Analog & Memory Companion Chips for STM32

Jan. 18th, 2011
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, 0.8x0.8mm 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

**Step-Down Converters**

- **ST1S12**: 700mA, Synchronous, TSOT23-5L
- **L5980**: 700mA, VFQFPN8
- **L692B**: 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

*Product under development. Contact Division*
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

[STM32 Home page](#)
**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

*STM32 Home page*
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
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 array 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
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
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
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)
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, $V_{io} = 1mV$ max

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

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

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

**TSV639x**: Rail-to-rail micro-power op-amps with standby version: 60µA – 2.5MHz, $G \geq +4$
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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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
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.
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, 0.5°C accuracy @ 25°C, Shut-down mode
**STDS75**: Digital temperature sensor, thermal watchdog, I2C/SMBus, 0.5°C accuracy @ 25°C, Shut-down mode
**STLM20**: Precision analog temperature sensor, ultra small and low power
**STLM75**: Digital temperature sensor, thermal watchdog, I2C/SMBus, 0.5°C accuracy @ 25°C, Shut-down mode
**STTS75**: Digital temperature sensor, thermal watchdog, I2C/SMBus, 0.5°C accuracy @ 25°C, 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
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)
- **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
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 snapshot 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

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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
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
## Define Your Needs

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