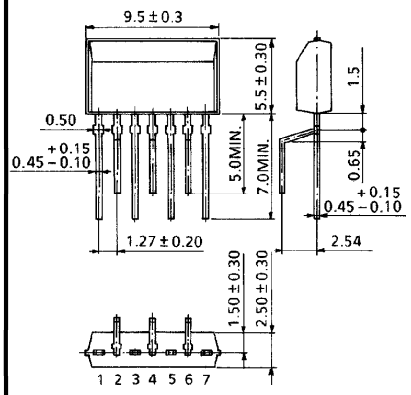
TOSHIBA DUAL FIELD EFFECT TRANSISTOR SILICON MONOLITHIC N CHANNEL JUNCTION TYPE

# 2SK389

LOW NOISE AUDIO AND DIFFERENTIAL AMPLIFIER APPLICATIONS.

Unit in mm

- 1 Chip Dual Type.
- Recommended for First Differential Stages of DC Amplifiers.
- Very High $|Y_{fs}|$ : $|Y_{fs}|$ = 20mS (Typ.)
  ($V_{DS}$ = 10V, $V_{GS}$ = 0, f = 1kHz, $I_{DSS}$ = 3mA)
- Good Pair Characteristics
- High Breakdown Voltage : $V_{GDS}$ = −50V (Min.)
- Very Low Noise : NF = 0.5dB (Typ.)
  ($V_{DS}$ = 10V, $I_D$ = 1mA, $R_G$ = 1kΩ, f = 1kHz)
- High Input Impedance : $I_{GSS}$ = −1.0nA (Max.) ($V_{GS}$ = −30V)
- Complementary to 2SJ109




1. DRAIN 1
2. GATE 1
3. SOURCE 1
4. SUBSTRATE (Note 2)
5. SOURCE 2
6. GATE 2
7. DRAIN 2

| | |
|---|---|
| JEDEC | — |
| EIAJ | — |
| TOSHIBA | 2-10M1A |

Weight : 0.37g (Typ.)

MAXIMUM RATINGS (Ta = 25°C)

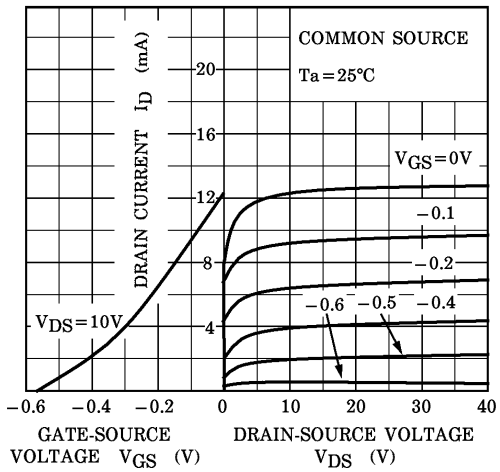
| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Gate-Drain Voltage | $V_{GDS}$ | −50 | V |
| Gate Current | $I_G$ | 10 | mA |
| Drain Power Dissipation | $P_D$ | 200 | mW |
| Junction Temperature | $T_j$ | 125 | °C |
| Storage Temperature Range | $T_{stg}$ | −55~125 | °C |

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

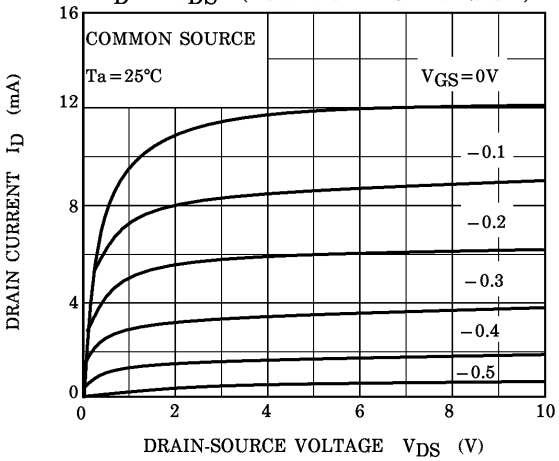
| CHARACTERISTIC | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Gate Cut-off Current | $I_{GSS}$ | $V_{GS}=-30V$, $V_{DS}=0$ | — | — | −1.0 | nA |
| Gate-Drain Breakdown Voltage | $V_{(BR)\,GDS}$ | $V_{DS}=0$, $I_G=-100\mu A$ | −50 | — | — | V |
| Drain Current | $I_{DSS}$ (Note 1) | $V_{DS}=10V$, $V_{GS}=0$ | 2.6 | — | 20 | mA |
| Drain Current Ratio | $I_{DSS}$ (small) / $I_{DSS}$ (large) | $V_{DS}=10V$, $V_{GS}=0$ | 0.9 | — | — | — |
| Gate-Source Cut-off Voltage | $V_{GS\,(OFF)}$ | $V_{DS}=10V$, $I_D=0.1\mu A$ | −0.15 | — | −2.0 | V |
| Forward Transfer Admittance | $\|Y_{fs}\|$ | $V_{DS}=10V$, $V_{GS}=0$ f=1kHz, $I_{DSS}=3mA$ | 8 | 20 | — | mS |
| Forward Transfer Admittance Ratio | $\|Y_{fs}\|$ (small) / $\|Y_{fs}\|$ (large) | $V_{DS}=10V$, $V_{GS}=0$, f=1kHz | 0.9 | — | — | — |
| Differential Gate-Source Voltage | $\|V_{GS1}-V_{GS2}\|$ | $V_{DS}=10V$, $I_D=1mA$ | — | — | 20 | mV |
| Input Capacitance | $C_{iss}$ | $V_{DS}=10V$, $V_{GS}=0$, f=1MHz | — | 25 | — | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | $V_{GD}=-10V$, $I_D=0$, f=1MHz | — | 5.5 | — | pF |
| Noise Figure | NF (1) | $V_{DS}=10V$, $R_G=1k\Omega$ $I_D=1mA$, f=10Hz | — | 1.5 | 10 | dB |
| | NF (2) | $V_{DS}=10V$, $R_G=1k\Omega$ $I_D=1mA$, f=1kHz | — | 0.5 | 2 | dB |

