LINEAR SYSTEMS

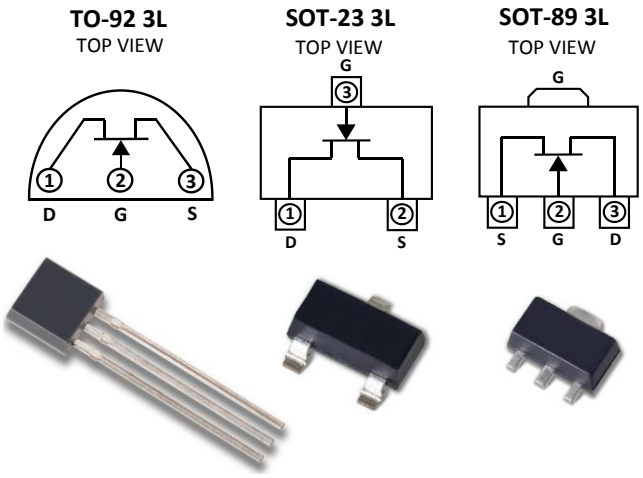
Over 30 Years of Quality Through Innovation

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
- Sonobouys
- 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.

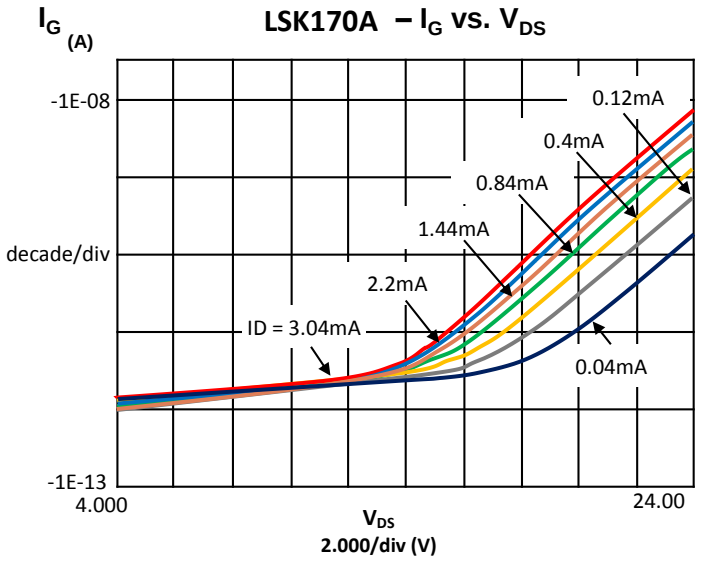
Electrical Characteristics @ 25°C (unless otherwise stated)

