# Analog & Memory Companion Chips for STM32


Jan.18th, 2011

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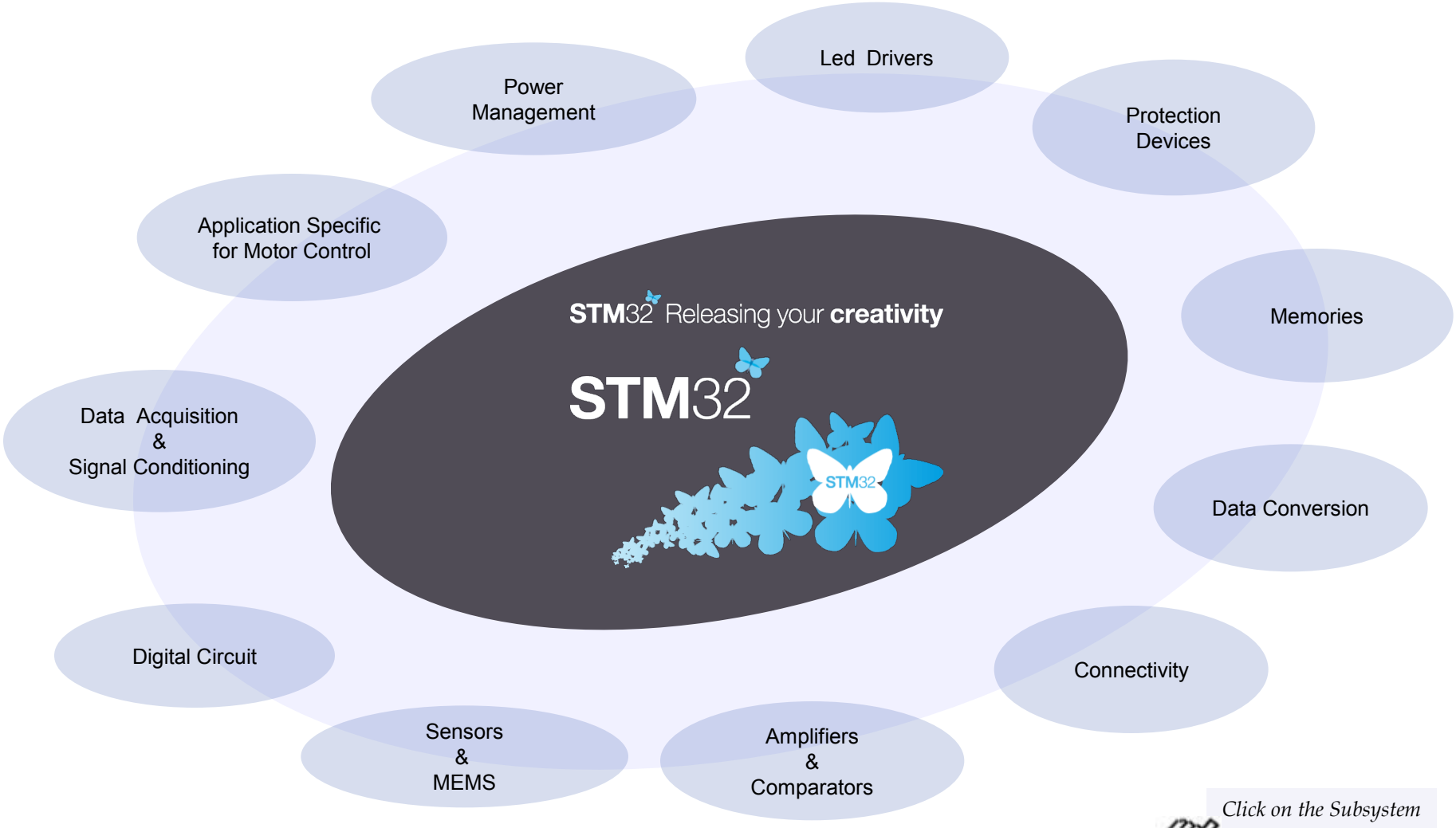


*Click on the Subsystem*

# Power Management (1/4)

The voltage regulator is probably the device that is used with the majority of applications.
The STM32 ARM® Cortex™-M3 requires a 2.0-3.6V operating voltage supply (VDD), with a total current up to 150mA (included the I/O current). Depending on the application requirements, it is possible to use either a linear or a switching voltage regulator.
The following are just a few of the many voltage regulators ST offers:

