Maintaining and Facilitating Component Manufacturing Without Ownership of Process or Test Equipment

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ES Components – Bio

ES Components, established in 1981, supports mission-critical defense and aerospace programs by delivering hard-to-find and high-reliability electronic components. With vertically integrated capabilities—from die access to hermetic packaging and screening—we help customers reduce supply-chain risk and sustain long-life systems. The product manufacturing team is led by Don Larson, who brings over 40 years of semiconductor industry experience.

Agenda

- Background & Motivation
- Transition to a Distributed Manufacturing Model
- Key Engineering & Operational Elements
- Process Controls & Documentation
- Integration Process
- Lessons Learned
- Conclusion & Q&A
- Case Studies

Background

- **2017 acquisition of Vishay Siliconix hermetic JFET, MOSFET & Analog Switch product lines**
- **Transition from die centric supplier → full manufacturer**
- **Need for a manufacturing model without owned process/test equipment**

Strategic Manufacturing Model

- Fully distributed manufacturing ecosystem
- Use of qualified external:
  - Wafer fab partners
  - Assembly & packaging houses
  - Electrical/environmental test labs

Strategic Manufacturing Model (Con't)

- **ES Components Audits:**
  - **Process flows**
  - **Documentation and configuration**
  - **Quality, reliability, and program compliance**

Key Engineering Considerations

- Die level material inventory structuring
- End to end process flow definition
- Build traveler and documentation governance
- Configuration management and revision control
- Multi site correlation & verification requirements

Process Control Methodology

- **Electrical parameter baseline characterization**
- **Stability trend monitoring across suppliers**
- **Yield and failure-mode tracking**
- **Subcontractor qualification and ongoing surveillance**
- **Process change assessment (PCN) & risk mitigation**

Documentation System

- **Manufacturing routers/travelers**
- **Controlled test flows & screening sequences**
- **Controlled build standards and drawing packages**
- **Closed-loop corrective action**

Customer Alignment

- Transparent communication with aerospace/defense customers
- Traceability assurance
- Build-to-print accuracy for legacy hermetic devices
- Supporting DMSMS-driven requirements

Integration Process – Pre Transition

- Setup transition team with all involved parties
- Coordinate with compliance agencies to ensure conformance to requirements
- Manage traceability of inventory
- Setup Inventory and Process control systems
- Identify and audit certified subcontractors

Integration Process – Post Transition

- **Integrate inventory into system**
- **Setup internal product management team**
- **Set up audit schedule with affected agencies/customers**
- **Qualify subcontracting facilities**

Risk Mitigation Framework

- **Multiple source and alternate process validation**
- **FMEA driven oversight**
- **Data-driven control: SPC, guard-banding, trend charts**
- **Rapid problem-resolution loops with subcontractors**
- **Maintain systematic Customer support**

Lessons Learned

- **Distributed manufacturing can meet MIL level reliability**
- **Strong documentation control is mandatory**
- **Partner alignment is continuous—not one-time**
- **Early correlation prevents downstream failures**
- **External equipment does not reduce internal engineering responsibility**

Conclusion

- **ES Components successfully manufactures high reliability products without owning process/test equipment**
- **Engineering discipline and documentation control are essential**
- **Model is scalable for mixed-technology, multi-partner environments, allowing for flexibility**
- **Useful template for organizations evaluating outsourced manufacturing strategies**

Case Study 1:
Die From Inventory

- **Core Memory die from existing legacy inventory**
- **Processed per customer supplied SCD**
- **Assembly using MIL-PRF-38535 certified subcontractor**
- **Test using customer recommended ESC audited subcontractor**

Case Study 2: Customer Supplied Die

- Customer supplied legacy die to support 8-line to 1-line data selector/multiplexer
- Created SCD referencing Generic Datasheet and Class S Mil Flow
- Assembly/Test using MIL-PRF-38535 certified subcontractor

Questions

Acronyms

- **DLA – Defense Logistics Agency**
- **DMSMS – Diminishing Manufacturing Sources and Material Shortages**
- **PCN – Product (Process) Change Notice**
- **SCD – Source Control Drawing**
- **SPC – Statistical Process Control**