GaN/SiC Bare Die Power HEMT

DC-15 GHz

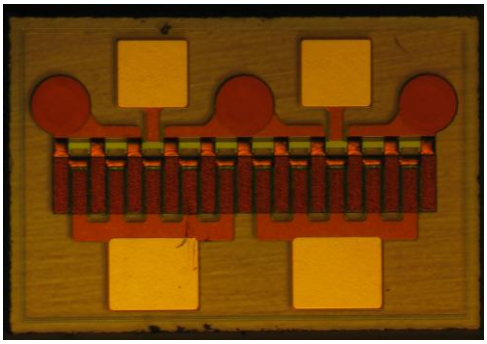
AM025WN-00-R

January 2015

Rev 1

DESCRIPTION

AMCOM's AM025WN-00-R is a discrete GaN/SiC HEMT that has a total gate width of 2.5mm (Two 1.25mm FETs in parallel). It is a bare die which can be operated up to 15 GHz. It can provide a typically saturated power of 40.5 dBm. This part is RoHS compliant.



FEATURES

- High Frequency Operation up to 15GHz
- Gain=21dB at 2GHz
- PAE=53%
- P_{5dB}=40.5 dBm

APPLICATIONS

- Cellular Radio Base Stations
- WLAN, Repeaters
- C-Band VSAT
- Radar
- Test Instrumentation
- Military

TYPICAL RF PERFORMANCE (CW)

FREQUENCY	2 (GHz)	10 (GHz)
P_{5dB} (dBm)	40.5	40.1
PAE @ P_{5dB}	53%	42%
Small Signal Gain (dB)	21	12
Load Reflection Coeff. (Per 1.25mm cell)	0.19∠101°	0.61∠141°

*(V_{ds} =28V, I_{ds} = 375mA)

**Bond wires are not included and the reference line is 75 microns from the edge of the bonding pad towards the device.

ABSOLUTE MAXIMUM RATING

Parameters	Symbol	Rating
Drain-Source Voltage (V)	V_{ds}	40
Gate-Source Voltage (V)	V_{gs}	-6
Drain Current (mA)	I_{ds}	1000
Continuous Dissipation At Room Temp. (W)	P_t	41.4
Operating Temp. (^oC)	T_A	-55 to +85
Max. Channel Temp. (^oC)	T_{ch}	+200

DC PARAMETERS

Parameters	Conditions	MIN	TYP	MAX
Saturation Current I_{dss} (mA)	V_{ds}=10V, V_{gs} =0V	1250	2000	2850
Pinch-off Voltage V_p (V)	V_{ds}=10V, Ids=2.5% I_{dss}	-3.9	-2.9	-1.9
Drain to Gate Breakdown Voltage BV_{gd} (V)	I_{dg} = 1 mA/mm	90	120	-
Thermal Resistance ($^oC/W$)		-	4.23	-

E-mail: info@amcomusa.com
http://www.amcomusa.com
Tel. (301) 353-8400 Fax. (301) 353-8401
401 Professional Drive, Gaithersburg, MD 20879

SMALL SIGNAL MEASUREMENTS *

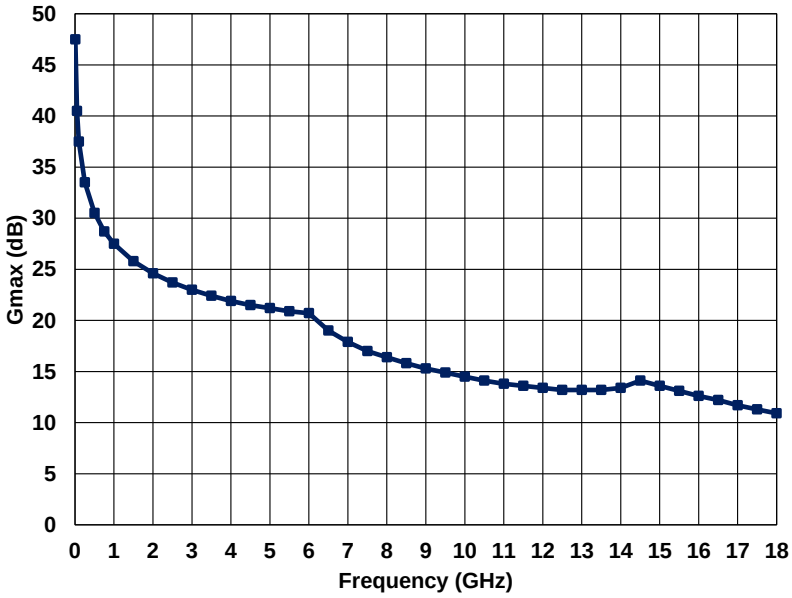
S-Parameters for AM025WN-00-R. V_{ds} =28V, V_{gs} = -2.35V, I_{ds} = 375mA*

