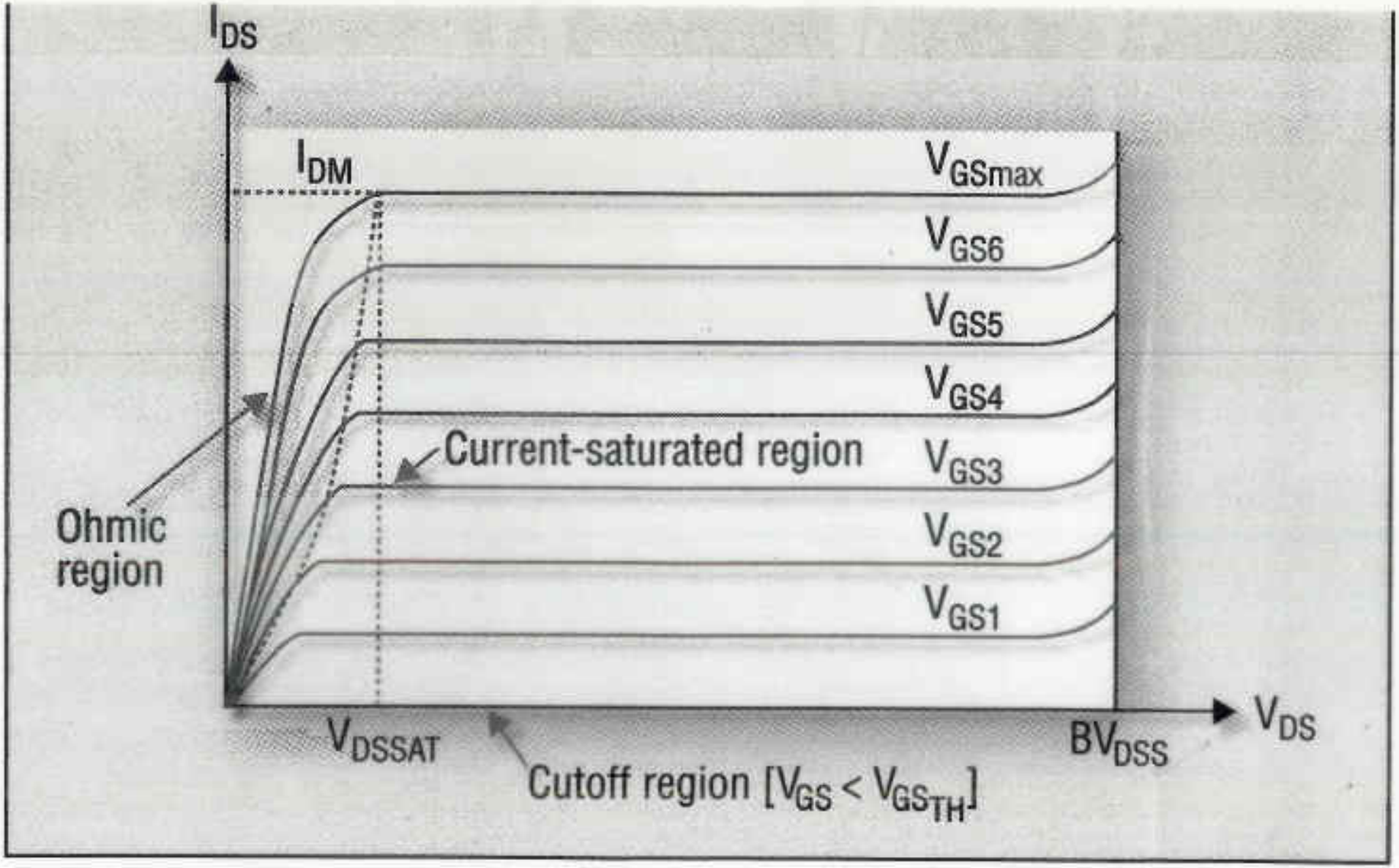
