The Flexible ASIC Leader

# GUC Supplier Management/Low ppm program

Oct 2016

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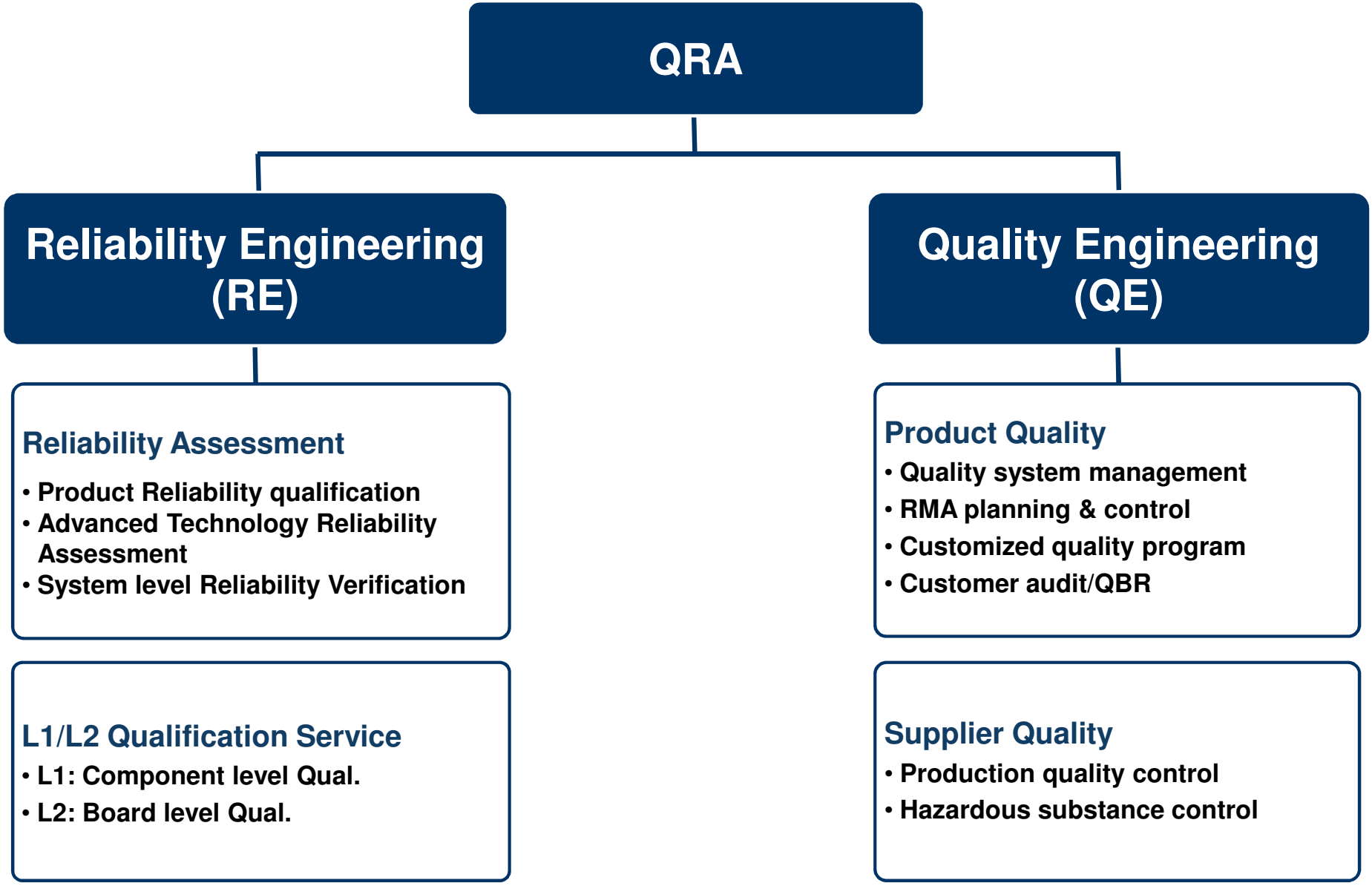
Security C

# Quality & Reliability Functions



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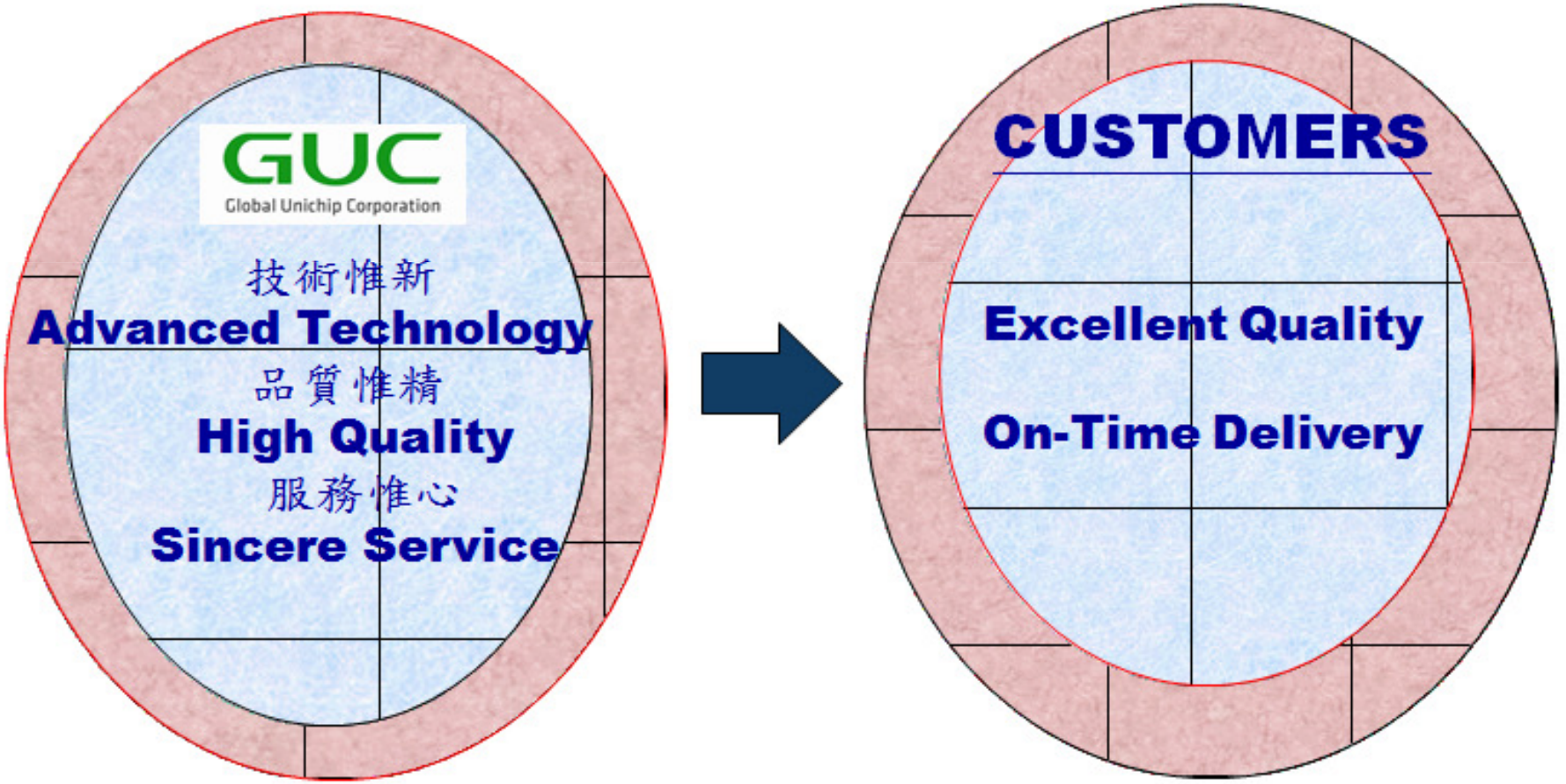
# Quality Policy

## Win - Win



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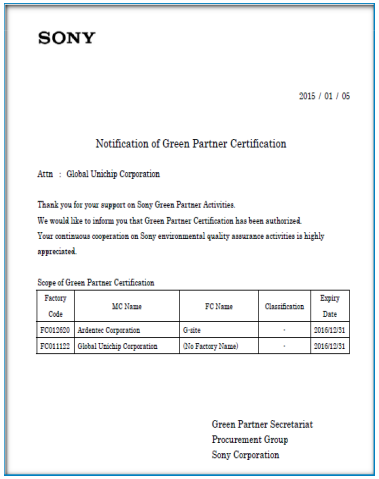
# GUC Corporate Quality System

- **GUC is certified by latest industry quality standards**
- **Qualified vendors quality comply with GUC system**

ISO9001:2000 (TUV)


2001

SONY
Green Partner




2008

IECQ/QC080000


2011

ISO9001:2008 (UL)


2012

EICC


2013



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# New Supplier Quality Certificates

- **GUC's suppliers should meet the capability and compliance with the required quality level at least**

| Certificate / Vendors | ISO9001 | TS16949 | ISO14001 | OHSAS18001 | Green (SONY GP, QC080000) | IECQ17025 |
|---|---|---|---|---|---|---|
| **Wafer FAB** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Wafer Sort** | ✓ | ✓ | | | | |
| **Assembly** | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Final Test** | ✓ | ✓ | | | | |
| **Bench Test** | ✓ | ✓ | | | | |
| **Reliability/ FA Lab** | ✓ | | | | | ✓ |

