MITSUBISHI SEMICONDUCTOR <GaAs FET>

MGFC34S SERIES

FOR MICROWAVE POWER AMPLIFIERS INTERNALLY MATCHED

PRELIMINARY

Notice This is not a final specification. Some parametric limits are subject to change

DESCRIPTION

The MGFC34S series is an internally impedance matched GaAs power FET especially designed for use is C-band amplifiers. The hermetically sealed metal-ceramic package guarantees high reliability.

FEATURES

- Internally impedance matched
- Flip-chip mounted
- Small and light package
- High output power
  P_{1dB} = 2.5 W (TYP.) @ each frequency band
- High linear power gain
  G_{LP} = 10 dB (TYP.) @ each frequency band
- High power added efficiency
  η_{add} = 30% (TYP.) @ each frequency band

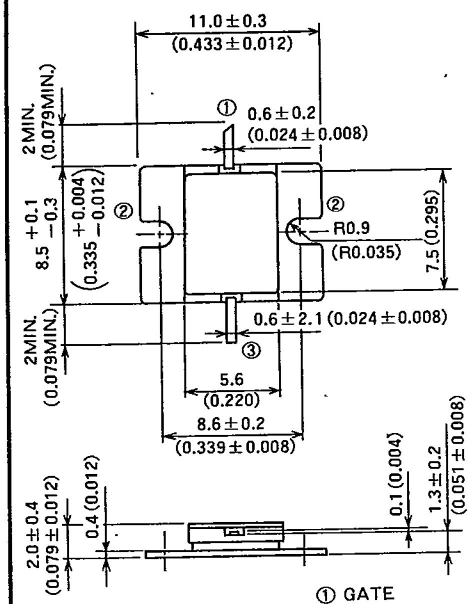
QUALITY GRADE

- IG

TYPE NUMBER

Type Number	Frequency (GHz)
MGFC34S5258	5.2~5.8
MGFC34S5464	5.9~6.4
MGFC34S6471	6.4~7.1

OUTLINE DRAWING Unit: millimeters (inches)



① GATE
② SOURCE
③ DRAIN

ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Symbol	Parameter	Rating	Unit
V_{GDO}	Gate to drain voltage	−15	V
V_{GSO}	Gate to source voltage	−15	V
I_D	Drain current	2800	mA
I_{GR}	Reverse gate current	−9.0	mA
I_{GF}	Forward gate current	13.0	mA
P_T	Total power dissipation	18.75	W
Tch	Channel temperature	175	°C
Tstg	Storage temperature	−55~+150	°C
Rth(ch-c)	Thermal resistance	8	°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	1600	2200	2800	mA
$V_{GS(off)}$	Gate to source cut-off voltage	V_{DS}=3V, I_D=10mA	−2		−5	V
gm	Transconductance	V_{DS}=3V, I_D=1.1A	600	1000		mS
P_{1dB}	Output power at 1 dB gain compression	V_{DS}=8V, I_D=1.1A f=5.2~5.8GHz, 5.9~6.4GHz, 6.4~7.1GHz	2	2.5		W
G_{LP}	Linear power gain		9	10		dB
η_{add}	Power added efficiency			35		%

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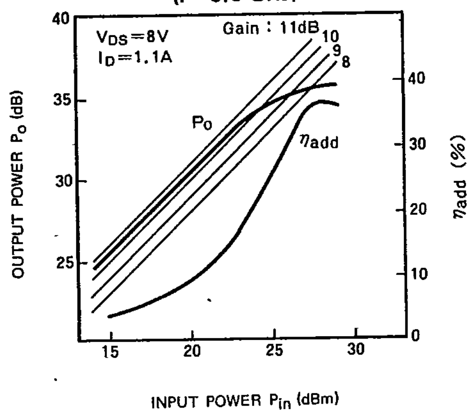
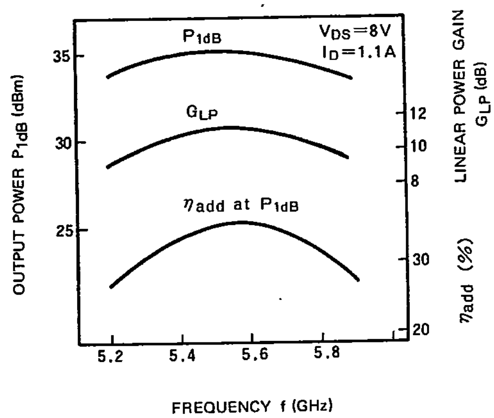
TYPICAL CHARACTERISTICS (Ta=25°C)

