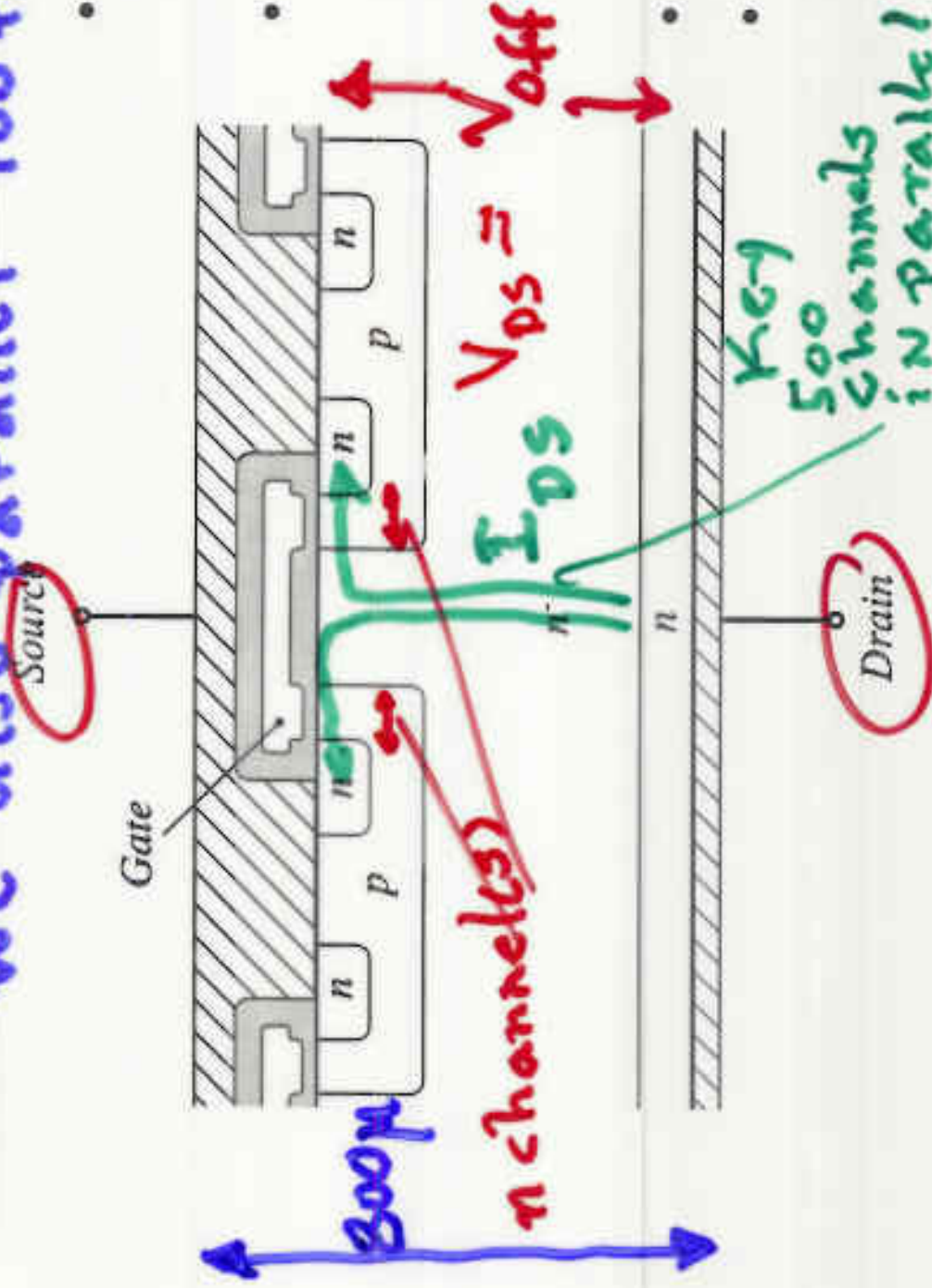


Fig 4.27 Pg 79

4.2.2. The Power MOSFET

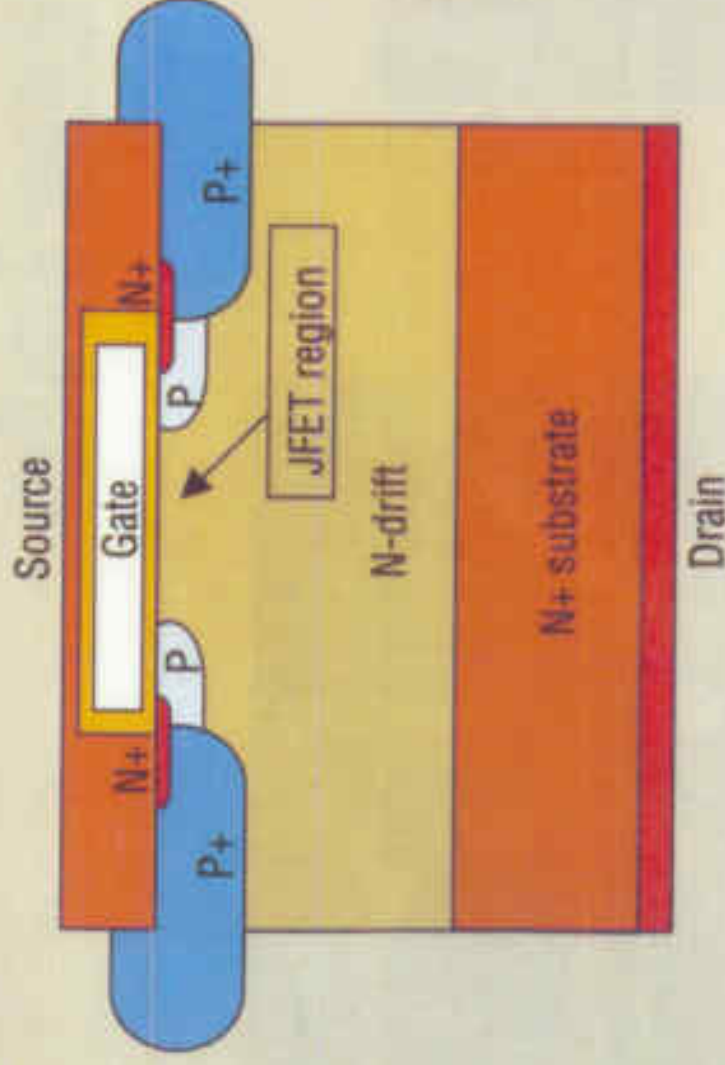
This is a vertical structure
we also parallel 100 to 1000 of them



- Gate lengths approaching one } 11 1000 in a 1-3mm area
- Consists of many small enhancement-mode parallel-connected MOSFET cells, covering the surface of the silicon wafer

