Facing New Space Challenges
European Scalable Solutions

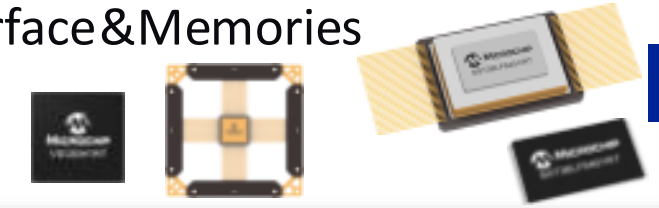
A Leading Provider of Smart, Connected and Secure Embedded Control Solutions

September 21 st, 2023

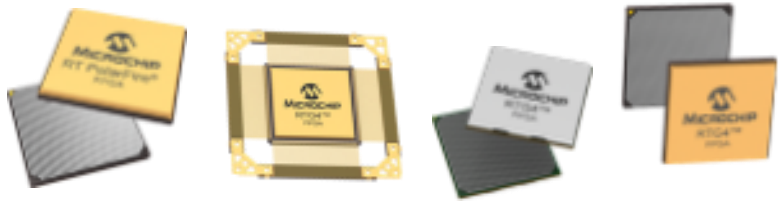
Largest Space Semiconductors Portfolio

MPU and MCUs
32-bit arm M3 & M7 and SPARC V8
8-bit AVR
GNSSSoC

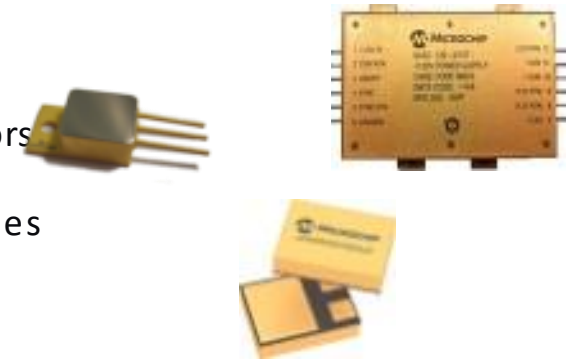
Communication Interface&Memories
Ethernet, SpaceWire
SRAMMemories
NVMMemories



FPGAs
RT PolarFire
RTG4
RT ProASIC3
RTAX, RTSX-SU



Power Solutions
JANS Diodes
Bipolar Small Signal Transistors
MOSFET
Isolated DC-DC Converter Modules
Point of Load Hybrid Solutions
Electromechanical Relays