Freq(GHz)	MAG(S11)	ANG(S11)	MAG(S21)	ANG(S21)	MAG(S12)	ANG(S12)	MAG(S22)	ANG(S22)
0.01	0.999	-2.177	32.57	174.77	0.001	86.629	0.195	-16.145
0.1	0.989	-21.494	31.747	165.62	0.006	77.898	0.2	-36.354
0.5	0.915	-86.758	22.508	128.67	0.02	42.982	0.32	-108.4
1	0.875	-124.07	14.094	106.44	0.025	23.318	0.385	-133.9
1.5	0.864	-140.94	9.884	94.363	0.026	13.871	0.416	-142.28
2	0.862	-150.16	7.503	85.984	0.026	8.195	0.441	-145.56
2.5	0.863	-155.94	5.989	79.31	0.026	4.332	0.466	-146.99
3	0.866	-159.91	4.943	73.587	0.025	1.56	0.492	-147.73
3.5	0.869	-162.85	4.178	68.477	0.024	-0.424	0.518	-148.26
4	0.873	-165.13	3.593	63.805	0.023	-1.749	0.544	-148.79
4.5	0.877	-167	3.131	59.478	0.022	-2.465	0.569	-149.37
5	0.882	-168.57	2.757	55.434	0.021	-2.573	0.594	-150.04
5.5	0.886	-169.94	2.449	51.637	0.02	-2.052	0.618	-150.78
6	0.89	-171.17	2.191	48.059	0.019	-0.861	0.641	-151.59
6.5	0.894	-172.28	1.972	44.679	0.017	1.045	0.662	-152.45
7	0.898	-173.32	1.785	41.48	0.016	3.71	0.682	-153.34
7.5	0.902	-174.28	1.623	38.449	0.016	7.157	0.7	-154.25
8	0.906	-175.2	1.482	35.574	0.015	11.367	0.718	-155.17
8.5	0.909	-176.07	1.358	32.844	0.014	16.26	0.733	-156.08
9	0.912	-176.91	1.25	30.25	0.014	21.678	0.748	-156.99
9.5	0.915	-177.73	1.153	27.782	0.014	27.394	0.761	-157.89
10	0.917	-178.51	1.068	25.434	0.014	33.143	0.774	-158.76
10.5	0.92	-179.28	0.991	23.197	0.015	38.672	0.785	-159.62
11	0.922	179.97	0.922	21.065	0.015	43.783	0.796	-160.46
11.5	0.924	179.24	0.861	19.032	0.016	48.358	0.805	-161.28
12	0.926	178.51	0.805	17.093	0.017	52.354	0.814	-162.07
12.5	0.928	177.8	0.755	15.242	0.018	55.78	0.822	-162.84
13	0.929	177.1	0.709	13.475	0.019	58.679	0.83	-163.59
13.5	0.931	176.41	0.667	11.788	0.02	61.112	0.837	-164.31
14	0.932	175.72	0.629	10.177	0.022	63.142	0.843	-165.02
14.5	0.933	175.04	0.594	8.639	0.023	64.827	0.849	-165.7
15	0.934	174.37	0.562	7.17	0.025	66.223	0.855	-166.37
15.5	0.935	173.69	0.533	5.768	0.026	67.377	0.86	-167.01
16	0.935	173.02	0.505	4.43	0.028	68.327	0.864	-167.64
16.5	0.936	172.35	0.48	3.155	0.029	69.11	0.869	-168.25
17	0.936	171.68	0.457	1.94	0.031	69.751	0.873	-168.84
17.5	0.937	171.01	0.436	0.784	0.032	70.275	0.876	-169.42
18	0.937	170.34	0.416	-0.314	0.034	70.7	0.88	-169.99

