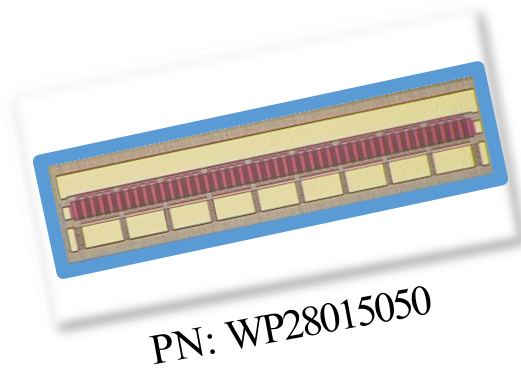




WP28015050

50W, 28V GaN HEMT Die



PN: WP28015050

The WP28015050 is a 50W 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 10GHz applications. GaN HEMT resistance is only 1/10 that of silicon transistors, making it capable of switching frequencies faster for greater energy efficiency.

Features

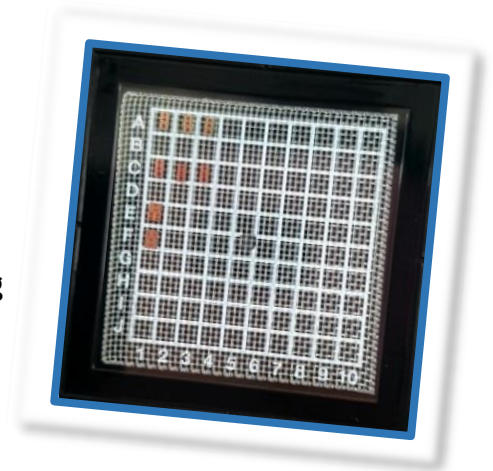
- Up to 15 GHz Operation
- 10.0 dB Typical Small Signal Gain @ 8.15 GHz
- 50 W Typical Psat @8.15GHz
- 28V Operation
- High Breakdown Voltage
- High Breakdown Voltage
- High Efficiency
- Reliability Monitoring Supporting

Applications

- U/VHF to X-band 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

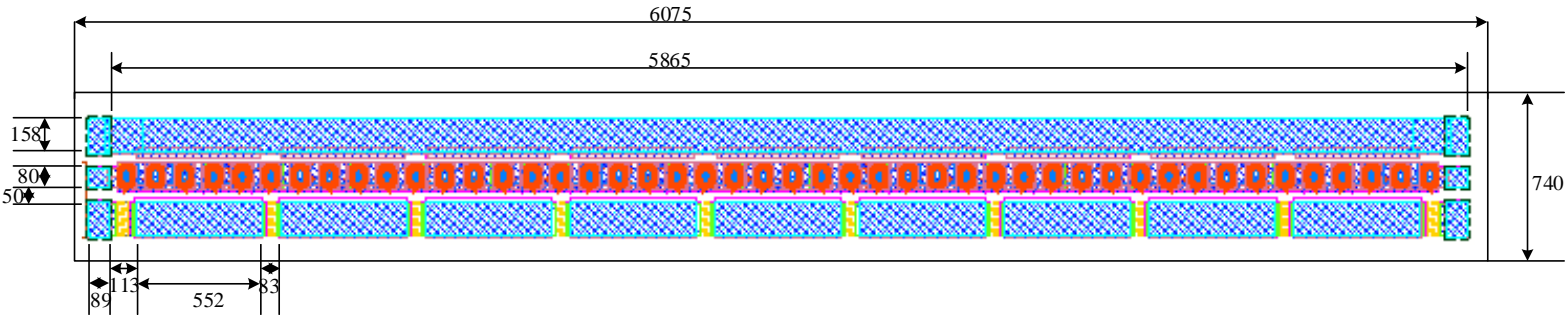
Parameter	Parameter	Typical Value	Units	Conditions
Threshold voltage @ Id=1mA/mm, Vd=10V	V _{to}	-3.2	V	25°C
Breakdown voltage @ Id=1mA/mm	V _{DG}	>100	V	25°C
Drain-source current, Id @ Vd=10V, Vg=0	I _{dss}	880	mA/mm	25°C
Operating Junction Temperature	T _J	225	°C	
Storage Temperature	T _{STG}	-65, +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 = 8.15 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} =400mA
Saturated Power Output	P _{SAT}	50	W	V _{DD} =28V, I _{DQ} =400mA
Drain Efficiency	η	>40	%	V _{DD} =28V, I _{DQ} =400mA
Intermodulation Distortion	IM3	<-30	dBc	V _{DD} =28V, I _{DQ} =400mA
Output Mismatch Stress	VSWR	10:1	ψ	



DIE Dimensions (units in microns)



Overall die size 6075 x 740 (+0/-50) microns, die thickness 100 (+/- 10) microns.
All Gate and Drain pads must be wire bonded for electrical connection.

