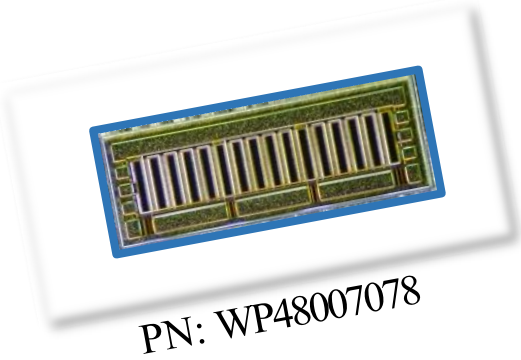
WAVE PIA IC DESIGN

WP48007078

78W, 48V GaN HEMT Die



The WP48007078 is a 78W 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. In addition, we're no EL Issue.

Features

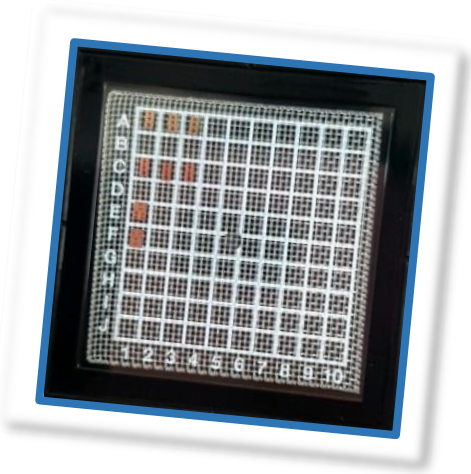
- Up to 8 GHz Operation
- 14.0 dB Typical Small Signal Gain @ 3.5 GHz
- 78 W Typical Psat @3.5GHz
- 48V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting

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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• Phone: +82-31-8058-3374 • Order online at www.wavepia.com
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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}	>13	dB	V_{DD}=48V, I_{DQ}=400mA
Saturated Power Output	P_{SAT}	78	W	V_{DD}=48V, I_{DQ}=400mA
Drain Efficiency	η	>60	%	V_{DD}=48V, I_{DQ}=400mA
Intermodulation Distortion	IM3	<-30	dBc	V_{DD}=48V, I_{DQ}=400mA
Output Mismatch Stress	VSWR	10:1	ψ	

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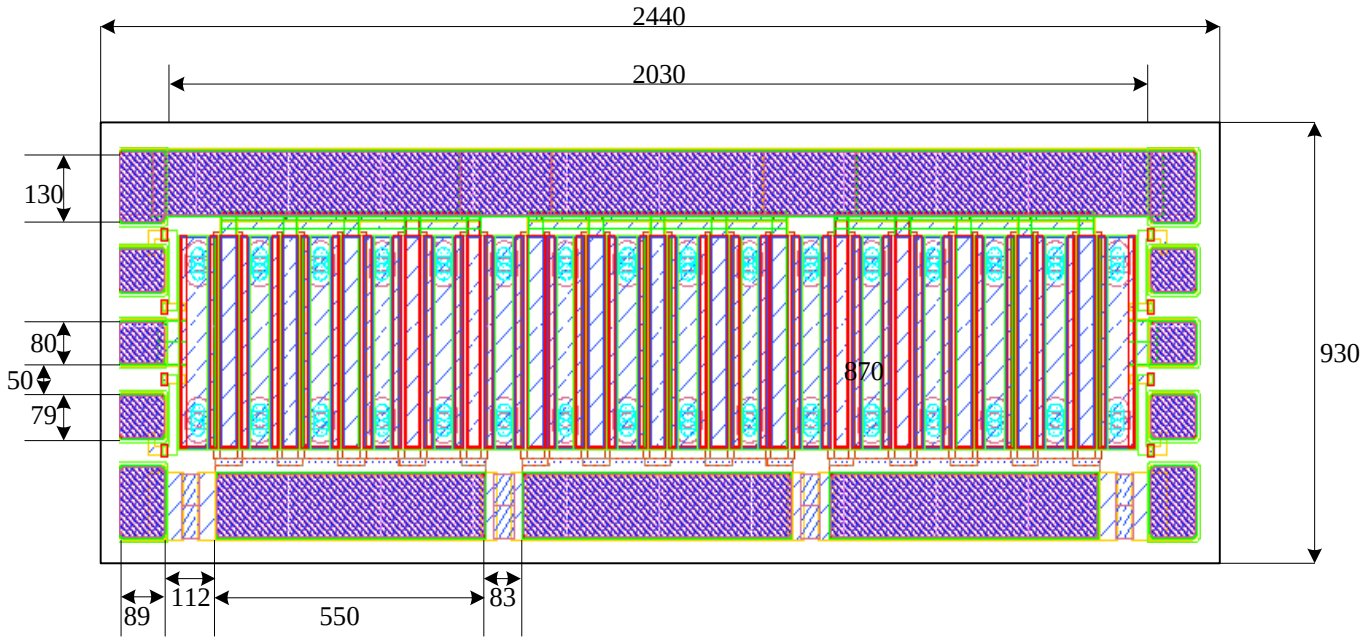
DIE Dimensions (units in microns)



