N-Channel JFET

Product Summary

<table>
<thead>
<tr>
<th>$V_{GSOFF}$ (V)</th>
<th>$V_{BRGSS}$ Min (V)</th>
<th>$g_m$ Min (mS)</th>
<th>$I_{DSS}$ Min (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq -8$</td>
<td>$-25$</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Features

- Excellent High-Frequency Gain: $G_{ps} 11$ dB @ 400 MHz
- Very Low Noise: $3$ dB @ 400 MHz
- Very Low Distortion
- High ac/dc Switch Off-Isolation
- High Gain: $A_V = 60$ @ 100 $\mu$A

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 2N3819 is a low-cost, all-purpose JFET which offers good performance at mid-to-high frequencies. It features low noise and leakage and guarantees high gain at 100 MHz.

Its TO-226AA (TO-92) package is compatible with various tape-and-reel options for automated assembly (see Packaging Information). For similar products in TO-206AF (TO-72) and TO-236 (SOT-23) packages, see the 2N4416/2N4416A/SST4416 data sheet.

Absolute Maximum Ratings

- Gate-Source/Gate-Drain Voltage: $-25$ V
- Forward Gate Current: $10$ mA
- Storage Temperature: $-55$ to $150$ °C
- Operating Junction Temperature: $-55$ to $150$ °C
- Lead Temperature (1/16” from case for 10 sec.): $300$ °C
- Power Dissipation: $350$ mW

Notes

- Derate 2.8 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 #70238.
# Specifications\(^a\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static</td>
<td></td>
<td></td>
<td>Min</td>
</tr>
<tr>
<td>Gate-Source Breakdown Voltage</td>
<td>( V_{(BR)GS} )</td>
<td>( I_G = -1 \mu A ), ( V_{DS} = 0 ) V</td>
<td>-25</td>
</tr>
<tr>
<td>Gate-Source Cutoff Voltage</td>
<td>( V_{GS(off)} )</td>
<td>( V_{DS} = 15 ) V, ( I_D = 2 ) nA</td>
<td>-3</td>
</tr>
<tr>
<td>Saturation Drain Current(^b)</td>
<td>( I_{DSS} )</td>
<td>( V_{GS} = 15 ) V, ( V_{GS} = 0 ) V</td>
<td>2</td>
</tr>
<tr>
<td>Gate Reverse Current</td>
<td>( I_{GSS} )</td>
<td>( V_{GS} = -15 ) V, ( V_{DS} = 0 ) V</td>
<td>0.002</td>
</tr>
<tr>
<td>Gate Operating Current(^d)</td>
<td>( I_G )</td>
<td>( V_{DG} = 10 ) V, ( I_D = 1 ) mA</td>
<td>-0.002</td>
</tr>
<tr>
<td>Drain Cutoff Current</td>
<td>( I_{D(off)} )</td>
<td>( V_{DS} = 10 ) V, ( V_{GS} = -8 ) V</td>
<td>0.002</td>
</tr>
<tr>
<td>Drain-Source On-Resistance</td>
<td>( r_{DS(on)} )</td>
<td>( V_{GS} = 0 ) V, ( I_D = 1 ) mA</td>
<td>150</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>( V_{GS} )</td>
<td>( V_{DS} = 15 ) V, ( I_D = 200 ) \mu ) A</td>
<td>-0.5</td>
</tr>
<tr>
<td>Gate-Source Forward Voltage</td>
<td>( V_{(GFS)} )</td>
<td>( I_G = 1 ) mA, ( V_{DS} = 0 ) V</td>
<td>0.7</td>
</tr>
<tr>
<td>Dynamic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common-Source Forward Transconductance(^d)</td>
<td>( g_f )</td>
<td>( V_{DS} = 15 ) V, ( V_{GS} = 0 ) V</td>
<td>2</td>
</tr>
<tr>
<td>Common-Source Output Conductance(^d)</td>
<td>( g_{os} )</td>
<td>( f = 1 ) kHz</td>
<td>5.5</td>
</tr>
<tr>
<td>Common-Source Input Capacitance</td>
<td>( C_{iss} )</td>
<td>( f = 100 ) MHz</td>
<td>1.6</td>
</tr>
<tr>
<td>Common-Source Reverse Transfer Capacitance</td>
<td>( C_{rss} )</td>
<td>( V_{DS} = 15 ) V, ( V_{GS} = 0 ) V, ( f = 1 ) MHz</td>
<td>4</td>
</tr>
<tr>
<td>Equivalent Input Noise Voltage(^d)</td>
<td>( \sigma_n )</td>
<td>( V_{DS} = 10 ) V, ( V_{GS} = 0 ) V, ( f = 100 ) Hz</td>
<td>6</td>
</tr>
</tbody>
</table>

