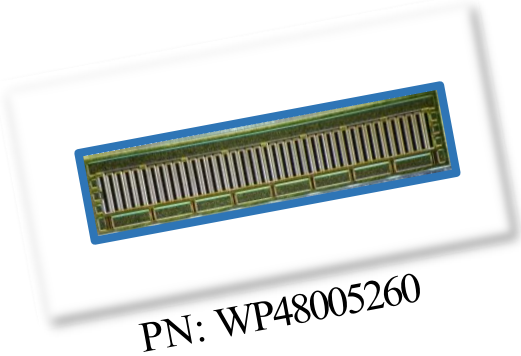
WAVE PIA IC DESIGN

WP48005260

260W, 48V GaN HEMT Die



PN: WP48005260

The WP48005260 is a 260W gallium nitride (GaN) High Electron Mobility Transistor (HEMT). This GaN HEMT is a wideband transistor optimized for 3.5GHz 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

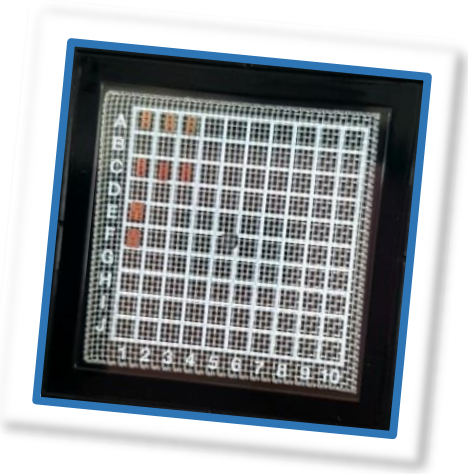
- Up to 5 GHz Operation
- 14.0 dB Typical Small Signal Gain @ 3.5 GHz
- 260 W Typical Psat @3.5GHz
- 48V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting

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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• Application Support: platune@wavepia.com

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}=1320mA
Saturated Power Output	P_{SAT}	260	W	V_{DD}=48V, I_{DQ}=1320mA
Drain Efficiency	η	>55	%	V_{DD}=48V, I_{DQ}=1320mA
Intermodulation Distortion	IM3	<-30	dBc	V_{DD}=48V, I_{DQ}=1320mA
Output Mismatch Stress	VSWR	10:1	ψ	

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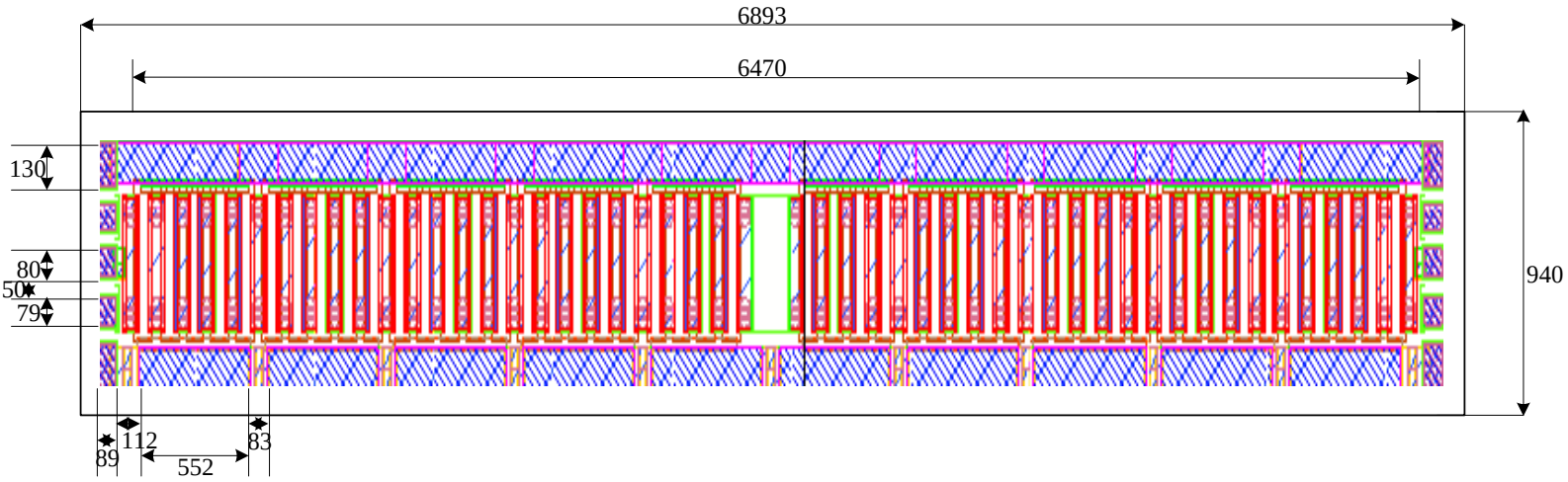
DIE Dimensions (units in microns)



