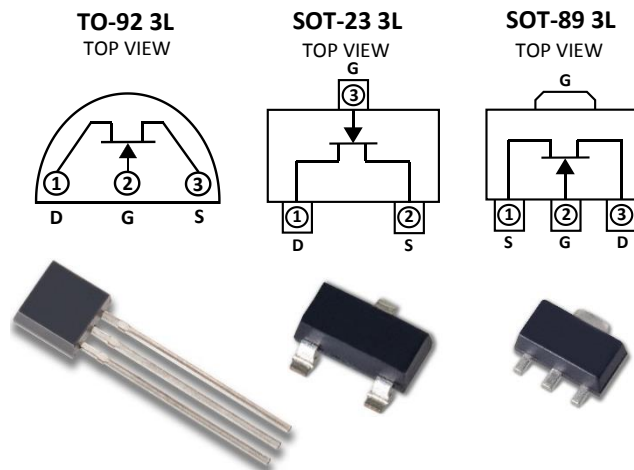


## Ultra-Low Noise at Both High & Low Frequencies With a Narrow Range of IDSS

<b>Absolute Maximum Ratings</b>	
@ 25 °C (unless otherwise stated)	
<b>Maximum Temperatures</b>	
Storage Temperature	-55 to +150°C
Junction Operating Temperature	-55 to +135°C
<b>Maximum Power Dissipation</b>	
Continuous Power Dissipation @ +25°C	400mW
<b>Maximum Currents</b>	
Gate Forward Current	$I_{G(F)} = 10\text{mA}$
<b>Maximum Voltages</b>	
Gate to Source	$V_{GSS} = 40\text{V}$
Gate to Drain	$V_{GDS} = 40\text{V}$



### Features

- ULTRA LOW NOISE ( $f=1\text{kHz}$ ):  $e_n = 0.9\text{nV}/\sqrt{\text{Hz}}$
- High Breakdown Voltage:  $BV_{GSS} = 40\text{V min}$
- High Gain:  $G_{fs} = 22\text{mS (typ)}$
- High Input Impedance:  $20\text{G}\Omega$  typ
- Low Capacitance:  $22\text{pF max}$
- Improved Second Source Replacement for 2SK170
- For Equivalent Monolithic-Dual, See the LSK389 Series

### Benefits

- Direct Pin-For-Pin Replacement of Toshiba's 2SK170
- Optimized to Provide Low Noise at Both High and Low Frequencies With a Narrow Range of IDSS and Low Capacitance
- Low Noise to Capacitance Ratio and Narrow Range of Low Value IDSS Provide Solutions for Low Noise Applications Which Cannot Tolerate High Values of Capacitance or Wide Ranges of IDSS

### Applications

- Audio Amplifiers and Preamps
- Discrete Low-Noise Operational Amplifiers
- Guitar Pickups
- Effects Pedals
- Microphones
- Audio Mixer Consoles
- Acoustic Sensors
- Sonobuoys
- Hydrophones

### Applications Cont'd

- Chemical and Radiation Detectors
- Instrumentation Amplifiers
- Accelerometers
- CT Scanners Input Stages
- Oscilloscope Input Stages
- Electrometers and Vibrations Detectors

### Description

The LSK170 is specifically designed for low noise, high input impedance applications within the audio, instrumentation, medical and sensors markets. The narrow ranges of  $I_{DSS}$  grades with the LSK170 promote ease of design, particularly in low voltage applications. The LSK170 is ideal for portable battery operated applications, and features high  $BV_{DSS}$  for maximum linear headroom in high transient program content amplifiers. The series has a uniquely linear  $V_{GS}$  transfer function for a stability that is highly desirable, particularly for audio front-end preamplifiers.

The device is available in a surface mount SOT-23 package, through-hole TO-92 package and SOT-89 package. The surface mount version of the LSK170 Series creates new opportunities for engineers seeking to design lower noise circuits in compact embeddable applications where shielding and space are critical. The LSK170 series is a pin for pin replacement of the Toshiba 2SK170 and improved functional replacement for the Interfet IF1320, IF1330, IF1331, and IF4500. Contact the factory for tighter noise and other specification selections.

