# N-Channel JFETs

| PRODUCT SUMMARY | | | | |
|---|---|---|---|---|
| Part Number | $V_{GS(off)}$ (V) | $V_{(BR)GSS}$ Min (V) | $g_{fs}$ Min (mS) | $I_{DSS}$ Max (mA) |
| 2N4338 | −0.3 to −1 | −50 | 0.6 | 0.6 |
| 2N4339 | −0.6 to −1.8 | −50 | 0.8 | 1.5 |
| 2N4340 | −1 to −3 | −50 | 1.3 | 3.6 |
| 2N4341 | −2 to −6 | −50 | 2 | 9 |

## FEATURES

- Low Cutoff Voltage: 2N4338 <1 V
- High Input Impedance
- Very Low Noise
- High Gain: $A_V$ = 80 @ 20 μA

## BENEFITS

- Full Performance from Low-Voltage Power Supply: Down to 1 V
- Low Signal Loss/System Error
- High System Sensitivity
- High-Quality Low-Level Signal Amplification

## APPLICATIONS

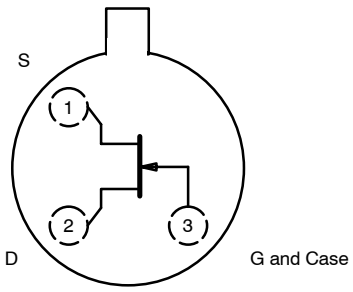
- High-Gain, Low-Noise Amplifiers
- Low-Current, Low-Voltage Battery-Powered Amplifiers
- Infrared Detector Amplifiers
- Ultrahigh Input Impedance Pre-Amplifiers

## DESCRIPTION

The 2N4338/4339/4340/4341 n-channel JFETs are designed for sensitive amplifier stages at low- to mid-frequencies. Low cut-off voltages accommodate low-level power supplies and low leakage for improved system accuracy.

The TO-206AA (TO-18) package is hermetically sealed and suitable for military processing (see Military Information). For similar products in TO-226AA (TO-92) and TO-236 (SOT-23) packages, see the J/SST201 series data sheet.

**TO-206AA**
**(TO-18)**




Top View

## ABSOLUTE MAXIMUM RATINGS

Gate-Source/Gate-Drain Voltage . . . . . −50 V
Forward Gate Current . . . . . 50 mA
Storage Temperature . . . . . −65 to 200°C
Operating Junction Temperature . . . . . −55 to 175°C
Lead Temperature ($^1/_{16}$" from case for 10 sec.) . . . . . 300°C
Power Dissipation[a] . . . . . 300 mW

Notes
a. Derate 2 mW/°C above 25°C

For applications information see AN102 and AN106.

## SPECIFICATIONS FOR 2N4338 AND 2N4339 ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Conditions | Typ[a] | Limits 2N4338 Min | Limits 2N4338 Max | Limits 2N4339 Min | Limits 2N4339 Max | Unit |
|---|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | | |
| Gate-Source Breakdown Voltage | $V_{(BR)GSS}$ | $I_G$ = –1 μA , $V_{DS}$ = 0 V | –57 | –50 | | –50 | | V |
| Gate-Source Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}$ = 15 V, $I_D$ = 0.1 μA | | –0.3 | –1 | –0.6 | –1.8 | V |
| Saturation Drain Current[b] | $I_{DSS}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V | | 0.2 | 0.6 | 0.5 | 1.5 | mA |
| Gate Reverse Current | $I_{GSS}$ | $V_{GS}$ = –30 V, $V_{DS}$ = 0 V | –2 | | –100 | | –100 | pA |
| | | $T_A$ = 150°C | –4 | | –100 | | –100 | nA |
| Gate Operating Current[b] | $I_G$ | $V_{DG}$ = 15 V, $I_D$ = 0.1 mA | –2 | | | | | pA |
| Drain Cutoff Current | $I_{D(off)}$ | $V_{DS}$ = 15 V, $V_{GS}$ = –5 V | 2 | | 50 | | 50 | pA |
| Gate-Source Forward Voltage[c] | $V_{GS(F)}$ | $I_G$ = 1 mA , $V_{DS}$ = 0 V | 0.7 | | | | | V |
| **Dynamic** | | | | | | | | |
| Common-Source Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 kHz | | 0.6 | 1.8 | 0.8 | 2.4 | mS |
| Common-Source Output Conductance | $g_{os}$ | | | | 5 | | 15 | μS |
| Drain-Source On-Resistance | $r_{ds(on)}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 0 V, f = 1 kHz | | | 2500 | | 1700 | Ω |
| Common-Source Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | 5 | | 7 | | 7 | pF |
| Common-Source Reverse Transfer Capacitance | $C_{rss}$ | | 1.5 | | 3 | | 3 | pF |
| Equivalent Input Noise Voltage[c] | $\overline{e}_n$ | $V_{DS}$ = 10 V, $V_{GS}$ = 0 V, f = 1 kHz | 6 | | | | | $\frac{nV}{\sqrt{Hz}}$ |
| Noise Figure | NF | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V<br>f = 1 kHz, $R_G$ = 1 MΩ | | | 1 | | 1 | dB |

