Application Note

# MAX2291 Gain Control for the Low−Power Path

Additional Information: Wireless Product Line Page
Applications Technical Support

The MAX2291 is a single−supply linear power amplifier in UCSP™ package designed for PCS band application. Through slight changes of the external impedance matching component values, it also works in WCDMA and TD−SCDMA band applications. The amplifier typically delivers an output of +29dBm in NCDMA, +30.5dBm in TDMA, +28dBm in WCDMA and TD−SCDMA.

The MAX2291 includes a low power path to achieve higher efficiency at middle output powers in the range around +15dBm.

In a radio transmitter system design, a transmitter IC and PA driver may not provide enough dynamic range to meet the system standard specifications. For example, in 3GPP standard, a WCDMA transmitter needs to deliver power between +24dm to −50dBm, resulting in required dynamic range of 74dB. Allowing for some margin, the preferred dynamic range of the transmitter should be over 80dB. Usually the dynamic range of a transmitter chip is limited by ACPR at the high−power end and by noise floor at the low power end. A PA gain control introduces additional attenuation to help meet the whole system dynamic range requirement.

The MAX2291 PA is a two−stage amplifier with external bias resistors used to adjust bias current for different applications. Gain variation can be obtained by changing the bias current of the first stage and/or at the second stage separately or simultaneously, depending upon performance and tuning DAC availability. The measurements performed below are based on adjusting two bias currents simultaneously.

The test setup of PA gain control measurement is shown in Figure 1. The low−power path is biased through $R_{BIAS1L}$ and $R_{BIAS2L}$, while the control voltage from a step power supply is connected to the biasing port through a resistor, which determines the throttle back current. Without the step power supply, the PA works in the normal condition. After the step power supply is connected, gain will be varied with the supply voltage.

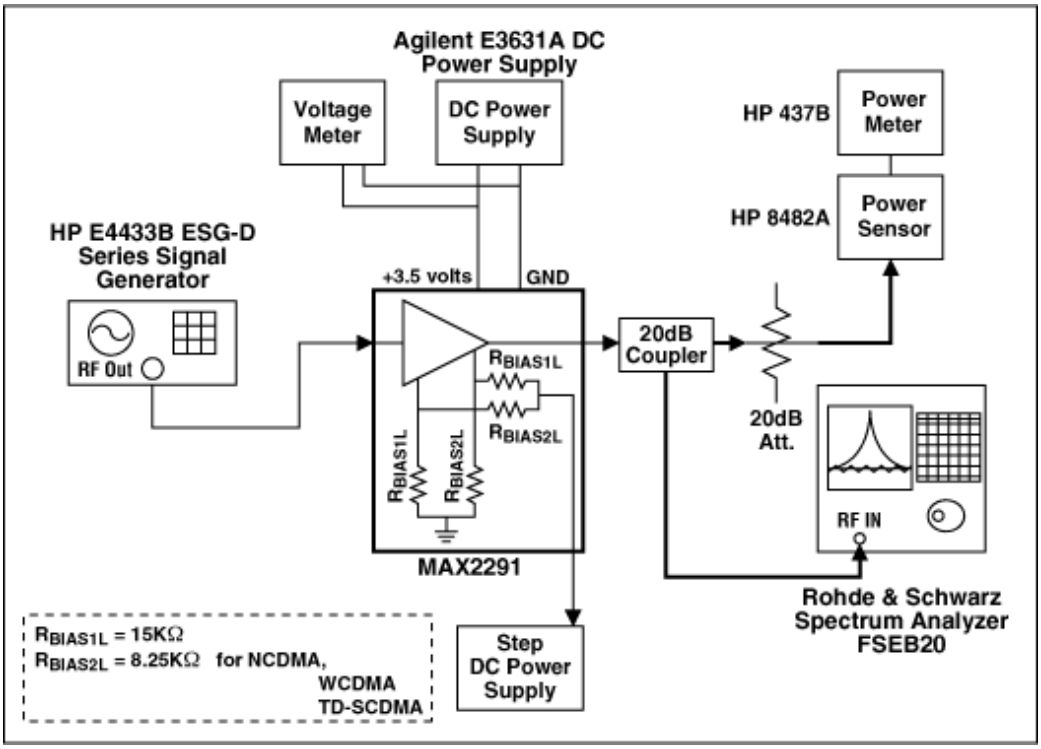


*Figure 1. Test set−up*

The measurement data of gain and ACPR versus control voltage is obtained and plotted in Figure 2 for NCDMA with input power of +2 to −5dBm (the input power adjustment is used to get the desired ACPR performance.

