

## ■ Features

- High Voltage Operation :  $V_{DS}=50V$
- High Power : 55.6dBm (typ.) @  $P_{sat}$
- Proven Reliability
- For peak stage of Doherty amplifier

## ■ Description

Sumitomo Electric'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 0.9GHz W-CDMA & LTE 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	$V_{DS}$		55	V
Drain-Source Voltage	$V_{DS}$	$V_{GS} = -8V$	160	V
Gate-Source Voltage	$V_{GS}$		-15	V
Total Power Dissipation	$P_t$		160.7	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	$V_{DS}$		$\leq 55$	V
Forward Gate Current	$I_{GF}$	$R_G = 10 \text{ ohm}$	$\leq 355.9$	mA
Reverse Gate Current	$I_{GR}$	$R_G = 10 \text{ ohm}$	$\geq -8.8$	mA
Channel Temperature	$T_{ch}$		$\leq 200$	deg.C
Average Output Power	$P_{ave.}$		$\leq 52.6$	dBm

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

Item	Symbol	Condition	Limit			Unit
			Min.	Typ.	Max.	
Pinch-Off Voltage	$V_p$	$V_{DS}=50V$ $I_{DS}=72mA$	-3.3	-	-2.1	V
Saturated Power	$P_{sat} *1$	$V_{DS}=50V$	54.6	55.6	-	dBm
Drain Efficiency at $P_{sat}$	$DE *1$	$I_{DS(DC)}=10mA$	63.0	70.0	-	%
Power Gain	$G_p *2$	$f=0.9GHz$	17.5	18.5	-	dB
Thermal Resistance	$R_{th}$	Channel to Case at 105W $P_{DC}$	-	1.2	1.4	deg.C/W
Load Mismatch Ruggedness *3	-	VSWR 10:1	No failures			

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

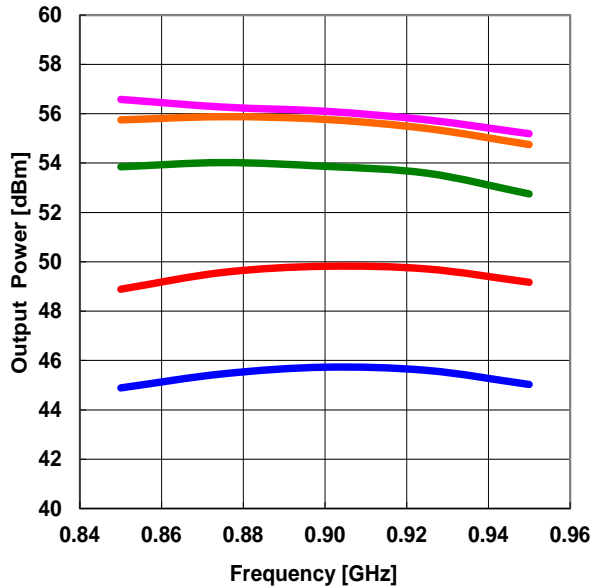
\*2 :  $P_{out}=51.5dBm$ , 10%-duty RF pulse ( DC supply constant )

\*3 : Fixed Pin :  $P_{out}=P3dB$  at  $R_L=50\text{ohm}$ , pulsed CW signal(10% duty)

RoHS Compliance	YES
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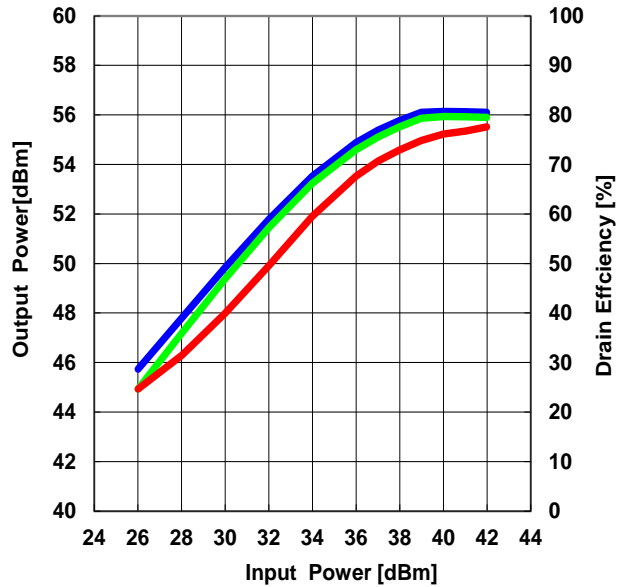
## RF characteristics @f=0.9GHz fine tuned

