

# LINEAR SYSTEMS

Twenty-Five Years Of Quality Through Innovation

## LSK489

### LOW NOISE LOW CAPACITANCE MONOLITHIC DUAL N-CANNEL JFET AMPLIFIER

#### FEATURES

|                       |                         |
|-----------------------|-------------------------|
| ULTRA LOW NOISE       | $e_n = 1.8nV/\sqrt{Hz}$ |
| LOW INPUT CAPACITANCE | $C_{iss} = 4pF$         |

#### Features

- Reduced Noise due to process improvement
- Monolithic Design
- High slew rate
- Low offset/drift voltage
- Low gate leakage  $I_{gss}$  &  $I_g$
- 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 LSK 489 series of high performance monolithic dual JFETs features extremely low noise, tight offset voltage and low drift over temperature specifications, and is targeted for use in a wide range or precision instrumentation applications. This series has a wide selection of offset and drift specifications. The SST series SO-8 package provided ease of manufacturing and the symmetrical pinout prevents improper orientation. The SO-8 package is available with tape and reel options for compatibility with automatic assembly methods. (See packaging data)

#### ABSOLUTE MAXIMUM RATINGS<sup>1</sup> @ 25 °C (unless otherwise stated)

##### Maximum Temperatures

|                                |               |
|--------------------------------|---------------|
| Storage Temperature            | -55 to +150°C |
| Junction Operating Temperature | -55 to +150°C |

##### Maximum Power Dissipation, TA = 25°C

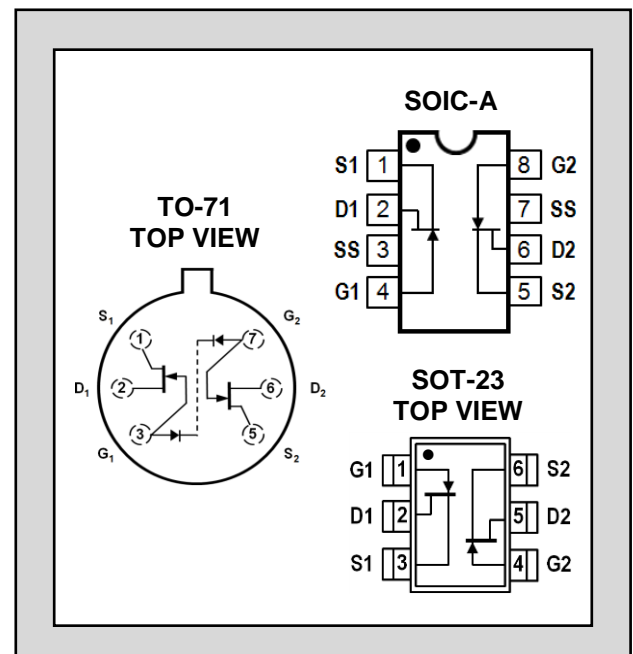
|   |       |
|---|-------|
| Continuous Power Dissipation, per side <sup>4</sup> | 300mW |
| Power Dissipation, total <sup>5</sup>               | 500mW |

##### Maximum Currents

|                      |                   |
|----------------------|-------------------|
| Gate Forward Current | $I_{G(F)} = 10mA$ |
|----------------------|-------------------|

##### Maximum Voltages

|                |                 |
|----------------|-----------------|
| Gate to Source | $V_{GSO} = 60V$ |
| Gate to Drain  | $V_{GDO} = 60V$ |



\* For equivalent single version, see LSK189

**MATCHING CHARACTERISTICS @ 25°C (unless otherwise stated)**

| SYMBOL                      | CHARACTERISTIC  | MIN | TYP | MAX | UNITS | CONDITIONS                                     |
|-----------------------------|---|-----|-----|-----|-------|--|
| $ V_{GS1} - V_{GS2} $       | Differential Gate to Source Cutoff Voltage  |     |     | 20  | mV    | $V_{DS} = 10V, I_D = 1mA$                      |
| $\frac{I_{DSS1}}{I_{DSS2}}$ | Gate to Source Saturation Current Ratio   | 0.9 |     | 1.0 |       | $V_{DS} = 10V, V_{GS} = 0V$                    |
| CMRR                        | <b>COMMON MODE REJECTION RATIO</b><br>$-20 \log  \Delta V_{GS1-2}/\Delta V_{DS} $ | 95  | 102 |     | dB    | $V_{DS} = 10V \text{ to } 20V, I_D = 200\mu A$ |

