



SUMITOMO ELECTRIC INDUSTRIES, LTD.

00.09.14

◆ *Features*

- Up to 2.5 GHz frequency band
- Beyond 22 dBm output power
- Low distortion characteristics
- Low power consumption
- High power gain
- Low-cost plastic mold package
- Low thermal resistance lead flame

P0110002P

Plastic Mini-mold

***Medium Power
GaAs FET***



◆ *Applications*

- Driver amplifier preceding final power amplifier for DECT

◆ *Description*

The P0110001P/2P/3P/4P/5P are high performance gallium arsenide Schottky-barrier-gate field effect transistors housed in a cost effective plastic mini-mold package. These devices achieve an excellent linearity and a high gain owing to the pulse-doped epitaxial structure, having very narrow active regions with high carrier concentration, developed by SEI. The P01 series are designed for use in mobile communication system applications up to 2.5 GHz required low distortion and low power dissipation. The P0110001P/2P are suitable for driver amplifiers in PHS, cellular, and DECT systems. The P0110003P/4P/5P can be applied for final power amplifiers as well. A specified gain can be obtained by less number of FET's due to their high gain performance. Furthermore, specified intermodulation and spurious level in adjacent channels can be achieved with lower power consumption owing

◆ Absolute Maximum Ratings

Case Temperature $T_c=25\text{ }^{\circ}\text{C}$

Parameter	Symbol	Value	Units
Drain - Source Voltage	V_{DS}	8	V
Gate - Source Voltage	V_{GS}	- 4	V
Drain Current	I_{DS}	I_{DSS}	---
Power Dissipation	P_T	1.7	W
Channel Temperature	T_{CH}	125	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-40 to +125	$^{\circ}\text{C}$

Notes: Operating of this device above any one of these parameters may cause permanent damage.

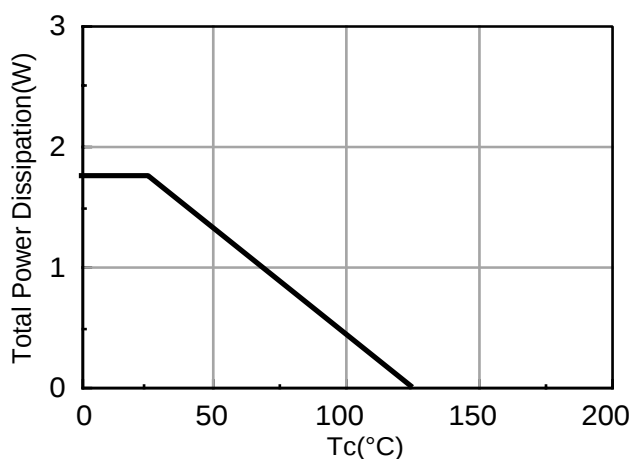
◆ Electrical Specifications

Case Temperature $T_c=25\text{ }^{\circ}\text{C}$

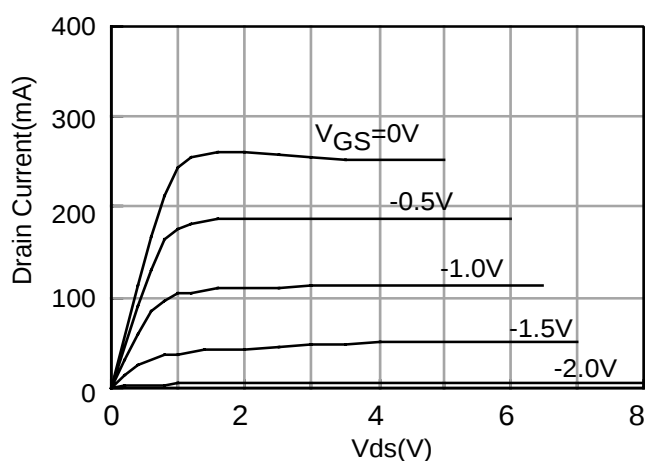
Parameter	Symbol	TestConditions	Value			Units
			Min.	Typ.	Max.	
Saturated Drain Current	I_{DSS}	$V_{DS}=3\text{V}, V_{GS}=0\text{V}$	---	---	300	mA
Transconductance	g_m	$V_{DS}=6\text{V}, I_{DS}=100\text{mA}$	90	---	---	mS
Pinchoff Voltage	V_p	$V_{DS}=6\text{V}, I_{DS}=10\text{mA}$	- 3.0	---	- 1.7	V
Gate-Source Breakdown Voltage	$ V_{GSO} $	$I_{GSO}= -10\mu\text{A}$	3.0	---	---	V
Output Power @ 1 dB Gain Compression	P_{1dB}	$V_{DS}=6\text{V}$	22	24	---	dBm
Small Signal Gain	G	$I_{DS}=50\%\text{ of } I_{DSS}$	16	---	---	dB
Power Added Efficiency	η_{add}	$f=1.5\text{GHz}$	---	43	---	%
Thermal Resistance	R_{th}	Channel-Case	---	---	60	$^{\circ}\text{C/W}$

