

**AMT4101-01**  
**Low Noise Transistor Device**



**Key Features :**

- Low noise figure : 0.5dB
- Gain G : 17dB@2GHz
- P<sub>1dB</sub> : 19dBm
- High OIP3 : 33dBm
- High current I : 60mA
- Wideband
- Superior biasing and matching requirement
- Applications : GSM wireless communication, transceiver module, radio telecommunication etc.

**Description :**

AMT4101-01 is a Gallium Arsenide (GaAs) pHEMT process designed super low noise amplifier, high IP3 transistor device. Incorporating the low noise figure and high IP3, at frequency below 4GHz, this can be an ideal amplifier for a harsh base station application.

**Absolute Maximum Ratings (Ta = 25°C)**

Parameter	Value	Unit	Remark
V <sub>DS</sub>	11	V	
V <sub>GS</sub>	-5 ~ 1	V	
V <sub>GD</sub>	-5 ~ 1	V	
I <sub>DS</sub>	720	mA	
I <sub>GS</sub>	2	mA	
RF input power	17	dBm	
Operation Temperature	-55 ~ +125°C	°C	
Sintering Temperature	-40 ~ +150°C	°C	
Storage Temperature	-65 ~ +150°C	°C	

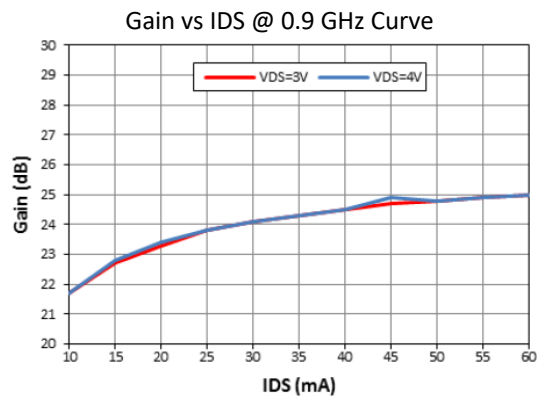
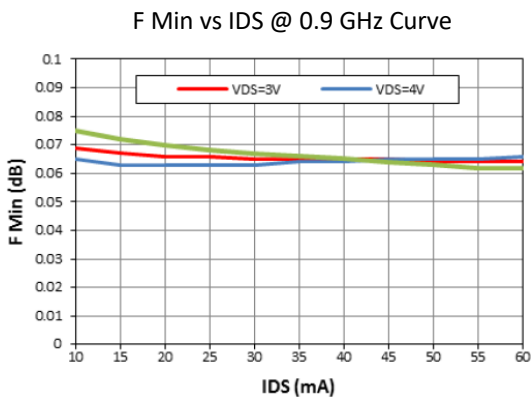
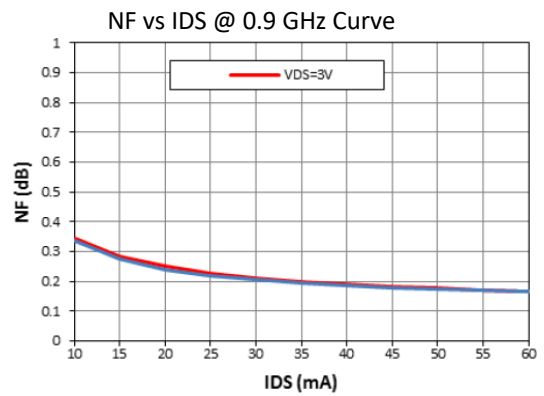
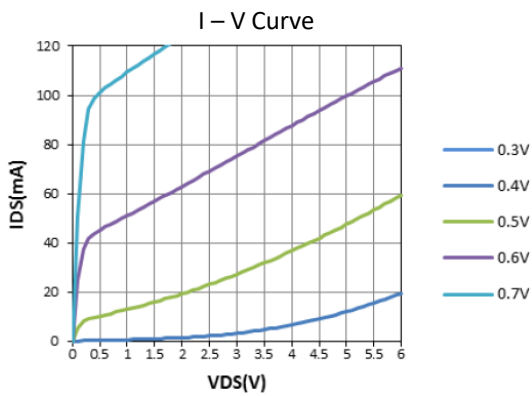
[1] Operation outside any of the Absolute Maximum Ratings may cause permanent device damage.

