

# Agilent ATF-501P8 High Linearity Enhancement Mode<sup>[1]</sup> Pseudomorphic HEMT in 2x2 mm<sup>2</sup> LPCC<sup>[3]</sup> Package

## Data Sheet

### Description

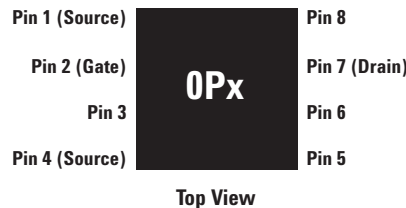
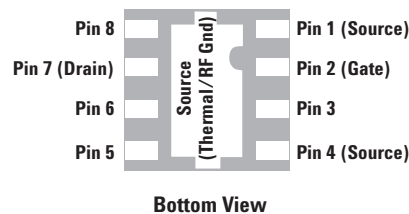
Agilent Technologies's ATF-501P8 is a single-voltage high linearity, low noise E-pHEMT housed in an 8-lead JEDEC-standard leadless plastic chip carrier (LPCC<sup>[3]</sup>) package. The device is ideal as a medium-power amplifier. Its operating frequency range is from 400 MHz to 3.9 GHz.

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 +85°C. 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 M0229 for DRP-N.
4. Linearity Figure of Merit (LFOM) is essentially OIP3 divided by DC bias power.

### Pin Connections and Package Marking



**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<sup>3</sup>
- Point MTTF > 300 years<sup>[2]</sup>
- 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<sup>[4]</sup>
- 65% PAE
- 23°C/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



**Agilent Technologies**

# ATF-501P8 Absolute Maximum Ratings<sup>[1]</sup>

Symbol	Parameter	Units	Absolute Maximum
$V_{DS}$	Drain-Source Voltage <sup>[2]</sup>	V	7
$V_{GS}$	Gate-Source Voltage <sup>[2]</sup>	V	-5 to 0.8
$V_{GD}$	Gate Drain Voltage <sup>[2]</sup>	V	-5 to 1
$I_{DS}$	Drain Current <sup>[2]</sup>	A	1
$I_{GS}$	Gate Current	mA	12
$P_{diss}$	Total Power Dissipation <sup>[3]</sup>	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
$\theta_{ch\_b}$	Thermal Resistance <sup>[4]</sup>	°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) temperature  $T_B$  is 25°C. Derate 43.5 mW/°C for  $T_B > 69.5^\circ\text{C}$ .
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<sup>[5,6]</sup>

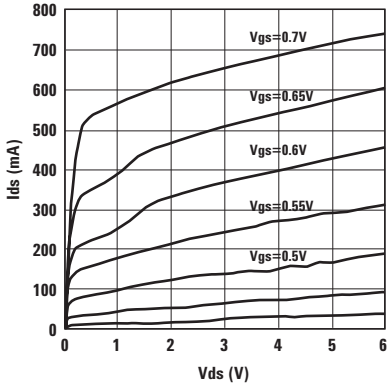


Figure 1. Typical IV curve ( $V_{gs} = 0.01V$ ) per step.

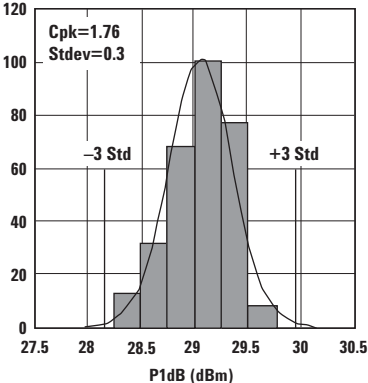


Figure 2. P1dB.

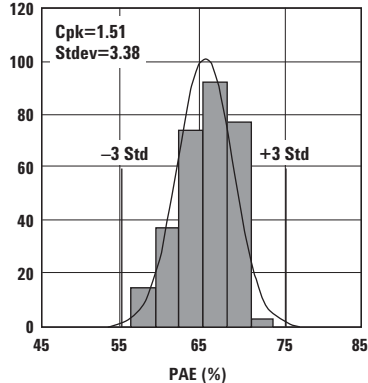


Figure 3. PAE.

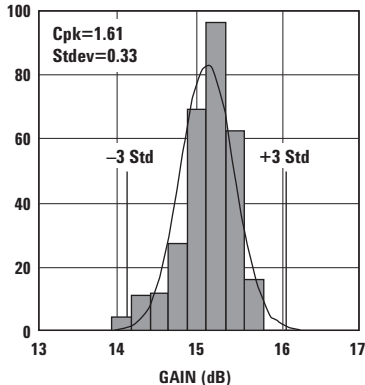


Figure 4. Gain.

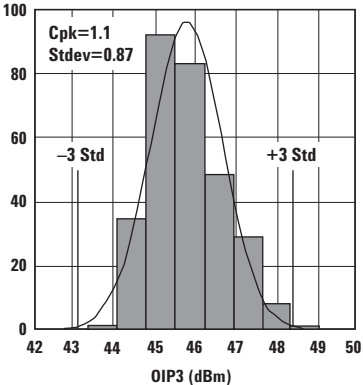


Figure 5. OIP3.

**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

$T_A = 25^\circ\text{C}$ , DC bias for RF parameters is  $V_{ds} = 4.5\text{V}$  and  $I_{ds} = 280\text{ mA}$  unless otherwise specified.

Symbol	Parameter and Test Condition	Units	Min.	Typ.	Max.	
$V_{gs}$	Operational Gate Voltage	$V_{ds} = 4.5\text{V}, I_{ds} = 280\text{ mA}$	V	0.42	0.55	0.67
$V_{th}$	Threshold Voltage	$V_{ds} = 4.5\text{V}, I_{ds} = 32\text{ mA}$	V	—	0.33	—
$I_{dss}$	Saturated Drain Current	$V_{ds} = 4.5\text{V}, V_{gs} = 0\text{V}$	$\mu\text{A}$	—	5	—
$G_m$	Transconductance	$V_{ds} = 4.5\text{V}, G_m = \Delta I_{ds} / \Delta V_{gs};$ $\Delta V_{gs} = V_{gs1} - V_{gs2}$ $V_{gs1} = 0.55\text{V}, V_{gs2} = 0.5\text{V}$	mmho	—	1872	—
$I_{gss}$	Gate Leakage Current	$V_{ds} = 0\text{V}, V_{gs} = -4.5\text{V}$	$\mu\text{A}$	-30	-0.8	—
NF	Noise Figure <sup>[1]</sup>	f = 2 GHz f = 900 MHz	dB dB	— —	1 —	— —
G	Gain <sup>[1]</sup>	f = 2 GHz f = 900 MHz	dB dB	13.5 —	15 16.6	16.5 —
OIP3	Output 3 <sup>rd</sup> Order Intercept Point <sup>[1,2]</sup>	f = 2 GHz f = 900 MHz	dBm dBm	43 —	45.5 42	— —
P1dB	Output 1dB Compressed <sup>[1]</sup>	f = 2 GHz f = 900 MHz	dBm dBm	27.5 —	29 27.3	— —
PAE	Power Added Efficiency <sup>[1]</sup>	f = 2 GHz f = 900 MHz	% %	50 —	65 49	— —
ACLR	Adjacent Channel Leakage Power Ratio <sup>[1,3]</sup>	Offset BW = 5 MHz Offset BW = 10 MHz	dBc dBc	— —	63.9 64.1	— —

### Notes:

- Measurements at 2 GHz obtained using production test board described in Figure 2 while measurement at 0.9GHz obtained from load pull tuner.
- 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.
- 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
- 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.