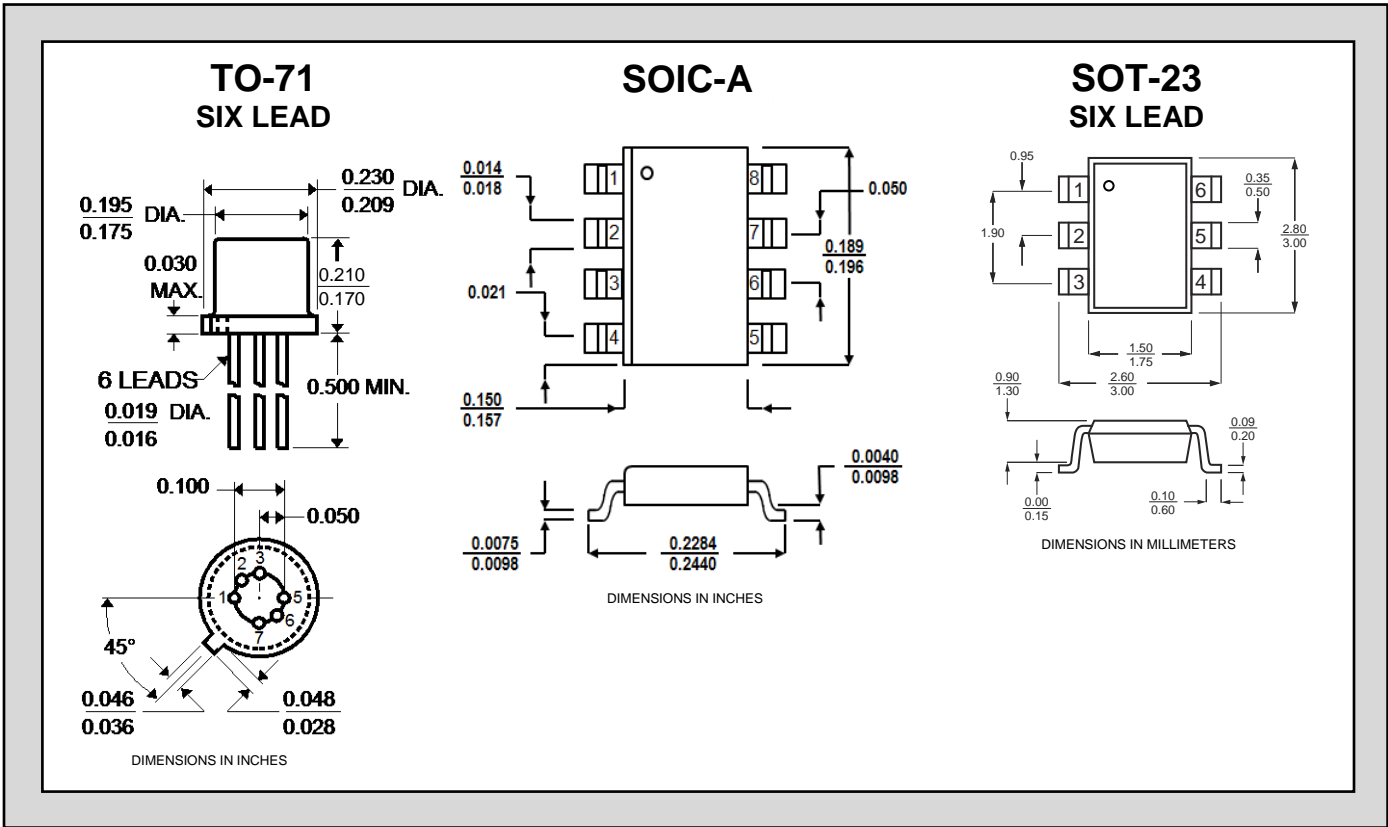
| SYMBOL    | CHARACTERISTIC                             | MIN | TYP | MAX | UNITS           | CONDITIONS                                       |
|-----------|--|-----|-----|-----|-----------------|--|
| $e_n$     | Noise Voltage                              |     | 1.8 | 2.0 | nV/ $\sqrt{Hz}$ | $V_{DS} = 15V, I_D = 2.0mA, f = 1kHz, NBW = 1Hz$ |
| $e_n$     | Noise Voltage                              |     | 2.8 | 3.5 | nV/ $\sqrt{Hz}$ | $V_{DS} = 15V, I_D = 2.0mA, f = 10Hz, NBW = 1Hz$ |
| $C_{ISS}$ | Common Source Input Capacitance            |     | 4   | 8   | pF              | $V_{DS} = 15V, I_D = 500\mu A, f = 1MHz$         |
| $C_{RSS}$ | Common Source Reverse Transfer Capacitance |     |     | 3   | pF              |  |

