BB506C

Built in Biasing Circuit MOS FET IC
UHF RF Amplifier

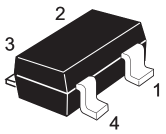
REJ03G1246-0100
Rev.1.00
Jun. 27, 2005

Features

- Built in Biasing Circuit; To reduce using parts cost & PC board space.
- High gain
  PG = 24 dB typ. (f = 900 MHz)
- Low noise
  NF = 1.4 dB typ. (f = 900 MHz)
- Low output capacitance
  Coss = 1.1 pF typ. (f = 1 MHz)
- Provide mini mold packages: CMPAK-4 (SOT-343mod)

Outline

RENESAS Package code: PTSP0004ZA-A
(Package name: CMPAK-4)



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

Notes: 1. Marking is “FS-“.
2. BB506C is individual type number of RENESAS BBFET.

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	Ratings	Unit
Drain to source voltage	V_{DS}	6	V
Gate1 to source voltage	V_{G1S}	+6 –0	V
Gate2 to source voltage	V_{G2S}	+6 –0	V
Drain current	I_D	30	mA
Channel power dissipation	Pch[Note3]	250	mW
Channel temperature	Tch	150	°C
Storage temperature	Tstg	–55 to +150	°C

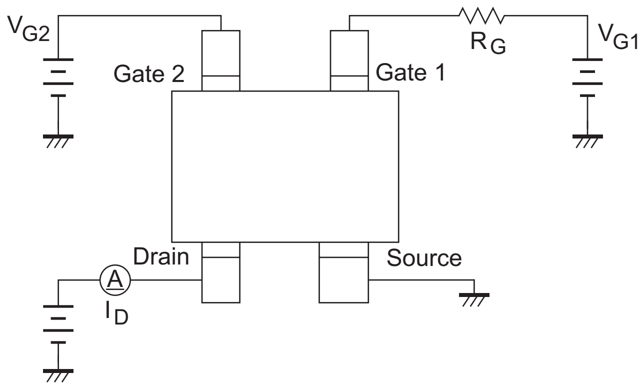
Notes: 3. Value on the glass epoxy board (50 mm × 40 mm × 1 mm).

Electrical Characteristics

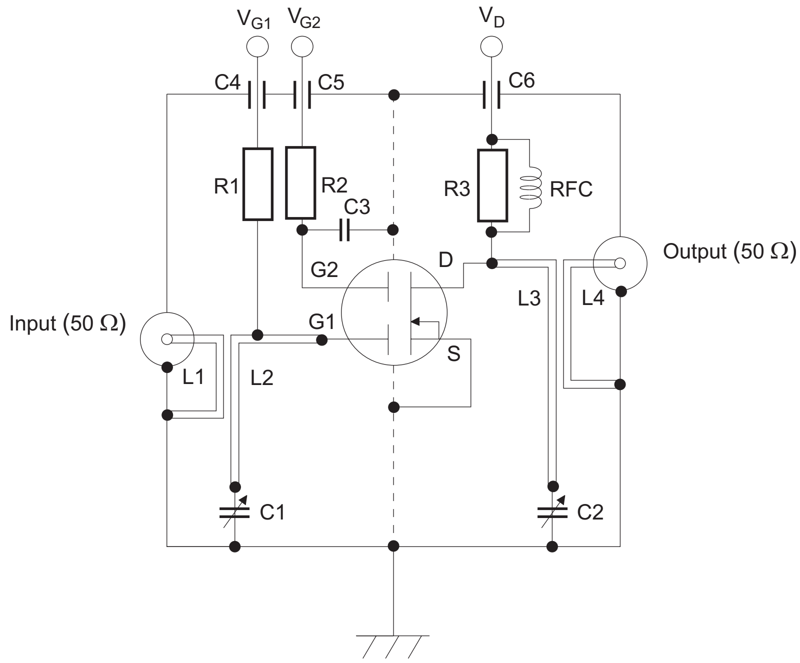
(Ta = 25°C)