## Linear Regulators

LD3985 :150mA, En, SOT23-5L, TSOT23-5L,CSP
LD2985 :150mA ,En, SOT23-5L
LD59015**:** 150mA,Low Noise, Low Iq, High PSRR, En, SOT323-5L
**LDLN015:** 150mA Ultra Low Noise, High PSRR, En, DFN2x2-6L
LD39015**:** 150mA, low Iq, En, SOT666, SOT23-5L,CSP
LD39115J/SJ: 150mA, low Iq, En, Low noise, 0.8x0.8 CSP
STLQ015**:** 150mA, Very low Iq, En,SOT666
LK112S: 200mA, SOT23-5L, En
LDS3985:300mA, En, DFN3x3-6L, SOT23-5L
**LD39030SJ*:** 300mA, low Iq, En, Low noise, 0.8x0.8mm CSP
LD39050**:** 500mA, low Iq, En, PG, DFN3x3-6L
LD39080: 800mA,En, PPAK, DFN8
LD39100: 1A, low Iq, En, PG, DFN3x3-6L
ST1L05: 1.3A, En, PG, DFN3x3-6L

*En=Enable Pin, PG=Power Good pin*

* Product under development. Contact Division

## Step-Down Converters

ST1S12: 700mA, Synchronous, TSOT23-5L
L5980: 700mA, VFQFPN8
L6928: 800mA, MSOP8
ST1S03: 1.5A, DFN3x3-6L
ST1S06: 1.5A,Synchronous, DFN3x3-6L
ST1S09: 2A,Synchronous, DFN3x3-6L
ST1S10: 3A Synchronous, DFN8
ST2S06A33: Double Output, 500mA, 3.3V + ADJ

## Step-Up Converters

L6920DB: 150mA, MSOP8
ST8R : Micropower 1A synchronous step-up

## Multifunction Regulators (Buck-Boost Converters)

STBB1**:** 1A synchronous, DFN3x3-10L
**STBB2*:** 800mA, 3MHz, synchronous, CSP

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# Power Management (2/4)

The STM32 ARM Cortex has an embedded reset but some applications need to be independent on micro hardware to ensure more robustness and reliability to the system. Moreover a tighter accuracy on voltage reference than the one offered by the STM32 can be required (+/-5% accuracy). ST offers a comprehensive family of reset, voltage detectors and supervisors.

### Microprocessor Supervisor & Reset ICs

STM1061 : low power voltage detectors +/-2% accuracy

STM809: Push-Pull Reset with Manual Reset Input
STM810/11/12 : Push-Pull Reset with Manual Reset Input

STM1001 : Active Low open drain Reset

STM181x : Reset with open drain, push-pull output and Manual Reset Input

STM63xx /68xx, STM70x, STM69x, STM8xx : Supervisor with Reset Output, Watchdog, Switch Over and PFI/PFO

### Voltage Reference, Low Power Shunt

An external low power voltage reference can be used to maintain ADC accuracy independent of Vcc variation such as in battery-powered applications.

TS431: adjustable shunt reference form 1.24V to 6V, SOT23-5, TO-92
TS432: adjustable shunt reference from 1.24 to 10V, SOT23-3
LM4041: fixed high precision shunt reference at 1.225V, SOT23-3L and SC70-5L

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# Power Management (3/4)

## Battery Management

L6924D: Battery Charger System for Li-Ion / Li-Polymer, VFQFPN16

STBC08: 800mA Standalone linear Li-Ion Battery charger with thermal regulation, DFN6

STC4054: 800mA Standalone linear Li-Ion Battery charger with thermal regulation, TSOT23-5L

**ST4078*** – Dual input linear battery charger (USB and wall adapter), DFN3x3-10L

External battery management circuits can be used to charge and monitor a Li-Ion battery in portable applications.

These devices are driven by a standard I²C link:

STw4102: Dual USB/wall adapter Li-ion battery charger with gas gauge

STC3100: Battery monitor IC with Coulomb counter/gas gauge
STC3105*: Battery monitor IC with Coulomb counter/gas gauge

* Product under development. Contact Division

# Power Management (4/4)

## Multifunction Linear Regulator

STCS1: Linear Single channel constant current LED driver
STLA01: 50mA stand-alone linear LED driver

## Multifunction Switching Regulator

**STLA02*:** 6 white/blue LED boost power supply
STLD40: 10 white LED boost power supply
**STLD41*:** 40 white LED boost power supply
STBB1**:** 1A synchronous, DFN3x3-10L
**STBB2*:** 800mA, 3MHz, synchronous, CSP

## OLED Display Power Supply

STOD1812**:** PMOLED (Passive Matrix OLED) display power supply
STOD2540: PMOLED (Passive Matrix OLED) display power supply
STOD02: AMOLED (Active Matrix OLED) 2.5”- 3” display power supply
STOD03: AMOLED (Active Matrix OLED) 3”- 4” display power supply
**STOD04***: AMOLED (Active Matrix OLED) 7” display power supply

* Product under development. Contact division.

