Digital Lighting & Power Supply Introduction

September 2016

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STLUX platform

- The STLux is a flexible digital platform with a full set of specific features and peripherals for AC/DC and DC/DC Power Conversion

- Suitable for:
  - SMART LIGHTING: **LED, HID, Fluorescent applications** with dimming capability (PWM and/or LINEAR) and integration with sensors
  - Digital Power Supply (SMPS): PFC control, LLC, Asymmetrical Half Bridge, Fly-back, Full Bridge topologies and Buck/Boost single/multi channel synchronous rectification

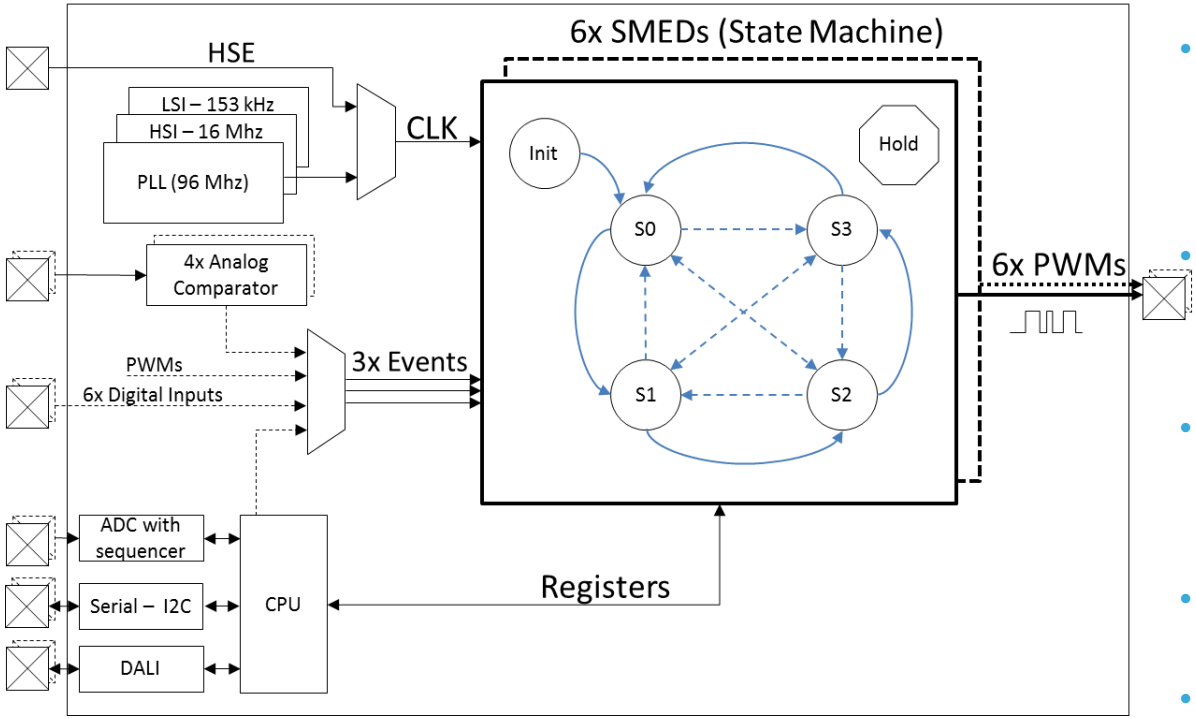
- Wired or wireless communications, simple installation in large indoor and outdoor area, reducing maintenance costs