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain to source breakdown voltage	$V_{(BR)DSS}$	6	—	—	V	I_D = 200 µA, V_{G1S} = V_{G2S} = 0
Gate1 to source breakdown voltage	$V_{(BR)G1SS}$	+6	—	—	V	I_{G1} = +10 µA, V_{G2S} = V_{DS} = 0
Gate2 to source breakdown voltage	$V_{(BR)G2SS}$	+6	—	—	V	I_{G2} = +10 µA, V_{G1S} = V_{DS} = 0
Gate1 to source cutoff current	I_{G1SS}	—	—	+100	nA	V_{G1S} = +5 V, V_{G2S} = V_{DS} = 0
Gate2 to source cutoff current	I_{G2SS}	—	—	+100	nA	V_{G2S} = +5 V, V_{G1S} = V_{DS} = 0
Gate1 to source cutoff voltage	$V_{G1S(off)}$	0.5	0.8	1.1	V	V_{DS} = 5 V, V_{G2S} = 4 V, I_D = 100 µA
Gate2 to source cutoff voltage	$V_{G2S(off)}$	0.4	0.7	1.0	V	V_{DS} = 5 V, V_{G1S} = 5 V, I_D = 100 µA
Drain current	$I_{D(op)}$	12	16	20	mA	V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V R_G = 100 kΩ
Forward transfer admittance	$\|y_{fs}\|$	27	32	38	mS	V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V R_G = 100 kΩ, f = 1 kHz
Input capacitance	C_{iss}	1.2	1.6	2.0	pF	V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V R_G = 100 kΩ, f = 1 MHz
Output capacitance	C_{oss}	0.7	1.1	1.5	pF	
Power gain	PG	19	24	29	dB	V_{DS} = 5 V, V_{G1} = 5V, V_{G2S} = 4 V R_G = 100 kΩ, f = 900 MHz
Noise figure	NF	—	1.4	2.1	dB	

Bias Circuit for Operating Items ($I_{D(op)}$, $|y_{fs}|$, Ciss, Coss, NF, PG)

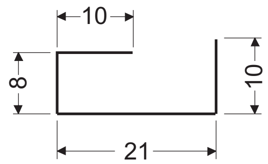


900 MHz Power Gain, Noise Figure Test Circuit



C1, C2 : Variable Capacitor (10 pF MAX)
C3 : Disk Capacitor (1000 pF)
C4 to C6 : Air Capacitor (1000 pF)
R1 : 100 kΩ
R2 : 47 kΩ
R3 : 4.7 kΩ

L1:



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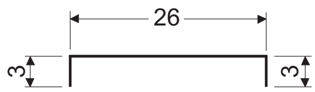
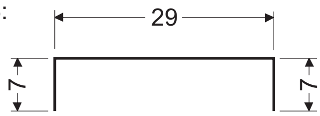
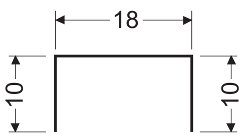


(ϕ1 mm Copper wire)
Unit : mm

L3:

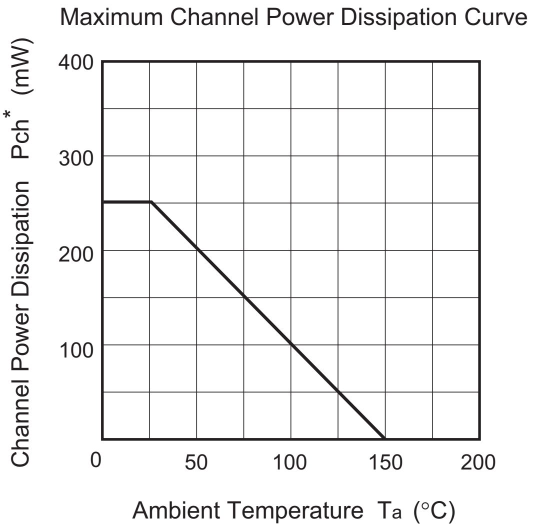


L4:

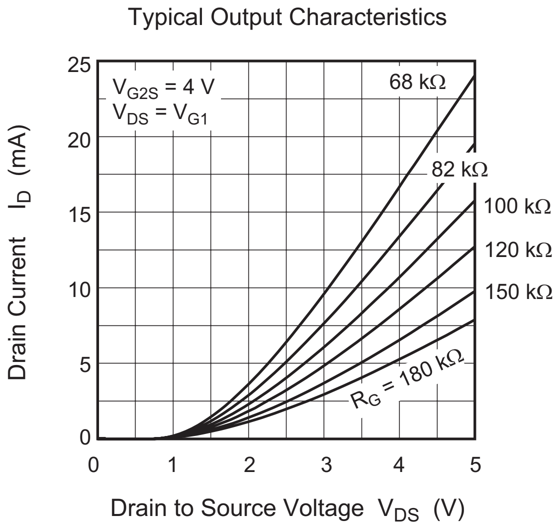


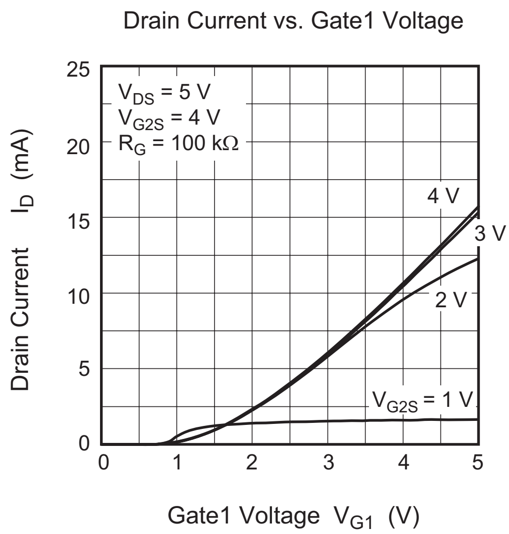
RFC : f1 mm Copper wire with enamel 4 turns inside dia 6 mm

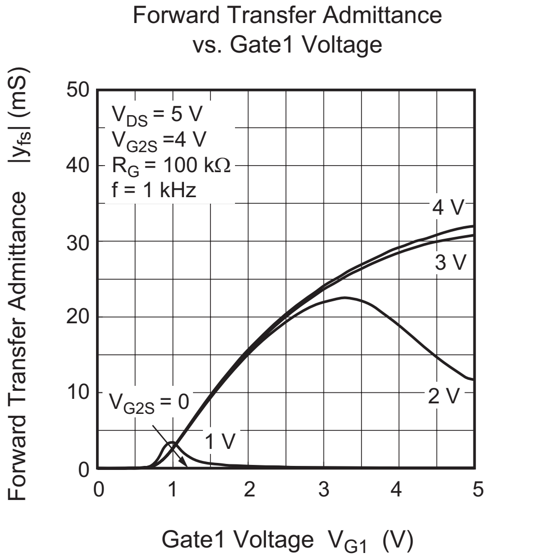
Main Characteristics

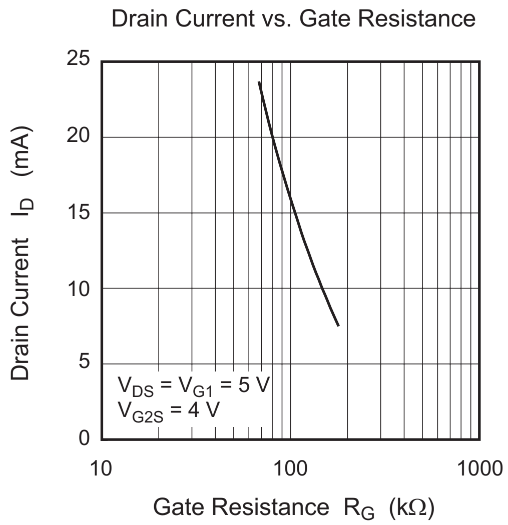


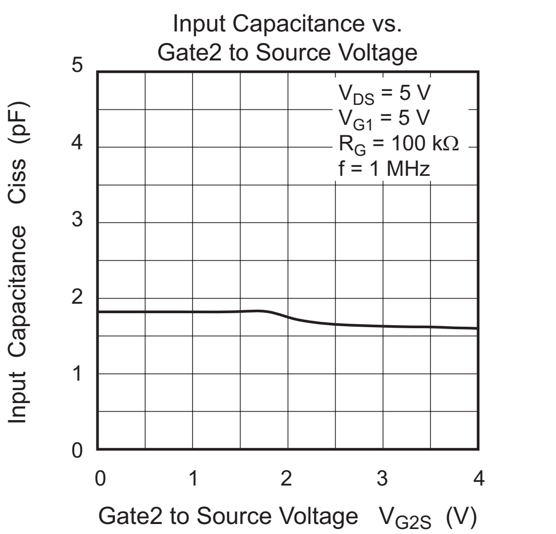
* Value on the glass epoxy board (50 mm × 40 mm × 1 mm)

