More connected, more secured, more immersive
ST’s solutions for mobile devices

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STMicroelectronics is a leading semiconductor supplier in the mobile industry and provides solutions to both mobile platform suppliers and mobile device manufacturers (OEM/ODM). ST has proven products for the cellular handset and mobile device markets and ships billions of products to the mobile industry every year. These products include the world’s most deployed MEMS accelerometers, gyroscopes, pressure sensors, compasses and inertial modules, state-of-the-art analog and digital MEMS microphones, high-quality audio headphone and speaker amplifiers, touch-sensor controllers with multi-touch capabilities, global Near Field Communication and secure element solutions, a wide RF product offer based on Integrated passive device technology, ESD protection and EMI filtering products (IPAD™), interface devices, level translators, I/O expanders, analog switches, supervisors and smart resets, camera system solutions with image sensors, camera modules and image signal processors, high-efficiency power management devices and innovative lighting management solutions. ST is an active player in all major standardization initiatives.

- **NFC AND SECURE ELEMENTS**
  Near Field Communication, secure MCUs

- **CAMERA SOLUTIONS**
  Image sensors, camera modules, image signal processors

- **SENSORS AND HUMAN INTERFACES**
  Accelerometers, gyroscopes, pressure sensors, iNEMO-Inertial modules, digital compasses, proximity sensors, touchscreen controllers, optical finger navigation sensors

- **INTERFACE AND INTERCONNECTED DEVICES**
  Level translators, I/O expanders, camera interfaces, analog switches, supervisors and smart resets

- **AUDIO SOLUTIONS**
  MEMS digital and analog microphones, headphone and speaker amplifiers

- **RADIO FREQUENCY**
  Couplers, diplexers, baluns, band-pass filters

- **POWER MANAGEMENT**
  LDO and DC-DC converters, battery management, Flash LED and backlight drivers, OLED display power supplies

- **PROTECTION AND EMI FILTERING**
  ESD and EOS protections, EMI filtering
Sensors and human interfaces

MEMS (micro-electromechanical systems) enable unique user-interface gesture recognition and motion detection. ST offers the widest and most complete MEMS portfolio on the market, and has shipped more than one billion MEMS sensors. Micro-machined accelerometers, gyroscopes and magnetic modules have enabled motion-activated user interfaces in a number of popular consumer devices, such as game consoles, smartphones and remote controls, making these more accessible and appealing to people. We are also introducing touch-sensor technology with multi-touch capabilities and force movement detection.

**MEMS**

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<th>Accelerometers</th>
<th>Gyroscopes</th>
<th>INEMO inertial modules</th>
<th>Digital compasses</th>
<th>Pressure sensors</th>
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</table>

- **ACCELEROMETERS**
  ST’s state-of-the-art analog and digital accelerometers feature up to ±24g full scale, high resolution, smart embedded functionalities and advanced power-saving features.

- **GYROSCOPES**
  ST’s portfolio of single-, dual- and tri-axis gyroscopes covers a wide full-scale range (from 30 to 6000 dps) in small LGA packages. The innovatively designed sensors can provide different combinations of analog and digital outputs.

- **INEMO INERTIAL MODULES**
  ST’s new INEMO inertial-module product family, designed for enhanced multiple degrees of freedom for motion detection, deliver multi-sensing integration to reduce system architecture size, BOM and to improve accuracy. The family today includes inertial modules featuring six degrees of freedom: 3-axis acceleration and 3-axis angular rate. ST’s INEMO inertial modules can be used together with ST’s new sensor-fusion software suite to design reliable and customizable hardware/software multi-axis MEMS solutions.

- **DIGITAL COMPASSES**
  Digital compasses integrate a 3-axis digital accelerometer with a 3-axis digital magnetic sensor in a single package to enhance advanced navigation features and smart location-based services.

- **PRESSURE SENSORS**
  ST’s ultra-small silicon pressure sensors provide extremely high resolution measurements of pressure, ideal for use in smartphone applications, including:
  - Indoor and outdoor navigation
  - Enhanced GPS for dead-reckoning
  - Altimeter and barometer

**Key features**

- Wide range of motion sensors with embedded features and programmable interrupts
- ST’s iNEMO™ sensor fusion engine delivering significantly more accurate and reliable sensor data
- Modules integrating multisensing capability for optimized size and cost
**Featured products**

**3-AXIS HIGH-RESOLUTION ACCELEROMETER WITH TWO EMBEDDED FINITE-STATE MACHINES**

**LIS3DSH**

The LIS3DSH is the first 3-axis high-resolution accelerometer with two embedded finite-state machines. These programmable blocks enable custom motion recognition inside the sensor, raising the bar by reducing system complexity and power consumption in motion-sensitive mobile phones and other smart consumer devices, so allowing users to answer calls, turn the ringer on or off, or launch applications like a pedometer, with a defined motion.

**Key features**

- Ultra low-power consumption
- ±2g/±4g/±6g/±8g/±16g dynamically selectable full-scale
- I²C/SPI digital output interface
- 16-bit data output
- Programmable embedded state machines
- Embedded temperature sensor
- Embedded self-test
- Embedded FIFO
- 10000 g high shock survivability

**DUAL-CORE, 3-AXIS DIGITAL OUTPUT GYROSCOPE FOR GAMING AND OIS**

**L3G4IS**

The L3G4IS is the market’s first dual-core gyroscope capable of handling both user-motion recognition and camera image stabilization. Manufacturers only need to use a single gyroscope for the two different functions, reducing the size, system complexity, and cost in mobile phones, tablets, and other smart consumer devices.

The innovative design of ST’s dual-core gyroscope employs separate output paths optimized for the two different functions in a 4 x 4 x 1 mm package.

**Key features**

- Three selectable full-scales (250/500/2000 dps) for gaming applications
- ± 65 dps full-scale for OIS applications
- Independent I²C and SPI digital interfaces
- Embedded temperature sensor
- Integrated low- and high-pass filters with user-selectable bandwidth
- Wide supply voltage range: 2.4 to 3.6 V
- Low-voltage compatible I/Os (1.8 V)
- Power-down and sleep mode for smart power saving
- Embedded FIFO
**iNEMO Module Integrates 6 Degrees of Freedom in 16 MM³**

**LSM330D**
The LSM330D multi-sensor module combines a user-selectable full-scale acceleration range from 2 to 16g with angular-rate detection from 250 to 2000 dps along the pitch, roll, and yaw axes. Addressing power constraints in battery-operated portable devices, the module includes power-down and sleep modes and two embedded FIFO memory blocks, one for each sensor, for smarter power management. In addition, it can operate with any supply voltage over the range of 2.4 to 3.6 V. Fully software compatible with ST’s latest-generation 3-axis digital accelerometers (LIS3DH) and gyroscopes (L3GD20), the new iNEMO module makes it easy for customers using ST’s single-function sensors to upgrade their designs, reducing the board size, number of external components, and overall application system complexity.

**Key Features**
- Analog supply voltage: 2.4 to 3.6 V
- Digital supply voltage IOs: 1.8 V
- Low-power mode
- Power-down mode
- 3 independent acceleration channels and 3 angular rate channels
- ±2 g/±4 g/±8 g/±16g dynamically selectable full scale
- ±250/±500/±2000 dps dynamically selectable full scale
- SPI/I2C serial interface (16-bit data output)
- Programmable interrupt generator for free-fall and motion detection

**Ultra-Compact, High-Performance e-Compass**

**LSM303DLHC**
The LSM303DLHC is a system-in-package featuring a 3D digital linear acceleration sensor and a 3D digital magnetic sensor. The LSM303DLHC has linear acceleration full-scales of ±2g / ±4g / ±8g / ±16g and a magnetic field full scale of ±1.3 / ±1.9 / ±2.5 / ±4.0 / ±4.7 / ±5.6 / ±8.1 gauss. All full-scales available are fully selectable by the user. The LSM303DLHC includes an I2C serial bus interface that supports standard and fast modes, 100 kHz and 400 kHz. The system can be configured to generate interrupt signals by inertial wakeup and free-fall events, as well as by the position of the device itself. Thresholds and timing of interrupt generators are programmable by the end user on the fly. Magnetic and accelerometer parts can be enabled or put into power-down mode separately.