Professional smart indoor

High-quality outdoor

Efficient Outdoor & High bay

STLUX385A meets Power Conv. requirements

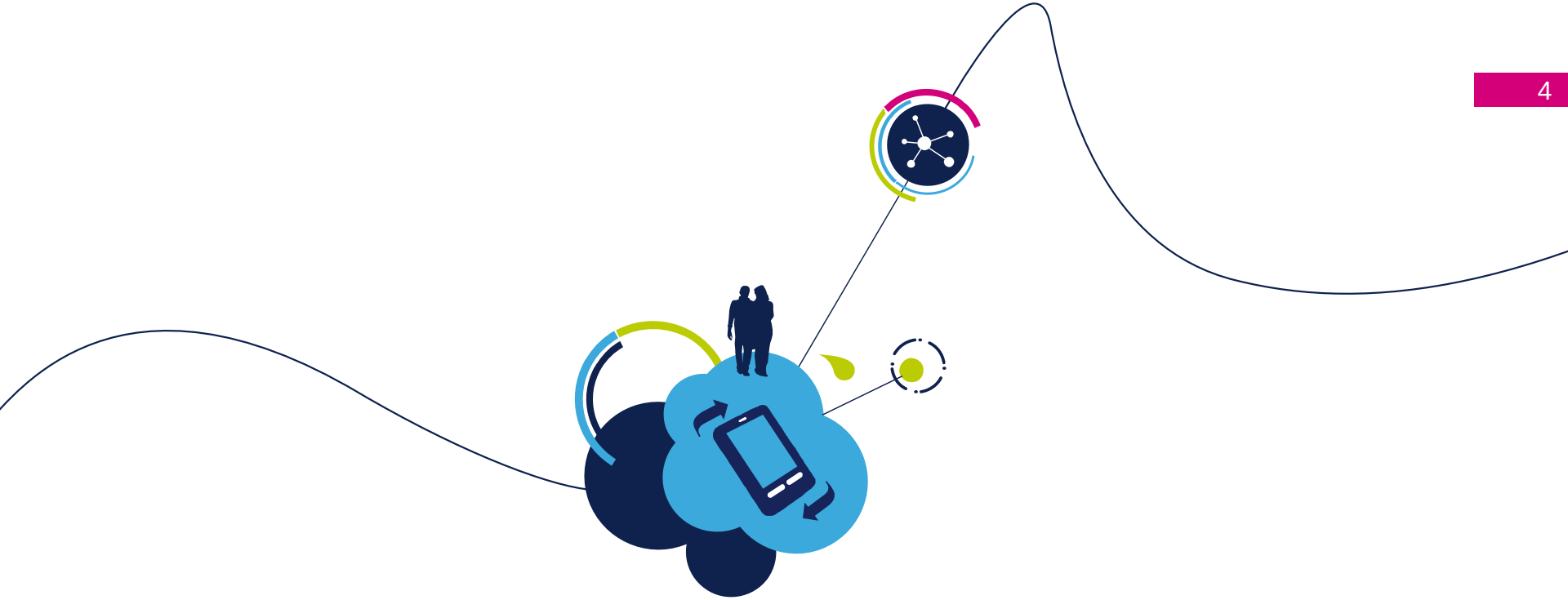


- **SIX** configurable PWM **S**tate **M**achine **E**vent **D**riven (SMED) 1.3ns resolution (with automatic dithering) – 10.4 native.
- 4 Analog Comparators and 6 fast digital inputs synchronized with 96MHz clock
- 8 channels 10 bit ADC with programmable op amp GAIN resolution, 2.4 µs conversion time,
- -40 ºC to 105 ºC temperature range
- TSSOP38

STLUX digital power converters are the right solution for digital power conversion applications.

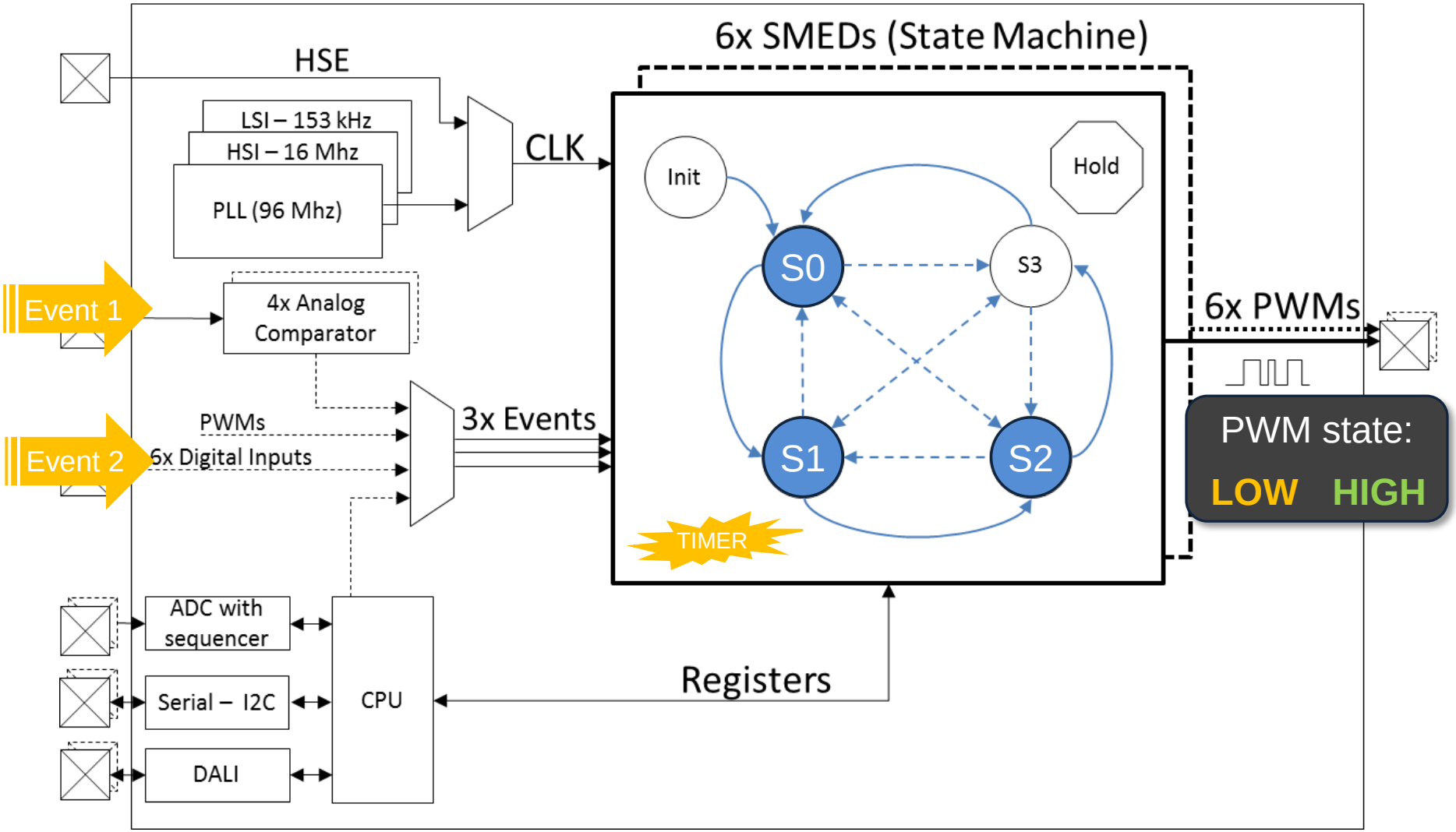
ST programmable SMED peripherals + Switch matrix and 8 bits ST core provide flexible and complete power management functionalities in a single IC.