# LED Drivers (1/2)

**LED driver**
If a great amount of external LEDs have to be driven then:

**24 bit:**
STP24DP05: 24-bit constant current (5-80mA) LED driver with outputs error detection

**16 bit:**
STP16CP05: 16-bit constant current (5-100mA) LED driver
STP16CPS05: 16-bit constant current (5-100mA) LED driver with auto power saving
STP16DP05: 16-bit constant current (5-100mA) LED driver with outputs error detection
STP16DPS05: 16-bit constant current (5-100mA) LED driver with outputs error detection and auto power saving
STP16CPC05: 16-bit constant current (5-100mA) LED driver with balanced outputs
STP16CP05: 16-bit constant current (3-40mA) LED driver
STP16CPS05: 16-bit constant current (3-40mA) LED driver with auto power saving
STP16DP05: 16-bit constant current (3-40mA) LED driver with outputs error detection
STP16DPS05: 16-bit constant current (3-40mA) LED driver with outputs error detection and auto power saving

**8 Bit:**
STP08CP05: 8-bit constant current (5-100mA) LED driver
STP08DP05: 8-bit constant current (5-100mA) LED driver with outputs error detection
STPIC6C595: 8-bit LED Driver with over-voltage protection
STPIC6D595: 8-bit LED Driver

**4 bit:**
STP04CM05: 4-bit constant current (80-400mA) power LED driver

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# LED Drivers (2/2)


## LED Display Driver

STLED316S: 6-digit LED controller  with key scan

## VFD Display Driver

STFPC311: VFD controller/Driver, 12 seg/16 Dig to 20 Seg/8 Dig, SPI protocol
STFPC320: VFD controller/Driver, 12 seg/16 Dig to 20 Seg/8 Dig, I2C protocol
STM86312: VFD controller/Driver, 11 Seg/11 Dig to 16 seg/4 Dig, SPI protocol

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# Protection Devices

## EMI Filtering & Signal Conditioning

USBLC6-2: Very low capacitance ESD protection for USB2.0.

USBUF01P6: EMI filter and line termination for USB upstream ports (low and full speed)

ECMF02-2AMX8 : Common Filter with integrated protection for USB ports (High speed)

EMIF04/06/08-1502Mx : 4, 6 or 8 line filter aray for Display or User interface

ESDA25B1: Transil™ array for bidirectional ESD protection, 25V breakdown, RS232

ESDA25-4BP6: Transil™ array for bidirectional ESD protection, 25V breakdown, RS232

ESDA14V2BP6: Transil™ array for bidirectional ESD protection, 14.2V breakdown, RS485

## ESD Suppressor

ESDA5V3SC: Quad Transil™ array for ESD protection, 5.3V breakdown

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# Memories

**I²C**

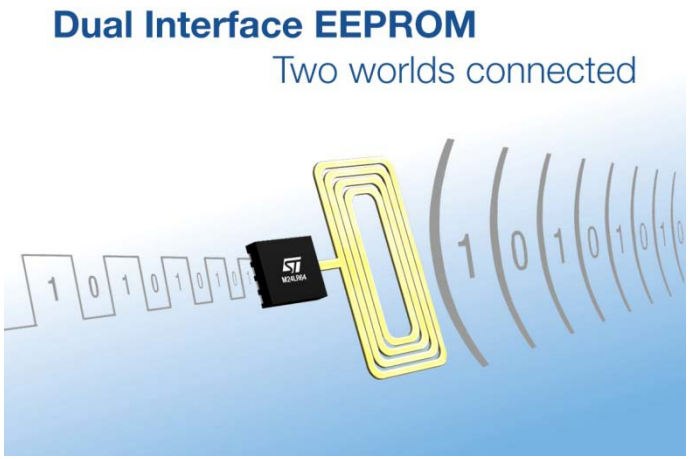
M24xxx: Serial I²C EEPROM, 1Kbit to 1Mbit, 1.7V to 5.5V

**SPI**

M95xxx: Serial I²C EEPROM, 1Kbit to 1Mbit, 1.8V to 5.5V

**Dual Interface EEPROM: 13.56MHz RF and I²C**

M24LR64 64 Kbit EEPROM with password protection & dual interface: 400 kHz I²C serial bus & ISO 15693 RF protocol at 13.56 MHz

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# Data Conversion (1/2)