**Key Features**
- Analog supply voltage: 2.4 to 3.6 V
- Digital supply voltage IOs: 1.8 V
- Low-power mode
- Power-down mode
- 3 magnetic field channels and 3 acceleration channels
- SPI/I2C serial interface (16-bit data output)
- Programmable interrupt generator for free-fall and motion detection
**INEMO ENGINE SENSOR FUSION SUITE**

The INEMO Engine sensor fusion suite is a filtering and predictive software that uses advanced algorithms to integrate outputs from multiple MEMS sensors. Real-time on-board motion-sensor data fusion is set to significantly improve the user experience, increasing accuracy, resolution, stability and response time in advanced motion-based applications in consumer, computer, industrial and medical fields.

The INEMO Engine can be combined with ST’s INEMO inertial modules to create the industry’s first complete and customizable hardware/software multi-axis MEMS sensor solutions for enhanced motion and accurate heading recognition. Equipment manufacturers across different market segments can now easily and quickly deploy robust and reliable high-performance motion-detection systems with up to 10 degrees of freedom, comprising 3-axis sensing of linear, angular, and magnetic motion with barometer/altitude readings from a pressure sensor, enabling true augmented-reality applications.

**Key features**

- Absolute point tracking and motion tracking accuracy
- Immunity to magnetic interference for high performance in real-world conditions
- Few user-calibration interruptions, enabling innovative and longer game play
- Reliable compass heading for accurate navigation
- Accurate direction, enabling true augmented reality applications

**HIGH-RESOLUTION DIGITAL PRESSURE SENSOR**

**LPS331AP**

The LPS331AP is an ultra compact absolute piezoresistive pressure sensor. It includes a monolithic sensing element and an IC interface to take the information from the sensing element and to provide a digital signal to the external world. The sensing element consists of a suspended membrane formed inside a single mono-silicon substrate. It is capable of detecting pressure and is manufactured using a dedicated process developed by ST, VENSENS.

**Key features**

- 260-1260 mbar absolute pressure range
- High-resolution mode: 0.020 mbar RMS
- Low power consumption:
  - Low-resolution mode: 5.5 µA
  - High-resolution mode: 30 µA
- High overpressure capability: 20x full scale
- Embedded temperature compensation
- Embedded 24-bit ADC
- Selectable ODR from 1 Hz to 25 Hz
- SPI and I2C interfaces
- Supply voltage 1.71 to 3.6 V
- High shock survivability: 10000 g
Touch sensing

**Proximity sensors**
- Class leading sensitivity and immunity for proximity detection
- Typical use-cases:
  - Switch-off touchscreen during a call
  - FCC SAR test compliancy in tablet PCs
  - Wake-up and energy saving

**Touchscreen controllers**
- Capacitive
  - Multi-touch controller with dedicated noise-tolerant sensing hardware, ultra-low-power operation and easy-to-use programming interface
- Resistive
  - Available for cost-sensitive and stylus-based products, high resolution and flexible features, low power consumption and small package size

**Optical finger navigation**
- Optical finger motion sensor for pointer-based navigation in portable multimedia devices, also ideal for web browsing, document scrolling and more

**Key features**
- Field-proven charge transfer surface capacitive technology
- Complete set of resistive and capacitive touchscreen controllers for single, dual and multi-touch

**Featured products**

**MULTI-TOUCH CAPACITIVE TOUCHSCREEN CONTROLLERS**

**STMT05E, STMT07**

Based on ST’s new FingerTip technology, these devices use a unique capacitance-to-voltage conversion acquisition engine to implement the S-Touch® capacitive sensing method. Coupled with the flexibility offered by the internal processor, the entire touchscreen sensing solution can measure, classify and track a single finger touch with fast report rate and response times on 240/736 nodes. A built-in movement tracking engine tracks more than 10 independent touch movements.

**Key features**
- Single-chip solution for screens up to 10 inches
- From 28- to 55-channels
- Powerful 32-bit DSP engine to eliminate noise effects
- Faster response time
- Very low power consumption
- Supports handwriting with small stylus and palm rejection
- Best linearity and accuracy in noisy conditions
**SINGLE-CHANNEL CAPACITIVE SENSOR FOR TOUCH AND PROXIMITY DETECTION**

**STM8T143**
The STM8T143 is a single-channel, fully-integrated, touch-sensing capacitive sensor. It uses the ProxSense™ charge transfer capacitive acquisition method that is capable of near-range proximity detection. The STM8T143 offers a state-of-the-art capacitive sensing engine with an embedded sampling capacitor and voltage regulator allowing the overall solution cost to be reduced and improving system immunity in noisy environments.

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**Key features**
- 1-inch detection range
- Not dependant on surface reflectance
- Invisible sensor using ITO material (no need for a clear opening in the bezel)
- Power consumption: ~12 µA
- High immunity to RF interference
- Low BOM, small 8-pin package
- Ideal replacement versus optical IR sensor

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**SENSORS AND HUMAN INTERFACE PRODUCTS**

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<td>LIS3DH</td>
<td>L3G4200D</td>
<td>LSM303DLHC</td>
<td>LPS331AP</td>
</tr>
<tr>
<td>Ultra-low-power, high-performance 3-axis digital output accelerometer</td>
<td>3-axis digital gyroscope, selectable full-scale ±250/±500/ ±2000 dps</td>
<td>Ultra-compact high-performance e-compass integrating 3D accelerometer and 3D magnetometer</td>
<td>260 to 1260 mbar absolute digital output barometer</td>
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<tr>
<td>LIS3DSH</td>
<td>L3GD20</td>
<td></td>
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<tr>
<td>Ultra low-power high-performance 3-axes nano accelerometer, embedding 2 finite-state machines</td>
<td>3-axis, digital, selectable full-scale ±250/±500/ ±2000 dps coupled with audio and mechanical noise immunity</td>
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<th>iNEMO engine sensor fusion libraries</th>
<th>Proximity sensors</th>
<th>Touchscreen controllers</th>
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<td>LSM330D</td>
<td>iNEMOEngine_LI3</td>
<td>STM8T143</td>
<td>STMPES12A</td>
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<tr>
<td>Multi-sensor device packs 6 degrees of freedom in 16 mm³</td>
<td>A free software library for motion-detection system evaluation</td>
<td>Single-channel touch and proximity sensor</td>
<td>4-wire resistive touchscreen controller</td>
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<td></td>
<td>STMT05E</td>
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<td></td>
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<td></td>
<td>Capacitive multi-touchscreen controller (up to 5 inches screen)</td>
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<td>STMT07</td>
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<td>Capacitive multi-touchscreen controller (up to 10 inches screen)</td>
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<tr>
<td>Low-power optical finger navigation sensor</td>
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<tr>
<td>VDS377†</td>
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<tr>
<td>Ultra-low-power optical finger navigation sensor</td>
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Note: 1. Under development. Target datasheet and samples available upon request.
High-quality audio is the differentiating factor for multimedia-rich mobile platforms. ST manufactures state-of-the-art analog and digital microphones with MEMS technology enabling crystal clear sound and conversations. Our audio amplifier portfolio ranges from class H headphone drivers to boosted class D speaker drivers that deliver high-quality sound extremely efficiently. Customers can also tune the complete audio system with ST’s APWorkbench™ software.

**MEMS microphones and audio subsystems**

- **MEMS MICROPHONES**
  MEMS microphones target all audio applications where small size, high sound quality, reliability and affordability are key. Based on Omron’s sensor technology, our microphones meet price points set by the traditional electret condenser microphones (ECM), while featuring superior reliability and robustness. ST’s MEMS microphones perfectly pair with our latest generation of Sound Terminal® audio processing devices, that feature a dedicated built-in interface for direct connection of a MEMS microphone, saving part count and cost.

- **HEADPHONE AMPLIFIERS**
  Very high audio quality and low power consumption with capacitor-less class G and class H architectures in tiny flip chip packages.

- **SPEAKER AMPLIFIERS**
  Wide range of filterless class D boosted audio amplifiers for mono and stereo applications with gain control, 3D sound effects, anti-clipping and speaker protection.

