

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.

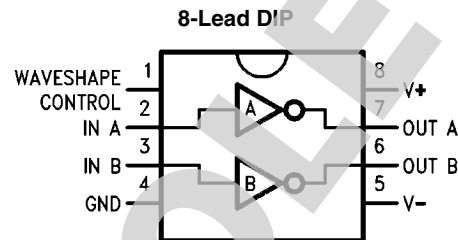
The DS9636A is suitable for use in digital data transmission systems where signal wave shaping is desired. The output slew rates are jointly controlled by a single external resistor connected between the wave shaping control lead (WS) and ground. This eliminates any need for external filtering of the 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



962001

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**

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 _A)	-55	25	125	0	25	70	°C
Wave Shaping Resistance (R _{WS})	10		500	10		1000	kΩ

Electrical Characteristics *(Note 2, Note 3)*

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
V _{OH1}	Output Voltage HIGH	R _L to GND (R _L = ∞)	5.0	5.6	6.0	V
V _{OH2}		R _L to GND (R _L = 3.0 kΩ)	5.0	5.6	6.0	V
V _{OH3}		R _L to GND (R _L = 450Ω)	4.0	5.5	6.0	V
V _{OL1}	Output Voltage LOW	R _L to GND (R _L = ∞)	-6.0	-5.7	-5.0	V
V _{OL2}		R _L to GND (R _L = 3.0 kΩ)	-6.0	-5.6	-5.0	V
V _{OL3}		R _L to GND (R _L = 450Ω)	-6.0	-5.4	-4.0	V
R _O	Output Resistance	450Ω ≤ R _L		25	50	Ω
I _{OS+}	Output Short Circuit Current <i>(Note 4)</i>	V _O = 0V, V _I = 0V	-150	-60	-15	mA
I _{OS-}		V _O = 0V, V _I = 2.0V	15	60	150	mA
I _{CEX}	Output Leakage Current	V _O = ±6.0V, Power-Off	-100		+100	μA
V _{IH}	Input Voltage HIGH		2.0			V
V _{IL}	Input Voltage LOW				0.8	V
V _{IC}	Input Clamp Diode Voltage	I _I = 15 mA	-1.5	-1.1		V
I _{IL}	Input Current LOW	V _I = 0.4V	-80	-16		V
I _{IH}	Input Current HIGH	V _I = 2.4V		1.0	10	μA
		V _I = 5.5V		10	100	
I+	Positive Supply Current	V _{CC} = ±12V, R _L = ∞, R _{WS} = 100 kΩ, V _I = 0V		13	18	mA
I-	Negative Supply Current	V _{CC} = ±12V, R _L = ∞, R _{WS} = 100 kΩ, V _I = 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_{CC} = 5V and T_A = 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.

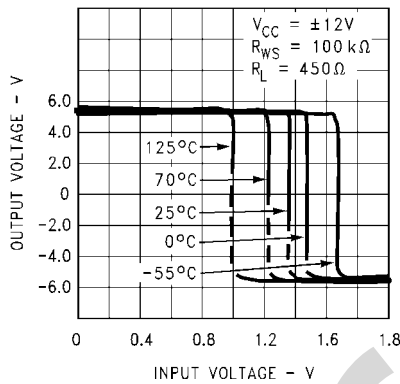
Switching Characteristics

$V_{CC} = \pm 12V \pm 10\%$, $T_A = 25^\circ C$, 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	μs
		$R_{WS} = 100\text{ k}\Omega$	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	μs
		$R_{WS} = 100\text{ k}\Omega$	8.0	11	14	
		$R_{WS} = 500\text{ k}\Omega$	40	55	70	
		$R_{WS} = 1000\text{ k}\Omega$	80	110	140	