By providing high–speed PWMs (96MHz), dedicated 8ch ADCs with selectable gain, STLUX exploits system performance and reliability



STLUX CORE : SMED

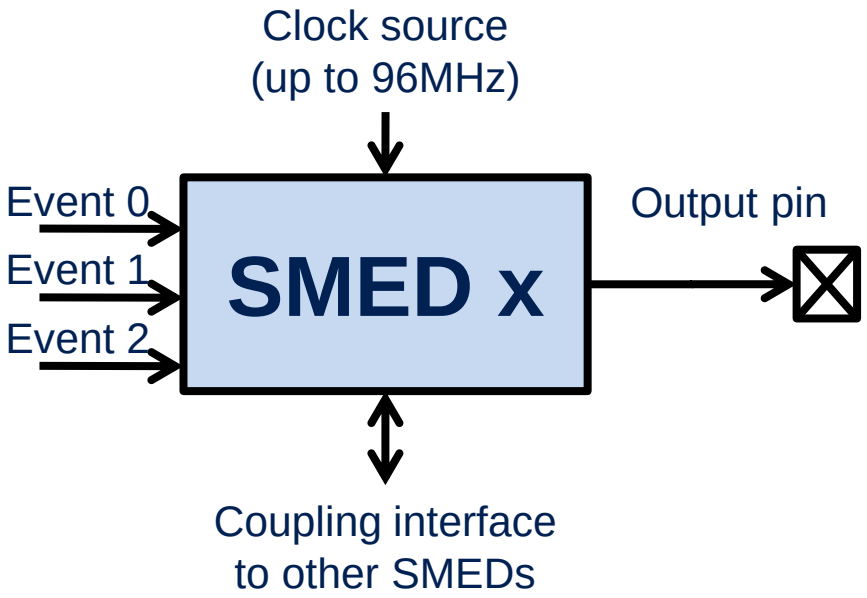
STLUX platform



SMED – Basic overview

State Machine – Event Driven

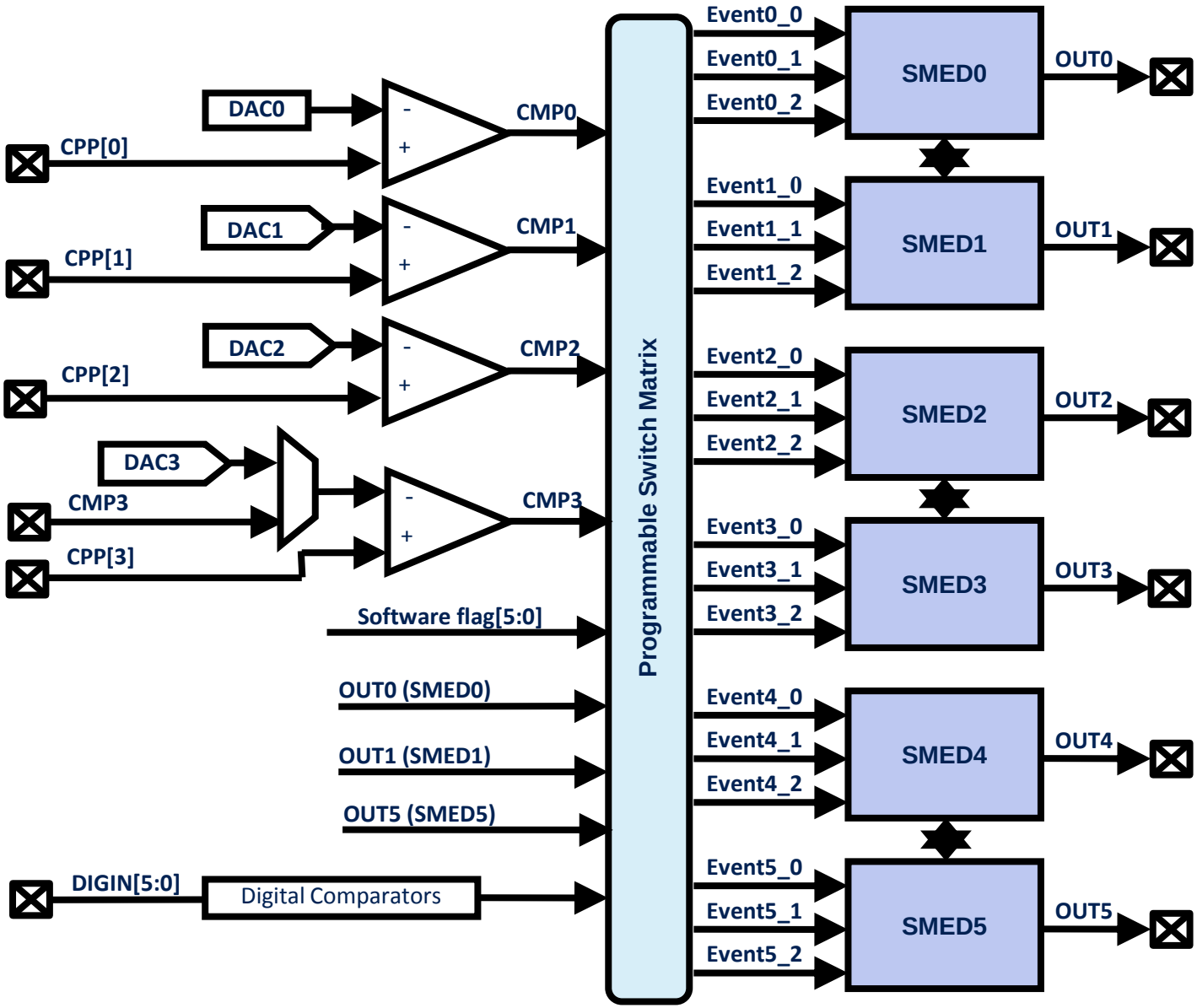
- **Signal generating machine**
- Software Configurable Peripheral
- Modular approach for maximum flexibility
- 6 independent SMED on STLUX385A



