

TOSHIBA

MICROWAVE SEMICONDUCTOR

TECHNICAL DATA

MICROWAVE POWER GaAs FET

JS8837A-AS

FEATURES :

- HIGH POWER
 $P_{1dB} = 32\text{dBm}$ at $f = 8\text{GHz}$
- HIGH GAIN
 $G_{1dB} = 7\text{dB}$ at $f = 8\text{GHz}$
- SUITABLE FOR C-BAND AMPLIFIER
- ION IMPLANTATION
- CHIP FORM

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

TYPE NUMBER				JS8837A-AS (CHIP)		
CHARACTERISTIC	SYMBOL	CONDITION	UNIT	MIN.	TYP.	MAX.
Output Power at 1dB Compression Point	P_{1dB}	$V_{DS} = 10\text{V}$ $f = 8\text{GHz}$	dBm	31.0	32.0	-
Power Gain at 1dB Compression Point	G_{1dB}		dB	6.0	7.0	-
Drain Current	I_{DS}		A	-	0.45	0.7
Power Added Efficiency	η_{add}		%	-	28	-

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

TYPE NUMBER				JS8837A-AS (CHIP)		
CHARACTERISTIC	SYMBOL	CONDITION	UNIT	MIN.	TYP.	MAX.
Trans-conductance	g_m	$V_{DS} = 3\text{V}$ $I_{DS} = 0.55\text{A}$	mS	-	350	-
Pinch-off Voltage	V_{GSoff}	$V_{DS} = 3\text{V}$ $I_{DS} = 8\text{mA}$	V	-2	-3.5	-5
Saturated Drain Current	I_{DSS}	$V_{DS} = 3\text{V}$ $V_{GS} = 0\text{V}$	A	-	1.1	1.4
Gate to Source Breakdown Voltage	V_{GSO}	$I_{GS} = -20\mu\text{A}$	V	-5	-	-
Thermal Resistance	$R_{th(c-c)}$	Channel to case	$^\circ\text{C/W}$	-	13	20

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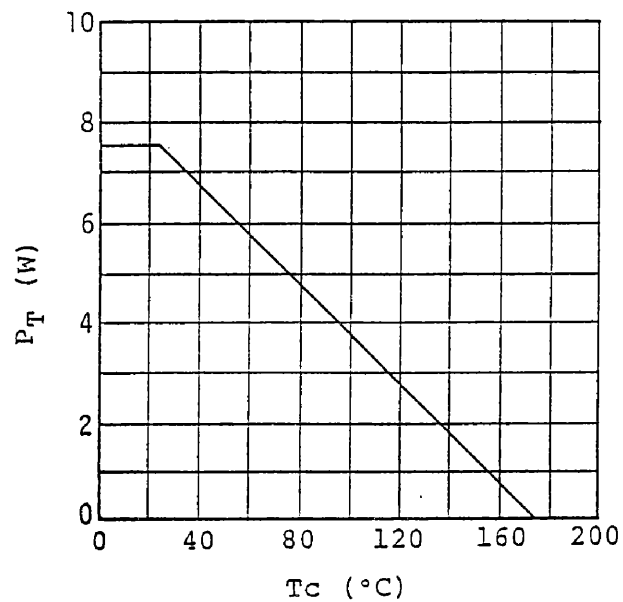


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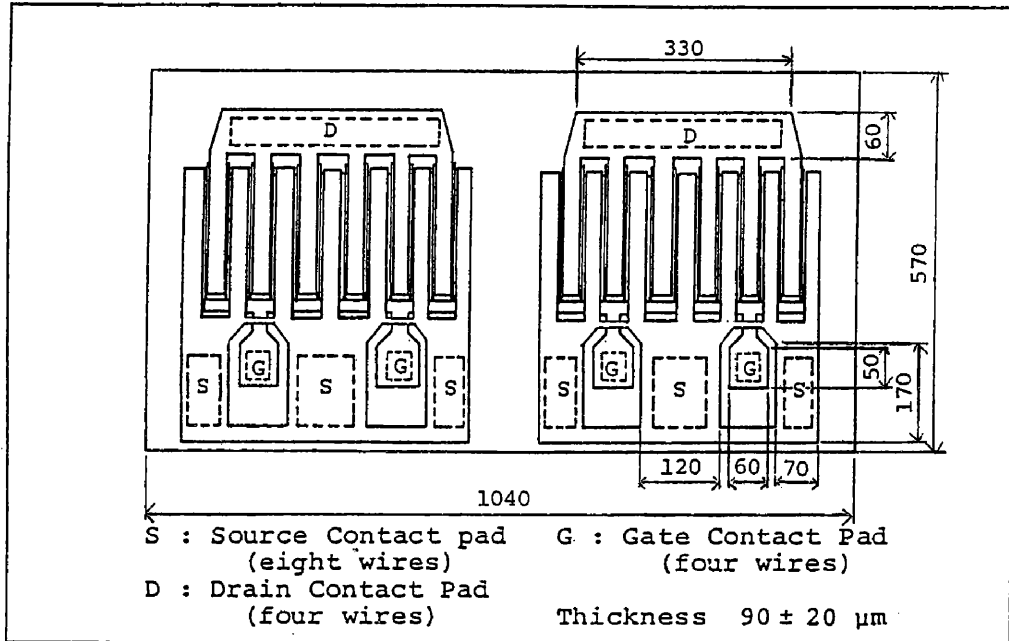
ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

