LT1X01P
Low Noise Transistor Device

Key Features :

- Low noise figure NF : 0.5dB
- Gain G : 17dB@2GHz
- P_{1dB} : 19dBm
- High OIP_3 : 33dBm
- High current I : 60mA
- Broadband
- Superior biasing and matching
- Applications : GSM, WLAN, Cellular etc.

Description :

LT1X01P is a super low noise figure, high IP3 transisitor device, by using E-PHEMT technology. This is an ideal amplifier for base station application, when it operates under below 4GHz, with its superior noise figure and high IP3 performance.

Absolute Maximum Ratings (Ta = 25°C)

Parameter	Unit	Value	Remark
V_{DS}	V	11	
V_{GS}	V	-5 ~ 1	
V_{GD}	V	-5 ~ 1	
I_{DS}	mA	720	
I_{GS}	mA	2	
RF Input Power	dBm	17	
Operating Temperature	°C	-55 ~ +125°C	
Sintering Temperature	°C	-40 ~ +150°C	
Storage Temperature	°C	-65 ~ +150°C	

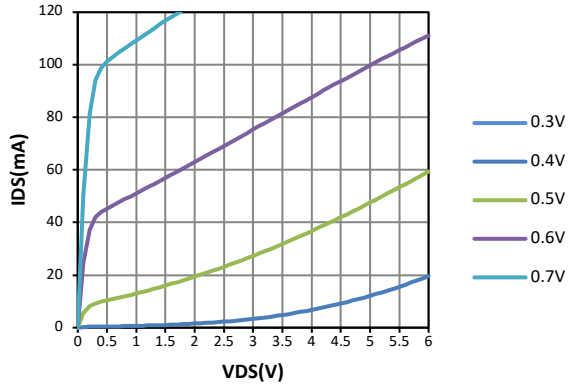
[1] Operation outside any of the Absolute Maximum Ratings may cause permanent device damage.

Electrical Characteristics (Ta = 25°C, Frequency 0.45 – 6GHz)

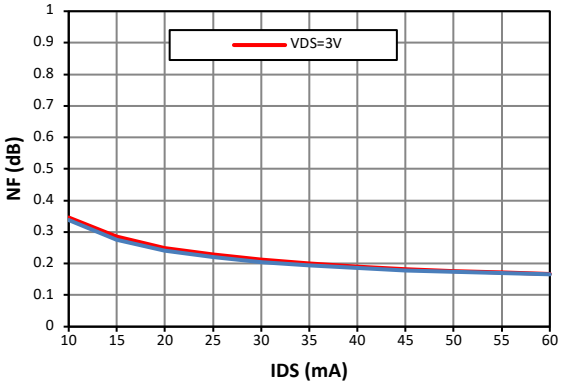
Symbol	Parameter	Test Conditions	Value			Unit
			Min	Typical	Max	
DC Characteristics						
V_{GS}	Gate Source Voltage	V_{DS} = 3V, I_{DS} = 60mA	0.5	0.55	0.6	V
V_{TH}	Threshold Voltage	V_{DS} = 3V, I_{DS} = 4mA	0.42	0.44	0.46	V
I_{DSS}	Saturated Drian Current	V_{DS} = 3V, V_{GS} = 0V	-	2	4	µA
G_M	Transconductance	V_{DS} = 3V, $G_M = \Delta I_{DS} / \Delta V_{GS}$ $\Delta V_{GS} = V_{GS1} - V_{GS2}$ $V_{GS1} = V_{GS}$ at I_{DS} = 60mA $V_{GS2} = V_{GS1} + 0.05V$	200	400	520	mS
I_{GSS}	Drian Leakage Current	$V_{GD} = V_{GS}$ = -3V	-	-	100	µA
RF Characteristics						
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	-	
OIP_3	3 dB Point Output	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	-	
P_{1dB}	Output Power at 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 Performance

