

# 0.18 $\mu\text{m}$ Process Family:

## > XP018



### 0.18 Micron CMOS Analog Mixed-Signal Process Technology

#### DESCRIPTION

The XP018 series is X-FAB's 0.18 micron Modular CMOS High Performance Analog Mixed-Signal Technology. Based upon the industrial standard single poly with up to six metal layers 0.18-micron drawn gate length N-well process, integrated with high voltage and Non-Volatile-Memory modules, the platform is engineered for applications needing an integrated solution and cost efficient process for

high performance analog ICs. Targeted applications are switching applications, lighting, display, etc; operating in temperature range of  $-40$  to  $175$   $^{\circ}\text{C}$ .

Comprehensive design rules, precise SPICE models, analog and digital libraries, IPs and development kits support the process for major EDA vendors.

#### KEY FEATURES OVERVIEW

- 0.18-micron single poly, up to six-metal N-well CMOS basic process
- Modular concept
- 1.8V & 5V Low Power or **5V only core module**
- Integrated digital, analog, HV and NVM in a single process
- High-reliability NVM using SONOS technology
- Isolation well for all 1.8V, 5V MOS devices
- Integrated high-ohmic poly resistor in core module (zero mask penalty)
- 15V~45V HVMOS module
- 15V~60V DMOS module
- Depletion transistors
- Single, double, triple MIM and Sandwich MIM Capacitors
- Vertical NPN BJT
- Excellent Ron in HVMOS module with multiple resurf technology
- Very low mask count for an integrated analog process with HV and NVM
- Very low cost-per-function
- Thick top metal
- High density up to 125000 gates per  $\text{mm}^2$
- Typical and worst-case models - BSIM3v3.24 (MOS, BJT, RES, CAP)
- MOS 1/f noise characterized & included in model
- Assura verification deck
- Common-Timing-Engine in Cadence P&R encounter platform
- Cadence PDK
- **NEW Primitive Devices:**
  - Low Vt Transistors
  - 30V~40V Asymmetrical HVMOS transistors
  - ESD protected HV PNP for reverse polarity protection (e.g. for LIN pins)

#### APPLICATIONS

- Sensor Interface
- Lighting
- Audio, Display
- Power management IC
- Switching applications, Portable analog applications
- Communications, Consumer and Industrial markets

#### QUALITY ASSURANCE

X-FAB spends a lot of effort to improve the product quality and reliability and to provide comprehensive 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, ISO TS 16949 and other standards.

**DELIVERABLES**

- PCM tested wafers
- Optional engineering services: Multi Project Wafer (MPW) and Multi Layer Mask Service (MLM)
- Optional design services: feasibility studies, Place & Route, synthesis, custom block development

**DIGITAL LIBRARIES**

- Foundry-specific optimized libraries
- Low power, low leakage library for energy efficient and small size digital blocks
- Junction isolated library for low noise applications
- Multi-voltage library for multi-voltage and power cut-off applications
- Liberty™ synthesis models
- IEEE 1364 Verilog simulation models
- IEEE 1076.4 VHDL-VITAL simulation models

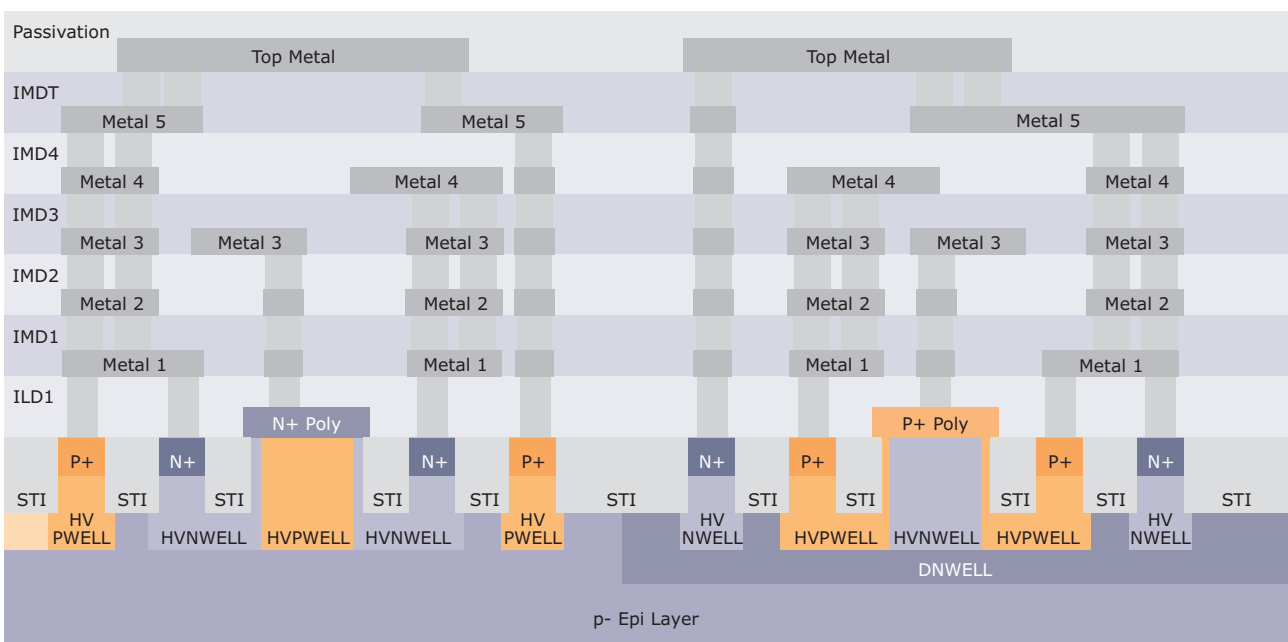
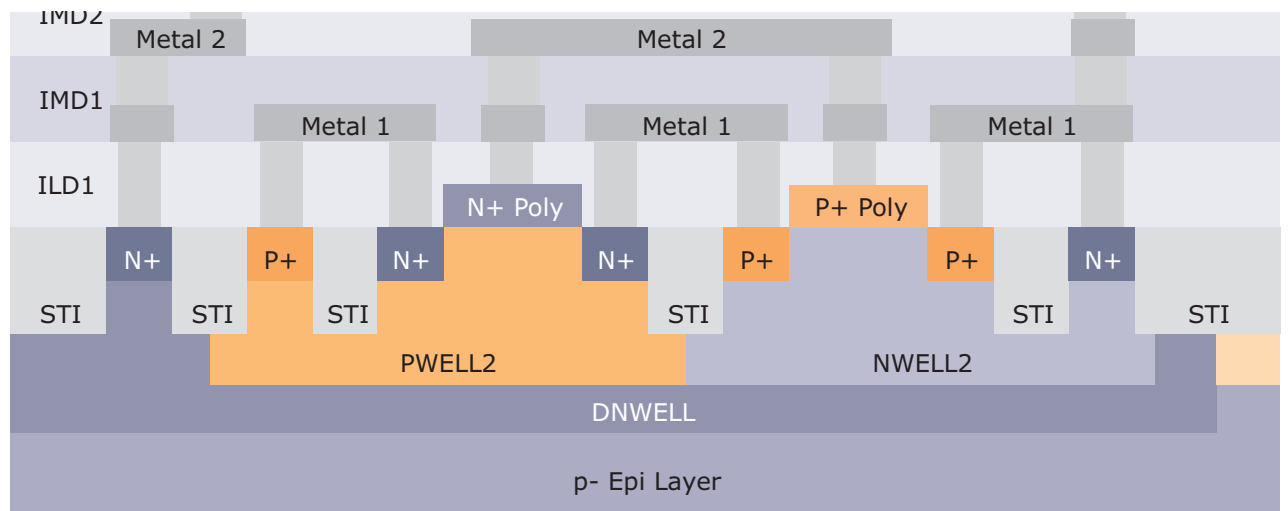
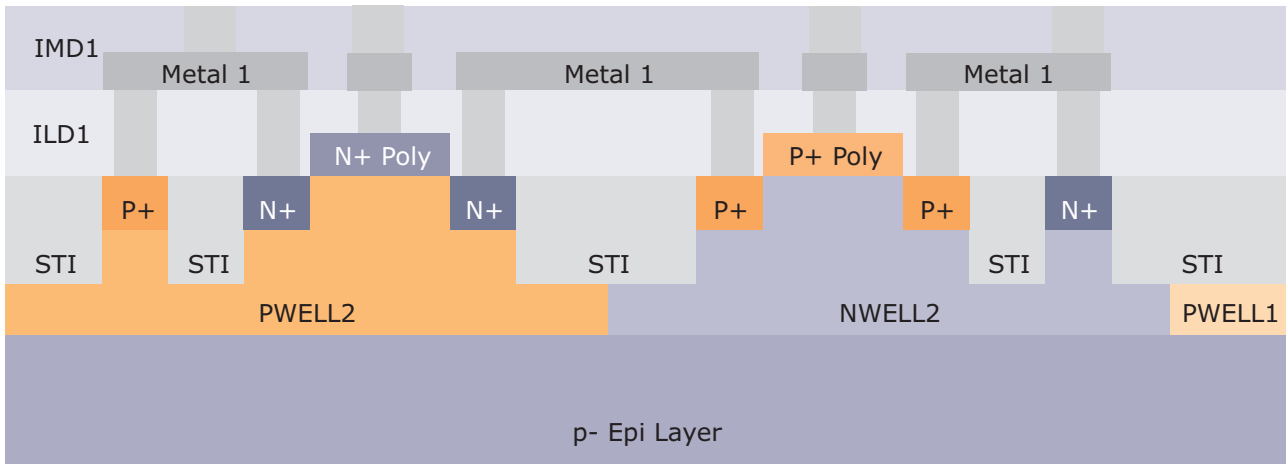
**PRIMITIVE DEVICES**

