## Main oversea offices have been established





## SHANGHAI TIMI MOTOR TECHNOLOGY CO., LTD. A DIVISION OF SIEYUAN ELECTRIC CO., LTD.



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# Timi is the Low Voltage **Automotive Tier-1** of Sieyuan Electric

A global leader in the electrical industry

**TIMI / SIEYUAN MISSION** 

Innovating and Surmount

> **OUR CORE** VALUES

Openness and Collaboration

> Self-criticism and Reflection

Sieyuan Electric Co., Ltd.



## **ABOUT SIEYUAN GROUP**

#### **Sieyuan Electric Company Profile**

Sieyuan Electric Co., Ltd, is a well-known, publicly-listed company in China (Stock code: 002028) devoted to electric power technology research, equipment manufacturing, and project services. Through the acquisition of domestic Power Transmission & Distribution equipment manufacturers, Sieyuan Electric has developed a deep and wide product range in various specialized fields of Power Transmission & Distribution technology, covering both primary & secondary equipment. Sieyuan Electric has been dedicated to manufacturing reliable, cutting-edge electrical equipment for more than 50 years.

As a recognized leader in global Power Transmission & Distribution Equipment & Engineering, Sieyuan aims to make electricity transmission and distribution safer, more controllable, and more efficient. Using its comprehensive product range and professional engineering design, Sieyuan continues to provide innovative products, solutions and EPC turnkey services to major power system customers, industrial utilities and power plants in more than 70 countries. Sieyuan's experts and core values provide strong technical support for Timi's products and services. Sieyuan has a family of subsidiary companies in Li-ion batteries and ultracapacitors.

## **High-voltage electrical group**

# Sieyuan® Sieyuan Electric Co., Ltd.

Shanghai Sieyuan Optoelectronics Co., Ltd. Shanghai Sieyuan High Voltage Switchgear Co., Ltd. Jiangsu Rugao High Voltage Electric Apparatus Co., Ltd. Jiangsu Sieyuan Hertz instrument Transformer Co., Ltd. Shanghai Sieyuan Power Capacitor Co., Ltd Sieyuan Qingneng Electric & Electronic Co., Ltd. Shanghai Sieyuan Hongrui Automation Co., Ltd. Shanghai Sieyuan Transmission & Distribution Engineering Co., Ltd. Jiangsu Juyuan Electric Co., Ltd. Changzhou Sieyuan Toshiba Transformer Co., Ltd.







#### Make power transmission and distribution safer, more controllable and more efficient!

## **Automotive Electronics Group**

## Tími



 Tier 1 supplier of automotive OEMs Established in 2018 Based in Shanghai, China

## GMCC



 GMCC is Timi's strategic partner for production and development of ultracapacitor • Established in 2010

Based in Wuxi. China



sech

JSET

JSET is Timi's strategic partner for production and development of Li-Batterv cells Established in 2021 Based in Wuxi, China

Extensive experience in

• Established in 2017

Based in Switzerland

ultracapacitor R&D, engineering, sales and marketing

## **Milestones in the Automotive Field**



-3-

## **Concept of Automotive Business**

- Focus on low-voltage energy storage and power distribution systems
- Provide a wide range of safe and reliable power supply solutions



## Shanghai Timi Motor Technology Co., Ltd.

#### **Timi Company Profile**

Shanghai Timi Motor Technology Co., Ltd. was founded in 2018 by Sieyuan Electric Co., Ltd. to be Sieyuan's Tier-1 low voltage power and energy global leader. Leveraging the strong core values of the parent company, Timi focuses on designing and manufacturing innovative low voltage, high-power solutions that advance automotive electrification. The Timi company maintains its leadership position by actively researching and responding to the next-generation automotive electrical architectures. Our dedicated professionals include experts from OEM advanced teams to ensure detailed understanding of our customer's needs. Timi incorporates world class simulation capabilities in all aspects of product design to quickly analyze the efficacy of proposed solutions w/o expensive, time-consuming iterative prototyping processes.

The family of Sieyuan's Automotive Group companies ensures our products are based upon cutting-edge, cost-effective LIB (JSET) and supercapacitor (SECH & GMCC) cells. Our sister companies produce their low voltage power products on automated cleanroom lines in both China and Free-Trade regions, as OEMs need. When the sister companies' capabilities are combined with Timi's leading power electronics, BMS, and software design and manufacturing capabilities, OEMs are guaranteed the best solutions for their automotive 12V and 48V needs. In order to streamline OEM design processes in a growing virtual design world. Timi is working to create and offer virtual cell and product models to potential OEM customers in App, Online, and database formats.

The Timi company is uniquely qualified to provide cost-effective, leading-edge, turnkey solutions. Our main products include QM to ASIL D 12V/48V Li-ion battery and supercapacitor modules, as well as 12V/48V electronic fuse-based products like PNGs, PDUs, Aggregators, etc.

