

APPLICATION NOTE

Voltage Detector Filter Optimization for the SKY65137 WLAN Power Amplifier

Introduction

The Skyworks SKY65137 Power Amplifier (PA) provides ideal features for Wireless Local Area Network (WLAN) applications. The device provides an output voltage signal, V_DET (pin 14), the voltage detector output filter. This signal can be used to control the input level of a signal source that is driving the RF_IN port (pin 18). In most applications, this is achieved by a baseband or controller circuit.

When a modulated signal is used as an input to the SKY65137, the modulated signal is coupled on the V_DET signal, itself. Depending on the baseband or controller used in the application, this signal may have to be filtered. This is illustrated in Figure 1.

This Application Note describes how to optimize the V_DET output filter for the SKY65137. Refer to the device Data Sheet (document number 200851) for additional electrical and mechanical details.

Notch Filter

Circuit Description

A low frequency notch filter is recommended to remove the coupled signal from V_DET. Depending on the baseband or controller requirements, the coupled signal can be completely filtered, but with a trade-off in rise time of the V_DET signal.

A schematic of the SKY65137 Evaluation Board is shown in Figure 2. The V_DET signal has two external components for the detector output filter, both shown with nominal values. However, a recommended notch filter would have three external components to completely filter out the coupled modulated signal. These three components are illustrated in Figure 3.

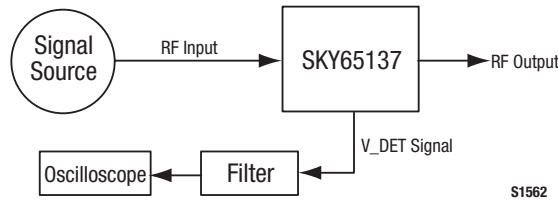
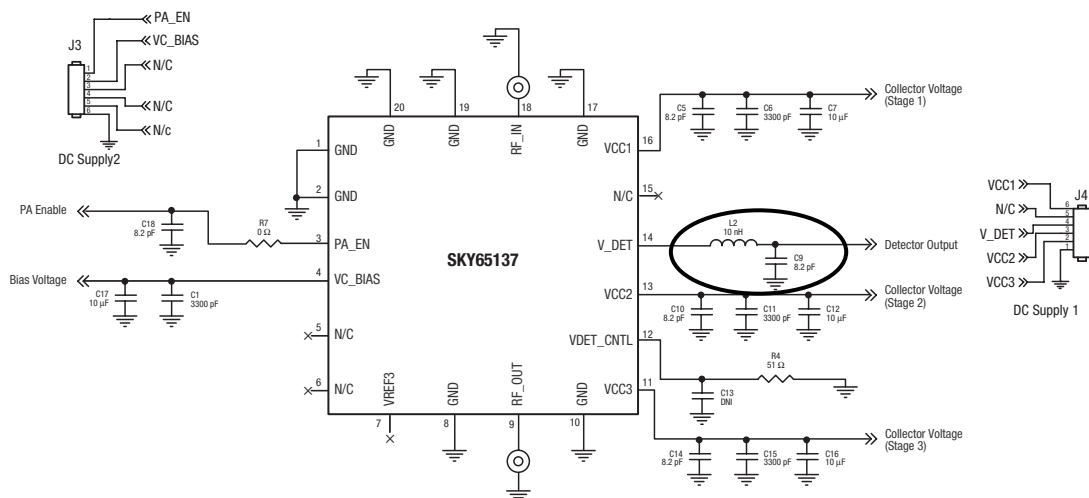


Figure 1. SKY65137/Voltage Detector Block Diagram



Note: Some component labels may be different than the corresponding component symbol shown here. Component values, however, are accurate as of the date of this Data Sheet.

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Figure 2. SKY65137 Evaluation Board Schematic



Figure 3. Recommended Notch Filter Topology

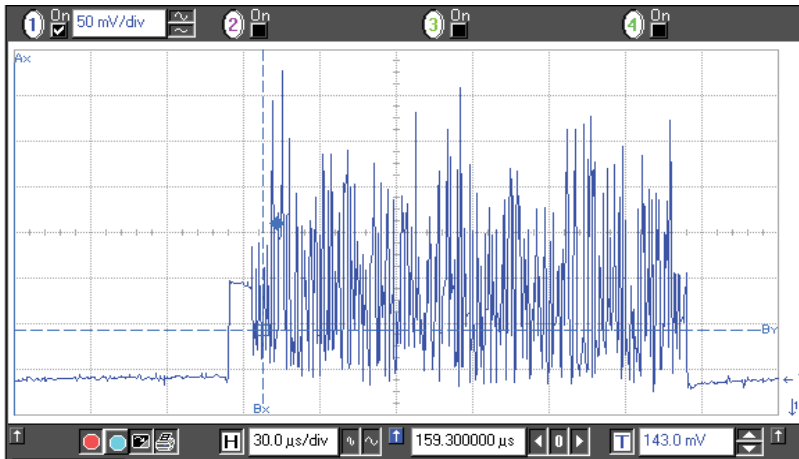


Figure 4. V_DET Signal With No Filter

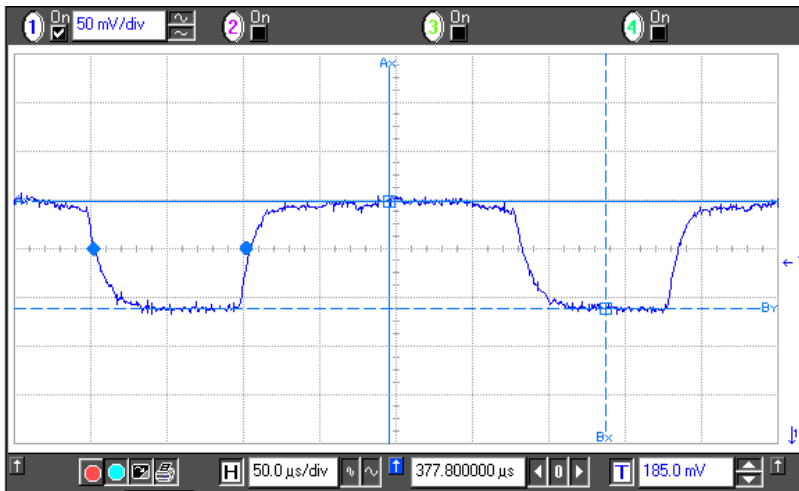


Figure 5. Filtered V_DET Signal

The IEEE 802.11a standard requires the V_DET signal to switch on and off. This switching has a rise and fall time, for which the baseband may impose timing requirements.

Figure 4 plots the result of V_DET voltage measurements (in mV) over time (in μs) without filters. When this signal is filtered with

the recommended notch filter, the resulting V_DET voltage measurements over time is shown in Figure 5. The filtered signal, however, has a rise time of 18 μs, which may not be acceptable to the baseband. Table 1 provides a list of resistor values against the rise time trade-off and voltage ripple.

Conclusion

The nominal filter implemented on the reference design is appropriate for most applications. However if an application has more restrictions on the noise present on the voltage detector

signal, a notch filter scheme can be implemented with much flexibility.

Table 1. Notch Filter Series Resistor Values, and Corresponding Rise Time and Voltage Ripple

V_DET Series Resistor Value (kΩ)	Rise Time (μs)	Voltage Ripple (mV)
No Match	<0.140	>200
1	0.146	100
10	1.45	50
20	3.00	20
50	9.30	15
100	18.0	10

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