## SPECIFICATIONS FOR 2N4340 AND 2N4341 ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

| Parameter | Symbol | Test Conditions | Typ[a] | Limits 2N4340 Min | Limits 2N4340 Max | Limits 2N4341 Min | Limits 2N4341 Max | Unit |
|---|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | | |
| Gate-Source Breakdown Voltage | $V_{(BR)GSS}$ | $I_G$ = –1 μA , $V_{DS}$ = 0 V | –57 | –50 | | –50 | | V |
| Gate-Source Cutoff Voltage | $V_{GS(off)}$ | $V_{DS}$ = 15 V, $I_D$ = 0.1 μA | | –1 | –3 | –2 | –6 | V |
| Saturation Drain Current[b] | $I_{DSS}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V | | 1.2 | 3.6 | 3 | 9 | mA |
| Gate Reverse Current | $I_{GSS}$ | $V_{GS}$ = –30 V, $V_{DS}$ = 0 V | –2 | | –100 | | –100 | pA |
| | | $T_A$ = 150°C | –4 | | –100 | | –100 | nA |
| Gate Operating Current[b] | $I_G$ | $V_{DG}$ = 15 V, $I_D$ = 0.1 mA | –2 | | | | | pA |
| Drain Cutoff Current | $I_{D(off)}$ | $V_{DS}$ = 15 V, $V_{GS}$ = –5 V | 2 | | 50 | | | pA |
| | | $V_{DS}$ = 15 V, $V_{GS}$ = –10 V | 3 | | | | 70 | pA |
| Gate-Source Forward Voltage | $V_{GS(F)}$ | $I_G$ = 1 mA , $V_{DS}$ = 0 V | 0.7 | | | | | V |

