2N5196/5197/5198/5199

Monolithic N-Channel JFET Duals

Product Summary

Part Number	$V_{GS(off)}$ (V)	$V_{(BR)GSS}$ Min (V)	g_{fs} Min (mS)	I_G Max (pA)	$\|V_{GS1} - V_{GS2}\|$ Max (mV)
2N5196	−0.7 to −4	−50	1	−15	5
2N5197	−0.7 to −4	−50	1	−15	5
2N5198	−0.7 to −4	−50	1	−15	10
2N5199	−0.7 to −4	−50	1	−15	15

Features

- Monolithic Design
- High Slew Rate
- Low Offset/Drift Voltage
- Low Gate Leakage: 5 pA
- Low Noise
- High CMRR: 100 dB

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 Signal

Applications

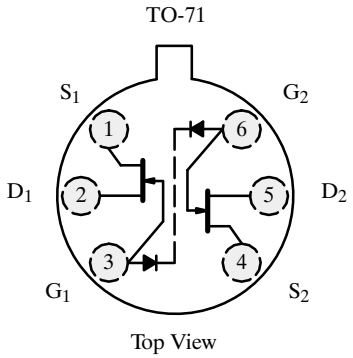
- Wideband Differential Amps
- High-Speed,Temp-Compensated, Single-Ended Input Amps
- High Speed Comparators
- Impedance Converters

Description

The 2N5196/5197/5198/5199 JFET duals are designed for high-performance differential amplification for a wide range of precision test instrumentation applications. This series features tightly matched specs, low gate leakage for accuracy, and wide dynamic range with I_G guaranteed at V_{DG} = 20 V.

The hermetically-sealed TO-71 package is available with full military processing (see Military Information and the 2N5545/5546/5547JANTX/JANTXV data sheet).

For similar products see the low-noise U/SST401 series, the high-gain 2N5911/5912, and the low-leakage U421/423 data sheets.



Absolute Maximum Ratings

Gate-Drain, Gate-Source Voltage . . . . . −50 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] . . . . . 250 mW
Total[b] . . . . . 500 mW

Notes
a. Derate 2 mW/°C above 85°C
b. Derate 4 mW/°C above 85°C

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Specifications[a] for 2N5196 and 2N5197

