



GaN-HEMT 20W

EGN21C020MK

High Voltage - High Power GaN-HEMT

FEATURES

- High Voltage Operation : $V_{DS}=50V$
- High Power : 43.5dBm (typ.) @ P_{sat}
- Power Gain : 19dB(typ.) @ $f=2.14GHz$
- Proven Reliability

DESCRIPTION

SEDI's GaN-HEMT offers high efficiency, ease of matching, greater consistency and broad bandwidth for high power L-band amplifiers with 50V operation, and gives you higher gain.

This new product is ideally suited for use in 2.1GHz W-CDMA design requirements as it offers high gain, long term reliability and ease of use.



ABSOLUTE MAXIMUM RATINGS (Case Temperature $T_c=25^{\circ}C$)

Item	Symbol	Condition	Rating	Unit
Operating-Voltage	V_{DS}		55	V
Drain-Source Voltage	V_{DS}	$V_{GS}=-8V$	160	V
Gate-Source Voltage	V_{GS}		-15	V
Total Power Dissipation	P_t		32.1	W
Storage Temperature	T_{stg}		-65 to +175	$^{\circ}C$
Channel Temperature	T_{ch}		250	$^{\circ}C$

RECOMMENDED OPERATING CONDITION

Item	Symbol	Condition	Limit	Unit
DC Input Voltage	V_{DS}		≤ 55	V
Forward Gate Current	I_{GF}	$R_G=15\Omega$	≤ 46	mA
Reverse Gate Current	I_{GR}	$R_G=15\Omega$	≥ -0.7	mA
Channel Temperature	T_{ch}		≤ 180	$^{\circ}C$
Average Output Power	$P_{ave.}$		≤ 40.5	dBm

ELECTRICAL CHARACTERISTICS (Case Temperature $T_c=25^{\circ}C$)

Item	Symbol	Condition	Limit			Unit
			min.	Typ.	Max.	
Pinch-Off Voltage	V_p	$V_{DS}=50V$ $I_{DS}=5.2mA$	-1.0	-1.5	-2.0	V
Saturated Power	$P_{sat} *1$	$V_{DS}=50V$	42.5	43.5	-	dBm
Drain Efficiency	$\eta_d *2$	$I_{DS}(DC)=100mA$	10.5	12.5	-	%
Power Gain	$G_p *2$	$f=2.14GHz$	18.0	19.0	-	dB
Thermal Resistance	R_{th}	Channel to Case at 21W P_{DC}	-	6.0	7.0	$^{\circ}C/W$

*1 : 10%-duty RF pulse (DC supply constant)

*2 : $P_{out} = 30dBm$, CW



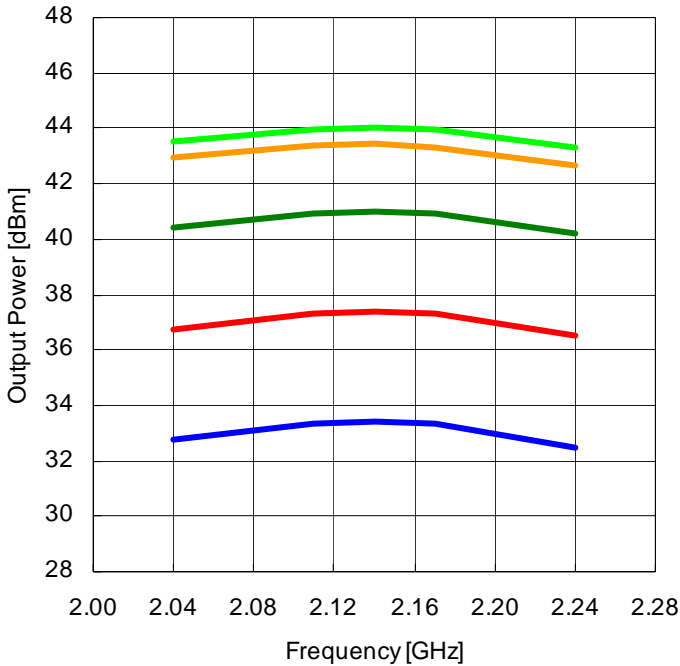
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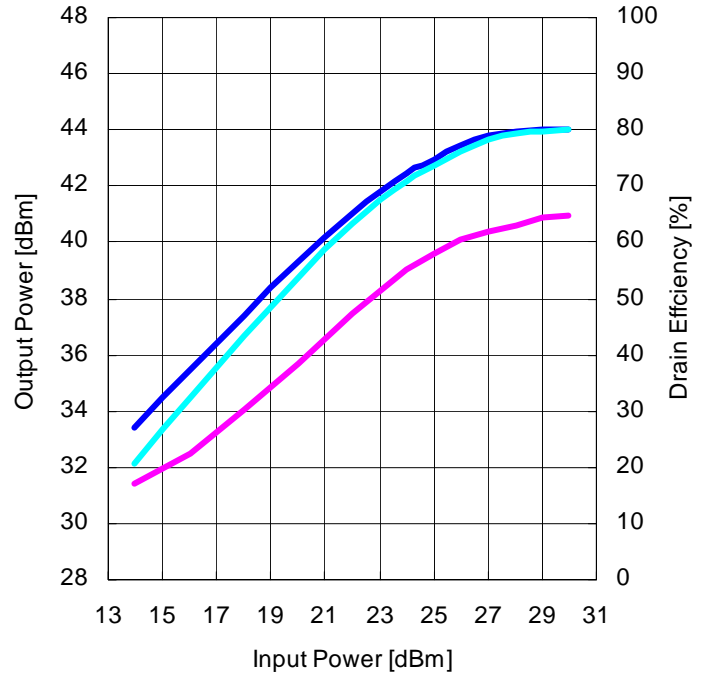
RF characteristics @f=2.14GHz fine tuned

