Matched N-Channel JFET Pairs

Product Summary

| Part Number | $V_{GS(0ff)}$ (V) | $V_{BR/SS}$ Min (V) | $g_f$ Min (mS) | $I_G$ Typ (pA) | $|V_{GS1} - V_{GS2}|$ Max (mV) |
|-------------|------------------|---------------------|----------------|--------------|------------------|
| 2N5911      | –1 to –5         | –25                 | 5              | –1           | 10               |
| 2N5912      | –1 to –5         | –25                 | 5              | –1           | 15               |

Features
- Two-Chip Design
- High Slew Rate
- Low Offset/Drift Voltage
- Low Gate Leakage: 1 pA
- Low Noise
- High CMRR: 85 dB

Benefits
- Minimum Parasitics Ensuring Maximum High-Frequency Performance
- Improved Op Amp Speed, Settling Time Accuracy
- Minimum Input Error/Trimming Requirement
- Insignificant Signal Loss/Error Voltage
- High System Sensitivity
- Minimum Error with Large Input Signal

Applications
- Wideband Differential Amplifiers
- High-Speed, Temp-Compensated, Single-Ended Input Amplifiers
- High Speed Comparators
- Impedance Converters

Description
The 2N5911/5912 are matched pairs of JFETs mounted in a TO-78 package. This two-chip design reduces parasitics and gives better performance at high frequencies while ensuring extremely tight matching.

For similar products see the SO-8 packaged SST440/SST441, the TO-71 packaged U440/U441, the low-noise SST/U401 series, and the low-leakage U421/423 data sheets.

The hermetically-sealed TO-78 package is available with full military screening per MIL-S-19500 (see Military Information).

Absolute Maximum Ratings

- Gate-Drain, Gate-Source Voltage ........................................... –25 V
- Gate-Gate Voltage ......................................................... ± 80 V
- Gate Current ............................................................... 50 mA
- Lead Temperature ($1/16"$ from case for 10 sec.) ............ 300°C
- Storage Temperature ...................................................... –65 to 200°C
- Operating Junction Temperature ................................... –55 to 150°C

Power Dissipation:
- Per Side*: .................................................. 367 mW
- Total*: .......................................................... 500 mW

Notes:
- Derate 3 mW/°C above 25°C
- Derate 4 mW/°C above 25°C

Updates to this data sheet may be obtained via facsimile by calling Siliconix FaxBack, 1-408-970-5600. Please request FaxBack document #70255. Applications information may also be obtained via FaxBack, request document #70595.
## Specifications\(^a\)

