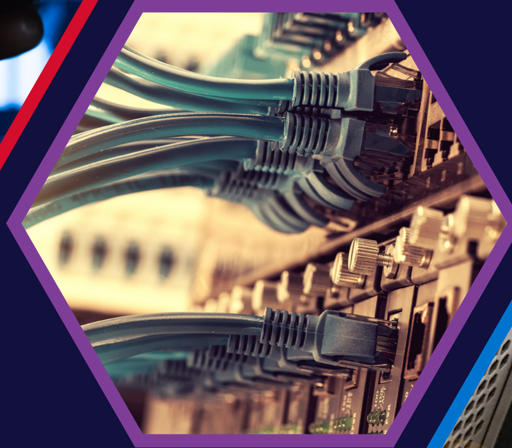
Circuitry • Semiconductor • Assembly



5G solutions

Enabling 5G From Start to Finish

We are supplying innovative specialty processes and materials across the entire 5G electronics supply chain:

- **Circuitry Solutions:** Circuit manufacturing solutions that address 5G challenges and opportunities from high speed innerlayers on exotic board materials to circuit density improvements in power hungry electronic devices.
- **Semiconductor Solutions:** The highest technology electronics metallization and packaging assembly processes that are powering the processors of next-generation mobile, mm-Wave devices, fiber optic networks and more.
- **Assembly Solutions:** High reliability joining / soldering material solutions for electronic assemblies used in a broad range of 5G related equipment; from wearable and handheld mobile devices to antennas and high speed infrastructure hardware.

MacDermid Alpha
ELECTRONICS SOLUTIONS

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CIRCUITRY SOLUTIONS

Co-Developed Solutions for 5G Circuitry and Niche Metallization

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Equipment Class	*Solution Requirements*
Communication Devices Mobile Phones & Wearables	• Very high-density interconnect technologies • Thermal management and mechanical enhancements for next generation designs • Reduced or eliminated need for planarization processes in multilayer build-up • Reliable micro via structures for long device lifetimes and reduced failure • Fine feature capable options for all manufacturing steps from build-up to final finish
Fronthaul Remote Radio Heads (integrated antennas) and Base Stations	• Reduced or eliminated need for planarization processes in multilayer build-up • Signal integrity on high speed, low loss materials • Fine feature capable options for everything from PCB to molded circuitry and final finishes • High thermal and electrical conductivity • Reliable metallization structures for long device lifetimes and reduced failure
Backhaul Switches, Routers Data Center Servers	• Reduced or eliminated need for planarization processes in multilayer build-up • Signal integrity on high speed, low loss materials. • High throughput processes with low defects • High thermal and electrical conductivity • Reliable metallization structures for long device lifetimes and reduced failure

Application	Product Name(s)	Product Attributes / Detail
High Speed Innerlayers	M-Speed HF	• Surface treatment for high speed copper innerlayers • Excellent adhesion on smooth innerlayers for improved signal integrity • Standard alternative oxide equipment with additional module • High levels of adhesion on a wide range of materials, reliable for high layer count designs
	M-Speed One	• Innerlayer dry film adhesion promotion system for boards with high frequency requirements
Molded Interconnect Devices	MID Series	• Industry leading portfolio of metallization solutions for molded interconnect devices • Mobile antennae metallization for smartphone • Infrastructure antennae for local repeaters
	PackagePlate	• Plating epoxy molding compound for advanced semiconductor lead frame packaging • Integration of electronic functionalities on EMC-encapsulated semiconductor packages
Primary Metallization	Shadow and Blackhole	• Environmentally friendly direct metallization processes for multilayer PCB • Direct copper to copper bonding enhances reliability • Low etch technology for precision high density interconnects • Unmatched compatibility with exotic laminate and board materials
	M-Copper EF	• Electroless copper primary metallization process • Horizontal application for thin core transport • High reliability to eliminate interconnect defects • Complete coverage in a single pass
Electrolytic Copper Metallization	MacuSpec VF-TH Series	• Simultaneous micro via filling and through hole plating metallization for HDI • Process step savings, exceptional over plate control, excellent physical properties
	MacuSpec AVF Series	• Advanced copper micro via filling metallization with extremely thin surface copper for high density circuitry in Any-Layer designs • Unmatched micro via reliability
	MacuSpec PPR Series	• Pulse plating copper metallization for through hole plating of thick multilayer boards • Exceptional over plate control, excellent microdistribution and physical properties
	Systek THF Series	• Electroplating process for copper through hole filling of core PCB • Revolutionary thermal, mechanical, and miniaturization design enhancements with minimal surface plating
Final Finishes	Entek Plus HT OSP	• Organic solderability preservative that has excellent solderability under multiple reflows • Very low signal loss in high frequency transmission applications
	Sterling Silver	• Immersion silver final finish utilized widely in electronics applications • Low signal loss in high frequency transmission
	ORMECON CSN	• Whisker-resistant immersion tin final finish widely specified by OEMs and fabricators • Consistent solderability over multiple lead free reflow / excellent press-fit performance
IC Substrates	Systek SAP/UVF/ ETS	• Copper metallization processes for IC substrate RDL. • Semi additive processing, ultra via filling, and embedded trace substrate plating processes • Enables gains in miniaturization, device speeds, signal properties and more