**Notes:**

**ISO9001: General Quality Management Certification (Must)**
**ISO/TS16949: Quality Management Certification for Automotive parts**
**ISO14001: Environment Management Certification**
**OHSAS18001: Occupational health and safety Management Certification**
**Green/QC080000: Hazardous Substance Process Management Certification**
**Green/SONY GP: SONY Green Partner Certification**
**IECQ17025: Independent Testing Laboratory Certification**



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# Disciplined Manufacturing Process Control

## Pre-production

### Qualification

- JEDEC, EIAJ, AEC, MIL STD Standards
- MTTF and FIT Estimation through Reliability Model
- RoHS, Hazardous Substance Control

### Verification & Screening

- PVT (Product Verification Test) Skew
- ATE and System Correlation
- Stress Testing (Voltage/Temp.)
- Low PPM Program *
- Automotive Program *

## Mass Production

### Quality & Reliability Control

- Manufacturing Data Monitor
- Test Yield Management
- Maverick Control *
- ELFR for Initial Production Lots *
- On-going Reliability Monitor (ORM) *

### Production & Supplier Management

- Quality Measurement and QBR
- Change Control
- Nonconforming Material Control (MRB)
- 100% Chips Visual Scanning
- On-site QC Checking *

*: Optional



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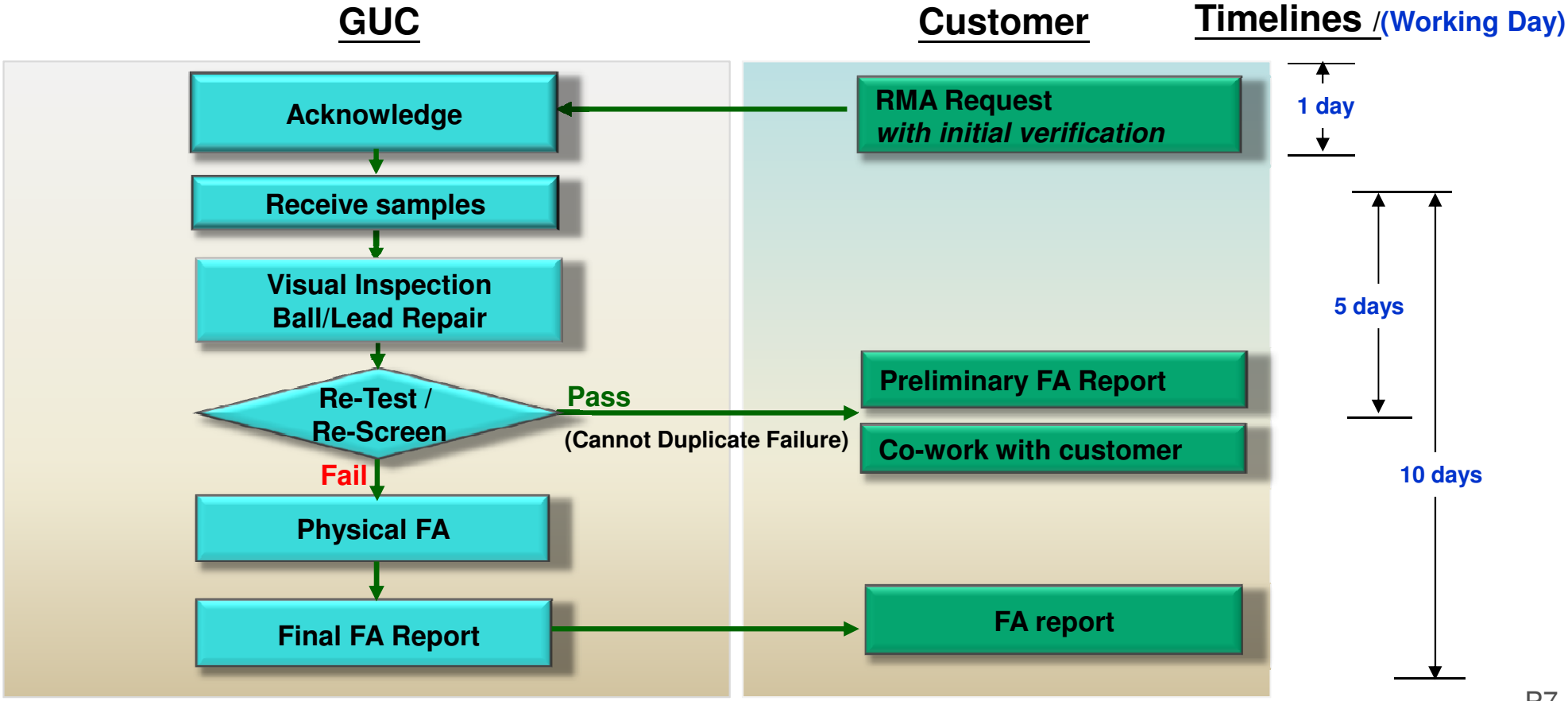
# RMA TAT Control

- **Component-level FA cycle time control**
  - Acknowledge: 1 working day
  - Preliminary FA report: 5 working days
  - Final/Status FA report: 10 working days



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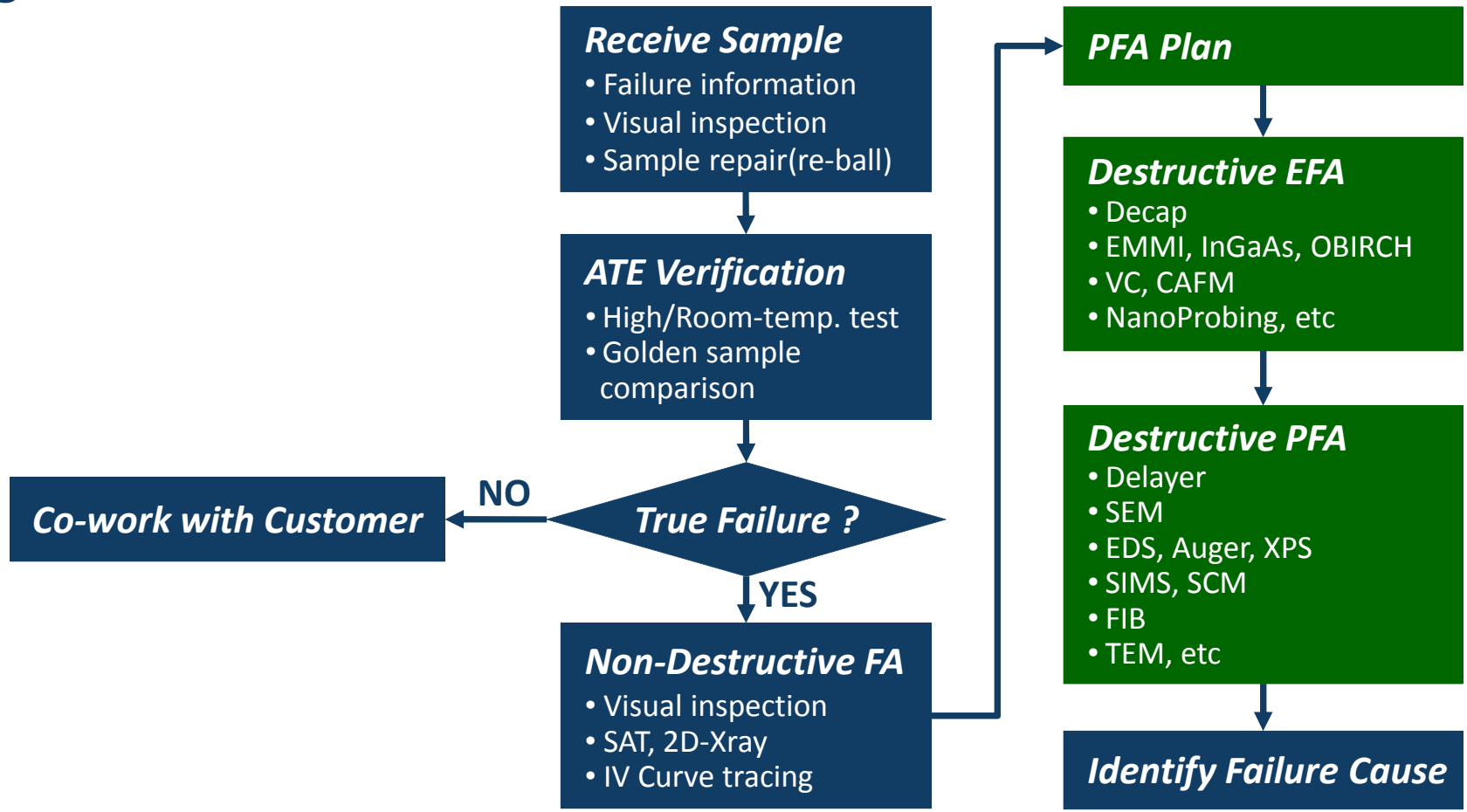
# Failure Analysis Support

- Support preliminary analysis, from sample repair, ATE verification and certain non-destructive FA
- GUC will propose PFA plan for Micron review and execute PFA per Micron agreement

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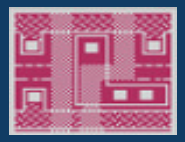
# Failure Analysis Support

