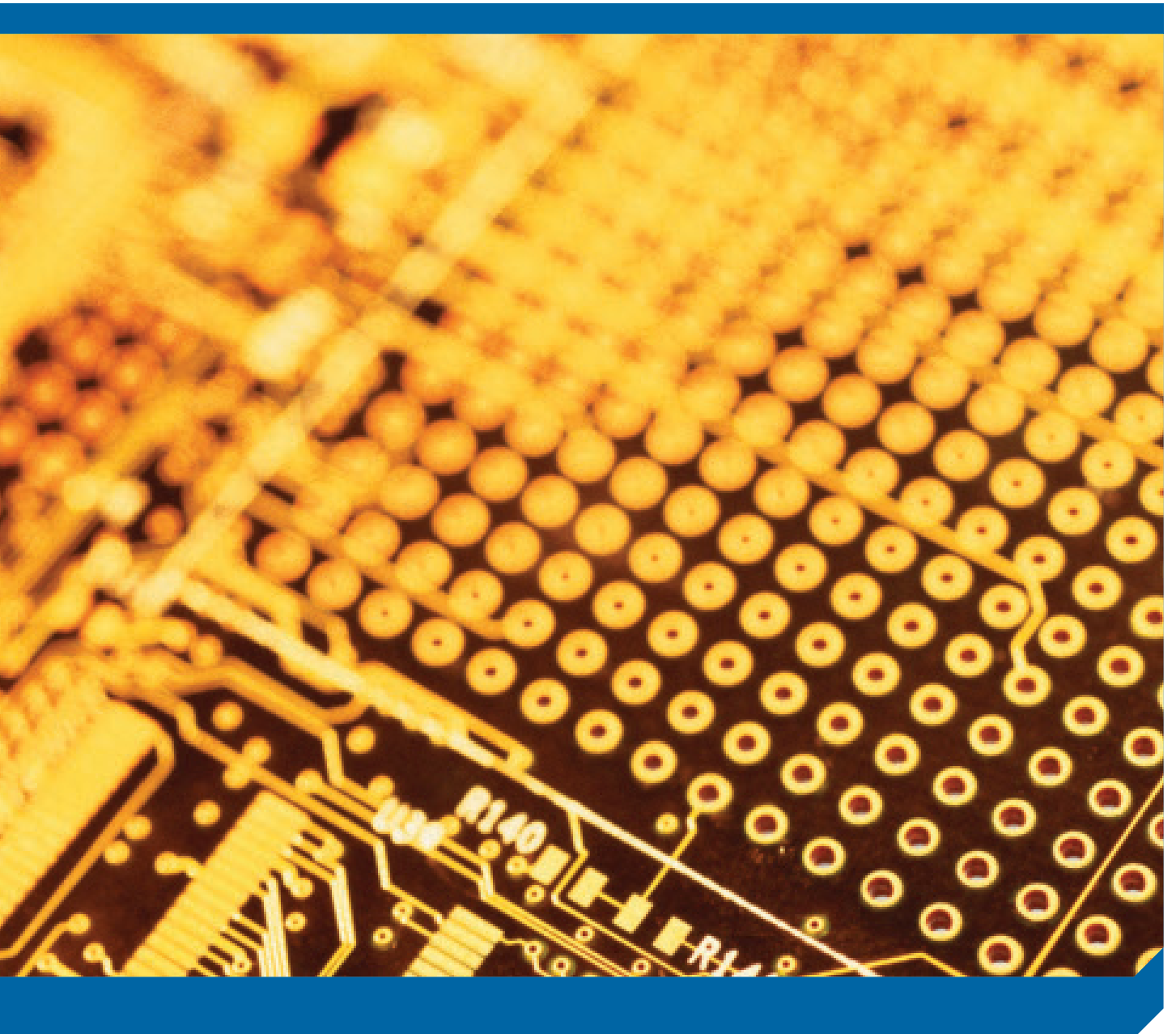
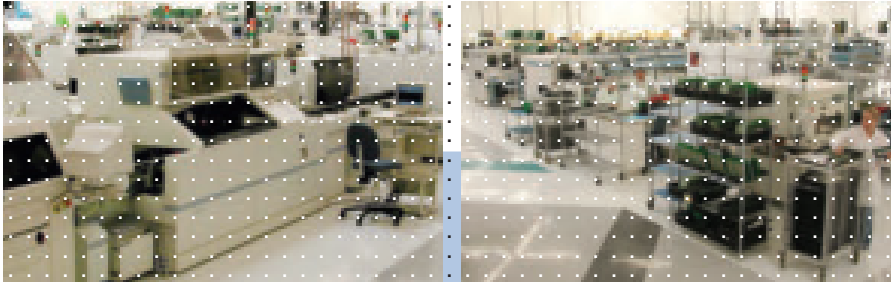


