

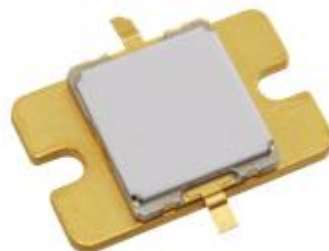
FEATURES

- High Voltage Operation : $V_{DS}=50V$
- High Power : 48.8dBm (typ.) @ P_{sat}
- High Efficiency : 60% (typ.) @ P_{sat}
- Power Gain : 15.5dB (typ.) @ $f=3.5GHz$
- Proven Reliability

DESCRIPTION

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

This new product is ideally suited for use in 3.5GHz WiMAX design requirements as it offers high gain, long term reliability and ease of use.

**ABSOLUTE MAXIMUM RATINGS (Case Temperature $T_c=25\text{deg.C}$)**

Item	Symbol	Condition	Rating	Unit
Operating Voltage	V_{DS}	$V_{GS}=-8V$	55	V
Drain-Source Voltage	V_{DS}		160	V
Gate-Source Voltage	V_{GS}		-15	V
Total Power Dissipation	P_t		75	W
Storage Temperature	T_{stg}		-65 to +175	deg.C
Channel Temperature	T_{ch}		250	deg.C

RECOMMENDED OPERATING CONDITION

Item	Symbol	Condition	Limit	Unit
DC Input Voltage	V_{DS}		≤ 55	V
Forward Gate Current	I_{GF}	$R_G=50\Omega$	≤ 76	mA
Reverse Gate Current	I_{GR}	$R_G=50\Omega$	≥ -2.6	mA
Channel Temperature	T_{ch}		≤ 180	deg.C
Average Output Power	P_{ave}		≤ 45.8	dBm

ELECTRICAL CHARACTERISTICS (Case Temperature $T_c=25\text{deg.C}$)

Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Pinch-Off Voltage	V_p	$V_{DS}=50V, I_{DS}=18mA$	-1.0	-1.5	-2.0	V
Saturated Power	$P_{sat} *1$	$V_{DS}=50V$	48.0	48.8	-	dBm
Drain Efficiency	$\eta_d *2$	$I_{DS}(DC)=300mA$	23.0	28.0	-	%
Power Gain	$G_p *2$	$f=3.5GHz$	14.5	15.5	-	dB
Thermal Resistance	R_{th}	Channel to Case at 48W PDC	-	2.5	3.0	deg.C/W

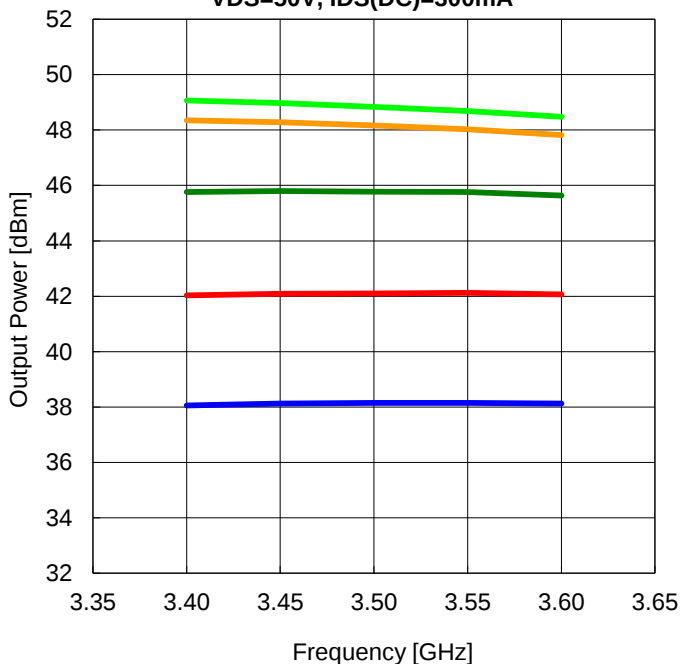
*1 : 10%-duty RF pulse (DC supply constant)

*2 : $P_{out}=40.8dBm$, CW modulation Signal (W-CDMA)

