LINEAR SYSTEMS

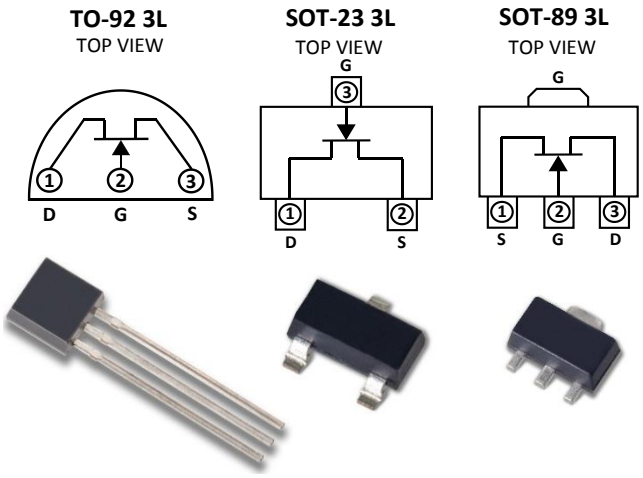
Quality Through Innovation Since 1987

LSK170 A/B/C/D

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

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

Absolute Maximum Ratings @ 25 °C (unless otherwise stated)	
Maximum Temperatures	
Storage Temperature	-55 to +150°C
Junction Operating Temperature	-55 to +135°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



Features

- ULTRA LOW NOISE (*f* =1khz): e_n = 0.9nV/√Hz
- High Breakdown Voltage: BV_{GSS} = 40V min
- High Gain: G_{fs} = 22mS (typ)
- High Input Impedance: 20GΩ typ
- Low Capacitance: 22pF 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.

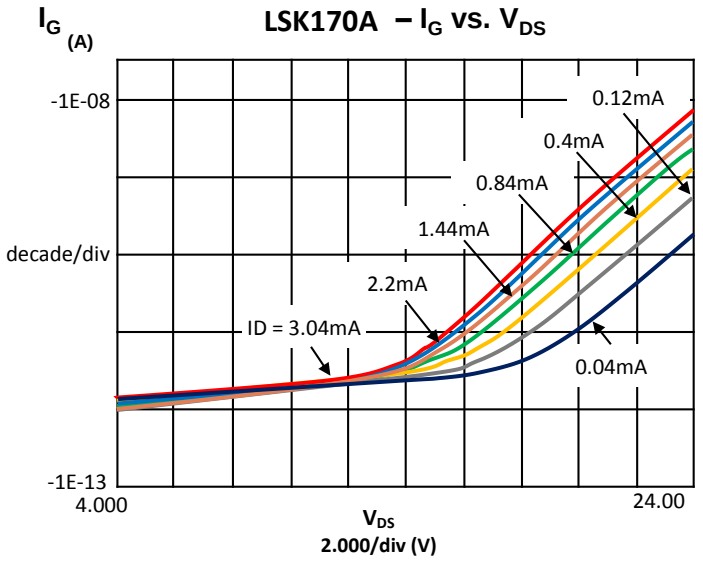
Electrical Characteristics @ 25°C (unless otherwise stated)

SYMBOL	CHARACTERISTIC		MIN	TYP	MAX	UNITS	CONDITIONS
BV_{GSS}	Gate to Source Breakdown Voltage		-40.0			V	V_{DS} = 0V, I_D = -100µA
$V_{GS(OFF)}$	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/√Hz	V_{DS} = 10V, I_D = 2mA, *f* = 1kHz, NBW = 1Hz
e_n	Noise Voltage			1.4	4.0	nV/√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 = 100µA, *f* = 1MHz,
C_{RSS}	Common Source Reverse Transfer Cap.			5.0		pF	V_{DS} = 15V, I_D = 100µA, *f* = 1MHz,

