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To Make Runic Chips Active In Every Corner of The World

江苏润石科技有限公司

Jiangsu Runic Technology Co.,Ltd

www.run-ic.com

AUTOMOTIVE
APPLICATION PROGRAM

汽车电子应用方案

2023 Rev.3

国 产 车 规 级 模 拟 芯 片

AUTOMOTIVE GRADE ANALOG IC

江苏润石科技有限公司

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COMPANY PROFILE

公司介绍

江苏润石科技有限公司是一家专注于高性能、高品质模拟/混合信号集成电路研发和销售的高科技半导体设计公司。

公司总部位于江苏省无锡市，扎根本土，服务全球。公司依托无锡市良好的集成电路产业环境，整合上下游优势资源，致力于汽车电子、新能源、工业控制、消费类电子、物联传感和医疗电子等领域的模拟芯片产品的研发设计，目前已完成多个门类的芯片设计和开发；同时积极布局新能源汽车领域，全力推进国产车规级模拟芯片的研发和生产，并通过车用IC可靠度 AEC-Q100 认证，以及ISO26262功能安全管理体系认证!

江苏润石始终坚持“自主创新，品质至上，团结协作，成就客户”为公司的核心价值，不断地推出具备更强竞争力和良好市场前景的模拟/混合信号芯片产品，携手客户共同发展，共创辉煌，让润石芯跳动在电子产品世界的每个角落，矢志成为全球一流的模拟芯片公司!

Runic Technology is a fast-growing, innovative semiconductor design and manufacture company that focus on general purpose and high-performance analog and mixed-signal ICs.

In order to deliver high quality and reliable analog ICs, especially automotive grade products, we have been working with manufacturing and assembly facilities that have achieved certifications in the internationally recognized standards of ISO 9001:2015, ISO 14001:2015, and, for automotive products, IATF 16949:2016.

Our Goal is to become a world-class analog IC supplier and bring our IC to serve worldwide customers.

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目录

受益于新能源汽车的蓬勃发展，汽车电子的需求增长迅猛；相较于传统汽车，新能源汽车对于模拟芯片的需求由电动化和智能化所催生。如动力系统、车身域、汽车座舱、自动驾驶、车载娱乐、车身电子及照明等领域。

新能源汽车对模拟芯片等电子元器件的可靠性要求极高；润石全力推进车规级模拟芯片的研发和生产，采用与国际一流车规级芯片原厂相同水准的制程，材料，工艺，选取拥有IATF16949资质，制程通过AEC-Q100认证且有实际车规量产经验的晶圆厂与拥有IATF16949资质，国际Tier1车规级芯片量产经验的封测代工厂如苏州日月新半导体，通富微电和华天科技合作，开发导入符合AEC-Q100 Grade1的车规级产品【湿敏等级达到MSL1】，由独立的第三方实验室做车规AEC-Q100的认证；润石在国际独立第三方检验与认证机构德国TÜV莱茵的辅导下，导入ISO26262 ASILD的功能安全流程体系。

公司依托无锡市良好的集成电路产业环境，整合上下游优势资源，积极布局新能源汽车领域，全力推进国产车规级模拟芯片的研发和生产。截至2023年11月，润石已有40多颗产品通过车规级认证并广泛应用在汽车领域。

Benefiting from the booming development of new energy vehicles, the demand for automotive electronics is growing rapidly; Compared to traditional cars, the demand for analog chips in new energy vehicles is driven by electrification and intelligence. In fields such as electrification, smart cockpit, telematics, ADAS, infotainment and lighting.

New energy vehicles have extremely high reliability requirements for electronic components such as analog chips; Runic technology is fully promoting the research and development and production of automotive grade simulation chips, using the same level of process, materials, and technology as international first-class automotive grade chip manufacturers. We have selected wafer factories with IATF16949 qualifications, AEC-Q100 certification in the process, and practical experience in automotive grade mass production. We have also collaborated with packaging and testing factories with IATF16949 qualifications and international Tier 1 automotive grade chip mass production experience, such as ATX Semiconductor (Suzhou) Co.,Ltd., Tongfu Microelectronics, and HT-tech, Develop and import vehicle specification grade products that comply with AEC-Q100 Grade1 [humidity sensitivity level reaches MSL1], and have the vehicle specification AEC-Q100 certified by an independent third-party laboratory; Runic has introduced the functional safety process system of ISO26262 ASILD under the guidance of the international independent third-party inspection and certification agency TÜV Rheinland in Germany.

Our company relies on the favorable integrated circuit industry environment in Wuxi City, integrates upstream and downstream advantageous resources, actively layout the field of new energy vehicles, and fully promotes the research and development and production of domestically produced automotive grade analog chips. As of November 2023, Runic has more than 40 products that have passed vehicle certification and are widely used in the automotive industry.

AEC-Q100测试项目
AEC-Q100 TEST ITEM

AEC-Q100是美国汽车电子协会(automotive electronics council, AEC)针对车载应用、汽车零部件、汽车车载电子制定实施的可靠性测试标准规范，目的是建立质量管理控制标准，提高车载电子的稳定性和标准化。AEC-Q100认证是集成电路厂商进入汽车领域的入场券，对芯片的质量和可靠性有极高的要求。与消费类半导体相比，汽车电子元器件与芯片的可靠性要求更高，需在更为苛刻的环境下保持正常运行。

AEC-Q100 is a failure mechanism based stress test qualification for packaged integrated circuits used in automo tive applications. This specification has been established by the Automotive Electronics Council (AEC) to define part-qualification and quality-system standards for packaged integrated circuits used in the automotive industry. In order to ensure proper function in harsh environment, electronics used in automotive industry has to meet higher quality and reliability standard that is defined in AEC-Q100.

序号 NO.	测试项目 Test Item Details	缩写 Abbreviation	检测方式 Referenced Standard
	A组 加速环境应力测试 Test Group A – Accelerated Environment Stress Tests		
A1	预处理 Preconditioning	PC	J-STD-020 JESD22-A113
A2	有偏温湿度或有偏高加速应力测试 High temperature/high humidity bias test Highly-accelerated stress test	THB/HAST	JESD22-A01 JESD22-A110
A3	高压或无偏高加速应力测试或无偏温湿度测试 Autoclave or Unbiased HAST or Temperature-Humidity (without Bias)	AC/UHST/TH	JESD22-A102 JESD22-A118 JESD22-A101
A4	温度循环 Temperature cycling test	TC	JESD22-A104
A5	高温存储寿命测试 High Temperature Storage Life	HTSL	JESD22-A103
	B组 加速寿命模拟测试 Test Group B – Accelerated Lifetime Simulation Tests		
B1	高温工作寿命 High Temperature Operating Life	HTOL	JEDEC JESD22-A108
B2	早期寿命失效率 Early Life Failure Rate	ELFR	AEC-Q100-008
	C组 封装组合完整性测试 Test Group C – Package Assembly Integrity Tes		
C1	绑线剪切 Wire Bond Shear	WBS	AEC-Q100-001
C2	绑线拉力 Wire Bond Pull	WBP	MIL - STD 883 Method2011
C3	可焊性 Solderability	SD	JESD22-B102
C4	物理尺寸 Physical Dimensions	PD	JESD22-B100 JESD22-B108
C5	锡球剪切 Solder Ball Shear	SBS	AEC-Q100-010
C6	引脚完整性 Lead Integrity	LI	JESD22-B105

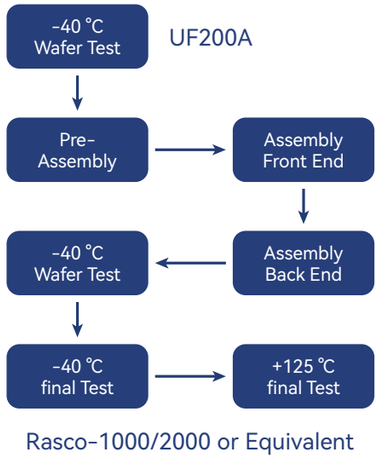
AEC-Q100测试项目
AEC-Q100 TEST ITEM

序号 NO.	测试项目 Test Item Details	缩写 Abbreviation	检测方式 Referenced Standard
D组 芯片晶圆可靠性测试 Test Group D – Die Fabrication Reliability Tests			
D1	电迁移 Electromigration	EM	JESD63
D2	经时介质击穿 Time Dependent Dielectric Breakdown	TDDB	JESD92
D3	热载流子注入 Hot Carrier Injection	HCI	JESD60/JESD28
D4	负温压温度不稳定性 Negative Bias Temperature Instability	NBTI	JESD90
D5	应力迁移 Stress Migration	SM	JEP39
E组 电气特性确认测试 Test Group E – Electrical Verification Tests			
E1	应力测试前后功能参数测试 Pre- and Post-Stress Function/Parameter	TEST	规格书 Datasheet
E2	静电放电 (HBM) Electrostatic Discharge Human Body Model / Machine Model	HBM	AEC-Q100-002
E3	静电放电 (CDM) Electrostatic Discharge Charged Device Model	CDM	AEC-Q100-011
E4	闩锁效应 Latch-Up	LU	AEC-Q100-004
E5	电分配 Electrical Distributions	ED	AEC-Q100-009
E6	故障等级 Fault Grading	FG	AEC-Q100-007
E7	特性描述 Characterization	CHAR	AEC-Q003
E9	电磁兼容 Electromagnetic Compatibility	EMC	SAE JI752/3
F组 缺陷筛选测试 Test Group F – Defect Screening Tests			
F1	过程平均测试 Process Average Testing	PAT	AEC-Q001
F2	统计良率分析 Statistical Bin/Yield Analysis	SBA	AEC-Q002

