

SPEL Semiconductor Limited

Chennai , India

Capabilities Presentation

1. About Us
2. OSAT Services
 - Turnkey Solutions & Value Added services
 - Package Portfolio
 - Bill of Material
 - Assembly & Test Capability
 - Road Map
 - Cost & Communication
3. Quality
4. Customers
5. Team
6. Logistics
7. Our USP
8. Contact

- The Valingro Group is involved in creating companies concentrating on global competitiveness, leveraging global opportunities and acquiring global capabilities
- Natronix Semiconductor Technology Private Limited headquartered in Singapore is a member of the Valingro Group
- Natronix Semiconductor Technology Private Limited has its OSAT presence in India through its subsidiary SPEL Semiconductor Limited
- SPEL is the first IC Assembly & Test facility in India which commenced commercial production in 1989
- SPEL has customers covering all major application segments
- SPEL is ISO 9001, ISO 14001 & IATF (TS) 16949 Certified and 100% Export Oriented unit.
- Natronix-Sg has targeted further acquisitions within OSAT and D&V segments.



Full Turnkey Solutions

- Assembly
- Testing & Packing

Value Added Services

1. Design :

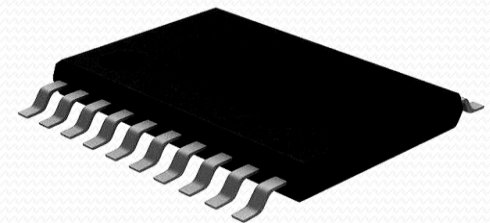
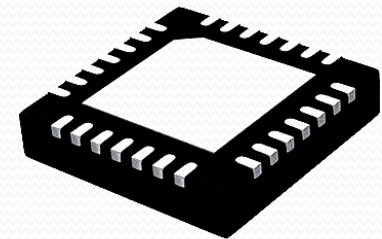
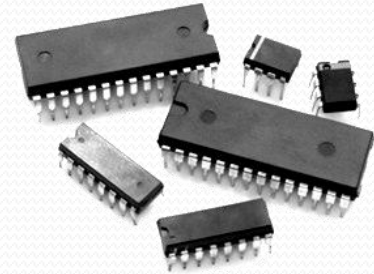
- Package design
- Lead frame design

2. Assembly :

- 100% Tin plating, 85:15 Tin:Lead and Ni-Pd-Au PPF
- Sandwich Package
- Wettable Flank in 9 TDFN, 32 QFN, 52 QFN Assembly
- Die level Tape and reel process

3. Others :

- Failure analysis & Reliability testing
- Test Program Development & Product Characterization
- Drop shipments across the globe



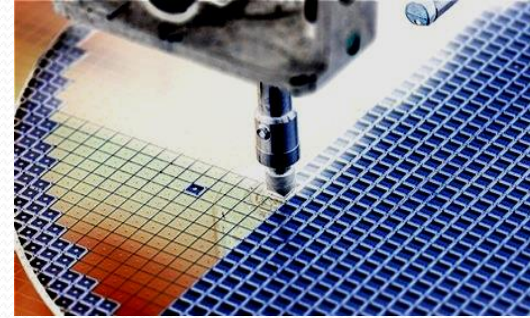
QFN Capability		Process	Package Thickness	Body Size in mm	Lead-Pitch	Lead-Count
		Saw Singulated QFN / DFN	0.40 mm 0.50 mm 0.75 mm 0.90 mm	0.6 x 1 to 12 x 12	0.40 mm 0.50 mm 0.65 mm	2 ~ 80 pins

Leaded	PACKAGE	150 MIL ; 300 MIL SOIC	LEAD COUNT	7/8/14/16; 16/20	JEDEC STANDARD	MS-012 ; MS-013
		150 MIL QSOP ; VSOP		16/20/24/28; 40/48		MS-137 ; MS-154
		173 MIL TSSOP		8/20/24/38		MO-153
		150 MIL MILLIPAQ		80		MO-154
		300 MIL PDIP		8/14/16		MS-001
		225 MIL SIP		8		NA

