life.augmented

Products and solutions for Wearable devices

Content

Introduction

Wearable devices by their very nature must be compact and comfortable for the user. They need to deliver precise information about the user, have low power consumption and the right level performance to make them convenient and easy to use. ST's products for wearable devices are designed to meet the needs of the most demanding wearable devices with a portfolio covering the needs of developers of smart watches, fitness trackers, heart-rate monitors, sports equipment and a variety of other wearable devices.

FITNESS TRACKERS

The development of the market for fitness trackers and activity monitors is driven by a desire to track, analyze and share data related to personal health and fitness. They provide feedback on exercise and health habits and must satisfy both fitness amateurs as well as professional athletes.

The main design challenges of a fitness tracker involve delivering low-power and high accuracy in a cost effective manner to allow tracking of general activity, specific exercises, heart rate and calories burned.

SMART WATCHES

Smart watches present a unique set of challenges when it comes to design. They offer a feature-set that goes far beyond what is found in traditional watches but come with expectations of a similar form factor. The features offered by the latest smart watches include application and notification syncing with a smartphone, fitness and health monitoring, location service, voice commands, payment and wireless charging. All this needed to be packed in a very small form factor with outstanding performance and long battery life in order to deliver the best user experience.

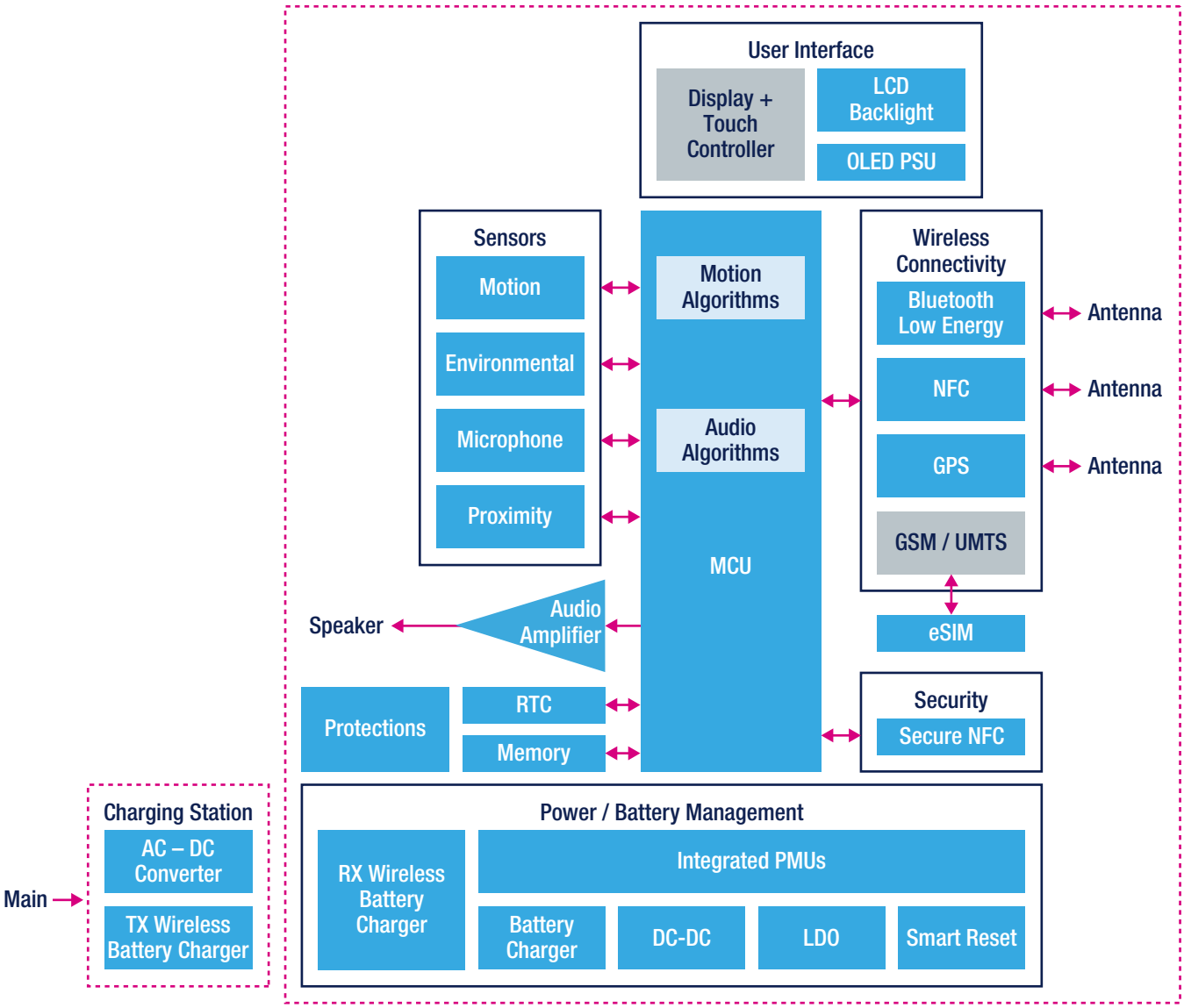
SPORT EQUIPMENTS

The smart sports equipment sector is growing fast. Electronics are adding new possibilities to improve sports devices to enable athletes to reach enhanced athletic and fitness performances. These devices rely on: precise monitoring of the athlete's actions; relevant body information; rapid analysis of data to allow concepts, such as virtual coaching.

ST portfolio includes digital processing, sensors, connectivity, security and power management solutions that can make the difference in this challenging and competitive market, in fact in these applications high precision, low power consumption, compact form factor and outstanding performance are a must and ST's products take into account the needs of the most recent and innovative wearable devices.

- Consumer fitness and wellness
- Healthcare
- Portable infotainment
- Worker safety

In these applications high precision, low power consumption, compact form factor and outstanding performance are a must and ST's products take into account the needs of the most recent and innovative wearable devices.



MEMS and Sensors

The most diversified and complete MEMS and sensors supplier

ST has shipped more than 14 billion micro-electromechanical sensors and has one of the industry's most extensive sensor portfolio including proximity sensors and MEMS accelerometers, gyroscopes, digital compasses, inertial modules, microphones, and environmental sensors such as pressure, temperature and humidity sensors.

- A unique sensor portfolio, from discrete to fully-integrated solutions, to meet all design needs
- High-volume manufacturing capacity to provide cost competitive solutions, fast time-to-market and security of supply
- High-performance sensor fusion to improve the accuracy of multi-axis sensor systems in order to enable emerging and highly-demanding applications, such as indoor navigation and location-based services
- High-quality products, already tested in different application fields, including mobile, portable, gaming, consumer, automotive and health care segments
- Multiple sites dedicated to MEMS, with full in-house dual-sourcing, guaranteeing 100% security of supply

COMPLETE SOLUTION

- Large sensor portfolio
- Integrated hardware and software solutions
- 100% security of supply
- Scalability of solutions
- Quality is a must for ST
- ST is MEMS market leader

SENSORS FOR IMPROVING WEARABLE APPLICATIONS

- Athlete performance monitoring
  - Movement recognition through shoes and wearable sensors (AXL, GYRO, PS)
  - Sport equipment swing detection (AXL, GYRO, MAG)
  - Body tracking recognition (AXL, GYRO, MAG, PS)
- Watches, personal navigation devices, PND and pedometers (AXL, GYRO, MAG, PS)
  - Map orientation
  - Heading and navigation
  - Power-saving using auto-wake-up functionality
  - Taps display activation

ACCELEROMETERS

ST's state-of-the-art MEMS accelerometers include analog and digital sensors featuring up to ±400g acceleration full scale and from 1.71 to 3.6 V supply voltage. Accelerometers have advanced power-saving features that make them suitable for ultra-low-power applications. These features include low-power mode, auto wake-up function and a FIFO buffer that can be used to store data, thus reducing the host processor loading and system power consumption. The small size and embedded features of ST's accelerometers make them an ideal choice for wearable applications and where long battery life is required.

KEY FEATURES

- Low power consumption and smart ultra-low-power operating modes including Always-on
- High resolution: accuracy and stability
- Selectable full-scale up to 16g
- Smart embedded features for less power hungry systems
- Ultra compact devices in packages smaller than 4 mm^3
- Advanced digital features
- Pin to pin compatible product family

Part number	Package size (mm)	Full-scale typ (g)	Typical Noise density (µg/√Hz)	Key features
LIS2DW12	2 x 2 x 0.7	±2; ±4; ±8; ±16	90	High-performance ultra-low-power 3-axis «femto» accelerometer
LIS2DS12	2 x 2 x 0.86	±2; ±4; ±8; ±16	100	14-bit, embedded smart functionalities
LIS2DH12	2 x 2 x 1	±2; ±4; ±8; ±16	220	12-bit,embedded FIFO, board compatible with compasses, ultra-low-power
LIS3DSH	3 x 3 x 1	±2; ±4; ±8; ±16	150	Ultra-low-power , high performance, 3-axis «nano» accelerometer with embedded programmable state machine
LIS2DE12	2 x 2 x 1	±2; ±4; ±8; ±16	220	8-bit ultra-low-power, high-performance 3-axis accelerometer

DIGITAL COMPASSES

ST's digital compasses include combo solutions, with an accelerometer and magnetic sensor integrated in a single LGA package and standalone magnetometer, to give the possibility of designing a solution locating the magnetic sensor in the best position on the board in order to minimize magnetic interference.

KEY FEATURES

- Ultra-compact high-performance magnetometer module
- Wide magnetic sensor dynamic range and ultra low magnetic offset
- Embedded Self Test and Temperature compensated
- Pin to pin compatible product family

Part number	Package size (mm)	Description	Magnetic Range (Gauss) typ	Idd (mA)	Key parameters
LIS3MDL	2 x 2 x 1	Ultra-low-power,high performance, 3-axis digittal output magnetometer	±4; ±8; ±12,±16	0.04 LP 0.27 HP	±4; ±8; ±12,±16 gauss selectable magnetic full scales, self test capability
LIS2MDL	2 x 2 x 0.7	Ultra-low-power,high performance, 3-axis digittal output magnetometer	±50	0.05 LP combo mode 0.2 HP combo mode	±50 gauss magnetic dynamic range, 3 magnetic field channels, Noise 3mGauss(RMS), ultra-low-power
LSM303AH	2 x 2 x 1	Ultra-compact high-performance eCompass module: ultra-low-power 3D accelerometer and 3D magnetometer	±50	0.05 LP 0.2 HP	±50 gauss magnetic dynamic range, ±2; ±4; ±8,±16 g selectable acceleration full scale

iNEMO® INERTIAL MODULES

iNEMO System-in-packages (SiP) combine accelerometer, gyroscope and magnetometer in a monolithic 6-axis or 9-axis solution. The integration of multiple sensor outputs bring motion sensing systems to the level of accuracy required for the most demanding applications, such as enhanced gesture recognition, gaming, augmented reality, indoor navigation and localization-based services.

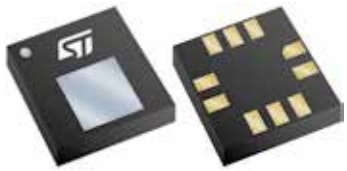
KEY FEATURES

- Always-on 3D accelerometer and 3D gyroscope
- Android M compliant
- Pedometer,step detector and step counter
- Rate noise density 4mdps/ √Hz (High Perf. Mode)
- Embedded Self Test and Temperature sensor

Parameter	LSM6DSO	LSM6DSL
Current consumption in High-performance mode (mA)	0.55	0.65
Current consumption in normal mode (mA)	0.43	0.45
Noise density in High-performance mode @ 2g Accelerometer (µg/√Hz)	70	80
Typical gyro noise density in High-performance mode (mdps/√Hz)	3.8	4.5
ODR (Hz)	Accel: 1.6 to 6664	Accel: 1.6 to 6664
	Gyro: 12.5 to 6664	Gyro: 12.5 to 6664
FIFO depth	Up to 9 Kbytes	Up to 4 Kbytes
Sensor data collection	Yes	Yes
Pedometer	Yes v2.0	Yes
Sensor sync	Yes	Yes

PRESSURE SENSORS

ST's absolute digital output barometer integrates ST's consolidated pressure sensor with the new fully molded package to further improve robustness, reliability and moisture resistance while reducing package thickness.



BENEFITS

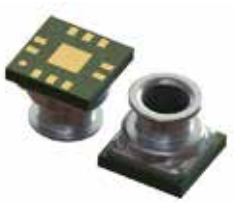
- Ultra-small footprint
- Low-power consumption
- Fully-molded package ensure stability and robustness in any condition and water resistance

Part number	Package (mm)	Pressure range (hpa)	Relative accuracy (hpa)	Absolute accuracy (hpa)	Noise	ODR (Hz)	Current consumption	Highshock survivability (g)	Advanced digital features
LPS22HH	HLGA-10L, 2 x 2 x 0.73 Full-molded	260 to 1260	±0.025	±0.5	0.65Pa RMS (with embedded filter) 1.7Pa RMS (without embedded filter	1, 10, 25, 50, 75,100, 200	12 µA @ 1 Hz (high resolution mode) 4 µA @ 1 Hz (low power mode)	22.000	128 samples FIFO/Embedded compensation/ Interrupt/ I2C/I3C/SPI
LPS22HB	HLGA-10L, 2 x 2 x 0.76 Full-molded	260 to 1260	±0.1	±1	2Pa RMS (with embedded filter) 0.75Pa RMS (without embedded filter	1, 10, 25, 50, 75	12 µA @ 1 Hz (high resolution mode) 3 µA @ 1 Hz (low power mode)	22.000	32 samples FIFO/Embedded compensation/ Interrupt/I2C/SPI

Note: a complete list of part numbers is available at www.st.com/pressure

WATER-PROOF PRESSURE SENSOR

Waterproof pressure sensors are also availble in STs pressure sensors portfolio. The LPS33HW is a waterproof pressure sensor, resistant to chemicals like chlorine, bromine, salt water and also resistant to soaps or detergents. Due to the sensor's high-performance built-in processor and the advanced formula of its water-resistant gel filling gives performance advantages and fast recovery between factory and store-shelf.
The LPS33HW can withstand being submerged up to 90 meters.



Part number	Package (mm)	Pressure accuracy (hpa)	Relative accuracy (hpa)	Absolute range (hpa)	Noise hPa (RMS)	ODR (Hz)	Current consumption	Overpressure	Advanced digital features
LPS33HW	CCLGA10L (3.3 x 3.3 x 2.9)	260 to 1260	±0.1	±1 after OPC ±2.5 before OPC	0.8Pa RMS (with embedded filter) 2Pa RMS(without embedded filter)	1, 10, 25,50, 75	15 µA @ 1 Hz (high resolution mode) 3 µA @ 1 Hz (low power mode)	10ATM	FIFO for Pressure Sensor data Programmable Interrupt/Data ready

Note(*): Water resistant

HUMIDITY AND TEMPERATURE SENSORS

The HTS221 is an ultra-compact sensor that measures relative humidity and temperature. Housed in a tiny but robust HLGA package (2 x 2 x 0.9 mm), the HTS221 is suitable for wearable and portable devices and all applications where comfort, health and safety might be negatively impacted by humidity and temperature variations.

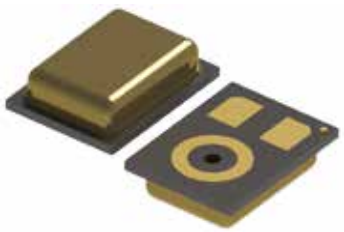
BENEFITS

- Ultra-small footprint
- Low-power consumption to address wearable devices
- Allows customized calibration for best design flexibility

Part number	General description	Package	Supply voltage min-max (V)	Humidity (RH) min-max (% RH)	Interfaces
HTS221	Capacitive digital sensor for relative humidity and temperature	HLGA-6L 2 x 2 x 0.9 mm	1.7-3.6	0-100	SPI, I²C

MEMS MICROPHONES

Voice control is a wide spreading trend across many portable applications, making the interaction easier, faster and smoother. It enables fashionable designs by reducing the number of buttons.



