Product Quality Excellence

Strategy & Roadmap

Q4 2012
Provide our **customers** with the highest level of **quality excellence** in the semiconductor industry.
Our goal

Be recognized as the benchmark for quality in the semiconductor industry.
United, integrated quality strategy and organization

A unique functional quality organization defines the ST quality strategy and drives its execution companywide.

Quality functions remain embedded in their specific structures to harmonize execution with all other operational teams.
Quality roadmap with focus on execution

- Plan for executing our strategy with clear ownership, timeline and resources

- Global accountability, tracking and targets for all ST quality activities

- Quarterly update to take into account feedback from customers, new technologies, products, solutions, business…
What do we have to do to get there?

1. We must achieve the\textit{ lowest levels of Defective Parts Per Million (DPPM)} for each industrial domain with the ultimate goal of\textit{ zero failures}.

2. We must prevent any impact to our\textit{ customers} due to excursions through\textit{ zero-excursion management}.

3. We must flawlessly\textit{ execute business processes to prevent problems} and continually\textit{ improve} the way we work.
How do we measure our performance?

1. **Lowest levels of Defective Parts Per Million:**
   ST results vs. best-in-class targets

2. **Zero excursions:**
   Number of excursions per quarter, per area, per customer

3. **Flawless execution:**
   Adherence to quality strategy and roadmap targets
Focus on zero excursions

| Excursion management process | ▪ Clear, shared definition of excursion*
|                            | ▪ Execute the new excursion management process with discipline
|                            | ▪ Be closely attuned to technical concerns |
| Prevention through more robust product development | ▪ Embed quality in design and engineering phases
|                                                | ▪ Manage changes robustly during the pre-production phase
|                                                | ▪ Increase early internal screening of excursions |
| Containment                                | ▪ Prevent outliers from reaching customers
|                                                | ▪ Reinforce Out-of-Control Action Plan (OCAP) management in frontend and backend manufacturing |
| Correction                                | ▪ Identify systemic root causes
|                                                | ▪ Share systemic learning |

* Number of units that trigger an excursion, as defined and agreed upon with the customer.
How will we reach our goal?

ST quality strategy: 7 pillars

- Proactive quality
  - People
  - Business processes, tools & indicators
  - Product & technology development

- Reactive quality
  - Customers
  - Change management
  - Economics
  - Manufacturing & supply chain

Quality excellence objectives:
- DPPM reduction
- Zero excursions
- Execution

/Quality
/Excellence
/Objectives
/DPPM
/Reduction
/Zero
/Excursions
1. Customers

Our goal
Delight our customers by providing best-in-class quality support, communication, and management of customer requirements.

What does this mean to us?

• Customer satisfaction
• Responsiveness and effective support
• Proactive communication and knowledge exchange
• Full compliance to agreed requirements
What are we doing to reach our goal?

- Cycle time reduction by adapting WIP management techniques and introducing failure analysis lab network
- Improve failure analysis technical capability leveraging on failure analysis lab network
- 8D report quality improvement campaign
- System-to-system electronic communication
  - Product/Process Change Notification (PCN)
  - Failure analysis cycle time
- Simplify PCN process to minimize the number of re-qualifications
- Standardized model of requirements by industry domain
## How do we measure our performance?

<table>
<thead>
<tr>
<th>Objective</th>
<th>Typical performance measurements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer satisfaction</td>
<td>▪ Customer perception survey</td>
</tr>
<tr>
<td>Responsiveness and effective support</td>
<td>▪ Complaints per million units</td>
</tr>
<tr>
<td></td>
<td>▪ Number of customer excursions</td>
</tr>
<tr>
<td></td>
<td>▪ Complaint cycle time</td>
</tr>
<tr>
<td></td>
<td>▪ Recurrences</td>
</tr>
<tr>
<td>Proactive communication and knowledge exchange</td>
<td>▪ Quality alert communication cycle time</td>
</tr>
<tr>
<td></td>
<td>▪ Customer satisfaction index for 8D reports</td>
</tr>
<tr>
<td>Full compliance to agreed customer requirements</td>
<td>▪ Customer scorecard</td>
</tr>
</tbody>
</table>
2. People

Our goal
Engage employees in the pursuit of quality excellence by ensuring people are empowered, connected, competent and dedicated to quality.