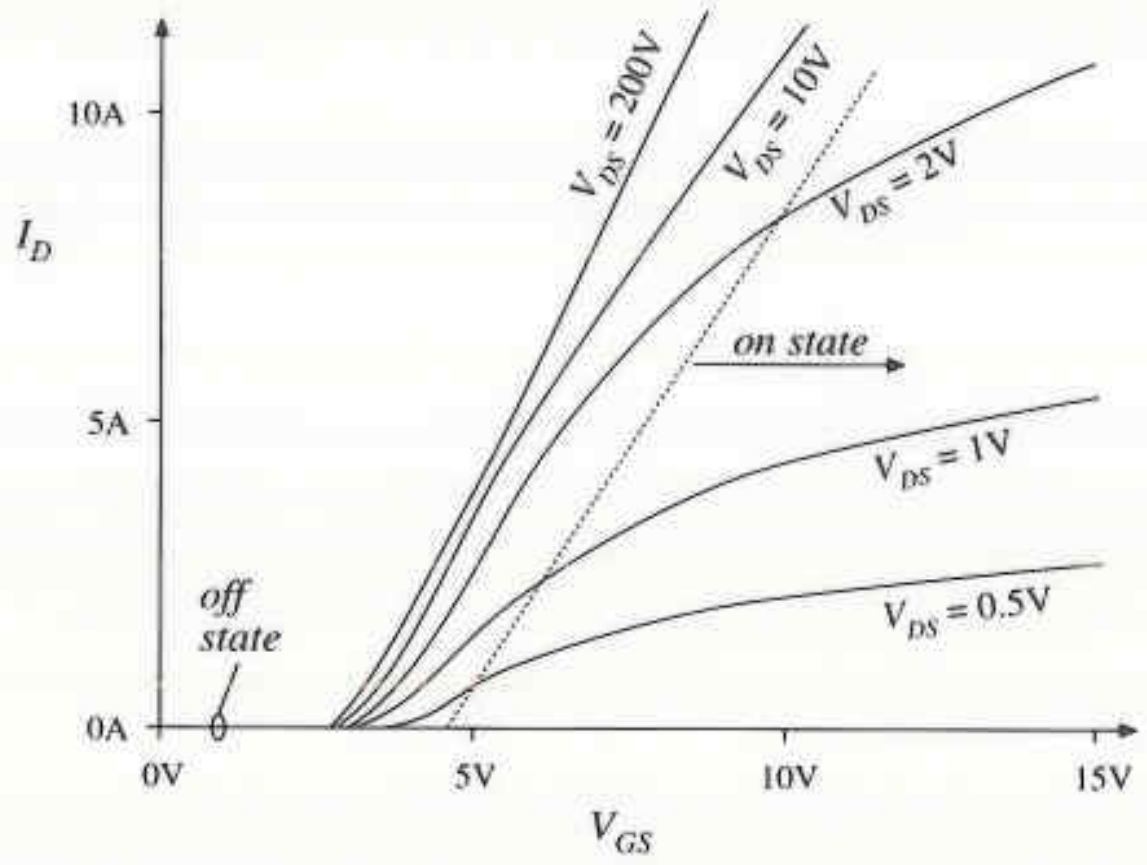