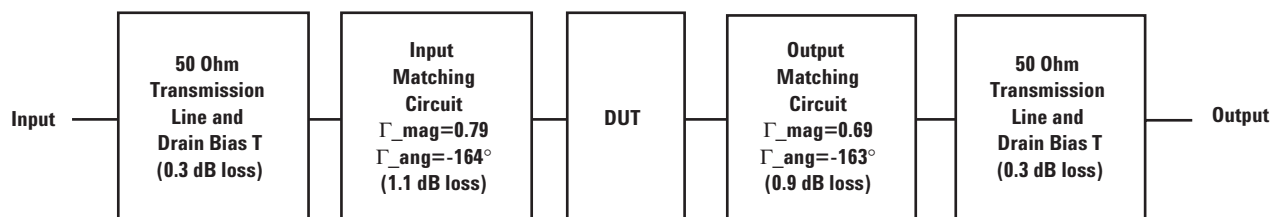


Figure 6. Block diagram of the 2 GHz production test board used for NF, Gain, OIP3, P1dB and PAE measurements at 2 GHz. This circuit achieves a trade-off between optimal OIP3, P1dB and VSWR. Circuit losses have been de-embedded from actual measurements.

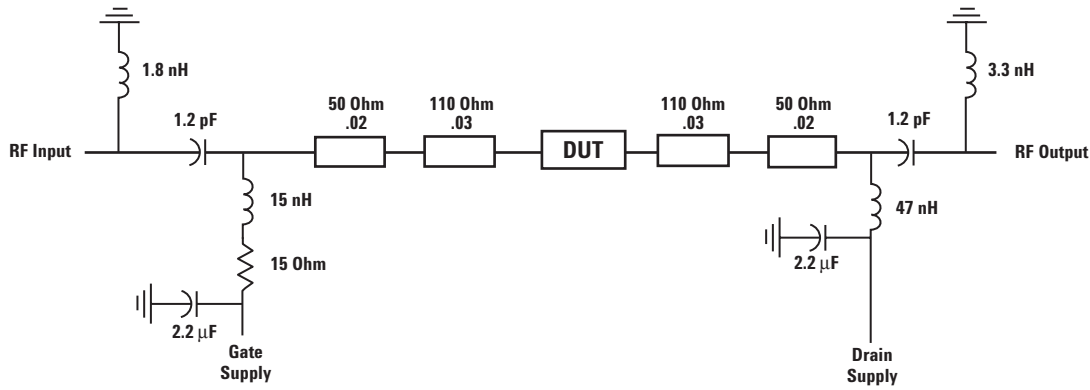


Figure 3. Simplified schematic of production test board. Primary purpose is to show 15 Ohm series resistor placement in gate supply. Transmission line tapers, tee intersections, bias lines and parasitic values are not shown.

### 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 quiescent bias respectively:

#### Typical Gammas at Optimum OIP3 at 4.5V 280 mA

Freq (GHz)	Optimized for maximum OIP3 at 4.5V 280 mA				Gamma Source	Gamma Load
	OIP3	Gain	P1dB	PAE		
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

Freq (GHz)	Optimized for maximum P1dB at 4.5V 280 mA				Gamma Source	Gamma Load
	OIP3	Gain	P1dB	PAE		
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

Freq (GHz)	Optimized for maximum OIP3 at 4.5V 400 mA				Gamma Source	Gamma Load
	OIP3	Gain	P1dB	PAE		
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

Freq (GHz)	Optimized for maximum P1dB at 4.5V 400 mA				Gamma Source	Gamma Load
	OIP3	Gain	P1dB	PAE		
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**

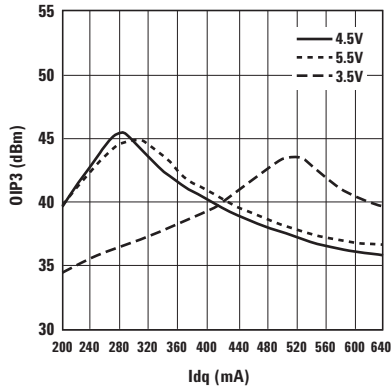


Figure 8. OIP3 vs. Idq and Vds at 2 GHz.

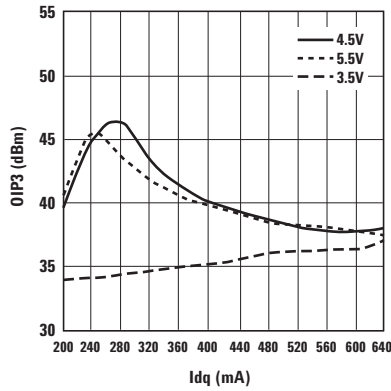


Figure 9. OIP3 vs. Idq and Vds at 0.9 GHz.

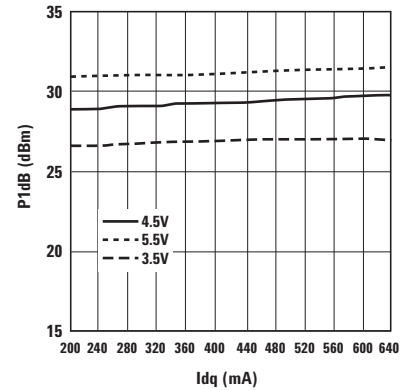


Figure 10. P1dB vs. Idq and Vds at 2 GHz.

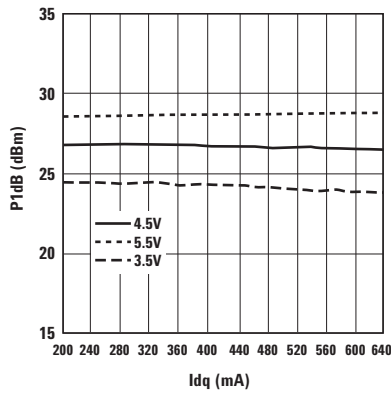


Figure 11. P1dB vs. Idq and Vds at 0.9 GHz.

