## DOLPHIN DESIGN EMPOWERS YOUR CREATIVITY

Dolphin Design is a leading provider of semiconductor IP solutions, specializing in ASIC and IP design targeting markets such as Defense, Automotive, Industrial, Personal electronics and IoT. Dolphin Design's cutting-edge technology IPs in AI computing, Power management, High-quality Audio, Power metering and Design Safety/robustness, allows their thousand customers and partners to accelerates design cycles, fosters faster time-to-market and builds products/solutions that address the challenges of any industries and support a more sustainable world.

DOLPHIN DESIGN

# IP SOLUTIONS CATALOG

H1 - 2024

SCAN TO CATALOGUE

## YOUR SALES INTERFACES


**China**

**Ying ZHAO**
+33 476 417 425
ying.zhao@dolphin.fr

**Americas**

**Ranjit ADHIKARY**
+1 408 515 5870
ranjit.adhikary@dolphin.fr

**EMEA**

**Romain Chantre**
+33 7 50 59 68 34
romain.chantre@dolphin.fr


DOLPHIN DESIGN


**Dolphin Design**
1 bis A, Chemin du Pré Carré,
38240 Meylan

dolphin-design.fr
+33 4 76 41 10 96

# TECHNOLOGICAL INNOVATION IS OUR JOURNEY

At Dolphin Design, we believe that it is possible to reconcile long-term sustainability with technological innovations that contribute to make our life better.

Our contribution, to make this happen, is to design silicon IPs enabling the cost-effective design of highly energy-efficient and ever more complex ASIC/SOCs, either made by, or for our clients.

We pave the way for intelligent SoCs that will ultimately operate with green energy or with harvested energy.

We tech it on!

DOLPHIN DESIGN

## Advanced Processing Solutions
## Computer Vision, DSP, and MCU Subsystem Platform IPs

### NN accelerator IP platform - RAPTOR — Digital IP

| | MACs | MAC efficiency | DMA | Supported layers | SDK compliance |
|---|---|---|---|---|---|
| Neural accelerator | 32 / 64 / 128 | Up to 60% | Yes | CNN | Pytorch, TensorFlow |

### NN/DSP co-processor IP platform - PANTHER — Digital IP

| | # DSP cores (# MACs) | RISC-V compliance | DMA | Floating Point Unit (FPU) | SDK compliance |
|---|---|---|---|---|---|
| Neural/DSP co-processor | 4 DSP cores (4x 32-bit MACs 8x 16-bit MACs 16x 8-bit MACs) | IMCF + X | Yes | Yes (32 bits) | C-based SDK (including C-Compiler…) AI SDK (soon) for Pytorch and TensorFlow |
| | 8 DSP cores (8x 32-bit MACs 16x 16-bit MACs 32x 8-bit MACs) | IMCF + X | Yes | Yes (32 bits) | C-based SDK (including C-Compiler…) AI SDK (soon) for Pytorch and TensorFlow |
| | 16 DSP cores (18x 32-bit MACs 32x 16-bit MACs 64x 8-bit MACs) | IMCF + X | Yes | Yes (32 bits) | C-based SDK (including C-Compiler…) AI SDK (soon) for Pytorch and TensorFlow |

### IP subsystem platform - CHAMELEON — Digital IP

| | Supported CPUs | Supported protocols | Built-in features | Built-in peripherals |
|---|---|---|---|---|
| Single core | ARM Cortex M & RISC-V | AMBA - AHB, AXI, APB | Multi-channel bi-directional DMA, DMA filter, Event Unit Manager, Context restorer, low-latency multi-master bus matrix with built-in interleaving engine | Communication: UART, I2C master, QSPI master, OctoSPI master Others: GPIO, GP Timer, Advanced Timer, Watchdog timer… |
| Dual core | ARM Cortex M & RISC-V (including hw semaphore for parallel processing) | AMBA - AHB, AXI, APB | Multi-channel bi-directional DMA, DMA filter, Event Unit Manager, Context restorer, low-latency multi-master bus matrix with built-in interleaving engine | Communication: UART, I2C master, QSPI master, OctoSPI master Others: GPIO, GP Timer, Advanced Timer, Watchdog timer… |

# SPIDER IPs - State-of-the art solution for Power Management

As a three-decade leader in Power Management IP, we've tailored solutions to fit your exact design needs, saving you time and resources while accelerating your time-to-market and boosting design productivity.