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

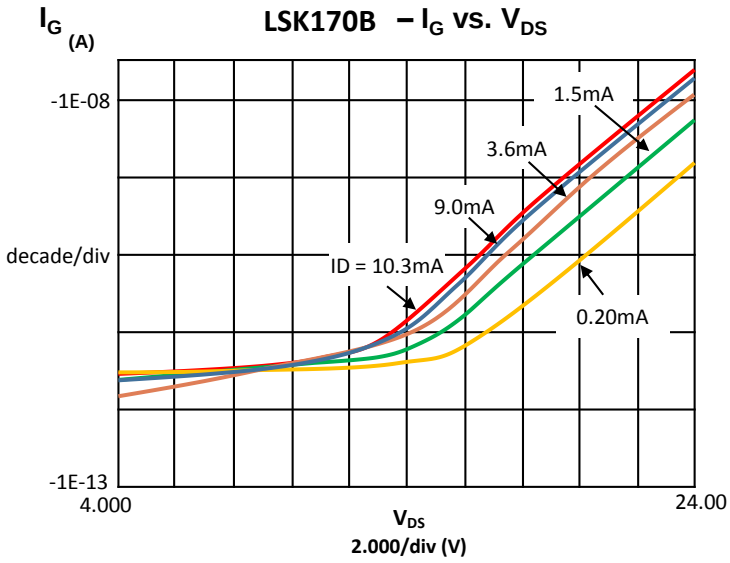
Operating Current

LSK170A – I_G vs. V_{DS}



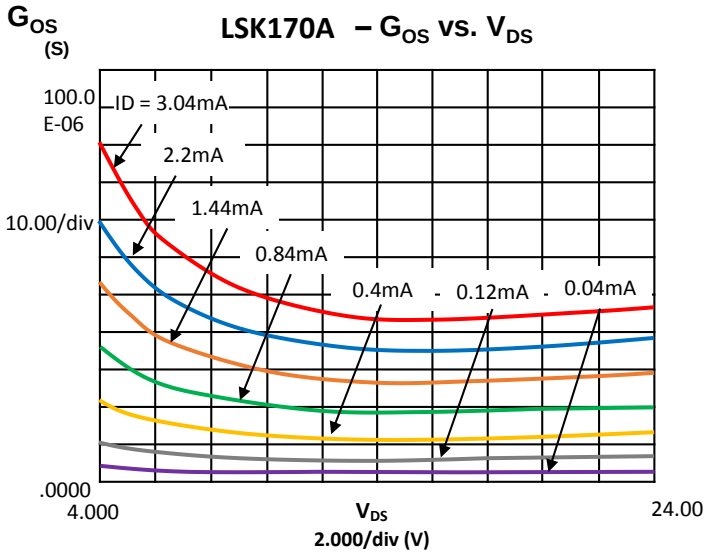
Operating Current

LSK170B – I_G vs. V_{DS}



