Infineon AURIX™ Microcontrollers
Intelligent solutions for Automotive & Off Highway Applications
AURIX™ TriCore unites the elements of a RISC processor core, a microcontroller and a DSP in one single MCU!

**Three in One**

**TriCore™ AURIX™ MCU**

**MICROCONTROLLER**
- Fast context switch & interrupt response
- Integrated Peripheral support
- Powerful bit manipulation unit & comparison Instructions

**RISC processor**
- 32-bit load/store Harvard architecture
- Super-scalar execution & uniform register set
- Memory Protection Unit (MPU) & C/C++ and RTOS support

**DSP**
- Sustainable single-cycle dual MAC
- DSP addressing modes & Zero overhead modes
- Saturation, Rounding & Q-Math (fraction format)
AURIX™ - One-stop-shop for Automotive

QUALITY & BUSINESS CONTINUITY

SCALEABLE FAMILY CONCEPT

FUNCTIONAL SAFETY

AUTOMOTIVE SECURITY

EXTREME TEMPERATURE

EXTENSIVE ECOSYSTEM

AURIX™ Leadership

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

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

Body/ advanced connectivity
- Advanced Body Control Module
- Connected Gateway
- Telematics
- Smart Cockpit
- Infrastructure Controller for IVI/V2V/V2X

New market trends set new MC requirements

**AURIX™ enables the latest market trends**

### Automotive Trends

#### 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

### Emission & CO2 regulations

- US 2016: 152
- US 2025: 107
- EU 2015: 140
- EU 2020: 95
- JP 2015: 132
- JP 2020: 95
- CN 2015: 159
- CN 2020: 117
- CN 2025: 95

### Autonomous driving

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

### Connected Car / Car2X

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

#### Infineon’s response

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

<table>
<thead>
<tr>
<th>Robustness</th>
<th>Customer value</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Functional Availability</td>
<td>High Quality</td>
</tr>
<tr>
<td>• Component Reliability</td>
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</table>

<table>
<thead>
<tr>
<th>Scalability</th>
<th>Customer value</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Design Flexibility</td>
<td>Cost optimized</td>
</tr>
<tr>
<td>• Hardware &amp; Software Reusability</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Safety and Security</th>
<th>Customer value</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Holistic Safety and Security Architecture</td>
<td>Risk control</td>
</tr>
<tr>
<td>• Application know-how</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trustworthy partnerships</th>
<th>Customer value</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Partner reliability</td>
<td>Continuous support</td>
</tr>
<tr>
<td>• Experience and know-how</td>
<td></td>
</tr>
<tr>
<td>• Trust and long-term commitment</td>
<td></td>
</tr>
</tbody>
</table>
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

## Development Process Flow
- **Quality gates**

## Product Design Measures
- **Design for Reliability**
- **Design for Manufacturability**
- **Design for test**

## Qualification Approach
- **AEC Q100**
- **Robustness:**
  - full temp profile
  - AEC Q006 for Cu Wire bond
  - Characterization of Functional Robustness

## Production measures
- **Tool & Process control**
- **Risk Management**
- **Monitoring**
- **Test / Burn In**
- **Quality screening PAT / Scrap limit**

---

The **Next Level of Zero Defect** program ensures **Quality** throughout the Product Life Cycle, with Infineon 32-bit MCUs already reaching < 1ppm.
Continuity of supply is critical for our customers. AURIX™ delivers.

