**FEATURES**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ULTRA LOW NOISE</td>
<td>$e_n = 2.0\text{nV/}\sqrt{\text{Hz}}$</td>
</tr>
<tr>
<td>LOW INPUT CAPACITANCE</td>
<td>$C_{iss} = 8\text{pF}$</td>
</tr>
</tbody>
</table>

**Features**
- Reduced Noise due to process improvement
- Monolithic Design
- High slew rate
- Low offset/drift voltage
- Low gate leakage $I_{gs}$ & $I_g$
- High CMRR 102 dB

**Benefits**
- Tight differential voltage match vs. current
- Improved op amp speed settling time accuracy
- Minimum Input Error trimming error voltage
- Lower intermodulation distortion

**Applications**
- Wide band differential Amps
- High speed temperature compensated single ended input amplifier amps
- High speed comparators
- Impedance Converters

**Description**
The LSJ689 high performance, P-Channel, monolithic dual JFET features extremely low noise, tight offset voltage and low drift over temperature. It is targeted for use in a wide range of precision instrumentation applications. The SOT-23, TO-71 and SO-8 packages provide ease of manufacturing and the symmetrical pinouts prevent improper orientation. The SOT-23 and SO-8 packages are available in tape and reel, compatible with automatic assembly methods. (See packaging data)

**ABSOLUTE MAXIMUM RATINGS**

@ 25 °C (unless otherwise stated)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum Temperatures</strong></td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55 to +150°C</td>
</tr>
<tr>
<td>Junction Operating Temperature</td>
<td>-55 to +150°C</td>
</tr>
<tr>
<td><strong>Maximum Power Dissipation, $T_A = 25°C$</strong></td>
<td></td>
</tr>
<tr>
<td>Continuous Power Dissipation, per side</td>
<td>300mW</td>
</tr>
<tr>
<td>Power Dissipation, total</td>
<td>500mW</td>
</tr>
<tr>
<td><strong>Maximum Currents</strong></td>
<td></td>
</tr>
<tr>
<td>Gate Forward Current</td>
<td>$I_{GF} = -10\text{mA}$</td>
</tr>
<tr>
<td><strong>Maximum Voltages</strong></td>
<td></td>
</tr>
<tr>
<td>Gate to Source</td>
<td>$V_{GS} = 50\text{V}$</td>
</tr>
<tr>
<td>Gate to Drain</td>
<td>$V_{GD} = 50\text{V}$</td>
</tr>
</tbody>
</table>
### Matching Characteristics @ 25°C (unless otherwise stated)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>CHARACTERISTIC</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
<th>CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>⎡VGSS – VGs⎤</td>
<td>Differential Gate to Source Voltage</td>
<td>20</td>
<td>nV</td>
<td></td>
<td></td>
<td>VDS = -15V, IG = -1mA</td>
</tr>
<tr>
<td>Ioss2 / Ioss1</td>
<td>Saturation Drain Current Ratio</td>
<td>0.90</td>
<td>1.0</td>
<td></td>
<td></td>
<td>VDS = -15V, VG = 0V</td>
</tr>
<tr>
<td>CMRR</td>
<td>COMMON MODE REJECTION RATIO -20 log</td>
<td>95</td>
<td>102</td>
<td>db</td>
<td></td>
<td>VDS = -10V to -20V, ID = -200µA</td>
</tr>
<tr>
<td>GS2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GS1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VGS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Electrical Characteristics @ 25°C (unless otherwise stated)