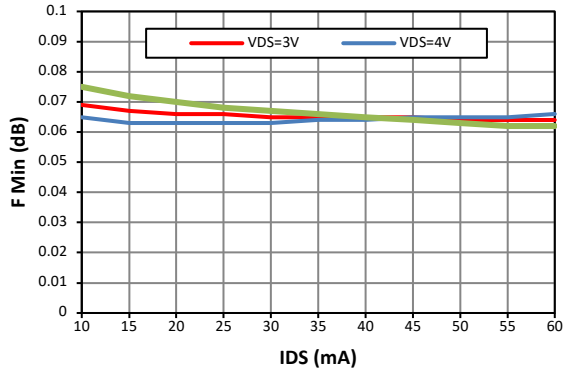
I – V Curve



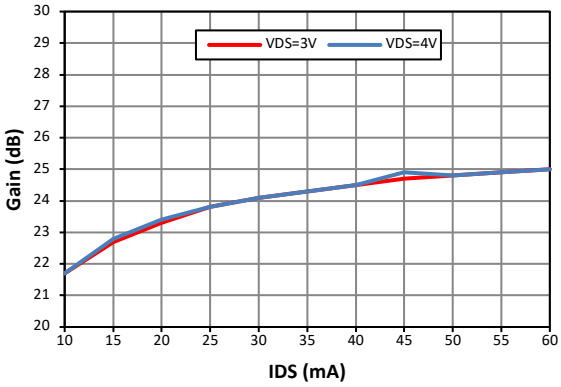
NF vs IDS @ 0.9GHz Curve



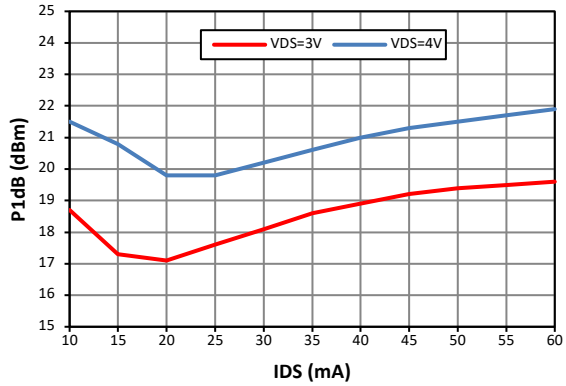
F Min vs IDS @ 0.9GHz Curve



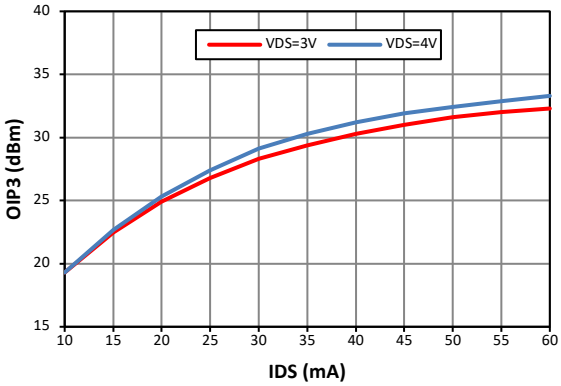
Gain vs IDS @ 0.9GHz Curve



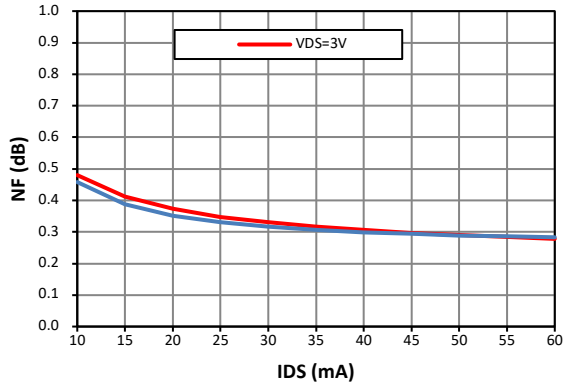
P_{1dB} vs IDS @ 0.9GHz Curve



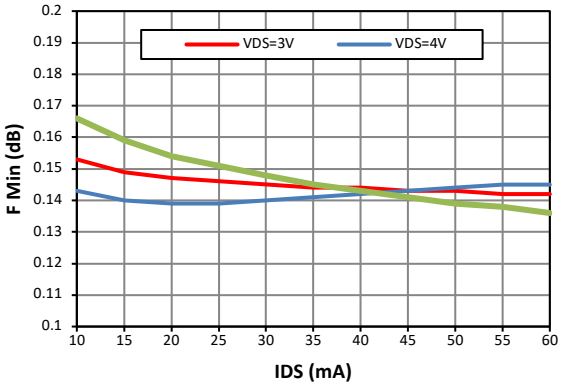
OIP_3 vs IDS @ 0.9GHz Curve