TYPE NUMBER			JS8837A-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	1.4
Total Power Dissipation ($T_c=25^\circ\text{C}$)	P_T	W	7.5
Channel Temperature	T_{ch}	$^\circ\text{C}$	175
Storage Temperature	T_{stg}	$^\circ\text{C}$	-65~175

POWER DISSIPATION VS. CASE TEMPERATURE



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

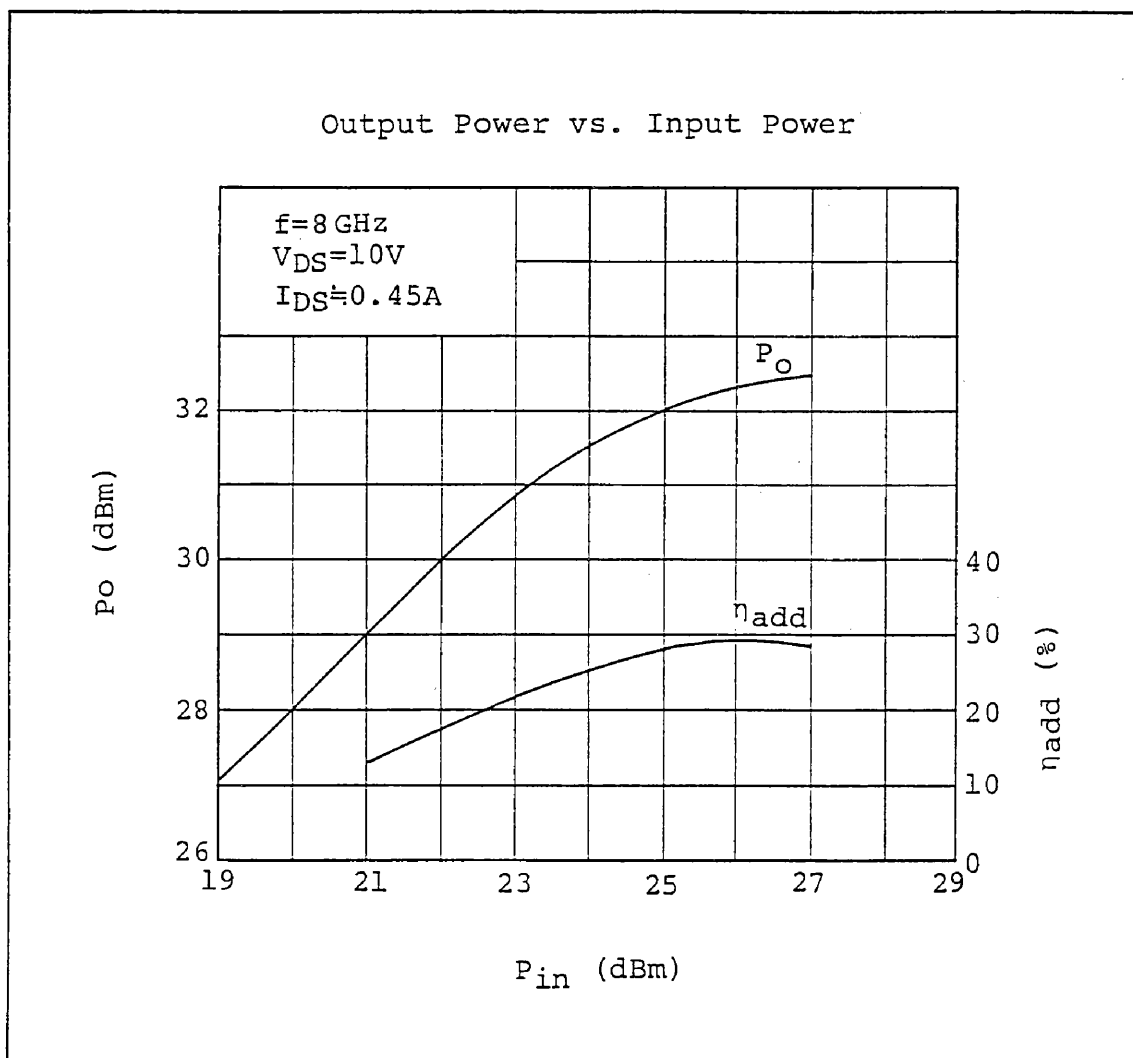
Die attachment can be accomplished with Au-Sn preform in nitrogen atmosphere. The operating temperature must be $290 \pm 10^\circ\text{C}$ for the preform to be well melted. The operating time should be kept within one minute.

