

## DS9639A Dual Differential Line Receiver

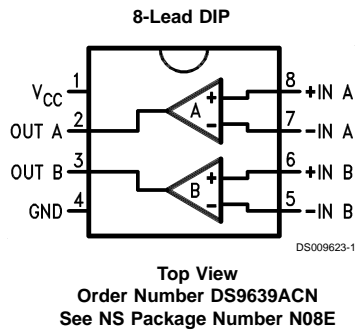
### General Description

The DS9639A is a Schottky dual differential line receiver which has been specifically designed to satisfy the requirements of EIA Standards RS-422, RS-423 and RS-232C. In addition, the DS9639A satisfies the requirements of MIL-STD 188-114 and is compatible with the International Standard CCITT recommendations. The DS9639A is suitable for use as a line receiver in digital data systems, using either single ended or differential, unipolar or bipolar transmission. It requires a single 5.0V power supply and has Schottky TTL compatible outputs. The DS9639A has an operational input common mode range of  $\pm 7.0V$  either differentially or to ground.

### Features

- Dual channel
- Single 5.0V supply
- Satisfies EIA Standards RS-422, RS-423 and RS-232C
- Built-in  $\pm 35$  mV hysteresis
- High input common mode voltage range
- High input impedance
- TTL compatible outputs
- Schottky technology

### Connection Diagram



## Absolute Maximum Ratings (Note 2)

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

Storage Temperature Range	-65°C to +175°C
Operating Temperature Range	0°C to +70°C
Lead Temperature	
Molded DIP (soldering, 10 sec.)	265°C
V <sub>CC</sub> Lead Potential to Ground	-0.5V to +7.0V
Input Potential to Ground Lead	±25V
Differential Input Voltage	±25V
Output Differential to Ground Lead	-0.5V to 5.5V

Output Sink Current	50 mA
Maximum Power Dissipation (Note 1) at 25°C	
Molded Package	930 mW

## Recommended Operating Conditions

	Min	Typ	Max	Units
Supply Voltage (V <sub>CC</sub> )	4.75	5.0	5.25	V
Operating Temperature (T <sub>A</sub> )	0	25	70	°C

Note 1: Derate molded DIP package 7.5mW/°C above 25°C.

## Electrical Characteristics (Notes 3, 4)

Over recommended operating temperature and supply voltage ranges, unless otherwise specified

Symbol	Parameter	Conditions (Note 2)	Min	Typ	Max	Units
V <sub>TH</sub>	Differential Input Threshold Voltage (Note 6)	-7.0V ≤ V <sub>CM</sub> ≤ +7.0V	-0.2		+0.2	V
V <sub>TH(R)</sub>	Differential Input Threshold Voltage (Note 7)	-7.0V ≤ V <sub>CM</sub> ≤ +7.0V	-0.4		+0.4	V
I <sub>I</sub>	Input Current (Note 8)	V <sub>I</sub> = 10V, 0V ≤ V <sub>CC</sub> ≤ 5.5V		1.1	3.25	mA
		V <sub>I</sub> = -10V, 0V ≤ V <sub>CC</sub> ≤ 5.5V		-1.6	-3.25	
V <sub>OL</sub>	Output Voltage LOW	I <sub>OL</sub> = 20 mA, V <sub>CC</sub> = Min		0.35	0.5	V
V <sub>OH</sub>	Output Voltage HIGH	I <sub>OH</sub> = -1.0 mA, V <sub>CC</sub> = Min	2.5	3.5		V
I <sub>OS</sub>	Output Short Circuit Current (Note 5)	V <sub>O</sub> = 0V, V <sub>CC</sub> = Max	-40	-75	-100	mA
I <sub>CC</sub>	Supply Current	V <sub>CC</sub> = Max, V <sub>I+</sub> = 0.5V, V <sub>I-</sub> = GND		35	50	mA
V <sub>HYST</sub>	Input Hysteresis	V <sub>CM</sub> = ±7.0V (See Curves)		70		mV

## Switching Characteristics

V<sub>CC</sub> = 5.0V, T<sub>A</sub> = 25°C

Symbol	Parameter	Conditions	Min	Typ	Max	Units
t <sub>PLH</sub>	Propagation Delay Time Low to High	See AC Test Circuit		55	85	ns
t <sub>PHL</sub>	Propagation Delay Time High to Low	See AC Test Circuit		50	75	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" provide conditions for actual device operation.

