3SK290

Silicon N-Channel Dual Gate MOS FET

HITACHI

ADE-208-271
1st. Edition

Application

UHF RF amplifier

Features

- Low noise figure.
  NF = 2.3 dB Typ. at f = 900 MHz
- High gain.
  PG = 19.3 dB Typ. at f = 900 MHz

Outline

CMPAK-4

1. Source
2. Gate1
3. Gate2
4. Drain

Hitachi semiconductor

Absolute Maximum Ratings (Ta = 25°C)

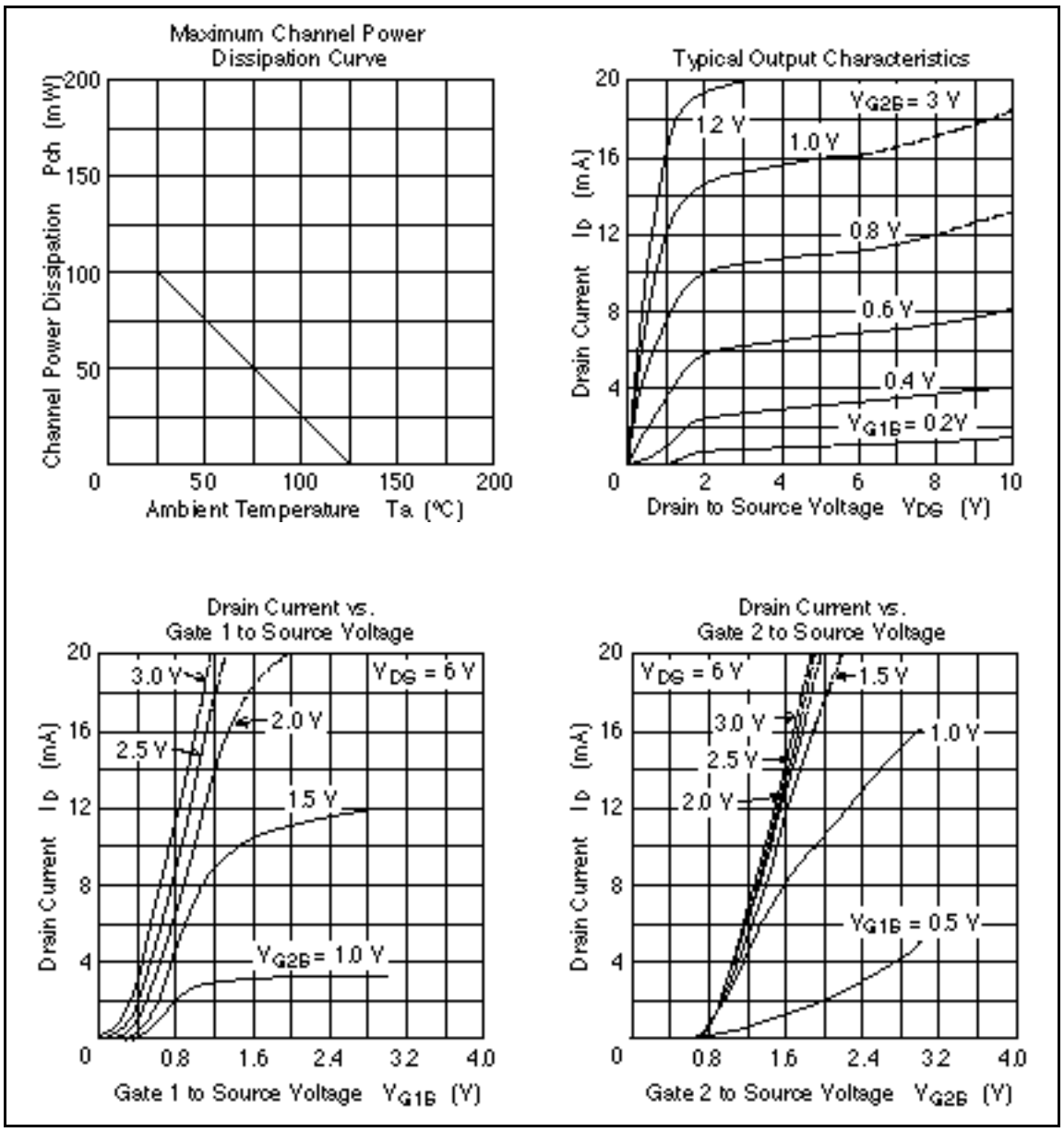
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	12	V
Gate 1 to source voltage	V_{G1S}	±8	V
Gate 2 to source voltage	V_{G2S}	±8	V
Drain current	I_D	25	mA
Channel power dissipation	Pch	100	mW
Channel temperature	Tch	125	°C
Storage temperature	Tstg	–55 to +125	°C

