APPLICATION NOTE

SKY85405-11: Ruggedness Improvements in 5 V Applications

Introduction

This Application Note provides information on how to improve ruggedness in a 5 V application.

The SKY85405-11 is rated for a maximum input power drive of +10 dBm under a voltage standing wave ratio (VSWR) of 10:1 presented to its output, but the device sometimes fails at input power of around 0 dBm when the actual Vcc = 5.25 V ~ 5.5 V.

This level can be significantly improved to greater than +12 dBm maximum input power drive by adding a 20 Ω series resistor on Vcc2 and a 1 Ω series resistor on Vcc3, with minimal trade-off on overall performance. The locations of the 20 Ω and the 1 Ω resistors are shown in Figure 1.

Skyworks Green™ products are compliant with all applicable legislation and are halogen-free. For additional information, refer to *Skyworks Definition of Green™*, document number SQ04–0074.

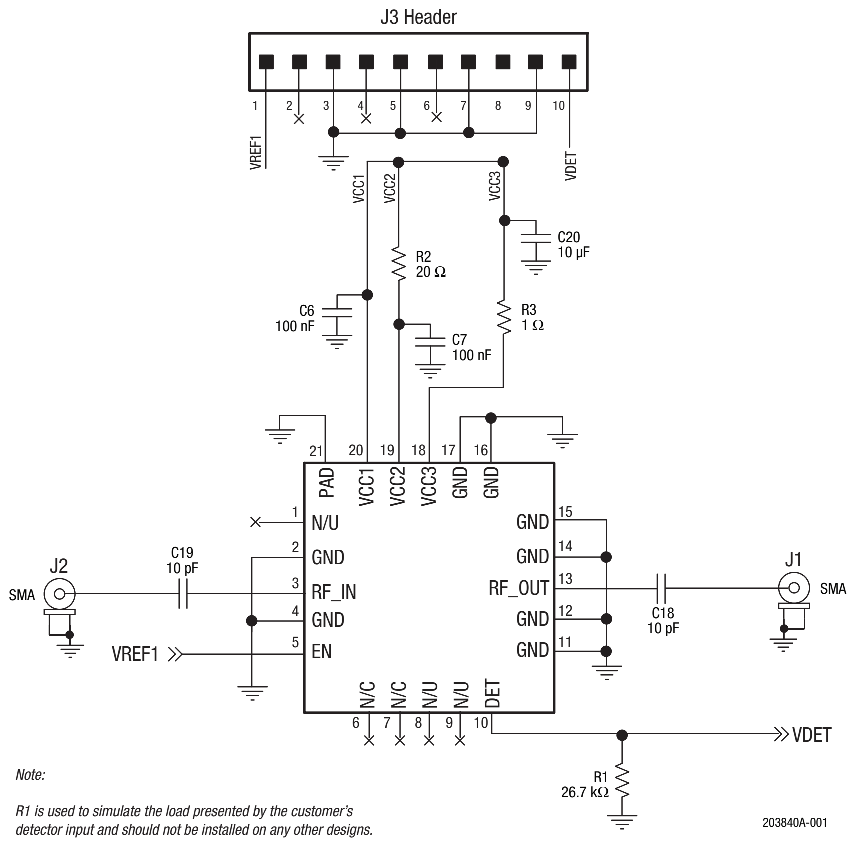

Figure 1. SKY85405-11 Schematic for Improved Ruggedness

Power Dissipation Considerations

Adding a series resistor on Vcc2 limits the Icc2 and Icc3 current and the voltage on pin 19 (Vcc2) as the last stage is eventually starved when the RF input exceeds saturation.

Adding a series resistor on Vcc3 further limits the voltage on pin 18 (Vcc3) and the Icc3 current to protect the last stage from being over-driven.

The voltage drop across the 20 Ω resistor on Vcc2 at 0 dBm (well above the 1dB input compression point) is 1.85 V or an equivalent power dissipation of 170 mW. The voltage drop across the 1 Ω resistor on Vcc3 at 0 dBm is 0.6 V or an equivalent power dissipation of 360 mW. The resistor should be sized appropriately to handle this power dissipation during operation conditions.

The measured current and voltage at pin 19 on Vcc2 and Vcc3 are shown in Figure 2 and Figure 3, respectively. The measured current and voltage at pin 18 on Vcc2 and Vcc3 are shown in Figure 3 and Figure 4, respectively.