- MOS transistors
- (Isolated) 1.8V, 5.0V LP NMOS/PMOS
- 15V, 30V, 40V HV NMOS/PMOS
- 12V, 15V, 25V, 40V, 60V lateral nDMOS/pDMOS
- Depletion NMOS
- Vertical PNP/NPN Bipolar transistors
- MIM, Sandwich, Fringe Capacitors
- Poly, Metal, Diffusion Resistors
- Schottky, Protection, Diffusion, Diodes

**XP018 BASIC DESIGN RULES**

| Mask                  | width [μm] | Spacing [μm] |
|-----------------------|------------|--------------|
| N-well                | 0.86       | 1.4          |
| Active Area           | 0.22       | 0.28         |
| Poly-silicon Gate     | 0.18       | 0.25         |
| Poly-silicon Resistor | 0.44       | 0.44         |
| Contact               | 0.22       | 0.25         |
| Metal 1               | 0.23       | 0.23         |
| Via 1, 2, 3, 4        | 0.26       | 0.26         |
| Metal 2, 3, 4, 5      | 0.28       | 0.28         |
| Top Via               | 0.36       | 0.35         |
| Top Metal             | 0.44       | 0.46         |
| Thick Metal           | 3.0        | 2.5          |

XP018 DEVICES SCHEMATIC CROSS SECTION



XP018 PROCESS FLOW

| LP5MOS/MOS5 Module    | Additional Modules           |   |
|-----------------------|------------------------------|---|
| Wafer Start           |                              |   |
| Active area           | Very deep N-well             | HVC/HVD/BIPESD  |
|                       | Deep N-well                  | ISOMOS/BJTA/<br>HV(A/AN/AP/C/D/EN/EP)<br>/DIODEB/BIPESD |
|                       | N-drain extension implant    | HV(EN/EP)   |
|                       | Deep P-barrier               | HVC   |
|                       | N-drain extension implant    | HV(B/C)   |
|                       | P-drain extension implant    | HV(A/AN/AP/D)<br>/BJTA/BIPESD                           |
|                       | P-drain extension implant    | HVEP  |
|                       | Non volatile memory          | NVM/FLASH   |
| 5V wells              |                              |   |
| 1.8V wells            |                              |   |
| 1.8V low Vt wells     |                              | LVT (LP5MOS only)                                       |
|                       | Additional wells (MOS5 only) | HVAN/HVAP/HVC/HVD/<br>HVEP/DIODEA/DIODEB                |
|                       | Depletion implant            | DEPL  |
| Gate oxide            |                              |   |
| Poly silicon gate     |                              |   |
| Source/Drain implants |                              |   |
|                       | HRPOLY implant               | HRPOLY  |
|                       | MRPOLY implant               | MRPOLY  |
| Salicidation          |                              |   |
| Contact               |                              |   |
| Metal 1               |                              |   |
| Via 1                 |                              |   |
| Metal 2               |                              |   |
|                       | M2/M3 MIM capacitor          | MIM23/MIMH23  |
|                       | Double MIM capacitor         | DMIM/DMIMH  |
|                       | Triple MIM capacitor         | TMIM/TMIMH  |
|                       | Via 2                        |   |
|                       | Metal 3                      | MET3  |
|                       | M3/M4 MIM capacitor          | MIM34/MIMH34  |
|                       | Double MIM capacitor         | DMIM/DMIMH  |
|                       | Triple MIM capacitor         | TMIM/TMIMH  |
|                       | Via 3                        |   |
|                       | Metal 4                      | MET4  |
|                       | Triple MIM capacitor         | TMIM/TMIMH  |
|                       | Via 4                        |   |
|                       | Metal 5                      | MET5  |
|                       | MIM capacitor                | MIM/MIMH  |
|                       | Top Via                      |   |
|                       | Top metal                    | METMID  |
|                       | Thick Via                    |   |
|                       | Thick Metal                  | METTHK  |
| PAD                   |                              |   |
|                       | Polyimide deposition         | PIMIDE  |

mask steps

| XP018 MODULE |                                 |           |
|--------------|---------------------------------|-----------|
| Module Name  | Descriptions                    | Masks No. |
| LP5MOS       | 1.8V/5.0V low power CMOS module | 19        |
| MOSS         | 5.0V low power CMOS module      | 14        |

| XP018 ADDITIONAL MODULES |  |           |
|--------------------------|--|-----------|
| Module Name              | Descriptions   | Masks No. |
| ISOMOS                   | Triple well isolated CMOS module                     | 1         |
| LVT                      | 1.8V low Vt module                                   | 2         |
| DEPL                     | Depletion module                                     | 1         |
| NVM                      | Non volatile memory module                           | 4         |
| FLASH                    | Flash module   | 0         |
| HVA *                    | High voltage module (15V nDMOS, symmetrical HV PMOS) | 2         |
| HVAN *                   | High voltage module (15V - 60V nDMOS)                | 3         |
| HVAP *                   | High voltage module (15V - 60V pDMOS)                | 3         |
| HVB                      | High voltage module (symmetrical HV NMOS)            | 1         |
| HVC *                    | High voltage module (vertical NPN BJT)               | 6         |
| HVD *                    | High voltage module (HV PNP)                         | 4         |
| HVEN *                   | High voltage module (low RDSon 12V nDMOS)            | 2         |
| HVEP *                   | High voltage module (low RDSon 12V pDMOS)            | 4         |
| BJTA *                   | Bipolar module                                       | 3         |
| DIODEA *                 | Diode module (N-type protection diode)               | 1         |
| DIODEB *                 | Diode module (Schottky & P-type protection diode)    | 2         |
| MRPOLY                   | Medium resistance polysilicon module                 | 1         |
| HRPOLY *                 | High resistance polysilicon module                   | 1         |
| OTP5                     | One-Time Programmable memory module                  | 0         |
| MIM                      | MIM capacitor module                                 | 1         |
| MIM23                    | MIM capacitor module                                 | 1         |
| MIM34                    | MIM capacitor module                                 | 1         |
| MIMH                     | High capacitance MIM capacitor module                | 1         |
| MIMH23                   | High capacitance MIM capacitor module                | 1         |
| MIMH34                   | High capacitance MIM capacitor module                | 1         |
| DMIM                     | Double MIM capacitor module                          | 1         |
| DMIMH                    | High capacitance double MIM capacitor module         | 1         |
| TMIM                     | Triple MIM capacitor module                          | 1         |
| TMIMH                    | High capacitance triple MIM capacitor module         | 1         |
| MET3                     | 3 metal module                                       | 2         |
| MET4                     | 4 metal module                                       | 2         |
| MET5                     | 5 metal module                                       | 2         |
| BIPESD                   | ESD module   | 4         |

