# RF Power SOI LDMOSFET with an Al/PolySi Gate

## Personnel
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## Sponsorship
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We are carrying out research on advanced MOSFET technology for RF power amplifiers, a critical component of all wireless systems. Recently we have developed an aluminum/PolySilicon damascene gate and have implemented it on a radio frequency Silicon-on-Insulator (SOI) Lateral Double Diffused MOSFET (LDMOSFET). This new gate structure greatly improves the device's high frequency performance.

A sketch of our device featuring the Al/PolySi damascene gate is shown in Figure 12. A strip of aluminum is self-aligned over the gate using a process that includes two Chemical Mechanical Polishing (CMP) steps. A titanium nitride barrier layer is used to prevent spiking of the aluminum through the polysilicon. The aluminum strip reduces the gate's resistance to 0.3 Ω/square, which is a 30 times improvement over a conventional polysilicon gate.

Figure 13 shows the performance of SOI LDMOSFETs with an Al/PolySi damascene gate and a polysilicon gate. $f_{max}$, which is a good figure of merit for RF power gain, is improved dramatically by the new gate. The performance improvement is greatest for the wide gate finger widths that are necessary in RF power applications.

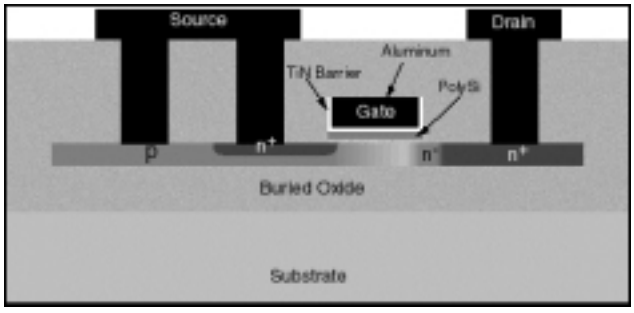


*Fig. 12: An RF Power LDMOSFET on SOI with an Aluminum/Polysilicon Damascene gate.*

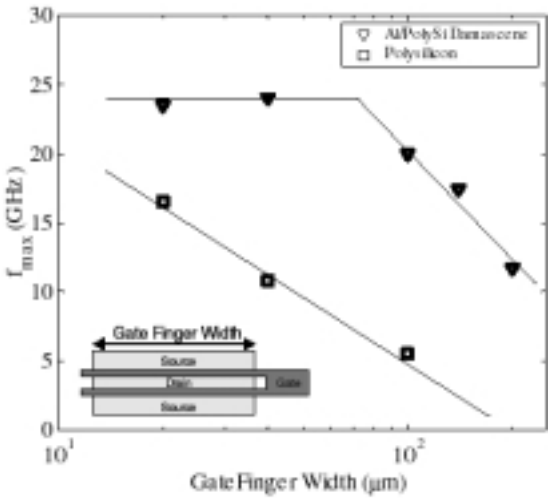


*Fig. 13: fmax vs unit finger width for SOI LDMOSFETs with an Al/PolySi gate and a standard polysilicon gate*