## SPECIFICATIONS FOR 2N4340 AND 2N4341 ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

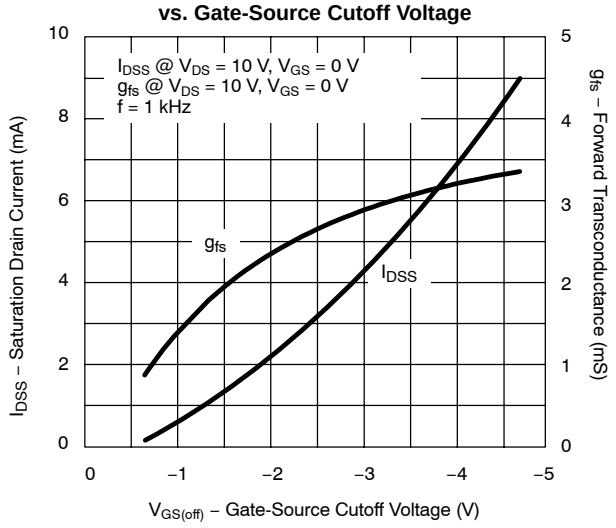
| Parameter | Symbol | Test Conditions | Typ[a] | Limits 2N4340 Min | Limits 2N4340 Max | Limits 2N4341 Min | Limits 2N4341 Max | Unit |
|---|---|---|---|---|---|---|---|---|
| **Dynamic** | | | | | | | | |
| Common-Source Forward Transconductance | $g_{fs}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 kHz | | 1.3 | 3 | 2 | 4 | mS |
| Common-Source Output Conductance | $g_{os}$ | | | | 30 | | 60 | μS |
| Drain-Source On-Resistance | $r_{ds(on)}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 0 V, f = 1 kHz | | | 1500 | | 800 | Ω |
| Common-Source Input Capacitance | $C_{iss}$ | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V, f = 1 MHz | 5 | | 7 | | 7 | pF |
| Common-Source Reverse Transfer Capacitance | $C_{rss}$ | | 1.5 | | 3 | | 3 | |
| Equivalent Input Noise Voltage[c] | $\overline{e}_n$ | $V_{DS}$ = 10 V, $V_{GS}$ = 0 V, f = 1 kHz | 6 | | | | | nV/√Hz |
| Noise Figure | NF | $V_{DS}$ = 15 V, $V_{GS}$ = 0 V<br>f = 1 kHz, $R_G$ = 1 MΩ | | | 1 | | 1 | dB |

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.

