

Application guide

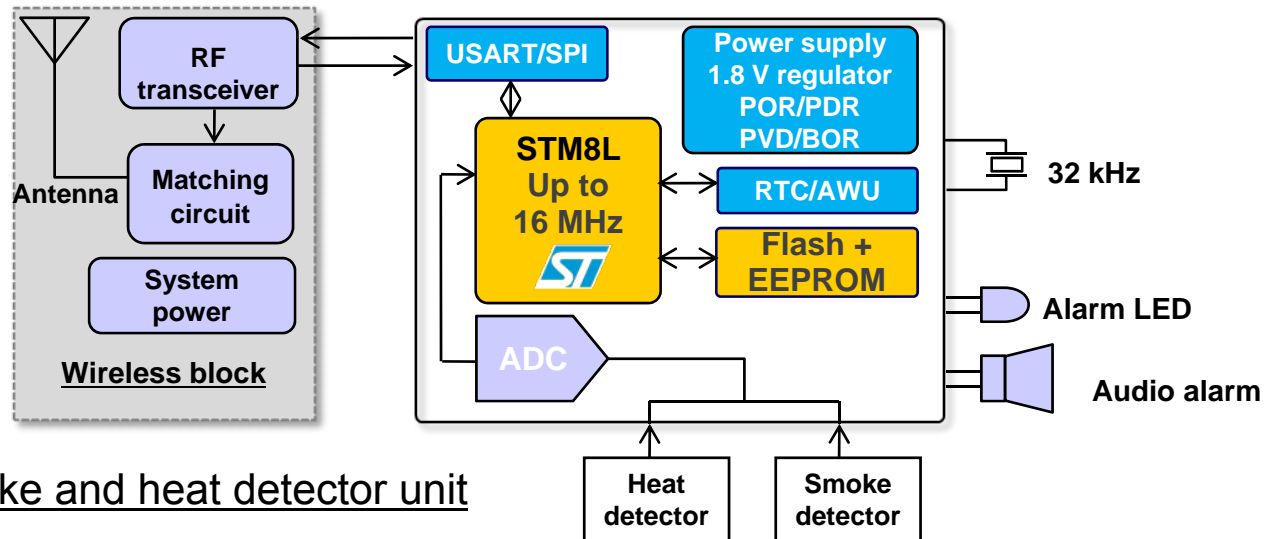
Fire alarms and smoke detectors



Typical fire alarm and smoke detector



- The latest worldwide regulations require smoke detectors to be installed in homes and public buildings
- Advanced smoke detectors are generally wireless with RF communication protocol
- Smoke detectors are often equipped with a photoelectric detector to detect smoke and a heat sensor that triggers the smoke alarm when the temperature increases rapidly



Technical data example: Wireless multisensor detector



Specifications are typical and given at 23 °C and 50% relative humidity unless otherwise stated

Detector type

Point type smoke detector for fire detection and fire alarm systems for buildings

Detector principle

Smoke: photoelectric detection of light scattered by smoke particles
Heat: temperature-sensitive resistance

Supply voltage

Regulated 3 V

Communication protocol

RF each 10 s
Duration: 75 ms

Quiescent current

500 μ A average, 750 μ A peak

Power-up surge current

1 mA

Maximum power-up time

10 s

Alarm LED current

3.5 mA

Remote LED current

4 mA, 5 V (measured across remote load)

Electromagnetic compatibility

EMC generic standard EN 61000-6-3/6-4

Temperature range

Max. continuous operating: +60 °C
Min. continuous operating: 0 °C
Min. operating (no condensation/icing): -20 °C
Storage: -30 to +80 °C

Humidity:

(No condensation)
0 to 95% relative humidity

Effect of temperature on optical detector

Less than 15% change in sensitivity over rated range
Slow changes in ambient conditions are automatically compensated for and do not affect sensitivity

