Agilent ATF-501P8 High Linearity Enhancement Mode[1] Pseudomorphic HEMT in 2x2 mm^2 LPCC[3] Package

Data Sheet

Description

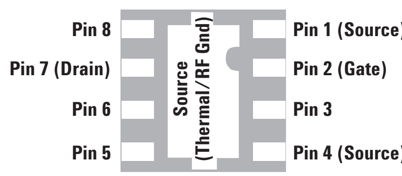
Agilent Technologies's ATF-501P8 is a single-voltage high linearity, low noise E-pHEMT housed in an 8-lead JEDEC-standard leadless plastic chip carrier (LPCC[3]) package. The device is ideal as a medium-power amplifier. Its operating frequency range is from 400 MHz to 3.9 GHz.

The thermally efficient package measures only 2mm x 2mm x 0.75mm. Its backside metalization provides excellent thermal dissipation as well as visual evidence of solder reflow. The device has a Point MTTF of over 300 years at a mounting temperature of +85ºC. All devices are 100% RF & DC tested.

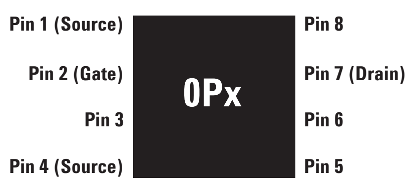
Notes:

1. Enhancement mode technology employs a single positive V_{gs}, eliminating the need of negative gate voltage associated with conventional depletion mode devices.
2. Refer to reliability datasheet for detailed MTTF data.
3. Conforms to JEDEC reference outline MO229 for DRP-N.
4. Linearity Figure of Merit (LFOM) is essentially OIP3 divided by DC bias power.

Pin Connections and Package Marking



Bottom View



Top View

Note:
Package marking provides orientation and identification:
"0P" = Device Code
"x" = Date code indicates the month of manufacture.

Attention:
Observe precautions for handling electrostatic sensitive devices.

ESD Machine Model (Class A)

ESD Human Body Model (Class 1B)

Refer to Agilent Application Note A004R: Electrostatic Discharge Damage and Control.

Features

- Single voltage operation
- High Linearity and P1dB
- Low Noise Figure
- Excellent uniformity in product specifications
- Small package size: 2.0 x 2.0 x 0.75 mm^3
- Point MTTF > 300 years[2]
- MSL-1 and lead-free
- Tape-and-Reel packaging option available

Specifications

- 2 GHz; 4.5V, 280 mA (Typ.)
- 45.5 dBm Output IP3
- 29 dBm Output Power at 1dB gain compression
- 1 dB Noise Figure
- 15 dB Gain
- 14.5 dB LFOM[4]
- 65% PAE
- 23ºC/W thermal resistance

Applications

- Front-end LNA Q2 and Q3, Driver or Pre-driver Amplifier for Cellular/PCS and WCDMA wireless infrastructure
- Driver Amplifier for WLAN, WLL/RLL and MMDS applications
- General purpose discrete E-pHEMT for other high linearity applications

ATF-501P8 Absolute Maximum Ratings[1]

Symbol	Parameter	Units	Absolute Maximum
V_{DS}	Drain–Source Voltage[2]	V	7
V_{GS}	Gate–Source Voltage[2]	V	-5 to 0.8
V_{GD}	Gate Drain Voltage[2]	V	-5 to 1
I_{DS}	Drain Current[2]	A	1
I_{GS}	Gate Current	mA	12
P_{diss}	Total Power Dissipation[3]	W	3.5
$P_{in\ max.}$	RF Input Power	dBm	30
T_{CH}	Channel Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to 150
θ_{ch_b}	Thermal Resistance[4]	°C/W	23

Notes:
1. Operation of this device in excess of any one of these parameters may cause permanent damage.
2. Assumes DC quiescent conditions.
3. Board (package belly) temperatureT_B is 25°C. Derate 43.5 mW/°C for T_B > 69.5°C.
4. Channel-to-board thermal resistance measured using 150°C Liquid Crystal Measurement method.

Product Consistency Distribution Charts at 2 GHz, 4.5V, 200 mA [5,6]

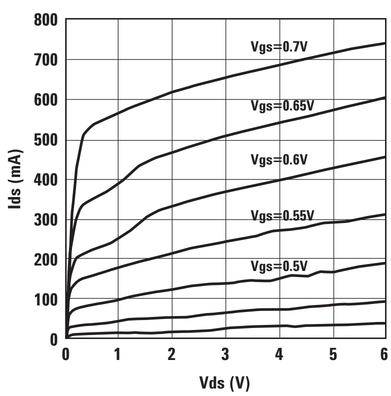


Figure 1. Typical IV curve (Vgs = 0.01V) per step.

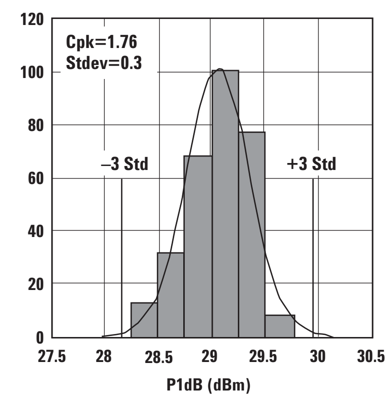


Figure 2. P1dB.

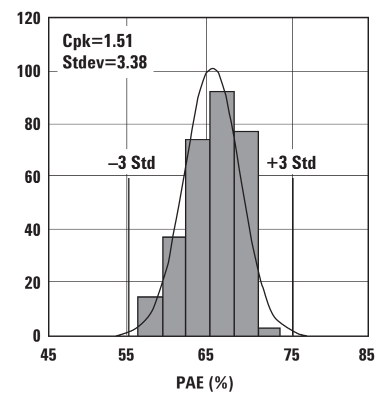


Figure 3. PAE.

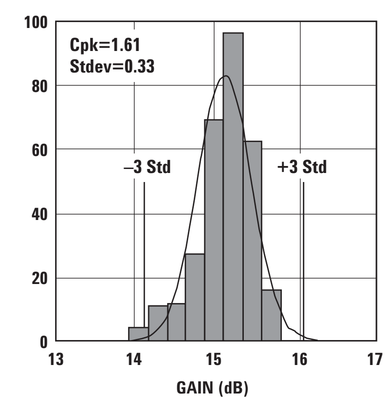


Figure 4. Gain.

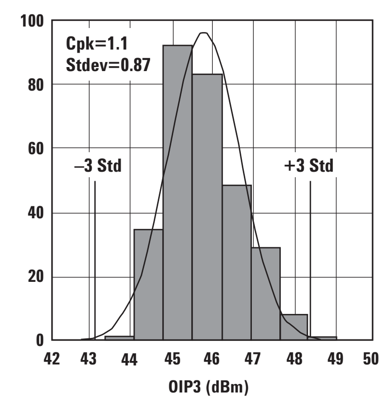


Figure 5. OIP3.

Notes:
5. Distribution data sample size is 300 samples taken from 3 different wafers and 3 different lots. Future wafers allocated to this product may have nominal values anywhere between the upper and lower limits.
6. Measurements are made on production test board, which represents a trade-off between optimal OIP3, P1dB and VSWR. Circuit losses have been de-embedded from actual measurements.

ATF-501P8 Electrical Specifications

T_A = 25°C, DC bias for RF parameters is Vds = 4.5V and Ids = 280 mA unless otherwise specified.

Symbol	Parameter and Test Condition		Units	Min.	Typ.	Max.
Vgs	Operational Gate Voltage	Vds = 4.5V, Ids = 280 mA	V	0.42	0.55	0.67
Vth	Threshold Voltage	Vds = 4.5V, Ids = 32 mA	V	—	0.33	—
Idss	Saturated Drain Current	Vds = 4.5V, Vgs = 0V	μA	—	5	—
Gm	Transconductance	Vds = 4.5V, Gm = ΔIds/ΔVgs; ΔVgs = Vgs1 – Vgs2 Vgs1 = 0.55V, Vgs2 = 0.5V	mmho	—	1872	—
Igss	Gate Leakage Current	Vds = 0V, Vgs = -4.5V	μA	-30	-0.8	—
NF	Noise Figure[1]	f = 2 GHz f = 900 MHz	dB dB	— —	1 —	— —
G	Gain[1]	f = 2 GHz f = 900 MHz	dB dB	13.5 —	15 16.6	16.5 —
OIP3	Output 3rd Order Intercept Point[1,2]	f = 2 GHz f = 900 MHz	dBm dBm	43 —	45.5 42	— —
P1dB	Output 1dB Compressed[1]	f = 2 GHz f = 900 MHz	dBm dBm	27.5 —	29 27.3	— —
PAE	Power Added Efficiency[1]	f = 2 GHz f = 900 MHz	% %	50 —	65 49	— —
ACLR	Adjacent Channel Leakage Power Ratio[1,3]	Offset BW = 5 MHz Offset BW = 10 MHz	dBc dBc	— —	63.9 64.1	— —

Notes:

1. Measurements at 2 GHz obtained using production test board described in Figure 2 while measurement at 0.9GHz obtained from load pull tuner.
2. i) 2 GHz OIP3 test condition: F1 = 2.0 GHz, F2 = 2.01 GHz and Pin = -5 dBm per tone.
   ii) 900 MHz OIP3 test condition: F1 = 900 MHz, F2 = 910 MHz and Pin = -5dBm per tone.
3. ACLR test spec is based on 3GPP TS 25.141 V5.3.1 (2002-06)
   - Test Model 1
   - Active Channels: PCCPCH + SCH + CPICH + PICH + SCCPCH + 64 DPCH (SF=128)
   - Freq = 2140 MHz
   - Pin = -5 dBm
   - Channel Integrate Bandwidth = 3.84 MHz
4. Use proper bias, board, heatsinking and derating designs to ensure max channel temperature is not exceeded. See absolute max ratings and application note for more details.

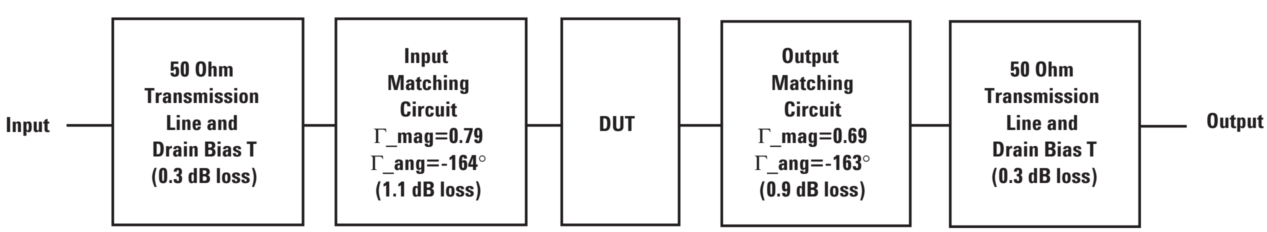


Figure 6. Block diagram of the 2 GHz production test board used for NF, Gain, OIP3 , P1dB and PAE measurements at 2 GHz. This circuit achieves a trade-off between optimal OIP3, P1dB and VSWR. Circuit losses have been de-embedded from actual measurements.

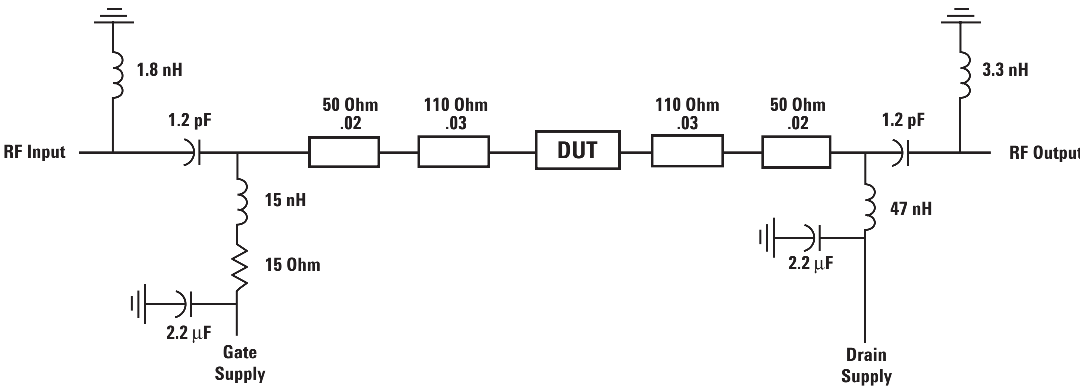


Figure 3. Simplified schematic of production test board. Primary purpose is to show 15 Ohm series resistor placement in gate supply. Transmission line tapers, tee intersections, bias lines and parasitic values are not shown.