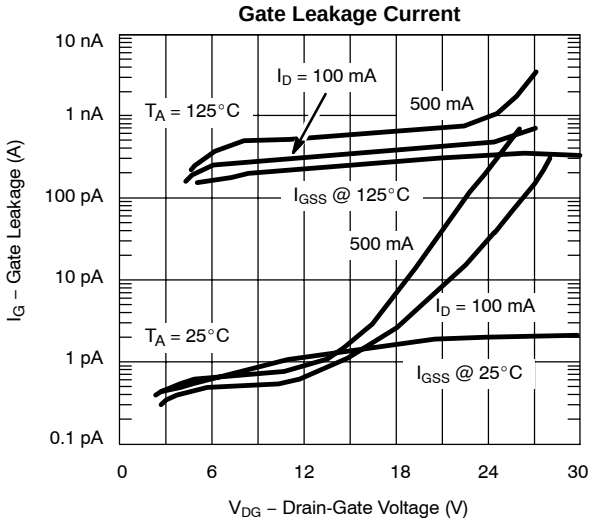
NPA

## TYPICAL CHARACTERISTICS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

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

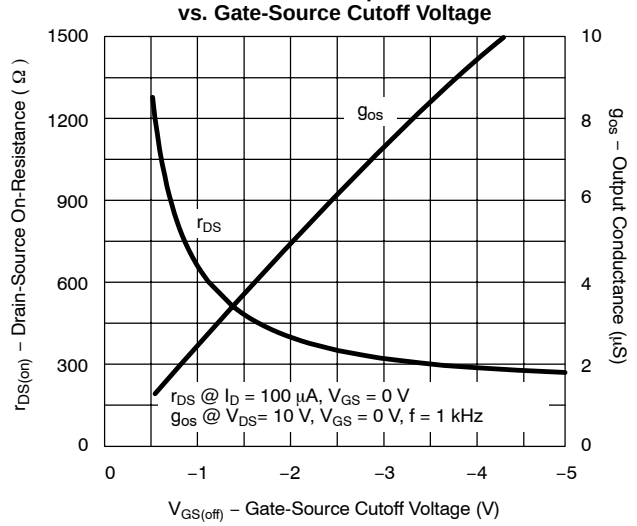



**Gate Leakage Current**

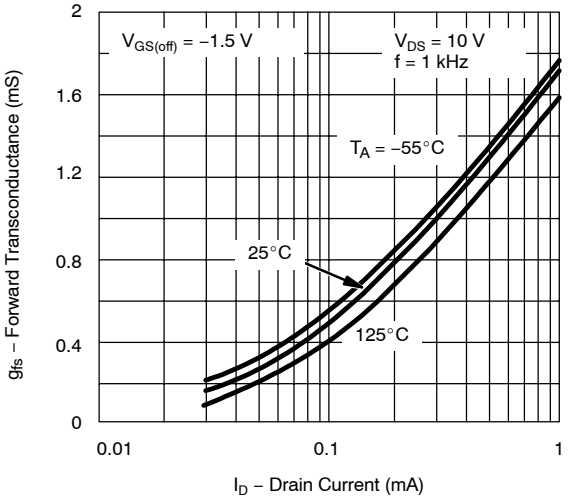


## TYPICAL CHARACTERISTICS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

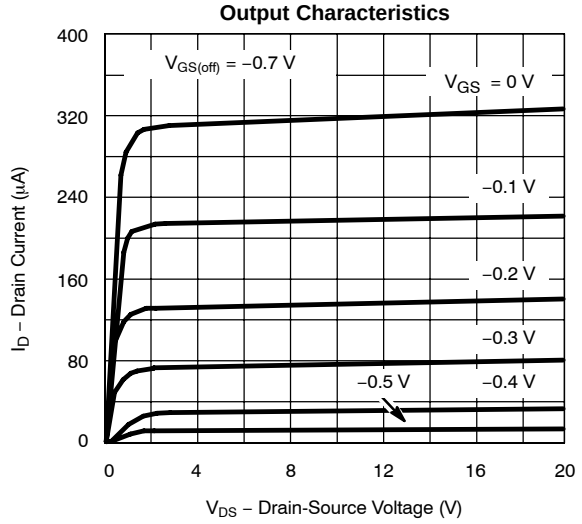
**On-Resistance and Output Conductance vs. Gate-Source Cutoff Voltage**



