



WEBINAR
EMBARCADOS

O FIM DAS BATERIAS DESCARREGADAS:

MULTIPLICANDO A VIDA ÚTIL DO SEU
PRODUTO IOT COM NANOPower NPZERO

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 **Alphatech**



Agenda

- Quem apresenta este webinar
- Quem somos e o que oferecemos
- O que temos conquistado: prêmios e reconhecimentos do mercado
- Redefinindo low power e como chegar neste novo nível de consumo
- Casos reais ~90% em redução de consumo de Corrente
- Ferramentas de apoio HW – Devkit, Stamp, reference designs
- Ferramentas de apoio SW - Live Demo do nPZero Configurator
- Provando nosso discurso → Live Demo da placa Nano-Stacker
- Call to Action
- Q & A



Suporte Nanopower



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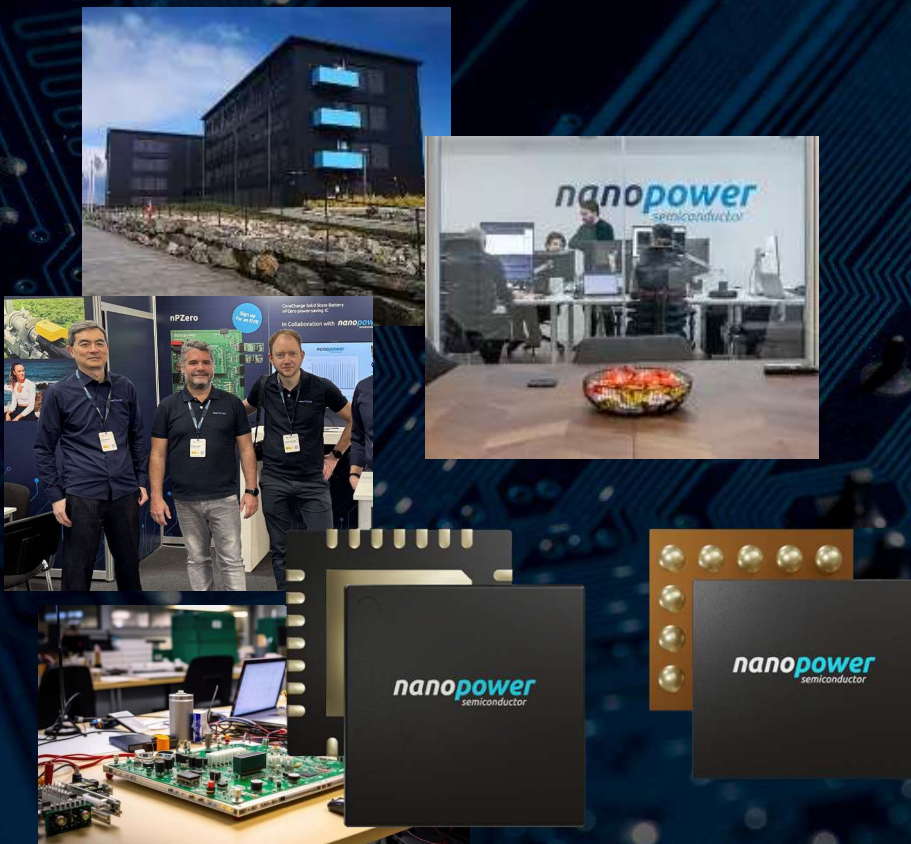
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Lateral Direito



Nanopower : “Nova solução para um problema antigo”

Uma nova categoria de CI que reduz drasticamente o consumo de energia



1. Empresa de semicondutores fabless (Operações na Noruega e Portugal)

2. Uso da tecnologia subthreshold Ultra-low Power (nA)

3. Fundada em 2017

1. *nPZero* é um PSIC Intelligent Power Saving Companion IC

2. Elimina o tempo ocioso de um MCU e periféricos

3. Reduz o consumo de energia durante longos períodos em idle ou sleep modes

1. *nPZero* Ecosystem: suporte desde a avaliação até a produção

2. Dev Portal com documentação, configurator tools e demos

3. Desenvolvimentos mais rápidos e redução do time-to-market

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Nanopower: Award Winning nPZero PSIC (Power Saving IC)

- WINNER of Consumer Semiconductor: Energy-Efficiency
- WINNER of EPDT Product of the year
- HIGHLY COMMENDED for Medical Semiconductor of the year
- Finalist across three categories at Elektra 2025



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Nanopower selected for Amazon Devices Climate Tech Accelerator



Meet the innovators selected for the 2026 Amazon Devices Climate Tech Accelerator



2026 Cohort

Amazon Devices Climate Tech Accelerator

Designed to accelerate the integration of innovation that can help reduce the carbon impact of Amazon devices.





