

Trench Technology Boosts Efficiency, New Package Saves Space For Rad-Hard MOSFETs

[International Rectifier](#) has introduced two high-performance R8 radiation hardened (rad-hard) power MOSFETs optimized for space-grade point-of-load (POL) voltage regulator applications. The new R8 logic-level, n-channel power MOSFETs use trench technology to offer extremely low on-state resistance ($R_{DS(ON)}$ is 12 m Ω typical) along with a total gate charge (Q_G) of 18 nC (typical). According to the company, when applied in POL buck converter designs, the new trench devices increase efficiency by up to 6% compared to the existing planar rad-hard MOSFETs (Fig. 1.) In addition, the new MOSFETs are offered in IR’s new SMD 0.2 surface-mount package, achieving a 50% space savings compared to the existing SMD 0.5 package (Fig 2.) The devices are also offered in a TO-39 package or in die form for microcircuit designs.

Tiva Bussarakons, marketing director, IR’s HiRel Business Unit, explains that R8 is the 5th generation of International Rectifier’s rad hard MOSFETs and represent the first generation of trench devices that are rad hard. “Delivering industry leading performance in the smallest footprint, and optimized for POL designs, IR’s new R8 RAD-Hard MOSFETs satisfy the space industry’s need to reduce the overall size and weight of the system while increasing efficiency,” says Bussarakons.

The products are fully characterized for radiation performance to 300 krad of TID and SEE with an LET of 81 MeV-cm²/mg with a VGS rating of 12 V. According to the company, the radiation specs of the R8 MOSFETs are similar to those of the company’s existing planar devices. Depending on the intended design orbit and anticipated radiation environment, R8 RAD-Hard MOSFETs may be well suited for applications requiring a mission life of 15 years or more (Fig. 3.)

There are currently four new devices in the R8 family. These parts are differentiated by package type (SMD 0.2 versus TO-39) and by TID level (see the table.) Datasheets, package dimensions and case outlines are available at www.irf.com. Pricing for the R8 MOSFETs begins at \$594 each for a 250-unit quantity.

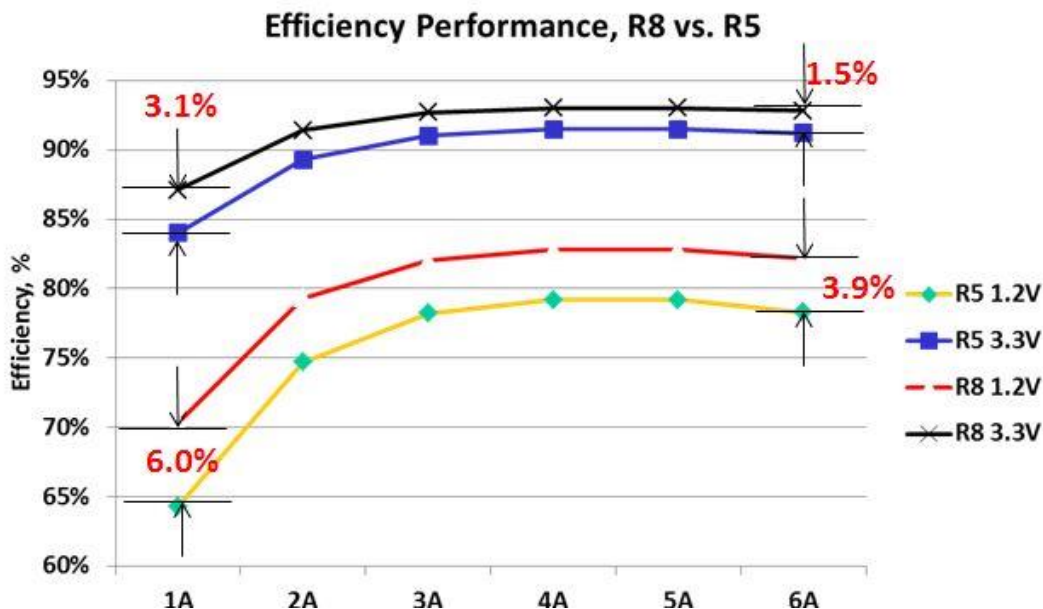


Fig. 1. Described as the first rad-hard MOSFETs fabricated using trench technology, IR’s R8 MOSFETs boost the efficiency of buck converter designs by up to 6% when compared with designs using one of the company’s previous generation, R5 rad-hard MOSFETs. In the measurements shown here, the converter is stepping down a 5-V input to the output voltage indicated. The R8 device is the 20-V rated IRHNM87Y20, which specifies an $R_{DS(ON)}$ of 15 m Ω max and a Q_G of 24 nC max. The R5 device is the IRHNJ57Z30, which is a 30-V rated MOSFET specifying an $R_{DS(ON)}$ of 20 m Ω max and a Q_G of 65 nC max.