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<td></td>
<td></td>
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<td>Min</td>
<td>Max</td>
<td>Min</td>
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<tr>
<td>Gate-Source Breakdown Voltage</td>
<td>(V_{(BR)GSS})</td>
<td>(I_G = -1 \mu A, V_{DS} = 0 \text{ V})</td>
<td>–35</td>
<td>–25</td>
<td>–25</td>
<td>(V)</td>
</tr>
<tr>
<td>Gate-Source Cutoff Voltage</td>
<td>(V_{GS(0)})</td>
<td>(V_{DS} = 10 \text{ V}, I_D = 1 \text{nA})</td>
<td>–3.5</td>
<td>–1</td>
<td>–5</td>
<td>–1</td>
</tr>
<tr>
<td>Saturation Drain Current</td>
<td>(I_{DS})</td>
<td>(V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V})</td>
<td>15</td>
<td>7</td>
<td>40</td>
<td>7</td>
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<tr>
<td>Gate Reverse Current</td>
<td>(I_{GSS})</td>
<td>(V_{GS} = -15 \text{ V}, V_{DS} = 0 \text{ V})</td>
<td>–1</td>
<td>–100</td>
<td>–100</td>
<td>(\text{pA})</td>
</tr>
<tr>
<td>Gate Operating Current</td>
<td>(I_{G})</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>–1</td>
<td>–100</td>
<td>–100</td>
<td>(\text{pA})</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>(V_{GS})</td>
<td>(V_{DG} = 10 \text{ V}, I_G = 5 \text{ mA})</td>
<td>–1.5</td>
<td>–0.3</td>
<td>–4</td>
<td>–0.3</td>
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<tr>
<td>Gate-Source Forward Voltage</td>
<td>(V_{GS(F)})</td>
<td>(I_G = 1 \text{ mA}, V_{DS} = 0 \text{ V})</td>
<td>0.7</td>
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<tr>
<td><strong>Dynamic</strong></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Common-Source Forward Transconductance</td>
<td>(g_{fs})</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>6</td>
<td>5</td>
<td>10</td>
<td>5</td>
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<tr>
<td>Common-Source Output Conductance</td>
<td>(g_{on})</td>
<td>(V_{DG} = 5 \text{ V}, f = 1 \text{ kHz})</td>
<td>70</td>
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<tr>
<td>Common-Source Forward Transconductance</td>
<td>(g_{fs})</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>5.8</td>
<td>5</td>
<td>10</td>
<td>5</td>
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<tr>
<td>Common-Source Output Conductance</td>
<td>(g_{on})</td>
<td>(V_{DG} = 10 \text{ V}, f = 100 \text{ MHz})</td>
<td>90</td>
<td>150</td>
<td>150</td>
<td>(\text{µS})</td>
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<tr>
<td>Common-Source Input Capacitance</td>
<td>(C_{iss})</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>3</td>
<td>5</td>
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<tr>
<td>Common-Source Reverse Transfer Capacitance</td>
<td>(C_{rss})</td>
<td>(V_{DG} = 10 \text{ V}, f = 1 \text{ MHz})</td>
<td>1</td>
<td>1.2</td>
<td>1.2</td>
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<tr>
<td>Equivalent Input Noise Voltage</td>
<td>(\varepsilon_n)</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>4</td>
<td>20</td>
<td>20</td>
<td></td>
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<tr>
<td>Noise Figure</td>
<td>(NF)</td>
<td>(R_G = 100 \text{ kΩ})</td>
<td>0.1</td>
<td>1</td>
<td>1</td>
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</table>

### Matching

<table>
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<th>Unit</th>
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<tr>
<td>Differential Gate-Source Voltage</td>
<td>(</td>
<td>V_{GS1} - V_{GS2}</td>
<td>)</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Gate-Source Voltage Differential Change with Temperature</td>
<td>(</td>
<td>\Delta V_{GS1} - \Delta V_{GS2}</td>
<td>)</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>(T_A = -55 \text{ to } 125 \text{ °C})</td>
<td>15</td>
</tr>
<tr>
<td>Saturation Drain Current Ratio</td>
<td>(I_{DSS1}/I_{DSS2})</td>
<td>(V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V})</td>
<td>0.98</td>
<td>0.95</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Transconductance Ratio</td>
<td>(g_{fs1}/g_{fs2})</td>
<td>(V_{DS} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>(f = 1 \text{ kHz})</td>
<td>0.98</td>
<td>0.95</td>
<td>1</td>
</tr>
<tr>
<td>Differential Gate Current</td>
<td>(</td>
<td>I_{G1} - I_{G2}</td>
<td>)</td>
<td>(V_{DG} = 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>(T_A = 125 \text{ °C})</td>
<td>0.005</td>
</tr>
<tr>
<td>Common Mode Rejection Ratio</td>
<td>CMRR</td>
<td>(V_{DG} = 5 \text{ to } 10 \text{ V}, I_D = 5 \text{ mA})</td>
<td>85</td>
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</tr>
</tbody>
</table>

### Notes

\(a\). \(T_A = 25\text{ °C}\) unless otherwise noted.
\(b\). Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
\(c\). Pulse test: \(PW \leq 300 \mu s\) duty cycle \(\leq 3\%\).
\(d\). This parameter not registered with JEDEC.
Typical Characteristics

