XH018 - Hall Sensor

**Description**

The XH018 Hall Sensor is X-FAB’s specialized ready-to-use Hall effect sensor IP, based on the 0.18 μm HV CMOS Processes.

The Hall sensor device is available when the LP3MOS core module is selected together with HALL modules. It comes as a layout box in the design kit with sensor contacts are drawn as Metal2 shapes.

The XH018 Hall Sensor is ideal for single chip integration of sensor and conditioning circuitry or for SoC implementation.

**Key Features**

- Build on XH018 process technology
- High sensitivity and linearity
- Low supply current (100μA)
- Sensitivity: 320V/(A*T)
- Operational junction temperature from -40 °C to +125 °C
- Supported in Cadence design kit 5.1 and 6.1
- Verilog-A model with magnetic field input
- Temperature model
- Application note and model guide

**Quality Assurance**

X-FAB spends a lot of effort to improve the product quality and reliability and to provide competent support to the customers. This is maintained by the direct and flexible customer interface, the reliable manufacturing process and complex test and evaluation conceptions, all of them guided by strict quality improvement procedures developed by X-FAB. This comprehensive, proprietary quality improvement system has been certified to fulfill the requirements of the ISO 9001, QS 9000, VDA 6, ISO TS 16949 and other standards.

**Deliverables**

- PCM tested wafers
- Optional production services: wafer sort
- Optional Engineering services: Multi Project Wafer (MPW) and Multi Layer Service (MLM)
- Optional Design services; e.g. feasibility studies, place & route, synthesis, custom block development

**Primitives Devices**

- Hall1

**Applications**

- Proximity sensor
- Current/Power metering
- Position/Distance/Rotational angle measurement
- Brushless DC motor application
- Replacement for mechanical switches
- Rotational speed measurement

![Figure 1: Illustrations of Hall Effect Sensor Applications](image)

Data Sheet XH018 Hall Sensor • Rev. 1.0 • Oct 2010
### Process Family

<table>
<thead>
<tr>
<th>Module Name</th>
<th>No. of Masks</th>
<th>Remarks</th>
<th>Typical Primitive Devices Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>LP3MOS</td>
<td>23</td>
<td>1.8V / 3.3V low power CMOS module single poly, four metals</td>
<td>1.8V and 3.3V LP NMOS/PMOS, PNP, well, polysilicon and metal resistors, I/O cells library</td>
</tr>
<tr>
<td>HALL a)</td>
<td>3</td>
<td>Hall sensor module</td>
<td>Hall sensor</td>
</tr>
</tbody>
</table>

Notes:  
- a) No additional mask is requited for HALL module when in combination with the DMOS module.  
  For the full list of available modules for XH018, please refer to the XH018 datasheet.

### Process Flow

**Core Module**
- Wafer Start
- Active area
- 1.8V wells
- 3.3V wells
- Dual gate oxide
- Poly silicon gate
- Source/Drain implants
- Salicidation
- Contact
- Metal 1
- Via 1
- Metal 2

**Additional Modules**
- HV gate oxide
- Deep N-well
- HV wells
- DMOS drift implant
- Depletion implant
- Non volatile memory
- Double MIM capacitor
- Via 2
- Metal 3
- Triple MIM capacitor
- Via 3
- Metal 4
- Triple MIM capacitor
- Via 4
- Metal 5
- MIM capacitor
- Top metal
- Thick Via
- Thick Metal
- Polyimide deposition
Because the Hall sensor can detect very small magnetic fields it is important to carefully design any metal shapes which are located close to the sensor. It is especially recommended not to place any power lines close to the Hall element because the induced stray magnetic fields could lead to significant modifications of the field strength at the location of the sensor.

All metal lines which are used to contact the active pins of the Hall sensor (t, l, b, r) should be drawn with equal length and width for all used layers to minimize any additional offset.
### Active Devices (typical data)

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</tr>
</thead>
<tbody>
<tr>
<td>hall1 LP3MOS +HALL</td>
<td>10.25</td>
<td>-10 / +10</td>
<td>320</td>
<td>-0.84</td>
<td>4.1</td>
<td>1.98</td>
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</table>

### Examples for measured and modeled parameter characteristics

**Hall Sensor Device Characteristics typical data**

**Figure 4:** hall1 vertical sensor current as a function of supply voltage for temperature range -50...+150 °C, blue line = -50 °C, red line = +150 °C, Tstep = 25 °C

**Figure 5:** hall1 diagonal sensor current as a function of supply voltage for temperature range -50...+150 °C, blue line = -50 °C, red line = +150 °C, Tstep = 25 °C

**Figure 6:** hall1 vertical temperature dependance of resistance. red dots = measured, blue dots = simulation, lines = guide, green dots = difference model vs. measurement in %

**Figure 7:** hall1 diagonal temperature dependance of resistance. red dots = measured, blue dots = simulation, lines = guide, green dots = difference model vs. measurement in %
The X-FAB IC Development Kit is a complete solution for easy access to X-FAB technologies. The Kit is the best interface between standard CAE tools and X-FAB’s processes and libraries. The Kit is available in two versions, the Master Kit and the Master Kit Plus. Both versions contain documentation, a set of software programs and utilities, digital and I/O libraries which contain full front-end and back-end information for the development of digital, analog and mixed signal circuits. Tutorials and application notes are included as well.

The Master Kit Plus additionally provides a set of general purpose analog functions mentioned in section “Analog Library Cells” and is subject to a particular license.

Note: Diagram shows overview of reference flow at X-FAB. Detailed information of supported EDA tools for major vendors like Cadence, Mentor and Synopsys can be found on X-FAB’s online technical information center, X-TIC.