INTEGRA
RF POWER DEVICES

Advantages of IGT1011S150 versus Two Separate Gain Stages

INTRODUCTION

IGT1011S150 is a high power, two-stage RF power transistor that has two discrete GaN-on-SiC transistors inside a single package. This Application Note will show the advantages of using this transistor versus using two separate transistors in terms of RF performance and size.

SIZE ADVANTAGE

IGT1011S150 delivers 150W at both 1030 and 1090 MHz with typically 37 dB gain under 32µs, 4% duty cycle pulse conditions, and is fully matched to 50 Ω at both input and output. This same overall performance could be obtained by cascading two separate transistors, namely IGN1011S25 followed by IGN1011S150. The latter delivers 150W at both 1030 and 1090 MHz with typically 20dB gain while the former produces 25W, also with 20dB gain.

Figure 1 shows a comparison of the overall size of the complete amplifier using these two different approaches. Using two separate gain stages gives an overall size of 2.65″ x 0.7″ (area 1.86 sq ″) while using IGT1011S150 gives an overall size of 1.8″ x 1″ (area 1.8 sq ″). However, this size can be reduced by using a transistor without any 'ears' on the package as shown in the lower section of Figure 1 on the right-hand side, in which case the size becomes 1.8″ x 0.7″ (area 1.26 sq ″), a 30% reduction in area.

A further significant advantage is reduced component count, the cascade of two discrete FETs uses a a total of forty surface mount components whereas IGT1011S150 uses only twenty-three, almost halving the total number of components.

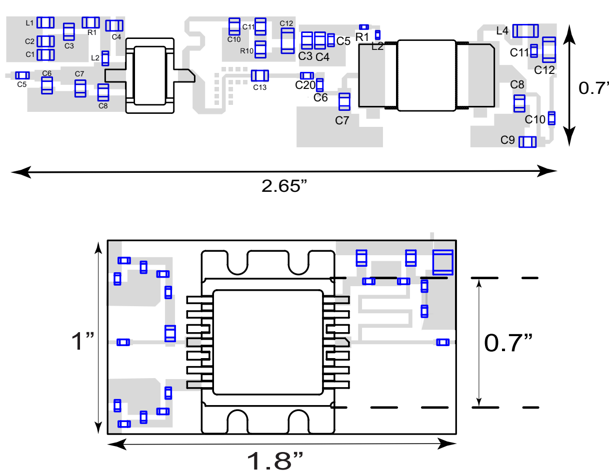

FIGURE 1: Size comparison between a cascade of two separate transistors (upper figure) and IGT1011S150 (lower figure.

RF PERFORMANCE

Table 1 lists the RF performance of IGN1011S25, IGN1011S150 and IGT1011S150, while Table 2 gives a comparison of the overall RF performance of the cascade of two FETs versus that of IGT1011S150. It can be seen that the two solutions have similar efficiency. However, IGT1011S150 has a gain tolerance of +/- 2 dB whereas the cascade of two separate transistors will have a wider gain window of at least +/- 3dB.

Device	Gain, dB	Efficiency, %	Pout, W
IGN1011S25	20	50	25
IGN1011S150	20	48	150
IGT1011S150	37	45	150

TABLE 1: RF performance of the three transitors.

Device	Gain, dB	Efficiency, %	Pout, W
IGT1011S150	37	45	150
Cascade of IGN1011S25 & IGN1011S150	40	48	150

TABLE 2: RF performance of IGT1011S150 versus the cascade of two transistors.

It should also be noted that the RF circuitry required for IGT1011S150 is just a 50 Ω transmission line at the input and output plus a non-critical value of DC blocking capacitor, whereas the cascade solution requires external RF matching circuitry at the input, output and interstage and so the test yield will be lower.

CONCLUSION

This Application Note has demonstrated the advantages of using a dual-stage transistor in a single package versus using two separate gain stages in terms of size, reduced component count, reduced gain tolerance, and higher test yield.

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