

May 1998

## DS9637A Dual Differential Line Receiver

### General Description

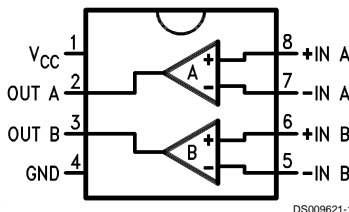
The DS9637A is a Schottky dual differential line receiver which has been specifically designed to satisfy the requirements of EIA Standards RS-422 and RS-423. In addition, the DS9637A satisfies the requirements of MIL-STD 188-114 and is compatible with the International Standard CCITT recommendations. The DS9637A 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 5V power supply and has Schottky TTL compatible outputs. The DS9637A has an operational input common mode range of  $\pm 7V$  either differentially or to ground.

### Features

- Dual channel
- Single 5V supply
- Satisfies EIA standards RS-422 and RS423
- Built-in  $\pm 35$  mV hysteresis
- High input common mode voltage range
- High input impedance
- TTL compatible outputs
- Schottky technology
- Extended temperature range

### Connection Diagram

8-Lead DIP and SO-8 Package



DS009621-1

Top View

Order Number DS9637ACM or DS9637ACN  
See NS Package Number M08A or N08E  
For Complete Military Product Specifications,  
refer to the appropriate SMD or MDS.  
Order Number DS9637AMJ/883  
See NS Package Number J08A

DS9637A Dual Differential Line Receiver

## 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

Ceramic DIP	–65°C to + 175°C
Molded DIP	–65°C to + 150°C

### Lead Temperature

Ceramic DIP	
(Soldering, 30 seconds)	300°C
Molded DIP and SO Package	
(Soldering, 10 seconds)	265°C

### Maximum Power Dissipation (Note 1) at 25°C

Cavity Package	1300 mW
Molded Package	930 mW
SO Package	810 mW

$V_{CC}$  Lead Potential to Ground –0.5V to 7.0V

Input Potential to Ground	±15V
Differential Input Voltage	±15V
Output Potential to Ground	–0.5V to +5.5V
Output Sink Current	50 mA

## Recommended Operating Conditions

	DS9637AM	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	4.5	5.5		V
Operating Temperature ( $T_A$ )	–55	+125		°C
	DS9637AC			
Supply Voltage ( $V_{CC}$ )	4.75	5.25		V
Operating Temperature ( $T_A$ )	0	+70		°C

**Note 1:** Derate cavity package 8.7 mW/°C above 25°C; derate molded DIP package 7.5 mW/°C above 25°C; derate SO package 6.5 mW/°C above 25°C.

## Electrical Characteristics (Notes 3, 4)

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{TH}$	Differential Input Threshold Voltage (Note 6)	$-7.0V \leq V_{CM} \leq +7.0V$	–0.2		+0.2	V
$V_{TH(R)}$	Differential Input Threshold Voltage (Note 7)	$-7.0V \leq V_{CM} \leq +7.0V$	–0.4		+0.4	V
$I_I$	Input Current (Note 8)	$V_I = 10V, 0V \leq V_{CC} \leq +5.5V$		1.1	3.25	mA
		$V_I = -10V, 0V \leq V_{CC} \leq +5.5V$		–1.6	–3.25	
$V_{OL}$	Output Voltage LOW	$I_{OL} = 20 \text{ mA}, V_{CC} = \text{Min}$		0.35	0.5	V
$V_{OH}$	Output Voltage HIGH	$I_{OH} = -1.0 \text{ mA}, V_{CC} = \text{Min}$	2.5	3.5		V
$I_{OS}$	Output Short Circuit Current (Note 5)	$V_O = 0V, V_{CC} = \text{Max}$	–40	–75	–100	mA
$I_{CC}$	Supply Current	$V_{CC} = \text{Max}, V_{I+} = 0.5V, V_{I-} = \text{GND}$		35	50	mA
$V_{HYST}$	Input Hysteresis	$V_{CM} = \pm 7.0V$ (See Curves)		70		mV

**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 –55°C to +125°C temperature range for DS9637AM and across the 0°C to +70°C range for the DS9637ASC. All typicals are given for  $V_{CC} = 5V$  and  $T_A = 25^\circ\text{C}$ .