- Vertical current flow
- n-channel device is shown

DMOSFET structure



Resistance contributions

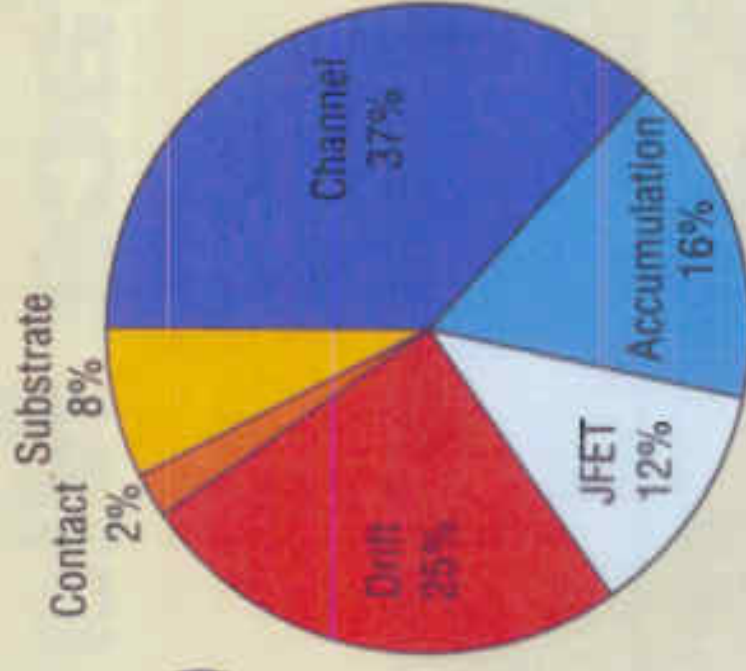
