SUMITOMO ELECTRIC INDUSTRIES, LTD.

00.09.14

P0110004P

Plastic Mini-mold

Medium Power GaAs FET

♦ *Features*

- Up to 2.5 GHz frequency band
- Beyond 28 dBm output power
- Low distortion characteristics
- Low power consumption
- High power gain
- Low-cost plastic mold package
- Low thermal resistance lead flame

♦ *Applications*

- 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 achive 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 achived with lower power consumption owing to their excellent linearity.

♦ *Absolute Maximum Ratings*

Case Temperature Tc=25 °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	4.3	W
Channel Temparature	T_{CH}	125	°C
Storage Temparature	Tstg	-40 to +125	°C

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

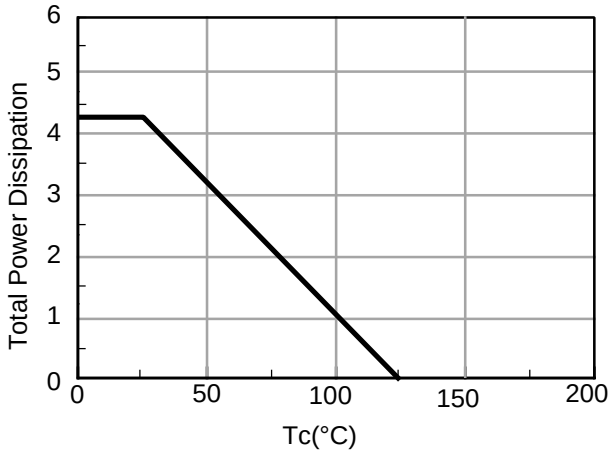
♦ *Electrical Specifications*

Case Temperature Tc=25 °C

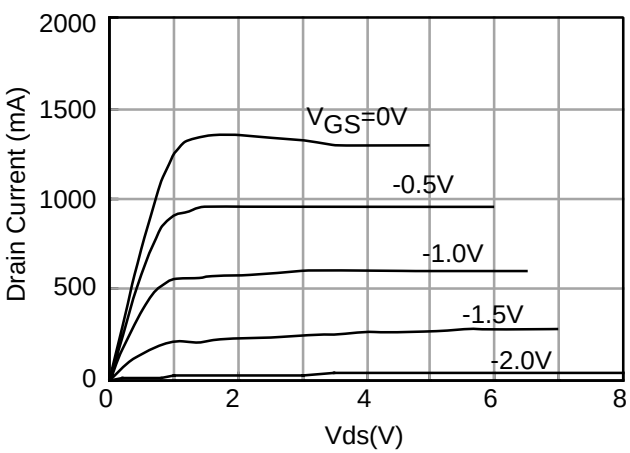
Parameter	Symbol	TestConditions	Value			Units
			Min.	Typ.	Max.	
Saturated Drain Current	I_{DSS}	V_{DS}=3V, V_{GS}=0V	---	---	1600	mA
Transconductance	gm	V_{DS}=6V, I_{DS}=500mA	450	---	---	mS
Pinchoff Voltage	Vp	V_{DS}=6V, I_{DS}=50mA	- 3.0	---	- 1.7	V
Gate-Source Breakdown Voltage	$\|V_{GSO}\|$	I_{GSO}= -50μA	3.0	---	---	V
Output Power @ 1 dB Gain Compression	P_{1dB}	V_{DS}=6V	28	30	---	dBm
Small Signal Gain	G	I_{DS}=30%of I_{DSS}	11	---	---	dB
Power Added Efficiency	ηadd	f =1.5GHz	---	43	---	%
Thermal Resistance	Rth	Channel-Case	---	---	23	°C/W