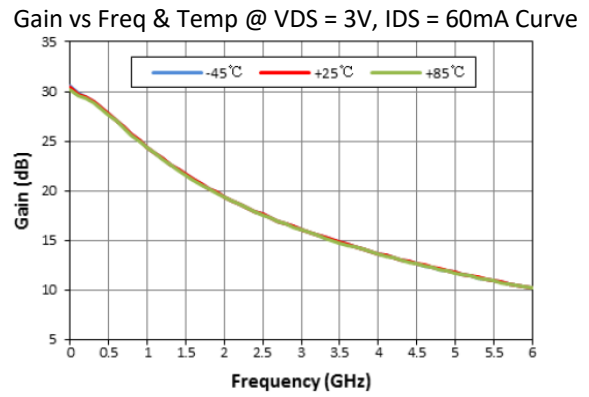
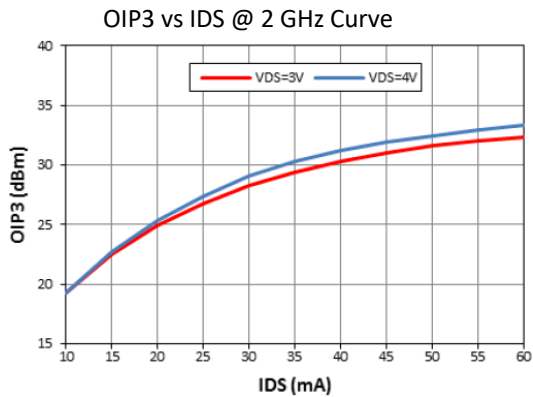
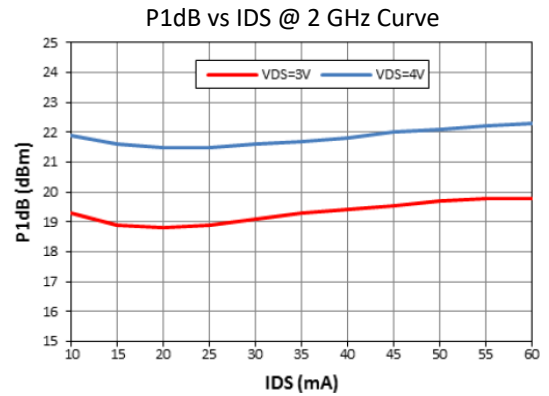
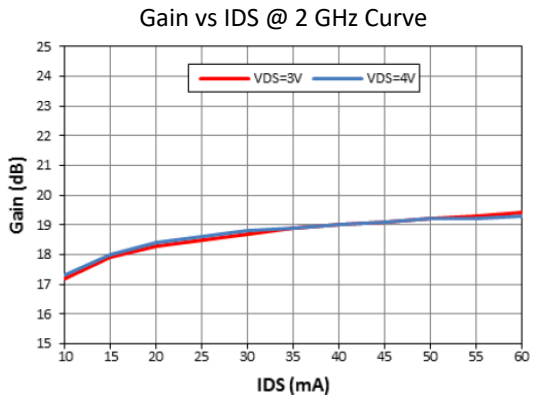
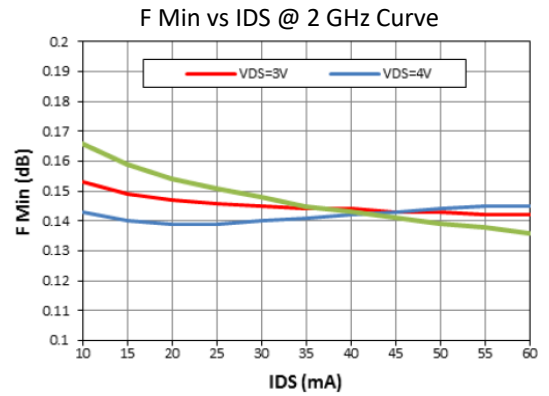
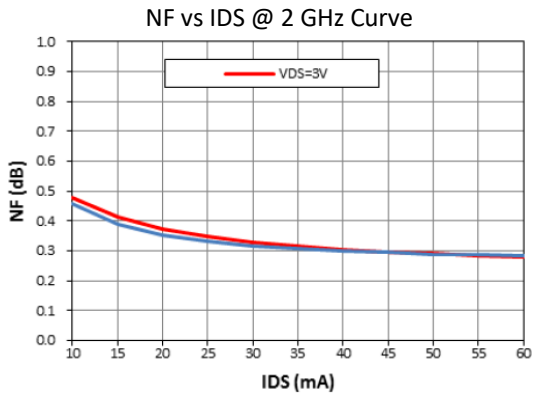
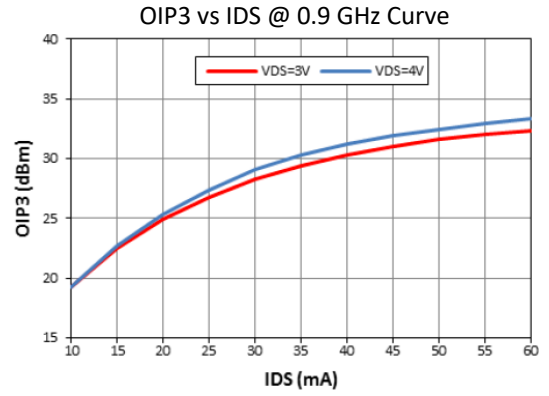
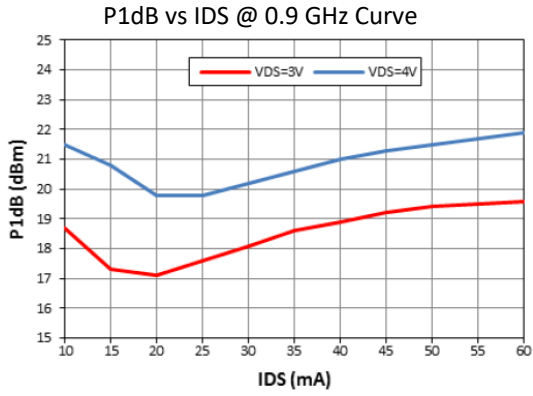
**Electrical Characteristics (Ta = 25°C, frequency 0.01 – 6 GHz)**

