LINEAR SYSTEMS

Over 30 Years of Quality Through Innovation

LSK389 A/B/C/D

Ultra-Low Noise Monolithic Dual N-Channel JFET Amplifier

INDUSTRY'S FIRST 100% TESTED LOWEST NOISE JFET

Absolute Maximum Ratings	
@ 25 °C (unless otherwise stated)	
Maximum Temperatures	
Storage Temperature	-65 to +150°C
Junction Operating Temperature	-55 to +150°C
Maximum Power Dissipation	
Continuous Power Dissipation @ +25°C	400mW
Maximum Currents	
Gate Forward Current	$I_{G(F)}$ = 10mA
Maximum Voltages	
Gate to Source	V_{GSS} = 40V
Gate to Drain	V_{GDS} = 40V

TO-71 6L Top View

SOIC 8L Top View
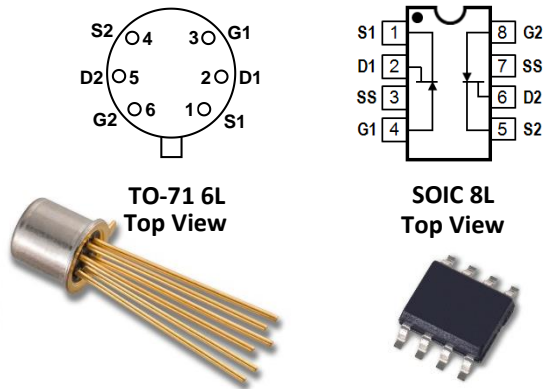
Features

- Ultra-Low Noise: e_n = 1.3nV/√Hz (typ), f = 1.0kHz and NBW = 1.0Hz
- Ultra-Low Noise: 1.5nV/√Hz (typ), f = 10Hz and NBW = 1.0Hz
- Tight Matching: $|V_{GS1-2}|$ = 15mV max
- High Breakdown Voltage: BV_{GSS} = 40V max
- High Gain: G_{fs} = 20mS (typ)
- Low Capacitance: 25pF (typ)
- Improved Second Source Replacement for 2SK389

Benefits

- Improved System Noise Performance
- Unique Monolithic Dual Design Construction of Interleaving Both JFETs on the Same Piece of Silicon
- Excellent Matching and Thermal Tracking
- Great for Maximizing Battery Operated Applications by Providing a Wide Output Swing
- A High Signal to Noise Ratio as a Result of the LSK389's Low and Tightly Matched Gate Threshold Voltages

Applications

- Audio Amplifiers and Preamps
- Discrete Low-Noise Operational Amplifiers
- Battery-Operated Audio Preamps
- Audio Mixer Consoles
- Acoustic Sensors
- Sonic Imaging
- Instrumentation Amplifiers
- Microphones
- Sonobouys
- Hydrophones
- Chemical and Radiation Detectors

Description

The LSK389 is the industry's lowest noise Dual N-Channel JFET, 100% tested, guaranteed to meet 1/ƒ and broadband noise specifications, while eliminating burst (RTN or popcorn) noise entirely. The LSK389 Series, Monolithic Dual N-Channel JFETs were specifically designed to provide users a better performing, less time consuming and cheaper solution for obtaining tighter IDSS matching, and better thermal tracking, than matching individual JFETs. The LSK389 features four grades of IDSS: 2.6-6.5mA, 6.0-12.0mA, 10.0-20.0mA and 17-30mA, with an IDSS match of 10 percent, a gate threshold offset of 15mV, a voltage noise (en) of 1.3nV/√Hz typical at f = 1.0kHZ, with a Gain of 20mS typical, and 25pF of capacitance typical. The LSK389 provides a wide output swing, and a high signal

to noise ratio as a result of the LSK389's tightly matched and low gate threshold voltages. The 40V breakdown provides maximum linear headroom in high transient program content amplifiers.

Additionally, the LSK389 provides a low input noise to capacitance product that has nearly zero popcorn noise. The narrow ranges of the IDSS electrical grades combined with the superior matching performance of the LSK389's monolithic dual construction promote ease of device tolerance in low voltage applications, as compared to matching single JFETs. Available in surface mount SOIC 8L and thru-hole TO-71 6L packages.

Contact the factory for tighter noise and other specification selections. For equivalent single N-Channel version, please refer to the LSK170 datasheet.

