

## DS7830/DS8830 Dual Differential Line Driver

### General Description

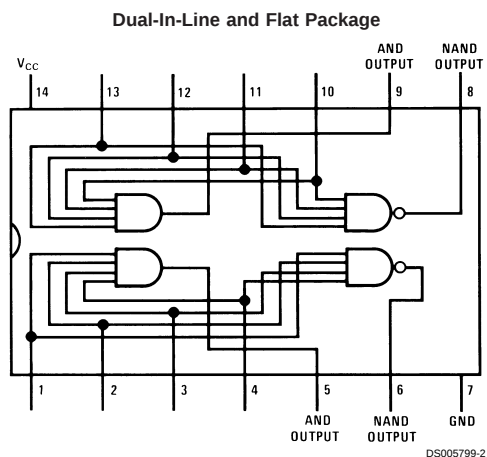
The DS7830/DS8830 is a dual differential line driver that also performs the dual four-input NAND or dual four-input AND function.

TTL (Transistor-Transistor-Logic) multiple emitter inputs allow this line driver to interface with standard TTL systems. The differential outputs are balanced and are designed to drive long lengths of coaxial cable, strip line, or twisted pair transmission lines with characteristic impedances of 50Ω to 500Ω. The differential feature of the output eliminates troublesome ground-loop errors normally associated with single-wire transmissions.

### Features

- Single 5V power supply
- Diode protected outputs for termination of positive and negative voltage transients
- Diode protected inputs to prevent line ringing
- High speed
- Short circuit protection

### Connection Diagram



#### Top View

Order Number DS8830N

See NS Package Number N14A

For Complete Military 883 Specifications, See RETS Data Sheet.

Order Number DS7830J/883 or DS7830W/883

See NS Package Number J14A

## Absolute Maximum Ratings (Note 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

|                                            |                 |
|--------------------------------------------|-----------------|
| $V_{CC}$                                   | 7.0V            |
| Input Voltage                              | 5.5V            |
| Storage Temperature                        | -65°C to +150°C |
| Lead Temperature (Soldering, 4 sec.)       | 260°C           |
| Output Short Circuit Duration (125°C)      | 1 second        |
| Maximum Power Dissipation (Note 1) at 25°C |                 |
| Cavity Package                             | 1308 mW         |
| Molded Package                             | 1207 mW         |

## Operating Conditions

|                             | Min  | Max  | Units |
|-----------------------------|------|------|-------|
| Supply Voltage ( $V_{CC}$ ) |      |      |       |
| DS8730                      | 4.5  | 5.5  | V     |
| DS8830                      | 4.75 | 5.25 | V     |
| Temperature ( $T_A$ )       |      |      |       |
| DS7830                      | -55  | +125 | °C    |
| DS8830                      | 0    | +70  | °C    |

**Note 1:** Derate cavity package 8.7 mW/°C above 25°C; derate molded package 9.7 mW/°C above 25°C.

## Electrical Characteristics (Notes 3, 4)

| Symbol   | Parameter                    | Conditions                                             | Min                        | Typ  | Max  | Units |
|----------|------------------------------|--------------------------------------------------------|----------------------------|------|------|-------|
| $V_{IH}$ | Logical "1" Input Voltage    |                                                        | 2.0                        |      |      | V     |
| $V_{IL}$ | Logical "0" Input Voltage    |                                                        |                            |      | 0.8  | V     |
| $V_{OH}$ | Logical "1" Output Voltage   | $V_{IN} = 0.8V$                                        | $I_{OUT} = -0.8\text{ mA}$ | 2.4  |      | V     |
|          |                              |                                                        | $I_{OUT} = 40\text{ mA}$   | 1.8  | 3.3  | V     |
| $V_{OL}$ | Logical "0" Output Voltage   | $V_{IN} = 2.0V$                                        | $I_{OUT} = 32\text{ mA}$   |      | 0.2  | V     |
|          |                              |                                                        | $I_{OUT} = 40\text{ mA}$   |      | 0.22 | V     |
| $I_{IH}$ | Logical "1" Input Current    | $V_{IN} = 2.4V$                                        |                            |      | 120  | μA    |
|          |                              | $V_{IN} = 5.5V$                                        |                            |      | 2    | mA    |
| $I_{IL}$ | Logical "0" Input Current    | $V_{IN} = 0.4V$                                        |                            |      | -4.8 | mA    |
| $I_{SC}$ | Output Short Circuit Current | $V_{CC} = 5.0V$ , $T_A = 125^\circ\text{C}$ , (Note 5) | -40                        | -100 | -120 | mA    |
| $I_{CC}$ | Supply Current               | $V_{IN} = 5.0V$ , (Each Driver)                        |                            | 11   | 18   | mA    |
| $V_I$    | Input Clamp                  | $V_{CC} = \text{Min}$ , $I_{IN} = -12\text{ mA}$       |                            | -1.0 | -1.5 | V     |

