Design areas

- **Satellite navigation**
  - GPS/GLONASS/Galileo receivers: RF Front-end and baseband chips

- **Near field communication (NFC) & RFID**
  - Biometric passport chips
  - RFID tags chips for 13.56 MHz and 900 MHz applications

- **Digital and analog TV**
  - DVB-T/T2/H/S receivers: silicon tuners (RF FE) and demodulator chips

- **FM radio**
  - Analog and digital single-chip receivers
Design areas

- **Communication systems**
  - Analog and digital transceiver ICs for 27 MHz to 3 GHz frequency range

- **Automotive electronics**
  - ASICs for automotive applications

- **Avionics and Robotics**
  - Wireless HD digital video link: video processing and modulator/demodulator chips
Part numbering

- **065TSMC**
- **IFA**
- **06**

- **Description**: 0.035 to 100 MHz Intermediate-frequency amplifier

- **Serial number**: 06

- **Category**: TSMC

- **Technology**: 65 nm

- **Foundry**: TSMC

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**Foundries**

- **TSMC**: TSMC
- **Global Foundries**: Global Foundries
- **UMC**: UMC
- **SMIC**: SMIC
- **iHP**: iHP
- **AMS**: AMS
- **Vanguard**: Vanguard
- **X-FAB**: X-FAB
- **Silterra**: Silterra
**SoC IP - Analog & Mixed**

**DTV**
- 180TSMC_NT1022 – Multiband multistandard direct-conversion TV tuner
- 180TSMC_NT2022 – Multiband multiaimed GPS/ Galileo/ GLONASS/ BeiDou & TV receiver

**GNSS**
- 180SMIC_NT1019 – L1 GPS/Galileo/GLONASS RF Front-end
- 180SMIC_NT1021 – GLONASS/GPS/Galileo/BeiDou Multisystem Single-band Two-channel Receiver RFIC
- 180TSMC_NT1020 – L1 GPS/Galileo/BeiDou/GLONASS multisystem single-band receiver
- 180TSMC_NT2022 – Multiband multiaimed TV receiver & GPS/Galileo/GLONASS/BeiDou
- 350AMS_NT1036.G4 – GPS/Galileo/GLONASS/BeiDou Two-band Two-channel Receiver

**RFID & NFC**
- 180SMIC_NT1025 – UHF RFID tag IC
- 180SMIC_NT1025D – UHF RFID tag IC with cryptographic authentication
- 180UMC_NT1045 – NFC/RFID transceiver
- 180UMC_NT1046 – NFC/RFID controller with embedded MCU
NT1022 Multiband multistandard direct-conversion TV tuner

The TV tuner supports DVB-H, DVB-T, IP-DAB, T-DMB, FM standards and covers FM (75 MHz to 108 MHz), VHF (170 MHz to 240 MHz), UHF (470 MHz to 860 MHz) bands and L-band (both 1450 MHz to 1490 MHz and 1660 MHz to 1685 MHz).

NT2022 Multiband multiaimed GPS/Galileo/GLONASS/BeiDou & TV receiver

The NT2022.2 integrates GPS/Galileo/GLONASS/BeiDou receiver with TV-tuner intended to perform a simultaneous reception, down conversion, filtering and amplifying of both television and GNSS GPS/Galileo/GLONASS/BeiDou signals.

NT1019 GPS/Galileo/GLONASS multisystem single-band receiver

The NT1019 is a multisystem receiver intended to perform a simultaneous reception, down conversion, filtering and amplifying of GNSS GPS/Galileo/GLONASS L1-band signals. IC is fabricated on CMOS SMIC 0.18 µm technology.

NT1021 GLONASS/GPS/Galileo/BeiDou Multisystem Single-band Two-channel Receiver RFIC

NT1021 is a single-chip dual-channel RF front-end consuming a very low power (47mW typical at 2.1V) and performing a simultaneous reception of both GPS/Galileo and GLONASS signals. Highly configurable, RFIC can deliver different clock frequencies and provide either analog or digital output using onboard ADC circuits. Fractional-N mode brings a feature of changing LO-frequency. In this mode IC is capable to receive BeiDou navigation system signals.

NT1020 GPS/Galileo/GLONASS/BeiDou multisystem single-band front-end

The NT1020 is a multisystem receiver intended to perform a simultaneous reception, down conversion, filtering and amplifying of GNSS GPS/Galileo/GLONASS/BeiDou L1/B1-band signals. IC is fabricated on SiGe BiCMOS TSMC 0.18 µm technology.

NT 1036 GPS/Galileo/GLONASS/BeiDou Two-band Two-channel Receiver

The NT1036 is a two-channel receiver for simultaneous receiving L1, L2 bands GNSS signals (GLONASS/GPS/Galileo/BeiDou). The NT1036 is implemented as superheterodyne single conversion receiver with integrated IF filters, IF amplifiers and two fully programmable LO frequency synthesizers (including integrated VCO).
**FEATURES**

- SMIC EEPROM CMOS 180 nm
- Operating temperature range -40...+65 °C
- EPC Class 1 Generation 2 compliant
- Operating frequency 860 - 960 MHz
- 224 bit memory organized in 3 banks: EPC, TID and RESERVED
- Small area (0.185 mm²)

**NT1025 UHF RFID tag IC**

**FEATURES**

- SMIC EEPROM CMOS 180 nm
- Operating temperature range -40...+65 °C
- Passive operation – no battery needed
- Operating frequency 860 - 960 MHz
- EPC Class 1 Generation 2 compliant
- 224 bit memory organized in 3 banks: EPC, TID and RESERVED
- Hidden 256 bit bank for secret key storing
- Secret-key authentication using GOST 28147-89 crypto algorithm
- Support of ClearKey, WriteKey and Authenticate custom commands for secret key management and authentication procedure
- Small area (0.242 mm²)

**NT1025D UHF RFID tag IC with cryptographic authentication**

**FEATURES**

- SMIC EEPROM CMOS 180 nm
- Operating temperature range -40...+65 °C
- Passive operation – no battery needed
- Operating frequency 860 - 960 MHz
- EPC Class 1 Generation 2 compliant
- 224 bit memory organized in 3 banks: EPC, TID and RESERVED
- Small area (0.242 mm²)

