PF0140

Preliminary

MOS FET Power Amplifier Module for GSM Handy Phone

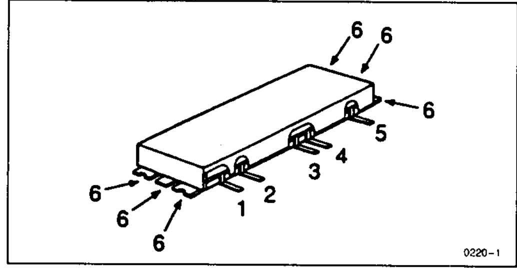
■ FEATURES

- Low Power Control Current .... 1.5 mA
- High Speed Switching .... 1.2 μs
- Wide Power Control Range .... 80 dB typ.
- Surface Mounted Thin Package
  with Shielded Cover 3.8mm

■ ABSOLUTE MAXIMUM RATINGS (T_C = 25°C)

Parameter	Symbol	Value	Unit
Supply Voltage	V_{DD}	12	V
Supply Current	I_{DD}	3	A
APC Voltage	V_{APC}	4	V
Input Power	P_{in}	20	mW
Operating Case Temperature	$T_C(op)$	− 30 ~ 100	°C
Storage Temperature	T_{stg}	− 30 ~ 100	°C

■ PIN ARRANGEMENT



■ PIN OUT

Pin No.	Pin Name
1	P_{in}
2	V_{APC}
3	V_{DD}
4	P_{out}
G	GND

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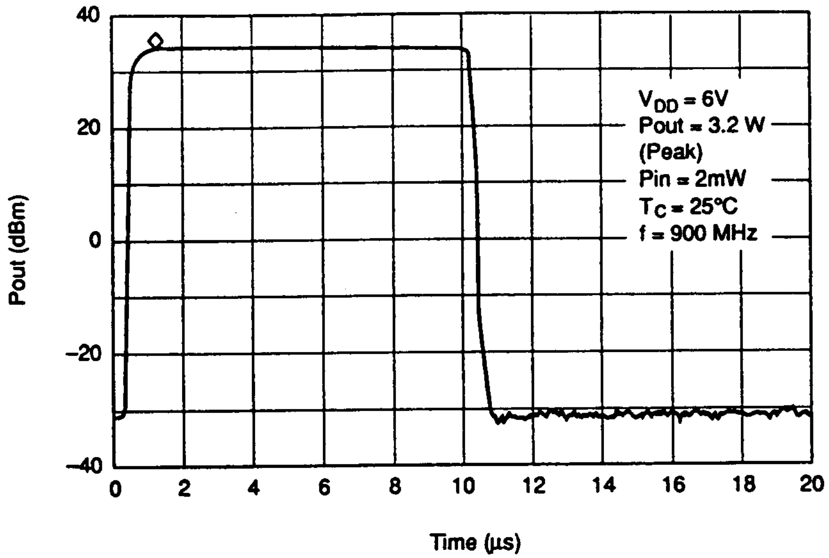
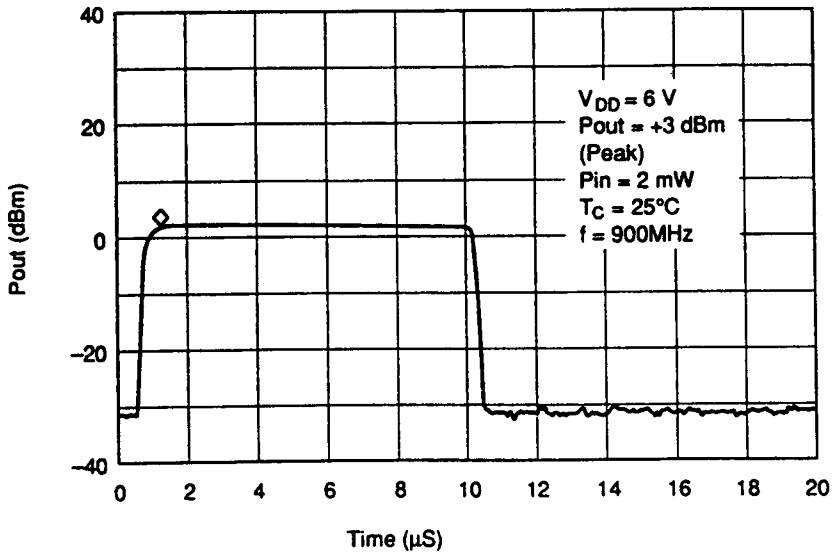
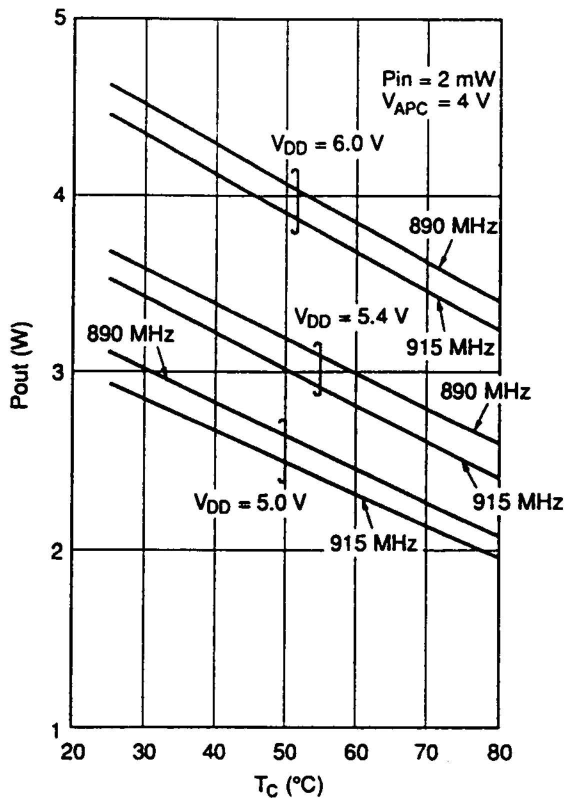
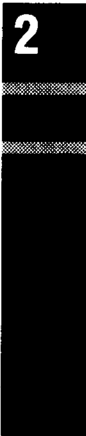
■ ELECTRICAL CHARACTERISTICS (T_C = 25°C)

