

TOSHIBA

MICROWAVE SEMICONDUCTOR

TECHNICAL DATA

MICROWAVE POWER GaAs FET

JS8893-AS

FEATURES:

- HIGH POWER
P_{1dB} = 24.0 dBm at f = 23 GHz
- HIGH GAIN
G_{1dB} = 6.0 dB at f = 23 GHz
- SUITABLE FOR K-BAND AMPLIFIER
- ION IMPLANTATION
- CHIP FORM

RF PERFORMANCE SPECIFICATIONS (T_a = 25° C)

TYPE NUMBER				JS8893-AS (CHIP)		
CHARACTERISTIC	SYMBOL	CONDITION	UNIT	MIN.	TYP.	MAX.
Output Power at 1dB Compression Point	P _{1dB}	V _{DS} =7V f = 23GHz	dBm	23.0	24.0	-
Power Gain at 1dB Compression Point	G _{1dB}		dB	5.0	6.0	-
Drain Current	I _{DS}		A	-	0.18	0.26
Power Added Efficiency	η _{add}		%	-	15	-

ELECTRICAL CHARACTERISTICS (T_a = 25° C)

TYPE NUMBER (PACKAGE CODE)				JS8893-AS (CHIP)		
CHARACTERISTIC	SYMBOL	CONDITION	UNIT	MIN.	TYP.	MAX.
Trans-Conductance	g _m	V _{DS} =3V I _{DS} =0.2A	mS	-	140	-
Pinch-off Voltage	V _{GSoff}	V _{DS} =3V I _{DS} =3mA	V	-2	-3.5	-5
Saturated Drain Current	I _{DSS}	V _{DS} =3V V _{GS} =0V	A	-	0.4	0.52
Gate to Source Breakdown Voltage	V _{GSO}	I _{GS} =-10μA	V	-5	-	-
Thermal Resistance	R _{th(c-c)}	Channel to case	°C/W	-	30	60

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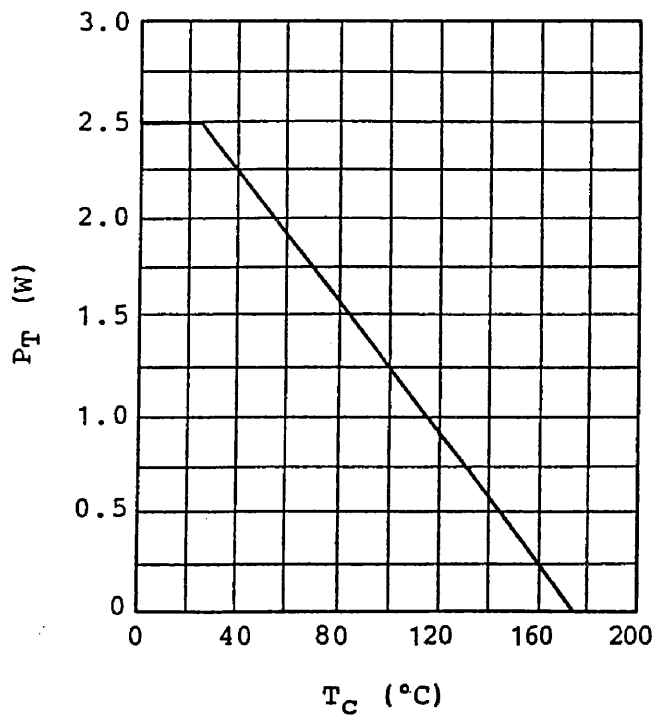