◆ Typical Characteristics

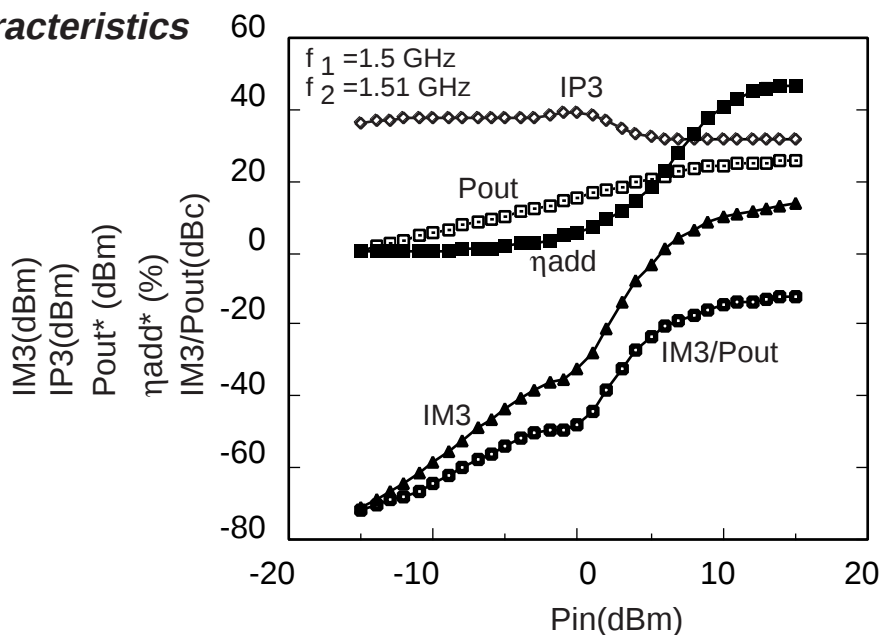
Derating Curve



Transfer Curve



◆ Power Characteristics



Pout* and η_{add} * are measured by one signal

Device : P0110002P

Frequency : $f_1 = 1.5$ GHz $f_2 = 1.51$ GHz

Bias : $V_{DS} = 6$ V, $I_{DS} = 100$ mA

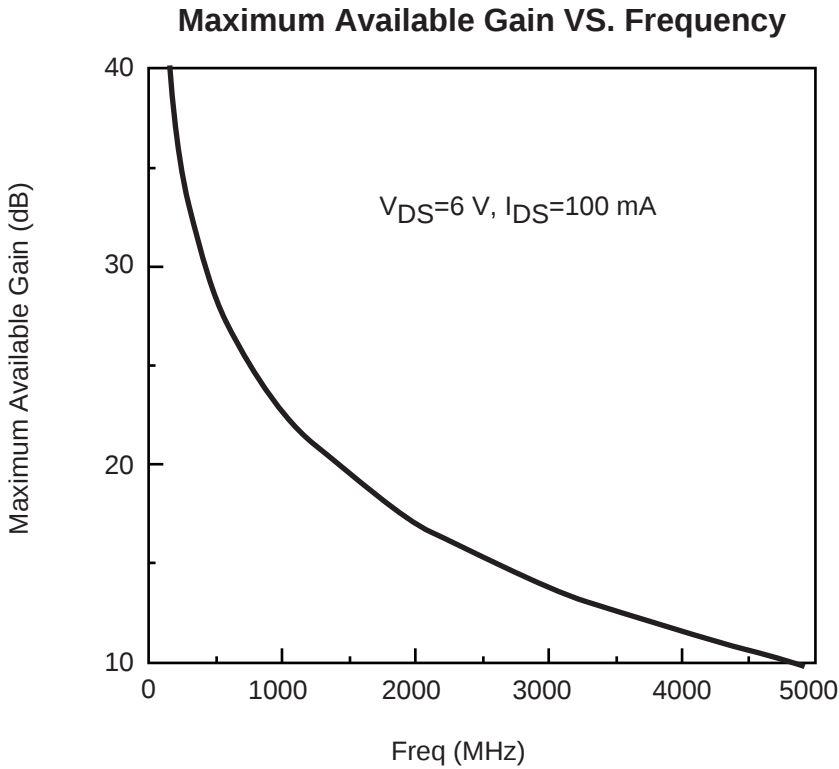
Source Matching : Mag0.45 , Angle130°

Load Matching : Mag0.02 , Angle123.7° , under the condition for the lowest distortion

Pin (dBm)	Pout (dBm)	Gain (dB)	IM3/Pout (dBc)	IM3 (dBm)	IP3 (dBm)	η_{add} (%)
-15.0	0.6	15.6	-71.7	-71.0	36.5	0.2
-14.0	1.7	15.7	-70.7	-69.0	37.0	0.2
-13.0	2.7	15.7	-69.1	-66.4	37.2	0.3
-12.0	3.7	15.7	-67.9	-64.2	37.6	0.4
-11.0	4.7	15.7	-66.3	-61.7	37.8	0.5
-10.0	5.7	15.7	-64.3	-58.6	37.8	0.6
-9.0	6.7	15.7	-62.2	-55.5	37.7	0.8
-8.0	7.7	15.7	-60.2	-52.5	37.7	1.0
