

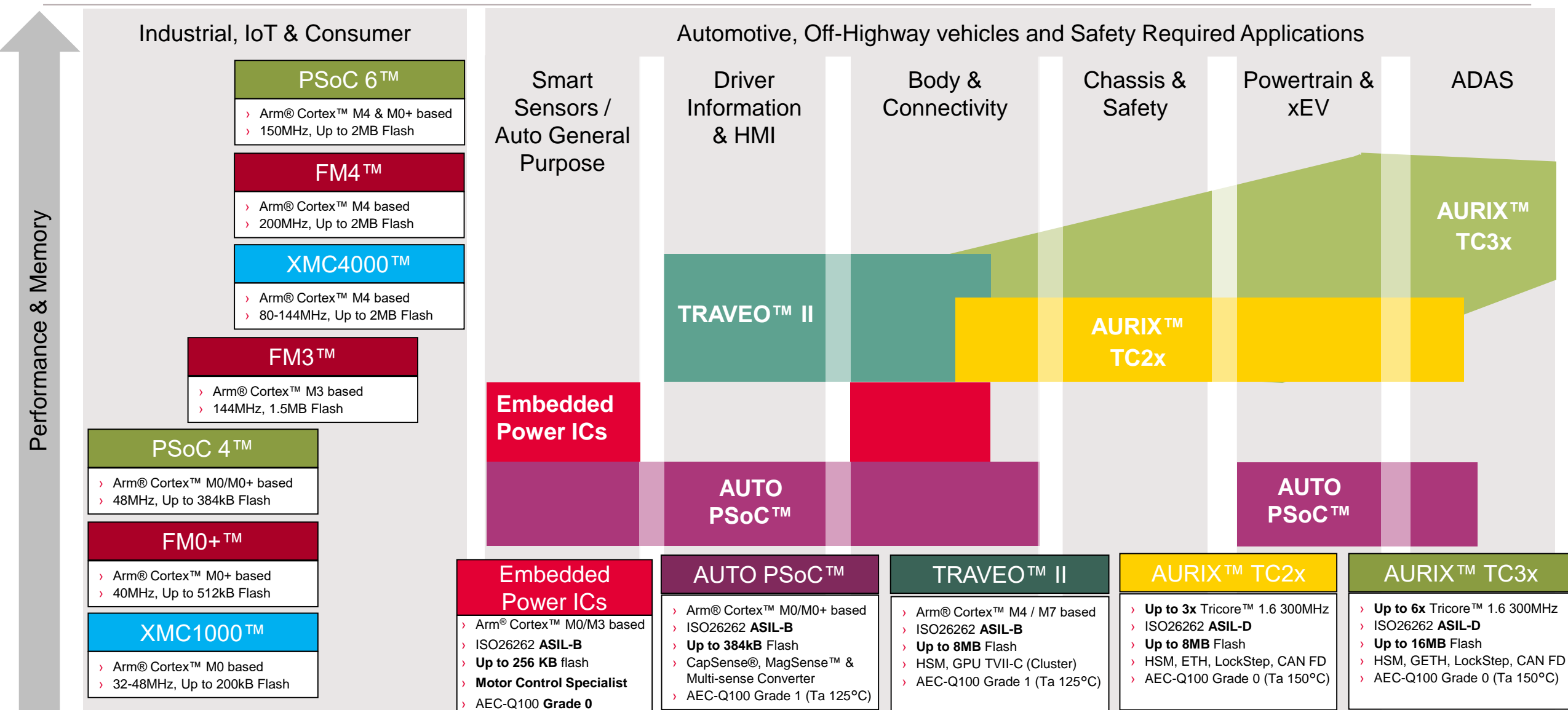
A close-up, angled view of a microcontroller chip, showing its intricate grid of circuitry and various colored components like gold, green, and blue. The image is slightly blurred, giving it a sense of depth and focus on the technology.

# Infineon AURIX™ Microcontrollers

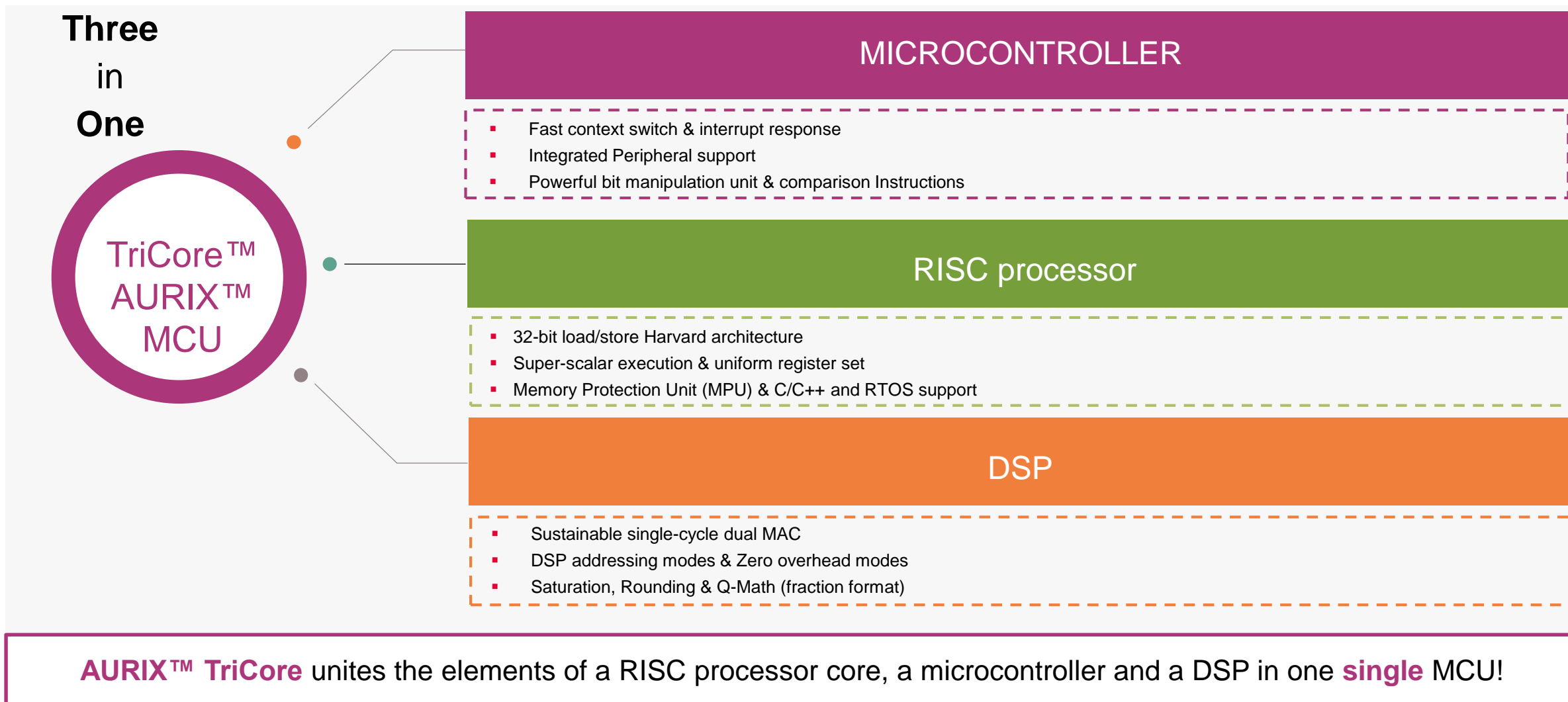
## Intelligent solutions for Automotive & Off Highway Applications



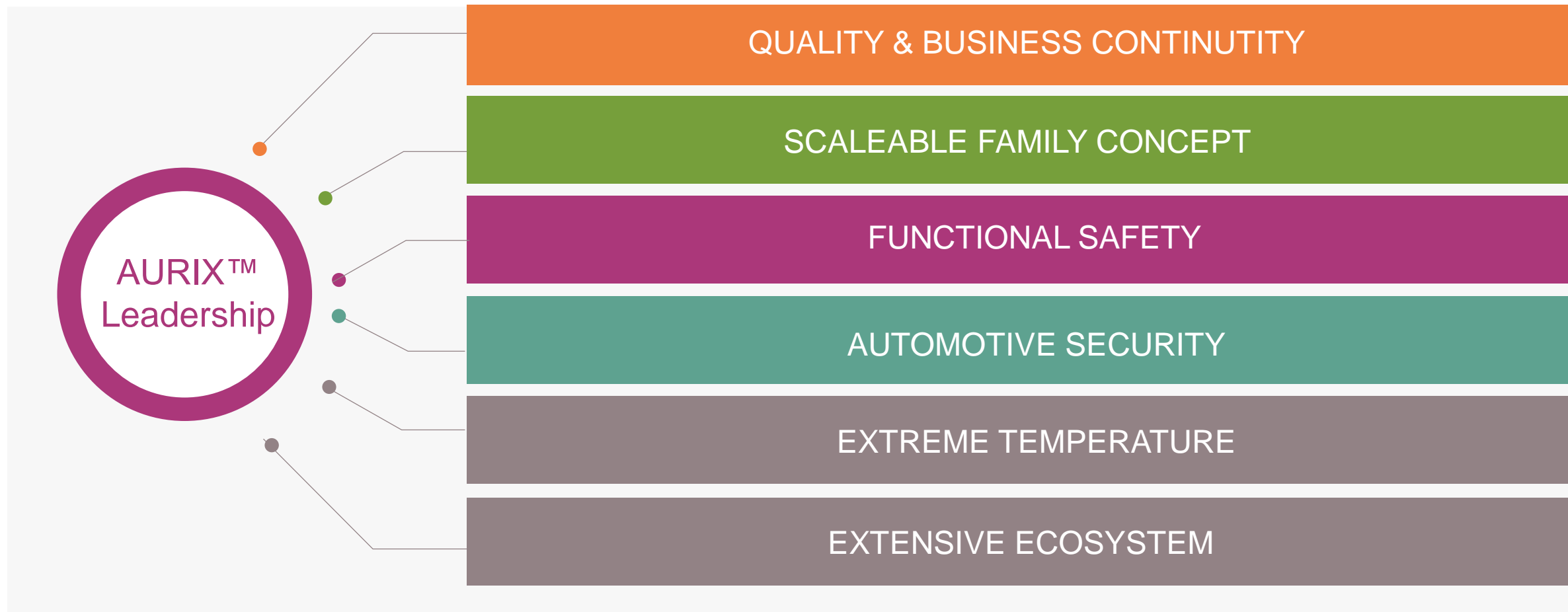
# Infineon MCU Portfolio & Roadmap – Industrial, Consumer & Automotive



# AURIX™: Infineon's TriCore Processor



# AURIX™ - One-stop-shop for Automotive



**No other** MCU family can offer this **combination** of functionality across multiple compatible products



# AURIX™: wide range of automotive applications

## Powertrain/ xEV



Engine

Transmission

HEV/BEV  
Inverter

DC-DC  
Converter  
/Charger

Hybrid Control Units

Battery  
Management

Real-time.

## chassis/safety/ADAS/AD



Domain Control

Chassis  
Suspension

Vehicle Stability  
Control

Power Steering

Electric Parking Brake

Airbag & Safety

77GHz Radar

24GHz Radar

Advanced Lighting

Driver Monitoring

Sensor Fusion

Vision  
Safe Host Controller

Safe

## Body/ advanced connectivity



Advanced Body  
Control Module

Connected Gateway

Telematics

Smart Cockpit

Infrastructure Controller  
for IVI/V2V/V2X

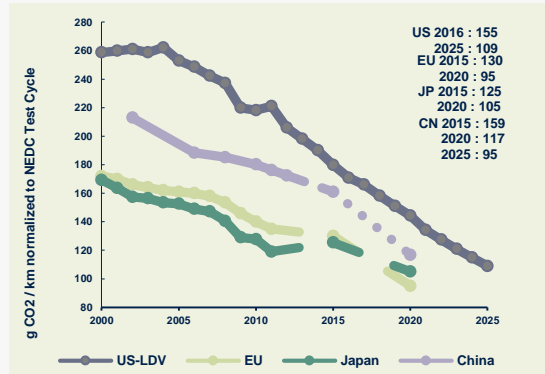
Secure.

# New market trends set new MC requirements

## *AURIX™ enables the latest market trends*

### Automotive Trends

#### Emission & CO2 regulations



### Challenges

- › Real-time performance
- › Safe performance

### Infineon's response

- › TriCore™ performance increase
- › Safety performance increase (LS cores)
- › Faster S-RAM and e-flash
- › More sensor interfaces
- › Improve ADCs
- › Better support of xEV applications

#### Autonomous driving



- › High performance clusters
- › Accelerators
- › Low latency & high bandwidth IFs
- › Fail Operational

- › Performance increase
- › Accelerators for signal processing support (SPU)
- › Accelerators for deep learning solutions
- › Support of new interfaces
- › Advanced self test capabilities

#### Connected Car / Car2X



- › Remote SW update
- › Remote diagnosis
- › High level of security

- › Secured storage and interoperability with trusted root
- › Secured on-board communication
- › Support of SOTA
- › Support of SW isolation mechanisms

# AURIX™ Transforming dependability into customer value

*“The quality of being trustworthy and reliable.”*

## Dependability

## Customer value

### Robustness

- Functional Availability
- Component Reliability

High Quality

### Scalability

- Design Flexibility
- Hardware & Software Reusability

Cost optimized

### Safety and Security

- Holistic Safety and Security Architecture
- Application know-how

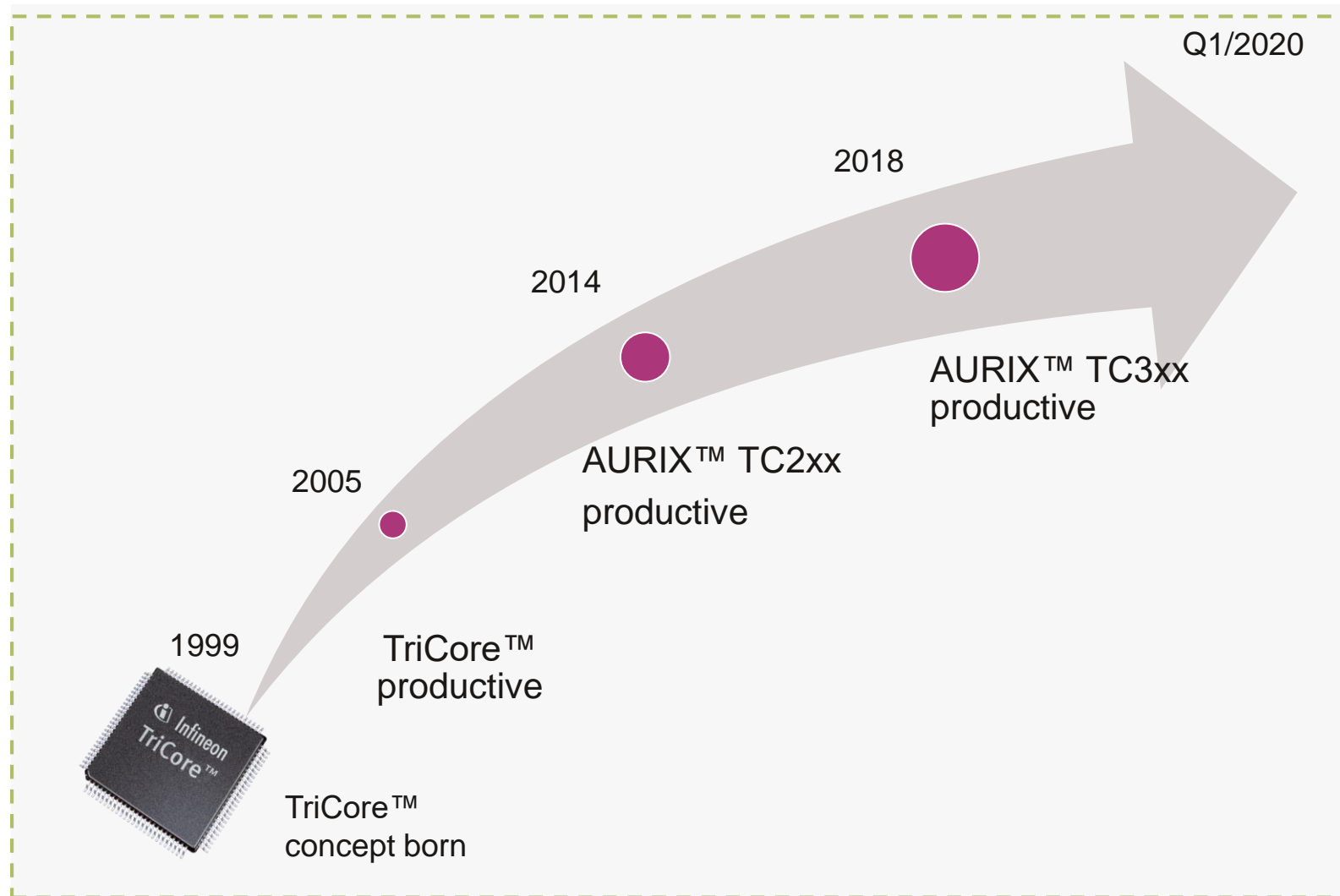
Risk control

### Trustworthy partnerships

- Partner reliability
- Experience and know-how
- Trust and long-term commitment

Continuous support

# TriCore™ based Infineon automotive MCUs



## What is TriCore™?

TriCore™ integrates three functions:  
DSP, RISC & MCU

## TriCore™ is designed for Safety

used in **>50** car brands

Committed to **Zero Defect**,  
high quality track record



**600,000,000** TriCore™ &

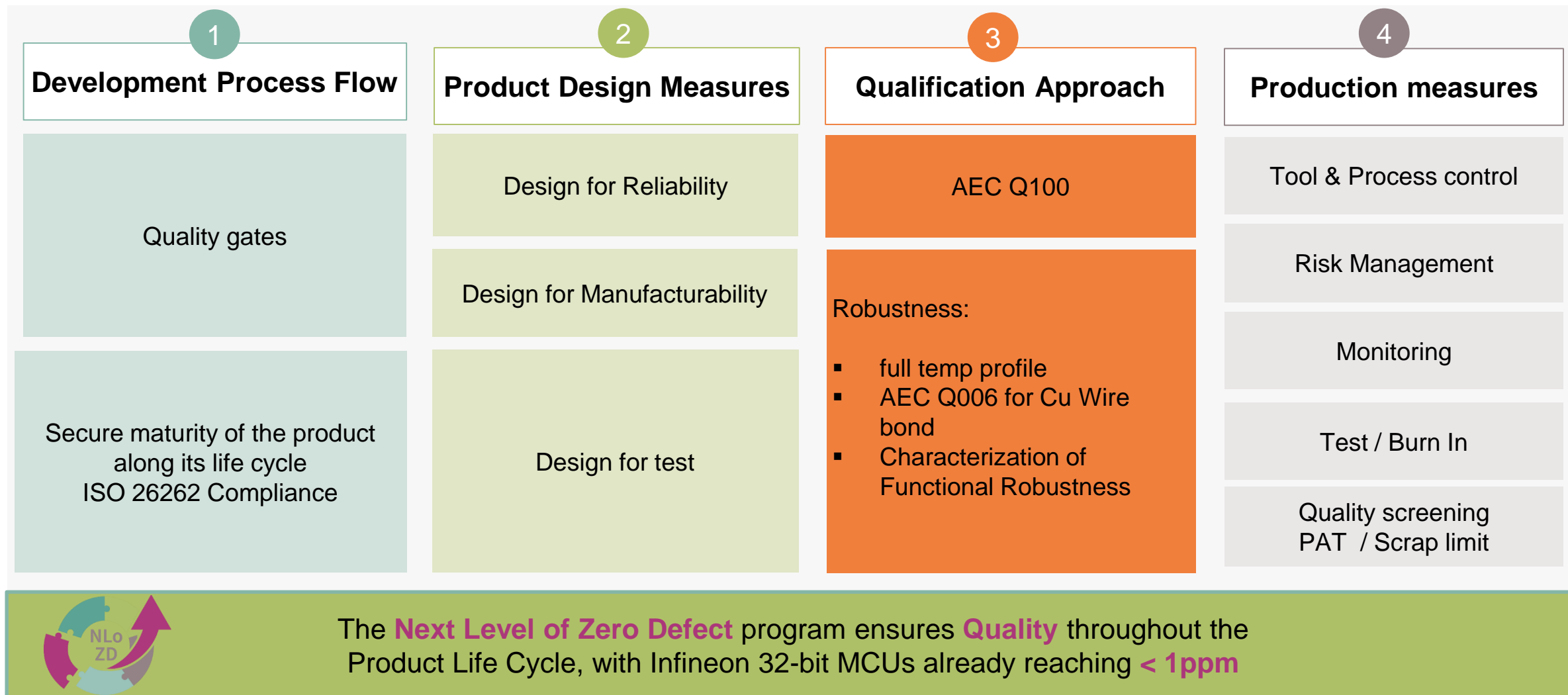
**150,000,000** AURIX™  
shipped!