\* The final mask count of this module will be less than the sum of the masks per single module when in combination with certain modules. Please refer to the Process Overview at X-TIC for the final mask count in case of such module combinations.

| XP018 ADDITIONAL MODULES |                       |           |
|--------------------------|-----------------------|-----------|
| Module Name              | Descriptions          | Masks No. |
| METTHIN                  | Thin top metal module | 0         |
| METMID                   | Top metal module      | 2         |
| METTHK                   | Thick metal module    | 2         |
| PIMIDE                   | Polyimide module      | 1         |

| XP018 RESTRICTION FOR MODULE COMBINATIONS |  |  |
|---|--|--|
| Module name                               | Use of the module also requires use of the following module(s) | Use of the module is not available with the use of the following module(s) |
| LP5MOS                                    | METTHIN, METMID, METTHK  | MOSS5  |
| MOSS5                                     | METTHIN, METMID, METTHK  | LP5MOS   |
| LVT                                       |  | MOSS5  |
| NVM                                       | ISOMOS   | MOSS5  |
| FLASH                                     | NVM  | MOSS5  |
| BJTA                                      |  | MOSS5  |
| MIM                                       | METMID   | MIM23, MIM34, DMIM, TMIM, MIMH, MIMH23, MIMH34, DMIMH, TMIMH               |
| MIM23                                     | MET3   | MIM, MIM34, DMIM, TMIM, MIMH, MIMH23, MIMH34, DMIMH, TMIMH                 |
| MIM34                                     | MET3   | MIM, MIM23, DMIM, TMIM, MIMH, MIMH23, MIMH34, DMIMH, TMIMH                 |
| MIMH                                      | METMID   | MIM, MIM23, MIM34, DMIM, TMIM, MIMH23, MIMH34, DMIMH, TMIMH                |
| MIMH23                                    | MET3   | MIM, MIM23, MIM34, DMIM, TMIM, MIMH, MIMH34, DMIMH, TMIMH                  |
| MIMH34                                    | MET4   | MIM, MIM23, MIM34, DMIM, TMIM, MIMH, MIMH23, DMIMH, TMIMH                  |
| DMIM                                      | MET4, MET3+METMID  | MIM, MIM23, MIM34, TMIM, MIMH, MIMH23, MIMH34, DMIMH, TMIMH                |
| TMIM                                      | MET5, MET4+METMID  | MIM, MIM23, MIM34, DMIM, MIMH, MIMH23, MIMH34, DMIMH, TMIMH                |
| DMIMH                                     | MET4, MET3+METMID  | MIM, MIM23, MIM34, DMIM, TMIM, MIMH, MIMH23, MIMH34, TMIMH                 |
| TMIMH                                     | MET5, MET4+METMID  | MIM, MIM23, MIM34, DMIM, TMIM, MIMH, MIMH23, MIMH34, DMIMH                 |
| MET4                                      | MET3   | METTHIN  |
| MET5                                      | MET4   | METTHIN, METTHK  |
| METTHIN                                   | MET3   | MET4, MET5, METMID, METTHK   |
| METMID                                    |  | METTHIN  |
| METTHK                                    |  | MET5, METTHIN  |

| XP018 METAL OPTIONS |   |  |
|---------------------|---|--|
| Metal Layers        | Available Metal Layer Combinations  | Module names (CORE = LP5MOS or MOSS5)  |
| 3                   | MET1-MET2-MET3<br>MET1-MET2-METTP<br>MET1-MET2-METTPL   | CORE+MET3+METTHIN<br>CORE+METMID<br>CORE+METTHK  |
| 4                   | MET1-MET2-MET3-METTP<br>MET1-MET2-MET3-METTPL<br>MET1-MET2-METTP-METTPL                               | CORE+MET3+METMID<br>CORE+MET3+METTHK<br>CORE+METMID+METTHK                               |
| 5                   | MET1-MET2-MET3-MET4-METTP<br>MET1-MET2-MET3-MET4-METTPL<br>MET1-MET2-MET3-METTP-METTPL                | CORE+MET3+MET4+METMID<br>CORE+MET3+MET4+METTHK<br>CORE+MET3+METMID+METTHK                |
| 6                   | MET1-MET2-MET3-MET4-MET5-METTP<br>MET1-MET2-MET3-MET4-MET5-METTPL<br>MET1-MET2-MET3-MET4-METTP-METTPL | CORE+MET3+MET4+MET5+METMID<br>CORE+MET3+MET4+MET5+METTHK<br>CORE+MET3+MET4+METMID+METTHK |

Active Devices

| XP018 MOS CORE TRANSISTORS |            |                       |         |                                   |                                  |          |              |              |
|----------------------------|------------|-----------------------|---------|-----------------------------------|----------------------------------|----------|--------------|--------------|
| Device                     | Name       | Available with module | VT  [V] | IDS [ $\mu\text{A}/\mu\text{m}$ ] | IOFF [ $\text{pA}/\mu\text{m}$ ] | BVDS [V] | Max. VDS [V] | Max. VGS [V] |
| 1.8V LP NMOS               | ne         | LP5MOS                | 0.60    | 480                               | < 3                              | > 3.6    | 1.98         | 1.98         |
| 1.8V LP PMOS               | pe, pe_5   | LP5MOS                | 0.65    | 170                               | < 3                              | > 3.6    | 1.98         | 1.98         |
| 1.8V native Vt NMOS        | nn         | LP5MOS                | 0.02    | 360                               |                                  |          | 1.98         | 1.98         |
| 5.0V native Vt NMOS        | nn5        | LP5MOS, MOSS          | 0.20    | 610                               |                                  |          | 5.5          | 5.5          |
| 5.0V LP PMOS               | ne5        | LP5MOS, MOSS          | 0.78    | 550                               | < 5                              | > 8.0    | 5.5          | 5.5          |
| 5.0V LP PMOS               | pe5, pe5_5 | LP5MOS, MOSS          | 0.86    | 250                               | < 10                             | > 7.5    | 5.5          | 5.5          |
| 1.8V low Vt NMOS           | nel        | LVT                   | 0.33    | 605                               | < 5K                             | > 3.6    | 1.98         | 1.98         |
| 1.8V low Vt PMOS           | pel, pel_5 | LVT                   | 0.34    | 310                               | < 10K                            | > 3.6    | 1.98         | 1.98         |

| XP018 ISOMOS TRANSISTORS |  |                       |         |                                   |                                  |           |              |              |
|--------------------------|--|-----------------------|---------|-----------------------------------|----------------------------------|-----------|--------------|--------------|
| Device                   | Name   | Available with module | VT  [V] | IDS [ $\mu\text{A}/\mu\text{m}$ ] | IOFF [ $\text{pA}/\mu\text{m}$ ] | BVDS  [V] | max. VDS [V] | max. VGS [V] |
| Iso. 1.8V LP NMOS        | nei, nei_m_6, nei_a_6, nei_b_6, nei_d_6      | ISOMOS                | 0.60    | 480                               | < 3                              | > 3.6     | 1.98         | 1.98         |
| Iso. 1.8V LP PMOS        | pei, pei_m_5, pei_a_5, pei_b_5, pei_d_5      | ISOMOS                | 0.65    | 170                               | < 3                              | > 3.6     | 1.98         | 1.98         |
| Iso. 5.0V LP NMOS        | ne5i, ne5i_m_6, ne5i_a_6, ne5i_b_6, ne5i_d_6 | ISOMOS                | 0.78    | 550                               | < 5                              | > 8.0     | 5.5          | 5.5          |
| Iso. 5.0V LP PMOS        | pe5i, pe5i_m_5, pe5i_a_5, pe5i_b_5, pe5i_d_5 | ISOMOS                | 0.86    | 250                               | < 10                             | > 7.5     | 5.5          | 5.5          |
| Iso. 1.8V low Vt NMOS    | neli, neli_m_6, neli_a_6, neli_b_6, neli_d_6 | LVT+ISOMOS            | 0.33    | 605                               | < 5K                             | > 3.6     | 1.98         | 1.98         |
| Iso. 1.8V low Vt PMOS    | pe5i, pe5i_m_5, pe5i_a_5, pe5i_b_5, pe5i_d_5 | LVT+ISOMOS            | 0.34    | 310                               | < 10K                            | > 3.6     | 1.98         | 1.98         |