## Switching Characteristics

$T_A = 25^\circ\text{C}$ ,  $V_{CC} = 5V$ , unless otherwise noted

| Symbol    | Parameter                   | Conditions                                             | Min | Typ | Max | Units |
|-----------|-----------------------------|--------------------------------------------------------|-----|-----|-----|-------|
| $t_{pd1}$ | Propagation Delay AND Gate  | $R_L = 400\Omega$ , $C_L = 15\text{ pF}$<br>(Figure 1) |     | 8   | 12  | ns    |
| $t_{pd0}$ |                             |                                                        |     | 11  | 18  | ns    |
| $t_{pd1}$ | Propagation Delay NAND Gate | $R_L = 400\Omega$ , $C_L = 15\text{ pF}$<br>(Figure 1) |     | 8   | 12  | ns    |
| $t_{pd0}$ |                             |                                                        |     | 5   | 8   | ns    |
| $t_1$     | Differential Delay          | Load, 100Ω and 5000 pF,<br>(Figure 2)                  |     | 12  | 16  | ns    |
| $t_2$     | Differential Delay          | Load, 100Ω and 5000 pF,<br>(Figure 2)                  |     | 12  | 16  | ns    |

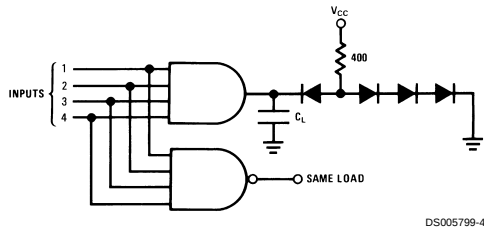
**Note 2:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**Note 3:** Unless otherwise specified min/max limits apply across the -55°C to +125°C temperature range for the DS7830 and across the 0°C to +70°C range for the DS8830. Typical values for  $T_A = 25^\circ\text{C}$  and  $V_{CC} = 5.0V$ .

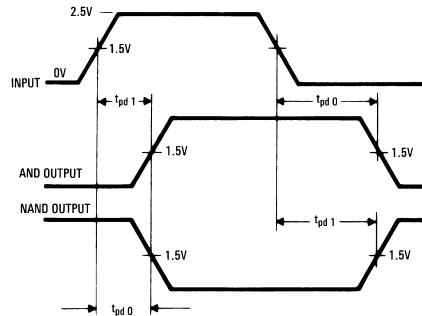
**Note 4:** All currents into device pins shown as positive, out of device pins as negative, all voltages referenced to ground unless otherwise noted. All values shown as max or min on absolute value basis.

**Note 5:** Only one output at a time should be shorted.

## AC Test Circuit and Switching Time Waveforms



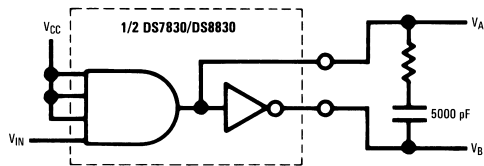
DS005799-4



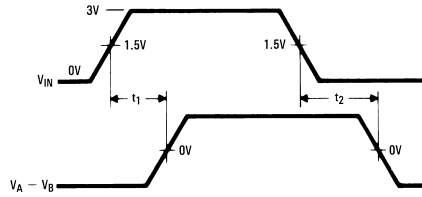
DS005799-9

$f = 1 \text{ MHz}$   
 $t_r = t_f \leq 10 \text{ ns}$  (10% to 90%)  
 Duty cycle = 50%

FIGURE 1.



DS005799-8

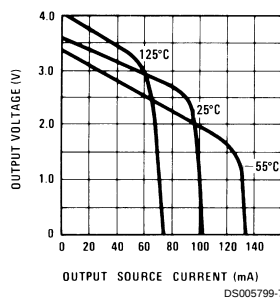


DS005799-10

FIGURE 2.