**ELECTRICAL CHARACTERISTICS @ 25°C (unless otherwise stated)**

| SYMBOL          | CHARACTERISTIC                     | MIN      | TYP      | MAX  | UNITS   | CONDITIONS  |
|-----------------|------------------------------------|----------|----------|------|---------|---|
| $BV_{GSS}$      | Gate to Source Breakdown Voltage   | -60      |          |      | V       | $V_{DS} = 0, I_D = -1nA$  |
| $V_{(BR)G1-G2}$ | Gate to Gate Breakdown Voltage     | $\pm 30$ | $\pm 45$ |      | V       | $I_G = \pm 1\mu A, I_D = I_S = 0A$ (Open Circuit)                 |
| $V_{GS(OFF)}$   | Gate to Source Pinch-off Voltage   | -1.5     |          | -3.5 | V       | $V_{DS} = 15V, I_D = 1nA$   |
| $V_{GS}$        | Gate to Source Operating Voltage   | -0.5     |          | -3.5 | V       | $V_{DS} = 15V, I_D = 500\mu A$                                    |
| $I_{DSS}^2$     | Drain to Source Saturation Current | 2.5      | 5        | 15   | mA      | $V_{DG} = 15V, V_{GS} = 0$  |
| $I_G$           | Gate Operating Current             |          | -2       | -25  | pA      | $V_{DG} = 15V, I_D = 200\mu A$<br>$T_A = 125^\circ C$             |
|                 |                                    |          | -0.8     | -10  | nA      |   |
| $I_{GSS}$       | Gate to Source Leakage Current     |          |          | -100 | pA      | $V_{DG} = -15V, V_{DS} = 0$                                       |
| $G_{fs}$        | Full Conductance Transconductance  | 1500     |          |      | $\mu S$ | $V_{DG} = 15V, V_{GS} = 0, f = 1kHz$                              |
| $G_{fs}$        | Transconductance                   | 1000     | 1500     |      | $\mu S$ | $V_{DG} = 15V, I_D = 500\mu A$                                    |
| $G_{OS}$        | Full Output Conductance            |          |          | 40   | $\mu S$ | $V_{DG} = 15V, V_{GS} = 0$  |
| $G_{OS}$        | Output Conductance                 |          | 1.8      | 2.7  | $\mu S$ | $V_{DG} = 15V, I_D = 200\mu A$                                    |
| NF              | Noise Figure                       |          |          | 0.5  | dB      | $V_{DS} = 15V, V_{GS} = 0, R_G = 10M\Omega, f = 100Hz, NBW = 6Hz$ |