KEY FEATURES

- Tiny packages
- Low power consumption
- High performance

Part number	Top/bottom port	Package size (mm)	Supply voltage (V)	SNR (dB)	Sensitivity (dBV)	AOP (dB SPL)	Current consumption (µA)
MP23ABS1	Bottom	3.5 x 2.65 x 0.98 (Metal)	1.52 to 3.6	64	-38	130	120

TIME-OF-FLIGHT PROXIMITY SENSORS

ST time-of-flight proximity and ranging sensors are based on F**light**Sense™ technology, which offers unique advantages:

- Absolute and accurate distance measurement in mm, whatever the target reflectance, material and color, unlikely traditional IR sensors which cannot output a distance and are highly impacted by the characteristics of the target
- The smallest ToF sensor on the Market today, which allows effective Industrial Designs
- Low power consumption
- Competitive system cost
- F**light**Sense™ proximity and ranging sensors are greatly easing the product integration, since they are packaged in a single module which integrates the Time-of-Flight SPAD sensor (Single Photon Avalanche Diode), the IR light source (VCSEL Vertical Cavity Surface-Emitting Laser), as well as the ALS (Ambient Light Sensor) in case of VL6180X

Part number	General description	Key features
VL53L0X	The smallest time-of-flight (ToF) ranging sensor on the market today, enabling accurate measurement up to 2 meters	• Accurate range measurement up to 2 meters, independent of target reflectance • Small form factor, easy integration • Low Power for battery operated devices
VL6180X	A proximity sensor, ambient light sensor (ALS) and IR light source in a single integrated module	• Proximity sensor, indicating actual distance from 0 to 40 cm typical • Ambient Light Sensor: 0 to 100 k Lux • Low power: Standby <1 µA, Low Power ranging 60 µA • Module including Laser class1 IR emitter
VL53L1X	New generation of Time-of-Flight ranging sensor, able to measure long distance up to 4 meters and enabling new use cases thanks to its integrated lens and programmable Field-of-view	• Long distance ranging up to 4 meters • Very fast (up to 100 Hz) • Programmable Field-of-view (15 degrees up to 27 degrees) • Small form factor, easy integration

TEMPERATURE SENSORS

STMicroelectronics' temperature sensors include both analog and digital temperature sensor ICs.

DIGITAL TEMPERATURE SENSORS BENEFITS

- One-shot mode for power saving
- Dual alarm
- Tiny package
- Programmable resolution
- Low supply current

ANALOG TEMPERATURE SENSORS BENEFITS

- Ultra small package: UDFN-4L (1 x 1.3 mm)
- Ultra-Low supply current: 4.8 µA typ.
- Oper. temperature: -55°C to 130°C

Part number	Package	General description	I/O Interface	Operating voltage min-max (V)	Standby current (µA typ)	Operating current (µA typ)
STTS751	UDFN-6L (2 x 2 mm)	2.25 V low-voltage local digital temperature sensor	SMBus/I²C compatible	2.25-3.6	3	15
STLM20	UDFN-4L (1 x 1.30 mm)	Ultra-low current 2.4 V precision analog temperature sensor	-	2.4-5.5	-	4.8

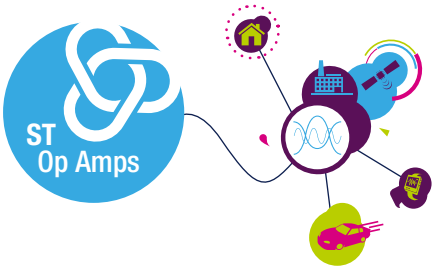
Signal conditioning

ST's product portfolio contains a large range of op amps, comparators and current-sense amplifiers.

In addition to our broad portfolio of mainstream devices, ST offers a range of high-performance products specifically designed to meet the tight requirements of the wearable market.

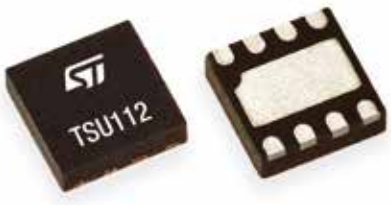
The main features of our growing portfolio are:

- Low power
- High precision
- Tiny packages



OPERATIONAL AMPLIFIERS

Analog sensors need signal transducers to deliver the information for digital processing. ST offers a dedicated set of operational amplifiers suitable for wearable devices with excellent features.



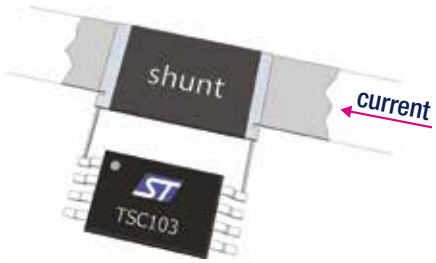
KEY FEATURES

- Very high accuracy and stability
- Low supply voltage and low power consumption for battery operation
- Rail-to-rail inputs and outputs
- High tolerance to ESD
- Extended temperature range
- Tiny packages

Part number	Number of Channels	Input Offset Voltage (µV) max	Input Bias Current (pA) max	Supply Current per Channel (µA) Typ	Supply voltage (V) @ 25 °C	Gain Bandwidth Product (kHz) typ	Package (mm)
TSU101 TSU102 TSU104	1, 2, 4	3000	5	0.58	1.5 to 5.5	8	SC70-5, SOT23-5L, DFN8 2x2, MiniSO-8, TSSOP-14, QFN16 3x3
TSU111 TSU112	1, 2	150	5	0.9	1.5 to 5.5	11.5	DFN6 1.2x1.3, SC70-5, DFN8 2x2, MiniSO-8
TSV711 TSV712 TSV714	1, 2, 4	200	10	10	1.5 to 5.5	120	SC70-5, DFN8 2x2, MiniSO-8, TSSOP-14, QFN16 3x3
TSV731 TSV732 TSV734	1, 2, 4	200	10	60	1.5 to 5.5	900	SC70-5, DFN8 2x2, MiniSO-8, TSSOP-14, QFN16 3x3
TSZ121 TSZ122 TSZ124	1, 2, 4	5	200	31	1.8 to 5.5	400	SC70-5, SOT23-5L, DFN8 2x2, MiniSO-8, SO-8, TSSOP-14, QFN16 3x3
TSZ181 TSZ182	1, 2	25	200	800	2.2 to 5.5	3000	DFN6 1.2x1.3, SOT23-5L, DFN8 2x2, MiniSO-8, SO-8

CURRENT SENSORS

Dedicated to battery and power management, the current sensors enable precise and best current measure with a low current consumption budget.



KEY FEATURES

- Up to 70 V line monitoring
- Independent supply and common mode voltages
- Selectable gains
- Low power

Part number	Common mode operating range (V)	Current consumption (µA) Typ	Gain (V/V)	Temperature range (°C)	Supply voltage (V)	Package (mm)
TSC101	2.8 to 30	165	20, 50, 100	-40 to 125	4 to 24	SOT23-5 (2.9 x 2.8 x 1.2)
TSC103	2.9 to 70	200	20, 50, 100	-40 to 125	2.7 to 5.5	TSSOP8 (6.4 x 3.0 x 1)

HOW TO MAKE YOUR SELECTION?

The ST Op Amps App is a free all-in-one design toolkit and smart selector for smartphones and tablets, You can select the best product from among our operational amplifier, comparator, current-sensing, power and high-speed amplifier portfolios.

You can also access to interactive schematics with smart component value calculator, access to 3D package data or access to datasheets while away from the desk.

The ST op Amps App is currently available on GooglePlay and AppStore.

www.st.com/oppamps-app

ANDROID APP ON Google play

Available on the App Store

ANALOG SWITCHES

In portable devices, switches are used to route a great variety of signals such as audio to speakers/headphones or other signals to and from sensors. ST's analog switch line-up is meant to cover all the possible signal typologies from audio to USB.

KEY FEATURES

- Ultra-low power dissipation
- Low on-resistance
- Wide operating voltage range
- USB (2.0) high-speed (480 Mbit/s) signal switching compliant
- Integrated fail-safe function
- Tiny packages

Part Number	Function	Supply voltage	Vin Range	Ron resistance	Package (mm)
STG3684AUTR	Dual SPDT	1.65 to 4.3 V	0 to Vcc	500 mΩ	QFN10L (1.8 x 1.4 x 0.5)
STMLS05ACQTR	5 channel PMOS Switches	1.8 to 3.6 V	1.05 to 5.5 V	120 mΩ	QFN16L (3 x 3 x 0.5)

Microcontrollers

STM32 AND STM8 WIDE CHOICE OF SOLUTIONS FOR WEARABLE DEVICES

By choosing one of ST's microcontrollers for your embedded application, you gain from our leading expertise in MCU architecture, technology, multi-source manufacturing and support. ST's product portfolio contains a comprehensive range of microcontrollers, from robust, low-cost 8-bit MCUs up to 32-bit Arm®-based Cortex®-M0 and M0+, Cortex®-M3, Cortex®-M33, Cortex®-M4 and Cortex®-M7, Flash microcontrollers with a great choice of peripherals. Leveraging its wide and market-proven portfolio, ST offers a selection of STM32 and STM8 microcontrollers perfectly fitting wearable devices.

KEY FEATURES

- Wide range of processing performance
- Low power and energy efficiency
- Multiple and flexible power modes
- Wide voltage operation range
- Batch Acquisition Mode (BAM)
- LCD drivers
- Serial Audio Interfaces
- RTC with Calendar
- Multiple peripherals
- Advance analog features
- WLCSP packages
- Small and thin UQFN packages

8-bit MCUs

STM8 L

32-bit MCUs

STM32 L — Ultra-low-power

STM32 F — Mainstream

STM32 F — High-performance

STM32 W — Wireless

How to make your selection?

The ST MCU Finder is a free app for mobile and desktop application, guiding you through the portfolio of more than 700 STM32 and STM8 MCUs, to select the best fit for your application. The selection results can be shared and technical features and documentation can be instantly accessed. An integrated feed provides up-to-date worldwide and local news around STM32 and STM8 MCUs. Supported languages are English, Chinese and Japanese.
The ST MCU Finder is currently available on GooglePlay and AppStore.
www.st.com/stmcufinder

ANDROID APP ON Google play

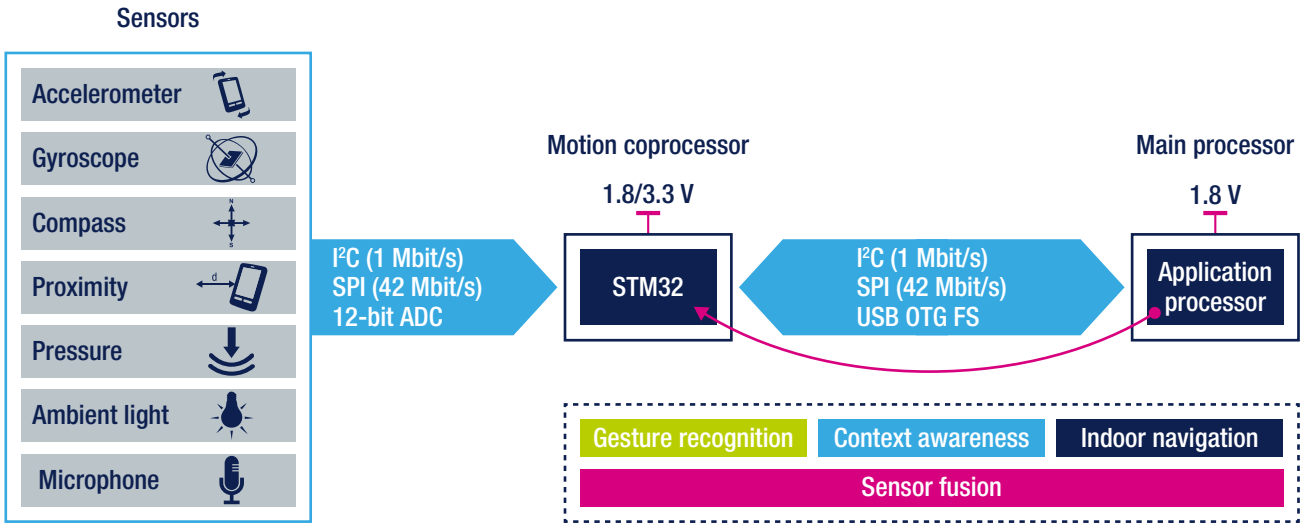
Available on the App Store

STM32L AND STM8L - ULTRA LOW POWER MCU FAMILIES

A complete microcontroller offer including ultra-low-power STM8L and STM32L as well as high-performance and power-efficient STM32F401/411 to address sensor hub applications in smartphones, tablets and wearable devices. STM32 sensor hub microcontrollers enable low power, low latency sensor fusion and implements an innovative Batch Acquisition Mode (BAM) allowing ultra-low-power sensor data acquisition. The application range is wide and covers from simple activity monitoring bands implementing a single accelerometer up to smartphones with 9-axis accelerometer, gyroscope & magnetometer combined with environmental sensor and audio with MEMS microphones. STM32 sensor hub microcontrollers are available with 3rd party motion processing libraries including Always-on sensor fusion, gesture recognition, activity & sleep monitoring, context awareness and indoor navigation with map matching on both Android™ and Windows® platforms.

KEY FEATURES

- Cortex®-M0+, M3, M33 and M4
- Up to 120 MHz with FPU
- Up to 165 DMIPS, 427 CoreMark
- Up to 1 Mbyte of Flash memory and 320 Kbytes of RAM
- Batch Acquisition Mode (BAM)
- Current down to 36 µA/MHz in Run mode
- Current down to 300 nA in Stop mode
- I²C, SPI/I²S, USB, USART, SDIO
- ADC, DFSDM (PDM to PCM)
- Down to WLCSP25 to 2x2.2mm



STM32 – THE REFERENCE IN ADVANCED GRAPHIC USER INTERFACES

Enhanced user experience with the Chrom-ART Accelerator™

STM32 portfolio offers a large choice of products combining high-end graphic capabilities with extended battery life. Thanks to the Chrom-ART Accelerator™, the MIPI-DSI® interface support and the round display optimized management, STM32 enables stunning graphic user interface additions to smart watches and wearable applications. The ultra-low-power consumption of STM32 products make it the ideal choice to develop advanced wearables with no compromise on battery life.

GRAPHICS ACCELERATION

- Chrom-ART Accelerator™
  - Offloads the main CPU from repetitive graphical operations
  - Enables high-end user interfaces in parallel with real-time processing
  - Offers an efficient font management capability enabling multi-language support with limited memory size impact
- Hardware JPEG codec
  - Brings additional branding and tutorial video capabilities to your HMI

INTEGRATION AND MEMORY EXTENSIONS

- Up to 2 Mbytes of internal Flash memory, NOR and NAND Flash extentions, and up to 640 Kbyte of internal SRAM
  - Optimum support of up to WQVGA resolutions with no exernal RAM
- Chrom-GRC™ «unsquares» round displays and saves 20% RAM memory resources and offers optimum support of up to 400x400 round displays with no external memory

DISPLAY INTERFACES

- MIPI-DSI® controller
  - For new-generation displays with higher pixel density, lower EMI and lower pin count
- 8080/6800 parallel interface
  - Ideal for small-sized displays
- LCD-TFT controller
  - For mid-sized displays
  - Supports up to XGA resolution

POWER EFFICIENCY

All STM32 MCUs bring low or even ultra-low-power capabilities enabling advanced UIs and longer battery life on consumer, medical, and industrial portable devices.

STM32 GRAPHICS ECOSYSTEM

STM32 graphics-enabled MCUs come with a rich hardware and software ecosystem enabling easy and efficient product prototyping and development.

Development kits

Each product line offers a discovery kit and an evaluation board that embed a display panel, external memory extensions as well as a rich set of connectivity features enablingeasy prototyping of your GUI design.

Embedded software

STM32Cube software brings all the hardware abstraction layer drivers, software middleware and implementation examples allowing you to quickly and efficiently benefit from STM32 MCUs and their IPs.