RoHS COMPLIANCE	Yes
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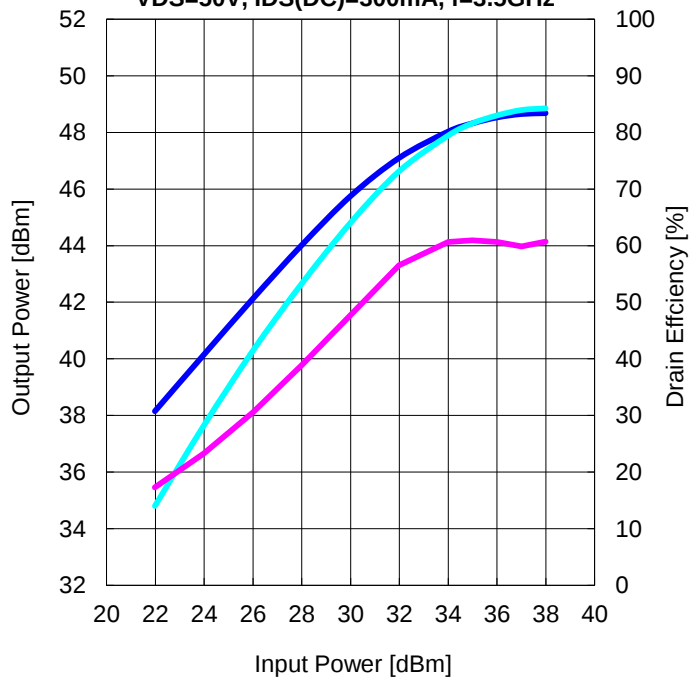
RF characteristics @f=3.5GHz fine tuned

Output Power vs. Frequency VDS=50V, IDS(DC)=300mA



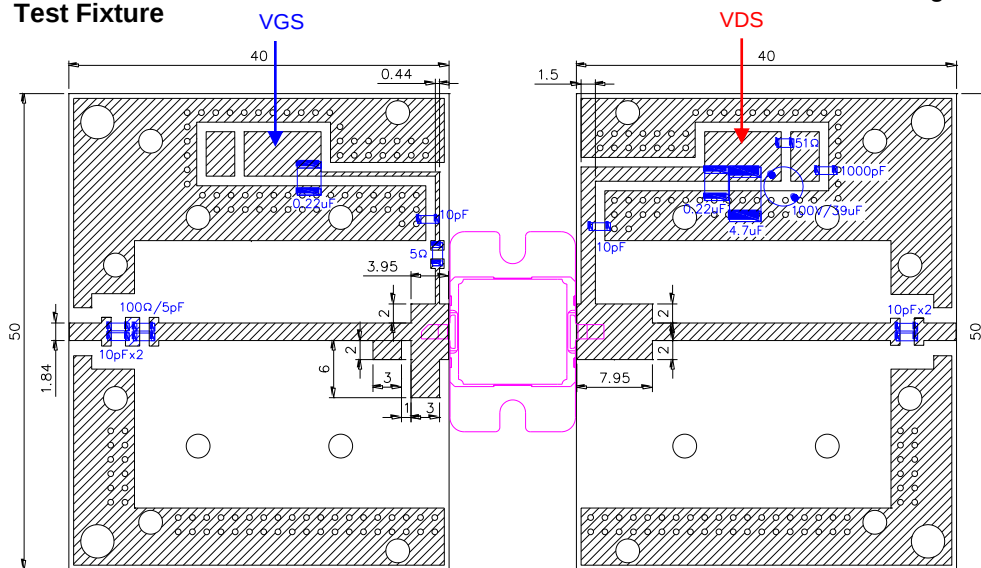
— Pin=22dBm — Pin=26dBm — Pin=30dBm
— Pin=34dBm — Pin=38dBm

Output Power and Drain Efficiency vs. Input Power
VDS=50V, IDS(DC)=300mA, f=3.5GHz



— Pout (class AB) — Pout (class B) — Nd (class B)