THREATS

- FIRE
- ACCIDENT
- NATURAL DISASTERS
- OTHER PERILS

Infineon DELIVERS

- Dual Fab Concept
  - TSMC Hsinchu, Fab12
  - TSMC Tainan, Fab14
- 3 Month Supply Chain Buffer
  - ~3 months delivery possible from available WIP within supply chain
- Preparedness
  - EDDIE: Early Detection System of Natural Hazards & Critical Incidents
  - Business Continuity Plan - in Place
AURIX™:
Scalable Family Concept
# AURIX™: TC2xx Scalable Family

From low cost to high performance applications

## 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

<table>
<thead>
<tr>
<th>Devices with HSM</th>
<th>TC29x 8 MB</th>
<th>Upgrade/Downgrade path with pin compatible packages</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC27x 4 MB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC26x 2.5 MB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC23x 2 MB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC22x 1 MB</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TC21x 512 kB</td>
<td></td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Flash Package</th>
<th>TC222L/S 133 MHz</th>
<th>TC223L/S 133 MHz</th>
<th>TC224L/S 133 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC299</td>
<td>TC298</td>
<td>TC297</td>
<td></td>
</tr>
<tr>
<td>TC298</td>
<td>TC275</td>
<td>TC277</td>
<td></td>
</tr>
<tr>
<td>TC275</td>
<td>TC264D 200 MHz</td>
<td>TC265D 200 MHz</td>
<td></td>
</tr>
<tr>
<td>TC264D</td>
<td>TC267D 200 MHz</td>
<td>TC237L 200 MHz</td>
<td></td>
</tr>
<tr>
<td>TC267D</td>
<td>TC234L 200 MHz</td>
<td>TC233L 200 MHz</td>
<td></td>
</tr>
<tr>
<td>TC234L</td>
<td>TC233L 200 MHz</td>
<td>TC232L/S 133 MHz</td>
<td></td>
</tr>
<tr>
<td>TC232L/S</td>
<td>TC223L/S 133 MHz</td>
<td>TC222L/S 133 MHz</td>
<td></td>
</tr>
<tr>
<td>TC222L/S</td>
<td>TC212L/S 133 MHz</td>
<td>TC213L 133 MHz</td>
<td></td>
</tr>
<tr>
<td>TC212L/S</td>
<td>TC213L 133 MHz</td>
<td>TC214L/S 133 MHz</td>
<td></td>
</tr>
</tbody>
</table>

## Package Options
- TQFP 80
- TQFP 100
- T/LQFP 144
- LQFP 176
- LFBGA 292
- BGA 416
- LFBGA 516

### Single Core (S)
- Single Lockstep Core (L)
- Dual Core (D)
- Triple Core (T)
### 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.

### System specifications:

- **TriCore™ 300 MHz DSP functionality**
- **Single voltage supply 5 V or 3.3**
- **EVR, HSM, SRAM**
- **Ambient temperature range -40°C...+150°C**
- **Safe DMA channels 128**
- **AUTOSAR V3.2 and V4.x**
- **ISO26262 – ASIL-D IEC61508 – SIL3**
- **co-processor FPU (Floating Point Unit)**
- **External bus interface**
- **Packages LFBGA-292 LFBGA-516**

### Connectivty:

- **TIMER/PWM**
  - Wake-up timer
  - GTM
  - GPT12
  - CCU6

- **Communication**
  - 6x CAN FD nodes
  - 15x SENT
  - 5x PSiS
  - 5x PSiSS
  - 2x FlexRay
  - Ethernet

- **5x GSPi/PS Emulation**
  - HSCT
  - HSSL
  - 3x MSC
  - 2x PC
  - 4x ASCLIN

### Memory:

- **2776 KB RAM ECC protection**
- **8 MB flash ECC protection**
- **128 KB EEPROM at 500 k cycles**

### Analog/ADC:

- **Analog/ADC**
  - Up to 8x ADC channels
AURIX™: TC21x Series – Low-end Device

AURIX™: TC22x Series

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**AURIX™ TC2xx: Standard devices in mass production**