| XP018 MEDIUM VOLTAGE TRANSISTORS |      |                       |         |                                   |  |  |           |                |              |
|----------------------------------|------|-----------------------|---------|-----------------------------------|--|--|-----------|----------------|--------------|
| Device                           | Name | Available with module | VT  [V] | IDS [ $\mu\text{A}/\mu\text{m}$ ] | RON [ $\text{k}\Omega\cdot\mu\text{m}$ ] | RON*A [ $\text{m}\Omega\cdot\text{mm}^2$ ] | BVDSS [V] | Max.  VDS  [V] | Max. VGS [V] |
| 15V HV NMOS                      | nmma | HVB                   | 0.87    | 117                               | 18                                       | 80   | > 25      | 15             | 5.5          |
| 30V HV NMOS                      | nmmb | HVB                   | 0.88    | 102                               | 26                                       | 195  | > 40      | 30             | 5.5          |
| 15V HV PMOS                      | pmma | HVA                   | 0.91    | 40                                | 60                                       | 300  | > 25      | 15             | 5.5          |
| 30V HV PMOS                      | pmmb | HVA                   | 0.90    | 25                                | 100                                      | 860  | > 35      | 30             | 5.5          |
| 30V Asy. HV NMOS                 | nmb  | HVB                   | 0.83    | 197                               | 17                                       | 95   | > 40      | 30             | 5.5          |
| 30V Asy. HV PMOS                 | pmb  | HVA                   | 0.87    | 80                                | 61                                       | 310  | > 35      | 30             | 5.5          |

## Active Devices (Continued)

### XP018 HIGH VOLTAGE TRANSISTORS

| Device           | Name | Available with module | VT  [V] | IDS [ $\mu$ A/ $\mu$ m] | RON [k $\Omega$ . $\mu$ m] | RON*A [m $\Omega$ .mm <sup>2</sup> ] | BVDSS [V] | Max.  VDS  [V] | Max. VGS [V] |
|------------------|------|-----------------------|---------|-------------------------|----------------------------|--------------------------------------|-----------|----------------|--------------|
| 40V/45V HV NMOS  | nmmc | HVB                   | 0.88    | 95                      | 30                         | 265                                  | > 55      | 40 / 45 *      | 5.5          |
| 35V/40V HV PMOS  | pmmc | HVA                   | 0.90    | 18                      | 150                        | 1850                                 | > 50      | 35 / 40 *      | 5.5          |
| 40V Asy. HV NMOS | nmc  | HVB                   | 0.83    | 184                     | 20                         | 130                                  | > 55      | 40             | 5.5          |
| 35V Asy. HV PMOS | pmc  | HVA                   | 0.88    | 61                      | 86                         | 617                                  | > 50      | 35             | 5.5          |

\* Value @ Tj = -40°C ... +175°C / Tj = 0°C ... +175°C

### XP018 DMOS TRANSISTORS

| Device               | Name   | Available with module | VT  [V] | IDS [ $\mu$ A/ $\mu$ m] | RON [k $\Omega$ . $\mu$ m] | RON*A [m $\Omega$ .mm <sup>2</sup> ] | BVDSS [V] | Max.  VDS  [V] | Max. VGS [V] |
|----------------------|--------|-----------------------|---------|-------------------------|----------------------------|--------------------------------------|-----------|----------------|--------------|
| Iso. drain 13V LDMOS | nhia * | HVC                   | 0.91    | 140                     | 7                          | 23                                   | > 37      | 13             | 5.5          |
| 12V nLDMOS           | nede   | HVEN                  | 0.95    | 139                     | 4.65                       | 11.9                                 | > 16      | 12             | 5.5          |
| 15V nLDMOS           | neda   | ISOMOS, HVA           | 0.92    | 100                     | 6.5                        | 19                                   | > 19      | 15             | 5.5          |
| 23V/25V nLDMOS       | nedb   | HVAN                  | 0.91    | 100                     | 12                         | 39                                   | > 28      | 23/25 **       | 5.5          |
| 35V/40V nLDMOS       | nedc   | HVAN                  | 0.91    | 90                      | 18                         | 75                                   | > 43      | 35/40 **       | 5.5          |
| 50V/60V nLDMOS       | nedd   | HVAN                  | 0.91    | 90                      | 19.5                       | 110                                  | > 62      | 50/60 **       | 5.5          |
| 12V pLDMOS           | pede   | HVEP                  | 1.05    | 42.7                    | 14.1                       | 33.1                                 | > 16      | 12             | 5.5          |
| 15V pLDMOS           | peda   | HVAP                  | 0.95    | 31                      | 20.5                       | 52                                   | > 24      | 15             | 5.5          |
| 25V pLDMOS           | pedb   | HVAP                  | 0.97    | 30                      | 27                         | 95                                   | > 35      | 25             | 5.5          |
| 35V/40V pLDMOS       | pedc   | HVAP                  | 0.97    | 28                      | 35                         | 154                                  | > 45      | 35/40 **       | 5.5          |
| 50V/60V pLDMOS       | pedd   | HVAP                  | 0.97    | 27                      | 43                         | 230                                  | > 61      | 50/60 **       | 5.5          |

\* The device nhia is still in development. All values quoted in the specification are preliminary.  
 \*\* Value @ Tj = -40°C ... +175°C / Tj = 0°C ... +175°C

### XP018 BIPOLAR TRANSISTORS

| Device    | Name  | Available    | BETA | VA [V] | BVCEO [V] | VBE [mV] | max. VCE [V] | VEB [V] |
|-----------|-------|--------------|------|--------|-----------|----------|--------------|---------|
| 1.8V vPNP | qpva  | LP5MOS       | 2.5  | 250    | > 6       | 710      | 1.98         | 1.98    |
|           | qpvb  |              | 2.6  | 150    |           | 669      |              |         |
|           | qpvc  |              | 2.8  | 100    |           | 636      |              |         |
| 5.0V vPNP | qpva5 | LP5MOS, MOSS | 1.7  | 100    | > 6       | 710      | 5.5          | 5.5     |
|           | qpvb5 |              | 2.0  | 100    |           | 670      |              |         |
|           | qpvc5 |              | 2.2  | 100    |           | 637      |              |         |
| vNPN      | qnva  | BJTA         | 55   | 15     | > 6       | 695      | 3.6          | 5.5     |
| vNPN      | qnva5 | HVAP         | 43   | 15     | > 6       | 695      | 3.6          | 5.5     |
| vNPN      | qnvb  | HVC          | 108  | 30     | > 13      | 615      | 10           | 10      |
| HV PNP    | qpvh  | HVD          | 74   | 155    |           | 610      | 60           | 25      |



Active Devices (Continued)

| XP018 DEPLETION TRANSISTORS |  |                       |         |                                   |           |                |              |
|-----------------------------|--|-----------------------|---------|-----------------------------------|-----------|----------------|--------------|
| Device                      | Name   | Available with module | VT  [V] | IDS [ $\mu\text{A}/\mu\text{m}$ ] | BVDSS [V] | Max.  VDS  [V] | Max. VGS [V] |
| 5.0V Depl. NMOS             | nd5  | DEPL                  | 0.52    | 730                               | > 8       | 5.5            | 5.5          |
| Iso. 5.0V Depl. NMOS        | nd5i, nd5i_m_6, nd5i_a_6, nd5i_b_6, nd5i_d_6 | DEPL+ISOMOS           | 0.52    | 730                               | > 8       | 5.5            | 5.5          |