**Drain Current and Transconductance vs. Gate-Source Cutoff Voltage**

- $I_{DSS} @ V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}$
- $f_s @ V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}$
- $f = 1 \text{ kHz}$

**Gate Leakage Current**

- $I_{G(on)} @ I_D$
- $I_{GSS} @ 125 \text{ °C}$
- $I_D = 10 \text{ mA}$
- $I_G @ 1 \text{ mA}$
- $V_{DG} = 1 \text{ mA}$
- $T_A = 25 \text{ °C}$
- $I_{GSS} @ 25 \text{ °C}$

**Output Characteristics**

- $V_{GS(oh)} = -2 \text{ V}$
- $V_{GS} = 0 \text{ V}$
- $V_{GS} = -0.2 \text{ V}$
- $V_{GS} = -0.4 \text{ V}$
- $V_{GS} = -0.6 \text{ V}$
- $V_{GS} = -0.8 \text{ V}$
- $V_{GS} = -1.0 \text{ V}$
- $V_{GS} = -1.2 \text{ V}$

- $V_{GS(oh)} = -5 \text{ V}$
- $V_{GS} = 0 \text{ V}$
- $V_{GS} = -0.5 \text{ V}$
- $V_{GS} = -1.0 \text{ V}$
- $V_{GS} = -1.5 \text{ V}$
- $V_{GS} = -2.0 \text{ V}$
- $V_{GS} = -2.5 \text{ V}$
- $V_{GS} = -3.0 \text{ V}$
- $V_{GS} = -3.5 \text{ V}$
Typical Characteristics (Cont’d)

**Transfer Characteristics**

- **V_{GS(off)}** = –2 V, V_{DS} = 10 V
- V_{GS(off)} = –5 V, V_{DS} = 10 V

**Transconductance vs. Gate-Source Voltage**

- **V_{GS(off)}** = –2 V, V_{DS} = 10 V, f = 1 kHz
- V_{DS} = 10 V

**Circuit Voltage Gain vs. Drain Current**

- **V_{GS(off)}** = –2 V, V_{GS(off)} = –5 V
- \( A_V = \frac{g_{fs}}{R_L + R_{L} \cdot R_{DS(on)}} \)

**On-Resistance vs. Drain Current**

- V_{DS} = 10 V
- T_A = 25°C
- V_{GS(off)} = –5 V

Assume V_{DD} = 15 V, V_{DS} = 5 V

\( R_L = \frac{10 \text{ V}}{I_D} \)
Typical Characteristics (Cont’d)

Common-Source Input Capacitance vs. Gate-Source Voltage

Common-Source Reverse Feedback Capacitance vs. Gate-Source Voltage

Input Admittance

Forward Admittance

Reverse Admittance

Output Admittance
Typical Characteristics (Cont’d)

- **Equivalent Input Noise Voltage vs. Frequency**
  - $V_{DS} = 10$ V
  - $I_D = 1$ mA
  - $V_{GS} = 0$ V

- **Output Conductance vs. Drain Current**
  - $V_{GS} = -5$ V
  - $f = 1$ kHz

- **On-Resistance and Output Conductance vs. Gate-Source Cutoff Voltage**
  - $I_D = 1$ mA
  - $V_{GS} = 0$ V
  - $V_{DS} = 10$ V

- **Common-Source Forward Transconductance vs. Drain Current**
  - $V_{GS} = -5$ V
  - $f = 1$ kHz

Symbols and units:
- $f$ – Frequency (Hz)
- $I_D$ – Drain Current (mA)
- $V_{GS}$ – Gate-Source Cutoff Voltage (V)
- $V_{DS}$ – Drain-Source On-Resistance (Ω)
- $g_{os}$ – Output Conductance (mS)
- $g_{fs}$ – Forward Transconductance (mS)