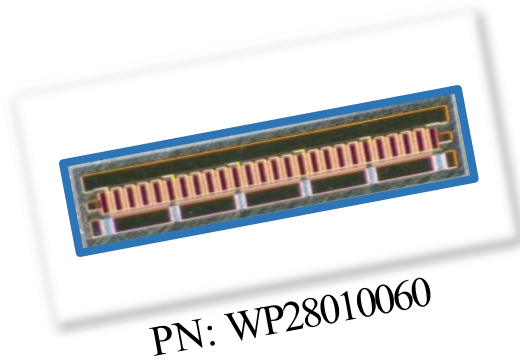




WP28010060

60W, 28V GaN HEMT Die



The WP28010060 is a 60W 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

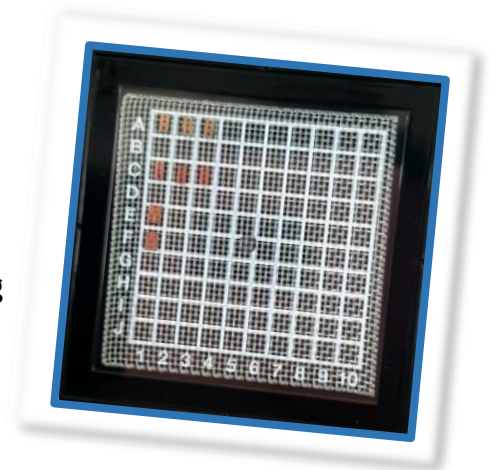
- Up to 10 GHz Operation
- 13.0 dB Typical Small Signal Gain @ 3.5 GHz
- 60 W Typical Psat @3.5GHz
- 28V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting

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



Absolute Maximum Ratings (not simultaneous) at 25 °C

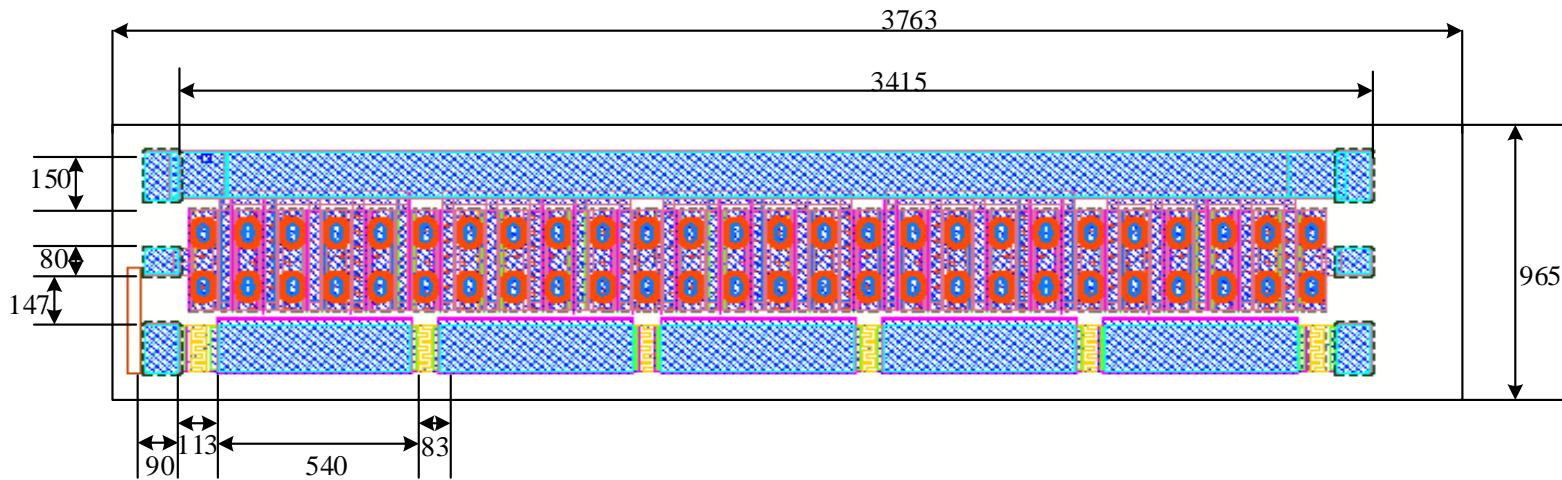
Parameter	Parameter	Typical Value	Units	Conditions
Threshold voltage @ Id=1mA/mm, Vd=10V	V _{to}	-3.2	V	25°C
Breakdown voltage @ Id=1mA/mm	V _{DG}	>100	V	25°C
Drain-source current, Id @ Vd=10V, Vg=0	I _{dss}	880	mA/mm	25°C
Operating Junction Temperature	T _J	225	°C	
Storage Temperature	T _{STG}	-65, +150	°C	
Thermal Resistance, Junction to Case (packaged)	R _{θJC}		°C/W	
Thermal Resistance, Junction to Case (die only)	R _{θJC}		°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	0.4	Ohm-mm	25°C
Maximum Drain-source current, Id @ Vd=10V, Vg=1V (1X125µm device)	I _{dmax}	1050	mA/mm	25°C
Max. trans-conductance, @ Vd=10V, Vg=-4V ~ -1V (1X125µm device)	GM_PEAK	340	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} =28V, I _{DQ} =200mA
Saturated Power Output	P _{SAT}	60	W	V _{DD} =28V, I _{DQ} =200mA
Drain Efficiency	η	>40	%	V _{DD} =28V, I _{DQ} =200mA
Intermodulation Distortion	IM3	<-30	dBc	V _{DD} =28V, I _{DQ} =200mA
Output Mismatch Stress	VSWR	10:1	ψ	