Parameter	Symbol	Test Conditions	Typ[b]	Limits 2N5196 Min	Limits 2N5196 Max	Limits 2N5197 Min	Limits 2N5197 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	$V_{GS(off)}$	$V_{DS} = 20$ V, $I_D = 1$ nA	−2	−0.7	−4	−0.7	−4	V
Saturation Drain Current[c]	I_{DSS}	$V_{DS} = 20$ V, $V_{GS} = 0$ V	3	0.7	7	0.7	7	mA
Gate Reverse Current	I_{GSS}	$V_{GS} = -30$ V, $V_{DS} = 0$ V	−10		−25		−25	pA
		$T_A = 150°C$	−20		−50		−50	nA
Gate Operating Current	I_G	$V_{DG} = 20$ V, $I_D = 200$ μA	−5		−15		−15	pA
		$T_A = 125°C$	−0.8		−15		−15	nA
Gate-Source Voltage	V_{GS}	$V_{DG} = 20$ V, $I_D = 200$ μA	−1.5	−0.2	−3.8	−0.2	−3.8	V
Dynamic								
Common-Source Forward Transconductance	g_{fs}	$V_{DS} = 20$ V, $V_{GS} = 0$ V, f = 1 kHz	2.5	1	4	1	4	mS
Common-Source Output Conductance	g_{os}		2		50		50	μS
Common-Source Forward Transconductance	g_{fs}	$V_{DS} = 20$ V, $I_D = 200$ μA, f = 1 kHz	0.8	0.7	1.6	0.7	1.6	mS
Common-Source Output Conductance	g_{os}		1		4		4	μS
Common-Source Input Capacitance	C_{iss}	$V_{DS} = 20$ V, $V_{GS} = 0$ V, f = 1 MHz	3		6		6	pF
Common-Source Reverse Transfer Capacitance	C_{rss}		1		2		2	pF
Equivalent Input Noise Voltage	$\bar{e}_n$	$V_{DS} = 20$ V, $V_{GS} = 0$ V, f = 1 kHz	9		20		20	$\frac{nV}{\sqrt{Hz}}$
Noise Figure	NF	$V_{DS} = 20$ V, $V_{GS} = 0$ V, f = 100 Hz, $R_G = 10$ MΩ			0.5		0.5	dB
Matching								
Differential Gate-Source Voltage	$\lvert V_{GS1}-V_{GS2}\rvert$	$V_{DG} = 20$ V, $I_D = 200$ μA			5		5	mV
Gate-Source Voltage Differential Change with Temperature	$\frac{\Delta\lvert V_{GS1}-V_{GS2}\rvert}{\Delta T}$	$V_{DG} = 20$ V, $I_D = 200$ μA, $T_A = -55$ to 125°C			5		10	μV/°C
Saturation Drain Current Ratio	$\frac{I_{DSS1}}{I_{DSS2}}$	$V_{DS} = 20$ V, $V_{GS} = 0$ V	0.98	0.95	1	0.95	1	
Transconductance Ratio	$\frac{g_{fs1}}{g_{fs2}}$	$V_{DS} = 20$ V, $I_D = 200$ μA, f = 1 kHz	0.99	0.97	1	0.97	1	
Differential Output Conductance	$\lvert g_{os1}-g_{os2}\rvert$		0.1		1		1	μS
Differential Gate Current	$\lvert I_{G1}-I_{G2}\rvert$	$V_{DG} = 20$ V, $I_D = 200$ μA, $T_A = 125°C$	0.1		5		5	nA
Common Mode Rejection Ratio[d]	CMRR	$V_{DG} = 10$ to 20 V, $I_D = 200$ μA	100					dB

Specifications[a] for 2N5198 and 2N5199

Parameter	Symbol	Test Conditions	Typ[b]	Limits 2N5198 Min	Limits 2N5198 Max	Limits 2N5199 Min	Limits 2N5199 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	$V_{GS(off)}$	$V_{DS} = 20$ V, $I_D = 1$ nA	−2	−0.7	−4	−0.7	−4	V
Saturation Drain Current[c]	I_{DSS}	$V_{DS} = 20$ V, $V_{GS} = 0$ V	3	0.7	7	0.7	7	mA
Gate Reverse Current	I_{GSS}	$V_{GS} = -30$ V, $V_{DS} = 0$ V	−10		−25		−25	pA
		$T_A = 150°C$	−20		−50		−50	nA
Gate Operating Current	I_G	$V_{DG} = 20$ V, $I_D = 200$ µA	−5		−15		−15	pA
		$T_A = 125°C$	−0.8		−15		−15	nA
Gate-Source Voltage	V_{GS}	$V_{DG} = 20$ V, $I_D = 200$ µA	−1.5	−0.2	−3.8	−0.2	−3.8	V
Dynamic								
Common-Source Forward Transconductance	g_{fs}	$V_{DS} = 20$ V, $V_{GS} = 0$ V, f = 1 kHz	2.5	1	4	1	4	mS
Common-Source Output Conductance	g_{os}		2		5 0		5 0	µS
Common-Source Forward Transconductance	g_{fs}	$V_{DS} = 20$ V, $I_D = 200$ µA , f = 1 kHz	0.8	0.7	1.6	0.7	1.6	mS
Common-Source Output Conductance	g_{os}		1		4		4	µS
Common-Source Input Capacitance	C_{iss}	$V_{DS} = 20$ V, $V_{GS} = 0$ V, f = 1 MHz	3		6		6	pF
Common-Source Reverse Transfer Capacitance	C_{rss}		1		2		2	pF
Equivalent Input Noise Voltage	$\bar{e}_n$	$V_{DS} = 20$ V, $V_{GS} = 0$ V, f = 1 kHz	9		20		20	$\frac{nV}{\sqrt{Hz}}$
Noise Figure	NF	$V_{DS} = 20$ V, $V_{GS} = 0$ V f = 100 Hz, $R_G = 10$ MΩ			0.5		0.5	dB
Matching								
Differential Gate-Source Voltage	$\lvert V_{GS1}-V_{GS2}\rvert$	$V_{DG} = 20$ V, $I_D = 200$ µA			10		15	mV
Gate-Source Voltage Differential Change with Temperature	$\frac{\Delta\lvert V_{GS1}-V_{GS2}\rvert}{\Delta T}$	$V_{DG} = 20$ V, $I_D = 200$ µA $T_A = -55$ to 125°C			20		40	µV/°C
Saturation Drain Current Ratio	$\frac{I_{DSS1}}{I_{DSS2}}$	$V_{DS} = 20$ V, $V_{GS} = 0$ V	0.97	0.95	1	0.95	1	
Transconductance Ratio	$\frac{g_{fs1}}{g_{fs2}}$	$V_{DS} = 20$ V, $I_D = 200$ µA , f = 1 kHz	0.97	0.95	1	0.95	1	
Differential Output Conductance	$\lvert g_{os1}-g_{os2}\rvert$		0 . 2		1		1	µS
Differential Gate Current	$\lvert I_{G1}-I_{G2}\rvert$	$V_{DG} = 20$ V, $I_D = 200$ µA $T_A = 125°C$	0.1		5		5	nA
Common Mode Rejection Ratio[d]	CMRR	$V_{DG} = 10$ to 20 V, $I_D = 200$ µA	97					dB