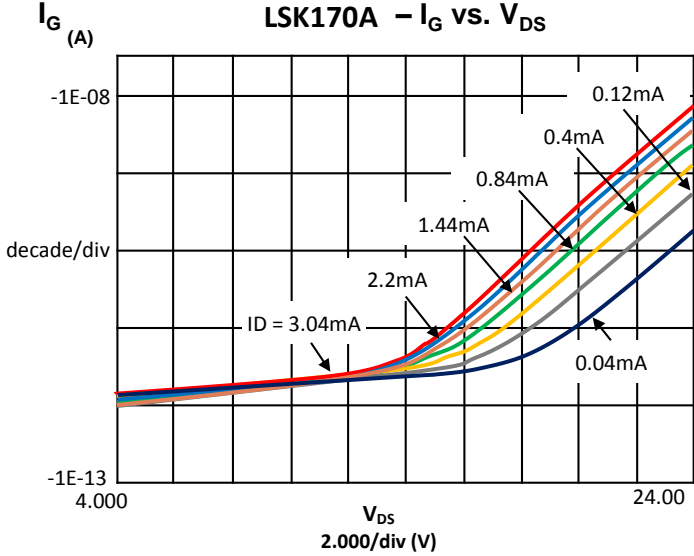
### Electrical Characteristics @ 25°C (unless otherwise stated)

SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNITS	CONDITIONS	
$BV_{GSS}$	Gate to Source Breakdown Voltage	-40.0			V	$V_{DS} = 0V, I_D = -100\mu A$	
$V_{GS(OFF)}$	Gate to Source Pinch-off Voltage	-0.2		-2.0	V	$V_{DS} = 10V, I_D = 1nA$	
$V_{GS}$	Gate to Source Operating Voltage		0.5		V	$V_{DS} = 10V, I_D = 1mA$	
$I_{DSS}^2$	Drain to Source Saturation Current	LSK170A	2.6		6.5	mA	$V_{DS} = 10V, V_{GS} = 0$
		LSK170B	6.0		12.0		
		LSK170C	10.0		20.0		
		LSK170D	18.0		30.0		
$I_G$	Gate Operating Current			-0.5	nA	$V_{DG} = 10V, I_D = 1mA$	
$I_{GSS}$	Gate to Source Leakage Current			-1.0	nA	$V_{GS} = -10V, V_{DS} = 0V$	
$G_{fs}$	Full Conduction Transconductance	14.0	22.0		mS	$V_{DS} = 10V, V_{GS} = 0, f = 1kHz$	
$G_{fs}$	Typical Conduction Transconductance	6.0	10.0		mS	$V_{DS} = 15V, I_D = 1mA$	
$e_n$	Noise Voltage		0.9	1.9	nV/ $\sqrt{Hz}$	$V_{DS} = 10V, I_D = 2mA, f = 1kHz, NBW = 1Hz$	
$e_n$	Noise Voltage		1.4	4.0	nV/ $\sqrt{Hz}$	$V_{DS} = 10V, I_D = 2mA, f = 10Hz, NBW = 1Hz$	
$C_{ISS}$	Common Source Input Capacitance		20.0		pF	$V_{DS} = 15V, I_D = 100\mu A, f = 1MHz,$	
$C_{RSS}$	Common Source Reverse Transfer Cap.		5.0		pF	$V_{DS} = 15V, I_D = 100\mu A, f = 1MHz,$	