Overall die size 1040 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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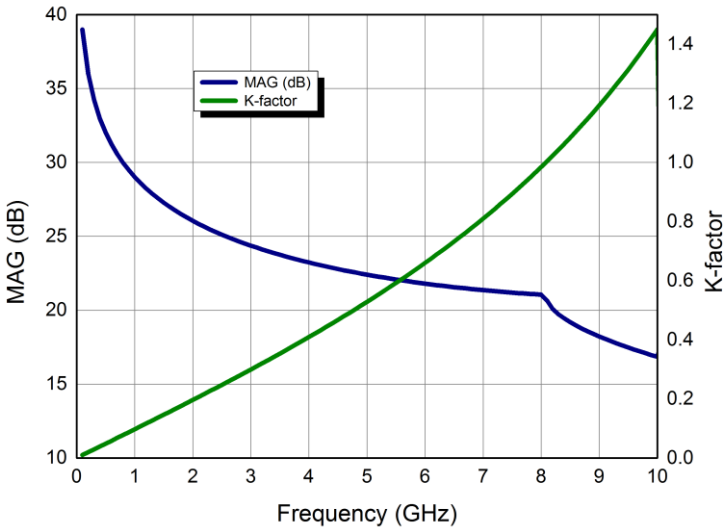
Typical Performance