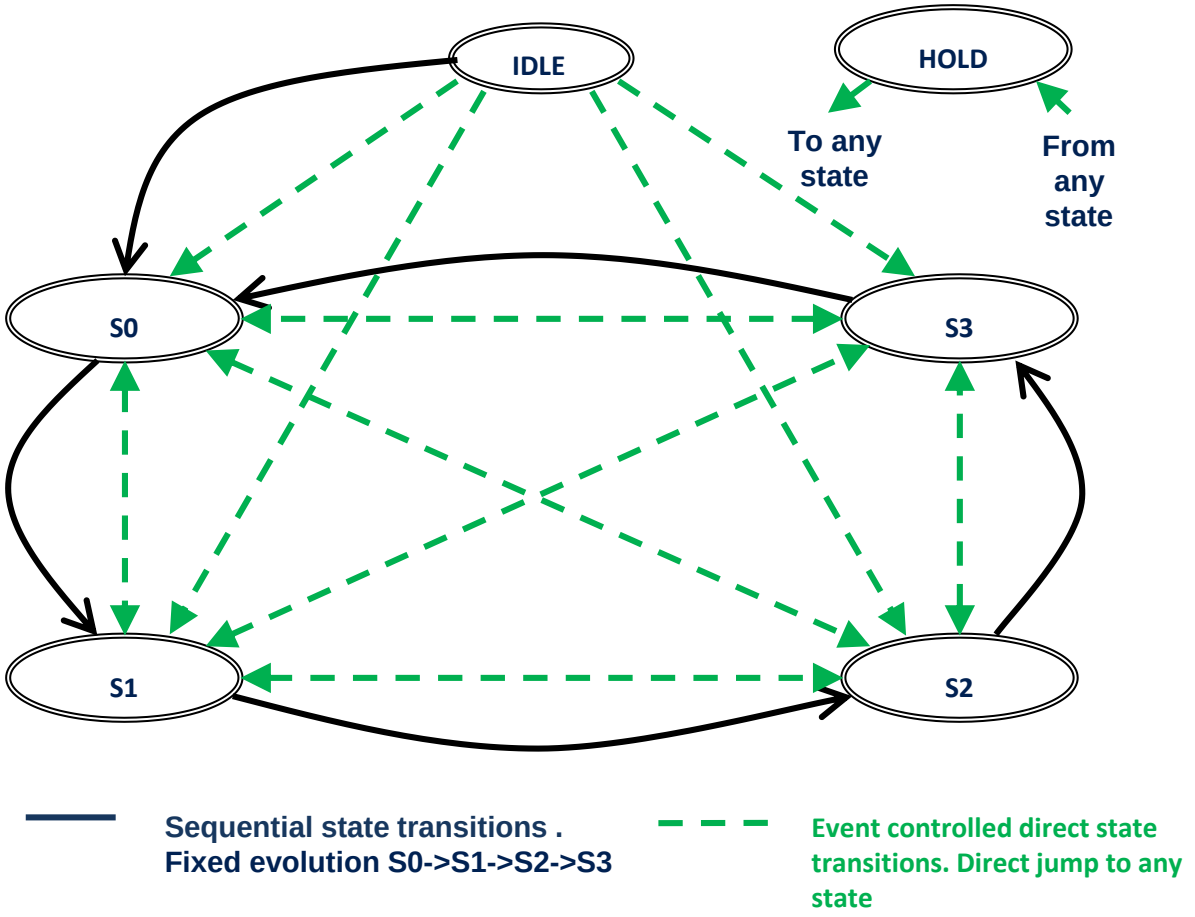
Each SMED integrates:

- One controlled output
- 3 programmable event inputs
- Edge/level event generation
- 16bits counter
- Clock frequency up to 96MHz
- Four 16bits time compare registers
- One 16bits dump register

Connection Switch Matrix – Input Events



State Machine - Complete



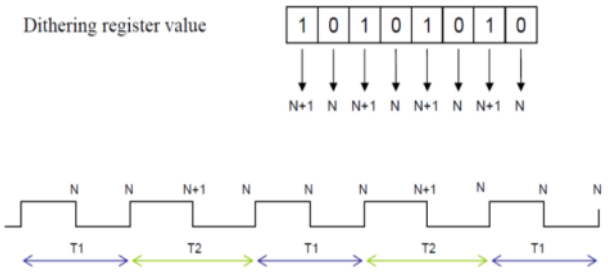
Each state has 3 configuration registers to program

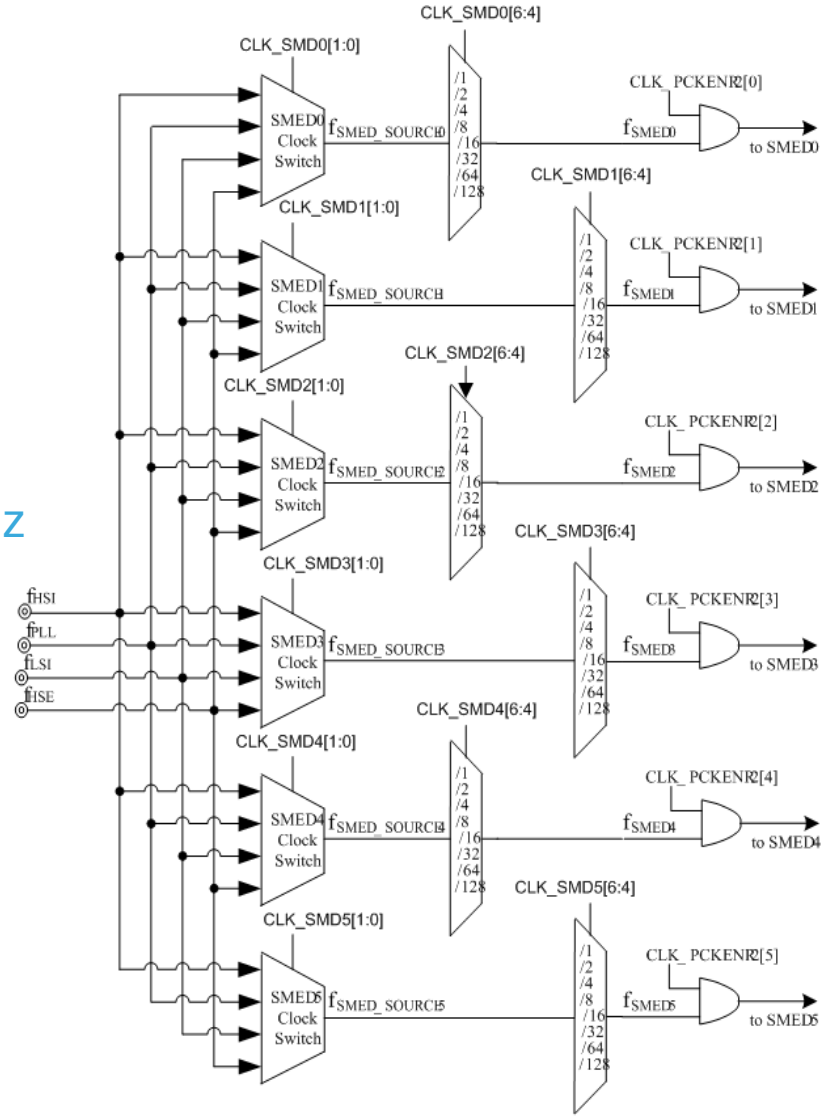
- Conditions when the machine leaves the current state and what is the next state
- Actions to be done when leaving the state – (counter reset and/or output pin level)

SMED Clock Sources

- Each SMED with independent clock

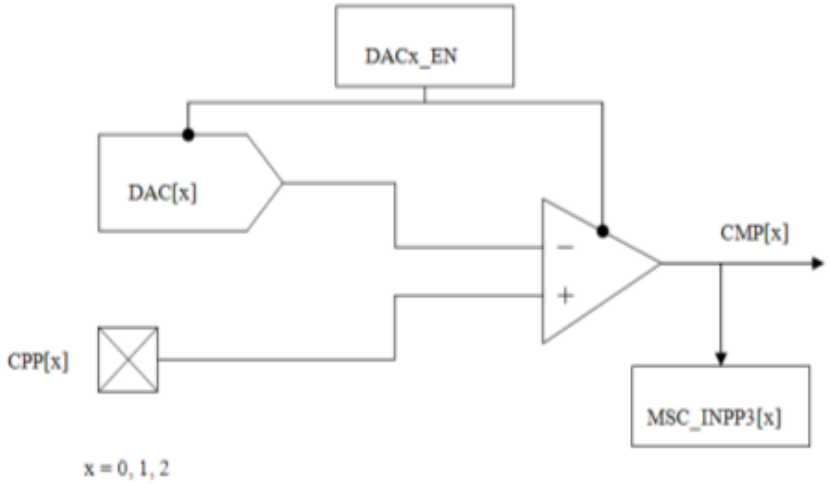
- 96MHz PLL+ programmable Dithering
  - 1.3ns average resolution
  - 13Hz average frequency step @ 100kHz
  - Higher resolutions even at low speed clocks