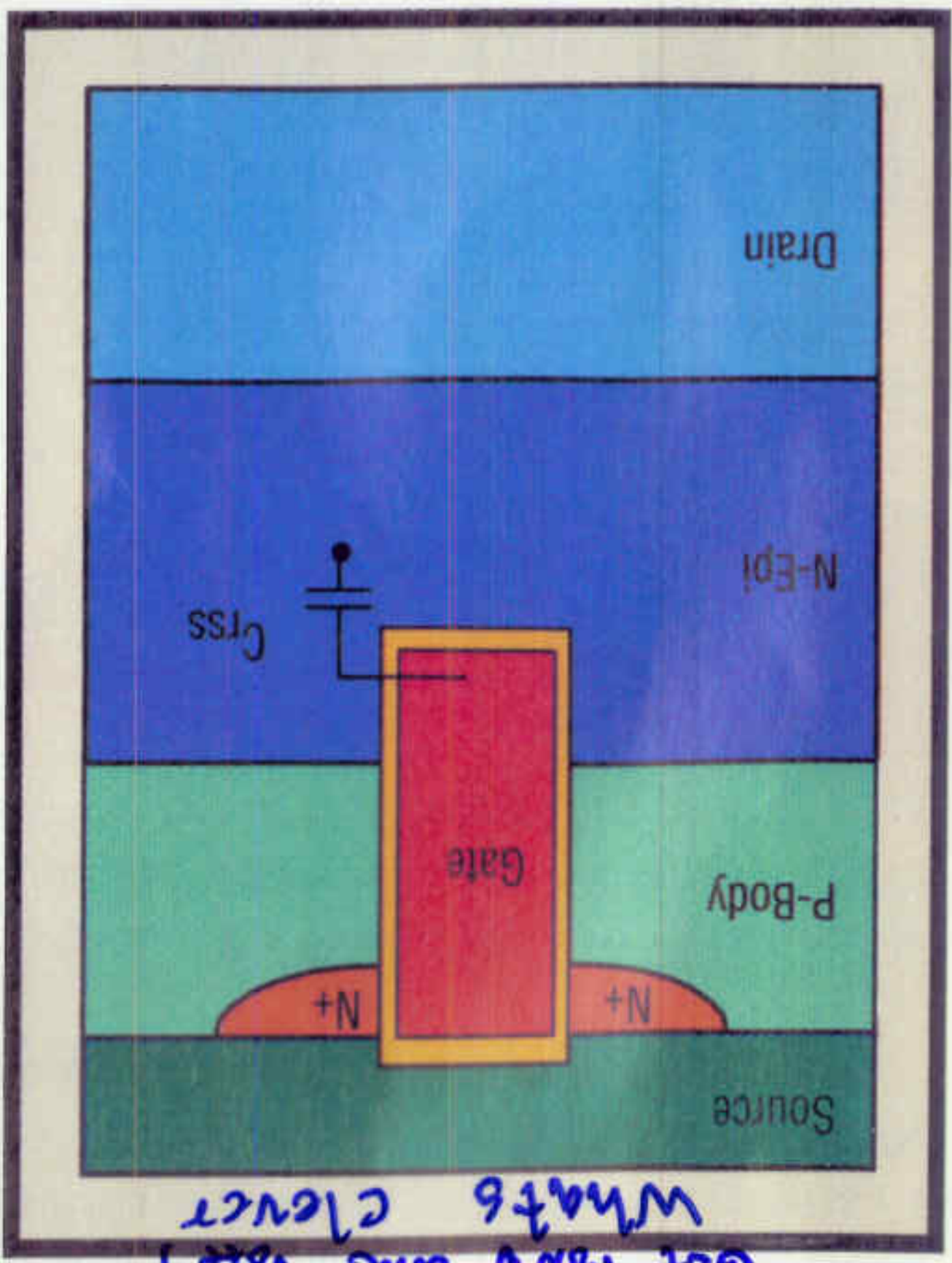


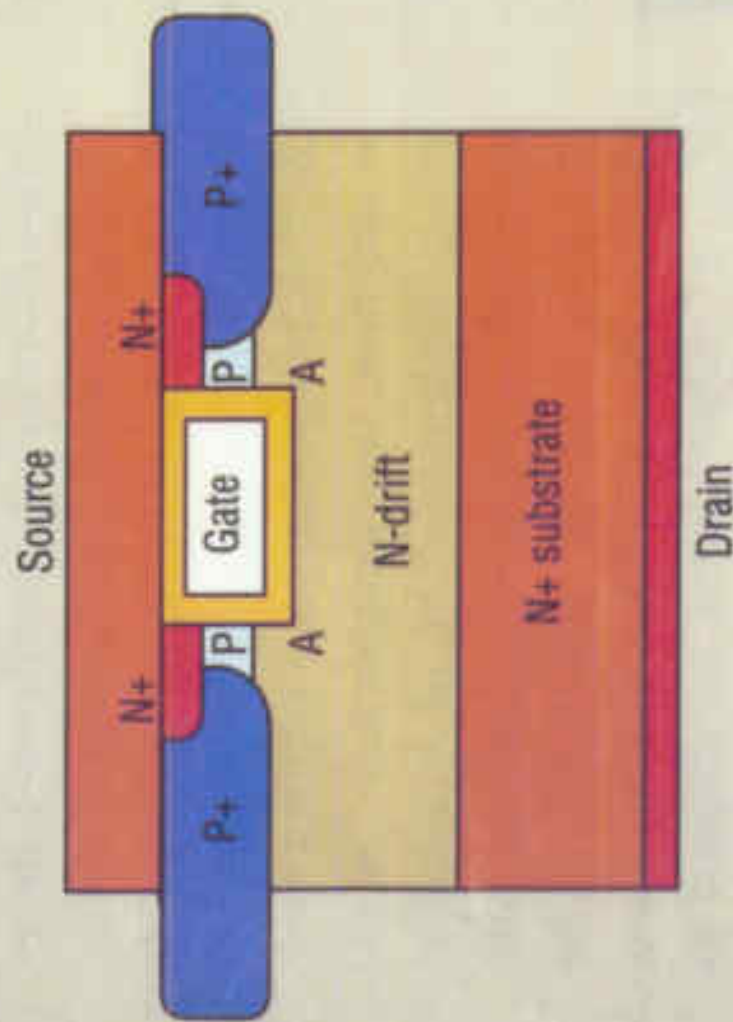
Fig. 2. DMOSFET structure and its internal resistance distribution.

