4.2.2. The Power MOSFET

This is a vertical structure, up to 1000 microns thick.

- Gate lengths approaching one micron.
- 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.

Vertical flow:

$V_{DS} = V_{TH}$

500 parallel channels for low RDS

800 μm

Source

Gate

n-channels

Drain
Fig. 2. DMOSFET structure and its internal resistance distribution.
Fig. 2. Schematic cross section of conventional Trench MOSFET.
Fig. 3. Trench of UMOSFET structure and its internal resistance distribution.
Fig. 6. Measured Gate Charge of a WFET vs. a Conventional Trench MOSFET.
Gated Trench MOSFET (WFEF).

Fig. 4. Schematic cross section of a W-
techniques lower RDS(on).

Additional cell density
device input capacitance.
The silicon trench to reduce
Gate oxide at the bottom of
technology uses a thicker
Vishay Siliconix, WFER.
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 $1.3V_{OUT}$. 