## Power management IP platform

| | | $V_{IN}$ (V) | $V_{OUT}$ (V) | $I_{OUT}$ | Iq (µA) | 180nm | 55nm | 40 | 22nm | 12nm *Roadmap 2024* |
|---|---|---|---|---|---|---|---|---|---|---|
| DC/DC Buck | Single input, multiple outputs SIMO DC/DC - Low quiescent | [1.8 - 5.5] | [0.5 - 3.5] | Up to 400 mA | 0.64 to 1.5 µA | | | | ✓ | O |
| | Single input, single output DC/DC - Low quiescent | [1.62 - 5.5] | [0.5 - 3.3] | 100 mA - 1 A | 0.35 to 0.37 µA | | | ✓ | ✓ | O |
| | | [1.62 - 3.63] | [0.5 - 2.5] | | 0.29 to 0.37 µA | | | ✓ | ✓ | |
| | DC/DC - Mainstream | [1.9 - 5.5] | [0.5 - 3.3] | 100 mA - 1 A | 80 to 100 µA | | | | ✓ | |
| | | [2.7 - 5.5] | [0.55 - 3.3] | | 130 to 187 µA | | | ✓ | | |
| | DC/DC - Legacy | [1.62 - 3.63] | [0.6 - 3.3] | 100 mA - 1 A | 75 to 100 µA | ✓ | ✓ | ✓ | ✓ | |
| | | [1.9 - 4.4] | [0.6 - 3.3] | 100 mA - 700 mA | 70 to 125 µA | ✓ | ✓ | | | |
| | Combo DC/DC Mainstream DC/DC + Low quiescent LDO | [1.9 - 5.5] | [0.5 - 3.3] | 100 mA - 1 A | (sleep) = 0.25 to 0.6 µA (active) = 100 to 130 µA | | | | ✓ | |
| | | [2.7 - 5.5] | [0.55 - 3.3] | | (sleep) = 0.37 µA // (active) = 155 µA | | | ✓ | | |
| | | [1.62 - 3.63] | [0.55 - 3.3] | 100 mA - 700 mA | (sleep) = 0.14 to 0.37 µA (active) = 75 to 100 µA | ✓ | ✓ | ✓ | ✓ | |
| LDO | LDO - Fast transient | [1.8- 5.5] | [0.5 - 3.3] | 100 mA - 500 mA | 25 to 65 µA | | | ✓ | ✓ | O |
| | | [2.7 - 5.5] | [0.55 - 3.3] | | 40 to 125 µA | ✓ | | ✓ | | |
| | | [1.44 - 1.98] | [0.6- 1.2] | | 40 µA | | | | ✓ | |
| | | [1.62 - 3.63] | [0.6 - 2.5] | | 23 to 200 µA | | ✓ | ✓ | ✓ | |
| | LDO - Low quiescent | [2.7 - 5.5] | [0.55 - 3.3] | up to 1 mA | 0.37 µA | | | ✓ | | |
| | | [1.9 - 4.4] | [0.55 - 3.3] | up to 1 mA | 0.075 to 0.17 µA | ✓ | ✓ | | | |
| | | [1.62 - 3.63] | [0.5 - 3.3] | up to 2 mA | 0.14 to 0.37 µA | ✓ | ✓ | ✓ | ✓ | O |
| | LDO - Capless | [0.72 - 1.8] | [0.5 - 0.9] | up to 50 mA | 7.5 to 12 µA | | | | ✓ | O |
| | Combo LDO LDO + Low quiescent LDO | [2.7 - 5.5] | [0.5 - 2.5] | 100 mA - 500 mA | (sleep) = 0.37 µA - (active) = 40 µA | | | ✓ | | |
| | | [1.62 - 3.63] | [0.55 - 2.5] | | (sleep) = 0.14 to 0.16 µA (active) = 45 to 75 µA | | ✓ | | ✓ | |
| Oscillators | 32 kHz Crystal | [0.72 - 0.99] | Freq = 32.768 kHz | | Iq = 97 to 165 nA - CL = 4 to 12.5 pF Accuracy = ±50 ppm | | | | ✓ | O |
| | | [0.81 - 1.21] | | | Iq = 50 to 120 nA // CL = 4 to 7 pF // Accuracy = ±50 ppm | | ✓ | ✓ | | |
| | 32 kHz RC | [0.54 - 0.99] | | | Iq = 55 to 70 nA Accuracy (after trimming) = ±1.5% | | | | ✓ | O |
| | | [0.495 - 1.21] | | | Iq = 70 to 420 nA // Accuracy (after trimming) = ±1.5% | | ✓ | ✓ | | |
| Monitors | POR-BOR | [1.62 - 3.63] | Monitored (V) = [0-AVD] | | 13 to 15 µA (continuous operation) < 150 nA (burst operation) < 100 nA (BOR disabled) | | ✓ | ✓ | ✓ | O |
| | | [1.44 - 1.98] | | | 16 µA (continuous operation) <150 nA (burst operation) < 100 nA (BOR disabled) | | | | ✓ | |
| PMU | RTC (full digital) | Core voltage | | | Accuracy = -2.1 to 1.6 ppm Nominal freq: 32.768 kHz | ✓ | ✓ | ✓ | ✓ | O |
| | Adaptative Body Bias | | | | | | | | ✓ | |
| | Power Controller compiler | GUI-based power controller compiler (RTL & C-drivers) - Boot & power sequences | | | | ✓ | ✓ | ✓ | ✓ | O |
| | | GUI-based UPF backbone generator | | | | ✓ | ✓ | ✓ | ✓ | O |