Gamma Load and Source at Optimum OIP3 and P1dB Tuning Conditions

The device's optimum OIP3 and P1dB measurements were determined using a load pull system at 4.5V 280 mA and 4.5V 400 mA quiesent bias respectively:

Typical Gammas at Optimum OIP3 at 4.5V 280 mA

	Optimized for maximum OIP3 at 4.5V 280 mA					
Freq (GHz)	**OIP3**	**Gain**	**P1dB**	**PAE**	**Gamma Source**	**Gamma Load**
0.9	46.42	16.03	26.67	45.80	0.305 < -140	0.577 < 162
2.0	45.50	15.07	28.93	50.30	0.806 < -179.2	0.511 < 164
2.4	44.83	12.97	29.03	45.70	0.756 < -167	0.589 < -168
3.9	43.97	6.11	27.33	33.90	0.782 < -162	0.524 < -153

Typical Gammas at Optimum P1dB at 4.5V 280mA

	Optimized for maximum P1dB at 4.5V 280 mA					
Freq (GHz)	**OIP3**	**Gain**	**P1dB**	**PAE**	**Gamma Source**	**Gamma Load**
0.9	39.29	20.90	30.49	41.00	0.859 < 165	0.757 < 179
2.0	41.79	14.72	30.60	45.30	0.76 < -171	0.691 < -168
2.4	42.37	11.25	30.24	39.70	0.745 < -166	0.694 < -161
3.9	42.00	5.63	28.26	25.80	0.759 < -159	0.708 < -149

Typical Gammas at Optimum OIP3 at 4.5V 400 mA

	Optimized for maximum OIP3 at 4.5V 400 mA					
Freq (GHz)	**OIP3**	**Gain**	**P1dB**	**PAE**	**Gamma Source**	**Gamma Load**
0.9	49.15	16.85	27.86	44.20	0.5852 < -135.80	0.4785 < 177.00
2.0	48.18	14.72	29.36	48.89	0.7267 < -175.37	0.7338 < 179.56
2.4	47.54	12.47	29.10	46.83	0.6155 < -171.71	0.5411 < -172.02
3.9	45.44	8.05	28.49	37.02	0.7888 < -148.43	0.5247 < -145.84

Typical Gammas at Optimum P1dB at 4.5V 400 mA

	Optimized for maximum P1dB at 4.5V 400 mA					
Freq (GHz)	**OIP3**	**Gain**	**P1dB**	**PAE**	**Gamma Source**	**Gamma Load**
0.9	41.78	21.84	31.23	49.97	0.7765 < 168.50	0.7589 < -175.09
2.0	43.28	14.83	31.03	44.78	0.8172 < -175.74	0.8011 < -165.75
2.4	42.46	11.90	30.66	41.00	0.8149 < -163.78	0.8042 < -161.79
3.9	42.94	7.70	29.56	33.06	0.8394 < -151.21	0.7826 < -149.00

ATF-501P8 Typical Performance Curves (at 25°C unless specified otherwise)
Tuned for Optimal OIP3 at 4.5V 280 mA

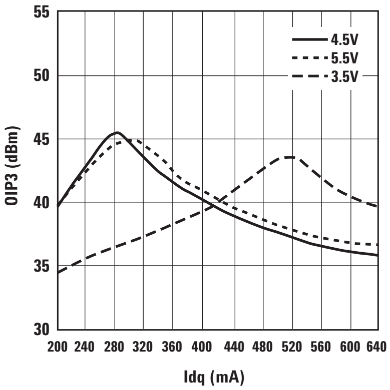


Figure 8. OIP3 vs. Idq and Vds at 2 GHz.

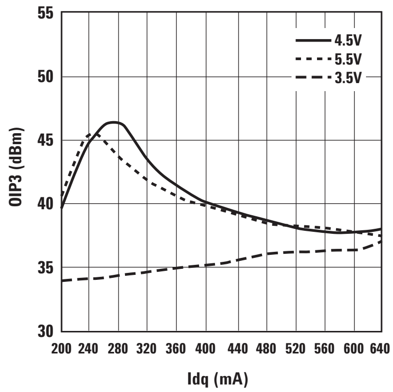


Figure 9. OIP3 vs. Idq and Vds at 0.9 GHz.

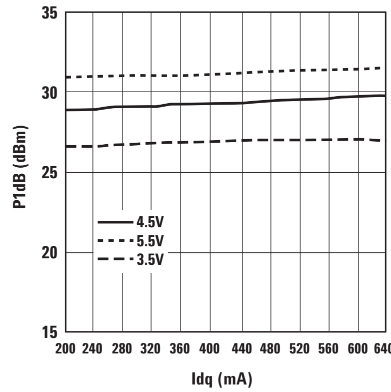


Figure 10. P1dB vs. Idq and Vds at 2 GHz.

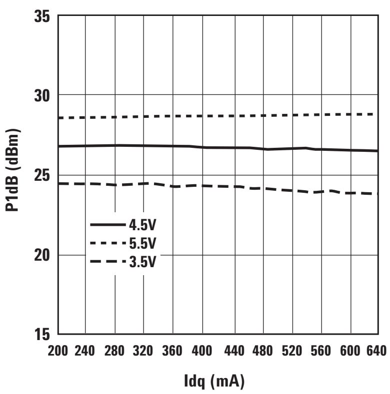


Figure 11. P1dB vs. Idq and Vds at 0.9 GHz.

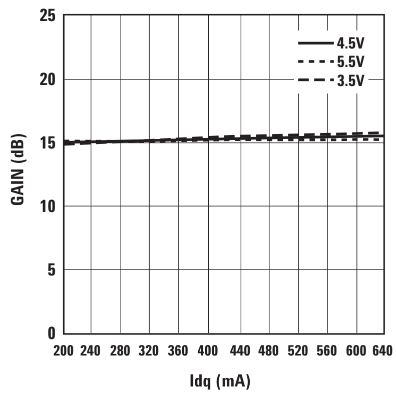


Figure 12. Gain vs. Idq and Vds at 2 GHz.

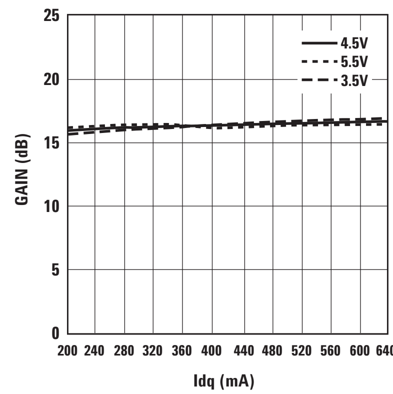


Figure 13. Gain vs. Idq and Vds at 0.9 GHz.

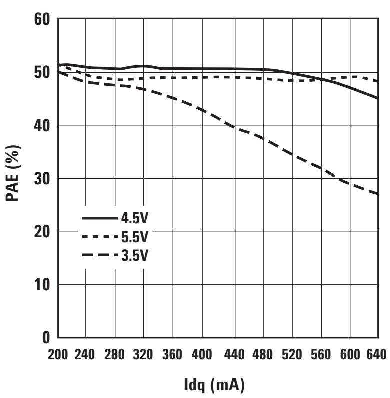


Figure 14. PAE vs. Idq and Vds at 2 GHz.

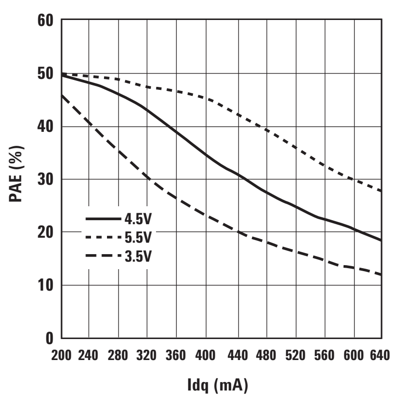


Figure 15. PAE vs. Idq and Vds at 0.9 GHz.

ATF-501P8 Typical Performance Curves (at 25°C unless specified otherwise)
Tuned for Optimal P1dB at 4.5V 280 mA

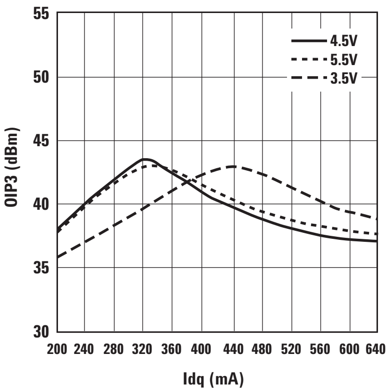


Figure 16. OIP3 vs. Idq and Vds at 2 GHz.

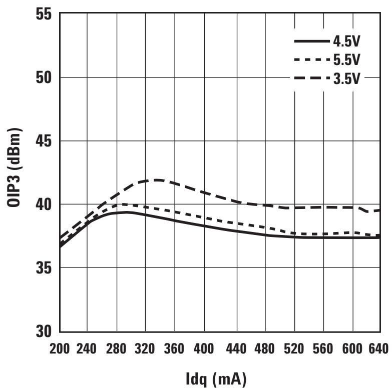


Figure 17. OIP3 vs. Idq and Vds at 0.9 GHz.

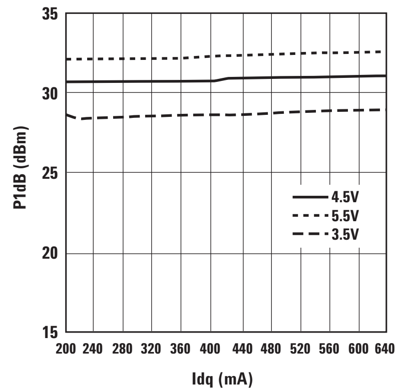


Figure 18. P1dB vs. Idq and Vds at 2 GHz.

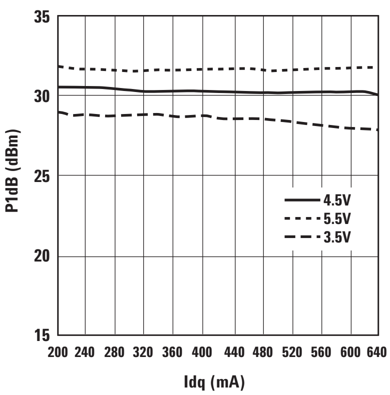


Figure 19. P1dB vs. Idq and Vds at 0.9 GHz.

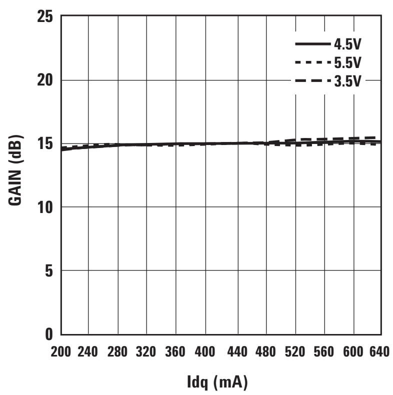


Figure 20. Gain vs. Idq and Vds at 2 GHz.

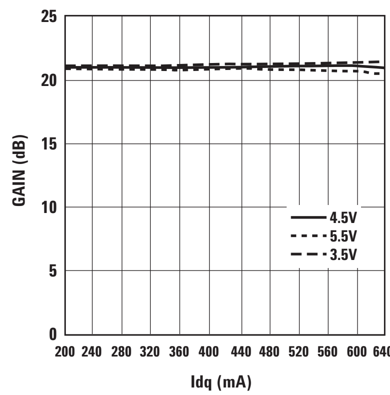


Figure 21. Gain vs. Idq and Vds at 0.9 GHz.