-7.0	8.6	15.6	-57.7	-49.0	37.5	1.2
-6.0	9.6	15.6	-55.8	-46.3	37.5	1.5
-5.0	10.5	15.5	-54.0	-43.6	37.5	1.8
-4.0	11.4	15.4	-51.9	-40.5	37.4	2.3
-3.0	12.4	15.4	-50.4	-38.0	38.7	2.9
-2.0	13.5	15.5	-49.8	-36.4	39.4	3.7
-1.0	14.5	15.5	-49.8	-35.4	39.4	4.7
0.0	15.5	15.5	-47.9	-32.5	39.4	5.8
1.0	16.4	15.4	-44.3	-27.8	38.6	7.3
2.0	17.4	15.4	-38.5	-21.1	36.7	9.1
3.0	18.4	15.4	-32.4	-14.0	34.6	11.5
4.0	19.4	15.4	-27.3	-7.8	33.1	14.4
5.0	20.5	15.5	-23.5	-3.0	32.3	18.1
6.0	21.6	15.6	-20.8	0.8	31.9	22.5
7.0	22.6	15.6	-18.7	3.9	31.9	27.8
8.0	23.4	15.4	-17.2	6.3	32.0	33.2
9.0	24.1	15.1	-15.8	8.3	31.9	37.6
10.0	24.5	14.5	-14.8	9.8	31.9	40.7
11.0	24.8	13.8	-14.0	10.8	31.8	43.2
12.0	25.1	13.1	-13.5	11.6	31.8	45.2
13.0	25.3	12.3	-12.9	12.4	31.8	46.2
14.0	25.5	11.5	-12.5	13.0	31.7	46.5
15.0	25.7	10.7	-12.1	13.6	31.7	46.2