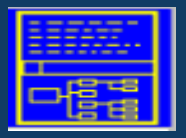
## Failure Unit in

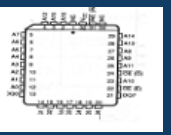
- Understand Failure & history



- Golden/ Failure units comparison

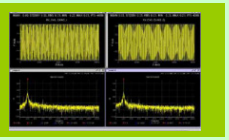

- Prepare Info. for FA



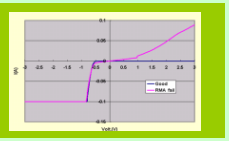


## Non-Destructive FA

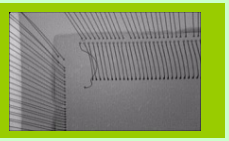
- ATE



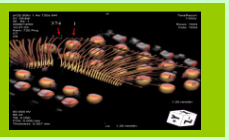
- Curve trace



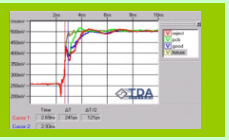
- 2D X-Ray



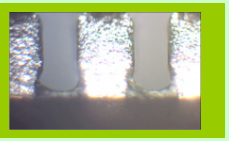
- 3D X-Ray



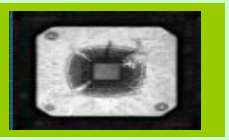
- TDR



- OM



- SAT

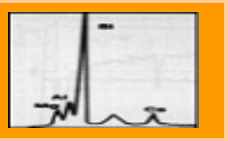


## Destructive EFA

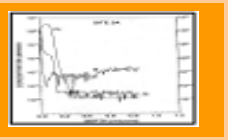
- EMMI

- OBIRCH

- EDX

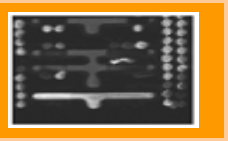


- SIMS



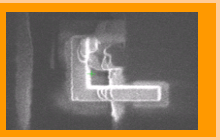
- CAFM


- Voltage Contrast

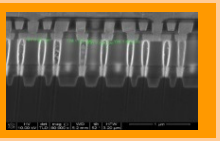


## PFA

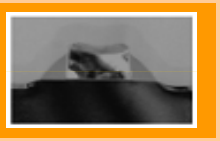
- FIB



- SEM

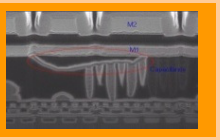


- TEM

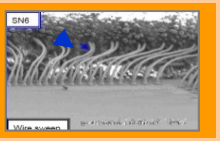


- Delayer

- X-Section



- PA-SEM

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# Change Control System

- **Engineering Change (ECN) procedure is implemented, and compliant with JEDEC/JESD46**
- **Change Category**
  - Major Change
    - A change that may affect the form, fit, function, quality, reliability, or
    - Changes that customer/GUC mutually agreed
  - Minor Change
    - A change that will not affect the form, fit, function, quality or reliability
- **Review, Notification, and Implementation**
  - QA and Product Engineer review all ECN before notification (major change) to customer or release to manufacturing site
  - Major change will be notified (thru ESN form) to customer with a minimum of **90 days** before proposed first ship date or customer/GUC agreed day



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# Change Classification

## Major Change Category – compliance with JESD46

| | |
|---|---|
| Design | Major design change |
| Wafer Fab | Wafer fab site |
| | Wafer diameter |
| | Diffusion dopant |
| | Gate oxide material |
| | Gate oxide thickness |
| | Dielectric material |
| | Polysilicon dopant type |
| | Metallization material |
| | Metallization thickness |
| | Top protective layer material |
| | Top protective layer thickness |
| | Die coating material |
| | Die coating thickness |
| Package Assembly | Assembly site |
| | Substrate or leadframe base material |
| | Plating material or process technique |
| | (BGA) Solder ball material composition |
| | Flipchip ball/bump and/or attach solder material composition |
| | Wire bond method |
| | Mold compound or underfill material |
| | Sealing material |
| | Die attach material |
| | Marking method |
| | Marking appearance (incl. Part Number marked on product) |
| Testing | Test site |
| | Test elimination |
| | Burn-in change or elimination |
| | Electrical Specification |
| | Change in AC specification |
| | Change in DC specification |
| Mechanical Specification | Change in case outline Loosening tolerance(s) |
| | Packing/Shipping/Labeling |
| | Change in Carrier (reel, tray) dimensions |
| | Drypack requirements |
| | Environment maximum storage temperature |
| | Environmental/Hazardous substance requirement |

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# Example Change Notice from subcon

## GUC Change Review Approval for Subcon

No. 2016-02-001

| | | | |
|---|---|---|---|
| Date | 2016/02/02 | ESN/PCN | |
| User | ryan.pan | For Project | ○ Yes ◉ No |
| Change Level | Level_A | Change Kind | Package |
| Reviewer | tom.kao, philip.tsai, richard.wang | Customer_Inform | ryan.pan, tracy.wu, victoria.chih |
| Subject | ASEK_MGC material grade change from Halogenated to non-halogenated | | |

Job Lists of Work Flow :

▼ SQE

☑ Upload so-te/PCN. Attachment & Comment : SB, SE.txt CER for MGC NXA.docx CRN for MGC NXA.docx

MGC material grade change from Halogenated to non-halogenated-20160202.pdf MSDS_GHPL830NX_typeA_20161127.pdf MSDS_HL83

832NXA.830NXA_20161007.pdf 832NXA.830NXA_Halogen_20161007.pdf

☑ Impact Lists. Attachment & Comment : Impact list for GUC_0224_Ryan.xlsx Impact device 為"N"則為非影響產品

GUC
Global Unichip Corporation

**Engineering Specification Notice**

■ New ☐ Revise

To : [redacted]

ESN#: 20160401 Version#:01
Date: Apr 20, 2016

Dear customers,

This message is to inform you that there is an engineering specification initiate/change that requires you be informed. Please find the detail below.

If you have any concern, please feel free to contact GUC Representative.

Subject:

Assembly subcon change the substrate from halogened to non-halogened.

Product Affected:

GUC Device: [redacted]

Customer Part [redacted]

Purpose:

For environment quality enhancement, substrate supplier (MGC) will stop halogened substrate. Non-halogened substrate for replacement. MGC will stop production.

Detail Description:

MGC will stop the production for halogen substrate. The substrate changed at ASE:

| Process Factor | Present Value | Proposed Value |
|---|---|---|
| Core & P.P. material type | Core:<br>CCL-HL 832( thickness ≦ 0.15mm)<br>CCL-HL 832 HS<br>CCL-HL 832( thickness ≧ 0.2mm)<br>CCL-HL 832 EX | Core: CCL-HL 832NX(A-EX)<br>CCL-HL 832NX(A-HS)<br>P.P.: GHPL-830NX(A) |

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# Example Change Notice from subcon

GUC
Global Unichip Corporation

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## Engineering Specification Notice

■ New ☐ Revise

To : [redacted]

ESN#: 20151002 Version#:01
Date: Oct 19th, 2015

Dear customers,
This message is to inform you that there is an engineering specification initiate/change that requires you be informed. Please find the detail below.
If you have any concern, please feel free to contact GUC Representative.

**Subject:**
[redacted]FT release at KYEC

**Product Affected:**
GUC Device: [redacted]
Customer Part [redacted]

**Purpose:**
Add capacity of [redacted] at KYEC site

**Detail Description:**
Test program: [redacted]FT1_P03a
Please refer the detail correlation result as attached file.

U80433D
FT@KYEC correlatio

**Implementation Plan:**
Once customer approved

☐Notification only
■ Do you agree this specification? (Y/N) Y
Your comment, if necessary:

Representative: [redacted] 10/20/15

Global UniChip Corp.
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(10-09-06-003B)

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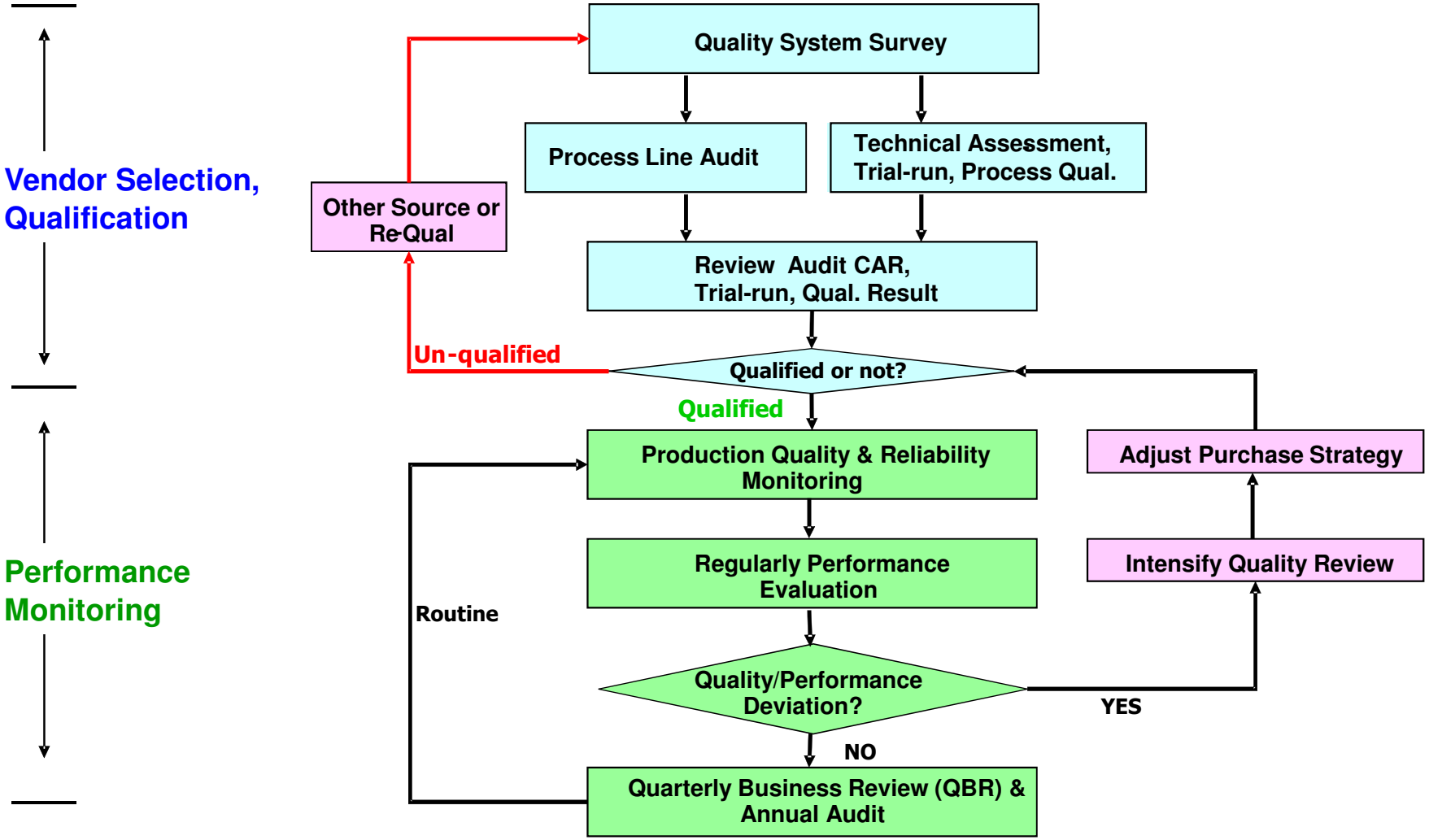
# Supplier Selection and Qualification

