MITSUBISHI SEMICONDUCTOR <GaAs FET>

MGF2116

FOR MICROWAVE POWER AMPLIFIERS

DESCRIPTION

The MGF2116, high-power GaAs FET with an N-channel Schottky gate, is designed for use in S- to Ku-band amplifiers. The hermetically sealed metal-ceramic package assures minimum parasitic losses, and has a configuration suitable for microstrip circuits.

FEATURES

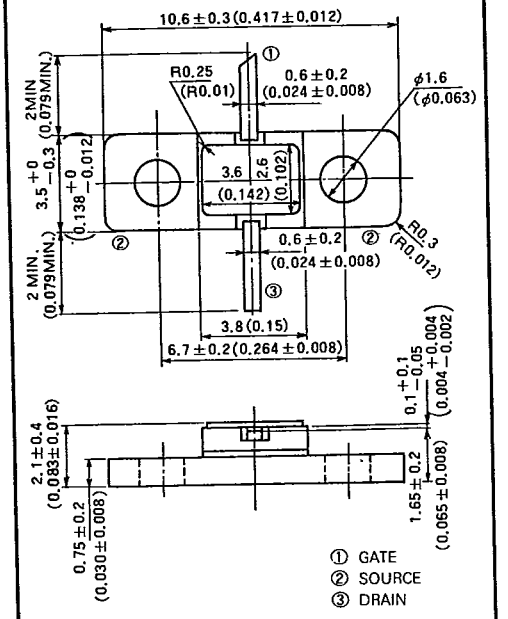
- High output power
  P_{1dB} = 0.4 W (TYP.) @ f = 12 GHz
- High linear power gain
  P_{LP} = 7 dB (TYP.) @ f = 12 GHz
- High power added efficiency
  η_{add} = 20% (TYP.) @ f = 12 GHz, P_{1dB}

QUALITY GRADE

- IG

OUTLINE DRAWING

Unit: millimeters(inches)



ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Symbol	Parameter	Rating	Unit
V_{GDO}	Gate to drain voltage	−11	V
V_{GSO}	Gate to source voltage	−11	V
I_D	Drain current	550	mA
I_{GR}	Reverse gate current	−1.2	mA
I_{GF}	Forward gate current	4.0	mA
P_T	Total power dissipation	3.65	W
Toh	Channel temperature	175	°C
Tstg	Storage temperature	−55~+175	°C
Rth(ch-c)	Thermal resistance	41	°C/W

ELECTRICAL CHARACTERISTICS (Ta=25°C)

Symbol	Parameter	Conditions	Limits			Unit
			Min	Typ	Max	
I_{DSS}	Saturated drain current	V_{DS}=3V, V_{GS}=0V	300	430	550	mA
$V_{GS(off)}$	Gate to source cut-off voltage	V_{DS}=3V, I_D=1mA	−2		−7	V
g_m	Transconductance	V_{DS}=3V, I_D=200mA	125	175		mS
P_{1dB}	Output power at 1 dB gain compression	V_{DS}=7V, I_D=200mA, f=12GHz	0.35	0.4		W
G_{LP}	Linear power gain		6	7		dB
η_{add}	Power added efficiency			20		%

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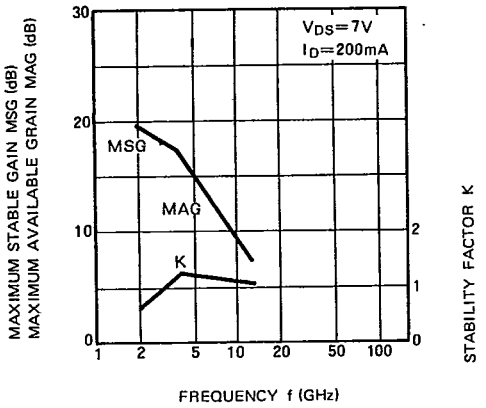
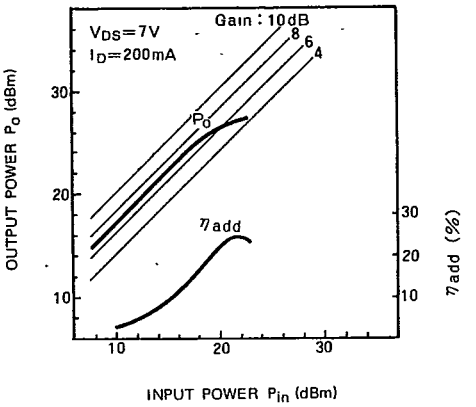
TYPICAL CHARACTERISTICS (Ta=25°C)

