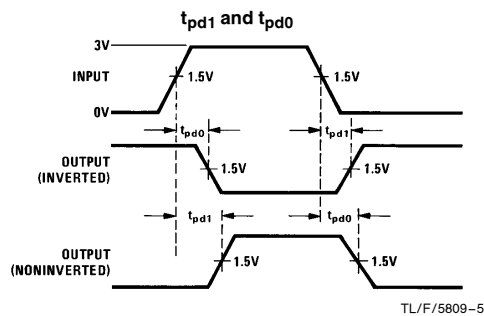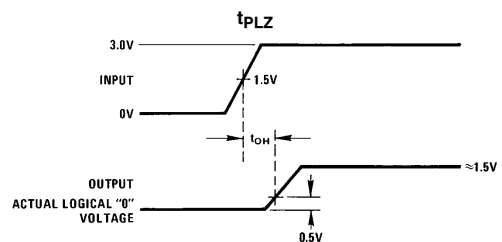| Symbol	Parameter	Conditions		Min	Typ	Max	Units
t_{pd0}	Propagation Delay to a Logic "0" from Input to Bus	(Figure 1)	DS7834/DS8834		10	20	ns
t_{pd1}	Propagation Delay to a Logic "1" from Input to Bus	(Figure 1)	DS7834/DS8834		11	30	ns
t_{pd0}	Propagation Delay to a Logic "0" from Bus to Output	(Figure 2)	DS7834/DS8834		16	35	ns
t_{pd1}	Propagation Delay to a Logic "1" from Bus to Output	(Figure 2)	DS7834/DS8834		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 Only			8	20	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 Only			20	35	ns
t_{PZH}	Delay from Disable Input to Logic "1" Level (from High Impedance State)	$C_L = 50$ pF, (Figures 1 and 2) Driver Only			24	40	ns
t_{PZL}	Delay from Disable Input to Logic "0" Level (from High Impedance State)	$C_L = 50$ pF, (Figures 1 and 2) Driver Only			19	35	ns

AC Test Circuit

FIGURE 1. Driver Output Load

TL/F/5809-3

FIGURE 2. Receiver Output Load

TL/F/5809-4

Switching Time Waveforms

t_{pd1} and t_{pd0}

TL/F/5809-5

t_{PLZ}

TL/F/5809-6

f = 1 MHz

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

Duty Cycle = 50%

http://www.national.com

Switching Time Waveforms (Continued)

