



GaN-HEMT 210W

EGNC210MK

High Voltage - High Power GaN-HEMT

FEATURES

- High Voltage Operation : $V_{DS}=50V$
- High Power : 53.5dBm (typ.) @ P_{sat}
- High Efficiency: 70%(typ.) @ P_{sat}
- Linear Gain : 17.5dB(typ.) @ $f=0.9GHz$
- 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 0.9GHz LTE 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 | | 173 | 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} | $R_G=10\Omega$ | ≤ 204 | mA |
| Reverse Gate Current | I_{GR} | $R_G=10\Omega$ | ≥ -7.8 | mA |
| Channel Temperature | T_{ch} | | ≤ 180 | $^{\circ}C$ |
| Average Output Power | $P_{ave.}$ | | ≤ 50.5 | dBm |

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

| Item | Symbol | Condition | Limit | | | Unit |
|--------------------|--------------|-------------------------------------|-------|------|------|---------------|
| | | | min. | Typ. | Max. | |
| Pinch-Off Voltage | V_p | $V_{DS}=50V$ $I_{DS}=54.4mA$ | -1.0 | -1.5 | -2.0 | V |
| Saturated Power | $P_{sat} *1$ | $V_{DS}=50V$ | 52.5 | 53.5 | - | dBm |
| Drain Efficiency | $\eta_d *2$ | $I_{DS}(DC)=750mA$ | 30 | 35 | - | % |
| Power Gain | $G_p *2$ | $f=0.9GHz$ | 16.5 | 17.5 | - | dB |
| Thermal Resistance | R_{th} | Channel to Case at 105W P_{DC} | - | 1.1 | 1.3 | $^{\circ}C/W$ |

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

*2 : $P_{out} = 45.5dBm$, CWmodulation Signal (W-CDMA)



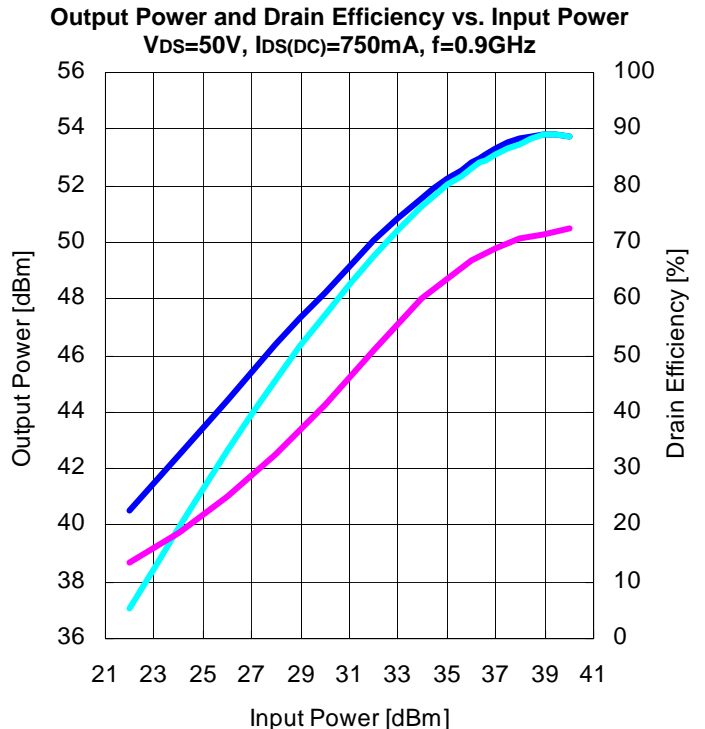
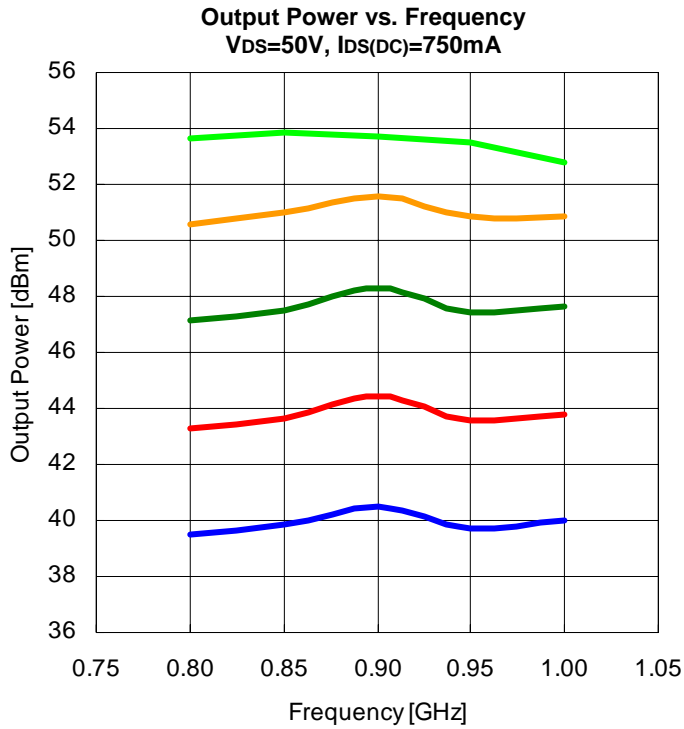