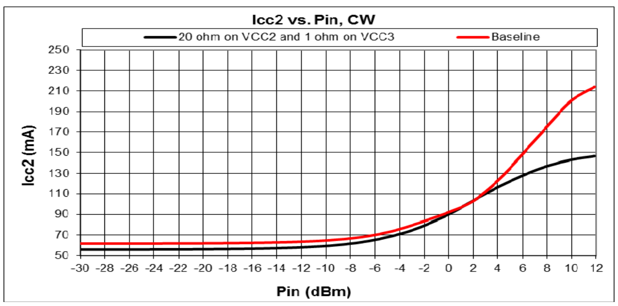

Figure 2. Measured Current at Pin-19 with and without 20 Ω on Vcc2 and 1 Ω Resistors on Vcc3

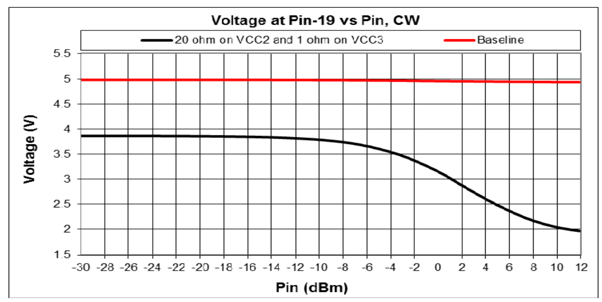

Figure 3. Measured Voltage at Pin-19 with and without 20 Ω on Vcc2 and 1 Ω Resistors on Vcc3

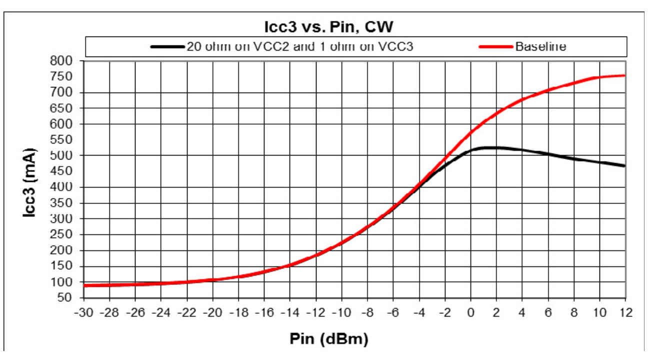

Figure 4. Measured Current at Pin-18 with and without 20 Ω on Vcc2 and 1 Ω Resistors on Vcc3

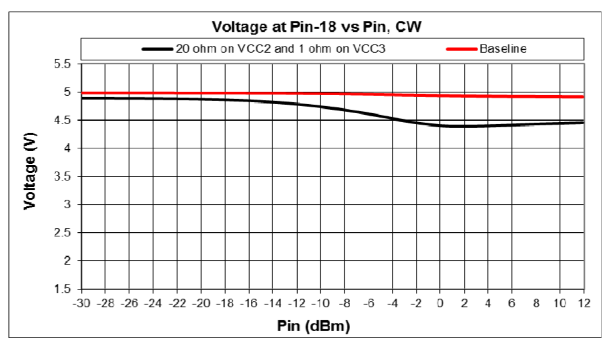

Figure 5. Measured Voltage at Pin-18 with and without 20 Ω on Vcc2 and 1 Ω Resistors on Vcc3

Performance Trade-Off

Because the voltage at Vcc2 and Vcc3 decreases as input power or current increases, some linearity degradation is expected.

HT20 MCS7 dynamic EVM performance with and without the resistors on Vcc2 and Vcc3 is shown in Figure 6. VHT80 MCS9 dynamic EVM performance with and without the resistors on Vcc2 and Vcc3 is shown in Figure 7.

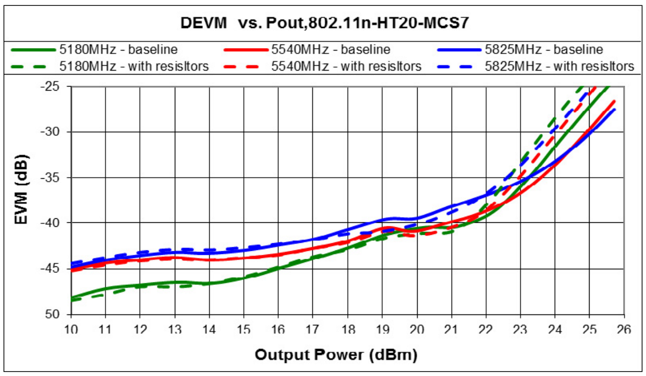

Figure 6. HT20 MCS7 Dynamic EVM performance with and without 20 Ω on Vcc2 and 1 Ω resistor on Vcc3

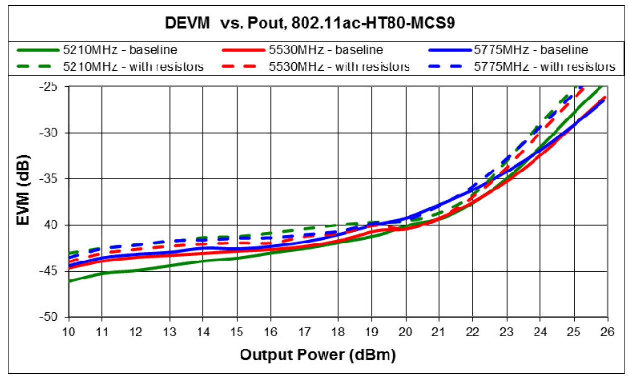

Figure 7. VHT80 MCS9 Dynamic EVM performance with and without 20 Ω on Vcc2 and 1 Ω resistor on Vcc3