Assembly Notes:

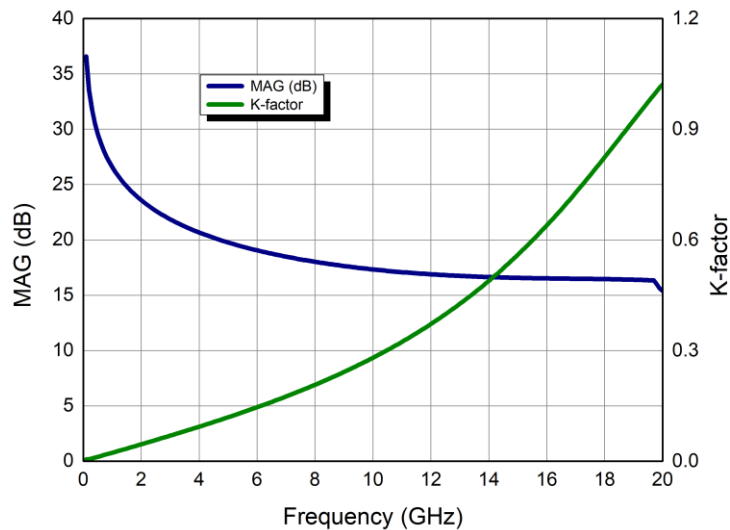
- Recommended solder is AuSn (80/20) solder. Refer to Wavepia's guide for the Eutectic Die Bond Procedure
- Vacuum collet is the preferred method of pick-up.
- The backside of the die is the Source (ground) contact.
- Die back side gold plating is 5 microns thick minimum.
- Thermosonic ball or wedge 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 WP28015050