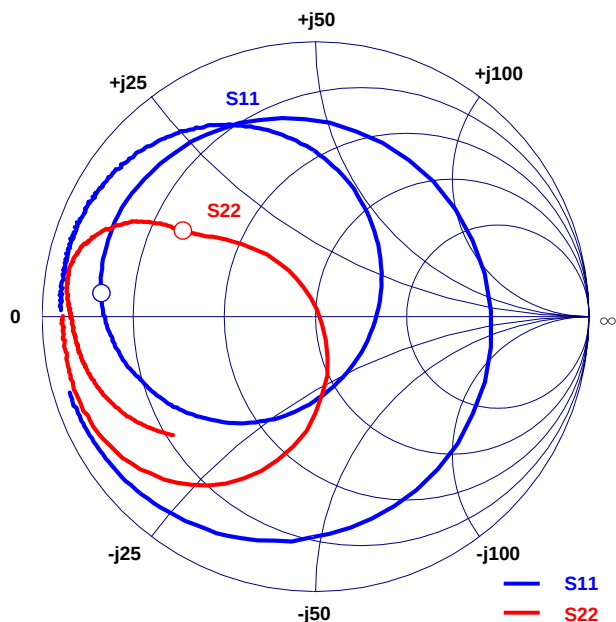
Test Fixture



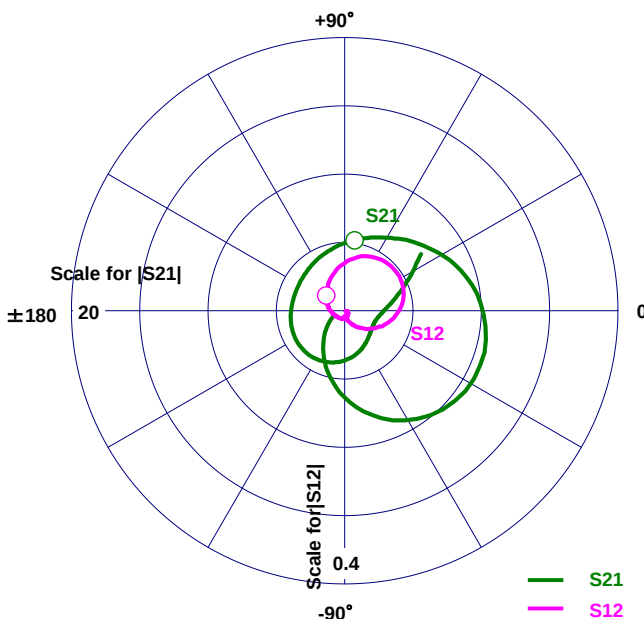
h=0.8mm $\epsilon_r=3.5$
Cu=18um Unit: mm

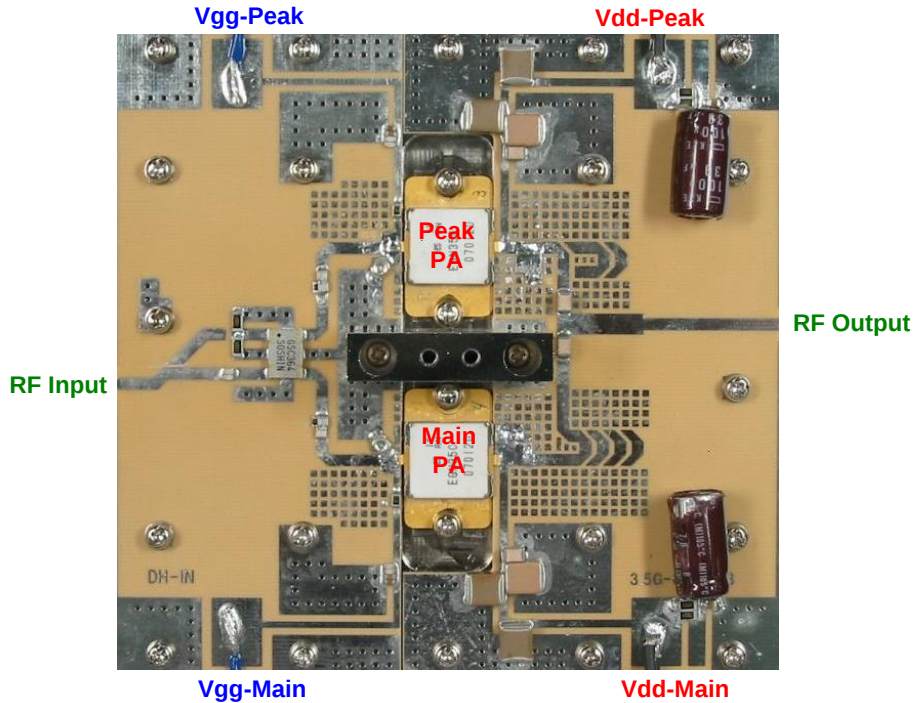
S-Parameters @VDS=50V, IDS(DC)=400mA, f=0.5 to 4.5GHz
Zl = Zs = 50ohm Marker : 3.5GHz