**NT1045 NFC/RFID transceiver and NT 1046 NFC/RFID controller with embedded MCU**

**FEATURES FOR BOTH NT1045 AND NT1046**

- UMC CMOS 180 nm technology
- Supports Near Field Communication standards NFCIP-1 and NFCIP-2
- Supports ISO14443A/B, Mifare and FeliCa standards in both reader and card emulation mode
- Supports ISO15693 standard in reader mode
- Supports high-speed transmissions up to 848 Kbps
- Sleep mode with ultra-low power consumption (<1 µA)
- Wake-up with programmable RF field level
- SPI interface for communications with master MCU
- Dual channel receiver architecture for elimination of “blind spots”
- Integrated voltage regulators for analog and digital parts and I/O

**IN ADDITION TO NT1046**

- Complete RFID reader solution including 8051-based MCU and USB interface for “desktop” applications
- “On the fly” 8051 firmware downloading via USB interface (controlled by driver for Windows)
- Possibility of boot from SPI flash
<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>180TSMC_NT1022</td>
<td>Multiband multistandard direct-conversion TV tuner</td>
</tr>
<tr>
<td>180TSMC_NT2022</td>
<td>Multiband multiarmed GPS/ Galileo/ GLONASS/ BeiDou &amp; TV receiver</td>
</tr>
<tr>
<td>180TSMC_NT1020</td>
<td>L1 GPS/Galileo/BeiDou/GLONASS multisystem single-band receiver</td>
</tr>
<tr>
<td>180TSMC_NT2022</td>
<td>Multiband multiarmed TV receiver &amp; GPS/Galileo/GLONASS/BeiDou</td>
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<td>040TSMC_TS_03</td>
<td>Temperature sensor</td>
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<tr>
<td>040TSMC_OSC_01</td>
<td>Crystal oscillator 32.768kHz</td>
</tr>
<tr>
<td>065TSMC_ADC_06</td>
<td>Low-Power High-Speed 10-Bit 130 MS/s ADC</td>
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<tr>
<td>065TSMC_IFA_06</td>
<td>0.035 to 100 MHz Intermediate-frequency amplifier</td>
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<tr>
<td>065TSMC_LDOVR_04</td>
<td>30 mA linear voltage regulator</td>
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<tr>
<td>065TSMC_LNA_09</td>
<td>0.1 to 150 MHz Low frequency LNA</td>
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<tr>
<td>065TSMC_LNA_10</td>
<td>65 to 3000 MHz Low noise amplifier</td>
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<tr>
<td>065TSMC_LPFD_05</td>
<td>30MHz, 50MHz, 100MHz Fifth-order passive LPF</td>
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<tr>
<td>065TSMC_LPF_06</td>
<td>150MHz Fifth-order passive LPF</td>
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<td>065TSMC_PA_01</td>
<td>Power amplifier</td>
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<td>065TSMC_PA_02</td>
<td>Power amplifier</td>
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<td>065TSMC_PLL_07</td>
<td>Phase-locked loop clock generator</td>
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<tr>
<td>065TSMC_PLL_08</td>
<td>Wide band 3GHz-6GHz phase-locked loop</td>
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<tr>
<td>065TSMC_PLL_09</td>
<td>Wide band 3GHz-6GHz phase-locked loop</td>
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<tr>
<td>065TSMC_QF_01</td>
<td>Quadrature former</td>
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<tr>
<td>065TSMC_QF_02</td>
<td>Quadrature former</td>
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<tr>
<td>065TSMC_QF_03</td>
<td>Quadrature former</td>
</tr>
<tr>
<td>065TSMC_QF_04</td>
<td>Quadrature former</td>
</tr>
<tr>
<td>065TSMC_TS_02</td>
<td>Temperature sensor</td>
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<tr>
<td>090TSMC_ADC_01</td>
<td>High speed 14-bit analog-to-digital converter</td>
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<tr>
<td>090TSMC_ADC_02</td>
<td>10-bit analog-to-digital converter</td>
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<tr>
<td>090TSMC_ADC_03</td>
<td>10 bit successive approximation ADC</td>
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<tr>
<td>090TSMC_ADC_04</td>
<td>14 bit 100/125 MSPS 1 channel ADC</td>
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<td>090TSMC_ADC_05</td>
<td>14 bit 50 MSPS 1 channel ADC</td>
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<tr>
<td>090TSMC_ADC_06</td>
<td>ADC Corrector</td>
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<tr>
<td>090TSMC_DAC_01</td>
<td>10-bit Digital-to-analog converter</td>
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<tr>
<td>090TSMC_DAC_02</td>
<td>12-bit R/2R Digital-to-analog converter</td>
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<tr>
<td>090TSMC_DAC_06</td>
<td>12-bit R/2R Digital-to-analog converter</td>
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<tr>
<td>090TSMC_LVDS_02</td>
<td>Programmable LVDS Transmitter/Receiver</td>
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<tr>
<td>090TSMC_LVDS_03</td>
<td>Programmable LVDS Transmitter</td>
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<tr>
<td>090TSMC_MDLL_01</td>
<td>Multiplying delay-locked loop</td>
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<td>090TSMC_PLL_05</td>
<td>0.03 - 3 GHz Phase locked loop</td>
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<tr>