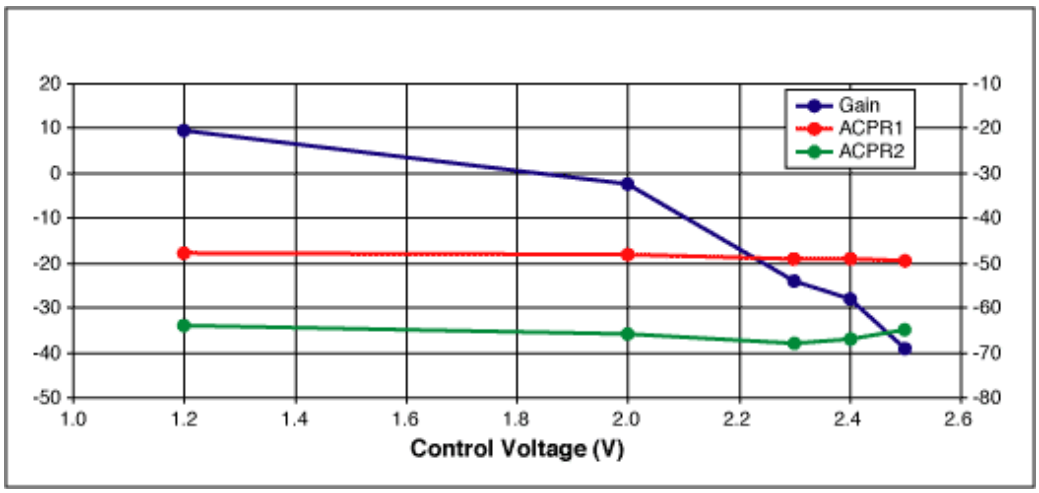


*Figure 2. The MAX2291 low−power gain and ACPR vs. control voltage for NCDMA application*

For the WCDMA and TD−SCDMA application, the measured data are displayed in Figure 3.

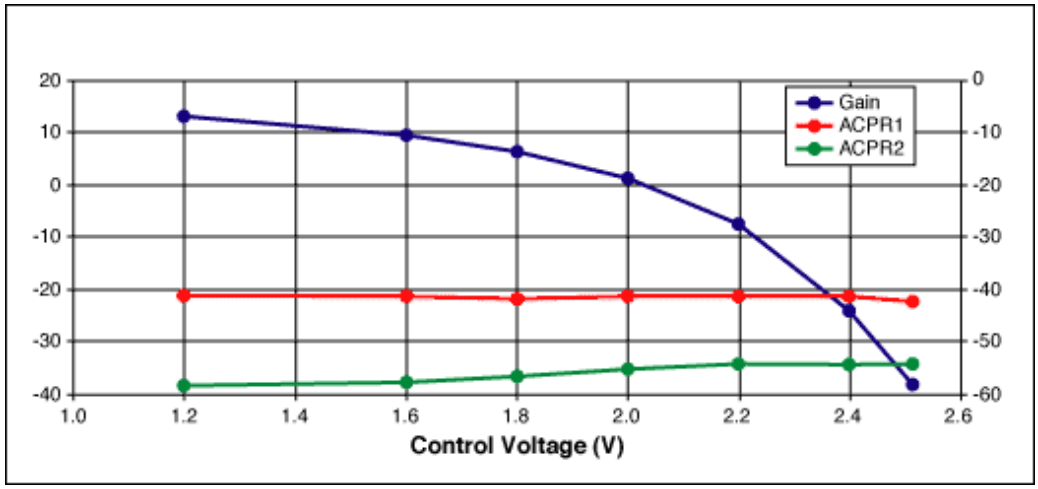


*Figure 3. The MAX2291 low−power gain and ACPR vs. control voltage for WCDMA and TD−SCDMA*

December 2001