



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.

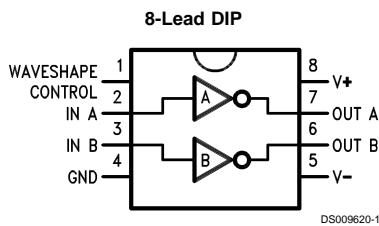
The DS9636A is suitable for use in digital data transmission systems where signal wave shaping is desired. The output slew rates are jointly controlled by a single external resistor connected between the wave shaping control lead (WS) and ground. This eliminates any need for external filtering of the 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 $\pm 12V$.

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

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 $+175^{\circ}\text{C}$
Molded DIP -65°C to $+150^{\circ}\text{C}$

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 $+15\text{V}$
V_- Lead Potential to Ground Lead	$+0.5\text{V}$ to -15V
V_+ Lead Potential to V_- Lead	0V to $+30\text{V}$
Output Potential to Ground Lead	$\pm 15\text{V}$
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 ($R_L = \infty$)	5.0	5.6	6.0	V
		R_L to GND ($R_L = 3.0\text{ k}\Omega$)	5.0	5.6	6.0	V
		R_L to GND ($R_L = 450\Omega$)	4.0	5.5	6.0	V
V_{OL1}	Output Voltage LOW	R_L to GND ($R_L = \infty$)	-6.0	-5.7	-5.0	V
		R_L to GND ($R_L = 3.0\text{ k}\Omega$)	-6.0	-5.6	-5.0	V
		R_L to GND ($R_L = 450\Omega$)	-6.0	-5.4	-4.0	V
R_O	Output Resistance	$450\Omega \leq R_L$		25	50	Ω
I_{OS+}	Output Short Circuit Current (Note 4)	$V_O = 0\text{V}$, $V_I = 0\text{V}$	-150	-60	-15	mA
		$V_O = 0\text{V}$, $V_I = 2.0\text{V}$	15	60	150	mA
I_{CEX}	Output Leakage Current	$V_O = \pm 6.0\text{V}$, 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	$I_I = 15\text{ mA}$	-1.5	-1.1		V
I_{IL}	Input Current LOW	$V_I = 0.4\text{V}$	-80	-16		V
I_{IH}	Input Current HIGH	$V_I = 2.4\text{V}$		1.0	10	μA
		$V_I = 5.5\text{V}$		10	100	
I_+	Positive Supply Current	$V_{CC} = \pm 12\text{V}$, $R_L = \infty$, $R_{WS} = 100\text{ k}\Omega$, $V_I = 0\text{V}$		13	18	mA
I_-	Negative Supply Current	$V_{CC} = \pm 12\text{V}$, $R_L = \infty$, $R_{WS} = 100\text{ k}\Omega$, $V_I = 0\text{V}$	-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 $+125^{\circ}\text{C}$ temperature range for the DS9636AM and across the 0°C to $+70^{\circ}\text{C}$ range for the DS9636AC. All typicals are given for $V_{CC} = 5\text{V}$ and $T_A = 25^{\circ}\text{C}$.

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 .

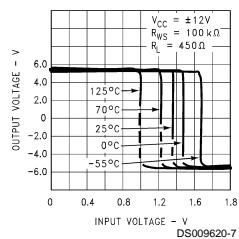
Switching Characteristics

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

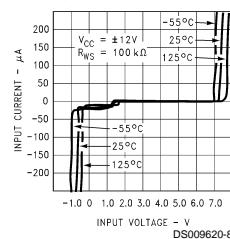
Symbol	Parameter	Condition	Min	Typ	Max	Units
t_r	Rise Time	$R_{WS} = 10 k\Omega$	0.8	1.1	1.4	μs
		$R_{WS} = 100 k\Omega$	8.0	11	14	
		$R_{WS} = 500 k\Omega$	40	55	70	
		$R_{WS} = 1000 k\Omega$	80	110	140	
t_f	Fall Time	$R_{WS} = 10 k\Omega$	0.8	1.1	1.4	μs
		$R_{WS} = 100 k\Omega$	8.0	11	14	
		$R_{WS}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

Typical Performance Characteristics

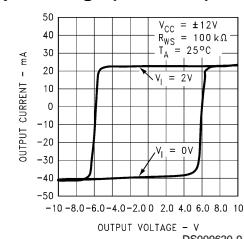
Input/Output Transfer Characteristic vs Temperature



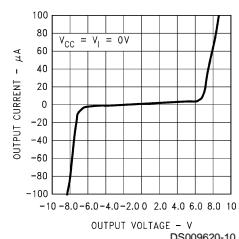
Input Current vs Input Voltage



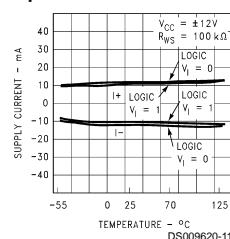
Output Current vs Output Voltage (Power On)



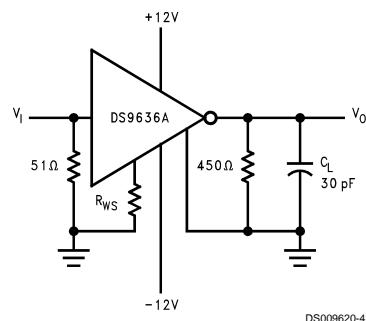
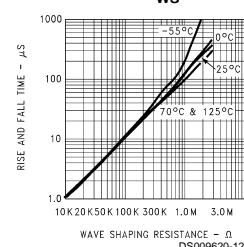
Output Current vs Output Voltage (Power Off)



