

May 1998

## DS9636A RS-423 Dual Programmable Slew Rate Line Driver

### General Description

The DS9636A is a TTL/CMOS compatible, dual, single ended line driver which has been specifically designed to satisfy the requirements of EIA Standard RS-423.

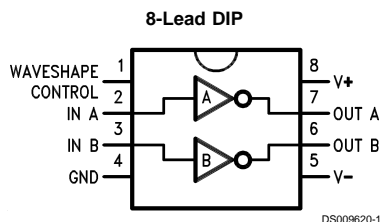
The DS9636A is suitable for use in digital data transmission systems where signal wave shaping is desired. The output slew rates are jointly controlled by a single external resistor connected between the wave shaping control lead (WS) and ground. This eliminates any need for external filtering of the output signals. Output voltage levels and slew rates are independent of power supply variations. Current-limiting is provided in both output states. The DS9636A is designed for nominal power supplies of  $\pm 12V$ .

Inputs are TTL compatible with input current loading low enough (1/10 UL) to be also compatible with CMOS logic. Clamp diodes are provided on the inputs to limit transients below ground.

### Features

- Programmable slew rate limiting
- Meets EIA Standard RS-423
- Commercial or extended temperature range
- Output short circuit protection
- TTL and CMOS compatible inputs

### Connection Diagram



Top View

Order Number DS9636ACN,  
See NS Package Number N08E  
For Complete Military Product Specifications,  
refer to the appropriate SMD or MDS.  
Order Number DS9636AJ/883  
See NS Package Number J08A

DS9636A RS-423 Dual Programmable Slew Rate Line Driver

## Absolute Maximum Ratings (Note 1)

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, 60 seconds)	300°C
Molded DIP (Soldering, 10 seconds)	265°C

## Maximum Power Dissipation\* at 25°C (Note 5)

Cavity Package	1560 mW
Molded Package	1300 mW
V+ Lead Potential to Ground Lead	V- to +15V
V- Lead Potential to Ground Lead	+0.5V to -15V
V+ Lead Potential to V- Lead	0V to +30V
Output Potential to Ground Lead	±15V
Output Source Current	-150 mA
Output Sink Current	150 mA

## Recommended Operating Conditions

Characteristics	DS9636AM			DS9636AC			Units
	Min	Typ	Max	Min	Typ	Max	
Positive Supply Voltage (V+)	10.8	12	13.2	10.8	12	13.2	V
Negative Supply Voltage (V-)	-13.2	-12	-10.8	-13.2	-12	-10.8	V
Operating Temperature (T <sub>A</sub> )	-55	25	125	0	25	70	°C
Wave Shaping Resistance (R <sub>WS</sub> )	10		500	10		1000	kΩ

## Electrical Characteristics (Notes 2, 3)

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V <sub>OH1</sub>	Output Voltage HIGH	R <sub>L</sub> to GND (R <sub>L</sub> = ∞)	5.0	5.6	6.0	V
V <sub>OH2</sub>		R <sub>L</sub> to GND (R <sub>L</sub> = 3.0 kΩ)	5.0	5.6	6.0	V
V <sub>OH3</sub>		R <sub>L</sub> to GND (R <sub>L</sub> = 450Ω)	4.0	5.5	6.0	V
V <sub>OL1</sub>	Output Voltage LOW	R <sub>L</sub> to GND (R <sub>L</sub> = ∞)	-6.0	-5.7	-5.0	V
V <sub>OL2</sub>		R <sub>L</sub> to GND (R <sub>L</sub> = 3.0 kΩ)	-6.0	-5.6	-5.0	V
V <sub>OL3</sub>		R <sub>L</sub> to GND (R <sub>L</sub> = 450Ω)	-6.0	-5.4	-4.0	V
R <sub>O</sub>	Output Resistance	450Ω ≤ R <sub>L</sub>		25	50	Ω
I <sub>OS+</sub>	Output Short Circuit Current (Note 4)	V <sub>O</sub> = 0V, V <sub>I</sub> = 0V	-150	-60	-15	mA
I <sub>OS-</sub>		V <sub>O</sub> = 0V, V <sub>I</sub> = 2.0V	15	60	150	mA
I <sub>CEX</sub>	Output Leakage Current	V <sub>O</sub> = ±6.0V, Power-Off	-100		+100	μA
V <sub>IH</sub>	Input Voltage HIGH		2.0			V
V <sub>IL</sub>	Input Voltage LOW				0.8	V
V <sub>IC</sub>	Input Clamp Diode Voltage	I <sub>I</sub> = 15 mA	-1.5	-1.1		V
I <sub>IL</sub>	Input Current LOW	V <sub>I</sub> = 0.4V	-80	-16		V
I <sub>IH</sub>	Input Current HIGH	V <sub>I</sub> = 2.4V		1.0	10	μA
		V <sub>I</sub> = 5.5V		10	100	
I+	Positive Supply Current	V <sub>CC</sub> = ±12V, R <sub>L</sub> = ∞, R <sub>WS</sub> = 100 kΩ, V <sub>I</sub> = 0V		13	18	mA
I-	Negative Supply Current	V <sub>CC</sub> = ±12V, R <sub>L</sub> = ∞, R <sub>WS</sub> = 100 kΩ, V <sub>I</sub> = 0V	-18	-13		mA

**Note 1:** "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 2:** Unless otherwise specified Min/Max limits apply across the -55°C to +125°C temperature range for the DS9636AM and across the 0°C to +70°C range for the DS9636AC. All typicals are given for V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C.