$V_{DD} = 28 \text{ V}$, $I_{DQ} = 400 \text{ mA}$



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 WP28015050

$V_{DD} = 28 \text{ V}$, $I_{DQ} = 400 \text{ mA}$

Under construction



Typical Die S-Parameters

(Small Signal, $V_{DS} = 28\text{ V}$, $I_{DQ} = 400\text{ mA}$, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
1000MHz	0.938899	-173.446	5.541096	80.22169	0.012186	-8.23425	0.766449	-173.365
1100MHz	0.939442	-173.91	5.014132	78.74914	0.012126	-9.54929	0.769141	-173.299
1200MHz	0.940032	-174.289	4.573002	77.33134	0.01206	-10.8096	0.771972	-173.204
1300MHz	0.940665	-174.602	4.198044	75.95928	0.011988	-12.0242	0.774938	-173.09
1400MHz	0.941336	-174.865	3.875197	74.6267	0.011912	-13.1993	0.778031	-172.964
1500MHz	0.942041	-175.088	3.59414	73.32914	0.011832	-14.3393	0.781241	-172.832
1600MHz	0.942777	-175.278	3.347127	72.06337	0.011747	-15.4473	0.784557	-172.698
1700MHz	0.94354	-175.443	3.128229	70.82701	0.011658	-16.5259	0.787966	-172.565
1800MHz	0.944326	-175.587	2.932834	69.61825	0.011566	-17.5766	0.791455	-172.435
1900MHz	0.945133	-175.713	2.757297	68.43574	0.011471	-18.6009	0.795013	-172.311
2000MHz	0.945958	-175.825	2.598701	67.2784	0.011373	-19.5998	0.798625	-172.192
2100MHz	0.946796	-175.925	2.454684	66.14539	0.011272	-20.5741	0.802281	-172.081
2200MHz	0.947647	-176.015	2.323309	65.03601	0.011169	-21.5246	0.805968	-171.978
2300MHz	0.948506	-176.097	2.202978	63.94969	0.011063	-22.4517	0.809677	-171.882
2400MHz	0.949372	-176.171	2.092353	62.88593	0.010956	-23.356	0.813395	-171.796
2500MHz	0.950241	-176.24	1.990313	61.8443	0.010847	-24.2378	0.817115	-171.717
2600MHz	0.951112	-176.304	1.895903	60.82439	0.010736	-25.0977	0.820826	-171.648
2700MHz	0.951984	-176.363	1.808313	59.82582	0.010624	-25.9358	0.824521	-171.586
2800MHz	0.952853	-176.419	1.726842	58.84825	0.010512	-26.7525	0.828192	-171.533
2900MHz	0.953718	-176.471	1.650887	57.89133	0.010398	-27.5483	0.831833	-171.488
3000MHz	0.954577	-176.521	1.579924	56.95472	0.010284	-28.3233	0.835438	-171.45
3100MHz	0.95543	-176.569	1.513492	56.03809	0.01017	-29.078	0.839	-171.42
3200MHz	0.956275	-176.614	1.45119	55.14108	0.010055	-29.8126	0.842516	-171.397
3300MHz	0.95711	-176.658	1.392662	54.26338	0.00994	-30.5275	0.845981	-171.381
3400MHz	0.957935	-176.701	1.337593	53.40462	0.009825	-31.2229	0.849392	-171.37
3500MHz	0.958749	-176.742	1.285702	52.56447	0.00971	-31.8993	0.852745	-171.366
3600MHz	0.959551	-176.782	1.236738	51.74259	0.009596	-32.557	0.856038	-171.367
3700MHz	0.96034	-176.821	1.190479	50.93861	0.009481	-33.1962	0.859269	-171.374
3800MHz	0.961116	-176.859	1.146721	50.15219	0.009368	-33.8174	0.862436	-171.386
3900MHz	0.961878	-176.896	1.105282	49.38297	0.009255	-34.4208	0.865539	-171.402
4000MHz	0.962626	-176.933	1.065998	48.6306	0.009142	-35.0068	0.868575	-171.422
4100MHz	0.963359	-176.969	1.028719	47.89471	0.009031	-35.5758	0.871544	-171.447
4200MHz	0.964078	-177.004656	0.993308	47.17496	0.00892	-36.128	0.874446	-171.474
4300MHz	0.964782	-177.039601	0.959642	46.47099	0.00881	-36.6639	0.87728	-171.506
4400MHz	0.965471	-177.074062	0.927607	45.78244	0.008701	-37.1837	0.880048	-171.54
4500MHz	0.966146	-177.108073	0.897099	45.10897	0.008593	-37.6878	0.882748	-171.577
4600MHz	0.966805	-177.141662	0.868022	44.45022	0.008486	-38.1765	0.885382	-171.617
4700MHz	0.967449	-177.175	0.840288	43.80585	0.00838	-38.6501	0.88795	-171.659
4800MHz	0.968078	-177.207661	0.813816	43.17552	0.008275	-39.109	0.890453	-171.704