Effect of atmospheric pressure on optical sensor: None

Effect of wind on optical sensor: None

Chamber configuration

Horizontal optical bench housing infra-red

emitter and sensor, arranged radially to detect forward scattered light

Sensor

Silicon PIN photo-diode

Emitter

GaAs infra-red light-emitting diode

Sampling frequency

Once each 10 s
Duration: 400 ms with RF communication

Life time on battery

3 years

Microcontroller characteristics

Core: 8 bit
Flash: less than 8 Kbytes
RAM: less than 1 Kbytes
EEPROM: 256 bytes (optional)
Pin-count: from 8 to 20 pins
Package: TSSOP, UQFN, DIP
Timers: 2x 16 bits
Real-time clock: yes
ADC: 10-bit 3-channel minimum
Other: secure reset signal, USART/SPI

ST's answer with the ultra-low-power platform

- Commitment to low power
 - Platform for 8-bit STM8L and 32-bit STM32L MCUs
 - ST's 130 nm ultra-low-leakage process technology
 - Significant improvement in all power consumptions – static and dynamic
- Pure efficiency
 - High performance/power-consumption ratio thanks to new architecture
 - Ultra-low-power modes: down to 350 nA with SRAM retention
 - Fast wake-up from low-power modes in 4 μ s
 - Advanced analog functions down to 1.8 V
 - Reprogramming capability down to 1.65 V
- Inside the STM8L
 - ST ultra-low-power 8-bit MCU supply voltage: from 1.8 to 3.6 V
 - Power-up peak consumption: 700 μ A
 - In active-halt mode (-40 to 25 °C) consumption: 0.5 μ A (typ.)
 - Maximum power-up time of the 8-bit MCU: 3 ms
 - Output driving current ($V_{DD} = 3$ V): +10 mA



Matching smoke detector

- ✓ Supply voltage
- ✓ Power-up surge current
- ✓ Quiescent current
- ✓ Maximum power-up time
- ✓ Alarm LED current
- ✓ Remote LED current

