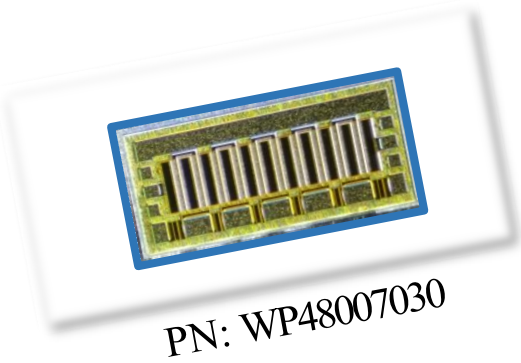
WAVE PIA IC DESIGN

WP48007030

30W, 48V GaN HEMT Die



The WP48007030 is a 30W 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

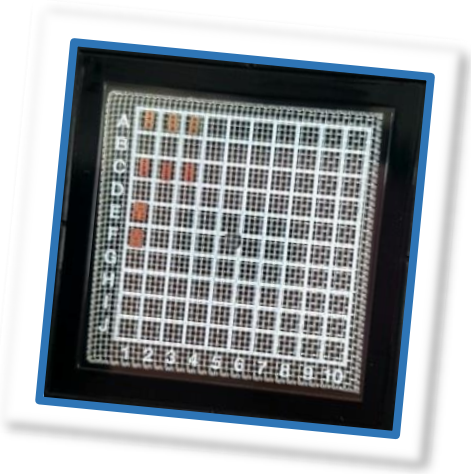
- Up to 8 GHz Operation
- 14.0 dB Typical Small Signal Gain @ 3.5 GHz
- 30 W Typical Psat @5.8GHz
- 48V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting

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}=250mA
Saturated Power Output	P_{SAT}	30	W	V_{DD}=48V, I_{DQ}=250mA
Drain Efficiency	η	>60	%	V_{DD}=48V, I_{DQ}=250mA
Intermodulation Distortion	IM3	<-30	dBc	V_{DD}=48V, I_{DQ}=250mA
Output Mismatch Stress	VSWR	10:1	ψ	

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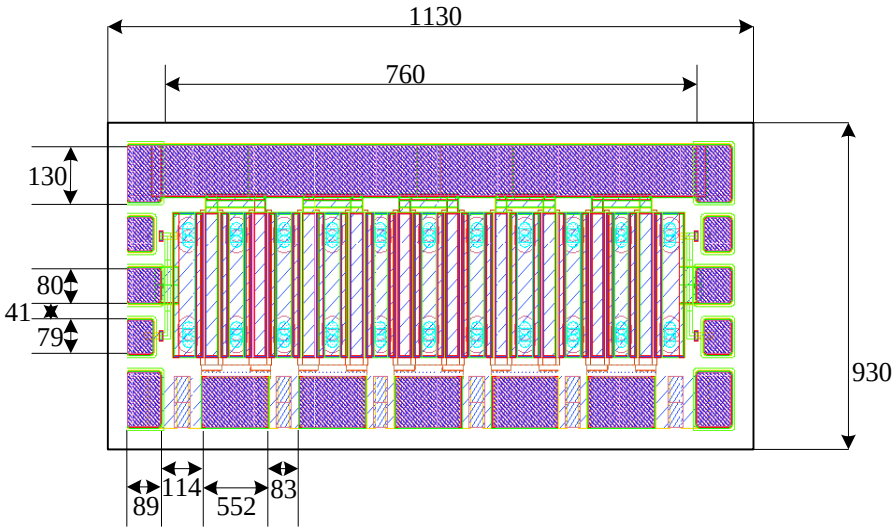
DIE Dimensions (units in microns)



Overall die size 1130 x 930 (+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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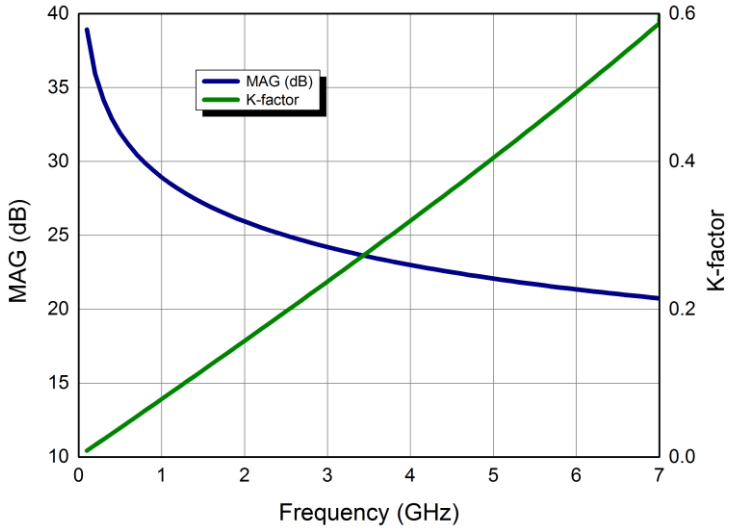
Typical Performance

