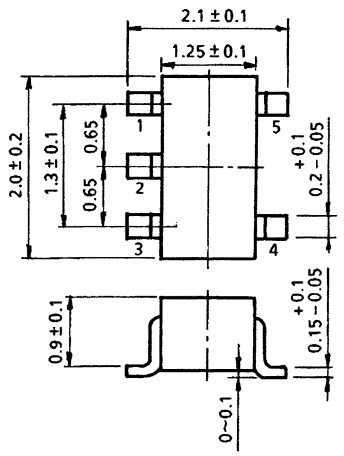
TOSHIBA Field Effect Transistor Silicon N Channel Junction Type

# 2SK3320

For Low Noise Audio Amplifier Applications

- Two devices in a ultra super mini (five pins) package
- High $|Y_{fs}|$: $|Y_{fs}|$ = 15 mS (typ.) ($V_{DS}$ = 10 V, $V_{GS}$ = 0)
- High breakdown voltage: $V_{GDS}$ = −50 V
- Super low noise: NF = 1.0dB (typ.)
  ($V_{DS}$ = 10 V, $I_D$ = 0.5 mA, f = 1 kHz, $R_G$ = 1 kΩ)
- High input impedance: $I_{GSS}$ = −1 nA (max) ($V_{GS}$ = −30 V)

Unit: mm




1. DRAIN 1 4. GATE 2
2. SOURCE 5. GATE 1
3. DRAIN 2

USV

| | |
|---|---|
| JEDEC | — |
| JEITA | — |
| TOSHIBA | 2-2L1B |

Weight: 6.2 mg (typ.)

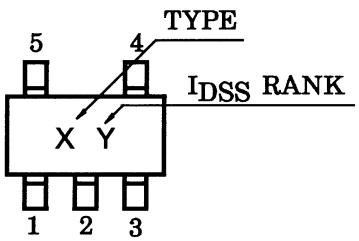
## Absolute Maximum Ratings (Ta = 25°C) (Q1, Q2 common)

| Characteristics | Symbol | Rating | Unit |
|---|---|---|---|
| Gate-drain voltage | $V_{GDS}$ | −50 | V |
| Gate current | $I_G$ | 10 | mA |
| Drain power dissipation | $P_D$ (Note 1) | 200 | mW |
| Junction temperature | $T_j$ | 125 | °C |
| Storage temperature range | $T_{stg}$ | −55~125 | °C |

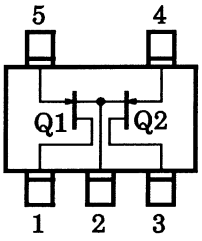
Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook (“Handling Precautions”/“Derating Concept and Methods”) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 1: Total rating

## Marking




## Pin Assignment (top view)



## Electrical Characteristics (Ta = 25°C) (Q1, Q2 common)

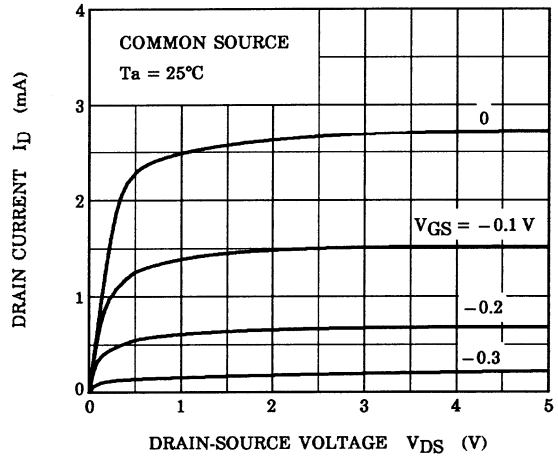
| Characteristics | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Gate cut-off current | $I_{GSS}$ | $V_{GS}$ = −30 V, $V_{DS}$ = 0 | — | — | −1.0 | nA |
| Gate-drain breakdown voltage | $V_{(BR)\ GDS}$ | $V_{DS}$ = 0, $I_G$ = −100 μA | −50 | — | — | V |
| Drain current | $I_{DSS}$ (Note) | $V_{DS}$ = 10 V, $V_{GS}$ = 0 | 1.2 | — | 14.0 | mA |
| Gate-source cut-off voltage | $V_{GS\ (OFF)}$ | $V_{DS}$ = 10 V, $I_D$ = 0.1 μA | −0.2 | — | −1.5 | V |
| Forward transfer admittance | $\|Y_{fs}\|$ | $V_{DS}$ = 10 V, $V_{GS}$ = 0, f = 1 kHz | 4.0 | 15 | — | mS |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 10 V, $V_{GS}$ = 0, f = 1 MHz | — | 13 | — | pF |
| Reverse transfer capacitance | $C_{rss}$ | $V_{DG}$ = 10 V, $I_D$ = 0, f = 1 MHz | — | 3 | — | pF |
| Noise figure | NF (1) | $V_{DS}$ = 10 V, $R_G$ = 1 kΩ, $I_D$ = 0.5 mA, f = 10 Hz | — | 5 | — | dB |
| | NF (2) | $V_{DS}$ = 10 V, $R_G$ = 1 kΩ, $I_D$ = 0.5 mA, f = 1 kHz | — | 1 | — | |

