



470- 960 MHz POWER AMPLIFIER MODULE WPM0509AE¹

WPM0509AE is a wideband, high power, and high linearity amplifier. The amplifier offers the exceptional +/- 0.50 dB gain flatness, 31.0 dB gain, 35.0 dBm P_{1dB} and output 49.0 dBm IP₃ at output composite power of 28 dBm at the frequency range from 470 MHz to 960 MHz.

WPM0509AE is most suitable for digital broadcast, cellular base stations, wireless data communications, tower top receiver amplifiers, cellular micro-cells, last-mile wireless communication systems, and wireless measurement applications of UHF and Cellular bands.

WPM0509AE has been designed to meet rugged standard of MIL-STD-202G and is RoHS complied product.



Key Features:

Impedance:	50 Ohm
Output IP ₃ :	49.0 dBm
Gain:	31.0
Gain Flatness:	+/-0.5 dB
Input VSWR:	1.5:1 typical
Output VSWR:	1.5:1 typical
P _{1dB} :	35.0 dBm
Single Power Supply:	0.95, @ +10 V
Frequency Range:	470 ~ 960 MHz
Operating Temperature:	-40 ~ +85 °C

Absolute Maximum Ratings²:

Symbol	Parameters	Units	Absolute Maximum
V _{dd}	DC Power Supply Voltage	V	10.5
I _{dd}	Drain Current	A	1.15
P _{diss}	Total Power Dissipation	W	12
P _{In,Max}	RF Input Power	dBm	10
T _{ch}	Channel Temperature	°C	175
T _{STG}	Storage Temperature	°C	-65 ~ 150
T _{O,MAX}	Maximum Operating Temperature	°C	-20 ~ +85
R _{th,c}	Thermal Resistance	°C/W	9

¹ Specifications are subject to change without notice.

² Operation of this device above any one of these parameters may cause permanent damage.

**Specifications:**a) **Table 1** Summary of the electrical specifications of WPM0509AE at room temperature

Index	Testing Item	Symbol	Test Constraints	Nom (RT)	Min	Max	Unit
1	Gain	S_{21}	470 - 960 MHz	31	29.5	32.5	dB
2	Gain Variation	ΔG	470 - 960 MHz	+/- 0.5		+/- 0.75	dB
3	Input Return Loss	S_{11}	470 - 960 MHz	14	12		dB
4	Output Return Loss	S_{22}	470 - 960 MHz	14	12		dB
5	Reverse Isolation	S_{12}	470 - 960 MHz	48	43		dB
7	Output P_{1dB} compression	P_{1dB}	470 - 960 MHz	35	34.5		dBm
8	Output-Third-Order Interception point	IP_3	Two-Tone, P_{out} 25 dBm each, 1 MHz separation	49	47		dBm
9	Noise Figure	NF	470 - 960 MHz	3.0			dB
10	Spurious	SP	470 - 960 MHz, $P_{out} = 25$ dBm		70		dBc
11	Current Consumption	I_{dd}	$V_{dd} = +10$ V	0.95			A
12	Power Supply Voltage	V_{dd}		+10	+9	+10.5	V
13	Operating Temperature	T_o			-40	+85	°C
14	Maximum Average RF Input Power	$P_{IN, MAX}$	470 - 960 MHz			10	dBm

As shown in **Figure 1**, the typical gain of the WPM0509AE is 31.0 dB across 470 MHz to 960MHz. The typical input and output return losses are 14 dB and better than 12 dB, respectively.

The output 1-dB compression point and IP_3 are shown in **Figure 2**. WPM0509AE offers typical 35.0 dBm or higher P_{1dB} throughout the passband.

Figure 3 provides the output IP_3 performance vs. frequency at different output power level per tone of the two-tone intermodulation test. By slightly adjusting the V_{dd} voltage, the amplifier's IP_3 performance can be optimized for P_{out} of each tone at the range from 23 dBm to 26 dBm or the 26 dBm to 29 dBm composite output power. The IP_3 reaches 49.0 dBm or higher in this power range.

Figure 4 illustrates the IP_3 performance vs. output composite power at different frequencies at the optimized V_{dd} voltages. The IP_3 is over 49 dBm at the 28 dBm output total power level in most frequencies.

