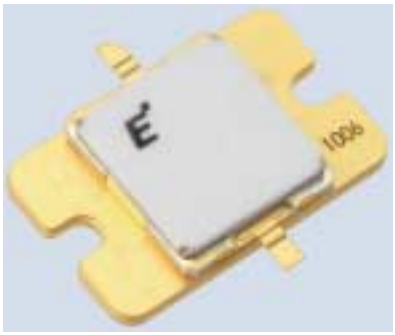
GaN-HEMT 105W

EGN21C105I2D

High Voltage - High Power GaN-HEMT



FEATURES

-High Voltage Operation : V_{DS}=50V
-High Power : 50.3dBm (typ.) @ Psat
-High Efficiency: 70%(typ.) @ Psat
-Power Gain : 18dB(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 2.14GHz W-CDMA & LTE 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		97.8	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}		≤ 55	V
Forward Gate Current	I_{GF}	R_G=5Ω	≤ 102	mA
Reverse Gate Current	I_{GR}	R_G=5Ω	≥ -3.9	mA
Channel Temperature	T_{ch}		≤ 180	ºC
Average Output Power	Pave.		≤ 47.3	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}=27mA	-1.0	-1.5	-2.0	V
Saturated Power	Psat *1	V_{DS}=50V	49.5	50.3	-	dBm
Drain Efficiency	η_d *2	$I_{DS(DC)}$=400mA	28	32	-	%
Power Gain	Gp *2		17.0	18.0	-	dB
3rd Order Inter-modulation Distortion	IM3 *2		-28	-32	-	dBc
Thermal Resistance	R_{th}	Channel to Case at 52.5W P_{DC}	-	2.0	2.3	ºC/W

*1 : 10%-duty RF pulse (DC supply constant), f=2.14GHz
*2 : Pout = 42dBm, f0=2.135GHz, f1=2.145GHz, W-CDMA(3GPP3.4 12-00) BS-1 64ch 47.5% clipping modulation (Peak/Avg.=8.5dB@0.01% Probability on CCDF).

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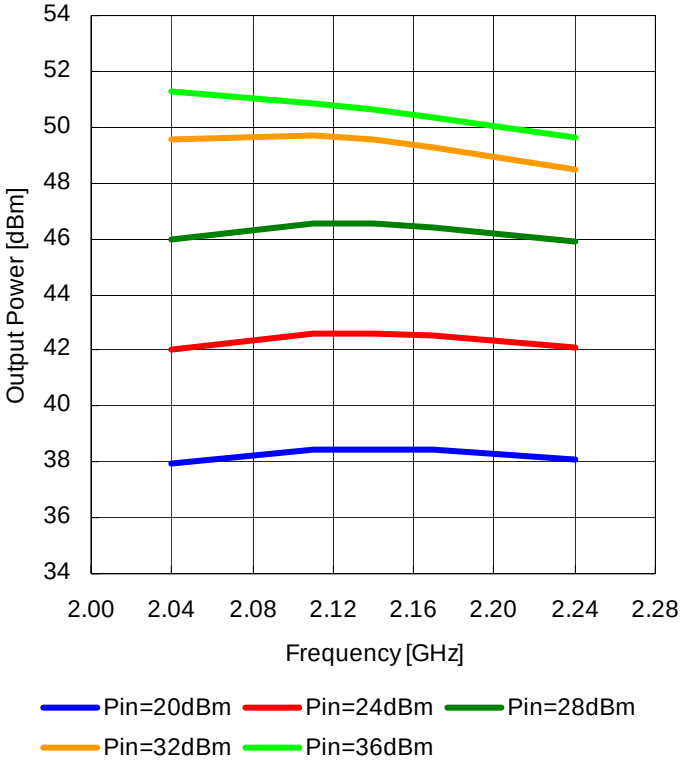
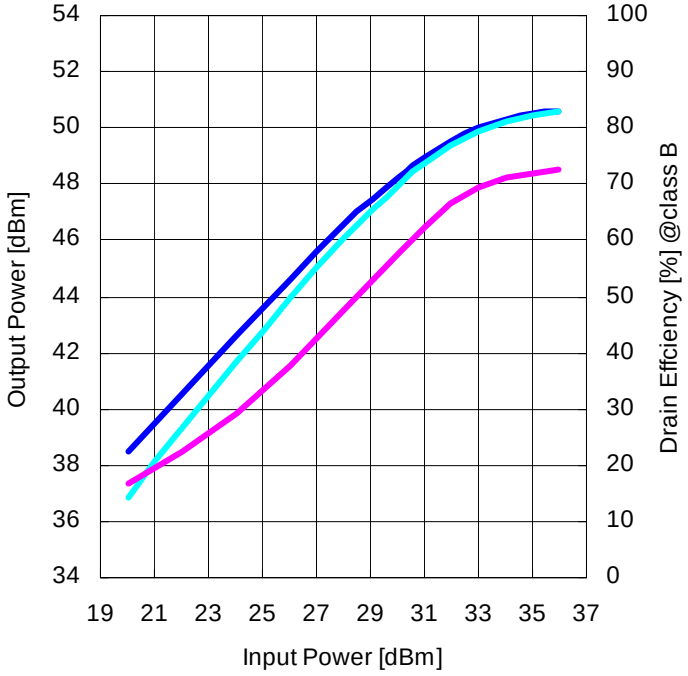
RF characteristics @f=2.14GHz fine tuned