**Key features**

- Microphones: Excellent SNR (>63 dB) with full frequency response (20 Hz to 20 kHz) in small package (3 x 4 x 1 mm)
- Headphone and speaker amplifiers: High audio quality (PSRR, SNR, THD+N) for headsets in high efficiency class G and class H topologies; high power in low battery voltages with boosted class D technology including speaker protection
- Audio system design: ST’s APWorkbench™ software to browse through ST’s audio portfolio, and select, control and tune the complete audio system easily and accurately
**Featured products**

- **HIGH-PERFORMANCE, LOW-POWER DIGITAL MEMS MICROPHONE WITH 63 DB SNR**
  
  **MP34DT01**
  The MP34DT01 is an ultra-compact, low-power, omnidirectional, digital MEMS microphone built with a capacitive sensing element and an IC interface. The sensing element that detects the acoustic waves is manufactured using a special silicon micromachining process dedicated to produce audio sensors. The IC interface is manufactured using a CMOS process so that a dedicated circuit may be designed to provide a digital signal externally in PDM format. The MP34DT01 has an acoustic overload point of 120 dBSPL with a 63 dB signal-to-noise ratio and -26 dBFS sensitivity.

- **TOP PORT MEMS AUDIO MICROPHONE WITH ANALOG OUTPUT IN 2 X 2 PACKAGE SIZE**
  
  **MP23AT01**
  The MP23AT01 is a compact, low-power microphone built with a low-profile sensing element. The sensing element that detects the acoustic waves is manufactured using a special silicon micromachining process to produce audio sensors. The MP23AT01 has an acoustic overload point of 115 dBSPL with a 66 dB signal-to-noise ratio. The MP23AT01 is available in a package compliant with reflow soldering and is guaranteed to operate over an extended temperature range from -30 to +100 °C.

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**Key features**

- Single supply voltage
- Low power consumption
- 120 dBSPL acoustic overload point
- 63 dB signal-to-noise ratio
- Omnidirectional sensitivity
- -26 dBFS sensitivity
- PDM output
- HCLGA package
- Top port design
- SMD compliant
- EMI shielded

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**Key features**

- SNR: 66 dB
- Sensitivity: -38 dBFS
- Acoustic overload point: 115 dBSPL
- Supply voltage: 1.5 to 3.6 V
- Current consumption: 150 µA
- Flat frequency response
- Size: (2.9 x 2.3 x 0.9 mm)
**2.2 W BOOSTED CLASS D AUDIO DAC WITH PDM OR ANALOG INPUT**

**STA4901**
The STA4901 is a PDM DAC followed by a class-D amplifier able to drive 2.2 W with 1% total harmonic distortion. It provides a full digital path from the audio processor to the loudspeaker in the mobile handset application. It embeds a DAC with PDM interface designed to provide a wide signal across the handset loudspeaker with high power efficiency in order to prolong battery life. It can also be used with analog inputs behaving like an analog class-D amplifier. High audio signal reproduction performances, including harmonic distortion, are ensured by an internal feedback system which rejects the battery perturbations and therefore suppresses audible burst noise on the loudspeaker.

**Key features**
- Class-D driver
- ADC 80 dB dynamic range, PDM output for load current measurement. No external component needed
- Unique clock from PDM interface: 2.4 to 6.5 MHz
- Direct connection to the battery (2.5 to 4.8 V)
- Digital I/O level: 1.62 to 1.98 V

**AUDIO SOLUTIONS**

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<th>Headphone amplifiers</th>
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<tbody>
<tr>
<td>TS4621</td>
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<tr>
<td>High audio quality class G, stereo, FC volume control, long battery life, integrated input low-pass filter</td>
</tr>
<tr>
<td>TS4621ML1</td>
</tr>
<tr>
<td>High audio quality class G, stereo, quiescent current less than 0.9 mA</td>
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<table>
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<tr>
<th>Speaker amplifiers</th>
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<tbody>
<tr>
<td>STA4901</td>
</tr>
<tr>
<td>2.2 W boosted class D audio DAC with PDM or analog input</td>
</tr>
<tr>
<td>TS4962M</td>
</tr>
<tr>
<td>Filterless 3 W mono</td>
</tr>
<tr>
<td>TS2007</td>
</tr>
<tr>
<td>Filterless 3 W mono, internal adjustable gain</td>
</tr>
<tr>
<td>TS2012</td>
</tr>
<tr>
<td>Filterless 2.2 W stereo, gain select</td>
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<th>MEMS microphones</th>
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<td>MP23AT011</td>
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<td>Analog MEMS microphone</td>
</tr>
<tr>
<td>MP34DB01</td>
</tr>
<tr>
<td>Bottom port, omnidirectional, digital MEMS microphone</td>
</tr>
<tr>
<td>MP34DT01</td>
</tr>
<tr>
<td>Top port omnidirectional, digital MEMS microphone featuring best in class SNR 63 dB</td>
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<tr>
<td>MP45DT02</td>
</tr>
<tr>
<td>Top port, omnidirectional, digital MEMS microphone</td>
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<th>Digital microphone processors</th>
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<td>STA321MP</td>
</tr>
<tr>
<td>6-channel digital microphone processor with beam forming capabilities in QFN56 package</td>
</tr>
</tbody>
</table>

Note: 1. Under development. Target datasheet and samples available upon request.
NFC (Near Field Communication) technology is at the heart of an expanding spectrum of easy-to-use, intuitive, contactless applications. These target a broad range of electronics devices such as handsets, PDAs and other consumer electronics devices.

STMicroelectronics is today the first and only silicon solution supplier on the market to provide a global offer of products and solutions for NFC enablement. This includes not only state-of-the-art NFC controllers but also a set of secure 32-bit Flash-based microcontrollers to address SWP-SIM, embedded secure elements and microSD SWP secure devices.

- **NFC CONTROLLER**
  - The ST21NFCA is based on a microcontroller architecture with embedded EEPROM and multiple connectivity channels. The device complies with all relevant standards, and is perfectly suited to address all possible NFC use cases.
  - ISO/IEC 14443 A, B, F
  - ISO/IEC 15693 and ISO/IEC 18092 compliant
  - PC/SPI for terminal host
  - SWP for UICC and secure element
  - Card, reader/writer and peer-to-peer modes
  - Power by the field capability
  - NFC SW stack in terminal host supporting multiple OS
  - Automatic SE selection and AID routing table

- **SECURE ELEMENT**
  - The ST33 family has been designed to meet the advanced EAL5+/EMVCO security and performance requirements, combining the latest Flash technologies with the highest security levels on the secure ARM Cortex™ SC300.
  - 32-bit ARM® SecureCore® SC300™
  - From 512-Kbyte to 1.2-Mbyte Flash with 30-Kbyte RAM
  - 1.8 V, 3 V and 5 V Vcc range
  - High-performance Nescrypt cryptographic engine
  - SWP and SPI interfaces
  - EMVCo and CC-EAL5+ certifications
  - Optional MIFARE™ support
  - Wafer, micro-module, DFN8 and WLCSP packages

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NFC and secure elements

**SECURE ELEMENT – SYSTEM ON CHIP**

Lowering the complexity of secured OS management, the STG_SE secure element is an ST33 with pre-loaded state-of-the-art Global Platform GP2.2 OS. A wide range of configurations are available to meet market demand.

- Java JC 3.0.1
- Global Platform GP2.2 Amendment A, C
- From 128- to 768-Kbyte user memory
- EMVCo and CC EAL4+ 2011
- Multiple TSM support
- Optional MIFARE Classic and DESFire

**SYSTEM IN PACKAGE**

Minimizing further the PCB footprint impact of NFC, the STG_NFCA is a stack combining ST21NFCA and STG_SE as part of ST’s global NFC offer.

