

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.

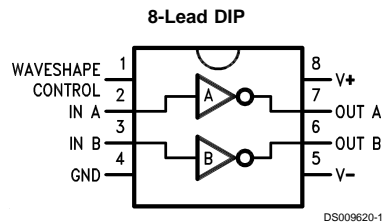
The DS9636A is suitable for use in digital data transmission systems where signal wave shaping is desired. The output slew rates are jointly controlled by a single external resistor connected between the wave shaping control lead (WS) and ground. This eliminates any need for external filtering of the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

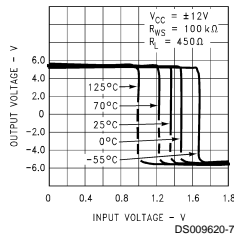
Switching Characteristics

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

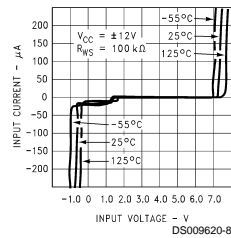
| Symbol | Parameter | Condition | Min | Typ | Max | Units |
|--------|-----------|--------------------------------|-----|-----|-----|---------|
| t_r | Rise Time | $R_{WS} = 10\text{ k}\Omega$ | 0.8 | 1.1 | 1.4 | μs |
| | | $R_{WS} = 100\text{ k}\Omega$ | 8.0 | 11 | 14 | |
| | | $R_{WS} = 500\text{ k}\Omega$ | 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

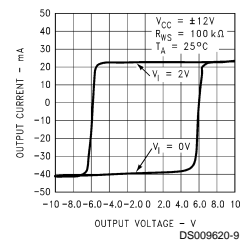
Input/Output Transfer Characteristic vs Temperature



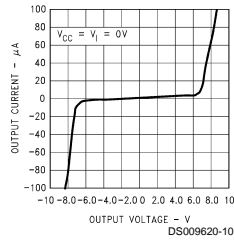
Input Current vs Input Voltage



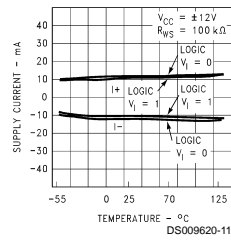
Output Current vs Output Voltage (Power On)



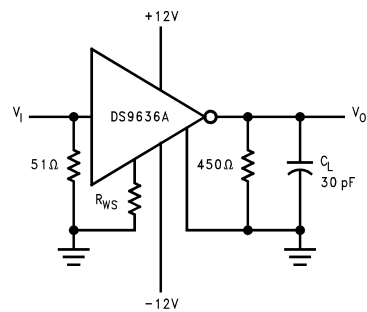
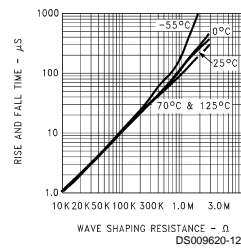
Output Current vs Output Voltage (Power Off)



Supply Current vs Temperature

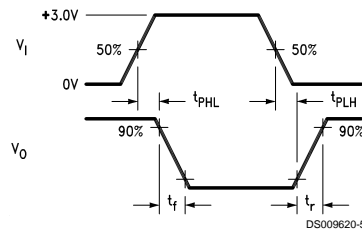


Transition Time vs Rws



C_L includes jig and probe capacitance

DS009620-4

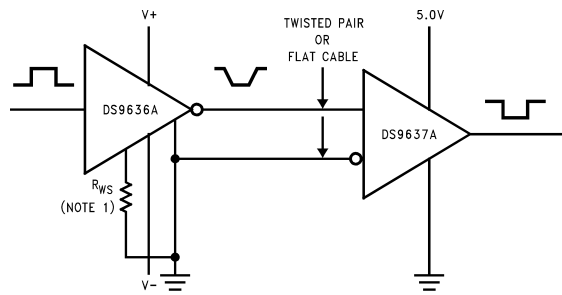


V_I
Amplitude: 3.0V
Offset: 0V
Pulse Width: 500 μs
PRR: 1.0 kHz
 $t_r = t_f \leq 10\text{ ns}$

