Discover ST’s portfolio for signal conditioning, interface, and power management in wearables
Wearable devices attributes

- Always on
- Low power
- Compact
- Environment aware
- Intelligent
- Connected

Devices worn for an extended time with significantly enhanced user experience
Market and applications

**Fitness and wellness**
Monitor activity and emotions
- Activity monitors, foot pods and pedometers, entertain sleep sensors, heart rate monitors
- Emotional measurement
- Smart clothing, smart watches, heads-up displays

**Healthcare and medical**
Monitor vital signs
- Blood pressure monitors, ECG monitors, continuous glucose monitoring
- Insulin pumps, drug delivery products

**Infotainment**
Entertain and enhance lifestyle
- Headsets
- Smart glasses, smart watches

**Industrial**
Hand-worn terminals, heads-up displays, smart clothing, wearable detection devices.
Operational amplifiers
Large portfolio of highly power efficient op amp in tiny packages

Smart reset
Customizable products providing safe and convenient reset

Battery gas gauges
Low-power gas gauge providing very accurate battery life indicator

Current sensors
High accuracy current measurement for contactless battery chargers

Audio amplifiers
High-efficiency Class D and G amplifiers for headsets and speakers

DC-DC Buck regulators
Very high efficiency in any output load conditions, high integration, flexibility

New ST LDOs for smartphones
The one-stop-shop supplier
Wearable devices

Analog and mixed signal products partitioning

- Digital sensors
- Analog front-end
- Analog sensors
- Power management
- MCU
- User interface
- Connectivity
- Operational Amplifiers
- Analog switches
- Smart reset
- Current sensors
- Battery gas gauges
Solutions for analog front-end
Analog transducers, getting the best from your sensor

Analog sensors need signal transducers to deliver the information to the MCU

- Accurate and stable to guarantee the maximum precision of the information
- Low power to guarantee a longer user experience
- Small to be integrated in the most stylish and thin designs

<table>
<thead>
<tr>
<th></th>
<th>Input offset voltage [µV]</th>
<th>Input offset voltage drift [µV]</th>
<th>Supply current [µA]</th>
<th>GBP [kHz]</th>
<th>Supply voltage [V]</th>
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</thead>
<tbody>
<tr>
<td><strong>TSU10x</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Very low power</td>
<td>100</td>
<td>5</td>
<td>0.6</td>
<td>8</td>
<td>1.5 - 5.5</td>
</tr>
<tr>
<td><strong>TSV71x</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low power precision</td>
<td>50</td>
<td>10</td>
<td>9</td>
<td>120</td>
<td>1.5 - 5.5</td>
</tr>
<tr>
<td><strong>TSZ12x</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High precision zero drift</td>
<td>1</td>
<td>0.01</td>
<td>28</td>
<td>400</td>
<td>1.8 - 5.5</td>
</tr>
</tbody>
</table>

ST offers a dedicated set of op amps to deliver the best match of current consumption and precision, for a wide range of applications.

More info on Operational Amplifiers
Analog Front-End
Signal transducers application: electromyography

A low input offset voltage with zero drift amplifier is mandatory. Otherwise, the electrodes information would be less accurate or lost. TSZ12x family is the perfect match offering:
- $V_{IO} = 1 \mu V$
- $\Delta V_{IO}/\Delta T = 0.010 \mu V$

Once the signal dynamic has been restored precision and micro power consumption amplifiers are needed before the signal is fed to the MCU TSV71x is the perfect match offering:
- $V_{IO} = 50 \mu V$
- $I_{CC} = 9 \mu A$
User Interface
Audio amplifiers

ST offers highly-efficient devices that can deliver high-quality audio into small, low power solutions.