Note 2: $I_{DSS}$ classification Y (Y): 1.2~3.0 mA, GR (G): 2.6~6.5 mA, BL (L): 6.0~14.0 mA

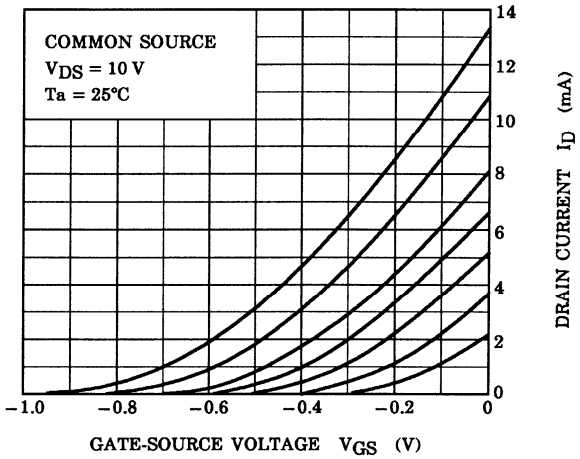
( ).....$I_{DSS}$ rank marking

**(Q1, Q2 common)**

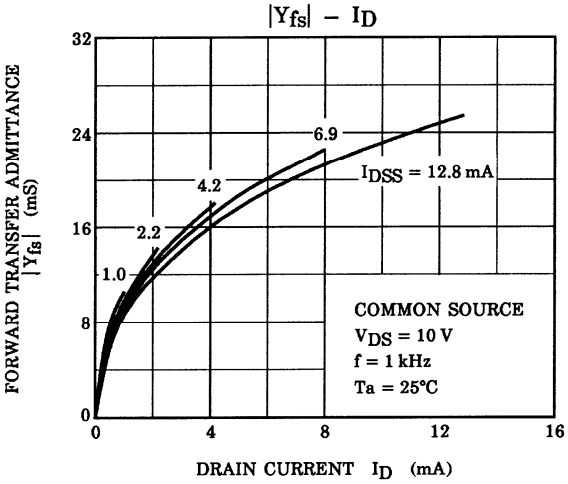
$I_D - V_{DS}$



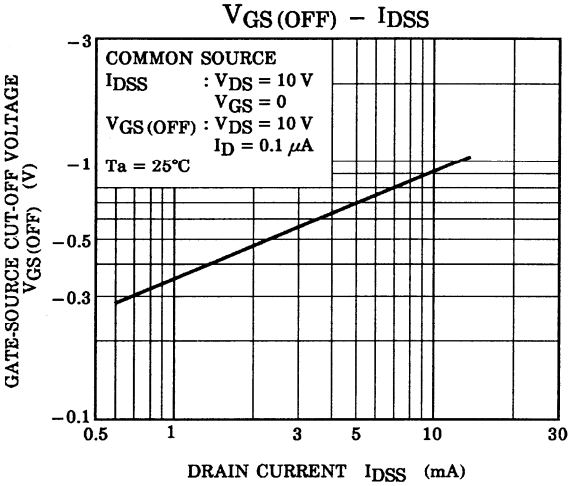

$I_D - V_{GS}$