What does this mean to us?
• Global, connected quality organization
• Clear information and expectations
• Highly competent, motivated workforce
• Ability to change and adapt quickly
What are we doing to reach our goal?

• Global quality organization to drive execution of quality strategy and roadmap

• Quality communication/information campaign
  • New media and local events to connect employees and management

• Quality network drive

• Change accompaniment workshops

• eCertification for broad population of professionals
## How do we measure our performance?

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<th>Objective</th>
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<tr>
<td>Global, connected quality organization</td>
<td>▪ Global key performance indicators (KPI’s)</td>
</tr>
<tr>
<td></td>
<td>▪ Network, meeting and events tracking</td>
</tr>
<tr>
<td>Clear information and expectations</td>
<td>▪ Employee performance review</td>
</tr>
<tr>
<td></td>
<td>▪ Surveys</td>
</tr>
<tr>
<td>Highly competent, motivated workforce</td>
<td>▪ eCertification tracking</td>
</tr>
<tr>
<td></td>
<td>▪ Workplace performance indicators</td>
</tr>
<tr>
<td></td>
<td>▪ Opinion survey</td>
</tr>
<tr>
<td>Ability to change and adapt quickly</td>
<td>▪ Pulse check</td>
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</table>
3. Change management

Our goal
Guarantee **product quality excellence** to our **customers** for any product, for any process, in any factory.

What does this mean to us?
• Benefit analysis including risk assessment and mitigation for all changes
• Qualification plan including robust risk assessment to ensure risks did not occur
• Enhanced visibility and traceability of all changes
3. Change management

What are we doing to reach our goal?

- Implementation of change management process and tool for enhanced visibility and traceability of all changes
- Radical change approach to quickly and safely introduce improvements to mature products
### 3. Change management

**How do we measure our performance?**

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<td>Benefit analysis including risk assessment and mitigation for all changes</td>
<td>▪ Risk assessment and mitigation scorecard</td>
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<tr>
<td>Qualification plan including robust risk assessment to ensure risks did not occur</td>
<td>▪ Qualification report assessment and statistical validation techniques</td>
</tr>
<tr>
<td>Enhanced visibility and traceability of all changes</td>
<td>▪ Full tracking of changes by extensive use of change management tool and changes to PCN link</td>
</tr>
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</table>
4. Manufacturing & supply chain

Our goal
Achieve zero excursions for our customers.

What does this mean to us?
• Proactive approach to prevent excursions
• Urgent reaction to contain and eradicate excursions and protect our customers
• Robust product and technology migration
4. Manufacturing & supply chain

What are we doing to reach our goal?

• Advanced statistical analysis for top-level detection (multivariate analysis, PAT…)

• “Walk the flow” to check processes, from silicon to finished goods

• Quality improvement programs

• Zero excursion program

• Systemic root cause elimination

• Supplier quality management
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<tr>
<td>Proactive approach to prevent excursions</td>
<td>▪ Number of customer excursions</td>
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<tr>
<td></td>
<td>▪ % of improvement actions closed on time</td>
</tr>
<tr>
<td></td>
<td>▪ Corrective action effectiveness matrix (1\textsuperscript{st} typical performance)</td>
</tr>
<tr>
<td>Urgent reaction to contain and eradicate excursions and protect our customers</td>
<td>▪ Customer complaints per plant, technology, process step</td>
</tr>
<tr>
<td></td>
<td>▪ Non-conforming lot indicators</td>
</tr>
<tr>
<td></td>
<td>▪ Mixing indicators</td>
</tr>
<tr>
<td>Robust product and technology migration</td>
<td>▪ Full statistical alignment on key process parameters and test values</td>
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5. Product & technology development

Our goal

Achieve **built-in quality** at **every step** of product and technology development.

What does this mean to us?