Figure 5 is the noise figure performance. The noise figure is below 3.0 dB at room temperature.

Figure 6 is the small signal performance of the amplifier at the extended frequencies. The amplifier has nice harmonics rejection.

Figure 7 demonstrates the stability factor k of the amplifier. k is great than 1 in any frequency and thus the amplifier is unconditional stable.

Figure 8 is the block diagram of internal circuit of WPM0509AE. It is a two-stage amplifier with the DC block capacitors at the input and output RF ports. All the RF matching networks, DC-DC converter, DC bias circuitries, and limited temperature compensation circuits are built in.

Figure 9 shows the mechanical outline of WPM0509AE. It is a WanTcom standard pallet package, WPM-2. The amplifier module is soldered on top of a very small gold plated metal flange plate. The plate can be soldered or mounted on a sufficient heat sink for the thermal dissipation. The thermal compound is required on bottom of the plate if the amplifier is bolt on the heat sink instead soldering.

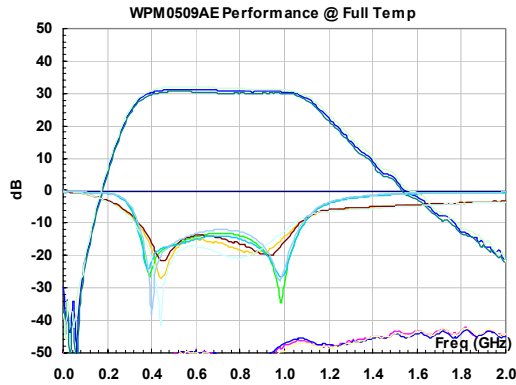


FIG. 1 Small signal performance of WPM0509AE

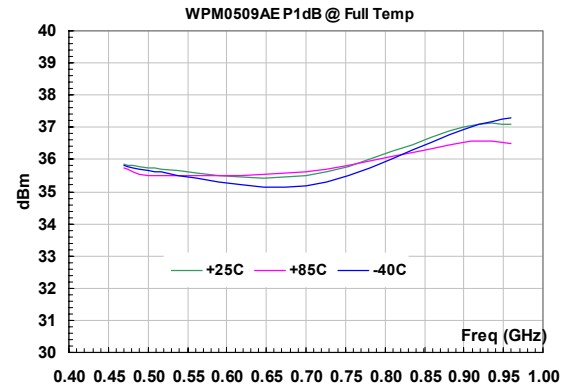


FIG. 2 Output 1-dB compression point

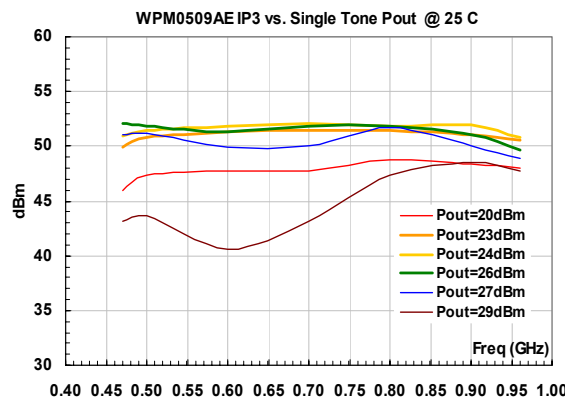


Fig. 3 Output IP_3 at different output power level

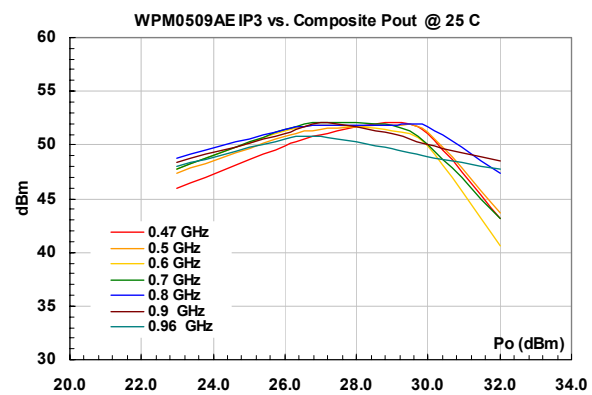


Fig. 4 Output IP_3 vs. output composite power