Symbol	Parameter	Test Conditions	Value			Unit
			Min	Typical	Max	
<b>Direct Current Characteristics</b>						
V <sub>GS</sub>	Useable gate voltage	V <sub>DS</sub> = 3V, I <sub>DS</sub> = 60mA	0.5	0.55	0.6	V
V <sub>TH</sub>	Turn-on voltage	V <sub>DS</sub> = 3V, I <sub>DS</sub> = 4mA	0.42	0.44	0.46	V
I <sub>DSS</sub>	Saturated drain current	V <sub>DS</sub> = 3V, V <sub>GS</sub> = 0V	-	2	4	μA
G <sub>M</sub>	Transconductance	V <sub>DS</sub> = 3V, G <sub>M</sub> = ΔI <sub>DS</sub> / ΔV <sub>GS</sub> ΔV <sub>GS</sub> = V <sub>GS1</sub> - V <sub>GS2</sub> V <sub>GS1</sub> = V <sub>GS</sub> at I <sub>DS</sub> = 60mA V <sub>GS2</sub> = V <sub>GS1</sub> + 0.05V	200	400	520	mS

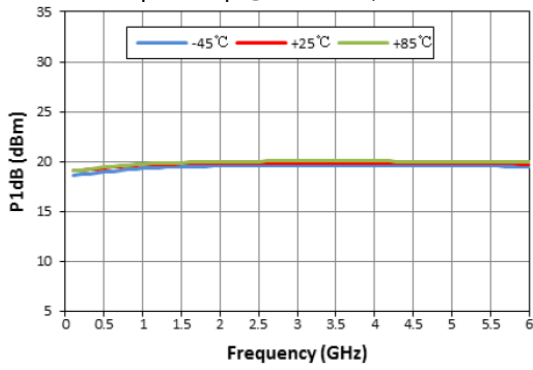
$I_{GSS}$	Gate leakage current	$V_{GD} = V_{GS} = -3V$	-	-	100	$\mu A$	
<b>RF Electrical Characteristics</b>							
NF	Noise figure	$V_{DS} = 3V, I_{DS} = 60mA$	$f = 0.9GHz$	-	0.2	-	dB
			$f = 2.0GHz$	-	0.3	-	
			$f = 3.9GHz$	-	0.7	-	
			$f = 5.8GHz$	-	1.2	-	
		$V_{DS} = 4V, I_{DS} = 60mA$	$f = 2.0GHz$	-	0.3	-	
Gain	Gain	$V_{DS} = 3V, I_{DS} = 60mA$	$f = 0.9GHz$	-	25	-	dB
			$f = 2.0GHz$	-	19.4	-	
			$f = 3.9GHz$	-	13.9	-	
			$f = 5.8GHz$	-	10.5	-	
		$V_{DS} = 4V, I_{DS} = 60mA$	$f = 2.0GHz$	-	19.3	-	
OIP3	Output third order intercept point	$V_{DS} = 3V, I_{DS} = 60mA$	$f = 0.9GHz$	-	32.3	-	dBm
			$f = 2.0GHz$	-	34.6	-	
			$f = 3.9GHz$	-	36.3	-	
			$f = 5.8GHz$	-	36.9	-	
		$V_{DS} = 4V, I_{DS} = 60mA$	$f = 2.0GHz$	-	34.3	-	
P1dB	Output 1dB compression point	$V_{DS} = 3V, I_{DS} = 60mA$	$f = 0.9GHz$	-	19.2	-	dBm
			$f = 2.0GHz$	-	19.9	-	
			$f = 3.9GHz$	-	19.9	-	
			$f = 5.8GHz$	-	19.8	-	
		$V_{DS} = 4V, I_{DS} = 60mA$	$f = 2.0GHz$	-	22.3	-	

**Typical Test Curve**

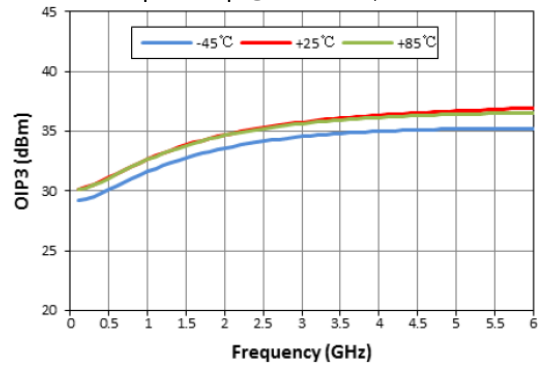




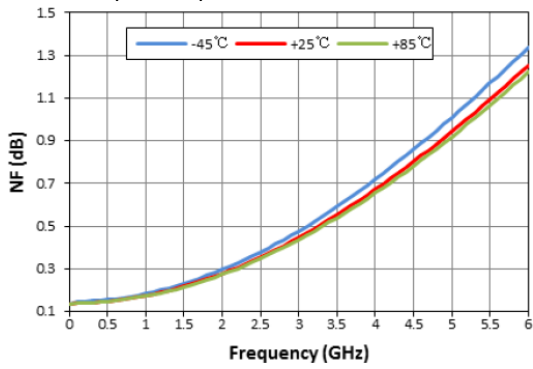
P1dB vs Freq & Temp @ VDS = 3V, IDS = 60mA Curve