Typical Die S-Parameters

(Small Signal, $V_{DS} = 28\text{ V}$, $I_{DQ} = 300\text{ mA}$, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
4900MHz	0.968692	-177.240107	0.788531	42.55889	0.008172	-39.5535	0.892892	-171.75
5000MHz	0.969292	-177.272201	0.764365	41.95563	0.008069	-39.9839	0.895268	-171.798
5100MHz	0.969877	-177.303956	0.741252	41.36541	0.007968	-40.4005	0.897581	-171.847
5200MHz	0.970448	-177.33538	0.719133	40.78791	0.007868	-40.8036	0.899833	-171.898
5300MHz	0.971005	-177.366479	0.697952	40.22282	0.007769	-41.1935	0.902026	-171.951
5400MHz	0.971547	-177.397261	0.67766	39.66982	0.007671	-41.5705	0.90416	-172.004
5500MHz	0.972077	-177.427729	0.658206	39.12861	0.007574	-41.9349	0.906236	-172.058
5600MHz	0.972592	-177.457889	0.639547	38.59889	0.007479	-42.2869	0.908257	-172.113
5700MHz	0.973095	-177.487743	0.62164	38.08037	0.007385	-42.6269	0.910222	-172.169
5800MHz	0.973585	-177.517295	0.604447	37.57276	0.007292	-42.955	0.912134	-172.225
5900MHz	0.974062	-177.546546	0.587931	37.07579	0.007201	-43.2716	0.913994	-172.282
6000MHz	0.974527	-177.5755	0.572058	36.58918	0.007111	-43.5769	0.915804	-172.34
6100MHz	0.97498	-177.604158	0.556796	36.11267	0.007021	-43.8711	0.917563	-172.397
6200MHz	0.975421	-177.632522	0.542114	35.646	0.006934	-44.1545	0.919275	-172.455
6300MHz	0.975851	-177.660593	0.527984	35.18891	0.006847	-44.4273	0.92094	-172.513
6400MHz	0.976269	-177.688374	0.51438	34.74116	0.006761	-44.6897	0.922559	-172.571
6500MHz	0.976677	-177.715866	0.501276	34.3025	0.006677	-44.942	0.924134	-172.63
6600MHz	0.977074	-177.74307	0.488649	33.87271	0.006594	-45.1843	0.925666	-172.688
6700MHz	0.97746	-177.769989	0.476476	33.45156	0.006512	-45.4169	0.927156	-172.746
6800MHz	0.977837	-177.796624	0.464737	33.03882	0.006431	-45.6399	0.928606	-172.804
6900MHz	0.978204	-177.822977	0.453412	32.63428	0.006351	-45.8536	0.930016	-172.862
7000MHz	0.978561	-177.84905	0.442482	32.23773	0.006273	-46.0581	0.931388	-172.92
7100MHz	0.978909	-177.874845	0.43193	31.84897	0.006195	-46.2536	0.932723	-172.977
7200MHz	0.979248	-177.900364	0.421738	31.4678	0.006119	-46.4403	0.934022	-173.034
7300MHz	0.979578	-177.925609	0.411891	31.09402	0.006044	-46.6184	0.935286	-173.091
7400MHz	0.979899	-177.951	0.402374	30.72745	0.00597	-46.7879	0.936516	-173.148
7500MHz	0.980213	-177.975287	0.393173	30.36791	0.005896	-46.9491	0.937713	-173.204
7600MHz	0.980518	-177.999724	0.384274	30.01522	0.005824	-47.102	0.938878	-173.26
7700MHz	0.980815	-178.023898	0.375665	29.66922	0.005753	-47.247	0.940013	-173.316
7800MHz	0.981105	-178.047809	0.367333	29.32972	0.005683	-47.3839	0.941117	-173.371
7900MHz	0.981387	-178.071461	0.359268	28.99658	0.005614	-47.5132	0.942193	-173.425
8000MHz	0.981663	-178.095	0.351457	28.66963	0.005546	-47.6347	0.94324	-173.48
8100MHz	0.981931	-178.117999	0.343892	28.34873	0.005478	-47.7487	0.94426	-173.533
8200MHz	0.982193	-178.140891	0.336561	28.03372	0.005412	-47.8552	0.945253	-173.587
8300MHz	0.982448	-178.163534	0.329456	27.72447	0.005347	-47.9545	0.946221	-173.64
8400MHz	0.982696	-178.185932	0.322567	27.42083	0.005282	-48.0465	0.947163	-173.692
8500MHz	0.982939	-178.208089	0.315887	27.12266	0.005219	-48.1314	0.948082	-173.744
8600MHz	0.983175	-178.230006	0.309406	26.82984	0.005156	-48.2093	0.948977	-173.795
8700MHz	0.983406	-178.251686	0.303118	26.54224	0.005094	-48.2803	0.94985	-173.846

Contact WAVEPIA to receive this s-parameter file in “.s2p” format at platune@wavepia.com



