National Semiconductor

DS9636A/μA9636A
RS-423 Dual Programmable Slew Rate Line Driver

General Description

The DS9636A/μA9636A 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/μA9636A 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/μA9636A is designed for nominal power supplies of ±12V.

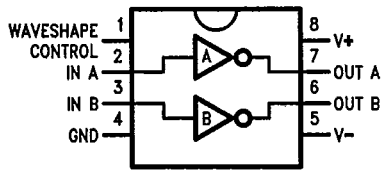
Inputs are TTL compatible with input current loading low enough (1/10 UL) to be also compatible with CMOS logic. Clamp diodes are provided on the inputs to limit transients below ground.

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



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Top View

Order Number DS9636ACJ, μA9636ARC, DS9636AMJ, μA9636ARM or DS9636ACN, μA9636ATC
See NS Package Number J08A or N08E

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*For most current package information, contact product marketing.

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, 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
- Cavity Package: 1300 mW
- Molded Package: 930 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

*Derate cavity package 6.7 mW/°C above 25°C; derate molded DIP package 7.5 mW/°C above 25°C.

Recommended Operating Conditions

Characteristics	DS9636AM/μA9636AM			DS9636AC/μA9636AC			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 Over recommended operating temperature, supply voltage and wave shaping resistance ranges unless otherwise specified (Notes 2 and 3)

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
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 ($R_L = \infty$)	−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, $R_L = \infty$, R_{WS} = 100 kΩ, V_I = 0V		13	18	mA
I−	Negative Supply Current	V_{CC} = ±12V, $R_L = \infty$, 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.

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

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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	

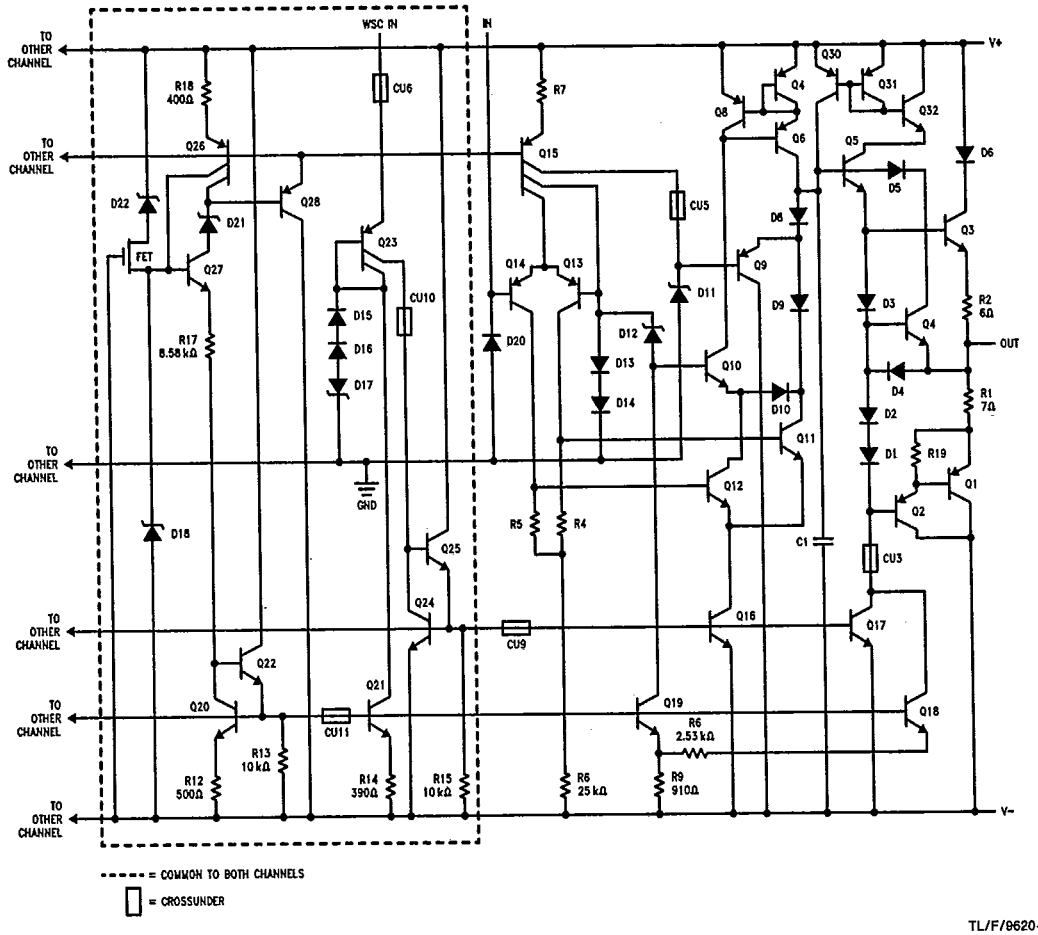

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FIGURE 1. Equivalent Circuit