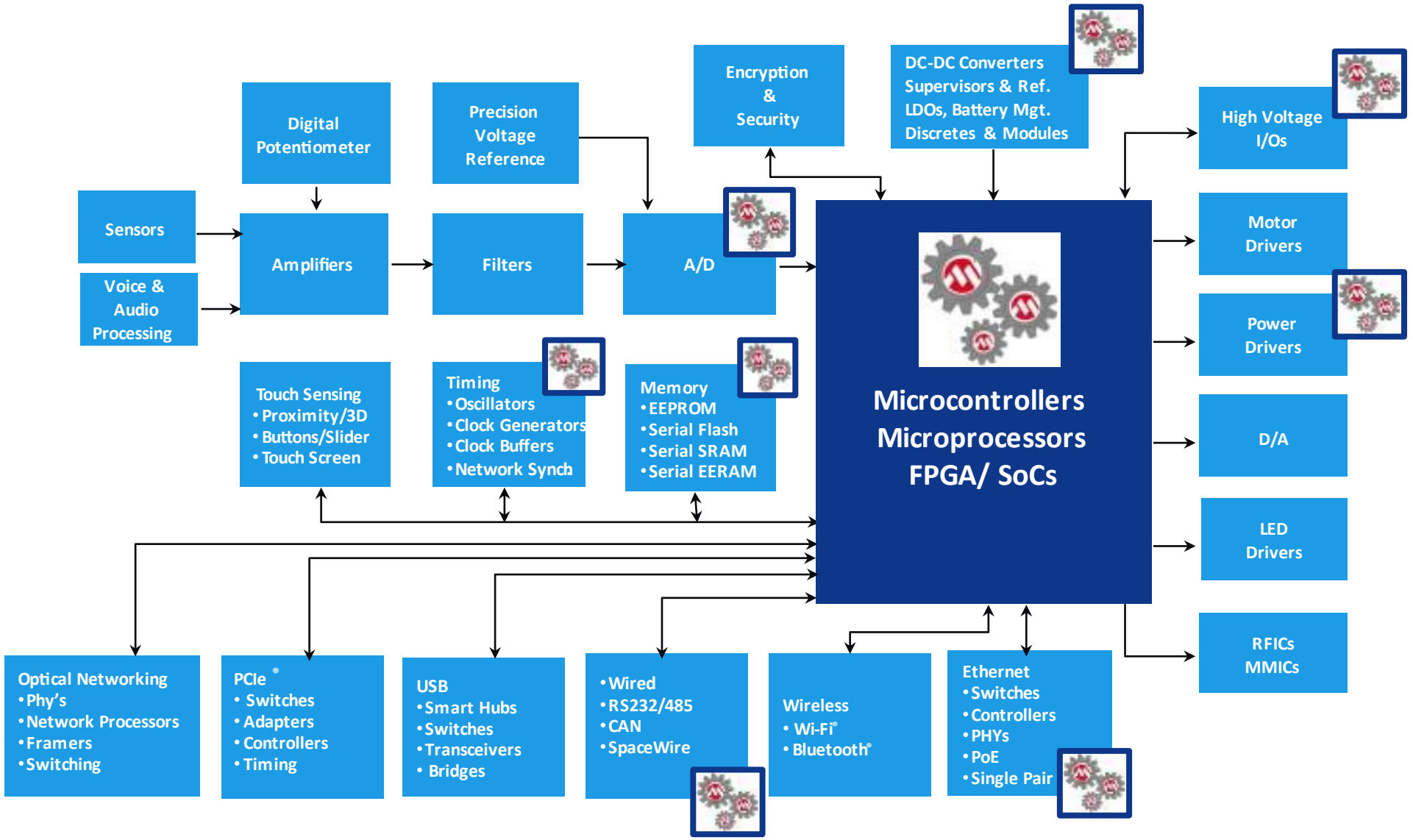


Mixed Signal Integrated Circuits
Telemetry Controller
Motor/Position Controller
Power Supply protection

RF Solutions
Packaged and Chip Silicon GaAs RF Diode
Surface Acoustic Wave (SAW) filters
GaAs MMICs
GaNonSiCHEMT transistors

Timing solutions &Oscillators
OvenizedQuartzOscillators
VoltageControlledCrystalOscillators
TemperatureCompensatedCrystalOscillators
CesiumClocks
ChipScaleAtomicClock(CSAC)

Drive innovation around processing solutions



Ethernet PHYs

Gbit/10Gbit

Switches 1588/TSN

PCIe solutions

Security devices

Flash/EEPROM

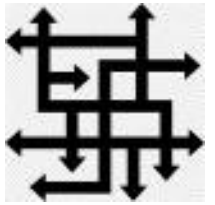
Power Modules

Clock Management

NewSpace Challenges / Semiconductors

- **Cost reduction** (but still low volume)
  - Recurrent costs @component level (RE)
  - Development costs @system level (NRE)

- **Development lead time pull in**
  - Driven by a shorter time ROI



- **Performances & Quality leverage**
  - Depending on mission, duration, orbit but also risk management
- **New actors coming from industrial/automotive**
  - Looking for easy access solution with known technology (eg. Ethernet)
  - Bidding on different opportunities from class 1 space agencies program to mega LEO small sat constellations.
- **Semiconductors technology** driven by commercial with more advanced technologies & « System on Chip » **=> more SEE events and higher access costs**

