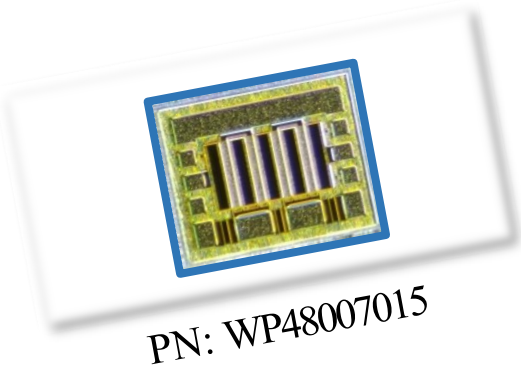
WAVE PIA IC DESIGN

WP48007015

15W, 48V GaN HEMT Die



PN: WP48007015

The WP48007015 is a 15W 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

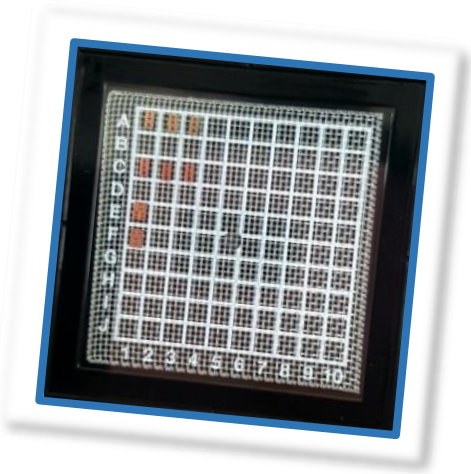
- Up to 8 GHz Operation
- 14.0 dB Typical Small Signal Gain @ 3.5 GHz
- 15 W Typical Psat @5.8GHz
- 48V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting

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



For price, delivery, and to place orders: WAVEPIA Co., Ltd.
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• Phone: +82-31-8058-3374 • Order online at www.wavepia.com
• 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}	14	dB	V_{DD}=48V, I_{DQ}=100mA
Saturated Power Output	P_{SAT}	15	W	V_{DD}=48V, I_{DQ}=100mA
Drain Efficiency	η	>60	%	V_{DD}=48V, I_{DQ}=100mA
Intermodulation Distortion	IM3	-30	dBc	V_{DD}=48V, I_{DQ}=100mA
Output Mismatch Stress	VSWR	10:1	ψ	

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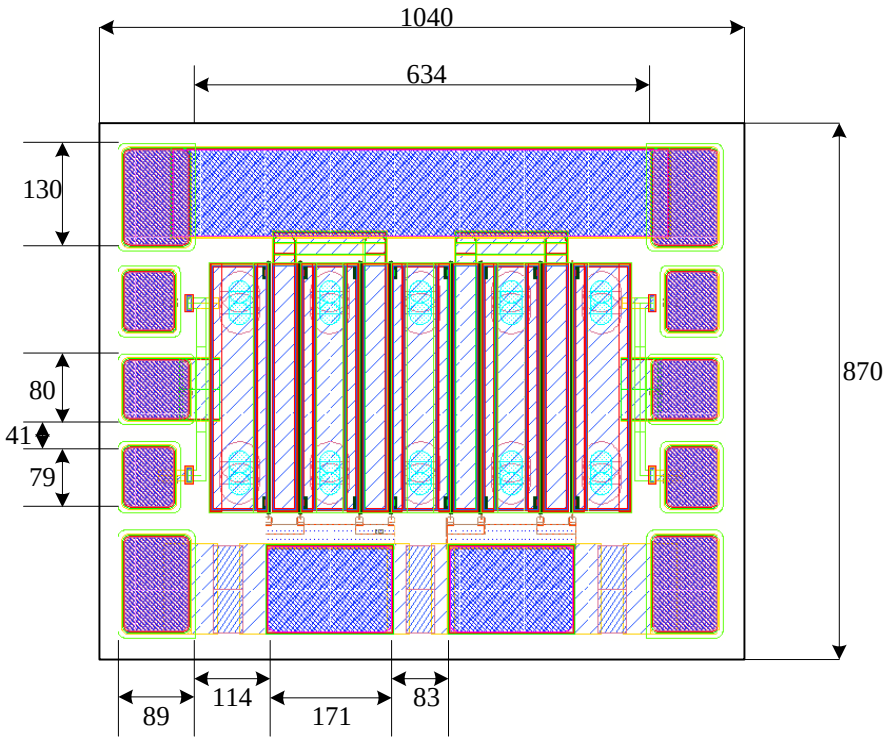
DIE Dimensions (units in microns)