Passive Devices

| XP018 DIFFUSION RESISTORS |        |                       |                         |   |                                     |             |
|---------------------------|--------|-----------------------|-------------------------|---|-------------------------------------|-------------|
| Device                    | Name   | Available with module | RS [ $\Omega/\square$ ] | Thickness/junc. depth [ $\mu\text{m}$ ] | Temp. Coeff. [ $10^{-3}/\text{K}$ ] | Max VTB [V] |
| 1.8V N+ diffusion         | rdn    | LP5MOS                | 62                      | 0.2                                     | 1.4                                 | 1.98        |
| 1.8V P+ diffusion         | rdp    | LP5MOS                | 135                     | 0.2                                     | 1.3                                 | 1.98        |
| 1.8V N-well               | rnw    | LP5MOS                | 1000                    | 1.5                                     | 3.0                                 | 5.5         |
| 5.0V N+ diffusion         | rdn5   | LP5MOS, MOSS          | 62                      | 0.2                                     | 1.4                                 | 5.5         |
| 5.0V P+ diffusion         | rdp5   | LP5MOS, MOSS          | 135                     | 0.2                                     | 1.3                                 | 5.5         |
| 5.0V N-well               | rnw5   | LP5MOS, MOSS          | 1200                    | 1.5                                     | 3.0                                 | 5.5         |
| 5V Deep N-well            | rdnwmv | ISOMOS                | 1750                    | 2.8                                     | 5.6                                 | 5.5         |

| XP018 POLY RESISTORS  |                 |                       |                         |                                     |             |
|-----------------------|-----------------|-----------------------|-------------------------|-------------------------------------|-------------|
| Device                | Name            | Available with module | RS [ $\Omega/\square$ ] | Temp. Coeff. [ $10^{-3}/\text{K}$ ] | Max VTB [V] |
| N+ Poly               | rnp1, rnp1_3*   | LP5MOS, MOSS          | 330                     | -1.4                                | 60          |
| P+ Poly               | rpp1, rpp1_3*   | LP5MOS, MOSS          | 280                     | -0.04                               | 60          |
| P+ Poly salicided     | rpp1s, rpp1s_3* | LP5MOS, MOSS          | 7.0                     | 2.90                                | 60          |
| High-Ohmic N+ Poly1   | rnp1h, rnp1h_3* | HRPOLY                | 6700                    | -5.7                                | 60          |
| Lightly dope P+ Poly1 | rpp1k, rpp1k_3* | MRPOLY                | 1000                    | -0.9                                | 60          |

\* These devices are variants of the corresponding basic device with an underlying well, but not crossing a well boundary. The models realize an improved description of bulk voltage dependency.

| XP018 METAL RESISTORS |       |                       |                         |   |                                     |                                     |             |
|-----------------------|-------|-----------------------|-------------------------|---|-------------------------------------|-------------------------------------|-------------|
| Device                | Name  | Available with module | RS [ $\Omega/\square$ ] | Thickness/junc. depth [ $\mu\text{m}$ ] | Max J/W [ $\text{mA}/\mu\text{m}$ ] | Temp. Coeff. [ $10^{-3}/\text{K}$ ] | Max VTB [V] |
| Metal 1               | rm1   | LP5MOS, MOSS          | 0.095                   | 0.555                                   | 1.0*                                | 3.2                                 | 60          |
| Metal 2               | rm2   | LP5MOS, MOSS          | 0.085                   | 0.555                                   | 1.0*                                | 3.2                                 | 60          |
| Metal 3               | rm3   | MET3                  | 0.085                   | 0.555                                   | 1.0*                                | 3.2                                 | 60          |
| Metal 4               | rm4   | MET4                  | 0.085                   | 0.555                                   | 1.0*                                | 3.2                                 | 60          |
| Metal 5               | rm5   | MET5                  | 0.085                   | 0.555                                   | 1.0*                                | 3.2                                 | 60          |
| Top Metal             | rmtpl | METMID                | 0.043                   | 0.975                                   | 1.6*                                | 3.2                                 | 60          |
| Thick Metal           | rmtpl | METTHK                | 0.0095                  | 3.00                                    | 6*                                  | 3.5                                 | 60          |

\* value @ Tj = -40°C ... +175°C, wide track (width > 0.44 $\mu\text{m}$ )

Passive Devices (Continued)

| XP018 SANDWICH CAPACITORS |          |                       |               |              |
|---------------------------|----------|-----------------------|---------------|--------------|
| Device                    | Name     | Available with module | Area Cap [fF] | Max. VTB [V] |
| Poly1/M1/M2/M3            | csandwt3 | MET3                  | 0.13          | 60           |
| Poly1/M1/M2/M3/M4         | csandwt4 | MET4                  | 0.16          | 60           |
| Poly1/M1/M2/M3/M4/M5      | csandwt5 | MET5                  | 0.20          | 60           |

| XP018 FRINGE CAPACITORS       |        |                       |          |        |              |
|-------------------------------|--------|-----------------------|----------|--------|--------------|
| Device                        | Name   | Available with module | Cap [fF] | BV [V] | Max. VTB [V] |
| Poly1/M1/M2 fringe            | csf2p  | LP5MOS, MOSS          | 22.9     | > 15   | 60           |
| Poly1/M1/M2/M3 fringe         | csf3p  | MET3                  | 33.8     | > 15   | 60           |
| M1/M2/M3 fringe               | csf3   | MET3                  | 29.9     | > 35   | 60           |
| 60V M1/M2/M3 fringe           | csf3a  | MET3                  | 21.7     | > 70   | 60           |
| M1/M2/M3/M4 fringe            | csf4   | MET4                  | 40.9     | > 35   | 60           |
| 60V M1/M2/M3/M4 fringe        | csf4a  | MET4                  | 29.9     | > 70   | 60           |
| M1/M2/M3/M4/M5 fringe         | csf5   | MET5                  | 52.8     | > 35   | 60           |
| 60V M1/M2/M3/M4/M5 fringe     | csf5a  | MET5                  | 38.0     | > 70   | 60           |
| M1/M2/M3/MTP fringe           | csft4  | MET3+METMID           | 33.8     | > 35   | 60           |
| 60V M1/M2/M3/MTP fringe       | csft4a | MET3+METMID           | 26.1     | > 70   | 60           |
| M1/M2/M3/M4/MTP fringe        | csft5  | MET4+METMID           | 44.9     | > 35   | 60           |
| 60V M1/M2/M3/M4/MTP fringe    | csft5a | MET4+METMID           | 34.3     | > 70   | 60           |
| M1/M2/M3/M4/M5/MTP fringe     | csft6  | MET5+METMID           | 56.9     | > 35   | 60           |
| 60V M1/M2/M3/M4/M5/MTP fringe | csft6a | MET5+METMID           | 42.4     | > 70   | 60           |

| XP018 MOS VARACTOR    |           |                       |                  |                               |                                |             |
|-----------------------|-----------|-----------------------|------------------|-------------------------------|--------------------------------|-------------|
| Device                | Name      | Available with module | Tuning range [%] | Cap @+V [fF/μm <sup>2</sup> ] | Cap. @-V [fF/μm <sup>2</sup> ] | Max VGB [V] |
| 1.8V N-type           | mosvc     | LP5MOS                | 80               | 8.3                           | 1.7                            | 1.98        |
| 5V N-type             | mosvc5    | LP5MOS, MOSS          | 63               | 2.7                           | 1                              | 5.5         |
| 1.8V P-type /DNWELLMV | mosvci_m  | LP5MOS+ISOMOS         | 75               | 2.1                           | 8.3                            | 1.98        |
| 1.8V P-type /DNWELL15 | mosvci_a  | LP5MOS+ISOMOS         | 75               | 2.1                           | 8.3                            | 1.98        |
| 1.8V P-type /DNWELL25 | mosvci_b  | LP5MOS+ISOMOS         | 75               | 2.1                           | 8.3                            | 1.98        |
| 1.8V P-type /DNWELL60 | mosvci_d  | LP5MOS+ISOMOS         | 75               | 2.1                           | 8.3                            | 1.98        |
| 5V P-type /DNWELLMV   | mosvc5i_m | (LP5MOS, MOSS)+ISOMOS | 67               | 0.9                           | 2.7                            | 5.5         |
| 5V P-type /DNWELL15   | mosvc5i_a | (LP5MOS, MOSS)+ISOMOS | 67               | 0.9                           | 2.7                            | 5.5         |
| 5V P-type /DNWELL25   | mosvc5i_b | (LP5MOS, MOSS)+ISOMOS | 67               | 0.9                           | 2.7                            | 5.5         |
| 5V P-type /DNWELL60   | mosvc5i_d | (LP5MOS, MOSS)+ISOMOS | 67               | 0.9                           | 2.7                            | 5.5         |

