# AEC-Q100G Qual Results

**Objective: TSMC14 & ATMC PBGA Cu Wire Qualification**

| | | | | | |
|---|---|---|---|---|---|
| Freescale PN:<br>Part Name: | SPC5676<br>Cobra | Customer Name(s):<br>PN(s): | Varies<br>Varies | Plan or Results:<br>Revision # & Date: | See revision history below |
| Technology:<br>Package: | CMOS90FG (H009FHX6)<br>PBGA-PGE 516 27SQ1.25P1 | Design Engr: | Not applicable | QUARTZ Tracking #: | 224661 |
| Fab / Assembly / Final Test Sites: | TSMC14 / FSL-KLM-FM / FSL-KLM-FM | Product Engr: | Sia Ying Ying-B33027 | | (Signature/Date shown below may be electronic) |
| Maskset#:<br>Rev#: | N23A<br>0 | GAO(Global Assembly Operation) Engr: | Chan Weng Hoong-B14777<br>603-78734888 | GAO Approval (for DIM/BOM results) Signature & Date: | Chan Weng Hoong-B14777<br>15-May-2014 |
| Die Size (in mm) W x L | 8.722 X 9.190 mm | NPI PRQE: | Chew Kim Seong-B36347<br>603-78732723 | NPI PRQE Approval Signature & Date: | Chew Kim Seong-B36347<br>15-May-2014 |
| Part Operating Temp. Grade: | Grade 1 - 40℃ to + 125℃ | Trace/DateCode: | LOT A: 8EMHA20L5200<br>LOT B: NA<br>LOT C: NA | CAB Approval Signature & Date: | 13191214M<br>16-May-2014 |
| | | | | Customer Approval Signature & Date: | NA |

***TESTS HIGHLIGHTED IN YELLOW WILL BE PERFORMED FOR THIS STUDY***

**This testing is performed by Freescale Reliability Lab (KLM) unless otherwise noted in the Comments.**

## GROUP A - ACCELERATED ENVIRONMENTAL STRESS TESTS

| Stress Test | Reference | Test Conditions | End Point Requirements | Minimum Sample Size | # of Lots | Total Units including spares | Results Lot ID-(#Rej/SS) NA=Not Applicable | Comments or Generic Data |
|---|---|---|---|---|---|---|---|---|
| PC | JESD22-A113<br>J-STD-020 | **Preconditioning (PC) :**<br>PC required for SMDs only.<br>MSL 3 @ 260℃, +5/-0℃ | TEST @ RH | All surface mount devices prior to THB, HAST, AC, UHST, TC and as required per test conditions. | | | Lot A: 0/231 | **Generic Data**<br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/231<br>Lot B: 0/231 |
| THB | JESD22-A101<br>A110 | **Temperature-Humidity-Bias (THB):**<br>PC before THB (for SMDs only): Required<br>THB = 85℃/85%RH for 1008 hrs.<br>Bias = Max Vdd<br>*Timed RO of 48hrs. MAX* | TEST @ RH | 77 | 1 | 77 | Lot A: 0/77 | **Generic Data**<br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77<br>Lot B: 0/77 |
| UHST | JESD22-A102<br>A118 | **Unbiased HAST (UHST):**<br>PC before UHST (for SMDs only): Required<br>UHST = 110℃/85%RH for 264 hrs.<br>*Timed RO of 2-48hrs. MAX* | TEST @ R | 77 | 1 | 77 | Lot A: 0/77 | **Generic Data**<br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77<br>Lot B: 0/77 |
| TC | JESD22-A104<br>AEC Q100-Appendix 3 | **Temperature Cycle (TC):**<br>PC before TC (for SMDs only): Required<br>TC = -65℃ to 150℃ for 500cyc.<br>WBP after TC on 5 devices per lot; 2 bonds per corner and one mid-bond per side on each device. Record which pins were used. | TEST @ H<br>For AEC: WBP =/> 3 grams | 77 | 1 | 77 | Lot A: 0/77<br>WP: 0/5, min > 3 grams | **Generic Data**<br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77; WP: 0/5, min > 3 grams<br>Lot B: 0/77; WP: 0/5, min > 3 grams |
| HTSL | JESD22-A103 | **High Temperature Storage Life (HTSL):**<br>150℃ for 1008 hrs.<br>*Timed RO = 96hrs. MAX* | TEST @ RH | 77 | 1 | 77 | Lot A: 0/77 | **Generic Data**<br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77<br>Lot B: 0/77 |