**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:**  $V_{DIFF}$  (Differential Input Voltage) =  $(V_{I+}) - (V_{I-})$ .  $V_{CM}$  (Common Mode Input Voltage) =  $V_{I+}$  or  $V_{I-}$ .

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

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

## Switching Characteristics

$V_{CC} = 5.0V, T_A = 25^\circ\text{C}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{PLH}$	Propagation Delay Time Low to High	See AC Test Circuit		15	25	ns
$t_{PHL}$	Propagation Delay Time High to Low	See AC Test Circuit		13	25	ns

## Switching Characteristics (Continued)

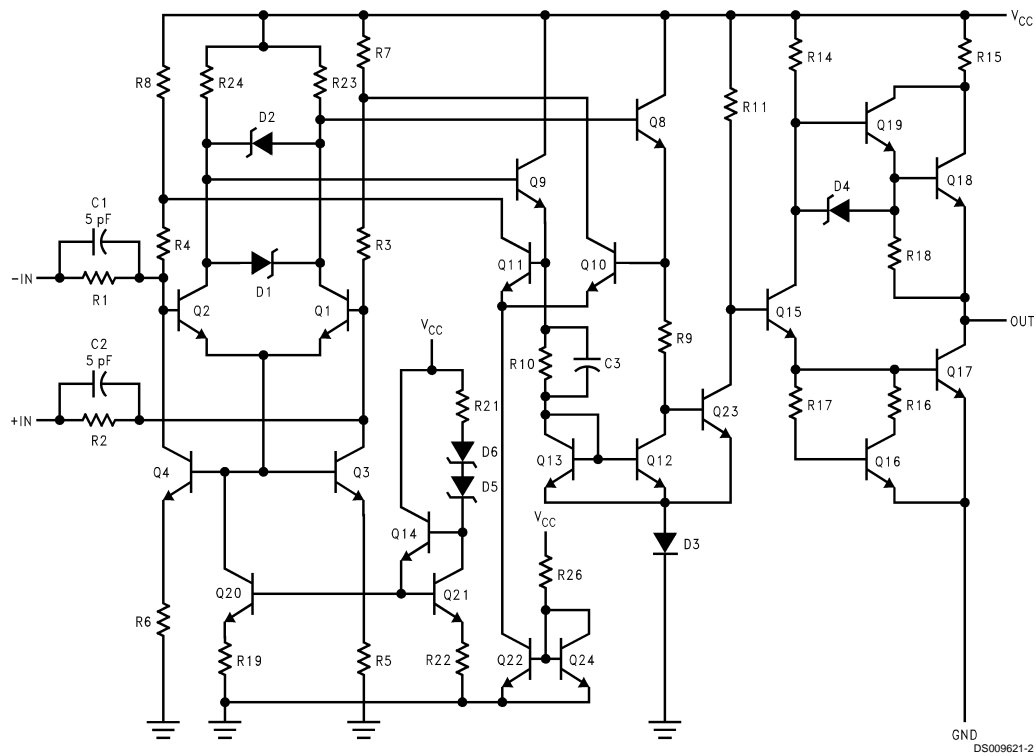
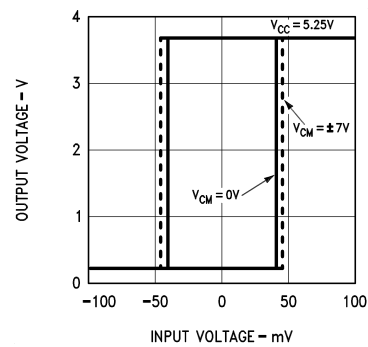
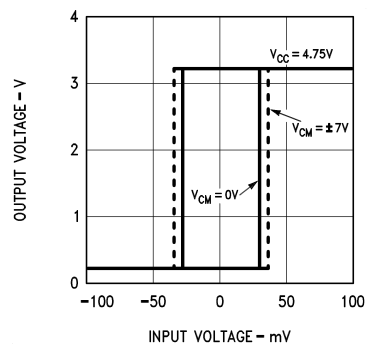
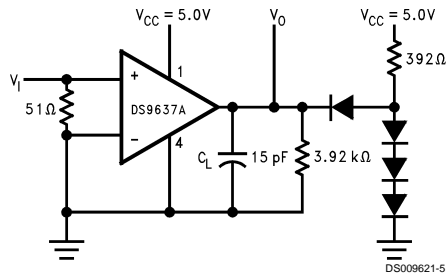


