

SJ MOSFETs Offer Fast Reverse Recovery And Design Flexibility For EV Charging Stations, Home Appliances

[ROHM Semiconductor](#)'s new lineup of its PrestoMOS series, the R60xxJNx series 600-V superjunction (SJ) MOSFETs includes 30 new models, which increase design flexibility while maintaining what's described as the industry's fastest reverse-recovery time (t_{rr}). The devices are optimized for EV charging stations and motor drives in home appliances such as refrigerators and air conditioners (ACs). The new MOSFETs are offered in different values of $R_{DS(on)}$ and in different package styles (see the table).

IGBTs are commonly used as switching elements in inverters that drive motors in home appliances such as refrigerators and ACs. Recent trends towards improving energy savings have driven the demand for MOSFETs with reduced power consumption during steady-state operation.

To meet this need, ROHM launched the PrestoMOS series of power MOSFETs in 2012. According to the company, this series features the industry's fastest reverse-recovery characteristics, achieving lower power consumption. As with Rohm's conventional products, this new series leverages the company's proprietary lifetime control technology to achieve ultra-fast t_{rr} . This enables a reduction in power loss by about 58% at light loads when compared with IGBT implementations.

Additionally, raising the reference voltage needed to turn on the MOSFET prevents self turn-on, which is one of the main causes of loss (Fig. 1). Furthermore, optimizing the characteristics of the built-in diode allowed the company to improve the soft-recovery index specific to superjunction MOSFETs, which reduces noise that can lead to malfunctions (Fig. 2).

Switching speed increase, self turn-ON, and noise generation are conflicting phenomena, making it necessary for customers to optimize circuitry by adjusting the gate resistance and other factors during circuit design. Unlike general-purpose MOSFETs, ROHM's R60xxJNx series takes measures against noise and self turn-ON, providing customers a great degree of design freedom.

Available now, the R60xxJNx series SJ MOSFETs are priced starting at \$1.54.

Table. The R60xxJNx series 600-V superjunction MOSFETs offer a range of on-resistance values and package styles.

		Packages				
		TO-252 (DPAK) [SC-63]	TO-263 (LPT(S) D2PAK) [SC-83]	TO-220FM	TO-3PF	TO-247
Ron typ (mΩ)	1100	New R6004JND3	New R6004JNJ	New R6004JNX		
	720	New R6006JND3	New R6006JNJ	☆ R6006JNX		
	600	New R6007JND3	New R6007JNJ	New R6007JNX		
	450	New R6009JND3	New R6009JNJ	New R6009JNX		
	350		New R6012JNJ	☆ R6012JNX		
	220		New R6018JNJ	New R6018JNX		
	180		New R6020JNJ	New R6020JNX	New R6020JNZ	New R6020JNZ4
	140			New R6025JNX	New R6025JNZ	New R6025JNZ4
	110			☆ R6030JNX	New R6030JNZ	New R6030JNZ4
	90					New R6042JNZ4
	64				☆ R6050JNZ	☆ R6050JNZ4
45					☆ R6070JNZ4	