Fig. 2. Schematic cross section of conventional Trench MOSFET.



Get R_{on} and V_{th} ↓
What's clever

UMOSFET structure



Resistance contributions

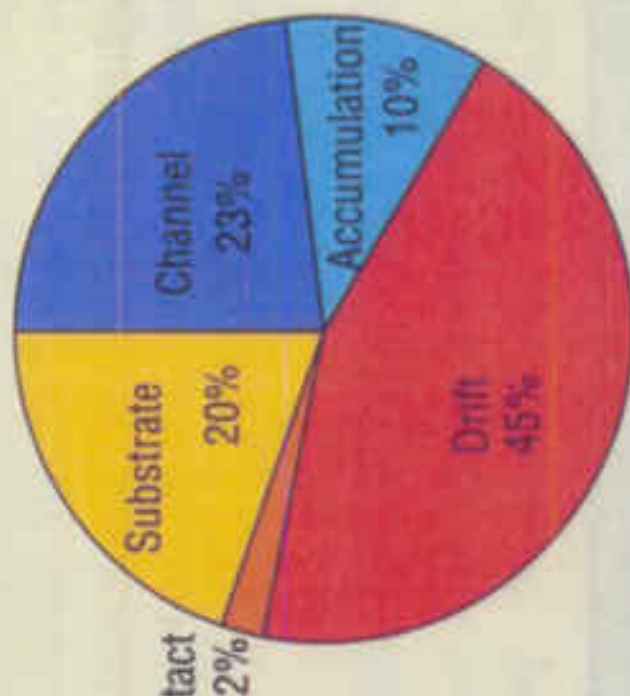


Fig. 3. Trench of UMOSFET structure and its internal resistance distribution.