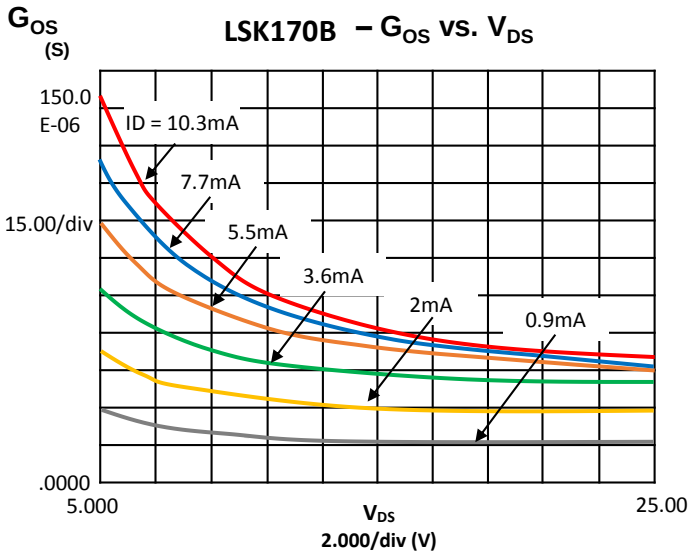
Output Conductance

LSK170A – G_{OS} vs. V_{DS}



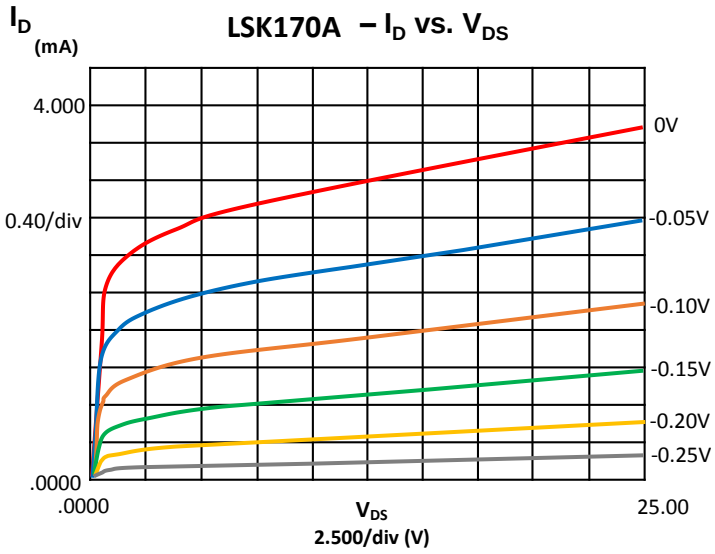
Output Conductance

LSK170B – G_{OS} vs. V_{DS}

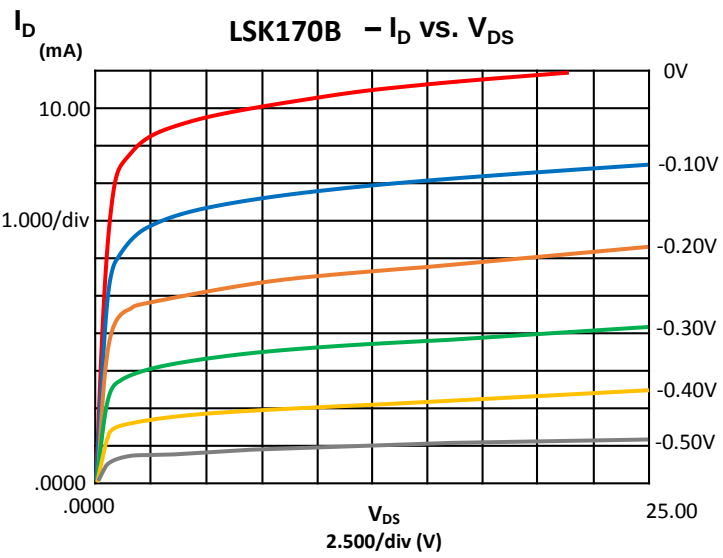