Capacidade: 240mAh

Nanopower nPZero IC



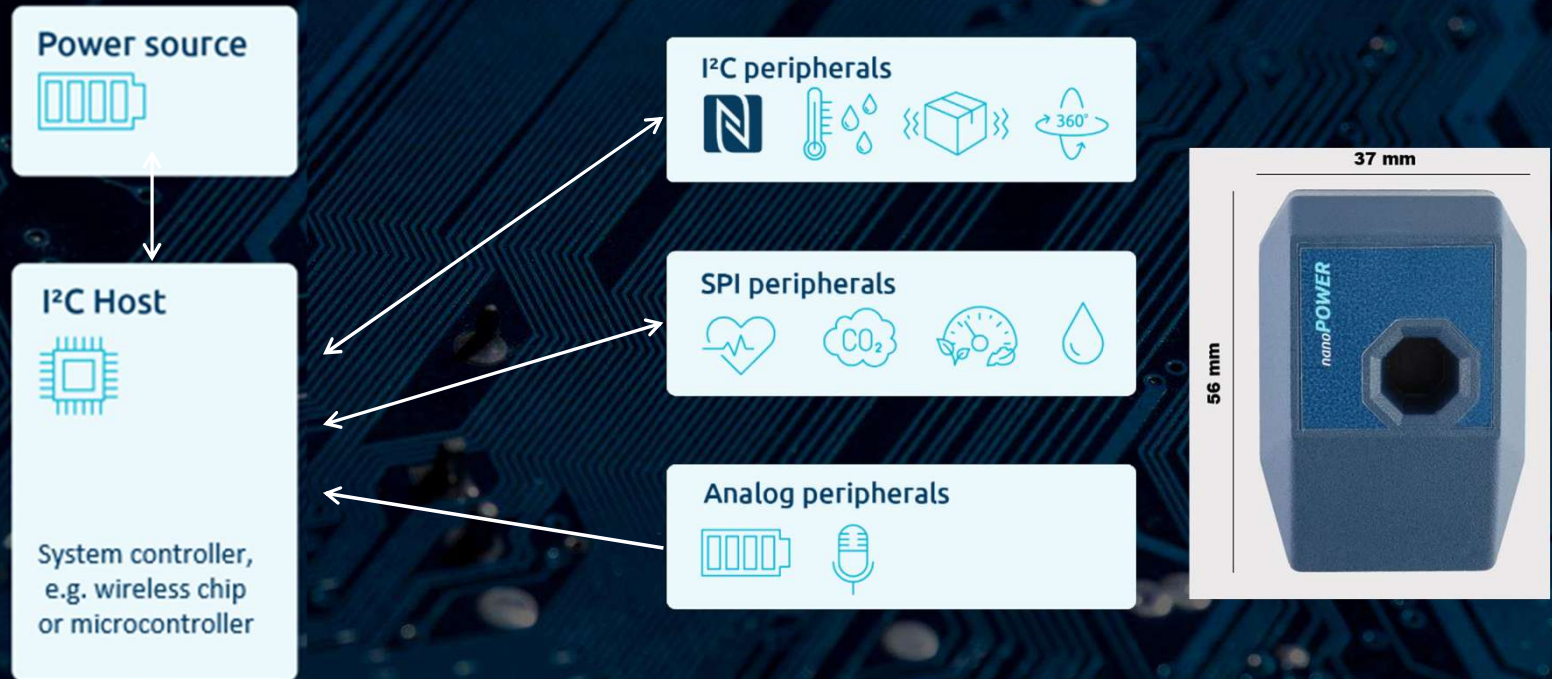
Consumo de energia: 100nA

Quanto tempo uma bateria CR2032 dura alimentando um nPZero?

Dura 274* anos

Nanopower: o desafio da barreira de 1uA

Este é o diagrama em blocos típico de um dispositivo IoT.



A grande jornada de William Xavier



**2 anos
(100nA)**

20mA

LEDs

No floating I/Os (Analog, Output)

Cristal Low power (500nA)