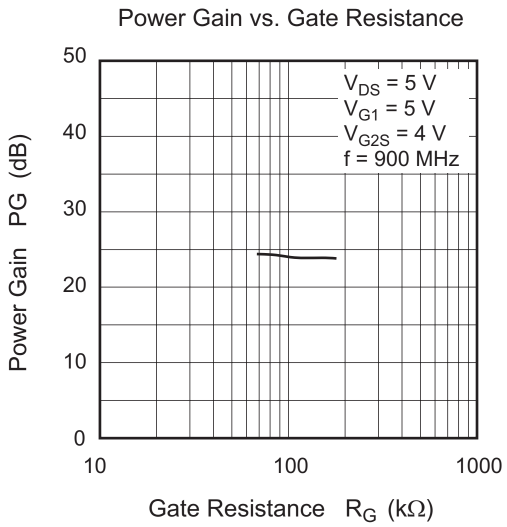


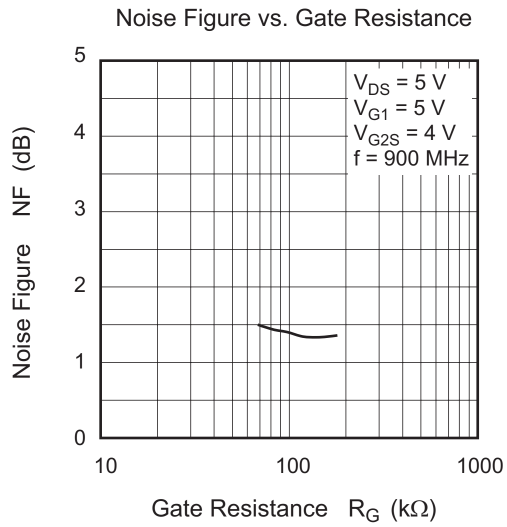


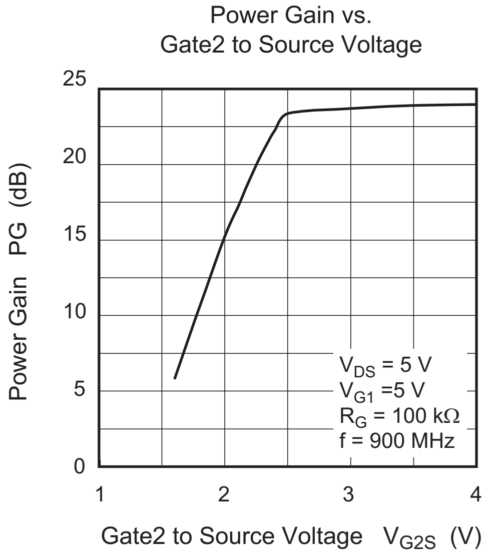


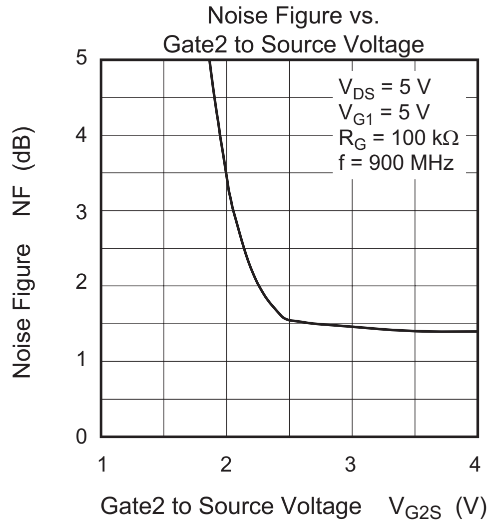


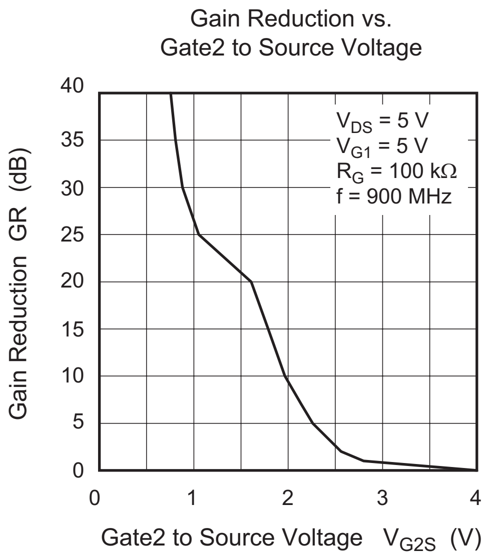



Power Gain vs. Gate Resistance
V_{DS} = 5 V
V_{G1} = 5 V
V_{G2S} = 4 V
f = 900 MHz
Power Gain PG (dB)
Gate Resistance R_G (kΩ)
0
10
20
30
40
50
10
100
1000

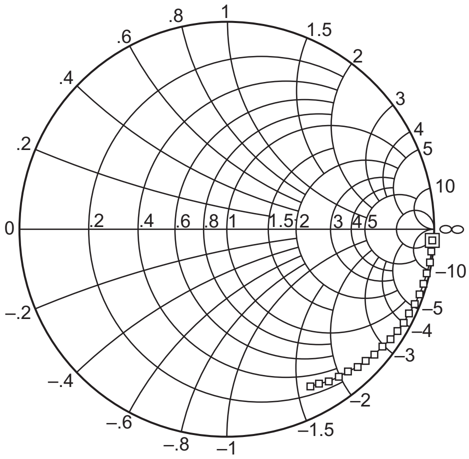

Noise Figure vs. Gate Resistance
V_{DS} = 5 V
V_{G1} = 5 V
V_{G2S} = 4 V
f = 900 MHz
Noise Figure NF (dB)
Gate Resistance R_G (kΩ)
0
1
2
3
4
5
10
100
1000


Power Gain vs.
Gate2 to Source Voltage
V_{DS} = 5 V
V_{G1} =5 V
R_G = 100 kΩ