Note 1 : $I_{DSS}$ Classification GR : 2.6~6.5mA, BL : 6~12mA, V : 10~20mA
Note 2 : Use the substrate lead with open.

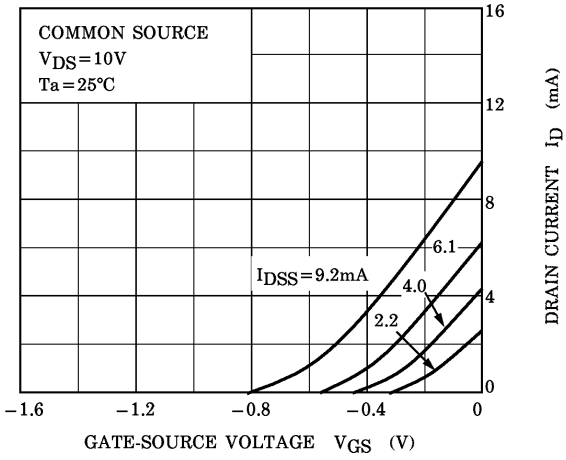
STATIC CHARACTERISTICS



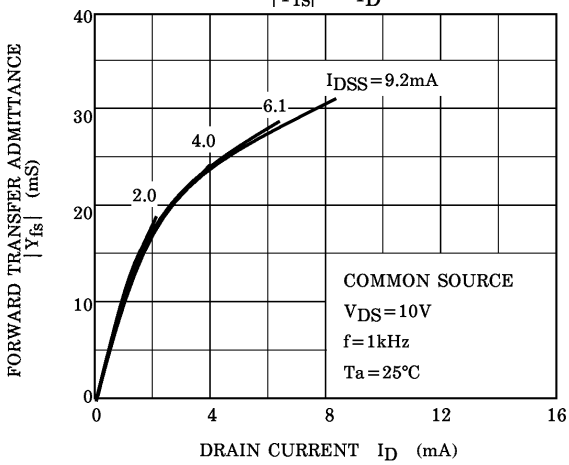

$I_D$ – $V_{DS}$ (LOW VOLTAGE REGION)