Menor pinout possível

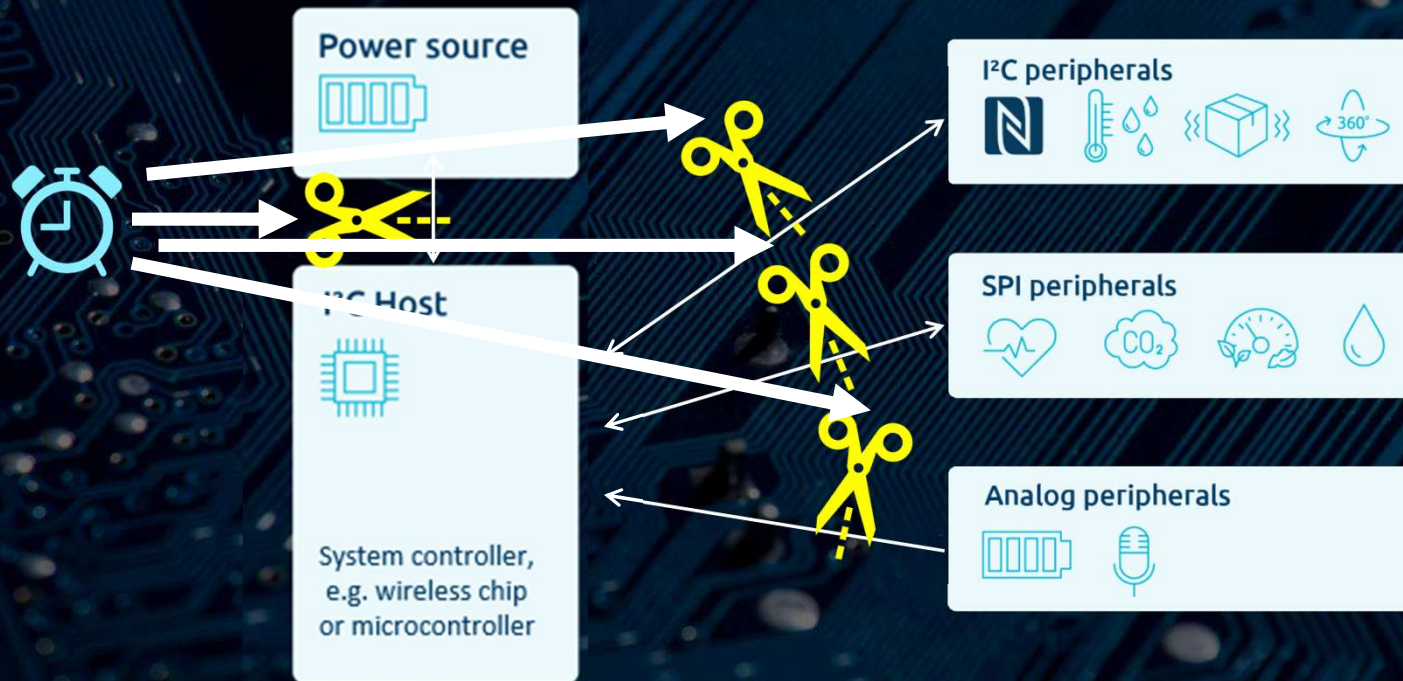
Sensor pooling

Evitar reguladores de tensão

20uA

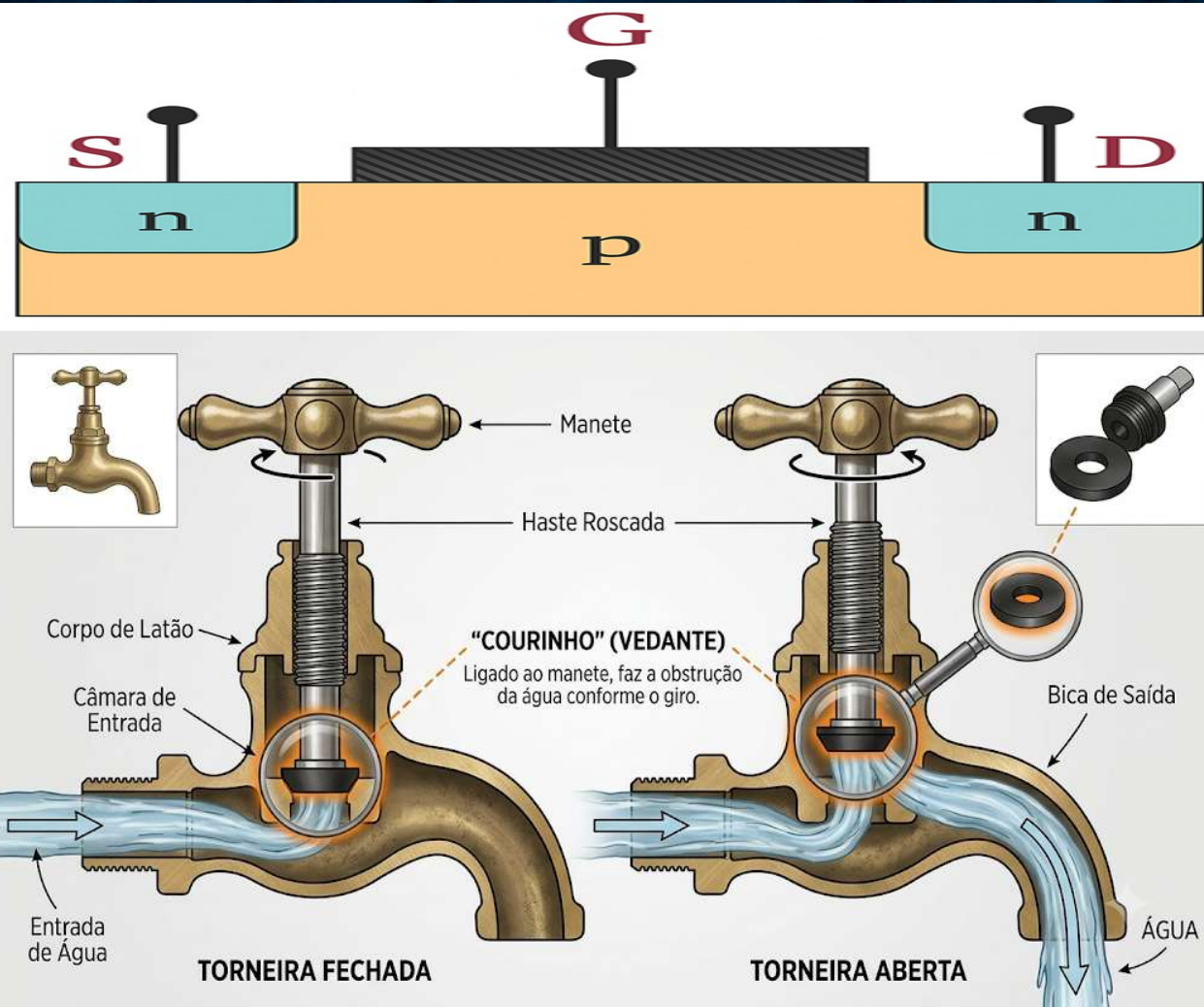
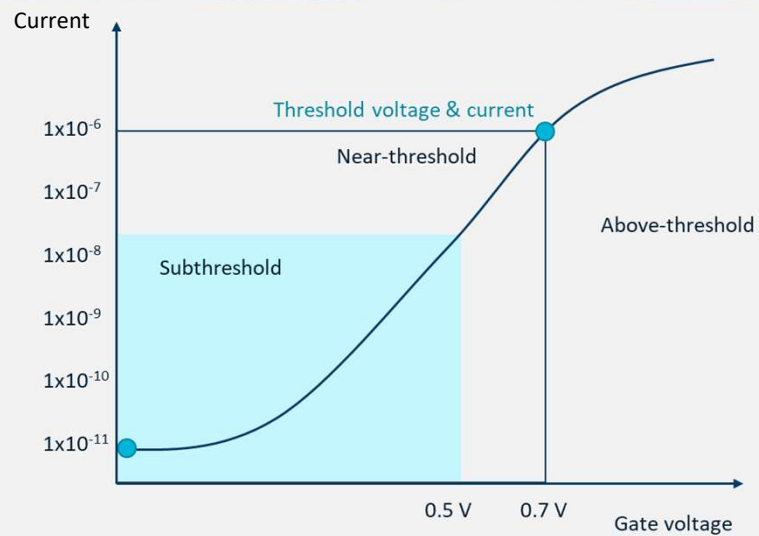
Nanopower: o desafio da barreira de 1uA

Este é o diagrama em blocos típico de um dispositivo IoT.