**Output Power vs. Frequency**  
 $V_{DS}=50V$ ,  $I_{DS(DC)}=800mA$



— Pin=26dBm      — Pin=30dBm  
— Pin=34dBm      — Pin=38dBm  
— Pin=42dBm

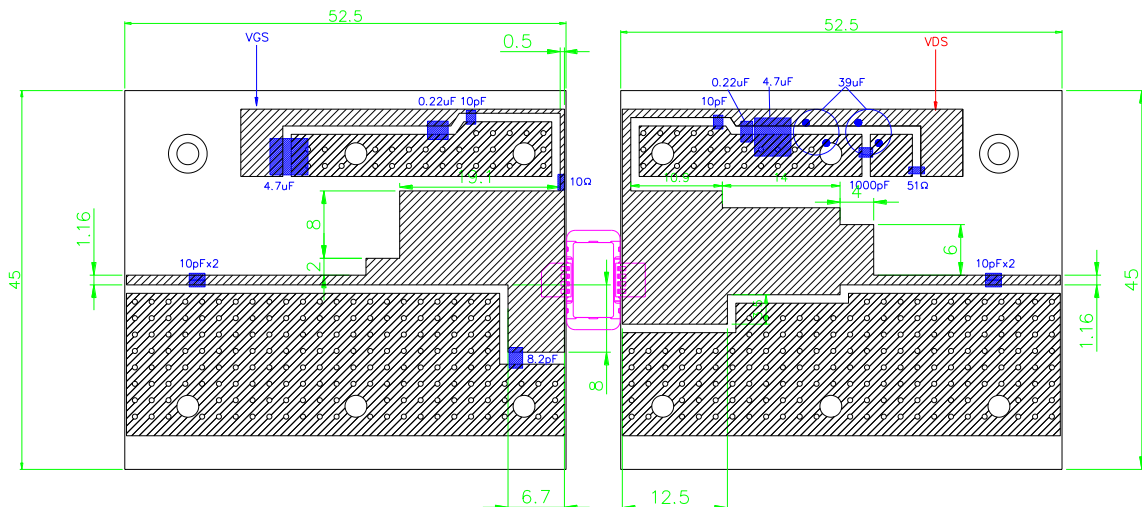
**Output Power and Drain Efficiency vs. Input Power**  
 $V_{DS}=50V$ ,  $I_{DS(DC)}=800mA$ ,  $f=0.9GHz$



— Pout (Class AB)      — Pout (Class B)      — DE (Class B)