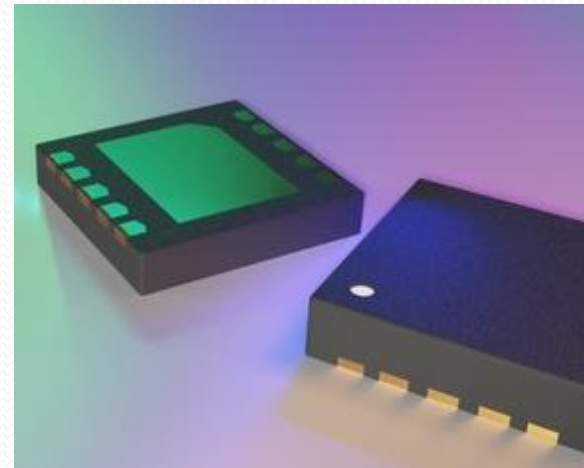
Test Platforms		TEST PLATFORM	Credence ASL 1000	Eagle ETS 364 / 88	Verigy V50
		DIGITAL	✓	✓	✓
		MIXED SIGNAL	✓	✓	✓
		ANALOG	✓	✓	

Material	Leaded / QFN / DFN	Supplier
Lead frame	C7025, Olin 194, EFTECH & NiPdAu Pre-plated	QPL (HK), NKQ (China), Fullriver (China)
Die Attach Epoxy	CRM1076NS	Sumitomo (Singapore)
Screen print Epoxy	Non Conductive 8006 Conductive 8008	Henkel (Korea)
Gold Wire	0.8 to 2.0 mil	Tanaka, Heraeus (Singapore)
Bare Copper wire / PdCu wire	0.8 to 2.0 mil	Tanaka (Singapore), Heraeus (Malaysia)
Mold Compound	G600, G633 & G770Series	Sumitomo (Singapore)

- Minimum die size : 10 Mils square
- 12" wafer assembly capability(From Die attach)
- Epoxy screen print capability
- Apart from Gold wire Copper wire bonding (Bare Cu & Pd Coated) – 0.8 mil to 2.0 mil