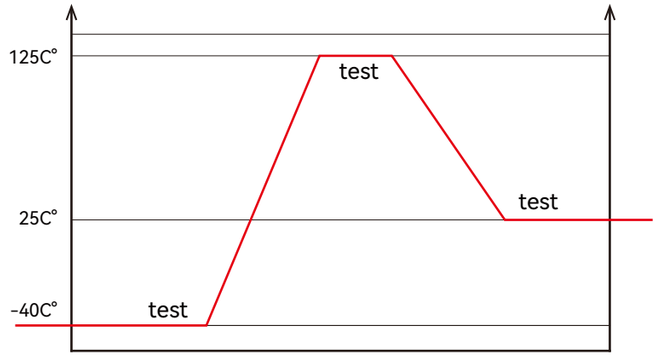
三温测试流程
TRI-TEMPERATURE TESTING PROCESS

选取与国际一流车规级汽车电子原厂相同且是行业最顶尖的Cohu三温测试设备，同时开创性地在晶圆级测试中使用低温测试方案，使用行业内最高水准，最通用的 TSK 三温Prober，使测试芯片能够更准确降温到指定温度；润石已经分批次购买数十台Cohu三温测试设备，首批已经投入使用。

Highest standard TSK tri-temperature prober and industry leading Cohu tester are used to implement Runic's tri-temperature test.



Rasco-1000/2000 or Equivalent



Rasco-1000

Rasco-2000

润石科技执行低温晶圆测试以筛选初期的晶圆级失效，在成品测试阶段保持常高温测试；润石的车规产品会经过100%的三温测试。

Runic implements low temperature test to screen wafer level early defects and room/high temperature tests for finished goods. All automotive grade products at Runic will go through full tri-temperature test flow.

车规产品质量设计
AUTOMOTIVE PRODUCT QUALITY DESIGN

江苏润石科技车规产品，以设计为质量基石，以两倍行业认证标准为质量保障，以最优的供应链为质量保驾护航，从而打造业内最高质量水准的车规产品。

Robust design is applied in RUNIC automotive product development, to keep good quality performance.

冗余设计
Green Product

1. 电路和版图设计采用冗余设计，在设计规则基础上加严10%~20%，关键指标加严50%；
2. 封装设计，采用与国际一流车规级汽车电子原厂相同的设计规则， 在芯片厚度，打线设计采用冗余设计；
3. 封装BOM，采用于国际一流车规级汽车电子原厂相同的材料.

……

1. Tighten 10%~20% limit in circuit and layout design, and tighten 50% in critical item.
2. Apply the same assembly design rule (die thickness / wafer saw / wire bonding…) as international first-class automotive electronics manufacturers.
3. Use the same assembly BOM with international first-class automotive electronics manufacturers.

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高标准可靠性认证体系
Strict Reliability Test Standard

可靠性认证，关键指标2倍于AEC-Q100 Grade 1标准，理论设计寿命达30年：

1. Automotive products all pass AEC-Q100 Grade1 & MSL1 certification.
2. And adopt more tighten reliability certification standards than AEC-Q100 to develop RUNIC automotive products to ensure that the theoretical design life is more than 25 years.

HTOL 125℃, 2000hrs | BHAST 130℃/85%RH 264hrs | TCT -65~150℃, 1000C | HTSL 150℃ 2000hrs

供应链质量体系
Supplier Quality System

1. 代工厂完全符合汽车电子生产标准IATF16949要求，并且必须有汽车电子量产经验；
2. 晶圆厂工艺平台通过AEC-Q100 Grade 1 （Group D）认证；
3. 成熟的车规产品生产控制计划
4. 100% 三温测试

1. All suppliers have been qualified by IATF16949, and have more than 7 years automotive product MP experience for Tier1 automotive IC company.
2. Fab process passed AEC-Q100 group D certification.
3. Rich experience in automotive product control plan , process flow and PFMEA.
4. Guarantee 100% tri-temperature test.

车规电子产品质量体系
AUTOMOTIVE ELECTRONICS QUALITY SYSTEM

在质量管理方面从DQE到SQE、CQE、QS建立质量规范、实施及保持质量管理体系，通过质量管理提升产品的制造设计、测试设计、可靠性验证从而提升产品质量。无论是进行AEC-Q100车规级认证还是导入ISO26262功能安全流程认证体系，不仅仅是满足汽车市场的应用，而是借此搭建起更严格的润石品控体系；是润石不断追求更高品质和质量管理水平，迈上质量管理新台阶的品质之路。

Runic Technology is continuously pursuing higher quality management systems. We have established DQE, SQE, CQE, QS to improve quality management on design, manufacture and test, which will result in higher product quality.

卓越的车规产品质量 (零缺陷, 零PPM, 零质量事故等等.)
High quality of automotive electronics (zero defect, PPM zero ppm, zero quality spill ,.etc)

质量目标：达到与国际一流车规级汽车电子原厂车规电子芯片相同的质量水准。
Quality objective: Achieve the same quality level as the world's fast-class automotive electronics chip.

人、机、料、法、环境
Human, Machine, Material, Method, Environment

在封测厂的外包商使用与国际一流车规级汽车电子原厂车规产品相同的人机料法环条件；对封测供应商进行每半年度的质量稽核。
The assembly factories apply 4M1E. Implements quality audit to suppliers every 6 months

车规电子的品质意识与方法 (零缺陷, 持续改善, 错误预防)
Quality awareness and method of automobile electronics (zero defect, continuous process improvement, error-proofing)

使用国际一流车规级汽车电子原厂的车规产品导入标准[APQP]在润石的车规产品导入上；持续推动封测代工厂做持续改善专案。
Runic implements APQP standard process on automobile products same as international tier 1 automobile product original manufacturer. Advance correct action plans to package contractors.

车规电子的质量要求范围
Automotive electronics quality requirement standard

定义润石的车规芯片的生产的指导文件与三温测试标准； 建立车规芯片的质量控制计划，测试监控机制等。
Define SOP and set up test standard for tri-temperature testing.Set up control plans and test surveillance plan for automotive grade products.

车规电子质量体系 (IATF16949, VDA6.3 , AEC-Q100)
Automotive electronics quality system (IATF16949, VDA6.3 , AEC-Q100)

选择具有TS16949认证与车规产品量产的封测厂与晶圆厂作为供应商；在润石公司内部引入并拿到ISO26262的汽车功能安全的体系认证；润石的车规芯片产品通过 AEC-Q100 Grade1 + MSL1 的可靠性认证。
Choose wafer foundries with TS16946 certification and automotive qualification standards.Implement and received ISO26262 functional safety standard certification.The Runic Technology automotive grade products pass AEC-Q100 Grade 1 + MSL1 qualification.

AEC-Q100认证料号
AEC-Q100 QUALIFICATION LIST

运算放大器 Operational Amplifier

Product	Feature	AEC-Q100	Package
RS8551-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers	√	SOT23-5
RS8552-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers	ON going	SOIC-8, MSOP8
RS8554-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers	ON going	SOIC-14
RS8557-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers	√	SOT23-5
RS321BK-Q1	1MHz, Precision, Rail-to-Rail I/O CMOS Operational Amplifier	√	SC70-5
RS621-Q1	7MHz, Rail-to-Rail I/O CMOS Operational Amplifier	√	SOT23-5
RS622-Q1	7MHz, Rail-to-Rail I/O CMOS Operational Amplifier	√	DFN2x2-8L
RS724-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier	√	TSSOP-14, SOIC-14
RS6332P-Q1	1.1MHz, Precision, Rail-to-Rail I/O CMOS Operational Amplifier	ON going	SOIC-8
RS721P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier	√	SOT23-5
RS722P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier	√	SOIC-8, MSOP8
RS8411-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier	√	SOT23-5
RS8412-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier	√	SOIC-8, MSOP8
RS8414-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier	√	TSSOP-14
RS8452-Q1	36V, 8MHz Rail-to-Rail Output CMOS Operational Amplifier	√	SOIC-8, MSOP8
RS8454-Q1	36V, 8MHz Rail-to-Rail Output CMOS Operational Amplifier	√	TSSOP-14, SOIC-14
RS8702-Q1	50MHz, Zero-Crossover, Low-Distortion, RRI/O Operational Amplifier	ON going	SOIC-8