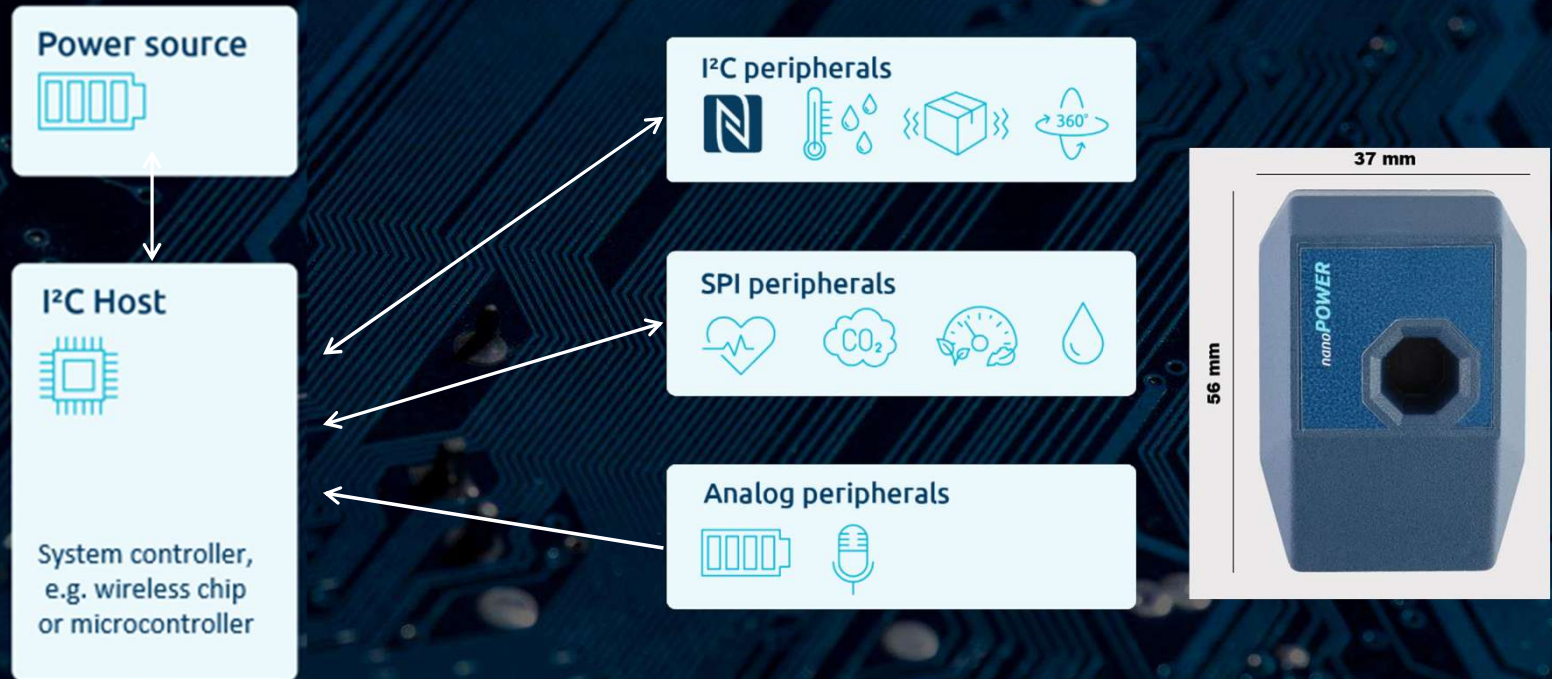
1uA

Tecnologia subthreshold



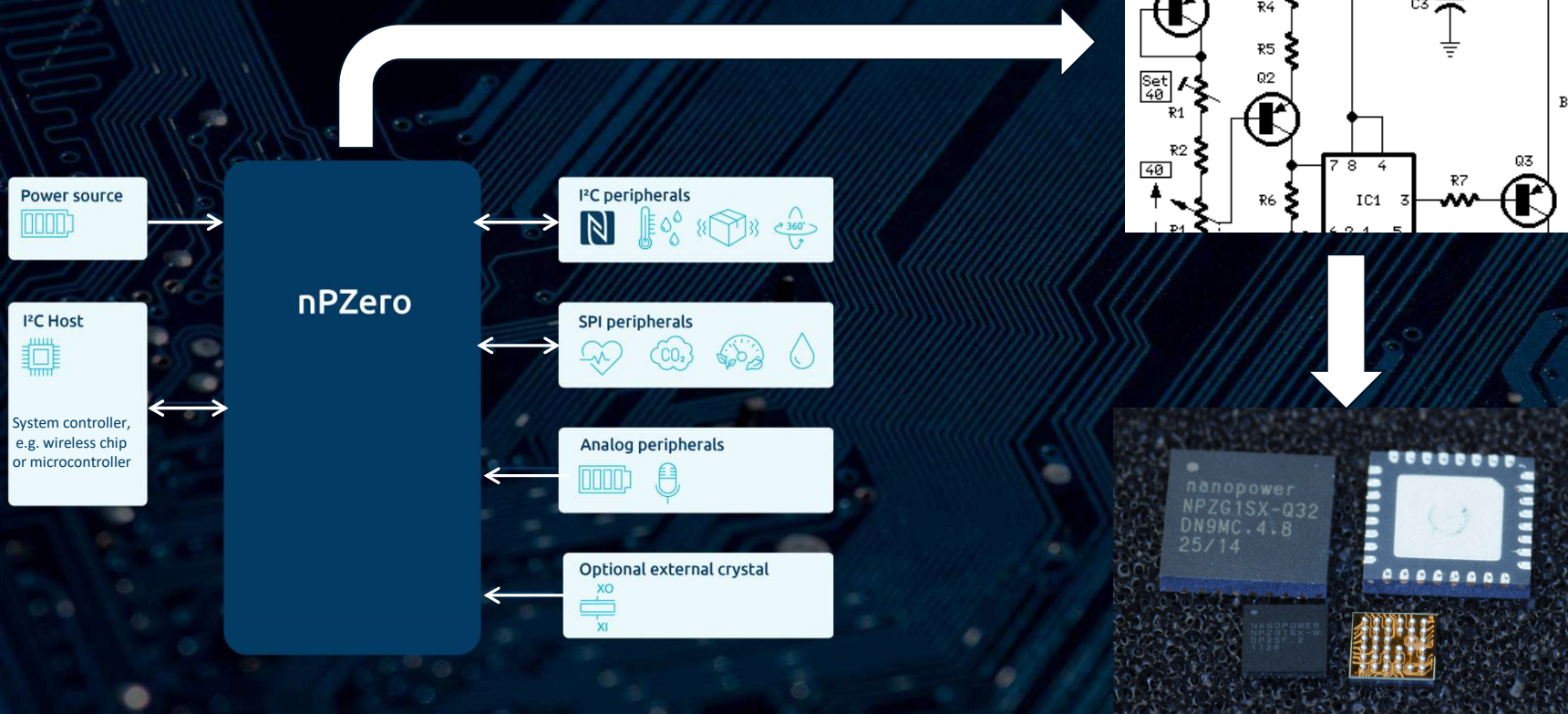
Nanopower: o desafio da barreira de 1uA

Este é o diagrama em blocos típico de um dispositivo IoT.