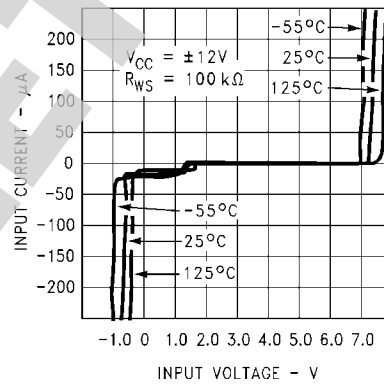
Typical Performance Characteristics

Input/Output Transfer Characteristic vs Temperature



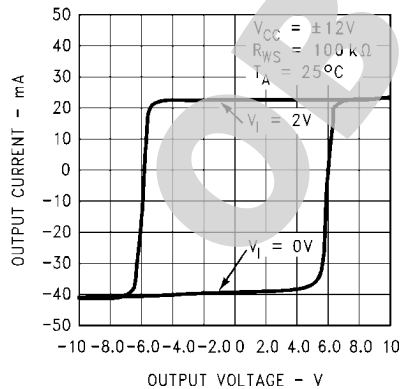
962007

Input Current vs Input Voltage



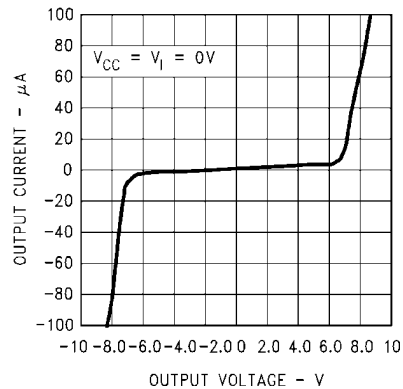
962008

Output Current vs Output Voltage (Power On)

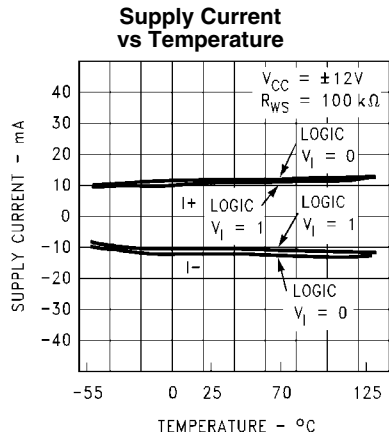


962009

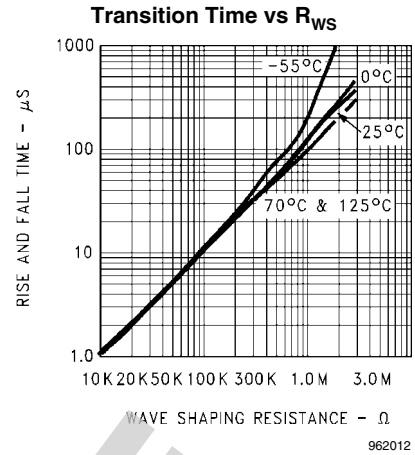
Output Current vs Output Voltage (Power Off)