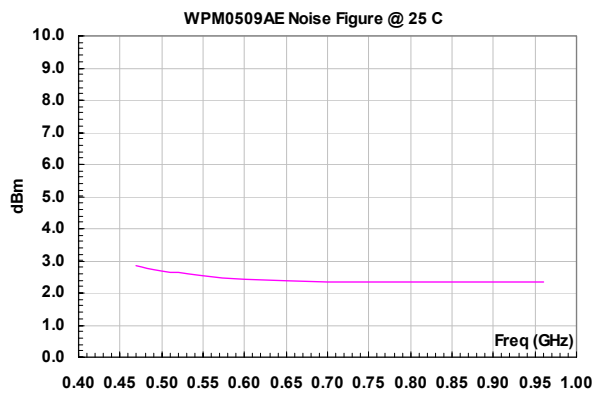


Fig. 5 Noise figure performance of WPM0509AE frequency.

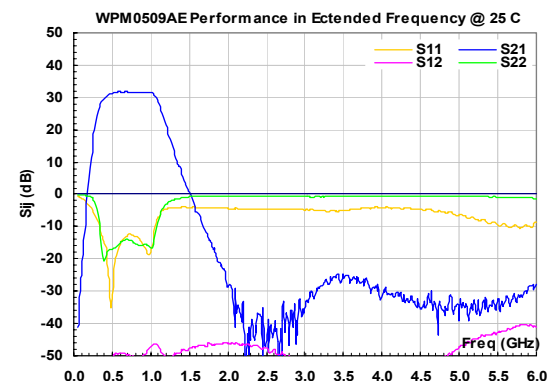
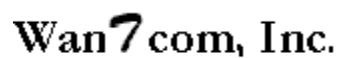
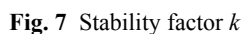


Fig. 6 Small signal performance at the extended



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The drawing shows the mechanical specifications of the WantaCom (Model)-(YYWW) component. The top view shows a rectangular component with a central area labeled "WantaCom (Model)-(YYWW)". The side view shows the component's profile with a rounded top and a flat bottom. The pin details show three pins labeled 1, 2, and 3, with their respective functions and dimensions.

PIN FUNC

PIN	FUNC
1	IN
2	V _{dd}
3	OUT

Dimensions (mm):

- Top View:
 - Overall Width: 1.14 [28.96]
 - Overall Height: 0.060 [1.52]
 - Central Width: 0.750 [19.05]
 - Pin 1 Width: 0.195 [4.95]
 - Pin 2 Width: 0.175 [4.45]
 - Pin 3 Width: 0.10 [2.54]
 - Pin 1 Spacing: 0.010 [0.25]
 - Pin 2 Spacing: 0.004 [0.10]
 - Pin 3 Spacing: 0.005 [0.13]
 - Pin 1 Position: 0.44 [11.18]
 - Pin 2 Position: 0.19 [4.85]
 - Pin 3 Position: 0.058 [1.48]
 - Pin 1 to Pin 2: 0.03 [0.76]
 - Pin 2 to Pin 3: 1.03 [26.16]
- Side View:
 - Overall Height: 0.45 [11.43]
 - Top Radius: R0.07 [R1.78]
 - Pin 1 Height: 0.06 [1.40]
 - Pin 2 Height: 0.004 [0.10]
 - Pin 3 Height: 0.005 [0.13]