Simulated Maximum Available Gain (MAG) and K Factor of the WP48007078

V_{DD} = 48 V, I_{DQ} = 400 mA

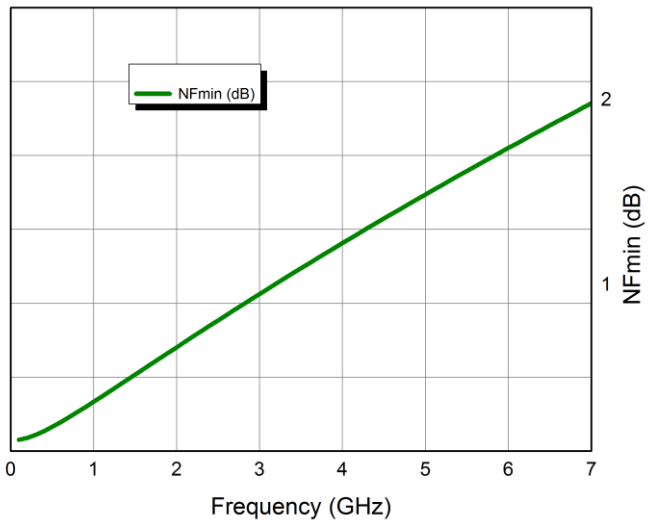


Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

Typical Performance

Simulated Minimum Noise Figure of the WP48007078

V_{DD} = 48 V, I_{DQ} = 400 mA



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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 400 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
100MHz	0.967335	-95.9584	60.94774	129.7926	0.00767	39.95622	0.46431	-146.115
200MHz	0.951458	-131.464	37.06382	110.8704	0.009327	21.19773	0.561629	-158.925
300MHz	0.946721	-146.516	25.8595	102.1368	0.00976	12.62774	0.588806	-164.21
400MHz	0.944949	-154.547	19.70302	96.85303	0.009912	7.507741	0.600488	-166.729
500MHz	0.944215	-159.491	15.85985	93.08136	0.009971	3.899861	0.60742	-168.025
600MHz	0.943944	-162.829	13.24276	90.09871	0.009987	1.081089	0.612635	-168.691
700MHz	0.943921	-165.228	11.34803	87.5796	0.009979	-1.27404	0.617223	-168.998
800MHz	0.944051	-167.035	9.913038	85.35726	0.009958	-3.3323	0.621641	-169.088
900MHz	0.944286	-168.444	8.7882	83.33788	0.009925	-5.18747	0.626098	-169.043
1000MHz	0.944601	-169.574	7.882281	81.46493	0.009885	-6.89607	0.630693	-168.912
1100MHz	0.944978	-170.5	7.136577	79.70245	0.009837	-8.49404	0.635469	-168.727
1200MHz	0.945407	-171.273	6.511637	78.02658	0.009784	-10.0052	0.640444	-168.511
1300MHz	0.94588	-171.929	5.979993	76.42097	0.009725	-11.4459	0.645615	-168.277
1400MHz	0.946391	-172.494	5.521934	74.87403	0.009662	-12.8278	0.650972	-168.038
1500MHz	0.946935	-172.985	5.12296	73.37742	0.009594	-14.1591	0.6565	-167.801
1600MHz	0.947508	-173.418	4.772163	71.92497	0.009523	-15.446	0.66218	-167.571
1700MHz	0.948106	-173.802	4.461186	70.51202	0.009447	-16.6931	0.667991	-167.353
1800MHz	0.948727	-174.146	4.183516	69.13504	0.009369	-17.904	0.673911	-167.149
1900MHz	0.949366	-174.458	3.934003	67.79127	0.009287	-19.0813	0.67992	-166.961
2000MHz	0.950022	-174.741	3.708519	66.47852	0.009203	-20.2274	0.685996	-166.791
2100MHz	0.95069	-175.001	3.503721	65.19506	0.009116	-21.3438	0.69212	-166.639
2200MHz	0.95137	-175.24	3.316866	63.93946	0.009027	-22.432	0.698273	-166.505
2300MHz	0.952059	-175.462	3.145687	62.71053	0.008936	-23.4931	0.704437	-166.39
2400MHz	0.952753	-175.67	2.98829	61.50729	0.008843	-24.5282	0.710596	-166.293
2500MHz	0.953453	-175.864	2.843082	60.32886	0.008749	-25.5381	0.716733	-166.213
2600MHz	0.954155	-176.047	2.708712	59.17451	0.008653	-26.5234	0.722836	-166.151
2700MHz	0.954857	-176.22	2.584026	58.04356	0.008556	-27.4849	0.728893	-166.106
2800MHz	0.955559	-176.385	2.468033	56.9354	0.008458	-28.4232	0.734891	-166.076
2900MHz	0.956259	-176.542	2.359875	55.84948	0.008359	-29.3387	0.74082	-166.061
3000MHz	0.956955	-176.692	2.258808	54.78526	0.008259	-30.232	0.746673	-166.06
3100MHz	0.957647	-176.836	2.16418	53.74226	0.008159	-31.1036	0.752441	-166.072
3200MHz	0.958333	-176.975	2.075419	52.72	0.008058	-31.9538	0.758117	-166.097
3300MHz	0.959011	-177.109	1.99202	51.71803	0.007958	-32.7832	0.763697	-166.133
3400MHz	0.959682	-177.239	1.913536	50.73589	0.007857	-33.5922	0.769175	-166.181
3500MHz	0.960345	-177.365	1.839569	49.77316	0.007755	-34.3811	0.774548	-166.238
3600MHz	0.960999	-177.487	1.769763	48.82941	0.007654	-35.1504	0.779812	-166.304
3700MHz	0.961642	-177.606	1.703799	47.90422	0.007554	-35.9005	0.784965	-166.379
3800MHz	0.962276	-177.723	1.641392	46.99718	0.007453	-36.6317	0.790005	-166.461
3900MHz	0.962899	-177.836	1.582281	46.10789	0.007353	-37.3445	0.794931	-166.551