962010

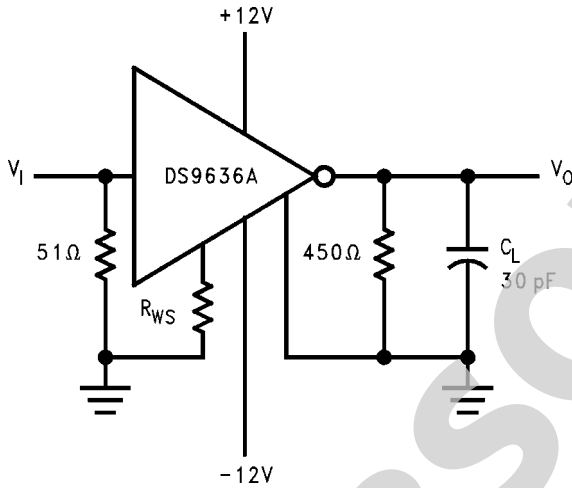


962011



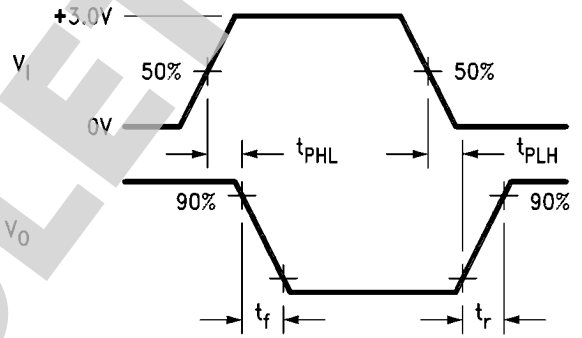
962012

AC Test Circuit and Waveforms



962004

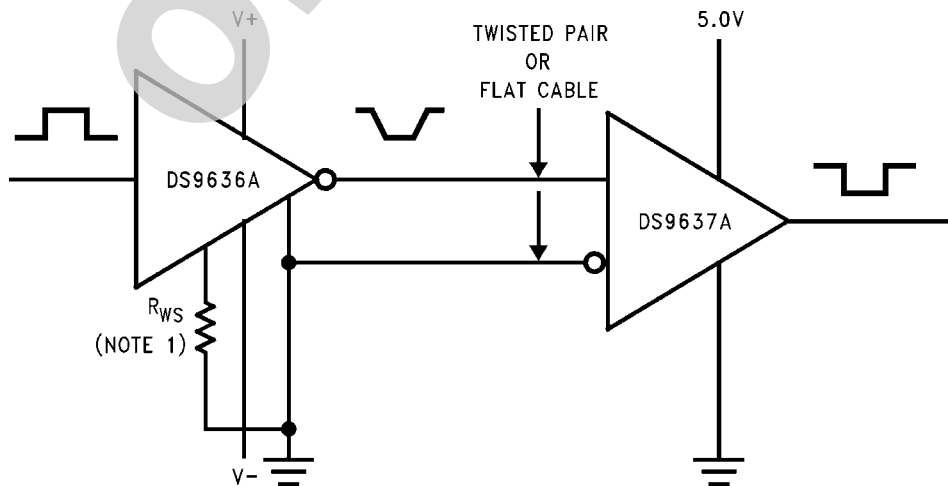
C_L includes jig and probe capacitance



962005

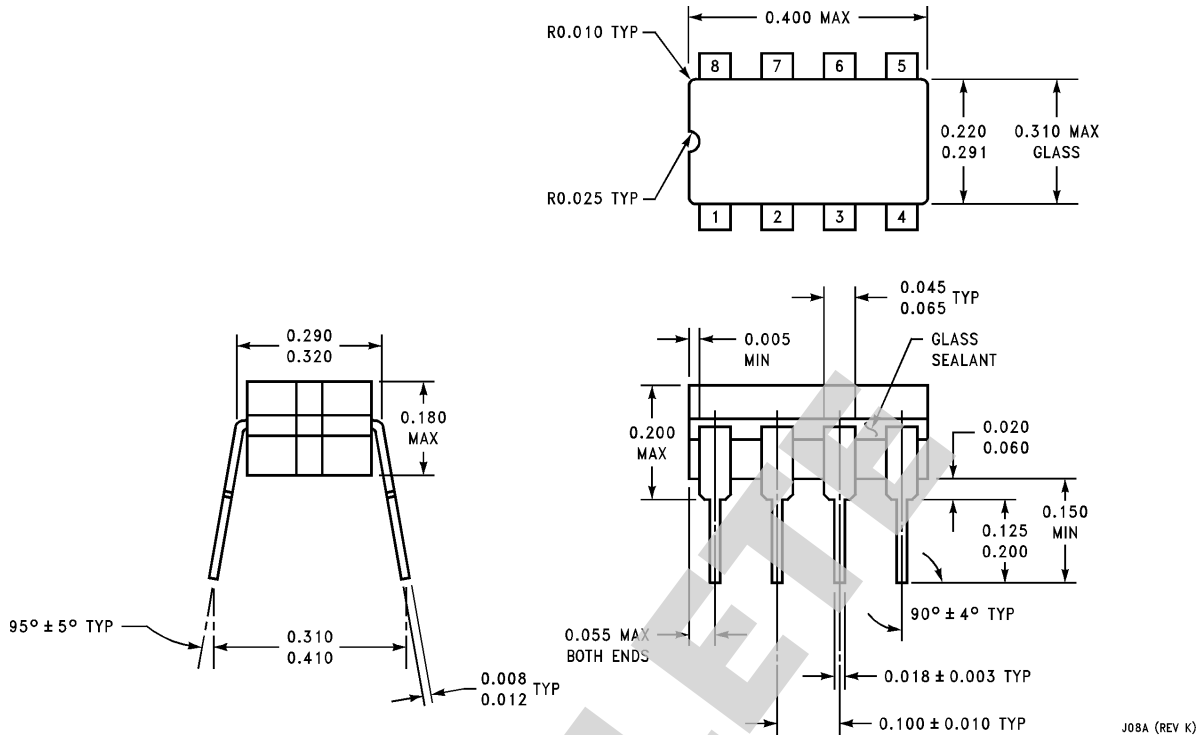
V_1
 Amplitude: 3.0V
 Offset: 0V
 Pulse Width: 500 μs
 PRR: 1.0 kHz
 $t_r = t_f \leq 10\text{ ns}$