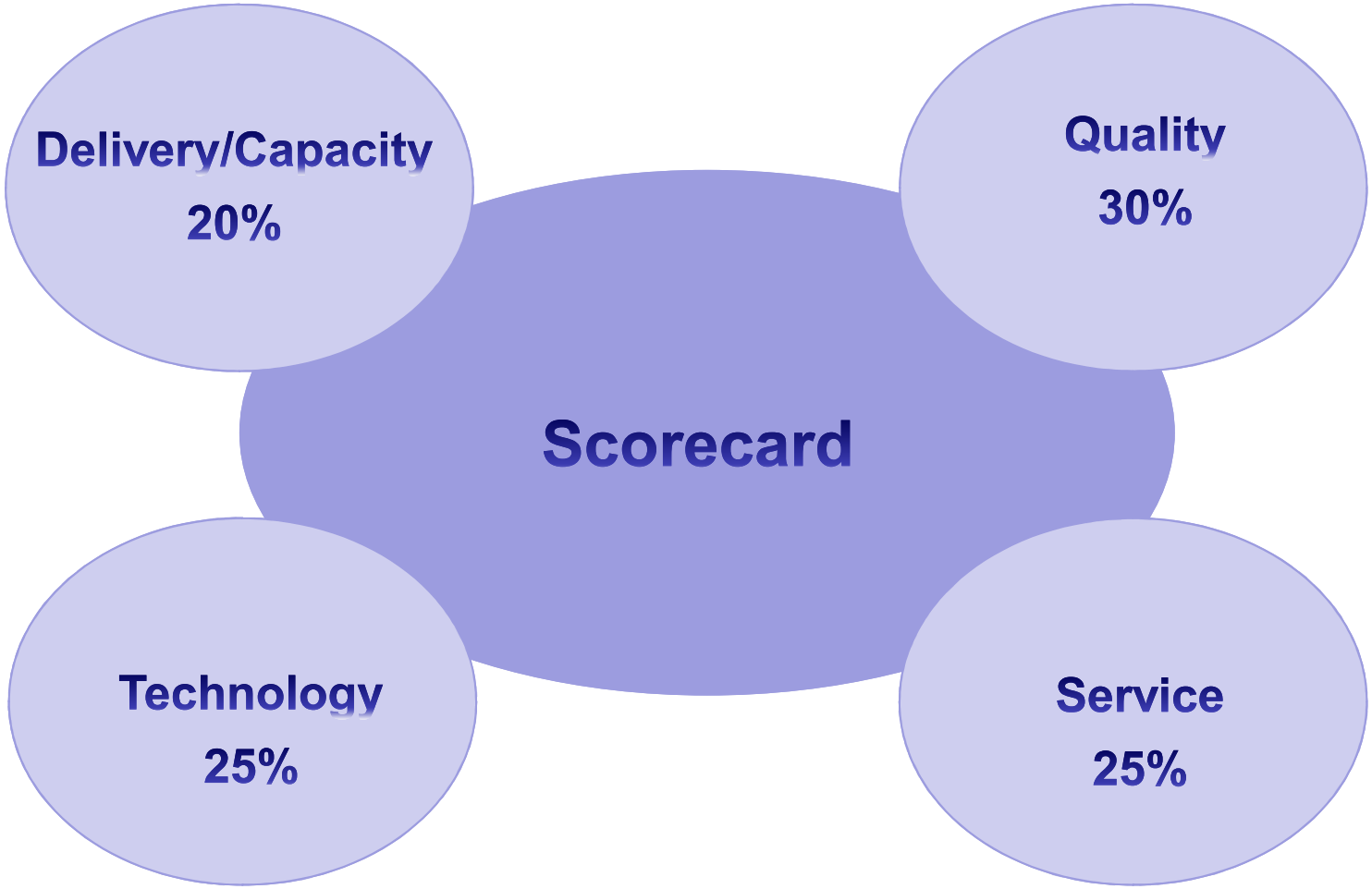
- **Verify supplier capability to ensure the compliance with GUC Q&R level.**




**Specification No. 10-06-04-000**

# Scorecard Participant Profile

- GUC's supplier will be scored in 4 directions, Delivery/Capacity, Quality, Technology and Service.
- The QBR is based on *Supplier Performance Review Procedure* (10-06-09-000).





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# Ranking

- GUC QBR Scorecard Guideline

  --- GUC will request Improvement plan once score is lower than

  --- Disqualified if continuous 2 times in grade E without improvement

| Classification | Score | Level | Description |
|---|---|---|---|
| A | Above 90.0 | Excellent | To Preserve a status / Condition |
| B | 80.0-89.9 | Satisfactory | Minimum improvement expected |
| C | 70.0-79.9 | Fair | Improvement required |
| D | 60.0-69.9 | Below average | Maximum improvement required |
| E | Under 60.0 | Poor | Probation with Maximum improvement |



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# Quality & Delivery/Capability (Fab)

## -- Quality Owner: Q&R

## -- Delivery/Capability Owner: PP

| | TSMC | | | | Q2 2016 | |
|---|---|---|---|---|---|---|
| Category | Evaluating items | Sub-score | | Criteria | Score | Comment |
| QUALITY | [End-Customer] Field Nonconforming Case | 15 | 15 | No compliant from GUC customer | | |
| | | | 10 | One compliant from GUC customer per quarter | | |
| | | | 5 | One compliant from GUC customer per month | | |
| | | | 0 | More than one compliant from GUC customer per month | | |
| | [End-Customer] RMA/FA TAT GUC goal: Preliminary reply(3D): 3 days; formal CAR(8D): 7 days | 15 | 15 | 100% meet the GUC's goal | | |
| | | | 10 | 100% meet the committed TAT, but don't meet GUC's goal | | |
| | | | 5 | Cannot 100% meet the committed TAT | | |
| | | | 0 | Cannot provide the committed TAT | | |
| | [End-Customer] FA success rate | 10 | 10 | FA success rate >= 80% | | |
| | | | 5 | FA success rate >= 50% | | |
| | | | 0 | FA success rate < 50% | | |
| | [End-Customer] Support for Product/Production Information Collection | 15 | 15 | Provided 100% timely and correctly | | |
| | | | 10 | Delay, or incorrect but provide update quickly | | |
| | | | 5 | Delay, or incorrect but provide update after several remindings | | |
| | | | 0 | Delay and impact GUC's report to end customer | | |
| | [Production Control] Process Nonconforming Case | 15 | 15 | No nonconformance or reject per month (AVG) | | |
| | | | 10 | Two nonconformance or reject per month (AVG) | | |
| | | | 5 | Four nonconformance or reject per month (AVG) | | |
| | | | 0 | More than Four nonconformance or reject per month (AVG) | | |
| | [Production Control] FAB event responsiveness | 15 | 15 | Timely inform the quality event in 24 hours | | |
| | | | 10 | Inform the quality event in 48 hours | | |
| | | | 5 | Inform the quality event longer than 48 hours | | |
| | | | 0 | No notification | | |
| | [Production Control] Yield improvement | 15 | 15 | All products meet tsmc's model yield | | |
| | | | 10 | 80% products meet tsmc's model yield. | | |
| | | | 5 | 50% products meet tsmc's model yield. | | |
| | | | 0 | Below 50% products meet tsmc's model yield. | | |
| | Total: | 100 | | Total Score: | 0 | |

| | TSMC | | | | Q2 Y2016 | |
|---|---|---|---|---|---|---|
| Category | Evaluating items | Sub-score | | Criteria | Score | Comment |
| DELIVERY / CAPACITY | CLIP/CVP (Confirmed Line Item Performance) (Confirmed Volume Performance) | 20 | 20 | 97.5 ~ 100% | | |
| | | | 15 | 90 ~ 97.5% | | |
| | | | 10 | 85% ~ 90% | | |
| | | | 5 | 80% ~ 85% | | |
| | | | 0 | <80% | | |
| | Production Cycle time Hit Rate | 20 | 20 | 90 ~ 100% compared to target cycle time | | |
| | | | 15 | 80 ~ 90% compared target cycle time | | |
| | | | 10 | 70 ~ 80% compared target cycle time | | |
| | | | 5 | 60 ~ 70% compared target cycle time | | |
| | | | 0 | <60% compared target cycle time | | |
| | Capacity/Allocation | 20 | 20 | 95% ~ 100% meet GUC expectation | | |
| | | | 15 | 90% ~ 95% meet GUC expectation | | |
| | | | 10 | 85% ~ 90% meet GUC expectation | | |
| | | | 5 | 80 ~ 85% meet GUC expectation | | |
| | | | 0 | <80% meet GUC expectation | | |
| | Rescheduling Flexibility | 20 | 20 | Fully fulfill all pull in & push out request | | |
| | | | 10 | Partial fulfill all pull in & push out request | | |
| | | | 0 | Reject all pull in & push out request | | |
| | Logistics Support 1. WIP data accuracy 2. Holiday/weekend support 3. Shipping arrangement 4. Response time | 20 | 20 | Fully support and meet all GUC expectation | | |
| | | | 10 | > 50% meet GUC expectation | | |
| | | | 0 | Inflexible and <50% meet GUC expectation | | |
| | Total: | 100 | | Total Score: | 0 | |

(10-06-09-001).