ORDERING INFORMATION

Function	Normal
Model Number:	WPM0509AE

**SMALL SIGNAL S-PARAMETERS:**

! WPM0509AE

! Vdd =+10V, Idd = 0.95A, Ta= 25 C, Date: 11/28/04

ghz s ma r 50

0.05	0.938	146.4	0.008	21.3	0.000089	53.4	0.979	164.1
0.1	0.877	112.3	0.045	-1.4	0.000249	48.7	0.968	146.7
0.2	0.678	42.1	1.799	-77.9	0.000238	12.7	0.933	104.0
0.3	0.414	-32.7	15.569	170.6	0.000548	-81.1	0.603	25.3
0.4	0.172	-107.6	30.697	52.6	0.001984	153.1	0.098	-151.4
0.5	0.031	41.0	36.669	-30.8	0.003123	85.2	0.142	141.3
0.6	0.170	-54.1	38.437	-100.3	0.003511	34.4	0.175	140.5
0.7	0.231	-112.5	38.114	-160.9	0.003317	-12.3	0.198	127.9
0.8	0.225	-162.2	37.683	143.2	0.002913	-67.8	0.171	122.0
0.9	0.168	145.1	37.546	85.8	0.003162	-139.3	0.164	132.6
1	0.127	12.9	37.617	18.9	0.004459	144.4	0.153	146.7
1.1	0.440	-103.3	26.508	-63.1	0.004401	80.4	0.403	173.9
1.2	0.595	-164.5	11.160	-128.5	0.003085	57.7	0.704	138.4
1.3	0.626	156.9	4.677	-171.4	0.003564	54.1	0.826	110.2
1.4	0.630	127.4	2.241	159.5	0.004012	42.7	0.882	88.5
1.5	0.623	103.4	1.080	138.5	0.004134	31.7	0.910	70.1
1.6	0.623	82.6	0.527	116.9	0.004467	16.4	0.928	53.7
1.7	0.624	61.9	0.277	94.8	0.004657	1.3	0.936	38.4
1.8	0.614	40.9	0.165	70.9	0.004763	-9.9	0.943	24.0
1.9	0.607	23.1	0.092	58.7	0.004764	-21.8	0.946	10.3
2	0.605	5.3	0.039	37.5	0.004881	-32.9	0.946	-3.5
2.1	0.599	-13.5	0.031	19.6	0.004599	-42.5	0.946	-16.9
2.2	0.590	-32.8	0.006	-53.1	0.004432	-53.3	0.945	-30.1
2.3	0.584	-49.2	0.008	-81.8	0.004093	-65.7	0.944	-43.5
2.4	0.595	-66.1	0.001	-89.9	0.004028	-75.3	0.941	-57.1
2.5	0.587	-85.2	0.005	165.9	0.003807	-84.5	0.937	-70.4
2.6	0.576	-102.6	0.007	113.5	0.003522	-90.4	0.932	-84.4
2.7	0.585	-117.6	0.016	-121.3	0.003267	-96.7	0.928	-98.4
2.8	0.594	-133.6	0.012	148.9	0.002755	-104.8	0.923	-112.4
2.9	0.584	-151.4	0.014	-176.9	0.002429	-114.6	0.922	-126.1
3	0.574	-166.9	0.023	-155.5	0.002117	-123.9	0.919	-140.7
3.1	0.579	178.4	0.028	177.8	0.001961	-138.7	0.912	-154.9
3.2	0.572	163.2	0.036	165.8	0.001667	-139.1	0.912	-168.5
3.3	0.543	150.7	0.046	138.9	0.001367	-145.7	0.914	177.7
3.4	0.545	140.7	0.054	109.7	0.001120	-159.2	0.915	163.7
3.5	0.572	129.2	0.057	76.4	0.001268	-169.2	0.919	150.7
3.6	0.580	115.7	0.044	52.5	0.000977	170.4	0.922	138.0
3.7	0.588	104.1	0.045	19.5	0.000767	162.5	0.922	124.8
3.8	0.614	92.4	0.039	13.7	0.000686	127.0	0.926	112.4
3.9	0.620	78.0	0.039	-4.5	0.000774	134.5	0.932	100.9
4	0.612	65.0	0.029	-26.3	0.000850	116.3	0.933	89.1
4.1	0.621	54.7	0.026	-41.1	0.000982	87.9	0.936	77.8
4.2	0.625	42.2	0.023	-68.2	0.001286	61.6	0.939	67.1
4.3	0.606	27.1	0.029	-65.0	0.001365	49.7	0.939	56.7
4.4	0.586	16.8	0.024	-80.8	0.001403	39.3	0.936	46.3
4.5	0.588	5.1	0.019	-87.8	0.001400	28.3	0.939	36.5
5	0.476	-69.8	0.017	-139.1	0.003300	-12.6	0.935	-12.8
5.5	0.333	-155.7	0.019	150.8	0.006236	-67.0	0.909	-61.7
6	0.370	127.0	0.041	85.0	0.008488	-166.7	0.868	-115.0