<td>090TSMC_PLL_06</td>
<td>1 - 600 MHz Phase locked loop</td>
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<tr>
<td>090TSMC_SERIAL_01</td>
<td>0.18 to 3Gbit/sec data serializer</td>
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<tr>
<td>090TSMC_USB_02</td>
<td>12/480 Mbit/s USB 2.0 interface</td>
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<tr>
<td>130TSMC_LVDS_04</td>
<td>Programmable LVDS Transmitter</td>
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<tr>
<td>180TSMC_AAD_01</td>
<td>Active antenna detector with load current limit; supply current 140 uA</td>
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<tr>
<td>180TSMC_AAD_02</td>
<td>Active antenna detector with load current limit</td>
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<td>180TSMC_BVR_01</td>
<td>Bandgap voltage reference</td>
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<td>180TSMC_DSM_01</td>
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<tr>
<td>180TSMC_IFA_01</td>
<td>Intermediate frequency amplifier</td>
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<tr>
<td>180TSMC_IFA_02</td>
<td>Intermediate frequency amplifier</td>
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<tr>
<td>180TSMC_IFA_04</td>
<td>5 to 20 MHz Intermediate frequency amplifier with wide gain range</td>
</tr>
<tr>
<td>180TSMC_LD_03</td>
<td>PLL Lock detector with low current consumption and high accuracy</td>
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<tr>
<td>180TSMC_LD_04</td>
<td>PLL Lock detector with low current consumption and high accuracy</td>
</tr>
<tr>
<td>180TSMC_LDOVR_01</td>
<td>LDO voltage regulator</td>
</tr>
<tr>
<td>180TSMC_LDOVR_02</td>
<td>LDO voltage regulator</td>
</tr>
<tr>
<td>180TSMC_LDOVR_03</td>
<td>LDO voltage regulator</td>
</tr>
<tr>
<td>180TSMC_LNA_01</td>
<td>Low-noise amplifier</td>
</tr>
<tr>
<td>180TSMC_LNA_02</td>
<td>Low-noise amplifier</td>
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<tr>
<td>180TSMC_LNA_03</td>
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<tr>
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<td>180TSMC_LNA_06</td>
<td>Low-noise amplifier</td>
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<tr>
<td>180TSMC_LNA_07</td>
<td>Low-noise amplifier</td>
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<tr>
<td>180TSMC_LNA_08</td>
<td>1550 to 1610 MHz Low-noise amplifier</td>
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<tr>
<td>180TSMC_LPFD_01</td>
<td>6.5 to 23 MHz Low pass filter</td>
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<tr>
<td>180TSMC_LPFD_03</td>
<td>Low pass filter</td>
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<tr>
<td>180TSMC_MIX_01</td>
<td>Mixer</td>
</tr>
<tr>
<td>180TSMC_MIX_02</td>
<td>Mixer</td>
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<tr>
<td>180TSMC_MIX_03</td>
<td>Mixer</td>
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<tr>
<td>180TSMC_MIX_04</td>
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<td>180TSMC_MIX_07</td>
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<tr>
<td>180TSMC_MIX_08</td>
<td>Mixer</td>
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<tr>
<td>180TSMC_MIX_09</td>
<td>Mixer</td>
</tr>
<tr>
<td>180TSMC_MIX_10</td>
<td>1550 to 1610 MHz Mixer</td>
</tr>
</tbody>
</table>
180TSMC_NDIV_01 – Programmable CMOS PLL high-frequency divider
180TSMC_NDIV_02 – Programmable CMOS PLL high-frequency divider
180TSMC_NDIV_03 – Programmable frequency N divider
180TSMC_PLL_01 – Phased-locked loop
180TSMC_PLL_02 – Phased-locked loop
180TSMC_PLL_03 – Phased-locked loop
180TSMC_PLL_04 – Phased-locked loop
180TSMC_PLLDIV_01 – 2/64/128 CMOS/ECL PLL high-frequency divider
180TSMC_PFD_01 – PLL phase-frequency detector with charge pump
180TSMC_PFD_02 – Phase-frequency detector
180TSMC_PFD_03 – Phase-frequency detector with charge pump
180TSMC_PFD_04 – Phase-frequency detector with charge pump (input amplitude 150...210 mV)
180TSMC_PoR_01 – Power on Reset
180TSMC_RDIV_01 – Programmable CMOS 5 bit low-frequency divider
180TSMC_RDIV_02 – Programmable frequency R divider
180TSMC_RS_01 – Current and voltage reference source
180TSMC_RS_02 – Reference voltage source
180TSMC_TS_01 – Temperature sensor
180TSMC_VCO_02 – Voltage controlled oscillator
180TSMC_VCO_03 – Voltage controlled oscillator
180TSMC_VCO_04 – Voltage controlled oscillator
180TSMC_VCO_05 – Voltage controlled oscillator
180TSMC_VCO_06 – Voltage controlled oscillator
180TSMC_VCO_07 – Voltage controlled oscillator
180TSMC_VCO_08 – Voltage controlled oscillator
180TSMC_VCO_09 – Voltage controlled oscillator
180TSMC_VCO_10 – Voltage controlled oscillator
180TSMC_XTAL_01 – Reference frequency oscillator
- UMC_NT1045 – NFC/RFID transceiver
- UMC_NT1046 – NFC/RFID controller with embedded MCU
- PLL_01 – Phase-locked loop frequency synthesizer
- ADC_01 – 100 MHz 2-bit 2-channel radiation hardened special ADC
- ADC_02 – 100 MHz 2-bit 2-channel radiation hardened special ADC
- BPF_01 – Amplifier with band-pass filter
- BVR_01 – Bandgap voltage reference
- LVDS_01 – Programmable LVDS transceiver
- PLL_02 – Frequency synthesizer 20 – 300 MHz
- RS_01 – Reference current and voltage source