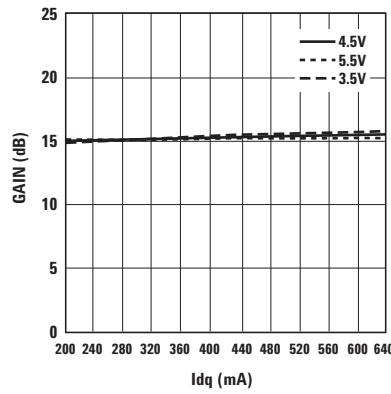


Figure 12. Gain vs. Idq and Vds at 2 GHz.

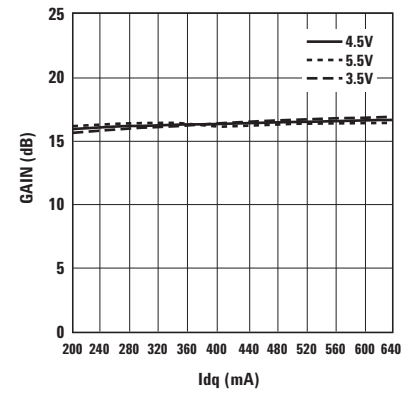


Figure 13. Gain vs. Idq and Vds at 0.9 GHz.

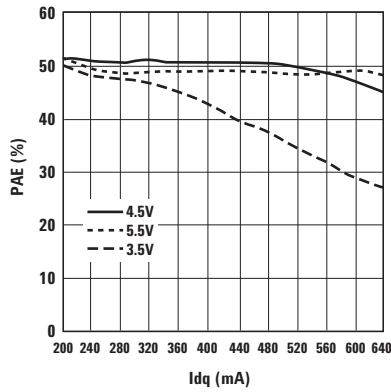


Figure 14. PAE vs. Idq and Vds at 2 GHz.

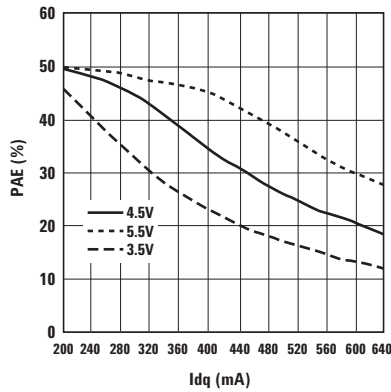


Figure 15. PAE vs. Idq and Vds at 0.9 GHz.

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

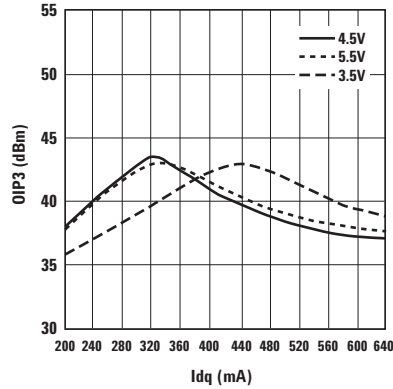


Figure 16. OIP3 vs. Idq and Vds at 2 GHz.

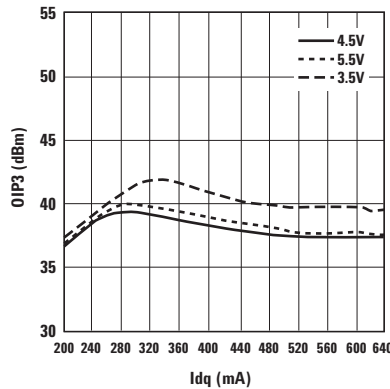


Figure 17. OIP3 vs. Idq and Vds at 0.9 GHz.

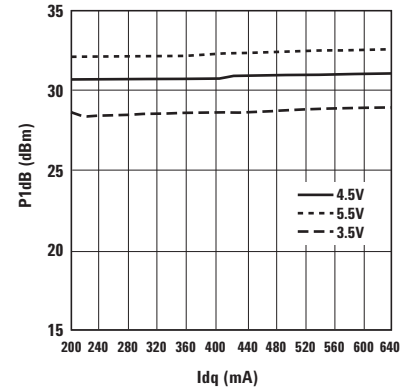


Figure 18. P1dB vs. Idq and Vds at 2 GHz.

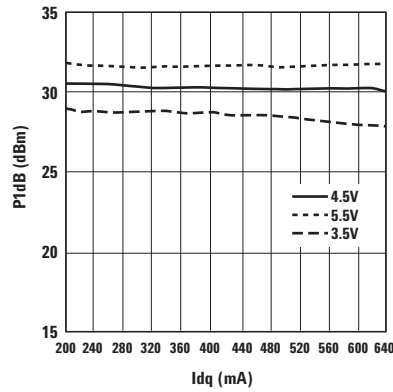


Figure 19. P1dB vs. Idq and Vds at 0.9 GHz.

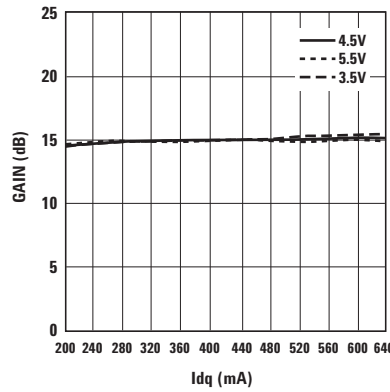


Figure 20. Gain vs. Idq and Vds at 2 GHz.

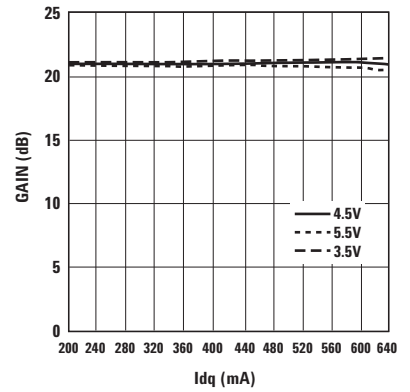


Figure 21. Gain vs. Idq and Vds at 0.9 GHz.

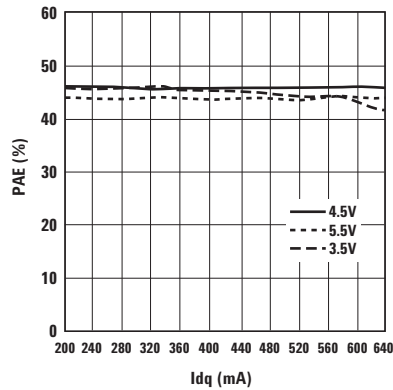


Figure 22. PAE vs. Idq and Vds at 2 GHz.