MGFC34S5258

P_o, η_{add} vs. P_{in}
(f = 5.5 GHz)

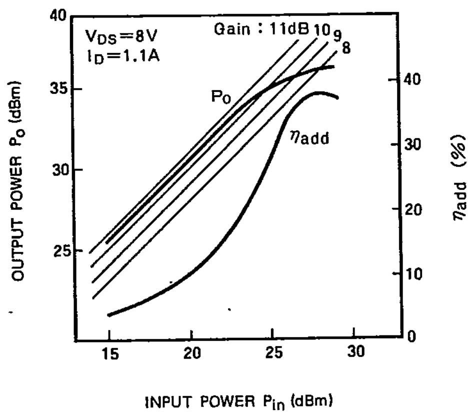


P_{1dB}, G_{LP} & η_{add} vs. f

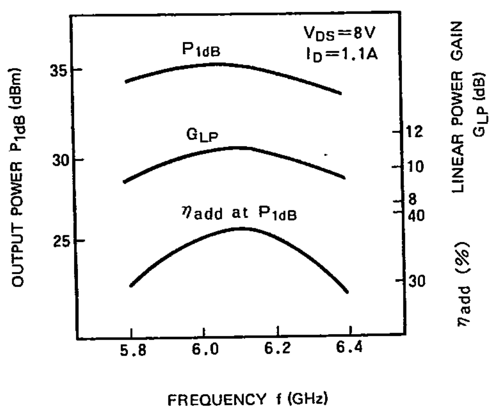


MGFC34S5964

P_o, η_{add} vs. P_{in}
(f = 6.15 GHz)

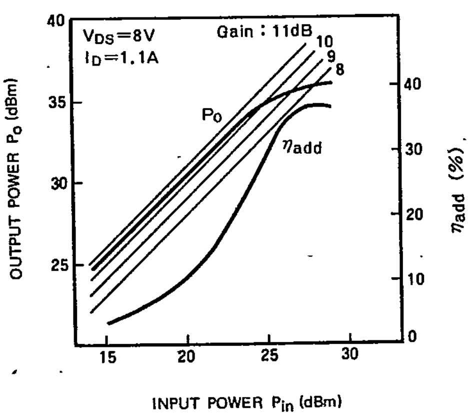


P_{1dB}, G_{LP} & η_{add} vs. f

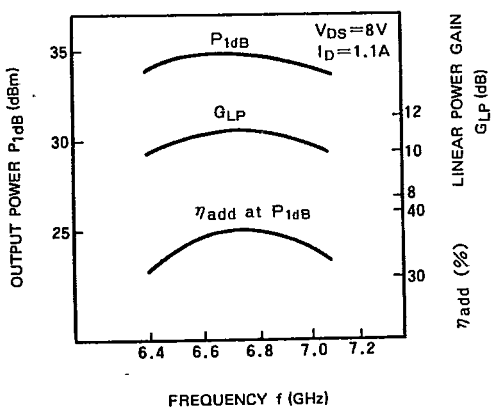


MGFC34S6471

P_o, η_{add} vs. P_{in}
(f = 6.75 GHz)



