National Semiconductor

May 1999

DS1603
TRI-STATE® Dual Receiver

General Description

The DS16033 is a dual differential TRI-STATE line receiver designed for a broad range of system applications. It features a high input impedance and low input current which reduces the loading effects on a digital transmission line, making it ideal for use in party line systems and general purpose applications like transducer preamplifiers, level translators and comparators.

The receivers feature a ±25 mV input sensitivity specified over a ±3V common mode range. Input protection diodes are incorporated in series with the collectors of the differential stage. These diodes are useful in applications that have multiple V_{CC}+ supplies or V_{CC}+ supplies that are turned off thus avoiding signal clamping. In addition, TTL compatible strobe and control lines are provide for flexibility in the application.

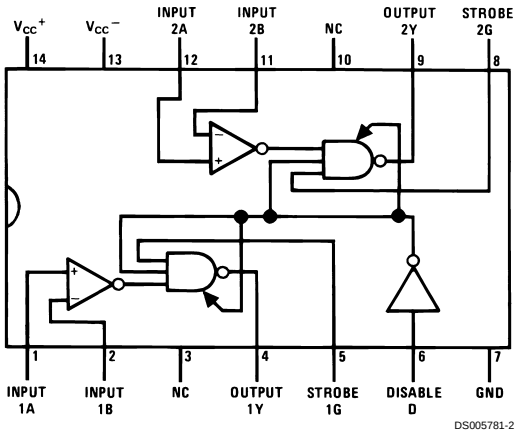
The DS1603 is pin compatible with the DS75107 dual line receiver.

Features

- Diode protected input stage for power “OFF” condition
- 17 ns typ high speed
- TTL compatible
- ±25 mV input sensitivity
- ±3V input common-mode range
- High-input inpedance with normal $V_{CC,}$ or V_{CC} = 0V
- Strobes for channel selection
- TRI-STATE outputs for high speed buses

Connection Diagram

Dual-In-Line Package



Top View
For Complete Military 883 Specifications, See RETS Data Sheet.
Order Number: DS1603J/883 or DS1603W/883
See NS Package Number J14A

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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 (V_{CC}^+)	7V
Supply Voltage (V_{CC}^-)	−7V
Differential Input Voltage	±6V
Common Mode Input Voltage	±5V
Strobe Input Voltage	5.5V
Storage Temperature Range	−65˚C to +150˚C
Maximum Power Dissipation (Note 1) at 25˚C	
Cavity Package	1308 mW
Molded Package	1207 mW
Lead Temperature (Soldering, 4 sec)	260˚C

Operating Conditions

	DS1603		
	Min	**Nom**	**Max**
Supply Voltage V_{CC}^+	4.5V	5V	5.5V
Supply Voltage V_{CC}^-	−4.5V	−5V	−5.5V
Operating Temperature Range	−55˚C	to	+125˚C

Note 1: Derate cavity package 8.7 mW/˚C; derate molded package 9.7 mW/˚C above 25˚C.

Electrical Characteristics (Notes 3, 4)

