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

Dual-In-Line Package

Top View
Order Number DS1489M, DS1489N
DS1489AM or DS1489AN
See NS Package Number M14A or N14A
AC Test Circuit and Voltage Waveforms

FIGURE 1.
Absolute Maximum Ratings (Note 2)
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 3): 1W
- Operating Temperature Range: 0˚C to +75˚C

Storage Temperature Range: -65˚C to +150˚C
Maximum Power Dissipation (Note 1) at 25˚C
- Molded DIP Package: 1207 mW
- SO Package: 1042 mW

Lead Temperature (Soldering, 4 sec.): 260˚C

Note 1: Do not stress above specified limits; they are stress ratings only. Functional operation beyond any one of these limits may impair the reliability of the device.

Electrical Characteristics (Notes 3, 4, 5)
DS1489/DS1489A: The following apply for V_CC = 5.0V ±1%, 0˚C ≤ T_A ≤ +75˚C unless otherwise specified.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{IH}</td>
<td>Input High Threshold Voltage</td>
<td>V_{OUT} ≤ 0.45V, I_{OUT} = 10 mA</td>
<td>DS1489 T_A = 25˚C 1.0 1.25 1.5 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DS1489A T_A = 25˚C 0.9 1.0 1.6 V</td>
</tr>
<tr>
<td>V_{IL}</td>
<td>Input Low Threshold Voltage</td>
<td>V_{OUT} ≥ 2.5V, I_{OUT} = −0.5 mA</td>
<td>T_A = 25˚C 0.75 1.00 1.25 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0.65 1.35 V</td>
</tr>
<tr>
<td>I_{IN}</td>
<td>Input Current</td>
<td>V_{IN} = +25V</td>
<td>+3.6 +5.6 +8.3 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{IN} = −25V</td>
<td>−3.6 −5.6 −8.3 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{IN} = +3V</td>
<td>+0.43 +0.53 mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V_{IN} = −3V</td>
<td>−0.43 −0.53 mA</td>
</tr>
<tr>
<td>V_{OH}</td>
<td>Output High Voltage</td>
<td>I_{OUT} = −0.5 mA</td>
<td>V_{IN} = 0.75V 2.6 3.8 5.0 V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Input = Open</td>
<td>2.6 3.8 5.0 V</td>
</tr>
<tr>
<td>V_{OL}</td>
<td>Output Low Voltage</td>
<td>I_{OUT} = −10 mA</td>
<td>V_{IN} = 3.0V 0.33 0.45 V</td>
</tr>
<tr>
<td>I_{SC}</td>
<td>Output Short Circuit Current</td>
<td>V_{IN} = 0.75V</td>
<td>−3.0 mA</td>
</tr>
<tr>
<td>I_{CC}</td>
<td>Supply Current</td>
<td>V_{IN} = 5.0V</td>
<td>14 26 mA</td>
</tr>
<tr>
<td>P_{d}</td>
<td>Power Dissipation</td>
<td>V_{IN} = 5.0V</td>
<td>70 130 mW</td>
</tr>
</tbody>
</table>

Switching Characteristics
V_{CC} = 5V, T_A = 25˚C

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>t_{pdh}</td>
<td>Input to Output “High”</td>
<td>R_L = 3.9k, (Figure f) (AC Test Circuit)</td>
<td>28 85 ns</td>
</tr>
<tr>
<td></td>
<td>Propagation Delay</td>
<td>R_L = 390Ω, (Figure f) (AC Test Circuit)</td>
<td>20 50 ns</td>
</tr>
<tr>
<td>t_{phd}</td>
<td>Input to Output “Low”</td>
<td>R_L = 3.9k, (Figure f) (AC Test Circuit)</td>
<td>110 175 ns</td>
</tr>
<tr>
<td></td>
<td>Propagation Delay</td>
<td>R_L = 390Ω, (Figure f) (AC Test Circuit)</td>
<td>9 20 ns</td>
</tr>
</tbody>
</table>

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 0˚C to +75˚C temperature range for the DS1489 and DS1489A.

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: These specifications apply for response control pin = open.
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

Applications Using the Response Control Pin

Noise Filter  
See Figure 7

Threshold Shift  
See Figures 3, 4

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

Application of DS1488, DS1489A and INS8250
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