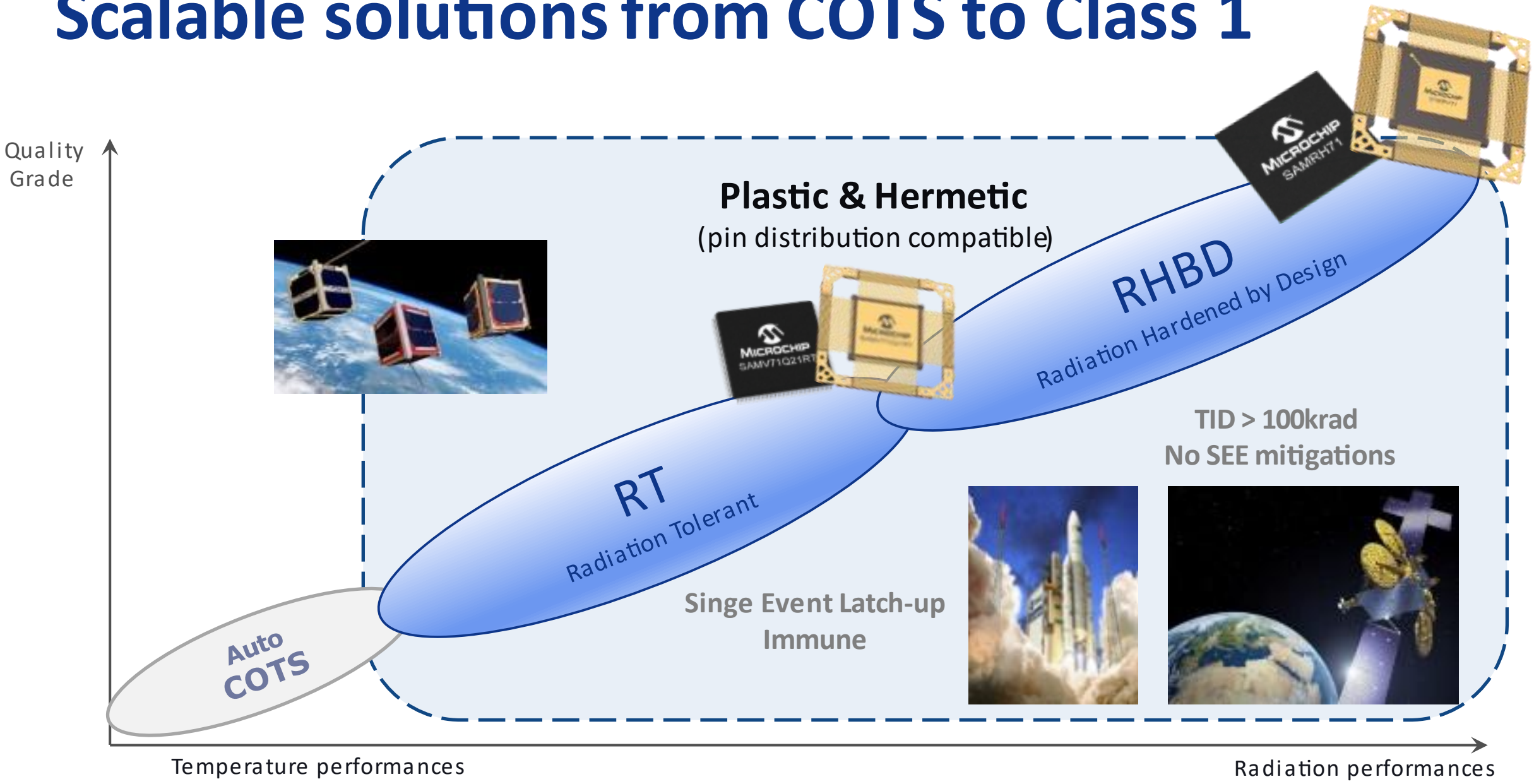
Space Evolution with Microchip

Hirel Plastic * Rad Tolerant * Rad Hard

- **Commercial leadership**
  - Very high -volume COTS supplier
  - MCU & FPGA Market leader
  - Connectivity - Ethernet
  - Security
- **Leader in Space**
  - Number 1 for Semiconductors
  - Strong flight heritage
  - Radiation expertise
  - JANS/ QML/ ESCC portfolio
- **Customization capabilities**
  - Bridge from COTS to RT
  - Bridge from QML to Sub QML
  - Scalability

MICROCHIP

Scalable solutions from COTS to Class 1



Hirel Plastic vs. COTS Automotive

- Ensure **full traceability** : Single Fab & Assembly w Dedicated Wafers
- Access to « Single Lot Date Code »
- Extended temperature range to -55/+125°C (according to rad perfs)
- Low MOQ : hundred of units

- **Reliability** verified on the **full temperature range**
- Extended qual. : HAST, Life Tests, Temp Cycling … ➔ prod spec & CoC
- **Full access to Qualification Data** (Qual Pack)

