power stages, to reduce the component stress and the size of the integrated chip. Furthermore, other desirable features and characteristics will become apparent from the subsequent detailed description and the appended claims, taken in conjunction with the accompanying drawings and this background of the disclosure.

Summary of Invention

[0012] According to the present application, a buck-boost power amplifier receiving a supply voltage and providing an output having a voltage swing higher than the supply voltage is provided. The buck-boost power amplifier comprises a buck power stage, a boost power stage, an inductor, and a non-linear pulse width modulator, wherein the non-linear pulse width modulator comprises a mode and duty cycle controller (MDC), a linear pulse width modulator (LPWM) and noise shaper, and a pulse generator with delay compensation, wherein the MDC is configured to process an input signal and generate a duty cycle signal and a mode signal, and wherein the mode signal and the duty cycle signal are provided into the LPWM and noise shaper and the pulse generator with delay compensation. The buck power stage and the boost power stage are independently controlled by the non-linear pulse width modulator. The non-linear pulse width modulator switches the buck-boost power amplifier between a buck mode wherein the output provides a voltage lower than the supply voltage and a boost mode wherein the output provides a voltage higher than the supply voltage.

Brief Description of Drawings

[0013] The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views and which together with the detailed description below are incorporated in and form part of the specification, serve to illustrate various embodiments and to explain various principles and advantages in accordance with a present embodiment.

[0014] **Fig. 1**
[Fig. 1] depicts a circuit diagram of a typical Class-D amplifier with a boost convertor. The boost converter is utilised to generate a supply voltage higher than the battery voltage, and to power the Class-D amplifier.

[0015] **Fig. 2**
Fig. 2 depicts a circuit diagram of a reported switching-mode power amplifier which utilises buck/boost power stages.

[0016] **Fig. 3**
Fig. 3 depicts a circuit diagram of another reported switching-mode power amplifier which utilises buck/boost power stages.

[0017] **Fig. 4**
Fig. 4 depicts a circuit diagram of a buck-boost power amplifier in accordance with the present embodiment, which comprises a buck cascaded buck-boost (BuCBB) power stage and a non-linear pulse width modulator.

[0018] **Fig. 5**

Fig. 5 depicts a waveform diagram of signal waveforms of input signal V_{IN}, amplified output signal V_{OUT}, a first signal pwm_bu, a second signal pwm_bo, and two