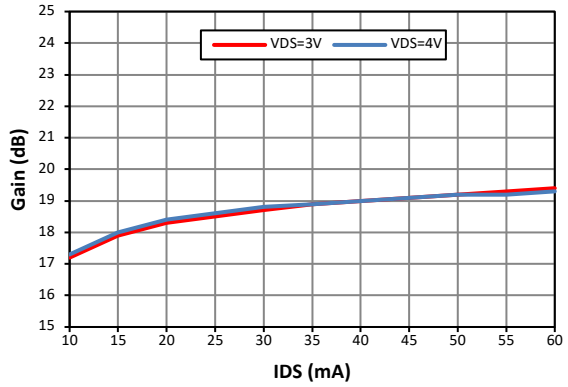
NF vs IDS @ 2GHz Curve



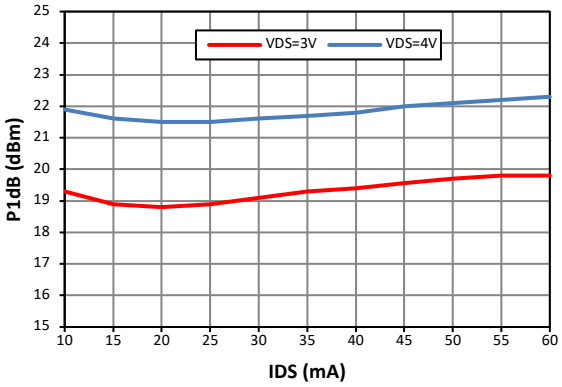
F Min vs IDS @ 2GHz Curve



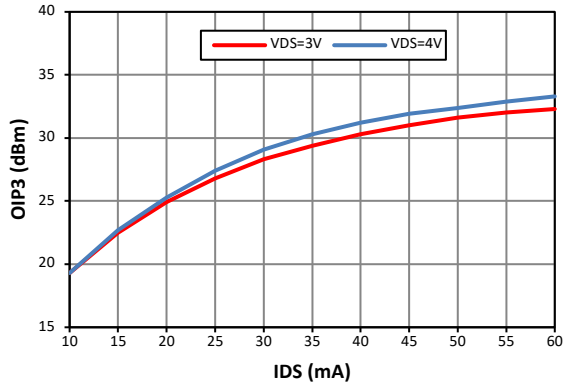
Gain vs IDS @ 2GHz Curve



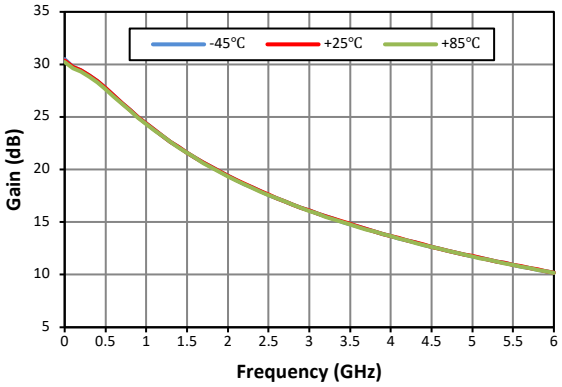
P_{1dB} vs IDS @ 2GHz Curve



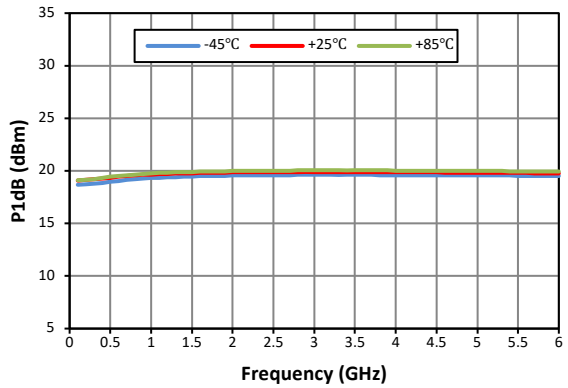
OIP_3 vs IDS @ 2GHz Curve



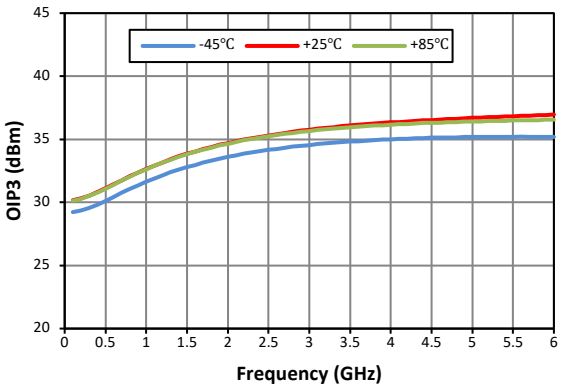
Gain vs Freq & Temp @ V_{DS} = 3V, I_{DS} = 60mA Curve



