# Matched N-Channel JFET Pairs

## Product Summary

| Part Number | $V_{GS(off)}$ (V) | $V_{(BR)GSS}$ Min (V) | $g_{fs}$ Min (mS) | $I_G$ Typ (pA) | $\|V_{GS1} - V_{GS2}\|$ Max (mV) |
|---|---|---|---|---|---|
| 2N5564 | –0.5 to –3 | –40 | 7.5 | –3 | 5 |
| 2N5565 | –0.5 to –3 | –40 | 7.5 | –3 | 10 |
| 2N5566 | –0.5 to –3 | –40 | 7.5 | –3 | 20 |

## Features

- Two-Chip Design
- High Slew Rate
- Low Offset/Drift Voltage
- Low Gate Leakage: 3 pA
- Low Noise: 12 nV/√Hz @ 10 Hz
- Good CMRR: 76 dB
- Minimum Parasitics

## Benefits

- Tight Differential Match vs. Current
- 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 Signals
- Maximum High Frequency Performance

## Applications

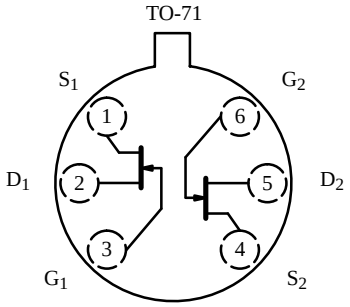
- Wideband Differential Amps
- High-Speed, Temp-Compensated, Single-Ended Input Amps
- High-Speed Comparators
- Impedance Converters
- Matched Switches

## Description

The 2N5564/5565/5566 are matched pairs of JFETs mounted in a TO-71 package. This two-chip design reduces parasitics for good performance at high frequency while ensuring extremely tight matching. This series features high breakdown voltage ($V_{(BR)DSS}$ typically > 55 V), high gain (typically > 9 mS), and <5-mV offset between the two die.

The hermetically-sealed TO-71 package is available with full military processing (see Military Information).

For similar products see the low-noise U/SST401 series, and the low-leakage 2N5196/5197/5198/5199 data sheets.



Top View

## Absolute Maximum Ratings

Gate-Drain, Gate-Source Voltage . . . . . –40 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[a] . . . . . 325 mW
Total[b] . . . . . 650 mW

Notes
a. Derate 2.6 mW/°C above 25°C
b. Derate 5.2 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 #70254.

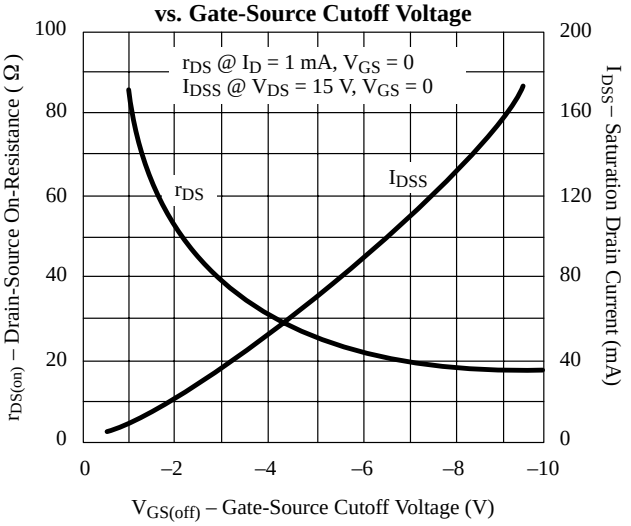
## Specifications[a]