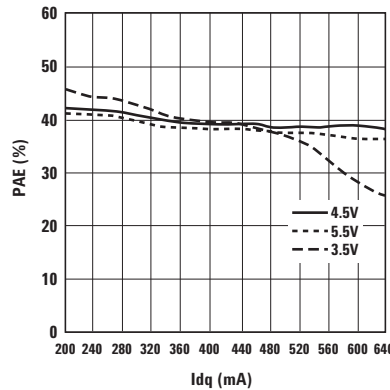
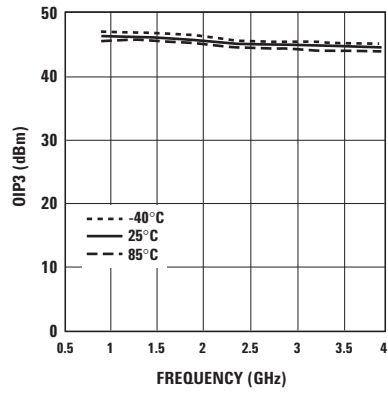
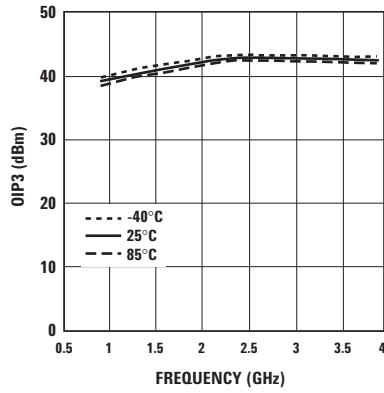


Figure 23. PAE vs. Idq and Vds at 0.9 GHz.

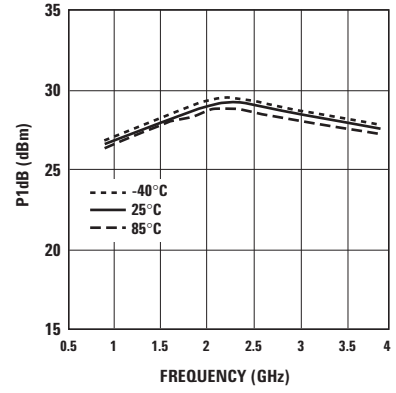
**ATF-501P8 Typical Performance Curves (at 25°C unless specified otherwise)**  
**Tuned for Optimum OIP3 at 4.5V 280 mA**



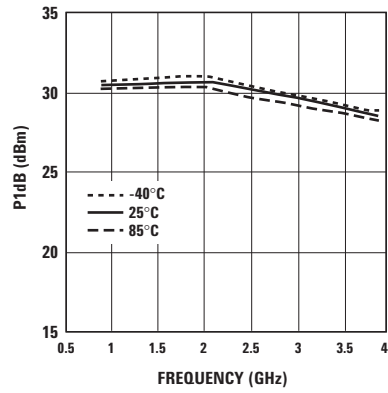
**Figure 24. OIP3 vs. Temperature and Frequency at Optimal OIP3.**



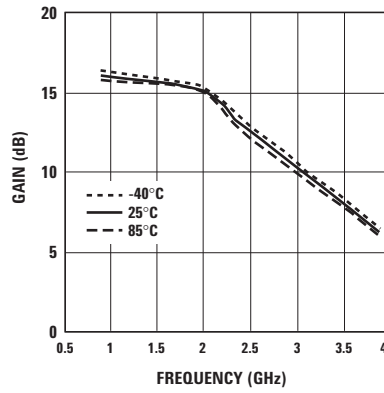
**Figure 25. OIP3 vs. Temperature and Frequency at Optimal P1dB.**



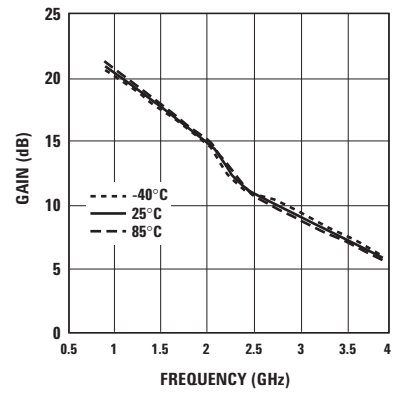
**Figure 26. P1dB vs. Temperature and Frequency at Optimal OIP3.**



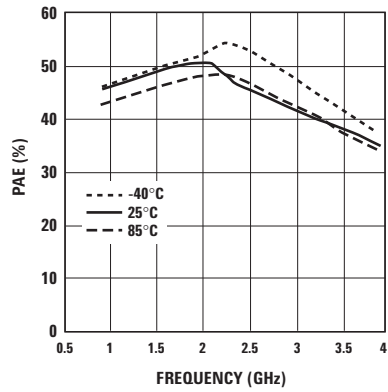
**Figure 27. P1dB vs. Temperature and Frequency at Optimal P1dB.**



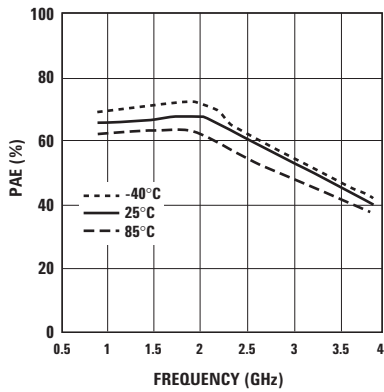
**Figure 28. Gain vs. Temperature and Frequency at Optimal OIP3.**



**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**

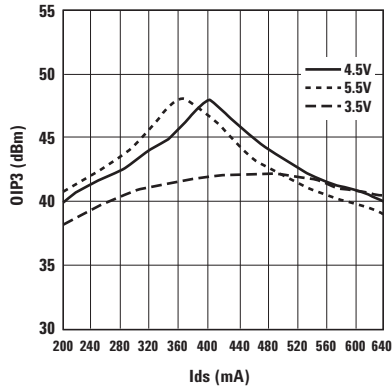


Figure 32. OIP3 vs. Ids and Vds at 2 GHz.

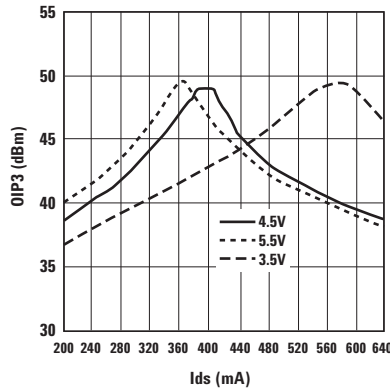


Figure 33. OIP3 vs. Ids and Vds at 900 MHz.