Passive Devices (Continued)

| XP018 MIM CAPACITOR  |   |   |                                |                |         |              |
|--|---|---|--------------------------------|----------------|---------|--------------|
| Device   | Name  | Available with module   | Area Cap [fF/μm <sup>2</sup> ] | V Coeff. [1/V] | BV  [V] | max. VTB [V] |
| Single MIM, M2/M3<br>Single MIM, M2/MTP<br>Single MIM, M3/MTP<br>Single MIM, M4/MTP<br>Single MIM, M5/MTP                | cmm3<br>cmm3t<br>cmm4t<br>cmm5t<br>cmm6t      | MIM23<br>METMID+MIM<br>(MET3+METMID)+MIM<br>(MET4+METMID)+MIM<br>(MET5+METMID)+MIM  | 1.00                           | 15             | > 20    | 60           |
| Single MIM, M3/M4  | cmm4  | MIM34   | 1.00                           | 15             | > 20    | 60           |
| High cap. MIM, M2/M3<br>High cap. MIM, M2/MTP<br>High cap. MIM, M3/MTP<br>High cap. MIM, M4/MTP<br>High cap. MIM, M5/MTP | cmmh3<br>cmmh3t<br>cmmh4t<br>cmmh5t<br>cmmh6t | MIMH23<br>METMID+MIM<br>(MET3+METMID)+MIM<br>(MET4+METMID)+MIM<br>(MET5+METMID)+MIM | 2.20                           | -120           | > 10    | 60           |
| High cap. MIM, M3/M4   | cmmh4   | MIMH34  | 2.20                           | -120           | > 10    | 60           |
| Double MIM, M2/M3/M4<br>Double MIM, M2/M3/MTP  | cdmm4<br>cdmm4t                               | MET4+DMIM<br>(MET3+METMID)+DMIM   | 2.00                           | 3              | > 20    | 60           |
| High cap. double MIM, M2/M3/M4<br>High cap. double MIM, M2/M3/MTP  | cdmmh4<br>cdmmh4t                             | MET4+DMIMH<br>(MET3+METMID)+DMIMH   | 4.40                           | -20            | > 10    | 60           |
| Triple MIM, M2/M3/M4/M5<br>Triple MIM, M2/M3/M4/MTP  | ctmm5<br>ctmm5t                               | (MET5+METMID)+TMIM<br>(MET4+ METMID)+ TMIM  | 3.00                           | 15             | > 20    | 60           |
| High cap. triple MIM, M2/M3/M4/M5<br>High cap. triple MIM, M2/M3/M4/MTP  | ctmmh5<br>ctmmh5t                             | MET5+TMIMH<br>(MET4+METMID)+TMIMH   | 6.60                           | -120           | > 10    | 60           |

| XP018 DIFFUSION DIODE |          |                                       |                                |         |                                       |             |
|-----------------------|----------|---------------------------------------|--------------------------------|---------|---------------------------------------|-------------|
| Device                | Name     | Available with module                 | Area Cap [fF/μm <sup>2</sup> ] | BV  [V] | Leakage Current [fA/μm <sup>2</sup> ] | Max VCC [V] |
| 1.8V N+ diff. /PW     | dn       | LP5MOS                                | 1.12                           | > 6     | 5.0 x 10 <sup>-4</sup>                | 1.98        |
| 1.8V P+ diff. /NW     | dp       | LP5MOS                                | 0.98                           | > 6     | 5.0 x 10 <sup>-4</sup>                | 1.98        |
| 1.8V NW /Psub         | dnw      | LP5MOS                                | 0.29                           | > 9     | 1.0 x 10 <sup>-3</sup>                | 5.5         |
| 5.0V N+ diff. /PW2    | dn5      | LP5MOS, MOSS                          | 1.07                           | > 7     | 7.0 x 10 <sup>-4</sup>                | 5.5         |
| 5.0V P+ diff. /NW2    | dp5      | LP5MOS, MOSS                          | 0.96                           | > 7     | 7.0 x 10 <sup>-4</sup>                | 5.5         |
| 5.0V NW /Psub         | dnw5     | LP5MOS, MOSS                          | 0.29                           | > 9     | 1.0 x 10 <sup>-3</sup>                | 5.5         |
| DNWMV /Psub           | ddnwmv   | ISOMOS                                | 0.08                           | > 15    | 5.0 x 10 <sup>-4</sup>                | 5..5        |
| DNW15 /Psub           | ddnw15   | ISOMOS, HVA, HVAN, HVAP, HVEN, HVEP   | 0.08                           | > 22    | 5.0 x 10 <sup>-4</sup>                | 15          |
| DNW25 /Psub           | ddnw25   | ISOMOS, HVA, HVAN, HVAP               | 0.08                           | > 34    | 5.0 x 10 <sup>-4</sup>                | 25          |
| DNW60 /Psub           | ddnw60   | ISOMOS, HVA, HVAN, HVAP, DIODEB, BJTA | 0.08                           | > 70    | 5.0 x 10 <sup>-4</sup>                | 60          |
| P+ diff. /DNWMV       | dpdnwmv  | ISOMOS                                | 0.98                           | > 10    | 6.0 x 10 <sup>-4</sup>                | 5.5         |
| P+ diff. /DNW15       | dpdnw15  | ISOMOS, HVA, HVAN, HVAP, HVEN, HVEP   | 0.98                           | > 10    | 6.0 x 10 <sup>-4</sup>                | 5.5         |
| P+ diff. /DNW25       | dpdnw25  | ISOMOS, HVA, HVAN, HVAP               | 0.98                           | > 10    | 6.0 x 10 <sup>-4</sup>                | 5.5         |
| P+ diff. /DNW60       | dpdnw60  | ISOMOS, HVA, HVAN, HVAP               | 0.98                           | > 10    | 6.0 x 10 <sup>-4</sup>                | 5.5         |
| Iso. PW /DNWMV        | dipdnwmv | ISOMOS                                | 0.33                           | > 15    | 6.0 x 10 <sup>-4</sup>                | 5.5         |
| Iso. PW /DNW15        | dipdnw15 | ISOMOS, HVA, HVAN, HVEN               | 0.33                           | > 15    | 6.0 x 10 <sup>-4</sup>                | 5.5         |
| Iso. PW /DNW25        | dipdnw25 | ISOMOS, HVA, HVAN                     | 0.33                           | > 15    | 6.0 x 10 <sup>-4</sup>                | 5.5         |
| Iso. PW /DNW60        | dipdnw60 | ISOMOS, HVA, HVAN                     | 0.33                           | > 15    | 6.0 x 10 <sup>-4</sup>                | 5.5         |