## RS232 interfaces @ 3V

The STM32 ARM® Cortex™-M3 handles the RS232 protocol,
but it needs an external interface to set the correct signal electrical levels:
ST3222Exx: 2 Drivers & 2 Receivers, ±15KV ESD protection
ST3232Exx: 2 Drivers & 2 Receivers, ±15KV ESD protection
ST3243Exx: 3 Drivers & 5 Receivers, ±15KV ESD protection

## RS485 interfaces @ 3V

The STM32 ARM® Cortex™-M3 handles the RS485 protocol,
but it is needs an external interface to set the signal electrical levels:
ST3485E: 1 Transceiver, ±15KV ESD protection
ST1480A: 1 Transceiver, ±15KV ESD protection

## Smart card interface

ST8004: Analog interface for asynchronous 3V and 5V smart cards.
ST8024: Analog interface for asynchronous 3V and 5V smart cards

## Camera Module Interface

The STM32 ARM® Cortex™-M3 can be interfaced with serial camera modules by using a deserializer chip:
STSMIA832: 1.8 V / 2.8 V high speed dual differential line receivers, (SMIA) decoder deserializer.

## Charger Detection ICs

STUSBCD01: USB charger detection interface, CSP

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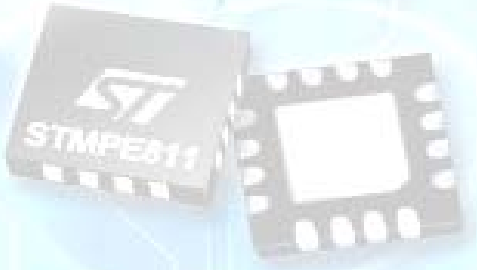
# Data Conversion (2/2)

**Xpander Logic**

STMPE801: 8-bit port expander,  I2C

STMPE2403: 1.8V, 24-bit port expander, Keypad, PWM controller, I2C (1.8V to 3.3V)

STMPE2401: 1.8V, 24-bit port expander, Keypad, PWM controller, I2C (1.8V to 3.3V)

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# Amplifiers and Comparators (1/3)

Offering low power consumption, high bandwidth and good accuracy, the TSV6xx families serve applications such as portable medical equipment, instrumentation, signal-conditioning systems, sensor interfaces, and active filtering.
Operating with same range of power supplies than the STM32, they can easily be used as signal conditioner to drive the ADC of the STM32.

## Operational Amplifiers

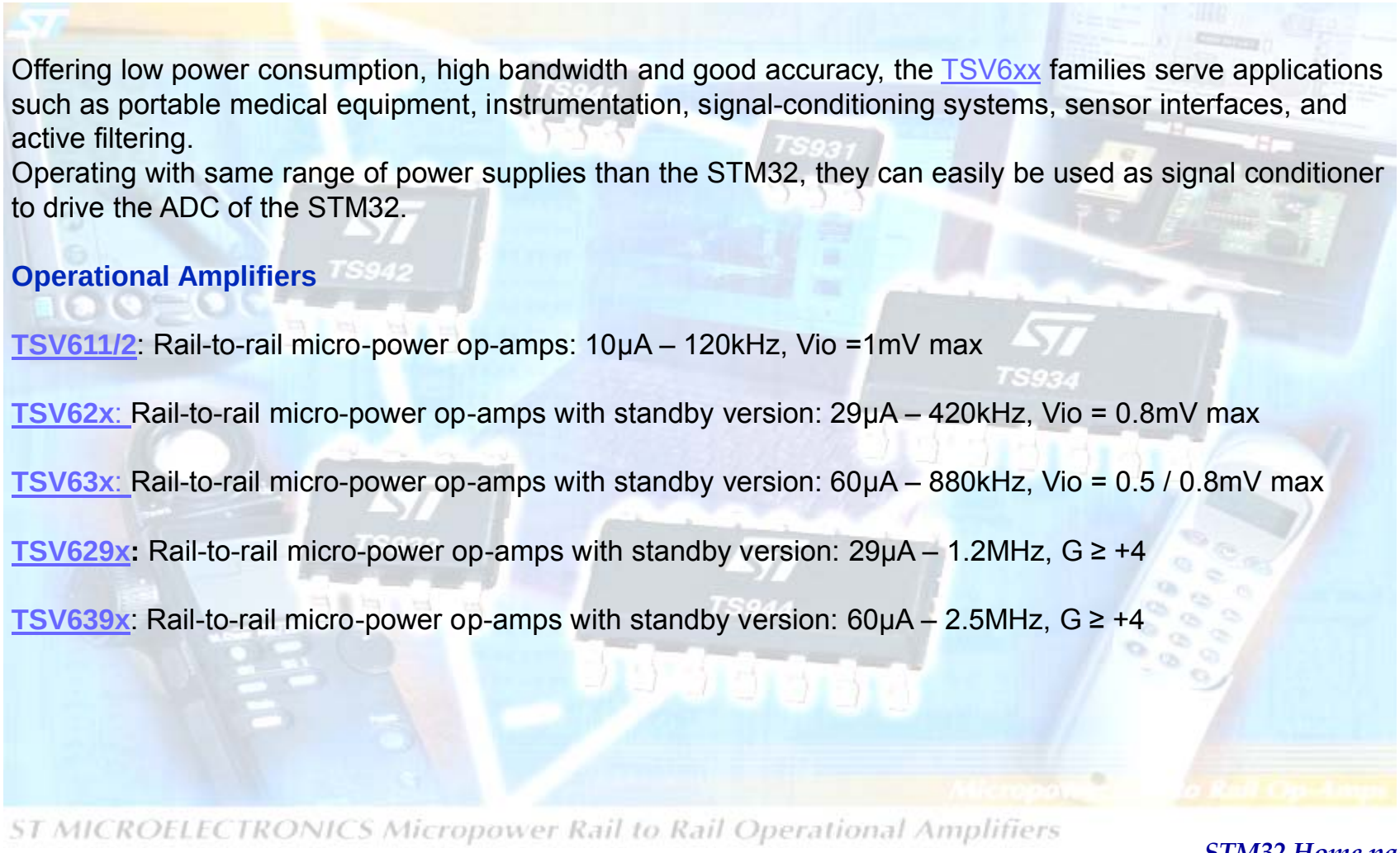
**TSV611/2**: Rail-to-rail micro-power op-amps: 10µA – 120kHz, Vio =1mV max