比较器 Comparator

Product	Feature	AEC-Q100	Package
RS8905-Q1	Nano-Power, CMOS Input, RRIO, Push-Pull Output Comparator	ON going	MSOP8
RS8907-Q1	Nano-Power, CMOS Input, RRIO, Push-Pull Output Comparator	ON going	SOT23-5
RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator	√	SOT23-5
RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator	√	SOIC-8
LM2901-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparators	√	TSSOP-14, SOIC-14
LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparator	√	SOIC-8, MSOP8

模拟开关 Analog Switch

Product	Feature	AEC-Q100	Package
RS2233-Q1	Wide-Bandwidth 4-Channel SPDT Video Analog Switch	√	TSSOP-16
RS2251-Q1	CMOS Single 8-Channel Analog Multiplexer/Demultiplexer	√	TSSOP-16
RS2260-Q1	CMOS Single 8-Channel Analog Multiplexer/Demultiplexer	√	TSSOP16, QFN2.5x3.5-16L
RS2166-Q1	4.5Ω Single Bilateral SPST Analog Switch	ON going	SC70-5

电平转换器 Level Converter

Product	Feature	AEC-Q100	Package
RS0102-Q1	2-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications	ON going	VSSOP-8
RS0104-Q1	4-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications	√	TSSOP-14, QFN2x1.7-12L
RS0108-Q1	8-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications	√	TSSOP-20
RS0204-Q1	4-Bit Bidirectional Voltage-Level Translator with Automatic Direction Sensing	ON going	TSSOP-14, QFN3.5x3.5-14L
RS1T45-Q1	1-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs	√	SC70-6
RS2T45-Q1	2-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs	√	VSSOP-8
RS4T245-Q1	4-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Output	√	QFN2.5x3.5-16L
RS8T245-Q1	8-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Output	√	TSSOP-24

逻辑 Logic Series

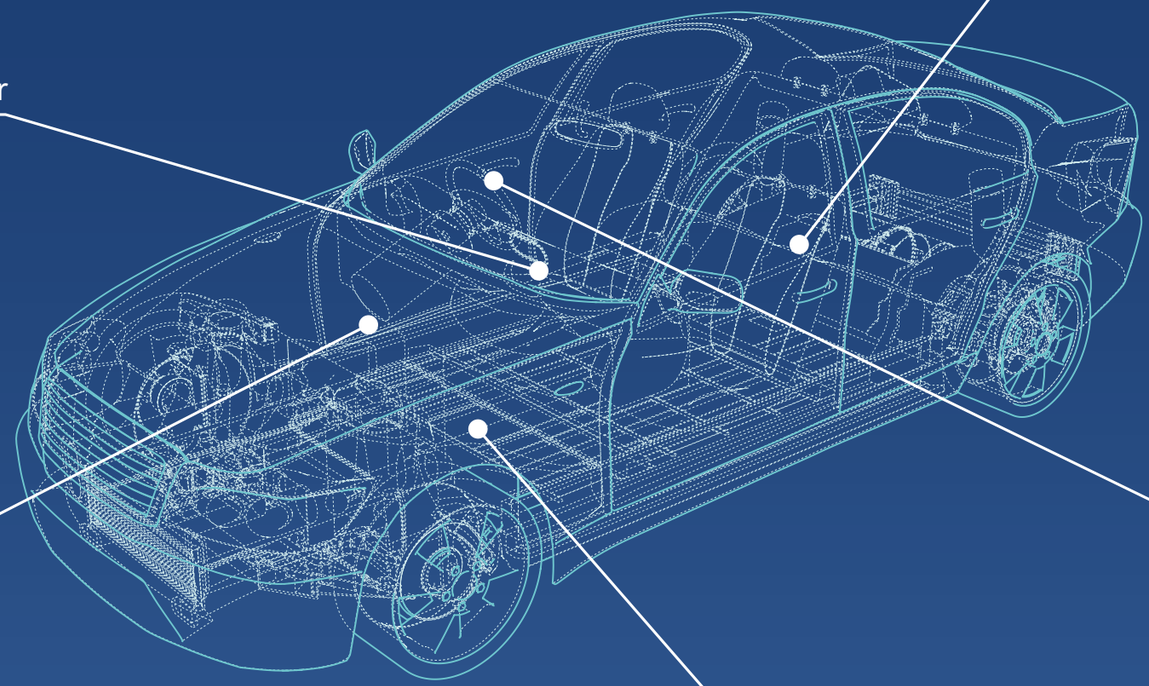
Product	Feature	AEC-Q100	Package
RS1G08-Q1	Single 2-Input Positive-AND Gate	√	SOT23-5, SC70-5
RS1G14-Q1	Single Schmitt-Trigger Inverter	√	SC70-5
RS1G17-Q1	Single Schmitt-Trigger buffer	√	SC70-5
RS1G32-Q1	Single 2-Input Positive-OR Gate	√	SOT23-5, SC70-5
RS1G74-Q1	Single Positive-Edge-Triggered D-Type Flip-Flop with Clear and Preset	ON going	VSSOP-8
RS1G125-Q1	Single Bus Buffer Gate With 3-State Output	√	SC70-5
RS1G175-Q1	Single D-Type Flip-Flop with Asynchronous Clear	ON going	SC70-6
RS3G11-Q1	Triple 3-Input Positive-AND Gate	ON going	TSSOP-14
RS4G00-Q1	Quadruple 2-Input Positive-NAND Gate	ON going	SOIC-14
RS4G08-Q1	Quadruple 2-Input Positive-AND Gate	ON going	SOIC-14, TSSOP-14
RS4GT08-Q1	Quadruple 2-Input Positive-AND Gate	ON going	TSSOP-14
RS4G32-Q1	Quadruple 2-Input Positive-OR Gate	ON going	SOIC14
RS4G125-Q1	Quadruple Bus Buffer Gate With 3-State Outputs	ON going	TSSOP-14
RS6G14-Q1	6-channel Schmitt-Trigger Inverter	ON going	SOIC14
RS244-Q1	Octal Buffer/Driver With 3-State Outputs	√	TSSOP-20
RS245-Q1	Octal Bus Transceiver with 3-State Outputs	ON going	TSSOP-20
RS595-Q1	8-Bit Shift Registers With 3-State Output	ON going	TSSOP-16
RS4538-Q1	Dual retriggerable precision monostable multivibrator	ON going	TSSOP-16

电压基准源 Voltage Reference

Product	Feature	AEC-Q100	Package
RS431-Q1	Precision Programmable Reference	√	SOT23
RS432-Q1	Precision Programmable Reference	√	SOT23

AUTOMOBILE ELECTRONIC SOLUTIONS

汽车电子解决方案



车载娱乐&仪表盘
Infotainment & Instrument Cluster

- 中控
- 仪表盘
- 抬头显示&音频系统
- 胎压监测
- 智能钥匙
- 车载T-BOX
- Infotainment
- Instrument Cluster
- Head Unit & Amplifier
- TMPS
- Smart key
- T-BOX(V2X)

车身电子&照明
Car Body & Lighting

- 车门控制模块
- 门窗系统
- 智能座舱
- 无线充电
- 安全气囊
- 行车记录仪
- 照明系统
- 空调系统
- BCM
- Door & Window & Seat
- Intelligent cockpit
- Mobile Wireless Charging & NFC
- Air bag
- Driving Recorder
- LED Lighting
- HVAC/PTC

动力总成
Powertrain

- 整车控制器
- 板载充电器
- 配电系统
- 电池管理系统
- 电机控制系统
- 电动机&发电机
- 变速箱
- 虚拟引擎声浪系统
- VCU
- OBC & DC-DC
- PDU
- BMS
- Inverter & Motor control & Pump
- Gear Box & Generator
- Gear Box
- VESS