Simulated Maximum Available Gain (MAG) and K Factor of the WP48007030

V_{DD} = 48 V, I_{DQ} = 250 mA

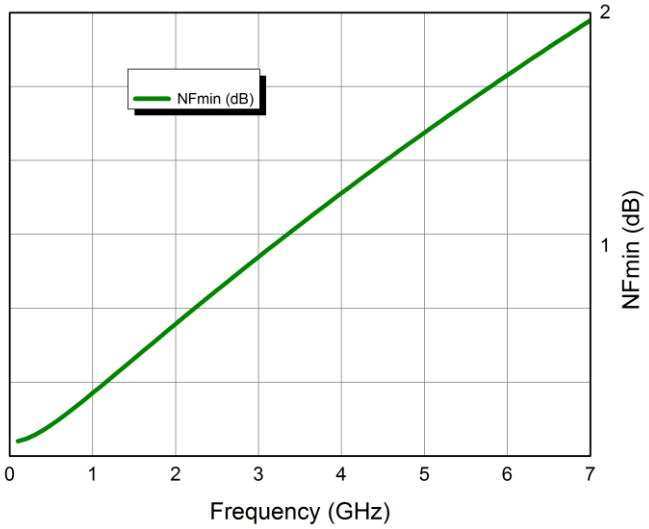


Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

Typical Performance

Simulated Minimum Noise Figure of the WP48007030

V_{DD} = 48 V, I_{DQ} = 250 mA



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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 250 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
100MHz	0.98148	-56.5206	59.38883	149.564	0.007598	59.67954	0.267952	-79.7911
200MHz	0.957075	-94.0773	45.30755	129.3897	0.011593	39.62072	0.346605	-114.096
300MHz	0.94289	-116.259	34.76345	117.2113	0.013342	27.55777	0.385671	-130.492
400MHz	0.935467	-129.925	27.67179	109.3274	0.014159	19.78939	0.406168	-139.42
500MHz	0.931433	-138.942	22.79461	103.7483	0.014578	14.3258	0.418828	-144.7
600MHz	0.929141	-145.258	19.29524	99.49655	0.014806	10.1896	0.428037	-147.985
700MHz	0.92781	-149.899	16.6823	96.06607	0.014932	6.874653	0.435687	-150.085
800MHz	0.927055	-153.439	14.66439	93.1756	0.014998	4.099732	0.442663	-151.439
900MHz	0.926667	-156.221	13.062	90.65852	0.015026	1.698217	0.449406	-152.304
1000MHz	0.926529	-158.46	11.75991	88.41064	0.015028	-0.43408	0.456144	-152.84
1100MHz	0.926571	-160.299	10.6813	86.36382	0.015011	-2.3653	0.462994	-153.152
1200MHz	0.926747	-161.835	9.773218	84.47179	0.014979	-4.14171	0.470015	-153.31
1300MHz	0.927027	-163.135	8.998088	82.70215	0.014936	-5.7957	0.477231	-153.363
1400MHz	0.92739	-164.25	8.328547	81.03159	0.014883	-7.35059	0.484644	-153.345
1500MHz	0.927823	-165.216	7.744235	79.44295	0.014822	-8.82354	0.492246	-153.283
1600MHz	0.928314	-166.062	7.229698	77.92336	0.014754	-10.2274	0.500021	-153.194
1700MHz	0.928853	-166.807	6.773008	76.46298	0.01468	-11.572	0.507948	-153.093
1800MHz	0.929434	-167.469	6.364813	75.05419	0.014601	-12.865	0.516006	-152.988
1900MHz	0.930052	-168.062	5.997685	73.691	0.014516	-14.1124	0.52417	-152.887
2000MHz	0.930701	-168.596	5.665645	72.36863	0.014427	-15.3189	0.532418	-152.794
2100MHz	0.931377	-169.079	5.363833	71.08325	0.014335	-16.4884	0.540726	-152.715
2200MHz	0.932077	-169.519	5.088256	69.83173	0.014238	-17.624	0.549073	-152.651
2300MHz	0.932797	-169.922	4.8356	68.61148	0.014138	-18.7282	0.557437	-152.603
2400MHz	0.933534	-170.292	4.603099	67.42038	0.014036	-19.8033	0.5658	-152.572
2500MHz	0.934285	-170.634	4.388419	66.25661	0.01393	-20.851	0.574143	-152.56
2600MHz	0.935048	-170.951	4.189581	65.11866	0.013822	-21.8728	0.58245	-152.565
2700MHz	0.935821	-171.246	4.004893	64.00523	0.013712	-22.8701	0.590705	-152.588
2800MHz	0.936601	-171.521	3.832902	62.91517	0.0136	-23.8439	0.598896	-152.628
2900MHz	0.937387	-171.779	3.67235	61.84751	0.013487	-24.7953	0.607009	-152.684
3000MHz	0.938177	-172.022	3.522147	60.80136	0.013371	-25.7251	0.615035	-152.755
3100MHz	0.938969	-172.251	3.381336	59.77596	0.013255	-26.6341	0.622963	-152.841
3200MHz	0.939761	-172.468	3.249081	58.77061	0.013137	-27.523	0.630784	-152.941
3300MHz	0.940552	-172.673	3.124644	57.78466	0.013018	-28.3924	0.638492	-153.053
3400MHz	0.941342	-172.869	3.007371	56.81755	0.012899	-29.2429	0.646081	-153.178
3500MHz	0.942127	-173.055	2.896681	55.86872	0.012779	-30.0751	0.653543	-153.313
3600MHz	0.942909	-173.233	2.792056	54.93769	0.012658	-30.8894	0.660877	-153.459
3700MHz	0.943685	-173.404	2.693031	54.02397	0.012537	-31.6863	0.668076	-153.614
3800MHz	0.944454	-173.567	2.599189	53.12714	0.012415	-32.4663	0.67514	-153.777
3900MHz	0.945217	-173.725	2.510156	52.24676	0.012294	-33.2297	0.682064	-153.948