| Parameter | Symbol | Test Conditions | Typ[b] | Limits 2N5564 Min | 2N5564 Max | 2N5565 Min | 2N5565 Max | 2N5566 Min | 2N5566 Max | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | | | | |
| Gate-Source Breakdown Voltage | $V_{(BR)GSS}$ | $I_G$ = –1 µA, $V_{DS}$ = 0 V | –55 | –40 | | –40 | | –40 | | V |
| Gate-Source Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}$ = 15 V, $I_D$ = 1 nA | –2 | –0.5 | –3 | –0.5 | –3 | –0.5 | –3 | V |
| Saturation Drain Current[c] | $I_{DSS}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V | 20 | 5 | 30 | 5 | 30 | 5 | 30 | mA |
| Gate Reverse Current | $I_{GSS}$ | $V_{GS}$ = –20 V, $V_{DS}$ = 0 V | –5 | | –100 | | –100 | | –100 | pA |
| | | $T_A$ = 150°C | –10 | | –200 | | –200 | | –200 | nA |
| Gate Operating Current[d] | $I_G$ | $V_{DG}$ = 15 V, $I_D$ = 2 mA | –3 | | | | | | | pA |
| | | $T_A$ = 125°C | –1 | | | | | | | nA |
| Drain-Source On-Resistance | $r_{DS(on)}$ | $V_{GS}$ = 0 V, $I_D$ = 1 mA | 50 | | 100 | | 100 | | 100 | Ω |
| Gate-Source Voltage[d] | $V_{GS}$ | $V_{DG}$ = 15 V, $I_D$ = 2 mA | –1.2 | | | | | | | V |
| Gate-Source Forward Voltage | $V_{GS(F)}$ | $I_G$ = 2 mA , $V_{DS}$ = 0 V | 0.7 | | 1 | | 1 | | 1 | V |
| **Dynamic** | | | | | | | | | | |
| Common-Source Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 2 mA f = 1 kHz | 9 | 7.5 | 12.5 | 7.5 | 12.5 | 7.5 | 12.5 | mS |
| Common-Source Output Conductance | $g_{os}$ | | 35 | | 45 | | 45 | | 45 | µS |
| Common-Source Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 15 V, $I_D$ = 2 mA f = 100 MHz | 8.5 | 7 | | 7 | | 7 | | mS |
| Common-Source Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15 V, $I_D$ = 2 mA f = 1 MHz | 10 | | 12 | | 12 | | 12 | pF |
| Common-Source Reverse Transfer Capacitance | $C_{rss}$ | | 2.5 | | 3 | | 3 | | 3 | pF |
| Equivalent Input Noise Voltage | $\bar{e}_n$ | $V_{DS}$ = 15 V, $I_D$ = 2 mA f = 10 Hz | 12 | | 50 | | 50 | | 50 | $nV/\sqrt{Hz}$ |
| Noise Figure | NF | $R_G$ = 10 MΩ | | | 1 | | 1 | | 1 | dB |
| **Matching** | | | | | | | | | | |
| Differential Gate-Source Voltage | $\lvert V_{GS1}-V_{GS2}\rvert$ | $V_{DG}$ = 15 V, $I_D$ = 2 mA | | | 5 | | 10 | | 20 | mV |
| Gate-Source Voltage Differential Change with Temperature | $\frac{\Delta\lvert V_{GS1}-V_{GS2}\rvert}{\Delta T}$ | $V_{DG}$ = 15 V, $I_D$ = 2 mA $T_A$ = –55 to 125°C | | | 10 | | 25 | | 50 | µV/°C |
| Saturation Drain Current Ratio[d] | $\frac{I_{DSS1}}{I_{DSS2}}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V | 0.98 | 0.95 | 1 | 0.95 | 1 | 0.95 | 1 | |
| Transconductance Ratio | $\frac{g_{fs1}}{g_{fs2}}$ | $V_{DS}$ = 15 V, $I_D$ = 2 mA f = 1 kHz | 0.98 | 0.95 | 1 | 0.90 | 1 | 0.90 | 1 | |
| Common Mode Rejection Ratio[d] | CMRR | $V_{DG}$ = 10 to 20 V $I_D$ = 2 mA | 76 | | | | | | | dB |

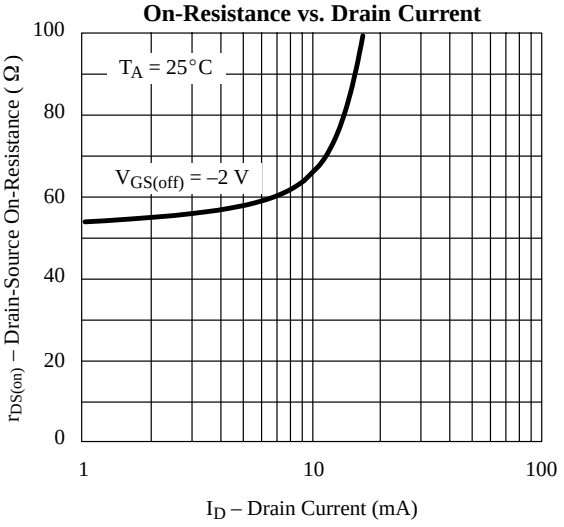
Notes
a. $T_A$ = 25°C unless otherwise noted. NCBD
b. Typical values are for DESIGN AID ONLY, not guaranteed nor subject to production testing.
c. Pulse test: PW ≤ 300 µs duty cycle ≤ 3%.
d. This parameter not registered with JEDEC.