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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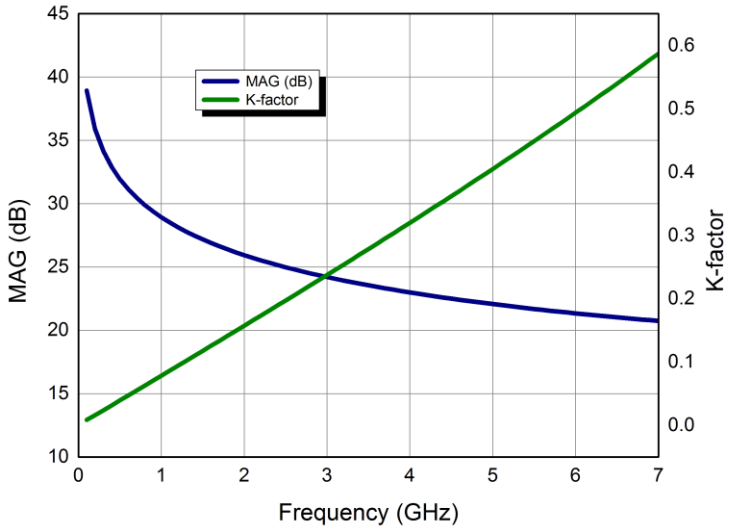
Typical Performance

Simulated Maximum Available Gain (MAG) and K Factor of the WP48007015

V_{DD} = 48 V, I_{DQ} = 100 mA

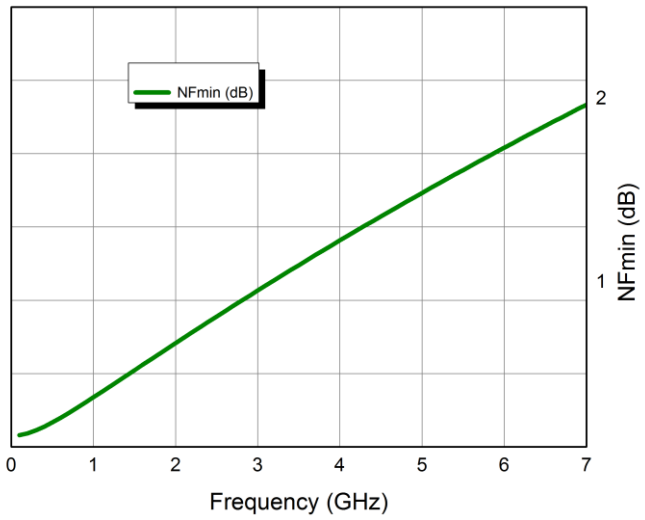


Intrinsic die parameters - reference planes at centers of gate and drain bonding pads. No wire bonds assumed.

Typical Performance

Simulated Minimum Noise Figure of the WP48007015

V_{DD} = 48 V, I_{DQ} = 100 mA



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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 100 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
100MHz	0.997	-19.084	35.432	169.064	0.004	79.180	0.565	-11.450
200MHz	0.988	-37.156	33.901	158.716	0.009	68.947	0.547	-22.299
300MHz	0.977	-53.499	31.735	149.362	0.012	59.709	0.521	-32.128
400MHz	0.965	-67.790	29.295	141.163	0.015	51.625	0.494	-40.764
500MHz	0.953	-80.034	26.848	134.093	0.017	44.670	0.467	-48.226
600MHz	0.944	-90.42	24.548	128.026	0.019	38.719	0.444	-54.634
700MHz	0.936	-99.2	22.460	122.807	0.020	33.615	0.424	-60.140
800MHz	0.929	-106.656	20.60	118.284	0.021	29.209	0.408	-64.896
900MHz	0.924	-113.003	18.957	114.33	0.022	25.369	0.395	-69.031
1000MHz	0.919	-118.445	17.51	110.836	0.022	21.991	0.385	-72.656
1100MHz	0.916	-123.142	16.235	107.718	0.023	18.989	0.378	-75.86
1200MHz	0.913	-127.227	15.108	104.907	0.023	16.294	0.373	-78.714
1300MHz	0.911	-130.802	14.109	102.35	0.023	13.853	0.370	-81.278
1400MHz	0.909	-133.954	13.218	100.006	0.023	11.624	0.368	-83.598
1500MHz	0.907	-136.748	12.422	97.84	0.024	9.573	0.368	-85.714
1600MHz	0.906	-139.242	11.706	95.823	0.024	7.672	0.369	-87.659
1700MHz	0.905	-141.478	11.06	93.935	0.024	5.90	0.370	-89.452
1800MHz	0.905	-143.495	10.474	92.157	0.024	4.238	0.373	-91.12
1900MHz	0.904	-145.321	9.942	90.475	0.024	2.671	0.376	-92.68
2000MHz	0.904	-146.985	9.455	88.876	0.024	1.188	0.38	-94.147
2100MHz	0.903	-148.504	9.008	87.35	0.024	-0.222	0.385	-95.531
2200MHz	0.903	-149.898	8.597	85.889	0.024	-1.566	0.39	-96.844
2300MHz	0.903	-151.181	8.218	84.486	0.024	-2.853	0.395	-98.095
2400MHz	0.903	-152.367	7.868	83.135	0.024	-4.089	0.400	-99.29
2500MHz	0.903	-153.466	7.542	81.83	0.024	-5.278	0.406	-100.435
2600MHz	0.903	-154.488	7.239	80.567	0.0239	-6.424	0.412	-101.537
2700MHz	0.903	-155.44	6.956	79.342	0.0238	-7.532	0.419	-102.6
2800MHz	0.904	-156.331	6.692	78.153	0.0237	-8.606	0.425	-103.626
2900MHz	0.904	-157.165	6.444	76.995	0.0237	-9.648	0.431	-104.62
3000MHz	0.904	-157.95	6.212	75.867	0.024	-10.66	0.438	-105.586
3100MHz	0.905	-158.688	5.993	74.767	0.023	-11.643	0.445	-106.525
3200MHz	0.905	-159.385	5.787	73.692	0.023	-12.601	0.452	-107.439
3300MHz	0.905	-160.044	5.592	72.641	0.023	-13.536	0.458	-108.33
3400MHz	0.906	-160.668	5.408	71.613	0.023	-14.448	0.465	-109.2
3500MHz	0.906	-161.261	5.233	70.605	0.023	-15.339	0.472	-110.05
3600MHz	0.907	-161.825	5.068	69.617	0.023	-16.21	0.479	-100.883
3700MHz	0.907	-162.362	4.911	68.648	0.023	-17.062	0.486	-111.062
3800MHz	0.908	-162.875	4.762	67.697	0.023	-17.896	0.493	-112.497
3900MHz	0.908	-163.365	4.619	66.763	0.023	-18.714	0.5	-113.28