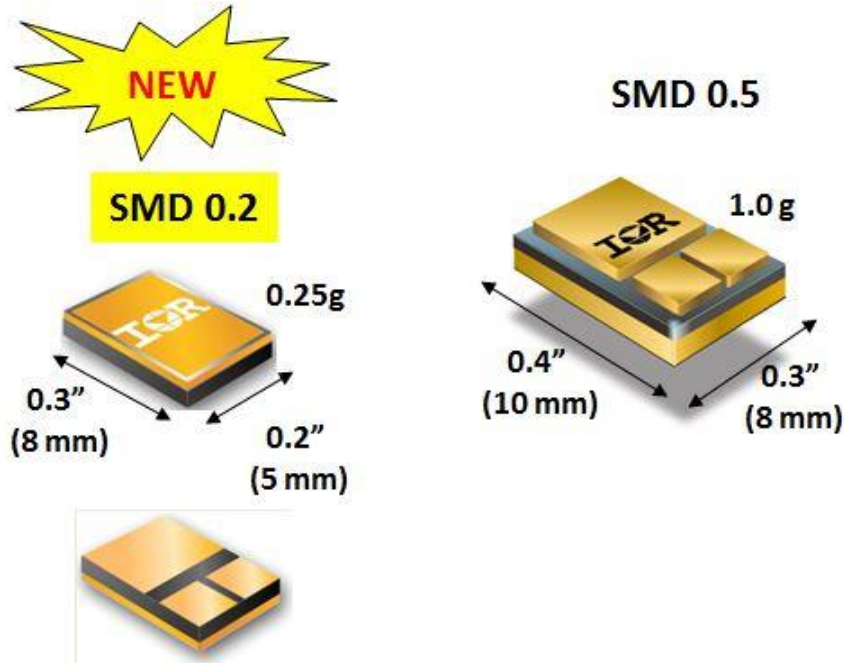


Fig. 2. Considered the industry's smallest low-power, surface-mount power package, the SMD 0.2 reduces the R8 devices' footprint by half in comparison with previous devices in the SMD 0.5 package. Meanwhile, the newer package weighs just one fourth that of the SMD 0.5.

ION	LET	Energy	Range	VDS (V)				
	MeV/(mg/cm ²)	MeV	μm	VGS = 0V	VGS = -1V	VGS = -3V	VGS = -5V	VGS = -10V
Br	36.93	298	38.2	18	18		8	4
I	59.72	320	31	18	18	12	8	
Au	81.43	332	27.5	18	18	12	6	

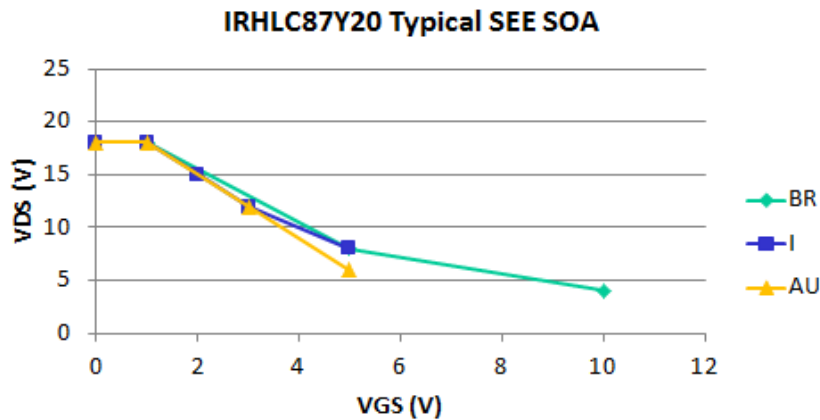


Fig. 3. Typical single event effects (SEE) performance of R8 MOSFETs. The radiation specs of the R8 trench MOSFETs are similar to those of the company's existing planar devices.

Table. Key specifications for the R8 rad-hard n-channel MOSFETs.

Part number	TID level (krads)	Package	BVDSS (V)	ID (A)	RDS(ON) (mΩ)	QG, max (nC)	ΘJC (°C/W)
IRHLNM87Y20SCS	100	SMD 0.2	20 V	17	15	24	3.5
IRHLNM83Y20SCS	300	SMD 0.2		17	15	24	3.5
IRHLF87Y20SCS	100	TO-39		12	32	27	8.0
IRHLF83Y20SCS	300	TO-39		12	32	27	8.0