## Typical Characteristics

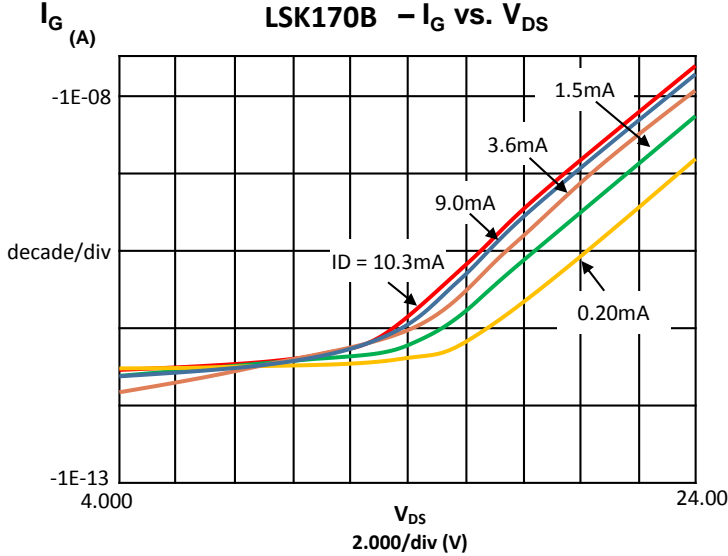
### Operating Current

#### LSK170A - $I_G$ vs. $V_{DS}$



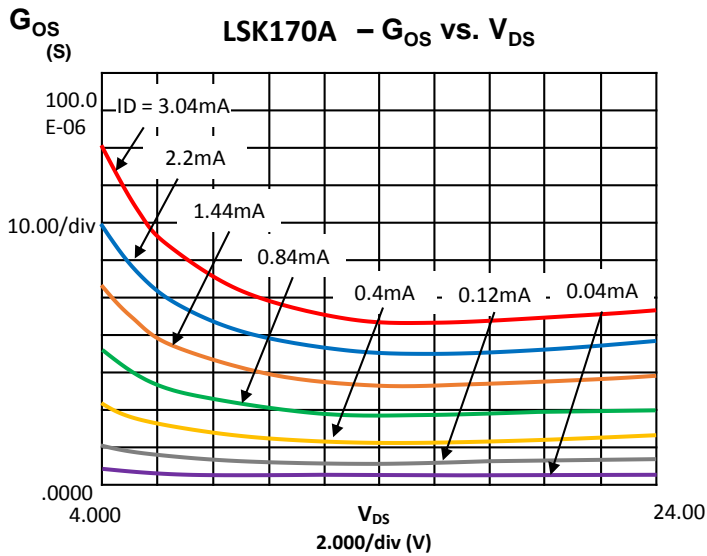
### Operating Current

#### LSK170B - $I_G$ vs. $V_{DS}$



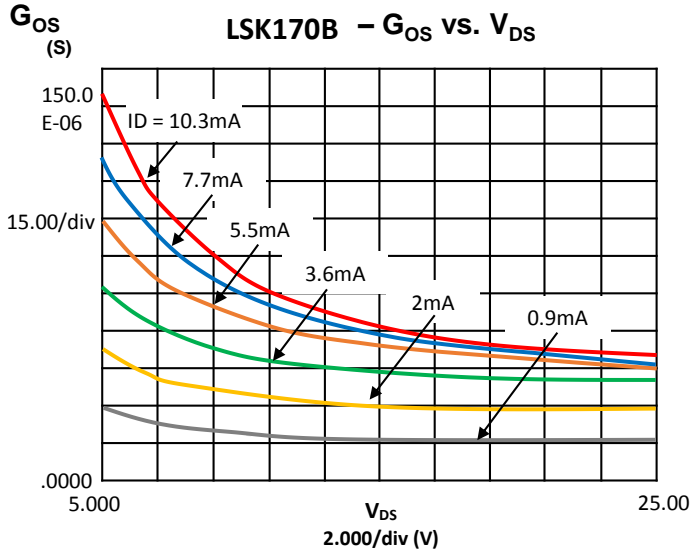
### Output Conductance

#### LSK170A - $G_{OS}$ vs. $V_{DS}$



### Output Conductance

#### LSK170B - $G_{OS}$ vs. $V_{DS}$



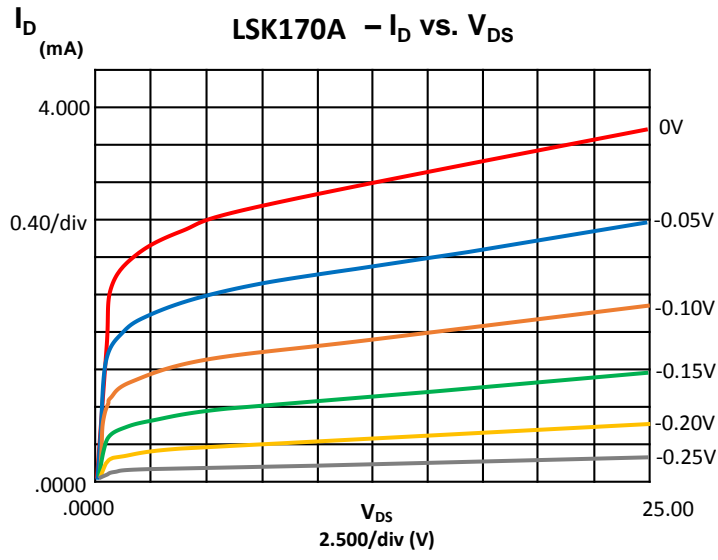
# LSK170 A/B/C/D

High Input Impedance, Ultra-Low Noise, Single N-Channel JFET

## Typical Characteristics

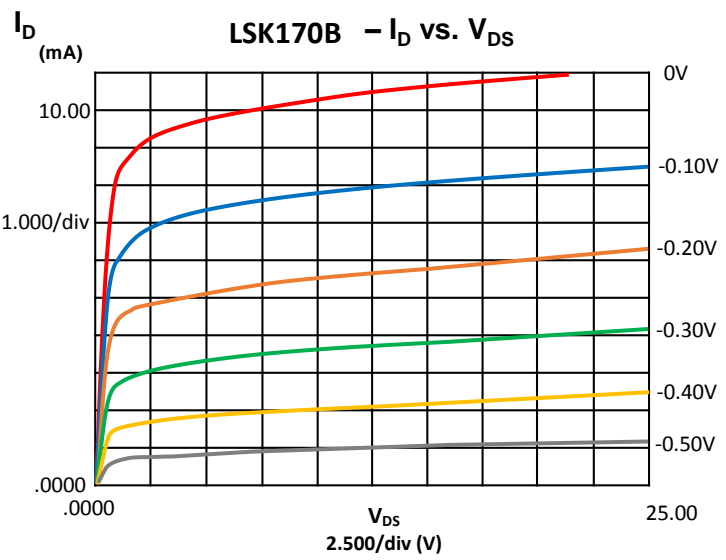
### Output Characteristics

#### LSK170A - $I_D$ vs. $V_{DS}$



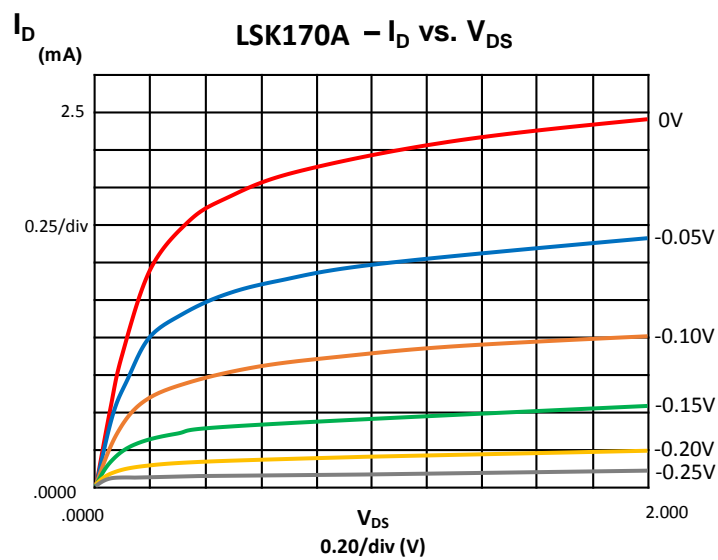
### Output Characteristics

#### LSK170B - $I_D$ vs. $V_{DS}$



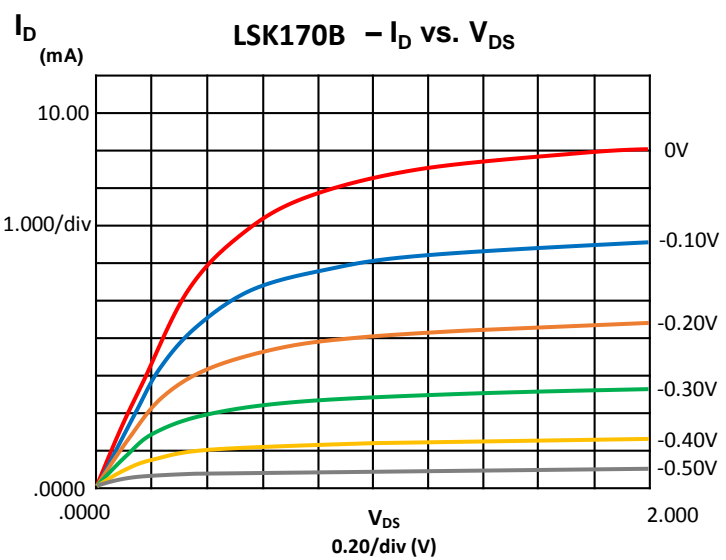
