

TOSHIBA

MICROWAVE SEMICONDUCTOR

TECHNICAL DATA

MICROWAVE POWER GaAs FET

JS8850A-AS

FEATURES:

- HIGH POWER
 $P_{1dB} = 21.5 \text{ dBm}$ at $f = 15 \text{ GHz}$
- HIGH GAIN
 $G_{1dB} = 9.0 \text{ dB}$ at $f = 15 \text{ GHz}$
- SUITABLE FOR Ku-BAND AMPLIFIER
- ION IMPLANTATION
- CHIP FORM

RF PERFORMANCE SPECIFICATIONS ($T_a = 25^\circ \text{C}$)

CHARACTERISTIC	SYMBOL	CONDITION		UNIT	MIN.	TYP.	MAX.
		f	V _{DS}				
Output Power at 1dB Compression Point	P _{1dB}	15GHz	10V	dBm	20.5	21.5	-
			8V		-	20.5	-
		18GHz	10V		-	21.0	-
			8V		-	20.0	-
Power Gain at 1dB Compression Point	G _{1dB}	15GHz	10V	dB	8.0	9.0	-
			8V		-	9.0	-
		18GHz	10V		-	8.5	-
			8V		-	8.5	-
Drain Current	I _{DS}	15GHz	10, 8V	A	-	0.06	0.09
		18GHz	10, 8V		-	0.06	0.09
Power Added Efficiency	η_{add}	15GHz	10V	%	-	21	-
			8V		-	20	-
		18GHz	10V		-	19	-
			8V		-	18	-

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ \text{C}$)

CHARACTERISTIC	SYMBOL	CONDITION	UNIT	MIN.	TYP.	MAX.
Trans-Conductance	g_m	V _{DS} =3V I _{DS} =45mA	mS	-	30	-
Pinch-off Voltage	V _{GSoff}	V _{DS} =3V I _{DS} =1.5mA	V	-2.5	-3.5	-5
Saturated Drain Current	I _{DSS}	V _{DS} =3V V _{GS} =0V	A	-	0.1	0.125
Gate to Source Breakdown Voltage	V _{GS0}	I _{GS} =-1.5 μ A	V	-5	-	-
Thermal Resistance	R _{th(c-c)}	Channel to Case	$^\circ\text{C/W}$	-	90	150

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* The information contained herein may be changed without prior notice. It is therefore advisable to contact TOSHIBA before proceeding with the design of equipment incorporating this product.

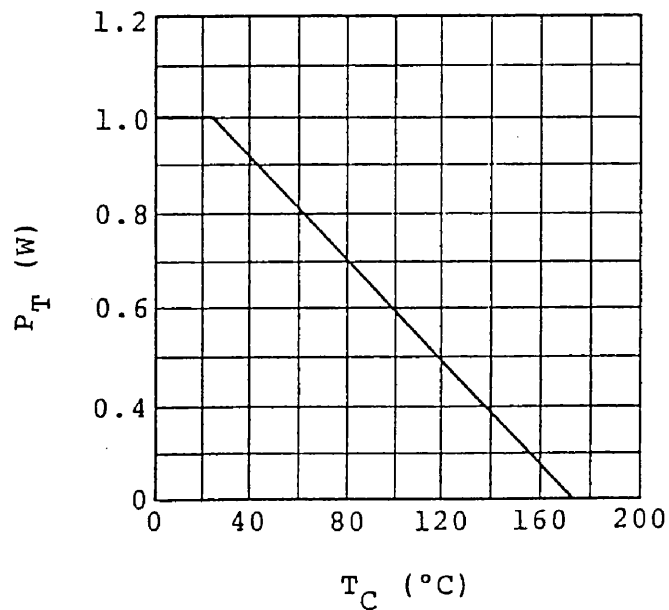


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ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$)