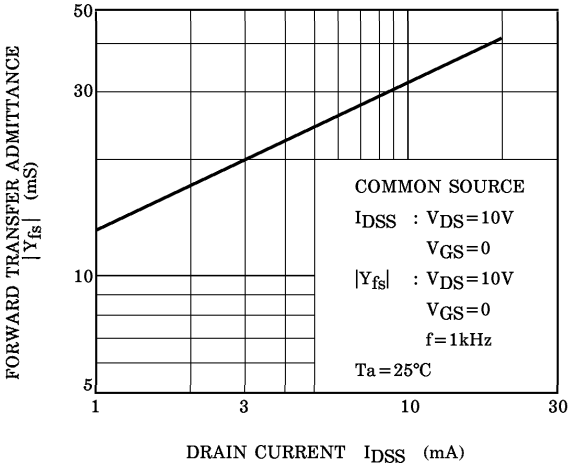

$I_D$ – $V_{GS}$



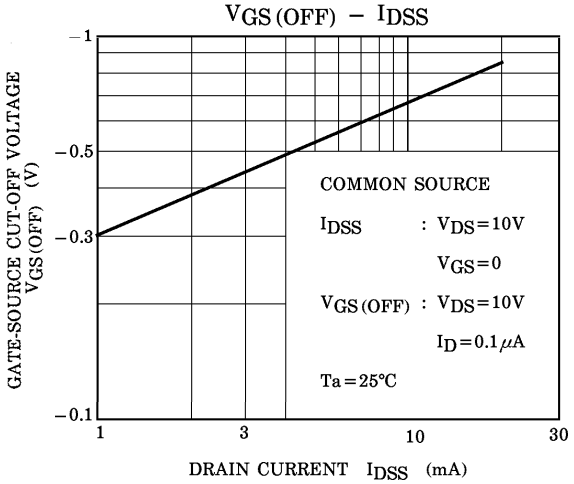

$|Y_{fs}|$ – $I_D$



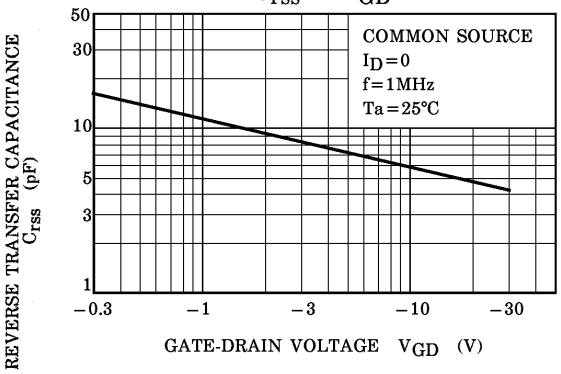

$|Y_{fs}|$ – $I_{DSS}$



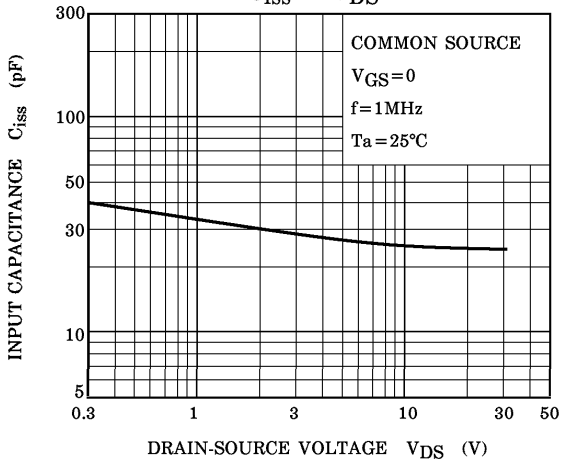

$V_{GS\,(OFF)}$ – $I_{DSS}$



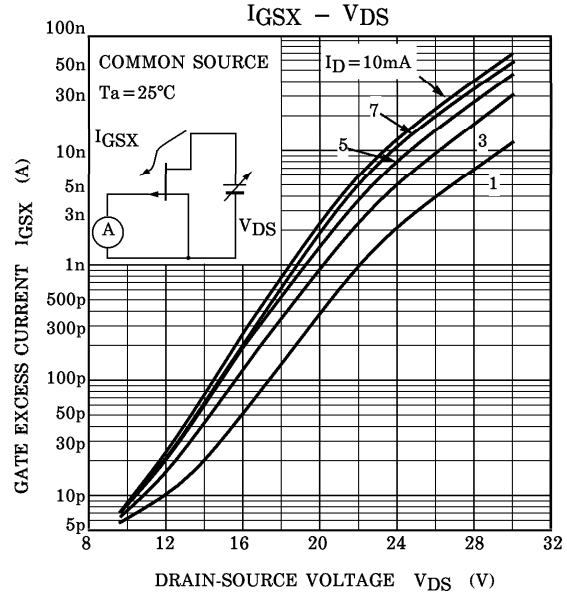
$C_{rss}$ – $V_{GD}$



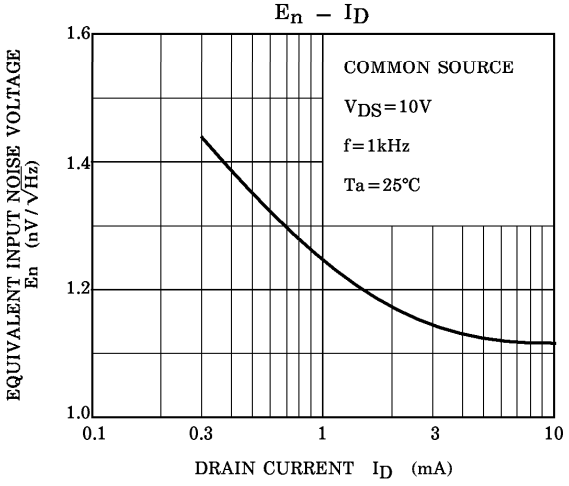

$C_{iss}$ – $V_{DS}$



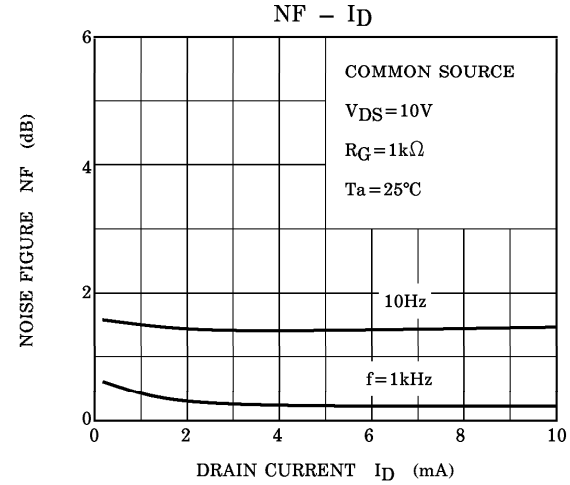

$I_{GSX}$ – $V_{DS}$



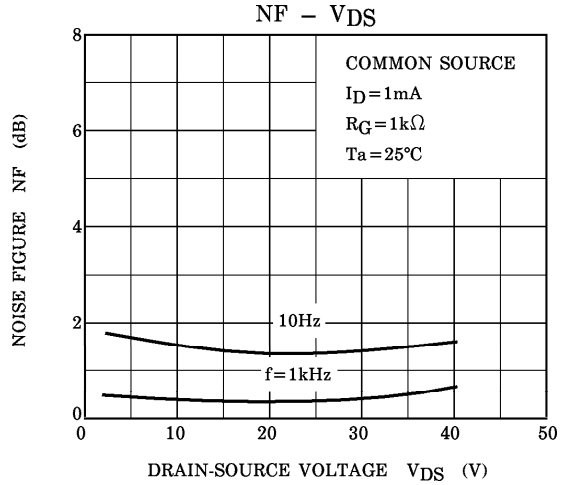