DIE Dimensions (units in microns)



Overall die size 3763 x 965 (+0/-50) microns, die thickness 100 (+/- 10) microns.
All Gate and Drain pads must be wire bonded for electrical connection.

Assembly Notes:

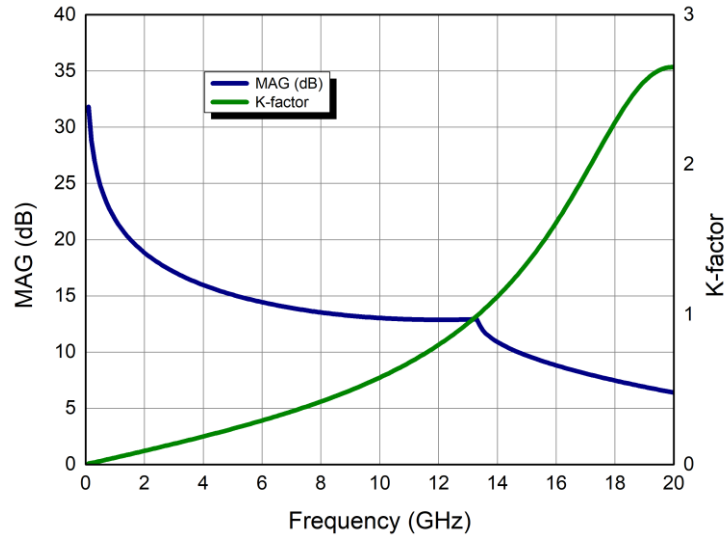
- Recommended solder is AuSn (80/20) solder. Refer to Wavepia's guide for the Eutectic Die Bond Procedure
- Vacuum collet is the preferred method of pick-up.
- The backside of the die is the Source (ground) contact.
- Die back side gold plating is 5 microns thick minimum.
- Thermosonic ball or wedge bonding are the preferred connection methods.
- Gold wire must be used for connections.



Typical Performance

Simulated Maximum Available Gain (MAG) and K Factor of the WP28010060

$$V_{DD} = 28 \text{ V}, I_{DQ} = 200 \text{ mA}$$



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 WP28010060

$$V_{DD} = 28 \text{ V}, I_{DQ} = 200 \text{ mA}$$

Under construction!