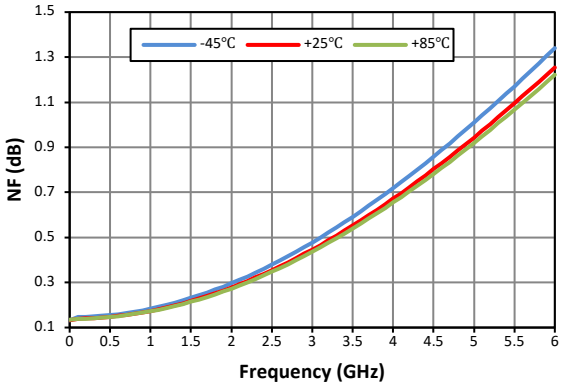
P_{1dB} vs Freq & Temp @ V_{DS} = 3V, I_{DS} = 60mA Curve



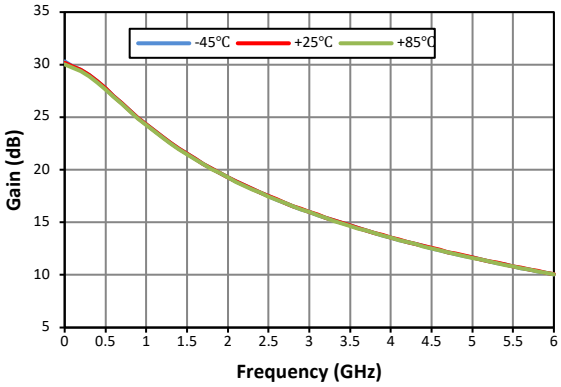
OIP_3 vs Freq & Temp @ V_{DS} = 3V, I_{DS} = 60mA Curve



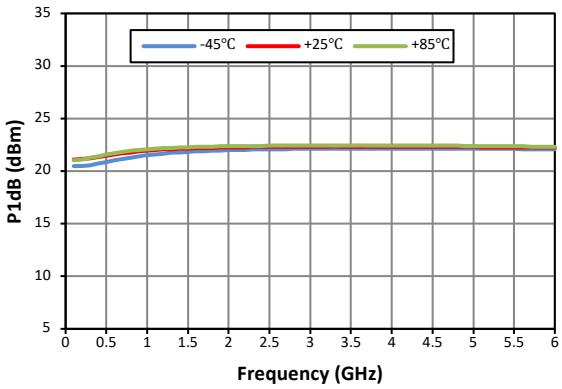
NF vs Freq & Temp @ V_{DS} = 3V, I_{DS} = 60mA Curve



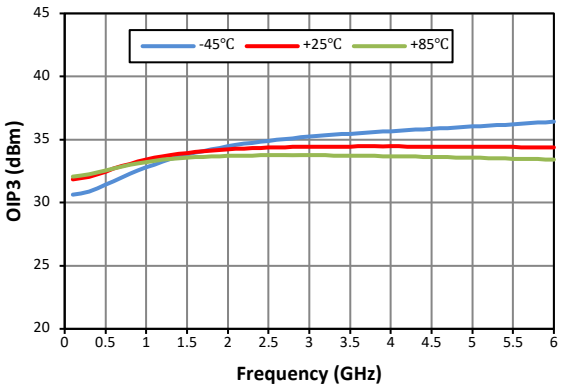
Gain vs Freq & Temp @ V_{DS} = 4V, I_{DS} = 60mA Curve



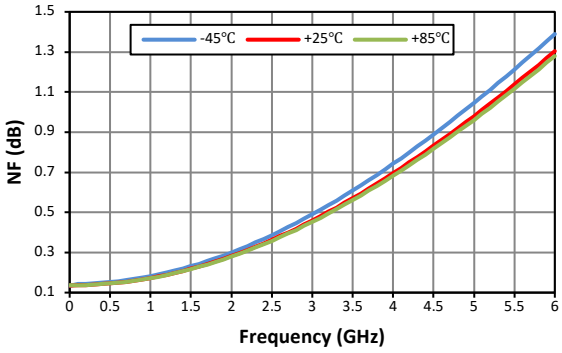
P_{1dB} vs Freq & Temp @ V_{DS} = 4V, I_{DS} = 60mA Curve