- Extra screening options : Burn-in, Temp Cycling, …
- **Extension towards QML-P / ESCC900P** standard qualification level

COTS to Space Qualified RT @ Microchip

1. **Identify industry needs, share roadmaps & input from other domains(eg. auto)**
2. **Select device in the Microchip's portfolio**
   - Select the best Design/Technology couple. Based on our experience, we select potential winners.
3. **Assess the device by simulation against SEE and TID using :**
   - Based Technology information (Foundries)
   - And Design data base (GDSII)
4. **Radiations Tests / defined boundary conditions**
   - TID : To characterize the product capability
   - SEE : To evaluate destructive events
     Single EventLatchup- Single Event Gate Rupture Single Event Burnout
5. **Product improvements towards RT level (process, fix, spec, …)**
6. **Qualification for space applications including radiations (SEU & TID)**
   - SEU : Characterization of all functional blocks of the device
   - Space qualification according to space standards / Ceramic & Plastic
7. **RT datasheet, radiation report and mitigation guidelines**
8. **Introduce and support COTS RT on space market w a dedicated team**
9. **Products belongs to French Export Control when all activities done in France**

ELEST

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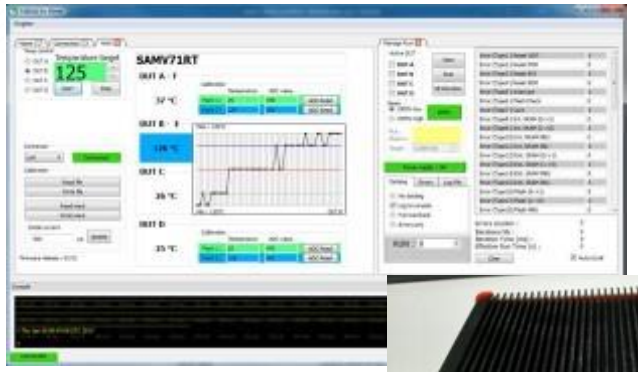

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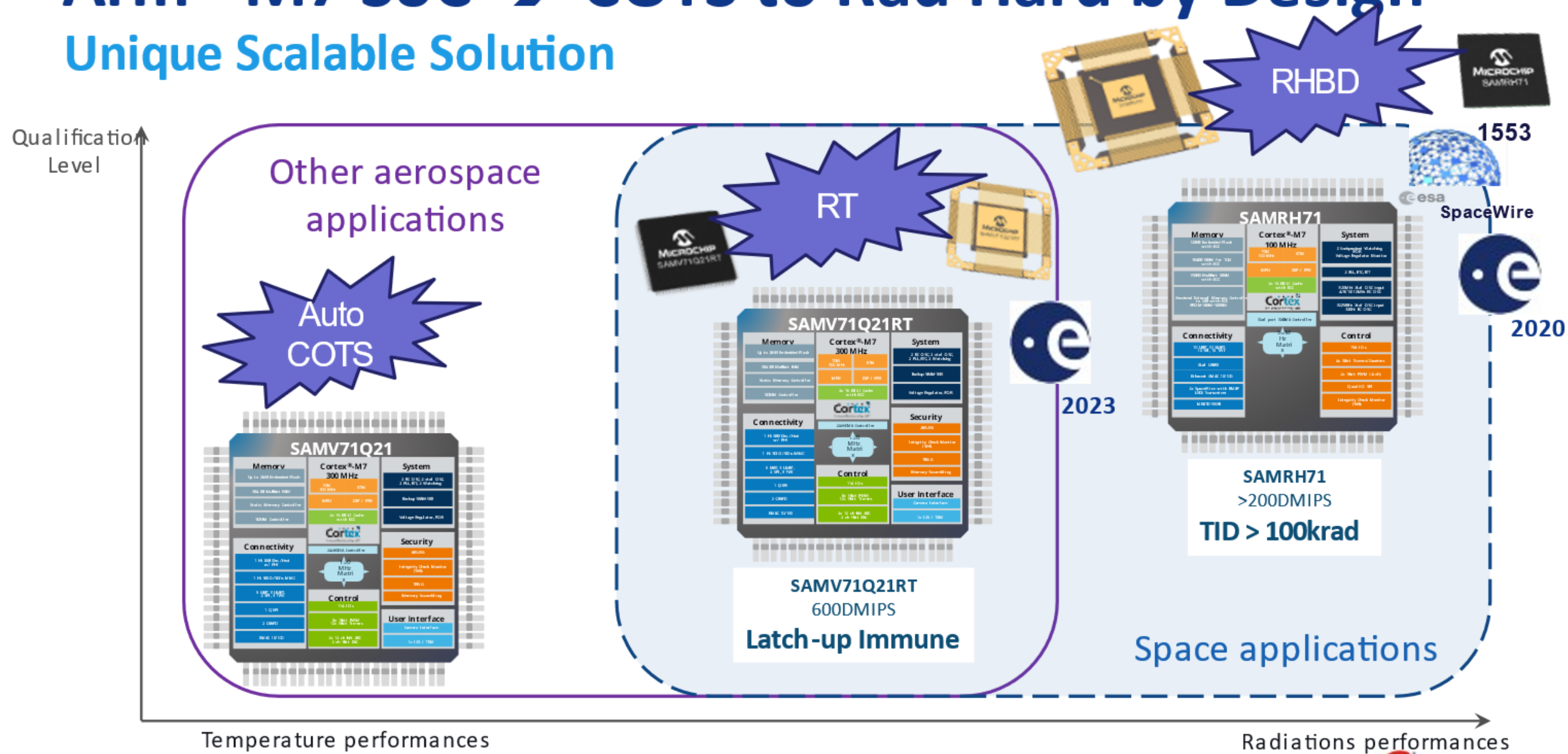
Arm® M7 SoC ➔ COTS to Rad Hard by Design