FIGURE 1. Equivalent Circuit

## Typical Input/Output Transfer Characteristics

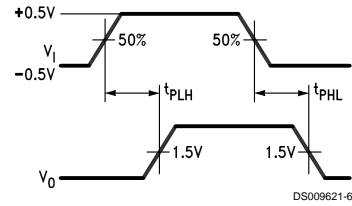


## AC Test Circuit and Waveforms



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

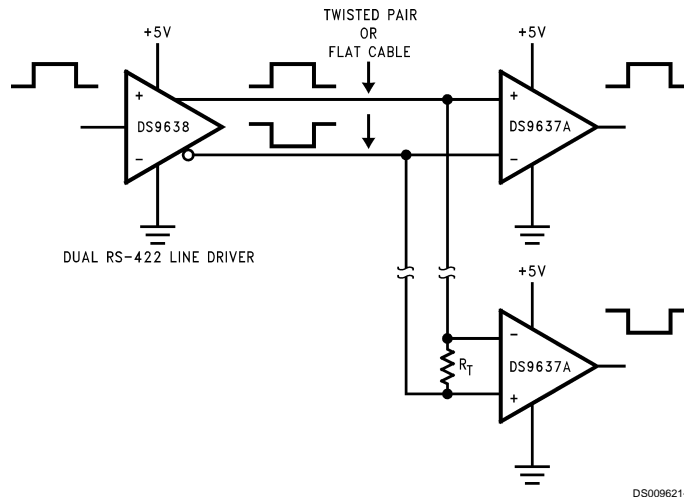
FIGURE 2.



$V_I$   
 Amplitude: 1.0V  
 Offset: 0.5V  
 Pulse Width: 100 ns  
 PRR: 5.0 MHz  
 $t_r = t_f \leq 5.0$  ns

FIGURE 3.