Parameter	Symbol	Min	Typ	Max	Unit	Test Conditions
Drain Cutoff Current	I_{DS}	—	—	100	μA	V_{DD} = 12V, V_{APC} = 0V
Total Efficiency	ηT	30	35	—	%	P_{in} = 2 mW, V_{DD} = 6V, P_{out} = 3.2W (at APC Controlled), R_L = Rg = 50Ω, T_C = 25°C
2nd Harmonic Distortion	2nd H.D.	—	− 45	− 30	dB	
3rd Harmonic Distortion	3rd H.D.	—	− 45	− 30	dB	
Input VSWR	VSWR (in)	—	2	3	—	
Output Power (1)	P_{out} (1)	3.6	4.2	—	W	P_{in} = 2 mW, V_{DD} = 6V, V_{APC} = 4V, R_L = Rg = 50Ω, T_C = 25°C
Output Power (2)	P_{out} (2)	2.0	2.4	—	W	P_{in} = 2 mW, V_{DD} = 5.4V, V_{APC} = 4V, R_L = Rg = 50Ω, T_C = 80°C
Isolation	—	—	− 43	− 35	dBm	P_{in} = 2 mW, V_{DD} = 6V, V_{APC} = 0.5V, R_L = Rg = 50Ω, T_C = 25°C
Switching Time	t_R, t_F	—	1.2	2	μs	P_{in} = 2 mW, V_{DD} = 6V, P_{out} = 3.2W, R_L = Rg = 50Ω, T_C = 25°C
Stability	—	No Parasitic Oscillation			—	P_{in} = 2 mW, V_{DD} = 7.5V, P_{out} ≤ 3.2W, (at APC controlled), Rg = 50Ω, t = 20 sec., T_C = 25°C, Output VSWR = 20 All Phases


Switching Response
Pout (dBm)
40
20
0
−20
−40
0 2 4 6 8 10 12 14 16 18 20
Time (µs)
VDD = 6V
Pout = 3.2 W
(Peak)
Pin = 2mW
TC = 25°C
f = 900 MHz
0220-3


Switching Response
Pout (dBm)
40
20
0
−20
−40
0 2 4 6 8 10 12 14 16 18 20
Time (µS)
VDD = 6 V
Pout = +3 dBm
(Peak)
Pin = 2 mW
TC = 25°C
f = 900MHz
0220-4