- Turnkey stack solution
- All NFC use cases supported
- BGA 4.5 x 4.5 x 0.9
- Pin compatibility with ST21NFCA

**NFC AND SECURE ELEMENTS PRODUCTS**

<table>
<thead>
<tr>
<th>NFC and secure MCUs</th>
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<tbody>
<tr>
<td><strong>ST21NFCA</strong></td>
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<td><strong>ST33F1M</strong></td>
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<td><strong>STG_SE</strong></td>
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<tr>
<td><strong>STG_NFCA</strong></td>
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**Key features**

- A global and highly-flexible NFC offer
- State-of-the-art NFC performances
- Secure elements in SWP-SIM, packaged eSE and µSD
- All MIFARE technologies supported
- Competitive PWB footprint
- State-of-the-art security
STMicroelectronics provides a wide RF product offer based on its integrated passive device (IPD) technology. IPD solutions based on glass substrate can offer a low parasitic and high-Q solution suitable for RF applications. STMicroelectronics also provides a comprehensive portfolio of clock and timer ICs providing best-in-class performance for accuracy and low power consumption.

Integrated passive devices for RF front-end

- **Baluns**
  Baluns use ST’s process to integrate high-quality RF passive components on a single glass substrate. As well as balanced/unbalanced conversion, they can also integrate a matching network in a footprint smaller than 1 mm² for the complete function.

- **Diplexers**
  Cost and size efficient way to combine different complementary radio access paths into a single antenna, combine dual antenna feeds into single feeds or vice versa.

- **Couplers**
  Wideband couplers use ST’s process to integrate high-quality RF passive components on a single glass substrate. They are intended for cellular applications (GSM, WCDMA, LTE). The range includes high-directivity, frequency selector and various coupling factor devices.

- **Band-pass filters**
  RF system performance improvement through cost-efficient frequency filtering for cellular and ISM bands. RF IPDs provide high-performance RF solutions with low sensitivity to top shielding.

**Key features**
- Size: up to 80% board saving
- Cost: up to 40% cost saving
- Performance: improved RF immunity
- Low component height compared to low-temperature co-fired ceramic technologies
- Fewer board placement variation effects than discrete due to monolithic implementation
- High predictability from simulation enabling fast production response time
SMALLEST HIGH-DIRECTIVITY WIDE-BAND COUPLERS WITH INTEGRATED ATTENUATORS

CPL and DCPL series
The CPL and DCPL are single- and dual-path antenna couplers used to closely monitor the forward and reverse power between the RF power amplifier and the antenna. By also integrating attenuators on coupled and isolated ports, the antenna couplers simplify circuit design while saving cost and PCB space. This additional integration is achieved using ST’s proprietary integrated passive device (IPD) technology. Other types of couplers need separate attenuators. In addition, insulated glass-substrate fabrication and wafer-level packaging reduce total device height and footprint compared to alternative low-temperature co-fired ceramic (LTCC) technology. ST now offers a range of couplers with various coupling levels and integrated flattener.

Key features
- 50-ohm nominal input/output impedance
- Operating frequency range: 700 to 2700 MHz
- Less than 0.2 dB insertion loss
- 20 to 40 dB typical coupling factor
- 25 dB typical directivity
- Component and PCB area:
  - 1.3 mm² for single path (incl. integrated attenuators)
  - 2.4 mm² for dual path (incl. integrated attenuators)

Low-loss Frequency Diplexer
DIP1524-01D3
The DIP1524-01D3 is a diplexer to separate GPS/Glonass signals and WLAN, Bluetooth or LTE band VII signals received on the same antenna. The 20 dB of attenuation between bands guarantees a good separation between GPS and the other RF signals. This diplexer uses ST’s proprietary integrated passive device (IPD) technology developed to address the needs of passive integration in RF applications.

The DIP1524-01D3 is available in a flip-chip package with a pitch of 0.4 mm and does not require any extra PCB land around the component such as for LTCC packages. ST’s solution is extremely small and gives a PCB space saving of over 50% versus conventional solutions.

Key features
- Operating frequency range: 1600 MHz and 2400 to 2700 MHz
- 0.65 to 0.85 dB insertion loss
- 20 dB attenuation between bands
- -20 to -10 dB return losses
- Component and PCB area: 1.1 mm²
- 50% space saving versus LTCC solutions
### Couplers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>CPL-WB-00C2</td>
<td>Cellular high-directivity coupler (CPL 28 to 39 dB)</td>
</tr>
<tr>
<td>CPL-WB-00D3</td>
<td>Cellular high-directivity coupler (CPL 28 to 39 dB) CSP 0.4 mm</td>
</tr>
<tr>
<td>CPL-WB-01D3</td>
<td>Cellular high-directivity coupler (CPL 18 to 27 dB)</td>
</tr>
<tr>
<td>DCPL-WB-00D3</td>
<td>Dual-path high-directivity coupler (CPL 29 to 37 dB)</td>
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</table>

### Bandpass filters

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<tr>
<th>Part Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>BPFF50-01D3</td>
<td>Low insertion loss, 5 GHz BP; High rejection of UMTS, GSM and GPS</td>
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</table>

### Diplexers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
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<tr>
<td>DIP1524-01D3</td>
<td>WLAN/GPS diplexer (ISM bands)</td>
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<tr>
<td>DIP2450-01D3</td>
<td>2.4G/5G WLAN diplexer</td>
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<tr>
<td>DIP1521-01D3</td>
<td>GPS/cellular diplexer</td>
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<tr>
<td>DIP152450-01D3</td>
<td>GPS/2.4G and 5G WLAN diplexer</td>
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</table>

### Baluns

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<th>Part Number</th>
<th>Description</th>
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<tr>
<td>BAL-2690-D3U</td>
<td>Matched balun for STLC2690</td>
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<tr>
<td>BAL-C2540D3</td>
<td>Matched balun for TI CC2540</td>
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<tr>
<td>BAL-C2531D3</td>
<td>Matched balun for TI CC2531</td>
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<tr>
<td>BAL-2505D3</td>
<td>2.5 GHz balun, matching 50/50</td>
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<tr>
<td>BAL-2510D3</td>
<td>2.5 GHz balun matching 50/100</td>
</tr>
<tr>
<td>BAL-NRF01D3</td>
<td>Matched balun for Nordic NRF24x with harmonic filter</td>
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</table>

Note: 1. Under development. Target datasheet and samples available upon request.
IPAD™ products integrate the various functions required by wireless applications, such as ESD protection diodes, EMI low-pass or common-mode filters, line terminations, pull-up or pull-down resistors.

ST’s complete protection and filtering range with integrated or standalone solutions offers design flexibility while bringing space saving and high system immunity.

Protection devices

• **ESD PROTECTION**
  
  Our solutions are not only specified against the highest level of IEC 61000-4-2 for robustness, but also target the lowest clamping voltages, and lowest residual currents for the highest protection efficiency. Protective devices for clamping arrays, rail-to-rail topologies, USB ports and high-speed ports are driven by requirements for robustness, efficiency and transparency.

• **EOS PROTECTION**
  
  ST proposes dataline and powerline high power-density protection, rated against IEC 61000-4-5. These EOS 8/20 µs protection devices are available in a large choice of packages, from 0402 to SMC, bringing flexibility to designers and reliability to the application.

**Key features**

- High ESD protection at system level including high-speed serial interfaces
EMI filtering

**Audio and video IPAD**
ST has developed a complete range of IPAD™ components dedicated to audio and video interfaces, such as microphones, headsets, speakers, earphones, and analog TV out or HDMI. These devices provide efficient filtering of the wireless frequencies above 800 MHz and superior ESD protection with extremely low clamping voltage.

**Display, camera and keypad IPAD**
A complete range of IPAD™ components dedicated to display, camera and keypad interfaces providing efficient filtering of wireless frequencies above 800 MHz and superior ESD protection with extremely low clamping voltage. Available in CSP or micro-QFN packages, these filters are based on RC, LC or common-mode topologies to cover up to 6 GHz applications.

**Memory and SIM card IPAD**
A complete range of IPAD™ components dedicated to memory-card interfaces such as microSD, T-Flash or SIM cards. These devices provide efficient filtering of the wireless frequencies above 800 MHz and superior ESD protection with extremely low clamping voltage. Available in CSP or micro-QFN packages, these filters cover new standards such as SDA3.0 (SDR 104).

**Standard multiline bus IPAD**
A complete range of IPAD™ components designed for bottom connectors and general purpose uses for mobile phones. These devices provide efficient filtering of the wireless frequencies above 800 MHz and superior ESD protection with extremely low clamping voltage. Available in CSP or micro-QFN packages, RC or LC topologies, low or high line capacitance, these multiline filters immunize digital and analog lines.

