AT&S
AT A GLANCE

AT&S is one of the world’s leading manufacturers of high-value printed circuit boards
Leading manufacturer of HDI printed circuit boards, at the heart of the electronics industry with high-tech production in China

AT&S operates in attractive niche growth markets
Smartphones and tablets as growth drivers for Mobile Devices, AT&S the leading supplier to the premium segment of the European automotive industry, more than 500 customers in the industrial area, medical technology as a profitable niche market, and a strong standing in Asia – the world’s largest growth market

AT&S puts its customers and their needs first
One-stop-shop solutions from prototype design to series production, delivering to major reductions in product development lead times for customers

AT&S uses problem-solving skills to add value
Broad-based technology portfolio, user-focused solutions at the cutting edge of the printed circuit board technology, patented technologies for increasingly high-performance and thinner printed circuit boards, adding value beyond the production section of the value chain

AT&S cultivates European engineering traditions
Around five percent of the Group’s revenue is reinvested in research and development, 83 patent families, and countless partnerships with leading international research institutions

AT&S is committed to the highest quality standards
Certification of all plants according to ISO 9001 and/or ISO/TS 16949, as one of just a handful of printed circuit board manufacturers that has achieved certification under the EN ISO 13485 standard for medical technology and the EN 9100 aerospace standard

AT&S plays a pioneering role in environmental protection
Production of highly complex printed circuit boards with a minimal impact on people and the environment, and annual reductions in CO2 emissions and fresh water consumption

AT&S is a successful business
Diversification by industries and geographical markets, constant revenue growth with strong margins, a stable ownership structure that safeguards the Group’s long-term development

APPLICATION AREAS

Today’s digital industry would be nothing without printed circuit boards. They are the ‘brains’ of virtually all electronic appliances – smartphones, navigation systems, cameras, automotive electronics, aeronautics – and a large number of modern industrial and medical technologies. They are central to our everyday life.

AT&S – part of your daily life
AT&S is one of the world’s leading manufacturers of high-end printed circuit boards for devices such as smartphones, tablets, digital cameras, portable music players. Its specialised skills and expertise, and innovative production technologies enable AT&S to meet its customers’ increasingly demanding technical requirements.

MOBILE DEVICES

AT&S’s industrial market comprises a large number of customers with an extremely wide range of technological requirements. A high degree of flexibility and the ability to adapt to new technical specifications are crucial success factors in this business.

INDUSTRIAL ELECTRONICS

In its automotive and aviation businesses, AT&S activities focus principally on safety systems, entertainment, electromobility, weight reduction and future driver assistance systems for driverless cars. The product portfolio covers the full range of technologies used in the automobile industry. Virtually all of the major tier one European automotive component suppliers in the premium segment are AT&S customers.

AUTOMOTIVE & AVIATION

In medical and health care applications, reductions in size and weight, and product reliability are the prime concern, especially for devices such as pacemakers and hearing aids. Here, our wealth of experience gained in the mobile devices business is an additional benefit to our customers.

MEDICAL & HEALTH CARE

Advanced Packaging bundles the activities based on ECP® (Embedded Component Packaging) technology. ECP® is a patented AT&S packaging technology used to embed active and passive electronic components directly in the printed circuit board.

ADVANCED PACKAGING

3D X-ray image of embedded electronic components
Double-sided printed circuit boards

Double-sided plated-through printed circuit boards are in use throughout the electronics sector, and more particularly in industrial and automotive applications. AT&S specialises in series production of double-sided printed circuit boards with thicknesses in the 0.1-3.2mm range.

AT&S offers double-sided plated-through printed circuit boards with the following special features:

- Edge plating for shielding and ground connection
- Metal core for high thermal conductivity
  (metal, copper or aluminium)
- Copper inlay for hotspot cooling
- Solder resist in green, white, black, blue, grey, brown, etc.
- Copper thickness of over 140μm
- All surfaces which are commonly used in the printed circuit board industry

Multilayer printed circuit boards

Multilayer printed circuit boards came into the industry with the advent of SMD population. They are found almost everywhere, wherever electronics are in use – from aircraft to motorcycles, and storage power stations to photovoltaics. AT&S produces printed circuit boards in whatever numbers are required – from individual prototypes to small batches and mass production. The number of layers ranges from 4 to 28, with a maximum thickness of 3.2mm.