Passive Devices (Continued)

| XP018 PROTECTION DIODES |      |                       |                         |        |                       |             |
|-------------------------|------|-----------------------|-------------------------|--------|-----------------------|-------------|
| Device                  | Name | Available with module | Leakage Current [pA/μm] | BV [V] | BV Temp. Coef. [mV/K] | Max Vcc [V] |
| 5.5V N-type Protection  | dnp  | DIODEA                | 2.5                     | 7.70   | 5                     | 9.6         |
| 5.5V P-type Protection  | dpp  | DIODEB                | 3.0                     | 7.60   | 5                     | 9.4         |

| XP018 SCHOTTKY DIODE |      |                       |              |               |         |              |
|----------------------|------|-----------------------|--------------|---------------|---------|--------------|
| Device               | Name | Available with module | Vforward [V] | ILeakage [nA] | BV  [V] | Max. VTB [V] |
| 5.5V Schottky        | dsa  | LP5MOS, MOSS          | 0.34         | < 10          | > 7.3   | 5.5          |
| 12V Schottky         | dsb  | DIODEB                | 0.41         | < 10          | > 14    | 45           |

| XP018 ESD DEVICES           |               |                               |      |         |           |         |              |
|-----------------------------|---------------|-------------------------------|------|---------|-----------|---------|--------------|
| Device                      | Name          | Available with module         | BETA | VBE [V] | BVCEO [V] | VEB [V] | Max. VCE [V] |
| 1.8V LV NMOS triggered SCR  | rnw_scr       | LP5MOS                        | -    | -       | -         | -       | -            |
| 5V LV NMOS triggered SCR    | rnw5_scr      | LP5MOS, MOSS                  | -    | -       | -         | -       | -            |
| Diode PDD /DNWELL           | dpdddnw_esd   | BJTA, HVA, HVAN, HVAP, BIPESD | -    | -       | -         | -       | -            |
| Diode PDD&ISOPWELL / DNWELL | dpddipdnw_esd | BIPESD                        | -    | -       | -         | -       | -            |
| Diode PDD&ISOWELL / VDNWELL | dpddvdnw_esd  | HVD, BIPESD                   | -    | -       | -         | -       | -            |
| Diode VDNWELL /PSUB         | dvdnw_esd     | HVC, HVD, BIPESD              | -    | -       | -         | -       | -            |
| ESD HV PNP                  | qpvhascr      | BIPESD                        | 5    | 568     | 70        | 35      | 45           |

These devices are only allowed to be used for ESD protection. Please refer to ESD documentation on XTIC.

Non-Volatile-Memory

| XP018 NVM                      |                                      |  |                                       |
|--------------------------------|--------------------------------------|--|---------------------------------------|
| Parameter                      | EEPROM                               | Flash *  | TrimOTP Compiler                      |
| Available with module          | NVM                                  | FLASH  | OTP5                                  |
| Memory Size                    | 1k bits                              | 312k bits  | 8 to 16k bits                         |
| Operating voltage              | 1.8 / 5.0V                           | 1.8 V  | 5.0V                                  |
| Operating temperature          | -40 to +175°C                        | -40 to +175°C read<br>-40 to +125°C NV write/erase                 | -40 to +175°C                         |
| Endurance                      | 20k cycles @25°C<br>5k cycles @125°C | 1k cycles @125°C   |                                       |
| Data retention                 | Min. 20 years @ 125°C                | Min. 10 years @125°C<br>Min. 3 years @150°C<br>Min. 1 years @175°C | Min. 20 years @ 125°C                 |
| Access time / programming time | 73ns read,<br>< 12ms write           | 60ns read,<br>5ms page write<br>20ms page erase                    | 25ns read (typ.)<br>10ms Byte program |

\* in development

| XP018 POLY FUSE |       |                       |                  |                 |                      |                        |
|-----------------|-------|-----------------------|------------------|-----------------|----------------------|------------------------|
| Device          | Name  | Available with module | Unprog. Res. [Ω] | Prog. Res. [kΩ] | Prog. Max VT1-T2 [V] | Unprog. Max VT1-T2 [V] |
| Poly fuse       | pfuse | LP5MOS, MOS5          | 32               | > 100           | 3.6                  | 0.1                    |

**STANDARD CELLS LIBRARIES**

| XP018 LOGIC LIBRARY |   |                        |   |
|---------------------|---|------------------------|---|
| Device              | Library feature                                     | Voltage range          | Application benefits  |
| D_CELLS             | Low power   | 1.8V, 1.2V             | High speed, P&R compatible with D_CELLSL  |
| D_CELLS_LL          | Low power, low leakage                              | 1.8V, 1.2V             | Low power consumption, low leakage, P&R compatible with D_CELLS   |
| D_CELLS_MV          | Multivoltage, power shut off                        | 1.8 / 1.2V ... 5.0V    | High speed, multivoltage  |
| D_CELLS_HD          | Low power, HD                                       | 1.8V, 1.2V             | High speed, high density routing pitch, low power cells available, P&R compatible with D_CELLS_HDMV                                       |
| D_CELLS_HDMV        | Multivoltage, power shut off, HD                    | 1.8 / 1.2V ... 5.0V    | Multi-supply voltage, power shut off, high density metal pitch  |
| D_CELLS_M5V         | Multivoltage, power shut off, HD                    | 5.0V / 2.5V ... 5.0V   | High speed, 5V supply, multivoltage   |
| D_CELLS_5V          | Low power, HD                                       | 5.0V, 4.0V, 3.3V, 2.5V | High speed, 5V supply   |
| D_CELLS_JI          | Junction isolated, low power                        | 1.8V, 1.2V             | High speed, junction isolated, low noise, voltage shifting, P&R compatible with D_CELLSL_JI   |
| D_CELLS_JILL        | Junction isolated, low leakage, low power           | 1.8V, 1.2V             | Low leakage, 0.21µm channel length, availability of low power cells, noise protection, voltage shifting, P&R compatible with D_CELLS_JI   |
| D_CELLS_JIMV        | Junction isolated, multivoltage, power shut off, HD | 1.8V / 1.2V ... 5.0V   | High speed, junction isolated, Multi-supply voltage   |
| D_CELLS_JIM5V       | Junction isolated, multivoltage, power shut off, HD | 5.0V / 2.5V ... 5.0V   | High speed, multivoltage, 5V supply, junction isolated, low noise, voltage shifting   |
| D_CELLS_JIHD        | Junction isolated, low power, HD                    | 1.8V, 1.2V             | High speed, high density routing pitch, low power cells available, noise protection, voltage shifting, P&R compatible with D_CELLS_JIHDMV |
| D_CELLS_JIHDLL      | Junction isolated, low leakage, low power, HD       | 1.8V, 1.2V             | Low leakage, low power cells available, noise protection, voltage shifting, P&R compatible with D_CELLS_JIHD, D_CELLS_JIHDMV              |
| D_CELLS_JIHDMV      | Junction isolated, multivoltage, power shut off, HD | 1.8V / 1.2V ... 5.0V   | Multi-supply voltage, power shut off, high density metal pitch, noise protection, voltage shifting  |
| D_CELLS_JI5V        | Junction isolated, low power, high density          | 5.0V, 3.3V, 2.5V       | High speed, 5V supply, junction isolated, low noise, voltage shifting   |

I/O LIBRARIES

| XP018 I/O CELLS LIBRARY |  |                     |                   |           |                      |  |
|-------------------------|--|---------------------|-------------------|-----------|----------------------|--|
| Device                  | Library Feature  | V <sub>CORE</sub> * | V <sub>IO</sub> * | ESD Level | Application benefits |  |
| IO_CELLS_5V             | Standard, 1.8V/5.0V multi supply voltage                           | 1.8V                | 5.0V              | 4kV HBM   | Pad limited          |  |
| IO_CELLS_F5V            | Standard, 1.8V/5.0V multi supply voltage                           | 1.8V                | 5.0V              | 2kV HBM   | Core limited         |  |
| IO_CELLS_C1V8           | Standard, V <sub>CORE</sub> =V <sub>IO</sub> single supply voltage | 1.8V (1.2V)         | 1.8V (1.2V)       | 4kV HBM   | Pad limited          |  |
| IO_CELLS_FC1V8          | Standard, V <sub>CORE</sub> =V <sub>IO</sub> single supply voltage | 1.8V (1.2V)         | 1.8V (1.2V)       | 2kV HBM   | Core limited         |  |
| IO_CELLS_C5V            | Standard, V <sub>CORE</sub> =V <sub>IO</sub> single supply voltage | 5.0V (3.3V)         | 5.0V (3.3V)       | 4kV HBM   | Pad limited          |  |
| IO_CELLS_FC5V           | Standard, V <sub>CORE</sub> =V <sub>IO</sub> single supply voltage | 5.0V (3.3V)         | 5.0V (3.3V)       | 2kV HBM   | Core limited         |  |
| IO_CELLS_I15V           | Junction isolated, 1.8V/5.V multi supply voltage                   | 1.8V                | 5.0V              | 4kV HBM   | Pad limited          |  |

