Micross is the leading one-source, one-solution provider of Bare Die & Wafers, Advanced Interconnect Technology, Custom Packaging & Assembly, Component Modification Services, Electrical & Environmental Testing and Hi-Rel Products to manufacturers and users of semiconductor devices. In business for more than 35 years, our comprehensive array of high-reliability capabilities serve the global Defense, Space, Medical, Industrial and Fabless Semiconductor markets. Micross possesses the sourcing, packaging, assembly, test and logistics expertise needed to support an application throughout its entire program cycle.

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MARKETS SERVED

Our products and services are found across all market segments where applications require faster, smaller and lighter products to be used in the most demanding environments.

- Defense
- Space
- Medical
- Industrial

QUALITY ACCREDITATIONS

Our goal is to continually provide customers with one solution, while upholding our long-tenured reputation and tradition of strict standards for quality and reliability.

- AS9100
- ISO 9001: 2008 Certified
- ISO: 13485
- DLA Lab Suitability (MIL-STD-883)
- MIL-PRF-38535
- Q and V (Assembly)
  Crewe UK (QML Q, V, Y for Column Attach)
- MIL-PRF-38534 H
- ITAR Registered
- Trusted Source (DMEA)
- Certified Class 100 Clean Room
- SMD, Levels Q & M

FLOWS:

- Customer-specific, Source Control Drawing (SCD)
- COTS/PEMS Plastic Flow
- JEDEC Standard for Plastics
Leading Global Source for Bare Die, Wafer & Value-Added Services

✓ Largest authorized line card for bare die & wafers in the industry
✓ Brodest in-house capabilities to meet customer demands
✓ Most experienced engineering support team — design application & engineering solutions

FULL TURNKEY WAFER PROCESSING

DICING
• Wafer sizes up to 12”/300mm
• Multi-project wafer dicing
• Step-cutting & advanced dicing techniques

DIE SORT/PICK & PLACE
• Automated, virtually contactless handling of singulated die
• Multiple bin/grade die picking

DIE INSPECTION
• Commercial, military, space grades & custom
• Automated Optical Inspection

PROBE
• Direct dock 12”/300mm wafer probers
• Elevated & low temperature
• Full parametric testing, functional test
• Speed or trim binning

WAFFER BUMPING
• Solder, gold & copper pillar bump

WAFFER THINNING
• Wafers thinned down to 100 μm

CARRIER OPTIONS
• Sawn wafer on film-frame and ring-frame
• Waffle pack; Gel-Pak®, Tape & Reel
• Reconstructed wafer

VALUE-ADDED SERVICES
• Lot Acceptance Testing: Class H & Class K
• Kitting, KANBAN and VMI Programs
• Extensive Die-specific Failure Analysis
• Part parametric search & cross-reference
• Systematic wafer lot traceability
• Mechanical & electrical verification of capacitors
• BOM analysis & logistics management

DIE BANKING & OBSOLESCENCE MANAGEMENT
• Die and finished product banking (multiple global storage sites)
• Production continuation
• Long-term risk mitigation and logistics
ADVANCED INTERCONNECT TECHNOLOGY

Innovative Next-Gen Packaging Solutions

✓ Premier Wafer Bumping & Wafer-Level Packaging ITAR-Registered Facility
✓ Supports Early Stage Development needs and low-to-mid volume production
✓ Established WLP processes & the flexibility to tailor unique solutions to the most demanding interconnect requirements

FULL INTEGRATION & PACKAGING TECHNOLOGIES INCLUDE:

• 3D integration technology: TSV, TGV, Si interposers, 3D IC

• Advanced interconnect and packaging technologies: Solder bumping, Cu pillar, Cu-based microbumps, IIC Quilt Packaging™ interconnect fabrication

• Flip-chip & Multi-chip module assembly, including patented PADS fluxless assembly process

• Novel microfabricated devices, including IR sensor and thin film thermoelectric solutions

• Microstructure fabrication and packaging: Monolithic integration, vacuum microelectronics, wafer-level vacuum/hermetic packaging

• Microfabrication facility offering development, custom (flexible) prototyping & small-volume production services for our customers

3D IR focal plane with TSVs in 0.35 µm analog readout IC (with DRS Technologies)

x-SEMs of ECM interposer showing TSV contact point (left) and frontside metal stack (right); TSVs are unfilled (barrel coated)
COMPLETE PACKAGING CAPABILITIES

- Hermetic Packaging: Ceramic & Metal Can
- Wafer-level Vacuum/Hermetic Packaging
- Plastic Packaging: CSP/BGA/QFN
- Flip-Chip/MCM/SiP
- Die Stacking 2.5D/3D
- Custom Packaging
- Customer-specific Package Solutions for standard OEM Devices

PLASTIC PACKAGING CAPABILITIES

Extended Temperature (-55°C to 125°C)
- CSP (Chip Scale Package)
- BGA (Ball Grid Array)
- QFN (Quad Flat No-Leads)
- SiP (System in Package)