AT&S offers multilayer printed circuit boards with the following special technologies:

- Edge plating for shielding and ground connection
- High frequency base materials for applications up to 80 GHz
- Cavities, countersunk holes or depth milling
- Thick copper up to 105μm (inner and outer layers)
- 500μm thick copper inlays using HSMtec technology
- Solder resist in green, white, black, blue, grey, brown, etc.
- Controlled impedances (single, differential, etc.)
- All recognised printed circuit board industry surfaces available
AT&S is a world leader in the global market for high-end printed circuit boards – a reflection of its acknowledged competence in the production of top quality, custom solutions using state-of-the-art printed circuit board technologies.

HDI microvia printed circuit boards

The history of AT&S has been shaped by high density interconnect (HDI) printed circuit boards. In 1997 they were developed for mass production for the nascent mobile phone industry. Since then HDI printed circuit boards have found applications throughout the electronics industry, and their use was given additional impetus by the introduction of BGA/CSP components. AT&S offers the full range of technologies, from 4-layer laser to 6-n-6 HDI multilayer in all thicknesses.

Special technologies offered by AT&S in connection with HDI:

- Edge plating for shielding and ground connection
- Copper-filled microvias
- Stacked and staggered microvias
- Cavities, countersunk holes or depth milling
- Solder resist in black, blue, green, etc.
- Minimum track width and spacing in mass production around 50μm
- Low-halogen material in standard and high Tg range
- Low-DK Material for Mobile Devices
- All recognised printed circuit board industry surfaces available

HDI any-layer printed circuit boards

HDI any-layer printed circuit boards are the next technological enhancement of HDI microvia printed circuit boards: all the electrical connections between the individual layers consist of laser-drilled microvias. The main advantage of this technology is that all the layers can be freely interconnected. AT&S uses two technologies to produce these circuit boards: the basic method uses laser-drilled microvias electroplated with copper, and the alternative uses Panasonic’s conductive paste to fill the microvias (ALIVH® Technology). ALIVH® is a registered trade mark of Panasonic Corporation.

Special technologies used with HDI any-layer printed circuit boards:

- Edge plating for shielding and ground connection
- Minimum track width and spacing in mass production around 40μm
- Stacked microvias (plated copper or filled with conductive paste)
- Cavities, countersunk holes or depth milling
- Solder resist in black, blue, green, etc.
- Low-halogen material in standard and high Tg range
- Low-DK Material für Mobile Devices
- All recognised printed circuit board industry surfaces available
Flexible printed circuit boards

Flexible printed circuit boards are now in use throughout the electronics industry. The circuit board is generally installed bent, folded or twisted. Flexible printed circuit boards are primarily used to replace wiring and connectors, and to create configurations and complex geometries that would be impracticable with rigid printed circuit boards.

AT&S offers the following product range:

- Flexible printed circuit boards based on polyimide, from single-sided to multilayer flex
- For use in dynamic or static applications
- With SMD population and underfill

Semiflexible printed circuit boards

Semiflexible printed circuit boards differ from fully flexible ones in the materials used, as well as in the restricted bending radii and the limited number of bending cycles. Instead of polyimide, we use standard FR4 thin laminate materials as a more economical alternative in certain applications.

In semiflexible printed circuit boards, AT&S offers:

- Thin, double-sided FR4 materials
- Maximum of five bending cycles with a 5mm bending radius
- Cost effective flex-to-install solutions
- Soldering without pre-baking
- More stable construction, simplifying handling during assembly

Rigid-flexible printed circuit boards

Rigid-flexible printed circuit boards directly combine the advantages of flexible and rigid printed circuit boards. This combination of technologies brings the user a variety of advantages especially in terms of signal transmission, overall size, assembly and stability. AT&S produces this technology in three of its plants, allowing it to offer a wide range of products and expertise.

In rigid-flexible printed circuit boards, AT&S offers:

- Printed circuit boards with rigid areas, and flexible areas with reduced numbers of layers
- Combination of polyimide and FR4, or FR4 and thin laminate
- Rigid-flexible printed circuit boards, which connect rigid boards without the need for cables or connectors, resulting in better signal transmission
- With SMD population and underfill
- All commonly used surfaces available
Flexible printed circuit boards on aluminium

The use of LEDs in the automotive industry and in lighting in buildings has posed new challenges in the shape and design of printed circuit boards. When installing LEDs in front headlights, for example, the printed circuit board is bonded to an aluminium heat sink to which the LEDs are then attached. The printed circuit boards offered by AT&S have either one, two or three layers (HDI).

AT&S offers the following options:

- Aluminium or copper heat sinks
- Available with thermally conductive bonding material or prepreg (0.3-3.0 W/(m•K))
- Available in punched version, or routed

HDI rigid-flex printed circuit boards

In response to market requirements, AT&S also offers mass production of its core HDI technology in combination with flexible printed circuit boards. To make this possible, AT&S has entered into a collaborative agreement with a world market leader in flexible circuit board technology.