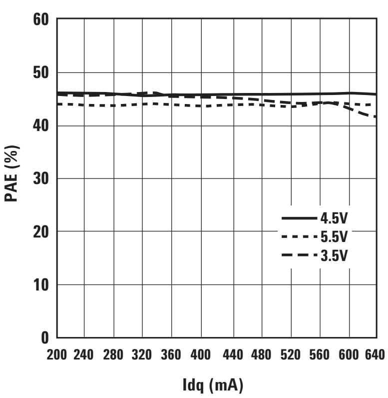


Figure 22. PAE vs. Idq and Vds at 2 GHz.

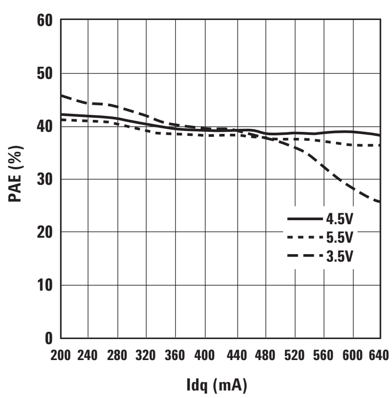


Figure 23. PAE vs. Idq and Vds at 0.9 GHz.

ATF-501P8 Typical Performance Curves (at 25°C unless specified otherwise)
Tuned for Optimum OIP3 at 4.5V 280 mA

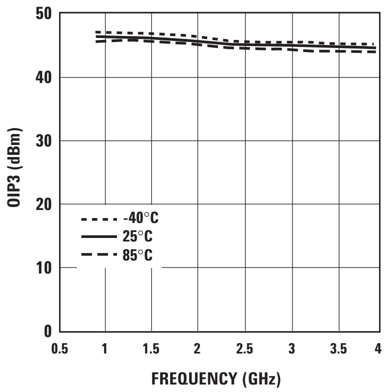


Figure 24. OIP3 vs. Temperature and Frequency at Optimal OIP3.

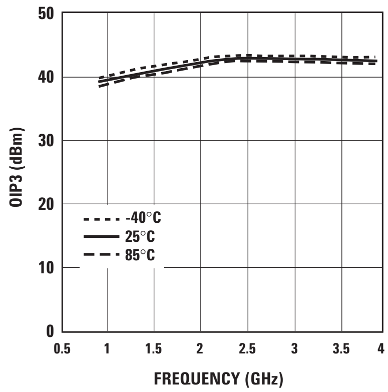


Figure 25. OIP3 vs. Temperature and Frequency at Optimal P1dB.

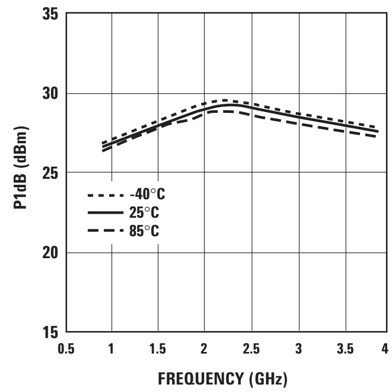


Figure 26. P1dB vs. Temperature and Frequency at Optimal OIP3.

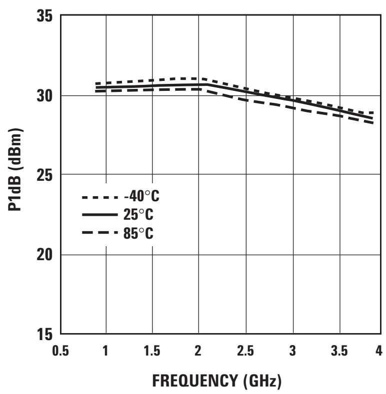


Figure 27. P1dB vs. Temperature and Frequency at Optimal P1dB.

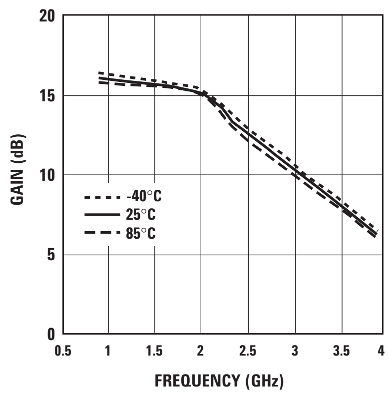


Figure 28. Gain vs. Temperature and Frequency at Optimal OIP3.

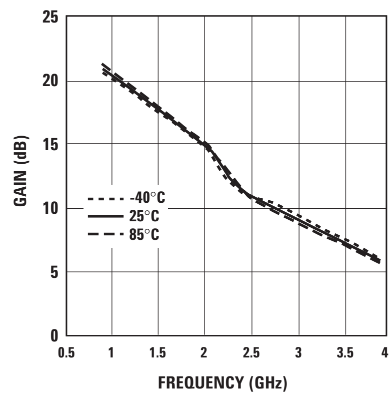


Figure 29. Gain vs. Temperature and Frequency at Optimal P1dB.

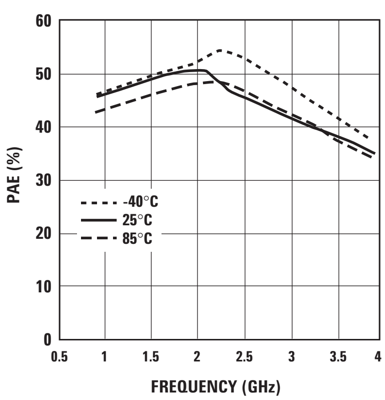


Figure 30. PAE vs. Temperature and Frequency at Optimal OIP3.

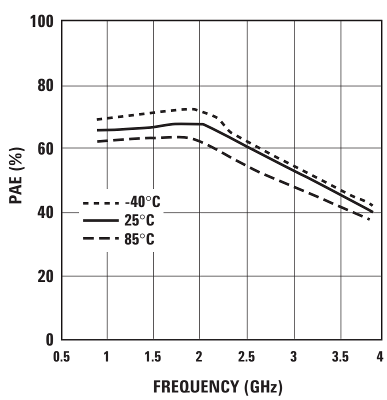


Figure 31. PAE vs. Temperature and Frequency at Optimal P1dB.

ATF-501P8 Typical Performance Curves (at 25°C unless specified otherwise)
Tuned for Optimal OIP3 at 4.5V 400 mA

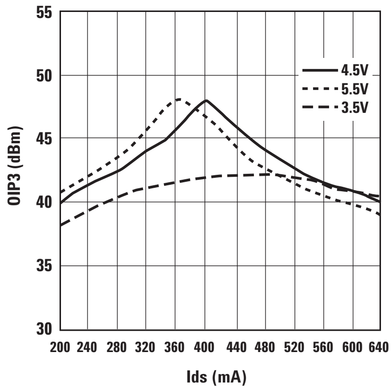


Figure 32. OIP3 vs. Ids and Vds at 2 GHz.

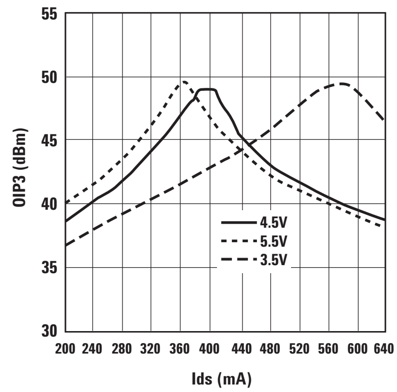


Figure 33. OIP3 vs. Ids and Vds at 900 MHz.

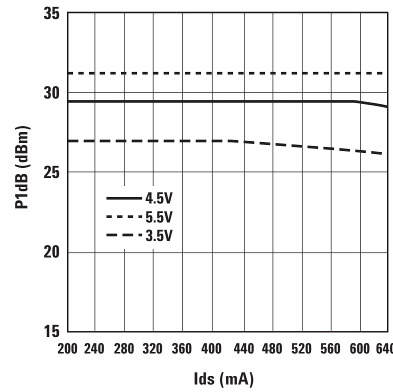


Figure 34. P1dB vs. Ids and Vds at 2 GHz.

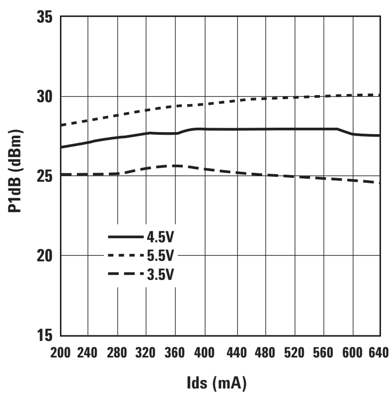


Figure 35. P1dB vs. Ids and Vds at 900 MHz.

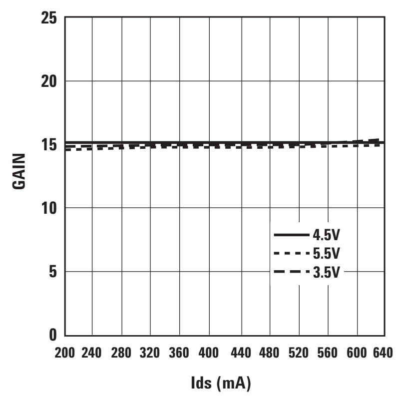


Figure 36. Gain vs. Ids and Vds at 2 GHz.

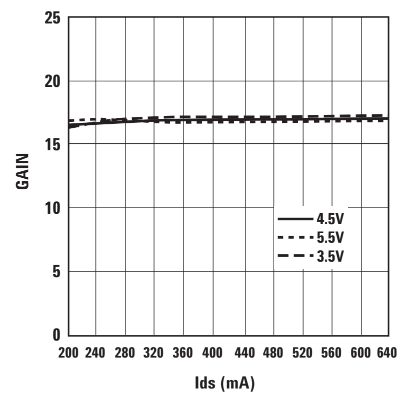


Figure 37. Gain vs. Ids and Vds at 900 MHz.

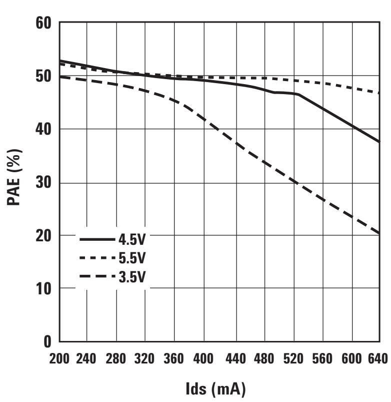


Figure 38. PAE vs. Ids and Vds at 2 GHz.

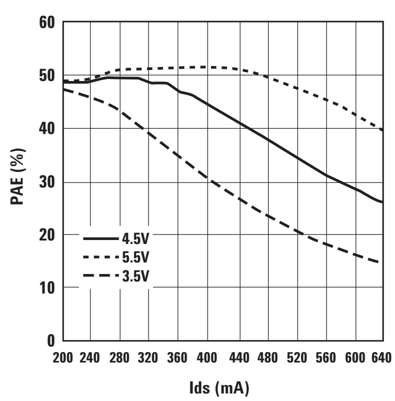


Figure 39. PAE vs. Ids and Vds at 900 MHz.

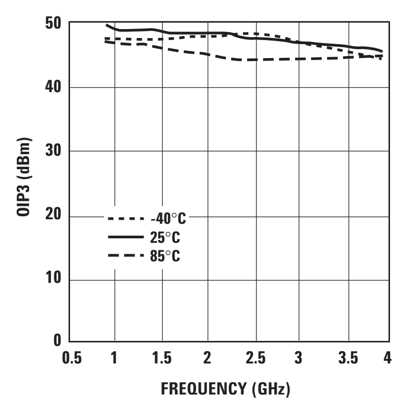


Figure 40. OIP3 vs. Temperature and Frequency at optimum OIP3.