COMPLETE ASSEMBLY SERVICES

Providing full assembly services as well as the one source for all of your packaging needs.
- Die Attach: Epoxy, Eutectic, Solder
- Flip-Chip
- Die Stacking
- Wire Bond: Ball/Wedge Bonding, Wedge/Wedge, Heavy Gauge Wedge/Wedge
- Lid Seal/Encapsulation
  - Material: Ceramic, Metal, Plastic
  - Epoxy, Solder, Resistance Weld, Parallel Seam Seal
- Marking
- Lead Finishing

HERMETIC PACKAGING CAPABILITIES

CERAMIC & METAL CAN

- Ceramic 600 & 400 mil DIP SOJ
- Two-sided LCC
- Four-sided LCC
- Gull Wing
- QFP
- PGA
- Flat Pack
- Formed-leaded Flat Pack
- Metal Can
SERVICES

• BGA Reballing
• Lead Attach & Form
• Tape & Reel, 3D Scan
• Lead Conditioning
• Axial & Radial Straightening
• SMT Lead Alignment
• PIND Testing
• XRF Screening
• Hermeticity (Fine & Gross Leak)
• Solderability
• Ionic Cleanliness
• Ball Shear

BGA/LGA MODIFICATIONS

• BGA re-balling for conversion from Pb free (RoHS) to leaded (SnPb) or reverse
• Ball attach to LGA components/BGA re-work
• Ball pitch from 0.4mm min/Ball diameter from 0.3mm min
• Component size from 4mm x 4mm to 52mm x 52mm
• CTE Mismatch Mitigation
  Options include: HMPS spheres, BTCE Micross patent, Non-collapsible spheres

LEAD ATTACH & FORM

• Thermo-compression bond/High-temperature solder (5/95)
• Lead Material:
  CDA 102 Copper, ASTM B-170 Grade 2
• Final lead forms available to meet design and operational requirements:
  Standard - J, Flat - J, Gullwing, etc.

PACKAGE TRIM & FORM COMPONENTS

• Trim & Form for J-Leaded, SOIC, SOJ, DIP, PSOP, TSOP, FP, QFP & other package outlines; Compliant to J-STD-001

ROBOTIC HOT SOLDER DIPPING & SOLDER EXCHANGE

THE GEIA-STD-0006 COMPLIANT PROCESS INCLUDES:

• Robotic-controlled six-axis dipping
• Solder dipping under a nitrogen blanket
• Solder-level sensing for accurate solder dipping
• Integral component wash and dry facility
• Preheating of components to negate thermal shock
• Solder exchange from Pb free (RoHS) SnPb
• Conversion of leadless and bottom terminated components

CGA ATTACH

• IBM Legacy Process
• 2,500+ Column Placement Capable
• 1mm/1.27mm pitch tooling available
• Level 2 process re-workable column
ELECTRICAL TEST

World’s leading 3rd Party Qualification & Production Testing of FPGA & VLSI ASIC’s

LEADING EDGE TEST SOLUTIONS

• Device Characterization Testing: FPGA, ASIC, RF
• High-Speed Digital
• Element Evaluation
• Failure Analysis: Engineering & Analytical Services
• Leading-edge Sub 28nm Test

EXTENSIVE IN-HOUSE TEST CAPABILITIES

• High Speed and RF Testing
• Testing for Memory, Analog, Logic, ASICs, Processor, Mixed Signal & Discrete
• Full Static & Dynamic Burn-in
• Controlled Chamber Testing
• Capability to -65°C to +320°C forced air
• 300mm Wafer Probe over Temp (-55°C to 125°C)
• Probe of partial wafers & singulated die

TEST PLATFORMS

• Verigy 93K, Pin Scale, Smart Scale
• LTX ASLX Mixed Signal Test/ LTX TS80 Linear/Mixed Signal Test
• ATS 8256 High Voltage CMOS
• Teradyne J937-50/100 MHz, 361/O’s
• Credence Diamond D10
• Testronics 201C Discrete Component Test

RF TEST SOLUTIONS

• 24-48 RF Ports on ATE
• ATE Hybrid testing platform based on best-of-breed equipment
• Higher throughput and less device damage compared to rack-and-stack systems
• RF 6-110 GHz

ONE COMPLETE TURNKEY SOLUTION FOR PEMS (Plastic Encapsulated Microcircuits)

Screening and Qualification services of COTS (Commercial Off-The-Shelf) and PEMS (Plastic Encapsulated Microcircuits) devices are part of our comprehensive approach to designing for high demanding environments.