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Output Power vs. Frequency
V_{DS}=50V, I_{DS(DC)}=100mA



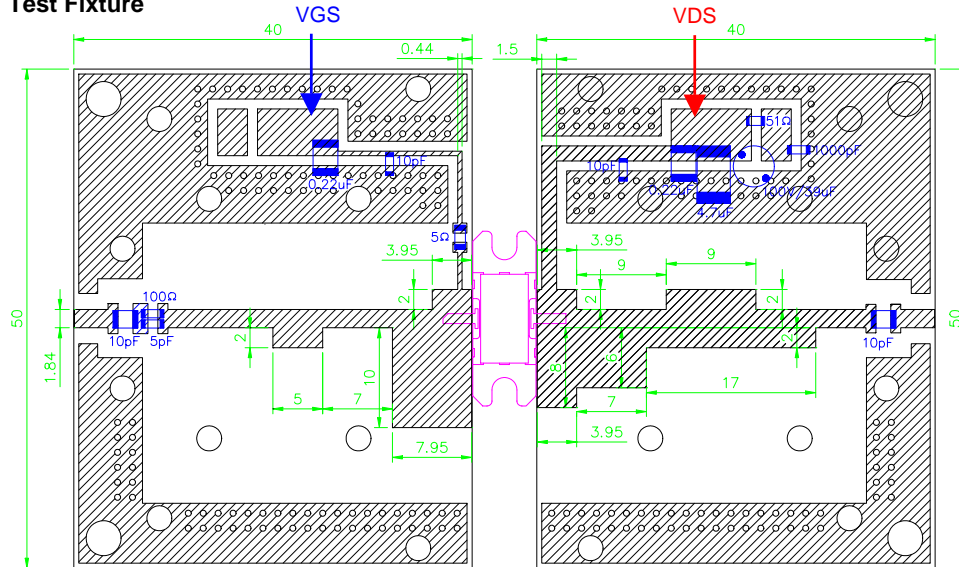
Output Power and Drain Efficiency vs. Input Power
V_{DS}=50V, I_{DS(DC)}=100mA, f=2.14GHz



Pin=14dBm Pin=18dBm Pin=22dBm
Pin=26dBm Pin=30dBm

Pout (class AB) Pout (class B) Nd (class B)
Pulse Signal (10%-duty, DC : constant)