Note:
Bias current (Ids) for the above charts are quiescent conditions. Actual level may increase or decrease depending on amount of RF drive.

ATF-501P8 Typical Performance Curves, continued (at 25°C unless specified otherwise)
Tuned for Optimal OIP3 at 4.5V 400 mA

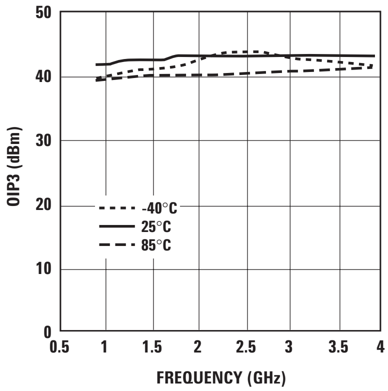


Figure 41. OIP3 vs. Temperature and Frequency at optimum P1dB.

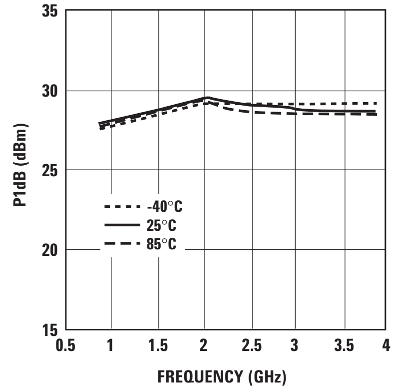


Figure 42. P1dB vs. Temperature and Frequency at optimum OIP3.

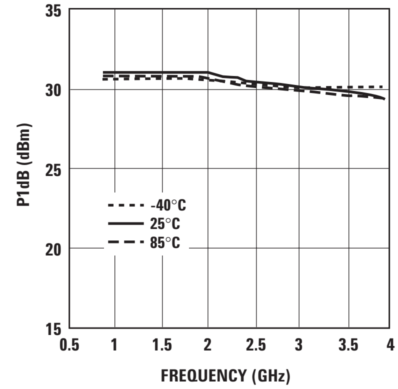


Figure 43. P1dB vs. Temperature and Frequency at optimum P1dB.

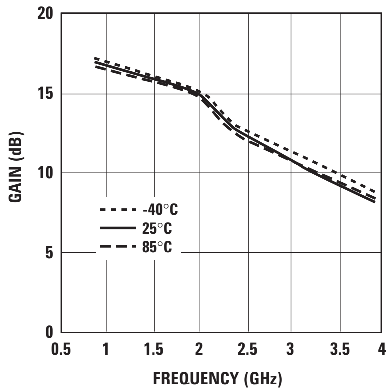


Figure 44. Gain vs. Temperature and Frequency at optimum OIP3.

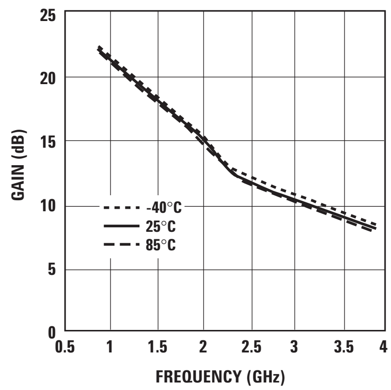


Figure 45. Gain vs. Temperature and Frequency at optimum P1dB.

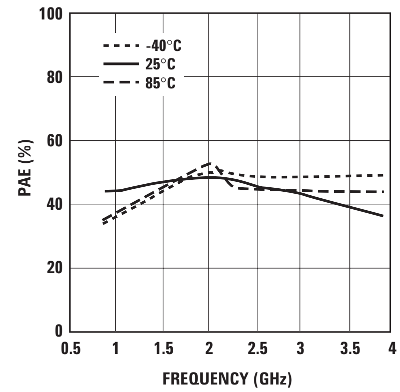


Figure 46. PAE vs. Temperature and Frequency at optimum OIP3.

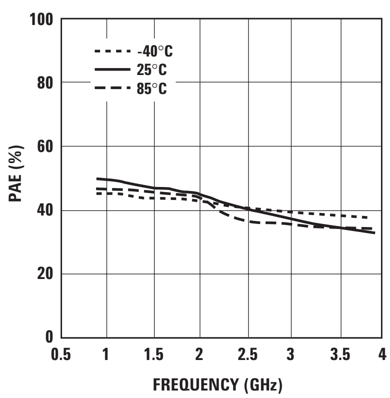


Figure 47. PAE vs. Temperature and Frequency at optimum P1dB.

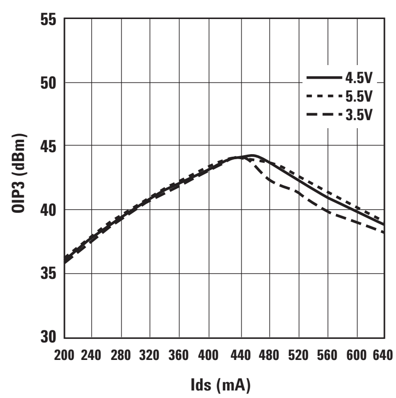


Figure 48. OIP3 vs. Ids and Vds at 2 GHz.

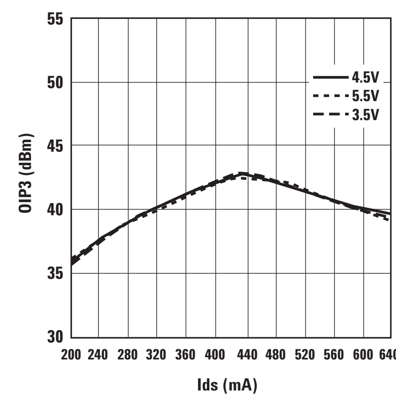


Figure 49. OIP3 vs. Ids and Vds at 900 MHz.

Note:
Bias current (Ids) for the above charts are quiescent conditions. Actual level may increase or decrease depending on amount of RF drive.

ATF-501P8 Typical Performance Curves, continued (at 25°C unless specified otherwise)
Tuned for Optimal P1dB at 4.5V 400 mA

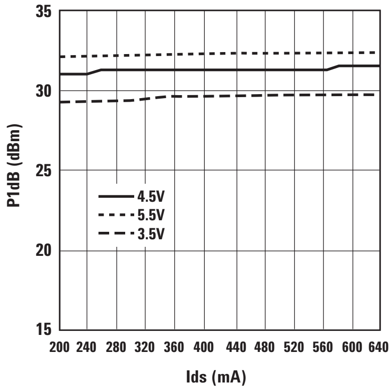


Figure 50. P1dB vs. Ids and Vds at 2 GHz.

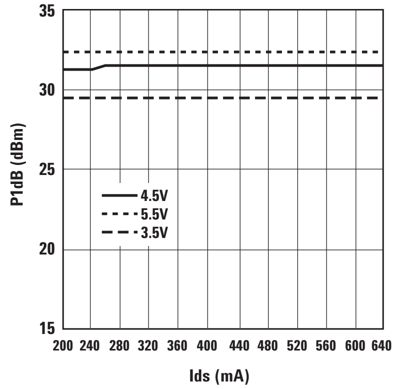


Figure 51. P1dB vs. Ids and Vds at 900 MHz.

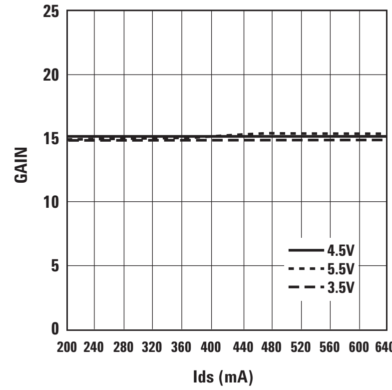


Figure 52. Gain vs. Ids and Vds at 2 GHz.

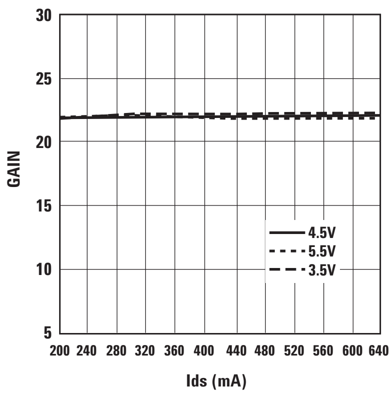


Figure 53. Gain vs. Ids and Vds at 900 MHz.

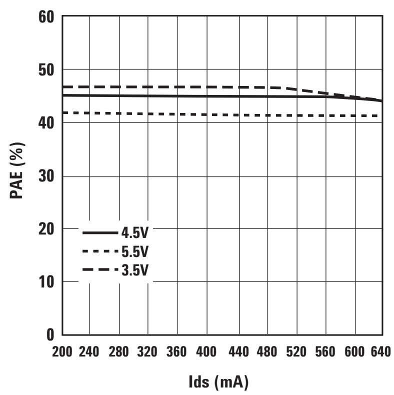


Figure 54. PAE vs. Ids and Vds at 2 GHz.

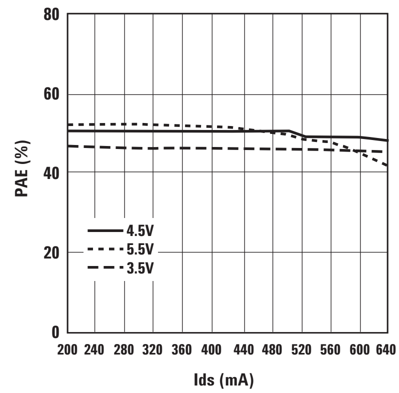


Figure 55. PAE vs. Ids and Vds at 900 MHz.

Note:
Bias current (Ids) for the above charts are quiescent conditions. Actual level may increase or decrease depending on amount of RF drive.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 4.5V, I_{DS} = 280 mA

Freq.	S_{11}		S_{21}			S_{12}			S_{22}		MSG/MAG	K
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.	dB	factor
0.1	0.915	-132.3	31.6	37.990	112.2	-38.4	0.012	29.3	0.647	-160.6	35.0	0.173
0.2	0.911	-156.2	26.2	20.324	99.9	-37.7	0.013	24.0	0.689	-171.1	31.9	0.314
0.3	0.910	-165.4	22.8	13.783	94.5	-37.1	0.014	24.5	0.699	-175.7	29.9	0.436
0.4	0.910	-170.9	20.3	10.342	91.1	-37.1	0.014	27.3	0.702	-178.5	28.7	0.569
0.5	0.908	-173.4	18.7	8.604	88.4	-36.5	0.015	29.6	0.691	-179.9	27.6	0.648
0.6	0.907	-176.1	17.1	7.194	86.1	-35.9	0.016	32.4	0.691	178.5	26.5	0.736
0.7	0.908	-178.5	15.8	6.167	84.1	-35.4	0.017	34.4	0.694	177.2	25.6	0.800
0.8	0.905	179.8	14.7	5.407	82.1	-34.9	0.018	36.3	0.695	175.2	24.8	0.871
0.9	0.909	178.2	13.6	4.799	80.3	-34.4	0.019	38.3	0.692	175.1	24.0	0.906
1	0.909	176.6	12.7	4.308	78.3	-34.0	0.020	39.9	0.692	173.9	23.3	0.953
1.5	0.902	170.5	9.1	2.859	70.3	-31.7	0.026	45.0	0.698	169.4	18.2	1.128
2	0.902	166.0	7.1	2.264	64.4	-30.5	0.030	46.9	0.700	165.6	16.0	1.209
2.5	0.901	165.0	6.6	2.134	63.1	-30.2	0.031	47.2	0.699	163.0	15.4	1.241
3	0.901	161.1	5.0	1.772	57.7	-28.9	0.036	47.4	0.697	159.1	13.8	1.278
4	0.898	155.0	3.0	1.412	49.3	-27.3	0.043	46.5	0.707	153.7	11.7	1.326
5	0.902	145.0	0.9	1.110	37.6	-24.7	0.058	43.5	0.699	146.8	9.7	1.272
6	0.893	134.9	-0.9	0.902	22.6	-22.9	0.072	35.6	0.697	145.3	7.8	1.286
7	0.899	125.8	-3.3	0.687	9.0	-22.2	0.078	27.3	0.652	134.1	5.7	1.394
8	0.895	115.6	-4.4	0.604	-1.1	-20.8	0.091	22.0	0.646	117.4	4.2	1.463
9	0.898	105.5	-5.3	0.542	-13.0	-19.6	0.105	12.3	0.641	115.5	3.2	1.447
10	0.886	95.5	-5.9	0.505	-20.2	-18.9	0.114	9.7	0.695	104.5	2.5	1.455
11	0.868	84.7	-6.6	0.469	-29.7	-17.6	0.132	0.5	0.742	91.3	1.6	1.431
12	0.862	74.0	-8.0	0.398	-40.8	-17.4	0.135	-6.3	0.735	88.1	-0.1	1.661
13	0.847	64.5	-7.9	0.403	-47.5	-16.0	0.159	-12.3	0.766	78.4	-0.1	1.491
14	0.844	55.6	-8.5	0.377	-58.4	-15.3	0.171	-21.3	0.800	68.9	-0.3	1.397
15	0.837	47.4	-9.0	0.354	-67.2	-14.6	0.187	-30.1	0.797	65.6	-1.1	1.414
16	0.824	39.9	-9.7	0.327	-72.0	-14.2	0.194	-36.8	0.763	51.5	-2.3	1.608
17	0.821	31.6	-9.8	0.323	-82.7	-13.4	0.215	-44.6	0.786	38.9	-2.4	1.488
18	0.805	24.6	-10.5	0.298	-90.1	-12.5	0.237	-51.8	0.781	29.5	-3.5	1.575