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PACKAGE DIMENSIONS



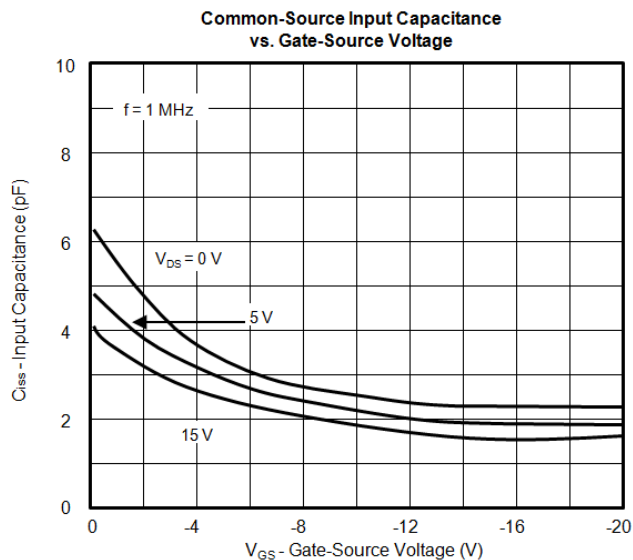
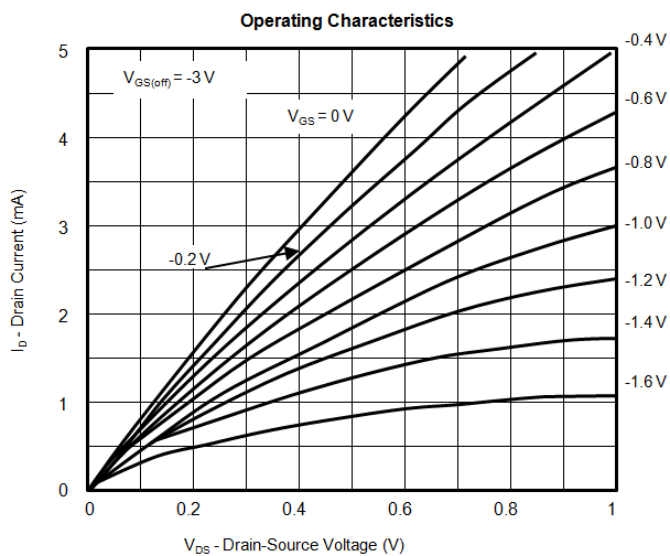