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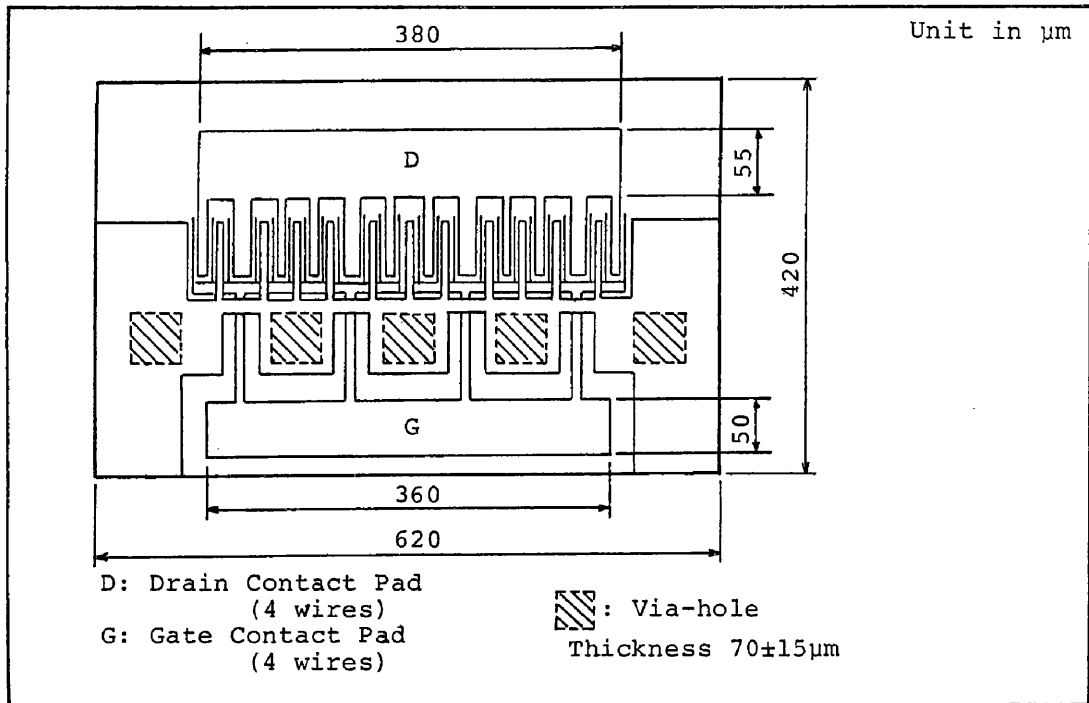
ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

TYPE NUMBER			JS8893-AS (CHIP)
CHARACTERISTIC	SYMBOL	UNIT	RATING
Drain-Source Voltage	V_{DS}	V	12
Gate-Source Voltage	V_{GS}	V	-5
Drain Current	I_D	A	0.52
Total Power Dissipation ($T_c=25^\circ\text{C}$)	P_T	W	2.5
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

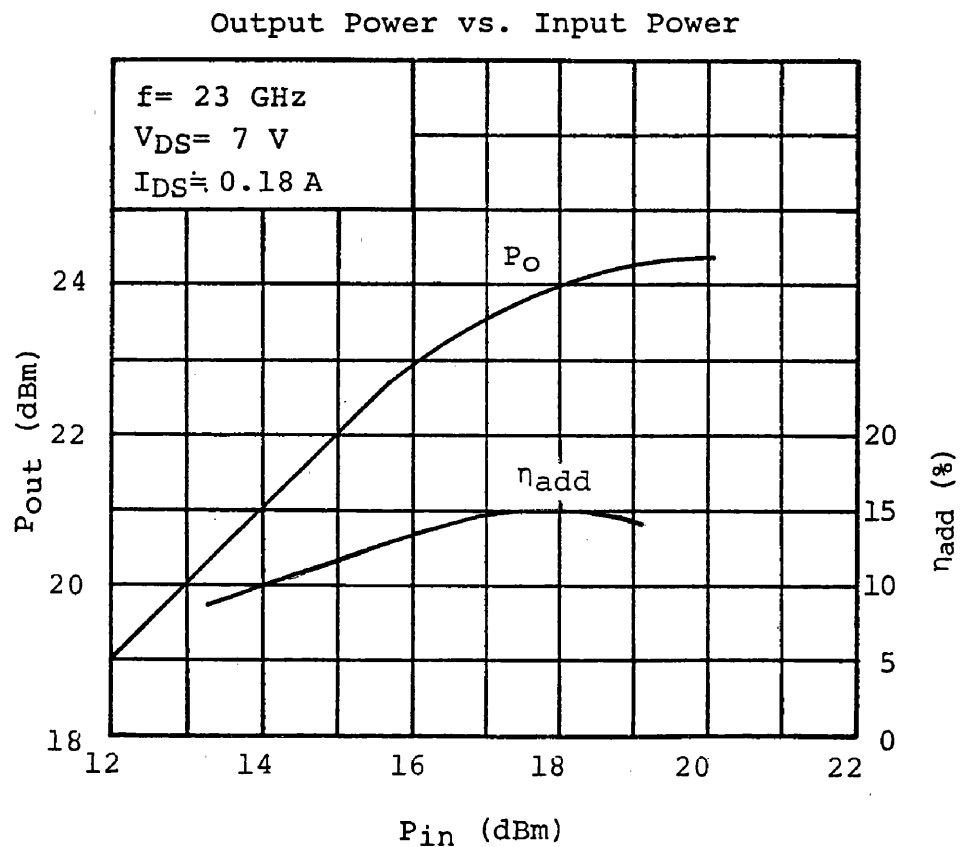
Die attachment can be accomplished with Au-Sn preform in nitrogen atmosphere. The operating temperature must be $290 \pm 10^\circ\text{C}$ for the preform to be well melted. The operating time should be kept within one minute.