Graphic libraries and tools

A wide choice of leading graphic software libraries and tools taking full advantage of STM32 graphics acceleration, display interfaces and smart architecture is also available to help you easily achieve the most advanced GUI design for STM32 MCUs.

Software examples

Development kits come preloaded with a graphics interface and application examples using different display solutions and demonstrating advanced graphical user interfaces.

STM32 – THE REFERENCE IN AUDIO AND VOICE

Low-power audio DSP replacement

STM32L4 ultra-low-power and STM32F4 Dynamic Efficiency™ product lines combine advanced processing capabilities, outstanding low power consumption and maximum integration to offer the ideal low-power audio and voice solutions for wearable applications.
Leveraging ST's proprietary ART Accelerator™, the two product lines achieve zero wait state execution from internal Flash memory and deliver the full processing capabilities of the Cortex-M4 core running at up to 80 and 100 MHz. The Cortex-M4 DSP instruction set and the embedded floating point unit boost the performance capabilities, enabling advanced audio processing.
STM32L4 ultra-low-power and STM32F4 Dynamic Efficiency™ access lines achieve an outstanding 36 µA/MHz power consumption in Run mode and offer a Batch Acquisition Mode (BAM) enabling extended battery life by exchanging batches of data through communication peripherals while maintaining the rest of the system, including the CPU, in power-saving modes.

KEY FEATURES

- 100/125/165 DMIPS
- DSP & FPU
- 36 µA/MHz in Run mode
- Batch Acquisition Mode
- Maximum integration

Ultra-low power always-on acquisition + Floor Sound detector	Low power Signal conditioning + Sound activity detector	Voice trigger detection
ULPSD (HW)	LPSD (SW)	ASR (SW)
< 70 µA	< 200 µA	1.2 mA

Wide range of processing performance, connectivity features and optimized software

ST's scalable STM32 microcontroller portfolio offers a wide range of processing performance and embedded SRAM sizes to meet a large number of audio application requirements. In addition, STM32 microcontrollers embed numerous audio interfaces with I²S, TDM and PDM support as well as audio dedicated PLLs to achieve audio accuracy.
STM32 microcontrollers also offer rich connectivity features with USB, SDMMC, camera, and display interfaces to meet the requirements for the most advanced applications.
Equally important, the STM32 software ecosystem facilitates the development of audio and voice applications by providing optimized internal and third-party audio software as well as hardware kits for prototyping. The software offer includes internal voice and audio codecs with MP3, AAC, WMA, Speex, ADPCM, G711 and G726 support. It also includes synchronization software, as well as audio post-processing solutions with SRC, equalization, bass management, smart volume control and visualization. The STM32 ecosystem also gives access to a wide range of optimized third-party software including voice command solutions.

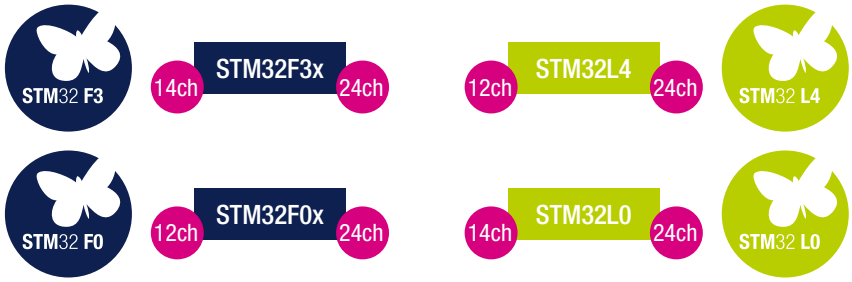
DSP CONCEPTS

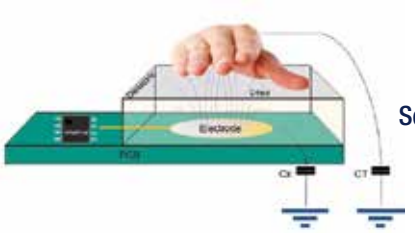
sensory

STM32 AND STM8 – THE REFERENCES IN TOUCH SENSING AND WIRELESS CHARGING

STM32 and STM8L families: Integrated touch-sensing functions

Certain STM32 microcontrollers feature a full hardware touch-sensing acquisition module based on self-capacitance technology. These devices include several I/Os (up to 24 channels) for integrating multiple touch keys and providing developers with a single-device solution.





Self -capacitance

Microcontroller-based I/Os internally coupled to touch sensing controller with up to 24 channels

Touch sensing acquisition < 5% CPU load. Based on charge transfer acquisition

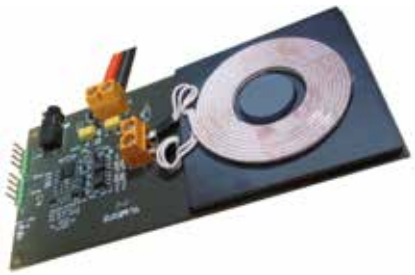
Free-of-charge software libraries (C source code, firmware examples)

Adapted development tools: STM-STUDIO STM32CubeMX and STM8CubeMX

STM8 - STM32 families: Wireless charging system

From basic waveform generation for low-end devices up to complex waveform generation, our MCU mainstream series ensures extreme flexibility for the digital control of the coil.

Timers with flexible PWM generation, dead time management or complemented output.



- **STM32 F3**
  - Arm Cortex-M4 + FPU at 72 MHz – 90 DMIPS
  - From 16 to 512 Kbytes of Flash memory
  - Mixed-signals: CCM-SRAM, 16-bit ADC ∑Δ, HR-timer…
- **STM32 F1**
  - Arm Cortex-M3 at 72 MHz – 61 DMIPS
  - From 16 Kbytes to 1 MB byte of Flash memory
  - STM32 foundation: USB, Ethernet, CEC…
- **STM32 F0**
  - Arm Cortex-M0 at 48 MHz – 38 DMIPS
  - From 16 to 256 Kbytes of Flash memory
  - Entry-level, cost-sensitive: 32-bit MCU at 32 cents, USB, CAN…
- **STM8 S**
  - STM8 core at 24 MHz
  - From 4 to 128 Kbytes of Flash memory, plus E^2Data
  - Robust and reliable for basic functions
- **STM8 L**
  - STM8 core at 16 MHz
  - From 2 to 64 Kbytes of Flash memory
  - Low voltage operation and reduced power consumption

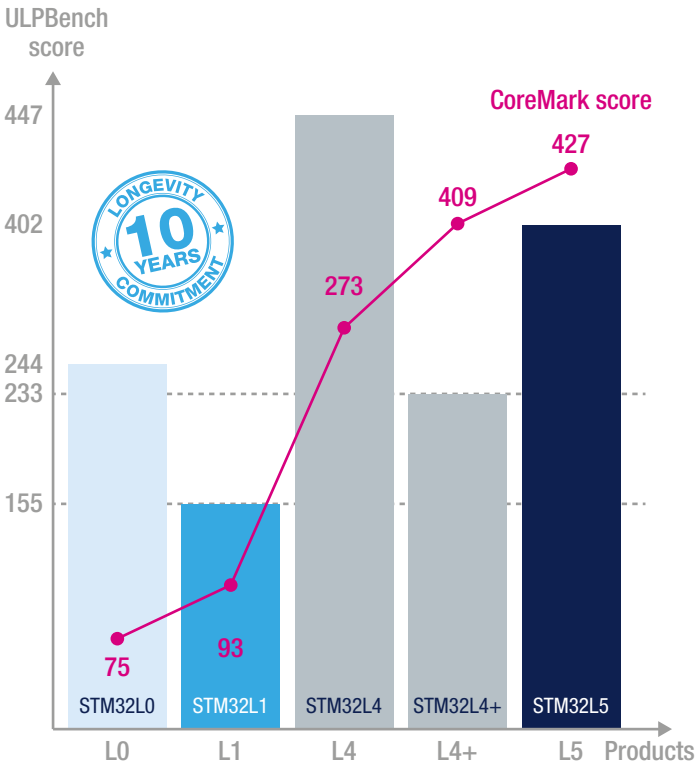
STM32 AND STM8 – THE REFERENCES IN POWER MANAGEMENT

STM8L family: 8-bit ultra-low-power MCU family

The STM8L, based on the 8-bit STM8 core, benefits from our proprietary ultra-low-leakage process, shared with the STM32L family, and features an ultra-low power consumption of 0.30 µA with the lowest power mode.

STM32L family: the 32-bit ultra-low power mcu family

ST's ultra-low-power MCU platform is based on a proprietary ultra-low-leakage technology. STM32L0 (Arm® Cortex®-M0+), STM32L1 (Cortex-M3), STM32L4 (Cortex-M4) and the STM8L (8-bit proprietary core) represent a large range of devices addressing devices supplied from batteries or through energy harvesting and grant an optimized cost/performance ratio in all kinds of low-power applications.
This ultra-low-power platform with the industry's lowest current variation between 25 and 125 °C warrants outstandingly low current consumption at elevated temperatures. The MCUs reach the industry's lowest power consumption of 350 nA in Stop mode (with SRAM retention), while maintaining the wakeup time as low as 3.5 µs.
The new STM32L4 is the convergence of the ultra-low-power and high performance providing 100 DMIPS with DSP instructions and floating point unit, more memory (up to 1 Mbyte of Flash) and innovative features.



- Entry-level in ultra-low-power performance
- Targeting cost-sensitive applications

- Ultra-low-power market-proven solutions
- Best in class in ultra–low-power performance

- 32-bit Arm® Cortex®-M33 + FPU at 110 MHz
- From 256 to 215 Kbytes of Flash memory
- Lowest power mode + RAM + RTC: 0.35 µA

- 32-bit Arm® Cortex®-M4 + FPU at 120 MHz
- From 1 to 2 Mbytes of Flash memory
- Lowest power mode + RAM + RTC: 1 µA

- 32-bit Arm® Cortex®-M4 + FPU at 80 MHz
- From 64 Kbytes to 1 Mbyte of Flash memory
- Lowest power mode + RAM + RTC: 0.34 µA

- 32-bit Arm® Cortex®-M3 at 32 MHz
- From 32 to 512 Kbytes of Flash memory
- Lowest power mode + RAM + RTC: 1.2 µA

- 32-bit Arm® Cortex®-M0+ at 32 MHz
- From 8 to 192 Kbytes of Flash memory
- Lowest power mode + RAM + RTC: 0.67 µA

- 8-bit STM8 core at 16 MHz
- From 2 to 64 Kbytes of Flash memory
- Lowest Halt mode: 0.3 µA

STM8CubeMX AND STM32CubeMX POWER CONSUMPTION CALCULATOR WIZARD

With STM8CubeMX and STM32CubeMX configuration and initialization C code generators, select your chip and use its Power Consumption Calculator wizard to select peripherals and power supply, then define a sequence of steps representing your application and analyze its power consumption and battery life results.

Motor Driver ICs

STSPIN LOW-VOLTAGE MONOLITHIC MOTOR DRIVERS

ST's STSPIN monolithic motor drivers are now optimized for low-voltage, battery-powered, portable applications.

ST's excellence in motor control is now packed into a tiny IC, integrating both the control logic and a high-efficiency, low $R_{DS(ON)}$ power stage. Thanks to the STSPIN233's high level of integration and allowed 3-shunt topology and 3 independent inputs, it's now possible to use FOC sensorless algorithms in portable IoT applications. This innovation will further improve the quality and user experience of modern IoT applications such as portable smartphone gimbals or healthcare equipment.

The devices are designed to operate at low input voltages down to 1.8 V, over a wider current and temperature range, and can be forced in a zero consumption state – with quiescent current down to 80 nA – which allows significant power saving and makes these ICs ideal for battery-operated applications with an extended battery lifetime.

A complete set of protection features is present including over-current, over-temperature and short-circuit, thus making a bullet-proof solution for demanding applications, especially in harsh industrial environments, and further reducing the number of external components, the cost and complexity.

All this comes in a miniaturized 3 x 3 mm QFN package that perfectly fits into compact portable devices thanks to its miniscule footprint.

KEY FEATURES AND BENEFITS

- Extremely low operating voltage from 1.8 to 10 V, ideal for low-voltage, battery-operated motors
- High output current up to 1.3 A_{RMS} for each full-bridge or half-bridge, depending on driver
- Energy saving and long battery life with best-in-class standby consumption down to 80 nA
- Extreme position accuracy and motion smoothness with up to 256 microsteps per full step (STSPIN220)
- 3-phase BLDC sensorless FOC algorithm supported (STSPIN233)
- High current up to 2.6 ARMS for single brushed DC motors (STSPIN250)
- Maximum reliability UVLO, over-current and thermal protection
- Ultra-miniaturized 3 x 3 mm QFN package

PRODUCT TABLE

Part number	Description	Typical $R_{DS(ON)}$ (Ω)	Minimum supply voltage (V)	Maximum supply voltage (V)	Maximum output current (A_{RMS})	Maximum peak output current- (A)	Expansion board for STM32 nucleo board
STSPIN220	Monolithic microstepping driver with up to 256 µsteps / step	0.2	1.8	10	1.3	2	X-NUCLEO-IHM06A1
STSPIN230	Monolithic driver for 3-phase brushless DC (BLDC) motors	0.2	1.8	10	1.3	2	X-NUCLEO-IHM11M1
STSPIN233	Monolithic driver for 3-phase brushless DC (BLDC) motors optimized for 3 shunts configuration	0.2	1.8	10	1.3	2	X-NUCLEO-IHM17M1
STSPIN240	Monolithic driver for two DC motors	0.2	1.8	10	1.3	2	X-NUCLEO-IHM12A1
STSPIN250	Monolithic driver for single DC motors	0.1	1.8	10	2.6	4	X-NUCLEO-IHM13A1

Security

SECURE ELEMENT AND INTEGRATED NFC BOOSTED SOLUTIONS FOR WEARABLE DEVICES

Wearable makers are facing multiple challenges to integrate secure contactless applications. They have to carefully address two main domains such as “Security” and “Contactless communication” to build a best–in-class wearable device.

ST platform security approach enables customers with a large choice of products and solutions for wearable applications such as payment, transport, and multiple contactless transactions answering the challenges such as Security certification, interoperability, power consumption, integration, and NFC highest performances.

BENEFITS

- Off-line payment thanks to tamper proof Secure Element
- Enhanced user experience (reading distances)
- Allows ultra-small antenna
- Minimize footprint & ease integration
- Easier design thanks to tolerance versus materials (i.e metal watch)

SECURE ELEMENT

The ST31 secure microcontroller family is the platform for highly secure applications including banking, identification, pay-TV, and transport.

With the Arm® SecurCore® SC000 processor and an architecture optimized for contactless performances, the ST31 offers a broad portfolio including MIFARE Plus® and MIFARE® DESFire® libraries, multiple interfaces, and certified cryptographic libraries.

ST31 dual interface secure microcontrollers are designed to enable secure and fast contactless transactions. They support various multiprotocol RF interfaces enhancing multi-application versatility. ISO/IEC 14443 Type A, B and B', NFC, ISO/IEC 18092 and Very High Bit Rate protocols are all available and Auto-detect mode allows automatic detection and dynamic adaptation of the device to the correct reader protocol. Combined with STS3922 booster, it meets all the requirements to support wearable payment/ transport applications with very small antennas.

ST33 secure microcontroller is designed to meet advanced security and performance requirements for secure application including NFC embedded secure element with a large user Flash memory capability. Combined with the ST's NFC controller ST21NFC, it meets all the requirements for the integration of the wearable payment, transport or multi-application in wearable device.

