

Power Converter Design Using Power Amplifier

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Abstract

In this paper, power converter is achieved by using the power amplifier. The power amplifier is an inverter and the process of amplifier converts the DC to AC signal, the inverter designed by using the transistor of RF3931 and achieves the steps for testing the transistors range verified and the HSMS2862 rectifier used for high switching frequency and converts AC to DC signal and for high output voltage compare to inverter the rectifier achieves high output voltage to develop for very high frequency applications and the matching circuits developed to matches the inverter and rectifier. The resultant measurement of power converter achieves 60dBm output voltage.

Keywords:

Class E Power Amplifier; Rectifier HSMS2862-2000301 ; Switching Frequency, Very High Frequency.

1. INTRODUCTION

Power supply is the most using device in current scenario and for very high applications. The process of delivering the power from one signal to another signal with high efficiency and high output voltage is important and unique. In power amplifier the input networks and output networks are matched by the transmission lines and the related the measurements using the substrate values used [1]. The power amplifier mostly used in switched mode power amplifier for achieving the highly efficient output and the development of high peak to ratio power [2]. The steady state of frequency domain describes the frequency of power amplifier and optimized efficiently with high [3]. It used for power electronics and the radio frequency applications and the function of the transistor is MOSFET and the ranges are measured by the general procedure of developing the condition of ON/OFF switching frequency [4-5].

The rectifier are generally developed for the AC to DC conversion and the function of simplicity and flexibility [6] and could provide the transformation for reduce the voltage level at the output side [7]. The rectifier of HSMS2862 series is used and developing the high switching mode frequency in the condition of

very high frequency application and the process of inverter could be power amplifier and the rectifier diode is used.

2. CLASS E POWER AMPLIFIER DESIGN (INVERTER)

Generally power amplifier used for the power boosting the high efficiency and achieves high gain. The PA should design by four simple ways for perfect transistor and then achieves the overall power amplifier is designed. The inverter could be DC to AC and the frequency of the power amplifier is 1GHz and the inverter is an reverse biasing because they direct the current in the opposite direction also but for rectifier always in same or direct direction flow of currents is used.

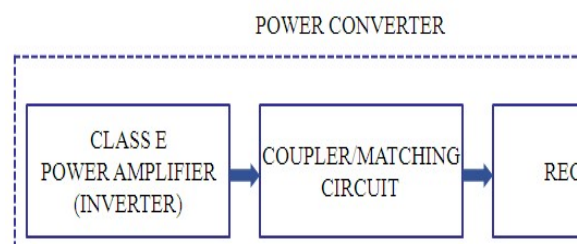


Figure 1. Overall design of power converter using the power amplifier

The process of the power converter are generally designed with low frequency signal should given as a input and getting the output voltage, instead of giving the input signal giving the RF high voltage signal is given and the function of output should be higher output voltage and the power converter converts the inverter to the rectifier. The inverter is the class E power amplifier DC to AC using RF3931 transistor and the rectifier is the high frequency switching of HSMS2862-2000301 and the diode of rectifier achieves high efficiency and the process of high output voltage in dBm are measured and they are matched by the coupler or matching circuit is used to proceed the overall design of power converter.

2.1 DC LOADLINE ANALYSIS

DC load line used to measure the power consumption level of the transistor and the voltage and current values are measured for different values. The DC load line should have voltage Gate- Source (VGS) and voltage Gate- Drain (VDS) and the current probes are connected to measure the current values and the three different regions are calculated by using the slope equations, and the transistor is placed between the VGS and VDS and then the process of the transistor shows if the voltage increases it decreases the current values and automatically reduces the power consumption level of using RF3931 device of the class E power amplifier. The process of DC loadline analysis achieves the power consumption and gives the high voltage and low current of the power used in it.