f = 900 MHz
Power Gain PG (dB)
Gate2 to Source Voltage V_{G2S} (V)
0
5
10
15
20
25
1
2
3
4


Noise Figure vs.
Gate2 to Source Voltage
V_{DS} = 5 V
V_{G1} = 5 V
R_G = 100 kΩ
f = 900 MHz
Noise Figure NF (dB)
Gate2 to Source Voltage V_{G2S} (V)
0
1
2
3
4
5
1
2
3
4


Gain Reduction vs.
Gate2 to Source Voltage
V_{DS} = 5 V
V_{G1} = 5 V
R_G = 100 kΩ
f = 900 MHz
Gain Reduction GR (dB)
Gate2 to Source Voltage V_{G2S} (V)
0
5
10
15
20
25
30
35
40
0
1
2
3
4

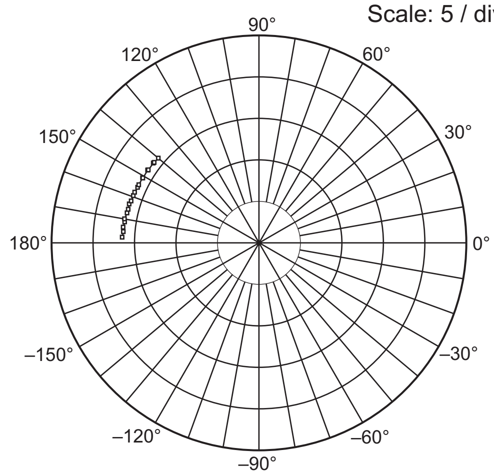
S_{11} Parameter vs. Frequency



Test condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{GS2} = 4 V, R_G = 100 kΩ
0.05 to 1.05 GHz (0.05 GHz step)

