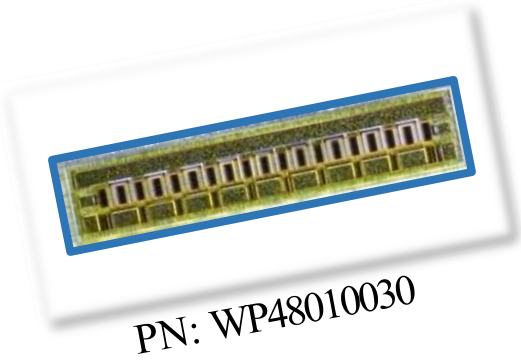
WAVE PIA IC DESIGN

WP48010030

30W, 48V GaN HEMT Die



PN: WP48010030

The WP48010030 is a 30W gallium nitride (GaN) High Electron Mobility Transistor (HEMT). This GaN HEMT is a wideband transistor optimized for X-band 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

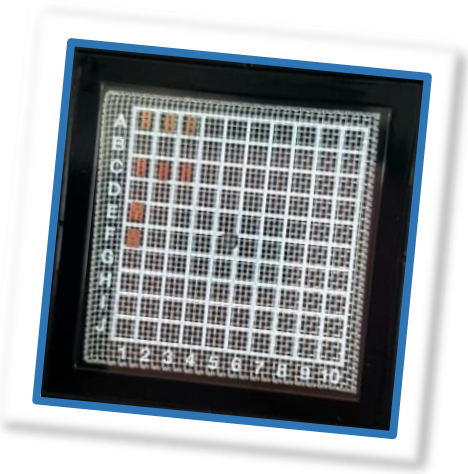
- Up to 10 GHz Operation
- 10.0 dB Typical Small Signal Gain @ 8.15GHz
- 30 W Typical Psat @5.8GHz
- 48V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting possible

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 = 8.15 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}	10	dB	V_{DD}=48V, I_{DQ}=200mA
Saturated Power Output	P_{SAT}	33	W	V_{DD}=48V, I_{DQ}=200mA
Drain Efficiency	η	>40	%	V_{DD}=48V, I_{DQ}=200mA
Intermodulation Distortion	IM3	<-30	dBc	V_{DD}=48V, I_{DQ}=200mA
Output Mismatch Stress	VSWR	10:1	ψ	

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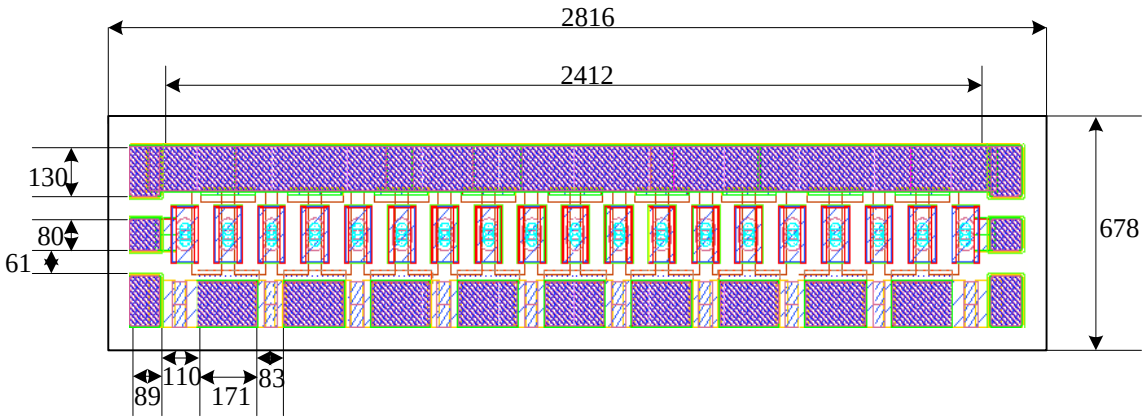
DIE Dimensions (units in microns)



Overall die size 2816 x 678 (+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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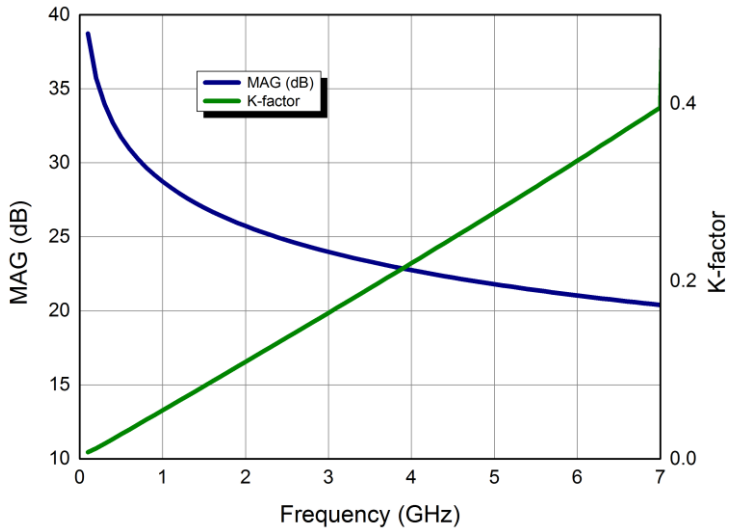
Typical Performance