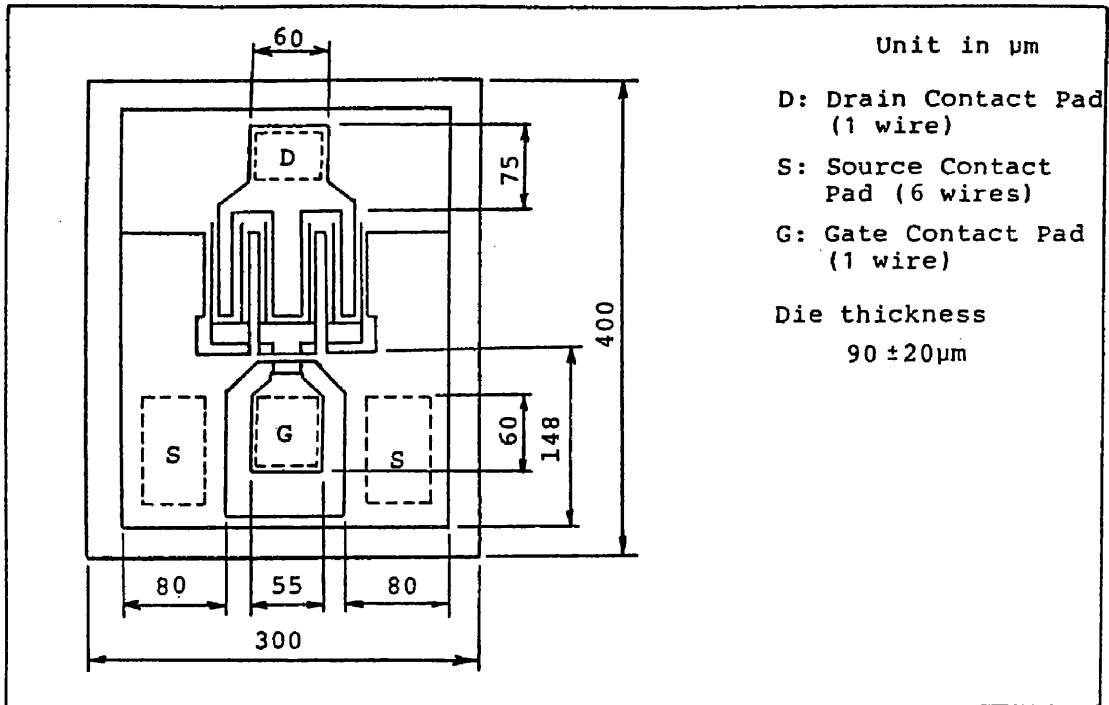
TYPE NUMBER (PACKAGE CODE)			JS8850A-AS (CHIP)
CHARACTERISTIC	SYMBOL	UNIT	RATING
Drain-Source Voltage	V_{DS}	V	15
Gate-Source Voltage	V_{GS}	V	-5
Drain Current	I_D	A	0.125
Total Power Dissipation ($T_c=25^\circ\text{C}$)	P_T	W	1
Channel Temperature	T_{ch}	$^\circ\text{C}$	175
Storage Temperature	T_{stg}	$^\circ\text{C}$	-65~175

POWER DISSIPATION VS. CASE TEMPERATURE



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CHIP OUTLINE



ASSEMBLY PRECAUTIONS FOR CHIP

The operations must be performed in a clean and dry environment. The chips must be kept in the same environment when they are not used. All test instruments, assembly machines, benches, tweezers and operators should be grounded to avoid damage due to electrostatic discharge. Careful attention must be paid in handling chips with tweezers because GaAs is more brittle than Si.

DIE ATTACHMENT

Die attachment can be accomplished with Au-Sn preform in nitrogen atmosphere. The operating temperature must be $290 \pm 10^\circ\text{C}$ for the preform to be well melted. The operating time should be kept within one minute.