**USB IPAD**
These devices combine EMI low-pass or common-mode filters, ESD protection, pull-up or pull-down resistors to support USB 2.0 and OTG (On-The-Go) specifications.

**Key features**
- Large IP integration library including accurate resistors, capacitors, inductors, ESD components
- Minimized track parasitic inductance thanks to integration and high-density package
**Featured products**

**USB FLOW-THRU ESD PROTECTION**

**USBULC6-2N4**
The USBULC6-2N4 is the smallest flow-thru plastic package on the market with a size of 0.8 mm x 1.0 mm. This part frees up to 60% of space on the board compared to the 0402 solution without impacting the PCB class since the pitch remains at 400 µm. The 6 GHz of bandwidth ensure a perfect signal integrity for USB 2.0 or even USB 3.0 datalines. The USBULC6-2N4 is the perfect solution to make your system ESD-proof thanks to a ESD robustness at 12 kV contact discharge exceeding the most stringent IEC 61000-4-2 level.

![USBULC6-2N4](image1)

**Key features**
- 0.8 mm² for 2 high-speed line protection
- 60% PCB space saving versus 0402 discrete solution
- ±12 kV ESD contact discharge exceeding IEC 61000-4-2 level 4
- 6 GHz bandwidth: 0.6 pF capacitance
- Easy flow-thru layout

**COMMON-MODE FILTERS WITH INTEGRATED ESD PROTECTION**

**ECMF series**
The ECMF series from ST offers the industry’s first silicon common-mode filters combined with high-efficiency ESD protection. Now available in micro-QFN and CSP packages, they offer ultra-compact form factors and cover high-speed serial interface standards including USB, MIPI, MDDI or HDMI. The ECMF series is designed to improve the noise immunity of applications such as mobile phones, notebooks or tablets, and to protect them against destructive ESD air and contact discharge.

![ECMF series](image2)

**Key features**
- Very large differential bandwidth: > 6 GHz
- High common-mode attenuation (Scc21):
  - -25 dB at 900 MHz
  - -20 dB between 800 MHz and 2.2 GHz
- IEC 61000-4-2 discharge with low clamping voltage
- Low DC resistance
- 60% PCB space saving versus discrete solution
- Available in single, dual, triple lane configuration

Downloaded from Arrow.com.
**PROTECTION AND EMI FILTERING**

<table>
<thead>
<tr>
<th>Display, camera and keypad iPad</th>
<th>Memory and SIM card iPad</th>
<th>USB iPad</th>
<th>Standard multiline bus iPad</th>
<th>USB port protection</th>
<th>Clamping array</th>
<th>High-speed port protection</th>
<th>EOS protection</th>
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<tbody>
<tr>
<td>EMIFxx-LCD02F3 7/10-line low-capacitance EMI filter and ESD protection in CSP 0.4 mm</td>
<td>EMIF03-SIM03F3 3-line EMI filter and ESD protection for SIM card interfaces in CSP 0.4 mm</td>
<td>EMIF02-USB04F3 EMI filter with integrated ESD protection for USB OTG filter</td>
<td>EMIF01-1003M3 1-line, high-attenuation filter</td>
<td>USBULC6-2F3 2-line iPAd™, ultra-low-capacitance protection for high-speed USB</td>
<td>ESDALC6V1-5T6 5-line 1 x 1 mm ESD protection</td>
<td>USBLUC6-2F3 4-line ESD protection for high-speed lines</td>
<td>ESDaxx-1K 350 W EOS and ESD TransIt™ protection for charger and battery port in SODS23</td>
</tr>
<tr>
<td>EMIF0x-LCD03F3 10-line LC EMI filter and ESD protection in CSP 0.4 mm</td>
<td>EMIF03-SIM05F3 3-line EMI filter and ESD protection for SIM card interfaces + NFC</td>
<td>ECMF02-2BF3 Single pair common-mode filter with integrated ESD protection in CSP 0.4 mm</td>
<td>EMIF02-1003M16 2-line EMI filter and ESD protection</td>
<td>USBULC6-2M6 Ultra-large-bandwidth ESD protection</td>
<td>ESDALC6V1M3 Dual low-capacitance TransIt array for ESD protection</td>
<td>USBLUC6-3F3 3-line low-capacitance protection for high-speed USB</td>
<td>ESDA9V2-1J 450 W EOS and ESD protection in SOD323</td>
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<td>EMIF0x-1502Mx 4/6/8-line low-capacitance EMI filter and ESD protection in micro-QFN</td>
<td>EMIF06-MSD02N16 6-line EMI filter and ESD protection for mini and microSD cards, SD3.0</td>
<td>ECMF02-2AMX6 Single pair common-mode filter with integrated ESD protection</td>
<td>EMIF06-1005M/N12 6-line EMI filter and ESD protection</td>
<td>USBULC6060-4M8 Ultra-low-capacitance ESD protection for enhanced mini USB interface</td>
<td>ESDALC6V1-1U2 Single-line low-capacitance ESD protection in 0201 package</td>
<td>USBP01-5M8 µUSB connector full solution integrating 28 V-enabled Vbus pin protected</td>
<td>ESDA9V2-1J 450 W EOS and ESD protection in SOD323</td>
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<tr>
<td>EMIF08-LCD04M16 8-line LC EMI filter and ESD protection DFN 1.2 mm</td>
<td>EMIF06-MSD03F3 6-line EMI filter and ESD protection for mini and microSD cards, SD3.0</td>
<td>ECMF02-4CMX8 1 Single pair common-mode filter + ID pin + Vbus with integrated ESD protection</td>
<td>EMIF08-1005M/T12 8-line EMI filter and ESD protection</td>
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<td>ESDARF01-1BM2 ESD protection for AM and FM antenna in 0402</td>
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<td>ECMF04-4AMX12 2 pair common-mode filter with integrated ESD protection</td>
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<td>ECMF02-2AMX8 1 Single pair common-mode filter + ID pin + Vbus with integrated ESD protection</td>
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<td>ECMF06-6AM16 3 pair common-mode filter with integrated ESD protection</td>
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<td>EMIF02-SPK02F2 2-line EMI filter and ESD protection for speakers</td>
<td>EMIF02-MIC07F3 EMI filter and ESD protection + AC decoupling for microphones</td>
<td>ECMS02-2BF3 Single pair common-mode filter with integrated ESD protection</td>
<td>EMIF01-1003M3 1-line, high-attenuation filter</td>
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<td>EMIF02-AV01F3 2-line EMI filter and ESD protection for audio and video interfaces</td>
<td>EMIF01-7V01F3 Single-line EMI filter and ESD protection for TV analog outputs</td>
<td>HDMS05-CL02F3 5-line signal conditioning and ESD protection for HDMI interfaces with CEC</td>
<td>EMIF02-1003M16 2-line EMI filter and ESD protection</td>
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Note: 1. Under development. Target datasheet and samples available upon request.
STMicroelectronics offers a wide range of image sensors, camera modules and ISPs (image signal processors).
With over 20 years’ experience and expertise in the complete imaging chain (sensors, optics, processing), ST’s imaging know-how is further enhanced through the creation of high image quality in compact form factors, delivering ultra-high-volume products to the mobile industry and serving other imaging markets and applications including digital still cameras, machine vision, automotive and gaming.
ST develops proprietary, high-performance image sensor technologies comprising the lowest optical stack FSI (front side illumination) and state of the art BSI (back side illumination) processes and pixels.
Our internal high-volume supply chain (sensors, camera modules, processors) guarantees supply, while still providing for short-term upside flexibility.