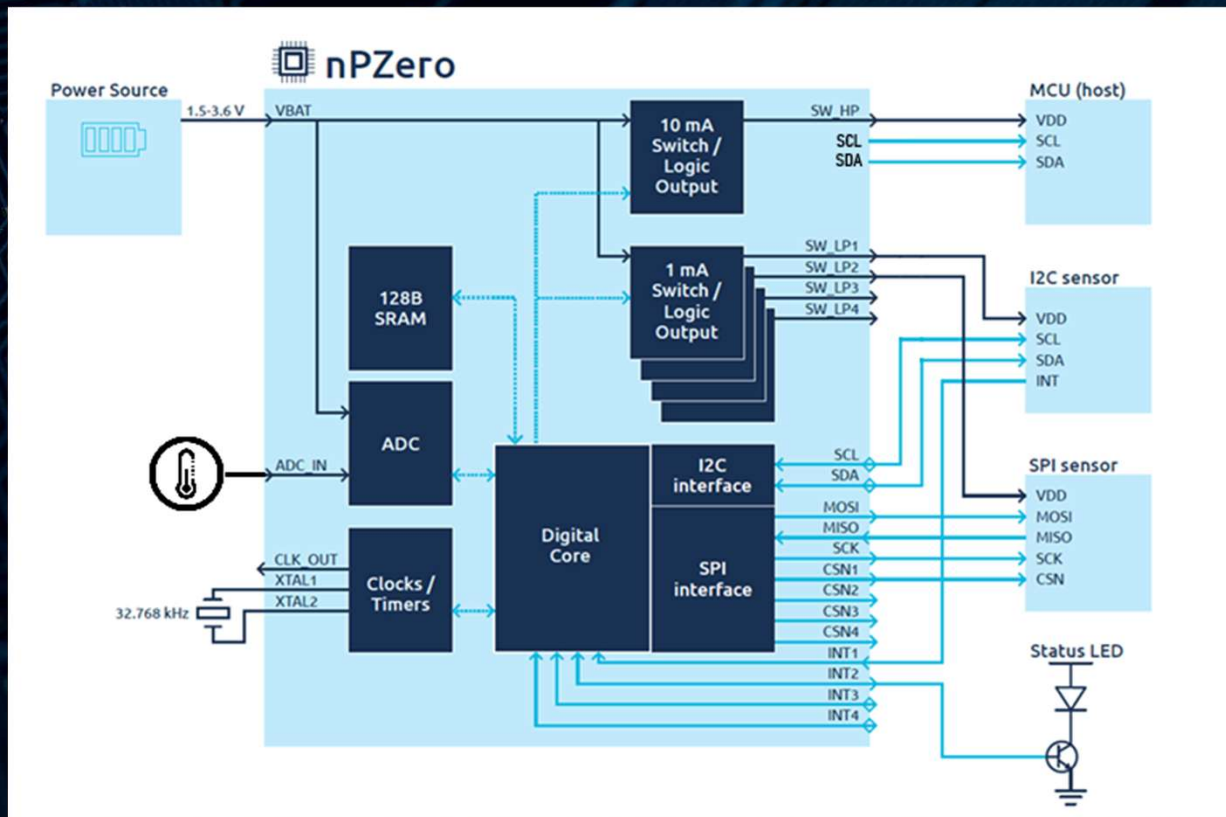


Nanopower: circuito que deu origem ao nPZero

Conseguimos romper a barreira do 1uA mas...



nPZero G1: Nascimento do primeiro PSIC – Power Saving IC

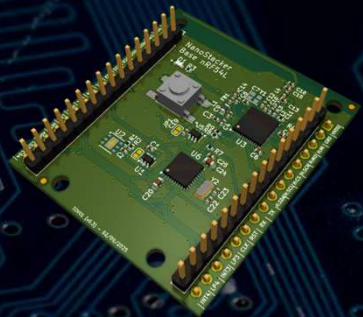


Blocos criados com a tecnologia subthreshold:

- Analog power switches
- Sensor hub : 4 x SPI/I2C to 1 x I2C
- Analog input ADC
- Clock
- 128 bytes SRAM
- Smart State Machine

Mestre em eficiência: estratégias de SW

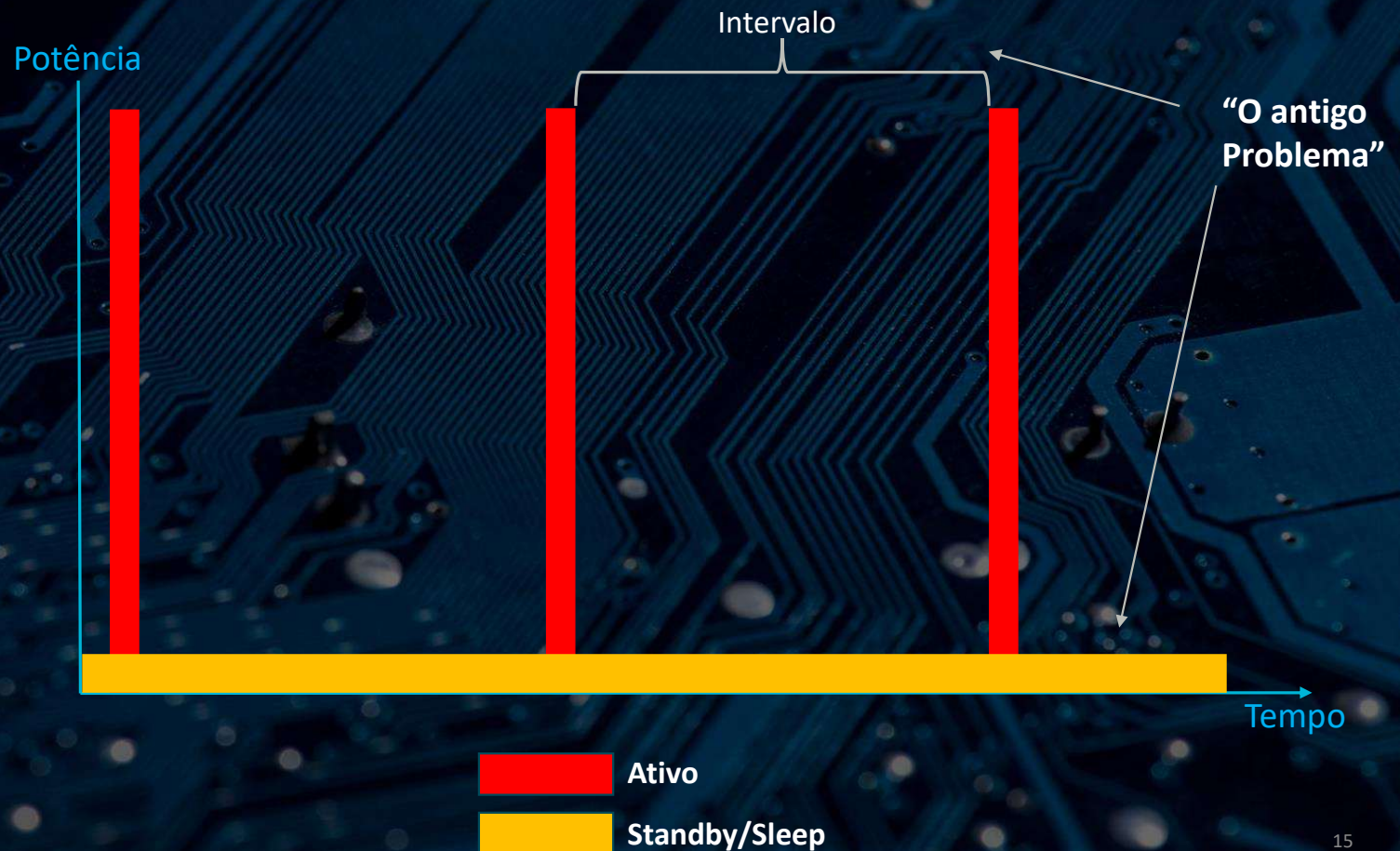
Uso do MCU em dispositivos IoT – versão simplificada



Blocos básicos de um dispositivo IoT:

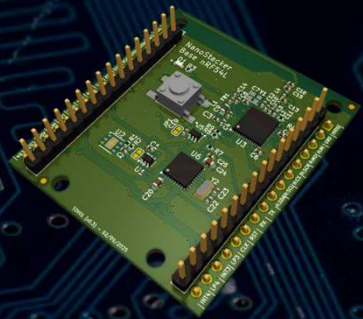
- MCU (ou módulo Wireless)
- Sensor(es)
- Bateria