◆ **Frequency Characteristics**

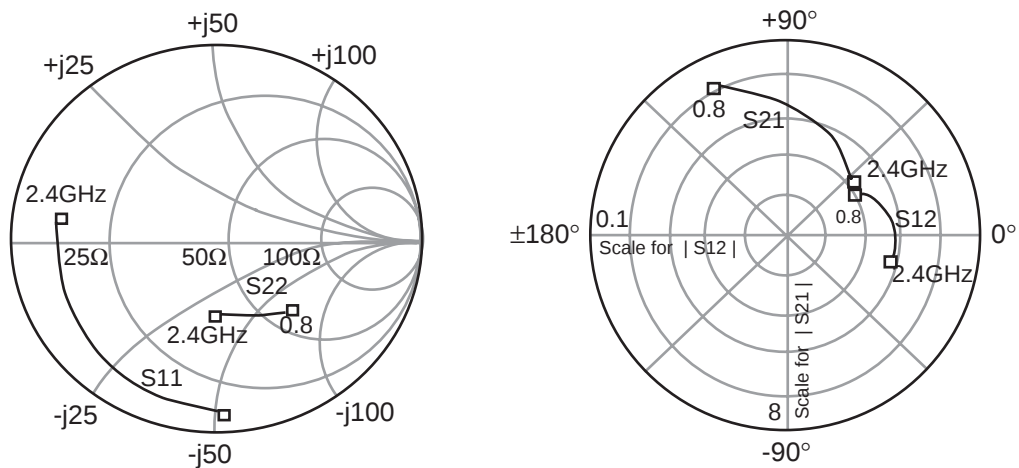
Tc=25 °C, V_{DS}=6 V, I_{DS}=100 mA, Common Source, Z_O=50 °C



Freq (GHz)	MAG (dB)	Freq (GHz)	MAG (dB)	Freq (GHz)	MAG (dB)
0.2	34.6	1.5	19.6	2.8	14.3
0.3	32.7	1.6	19.1	2.9	14.0
0.4	30.5	1.7	18.5	3.0	13.6
0.5	28.8	1.8	18.0	3.1	13.4
0.6	27.2	1.9	17.6	3.2	13.3
0.7	25.9	2.0	17.1	3.3	13.2
0.8	24.7	2.1	16.7	3.4	13.0
0.9	23.7	2.2	16.3	3.5	12.9
1.0	22.8	2.3	15.9	3.6	12.7
1.1	22.2	2.4	15.6	3.7	12.5
1.2	21.5	2.5	15.3	3.8	12.3
1.3	20.8	2.6	14.9	3.9	12.1
1.4	20.2	2.7	14.6	4.0	11.9

◆ Typical Scattering Parameters

$T_c=25\text{ }^{\circ}\text{C}$, $V_{DS}=6\text{ V}$, $I_{DS}=100\text{ mA}$, Common Source, $Z_0=50\text{ }\Omega$



Freq (GHz)	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
0.8	0.89	-90	6.68	115	0.040	37	0.48	-46
0.9	0.88	-98	6.36	109	0.042	32	0.48	-49
1.0	0.87	-105	6.06	104	0.044	28	0.47	-53
1.1	0.85	-113	5.74	99	0.046	25	0.46	-54
1.2	0.84	-121	5.47	93	0.047	21	0.45	-58
1.3	0.84	-128	5.23	87	0.049	17	0.44	-62
1.4	0.83	-135	5.00	82	0.050	13	0.43	-67
1.5	0.82	-142	4.79	77	0.050	10	0.42	-70
1.6	0.82	-148	4.56	72	0.052	7	0.41	-73
1.7	0.81	-154	4.38	67	0.053	3	0.41	-76
1.8	0.81	-159	4.21	63	0.053	-0	0.40	-79
1.9	0.81	-165	4.05	58	0.054	-3	0.40	-82
2.0	0.80	-170	3.90	54	0.054	-6	0.39	-85
2.1	0.80	-175	3.77	50	0.054	-9	0.39	-88
2.2	0.80	-179	3.65	45	0.054	-12	0.38	-92
2.3	0.80	176	3.53	41	0.055	-14	0.39	-94
2.4	0.79	172	3.42	38	0.055	-16	0.38	-96