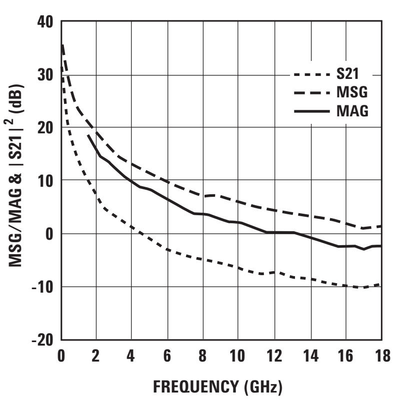


Figure 56. MSG/MAG & |S21|^2 vs. Frequency at 4.5V 280mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 4.5V, I_{DS} = 200 mA

Freq.	S_{11}		S_{21}			S_{12}			S_{22}		MSG/MAG	K
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.	dB	factor
0.1	0.922	-131.5	31.1	35.978	112.6	-37.7	0.013	28.9	0.664	-159.8	34.4	0.142
0.2	0.914	-155.7	25.7	19.290	100.1	-36.5	0.015	22.4	0.709	-170.7	31.1	0.274
0.3	0.914	-165.2	22.3	13.088	94.7	-36.5	0.015	22.5	0.719	-175.4	29.4	0.390
0.4	0.911	-170.5	19.8	9.814	91.4	-35.9	0.016	24.9	0.722	-178.4	27.9	0.510
0.5	0.911	-173.3	18.3	8.176	88.6	-35.4	0.017	26.8	0.713	-179.9	26.8	0.577
0.6	0.912	-176.0	16.7	6.834	86.4	-34.9	0.018	29.3	0.713	178.6	25.8	0.653
0.7	0.910	-178.3	15.4	5.861	84.3	-34.4	0.019	31.3	0.716	177.2	24.9	0.725
0.8	0.910	179.9	14.2	5.141	82.3	-34.4	0.019	33.0	0.718	175.5	24.3	0.801
0.9	0.913	178.4	13.2	4.558	80.5	-34.0	0.020	34.9	0.712	175.0	23.6	0.840
1	0.910	176.8	12.2	4.092	78.7	-33.6	0.021	36.6	0.714	173.8	22.9	0.903
1.5	0.904	170.5	8.7	2.718	70.5	-31.4	0.027	41.7	0.721	169.0	18.3	1.077
2	0.905	166.1	6.7	2.153	64.9	-30.2	0.031	44.2	0.721	165.2	16.0	1.161
2.5	0.905	165.2	6.1	2.027	63.7	-29.9	0.032	44.5	0.719	162.5	15.4	1.188
3	0.906	161.1	4.5	1.684	58.3	-28.6	0.037	44.9	0.715	158.5	13.7	1.227
4	0.905	154.9	2.6	1.354	50.3	-27.1	0.044	44.3	0.725	152.9	11.8	1.262
5	0.904	145.1	0.4	1.053	38.5	-24.7	0.058	41.6	0.716	145.7	9.5	1.271
6	0.899	134.9	-1.3	0.863	23.9	-22.9	0.072	34.1	0.712	144.1	7.7	1.263
7	0.905	126.0	-3.6	0.661	10.5	-22.2	0.078	26.0	0.660	132.9	5.6	1.371
8	0.902	115.8	-4.6	0.587	0.3	-20.8	0.091	20.8	0.654	116.3	4.2	1.423
9	0.900	106.4	-5.6	0.527	-11.1	-19.6	0.105	11.1	0.649	114.4	3.0	1.451
10	0.894	95.9	-6.1	0.498	-17.7	-18.9	0.114	8.4	0.700	103.4	2.6	1.412
11	0.882	84.9	-7.0	0.448	-26.8	-17.7	0.130	-0.9	0.746	90.5	1.6	1.407
12	0.873	74.3	-8.1	0.393	-38.8	-17.5	0.133	-7.5	0.738	87.3	0.1	1.614
13	0.856	64.6	-8.1	0.393	-45.4	-16.1	0.156	-13.1	0.768	77.8	-0.1	1.492
14	0.853	56.0	-8.4	0.380	-55.0	-15.6	0.166	-21.4	0.800	68.4	-0.2	1.399
15	0.837	47.4	-8.8	0.361	-64.1	-14.8	0.182	-29.6	0.799	65.2	-1.0	1.439
16	0.829	40.6	-9.2	0.345	-72.0	-14.4	0.190	-35.9	0.763	51.1	-1.8	1.556
17	0.828	32.7	-9.5	0.336	-80.5	-13.4	0.213	-43.3	0.787	38.5	-2.0	1.449
18	0.807	26.1	-10.2	0.310	-88.2	-12.5	0.236	-50.5	0.782	29.1	-3.2	1.542

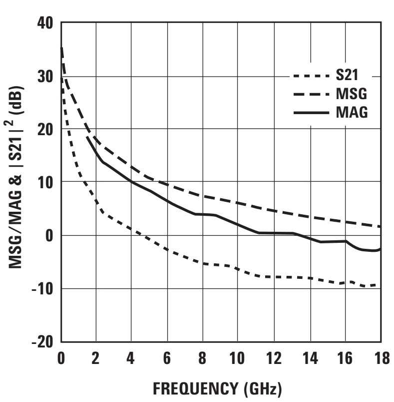


Figure 57. MSG/MAG & $|S21|^2$ vs. Frequency at 4.5V 200mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 4.5V, I_{DS} = 360 mA

Freq.	S_{11}			S_{21}			S_{12}		S_{22}		MSG/MAG	K
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.	dB	factor
0.1	0.911	-132.8	31.6	38.110	112.4	-39.2	0.011	30.3	0.649	-162.1	35.4	0.200
0.2	0.910	-156.5	26.2	20.415	100.0	-38.4	0.012	24.9	0.692	-171.8	32.3	0.340
0.3	0.911	-165.8	22.8	13.848	94.6	-37.7	0.013	26.2	0.701	-176.2	30.3	0.472
0.4	0.913	-171.1	20.3	10.397	91.3	-37.7	0.013	28.9	0.704	-178.9	29.0	0.600
0.5	0.907	-173.7	18.7	8.640	88.5	-36.5	0.015	31.8	0.693	179.7	27.6	0.679
0.6	0.910	-176.3	17.2	7.232	86.2	-35.9	0.016	34.5	0.694	178.2	26.6	0.747
0.7	0.910	-178.6	15.8	6.200	84.2	-35.9	0.016	36.8	0.696	176.9	25.9	0.838
0.8	0.906	179.7	14.7	5.431	82.2	-35.4	0.017	38.8	0.697	175.6	25.0	0.914
0.9	0.913	178.0	13.7	4.826	80.3	-34.9	0.018	40.6	0.695	174.8	24.3	0.930
1	0.907	176.4	12.7	4.328	78.4	-34.0	0.020	42.3	0.694	173.7	23.4	0.984
1.5	0.904	170.3	9.2	2.878	70.4	-32.0	0.025	47.0	0.698	169.4	18.2	1.154
2	0.906	165.9	7.1	2.275	64.5	-30.5	0.030	48.7	0.702	165.5	16.1	1.193
2.5	0.904	164.8	6.6	2.146	63.2	-30.2	0.031	49.0	0.701	162.8	15.5	1.231
3	0.907	160.9	5.0	1.783	57.9	-28.9	0.036	49.0	0.699	159.0	14.0	1.246
4	0.906	154.7	3.1	1.424	49.4	-27.3	0.043	47.7	0.708	153.6	12.0	1.275
5	0.903	144.8	0.9	1.114	37.7	-24.7	0.058	44.2	0.701	146.7	9.7	1.268
6	0.896	134.7	-0.8	0.907	22.7	-22.7	0.073	36.2	0.699	145.1	7.9	1.256
7	0.903	125.6	-3.2	0.691	8.9	-22.2	0.078	27.9	0.654	134.0	5.9	1.355
8	0.903	115.0	-4.3	0.612	-1.0	-20.7	0.092	22.4	0.647	117.3	4.6	1.375
9	0.891	105.6	-5.3	0.544	-13.3	-19.5	0.106	12.8	0.642	115.4	2.9	1.495
10	0.885	94.9	-6.0	0.504	-20.0	-18.8	0.115	10.2	0.697	104.4	2.4	1.462
11	0.873	84.3	-6.7	0.465	-28.4	-17.5	0.133	0.9	0.743	91.3	1.6	1.416
12	0.866	74.0	-7.9	0.403	-41.1	-17.3	0.137	-5.8	0.735	87.9	0.1	1.607
13	0.849	64.3	-7.8	0.406	-47.3	-15.9	0.161	-12.1	0.768	78.3	0.0	1.464
14	0.849	55.7	-8.4	0.379	-57.9	-15.2	0.174	-21.3	0.801	68.8	-0.2	1.361
15	0.841	46.6	-9.0	0.353	-69.0	-14.5	0.189	-30.3	0.800	65.5	-0.9	1.376
16	0.828	39.0	-9.4	0.337	-73.1	-14.2	0.196	-37.1	0.763	51.4	-2.0	1.547
17	0.817	31.0	-9.8	0.322	-83.0	-13.2	0.218	-45.1	0.787	38.7	-2.4	1.491
18	0.809	23.9	-10.3	0.304	-92.7	-12.4	0.240	-52.4	0.783	29.3	-3.2	1.513

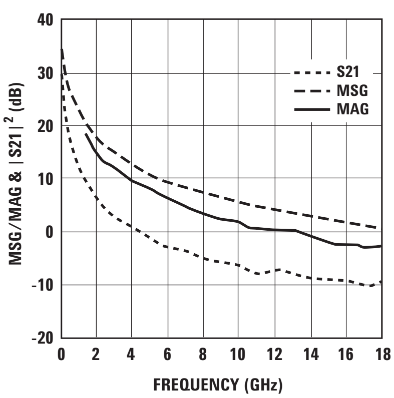


Figure 58. MSG/MAG & $|S21|^2$ vs. Frequency at 4.5V 360mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 3.5V, I_{DS} = 280 mA