- Reference DATA -

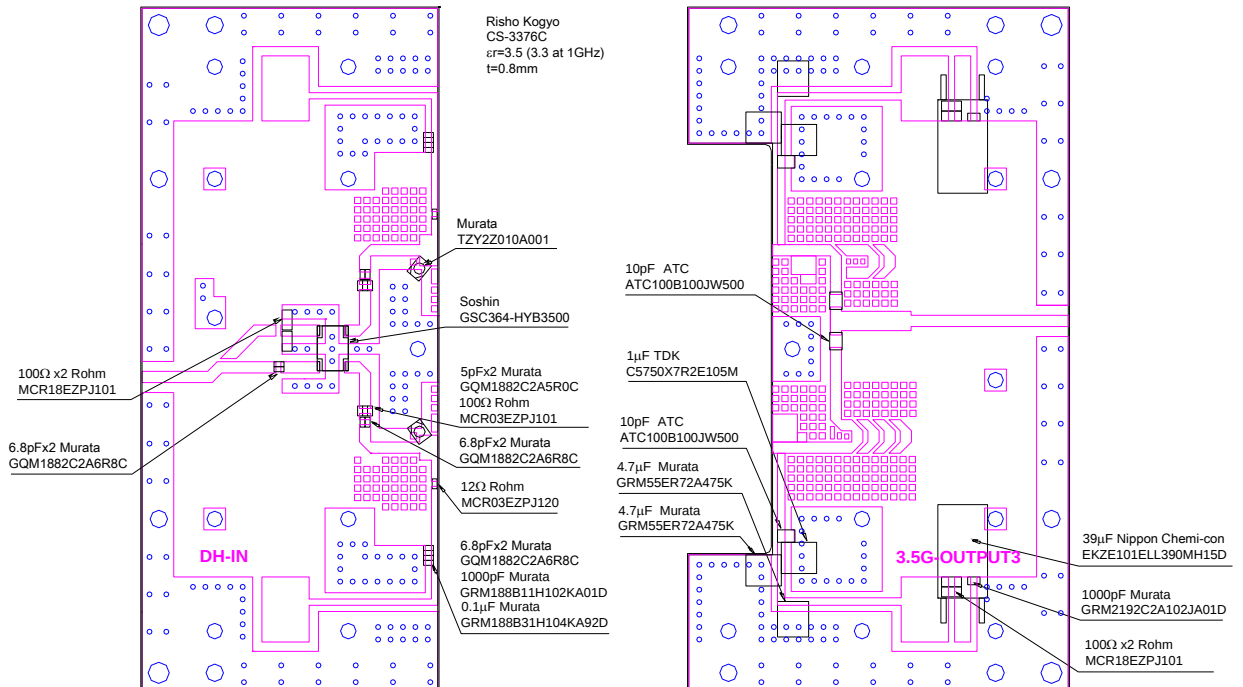


Freq. GHz	S11			S21			S12			S22		
	MAG	ANG		MAG	ANG		MAG	ANG		MAG	ANG	
0.50	0.93	178.53		6.96	36.56		0.005	-32.55		0.68	-140.42	
0.60	0.93	174.98		5.50	28.19		0.004	-39.59		0.73	-146.09	
0.70	0.93	171.49		4.50	20.62		0.004	-40.40		0.77	-150.92	
0.80	0.93	168.49		3.82	13.70		0.003	-42.98		0.80	-155.33	
0.90	0.93	165.68		3.30	7.39		0.003	-38.97		0.82	-158.81	
1.00	0.93	162.39		2.95	1.42		0.003	-42.64		0.84	-162.14	
1.10	0.93	159.36		2.70	-4.23		0.002	-38.13		0.85	-165.02	
1.20	0.93	155.96		2.53	-9.71		0.002	-27.66		0.86	-167.77	
1.30	0.92	151.86		2.41	-15.33		0.002	-26.07		0.87	-170.14	
1.40	0.91	148.26		2.35	-20.77		0.003	-14.45		0.88	-172.11	
1.50	0.90	143.93		2.35	-26.76		0.003	-19.07		0.88	-174.01	
1.60	0.88	139.00		2.37	-33.28		0.003	-20.17		0.88	-175.82	
1.70	0.86	133.60		2.46	-39.97		0.004	-17.61		0.89	-177.47	
1.80	0.84	126.93		2.59	-47.57		0.004	-26.20		0.89	-179.38	
1.90	0.80	118.91		2.79	-56.03		0.005	-26.01		0.89	-179.09	
2.00	0.73	108.96		3.05	-66.07		0.006	-30.32		0.90	-177.82	
2.10	0.64	96.23		3.36	-77.66		0.007	-38.49		0.91	-176.12	
2.20	0.52	79.20		3.67	-91.52		0.007	-53.68		0.92	-174.36	
2.30	0.38	55.26		3.95	-106.92		0.009	-63.48		0.91	-172.34	
2.40	0.24	13.84		4.12	-123.72		0.010	-81.56		0.92	-170.26	