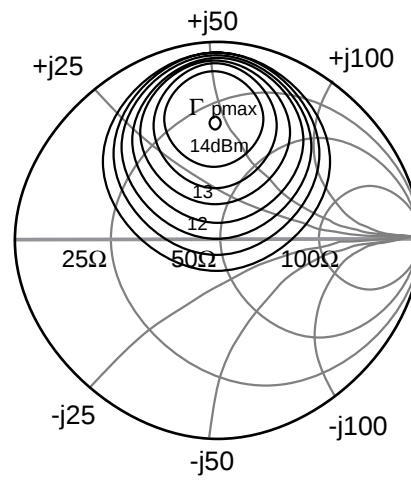
◆ Load-pull characteristics

$T_c=25\text{ }^{\circ}\text{C}$, $V_{DS}=6\text{ V}$, $I_{DS}=100\text{ mA}$, Common Source, $P_{in}=-5\text{ dBm}$

Pout - Lstate

$f_1=1.5\text{GHz}$

$V_{ds}=6\text{V}$, $I_{ds}=100\text{mA}$



$\Gamma_{IP3max}=0.62 \angle 95^\circ$

$P_{in}=-5\text{ dBm}$

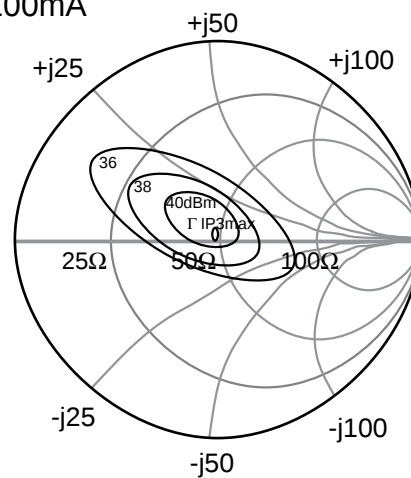
$IP3_{MAX}=15.3\text{ dBm}$

IP3 - Lstate

$f_1=1.5\text{GHz}$

$f_2=1.51\text{GHz}$