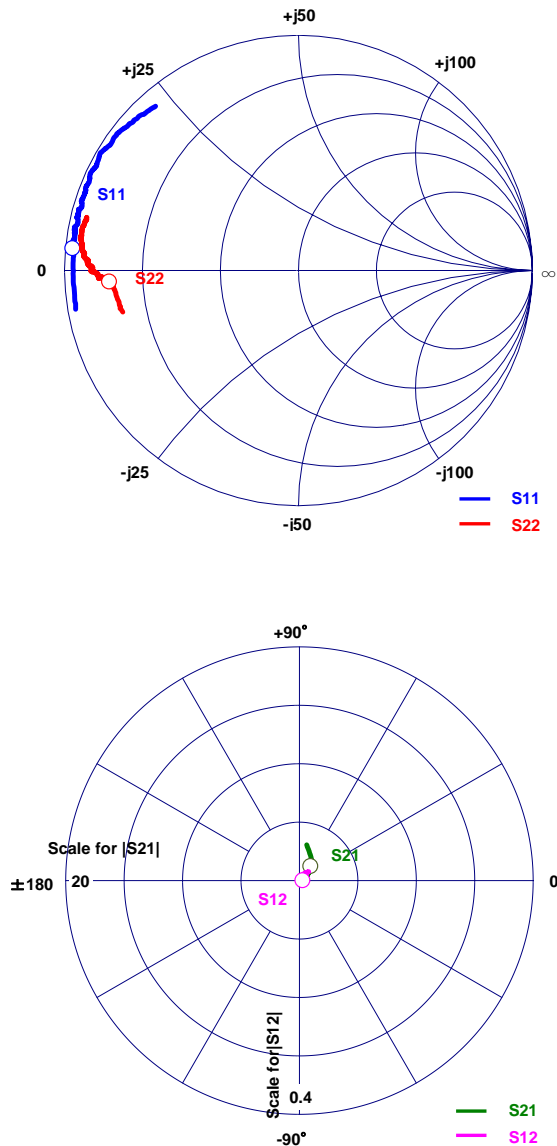
**Pulse Signal (10%-duty, DC : constant)**

