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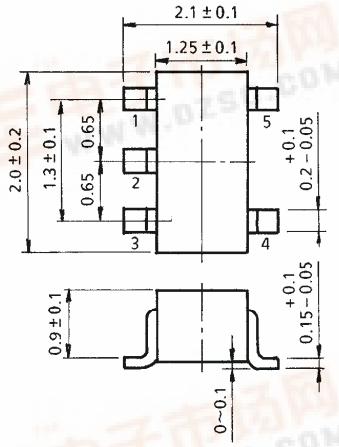
TOSHIBA FIELD EFFECT TRANSISTOR SILICON N CHANNEL JUNCTION TYPE

2SK3320

FOR LOW NOISE AUDIO AMPLIFIER APPLICATIONS

Unit in mm

- 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 = 1.0 dB (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)



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

USV	
JEDEC	—
EIAJ	—
TOSHIBA	2-2L1B

MAXIMUM RATINGS (Ta = 25°C) (Q1, Q2 COMMON)

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

* : Total Rating

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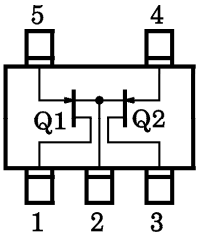
ELECTRICAL CHARACTERISTICS (Ta = 25°C) (Q1, Q2 COMMON)

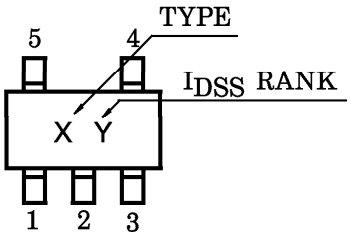
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Cut-off Current	I_{GSS}	$V_{GS} = -30$ V, $V_{DS} = 0$	—	—	−1.0	nA
Gate-Drain Breakdown Voltage	$V_{(BR)GDS}$	$V_{DS} = 0$, $I_G = -100\ \mu A$	−50	—	—	V
Drain Current	I_{DSS} (Note)	$V_{DS} = 10$ V, $V_{GS} = 0$	1.2	—	14.0	mA
Gate-Source Cut-off Voltage	$V_{GS(OFF)}$	$V_{DS} = 10$ V, $I_D = 0.1\ \mu A$	−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, $R_G = 1\ k\Omega$, $I_D = 0.5$ mA, f = 10 Hz	—	5	—	dB
	NF (2)	$V_{DS} = 10$ V, $R_G = 1\ k\Omega$, $I_D = 0.5$ mA, f = 1 kHz	—	1	—	

(Note) : 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

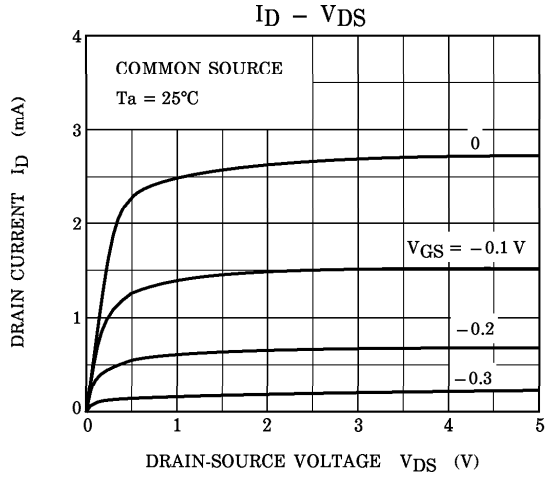
PIN ASSIGNMENT (TOP VIEW)

