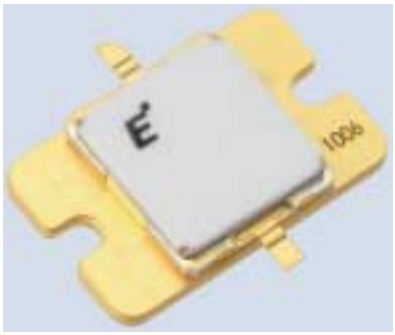
GaN-HEMT 75W

EGN35C070I2D

High Voltage - High Power GaN-HEMT



FEATURES

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

DESCRIPTION

SEDI's GaN-HEMT offers high efficiency, ease of matching, greater consistency and broad bandwidth for high power S-band 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 Tc=25ºC)

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		75	W
Storage Temperature	T_{stg}		-65 to +175	ºC
Channel Temperature	T_{ch}		250	ºC

RECOMMENDED OPERATING CONDITION

Item	Symbol	Condition	Limit	Unit
DC Input Voltage	V_{DS}		≤ 50	V
Forward Gate Current	I_{GF}	R_G=5Ω	≤ 76	mA
Reverse Gate Current	I_{GR}	R_G=5Ω	≥ -2.6	mA
Channel Temperature	T_{ch}		≤ 180	ºC
Average Output Power	Pave.		≤ 45.8	dBm

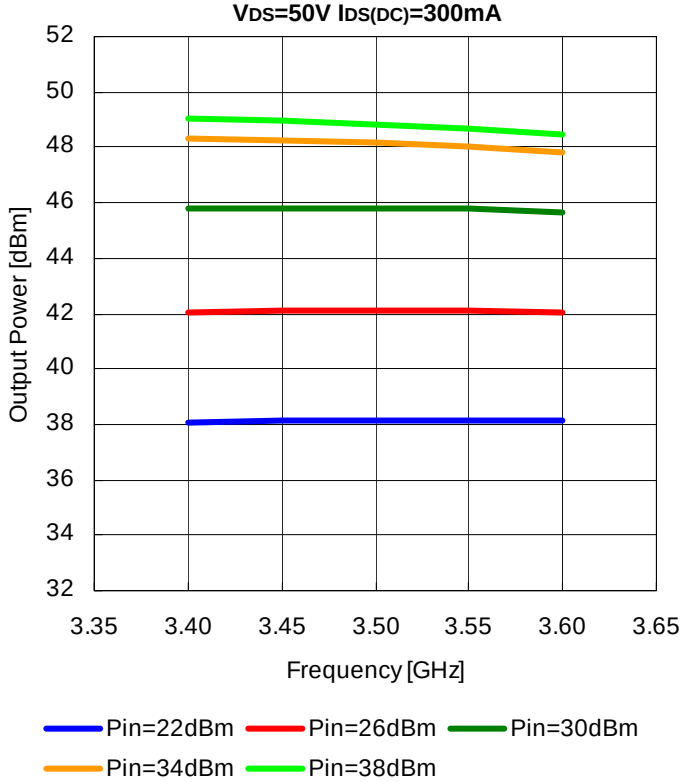
ELECTRICAL CHARACTERISTICS (Case Temperature Tc=25ºC)

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	Psat *1	V_{DS}=50V	48.0	48.8	-	dBm
Drain Efficiency	η_d *2	$I_{DS(DC)}$=300mA	23	28	-	%
Power Gain	Gp *2	f=3.50GHz	14.5	15.5	-	dB
Thermal Resistance	R_{th}	Channel to Case at 48W P_{DC}	-	2.5	3.0	ºC/W