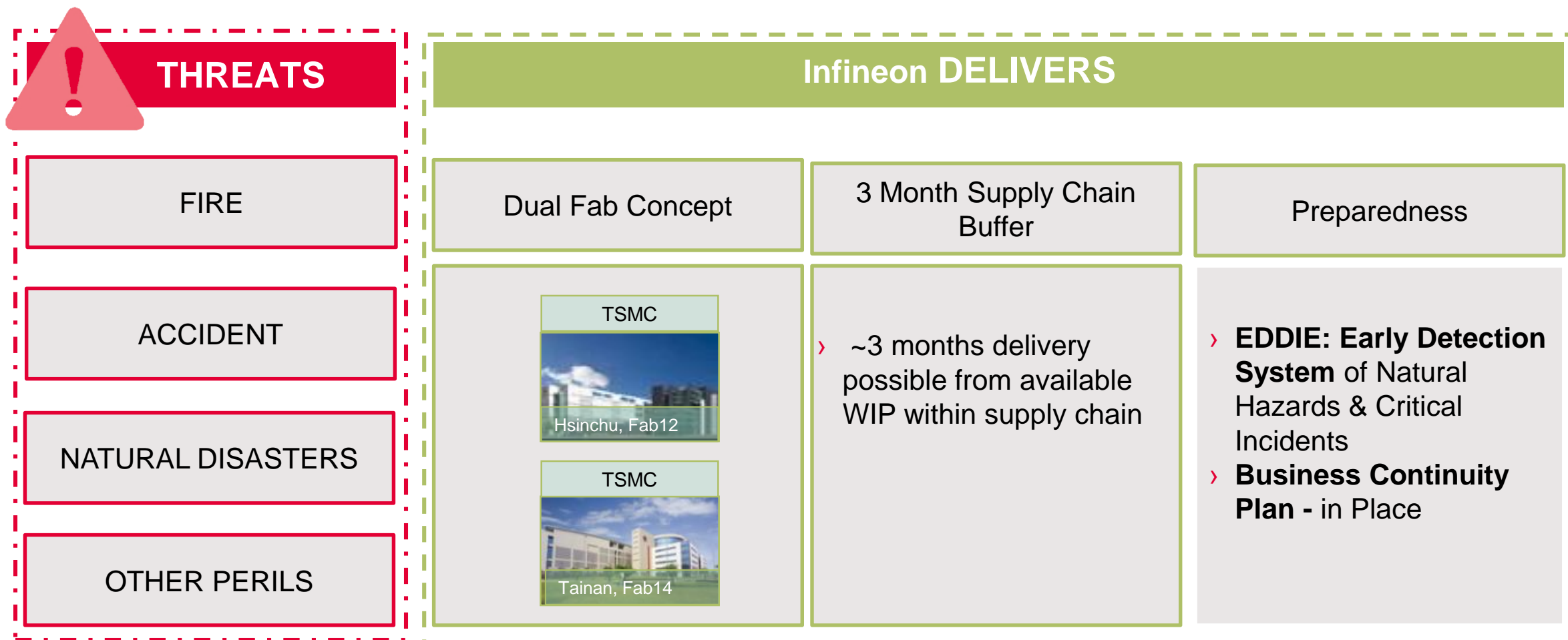
# AURIX™:

## Quality & Business Continuity Leadership

# AURIX™: Quality Leadership by design

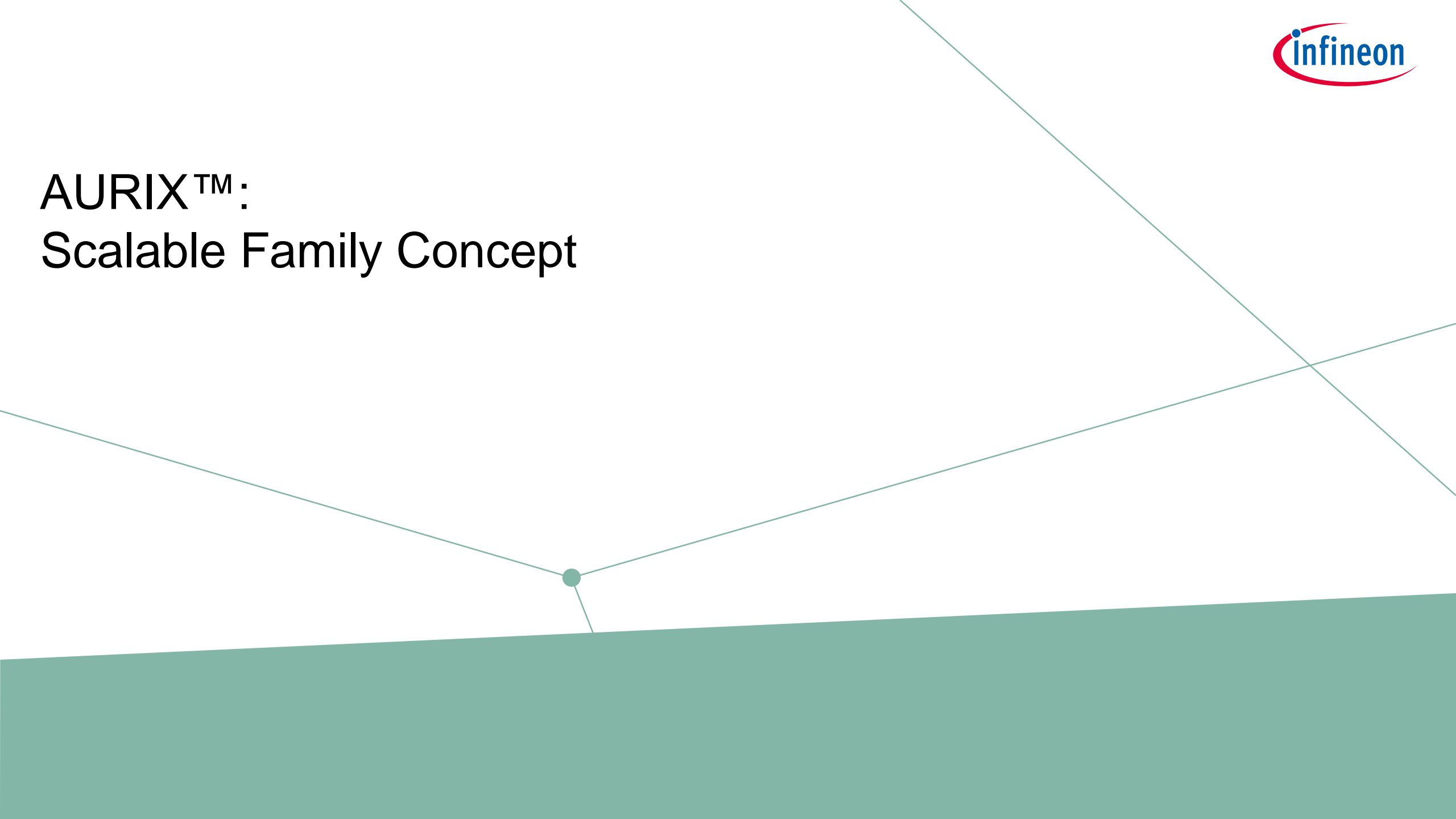


# AURIX™: Supply Security Leadership



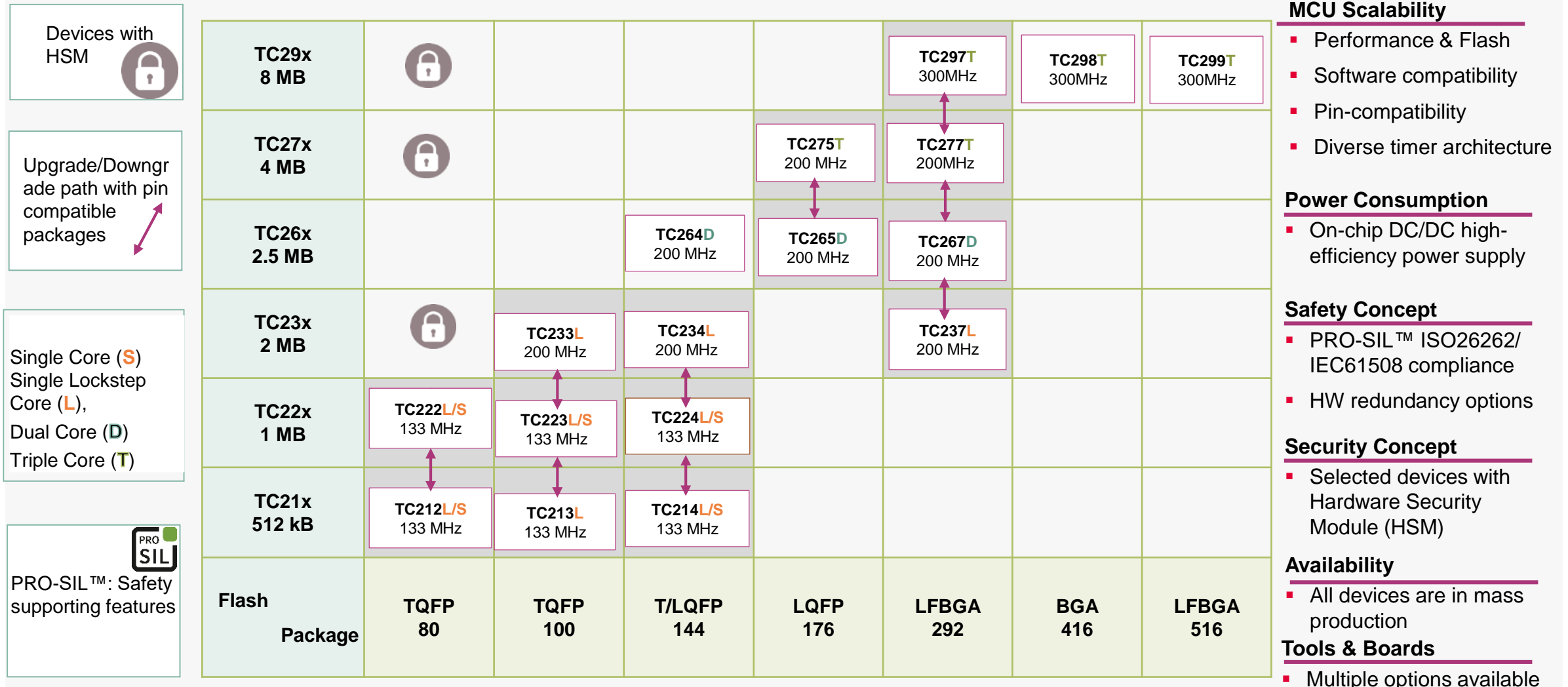
Continuity of supply is critical for our customers. AURIX™ delivers.

# AURIX™: Scalable Family Concept



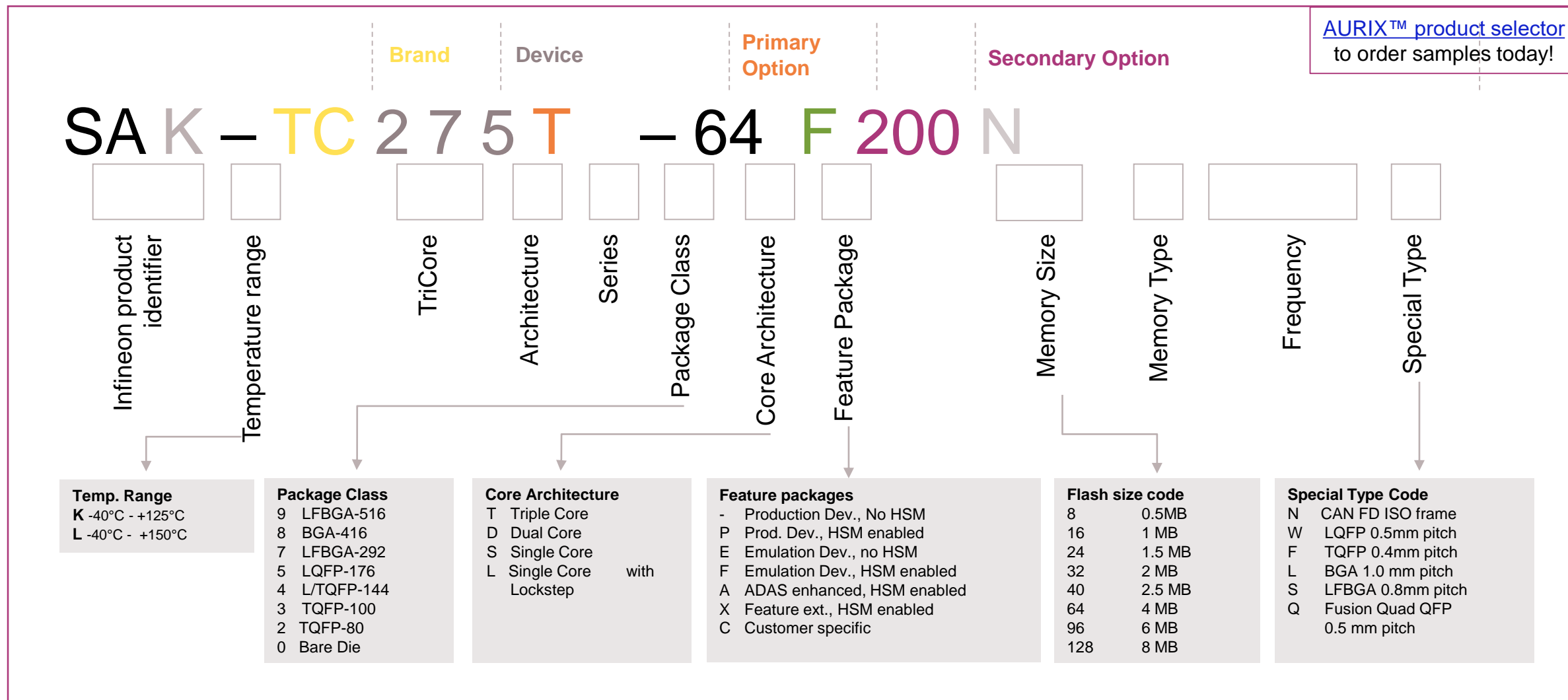
# AURIX™: TC2xx Scalable Family

## From low cost to high performance applications





# AURIX™ Getting Started with TC2xx: Product Selector



# AURIX™: TC29x Series – Performance Device

## AURIX™: TC29x Series

The AURIX™ family addresses applications, where more performance, connectivity, safety and security are needed.

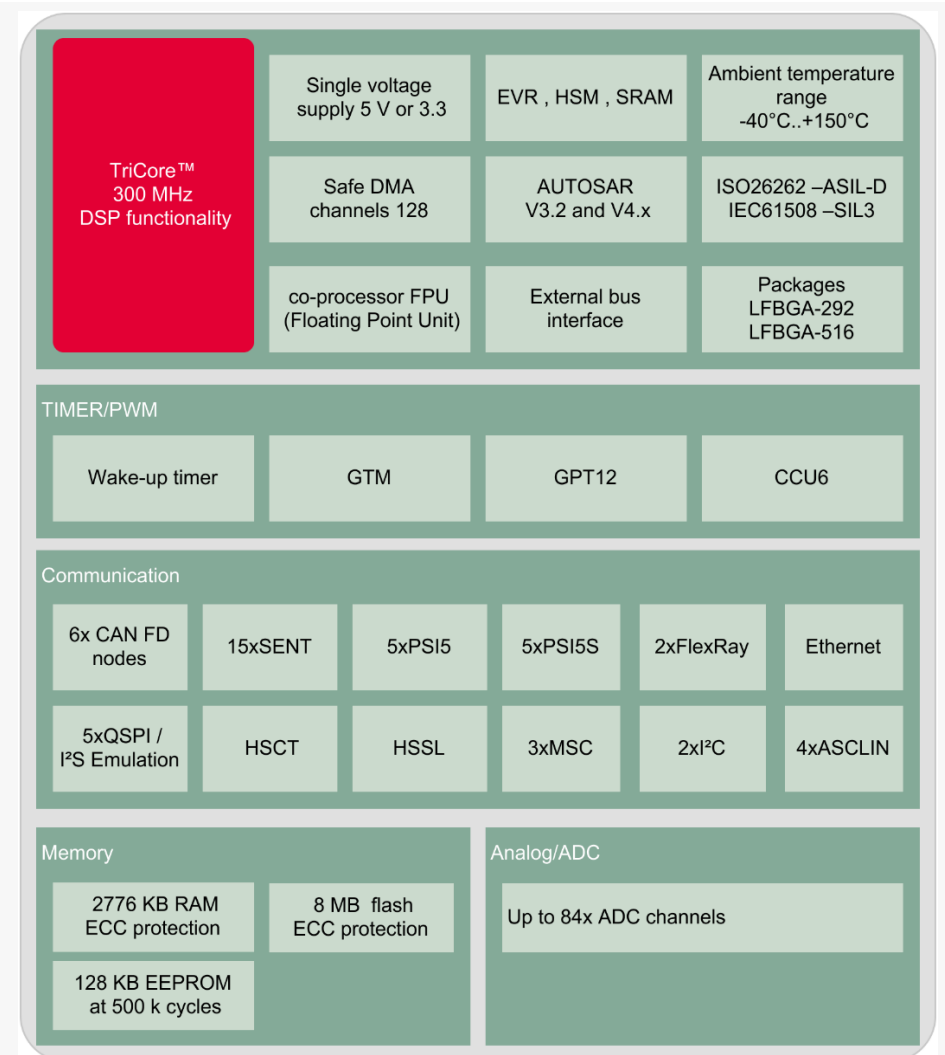
AURIX™ TC2xx microcontrollers serve the precise needs of the automotive and industrial market in terms of performance and safety

## Most innovative safety:

- › Diverse Lockstep Core with clock delay
- › Redundant and diverse timer modules (GTM, CCU6, GPT12)
- › Access permission system
- › Safety management unit
- › DMA
- › I/O, clock, voltage monitor
- › Developed and documented following ISO 26262 to support safety requirements up to ASIL-D
- › AUTOSAR V3.2 and V4.x

## System benefits :

- › Diverse Lockstep architecture to reduce development effort for ASIL-D systems .
- › High integration for reduced complexity and significant cost savings .
- › Delta-sigma analog-to-digital converters for fast and accurate measurements .
- › Innovative single supply concept for best-in-class power consumption and cost savings in external supply .
- › Scalability in terms of performance, packages, memory and peripherals for flexibility across platform concepts .
- › Available as single and lockstep core .
- › Latest connectivity CAN FD (flexible data rate) .
- › Scalable safety from QM to ASIL D for Industrial and Automotive Applications .
- › Dedicated emulation device chip (ED) for multicore debugging, tracing and calibration .
- › Hot package options for extended temperature range



# AURIX™: TC21x Series – Low-end Device

## AURIX™: TC22x Series

The AURIX™ family addresses applications, where more performance, connectivity, safety and security are needed.