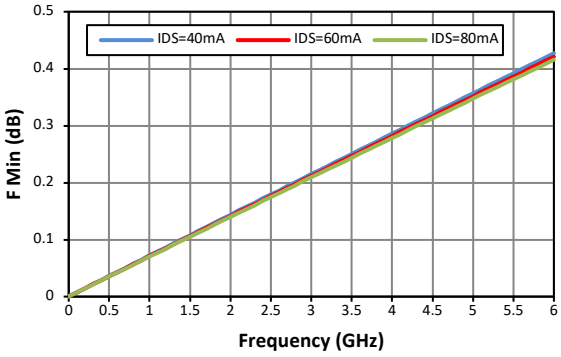
OIP_3 vs Freq & Temp @ V_{DS} = 4V, I_{DS} = 60mA Curve



NF vs Freq & Temp @ V_{DS} = 4V, I_{DS} = 60mA Curve



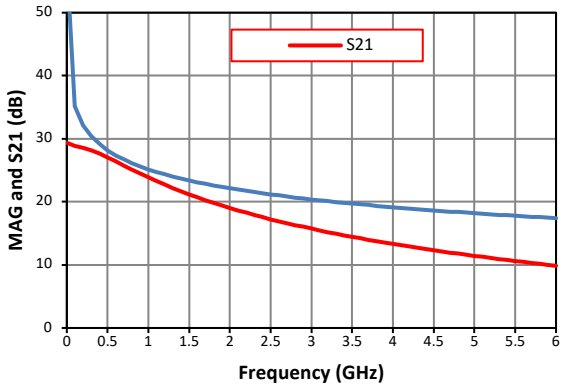
F Min vs Freq @ V_{DS} = 3V Curve



Typical S parameter, V_{DS} = 3V, I_{DS} = 40mA

	S11		S21			S12		S22		
Freq (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG (dB)
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

MAG/Gain vs Frequency



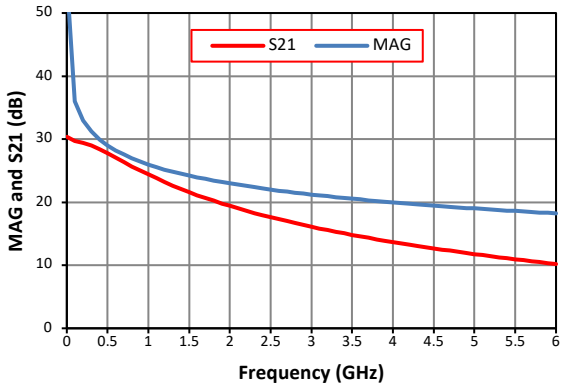
Typical Noise parameter, V_{DS} = 3V, I_{DS} = 40mA

Freq (GHz)	F Min (dB)	ΓOpt (Magnitude)	ΓOpt (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

	S11		S21			S12		S22		
Freq (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG (dB)
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
	S11		S21			S12		S22		
Freq (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG (dB)
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

MAG/Gain vs Frequency



Typical Noise parameter, V_{DS} = 3V, I_{DS} = 60mA

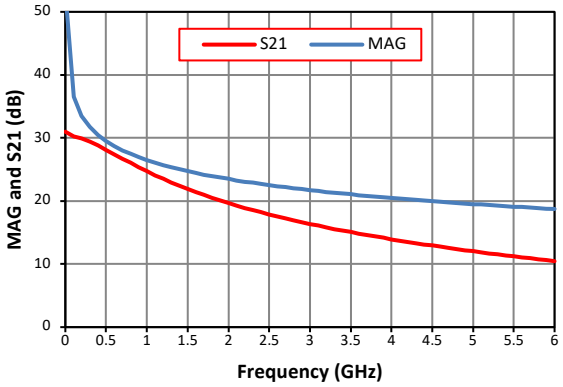
Freq (GHz)	F Min (dB)	ΓOpt (Magnitude)	ΓOpt (Angle)	Rn/50
0.5	0.036	0.786	25.21	0.032
0.7	0.05	0.723	35.2	0.032
0.9	0.064	0.674	45.04	0.032
1.0	0.071	0.654	49.87	0.032
1.9	0.134	0.58	87.61	0.032
2.0	0.142	0.58	90.1	0.032
2.4	0.17	0.587	102.91	0.032
3.0	0.212	0.611	116.569	0.032
3.9	0.275	0.654	130.446	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 Noise parameter, V_{DS} = 3V, I_{DS} = 80mA