Overall die size 6893 x 940 (+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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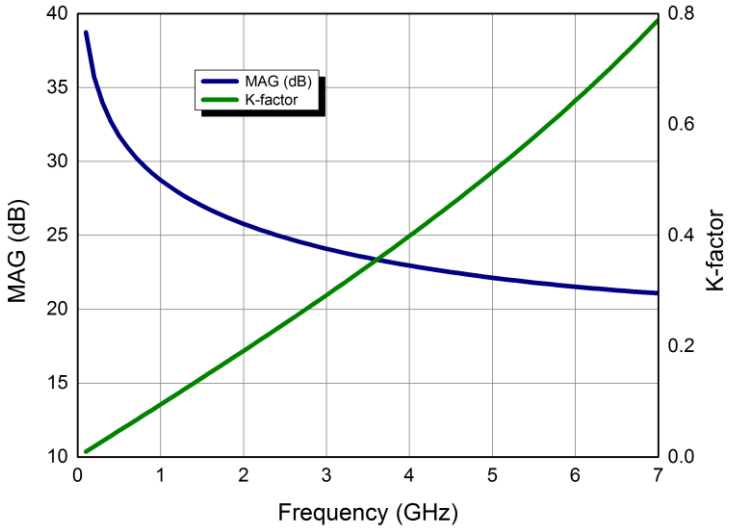
Typical Performance