2.50	0.22	-50.24		4.16	-140.32		0.011	-95.51		0.91	-168.13	
2.60	0.32	-94.14		4.11	-156.38		0.013	-109.91		0.90	-165.61	
2.70	0.43	-117.89		4.00	-171.12		0.013	-126.98		0.89	-163.19	
2.80	0.52	-133.27		3.89	-175.38		0.014	-137.17		0.87	-160.97	
2.90	0.59	-144.01		3.84	-162.82		0.015	-150.65		0.84	-158.71	
3.00	0.64	-152.85		3.85	-150.54		0.016	-160.42		0.81	-156.62	
3.10	0.68	-159.73		3.95	-138.19		0.018	-170.61		0.78	-154.23	
3.20	0.71	-165.79		4.13	-125.50		0.022	-177.75		0.73	-152.03	
3.30	0.74	-171.93		4.37	-111.99		0.025	-164.47		0.68	-150.14	
3.40	0.77	-178.40		4.74	-97.79		0.029	-152.73		0.63	-148.49	
3.50	0.79	-173.72		5.20	-82.02		0.035	-140.72		0.58	-147.15	
3.60	0.80	-162.42		5.94	-64.73		0.043	-124.44		0.51	-144.36	
3.70	0.80	-143.99		7.15	-44.40		0.057	-106.61		0.40	-137.77	
3.80	0.74	-106.12		9.26	-15.35		0.078	-79.59		0.16	-116.93	
3.90	0.64	-14.23		10.61	-33.65		0.095	-32.29		0.42	-94.51	
4.00	0.78	-80.59		7.10	-83.32		0.066	-15.63		0.83	-136.60	
4.10	0.88	-120.33		4.06	-110.74		0.039	-42.48		0.91	-156.65	
4.20	0.92	-139.13		2.54	-126.92		0.024	-59.54		0.92	-166.50	
4.30	0.93	-149.95		1.71	-137.96		0.016	-70.77		0.92	-172.78	
4.40	0.93	-157.29		1.23	-146.56		0.012	-80.41		0.92	-176.84	
4.50	0.94	-162.93		0.93	-154.04		0.008	-87.57		0.92	-179.85	





