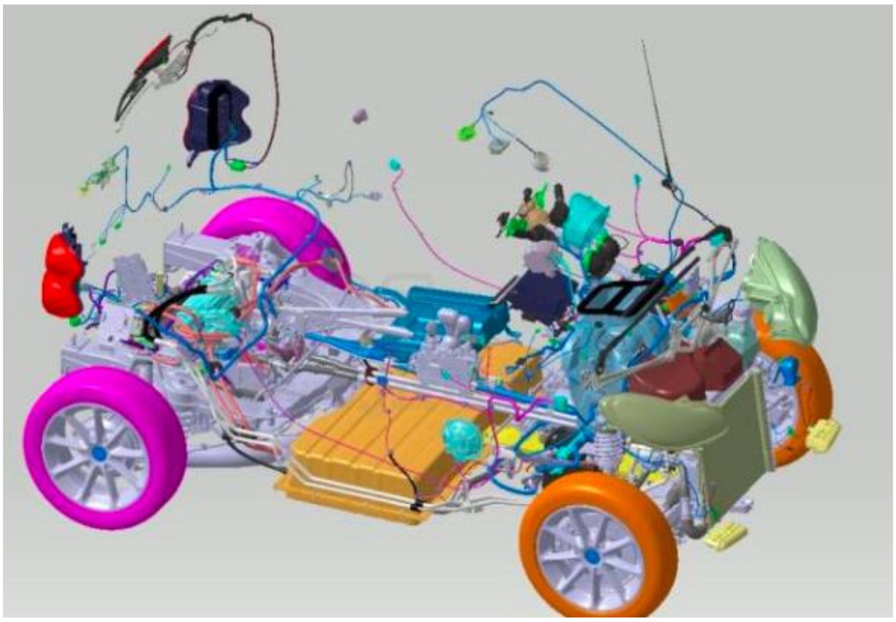
48V Architecture Testing for New Energy Vehicles

In 2023, global automobile sales reached 92.72 million units, with new energy vehicle (NEV) sales accounting for 14.65 million units, representing a market share of 15.8%. According to the latest market trend report on electric vehicles (EVs) released by the International Energy Agency (IEA) on April 23, it is projected that by 2035, EVs will account for over 50% of global new car sales. With promising market prospects, the NEV industry is experiencing rapid technological advancements and increasingly fierce competition.

It is well known that the automotive industry is evolving towards electrification and intelligence. Currently, NEVs primarily use lithium batteries, and their range and charging speed remain key constraints on their development. The power transmission capacity of the supply system follows fundamental electrical principles, where P = UI. To achieve higher power output, either the system voltage level must be increased or thicker wiring must be used to carry greater current. However, increasing current inevitably leads to higher conductor usage and greater thermal losses. Given the limitations of component costs, size, and weight, raising the power supply voltage level in automotive electrical systems is a more economical solution.

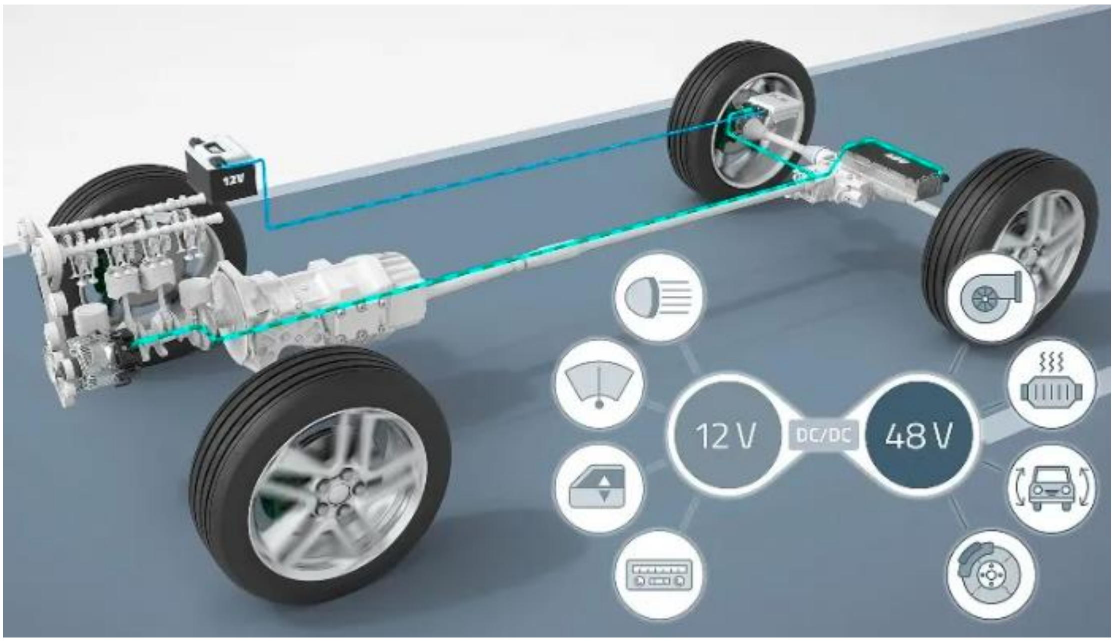
The electrical systems of NEVs are divided into high-voltage and low-voltage sections. The high-voltage section includes the battery, motor, power electronics, and high-voltage wiring. To meet fast-charging demands, mainstream manufacturers are widely equipping their new models with 800V high-voltage architecture and promoting this feature extensively. In contrast, the low-voltage automotive electronic system—including control systems, power systems, sensor systems, multimedia systems, lighting systems, and safety systems—is mainly advancing towards intelligentization. However, the auxiliary battery remains at the 12V level.