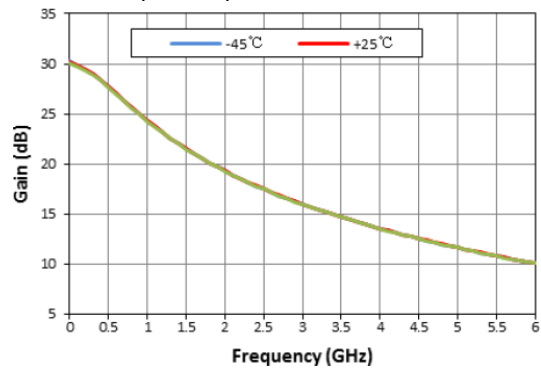
OIP3 vs Freq & Temp @ VDS = 3V, IDS = 60mA Curve



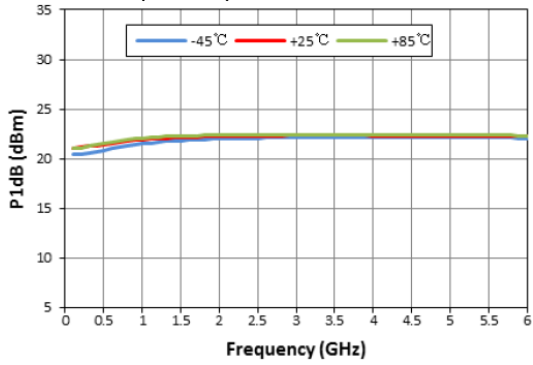
NF vs Freq & Temp @ VDS = 3V, IDS = 60mA Curve



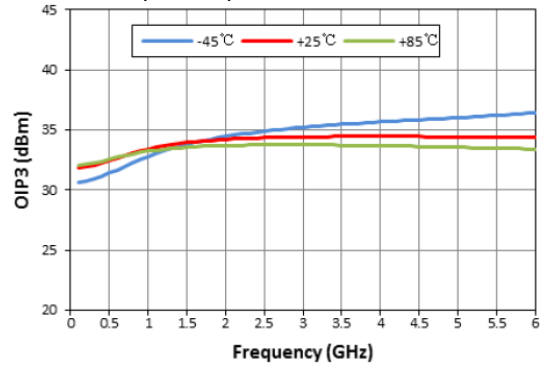
Gain vs Freq & Temp @ VDS = 4V, IDS = 60mA Curve



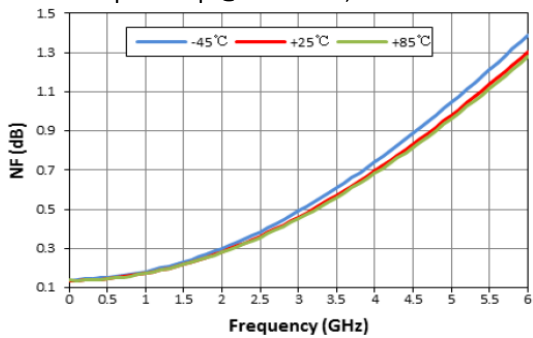
P1dB vs Freq & Temp @ VDS = 4V, IDS = 60mA Curve



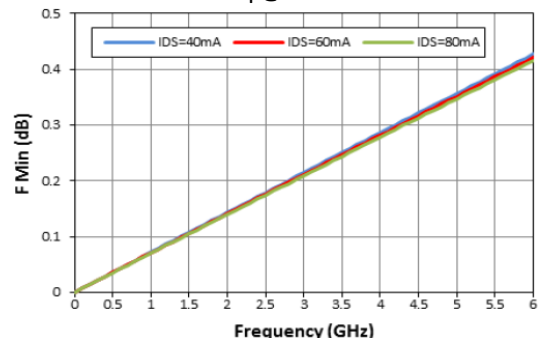
OIP3 vs Freq & Temp @ VDS = 4V, IDS = 60mA Curve