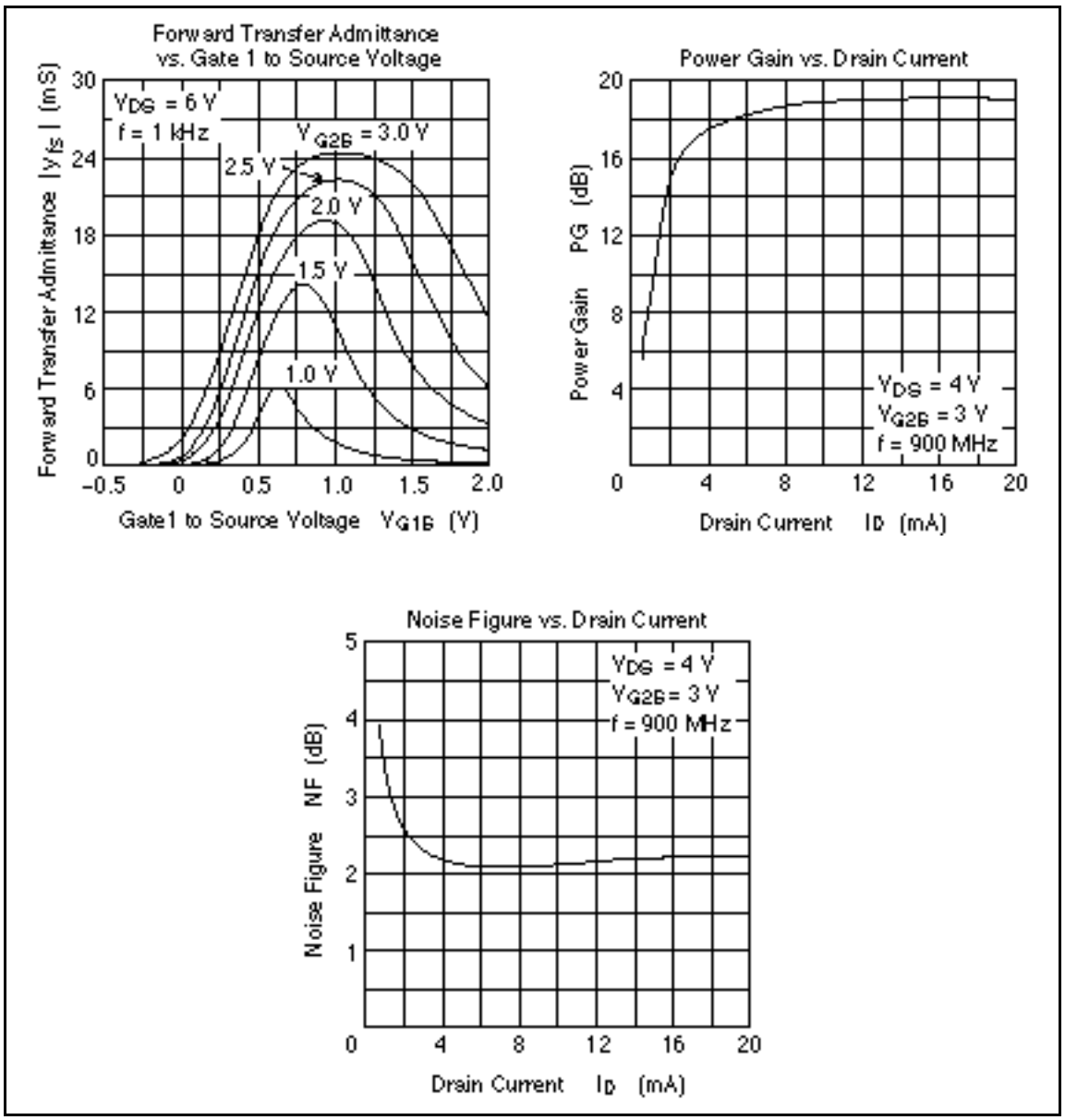
Attention: This device is very sensitive to electro static discharge.
It is recommended to adopt appropriate cautions when handling this transistor.