Electrical Characteristics @ 25°C (unless otherwise stated)

SYMBOL	CHARACTERISTIC		MIN	TYP	MAX	UNITS	CONDITIONS
BV_{GSS}	Gate to Source Breakdown Voltage		-40	---	---	V	$V_{DS} = 0$, $I_D = -100\mu A$
$V_{GS(OFF)}$	Gate to Source Pinch-off Voltage		-0.3	---	-1.6	V	$V_{DS} = 10V$, $I_D = 0.1\mu A$
I_{DSS}	Drain to Source Saturation Current	LSK389A	2.6	---	6.5	mA	$V_{DS} = 10V$, $V_{GS} = 0$
		LSK389B	6	---	12		
		LSK389C	10	---	20		
		LSK389D	17	---	30		
I_{GSS}	Gate to Source Leakage Current		---	-100	-300	pA	$V_{GS} = -25V$, $V_{DS} = 0$
I_{G1G2}	Gate to Gate Isolation Current		---	±1.0	±50	nA	$V_{G1-G2} = ±45V$, $I_D = I_S = 0A$
G_{fs}	Full Conduction Transconductance		8	20	---	mS	$V_{DS} = 10V$, $V_{GS} = 0$, $f = 1kHz$
e_n	Noise Voltage		---	1.3	1.9	nV/√Hz	$V_{DS} = 10V$, $I_D = 2mA$, $f = 1kHz$, NBW = 1Hz
e_n	Noise Voltage		---	1.5	4.0	nV/√Hz	$V_{DS} = 10V$, $I_D = 2mA$, $f = 10Hz$, NBW = 1Hz
C_{ISS}	Common Source Input Capacitance		---	25	---	pF	$V_{DS} = 10V$, $V_{GS} = 0$, $f = 1MHz$,
C_{RSS}	Common Source Reverse Transfer Cap.		---	5.5	---	pF	$V_{DG} = 10V$, $I_D = 0$, $f = 1MHz$,

Matching Characteristics @ 25°C (unless otherwise stated)

SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNITS	CONDITIONS
$|V_{GS1} - V_{GS2}|$	Differential Gate to Source Cutoff Voltage	---	6.0	15	mV	$V_{DS} = 10V$, $I_D = 1mA$
$\dfrac{I_{DSS1}}{I_{DSS2}}$	Saturation Drain Current Ratio	0.9	1.0	1.1	n/a	$V_{DS} = 10V$, $V_{GS} = 0V$

Notes

1. Absolute maximum ratings are limiting values above which serviceability may be impaired.

2. Pulse Test: PW ≤ 300µs, Duty Cycle ≤ 3%

3. All characteristics MIN/TYP/MAX numbers are absolute values. Negative values indicate electrical polarity only.
Information furnished by Linear Integrated Systems is believed to be accurate and reliable. However, no responsibility is assumed for its use; nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Linear Integrated Systems.