CLASS G HEADPHONE AMPLIFIER
**TS4621ML | TS4621E** (μ-less)
- Power supply range 2.3 V - 4.8 V
- Low stand by current 0.6 μA
- Vout = 0.8 Vrms into 16 Ω, at 1% THD+N, VCC = 3.6 V
- SNR = 100 dB @ 1 kHz
- Reduced external BOM
- Flip-chip package

3W CLASS D MONO SPEAKER AMPLIFIER
**TS4962M**
- Power supply range 2.4 V - 5.5 V
- Low stand by current <1 μA
- Pout = 0.8 W into 8 Ω, at 10% THD+N, VCC = 3 V
- SNR = 85 dB @ 1 kHz
- Reduced external BOM
- Small flip-chip package

Low power
High quality
Small size

Headphone and Low Power Amplifiers - online
Solutions for power management
KEY APPLICATIONS
- Smartphones
- Tablets
- Handheld devices
- Wearable
- IoT
- Non-removable battery powered devices

KEY FEATURES
- 1 or 2 push buttons
- Customizable Reset set-up delay
- Device ship mode
- Tiny package

SMART RESET ICs
Extend the functionality of existing buttons by enabling ‘hidden’ features (hard reset, factory reset etc) that can be activated by users with long press on 1 or 2 buttons simultaneously.

<table>
<thead>
<tr>
<th></th>
<th># of reset buttons</th>
<th>Reset set-up delay</th>
<th>Reset pulse duration</th>
<th>extra feature</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>STM6519</td>
<td>1</td>
<td>1.5s to 10s</td>
<td>Fixed or push button controlled</td>
<td>Customer test mode</td>
<td>DFN-6</td>
</tr>
<tr>
<td>STM6520</td>
<td>2</td>
<td>7.5s to 12.5s</td>
<td>Fixed or push button controlled</td>
<td>1 push-pull output</td>
<td>DFN-8</td>
</tr>
<tr>
<td>STM6524</td>
<td>2</td>
<td>4s to 10s</td>
<td>Fixed or push button controlled</td>
<td>Customer test mode</td>
<td>DFN-6</td>
</tr>
<tr>
<td>STM6600</td>
<td>1</td>
<td>Selectable via ext. capacitor</td>
<td>360ms</td>
<td>1 power button</td>
<td>DFN-12</td>
</tr>
<tr>
<td>STM6620</td>
<td>2</td>
<td>10s</td>
<td>push button controlled</td>
<td>Ship mode</td>
<td>QFN-10</td>
</tr>
</tbody>
</table>
STUSB4500L
USB-C charging - SINK

Auto-run / plug & play / optional MCU support
SOURCE power budget identification
Automatic error recovery and **restart** on fault
Dead battery support

**Collateral**
STSW-STUSB002 - GUI
STSW-STUSB007 - Software library

**Package**
QFN-24 EP 4x4 mm²
CSP-25 2.6x2.6 mm²

**Evaluation boards & ref designs**
open source ALTIUM library
EVAL-SCS002V1

**STUSB4500L – USB micro-B replacement – 15 W**
Wearable, portable consumer, gaming, healthcare, POS

Find out more
### Current sensing

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>TSC101</td>
<td>1.5</td>
<td>2.8 - 30.0</td>
<td>4.0 - 24.0</td>
<td>165</td>
<td>20, 50, 100 fixed internally</td>
<td>no</td>
<td>SOT23-5L</td>
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<tr>
<td>TSC103</td>
<td>0.5</td>
<td>2.9 - 70.0 -2.1 - 65.0</td>
<td>2.7 - 5.5</td>
<td>200</td>
<td>20, 50, 100 pin selectable</td>
<td>no</td>
<td>TSSOP-8L, SO-8</td>
</tr>
<tr>
<td>TSC21x</td>
<td>0.035</td>
<td>-0.3 - +26</td>
<td>2.7 - 26</td>
<td>100</td>
<td>200 500 1000 50 100 75</td>
<td>yes</td>
<td>SC70-6, QFN-10L</td>
</tr>
</tbody>
</table>

#### Power management in wearable devices:
- Wired or wireless battery chargers
- Precision current sources from sensors
- Photovoltaic systems

#### ST current sensing ICs portfolio cover most application needs:
- Independent supply and common mode voltages
- Wide supply voltage range
- Selectable gains
- Low power solutions

More info Current Sensing - online
• When swimming water pressure can reach up to 5 atm
• Wearable technology needs to be sealed. All the electrical connections with the external have to be removed.
• Wireless battery charging is mandatory