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# Technology & Service (Fab)

## -- Technology Owner: PE/DS

## -- Service Owner: Purchaser and all

| | TSMC | | | | Q2 2016 | |
|---|---|---|---|---|---|---|
| **Category** | **Evaluating items** | **Sub-score** | | **Criteria** | **Score** | **Comment** |
| TECHNOLOGY | **Technology Roadmap** | 15 | 15 | Proactively provide Technology Roadmap & knowledge | | |
| | | | 10 | Provide Technology Roadmap & knowledge upon request | | |
| | | | 5 | Provide limited Technology Roadmap & knowledge | | |
| | | | 0 | Can not provide Technology Roadmap & knowledge | | |
| | **Design support response time** | 15 | 15 | Reply proposal within 48 hours | | |
| | | | 10 | Reply proposal within 96 hours | | |
| | | | 5 | Reply proposal after 96 hours | | |
| | | | 0 | cannot reply | | |
| | **Design documentation** | 15 | 15 | Provide complete/corrective documents | | |
| | | | 10 | Provide partial documents | | |
| | | | 0 | Cannot provide document | | |
| | **Quality** | 25 | 25 | IP/Design quality meet application requirement | | |
| | | | 15 | One project suffered IP/design quality issue | | |
| | | | 5 | Two projects suffered IP/Design quality issue | | |
| | | | 0 | More than two projects suffered IP/Design quality issue | | |
| | **Testing solution** | 15 | 15 | Provide production solution | | |
| | | | 10 | Provide partial production solution | | |
| | | | 5 | Provide engineering solution, but no production solution. | | |
| | | | 0 | Cannot provide any solution | | |
| | **FA cycle time & success rate** | 15 | 15 | Reply plan within 48 hours, and submit report on committed schedule | | |
| | | | 10 | Reply plan after 48 hours, submit report on committed schedule | | |
| | | | 5 | Reply plan within 48 hours, does not submit report on committed schedule | | |
| | | | 0 | Cannot provide plan and report | | |
| | **Total:** | **100** | | **Total Score:** | **0** | |

| | TSMC | | | | Q2 2016 | |
|---|---|---|---|---|---|---|
| **Category** | **Evaluating items** | **Sub-score** | | **Criteria** | **Score** | **Comment** |
| SERVICE | **Response & follow up Fulfillment** | 25 | 25 | 100% fulfillment | | |
| | | | 15 | Satisfactory | | |
| | | | 0 | Poor support | | |
| | **Meeting efficiency & accuracy** | 25 | 25 | 100% fulfillment | | |
| | | | 15 | Satisfactory | | |
| | | | 0 | Poor support | | |
| | **Proactive service** | 25 | 25 | 100% fulfillment | | |
| | | | 15 | Satisfactory | | |
| | | | 0 | Poor support | | |
| | **Resource support (Manpower, design resource, engineering, QA support)** | 25 | 25 | 100% fulfillment | | |
| | | | 15 | Satisfactory | | |
| | | | 0 | Poor support | | |
| | **Total:** | **100** | | **Total Score:** | **0** | |

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# Quality & Delivery/Capability (ASSY)

## -- Quality Owner: Q&R

## -- Delivery/Capability Owner: PP

| ASE | | Rated by: QRA | | | |
|---|---|---|---|---|---|
| Evaluation Items | Sub-score | Criteria | | | Score |
| RMA/CCN | 30 | Case | 10 | -10 per case | |
| | | Impact Rate (IR) | 10 | IR < 10000 ppm | |
| | | | 5 | 10000 ≦ IR < 50000 ppm | |
| | | | 0 | IR ≧ 50000 ppm, or line down | |
| | | 3D(4D)/8D | 5 | -5 per delay times | |
| | | Final 8D/AR update | 5 | -5 per delay times | |
| LQI/RN<br>(Low yield Flag: 99.00%) | 20 | Case | 5 | -5 per case | |
| | | Impact q'ty | 5 | <50K | |
| | | | 3 | 50~100K | |
| | | | 0 | >100K, or Line down | |
| | | 3D(4D)/8D | 5 | -5 per delay times | |
| | | Final 8D/AR update | 5 | -5 per delay times | |
| Yield performance | 20 | Average assembly yield (Y)<br>(Yield Goal: G) | 20 | Y-G ≧ 0.35% | |
| | | | 10 | 0% ≦ Y-G < 0.35% | |
| | | | 5 | -0.50% ≦ Y-G < 0% | |
| | | | 0 | Y-G < -0.50% | |
| ECN implementation | 20 | Implementation & response | 20 | 100% & proactive response w/evidence | |
| | | | 10 | 100% implementation | |
| | | | 0 | no 100% implementation or delay | |
| RoHS survey service | 10 | Case | 10 | 100% meet and urgent case support | |
| | | | 5 | 100% on time | |
| | | | 0 | Any case delay, poor report quality or not support urgent case | |

| ASE | | Rated by: PP | | |
|---|---|---|---|---|
| Evaluation | Sub-total | Criterion | | Score |
| CLIP & CVP<br>Commit Line Item Performance<br>Commit Volume Performance | 20 | 20 | 98 ~ 100% | |
| | | 15 | 90 ~ 97% | |
| | | 10 | 85% ~ 89% | |
| | | 5 | 80% ~ 84% | |
| | | 0 | <80% | |
| Cycle time support<br>1. Including Production/Engineering modes<br>2. Comparison among competitors<br>3. Comparison to supplier standard cycle time | 20 | 20 | Best performance compared to all competitors | |
| | | 15 | Similar to competitors most of the times/ Meet supplier standard cycle time | |
| | | 5 | Worse than competitors most of the times | |
| | | 0 | Lead time not predictable, not a dependable supplier | |
| Capacity booking /Allocation | 20 | 20 | 95% ~ 100% | |
| | | 15 | 90% ~ 95% | |
| | | 10 | 85% ~ 90% | |
| | | 5 | 80 ~ 85% | |
| | | 0 | <80% | |
| Pull-in or Push out rescheduling flexibility | 20 | 20 | Fully support and meet all GUC expectation | |
| | | 15 | Excellent support and >90% meet GUC expectation | |
| | | 5 | support and >50% meet GUC expectation | |
| | | 0 | Inflexible and <50% meet GUC expectation | |
| Logistics Support<br>1. WIP data accuracy<br>2. Holiday/weekend support<br>3. Product information<br>4. Response/feedback time (within 2 days) | 20 | 20 | Fully support and meet all GUC expectation | |
| | | 15 | Excellent support and >75% meet GUC expectation | |
| | | 10 | Good support and >50% meet GUC expectation | |
| | | 0 | Inflexible and <50% meet GUC expectation | |

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# Technology & Service (ASSY)

## -- Technology Owner: PE

## -- Service Owner: Purchaser and all

| ASE | | Rated by: PA | | |
|---|---|---|---|---|
| Evaluation | Sub-total | Criterion | | Score |
| New Technology support<br>-Roadmap update<br>-Knowledge sharing<br>-Tech. inquiry response | 10 | 10 | Proactively provide Technology Roadmap & knowledge | |
| | | 7 | Provide Technology Roadmap & knowledge upon request | |
| | | 3 | Provide limited Technology Roadmap & knowledge | |
| | | 0 | Can't provide Technology Roadmap & knowledge | |
| 1. New product development support - SB base<br>-Substrate 1st design process time can't meet commit ( 7~14 days, case by case)<br>-Substrate modify process time can't meet commit (3~5 days, case by case)<br>-Substrate design violate constraint<br>-Modify frequency<br>-Design quality<br><br>2. New product development support - LF base<br>-BD delivery (>3 days delivery fail )<br>-Design quality | 45 | Meet basic support 34<br>-2 per case delay<br>+2 per case pull in<br>-3 per case if modification frequency over 4 times<br>+3 per case if modification frequency under 2 times<br>-5 per case if design fail<br>+3~5high volume(compared with competitors) and without any failure | | |
| Engineering support and troubleshooting<br>-Electrical simulation cycle time(target 14 days)<br>-Thermal simulation cycle time(target 10 days)<br>-Data accuracy<br>-Pilot ENG issue solve<br>-Engineering troubleshooting<br>-Special DOE support | 20 | Meet bsaic support 15<br>-2 per case delay<br>+2 per case pull in<br>-1 per case if wrong data<br>+1 per special DOE support<br>+1 per case for ENG issue solved or troubleshooting proactively<br>-2 per case for ENG poor support or troubleshooting fail | | |
| Pilot Assembly Yield improve & Enhance<br>-Pilot lot /ENG lot assy yield > 98%<br>-improve plan and response | 10 | Meet target yield score 7<br>+1 per case meets GUC's goal & with improve activities<br>-1 per case if assy yield < 98%<br>-2 per case if low yield without improve plan | | |
| Pilot O/S ratio/ FA & improvement<br>-Pilot lot O/S <1% (exclude non-cp wafer)<br>-FA: 3days preliminary report<br>-FA: 7days final report<br>-improve plan and response | 15 | Meet target & basic support 12<br>+1 per case if its yield meets GUC's goal & keep improve activities<br>-1 per case if O/S >1%<br>-2 per case if O/S > 1% and no improve plan<br>-1 per case if FA delay | | |

| ASE | | Rated by: QRA | | | |
|---|---|---|---|---|---|
| Evaluation Items | Sub-score | Criteria | | | Score |
| FA/Reliability support | 20 | Case | 20 | 100% meet and urgent case support | |
| | | | 15 | 100% meet | |
| | | | 10 | 90% meet | |
| | | | 0 | < 90% meet | |
| Action request | 40 | Case | 40 | 100% meet and urgent case support | |
| | | | 30 | 100% on time | |
| | | | 20 | one case delay or poor report quality | |
| | | | 0 | Two more cases delay or not support urgent case | |
| Continuous improvement | 30 | Case | 30 | Proactive plan | |
| | | | 20 | Act as required in need | |
| | | | 10 | Not implemented | |
| | | | 0 | Not implemented as required | |
| Meeting efficiency | 10 | Case | 10 | 100% on time & AR follow-up | |
| | | | 5 | one case delay or poor report quality | |
| | | | 0 | Two more cases delay | |