底盘域
Chassis Domain

- 电动助力转向
- 悬架系统
- 线控制动系统
- EPS & ABS & EPB
- Suspension system
- BSC

自动驾驶&辅助驾驶
Autopilot &Driving

- 摄像头
- 超声波雷达
- 激光雷达
- 传感器
- Camera
- Ultrasound
- Radar & LiDAR
- Sensor fusion

POWERTRAIN

动力总成

电机控制系统
Motor control system

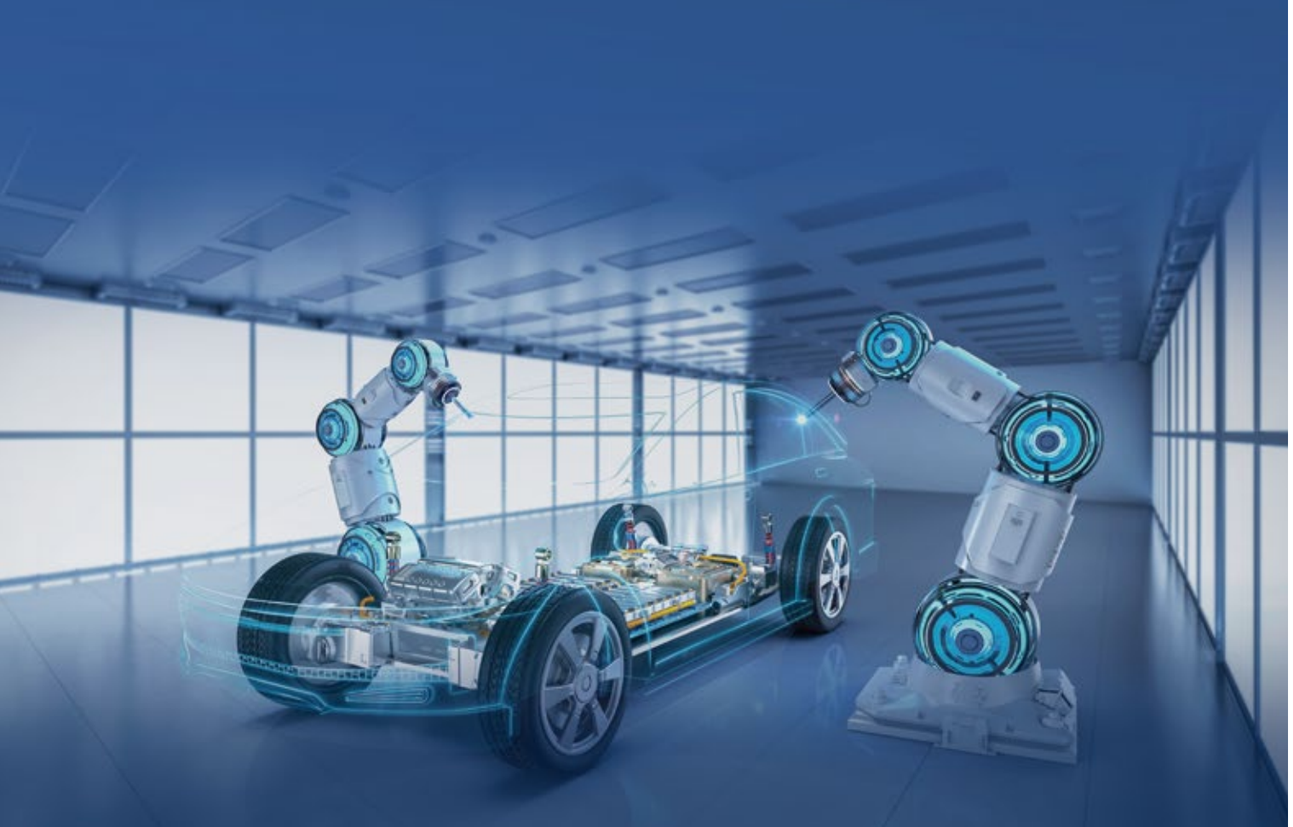
车辆控制单元
Vehicle Control Unit

电动汽车减速器
Electric Cars Reducing Gear

电池管理系统
Battery Management System

板载充电器
On-board charger

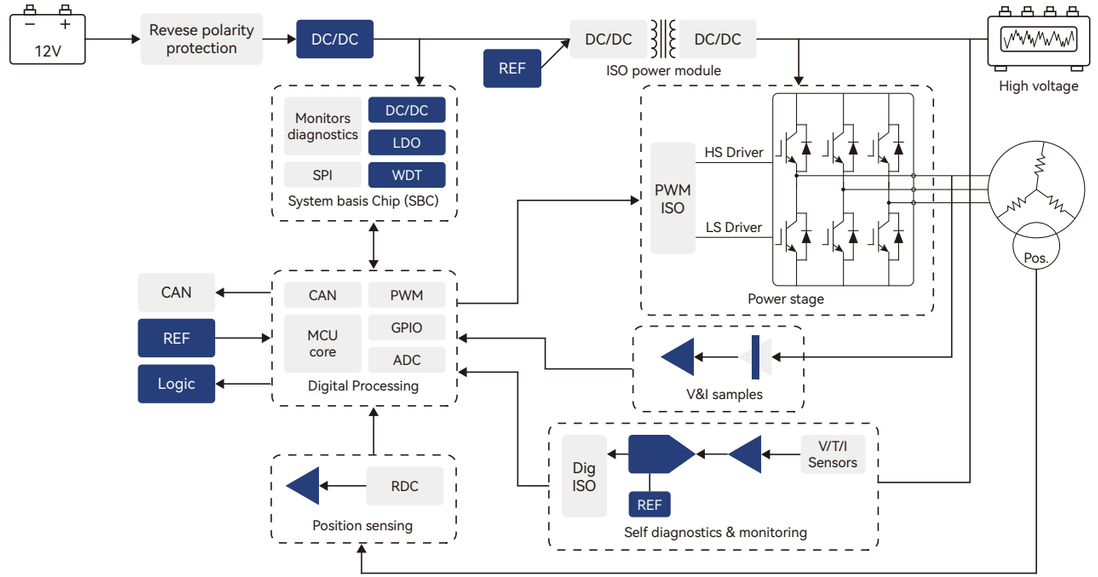
DC/DC转换器
DC/DC Converter



电机控制系统
Motor control system

在电动汽车中，电机控制器将动力电池所存储的电能转化为驱动电机所需的电能，来控制电动车辆的启动运行、进退速度、爬坡力度等行驶状态，或者将帮助电动车辆刹车，并将部分刹车能量存储到动力电池中。

We use motor drivers to give high power to the motor to control electric vehicle to move, climb or help to reduce speed and store brake energy into power battery.

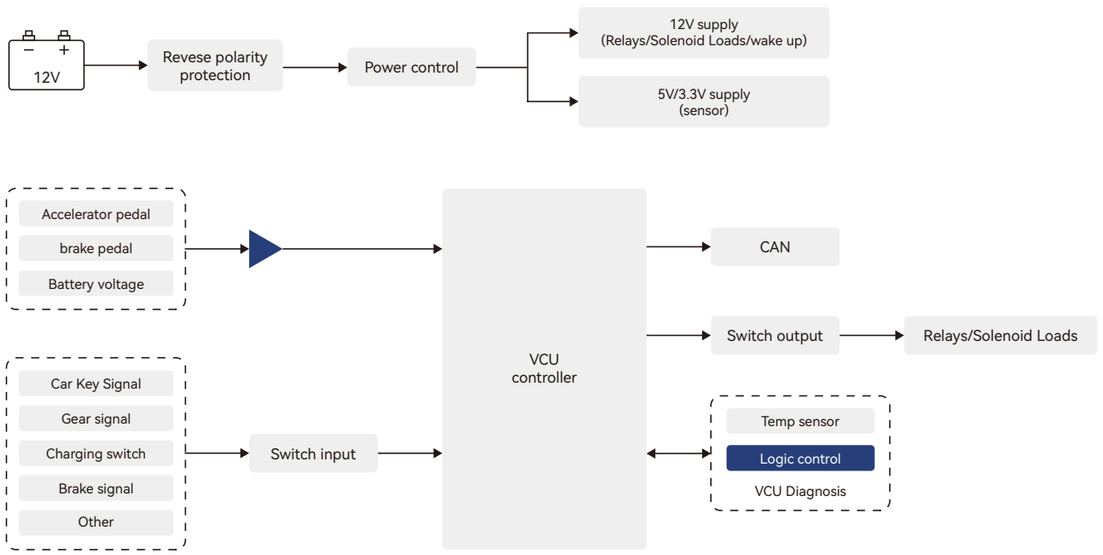


Product Category	Product	Feature
运算放大器 Operational Amplifier	RS721/2P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8411/2/4-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
	RS8452/4-Q1	36V, 8MHz Rail-to-Rail Output CMOS Operational Amplifier
	RS8557-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2901-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparators
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
电平转换器 Level converter	RS8T245-Q1	8-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Output
	RS4T245-Q1	4-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Output
	RS2T45-Q1	2-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Outputs
逻辑芯片 Logic IC	RS4G00-Q1	Quadruple 2-Input Positive-NAND Gate
	RS1G08-Q1	Single 2-Input Positive-AND Gate
	RS1G14-Q1	Single Schmitt-Trigger Inverter
	RS6G14-Q1	6-channel Schmitt-Trigger Inverter
	RS1G17-Q1	Single Schmitt-Trigger buffer
电压基准源 Voltage Reference	RS431-Q1	Precision Programmable Reference
	RS432-Q1	Precision Programmable Reference

车辆控制单元
Vehicle Control Unit

车辆控制单元是新能源汽车的核心控制部件，主要功能是解析驾驶员需求，监控汽车行驶状态，协调控制单元如BMS、MCU、EMS、TCU等的工作，实现整车的上下电、驱动控制、能量回收、附件控制和故障诊断等功能。

Vehicle control unit (VCU) is the core of the entire control system , the main function of VCU is analyze driver's need , monitor driving status , coordinate with BMS, EMS and TCU to fulfill vehicle power ,drive control, energy recovery, accessory control and fault functions diagnosis.

