

## DS9637A Dual Differential Line Receiver

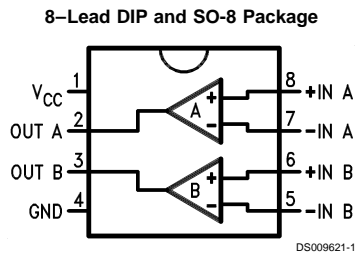
### General Description

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



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**

## 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

	Min	Max	Units
<b>DS9637AM</b>			
Supply Voltage ( $V_{CC}$ )	4.5	5.5	V
Operating Temperature ( $T_A$ )	-55	+125	°C
<b>DS9637AC</b>			
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)

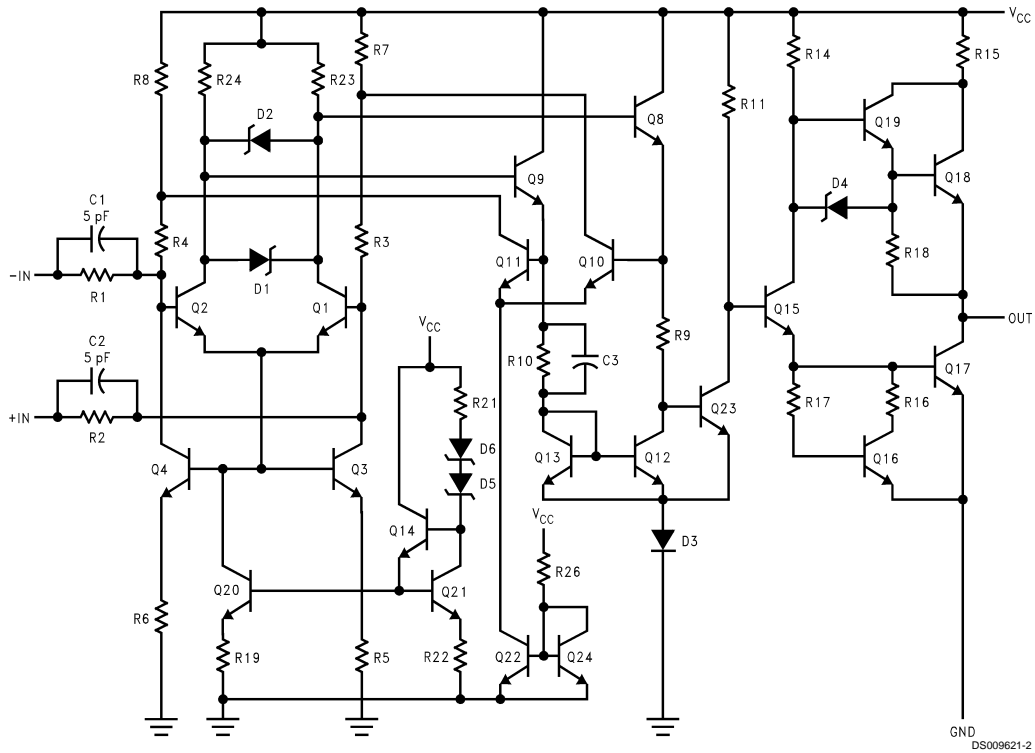
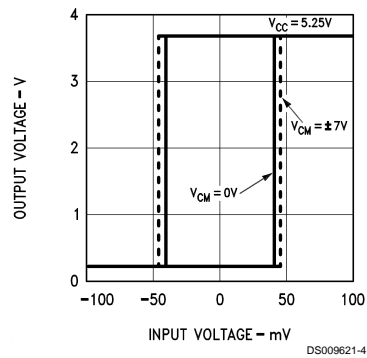
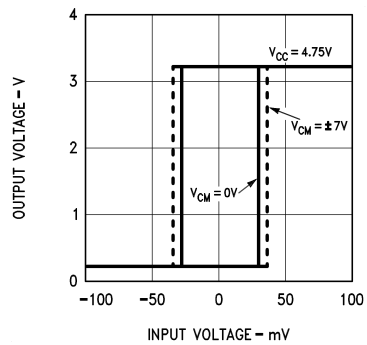
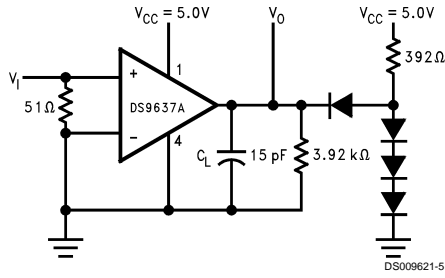


