# TYPES 2N5949 THRU 2N5953
# N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

BULLETIN NO. DL-S 7011338, APRIL 1970

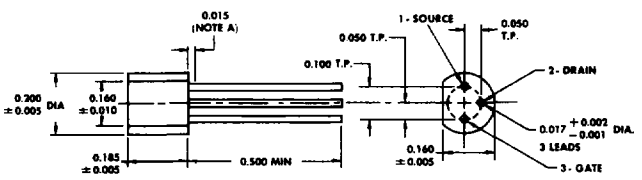
## SILECT† FIELD-EFFECT TRANSISTORS‡

- Narrow $I_{DSS}$ and $V_{GS(off)}$ Ranges
- For Low-Noise Audio-Frequency Amplifier Applications
- For RF Amplifier Applications Thru 100 MHz
- Low $r_{ds(on)}$ for Chopper and Switching Applications

### mechanical data

These transistors are encapsulated in a plastic compound specifically designed for this purpose, using a highly mechanized process developed by Texas Instruments. The case will withstand soldering temperatures without deformation. These devices exhibit stable characteristics under high-humidity conditions and are capable of meeting MIL-STD-202C Method 106B. The transistors are insensitive to light.

***CASE OUTLINE**




NOTES: A. Lead diameter is not controlled in this area.
B. Leads having maximum diameter (0.019) shall be within 0.007 of their true positions measured in the gaging plane 0.054 below the seating plane of the device relative to a maximum diameter package.
C. All dimensions are in inches.

### *absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

| | |
|---|---|
| Drain-Gate Voltage | 30 V |
| Reverse Gate-Source Voltage | −30 V |
| Continuous Forward Gate Current | 10 mA |
| Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 1) | 360 mW |
| Continuous Device Dissipation at (or below) 25°C Lead Temperature (See Note 2) | 500 mW |
| Storage Temperature Range | −65°C to 150°C |
| Lead Temperature 1/16 Inch from Case for 10 Seconds | 260°C |

NOTES: 1. Derate linearly to 150°C free-air temperature at the rate of 2.88 mW/°C.
2. Derate linearly to 150°C lead temperature at the rate of 4 mW/°C. Lead temperature is measured on the gate lead 1/16 inch from the case.

*JEDEC registered data. This data sheet contains all applicable registered data in effect at the time of publication.
†Trademark of Texas Instruments.
‡U. S. Patent No. 3,439,238

USES CHIP JN51

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# N-CHANNEL SILICON JUNCTION FIELD-EFFECT TRANSISTORS

## *electrical characteristics at 25°C free-air temperature (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | 2N5949 | | 2N5950 | | 2N5951 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | MAX | MIN | MAX | MIN | MAX | |
| $V_{(BR)GSS}$ | Gate-Source Breakdown Voltage | $I_G = -1\ \mu A$, | $V_{DS} = 0$ | −30 | | −30 | | −30 | | V |
| $I_{GSS}$ | Gate Reverse Current | $V_{GS} = -15$ V, | $V_{DS} = 0$ | | −1 | | −1 | | −1 | nA |
| | | $V_{GS} = -15$ V, $T_A = 100°C$ | $V_{DS} = 0$, | | −200 | | −200 | | −200 | |
| $V_{GS(off)}$ | Gate-Source Cutoff Voltage | $V_{DS} = 15$ V, | $I_D = 100$ nA | −3 | −7 | −2.5 | −6 | −2 | −5 | V |
| $V_{GS}$ | Gate-Source Voltage | $V_{DS} = 15$ V, | $I_D = 1.2$ mA | −2.25 | −6 | | | | | V |
| | | $V_{DS} = 15$ V, | $I_D = 1$ mA | | | −1.8 | −5 | | | |
| | | $V_{DS} = 15$ V, | $I_D = 0.7$ mA | | | | | −1.3 | −4.5 | |
| $I_{DSS}$ | Zero-Gate-Voltage Drain Current | $V_{DS} = 15$ V, See Note 3 | $V_{GS} = 0$, | 12 | 18 | 10 | 15 | 7 | 13 | mA |
| $r_{ds(on)}$ | Small-Signal Drain-Source On-State Resistance | $V_{GS} = 0$, $f = 1$ kHz | $I_D = 0$, | | 200 | | 210 | | 250 | Ω |
| $\lvert y_{fs} \rvert$ | Small-Signal Common-Source Forward Transfer Admittance | $V_{DS} = 15$ V, $f = 1$ kHz, | $V_{GS} = 0$, See Note 4 | 3.5 | 7.5 | 3.5 | 7.5 | 3.5 | 6.5 | mmho |
| $\lvert y_{os} \rvert$ | Small-Signal Common-Source Output Admittance | | | | 75 | | 75 | | 75 | μmho |
| $C_{iss}$ | Common-Source Short-Circuit Input Capacitance | $V_{DS} = 15$ V, $f = 1$ MHz, | $V_{GS} = 0$, See Note 4 | | 6 | | 6 | | 6 | pF |
| $C_{rss}$ | Common-Source Short-Circuit Reverse Transfer Capacitance | | | | 2 | | 2 | | 2 | pF |
| $g_{is}$ | Small-Signal Common-Source Input Conductance | $V_{DS} = 15$ V, $f = 100$ MHz, | $V_{GS} = 0$, See Note 4 | | 250 | | 250 | | 250 | μmho |
| $g_{fs}$ | Small-Signal Common-Source Forward Transfer Conductance | | | 3 | 7.5 | 3 | 7.5 | 3 | 6.5 | mmho |
| $g_{os}$ | Small-Signal Common-Source Output Conductance | | | | 150 | | 125 | | 100 | μmho |