## Test Fixture



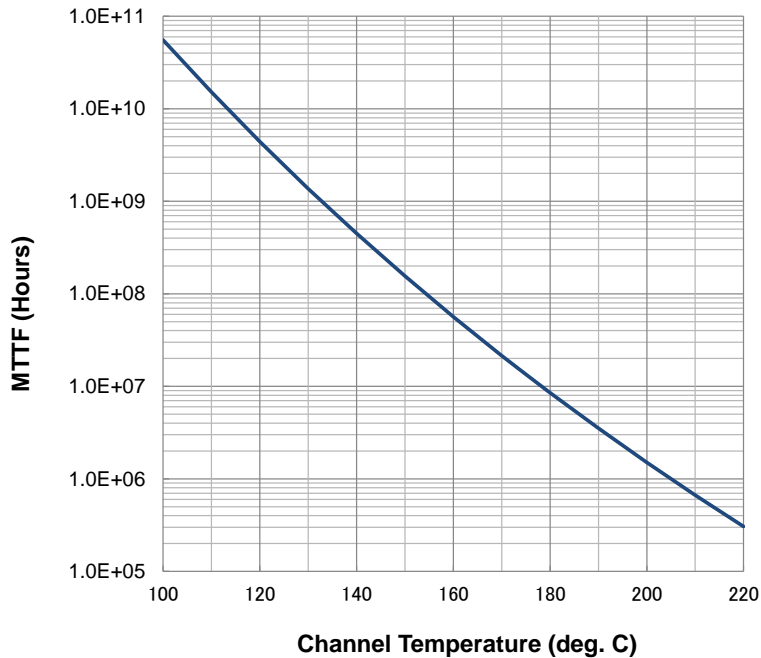
**- Reference DATA -**

**S-Parameters @VDS=50V, IDS(DC)=800mA, f=0.5 to 4.5GHz**  
**ZI = Zs = 50ohm      Marker : 0.9GHz**



Freq. GHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.5	0.97	-170.18	3.13	78.66	0.005	10.03	0.77	-166.78
0.6	0.96	-177.12	2.51	69.38	0.005	7.79	0.78	-171.60
0.7	0.96	176.18	2.07	59.94	0.005	0.86	0.80	-176.41
0.8	0.97	175.20	1.76	56.85	0.005	3.42	0.81	-176.85
0.9	0.97	174.37	1.56	53.60	0.005	7.53	0.81	-176.71
1.0	0.97	173.37	1.39	49.65	0.005	7.52	0.82	-176.83
1.1	0.97	172.57	1.23	46.73	0.005	8.74	0.83	-177.16
1.2	0.97	171.78	1.09	44.11	0.004	14.85	0.83	-177.75
1.3	0.97	170.69	0.99	41.19	0.004	18.37	0.84	-177.91
1.4	0.97	169.98	0.92	37.86	0.004	19.30	0.85	-177.84
1.5	0.97	169.45	0.83	35.42	0.004	22.49	0.85	-178.17
1.6	0.97	168.47	0.76	33.22	0.004	29.90	0.86	-178.95
1.7	0.97	167.28	0.71	29.81	0.004	31.37	0.87	-179.28
1.8	0.97	166.48	0.66	27.04	0.005	32.89	0.88	-179.68
1.9	0.97	165.97	0.62	24.75	0.005	33.70	0.88	-179.84
2.0	0.97	164.89	0.58	23.34	0.005	38.45	0.88	179.82
2.1	0.97	164.44	0.54	20.32	0.005	45.04	0.88	179.01
2.2	0.97	163.18	0.51	17.82	0.005	44.92	0.89	178.89
2.3	0.97	162.36	0.48	15.97	0.006	46.66	0.90	178.38
2.4	0.97	161.84	0.46	14.26	0.006	46.37	0.90	177.85
2.5	0.97	160.60	0.44	12.07	0.007	51.17	0.90	177.56
2.6	0.97	159.82	0.42	9.86	0.007	51.61	0.90	177.08
2.7	0.98	158.94	0.40	7.97	0.007	50.63	0.92	176.39
2.8	0.97	157.71	0.39	5.93	0.007	54.85	0.92	175.98
2.9	0.97	156.89	0.37	3.99	0.008	56.10	0.92	175.56
3.0	0.98	156.03	0.36	2.63	0.008	55.04	0.92	175.17
3.1	0.98	154.82	0.35	0.96	0.009	55.78	0.93	174.39
3.2	0.97	153.63	0.34	-1.05	0.009	57.96	0.93	173.73
3.3	0.97	152.37	0.33	-3.21	0.010	57.86	0.93	173.25
3.4	0.98	150.97	0.32	-4.72	0.010	57.02	0.93	172.83
3.5	0.98	149.76	0.32	-6.42	0.011	55.64	0.94	172.05
3.6	0.98	148.13	0.32	-8.35	0.012	56.57	0.94	171.15
3.7	0.97	146.79	0.31	-10.38	0.013	55.08	0.94	170.87
3.8	0.97	144.99	0.31	-12.66	0.014	55.97	0.94	170.18
3.9	0.97	143.15	0.31	-14.38	0.015	54.00	0.94	169.45
4.0	0.96	141.24	0.31	-16.61	0.016	51.63	0.94	168.76
4.1	0.95	139.89	0.31	-18.49	0.017	51.68	0.94	168.32
4.2	0.95	137.84	0.31	-20.60	0.018	48.92	0.94	168.02
4.3	0.94	135.43	0.31	-23.27	0.019	46.75	0.94	167.08
4.4	0.93	133.18	0.31	-25.57	0.020	44.63	0.93	166.53
4.5	0.93	131.16	0.32	-27.85	0.022	43.83	0.93	165.97

### MTTF Calculation – Estimated MTTF –



Ea=1.6eV  
Confidence Level=90%

Channel Temp (deg.C)	MTTF (Hours)
160	5.98 x 10 <sup>7</sup>
180	9.02 x 10 <sup>6</sup>
200	1.60 x 10 <sup>6</sup>

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

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

Where;

AF: acceleration factor

Ea: activation energy (1.6 eV)

k: Boltzman's constant (8.62 x 10<sup>-5</sup> eV/K)

T<sub>stress</sub>: stress temperature (K)