### Operating Characteristics

#### LSK170A - $I_D$ vs. $V_{DS}$



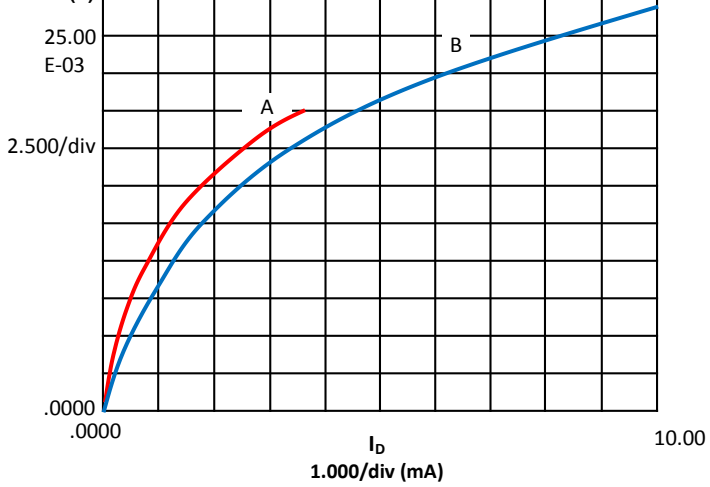
### Operating Characteristics

#### LSK170B - $I_D$ vs. $V_{DS}$

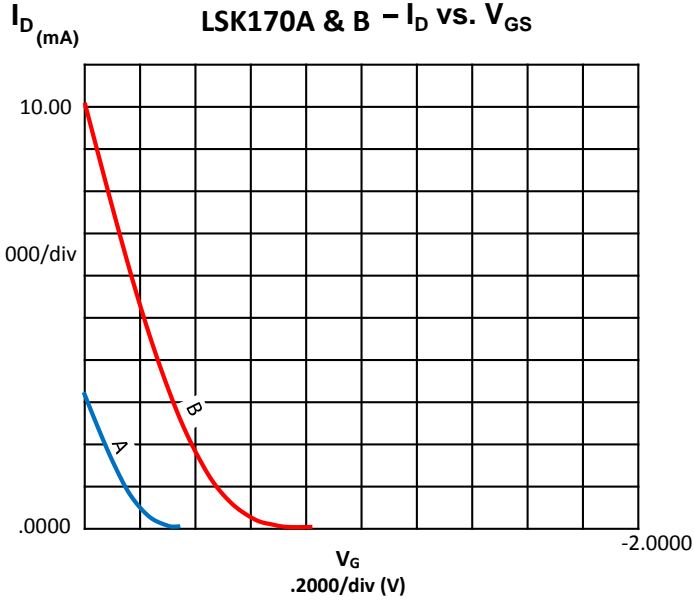
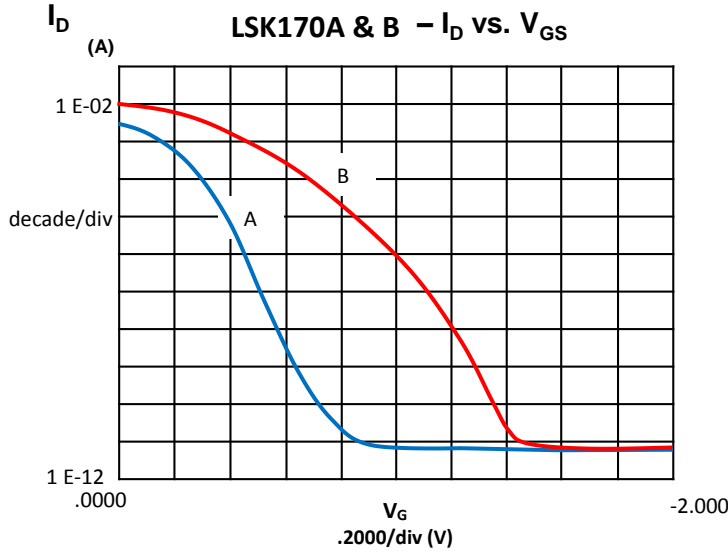
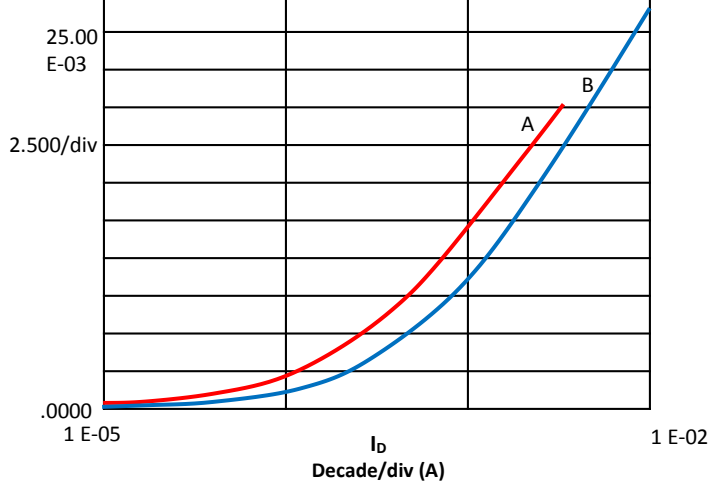