Note 3: Unless otherwise specified min/max limits apply across the 0°C to +70°C range for the DS9639A. All typicals are given for V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C.

Note 4: All currents into the device pins are positive; all currents out of the device pins are negative. All voltages are referenced to ground unless otherwise specified.

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

Note 6: V<sub>DIFF</sub> (Differential Input Voltage) = (V<sub>I+</sub>) - (V<sub>I-</sub>). V<sub>CM</sub> (Common Mode Input Voltage) = V<sub>I+</sub> or V<sub>I-</sub>.

Note 7: 500Ω ±1% in series with inputs.

Note 8: The input not under test is tied to ground.

## Equivalent Circuit

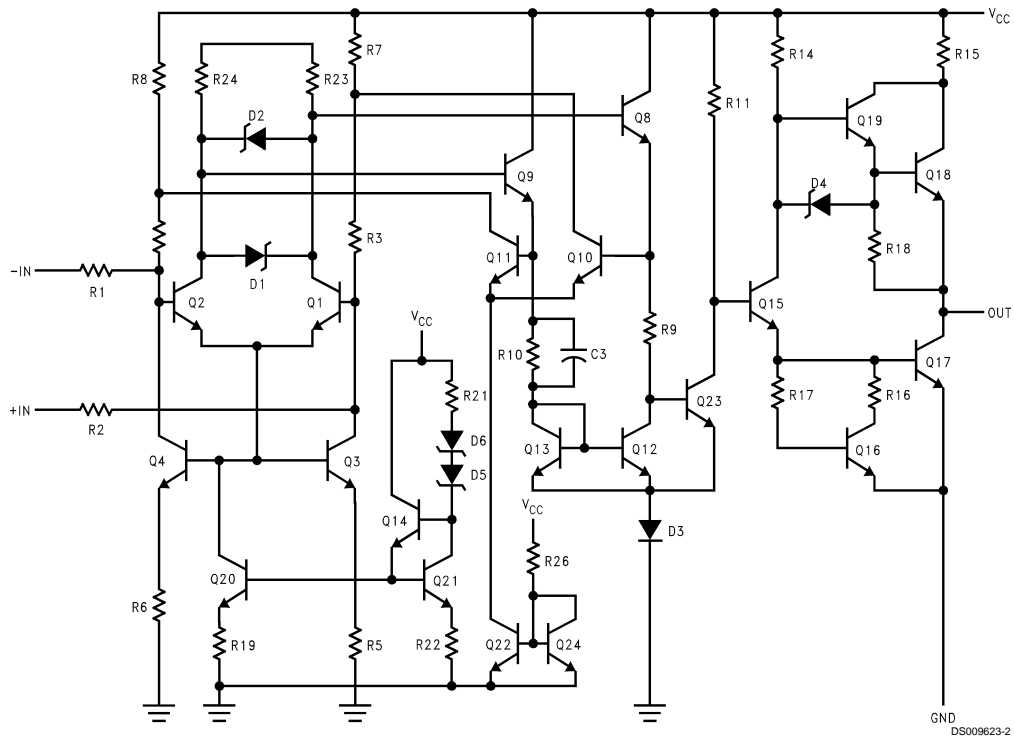


FIGURE 1. Equivalent Circuit

## Typical Input/Output Transfer Characteristics

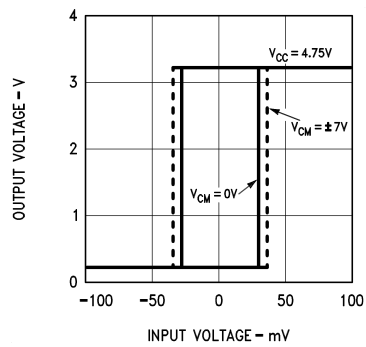


FIGURE 2.

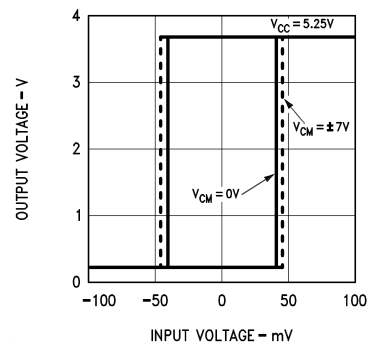
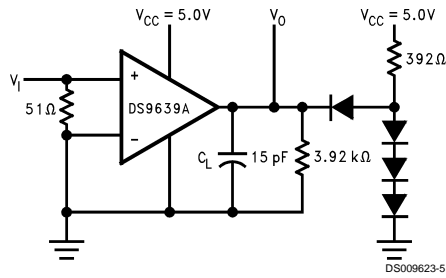


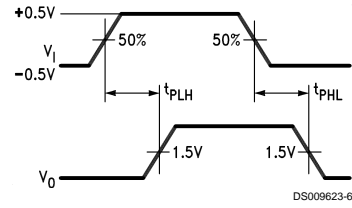
FIGURE 3.