Notes
a. $T_A = 25°C$ unless otherwise noted. NQP
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.

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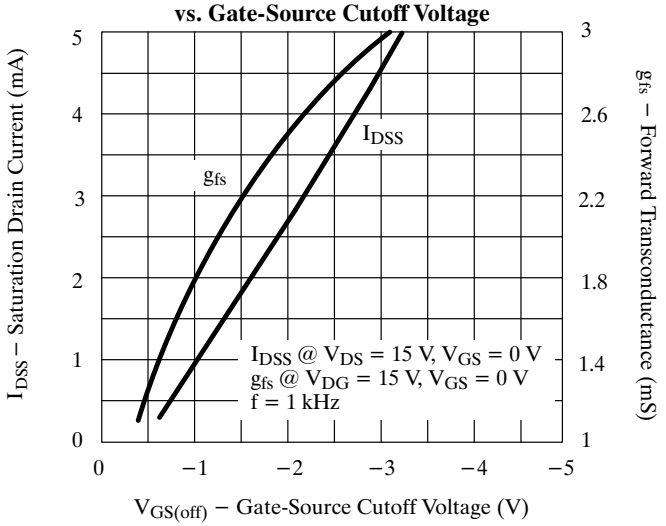
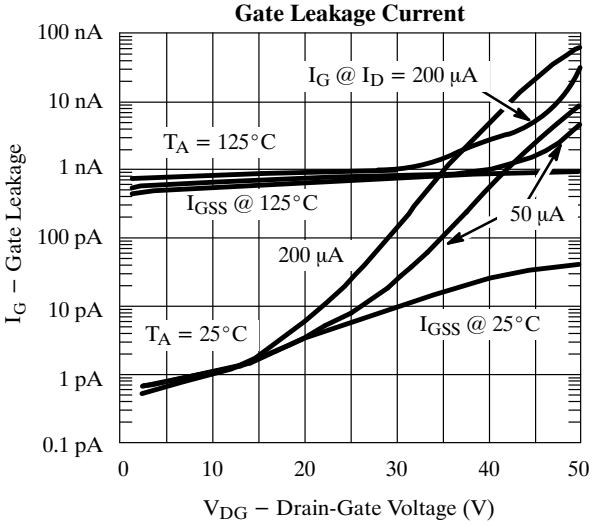
Typical Characteristics