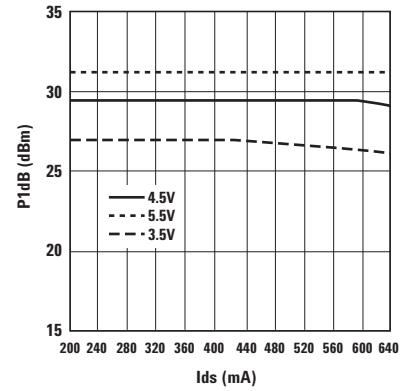


Figure 34. P1dB vs. Ids and Vds at 2 GHz.

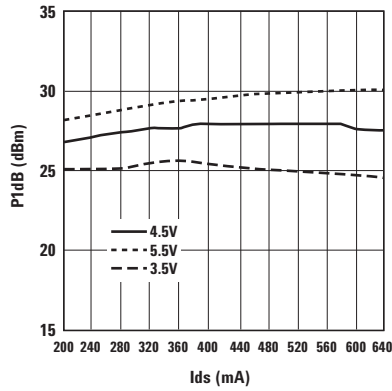


Figure 35. P1dB vs. Ids and Vds at 900 MHz.

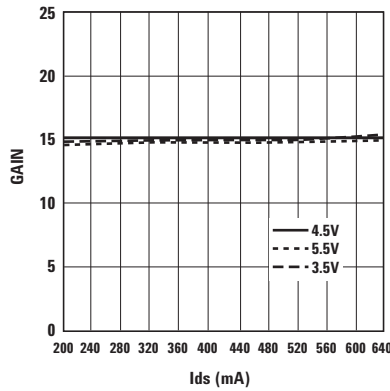


Figure 36. Gain vs. Ids and Vds at 2 GHz.

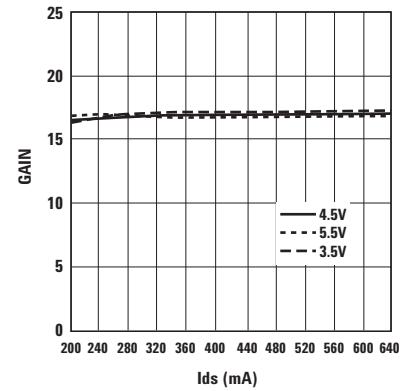


Figure 37. Gain vs. Ids and Vds at 900 MHz.

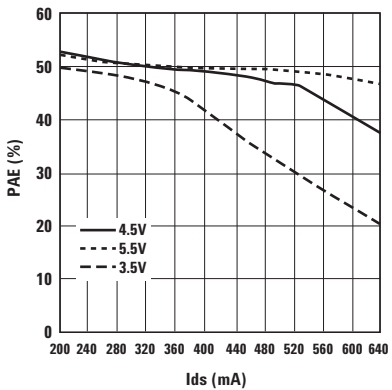


Figure 38. PAE vs. Ids and Vds at 2 GHz.

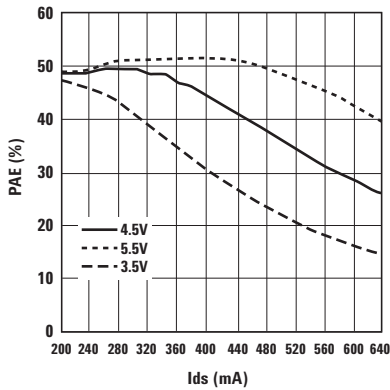


Figure 39. PAE vs. Ids and Vds at 900 MHz.

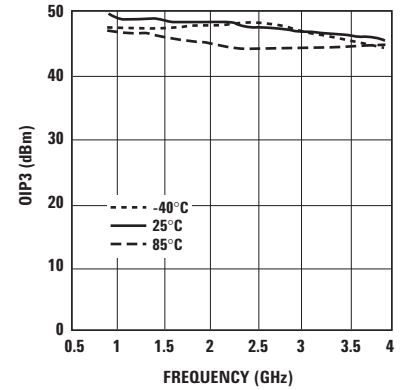


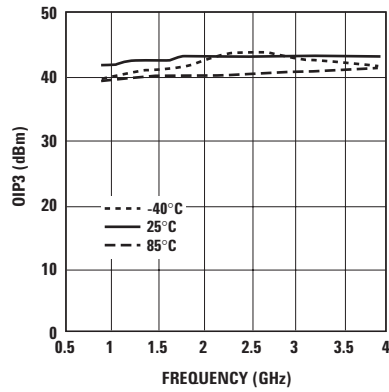
Figure 40. OIP3 vs. Temperature and Frequency at optimum OIP3.

**Note:**

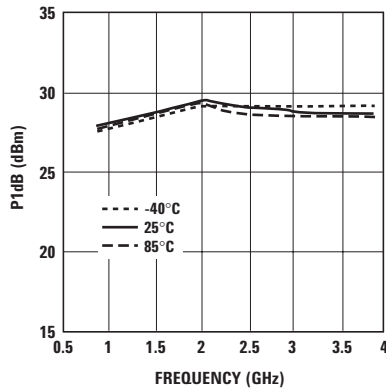
Bias current (Ids) for the above charts are quiescent conditions. Actual level may increase or decrease depending on amount of RF drive.



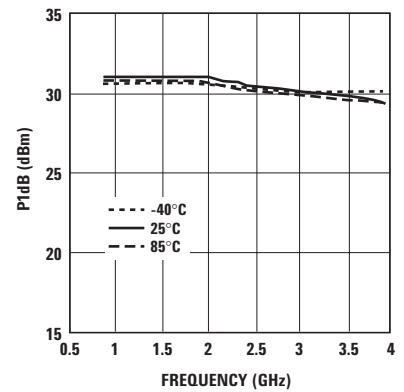
**ATF-501P8 Typical Performance Curves, continued (at 25°C unless specified otherwise)  
Tuned for Optimal OIP3 at 4.5V 400 mA**



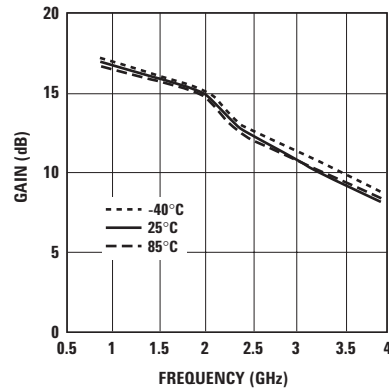
**Figure 41. OIP3 vs. Temperature and Frequency at optimum P1dB.**