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

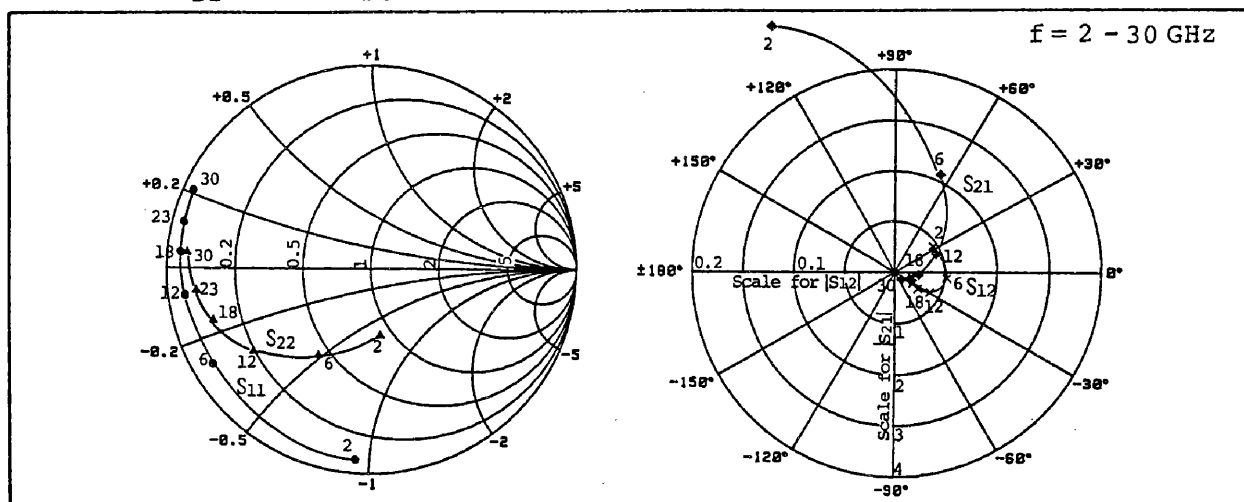
OUTPUT POWER CHARACTERISTIC



JS8893-AS

JS8893-AS S-PARAMETERS (MAGN. and ANGLES)