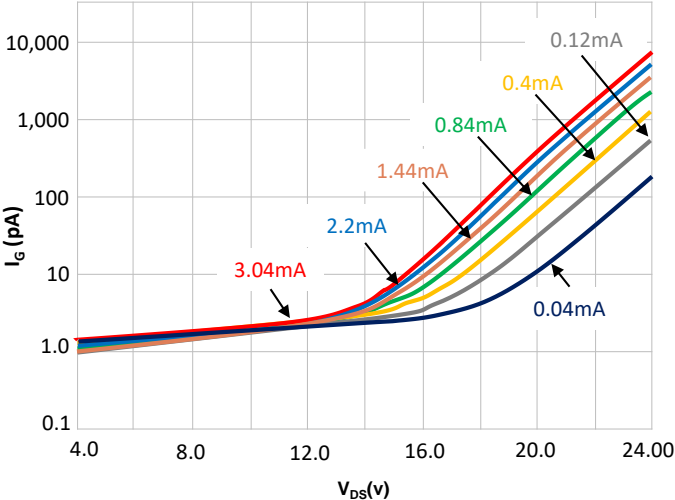## Typical Characteristics

LSK389A

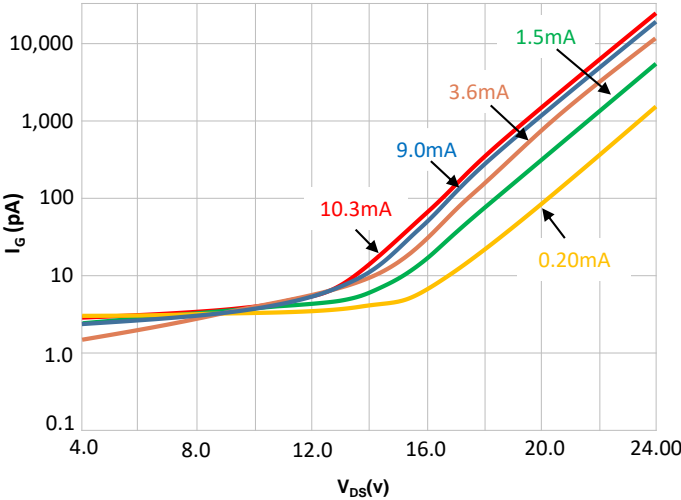Figure 1. Gate Current (I_G) vs. V_{DS} vs. I_D

LSK389B

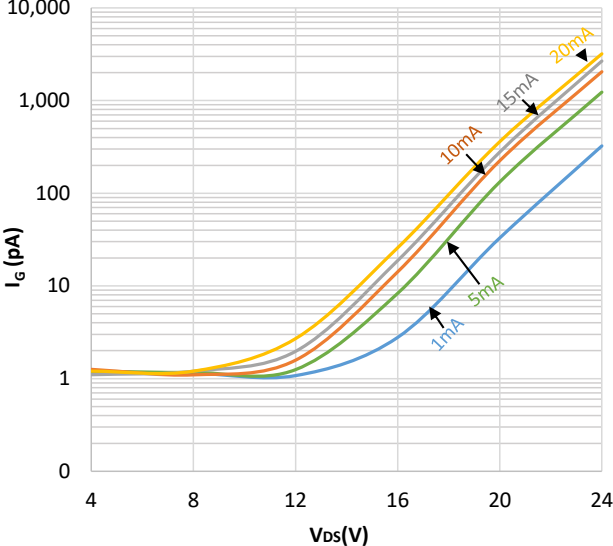Figure 2. Gate Current (I_G) vs. V_{DS} vs. I_D

LSK389C

Figure 3. Gate Current (I_G) vs. V_{DS} vs. I_D
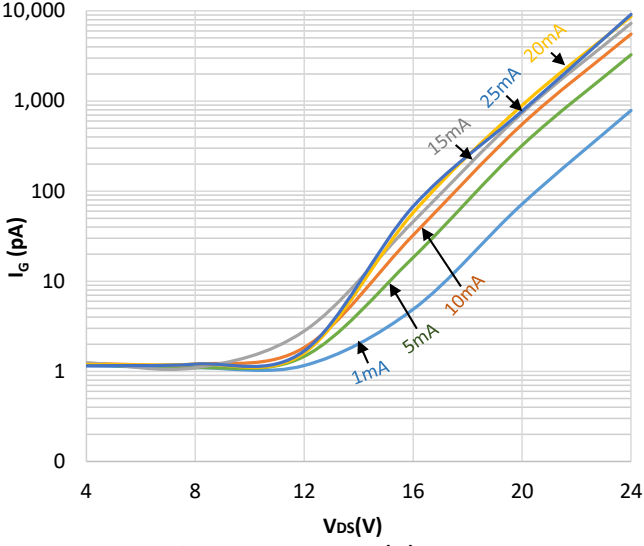
LSK389D