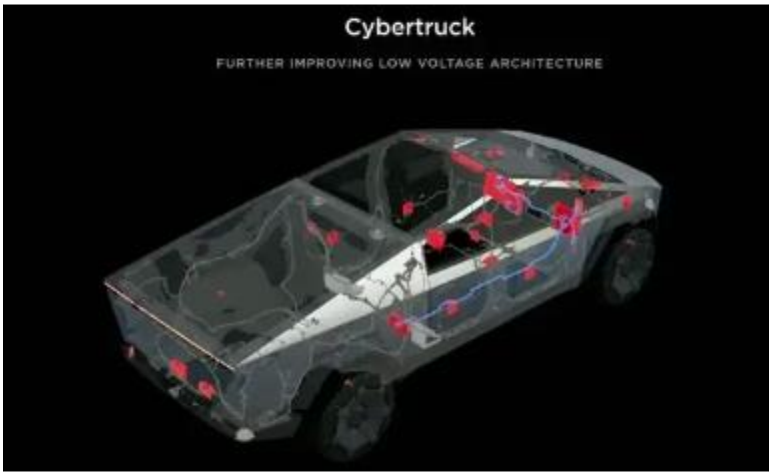
The 12V automotive electrical architecture has been in use for over 70 years and is a highly mature system. However, it has nearly reached its capacity limits, struggling to support the growing demand for intelligent and entertainment features.

A 48V system offers four times the capacity of a 12V system while enabling smaller, lighter wiring and components with higher integration. It supports higher power demands while reducing the manufacturing and operating costs of electric vehicles. Additionally, staying below the 60V safety threshold, it strikes a balance between performance and safety.

Despite these advantages, the market has been slow to adopt higher low-voltage levels. Currently, 48V architectures are primarily used in mild hybrid vehicles, including models from Mercedes-Benz, BMW, Audi, Toyota, and Hongqi. Leading component suppliers include Bosch, Continental, Valeo, and Schaeffler. In practice, 48V and 12V systems coexist, resulting in a more complex circuit structure.



In December 2023, Tesla delivered its Cybertruck, marking the first adoption of a 48V electrical architecture in its vehicles. The company plans to implement this technology across all future models. Tesla CEO Elon Musk has even shared system design patents with other automakers, encouraging broader industry adoption of the 48V architecture. Given Tesla's massive order backlog, this move will undoubtedly accelerate the adoption and development of 48V systems, providing a significant boost to its market prospects.