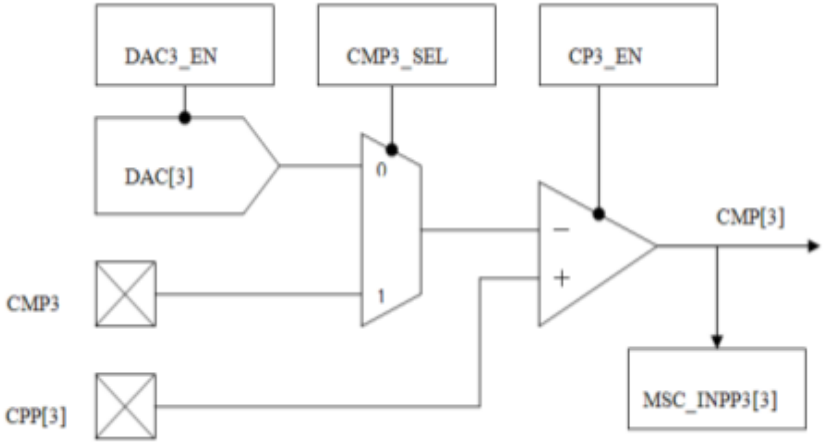




Analog Comparators

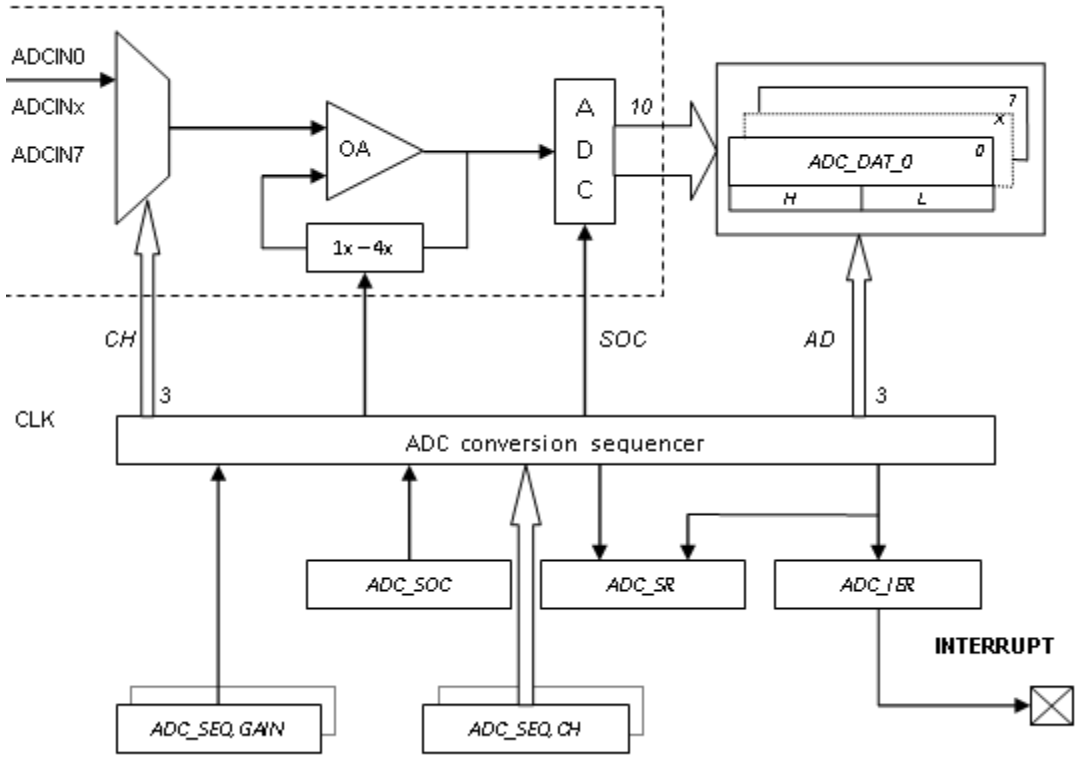
- Up to 4 independent comparators
- Very fast propagation delay (50 ns max)
- Internal 4 bit DAC reference: 16 values selectable from 0 to 1.23 V (bandgap reference)
- One comparator available with external reference





