Products the world can trust

Comprehensive PCB compliance, performance and reliability testing solutions
UL drives trust to:

Help companies

- Innovate safely
- Mitigate risks
- Protect and enhance brand reputation
- Increase visibility and control
- Grow market share
- Demonstrate leadership
- Communicate and connect
- Access global markets

Help the market

- Enhance data security
- Demonstrate corporate responsibility
- Earn regulatory approval
- Reduce returns/recalls
- Make smarter choices
- Make confident decisions
- Access safer products
- Conduct secure transactions
- Align
- Access sustainable living
- Identify reliable marketing claims
- Enjoy peace of mind

UL software is used by more than 10,000+
ORGANIZATIONS in over 10 INDUSTRIES

UL has helped to set more than 1,600
STANDARDS defining SAFETY, SECURITY,
QUALITY AND SUSTAINABILITY

UL reaches more than 2 BILLION
GLOBAL CONSUMERS ANNUALLY
with safety messages

UL Marks appear on more than 22 BILLION
PRODUCTS GLOBALLY

UL operates in MORE THAN 143
COUNTRIES and across MORE THAN 20
INDUSTRIES

3 OUT OF 4 U.S. CONSUMERS
are familiar with the UL Mark

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UL serves 1 OUT OF 3 FORTUNE 500
COMPANIES

UL’s sustainability certifications are referenced in
900+ SUSTAINABLE PRODUCT
SPECIFICATIONS OR PURCHASING
GUIDELINES around the globe

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Testing services for printed circuit boards (PCBs)

UL serves manufacturers across the entire PCB supply chain:

Industrial laminates
- Rigid
- Ultrathin
- Flexible
- High-density interconnect
- Metal clad
- Metal-clad lamination

Coatings
- Solder resist
- Conformal coating
- Films
- Liquids
- Photoimageable
- UV curable

PCBs
- Single-layer
- Multilayer
- Hybrid
- Flexible
- Flex-rigid
- Metal-based

Assemblies
- Traceability program

Precertification services
- Consulting
- Planning
- Project optimization
- Quotation

Safety testing and certification
- PCB compliance
- laminate and coating compliance
- Production board testing
- Assembly traceability

Performance and reliability testing
- Reflow simulation
- Thermal cycling and thermal stress
- Failure analysis
- Interconnect stress testing (IST)
- Signal integrity testing
- Conductive anode filament growth (CAF)
- Coating testing — conformal coating and solder mask

Optimized market access
UL offers a full range of testing and certification services to UL Standards and many other international, national and regional requirements, including American Society for Testing and Materials (ASTM), Association Connecting Electronics Industries (IPC) and International Electrotechnical Commission (IEC).

In each targeted market, UL can help you gain the confidence you need to succeed. The scope of our services include:

Optimized market access
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Performance and reliability testing
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- Thermal cycling and thermal stress
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- Interconnect stress testing (IST)
- Signal integrity testing
- Conductive anode filament growth (CAF)
- Coating testing — conformal coating and solder mask

Overall testing capability
- Advanced analytical
- Chemical
- Electrical
- Environmental
- Flammability
- Mechanical and physical
- Coatings
The credit is only applicable for the Scope of Services and test program agreed upon in the associated precertification project. The credit is valid for a maximum of 120 days after the completion of the precertification project (may be less based on country-specific business laws and practices). Additional terms may apply.

**Precertification services**

Paving the way for future compliance

UL’s precertification reviews are designed to shorten the path to certification. Through an advanced technical consultation with a UL engineer, we’ll help make sure you fully understand the sample requirements and test program ahead of time, thus avoiding potential costly delays. Precertification reviews are also eligible for a 100 percent credit toward certification costs.*

Benefits

**Accelerated time to market**

We make sure that you understand the test program and its requirements, enabling you to avoid obstacles and proactively build in efficiencies that accelerate certification. In addition, precertification identification of potential noncompliance issues allows you to correct them before they occur.

**Decreased costs**

We minimize the possibility of expensive rework or redesign delays resulting from improper sample submissions and test failures.

**Increased peace of mind**

We keep you informed and up to date throughout the entire process, so you can feel confident that your product and your business needs are well cared for.

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Safety testing and certification

Setting the benchmark

UL is the only organization that issues PCB safety Standards. You can make use of our technical expertise in safety testing and certification services; this process can help achieve regulatory compliance as well as communicate to customers that your product has been tested to the benchmark of product safety.