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# Service (ASSY)

## -- Service Owner: Purchaser and all

| ASE | | Rated by: PP | | |
|---|---|---|---|---|
| Evaluation | Sub-total | Criterion | | Score |
| Response & follow up Fulfillment | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Meeting efficiency & accuracy | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Proactive service | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Resource & capacity support | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |

| ASE | | Rated by: PA | | |
|---|---|---|---|---|
| Evaluation | Sub-total | Criterion | | Score |
| Resource support (Manpower, design resource, engineering support) | 40 | 40 | Proactive support with 100% fulfillment | |
| | | 35 | Very satisfactory & minimum improvement required | |
| | | 30 | Satisfactory & improvement required | |
| | | 20 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Communication efficiency | 30 | 30 | Proactive support with 100% fulfillment | |
| | | 20 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Action follow up and response quality | 30 | 30 | Proactive support with 100% fulfillment | |
| | | 20 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |

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# Quality & Delivery/Capability (Test)

## -- Quality Owner: Q&R

## -- Delivery/Capability Owner: PP

| ASE | | Rated by: QRA | | |
|---|---|---|---|---|
| Evaluating items | Sub-score | Criteria | | Score |
| End-Customer Service<br>Nonconforming Case<br>(Score deduction doubled for serious events) | 30 | 30 | No complaint from GUC customer | |
| | | 20 | 1 complaint(not repeating failure) from GUC customer | |
| | | 10 | 1 complaint(repeating failure) from GUC customer | |
| | | 0 | >=2 complaints from GUC customer | |
| End-Customer Service<br>1. Nonconforming case request handling & response<br>GUC goal: Preliminary reply(3D): 3 days<br>Formal CAR(8D): 7 days<br>2. Customer special request handling & response<br>GUC goal: According to customer request | 15 | 15 | Meet the GUC's goal | |
| | | 10 | Can't meet committed date but notify GUC with agreement for rescheduling | |
| | | 0 | Can't meet the committed day & didn't notify GUC to reschedule or no effective actions | |
| IQC failure rate<br>(Score deduction double if delivery impacted or same defect repeatedly) | 15 | 15 | No reject by GUC or GUC's suppliers | |
| | | 10 | One reject case by GUC or GUC's suppliers in the month | |
| | | 5 | Two reject cases by GUC or GUC's suppliers in the month | |
| | | 0 | more than two reject cases by GUC or GUC's suppliers in the month | |
| Average Loss Rate<br>( Score deduction doubled if<br>1. Loss rate > 300ppm without improve action<br>2. Single lot loss rate > 300ppm without improve action) | 10 | 10 | Loss rate < 50 ppm | |
| | | 5 | Loss rate < 100 ppm, > 50 ppm | |
| | | 0 | Loss rate < 300 ppm, > 100 ppm | |
| ECN supporting | 5 | 5 | Timely informed & approved before change | |
| | | 0 | One case inform delayed but still get approval before change | |
| Others | 25 | 0~25 | Proactively work with GUC on CIP project | |
| | | | Proactively work with GUC on 8D follow up and/or close | |
| | | | Proactively at IQC gating and cath quality issues from oyther subcons | |
| | | | Proactively initiate and report on subcon CIP project for GUC/customer baseline improvement | |

| ASE | | Rated by: PP | | |
|---|---|---|---|---|
| Evaluation | Sub-total | Criterion | | Score |
| CLIP & CVP<br>Commit Line Item Performance<br>Commit Volume Performance | 20 | 20 | 98 ~ 100% | |
| | | 15 | 90 ~ 97% | |
| | | 10 | 85% ~ 89% | |
| | | 5 | 80% ~ 84% | |
| | | 0 | <80% | |
| Cycle time support<br>1. Including Production/Engineering modes<br>2. Comparison among competitors<br>3. Comparison to supplier standard cycle time | 20 | 20 | Best performance compared to all competitors | |
| | | 15 | Similar to competitors most of the times/ Meet supplier standard cycle time | |
| | | 5 | Worse than competitors most of the times | |
| | | 0 | Lead time not predictable, not a dependable supplier | |
| Capacity booking /Allocation | 20 | 20 | 95% ~ 100% | |
| | | 15 | 90% ~ 95% | |
| | | 10 | 85% ~ 90% | |
| | | 5 | 80 ~ 85% | |
| | | 0 | <80% | |
| Pull-in or Push out rescheduling flexibility | 20 | 20 | Fully support and meet all GUC expectation | |
| | | 15 | Excellent support and >90% meet GUC expectation | |
| | | 5 | support and >50% meet GUC expectation | |
| | | 0 | Inflexible and <50% meet GUC expectation | |
| Logistics Support<br>1. WIP data accuracy<br>2. Holiday/weekend support<br>3. Product information<br>4. Response/feedback time<br>(within 2 days) | 20 | 20 | Fully support and meet all GUC expectation | |
| | | 15 | Excellent support and >75% meet GUC expectation | |
| | | 10 | Good support and >50% meet GUC expectation | |
| | | 0 | Inflexible and <50% meet GUC expectation | |

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# Technology & Service (Test)

## -- Technology Owner: TE

## -- Service Owner: Purchaser and all

| ASE | | Rated by: TED | |
|---|---|---|---|
| Evaluation | sub-total | Criterion | Score |
| CP Re-test Yield Gain | 20 | Meet the GUC's goal : 17<br>1. Each reduce 1% (+3)<br>2. Each increase 1% (-3) | |
| FT Re-test Yield Gain | 25 | Meet the GUC's goal : 22<br>1. Each reduce 1% (+3)<br>2. Each increase 1% (-3) | |
| Hold Lot Cycle Time | 25 | Meet the GUC's goal : 22<br>1. Each reduce 1 hour (+3)<br>2. Each increase 1 hour (-3) | |
| FA Performance<br>-Troubleshooting | 15 | Meet basic requirement: 12<br>1. Each feedback delay (-3)<br>2. Each weakness (-3)<br>3. Each strength (+3)<br>Weakness : No report by committed schedule or FA unsuccessful<br>Strength : Submit report by committed schedule and FA successful | |
| Capability<br>1. Testing<br>2. Supporting<br>3. Hardware improvement<br>4. Software improvement | 15 | Meet basic requirement: 11<br>1. Each feedback delay (-2)<br>2. Each weakness (-2)<br>3. Each strength (+2)<br>Weakness : Poor service or fail GUC's task<br>Strength : Proactive and provide effective soultion to GUC | |

| ASE | | Rated by: QRA | | | |
|---|---|---|---|---|---|
| Evaluation Items | Sub-score | Criteria | | | Score |
| FA/Reliability support | 20 | Case | 20 | 100% meet and urgent case support | |
| | | | 15 | 100% meet | |
| | | | 10 | 90% meet | |
| | | | 0 | < 90% meet | |
| Action request | 40 | Case | 40 | 100% meet and urgent case support | |
| | | | 30 | 100% on time | |
| | | | 20 | one case delay or poor report quality | |
| | | | 0 | Two more cases delay or not support urgent case | |
| Continuous improvement | 30 | Case | 30 | Proactive plan | |
| | | | 20 | Act as required in need | |
| | | | 10 | Not implemented | |
| | | | 0 | Not implemented as required | |
| Meeting efficiency | 10 | Case | 10 | 100% on time & AR follow-up | |
| | | | 5 | one case delay or poor report quality | |
| | | | 0 | Two more cases delay | |

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# Service (Test)

## -- Service Owner: Purchaser and all

| ASE | | Rated by: PP | | |
|---|---|---|---|---|
| Evaluation | Sub-total | Criterion | | Score |
| Response & follow up Fulfillment | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Meeting efficiency & accuracy | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Proactive service | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |
| Resource & capacity support | 25 | 25 | Proactive support with 100% fulfillment | |
| | | 20 | Very satisfactory & minimum improvement required | |
| | | 15 | Satisfactory & improvement required | |
| | | 10 | Below average & maximum improvement required | |
| | | 0 | Poor support & maximum improvement required immediately | |

| ASE | | Rated by: TED | |
|---|---|---|---|
| Evaluation | Sub-total | Criterion | Score |
| **Service Efficiency**<br>1. Engineering data<br>2. Test result<br>3. Special request | 100 | **Meet Basic support 75**<br>**1. Each feedback delay (-5)**<br>**2. Each weakness (-5)**<br>**3. Each strength (+5)**<br>**Weakness : No data reply within 96 hrs after request**<br>**Strength : Provide useful data proactively and real time** | |