Electronics Manufacturing Solutions





CTS Electronics Manufacturing Solutions

CTS Electronics Manufacturing Solutions (EMS) is a turnkey provider of manufacturing solutions to customers in a range of electronics equipment markets. With global manufacturing facilities, a broad product offering and a complete range of turnkey services, CTS is the ideal choice for an OEM seeking customized product solutions from a focused and agile EMS partner.

What Makes CTS EMS Different?

CTS doesn't provide a 'one-size-fits-all' solution – but focuses on providing customers with a flexible, global, full-service electronics manufacturing solution based on your product needs.

CTS Provides Solutions For -

- ⦿ Customers who require a medium to high mix, low to medium volume solution
- ⦿ Higher complexity, or higher technology products
- ⦿ Medical, defense, aerospace, communications, industrial and computing applications.

Our Strategy Is -

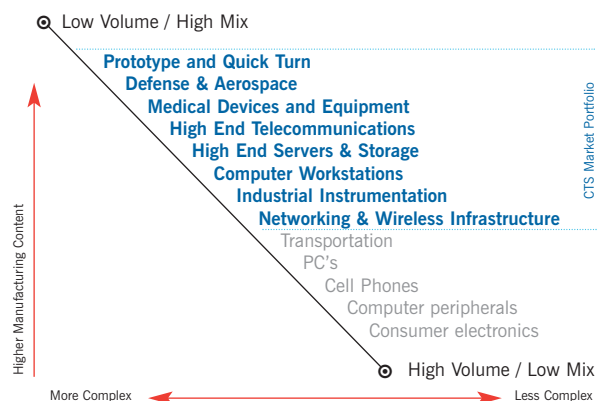
- ⦿ To provide optimized product solutions according to customer need –
 - ⦿ Local manufacturing close to the customer
 - ⦿ Multi-site volume fulfilment – Asia, North America, Europe
 - ⦿ Local NPI and transition to lower-cost or other geographies
- ⦿ To be an integrated global business, with a centralized strategy, systems & processes

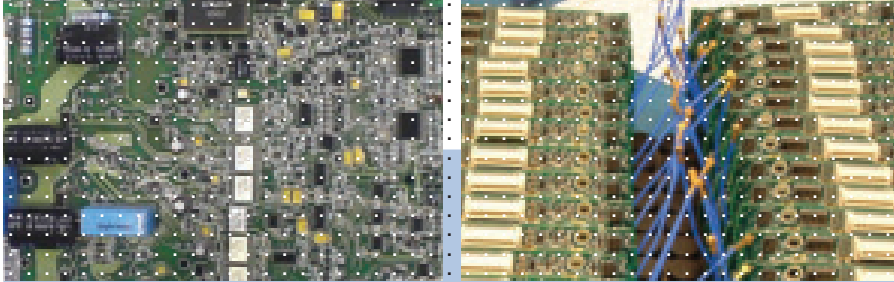
CTS Products

- ⦿ Printed Circuit Board Assembly
- ⦿ Backplane Assembly
- ⦿ High Level Assembly (Box Build)

CTS Services

- ⦿ Design & Manufacturing Engineering
 - ⦿ Design for Manufacturing
 - ⦿ Design for Test
 - ⦿ New Product Development & Introduction
- ⦿ New Product Introduction (NPI)
- ⦿ Volume Manufacturing – Global Opportunities
- ⦿ Program Management – Regional & Global
- ⦿ Test Engineering
- ⦿ Supply Chain Management & Global Logistics
- ⦿ Repair, Rework & Upgrade Services





Product Assembly

CTS EMS provides all levels of product build – from the smallest PCB assemblies to large-form populated box build assemblies. Our global facilities are positioned to offer an optimal manufacturing solution for customers and we invest continuously in the latest equipment, techniques and processes to sustain excellent levels of customer service worldwide.