Low quiescent = Low quiescent

O = roadmap

# BAT IPs - Amplifying Audio Excellence

**For over 30 years, Dolphin Design is leading Audio premium IPs, catering to diverse applications including TWS, Smart speakers, Wearables, IoT, Automotive, and more. Our BAT IP family offers seamless configurability and assembly for high-fidelity, low-power audio devices, ensuring faster time-to-market with robust and advanced IPs.**

## Mixed signal Voice & Audio IP platform

| | | Power supply | SNR | THD+N | Input noise | Power consumption | 180nm | 55nm | 40nm | 28nm | 22nm | 12nm |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ΔΣ 24-bit ADC(*) | Voice/audio ADC - Performance | 1.8 V +/- 10% | 107 dB | -98 dB | 3.1 µVrms | Full perf. mode: 250 µA Low power mode: 125 µA | | | | | O | O |
| | Voice/audio ADC - Mainstream+ | 1.8 V +/- 10% | 104.5 dB | - 75 dB | 2.6 µVrms | Full perf. mode: 550 µA Low power mode: 150 µA | | | | | ✓ | ✓ |
| | | 1.8 V to 3.3 V | 109 dB | - 75 dB | 2.6 µVrms | Full perf. mode: 550 µA Low power mode: 150 µA | | | ✓ | | ✓ | |
| | Voice/audio ADC - Mainstream | 1.8 V +/- 10% | 101 dB | - 80 dB | 3.8 µVrms | Full perf. mode: 550 µA Low power mode: 170 µA | | | | | ✓ | ✓ |
| | | 1.8 V to 3.3 V | 106 dB | - 80 dB | 3.8 µVrms | Full perf. mode: 550 µA Low power mode: 140 µA | | | ✓ | | ✓ | |
| | Voice/audio ADC - Legacy | 2.7 V to 3.63 V | 90 dB | - 90 dB | 7.7 µVrms | Full perf. mode: 1.7 mA | | ✓ | ✓ | | | |
| | | 1.8 V +/- 10% | 85 dB | - 80 dB | 8 µVrms | Full perf. mode: 1.7 mA | | | | ✓ | ✓ | |

| (*) provided stand-alone or as part of CODEC configuration | | Power supply | SNR | THD+N | Output noise | Power consumption | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ΣΔ 24-bit DAC (*) | Audio DAC + class-D amp. - performance | 1.8 V +/- 10% | 115 dB | - 95 dB | 1.78 µVrms | 915 µA without load 1.055 mA at 0.1 mW | | | | | O | ✓ |
| | Audio DAC + class-AB amp. - Mainstream | 1.8 V +/- 10% | 115 dB | - 90 dB | 1.9 µVrms | 1,175 µA without load 3.4 mA at 0.1 mW | | | | | ✓ | |
| | | 1.8 V to 3.3 V | 120 dB | - 90 dB | 1.9 µVrms | 1,175 µA without load 3.4 mA at 0.1 mW | | | | | ✓ | |
| | Audio DAC + class-AB amp. - Legacy | 2.97 V to 3.63 V | 100 dB | - 90 dB | 6 µVrms | 2,200 µA without load | | ✓ | ✓ | | | |

O = roadmap

## Smart audio IP platform

| | | Input signal | Output signal | Main clock | Power consumption | 180nm | 55nm | 40nm | 28nm | 22nm | 12nm |
|---|---|---|---|---|---|---|---|---|---|---|---|
| VUI | Voice Activity Dectection WhisperTrigger | Analog microphone | IRQ upon voice detection | 32 kHz RC or 32 kHz crystal | 13 µW @ 40 & 22nm | | ✓ | ✓ | | ✓ | |
| | | Digital microphone | IRQ upon voice detection | From 6 MHz to 13 MHz | 25 µW @ 40 nm | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Audio neuromorphic front end (aMFCC) WhisperExtractor | Analog microphone | MFCC data IRQ upon voice detection | 32 kHz RC or 32 kHz crystal | 7 µW @ 22 nm | | | O | | ✓ | O |

O = roadmap

## Digital Audio IP platform

| | | SNR | THD+N | Main clock | Number of channels | Phase alignement | PLL less filters | Low latency filters | Asynchronous interface |
|---|---|---|---|---|---|---|---|---|---|
| Digital audio | PDM to PCM converter Digital microphone input | 117 dB | - 110 dB | 12 or 11 MHz or 19.2 MHz 12.288 MHz or 11.2896 MHz | From 1 to 8 | ✓ | ✓ | ✓ | ✓ |
| | Digital audio DAC PWM | 110 dB | - 95 dB | 12 or 11 MHz or 19.2 MHz 12.288 MHz or 11.2896 MHz | From 1 to 8 | ✓ | ✓ | ✓ | ✓ |
| | Asynchronous Sample Rate Converter ASRC | 114 dB | - 114 dB | 24 or 26 MHz or 24.576 MHz | From 2 to 8 | ✓ | ✓ | ✓ | ✓ |

**Phase alignment:** Ensure 0°phase mismatch between channels for accurate beamforming.
**PLL-less:** Use standart clock available in your system and save an audio PLL.
**Low latency filters:** Enable µs latency for applications like ANC or RNC.