*Notes:

1) Bond wires are not included and the reference line is 75 microns from the edge of the bonding pad towards the device.
2) S2P file downloadable from the web : http://www.amcomusa.com/products/rftrans.html

MAXIMUM AVAILABLE GAIN (Gmax) 28V/375 mA



POWER DATA (CW)

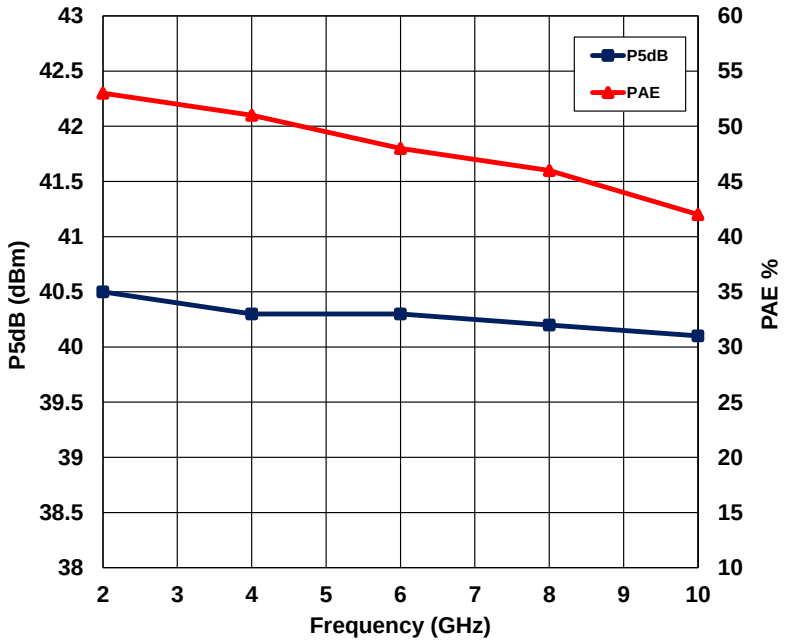
1) Optimum P_{SAT} tune (V_{ds} =28V, I_{ds} = 375mA) *

Frequency	SOURCE Γ (per 1.25 mm cell)	LOAD Γ (per 1.25 mm cell)	Gain (dB)	P_{1dB} (dBm)	P_{5dB} (dBm)	PAE @ P_{5dB}
2 GHz	0.8∠101°	0.19∠101°	21	38.9	40.5	53%
4 GHz	0.8∠131°	0.36∠113°	18	37.8	40.3	51%
6 GHz	0.81∠141°	0.44∠125°	14.5	37.3	40.3	48%
8 GHz	0.8∠165°	0.54∠138°	14	37	40.2	46%
10 GHz	0.75∠170°	0.61∠141°	12	36	40.1	42%

*Notes:

1) Source tuning has effect on P_{1dB} & small signal gain, and the source points in this table is a compromise between high gain and high P_{1dB} at that frequency.
2) Bond wires are not included and the reference line is 75 microns from the edge of the bonding pad towards the device.
3) AM025WN-00-R is 2.5mm device which consists of two 1.25mm cells in parallel.