UL’s extensive relationships across the entire PCB supply chain have manufacturers turning to us when they are looking for reliable components from trustworthy sources. Your customers will also value how UL assists them to eliminate duplicate testing of the finished end products when they contain UL Recognized components.

All testing can be conducted in UL-accredited laboratories or in your own qualified facilities.

UL Standards for PCBs

For UL recognition of PCB safety, the following Standards apply:

- UL 796 Printed Wiring Boards – for standard rigid, metal-based and HDI PCBs
- UL 796F Flexible Materials Interconnect Constructions – for flexible and flex-rigid PCBs
- UL 7462 Polymeric Materials – for industrial laminates and materials used in PCBs
- UL 7464 Polymeric Materials – for flexible dielectric film materials
- UL 94 – for flammability of plastic materials

UL Standards related to PCBs

Certification is driven by end-product requirements. The actual PCB ratings required are dependent on the end-product application and how the PCB will be employed. Always check with the end-product manufacturer to determine what ratings they require. Many end-product standards, such as the following, require UL Recognized PCBs:

- UL 60950 – Information technology equipment
- UL 60065 – Audio and video equipment
- UL 62368 – ITE and audio/video equipment
- UL 60601 – Medical equipment
- UL 60335 – Appliances
- UL 61010 – Industrial control equipment
- UL 8750 – LED equipment

UL Recognized = enhanced market acceptance

PCB components and materials that are recognized by UL are known to have undergone the industry’s most stringent safety testing and follow-up program. UL Recognized components are listed in UL’s Online Certifications Directory, UL.com/database and the UL OS+ database at UL.com/web. These allow your customers to search and identify the components and materials they need to complete their subassemblies or end products.

QUICK-TURN CERTIFICATION for rush orders

UL also offers Quick-Turn Certification of production boards to UL 796. This service allows for faster time to market by testing actual production boards instead of requiring specialized samples that first need to be created. The service is limited to the tested build of materials, constructions stack-up and trace layout.
Performance and reliability testing

Empowering the PCB industry

Advances in today’s electronic applications depend upon sophisticated PCB technology. If it doesn’t work, the whole product will be compromised. Increase your customers’ confidence by demonstrating the PCB is not only compliant to regulatory safety requirements but also tested to perform reliably.

Our performance testing and certification programs apply to a comprehensive range of PCB components and materials. Every program can be customized to match the PCB application and meet your business needs.

Thermal and environmental conditioning

Thermal and environmental conditioning accelerates degradation of the PCB to determine material and structural integrity via microsection analysis and destructive and nondestructive testing.

Interconnect stress testing (IST)

IST speeds up temperature cycling to detect susceptibility to early failure, and thereby increases product reliability 12 times faster than in an air-to-air thermal oven, creating the opportunity for greater testing output.

Signal integrity testing

Signal integrity testing (SIT) determines the amount of signal propagation caused by the characteristics of the materials, conductors and accompanying structures on the PCB. Losses in the signal will result in frequency-dependent attenuation.

Conductive anodic filament (CAF) growth

The need for CAF testing is ever increasing with overall product sizes and conductor spacings being reduced. CAF failures involve the growth or “electrochemical migration” of copper in a PCB. This unintentional growth typically bridges two oppositely biased copper conductors resulting in a short circuit. Catching and correcting this potential failure can substantially lengthen product lifespans.

Conformal coating and solder mask testing

Conformal coatings are applied to electronic circuits to provide a barrier to moisture and contamination and to provide electrical insulation. UL offers a full suite of coating testing services, including:

- UL 746E evaluations
- IPC-CC-830: Qualification and performance testing of electrical insulating compounds for printed circuit assemblies
- IPC-SM-840: Qualification and performance specification of permanent solder mask and flexible cover materials
- IEC-60664-3: Insulation coordination for equipment within low-voltage systems, via the use of coatings to achieve insulation coordination of printed board performance and assemblies.

