DS1489/DS1489A Quad Line Receiver

General Description
The DS1489/DS1489A are quad line receivers designed to interface data terminal equipment with data communications equipment. They are constructed on a single monolithic silicon chip. These devices satisfy the specifications of EIA Standard RS-232D. The DS1489/DS1489A meet and exceed the specifications of MC1489/MC1489A and are pin-for-pin replacements.

Features
- Four separate receivers per package
- Programmable threshold
- Built-in input threshold hysteresis
- "Fail safe" operating mode: high output for open inputs
- Inputs withstand ±30V

Schematic and Connection Diagrams

DS1489: $R_F = 10k$
DS1489A: $R_F = 2k$

Top View
Order Number DS1489J, DS1489M, DS1489AM, DS1489N or DS1489AN
See NS Package Number J14A, M14A or N14A

AC Test Circuit and Voltage Waveforms

FIGURE 1

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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.

- Power Supply Voltage: 10V
- Input Voltage Range: ±30V
- Output Load Current: 20 mA
- Power Dissipation (Note 2): 1W
- Operating Temperature Range: 0°C to +75°C
- Storage Temperature Range: −65°C to +150°C

Maximum Power Dissipation* at 25°C
- Cavity Package: 1308 mW
- Molded DIP Package: 1207 mW
- SO Package: 1042 mW
- Lead Temperature (Soldering, 4 sec.): 260°C

*Derate cavity package 8.7 mW/°C above 25°C; derate molded DIP package 9.7 mW/°C above 25°C; derate SO package 8.33 mW/°C above 25°C.

Electrical Characteristics (Notes 2, 3 and 4)
DS1489/DS1489A: The following apply for VCC = 5.0V ±1%, 0°C ≤ TA ≤ +75°C unless otherwise specified.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTTH</td>
<td>Input High Threshold Voltage</td>
<td>VOUT ≤ 0.45V, IOUT = 10 mA</td>
<td>DS1489</td>
<td>TA = 25°C</td>
<td>1.0</td>
<td>1.25</td>
<td>1.5</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>DS1489A</td>
<td>TA = 25°C</td>
<td>1.75</td>
<td>2.00</td>
<td>2.25</td>
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<tr>
<td>VTL</td>
<td>Input Low Threshold Voltage</td>
<td>VOUT ≥ 2.5V, IOUT = −0.5 mA</td>
<td>TA = 25°C</td>
<td>0.75</td>
<td>1.00</td>
<td>1.25</td>
<td>V</td>
</tr>
<tr>
<td>IN</td>
<td>Input Current</td>
<td>VOUT ≤ 30V, IOUT = 10 mA</td>
<td>DS1498</td>
<td>TA = 25°C</td>
<td>0.33</td>
<td>0.45</td>
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<td></td>
<td></td>
<td></td>
<td>DS1499</td>
<td>TA = 25°C</td>
<td>0.33</td>
<td>0.45</td>
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</tr>
<tr>
<td>VOH</td>
<td>Output High Voltage</td>
<td>IOUT = −0.5 mA</td>
<td>VIN = 7.5V</td>
<td>2.6</td>
<td>3.0</td>
<td>5.0</td>
<td>V</td>
</tr>
<tr>
<td>VOL</td>
<td>Output Low Voltage</td>
<td>IOUT = −0.5 mA</td>
<td>VIN = 3.0V</td>
<td>2.6</td>
<td>3.0</td>
<td>5.0</td>
<td>V</td>
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<td>ISC</td>
<td>Output Short Circuit Current</td>
<td>VIN = 0.75V</td>
<td>0.53</td>
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<tr>
<td>ICC</td>
<td>Supply Current</td>
<td>VIN = 5.0V</td>
<td>0.53</td>
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<tr>
<td>PD</td>
<td>Power Dissipation</td>
<td>VIN = 5.0V</td>
<td>70</td>
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Switching Characteristics VCC = 5V, TA = 25°C

<table>
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<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ipd1</td>
<td>Input to Output “High” Propagation Delay</td>
<td>RL = 3.9k, (Figure 1) (AC Test Circuit)</td>
<td>28</td>
<td>85</td>
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<td>ns</td>
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<tr>
<td>Ipd0</td>
<td>Input to Output “Low” Propagation Delay</td>
<td>RL = 3900Ω, (Figure 1) (AC Test Circuit)</td>
<td>20</td>
<td>50</td>
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<td>ns</td>
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<tr>
<td>tr</td>
<td>Output Rise Time</td>
<td>RL = 3.9k, (Figure 1) (AC Test Circuit)</td>
<td>110</td>
<td>175</td>
<td></td>
<td>ns</td>
<td></td>
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<tr>
<td>tf</td>
<td>Output Fall Time</td>
<td>RL = 390Ω, (Figure 1) (AC Test Circuit)</td>
<td>9</td>
<td>20</td>
<td></td>
<td>ns</td>
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</tbody>
</table>

Note 1: “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 2: Unless otherwise specified min/max limits apply across the 0°C to +75°C temperature range for the DS1489 and DS1489A.

Note 3: 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 4: These specifications apply for response control pin = open.

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Typical Characteristics

$V_{CC} = 5.0V, T_A = +25^\circ C$ unless otherwise noted

**FIGURE 2. Input Current**

**FIGURE 3. DS1489 Input Threshold Voltage Adjustment**

**FIGURE 4. DS1489A Input Threshold Voltage Adjustment**

**FIGURE 5. Input Threshold Voltage vs Temperature**

**FIGURE 6. Input Threshold vs Power Supply Voltage**

**FIGURE 7. Noise Rejection vs Capacitance for DS1489A**
Typical Application Information

Optional for noise filtering. TL/F/5777–5

Applications Using the Response Control Pin

Noise Filter
(See Figure 7)

Threshold Shift
(See Figures 3 and 4)

Noise Filter and Threshold Shift
(See Figures 3, 4 and 7)

Application of DS148, DS1489A and INS8250

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Physical Dimensions  inches (millimeters)

Ceramic Dual-In-Line Package (J)
Order Number DS1489J
NS Package Number J14A

SO Package (M)
Order Number DS1489M or DS1489AM
NS Package Number M14A
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.