Printed Circuit Board Assemblies – Value through Experience

Global SMT Capabilities – North America, Asia, Europe

- ⦿ 0201 to 55mm² Packages
- ⦿ Plastic / Ceramic BGA / μ BGA / Flip Chip Scale Packages
- ⦿ Ultra-Fine 0.3mm Pitch Capability
- ⦿ Odd-Form Manufacturing to 165mm Length
- ⦿ Class 10,000 Clean-Room Manufacturing
- ⦿ Wire Bonding – Chip on Board
- ⦿ Specialist Manufacturing for Critical Applications (FDA controlled)
- ⦿ IPC Class II & III Assembly
- ⦿ Assembly in Accordance with AS9100 & ISO13485
- ⦿ Compliant to Part 820, 21 CFR Requirements & GMP Standards

Backplane Assembly:

- ⦿ Design, Layout & Simulation of Backplanes
- ⦿ Design to Industry Specification
- ⦿ High-Complexity Applications
- ⦿ In-House Conformal Coating
- ⦿ IPC Class II & III Workmanship Standards
- ⦿ Material Technologies
 - ⦿ FR4 to High-tech – Rogers, FR406, Polyimide / Flex, Halogen Free
- ⦿ Geometries
 - ⦿ Length - 2.0cm to 1.5m (1.0" to 60.0")
 - ⦿ Thickness - <9.5mm (0.375")
 - ⦿ Layer Count - <56 Layers
- ⦿ Finishes
 - ⦿ HASL, Immersion Tin/ Gold/ Silver, OSP
- ⦿ Standard Clean / No Clean Materials
- ⦿ Buried & Blind Vias
- ⦿ Controlled Impedance +/- 7.5%



CTS Electronics Manufacturing Solutions

Higher Level Integration (HLA)

From 1U assemblies to specialist medical equipment, plastics integration to full outdoor cabinet assembly, CTS provides value add manufacturing services in North America, Europe and Asia. CTS scales its capacity and capabilities to meet requirements – offering customers improved time-to-market, flexibility and cost-reduction opportunities.

HLA Options

- ⦿ Assembly & Test of Press-Fit & SMT Printed Circuit Boards
- ⦿ Sub-Rack Assembly
- ⦿ Integration of Cards, PCA Modules & Other Sub-Assemblies
- ⦿ Assembly of Power Units, Cable Assemblies, Thermal Management
- ⦿ Specialist Integration of Gas, Electronics Controls or Moving Parts
- ⦿ Full Cabinet Integration – Configured to Customer Specification
- ⦿ Final Test to Customer Specification
- ⦿ Direct Ship to Point-of-Use
- ⦿ Managed Spares, Repair and Warranty
- ⦿ Assembly According to ISO9001, ISO13485, FDA or AS9100 Requirements

Market Applications

- ⦿ Wireless Infrastructure
- ⦿ Networking Equipment
- ⦿ Medical Equipment
- ⦿ Test & Measurement Devices
- ⦿ Security Systems
- ⦿ Data Storage
- ⦿ Defense & Aerospace Equipment
- ⦿ Industrial Units & Controls

Technical & Engineering Services

Engineering services are fundamental to CTS' ability to offer competitive product support worldwide. From development services and product evaluation and introduction, to customized test support, our customers are able to draw on a talented pool of engineering professionals worldwide.

Design & Manufacturing Engineering

CTS engineers have extensive experience in designing electronic modules and subsystems for inclusion in some of the most technologically advanced systems in the world.

Design Services

- ⦿ Analog & Digital Design
- ⦿ RF & Microwave Design
- ⦿ Embedded Software
- ⦿ Schematic Capture & PCB Layout
- ⦿ Electromechanical Design
- ⦿ Design for International Compliance
 - ⦿ CE Marking, Low-Voltage, EMC & RoHS
 - ⦿ UL, CSA & Telcordia Requirements



We also use our comprehensive EMS manufacturing experience to assist customers in developing market-and production-ready products, reducing risk in the critical early phases of manufacturing.