Electrical Characteristics (Ta = 25°C)

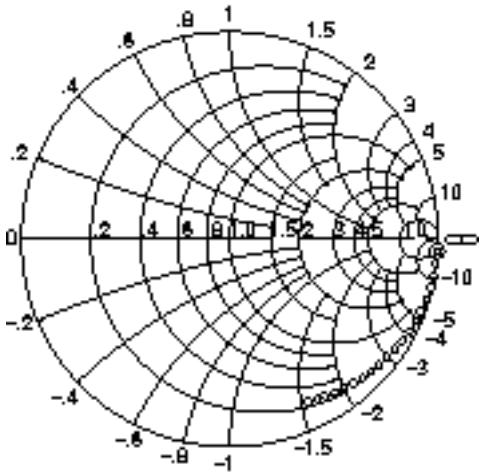
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSX}$	12	—	—	V	I_D = 200 µA, V_{G1S} = –3 V, V_{G2S} = –3 V
Gate 1 to source breakdown voltage	$V_{(BR)G1SS}$	±8	—	—	V	I_{G1} = ±10 µA, V_{G2S} = V_{DS} = 0
Gate 2 to source breakdown voltage	$V_{(BR)G2SS}$	±8	—	—	V	I_{G2} = ±10 µA, V_{G1S} = V_{DS} = 0
Gate 1 cutoff current	I_{G1SS}	—	—	±100	nA	V_{G1S} = ±6 V, V_{G2S} = V_{DS} = 0
Gate 2 cutoff current	I_{G2SS}	—	—	±100	nA	V_{G2S} = ±6 V, V_{G1S} = V_{DS} = 0
Drain current	$I_{DS(on)}$	0.5	—	10	mA	V_{DS} = 6 V, V_{G1S} = 0.5 V, V_{G2S} = 3 V
Gate 1 to source cutoff voltage	$V_{G1S(off)}$	–0.6	—	+0.5	V	V_{DS} = 10 V, V_{G2S} = 3 V, I_D = 100 µA
Gate 2 to source cutoff voltage	$V_{G2S(off)}$	0	—	+1.0	V	V_{DS} = 10 V, V_{G1S} = 3 V, I_D = 100 µA
Forward transfer admittance	$\|y_{fs}\|$	16	22	—	mS	V_{DS} = 6 V, V_{G2S} = 3 V, I_D = 10 mA, f = 1 kHz
Input capacitance	Ciss	1.2	1.8	2.2	pF	V_{DS} = 6 V, V_{G2S} = 3V, I_D = 10 mA, f = 1 MHz
Output capacitance	Coss	0.7	1.2	1.4	pF	
Reverse transfer capacitance	Crss	—	0.02	0.03	pF	
Power gain	PG	17	19.3	—	dB	V_{DS} = 4 V, V_{G2S} = 3 V, I_D = 10 mA, f = 900 MHz
Noise figure	NF	—	2.3	2.8	dB	

Note: Marking is “ZJ–”.


Maximum Channel Power Dissipation Curve
Channel Power Dissipation Pch (mW)
200
150
100
50
0
50
100
150
200
Ambient Temperature Ta (°C)
Typical Output Characteristics
Drain Current ID (mA)
20
16
12
8
4
0
2
4
6
8
10
Drain to Source Voltage VDS (V)
VG2S = 3 V
1.2 V
1.0 V
0.8 V
0.6 V
0.4 V
VG1S = 0.2V
Drain Current vs. Gate 1 to Source Voltage
Drain Current ID (mA)
VDS = 6 V
3.0 V
2.5 V
2.0 V
1.5 V
VG2S = 1.0 V
0.8
1.6
2.4
3.2
4.0
Gate 1 to Source Voltage VG1S (V)
Drain Current vs. Gate 2 to Source Voltage
Drain Current ID (mA)
VDS = 6 V
1.5 V
3.0 V
2.5 V
2.0 V
1.0 V
VG1S = 0.5 V
Gate 2 to Source Voltage VG2S (V)

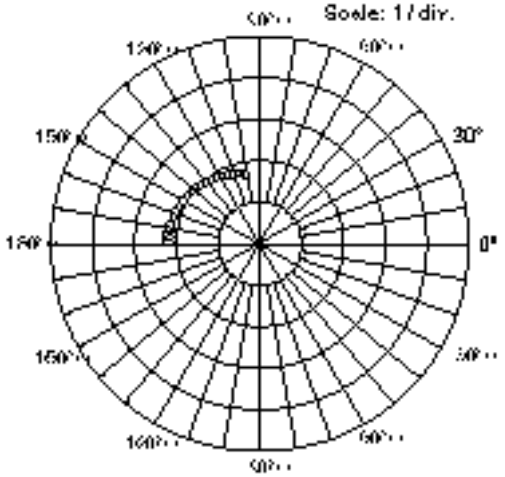

Forward Transfer Admittance
vs. Gate 1 to Source Voltage
Forward Transfer Admittance |Yfs| (mS)
VDS = 6 V
f = 1 kHz
VG2B = 3.0 V
2.5 V
2.0 V
1.5 V
1.0 V
Gate1 to Source Voltage VG1B (V)
Power Gain vs. Drain Current
Power Gain PG (dB)
VDS = 4 V
VG2B = 3 V
f = 900 MHz
Drain Current ID (mA)
Noise Figure vs. Drain Current
Noise Figure NF (dB)
VDS = 4 V
VG2B = 3 V
f = 900 MHz
Drain Current ID (mA)