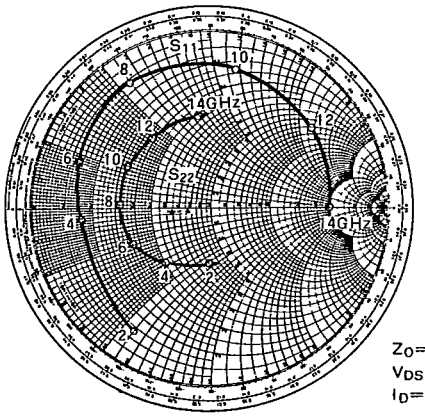
MSG, MAG, & K vs. f



P_o, η_{add} vs. P_{in} (f = 12GHz)

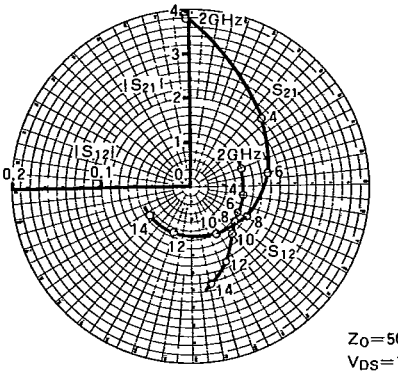


S_{11}, S_{22} vs. f



ZO=50Ω
VDS=7V
ID=200mA

S_{12}, S_{21} vs. f



ZO=50Ω
VDS=7V
ID=200mA

S PARAMETERS (Ta=25°C, VDS=7V, ID=200mA)

f (GHz)	S Parameters (TYP.)							
	S_{11}		S_{12}		S_{21}		S_{22}	
	Magn.	Angle (deg.)	Magn.	Angle (deg.)	Magn.	Angle (deg.)	Magn.	Angle (deg.)
2	0.812	−121.4	0.059	19.1	3.78	91.3	0.340	−93.0
4	0.739	−172.8	0.055	−12.5	2.12	43.0	0.414	−130.3
6	0.776	160.7	0.061	−30.9	1.73	10.1	0.498	−153.6
8	0.823	122.2	0.068	−42.5	1.48	−29.8	0.523	179.1
10	0.798	80.0	0.078	−52.1	1.26	−63.4	0.520	154.1
12	0.731	37.2	0.096	−66.9	1.15	−109.3	0.519	129.7
14	0.667	−0.4	0.113	−79.2	1.13	−146.8	0.532	98.9

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HANDLING PRECAUTIONS FOR GaAs FETs

1. Check of Electrical Characteristics

(1) Measurement of DC Characteristics by Curve Tracer
Many curve tracers, if not properly grounded, exhibit a high leakage current from the high-voltage transformer, which can be a prime cause of failure or degradation of the FET. Measurement of the DC characteristics using a curve tracer is therefore not recommended. However, when tests using a curve tracer are required, first of all, check that the curve tracer is grounded to earth.
(2) Measurement of RF Characteristics
Before measurement, check that the measuring instruments are grounded to earth. Many instruments to measure RF characteristics such as RF power meters, network analyzers and so on, if not properly grounded to earth, sometimes allow a high AC leakage of up to 20 or more volts, which can be a cause of failure or degradation of the FET.

2. Installation of GaAs FET

When GaAs FET is soldered on a microstrip circuit, the following should be attended to,
(1) Properly ground the soldering iron to earth.
Leakage current from the soldering iron could cause failure or degradation of the FET.
(2) Solder the FET as promptly as possible at a low temperature. For a criterion, soldering in less than 8 seconds at a temperature of less than 250°C is recommended for each soldering process.

3. Bias Procedure and Conditions

When GaAs FET is biased, the following procedure is recommended.
(1) Slowly adjust the gate to source voltage, V_{GS}, to about $-1V$.
(2) Gradually increase the drain to source voltage, V_{DS}, from zero to a desired value.
(3) Adjust the drain current, I_D, to the desired value by controlling the gate to source voltage, V_{GS}.
When bias is released, the reverse procedure is recommended.
Be careful that the FET is not operated under conditions exceeding the absolute maximum ratings.

4. Guaranteed Characteristics

All the graphic characteristics illustrated in this catalog are typical examples. The characteristics of individual devices as specified in the tables of absolute maximum ratings and electrical characteristics are guaranteed under the specified conditions.