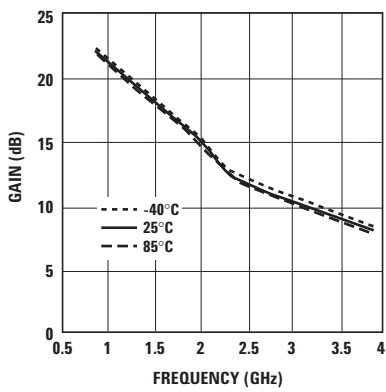
**Figure 42. P1dB vs. Temperature and Frequency at optimum OIP3.**



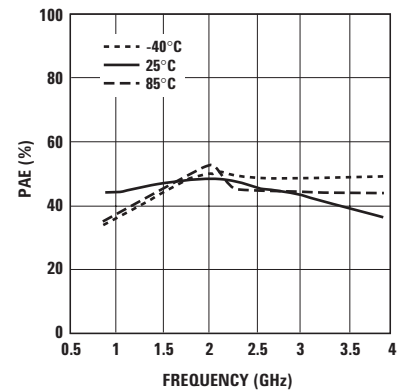
**Figure 43. P1dB vs. Temperature and Frequency at optimum P1dB.**



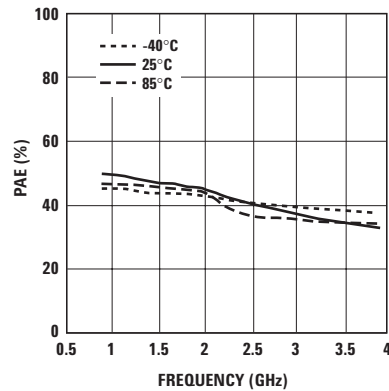
**Figure 44. Gain vs. Temperature and Frequency at optimum OIP3.**



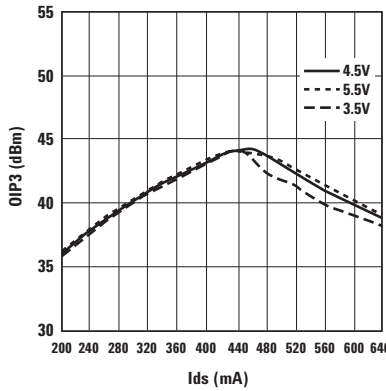
**Figure 45. Gain vs. Temperature and Frequency at optimum P1dB.**



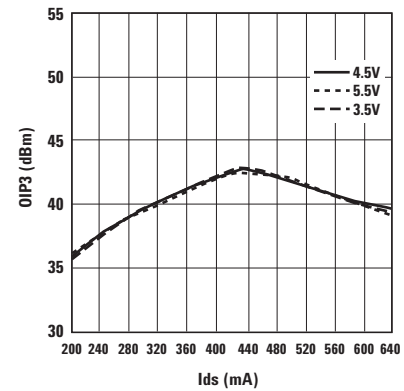
**Figure 46. PAE vs. Temperature and Frequency at optimum OIP3.**



**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**

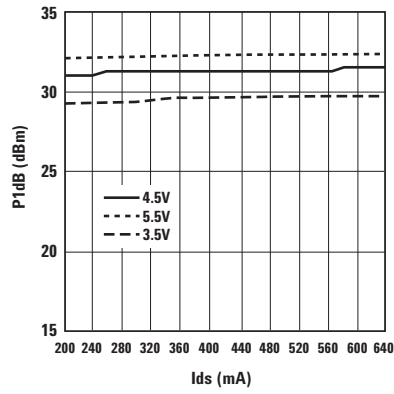


Figure 50. P1dB vs. Ids and Vds at 2 GHz.

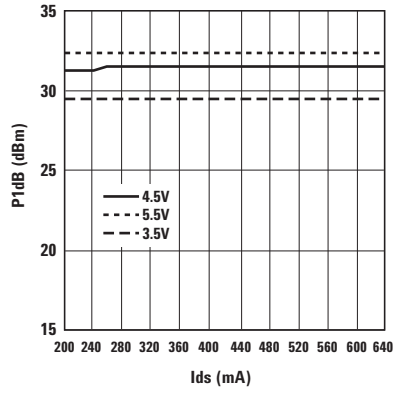


Figure 51. P1dB vs. Ids and Vds at 900 MHz.

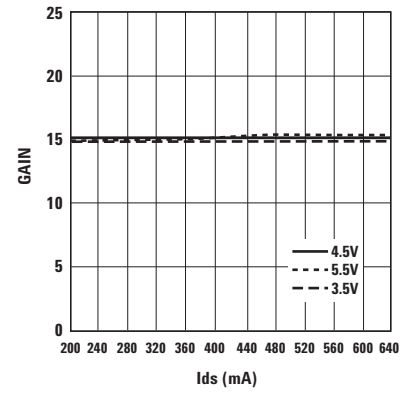


Figure 52. Gain vs. Ids and Vds at 2 GHz.

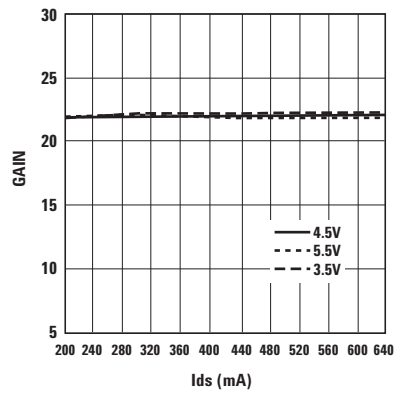


Figure 53. Gain vs. Ids and Vds at 900 MHz.

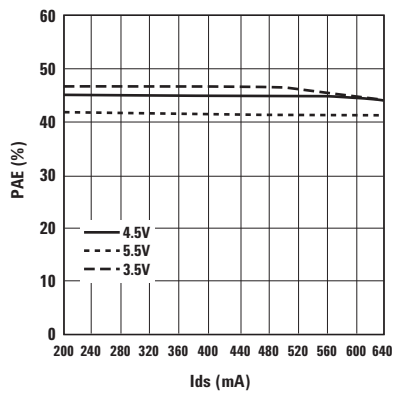


Figure 54. PAE vs. Ids and Vds at 2 GHz.

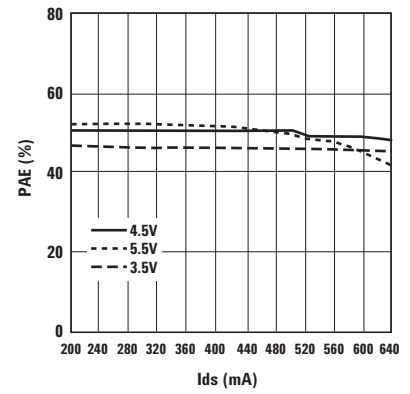


Figure 55. PAE vs. Ids and Vds at 900 MHz.