$T_{MIN} \le T_A \le T_{MAX}$

Symbol	Parameter	Conditions		Min	Typ	Max	Units
I_{IH}	High Level Input Current into 1A, 1B, 2A or 2B	V_{CC}^+ = Max, V_{CC}^- = Max, V_{ID} = 0.5V, V_{IC} = −3V to 3V			30	75	µA
I_{IL}	Low Level Input Current into 1A, 1B, 2A or 2B	V_{CC}^+ = Max, V_{CC}^- = Max, V_{ID} = −2V, V_{IC} = −3V to 3V				−10	µA
I_{IH}	High Level Input Current into 1G, 2G or D	V_{CC}^+ = Max	$V_{IH(S)}$ = 2.4V			40	µA
		V_{CC}^- = Max	$V_{IH(S)}$ = Max V_{CC}^+			1	mA
I_{IL}	Low Level Input Current into D	V_{CC}^+ = Max, V_{CC}^- = Max, $V_{IL(D)}$ = 0.4V				−1.6	mA
I_{IL}	Low Level Input Current into 1G or 2G	V_{CC}^+ = Max,	$V_{IH(D)}$ = 2V			−40	µA
		V_{CC}^- = Max, $V_{IL(G)}$ = 0.4V	$V_{IL(D)}$ = 0.8V			−1.6	mA
V_{OH}	High Level Output Voltage	V_{CC}^+ = Min, V_{CC}^- = Min, I_{LOAD} = −2 mA, V_{ID} = 25 mV, $V_{IL(D)}$ = 0.8V, V_{IC} = −3V to 3V		2.4			V
V_{OL}	Low Level Output Voltage	V_{CC}^+ = Min, V_{CC}^- = Min, I_{SINK} = 16 mA, V_{ID} = −25 mV, $V_{IL(D)}$ = 0.8V, V_{IC} = −3V to 3V				0.4	V
I_{OD}	Output Disable Current	V_{CC}^+ = Max,	V_{OUT} = 2.4V			40	µA
		V_{CC}^- = Max, $V_{IH(D)}$ = 2V	V_{OUT} = 0.4V			−40	µA
I_{OS}	Short Circuit Output Current	V_{CC}^+ = Max, V_{CC}^- = Max, $V_{IL(D)}$ = 0.8V (Note 5)		−18		−70	mA
I_{CCH}^+	High Logic Level Supply Current from V_{CC}^+	V_{CC}^+ = Max, V_{CC}^- = Max, V_{ID} = 25 mV, T_A = 25˚C			28	40	mA
I_{CCH}^-	High Logic Level Supply Current from V_{CC}^-	V_{CC}^+ = Max, V_{CC}^- = Max, V_{ID} = 25 mV, T_A = 25˚C			−8.4	−15	mA
V_I	Input Clamp Voltage on G or D	V_{CC}^+ = Min, V_{CC}^- = Min, I_{IN} = −12 mA, T_A = 25˚C			−1	−1.5	V

Note 2: "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 3: Unless otherwise specified min/max limits apply across the −55˚C to +125˚C temperature range for the DS1603 and across the 0˚C to +70˚C range for the DS3603. All typical values are for T_A = 25˚C and V_{CC} = 5V.

Electrical Characteristics (Notes 3, 4) (Continued)

Note 4: All current 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 5: Only one output at a time should be shorted.

Switching Characteristics

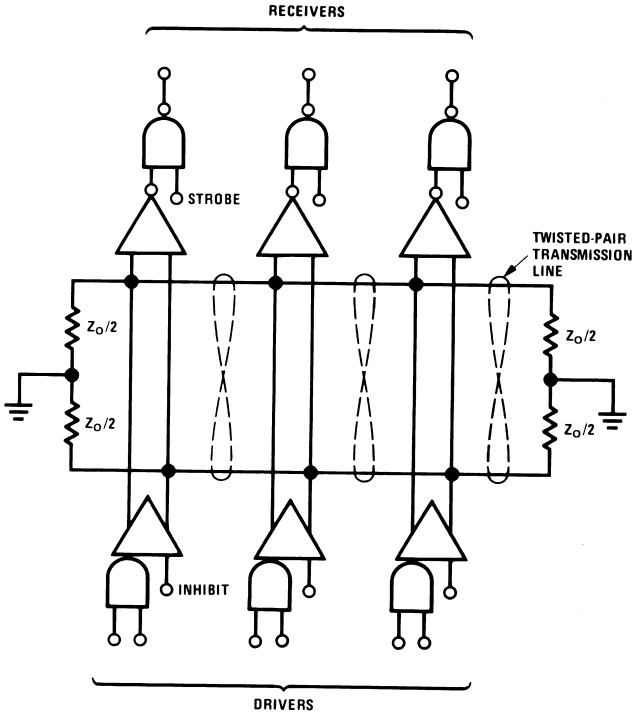
$V_{CC}^+ = 5V$, $V_{CC}^- = -5V$, $T_A = 25^\circ C$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{PLH(D)}$	Propagation Delay Time, Low-to-High Level, from Differential Inputs A and B to Output	$R_L = 390\Omega$, $C_L = 50$ pF, (Note 6)		17	25	ns
$t_{PHL(D)}$	Propagation Delay Time, High-to-Low Level, from Differential Inputs A and B to Output	$R_L = 390\Omega$, $C_L = 50$ pF, (Note 6)		17	25	ns
$t_{PLH(S)}$	Propagation Delay Time, Low-to-High Level, from Strobe Input G to Output	$R_L = 390\Omega$, $C_L = 50$ pF		10	15	ns
$t_{PHL(S)}$	Propagation Delay Time, High-to-Low Level, from Strobe Input G to Output	$R_L = 390\Omega$, $C_L = 50$ pF		8	15	ns
t_{1H}	Disable Low-to-High to Output High to Off	$R_L = 390\Omega$, $C_L = 5$ pF			20	ns
t_{0H}	Disable Low-to-High to Output Low to Off	$R_L = 390\Omega$, $C_L = 5$ pF			30	ns
t_{H1}	Disable High-to-Low to Output Off to High	$R_L = 1k$ to 0V, $C_L = 50$ pF			25	ns
t_{H0}	Disable High-to-Low to Output Off to Low	$R_L = 390\Omega$, $C_L = 50$ pF			25	ns