Supply Current vs Temperature

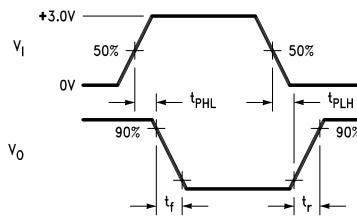


Transition Time vs R_{WS}



C_L includes jig and probe capacitance

FIGURE 1. AC Test Circuit and Waveforms



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

Typical Performance Characteristics (Continued)

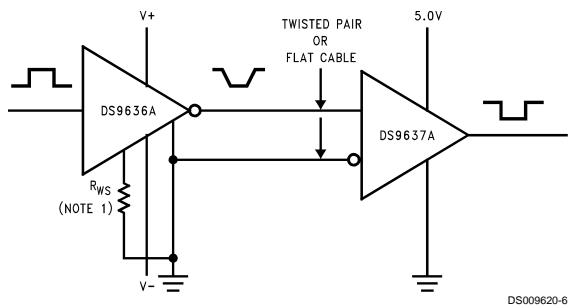
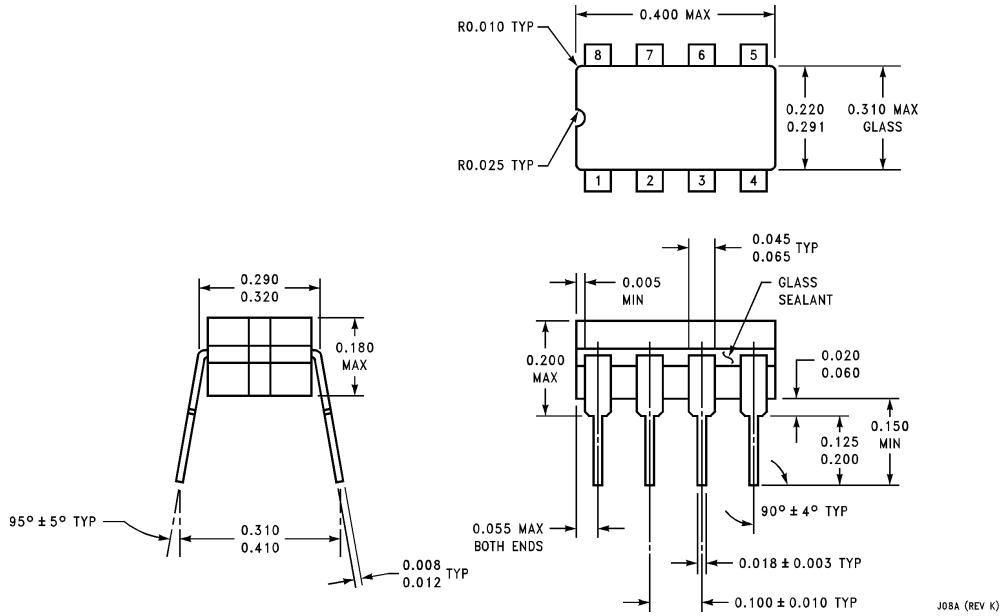


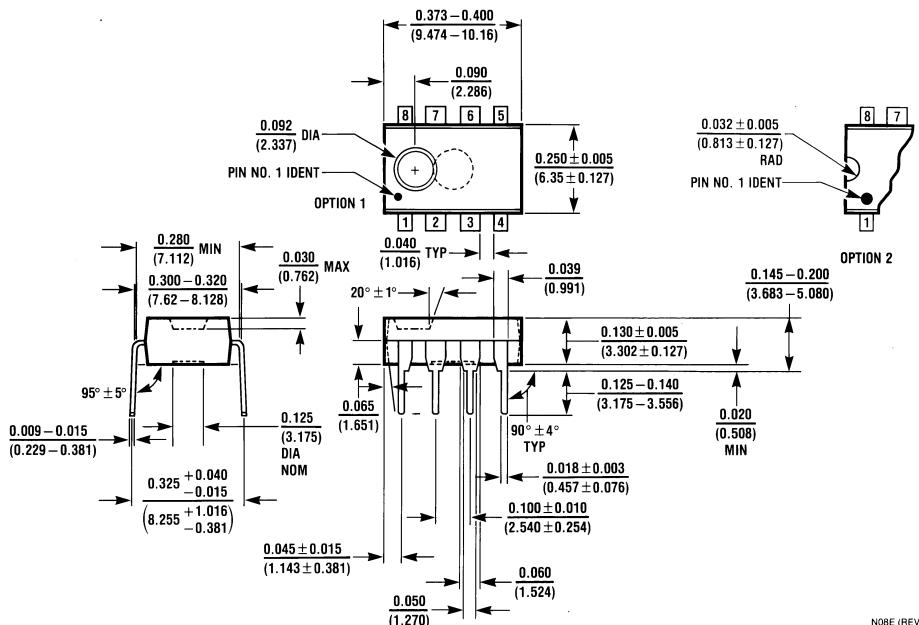
FIGURE 2. RS-423 System Application

DS009620-6

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

DS9636A RS-423 Dual Programmable Slew Rate Line Driver

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