**Note 3:** All currents into the device pins are positive; all currents out of the device pins are negative. All voltages are reference to ground unless otherwise specified.

**Note 4:** Only one output at a time should be shorted.

**Note 5:** Ratings apply to ambient temperature at 25°C. Above this temperature, derate J and N packages 10.4 mW/°C.

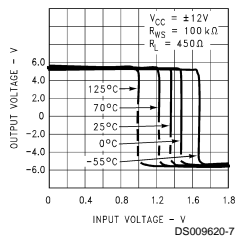
## Switching Characteristics

$V_{CC} = \pm 12V \pm 10\%$ ,  $T_A = 25^\circ C$ , see AC Test Circuit

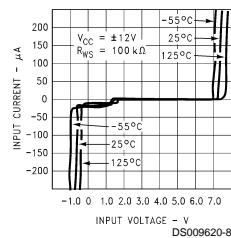
Symbol	Parameter	Condition	Min	Typ	Max	Units
$t_r$	Rise Time	$R_{WS} = 10\text{ k}\Omega$	0.8	1.1	1.4	$\mu s$
		$R_{WS} = 100\text{ k}\Omega$	8.0	11	14	
		$R_{WS} = 500\text{ k}\Omega$	40	55	70	
		$R_{WS} = 1000\text{ k}\Omega$	80	110	140	
$t_f$	Fall Time	$R_{WS} = 10\text{ k}\Omega$	0.8	1.1	1.4	$\mu s$
		$R_{WS} = 100\text{ k}\Omega$	8.0	11	14	
		$R_{WS} = 500\text{ k}\Omega$	40	55	70	
		$R_{WS} = 1000\text{ k}\Omega$	80	110	140	

## Typical Performance Characteristics

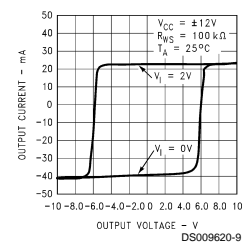
Input/Output Transfer Characteristic vs Temperature



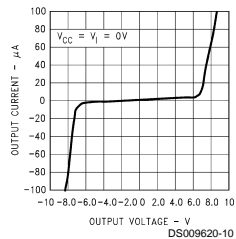
Input Current vs Input Voltage



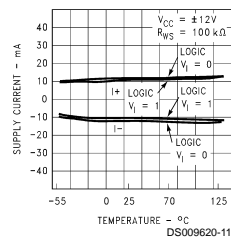
Output Current vs Output Voltage (Power On)



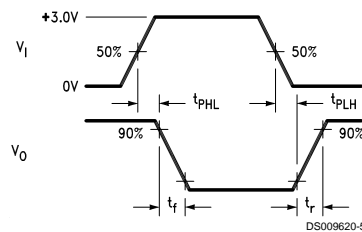
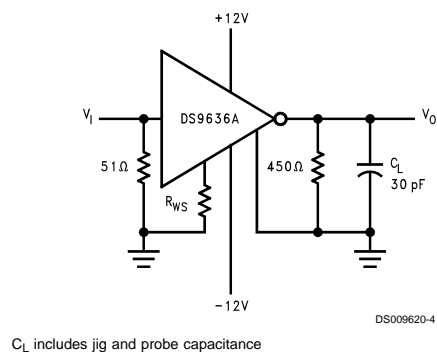
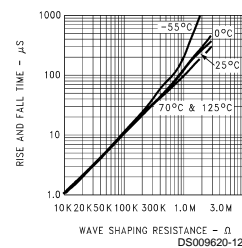
Output Current vs Output Voltage (Power Off)



Supply Current vs Temperature



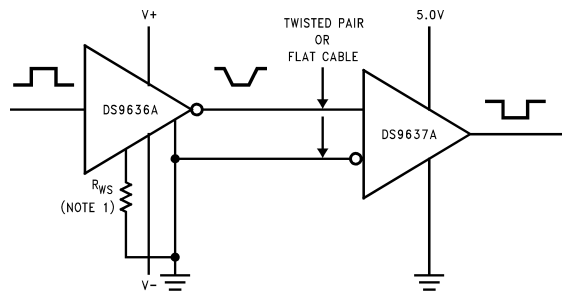
Transition Time vs Rws



$V_I$   
Amplitude: 3.0V  
Offset: 0V  
Pulse Width: 500  $\mu s$   
PRR: 1.0 kHz  
 $t_r = t_f \leq 10\text{ ns}$

