



Introduction

- Natronix Semiconductor Technology is a member of the [Valingro](#) Group. The Group's Vision is "Building businesses that transcend time"
- [Natronix](#) is a Semiconductor Packaging & Design company focusing on complex solutions to global Semiconductor companies
- Natronix's India OSAT (Outsourced Semiconductor Assembly & Test) presence is SPEL Semiconductor Limited
- SPEL is India's 1st & only SATS (Semiconductor Assembly & Test Services) company, having a successful global track record
- 350 Employees worldwide with direct Customer support in US, Europe, Taiwan & India
- Significant presence in QFN & Gull wing packages, with scheduled expansion in BGA, WLCSP, MEMS packages

Vision

To be the Natural Destination for global Customers seeking cost-effective offshore turnkey IC assembly & Test services

Values

All Employees are inculcated with the following Values from their joining thru their growth with us. These are the guiding beliefs our Employees follow while dealing with both internal & external worlds. Our Values in turn helps the organization grow further.

1. **Business Ethics** : Defines us as a Company
2. **Professionalism** : Defines us as individuals
3. **Citizenship** : Defines our contribution to society

Mission

SPEL Semiconductor Limited, an IC Assembly & Test Subcontractor for over 25 years, works as one Team to achieve zero defect, Just-in-time, Cost-effective solutions with Service that is uncompromised

SPEL's Partners ➡ Customers, Suppliers, Employees & Shareholders are confident in the knowledge that we are consistently meeting and exceeding their expectations

Corporate Objectives

1. **Profit - Earnings** that enable achieving our other 4 objectives
2. **Customer Satisfaction**
3. **Competence**
4. **Employee satisfaction**
5. **Growth**



SPEL Assembly Floor – Front of Line

Turnkey Services

SPEL offers a range of turnkey services like:

- Self-Clearance of wafers from airport customs
- Die bank storage at Nitrogen atmosphere
- Wafer Sort
- Assembly Services
- Final Electrical Test Services
- Tube / Tape & Reel / Tray packing
- Custom packing / labeling
- Finished goods store
- Drop-shipment to end-Customers
- Quickest cycle time

Packaging services

- Build sheet generation support using A-CAD
- Preproduction Engineering lots Support & Fast track turnaround
- Chip on Board (COB) assembly
- New Package development in short time (12 Weeks Max)
- Leadframe & Package design support (4 Weeks Max)
- Attractive pricing for Customers consigning equipment and Customers investing for captive line support
- Assembly prototyping support & failure analysis services for local design houses

Value Proposition

SPEL offers cost effective turnkey packaging services to Customers. As a major subcon, SPEL is geared towards meeting the industry's ever growing needs for faster, lighter, smaller & high performance chips. SPEL is able to meet this by offering a **wide portfolio of Packaging & Test technology with state-of-art equipment & versatile operational scale.**

SPEL's services are utilized by major Integrated Device Manufacturers (IDMs) also to a larger extent. By working with SPEL, Customers are able to reduce their manufacturing costs and focus on their core competencies. SPEL also offers a choice to use its exhaustive list of more than 100 QFN open tools to shorten the product launch time-frame.

SPEL is an ideal choice for business partnership for all design houses to get their products assembled with right Packaging technology & enabling them for shorter time to market.

Business Partnership Redefined

Customers have trusted SPEL as their manufacturing partner for Assembly & Test services for more than 2 decades. They prefer SPEL as their partner for the **Quality, Cost competitiveness, Cycle time performance and excellent Service (QCDS factors)**. Our Customers have been making sizeable investments by establishing captive lines at SPEL thereby enjoying benefits in terms of pricing, cycle time & capacity. Customers are very much impressed with this "Partnership model" with us and continue to make use of it for their growth as well as minimizing their operational expenses. With a strategic package road map in line with current market demands, SPEL is well prepared to be the most preferred assembly & test partner.