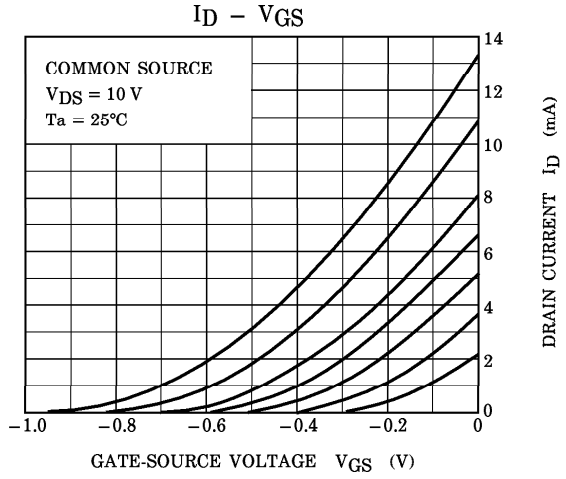


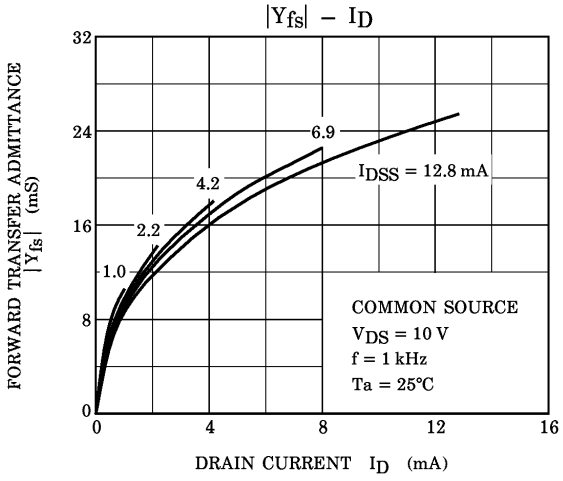
MARKING

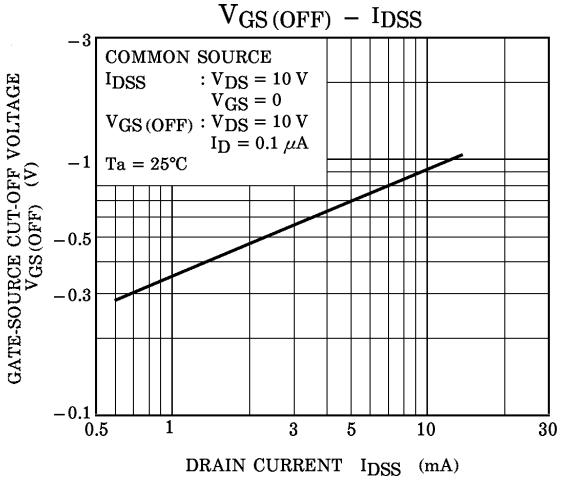


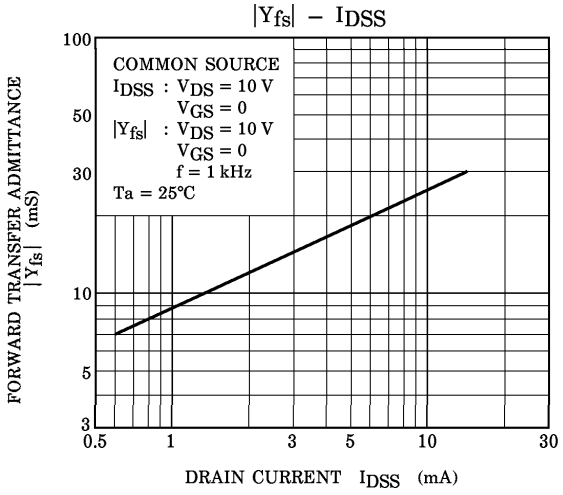
(Q1, Q2 COMMON)

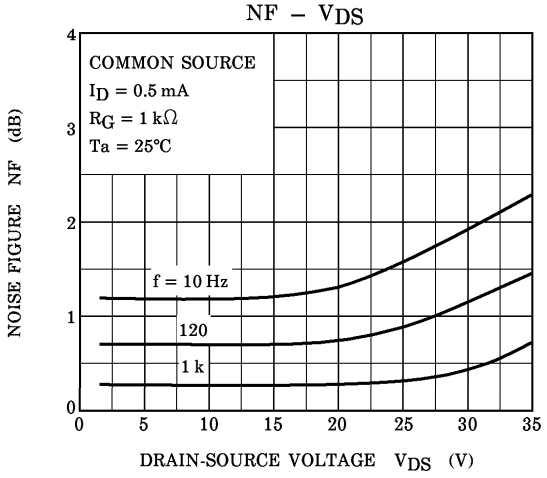

I_D – V_{DS}
COMMON SOURCE
Ta = 25°C
0
V_{GS} = –0.1 V
–0.2
–0.3
DRAIN CURRENT I_D (mA)
DRAIN-SOURCE VOLTAGE V_{DS} (V)


