To all our customers

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The semiconductor operations of Mitsubishi Electric and Hitachi were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Hitachi, Hitachi, Ltd., Hitachi Semiconductors, and other Hitachi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

Cautions

3SK290

Silicon N-Channel Dual Gate MOS FET

ADE-208-271
1st. Edition

Application

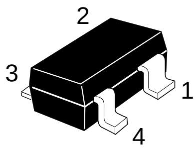
UHF RF amplifier

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

Absolute Maximum Ratings (Ta = 25°C)

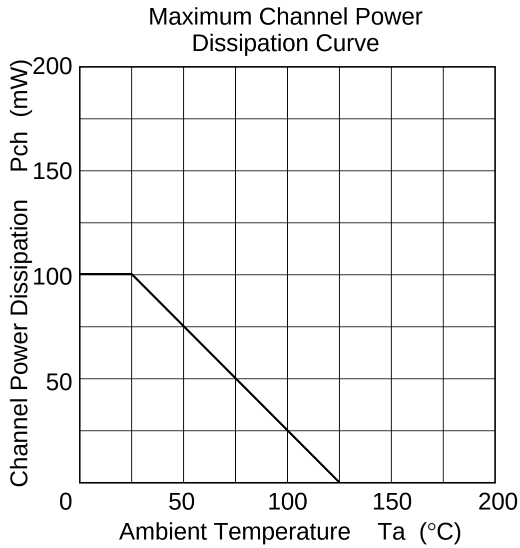
Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	12	V
Gate 1 to source voltage	V_{G1S}	±8	V
Gate 2 to source voltage	V_{G2S}	±8	V
Drain current	I_D	25	mA
Channel power dissipation	Pch	100	mW
Channel temperature	Tch	125	°C
Storage temperature	Tstg	–55 to +125	°C

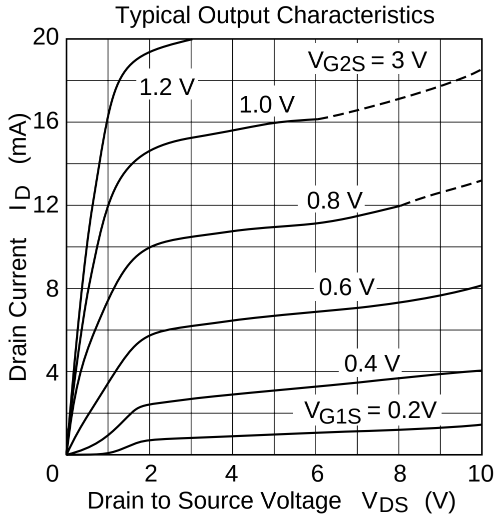
Attention: This device is very sensitive to electro static discharge.
It is recommended to adopt appropriate cautions when handling this transistor.

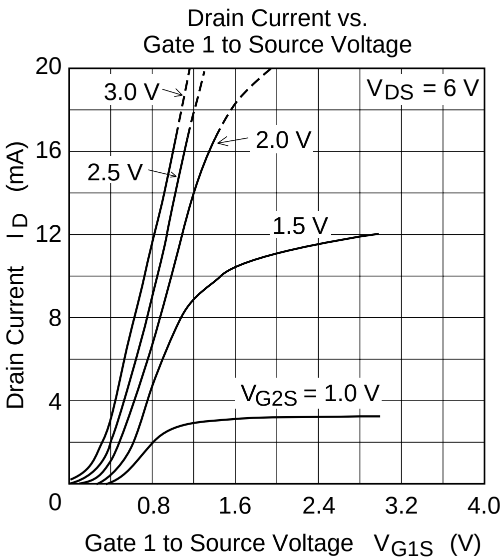
Electrical Characteristics (Ta = 25°C)

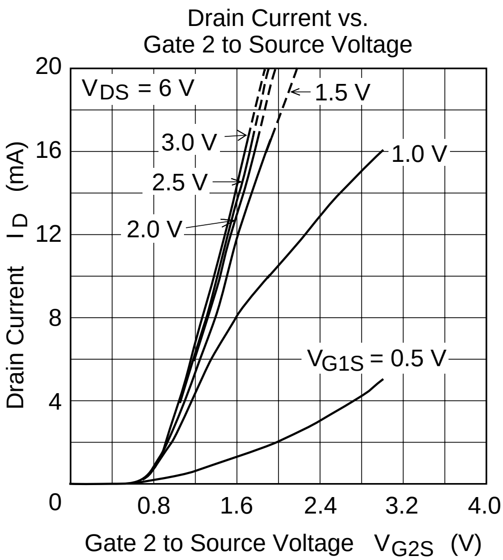
Item	Symbol	Min	Typ	Max	Unit	Test conditions
Drain to source breakdown voltage	$V_{(BR)DSX}$	12	—	—	V	I_D = 200 µA, V_{G1S} = –3 V, V_{G2S} = –3 V
Gate 1 to source breakdown voltage	$V_{(BR)G1SS}$	±8	—	—	V	I_{G1} = ±10 µA, V_{G2S} = V_{DS} = 0
Gate 2 to source breakdown voltage	$V_{(BR)G2SS}$	±8	—	—	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–”.