Note 6: Differential input is +100 mV to −100 mV pulse. Delays read from 0 mV on input to 1.5V on output.

Typical Application

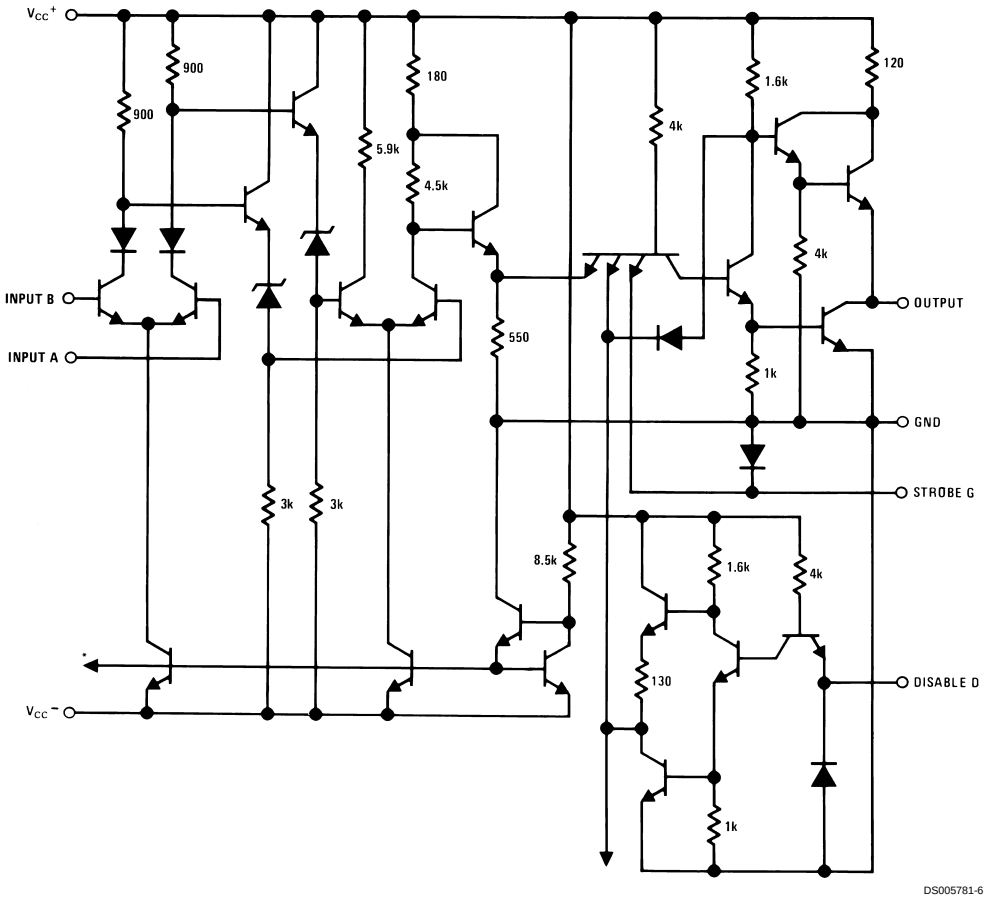
Line Receiver Used in a Party-Line or Data-Bus System