I_D – V_{GS}
COMMON SOURCE
V_{DS} = 10 V
Ta = 25°C
DRAIN CURRENT I_D (mA)
GATE-SOURCE VOLTAGE V_{GS} (V)

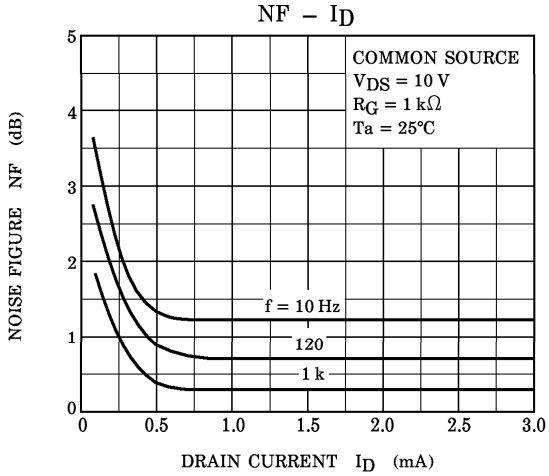

$|Y_{fs}|$ – I_D
6.9
4.2
2.2
1.0
I_{DSS} = 12.8 mA
COMMON SOURCE
V_{DS} = 10 V
f = 1 kHz
Ta = 25°C
FORWARD TRANSFER ADMITTANCE $|Y_{fs}|$ (mS)
DRAIN CURRENT I_D (mA)

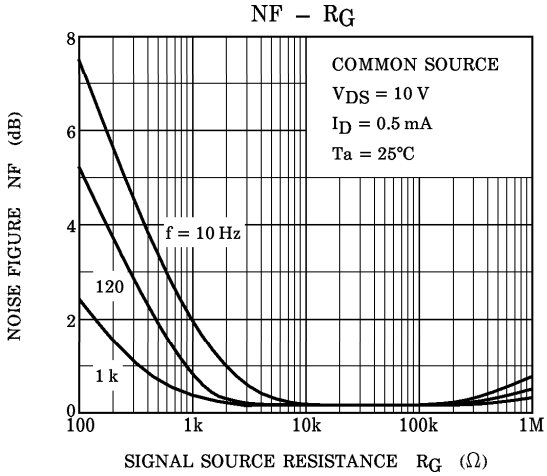

$V_{GS(OFF)}$ – I_{DSS}
COMMON SOURCE
I_{DSS} : V_{DS} = 10 V
V_{GS} = 0
$V_{GS(OFF)}$: V_{DS} = 10 V
I_D = 0.1 μA
Ta = 25°C
GATE-SOURCE CUT-OFF VOLTAGE $V_{GS(OFF)}$ (V)
DRAIN CURRENT I_{DSS} (mA)

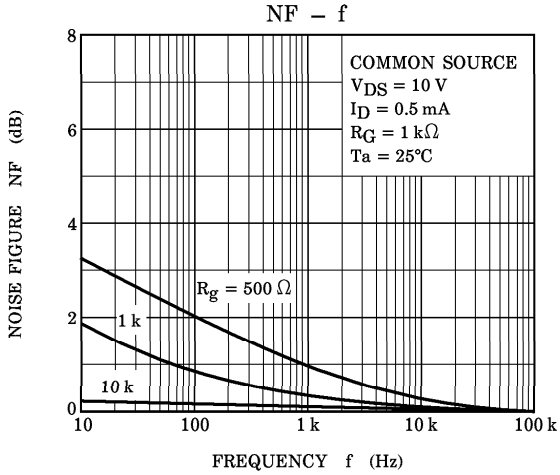

$|Y_{fs}|$ – I_{DSS}
COMMON SOURCE
I_{DSS} : V_{DS} = 10 V
V_{GS} = 0
$|Y_{fs}|$: V_{DS} = 10 V
V_{GS} = 0
f = 1 kHz
Ta = 25°C
FORWARD TRANSFER ADMITTANCE $|Y_{fs}|$ (mS)
DRAIN CURRENT I_{DSS} (mA)