Typical Characteristics

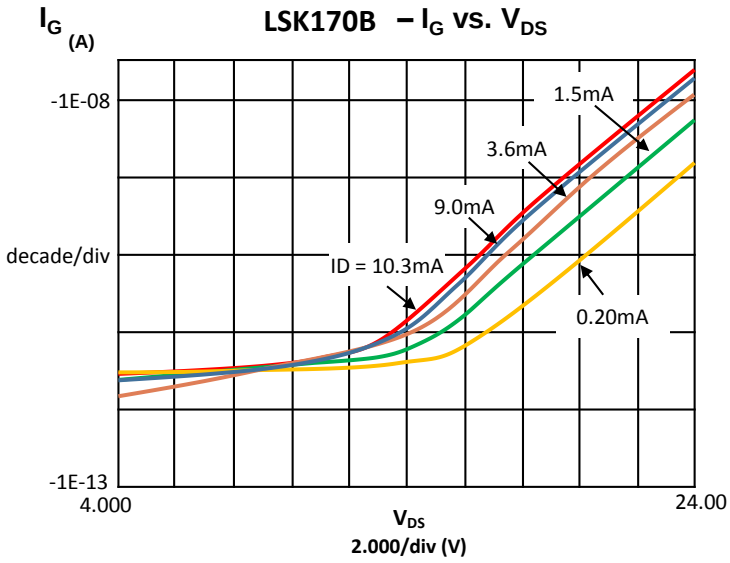
Operating Current

LSK170A – I_G vs. V_{DS}



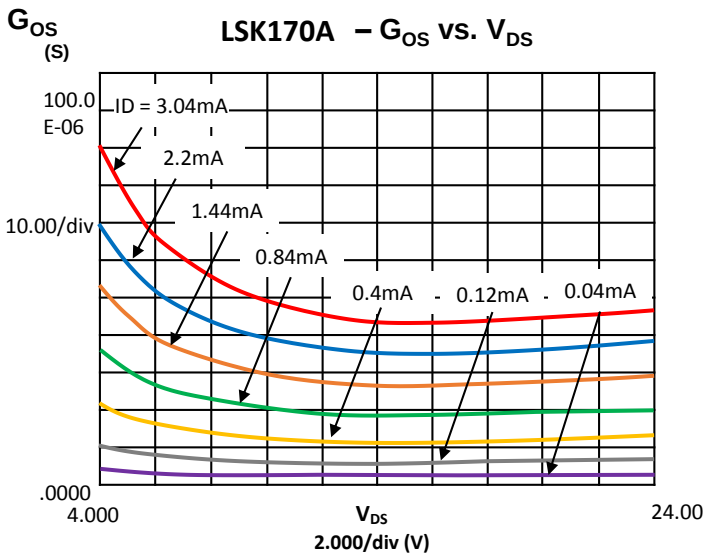
Operating Current

LSK170B – I_G vs. V_{DS}



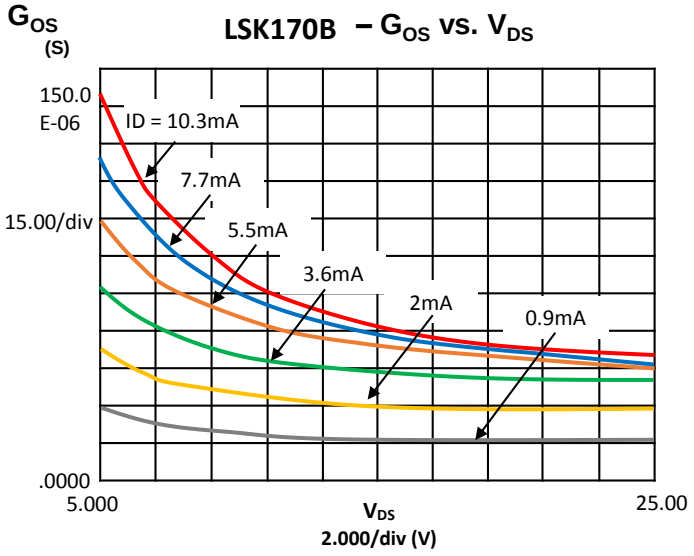