Product Manufacturability & New Product Introduction

- ⦿ Design for Fabrication (DFF)
- ⦿ Design for Assembly (DFA)
- ⦿ Design for Manufacture (DFM)
- ⦿ Design for Test (DFT)
- ⦿ Failure Mode Evaluation Analysis (FMEA)

Test Engineering

Controlled by ISO9001, ISO13485 or AS9100 according to customer requirements, CTS is able to provide a custom-designed test solution for every customer.

- ⦿ Design for Test (DFT) for Optimal Test Solution
- ⦿ Program Generation Direct from CAD Data
- ⦿ Manual Defect Analysis (MDA)
- ⦿ In-Circuit Test (ICT)
- ⦿ Stand-Alone Boundary Scan Test
- ⦿ Contact-Less Methodology
- ⦿ Functional Test
- ⦿ Customer Supplied or In-House Test Solution
- ⦿ Flying Probe Test for NPI
- ⦿ Hi-Pot Test on Assembled Rack, Power Supplies of Complete System
- ⦿ Audit Test on Complete System
- ⦿ Burn-In (Accelerated Life Test)
- ⦿ Environmental Testing
- ⦿ HALT / HASS Specialist Test
- ⦿ Automated Optical Inspection

Lifecycle Management

CTS' core strategy is to provide optimal value to customers at each stage of the lifecycle. Prior to a program start, CTS identifies customer specific requirements and develops a customized manufacturing solution, defined according to customer need, product volumes and mix, demand characteristics and technology.

New Product Introduction (NPI)

The ability of an EMS provider to add value in the critical NPI phase is paramount. It is here that experience, technical capability and skilled personnel can help customers to reduce time to market, address costs, meet regulatory requirements and limit the 'scope creep' that can occur very easily in this difficult and risk-prone area of manufacturing. CTS works closely with the customer to define a manufacturing strategy at the outset, allocating a specialist cross-functional team to manage the product until its transition to volume.

NPI Services

- ⦿ NPI Program Manager & Cross-Functional Team Assigned to Each Customer
- ⦿ Dedicated Prototype Lines at Each Facility for Flexibility & Focus
- ⦿ Parallel Supply Chain, Test & Manufacturing Strategies
- ⦿ ECO Control Throughout
- ⦿ Control aligned with ISO9001, ISO13485, FDA or AS9100 Requirements
- ⦿ Specialist Clinical Trial Support for Medical Customers
- ⦿ Pre- & Post-NPI Analysis to Identify Opportunities Improvement
- ⦿ Product Transition Process In Place for Transfer to Alternative CTS Facilities
- ⦿ FMEA Process



CTS Electronics Manufacturing Solutions

Volume Manufacturing

Manufacturing Strategy

- ⦿ Global Facilities
- ⦿ Product Transfer Expertise
- ⦿ Program Management Approach
- ⦿ Focus on Flexibility, Agility & Responsiveness
- ⦿ Medium to High Mix Speciality
- ⦿ Quality Assurance Core Strategy
- ⦿ Lean Manufacturing Methodologies
 - ⦿ Six Sigma
 - ⦿ CpK Measures
 - ⦿ 5-Why Root Cause Analysis

Program Management

Every customer has a dedicated Program Manager, who leads a cross-functional operational team of skilled personnel. The Program Manager exists to –

- ⦿ Understand and define customer requirements
- ⦿ Communicate customer needs to CTS
- ⦿ Ensure that operations execute to customer requirements
- ⦿ Be a single point of contact for the customer
- ⦿ Measure performance to ensure continuous improvement

Multi Regional Support

If a customer requires product to be built at more than one location, a team will be established at each site, managed by the lead account manager at the most convenient location for the customer.

Program Transfer

CTS employs a robust, documented process to ensure that program transition from customer to CTS, or from one CTS site to another, is seamless and efficient.