Optimum P_{SAT} tune (28V/ 375 mA)



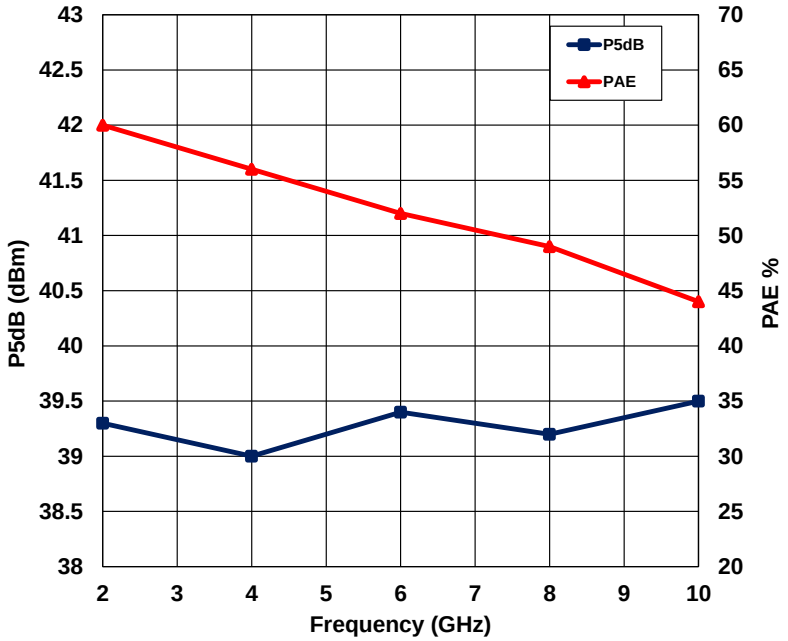
2) Optimum PAE tune (V_{ds} =28V, I_{ds} = 375mA) *

Frequency	SOURCE Γ (per 1.25 mm cell)	LOAD Γ (per 1.25 mm cell)	Gain (dB)	P_{1dB} (dBm)	P_{5dB} (dBm)	PAE @ P_{5dB}
2 GHz	0.8∠101°	0.54∠67°	22	38.1	39.3	60%
4 GHz	0.8∠131°	0.63∠92°	17	36.8	39	56%
6 GHz	0.81∠141°	0.65∠108°	14	36.7	39.4	52%
8 GHz	0.8∠165°	0.7∠131°	14	36.3	39.2	49%
10 GHz	0.75∠170°	0.72∠134°	12	36	39.5	44%

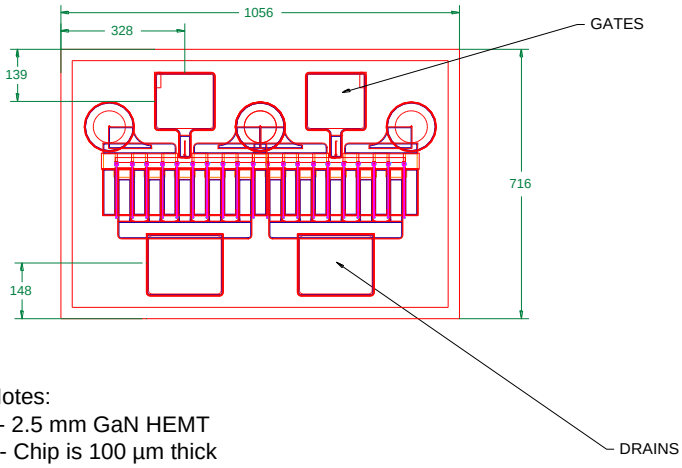
*Notes:

1) Source tuning has effect on P_{1dB} & small signal gain, and the source points in this table is a compromise between high gain and high P_{1dB} at that frequency.
2) Bond wires are not included and the reference line is 75 microns from the edge of the bonding pad towards the device.
3) AM025WN-00-R is 2.5mm device which consists of two 1.25mm cells in parallel.

