



(19) **United States**

(12) **Patent Application Publication**
Zhang

(10) **Pub. No.: US 2024/0178752 A1**

(43) **Pub. Date: May 30, 2024**

(54) **RF CIRCUIT WITH NEGATIVE VOLTAGE GENERATION AND A METHOD FOR RF CIRCUIT CONTROL**

(52) **U.S. Cl.**

CPC **H02M 3/071** (2021.05); **H03K 3/0315** (2013.01); **H03K 17/063** (2013.01)

(71) Applicant: **Chengdu Sicore Semiconductor Corp. Ltd.**, Chengdu (CN)

(57)

ABSTRACT

(72) Inventor: **Cemin Zhang**, Chino, CA (US)

(73) Assignee: **Chengdu Sicore Semiconductor Corp. Ltd.**, Chengdu (CN)

(21) Appl. No.: **18/092,521**

(22) Filed: **Jan. 3, 2023**

(30) **Foreign Application Priority Data**

Nov. 29, 2022 (CN) 202211501712.2

Publication Classification

(51) **Int. Cl.**

H02M 3/07 (2006.01)

H03K 3/03 (2006.01)

H03K 17/06 (2006.01)

Various embodiments for RF control circuit with negative voltage generation are disclosed. The application of a negative bias to an RF control circuit provides improved RF isolation and enhanced RF power handling capability. A negative voltage generator (NVG) with a frequency-varying clock signal is used for negative bias generation. The NVG comprises an oscillator and a negative voltage charge pump. The oscillator outputs a clock signal having a frequency varied in a span to the negative voltage charge pump, which generates a negative bias based on the frequency-varying clock signal. A level shifter receives the negative bias and outputs a shifted control signal having the negative bias. Since the clock signal has a varying frequency, the spectrum of the noise signal superimposed on the output negative bias is spread out. Consequently, noise spurs on an output RF signal are spread and suppressed, even with a high-power input RF signal.

200