The process includes -

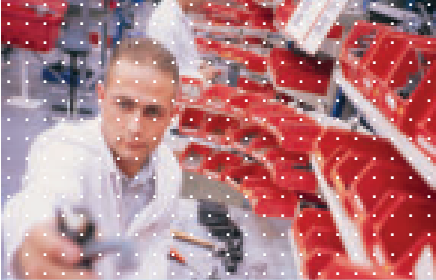
- ⦿ Feasibility Analysis
- ⦿ Planning Guidelines
- ⦿ Documentation & Activity Checklist
- ⦿ Project Management Approach

This is especially critical when transitioning medical or highly complex programs.

Product Optimization

Product optimization is a core strategy for CTS EMS. We seek to develop a manufacturing and product management strategy that best meets the customer's requirements. A broad strategic footprint and global team approach ensures that customers benefit from an objective solution, based on aligning their needs with CTS' operational strengths. Sample options –

- ⦿ Single site build local to the customer
- ⦿ Local NPI for control, transition to low-cost operation for volume
- ⦿ Multi-region build of major volume products to meet channel needs
- ⦿ Split builds –
 - ⦿ Complex / unstable products built local to the customer
 - ⦿ Stable, higher volume products built in low-cost regions
- ⦿ CTS global footprint ensures that a product management strategy has the flexibility and scope to evolve throughout the product lifecycle.



Global Supply Chain Scale & Logistics Management

Cost control, reduced lead times and product reliability are critical elements in meeting customer needs. All are enabled by an effective supply chain & logistics process.

Supply Chain Strategy

- ⦿ Global Fulfilment, Local to the Customer, from Short Pipelines
- ⦿ Supplier-Owned Consigned Raw Material Inventory
- ⦿ Finished Goods Buffer Inventory Positioned at Customer's Preferred Location
- ⦿ Single Signal Consumption Driven Replenishment
- ⦿ Product-Focused Planning Drives 'Matched Sets' throughout the Supply Chain
- ⦿ Single Point of Ownership for Entire Supply Chain
- ⦿ Preferential Terms throughout the Supply Chain
- ⦿ ECO Control
- ⦿ Lifecycle Management & Product-Level Controls

Logistics

Good logistics management is more than just shipping product on time – it is about managing a complex supply chain, distribution and repair network, frequently across several facilities and regions, in order to add value to the customer's business. CTS EMS has a global network of logistics and supply chain experts who have more than twenty years' experience in supporting customers regionally and worldwide.

Direct Ship – To the Customer's Customer

One of CTS' foremost value-adding services is Direct Ship or managing the customer's order process from EDI order signal to shipping products directly to the customer's channels. This is the ultimate customer support service – saving the customer time and money –

- ⦿ Predictable & Reliable Service
- ⦿ Reduces Freight & Handling Costs
- ⦿ Minimizes Lead-Times
- ⦿ Global Sourcing Ensures Competitive Pricing
- ⦿ Absolute Flexibility

Service & Warranty

To 'close the loop' of lifecycle management, CTS provides a seamless repair and warranty service for customers, controlled and defined by ISO9001, ISO13485 or AS9100 requirements. This approach provides customers with the reassurance that repairs will be dealt with promptly – an audit trail, quality analysis and feedback further strengthen this service.



www.ctscorp.com/ems
sales@is.ctscorp.com

ISO 9001 – 2000 • ISO 14001 • ISO 13485 • FDA Compliance
AS9100 • NISP Compliance • IPC Class II & III Workmanship Standards
GMP 21CFR Part 820



CTS Manufacturing:

Moorpark CA, USA
Santa Clara CA, USA
Matamoros, Mexico
Glasgow, Scotland
Londonderry, NH, USA
Tianjin, China
Singapore
Bangkok, Thailand

CTS Electronics Manufacturing Solutions has sales locations worldwide -
for your nearest representative, please contact: sales@is.ctscorp.com

To contact a sales person in your region -

NORTH AMERICA

West

T : 805-532-2800

East

T : 603-421-2546

EUROPE

T : +44 (0)1698 505050

CHINA

Beijing

T : +86 13381232710

Shanghai

T : +86-13564756640

SINGAPORE

T : 65-6486-0511

THAILAND

T : 65-3552-1570

THAILAND

T : 65-3552-1570