SOFE05-194

FUSION POWER SUPPLIES USING MAGNETIC ENERGY RECOVERY SWITCH

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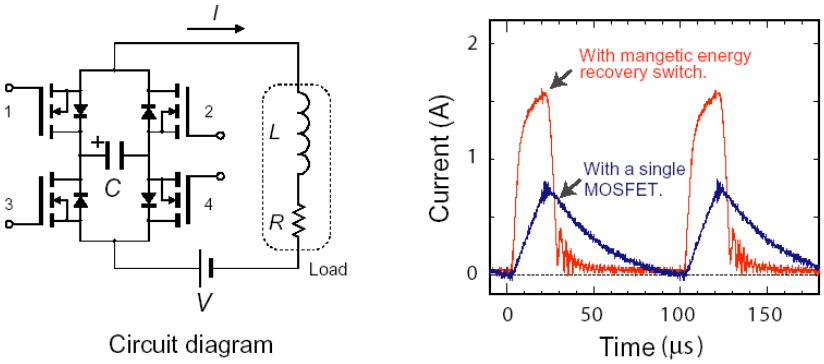
In this paper, a new concept of pulse power supplies that can boost up the pulse current and/or can reduce the voltage rating of the power supplies is proposed. A magnetic energy recovery switch (MERS) consists of four MOSFETs or IGBTs and a capacitor. The MERS is connected in series to a power supply and a coil. The MERS is a switch module and it has no power supply in itself. When the current of coil decrease, the MERS absorbs the magnetic energy stored in the coil and re-generates a high voltage in the capacitor. When the current increases, the MERS adds the voltage to raise currents faster than the time constant of the coil. Because the MERS re-generates a voltage required for the inductance of the coil by using the previous magnetic energy. So, the power supply only has to supply a voltage required for the resistance of the coil. The MERS can reduce a voltage rating and capacity of the power supply. By using the MERS with a power supply of a pulsed magnet, high-repetition pulsed current can be realized with a comparatively small capacity of the power supply. Some applications require a controlled current waveform. By controlling the MERS using PWM, the controlled current waveform is obtained. Operation principles and characteristics of the MERS are described. Some experiments were carried out. Experimental results confirm that the MERS can reduce voltage ratings of power supplies and/or generate high-repetition pulsed boost-up currents.



Circuit diagram

Current waveforms with and without this switch are compared.

"Topical Category" 17) Power systems "Poster"

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