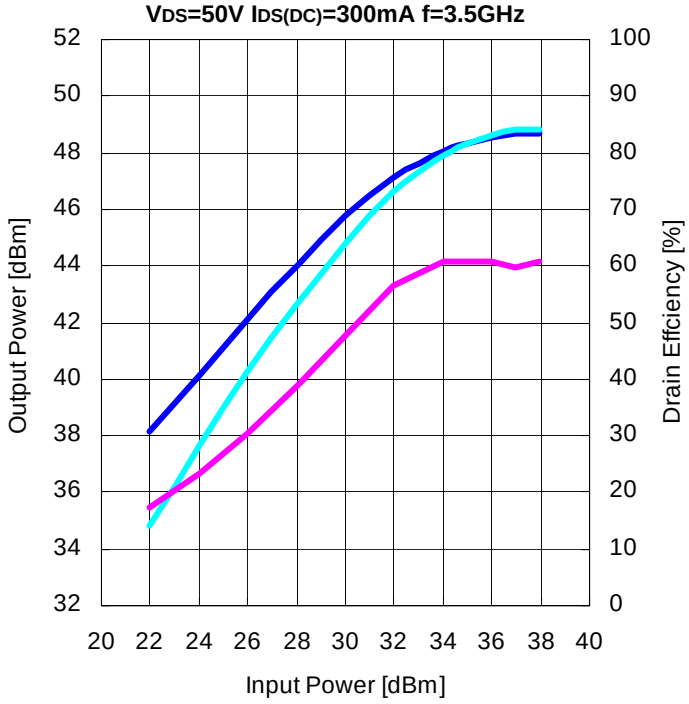
*1 : 10%-duty RF pulse (DC supply constant)
*2 : Pout = 40.8dBm, CW modulation Signal (W-CDMA or WiMAX)

