Leadframes & Packaging Solutions

STAMPING, OVERMOLDING, MECHATRONICS





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Stamped & overmolded leadframes



Headquartered in France, the Axon Group has significant sales and manufacturing footprints in North America, Europe and Asia. The group has in-house expertise including plating, machining, lathing, electrostriction, assembling, molding/ overmolding, mechatronics and cabling.

Axon' Mechatronics, part of the Axon' group, is a renowned specialist in the development and manufacture of industrial connectors and leadframes. The company offers a complete service including:

- over 60 years expertise,
- dedicated project development engineers,
- prototyping,
- production phase,
- creation of production tools (stamping tools, injection mold tools, assembly machines),
- production sites worldwide.





Stamped & overmolded leadframes

Automotive and electronics including semiconductor chips, electronic equipment packaging, electrical devices and PCBAs. Electrical and mechanical applications including, industrial automation, machinery and sensor systems.

CUSTOM DESIGN AND HIGH PRECISION

In order to meet customer requirements, Axon' mechatronics offers different types of leadframes to be used in semiconductor packages:

- stamped leadframes and grids : these can be either 2D or 3D shapes depending on the application,
- overmolded leadframes, housing and power modules designed to accomodate electronic components and/ or bonded PCBs.

WHY CHOOSE AXON' MECHATRONICS

- Project profitability:
 - complete product and process solutions: co-design development of optimized products and associated manufacturing processes,
 - global expertise: cutting, molding/overmolding and assembly.
- Project management: from design to mass manufacture (several million pieces).
- Prototyping: validation of the final design.
- Continual focus through all project phases to achieving on-time delivery.





Stamped & overmolded leadframes

TO MAXIMIZE COMPONENT PERFORMANCE



- A **leadframe** is a stamped and formed metal circuit on to which electronic components are soldered or attached during the device assembly process. This metal component made from a variety of possible materials, connects the wiring from the electrical leads of components to the output terminals of automotive, electrical devices and Printed Circuit Boards.
- The stamped leadframes can also be assembled or overmolded to form the housing of an electronic system. This box can integrate electronic, electro-mechanical components and/or printed circuits.
- Leadframes can be plated to improve bonding, corrosion resistance and solderability: in-house selective or full plating.

• Forensic focus on quality. The slightest imperfection in the leadframe can have an impact on the assembly of the semiconductors and, ultimately, make the whole assembly inoperative. Axon Mechatronics' expertise in precision stamping, together with high quality in-house plating delivers a consistently reliable product.



Expertise in mechanical design

Axon' Mechatronics engineers are very well versed in the design of leadframe packaging. Taking into account mechanical requirements including volume, support devices, interface, and external connections, they develop creative solutions that precisely meet the needs of each application. Axon' Mechatronics engineers can provide:

- 3D files for validation,
- calculation report,
- mechanical simulation.
- Wide range of expertise: co-design to mass manufacture

ENGINEERING	Co-design	Design to customer specification. Project follow-up
	2D or 3D files	Multiple exchange formats including PDF, Pro-E (DRW, PRT, XPR), SolidWorks (SLDPRT, SLDDRW, SLDDRT, SLDASM), STEP, IGES
	Cutting tool	Single or multi-cavity
GENERAL FEATURES	Production	Prototypes
		Volume from 100,000 to several million
	Material	Cu, CuZn, CuSn, CuNiSi, CuBe, Al, Inconel, co-laminated materials
	Max. band width	300 mm
	Thicknesses	0.05 mm to 3 mm
	Plating	Nickel, tin, gold, silver, AlSi inlay
PRODUCTION CAPABILITIES	Press machines	25 to 100 tons
	Speed	80 to 500 SPM
	Packaging	Bulk
		Reels
		Thermoformed trays
QUALITY / ENVIRONMENT	Approvals	ISO 9001
		ISO TS 16949
		ISO 14001



Stamped leadframes & grids



- Stamped leadframes and grids are designed to support and accomodate electronic components and PCBAs.
- Stamped grids are used as contact elements for electronics industry, automotive industry, building technology and industrial automation.
- Full or selective tin, nickel, silver or gold plating depending on the final requirement (mechanical protection, solderability).
- Stamped leadframes can be packaged:
 - on reels : easy to assemble on automatic lines for high volume manufacturing,

- in segments for an easy transfer to automated processes,
- in bulk for overmolding.