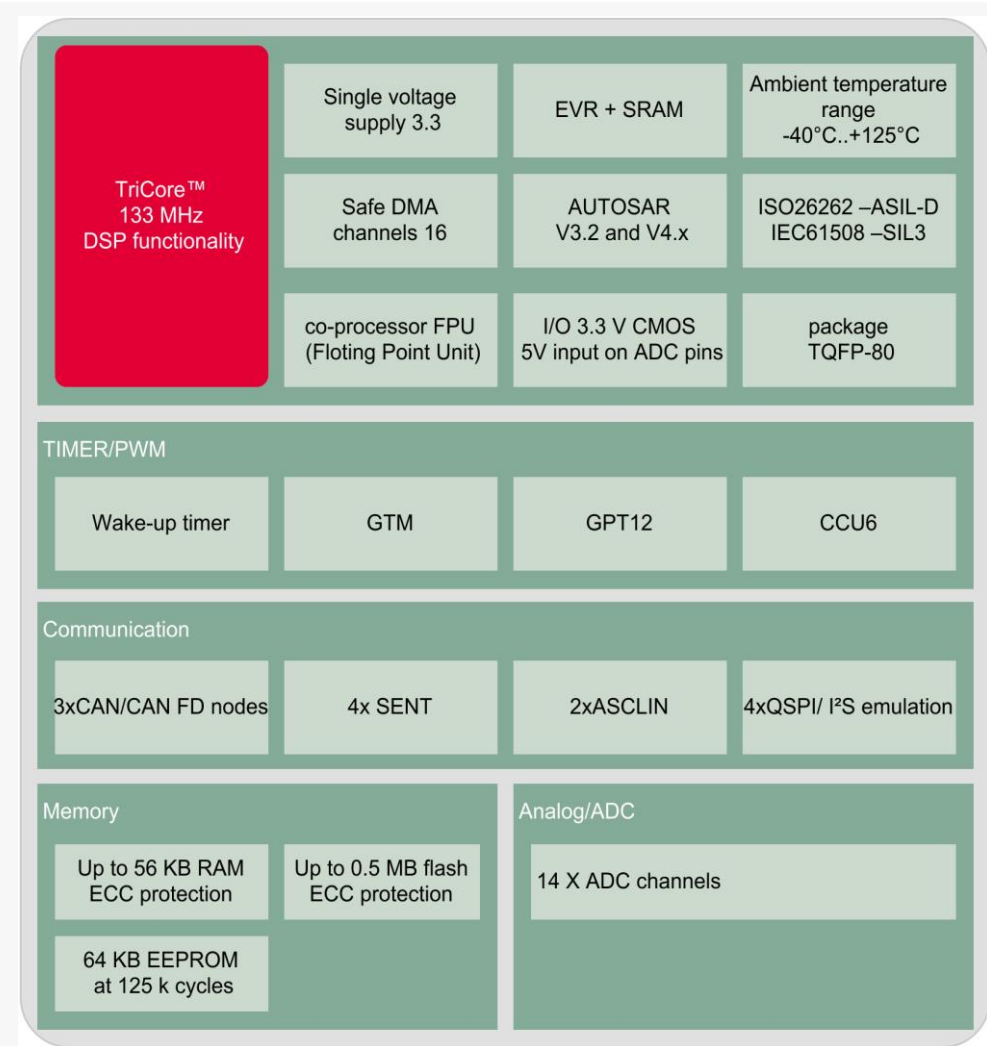
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- › Dedicated emulation device chip (ED) for multicore debugging, tracing and calibration .
- › Hot package options for extended temperature range

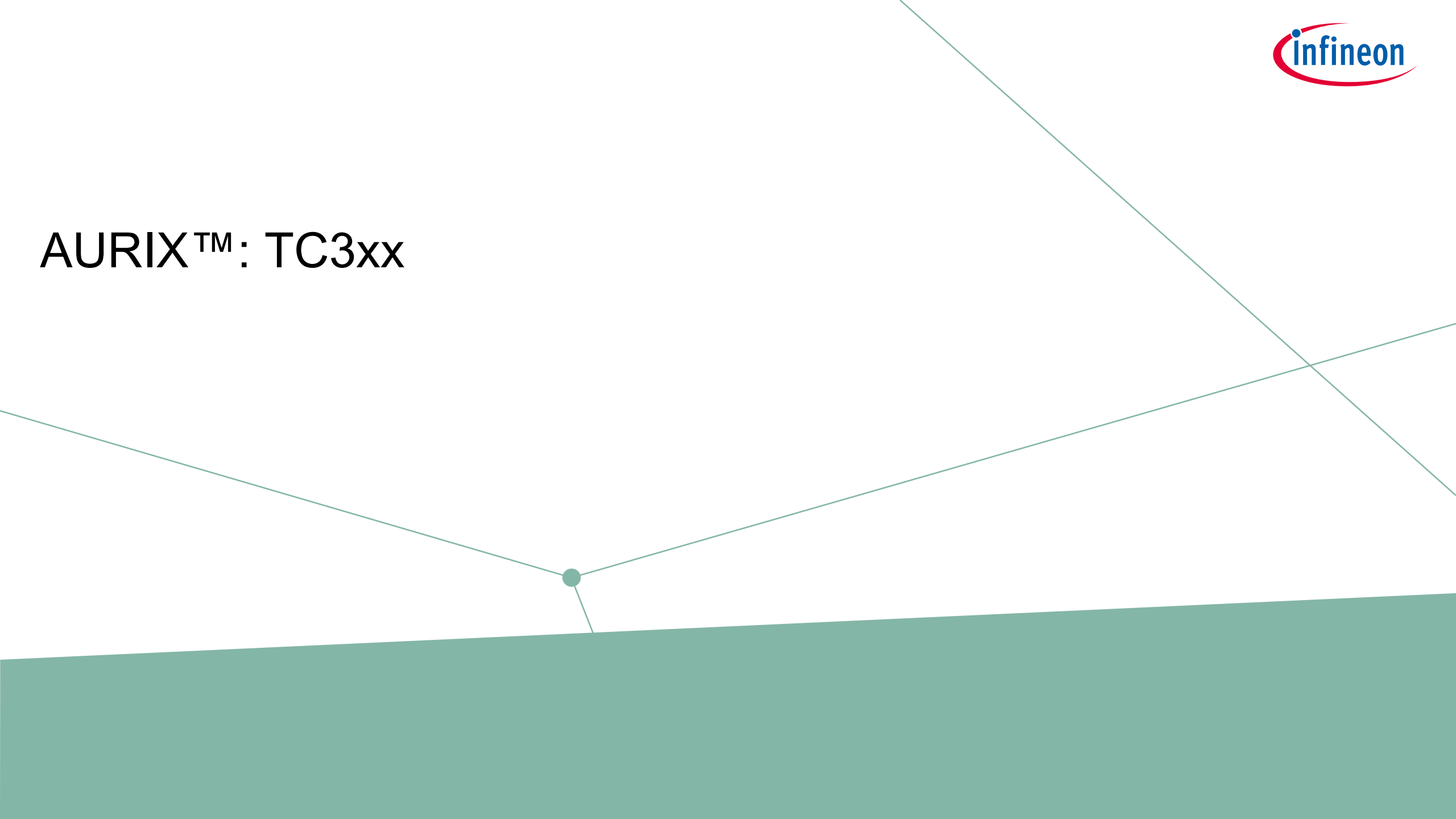


# AURIX™ TC2xx: Standard devices in mass production

Feature Set		9x Series	7x Series	6x Series	3x Series	2x Series	1x Series
TriCore 1.6P	# Cores / Checker	3 / 1	2 / 1	1 / 1	- / -	- / -	- / -
	Frequency	2x300 / 1x200 MHz	200 MHz	200 MHz	-	-	-
TriCore 1.6E	# Cores / Checker	- / -	1 / 1	1 / -	1 / 1	1 / 1 (1 / 0)	1 / 1 (1 / 0)
	Frequency	-	200 MHz	200 MHz	200 MHz	133 MHz	133 MHz
Flash	Program Flash	8 MB	4 MB	2.5 MB	2 MB	1 MB	512 KB
	EEProm @ w/e cycles	128 KB @ 500k	64 KB @ 500k	16 KB @ 500k	128k @ 125 k cycles	96k @ 125k cycles	64k @ 125k cycles
SRAM	Total (DMI , PMI, LMU)	728 KB	472 KB	240 KB	192 KB	96 KB	56 KB
DMA	Channels	128	64	48	16	16	16
ADC	Modules 12bit / DS	11 / 10	8 / 6	4 / 3	2 / -	2 / -	2 / -
	Channels 12bit / DS	84 / 10 diff	60 / 6 diff	50 / 3 diff	24 / -	/ -	24 / -
Timer	GTM Input / Output	48 / 152 channels	32 / 88 channels	24 / 64 channels	8 / 32	8 / 32	8 / 32
	CCU / GPT modules	2 / 1	2 / 1	2 / 1	2 / 1	2 / 1	2 / 1
Interfaces	FlexRay (#/ch.)	2 / 4	1 / 2	1 / 2	1 / 2	-	-
	CAN FD <sup>3)</sup> (nodes/obj)	6 / 384	4 / 256	5 / 256	6 / 256	3 / 128	3 / 128
	QSPI / ASCLIN / I2C	6 / 4 / 2	4 / 4 / 1	4 / 4 / 1	4 / 2 / -	4 / 2 / -	4 / 2 / -
	SENT / PSI5 / PSI5S	15 / 5 / 1	10 / 3 / 1	6 / 2 / 1	4 / -	4 / -	4 / -
	HSCT / MSC / EBU	1 / 3 diff LVDS / 1	1 / 2 diff LVDS / -	1 / 2 diff LVDS / -	- / - / -	- / - / -	- / - / -
	Other	Ethernet	Ethernet	Ethernet	-	-	-
Safety	SIL Level	ASIL-D	ASIL-D	ASIL-D	ASIL-D	ASIL-D	ASIL-D
Security	HSM	Yes	Optional	No	Optional	No	No
Power	EVR	Yes	Yes	Yes	Yes	Yes	Yes

AURIX™ family concept offers both **scalable** feature-sets and pin-outs for **optimal flexibility**

# AURIX™: TC3xx





# AURIX™ TC3xx Architecture Evolution (enhancements vs. AURIX™)

## Performance

- New TriCore™ 162 generation
- New instructions
- up to 6 CPUs @300MHz
- New direct Flash access path

## Memories

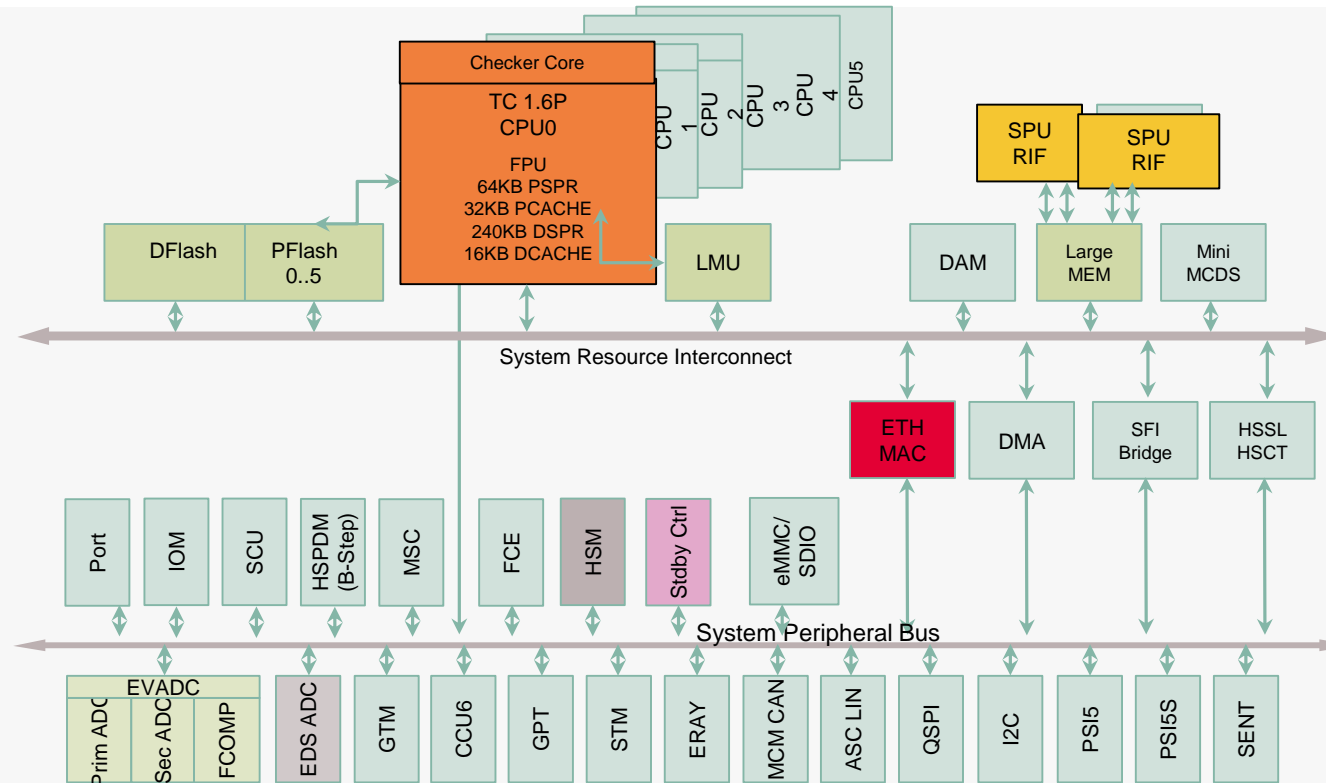
- Larger SRAM
- SRAM/Flash ratio increased
- enhanced MPU

## ADC

- Improvement of existing ADC
- Reduction of capacitive load

## Delta-Sigma:

- enhanced concept



## HSM: Full Evita compliance

- New accelerators ECC256 / SHA256
- Available on all devices

## Standby Control Unit

- Low power modes

## ADAS

- New SPU concept

## Safety

- LBIST
- MBIST upgrade

## Ethernet

- 1Gbit/s ETH
- QoS services

## IO Pads

- all 5V/3.3V

# AURIX™: TC3xx Scalable Family

## From low cost to high performance applications



Devices with HSM	6x 300 MHz	9xA Series 16 MB	Control & Actuate Sense & Compute						TC397XA 300 MHz	
	6x 300 MHz	9x Series 16 MB							TC397X 300 MHz	TC399X 300 MHz
Upgrade/Downgrade path with pin compatible packages	4x 300 MHz	Ex Series 12 MB							TC3E7Q 300 MHz	
	4x 300 MHz	8x Series 10 MB							TC387Q 300 MHz	TC389Q 300 MHz
	3x 300 MHz	7xX Series 6 MB							TC377TX 300 MHz	
	3x 300 MHz	7x Series 6 MB							TC377T 300 MHz	
Single Core (S) Single Lockstep Core (L), Dual Core (D) Triple Core (T)	2x 300 MHz	6x Series 4 MB					TC364D 300 MHz	TC366D 300 MHz	TC365D 300 MHz	TC367D 300 MHz
	3x 300 MHz	5xA Series 4 MB						TC356TA 300 MHz		TC357TA 300 MHz
	2x 300 MHz	3xA Series 2 MB						TC336DA 300 MHz		TC337DA 300 MHz
	1x 200 MHz *	3x Series 2 MB					TC332L 200MHz *	TC333L 200MHz *	TC334L 200 MHz *	TC336L 200 MHz *
PRO-SIL™: Safety supporting features	1x 160 MHz	2x Series 1 MB					TC322L 160 MHz	TC323L 160 MHz	TC324L 160 MHz	
										TC327L 160 MHz
	Flash	Package					TQFP-80	TQFP-100	T/LQFP-144	BGA-180
										LQFP-176
										BGA-216
										LFBGA-292
										LFBGA-516

### MCU Scalability

- Performance & Flash
- Software compatibility
- Pin-compatibility
- Diverse timer architecture

### Power Consumption

- On-chip DC/DC high-efficiency power supply

### Safety Concept

- PRO-SIL™ ISO26262/IEC61508 compliance
- HW redundancy options

### Security Concept

- Selected devices with Hardware Security Module (HSM)

### Availability

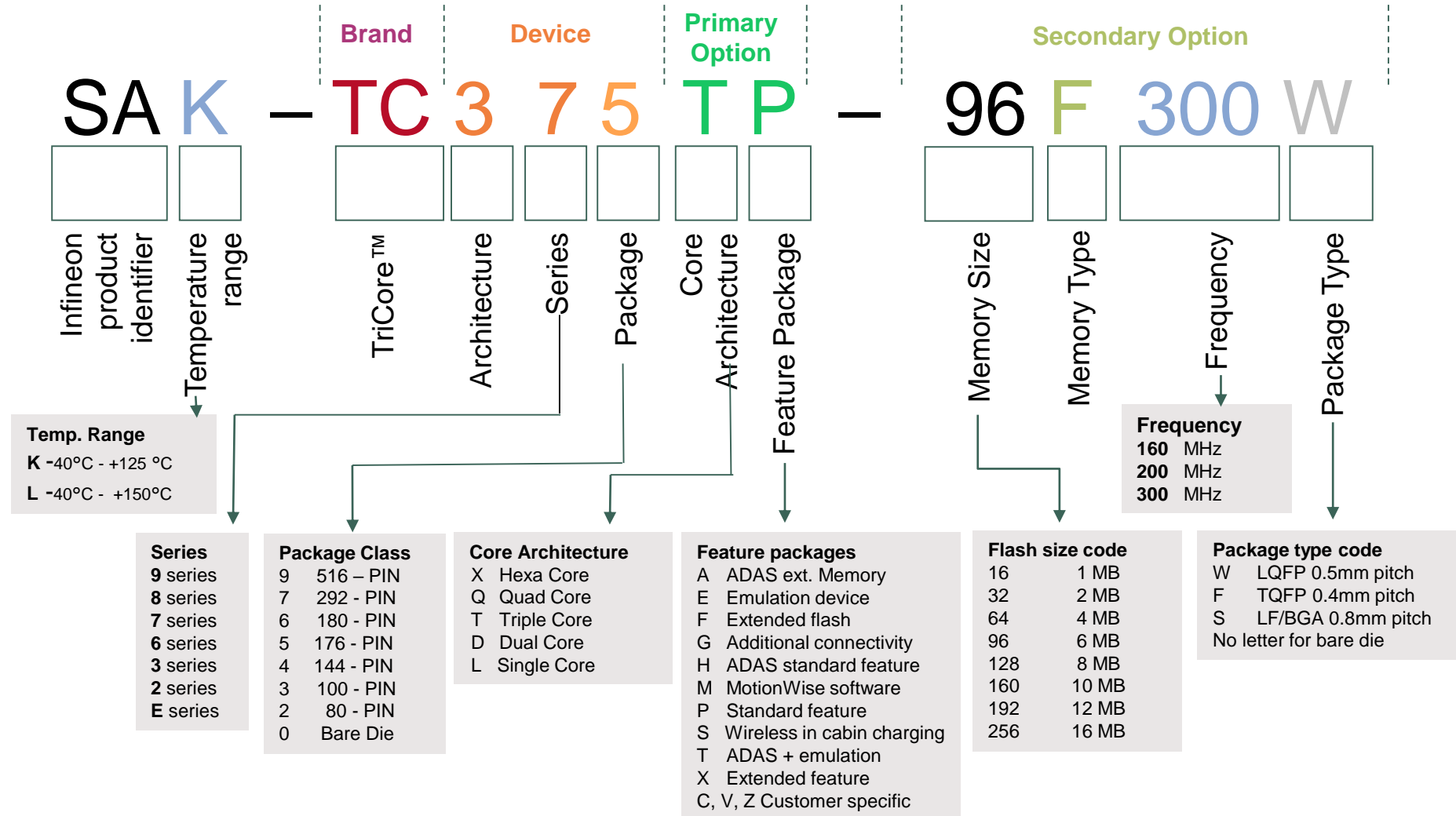
- All devices are in mass production

### Tools & Boards

- Multiple options available

# Getting Started with AURIX™ TC3xx

## Product Nomenclature NOT Legos



# AURIX™ – TC3xx

## Terminology

Term	Description
<b>DFlash</b>	Data flash for persistent storage of varying data
<b>PFlash</b>	Program flash where code and constants reside
<b>DSPR</b>	Data Scratch Pad RAM, essentially RAM for variable storage, stack, etc.
<b>PSPR</b>	Program Scratch Pad RAM, for buffering code fetched from PFlash, running code from RAM, etc
<b>dLMU</b>	Distributed Local Memory Unit: additional RAM available on the SRI, with direct connection from each block to a certain core to avoid SRI congestion
<b>Global LMU</b>	Similar to dLMU, except that all requests must go through SRI
<b>DAM</b>	Default Application Memory, additional RAM on SRI
<b>EMEM</b>	Extension Memory, additional RAM on SRI
<b>MCDS</b>	Multi Core Debug Solution, the debug system
<b>EBU</b>	External Bus Unit for connecting certain external memories and peripherals
<b>ETH MAC</b>	Ethernet controller
<b>DMA</b>	Direct Memory Access for transferring data from flash, peripherals, and RAM to peripherals and RAM
<b>SFI Bridge</b>	A bridge connecting SRI and SPB
<b>HSSL</b>	High speed serial link, typically used to connect with another AURIX MCU, FPGA, or SoC
<b>HSCT</b>	High Speed Communication Tunnel, companion to HSSL

