Geehy SEMICONDUCTOR

Automotive-Grade MCUs & Applications

Low Power | High Performance | High Reliability

Empowering the development & innovation of electrification, intelligence, and digitalization of vehicles

Geehy
SEMICONDUCTOR

Geehy Achieves TÜV Rheinland ISO 26262 Automotive Safety Certification

"The ISO 26262 standard is the "universal guideline" for the global production of safe vehicles and is one of the entry thresholds for automotive supply chain manufacturers.

Passing the ISO 26262 functional safety management system certification undoubtedly shows Geehy's determination and ability to conform to international standards.

With the implementation of this international product standard system, Geehy will insist on outputting high-quality and high-stability products in the future."

Jason Wang

About TÜV Rheinland

TÜV Rheinland stands for safety and quality in virtually all areas of business and life. Founded almost 150 years ago, the company is one of the world's leading testing service providers with more than 20,600 employees and annual revenues of around 2 billion euros. TÜV Rheinland's highly qualified experts test technical systems and products around the world, support innovations in technology and business, train people in numerous professions and certify management systems according to international standards.

About Geehy

Geehy Semiconductor Co., Ltd. is an IC Fabless company dedicated to developing industrial & automotive grade Microcontrollers, mixed-signal analog ICs and SoCs, its parent company is Ninestar Corporation (002180. SZ).

With 20 years of IC design experience and embedded system capability, the Geehy team can provide customers with core and reliable chip products that enable accurate sensing, secure transmission, and real-time control, helping them to expand in smart home, high-end consumer electronics, automotive electronics, industrial controls, and intelligent energy.

20 Years — IC chip design experience

450 Million — Annual chip shipment

500 Engineers — R&D design team

4 Offices — Shanghai/Shenzhen /Chengdu/Guangzhou

6 R&D Centers — Zhuhai/Shanghai/Zhengzhou/Hangzhou/Chengdu/North Carolina(USA)

Leading Chip Design Technology
- CPU design & application
- Heterogeneous multi-core chip design
- Secure encryption eSE chip design

Main Products & Market Applications

APM32 Industrial & Automotive Grade MCUs

SoC-eSE Heterogeneous Multi-Core Security Controller

Mixed-signal Analog ICs

Printer SoC & Replacement Chip

Focus on Stable and Reliable Lifecycle Markets

Smart Home

High-end Consumer Electronics

Automotive Electronics

Industrial Controls

Smart Energy

Communication Facilities

Highly Reliable Automotive Grade Technology Platform

Heterogeneous Multi-Core & Lockstep

- Based on Arm® Cortex®-M0+/M3/M4/M7/M33 CPUs
- Tightly coupled computing and communication architecture comes with real-time control and processing capabilities
- Lock-step architecture supports dual-core to multi-core CPUs
- Backward compatibility for easy product selection and switching

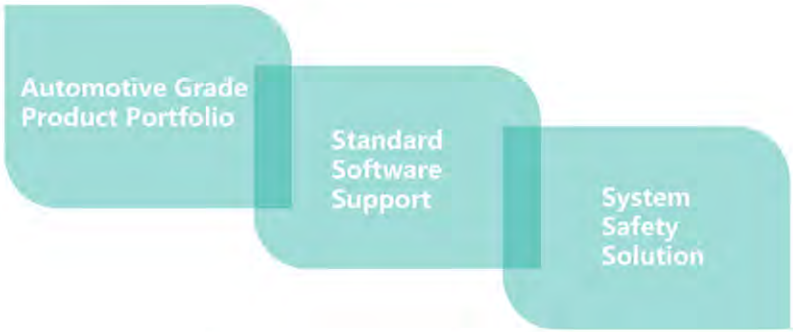
Functional Safety & Information Security

- Hybrid multi-core RISC-V cores as security unit modules, with customizable secure CPU cores
- eSE on-chip subsystem supports encryption agility, anti-side channel attack, full lifecycle management
- A programmable hardware encryption engine supports national cryptographic algorithms and is compatible with international cryptographic algorithms
- All series certified AEC-Q100 and G32A series certified ISO 26262 ASIL B-D
- OTA ready: easy A/B switching, rollback options, and secure HSE firmware updates

Eco-Friendly Environment, Easy for Development and Expansion

- Support MCAL+SDKs
- Support Chipset, SIP; high integration, small size, low BOM, and high reliability with other dedicated modules in one packages
- The developer community helps engineers to communicate and learn online

- Based on highly reliable automotive-grade general-purpose architecture
- Build a design system that complies with ISO 26262 standard
- ASIL-D based target enhances comprehensive security
- eSE substructure ensures information security



Quality Automotive Grade Delivery Platform

Automotive Grade Experimental Platform

- A highly reliable automotive-grade laboratory can independently complete ACE-Q100 test items
- Equipment with five laboratories: Electrical Verification, Component Reliability, Environmental Reliability, Failure Analysis, and Application
- Provide a customized chip testing and verification process and create reliability test solutions according to customer needs
- Ensure the performance and reliability of automotive-grade chips

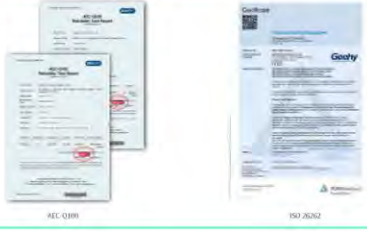
Production & Packaging

- An independent first-class supply chain through upstream and downstream cooperation forms an industrial chain in chip design, key IP, special process, packaging, and testing to ensure the quality of automotive chips
- The full lifecycle quality control system complies with the IATF16949 requirements
- Build a solid supply system of automotive-grade chips

Verification & Test

- Comply with ISO 26262 standard
- Meet AEC-Q100 standard
- Pass CP/FT/QC

Certification



Software - Tools - Document

- Security-compliant software simplifies application development and training

Product Layout

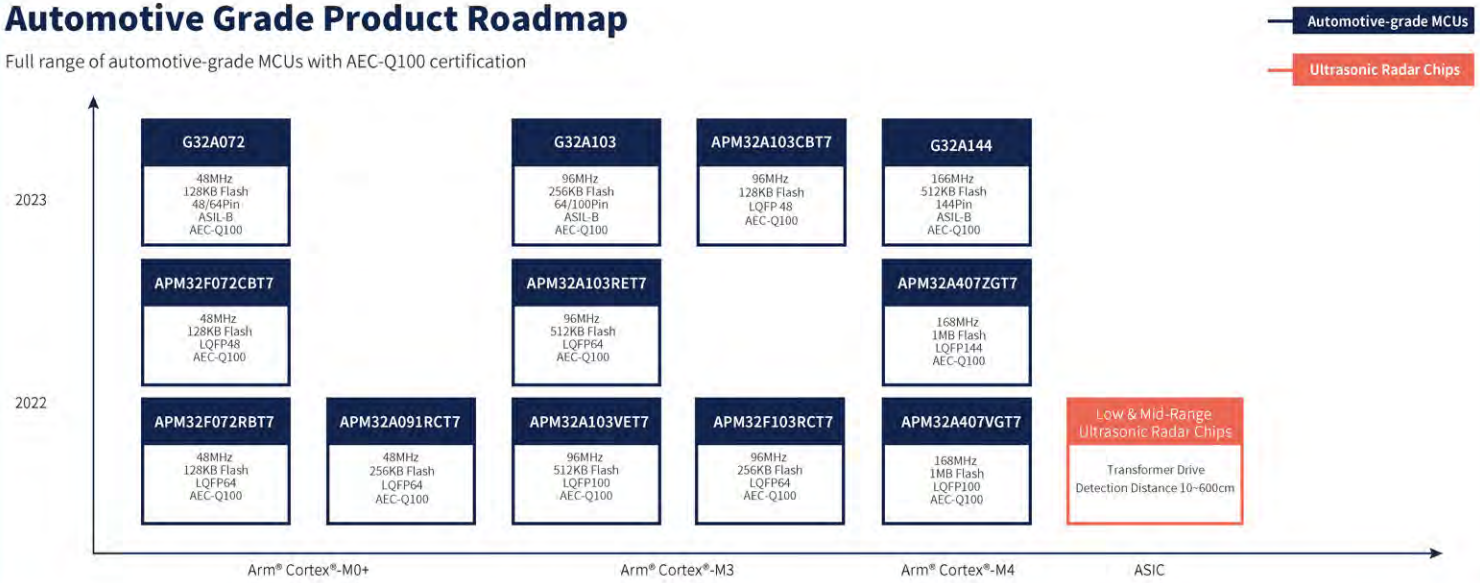
- Launch of automotive-grade MCUs and sensors that comply with the ISO 26262 standard
- Strategic layout of body control, intelligent cockpit, BMS, power, security, domain control, and other areas
- Deep cooperation with automotive OEMs and Tier 1 suppliers to fully collaborate in product definition, iterative upgrade, and application validation

Automotive Grade MCU Layout

CPU	Flash	ASIL	Pin
Arm® Cortex® -M0+	128KB~256KB	ASIL-B	32~257pin
Arm® Cortex® -M3	256KB~512KB	ASIL-B	
Arm® Cortex® -M4	512KB~2M	ASIL-B	
Arm® Cortex® -M7 Multi-core	1M~8M	ASIL-B~ASIL-D	

Automotive Grade Product Roadmap

Full range of automotive-grade MCUs with AEC-Q100 certification



Application & Layout

Body Control

- Power Tailgate
- Body Domain Controller
- Remote Window Control/Central Locking Control/Light Control

Security System

- Reversing Radar
- Tire Pressure Monitoring
- EDR/OBD
- Drive Recorder
- Automotive Grade MCU APM32F103RCT7

Infotainment System

Intelligent Cockpit

- Human-computer Interaction
- Intelligent Seat
- T-Box/HUD
- Center Console/Instrument Cluster

Multimedia

- GPS Navigation
- Bluetooth Communication
- In-car Voice
- Car Audio

Power System

Power Control

- Motor Drive
- Transmission System
- Engine Control
- Chassis Domain Control

Power Management

- BMS Control Board
- Charging Pile

Automotive Grade MCU APM32F103RCT7

System

- Arm® Cortex®-M3
- Working frequency: 96MHz

Memory

- FLASH: 256KB
- SRAM: 64KB

Power & Temperature

- Operating voltage range: 2.0V~3.6V
- Working temperature: -40°C~105°C

Timer

- 16-bit universal timer: 4
- 16-bit advanced timer: 2
- 16-bit basic timer: 2
- Watchdog timer: 2
- SysTick: 1
- RTC: 1

Package

- LQFP64

Debug Mode

- SWD、JTAG
- Cortex-M3 embedded debug & trace module

Analog Peripherals

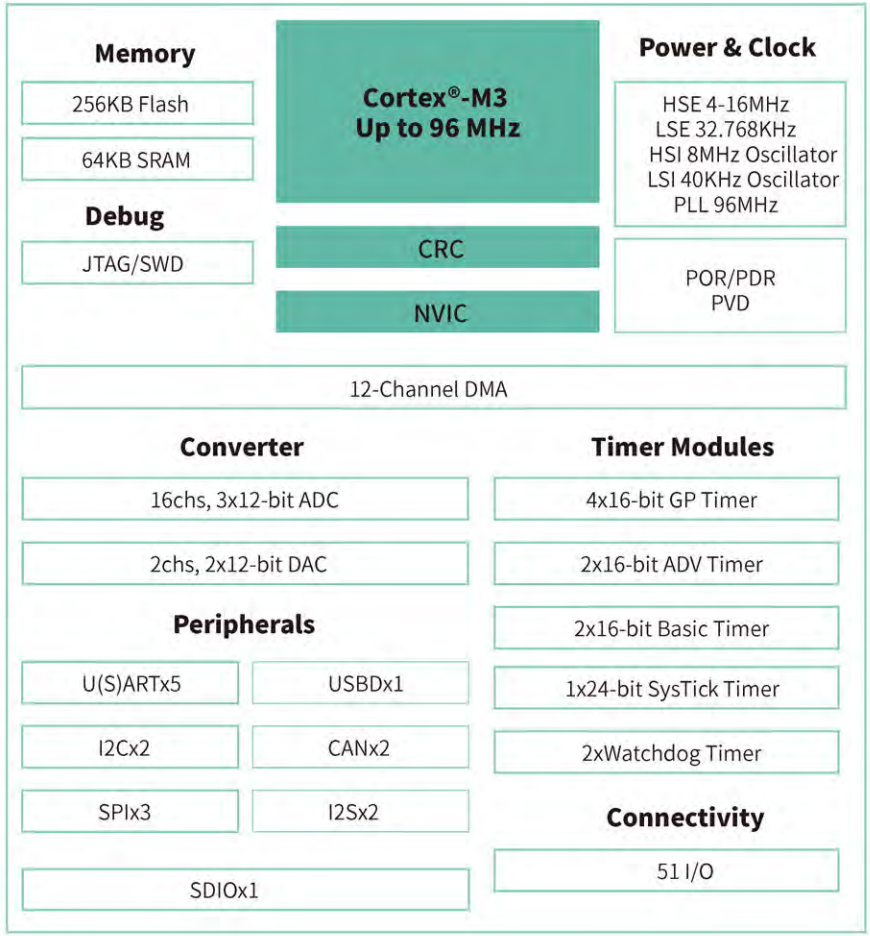
- 12-bit ADC: 2; external channels: 16
- 12-bit DAC: 2

Communication Interfaces

- I2C:2
- U(S)ART:5
- SPI:3
- USBD:1
- CAN:2
- SDIO:1
- Supports independent USB and CAN

Certified

- AEC-Q100



Automotive Grade MCU APM32F072RBT7

System

- Arm® Cortex®-M0+
- Working frequency: 48MHz

Memory

- FLASH:128KB
- SRAM:16KB

Power & Temperature

- Operating voltage range: 2.0V~3.6V
- Working temperature: -40°C~105°C

Timer

- 16/32-bit universal timer: 5/1
- 16-bit advanced timer: 1
- 16-bit basic timer: 2
- Watchdog timer: 2
- SysTick: 1
- RTC: 1

Debug Mode

- SWD

Analog Peripherals

- 12-bit ADC: 1, external channels: 16
- 12-bit DAC: 2, dual channel
- Analog comparator: 2
- Capacitive sensing channels: 24

Communication Interfaces

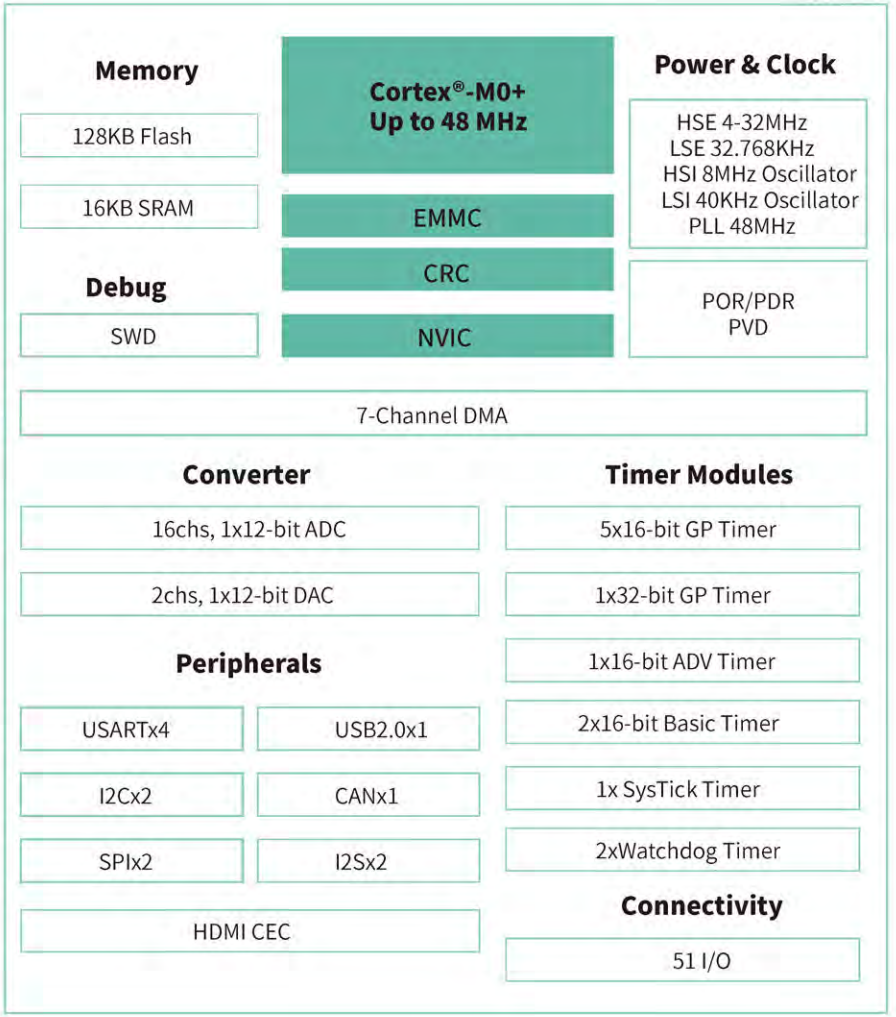
- I2C:2
- USART:4
- SPI:2
- USB2.0 :1 without external crystal
- CAN:1
- HDMI CEC

Certified

- AEC-Q100

Package

- LQFP64



Automotive Grade MCU APM32A407

System

- Arm® Cortex®-M4
- Working frequency: 168MHz

Memory

- FLASH:1024KB
- SRAM:192+4KB

Power & Temperature

- Operating voltage range: 1.8V~3.6V
- Working temperature: -40°C~105°C

Timer

- 16/32-bit universal timer: 8/2
- 16-bit advanced timer: 2
- 16-bit basic timer: 2
- Watchdog timer: 2
- SysTick: 1

Certified

- AEC-Q100(underway)

Debug Mode

- SWD、JTAG
- Cortex-M4 embedded debug & trace module

Analog Peripherals

- 12-bit ADC：3, external channels: 24
- 12-bit DAC：2

DMA

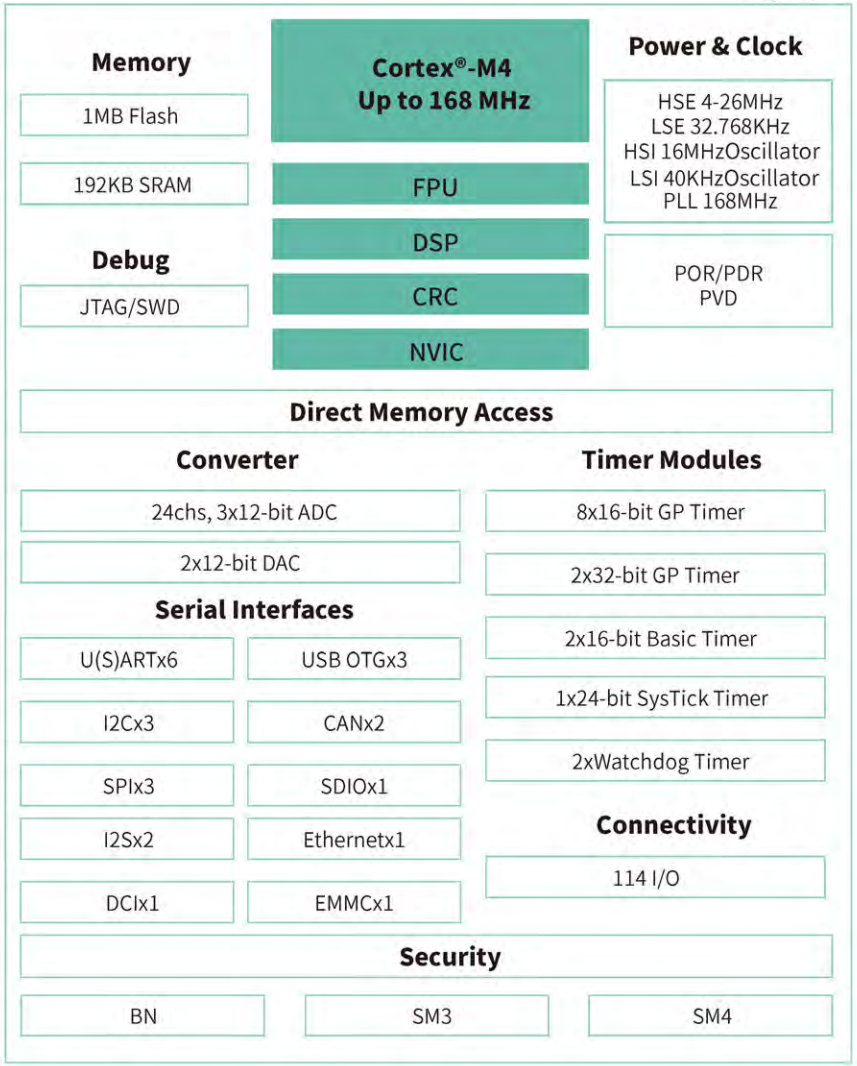
- 12 independent configurable channels

Communication Interfaces

- I2C：3
- CAN：2
- U(S)ART：6
- DCI：1
- SPI：3
- SDIO：1
- I2S：2
- Ethernet：1
- USB OTG：3
- EMMC：1

Package

- LQFP100/144



Automotive-Grade MCU G32A144

System

- Arm® Cortex®-M4
- Working frequency: 122MHz
- Provides 1.25DMIPS/MHz performance

Memory

- FLASH: 512KB (with ECC)
- SRAM: 64KB

Power & Temperature

- Operating voltage range: 2.7V~3.6V
- Working temperature: -40°C~105°C

Timer

- 4-40 MHz fast external oscillator
- 48 MHz fast internal RC oscillator
- 128 KHz low power oscillator (LPO)
- Up to 112 MHz (HSRUN) system phased-lock loop
- 32 KHz external RTC clock (RTC_CLKIN)

Peripheral Resources

- 12-bit ADC: 2
- 12-bit DAC: 2
- UART/LIN: 3
- SPI:3
- I2C:1
- CAN/CAN FD:3
- I/O:128

Encryption & Security

- CSEc security module implements SHE (Secure Hardware Extension) full encryption function
- Flash and SRAM with built-in ECC (Error Correction Code)
- CRC (Cyclic Redundancy Check) module
- Internal supervision within Watchdog
- EWM (External watchdog monitor) module
- System MPU

Package

- LQFP64/100/144/176

Certified

- ISO 26262 ASIL B

Coming soon

Battery Management System (BMS) Solution

Supports the real-time collection, processing, and storage of important information during battery pack operation.
Can cooperate with external devices such as the vehicle controller to exchange information, solve the key problems of safety, availability, ease of use, lifespan in the battery system, effectively prolong its lifespan and improve energy use.

Highly Reliable Software & Hardware

The flexible configuration enables users to shorten R&D and test time

High Security

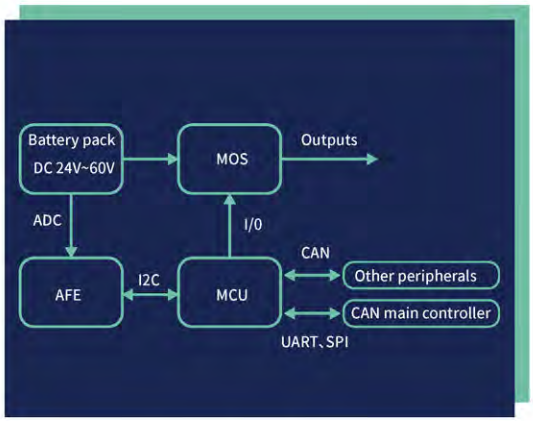
Certified IEC 61508/ISO 26262

Mass Production

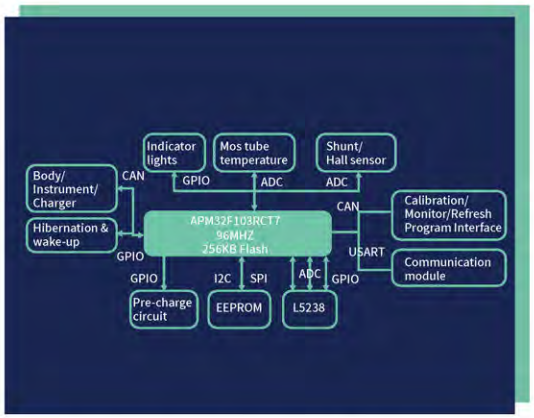
Available in bulk supply

Cost Control

Highly compatible with flexible applications



BMS Block Diagram



BMS Application Solutions Block Diagram

Features

- Based on APM32F103RCT7 automotive-grade MCU
- Powered by Arm® Cortex® -M3 core
- 6~18V ultra-wide power input
- 42 strings of voltage acquisition (±5mV)
- 12-way temperature acquisition (±1°C)
- Multi-way CAN supports a specified wake-up frame
- Support high-precision Shunt and Hall current sensing
- Support OTA, rolls back a software upgrade

Intelligent Cockpit Solution

High Performance

Adopt high-performance CPU cores

AI Accelerator

Integrated configurable AI hardware acceleration engine

Flexible Configuration

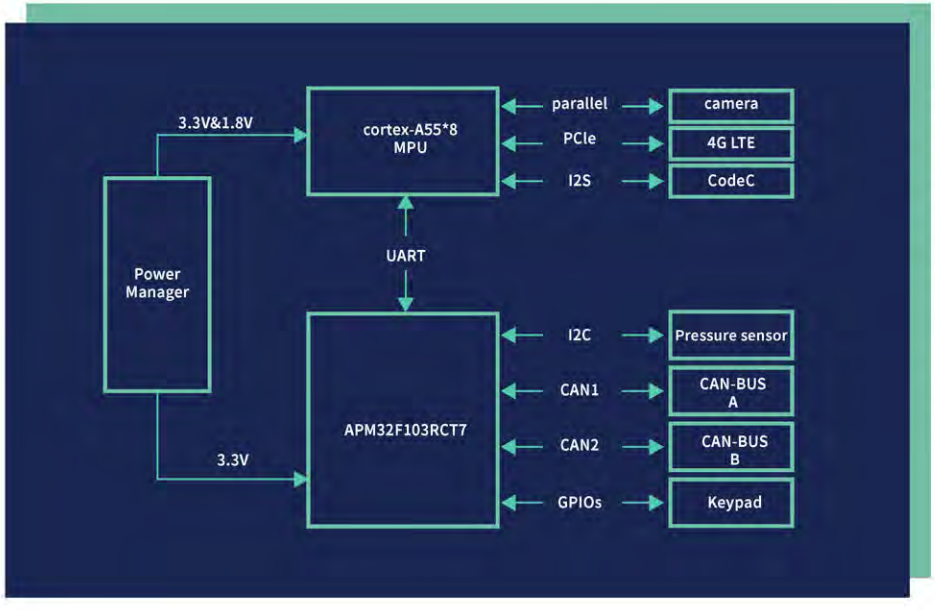
Provide matched solutions for high, medium, and low-end markets

Multi-System

Support hardware virtualization and isolation to run multiple operating systems on a single SoC

Automotive-Grade

Comply with AEC-Q100 standard

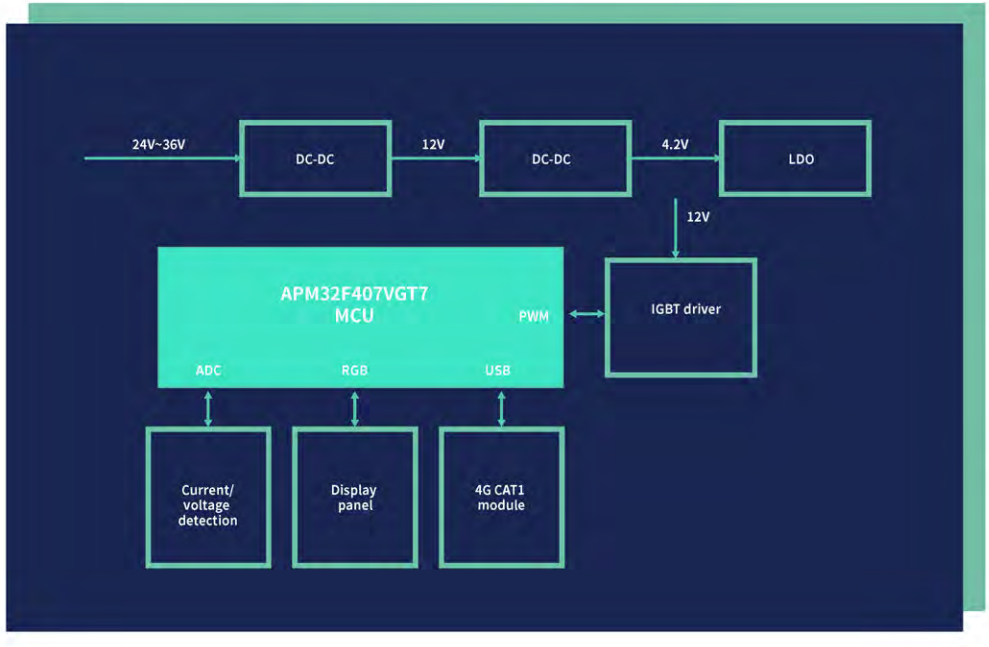


Features

- Based on APM32F103RCT7 automotive-grade MCU
- Powered by Arm® Cortex® -M3 core
- Support dual CAN communication, keypad control, and sensor signal acquisition
- Provide two-way and high communication speed
  - Physical keyboard input provokes a fast response
  - Working temperature: -40°C~105 °C
- Certified AEC-Q100, compliant with automotive-grade reliability standards

AC Charging Pile Solution

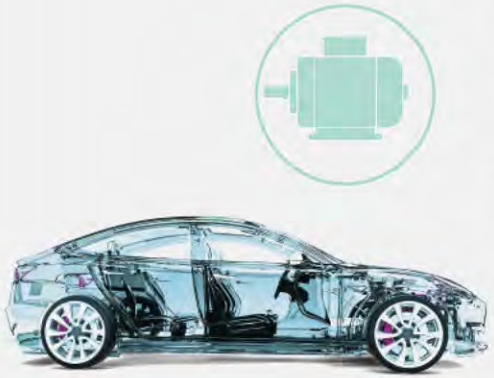
AC charging pile refers to a special power supply device that uses conduction to provide AC power to electric vehicles with on-board chargers. It comes with the advantages of compact size, hassle-free installation, and easy handling.



Features

- Based on APM32F407VGT7 automotive-grade MCU
- Powered by Arm® Cortex® -M4 core
- Realize continuous and efficient power output through voltage and current detection
  - Analyze charging efficiency
  - Display panel reads information such as electricity usage, charging rate, charge percentage, remaining charging time, etc.
  - Realize real-time terminal communication
- AEC-Q100 certification (underway)

Motor Drive Solution

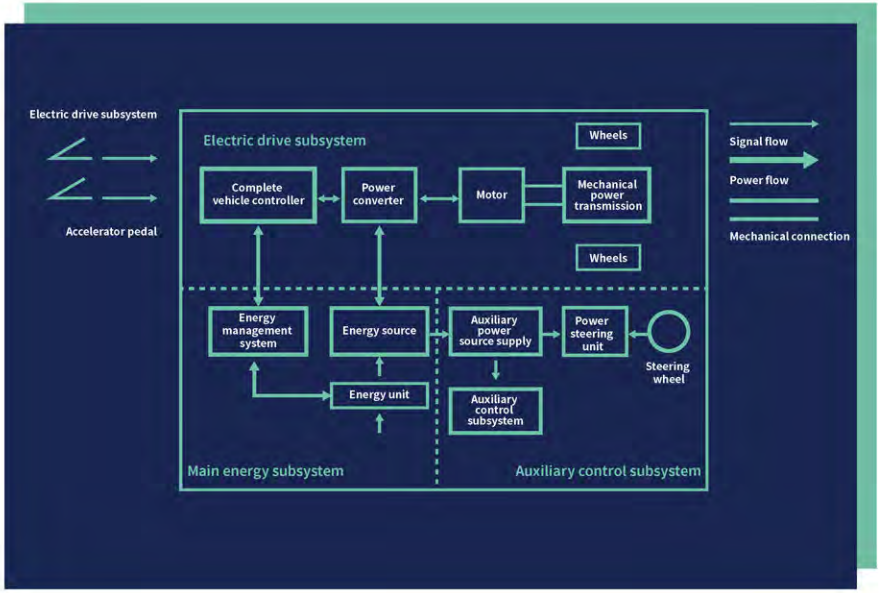


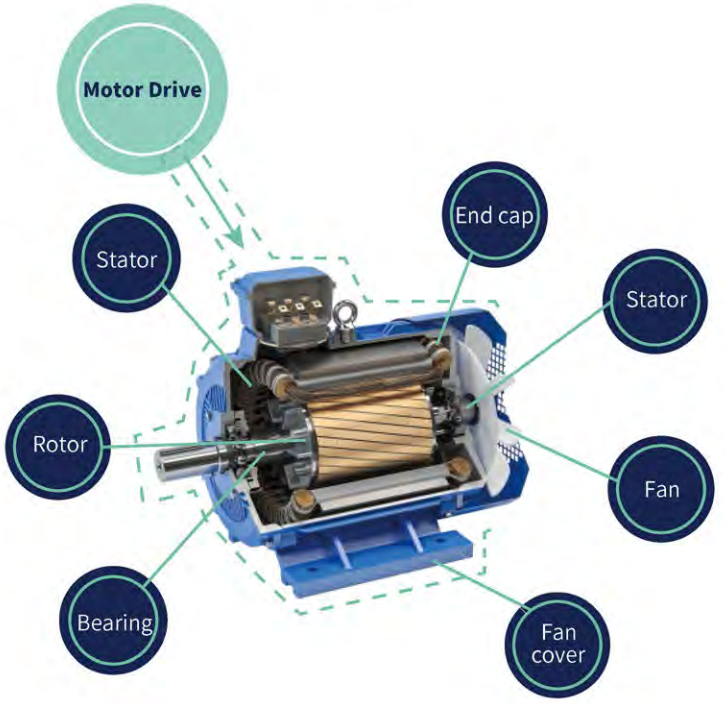
The motor drive system is the heart of the vehicle and consists of the motor, power converter, controller, various detection sensors, and power supply. Its task is to convert the electrical energy from the battery into mechanical energy of the wheels to drive the vehicle's components under the driver's control, or to feed the kinetic energy from the wheels back into the power battery.

Motor Drive Performance Requirements

- High voltage, high speed, high efficiency, high power density
- Fast torque response, small fluctuation, good stability
- High reliability, strong electromagnetic compatibility, easy maintenance
- High anti-overload capability, high starting torque, wide speed regulation range
- High controllability, steady-state accuracy, dynamic performance, high mechanical efficiency

Automotive Motor Drive System Structure





Geehy Ecosystem