Fig. 1. *As shown in this generalized graph of output characteristics, an n-channel power MOSFET has three possible modes of operation.*

Typical MOSFET characteristics



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

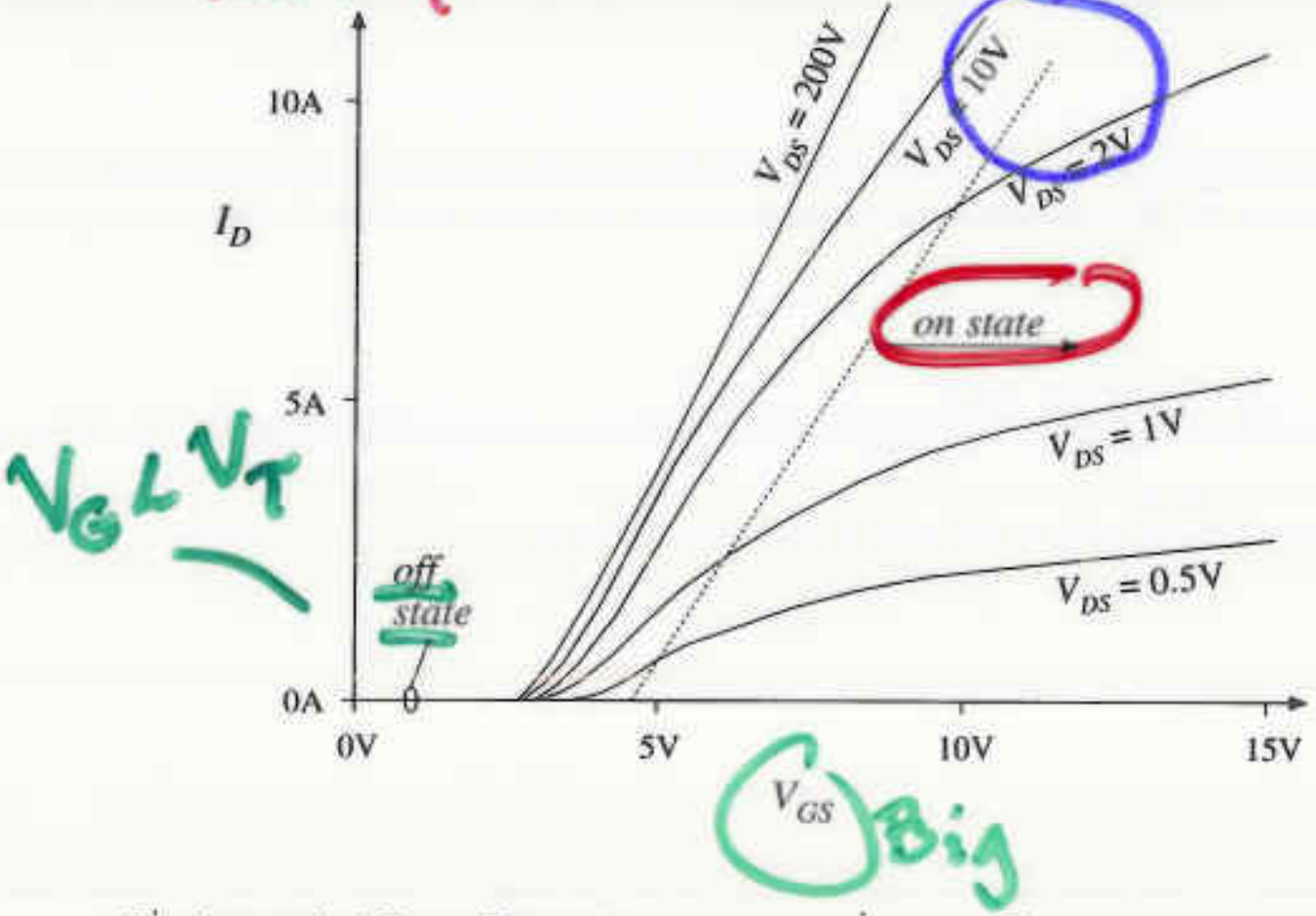
Fig 4.28 pg 80

C_{IN} to power Fet : 10nF 100nF

Typical MOSFET characteristics