Output Power vs. Frequency
VDS=50V IDS(DC)=400mA

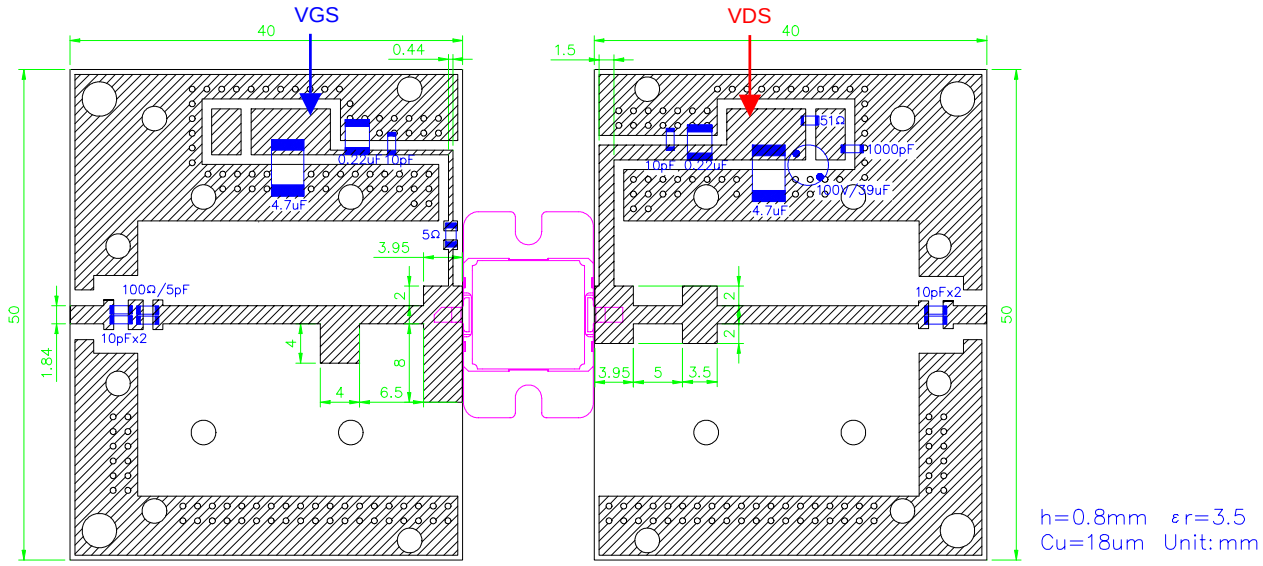


Output Power and Drain Efficiency vs. Input Power
VDS=50V IDS(DC)=400mA f=2.14GHz

