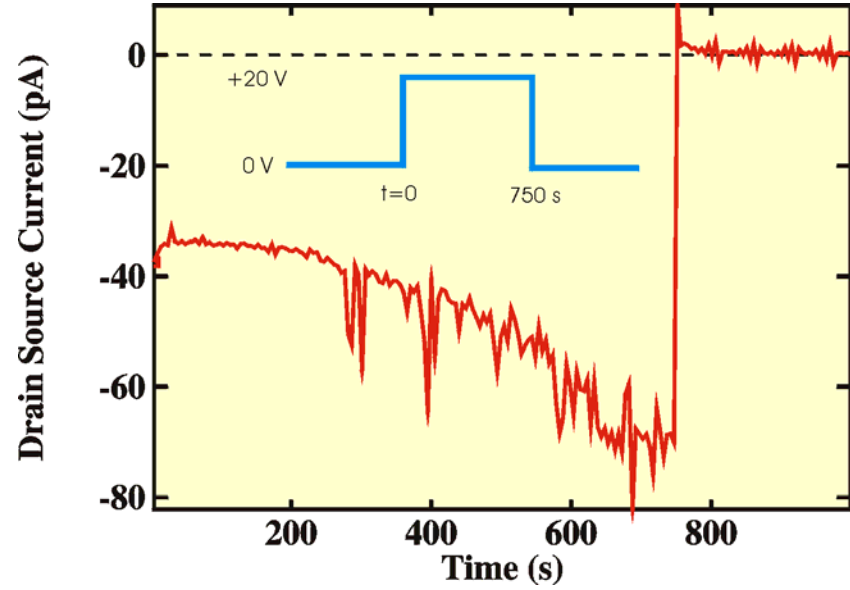
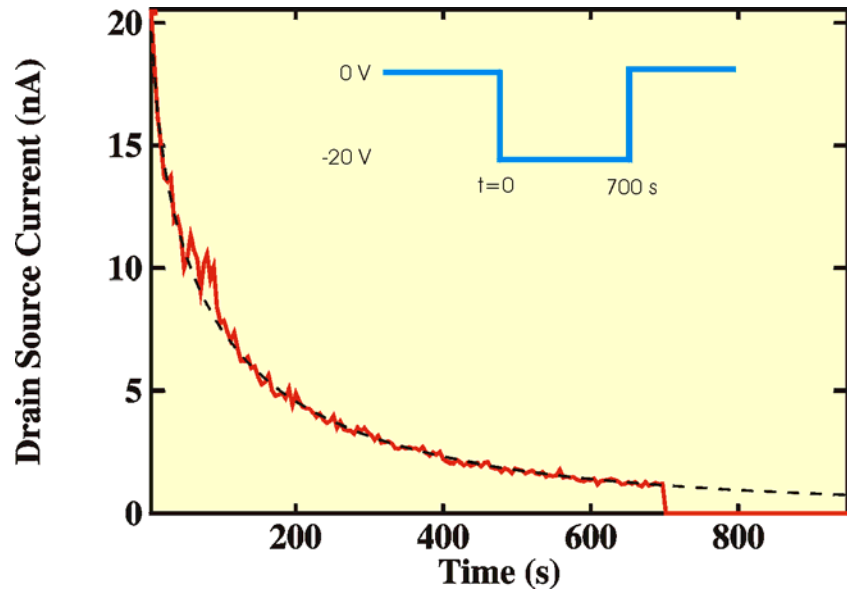