| PARAMETER | | TEST CONDITIONS | | | 2N5952 | | 2N5953 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | MIN | MAX | MIN | MAX | |
| $V_{(BR)GSS}$ | Gate-Source Breakdown Voltage | $I_G = -1\ \mu A$, | $V_{DS} = 0$ | | −30 | | −30 | | V |
| $I_{GSS}$ | Gate Reverse Current | $V_{GS} = -15$ V, | $V_{DS} = 0$ | | | −1 | | −1 | nA |
| | | $V_{GS} = -15$ V, | $V_{DS} = 0$, | $T_A = 100°C$ | | −200 | | −200 | |
| $V_{GS(off)}$ | Gate-Source Cutoff Voltage | $V_{DS} = 15$ V, | $I_D = 100$ nA | | −1.3 | −3.5 | −0.8 | −3 | V |
| $V_{GS}$ | Gate-Source Voltage | $V_{DS} = 15$ V, | $I_D = 0.4$ mA | | −0.75 | −3 | | | V |
| | | $V_{DS} = 15$ V, | $I_D = 0.25$ mA | | | | −0.5 | −2.5 | |
| $I_{DSS}$ | Zero-Gate-Voltage Drain Current | $V_{DS} = 15$ V, | $V_{GS} = 0$, | See Note 3 | 4 | 8 | 2.5 | 5 | mA |
| $r_{ds(on)}$ | Small-Signal Drain-Source On-State Resistance | $V_{GS} = 0$, | $I_D = 0$, | $f = 1$ kHz | | 300 | | 375 | Ω |
| $\lvert y_{fs} \rvert$ | Small-Signal Common-Source Forward Transfer Admittance | $V_{DS} = 15$ V, See Note 4 | $V_{GS} = 0$, | $f = 1$ kHz, | 2 | 6.5 | 2 | 6.5 | mmho |
| $\lvert y_{os} \rvert$ | Small-Signal Common-Source Output Admittance | | | | | 50 | | 50 | μmho |
| $C_{iss}$ | Common-Source Short-Circuit Input Capacitance | $V_{DS} = 15$ V, See Note 4 | $V_{GS} = 0$, | $f = 1$ MHz, | | 6 | | 6 | pF |
| $C_{rss}$ | Common-Source Short-Circuit Reverse Transfer Capacitance | | | | | 2 | | 2 | pF |
| $g_{is}$ | Small-Signal Common-Source Input Conductance | $V_{DS} = 15$ V, See Note 4 | $V_{GS} = 0$, | $f = 100$ MHz, | | 250 | | 250 | μmho |
| $g_{fs}$ | Small-Signal Common-Source Forward Transfer Conductance | | | | 1 | 6.5 | 1 | 6.5 | mmho |
| $g_{os}$ | Small-Signal Common-Source Output Conductance | | | | | 75 | | 50 | μmho |

## *operating characteristics at 25°C free-air temperature

| PARAMETER | | TEST CONDITIONS | | | | ALL TYPES | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | MIN | MAX | |
| F | Common-Source Spot Noise Figure | $V_{DS} = 15$ V, See Note 4 | $V_{GS} = 0$, | $f = 100$ MHz, | $R_G = 1$ kΩ, | | 5 | dB |
| | | $V_{DS} = 15$ V, See Note 4 | $V_{GS} = 0$, | $f = 1$ kHz, | $R_G = 1$ MΩ, | | 2 | |
| $V_n$ | Equivalent Input Noise Voltage | $V_{DS} = 15$ V, | $V_{GS} = 0$, | $f = 1$ kHz, | See Note 4 | | 100 | $nV/\sqrt{Hz}$ |

NOTES: 3. This parameter must be measured using pulse techniques. $t_w = 300\ \mu s$, duty cycle ≤ 2%.
4. These parameters must be measured with bias conditions applied for less than 5 seconds to avoid overheating.

*JEDEC registered data



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