♦ *Typical Characteristics*

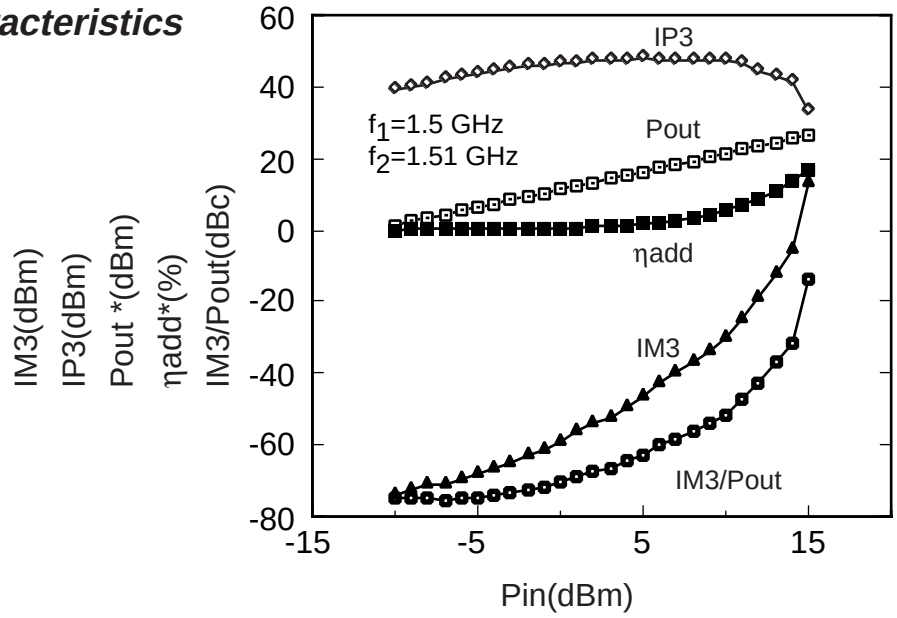
Derating Curve



Transfer Curve



♦ *Power Characteristics*



Pout*and ηadd* are measured by one signal.

Device : P0110004P

Frequency : f_1=1.5GHz f_2=1.51GHz

Bias : V_{DS}=6V, I_{DS}=400mA

Source Matching : Mag 0.73 , Angle-179°

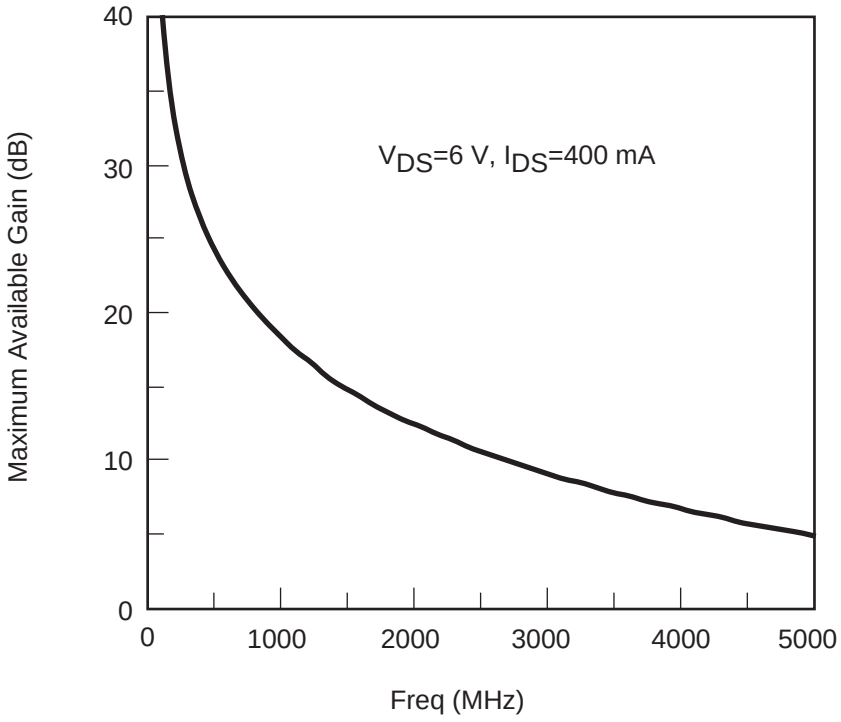
Load Matching : Mag 0.59 , Angle-140.5°, under the condition for the lowest distortion