\* Please refer to the library databook for details about available PVT ranges

| XP018 HV CELLS LIBRARY |  |               |             |                       |
|------------------------|--|---------------|-------------|-----------------------|
| Device                 | Library Feature  | Voltage Range | ESD Level   | Application benefits  |
| HV_CELLS               | Special LV I/O, operating voltage specific HV ESD protection cells | LV, 8.5V-61V  | 2kV-8kV HBM | Customized I/O Design |

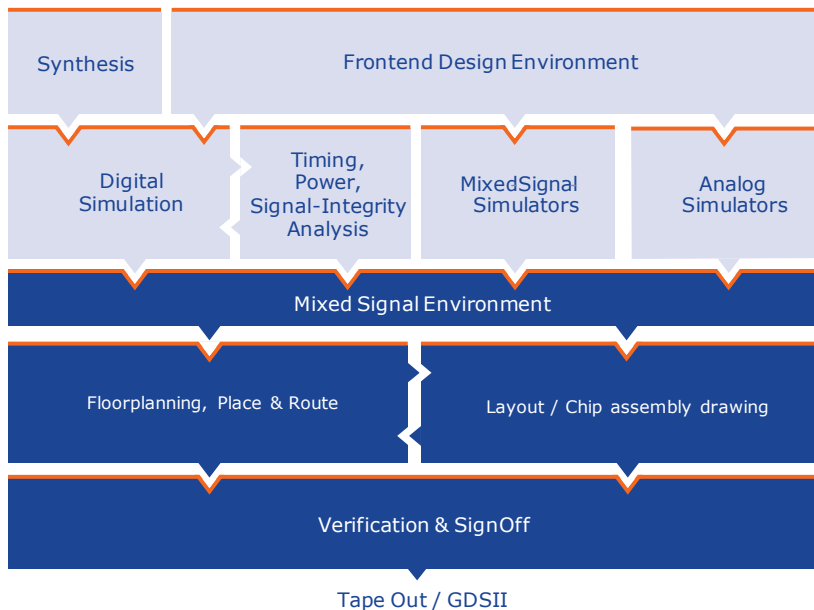
ANALOG LIBRARIES

| XP018 5V A_CELLS ANALOG LIBRARY |  |   |                           |
|---------------------------------|--|---|---------------------------|
| Library                         | Cell Name  | Operating conditions                    | Required module           |
| Bias Cells                      | abiac01_5v<br>abiac02_5v   | VDD: 3.5V to 5.5V; T: -40...175°C       | LP5MOS/MOSS, MET3         |
| Bias Cells                      | acsoc01_5v<br>acsoc02_5v   | VDD: 3.5V to 5.5V; T: -40...175°C       | LP5MOS/MOSS, MET3         |
| Bandgap                         | abgpc01_5v<br>abgpc02_5v<br>abgpc03_5v<br>abgpc04_5v<br>abgpc05_5v<br>abgpc06_5v | VDD: 3V, (2.5)V to 5.5V; T: -40...150°C | LP5MOS/MOSS, MET3         |
| Operational Amplifier           | aopac01_5v<br>aopac02_5v<br>aopac03_5v<br>aopac04_5v                             | VDD: 3.5V to 5.5V; T: -40...125°C       | LP5MOS/MOSS, MET3         |
| Comparators                     | acmpc01_5v<br>acmpc02_5v   | VDD: 3.5V to 5.5V; T: -40...125°C       | LP5MOS/MOSS, MET3         |
| RC Oscillators                  | arcoc01_5V<br>arcoc02_5V<br>arcoc03_5V<br>arcoc04_5V                             | VDD: 3.5V to 5.5V; T: -40...175°C       | LP5MOS/MOSS, MET3         |
| ADC                             | aadcc01_5v   | VDDA: 3.5V to 5.5V; T: -40...125°C      | LP5MOS, MET3, METMID, MIM |
| DAC                             | adacc01_5v   | VDDA: 3.5V to 5.5V; T: -40...125°C      | LP5MOS, MET3              |
| Power-On-Reset                  | aporc01_5v<br>aporc02_5v<br>aporc03_5v   | VDD: 3.5V to 5.5V; T: -40...125°C       | LP5MOS/MOSS, MET3         |
| Voltage Regulator               | aregc01_5v   | T: -40...125°C                          | LP5MOS/MOSS, MET3, METMID |
| Over-Temperature Detector       | atmpc01_5v   | VDD: 3.0V to 5.5V; T: -40...175°C       | LP5MOS/MOSS, MET3         |

**ANALOG LIBRARIES** (Continued)

| <b>XP018 1.8V A_CELLS ANALOG LIBRARY</b> |  |  |  |
|--|--|--|--|
| <b>Library</b>                           | <b>Cell Name</b>   | <b>Operating conditions</b>                          | <b>Required module</b>   |
| Bandgap                                  | abgpc01_1v8<br>abgpc03_1v8<br>abgpc04_1v8<br>abgpc07_1v8   | VDD: 1.5V to 1.98V; T: -40...125°C                   | LP5MOS, BJTA, MET3<br>LP5MOS, MET3<br>LP5MOS, MET3<br>LP5MOS, BJTA, MET3 |
| Current Sources                          | acsoc01_1v8<br>acsoc02_1v8<br>acsoc03_1v8<br>acsoc04_1v8<br>acsoc05_1v8<br>acsoc06_1v8<br>acsoc07_1v8<br>acsoc08_1v8<br>acsoc09_1v8<br>acsoc10_1v8 | VDD: 1.5V, (1.2)V to 1.98V;<br>T: -40...150, (175)°C | LP5MOS, MET3<br><br><br><br><br><br><br><br><br><br>LP5MOS, MRPOLY, MET3 |
| ADC                                      | aadcc01_1v8  | VDD: 1.62V to 1.98V; T: -40...150°C                  | LP5MOS, MRPOLY, MET3, METMID, MIM  |
| DAC                                      | adacc01_1v8  | VDD: 1.62V to 1.98V; T: -40...125°C                  | LP5MOS, ISOMOS, MET3   |
| Operational Amplifiers                   | aopac01_1v8<br>aopac03_1v8<br>aopac05_1v8<br>aopac06_1v8<br>aopac07_1v8<br>aopac08_1v8<br>aopac09_1v8  | VDD: 1.5V to 1.98V; T: -40...150°C                   | LP5MOS, MET3   |
| Comparators                              | acmpc01_1v8<br>acmpc02_1v8<br>acmpc03_1v8<br>acmpc04_1v8<br>acmpc05_1v8<br>acmpc06_1v8<br>acmpc07_1v8  | VDD: 1.5V to 1.98V; T: -40...150°C                   | LP5MOS, MET3   |
| Power-On/Off-Resets                      | aporc02_1v8  | VDD: 1.62V to 1.98V; T: -40...125°C                  | LP5MOS, MET3   |
| RC Oscillators                           | arcoc01_1v8<br>arcoc02_1v8<br>arcoc03_1v8<br>arcoc05_1v8<br>arcoc06_1v8<br>arcoc07_1v8<br>arcoc08_1v8<br>arcoc10_1v8                               | VDD: 1.5V to 1.98V; T: -40...175°C                   | LP5MOS, MET3   |

**XP018 SUPPORTED EDA TOOLS**



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.

**X-FAB'S IC DEVELOPMENT KIT "THEKIT"**

The X-FAB IC Development Kit is a complete solution for easy access to X-FAB technologies. TheKit is the best interface between standard CAE tools and X-FAB's processes and libraries. TheKit 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.

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