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>CHARACTERISTIC</th>
<th>MIN</th>
<th>TYP</th>
<th>MAX</th>
<th>UNITS</th>
<th>CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>e_n</td>
<td>Noise Voltage</td>
<td>2.0</td>
<td>nV/√Hz</td>
<td></td>
<td></td>
<td>VDS = -15V, I0 = -2.0mA, f = 1kHz, NBW = 1Hz</td>
</tr>
<tr>
<td>e_n</td>
<td>Noise Voltage</td>
<td>3.5</td>
<td>nV/√Hz</td>
<td></td>
<td></td>
<td>VDS = -15V, I0 = -2.0mA, f = 10Hz, NBW = 1Hz</td>
</tr>
<tr>
<td>Ciss</td>
<td>Common Source Input Capacitance</td>
<td>8</td>
<td>pF</td>
<td></td>
<td></td>
<td>VDS = -15V, I0 = -200µA, f = 1MHz</td>
</tr>
<tr>
<td>Crss</td>
<td>Common Source Reverse Transfer Capacitance</td>
<td>3</td>
<td>pF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bvgs</td>
<td>Gate to Source Breakdown Voltage</td>
<td>50</td>
<td>V</td>
<td></td>
<td></td>
<td>VDS = 0V, IG = 1µA</td>
</tr>
<tr>
<td>V(BRG1 - G2)</td>
<td>Gate to Gate Breakdown Voltage</td>
<td>±30</td>
<td>±45</td>
<td>V</td>
<td></td>
<td>IG = ±1µA, I0 = IGS = 0A (Open Circuit)</td>
</tr>
<tr>
<td>Vgs(off)</td>
<td>Gate to Source Pinch-off Voltage</td>
<td>1.50</td>
<td>5.0</td>
<td>V</td>
<td></td>
<td>VDS = -15V, IG = -1mA</td>
</tr>
<tr>
<td>Ids</td>
<td>Drain to Source Saturation Current</td>
<td>-2.5</td>
<td>-30</td>
<td>mA</td>
<td></td>
<td>VDS = -15V, VG = 0V</td>
</tr>
<tr>
<td>IG</td>
<td>Gate Operating Current</td>
<td>2</td>
<td>pA</td>
<td></td>
<td></td>
<td>VGG = -15V, I0 = -200µA</td>
</tr>
<tr>
<td>Igs</td>
<td>Gate to Source Leakage Current</td>
<td>0.9</td>
<td>100</td>
<td>pA</td>
<td></td>
<td>VGS = 15V, VDS = 0V</td>
</tr>
<tr>
<td>Gfs</td>
<td>Full Conductance Transconductance</td>
<td>1500</td>
<td>µS</td>
<td></td>
<td></td>
<td>VDS = -15V, VG = 0V, f = 1kHz</td>
</tr>
<tr>
<td>Gfs</td>
<td>Transconductance</td>
<td>1500</td>
<td>µS</td>
<td></td>
<td></td>
<td>VDS = -15V, I0 = -200µA, f = 1kHz</td>
</tr>
<tr>
<td>GOS</td>
<td>Full Output Conductance</td>
<td>38</td>
<td>µS</td>
<td></td>
<td></td>
<td>VDS = -15V, VG = 0V, f = 1kHz</td>
</tr>
<tr>
<td>GOS</td>
<td>Output Conductance</td>
<td>3</td>
<td>µS</td>
<td></td>
<td></td>
<td>VDS = -15V, I0 = -200µA, f = 1kHz</td>
</tr>
<tr>
<td>NF</td>
<td>Noise Figure</td>
<td>0.5</td>
<td>db</td>
<td></td>
<td></td>
<td>VDS = -15V, VG = 0V, RG = 10mΩ</td>
</tr>
</tbody>
</table>

### Typical Spice Parameters for LSJ689 in LTSpice Format:

```
LSJ689_4 IDSS = 14.0mA RDS=112
.Model LSJ689_4 PJF (LEVEL=1 BETA=28E-4 VTO=-2.75 LAMBDA=2E-3
+ IS=4.5E-16 N = 1 RD=73 RS=35 CGD=6E-12 CGS=11E-12 PB=0.25 MJ=0.3 FC=0.5
+ KF=2E-18 AF=1 XTI=0)
```
NOTES

1. Absolute maximum ratings are limiting values above which serviceability may be impaired.
2. Pulse width ≤2 ms.
3. All MIN/TYP/MAX Limits are absolute values. Negative signs indicate electrical polarity only.
4. Derate 2.4 mW/°C above 25°C.
5. Derate 4 mW/°C above 25°C.

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TYPICAL CHARACTERISTICS

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
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VGS=0.6V
VGS=0.8V
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VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
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VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)

Output Characteristics
Tj=25°C
VGS=0.0V
VGS=0.2V
VGS=0.4V
VGS=0.6V
VGS=0.8V
VGS=1.0V
VGS=1.2V
VGS=2.0V

DRAIN CURRENT (mA) vs DRAIN-SOURCE VOLTAGE (V)
TYPICAL CHARACTERISTICS (CONT'D)

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

*Tj=25°C*  

**Equivalent Input Noise Voltage vs Frequency**

*VDS=15V*  
*ID=2mA*

**On-Resistance and Output Conductance vs. Gate-Source Cutoff Voltage**

*Tj=25°C*

**Output Conductance vs. Drain Current**

*VDS=15*  

**Reverse Transfer Capacitance (Crss) vs Gate-to-Drain Voltage**

*VGS=0V*  
*f=1MHz*  
*Tj=25°C*

**Input Capacitance (Ciss) vs Drain-to-Source Voltage**

*VGS=0V*  
*f=1MHz*  
*Tj=25°C*
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