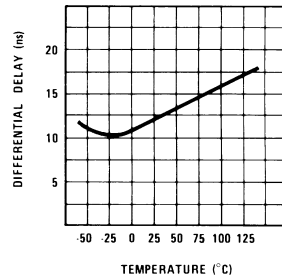
## Typical Performance Characteristics

Output High Voltage  
(Logical "1")  
vs Output Current



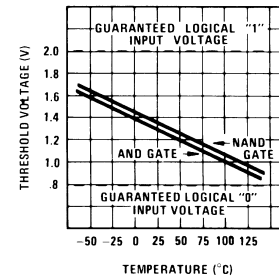
DS005799-7

Differential Delay vs  
Temperature



DS005799-11

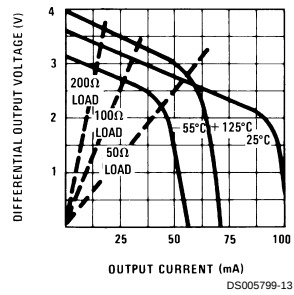
Threshold Voltage  
vs Temperature



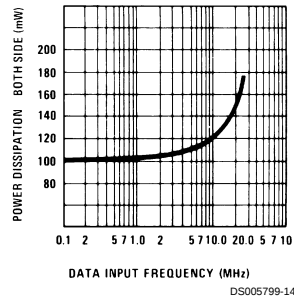
DS005799-12

## Typical Performance Characteristics (Continued)

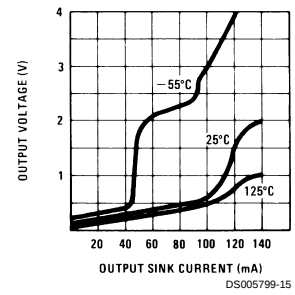
Differential Output Voltage  
( $|V_{AND} - V_{NAND}|$ ) vs  
Differential Output Current