Test Fixture

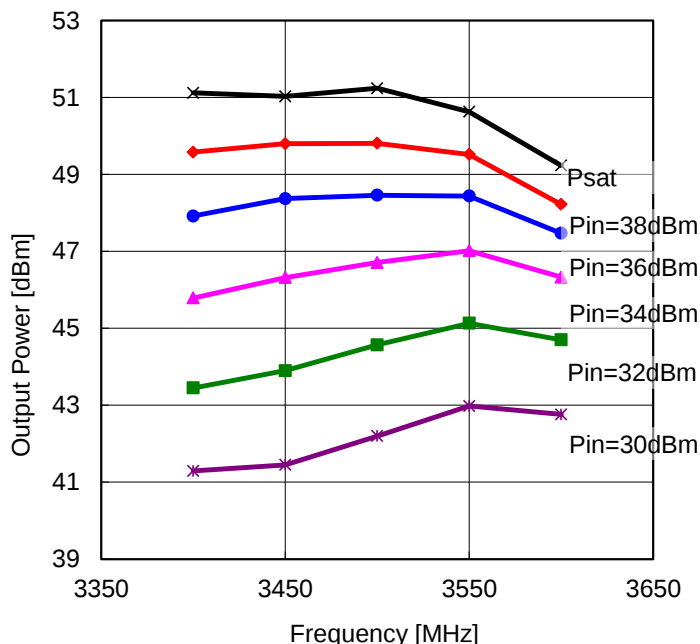
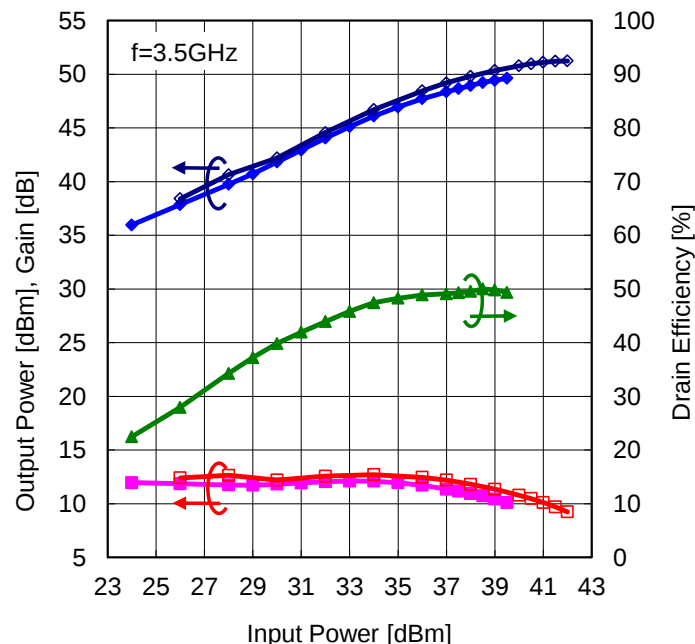


CS3376C, $t=0.8\text{mm}$, $\epsilon_r=3.5$

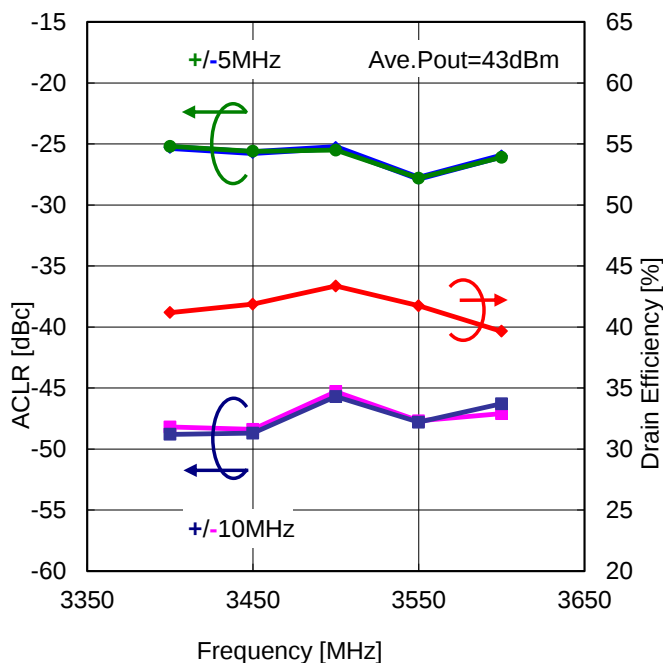
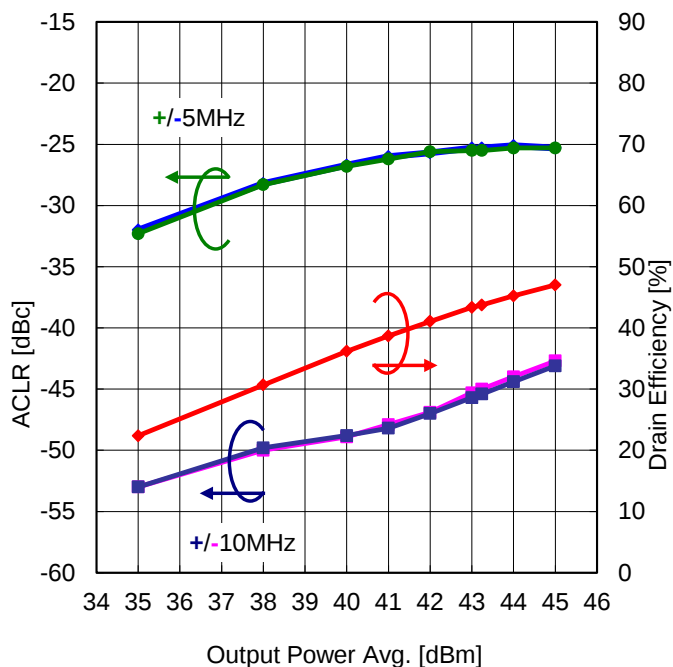
Doherty Amplifier characteristics