Technical Capabilities

Process	Capability
Wafer Probing	Max 8" wafers
Back grinding	Silicon wafers – Max 8" Down to 6 Mils (6" Wafers) & 8 mils (8" Wafers)
Dicing	Max 12" wafer
Wafer Backside coating	Available for QFN with B-stage epoxy
Die Attach	Max 12" wafers Minimum die size – 10x10 Mils Wafer Map Capability Multi die Capability
Wire Bond	Both Gold & Copper wire (Also Pd coated Cu wire for Preplated L/fs)
Wire bond (Cu)	For dies with bond pad thickness > 0.8 Microns
Encapsulation (QFN)	Saw singulation method
Top Mark	Laser
Lead Finish	100% Matte Tin; Preplated lead finish on select packages

- **Encapsulation:** QFN packages molded in cake-form which allows offering various package body sizes without significant change in tooling, thereby reducing Non-Recurring Expenditure for Customers.
- **Saw Singulation:** Method used to singulate individual ICs from leadframes for QFN. State-of-art dicers used to attain high throughput & optimal quality. Offers flexibility in package types that cannot be obtained through punch singulation. Results in faster time to market & wider choice of package footprint with minimum investment.
- **Electrical Testing:** Robust test setup with wide variety of advanced test systems capable of handling mixed signal, analog & digital devices and highly complex custom built ASICs.

Package Data & Bill of Material

	Leaded	Non-Leaded
Pkg types	SOIC, QSOP, TSSOP, SSOP	COL, TDFN, TQFN
Body size	150, 173, 240, 300 mils	1*1 ~ 12*12 mm
Pin count	8 ~ 80 pins	4 ~ 80 pins
Lead pitch	0.4mm Min	0.4mm ~ 0.65mm
Pkg Thickness	0.9mm ~ 2.5mm	0.4, 0.5, 0.75, 0.9 mm

Leadframe	Cu 194 / Preplated (NiPdAu)
Die attach Epoxy	Conductive / Non-Conductive
Epoxy application	Dispense / Backside coating
Bond Wire	Gold / Copper (0.8 Mil ~ 2 Mil dia)
Mold Compound	Customer specs / SPEL Standard

Custom size QFN's can be arranged with nominal tooling cost. Customer specific BOM is also considered. As a value added service, SPEL offers its Customers Package selection & Leadframe design support and recommending right test platforms. **For Complete Package Portfolio, Die design rule, Open tool availability, Package outline drawings & Package specific Reliability data / Moisture Sensitivity Level (MSL data) – Refer our website or contact our Sales office.**

Engineering Expertise

SPEL's engineering team is comprised of experienced and talented pool of Engineers. Our Engineers care about micro details in all technical matters aiming at continuous improvement in all processes & systems. We cater to the needs of Customer specific requirements with custom designed leadframes using in-house leadframe design capability.

Team members undergo rigorous internal & external training programs at regular intervals, including at supplier sites, to sharpen their engineering skills & performance. The team in turn conducts structured training to all Operators to perform things Right the First Time.

Quality Policy

Consistently provide products and services that will exceed the quality expectation of our Customers. Implement process improvement programs which will enable each Employee to do their job right the first time. Work towards continual quality improvement through training and teamwork.

Quality Accreditations

Quality and time-to-market are 2 crucial factors in the success of a product. To ensure the highest level of quality, SPEL has worked towards obtaining the top industry certifications including **ISO 9001, ISO 14001, TS (IATF) 16949** and the **Sony Green Partner** Certification.

Quality & Reliability

Quality is a way of life at SPEL and is inbuilt in all processes & systems. SPEL conducts regular training programs on various QC tools for all Employees to do their job Right the First Time. Internal corrective action procedures adopt Systems level approaches that help increase Productivity & Quality. SPEL adopts various quality systems and constantly benchmarks itself against the leading players in the industry thereby working towards continuing improvement.



Reliability

Our Short & Long term reliability study helps in Evaluation & Qualification of New Packages, Processes, Materials, Technology & Equipment. SPEL performs periodic reliability study and provides updates to Customers at reasonable charges. SPEL provides the following reliability test services with state-of-art equipment:

- High temperature Operating Life test
- Temperature Cycler test
- Highly Accelerated Stress Test (HAST)
- High Temperature Storage life test
- Temperature & Humidity Bias test
- Unbiased pressure pot test
- Low Temperature storage test
- Preconditioning & MSL Evaluation test

Failure Analysis

SPEL has the following equipment for detailed failure analysis of IC Packages with which we offer test low yield failure analysis support:

- Low speed saw / Grinder / Polisher
- Microfocus X-ray Inspection
- Microzoom / Stereo Microscopes (High Power)
- Scanning Acoustic Microscope
- Package decapsulation -Chemical (Jetetch)
- IR reflow oven
- Scanning Electronic Microscope (third party labs)