**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,  $V_{DS} = 4.5V$ ,  $I_{DS} = 280\text{ mA}$

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	

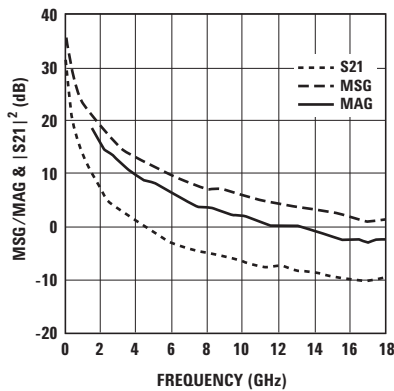


Figure 56. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 4.5V 280mA.

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,  $V_{DS} = 4.5V$ ,  $I_{DS} = 200\text{ mA}$

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	

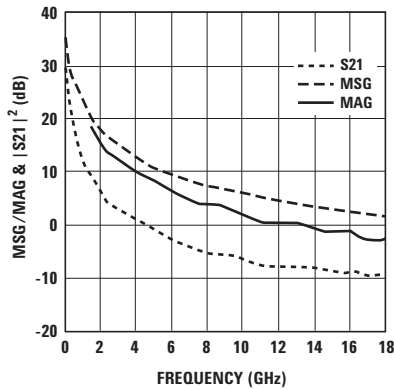


Figure 57. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 4.5V 200mA.

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,  $V_{DS} = 4.5V$ ,  $I_{DS} = 360\text{ mA}$

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	

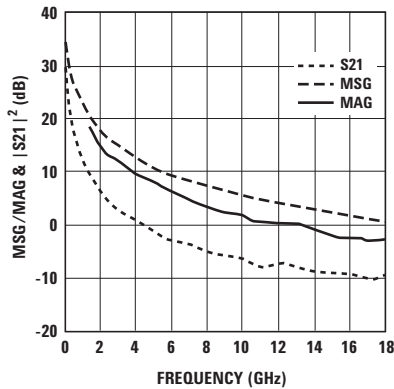


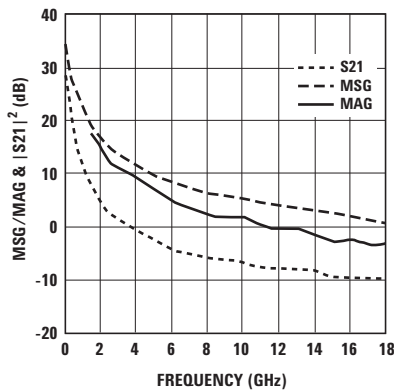
Figure 58. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 4.5V 360mA.

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,  $V_{DS} = 3.5V$ ,  $I_{DS} = 280\text{ mA}$**

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	



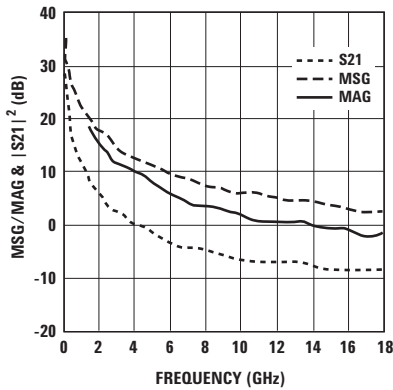
**Figure 59. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 3.5V 280mA.**

**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,  $V_{DS} = 3.5V$ ,  $I_{DS} = 200\text{ mA}$

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	



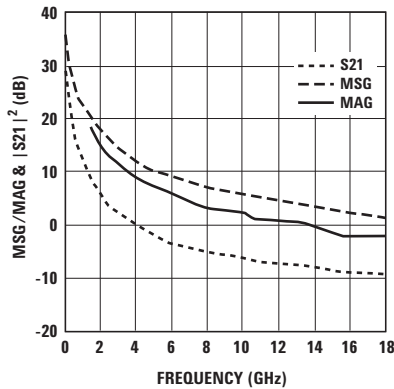
Notes:

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.

Figure 60. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 3.5V 200mA.

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

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	



Notes:

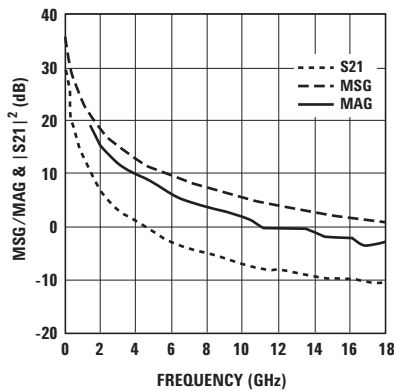
1. S parameter is measured on a microstrip line made on 0.025 inch thick alumina carrier. The input reference plane is at the end of the gate lead. The output reference plane is at the end of the drain lead.

Figure 61. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 3.5V 360mA.



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

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	



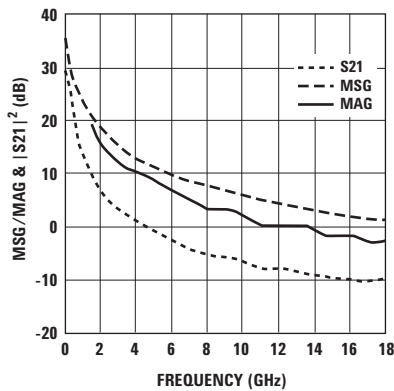
**Notes:**

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.

**Figure 62. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 5.5V 280mA.**

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

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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 &  $|S_{21}|^2$  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,  $V_{DS} = 5.5V$ ,  $I_{DS} = 360\text{ mA}$

Freq. GHz	$S_{11}$			$S_{21}$			$S_{12}$			$S_{22}$		MSG/MAG dB	K factor
	Mag.	Ang.	dB	Mag.	Ang.	dB	Mag.	Ang.	Mag.	Ang.			
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	

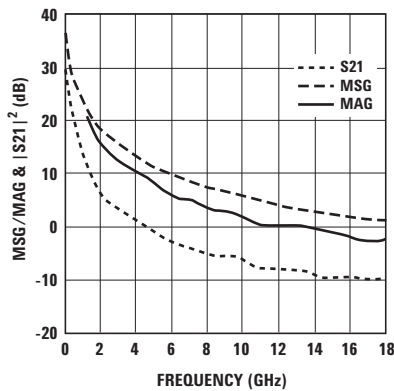


Figure 64. MSG/MAG &  $|S_{21}|^2$  vs. Frequency at 5.5V 360mA.

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.