<table>
<thead>
<tr>
<th>Feature Set</th>
<th>9x Series</th>
<th>7x Series</th>
<th>6x Series</th>
<th>3x Series</th>
<th>2x Series</th>
<th>1x Series</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TriCore 1.6P</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Cores / Checker</td>
<td>3 / 1</td>
<td>2 / 1</td>
<td>1 / 1</td>
<td>- / -</td>
<td>- / -</td>
<td>- / -</td>
</tr>
<tr>
<td>Frequency</td>
<td>2x300 / 1x200 MHz</td>
<td>200 MHz</td>
<td>200 MHz</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>TriCore 1.6E</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td># Cores / Checker</td>
<td>- / -</td>
<td>1 / 1</td>
<td>1 / -</td>
<td>1 / 1</td>
<td>1 / (1 / 0)</td>
<td>1 / (1 / 0)</td>
</tr>
<tr>
<td>Frequency</td>
<td>-</td>
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<td>200 MHz</td>
<td>200 MHz</td>
<td>133 MHz</td>
<td>133 MHz</td>
</tr>
<tr>
<td><strong>Flash</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Flash</td>
<td>8 MB</td>
<td>4 MB</td>
<td>2.5 MB</td>
<td>2 MB</td>
<td>1 MB</td>
<td>512 KB</td>
</tr>
<tr>
<td>EEPROM @ w/e cycles</td>
<td>128 KB @ 500k</td>
<td>64 KB @ 500k</td>
<td>16 KB @ 500k</td>
<td>128k @ 125 k cycles</td>
<td>96k @ 125k cycles</td>
<td>64k @ 125k cycles</td>
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<tr>
<td><strong>SRAM</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total (DMI , PMI, LMU)</td>
<td>728 KB</td>
<td>472 KB</td>
<td>240 KB</td>
<td>192 KB</td>
<td>96 KB</td>
<td>56 KB</td>
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<tr>
<td><strong>DMA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Channels</td>
<td>128</td>
<td>64</td>
<td>48</td>
<td>16</td>
<td>16</td>
<td>16</td>
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<tr>
<td><strong>ADC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modules 12bit / DS</td>
<td>11 / 10</td>
<td>8 / 6</td>
<td>4 / 3</td>
<td>2 / -</td>
<td>2 / -</td>
<td>2 / -</td>
</tr>
<tr>
<td>Channels 12bit / DS</td>
<td>84 / 10 diff</td>
<td>60 / 6 diff</td>
<td>50 / 3 diff</td>
<td>24 / -</td>
<td>/ -</td>
<td>24 / -</td>
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<tr>
<td><strong>Timer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>GTM Input / Output</td>
<td>48 / 152 channels</td>
<td>32 / 88 channels</td>
<td>24 / 64 channels</td>
<td>8 / 32</td>
<td>8 / 32</td>
<td>8 / 32</td>
</tr>
<tr>
<td>CCU / GPT modules</td>
<td>2 / 1</td>
<td>2 / 1</td>
<td>2 / 1</td>
<td>2 / 1</td>
<td>2 / 1</td>
<td>2 / 1</td>
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<tr>
<td><strong>Interfaces</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FlexRay (#/ch.)</td>
<td>2 / 4</td>
<td>1 / 2</td>
<td>1 / 2</td>
<td>1 / 2</td>
<td>-</td>
<td>-</td>
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<tr>
<td>SENT / PSIS / PSIS5</td>
<td>15 / 5 / 1</td>
<td>10 / 3 / 1</td>
<td>6 / 2 / 1</td>
<td>4 / -</td>
<td>4 / -</td>
<td>4 / -</td>
</tr>
<tr>
<td>HSCT / MSC / EBU</td>
<td>1 / 3 diff LVDS / 1</td>
<td>1 / 2 diff LVDS / -</td>
<td>1 / 2 diff LVDS / -</td>
<td>- / - / -</td>
<td>- / - / -</td>
<td>- / - / -</td>
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<tr>
<td>Other</td>
<td>Ethernet</td>
<td>Ethernet</td>
<td>Ethernet</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>SIL Level</td>
<td>ASIL-D</td>
<td>ASIL-D</td>
<td>ASIL-D</td>
<td>ASIL-D</td>
<td>ASIL-D</td>
<td>ASIL-D</td>
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<tr>
<td><strong>Security</strong></td>
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</tr>
<tr>
<td>HSM</td>
<td>Yes</td>
<td>Optional</td>
<td>No</td>
<td>Optional</td>
<td>No</td>
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<td><strong>Power</strong></td>
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<td></td>
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<tr>
<td>EVR</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