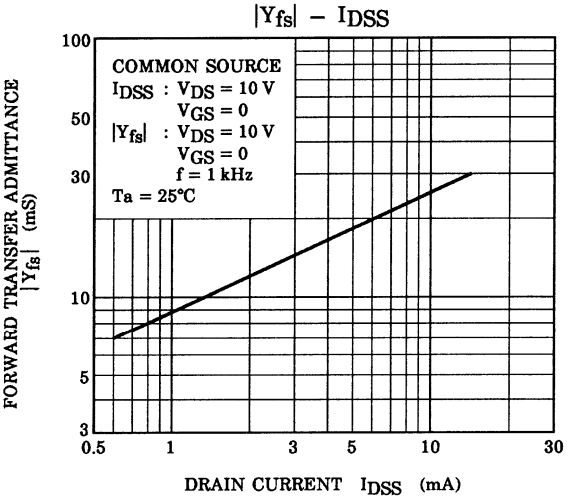

$|Y_{fs}| - I_D$



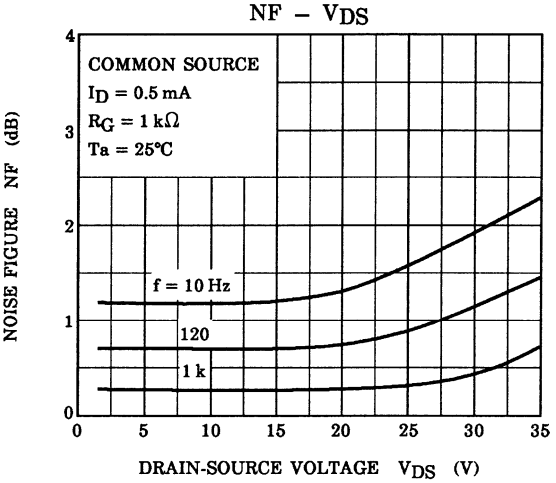

$V_{GS\,(OFF)} - I_{DSS}$




$|Y_{fs}| - I_{DSS}$

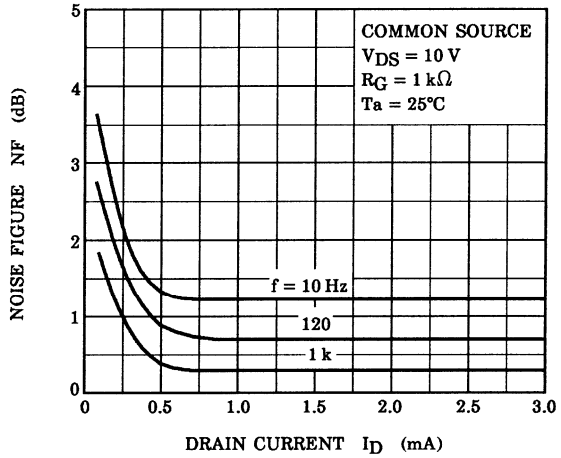



NF − $V_{DS}$

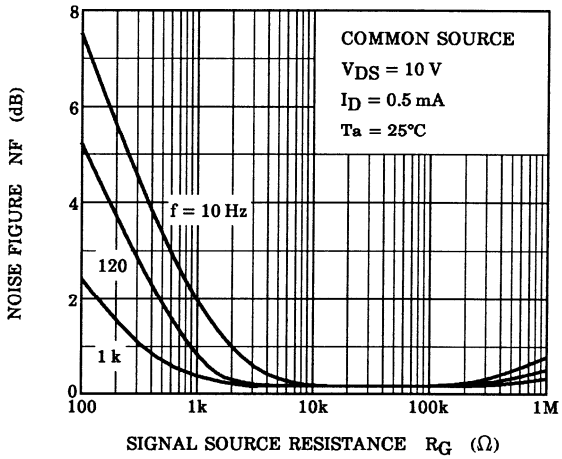


**(Q1, Q2 common)**

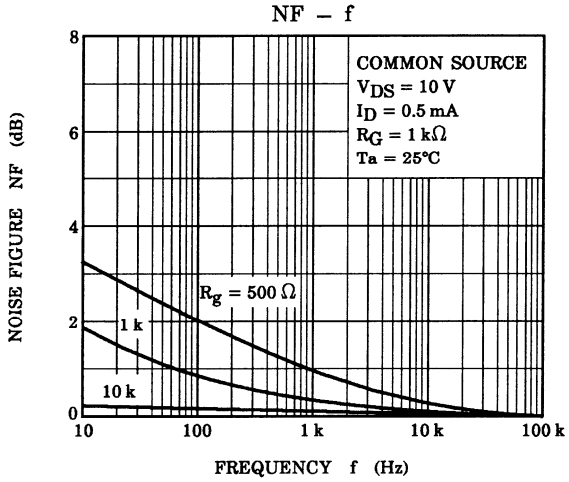