ASSEMBLY SOLUTIONS

High Performance Joining Materials for 5G Related Electronics Assemblies

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Equipment Class	Solution Requirements
Communication Devices Mobile Phones & Wearables	• High mechanical and electrical reliability • Fine feature capable • Enable flexibility in board design and manufacturing process • Lowers total cost of ownership
Fronthaul Remote Radio Heads (integrated antennas) and Base Stations	• High performance under wide manufacturing process conditions • High mechanical and electrochemical reliability in potentially harsh operating environments • Fine feature capable • High thermal and electrical conductivity • Lowers manufacturing costs
Backhaul Switches, Routers Data Center Servers	• Enable flexibility in board design and manufacturing process • High electrochemical reliability alone and in combination with other joining materials • High thermal and electrical conductivity • High throughput, low defects

Product Type	Product(s)	Product Attributes
Solder Paste	ALPHA OM-353 SAC305 / SACX Plus 0307 & 0807	• Repeatable printing down to 0.3mm/.012" pitch and 01005 passives • Excellent post reflow residue containment; low HIP and NWO Defects
	ALPHA JP-510 SAC305	• Jettable to 0.5mm/.020" pitch • High mechanical and electrochemical reliability
	ALPHA OM-372 SAC305	• Lowest post reflow flux residue among SMT Pastes • Ultra-fine feature printability down to 0008004 package sizes • Highest electrochemical reliability on fine pitch, low standoff packages
	ALPHA OM-565 HRL3	• Peak reflow 175°C to mitigate warpage induced defects (eg. NWO/HIP) • Superior mechanical reliability compared to existing low temperature solutions
	ALPHA JP-501 SnBiAg	• Low HIP and NWO Defects • Jettable to 0.5mm/.020" pitch
Cored Wire	Kester 268 SAC305 & K100LD	• Wire diameters down to 0.1mm (or 0.25mm); available in many alloys including Innolot • Ideal for robotic and manual soldering; halogen and halide free
	ALPHA HF-850 SAC305 / SACX Plus 0307 & 0807	• Wire diameters down to 0.1mm; available in many alloys including Innolot • Ideal for robotic and manual soldering
Adhesives	ALPHA HiTech SM42-1311 ALPHA HiTech SM42-120P ALPHA HiTech HT-130DHF-3	• Non-Sagging • Excellent adhesion on FR4 • Resists change due to high heat post application processing (ie. wave soldering)
Underfill	ALPHA HiTech CU31-2030	• Fast flow & reworkable
Encapsulant	ALPHA HiTech EN31-4007B ALPHA HiTech C21-4210F	• Excellent Impact Bend Resistance • 20-day Pot Life; reworkable
Edgebond	ALPHA HiTech CF41-4010	• A lower cost option to conventional underfilling process with increased productivity and lower material volume required • High Tg and low CTE values drastically improve ability to pass more Stringent Thermal Cycling Test; reworkable
Preforms	ALPHA Tape and Reel Preforms	• High solder volume precision and production yields using pick and place • Flux coated versions available; available in many alloys, sizes and shapes
	Accuflux Preforms SAC305 / SACX Plus / Low-temp	• Increasing thermal conductivity through void reduction • Low flux residue improves electrochemical reliability
Solid Solder	ALPHA SAC305	• Excellent soldering performance • High thermal fatigue resistance
	ALPHA SACX Plus 0807	• Low Silver (0.8%) for improved value vs. SAC305 • SAC305-like soldering and reliability performance on complex assemblies • Low Copper dissolution and low drossing
Liquid Soldering Flux	ALPHA EF-6808HF Kester NF372-TB	• ROL0, passes SIR IPC J-STD-004B • Excellent for most standard complexity assemblies
	ALPHA EF-8800HF	• ORL0, passes SIR IPC J-STD-004B • Designed for thick, complex boards

