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Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

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Leea Storer Lee

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(12) **United States Patent**
Mori et al.

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(54) **SWITCHING REGULATOR**

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(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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See application file for complete search history.

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(57) **ABSTRACT**

The invention provides a technique to widely spread the frequency spectrum of switching noise generated by a switching action and to reduce the noise level at a particular frequency. A switching regulator (6A) includes a computing unit with computing function. First, in the computing unit, a pulse-width-modulation processing unit (PWM) (2a) performs pulse-width-modulation processing of receiving a feedback signal corresponding to the output of a detector 1 to determine an on-duty cycle of a pulse signal. Subsequently, for the signal and data obtained by the PWM (2a) to be subjected to further modulation processing for spectrum spreading, a branching processing is performed by making changing-over unit (2d) randomly select asynchronous-modulation processing unit (ASM) (2e) or pulse-position-modulation processing unit (PPM). When the PPM is selected, another branching processing is performed by making the changing-over unit (2d) select a first PPM (2f) or a second PPM (2g) depending on the on-duty cycle.

10 Claims, 15 Drawing Sheets

