APPLICATION NOTE

# SKY65367 and SKY66100: Using a Ferrite to Increase Isolation between Stages

## Introduction

The SKY65367-11 and SKY66100-11 are high performance, transmit/receive (T/R) Front-End Modules (FEMs).

The SKY65367-11 includes a Power Amplifier (PA) capable of more than +30 dBm of transmit output power ($V_{CC}$ = 3.6 V) at more than 43 percent PAE for the module (63 percent for the standalone PA).

The SKY66100-11 includes a Power Amplifier (PA) capable of more than +27 dBm of transmit output power at more than 50 percent PAE for the module (60 percent for the standalone PA).

For current-sensitive applications, the PA can be bypassed to save battery current.

This application note is for both PAs at 169 MHz providing high gain. A high gain PA can be at risk of possible feedback and oscillation, depending on variations in board layout.

This application note shows how to simulate and evaluate the isolation between stages. The RF choke values cannot be changed because they are part of the PA design. The values are so small that their reactance is very low and is not helpful for improving the isolation. However, adding a ferrite (such as the Murata BLM15BD601SN1 or equivalent) on the low current side does help to improve the isolation. Refer to Figure 1.

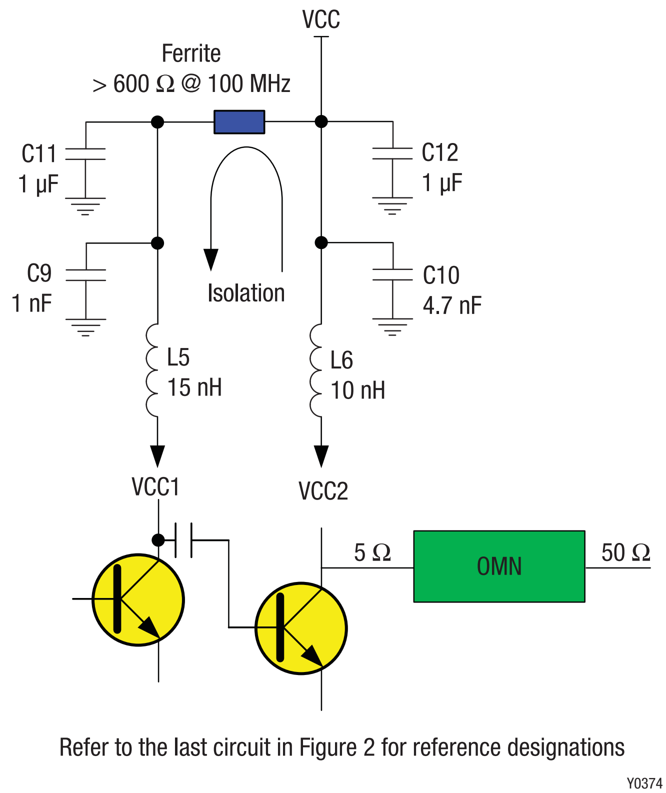


**Figure 1. Ferrite Added to Low Current Side Improves Isolation**

The impedance at VCC2 is mostly driven by the Output Match Network (OMN). In the case of the SKY65367, the Zopt is 5 Ω. This impedance is in parallel with the transistor.

The impedance at VCC1 is higher at approximately 500 Ω.

## Circuit Diagrams

Figure 2 shows the circuit diagrams for the three different circuits and the effect of using the .s2p files.

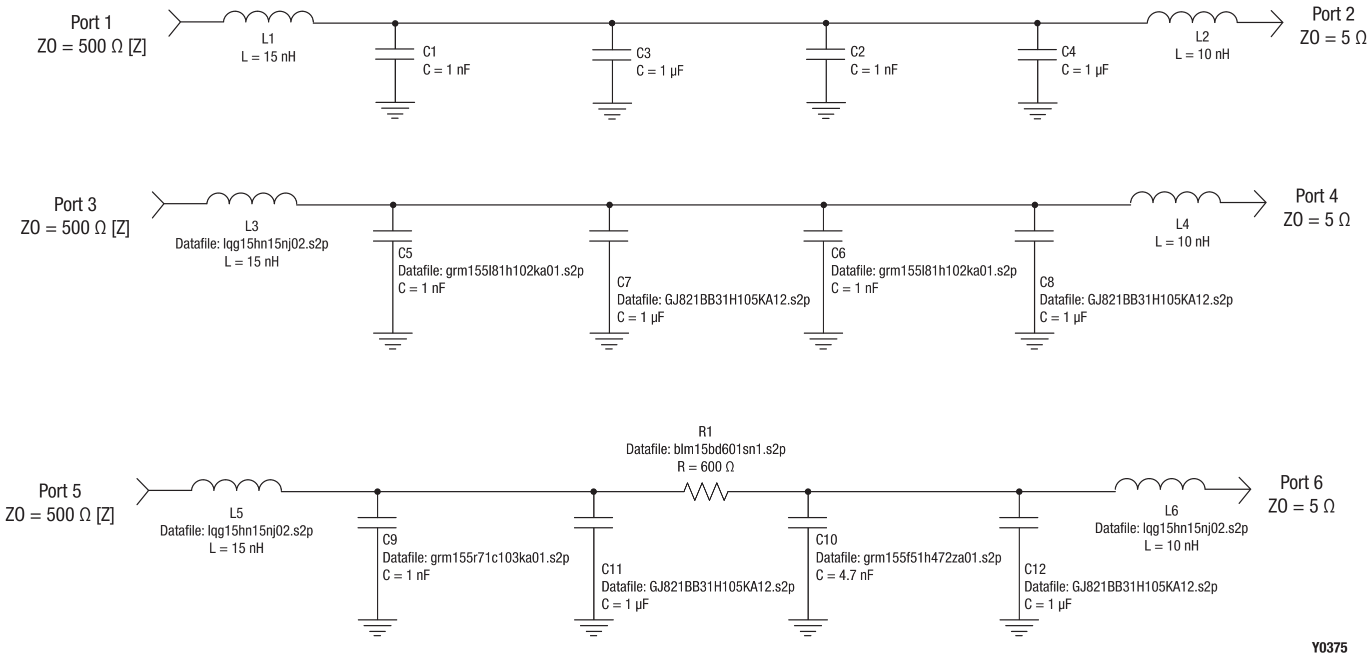


**Figure 2. Circuit Diagrams with Suggested Part Numbers from Murata**

## Simulation

To demonstrate this capability, the simulation in Figure 3 shows analysis of three circuits. The first circuit uses ideal components with typical values for low frequency decoupling. The red trace on the graphic shows the frequency response.

When the ideal components are replaced with their respective .s2p files, the frequency response shows poor attenuation (blue trace) at 169 MHz, compared to the ideal components.

The third circuit shows the final circuit after some iterations for finding the best capacitors such as the C10 in Figure 2. The green trace shows higher than 100 dB isolation.


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**Figure 3. Simulation**