Pin(dBm)	Pout(dBm)	Gain(dB)	IM3/Pout(dBc)	IM3(dBm)	IP3(dBm)	ηadd(%)
-10.0	1.4	11.4	-75.1	-73.7	39.0	0.1
-9.0	2.5	11.5	-74.8	-72.3	39.9	0.1
-8.0	3.5	11.5	-74.6	-71.1	40.8	0.1
-7.0	4.5	11.5	-75.4	-70.9	42.2	0.1
-6.0	5.5	11.5	-74.9	-69.5	42.9	0.1
-5.0	6.5	11.5	-74.7	-68.2	43.8	0.2
-4.0	7.5	11.5	-74.0	-66.5	44.5	0.2
-3.0	8.5	11.5	-73.6	-65.1	45.3	0.3
-2.0	9.5	11.5	-72.6	-63.1	45.8	0.3
-1.0	10.4	11.4	-71.5	-61.1	46.2	0.4
0.0	11.4	11.4	-70.3	-58.9	46.5	0.5
1.0	12.4	11.4	-68.6	-56.2	46.7	0.7
2.0	13.4	11.4	-67.5	-54.1	47.2	0.8
3.0	14.4	11.4	-66.5	-52.1	47.6	1.1
4.0	15.4	11.4	-64.6	-49.2	47.7	1.3
5.0	16.4	11.4	-63.0	-46.6	47.9	1.7
6.0	17.4	11.4	-60.2	-42.8	47.5	2.1
7.0	18.4	11.4	-58.5	-40.1	47.7	2.7
8.0	19.4	11.4	-56.5	-37.1	47.7	3.4
9.0	20.4	11.4	-54.2	-33.7	47.5	4.3
10.0	21.4	11.4	-51.3	-29.9	47.1	5.4
11.0	22.4	11.4	-47.6	-25.2	46.2	6.9
12.0	23.5	11.5	-42.4	-19.0	44.7	8.7
13.0	24.5	11.5	-36.7	-12.2	42.8	10.9
14.0	25.5	11.5	-31.3	-5.8	41.1	13.8
15.0	26.5	11.5	-13.8	12.7	33.4	17.2

♦ *Typical Scattering Parameters*

Tc=25 °C, V_{DS}=6 V, I_{DS}=400 mA, Common Source, Z_O=50 Ω

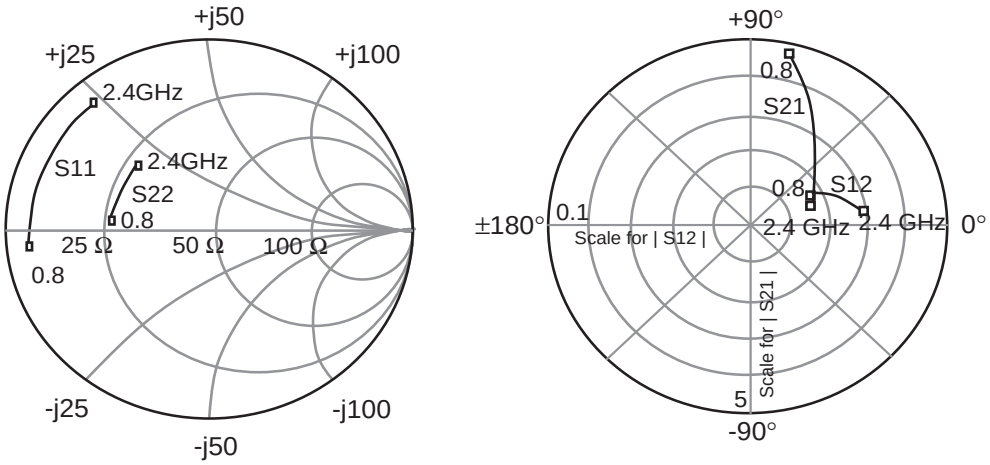
Maximum Available Gain VS. Frequency



Freq (GHz)	MAG (dB)	Freq (GHz)	MAG (dB)	Freq (GHz)	MAG (dB)
0.2	31.1	1.5	14.9	2.8	9.9
0.3	28.2	1.6	14.4	2.9	9.8
0.4	26.0	1.7	13.9	3.0	9.4
0.5	24.3	1.8	13.4	3.1	9.2
0.6	22.7	1.9	12.9	3.2	9.0
0.7	21.4	2.0	12.5	3.3	8.8
0.8	20.3	2.1	12.1	3.4	8.5
0.9	19.3	2.2	11.7	3.5	8.3
1.0	18.4	2.3	11.4	3.6	8.1
1.1	17.6	2.4	11.0	3.7	7.8
1.2	16.9	2.5	10.8	3.8	7.6
1.3	16.1	2.6	10.5	3.9	7.4
1.4	15.5	2.7	10.1	4.0	7.2