Power Dissipation (No Load)  
vs Data Input Frequency

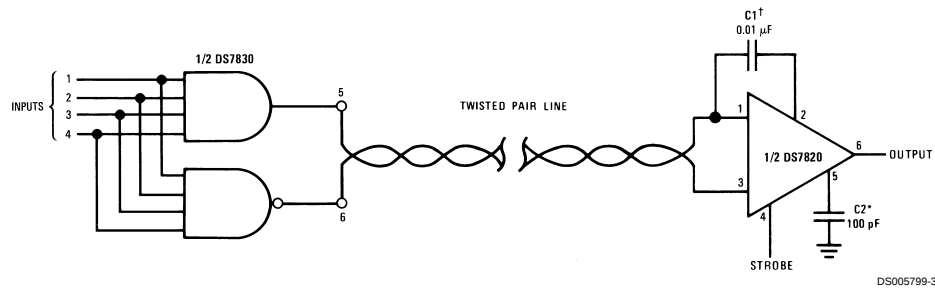


Output Low Voltage  
(Logical "0") vs  
Output Current



## Typical Application

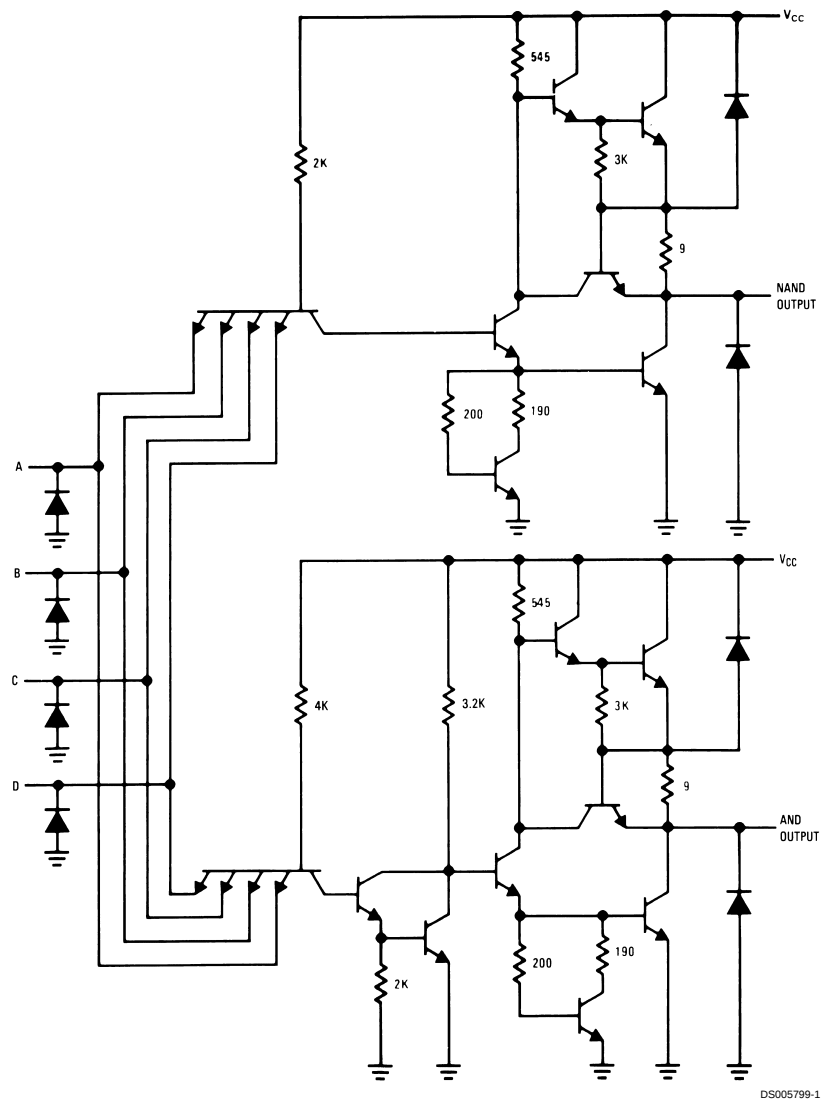
### Digital Data Transmission



†Exact value depends on line length.

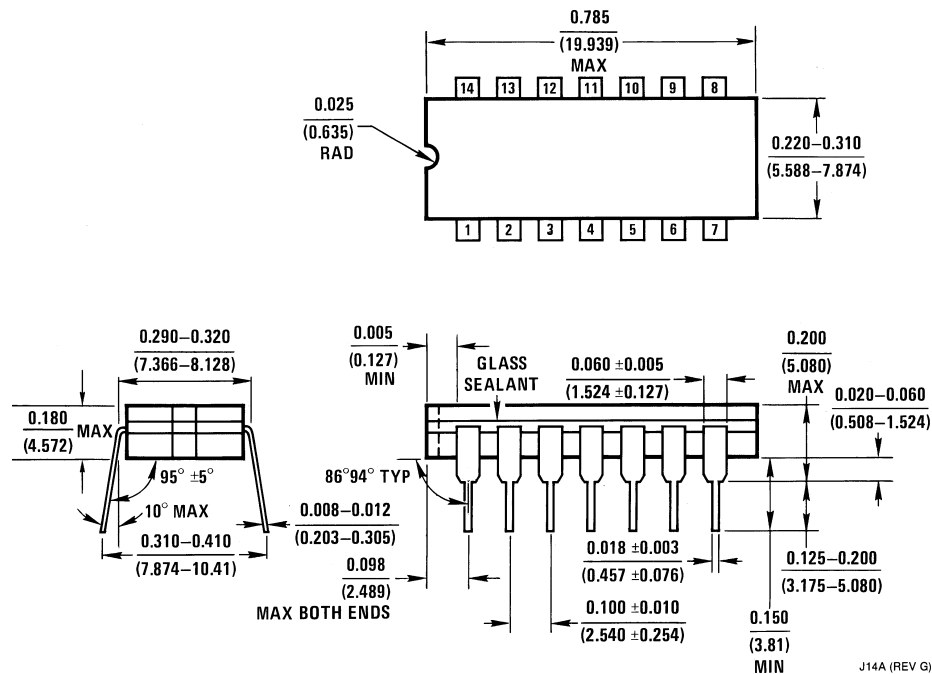
\*Optional to control response time.

# Schematic Diagram

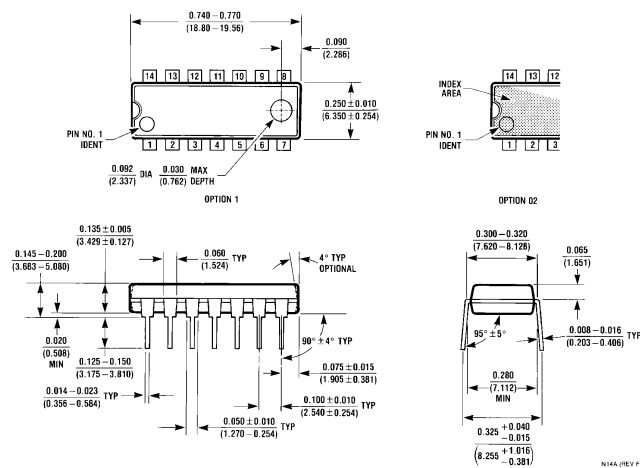


\*2 Per Package

# Physical Dimensions inches (millimeters) unless otherwise noted



**Ceramic Dual-In-Line Package (J)**  
**Order Number DS7830J or DS8830J**  
**NS Package Number J14A**



**Molded Dual-In-Line Package (N)**  
**Order Number DS8830N**  
**NS Package Number N14A**

## Notes

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