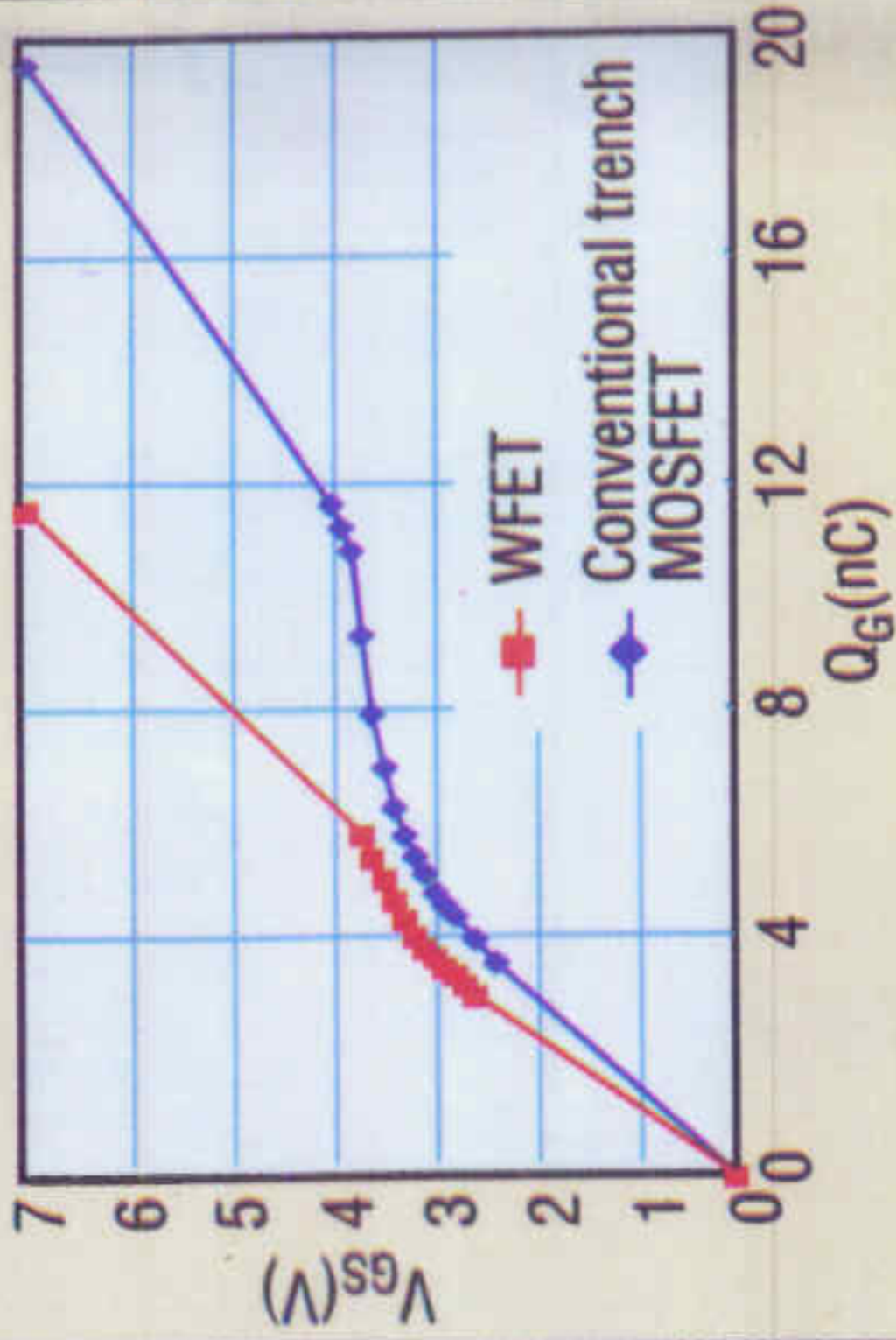
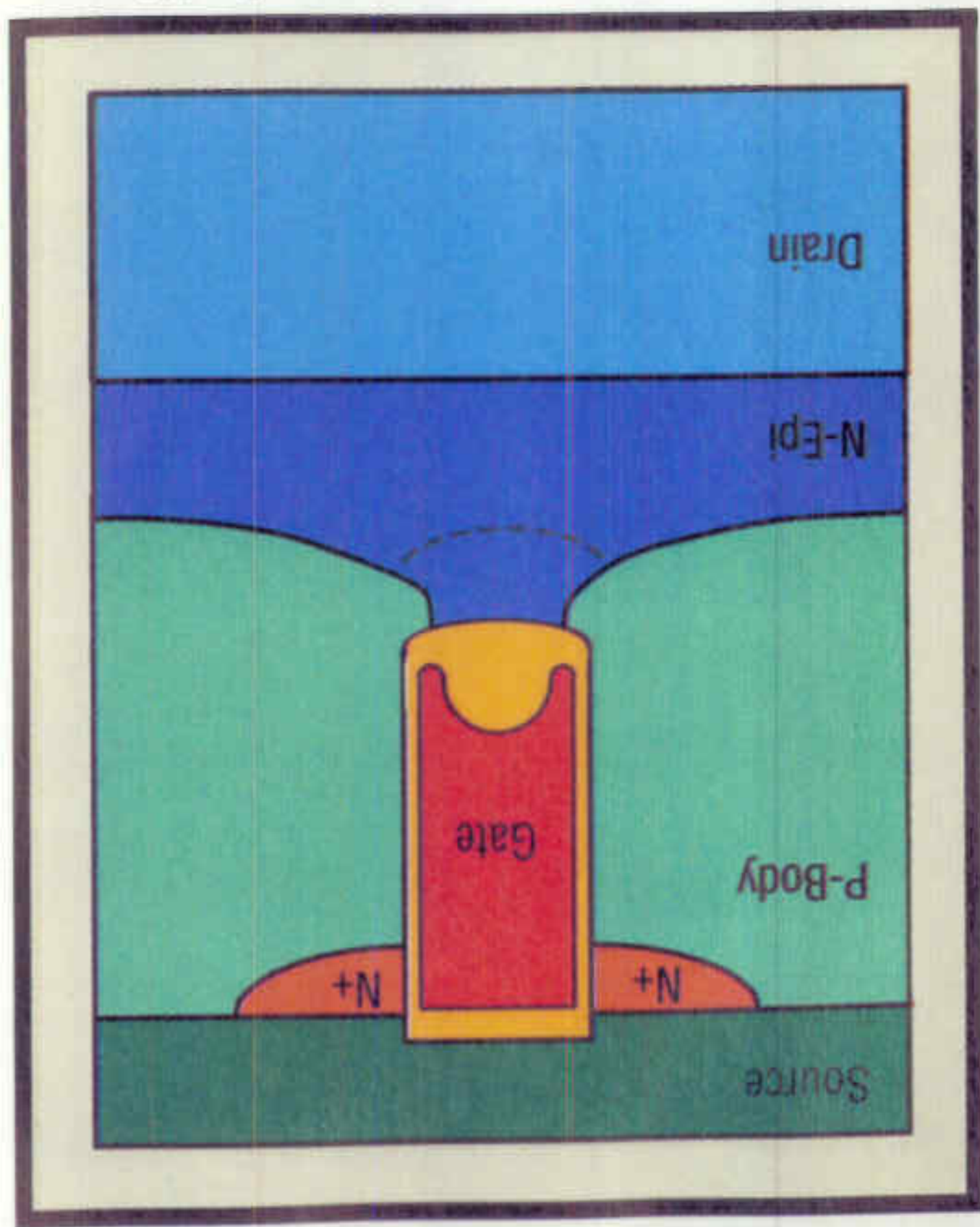