P_{1dB}, G_{LP} & η_{add} vs. f



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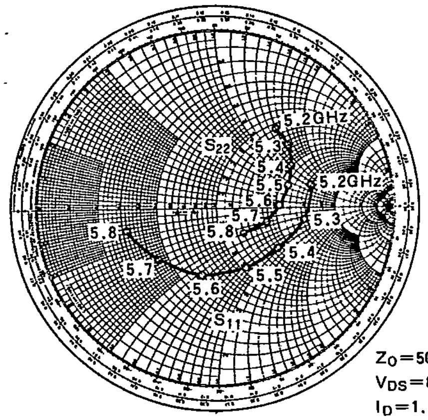
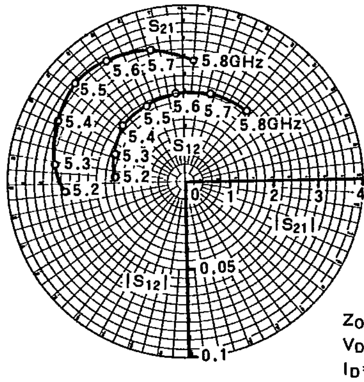
S_{11}, S_{22} vs. f



$Z_0=50\Omega$
$V_{DS}=8V$
$I_D=1.1A$

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



$Z_0=50\Omega$
$V_{DS}=8V$
$I_D=1.1A$

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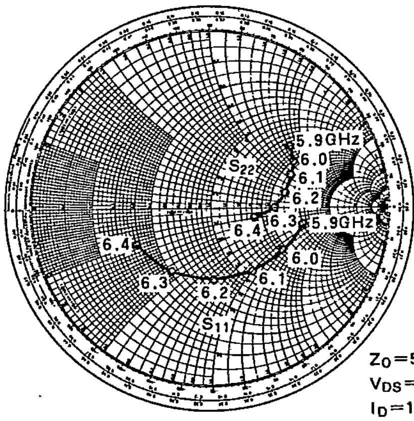
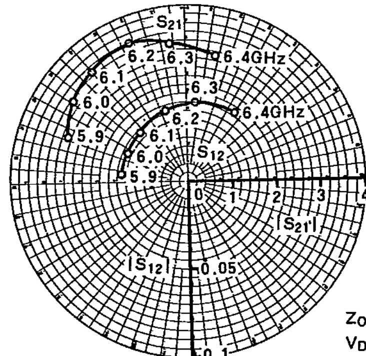
S_{11}, S_{22} vs. f



$Z_0=50\Omega$
$V_{DS}=8V$
$I_D=1.1A$

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



$Z_0=50\Omega$
$V_{DS}=8V$
$I_D=1.1A$

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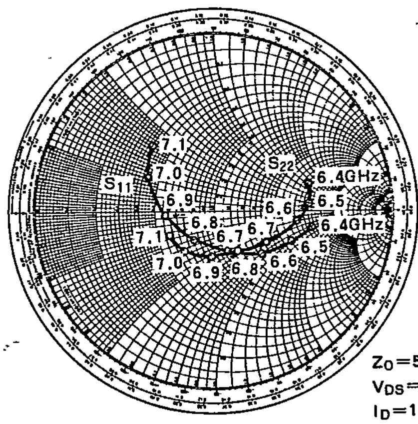
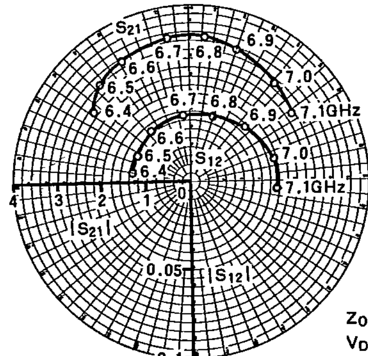
S_{11}, S_{22} vs. f



$Z_0=50\Omega$
$V_{DS}=8V$
$I_D=1.1A$

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



$Z_0=50\Omega$
$V_{DS}=8V$
$I_D=1.1A$

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S PARAMETERS (V_{DS}=8V, I_D=1.1A)

