LAB EMBEDDED SYSTEM DESIGN 2 PROJECT

Currents

Brecht Van Eeckhoudt

27 maart 2019

1 Happy Gecko – Energy modes

We jump between `EM0` and `EM2`. *The following data is from the datasheet.*

EM0 230 μA/MHz

EM1 67 μA/MHz

EM2 0,95 μA (RTC disabled – not in our case since every hour we need to wake up?)

EM3 0,65 μA

EM4 20 nA

2 ADXL362

We use the accelerometer now @ 12,5 Hz ODR[1] so the actual current should be lower. *The following data is from the datasheet.*

100 Hz ODR @ 2V 1,8 μA

400 Hz ODR @ 2V 3,0 μA

Wakeup mode @ 2V 270 nA[2]

3 Happy Gecko + ADXL362

The following data is approximated using measurements.

Both active 2,30 mA

Happy Gecko @ EM0, ADXL active < 4 μA[3]

[1] Output Data Rate

[2] Not yet implemented, 6 checks/second.

[3] ADXL measuring @ ODR 12,5 Hz and waiting to generate an interrupt.

4 Time and current estimates

The following data is approximated using measurements and common sense. They are pretty *worst-case* and should represent the total currents used by everything.

Every hour measurements 1s @ 2,8 mA

Every day sending LoRaWAN data 2s @ 30 mA

Sleep 5 μA

$E_{measure/day} = 24\ [times] \cdot 1\ [second] \cdot 2,8\ mA \cdot 3,3\ V = 0,22176\ [J]$

$E_{send/day} = 1\ [time] \cdot 2\ [seconds] \cdot 30\ mA \cdot 3,3\ V = 0,198\ [J]$

$t_{sleep} = (24\ [hours] \cdot 60\ [minutes] \cdot 60\ [seconds]) - 24 \cdot 1\ [second] - 2\ [seconds]$
$t_{sleep} = 86374\ [seconds]$

$E_{sleep/day} = 86374\ [seconds] \cdot 5\ \mu A \cdot 3,3\ V = 1,425171\ [J]$

$E_{total/day} = 0,22176\ [J] + 0,198\ [J] + 1,425171\ [J] = 1,844931\ [J]$

- $[J] \Rightarrow [mAh]$: $/3,6/V_{DD}$
- How much years will it last? (at least 5!)
    1. You have a number in Joules/day, convert it to the mean current throughout the whole day.
    2. Take the mAh value of the battery and use it to calculate the lifetime in years.