# Li-ion Battery

**UCAP** module

ultra-long cycle life

lifespan

 Specialized high-power cells Platformized BMS technology Customized "All in One" solutions · Fully developed in-house, from cell

- to BMS to pack
- Offer 12V and 48V products
- Systematic protection function and comprehensive protection strategy Solutions with functional safety level from QM to ASIL D,
- cybersecurity level up to CAL2 Low quiescent current detection
- -4-

 Wide operating temperature range ultra-low internal resistance,

• Low thermal runaway risk, can be packaged in passenger cabin

• Large instantaneous charge and discharge current capabilities

 Adaptive charge and discharge solution extending ultracapacitor's

 Meet customer functional safety and cybersecurity requirement

 Ultracapacitor degradation assessment based on calendar life, and online capacity and internal resistance

#### Electronic fuse switch ⊣₽₹

- Switching simulation ensures safety under various operating conditions
- Extremely low FIT rate
- Prevent localized overheating by simulation and experiment, extending device lifespan
- Protection strategies and ripple measurement derived from high-voltage power grid experience
- Solutions with safety level from ASIL B to ASIL D

## **Main Products Introduction**

## **Li-ion Battery**

+ 12V 13Ah ASIL B Main power supply





- High charging & discharging capabilities, 25C/42C pulse charging & discharging, 10C/15C continuous charging & discharging
- Equipped with 5 pairs of MOSFETs, enabling door unlocking in the event of a collision that triggers a 1500A short circuit
- Multiple low-current charging circuits of 0.5A, 1A, 2A, and 4A, adapting to different application scenarios such as low temperature or severe undervoltage
- · Control strategy that lockouts at critically low SOC and discharges only when overvoltage, ensuring stable operation performance in all scenarios
- · High-precision sampling, hardware coulometer, OCV and EKF calibration ensure SOC accuracy

#### +12V 30Ah ASIL B Main power supply for L4 autonomous vehicle





- Two independent battery modules for the dual redundant power supply system
- · Equipped with low-temperature heating function, can ensure high power level output at low temperature. Suitable for vehicles with strict requirements at low temperature
- High charging & discharging capabilities of 300A pulse charging & discharging, and 250A continuous charging & discharging
- · Magnetic retention relay as switch with low power consumption and high load capacity, safe and reliable, long service life
- Large capacity (30Ah) for long-time output (100A for 18mins), can provide high power level output after DCDC failure, ensuring vehicle can be safely pulled over

## +12V 13Ah ASIL C

#### Backup power supply for safe loads



- 4 independent outputs (braking, automated parking, door unlocking and calling for roadside assisstance), with different control strategies based on collision or power failure
- Intelligent charging circuit with input voltage range of 9-16V, variable current of 0-7A. Automatically adjust charging current to optimal level, meet SOC calibration requirement
- · Unique algorithm to ensure high accuracy of SOX. Reasonable product SOC range to extend product's service life
- · SOC reconfirmation based on small slope algorithm and SOH evaluation technology. No need for full discharge, suitable for backup battery
- · Backup power supply with ASIL C certification meets strict safety load requirements of vehicle
- · Precise control of SOC range based on SOF evaluation, ensuring 15 years of calendar life

## +12V 13Ah QM

### Main power supply, with considerable cost benefit



wake-up

#### +48V 5Ah ASIL B Backup power supply for steer-by-wire system



- Built-in heating system to meet the performance requirements over the full working temperature range (-30 C ~65 C)
- Small size, light weight, high IP protection level, high functional safety level, MOSFET as power switch
- or overcurrent, isolate safety loads from regular loads
- Uninterrupted power supply for steer-by-wire(SBW) system or other 48V loads
- Intelligent energy supplement from HV battery during long-term parking



Relay as main switch, continuous current capability of 120A. Suitable for low-voltage architecture of entry-level EV

Cost optimization and system platformization solution, integrating MCU, SBC and AFE in one chip, with significant cost advantage

Bypass power supply through low-power consumption MOSFET during parking, featuring short circuit protection and overcurrent

 Same cell with other Li-ion battery product, high power output core, ensuring battery charging and discharging performance



• Support 4 outputs, each output has independent electronic switch, can quickly respond to circuit fault such as short circuits

## **Main Products Introduction**

## **UCAP** module

#### +12V 5F CPM

Power supply for door unlocking during collision or power failure







Auto type

- · Trigger type will be activated by external unlock signal, while auto type activates when main power source fails
- Ultra long lifespan design, meeting high product life requirement of OEM

Trigger type

- Working temperature range of -40 C~65 C to ensure operation in extremely cold and hot conditions
- Greater than 0.1Wh of stored energy can be supplied when main power supply fails. Support more than 2 hours of rescue standby time, bringing high safety level
- · 2 output ports, can be customized and extended to 4 output ports. Support 25A discharge current, with 25A fuse installed ensuring circuit safety and functional integrity
- · CPM could be directly connected between door lock module and its power supply with no need of further modification of the electrical architecture
- · Small size, light weight, convenient installation, cutting-edge technology, meet the safety and cost demand for customer