Output Conductance

LSK170A – G_{OS} vs. V_{DS}



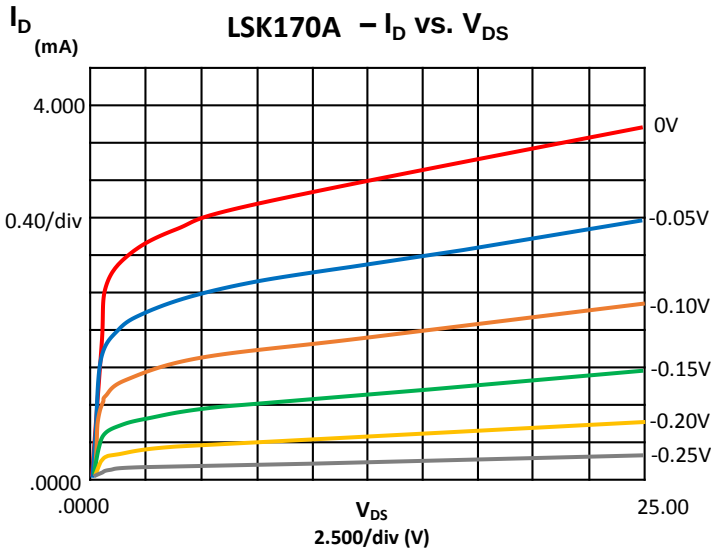
Output Conductance

LSK170B – G_{OS} vs. V_{DS}

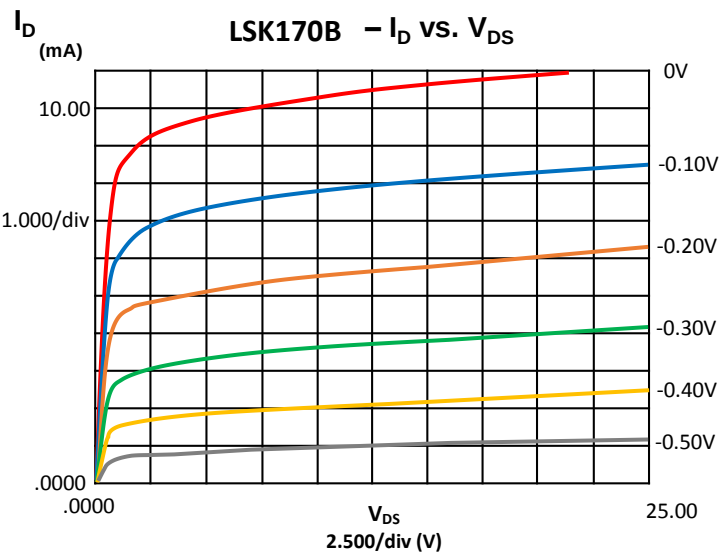


Typical Characteristics