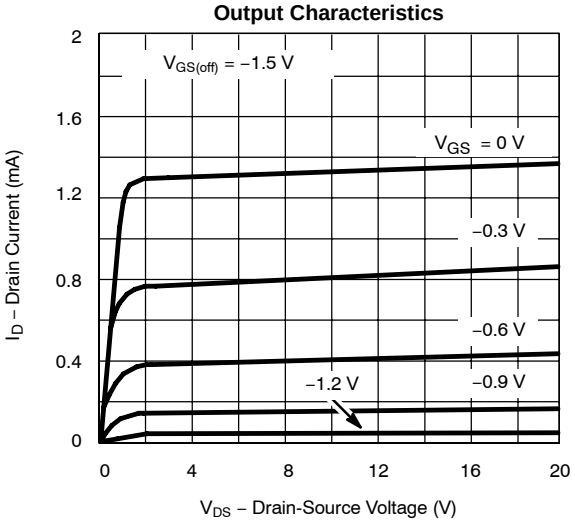

**Common-Source Forward Transconductance vs. Drain Current**



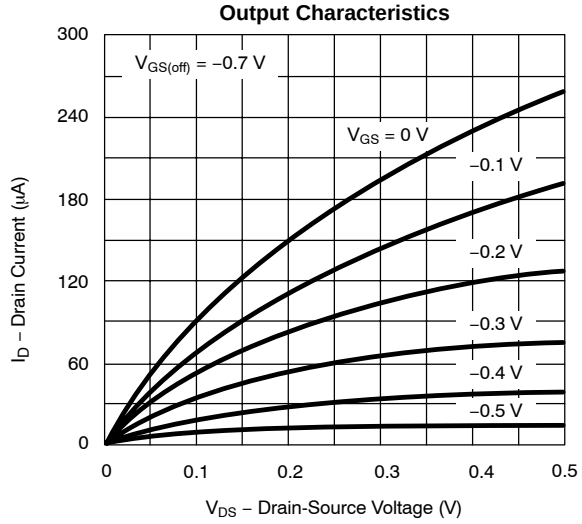

**Output Characteristics**



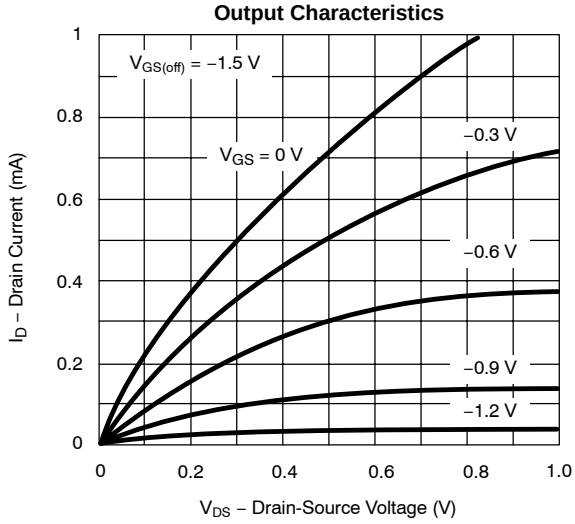

**Output Characteristics**




**Output Characteristics**




**Output Characteristics**

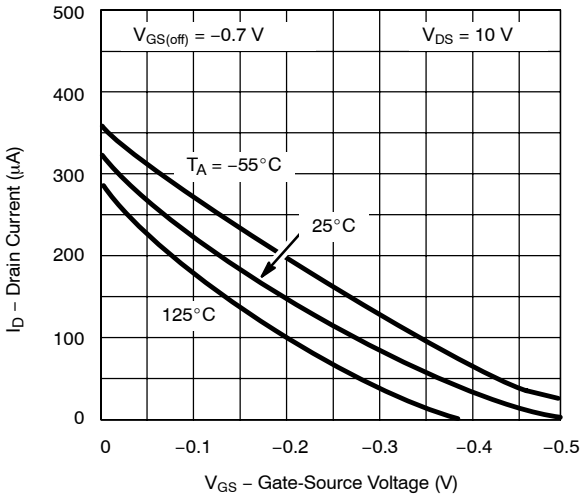




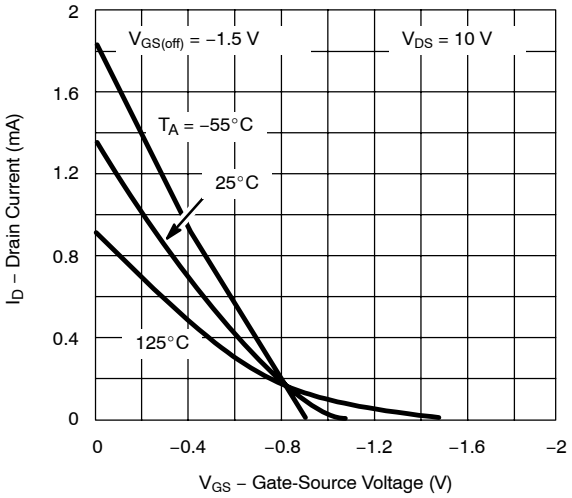

Document Number: 70240
S-40990—Rev. F, 24-May-04