Big gate voltage required

100A possible



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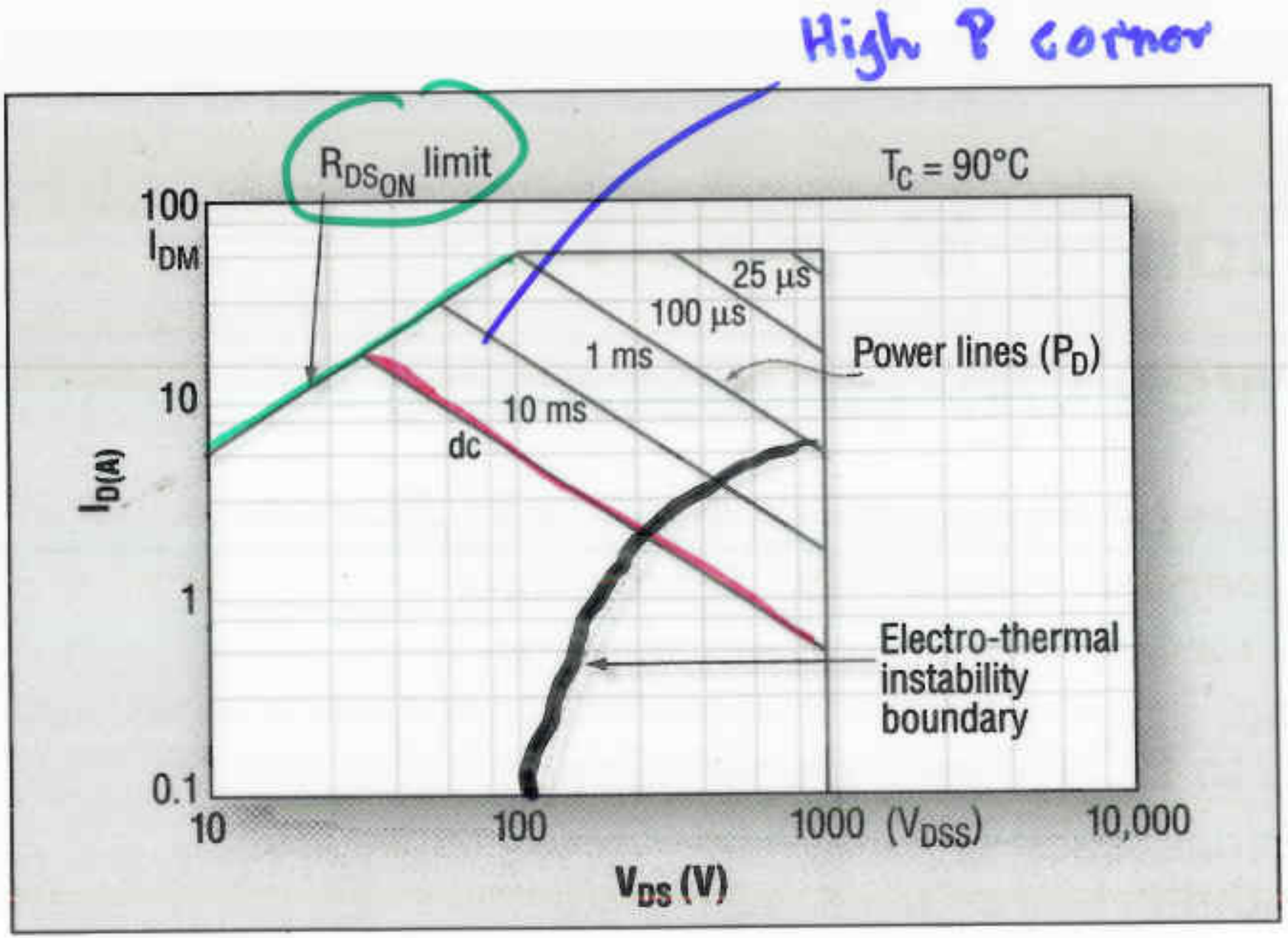

Fig. 2. *Power MOSFETs optimized for switched-mode designs have limited ability to operate in the corner of the FBSOA graph, where electro-thermal instability can occur as shown here for a typical n-channel power MOSFET.*