RF characteristics @f=3.5GHz fine tuned

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

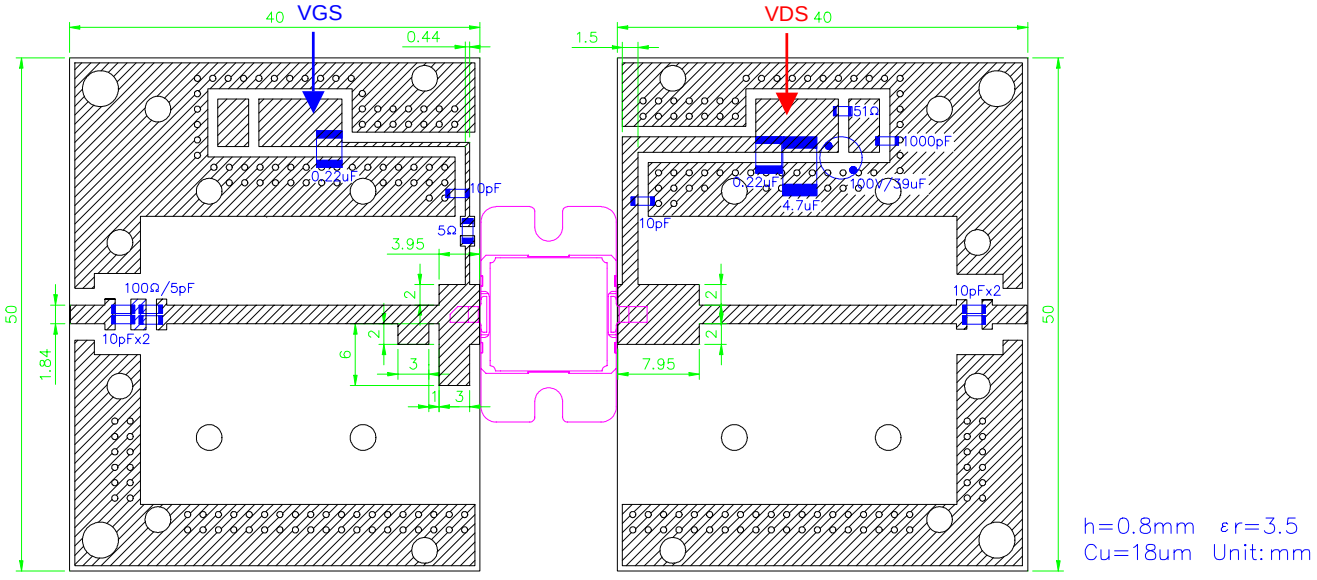


Output Power and Drain Efficiency vs. Input Power
VDS=50V IDS(DC)=300mA f=3.5GHz

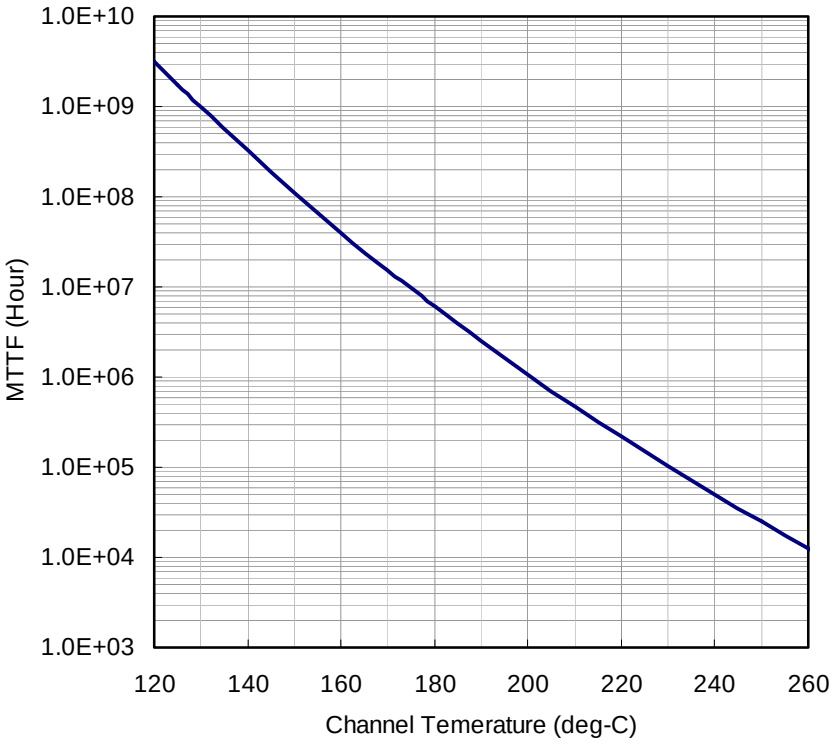


Pulse Signal (10%-duty, DC : constant)

Test Fixture



MTTF Calculation
– Estimated MTTF –



Ea=1.6eV
Confidence Level=90%

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

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

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

Where;

AF: acceleration factor

Ea: activation energy (1.6 eV)

k: Boltzman's constant (8.62×10^{-5} eV/K)

T_{stress}: stress temperature (K)

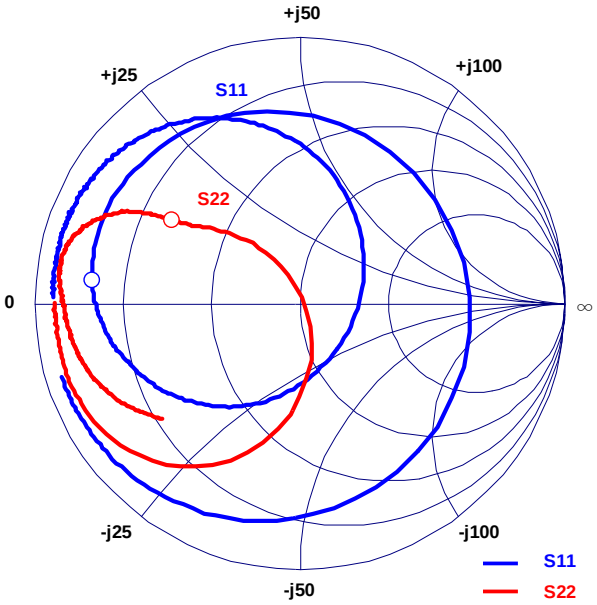
T_{use}: use temperature (K)