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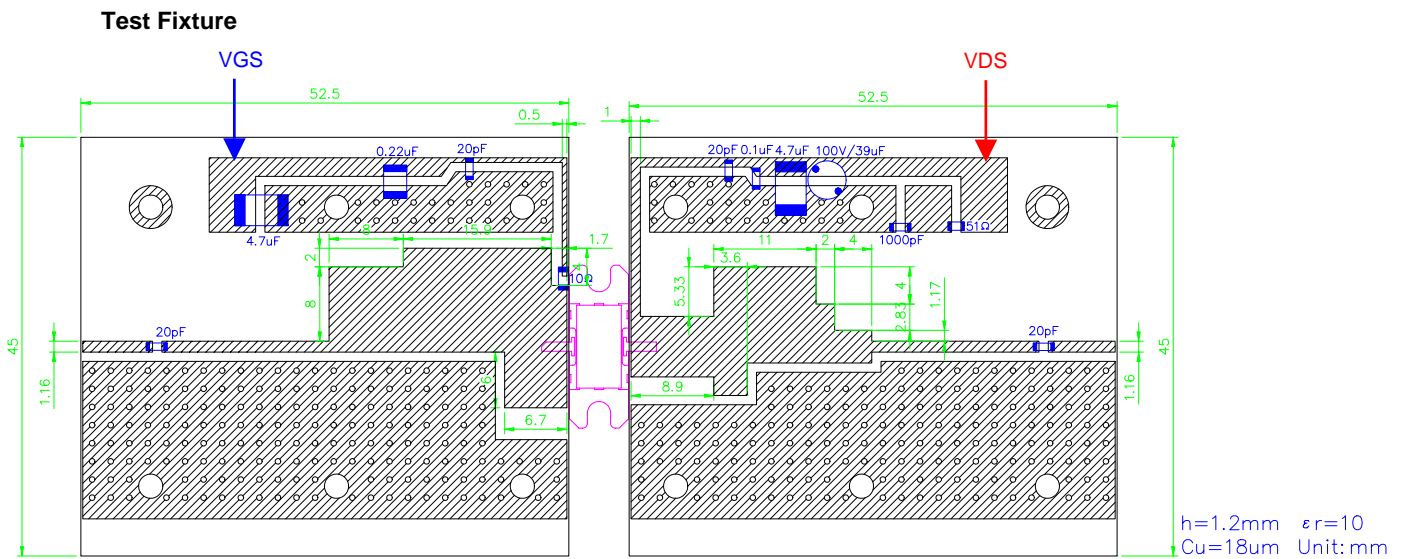
RF characteristics @f=0.9GHz fine tuned

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— Pin=22dBm — Pin=26dBm — Pin=30dBm
— Pin=34dBm — Pin=40dBm