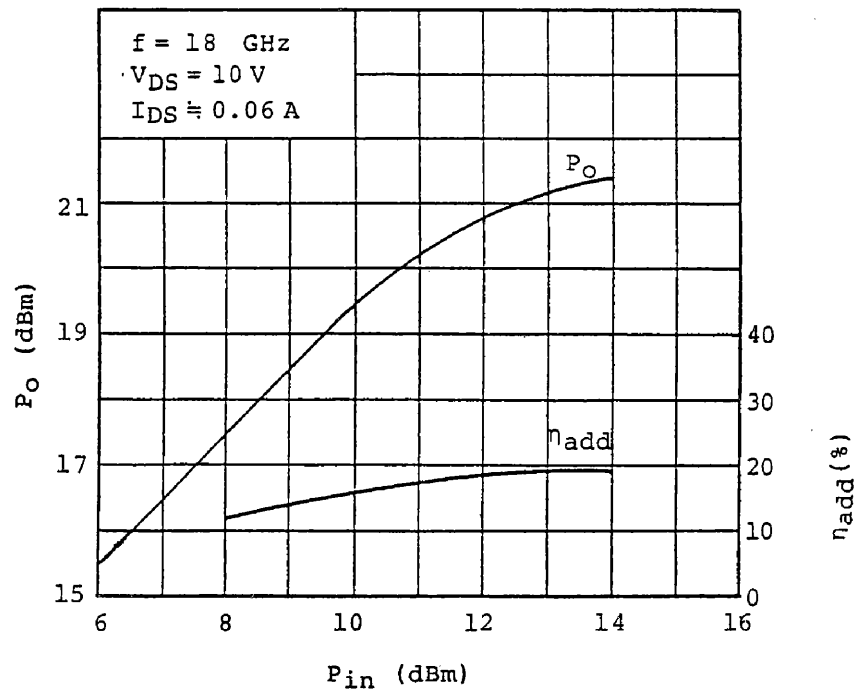
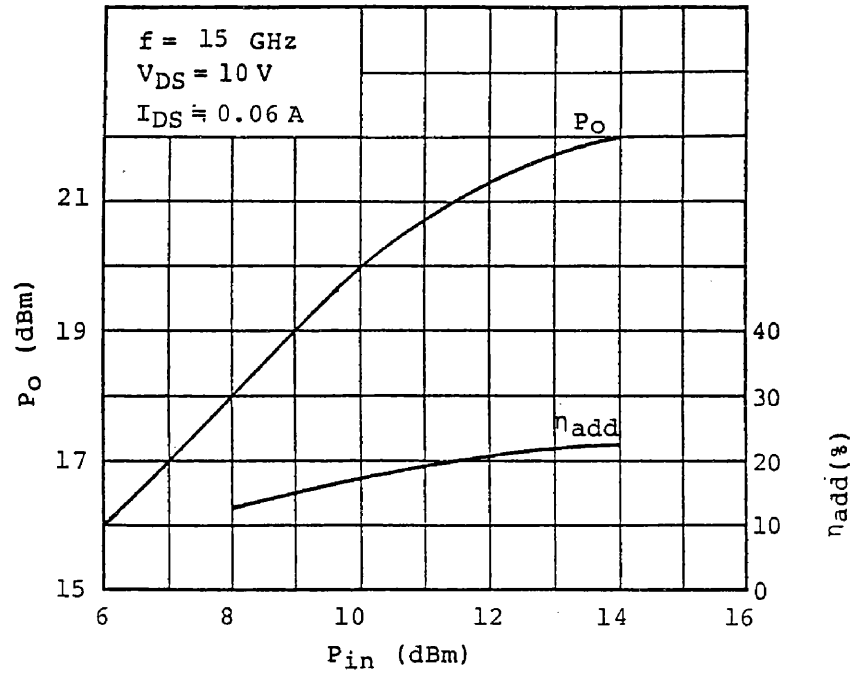
WIRE BONDING

Bonding should be performed with thermal compression wedge bonder in nitrogen atmosphere. The recommended conditions of wire bonding are as follows:

- (1) Operating temperature $200 \pm 10^\circ\text{C}$
- (2) Operating time 5 minutes max.
- (3) Bonding wire 25 µm diameter pure Au