Typical Die S-Parameters

(Small Signal, $V_{DS} = 28\text{ V}$, $I_{DQ} = 200\text{ mA}$, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
1000MHz	0.929543	-174.597	3.003461	73.89757	0.019772	-14.6996	0.746079	-171.03
1100MHz	0.930804	-174.894	2.704986	72.02277	0.019577	-16.4322	0.751662	-170.845
1200MHz	0.932134	-175.134	2.454699	70.21103	0.019369	-18.1016	0.757477	-170.657
1300MHz	0.933521	-175.332	2.241646	68.45676	0.01915	-19.7136	0.763475	-170.475
1400MHz	0.934953	-175.497	2.057999	66.75612	0.01892	-21.272	0.769611	-170.305
1500MHz	0.93642	-175.639	1.898009	65.10638	0.018682	-22.7793	0.775841	-170.151
1600MHz	0.937911	-175.761	1.757359	63.50551	0.018436	-24.2378	0.782125	-170.016
1700MHz	0.939418	-175.87	1.632743	61.95188	0.018184	-25.6488	0.788424	-169.9
1800MHz	0.940931	-175.967	1.521583	60.44416	0.017927	-27.0139	0.794706	-169.805
1900MHz	0.942444	-176.056	1.421836	58.98115	0.017665	-28.334	0.800942	-169.729
2000MHz	0.94395	-176.138	1.331866	57.56175	0.017401	-29.6105	0.807107	-169.672
2100MHz	0.945442	-176.214	1.250339	56.18491	0.017134	-30.8442	0.813177	-169.633
2200MHz	0.946915	-176.287	1.176161	54.84958	0.016867	-32.0362	0.819135	-169.611
2300MHz	0.948366	-176.356	1.108422	53.55474	0.016599	-33.1875	0.824967	-169.605
2400MHz	0.94979	-176.423	1.04636	52.29934	0.016331	-34.2992	0.830659	-169.613
2500MHz	0.951185	-176.487768	0.989329	51.08234	0.016064	-35.3723	0.836202	-169.635
2600MHz	0.952547	-176.550846	0.93678	49.90266	0.015798	-36.4078	0.841589	-169.669
2700MHz	0.953875	-176.612577	0.888242	48.75924	0.015534	-37.4068	0.846816	-169.713
2800MHz	0.955168	-176.673191	0.843306	47.65101	0.015273	-38.3704	0.851878	-169.767
2900MHz	0.956425	-176.732859	0.801618	46.5769	0.015014	-39.2995	0.856774	-169.83
3000MHz	0.957644	-176.792	0.76287	45.53583	0.014759	-40.1954	0.861504	-169.901
3100MHz	0.958825	-176.85	0.726789	44.52673	0.014506	-41.059	0.866069	-169.978
3200MHz	0.959969	-176.907297	0.693134	43.54857	0.014257	-41.8913	0.87047	-170.061
3300MHz	0.961075	-176.964145	0.661694	42.60029	0.014012	-42.6935	0.87471	-170.149
3400MHz	0.962144	-177.020406	0.63228	41.68089	0.013771	-43.4664	0.878792	-170.242
3500MHz	0.963176	-177.076099	0.604722	40.78935	0.013534	-44.2111	0.882719	-170.338
3600MHz	0.964172	-177.131234	0.578869	39.92469	0.013301	-44.9286	0.886496	-170.437
3700MHz	0.965132	-177.186	0.554586	39.08598	0.013072	-45.6197	0.890127	-170.539
3800MHz	0.966058	-177.239837	0.531175	38.27227	0.012847	-46.2855	0.893617	-170.642
3900MHz	0.96695	-177.293	0.51025	37.48266	0.012626	-46.9267	0.89697	-170.748
4000MHz	0.967809	-177.346201	0.489986	36.71628	0.01241	-47.5443	0.900191	-170.854
4100MHz	0.968637	-177.398532	0.470867	35.97229	0.012198	-48.1391	0.903284	-170.962
4200MHz	0.969434	-177.450286	0.45281	35.24986	0.01199	-48.7118	0.906255	-171.07
4300MHz	0.970201	-177.501458	0.43574	34.5482	0.011786	-49.2634	0.909108	-171.178
4400MHz	0.970939	-177.552044	0.419588	33.86655	0.011587	-49.7944	0.911849	-171.286
4500MHz	0.97165	-177.602039	0.404292	33.20418	0.011391	-50.3056	0.91448	-171.394
4600MHz	0.972335	-177.65144	0.389792	32.56038	0.011199	-50.7978	0.917008	-171.502
4700MHz	0.972993	-177.700244	0.376036	31.93446	0.011012	-51.2715	0.919436	-171.61
4800MHz	0.973627	-177.74845	0.362976	31.32579	0.010828	-51.7274	0.921768	-171.716