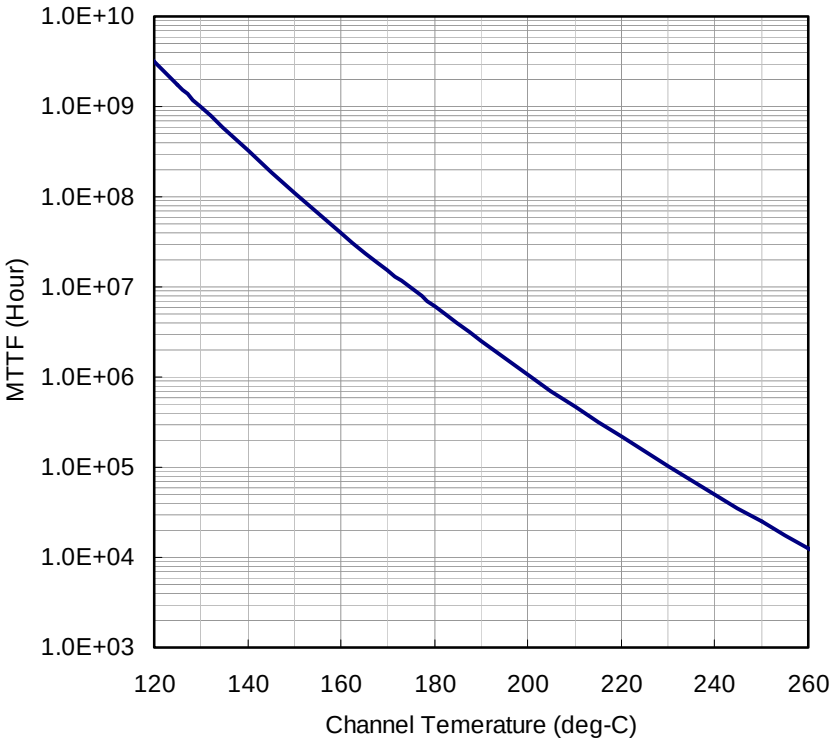


Pulse Signal (10%-duty, DC : constant)

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)

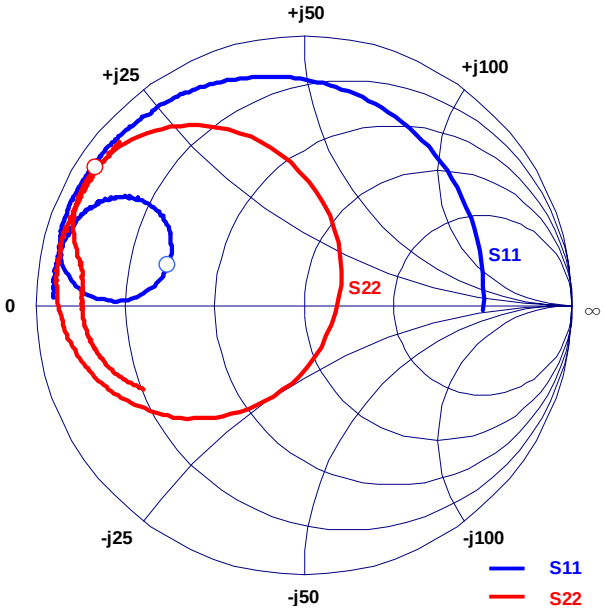
T_{use}: use temperature (K)