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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 250 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4000MHz	0.945972	-173.876	2.42559	51.38244	0.012172	-33.977	0.688849	-154.126
4100MHz	0.946718	-174.023	2.345185	50.53379	0.012051	-34.7085	0.695492	-154.31
4200MHz	0.947455	-174.164	2.268661	49.70044	0.01193	-35.4247	0.701993	-154.5
4300MHz	0.948182	-174.301	2.195762	48.88203	0.011809	-36.1258	0.708353	-154.694
4400MHz	0.9489	-174.434	2.126256	48.07822	0.011689	-36.8122	0.71457	-154.893
4500MHz	0.949607	-174.562	2.059929	47.28867	0.011569	-37.4843	0.720647	-155.096
4600MHz	0.950303	-174.688	1.996585	46.51305	0.011449	-38.1423	0.726583	-155.302
4700MHz	0.950989	-174.81	1.936045	45.75104	0.01133	-38.7867	0.732381	-155.511
4800MHz	0.951663	-174.928	1.878142	45.00235	0.011212	-39.4176	0.738041	-155.722
4900MHz	0.952326	-175.044	1.822724	44.26665	0.011094	-40.0355	0.743566	-155.935
5000MHz	0.952977	-175.157	1.769648	43.54366	0.010977	-40.6405	0.748956	-156.15
5100MHz	0.953617	-175.267	1.718784	42.83308	0.010861	-41.233	0.754215	-156.366
5200MHz	0.954245	-175.375	1.670009	42.13463	0.010746	-41.8132	0.759345	-156.583
5300MHz	0.954861	-175.481	1.623212	41.44804	0.010632	-42.3815	0.764347	-156.801
5400MHz	0.955466	-175.584	1.578285	40.77303	0.010519	-42.9381	0.769224	-157.019
5500MHz	0.956058	-175.685	1.535132	40.10934	0.010406	-43.4833	0.773979	-157.237
5600MHz	0.95664	-175.785	1.49366	39.45671	0.010295	-44.0172	0.778613	-157.456
5700MHz	0.957209	-175.882	1.453784	38.81489	0.010184	-44.5403	0.783131	-157.674
5800MHz	0.957767	-175.978	1.415424	38.18362	0.010075	-45.0526	0.787533	-157.891
6000MHz	0.958314	-176.072	1.378505	37.56266	0.009967	-45.5545	0.791824	-158.108
6100MHz	0.958849	-176.164	1.342956	36.95177	0.009859	-46.0462	0.796004	-158.324
6200MHz	0.959373	-176.255	1.308712	36.35073	0.009753	-46.528	0.800078	-158.539
6300MHz	0.959886	-176.345	1.27571	35.7593	0.009648	-46.9999	0.804047	-158.753
6400MHz	0.960388	-176.433	1.243892	35.17726	0.009544	-47.4624	0.807915	-158.966
6500MHz	0.960879	-176.519	1.213203	34.6044	0.009441	-47.9155	0.811683	-159.178
6600MHz	0.96136	-176.605	1.183592	34.0405	0.009339	-48.3595	0.815355	-159.388
6700MHz	0.961831	-176.689	1.155009	33.48535	0.009238	-48.7946	0.818933	-159.597
6800MHz	0.962291	-176.772	1.127409	32.93875	0.009139	-49.221	0.822418	-159.805
6900MHz	0.962741	-176.853	1.100747	32.4005	0.00904	-49.6389	0.825815	-160.01
7000MHz	0.963181	-176.934	1.074983	31.87042	0.008943	-50.0484	0.829125	-160.214

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