$V_{ds}=6\text{V}$, $I_{ds}=100\text{mA}$



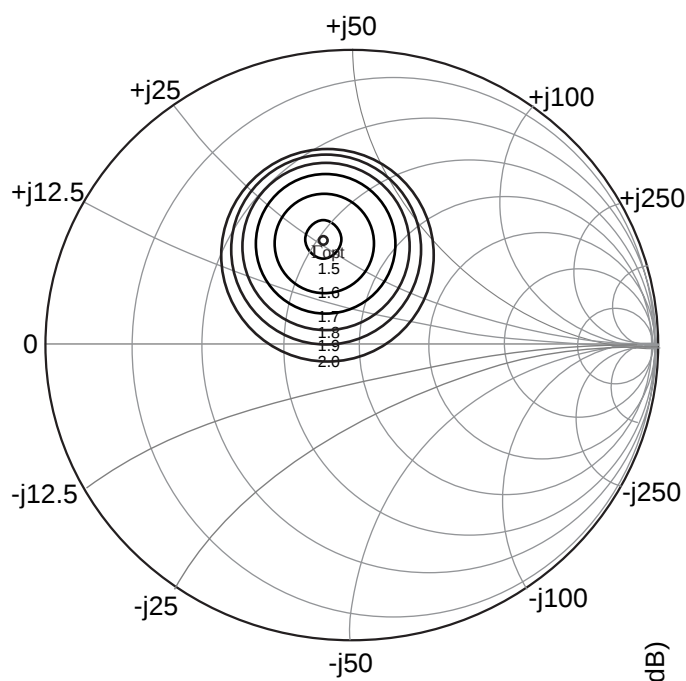
$\Gamma_{IP3max}=0.02 \angle 124^\circ$

$P_{in}=-5\text{ dBm}$

$IP3_{MAX}=40.5\text{ dBm}$

◆ NF characteristics

Fig. NF Circles

f=2.0 GHz, $V_{DS}=6$ V, $I_{DS}=60$ mA

P0110002P
 OPT=0.38 $\angle$ 105°
 Rn/50=0.25
 NFmin=1.49 dB

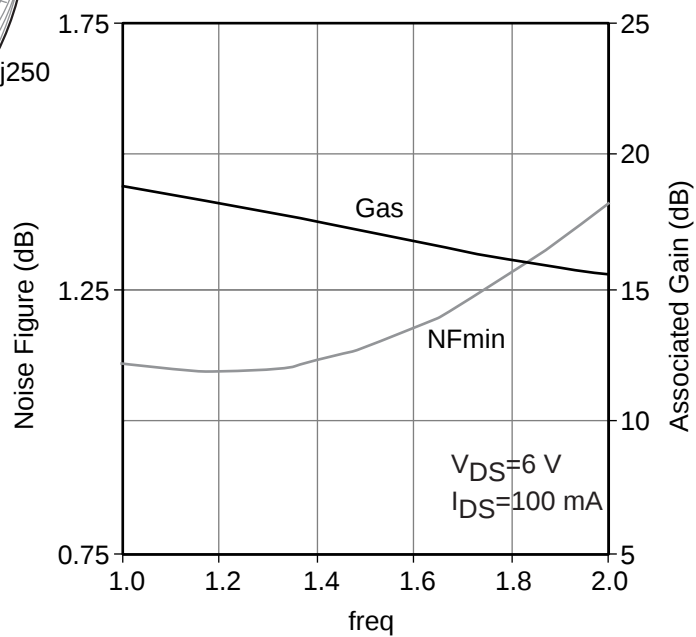
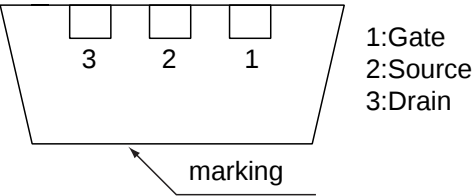
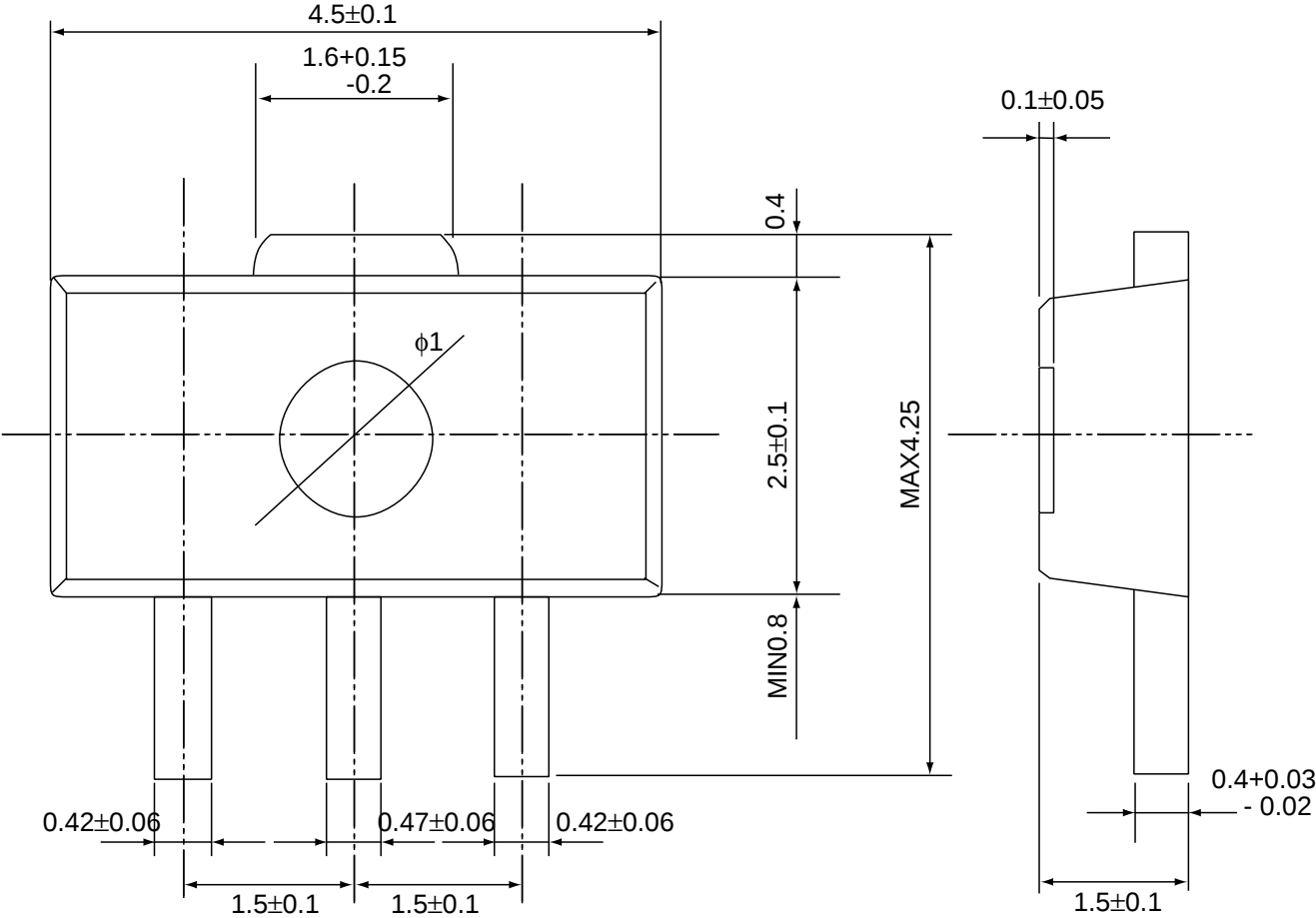