In HDI rigid-flex, AT&S can offer the following features:

- Combination of HDI rigid and HDI flex layers
- Stacked and staggered microvias on all layers
- Halogen-free base material (medium Tg) and polyimide
- SMD population
- Mechanical assembly in or on the housing

Insulated metal substrate (IMS) printed circuit boards

In the single side printed circuit board business, AT&S focuses on IMS boards. These are used primarily as heat sinks for LEDs and power components. To enable heat dissipation, the base material used has one side that is an aluminium or copper layer either 1.0mm or 1.6mm thick.

AT&S offers the following special features:

- Materials with prepreg or thermally conductive resins
- Thermal conductivity in the 0.35-8.0 W/(m•K) range
- Scored or routed versions
- White or black solder resist
- Based on highly reflective aluminium e.g. Alanod®
- Special surfaces are possible, such as ceramic surfaces
ECP® Embedded Component Packaging

ECP® is the patented AT&S packaging technology used to embed active and passive electronic components directly in the inner layers of the printed circuit board. The technology is used to miniaturise circuits and reduce the space they require, and to increase reliability and product lives. In line with the general trend, printed circuit boards produced with ECP® technology are used in ever smaller, more efficient and more powerful devices, such as smartphones, tablets, digital cameras, and hearing aids.

Advantages

- Efficient circuit miniaturisation through component embedding
- Performance enhancement through integration of new functionalities
- Increases in reliability and product lives
- Enhanced signal quality through copper connection of the integrated components
- Cooling optimisation
- Compatibility with traditional SMT processes

2.5D® Technology Platform

The 2.5D® Technology Platform is a patented AT&S technology for combining mechanical and electronic miniaturisation. It can be used to make cavities in the printed circuit board so that electronic components can be positioned lower, with the result that the complete assembly has a thinner profile. In addition to cavities, flex-to-install printed circuit boards with inner and outer flex layers are also possible. The use of polyimide-free base materials makes for extremely reliable printed circuit boards.

Advantages

- Cost advantages over conventional cavity and rigid-flex approaches as a result of the elimination of several process steps (e.g. stamping) and the use of standard printed circuit board materials (e.g. prepregs, RCC foils)
- Cavities of different depths on the same printed circuit board, and no restrictions on cavity shapes
- No restrictions on base materials, and use of state-of-the-art design rules
- Surfaces of cavities suitable for solder resist
- Different technologies can be combined (e.g. rigid-flex and cavity)
- UL approval for cavity and rigid-flex applications
The portfolio of patented technologies focuses on the continuing trend towards miniaturisation combined with performance enhancement and reduced consumption of natural resources.

**NucleuS® Environmentally-friendly single-card manufacturing concept**

The patented NucleuS® production technology allows for optimal use of the production format in the series production of individual cards. These are then fitted with their frames before being shipped out to subcontract assemblers for population. This brings advantages both in printed circuit board production and in board population.

**Advantages**
- Material and energy savings as a result of more efficient panel usage
- Minimal reject rates
- Reduction in registration errors in individual cards
- Flexibility in the design of cards with minimal impact on costs (spacing, frames)
- Potential for increasing card sizes with improved registration accuracy
- Potential for card standardisation and increase in population capacities

**ALIVH® Any Layer Interstitial Via Hole**

The ALIVH® Technology (ALIVH® is a registered trade mark of Panasonic Corporation) uses a copper-resin paste for through-hole connections and filling laser-drilled holes, in a screen printing process developed specially for the purpose. This replaces the electroplating process generally used in the printed circuit board industry to create the electrical connections between the individual layers. The advantages are a reduction in the thickness of the printed circuit board, improved etching properties resulting in finer tracks through the use of thinner copper foil, and greater impedance accuracy in series production. ALIVH® Technology also helps conserve resources (water, energy, copper, etc.) and makes possible the uses of more environmentally friendly processes.