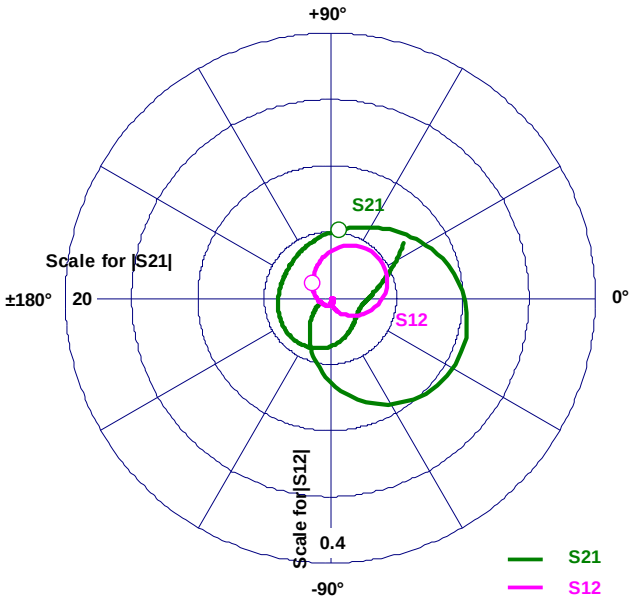
ESD characteristic

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

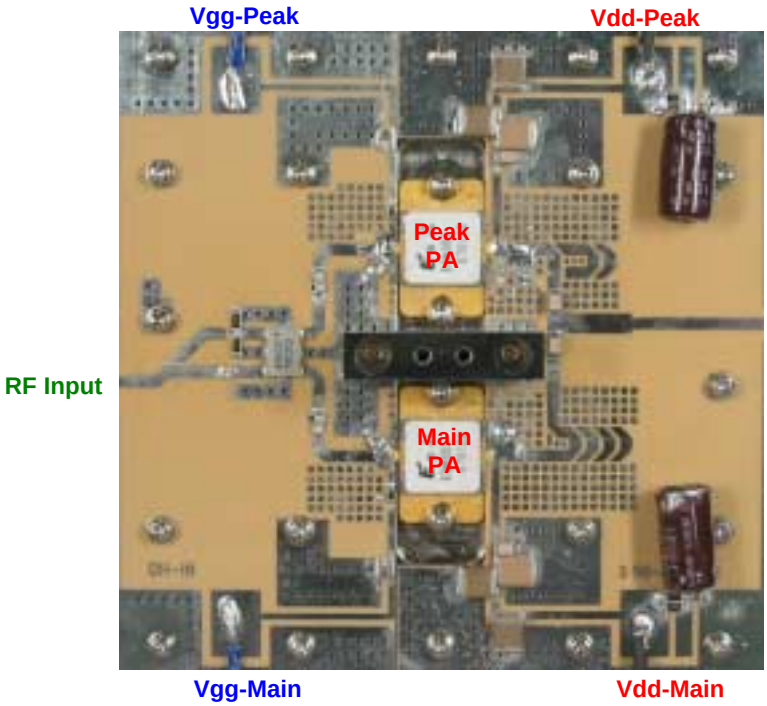
- Reference DATA -

S-Parameters @V_{DS}=50V, $I_{DS(DC)}$=300mA, f=0.5 to 4.5 GHz
$Z_l = Z_s$ = 50 ohm Marker : 3.5GHz