Pout vs Case Temperature
Pin = 2 mW
VAPC = 4 V
VDD = 6.0 V
890 MHz
915 MHz
VDD = 5.4 V
890 MHz
915 MHz
890 MHz
VDD = 5.0 V
915 MHz
Pout (W)
TC (°C)
5
4
3
2
1
20
30
40
50
60
70
80
0220-5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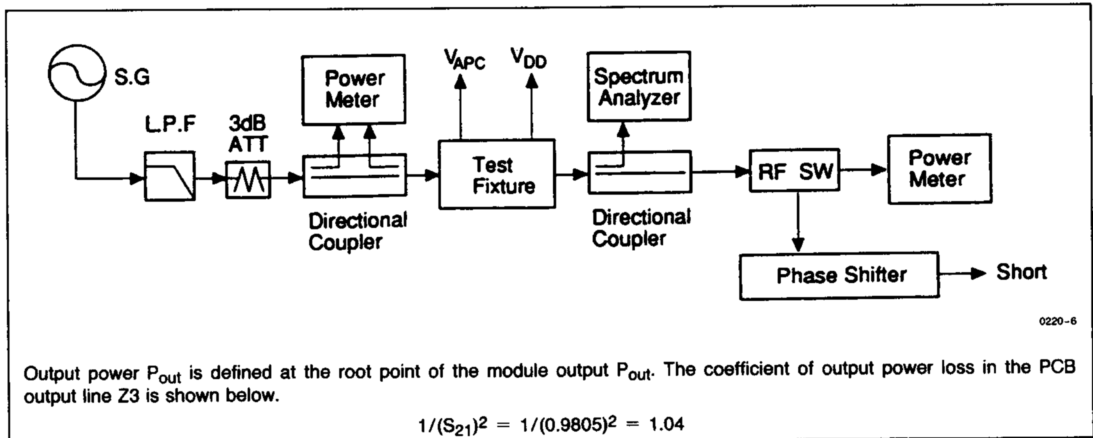
■ TEST SYSTEM DIAGRAM



Output power P_{out} is defined at the root point of the module output P_{out}. The coefficient of output power loss in the PCB output line Z3 is shown below.

$$1/(S_{21})^2 = 1/(0.9805)^2 = 1.04$$

■ TEST FIXTURE PATTERN

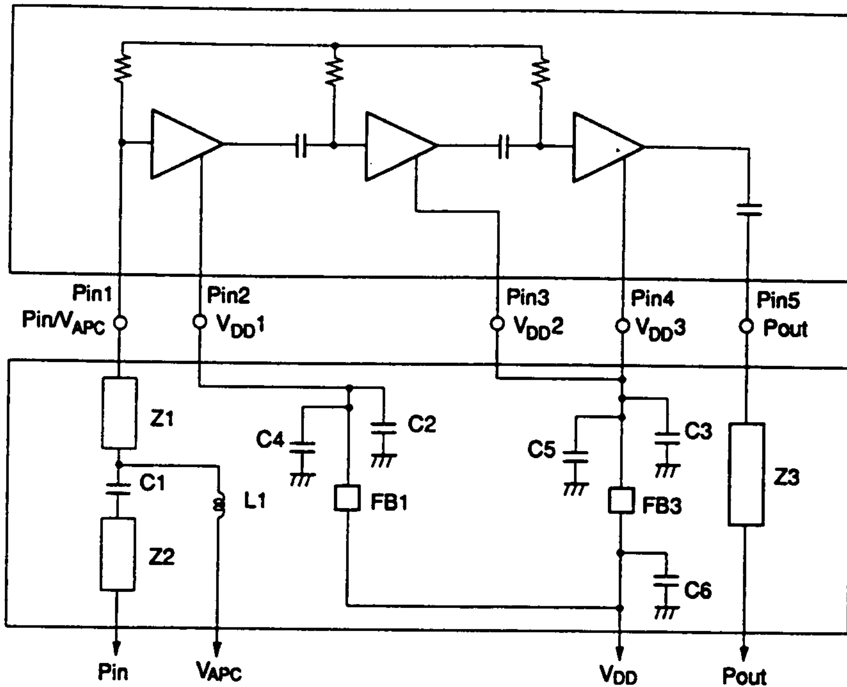
Unit: mm

33 28 18 2.88 2.88 1.5 2.88 2 1 2 15 10 11 14 2.88 7 4 4 4 1.5 4 4 4 15 1.5 5 5 1.5 5 5 1.5 80 50 5 5 5 5 100 3.5φ−5