Typical Characteristics

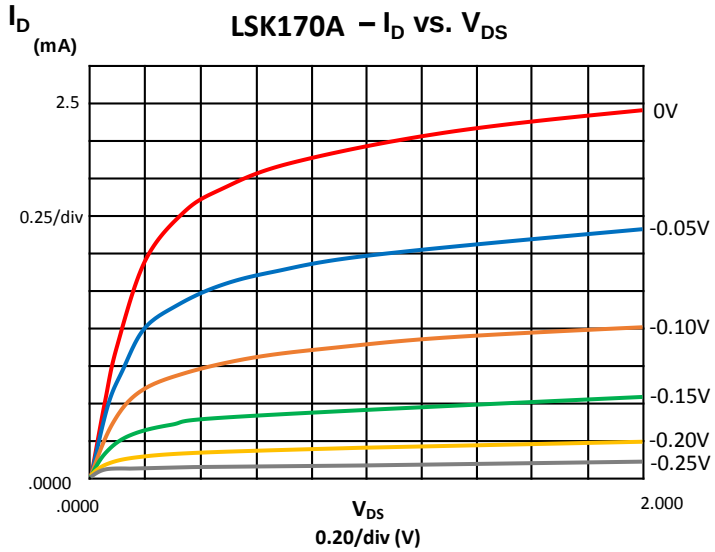
Output Characteristics



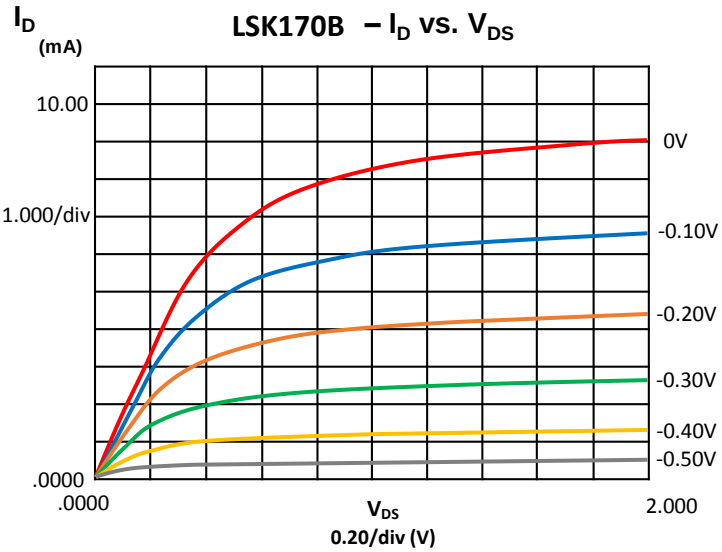
Output Characteristics



Operating Characteristics

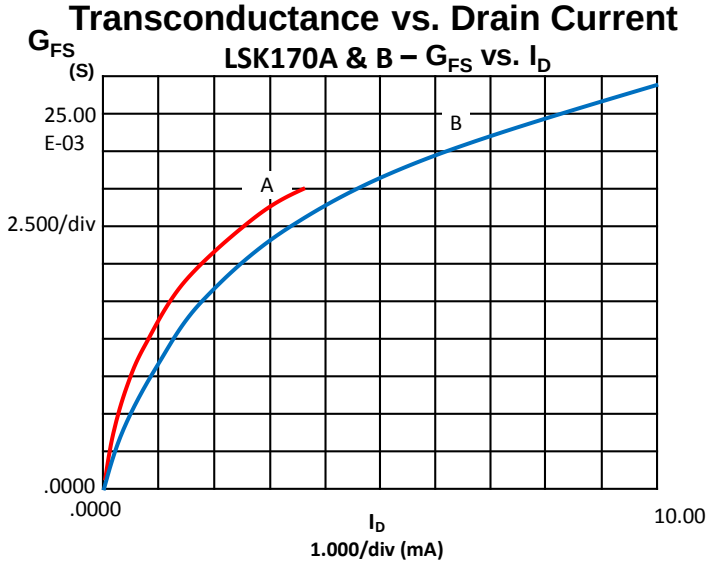