NF – $I_D$



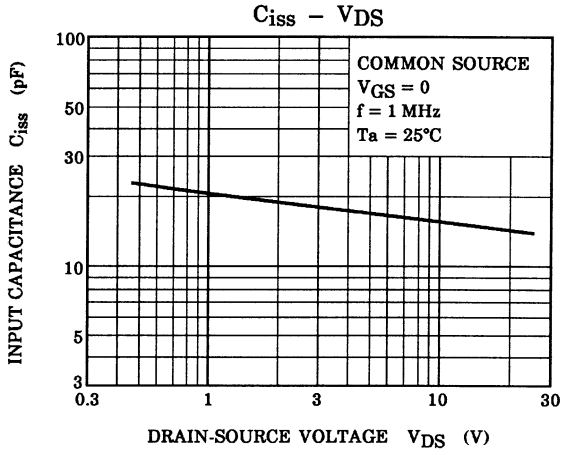

NF – $R_G$



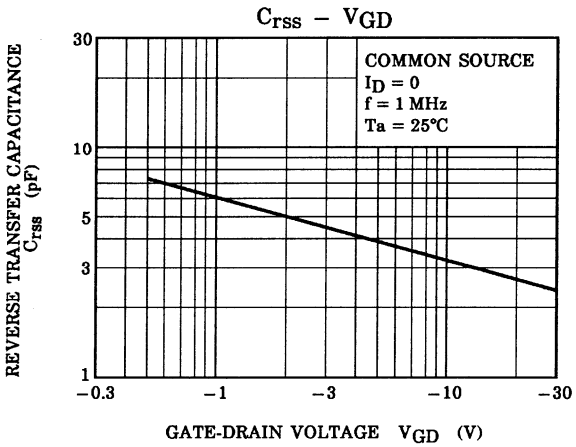

NF – f



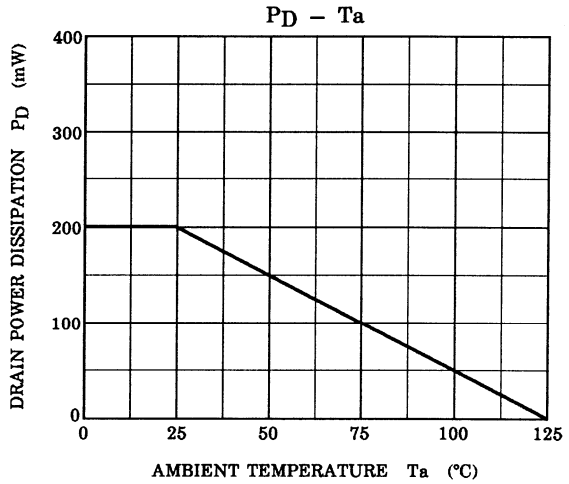

$C_{iss}$ – $V_{DS}$




$C_{rss}$ – $V_{GD}$




$P_D$ – Ta



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