Term	Description
<b>Port</b>	Allows for pin configuration, pad strength, etc
<b>IOM</b>	Input Output Monitor, a powerful HW based smart IO comparison unit
<b>SCU</b>	System Control Unit, a cluster of system units handling reset, traps, system registers, watchdog, etc.
<b>HSPDM</b>	High Speed Pulse Density Modulation Module, generates bit streams that can be low pass filtered externally to generate analog voltage
<b>MSC</b>	Micro Second Channel, a serial interface that is especially designed to connect external power devices
<b>FCE</b>	Flexible CRC Engine that can generate CRCs of different polynomials
<b>HSM</b>	Hardware Security Module containing accelerators for cryptography and providing a secure execution environment and key storage
<b>Stdby Ctrl</b>	Standby Controller that can be operated under low power conditions
<b>eMMC/SDIO</b>	An interface to external eMMC or SDIO memories
<b>SMU</b>	Safety Management Unit, a central area for configuration of safety alarms
<b>EVADC</b>	Enhanced Versatile ADC, a traditional SAR ADC with primary, secondary, and fast compare engines
<b>EDSADC</b>	Enhanced Delta-Sigma ADC, an ADC based on Delta-Sigma conversion principle

Term	Description
<b>GTM</b>	Generic Timer Module, a powerful timing module for analyzing and generating PWM signals, and several other functions
<b>CCU6</b>	Capture Compare Unit 6, high-resolution 16-bit capture and compare unit with application-specific modes, mainly for AC drive control
<b>GPT</b>	General Purpose Timer, a flexible timing module which may be used for timing, event counting, pulse width measurement, pulse generation, frequency multiplication, and other purposes
<b>STM</b>	System Timer Module, provides free running high precision timers typically used for OS tick generation
<b>ERAY</b>	FlexRay controller
<b>MCMCAN</b>	CAN controller
<b>ASC_LIN</b>	Asynchronous/Synchronous Local Interconnect Network, a flexible communication controller that provides SPI, UART, and LIN interface
<b>QSPI</b>	Queued Synchronous Peripheral Interface, a powerful SPI serial communication controller
<b>I2C</b>	Inter-Integrated Circuit, an I2C serial communication controller
<b>PSI5</b>	Peripheral Sensor Interface, for communication with the external devices (typically sensors) via one I/O line for each channel using PSI5 communication protocol
<b>SENT</b>	Single Edge Nibble Transmission, for communication with the external devices (typically sensors) via one I/O line for each channel using SENT communication protocol

# AURIX™: TC39x Series – Super set Device

## AURIX™: TC39Xx Series

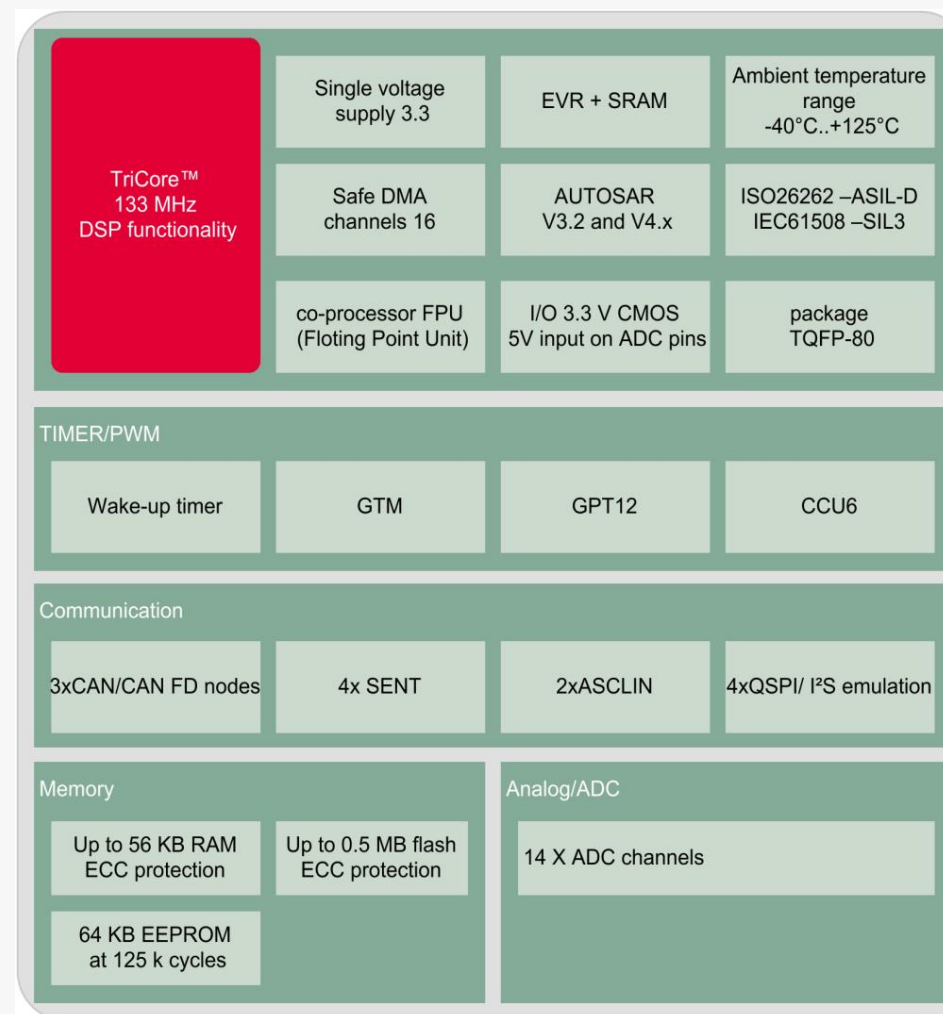
This family has more than 20 products to provide the most scalable portfolio of safety microcontroller. In terms of performance, the highest end product TC39x offers 6 cores running at 300 MHz and up to 6.9 MBytes embedded RAM, and consuming below 2 W. Its mirrored embedded flash banks offers A/B swap capabilities.

## Most innovative safety:

- › Best-in-class performance enabling ASIL-D designs
- › Downward scalable to lower cost AURIX™ TC3xx microcontrollers
- › A/B swap software update over the air support
- › Easy migration from AURIX™ first generation thanks to the software and hardware compatibility

## Key features

- › 6 TriCore™ running at 300 MHz (with 4 additional checker cores delivering 4000 DMIPS)
- › Supporting floating point and fix point with all cores
- › 16 MB flash/ ECC protection
- › Up to 6.9 MB SRAM/ ECC protection
- › [1 Gbit Ethernet](#)
- › 12x CAN FD, 2x [FlexRay](#), 12x [ASCLIN](#), 6x [QSPI](#), 2x I<sup>2</sup>C, 25x [SENT](#), 4x [PSI5](#), 1x [PSI5S](#), 2x [HSSL](#), 4x [MSC](#), 1x eMMC/SDIOT, 1x I<sup>2</sup>S emulation
- › Redundant and diverse timer modules ( [GTM](#) , [CCU6](#) , [GPT12](#) )
- › EVITA Full [HSM](#) (ECC256 and SHA2)
- › [LFBGA-292](#) package
- › [LFBGA-516](#) package
- › Developed and documented following ISO 26262/IEC61508 to support safety requirements up to ASIL-D/SIL3
- › [AUTOSAR](#) 4.2 support
- › Single voltage supply 5 V or 3.3 V
- › 165°C junction temperature





# AURIX™ – TC39xXA (ADAS)

## AURIX™: TC39Xx Series

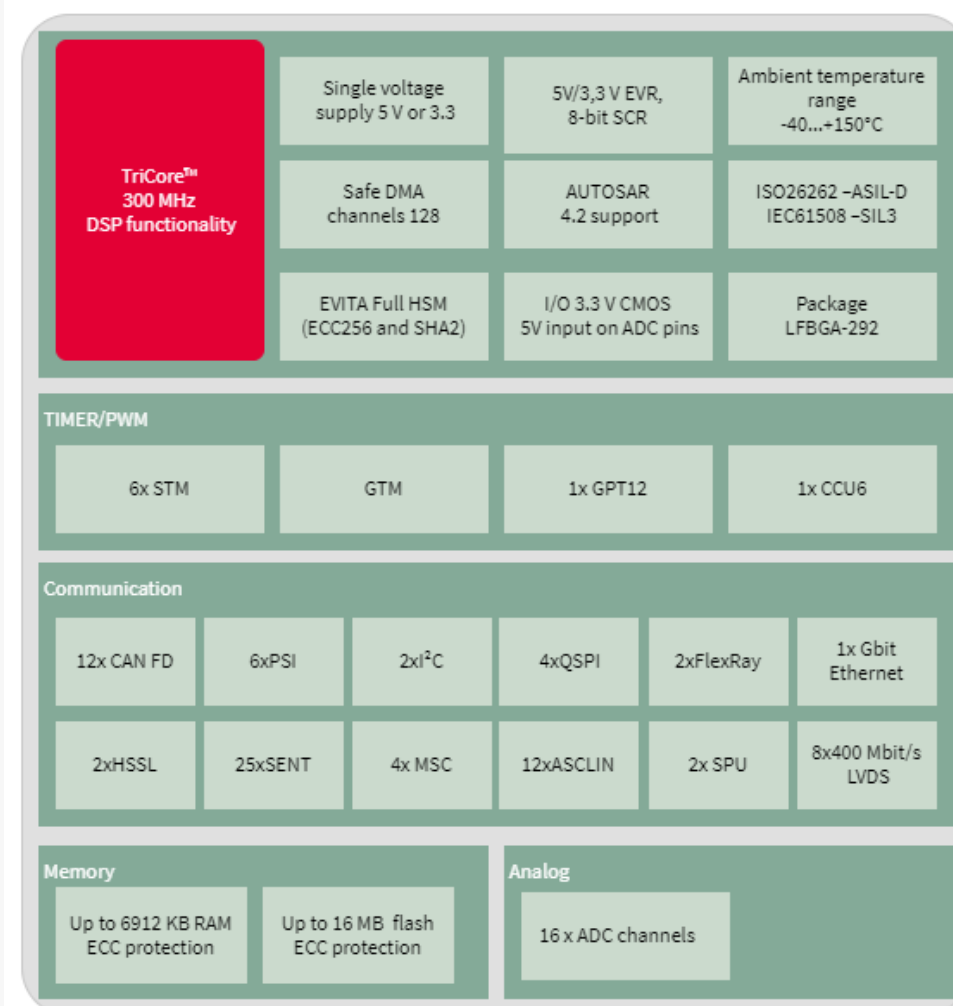
This family has more than 20 products to provide the most scalable portfolio of safety microcontroller. In terms of performance, the highest end product TC39x offers 6 cores running at 300 MHz and up to 6.9 MBytes embedded RAM, and consuming below 2 W. Its mirrored embedded flash banks offers A/B swap capabilities.

## Most innovative safety:

- › Complete Infineon chipset: MCU, front-end MMIC and safe power supply
- › Highly integrated solution for performance demanding **radar applications**
- › Fully compatible with [TC357TA](#) for more cost effective solutions
- › **Radar cluster:**
- › LVDS radar interface
- › Lock-stepped radar processor
- › High bandwidth radar SRAM

## Key features

- › 16 MB flash / ECC protection
- › up to 6.9 MB SRAM / ECC protection
- › 1 Gbit [Ethernet](#)
- › 12xCAN FD , 2x[FlexRay](#), 12xLINs, 4xQSP , 2x[I<sup>2</sup>C](#) , 25x[SENT](#), 6xPSI, 2x[HSSL](#), 4x[MSC](#) , 1x eMMC/SDIO
- › **8x400 Mbit/s LVDS Radar Interface**
- › 2x SPU (Signal Processing Unit) for Radar signal processing
- › Redundant and diverse timer modules (GTM, CCU6, GPT12)
- › EVITA Full HSM (ECC256 and SHA2)
- › BGA-292 package
- › Developed and documented following ISO 26262/IEC61508 to support safety requirements up to ASIL-D/SIL3
- › AUTOSAR 4.2 support
- › Single voltage supply 5 V or 3.3 V
- › 165°C junction temperature



### AURIX™: TC39Xx Series

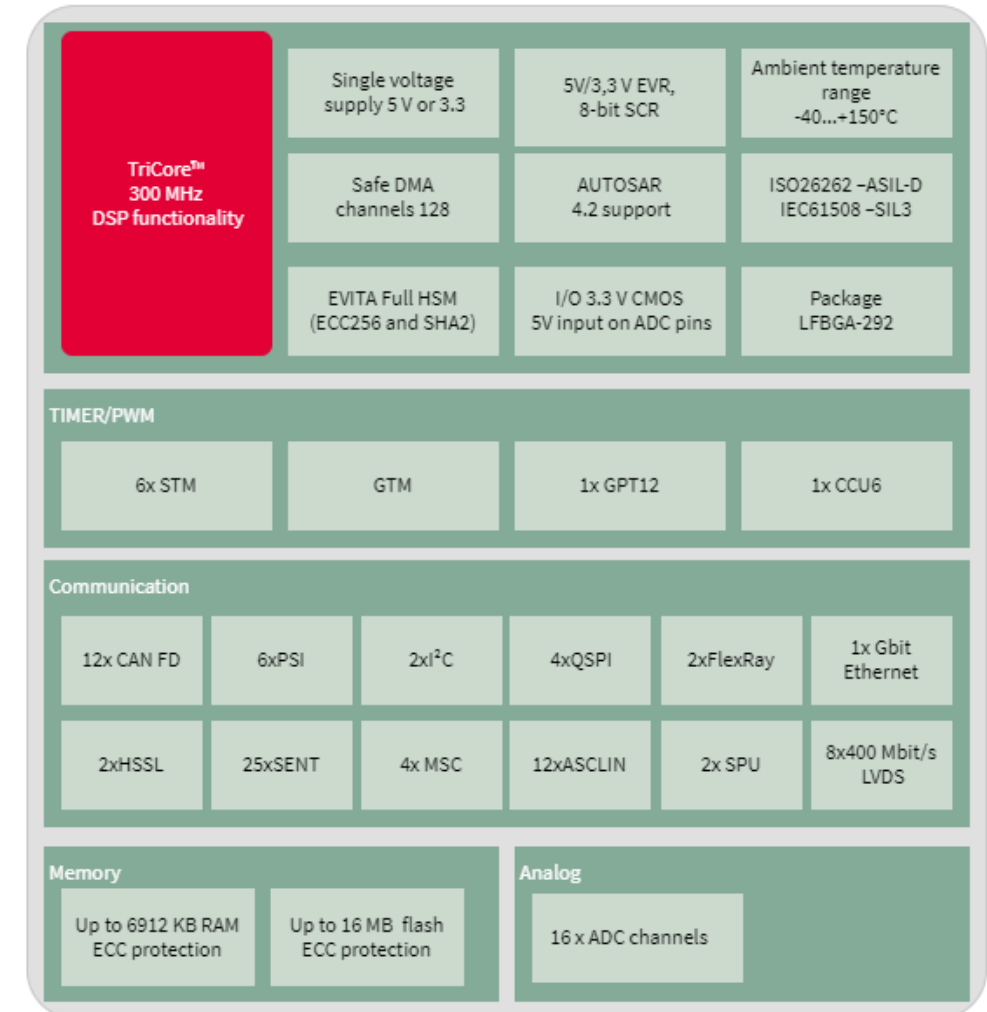
AURIX™ TC3xx family comes with an increase in performance, memory sizes, connectivity and scalability to address the new automotive trends and challenges. In terms of performance, the radar application high-runner TC35xTA offers 3 cores at 300 MHz, up to 3.6 MBytes embedded RAM, and consumption below 2 W. Its mirrored embedded flash banks (2x 2 MB) support A/B swap capabilities.