## TYPICAL CHARACTERISTICS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

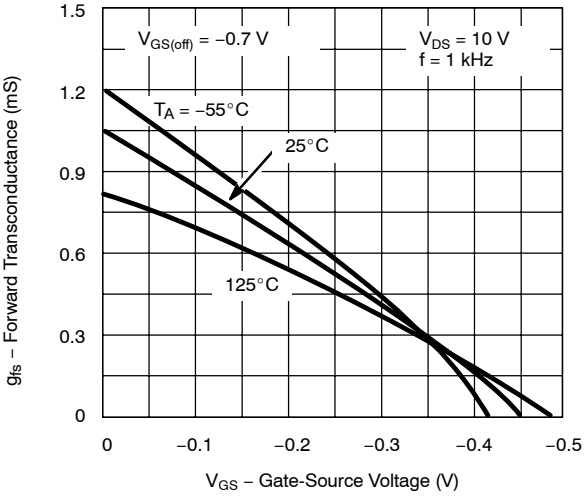
**Transfer Characteristics**



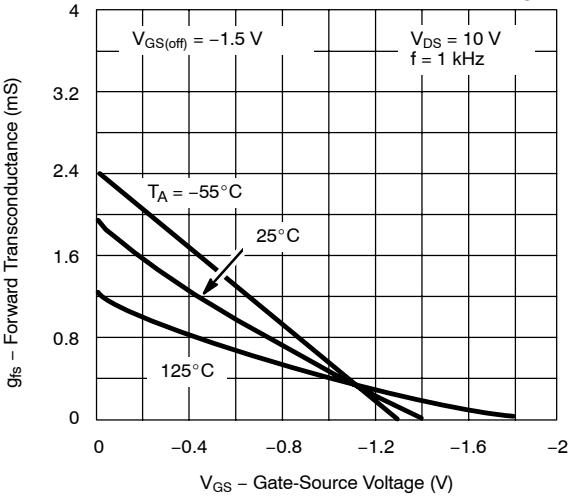

**Transfer Characteristics**



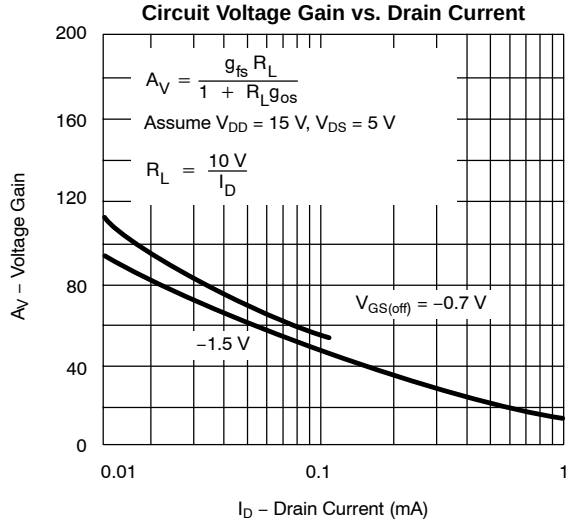

**Transconductance vs. Gate-Source Voltage**



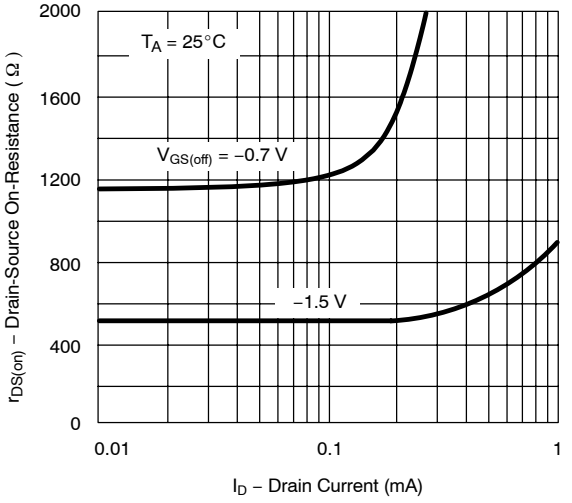

**Transconductance vs. Gate-Source Voltage**




**Circuit Voltage Gain vs. Drain Current**

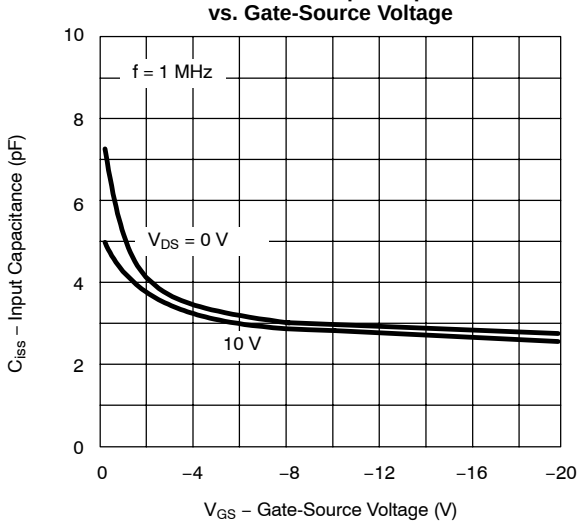



**On-Resistance vs. Drain Current**

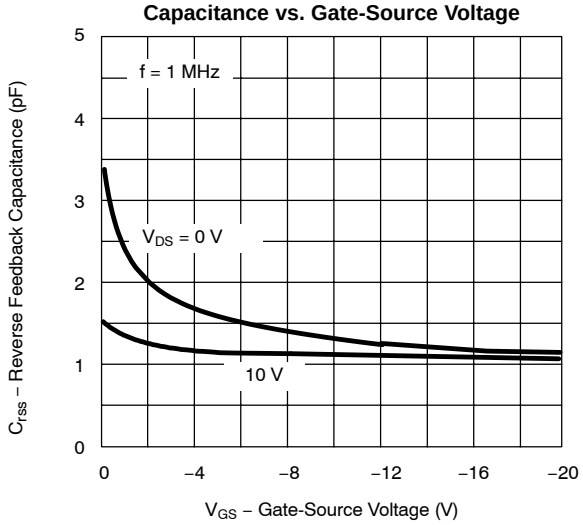