KEY FEATURES

- 32-bit Arm SC000 CPU/ SC300 CPU
- Multi-protocol (ISO7816, ISO14443 A/B/F, VHBR)
- EMVCo and Common Criteria certified

Part number	Secure device	NFC Mode	RF Protocol	Interface	Key features	Package
ST31G480	eSE 480 kB	Card Emulation	ISO 14443 A, B, B' – ISO 18092, VHBR	ISO 7816 ISO 14443	32-bit Arm® SecurCore® SC000 CPU with 20.68 and 160pf coupling capacitor eSE for payment, transport, access control MIFARE® Classic & DESFire® Available with or without STPay Payment application Ideal for contactless payment integration in battery-less wearables	DFN Bare die
ST33G1M2	eSE 1.2 MB	Card emulation / reader / P2P combined with NFC controller	Managed by NFC controller	ISO7816, SPI, SWP	32-bit Arm® SecurCore® SC300 CPU eSE for payment, transport, access control MIFARE® Classic & DESFire®	Wafer DFN8 4.2 * 4 WLCSP
ST33J2M0	eSE 2 MB	Card emulation / reader / P2P combined with NFC controller	Managed by NFC controller	ISO7816, SPI, I²C, SWP	32-bit Arm® SecurCore® SC300 CPU MIFARE® Classic & DESFire®, FeliCa® combining eSE and eSIM	Wafer QFN20 WLCSP

NFC BOOSTER AND NFC CONTROLLER SOLUTIONS

ST NFC booster (STS3921/22) and NFC controller (ST21NFCD) solutions, implementing Active Load Modulation technology guarantee NFC transactions on wearables in challenging metallic environment or with a very small antenna. The key benefits of these product families are to:

- Simplify the software integration: Compatible with most operating systems on the market (Linux, Android, RTOS, …). ST lowers the cost for developers by providing multi-application support with optimized solutions including intuitive SDK platforms for integrating contactless services around any microcontroller wearable device architecture
- Simplify the hardware integration: Reference designs, expansion boards, design guidelines
- Simplify the deployment: Integration into the most popular TSMs, pre-certification services to help reduce the time to market as well as development costs

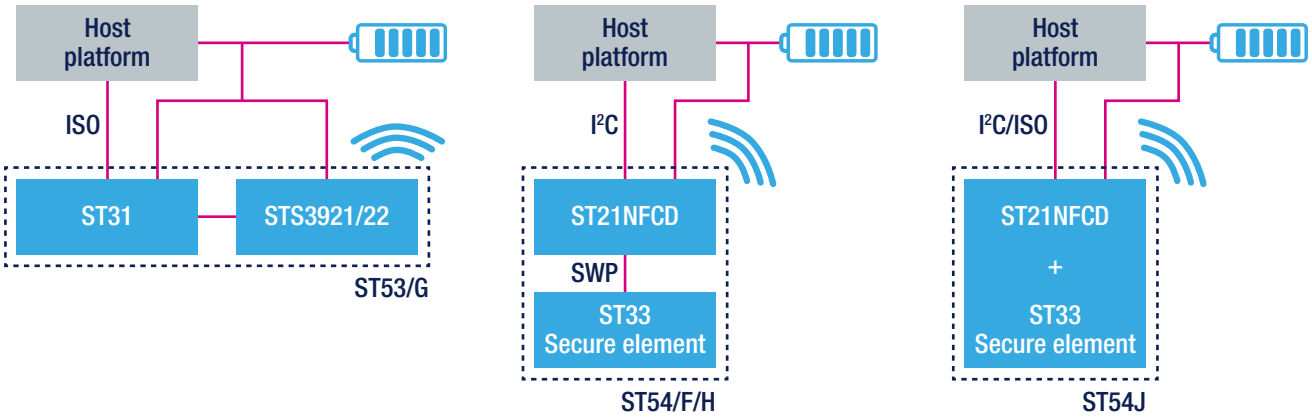
KEY FEATURES

- Enhanced user experience (reading distance)
- Allows ultra-small antenna
- Minimize footprint & ease integration
- Increase interoperability
- Reach low power consumption

Part number	Type	NFC Modes	RF Protocol	Interface	Key features	Package
STS3921	Boosted NFC	Card Emulation	ISO14443A	Contactless bridge to Secure microcontroller chip SPI to Host	Active Load Modulation Q factor adjustment Automatic Power Control, Automatic Gain Control Low power field detection	WLCSP
STS3922	Boosted NFC	Card Emulation	ISO14443A	Contactless bridge to Secure microcontroller chip SPI to Host	Active Load Modulation Automatic Antenna Tuning Q factor adjustment Automatic Power Control, Automatic Gain Control Low power field detection	Bare die
ST21NFCD	NFC Controller	Card Emulation/ reader/P2P	ISO14443A/B ISO18092 ISO15693	SWP SPI, I²C, UART	Active Load modulation Optimized power consumption modes NCI 2.0 compliant Secure Firmware update mechanism	BGA64 4*4

INTEGRATED SOLUTION

From ST31 Secure Microcontroller, STPay and ST33 to full blown NFC solutions based on ST53 and ST54 families, ST offers a complete range of turnkey solutions pre-certified for most payment and transit schemes (EMVCo, PBOC, VISA, MC, AMEX, Discover, MIFARE®, …).
STPay, ST secure payment solution is now available with an over-the-air (OTA) personalization with third party partner.



Part number	SE integrated	Contactless front end	Targeted devices	Package (mm)
ST53G	ST31G480	STS3922	Ideal for single/dual contactless applications Ideal for low and middle-end wearables Available with or without STPay ST secure Payment application (STPay-Boost)	BGA 4x4
ST54F	ST33G1M2	ST21NFCD	Support multiple secure applications Ideal for middle and high end wearables	BGA 4x4
ST54H	ST33J2M0	ST21NFCD	Support multiple secure applications and eSIM Ideal and to enable convergence of application such as eSIM & FeliCa®	BGA 4x4
ST54J	Single die with ST33 2MB & NFC controller		Support multiple secure applications and eSIM Ideal to enable convergence of application such as eSIM	WLCSP

Wireless Connectivity

ST's portfolio offers a variety of wireless ICs and modules to address the needs of designers for their applications. Low-power wireless connectivity represents the key technology for connecting smart objects to the internet and the cloud. As a matter of fact, wireless connectivity is not dominated by one single technology. Depending on application needs or technology constraints, different hardware and software integration requirements must be considered.

BlueNRG PRODUCT FAMILY FOR BLUETOOTH LOW ENERGY

The BlueNRG product family is the ST solution for Bluetooth Low Energy connected devices, enabling the most convenient wireless connectivity with Smartphones and Smart Apps.
BlueNRG devices offer excellent low-power efficiency and top-notch radio performances. The unmatchable energy efficiency due to its ultra-low power consumption as well as its ultra-fast state transition speed between low-power and active states, greatly extending battery life from month to years. In addition, RF-output power is boosted up to +8 dBm to ensure clear and reliable communication even in noisy environments.

BlueNRG-MS is the Bluetooth Low Energy network processor, compliant with Bluetooth 4.2 core specifications, and able to support master and slave roles simultaneously. BlueNRG-MS gives designer the flexibility to choose their preferred host microcontroller to run the application.

KEY FEATURES

- Significantly extends battery life
- Robust and reliable RF connections
- Excellent co-existence performance in crowded 2.4 GHz bandwidth
- Full-featured SDK, with templates, examples and iOS/Android apps

BlueNRG-1 is ST's first Bluetooth Low Energy Application Processor compliant with 5.0 core specifications. It is based on a 32-bit Arm® Cortex®-M0 running at 32 MHz and embeds 160 Kbyte of on-chip flash, 24 kB RAM, 10-bit Analog/Digital Converter, GPIOs and standard I/O peripherals such as SPI, I²C and UART. Also, a Pulse-Digital Modulation (PDM) interface allows to capture voice directly from a digital MEMS microphone, suitable for voice-commanded applications.
BlueNRG-1 provides a single-chip solution perfectly suited for size-constrained wearable application and IoT objects. The entire product family offers easy firmware upgrades in the field through an OTA (Over-the-Air) mechanism, a perfect solution for IoT applications.

BlueNRG-2 is the new generation of the 5.0 Bluetooth® Low Energy (BLE) System-on-Chip, based on 32-bit Arm® Cortex®-M0 and integrating 256 KB of Flash memory, 24 kB RAM and the same set of peripherals of BluenRG-1. In addition, the latest evolution of the BLE stack adds state-of-the-art security and privacy communication along with a faster data transfer. BlueNRG-2 offers a unique combination of low power consumption, scalable GPIO pins, with high radio performance, and large integrated memory, meeting all the needs of the smartphone-controlled IoT applications.

Order code	System partitioning	Operating voltage (V)	Standby current typ (µA)	RX current typ (mA)	TX current @ 0dBm output power (mA)	RX sensitivity typ (dBm)	Output power (dBm)	Operating temperature (°C)	Flash size (kB)	Package (mm)
BlueNRG-232	System On Chip	1.7 to 3.6	0.9	7.7	8.2	-88	+8	-40 to 105	256	VFQFPN32 - 5x5x1
BlueNRG-234	System On Chip									WLCSP - 2.66x2.56x0.5
BlueNRG-248	System On Chip									VFQFPN48 - 6x6x1
BlueNRG-132	System On Chip								160	VFQFPN32 - 5x5x1
BlueNRG-134	System On Chip									WLCSP - 2.66x2.56x0.5
BlueNRG-MSQTR	Network Processor		1.7					-40 to 85	-	VFQFPN32 - 5x5x1
BlueNRG-MSCSP	Network processor								-	WLCSP - 2.66x2.56x0.5

COMPANION BALUNS

Part number	General description	Integrated harmonic filter	Insertion loss(IL) max (dB)	Operating frequency (f) min (GHz)	Operating frequency (f) max (GHz)	Package (mm)
BALF-NRG-01D3	50 Ω nominal input / conjugate match balun to BLUENRG-MS	Y	1.1	2.4	2.5	WLCSP
BALF-NRG-02D3	50 Ω nominal input / conjugate match balun to BLUENRG-1 and BLUENRG-2	Y	1.3	2.4	2.5	WLCSP
BALF-NRG-01J5	50 Ω nominal input / conjugate match balun to BLUENRG-1 and BLUENRG-2	Y	1.3	2.4	2.5	Bumpless CSP (LTCC assembly-like)

BlueNRG NAVIGATOR PC APPLICATION

The BlueNRG Navigator (included in STSW-BLUENRG1-DK) provides an interactive, simple and user-friendly interface to select and run demonstration applications for the resources available in the BlueNRG-1 and BlueNRG-2 Development Kits SW packages, without the need for any extra hardware. The BlueNRG-1 and BlueNRG-2 Navigator are two instances of the same application tailored for the respective device, allowing access to the relative HW and SW kit resources available.

https://www.st.com/content/st_com/en/products/embedded-software/evaluation-tool-software/stsw-bluenrg1-dk.html

VERY LOW POWER MODULE FOR BLUETOOTH® LOW ENERGY

The SPBTLE-RF and SPBTLE-RF0 are easy-to-use Bluetooth® master/slave network processor module compliant with Bluetooth® v4.1. Designed around ST's BlueNRG-MS network processor take advantage of its enhanced features to create a complete RF platform in a tiny form factor. Integrating radio, antenna, high frequency and LPO oscillators, the SPBTLE-RF and SPBTLE-RF0 offer certified (ETSI, FCC, IC) solutions to optimize the time to market of the final applications and to simplify the RF and wireless design, allowing engineers to concentrate on creating innovative IoT applications.

In particular the SPBTLE-RF0 module is a cost effective solution considering it is working with internal cristal oscillator and Internal LDO (SMPS Off).

The SPBTLE-1S is a Bluetooth® low Energy System-on-Chip application processor certified module, compliant with BT specifications v4.2 and BQE qualified. The SPBTLE-1S module supports multiple roles simultaneously and can act at the same time as Bluetooth master and slave device. The SPBTLE-1S is based on BlueNRG-1 system-on-chip and entire Bluetooth Low Energy stack and protocols are embedded into module.
The SPBTLE-1S module provides a complete RF platform in a tiny form factor. Radio, embedded antenna and high frequency oscillators are integrated to offer a certified solution to optimize the time to market of the final applications.

KEY FEATURES

- Significantly extends battery life
- Master, slave role support
- Bluetooth radio performance:
  - Embedded ST BlueNRG-MS
  - BQE End-Product qualified
  - Tx power: + 4 dBm
  - Rx sensitivity: -88 dBm
  - Link budget up to 92 dB with excellent link reliability
- Fully RF certified
  - CE/RED
  - FCC
  - IC
  - ARIB
  - TELEC (SPBTLE-RFTR)
  - SRRC (SPBTLE-1S)
- Operating supply voltage: from 1.7 to 3.6 V
- Operating temperature range: -40 °C to 85 °C

Sub-1GHz TRANSCEIVERS

ST's RF transceivers are intended for operating in unlicensed and globally available Sub-1GHz frequency bands, guaranteeing robust and reliable communication.
The new ultra-low power sub-1 GHz transceiver **S2-LP** is the ideal solution for allowing smart connected object to operate for up 10 years without replacing batteries, while the receiver sensitivity of -130 dBm enables connection over distances up to several hundred kilometers, depending on the environment, thus enabling wide-area coverage. It supports point-to-point, star, as well as mesh networking topologies thus resulting in a very flexible wireless transceiver for connected objects. Moreover the S2-LP enables connectivity to the Sigfox global network, which is being rolled out worldwide to provide a reliable cost- and energy-efficient communication solution for billions of sensors and smart things.

The S2-LP delivers extremely low power consumption, drawing only 6.7 mA in receive mode, and 10 mA when transmitting at 10 dBm. Sleep and standby modes reduce the current to just 600 nA and 350 nA, respectively.

KEY FEATURES

- Frequency bands: 413-479 MHz (S2-LPQTR), 452-527 MHz (S2-LPCBQTR), 826-958 MHz (S2-LPQTR), 904-1055 MHz (S2-LPCBQTR)
- Ultra-low current consumption (7 mA RX and 10 mA TX @ +10 dBm)
- Excellent receiver sensivity down to-130 dBm
- Enables operation in the SIGFOX™ networks
- QFN 24 4 x 4 package

The **SPIRIT1** transceiver is intended for RF wireless-sensor node applications in the Sub-1GHz band, such as Automatic Meter Infrastructure, alarm and security systems, home and building automation, and industrial monitoring and control. It combines excellent receiver sensitivity with a very low current consumption. Additional embedded features include a "Listen-before-talk" with CSMA/CA engine, AES-128-bit data encryption, error correction and detection, FIFO memory blocks, as well as a highly flexible and programmable data packet which contributes to further reducing the computational load of the host microcontroller and the overall system power consumption. SPIRIT1 is designed to operate within the ISM and SRD sub-1 GHz frequency bands namely at 169, 315, 433, 868, and 915 MHz. Several software stacks are available, such as the 6LoWPAN protocol stack enabling low-power devices to participate in the IoT.

SPIRIT1 KEY FEATURES

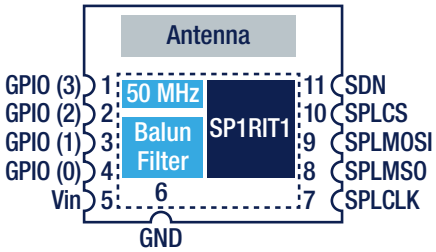
- Frequency bands: 150-174 MHz, 300-348 MHz, 387-470 MHz, 779-956 MHz
- Ultra-low current consumption (9mA RX and 21 mA TX @ +11 dBm)
- Excellent sensivity -122 dBm @ 1.2 Kbit/s (1% BER)
- ETSI, FCC and ARIB compliant
- Wireless MBUS, 6LowPan
- QFN 20 4 x 4 package

COMPANION BALUNS

Part number	General description	Integrated harmonic filter	Insertion loss (IL) max (dB)	Operating frequency (f) min (GHz)	Operating frequency (f) max (GHz)	Package
BALF-SPI-01D3	50 Ω nominal input / conjugate match balun to SPIRIT1 for 868 MHz configuration	Y	2	779	956	WLCSP
BALF-SPI-02D3	50 Ω nominal input / conjugate match balun to SPIRIT1 for 433 MHz configuration	Y	3	390	470	WLCSP
BALF-SPI2-01D3	50 Ω / Conjugate match BALUN to SPIRIT2-LP for 868 MHz configuration	Y	1.7 (typ)	779	956	WLCSP
BALF-SPI2-02D3	50 Ω / Conjugate match BALUN to SPIRIT2-LP in 433 MHz configuration	Y	1.7 (typ)	390	470	WLCSP

SPSGRF and SPSGRC Modules: 413, 868 and 915 MHz

The SPSGRF and SPSGRF-C are ultra-low-power sub-GHz modules based on ST's SPIRIT1 RF transceiver.
SPSGRF family is embedding chip antenna, family is including SPSGRF-868 and SPSGRF-915 operating respectively in the 868 MHz SRD and 915 MHz ISM bands.
SPSGRFC family is embedding UFL connector to connect external antenna to extend the trasmission range; SPSGRFC family is including SPSGRFC-433, SPSGRFC-868 and SPSGRFC-915 operating respectively in the 433 MHz, 868 MHz SRD and 915 MHz ISM bands.
SPSGRF and SPSGRFC are totally firmware and pin to pin compatible.
These modules provide a complete RF platform for wireless connectivity in a tiny form factor and include 4 programmable I/O pins and SPI serial interfaces. Being an FCC, IC, and CE certified solution, the SPSGRF and SPSGRFC series reduces the time-to-market of end applications.