Simulated Maximum Available Gain (MAG) and K Factor of the WP48005260

V_{DD} = 48 V, I_{DQ} = 1320 mA

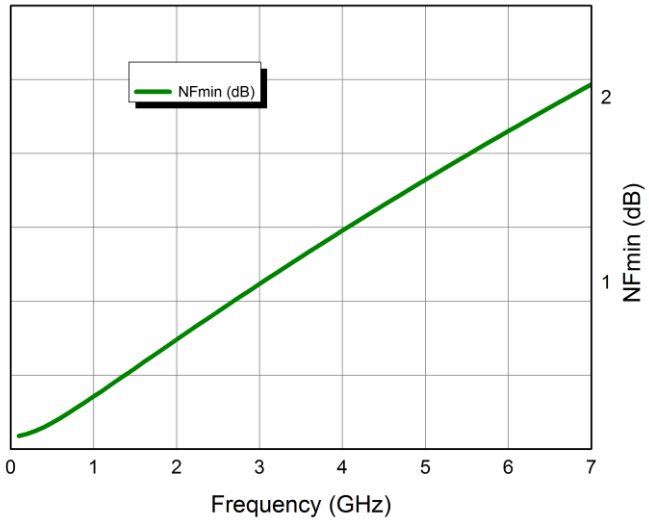


Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

Typical Performance

Simulated Minimum Noise Figure of the WP48005260

V_{DD} = 48 V, I_{DQ} = 1320 mA



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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 1320 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
100MHz	0.976668	-155.255	28.3582	100.5665	0.003799	10.72547	0.840368	-175.964
200MHz	0.975938	-167.452	14.40755	92.87321	0.00386	3.19119	0.848269	-177.545
300MHz	0.975869	-171.584	9.618342	89.17357	0.003865	-0.34943	0.850309	-177.927
400MHz	0.975928	-173.649	7.203394	86.5022	0.003858	-2.86173	0.851641	-177.997
500MHz	0.976046	-174.884	5.746818	84.25091	0.003846	-4.9539	0.85292	-177.945
600MHz	0.976204	-175.702	4.771307	82.21682	0.003831	-6.82879	0.854303	-177.834
700MHz	0.976395	-176.282	4.071318	80.3138	0.003812	-8.57252	0.855836	-177.694
800MHz	0.976616	-176.715	3.543825	78.49963	0.00379	-10.2273	0.857528	-177.54
900MHz	0.976862	-177.049	3.131511	76.75155	0.003765	-11.8159	0.859378	-177.38
1000MHz	0.977131	-177.314	2.79996	75.05647	0.003738	-13.3513	0.861377	-177.219
1100MHz	0.977422	-177.53	2.52726	73.40655	0.003709	-14.8415	0.863513	-177.062
1200MHz	0.977731	-177.709	2.298799	71.7969	0.003677	-16.2912	0.865772	-176.909
1300MHz	0.978057	-177.86	2.104461	70.22443	0.003644	-17.7035	0.86814	-176.764
1400MHz	0.978397	-177.99	1.937018	68.68713	0.003608	-19.0805	0.870601	-176.626
1500MHz	0.978749	-178.103	1.79117	67.18368	0.003572	-20.4235	0.873142	-176.498
1600MHz	0.979112	-178.202	1.662938	65.71317	0.003533	-21.7332	0.875746	-176.379
1700MHz	0.979483	-178.29	1.54928	64.27495	0.003493	-23.0105	0.878401	-176.269
1800MHz	0.97986	-178.37	1.447829	62.86855	0.003452	-24.2556	0.881094	-176.17
1900MHz	0.980242	-178.442	1.356711	61.49357	0.00341	-25.4691	0.883811	-176.079
2000MHz	0.980627	-178.508	1.274428	60.14964	0.003368	-26.6512	0.886541	-175.999
2100MHz	0.981013	-178.569	1.199763	58.83641	0.003324	-27.8024	0.889274	-175.927
2200MHz	0.9814	-178.625	1.131718	57.55354	0.00328	-28.9228	0.892001	-175.865
2300MHz	0.981785	-178.679	1.069468	56.30065	0.003235	-30.013	0.894711	-175.811
2400MHz	0.982169	-178.729	1.01232	55.07733	0.00319	-31.0732	0.897399	-175.765
2500MHz	0.982549	-178.776913	0.959693	53.88315	0.003145	-32.1039	0.900056	-175.728
2600MHz	0.982924	-178.822512	0.91109	52.71765	0.003099	-33.1055	0.902677	-175.697
2700MHz	0.983295	-178.866236	0.866089	51.58033	0.003054	-34.0785	0.905256	-175.673
2800MHz	0.98366	-178.908336	0.824323	50.47068	0.003008	-35.0235	0.907791	-175.656
2900MHz	0.984019	-178.949021	0.785477	49.38814	0.002963	-35.9409	0.910275	-175.645
3000MHz	0.984372	-178.988467	0.749273	48.33215	0.002918	-36.8312	0.912708	-175.64
3100MHz	0.984717	-179.02682	0.71547	47.30213	0.002873	-37.6951	0.915086	-175.64
3200MHz	0.985054	-179.064205	0.683854	46.29748	0.002828	-38.5332	0.917407	-175.645
3300MHz	0.985384	-179.100725	0.654237	45.31758	0.002784	-39.3459	0.919671	-175.654
3400MHz	0.985707	-179.136467	0.626451	44.36183	0.00274	-40.134	0.921875	-175.667
3500MHz	0.986021	-179.171507	0.600346	43.4296	0.002696	-40.898	0.924021	-175.684
3600MHz	0.986327	-179.205906	0.575789	42.52026	0.002653	-41.6384	0.926106	-175.704
3700MHz	0.986624	-179.23972	0.552659	41.6332	0.00261	-42.3561	0.928133	-175.728
3800MHz	0.986914	-179.272993	0.530848	40.76779	0.002568	-43.0514	0.9301	-175.754
3900MHz	0.987196	-179.306	0.510258	39.92342	0.002526	-43.725	0.932008	-175.783