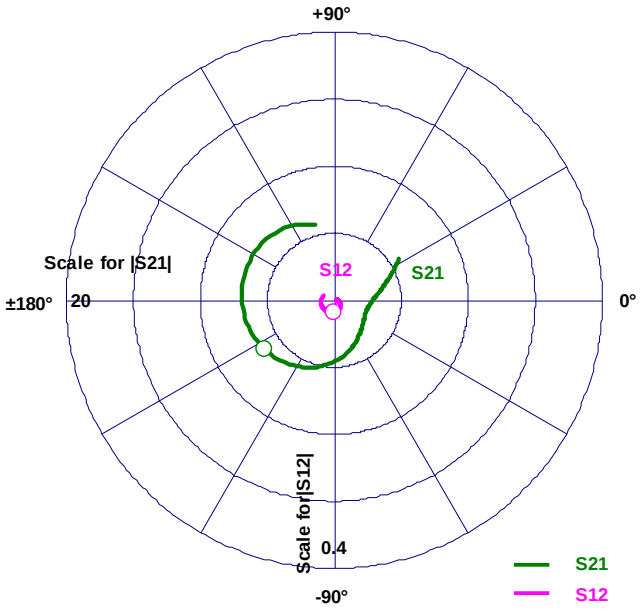
ESD characteristic

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

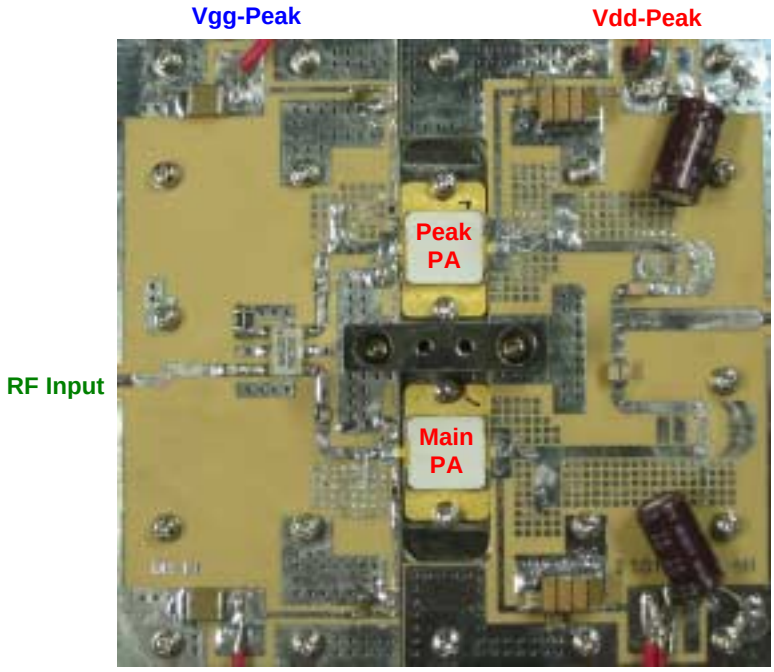
- Reference DATA -

S-Parameters @V_{DS}=50V, $I_{DS(DC)}$=300mA, f=0.5 to 4.5 GHz
$Z_l = Z_s$ = 50 ohm Marker : 2.14GHz