Figure 4. Gate Current (I_G) vs. V_{DS} vs. I_D

Typical Characteristics
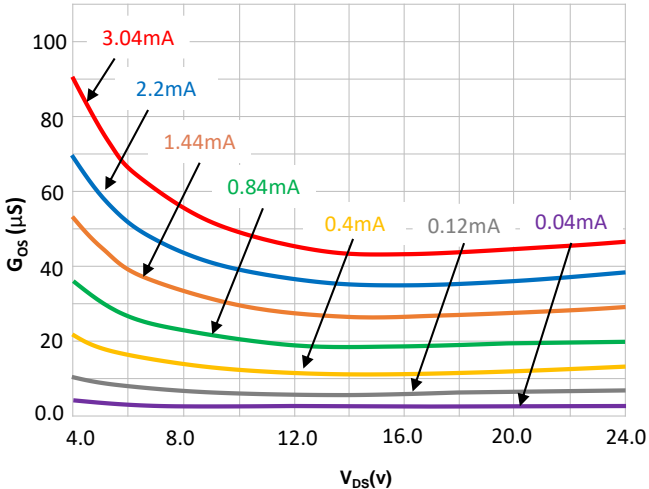
LSK389A

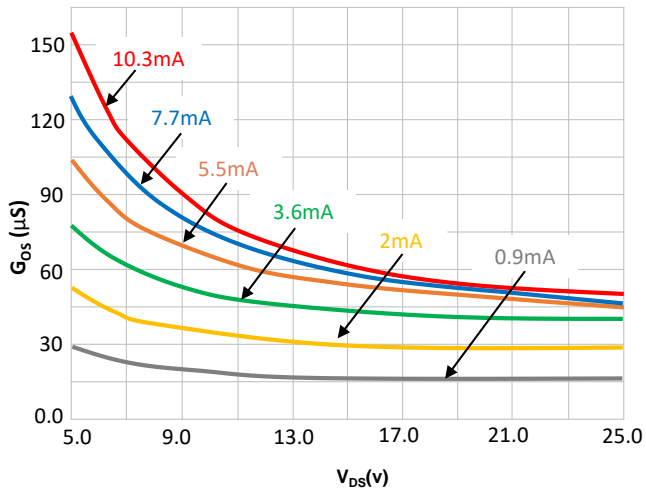Figure 5. Output Conductance - G_{OS} vs. V_{DS} vs. I_D

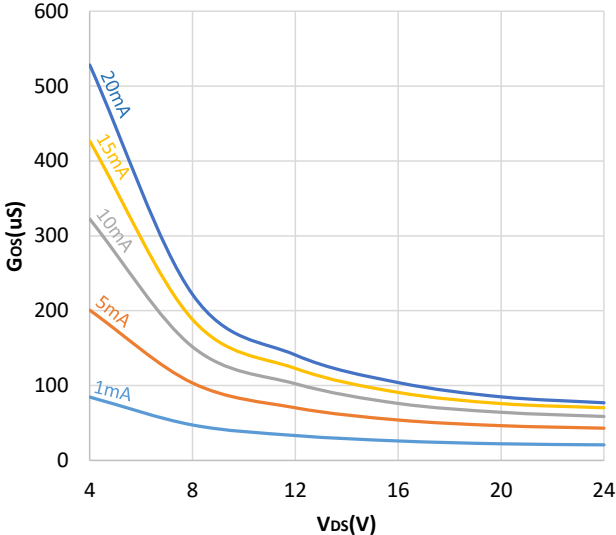**LSK389B**

Figure 6. Output Conductance - G_{OS} vs. V_{DS} vs. I_D

LSK389C

Figure 7. Output Conductance - G_{OS} vs. V_{DS} vs. I_D
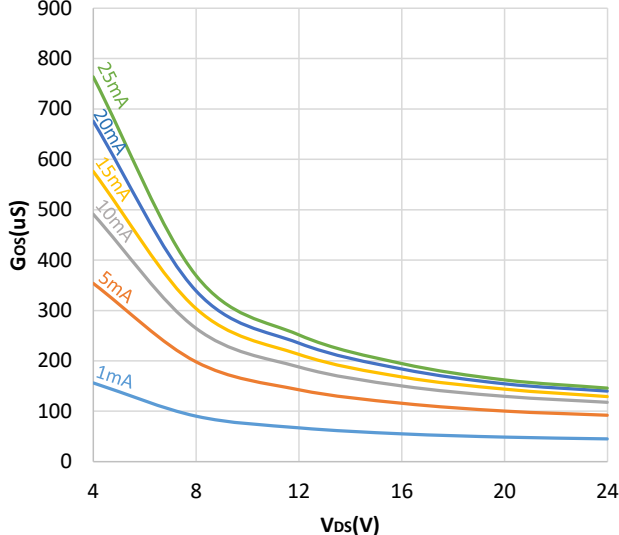
LSK389D

