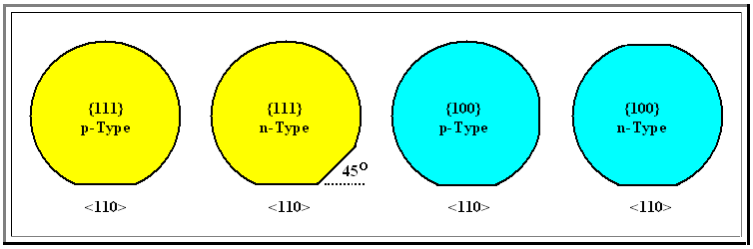
Wafer Flats

Illustration

- In the old times (up to the **150 mm** wafer diameter era), wafers had **flats**, and the flats told you two things:
  1. The doping type of the wafer (**n**- or **p**-type
  2. The orientation of the wafer: **{100}** or **{111}**
  - While this is trivial information, consider: All wafers, whatever doping type or crystal orientation, look exactly the same! As soon as a wafer has been removed from its box that carried this and other information, you can't see anymore what you got. You also cannot measure it easily (and without destroying the wafer).
  - And if something goes wrong here (and things that can go wrong will go wrong some day), it may be a horribly expensive mistake! If you feed wafers of the wrong doping kind into the line, it will really, really cost you - probably your job.
- So here is the convention



- But beware! Wafer manufacturers will produce whatever the customer wanted, and after **n**-type **Si** went out of style for most mass-produced chips, the only reason for a flat was to allow the patterns to be made to be aligned with a crystallographic direction.
  - You then ordered your **p**-type **{100}** wafers with only one flat in the **<110>** direction. One reason was that the wafer would easily cleave along this and the respective perpendicular direction.
  - So wafers with diameters larger or equal to, say, **100 mm** and just *one* flat are more likely **{100}** **p**-type than the "proper" **{111}** **p**-type. The picture in the backbone, e.g., shows **p** -type **{100}** **150 mm** wafer!
  - And wafers with diameters larger or equal to, say, **200 mm**, probably will have no flat at all, but just a small "**notch**" - simply because you loose too much expensive area by cutting of a flat.
- So, how can you tell what you have - if you don't trust the one flat there is, or if there is none! There are extremely simple ways of checking:
  - *Checking doping type*: Take an Voltmeter and measure the *thermovoltage* between a hot tip (tale a soldering iron) and a room-temperature tip pressed on the wafer somewhere. Its *sign* will tell you if the wafer is **n**- or **p**-type. Which is which results from hard thinking or from checking a known piece of **Si**.
  - *Checking orientation*: Break your wafer. If the pieces tend to be rectangular, it was **{100}**.
- In either case your wafer is now "dead", i.e. no longer usable for making **IC's.**