### Most innovative safety:

- › Complete Infineon chipset: MCU, front-end MMIC and safe power supply
- › Highly integrated solution for performance demanding **radar applications**
- › Fully compatible with [TC357TA](#) for more cost effective solutions
- › **Radar cluster:**
  - › LVDS radar interface
  - › Lock-stepped radar processor
  - › High bandwidth radar SRAM

### Key features

- › 3 TriCore™ running at 300 MHz (with 2 additional checker cores delivering 2100 DMIPS)
- › Up to 4 MB flash/ECC protection
- › Up to 3.6 MB SRAM/ECC protection
- › 1 Gbit Ethernet
- › 8xCAN FD 1xI<sup>2</sup>C 4xASCLIN ,1xFlexRay ,Radar/ext. ADC IF (RIF),4xQSPI
- › **8x400 Mbit/s LVDS Radar Interface;**
- › 2x SPU (Signal Processing Unit) for Radar signal processing
- › EVITA Full HSM (ECC256 and SHA2)
- › BGA-292 package and BGA-180 package
- › Developed and documented following ISO 26262/IEC61508 to support safety requirements up to ASIL-D/SIL3
- › AUTOSAR 4.2 support
- › Single voltage supply 5 V or 3.3 V
- › 165°C junction temperature
- › Standby mode controller



# AURIX™ – TC37xTX

## AURIX™: TC39Xx Series

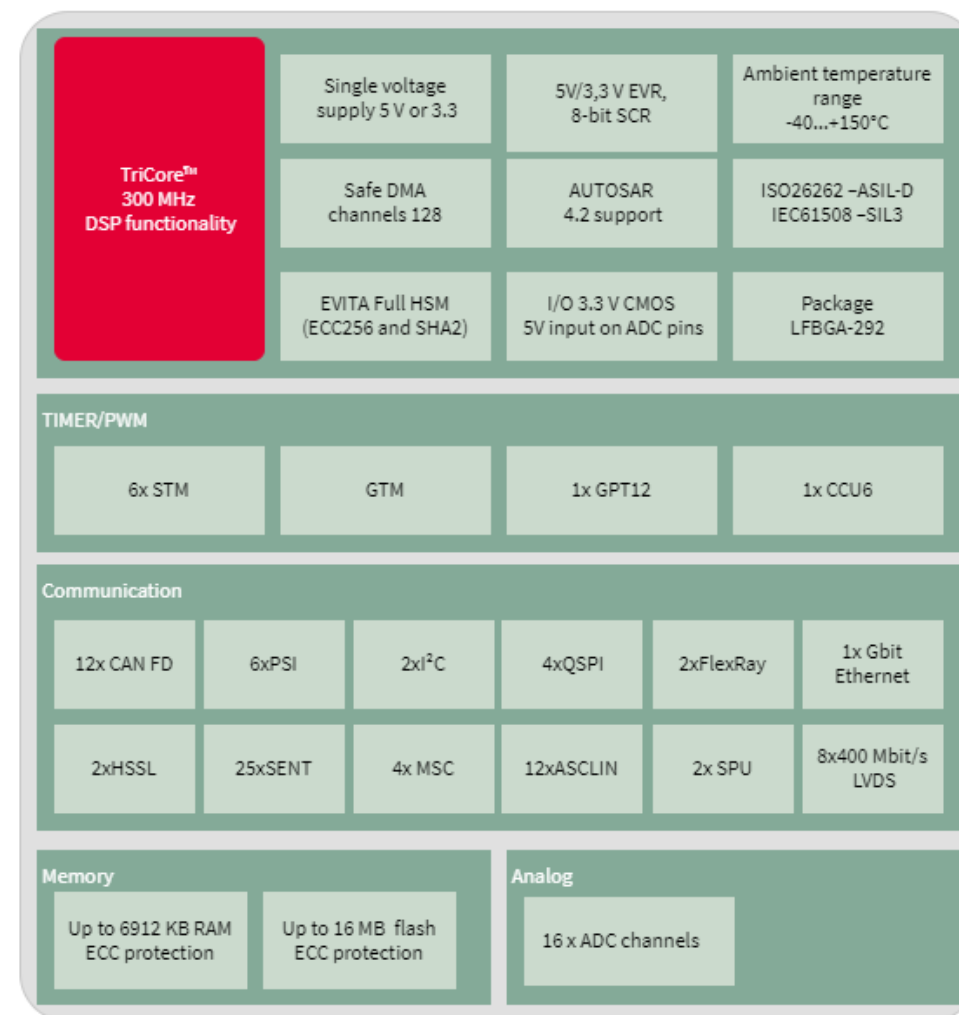
This family has more than 20 products to provide the most scalable portfolio of safety microcontroller. In terms of performance, T37xTX offers 3 cores running at 300 MHz and up to 4.3 MBytes embedded RAM, and consuming below 2 W. Its mirrored embedded flash banks offers A/B swap capabilities.

## Most innovative safety:

- › Best-in-class performance enabling ASIL-D designs
- › Upward and downward scalable to the rest of [AURIX™ TC3xx](#) family
- › A/B swap software update over the air support
- › Easy migration from [AURIX™ TC2xx](#) thanks to high software and hardware compatibility

## Key features

- › 3 TriCore™ running at 300 MHz
- › Supporting floating point and fix point with all cores
- › 6 MB flash/ECC protection
- › 4.3 MB SRAM / ECC protection
- › **128x DMA** channels
- › **2x Gbit Ethernet**
- › **12x CAN FD**, **1x FlexRay**, **12x LINs**, **6x QSPI**, **1x I²C**, **15x SENT**, **5x PSI**, **1x HSSL**, **2x MSC**, **1x eMMC**
- › eVita full **HSM** (ECC256 and SHA2)
- › **LFBGA-292 package**
- › Developed and documented following ISO 26262/IEC61508 to support safety requirements up to ASIL-D/SIL3
- › **AUTOSAR** 4.2 support
- › Single voltage supply 5 V or 3.3 V
- › Standby mode controller
- › Temperature: -40°C to 150°C



# AURIX™ – TC33xLP

## AURIX™: TC33xLP Series

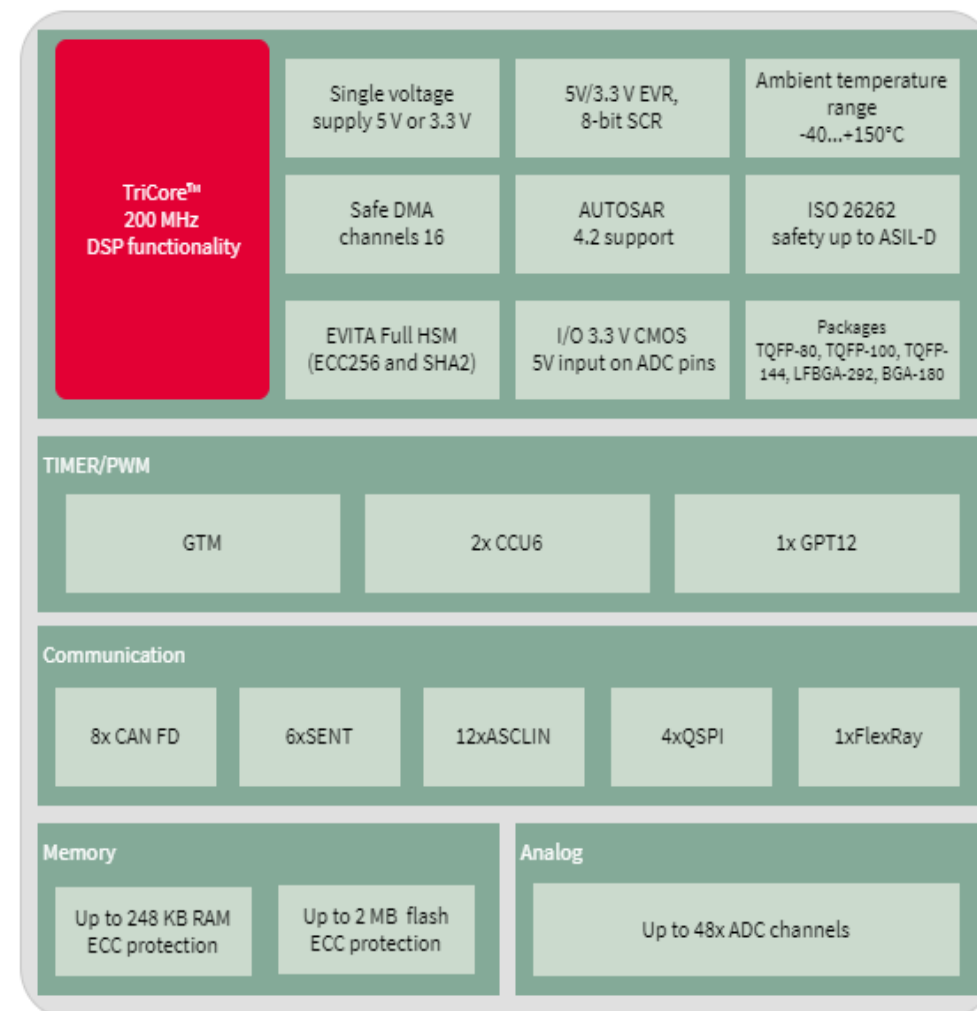
Infineon releases its second generation AURIX™ microcontroller in embedded flash 40 nm technology. It comes back with an increase in performance, memory sizes, connectivity and more scalability to address the new automotive trends and challenges. In terms of performance, T33xLP offers 1 core running at 200 MHz (300 MHz\*) and up to 248 KBytes embedded RAM, and consuming below 1 W.

### Most innovative safety:

- › Best-in-class performance enabling ASIL-D designs
- › Upward and downward scalable to the rest of AURIX™ TC3xx family
- › Easy migration from AURIX™ TC2xx thanks to high software and hardware compatibility

## Key features

- › 1 TriCore™ running at 200 MHz (300 MHz\*)
- › Supporting floating point and fix point with all cores
- › 2 MB flash/ ECC protection
- › 248 KB SRAM / ECC protection
- › **16x DMA** channels
- › Redundant and diverse timer modules ([GTM](#), [CCU6](#), [GPT12](#))
- › **1x FlexRay**,
- › 8x CANFD, 12x [ASCLIN](#), 4x [QSPI](#), 6x [SENT](#), 1x I²S emulation
- › eVita full [HSM](#) (ECC256 and SHA2)
- › [LFBGA-292 package](#)
- › [TQFP-144 package](#)
- › [TQFP-100 package](#)
- › [TQFP 80 package](#)
- › BGA 180 package
- › ISO 26262 ASIL-D support
- › [AUTOSAR](#) 4.2 support
- › Single voltage supply 5 V or 3.3 V
- › Standby mode controller
- › Temperature : -40°C to 150°C



# AURIX™: Functional Safety Leadership



# AURIX™ TC3xx Feature Table



This is an overview and not the full list. Please refer to datasheet variants addendums for full details.

\* 300MHz Option

Feature Set		9xA Series +eXtension (16MB)	9x Series (16MB)	Ex Series (12MB)	8x Series (10MB)	7x Series eXtended (6MB)	7x Series (6MB)	6x Series (4MB)	5xA Series (4MB)	3xA Series (2MB)	3x Series (2MB)	2x Series (1MB)
<b>TriCore</b> 1.6	# Cores / Checker	6/4	6/4	4/2	4/2	3/3	3/2	2/2	3/2	2/1	1/1	1/1
	Frequency	300MHz	300MHz	300MHz	300MHz	300MHz	300MHz	300MHz	300MHz	200MHz*	200MHz*	160MHz
<b>Accel</b>	Signal Processing Unit (SPU)	2xSPU							2xSPU	1xSPU		
<b>Flash</b>	Program Flash	16MB	16MB	12MB	10MB	6MB	6MB	4MB	4MB	2MB	2MB	1MB
	Data Flash	1024kB	1024kB	1024kB	512kB	256kB	256kB	128kB	128kB	128kB	128kB	96kB
<b>SRAM</b>	Total (DSPR, PSPR, LMU, AMU, EMEM) w/o Cache	6624kB	2528kB	1504kB	1376kB	4064kB	992kB	576kB	3520kB	1480kB	208kB	104kB
<b>DMA</b>	Channels	128	128	128	128	128	128	64	64	64	64	64
<b>ADC</b>	Modules Primary / Sec / FC / DS	8/4/8/14	8/4/8/14	8/4/4/10	8/4/4/10	4/4/4/6	4/4/4/6	4/2/2/4	2/0/0/0	6/0/0/0	2/2/0/0	2/2/0/0
	Channels Primary / Sec / FC / DS	64/60/8/14	64/60/8/14	64/60/4/10	64/60/4/6	32/60/4/6	32/60/4/6	32/32/2/4	16/0/0/0	40/0/0/0	16/28/0/0	16/28/0/0
<b>Timer</b>	GTM TIM / (A)TOM / MCS	64/192/10	64/192/10	56/152/7	56/152/7	40/96/5	40/96/5	24/64/3	-	-	16/40/0	16/40/0
	CCU / GPT modules / bit streaming	2/1/1	2/1/1	2/1/0	2/1/0	2/1/0	2/1/-	2/1/0	2/1/1	2/1/1	2/1/0	2/1/0
<b>Interfaces</b>	FlexRay (mod / channels)	2/4	2/4	2/4	2/4	1/2	1/2	1/2	1/2	0/0	1/2	0/0
	CAN-FD / TT	12/1	12/1	20/1	12/1	12/1	8/1	8/1	8/0	4/0	8/0	6/0
	QSPI / ASCLIN / I2C / I2S(emulation)	6/12/2/1	6/12/2/1	5/24/2/1	5/24/2/1	5/12/1/1	5/12/1/1	4/12/1/1	4/4/1/1	4/6/0/1	4/12/0/1	4/6/0/1
	SENT / PSI5 / PSI5S	25/4/1	25/4/1	25/4/1	25/4/1	15/2/1	15/2/1	10/2/1	0/0/0	6/0/0	6/0/0	6/0/0
	HSSSL / MSC / EBU	2/4/1	2/4/1	1/3/0	1/3/0	1/2/0	1/2/0	1/1/0	0/0/0	0/0/0	0/0/0	0/0/0
	Ethernet (100Mbps/1Gbps)	1	1	1	1	2	1	1	1	1	-	-
	SDMMC (eMMC / SDIO)	1	1	1		1				1		
	Radar / ext. ADC IF (RIF)	8x400Mbps LVDS	-	-	-	-	-	-	8x400Mbps LVDS	4x400Mbps LVDS	-	-
	Camera IF (CIF)	-	-	-	-	1	-	-	-	-	-	-
<b>Security</b>	HSM (AES128, ECC256, and SHA2)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
<b>Safety</b>	SIL Level	ASIL D	ASIL D	ASIL D	ASIL D	ASIL D	ASIL D	ASIL D	ASIL D	ASIL D	ASIL D	ASIL D
<b>Power</b>	EVR (3.3V / 5V)	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
	Standby Control Unit	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes

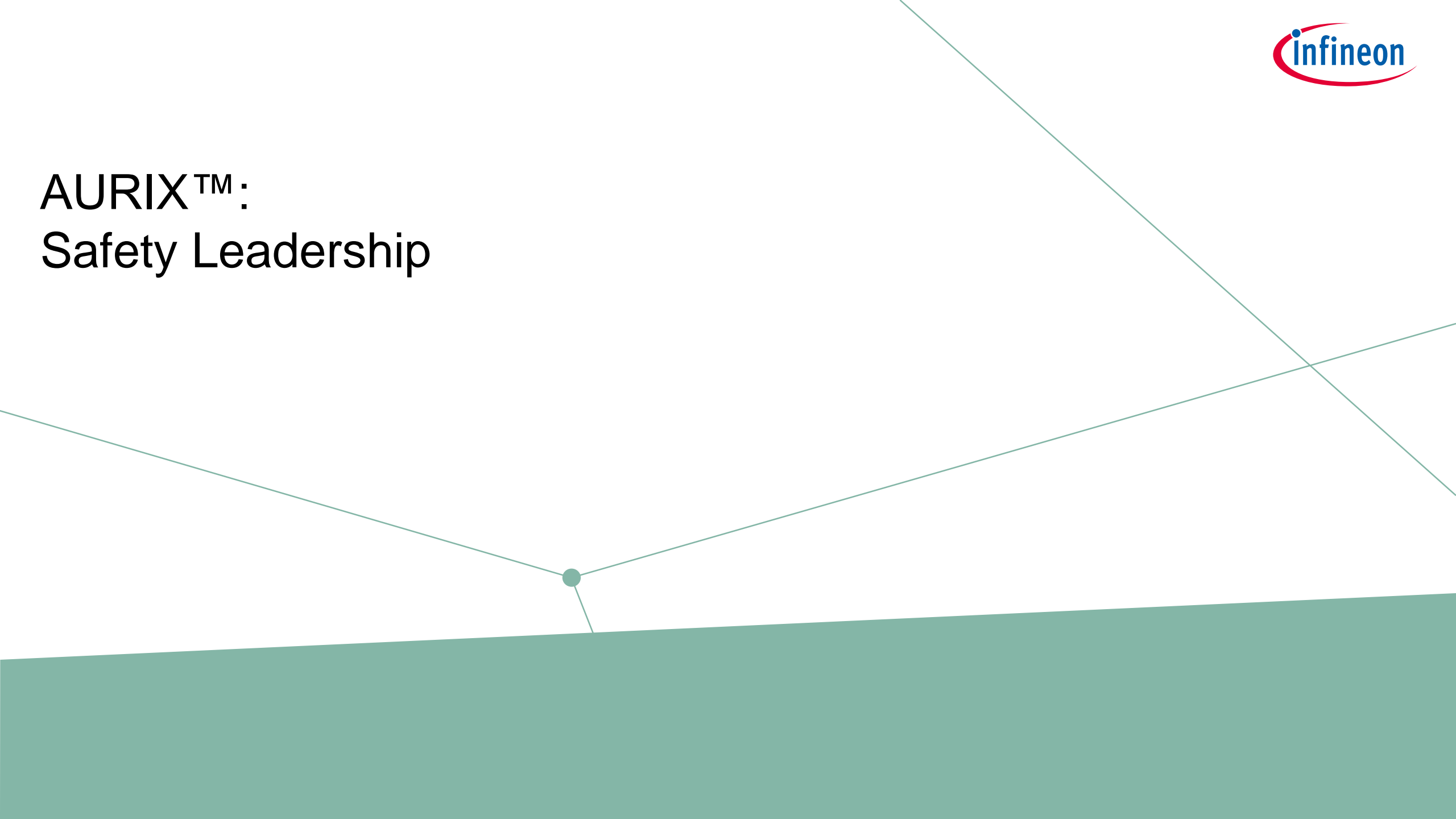
# AURIX™ TC3xx to AURIX™ TC2xx

## SRAM Overview



	16MB	12MB	10MB	8MB	6MB		4MB			2.5MB	2MB			1MB	
	39xXX	3E7Qx	38xQ	29xT	37xTX	37xT	27xT	36xD	35xTA	26xD	33xDA	33xL	23xL	32xL	22xL
<b>PSPR</b>	6x64	4x64	4x64	32+32+32	3x64	3x64	24+32+32	2x32	3x64	16+32	32+64	8	8	8	8
<b>P-Cache</b>	6x32	4x32	4x32	16+32+32	3x32	3x32	8+16+16	2x32	3x32	8+16	2x32	32	8	32	8
<b>dLMU</b>	6x64	4x64	4x64	-	3x64	3x64	-	2x64	3x64	-	8+64	8	-	-	-
<b>DSPR CPU 0/1</b>	2x240	2x240	2x240	120+240	2x240	2x240	112+120	2x192	2x240	72+120	192+96	192	184	96	88
<b>DSPR CPU 2-5</b>	4x96	2x96	2x96	240	1x96	1x96	120	-	1x96		-	-		-	
<b>D-Cache</b>	6x16	4x16	4x16	3x8	3x16	3x16	0+8+8	2x16	3x16	0+8	2x16	16	-	16	-
<b>Global LMU</b>	768	256	128	32	-	-	32	-	512	-	-	-	-	-	-
<b>DAM</b>	128	64	64		32	32	-	-	-	-	-	-	-	-	-
<b>EMEM</b>	4096	-	-		3072	-		-	2048		1024	-	-	-	-
<b>All SRAM w/cache</b>	6912	1696	1568	832	4208	1136	728	672	3664	296	1576	252	200	152	104
<b>All SRAM w/o cache</b>	6624	1504	1504	712	4064	992	576	576	3520	240	1480	208	192	104	96

# AURIX™: Safety Leadership



# AURIX™ TC3xx Leading the way

**1<sup>st</sup>  
Microcontroller  
to receive  
TÜV ISO  
26262:2018  
certification!**



# NEW!!! AURIX™ gets IEC61508 Certified



**1<sup>st</sup>**  
**Microcontroller**  
**to receive**  
**TÜV ISO**  
**26262:2018**  
**certification!**

IEC 61508 compliance  
 certified by TÜV SAAR for  
**TC39xBC** – baseline for  
 the certificate