**IMAGE SENSORS**
- Production from 1.4 µm to 5.6 µm pixel
- 1.1 µm development
- From VGA to 24 Mpixel
- 12" second source foundry (ST process)
- 12" ST TSV foundry
- ST internal EWS

**CAMERA MODULES**
- Fixed focus cameras
- Wafer level reflowable cameras
- EDOF cameras
- Autofocus cameras
- Innovative optics, assembly and test technologies
- ST manufacturing
- Long term optics and supply chain partners

**INTERNAL SIGNAL PROCESSORS**
- Stand alone ISP
- Full ST video pipe IP
- Integration of third party IP on demand
- 12" CMOS40 nm ST foundry
- 12" CMOS40 nm second source foundries
- ST internal BGA assembly line

**A LONG-TERM COMMITMENT TO IMAGING**
- VLSI Vision founded in 1990, a pioneer of CMOS imaging, acquired by ST in 1999
- 1st imaging products started in ST in 1995
- Internal sensor manufacturing since 2000
- More than 900m sensors delivered to industry players
- More than 700m ISP delivered to the industry
Image sensors and camera modules

• **IMAGE SENSORS AND FIXED-FOCUS CAMERA MODULES**
  - A wide range of resolutions and pixel sizes
    - From VGA to 3 Mpixels
    - 1.4 µm, 1.75 µm, 2.2 µm pixel sizes providing best fit for resolution and low-light requirements
  - Primary and secondary camera offer
    - Very low cost primary camera (stills and video)
    - High-performance secondary camera (stills and video)
  - Simple construction and physical integration
    - Reflowable camera modules can be surface mounted to the product PCB avoiding extra cost of socket or flex PCB
    - Modules compatible with industry standard sockets
    - Enhanced EMC performance enabled by integrated EMC shielding and sensor EMI reduction techniques
  - Standard interfaces
    - CSI-2 and CCP2 serial interfaces supported
    - Industry-standard parallel IF ITU Rec656 supported (2-Mpixel SoC)
  - Small footprint and low Z height
    - Small form factor modules (SMIA65 or smaller dimensions)
  - High-performance, compact optics yield ultra-low profile cameras

• **IMAGE SENSORS AND EDOF AND AUTOFOCUS CAMERA MODULES**
  - A wide range of resolutions and pixel sizes
    - From 3 to 8 Mpixels (and beyond)
    - 1.4 µm and 1.75 µm pixel sizes providing best fit for resolution and low-light requirements
  - Extended depth of field (EDoF) added value
    - Focusing can be performed without moving components. This simplifies the camera construction and provides smaller size, cost and power dissipation than VCM based autofocus modules
    - Autofocus to further enhance user experience
      - Ultimate macro focus supported while maintaining full optical performance at infinity
      - Traditional photographic user experience with moving optical system
  - Standard interfaces
    - Both CSI-2 and CCP2 supported
    - Industry-standard parallel IF ITU Rec656 supported (5-Mpixel SoC)
  - Fast operation
    - EDoF IP delivers virtual zero shutter to capture latency
    - Fast autofocus using state-of-the-art VCM integration in closed-loop control

**Key features**

- Leading-edge sensor pixel performance (low-light performance, excellent RI at high CRA, low noise levels)
- Ultra-low optical stack height FSI pixel proven in mass volume with high image quality and low cost
- High-density process technologies for smallest die size and small form factor modules
- Bayer and SoC solution allows reduced development time and resource impact on platform provider
- Standard interface support (CSI-2, CCP2, parallel)
- High system integration, integrated ISP for SoC systems, embedded EDoF or on-chip VCM driver
- Reflow, socket or flex PCB connection
- Sensors and camera modules to cover both primary camera and secondary camera requirements
Imaging signal processors

• VIDEO CAPABILITY
  Up to 30 fps HD video; a dual video pipe generates concurrent viewfinder and still/movie image generation.

• SMALL FOOTPRINT
  Available in TFBGA packages.

• STANDARD INTERFACES
  CCP2, 1 Gbit/s CSI-2 and ITU parallel supported.

• STREAMING ENGINE
  Low latency with JPEG compression with programmable target size or target quality; dual pipe architecture for concurrent still and video and viewfinder; low-cost streaming architecture with no frame store.

• ADVANCED ALGORITHMS
  Advanced noise filtering for improved low light performance; smart lightening, color enhancement, state-of-the-art AWB and part-to-part variation support for high-quality images; fast autofocus control.

• ADVANCED FEATURES
  Face or object detection and tracking, video stabilization and auto ISO.

Key features

• Can connect two cameras to a host with a single camera input interface
• Virtual zero shutter lag using twin video pipeline
• Simplifies camera module integration and adapts different camera modules to a system without modifying host software
• Provides DSC-class ISP to systems with limited or no embedded host ISP
### Fixed-focus camera modules and image sensors

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensor Details</th>
<th>Interface Options</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>VW6558</td>
<td>VGA sensor, 2.2 µm pixel, optical format 1/10”, CCP2 or MIPI/CSI-2 interface, 3.03 x 3.5 x 2.5 mm reflowable module</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VS6559T</td>
<td>VGA sensor, 2.2 µm pixel, optical format 1/10”, CCP2 or MIPI/CSI-2 interface, 3.5 x 3.5 x 2.5 mm reflowable module</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VS6863</td>
<td>1.3-Mpixel sensor, 1.75 µm pixel, optical format 1/6”, CCP2 or MIPI/CSI-2 interface, 6.5 x 6.5 x 4.1 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VW6754</td>
<td>2-Mpixel sensor, 1.75 µm pixel, optical format 1/5”, CCP2 Interface, 5.0 x 5.0 x 3.8 mm reflowable module</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VS6725C</td>
<td>2-Mpixel sensor, 1.75 µm pixel, system on chip with on-board ISP, optical format 1/5”, ITU parallel interface, 6.0 x 6.0 x 4.0 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VS6735C</td>
<td>2-Mpixel sensor, 1.75 µm pixel, system on chip with on-board ISP, optical format 1/5”, MIPI/CSI-2 interface</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VX6845C</td>
<td>3-Mpixel sensor, 1.75 µm pixel, optical format 1/4”, CCP2 or MIPI/CSI-2 interface, embedded EDoF logic and lens, 6.5 x 6.5 x 4.6 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VB6936</td>
<td>5-Mpixel sensor, 1.4 µm pixel, AF system on chip with on-board ISP, AF VCM driver integrated in sensor chip, optical format 1/4”, dual-lane MIPI/CSI-2 interface, 7.5 x 7.5 x 5.0 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VX6953C</td>
<td>5-Mpixel sensor, 1.4 µm pixel, optical format 1/4”, CCP2 or MIPI/CSI-2 interface, embedded EDoF logic and lens, 6.5 x 6.5 x 4.6 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VB6955</td>
<td>5-Mpixel sensor, 1.4 µm pixel, optical format 1/4”, CCP2 or dual-lane MIPI/CSI-2 interface AF75 VCM autofocus, 7.5 x 7.5 x 5.0 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VB6A64</td>
<td>8-Mpixel sensor, 1.4 µm pixel, optical format 1/3”, dual-lane MIPI/CSI-2 interface, AF85 VCM autofocus, 8.5 x 8.5 x 6.0 mm module (socket or flex)</td>
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</tbody>
</table>

### Auto focus and EDoF camera modules and image sensors

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensor Details</th>
<th>Interface Options</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>VX6845C</td>
<td>3-Mpixel sensor, 1.75 µm pixel, optical format 1/4”, CCP2 or MIPI/CSI-2 interface, embedded EDoF logic and lens, 6.5 x 6.5 x 4.6 mm module (socket or flex)</td>
<td>-</td>
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</tr>
<tr>
<td>VB6936</td>
<td>5-Mpixel sensor, 1.4 µm pixel, AF system on chip with on-board ISP, AF VCM driver integrated in sensor chip, optical format 1/4”, dual-lane MIPI/CSI-2 interface, 7.5 x 7.5 x 5.0 mm module (socket or flex)</td>
<td>-</td>
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</tr>
<tr>
<td>VX6953C</td>
<td>5-Mpixel sensor, 1.4 µm pixel, optical format 1/4”, CCP2 or MIPI/CSI-2 interface, embedded EDoF logic and lens, 6.5 x 6.5 x 4.6 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VB6955</td>
<td>5-Mpixel sensor, 1.4 µm pixel, optical format 1/4”, CCP2 or dual-lane MIPI/CSI-2 interface AF75 VCM autofocus, 7.5 x 7.5 x 5.0 mm module (socket or flex)</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>VB6A64</td>
<td>8-Mpixel sensor, 1.4 µm pixel, optical format 1/3”, dual-lane MIPI/CSI-2 interface, AF85 VCM autofocus, 8.5 x 8.5 x 6.0 mm module (socket or flex)</td>
<td>-</td>
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</tr>
</tbody>
</table>

All image sensor products can be delivered either as a full, ready-to-use camera modules for direct assembly in a mobile phone, or as reconstructed wafers of sensors for further integration with third-party components.