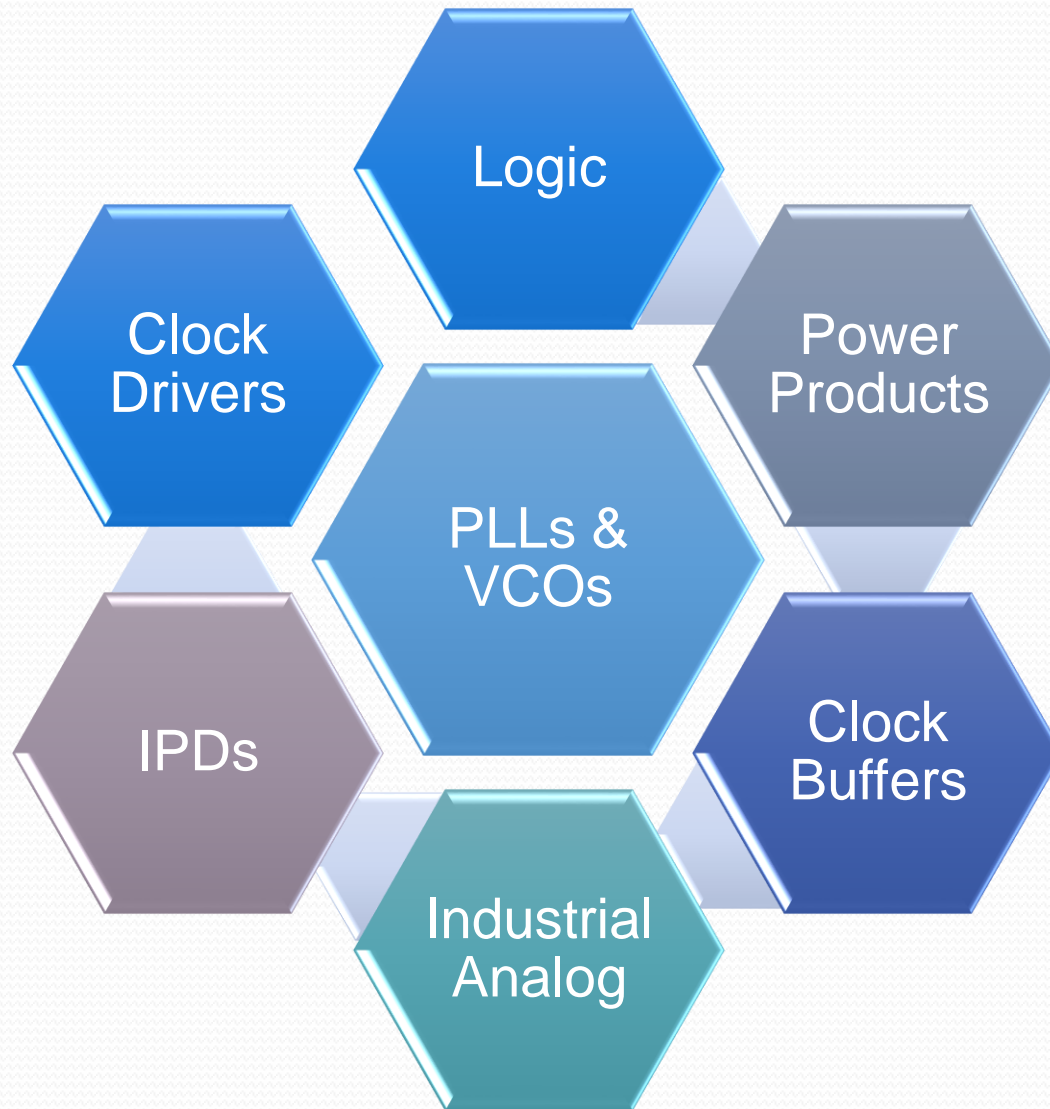


- Bond Pad Pitch : 40 microns
- Low loop bonding : 4 mils
- Ultra Thin packages : 0.4mm
- Wafer mapping at Die Attach
- Multi-die package assembly
- Multi-site Test capability



Package Category	Capacity / Month (Mln Units)	Remarks
Leaded	1.7	Twenty Lead Equivalent
QFN / DFN	3.3	Three Sq.MM Equivalent

- 32% of the Total Capacity is available for Copper Bonding
- 100 % power backup



Final Testers		
Tester Name	Manufacturer	Model
TMT	TMT inc	ASL1000
TMT	Credence	ASL1000
ETS3	Teradyne	ETS364
ETS4	Teradyne	ETS364
ETS	Teradyne	ETS88
MCT	MCT	MCT 2010
HANDLERS		
Handler #	Manufacturer	Model
H-18	Micro Comp Tech	MCT3608E
H-49	Micro Comp Tech	MCT5105
H-51	Micro Comp Tech	MCT5105
H-29	Multitest	8704
H-36	Sessco	Gravity
H-55	SRM	XD248
H-56	SRM	XD248
H-42	TeSsec Mapper	3270-H

SI #	Reliability Test	Test Specifications	Jedec Standard
1	Burn-in Test	125°C, 1000 Hrs	JESD22-A108
2	Unbiased Temperature & Humidity	85°C, 85% RH, 1000 Hrs	JESD22-A101
3	Temperature Cycling Test	-65°C to 150°C, 500 cycles	JESD22-A104
4	High Temperature Storage Life Test	150°C, 1000 Hrs	JESD22-A103
5	Unbiased HAST (UHAST)	130°C , 85% RH, 96 Hrs	JESD22-A118
6	Autoclave Test	100% RH, 121°C, 96 Hrs	JESD22-A102
7	Preconditioning & MSL Tests	-	JESD22-A113 & JESD-020

SI #	Reliability Equipment	Manufacturer
1	Burn-in	Blue-M, USA
2	Temperature & Humidity	Blue-M, USA
3	Temperature Cycler	ESPEC, Japan
4	Dry Heat (Class 100) Oven	Lab line, USA
5	HAST	Hirayama, Japan
6	Autoclave	Hirayama, Japan
7	Solder Pot	HMP, USA
8	Reflow Oven	Heller, USA



PC-422R8

Test FA Equipment

SI #	Equipment	Manufacturer
1	LCR Meter	HP, USA
2	Data Acquisition Unit	HP, USA
3	RF MUX	HP, USA
4	40 Channel MUX	HP, USA
5	V/I Source Meter	Keithley, USA
6	Oscilloscope	Keithley, USA
7	Pulse Generator	HP, Singapore