_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

**ADAS**
- New SPU concept

**Safety**
- LBIST
- MBIST upgrade

**Ethernet**
- 1GBit/s ETH
- QoS services

**IO Pads**
- all 5V/3.3V

**HSM: Full Evita compliance**
- New accelerators ECC256 / SHA256
- Available on all devices

**Standby Control Unit**
- Low power modes
AURIX™: TC3xx Scalable Family
From low cost to high performance applications

- Devices with HSM
- Upgrade/Downgrade path with pin compatible packages
- Single Core (S), Single Lockstep Core (L), Dual Core (D), Triple Core (T)
- PRO-SIL™: Safety supporting features
- 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

<table>
<thead>
<tr>
<th>Series</th>
<th>Package Class</th>
<th>Core Architecture</th>
<th>Feature Packages</th>
<th>Package Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>9 516 – PIN</td>
<td>X Hexa Core</td>
<td>A ADAS ext. Memory</td>
<td>W LOFP 0.5mm pitch</td>
</tr>
<tr>
<td>8</td>
<td>7 292 - PIN</td>
<td>Q Quad Core</td>
<td>E Emulation device</td>
<td>F QFP 0.4mm pitch</td>
</tr>
<tr>
<td>7</td>
<td>6 180 - PIN</td>
<td>T Triple Core</td>
<td>F Extended flash</td>
<td>S LF/BGA 0.8mm pitch</td>
</tr>
<tr>
<td>6</td>
<td>5 176 - PIN</td>
<td>D Dual Core</td>
<td>G Additional connectivity</td>
<td>No letter for bare die</td>
</tr>
<tr>
<td>3</td>
<td>4 144 - PIN</td>
<td>L Single Core</td>
<td>H ADAS standard feature</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3 100 - PIN</td>
<td></td>
<td>M MotionWise software</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>2 80 - PIN</td>
<td></td>
<td>P Standard feature</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 Bare Die</td>
<td></td>
<td>S Wireless in cabin charging</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T ADAS + emulation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>X Extended feature</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C, V, Z Customer specific</td>
<td></td>
</tr>
</tbody>
</table>

Temperature range:
- K: -40°C - 125°C
- L: -40°C - 150°C

Flash size code:
- 16: 1 MB
- 32: 2 MB
- 64: 4 MB
- 96: 6 MB
- 128: 8 MB
- 160: 10 MB
- 192: 12 MB
- 256: 16 MB

Package type code:
- W LOFP 0.5mm pitch
- F QFP 0.4mm pitch
- S LF/BGA 0.8mm pitch

<table>
<thead>
<tr>
<th>Brand</th>
<th>Device</th>
<th>Primary Option</th>
<th>Secondary Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA</td>
<td>K</td>
<td>TC</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>7</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>T</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P</td>
<td>W</td>
</tr>
</tbody>
</table>

Series:
- 9 series
- 8 series
- 7 series
- 6 series
- 3 series
- 2 series
- E series

Frequency:
- 160 MHz
- 200 MHz
- 300 MHz

Package Type:
- LQFP 0.5mm pitch
- TQFP 0.4mm pitch
- LF/BGA 0.8mm pitch
- No letter for bare die
### Terminology