### Standalone image signal processor (ISP) – up to 8 Mpixels

<table>
<thead>
<tr>
<th>Model</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>STV0987B</td>
<td>30 fps at 5 Mpixels, 15 fps at 8 Mpixels, improved anti-shaking and video stabilization, HD 1080p @ 30 fps, face detection and tracking, low latency autofocus, auto ISO and LED flash support, IF: MIPI, ITU parallel and CCP2, TFBGA, 84 balls, 6 x 6 x 1.2 mm</td>
</tr>
</tbody>
</table>

Note: For further product info please contact sales office.
ST’s power management devices provide high efficiency, power density and low standby power consumption. The product offer also includes complete solutions for battery charge and monitoring functions. Our highly efficient and small-sized lighting solutions are well suited for mobile phones and other handheld devices. ST’s innovative LED flash supply ICs with enhanced diagnostics and I2C communication provides brighter flash and higher quality pictures even under the most demanding lighting conditions.

LDO and DC-DC converters

**LDO REGULATORS**
ST’s LDOs feature an optimal combination of low dropout voltage, low quiescent current, fast transient response, low noise, high power supply rejection, and external capacitor requirements. With voltages ranging from 0.8 to 5 V and current from 50 to 300 mA, they are available in miniature packages making them ideal for micropower applications with board space constraints.

**DC-DC CONVERTERS**
High-frequency switching, step-down, step-up and buck-boost topology families, available in ultra-small packages optimized for battery powered applications.

**Key features**
- Ideal solutions for micropower applications and when board space is at a premium
- Very low quiescent current ensuring extended battery life in applications with a very long standby time
- Latest capacitorless LDOs (no bypass capacitor) for PCB space saving
- Low system power consumption with low quiescent current
- Ultra-low noise and high PSRR for RF circuit power supplies
Battery management

- **BATTERY CHARGERS**
  
  Single input from wall adapters and dual inputs from USB and wall adapters, programmable charging current, up to 1.1 A output current.

- **BATTERY MONITORING**
  
  Monitoring of the battery voltage, current and temperature for accurate battery state-of-charge reporting.

---

**Key features**

- Up to 6 MHz switching frequency to minimize solution size
- Operates over a wide input range of 2.05 to 6 V to support applications powered from Li-ion batteries and extended usage time
- Low system power consumption with high efficiency
- Several package options: chip scale, DFN and BGA

Lighting management

- **BACKLIGHT DRIVERS**
  
  Boost converter for high-brightness LED drivers with multiple dimming controls. High-efficiency solutions for extended battery life.

- **FLASH LED SUPPLIES**
  
  High-efficiency LED flash power supply ICs are ideal for driving a single or multiple white LED flashes in camera phones, PDAs and other handheld devices. The synchronous buck-boost topology with output current control guarantees the correct LED current over all possible conditions of battery level and LED forward voltage. Hard and soft triggering of the flash are supported.

- **OLED DISPLAY POWER SUPPLIES**
  
  Highly-integrated power supply IC family for PMOLED and AMOLED display matrices; AMOLED optimized low-noise DC-DC converters ensure excellent display accuracy and low external component count; negative voltage capability via s-wire.

---

**Key features**

- Up to 6 MHz switching frequency to minimize solution size
- Operates over a wide input range of 2.05 to 6 V to support applications powered from Li-ion batteries and extended usage time
- Low system power consumption with high efficiency
- Several package options; chip scale, DFN and BGA
Featured products

**HIGH-EFFICIENCY SOLAR BATTERY CHARGER WITH EMBEDDED MPPT ALGORITHM**

**SPV1040**
The SPV1040 is a high-efficiency, low-power, low-voltage DC-DC step-up converter that maximizes the energy transferred from the solar panel to the load using an embedded MPPT algorithm. It is based on a perturb-and-observe method which applies a duty cycle variation to a PWM signal according to the input power trend. Furthermore, the device guarantees the safety of the application by implementing either an overcurrent or over-temperature protection and regulating the battery voltage at any time. The 0.3 V start-up input voltage is well suited to any portable application where only a few photovoltaic power cells are used.

**Key features**
- 0.3 to 5.5 V input operating voltage
- 120 mΩ internal active switch
- 140 mΩ internal synchronous rectifier
- 2 to 5.2 V output voltage regulation
- 1.8 A maximum output current
- 155 ºC over-temperature shutdown

**HIGH-POWER WHITE LED SUPERCAP DRIVER WITH I²C INTERFACE**

**STCF04**
The STCF04 is a dedicated and space-optimized high-efficiency solution for driving a flash LED module in camera phones, PDAs and other handheld devices using the SuperCap technology. It is based on a DC-DC buck-boost converter, which ensures correct and efficient charging control and monitoring of the SuperCap within the entire battery voltage range. The output current control ensures good current regulation over the forward voltage spread characteristics of the flash LEDs in torch and flash mode operation. The SuperCap charging current is programmed to a defined value which avoids overload of the battery. The SuperCap discharge current flows through the LEDs and the external MOSFET which must be chosen according to the required flash current.

**Key features**
- 1.8 MHz buck-boost power stage
- Standalone operation or with companion chip STCS44 up to 10 A
- Programmable charging current
- Programmable SuperCap charging voltage
- Full I²C control
- Torch- and flash-mode operation
- LED over-temperature protection and light sensor support
**MINIATURE LDO WITH A GREEN-MODE CIRCUIT**

**LD39130S**  
The LD39130S is a precision miniature LDO, featuring an optimal combination of good dynamic characteristics, low dropout voltage, high ripple rejection ratio and low noise. Housed either in the ultra-small 0.69 x 0.69 mm² CSP, or in the compact DFN6L 1.2 x 1.3 mm² package, it is equipped with a new green-mode circuit, able to put the regulator in ultra-low consumption mode when the output current required is very low. In this condition, the LDO's intrinsic consumption is reduced to less than 1 µA.

---

**250 MA DUAL DC-DC CONVERTER FOR POWERING AMOLED DISPLAYS**  
**STOD13AS**  
The STOD13AS integrates a step-up and an inverting DC-DC converter making it particularly suitable for battery operated products for which the major concern is the overall system efficiency. It works in pulse-skipping mode during low load conditions and PWM mode at 1.5 MHz frequency for medium/high load condition. The high frequency helps reduce the value and size of external components. The Enable pin allows the device to be turned off, so reducing the current consumption to less than 1 µA. The negative output voltage can be programmed by an MCU through a dedicated pin which implements single-wire protocol. Soft start with controlled inrush current limit, thermal shutdown and short-circuit protection are integrated functions of the device.

