N-Channel JFETs

PRODUCT SUMMARY

<table>
<thead>
<tr>
<th>Part Number</th>
<th>$V_{GS(\text{off})}$ (V)</th>
<th>$V_{(BR)\text{GSS}}$ Min (V)</th>
<th>$g_{fs}$ Min (mS)</th>
<th>$I_{DSS}$ Min (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2N4416</td>
<td>$-\leq 6$</td>
<td>$-30$</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>2N4416A</td>
<td>$-2.5$ to $-6$</td>
<td>$-35$</td>
<td>4.5</td>
<td>5</td>
</tr>
<tr>
<td>SST4416</td>
<td>$-\leq 6$</td>
<td>$-30$</td>
<td>4.5</td>
<td>5</td>
</tr>
</tbody>
</table>

FEATURES

- Excellent High-Frequency Gain: 2N4416/A, $G_{ps}$ 13 dB (typ) @ 400 MHz
- Very Low Noise: 3 dB (typ) @ 400 MHz
- Very Low Distortion
- High AC/DC Switch Off-Isolation

BENEFITS

- Wideband High Gain
- Very High System Sensitivity
- High Quality of Amplification
- High-Speed Switching Capability
- High Low-Level Signal Amplification

APPLICATIONS

- High-Frequency Amplifier/Mixer
- Oscillator
- Sample-and-Hold
- Very Low Capacitance Switches

DESCRIPTION

The 2N4416/2N4416A/SST4416 n-channel JFETs are designed to provide high-performance amplification at high frequencies.

The TO-206AF (TO-72) hermetically-sealed package is available with full military processing (see Military Information.) The TO-236 (SOT-23) package provides a low-cost option and is available with tape-and-reel options (see Packaging Information). For similar products in the TO-226AA (TO-92) package, see the J304/305 data sheet.

For applications information see AN104.
## ABSOLUTE MAXIMUM RATINGS

- **Gate-Drain, Gate-Source Voltage:**
  - (2N/SST4416) −30 V
  - (2N4416A) −35 V
- **Gate Current:**
  - 10 mA
- **Lead Temperature:**
  - 300 °C
- **Storage Temperature:**
  - (2N Prefix) −65 to 200 °C
  - (SST Prefix) −65 to 150 °C
- **Operating Junction Temperature:**
  - −55 to 150 °C
- **Power Dissipation:**
  - (2N Prefix) 300 mW
  - (SST Prefix) 350 mW