♦ *Typical Scattering Parameters*

Tc=25 °C, V_{DS}=6 V, I_{DS}=40 0mA, Common Source, Z_O=50 Ω



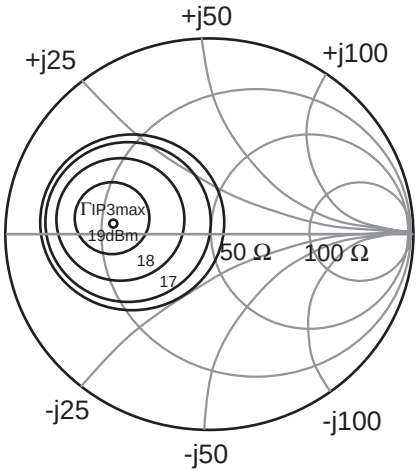
Freq (GHz)	S11 Mag	S11 Ang	S21 Mag	S21 Ang	S12 Mag	S12 Ang	S22 Mag	S22 Ang
0.8	0.87	-174	4.55	76	0.034	23	0.048	174
0.9	0.86	-179	4.12	71	0.036	22	0.048	171
1	0.86	176	3.77	67	0.038	21	0.047	168
1.1	0.86	171	3.47	63	0.039	21	0.047	165
1.2	0.86	167	3.18	59	0.040	20	0.047	162
1.3	0.86	163	2.95	55	0.042	19	0.047	160
1.4	0.86	160	2.74	51	0.043	18	0.048	158
1.5	0.87	156	2.57	47	0.044	18	0.048	156
1.6	0.87	153	2.41	44	0.046	16	0.048	153
1.7	0.87	150	2.28	40	0.047	15	0.048	151
1.8	0.87	146	2.15	36	0.048	14	0.048	148
1.9	0.87	143	2.05	33	0.050	13	0.048	146
2	0.87	140	1.96	29	0.051	11	0.048	144
2.1	0.87	137	1.87	26	0.053	10	0.048	141
2.2	0.87	134	1.80	22	0.055	8	0.049	139
2.3	0.87	132	1.73	19	0.056	7	0.048	137
2.4	0.86	128	1.67	15	0.058	5	0.048	134