### • 12V 120F Backup for SBW Backup power supply for steer-by-wire system



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- Excellent charge and discharge performance at low temperature, providing safe and reliable power for high power loads across the full temperature range of -40 C ~65 C
- No thermal runaway, minimizing fire or explosion risk
- · Large instantaneous charge and discharge current, especially suitable for transient high power scenario
- Provide a heterogeneous power supply solution for automotive electrical architectures (main Li-Ion and backup UCAP) to further enhance redundancy and safety
- Include protection and cybersecurity functions to meet the strict requirements for vehicle electrical architecture design
- Reinforced structural design prevents gas leakage, eliminates the need for exhaust pipe, facilitating vehicle layout

#### 12V 55F Transient support Provide transient support for busbar voltage



- The module is able to emit and absorb current in order to keep the voltage range of the LV system within a permitted working range
- · Meet SOF requirements across full temperature range
- · Safe and reliable, no thermal runaway
- · MOSFET in replace of fuse as power switch, can quickly respond to circuit fault including short circuits, overcurrent and overvoltage, deliver solid protection capability
- · Include protection and cybersecurity functions, can meet the strict requirement for vehicle electrical architecture design

### +12V 120F Start/Stop Power supply for engine start-stop motor



# • 48V 16F EDLC



- Wide operating temperature range (-40 C ~65 C, short time at 65 C ~ 85 C for discharging) · Suitable for high power requirement but low energy consumption load system. With EDLC, DCDC power capacity, low-volt-
- age battery capacity, and cable cross-sectional area can be reduced
- No thermal runaway, can be packaged in the passenger cabin
- as a backup power supply for other 48V loads, such as steer-by-wire (SBW) systems
- Suitable for vehicles with 48V or mixed 12V and 48V systems



Provide sufficient power for the engine start-stop motor independently of the electrical system

Full working temperature range -40 C ~65 C, full life cycle of 15 years ensuring high power output performance, while enhancing stability of 12V power system of the vehicle

Safe and reliable, no thermal runaway, small size and light weight

#### Instantaneous power support and energy recovery for active stabilization bar



· Both input and output have electronic switches installed to rapidly respond to circuit faults. Support 4 outputs to enable use

## **Main Products Introduction**

## **Electronic fuse switch**

#### PNG (LCS)

Isolate ordinary load and safe load





- · Rapidly disconnect ordinary load during fault or power supply malfunction. Ensure power supply for safe load stay unaffected, realizing safety level of ASIL B(D)
- · Well-designed MOSFET switch with long service life and low failure rate. No need for maintenance during vehicle lifecycle
- · Capable of reclosing based on control strategy, enhancing power supply reliability in instantaneous short-circuit case such as car crash
- · MOSFET switch trips in µs level with highly accurate fault protection function regarding trip threshold and delay
- Driven by bypass circuit, which can significantly reduce the quiescent power consumption during parking
- · Allow flexible installation anywhere in the vehicle, providing design versatility for customer

### • PNG (PIS)

#### Isolate DCDC power supply and 12V battery power supply



Current and voltage protection between Li-ion battery and DCDC

- · Diagnostic and measurement functions
- · Powernet isolation function can achieve ASIL D safety level
- · Bidirectional continuous current capacity of 300A, capable of withstanding short-circuit current
- · Optional ripple voltage and ripple current monitoring in the range of 20Hz-25kHz

#### • xPDU

#### Power distribution unit with multiple output ports





- Equipped with advanced protection function to guard against short circuit / reverse current or voltage / overtemperature / overvoltage / overcurrent / surge / pulse, etc.
- Protection system responds in less than 150µs. Protection precision is within 5%
- · Include reclosing and voltage/current measurement function

## **Manufacturing Capability**





Pack line overview

Cell feeding

• Timi provides a series of highly reliable products to enable our customers to better serve end users and help them achieve their design goals. Timi's robust supply chain team is well-equipped to adapt to flexible market trends, offering just-in-time service to OEMs. Our fully automated production lines ensure top-tier quality in manufacturing, supported by ERP, MES, and WMS system. Our end-to-end traceable system is available 24/7 to guarantee the safety of our customers and end users. We continually seek ways to enhance the flexibility, speed, and efficiency of our manufacturing and process technologies.

## **Test Capability**



Electromagnetic **Compatibility Lab**  Supercomputing center

• Timi, features cutting-edge testing capabilities through its supercomputing center and specialized test facilities. Our high-performance supercomputing system optimally manages resources for advanced simulations in mechanical, thermal, EMC, and power systems. Our test center conducts essential evaluations, including EMC testing, environmental adaptability assessments, electrical performance and mechanical property tests. Additionally, Timi's battery performance lab is equipped with over 600 charge-discharge test channels, enabling precise testing for various specifications under strict standards such as GB/T31484-2015 and IEC62133.



Cell adhesive stack assembly

Battery performance lab Electrical and mechanical performance Lab

## **Achievements and Certifications**

## Timi: Automotive Low Voltage Power Supply & Distribution Innovator





# **Our Customers**

