



# Amplifying With W-CDMA

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**Transmission of wideband CDMA requires a new approach.**

**T**he new 3G technologies, W-CDMA and cdma2000, are considerably more sophisticated than previous generations, and the requirements on system performance have increased immeasurably. The challenge of transmitting the new 3G CDMA signals through base-station amplifiers is increased when multiple signals are transmitted. W-CDMA signals are allocated a 5MHz channel and

have an occupied bandwidth of 3.84MHz. The spectrum-mask requirements for W-CDMA are given in Figure 1 on page 54. Service providers can transmit up to four contiguous channels for a total allocated bandwidth of 20MHz.

Meeting the spectral-mask requirements is especially difficult due to the high crest factor of W-CDMA signals. The crest factor for a typical single W-CDMA signal can be as high as 11dB. Further, the overall dynamic range of this signal is infinite.

### Signal Amplitude Variation

Amplifiers operating well within class A limits are extremely linear. When operating at class A limits, the maximum RF-output-power level is well below device-saturation level, and power consumption is independent of RF-output power. The penalty for achieving this linearity is efficiency. Typical operating efficiencies for a truly class A linear operation are less than 5%. Low efficiency is only acceptable when amplifying very low power signals (in the milliwatt range). At high-transmission power levels, however, poor efficiency results in unacceptable power consumption, heat generation, and, perhaps of most significance, poor reliability. High junction temperatures required by high-power class A amplifiers cause poor reliability. These high temperatures have been shown to cause low mean time between failure.

To improve the efficiency of an amplifier, it's necessary to operate the amplifier much closer to device saturation and to bias the devices in a more efficient manner. Typical wireless-transmitter systems are biased in class AB mode. In this mode of operation,