High Voltage - High Power GaN-HEMT

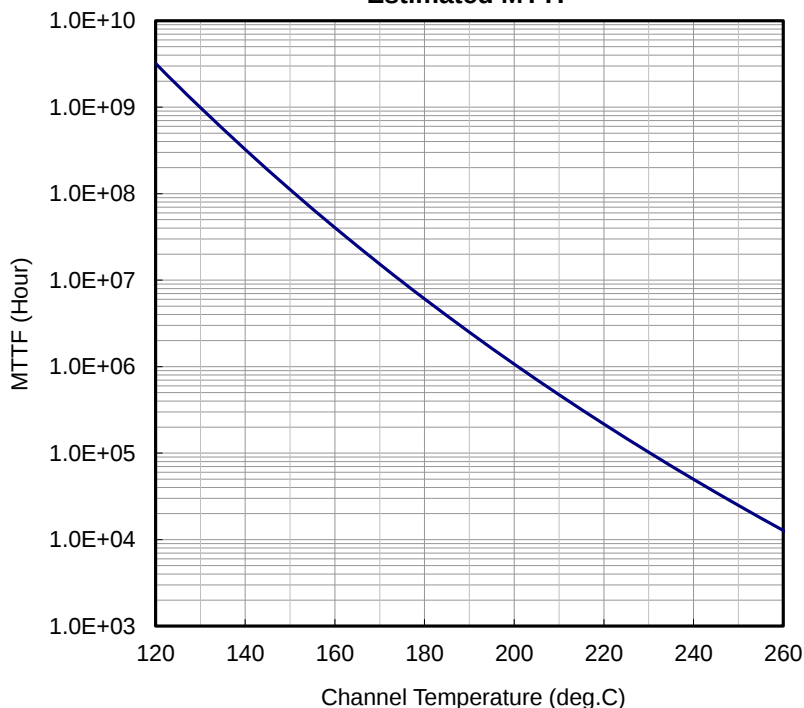
Test conditions : $V_{ds}=50V$, $I_{ds-main}=200mA$, $V_{gs-peak}=-3.5V$, Pulse Duty : 10% (6us/60us)



Test conditions : $V_{ds}=50V$, $I_{ds-main}=200mA$, $V_{gs-peak}=-3.5V$, W-CDMA 1-carrier, PAR=7.9dB(0.01%)



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

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

$$MTTF_{use} = MTTF_{stress} \times AF$$

Where;

AF : acceleration factor

Ea : activation energy (1.6eV)

k : Boltzmann's constant (8.62x10⁻⁵eV/K)