Figure 8. Output Conductance - G_{OS} vs. V_{DS} vs. I_D

Ultra-Low Noise Monolithic Dual N-Channel JFET Amplifier

Typical Characteristics
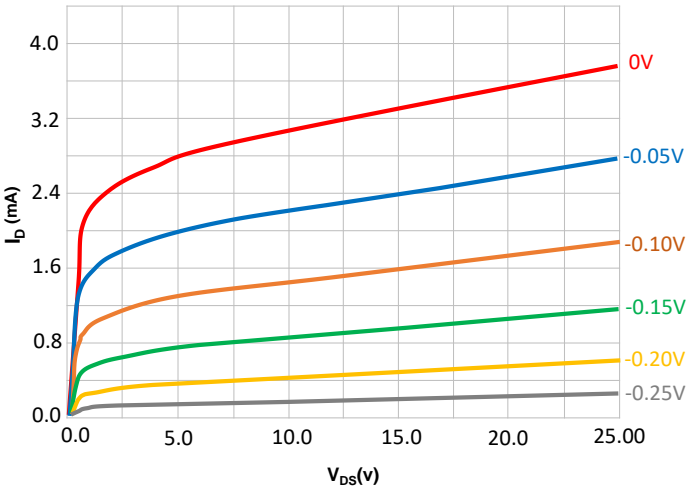
LSK389A

Figure 9. I_D vs. V_{DS} vs. V_{GS}

LSK389B
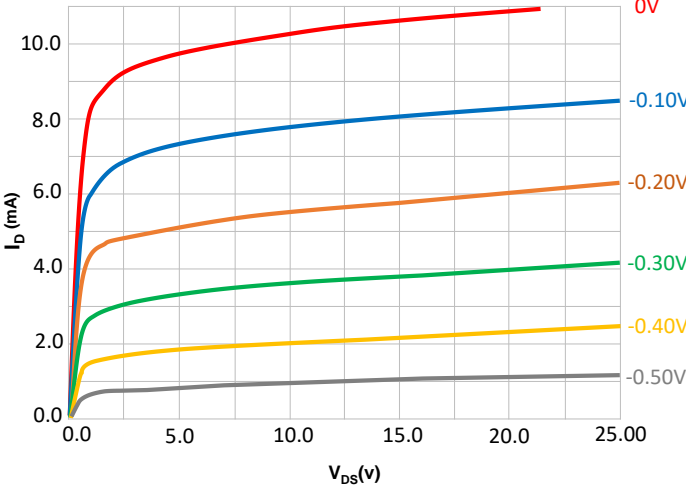
Figure 10. I_D vs. V_{DS} vs. V_{GS}

LSK389C
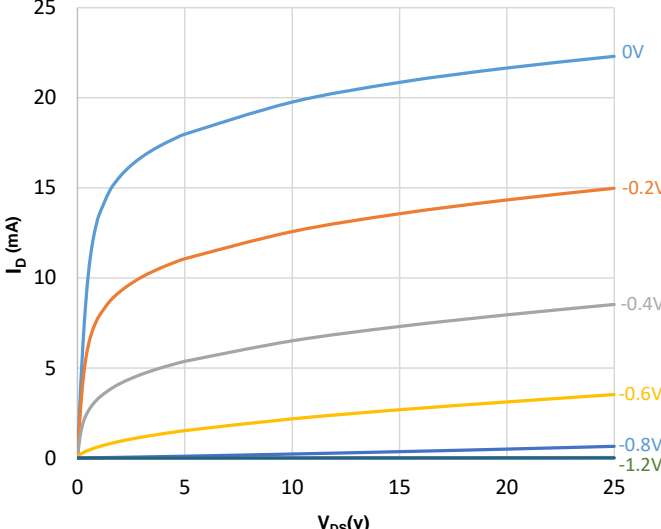
Figure 11. I_D vs. V_{DS} vs. V_{GS}

LSK389D
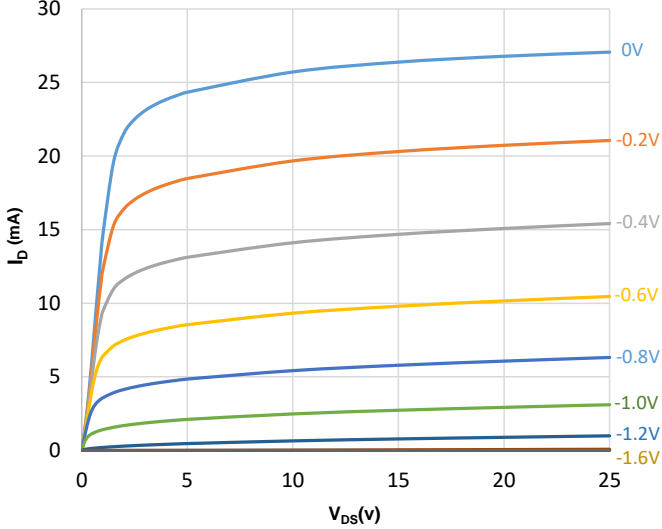
Figure 12. I_D vs. V_{DS} vs. V_{GS}