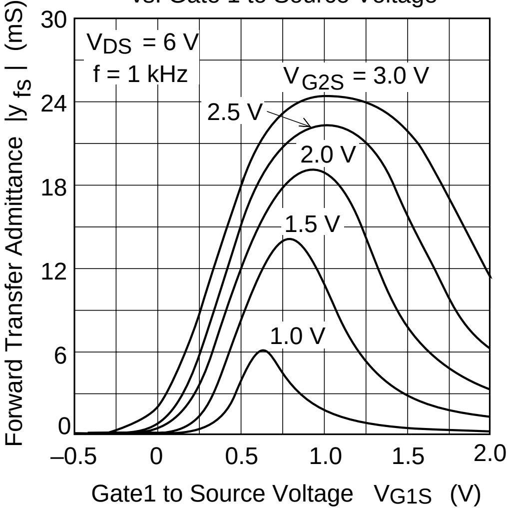

Maximum Channel Power Dissipation Curve
Channel Power Dissipation Pch (mW)
200
150
100
50
0
50
100
150
200
Ambient Temperature Ta (°C)


Typical Output Characteristics
Drain Current I_D (mA)
VG2S = 3 V
1.2 V
1.0 V
0.8 V
0.6 V
0.4 V
VG1S = 0.2V
20
16
12
8
4
0
2
4
6
8
10
Drain to Source Voltage VDS (V)

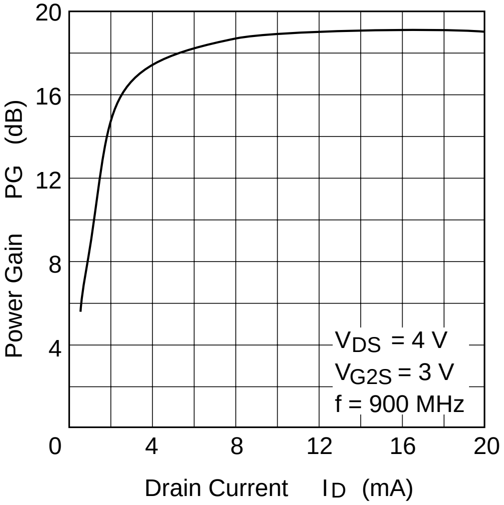

Drain Current vs. Gate 1 to Source Voltage
Drain Current I_D (mA)
VDS = 6 V
3.0 V
2.5 V
2.0 V
1.5 V
VG2S = 1.0 V
20
16
12
8
4
0
0.8
1.6
2.4
3.2
4.0
Gate 1 to Source Voltage VG1S (V)


Drain Current vs. Gate 2 to Source Voltage
Drain Current I_D (mA)
VDS = 6 V
1.5 V
3.0 V
2.5 V
2.0 V
1.0 V
VG1S = 0.5 V
20
16
12
8
4
0
0.8
1.6
2.4
3.2
4.0
Gate 2 to Source Voltage VG2S (V)

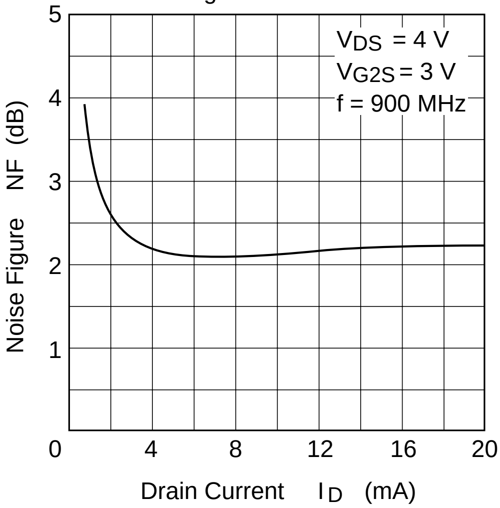
Forward Transfer Admittance vs. Gate 1 to Source Voltage