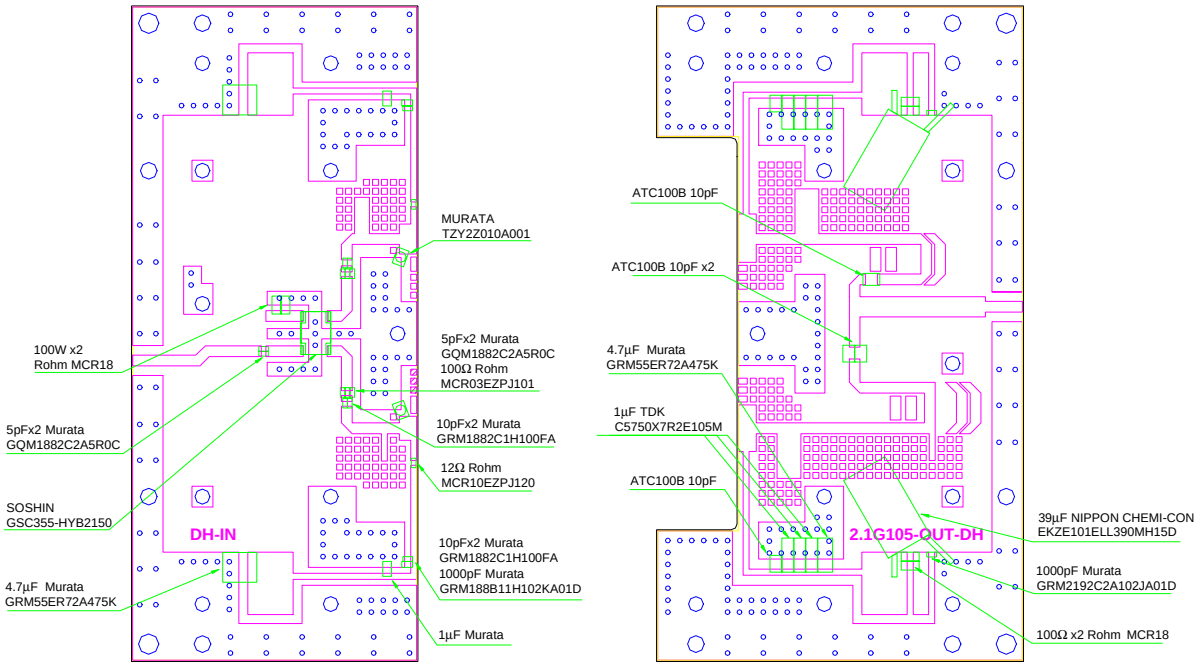


Freq.	S11		S21		S12		S22	
GHz	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.50	0.93	178.34	5.77	32.71	0.004	-27.93	0.67	-152.62
0.60	0.94	175.81	4.61	23.97	0.004	-25.86	0.72	-157.40
0.70	0.94	173.50	3.82	16.22	0.003	-24.90	0.76	-161.52
0.80	0.94	171.83	3.29	9.12	0.003	-17.55	0.78	-165.49
0.90	0.94	169.46	2.95	2.13	0.003	-13.17	0.80	-168.94
1.00	0.93	167.43	2.71	-4.46	0.003	-6.60	0.81	-172.13
1.10	0.93	165.09	2.58	-10.90	0.003	-5.13	0.82	-175.02
1.20	0.92	163.06	2.52	-17.64	0.003	-7.75	0.83	-177.72
1.30	0.91	160.75	2.51	-24.39	0.004	5.78	0.83	179.69
1.40	0.89	158.14	2.62	-31.70	0.005	0.88	0.83	177.50
1.50	0.87	155.60	2.77	-40.76	0.006	-0.27	0.83	175.32
1.60	0.85	152.87	3.03	-49.68	0.006	-7.41	0.83	173.41
1.70	0.81	150.16	3.42	-60.92	0.008	-15.25	0.84	171.21
1.80	0.75	147.90	3.93	-74.35	0.010	-22.34	0.85	169.12
1.90	0.67	147.02	4.61	-90.86	0.012	-38.27	0.88	166.12
2.00	0.58	150.12	5.35	-111.09	0.015	-60.13	0.91	161.03
2.10	0.53	158.90	6.08	-134.35	0.017	-81.20	0.94	151.94
2.20	0.55	170.58	6.68	-160.40	0.019	-107.85	0.90	137.93
2.30	0.65	177.91	6.99	170.59	0.020	-138.17	0.75	118.18
2.40	0.77	178.08	6.84	138.32	0.020	-169.78	0.46	87.92
2.50	0.88	173.34	5.78	104.05	0.017	155.34	0.12	-10.41
2.60	0.94	167.29	4.24	74.99	0.013	125.34	0.39	-112.17
2.70	0.95	162.38	2.98	54.18	0.010	103.11	0.60	-135.91
2.80	0.95	158.60	2.15	39.55	0.007	89.73	0.73	-149.65
2.90	0.95	155.53	1.62	27.81	0.005	81.08	0.80	-158.53
3.00	0.95	152.46	1.27	18.05	0.004	70.79	0.85	-164.97
3.10	0.94	149.96	1.03	10.66	0.004	84.45	0.88	-170.44
3.20	0.95	146.88	0.86	3.25	0.003	70.88	0.90	-175.14
3.30	0.94	143.66	0.75	-3.19	0.004	84.31	0.91	-178.78
3.40	0.93	140.47	0.66	-9.44	0.003	86.56	0.92	177.62
3.50	0.93	137.06	0.61	-15.25	0.004	84.50	0.93	174.47
3.60	0.92	132.68	0.57	-21.07	0.005	72.51	0.93	171.17
3.70	0.92	128.24	0.55	-27.00	0.004	74.57	0.93	168.47
3.80	0.91	122.60	0.55	-32.91	0.005	72.14	0.93	165.82
3.90	0.90	115.51	0.56	-40.31	0.005	61.56	0.93	162.84
4.00	0.88	107.05	0.58	-47.68	0.006	42.28	0.93	159.71
4.10	0.86	96.25	0.63	-57.21	0.007	36.94	0.93	156.35
4.20	0.82	81.62	0.70	-68.23	0.006	23.27	0.93	152.88
4.30	0.77	61.85	0.79	-81.30	0.007	6.67	0.92	148.90
4.40	0.71	34.19	0.89	-97.78	0.007	-20.41	0.92	144.48
4.50	0.67	-1.61	0.98	-117.86	0.007	-44.32	0.92	138.81