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# Automotive/Low PPM program introduction

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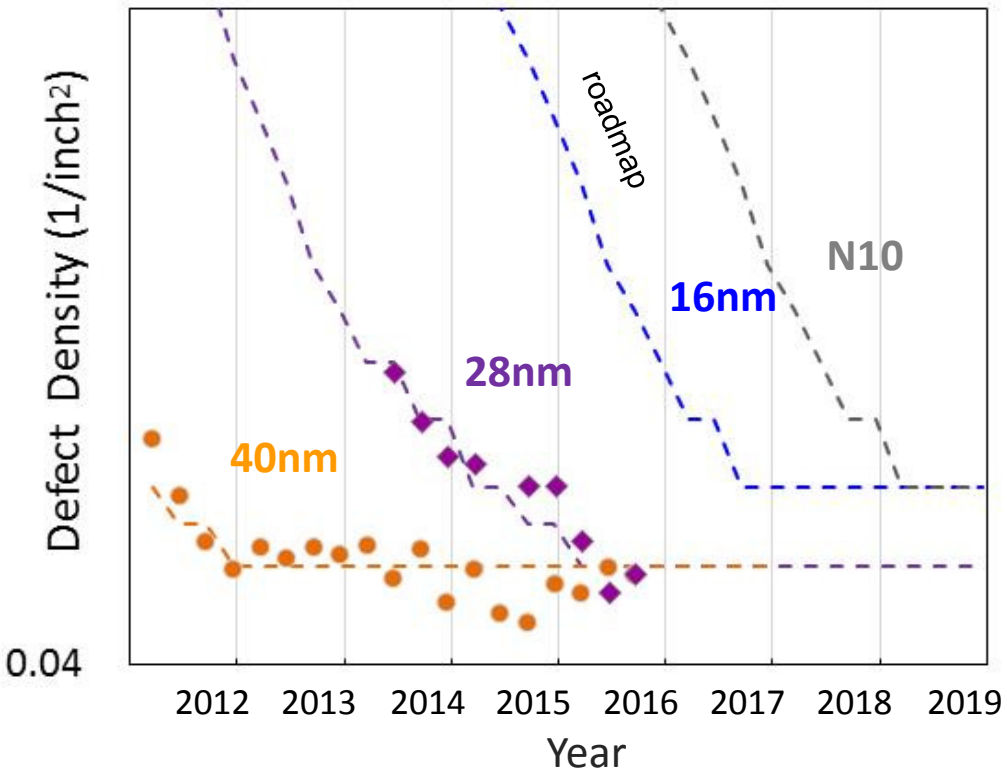
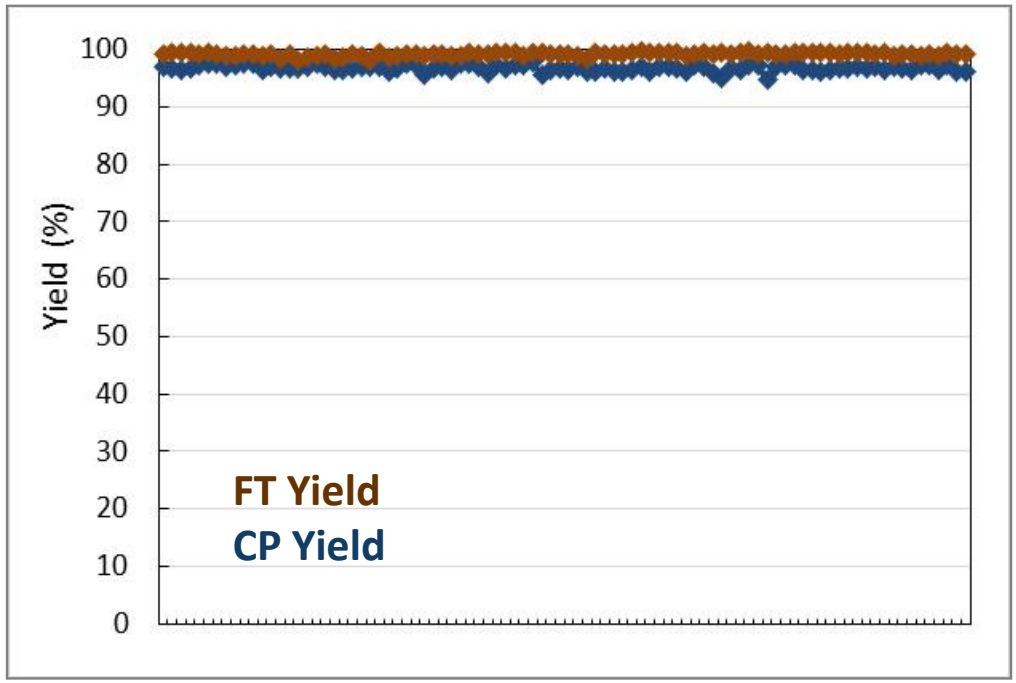
# Better Yield than Manufacturer Roadmap

- **Good relationship and working with all manufacturers for BKM and improvement.**
- **Experienced PE engineers with FAB expertise to work closely with tsmc to achieve better yield performance than manufacturing roadmap.**

*Actual D0 vs. Roadmap*

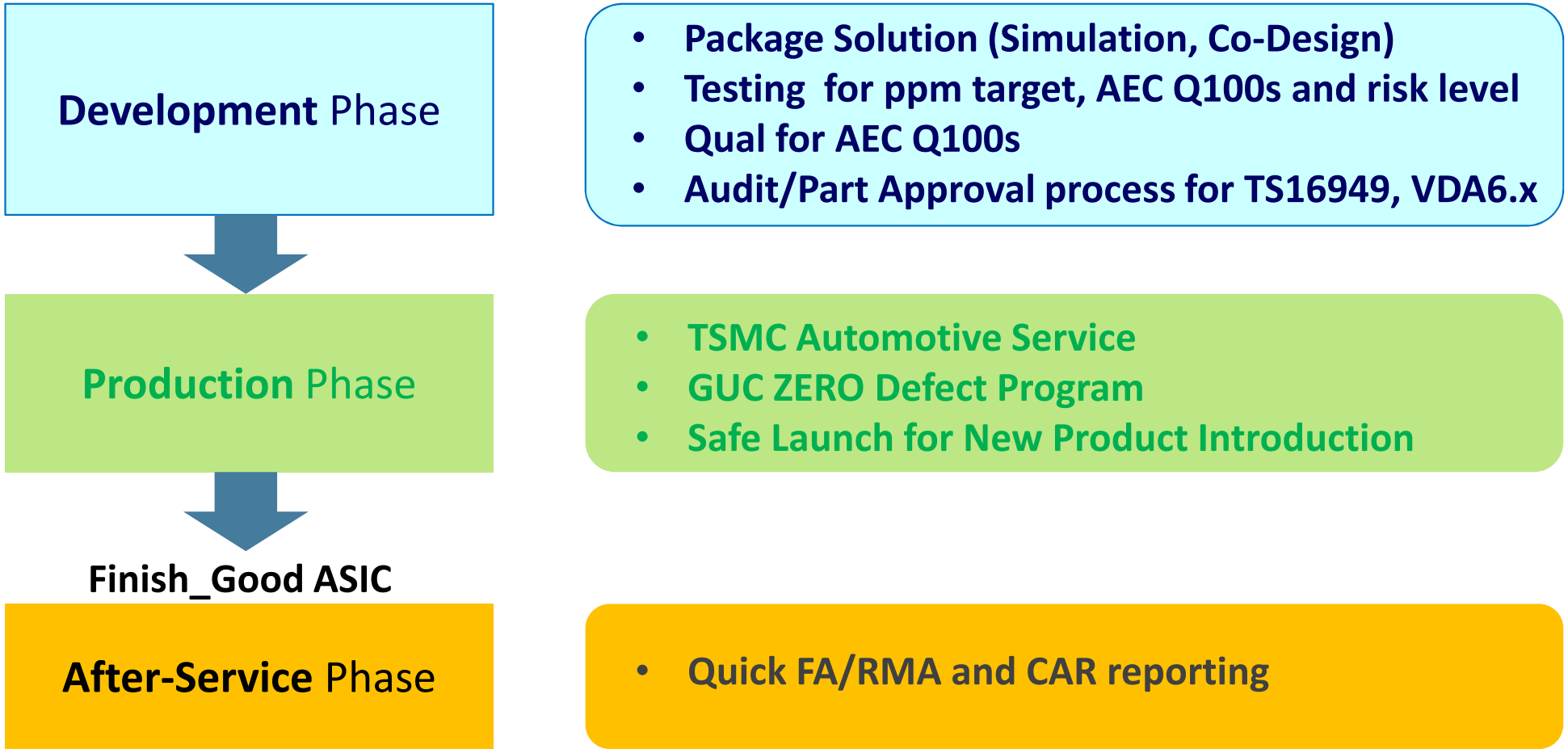



*65nm Automotive Product CP&FT Yield*



# Realize Your Chips for Automotive Requirements

- **Incorporating GUC automotive solutions and TSMC automotive service package for your quality/reliability targets.**



# GUC Automotive Projects Update

- **Flexible service model to support automotive part production.**

| Project # | Wafer Technology | AEC Grade | Service Model | CAR Makers (or Tier-1) | Status |
|---|---|---|---|---|---|
| Project A | 65nm low power | Grade 1 | RTL-in to F/G | Germany, Japan | Volume production |
| Project B | 90nm eDRAM | Grade 2 | GDS-in to F/G | Germany, Korea | Pre-qual |
| Project C | 180nm BCD | Grade 1 | GDS-in to wafer | Japan | Under qualification |
| Project D | 28nm HPC | Grade 1 | RTL-in to F/G | Germany, US | MPW Prototyping |
| Project E | 250nm BCD | Grade 1 | GDS-in to F/G | Korea | MPW Prototyping |