$E_n$ – $I_D$



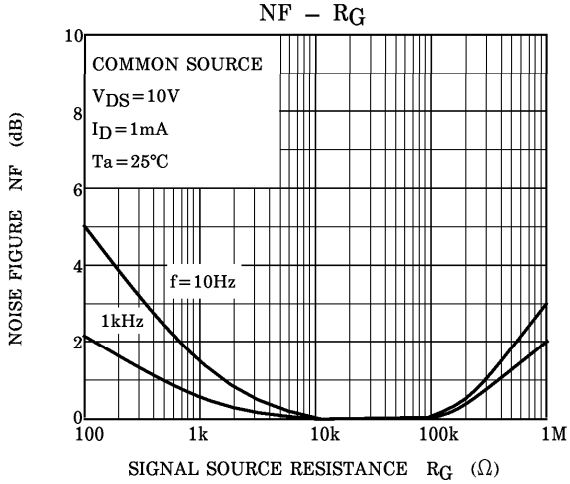

NF – $I_D$



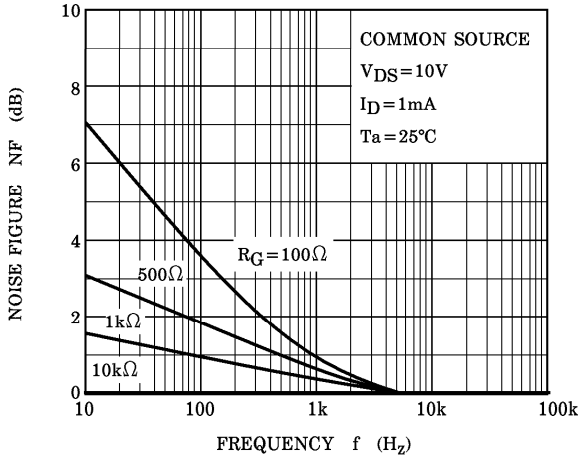

NF – $V_{DS}$



NF – $R_G$


COMMON SOURCE
$V_{DS}$=10V
$I_D$=1mA
Ta=25°C
f=10Hz
1kHz
NOISE FIGURE NF (dB)
SIGNAL SOURCE RESISTANCE $R_G$ (Ω)
10
8
6
4
2
0
100
1k
10k
100k
1M

NF – f


COMMON SOURCE
$V_{DS}$=10V
$I_D$=1mA
Ta=25°C
$R_G$=100Ω
500Ω
1kΩ
10kΩ
NOISE FIGURE NF (dB)
FREQUENCY f ($H_z$)
10
8
6
4
2
0
10
100
1k
10k
100k

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