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Stamped leadframes with pressfit zones

FOR EASY INSERTION



Pressfit terminals: stamped terminals to be inserted into the PCB.

- Avoids additional soldering processes to save cost and increase productivity.
- Avoids thermal stress of a second reflow phase.
- Delivers high mechanical retention and excellent electrical contact after insertion.

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- Materials:
 - CuSn6P continuous temperature: 125°C,
 - CuNiSi continuous temperature: 170°C,
 - thicknesses : 0.6, 0.8 and 1.0 mm.
- Can be packaged in alveolar trays: easy to handle for automated process.





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Stamped leadframes & grids

FOR POWER APPLICATIONS



- Stamped leadframes for IML (Insert Molded Leadframe) & TML (Transfer Molded Leadframe).
- Soldered integrated circuits "chips" require a perfect flatness of the leadframe (thickness with a tolerance of +/- 0.05 mm) : a 100 % camera control of the leadframe is carried out during manufacturing.
- Excellent high temperature stability : the CTE (Coefficient of Thermal Expansion) has to be as low as possible with good electrical and thermal conductivity.
- In-house selective electrolytic plating with or without masking on pads is possible.
- Close working relationship between Axon' Mechatronics and specialist raw material suppliers to determine the optimum substrate.





3D stamped leadframes & grids

GIVE SHAPE TO YOUR PARTS



- 3D stamped leadframes and grids are designed for the assembling or overmolding of electro-mechanical and/or mechatronics components.
- Made with copper alloys.
- Full or selective plating adapted to the type of parts to be assembled.
- 3D overmolded leadframes can be designed to accommodate SMD components before reflow soldering.
- Packaging in thermoformed trays for direct use on assembly or overmolding lines: **time saving** for the customer.





3D Stamped leadframes & grids

FOR VARIOUS APPLICATIONS



A few examples of custom-designed leadframes:

- leadframes stamped in three dimensions used for an ABS speed sensor on which a hall effect sensor is welded,
- the copper alloy leadframe is packaged in a thermoformed tray that can be used directly on assembly and overmolding lines,
- stamped power leadframes and bus bars : pads can be mechanically assembled or electrically welded,
- leadframes and grids can be made with full or selective plating.



Overmolded leadframes & modules

FOR OPTIMIZED PRODUCTION





- **Overmolded leadframes** made with high performance plastic resins are designed to accomodate and support components which are then protected in the housing.
- The overmolded housing allows for the integration of:
 - the connection area for bonding power components,
 - the output connector to the customer interface,
 - specific terminals to accommodate components to be soldered (such as electric capacitors, for example).
- The terminals offered can be:
 - through-hole terminals : insertion of the tabs through the PCBA and wave-soldering,
 - pressfit terminals to assemble power or signal modules to PCBA without soldering.
- Different types of plating can be used for the connector pads for bonding and soldering to PCBA: full or selective tin, silver or gold plating.





Overmolded leadframes & power modules

SIC MOSFETS & IGBT POWER SWITCH PACKAGING



- **Power leadframes** are used in a variety of applications such as control units and sensors in the automotive or electronics industries.
- Axon' proposes different copper alloys and electroplated deposit for wire bonding and other interconnect technologies.
- To achieve a strong metallurgical bond, a suitable surface preparation of the stamped leadframe and a perfect flatness are required.
- Pressfit terminals can also be used for plastic packages to assemble power modules to PCBAs without soldering.
 - Pressfit thicknesses: from 0.6mm to 1.0mm.

- Different pressfit types for signal or power applications.



Overmolded leadframes & power modules

SIC AND GAN LEADFRAME PACKAGING FOR POWER APPLICATIONS E-MOBILITY



- Overmolded leadframes designed for the assembly of Silicon Carbide (SiC) and Galium Arsenide (GaN) components for power electronics applications.
- Overmolded leadframes for IML technology with perfect stamping and surface plating, (e,g, for electric motor control, for example).
- Manufacturing processes are designed to meet challenging requirements including high temperatures and minimal available space.