Analog to Digital Converter

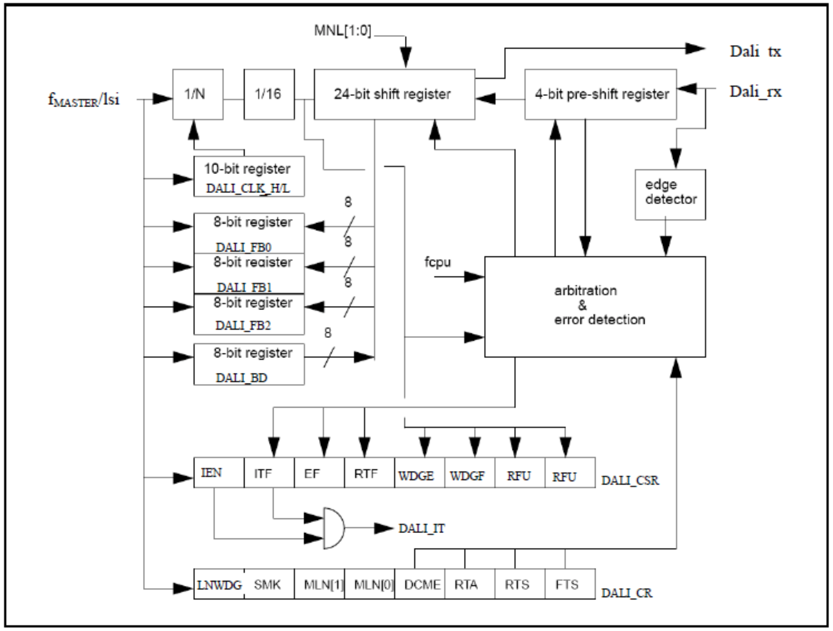
- 8 channels
- 10 bit resolution with gain (x1 or x4)
- 300 µV resolution (gain = x4)
- Conversion time: 2.4 µs (single mode), 3 µs (circular mode)
- Reference internally generated from the band-gap => independent on supply voltage => no need for very accurate voltage supply



Hardware DALI

Main features:

- Bi-phase Manchester asynchronous serial data format (6-9V)
- Programmable 1.2kHz, 2.4kHz and 4.8 kHz transmission rate (±10%)
- Bi-directional communications in four 8-bit forward/backward data registers
- Variable 16-18bit and 24 bit forward message length are supported
- 153.6Khz internal RC can be used in low power (standby) mode for Dali peripheral
- 500ms (±10%) interface failure detection to monitor receiver line timeout
- Maskable interrupt
- Dali_rx, Dali_tx polarity insensitive signal lines
- Configurable Noise Rejection Fitler
  - remove any RX bounce, glitch or spurious pulse



Standard references – IEC 62386 – xxx:

- **101 – general requirements of systems**
- **102 – general requirements of control gears**
- 201 – fluorescent lamps
- 202 – emergency lighting
- 203 – discharge lamp (not Fluorescent)
- **204 – LV Halogen**
- 205 – supply voltage for incandescent lamps
- 206 – Conversion from digital to DC voltage
- **207 – LED modules**
- 208 – Switching function (on/off devices ndr)
- **209 – Color LED**
- 210 – Sequencer

*** available**

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STNRG family

Digital power conversion

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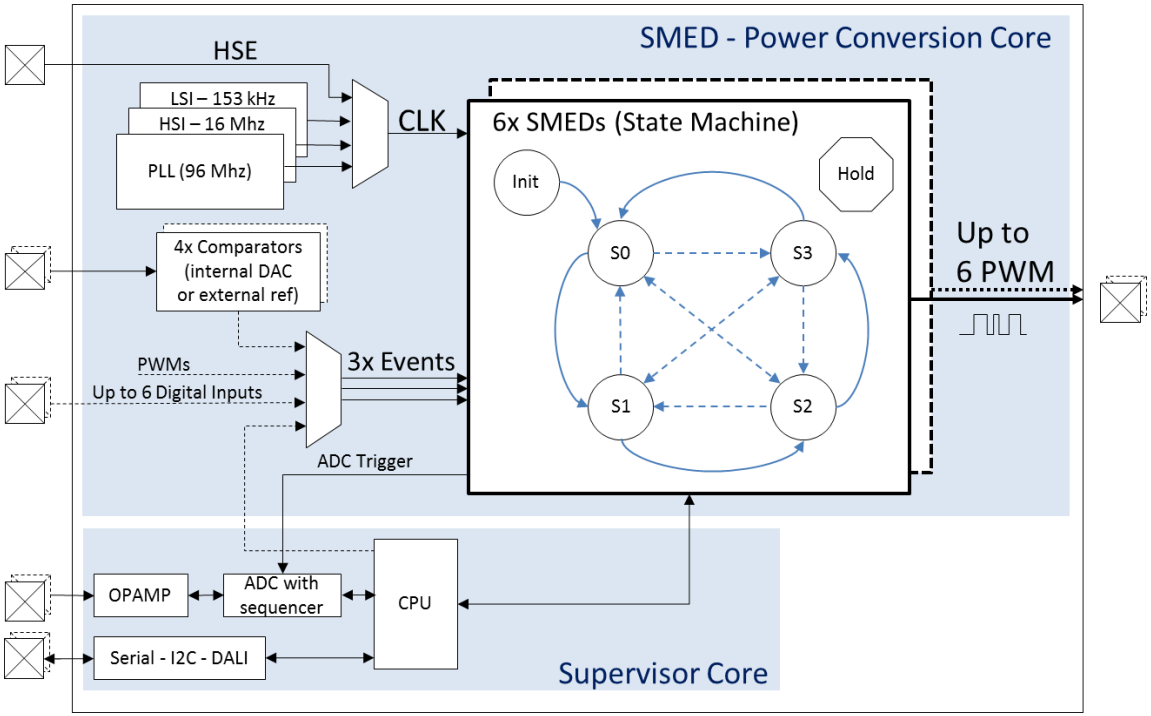
STNRG family