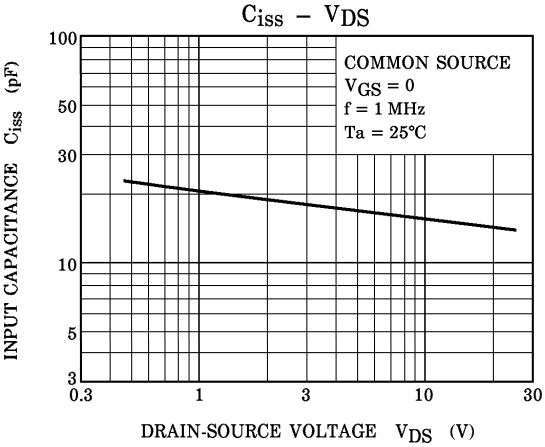

NF – V_{DS}
COMMON SOURCE
I_D = 0.5 mA
R_G = 1 kΩ
Ta = 25°C
f = 10 Hz
120
1 k
NOISE FIGURE NF (dB)
DRAIN-SOURCE VOLTAGE V_{DS} (V)

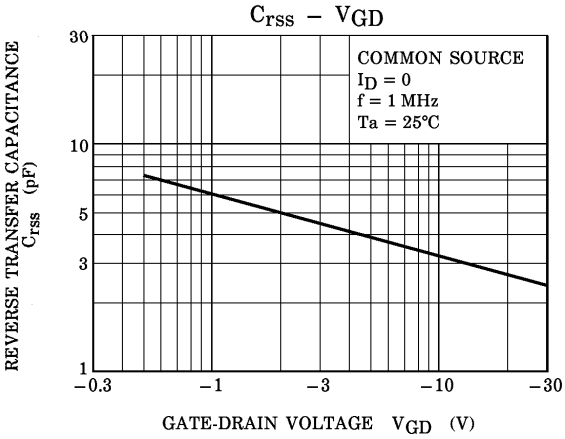
(Q1, Q2 COMMON)

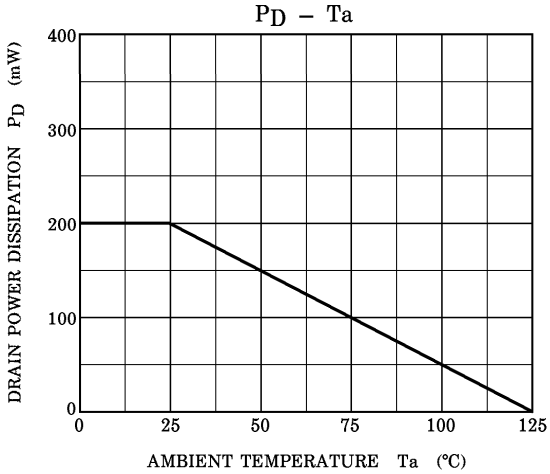

NF – ID
COMMON SOURCE
VDS = 10 V
RG = 1 kΩ
Ta = 25°C
f = 10 Hz
120
1 k
NOISE FIGURE NF (dB)
DRAIN CURRENT ID (mA)
0
0.5
1.0
1.5
2.0
2.5
3.0
1
2
3
4
5


NF – RG
COMMON SOURCE
VDS = 10 V
ID = 0.5 mA
Ta = 25°C
f = 10 Hz
120
1 k
NOISE FIGURE NF (dB)
SIGNAL SOURCE RESISTANCE RG (Ω)
100
1k
10k
100k
1M
0
2
4
6
8


NF – f
COMMON SOURCE
VDS = 10 V
ID = 0.5 mA
RG = 1 kΩ
Ta = 25°C
Rg = 500 Ω
1 k
10 k
NOISE FIGURE NF (dB)
FREQUENCY f (Hz)
10
100
1 k
10 k
100 k
0
2
4
6
8


Ciss – VDS
COMMON SOURCE
VGS = 0
f = 1 MHz
Ta = 25°C
INPUT CAPACITANCE Ciss (pF)
DRAIN-SOURCE VOLTAGE VDS (V)
0.3
1
3
10
30
3
5
10
30
50
100


Crss – VGD
COMMON SOURCE
ID = 0
f = 1 MHz
Ta = 25°C
REVERSE TRANSFER CAPACITANCE Crss (pF)
GATE-DRAIN VOLTAGE VGD (V)
−0.3
−1
−3
−10
−30
1
3
5
10
30


PD – Ta
DRAIN POWER DISSIPATION PD (mW)
AMBIENT TEMPERATURE Ta (°C)
0
25
50
75
100
125
0
100
200
300
400