☆ : Under Development

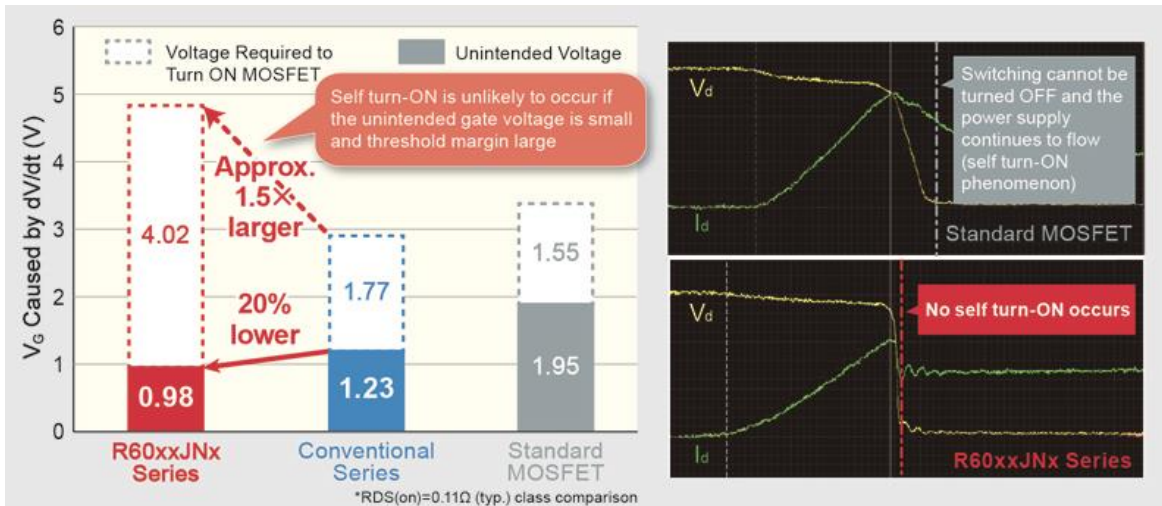


Fig. 1. Implementing self turn-on countermeasures minimizes loss. Optimizing the parasitic capacitance inherent within the MOSFET structure allowed ROHM to reduce unintended gate voltage during switching by 20%. In addition, the specialized design makes it difficult for self turn-on to occur by increasing the threshold voltage (V_{th}) necessary for turning on the MOSFET by 1.5x. This expands the loss adjustment range due to gate resistance and other factors implemented by the customer.

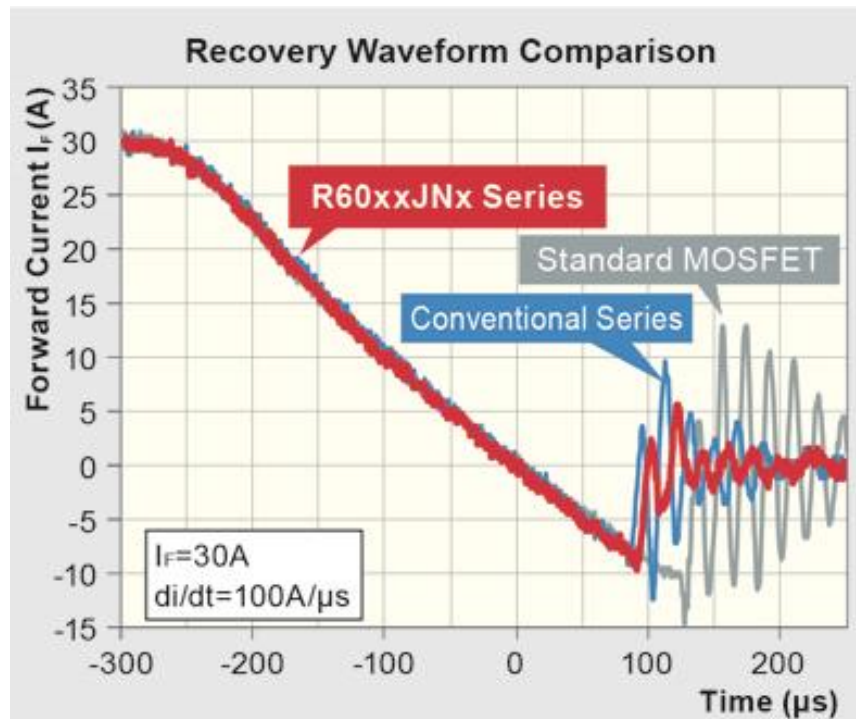


Fig. 2. Improving recovery characteristics reduces noise. Generally, the recovery characteristics of the superjunction MOSFET's internal diode shows hard recovery. However, by optimizing the internal structure, ROHM's R60xxJNx series is able to improve the soft recovery index by 30% over conventional products and succeed in reducing noise while maintaining the industry's fastest reverse-recovery time (t_{rr}). This makes it easy for customers to adjust noise (i.e. due to gate resistance).