Surface Mount Technology is the practice and method of attaching leaded and nonleaded electrical components to the surface of a conductive pattern that does not utilize leads in feed through holes.
Original SMT Market Drivers 1960-?

- Smaller – Faster – Better products
- Added capacity need in restricted size form factor
- Financial advantages and prestige of smaller product sizes
Technology Drivers

Justified needs generate technology solutions

- Digital circuit operations
- Reduced power requirements
- Refinements in
  - die technology
  - attachment methods
  - assembly methodologies
- Automation techniques
- Limited availability of through-hole components
Technology Enhancements

- Solder paste and materials maturity
- Alternate lead forms J lead, BGA, etc.
- Substrate material enhancements
- Component availability and robustness
- Standardized
  - package types
  - footprints
  - process methodologies
Department of Defense

Interest in enhanced capability for avionics, space, and support resources

- Initial reservations (DOD, Space, and others)
- Through-hole technology was mature, robust and well understood.
- Commonly defined as “Planar Mount” or on one plane
- Similar to DIP devices but doubled circuit density
Desired components were not always available as SMD
Original Surface Mount applications were often Hybrid or Flat-pack
Flat-packs had dual capability for through hole as well as Planar through flexible lead form
Leadless components were suspect when considered for rigorous applications
SMT Advantages Embraced by Commercial Users

Reduction in
- Human intervention
- Labor cost
- Production cost
- Material cost
- Overhead
SMT Advantages Embraced by Commercial Users

- Enhanced production speed
- Increase circuit density
- Higher operating speed
- Repetitive operations support
  - process control
  - quality concepts
SMT Advantages Embraced by Commercial Users

- Useful in combination with through-hole technique
- Reduced power consumption
- Reduced heat generation
SMT Advantages Embraced by Commercial Users

- Increased circuit capability
- Adequate performance capability
- Continued production enhancements and evolution
Industry Segments Driving SMT Technology Today

- Telecommunications
- PDA
- Netbook
- Laptop computers
- Automotive
- DOD and NASA piggybacking commercial (COTS – commercial, off-the-shelf) components
The Basic SMT Process

1. Apply Solder Paste
2. Place Chip Components
3. Place Advanced Components
4. Reflow
5. Clean
6. Test

Surface Mount Technology - A Historical Perspective
Current Technology Enhancements

Smaller – Better – Cheaper

- Direct die attach, COB, Flip Chip
- BGA, microBGA, PoP
- Micro-via technology
- System – In- Package
- Low voltage development
Current Technology Challenges

- Pb-Free QFN/DFN/LGA
- Component and substrate material enhancement
- Embedded component (inter-layer capacitor/resistor)
New Technology Enhancements and Challenges for the Future

- Nanotechnologies
- 3D semiconductor architectures
- Next generation lead-free alloys & fluxes
New Technology Enhancements and Challenges for the Future

- Harsh/Hostile environment
- Photovoltaic
- More complex tuck/SOC/PoP
The future is limited only by our imagination