FIGURE 1. AC Test Circuit and Waveforms

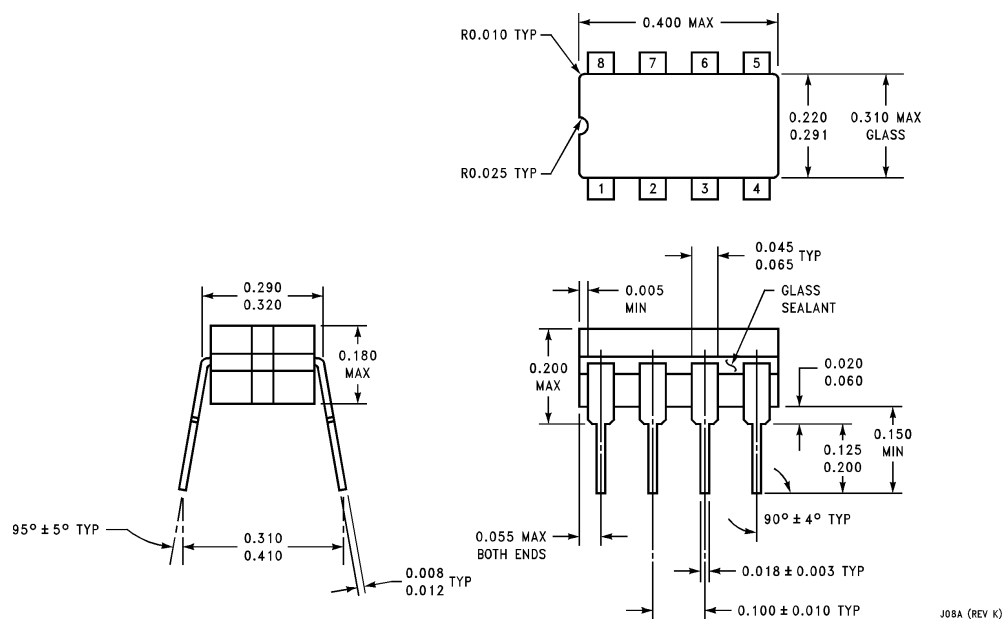
## Typical Performance Characteristics (Continued)



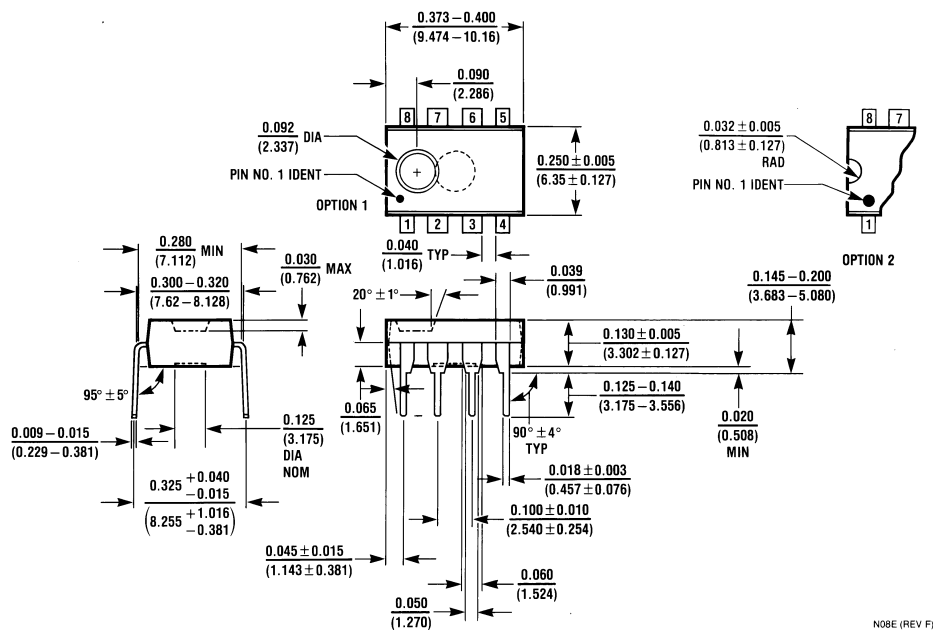
DS009620-6

FIGURE 2. RS-423 System Application

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



**Ceramic Dual-In-Line Package (J)**  
**Order Number DS9636AJ/883**  
**NS Package Number J08A**



**Molded Dual-In-Line Package (N)**  
**Order Number DS9636ACN**  
**NS Package Number N08E**

#### 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](http://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

Copyright © Each Manufacturing Company.

All Datasheets cannot be modified without permission.

This datasheet has been download from :

[www.AllDataSheet.com](http://www.AllDataSheet.com)

100% Free DataSheet Search Site.

Free Download.

No Register.

Fast Search System.

[www.AllDataSheet.com](http://www.AllDataSheet.com)