Test Fixture



h=0.8mm εr=3.5
Cu=18um Unit:mm

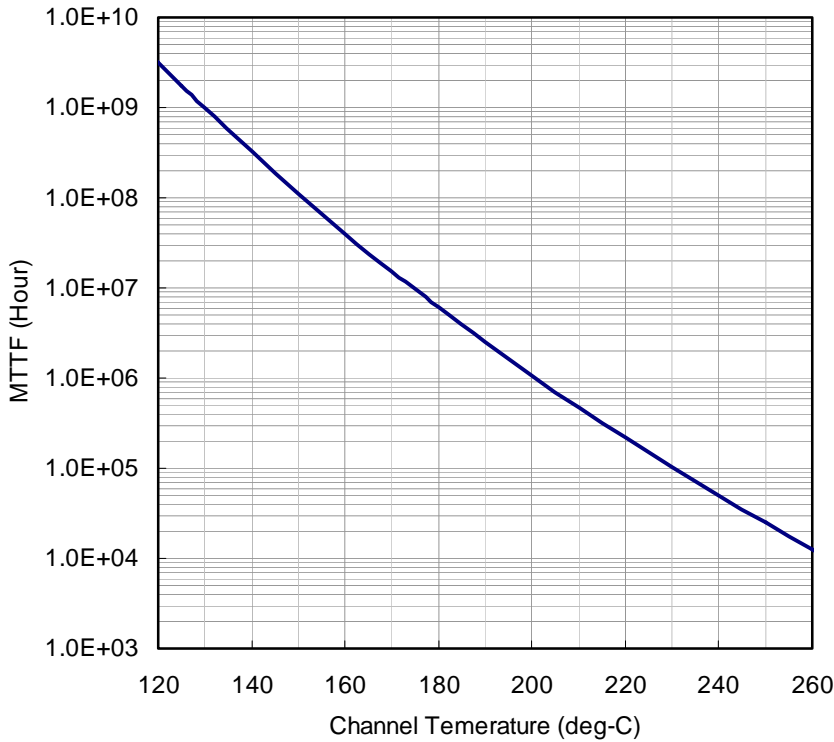


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MTTF Calculation
- Estimated MTTF -



Ea=1.6eV
Confidence Level=90%

Channel Temp (deg-C)	MTTF (Hours)
160	4.05 x 10 ⁷
180	6.07 x 10 ⁶
200	1.07 x 10 ⁶

$$AF = \exp\left[-\frac{Ea}{k}\left(\frac{1}{T_{stress}} - \frac{1}{T_{use}}\right)\right]$$

$$MTTF_{use} = MTTF_{stress} * AF$$

Where;

AF: acceleration factor

Ea: activation energy (1.6 eV)

k: Boltzman's constant (8.62 x 10⁻⁵ eV/K)

T_{stress}: stress temperature (K)

T_{use}: use temperature (K)

ESD characteristic

Test Methodology	Class
Human Body Model (per JESD22-A114)	0
Machine Model (per JEI/ESD22-A115)	A



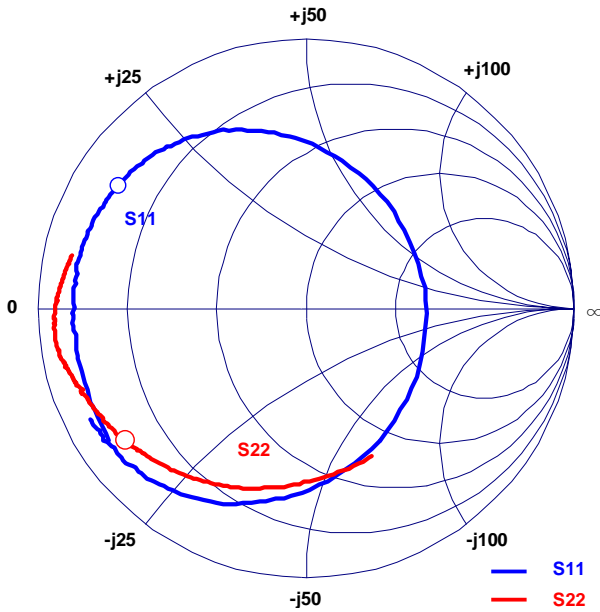
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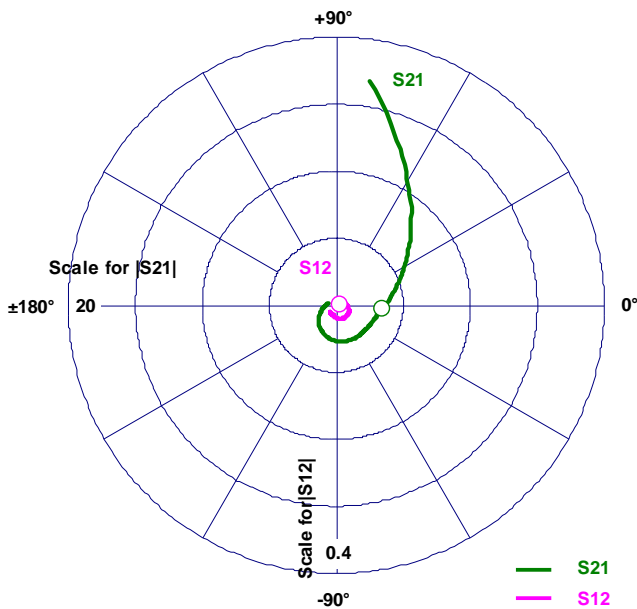
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- Reference DATA -

S-Parameters @V_{DS}=50V, I_{DS(DC)}=100mA, f=0.5 to 5.5GHz
Z_I = Z_s = 50 ohm Marker : 2.14GHz