- **Power conversion core**
  - **6** smart PWM (SMED - **S**tate **M**achine **E**vent **D**riven) with up to 1.3ns resolution (automatic dithering).
  - Up to 96Mhz PLL
  - 4 fast comparators with internal DACs or external references and hysteresis.
- **Supervisor core**
  - 8 channels ADC with 1MΩ impedance and SMED controlled triggering
  - Integrated OPAMP
  - STM8 controller with: 32K EEPROM, 6K RAM
  - Serial, I2C and GPIOs
- -40 ºC to 105 ºC temperature range
- Package: TSSOP38, TSSOP28, QFN32,

STNRG digital power converters are the right solution for digital power conversion applications.

The programmable SMED is the hearth of the power conversion core and provides hardware based flexibility and high speed for complete MOSFET control. The supervisor core offers monitoring, communication and loop control capabilities.

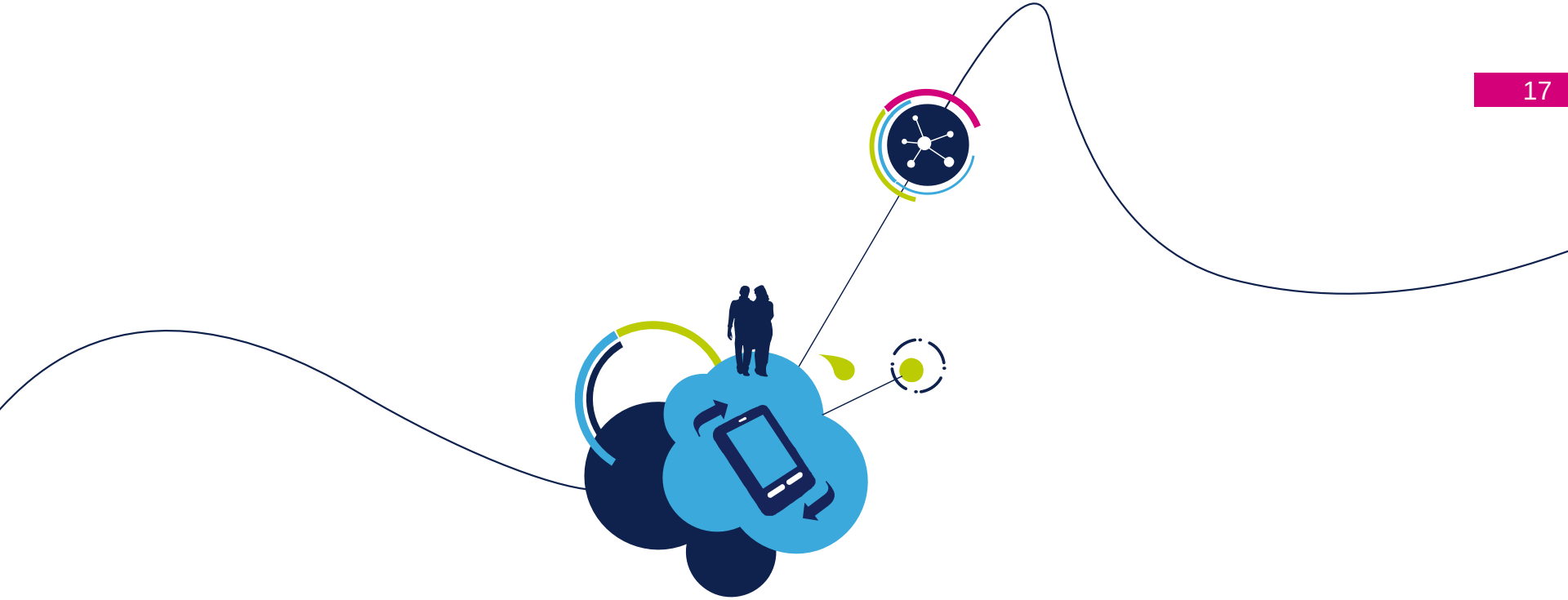
The STNRG integrated dual core architecture integrates all the power management functionalities in a single IC.

STNRG enhancement VS STLUX (1)

- Improved comparators:
  - Programmable hysteresis for each comparator
  - Interrupt on comparators output via CMP[3:0] (INPP3)
  - Added external reference voltage for COMP2,1,0 (chip type dependent)
- ADC improvements:
  - Insertion ADC HW trigger generated by the following sources:
    - Digin[0,3] / comp[0,3] / SysTimer / SMED[5:0] state 2 / AuxTimer[0,1]
  - Automatic update is some ADC function
- Add 2 programmable Basic Timer with interrupt
- PWM output open drain feature configurable by SW
- Interrupt on SMED PWM via GPIO1[5:0] (INPP1)
- Increased I/O mux scheme (I2C, SWIM)

STNRG enhancement VS STLUX (2)

- Ram increasing to 6K byte leaves the possibility of run code into this area.
  - Increase speed execution
  - Decrease power requirement especially during low power mode



Thanks