• Comprehensive Knowledge of All Semiconductor Components – Discretes, Passives, Linears, Memory, FPGA, Microcontrollers, ADC/DAC
• Extensive Test Capabilities – HAST, Temp Cycle, Dynamic Burn-in & Full Electrical Testing of devices
• Destructive Physical Analysis & Failure Analysis
• Laser Ablation for Advanced Decapsulation of Copper Bond Wire Devices
ENVIROMENTAL TEST

KEY RELIABILITY TEST SERVICES

- Environmental Reliability Tests
- Life Test/Burn-in (HTOL/LTOL), Junction Regulated
- HTOL – Dynamic/Static/DC/RF, Junction Controlled
- Pre-Conditioning/MRT
- Temperature & Power Cycling
- Temperature Humidity Bias (THB)
- HAST, Thermal Shock
- Autoclave
- Mechanical Shock, Vibration, Acceleration
- Fine/Gross Leak — Kr85

- Temperature/Power Cycle Operating Life
- Thermal Shock
- EFR Analysis
- ESD/Latch-up
- Acoustic Microscopy
- X-Ray
- Shadow Moiré/Warpage Analysis
- Solderability
- Salt Atmosphere
- Particle Impact Noise Detection
- Other Level III & Sub System

RELIABILITY ANALYSIS
Evaluate parts with a wide array of environmental and mechanical stresses

LEVEL I & LEVEL II
Comprehensive suite of board-level, package-level reliability

QUALIFICATION REGIME
ESD, EFR, IME, Smart Burn-in, ACBITM

RESEARCH-BASED RELIABILITY
Customized qualification plans. Specialized set-ups, real-time monitoring and data-logging capabilities

FAILURE ANALYSIS
In-depth investigation of process, field failures and elemental analysis

RELIABILITY UPSCREENING
Evaluate and perform upscreening devices for Hi-rel Applications
HI-REL PRODUCTS

- SMD/5962
- Memory
- Analog & Power
- COTS/Retail+

HI-REL MEMORY

<table>
<thead>
<tr>
<th>Component</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRAM</td>
<td>256Kb to 16Mb Mono, 16Mb MCM, 5V &amp; 3.3V, 10ns to 100ns, x8/x16/x32</td>
</tr>
<tr>
<td>SDRAM</td>
<td>SDR – 64Mb, 128Mb, 256Mb, 512Mb, PC100 or PC133</td>
</tr>
<tr>
<td></td>
<td>iPEM SDR – 1.2Gb, 25mm x 32mm</td>
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<tr>
<td></td>
<td>iPEM DDR – 1.2Gb, 2.4Gb, 25mm x 32mm &amp; 16mm x 23mm</td>
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<tr>
<td></td>
<td>iPEM DDR2 – 2.1Gb, 2.4Gb, 4.2Gb, 4.8Gb, 25mm x 32mm &amp; 16mm x 23mm</td>
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<tr>
<td></td>
<td>iPEM DDR3 – 1GB, 4GB, 21mm x 19mm</td>
</tr>
<tr>
<td>Sync SRAM</td>
<td>4.0Mb to 36Mb, 100-250MHZ, 3.3V, Pipeline, Flow-Through &amp; ZBL</td>
</tr>
<tr>
<td>Legacy DRAM</td>
<td>256Kb to 64Mb, 5V, x1 and x4 LCC, Flatpack and DIP</td>
</tr>
<tr>
<td>DRAM</td>
<td>DDR2 &amp; DDR3</td>
</tr>
<tr>
<td>EEPROM</td>
<td>1Mb Mono, 4Mb MCM, 5V, in Flatpack, LCC, CSOJ, PGA, and CQFP</td>
</tr>
<tr>
<td>Flash</td>
<td>1Mb &amp; 4Mb Mono, 16Mb to 64Mb MCM, 5V &amp; 3V, 60ns to 150ns, multiple packages including DIP, Flatpack, LCC and CQFP</td>
</tr>
<tr>
<td>UVEPROM</td>
<td>256Kb to 1Mb Mono, 55ns to 200ns, in LCC, DIP</td>
</tr>
<tr>
<td>VRAM</td>
<td>1Mb/4Mb, 100ns to 200ns, in LCC, DIP and CSOJ</td>
</tr>
</tbody>
</table>

MRAM, FRAM, & Radiation Tolerant Devices

RETAIL+ PRODUCT LINE

Micross Retail+ Product Line enables customers to use industry-leading components that were not previously available for their hi-rel, long-life applications. Micross purchases COTS components and enhances them for use in military, aerospace, transportation, industrial and medical applications.

Retail+ Products are converted from RoHS Pb-free solder metallurgies to tin-lead (SnPb 63/37) based metallurgies. Pb-free BGA packages are reballed and Pb-free leaded and non-leaded packages go through a solder dip exchange using our established processes that brings them up to standards for use in hi-rel applications.

Available Products: DDR and Flash Memory, Processors, Power Management Integrated Circuits (PMIC)
GLOBAL LOCATIONS

Ten operating and sales locations across the U.S., Europe & Asia

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