NF vs Freq & Temp @ VDS = 4V, IDS = 60mA Curve

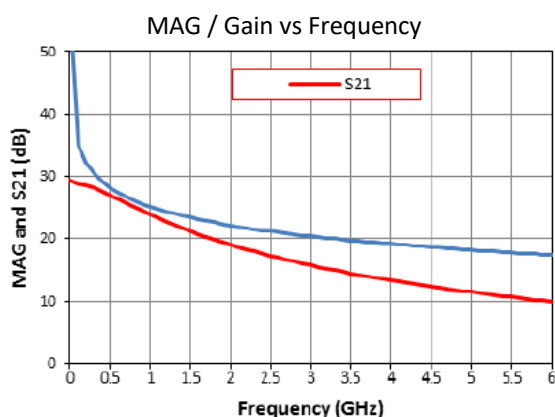


F Min vs Freq @ VDS = 3V Curve



**Typical S Parameter,  $V_{DS} = 3V$ ,  $I_{DS} = 40mA$**

Freq (GHz)	S11		S21			S12		S22		MSG (dB)
	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	
0.1	1	-16.1	27.71	28.85	171.4	0.008	81.5	0.31	-24.5	35.2
0.5	0.97	-70.6	22.49	27.04	142.5	0.034	53.1	0.42	-91.5	28.2
0.9	0.94	-103.7	16.79	24.5	125.1	0.046	36.3	0.5	-121.5	25.6
1.0	0.94	-109.4	15.65	23.89	122.1	0.048	33.4	0.51	-126.2	25.2
1.5	0.92	-129.4	11.47	21.19	111.3	0.052	23.4	0.54	-141.7	23.4
1.9	0.92	-139.1	9.36	19.42	105.9	0.054	-139.1	0.56	-148.8	22.4
2	0.92	-140.9	8.94	19.03	104.8	0.054	17.5	0.56	-150.1	22.2
2.5	0.92	-148.3	7.28	17.25	100.3	0.055	13.7	0.57	-155.2	21.2
3.0	0.91	-153.3	6.13	15.75	96.9	0.056	11	0.57	-158.6	20.4
4.0	0.91	-159.7	4.64	13.34	91.9	0.056	7.3	0.58	-162.6	19.2
5.0	0.91	-163.6	3.73	11.43	88.1	0.057	4.9	0.58	-164.8	18.2
6.0	0.91	-166.2	3.11	9.86	85	0.056	3.1	0.59	-166.1	17.4
7.0	0.91	-168	2.67	8.52	82.2	0.056	1.7	0.59	-166.8	16.8
8.0	0.91	-169.4	2.33	7.35	79.6	0.056	0.5	0.59	-167.2	16.2
9.0	0.91	-170.5	2.07	6.31	77.2	0.056	-0.5	0.6	-167.4	15.7
10.0	0.91	-171.3	1.86	5.38	74.9	0.055	-1.5	0.6	-167.5	15.3
11.0	0.91	-172	1.69	4.53	72.7	0.055	-2.3	0.61	-167.5	14.9
12.0	0.91	-172.6	1.54	3.76	70.6	0.055	-3	0.61	-167.4	14.5
13.0	0.91	-173.1	1.42	3.03	68.5	0.054	-3.7	0.62	-167.3	14.2
14.0	0.92	-173.5	1.31	2.36	66.5	0.054	-4.3	0.62	-167.2	13.9
15.0	0.92	-173.8	1.22	1.73	64.6	0.053	-4.9	0.63	-167.1	13.6
16.0	0.92	-174.1	1.14	1.14	62.7	0.053	-5.4	0.63	-166.9	13.4
17.0	0.92	-174.4	1.07	0.58	60.8	0.052	-5.9	0.64	-166.8	13.1
18.0	0.92	-174.6	1.01	0.05	58.9	0.051	-6.3	0.64	-166.7	12.9

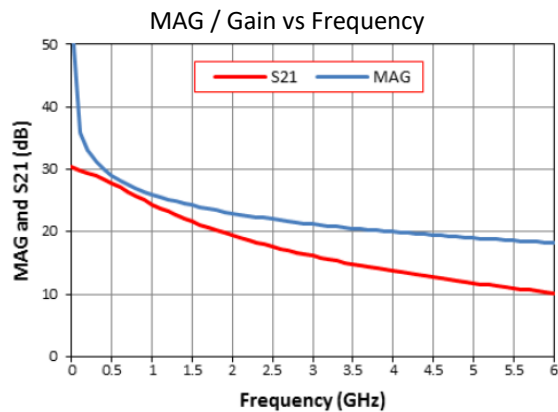


**Typical Noise Parameter,  $V_{DS} = 3V$ ,  $I_{DS} = 40mA$** 

Freq (GHz)	F Min (dB)	$\Gamma$ Opt (Magnitude)	$\Gamma$ Opt (Angle)	Rn/50
0.5	0.036	0.809	24.46	0.038
0.7	0.05	0.752	34.1	0.038
0.9	0.065	0.707	43.535	0.038
1.0	0.072	0.688	48.15	0.038
1.9	0.136	0.611	84.36	0.038
2.0	0.144	0.61	87.65	0.038
2.4	0.172	0.614	99.37	0.038
3.0	0.215	0.632	113.05	0.037
3.9	0.279	0.67	127.27	0.037
5.0	0.357	0.714	138.45	0.037
5.8	0.413	0.741	144.09	0.037
6.0	0.427	0.747	145.28	0.037