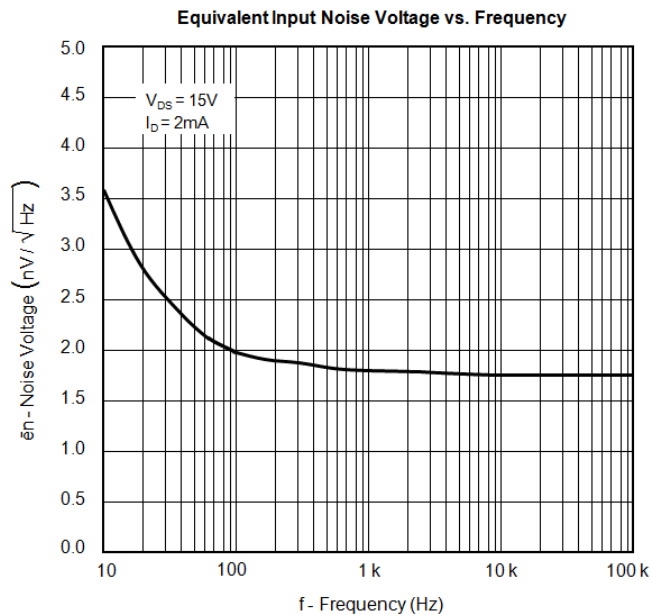
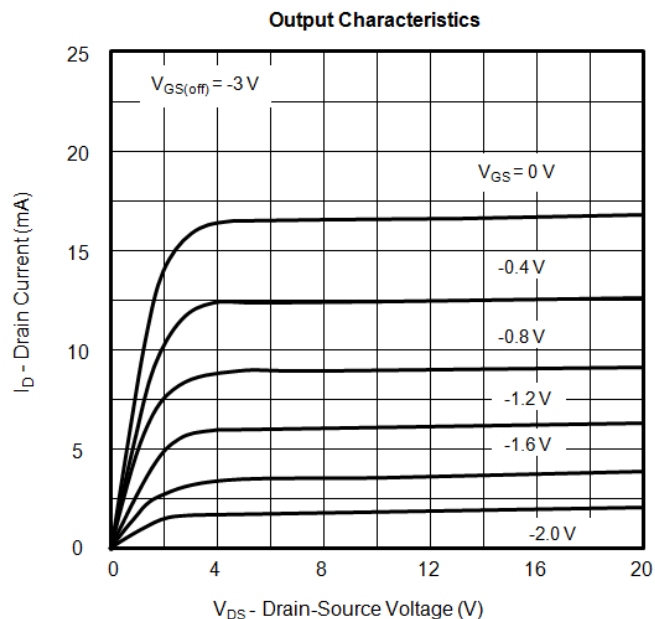
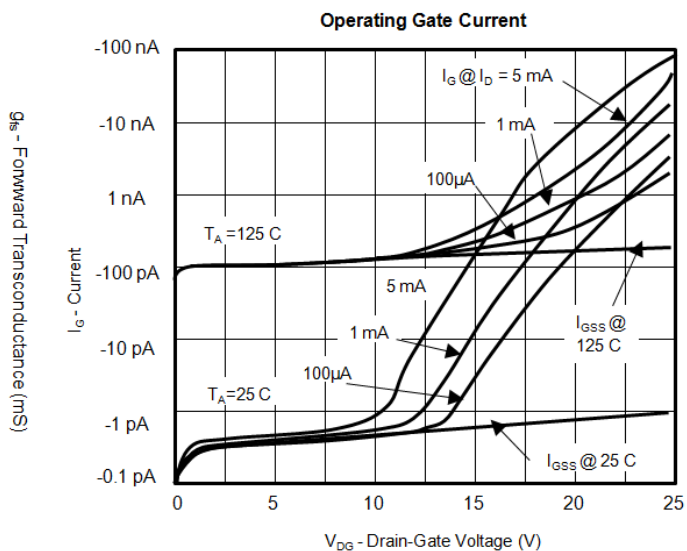
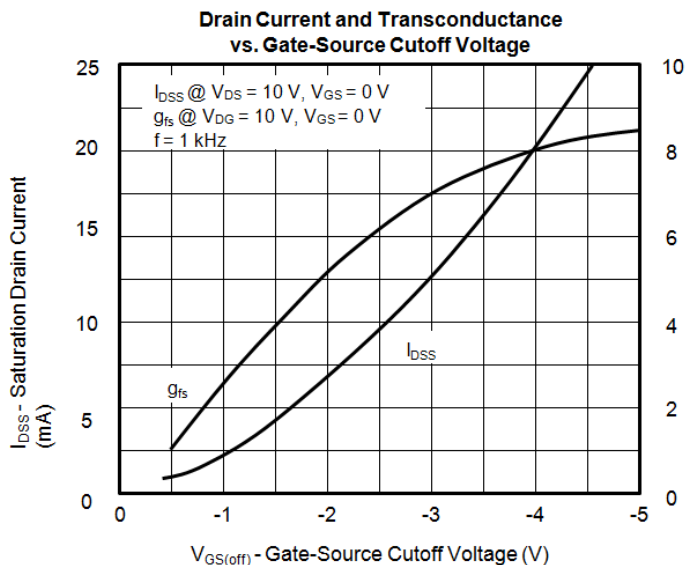
**NOTES**