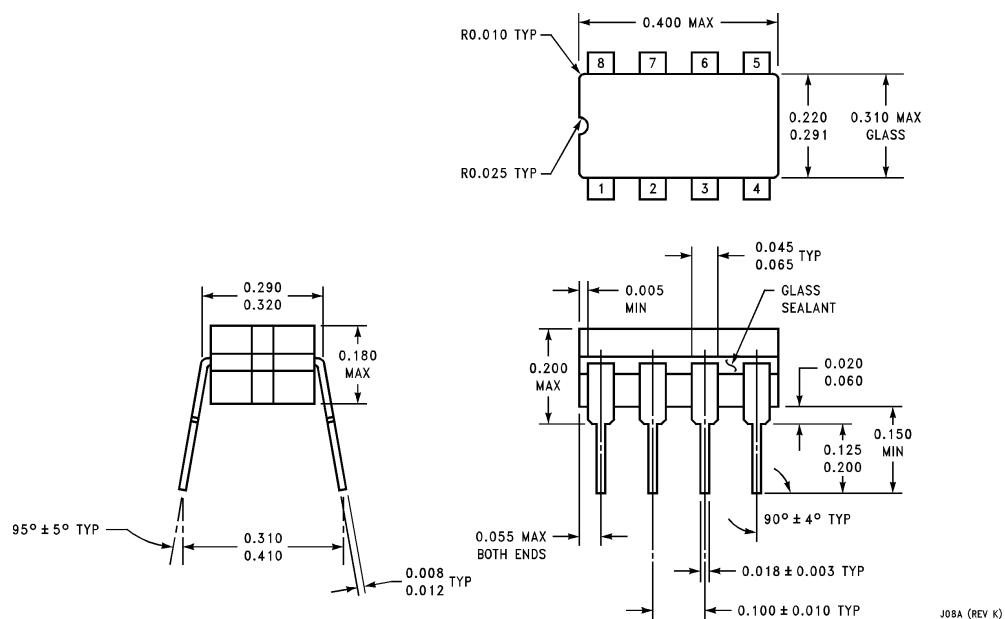
## Typical Applications



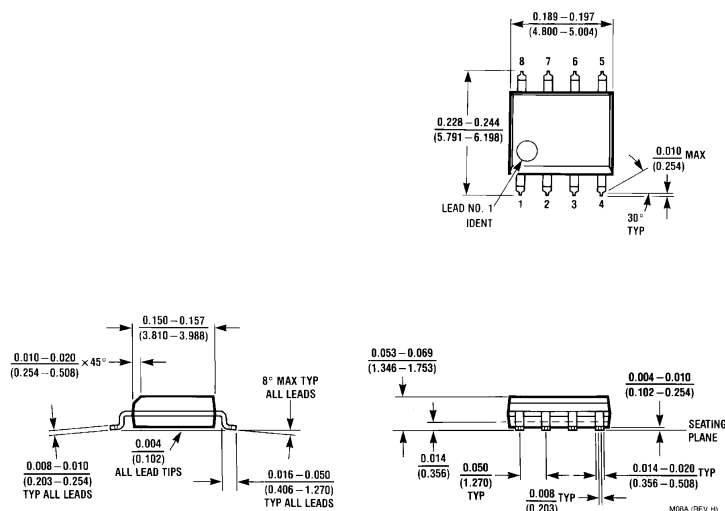
**Notes:**  
 $R_T \geq 50\Omega$  for RS-422 operation.  
 $R_T$  combined with input impedance of receivers must be greater than  $90\Omega$ .

FIGURE 4. RS-422 System Application (FIPS 1020) Differential Simplex Bus Transmission

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

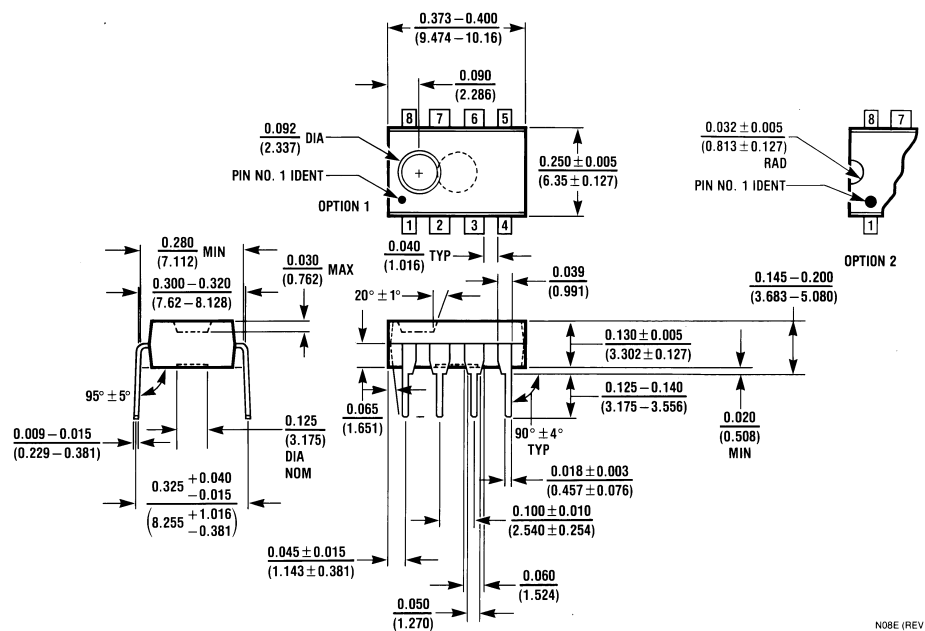


**Ceramic Dual-In-Line Package (J)**  
**Order Number DS9637AMJ/883**  
**NS Package Number J08A**



**Molded Surface Mount Package (M)**  
**Order Number DS9637ACM**  
**NS Package Number M08A**

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



Molded Dual-In-Line Package (N)  
Order Number DS9637ACN  
NS Package Number N08E

N08E (REV F)

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