Peripheral semiconductors for set-top box applications
### ST peripheral products overview for set-top boxes

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ST peripheral products overview for set-top boxes

Power management

Power MOSFETs – low voltage (StriFET VI DeepGATE, N- and P-channel)
- Available in 4/6/8-line configuration
- Micro cFET package
- IEC 61000-4-2 level 4, 15 kV

VFD controllers
- Compact single-chip solution
- Easy software implementation through SPI/PC serial interface
- Drives VFD panels with 8 digits, 20 segments up to 16 digits, 12 segments
- Energy Star and Blue Angel standard compliant
- Integrated key-scan, infrared RC decoder and real-time clock (RTC)

LED controllers
- Drives up to 7 digits, 8 segments
- Drive capability of 40 mA (max)
- Integrated key-scan up to 16 keys
- 3-wire serial SPI interface
- Low power consumption during standby

Microcontrollers
- STMicroelectronics
- Ultra-low-power 8-bit MCU
- 4- to 64-Kbyte Flash, 20 to 80 pins
- 12-bit ADC (1 μA), 12-bit DAC
- PWM timers, watchdogs
- Drives 8 x 40 LCD
- Keys and touch sensing
- Mechanical and touch sensing keys
- Support of any IR protocol
- CEC control

Separable security

Power switches
ST890
- Input range: 2.7 to 5.5 V
- Programmable current limit: up to 1.2 A by external resistance
- Low quiescent current
- Thermal shutdown, fault indicator output

STMPS2141, STMPS2151, STMPS2161, STMPS2171, STMPS2242, STMPS2252, STMPS2262, STMPS2272
- Enhanced single or dual power switches
- Input range: 2.7 to 5.5 V
- 500 mA 1 A continuous current with fixed current limit
- Low quiescent current
- Thermal shutdown, fault indicator output, reverse-current protection and fault-blanking features

Hot-swap power management – e-fuses
STEF05, STEF12
- 5 V and 12 V rails
- Programmable current limit
- Programmable soft-start
- Overvoltage clamp
- Fault indicator

Serial real-time clocks
M41T62
- World’s smallest embedded crystal RTC
- Serial RTC with alarm
- 32 kHz output
- Power supply from 1.3 to 4.4 V
- Timekeeping down to 1.0 V
- Current consumption: 350 nA at 3 V

Temperature sensors
STTS75, STTS751
- Digital PC temperature sensor
- ±1.0 °C (typ) accuracy from 0 °C to +85 °C
- Power saving one-shot temperature measurement
- Power supply range: 2.25 to 5.5 V

STLM20
- Precision analog voltage output temperature sensor
- Operating voltage: 2.4 to 5.5 V
- Ultra-low quiescent supply current: 8.0 μA max

Front panel displays

Integrated EMI filtering and ESD protection
EMIF-1005
- Available in 4/6/8-line configuration
- Micro cFET package
- IEC 61000-4-2 level 4, 15 kV

VFO controllers
- Compact single-chip solution
- Easy software implementation through SPI/PC serial interface
- Drives VFD panels with 8 digits, 20 segments up to 16 digits, 12 segments
- Energy Star and Blue Angel standard compliant
- Integrated key-scan, infrared RC decoder and real-time clock (RTC)

LED controllers
STLED316, STLED325
- Drives up to 7 digits, 8 segments
- Drive capability of 40 mA (max)
- Integrated key-scan up to 16 keys
- 3-wire serial SPI interface
- Low power consumption during standby

Microcontrollers
STM8L
- Ultra-low-power 8-bit MCU
- 4- to 64-Kbyte Flash, 20 to 80 pins
- 12-bit ADC (1 μA), 12-bit DAC
- PWM timers, watchdogs
- Drives 8 x 40 LCD
- Keys and touch sensing
- Mechanical and touch sensing keys
- Support of any IR protocol
- CEC control

Note:
1. Details in following pages
2. * is used as a wildcard character for related part numbers
LNB power supplies

LNB supply ICs
- LNBH2®, LNBH3
  - Built-in DC-DC converters for single 12 V supplies with integrated NMOS
  - Built-in 22 kHz tone detector supports bidirectional DiSEqC™
    - 2.0, DiSEqC 1.0, L version receivers/sat-TV, sat-PC cards
  - LNB short-circuit dynamic protection and diagnostics
  - Dual tuner application (LNBH24/24L, LNBH26/26L)

Protection devices
LNBTVS
- Up to 500 A peak protection (1.2/50 μs; 8/20 μs combination waveform)
- Unidirectional protection
- 2 voltages according to LNB choice

Audio blocks

EMIF02-SPK02F2
- Low serial impedance
- High rejection of the 900 MHz to 3 GHz band
- Ultra-small CSP package

LM833
- Low-noise dual operational amplifier
- Wide power supply range: +/- 2.5 V to +/- 15 V
- 15 MHz bandwidth
- Low distortion and low noise