1. Absolute maximum ratings are limiting values above which serviceability may be impaired.
2. Pulse width  $\leq 2_{ms}$ .
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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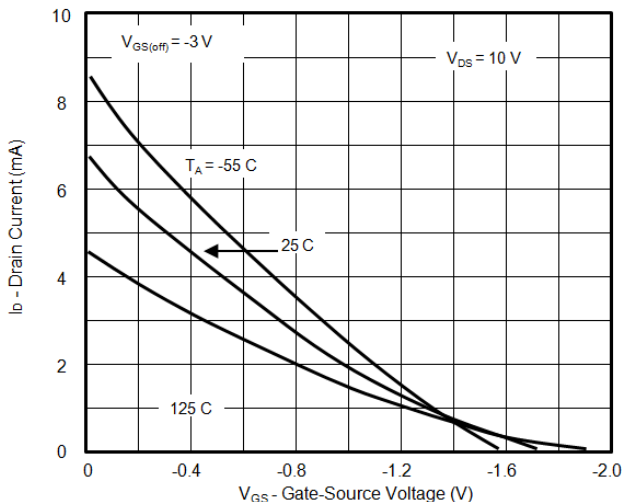
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# Typical Characteristics

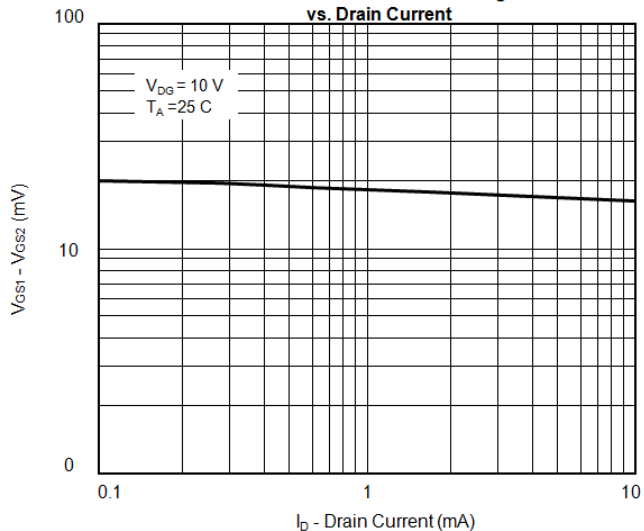