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

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

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTM</td>
<td>Generic Timer Module, a powerful timing module for analyzing and generating PWM signals, and several other functions</td>
</tr>
<tr>
<td>CCU6</td>
<td>Capture Compare Unit 6, high-resolution 16-bit capture and compare unit with application-specific modes, mainly for AC drive control</td>
</tr>
<tr>
<td>GPT</td>
<td>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</td>
</tr>
<tr>
<td>STM</td>
<td>System Timer Module, provides free running high precision timers typically used for OS tick generation</td>
</tr>
<tr>
<td>ERAY</td>
<td>FlexRay controller</td>
</tr>
<tr>
<td>MCMCAN</td>
<td>CAN controller</td>
</tr>
<tr>
<td>ASC_LIN</td>
<td>Asynchronous/Synchronous Local Interconnect Network, a flexible communication controller that provides SPI, UART, and LIN interface</td>
</tr>
<tr>
<td>QSPI</td>
<td>Queued Synchronous Peripheral Interface, a powerful SPI serial communication controller</td>
</tr>
<tr>
<td>I2C</td>
<td>Inter-Integrated Circuit, an I2C serial communication controller</td>
</tr>
<tr>
<td>PSI5</td>
<td>Peripheral Sensor Interface, for communication with the external devices (typically sensors) via one I/O line for each channel using PSi5 communication protocol</td>
</tr>
<tr>
<td>SENT</td>
<td>Single Edge Nibble Transmission, for communication with the external devices (typically sensors) via one I/O line for each channel using SENT communication protocol</td>
</tr>
</tbody>
</table>
**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.

### 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 I²C, 25x SENT, 4x PSI5, 1x PSI5S, 2x HSSL, 4x MSC, 1x eMMC/SDIOT, 1x 1S 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

### 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
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, 2xFlexRay, 12xLINs, 4xOSP, 2xPCI, 25xSENT, 6xPSI, 2xHSSL, 4xMSC, 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 (EC256 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™ – TC39xXA (ADAS) Diagram](image-url)
AURIX™– TC35xTA (ADAS)
High performance radar and autonomous driving microcontroller

**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 1xI²C 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–ier. 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 1PC, 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)
- 1xFlexRay,
- 8x CANFD, 12x ASCLIN, 4x QSPI, 6x S ENT, 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

Image:

- Single voltage supply 5 V or 3.3 V
- 5V/3.3 V EVR, 8-bit SCR
- Ambient temperature range -40°C to 150°C
- Safe DMA channels 16
- AUTOSAR 4.2 support
- ISO 26262 safety up to ASIL-D
- eVITA Full HSM (ECC256 and SHA2)
- 1/0 3.3 V CMOS
- 5V input on ADC pins
- Packages: TQFP-144, TQFP-100, TQFP-80, LFBGA-292, BGA-180

Features:

- GTM
- 2x CCU6
- 1x GPT12

Communication:

- 8x CAN FD
- 6xSENT
- 12xASCLIN
- 4xQSPI
- 1xFlexRay

Memory:

- Up to 248 KB RAM ECC protection
- Up to 2 MB flash ECC protection

Analog:

- Up to 48x ADC channels
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

<table>
<thead>
<tr>
<th>Feature Set</th>
<th>9xA Series +eXtension (16MB)</th>
<th>9x Series (16MB)</th>
<th>Ex Series (12MB)</th>
<th>8x Series (10MB)</th>
<th>7x Series eXtended (6MB)</th>
<th>7x Series (6MB)</th>
<th>6x Series (4MB)</th>
<th>5xA Series (4MB)</th>
<th>3xA Series (2MB)</th>
<th>3x Series (2MB)</th>
<th>2x Series (1MB)</th>
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</thead>
<tbody>
<tr>
<td>TriCore</td>
<td># Cores / Checker</td>
<td>6/4</td>
<td>6/4</td>
<td>4/2</td>
<td>4/2</td>
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<td>3/2</td>
<td>2/2</td>
<td>3/2</td>
<td>2/1</td>
<td>1/1</td>
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<td>TriCore 1.6</td>
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<td>300MHz</td>
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<td>200MHz*</td>
<td>160MHz</td>
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<td>Accel</td>
<td>Signal Processing Unit (SPU)</td>
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<td>Program Flash</td>
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<tr>
<td>Flash</td>
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<td>Total (DSPR, PSPR, LMU, AMU, EMEM) w/o Cache</td>
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<td>2528kB</td>
<td>1504kB</td>
<td>1376kB</td>
<td>4064kB</td>
<td>992kB</td>
<td>576kB</td>
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<td>Channels Primary / Sec / FC / DS</td>
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<td>64/192/10</td>
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<td>CCI / GPT modules / bit streaming</td>
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<td>4/0</td>
<td>8/0</td>
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<td>QSPI / ASCLIN / I2C / I2S(emulation)</td>
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<td>8x400Mbps LVDS</td>
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<td>8x400Mbps LVDS</td>
<td>4x400Mbps LVDS</td>
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<tr>
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<tr>
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<tr>
<td>Power</td>
<td>Standby Control Unit</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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Note: * 300MHz Option
# SRAM Overview