Typical Characteristics
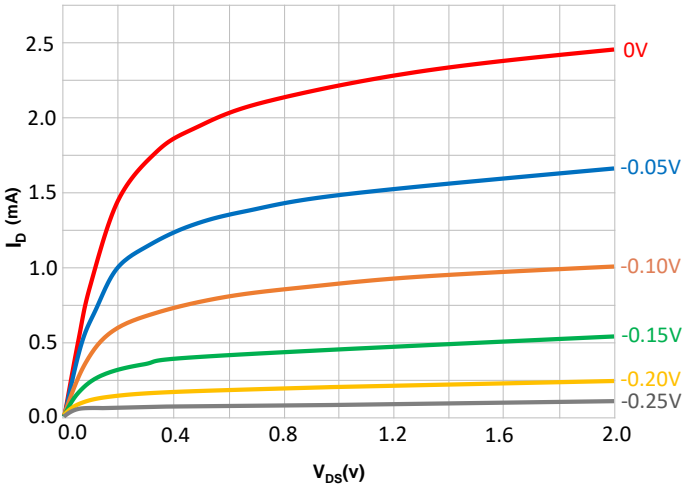
LSK389A

Figure 13. I_D vs. V_DS vs. V_GS
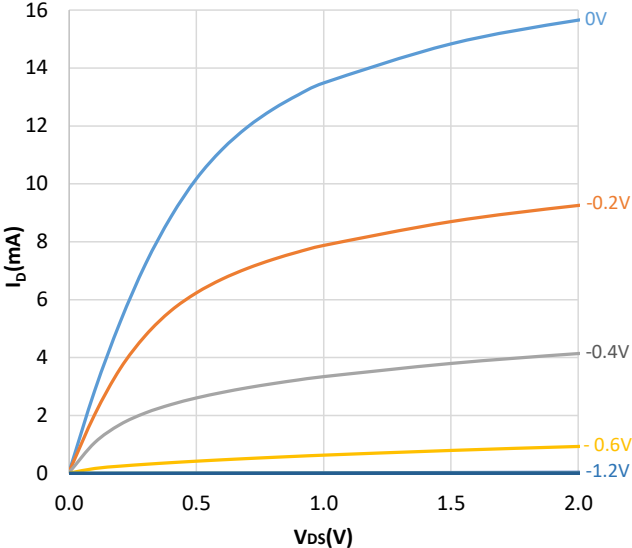
LSK389B
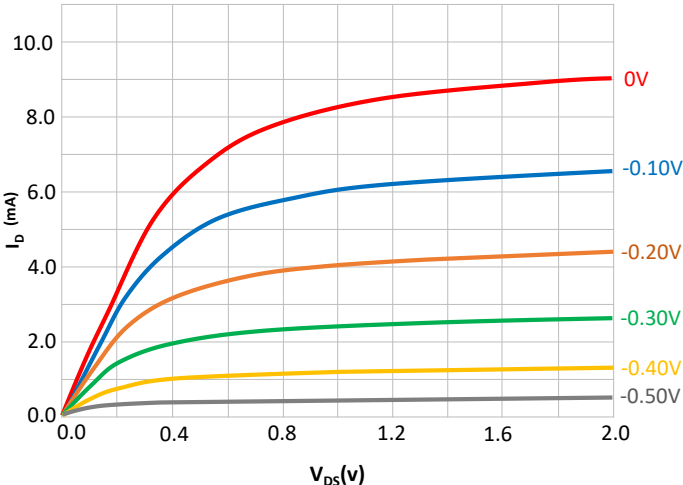
Figure 14. I_D vs. V_DS vs. V_GS