Freq.	S_{11}			S_{21}			S_{12}		S_{22}		MSG/MAG	K
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.	dB	factor
0.1	0.923	-133.9	30.6	34.047	111.6	-38.4	0.012	28.8	0.716	-164.7	34.5	0.166
0.2	0.922	-157.1	25.2	18.161	99.7	-37.7	0.013	23.8	0.759	-173.4	31.5	0.301
0.3	0.920	-166.1	21.8	12.313	94.5	-37.1	0.014	25.0	0.767	-177.3	29.4	0.427
0.4	0.920	-171.3	19.3	9.220	91.4	-37.1	0.014	27.5	0.770	-179.8	28.2	0.549
0.5	0.915	-173.9	17.7	7.674	88.7	-35.9	0.016	30.0	0.760	178.8	26.8	0.622
0.6	0.917	-176.5	16.2	6.429	86.6	-35.4	0.017	32.9	0.761	177.2	25.8	0.697
0.7	0.917	-178.9	14.8	5.511	84.6	-34.9	0.018	34.8	0.762	175.8	24.9	0.761
0.8	0.915	179.6	13.6	4.813	82.8	-34.9	0.018	37.2	0.760	175.0	24.3	0.843
0.9	0.918	177.7	12.7	4.302	81.0	-34.4	0.019	38.8	0.764	173.7	23.5	0.877
1	0.913	176.4	11.7	3.850	79.1	-33.6	0.021	40.5	0.759	172.4	22.6	0.930
1.5	0.913	170.4	8.1	2.555	72.0	-31.4	0.027	45.6	0.759	168.1	18.1	1.070
2	0.913	166.1	6.1	2.025	66.3	-30.2	0.031	47.1	0.763	163.9	15.9	1.139
2.5	0.910	164.8	5.6	1.912	65.1	-29.9	0.032	47.6	0.762	161.0	15.2	1.181
3	0.913	160.9	4.0	1.588	60.4	-28.6	0.037	47.5	0.758	156.7	13.6	1.206
4	0.906	154.6	2.1	1.276	52.2	-26.9	0.045	45.9	0.762	150.9	11.5	1.261
5	0.910	144.7	0.1	1.012	41.6	-24.4	0.060	42.4	0.754	143.3	9.4	1.226
6	0.903	134.6	-1.6	0.827	27.2	-22.5	0.075	34.3	0.742	141.3	7.5	1.239
7	0.907	125.4	-3.9	0.636	14.0	-22.0	0.079	25.3	0.674	130.1	5.3	1.402
8	0.903	115.2	-4.9	0.570	5.1	-20.6	0.093	19.8	0.669	113.5	3.9	1.448
9	0.897	105.5	-5.6	0.522	-7.0	-19.4	0.107	9.9	0.666	112.0	2.8	1.484
10	0.889	94.8	-6.0	0.499	-14.5	-18.8	0.115	7.0	0.709	100.9	2.4	1.458
11	0.880	84.2	-6.4	0.477	-23.6	-17.7	0.131	-2.4	0.754	88.2	1.9	1.378
12	0.870	73.4	-7.7	0.411	-33.8	-17.6	0.132	-9.1	0.745	85.0	0.3	1.614
13	0.847	63.8	-7.5	0.421	-41.1	-16.3	0.153	-14.5	0.770	75.9	0.1	1.519
14	0.839	55.1	-8.0	0.397	-52.2	-15.8	0.163	-22.5	0.801	66.5	-0.1	1.458
15	0.816	47.3	-8.2	0.390	-63.9	-15.0	0.178	-30.0	0.795	63.4	-0.8	1.495
16	0.808	39.8	-9.2	0.345	-70.3	-14.6	0.186	-35.9	0.755	49.5	-2.3	1.727
17	0.794	32.3	-9.0	0.354	-81.5	-13.5	0.211	-43.3	0.787	36.6	-2.1	1.538
18	0.769	26.0	-9.7	0.329	-91.7	-12.6	0.234	-50.7	0.777	27.7	-3.2	1.632

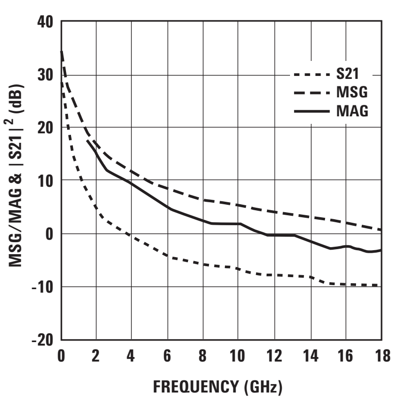


Figure 59. MSG/MAG & |S21|^2 vs. Frequency at 3.5V 280mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 3.5V, I_{DS} = 200 mA

Freq. GHz	S_{11} Mag.	S_{11} Ang.	S_{21} dB	S_{21} Mag.	S_{21} Ang.	S_{12} dB	S_{12} Mag.	S_{12} Ang.	S_{22} Mag.	S_{22} Ang.	MSG/MAG dB	K factor
0.1	0.924	-132.7	30.5	33.400	112.1	-37.1	0.014	28.4	0.703	-162.3	33.8	0.150
0.2	0.919	-156.5	25.0	17.862	99.9	-36.5	0.015	22.1	0.749	-172.1	30.8	0.269
0.3	0.918	-165.7	21.7	12.118	94.6	-36.5	0.015	22.7	0.757	-176.5	29.1	0.390
0.4	0.918	-171.0	19.2	9.080	91.4	-35.9	0.016	24.6	0.760	-179.2	27.5	0.496
0.5	0.918	-173.6	17.6	7.556	88.7	-35.4	0.017	26.4	0.751	179.4	26.5	0.559
0.6	0.915	-176.2	16.0	6.328	86.5	-34.9	0.018	29.3	0.752	177.7	25.5	0.651
0.7	0.915	-178.5	14.7	5.422	84.5	-34.4	0.019	31.3	0.753	176.3	24.6	0.717
0.8	0.914	179.8	13.5	4.739	82.7	-34.0	0.020	33.2	0.752	175.3	23.7	0.777
0.9	0.919	178.0	12.5	4.232	80.8	-33.6	0.021	35.1	0.755	174.1	23.0	0.806
1	0.916	176.7	11.6	3.788	79.0	-33.2	0.022	36.7	0.750	172.8	22.4	0.870
1.5	0.912	170.5	8.0	2.515	71.5	-31.4	0.027	42.0	0.750	168.3	18.2	1.057
1.9	0.911	166.0	6.0	1.991	65.8	-29.9	0.032	44.3	0.755	165.0	15.8	1.126
2	0.910	164.9	5.5	1.882	64.7	-29.6	0.033	44.7	0.753	164.2	15.2	1.157
2.4	0.911	160.9	3.9	1.562	59.7	-28.6	0.037	45.0	0.750	161.3	13.5	1.215
3	0.909	154.7	2.0	1.255	51.5	-26.9	0.045	43.9	0.754	157.0	11.5	1.244
4	0.911	144.8	-0.1	0.988	40.4	-24.4	0.060	41.0	0.746	151.3	9.3	1.225
5	0.902	134.8	-1.8	0.813	25.9	-22.6	0.074	33.3	0.735	143.7	7.4	1.255
6	0.904	125.5	-4.1	0.624	12.7	-22.0	0.079	24.6	0.669	141.8	5.0	1.438
7	0.904	115.6	-5.1	0.555	3.9	-20.6	0.093	19.3	0.664	130.6	3.8	1.455
8	0.901	105.6	-5.9	0.509	-8.3	-19.4	0.107	9.5	0.662	113.9	2.7	1.466
9	0.897	95.4	-6.4	0.477	-14.5	-18.8	0.115	6.6	0.705	112.3	2.3	1.437
10	0.880	84.1	-6.9	0.450	-23.9	-17.7	0.130	-3.0	0.751	101.2	1.5	1.429
11	0.872	73.7	-8.1	0.393	-34.0	-17.6	0.132	-9.7	0.742	88.5	0.0	1.646
12	0.849	64.2	-7.8	0.408	-42.5	-16.4	0.152	-14.9	0.767	85.3	0.0	1.539
13	0.841	55.5	-8.2	0.391	-53.2	-15.8	0.162	-22.8	0.798	76.2	-0.2	1.465
14	0.820	47.1	-8.5	0.377	-63.5	-15.1	0.176	-29.9	0.793	66.8	-1.0	1.527
15	0.809	39.3	-9.0	0.354	-69.5	-14.7	0.185	-35.9	0.754	63.6	-2.1	1.708
16	0.794	32.7	-9.1	0.350	-84.1	-13.6	0.210	-43.1	0.785	49.8	-2.1	1.543
17	0.770	25.8	-9.6	0.332	-89.0	-12.6	0.234	-50.5	0.776	36.9	-3.1	1.634
18	0.766	21.5	-9.2	0.346	-99.8	-11.5	0.266	-60.7	0.797	28.0	-2.6	1.394

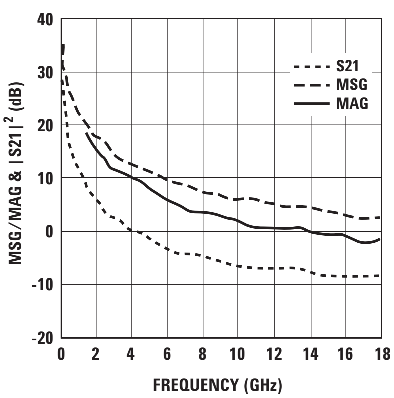


Figure 60. MSG/MAG & |S21|^2 vs. Frequency at 3.5V 200mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 3.5V, I_{DS} = 360 mA

Freq.	S_{11}		S_{21}			S_{12}			S_{22}		MSG/MAG	K
GHz	**Mag.**	**Ang.**	**dB**	**Mag.**	**Ang.**	**dB**	**Mag.**	**Ang.**	**Mag.**	**Ang.**	**dB**	**factor**
0.1	0.919	-134.2	30.8	34.576	111.7	-39.2	0.011	29.6	0.722	-166.1	35.0	0.191
0.2	0.920	-157.3	25.3	18.445	99.7	-38.4	0.012	25.5	0.763	-174.1	31.9	0.336
0.3	0.921	-166.4	21.9	12.499	94.6	-37.7	0.013	26.7	0.771	-177.8	29.8	0.460
0.4	0.918	-171.4	19.4	9.372	91.5	-37.7	0.013	30.0	0.773	179.8	28.6	0.599
0.5	0.915	-174.0	17.8	7.792	88.8	-36.5	0.015	32.7	0.763	178.6	27.2	0.665
0.6	0.916	-176.7	16.3	6.537	86.6	-35.9	0.016	35.7	0.765	176.9	26.1	0.744
0.7	0.916	-178.9	15.0	5.596	84.7	-35.4	0.017	37.9	0.765	175.6	25.2	0.809
0.8	0.914	179.4	13.8	4.888	83.1	-34.9	0.018	40.0	0.764	174.9	24.3	0.871
0.9	0.919	178.1	12.8	4.370	81.1	-34.4	0.019	41.8	0.768	173.4	23.6	0.892
1	0.914	176.2	11.8	3.911	79.3	-34.0	0.020	43.0	0.762	172.2	22.9	0.963
1.5	0.912	170.2	8.3	2.596	72.2	-31.7	0.026	47.8	0.761	168.1	18.0	1.103
2	0.914	165.8	6.3	2.059	66.7	-30.2	0.031	49.2	0.766	163.8	15.9	1.142
2.5	0.910	164.7	5.8	1.940	65.6	-29.9	0.032	49.3	0.765	160.9	15.2	1.185
3	0.912	160.8	4.2	1.618	60.7	-28.6	0.037	49.0	0.761	156.6	13.6	1.210
4	0.913	154.4	2.3	1.296	52.9	-26.9	0.045	47.3	0.765	150.8	11.8	1.221
5	0.908	144.7	0.2	1.023	42.0	-24.4	0.060	43.2	0.756	143.0	9.4	1.236
6	0.903	134.5	-1.5	0.844	27.9	-22.5	0.075	34.8	0.745	141.1	7.6	1.233
7	0.906	125.5	-3.8	0.647	15.0	-21.9	0.080	25.7	0.676	129.9	5.3	1.392
8	0.904	115.1	-4.7	0.582	5.9	-20.6	0.093	20.3	0.670	113.3	4.1	1.430
9	0.902	105.3	-5.5	0.532	-6.4	-19.4	0.107	10.3	0.666	111.6	3.1	1.433
10	0.893	95.0	-5.8	0.513	-13.3	-18.8	0.115	7.5	0.710	100.7	2.7	1.416
11	0.881	84.1	-6.5	0.474	-22.0	-17.7	0.131	-1.9	0.756	88.2	1.9	1.388
12	0.873	73.6	-7.6	0.417	-32.9	-17.5	0.133	-8.5	0.746	84.9	0.5	1.577
13	0.847	63.9	-7.5	0.424	-40.6	-16.2	0.154	-13.9	0.772	75.7	0.2	1.507
14	0.844	55.4	-7.8	0.407	-52.7	-15.7	0.165	-22.0	0.802	66.3	0.1	1.407
15	0.827	47.4	-8.2	0.389	-63.7	-14.9	0.180	-29.7	0.793	63.2	-0.7	1.457
16	0.818	40.2	-8.9	0.357	-67.9	-14.6	0.187	-35.8	0.759	49.4	-1.9	1.637
17	0.799	32.9	-9.0	0.353	-81.4	-13.5	0.211	-43.1	0.786	36.5	-2.0	1.526
18	0.780	26.7	-9.3	0.344	-90.7	-12.5	0.236	-50.4	0.777	27.6	-2.7	1.549