- 350GF_ADC_01 – Analog-to-digital converter
- 350GF_DAC_01 – Digital-to-analog converter
- 350GF_PLL_01 – Phase locked loop
- 180SMIC_NT1019 – L1 GPS/Galileo/GLONASS RF Front-end
- 180SMIC_NT1021 – GLONASS/GPS/Galileo/BeiDou Multisystem Single-band Two-channel Receiver RFIC
- 180SMIC_NT1025 – UHF RFID tag IC
- 180SMIC_NT1025D – UHF RFID tag IC with cryptographic authentication

- 090SMIC_HSI_01 – High-speed interface
- 180SMIC_BPF_01 – Band-pass filter
- 180SMIC_BPF_02 – Band-pass filter
- 180SMIC_BVR_01 – 1.2V Bandgap voltage reference
- 180SMIC_BVR_02 – 0.6V Bandgap voltage reference
- 180SMIC_BVR_03 – 1.2V Bandgap voltage reference
- 180SMIC_ContCAN_01 – Controller CAN
- 180SMIC_ContDMA_02 – Controller DMA
- 180SMIC_ContLCD_03 – Controller LCD
- 180SMIC_ContNAND_04 – Controller NAND
- 180SMIC_PFD_01 – Phase frequency detector
- 180SMIC_PFD_02 – PLL 24.84 MHz phase-frequency detector with charge pump
- 180SMIC_PFD_03 – Phase frequency detector and charge pump
- 180SMIC_PLL_01 – Phase-locked loop system
- 180SMIC_PLL_02 – Phase-locked loop system
- 180SMIC_PLL_03 – Phase-locked loop system
- 180SMIC_PoR_01 – Power on Reset
- 180SMIC_RDIV_01 – Programmable frequency R divider
- 180SMIC_RS_01 – Current and voltage reference source
- 180SMIC_RS_02 – Reference voltage source
- 180SMIC_RS_03 – Reference voltage source
- 180SMIC_RS_04 – Reference voltage source
- 180SMIC_TS_01 – Temperature sensor
- 180SMIC_TS_02 – Temperature sensor
- 180SMIC_USB_01 – USB 2.0 High/Full-Speed interface
- 180SMIC_VCO_01 – Voltage controlled oscillator
- 180SMIC_VCO_02 – Voltage controlled oscillator
- 180SMIC_VCO_03 – Voltage-controlled oscillator
- 180SMIC_VR_01 – Voltage regulator
- 180SMIC_VR_02 – Voltage regulator
- 180SMIC_VR_03 – Voltage regulator
- 180SMIC_VR_04 – Voltage regulator
- 180SMIC_VR_05 – Voltage regulator
- 180SMIC_VR_06 – Voltage regulator
- 180SMIC_VR_07 – Voltage regulator
- 180SMIC_VR_08 – Voltage regulator
- 180SMIC_VR_09 – Voltage regulator
- 180SMIC_VR_10 – Voltage regulator
- 180SMIC_VR_11 – Voltage regulator
- 180SMIC_XTAL_01 – Reference frequency oscillator

- 350SMIC_DC_01 – DC Correlator
250iHP_ADC_01 – iHP 0.25 BiCMOS 1-bit delta-sigma ADC
250iHP_ADC_02 – 14 bit ADC, 10 to 100 MHz
250iHP_ADC_03 – Analog-to-digital converter 14 bit, 15 to 25 MHz
250iHP_ADC_04 – 0.5 to 33 MSPS 9-bit 2-channel ADC
250iHP_ADC_07 – 14-bit 8-channels ADC
250iHP_DEMOD_01 – Digital IQ demodulator
250iHP_DIGFIL_01 – Digital filter
250iHP_FDIV_01 – Programmable 6-bit CMOS frequency divider
250iHP_IFA_01 – 60 to 83 MHz High linearity intermediate frequency amplifier
250iHP_IFA_03 – Intermediate frequency amplifier
250iHP_IFA_04 – 8 to 800 kHz Intermediate-frequency amplifier
250iHP_LD_01 – PLL Lock detector with low current consumption and high accuracy
250iHP_LDOVR_01 – 3.3V to 2.5V Programmable Low drop out voltage regulator
250iHP_LDOVR_02 – 3.3V to 2.5V Programmable Low drop out voltage regulator
250iHP_LDOVR_03 – 3.3V to 2.5V Programmable Low drop out voltage regulator
250iHP_LNA_01 – 1220 to 1610 MHz Low-noise amplifier
250iHP_LNA_03 – 130 to 930 MHz Low-noise amplifier
250iHP_MIX_01 – 1220 to 1610 MHz Mixer
250iHP_MIX_03 – 130 to 935 MHz Mixer
250iHP_NDIV_01 – Programmable 9-bit CMOS frequency divider (2...511 dividing ratio)
250iHP_NDIV_02 – Programmable CMOS HF divider (16...4095 dividing ratio)
250iHP_NDIV_03 – Programmable CMOS frequency divider (32...16383 dividing ratio)
250iHP_NDIV_04 – Programmable frequency N divider
250iHP_NDIV_05 – Programmable frequency N divider
250iHP_PA_01 – Power amplifier
250iHP_PFD_01 – PLL ECL phase-frequency detector with ECL charge pump
250iHP_PFD_02 – PLL CMOS phase-frequency detector with ECL charge pump
250iHP_PFD_03 – PLL ECL phase-frequency detector with ECL charge pump
250iHP_PFD_04 – PLL CMOS phase-frequency detector with CMOS charge pump
250iHP_PFD_05 – Phase-frequency detector
250iHP_PLL_01 – Phased-locked loop system
250iHP_PLL_02 – Phased-locked loop
250iHP_RDIV_01 – Programmable 9-bit CMOS low-frequency divider (5...511 dividing ratio)
250iHP_RS_01 – Current and voltage reference source
250iHP_RS_02 – 1.18 V/ 1.02...5.1 uA Reference current and voltage source
250iHP_RS_03 – Reference current and voltage source
250iHP_TS_01 – Temperature sensor
250iHP_VCO_01 – 1237...1606 MHz Voltage controlled oscillator
250iHP_VCO_02 – 135...935 MHz Voltage-controlled oscillator
250iHP_VR_04 – 1.6...2.2V Voltage regulator
250iHP_VR_05 – 0...1.8V Power supply voltage stabilizer
250iHP_XTAL_01 – Reference frequency oscillator
250iHP_XTAL_02 – Tunable oscillator of reference frequency
- 350AMS_NT1036.G4 – GPS/Galileo/GLONASS/BeiDou Two-band Two-channel Receiver
- 350AMS_ADC_02 – Analog-to-digital converter
- 350AMS_CDIV_01 – 5-bit programmable ECL HF divider
- 350AMS_CP_01 – CMOP charge pump
- 350AMS_CP_02 – Charge pump
- 350AMS_IFA_01 – 2.5 to 22.5 MHz Intermediate frequency amplifier with wide gain range
- 350AMS_IFA_02 – Intermediate frequency amplifier
- 350AMS_IFA_03 – Intermediate frequency amplifier
- 350AMS_IFA_04 – Intermediate frequency amplifier
- 350AMS_IFA_05 – 0.8 to 25 MHz Intermediate-frequency amplifier
- 350AMS_LD_01 – PLL Lock detector with low current consumption and high accuracy
- 350AMS_LD_02 – PLL Lock detector with low current consumption and high accuracy
- 350AMS_LD_03 – PLL Lock detector with low current consumption and high accuracy
- 350AMS_LDOVR_01 – LDO voltage regulator
- 350AMS_LNA_01 – Low noise amplifier
- 350AMS_LNA_02 – Low noise amplifier
- 350AMS_LNA_03 – Low noise amplifier
- 350AMS_LPF_01 – 22 to 50 MHz 4rd order Low pass filter
- 350AMS_LPF_02 – 21 to 50 MHz 4rd order Low pass filter
- 350AMS_LPF_03 – Low pass filter
- 350AMS_LPF_04 – 9.6 to 25 MHz Low pass filter
- 350AMS_MIX_01 – Mixer
- 350AMS_MIX_02 – Mixer
- 350AMS_MIX_03 – Mixer
- 350AMS_MIX_04 – Mixer
- 350AMS_MIX_05 – Mixer
- 350AMS_MIX_06 – 1160 to 1610 MHz Mixer
- 350AMS_MIX_07 – 1160 to 1610 MHz Image rejection mixer
- 350AMS_NDIV_01 – Programmable frequency N divider
- 350AMS_NDIV_02 – Programmable frequency N divider
- 350AMS_NDIV_03 – 9-bit programmable ECL HF divider
- 350AMS_PFD_01 – 1 to 20 MHz Phase-frequency detector and charge pump
- 350AMS_PFD_02 – PLL 24.84 MHz phase-frequency detector with charge pump
- 350AMS_PFD_03 – Phase-frequency detector
- 350AMS_PFD_04 – Phase-frequency detector in ECL logic
- 350AMS_PFD_05 – Phase-frequency detector in CMOS logic
- 350AMS_PLL_01 – Phased-locked loop
- 350AMS_PLL_02 – Phased-locked loop
- 350AMS_PLL_03 – Phased-locked loop
- 350AMS_RS_01 – Reference voltage source
- 350AMS_RS_02 – Reference voltage source
- 350AMS_RS_03 – Reference voltage source
- 350AMS_RDIV_01 – Programmable frequency R divider
- 350AMS_RDIV_03 – 4-bit programmable ECL LF divider
- 350AMS_QF_01 – Quadrature former
- 350AMS_VCO_01 – 1270…1650 MHz Voltage controlled oscillator
- 350AMS_VCO_02 – Voltage controlled oscillator
- 350AMS_VCO_03 – Voltage controlled oscillator
- 350AMS_VCO_04 – 2693 to 3753 MHz Voltage controlled oscillator
- 350AMS_VCO_05 – 2096 to 2916 MHz Voltage controlled oscillator
Vanguard