Certificate  
 available since  
 30.06.2021

All documents  
 released on MyICP

More on the topic  
 could be found in



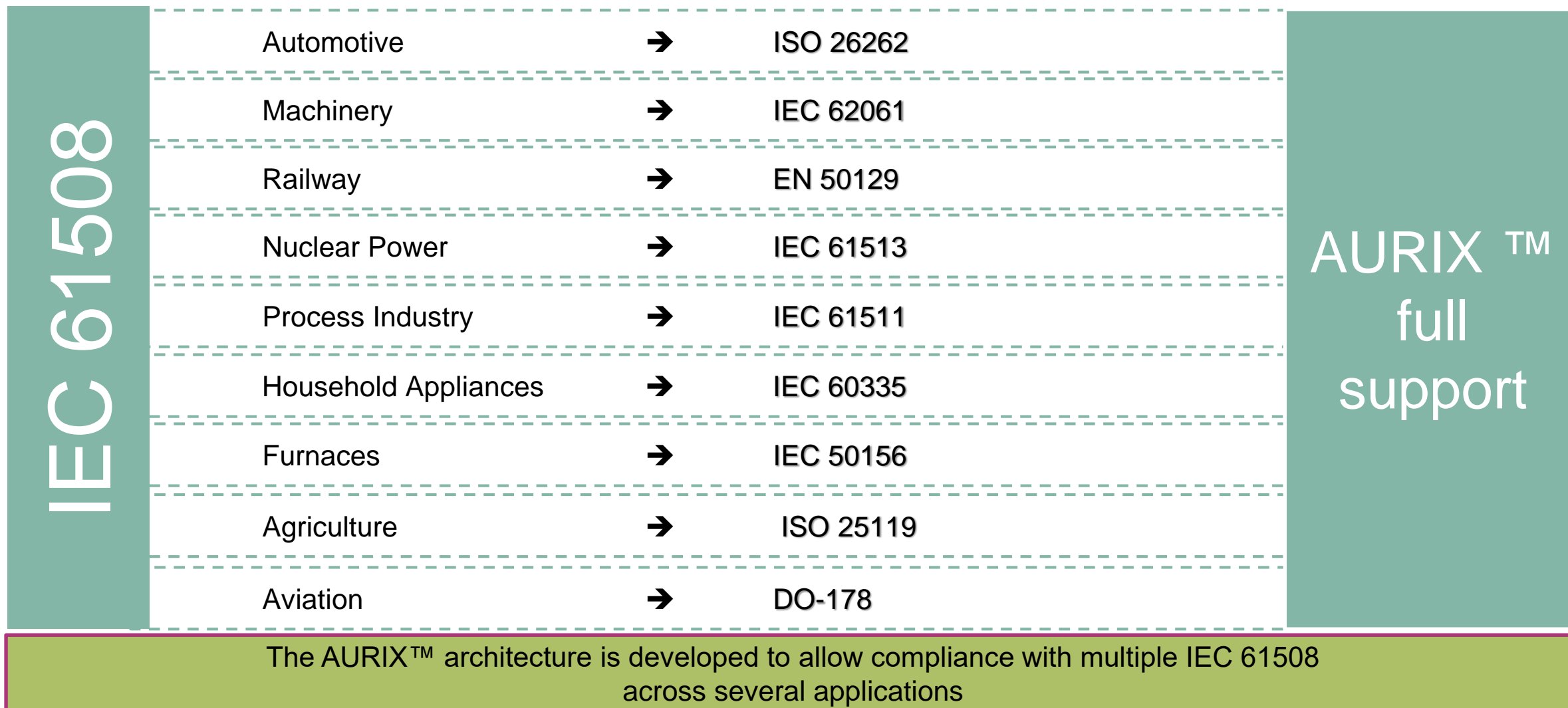
## Where AURIX™ stands for Safety?

	Probability of Dangerous Failure per Hour (PFHd)	SIL	SIL	PL	AgPL	ASIL
	10e-9	IEC 61508	EN 62061	EN ISO 13849	ISO 25119	ISO 26262
	10e-8	4	-	-	-	-
	10e-7	3	3	e	e	D
	10e-6	2	2	d	d	C
	3x10e-6	1	1	c	c	A
	10e-5			b	b	
	1,00E-03	-	-	a	a	QM
		-	-	-	QM	

Risk of Failure

Equivalency within multiple IEC 61508 standards  
 across several applications

# AURIX™: Hardware Functional Safety Leadership

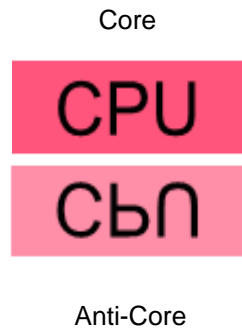


# AURIX™ Functional Safety concept

## Holistic approach with a multitude of hardware measures

### HW designed for functional safety

Superior Lockstep CPU with  
Anti-core in inverse logic



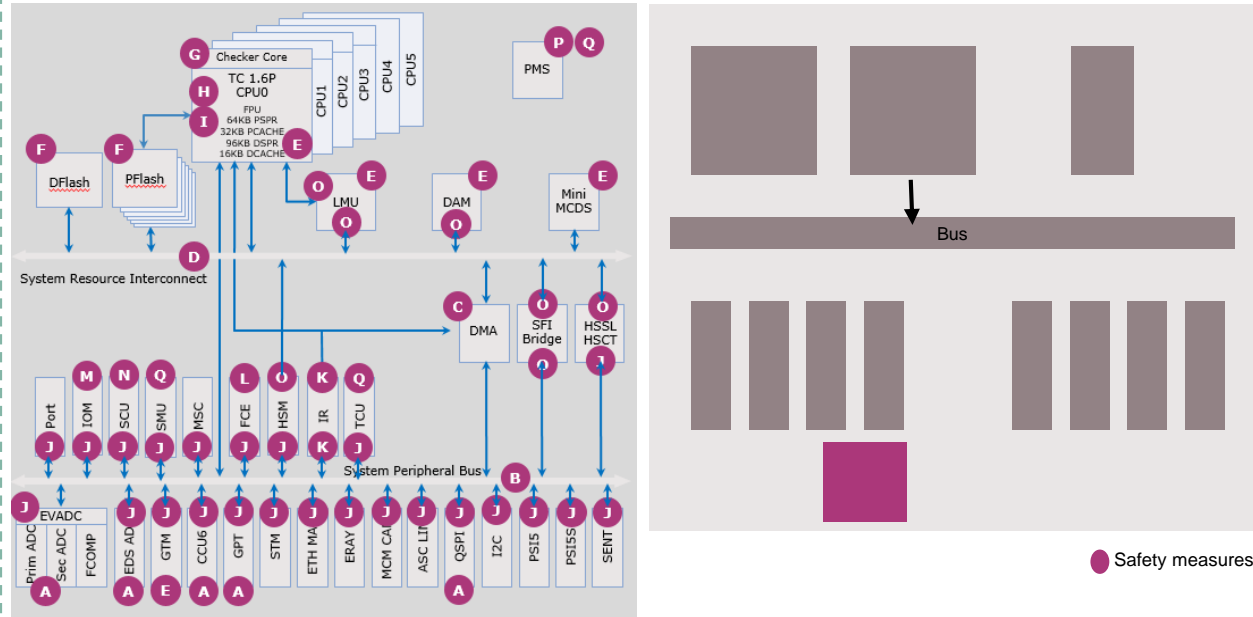
Holistic safety concept in core, memories, peripherals, buses

SMU for alarm and fault management in one control point

3-layer access protection:

- Memories
- Peripherals
- Global registers

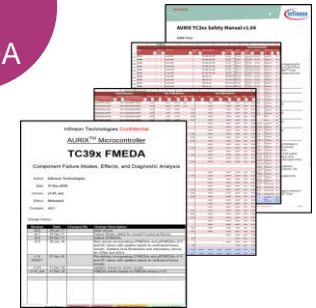
### Much more than just a safety island!!



- |   |   |                                    |
|---|---|------------------------------------|
| <b>A</b> Redundant, spatial separated peripherals | <b>F</b> Flash ECC                                | <b>L</b> Flexible CRC Engine (FCE) |
| <b>B</b> Safe SPB                                 | <b>G</b> Lockstep core                            | <b>M</b> IO Monitor                |
| <b>C</b> Safe DMA                                 | <b>H</b> CPU self tests (90% Latent Fault Metric) | <b>N</b> Clock Monitoring          |
| <b>D</b> Safe SRI                                 | <b>I</b> Memory protection core                   | <b>O</b> E2E protection            |
| <b>E</b> SRAM ECC                                 | <b>J</b> Register access protection               | <b>P</b> Power Supply Monitoring   |
|   | <b>K</b> Safe Interrupt Processing                | <b>Q</b> Self Test                 |

### Everything documented

50k  
lines  
FMEDA



**Comprehensive safety manual & Fully Configurable FMEDA**

- › Provides all relevant information necessary for safety analysis
- › Can be tailored to match the user configurations

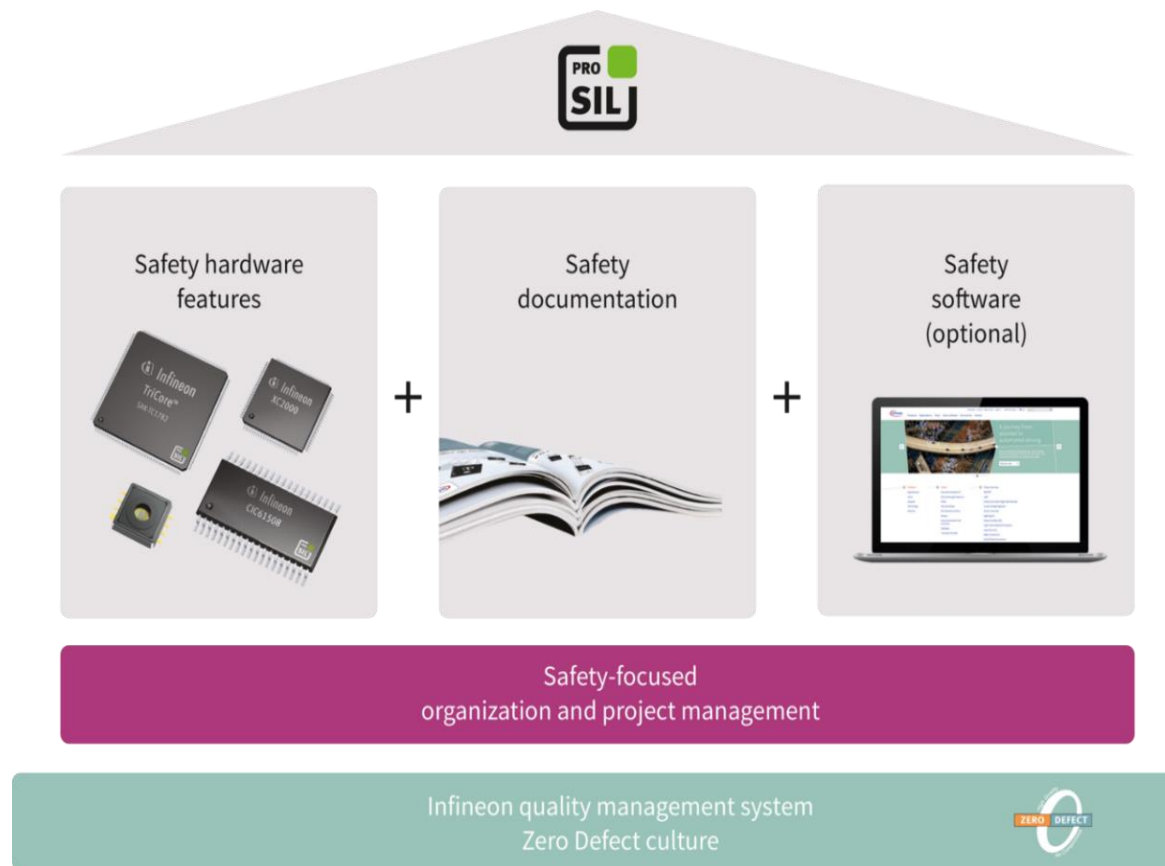


# AURIX™: Hardware Functional Safety Leadership

## What is PRO-SIL™?



- PRO-SIL™ shows where an Infineon product has SIL (Safety Integrity Level) features
- Allows Infineon products to attain SIL (IEC 61508) and ASIL ISO 26262) level for safety systems



Safety concept training can be found [here](#)

More about PRO-SIL™ can be found [here](#)

The AURIX™ is PRO-SIL™ compliant with safety hardware features throughout. Documentation may require an NDA. PRO-SIL™ SafeTlib Safety Software is available.

# AURIX™ TC2xx / TC3xx Infineon embedded software offer

AUTOSAR MCAL	<p>MC ISAR AUTOSAR-compliant MCAL including:</p> <ul style="list-style-type: none"> <li>Standard AUTOSAR drivers for initialization, input/output (e.g. DIO, PWM, ADC...), communication (CAN, LIN, FlexRay, Ethernet), memory abstraction (FEE FLASH EEPROM Emulation), libraries (e.g. CRC...)</li> <li>Additional complex drivers (e.g. DMA, UART...)</li> </ul>
SAFETY SW	<p>AURIX™ TC2xx "SafeTlib":</p> <ul style="list-style-type: none"> <li>Set of SW tests to support applications with functional safety requirements including "Software Based Self Test" (SBST) for the CPU core</li> <li>Support of system integration with application-dependent tests</li> <li>Handling of internal and external watchdogs (SafeWDG)</li> </ul> <p>AURIX™ TC3xx:</p> <ul style="list-style-type: none"> <li>Most SafeTlib test merged into the Hardware</li> <li>SBST for the CPU core and SPU</li> </ul>
Security SW	<ul style="list-style-type: none"> <li>The crypto libraries and software stack is provided via 3<sup>rd</sup> party partners (Elektrobit, ETAS/Esccrypt, Vector, Integrity Security Services ISS) including <ul style="list-style-type: none"> <li>SHE+, key management/storage, secure boot, secure SW update (incl. SOTA), secure onboard communication, etc.</li> </ul> </li> </ul>
Infineon Low Level Drivers (ILLD)	<ul style="list-style-type: none"> <li>Free of charge Drivers to abstract the basic functionality of the peripherals</li> </ul>
Virtual prototype	<ul style="list-style-type: none"> <li>Virtual representation (model) of the Silicon</li> </ul>
Customization	<ul style="list-style-type: none"> <li>Optimization of available MCAL and SafeTlib for e.g. different compiler versions or customer specific requirements</li> </ul>

# AURIX™ TC2xx / TC3xx tool, software, service partner

## Embedded Software Solutions

- › AUTOSAR suites
- › Operating systems
- › Hypervisor
- › Middleware and stacks
- › Libraries and driver
- › Security and safety



## Hardware and Software Development Tools

- › Compiler toolchains
- › Debugger and test tools
- › Software automation
- › Timing and program analysis
- › Simulation and modelling
- › Virtual prototyping
- › Calibration and data measurement
- › Rapid prototyping
- › Verification and rule checker
- › Flash programmer



## Training and Services

- › Soft. and hardware coaching
- › Flash programming services
- › Engineering services and training

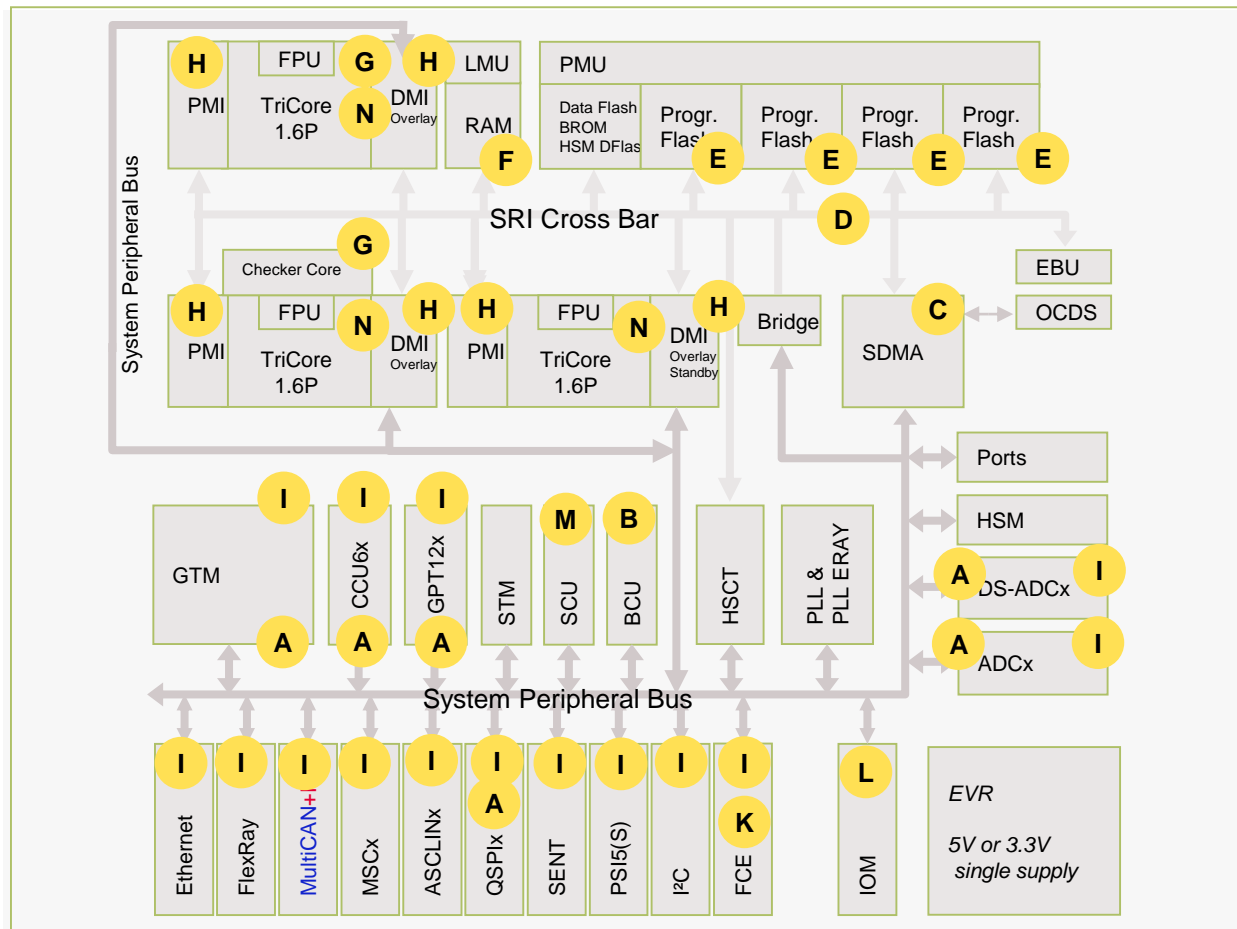


## Free Tools

- › Compiler and debugger toolchains
- › Configuration and pin mapper
- › Flash programmer