Thermal and environmental conditioning
Overview of safety, performance and reliability testing

Explore our range of testing services. The following list includes commonly requested tests, such as flammability, ignition, long-term thermal aging and microsectioning analysis. We also perform many other tests that aren’t listed. Please contact us about custom testing and designing a test plan to fit your unique needs.
Environmental testing

- Accelerated aging
- Altitude
- Autoclave (pressure vessel)
- Conductive anodic filament (CAF)
- Chemical resistance
- Cold-impact
- Compressor-resistance
- Drop/Impact
- Drop resistance
- Electromigration/electrochemical migration (ECM)
- Flammability
- Fluid resistance
- Fungus resistance
- Humidity (cycling or steady state)
- Hydrolytic stability
- Immersion
- Interconnect stress test
- Ingress protection (IP)
- Moisture and insulation resistance (MIR)
- Moisture absorption
- Moisture resistance
- Oxygen index
- Salt spray/fog
- Solvent resistance
- Temperature/humidity
- Thermal aging
- Thermal cycling
- Thermal shock
- Thermal stress
- Time to delamination
- U/V exposure
- Vault softening point
- Water spray
- Water vapor transmission/water absorption
- Weathering

Flammability testing

- Burning rate ASTM D 2863, sections 61-66 (method/vertical)
- Burning rate ASTM D 635 (horizontal)
- Burning rate Eta 21 B 135 (horizontal)
- Burning rate FMVSS 302 (HV) (horizontal)
- Burning rate ISO 7725 (vertical)
- Burning rate UL 94 HB (horizontal)
- Burning rate UL 94 V0 (vertical)
- Burning rate UL 94 V1 (vertical)
- Burning rate UL 94 V2 (vertical)
- Burning rate UL 94 VTM (vertical)
- Flammability, small component, IEC 61094
- Oxygen index ASTM D 2863 (Procedure A/Test Method A)

Electrical testing

- Arc resistance
- Capacitance
- Comparative tracking index (CTI)
- Conductive anodic filament growth (CAF)
- Conductivity
- Dielectric breakdown
- Dielectric constant/permittivity
- Dielectric strength
- Dielectric withstanding voltage (DWV)
- Dissipation factor/loss tangent
- Electromigration/electrochemical migration (ECM)
- High-current arc ignition (HAI)
- High-voltage arc tracking
- Hot wire ignition
- Inclined plane tracking
- Interconnect stress test
- Resistance
- Signal integrity testing (SIT)/DET30X/TDR
- Surface insulation resistance (SIR)/insulation resistance
- Volume and surface resistivity
- Class transition temperature by thermal mechanical analysis (TMA)
- Hardness
- Impact strength
- Impact resistance
- Lap shear strength
- Mechanical cycling
- Mechanical strength
- Microcracking
- Peel strength
- Flaking thickness
- Breech simulation
- Shear properties
- Shear strength
- Soldering paste
- Specific gravity/density
- Tear resistance
- Tensile impact
- Tensile strength
- Tensile properties
- Tension and compression
- Young’s Modulus

Mechanical and physical property testing

- Abrasion
- Adhesion
- Bent testing
- Bend strength
- Bow and twist
- Breaking strength
- Britteness
- Coating thickness
- Coefficient of friction
- Coefficient of thermal expansion (CTE)
- Compression set
- Compression properties
- Cross-section analysis
- Cure
- Deflection under load
- Deformation temperature
- Dimensional stability
- Dynamic mechanical analysis (DMA)
- Elongation
- Flexural strength and modulus
- Glass transition temperature by thermal mechanical analysis (TMA)
- Hardness
- Impact strength
- Impact resistance
- Lap shear strength
- Mechanical cycling
- Mechanical strength
- Microcracking
- Peel strength
- Flaking thickness
- Breech simulation
- Shear properties
- Shear strength
- Soldering paste
- Specific gravity/density
- Tear resistance
- Tensile impact
- Tensile strength
- Tensile properties
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Coatings — conformal coating and solder masks

- Abrasion (Tabor)
- Adhesion
- Appearance
- Coating thickness
- Cure time and temperature
- Dielectric strength
- Dielectric withstanding voltage (DWM)
- Electrochemical migration
- Flammability
- Flexibility
- Fluorescence
- Fourier transform infrared spectroscopy (FTIR)
- Glass transition temperature by thermal mechanical analysis (TMA)
- Hardness
- Hydrolytic stability
- Insulation resistance
- Lap shear
- Moisture insulation resistance
- Peel strength
- Q-resonance
- Resistance to chemicals, solvents and cleaning agents
- Shelf life
- Tensile strength
- Thermal shock
- Thermal stress
- Viscosity
- Visual requirements
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