Typical Die S-Parameters

(Small Signal, $V_{DS} = 28\text{ V}$, $I_{DQ} = 400\text{ mA}$, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
8800MHz	0.983631	-178.273134	0.297015	26.25974	0.005033	-48.3444	0.9507	-173.897
8900MHz	0.98385	-178.294351	0.29109	25.98221	0.004973	-48.4018	0.951529	-173.947
9000MHz	0.984064	-178.315342	0.285337	25.70954	0.004914	-48.4525	0.952338	-173.996
9100MHz	0.984273	-178.336108	0.279748	25.44161	0.004856	-48.4966	0.953126	-174.045
9200MHz	0.984477	-178.356653	0.274318	25.17832	0.004798	-48.5342	0.953895	-174.094
9300MHz	0.984676	-178.37698	0.269041	24.91956	0.004741	-48.5653	0.954645	-174.142
9400MHz	0.98487	-178.397092	0.263912	24.66522	0.004685	-48.5901	0.955376	-174.189
9500MHz	0.985059	-178.416993	0.258924	24.41521	0.004629	-48.6084	0.95609	-174.236
9600MHz	0.985244	-178.436684	0.254074	24.16943	0.004575	-48.6205	0.956786	-174.283
9700MHz	0.985425	-178.45617	0.249356	23.92778	0.004521	-48.6264	0.957466	-174.329
9800MHz	0.985602	-178.475	0.244766	23.69016	0.004467	-48.6261	0.958129	-174.374
9900MHz	0.985774	-178.494536	0.240298	23.4565	0.004415	-48.6196	0.958777	-174.419
10000MHz	0.985942	-178.513422	0.23595	23.22671	0.004363	-48.607	0.959409	-174.464
11000MHz	0.986107	-178.532114	0.231716	23.00069	0.004312	-48.5884	0.960027	-174.508
11100MHz	0.986268	-178.550615	0.227593	22.77837	0.004261	-48.5638	0.96063	-174.551
11200MHz	0.986425	-178.568928	0.223578	22.55967	0.004211	-48.5331	0.961218	-174.594
11300MHz	0.986578	-178.587056	0.219665	22.34451	0.004162	-48.4965	0.961794	-174.637
11400MHz	0.986728	-178.605001	0.215853	22.13282	0.004114	-48.4539	0.962356	-174.679
11500MHz	0.986875	-178.622766	0.212138	21.92452	0.004066	-48.4054	0.962905	-174.721
11600MHz	0.987018	-178.640355	0.208516	21.71954	0.004018	-48.351	0.963442	-174.762
11700MHz	0.987158	-178.65777	0.204984	21.51781	0.003972	-48.2908	0.963966	-174.803
11800MHz	0.987295	-178.675	0.20154	21.31927	0.003925	-48.2246	0.964479	-174.843
11900MHz	0.987429	-178.692	0.198181	21.12385	0.00388	-48.1526	0.96498	-174.883
12000MHz	0.98756	-178.708995	0.194904	20.93148	0.003835	-48.0747	0.96547	-174.922
12100MHz	0.987689	-178.726	0.191707	20.74211	0.00379	-47.9909	0.965949	-174.961
12200MHz	0.987814	-178.742324	0.188586	20.55568	0.003747	-47.9013	0.966418	-175
12300MHz	0.987937	-178.758749	0.18554	20.37213	0.003703	-47.8059	0.966876	-175.038
12400MHz	0.988057	-178.775019	0.182566	20.19139	0.00366	-47.7046	0.967325	-175.076
12500MHz	0.988175	-178.791135	0.179662	20.01342	0.003618	-47.5974	0.967763	-175.113
12600MHz	0.98829	-178.8071	0.176826	19.83816	0.003576	-47.4843	0.968193	-175.15
12700MHz	0.988402	-178.822917	0.174056	19.66557	0.003535	-47.3653	0.968613	-175.186
12800MHz	0.988513	-178.838587	0.17135	19.49558	0.003494	-47.2404	0.969024	-175.222
12900MHz	0.988621	-178.854113	0.168706	19.32815	0.003454	-47.1096	0.969427	-175.258
13000MHz	0.988727	-178.869498	0.166121	19.16323	0.003415	-46.9728	0.969821	-175.293
13100MHz	0.98883	-178.884744	0.163595	19.00078	0.003375	-46.8301	0.970206	-175.328
13200MHz	0.988932	-178.899852	0.161126	18.84074	0.003337	-46.6814	0.970584	-175.363
13300MHz	0.989031	-178.914825	0.158712	18.68308	0.003298	-46.5266	0.970954	-175.397
13400MHz	0.989128	-178.93	0.156351	18.52776	0.00326	-46.3658	0.971317	-175.431
13500MHz	0.989224	-178.944375	0.154041	18.37472	0.003223	-46.1989	0.971672	-175.464



Typical Die S-Parameters

(Small Signal, $V_{DS} = 28\text{ V}$, $I_{DQ} = 400\text{ mA}$, magnitude / angle)