# AURIX™: Hardware Functional Safety Leadership



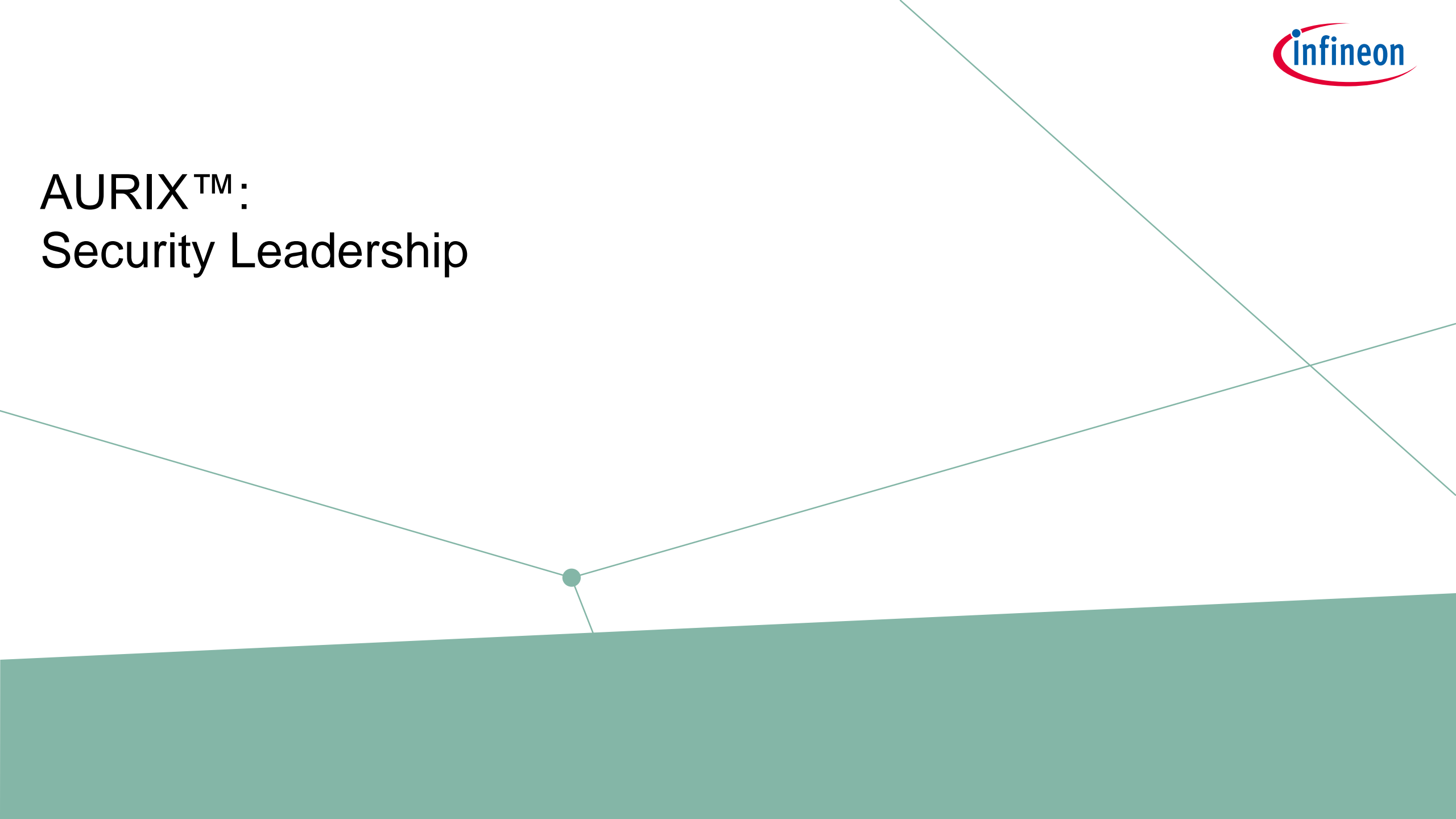
- A** Redundant, spatially separated peripherals
- B** Bus Monitoring Unit
- C** Safe DMA
- D** Safe SRI
- E** FLASH ECC (detects multi bit failures)
- F** SRAM ECC (detects multi bit failures)
- G** Lockstep core
- H** Memory protection core
- I** Memory protection peripherals
- J** Safe Interrupt Processing
- K** Flexible CRC Engine (FCE)
- L** IO Monitor
- M** Clock Monitoring
- N** CPU self tests (90% Latent Fault Metric)

SAFETY is more than just a lockstep core.

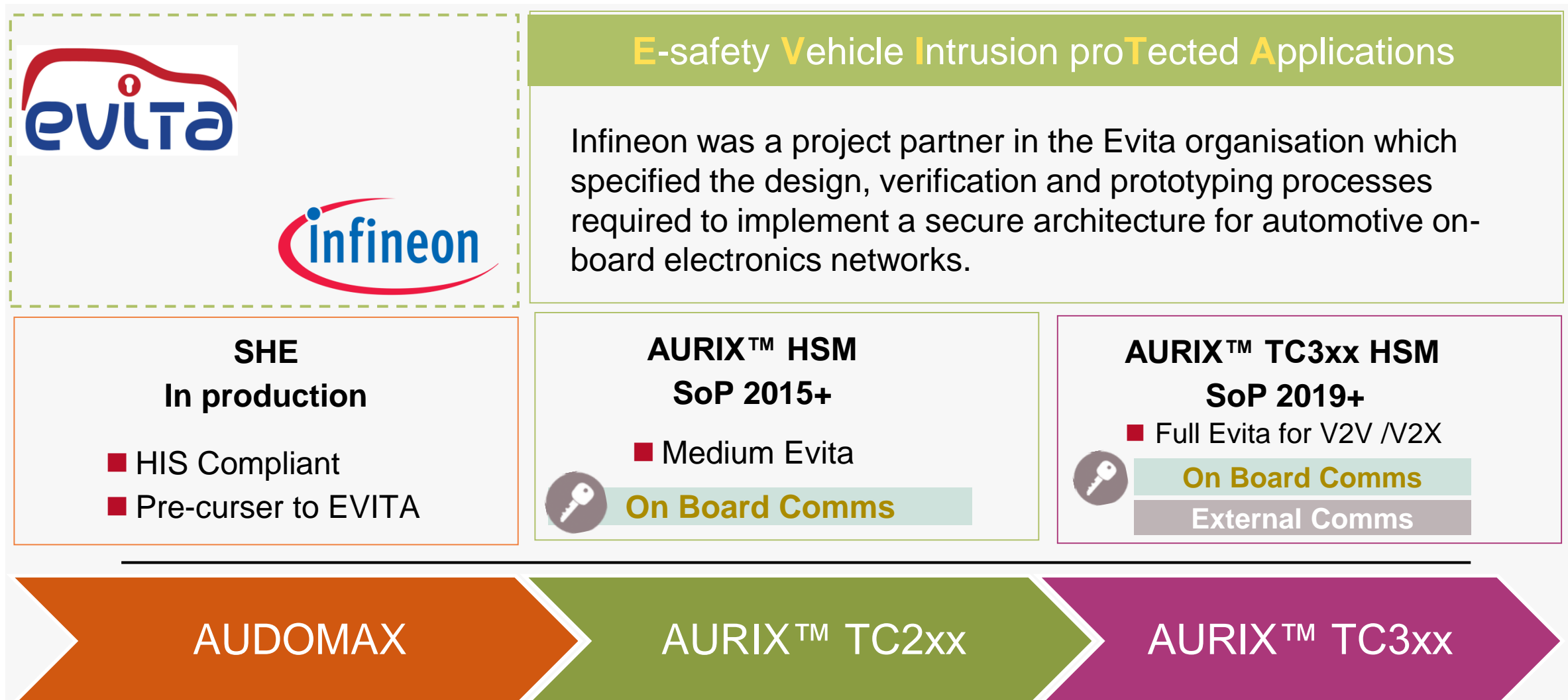
AURIX™ is designed with Pro-SIL™ (Safety Integrity Level) features throughout



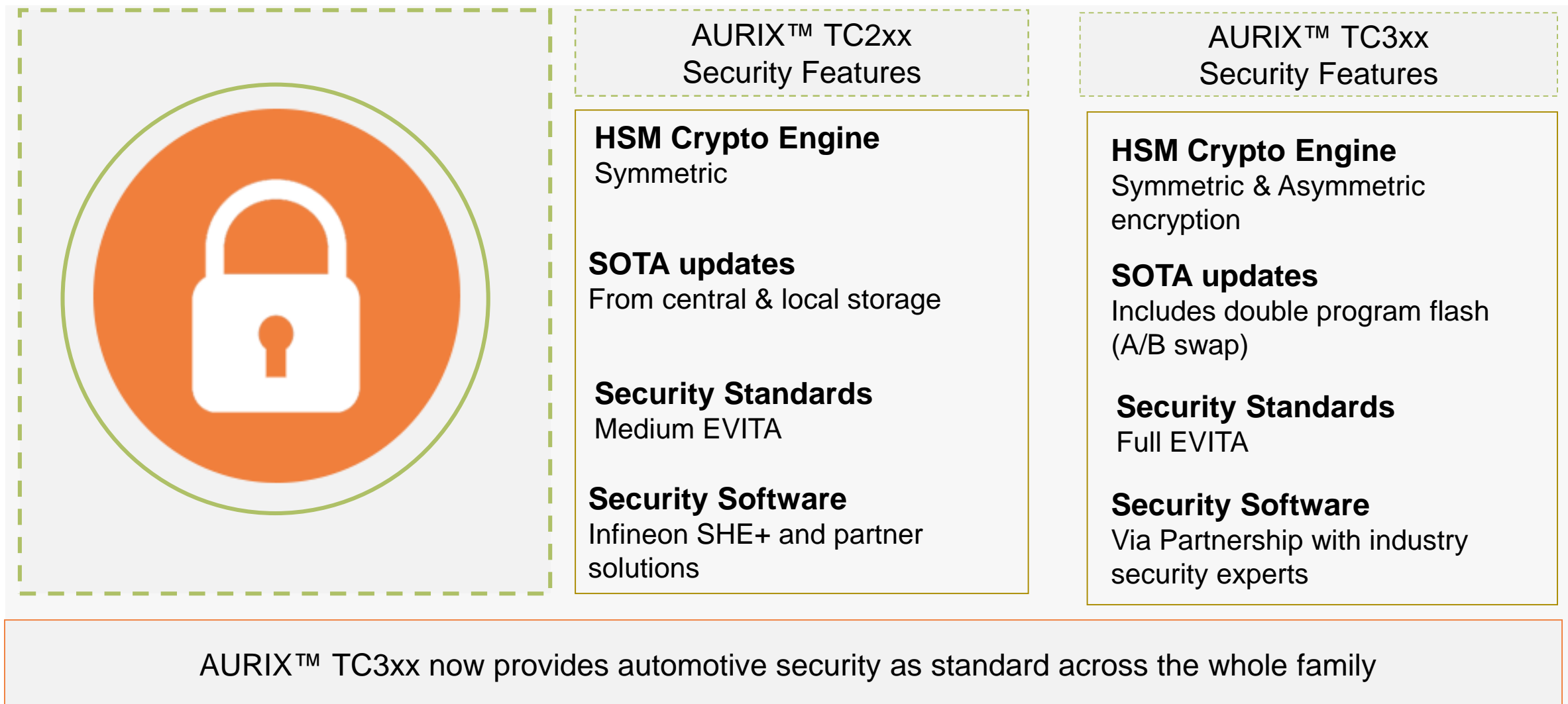
# AURIX™: Security Leadership



# Infineon is a key player in security standardisation

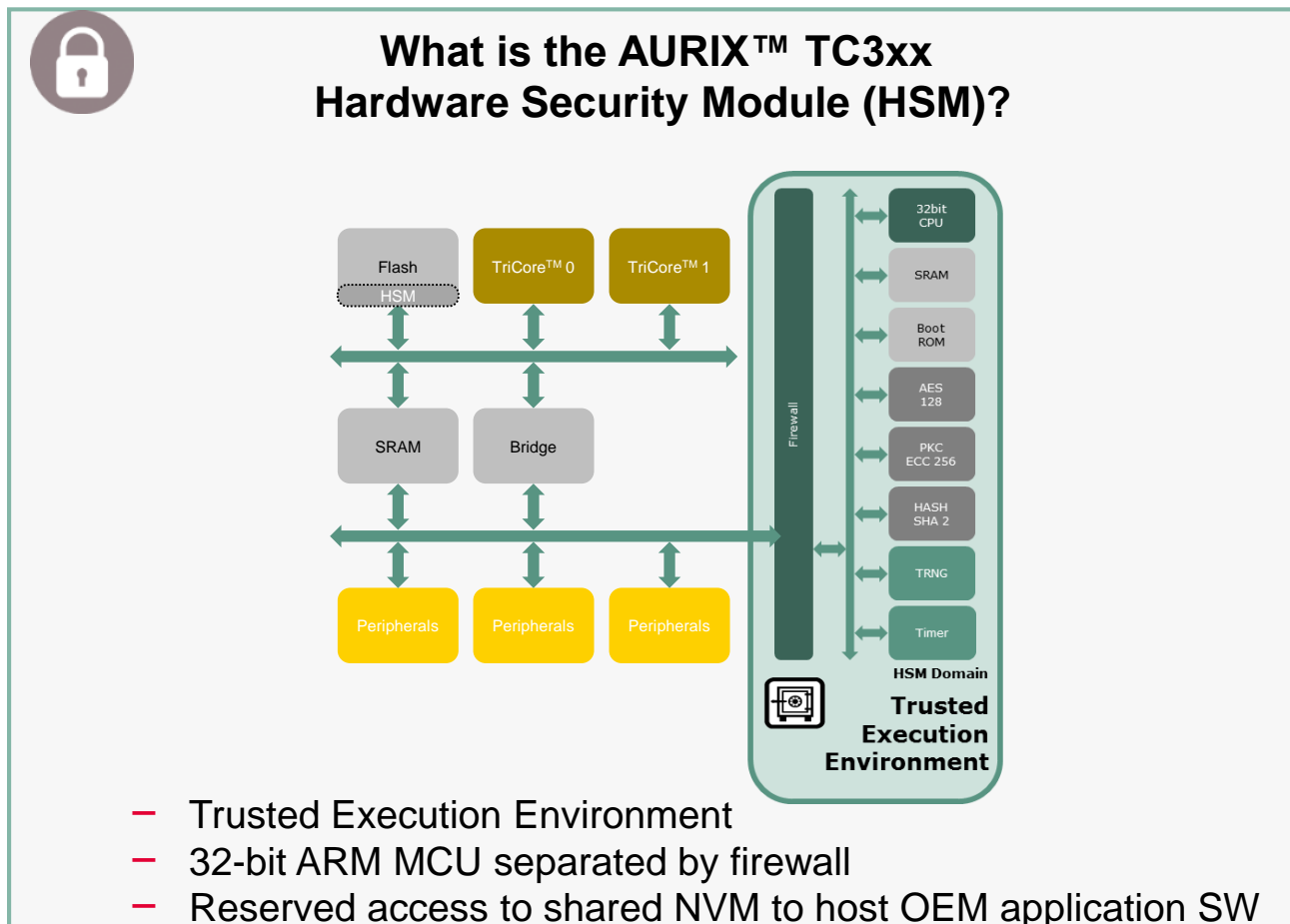


# AURIX™ TC2xx to AURIX™ TC3xx: Security Concept Evolution





# AURIX™ TC3xx HSM: Automotive Security Leadership



## AURIX™ TC3xx HSM Use Cases

- On Board and external Communications

## AURIX™ HSM Crypto Accelerators

- On-chip Symmetric: HW AES-128
- Asymmetric: HW ECC 256, SHA2

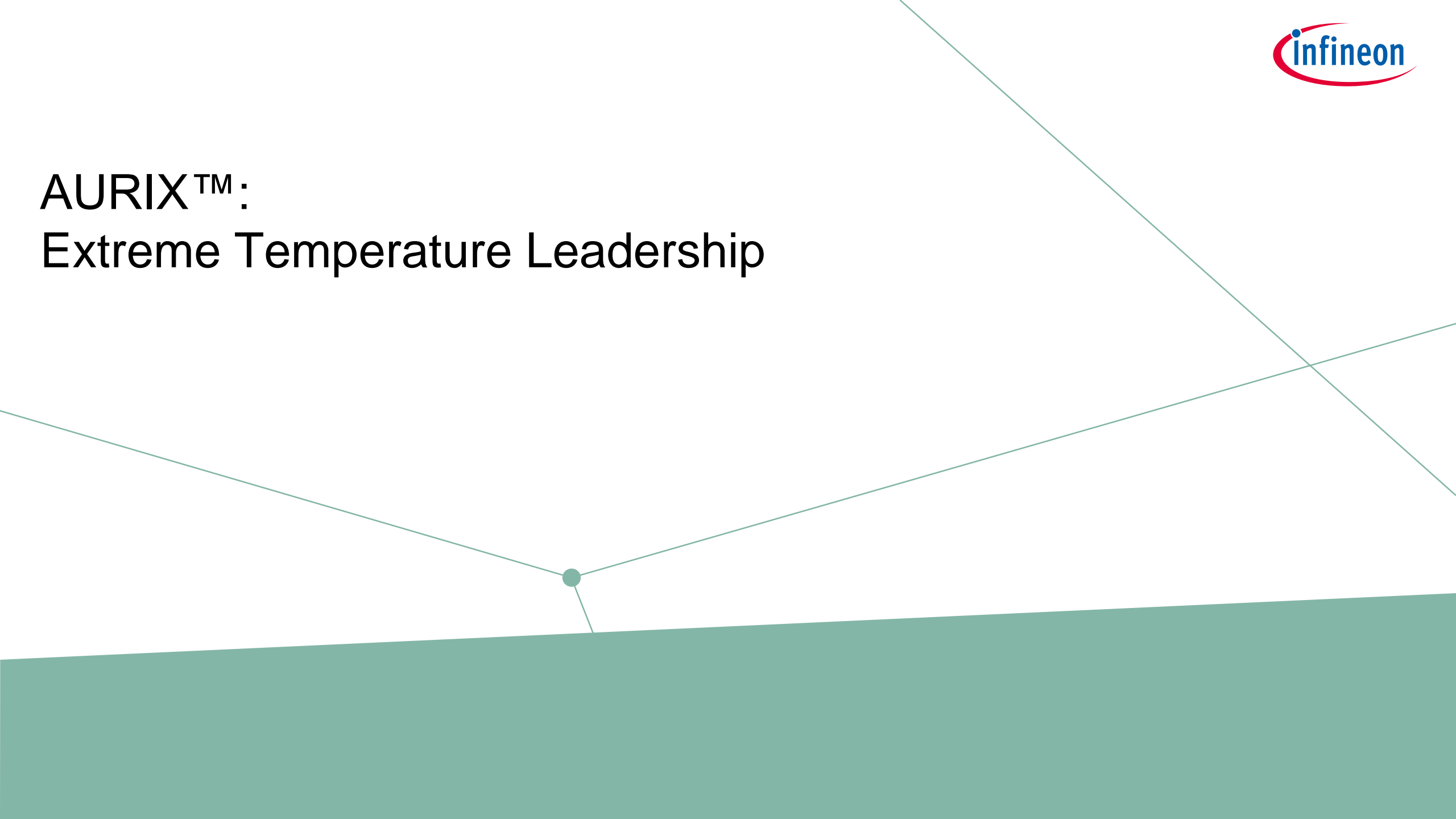
## AURIX™ HSM Security Level

- EVITA Full



AURIX™ TC3xx provides security leadership by enabling secure on-board communications. HSM is available as standard on all AURIX™ TC3xx devices.

# AURIX™: Extreme Temperature Leadership



# AURIX™: Extreme Temperature Leadership



## Standard Automotive Temp (SAK)

- Standard Auto Temp range
  - -40 to + 125°C

## Infineon HOT Package (SAL)

- Upgraded to
  - -40 to + 150°C

## Potential Application

- Anywhere where extreme temperatures are required
- Examples include, transmissions, All wheel drive, starter generator....

