What has changed in the NEW APC128 DMILL:

The new APC128-DMILL is designed and produced in the radiationhard DMILL-0.8μ process. It is the radiation hard successor of the APC128 produced in the non radiation hard SACMOS 1μ-technology.

This leaflet addresses people already familiar with the APC128. A detailed description of the chip is beyond the scope of this text. More information about the APC can be found in [1], [2] and [3].

One of the targets was to achieve maximum combatibility between existing systems (in particular the vertex detector CST of the H1 experiment at DESY) and the new APC128-DMILL. Nevertheless some minor changes were made.

For users using the SACMOS APC128 up to now the following overview might help for a smooth change-over to the usage of the new APC128-DMILL-chip

What has changed compared to the SACMOS APC128:

- To prevent the preamplifier from ringing, the feedback resistor is realized in a somewhat more complex way: A current is required to activate and adjust the feedback resistor. This current has to flow into the new Ifb-Pad (see figure 1). An external resistor between the Ifb-Pad and 5V will allow you to give this current. A current between 2uA (large feedback resistor) and 60uA (small feedback resistor) seems reasonable.
  Important: The Ifb-pad has to be bonded ! (unless you operate the APC128-DMILL with R12=OFF)

- As the feedback resistor is now controlled by the Ifb-Pad, the RG-Pad is no longer necessary. It has been replaced by the CS2 function (see figure 1).

- The new APC128-DMILL comes with two additional feedback capacitances: CS and CS2. Therefore CS is smaller now: It used to be 540 fF, it is now 300fF. The new feedback capacitance CS2 is designed to be 150fF. You can choose between 4 settings:

  - no additional feedback C: CS=OFF, CS2=OFF
  - 150f additional feedback C: CS=OFF, CS2=ON
  - 300f additional feedback C: CS=ON, CS2=OFF

   - 450f additional feedback C: CS=ON, CS2=ON

  If not connected both CS and CS2 are forced to OFF by an on-chip pulldown resistor.

  Note that the built in feedback capacitance is circa 375fF.

- The bandwidth limiting resistor (BWL) has vanished. The formerly BWL-Pad has a new designation: it is the Ifb-Pad (see above and figure 1).
- Giving the same analog voltage Vana to the APC128DMILL will result in an analog current that is considerably larger than for the SACMOS APC. So you might want to reduce the analog-voltage.
- The noise behaviour of the chip can be improved by a low pass filter for the analog voltage: put a coil in the supply path and 10uF to ground.
- The size of the chip has changed slightly: The height has changed from 3500μm to 3560μm.

References

[1] NIM A326 (1993) 92-99 *Describes the first prototype in an old 2μ technology with only 12 channels but showing the same functionality as todays APCs.*

[2] ETHZ-IPP Internal Report 95-5, September 1995, pages 7-17. *Diploma Thesis G.Klaiber (in German).*

[3] PhD-Thesis M.Hilgers, ETH Zürich (2001). *Still to be written.*

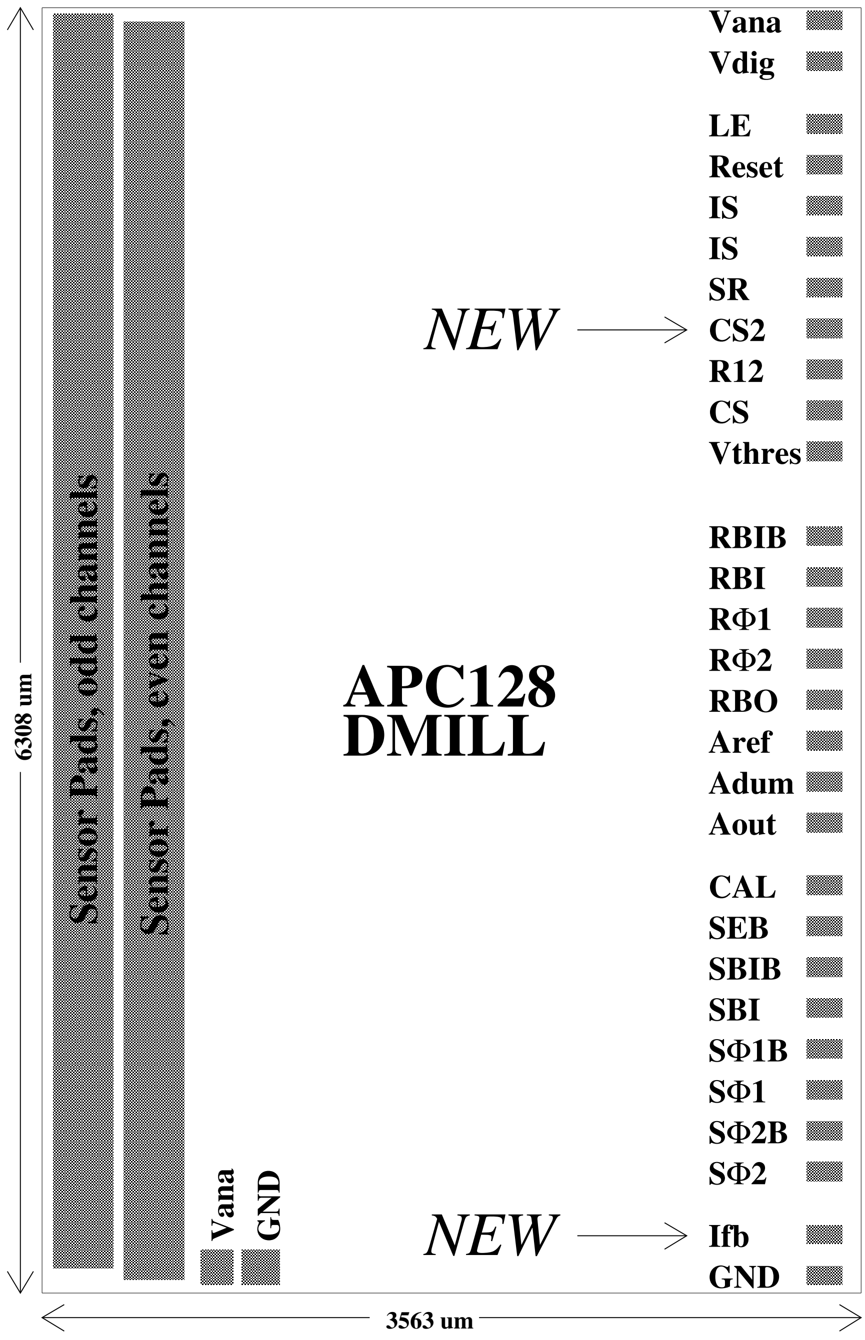

Figure 1: Padlayout of the APC 128 DMILL