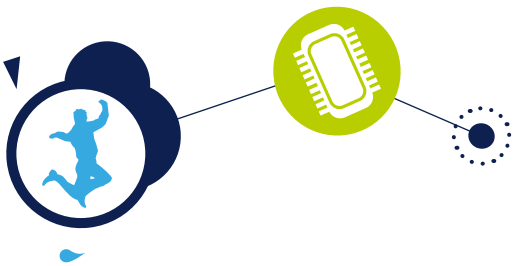


FEATURES

- Module based on:
  - SPIRIT1 low-data-rate, low-power sub-GHz transceiver
  - BALF-SPI-01D3 868/915 MHz balun with integrated harmonic filter
  - On-board antenna and crystal oscillator
- Modulation schemes: 2-FSK, GFSK, MSK, GMSK, OOk, and ASK
- Air data rate from 1 to 500 kbit/s
- Receiver sensitivity: -118 dBm
- Programmable RF output power up to +16 dBm
- 1.8 V to 3.6 V supply - Low power consumption
- RX: 9 mA, Tx: 21 mA @ +11 dBm

BENEFITS

- Add wireless capability to any electronic device without requiring RF experience
- Compact size
- CE (RED), FCC and IC certified



Baluns

ST's balun tranformers and balanced filters integrate specific complex impedances for the main Bluetooth, SubGHz and Wi-Fi chips offered by major manufacturers. They boost RF performance and simplify RFIC to antenna implementation thanks to its highly integrated technology.

RF IC supplier	RF IC name	Matched Balun	Frequency (MHz)	Integrated filter	Size	Package
STMicroelectronics	SPIRIT 1	**BALF-SPI-01D3**	868-915	Yes	1.4 mm x 2.0 mm	CSP
		BALF-SPI-02D3	433	Yes	1.4 mm x 2.0 mm	CSP
	S2-LP	**BALF-SPI2-01D3**	868-915	Yes	2.1 mm x 1.55 mm	CSP
		BALF-SPI2-02D3	433	Yes	2.1 mm x 1.55 mm	CSP
	BlueNRG-MS (QFP32 &nd CSP34)	**BALF-NRG-01D3**	2400	Yes	1.4 mm x 0.85 mm	CSP
	BlueNRG-1 (QFP32 and CSP34) BlueNRG-2 (QFN32 and CSP34)	**BALF-NRG-02D3** **BALF-NRG-02J5 (Height <350 µm)**	2400	Yes	1.4 mm x 0.85 mm	CSP and Thin CSP
Atmel	ATWINC1500A	**BAL-WILC10-01D3**	2400	No	0.95mm x 0.95mm	CSP
	ATSAMR21E8	**BALF-ATM-01E3**	2400	Yes	2.0 mm x 1.25 mm	Bumpless CSP (LTCC assy-like)
Texas Instrument	CC1101	**BAL-CC1101-01D3**	868-915	No	2.0 mm x 1.0 mm	CSP
	CC1120/C1125	**BALF-112X-01D3**	868-915	Yes	1.95 mm x 1.87mm	CSP
		BALF-112X-02D3	433	Yes	1.95 mm x 1.87mm	CSP
	CC2540/43/45, CC2530/31/33	**BAL-CC25-01D3**	2400	Yes	0.9 mm x 0.9 mm	CSP
	CC2541	**BALF-CC25-02D3**	2400	Yes	0.9 mm x 0.9 mm	CSP
	CC2610/2620/2630/2640/2650	**BALF-CC26-05D3**	2400	Yes	0.9 mm x 0.9 mm	CSP
Nordic Semi	nRF51822-QFAACx/QFABAx nRF51422-QFAACx	**BAL-NRF01D3**	2400	Yes	1.5 mm x 1.0 mm	CSP
	nRF51822-CTAx	**BALF-NRF01J5 (Height <350 µm)**	2400	Yes	1.4 mm x 0.85 mm (height < 350µm)	Thin CSP
	nRF51822-CxAx/nRF51422-CxAx	**BAL-NRF02D3**	2400	Yes	1.4 mm x 0.9 mm	CSP
	nRF51822-QFAAHx/nRF51822-QFACAx nRF51422-QFAAFx/nRF51422-QFACAx	**BALF-NRF01E3**	2400	Yes	1.5 mm x 1.0 mm	Bumpless CSP (LTCC assy-like)
	nRF51822-QFAAGx/nRF51822-QFABBx nRF51422-QFAAEx/nRF51422-QFABAx	**BALF-NRF01D3**	2400	Yes	1.5 mm x 1.0 mm	CSP

RF IC supplier	RF IC name	Matched Low Pass Filter	Frequency (MHz)	Integrated filter	Size	Package
STMicroelectronics	STM32WB55Cx BLE 5.0	**MLPF-WB55-01E3***	2400-2500	Yes	1.5 mm x 1.0 mm	Bumpless CSP (LTCC assy-like)

Note: * Available Q1 2019

RF IC supplier	Ultra Wide Band	Balun 50/100 Ω	Frequency (GHz)	Integrated filter	Size	Package
Ultra Wide Band	Recommended for DW1000 from DecaWave	**BAL-UWB-01E3***	3-8	No	1.8 mm x 1.25 mm	Bumpless CSP (LTCC assy-like)

Note: * Available Q1 2019

NFC & RFID

NFC/RFID Tags & Readers

ST offers a comprehensive portfolio of NFC/RFID products, which operate at 13.56 MHz frequency and are based on NFC and ISO standards:

- NFC/RFID Tags, ideal for wireless pairing (Bluetooth or Wi-Fi) consumer engagement and product identification, feature counters, data protection (password) and able to wake-up the Host chip thanks to a General Purpose Output
- Dynamic NFC tag, featuring a reliable EEPROM memory with data protection (password), an I²C interface to connect to a MCU and a RFID/NFC tag interface, enabling multiple use cases for Consumer, Wearables and IoT
- NFC/RFID Readers, which support multiple NFC protocols in Reader, Writer and Peer-to-Peer modes, accessed by SPI interface and able to cope with the most challenging environment thanks to High RF performances and advanced features

ST also offers a large range of discovery kits, Nucleo shields, reference softwares and documentations in order to ease the design process.

KEY FEATURES

- Best-in-class RF performances
- HF 13.56 MHz frequency
- High reliable EEPROM with data protection
- I²C/SPI serial interface
- Energy harvesting capabilities
- Tamper detection feature
- Automatic Antenna Tuning
- High and Dynamic Power Output
- ISO14443 and ISO15693 standards
- NFC Forum Type 4 and Type5 standards

Part number	Mode	Protocol	Serial interface	Key features	Package
ST25R3911B **ST25R3912** **ST25R3913**	Reader/Writer P2P	ISO14443A/B ISO15693 FeliCa	SPI	Automatic Antenna Tuning Dynamic Power Output (up to 1.4 W) Very High Baud Rate 6.8 Mbps Capacitive & Inductive wake-up	QFN32 (5x5 mm)
ST25R3916	Reader/Writer Card Emulation P2P	ISO14443A/B ISO15693 FeliCa	SPI I²C	Automatic Antenna Tuning Dynamic Power Output (up to 1.6 W) Noise Suppressor Receiver Active Wave Shaping Capacitive & Inductive wake-up	QFN32 (5x5 mm)
ST25R95	Reader/Writer Card Emulation	ISO14443A/B ISO15693 FeliCa	SPI	Power Output (up to 0.23 W) Inductive wake-up	QFN32 (5x5 mm) WLCSP
ST25DV-I2C	Dynamic Tag	ISO15693	I²C	EEPROM 4 kb, 16 kb & 64 kb Fast Transfer Mode (256 B buffer) 64-bit password Energy Harvesting GPO MCU wake-up	SO8 TSSOP8 FPN8 FPN12 WLCSP
M24SR	Dynamic Tag	ISO14443A	I²C	EEPROM 4 kb, 16 kb & 64 kb 128-bit password GPO MCU wake-up	SO8 TSSOP8 FPN8 Die
ST25TA	Tag	ISO14443A	NA	EEPROM 512 b, 2 kb, 16 kb & 64 kb 128-bit password 20-bit Counter GPO MCU wake-up	Die FPN5
ST25TV	Tag	ISO15693	NA	EEPROM 512 b, 2 kb,16 kb and 64 kb 64-bit password Tamper Detect loop 20-bit Counter GPO MCU wake-up	Die FPN5

NFC Controller, NFC booster and Secure Element

Near field communication (NFC) technology is at the heart of an expanding spectrum of easy-to-use, intuitive, contactless applications. Integration of NFC is more and more common into wearables to enable contactless payment, transport and access control features.

STMicroelectronics provides a global offer of products and solutions for security and NFC enablement. This includes state-of-the-art NFC controllers, Boosted NFC solutions, and a set of secure 32-bit Flash-based microcontrollers to address embedded Secure Element (eSE). Solutions are delivered as discrete ICs, or system-in-package for optimized integration.

Refer to the **Security Paragraph** for more information

GPS/GNSS RECEIVERS

Teseo III is a GNSS positioning receiver family supporting GPS, Galileo, GLONASS, BeiDou, QZSS and SBAS systems

KEY FEATURES

- Best in class positioning accuracy
- Best stand-by current <10 uA
- Small footprint
- Smart power management

Part number	Voltage supply range	Peripherals	Options	Package
STA8090FG	1.6 - 4.3 V	#3 UARTs, USB, SPI, I²C, SDMMC, PPS	FreeRTOS SDK offer	TFBGA99 5 x 6 x 1.2 mm 0.5 mm pitch
STA8090WG	1.6 - 4.3 V	#3 UARTs, USB, SPI, I²C, PPS	GNSS ROM	WLCSP77 3.9 x 3.9 x 0.6 mm 0.4 mm pitch

Power/Battery management

High integration combined with a broad IP portfolio, complete system competency and state-of-the-art technology.

ST is a leading supplier in power management and mixed-signal ICs for mobile applications, offering a wide range of products from simple power management ICs up to highly-integrated devices that mix power management blocks with advanced analog and digital functionality.

LDOs

- Wide product selection
- Unique bump-less technology allows the smallest form factor

DC-DC converters

- High frequency high dynamic performance f_{SW} = 6 MHz
- Buck-Boost converter with Vout up to 5.5 V

Battery management ICs

- Advanced embedded features (power path, shipping mode, protection circuit module PCM)
- Battery monitoring

Smart reset

- Customizable products providing safe and convenient reset

Energy harvesting

- Energy harvested from PV and thermo-electric generator (TEG)
- Smart power management architecture (Boost/Buck-boost based on the available energy source)

Wireless charging

- TX and RX architectures supported
- Compliant with PMA and Qi standards

BATTERY CHARGER

ST's battery management devices provide high efficiency, power density and low standby power consumption. Our product portfolio includes complete solutions for battery chargers: switching chargers that offer charge currents up to 1.2 A, integrating in the same chip a fuel gauge function; linear chargers with charge currents from 15 mA to 1.1 A and wireless chargers compliant with PMA and Qi standards. By combining wireless power technology with high efficiency and smart charging, ST creates easier, faster, innovative, ways to power up smartphones, tablets and other mobile devices.

Part number	General description	Operating temperature		Charge current (A)	Supply current (bat) typ (µA)	Supply voltage (V_{DD})		Package
		min (°C)	max (°C)			min (V)	max (V)	
L6924D	Single Cell Li Ion battery Charger	-40	85	1	0.25	2.5	12	VFQFPN 16
L6924U	Single Cell Li-Ion Battery Charger IC for USB port and AC Adapter	-40	85	1	0.25	2.5	12	VFQFPN 16
STBCFG01	Switch-mode Single Cell Li+ Battery Charger with OTG Boost, Voltage Mode Fuel Gauge and LDO	-40	85	-	10	3.78	5.95	Flip-Chip25
STNS01	Li-Ion Linear Battery Charger with LDO	-30	85	0.2	6	4.55	5.4	DFPN 12 3 x 3
STWBC-WA	Digital controller for wireless battery charger transmitters for wearable and smart watches applications	-40	105	-	-	3	5.5	VFQFPN 32
STBC02	Li-Ion Linear Battery charger with LDO, Load Switches, Battery Protection and Reset Generator	-40	85	0.45	4	4.55	5.4	Flip-chip30
STBC03	Li-Ion Linear Battery charger with LDO, Load Switches and Battery Protection	-40	85	0.65	4	4.55	5.4	Flip-chip30
STBC15	Ultra-low current consumption linear battery charger for thin film and Li-ion Batteries	-40	85	0.04	0.25	3.2	6.5	QFN 12 Flip-chip12

WIRELESS BATTERY CHARGER

ST's transmitter and receiver solutions for wireless battery charging are designed for ultra-compact battery-operated devices such as wearables, sports gear, smart watches, sensors and medical equipment. The STWBC-WA transmitter can support both full- and half-bridge topologies and provides designers with increased flexibility thanks to a powerful software API which allows modifying the behavior of LED and GPIOs, as well as adding external interfaces via I²C and UART communication ports. Efficient power transfer is enhanced by a smart standby state while waiting for a receiver, which guarantees a power consumption as low as 3 mW while maintaining the foreign object detection (FOD) function active for maximum safety. The STWLC30JRF* receiver can support solution for portable applications up to 5 W. It is able to operate with Qi 1.2 protocol and it can be switched to transmitter mode to provide power to another receiver.

ST provide a complete ecosystem to evaluate the offer for Wireless Battery charger:

- The STEVAL-ISB045V1 reference design includes a wireless power transmitter board, turn-key firmware APIs, user-friendly GUI and USB-to-UART dongle. It supports wireless power transfer of 2.5 W over a 20 mm antenna on the transmitter side and can be scaled-down to 1 W by switching to a half-bridge configuration
- The STEVAL-ISB043V1 provides a complete kit compliant to Qi 1.2 up to 2.5W output power, the firmware gives user the flexibility to modify parameters and setting to ensure the fitting in final application

Note: * Available in Q1 2019

BATTERY MONITORING ICs

STC3115/STC3117

ST's battery fuel gauge ICs can be located in the battery pack or in the handheld device and integrate functions to monitor the battery voltage, current and temperature. Using a built-in Coulomb counter, these fuel gauge ICs calculate battery charge and store the data in 16-bit register resolution for retrieval by the system controller. Access is via an industry-standard I²C interface, enabling the controller to create an accurate graphical representation of the remaining battery-operating time. Battery-monitoring fuel gauge ICs combine a small footprint with outstanding measurement accuracy and extremely low power consumption to increase battery runtime and lifespan in mobile phones, multimedia players, digital cameras, and other space-constrained portable devices.