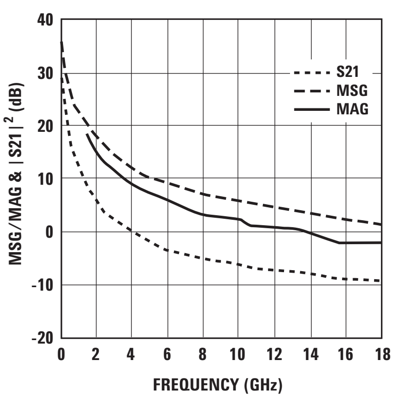


Figure 61. MSG/MAG & $|S21|^2$ vs. Frequency at 3.5V 360mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 5.5V, I_{DS} = 280 mA

Freq.	S_{11}		S_{21}			S_{12}			S_{22}		MSG/MAG	K
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.	dB	factor
0.1	0.914	-131.5	31.8	39.087	112.6	-38.4	0.012	29.6	0.618	-158.7	35.1	0.172
0.2	0.912	-155.7	26.4	20.961	100.1	-37.7	0.013	23.9	0.661	-170.0	32.1	0.307
0.3	0.914	-165.2	23.1	14.228	94.5	-37.1	0.014	24.1	0.670	-174.9	30.1	0.420
0.4	0.913	-170.5	20.6	10.678	91.1	-37.1	0.014	26.7	0.674	-177.9	28.8	0.550
0.5	0.909	-173.3	19.0	8.871	88.3	-36.5	0.015	29.0	0.662	-179.3	27.7	0.638
0.6	0.910	-176.0	17.4	7.417	86.0	-35.9	0.016	31.7	0.663	179.2	26.7	0.715
0.7	0.911	-178.2	16.1	6.365	83.9	-35.4	0.017	34.3	0.666	177.8	25.7	0.782
0.8	0.908	-179.8	14.9	5.577	81.8	-34.9	0.018	36.0	0.667	176.3	24.9	0.850
0.9	0.913	178.4	13.9	4.956	79.9	-34.4	0.019	38.0	0.664	175.7	24.2	0.878
1	0.907	176.7	13.0	4.446	78.0	-34.0	0.020	39.4	0.664	174.5	23.5	0.958
1.5	0.903	170.5	9.4	2.951	69.6	-32.0	0.025	44.5	0.672	170.1	18.4	1.141
2	0.905	166.2	7.4	2.331	63.5	-30.5	0.030	46.4	0.674	166.5	16.3	1.182
2.5	0.903	165.2	6.8	2.197	62.1	-30.2	0.031	47.0	0.674	164.0	15.7	1.222
3	0.903	161.0	5.2	1.822	56.7	-29.1	0.035	47.3	0.672	160.3	14.0	1.284
4	0.900	154.7	3.3	1.455	47.9	-27.3	0.043	46.7	0.685	155.2	12.0	1.307
5	0.902	145.0	1.1	1.129	35.9	-24.9	0.057	43.8	0.679	148.6	9.8	1.278
6	0.895	134.9	-0.8	0.916	20.6	-23.0	0.071	36.2	0.681	147.0	8.0	1.271
7	0.903	125.8	-3.2	0.695	6.8	-22.3	0.077	28.3	0.648	135.8	6.1	1.340
8	0.898	115.4	-4.2	0.616	-3.5	-20.8	0.091	22.9	0.641	119.2	4.5	1.401
9	0.898	105.8	-5.3	0.546	-16.3	-19.6	0.105	13.3	0.636	117.2	3.3	1.416
10	0.884	95.4	-6.0	0.499	-23.2	-18.9	0.114	10.9	0.694	106.2	2.4	1.459
11	0.871	84.6	-6.8	0.458	-31.5	-17.6	0.132	1.6	0.741	92.7	1.6	1.420
12	0.864	74.2	-8.3	0.386	-43.6	-17.3	0.137	-5.2	0.731	89.5	-0.2	1.655
13	0.849	64.8	-8.3	0.385	-49.9	-15.8	0.162	-11.5	0.768	79.6	-0.3	1.479
14	0.854	56.1	-8.7	0.366	-60.4	-15.2	0.174	-20.9	0.804	70.2	-0.2	1.332
15	0.841	47.7	-9.6	0.330	-68.9	-14.4	0.191	-29.9	0.807	66.7	-1.3	1.385
16	0.834	40.0	-10.0	0.317	-73.5	-14.1	0.198	-37.0	0.768	52.4	-2.3	1.536
17	0.824	31.9	-10.2	0.310	-83.2	-13.2	0.219	-45.0	0.792	39.7	-2.5	1.466
18	0.813	24.7	-10.7	0.291	-88.9	-12.4	0.240	-52.2	0.788	30.0	-3.5	1.533

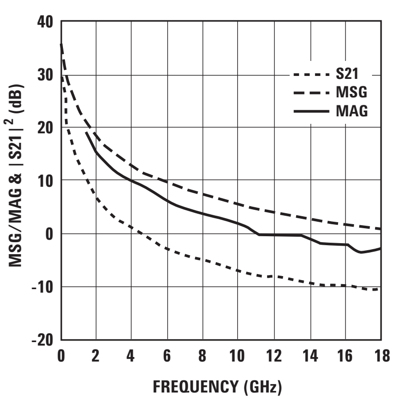


Figure 62. MSG/MAG & $|S21|^2$ vs. Frequency at 5.5V 280mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 5.5V, I_{DS} = 200 mA

Freq.	S_{11}			S_{21}			S_{12}		S_{22}		MSG/MAG	K
GHz	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.	dB	factor
0.1	0.921	-130.1	31.8	38.725	113.1	-37.7	0.013	29.6	0.615	-156.5	34.7	0.145
0.2	0.914	-155.0	26.4	20.822	100.3	-37.1	0.014	22.8	0.659	-168.9	31.7	0.274
0.3	0.914	-164.6	23.0	14.136	94.7	-36.5	0.015	22.7	0.669	-174.1	29.7	0.385
0.4	0.913	-170.1	20.5	10.611	91.3	-36.5	0.015	24.9	0.673	-177.3	28.5	0.510
0.5	0.909	-172.9	18.9	8.824	88.4	-35.4	0.017	26.8	0.662	-178.9	27.2	0.576
0.6	0.909	-175.7	17.4	7.375	86.0	-35.4	0.017	29.4	0.662	179.6	26.4	0.672
0.7	0.909	-178.1	16.0	6.329	83.9	-34.9	0.018	31.3	0.665	178.2	25.5	0.739
0.8	0.908	-179.7	14.9	5.549	81.8	-34.4	0.019	32.9	0.667	176.5	24.7	0.798
0.9	0.911	178.5	13.8	4.922	80.0	-34.0	0.020	35.3	0.662	176.0	23.9	0.843
1	0.909	176.8	12.9	4.418	78.0	-33.6	0.021	36.4	0.664	174.8	23.2	0.897
1.5	0.905	170.8	9.3	2.933	69.4	-31.7	0.026	41.7	0.673	170.3	18.8	1.079
2	0.907	166.3	7.3	2.322	63.4	-30.5	0.030	44.3	0.674	166.6	16.5	1.153
2.5	0.903	165.3	6.8	2.182	62.1	-30.2	0.031	44.5	0.673	164.1	15.7	1.208
3	0.906	161.2	5.2	1.815	56.5	-28.9	0.036	45.1	0.671	160.4	14.2	1.226
4	0.903	155.0	3.2	1.447	47.8	-27.3	0.043	44.7	0.684	155.3	12.1	1.273
5	0.904	145.1	1.0	1.123	35.9	-24.9	0.057	42.3	0.678	148.7	9.9	1.257
6	0.899	135.2	-0.8	0.909	20.3	-23.0	0.071	35.1	0.681	147.2	8.2	1.235
7	0.904	126.2	-3.2	0.693	6.5	-22.4	0.076	27.4	0.647	136.0	6.2	1.332
8	0.901	115.6	-4.3	0.608	-4.0	-20.9	0.090	22.2	0.640	119.4	4.6	1.386
9	0.896	106.2	-5.4	0.536	-15.9	-19.7	0.104	12.6	0.634	117.5	3.1	1.459
10	0.891	95.4	-6.1	0.497	-23.9	-18.9	0.113	10.2	0.692	106.3	2.6	1.408
11	0.877	85.0	-7.0	0.446	-32.3	-17.7	0.131	1.0	0.739	92.9	1.5	1.403
12	0.871	74.4	-8.3	0.386	-42.5	-17.4	0.135	-5.8	0.730	89.7	-0.1	1.625
13	0.851	64.9	-8.2	0.387	-49.0	-15.9	0.160	-11.8	0.767	79.8	-0.3	1.480
14	0.850	56.2	-8.8	0.364	-60.0	-15.3	0.172	-21.0	0.803	70.5	-0.3	1.364
15	0.839	48.0	-9.5	0.335	-67.9	-14.5	0.188	-29.9	0.805	66.9	-1.3	1.403
16	0.834	39.7	-10.2	0.309	-72.5	-14.2	0.195	-36.8	0.768	52.7	-2.5	1.585
17	0.827	32.2	-10.2	0.309	-82.4	-13.3	0.216	-44.6	0.792	39.9	-2.5	1.472
18	0.814	24.4	-10.5	0.298	-89.4	-12.5	0.238	-51.8	0.790	30.2	-3.2	1.510

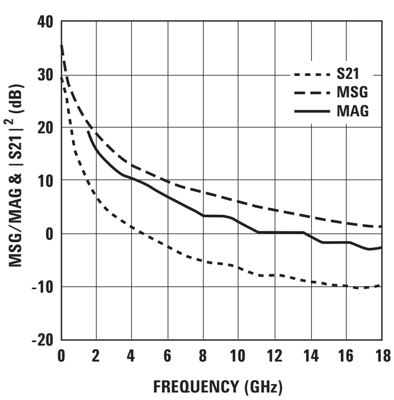


Figure 63. MSG/MAG & |S21|^2 vs. Frequency at 5.5V 200mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