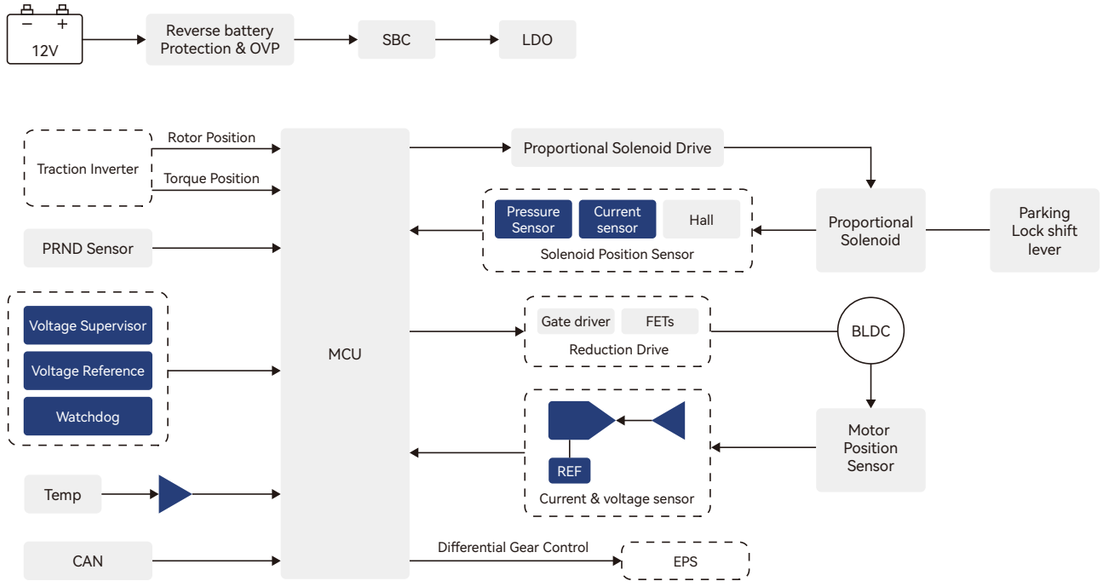


Product Category	Product	Feature
运算放大器 Operational Amplifier	RS721/2P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8412/4-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
电平转换器 Level Converter	RS0104-Q1	4-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications
	RS0204-Q1	4-Bit Bidirectional Voltage-Level Translator with Automatic Direction Sensing
	RS0108-Q1	8-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications
	RS8T245-Q1	8-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Output
电压基准源 Voltage Reference	RS431-Q1	Precision Programmable Reference

电动汽车减速器
Electric Cars Reducing Gear

电动减速机在原动机和工作机或执行机构之间起匹配转速和传递转矩的作用，减速机是一种相对精密的机械，使用它的目的是降低转速，增加转矩。

A reducer adjusts and conveys revolutions. The reducer is a precise machine used to reduce speed and increase the torque.

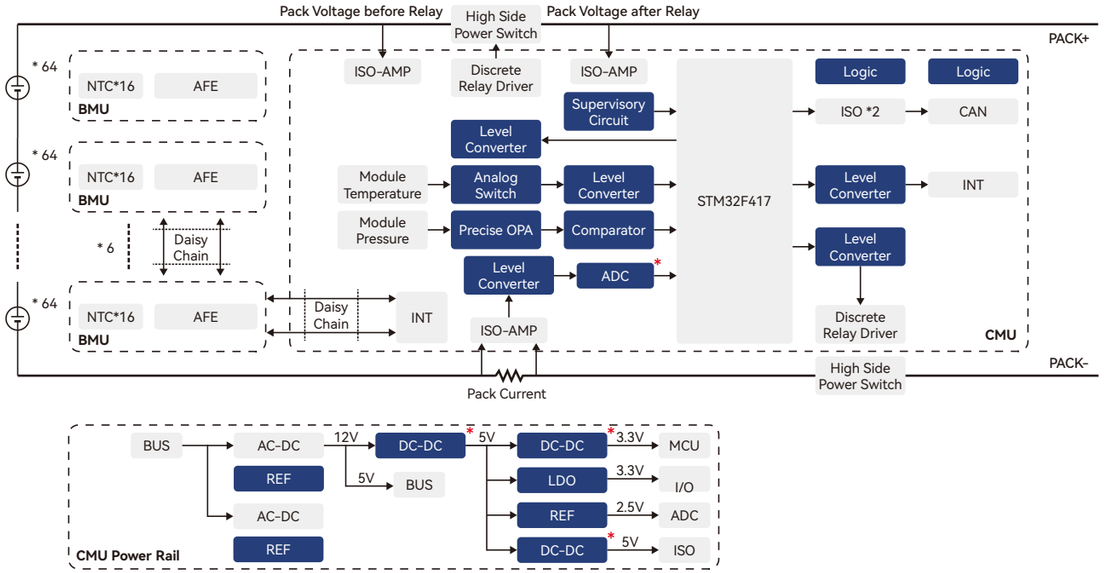


Product category	Product	Feature
运算放大器 Operational Amplifier	RS721P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8412-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
逻辑芯片 Logic IC	RS1G17-Q1	Single Schmitt-Trigger buffer
电压基准源 Voltage Reference	RS431-Q1	Precision Programmable Reference

电池管理系统
Battery Management System

动力电池是电动汽车的核心，而电池管理系统则是其中的核心，是对电池进行监控和管理的系统，通过对电压、电流、温度以及SOC等参数采集、计算，进而控制电池的充放电过程，实现对电池的保护，提升电池综合性能的管理系统，是连接车载动力电池和电动汽车的重要纽带。

The power battery is the core of an electric vehicle and battery management system is the core of power battery. BMS monitors and manages battery through voltage , current , temperature and SOC parameter and calculation to controlling and protecting the process of battery charging and battery releasing and enhancing a comprehensive performance.

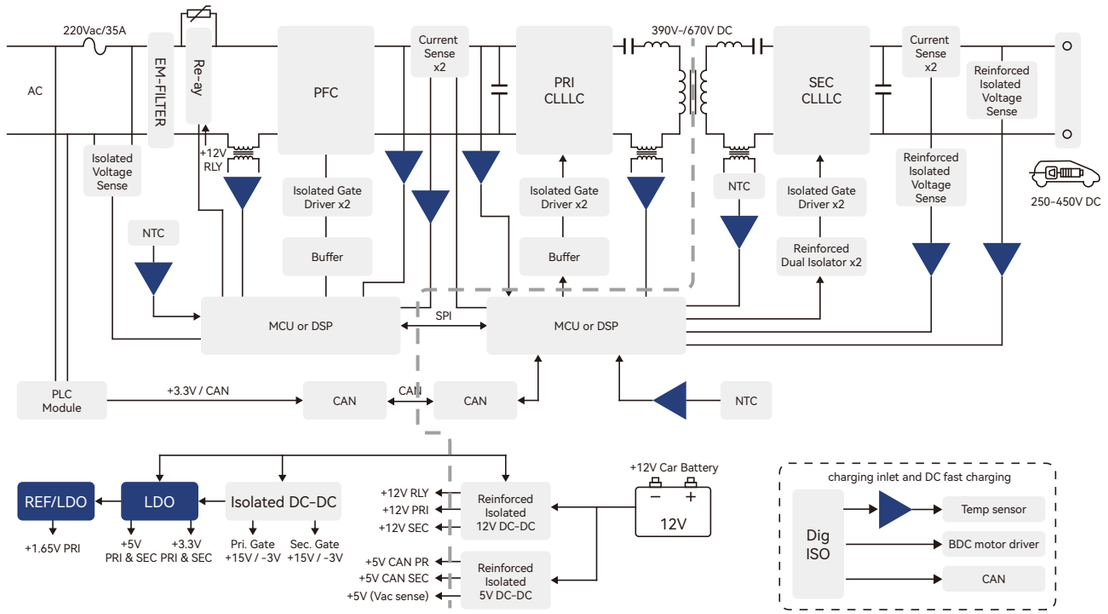


Product Category	Product	Feature
运算放大器 Operational Amplifier	RS721/2/4P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8412/4-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
	RS8557-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2901-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparators
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
电平转换器 Level Converter	RS0108-Q1	8-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications
	RS0204-Q1	4-Bit Bidirectional Voltage-Level Translator with Automatic Direction Sensing
逻辑芯片 Logic IC	RS4G00-Q1	Quadruple 2-Input Positive-NAND Gate
	RS1G08-Q1	Single 2-Input Positive-AND Gate
	RS4G08-Q1	Quadruple 2-Input Positive-AND Gate
	RS1G17-Q1	Single Schmitt-Trigger buffer
	RS1G125-Q1	Single Bus Buffer Gate With 3-State Output
电压基准源 Voltage Reference	RS431-Q1	Precision Programmable Reference

板载充电器
On-board charger

板载充电器，顾名思义，是安装于汽车上的，并配备气体或液体冷却装置，应对不同功率水平下的热管理。根据架构不同，OBC的输出电压有时需低至250VDC或以下，当为汽车的主电池组充电时又需达到800VDC及以上。

An onboard charger (OBC) is a power electronics device in electric vehicles and equipped with liquid or gas cooling device to react to multiple power standards. The output voltage of OBC would depend on the conditions.