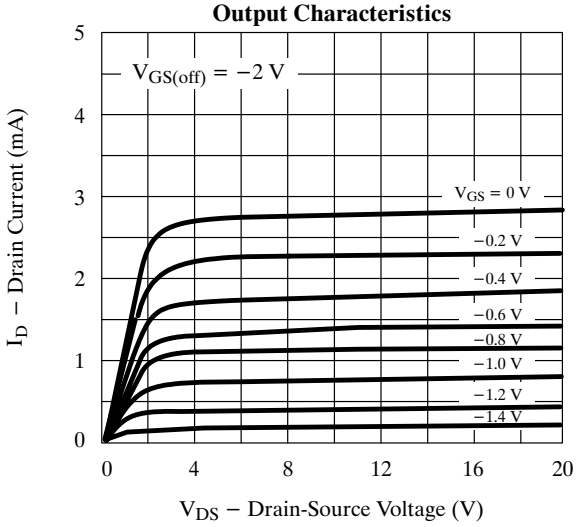
Drain Current and Transconductance vs. Gate-Source Cutoff Voltage



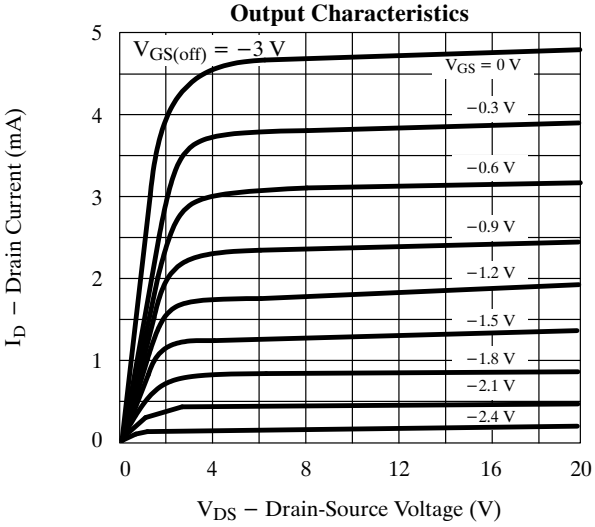
Gate Leakage Current



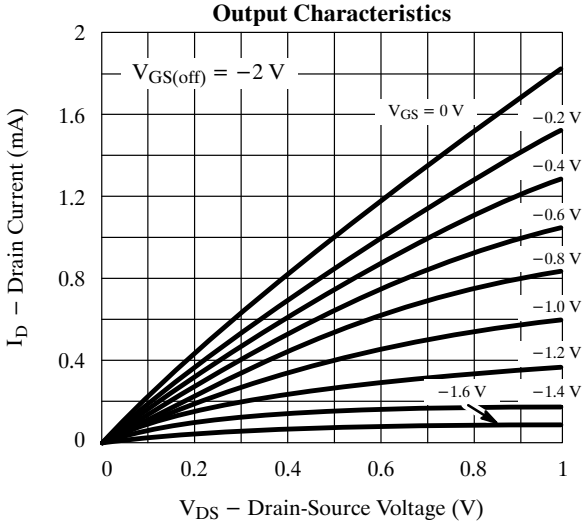
Output Characteristics



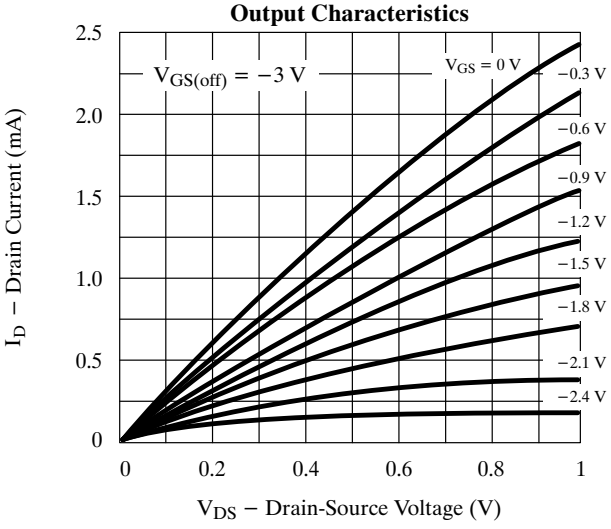
Output Characteristics