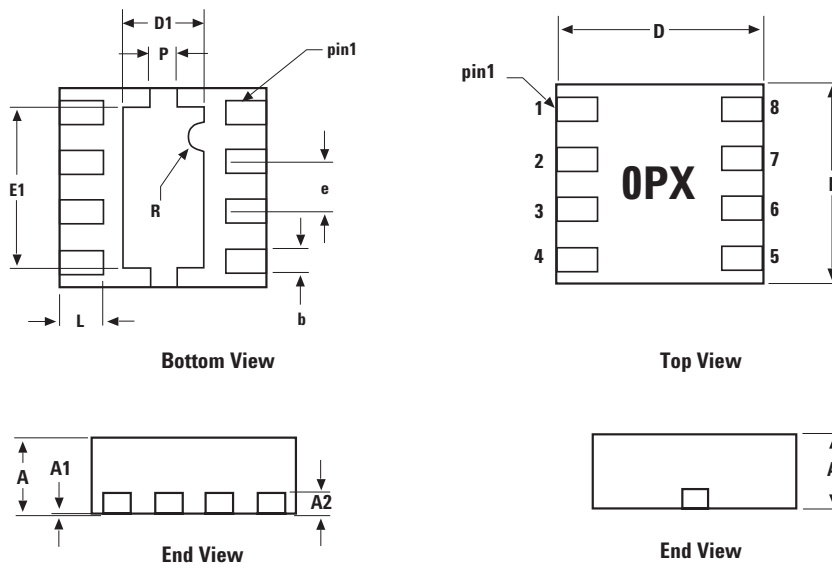
## Device Models

Refer to Agilent's Web Site  
[www.agilent.com/view/rf](http://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

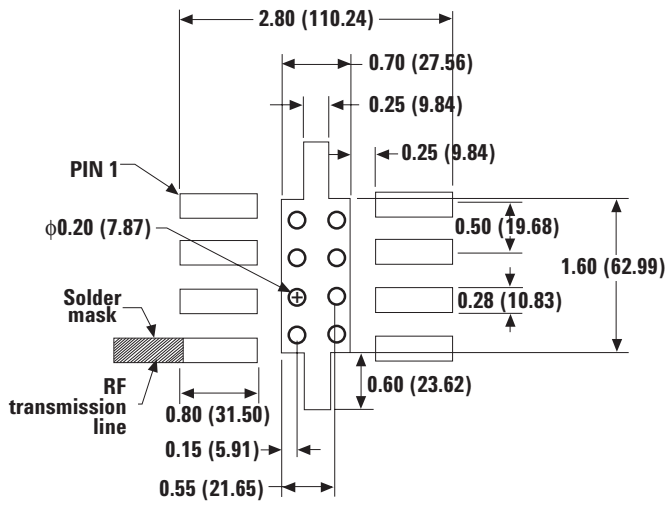
## 2x2 LPCC (JEDEC DFP-N) Package Dimensions



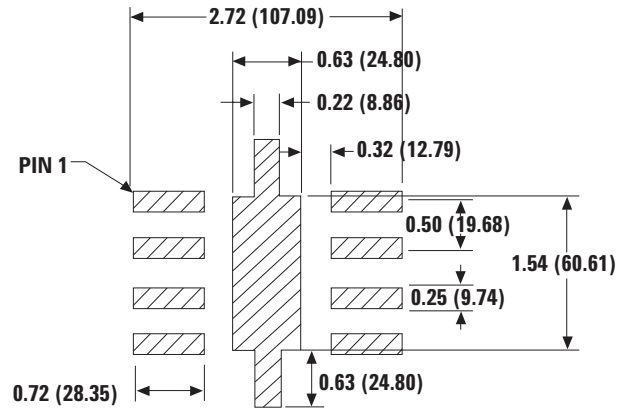
SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0	0.02	0.05
A2	0.203 REF	0.203 REF	0.203 REF
b	0.225	0.25	0.275
D	1.9	2.0	2.1
D1	0.65	0.80	0.95
E	1.9	2.0	2.1
E1	1.45	1.6	1.75
e	0.50 BSC	0.50 BSC	0.50 BSC

DIMENSIONS ARE IN MILLIMETERS

## PCB Land Pattern and Stencil Design



PCB Land Pattern (top view)

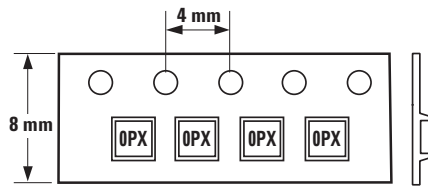
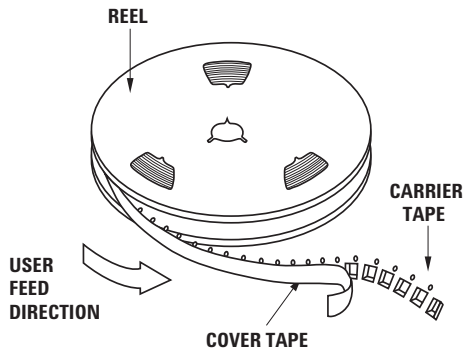


Stencil Layout (top view)

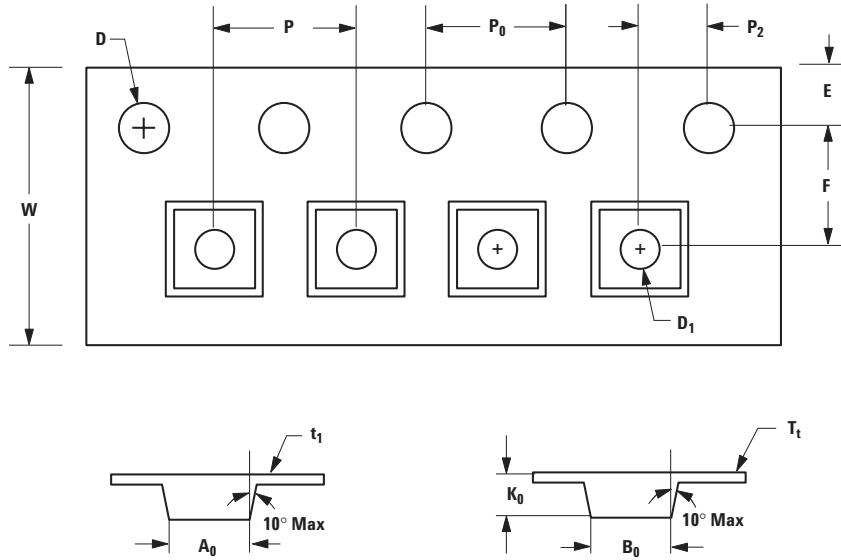
### Notes:

Typical stencil thickness is 5 mils.  
Measurements are in millimeters (mils).

## Device Orientation



## Tape Dimensions



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

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