LSK389C

Figure 15. I_D vs. V_DS vs. V_GS

LSK389D

Figure 16. I_D vs. V_DS vs. V_GS

Ultra-Low Noise Monolithic Dual N-Channel JFET Amplifier

Typical Characteristics

**Common Source Forward Transconductance
vs. Drain Current
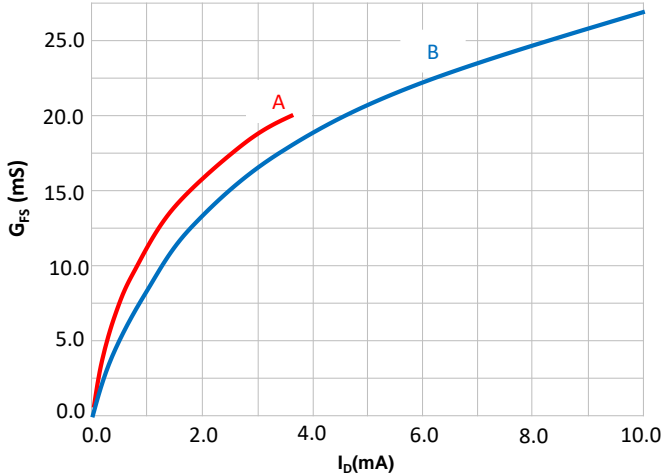LSK389A & B**

Figure 17. G$_{FS}$ vs. I$_D$

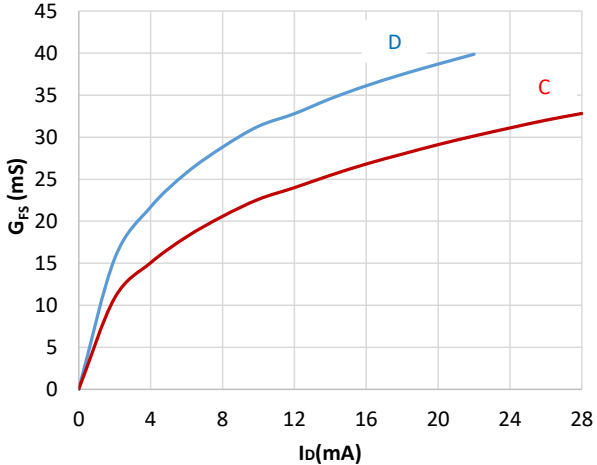**Common Source Forward Transconductance
vs. Drain Current
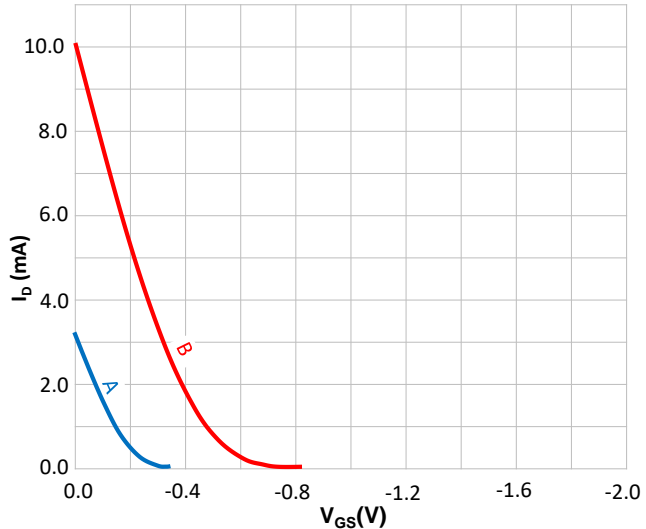LSK389C & D**

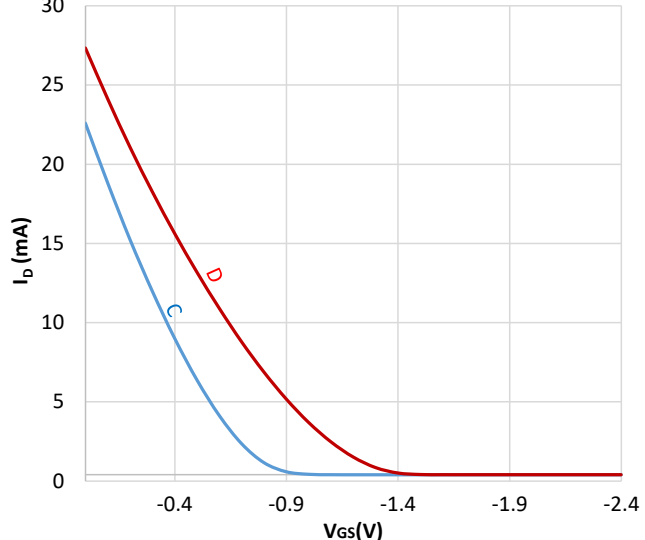**Figure 18. G$_{FS}$ vs. I$_D$**

LSK389A & B

Figure 19. I$_D$ vs. V$_{GS}$

LSK389C & D

Figure 20. I$_D$ vs. V$_{GS}$