Output Characteristics

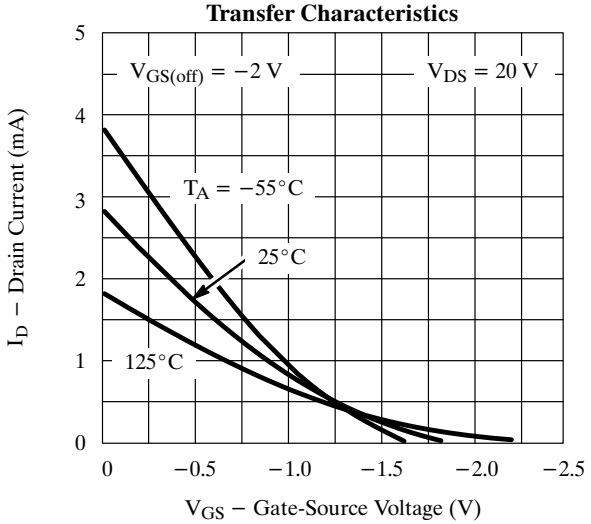


Output Characteristics

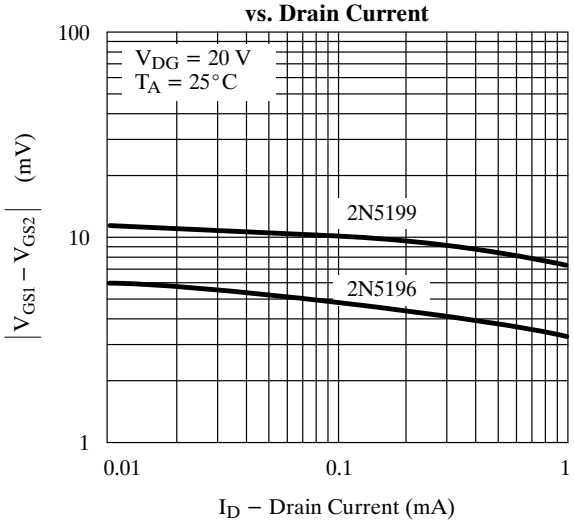


Typical Characteristics (Cont'd)

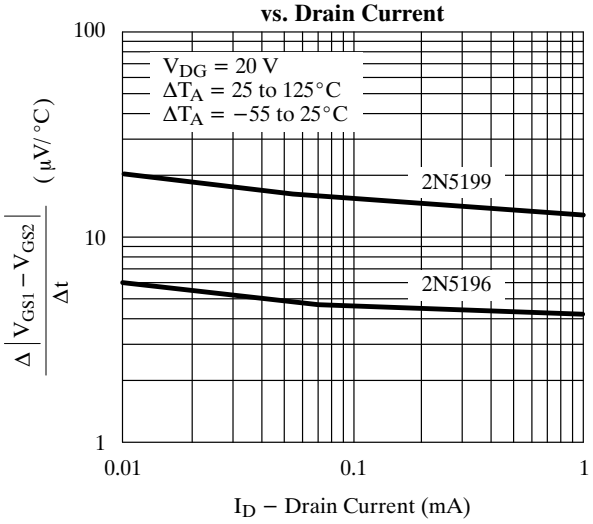
Transfer Characteristics



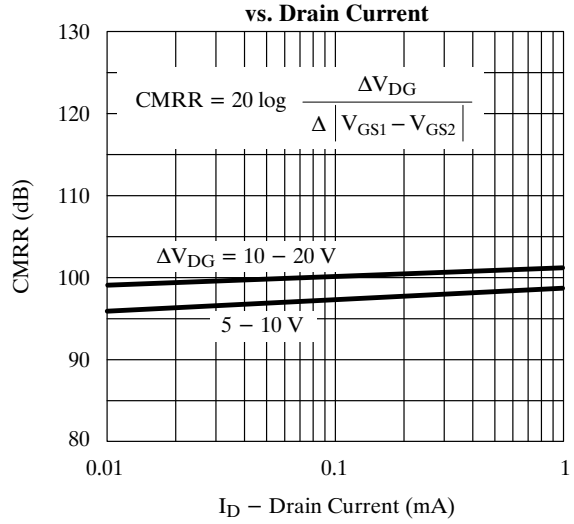
Gate-Source Differential Voltage vs. Drain Current