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<tr>
<th></th>
<th>16MB</th>
<th>12MB</th>
<th>10MB</th>
<th>8MB</th>
<th>6MB</th>
<th>4MB</th>
<th>2.5MB</th>
<th>2MB</th>
<th>1MB</th>
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<tbody>
<tr>
<td></td>
<td>39xXX</td>
<td>3E7Qx</td>
<td>38xQ</td>
<td>29xT</td>
<td>37xTX</td>
<td>37xT</td>
<td>27xT</td>
<td>36xD</td>
<td>35xTA</td>
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<tr>
<td>PSPR</td>
<td>6x64</td>
<td>4x64</td>
<td>4x64</td>
<td>32+32+32</td>
<td>3x64</td>
<td>3x64</td>
<td>24+32+32</td>
<td>2x32</td>
<td>3x64</td>
</tr>
<tr>
<td>P-Cache</td>
<td>6x32</td>
<td>4x32</td>
<td>4x32</td>
<td>16+32+32</td>
<td>3x32</td>
<td>3x32</td>
<td>8+16+16</td>
<td>2x32</td>
<td>3x32</td>
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<tr>
<td>dLMU</td>
<td>6x64</td>
<td>4x64</td>
<td>4x64</td>
<td>-</td>
<td>3x64</td>
<td>3x64</td>
<td>-</td>
<td>2x64</td>
<td>3x64</td>
</tr>
<tr>
<td>DSPR CPU 0/1</td>
<td>2x240</td>
<td>2x240</td>
<td>2x240</td>
<td>120+240</td>
<td>2x240</td>
<td>2x240</td>
<td>112+120</td>
<td>2x192</td>
<td>2x240</td>
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<tr>
<td>DSPR CPU 2-5</td>
<td>4x96</td>
<td>2x96</td>
<td>2x96</td>
<td>240</td>
<td>1x96</td>
<td>1x96</td>
<td>120</td>
<td>-</td>
<td>1x96</td>
</tr>
<tr>
<td>D-Cache</td>
<td>6x16</td>
<td>4x16</td>
<td>4x16</td>
<td>3x8</td>
<td>3x16</td>
<td>3x16</td>
<td>0+8+8</td>
<td>2x16</td>
<td>3x16</td>
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<tr>
<td>Global LMU</td>
<td>768</td>
<td>256</td>
<td>128</td>
<td>32</td>
<td>-</td>
<td>-</td>
<td>32</td>
<td>-</td>
<td>512</td>
</tr>
<tr>
<td>DAM</td>
<td>128</td>
<td>64</td>
<td>64</td>
<td>32</td>
<td>32</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>EMEM</td>
<td>4096</td>
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<td>-</td>
<td>3072</td>
<td>-</td>
<td>-</td>
<td>2048</td>
<td>-</td>
<td>1024</td>
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<tr>
<td>All SRAM w/cache</td>
<td>6912</td>
<td>1696</td>
<td>1568</td>
<td>832</td>
<td>4208</td>
<td>1136</td>
<td>728</td>
<td>672</td>
<td>3664</td>
</tr>
<tr>
<td>All SRAM w/o cache</td>
<td>6624</td>
<td>1504</td>
<td>1504</td>
<td>712</td>
<td>4064</td>
<td>992</td>
<td>576</td>
<td>576</td>
<td>3520</td>
</tr>
</tbody>
</table>
AURIX™: Safety Leadership
AURIX™ TC3xx Leading the way

1st Microcontroller to receive TÜV ISO 26262:2018 certification!
NEW!!! AURIX™ gets IEC61508 Certified

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?