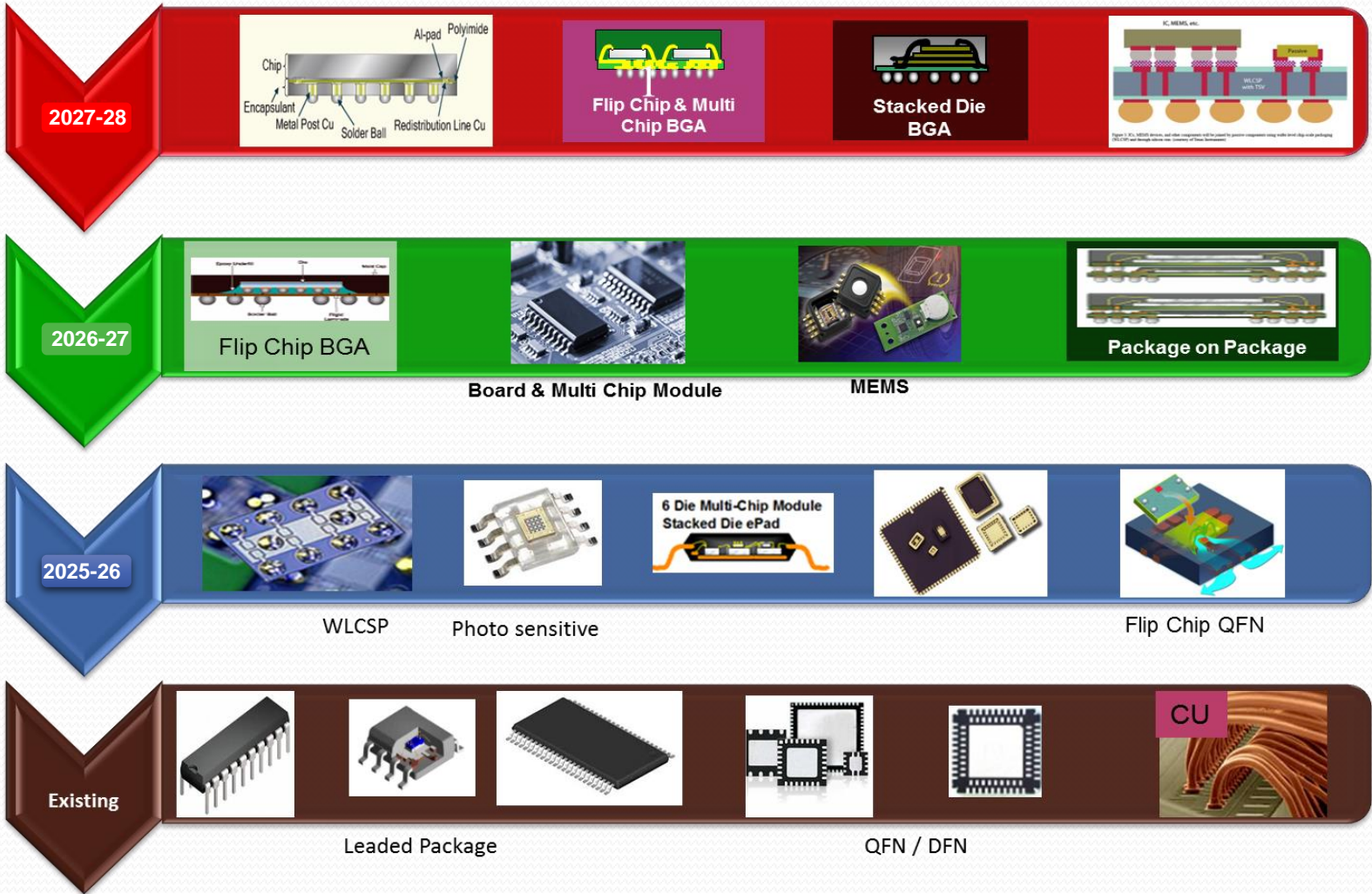
- **Internal / external inspection**
- High / low power microscope
- **X-RAY**
- **Decapsulation**
- Niesene
- **Open / short test**
- **85% / 85°C moisture soak**
- **Environmental Test Chamber**
- **Temperature cycle**
- ENVIRO SYSTEM chamber
- **HTOL Test Chamber**
- **Reflow Oven**
- **Cratering Test**



Site Area
Built Up Area

362.854 K Sq Ft
92,191 Sq Ft





Packaging Cost

- Substantial Cost Savings
- Low Cost for new package development in QFN / DFN
- Attractive amortization proposals for new package tooling

Test Cost

- Low Development Charges – Onsite or Offshore
- Low Production Costs
- Attractive pricing for the consigned testers



Consistently provide products and services that will exceed the quality expectations 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 methodologies are guided by International standards
- Quality endeavour is to deliver best in high-class, defect-free solutions and services
- Standardizing development activities to align with Customers requirements
- Process robustness are built through ISO 9001:2015 standards accreditation
- Zero Customer Return
- Continuous Improvements through Industry Benchmarking
- Effectively Implement PPAP, APQP, MSA, SPC & FMEA to ensure Outgoing Product Quality

Natronix

Customers

SPEL

THAT Corporation
Making Good Sound Better®

RENESAS **HMT**
microelectronic AG

DEVICE
ENGINEERING
INCORPORATED

TopLine **SYRMA**
SGS

NVE
NVE CORPORATION

TE
connectivity

RF **MICRON**

IC **LOGIC**
MICROCHIPS

KOA

LSI/CSI
a Semiconductor Company

KOA
KOA SPEER ELECTRONICS, INC.