**TSV62x**: Rail-to-rail micro-power op-amps with standby version: 29µA – 420kHz, Vio = 0.8mV max

**TSV63x**: Rail-to-rail micro-power op-amps with standby version: 60µA – 880kHz, Vio = 0.5 / 0.8mV max

**TSV629x**: Rail-to-rail micro-power op-amps with standby version: 29µA – 1.2MHz, G ≥ +4

**TSV639x**: Rail-to-rail micro-power op-amps with standby version: 60µA – 2.5MHz, G ≥ +4

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# Amplifiers and Comparators (2/3)

## Audio Amplifiers

The STM32 ARM® Cortex™-M3 can be used to generate an audio signal in PWM format,
but the device doesn't have the capability to drive directly a speaker (power limitation).
Using an external audio amplifier it is possible to filter the signal and add enough power to drive a speaker up to 1.2W.
**TS92x:** Rail-to-rail high output current (80mA) operational amplifier series

TS421: 360mW mono audio amplifier with active high/low standby mode

TS486 & TS487: 100mW stereo headphone amplifier with active low/high standby mode

TS4601: High performance stereo headphone amplifier with capaless output

TS4871: 1W mono audio power amplifier with standby active high

TS4990: 1.2W mono audio power amplifier with active low standby mode

TS4985: 2x1.2W stereo audio power amplifier with dedicated standby pin

To reach an output power of up to 3W it is possible to use an external Class D audio amplifier such as:

TS4962M: 3W filter-free class D audio power amplifier
TS2007: 3W filter-free Class D audio power amplifier with 6-12dB fixed gain select Microphone preamplifier
TS2012: 3W stereo filter-free class D audio power amplifier
TS4999: 3W stereo filter-free class D audio power amplifier with 3D effect
TS472: Very low noise microphone preamplifier, 2V biased output, active low standby mode
TS4657: Stereo audio line driver with integrated DACs

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# Amplifiers and Comparators (2/3)

## Comparators

TS7211: Single BiCMOS rail-to-rail micro-power comparator, push-pull output

TS7221: Single BiCMOS rail-to-rail micro-power comparator, open drain output

TS86x: rail to rail micro-power BiCMOS comparators family (single, dual & quad), push-pull output

TS3021/2: Rail-to-rail 1.8V high-speed comparators (single dual), push-pull output

TS331: Single rail-to-rail 1.6V micro-power comparator in SC70-5 micro-package, open drain output

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# Sensors & MEMS (1/4)

## Capacitive Touch Sensor

STMPE821: 8 channel cap-sensing, I2C
STMPE1208: 12 cap-sensing channel + 12 GPIO, I2C
STMPE16/24M31: 16/24 High Sensitivity cap-sensing channel +16 PWM + 16 GPIO
STM8-TOUCH-LIB: STMTouch - Touch Sensing Firmware library for STM8 Standard MCUs
STM8T141: Proximity or single Key Touch Controller
**STM8T143*:**Single channel proximity sensor

## Resistive and Touch Screen Controller

STMPE811: resistive touch screen controller with 8-bit port expander, 12bit ADC, I2C

## Capacitive and Touch Screen Controller

STMT05: S-Touch™FingerTip Multi-touch capacitive touchscreen controller

* Product under development. Contact division.