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

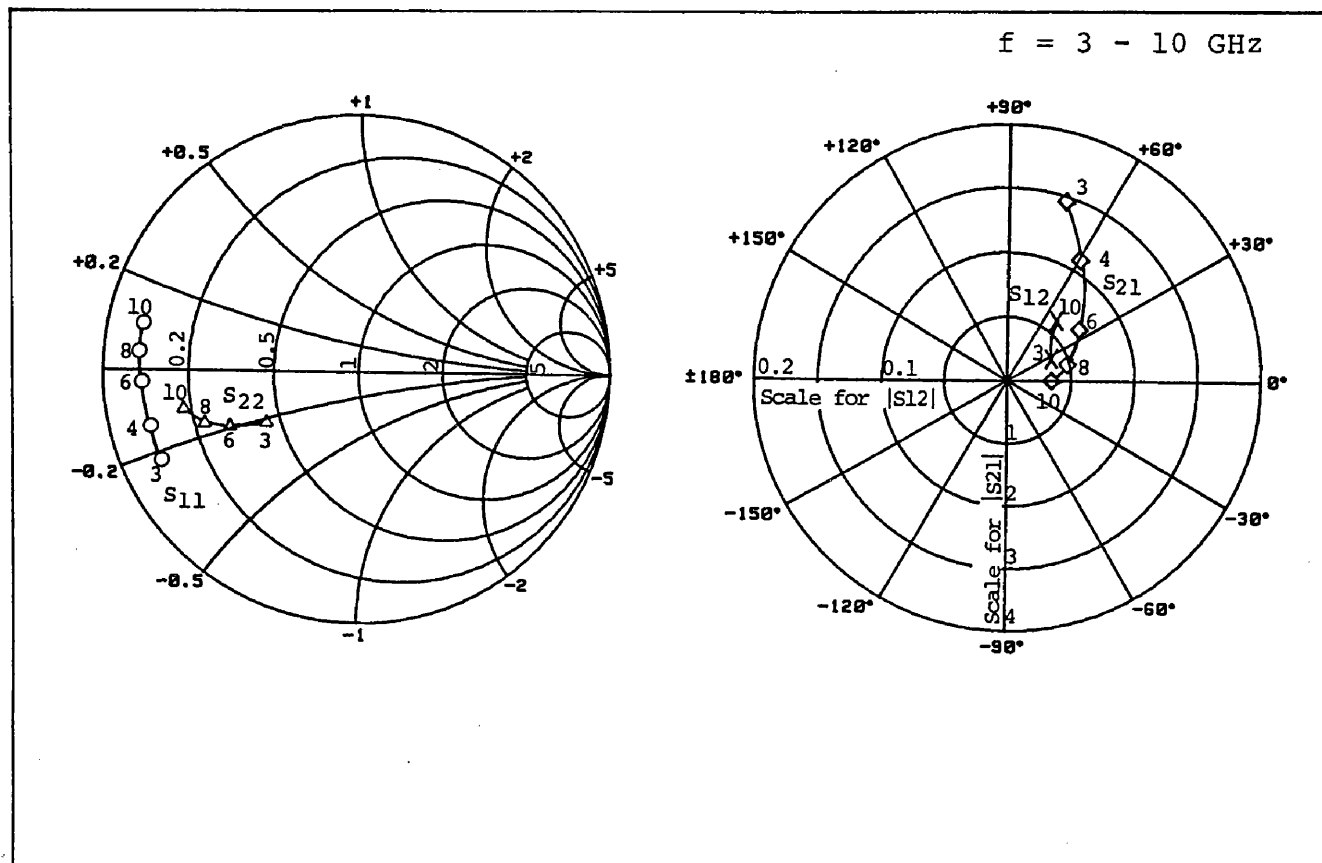
OUTPUT POWER CHARACTERISTIC



JS8837A-AS

JS8837A-AS S-PARAMETERS (MAGN. and ANGLES)