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



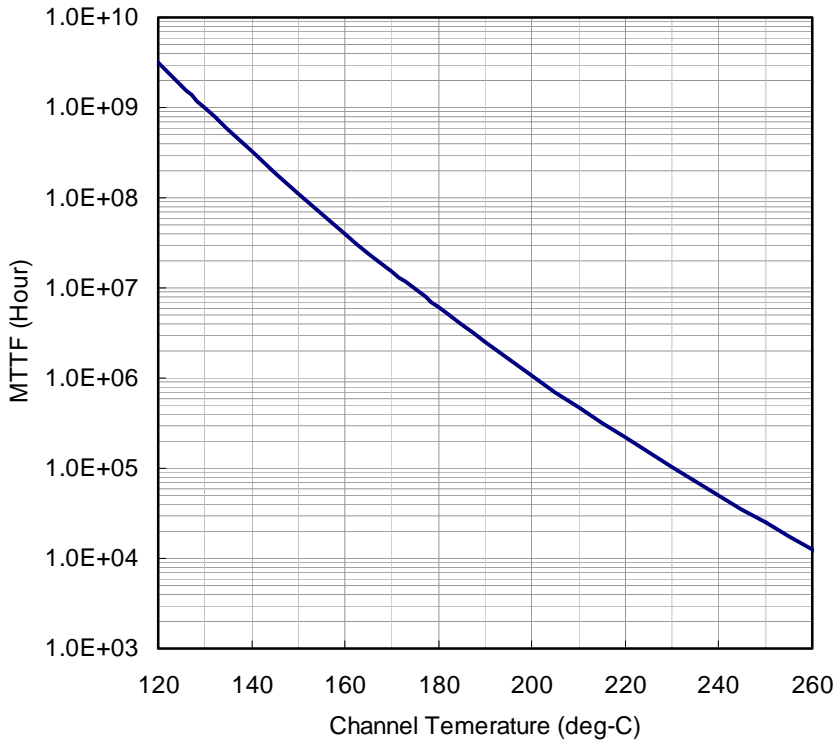


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MTTF Calculation
- Estimated MTTF -



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) | 1B |
| Machine Model (per JEI/ESD22-A115) | A |



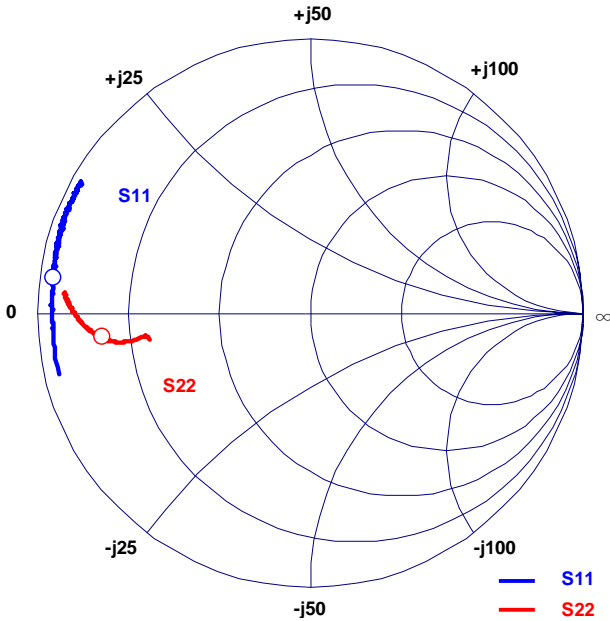
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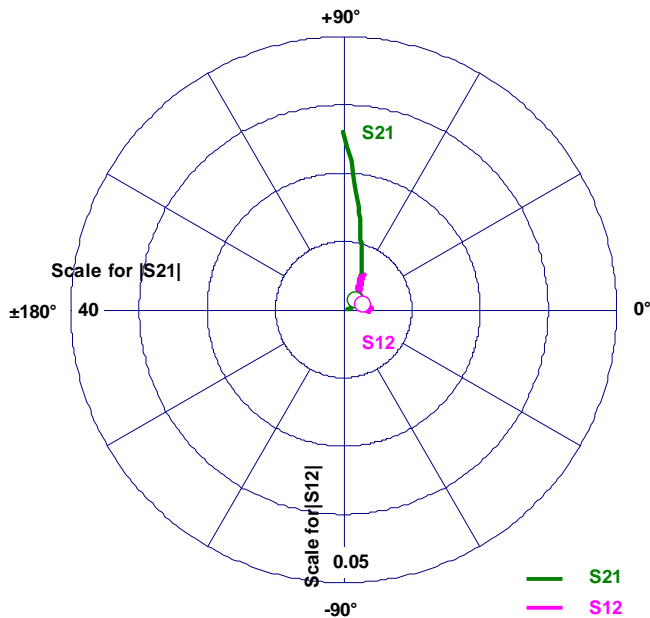
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- Reference DATA -