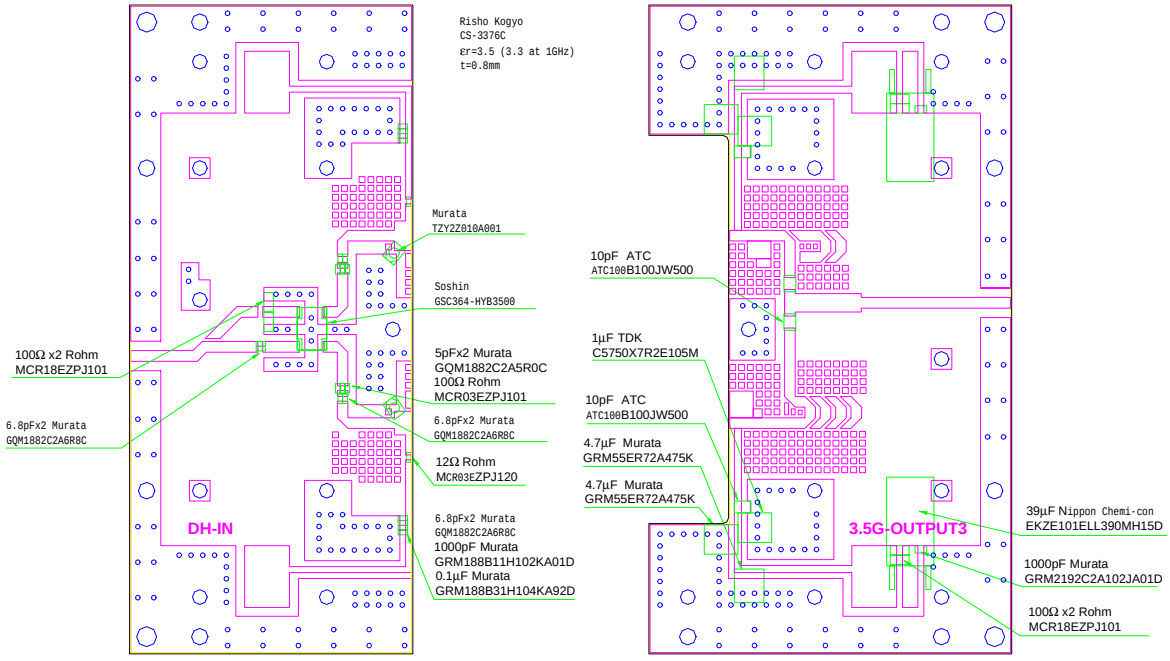


Freq.	S11		S21		S12		S22	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.50	0.93	178.53	6.96	36.56	0.005	-32.55	0.68	-140.42
0.60	0.93	174.98	5.50	28.19	0.004	-39.59	0.73	-146.09
0.70	0.93	171.49	4.50	20.62	0.004	-40.40	0.77	-150.92
0.80	0.93	168.49	3.82	13.70	0.003	-42.98	0.80	-155.33
0.90	0.93	165.68	3.30	7.39	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