2.2 STABILITY MEASUREMENTS

Biasing is used to verify the flow of currents and the resistance is placed to reduce the negative resistance. The process stability have two conditions, stability measurements should satisfies the condition of lesser than one value so that they have achievements of the stability measurements and then the stability factor denotes the K value should satisfies only the conditions for greater than one value and the process should proceed the future work of developing the device with bias network were created to make it as a simple small device and then the stability measurements and factors are built in the process and the functions of graph describes the 1 GHz value they used in the power amplifier. Therefore the condition of stability should satisfies the condition of the stability measurement and stability factor.

2.3 LOADPULL ANALYSIS

Loadpull measurements used for the achieving the high output voltage and the improvements of the gain are achieved by changing the value of source input value the gain values are changed to high. The process of loadpull analysis designed by the one tone pull design and then the two DC parts are attached in input side and output side for measuring the range of dBm values of output voltage of the device and the bias is connected to reduce the occupied current values and the flow of device with bias as measured the gain values. The gain value is 14dBm and the source pull value is 32dBm and the condition is that frequency range of the device is 900 MHz and the achievements in the Z_{load} values are measured by the equations they have four iterations and Z_{source} have the same and the process can developed and by using the load and source values measuring the range of input impedance and output impedance values.

2.4 IMPEDANCE MATCHING

The impedance matching used for matches the input and output device with device and bias network can match and then power added efficiency values are measured. The impedance matching should have power added efficiency (PAE) and the current probes are attached at the VGS, VDS and the process of input probe at the input match, Idc current at the VDS side, the Iout output current probe attached at the output matching network and the function of PAE are measured in the current probes, the p_tone power used for the frequency values and the development of the voltage are connected respectively. The Harmonic Balance (HB) is used for the frequency measurements in the developed conditions in it. The output of the device is 1GHz at 35.4(dBm) and the PAE is 23%. After that optimization process is developed to improve the PAE and the output voltage device by using the optimum goal and the goal achievement gradient are used for achieving the high output voltage is 44.5(dBm) and the PAE is 64.50% are achieved by using the device with bias network value.

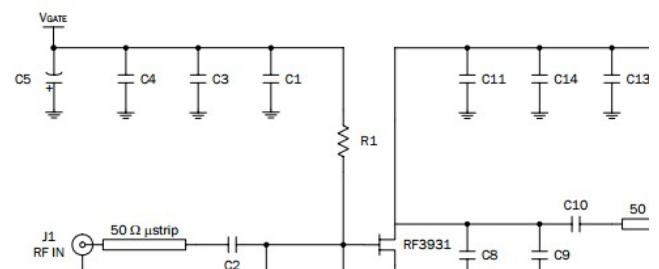


Figure 2. The Overall Design of Class E Power Amplifier Using RF3931 Device (Inverter) with Some Procedure of the PA

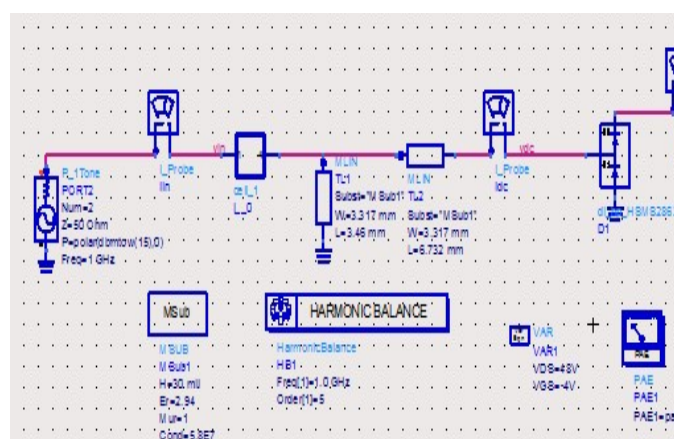
The process of overall design of RF3931 transistor are developed the condition and the design is developed in ADS tool and then make it as a small symbol and the function of using the conditions are VGate should connected with the resistor because the condition should not be oscillator it should be stable in condition, and the drain system at Vdrain are only with capacitors and the relative tables are shown and the micro strip line of 50ohm are designed at both the RF input and output side and then the transistor of RF3931 are attached between the input and output match. The power amplifier should have the values of the capacitor and the resistors are used in the design.