♦ *Load-pull characteristics*

Tc=25 °C, V_{DS}=6V, I_{DS}=400 mA, Common Source, Pin=8 dBm

Pout - Lstate

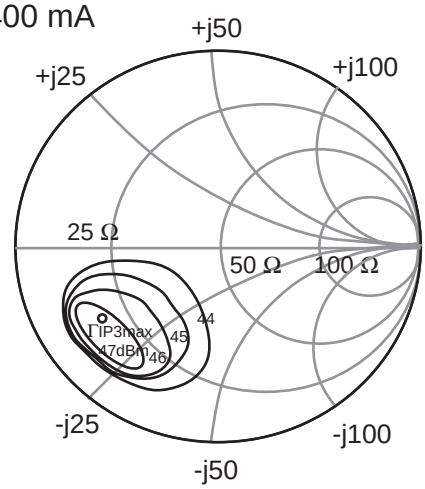
f1=1.5 GHz
Vds=6 V, Ids=400 mA



ΓIP3max=0.43∠172°
Pin=5 dBm
Pout MAX=19.7 dBm

IP3 - Lstate

f1=1.5 GHz
f2=1.51 GHz
Vds=6 V, Ids=400 mA

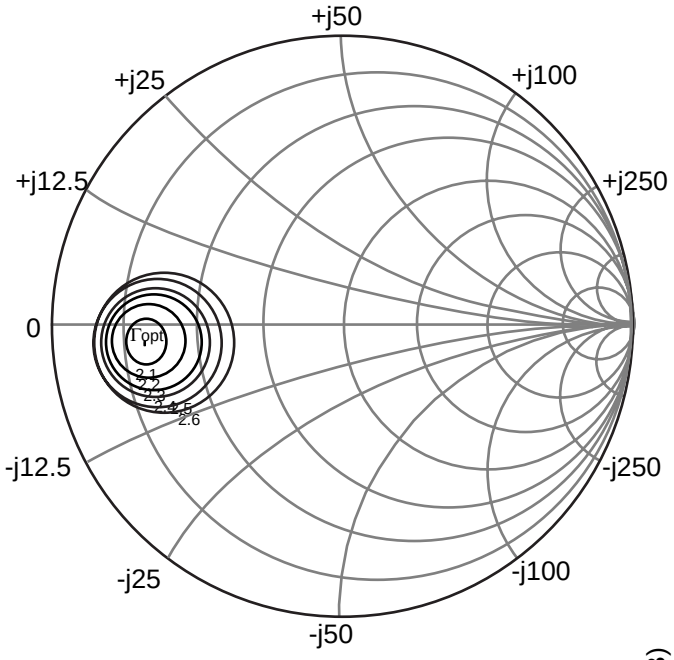


ΓIP3max=0.59∠-141°
Pin=5 dBm
IP3 MAX=47.9 dBm

♦ *NF characteristics*

Fig. NF Circles

f=2.0 GHz, V_{05}=6 V, I_{DS}=400mA



P0110004P
