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**Cho et al.**(10) **Pub. No.: US 2024/0178759 A1**(43) **Pub. Date: May 30, 2024**(54) **ELECTRICAL DEVICE INCLUDING  
BIDIRECTIONAL SWITCHING CONVERTER****Publication Classification**(71) Applicant: **SAMSUNG ELECTRONICS CO.,  
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LTD.**, Suwon-si (KR)(21) Appl. No.: **18/238,307**(22) Filed: **Aug. 25, 2023**(30) **Foreign Application Priority Data**

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(57)

**ABSTRACT**

An electronic device is provided. The electronic device includes: a first transistor configured to connect an input voltage node to a switching node; a second transistor configured to connect the switching node to a ground node; a latch circuit configured to generate a first signal having a first frequency and to control the first frequency based on a level of a load current; a switching modulation circuit configured to generate a second signal having a second frequency which is  $1/N$  (where  $N$  is a natural number) times the first frequency; and a controller configured to control each of the first transistor and the second transistor, based on the second signal.

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