- 250VIS_DC_01 – DC Correlator
- 500VIS_LDOVR_01 – 150/300/600/1500 mA LDO voltage regulator

Silterra

- 180SIL_PLL_01 – Frequency synthesizer 20÷300MHz

X-FAB

- 600XFAB_PLL_01 – Frequency phase locked loop synthesizer
- 600XFAB_DEMOD_01 – Frequency demodulator with filter
- 600XFAB_ADC_01 – Analog-to-digital converter
- 600XFAB_DAC_01 – 100 MHz 4-bit current digital-to-analog converter
- 600XFAB_DECOD_01 – Stereo decoder
- 600XFAB_DIV_01 – PLL divider
- 600XFAB_IFA_01 – IF digital signal former with
- 600XFAB_LNA_01 – Low noise amplifier
- 600XFAB_LPF_01 – Tunable intermediate frequency filter – low pass filter
- 600XFAB_MIX_01 – Quadrature mixer with AGC
- 600XFAB_OTA_01 – Transcoder of IF filter and stereo decoder frequency adjustment system
- 600XFAB_OTA_02 – Phase-frequency detector of IF filter and frequency adjustment system
- 600XFAB_PFD_01 – Phase-frequency detector with charge pump
- 600XFAB_PFD_02 – Phase-frequency detector with charge pump
- 600XFAB_PLL_01 – 300 Mhz phase locked loop synthesizer
- 600XFAB_RS_01 – Current and voltage reference source
- 600XFAB_VCO_01 – Voltage controlled oscillator
- 600XFAB_VCO_02 – VCO of IF filter and stereo decoder frequency adjustment system
- 600XFAB_XTAL_01 – Dual-mode crystal oscillator
IC Components IP - Analog & Mixed

**AAD**
- 180TSMC_AAD_01 – Active antenna detector with load current limit; supply current 140 µA
- 180TSMC_AAD_02 – Active antenna detector with load current limit

**ADC**
- 065TSMC_ADC_06 – Low-Power High-Speed 10-Bit 130 MS/s ADC
- 090TSMC_ADC_04 – 14 bit 100/125 MSPS 1 channel ADC
- 090TSMC_ADC_05 – 14 bit 50 MSPS 1 channel ADC
- 090TSMC_ADC_01 – High speed 14-bit analog-to-digital converter
- 090TSMC_ADC_02 – 10-bit analog-to-digital converter
- 090TSMC_ADC_03 – 10 bit successive approximation ADC
- 250iHP_ADC_01 – iHP 0.25 BiCMOS 1-bit delta-sigma ADC
- 250iHP_ADC_02 – 14 bit ADC, 10 to 100 MHz
- 250iHP_ADC_03 – Analog-to-digital converter 14 bit, 15 to 25 MHz
- 250iHP_ADC_04 – 0.5 to 33 MSPS 9-bit 2-channel ADC
- 250iHP_ADC_07 – 14-bit 8-channels ADC
- 350AMS_ADC_02 – Analog-to-digital converter
- 350GF_ADC_01 – Analog-to-digital converter
- 600XFAB_ADC_01 – Analog-to-digital converter
- 180UMC_ADC_01 – 100 MHz 2-bit 2-channel radiation hardened special ADC

**BPF**
- 180SMIC_BPF_01 – Band-pass filter
- 180SMIC_BPF_02 – Band-pass filter
- 180UMC_BPF_01 – Amplifier with band-pass filter

**DAC**
- 090TSMC_DAC_01 – 10-bit Digital-to-analog converter
- 090TSMC_DAC_02 – 12-bit R/2R Digital-to-analog converter
- 090TSMC_DAC_06 – 12-bit R/2R Digital-to-analog converter
- 180SMIC_DAC_01 – DAC 10 bit, 100 MHz
- 350GF_DAC_01 – Digital-to-analog converter
- 600XFAB_DAC_01 – 100 MHz 4-bit current digital-to-analog converter
IC Components IP - Analog&Mixed