S_{21} Parameter vs. Frequency

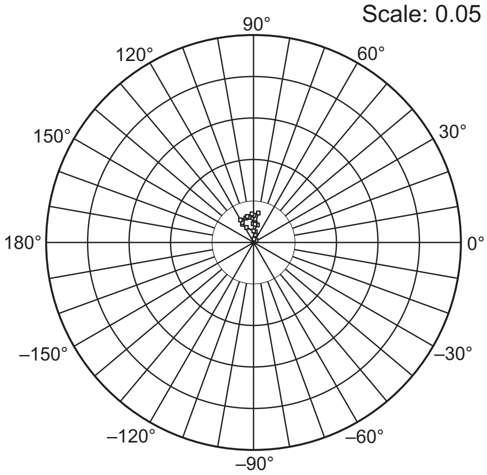
Scale: 5 / div.



Test condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{GS2} = 4 V, R_G = 100 kΩ
0.05 to 1.05 GHz (0.05 GHz step)

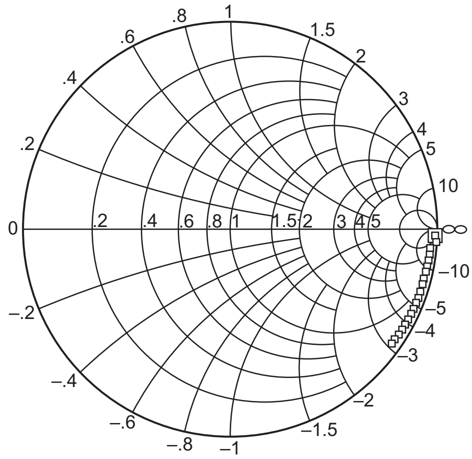
S_{12} Parameter vs. Frequency

Scale: 0.05 / div.



Test condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{GS2} = 4 V, R_G = 100 kΩ
0.05 to 1.05 GHz (0.05 GHz step)

S_{22} Parameter vs. Frequency



Test condition: V_{DS} = 5 V, V_{G1} = 5 V, V_{GS2} = 4 V, R_G = 100 kΩ
0.05 to 1.05 GHz (0.05 GHz step)