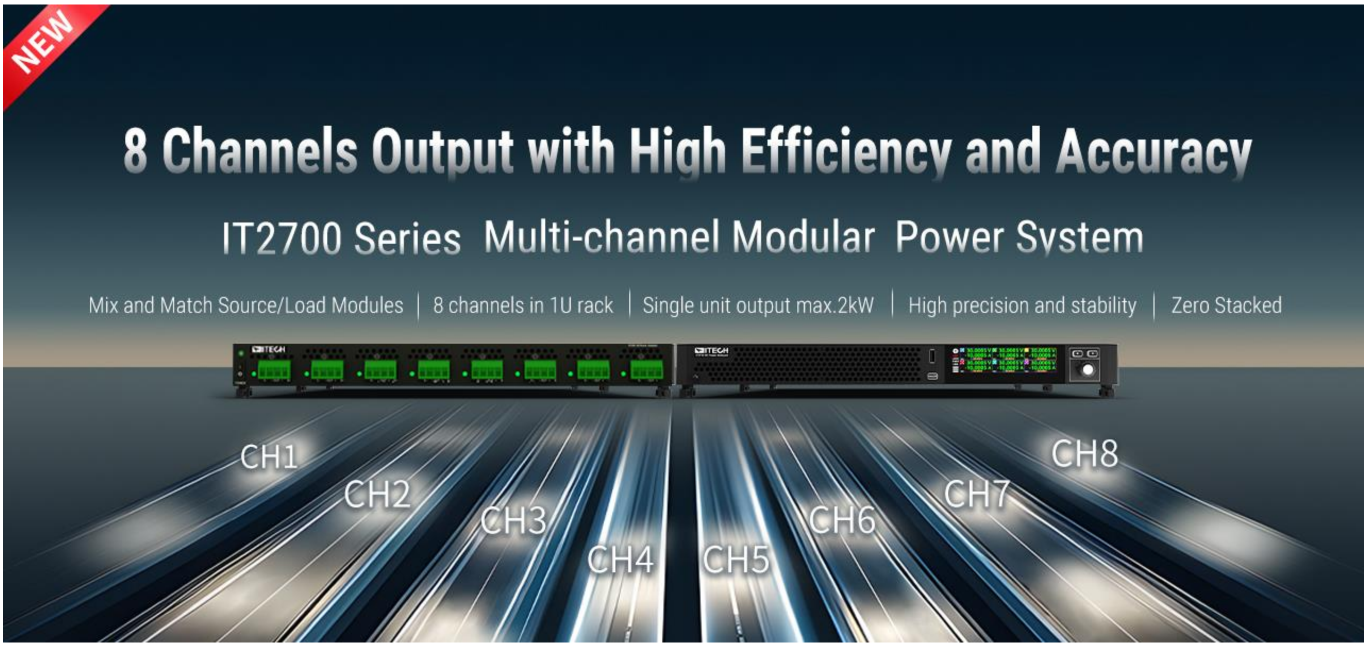
Shifting to a 48V electrical system requires not only higher-performance batteries but also upgrading all low-voltage components, including audio systems, wipers, lighting, wiring harnesses, switches, and motors. Tesla's pioneering move creates new opportunities for automotive component suppliers while also introducing new challenges, particularly in ensuring product reliability and safety.

ITECH provides professional and efficient electrical testing solutions for automotive electronics.

With a wide range of automotive electronic products, production lines demand highly efficient and integrated testing solutions. The IT2700 Multi-channel Modular Power System delivers ultra-high power density with 30V/60V/150V wide-range output, covering all low-voltage automotive system testing needs.

The 1U mainframe accommodates up to eight 200W modules or four 500W modules, offering flexible module selection, including bi-directional DC power supplies, unidirectional DC power supplies, and regenerative DC electronic loads. Modules can be mixed, synchronized, or paralleled, providing maximum adaptability.

Standard features include LAN, USB, CAN communication interfaces, digital I/O interfaces, and free upper computer software, making it ideal for DC-DC modules, power devices, DC motors, batteries, and power management chips across R&D, design verification, and ATE system integration in manufacturing.

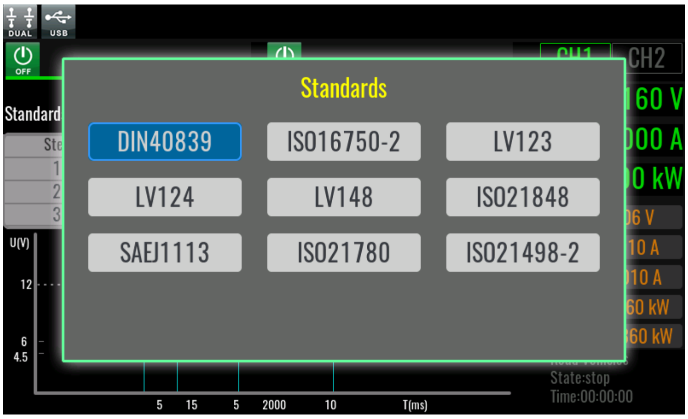


The IT6000C and IT-M3900C bi-directional DC power supplies come with built-in voltage waveforms for automotive power network testing, supporting industry standards such as LV123, LV148, DIN40839, ISO-16750-2, SAE J1113-11, LV124, ISO 21780, and ISO 21848.

The newly launched IT6600C high-power bi-directional DC power supply further expands compliance with ISO 21498-2, bringing the total to nine regulatory test functions.

