Fig. 1. As shown in this generalized graph of output characteristics, an n-channel power MOSFET has three possible modes of operation.
Chapter 4: Switch Realization

Typical MOSFET Characteristics

- Easy to parallel
- Coefficient, hence positive temperature
- On resistance has unchanged characteristics - current rating exceeds normal in conduct peak
- MOSFET can
  - On state: \( V_s > V \)
  - Off state: \( V_s < V \)
Chapter 4: Switch Realization

- Easy to parallel coefficient, hence positive temperature on-resistance has changed.
- Unchanged characteristics are current rating — excess of average current well in conduct peak. MOSFET can.
- On state: $V_{GS} < V_{th}$
- Off state: $V_{GS} > V_{th}$

Typical MOSFET Characteristics

Big gate voltage necessary

$V_{GS}$ at $100V$ and $100mA$ power; $V_{DS}$ at $10V$.
n-channel power MOSFETs. Electro-thermal instability can occur as shown here for a typical limited ability to operate in the corner of the FBsOA graph, where limited designs have been optimized for switched-mode designs have been optimized for switched-mode designs.

**Fig. 2.** Power MOSFETs optimized for switched-mode designs.
Figure 3. Degradation of MOSFET transfer curve with time under avalanche stress.

Gate Bias (V)

Drain Current (A)

- 284 hrs
- 265 hrs
- 285 hrs
- 287 hrs

Reverse Recovery
-Other Stress
-V<50A
-R>1

With (avalanche stress)
Bridge: Green from body pic
Simple boost: Avanttech

Figure 4.a SOA characteristics.

(a) Dynamic SOA

(b) Variation of K with age

Time

Age

Stress

Reverse Recovery

dV/dt stress

H is experimental factor

Depends on:

Specific stresses

- Circuit used in
Fig. 3. Avalanche damage to Planar FETs (left) and Trench FETs (right). The bond-wire has been cut and moved out of the way to expose the damage in the part at upper right.