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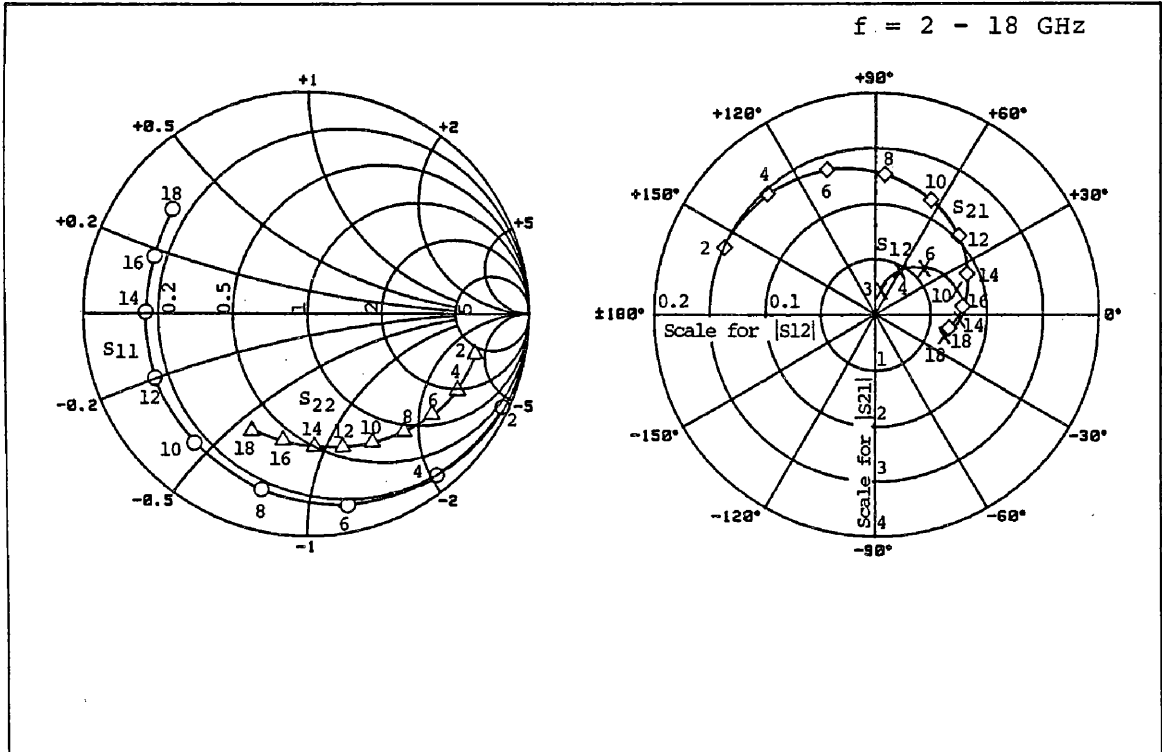
RF PERFORMANCES



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JS8850A-AS S-PARAMETERS (MAGN. and ANGLES)