**Divider**
- 180TSMC_NDIV_01 – Programmable CMOS PLL high-frequency divider
- 180TSMC_NDIV_02 – Programmable CMOS PLL high-frequency divider
- 180TSMC_NDIV_03 – Programmable frequency N divider
- 180TSMC_PLLDIV_01 – 2/64/128 CMOS/ECL PLL high-frequency divider
- 180TSMC_RDIV_01 – Programmable CMOS 5 bit low-frequency divider
- 180TSMC_RDIV_02 – Programmable frequency R divider
- 180SMIC_NDIV_01 – Programmable frequency N divider
- 180SMIC_RDIV_01 – Programmable frequency R divider
- 250iHP_FDIV_01 – Programmable 6-bit CMOS frequency divider
- 250iHP_NDIV_01 – Programmable 9-bit CMOS frequency divider (2...511 dividing ratio)
- 250iHP_NDIV_02 – Programmable CMOS HF divider (16...4095 dividing ratio)
- 250iHP_NDIV_03 – Programmable CMOS frequency divider (32...16383 dividing ratio)
- 250iHP_NDIV_04 – Programmable frequency N divider
- 250iHP_NDIV_05 – Programmable frequency N divider
- 250iHP_RDIV_01 – Programmable 9-bit CMOS low-frequency divider (5...511 dividing ratio)
- 350AMS_CDIV_01 – 5-bit programmable ECL HF divider
- 350AMS_NDIV_01 – Programmable frequency N divider
- 350AMS_NDIV_02 – Programmable frequency N divider
- 350AMS_NDIV_03 – 9-bit programmable ECL HF divider
- 350AMS_RDIV_01 – Programmable frequency R divider
- 350AMS_RDIV_03 – 4-bit programmable ECL LF divider
- 600XFAB_DIV_01 – PLL divider

**DLL**
- 090TSMC_MDLL_01 – Multiplying delay-locked loop
IC Components IP - Analog&Mixed

**IFA**
- 065TSMC_IFA_06 – 0.035 to 100 MHz Intermediate-frequency amplifier
- 180TSMC_IFA_01 – Intermediate frequency amplifier
- 180TSMC_IFA_02 – Intermediate frequency amplifier
- 180TSMC_IFA_04 – 5 to 20 MHz Intermediate frequency amplifier with wide gain range
- 180SMIC_IFA_01 – 7 to 20 MHz Intermediate frequency amplifier
- 180SMIC_IFA_02 – 5 to 20 MHz Intermediate frequency amplifier
- 180SMIC_IFA_03 – Intermediate frequency amplifier
- 250iHP_IFA_01 – 60 to 83 MHz High linearity intermediate frequency amplifier
- 250iHP_IFA_03 – Intermediate frequency amplifier
- 250iHP_IFA_04 – 8 to 800 kHz Intermediate-frequency amplifier
- 350AMS_IFA_01 – 2.5 to 22.5 MHz Intermediate frequency amplifier with wide gain range
- 350AMS_IFA_02 – Intermediate frequency amplifier
- 350AMS_IFA_03 – Intermediate frequency amplifier
- 350AMS_IFA_04 – Intermediate frequency amplifier
- 350AMS_IFA_05 – 0.8 to 25 MHz Intermediate-frequency amplifier
- 600XFAB_IFA_01 – IF digital signal former with

**LD**
- 180TSMC_LD_03 – PLL Lock detector with low current consumption and high accuracy
- 180TSMC_LD_04 – PLL Lock detector with low current consumption and high accuracy
- 180SMIC_LD_01 – PLL Lock detector with low current consumption and high accuracy
- 250iHP_LD_01 – PLL Lock detector with low current consumption and high accuracy
- 350AMS_LD_01 – PLL Lock detector with low current consumption and high accuracy
- 350AMS_LD_02 – PLL Lock detector with low current consumption and high accuracy
- 350AMS_LD_03 – PLL Lock detector with low current consumption and high accuracy
IC Components IP - Analog&Mixed

LNA
- 065TSMC_LNA_09 – 0.1 to 150 MHz Low frequency LNA
- 065TSMC_LNA_10 – 65 to 3000 MHz Low noise amplifier
- 180TSMC_LNA_01 – Low-noise amplifier
- 180TSMC_LNA_02 – Low-noise amplifier
- 180TSMC_LNA_03 – Low-noise amplifier
- 180TSMC_LNA_04 – Low-noise amplifier
- 180TSMC_LNA_08 – 1550 to 1610 MHz Low-noise amplifier
- 180SMIC_LNA_01 – Low-noise amplifier
- 250iHP_LNA_01 – 1220 to 1610 MHz Low-noise amplifier
- 250iHP_LNA_03 – 130 to 930 MHz Low-noise amplifier
- 350AMS_LNA_01 – Low noise amplifier
- 350AMS_LNA_02 – Low noise amplifier
- 350AMS_LNA_03 – Low noise amplifier
- 600XFAB_LNA_01 – Low noise amplifier

LPF
- 040TSMC_OSC_01 – Crystal oscillator 32.768kHz
- 065TSMC_LPF_05 – 30MHz, 50MHz, 100MHz Fifth-order passive LPF
- 065TSMC_LPF_06 – 150MHz Fifth-order passive LPF
- 180TSMC_LPF_01 – 6.5 to 23 MHz Low pass filter
- 180TSMC_LPF_03 – Low pass filter
- 180SMIC_LPF_01 – 1 to 200 MHz Low-pass filter
- 180SMIC_LPF_02 – 1 to 200 MHz Low-pass filter with frequency adjustment system
- 180SMIC_LPF_03 – Low-pass filter
- 180SMIC_LPF_04 – Low-pass filter frequency adjustment system
- 180SMIC_LPF_05 – Low-pass filter
- 180SMIC_OSC_01 – 7 to 150 MHz Low-pass filter generator
- 180SMIC_OSC_02 – Low-pass filter generator
- 350AMS_LPF_01 – 22 to 50 MHz 4rd order Low pass filter
- 350AMS_LPF_02 – 21 to 50 MHz 4rd order Low pass filter
- 350AMS_LPF_03 – Low pass filter
- 350AMS_LPF_04 – 9.6 to 25 MHz Low pass filter
- 600XFAB_LPF_01 – Tunable intermediate frequency filter -- low pass filter
IC Components IP - Analog&Mixed

**LVDS**
- 090TSMC_SERIAL_01 – 0.18 to 3Gbit/sec data serializer
- 090TSMC_LVDS_02 – Programmable LVDS Transmitter/Receiver
- 090TSMC_LVDS_03 – Programmable LVDS Transmitter
- 130TSMC_LVDS_04 – Programmable LVDS Transmitter
- 180UMC_LVDS_01 – Programmable LVDS Transmitter