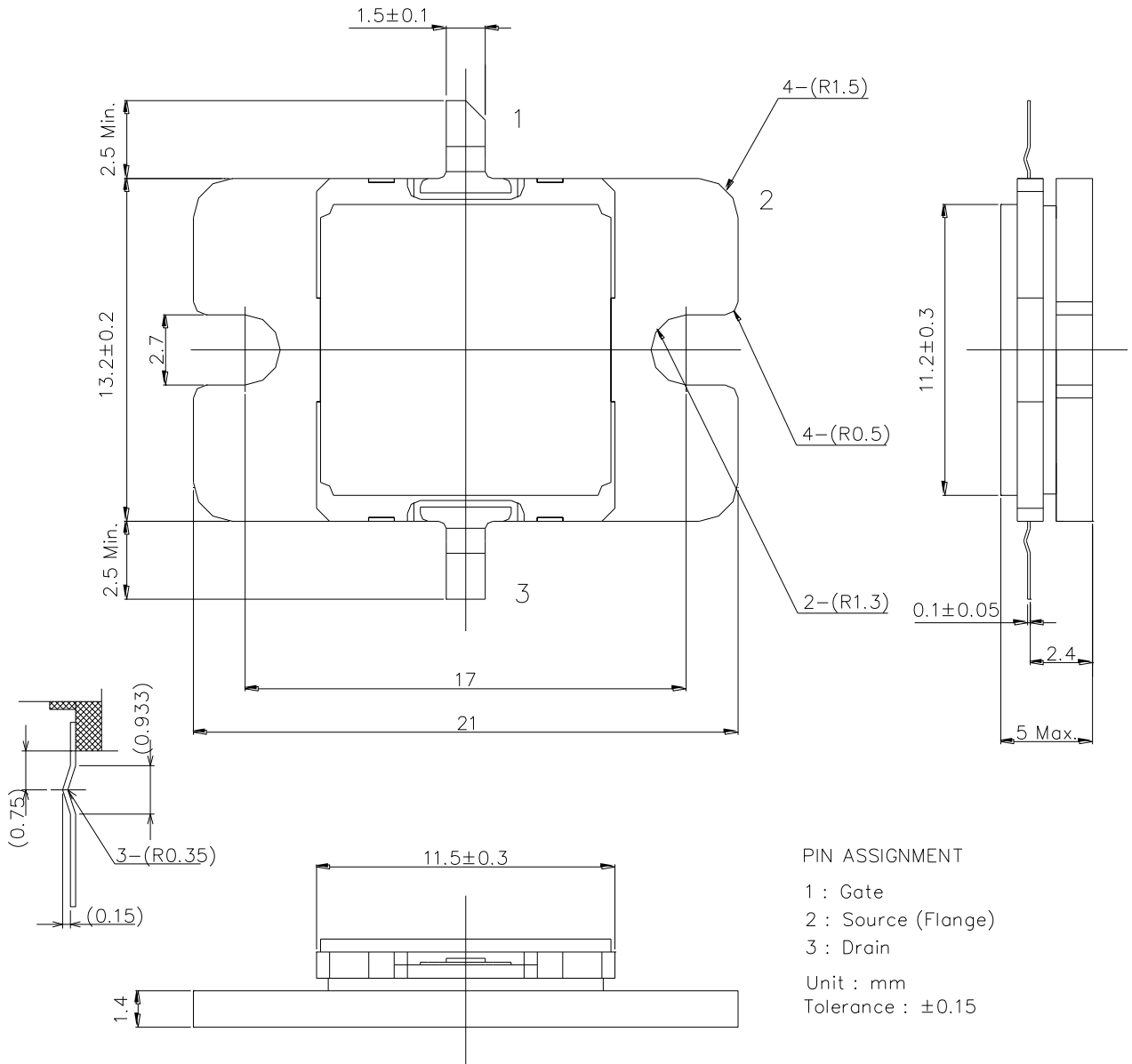
T_{stress} : stress temperature (K)

T_{use} : use temperature (K)

ESD characteristic

Test Methodology	Class
Human Body Model (per JESD22-A114)	1A
Machine Model (per JEIA/ESD22-A115)	A

I2D Package Outline Metal-Ceramic Hermetic Package





EGN35C070I2D

High Voltage - High Power GaN-HEMT

For further information please contact:

<http://global-sei.com/Electro-optic/about/office.html>