Output Characteristics



Output Characteristics



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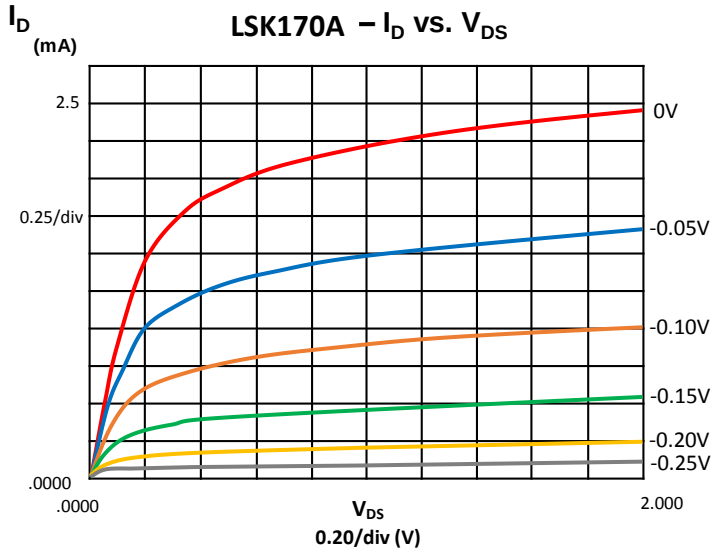
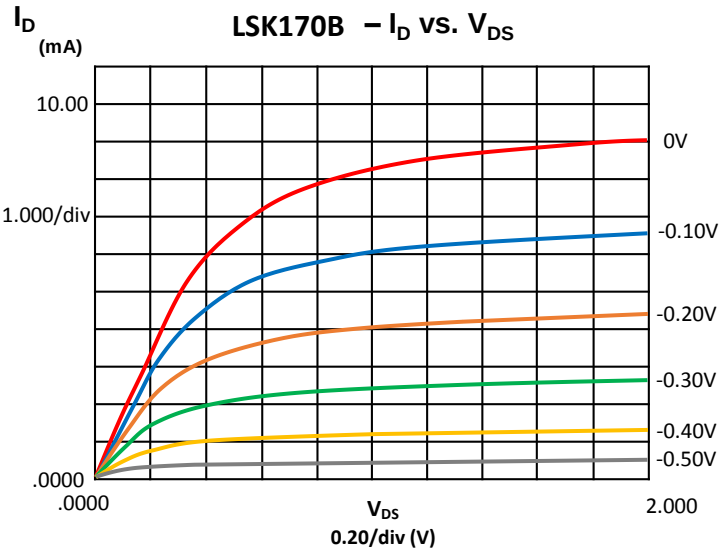
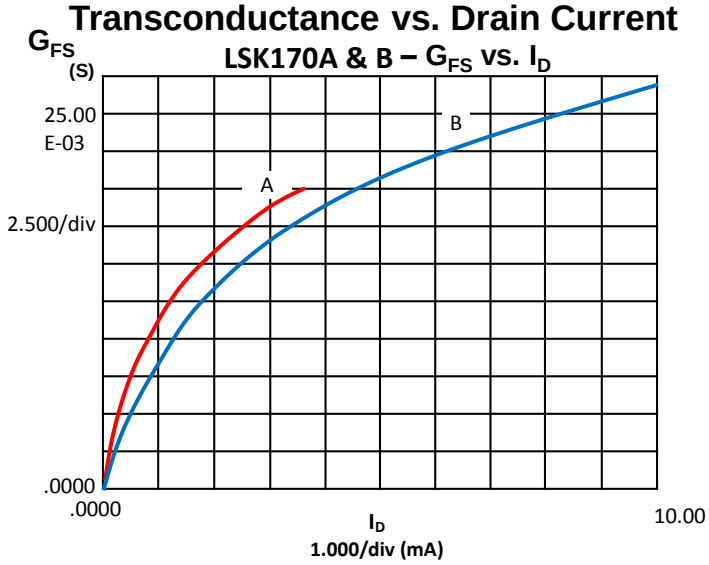