## TYPICAL CHARACTERISTICS ($T_A$ = 25°C UNLESS OTHERWISE NOTED)

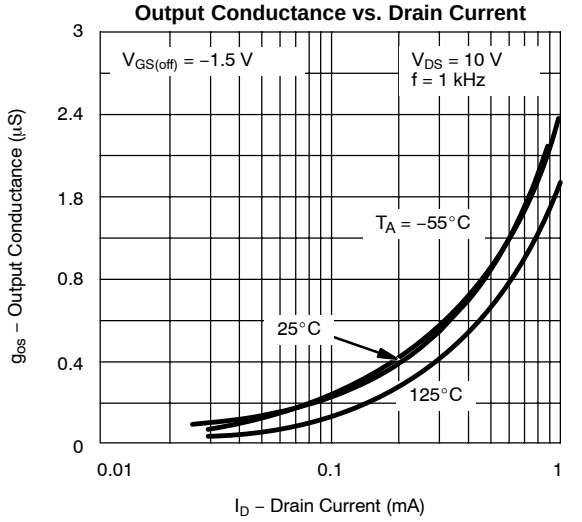
**Common-Source Input Capacitance vs. Gate-Source Voltage**



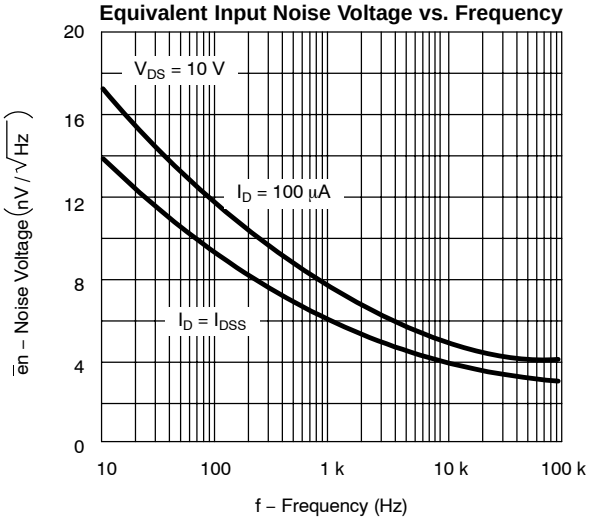

**Common-Source Reverse Feedback Capacitance vs. Gate-Source Voltage**




**Output Conductance vs. Drain Current**




**Equivalent Input Noise Voltage vs. Frequency**



# Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay’s terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.