---

**Key features**

- **Input voltage:** from 1.4 to 5.5 V  
- **Guaranteed output current:** 300 mA  
- **Automatic green mode for low consumption at light loads**  
- **Very low quiescent current**  
- **1 µA typ in low power mode**  
- **55 µA typ @ 300 mA load**  
- **0.1 µA typ in off mode**  
- **Wide V<sub>out</sub> range:** adjustable (DFN package) and fixed from 0.8 to 4 V with 100 mV steps  
- **Logic controlled enable pin**  
- **Very low LDO voltage:** 300 mV typ @ 300 mA load  
- **Internal soft start**  
- **Package:** CSP 4 bumps 0.69 x 0.69 mm

---

**Key features**

- **Step-up and inverter converters**  
- **Operating input voltage range:** from 2.5 V to 4.5 V  
- **Synchronous rectification for both DC-DC converters**  
- **Minimum 250 mA output current**  
- **Programmable negative voltage by SWIRE**  
- **TDMA noise high immunity**  
- **Low quiescent current in shutdown mode**  
- **Soft-start with inrush current protection**  
- **True shutdown mode**
## POWER MANAGEMENT PRODUCTS

### LDO regulators

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STLQ015</td>
<td>150 mA, ultra low IQ, very low drop</td>
</tr>
<tr>
<td>STLQ050</td>
<td>50 mA, ultra low IQ, very low drop</td>
</tr>
<tr>
<td>LD39115/SJ</td>
<td>150 mA, ultra low drop, low IQ(*)</td>
</tr>
<tr>
<td>LD59015</td>
<td>150 mA, very low noise, high PSRR</td>
</tr>
<tr>
<td>LDCL015</td>
<td>150 mA, capacitor less, ultra low drop</td>
</tr>
<tr>
<td>LDLN015(*)</td>
<td>150 mA, ultra low noise, high PSRR</td>
</tr>
<tr>
<td>LD39030SJ</td>
<td>300 mA, ultra low drop, soft start</td>
</tr>
<tr>
<td>LD39050</td>
<td>500 mA, ultra low drop, power good</td>
</tr>
</tbody>
</table>

### Flash LED supply

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STCF04</td>
<td>High power white LED SuperCap driver with I2C interface</td>
</tr>
<tr>
<td>STCF10(*)</td>
<td>Two LEDs camera flash driver, up to 950 mA in CSP 2.07x2.07 mm</td>
</tr>
<tr>
<td>STCF11(*)</td>
<td>Single LED camera flash driver, up to 320 mA in CSP 1.07x1.58 mm</td>
</tr>
</tbody>
</table>

### Battery management

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L6924D/U</td>
<td>1 A wall/USB charger for Li-ion and LiP</td>
</tr>
<tr>
<td>STBC21(*)</td>
<td>1.2 A linear charger with battery temperature control</td>
</tr>
<tr>
<td>STW4102</td>
<td>Dual-source USB Li-ion charger with gas gauge</td>
</tr>
<tr>
<td>STC3105</td>
<td>Industry’s smallest solution for accurate battery monitoring involving Coulomb counter and voltage based fuel gauge</td>
</tr>
</tbody>
</table>

### OLED display power supply

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST0002</td>
<td>AMOLED 2.5 - 3” display 150 mA</td>
</tr>
<tr>
<td>ST0003</td>
<td>Step-up and inverting 1.6 MHz PWM</td>
</tr>
<tr>
<td>ST0005(*)</td>
<td>AMOLED 3 - 4” display</td>
</tr>
<tr>
<td>ST001317B</td>
<td>AMOLED 3 - 4” display 200 mA dual DC-DC</td>
</tr>
<tr>
<td>ST0013A</td>
<td>PMOLED step-up converter 120 mA</td>
</tr>
</tbody>
</table>

### DC-DC converters

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST1S15(*)</td>
<td>500 mA, 6 MHz, PFM/PWM step-down converter</td>
</tr>
<tr>
<td>ST1400(*)</td>
<td>600 mA, 3 MHz, PFM/PWM step-up converter</td>
</tr>
<tr>
<td>STB82(*)</td>
<td>800 mA, 3 MHz, buck-boost converter in CSP package</td>
</tr>
<tr>
<td>STB83(*)</td>
<td>2 A, 2 MHz, buck-boost converter</td>
</tr>
<tr>
<td>SPV1040</td>
<td>High-efficiency solar battery charger with embedded MPPT</td>
</tr>
</tbody>
</table>

### Backlight drivers

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>STLD41</td>
<td>Boost up to 38 V @ 120 mA 4 x 10 LEDs</td>
</tr>
<tr>
<td>STLED25</td>
<td>Boost up to 7.5 V @ 125 mA 5 x 2 LEDs</td>
</tr>
</tbody>
</table>

Note: 1. Under Development. Target datasheet and samples available upon request.
Interface and interconnect devices

Interface secure digital (SD) cards with ST level translators.
Increase the number of I/O ports and enhance the control capability of existing platforms with ST’s Xpander™ technology.
Direct audio and data signals on mobile devices with audio and high-speed switches.
Improve design and user experience with smart reset devices when dedicated reset hole is not needed and there is no need to remove battery when device freezes.
Prevent over discharging and system start-up with low battery with supervisor devices.

Interface ICs

Level translators

I/O expanders

Camera interfaces

- **LEVEL TRANSLATORS**
  STMicroelectronics’ dual-supply level translators are the ideal solution for bidirectional level translation with mixed voltage systems of 1.8 V, 3.3 V and 5 V.

- **I/O EXPANDERS**
  I/O expanders with advanced features: keypad scanning, PWM and rotator
  General I/O expanders with 8-16 I/Os.

- **CAMERA INTERFACES**
  Deserializer for SMIA CCP1 and CCP2.
  Dual mode deserializer for SMIA/CCP2 and MIPI/CSI-2.

**Key features**
- Flexibility in system design versus monolithic implementation
- Easier verification of subsystems
- Faster development time by using discrete components
- Deserializer enables use of parallel interface baseband with serial cameras
Analog switches

• **ANALOG SWITCHES**
  For audio line multiplexing, for example between headset and phone speakers and microphone; special negative rail switches to prevent pop-noise.

  ![](analog_switch_diagram.png)

  Analog switch

• **HIGH-SPEED SWITCHES**
  For high-frequency lines such as USB and CCP (compact camera port), designed to be compliant with USB 2.0 (HS) with bandwidth up to 950 MHz.

• **HIGH ESD SWITCHES**
  Used in applications that are directly connected to phone connectors (risk of electrostatic discharge). ESD protection on the component reduces area on PWB and saves time in assembly.

**Key features**
- Flexibility in system design versus monolithic implementation
- Easier verification of subsystems
- Faster development time by using discrete components

Supervisors and smart resets

• **SMART RESETS**
  Programmable push button solutions; hardware reset or shutdown by using existing keys; smart power on/off controllers.

![](smart_reset_diagram.png)

• **SUPERVISORS**
  Smart voltage supervisors with on/off Controls; prevents over-charging and starting system with low battery.

**Key features**
- Improves mobile device design
- Resets device without taking battery out
- Reuses existing keys for reset, no need for dedicated reset key
**HIGH-PERFORMANCE SD CARD LEVEL TRANSLATOR**

**ST6G3244**

The ST6G3244ME is a dual-supply, low-voltage 6-bit bidirectional CMOS level translator for SD, miniSD and microSD cards. Designed for use as an interface between baseband and memory cards, it achieves high-speed operation while maintaining CMOS low power dissipation. This device is intended for two-way asynchronous communication between data buses. All inputs are equipped with protection circuits against electrostatic discharge, giving them ESD and transient excess voltage immunity.

**Key features**

- Supports 60 MHz clock rate
- Supports DDR mode for SD Card™
- Compliant with
  - SD Specification Part 1 Physical Layer Specification 3.00 (SDR12, SDR25, DDR50)
  - SD Specification Part 1 Physical Layer Specification 2.00
- Bidirectional with direction control pin
- EMI filtering and signal conditioning

**INTERFACE AND INTERCONNECT DEVICES**

<table>
<thead>
<tr>
<th>Level translators</th>
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<tbody>
<tr>
<td>ST21298</td>
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<tr>
<td>ST23298</td>
</tr>
<tr>
<td>ST21498</td>
</tr>
<tr>
<td>ST6G3244</td>
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</table>

<table>
<thead>
<tr>
<th>Camera interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>STMIPI002</td>
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<tr>
<td>STSMIA832</td>
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<thead>
<tr>
<th>I/O expanders</th>
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<tbody>
<tr>
<td>STMP1005</td>
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<tr>
<td>STMP1600</td>
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<td>STMP1801</td>
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<table>
<thead>
<tr>
<th>Analog switches</th>
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<tbody>
<tr>
<td>STG5123</td>
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<td>STG5223</td>
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<td>STG3692</td>
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<td>STG3696</td>
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<td>STG4160</td>
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<td>STG3220</td>
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<td>STG5678</td>
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<table>
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<tr>
<th>Smart resets</th>
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<tbody>
<tr>
<td>STM6519</td>
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<td>STM6524</td>
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<thead>
<tr>
<th>Supervisors</th>
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<tbody>
<tr>
<td>STBP110</td>
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life.augmented