SOA

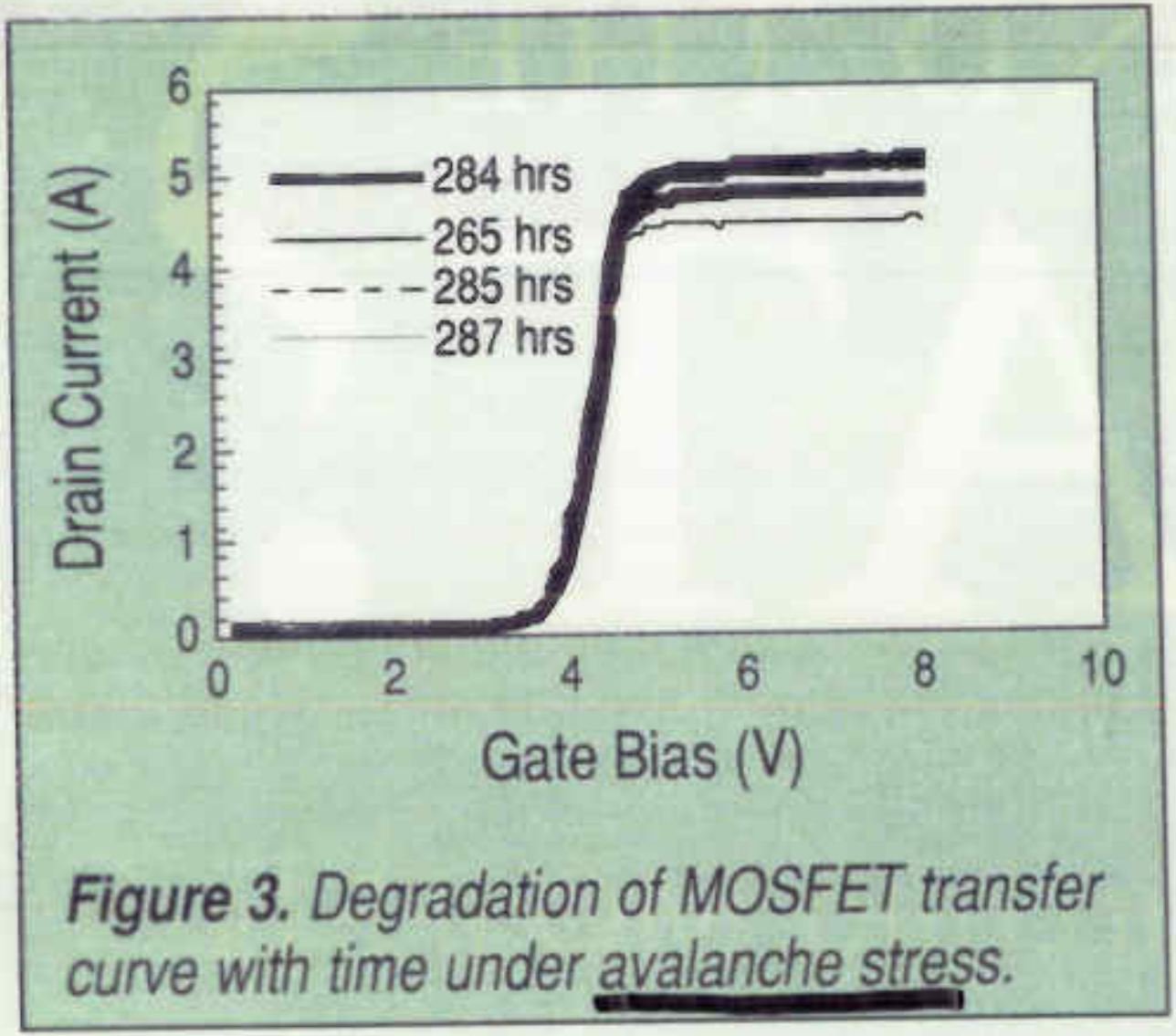

Figure 3. *Degradation of MOSFET transfer curve with time under avalanche stress.*

With (avalanch stress)