# Typical Characteristics

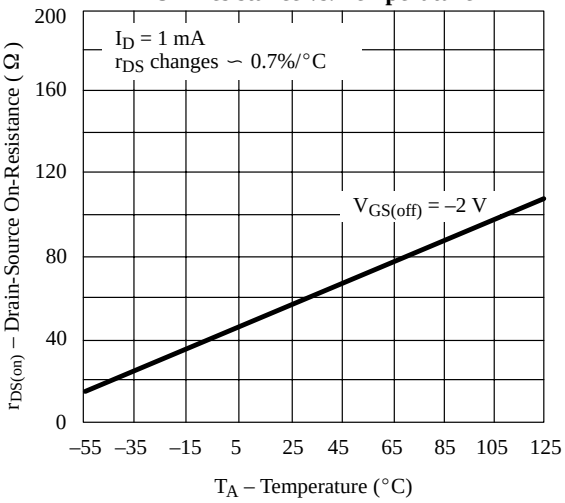
**On-Resistance and Drain Current vs. Gate-Source Cutoff Voltage**



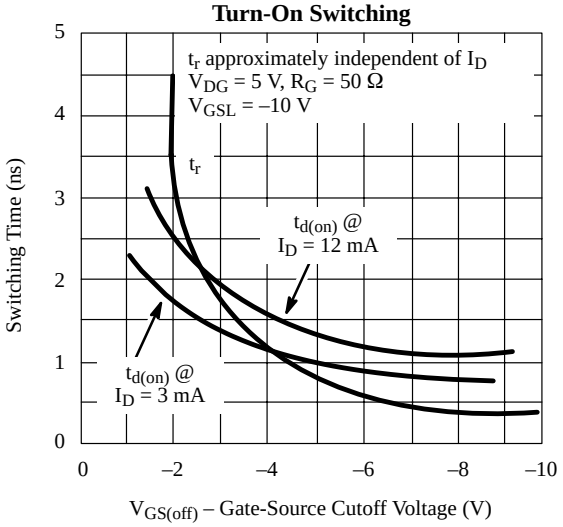

**On-Resistance vs. Drain Current**



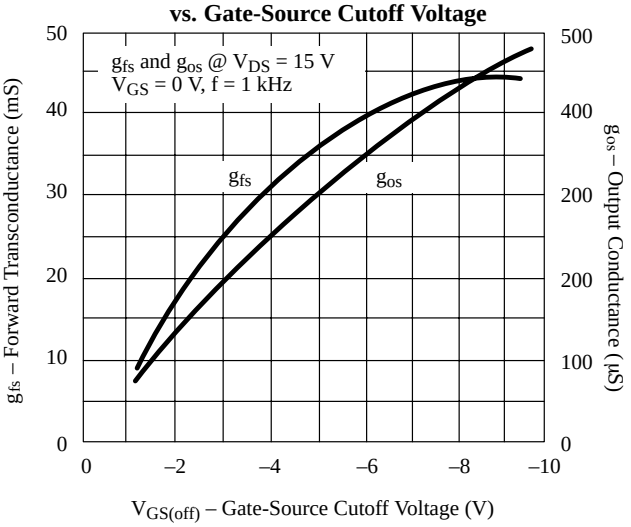

**On-Resistance vs. Temperature**



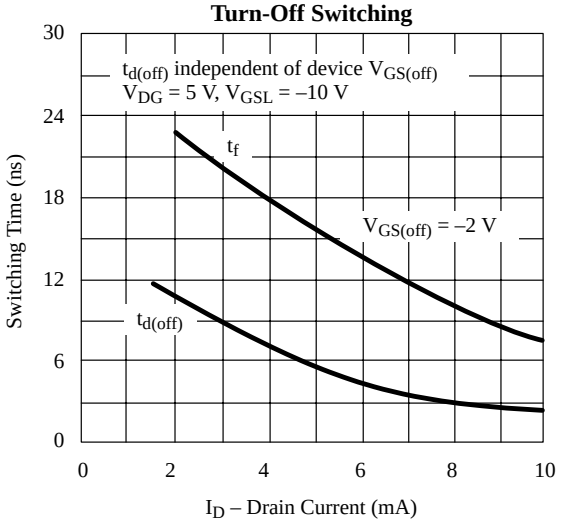