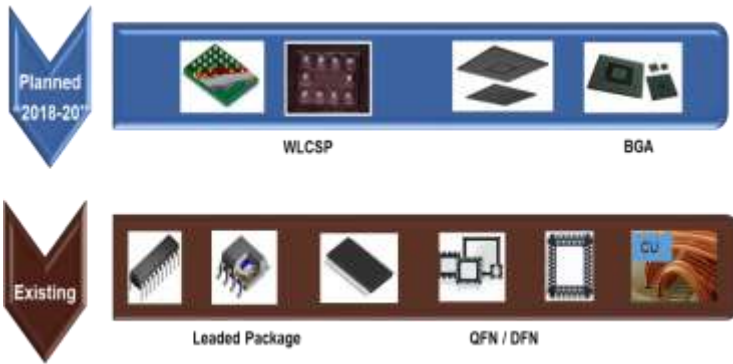
Customer Loyalty

QCDS factors are the key mantras driving each of our Employees. We believe in providing accurate and fast response to all our Customer queries aiming at total Customer satisfaction.

We strive to be our Customer's preferred choice of vendor, by working closely with our Customers through regular interactions & feedbacks. We offer them a more personalized experience. We constantly strive to achieve operational excellence through continual improvement programs to meet Customers expectations & targets. We remain committed to identifying & meeting individual Customer needs through improved business processes, operating procedures & systems.



SPEL Assembly Floor – End of Line



Consumer needs using electronic technology is rapidly changing with the drive towards getting smarter, faster, smaller & cheaper systems with improved functionality. Semiconductors play a prominent role in achieving this with their higher integration potential. **SPEL's package roadmap encompasses the increasingly complex packaging requirements to support virtually most of the packaging needs of the semiconductor industry.**

SPEL's technology road map includes investment on growth packages like BGA, WLCSP, Flip chip packaging, System in Package, MEMS and new emerging packaging technologies like 3D packaging & WLCSP. These packaging technologies are adopted in wide range of devices such as smartphones, gaming, Automotive, Entertainment & handheld intelligent systems

Logistics

Being a 100% export oriented unit, SPEL enjoys Green Channel status for all its exports & imports.

- No open inspection of wafers & raw material is done at Customs
- SPEL's own office at the airport assists in expediting all Customs clearances
- Easy equipment consignment procedures (Customs related) have benefitted many Customers to greater extent
- SPEL is capable of achieving overall cycle times of less than 10 days, assisted with Customer consigned equipment
- Chennai International airport has Flights to USA, Europe, Japan, APAC & Middle East Asia

Going Lean...

SPEL is actively involved in implementing **Lean manufacturing and Just-In-Time** concepts to maximize operational efficiency, improve assembly yield, cycle time and minimize operational costs.

SPEL has also developed its own ERP that enables real-time tracking of WIP. Assembly yield is monitored for continuous improvement. Customers can check the status of their orders by logging onto our website.

Talent Management

SPEL has always been successful at retaining talent by fostering growth and aiding in overall development of its Employees. Attrition at SPEL is perhaps the lowest in the industry. Concerns are mutually addressed with adequate communication mechanisms thereby enabling smooth & continuous operations. SPEL functions as a family more than an organization with excellent handshake among inter-disciplinary teams.

R&D

SPEL has carved out an ambitious investment plan in R&D. This includes investment in Design & Verification and Package IP. This will assist our revenue and profitability in the coming years.

S-E-C (Socio Economic Contribution)

Understanding human behavior and tuning it towards self-disciplined citizens underlines the concept of S-E-C implemented in SPEL. Employees are given to comprehend their roles as an individual and their responsibility to bring up fellow citizens. SPEL appreciates its Employees commitment and complements them by assisting their growth to become future leaders.

On the Growth path...

With the guidance of an eminent board & dynamic leadership, SPEL is on target with respect to growth on Revenue, Volume, Technology & Customers. There is ample land in the factory to support our planned expansion. SPEL has also mastered its hiring & training methodology thereby enabling faster scaling-up of technology & capacity.

Our Employees know that Leadership is related to Action and not Position. The Management Team has been creating an Open Work Environment, encouraging people to exhibit their leadership skills through various initiatives. SPEL has been growing by nurturing its people to become Leaders who will continue to make their impact in the Semiconductor Industry.



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