Energia = Potência * Tempo



nPZero reduz significativamente o consumo em modo ativo e standby

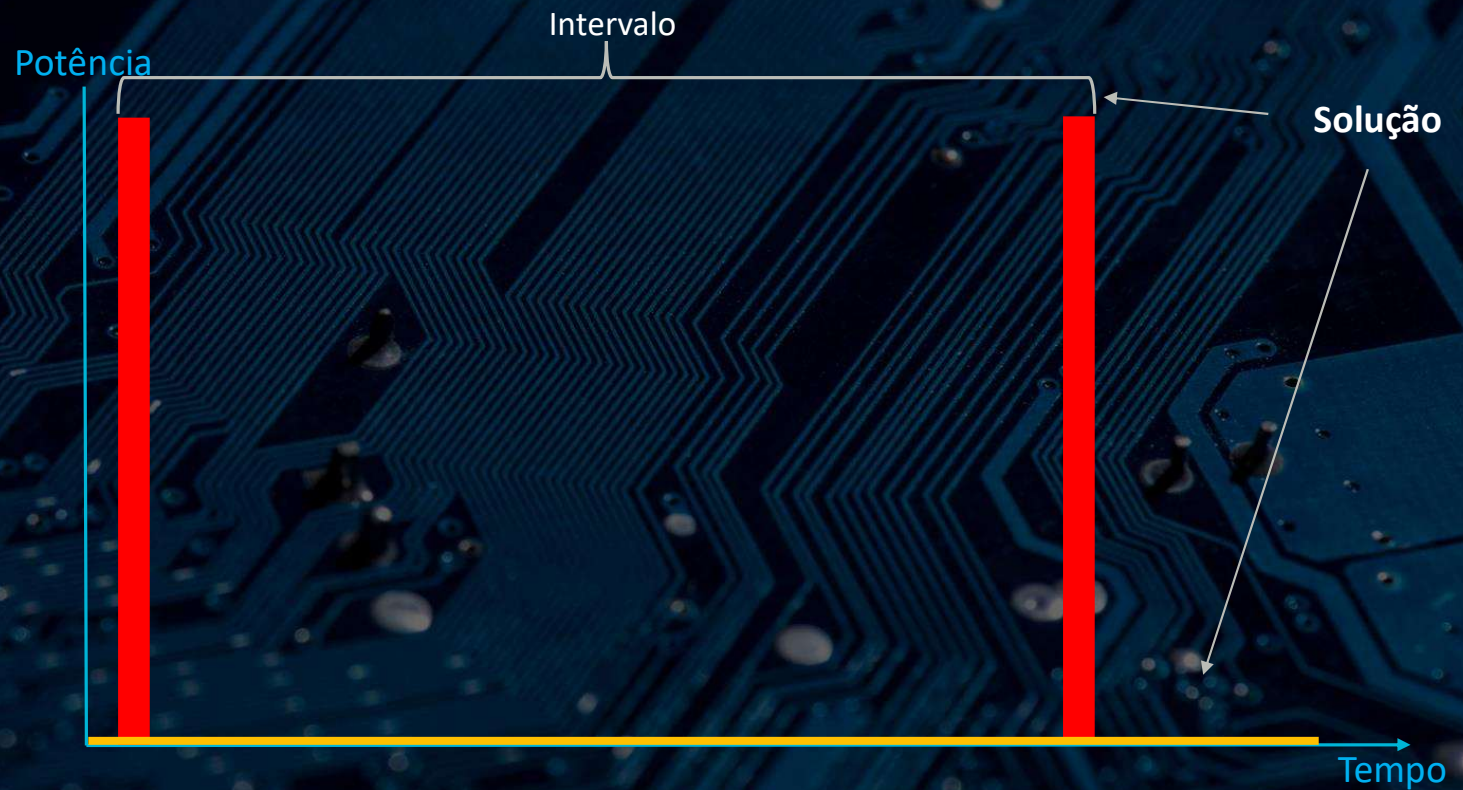
Uso do MCU em dispositivos IoT– com nPZero em ação



Blocos básicos de um dispositivo IoT:

- MCU (ou módulo Wireless)
- Sensor(es)
- Bateria

$$\text{Energia} = \text{Potência} * \text{Tempo}$$

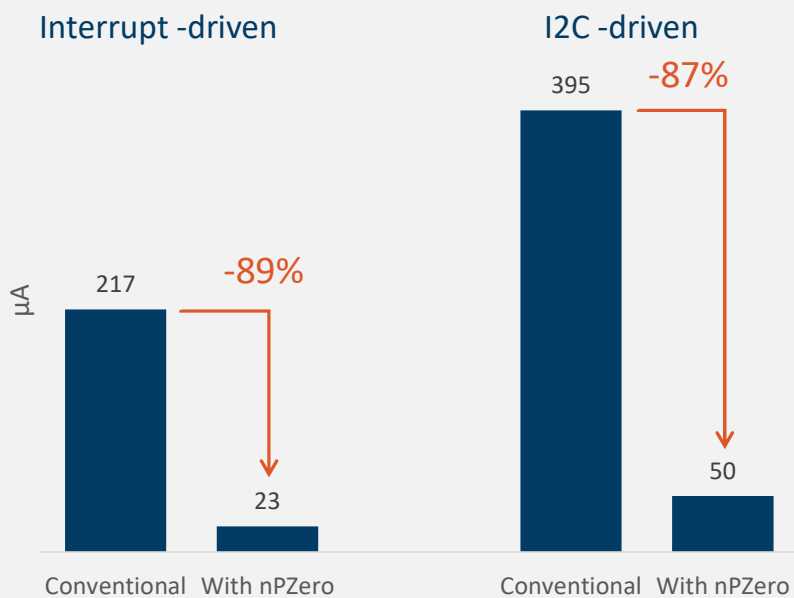


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Nanopower/TDK Demo validates ~90% power consumption reduction

SYSTEM CURRENT CONSUMPTION

Example: Demonstrator based on Onsemi RSL15 BLE SoC with temperature sensor & accelerometer. E.g. for goods condition monitoring.