FEATURES

- OptimGauge™ algorithm for STC3115
- OptimGauge+™ algorithm for STC3117
- Coulomb counter and voltage gas gauge operations
- Programmable low battery alarm
- Internal temperature sensor

BENEFITS

- 3% accuracy of battery state of charge no need for shunt resistor
- Accurate estimation of battery state of charge at power-up
- Reliable battery swap detection
- SoH and impedance tracking with OptimGauge+ algorithm (ST IP)
- Charger enable and system reset control for accurate OCV reading fuel
- Minimum form factor

Part number	Charging sensing voltage range	Charging sensing resistor	Typical supply current (Icc)	Supply voltage (VDD)		Comment	Package
				Min	Max		
STC3115	±40 mV	5 to 50 mΩ	0.045 µA	2.7 V	4.5 V	OptimGauge™ algorithm	1.4 x 2.0 mm 10-bump CSP 2.0 x 3.0 mm DFN10
STC3117	±40 mV	5 to 50 mΩ	0.04 µA	2.7 V	4.5 V	Patented OptimGauge™ algorithm for accurate battery capacity calculation	1.5 x 1.6 mm 9-bump CSP

USB TYPE C & PD

USB Type-C is now established as a standard for medium to high-end Smartphones, Computers, Notebook, video game consoles introduced in the market. Democratization process is on-going, and the “old fashion” legacy micro-B connector being smoothly replaced by the tiny, powerful and reversible type-C plug in most battery powered portable devices.

To enable this massive migration, STMicroelectronics has introduced a ready-to-use, tiny, safe, certified and easily customizable SINK PD controller. The IC is called STUSB4500 and is the first controller optimized for SINK only applications. Being standalone, the IC does not need any complex software development to handle the USB PD stack, negotiate with the SOURCE, monitor incoming power and protect the application from up to 28 V external voltage. Power profiles can be easily adjusted through Non Volatile Memory or external MCU support, when available. On top of QFN4x4 package, a 2.6x2.6 CSP package integrating also the high voltage protections is available to address the smallest form factors.

Evaluation board (STEVAL-ISC005V1) and minimum form factor reference design (STREF-SCS001V1) are available from st.com or through STUSB4500 product page.

STUSB45
Stand-alone USB PD controller - SINK

FEATURES

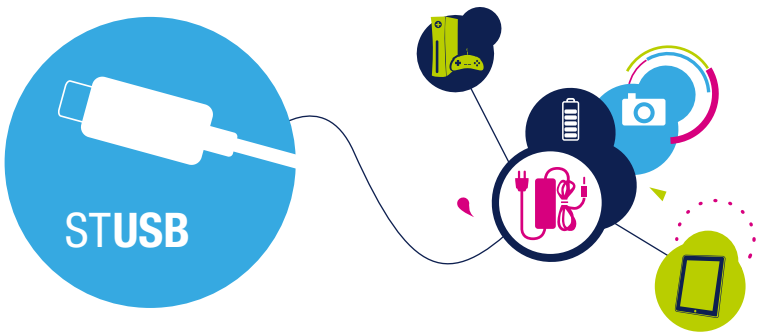
- Consumer – UFP
- Auto-run & Dead Battery support
- Up to 3 SINK PDO profiles
- Dual VBUS gate drivers: Low voltage (5 V) and High Voltage (up to 20 V) charging paths
- Short-to-VBUS protections up to 28 V
- Integrated Voltage monitoring
- Integrated VBUS discharge path
- Dual power supply (VBUS and/or VSYS):
  - VBUS = (4.1 V - 22 V) - AMR = 28 V
  - VSYS = (3.0 V; 5.5 V)

BENEFITS

- Plug & Play
- Can run without MCU support
- Robust to high voltage spikes
- Configurable and flexible
- Integrated solution: low BOM cost

PACKAGE

- QFN-24 EP 4 x 4 mm^2
- CSP-24 2.6 x 2.6 mm^2
- CSP-25 2.6 x 2.6 mm^2



ENERGY HARVESTING

Energy harvesting and solar charging ICs from ST supply the Internet of Things ecosystem by extracting energy from ambient light or thermal differences to power small devices in applications such as remote monitoring, wearables and fitness sensors.

SPV1050

The SPV1050 takes energy from the environment and converts it into useful electrical energy, thus making a wireless sensor node fully autonomous. The SPV1050 is an ultra-low-power energy harvester and battery charger that captures the maximum energy from a photovoltaic (PV) cell or a thermo-electric generator (TEG).

BENEFITS

- Energy harvesting from light or thermal gradient with 90% or more conversion efficiency
- Boost and buck-boost topologies fitting small and large solar modules
- Up to 60% energy maximization more than no MPPT algorithm
- Enhanced battery longevity

SPV1040

The SPV1040 is a monolithic DC-DC synchronous boost converter able to harvest the energy generated by even a single solar cell characterized by a very low output voltage. It is especially designed to work in outdoor environments with loads up to about 3 W.

BENEFITS

- 400 mW – 3 W Solar Energy Harvester for outdoor
- 120 mΩ and 140 mΩ embedded Very Low N-MOS and P-MOS $R_{DS(on)}$
- Output Over-current & On Silicon Over-temperature Protection

Part number	General description	Input voltage (Vin)		Operating temperature		LDOs output voltage		Battery voltage		Output Current-Max (I_{OUT}) (A)	Start-up input current Iin-min (µA)		Enable Pin
		min (V)	max (V)	min (°C)	max (°C)	min (V)	max (V)	min (V)	max (V)		Boost	Buck-Boost	
SPV1050	Ultra low power energy harvester and battery charger with embedded MPPT and LDOs	0.15	18	-40	85	1.8	3.3	2.2	5.3	0.07	30	5	No
SPV1040	Low Power Energy Harvester with embedded MPPT optimized for outdoor environments	0.45	5.5	-40	85	-	-	2	5.2	0.6	60	-	Yes

DC-DC OR POINT OF LOAD

ST's DC-DC synchronous converters are designed for consumer and portable applications. Buck, buck-boost and boost switching regulators must provide low power consumption, high-efficiency power conversion, and be available in very small packages from standard leadless plastic to flip-chip pure bumped silicon. The switching frequency control loop guarantees high dynamic response with very small inductor size. All products are optimized to work with Li-ion batteries, USB sources or the latest battery chemistries.

KEY FEATURES

- Syncronous rectification and high switching frequency
- Automatic PWM and PSM mode
- Low quiescent current
- Programmable output voltage
- Automatic transition between buck and boost mode
- Low output voltage ripple for noise sensitive systems
- By-pass mode

BENEFITS

- PCB Miniaturization with less passive components. Chip coil inductor can be used for ST1S15
- Maximizes efficency over the whole load range
- Extends system battery life
- One/two/three pins allow selecting the required output voltage
- Allows using battery over the entire operating voltage range
- No secondary stage regulation is needed STBB2/STBB3
- Reduced power consumption for long live battery

Part number	General description	Input voltage (Vin)		Regulated output voltage		Output Current-Max (I_{OUT}) (A)	Quiescent current(Iq) typ (µA)	Switching frequency typ (KHz)	Package
		min (V)	max (V)	min (V)	max (V)				
ST1S15	500 mA, 6 MHz synchronous step-down converter	2.3	5.5	1.82	1.82	0.5	45	6000	Flip-Chip 6
STBB2	800 mA 2.5 MHz, high efficiency dual mode buck-boost DC-DC with by-pass mode	2.3	5.5	1.2	4.5	0.8	35	2500	Flip-Chip 20
STBB3J	2 A, 2 MHz, high efficiency dual mode buck-boost DC-DC converter	1.8	5.5	1.2	5.5	2	35	2000	Flip-Chip 20
STBB3JCC	2 A, high efficiency single inductor buck-boost DC-DC converter and High Brightness White LED Driver	1.8	5.5	1.2	5.5	2	35	2000	Flip-Chip 20
ST1PS01	400 mA Nano-Quiescent™ Synchronous step-down converter with voltage selection and power good	1.8	5.5	0.7	3.3	0.40	0.04	2000	Flip-chip 8
ST1PS02*	400 mA Nano-Quiescent™ Synchronous step-down converter with voltage selection, power good, Aux Switch	1.8	5.5	0.7	3.3	0.40	0.04	2000	TQFN 12 2.0 x 1.7mm

Note: * Full production in Q2 2019

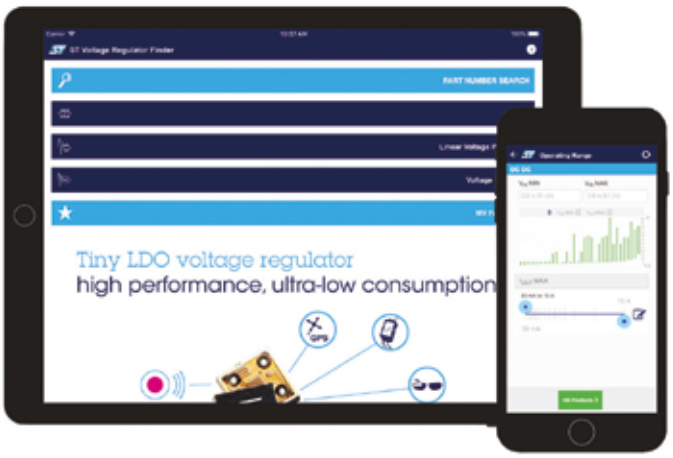
LOW-DROPOUT REGULATOR (LDO)

ST offers a complete portfolio of high-performance LDOs, with state-of-the-art figures on the key merit parameters fitting into the smallest packages available. ST's ultra-small, high-performance LDOs are particularly suitable for the latest generation of portable devices

Part number	General description	Input voltage Range (V)	Output Voltage (V_{OUT}) (V)	Output Current (I_{OUT}) (mA)	Adjustable Regulated Output Voltage	Supply Voltage Rejection Ratio (SVR) (@ 10 kHz) typ (dB)	Dropout Voltage (VD) nom (mV) @ max I_{OUT}	Output Tollerance (%) typ	Quiescent Current (Iq) typ (µA)	Operating Temperature		Package
										min (°C)	max (°C)	
STLQ50	50 mA, 3µA Supply current low drop linear regulator	2.3 to 12	1.8 : 5	50	Yes	20	200	2	3	-40	125	SOT323-5L
LD39115J	150 mA low quiescent current low noise voltage regulator	1.5 to 5.5	0.8 : 4.5	150	No	67	90	2	20	-40	125	Flip-Chip 4
LD59015	150 mA low noise high PSRR linear voltage regulator	2.4 to 5.5	0.8 : 3.3	150	No	76	150	1.8	31	-40	125	SOT323-5L
LD39020	200 mA very low quiescent current Linear regulator IC	1.5 to 5.5	0.8 : 5	200	No	67	200	0.5	20	-40	125	DFN4 1x1
LDBL20	200 mA very low quiescent current Linear regulator IC	1.5 to 5.5	0.8 : 5	200	No	67	200	1.5	20	-40	125	ST STAMP™
LDK120	200 mA low quiescent current very low noise LDO	1.9 to 5.5	0.8 : 3.5	200	Yes	36	150	2	30	-40	125	SOT23-5L; SOT323-5L; DFN6 1.2x1.3
STLQ020	200 mA - ultra low quiescent current linear voltage regulator	2 to 5.5	0.8 : 4.5	200	Yes	50	160	2	0.3	-40	125	Flip-Chip 4; SOT323-5L; DFN6 2x2
LDLN025	250 mA - ultra low noise - high PSRR linear voltage regulator IC	1.5 to 5.5	1 : 5	250	No	70	120	1	12	-40	125	Flip-Chip 4; DFN4 1x1; SOT23-5L"
LD39030SJ	300 mA low quiescent current soft-start, low noise voltage regulator	1.5 to 5.5	0.8 : 4.5	300	No	62	200	2	20	-40	125	Flip-Chip 4
LD39130S	300 mA very low quiescent current Linear regulator IC with automatic Green mode	1.4 to 5.5	0.8 : 4	300	Yes	65	300	1	1	-40	125	Flip-Chip 4; DFN6 1.2 x 1.3
LD59030	300 mA very low drop Linear regulator IC	1.5 to 5.5	0.8 : 5	300	No	67	135	1	28	-40	125	DFN4 1x1
LDK130	300 mA low quiescent current very low noise LDO	1.9 to 5.5	0.8 : 3.5	300	Yes	35	200	2	30	-40	125	SOT23-5L; SOT323-5L; DFN6 1.2x1.3

ST-VREG-FINDER

The ST-VREG-FINDER is a free application for smartphones and tablets that enables a smart selection of products, both bet.



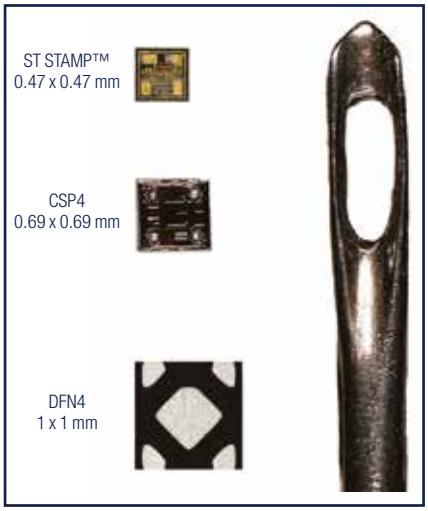
Google play

Available on the App Store

ST STAMP™: A STEP FURTHER IN MINIATURIZATION

ST STAMP™ (ST Small Thickness Advanced Micro Package) is ST's trademark for our new unique and innovative bumpless CSP package.

Compared to the smallest DFN plastic packages and flip-chips, the ST STAMP™ solution provides similar package performance and reliability, reducing the total heigth to 200 µm or less, with a smaller footprint.



SMART RESET

ST's smart reset ICs extend the functional capacity of existing control buttons to give users the possibility of resetting a device, with a single or two simultaneous buttons.

KEY FEATURES

- Choice of a single button or two simultaneous buttons to signal a reset
- Support for applications where the battery cannot be removed
- Tiny packages

Part number	Number of reset button	Number of power button	Reset setup delay typ (sec)	Reset pulse duration (ms). Typ.	Supply voltage (V)	Package
SR1	1	-	(1.5-10)	Push button controlled or factory programmed time	2 to 5.5	DFN6 (1x1.45x0.55)
SR2	2	-	(4-10)	Push button controlled or factory programmed time	1.65 to 5.5	DFN6 (1x1.3x0.55)
SRC0	1	1	Selectable via ext. capacitor	360	1.6 to 5.5	DFN12 (2x3x0.75)

User interface

AUDIO AMPLIFIERS

ST's wide audio IC portfolio includes low-power speaker amplifiers meeting wearable 's requirements.

KEY FEATURES

- High efficiency
- Battery-operated features
- Tiny packages
- High audio quality

Part number	Description	Class	Output power (W)	Efficiency typ (%)	Supply voltage (V)	SNR typ (dB)	THD+N Typ (%)	Package
TS4962M	3 W filter-free power amplifier	D	2.3 (into 4 Ohm) 1.4 (into 8 Ohm)	88	2.4 to 5.5	85	<= 1	9- bump flip chip, 500 um pitch, 1.6 x 1.6 x 0.6
TS2007FC	3 W filter-free differential power amplifier with 6 or 12 dB fixed gain select	D	2.3 (into 4 Ohm) 1.4 (into 8 Ohm)	86	2.4 to 5.5	90	<= 1	9- bump flip chip, 500um pitch, 1.6 x 1.6 x 0.6
TS4990	1.2 W power amplifier with standby active low	AB	1.2 (into 8 Ohm)	-	2.2 to 5.5	> 100	0.1	9- bump flip chip, 500 um pitch, 1.6 x 1.6 x 0.6
TS419/ TS421	360 mW mono amplifier with standby active high/ 360 mW mono amplifier with standby active low	AB	0.190 (into 32 Ohm) 0.270 (into 16 Ohm)	-	2 to 5.5	98	0.1	SO8 MiniSO8 DFN8

LED / OLED

ST provides monolithic OLED power management devices that add value to new designs by simplifying power-supply circuitry and also maximizing battery life for feature-rich portable products. Yet, ST's intelligent LED drivers provide the necessary voltage to power multiple LEDs that can be arranged in different configurations.