0220-7

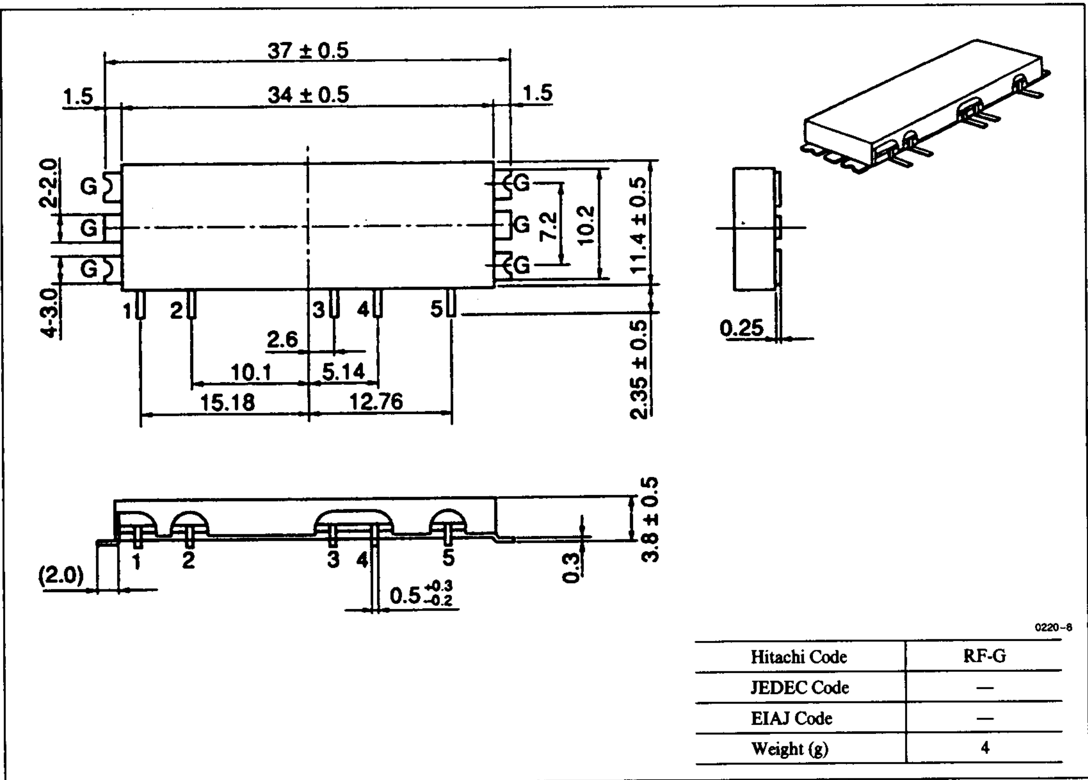
Grass Epoxy Double Sided P.C.B
(t = 1.6 mm, and r = 4.8)

■ INTERNAL DIAGRAM



C1 = 100 pF Ceramic Chip
C2, C3 = 0.01 μF Ceramic Chip
C4, C5 = 4.7 μF Tantalum
C6 = 220 μF Aluminum Electrolyte
L1 = RFC 1 mm ∅, 15 turns
FB = Ferrite Bead BLO1RN1-A62-001 (Murata) or Equivalent
Z1, Z2, Z3 = 50Ω Microstrip Line

■ PACKAGE DIMENSIONS



Hitachi Code	RF-G
JEDEC Code	—
EIAJ Code	—
Weight (g)	4

■ NOTES FOR USE

1. Don't apply the reflow soldering process.
2. Don't apply the dipping solder process to the lead pins.
3. To avoid the stress against the lead pins, lead pins should be soldered after the soldering of ground flange.
4. Soldering temperature and time should be less than 230°C, 10 sec. per each pin.
5. To protect devices from electro-static damage, soldering iron, measuring equipment and human body etc., should be grounded.
6. To avoid the degradation of efficiency and output power, lead pins should not be floating from PCB, and connected just on the RF signal line. (Refer to Figure 1.)
7. Recommendation to decrease the thermal resistance is shown below.
   a. Arrangement of through holes under as many as possible under module.
   b. Addition of external heat sink on the metal case of module.
8. Don't wash module except lead pins and ground flange.
9. It should be recommended to apply a non-chlorine solder for modules. For example, KR19 by Nihon Almit Co., LTD.
10. When the external parts (Isolator, Duplexer, etc.) of the module are changed, the electrical characteristics should be evaluated enough.
11. To get stable operation, all ground pins (total 6 pins) should be connected to PCB ground plane directly, and the through holes under module should be made as many as possible.

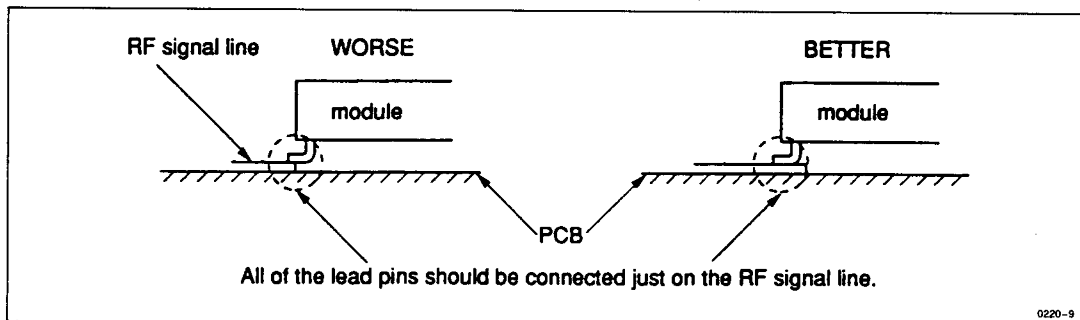


Figure 1