**Turn-On Switching**




**Forward Transconductance and Output Conductance vs. Gate-Source Cutoff Voltage**

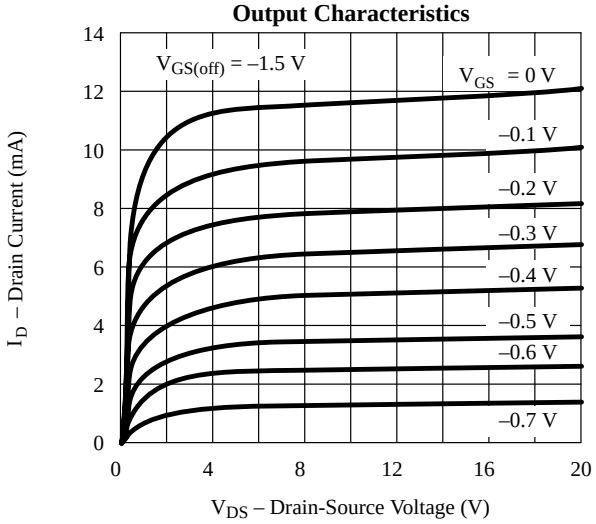



**Turn-Off Switching**

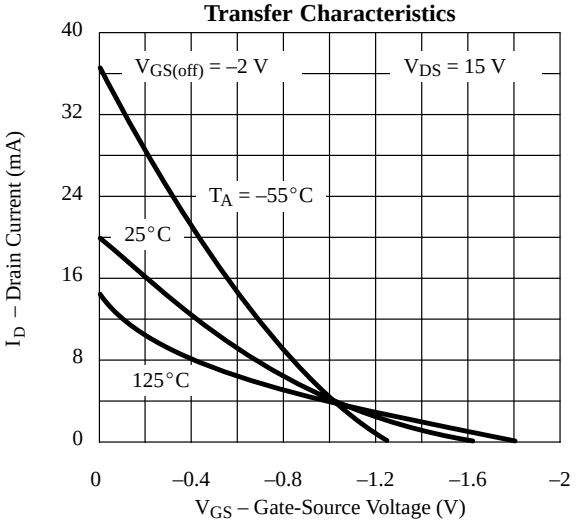


## Typical Characteristics (Cont'd)

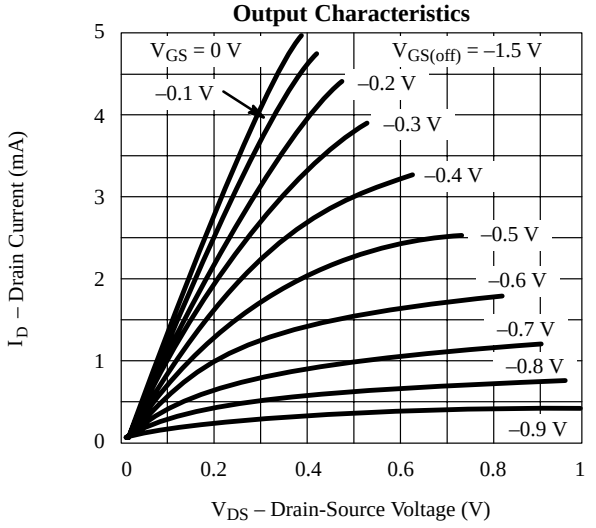
**Output Characteristics**



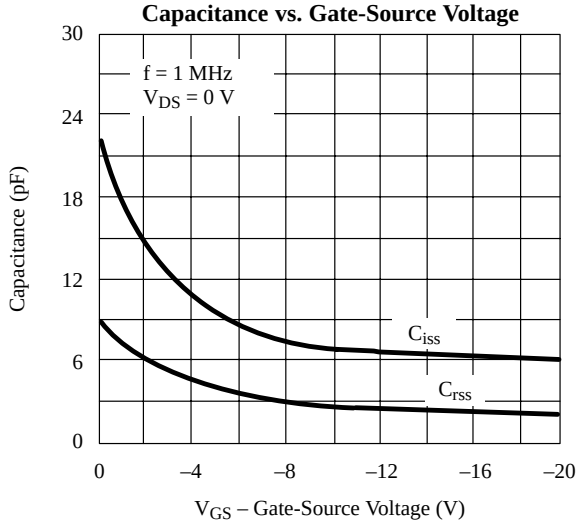