S11 Parameter vs. Frequency



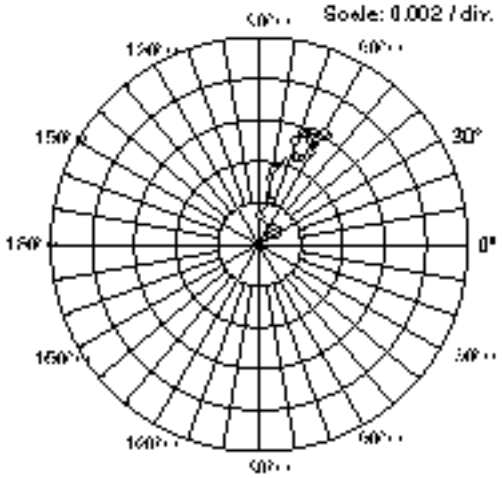
Condition: V_{DS} = 4 V, V_{G2S} = 3 V
I_D = 10 mA, Z_o = 50 Ω
50 to 1000 MHz (50 MHz step)

S21 Parameter vs. Frequency



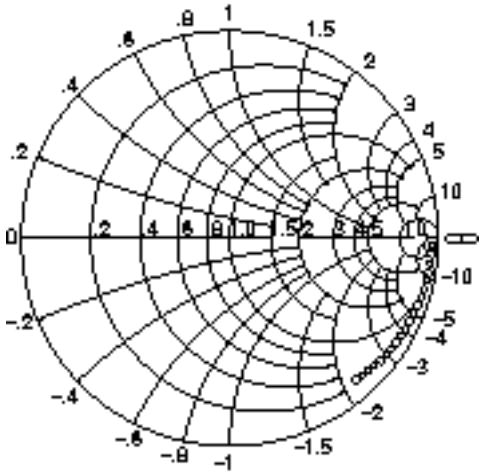
Condition: V_{DS} = 4 V, V_{G2S} = 3 V
I_D = 10 mA, Z_o = 50 Ω
50 to 1000 MHz (50 MHz step)

S12 Parameter vs. Frequency



Condition: V_{DS} = 4 V, V_{G2S} = 3 V
I_D = 10 mA, Z_o = 50 Ω
50 to 1000 MHz (50 MHz step)

S22 Parameter vs. Frequency



Condition: V_{DS} = 4 V, V_{G2S} = 3 V
I_D = 10 mA, Z_o = 50 Ω
50 to 1000 MHz (50 MHz step)

S Parameter (V_{DS} = 4 V, V_{G2S} = 3 V, I_D = 10 mA, Z_O = 50 Ω)

Freq.	S11		S21		S12		S22	
(MHz)	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
50	0.998	–3.3	2.17	176	0.001	41.3	0.971	–1.9
100	0.994	–6.7	2.20	172	0.001	88.9	0.971	–4.5
150	0.997	–10.2	2.19	168	0.002	74.4	0.970	–7.1
200	0.991	–13.5	2.17	163	0.003	81.6	0.969	–9.8
250	0.993	–16.9	2.16	159	0.004	79.7	0.967	–12.1
300	0.980	–20.8	2.12	155	0.004	72.6	0.965	–14.8
350	0.976	–23.7	2.10	151	0.005	66.9	0.962	–17.3
400	0.971	–27.0	2.08	146	0.005	70.9	0.959	–19.7
450	0.962	–30.7	2.05	142	0.006	67.7	0.956	–22.1
500	0.955	–33.7	2.03	139	0.006	63.9	0.953	–24.8
550	0.945	–36.9	1.99	135	0.006	64.1	0.950	–27.2
600	0.939	–40.2	1.96	131	0.006	63.9	0.946	–29.5
650	0.927	–43.3	1.93	127	0.006	59.9	0.942	–32.1
700	0.925	–46.5	1.90	123	0.006	60.0	0.939	–34.6
750	0.911	–49.4	1.87	120	0.006	58.3	0.933	–36.7
800	0.901	–52.3	1.84	116	0.006	60.3	0.930	–39.1
850	0.893	–55.9	1.81	112	0.005	62.0	0.925	–41.5
900	0.881	–59.0	1.78	108	0.005	61.2	0.921	–43.8
950	0.876	–61.5	1.75	105	0.005	65.0	0.917	–46.1
1000	0.869	–64.3	1.71	102	0.005	68.8	0.913	–48.4

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