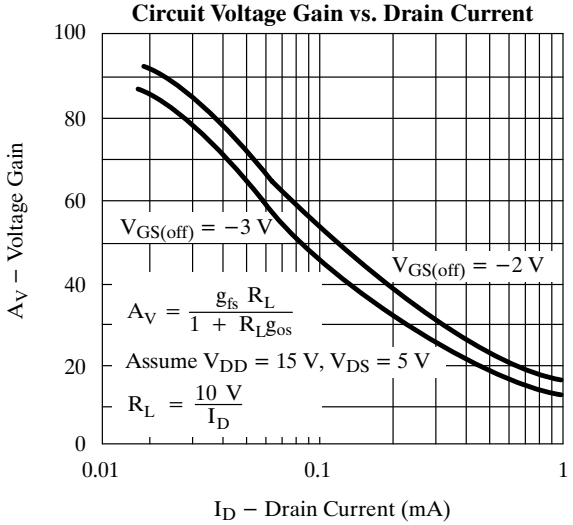
Voltage Differential with Temperature vs. Drain Current



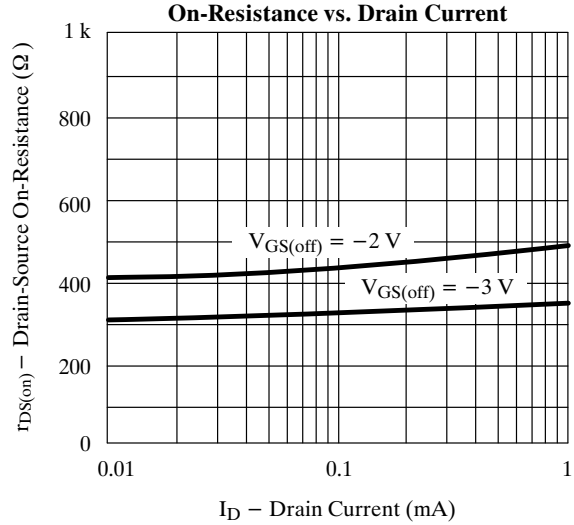
Common Mode Rejection Ratio vs. Drain Current



Circuit Voltage Gain vs. Drain Current



On-Resistance vs. Drain Current



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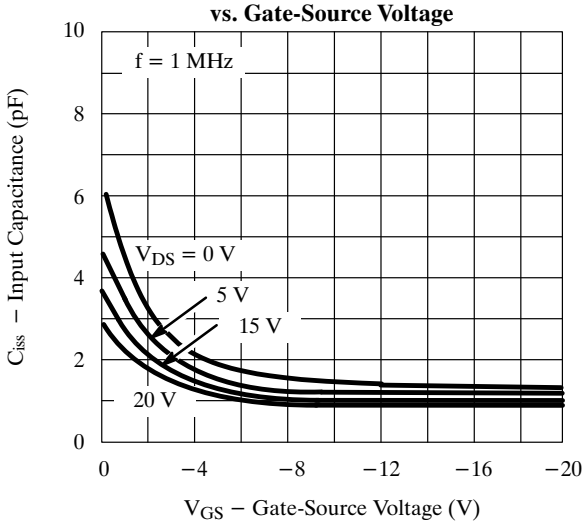
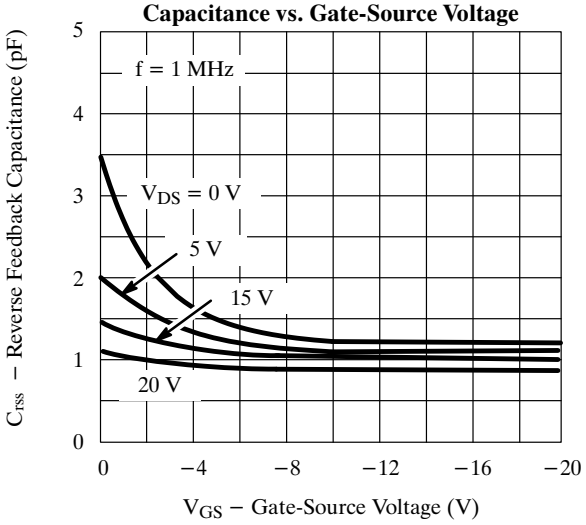
Typical Characteristics (Cont'd)