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# Sensors & MEMS (2/4)

**Temperature sensor**

The STM32 ARM® Cortex™-M3 has an internal temperature sensor, which generate a voltage proportional to the variation in temperature. The conversion range is between 2 V < VDDA < 3.6 V. The temperature sensor is internally connected to the ADC_IN16 input channel, which is used to convert the sensor output voltage into a digital value. However, in all those applications where the temperature sensor has to be remotely placed or tighter accuracy is required a stand-alone sensor must be used.

STCN75: Digital temperature sensor, thermal watchdog, I2C/SMBus, 0.5C accuracy @ 25C, Shut-down mode
STDS75: Digital temperature sensor, thermal watchdog, I2C/SMBus, 0.5C accuracy @ 25C, Shut-down mode
STLM20: Precision analog temperature sensor, ultra small and low power
STLM75: Digital temperature sensor, thermal watchdog, I2C/SMBus, 0.5C accuracy @ 25C, Shut-down mode
STTS75: Digital temperature sensor, thermal watchdog, I2C/SMBus, 0.5C accuracy @ 25C, SMBus Time-out, One-Shot power saving mode
STTS751: 2.25V low-voltage local digital temperature sensors

**Current Sensing Amplifiers**

TSC101: High side current sensing amplifier

TSC102: High side current sensing amplifier + signal conditioning amplifier

**Pressure sensors**

LPS001WM: MEMS pressure sensor:300 - 1100 mbar absolute digital output barometer

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# Sensors & MEMS (3/4)

## Accelerometers

**Digital:**

LIS302DL: 3-axis accelerometer, ± 2g/± 8g, 8-bit resolution, I²C/SPI digital output interface (LGA 3x5x0.9)
LIS331DL: 3-axis accelerometer, ± 2g/± 8g, 8-bit resolution, I²C/SPI digital output interface (LGA 3x3x0.9)
LIS3LV02DL: 3-axis accelerometer, ± 2g/± 6g, 12-bit resolution, I²C/SPI digital output interface (LGA 7.5x4.4x0.9)
LIS331DLH: 3-axis accelerometer, ± 2/4/8g, 12-bit resolution, low power, I²C/SPI digital output interface (LGA 3x3x0.9)
LIS331DLM: 3-axis accelerometer, ± 2/4/8g, 8-bit resolution, low power, I²C/SPI digital output interface (LGA 3x3x0.9)
LIS331DLF: 3-axis accelerometer, ± 2/4/8g, 6-bit resolution, low power, I²C/SPI digital output interface (LGA 3x3x0.9)
LIS3DH **:** ultra low-power high performance three axes linear accelerometer, ±2g/±4g/±8g/±16g, digital output interface (LGA 3x3x0.9)

**Analog**:

LIS344ALH: 3-axis accelerometer, ±2g/±6g, analog output, high resolution (LGA 4x4x1.5)
LIS344AL: 3 axis accelerometer ±3.5g, analog output (LGA 4x4x1.5)
LIS332AR: 3 axis accelerometer ±2g, analog output, ultra stability over temperature (LGA 3x3x0.9)
LIS352AR: 3 axis accelerometer ±2g, analog output, ultra stability over temperature (LGA 3x5x0.9)
LIS332AX: 3 axis accelerometer ±2g, absolute analog output, ultra stability over temperature (LGA 3x3x0.9)
LIS352AX: 3 axis accelerometer ±2g, absolute analog output, ultra stability over temperature (LGA 3x5x0.9)

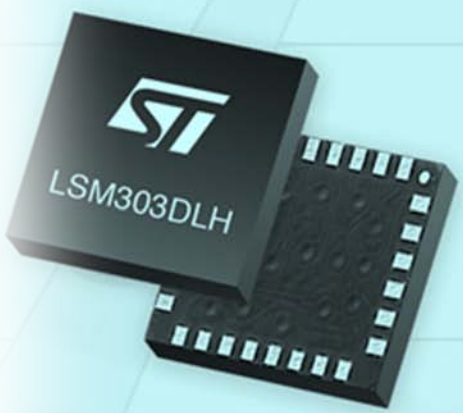
## Gyroscope

LY5xxALH: single axis yaw rate analog gyroscope (Full scale from 30dps up to 6000dps) (LGA 5x5x1.5)
LPY5xxAL: two axis pitch and yaw rate analog gyroscope (Full scale from 30dps up to 6000dps) (LGA 5x5x1.5)
LPR5xxAL: two axis pitch and roll rate analog gyroscope (Full scale from 30dps up to 6000dps) (LGA 5x5x1.5)