LMV358L
- Low-power rail-to-rail amplifier
- Low supply voltage: 2.7 to 5.5 V
- Low current consumption: 130 μA

TSH62
- Low-cost rail-to-rail wide band amplifier
- Wide power supply range: 5 to 12 V
- 60 MHz bandwidth
- Excellent PSRR leading to better audio performances

TSH4657
- Stereo digital audio line driver with capless outputs
- Single supply voltage: 3.0 to 5.5 V
- Output voltage: 2.2 Vrms max
- Digital audio inputs: I²S, left-justified, right-justified
- 16-bit to 24-bit data format, 32 kHz to 48 kHz

Smartcard readers

Smartcard interface (ASI)
ST8024, ST8024L
- ISO 7816-3 compatible with the NDS conditional access system (ST8024 in progress)
- 3 specific, protected half-duplex bidirectional buffered I/O lines
- Compatible with class A, B and C smartcards

Microcontrollers
STM32F, STM32L
- 32-bit Cortex-M family
- 24 to 150 MHz
- 16-Kbyte to 1-Mbyte Flash
- Full set of communication peripherals: UART, SPI, I²C, USB device/host, Ethernet, SDIO
- HDMI electronic consumer control (ECC)

Remote controls

LDO linear regulators
LDCL015, LD39115J, STL0015, LD59015
- 150 mA maximum current
- Ultra low dropout (< 150 mV)
- Tiny packages: SO70, SOT666 and SOT23

Microcontrollers
STM32W
- 32-bit ARM Cortex-M3 with 2.4 GHz radio embedded
- 64- to 256-Kbyte Flash memory
- ZigBee® RF4CE certified protocol stack with ZigBee® remote control application profile

Baluns
BAL-NRF01F3
- 50 Ω nominal input
- RF BOM and area reduction

BAL-32W108-01E3
- 50 Ω nominal input
- Integrated 2.4 GHz band pass filter
- High rejection level of 2nd and 3rd order harmonics
- Compliant with ETSI/FCC regulations

Data communication

RS-232 interface ICs
ST2E, ST32E
- ±15 kV human body model (E series)
- ±8 kV contact discharge and ±15 kV air-gap discharge, IEC 1000-4-2

- Data rate: 120 to 480 Kbit/s
- Slew rate range: 3 to 30 V/μs

Protection devices
USBLCD
- IEC 61000-4-2
- C = 0.42 pF

LCP
- ITU-T K20/21 and GR-1089
- Up to 175 V, 500 A, 2/10 μs

HSP061
- 2-, 4- and 8-line ESD protection for high-speed lines
- Ultra-large bandwidth (6 GHz)
- Ultra-low capacitance (0.6 pF)
- High integration
- High ESD protection level

Video blocks

Video drivers
TSH545/TSH546
- High-definition video
- Single 5 V supply
- Integrated 6 dB gain
- Integrated 6th order video reconstruction filters for SD/PV/HV (TSH545) or HD only (TSH546)
- Multiplexed inputs (TSH545)

TSH343/TSH344
- High-definition video
- Single 5 V supply
- ±250 MHz bandwidth
- Slew rate > 750 V/μs
- 0.1 dB gain flatness: 65 MHz
- Internal 6 dB gain
- Integrated DC shift (TSH343)

Integrated EMI filtering and ESD protection
HDMI2C1-14HD
- HDMI 1.4 compliant
- HEAC compliant
- ESD protection (8 kV contact IEC 61000-4-2)
- Long-/poor-quality-cable drive
- TMDS ESD protection up to 340 MHz
- Wake-up via CEC
- Optimized power consumption in standby mode

High-speed port protection
HSP061
- 2-, 4- and 8-line ESD protection for high-speed lines
- Ultra-large bandwidth (6 GHz)
- Ultra-low capacitance (0.6 pF)
- High integration
- High ESD protection level

HDMIULC6
- 15 kV (IEC 61000-4-2) ESD protection
- Ultra-large bandwidth (5.3 GHz)
- Low clamping voltage
- No impact on signal integrity

Touch-sensing capacitive sensors
STMT142
- Multi-channels (from 1 to 300 matrix channels)
- Implementation of touchkeys, sliders and trackpad
- Long range proximity detection (25 cm)
- 10 μA range active low-power mode

STMT07
- FingerTip multi-touch capacitive touchscreen controller
- Supports up to 10” screen on-cell and in-cell
- 20 mW for 10” screen active scanning
- <1 mm accuracy, <80 Hz scan rate
- Unprecedented charger noise immunity

Motion sensors (MEMS)¹

INEMO - Inertial modules
- LSM330DLC, LSM330D

Gyrosopes
- L3G20

Accelerometers
- LIS3DH, LIS3DSH, LIS2DH

Digital compasses
- LSM303DLC, LSM303D

Note: 2. Available in Q1-13
Motion sensors (MEMS)

Wide range of sensors enabling enhanced capabilities for smart remote control

**iNEMO - Inertial modules**

**LSM330DLC, LSM330D**
The LSM330DLC and LSM330D are digital modules combining a 3D accelerometer and 3D gyroscope for smart remote control enabling gesture recognition, pointing, gaming and smart power management.