## AC Test Circuit and Switching Time Waveform



$C_L$  includes jig and probe capacitance.  
All diodes are FD700 or equivalent.

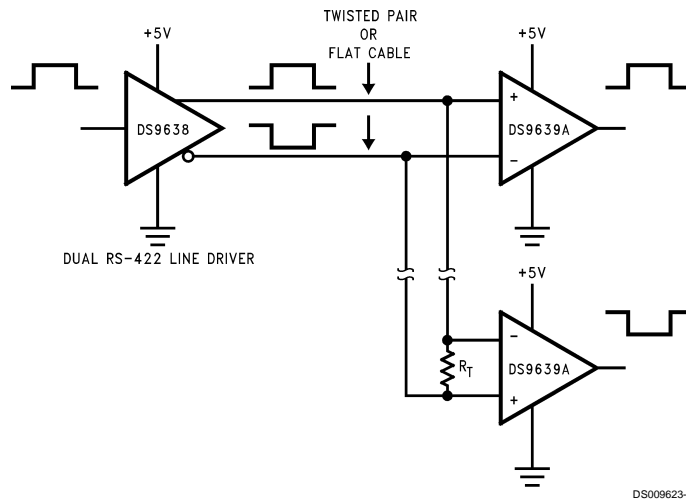
**FIGURE 4. AC Test Circuit and Waveforms**



$V_I$   
Amplitude: 1.0V  
Offset: 0.5V  
Pulse Width: 500 ns  
PRR: 1 MHz  
 $t_r = t_f \leq 5.0$  ns

**FIGURE 5.**

## Typical Applications

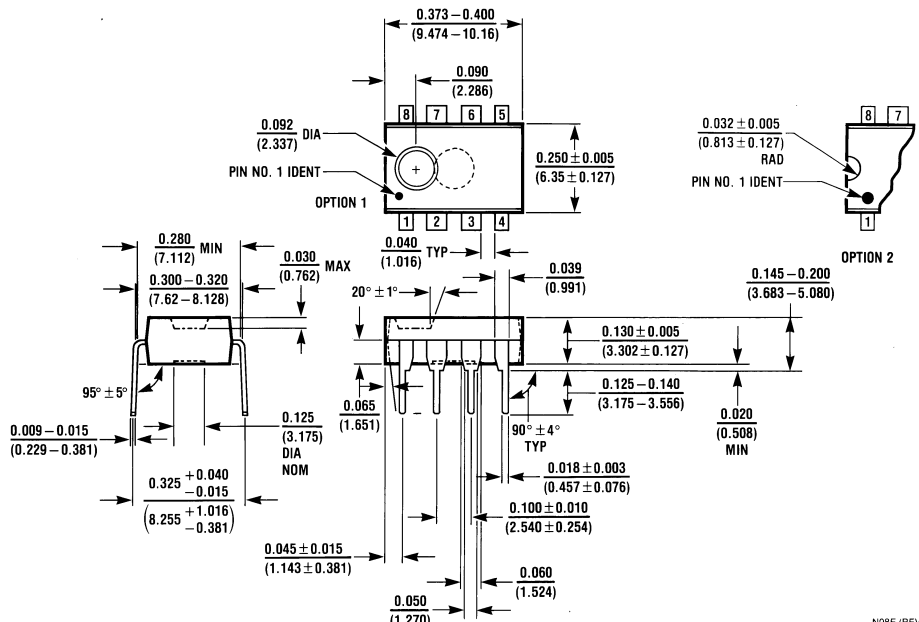


$R_T \geq 50\Omega$  for RS-422 operation.  
 $R_T$  combined with input impedance of receivers must be greater than  $90\Omega$ .

**FIGURE 6. RS-422 System Application (FIPS 1020) Differential Simplex Bus Transmission**



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



**Molded Dual-In-Line Package (N)**  
**Order Number DS9639ACN**  
**NS Package Number N08E**

N08E (REV F)

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