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Typical Die S-Parameters

(Small Signal, V_{DS} = 48 V, I_{DQ} = 100 mA, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4000MHz	0.909	-163.834	4.484	65.844	0.023	-19.515	0.506	-114.049
4100MHz	0.909	-164.284	4.355	64.942	0.022	-20.3	0.513	-114.804
4200MHz	0.91	-164.716	4.231	64.054	0.022	-21.071	0.52	-115.546
4300MHz	0.91	-165.131	4.113	63.18	0.022	-21.828	0.526	-116.275
4400MHz	0.911	-165.531	4.0	62.32	0.022	-22.57	0.533	-116.993
4500MHz	0.911	-165.917	3.892	61.473	0.022	-23.3	0.54	-117.699
4600MHz	0.912	-166.289	3.788	60.639	0.022	-24.017	0.546	-118.393
4700MHz	0.913	-166.648	3.689	59.816	0.022	-24.721	0.553	-119.076
4800MHz	0.913	-166.995	3.593	59.006	0.021	-25.414	0.559	-119.75
4900MHz	0.914	-167.332	3.501	58.208	0.021	-26.094	0.565	-120.413
5000MHz	0.914	-167.658	3.413	57.42	0.021	-26.764	0.571	-121.066
5100MHz	0.915	-167.974	3.328	56.643	0.021	-27.423	0.578	-121.71
5200MHz	0.915	-168.281	3.246	55.877	0.021	-28.07	0.584	-122.344
5300MHz	0.916	-168.58	3.168	55.121	0.021	-28.708	0.59	-122.97
5400MHz	0.917	-168.87	3.092	54.375	0.02	-29.336	0.595	-123.586
5500MHz	0.917	-169.154	3.019	53.639	0.02	-29.953	0.601	-124.194
5600MHz	0.918	-169.43	2.948	52.913	0.02	-30.561	0.607	-124.794
5700MHz	0.918	-169.698	2.88	52.195	0.02	-31.16	0.613	-125.386
5800MHz	0.919	-170.217	2.75	50.787	0.02	-32.33	0.624	-126.545
6000MHz	0.92	-170.468	2.689	50.096	0.02	-32.902	0.629	-127.113
6100MHz	0.921	-170.713	2.629	49.414	0.02	-33.465	0.634	-127.674
6200MHz	0.921	-170.953	2.571	48.74	0.02	-34.019	0.64	-128.227
6300MHz	0.922	-171.188	2.516	48.074	0.02	-34.566	0.645	-128.773
6400MHz	0.922	-171.418	2.462	47.416	0.02	-35.104	0.65	-129.312
6500MHz	0.922	-171.644	2.409	46.765	0.02	-35.635	0.655	-129.844
6600MHz	0.923	-171.865	2.358	46.123	0.019	-36.157	0.66	-130.37
6700MHz	0.924	-172.083	2.309	45.488	0.019	-36.672	0.665	-130.888
6800MHz	0.924	-172.296	2.262	44.86	0.019	-37.18	0.7	-131.4
6900MHz	0.925	-172.506	2.215	44.239	0.018	-37.68	0.674	-131.906
7000MHz	0.925	-172.711	2.17	43.625	0.018	-38.173	0.678	-132.405

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