# Typical Characteristics (Cont'd)

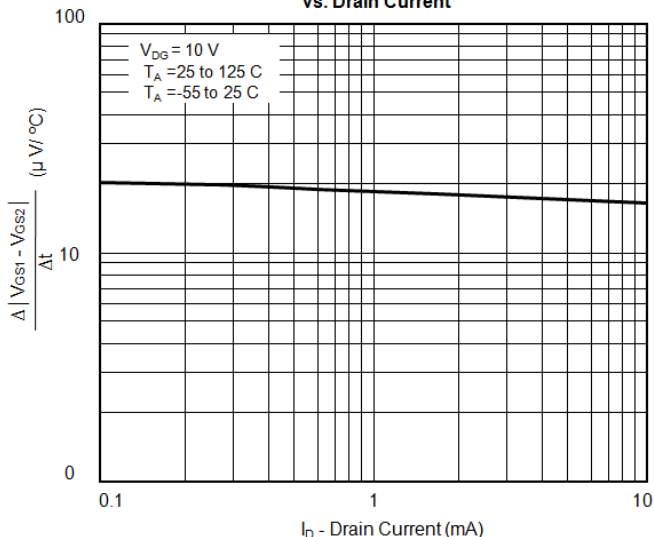
**Transfer Characteristics**



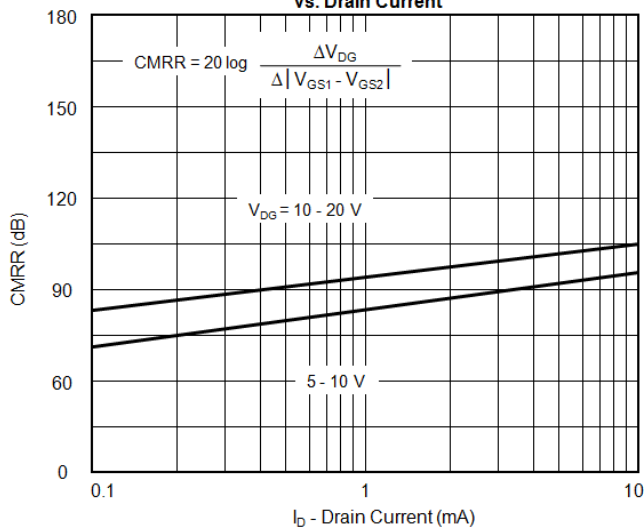
**Gate-Source Differential Voltage vs. Drain Current**



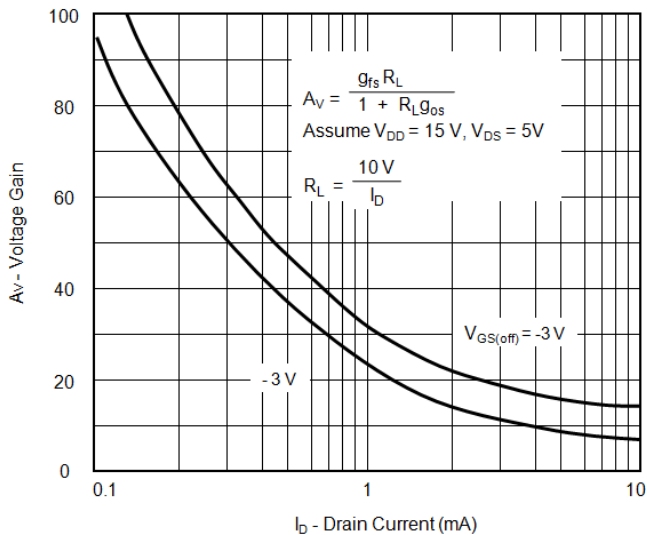
**Voltage Differential with Temperature vs. Drain Current**



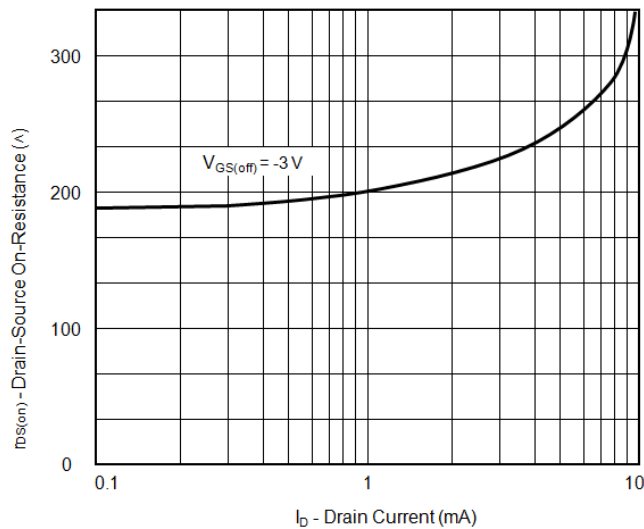
**Common Mode Rejection Ratio vs. Drain Current**