Optimum PAE tune (28V/ 375 mA)



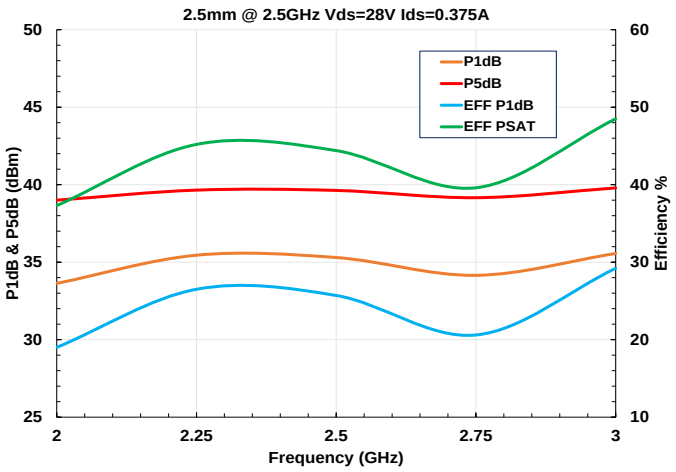
CHIP OUTLINE

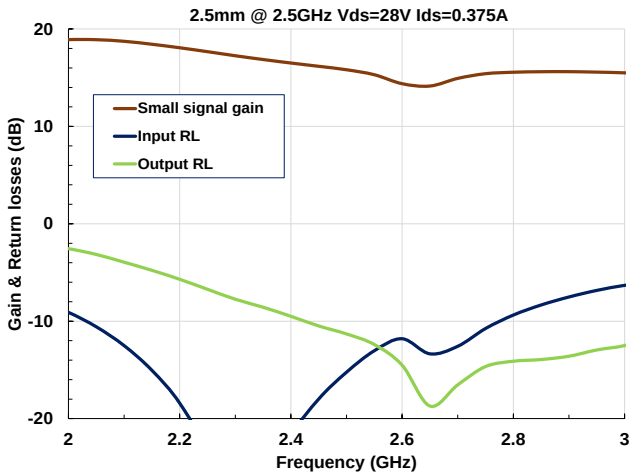


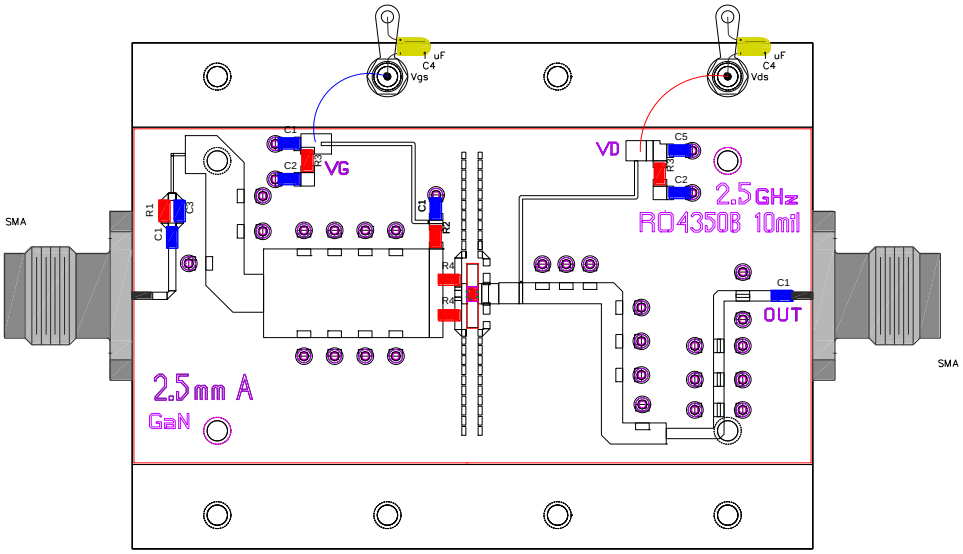
Notes:
1- 2.5 mm GaN HEMT
2- Chip is 100 µm thick
3- Dimensions in microns
4- Use eutectic bonding Au85Sn15 at 290°C

TEST CIRCUIT

28V/375mA







Notes:
1- 10mils Rogers 4350 Material (LoPro)
2- Ckt is for 2.5mm mask71 @ 2.5GHz
3- C1=100pF, C2=1000pF, C3=2.2pF, C4=1uF, C5=47pF
R1=18ohms, R2=470ohms, R3=22ohms, R4=3ohms
4- All Caps & Resistors are 0603 size