# Sensors & MEMS (4/4)

LSM303DLH: 3-Axis Accelerometer and 3-Axis Magnetometer (E-Compass)

MP45DT01: Top Port Digital Microphone

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# Digital Circuit

The STM32 ARM® Cortex™-M3 logic inputs are 5 volt tolerant, so a level translator is not needed for a 5V input signal. Due to the input thresholds, a level translator is necessary with a 1.8V input signal.
The outputs of the STM32 can be configured as open drain and, depending on the reference voltage of the external pull-up, it is possible to create a level translator, but the output current capability is low. Using a level translator increases the current capability.

**Level Translators**

**- 1.8V to 5.0V**

ST2129 : 2-bits, dual supply, auto directional, tri-state, 84 Mbps
ST2149 : 4-bits, dual supply, auto directional, tri-state, 84 Mbps
ST2378E: 8-bits, dual supply, auto directional, tri-state,13 Mbps,15kV ESD protection

**- 1.5V to 3.3V**

ST1G3234: 1-bit, dual supply, uni directional, 380Mbps, Flip Chip
ST2G3236: 2-bits, dual supply, bi directional, 380Mbps, tri-state
ST4G3234: 4-bits, dual supply, uni directional, 380Mbps, Flip Chip

**- Application specific**

ST2329: I2C, 2-bits, 1.8V to 5V, auto directional, tri-state
ST2349: UART, 4-bits, 1.8V to 5V, auto directional,
ST6G3244*: SD3.0, 6-bits, 1.8V to 5.0V, 100Mbps, EMI filtering, Integrated LDO 1.8V/2.9V, 15kV ESD protection
ST16C32245:camera, 14+2 bits (data+I2C), 1.8V to 3.3V

**Single gates**

**74V1Gxx**

* Product under development. Contact Division

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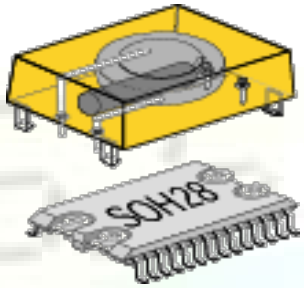
# Timing

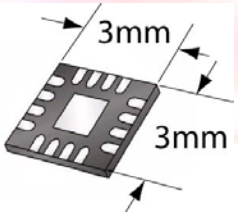



## RTC

The STM32 ARM Cortex has an embedded timer to make a Real Time Clock.
A stand-alone RTC embeds the following key features:

- ✓ Time data available in BCD format
- ✓ 32kHz output (a Bluetooth module can be driven)
- ✓ Back-up voltage down to 1V for supercap back-up
- ✓ Max. Operating Voltage up to 4.4V or 5.5V (can be directly connected to a rechargeable lithium ion battery)
- ✓ Very low power consumption down to 350nA (ideal for portable applications)
- ✓ Analog Calibration guarantying down to ± 5ppm after 2 reflows (performed at ST fab for snaphat RTC versions)
- ✓ 100th and 10th of seconds time granularity
- ✓ Allows 12.5pF load crystal capacitance (a standard value and the cheapest in the market)
- ✓ Alarm generation capability available in back-up mode on dedicated output
- ✓ Many package options (with and without embedded crystal and battery)


M41T00S, M41T81S, M41T6x, M41T83/93, M41ST87, M41ST84/85/95




SOX18

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# Application Specific for Motor control

Motion Control is a key function in a broad range of systems. ST's global system solution approach greatly simplifies the design of flexible motor controllers. Ideal for driving Brush DC , Bipolar Stepper and permanent magnet three phase brushless motors, ST's motor control solutions offer an open, scalable and integrated answer to the market's most demanding motion control performances.