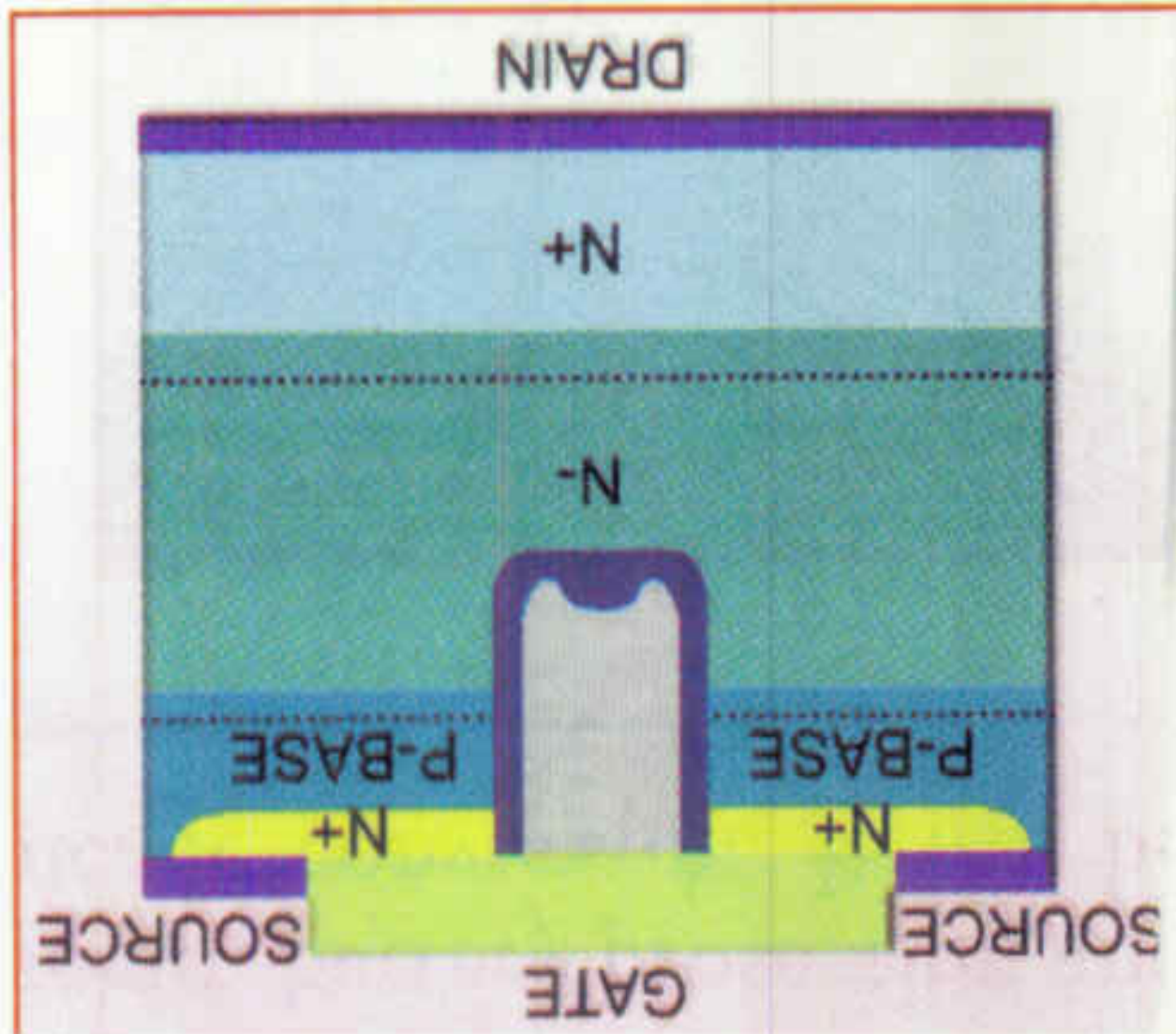