DS005781-3

Line receivers are
DS75107/DS75108
or DS3603
Line drivers are
SN75109/µA75110/DS75110
or DS8831

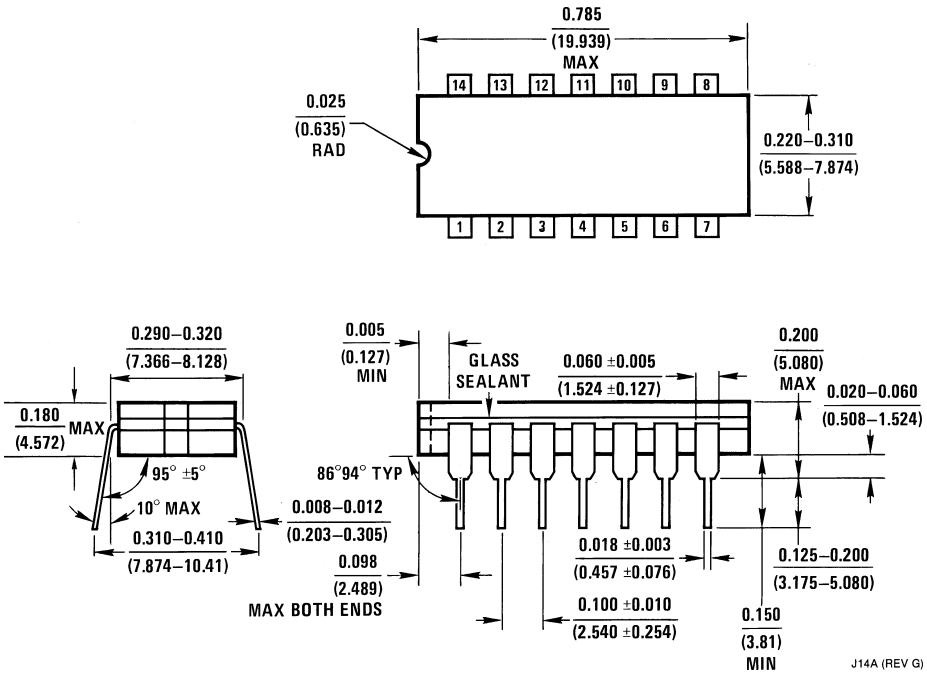
Schematic Diagram (Note 7)



Note 7: ½ of the dual circuit is shown.

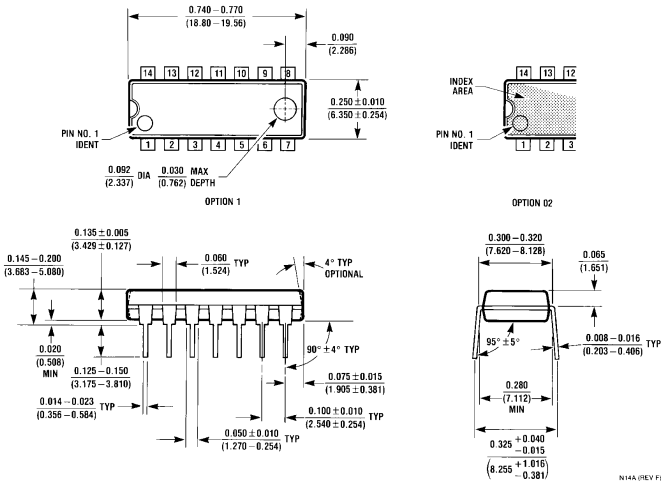
Note 8: *Indicates connections common to second half of dual circuit.

Physical Dimensions inches (millimeters) unless otherwise noted



Ceramic Dual-In-Line Package (J)
Order Number DS1603J
NS Package Number J14A

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



Molded Dual-In-Line Package (N)
Order Number DS3603N
NS Package Number N14A

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