SEMICONDUCTOR SOLUTIONS

Advanced Electronics Materials For 5G Processing Power

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Equipment Class

Solution Requirements

Communication Devices
Mobile Phones & Wearables

- High mechanical and electrical reliability
- Integration capable solutions
- Product options to enable flexibility in package design and manufacturing process
- Excellent value, lower total cost of ownership

Fronthaul
Remote Radio Heads (integrated antennas) and Base Stations

- Low K dielectric compatible manufacturing processes
- Enables lower thermal resistance designs
- Shorter interconnect distances for increased speeds and overall performance
- Ultra-low alpha solder for improved transistor junction reliability
- Lower parasitics and lower inductance
- Substrate-free packaging

Backhaul
Switches, Routers Data Center Servers

- High-speed communications enabling products and technologies
- High reliability chemistries and attachment technologies
- Excellent thermal and electrical conductivity material solutions
- High throughput, low defect processes

Application	Product Name(s)	Product Attributes / Details
High Thermal and Electrical Die Attach	ATROX® 800HT Series	Hybrid silver sintered dispensable, jettable, printable die attach pastes with >100 W/m-K thermal conductivity
	ATROX® CF200 Series	High thermal and electrical conductive die attach film with >20 W/m-K thermal conductivity
	ATROX® R700 Series	Jet-Dispensable electrically conductive adhesives for RF shielding applications
Paste and Liquid Fluxes, Fine Pitch Solder Pastes	Alpha WS 9160, WS 9180, 600MHV, WSX 9284, NCX PRL507, WS 698, WS 630, 5030-FS, NCP LR002	Water soluble fluxes, no-clean fluxes, high activity options, low residue no-clean fluxes, epoxy polymer fluxes, Fine pitch pastes with water soluble series and no-clean series fluxes
Solder Spheres	MaxRel Plus and HRL Solder Spheres	High reliability SAC MaxRel / Innolot alloys and low temperature HRL series alloys
Wafer Level Packaging	Microfab & Novafab Series – Au, Cu, Sn, Sn/Ag, Ni, Neutronex Series – Au	High speed, high purity plating solutions that meet the requirements of OSAT's, IDM's and OEMS. Enabling electroplating of Air Bridge, Connection, AiP, Pillar, Mega Pillar, RDL, Barrier, RDL + Viafill, Cu-Cu Hybrid Bonding, TSV and Interposer
	Compugraphics Photomasks	WLP Photolithography applications
Damascene	ViaForm - Copper Damascene, Cobalt Damascene	Plating chemicals for BEOL IC interconnect
Moisture & Hydrogen Getters	STAYDRY Getters - HiCap 2000, 2100, Z20, H2-3000	High reliability moisture and hydrogen getters for hermetically sealed OPTO packages used in network infrastructure applications
Thermoplastic and Thermosetting Polymer Bonding	STAYSTIK Films and Pastes	Conductive and non-conductive polymer bonding products for lid seal, substrate attachment, backplane attachment, and temporary bonding during wafer thinning
Wafer Lithography	Compugraphics Advanced 4X DUV Reticles	Production of RF Surface Acoustic Wave and Bulk Acoustic Wave Filter Chips

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