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

Risk of Failure

Equivalency within multiple IEC 61508 standards across several applications
# AURIX™: Hardware Functional Safety Leadership

<table>
<thead>
<tr>
<th>Industry</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive</td>
<td>ISO 26262</td>
</tr>
<tr>
<td>Machinery</td>
<td>IEC 62061</td>
</tr>
<tr>
<td>Railway</td>
<td>EN 50129</td>
</tr>
<tr>
<td>Nuclear Power</td>
<td>IEC 61513</td>
</tr>
<tr>
<td>Process Industry</td>
<td>IEC 61511</td>
</tr>
<tr>
<td>Household Appliances</td>
<td>IEC 60335</td>
</tr>
<tr>
<td>Furnaces</td>
<td>IEC 50156</td>
</tr>
<tr>
<td>Agriculture</td>
<td>ISO 25119</td>
</tr>
<tr>
<td>Aviation</td>
<td>DO-178</td>
</tr>
</tbody>
</table>

The AURIX™ architecture is developed to allow compliance with multiple IEC 61508 across several applications.
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

**CPU**

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

**Core**

**Anti-Core**

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

- Redundant, spatial separated peripherals
- Safe SPB
- Safe DMA
- Safe SRI
- SRAM ECC
- Flash ECC
- Lockstep core
- CPU self tests (90% Latent Fault Metric)
- Memory protection core
- Register access protection
- Safe Interrupt Processing
- Flexible CRC Engine (FCE)
- IO Monitor
- Clock Monitoring
- E2E protection
- Power Supply Monitoring
- 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
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

AURIX™ is PRO-SIL™ compliant with safety hardware features throughout. Documentation may require an NDA. 

PRO-SIL™ SafeTlib Safety Software is available.

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

More about PRO-SIL™ can be found [here](#).
### AURIX™ TC2xx / TC3xx Infineon embedded software offer

| **AUTOSAR MCAL** | MC ISAR AUTOSAR-compliant MCAL including:  
- 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...)  
- Additional complex drivers (e.g. DMA, UART...) |
| **SAFETY SW** | AURIX™ TC2xx "SafeTlib":  
- Set of SW tests to support applications with functional safety requirements including “Software Based Self Test” (SBST) for the CPU core  
- Support of system integration with application-dependent tests  
- Handling of internal and external watchdogs (SafeWDG)  
AURIX™ TC3xx:  
- Most SafeTlib test merged into the Hardware  
- SBST for the CPU core and SPU |
| **Security SW** | The crypto libraries and software stack is provided via 3rd party partners (Elektrobit, ETAS/Escrypt, Vector, Integrity Security Services ISS) including  
- SHE+, key management/storage, secure boot, secure SW update (incl. SOTA), secure onboard communication, etc. |
| **Infineon Low Level Drivers (ILLD)** | Free of charge Drivers to abstract the basic functionality of the peripherals |
| **Virtual prototype** | Virtual representation (model) of the Silicon |
| **Customization** | Optimization of available MCAL and SafeTlib for e.g. different compiler versions or customer specific requirements |
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

SAFETY is more than just a lockstep core.
AURIX™ is designed with Pro-SIL™ (Safety Integrity Level) features throughout

- Redundant, spatially separated peripherals
- Bus Monitoring Unit
- Safe DMA
- Safe SRI
- FLASH ECC (detects multi bit failures)
- SRAM ECC (detects multi bit failures)
- Lockstep core
- Memory protection core
- Memory protection peripherals
- Safe Interrupt Processing
- Flexible CRC Engine (FCE)
- IO Monitor
- Clock Monitoring
- CPU self tests (90% Latent Fault Metric)
AURIX™:
Security Leadership
Infineon was a project partner in the Evita organisation which specified the design, verification and prototyping processes required to implement a secure architecture for automotive onboard electronics networks.
AURIX™ TC2xx to AURIX™ TC3xx: Security Concept Evolution