L6208: DMOS driver for bipolar stepper motor

L6206 : DMOS dual full bridge driver

L6235: DMOS driver for three-phase brushless dc motor

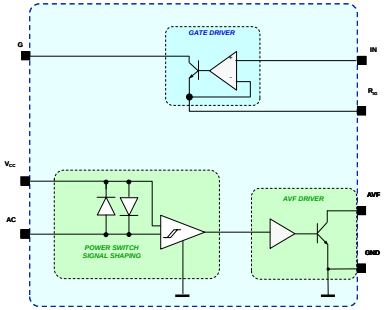
L638x/L639x: HV half-bridge drivers IGBTs/ Power MOSFETs

T12T: sensitive TRIAC for motor control in appliances

T1235H : High Tj TRIAC for universal motor control

T1010H-6I: sensitive High Tj for small appliances

STCC08: TRIAC driver and monitoring for major appliances

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# Connectivity

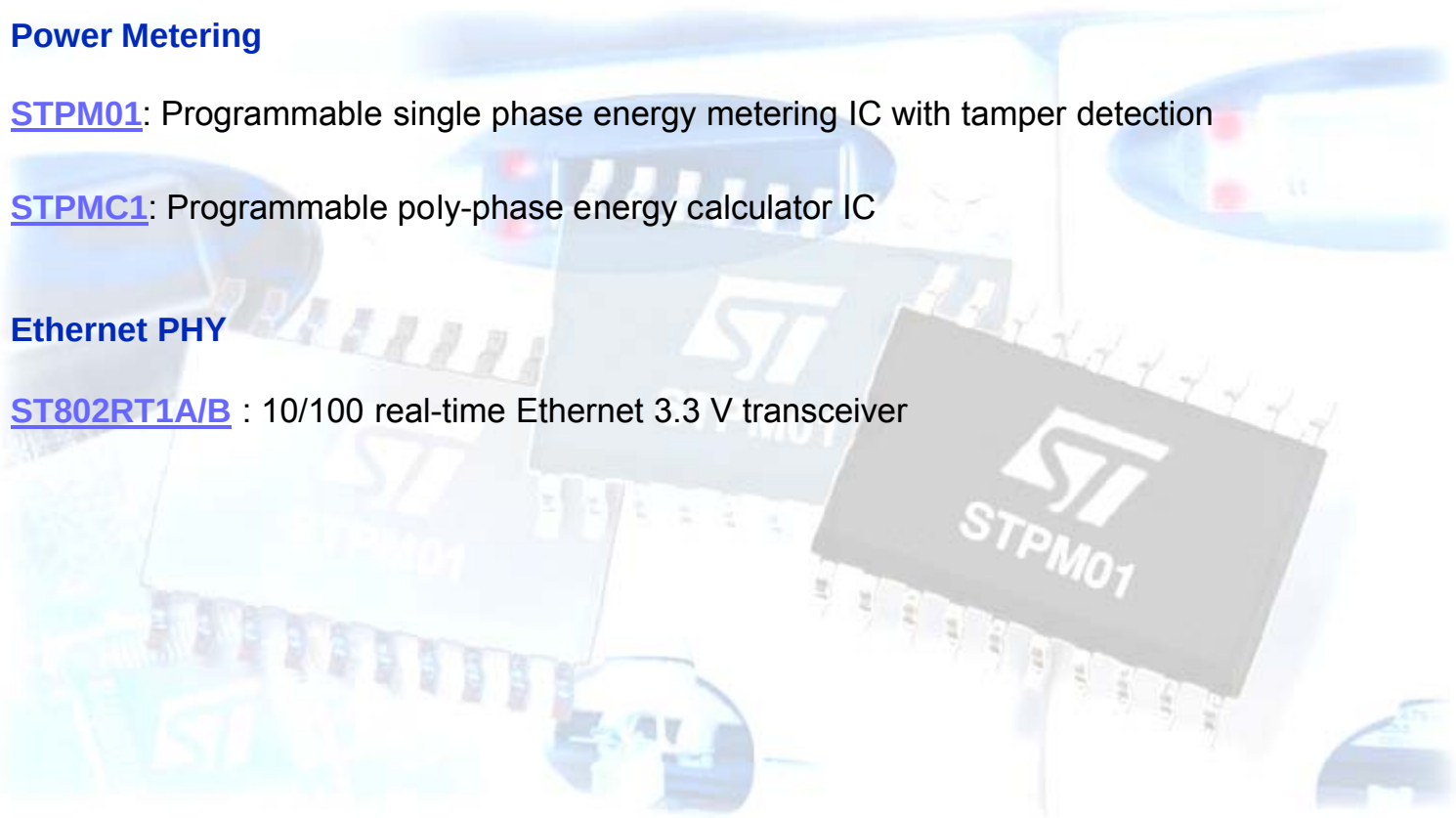
## Power Metering

STPM01: Programmable single phase energy metering IC with tamper detection

STPMC1: Programmable poly-phase energy calculator IC

## Ethernet PHY

ST802RT1A/B : 10/100 real-time Ethernet 3.3 V transceiver

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# *Define Your Needs*

Customer Name: Project Name:

Company Name: Telephone:

Application: Email:

Planned Action:

ST Support Needed: