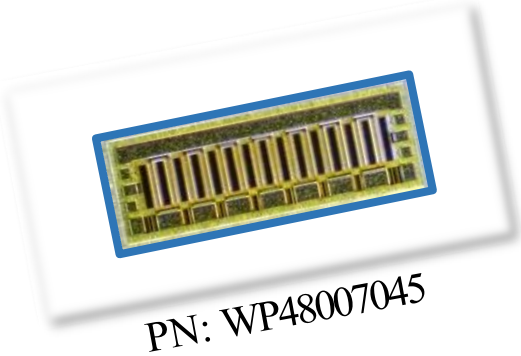
WAVE PIA IC DESIGN

WP48007045

45W, 48V GaN HEMT Die



PN: WP48007045

The WP48007045 is a 45W gallium nitride (GaN) High Electron Mobility Transistor (HEMT). This GaN HEMT is a wideband transistor optimized for 5.8GHz operation in a user-friendly device for high bandwidth applications. Gallium nitride (GaN) HEMT is a device optimized for 5G. GaN HEMT resistance is only 1/10 that of silicon transistors, making it capable of switching frequencies faster for greater energy efficiency.

Features

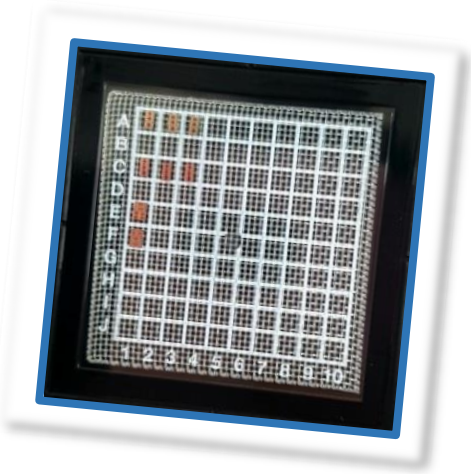
- Up to 8 GHz Operation
- 14.0 dB Typical Small Signal Gain @ 3.5 GHz
- 45 W Typical Psat @5.8GHz
- 48V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting

Applications

- U/VHF Amplifiers
- Broadband Amplifiers
- Base Station Communications
- Drone, UAV
- WiMAX, LTE, WCDMA, GSM
- WPT, V2X
- Radar application

Packaging Information

- Bare die are shipped in Wafer-level with Expander Ring or Gel-Pak® containers.
- Possible UV Curing for Wafer-level with dicing saw



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Absolute Maximum Ratings (not simultaneous) at 25˚C

Parameter	Parameter	Typical Value	Units	Conditions
Threshold voltage @ Id=1mA/mm, Vd=10V	V_{to}	-3.4	V	25°C
Breakdown voltage @ Id=1mA/mm	V_{DG}	160	V	25°C
Drain-source current, Id @ Vd=10V, Vg=0	I_{dss}	800	mA/mm	25°C
Operating Junction Temperature	T_J	225	°C	
Storage Temperature	T_{STG}	-65, +150	°C	
Thermal Resistance, Junction to Case (packaged)	$R_{\theta JC}$		°C/W	
Thermal Resistance, Junction to Case (die only)	$R_{\theta JC}$		°C/W	
Mounting Temperature (30 seconds)	T_S	320	°C	30 seconds

Electrical Characteristics (Frequency = 3.5 GHz unless otherwise stated; TC = 25˚C)

Parameter	Parameter	Typical Value	Units	Conditions
DC Characteristics				
Ohmic contact resistance	RC	0.3	Ohm-mm	25°C
Maximum Drain-source current, Id @ Vd=10V, Vg=1V (1X125μm device)	I_{dmax}	1000	mA/mm	25°C
Max. trans-conductance, @ Vd=10V, Vg=-4V ~ -1V (1X125μm device)	GM_PEAK	290	mS/mm	25°C
Maximum Drain-source current, Id @ Vd=10V, Vg=1V (1X125μm device)	I_{dmax}	1000	mA/mm	25°C
RF Characteristics				
Small Signal Gain	G_{SS}	>12	dB	V_{DD}=48V, I_{DQ}=300mA
Saturated Power Output	P_{SAT}	45	W	V_{DD}=48V, I_{DQ}=300mA
Drain Efficiency	η	>60	%	V_{DD}=48V, I_{DQ}=300mA
Intermodulation Distortion	IM3	<-30	dBc	V_{DD}=48V, I_{DQ}=300mA
Output Mismatch Stress	VSWR	10:1	ψ	

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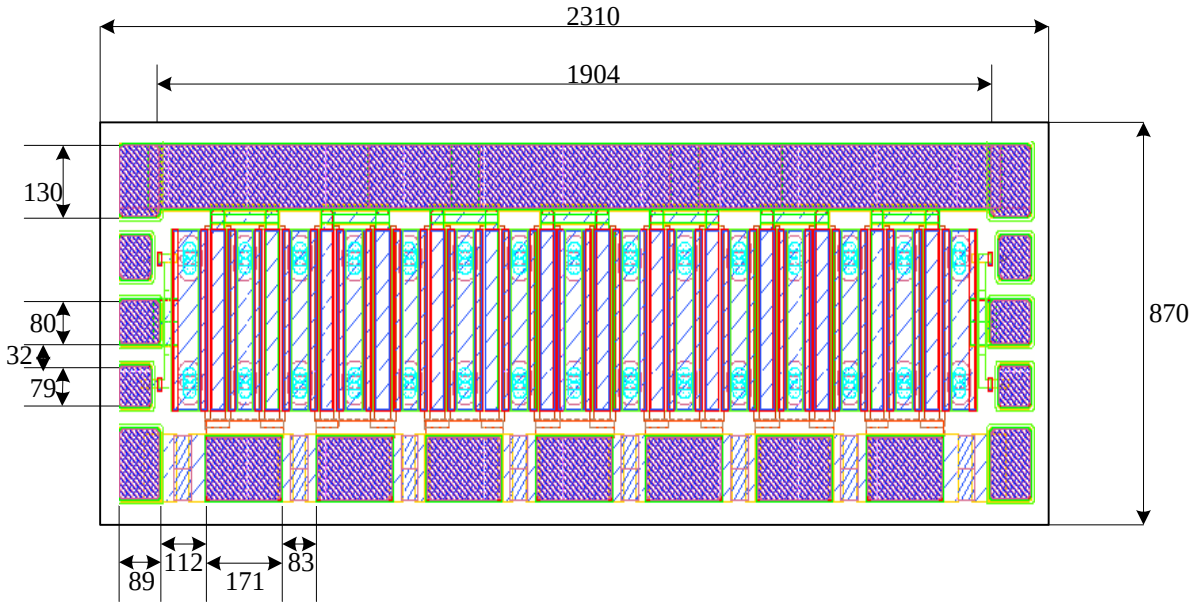
DIE Dimensions (units in microns)



Overall die size 2310 x 870 (+0/-50) microns, die thickness 100 (+/- 10) microns.
All Gate and Drain pads must be wire bonded for electrical connection.

Assembly Notes:

- Recommended solder is AuSn (80/20) solder. Refer to Wavepia's guide for the Eutectic Die Bond Procedure
- Vacuum collet is the preferred method of pick-up.
- The backside of the die is the Source (ground) contact.
- Die back side gold plating is 5 microns thick minimum.
- Thermosonic ball or wedge bonding are the preferred connection methods.
- Gold wire must be used for connections.

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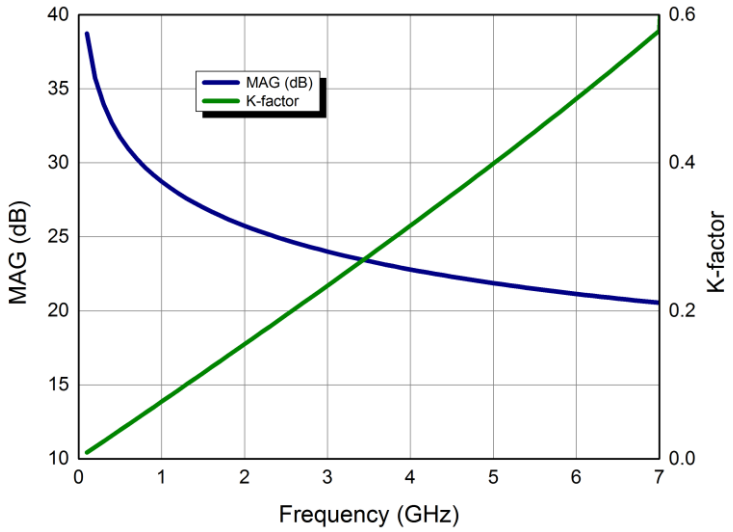
Typical Performance

Simulated Maximum Available Gain (MAG) and K Factor of the WP48007045

V_{DD} = 48 V, I_{DQ} = 300 mA

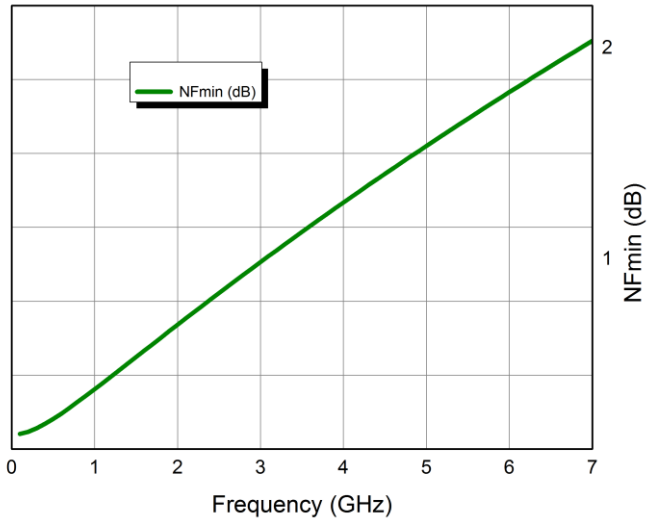


Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

Typical Performance

Simulated Minimum Noise Figure of the WP48007045

V_{DD} = 48 V, I_{DQ} = 300 mA



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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 300 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
100MHz	0.972215	-77.9488	61.42908	138.6989	0.00823	48.81337	0.34077	-122.695
200MHz	0.950458	-116.485	41.03242	118.1598	0.010994	28.3887	0.454357	-143.933
300MHz	0.941997	-135.064	29.56317	107.7066	0.01188	18.05	0.492626	-153.043
400MHz	0.938417	-145.444	22.82918	101.3077	0.012231	11.76563	0.509931	-157.603
500MHz	0.936743	-151.958	18.49993	96.8047	0.012388	7.377102	0.520167	-160.089
600MHz	0.935945	-156.392	15.50631	93.32024	0.012459	4.007143	0.527666	-161.487
700MHz	0.935612	-159.591	13.31957	90.44278	0.012484	1.244191	0.534065	-162.261
800MHz	0.935558	-162.001	11.65412	87.9564	0.012481	-1.12766	0.540068	-162.651
900MHz	0.935686	-163.877	10.34374	85.73785	0.01246	-3.23167	0.546007	-162.799
1000MHz	0.935945	-165.376	9.285652	83.712	0.012425	-5.14297	0.552043	-162.79
1100MHz	0.936302	-166.6	8.413056	81.83066	0.01238	-6.90974	0.558251	-162.68
1200MHz	0.936738	-167.617	7.680761	80.06163	0.012327	-8.56418	0.564664	-162.506
1300MHz	0.937237	-168.474	7.057133	78.38263	0.012266	-10.1286	0.571286	-162.295
1400MHz	0.93779	-169.206	6.519385	76.77784	0.012199	-11.6187	0.57811	-162.065
1500MHz	0.938388	-169.839	6.050698	75.23572	0.012126	-13.0462	0.585119	-161.828
1600MHz	0.939026	-170.39	5.638395	73.74772	0.012049	-14.4195	0.592289	-161.594
1700MHz	0.939697	-170.876	5.272737	72.30734	0.011967	-15.7452	0.599597	-161.37
1800MHz	0.940398	-171.306	4.946125	70.9096	0.011881	-17.0282	0.607018	-161.161
1900MHz	0.941123	-171.691	4.652543	69.5506	0.011791	-18.2724	0.614525	-160.969
2000MHz	0.94187	-172.038	4.387163	68.22724	0.011698	-19.4809	0.622094	-160.796
2100MHz	0.942635	-172.351	4.14607	66.93704	0.011603	-20.6563	0.6297	-160.644
2200MHz	0.943414	-172.637	3.926051	65.67796	0.011504	-21.8005	0.637322	-160.514
2300MHz	0.944205	-172.898	3.724448	64.44834	0.011403	-22.9152	0.644938	-160.405
2400MHz	0.945005	-173.139	3.539039	63.24675	0.0113	-24.0018	0.65253	-160.317
2500MHz	0.945811	-173.362	3.367954	62.072	0.011195	-25.0615	0.660079	-160.25
2600MHz	0.946622	-173.568	3.209609	60.92305	0.011089	-26.0954	0.66757	-160.202
2700MHz	0.947435	-173.761	3.062647	59.79898	0.010981	-27.1044	0.674988	-160.173
2800MHz	0.948248	-173.942	2.925904	58.69898	0.010872	-28.0893	0.682322	-160.163
2900MHz	0.94906	-174.112	2.798374	57.62231	0.010762	-29.0507	0.689559	-160.169
3000MHz	0.949869	-174.272	2.679181	56.56831	0.010651	-29.9895	0.69669	-160.191
3100MHz	0.950673	-174.424	2.567559	55.53636	0.01054	-30.9061	0.703707	-160.228
3200MHz	0.951471	-174.569	2.462837	54.52586	0.010428	-31.8013	0.710603	-160.278
3300MHz	0.952262	-174.706	2.364421	53.53627	0.010316	-32.6754	0.717371	-160.342
3400MHz	0.953045	-174.837	2.271785	52.56707	0.010204	-33.5291	0.724008	-160.416
3500MHz	0.953818	-174.963	2.184462	51.61775	0.010092	-34.3629	0.730509	-160.502
3600MHz	0.954582	-175.083	2.102033	50.68782	0.00998	-35.1772	0.736871	-160.597
3700MHz	0.955335	-175.199	2.024125	49.77683	0.009868	-35.9725	0.743093	-160.701
3800MHz	0.956076	-175.311	1.950401	48.88431	0.009757	-36.7493	0.749172	-160.813
3900MHz	0.956806	-175.419	1.880557	48.00982	0.009646	-37.5079	0.755107	-160.933