MICRODUL
Customized Swiss Microelectronics

ADVANCED
LINEAR
DEVICES, INC.

MICROCHIP

SERMA
GROUP

kinetic
technologies

HOLT
INC.
INTEGRATED CIRCUITS

ON Semiconductor

ON

JVD

GStek

SimpleChips Technology
Analog & Mixed-Signal ICs

SENSONIX

MSI
TEC

Microelectronics
CORPORATION

data
delay
devices, inc.

iSino

AEMICS
smart products

TIMKEN

VISHAY

Littelfuse

Key Design

SILTERRA

TT Electronics

E.K.S.S. Microelectronics Ltd
Operating your Silicon to Success

bruco
INTEGRATED CIRCUITS

meticom

NOVA

End Customers

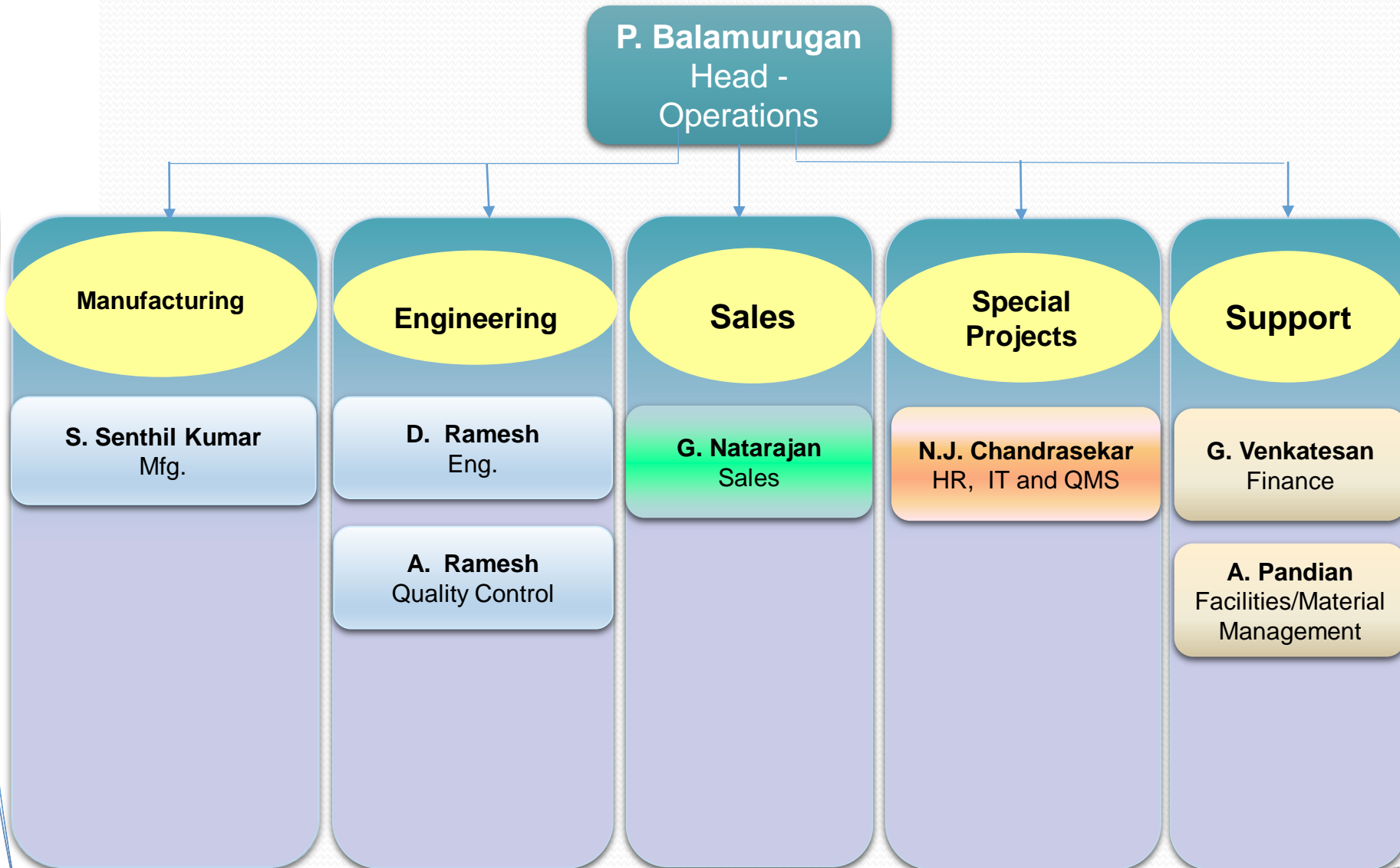


Customers





- Technically qualified operators & technicians
- Skilled engineers & experienced Management
- With total manpower of 105+ Employees
- Low attrition rate (< 6%). Developed second-in-line in all functions starting from Supervisor level
- Strong engineering database ensures that any attrition will not affect any process
- Over 40% of the employees have over 15 years of service with SPEL
- Low direct labor cost & management provides various Employee welfare schemes as a motivational activity through Employee Welfare Committee
- Training cell providing comprehensive training (including soft skill & Customer focus) to all level at regular interval & conducts test to ensure the capability
- Talent pool available from Local universities with electronics/semiconductor background



- One Stop Turnkey Destination :
- ***Probe → B/G → Assembly → Test → T&R → Drop shipment***
- Turnaround time
- Assembly 5 days with Linear Loading
- Testing : 2 days
- Fast Track Assembly in 2 days with Premium Charge
- Factory Schedule : 24 x 7
- Drop Ship to End-Customers
- Daily Direct Flights to US, Europe & Asia Pacific :
- 2days Transit (Inbound / Outbound)