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Typical Performance Characteristics

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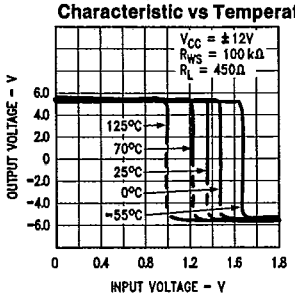
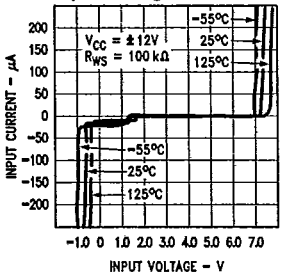
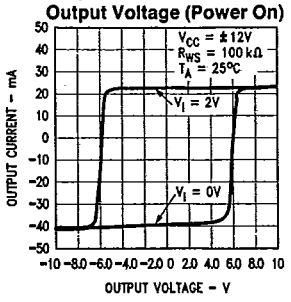
Input/Output Transfer Characteristic vs Temperature



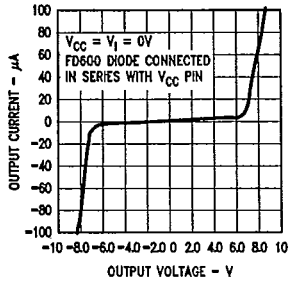
Input Current vs Input Voltage



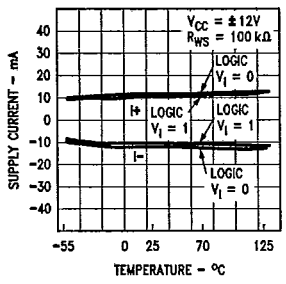
Output Current vs Output Voltage (Power On)



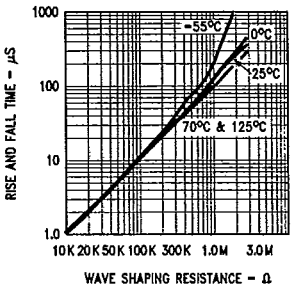
Output Current vs Output Voltage (Power Off)



Supply Current vs Temperature



Transition Time vs R_{WS}



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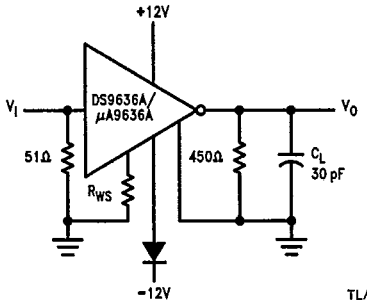

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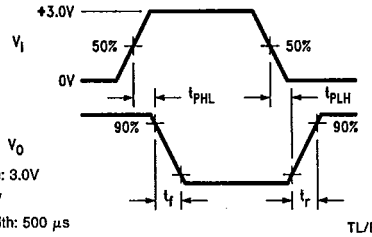

V_I V_O
Amplitude: 3.0V
Offset: 0V
Pulse Width: 500 μs
PRR: 1.0 kHz
$t_r = t_f \leq 10$ ns

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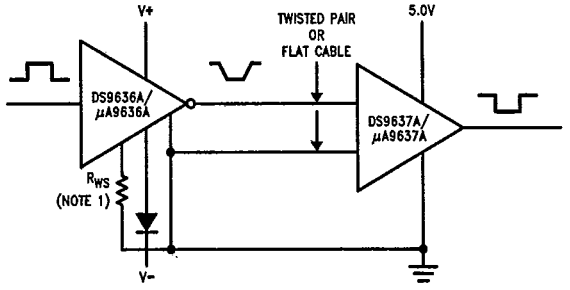
Note: C_L includes jig and probe capacitance

FIGURE 2. AC Test Circuit and Waveforms



Note: Use 1N4446 or equivalent.

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FIGURE 3. RS-423 System Application