$V_{DS} = 7 \text{ V}$, $I_{DS} = 0.2 \text{ A}$



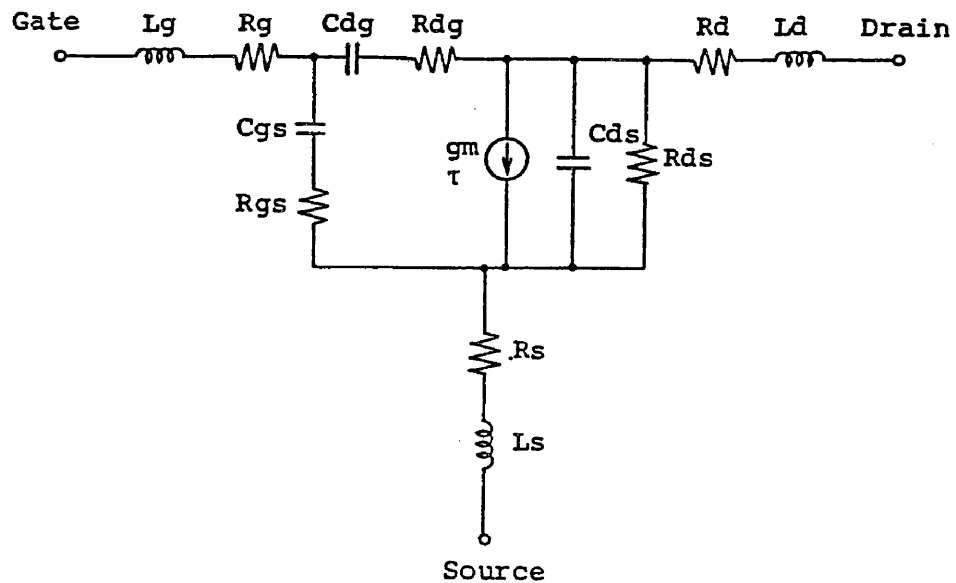
FREQUENCY (GHz)	S_{11}		S_{12}		S_{21}		S_{22}		K	MAXIMUM GAIN	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.		AVAILABLE	STABLE
2	0.93	-94	0.046	34	5.42	117	0.33	-81	0.12	-	20.8
4	0.90	-117	0.053	8	3.21	86	0.40	-108	0.23	-	17.8
6	0.90	-149	0.052	-6	2.14	66	0.48	-121	0.35	-	16.1
8	0.90	-159	0.049	-16	1.54	49	0.57	-131	0.47	-	15.0
10	0.91	-167	0.045	-23	1.16	36	0.64	-139	0.60	-	14.1
12	0.92	-172	0.040	-28	0.90	24	0.69	-145	0.73	-	13.5
14	0.92	-177	0.036	-32	0.72	13	0.74	-152	0.86	-	13.0
16	0.93	179	0.032	-34	0.59	4	0.78	-157	1.01	12.15	-
18	0.93	175	0.028	-34	0.49	-5	0.81	-162	1.16	9.94	-
20	0.94	171	0.025	-34	0.41	-13	0.83	-167	1.13	8.74	-
22	0.94	168	0.023	-32	0.35	-20	0.85	-171	1.48	7.80	-
23	0.94	166	0.021	-30	0.32	-24	0.86	-173	1.56	7.38	-
24	0.96	165	0.020	-29	0.30	-27	0.87	-175	1.63	6.99	-
26	0.95	162	0.019	-24	0.26	-33	0.88	-178	1.78	6.28	-
28	0.95	159	0.017	-19	0.22	-39	0.89	179	1.90	5.62	-
30	0.95	156	0.017	-12	0.19	-44	0.90	175	1.98	5.00	-

JS8893-AS

JS8893-AS EQUIVALENT CIRCUIT

(Includes normal bonding wires)

$$V_{DS} = 7 \text{ V}, I_{DS} = 0.2 \text{ A}$$



g_m	135	mS
τ	3.967	ps
R_g	0.419	Ω
R_s	0.318	Ω
R_d	0.718	Ω
R_{gs}	0.359	Ω
R_{gd}	0.001	Ω
R_{ds}	86.2	Ω
C_{gs}	1.3	pF
C_{gd}	0.082	pF
C_{ds}	0.496	pF
L_g	0.074	nH
L_s	0.003	nH
L_d	0.058	nH