R_{ON} ↑

V_{BK} ↓

∴ Reduce SOA

Other stress

$\frac{dV}{dt}$

reverse recovery Q_{rr}

Derate High P region

K is experimental factor depends on:
- circuit used in
- specific stresses

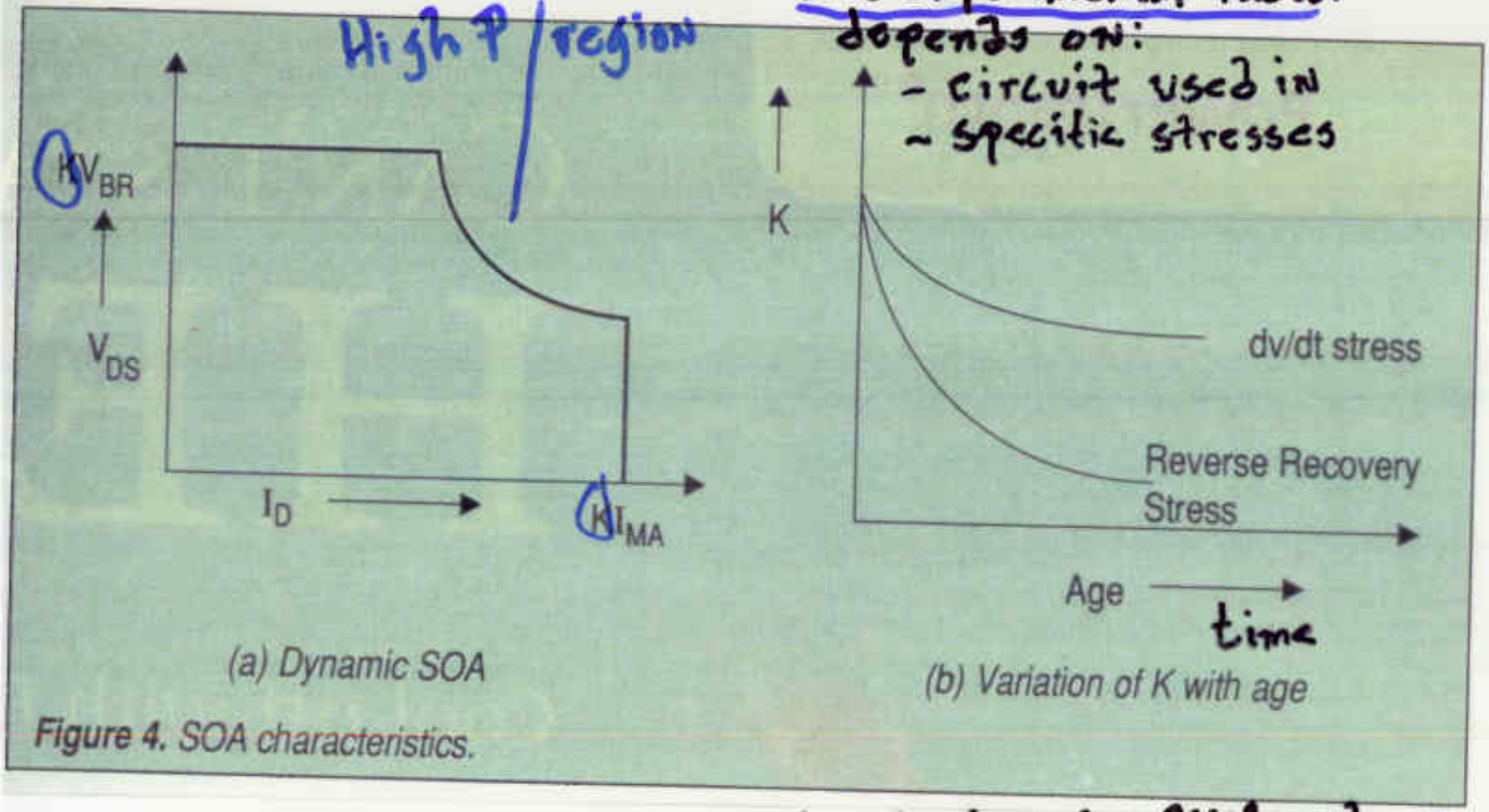

Figure 4. SOA characteristics.