	S11		S21			S12		S22		
Freq (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG (dB)
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

	S11		S21			S12		S22		
Freq (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG (dB)
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

MAG/Gain vs Frequency



Typical Noise parameter, V_{DS} = 3V, I_{DS} = 80mA

Freq (GHz)	F Min (dB)	ΓOpt (Magnitude)	ΓOpt (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

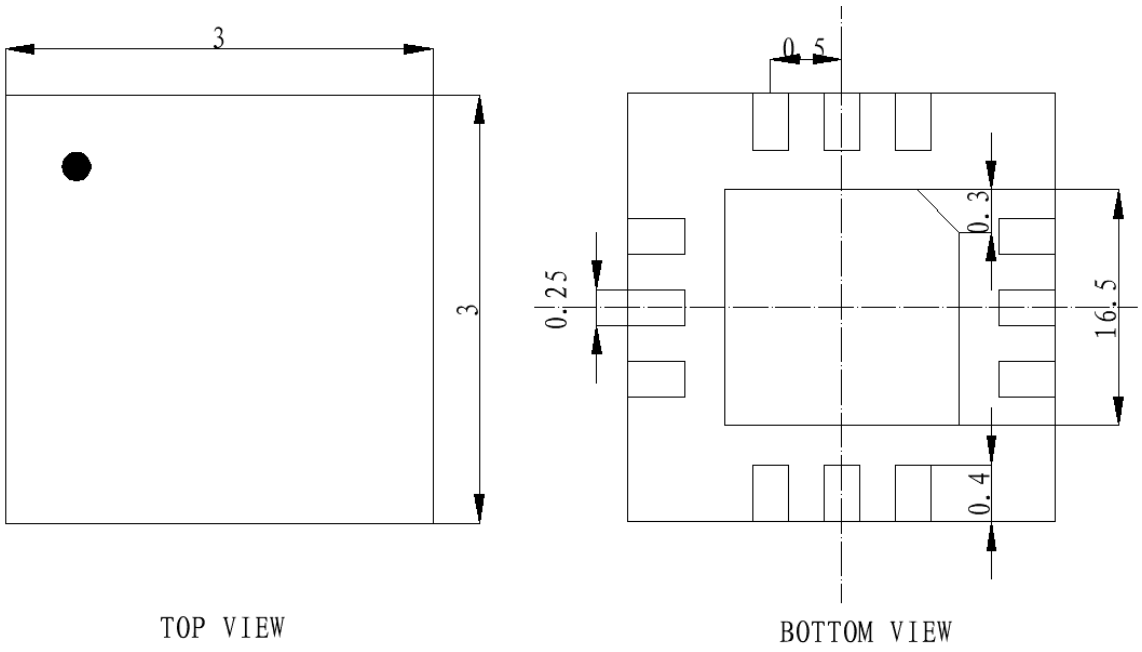
Typical S parameter, V_{DS} = 4V, I_{DS} = 60mA

	S11		S21			S12		S22		
Freq (GHz)	Mag.	Ang.	Mag.	Mag (dB)	Ang.	Mag.	Ang.	Mag.	Ang.	MSG (dB)
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

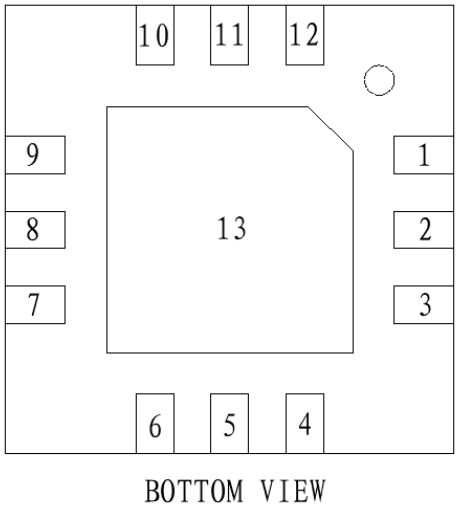
Typical Noise parameter, V_{DS} = 4V, I_{DS} = 60mA

Freq (GHz)	F Min (dB)	ΓOpt (Magnitude)	ΓOpt (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

Chip Dimensions (Unit : μm)



Lead Diagram



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