- STAR eWIP - an online Semiconductor Tracking And Resourcing Software for regular Customer WIP update

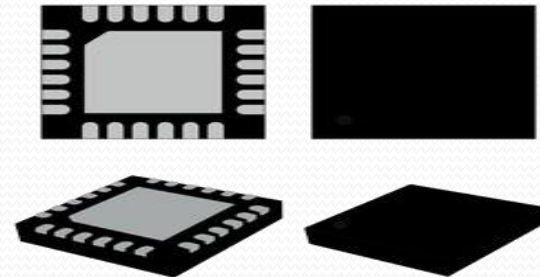
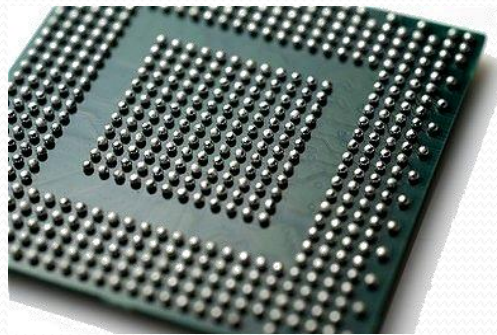




- SPEL is awarded AEO (Authorized Economic Operator) Certificate by Central Board of Excise & Customs
- Green Channel Status for Imports & Exports
- Zero Customs Duty & No Open Inspection
- Our Own Custom clearance office in Airport premises
- Clearance within 6 Working hrs.
- Easy Equipment Consignment In & Out of factory
- Certified as Star Export house by Ministry of Commerce & Industry, Govt. of India
- Accredited Client Programme (ACP) status from Board of Excise & Customs enables faster clearance



- Adding few more QFN packages with minimum sizes
- Qualified for Silver bonding
- Packaged die to die bonding & PCB bonding for domestic Customers
- Pursuing to acquire assembly houses for BGA & WLCSP packages
- Increasing Cu volume to 32% and plan to improve further
- Added Wetable Flank packages for better solderability
- Sandwich package



- Excellent Value proposition
- Low cost Turnkey services
- Provides one stop solution for all QFN & Leaded packages
- Excellent Customer service
- Dedicated Customer account engineers. Interacting on daily basis with Customers in real time basis. No need of any resident engineer for any of the Customer
- Package Portfolio covering major application segments
- Has test platforms for all products
- New package development and prototype assembly
- Has talented team to provide solutions
- Test engineering support
- Developing test programs for all needs
- On-Time delivery
- Potential market growth in India
- Govt's policy initiations, Incentive schemes, Encouraging indigenous manufacturing, Consumer consumptions growth etc.