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f (GHz)	S Parameters (TYP.)							
	S_{11}		S_{12}		S_{21}		S_{22}	
	Magn.	Angle(deg.)	Mang.	Angle(deg.)	Mang.	Angle(deg.)	Mang.	Angle(deg.)
5.2	0.559	13	0.039	175	2.692	−176	0.566	52
5.3	0.502	− 7	0.043	158	2.985	171	0.543	41
5.4	0.421	− 34	0.047	133	3.199	153	0.481	29
5.5	0.375	− 63	0.048	115	3.350	137	0.433	17
5.6	0.396	−102	0.051	94	3.236	121	0.361	1
5.7	0.437	−138	0.052	72	3.090	104	0.298	−16
5.8	0.526	−166	0.053	49	2.786	85	0.218	−39

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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.)
5.9	0.531	− 10	0.037	172	2.851	158	0.575	38
6.0	0.476	− 30	0.037	152	3.199	144	0.546	30
6.1	0.437	− 57	0.040	131	3.311	130	0.511	22
6.2	0.409	− 87	0.041	107	3.350	112	0.448	11
6.3	0.425	−121	0.044	83	3.162	96	0.363	0
6.4	0.473	−153	0.047	56	2.884	77	0.266	−14

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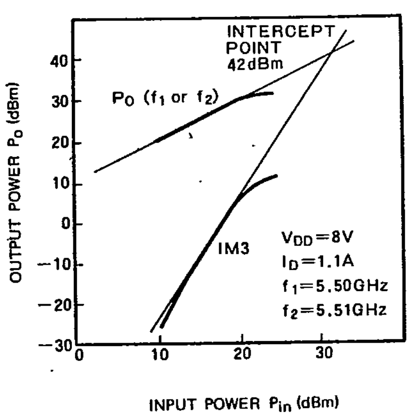
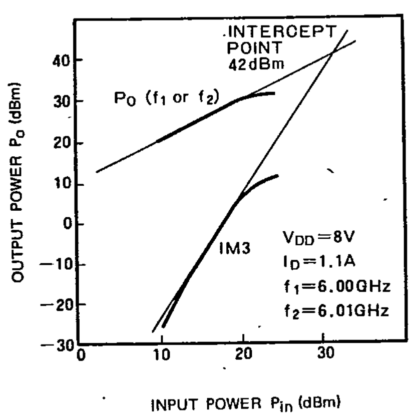
f (GHz)	S Parameters (TYP.)							
	S_{11}		S_{12}		S_{21}		S_{22}	
	Magn.	Angle(deg.)	Magn.	Angle(deg.)	Magn.	Angle(deg.)	Mang.	Angle(deg.)
6.4	0.557	− 10	0.033	170	2.692	144	0.566	16
6.5	0.464	− 22	0.034	152	2.990	133	0.538	5
6.6	0.365	− 42	0.036	128	3.199	119	0.471	− 8
6.7	0.251	− 74	0.038	96	3.311	99	0.349	− 22
6.8	0.212	−125	0.039	70	3.273	84	0.268	− 62
6.9	0.284	−173	0.044	45	3.162	70	0.277	− 94
7.0	0.431	154	0.049	16	2.917	49	0.295	−125
7.1	0.516	133	0.049	−6	2.723	34	0.297	−153

MGFC34S5258 IM$_3$ vs. P$_{in}$



MGFC34S5964 IM$_3$ vs. P$_{in}$



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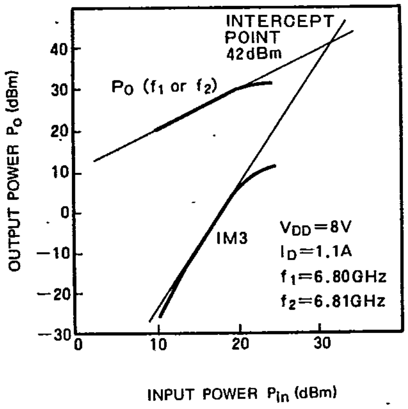
IM_3 vs. P_{in}



HANDLING PRECAUTIONS

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 several tens 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 a 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 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.