National Semiconductor

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 ±12V.

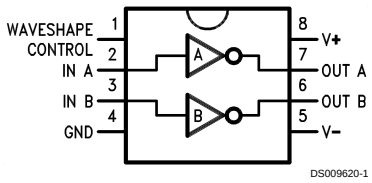
Inputs are TTL compatible with input current loading low enough (1/10 UL) to be also compatible with CMOS logic. Clamp diodes are provided on the inputs to limit transients below ground.

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

8-Lead DIP



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

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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 (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_{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 (Note 4)	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.

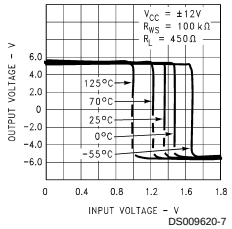
Switching Characteristics

V_{CC} = ±12V ±10%, T_A = 25˚C, see AC Test Circuit

Symbol	Parameter	Condition	Min	Typ	Max	Units
t_r	Rise Time	R_{WS} = 10 kΩ	0.8	1.1	1.4	
		R_{WS} = 100 kΩ	8.0	11	14	µs
		R_{WS} = 500 kΩ	40	55	70	
		R_{WS} = 1000 kΩ	80	110	140	
t_f	Fall Time	R_{WS} = 10 kΩ	0.8	1.1	1.4	
		R_{WS} = 100 kΩ	8.0	11	14	µs
		R_{WS} = 500 kΩ	40	55	70	
		R_{WS} = 1000 kΩ	80	110	140	

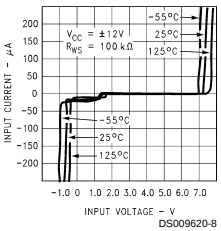
Typical Performance Characteristics

Input/Output Transfer Characteristic vs Temperature



DS009620-7

Input Current vs Input Voltage



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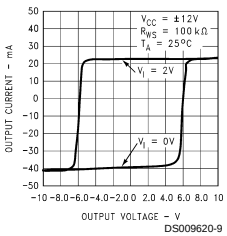
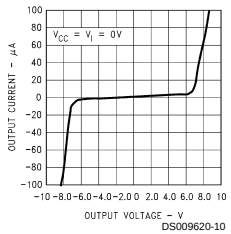
Output Current vs Output Voltage (Power On)



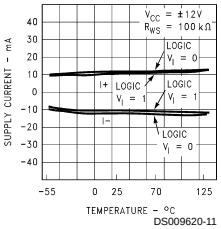
DS009620-9

Output Current vs Output Voltage (Power Off)



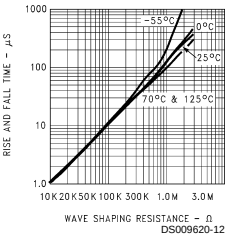
DS009620-10

Supply Current vs Temperature

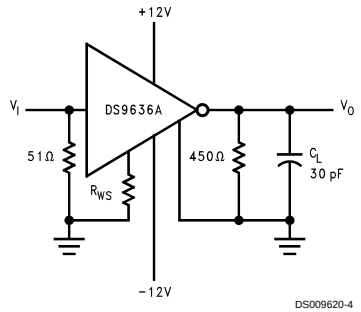


DS009620-11

Transition Time vs R_{WS}

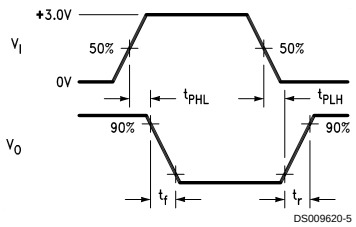


DS009620-12



DS009620-4

C_L includes jig and probe capacitance



DS009620-5

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

FIGURE 1. AC Test Circuit and Waveforms

Typical Performance Characteristics (Continued)