**Notes:**
- a. Derate 2.4 mW/°C above 25 °C
- b. Derate 2.8 mW/°C above 25 °C

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### SPECIFICATIONS (TA = 25 °C UNLESS NOTED)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Typ(^a)</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Static</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate-Source Breakdown Voltage</td>
<td>V(_{BR GS})</td>
<td>IG = −1 μA, V(_{DS}) = 0 V</td>
<td>−36 −30 −35 −30</td>
<td>V</td>
</tr>
<tr>
<td>Gate-Source Cutoff Voltage</td>
<td>V(_{GS (off)})</td>
<td>V(_{DS}) = 15 V, ID = 1 nA</td>
<td>−3 −6 −2.5 −6</td>
<td>−6 V</td>
</tr>
<tr>
<td>Saturation Drain Current(^b)</td>
<td>I(_{DSS})</td>
<td>V(<em>{DS}) = 15 V, V(</em>{GS}) = 0 V</td>
<td>10 5 15 5 15</td>
<td>mA</td>
</tr>
<tr>
<td>Gate Reverse Current</td>
<td>I(_{GS})</td>
<td>V(<em>{GS}) = −20 V, V(</em>{DS}) = 0 V (2N)</td>
<td>−2</td>
<td>−100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TA = 150 °C</td>
<td>−4</td>
<td>−100</td>
</tr>
<tr>
<td></td>
<td></td>
<td>V(<em>{GS}) = −15 V, V(</em>{DS}) = 0 V (SST)</td>
<td>−0.002</td>
<td>−1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TA = 125 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate Operating Current</td>
<td>I(_{G})</td>
<td>V(_{DG}) = 10 V, ID = 1 mA</td>
<td>−20</td>
<td></td>
</tr>
<tr>
<td>Drain Cutoff Current(^c)</td>
<td>I(_{D (off)})</td>
<td>V(<em>{DS}) = 10 V, V(</em>{GS}) = −6 V</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Drain-Source On-Resistance(^c)</td>
<td>I(_{DSS (on)})</td>
<td>V(_{GS}) = 0 V, ID = 300 μA</td>
<td>150</td>
<td></td>
</tr>
<tr>
<td>Gate-Source Forward Voltage(^c)</td>
<td>V(_{GS (F)})</td>
<td>IG = 1 mA, V(_{DS}) = 0 V</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td><strong>Dynamic</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common-Source Forward Transconductance(^p)</td>
<td>g(_{fs})</td>
<td>V(<em>{DS}) = 15 V, V(</em>{GS}) = 0 V f = 1 kHz</td>
<td>6 4.5 7.5 4.5 7.5 4.5 7.5 7.5</td>
<td>mS</td>
</tr>
<tr>
<td>Common-Source Output Conductance(^p)</td>
<td>g(_{os})</td>
<td>V(<em>{DS}) = 15 V, V(</em>{GS}) = 0 V f = 1 kHz</td>
<td>15 50 50 50</td>
<td>μS</td>
</tr>
<tr>
<td>Common-Source Input Capacitance</td>
<td>C(_{gs})</td>
<td>V(<em>{DS}) = 15 V, V(</em>{GS}) = 0 V f = 1 MHz</td>
<td>2.2 4 4</td>
<td></td>
</tr>
<tr>
<td>Common-Source Reverse Transfer Capacitance</td>
<td>C(_{gss})</td>
<td>V(<em>{DS}) = 15 V, V(</em>{GS}) = 0 V f = 1 kHz</td>
<td>0.7 0.8 0.8</td>
<td></td>
</tr>
<tr>
<td>Common-Source Output Capacitance</td>
<td>C(_{oss})</td>
<td>V(<em>{DS}) = 15 V, V(</em>{GS}) = 0 V f = 1 kHz</td>
<td>1 2 2</td>
<td></td>
</tr>
<tr>
<td>Equivalent Input Noise Voltage(^c)</td>
<td>e(_{in})</td>
<td>V(<em>{DS}) = 10 V, V(</em>{GS}) = 0 V f = 1 kHz</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>
HIGH-FREQUENCY SPECIFICATIONS FOR 2N4416/2N4416A (T_A = 25°C UNLESS NOTED)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Source Input Conductance</td>
<td>giss</td>
<td>V_DS = 15 V, V_GS = 0 V</td>
<td>100 1,000 µS</td>
</tr>
<tr>
<td>Common Source Input Susceptance</td>
<td>biss</td>
<td>2,500 10,000</td>
<td></td>
</tr>
<tr>
<td>Common Source Output Conductance</td>
<td>goss</td>
<td>V_DS = 15 V, I_D = 5 mA</td>
<td>18 10 dB</td>
</tr>
<tr>
<td>Common Source Output Susceptance</td>
<td>bosses</td>
<td>V_DS = 15 V, I_D = 5 mA</td>
<td>4,000</td>
</tr>
<tr>
<td>Common Source Forward Transconductance</td>
<td>gfs</td>
<td>f = 1 kHz</td>
<td></td>
</tr>
<tr>
<td>Common-Source Power Gain</td>
<td>Gps</td>
<td>f = 1 kHz</td>
<td></td>
</tr>
<tr>
<td>Noise Figure</td>
<td>NF</td>
<td>R_G = 1 kΩ</td>
<td>2 4 dB</td>
</tr>
</tbody>
</table>

Notes:

a. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.

b. Pulse test: PW = 300 µs duty cycle ≤ 3%.

c. This parameter not registered with JEDEC.

d. Not a production test.

TYPICAL CHARACTERISTICS (T_A = 25°C UNLESS OTHERWISE NOTED)
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On-Resistance vs. Drain Current

Ciss – Input Capacitance (pF)

Common-Source Input Capacitance vs. Gate-Source Voltage

f = 1 MHz

VDS = 0 V

10 V

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

f = 1 MHz

VDS = 0 V

10 V

Input Admittance

Forward Admittance

TA = 25°C

VDS = 15 V

VGS = 0 V

Common Source

TA = 25°C

VDS = 15 V

VGS = 0 V

Common Source

Drain-Source On-Resistance (Ω)

VDS = 0 V

VGS = 0 V

Common Source

rDS(on)
TYPICAL CHARACTERISTICS (TA = 25°C UNLESS OTHERWISE NOTED)

Reverse Admittance

Output Admittance

Gate Leakage Current

Common-Source Forward Transconductance vs. Drain Current

Equivalent Input Noise Voltage vs. Frequency

Output Conductance vs. Drain Current

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