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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 1320 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4000MHz	0.987469	-179.33807	0.490799	39.09948	0.002485	-44.3775	0.933859	-175.814
4100MHz	0.987735	-179.37	0.472392	38.29537	0.002444	-45.0094	0.935652	-175.848
4200MHz	0.987992	-179.401392	0.454963	37.51051	0.002404	-45.6214	0.93739	-175.883
4300MHz	0.988242	-179.432457	0.438444	36.7443	0.002365	-46.214	0.939073	-175.92
4400MHz	0.988484	-179.46315	0.422775	35.9962	0.002326	-46.7876	0.940703	-175.958
4500MHz	0.988719	-179.49349	0.407899	35.26563	0.002287	-47.343	0.94228	-175.998
4600MHz	0.988947	-179.523491	0.393765	34.55206	0.00225	-47.8804	0.943806	-176.038
4700MHz	0.989168	-179.553168	0.380324	33.85496	0.002212	-48.4006	0.945283	-176.08
4800MHz	0.989381	-179.582531	0.367534	33.17381	0.002176	-48.9039	0.946711	-176.123
4900MHz	0.989588	-179.611593	0.355354	32.50812	0.00214	-49.3907	0.948093	-176.166
5000MHz	0.989789	-179.640364	0.343747	31.8574	0.002104	-49.8617	0.94943	-176.21
5100MHz	0.989983	-179.669	0.332678	31.22117	0.002069	-50.3172	0.950722	-176.255
5200MHz	0.990171	-179.697066	0.322115	30.59898	0.002035	-50.7576	0.951973	-176.3
5300MHz	0.990353	-179.725014	0.312029	29.99039	0.002001	-51.1833	0.953182	-176.346
5400MHz	0.990529	-179.752704	0.302393	29.39496	0.001968	-51.5948	0.954351	-176.391
5500MHz	0.990699	-179.780143	0.29318	28.81229	0.001935	-51.9924	0.955482	-176.437
5600MHz	0.990864	-179.807336	0.284366	28.24196	0.001903	-52.3764	0.956576	-176.483
5700MHz	0.991024	-179.834291	0.275931	27.68358	0.001871	-52.7473	0.957634	-176.53
5800MHz	0.991179	-179.861	0.267852	27.13679	0.00184	-53.1054	0.958658	-176.576
6000MHz	0.991329	-179.887508	0.26011	26.60122	0.00181	-53.4509	0.959648	-176.622
6100MHz	0.991474	-179.913782	0.252689	26.07652	0.00178	-53.7842	0.960607	-176.668
6200MHz	0.991615	-179.939839	0.24557	25.56235	0.00175	-54.1056	0.961534	-176.714
6300MHz	0.991751	-179.965685	0.238738	25.05839	0.001721	-54.4154	0.962432	-176.76
6400MHz	0.991883	-179.991	0.232178	24.56431	0.001692	-54.7138	0.9633	-176.806
6500MHz	0.992011	179.983238	0.225876	24.07982	0.001664	-55.0011	0.964141	-176.852
6600MHz	0.992134	179.957997	0.219819	23.60461	0.001636	-55.2775	0.964956	-176.897
6700MHz	0.992254	179.932948	0.213995	23.13842	0.001609	-55.5433	0.965744	-176.942
6800MHz	0.992371	179.908088	0.208393	22.68096	0.001582	-55.7987	0.966508	-176.987
6900MHz	0.992483	179.883412	0.203002	22.23197	0.001556	-56.0438	0.967248	-177.032
7000MHz	0.992593	179.858915	0.197811	21.7912	0.00153	-56.2789	0.967965	-177.076

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