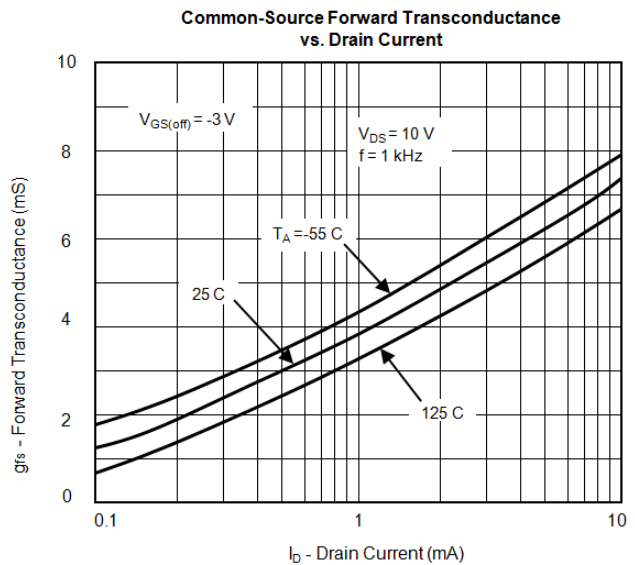
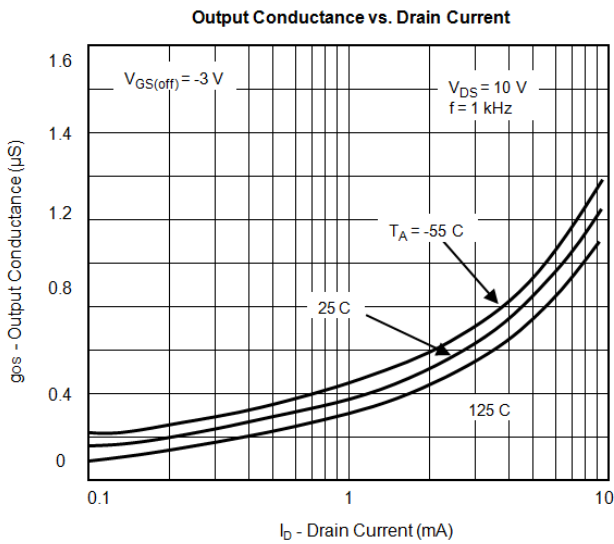
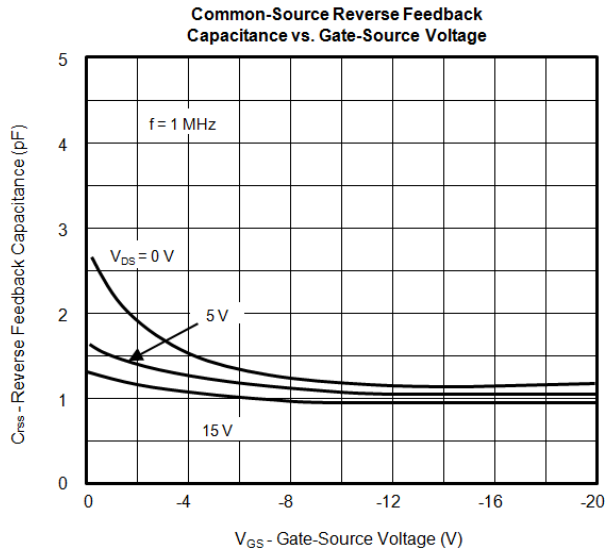
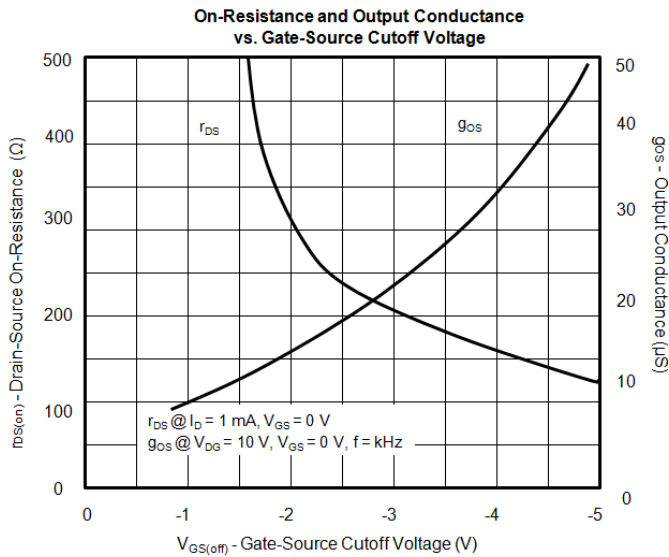
**Circuit Voltage Gain vs. Drain Current**



**On-Resistance vs. Drain Current**



# Typical Characteristics (Cont'd)



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