AURIX™ TC2xx Security Features
- HSM Crypto Engine
  Symmetric
- SOTA updates
  From central & local storage
- Security Standards
  Medium EVITA
- Security Software
  Infineon SHE+ and partner solutions

AURIX™ TC3xx Security Features
- HSM Crypto Engine
  Symmetric & Asymmetric encryption
- SOTA updates
  Includes double program flash (A/B swap)
- Security Standards
  Full EVITA
- Security Software
  Via Partnership with industry security experts

AURIX™ TC3xx now provides automotive security as standard across the whole family
AURIX™ TC3xx HSM: Automotive Security Leadership

What is the AURIX™ TC3xx Hardware Security Module (HSM)?

- Trusted Execution Environment
- 32-bit ARM MCU separated by firewall
- Reserved access to shared NVM to host OEM application SW

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

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™: 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

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.
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 our how to license MC-ISAR software, please contact tac@infineon.com
Infineon AURIX™ TC3xx: Software portfolio

Infineon and partners deliver high quality, hardware optimized, software

AURIX™
TC3xx:
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 campanion chip (ISO fuctional safety standard and EVITA FULL security standars
› Highest scalability in performance, memory & peripherals across applications

But also:
› A solution with fully functioning supported ecosystem

Full documentation available online for AURIX™ in order to support our customers

› High quality web pages and content including:
  – Product pages, Trainings, documentation
  – New tools and software ecosystem
  – New partner ecosystem

› AURIX™ Development Studio
  › New IDE Free off charge
  › Expert trainings
  › Code examples

› AURIX™ Forum
  › Customers can find answers by themselves
  › Increase the traffic in the forum
  › A maintained forum as first support

› Buy online & New kits
  › Aurix Lite kit for AURIX™ TC2xx & TC3xx
  › Stock availability for buy online (kits and devices)
Infineon MCU Documentation: Multiple options of access

Access to public documentation

Documents
- Login to myinfineon to see all documents available
- 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.

1. Register for MyInfineon
2. Send an email to 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

Eclipse base IDE (06/2020)
› Editor
› TASKING Compiler
› TASKING Debugger

Device Support
› AURIX TC2xx
› AURIX TC3xx

Usage
› Free-of-charge
› No code size or time limitation
› TASKING Compiler&Debugger for non-productive use only

Ease-of-Use
› Download and installation in one go
› Get project running within a few minutes

Integrated Tools
› Serial Monitor
› Flash Programmer
› TASKING Pin Mapper
› Project Creator with iLLDs

Where to get it?
› Download within the Infineon Toolbox
# AURIX™ TC2xx kits – Evaluation and starter Kits

## Lets get started!

<table>
<thead>
<tr>
<th>Kit Name</th>
<th>Price</th>
<th>Description</th>
</tr>
</thead>
</table>
| **AURIX™ TC275 Lite Kit** | €30 | - 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 |
| **Arduino Shield Buddy** | €99 | - The Hitex TC275 ShieldBuddy follows the Arduino standard  
- Compatible with 100’s of Arduino application shields  
- Evaluation licenses available  

KIT_AURIX_TC275ARD_SB |
| **AURIX™ TFT** | €149 | - 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 |
| **AURIX™ TriBoard** | €350 | - Full evaluation board for development to write and debug your 1st 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**

€30

#### 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**

€99

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

**KIT_AURIX_TC3xx_TRB**

€149

#### Coming soon

- 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**
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

www.infineon.com/aurix
tools

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

www.infineon.com/aurix
embeddedsoftware
www.infineon.com/aurix
tools
Video and eLearning Platform for more support you

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 fulfills all your needs, with a proven track record.

https://www.infineon.com/aurixvideohub
Part of your life. Part of tomorrow.