Unique Scalable Solution



Scalable & Plastic solutions

- **COTS Rad Tolerant**

Products	Type	Summary / Highlights	Flight Models
ATmegaS128	MCU AVR8	~10 DMIPS,SPI,TWI,UART,ADC	**2017**
ATmegaS64M1	MCU AVR8	~10 DMIPS, CAN,DAC and Motor Control	**2017**
SAMV71Q21RT	MCU ARM M7	600 DMIPS, CANFD, Ethernet TSN, DSP	**2018**
SAM3X8ERT	MCU ARM M3	100 DMIPS, CAN, Ethernet, Dual CAN	**2020**
VSC8541RT	Ethernet PHY	100Mb/1Gbit Ethernet Transceiver, RMII/RGMII	**2020**
SST38LF6401RT	Parallel Flash	64 Mbit Parallel Rad Tolerant Flash Memory	**2021**
SST26LF064RT	Serial Flash	64 Mbit Serial Rad Tolerant Flash Memory	**2022**

- **Rad hard by Design**

Products	Space Techno	Summary / Highlights	Flight Models
SAMRH71 MPU ESCC9512006	ATMX150RHA	**Arm CortexM7**, >200 DMIPS Spw/1553/CAN FD/Eth, TCM/FPU/MPU/ECC	**2020**
SAMRH707 MCU	ATMX150RHA	**Arm CortexM7, 100 DMIPS** Spw/1553/CAN FD,**ADC/DAC, NVM+, small package**	**2023**

Time is the Essence of New Space

Reducing development costs leads to reduce development cycles

Microchip proposes **« System Use Cases » to boost your development lead times & ease your system design:**

- Suggesting a list of Microchip components working together
- Providing hardware example associating some Microchip components
- Developing software examples to interact with other Microchip components
- Demonstrating application use cases at system leve
- Offering application notes, tools and presentations to ease customer system integration with Microchip components

Summary – New Space Challenges

- **Microchip A&D product lines in Europe**
  - Contributing to largest Space products portfolio
  - Drive space system innovation around processing solutions
- **New Space Challenges / Semiconductors**
  - Costs, Schedules, ROI, New players, Technology trend, …
- **Scalable Solutions for New Space in Europe**
  - COTS upgrade to qualified plastic & ceramic for space
  - Solutions from Europe : MCU/MPU, Ethernet, Memories, …
  - System use cases to reduce development lead times

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Thank You !

Aerospace & Defense Group - Product Marketing
Microchip Technology Nantes S.A.S.

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https://www.microchip.com/design -centers/aerospace-and-defense
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