Table 1 Values of overall designed power amplifier

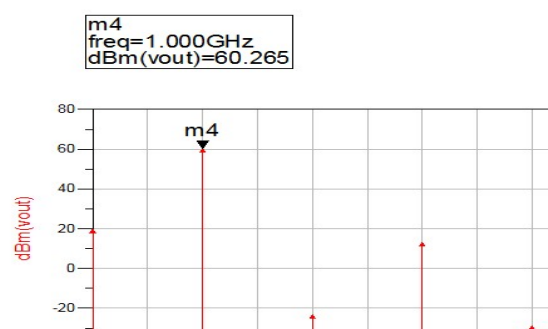
Designator	Description
C1, C2, C10, C11	33pF, $\pm 5\%$, NPO Ceramic, ATC800A
C3, C14	0.1uF, 100V, 1210, X7R Ceramic, Murata GRM32NR72A104H
C4, C13	4.7uF, 100V, 2220, X7R Ceramic, Murata GRM55ER72A475K
C5	100uF, 50V, Electrolytic, Panasonic ECE-V1HA101UP
C6	2.2pF, ± 0.1 pF, NPO Ceramic, ATC800A
C7	0.7pF, ± 0.1 pF, NPO Ceramic, ATC800A
C8	1.0pF, ± 0.1 pF, NPO Ceramic, ATC800A
C9	2.7pF, ± 0.1 pF, NPO Ceramic, ATC800A
C12	330uF, 100V, Electrolytic, Panasonic EEU-FC2A331

1. Power Converter Design

The power converts generally converts the energy from one signal to another signal and from this they converts DC-DC power converter that is the power amplifier of class E using the transistor of Rf3931 is used, which converts the DC to AC and it should reverse the current direction and the rectifier is AC to DC and the development of the function in direct direction flow of current and the process of the power converts it using the power_tone one is used for giving the input frequency and then the RF input signal is applied in it.

**Figure. 3** Overall design of power converter using the class e power amplifier of using RF3931 transistor

The class E power amplifier is make it as the small symbol for the inverter part and the transmission lines of matching circuit is used and calculated by the line calculation of the substrate are used. The current probe of Vdc of the Dc side and the process of rectifier side are used in HSMS2862-200301 process of achieving the high switching frequency and the high efficiency are achieved in the Vout are connected at the output voltage and the terminator are used in the 50ohm power amplifier and the MSUB is the microstrip substrate are used for the substrate matching and the HB for the frequency measurements are measured at 1 GHz and the power added efficiency is drained and the gate voltage is used for the function of the radio frequency voltage is developing the conditions of variance value of the VDS is 48V and the VGS is -4V and the process of the PAE gives the high efficiency values are achieved.

**Figure 4.** Output voltage of power converter 60(dBm) at 1 GHz

The maximum output of power converter is 60(dBm) output voltage and the function of the power amplifier achieves the 44(dBm) and the process of the inverter gets the DC to AC and the variance values are the VDS and VGS and the achievable amount of output voltage gets increased.

**Figure. 5** Efficiency of RF conversion of dc and the input power

The above Fig 5. Shows the efficiency values of DC to DC gives the input power of 0-9mW and the input power increases as same as the efficiency of DC power also gets increases and the output power voltage values shows in the Fig 4. Achieves the output voltage of 60(dBm) are achieved and the efficiency of overall power converter is 60%. So the process of power converter almost achieves the high efficiency for switching mode power supply requirement.

2. Conclusion

The process of power converter using the power amplifier of class E using RF3931 (Inverter) and the rectifier are converts the power signal by DC to DC conversion, the input power is 0-9mW and the output voltage is 60(dBm) and the efficiency of the overall the RF conversion is 60% and then the application of the power converter is very high frequency of switch mode power supply(SMPS) for the computer battery used, and the input power should be in Radio Frequency(RF) and getting the Rf output voltage, the diode rectifier can achieves the output current and output voltage values of 2.3mW for DC conversion.

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