$V_{DS} = 10 \text{ V}$, $I_{DS} = 450 \text{ mA}$



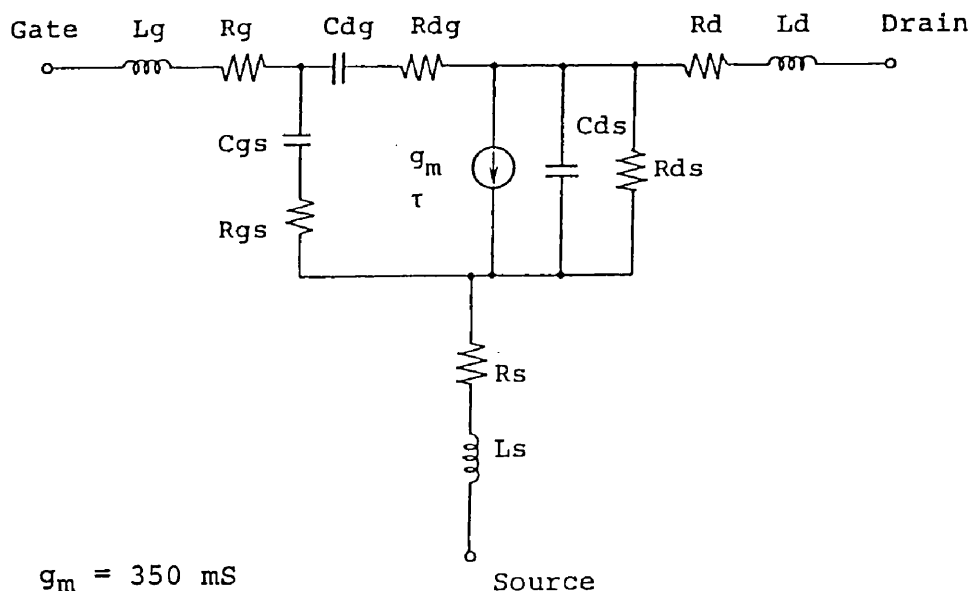
FREQUENCY (GHz)	S_{11}		S_{12}		S_{21}		S_{22}	
3	0.84	-155	0.040	28	2.94	72	0.41	-151
4	0.84	-165	0.041	30	2.19	59	0.46	-152
5	0.84	-171	0.043	34	1.72	47	0.51	-154
6	0.85	-177	0.045	38	1.40	36	0.55	-156
7	0.85	179	0.048	42	1.16	26	0.59	-159
8	0.86	175	0.052	46	0.98	17	0.63	-161
9	0.86	172	0.057	49	0.83	9	0.67	-164
10	0.86	168	0.060	51	0.72	1	0.70	-167

JS8837A-AS

JS8837A-AS EQUIVALENT CIRCUIT

(Includes normal bonding wires)

$$V_{DS} = 10 \text{ V}, I_{DS} = 450 \text{ mA}$$



$$g_m = 350 \text{ mS}$$

$$\tau = 9.4 \text{ ps}$$

$$R_g = 1.10 \text{ } \Omega$$

$$R_s = 0.87 \text{ } \Omega$$

$$R_d = 1.15 \text{ } \Omega$$

$$R_{gs} = 1.45 \text{ } \Omega$$

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

$$R_{ds} = 35 \text{ } \Omega$$

$$C_{gs} = 3.45 \text{ pF}$$

$$C_{dg} = 0.12 \text{ pF}$$

$$C_{ds} = 0.95 \text{ pF}$$

$$L_g = 0.13 \text{ nH}$$

$$L_s = 0.03 \text{ nH}$$

$$L_d = 0.08 \text{ nH}$$

Bonding wire condition

	Number (pcs)	Length (Approx.) (mm)	Dia (μm)
Drain	4	0.4	$\phi 25$
Gate	4	0.4	$\phi 25$
Source	8	0.3	$\phi 25$