Gate Voltaic Transients

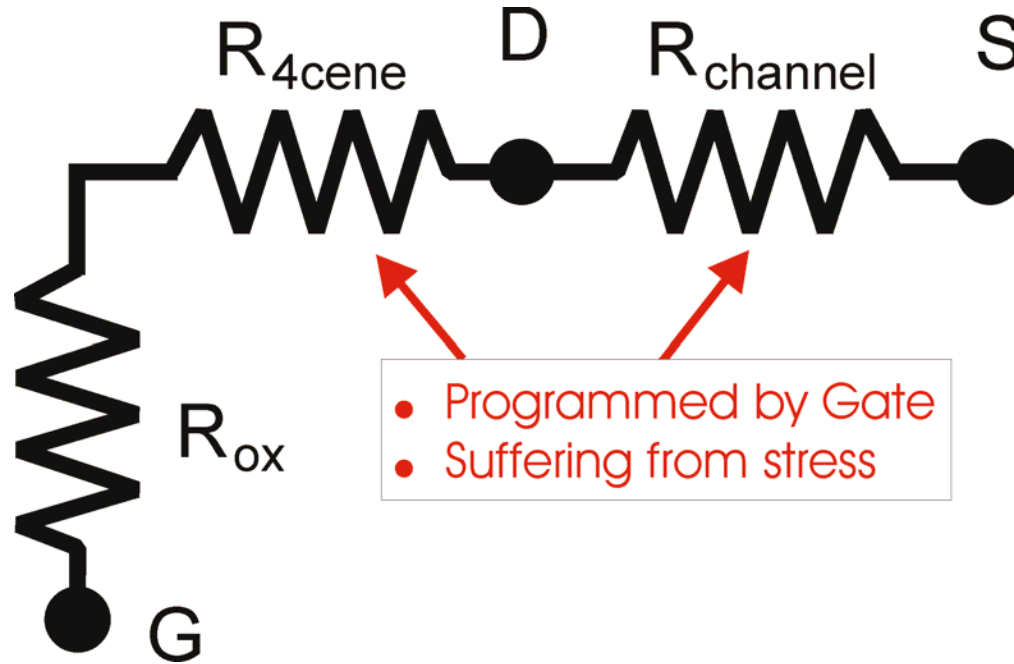


Gate Voltaic Transients

- Not displacement
 - $Q = \text{Integrated } I$ is too large ($Q = DV A C_{ox}$, $C_{ox} = \epsilon_0 \epsilon_r / d_{ox}$ $Q = 6.91 \times 10^{-7} \text{ C}$)
 - When switching off the voltage, Q doesn't come out.
 - For positive V_G : not same (magnitude of) current.
- Follows exponent of square-root-of-time behavior:

$$I_{ds} = I_0 \exp(-(t/t)^{0.5}) + I_{\text{off}}$$

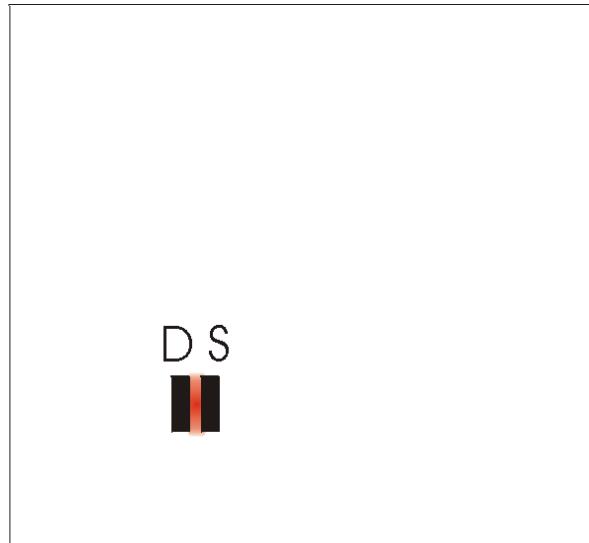
The Model



The Model



Leakage Current

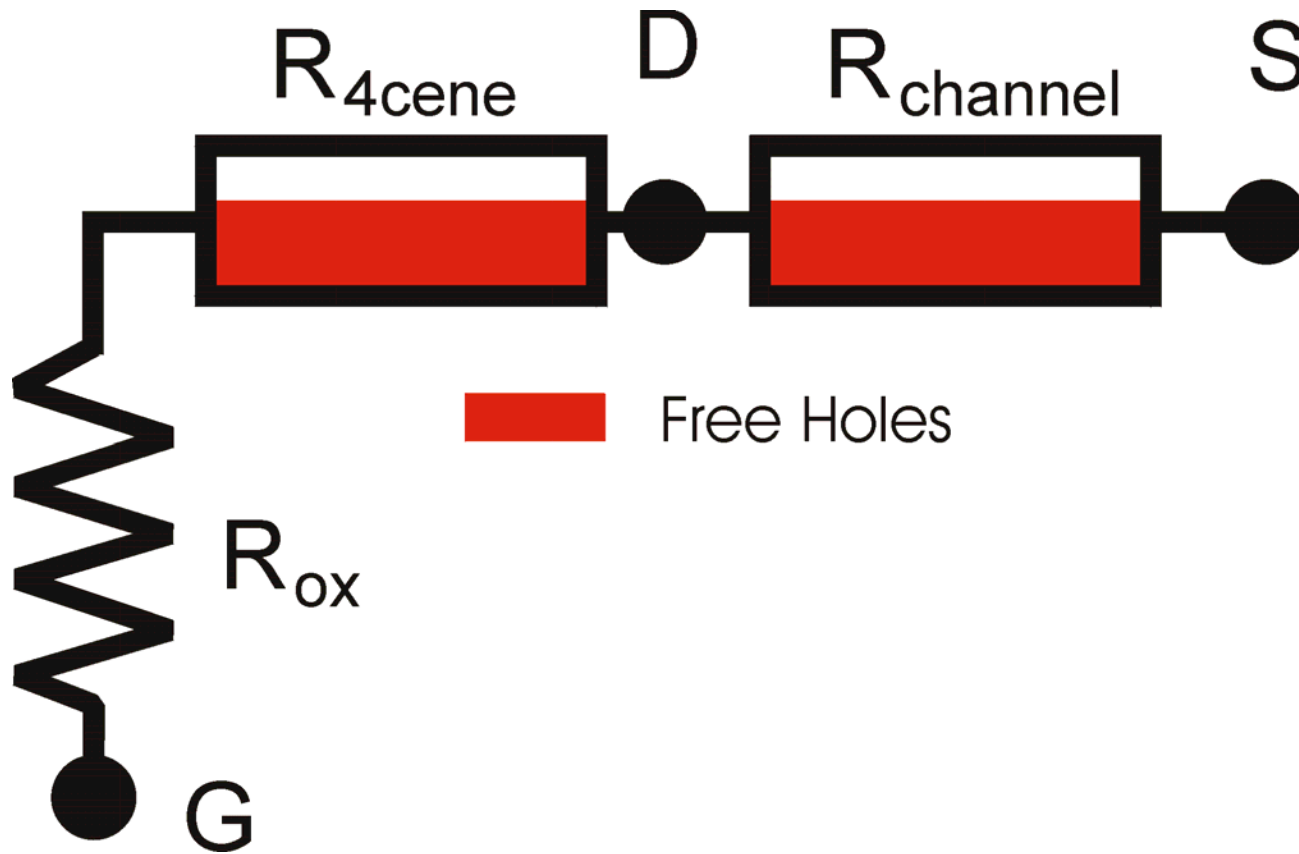


Channel Current

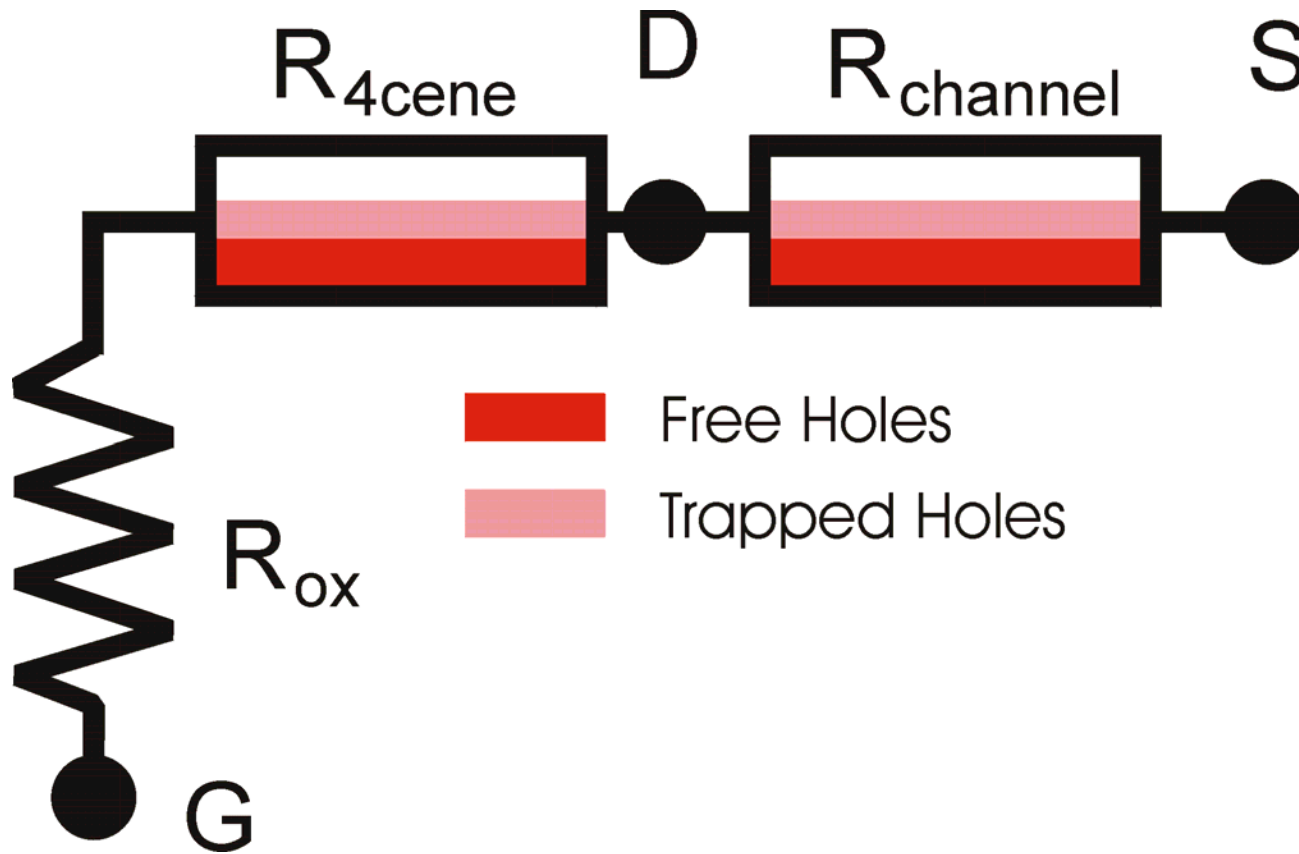
Leakage current and channel current about the same magnitude

