EFM32 Series 0: Low Energy Sensor (LESENSE) Interface
LESENSE – Low Energy Sensor Interface

Analog events
Capacitive, inductive or resistive sensors
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Generic MCU
Wake-up periodically to detect the events
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EFM32 MCU
Wake-up only on the events
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EFM32 MCU
Wake-up only on the events

Conditional wake-up (e.g. on every 2\textsuperscript{nd} event)
LESENSE – Low Energy Sensor Interface

• Autonomous sensing in Deep Sleep
  • LESENSE with central control logic
  • ACMP for sensor input
  • DAC for reference generation
• Measure up to 16 sensors
  • Inductive (LC)
  • Capacitive (e.g. capacitive buttons)
  • General analog sensors (e.g. resistive)
• Programmable state machine
  • 16 states, 4 input channels
  • Can do quadrature decoding
• Interrupt/PRS on sensor events
Capacitive Measurement

Interrupt!

<2 μA
Resistive/General Measurement

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LESENSE

Excitation

CPU

ACMP

Output

Sample

Sample

Sample

Power supply

Sensor

PRS

..101..

<1.5 μA
LESENSE Inductive Measurement

<2 µA

Fixed at Vdd/2

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DAC0_OUT0

ACMP0_CH0

No metal

Metal

[Graphs showing waveforms for no metal and metal conditions]
LESENSE Inductive Measurement – Timing

- LESENSE scans all the enabled channels at a configurable frequency.

Analog Comparator and DAC Enabled
Excitation (pull CH0 pin low)
Sampling Window

Acmp and DAC on
Hi-Z
High-Z input
Acmp gated to counter

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DAC0_OUT0
ACMP0_CH0

LESENSE
10
<
6
Feel the flow!!

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LESENSE

CH0

CH1

Compare

Interrupt!!

Flow
State Machine - Slide to Wake up!

- Autonomous Gesture Detection
- Up to 16 Different States
- Output to PRS or Interrupt
Slide to Wake up!

• What happens on incomplete gesture ??
LESENSE – Statemachine / Decoder

- Up to 16 states.
- 4 Inputs from scan-result or PRS.
- 2 configurable next states per transition.
- 3 output action signals on state transition.
- Interrupt on state transition.
- One transition per scan-sequence.
LESENSE Overview
Measurement Timing