RS-423 System Application



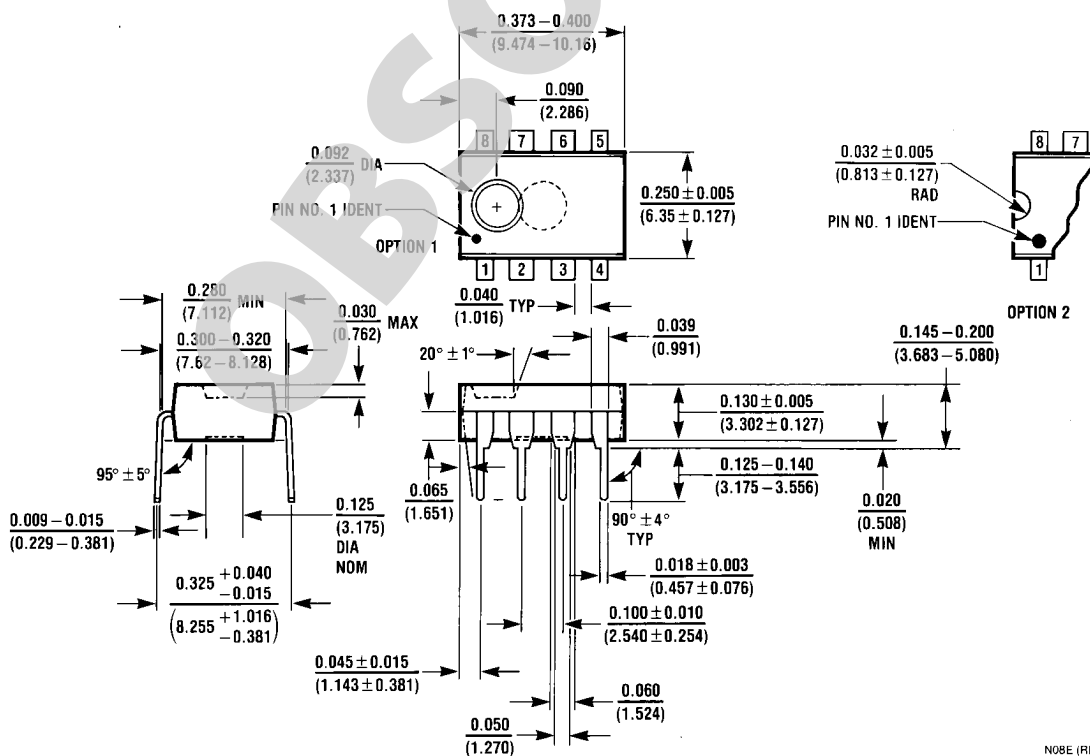
962006

Physical Dimensions inches (millimeters) unless otherwise noted



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

J08A (REV K)



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

N08E (REV F)

Notes

For more National Semiconductor product information and proven design tools, visit the following Web sites at:

Products		Design Support	
Amplifiers	www.national.com/amplifiers	WEBENCH® Tools	www.national.com/webench
Audio	www.national.com/audio	App Notes	www.national.com/appnotes
Clock and Timing	www.national.com/timing	Reference Designs	www.national.com/refdesigns
Data Converters	www.national.com/adc	Samples	www.national.com/samples
Interface	www.national.com/interface	Eval Boards	www.national.com/evalboards
LVDS	www.national.com/lvds	Packaging	www.national.com/packaging
Power Management	www.national.com/power	Green Compliance	www.national.com/quality/green
Switching Regulators	www.national.com/switchers	Distributors	www.national.com/contacts
LDOs	www.national.com/ldo	Quality and Reliability	www.national.com/quality
LED Lighting	www.national.com/led	Feedback/Support	www.national.com/feedback
Voltage Reference	www.national.com/vref	Design Made Easy	www.national.com/easy
PowerWise® Solutions	www.national.com/powerwise	Solutions	www.national.com/solutions
Serial Digital Interface (SDI)	www.national.com/sdi	Mil/Aero	www.national.com/milaero
Temperature Sensors	www.national.com/tempensors	SolarMagic™	www.national.com/solarmagic
Wireless (PLL/VCO)	www.national.com/wireless	PowerWise® Design University	www.national.com/training

THE CONTENTS OF THIS DOCUMENT ARE PROVIDED IN CONNECTION WITH NATIONAL SEMICONDUCTOR CORPORATION ("NATIONAL") PRODUCTS. NATIONAL MAKES NO REPRESENTATIONS OR WARRANTIES WITH RESPECT TO THE ACCURACY OR COMPLETENESS OF THE CONTENTS OF THIS PUBLICATION AND RESERVES THE RIGHT TO MAKE CHANGES TO SPECIFICATIONS AND PRODUCT DESCRIPTIONS AT ANY TIME WITHOUT NOTICE. NO LICENSE, WHETHER EXPRESS, IMPLIED, ARISING BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT.

TESTING AND OTHER QUALITY CONTROLS ARE USED TO THE EXTENT NATIONAL DEEMS NECESSARY TO SUPPORT NATIONAL'S PRODUCT WARRANTY. EXCEPT WHERE MANDATED BY GOVERNMENT REQUIREMENTS, TESTING OF ALL PARAMETERS OF EACH PRODUCT IS NOT NECESSARILY PERFORMED. NATIONAL ASSUMES NO LIABILITY FOR APPLICATIONS ASSISTANCE OR BUYER PRODUCT DESIGN. BUYERS ARE RESPONSIBLE FOR THEIR PRODUCTS AND APPLICATIONS USING NATIONAL COMPONENTS. PRIOR TO USING OR DISTRIBUTING ANY PRODUCTS THAT INCLUDE NATIONAL COMPONENTS, BUYERS SHOULD PROVIDE ADEQUATE DESIGN, TESTING AND OPERATING SAFEGUARDS.

EXCEPT AS PROVIDED IN NATIONAL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, NATIONAL ASSUMES NO LIABILITY WHATSOEVER, AND NATIONAL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY RELATING TO THE SALE AND/OR USE OF NATIONAL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

LIFE SUPPORT POLICY


NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS PRIOR WRITTEN APPROVAL OF THE CHIEF EXECUTIVE OFFICER AND GENERAL COUNSEL OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

Life support devices or systems are devices 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. A critical component is any component in 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 and the National Semiconductor logo are registered trademarks of National Semiconductor Corporation. All other brand or product names may be trademarks or registered trademarks of their respective holders.

Copyright© 2009 National Semiconductor Corporation

For the most current product information visit us at www.national.com


National Semiconductor
Americas Technical
Support Center
 Email: support@nsc.com
 Tel: 1-800-272-9959

National Semiconductor Europe
Technical Support Center
 Email: europe.support@nsc.com

National Semiconductor Asia
Pacific Technical Support Center
 Email: ap.support@nsc.com

National Semiconductor Japan
Technical Support Center
 Email: jpn.feedback@nsc.com