Operating Characteristics

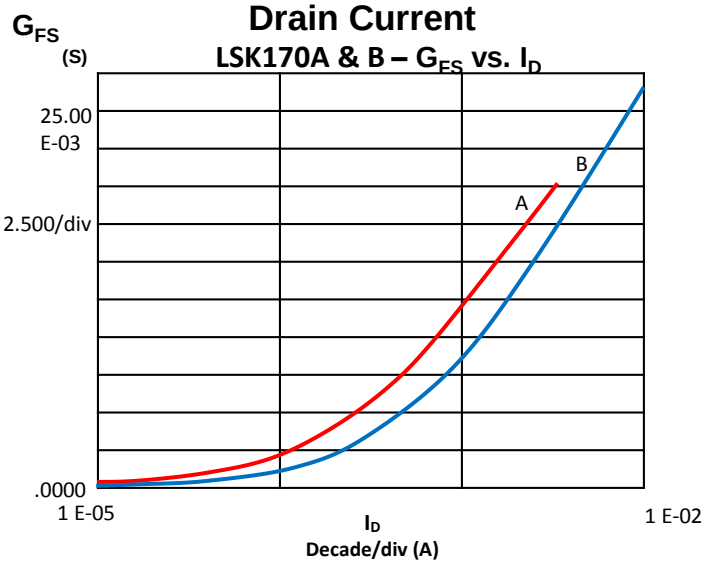


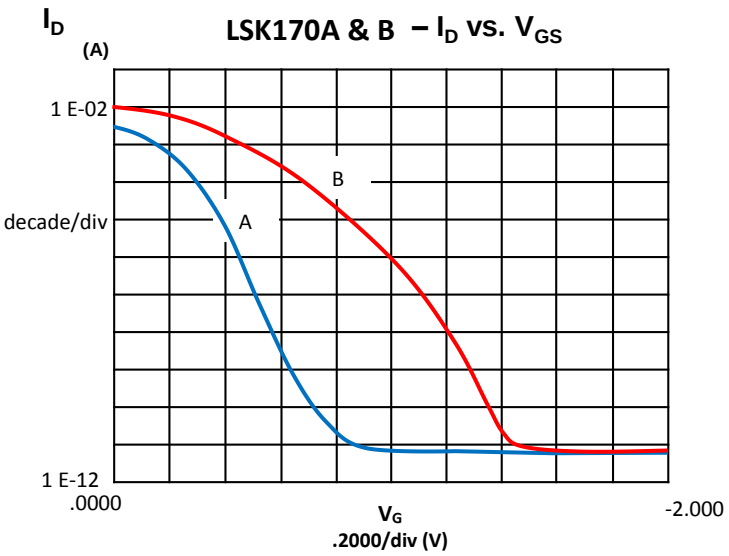
Typical Characteristics

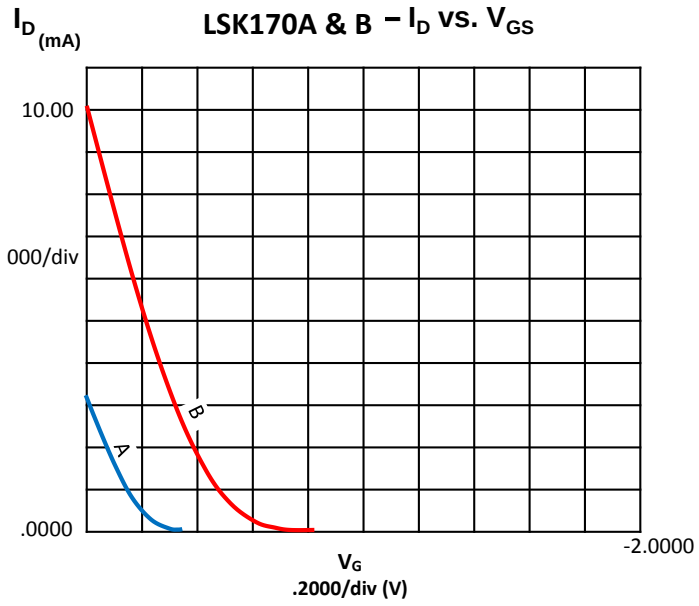
Common Source Forward Transconductance vs. Drain Current