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# TSMC's Automotive Program Update

- **State of the art quality system in place**
  - ISO/TS16949, ISO14001 certified for all Fabs
  - The ultimate goal of our quality policy - Zero defect - in everything we do.
- **Focused Automotive Program established in 2008.**
  - Automotive process Qual Spec per AEC-Q100.
  - Automotive service package to eliminate outlier wafers.
  - Safe launch program to early detect failures and take corrective actions.
  - Enhancing the program through TSMC initiative and supply chain's inputs.
- **Technologies range from 0.8µm to 28nm; include logic, mixed signal, HV, CIS, Embedded Flash**
- **Started shipment to automotive industry from 1997. Shipped more than 2.1 million automotive wafers with good ppm level performance**
  - More than 800K 0.25µm EmbFlash wafers, ppm level <1 in 2013
  - More than 500K 0.18µm EmbFlash wafers, ppm level <1 in 2013
  - More than 50K 90nm Logic 12" wafers, ppm level <1 in 2013
  - More than 50K 65nm Logic 12" wafers

# Good Performance to Deliver Automotive Chips

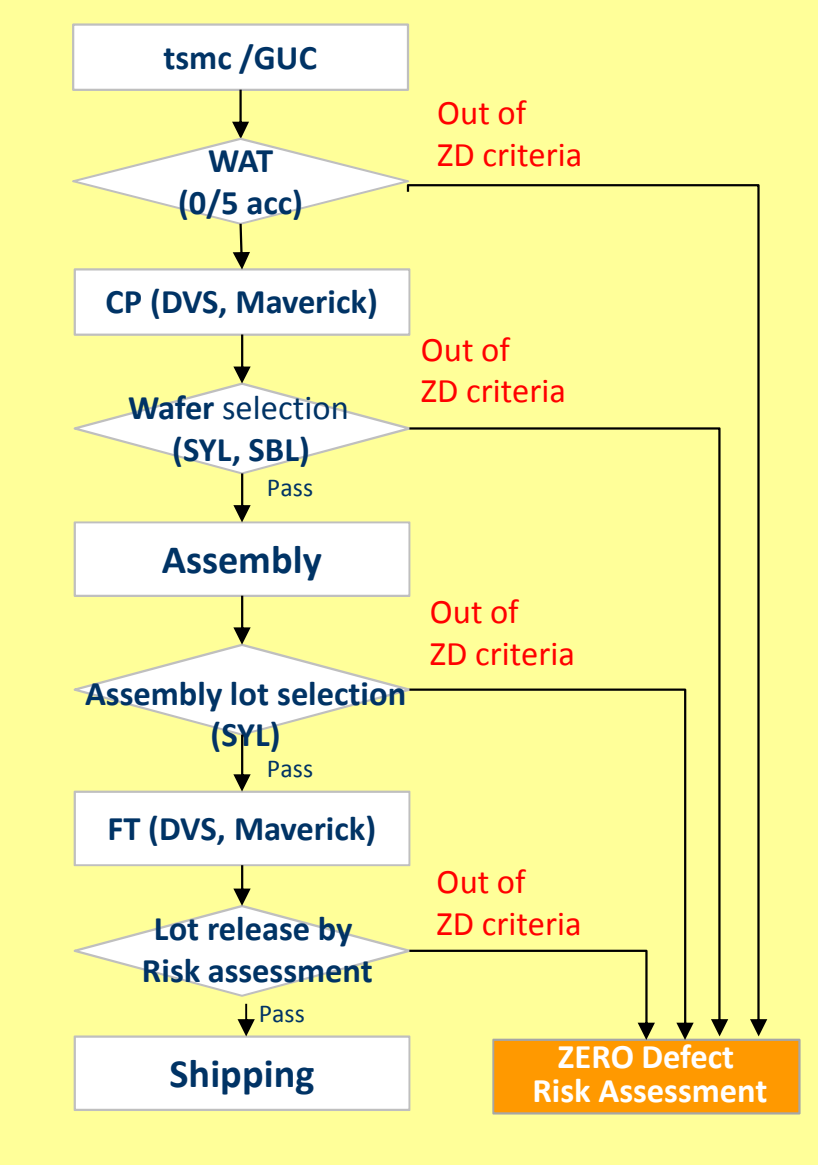
- **GPS controller ASIC, Grade 1, non-safety**
  - 65nm technology, 16x16 BGA
  - Apply **ZERO Defect program**

✓ **Qualified AEC Q100**

✓ **More than 1M units production shipment since 2010**

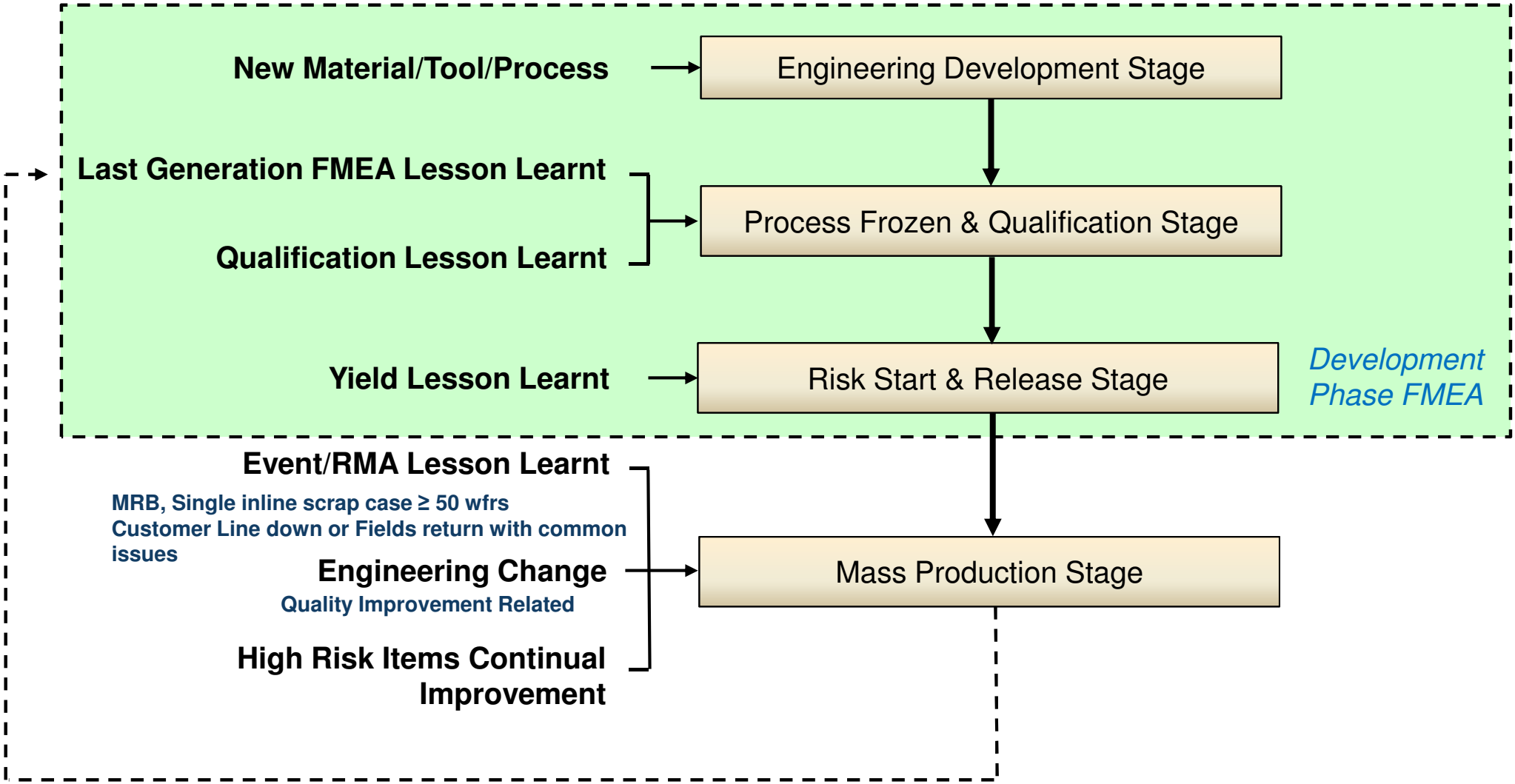
✓ **No RMA up to now**

**ppm level < 1**



# FMEA Practice in Foundry

- **Foundry FMEA Practice**

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# ZERO Defect Program

| Phase | ZERO Defect rules |
|---|---|
| F/E, B/E Design | Tighten EM rules |
| | Special Design rules |
| | T/O guidelines |
| | DFT rules for ZERO Defect |
| | Advanced ESD/LU rules |
| | eFuse for traceability |
| Production | WAT tighten control rules |
| | Tighten SPC/Cpk rules |
| | SYL, SBL |
| | Part Average Testing |
| | Dynamic Voltage Stress Test |
| | Temp. Stress Test |
| | Maverick rules |
| | Geographic Defect Detection |
| | Quick RMA/FA |
| | BCP guideline |
| | Reliability monitor (ORM) |

- **GUC will adopt design, wafer production (WAT, Cp/Cpk, Maverick), RMA and BCP.**
- **Cooperate with customer to adopt**
  - Maverick (CP, FT)
  - DVS
  - SYL and SBL
  - Geographic defect detection
  - On-going Reliability Monitor