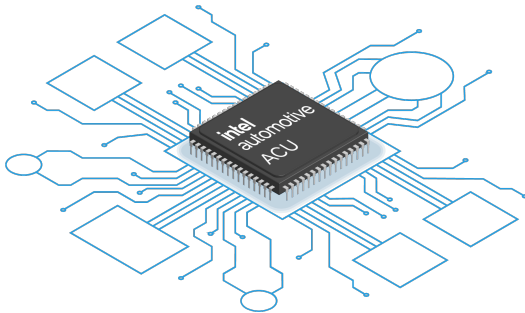


Adaptive Control Unit T222

Flexible, real-time and safe automotive semiconductor for electrified powertrain control



- Electric Motor and Inverter control
- High Frequency DC-DC converter control
- High Frequency On Board Charger control
- Transmission control
- ISO 26262 ASIL D certified design ready

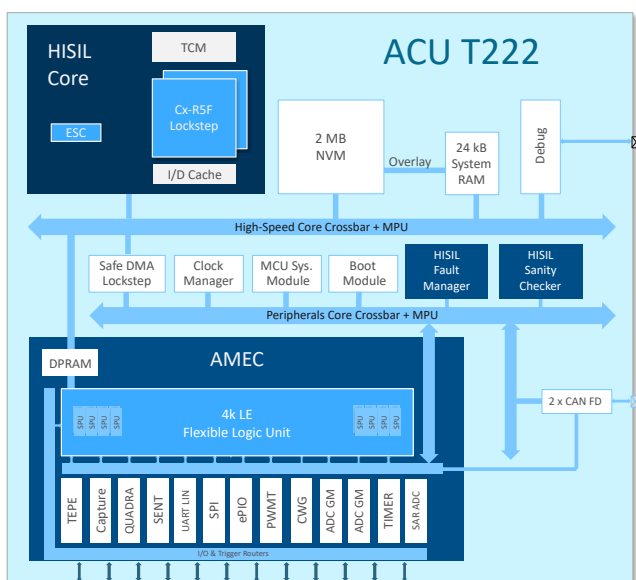
One of a kind

ACU T222 is a member of the ACS family for safe and real-time automotive control solutions. ACU T222 is the industry's first Adaptive Control Unit (ACU), a unique semiconductor architecture defined as a combination of the hardware flexibility of the AMEC real-time control unit with the software flexibility of a standard processor into a single chip.

AMEC integrates parallel data paths between acquisition and actuation peripherals and the Flexible Logic Unit (FLU), an automotive specific and robust embedded programmable logic with DSP resources. ACU T222 also benefits from HISIL, an ASIL-D functional safety integrated architecture. HISIL increases faults coverage and implements reliable countermeasures at chip level and at application level without compromising the performances.

ACU removes software bottleneck by enabling software and hardware execution of high frequency and precise PWM control algorithm while limiting heat dissipation. Using Silicon Mobility's ACU, user's control command can be programmed in hardware into the FLU and delivers the following performances compared to conventional microcontroller based solutions:

- 40x acceleration of data processing capabilities
- Up to 20x faster hard real-time control loop
- Up to 180x power supply reduction



Unique technologies

- AMEC FLU: real-time actuators/sensors control and processing unit based on programmable logic
- HISIL: ISO 26262 ASIL-D functional safety solution

Open architecture

- ARM® Cortex-R5F in lockstep
- Embedded Flash
- CAN & LIN Communication ports

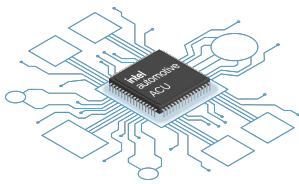
Standards compliancy

- ISO 26262 ASIL-D qualified TUV Saar
- AUTOSAR 4.3
- AEC-Q100 Automotive Quality

Features

Processing	<ul style="list-style-type: none"> 32-bit ARM® Cortex-R5F in lockstep • 200 MHz operating frequency • 16 KB / 8 KB instruction and data cache L1 with ECC • 64 KB Tightly Coupled Memory with ECC • Floating point unit • Thumb2 high code density 	
Sensors Actuators Control and Processing	<ul style="list-style-type: none"> Advanced Motor Event Control - AMEC • Flexible Logic Unit <ul style="list-style-type: none"> ◦ 4 560 Programmable Logic Elements ◦ 20 x 24-bit Signal Processing Units ◦ 200 MHz clock input ◦ 8 KB DPRAM ◦ Parallel access for acquisition & control • Complex Waveform Generator (CWG) with 4 channels • 5 x 200 MHz Pulse Width Modulator (PWM) w. 4 channels 	<ul style="list-style-type: none"> • 16 channels capture • Quad-Encoder • Thermal Estimator Position Engine • 3 x SENT • 2 x SPI with PSI5-S support • 3 x UART with PSI5-S support • 2 x ADC Group Manager • Triggers Router • 118-ch Multiplexed General Purpose I/O • 33 Programmable Input filters
Safety	<ul style="list-style-type: none"> Safety Integrated Level Agent - HISIL • ASIL-D architecture and infrastructure including, for transient faults, system Events Sequences Controlling (ESC), Masters and PWM in lockstep, end to end ECC transfers, safe DMA transfers, CRC, and protections for , I/O, clock, configuration registers, chip supply • Sanity Checker providing BIST for latent faults in logic/memory (LBIST & MBIST) on safety mechanisms, ADC Self-test • Fault Manager Unit 	
System	<ul style="list-style-type: none"> • 2 MB eFlash with EEPROM Emulation support • 24 KB of System SRAM with ECC • DMA Controller with CRC providing 16 channels in lockstep mode and 32 channels DMA split-mode • 8 x System Timers • Watchdog complying AUTOSAR 4.3 	<ul style="list-style-type: none"> • MCU System Configuration Module • 16-priorities Advanced Generic Interrupt Controller • Interconnect with end to end ECC and Multilayer MPU • JTAG and SWD debug ports • Trace Port Interface Unit and Embedded Trace Buffer • 16 KB Overlay RAM
Communication Ports	<ul style="list-style-type: none"> • 2 x CAN FD complying ISO 11898-1:2015 • 3 x UART-LIN complying LIN 1.3; 2.0 and 2.1 	
Analog	<ul style="list-style-type: none"> • 50 MHz Internal Ring Oscillator • Crystal oscillator input 1-50 MHz • Voltage Regulator (3.3V to 1.2V) with bypass • Power on Reset with LVD/HVD 	<ul style="list-style-type: none"> • 8 x 4 channels 12-bit ADC SAR @ 2MS/s MAX • 8 x Analog comparators • 2 x Temperature Sensors
Miscellaneous	<ul style="list-style-type: none"> Supply • 3.3 or 1.2V for Core supply • 3.3V for I/O supply • 3.3V for ADC supply Packages • QFP 100 and 176 	<ul style="list-style-type: none"> Power Consumption • < 200mW Ambient Temperature Range • -40°C to +125°C (AEC-Q100 Grade 1)

End to end solution



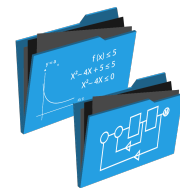
ACU

Automotive semiconductor solution designed to process critical information faster with 100% predictability and accuracy.



AC Composer

Robust development and calibration framework for rapid application development with ACU using best of industry's standard EDA tools.



AC Lib

Highly optimized automotive control algorithms and software libraries for ACU.

All in one place

A wide eco-system of tools, software and hardware is available with ACU from Silicon Mobility or third parties for a fast application design start. Technical manuals, test reports, PPAP documentation and ISO 26262 safety work products package are also available.