**Advantages**
- Reduction in circuit board thickness
- Stacked and staggered microvias
- Up to 12 layers with three HDI build-up layers per side (ALIVH-C®)
- Up to 12 layers with connections across all layers (ALIVH-G®)
- Halogen-free base material (Tg ~ 150°C)
- Etching of finer tracks on all layers (< 50μm)
- Greater impedance accuracy
- Reduced series delivery times
- => Parallel processing methods
- More environmentally friendly production process, with reduced consumption of resources
GLOBAL PRESENCE

AT&S LOCATIONS AND COMPETENCES

- Production facilities in Europe and Asia
- Headquarters in Leoben, Austria
- Procurement centre in Hong Kong, China
- Design centre in Düren, Germany
- Sales network spanning four continents
- Approximately 7,300 staff

Each AT&S plant concentrates on a specific portfolio of technologies. The Austrian plants primarily supply the European market and increasingly the American one. In Europe, short lead times, special applications and closeness to customers are typically the most important considerations. The plants in Austria, India and Korea generally concentrate on small and medium-sized batches for industrial and automotive customers. In Shanghai, the focus is on large-volume production of HDI printed circuit boards for mobile communications customers, and increasingly also for the automotive industry. In Chongqing, also in China, a new plant is under construction. In collaboration with a leading semiconductor manufacturer, it will concentrate on the production of IC substrates.

Shanghai and Leoben are major technology drivers within the AT&S Group thanks to their research and development facilities.

LEOBEN, AUSTRIA

HEADQUARTERS
- Staff: 800
- Opened: 1982
- Production capacity: 110,000 square metres
- Customer orientation: Automotive, Industrial, Medical

TECHNOLOGIES
- Standard printed circuit boards
- HDI Multilayer printed circuit boards
- Rigid-flex printed circuit boards
- ECP® (Embedded Component Packaging)
- Printed circuit boards for high voltage applications
- Prototypes, test- and reference boards

CERTIFICATIONS
- ISO 9001:2008
- ISO/TS 16949:2009
- ISO 14001:2004
- OHSAS 18001:2007
- EN13485:2003
- Sony Green Partner Certificate
- EN9100:2009
- AEO Certificate
- UL Listing

FEHRING, AUSTRIA

- Staff: 400
- Opened: 1974
- Production capacity: 300,000 square metres
- Customer orientation: Automotive, Industrial

TECHNOLOGIES
- Double-sided plated-through printed circuit boards
- Rigid-flex printed circuit boards
- Flexible printed circuit boards
- Metal core printed circuit boards

CERTIFICATIONS
- ISO 9001:2008
- ISO/TS 16949:2009
- ISO 14001:2004
- OHSAS 18001:2007
- Sony Green Partner Certificate
- AEO Certificate
- UL Listing

NANJANGUD, INDIA

- Staff: 1,100
- Opened: 1999
- Production capacity: 380,000 square metres
- Customer orientation: Automotive, Industrial

TECHNOLOGIES
- Standard multilayer circuit boards
- Double-sided plated-through printed circuit boards

CERTIFICATIONS
- ISO 9001:2008
- ISO/TS 16949:2009
- ISO 14001:2004
- OHSAS 18001:2007
- UL Listing
Plants
Sales offices / representations

GUOBAL PRESENCE
AT&S LOCATIONS AND COMPETENCE CENTRES

ANSAN, KOREA
- Staff: 300
- Opened: 2006
- Production capacity: 120,000 square metres
- Customer orientation: Industrial, Automotive, Medical

TECHNOLOGIES
- Single and double-sided flexible printed circuit boards
- Flexible multilayer circuit boards
- Rigid-flex printed circuit boards
- Flexible printed circuit boards with metal reinforcement

CERTIFICATIONS
- ISO 9001:2008
- ISO/TS 16949:2009
- ISO 14001:2004
- OHSAS 18001:2007
- Sony Green Partner Certificate
- Canon Green Partner Certificate
- UL Listing

CHONGQING, CHINA
- Groundbreaking ceremony: June 2011
- Focus: IC-substrates
- Under construction

TECHNOLOGIES
- HDI multilayer printed circuit boards
- ALIVH® printed circuit boards
- Rigid-flex HDI printed circuit boards
- HDI any-layer printed circuit boards

CERTIFICATIONS
- ISO 9001:2008
- ISO/TS 16949:2009
- ISO 14001:2004
- OHSAS 18001:2007
- Sony Green Partner Certificate
- Canon Green Partner Certificate
- UL Listing

SHANGHAI, CHINA
- Staff: 4,500
- Opened: 2002
- Production capacity: 790,000 square metres
- Customer orientation: Mobile Devices, Automotive

TECHNOLOGIES
- HDI multilayer printed circuit boards
- ALIVH® printed circuit boards
- Rigid-flex HDI printed circuit boards
- HDI any-layer printed circuit boards

CERTIFICATIONS
- ISO 9001:2008
- ISO/TS 16949:2009
- ISO 14001:2004
- OHSAS 18001:2007
- Sony Green Partner Certificate
- Canon Green Partner Certificate
- UL Listing
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