**Key features**
- User-selectable acceleration and gyroscope full scales
- 16-bit data output
- Low-power and power-down modes
- Independent embedded FIFO
- Independent programmable interrupts

**Gyrosopes**

**L3GD20**
The L3GD20 is a 3D digital gyroscope for gaming, pointing and motion control that gives applications greater accuracy and high reliability.

**Key features**
- Three selectable full scales (250/500/2000 dps)
- 16-bit data output
- Power-down and sleep modes
- Embedded FIFO
- Integrated low- and high-pass filters
- Ultra-stable over temperature and time

**Accelerometers**

**LIS3DH, LIS3DSH, LIS2DH**
The LIS3DH, LIS3DSH and LIS2DH are 3D digital accelerometers for smart power management, motion and orientation/direction detection.

**Key features**
- ±2g/±4g/±8g/±16g dynamically selectable full scale
- High resolution: up to 14 bits
- Ultra-low-power mode consumption down to 1 μA
- Embedded FIFO
- Independent programmable interrupts
- Embedded free-fall and motion detection

**Digital compasses**

**LSM303DLHC, LSM303D**
The LSM303DLHC and LSM303D are digital 3D accelerometer and 3D magnetometer modules for high-end remote control providing linear acceleration detection and heading for gaming and gesture recognition.

**Key features**
- User-selectable acceleration and magnetic full scales
- 16-bit data output
- Low-power and power-down modes
- 6D/4D orientation detection
- High resolution and high sensitivity for both accelerometer and magnetometer
- Independent programmable interrupts
Power management

Set-top-IC and low-noise-block supplies

Switching regulators

ST1S40
The ST1S40 is an internally compensated 850 kHz fixed-frequency PWM synchronous step-down regulator. The ST1S40 operates with an input from 4.0 to 18 V and regulates an output voltage as low as 0.8 V and up to VIN to supply your STB ICs. The peak-current mode control with internal compensation delivers a very compact solution with a minimum component count.

Key features
- 4 A peak output current
- Internal soft start
- Integrated 95 mΩ and 69 mΩ power MOSFETs
- Enable pin
- All ceramic capacitors
- Cycle-by-cycle current limiting
- Current foldback short-circuit protection

LNB supply ICs

LNBH25/25L, LNBH26/26L, LNBH29
Intended for analog and digital satellite receivers, satellite TV, satellite PC cards, these devices are monolithic voltage regulator and interface ICs. They are specifically designed to provide the 13/18 V power supply and the 22 kHz tone signaling to the LNB downconverter in antenna dishes or to the multi-switch box.

Key features
- Complete interface between LNB and I²C bus
- 15 output voltage levels
- Output surge robustness up to 40 V
- P2P compatibility between single and dual tuner versions
- Stable with ceramic and electrolytic capacitors
- Built-in high-efficiency 12 V DC-DC converter
- Selectable output current limit by external resistor
- Compliant with main satellite-receiver output-voltage specifications
- Accurate built-in 22 kHz tone generator suits widely accepted standards
- Internal overload and over-temperature protection
Integrated EMI filtering and ESD protection

HDMI2C
The HDMI2C series integrates ESD protection and signal conditioning for HDMI 1.4 transmitter and emitter interfaces.

Key features
- CEC, DDC, HEAC, 5 V and HPD 8 kV contact ESD protection
- Integrated I²C bidirectional reshaping and level shifter
- Supports direct connection to low-voltage HDMI ASICs
- Short-circuit and over-temperature protection on 5 V output
- Long or poor-quality HDMI cable drive support
- Optimized power consumption in standby mode and wake-up via CEC

High-speed protection devices

HSP061
Monolithic, application-specific discrete devices dedicated to ESD protection of high-speed line connections.

Key features
- 2-, 4- and 8-line ESD protection for high-speed lines
- Ultra-large bandwidth: up to 7 GHz
- Ultra-low capacitance: down to 0.6 pF
- Low leakage current: down to 100 nA
- High ESD robustness for HDMI, DVI, USB, serial ATA, Ethernet, and other connections

Smartcard interfaces

ST8024L
The ST8024L is a complete low-cost analog interface for asynchronous Class A, B and C smartcards. It can be placed between the card and the set-top box microcontroller with only a few external components to perform all supply protection and control functions.

Key features
- Designed to be compatible with the NDS conditional access system
- 1.8 V, 3 V or 5 V supply for the IC
- Step-up converter to supply the card
- 26 MHz integrated crystal oscillator
- Clock generation for cards up to 20 MHz with synchronous frequency changes
- Enhanced ESD protection on card side (> 6 kV)
- ISO 7816, GSM11.11 and EMV 4.0 (payment systems) compatibility

Order code: BRSTB0912

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