**Typical S Parameter,  $V_{DS} = 3V, I_{DS} = 60mA$**

Freq (GHz)	S11		S21			S12		S22		MSG (dB)
	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	
0.1	1	-17.3	30.73	29.75	170.8	0.008	80.9	0.24	-32.8	36
0.5	0.97	-74.6	24.36	27.73	140.6	0.031	51.4	0.42	-103.8	29
0.9	0.95	-107.8	17.83	25.02	123.4	0.041	34.7	0.51	-130.4	26.4
1.0	0.94	-113.4	16.57	24.39	120.4	0.042	31.8	0.53	-134.5	26
1.5	0.93	-132.7	12.04	21.61	110.1	0.046	22.3	0.57	-147.8	24.2
1.9	0.93	-141.8	9.78	19.81	105	0.047	-141.8	0.58	-153.8	23.2
2	0.93	-143.6	9.34	19.4	103.9	0.047	16.8	0.58	-154.9	23
2.5	0.92	-150.5	7.59	17.61	99.7	0.048	13.3	0.59	-159.3	22
3.0	0.92	-155.2	6.38	16.1	96.5	0.048	10.8	0.6	-162.2	21.2
4.0	0.92	-161.2	4.83	13.68	91.9	0.049	7.6	0.6	-165.6	20
5.0	0.92	-164.8	3.88	11.77	88.3	0.049	5.5	0.61	-167.5	19
6.0	0.92	-167.3	3.23	10.2	85.4	0.049	4	0.61	-168.6	18.2
7.0	0.92	-169	2.77	8.86	82.8	0.049	2.8	0.61	-169.2	17.6
8.0	0.92	-170.3	2.42	7.69	80.4	0.048	1.9	0.62	-169.6	17
9.0	0.92	-171.3	2.15	6.66	78.2	0.048	1.1	0.62	-169.8	16.5
10.0	0.92	-172.1	1.93	5.73	76.1	0.048	0.5	0.62	-169.8	16.1
11.0	0.92	-172.8	1.76	4.89	74	0.048	-0.1	0.63	-169.8	15.7
12.0	0.92	-173.3	1.61	4.12	72	0.047	-0.6	0.63	-169.8	15.3
13.0	0.92	-173.8	1.48	3.4	70.1	0.047	-1.1	0.63	-169.7	15
14.0	0.92	-174.2	1.37	2.73	68.2	0.047	-1.5	0.64	-169.6	14.7
15.0	0.92	-174.5	1.28	2.11	66.4	0.046	-1.9	0.64	-169.5	14.4
16.0	0.92	-174.8	1.19	1.53	64.6	0.046	-2.2	0.65	-169.3	14.2
17.0	0.93	-175	1.12	0.97	62.8	0.045	-2.4	0.65	-169.2	13.9
18.0	0.93	-175.3	1.05	0.45	61.1	0.045	-2.7	0.66	-169.1	13.7



**Typical Noise Parameter,  $V_{DS} = 3V$ ,  $I_{DS} = 60mA$** 

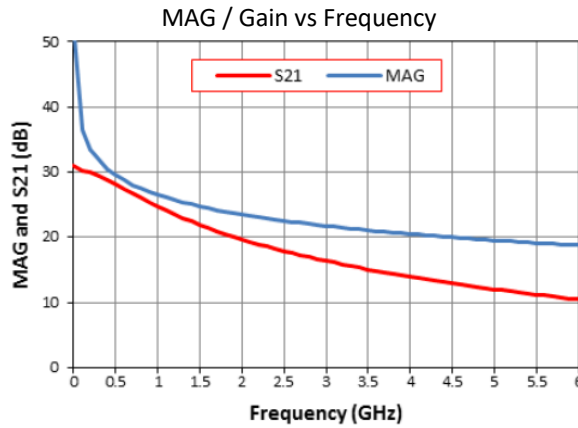
Freq (GHz)	F Min (dB)	$\Gamma_{Opt}$ (Magnitude)	$\Gamma_{Opt}$ (Angle)	Rn/50
0.5	0.036	0.786	25.21	0.032
0.7	0.05	0.723	35.2	0.032
0.9	0.064	0.674	45.04	0.032
1.0	0.071	0.654	49.87	0.032
1.9	0.134	0.58	87.61	0.032
2.0	0.142	0.58	90.1	0.032
2.4	0.17	0.587	102.91	0.032
3.0	0.212	0.611	116.569	0.032
3.9	0.275	0.654	130.446	0.032
5.0	0.352	0.702	141.16	0.032
5.8	0.407	0.731	146.51	0.032
6.0	0.421	0.737	147.63	0.032

**Typical S Parameter,  $V_{DS} = 3V$ ,  $I_{DS} = 80mA$** 

Freq (GHz)	S11		S21			S12		S22		MSG (dB)
	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	
0.1	0.99	-17.9	32.59	30.26	170.5	0.007	80.6	0.2	-39.7	36.5
0.5	0.97	-76.5	25.55	28.15	139.8	0.029	50.6	0.42	-110.2	29.5
0.9	0.95	-109.6	18.54	25.36	122.6	0.037	34	0.52	-134.7	27
1.0	0.94	-115.2	17.21	24.71	119.7	0.039	31.2	0.54	-138.4	26.5
1.5	0.93	-134.1	12.45	21.9	109.6	0.042	21.8	0.58	-150.6	24.7
1.9	0.93	-143	10.1	20.09	104.6	0.043	-143	0.6	-156.1	23.7
2	0.93	-144.7	9.64	19.68	103.6	0.043	16.6	0.6	-157.2	23.5
2.5	0.93	-151.4	7.83	17.88	99.5	0.044	13.2	0.61	-161.2	22.5
3.0	0.93	-156	6.58	16.37	96.4	0.044	10.9	0.61	-163.8	21.7
4.0	0.93	-161.8	4.98	13.94	91.9	0.044	7.9	0.62	-166.9	20.5
5.0	0.93	-165.4	3.99	12.03	88.5	0.045	5.9	0.62	-168.7	19.5
6.0	0.93	-167.7	3.33	10.46	85.7	0.044	4.6	0.63	-169.7	18.7
7.0	0.93	-169.4	2.86	9.12	83.1	0.044	3.6	0.63	-170.3	18.1
8.0	0.93	-170.7	2.5	7.96	80.9	0.044	2.8	0.63	-170.7	17.5
9.0	0.93	-171.7	2.22	6.92	78.7	0.044	2.2	0.63	-170.8	17
10.0	0.93	-172.5	1.99	6	76.7	0.044	1.6	0.64	-170.9	16.6
11.0	0.93	-173.1	1.81	5.16	74.7	0.044	1.2	0.64	-170.9	16.2



12.0	0.93	-173.6	1.66	4.39	72.8	0.043	0.8	0.64	-170.9	15.8
13.0	0.93	-174.1	1.53	3.67	70.9	0.043	0.5	0.65	-170.8	15.5
14.0	0.93	-174.5	1.41	3.01	69.1	0.043	0.2	0.65	-170.7	15.2
15.0	0.93	-174.8	1.32	2.39	67.4	0.042	0	0.65	-170.6	14.9
16.0	0.93	-175.1	1.23	1.81	65.6	0.042	-0.2	0.66	-170.5	14.7
17.0	0.93	-175.3	1.16	1.26	63.9	0.042	-0.4	0.66	-170.4	14.4
18.0	0.93	-175.6	1.09	0.74	62.2	0.041	-0.5	0.66	-170.2	14.2

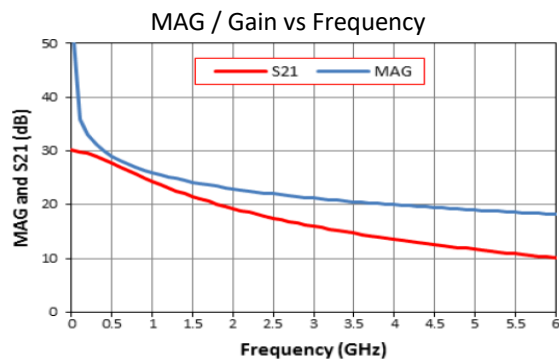


**Typical Noise Parameter,  $V_{DS} = 3V$ ,  $I_{DS} = 60mA$**

Freq (GHz)	F Min (dB)	$\Gamma$ Opt (Magnitude)	$\Gamma$ Opt (Angle)	Rn/50
0.5	0.035	0.772	25.47	0.03
0.7	0.049	0.706	35.63	0.03
0.9	0.063	0.655	45.68	0.03
1.0	0.07	0.634	50.61	0.03
1.9	0.133	0.561	89.24	0.03
2.0	0.14	0.561	92.69	0.03
2.4	0.168	0.571	104.74	0.03
3.0	0.209	0.598	118.39	0.03
3.9	0.272	0.644	132.1	0.03
5.0	0.347	0.694	142.57	0.029
5.8	0.402	0.724	147.77	0.029
6.0	0.416	0.731	148.86	0.029

**Typical S Parameter,  $V_{DS} = 4V, I_{DS} = 60mA$**

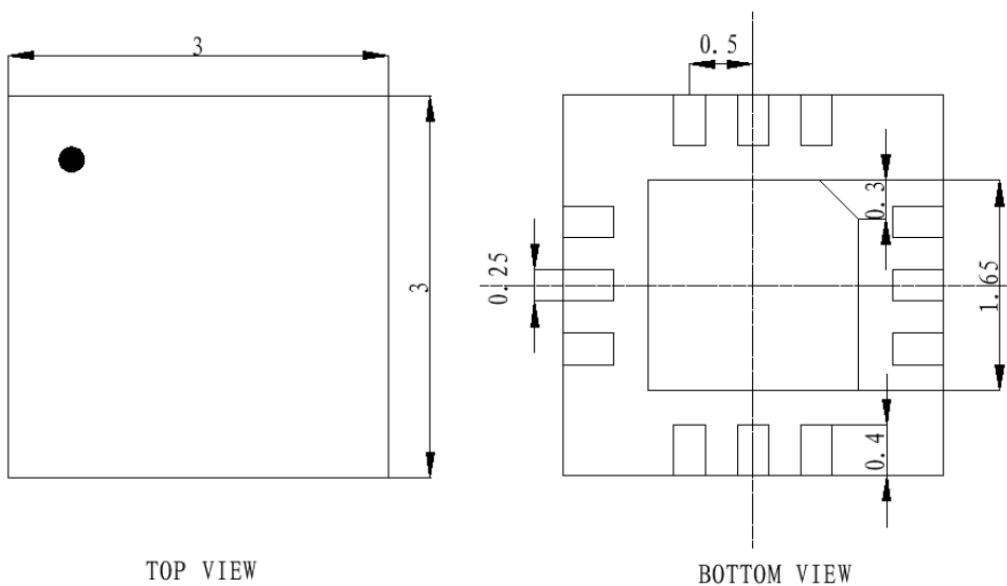
Freq (GHz)	S11		S21			S12		S22		MSG (dB)
	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	
0.1	1	-17.7	30.93	29.81	170.6	0.008	80.7	0.24	-32.3	36
0.5	0.97	-75.7	24.34	27.73	140.1	0.031	50.8	0.42	-103.7	29
0.9	0.95	-108.9	17.71	24.97	122.8	0.04	34.1	0.51	-130.5	26.4
1.0	0.94	-114.5	16.45	24.32	119.9	0.042	31.3	0.52	-134.6	26
1.5	0.93	-133.5	11.92	21.52	109.6	0.045	21.8	0.56	-147.9	24.2
1.9	0.93	-142.5	9.67	19.71	104.5	0.047	-142.5	0.57	-153.8	23.2
2	0.93	-144.3	9.23	19.31	103.5	0.047	16.4	0.58	-155	23
2.5	0.93	-151	7.5	17.5	99.3	0.047	12.9	0.58	-159.3	22
3.0	0.92	-155.7	6.31	15.99	96.2	0.048	10.5	0.59	-162.1	21.2
4.0	0.92	-161.6	4.77	13.57	91.5	0.048	7.3	0.6	-165.4	20
5.0	0.92	-165.1	3.83	11.66	88	0.048	5.2	0.6	-167.3	19
6.0	0.92	-167.5	3.19	10.08	85	0.048	3.7	0.6	-168.3	18.2
7.0	0.92	-169.2	2.74	8.74	82.4	0.048	2.6	0.61	-168.9	17.6
8.0	0.92	-170.5	2.39	7.57	80	0.048	1.6	0.61	-169.2	17
9.0	0.92	-171.5	2.12	6.54	77.7	0.048	0.8	0.61	-169.4	16.5
10.0	0.92	-172.3	1.91	5.61	75.6	0.047	0.1	0.62	-169.4	16.1
11.0	0.92	-172.9	1.73	4.76	73.5	0.047	-0.5	0.62	-169.4	15.7
12.0	0.92	-173.4	1.58	3.99	71.5	0.047	-1	0.62	-169.3	15.3
13.0	0.92	-173.9	1.46	3.27	69.5	0.046	-1.5	0.63	-169.2	15
14.0	0.93	-174.3	1.35	2.6	67.6	0.046	-1.9	0.63	-169	14.7
15.0	0.93	-174.6	1.26	1.97	65.8	0.046	-2.2	0.64	-168.9	14.4
16.0	0.93	-174.9	1.17	1.39	63.9	0.045	-2.5	0.64	-168.7	14.1
17.0	0.93	-175.1	1.1	0.83	62.2	0.045	-2.8	0.65	-168.6	13.9
18.0	0.93	-175.4	1.04	0.3	60.4	0.044	-3.1	0.65	-168.4	13.7



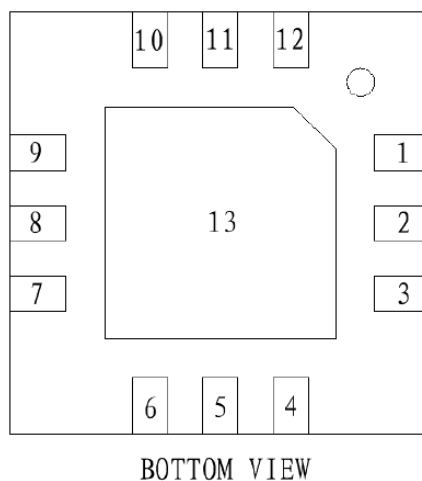
**Typical Noise Parameter,  $V_{DS} = 4V$ ,  $I_{DS} = 60mA$** 

Freq (GHz)	F Min (dB)	$\Gamma$ Opt (Magnitude)	$\Gamma$ Opt (Angle)	Rn/50
0.5	0.037	0.777	26.03	0.032
0.7	0.051	0.713	36.36	0.032
0.9	0.066	0.663	46.52	0.032
1.0	0.073	0.644	51.49	0.032
1.9	0.138	0.575	90	0.032
2.0	0.145	0.575	93.37	0.032
2.4	0.174	0.585	105.25	0.032
3.0	0.218	0.612	118.71	0.032
3.9	0.283	0.657	132.25	0.032
5.0	0.362	0.706	142.63	0.031
5.8	0.419	0.735	147.79	0.031
6.0	0.433	0.741	148.88	0.031

**Dimensions (Unit : mm)**



**Lead Diagram**



Lead	2	5	8	11	Other
Use	GATE	SOURCE	DRAIN	SOURCE	GND