- Advanced techniques to ensure robust process and product design
- Secure industrialization of new processes, products and changes
- Improved screening methods to eliminate outliers
- Legacy management
5. Product & technology development

What are we doing to reach our goal?

• Advanced Quality Plan Approach (APQP)

• “Quality in design” function in each design team

• Reinforce formal gate reviews: design for technology (DFT), design for manufacturing (DFM), etc.

• Reliability anticipation techniques

• Multiple layer test methodology

• Systematic use of statistical bin levels (SBL), part average testing (PAT) and multivariate analysis

• Formal full product development flow by technology
## 5. Product & technology development

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<td>Advanced techniques to ensure robust process and product design</td>
<td>- Clean tape out indicators</td>
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<td></td>
<td>- % of new products implementing advanced techniques</td>
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<tr>
<td>Secure industrialization of new processes, products and changes</td>
<td>- Number of products covered through safe launch/line stress approach</td>
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<tr>
<td>Improved screening methods to eliminate outliers</td>
<td>- Outlier elimination indicators</td>
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<tr>
<td>Legacy management</td>
<td>- Number of recurrences on the same technology</td>
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How do we measure our performance?
6. Business processes, tools & indicators

Our goal
Provide the quality framework for the company business model.

What does this mean to us?
- Robust business model
- Metrics-driven approach
- Integrated quality management system
6. Business processes, tools & indicators

What are we doing to reach our goal?

• Integrated key process framework and process management approach

• Systematic use of audit outcomes

• Training and certification on business processes

• Best-in-class IT tools for quality

• Key process indicators (KPI’s) for each process
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<td>Robust business model</td>
<td>- Audit results</td>
</tr>
<tr>
<td>Metrics-driven approach</td>
<td>- Key process indicator (KPI) dashboard</td>
</tr>
<tr>
<td>Integrated quality management system</td>
<td>- Satisfaction index for all tools</td>
</tr>
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</table>
Our goal
Consider quality as an investment by using an economics approach that measures the value of quality to our bottom line.

What does this mean to us?
- Measured cost reduction and increased productivity through improved quality and service
What are we doing to reach our goal?
- Cost measurement of excursions and customer complaints
- Protect capex for quality

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<td>Increased productivity by improving quality and service</td>
<td>▪ Savings ▪ Productivity gains</td>
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</table>
Highlights & priorities
• Key Customer Excursions on target for last 6 quarters (2 vs. target of 3)
• Customer complaints on Frontend Backend compatibility reduced by 50% in 2011
• Industrial Requirement Domain defined for automotive, medical and generic products
• Framework defined to grow safely and profitably in the medical business
• Target to reduce non-conforming lots shipped from FE to BE by over 15% surpassed in Q2 & Q3, for both major and minor
• Change management process and tool released and in deployment
• Advanced Product Qualification Plan at 96% end September for eligible products
• Integrated solution defined for test flow to secure robust products
• Quality communication campaign continues to generate strong interest
• Renewal of ISO/TS certification on-going, focus on execution
• Assessment and rationalization of quality headcount to better align results with effort
• SPC step up activity to improve manufacturing efficiency and quality
Priorities

• Execute **excursion eradication** program

• Deploy **change management** process and tool

• Better management of **New Product Releases** (NPR’s) to deliver products on time vs. plan

• Execute **Test Efficiency and Effectiveness Improvement Program (TEIP)**

• Better integrate quality into **product design**

• Execute **Quality Improvement Plans (QIP’s)** to eliminate defects and rejects

• Enable integrated prevention through the **Failure Mode Knowledge Matrix** (tool to capitalize on experience and share knowledge)

• Confirm improvement on **failure analysis total cycle time** in Q4 2012
Our mission is clear. Provide our customers with the highest level of quality excellence in the semiconductor industry.

Our objectives are clear. We have a strategy and roadmap to get there.

And we are committed.
What next?

• These changes will be visible in your interactions with ST and in your own results.

• But you will be the final judge on whether we are meeting your expectations.

• Your business is important to us, and we will listen to and act on your feedback.