**MIXER**
- 180SMIC_MIX_01 – 1571 to 1606 MHz Mixer
- 180SMIC_MIX_02 – 1571.3 to 1606.4 MHz Mixer
- 180SMIC_MUX_03 – Multiplexer
- 180TSMC_MIX_01 – Mixer
- 180TSMC_MIX_02 – Mixer
- 180TSMC_MIX_03 – Mixer
- 180TSMC_MIX_04 – Mixer
- 180TSMC_MIX_05 – Mixer
- 180TSMC_MIX_06 – Mixer
- 180TSMC_MIX_07 – Mixer
- 180TSMC_MIX_08 – Mixer
- 180TSMC_MIX_09 – Mixer
- 180TSMC_MIX_10 – 1550 to 1610 MHz Mixer
- 250iHP_MIX_01 – 1220 to 1610 MHz Mixer
- 250iHP_MIX_03 – 130 to 935 MHz Mixer
- 350AMS_MIX_01 – Mixer
- 350AMS_MIX_02 – Mixer
- 350AMS_MIX_03 – Mixer
- 350AMS_MIX_04 – Mixer
- 350AMS_MIX_05 – Mixer
- 350AMS_MIX_06 – 1160 to 1610 MHz Mixer
- 350AMS_MIX_07 – 1160 to 1610 MHz Image rejection mixer
- 600XFAB_MIX_01 – Quadrature mixer with AGC
IC Components IP - Analog&Mixed

**MULTIPLEXER**
- 180SMIC_MUX_01 – Multiplexer
- 180SMIC_MUX_02 – Multiplexer

**MULTIPLIER**
- 250iHP_FREQMULT_01 – Frequency multiplier

**OTA**
- 600XFAB_OTA_01 – Transcoder of IF filter and stereo decoder frequency adjustment system
- 600XFAB_OTA_02 – Phase-frequency detector of IF filter and frequency adjustment system

**PA**
- 065TSMC_PA_01 – Power amplifier
- 065TSMC_PA_02 – Power amplifier
- 250iHP_PA_01 – Power amplifier
IC Components IP - Analog&Mixed

**PFD**
- 180TSMC_PFD_02 – Phase-frequency detector
- 180TSMC_PFD_04 – Phase-frequency detector with charge pump (input amplitude 150...210 mV)
- 180TSMC_PFD_01 – PLL phase-frequency detector with charge pump
- 180TSMC_PFD_03 – Phase-frequency detector with charge pump
- 180SMIC_PFD_01 – Phase frequency detector
- 180SMIC_PFD_02 – PLL 24.84 MHz phase-frequency detector with charge pump
- 180SMIC_PFD_03 – Phase frequency detector and charge pump
- 250iHP_PFD_01 – PLL ECL phase-frequency detector with ECL charge pump
- 250iHP_PFD_02 – PLL CMOS phase-frequency detector with ECL charge pump
- 250iHP_PFD_03 – PLL ECL phase-frequency detector with ECL charge pump
- 250iHP_PFD_04 – PLL CMOS phase-frequency detector with CMOS charge pump
- 250iHP_PFD_05 – Phase-frequency detector
- 350AMS_CP_01 – CMOP charge pump
- 350AMS_CP_02 – Charge pump
- 350AMS_PFD_01 – 1 to 20 MHz Phase-frequency detector and charge pump
- 350AMS_PFD_02 – PLL 24.84 MHz phase-frequency detector with charge pump
- 350AMS_PFD_03 – Phase-frequency detector
- 350AMS_PFD_04 – Phase-frequency detector in ECL logic
- 350AMS_PFD_05 – Phase-frequency detector in CMOS logic
- 600XFAB_PFD_01 – Phase-frequency detector with charge pump
- 600XFAB_PFD_02 – Phase-frequency detector with charge pump
IC Components IP - Analog&Mixed

**PLL**
- 065UMC_PLL_01 – Phase-locked loop frequency synthesizer
- 180UMC_PLL_02 – Frequency synthesizer 20 – 300 MHz
- 065TSMC_PLL_07 – Phase-locked loop clock generator
- 065TSMC_PLL_08 – Wide band 3GHz-6GHz phase-locked loop
- 065TSMC_PLL_09 – Wide band 3GHz-6GHz phase-locked loop
- 090TSMC_PLL_05 – 0.03 - 3 GHz Phase locked loop
- 090TSMC_PLL_06 – 1 - 600 MHz Phase locked loop
- 180TSMC_PLL_01 – Phased-locked loop
- 180TSMC_PLL_02 – Phased-locked loop
- 180TSMC_PLL_03 – Phased-locked loop
- 180TSMC_PLL_04 – Phased-locked loop
- 180SMIC_PLL_01 – Phase-locked loop system
- 180SMIC_PLL_02 – Phase-locked loop system
- 180SMIC_PLL_03 – Phase-locked loop system
- 180SIL_PLL_01 – Frequency synthesizer 20÷300MHz
- 250iHP_PLL_01 – Phased-locked loop system
- 250iHP_PLL_02 – Phased-locked loop
- 350AMS_PLL_01 – Phased-locked loop
- 350AMS_PLL_02 – Phased-locked loop
- 350AMS_PLL_03 – Phased-locked loop
- 350GF_PLL_01 – Phase locked loop
- 600XFAB_PLL_01 – Frequency phase locked loop synthesizer
- 600XFAB_PLL_02 – 300 Mhz phase locked loop synthesizer

**QF**
- 065TSMC_QF_01 – Quadrature former
- 065TSMC_QF_02 – Quadrature former
- 065TSMC_QF_03 – Quadrature former
- 065TSMC_QF_04 – Quadrature former
- 350AMS_QF_01 – Quadrature former
IC Components IP - Analog&Mixed