S-Parameters @V_{DS}=50V, I_{DS(DC)}=750mA, f=0.1 to 3.1GHz
 Z_I = Z_s = 50 ohm Marker : 0.9GHz



| Freq. GHz | S11 | | S21 | | S12 | | S22 | |
|--------------|------|---------|-------|--------|-------|-------|------|---------|
| | MAG | ANG | MAG | ANG | MAG | ANG | MAG | ANG |
| 0.10 | 0.95 | -166.25 | 26.13 | 90.06 | 0.005 | 8.04 | 0.60 | -170.68 |
| 0.20 | 0.95 | -174.87 | 12.83 | 79.54 | 0.005 | 1.70 | 0.61 | -172.09 |
| 0.30 | 0.95 | -178.43 | 8.37 | 71.98 | 0.005 | -3.78 | 0.63 | -171.79 |
| 0.25 | 0.95 | -176.75 | 10.16 | 75.53 | 0.005 | 1.09 | 0.62 | -172.04 |
| 0.40 | 0.94 | 179.26 | 6.09 | 65.00 | 0.005 | 2.97 | 0.65 | -171.27 |
| 0.50 | 0.95 | 177.74 | 4.69 | 58.95 | 0.004 | 0.83 | 0.68 | -171.15 |
| 0.60 | 0.95 | 176.19 | 3.77 | 53.60 | 0.004 | 3.77 | 0.70 | -171.19 |
| 0.70 | 0.95 | 174.77 | 3.10 | 47.97 | 0.004 | 7.41 | 0.73 | -171.74 |
| 0.80 | 0.95 | 173.36 | 2.62 | 43.45 | 0.004 | 9.08 | 0.75 | -172.32 |
| 0.90 | 0.95 | 172.24 | 2.22 | 39.08 | 0.004 | 13.17 | 0.77 | -173.35 |
| 1.00 | 0.95 | 171.07 | 1.93 | 34.59 | 0.004 | 23.42 | 0.79 | -174.11 |
| 1.10 | 0.95 | 169.96 | 1.69 | 30.38 | 0.004 | 33.31 | 0.80 | -175.03 |
| 1.20 | 0.96 | 168.74 | 1.49 | 26.67 | 0.004 | 41.79 | 0.82 | -176.12 |
| 1.30 | 0.96 | 167.53 | 1.32 | 23.31 | 0.004 | 46.56 | 0.83 | -177.10 |
| 1.40 | 0.96 | 166.52 | 1.17 | 19.84 | 0.004 | 47.02 | 0.85 | -177.98 |
| 1.50 | 0.96 | 165.79 | 1.06 | 16.98 | 0.005 | 51.22 | 0.86 | -179.16 |
| 1.60 | 0.96 | 164.63 | 0.97 | 13.59 | 0.005 | 54.38 | 0.87 | 179.85 |
| 1.70 | 0.97 | 163.86 | 0.89 | 10.86 | 0.005 | 57.67 | 0.88 | 178.76 |
| 1.80 | 0.96 | 162.62 | 0.80 | 8.19 | 0.006 | 58.39 | 0.89 | 177.85 |
| 1.90 | 0.96 | 161.81 | 0.74 | 5.81 | 0.006 | 58.24 | 0.90 | 176.99 |
| 2.00 | 0.97 | 160.73 | 0.68 | 3.10 | 0.007 | 58.48 | 0.90 | 176.04 |
| 2.10 | 0.97 | 159.74 | 0.63 | 1.39 | 0.007 | 59.15 | 0.91 | 175.26 |
| 2.20 | 0.97 | 158.91 | 0.59 | -1.42 | 0.007 | 62.51 | 0.91 | 174.43 |
| 2.30 | 0.97 | 158.23 | 0.55 | -3.01 | 0.008 | 60.55 | 0.91 | 173.51 |
| 2.40 | 0.97 | 157.05 | 0.52 | -5.63 | 0.008 | 64.19 | 0.92 | 172.92 |
| 2.50 | 0.97 | 156.47 | 0.49 | -7.02 | 0.009 | 62.21 | 0.92 | 171.85 |
| 2.60 | 0.96 | 155.13 | 0.46 | -8.75 | 0.009 | 63.44 | 0.93 | 171.42 |
| 2.70 | 0.97 | 154.08 | 0.44 | -10.43 | 0.009 | 62.18 | 0.93 | 170.60 |
| 2.80 | 0.97 | 153.15 | 0.42 | -12.80 | 0.010 | 64.83 | 0.93 | 169.95 |
| 2.90 | 0.97 | 152.50 | 0.40 | -13.65 | 0.011 | 63.31 | 0.94 | 169.28 |
| 3.00 | 0.97 | 151.20 | 0.38 | -16.58 | 0.011 | 63.94 | 0.94 | 168.54 |
| 3.10 | 0.97 | 150.54 | 0.37 | -18.81 | 0.011 | 65.28 | 0.94 | 168.10 |





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MK Package Outline Metal-Ceramic Hermetic Package