Both suffer from trapping of free carriers which increases the resistivity.

The Model: Transient Behavior

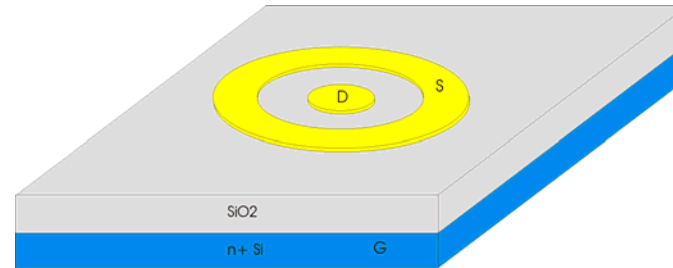


The Model: Transient Behavior



The Solution

Circular FETs



Poor man's alternatives:

Scratching/isolating single devices

Also connect pads on side of device to source

Measuring always with $V_g = V_d$

Note: there is no use in masking the edges!

Ideas / Comments

To set up the **ultra-fast pulse** experiment (Lecroy-Agilent): IEEE cables (2) and interface card (1) are needed urgently.

To study the interfaces of FETs, **sandwich structures** are needed



The FlexiFET program

The screenshot displays the FlexiFET software interface, which is organized into several functional panels:

- Voltage Sequence:** Contains a file path field set to `C:\sequence.dat`, a table with columns `Vds`, `Vg`, and `Δt`, and buttons for `DIR`, `GENERATE`, and `VIEW`.
- Status:** Shows real-time voltage levels: `Vds` at `0,0000 V` and `Vg` at `0,000 V`. It includes status indicators for `Vds ON` and `Vg ON`, a `time to go` field set to `0`, and a `KEEP` button.
- Settings:** Features radio buttons for `current` and `luminescence`, and a sub-panel with `CW` and `pulsed` modes. It also includes dropdown menus for `source range` (Auto (CW)), `measure range` (Auto (CW)), and `measurement time` (28 ms), along with a `Sample Name` input field.
- Last Data Point:** Displays the most recent measurements: `Last Vds` (0,0000 V), `Last Vg` (0,0000 V), `Last t` (0,000 s), `Last Curr` (0,000000E+0 A), and `Last Lumi` (0,000000E+0 A).
- Communication:** Allows configuration of `IEEE address (Vds)` (16), `IEEE address (Vg)` (5), and `IEEE address (K197A)` (20).
- Results:** Contains two empty plots with y-axes ranging from `-1,0E+0` to `1,0E+0` and x-axes from `1,0` to `5,0`. The top plot is labeled `Ids` and the bottom `lumi`. It includes a `SAVE` button and a format dropdown set to `ASCII`.
- Control:** A large green `START` button is centrally located, with an `EXIT` button below it.
- Footer:** A `Comment:` field is provided at the bottom of the interface.

How to increase the luminescence

Use **half-locus** curves

$$V_g = (V_d + V_s)/2$$

In this way, the drain-source voltage can be increased, without ultrapassing the oxide breakdown voltage anywhere.

Example