**Transfer Characteristics**



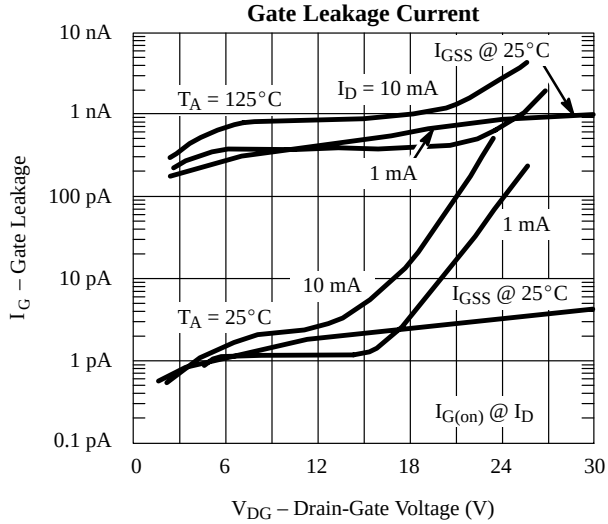

**Output Characteristics**



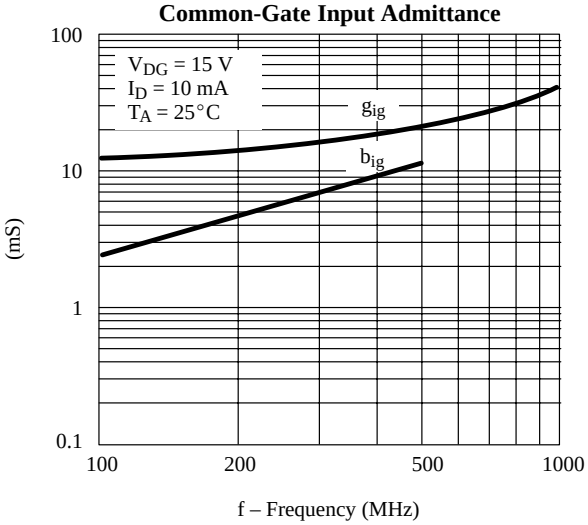

**Capacitance vs. Gate-Source Voltage**




**Gate Leakage Current**

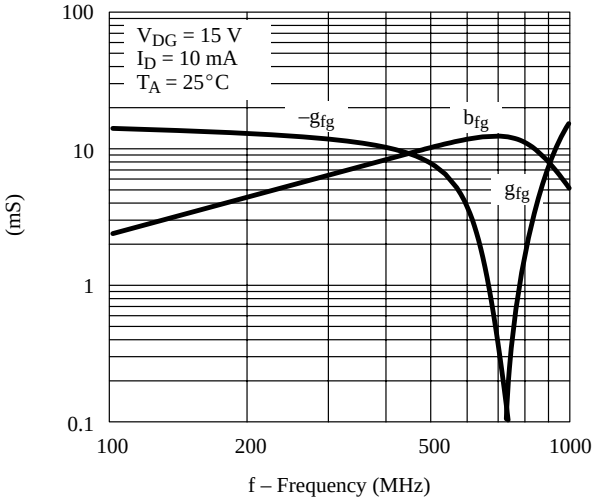



**Common-Gate Input Admittance**

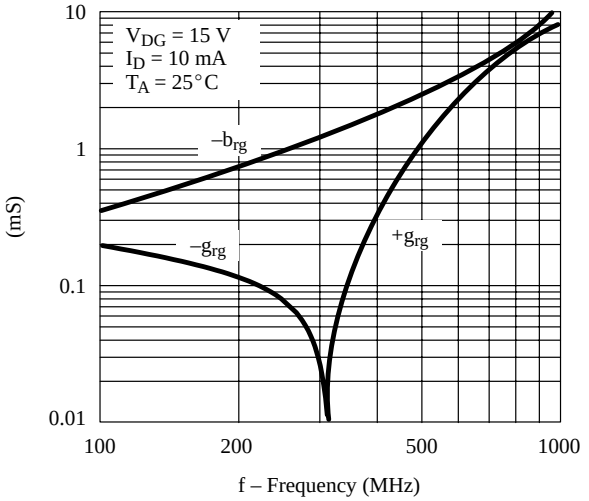