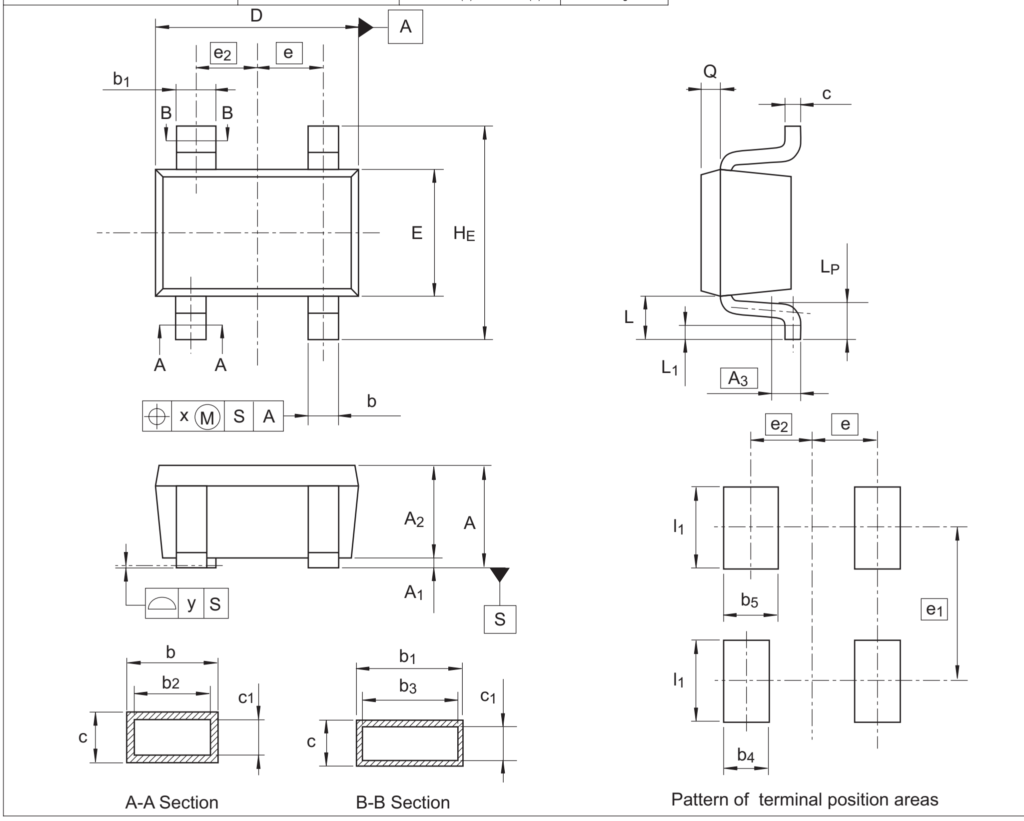
S parameter

(V_{DS} = 5 V, V_{G1} = 5 V, V_{G2S} = 4 V, R_G = 100 kΩ, Zo = 50 Ω)

Freq (MHz)	S11		S21		S12		S22	
	Mag	Deg	Mag	Deg	Mag	Deg	Mag	Deg
50	0.995	-3.3	3.28	177.9	0.001	17.6	0.991	-1.8
100	0.991	-6.2	3.26	175.5	0.001	75.6	0.996	-3.6
150	0.992	-9.3	3.28	173.7	0.002	73.8	0.995	-5.2
200	0.987	-12.4	3.26	171.3	0.002	79.5	0.997	-7.0
250	0.984	-15.5	3.27	170.0	0.004	116.5	0.995	-8.6
300	0.981	-18.6	3.24	167.3	0.003	89.6	0.993	-10.3
350	0.975	-21.7	3.23	165.8	0.004	76.3	0.992	-11.8
400	0.967	-24.8	3.24	163.3	0.004	87.0	0.989	-13.9
450	0.964	-27.9	3.22	161.9	0.004	91.9	0.991	-15.5
500	0.958	-30.8	3.22	159.4	0.006	89.0	0.987	-17.0
550	0.951	-33.9	3.22	157.9	0.006	100.4	0.988	-18.9
600	0.939	-37.0	3.20	155.4	0.004	84.2	0.985	-20.4
650	0.933	-40.3	3.20	154.1	0.004	85.4	0.984	-22.2
700	0.922	-43.5	3.20	150.7	0.007	80.4	0.983	-23.7
750	0.916	-46.5	3.19	150.7	0.007	93.5	0.981	-25.5
800	0.900	-49.6	3.19	146.7	0.006	108.8	0.979	-27.2
850	0.892	-52.8	3.18	146.4	0.005	122.9	0.978	-28.9
900	0.883	-56.2	3.18	142.8	0.005	120.3	0.975	-30.6
950	0.866	-59.2	3.17	142.3	0.006	104.0	0.970	-32.3
1000	0.858	-62.0	3.16	139.8	0.006	121.3	0.970	-33.8

Package Dimensions

JEITA Package Code	RENESAS Code	Package Name	MASS[Typ.]
SC-82A	PTSP0004ZA-A	CMPAK-4(T) / CMPAK-4(T)V	0.006g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	0.8	—	1.1
A_1	0	—	0.1
A_2	0.8	0.9	1.0
$\boxed{A_3}$	—	0.25	—
b	0.25	0.32	0.4
b_1	0.35	0.42	0.5
b_2	—	0.3	—
b_3	—	0.4	—
c	0.1	0.13	0.15
c_1	—	0.11	—
D	1.8	2.0	2.2
E	1.15	1.25	1.35
$\boxed{e}$	—	0.65	—
$\boxed{e_2}$	—	0.6	—
H_E	1.8	2.1	2.4
L	0.3	—	0.7
L_1	0.1	—	0.5
L_P	0.2	—	0.6
x	—	—	0.05
y	—	—	0.05
b_4	—	—	0.45
b_5	—	—	0.55
$\boxed{e_1}$	—	1.5	—
l_1	—	—	0.9
Q	—	0.2	—

Ordering Information

Part Name	Quantity	Shipping Container
BB506CFS-	3000	Taping

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

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http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

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Colophon .3.0