More Real-World Use Cases Built in Hardware



Wearable UV Meter

Problem: Battery drains fast; heavy weight & large size due to high-power BLE + MCU

- ✓ SuperCap replaces heavy battery
- ✓ BLE enters deep sleep mode
- ✓ Lighter, compact form factor

Conventional

495 μ A · 0.6 hr

w/ nPZero

2.71 μ A · 63.7 hrs

↑ 106× longer life



Precision Agriculture Sensor

Problem: Battery drains fast; fragile solar panel; enclosure not rugged enough

- ✓ RF energy harvesting enabled
- ✓ IP69 RF-permeable enclosure
- ✓ Added temp & humidity sensing

Conventional

3,535 μ A · 1,980 hrs

w/ nPZero

1,109 μ A · 6,311 hrs

↑ 3.2× longer life



Presence Sensor

Problem: Battery drains fast; high maintenance cost; installed in high ceilings

- ✓ RF energy harvesting enabled
- ✓ High-end presence sensor added
- ✓ Fully maintenance-free

Conventional

247 μ A · 3 years

w/ nPZero

74.2 μ A · 10 years

↑ 3.3× longer life



Emergency Button Wearable

Problem: Users forget to charge; high-power MCU + radio + GPS drains battery

- ✓ RF & switch energy harvesting
- ✓ Smaller, lighter battery
- ✓ Heat stroke alarm (Japan market)

Conventional

50.5 μ A · 1.1 months

w/ nPZero

0.9 μ A · 61.7 months

↑ 56× longer life

Tools

DEVportal

– Página web para encontrar toda a documentação para desenvolver com o nPZero



Documentation Reference ▼

DevPortal

Technical resources for low power development

nPZero Documentation

Access detailed documentation for the nPZero IC and the nPZero Development Kit.



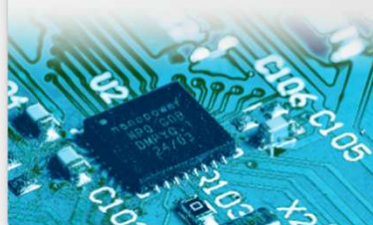
Tools

Download development tools, such as the nPZero Configurator, to speed up development.



Application Notes

Download appnotes with additional use cases, platforms and solution for nPZero designs.



Demos

Download documentation and hardware design files for the nPZero demonstrators.



API reference

Get documentation for the nPZero API Driver, and the examples provided for the nPZero IC.



<https://dev.nanopowersemi.com>



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nPZero DevKit e Stamp para acelerar seu desenvolvimento

DevKit – all in one baseboard, STM32L MCU board e 2x placas com sensors pinout PMOD

BASEBOARD

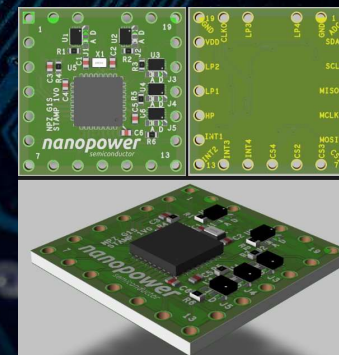
PMOD SENSOR BOARD



MCU BOARD



Stamp é um modulo compacto de 15 x 15 mm que facilita a integração e teste da tecnologia subthreshold diretamente no seu projeto atual.



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nPZero Configurator ferramenta que facilita a configuração

FileViewRecent WorkspacesHelp

Registers

Addr	Name	Val	Fields
[0x00]	IDLE_RST	0x00	0x00000000 0x00 - Reset Value
[0x01]	ID	0x60	0x00000060 0x00 - nZero GTS
[0x02]	STA1	0x01	0x00000001 0x00 - Disabled
[0x03]	STA2	0x00	0x00000000 0x00 - Disabled
[0x04]	PSWCTL	0x00	0x00000000 0x00 - Disabled
[0x05]	SYSCFG1	0x00	0x00000000 0x00 - Disabled
[0x06]	SYSCFG2	0x00	0x00000000 0x00 - Disabled
[0x07]	SYSCFG3	0x0E	0x0000000E 0x00 - Disabled
[0x08]	TOUT_L	0xFF	0x000000FF 0x00 - Disabled
[0x09]	TOUT_H	0xFF	0x000000FF 0x00 - Disabled
[0x0A]	INTCFG	0x55	0x00000055 0x00 - Disabled
[0x10]	CFGP1	0x00	0x00000000 0x00 - Disabled
[0x11]	MODP1	0x00	0x00000000 0x00 - Disabled
[0x12]	PERP1_L	0x02	0x00000002 0x00 - Disabled
[0x13]	PERP1_H	0x00	0x00000000 0x00 - Disabled
[0x14]	NCMDP1	0x00	0x00000000 0x00 - Disabled
[0x15]	ADDRP1	0x00	0x00000000 0x00 - Disabled
[0x16]	RREGP1	0x00	0x00000000 0x00 - Disabled
[0x17]	THROVP1_L	0x00	0x00000000 0x00 - Disabled
[0x18]	THROVP1_H	0x00	0x00000000 0x00 - Disabled
[0x19]	THRUNP1_L	0x00	0x00000000 0x00 - Disabled
[0x1A]	THRUNP1_H	0x00	0x00000000 0x00 - Disabled
[0x1B]	TWTP1	0x00	0x00000000 0x00 - Disabled
[0x1C]	TCFGP1	0x00	0x00000000 0x00 - Disabled
[0x1D]	CFGP2	0x00	0x00000000 0x00 - Disabled
[0x1E]	MODP2	0x00	0x00000000 0x00 - Disabled
[0x1F]	PERP2_L	0x02	0x00000002 0x00 - Disabled
[0x20]	PERP2_H	0x00	0x00000000 0x00 - Disabled
[0x21]	NCMDP2	0x00	0x00000000 0x00 - Disabled
[0x22]	ADDRP2	0x00	0x00000000 0x00 - Disabled
[0x23]	RREGP2	0x00	0x00000000 0x00 - Disabled
[0x24]	THROVP2_L	0x00	0x00000000 0x00 - Disabled
[0x25]	THROVP2_H	0x00	0x00000000 0x00 - Disabled

Configuration

Global Configuration

Host power switch mode

Power Switch Mode (outputs VBAT or open)

System clock divider

Disabled

System clock source

Slow oscillator (10 Hz)

ADC clock divider

System clock (10 Hz)

Internal ADC channel trigger as wakeup source

☐ Enable

External ADC input sampling (ADC_IN pin)

☐ Enable

Wake up on any or all triggers

Any trigger

Host wakeup timeout (ticks)

1.82 hours 65535

Interrupt pin pull-up configuration

1: Low Strength 2: Low Strength

IO Output strength

Normal

Internal I2C pull-ups

Auto (disabled in idle)