Typical Die S-Parameters

(Small Signal, $V_{DS} = 28\text{ V}$, $I_{DQ} = 200\text{ mA}$, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4900MHz	0.974237	-177.796059	0.350567	30.73372	0.010648	-52.1661	0.924009	-171.822
5000MHz	0.974825	-177.84307	0.338767	30.15767	0.010472	-52.5883	0.926163	-171.927
5100MHz	0.97539	-177.889487	0.327538	29.59704	0.010299	-52.9944	0.928233	-172.032
5200MHz	0.975935	-177.935311	0.316844	29.05128	0.010131	-53.385	0.930223	-172.135
5300MHz	0.976459	-177.980547	0.306654	28.51987	0.009965	-53.7605	0.932136	-172.237
5400MHz	0.976965	-178.025199	0.296937	28.00229	0.009803	-54.1216	0.933976	-172.338
5500MHz	0.977451	-178.069272	0.287664	27.49806	0.009644	-54.4686	0.935746	-172.437
5600MHz	0.97792	-178.113	0.27881	27.0067	0.009489	-54.8021	0.93745	-172.536
5700MHz	0.978372	-178.155705	0.270351	26.52777	0.009337	-55.1223	0.939089	-172.633
5800MHz	0.978808	-178.19808	0.262264	26.06084	0.009188	-55.4298	0.940667	-172.729
5900MHz	0.979228	-178.239902	0.254529	25.6055	0.009041	-55.7249	0.942187	-172.823
6000MHz	0.979633	-178.281179	0.247124	25.16134	0.008898	-56.008	0.943651	-172.916
6100MHz	0.980024	-178.322	0.240034	24.72801	0.008758	-56.2795	0.945061	-173.008
6200MHz	0.980401	-178.362135	0.233239	24.30513	0.00862	-56.5396	0.946421	-173.099
6300MHz	0.980765	-178.40183	0.226726	23.89235	0.008485	-56.7887	0.947731	-173.188
6400MHz	0.981116	-178.441015	0.220477	23.48935	0.008353	-57.0271	0.948995	-173.276
6500MHz	0.981455	-178.479698	0.214481	23.09581	0.008224	-57.255	0.950213	-173.363
6600MHz	0.981783	-178.517889	0.208723	22.71142	0.008097	-57.4729	0.951389	-173.448
6700MHz	0.982099	-178.555598	0.203192	22.33589	0.007972	-57.6809	0.952524	-173.532
6800MHz	0.982405	-178.592832	0.197876	21.96894	0.00785	-57.8792	0.95362	-173.615
6900MHz	0.9827	-178.629602	0.192764	21.61031	0.00773	-58.0681	0.954678	-173.696
7000MHz	0.982986	-178.666	0.187846	21.25972	0.007612	-58.2479	0.955699	-173.776
7100MHz	0.983262	-178.701784	0.183113	20.91695	0.007496	-58.4187	0.956687	-173.855
7200MHz	0.983529	-178.737	0.178556	20.58175	0.007383	-58.5807	0.957641	-173.933
7300MHz	0.983788	-178.772217	0.174166	20.25389	0.007271	-58.7342	0.958563	-174.009
7400MHz	0.984038	-178.8068	0.169936	19.93316	0.007162	-58.8793	0.959456	-174.085
7500MHz	0.98428	-178.840973	0.165857	19.61935	0.007055	-59.0162	0.960318	-174.159
7600MHz	0.984514	-178.874744	0.161924	19.31226	0.006949	-59.145	0.961153	-174.232
7700MHz	0.984741	-178.908123	0.158128	19.01169	0.006846	-59.2659	0.961961	-174.304
7800MHz	0.984961	-178.941116	0.154465	18.71747	0.006744	-59.379	0.962743	-174.374
7900MHz	0.985174	-178.973733	0.150928	18.42941	0.006644	-59.4844	0.963501	-174.444
8000MHz	0.985381	-179.005983	0.147511	18.14734	0.006545	-59.5824	0.964234	-174.513
8100MHz	0.985581	-179.037872	0.144209	17.87111	0.006449	-59.673	0.964945	-174.58
8200MHz	0.985775	-179.069	0.141017	17.60055	0.006354	-59.7562	0.965634	-174.647
8300MHz	0.985964	-179.101	0.137931	17.33551	0.00626	-59.8323	0.966301	-174.712
8400MHz	0.986146	-179.131459	0.134945	17.07585	0.006168	-59.9013	0.966948	-174.777
8500MHz	0.986324	-179.161987	0.132056	16.82143	0.006078	-59.9633	0.967576	-174.841
8600MHz	0.986496	-179.192192	0.12926	16.57212	0.005989	-60.0183	0.968185	-174.903
8700MHz	0.986663	-179.222083	0.126552	16.32778	0.005901	-60.0665	0.968776	-174.965

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