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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 400 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4000MHz	0.963511	-177.947	1.526234	45.23593	0.007253	-38.0392	0.799742	-166.647
4100MHz	0.964111	-178.056	1.473037	44.38093	0.007154	-38.7161	0.804438	-166.749
4200MHz	0.9647	-178.163	1.422498	43.54247	0.007055	-39.3757	0.80902	-166.856
4300MHz	0.965278	-178.268	1.37444	42.72019	0.006957	-40.0183	0.813488	-166.969
4400MHz	0.965843	-178.371	1.328702	41.91369	0.00686	-40.6442	0.817842	-167.085
4500MHz	0.966397	-178.473	1.285135	41.1226	0.006763	-41.2539	0.822084	-167.206
4600MHz	0.966938	-178.573	1.243605	40.34656	0.006667	-41.8476	0.826215	-167.33
4700MHz	0.967468	-178.671	1.203987	39.58519	0.006572	-42.4256	0.830237	-167.457
4800MHz	0.967986	-178.768	1.166164	38.83813	0.006478	-42.9883	0.834151	-167.587
4900MHz	0.968491	-178.864	1.130032	38.10505	0.006384	-43.5361	0.83796	-167.72
5000MHz	0.968986	-178.959	1.09549	37.38557	0.006292	-44.0692	0.841665	-167.854
5100MHz	0.969468	-179.053	1.06245	36.67938	0.0062	-44.5879	0.845268	-167.99
5200MHz	0.969939	-179.145	1.030824	35.98613	0.00611	-45.0925	0.848772	-168.128
5300MHz	0.970399	-179.236	1.000536	35.30551	0.00602	-45.5834	0.852179	-168.267
5400MHz	0.970847	-179.326695	0.971512	34.63717	0.005931	-46.0608	0.855492	-168.407
5500MHz	0.971284	-179.416138	0.943684	33.98083	0.005843	-46.5249	0.858711	-168.549
5600MHz	0.971711	-179.504678	0.916987	33.33616	0.005756	-46.976	0.861841	-168.69
5700MHz	0.972127	-179.592351	0.891364	32.70288	0.00567	-47.4145	0.864883	-168.833
5800MHz	0.972532	-179.679192	0.866757	32.08068	0.005585	-47.8405	0.867839	-168.975
6000MHz	0.972928	-179.765233	0.843116	31.46929	0.005501	-48.2542	0.870712	-169.118
6100MHz	0.973313	-179.850504	0.820392	30.86842	0.005418	-48.656	0.873504	-169.261
6200MHz	0.973688	-179.935034	0.798538	30.27781	0.005336	-49.046	0.876218	-169.404
6300MHz	0.974054	179.981153	0.777513	29.69719	0.005255	-49.4244	0.878855	-169.547
6400MHz	0.974411	179.898032	0.757275	29.1263	0.005175	-49.7915	0.881418	-169.689
6500MHz	0.974758	179.81558	0.737787	28.5649	0.005096	-50.1474	0.883909	-169.831
6600MHz	0.975097	179.733776	0.719013	28.01273	0.005017	-50.4924	0.88633	-169.973
6700MHz	0.975427	179.652599	0.700919	27.46956	0.00494	-50.8265	0.888684	-170.114
6800MHz	0.975748	179.572031	0.683475	26.93516	0.004864	-51.1501	0.890972	-170.255
6900MHz	0.976061	179.492054	0.66665	26.40931	0.004788	-51.4632	0.893196	-170.395
7000MHz	0.976366	179.41265	0.650416	25.89179	0.004714	-51.7659	0.895358	-170.534

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