# Typical Characteristics (Cont'd)

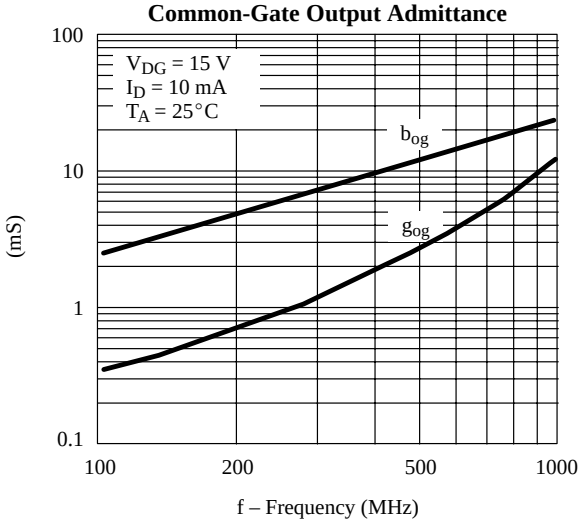
**Common-Gate Forward Admittance**



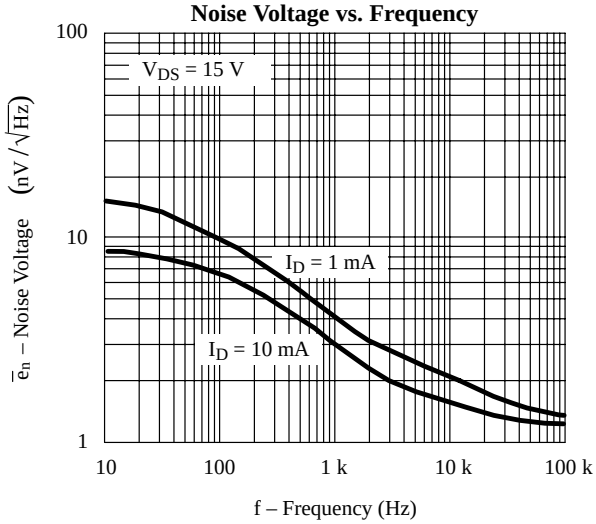

**Common-Gate Reverse Admittance**



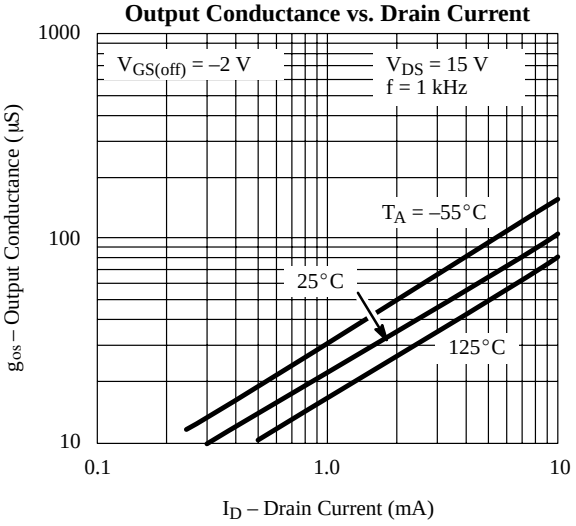

**Common-Gate Output Admittance**




**Noise Voltage vs. Frequency**




**Output Conductance vs. Drain Current**




**Transconductance vs. Drain Current**