Inside the STM8L

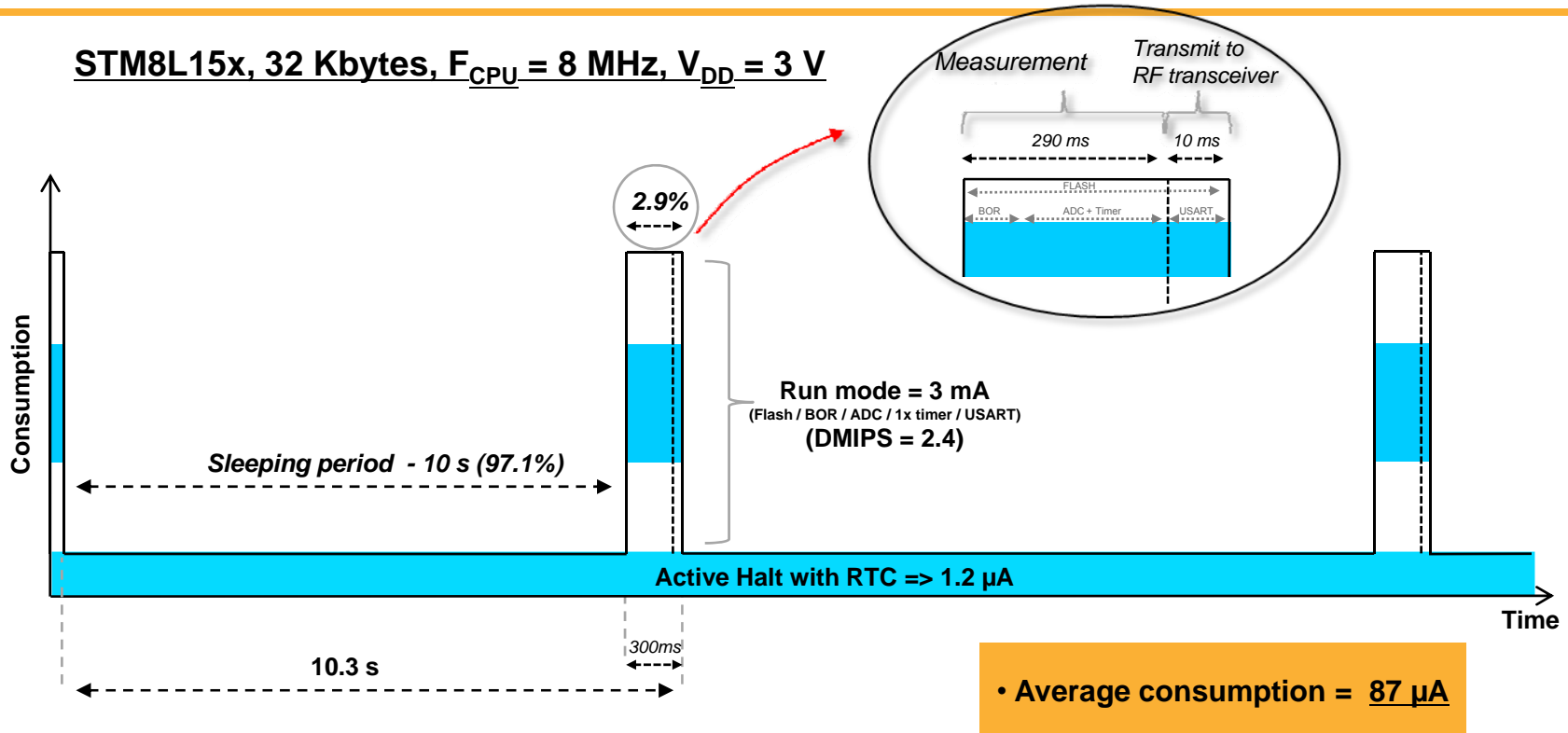


- Flash from 4 to 64 Kbytes + true embedded EEPROM up to 2 Kbytes
- SRAM: 1 up to 2 Kbytes
- 12-bit embedded ADC: up to 1 MSPS/25 channels
- Small package and pin count: TSSOP and UQFN, 20 pins
- 8-bit MCU EMC: IEC 61967-2 level compliant
- Embedded ultra-low-power real-time clock
 - Sub 1 μ A hardware RTC and AWU or regular wake-up application
 - Sub-second hardware RTC for precise synchronization in RF networks
 - Fine-grain calibration accuracy down to +/- 2 ppm
- 5 ultra-low-power modes down to 0.35 μ A
- 2 ultra-low-power comparators
- Temperature range: -40 to +125 $^{\circ}$ C
- Humidity: package supports up to 85% relative humidity
- Other features:
 - 2x16-bit timers
 - USART, SPI and I²C
 - Secure reset signal with PVD, BOR, LVD

Matching smoke detector

- ✓ Microcontroller characteristics
- ✓ Electromagnetic compatibility
- ✓ Sampling frequency
- ✓ Quiescent current
- ✓ Temperature range
- ✓ Humidity

STM8L smoke detector – power versus time



- Using 2x AA batteries (3 V, 2700 mAh), the STM8L guarantees at least 3.5 years functionality

• **DMIPS values:** measured by MCD Application Lab (using Dhrystone code V2.1)
• **Consumption:** MCUs execute Dhrystone code V2.1 @ 3 V, 25 °C
• Based on a standard smoke detector scenario

The STM8L helps achieve
✓ 3 years life capability

STM8L – the ideal MCU



- STMicroelectronics supports the ultra-low consumption application market with its proprietary 130 nm ultra-low-leakage process technology
- The 5 ultra-low-power modes, combined with the ultra-low-power RTC, makes the STM8L an ideal MCU to design advanced fire alarm and smoke detector systems
- With a 16 MHz core, a large Flash memory (4 up to 64 Kbytes) and a true embedded EEPROM, the STM8L can be used in many other applications requiring complex programming code

Thank you for your attention



For more information, visit

www.st.com/stm32l

www.st.com/stm8l