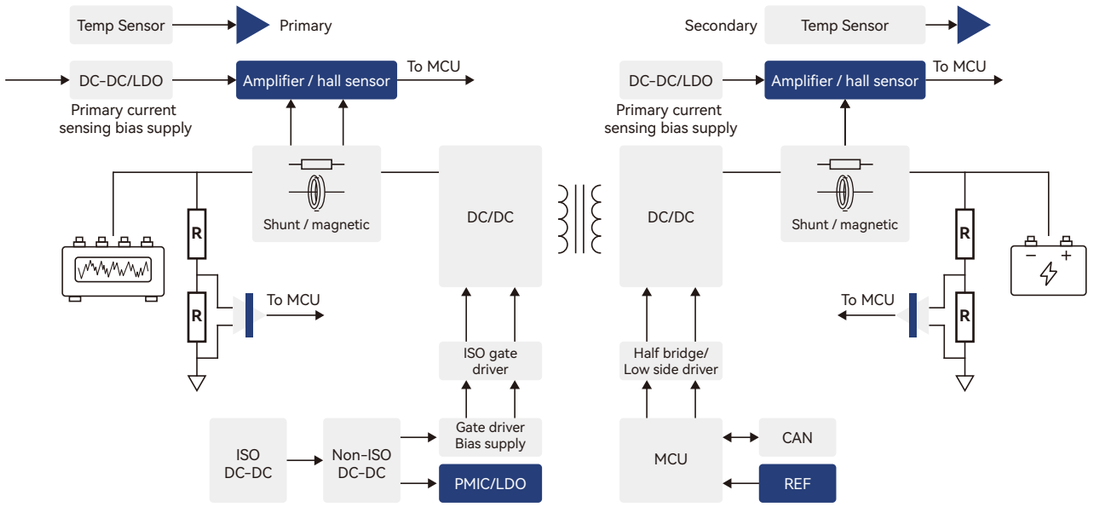


Product Category	Product	Feature
运算放大器 Operational Amplifier	RS721/2/4P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8412/4-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
	RS8557-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2901-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparators
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
模拟开关 Analog Switch	RS2251-Q1	CMOS Single 8-Channel Analog Multiplexer/Demultiplexer
电压基准源 Voltage Reference	RS431-Q1	Precision Programmable Reference

DC/DC转换器
DC/DC Converter

DC/DC转换器，作为电动汽车动力系统中很重要的一部分，它的一类重要功用是为动力转向系统，空调以及其他辅助设备提供所需的电力。另一类，是出现在复合电源系统中，与超级电容串联，起到调节电源输出，稳定母线电压的作用。

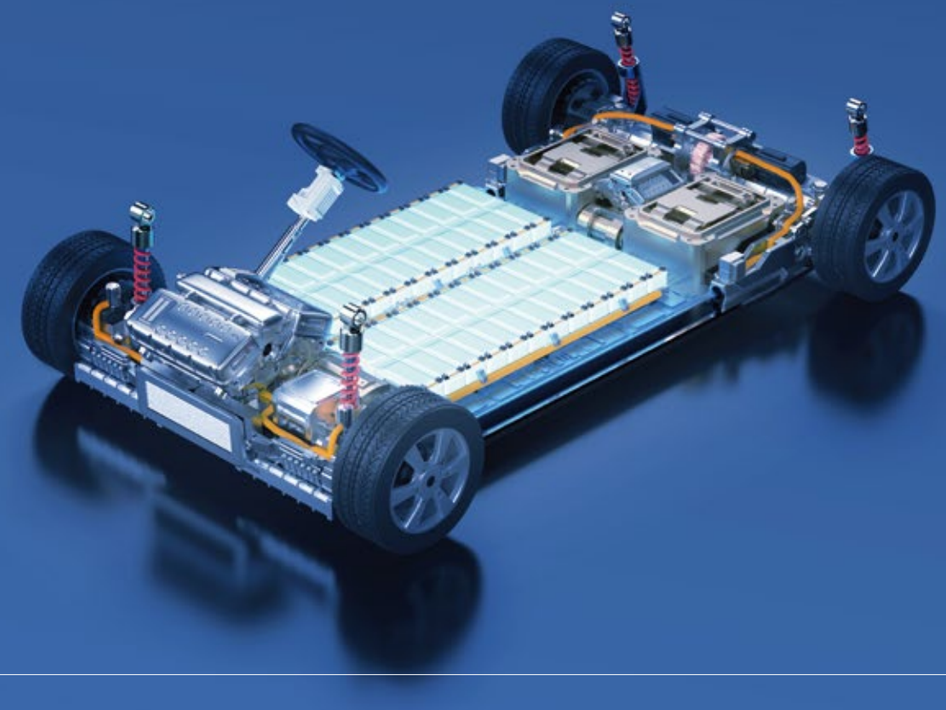
DC/DC converter is an important part of the electric vehicle power system. The DC/DC converter is to provide power for steering system, air conditioner and other auxiliary equipment.The other type of DC/DC converter is used on composite power system and is connected with super capacitor to regulate the output voltage and stabilize BUS.



Product Category	Product	Feature
运算放大器 Operational Amplifier	RS721/2/4P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8412/4-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
电压基准源 Voltage Reference	RS431-Q1	Precision Programmable Reference

CHASSIS DOMAIN
底盘域

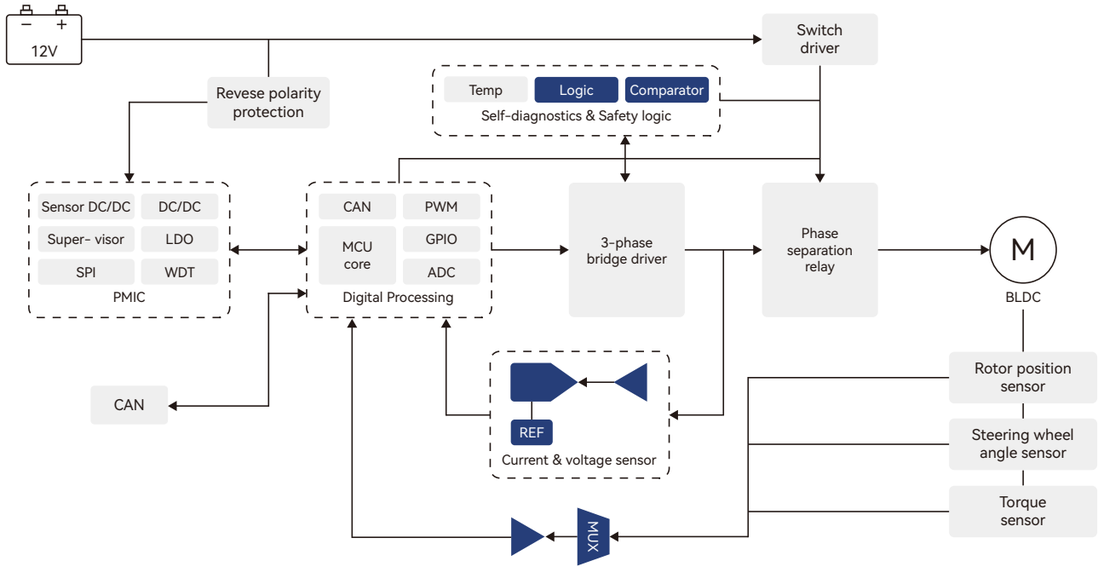
电动助力转向
Electric Power Steering



电动助力转向
Electric Power Steering

电动助力转向系统是利用电动机产生的动力来帮助驾驶员进行转向操作，系统主要由三大部分构成，信号传感装置、转向助力机构及电子控制装置。电动机仅在需要助力时工作，驾驶员在操纵转向盘时，扭矩转角传感器根据输入扭矩和转向角的大小产生相应的电压信号，车速传感器检测到车速信号，控制单元根据电压和车速的信号，给出指令控制电动机运转，从而产生所需要的转向助力。

The EPS controls and assists with the support of an intelligent electric motor the vehicle steering. The EPS is comprised of three mains –sensor device, power steering mechanism and electronic control unit.