Operating Characteristics

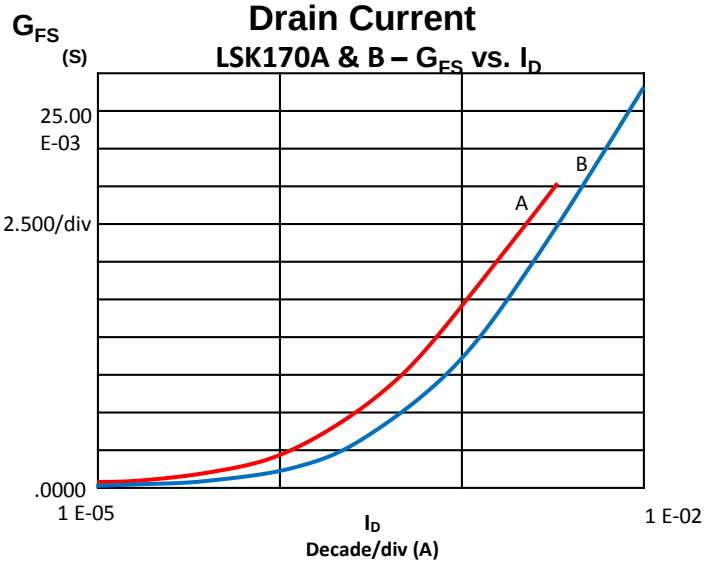


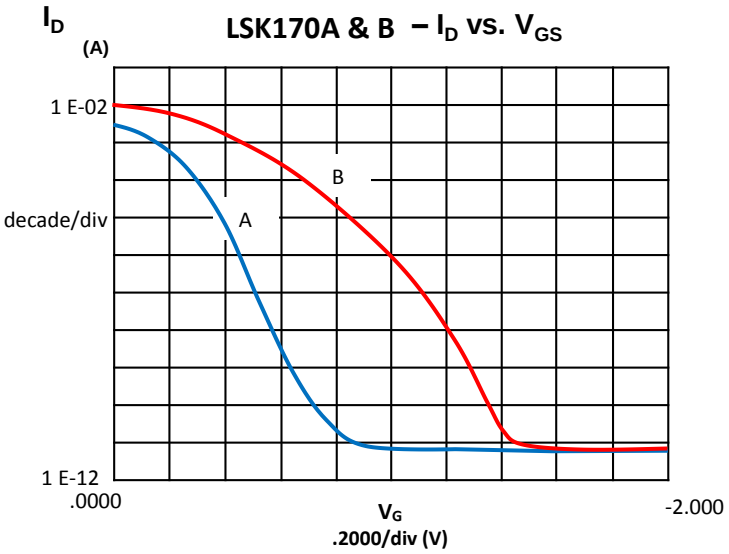
Typical Characteristics

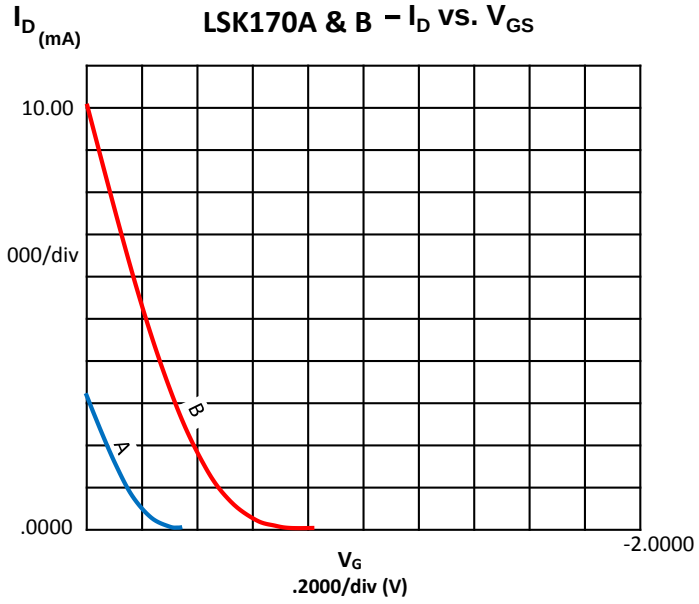
Common Source Forward Transconductance vs. Drain Current



Common Source Transconductance vs. Drain Current

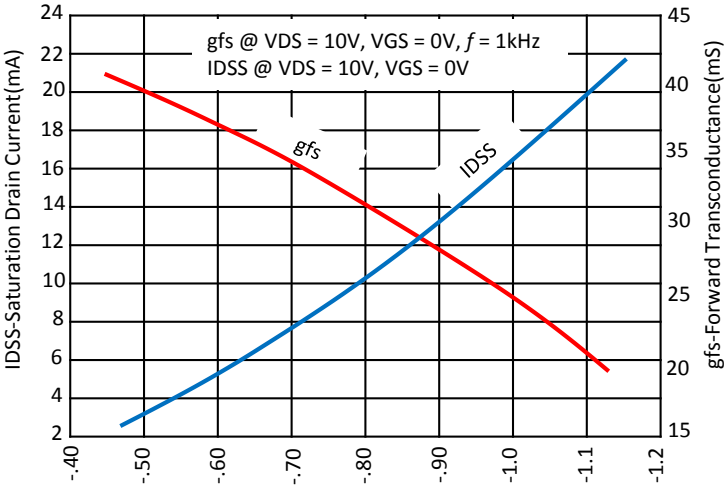






Typical Characteristics

Drain Current Transconductance vs. Gate-Source Cutoff Voltage



Equivalent Input Noise Voltage vs. Frequency