DS009620-5

FIGURE 1. AC Test Circuit and Waveforms

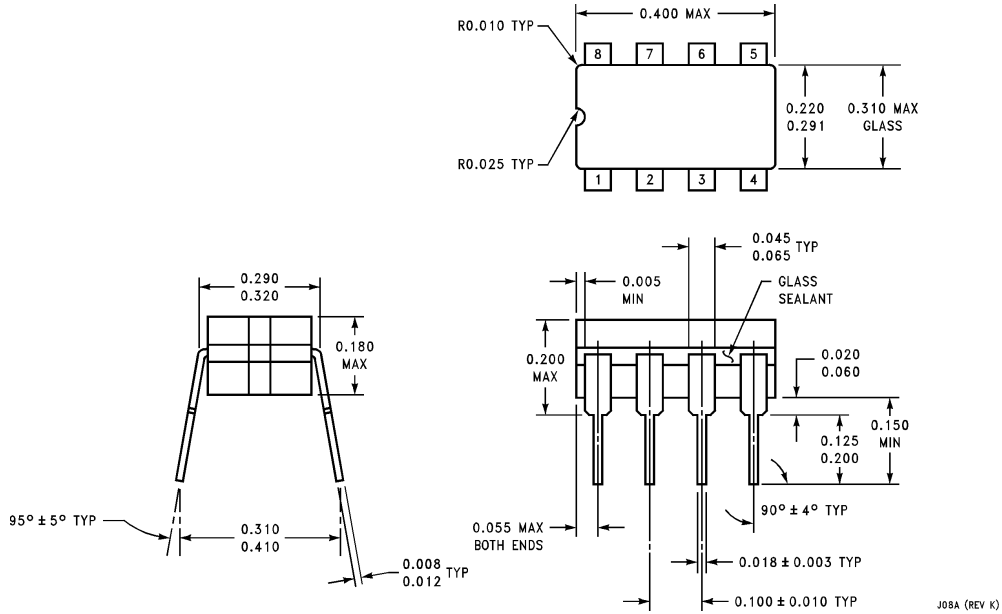
Typical Performance Characteristics (Continued)



DS009620-6

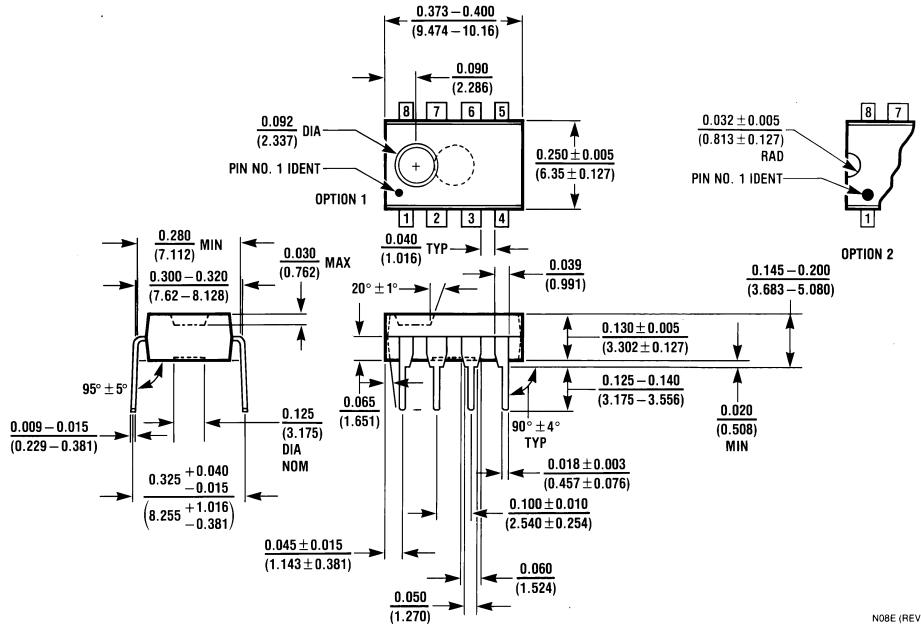
FIGURE 2. RS-423 System Application

Physical Dimensions inches (millimeters) unless otherwise noted



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

J08A (REV K)



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

N08E (REV F)

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National Semiconductor Corporation
Americas
Tel: 1-800-272-9959
Fax: 1-800-737-7018
Email: support@nsc.com

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
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Français Tel: +49 (0) 1 80-532 93 58
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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
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