Fig. 6. Measured Gate Charge of a WFET vs. a Conventional Trench MOSFET.

Fig. 4. Schematic cross section of a W-Gated Trench MOSFET (WFET).



Vishay Siliconix' WFET
 technology uses a thicker
 gate oxide at the bottom of
 the silicon trench to reduce
 device input capacitance.
 Additional cell density
 techniques lower $R_{DS(on)}$.



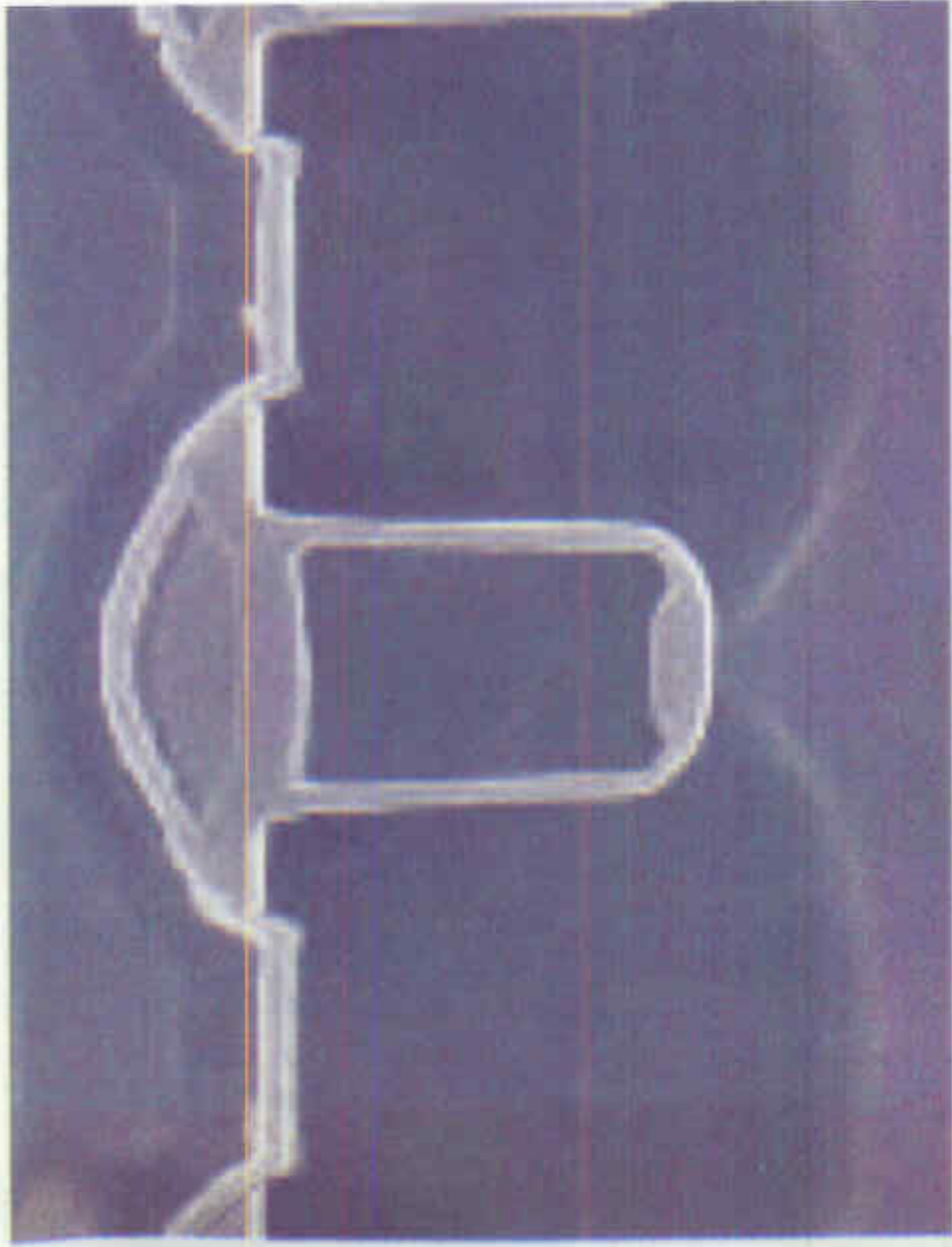


Fig. 5. SEM cross section of a W-Gated Trench MOSFET WFET.