The ISO 21780:2020 standard, issued by ISO, specifies the electrical requirements and testing procedures for components used in 48V DC automotive electrical systems. It covers general system requirements, voltage ranges, as well as slow voltage transients and fluctuations.

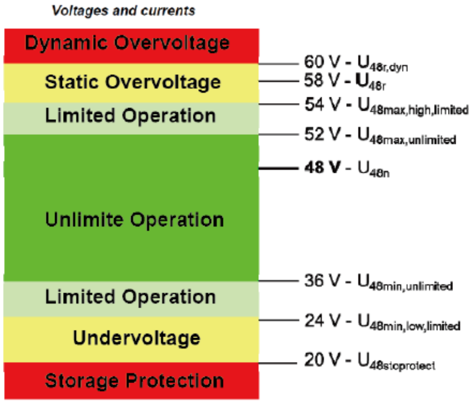
The IT6600C series features an intuitive touchscreen graphical interface, making operation more user-friendly and efficient.



IS-O217-80	ISO21780波形协议	
	TEST-01	标称电压范围
	TEST-02	• Upper Range：过渡电压的上限范围 • Lower Range：过渡电压的下限范围
	TEST-03	短时过电压
	TEST-04	供电部件的抛负载控制试验
	TEST-05	启动特性
	TEST-06	长时过压
	TEST-07	可能提供电能的消耗组件的过电压
	TEST-08	供电电源的减小和增加
	TEST-10	重新初始化
	TEST-11	电源电压中断

LV148, "Electrical and Electronic Components in Automobiles – Requirements and Test Conditions for 48V On-Board Electrical Systems," was jointly released by major German automakers and is widely adopted in the industry.

The IT-M3900C series Bidirectional Programmable DC Power Supply supports 32V-1500V with built-in automotive electronic waveforms, making it suitable for both high-voltage and low-voltage system testing. With a power range of 2kW-12kW and high power density, it provides a compact yet powerful solution for comprehensive automotive electronics testing.



LV148	LV148波形协议	
E-01	长期过电压实验脉冲 测试了组件对长期过电压的抵抗力。模拟了驾驶过程中的发电机控制故障。	
E-02	瞬态过电压实验脉冲 由于负载的切断和加速器加速踏板的插入，可能会在电气系统中产生瞬态过电压。通过该测试可以模拟这些过电压。	
	Short	短时模式（3 times）
	Endurance	持续模式（1000 times）
E-03	瞬态欠压实验脉冲 电气系统中的瞬态欠压可能会由于负载接通而发生。这些欠压通过此测试进行模拟。	
E-04	跃变启动实验脉冲 模拟车辆的起步。最大测试电压来自商用车辆系统及其升高的电气系统电压。	
E-06A	缓慢降低和增加供电电压（不存储能量） 模拟了在车辆电池缓慢放电和充电过程中发生的电源电压的缓慢下降和升高。	
	T1 Holding Time	持续时间
E-06B	缓慢降低和增加供电电压（带有能量存储–第1部分）	
E-07	供电电压缓慢下降和快速提升实验参数 该测试模拟了将车辆系统电压缓慢降低至储能保护电压，然后关机至0V，并通过已充电或新储能的电池突然重新连接系统电压的过程。	
	T1 Holding Time	持续时间
	T1 Rising Time	上升时间
E-08	复位特性实验 这项实验用于模拟和检测部件在其环境中的复位特性。必须详细说明检测的边际 条件（例如：互联、端子、系统）。在工作中出现的一种反复接通/切断在任意时间上的操作顺序，不得导致部件特 性不确定。以一种电压方差和一种时间方差来反映复位特性。为了模拟各种不同 的切断时间，要求两种不同的实验流程。一种部件必须自始至终经历这两种实验 流程。	
E-10	启动脉冲 在冷启动（电动机启动）期间，储能电池的电压会短暂下降，然后再次上升。 不考虑热启动，因为保持了工作范围。	
	Normal	标准型实验脉冲
	Severe	加强型实验脉冲
E-15	在无功能限制的范围内操作 检查范围极限下的运行行为。	
E-16	具有功能限制的上限操作 检查变化且在范围极限处的运行行为。	
E-18	过电压范围内操作 该测试旨在显示存储充电过程中的负载切断情况，并检查运行行为在过电压范围内的变化。	

YOUR POWER TESTING SOLUTION

For more information, pls. visit www.itechate.com or send email to info@itechate.com .

We are always here for you.