Common Source Transconductance vs. Drain Current

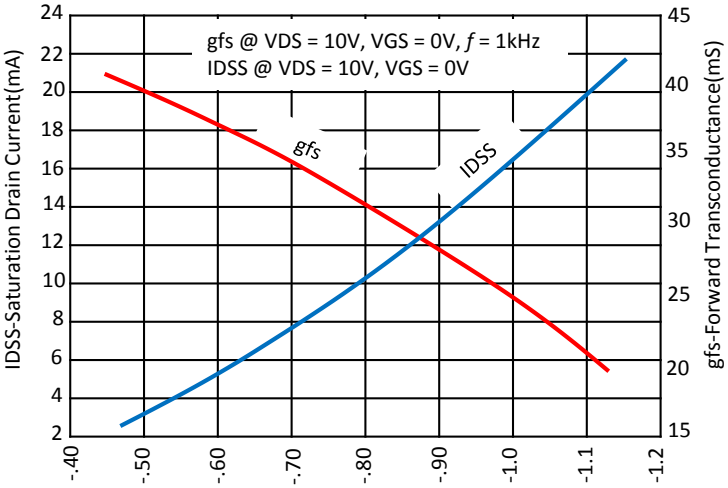




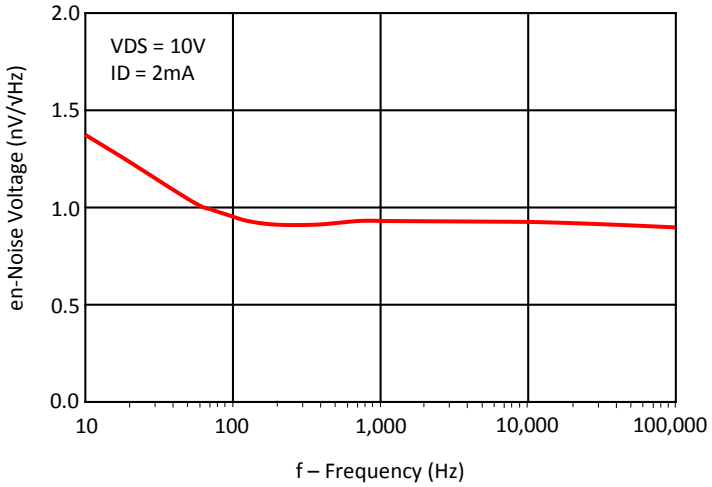


Typical Characteristics

Drain Current Transconductance vs. Gate-Source Cutoff Voltage



Equivalent Input Noise Voltage vs. Frequency

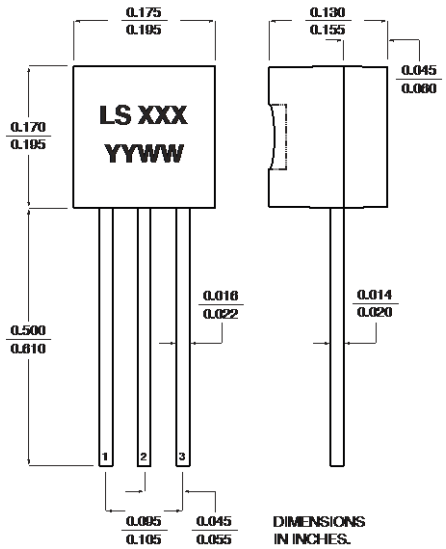


Ordering Information

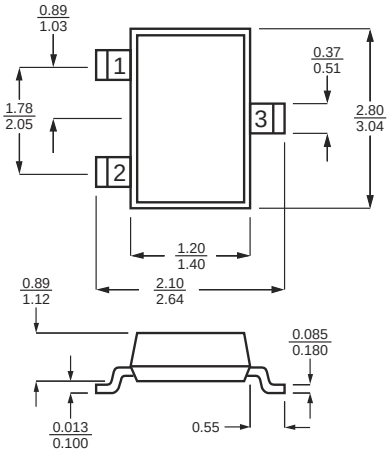
STANDARD PART CALL-OUT	CUSTOM PART CALL-OUT CUSTOM PARTS INCLUDE SEL + 4 DIGIT NUMERIC CODE)
LSK170A TO-92 3L RoHS	LSK170A TO-92 3L RoHS SELXXXX
LSK170B TO-92 3L RoHS	LSK170B TO-92 3L RoHS SELXXXX
LSK170C TO-92 3L RoHS	LSK170C TO-92 3L RoHS SELXXXX
LSK170D TO-92 3L RoHS	LSK170D TO-92 3L RoHS SELXXXX
LSK170A SOT-23 3L RoHS	LSK170A SOT-23 3L RoHS SELXXXX
LSK170B SOT-23 3L RoHS	LSK170B SOT-23 3L RoHS SELXXXX
LSK170C SOT-23 3L RoHS	LSK170C SOT-23 3L RoHS SELXXXX
LSK170D SOT-23 3L RoHS	LSK170D SOT-23 3L RoHS SELXXXX
LSK170A SOT-89 3L RoHS	LSK170A SOT-89 3L RoHS SELXXXX
LSK170B SOT-89 3L RoHS	LSK170B SOT-89 3L RoHS SELXXXX
LSK170C SOT-89 3L RoHS	LSK170C SOT-89 3L RoHS SELXXXX
LSK170D SOT-89 3L RoHS	LSK170D SOT-89 3L RoHS SELXXXX

Package Dimensions

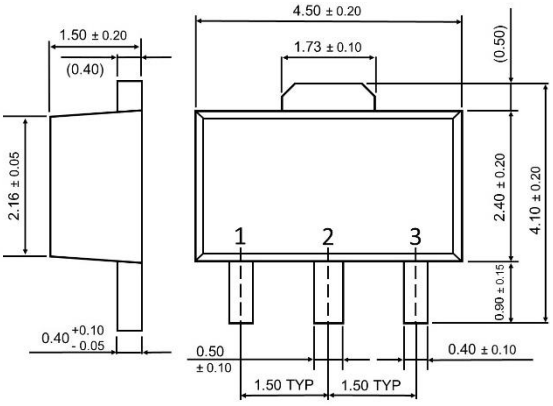
TO-92 3 Lead



SOT-23 3 Lead



SOT-89 3 Lead



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.
4. When ordering include the full Linear Systems part number and package type. Linear Systems creates custom parts on a case by case basis. To learn whether Linear Systems can meet your requirements, please send your drawing along with a detailed description of the device specifications to sales@linearsystems.com. One of our qualified representatives will contact you.
5. All standard parts are RoHS compliant. Contact the factory for availability of non-RoHS parts.
6. 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.
7. Voltage specifications are not tested 100%, but guaranteed by lot sampling. Contact the factory if 100% test is required.