EMBEDDED PROCESSORS FOR FUTURE APPLICATIONS

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I.MX APPLICATION PROCESSOR PRODUCT LINE

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"Leadership is the art of giving people a platform for spreading ideas that work." --Seth Godin

FD-SOI is a technology platform enabling innovation for edge computing
The AI / IoT Era Will Create New Industry Leaders

“The 4th Tectonic Shift in Computing”

Units Shipped (Millions)

10,000
1000
100
10
1
0.1
0.01


Mainframe Mini-Computer PCs Cell Phones AI / IoT

* Source: Jefferies
SCALABILITY OF EMBEDDED PROCESSING

28 FD SOI PLATFORM

Ultra-low Power Dynamic & Static
Common IP with i.MX ARM Cortex M7 + 2D Large OCRAM
i.MX 7 ULP

Ultra Low Power processing for use cases demanding long battery life

- FD-SOI 28nm Process Technology
- Heterogeneous architecture
- IP selection
- Low Power SW enablement
High Performance & Longer Battery Lifetime with FD-SOI Technology

- Battery Drain
  - Bulk Silicon Process Techniques: >100x
  - FD-SOI Design Techniques: >10x
  - Longer battery life @ same speed

- Speed
  - Faster speed
  - Same battery life

Arm Cortex® - A7 + Cortex® - M4

NXP i.MX 7ULP
Leveraging Biasing for Next Generation Applications

- Vdd Overdrive Only
- SOG Global Body Biasing
- Independent Domain Body Biasing
- On Chip Memory Array Body Biasing
- Assymetric Device Body Biasing
- Mixed Vt Common Well Body Biasing
Advanced Real-time Edge Computing
The New Normal – Crossover Processors

- High data volume and sensors traffic-pushing more processing to the edge
- Consumers expect smartphone-like GUI experience
- Need for GHz Application Processors, e.g.: ARM® Cortex®-A performance, at Cortex-M cost & power consumption

i.MX RT Series

- Industries 1st Crossover processor
- Record breaking MCU performance
- Application Processor integration in an MCU
- MCU with a true high performance DSP core
Breaking the ‘GHz’ Barrier – i.MX RT1100 MCUs

CoreMark® > 5000

- Overdrive
- Voltage
- Underdrive

1 GHz

- Cortex-M7
- Cortex-M4

GHz Performance
Auto & Industrial Grade

Low Power 28 FD-SOI

Cortex-M7
Up to 1GHz

Cortex-M4
Up to 400MHz

Secure Resource Controller

Secure Boot, PUF
On-the-fly Crypto
Tamper Detect

TSN, Hi-Perf Analog
Extreme Real-Time Response with i.MX RT & Zephyr OS

High performance with secure, open-source, comprehensive RTOS (e.g. Zephyr) will enable IoT systems of the future
Machine Learning at the Edge
ML Acceleration with Co-Processors & DSP Extensions

- TensorFlow Lite
- Arm CMSIS-NN
- eIQ-CML with OpenCV for classical ML algorithms

- Arm v8-M feature - tightly couples co-processor to the M33 core
- Faster execution than instruction extensions
- Maintains ecosystem and toolchain compatibility

- NXP-designed accelerator for DSP Functions
- 5-10x faster for Matrix, FIR, Convolution, Correlation ops
- 15x faster running CMSIS-DSP library for FFT / IFFT

- DSP Tensilica HiFi 4 @ 600MHz for Natural Language
- Tensilica Instruction Extension (TIE) for Sigmoid transfer function – accelerating wake-word

Designed to unlock the potential of voice-assisted end nodes
i.MX 8 and 8X Subsystem Reuse
Scalability of Embedded Processing for Automotive & Industrial Applications

HMI, Vision, Audio and Voice Enabled with i.MX
DSP, Vision Acceleration, Real Time Domain, Safe Camera/Display/Audio, Simplified eCockpit

New Connectivity & Headless Optimization
8DXL / SXL
Edge Computing in Industrial Environments

Basler I.MX8 - Embedded Vision Kit
i.MX 8 and 8X Hardware Virtualization & Safety
Safe Display, Camera, Audio & User Monitoring

2 Independent Operating Systems with thin Hypervisor (Xen) or NO Hypervisor
i.MX 8 & 8X
i.MX 8X Strongly Positioned in Multiple Auto Applications

Parking Camera
- Safe processing & machine learning
- i.Mx SoC for integration in headunit

V2X
- Modem, Processor, SW, Security
- #1 Leader with scalable processing

In Vehicle Monitors
- Driver Monitoring, HMI
Scalable Solutions

Real Time & General Compute

Lowest Leakage Memories

Best Dynamic & Static Power

Leadership Thru Body Biasing

Enabling Edge Compute
The Future of Embedded Processing
Enabled by FD SOI
SECURE CONNECTIONS FOR A SMARTER WORLD