Frequency	Mag S11	Ang S11	Mag S21	Ang S21	Mag S12	Ang S12	Mag S22	Ang S22
13600MHz	0.974996	-177.047	0.402075	24.27448	0.007443	-45.4096	0.93402	-169.818
13700MHz	0.975184	-177.071	0.396785	24.10007	0.007383	-45.3912	0.934747	-169.878
13800MHz	0.975368	-177.094851	0.391597	23.92772	0.007324	-45.3695	0.935461	-169.938
13900MHz	0.97555	-177.118699	0.386508	23.7574	0.007265	-45.3447	0.936162	-169.997
14000MHz	0.975728	-177.142339	0.381516	23.58909	0.007207	-45.3168	0.936852	-170.056
14100MHz	0.975904	-177.165774	0.376618	23.42274	0.007149	-45.2857	0.93753	-170.114
14200MHz	0.976076	-177.189007	0.371813	23.25833	0.007092	-45.2514	0.938196	-170.172
14300MHz	0.976246	-177.212041	0.367097	23.09584	0.007036	-45.2141	0.938851	-170.229
14400MHz	0.976413	-177.234877	0.362468	22.93522	0.00698	-45.1737	0.939495	-170.285
14500MHz	0.976577	-177.25752	0.357925	22.77645	0.006924	-45.1302	0.940128	-170.341
14600MHz	0.976739	-177.27997	0.353466	22.61951	0.00687	-45.0836	0.94075	-170.397
14700MHz	0.976898	-177.302232	0.349088	22.46436	0.006815	-45.0339	0.941362	-170.452
14800MHz	0.977054	-177.324308	0.34479	22.31097	0.006762	-44.9813	0.941964	-170.507
14900MHz	0.977208	-177.346199	0.340569	22.15933	0.006708	-44.9255	0.942556	-170.561
15000MHz	0.97736	-177.367909	0.336424	22.0094	0.006655	-44.8668	0.943139	-170.614
15100MHz	0.977509	-177.38944	0.332354	21.86116	0.006603	-44.805	0.943711	-170.667
15200MHz	0.977655	-177.410795	0.328355	21.71458	0.006551	-44.7403	0.944275	-170.72
15300MHz	0.9778	-177.431975	0.324428	21.56964	0.0065	-44.6725	0.944829	-170.772
15400MHz	0.977942	-177.452983	0.320569	21.42632	0.006449	-44.6017	0.945374	-170.824
15500MHz	0.978082	-177.473821	0.316778	21.28459	0.006399	-44.528	0.945911	-170.875
15600MHz	0.978219	-177.494492	0.313053	21.14443	0.006349	-44.4512	0.946439	-170.926
15700MHz	0.978355	-177.514998	0.309392	21.00581	0.0063	-44.3715	0.946958	-170.976
15800MHz	0.978488	-177.53534	0.305794	20.86872	0.006251	-44.2888	0.947469	-171.026
15900MHz	0.97862	-177.555522	0.302258	20.73313	0.006202	-44.2032	0.947972	-171.075
16000MHz	0.978749	-177.575545	0.298782	20.59901	0.006154	-44.1146	0.948467	-171.124
16100MHz	0.978876	-177.595	0.295365	20.46636	0.006107	-44.023	0.948955	-171.172
16200MHz	0.979002	-177.615122	0.292006	20.33515	0.006059	-43.9284	0.949434	-171.221
16300MHz	0.979125	-177.634681	0.288703	20.20535	0.006013	-43.8309	0.949907	-171.268
16400MHz	0.979247	-177.654	0.285455	20.07696	0.005966	-43.7304	0.950372	-171.315
16500MHz	0.979367	-177.673348	0.282261	19.94994	0.00592	-43.627	0.950829	-171.362
16600MHz	0.979485	-177.69246	0.27912	19.82429	0.005875	-43.5206	0.95128	-171.409
16700MHz	0.979601	-177.711	0.27603	19.69998	0.00583	-43.4113	0.951724	-171.455
16800MHz	0.979715	-177.730253	0.272991	19.57699	0.005785	-43.299	0.952161	-171.5
16900MHz	0.979828	-177.748936	0.270001	19.45531	0.005741	-43.1837	0.952591	-171.545
17000MHz	0.979939	-177.76748	0.26706	19.33491	0.005697	-43.0655	0.953015	-171.59
17100MHz	0.980049	-177.785886	0.264166	19.21579	0.005654	-42.9443	0.953433	-171.635
17200MHz	0.980157	-177.804156	0.261318	19.09792	0.005611	-42.8201	0.953844	-171.679
17300MHz	0.980263	-177.822293	0.258516	18.98129	0.005568	-42.6929	0.954249	-171.722
17400MHz	0.980368	-177.840297	0.255758	18.86588	0.005526	-42.5628	0.954648	-171.766

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