Simulated Maximum Available Gain (MAG) and K Factor of the WP48010030

V_{DD} = 48 V, I_{DQ} = 200 mA

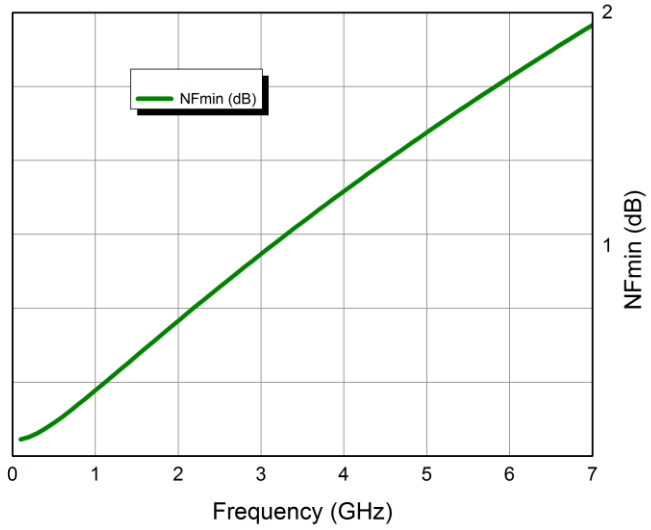


Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

Typical Performance

Simulated Minimum Noise Figure of the WP48010030

V_{DD} = 48 V, I_{DQ} = 200 mA



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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 200 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
100MHz	0.987826	-42.8032	52.8104	156.6274	0.007075	66.72906	0.321116	-44.933
200MHz	0.967341	-76.1183	44.13176	138.4728	0.011824	48.67615	0.331693	-78.0006
300MHz	0.951206	-99.0854	35.98498	125.8288	0.014462	36.13379	0.340731	-99.2025
400MHz	0.9409	-114.697	29.67039	116.9814	0.015898	27.38804	0.347829	-112.613
500MHz	0.934545	-125.613	24.95425	110.5048	0.016713	21.0131	0.353924	-121.325
600MHz	0.930575	-133.534	21.39893	105.5201	0.017197	16.13004	0.359701	-127.163
700MHz	0.92805	-139.485	18.66012	101.5092	0.017495	12.22081	0.365534	-131.177
800MHz	0.926432	-144.092	16.50089	98.16049	0.017679	8.973807	0.371611	-133.991
900MHz	0.925409	-147.749	14.7617	95.27968	0.017791	6.194675	0.378019	-135.994
1000MHz	0.924793	-150.713	13.33401	92.74081	0.017854	3.757485	0.38479	-137.434
1100MHz	0.924468	-153.16	12.14251	90.45939	0.017882	1.577738	0.391925	-138.477
1200MHz	0.924356	-155.211	11.13375	88.37691	0.017885	-0.40305	0.399407	-139.24
1300MHz	0.924409	-156.951	10.26897	86.4518	0.017868	-2.22648	0.407212	-139.801
1400MHz	0.92459	-158.445	9.519482	84.65373	0.017836	-3.92285	0.415307	-140.219
1500MHz	0.924874	-159.741	8.863661	82.9602	0.01779	-5.51469	0.423659	-140.536
1600MHz	0.925244	-160.874	8.284921	81.35413	0.017734	-7.01905	0.432233	-140.782
1700MHz	0.925684	-161.873	7.770351	79.82239	0.017669	-8.44908	0.440997	-140.979
1800MHz	0.926183	-162.76	7.309761	78.35473	0.017596	-9.81503	0.449915	-141.146
1900MHz	0.926734	-163.553	6.895007	76.94304	0.017516	-11.125	0.458958	-141.293
2000MHz	0.927329	-164.265	6.519508	75.58081	0.01743	-12.3855	0.468095	-141.431
2100MHz	0.927961	-164.908	6.177888	74.2628	0.017339	-13.6018	0.477298	-141.566
2200MHz	0.928626	-165.492	5.865716	72.98472	0.017243	-14.7781	0.486543	-141.702
2300MHz	0.929319	-166.025	5.579308	71.74301	0.017142	-15.9181	0.495804	-141.843
2400MHz	0.930037	-166.513	5.315575	70.53472	0.017038	-17.0246	0.505061	-141.992
2500MHz	0.930776	-166.961	5.07191	69.35739	0.016929	-18.1002	0.514294	-142.15
2600MHz	0.931533	-167.375	4.846095	68.2089	0.016818	-19.1469	0.523485	-142.318
2700MHz	0.932304	-167.759	4.636233	67.08747	0.016704	-20.1665	0.532618	-142.496
2800MHz	0.933089	-168.115	4.440693	65.99156	0.016587	-21.1607	0.541678	-142.685
2900MHz	0.933883	-168.447	4.25806	64.91982	0.016468	-22.1306	0.550652	-142.884
3000MHz	0.934686	-168.757	4.087107	63.87108	0.016346	-23.0775	0.55953	-143.093
3100MHz	0.935494	-169.048	3.926757	62.84432	0.016223	-24.0025	0.568302	-143.312
3200MHz	0.936307	-169.322	3.776069	61.83861	0.016098	-24.9064	0.576958	-143.54
3300MHz	0.937123	-169.58	3.634209	60.85313	0.015972	-25.79	0.585491	-143.776
3400MHz	0.93794	-169.823	3.500441	59.88715	0.015844	-26.6541	0.593894	-144.019
3500MHz	0.938756	-170.054	3.374109	58.93998	0.015716	-27.4994	0.602163	-144.27
3600MHz	0.939571	-170.273	3.254629	58.01102	0.015586	-28.3265	0.610292	-144.527
3700MHz	0.940383	-170.481	3.141477	57.0997	0.015456	-29.1359	0.618277	-144.79
3800MHz	0.941191	-170.679	3.034183	56.20548	0.015325	-29.9282	0.626117	-145.058
3900MHz	0.941995	-170.868	2.932323	55.32789	0.015194	-30.7039	0.633808	-145.33