Product Category	Product	Feature
运算放大器 Operational Amplifier	RS721/2/4P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8412/4-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
	RS6332P-Q1	1.1MHz, Precision, Rail-to-Rail I/O CMOS Operational Amplifier
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2901-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparators
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
逻辑芯片 Logic IC	RS1G08-Q1	Single 2-Input Positive-AND Gate
	RS1G125-Q1	Single Bus Buffer Gate With 3-State Output

BODY ELECTRONICS & LIGHTING
车身电子&照明

车身控制模块
Car Body Control Module

暖通空调系统
HVAC Compressor

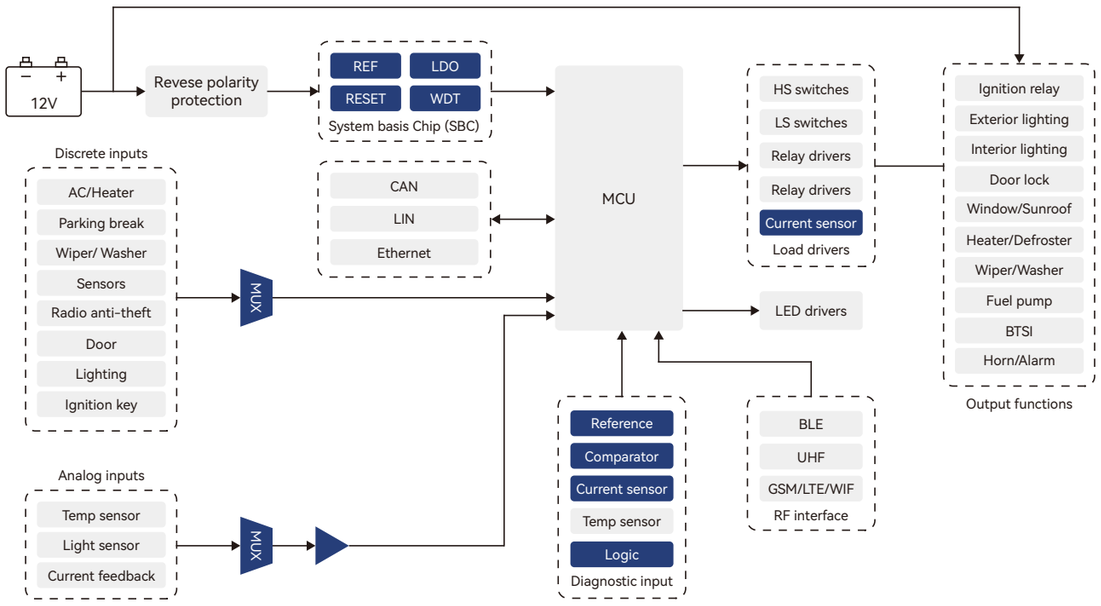
车门模块
Automotive Door-module

PTC控制器
PTC Controller

车身控制模块
Car Body Control Module

车身控制模块是一个高集成度的芯片，它可以实现车辆安全性、舒适性等功能的智能化操作，包括车门车窗遥控上锁与开锁、电动后视镜、中控门锁、玻璃升降装置、车灯、仪表背光调节和电源分配等。

Body control modules (BCM) depend on highly reliable electronic components to monitor and control car safety and comfortability including window, electric rearview mirror, central door lock, glass lifter, car lights, instrument backlight and power distribution.

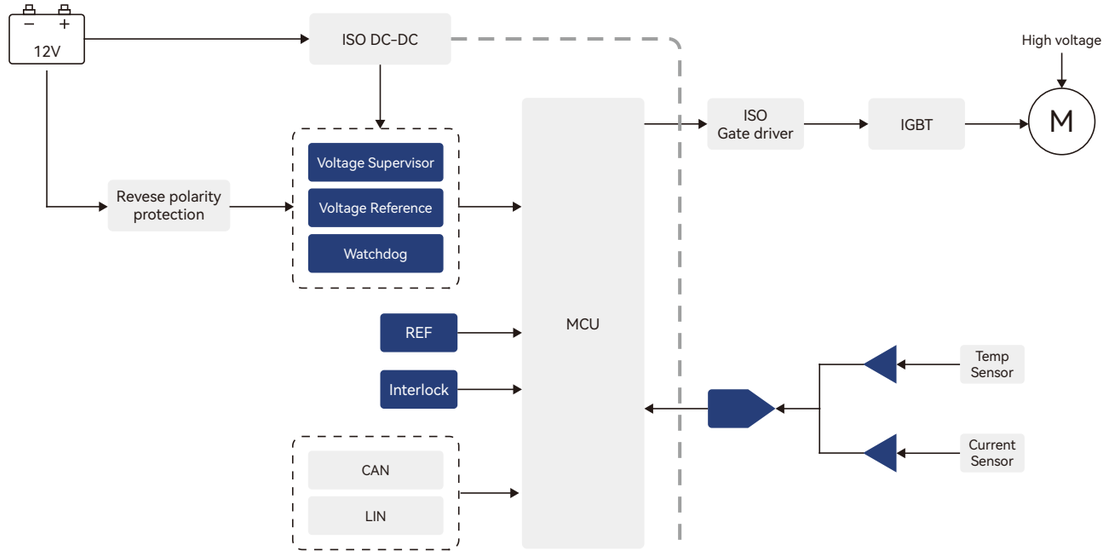


Product Category	Product	Feature
运算放大器 Operational Amplifier	RS8411/2/4-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
	RS6332P-Q1	1.1MHz, Precision, Rail-to-Rail I/O CMOS Operational Amplifier
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2901-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparators
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
模拟开关 Analog Switch	RS2251-Q1	CMOS Single 8-Channel Analog Multiplexer/Demultiplexer
	RS2260-Q1	CMOS Single 8-Channel Analog Multiplexer/Demultiplexer
电平转换器 Level Converter	RS0108-Q1	8-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications
	RS0204-Q1	4-Bit Bidirectional Voltage-Level Translator with Automatic Direction Sensing
逻辑芯片 Logic IC	RS1G17-Q1	Single Schmitt-Trigger buffer
	RS1G125-Q1	Single Bus Buffer Gate With 3-State Output

暖通空调系统
HVAC Compressor

暖通空调 (HVAC) 系统旨在调节、加热、冷却、通风、清洁或除湿车厢内的空气质量 (IAQ)。暖通空调系统由前端的传感器和机械/电子开关、鼓风机电机、执行器以及制冷装置组成，这些装置将空气输送到后端的座舱，以确保驾驶员和乘客的热舒适性。

HVAC systems control the ambient environment –adjust temperature, air flow and air filtering.

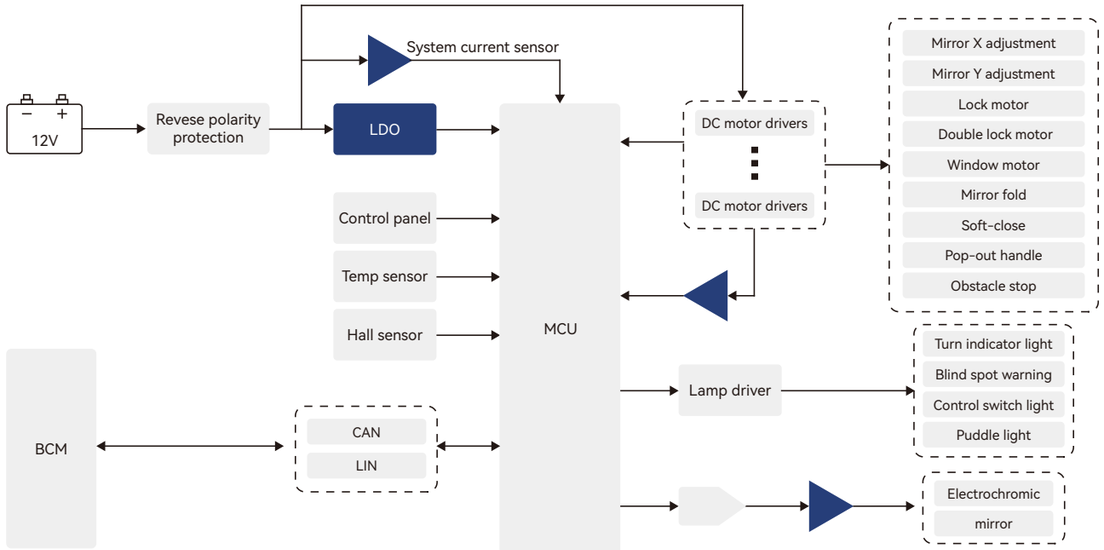


Product Category	Product	Feature
运算放大器 Operational Amplifier	RS721/2/4P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS8412-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
比较器 Comparator	RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2901-Q1	General-Purpose High-Voltage Open-Drain Output Quad Comparators
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
电压基准源 Voltage Reference	RS431-Q1	Precision Programmable Reference

车门模块
Automotive Door-module

车门控制模块也叫车身控制单元，是对车门及车门周边电器部件如玻璃升降及防夹，中央门锁，后视镜调节，门灯等进行智能化集中控制的一种汽车电子产品。

The door control module (DCM) also known as door control unit (DCU).DCM is an intelligent centralized automotive product to adjust mirror , door lock , rearview mirror , door light and so on.