## Typical Characteristics

**Common Source Forward Transconductance vs. Drain Current**  
LSK170A & B -  $G_{FS}$  vs.  $I_D$

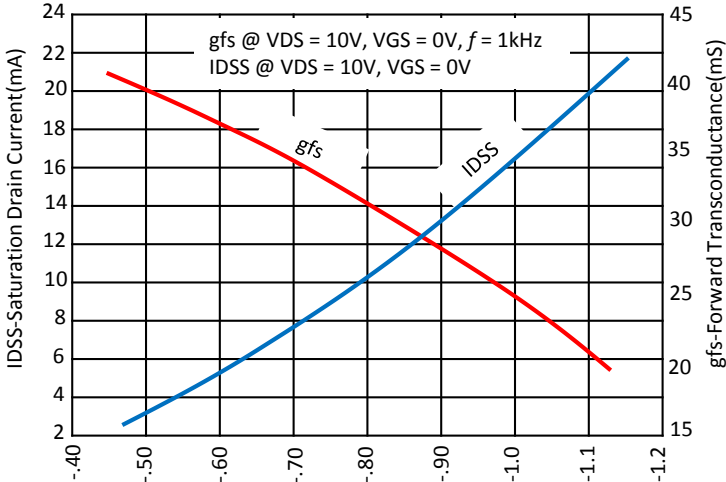


**Common Source Transconductance vs. Drain Current**  
LSK170A & B -  $G_{FS}$  vs.  $I_D$



## Typical Characteristics

### Drain Current Transconductance vs. Gate-Source Cutoff Voltage



### Equivalent Input Noise Voltage vs. Frequency