FIGURE 1. Equivalent Circuit

## Typical Input/Output Transfer Characteristics

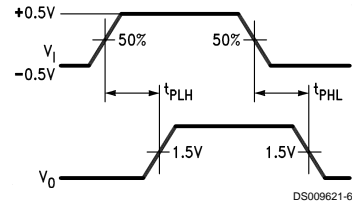


## AC Test Circuit and Waveforms



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

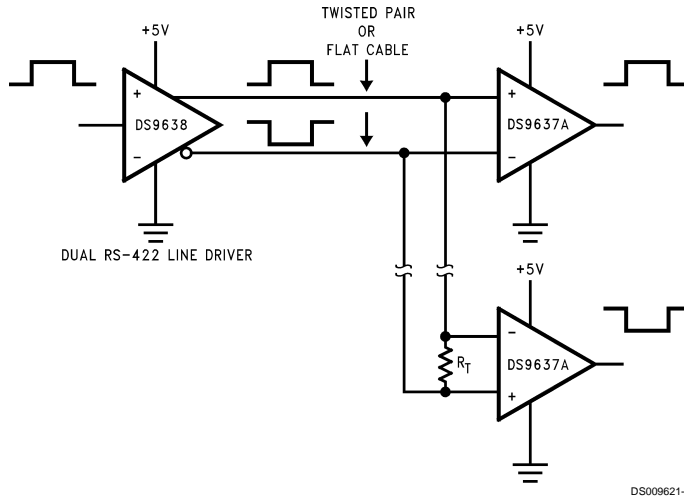
FIGURE 2.



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

FIGURE 3.

