

# High Voltage RF MOSFETs

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## SD3931-10 / SD3932 / SD3933: 150W AND 300W UNDER 100V SUPPLY VOLTAGE

A new series of high voltage RF Power MOSFETs targeted at ISM (Industrial Scientific and Medical) applications operating at very high frequencies has been introduced.

The new SD39xx series specifies a minimum breakdown ( $BV_{DSS}$ ) of 250V, thus allowing operating voltages up to 100V. The use of 250V MOSFETs brings several benefits such as improved ruggedness and better reliability, which are key factors in plasma generator equipment where the RF power transistors are exposed to large voltage swings.

Another important benefit when using 100V supply voltage is the higher optimum load impedance for the device, which means a lower current requirement and consequently lower  $I_R$  (dissipation) losses in the entire system.

### The SD39XX Series

The SD39xx series is based on the gold metallized N-Channel RF power MOSFET technology. This uses a new patented process including a "SIPS ring" edge termination structure with a new epitaxial layer to increase drain-source breakdown voltage (min  $BV_{DSS}$  of 250V).

The new process also reduces the overall parasitic components. The new products are able to achieve outstanding RF performance, while keeping the well proven ruggedness and reliability of the existing 50V SD29xx series.

Three devices deliver output power from 150W to 300W (in single ended or push pull packages) offering reliable operations under severe operating conditions thanks to their 3dB overdrive and high VSWR load mismatch capability (the single die is capable of withstanding infinite:1 during all phases). The SD39XX series also benefits from the "non-pedestal" ceramic packages with the lowest thermal resistance on the market and the reliability of the standard gold ceramic RF packages.



For more information refer to application note AN1227: "IMPROVED RF MOSFET RELIABILITY THROUGH PACKAGING ENHANCEMENTS" on ST.com at <http://www.st.com/stonline/books/pdf/docs/6979.pdf>

### Features

- Gold metallization;
- 250V breakdown voltage;
- New patented process;
- Lowest thermal resistance.

### Benefits

- Best ruggedness performance;
- Excellent thermal stability;
- Best in class reliability;
- Cost effectiveness.

### Segments and Applications

- Single Side Bands (SSB);
- Plasma generators;
- Nuclear Magnetic Resonance (NMR);
- RF heating.

## SD39XX Product Range

	SD3931-10	SD3932	SD3933
Supply voltage	100V	100V	100V
Breakdown voltage	>250V	>250V	>250V
Frequency	150MHz	150MHz	30MHz
Power Out	150W	300W	300W
Gain	18 dBmin	18 dBmin	20 dBmin
VSWR	10:1	10:1	3:1
Package	M174 Single-ended	M244 Push-pull	M177 Single-ended
RTHj-c	0.45°C/W	0.35°C/W	0.27°C/W



M174



M177



M244

## 50V-100V Technology Comparison

A comparison between the 100V and the 50V products shows a significant enhancement in the overall RF performance when switching from the 50V to the 100V technology.

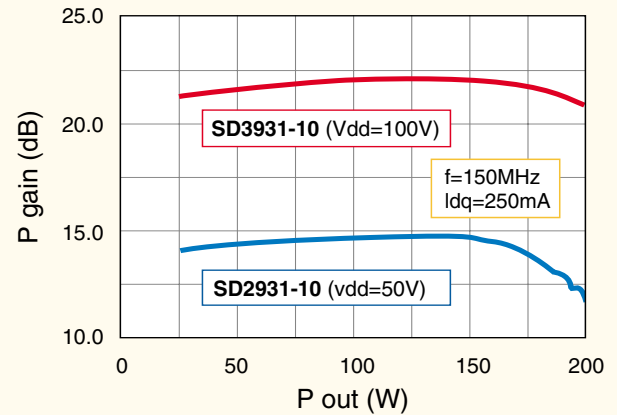
The improved results have been obtained thanks to a new process and layout which reduce the parasitic effects. The following table shows a brief summary of the main static parameters.

	SD3931-10 (100V)	SD2931-10 (50V)
BV <sub>DSS</sub>	>250	>125
C <sub>oss</sub>	134	190
Cr <sub>ss</sub>	6	18

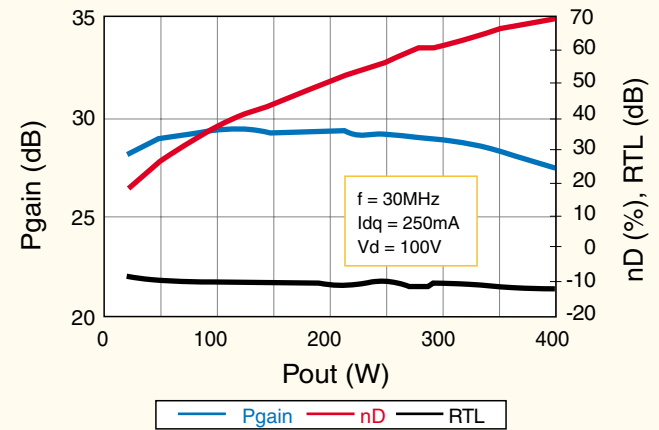
Comparison between 100V and 50V products

The Cr<sub>ss</sub> and C<sub>oss</sub> values suggest, for the 100V die, higher gain, better efficiency and bandwidth operations of up to UHF frequencies.

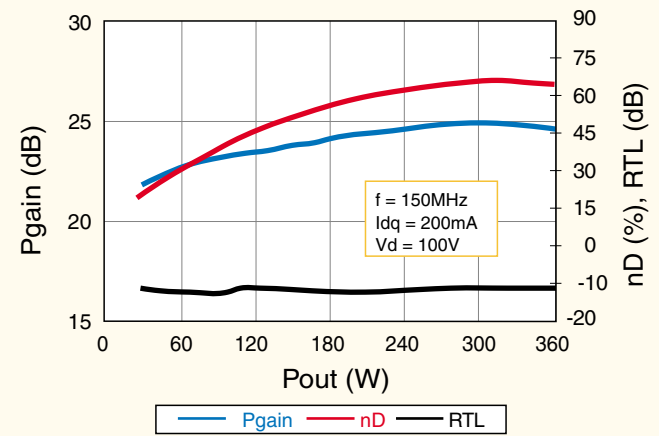
Three basic RF characterizations of the 100V DMOS products are shown in the following graphs. The top graph in particular gives a clear confirmation of the expected improvements in the RF behaviour for the SD39XX series.



SD3931-10 / SD2931-10 power gain vs Pout



SD3933 Typical performance



SD3932 Typical performance