Γ_{OPT}=0.68∠-175°
Rn/50=0.06
NFmin=2.04dB

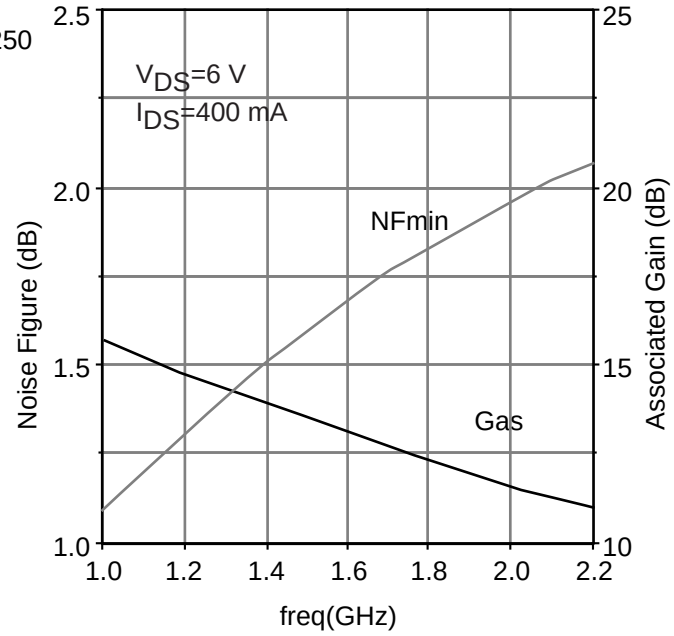


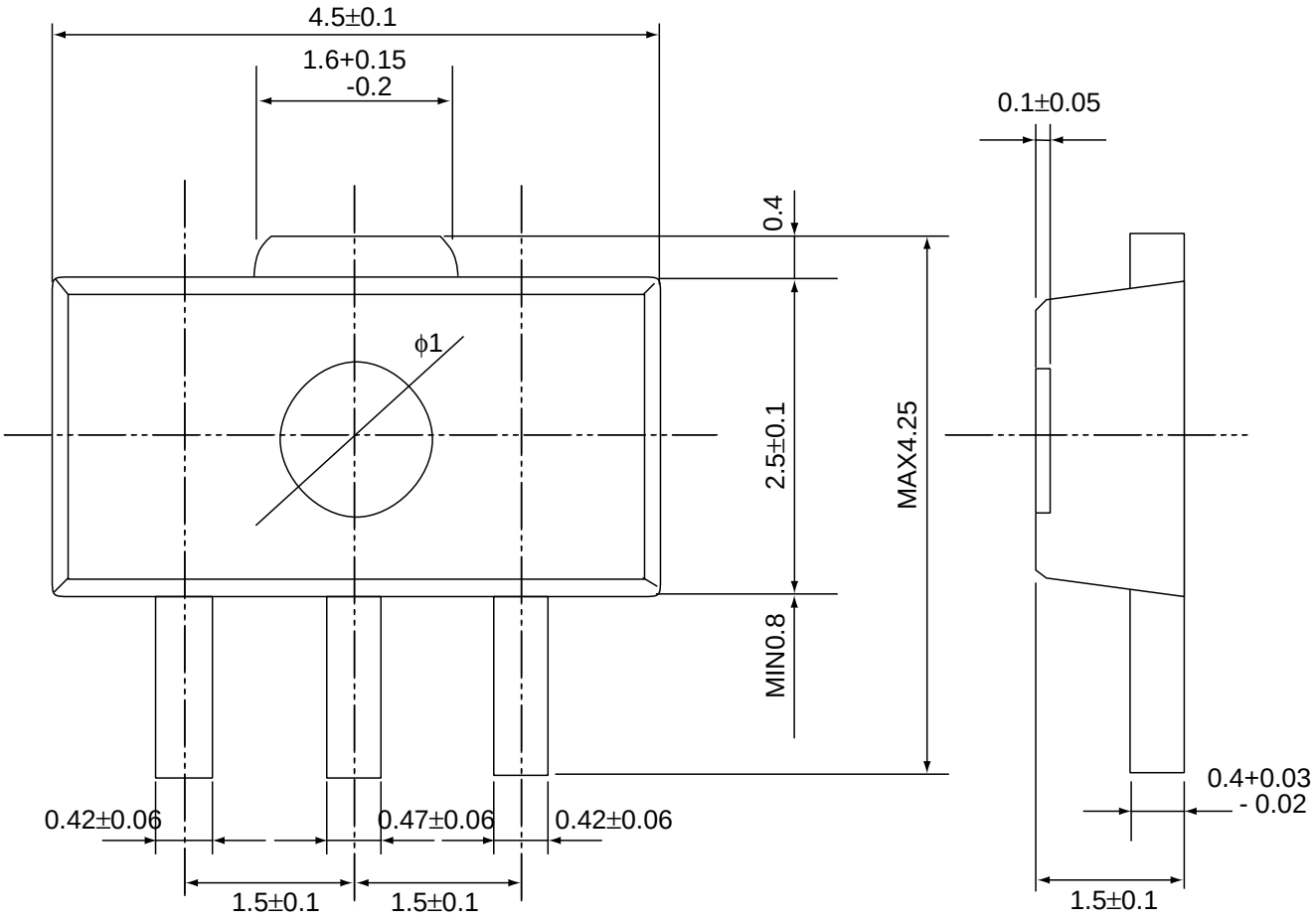
Fig. Noise Figure,Associated Gain-freq

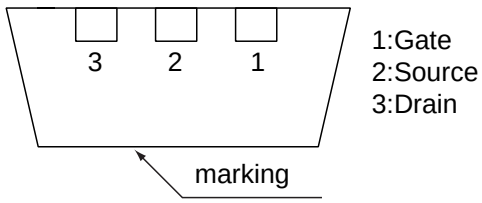
Table. Noise Parameter

V_{DS}=6 V, I_{DS}=400 mA

freq (GHz)	Γ_{OPT}		NFmin (dB)	Rn/50
	MAG	ANG		
1.00	0.52	159.7	0.93	0.06
1.20	0.53	168.6	1.52	0.07
1.40	0.65	169.6	1.46	0.04
1.60	0.65	176.4	1.57	0.04
1.80	0.64	-179.1	1.94	0.06
2.00	0.68	-174.7	2.04	0.06