**RS**
- 180TSMC_BVR_01 – Bandgap voltage reference
- 180TSMC_RS_01 – Current and voltage reference source
- 180TSMC_RS_02 – Reference voltage source
- 180SMIC_RS_01 – Reference voltage source
- 180SMIC_RS_02 – Reference voltage source
- 180SMIC_RS_03 – Reference voltage source
- 180SMIC_RS_04 – Reference voltage source
- 180SMIC_BVR_01 – 1.2V Bandgap voltage reference
- 180SMIC_BVR_02 – 0.6V Bandgap voltage reference
- 180SMIC_BVR_03 – 1.2V Bandgap voltage reference
- 180UMC_RS_01 – Reference current and voltage source
- 180UMC_BVR_01 – Bandgap voltage reference
- 250iHP_RS_02 – 1.18 V/ 1.02...5.1 uA Reference current and voltage source
- 250iHP_RS_03 – Reference current and voltage source
- 350AMS_RS_01 – Reference voltage source
- 350AMS_RS_02 – Reference voltage source
- 350AMS_RS_03 – Reference voltage source
- 600XFAB_RS_01 – Current and voltage reference source

**SENSOR**
- 040TSMC_TS_03 – Temperature sensor
- 065TSMC_TS_02 – Temperature sensor
- 180TSMC_TS_01 – Temperature sensor
- 180SMIC_TS_01 – Temperature sensor
- 180SMIC_TS_02 – Temperature sensor
- 250iHP_TS_01 – Temperature sensor
IC Components IP - Analog&Mixed

**VCO**

- 180TSMC_VCO_02 – Voltage controlled oscillator
- 180TSMC_VCO_03 – Voltage controlled oscillator
- 180TSMC_VCO_04 – Voltage controlled oscillator
- 180TSMC_VCO_05 – Voltage controlled oscillator
- 180TSMC_VCO_06 – Voltage controlled oscillator
- 180TSMC_VCO_07 – Voltage controlled oscillator
- 180TSMC_VCO_08 – Voltage controlled oscillator
- 180TSMC_VCO_09 – Voltage controlled oscillator
- 180TSMC_VCO_10 – Voltage controlled oscillator
- 180SMIC_VCO_01 – Voltage controlled oscillator
- 180SMIC_VCO_02 – Voltage controlled oscillator
- 180SMIC_VCO_03 – Voltage-controlled oscillator
- 250iHP_VCO_01 – 1237...1606 MHz Voltage controlled oscillator
- 250iHP_VCO_02 – 135...935 MHz Voltage-controlled oscillator
- 350AMS_VCO_01 – 1270...1650 MHz Voltage controlled oscillator
- 350AMS_VCO_02 – Voltage controlled oscillator
- 350AMS_VCO_03 – Voltage controlled oscillator
- 350AMS_VCO_04 – 2693 to 3753 MHz Voltage controlled oscillator
- 350AMS_VCO_05 – 2096 to 2916 MHz Voltage controlled oscillator
- 600XFAB_VCO_01 – Voltage controlled oscillator
- 600XFAB_VCO_02 – VCO of IF filter and stereo decoder frequency adjustment system
IC Components IP - Analog&Mixed

**VR**
- 065TSMC_LDOVR_04 – 30 mA linear voltage regulator
- 180TSMC_LDOVR_01 – LDO voltage regulator
- 180TSMC_LDOVR_02 – LDO voltage regulator
- 180TSMC_LDOVR_03 – LDO voltage regulator
- 180SMIC_VR_01 – Voltage regulator
- 180SMIC_VR_02 – Voltage regulator
- 180SMIC_VR_03 – Voltage regulator
- 180SMIC_VR_04 – Voltage regulator
- 180SMIC_VR_05 – Voltage regulator
- 180SMIC_VR_06 – Voltage regulator
- 180SMIC_VR_07 – Voltage regulator
- 180SMIC_VR_08 – Voltage regulator
- 180SMIC_VR_09 – Voltage regulator
- 180SMIC_VR_10 – Voltage regulator
- 180SMIC_VR_11 – Voltage regulator
- 250iHP_LDOVR_01 – 3.3V to 2.5V Programmable Low drop out voltage regulator
- 250iHP_LDOVR_02 – 3.3V to 2.5V Programmable Low drop out voltage regulator
- 250iHP_LDOVR_03 – 3.3V to 2.5V Programmable Low drop out voltage regulator
- 250iHP_VR_04 – 1.6…2.2V Voltage regulator
- 250iHP_VR_05 – 0…1.8V Power supply voltage stabilizer
- 350AMS_LDOVR_01 – LDO voltage regulator
- 500VIS_LDOVR_01 – 150/300/600/1500 mA LDO voltage regulator

**XTAL**
- 180TSMC_XTAL_01 – Reference frequency oscillator
- 180SMIC_XTAL_01 – Reference frequency oscillator
- 250iHP_XTAL_01 – Reference frequency oscillator
- 250iHP_XTAL_02 – Tunable oscillator of reference frequency
- 600XFAB_XTAL_01 – Dual-mode crystal oscillator

**Other**
- 180TSMC_PoR_01 – Power on Reset
- 180SMIC_PoR_01 – Power on Reset
IC Components IP - Digital

Controllers
- 180SMIC_ContCAN_01 – Controller CAN
- 180SMIC_ContDMA_02 – Controller DMA
- 180SMIC_ContLCD_03 – Controller LCD
- 180SMIC_ContNAND_04 – Controller NAND
- 180SMIC_ContSPI_05 – Controller SPI
- 180SMIC_ContUSB_06 – Controller USB

Corrector
- 090TSMC_CorADC_01 – ADC Corrector

Correlator
- 250VIS_DC_01 – DC Correlator
- 350SMIC_DC_01 – DC Correlator

DECODER
- 600XFAB_DECOD_01 – Stereo decoder

DEMODULATOR
- 250iHP_DEMOD_01 – Digital IQ demodulator
- 600XFAB_DEMOD_01 – Frequency demodulator with filter

DIGITAL FILTER
- 250iHP_DIGFIL_01 – Digital filter

EEPROM
- 180SMIC_EEPROM_HS_01 – 704-bit EEPROM

INTERFACE
- 090SMIC_HSI_01 – High-speed interface
IC Components IP – Digital & Soft

**USB**
- 090TSMC_USB_02 – 12/480 Mbit/s USB 2.0 interface
- 180SMIC_USB_01 – USB 2.0 High/Full-Speed interface

**MEMORY**
- DDR2

**Cryptography**
- Crypt 28147-89
- Crypt DES
- Crypt 3DES
- Crypt AES-128
- Crypt AES-192
- Crypt AES-256
- Crypt RSA
- Crypt P34.10-2001