AMOLED Power Supply

- World's best product portfolio
- Outstanding electrical performance
  - 90% efficiency in worst case
  - TDMA noise control to minimize display flickering

LCD backlight

- Series and parallel LED configuration powered by linear or switching architectures
- Superior brightness control
  - 1% current matching
  - High resolution PWM dimming
- Full LED diagnostics for service and production

Matrix LED drivers

- High level of integration with embedded power rail
  - Adaptive power rail to maximize efficiency
- Analog and digital PWM dimming for optimum color calibration
- LED failure detection

OLED

Part number	General description	Input voltage (Vcc) min (V)	Output voltage (Vout) (positive)		Output voltage variation (positive) typ (%)	Quiescent current (Iq) typ (mA)	Switching frequency typ (MHz)	Topology	Efficiency max (%)	Package
			min (V)	max (V)						
STOD1317B	170 mA 13 V, high efficiency boost converter + LDO	2.6	6	13	-1.0, +1.0	1	1.2	Boost cascaded with an LDO	85	DFN12
STOD32W	100 mA triple DC-DC converter for powering AMOLED displays	2.9	4.577	4.623	-0.5, +0.5	-	1.55	Boost + Inverting	92	Flip-Chip 12

LED DRIVERS

Part number	General description	Input voltage (Vcc)		Output current-Max (I_{OUT}) nom (mA)	Output current accuracy typ (%)	Number of LEDs max ()	Switching frequency typ (MHz)	LED configuration	Package
		min (V)	max (V)						
STLED524	Intelligent matrix LED display driver	2.7	5.5	480	7.5	5x24	2.4	Matrix	CSP 56 3.4 x 3.0 mm, pitch 0.4 mm
STP4CMP	Low voltage 4-channel constant current LED driver with charge pump	2.7	5.5	120	7	4	-	Parallel	QFPN 20 3.2 x 1.8
LED1202*	12-Channels,1.8 V compatible I²C, 12-bit PWM, 8-bit Analog local dimming, 8 patterns with progammable patterns sequence, Low Iq, Open LED Detection.	2.6	5	20	1	12	-	Parallel	WLCSP 1.71 x 2.16 x 0.5 mm 20 with 0.4 mm pitch and ball 0.25mm. VFQFPN 3 x 3 x 0.6 20L with 0.5 mm pitch

Note: * Available in Q1 19

FingerTip TOUCHSCREEN CONTROLLERS

ST's FingerTip® family of touch controllers provides true multi-touch capability, supporting unlimited simultaneous touches. These devices represent a marked improvement by providing an optimal mix of low power, small size and highly-precise multiple finger tracking in a single chip.

KEY FEATURES

- Small touch screen size with round or square form factor
- Support all types of Touch ITO
- Support multi-finger, thick glove, wet fingers and 1 mm passive pen
- Ultra-low power for longer battery life
- Noise immunity to all sources
- High SNR
- Scan rate >150 Hz
- GPIO for button support
- I²C interface
- Small and thin QFN 4x4x0.4 mm

The latest FingerTip series is available for selected customers for high volume. For more information, contact your ST sales office.

REAL-TIME CLOCK

ST's M41T62LC6F real-time clock is the perfect match for wearable devices when size, weight, and power-efficiency matters. It offers a very low frequency error at 25 °C which equates to about 5 seconds per month, an ultra-low power consumption of 350 nA in stand-by, and comes in an ultra-small 1.5 x 3.2 mm package with an embedded crystal oscillator.

BENEFITS

- Ultra-small package with embedded crystal 1.5 x 3.2 x 0.8mm
- Ultra-low power consumption 350nA
- Timekeeping voltage down to 1 V
- Programmable alarms with wake-up functions
- +/- 2PPM accuracy by digital calibration
- Compatible with Li-Ion battery voltages

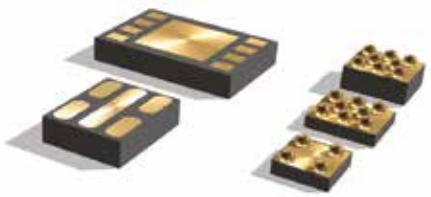
Part number	General description	Package	Battery supply current (nA typ.)	Data Bus type	Supply Voltage min-max (V)
M41T62	Ultra low-power serial real-time clock	LCC8 (3.2 x 1.5mm)	350	I²C	1.3-4.4

Serial EEPROM

STMicroelectronics is Nb 1 Serial EEPROM supplier since more than 10 years thanks to a complete range of densities and packages which brings flexibility in design and enable reliable parameter management. The latest Serial EEPROMs designed with advanced technology offer the required features for comfortable and high performance wearables.

FLEXIBILITY AND HIGH ENDURANCE

- Byte granularity — Flexible data management for accurate modules
- Best NVM for low power operation — Use EEPROM for Longer battery life time
- Low voltage operation 1.6 V min — Operates with weak battery
- 4 Million cycles per byte at 25 °C — Enables datalog for precise data collection



		2 Kb	4 Kb	8 Kb	16 Kb	32 Kb	64 Kb	128 K	256 K	512 K	1 Mb	2 Mb
I²C	DFN8 2 x 3 mm	•	•	•	•	•	•	•	•	•		
	DFN5 1.5 x 1.7 mm	•	•	•	•	•	•	•				
	WLCSP 8 balls						•	•	•	•	•	•
	WLCSP Ultrathin 4 balls			•	•	•	•	•				
SPI	DFN8		•	•	•	•	•	•	•	•		
	WLCSP 8 balls						•	•	•	•	•	•

Read more at www.st.com/standardeeprom

WLCSP THE SMALLEST FOOTPRINT

- Low pin count for I²C bus — Only 4 wires routing
- Smallest size at 0.5 mm² — Almost invisible PCB footprint
- Ultra Thin < 0.3mm — Fits the thinest modules
- Light weight < 1mg — For comfortable wearables

SELECT YOUR PRODUCT WITH ST EEPROM FINDER APP

ANDROID APP ON Google play

Available on the App Store

ESD protection

Wearable devices are by nature vulnerable to ESD. Indeed, they are small integrated devices using ESD-sensitive ICs with thin lithography technologies and in close contact with electrostatic charges that a human can develop in low relative humidity. The risk of ESD damage is then very high.

Benefits of ST's current ESD protection devices:

- High efficiency of protection with low clamping voltages down 7 V with Snapback « Z » series.
- Transparency to high-speed signals with ultra-wide bandwidth up to 20 GHz
- Flexibility and Integration with single- or multi-line products from 01005 package size
- High robustness against surges with capability up to 30 kV
- High Ipp versions to combine EOS and ESD in smallest packages

Part number	Number of lines	Directionality	Breakdown voltage (in volt)	Capacitance line to GND (C_{line} in pF)	Clamping voltage max (V_{CL} @ 30 ns)	IEC 61000-4-2 min (contact for 8 kV in V)	Package & size (mm x mm)
General purpose ESD protection							
ESDA5-1BF4	1	Bi-Directional	5.8	45	11	8	ST0201 0.6 x 0.3
ESDZV5-1BF4	1	Bi-Directional	5.8	5	7	18	ST0201 0.6 x 0.3
ESDZV5-1BU2	1	Bi-Directional	5.5	6	9	8	ST0201 0.6 x 0.3
ESDZV5H-1BU2	1	Bi-Directional	5.5	4	10	14	ST0201 0.6 x 0.3
ESDZV18-1BF4	1	Bi-Directional	18	3	21.5	30	ST0201 0.6 x 0.3
ESDZV5-1BV2	1	Bi-Directional	5.8	5	7	16	ST01005 0.2 x 0.45
ESDAVLC12-1BV2	1	Bi-Directional	12	7	30	15	ST01005 0.2 x 0.45
ESDAVLC5-4BU4	4	Bi-Directional	5.5	6	15	15	uQFN-4L 0.9 x 0.5
High-speed signals ESD protection							
ESDAXLC5-1U2	1	Uni-Directional	5	0.55	10,4	16	ST0201 0.6 x 0.3
ESDARF02-1BU2CK	1	Bi-Directional	5	0.25	19	8	ST0201 0.6 x 0.3
HSP051-4N10	4	Uni-Directional	4.5	0.4	13	8	uQFN-10L 1.9 x 1.0
HSP053-4M5	4	Uni-Directional	5.8	0.25	15	10	uQFN-10L 1.3 x 0.8
USBULC6-2N4	2	Uni-Directional	6	0.6	17	12	uQFN-4L 1.0 x 0.8
USB Vbus and Vbat ESD & EOS protection							
Part number	**Number of lines**	**Directionality**	**Voltage**	**Peak pulse current (I_{PP} @ 8/20 µs**	**V_{CL} @ I_{PP} (@ 8/20 µs surge)**	**IEC 61000-4-2 min (contact for 8 kV in V)**	**Package & size (mm x mm)**
ESDA7P60-1U1M	1	Uni-Directional	5.5	80	8	30	ST1608 1.6 x 0.8
ESDA7P120-1U1M	1	Uni-Directional	5.5	120	11	30	ST1608 1.6 x 0.8
ESDA8P30-1T2	1	Uni-Directional	6.3	30	12	30	SOD882T 1.0 x 0.6
ESDA13P70-1U1M	1	Uni-Directional	12	70	20	30	ST1608 1.6 x 0.8
ESDA15P60-1U1M	1	Uni-Directional	13.2	60	20	30	ST1608 1.6 x 0.8
ESDA17P50-1U1M	1	Uni-Directional	15	50	24	30	ST1608 1.6 x 0.8
ESDA17P100-1U2M	1	Uni-Directional	15	160	28	30	QFN 2.0 x 1.8
ESDALC20-1BF4	1	Bi-Directional	20	2.4	37	20	ST0201 0.6 x 0.3
ESDA22P150-1U3M	1	Uni-Directional	20	150	27	30	QFN 2.0 x 2.0
ESDA25P35-1U1M	1	Uni-Directional	22	35	39	30	ST1608 1.6 x 0.8
ESDA24P140-1U3M	1	Uni-Directional	22	140	33	30	QFN 2.0 x 2.0

EMI filtering

Wearable devices are sensitive to electro-magnetic interference. They are small integrated devices with a high density of components mounted on PCB. The risk of antenna desense and EMI coupling must be mitigated.

ST offers a wide range of EMI and common-mode filters (ECMF™) with the following benefits:

- Drastically reduce radiated noise and antenna de-sense with unique extra large rejection band or extra deep rejection at selected frequencies
- High integration: 1mm^2 for 2 differential lines for ECMF™
- High quality of protection with low clamping voltages

EMI FILTERS

Part number	Target interface	Number of lines	Number of integrated discrete components	Clamping voltage max (V_{CL} @ 30 ns in V)	IEC 61000-4-2 min (contact discharge) in kV)	Package	Package size (mm x mm)
EMIF02-SPK03F2	Speaker	2	10	16.7 V for 30 kV contact surge	30	WLCSP	0.89 x 1.26
EMIF02-MIC03F2	Micro	2				WLCSP	
EMIF04-EAR02M8	Audio jack	4	20	9.2 V for 8 kV contact surge	30	uQFN-8L	1.5 x 1.7
EMIF06-USD04F3	Micro-SD card	6	24	24.9 V for 8 kV contact surge	8	WLCSP	1.54 x 1.54
EMIF08-VID1F3	Keypad, camera, LCD	8	40	4.5 V for 8 kV contact surge	20	WLCSP	1.04 x 3.15

COMMON-MODE FILTERS

Part number	Number of lines	Attenuation @ Frequency	Bandwidth (@-3 dB) in MHz	Clamping voltage max (V_{CL} @ 30 ns in V)	IEC 61000-4-2 min (contact discharge) in kV)	Package	Package size (mm x mm)
ECMF02-2HSMX6	2	-20 dB @ 2400 MHz	3200	26,8	8	uQFN-6L	1.35 x 1.60
ECMF02-2BF3	3	-30 dB @ 900 MHz	5000	30	10	WLCSP	1.35 x 0.83
ECMF4-20A42N10	4	-13 dB at 0.7 GHz -15 dB at 1.5 GHz -25 dB at 2.4 GHz -23 dB at 2.7 GHz -13 dB at 5.0 GHz	5000	11	8	uQFN-10L	1.35 x 2.2
ECMF4-2450A60N10	4	-30 dB at 2.4 GHz -15 dB at 5.0 GHz	6000	11	10	uQFN-10L	1.35 x 2.2

Design support

Considering the wide product portfolio for Wearable applications, ST provides different hardware and software solutions to help designers in their job. Starting from the Product Evaluation Boards, that can be used to perform a comprehensive evaluation of ST's products, arriving to the Solution Evaluation Boards tailored to exploit one or more features of the application. Between these two families of evaluation boards, ST offers a fast and modular prototyping system, namely STM32 Open Development Environment (ODE), which permits to combine STM32 microcontroller with a broad range of expandable boards to reproduce the desired set of functions for sensing, connectivity, power, audio, motor control and more.

The ST Software Development Tools complement the ST hardware ecosystem adding programming tools, firmware libraries, middleware and stacks to reduce the design complexity.

PRODUCT EVALUATION BOARDS

These evaluation boards help you to evaluate the features and performance of selected products, all of them have been published online fully tested schematics, BOMs, and Gerber files to facilitate your hardware design. Many, where appropriate, also have firmware or demonstration software packages available as well. You can easily find the right Product Evaluation Board associated to the selected product in the same web page of it.

STM32 OPEN DEVELOPMENT ENVIRONMENT

The STM32 Open Development Environment (STM32 ODE) is an open, flexible, easy and affordable way to develop innovative devices and applications based on the STM32 32-bit microcontroller family combined with other state-of-the-art ST components connected via expansion boards. It enables fast prototyping with leading-edge components that can quickly be transformed into final designs.

The STM32 ODE includes the following five elements:

- STM32 Nucleo development boards. A comprehensive range of affordable development boards for all STM32 microcontroller series, with unlimited unified expansion capability, and with integrated debugger/programmer
- STM32 Nucleo expansion boards. Boards with additional functionality to add sensing, control, connectivity, power, audio or other functions as needed. The expansion boards are plugged on top of the STM32 Nucleo development boards. More complex functionalities can be achieved by stacking additional expansion boards
- STM32Cube software. A set of free-of-charge tools and embedded software bricks to enable fast and easy development on the STM32, including a Hardware Abstraction Layer, middleware and the STM32CubeMX PC-based configurator and code generator
- STM32Cube expansion software. Expansion software provided free of charge for use with STM32 Nucleo expansion boards, and compatible with the STM32Cube software framework
- STM32 ODE Function Packs. Set of function examples for some of the most common application cases built by leveraging the modularity and interoperability of STM32 Nucleo development boards and expansions, with STM32Cube software and expansions.

The STM32 Open Development Environment is compatible with a number of IDEs including IAR EWARM, Keil MDK, mbed and GCC-based environments.

Sharing Arduino™ connectors and ST morpho headers, STM32 Nucleo boards can easily be extended with a large number of expansion boards available from ST and from third parties. Stack as many boards as you need to create the functionality required.