Clock out configuration

Disabled

Peripheral 1

Configuration preset

Load Save Clear

Peripheral on in standby mode

☐ Enable

Power mode

Disabled

Swap registers

☐ Enable

Peripheral 2

Configuration preset

Load Save Clear

Peripheral on in standby mode

☐ Enable

Power mode

Disabled

Peripheral 3

Configuration preset

Load Save Clear

Peripheral on in standby mode

☐ Enable

Power mode

Disabled

Peripheral 4

Configuration preset

Load Save Clear

Peripheral on in standby mode

☐ Enable

Power mode

Disabled

Generated code

```
#include <zephyr/kernel.h>
#include <stdio.h>

// [CFGSTRUCT_START]
npz_adc_config_channels_s npz_adc_internal_config = {
    .wakeup_enable = 0,
    .over_threshold = 0,
    .under_threshold = 0,
};

npz_adc_config_channels_s npz_adc_external_config = {
    .wakeup_enable = 0,
    .over_threshold = 0,
    .under_threshold = 0,
};

npz_device_config_s npz_configuration = {
    .host_power_mode = HOST_POWER_MODE_SWITCH,
    .power_switch_normal_mode_per1 = 0,
    .power_switch_normal_mode_per2 = 0,
    .power_switch_normal_mode_per3 = 0,
    .power_switch_normal_mode_per4 = 0,
    .system_clock_divider = SCLK_DIV_DISABLE,
    .system_clock_source = SYS_CLOCK_10HZ,
    .io_strength = IO_STR_NORMAL,
    .i2c_pull_mode = I2C_PULL_AUTO,
    .spi_auto = SPI_PINS_AUTO_DISABLE,
    .xo_clock_out_sel = XO_CLK_OFF,
    .wake_up_per1 = 0,
    .wake_up_per2 = 0,
    .wake_up_per3 = 0,
    .wake_up_per4 = 0,
    .wake_up_any_or_all = WAKEUP_ANY,
    .global_timeout = 65535,
    .interrupt_pin_pull_up_pin1 = INT_PIN_PULL_LOW,
    .interrupt_pin_pull_up_pin2 = INT_PIN_PULL_LOW,
    .interrupt_pin_pull_up_pin3 = INT_PIN_PULL_LOW,
    .interrupt_pin_pull_up_pin4 = INT_PIN_PULL_LOW,
    .adc_ext_sampling_enable = 0,
    .adc_clock_sel = ADC_CLK_SC,
    .adc_channels = {&npz_adc_internal_config, &npz_adc_external_config},
    .peripherals = {0, 0, 0, 0},
};

// [CFGSTRUCT_END]

static void read_peripheral_temp(int peripheral_value)
{
    // Calculate the temperature in degrees Celsius
    float temperature = peripheral_value * 0.0078125; // // A56212 temperature sensor resolu
    printf("Calculated temperature: %d.%03d °C\r\n", (int) temperature,
        (int) ((temperature - (int) temperature) * 1000));
}

static void npz_read_status_registers(npz_status_s *status)
{
    // Read the first status register
    if (npz_read_STA1(&status->status1) != OK) {

```

Time

12:23:29 PM nZero Configurator launched - Version 1.2.6, Date: 03/06/2026

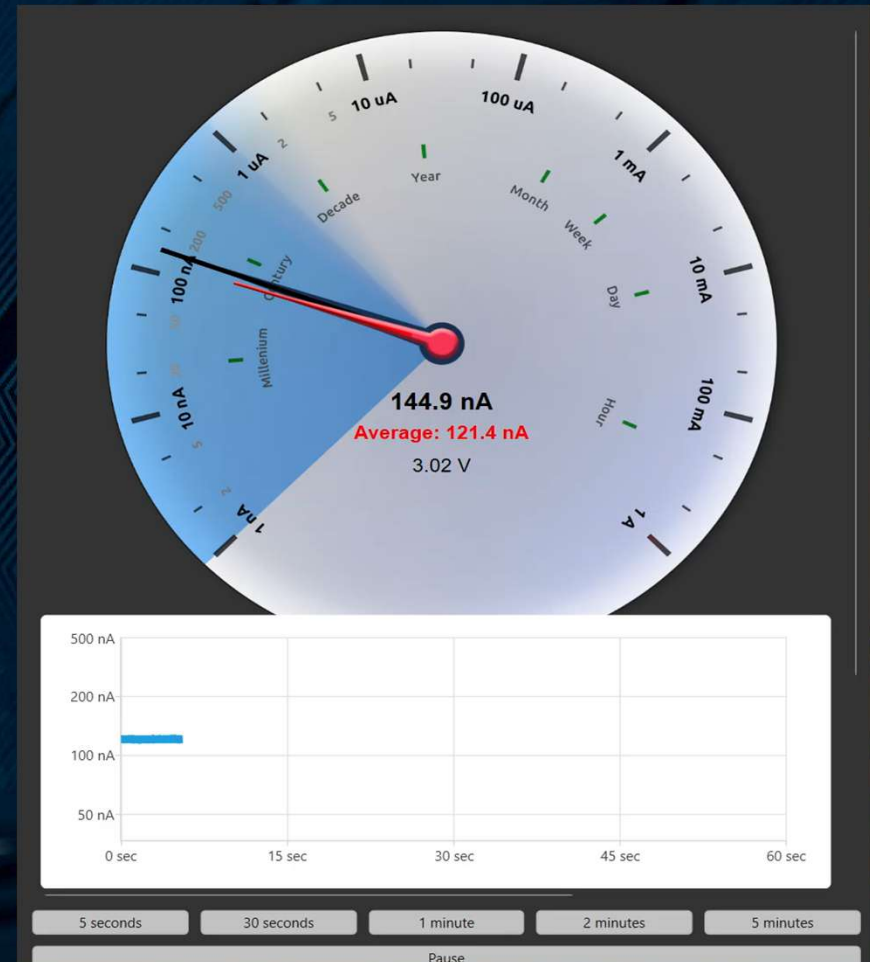
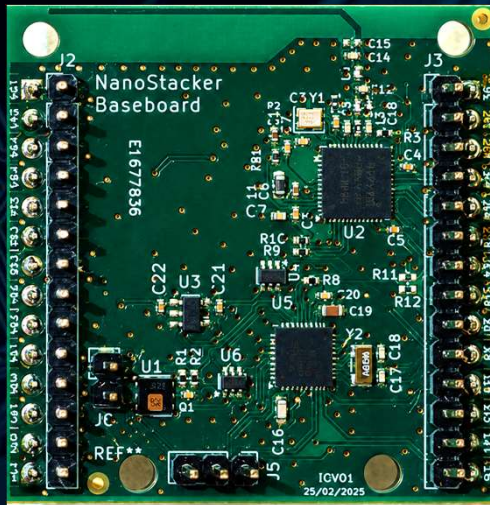
12:23:29 PM Workspace loaded: config_default.xml

Pausa nos Slides! Live demos

- nPZero Configurator Live Demo
- Nano-Stacker Live Demo



Demonstrating an ultra-low power system



Call to Action

- Por favor contacte o canal de distribuição para agendar uma reunião com o time da Nanopower onde podemos analisar seu caso e demonstrar como reduzir significativamente o consumo do seu dispositivo IoT.



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