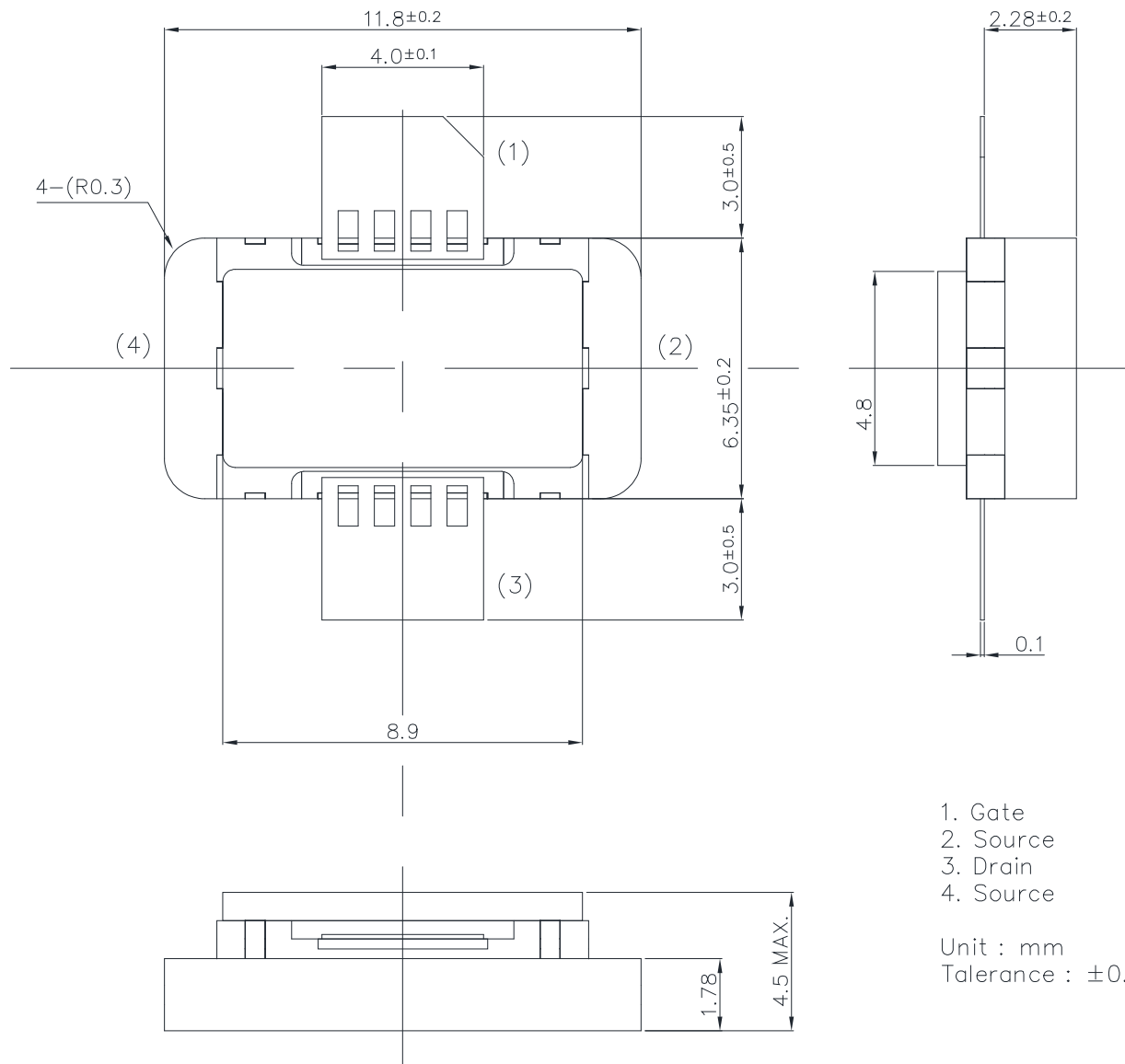
T<sub>use</sub>: use temperature (K)

### ESD characteristic

Test Methodology	Class
Human Body Model (per JESD22-A114)	2
Machine Model (per JEIA/ESD22-A115)	B
Device Charged Model (per JESD22-C101)	IV



**M1H Package Outline  
Metal-Ceramic Hermetic Package**



## **For Safety, Observe the Following Procedures Environmental Management**

- Do not put this product into the mouth.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Respect all applicable laws of the country when discarding this product.  
This product must be disposed in accordance with methods specified by applicable hazardous waste procedures.

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