Application Fixture (CGHV27060MP-AMP3) for Tactical Communication Radios

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Wolfspeed, a Cree Company, has developed an application circuit that demonstrates the ability for the CGHV27060MP to operate between 800 MHz to 2700 MHz for tactical communication power amplifier applications. The CGHV27060MP houses a GaN die in a plastic package for added cost benefits however in a thermally viable TSSOP package. The device can deliver over 60W of continuous wave (CW) output power.

This application note describes the typical performance that has been achieved and what can be expected when evaluating the application fixture. Key features of the amplifier include:

- Frequency range 800 MHz – 2700 MHz
- Over 15 dB of small signal gain
- Over 49 % drain efficiency
- 70W typical saturated output power
- Gain flatness < 3.5 dB

OVERALL DESIGN

The design goal was to create an output stage amplifier for tactical communication applications operating over a large case temperature (-40 C to 75 C) and delivering over 60 W of output power. The circuit was constructed on RO4350B 20 mil thick substrate and mounted on a copper baseplate to allow for the transistor to be mounted directly to the baseplate for cooling purposes. The design used a three-section input match to help provide the gain flatness achieved along with a multi-stage output match to achieve the broadband performance. The biasing was chosen to optimize the linearity under two tone signals. A picture of the PCB can be seen in Figure 1.

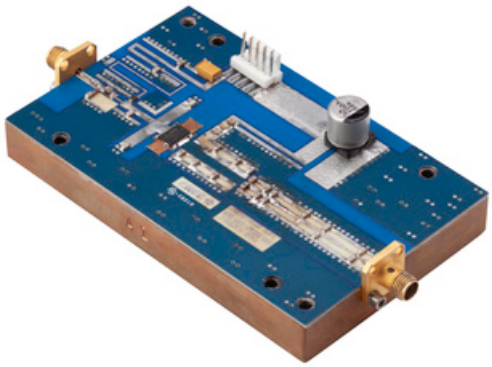

Figure 1. Picture of CGHV27060MP-AMP3 0.8 – 2.7 GHz Application Board

APPLICATION FIXTURE PERFORMANCE

Overall the application fixture operates in the intended band from 800 MHz – 2700 MHz and delivering over 48 dBm across the band at saturated output power as shown in Figure 2. Drain efficiency across the band remains over 49% with small signal gain of over 15 dB. Under elevated case temperature the performance remains within specification with power decreasing 0.1 dB / 10 degC as is typical with GaN devices. With the design being very wideband and spanning over an octave the return loss remains remains below -5 dB as shown in Figure 3.

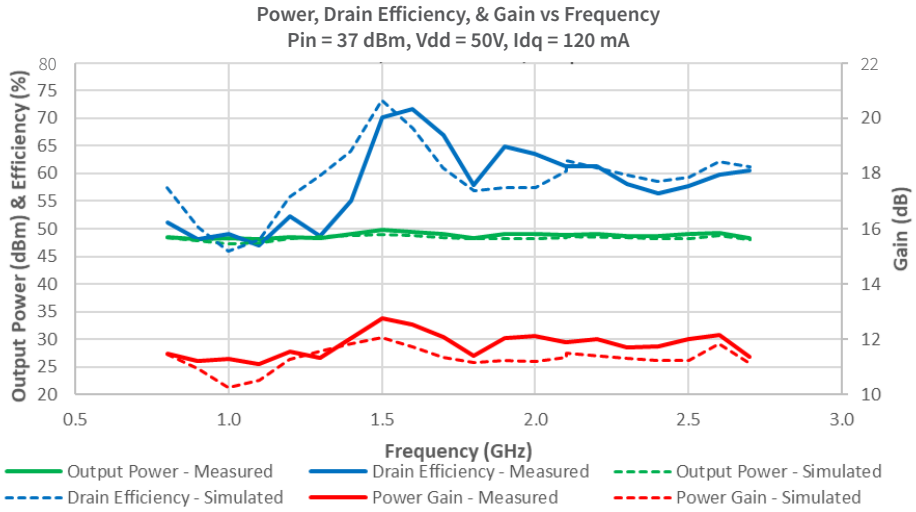

Figure 2. CGHV27060MP-AMP3 performance at 37 dBm fixed input power.

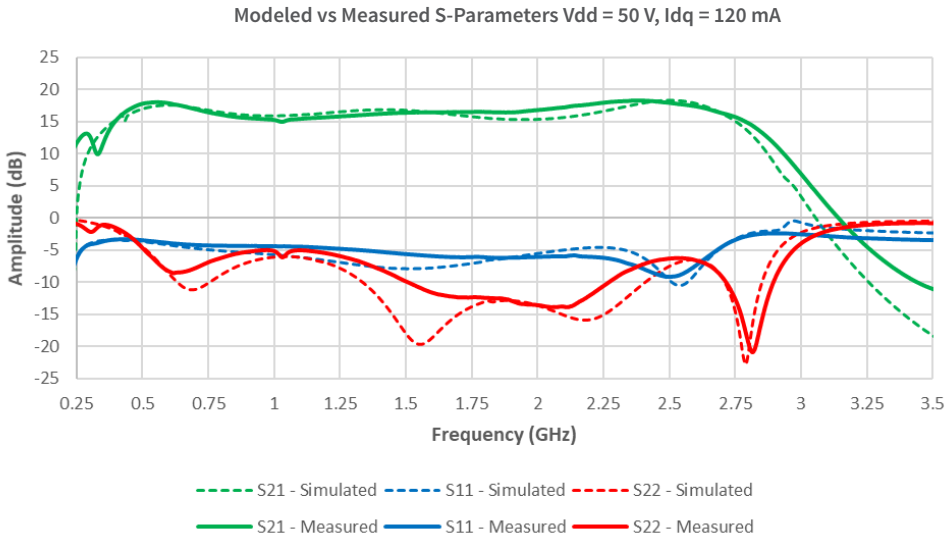

Figure 3. CGHV27060MP-AMP3 small signal performance at room temperature

MEASURED TO MODELLED CORRELATION

The design was completed in National Instruments AWR Design Environment using Cree's proprietary large signal transistor model for the CGHV27060MP. All passive components used in the design were modelled using the Modelithics component library to include the effect of pad parasitics. Figure 2 shows the measured to modelled large signal performance and Figure 3 shows the small signal measured to modelled results. As can be seen very tight alignment can be seen in the large signal data for both output power and drain efficiency across the full band. Small signal gain alignment remained within 1 dB across the design band.

CONCLUSIONS

The application note demonstrates the performance of the CGHV27060MP-AMP3 which shows great performance from 800 – 2700 MHz. The measured to modelled correlation shows that first pass success is achievable using Cree's propriety large signal models.