What you want to do	What we provide	Components	Board reference
Process and Storage*	Ultra-low power	STM32L0 - Arm® Cortex®-M0+ ultra-low power 32-bit MCU	NUCLEO-L053R8
	High performance	STM32F4 - Arm® Cortex®-M4 high-performance 32-bit MCU	NUCLEO-F401RE
	Rich peripheral set	STM32L4 - Arm® Cortex®-M4 ultra-low power, high-performance 100DMIPS 32-bit MCU with USB-OTG, rich peripheral set and security features	NUCLEO-L476RG
	Standard serial EEPROM	Standard I²C and SPI EEPROM memory expansion board based on M24xx and M95xx series for STM32 Nucleo	X-NUCLEO-EEPRMA1
Sense motion, pressure, humidity, temperature, distance, light, sound	Motion & Environmental sensors	LSM6DSL 3-axis accelerometer + 3-axis, LSM303AGR 3-axis magnetometer + 3-axis accelerometer, HTS221 humidity and temperature, LPS22HB pressure	X-NUCLEO-IKS01A3
		LSM6DSO 6-axis AXL + GYRO, LIS2DW12 3-axis AXL, LI2MDL 3-axis Magnetometer, HTS221 humidity and temperature, LPS22HH pressure	X-NUCLEO-IKS01A2
	Proximity sensors	VL6180X FlightSense™ proximity, gesture and ambient light sensor	X-NUCLEO-6180XA1
		VL53L0X FlightSense™ ranging and gesture sensor	X-NUCLEO-53L0A1
		VL53L1X FlightSense™ ranging and gesture sensor	X-NUCLEO-53L1A1
	Microphone	MP34DT01-M digital microphone	X-NUCLEO-CCA02M1
Connect	Bluetooth Low Energy 4.1	BlueNRG-MS based Bluetooth Low Energy (V4.1) Module	X-NUCLEO-IDB05A1
	Sub-GHz radio	SPIRIT1 RF SPSGRF-868 module	X-NUCLEO-IDS01A4
		SPIRIT1 RF SPSGRF-915 module	X-NUCLEO-IDS01A5
		SPIRIT2 RF Sub-1 GHz 868	X-NUCLEO-S2868A1
	NFC	M24SR Dynamic NFC tag	X-NUCLEO-NFC01A1
		M24LR Dynamic NFC tag	X-NUCLEO-NFC02A1
		CR95HF NFC Reader	X-NUCLEO-NFC03A1
		ST25DV Dynamic NFC/RFID tag	X-NUCLEO-NFC04A1
		ST25R3911B NFC Reader	X-NUCLEO-NFC05A1
GNSS/GPS	Navigation	GNSS expansion board based on Teseo-LIV3F module for STM32 Nucleo	X-NUCLEO-GNSS1A1
Move/Actuate	Motor driver	STSPIN230 Low-voltage BLDC 3-phase motor driver	X-NUCLEO-IHM11M1
		STSPIN240 Low-voltage dual-brush DC motor driver	X-NUCLEO-IHM12A1
		STSPIN250 Low-voltage DC motor driver	X-NUCLEO-IHM13A1
		STSPIN233 Low-voltage 3-phase brushless DC motor driver	X-NUCLEO-IHM17M1
Human Machine Interface	Battery and energy management	VPS2535H 24V Intelligent power switch	X-NUCLEO-IPS02A1
	LED Lighting	LED6001 Single channel LED driver with integrated boost controller	X-NUCLEO-LED61A1
		16-channel LED driver board	X-NUCLEO-LED16A1
Discovery Boards	IoT Discovery Kit	STM32L4 Discovery kit IoT node, low-power wireless, BLE, NFC, SubGHz, Wi-Fi	B-L475E-IOT01A
	STM32L4 Discovery IoT node	Discovery kit with STM32L496AG MCU	32L496GDISCOVERY
		Discovery kit with STM32L4R9AI MCU	32L4R9IDISCOVERY
	Bluetooth® Low Energy and 802.15.4 Nucleo pack	STM32WB Nucleo pack for wireless solutions	P-NUCLEO-WB55
Others	Audio processing	STA350BW High-efficiency digital audio system	X-NUCLEO-CCA01M1
	Op Amp	Operational Amplifiers (TSZ124)	X-NUCLEO-IKA01A1

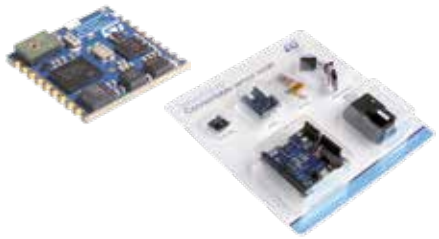
Table as of December 1st 2018. For latest update please refer to www.st.com/x-nucleo
Note: * Additional STM32 Nucleo development boards can also be used with firmware adaption

WEARABLE SOLUTION EVALUATION BOARD

ST offers a variety of reference platforms to easy develop wearable applications, these satisfy some of main design challenges: compact solutions, ultra-low power hardware and firmware features, turn-key software on host device (i.e. Smartphone or Tablet).

SensorTile development kit

STEVAL-STLKT01V1



KEY FEATURES

- 13x13 mm solderable module (STEVAL-STLCS01V1) and connectable module (STEVAL-STLCS02V1)
- SensorTile expansion Cradle board equipped with audio DAC, USB port and STM32 Nucleo connector
- SensorTile Cradle with battery charger, humidity and temperature sensor, SD memory card slot and USB port
- 100 mAh Li-Ion battery, UN38.3 tested and certified
- SWD programming cable
- Fully tested and certified by FCC, IC, Japan Radio

BlueCoin Development Kit

STEVAL-BCNKT01V1

KEY FEATURES

- BlueCoin module with STM32, Motion Sensors, Microphones and Bluetooth Low Energy Connectivity
- Coin Station board equipped with Time-of-Flight sensor and Power Management stage
- BlueCoin Cradle with SD memory card slot, USB port and battery connector
- 130 mAh Li-Po battery, UN38.3 tested and certified
- Fully tested and certified by FCC, IC

NFC Sensor TAG solution

STEVAL-SMARTAG1

KEY FEATURES

- Multiple ST technologies: NFC dynamic tag connectivity and energy harvesting, Low Power MCU, environmental and motion sensors
- Multiple applications: Asset Tracking, Cold Chain, Medical, smart sensing, smart home, smart city and home building automation
- Complete evaluation solution available from ST in small form factor 4x4 cm
- Mobile App (Android/iOS) available
- FCC verified

Geo IoT Tracker

STEVAL-STRKT01

KEY FEATURES

- Optimized tracker solution over LoRaWAN network with simultaneous multi-constellation GNSS positioning and Geofencing support
- Battery operated solution with smart power management architecture
- Environmental and motion sensors
- Data Logging
- High flexibility to cover different application profiles (pet-tracker,asset monitoring, …)

BlueNRG-Tile Bluetoothe LE enabled sensor node development kit

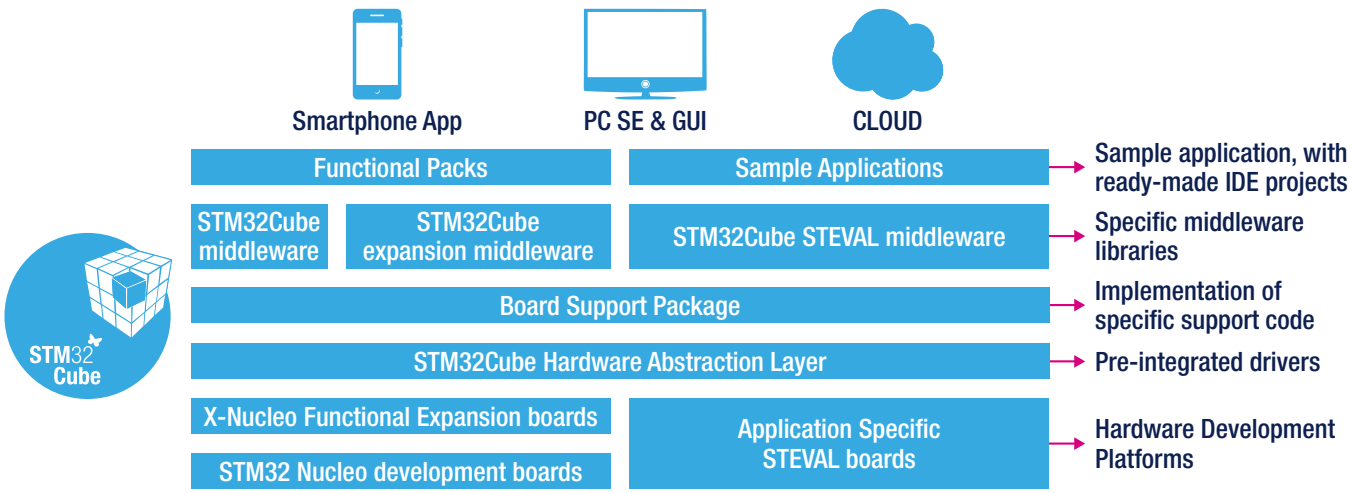
STEVAL-BCN002V1B

KEY FEATURES

- STEVAL-BCN002V1B evaluation kit with STEVAL-BCN002V1 sensor board (a.k.a. BlueNRG-Tile) and STEVAL-BCN002V1D programming board
- BlueNRG-Tile Bluetooth LE enabled multi-sensor node development kit based on BlueNRG-2 SoC Bluetooth Low Energy application processor
- All-in-one IoT-node including accelerometer, gyroscope, magnetometer, pressure, humidity, Time-of-Flight and microphone sensors, powered by a common CR2032 coin cell
- Embedded SMD chip antenna, according to FCC, IC and RED regulations in terms of safety directives and standards
- Comprehensive STSW-BLUETILE-DK Software Development Kit (SDK) including 9-axis sensor fusion and data streaming, ADPCM compression and voice streaming, HID peripheral, BLE Beacon, BlueNRG-Mesh, and OTA FW update
- ST BLE Sensor App available on Android (Google Play) and iOS (iTunes) stores, and mobile SDK with major cloud providers support

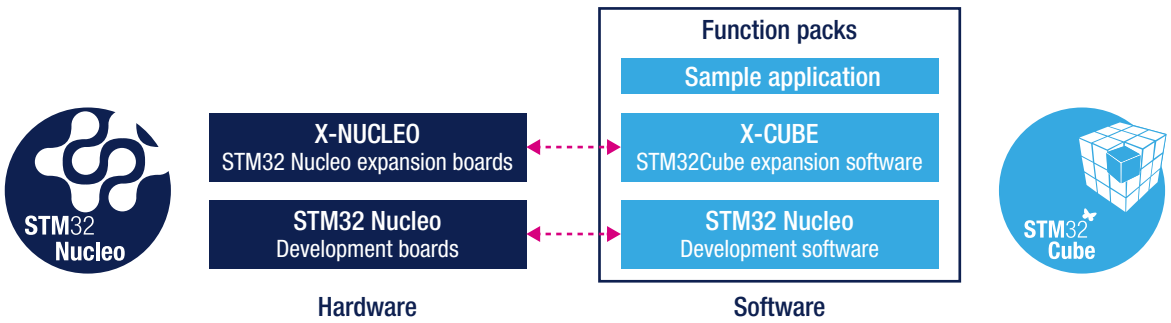
SOFTWARE DEVELOPMENT TOOLS

The ST Software Development Tools complement the ST hardware ecosystem adding programming tools, firmware libraries, middleware, codecs, protocol stacks and application examples to reduce the design complexity.



STM32 ODE FUNCTION PACKS

STM32 Function Packs are a combination of low-level drivers, middleware libraries and sample applications assembled into a single software package. Used together with the suggested combination of STM32 Nucleo development boards and X-NUCLEO expansion boards, Function Packs help jump-start the implementation and the development of a number of “functions” in different domains: Cloud connectivity, Networking, Security and Sensing.



PC SOFTWARE TOOLS

These evaluation boards help you to evaluate the features and performance of selected products, all of them have been published online fully tested schematics, BOMs, and Gerber files to facilitate your hardware design. Many, where appropriate, also have firmware or demonstration software packages available as well. You can easily find the right Product Evaluation Board associated to the selected product in the same web page of it.

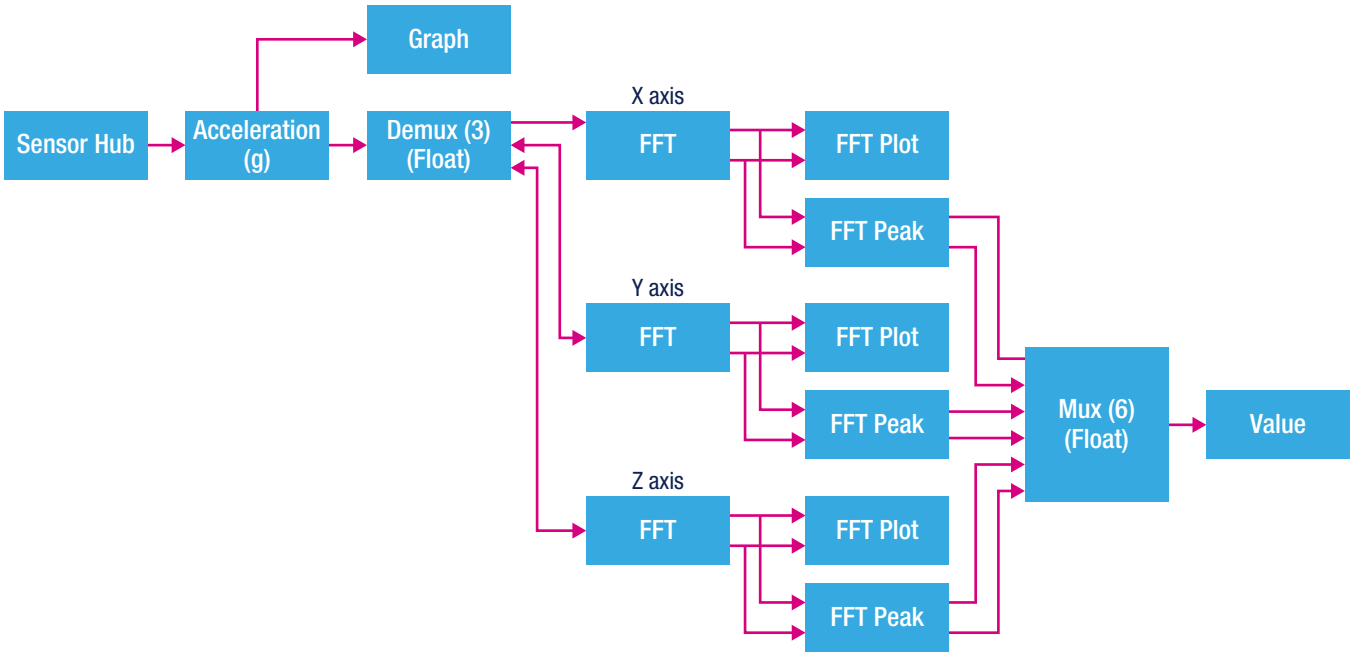
eDesignSuite

eDesignSuite is an easy-to-use comprehensive software suite ready to help customers define their needs by transforming their application requirements into satisfactory solutions based on the wide range of ST products.
The suite includes three types of software tool:

- Smart simulator and system design engine
  - It is able to suggest products and topologies for various types of application like power conversion (SMPS, photovoltaic and battery charger), LED lighting, signal conditioning and RF design. The main features of this tool type are: automatic proposal for complete solution or fully customizable design, fully annotated and interactive schematics, complete and interactive bill of materials, main current and voltage simulations, efficiency curves, Bode stability and power-loss data, and fully interactive transformer design.
- Smart product selectors
  - This tool type is used to help select the products (e.g. diodes) best suited to your application. The main features of this tool type are: part numbers proposed based on application electrical specifications, I-V curves comparison among several part numbers, power losses calculated based on voltage/current target application waveforms.
- Configurators
  - It is used to reduce implementation time and efforts for setting product parameters for the specific application(e.g. STLUX & STNRG SMEDs for lighting and power, Workbench for motor control). The main features of this tool type are: SMED configurator schemes, input configuration, clock/comparators and ADC settings, FSM (finite state machine) configuration, C code generation, load register setting on board in a click.

AlgoBuilder

For algorithm development, ST offers a graphical tool integrated with STM32 ODE (called Algobuilder) which can be used, connecting graphical blocks in a simple GUI, to automatically generate the code needed to run ST's sensors.



It quickly elaborates prototypes of applications for STM32 microcontrollers and MEMS sensors, including already existing algorithms (i.e. sensor fusion or pedometer), user-defined data processing blocks and additional functionalities. The results of such code can be verified quickly on screen and the can be integrated with all the other routines directly inside the IDE.

SMARTPHONE APPS AND SDKS

Several Apps are available to evaluate quickly ST Solutions, multi-platform Software Development Kit for Android and iOS. Easy development thanks to the source code availability and application examples available for quick startup.

Board Data collecting and configuration services

ANDROID APP ON Google play

Available on the App Store

Over the Air Firmware Upgrade

CLOUD PARTNERS PROGRAM

ST offer a Cloud Partners Program* permitting users to focus on wireless node added values. Available for developers there are Cloud Access Functions Packs providing reference implementations for connecting STM32ODE developer systems directly with cloud service providers without the need for developers to write specific code.

Visit www.st.com for further details.

Note: * Cloud platform development available according to partners standard schemes.

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