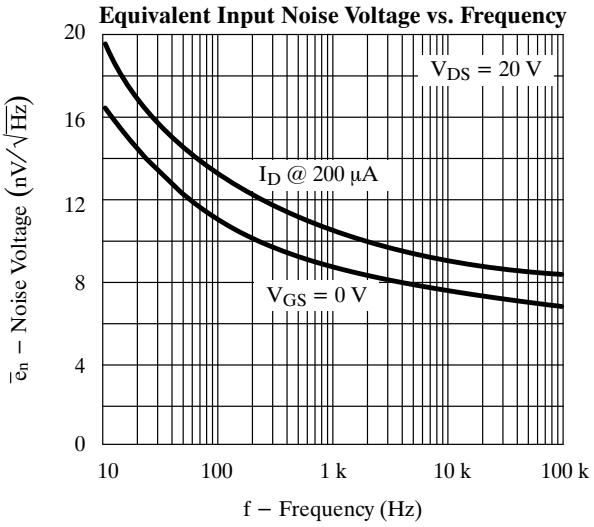
Common-Source Input Capacitance vs. Gate-Source Voltage



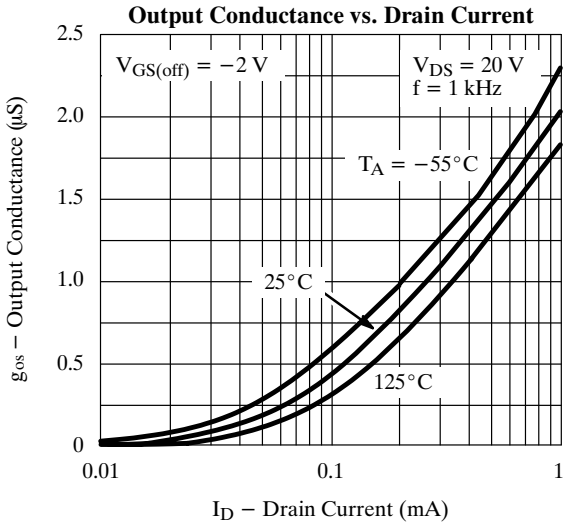
Common-Source Reverse Feedback Capacitance vs. Gate-Source Voltage



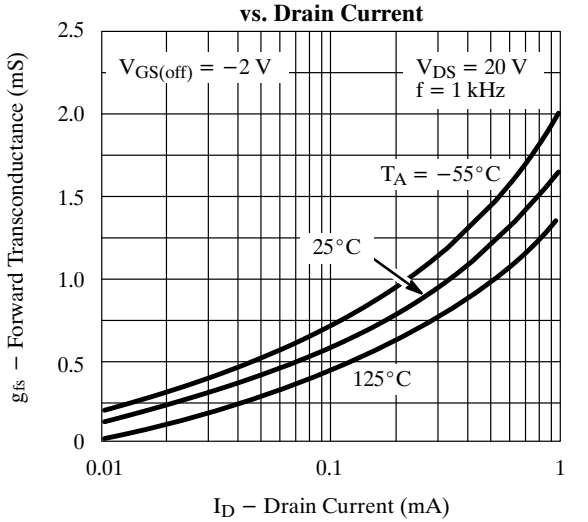
Equivalent Input Noise Voltage vs. Frequency



Output Conductance vs. Drain Current



Common-Source Forward Transconductance vs. Drain Current



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