Fig. Noise Figure, Associated Gain-freq

Table. Noise Parameter
 $V_{DS}=6$ V, $I_{DS}=100$ mA

freq (GHz)	Γ_{OPT}		NFmin (dB)	Rn/50
	MAG	ANG		
1.00	0.45	48.4	1.08	0.34
1.20	0.42	62.2	1.06	0.32
1.40	0.34	84.4	1.27	0.29
1.60	0.56	84.6	1.13	0.26
1.80	0.55	91.3	1.13	0.25
2.00	0.37	105.3	1.49	0.25

◆ Package Drawings



Note: All dimensions in millimeters

◆ **Evaluation Board Layout (Dimensions are mm)**

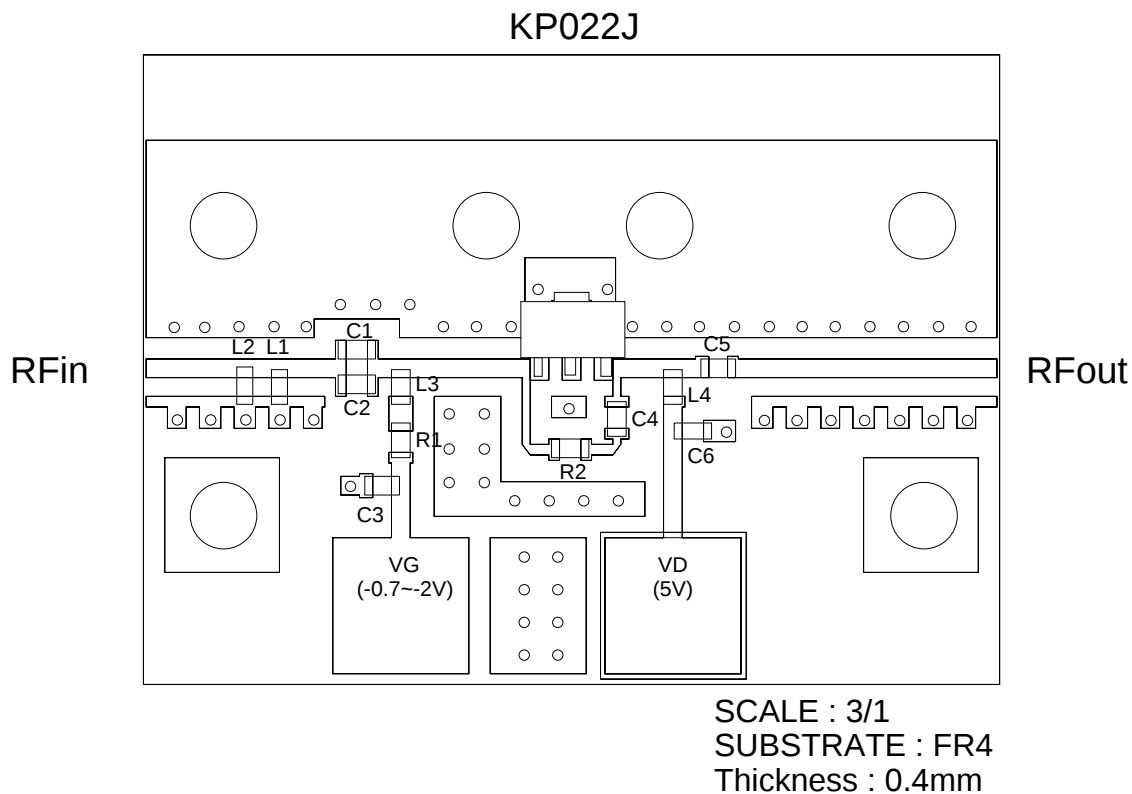


Fig.1 Pout.(freq:2110~2170MHz) test fixture (top view) for P0110002P

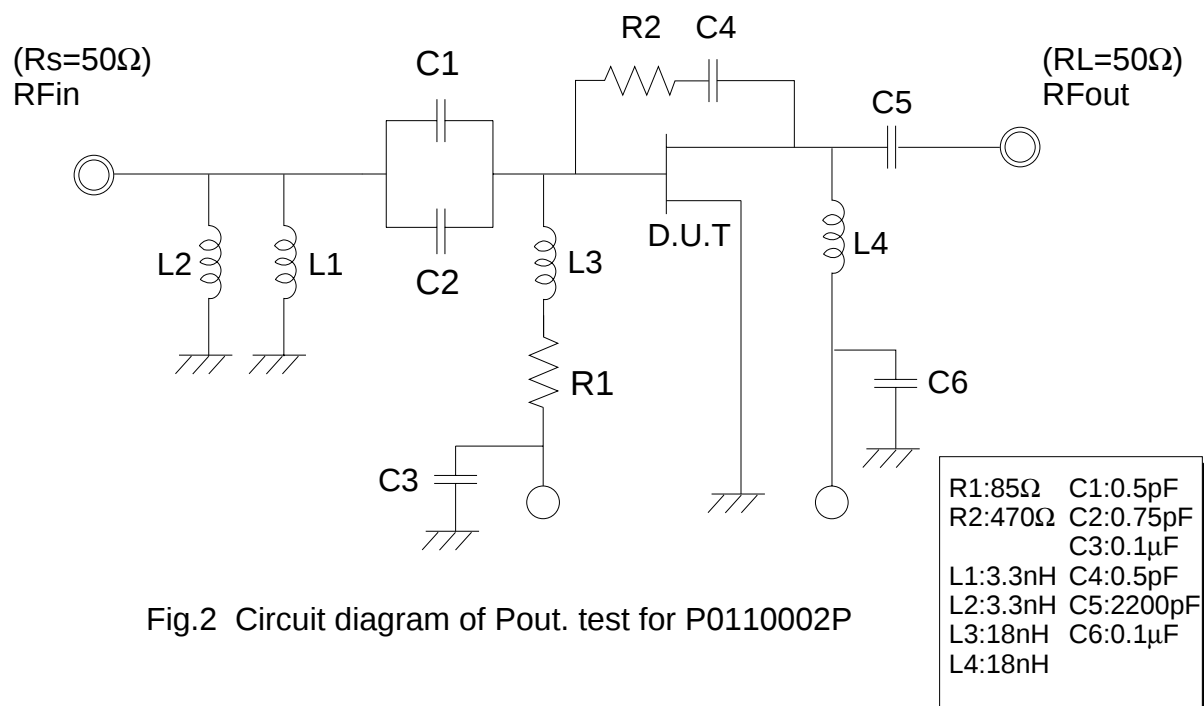


Fig.2 Circuit diagram of Pout. test for P0110002P