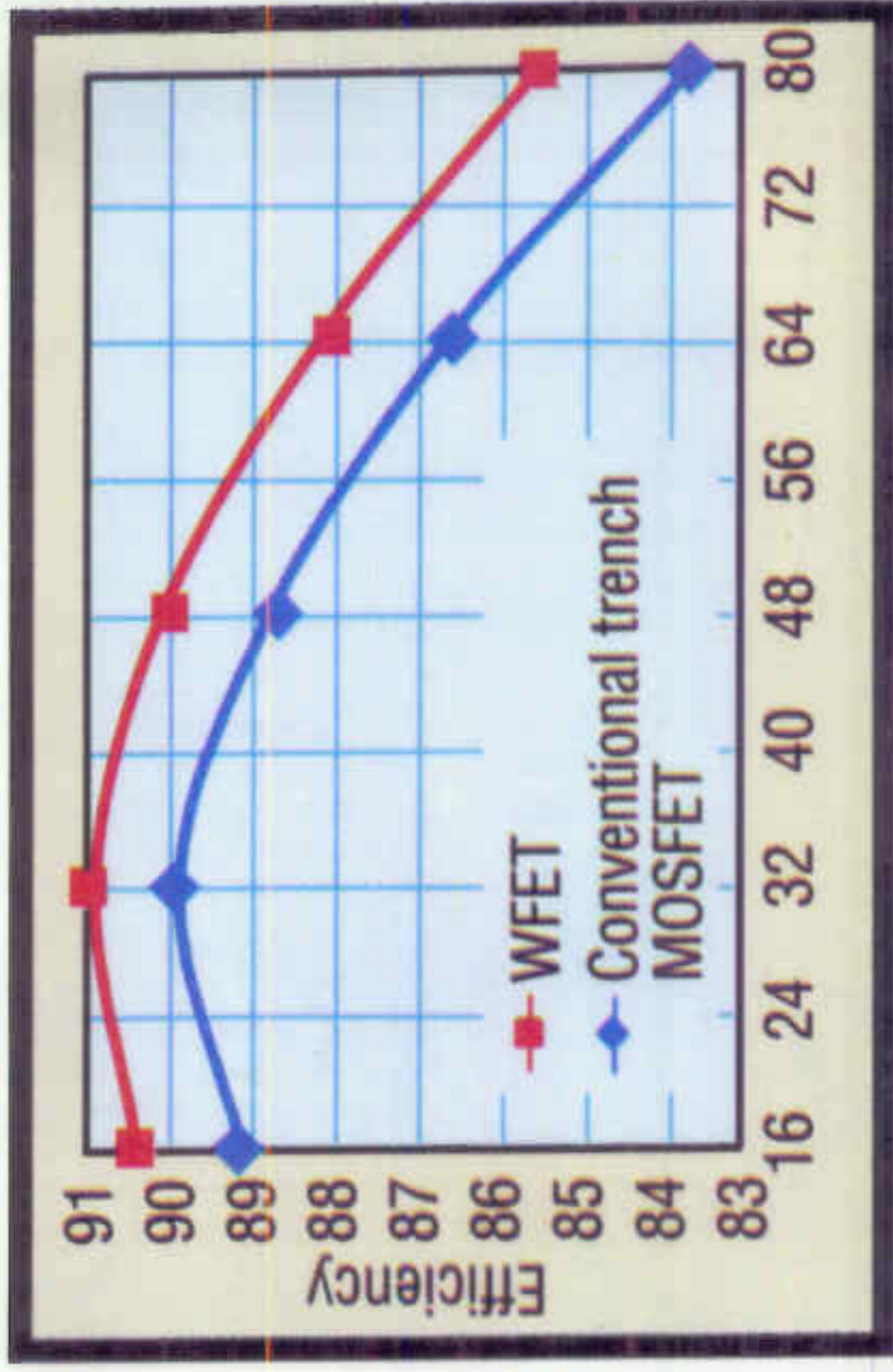


Fig. 9. Measured efficiency vs. output current for a PWM switch-mode 4-phase dc-to-dc buck converter with $19V_{IN}$ and $1.3V_{OUT}$