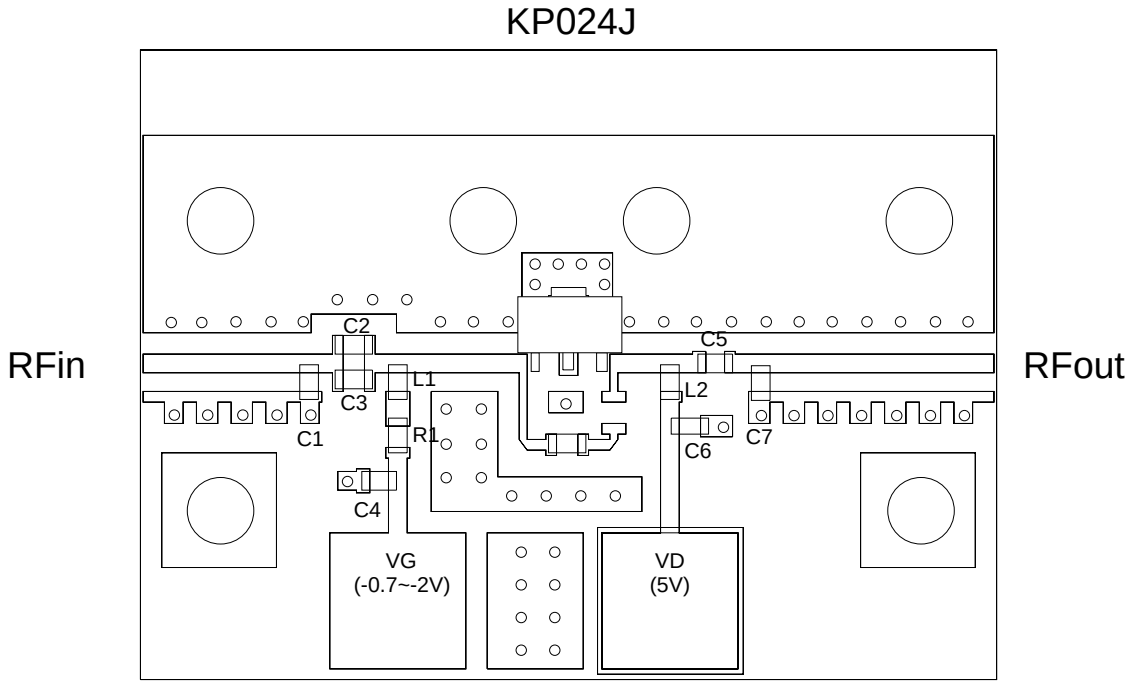
♦ *Package Drawings*





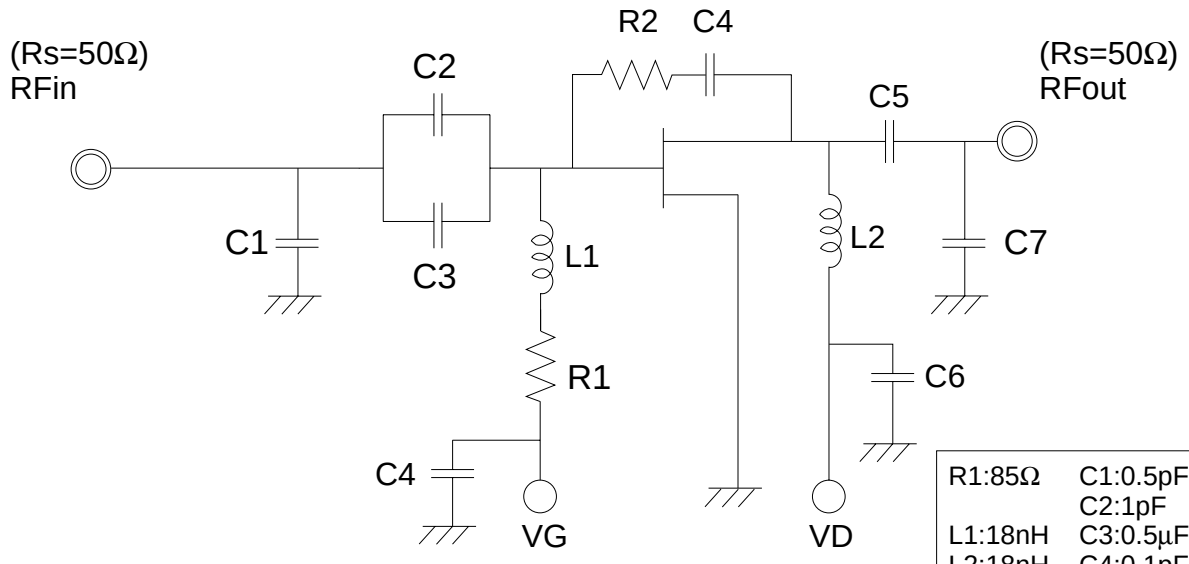
1:Gate
2:Source
3:Drain

♦ *Evaluation Board Layout (Dimensions are mm)*



SCALE : 3/1
SUBSTRATE : FR4
Thickness : 0.4mm

Fig.1 Pout.(freq:2110~2170MHz) test fixture (top view) for P0110004P



R1:85Ω	C1:0.5pF
	C2:1pF
L1:18nH	C3:0.5μF
L2:18nH	C4:0.1pF
	C5:3pF
	C6:0.1μF
	C7:1p

Fig.2 Circuit diagram of Pout. test for P0110003P