ATF-501P8 Typical Scattering Parameters, V_{DS} = 5.5V, I_{DS} = 360 mA

Freq. GHz	S_{11} Mag.	S_{11} Ang.	S_{21} dB	S_{21} Mag.	S_{21} Ang.	S_{12} dB	S_{12} Mag.	S_{12} Ang.	S_{22} Mag.	S_{22} Ang.	MSG/MAG dB	K factor
0.1	0.904	-132.0	31.8	38.785	113.0	-39.2	0.011	29.8	0.619	-159.9	35.5	0.198
0.2	0.910	-156.2	26.4	20.860	100.3	-38.4	0.012	24.8	0.662	-170.6	32.4	0.338
0.3	0.912	-165.4	23.0	14.161	94.7	-37.7	0.013	25.5	0.672	-175.3	30.4	0.459
0.4	0.912	-170.7	20.5	10.635	91.2	-37.1	0.014	27.8	0.675	-178.2	28.8	0.571
0.5	0.907	-173.5	18.9	8.834	88.4	-36.5	0.015	30.5	0.663	-179.5	27.7	0.666
0.6	0.909	-176.1	17.4	7.399	86.1	-35.9	0.016	33.4	0.664	178.9	26.7	0.741
0.7	0.909	-178.3	16.0	6.337	83.9	-35.4	0.017	35.7	0.666	177.6	25.7	0.808
0.8	0.907	179.9	14.9	5.557	81.9	-35.4	0.017	37.6	0.668	176.2	25.1	0.901
0.9	0.909	178.4	13.9	4.942	80.0	-34.9	0.018	39.7	0.665	175.5	24.4	0.943
1	0.906	176.7	12.9	4.429	78.0	-34.4	0.019	41.2	0.665	174.3	23.7	1.008
1.5	0.904	170.5	9.4	2.941	69.7	-32.0	0.025	46.2	0.672	170.1	18.4	1.150
2	0.904	166.1	7.3	2.325	63.6	-30.8	0.029	47.9	0.676	166.5	16.2	1.225
2.5	0.900	165.1	6.8	2.191	62.2	-30.2	0.031	48.4	0.675	163.9	15.5	1.254
3	0.905	161.0	5.2	1.817	56.6	-29.1	0.035	48.6	0.674	160.2	14.0	1.278
4	0.900	155.0	3.3	1.456	48.2	-27.5	0.042	47.4	0.686	155.1	12.0	1.329
5	0.904	144.9	1.1	1.130	35.7	-24.9	0.057	44.4	0.680	148.5	9.9	1.267
6	0.897	134.8	-0.8	0.913	20.7	-23.0	0.071	36.8	0.683	146.9	8.0	1.264
7	0.902	125.7	-3.2	0.695	7.3	-22.3	0.077	28.9	0.649	135.8	6.0	1.359
8	0.899	115.5	-4.3	0.609	-3.7	-20.8	0.091	23.4	0.643	119.1	4.5	1.402
9	0.893	105.9	-5.3	0.544	-16.0	-19.6	0.105	13.8	0.636	117.1	3.1	1.470
10	0.886	95.4	-6.0	0.499	-23.1	-18.9	0.114	11.7	0.696	106.1	2.4	1.447
11	0.867	85.0	-6.8	0.455	-31.7	-17.5	0.133	2.3	0.743	92.6	1.4	1.439
12	0.871	75.0	-8.2	0.389	-43.4	-17.2	0.138	-4.6	0.732	89.3	0.0	1.589
13	0.854	65.6	-8.2	0.387	-49.9	-15.7	0.164	-11.0	0.769	79.4	-0.2	1.436
14	0.855	56.8	-8.9	0.360	-61.2	-15.1	0.176	-20.4	0.805	70.0	-0.3	1.323
15	0.845	48.1	-9.6	0.330	-68.7	-14.3	0.192	-29.6	0.806	66.4	-1.3	1.371
16	0.842	40.7	-10.0	0.315	-72.5	-14.0	0.199	-36.7	0.769	52.1	-2.2	1.502
17	0.833	32.6	-10.2	0.309	-82.1	-13.2	0.220	-44.6	0.792	39.4	-2.4	1.436
18	0.826	25.5	-10.5	0.299	-87.9	-12.3	0.242	-51.8	0.789	29.7	-3.1	1.457

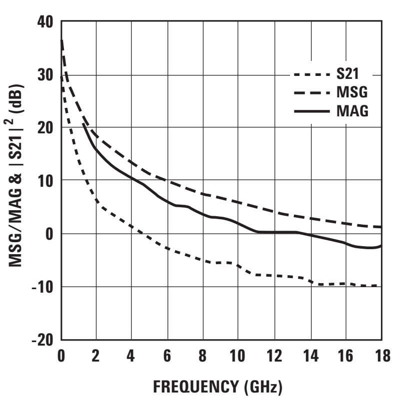


Figure 64. MSG/MAG & $|S21|^2$ vs. Frequency at 5.5V 360mA.

Notes:

1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

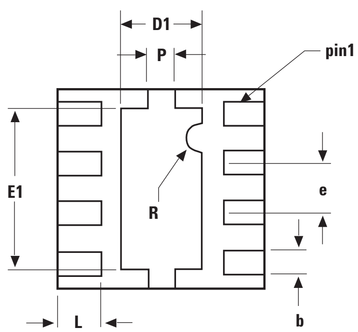
Device Models

Refer to Agilent's Web Site
www.agilent.com/view/rf

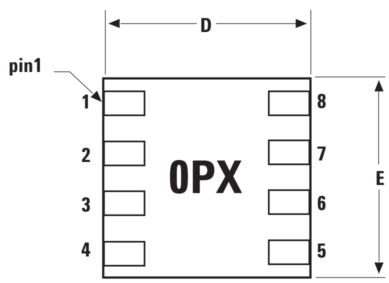
Ordering Information

Part Number	No. of Devices	Container
ATF-501P8-TR1	3000	7" Reel
ATF-501P8-TR2	10000	13"Reel
ATF-501P8-BLK	100	antistatic bag

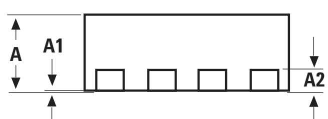
2 x 2 LPCC (JEDEC DFP-N) Package Dimensions



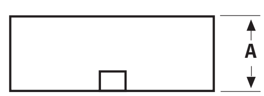
Bottom View



Top View



End View

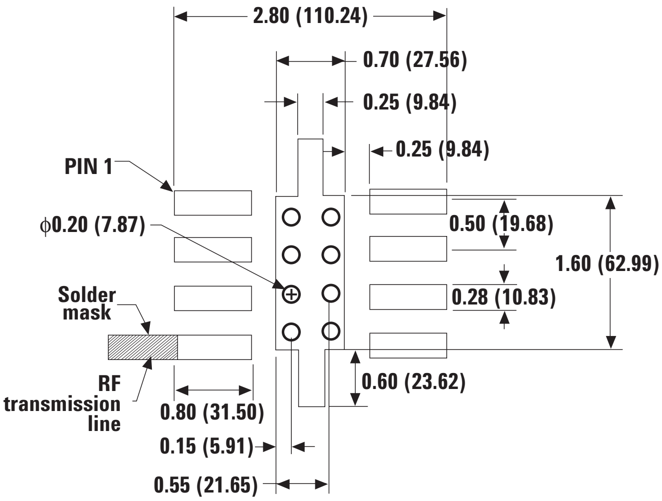


End View

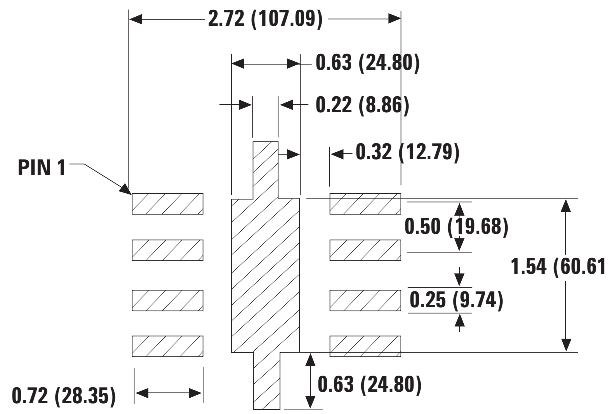
SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0	0.02	0.05
A2	0.203 REF	0.203 REF	0.203 REF
b	0.225	0.25	0.275
D	1.9	2.0	2.1
D1	0.65	0.80	0.95
E	1.9	2.0	2.1
E1	1.45	1.6	1.75
e	0.50 BSC	0.50 BSC	0.50 BSC

DIMENSIONS ARE IN MILLIMETERS

PCB Land Pattern and Stencil Design



PCB Land Pattern (top view)



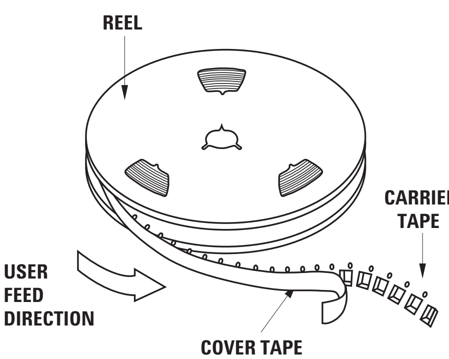
Stencil Layout (top view)

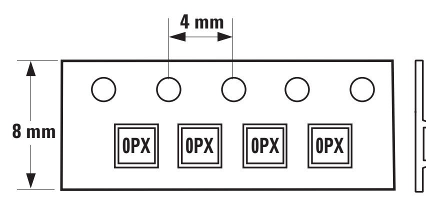
Notes:

Typical stencil thickness is 5 mils.

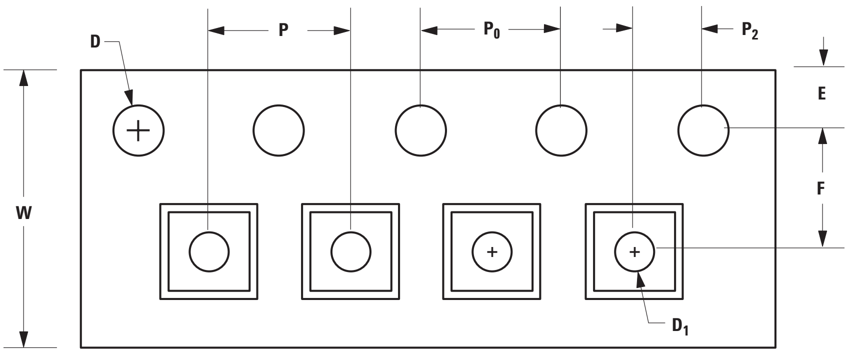
Measurements are in millimeters (mils).

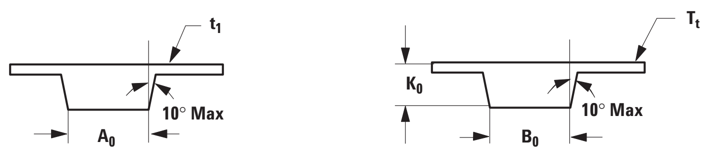
Device Orientation





Tape Dimensions





DESCRIPTION		SYMBOL	SIZE (mm)	SIZE (inches)
CAVITY	LENGTH	A_0	2.30 ± 0.05	0.091 ± 0.004
	WIDTH	B_0	2.30 ± 0.05	0.091 ± 0.004
	DEPTH	K_0	1.00 ± 0.05	0.039 ± 0.002
	PITCH	P	4.00 ± 0.10	0.157 ± 0.004
	BOTTOM HOLE DIAMETER	D_1	1.00 + 0.25	0.039 + 0.002
PERFORATION	DIAMETER	D	1.50 ± 0.10	0.060 ± 0.004
	PITCH	P_0	4.00 ± 0.10	0.157 ± 0.004
	POSITION	E	1.75 ± 0.10	0.069 ± 0.004
CARRIER TAPE	WIDTH	W	8.00 + 0.30 8.00 – 0.10	0.315 ± 0.012 0.315 ± 0.004
	THICKNESS	t_1	0.254 ± 0.02	0.010 ± 0.0008
COVER TAPE	WIDTH	C	5.4 ± 0.10	0.205 ± 0.004
	TAPE THICKNESS	T_t	0.062 ± 0.001	0.0025 ± 0.0004
DISTANCE	CAVITY TO PERFORATION (WIDTH DIRECTION)	F	3.50 ± 0.05	0.138 ± 0.002
	CAVITY TO PERFORATION (LENGTH DIRECTION)	P_2	2.00 ± 0.05	0.079 ± 0.002

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ООО «НИОКР СИТЕМС»
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Телефон: 8 (495) 268-14-82
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