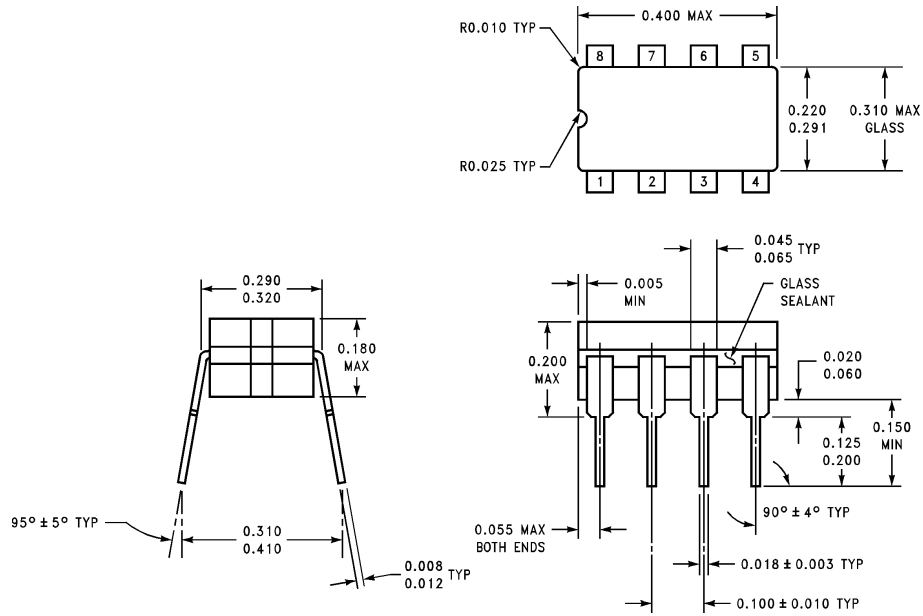
## Typical Applications



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

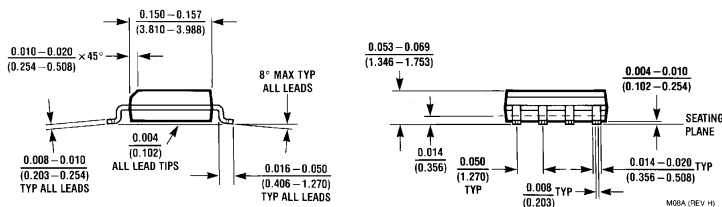
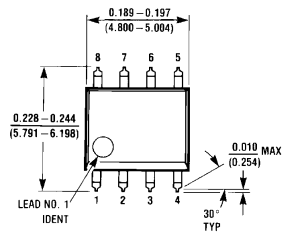
FIGURE 4. RS-422 System Application (FIPS 1020) Differential Simplex Bus Transmission

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



J08A (REV K)

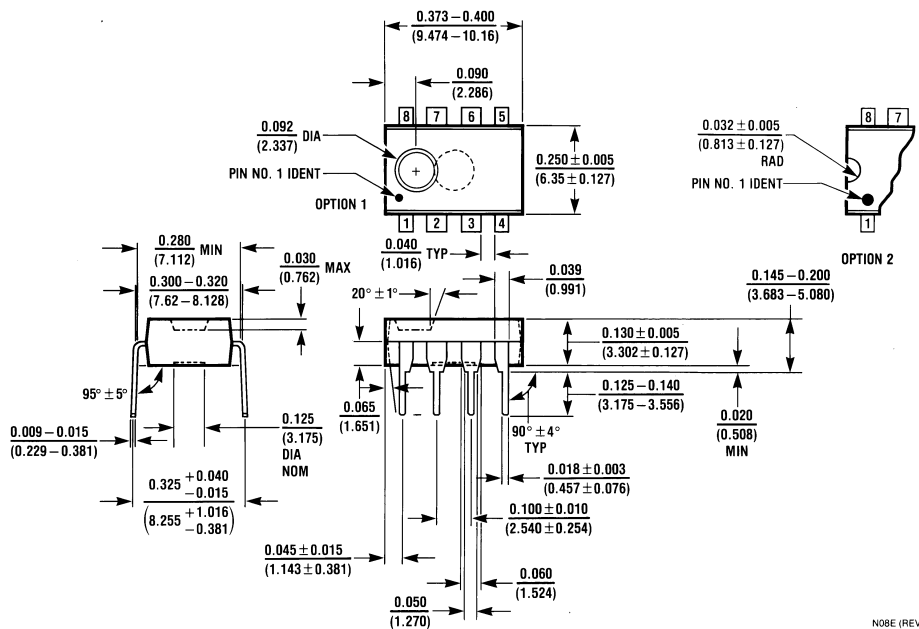
**Ceramic Dual-In-Line Package (J)**  
**Order Number DS9637AMJ/883**  
**NS Package Number J08A**



M08A (REV H)

**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**

NO8E (REV F)

**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 in 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.

 **National Semiconductor Corporation**  
 Americas  
 Tel: 1-800-272-9959  
 Fax: 1-800-737-7018  
 Email: support@nsc.com  
 www.national.com

**National Semiconductor Europe**  
 Fax: +49 (0) 1 80-530 85 86  
 Email: europe.support@nsc.com  
 Deutsch Tel: +49 (0) 1 80-530 85 85  
 English Tel: +49 (0) 1 80-532 78 32  
 Français Tel: +49 (0) 1 80-532 93 58  
 Italiano Tel: +49 (0) 1 80-534 16 80

**National Semiconductor Asia Pacific Customer Response Group**  
 Tel: 65-2544466  
 Fax: 65-2504466  
 Email: sea.support@nsc.com

**National Semiconductor Japan Ltd.**  
 Tel: 81-3-5620-6175  
 Fax: 81-3-5620-6179