**Notes**
- \( T_A = 25^\circ \) C unless otherwise noted.
- Typical values are for Design Aid Only, not guaranteed nor subject to production testing.
- Pulse test: \( PW \leq 300 \) \( \mu \) s, duty cycle \( \leq 2\% \).
- This parameter not registered with JEDEC.

## Typical Characteristics

<table>
<thead>
<tr>
<th>Drain Current and Transconductance vs. Gate-Source Cutoff Voltage</th>
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</table>

- **Saturation Drain Current** \( I_{DSS} \) vs. \( V_{GS(off)} \) - Gate-Source Cutoff Voltage
- **Forward Transconductance** \( g_f \) vs. \( V_{GS(off)} \) - Gate-Source Cutoff Voltage

<table>
<thead>
<tr>
<th>On-Resistance and Output Conductance vs. Gate-Source Cutoff Voltage</th>
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</table>

- **Drain-Source On-Resistance** \( r_{DS(on)} \) vs. \( V_{GS(off)} \) - Gate-Source Cutoff Voltage
- **Output Conductance** \( g_{os} \) vs. \( V_{GS(off)} \) - Gate-Source Cutoff Voltage
Typical Characteristics (Cont’d)

**Gate Leakage Current**

- $V_{DG}$ – Drain-Gate Voltage (V)
- $I_G$ – Gate Leakage (mA)
- $I_GS$ @ 25°C
- $I_GS$ @ 125°C
- $I_GS$ @ 25°C
- $I_GS$ @ 125°C

**Common-Source Forward Transconductance vs. Drain Current**

- $V_{GS(off)} = -3$ V
- $V_{DS} = 10$ V
- $f = 1$ kHz
- $T_A = -55^\circ$ C

**Output Characteristics**

- $V_{GS(off)} = -2$ V
- $V_{GS} = 0$ V
- $V_{DS} = 10$ V

**Transfer Characteristics**

- $V_{GS}$ – Gate-Source Voltage (V)
- $I_D$ – Drain Current (mA)
- $V_{DS}$ – Drain-Source Voltage (V)

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Typical Characteristics (Cont’d)

Transconductance vs. Gate-Source Voltage

- $g_{fs} = \text{Forward Transconductance (mS)}$
- $V_{GS} = \text{Gate-Source Voltage (V)}$
- $V_{GS(\text{off})} = -2 \, \text{V}$
- $V_{DS} = 10 \, \text{V}$
- $f = 1 \, \text{kHz}$
- $T_A = -55^\circ \text{C}$
- $25^\circ \text{C}$
- $125^\circ \text{C}$

On-Resistance vs. Drain Current

- $r_{DS(on)} = \text{Drain-Source On-Resistance (}\Omega\text{)}$
- $V_{GS(\text{off})} = -2 \, \text{V}$
- $V_{GS(\text{off})} = -3 \, \text{V}$
- $T_A = -55^\circ \text{C}$

Common-Source Input Capacitance vs. Gate-Source Voltage

- $C_{iss} = \text{Input Capacitance (pF)}$
- $f = 1 \, \text{MHz}$
- $V_{DS} = 0 \, \text{V}$
- $V_{DS} = 10 \, \text{V}$

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

- $C_{rss} = \text{Reverse Feedback Capacitance (pF)}$
- $f = 1 \, \text{MHz}$
- $V_{DS} = 0 \, \text{V}$
- $V_{DS} = 10 \, \text{V}$

Circuit Voltage Gain vs. Drain Current

- $A_V = \frac{g_{fs} R_L}{1 + R_{L} g_{os}}$
- Assume $V_{DD} = 15 \, \text{V}$, $V_{DS} = 5 \, \text{V}$
- $V_{GS(\text{off})} = -2 \, \text{V}$
- $V_{GS(\text{off})} = -3 \, \text{V}$
Typical Characteristics (Cont’d)

Input Admittance

Reverse Admittance

Forward Admittance

Output Admittance

Equivalent Input Noise Voltage vs. Frequency

Output Conductance vs. Drain Current

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