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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 300 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4000MHz	0.957523	-175.524	1.814317	47.15293	0.009535	-38.2489	0.7609	-161.059
4100MHz	0.958227	-175.625	1.751432	46.3132	0.009426	-38.9727	0.766549	-161.191
4200MHz	0.958919	-175.723	1.691676	45.49023	0.009317	-39.6796	0.772056	-161.328
4300MHz	0.959597	-175.818	1.63484	44.6836	0.009208	-40.3701	0.777422	-161.469
4400MHz	0.960262	-175.911	1.580736	43.89292	0.009101	-41.0446	0.782649	-161.615
4500MHz	0.960913	-176.002	1.529189	43.11779	0.008994	-41.7034	0.787737	-161.764
4600MHz	0.961551	-176.09	1.480041	42.35783	0.008889	-42.347	0.792689	-161.916
4700MHz	0.962174	-176.176	1.433145	41.61266	0.008784	-42.9757	0.797508	-162.071
4800MHz	0.962785	-176.26	1.388365	40.88191	0.008681	-43.5898	0.802195	-162.228
4900MHz	0.963381	-176.342	1.345577	40.16522	0.008578	-44.1899	0.806754	-162.387
5000MHz	0.963964	-176.423	1.304664	39.46224	0.008477	-44.7761	0.811186	-162.548
5100MHz	0.964534	-176.502	1.26552	38.77261	0.008376	-45.3488	0.815496	-162.71
5200MHz	0.96509	-176.579	1.228045	38.09599	0.008277	-45.9085	0.819684	-162.872
5300MHz	0.965633	-176.655	1.192148	37.43206	0.008179	-46.4554	0.823755	-163.036
5400MHz	0.966164	-176.729	1.157741	36.78049	0.008082	-46.9897	0.827711	-163.199
5500MHz	0.966681	-176.802	1.124745	36.14096	0.007986	-47.512	0.831556	-163.363
5600MHz	0.967186	-176.874	1.093085	35.51316	0.007892	-48.0224	0.835292	-163.527
5700MHz	0.967679	-176.944	1.062692	34.89679	0.007798	-48.5212	0.838921	-163.691
5800MHz	0.968159	-177.014	1.033499	34.29154	0.007706	-49.0088	0.842448	-163.855
6000MHz	0.968627	-177.082	1.005447	33.69714	0.007615	-49.4855	0.845875	-164.018
6100MHz	0.969084	-177.149129	0.978477	33.11331	0.007525	-49.9514	0.849204	-164.18
6200MHz	0.96953	-177.215196	0.952535	32.53976	0.007436	-50.407	0.852439	-164.342
6300MHz	0.969964	-177.280258	0.927572	31.97623	0.007349	-50.8524	0.855582	-164.502
6400MHz	0.970387	-177.344	0.903541	31.42246	0.007262	-51.2878	0.858636	-164.662
6500MHz	0.9708	-177.407507	0.880395	30.8782	0.007177	-51.7137	0.861603	-164.821
6600MHz	0.971202	-177.469761	0.858094	30.3432	0.007093	-52.1301	0.864487	-164.979
6700MHz	0.971594	-177.531143	0.836598	29.81722	0.00701	-52.5374	0.86729	-165.136
6800MHz	0.971976	-177.591681	0.81587	29.30003	0.006928	-52.9358	0.870014	-165.291
6900MHz	0.972348	-177.651	0.795874	28.7914	0.006848	-53.3254	0.872662	-165.445
7000MHz	0.972711	-177.71033	0.776577	28.29111	0.006768	-53.7066	0.875236	-165.598

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