$V_{DS} = 10 \text{ V}, I_{DS} = 50 \text{ mA}$

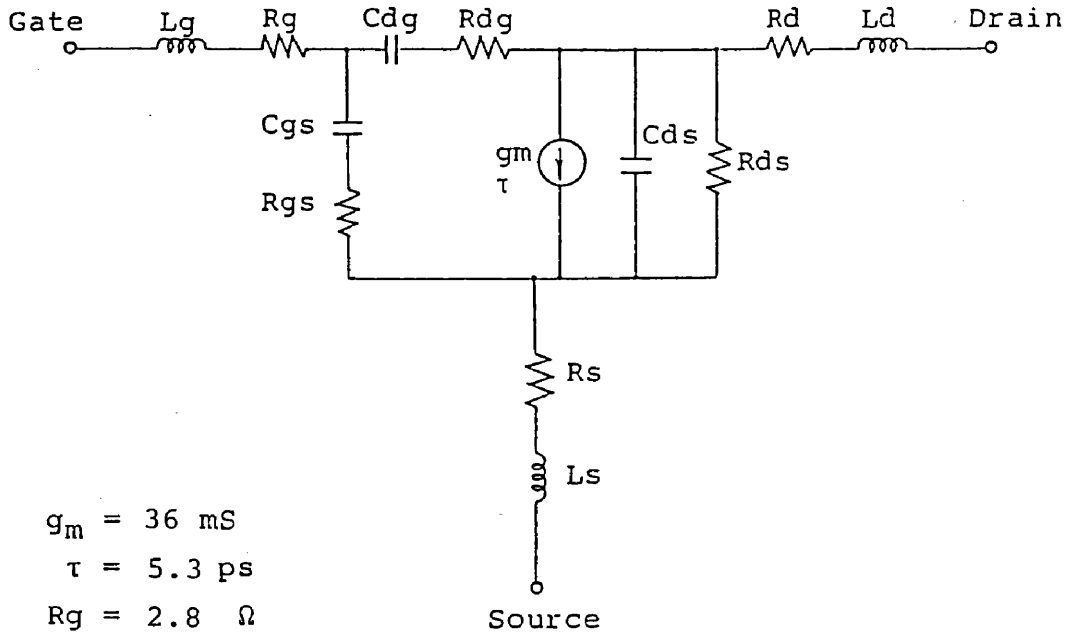


FREQUENCY (GHz)	S_{11}		S_{12}		S_{21}		S_{22}	
2	0.98	-25	0.023	74	3.00	156	0.78	-13
3	0.96	-38	0.034	66	2.96	144	0.77	-19
4	0.94	-51	0.044	58	2.91	132	0.76	-26
5	0.91	-64	0.053	51	2.84	121	0.74	-32
6	0.88	-77	0.061	43	2.75	109	0.72	-38
7	0.84	-90	0.068	36	2.65	97	0.70	-44
8	0.81	-104	0.073	29	2.54	86	0.68	-50
9	0.78	-118	0.076	22	2.43	75	0.66	-56
10	0.76	-131	0.078	16	2.30	64	0.64	-62
11	0.74	-144	0.079	10	2.18	54	0.63	-68
12	0.73	-157	0.079	4	2.05	44	0.61	-74
13	0.72	-169	0.078	-1	1.93	34	0.60	-80
14	0.72	179	0.077	-5	1.80	24	0.59	-86
15	0.73	169	0.074	-9	1.68	15	0.58	-93
16	0.73	159	0.072	-12	1.57	5	0.57	-100
17	0.74	150	0.069	-15	1.46	-3	0.57	-107
18	0.76	142	0.066	-17	1.35	-12	0.57	-115

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EQUIVALENT CIRCUIT (Includes normal bonding wires)

JS8850A-AS : $V_{DS} = 10$, $I_{DS} = 50$ mA



$$g_m = 36 \text{ mS}$$

$$\tau = 5.3 \text{ ps}$$

$$R_g = 2.8 \text{ } \Omega$$

$$R_s = 1.5 \text{ } \Omega$$

$$R_d = 2.6 \text{ } \Omega$$

$$R_{gs} = 2.5 \text{ } \Omega$$

$$R_{dg} = 0.01 \text{ } \Omega$$

$$R_{ds} = 405 \text{ } \Omega$$

$$C_{gs} = 0.31 \text{ pF}$$

$$C_{dg} = 0.02 \text{ pF}$$

$$C_{ds} = 0.13 \text{ pF}$$

$$L_g = 0.37 \text{ nH}$$

$$L_s = 0.02 \text{ nH}$$

$$L_d = 0.23 \text{ nH}$$

Bonding wire condition

	Number (pcs)	Length (Approx.) (mm)	Dia. (μm)
Source	6	0.3	$\phi 25$
Drain	1	0.4	$\phi 25$
Gate	1	0.4	$\phi 25$