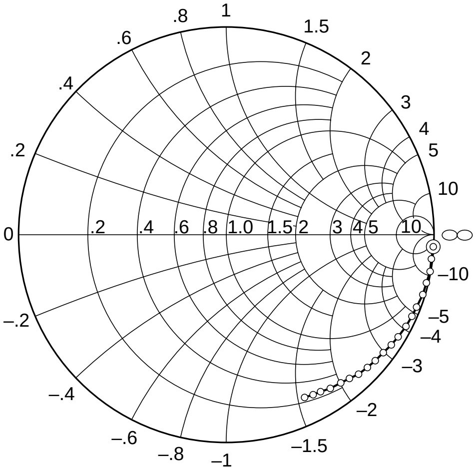
Power Gain vs. Drain Current



Noise Figure vs. Drain Current

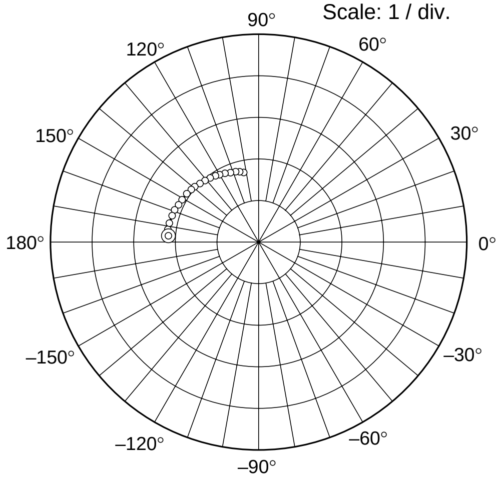


S11 Parameter vs. Frequency



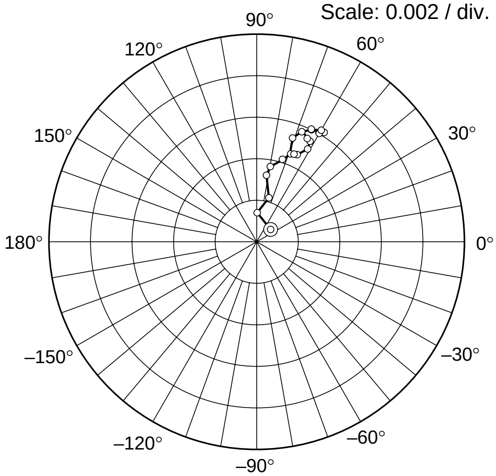
Condition: V_{DS} = 4 V , V_{G2S} = 3 V
I_D = 10 mA , Zo = 50 Ω
50 to 1000 MHz (50 MHz step)

S21 Parameter vs. Frequency



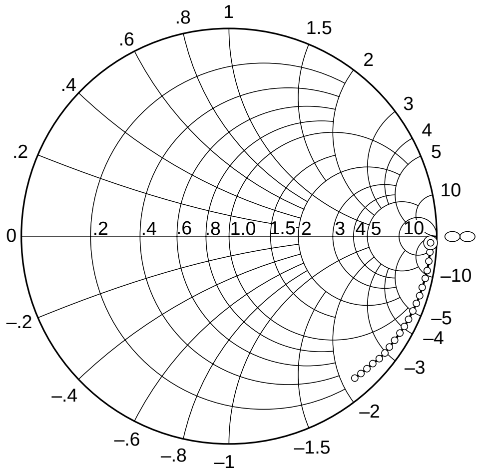
Condition: V_{DS} = 4 V , V_{G2S} = 3 V
I_D = 10 mA , Zo = 50 Ω
50 to 1000 MHz (50 MHz step)

S12 Parameter vs. Frequency



Condition: V_{DS} = 4 V , V_{G2S} = 3 V
I_D = 10 mA , Zo = 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 , Zo = 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)

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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HITACHI

Hitachi, Ltd.
Semiconductor & IC Div.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100, Japan
Tel: Tokyo (03) 3270-2111
Fax: (03) 3270-5109

For further information write to:

Hitachi America, Ltd.
Semiconductor & IC Div.
2000 Sierra Point Parkway
Brisbane, CA. 94005-1835
U S A
Tel: 415-589-8300
Fax: 415-583-4207

Hitachi Europe GmbH
Electronic Components Group
Continental Europe
Dornacher Straße 3
D-85622 Feldkirchen
München
Tel: 089-9 91 80-0
Fax: 089-9 29 30 00

Hitachi Europe Ltd.
Electronic Components Div.
Northern Europe Headquarters
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA
United Kingdom
Tel: 0628-585000
Fax: 0628-778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 0104
Tel: 535-2100
Fax: 535-1533

Hitachi Asia (Hong Kong) Ltd.
Unit 706, North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon
Hong Kong
Tel: 27359218
Fax: 27306071

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