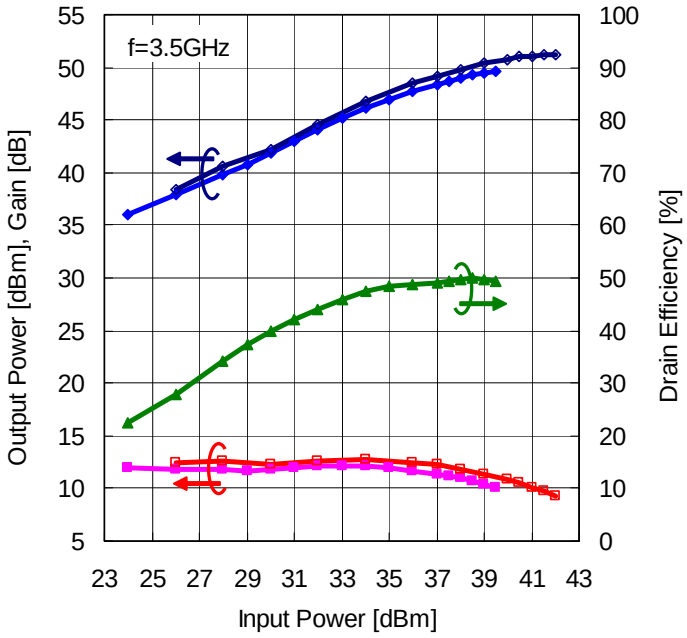
CS-3376C
t=0.8mm, εr=3.3

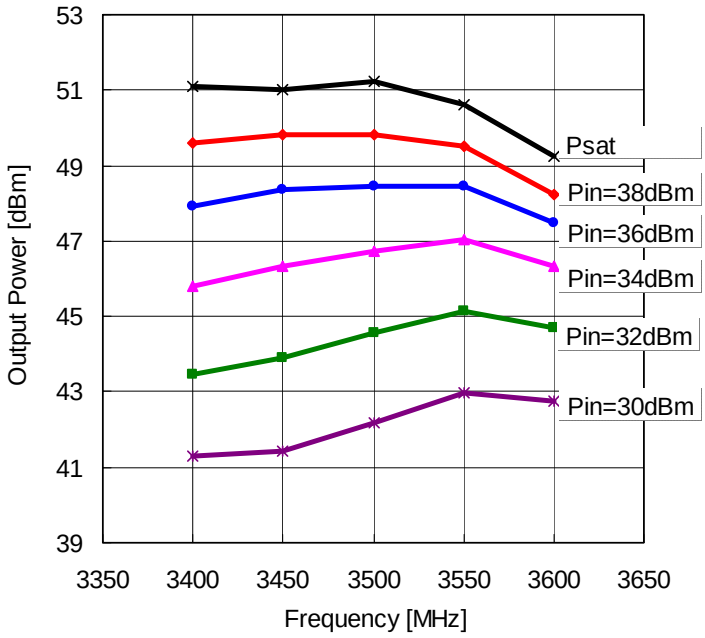
Test Fixture



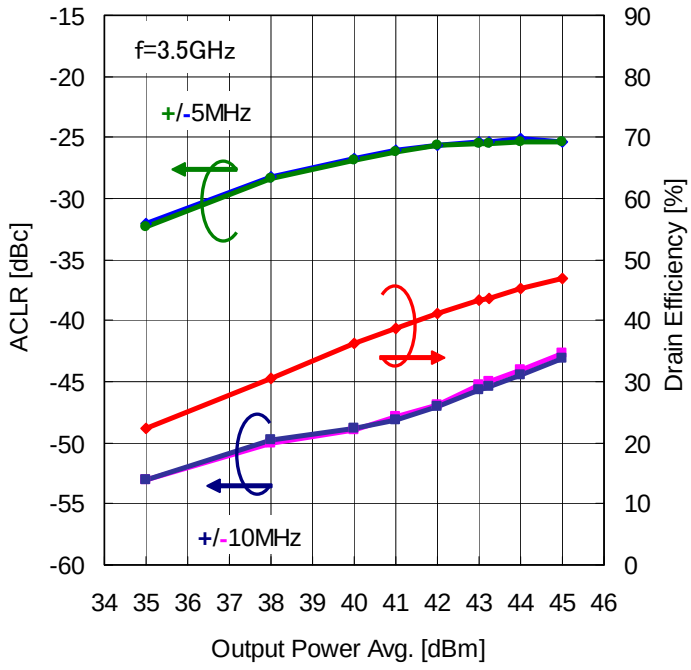
CS3376C, t=0.8mm, Er=3.5

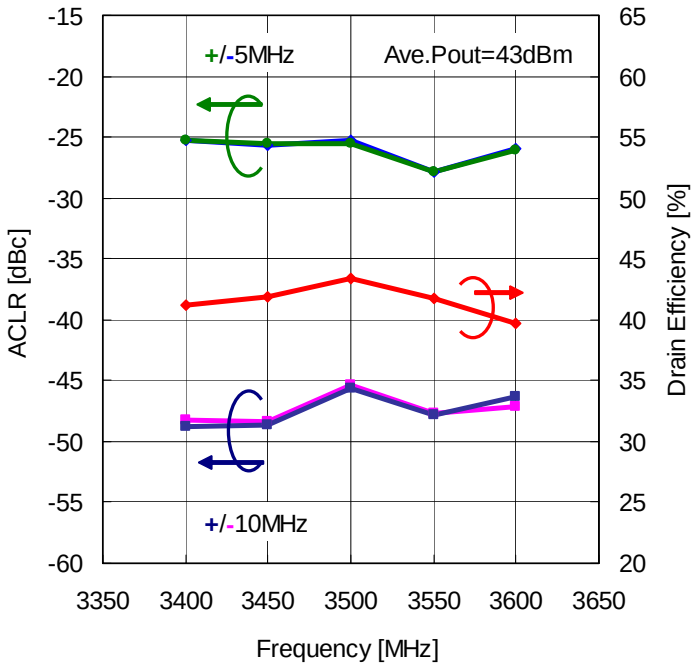
Test conditions : Vds=50V, Ids-main=200mA, Vgs-peak=-3.5V, Pulse Duty : 10% (6us/60us)





Test conditions : Vds=50V, Ids-main=200mA, Vgs-peak=-3. 5V, W-CDMA 1-carrier, PAR=7.9dB(0.01%)





I2D Package Outline
Metal-Ceramic Hermetic Package