No other scalable Automotive MCU family can offer HOT package, SAFETY and SECURITY across the entire product range

# AURIX™: tools and software ecosystem

# AURIX™ Getting Started: Free Tools

## AURIX™ Free Tool Chain

- › **Provider:** HighTec
- › Eclipse based IDE
- › GNU C compiler
- › On-chip flash programming

## AURIX™ Free Flash Loader

- › **Provider:** Infineon Mem Tool
- › Flash Programmer
- › Data Communication

Free Entry  
Toolchain

Config  
Tool

Flash  
Loader

Software

## AURIX™ Configuration

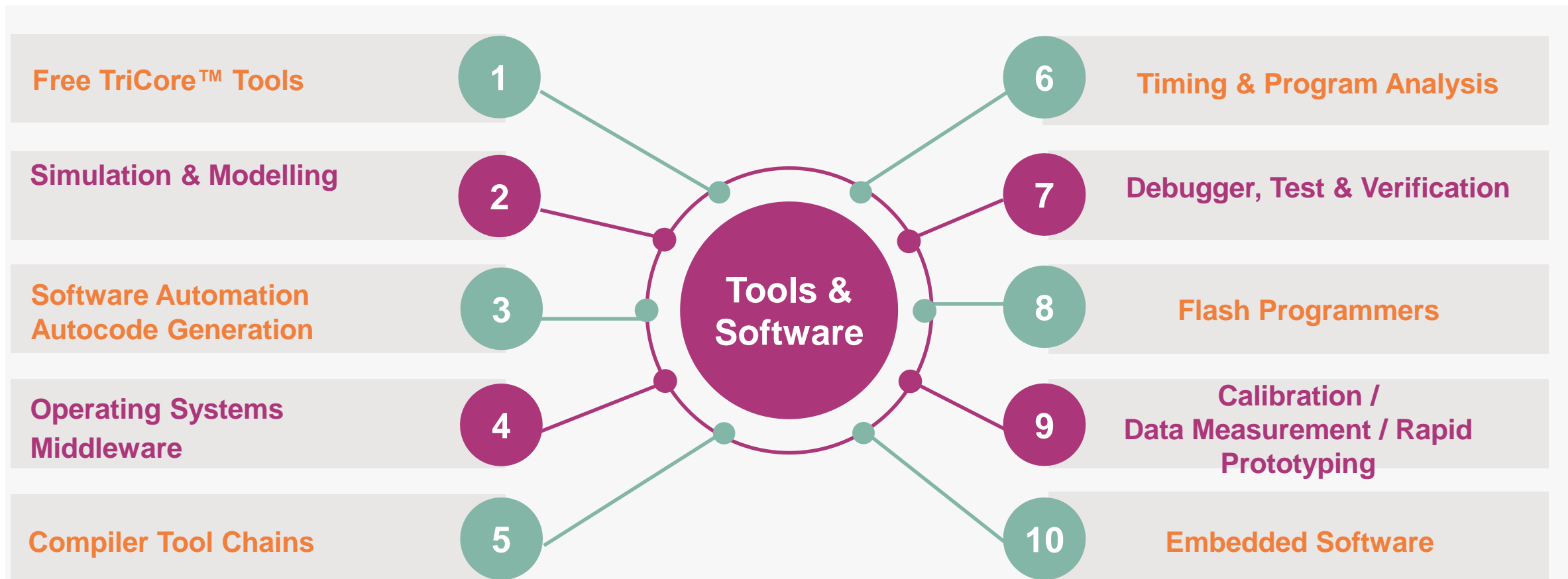
- › **Provider:** Altium Tasking
- › AURIX™ TC3xx™ ACT pin mapping
- › Drivers files + OS
- › Compiler and debugger

## AURIX™ Software

- › **Provider:** Infineon
- › Mem Tool – on chip flash programming
- › DAS (Device Access Server) tool interface

It's easier than ever to [get started with AURIX™ free Tools](#)

# AURIX™ Tools & Software Ecosystem



Infineon, together with our partners, has created an extensive AURIX™ Tools and Software Ecosystem.

[Find the solution that works for you!](#)

# AURIX™ TC3xx: Embedded Software Solution MC-ISAR



## Why Infineon MC-ISAR Software?

1. MC-ISAR low-level drivers based are on the AUTOSAR MCAL layer, the standard in automotive
2. Customer gets optimized software based on IFX hardware expertise.
3. Infineon saves the opportunity cost of SW developers
4. Leaves more time to differentiate with systems level software



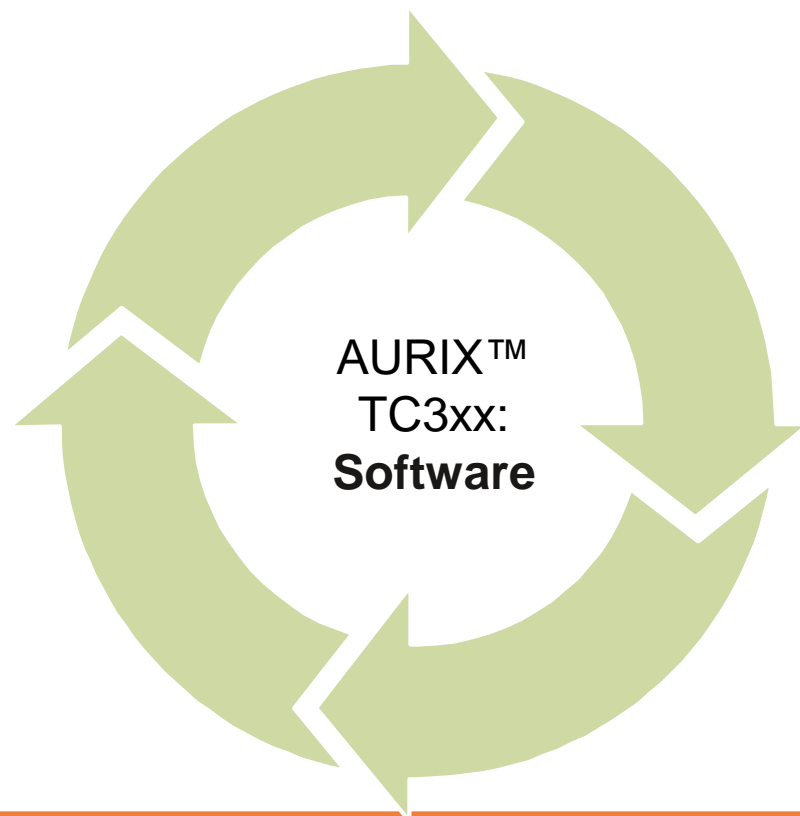
## A solution you can trust

Infineon has offered AUTOSAR in production since 2009!

To find out how to license MC-ISAR software, please contact [tac@infineon.com](mailto:tac@infineon.com)



# Infineon AURIX™ TC3xx: Software portfolio



**Infineon and partners deliver high quality,  
hardware optimized, software**

## Basic AUTOSAR Package

- AUTOSAR MCAL: v4.2.2, TC4.3 x (on request)
  - MC-ISAR Basic (Base, MEM, COM Basic)
  - MC-ISAR COM Enhanced
  - MCAL Complex Driver MCD and Demo code

## Infineon Basic Safety Software

- SBST Software Based Self Test for ASIL-B non lockstep core
- SBST for Radar ASIL-C SPU
- External watchdog driver for external watchdog device (TLF 3x) in development with external partner (Hitex)
  - SafeTlib made obsolete by self-test functionality in HW

## Security Software via Partners

- SHE+ driver
- AUTOSAR v4.3 crypto driver
- Intrusion detection

## Software Libraries

- Infineon DSP Lib
- LAPACK via partner

## Getting Started Software

- iLLD Infineon low level driver

# AURIX™: Extensive Ecosystem



# AURIX™ : Ease-of-Use (EoU) - More than just one MCU

## Not Only:

- › Safe and secure companion chip (ISO functional safety standard and EVITA FULL security standards)
- › Highest scalability in performance, memory & peripherals across applications

## But also:

- › A solution with fully functioning supported ecosystem



# Infineon MCU Documentation: Multiple options of access

## Access to public documentation

Overview  
Products  
Highlights  
**Documents**  
Boards  
Tools & Software  
Videos  
Partners  
Training  
Support

**Documents**

> Login to myInfineon to see all documents available

+ Expand all

- + Product Brochure
- + Product Selection Guide
- + Product Brief
- + User Manual
- + Data Sheets
- + Application Brochure
- + Application Notes
- + Application Brief
- + Whitepaper
- + Additional Product Information
- + Additional Technical Information
- + Article
- + Errata Sheet
- + Presentations

## Access to additional confidential documentation

Collaboration Platform you can get access to additional add-on technical documentation, trainings, tools, and much more.

myInfineon

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Valuable Content

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Personalized Experience

First name

Please enter at least 1 character and do not use special characters except ". " or "' " or "- ". Please notice that the first character shouldn't be a number.

Last name

Company

Country/Territory

Germany

Company E-mail

- 1 Register for [MyInfineon](#)
- 2 Send an email to [AURIX@infineon.com](mailto:AURIX@infineon.com)
- 3 You will receive a confirmation which explains how to use your new access

For more guidance on available documentation and MyICP process  
Please visit our

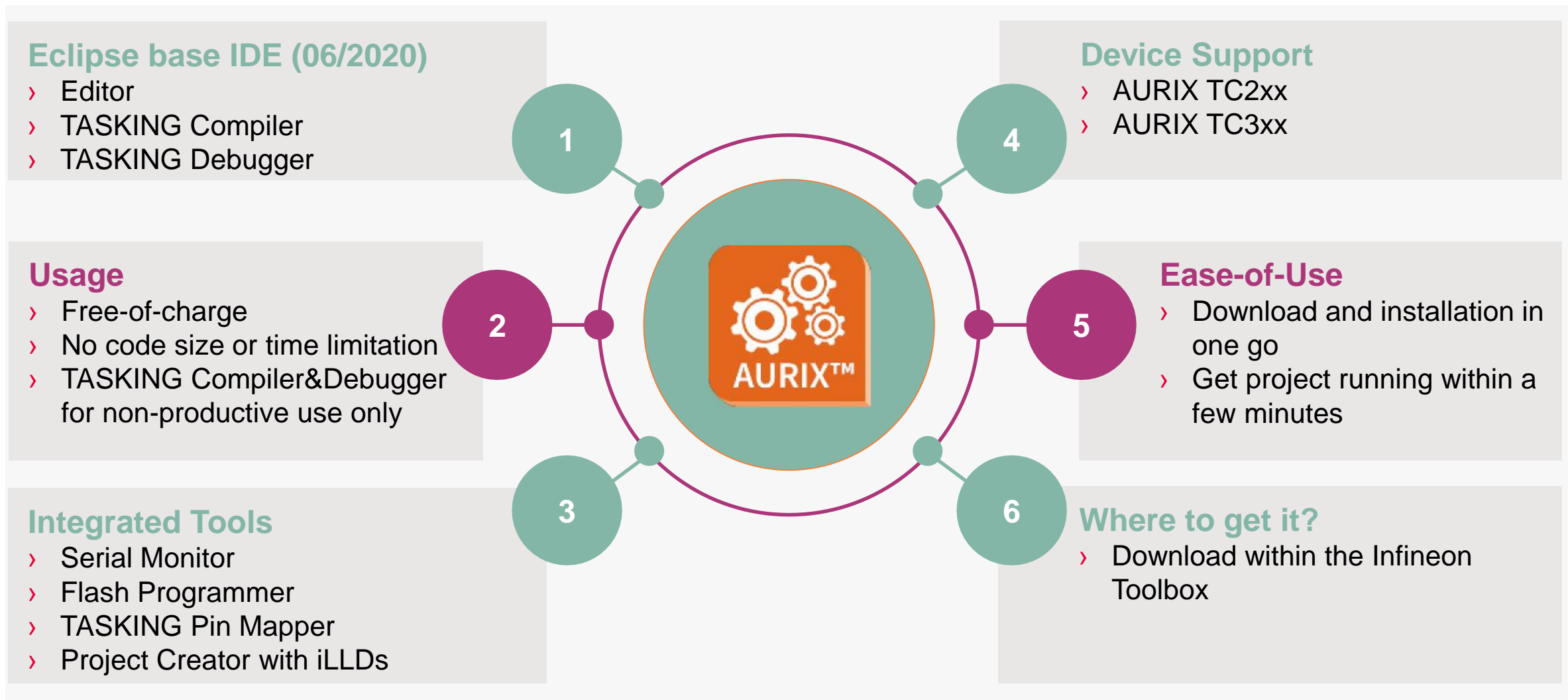
## [MCU documentation Platform](#)

[AURIX™ documentation](#)

[PSoC™ 4 documentation](#)

[TRAVEO™ II documentation](#)

# AURIX™ Development Studio (ADS) - Overview



# AURIX™ TC2xx kits – Evaluation and starter Kits

Lets get started!



Supported  
by ADS

## AURIX™ TC275 Lite Kit

- › AURIX™ TC275 Device in LQFP-176 package
- › FTDI based Debugger with micro USB
- › Use of Arduino Uno/compatible platform

[KIT\\_AURIX\\_TC275\\_LITE](#)  
[Infineon Technologies](#)



Supported  
by ADS

## Arduino Shield Buddy

- › The Hitex TC275 ShieldBuddy follows the Arduino standard
- › Compatible with 100's of Arduino application shields
- › Evaluation licenses available

[KIT\\_AURIX\\_TC275\\_ARD\\_SB](#)



Partially  
Supported  
by ADS

## AURIX™ TFT

- › Low cost board for early evaluation with limited access to signals
- › Additional touchscreen display for convenient handling
- › TFT board available for every silicon

[KIT\\_AURIX\\_TC2xx\\_TFT](#)



Partially  
Supported  
by ADS

## AURIX™ TriBoard

- › Full evaluation board for development to write and debug your 1<sup>st</sup> programs
- › Includes Getting Started advice, free TriCore™ Entry Tool Chain, technical documentation, compiler and debugger.
- › TriBoard available for every silicon

[KIT\\_AURIX\\_TC2xx\\_TRB](#)

# AURIX™ TC3xx kits – Evaluation and starter Kits

Lets get started!



## AURIX™ TC375 Lite Kit

- › AURIX™ TC375 Device
- › **Ethernet PHY**
- › FTDI based Debugger with micro USB
- › Use of Arduino Uno/ compatible platform
- › [KIT A2G TC375 LITE - Infineon Technologies](#)

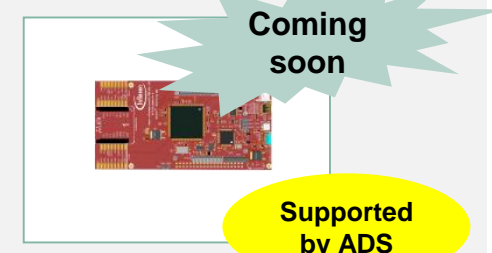


## Arduino Shield Buddy

- › The Hitex TC375
- › ShieldBuddy follows the Arduino standard
- › Compatible with 100's of Arduino application shields
- › Evaluation licenses available
- › [KIT A2G TC375 ARD SB - Infineon Technologies](#)



- › Low cost board for early Low cost board for early evaluation with limited access to signals
- › Additional touchscreen display for convenient handling
- › TFT board available for every silicon
- › [32-bit TriCore™ AURIX™ - TC3xx - Infineon Technologies](#)



## AURIX™ TriBoard

- › Full evaluation board for development to write and debug your 1<sup>st</sup> programs
- › Includes Getting Started advice, free TriCore™ Entry Tool Chain , technical documentation, compiler and debugger.
- › TriBoard available for every silicon

[KIT AURIX TC3xx TRB](#)



# Easy to reach Tools and Software ecosystem

## 1 Find what you need in a glance

Tools & Software

AURIX™ Embedded Software

- AURIX™ Applications software
- Autosar
- Non-Autosar OS/RTOS
- Middleware
- Communication and connectivity
- Bootloader/OTA
- Safety
- Security

AURIX™ Tool

- AURIX™ Free Tools
- Calibration/Measurement/Prototyping
- Compilers
- Debugger, Test Tools
- Flash Tools
- Simulation/Modelling
- SW Automation/Autocoding
- Timing & Program Analysis

## 2 Go directly to the category that interests you

> Home > Tools > AURIX™ Embedded Software > Autosar

Baselabs  
Elektrobit  
ETAS  
HighTec  
Hitex  
Infineon  
Vector Informatik  
Siemens

AUTOSAR

Full AUTOSAR framework to enable exchangeability and reuse of software components

> Baselabs  
> Elektrobit  
> ETAS  
> Hitex  
> Infineon  
> Vector Informatik  
> Siemens

## 3 Within a click, see all our partners offerings in the different sections

[www.infineon.com/aurix/embeddedsoftware](http://www.infineon.com/aurix/embeddedsoftware)

[www.infineon.com/aurix/tools](http://www.infineon.com/aurix/tools)

> Home > Tools > AURIX™ Embedded Software > Autosar > Baselabs

Baselabs  
Elektrobit  
ETAS  
HighTec  
Hitex  
Infineon  
Vector Informatik  
Siemens

BASELABS Create Embedded

BASELABS Create Embedded is a modular and safe data fusion library for the development of data fusion systems for automated driving functions on embedded platforms. The software significantly reduces the development costs of Level 2 ADAS and automated driving functions, shortens the time to market, and considers ISO 26262 efficiently.

It contains sensor fusion algorithms that combine data from radar, camera, and lidar sensors. The resulting object fusion provides a unified object list of the vehicle environment and serves as an input for path planning and decision algorithms.

The resulting sensor fusion library

> integrates for the Infineon's AURIX™ TC3xx microcontroller platforms and runs as an > SWC on AUTOSAR.

More information:

> Data Fusion Library for Infineon AURIX™

> Data Fusion Library for AUTOSAR

# Video and eLearning Platform for more support you

AURIX™ Video Hub Video

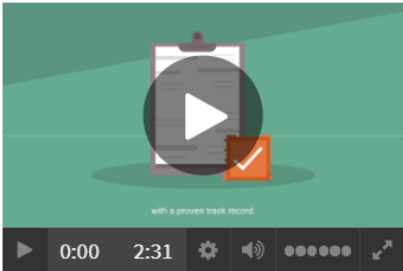
[Get Started with AURIX™](#)  
[AURIX™ Microcontroller and its applications](#)  
[AURIX™ Microcontrollers for makers](#)  
[Discover AURIX™ Starter Kits with our Engineers](#)  
[AURIX™ trainings and E-learnings](#)

## AURIX™ Video Hub

Welcome to Infineon AURIX™ Video Hub!

Want to learn how AURIX™ is the ideal platform for a wide range of automotive and industrial applications, as well as, how it can also be used for a diversified variety of projects and environments? Our Video Hub aims to assist you in getting all the fundamental knowledge about AURIX™ and its product families.

From an overview of the features and softwares of AURIX™ kits, to use cases of AURIX™ Microcontrollers for different applications - Find all AURIX™ related videos with just a click!




Introducing AURIX™, Infineon's MCU solution.

Take a look at AURIX™ microcontroller. The chip that fulfils all your needs, with a proven track record.

Special section to our E-Learning

[Get Started with AURIX™](#)  
[AURIX™ Microcontroller and its applications](#)  
[AURIX™ Microcontroller for makers](#)  
[Discover AURIX™ Starter Kits with our Engineers](#)  
[AURIX™ trainings and E-learnings](#)


## Our Trainings and E-Learnings



AURIX™ Ease of Use

- Easily navigate through our website infrastructure and indicate where to find AURIX™ easy-to-reach sources of information and documentation
- Easily identify our tools and software platform, our partner ecosystem as well as our kits platform and its support ecosystem

> Watch eLearning



Basics of software over-the-air concept using AURIX™

- Get to know why systems require frequent updates, how this is done and how automotive systems try to ensure their security when they are updated
- Learn how AURIX™ families of microcontrollers support over-the-air software updates

> Watch eLearning

<https://www.infineon.com/aurixvideohub>

2021-02-08 restricted

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