Overmolded leadframes & power modules

PACKAGING FOR HIGH POWER APPLICATIONS - E-MOBILITY



- The packaging of power converter modules requires the design of leadframes that can meet harsh environments including temperature and space saving.
- The stamped leadframes can receive interconnections with **wire bonding**. They are integrated in a "single-face" connection and a cooling structure.



Overmolded housings & modules

SOLDERLESS PACKAGES FOR SIGNAL & POWER APPLICATIONS



- Design and manufacture of **custom-designed housings** for signal and power applications.
- Pressfit interconnects for PCBA solderless assemblies can be integrated in a standard workshop (no clean room).
- To meet IP67 standards, modules can be naturally watertight thanks to a combined design of terminals and overmolding or by adding sealant or potting. The sealant is added into a cavity where the terminals are inserted and then cured.

Overmolded leadframes & mechatronics

MECHANICAL & ELECTRONICS FUNCTIONS

More and more applications require additional functions including **mechanics and electronics**. Several types of electronic component assemblies can be offered. The components can be:

- soldered by reflow on a 3D overmolded leadframe to perfectly fit the finished product. The mechatronics object integrates the different output connections,
- soldered on a leadframe cut into sections allowing the use of traditional PCBA assembly methods before being encapsulated by a plastic resin to obtain the desired product.

Overmolded leadframes & mechatronics

POWER MODULE MECHATRONICS

Power modules may require leadframes integrating mechatronics components.

- Automated assembly of electronic and electro-mechanical components on overmolded leadframe by soldering and electric welding.
- Space-optimized leadframes. The restricted size of power modules requires a high number of components in a limited space. Axon' Mechatronics takes this requirement into account when designing 3D overmolded leadframes with various components to be assembled.
- Bespoke leadframes based on multi-expertise in:
 - leadrame stamping,
 - plating,
 - thermoplastic overmolding,
 - component trimming and forming,
 - assembly of components by electric welding and/or soldering,
 - electrical and functional tests,
 - final packaging.

Overmolded leadframes & mechatronics

ELECTRONIC COMPONENT ASSEMBLY

- As an expert in overmolding, leadframe manufacturing and component assembling, Axon' Mechatronics offers overmolded leadframes for electronic component assemblies.
- The stamped leadframe is overmolded to obtain a housing which integrates connections to a motor or electronic components and tailor-made connectors adapted to each application. For example (see right picture), the current sensor is placed as close as possible to the element to be measured. The shape of the housing perfectly fits the customer's system.
- Assembling of the sensor and/or other components by electrical welding.
- High quality: 100% functional testing of the final assembly.

In-house production capabilities

HIGH PRECISION STAMPING & PLATING

PLATING PRODUCTION LINE

Standard manufacturing processes for stamped and processed leadframes:

- supply chain management: from raw material to finished product,
- stamping presses,
- progression stamping tools,
- reel-to-reel plating lines,
- highly skilled manpower.

In-house production capabilities

- Selection of the most suitable materials for molded leadframes, depending on the operating conditions.
- Compromise between cost and performance.
- Area of Axon' Mechatronics expertise covers a large range of high-performance materials including engineering and high temperature plastics.

The selection criteria are:

- high rigidity and strength,
- very good dimensional stability,
- low water absorption,
- high resistance to chemicals,
- excellent behavior to thermal ageing,

self-extinguishing.

In-house production capabilities

MOLDING & OVERMOLDING EXPERTISE

- Highly skilled staff.
- Standard manufacturing processes for overmolded leadframes.
- Multi-cavity injection mold tools.
- Injection workshops with vertical and horizontal injection presses and automated processes.

- Overmolding of loose or reeled parts.
- All types of overmolded and molded parts.

A worldwide presence

The Axon' Group: Over 50 years of experience in cables and interconnect.

At the very beginning, Axon' Cable manufactured high temperature insulated wires. Since then, the group has greatly enlarged its areas of expertise to offer complete solutions to customers:

- design and manufacture of wires, cable assemblies, custom-designed connectors with Axon' Cable,
- design and manufacture of metal-plastic parts and components with Axon' Mechatronics and Axon' Nanotec,

AXON' IS CLOSER

THAN YOU THINK !

• design and manufacture of elastomeric components with Addix.

Axon' is a medium-sized

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