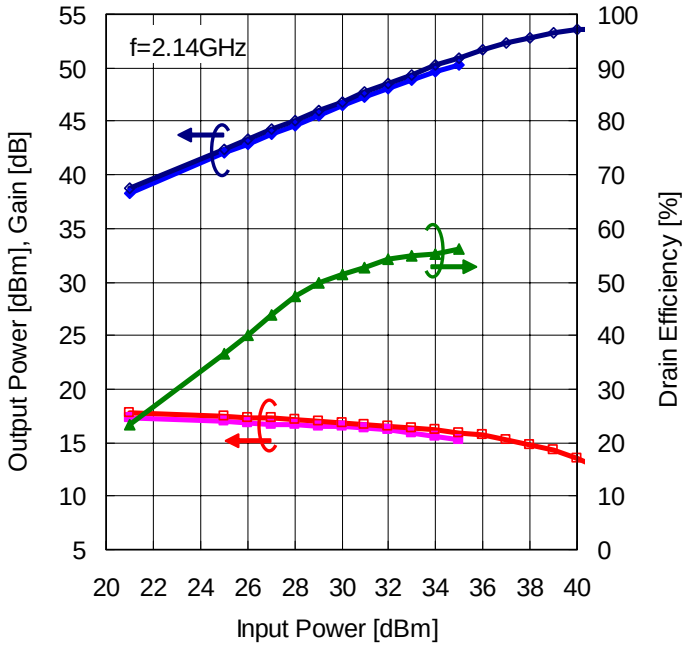
CS-3376C
t=0.8mm, εr=3.3

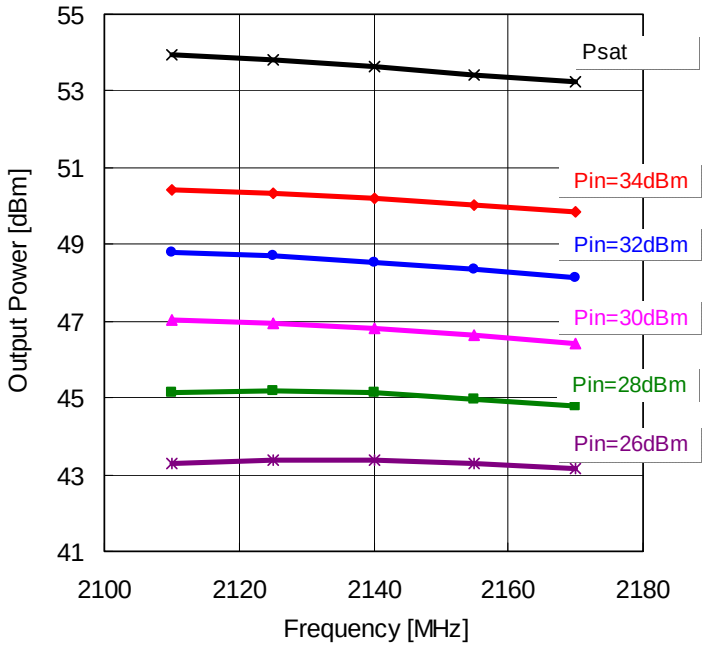
Test Fixture



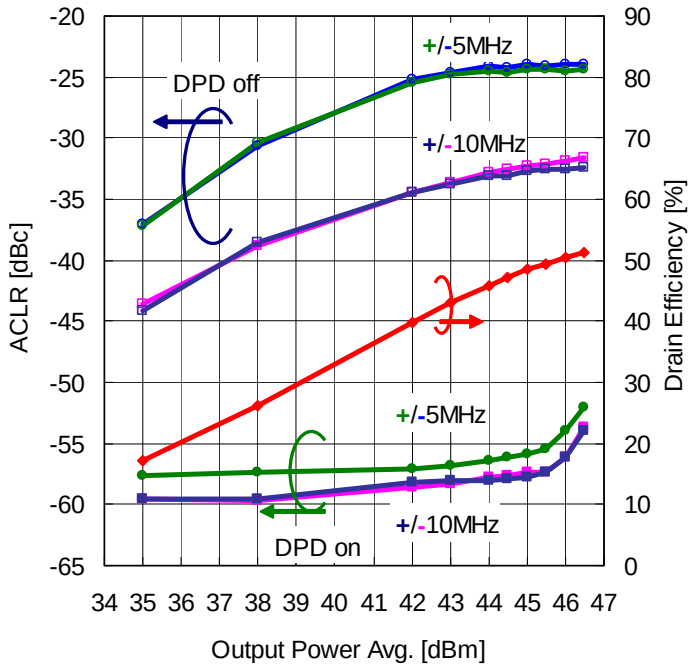
CS3376C, t=0.8mm, Er=3.5

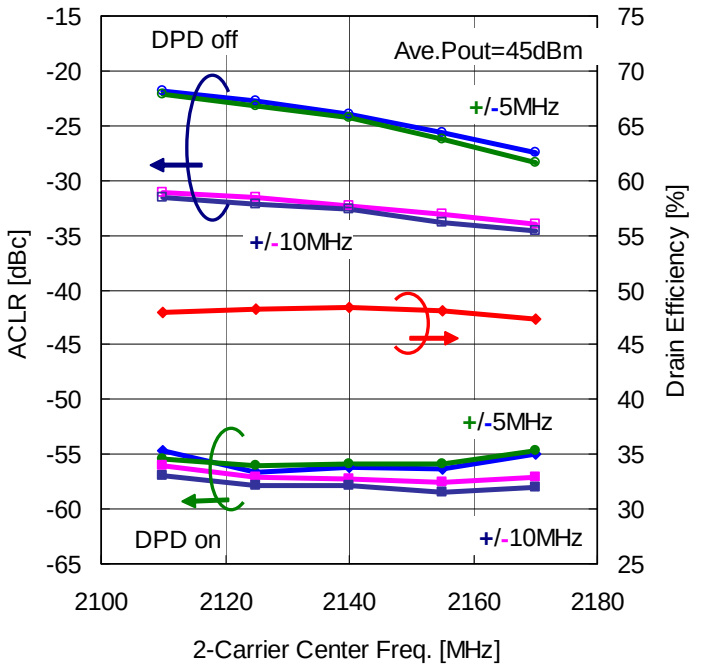
Test conditions : Vds=50V, Ids-main=400mA, Vgs-peak=-3.5V, Pulse Duty : 10% (6us/60us)





Test conditions : Vds=50V, Ids-main=400mA, Vgs-peak=-3.5V
W-CDMA 2-carrier, 5MHz Spacing, PAR=7.8dB(0.01%), f1=2137.5MHz, f2=2142.5MHz





I2D Package Outline
Metal-Ceramic Hermetic Package