Freq. GHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.50	0.88	-146.18	16.94	81.44	0.010	5.38	0.60	-66.00
0.60	0.88	-154.55	14.18	73.42	0.011	-4.66	0.61	-73.24
0.70	0.87	-161.40	12.14	65.99	0.011	-5.37	0.62	-80.40
0.80	0.87	-166.49	10.47	59.51	0.010	-11.13	0.64	-87.36
0.90	0.87	-171.15	9.25	52.52	0.010	-15.60	0.66	-94.01
1.00	0.87	-175.53	8.13	47.24	0.009	-15.56	0.68	-100.12
1.10	0.87	-178.91	7.31	41.29	0.008	-18.70	0.69	-105.62
1.20	0.87	-177.35	6.64	36.41	0.008	-22.14	0.71	-110.46
1.30	0.86	-173.92	6.02	31.34	0.007	-21.64	0.73	-115.24
1.40	0.87	-170.69	5.50	26.41	0.007	-14.40	0.74	-119.58
1.50	0.87	-167.62	5.08	21.68	0.006	-18.14	0.76	-123.69
1.60	0.86	-164.64	4.70	17.45	0.007	-15.73	0.77	-127.50
1.70	0.86	-161.32	4.39	12.82	0.006	-13.23	0.78	-130.99
1.80	0.86	-158.57	4.10	9.15	0.006	-8.54	0.80	-134.32
1.90	0.85	-155.12	3.87	4.41	0.006	-6.30	0.81	-137.36
2.00	0.84	-152.07	3.66	0.54	0.005	-5.60	0.82	-140.28
2.10	0.84	-149.07	3.49	-3.39	0.005	4.54	0.83	-142.73
2.20	0.83	-145.33	3.34	-7.11	0.005	9.44	0.84	-145.20
2.30	0.83	-142.42	3.20	-11.26	0.006	10.56	0.85	-147.43
2.40	0.81	-138.40	3.12	-15.01	0.007	18.87	0.86	-149.55
2.50	0.81	-134.15	3.02	-19.73	0.008	15.70	0.86	-151.73
2.60	0.79	-129.94	2.95	-24.18	0.008	18.41	0.87	-153.68
2.70	0.77	-124.87	2.90	-28.52	0.009	10.65	0.88	-155.43
2.80	0.75	-119.63	2.83	-32.99	0.010	23.07	0.88	-157.04
2.90	0.72	-113.60	2.84	-38.73	0.011	15.95	0.89	-158.52
3.00	0.69	-106.31	2.80	-43.13	0.011	14.77	0.89	-160.01
3.10	0.65	-98.33	2.80	-49.69	0.013	10.31	0.90	-161.33
3.20	0.61	-87.98	2.81	-55.45	0.015	6.57	0.90	-162.74
3.30	0.56	-76.44	2.80	-62.29	0.016	-0.10	0.91	-164.01
3.40	0.52	-60.95	2.77	-69.66	0.017	-2.46	0.92	-165.14
3.50	0.47	-42.98	2.77	-77.81	0.019	-8.38	0.92	-166.64
3.60	0.45	-21.46	2.67	-85.91	0.020	-18.74	0.93	-167.78
3.70	0.45	-2.47	2.61	-95.63	0.021	-26.56	0.94	-169.27
3.80	0.47	-26.11	2.48	-104.03	0.022	-34.29	0.94	-170.44
3.90	0.52	-46.95	2.33	-113.69	0.022	-42.69	0.94	-172.08
4.00	0.58	-64.96	2.15	-121.91	0.022	-52.06	0.94	-173.41
4.10	0.63	-79.35	1.97	-130.15	0.023	-62.15	0.94	-174.74
4.20	0.69	-91.24	1.78	-137.39	0.022	-70.06	0.94	-176.23
4.30	0.73	-101.75	1.62	-144.45	0.021	-77.96	0.94	-177.46
4.40	0.77	-109.58	1.46	-149.99	0.020	-83.26	0.94	-178.81
4.50	0.80	-116.64	1.32	-155.92	0.018	-94.04	0.94	-179.99
4.60	0.83	-122.60	1.20	-160.53	0.018	-99.05	0.93	-178.68
4.70	0.84	-127.59	1.09	-164.99	0.017	-103.89	0.93	-177.46
4.80	0.86	-132.05	1.00	-170.33	0.016	-107.20	0.93	-176.21
4.90	0.87	-135.91	0.92	-173.47	0.015	-111.91	0.92	-174.99
5.00	0.88	-139.53	0.84	-177.57	0.015	-119.02	0.92	-173.75
5.10	0.89	-142.60	0.78	-179.41	0.014	-121.97	0.91	-172.57
5.20	0.89	-145.72	0.72	-175.88	0.015	-125.04	0.91	-171.34
5.30	0.89	-148.03	0.68	-172.69	0.014	-126.75	0.90	-169.94
5.40	0.90	-150.59	0.64	-169.71	0.015	-133.39	0.90	-168.69
5.50	0.90	-152.95	0.60	-166.63	0.014	-134.49	0.90	-167.23





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MK Package Outline Metal-Ceramic Hermetic Package