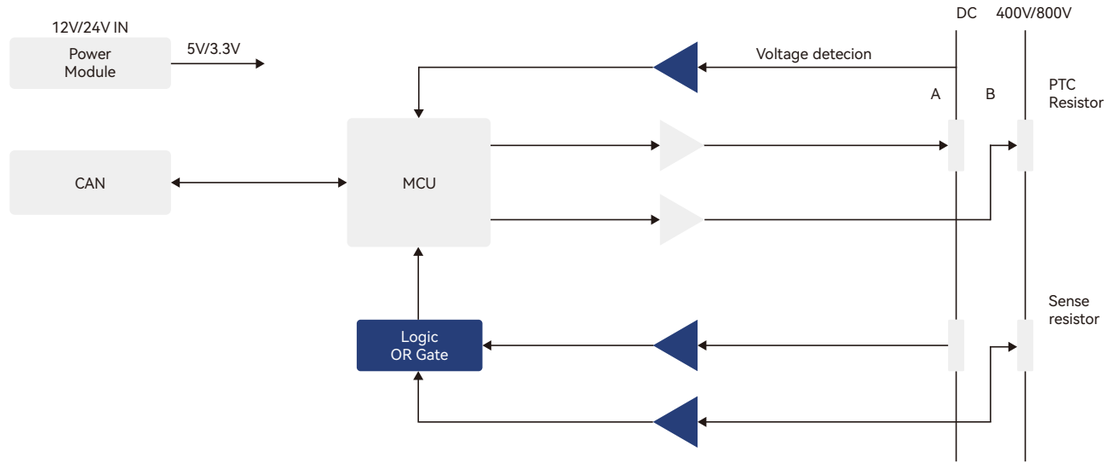


Product Category	Product	Feature
运算放大器 Operational Amplifier	RS8412-Q1	36V, 1.2MHz Rail-to-Rail Output CMOS Operational Amplifier
	RS6332P-Q1	1.1MHz, Precision, Rail-to-Rail I/O CMOS Operational Amplifier
比较器 Comparator	RS331-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator

PTC 控制器
PTC Controller

PTC 加热器控制器可以实现整车空调系统制热功率的精确控制，在达到同等制热效果的条件下降低制热功耗，进而增加续航里程。同时可以将PTC 加热器工作状态上传至整车通讯,网终并提供各种保护。

The PTC heater controller can realize the accurate control of the heating power of the vehicle air conditioning system, reduce the heating power consumption under the condition of achieving the same heating effect, and then increase the endurance mileage. At the same time, the working status of the PTC heater can be uploaded to the vehicle communication, and provide various protections.



Product Category	Product	Feature
运算放大器 Operational Amplifier	RS8557-Q1	Zero-Drift, Rail-to-Rail I/O CMOS Operational Amplifiers
	RS722P-Q1	13MHz, Rail-to-Rail I/O CMOS Operational Amplifier
	RS199-Q1	Bidirectional, Zero-Drift, High or Low Side,Voltage Output, Current Shunt Monitor
比较器 Comparator	RS393-Q1	General-Purpose Low-Voltage Open-Drain Output Comparator
	LM2903-Q1	General-Purpose High-Voltage Open-Drain Output Dual Comparator
逻辑芯片 Logic IC	RS1G32-Q1	Single 2-Input Positive-OR Gate
线性稳压器 Linear Regulator	RS3005	150mA, Low Power Consumption,High Voltage CMOS LDO Regulator
	RS3007	300mA LOW POWER LDO

IN-CAR ENTERTAINMENT & DASHBOARD

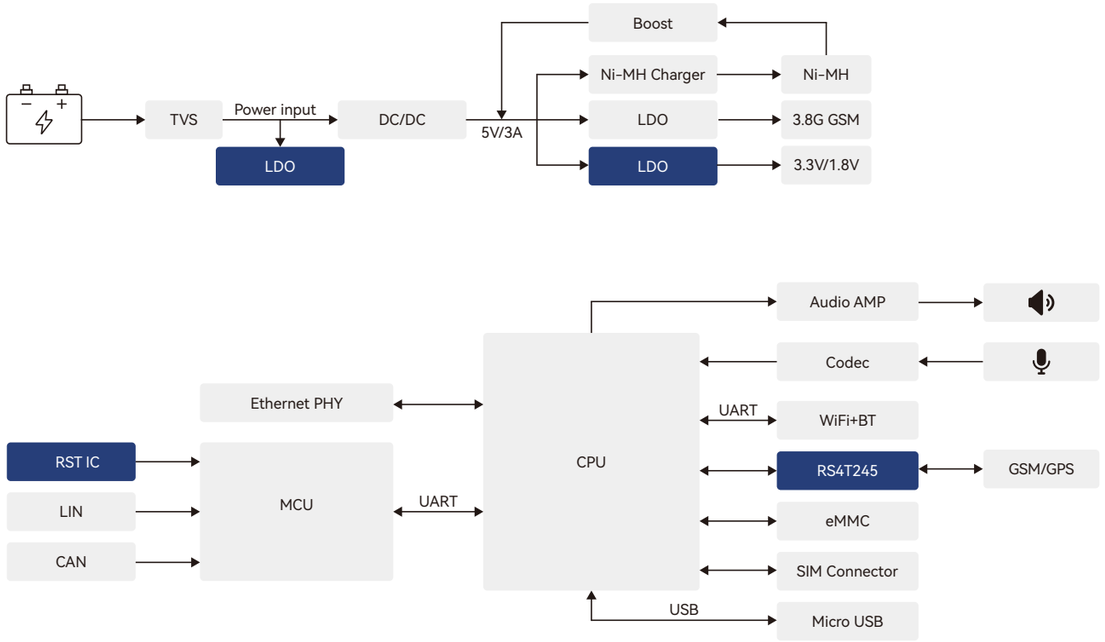
车载娱乐&仪表盘

T-BOX
T-BOX

T-BOX
T-BOX

T-BOX是车联网系统，它专门用汽车上，全称叫做telematics box，通俗来讲就是用远距离通信和信息科学技术，为汽车提供行车数据采集、远程查询和控制、监测故障等等服务，比如它可以为我们提供故障诊断、道路救援、远程开锁、控制空调等等。

T-BOX (telematics box) is car networking system. T-box provides data collection, remote control and fault monitoring by using long distance communication and information science. T-box can provide fault diagnosis, road rescue, remote unlock and air conditioning.



Product Category	Product	Feature
线性稳压器 Linear Regulator	RS3007	300mA LOW POWER LDO
	RS3236	Low Power, Low Dropout, 500mA RF Linear Regulators
电平转换器 Level Converter	RS0102-Q1	2-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Application
	RS0104-Q1	4-Bit Bidirectional Voltage-Level Translator for Open-Drain and Push-Pull Applications
	RS0204-Q1	4-Bit Bidirectional Voltage-Level Translator with Automatic Direction Sensing
	RS4T245-Q1	4-Bit Dual-Supply Bus Transceiver with Configurable Voltage Translation and 3-State Output
复位 Reset IC	RS706	Supply Voltage Supervisor with Watchdog and Manual Reset

汽车电子其他应用

Automotive Electronics Other Applications

Gear box					
运算放大器 Operational Amplifier	RS721/2/4P-Q1	比较器 Comparator	LM2903-Q1	逻辑芯片 Logic Gate	RS4G00-Q1
	RS321B-Q1				RS1/2/4G08-Q1
	RS6332P-Q1	电压基准源 Voltage Reference	RS431-Q1		RS1G17-Q1
	RS8411/2/4-Q1		RS432-Q1		RS1G125-Q1

VESS			
运算放大器 Operational Amplifier	RS721/2/4P-Q1	比较器 Comparator	LM2903-Q1
	RS321B-Q1		
	RS6332P-Q1	电平转换器 Level Converter	RS0102-Q1
	RS8411/2/4-Q1		RS2T45-Q1

Intelligent cockpit					
运算放大器 Operational Amplifier	RS62X	电平转换器 Level Converter	RS010X-Q1	线性稳压器 Linear Regulator	RS3236
			RS2T45-Q1		RS3007
模拟开关 Analog Switch	RS2227		RS4T245-Q1	负载开关 Load Switch	RS2588
	RS2228				

GPS Tracker			
运算放大器 Operational Amplifier	RS8511-Q1	线性稳压器 Linear Regulator	RS3221
比较器 Comparator	RS8901		

Mobile wireless charging			
运算放大器 Operational Amplifier	LM358	线性稳压器 Linear Regulator	RS73xx-1

Driving recorder					
运算放大器 Operational Amplifier	RS62X	电平转换器 Level Converter	RS010X-Q1	线性稳压器 Linear Regulator	RS3236
			RS2T45-Q1		RS3007
模拟开关 Analog Switch	RS2227		RS4T245-Q1	负载开关 Load Switch	RS2588
	RS2228				

汽车电子合作客户

Automotive Electronics Corporate Customers