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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 200 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4000MHz	0.942793	-171.049	2.835514	54.46646	0.015063	-31.4634	0.641349	-145.606
4100MHz	0.943584	-171.223	2.743409	53.62075	0.014931	-32.2072	0.648738	-145.886
4200MHz	0.944368	-171.389	2.655692	52.79036	0.0148	-32.9356	0.655975	-146.168
4300MHz	0.945144	-171.549	2.572076	51.97489	0.014668	-33.6491	0.663061	-146.453
4400MHz	0.945912	-171.703	2.492299	51.17397	0.014537	-34.348	0.669994	-146.739
4500MHz	0.946671	-171.851	2.41612	50.38725	0.014406	-35.0327	0.676776	-147.027
4600MHz	0.94742	-171.994	2.343318	49.61437	0.014275	-35.7036	0.683408	-147.315
4700MHz	0.94816	-172.132	2.273691	48.85502	0.014145	-36.3609	0.689891	-147.604
4800MHz	0.948889	-172.266	2.207052	48.10886	0.014015	-37.005	0.696226	-147.894
4900MHz	0.949608	-172.395	2.143228	47.37559	0.013886	-37.6362	0.702415	-148.183
5000MHz	0.950316	-172.52	2.082061	46.65491	0.013757	-38.2548	0.70846	-148.472
5100MHz	0.951013	-172.642	2.023402	45.94653	0.01363	-38.861	0.714363	-148.76
5200MHz	0.951699	-172.76	1.967114	45.25017	0.013503	-39.4553	0.720126	-149.047
5300MHz	0.952374	-172.875	1.91307	44.56554	0.013376	-40.0377	0.725752	-149.333
5400MHz	0.953037	-172.986	1.861152	43.89238	0.013251	-40.6087	0.731243	-149.618
5500MHz	0.953689	-173.095	1.811248	43.23043	0.013127	-41.1685	0.736601	-149.901
5600MHz	0.95433	-173.201	1.763257	42.57944	0.013003	-41.7173	0.741828	-150.183
5700MHz	0.954959	-173.304	1.717081	41.93915	0.012881	-42.2553	0.746929	-150.463
5800MHz	0.955577	-173.405	1.672631	41.30932	0.01276	-42.7829	0.751904	-150.74
6000MHz	0.956183	-173.503	1.629822	40.68972	0.012639	-43.3002	0.756758	-151.016
6100MHz	0.956778	-173.599	1.588574	40.08011	0.01252	-43.8075	0.761492	-151.289
6200MHz	0.957361	-173.693	1.548814	39.48027	0.012402	-44.3051	0.766109	-151.56
6300MHz	0.957934	-173.785	1.510472	38.88998	0.012285	-44.793	0.770612	-151.829
6400MHz	0.958495	-173.875	1.473481	38.30902	0.012169	-45.2716	0.775004	-152.095
6500MHz	0.959045	-173.963	1.43778	37.73718	0.012054	-45.741	0.779286	-152.358
6600MHz	0.959584	-174.049	1.403311	37.17425	0.01194	-46.2015	0.783463	-152.619
6700MHz	0.960113	-174.133	1.370018	36.62004	0.011828	-46.6533	0.787537	-152.877
6800MHz	0.96063	-174.216	1.33785	36.07434	0.011716	-47.0965	0.791509	-153.133
6900MHz	0.961138	-174.297	1.306757	35.53697	0.011606	-47.5314	0.795383	-153.386
7000MHz	0.961635	-174.377	1.276693	35.00774	0.011497	-47.9581	0.799161	-153.636

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