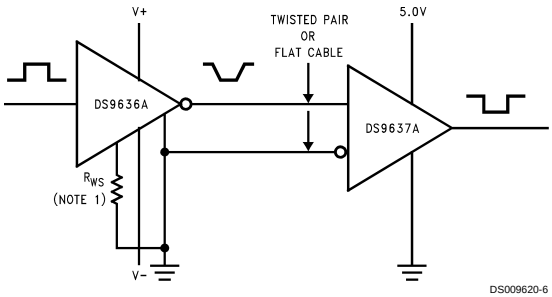
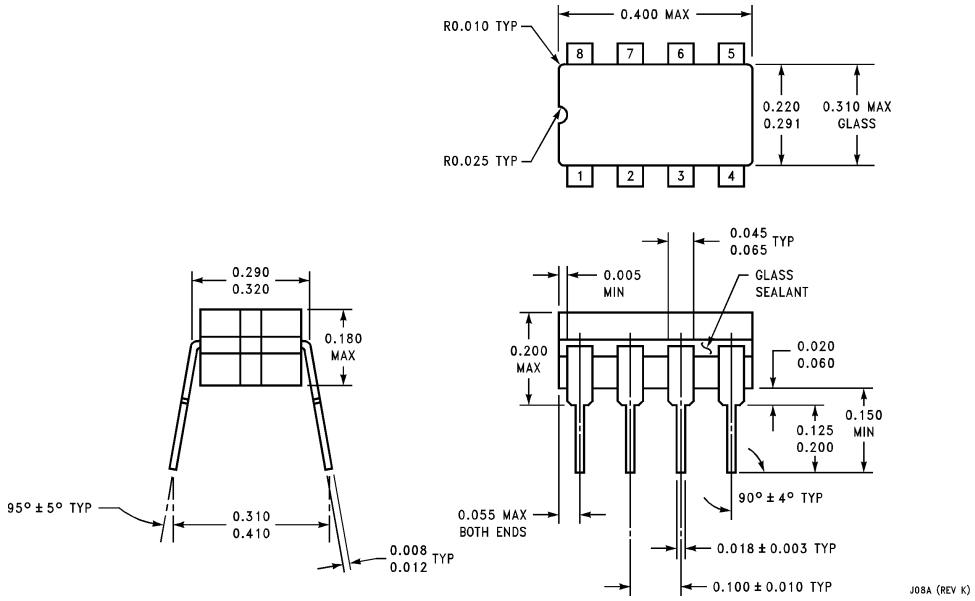
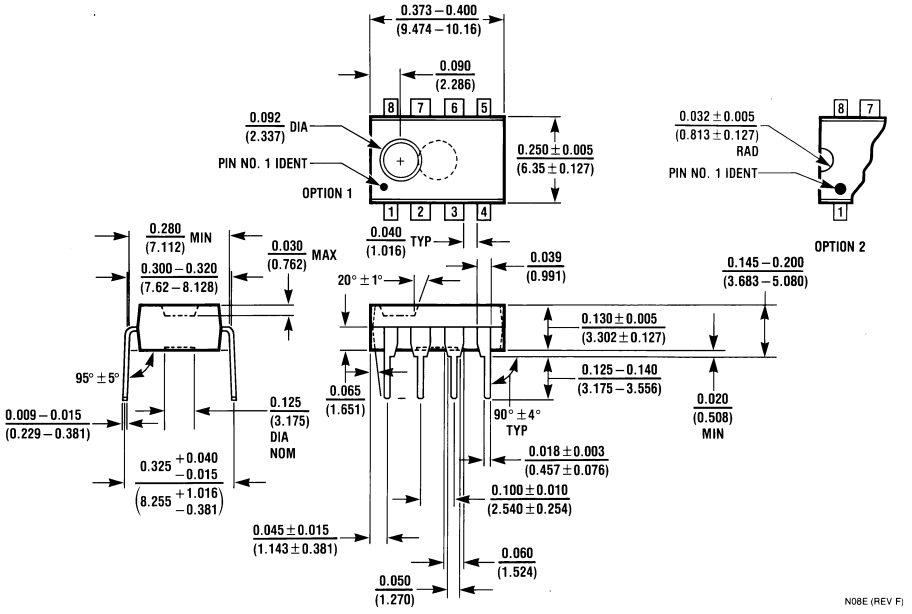


FIGURE 2. RS-423 System Application

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

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