t$_{PHZ}$

3V ──────

INPUT ──── 1.5V

0V ────

ACTUAL LOGICAL "1" VOLTAGE

0.5V

OUTPUT

≈1.5V

|← t$_{IH}$ →|

TL/F/5809–7

t$_{PZL}$

3V ────

INPUT ──── 1.5V

0V ────

≈ 1.5V

0.5V

OUTPUT

|← t$_{HO}$ →|

ACTUAL LOGICAL "0" VOLTAGE

TL/F/5809–8

t$_{PZH}$

3V ────

INPUT ──── 1.5V

0V ────

t$_{HI}$

ACTUAL LOGICAL "1" VOLTAGE

OUTPUT

≈ 1.5V

0.5V
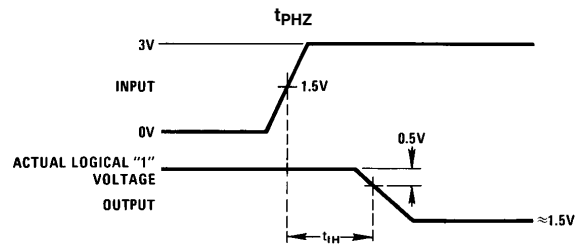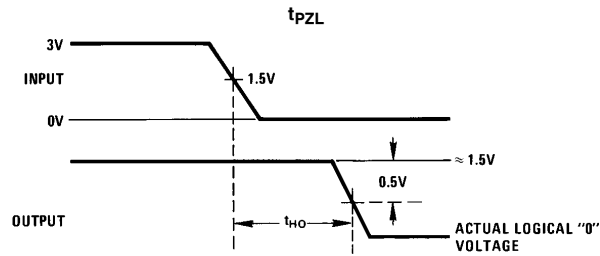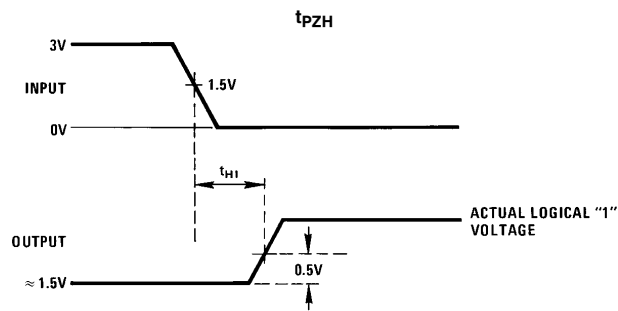
TL/F/5809–9

Truth Table

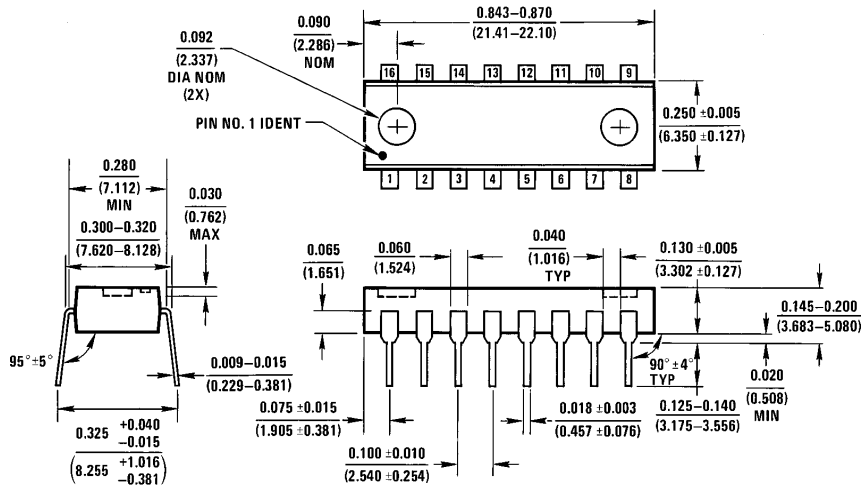| Disable Input	Driver Input (IN$_X$)	Receiver Input/ Bus Output (BUS$_X$)	Receiver Output (OUT$_X$)	Mode of Operation
DS7834/DS8834				
1	X		$\overline{BUS}$	Receive Bus Signal
0	1	0	1	Drive Bus
0	0	1	0	Drive Bus

X = Don't care

Physical Dimensions inches (millimeters)

Ceramic Dual-In-Line Package (J)
Order Number DS7834J
NS Package Number J16A

Physical Dimensions inches (millimeters) (Continued)

0.092
(2.337)
DIA NOM
(2X)

0.090
(2.286)
NOM

0.843−0.870
(21.41−22.10)

PIN NO. 1 IDENT

16 15 14 13 12 11 10 9

0.250 ±0.005
(6.350 ±0.127)

1 2 3 4 5 6 7 8

0.280
(7.112)
MIN

0.300−0.320
(7.620−8.128)

0.030
(0.762)
MAX

95°±5°

0.009−0.015
(0.229−0.381)

0.325 +0.040 −0.015
(8.255 +1.016 −0.381)

0.065
(1.651)

0.060
(1.524)

0.040
(1.016)
TYP

0.130 ±0.005
(3.302 ±0.127)

0.145−0.200
(3.683−5.080)

90°±4°
TYP

0.020
(0.508)
MIN

0.075 ±0.015
(1.905 ±0.381)

0.018 ±0.003
(0.457 ±0.076)

0.125−0.140
(3.175−3.556)

0.100 ±0.010
(2.540 ±0.254)

N16A (REV E)

Molded Dual-In-Line Package (N)
Order Number DS8834N
NS Package Number N16A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.

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.