Simple boost: Avalanch stress

Bridge: Qrr from body diode

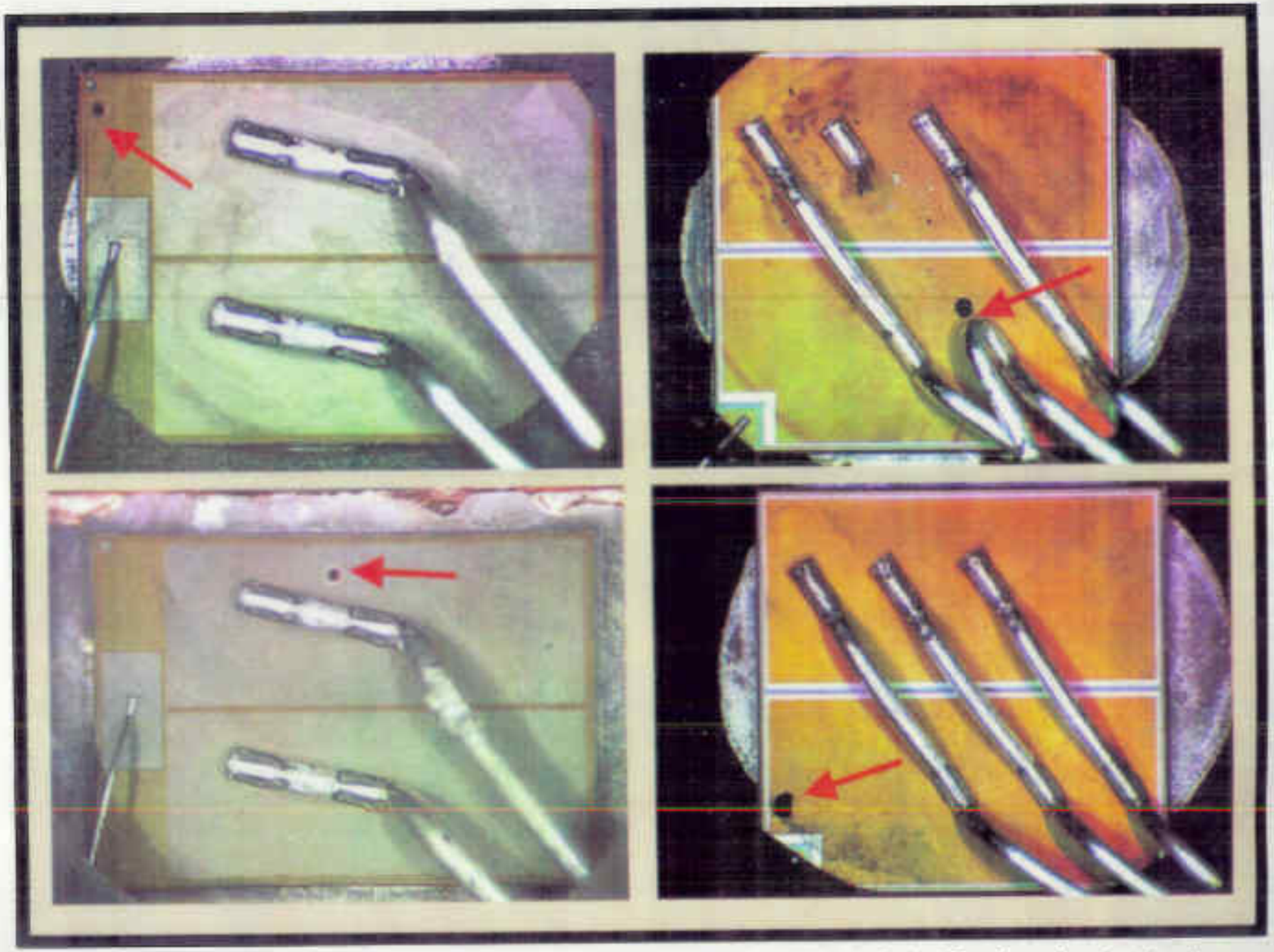

Fig. 3. *Avalanche damage to Planar FETs (left) and Trench FETs (right). The bond-wire has been cut and moved out of the way to expose the damage in the part at upper right.*