Current sensing application: wireless battery charging

High side current sensing through the transmitter coil to dynamically regulate the charger power output

- 19V power source
- TSC103
- Half bridge gate driver 30 V Mosfets
- Digital controller
- Transmitter / Base station
- Receiver / Device
- Power
- Communication
Intelligent battery monitoring

STC3115 - Gas gauge IC with alarm output for wearable devices

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Accuracy</strong></td>
<td>• Coulomb counter mode, voltage mode and mixed mode operations</td>
</tr>
<tr>
<td></td>
<td>• 0.25 % accuracy battery voltage monitoring</td>
</tr>
<tr>
<td><strong>Robustness</strong></td>
<td>• Analog and temperature compensation</td>
</tr>
<tr>
<td></td>
<td>• Internal temperature sensor</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>• Low battery level alarm output with programmable thresholds</td>
</tr>
<tr>
<td></td>
<td>• Custom battery OCV curve</td>
</tr>
<tr>
<td><strong>Low power</strong></td>
<td>2 µA in standby, 45 µA in operating</td>
</tr>
<tr>
<td><strong>Small size</strong></td>
<td>Flip chip, 2.01 x 1.37 x 0.6 mm, 10 bumps, 0.4 mm pitch</td>
</tr>
</tbody>
</table>

ST offers an integrated solution combining current integration and voltage variation over the time thus providing the most accurate battery status measurement.

Read more about battery fuel gauge - online
New ST LDOs for smartphones
One-stop shop supplier

**LD56050**
500 mA Ultra Low Dropout
Separate Bias Rail
Low output voltages

**LD56100**
1 A Ultra Low Dropout
Fast transient
Ultra Low Noise

**LD56020**
200 mA, low input voltage
High PSRR, Low noise

**LD39130S**
300 mA Ultra Low I<sub>Q</sub>
Green Mode

**LD57100**
1 A Ultra, Low I<sub>Q</sub>
Low Dropout with bias

**LD59030**
300 mA Ultra Low Dropout

**LDLN025**
250 mA Ultra Low Noise
Very High PSRR
DC-DC buck regulators

**Very high efficiency in any output load conditions**
- 95% typical efficiency at 1mA load
- 92% typical efficiency at 400mA load

**High integration for the minimum board size and number of external components**
- Synchronous rectification
- Internal Loop Compensation
- Tiny external components
- Embedded Soft start Circuit

**Flexibility**
- Extended input voltage range, minimum Vin=1.8V
- Dynamic output voltage selection

**KEY APPLICATIONS**
- Wearable application
- Personal Tracking monitors
- Industrial sensors
- Bluetooth Low Energy

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**ST1PS01**

**Part Numbers**
- ST1PS01AJR
- ST1PS01BJR
- ST1PS01CJR
- ST1PS01DJR
- ST1PS01EJR
- ST1PS01FJR
- ST1PS01GJR
- ST1PS01HJR

**Output Voltages**
- From 1.9V to 2.8V
- From 1.1V to 1.7V
- From 1V to 1.5V
- From 1.8V to 2.8V
- From 1.8V to 3.3V
- From 1.05V to 1.55V
- From 0.73V to 1V
- From 0.625V to 1.05V

**Package**
- FlipChip

**ST1PS02**

**Part Numbers**
- ST1PS02AQTR
- ST1PS02A1QTR
- ST1PS02BQTR
- ST1PS02B1QTR
- ST1PS02CQTR
- ST1PS02C1QTR
- ST1PS02DQTR
- ST1PS02D1QTR

**Output Voltages**
- From 1.4V to 1.75V, 50mV step
- From 1.8V to 2.5V, 100mV step
- From 2.6V to 3.3V, 100mV step
- From 1V to 1.35V, 50mV step

**Output Discharge**
- Yes
- No

**Package**
- TQFN12L

**ST1PS03**

**Part Numbers**
- ST1PS03AQTR
- ST1PS03A1QTR

**Output Voltages**
- From 1.6V to 3.3V

**Output Discharge**
- Yes
- No

**Package**
- TQFN12L

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Read more about buck regulators
Our technology starts with You

Find out more at www.st.com