## TEST GROUP B - ACCELERATED LIFETIME SIMULATION TESTS

| Stress Test | Reference | Test Conditions | End Point Requirements | Minimum Sample Size | # of Lots | Total Units including spares | Results Lot ID-(#Rej/SS) NA=Not Applicable | Comments or Generic Data |
|---|---|---|---|---|---|---|---|---|
| HTOL | JESD22-A108 | **High Temperature Operating Life (HTOL):**<br>AEC Ta = 125℃ for 1008 hrs.<br>Devices incorporating NVM shall receive 1X 'NVM endurance preconditioning'(W/E cycling). Test R, H, C after W/E cycling.<br>*Timed RO of 96hrs. MAX* | TEST @ RHC | 77 | 0 | 0 | Not required | |
| ELFR | AEC Q100-008 | **Early Life Failure Rate (ELFR):**<br>AEC Ta = 125℃ for 48 hrs<br>*Timed RO of 48 hrs MAX* | TEST @ RH | 800 | 0 | 0 | Pass | **Generic Data**<br>Mamba_SPC5674, (N31E), 516TePBGA 27x27, TSMC14, Q223225:<br>Result: 0/800 |
| EDR | AEC Q100-005 | **NVM Endurance, Data Retention, and Operational Life (EDR):**<br>Devices incorporating NVM shall receive 'NVM endurance preconditioning'(W/E cycling). Test R, H, C after W/E cycling.<br>*Timed RO of 96hrs. MAX* | TEST @ RHC | 77 | 0 | 0 | Not required | |

## TEST GROUP C - PACKAGE ASSEMBLY INTEGRITY TESTS

| Stress Test | Reference | Test Conditions | End Point Requirements | Minimum Sample Size | # of Lots | Total Units including spares | Results Lot ID-(#Rej/SS) NA=Not Applicable | Comments or Generic Data |
|---|---|---|---|---|---|---|---|---|
| WBS | AEC Q100-001 | **Wire Bond shear (WBS)** | Cpk = or > 1.67 | 30 bonds from minimum 5 units | 1 | 5 | Lot A: 0/5; Cpk> 1.67 | **Generic Data**<br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM,<br>Lot A: 0/5; Cpk> 1.67<br>Lot B: 0/5; Cpk> 1.67 |
| WBP | MilStd883-2011 | **Wire Bond Pull (WBP):**<br>Cond. C or D | Cpk = or > 1.67 | 30 bonds from minimum 5 units | 1 | 5 | Lot A: 0/5; Cpk> 1.67 | **Generic Data**<br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM,<br>Lot A: 0/5; Cpk> 1.67<br>Lot B: 0/5; Cpk> 1.67 |
| SD | JESD22-B102 | **Solderability (SD):**<br>8hr.(1 hr. for Au-plated leads) Steam age prior to test.<br>If production burn-in is done, samples must also undergo burn-in prior to SD. | >95% lead coverage of critical areas | 15 | 0 | 0 | Not required | |
| PD | JESD22-B100 | **Physical Dimensions(PD):**<br>PD per FSL 98A drawing | Cpk = or > 1.67 | 10 | 0 | 0 | Not required | |
| DIM & BOM | | **Dimensional (DIM):**<br>GAO to verify PD results against valid 98A drawing.<br>**BOM Verification (BOM):**<br>GAO to verify qual lot ERF BOM is accurate. | | | | | DIM: Not applicable<br>BOM: Approved | |
| SBS | AEC-Q100-010 | **Solder Ball Shear (SBS):**<br>Performed on all solder ball mounted packages e.g. PBGA, Chip Scale, Micro Lead Frame (but NOT Flip Chip).<br>Two reflow cycles at MSL reflow temperature before shear. | Cpk = or >1.67 | 10<br>(5 balls from a min. of 10 devices) | 0 | 0 | Not required | For solder ball mounted packages only; NOT for Flip Chips. |
| LI | JESD22-B105 | **Lead Integrity (LI):**<br>Not required for surface mount devices;<br>Only required for through-hole devices. | No lead breakage or cracks | 5<br>(10 leads from each of 5 parts) | 0 | 0 | Not required | |

## TEST GROUP D - DIE FABRICATION RELIABILITY TESTS

| Stress Test | Reference | Test Conditions | End Point Requirements | Minimum Sample Size | # of Lots | Total Units including spares | Results Lot ID-(#Rej/SS) NA=Not Applicable | Comments |
|---|---|---|---|---|---|---|---|---|
| **EM** | | **Electro Migration (EM)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **TDDB** | | **Time Dependent Dielectric Breakdown (TDDB)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **HCI** | | **Hot Carrier Injection (HCI)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **SM** | | **Stress Migration (SM)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **NBTI** | | **Negative Bias Temperature Instability (NBTI)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |

## TEST GROUP E - ELECTRICAL VERIFICATION TESTS

| Stress Test | Reference | Test Conditions | End Point Requirements | Minimum Sample Size | # of Lots | Total Units including spares | Results Lot ID-(#Rej/SS) NA=Not Applicable | Comments or Generic Data |
|---|---|---|---|---|---|---|---|---|
| **TEST** | Freescale 48A | **Pre- and Post Functional / Parametrics (TEST):**<br>For AEC, test software shall meet requirements of AEC-Q100-007.<br>Testing performed to the limits of device specification in temperature and limit value. | 0 Fails | All | All | All | See Results Summary | This action refers to Final Testing of all qualification units. |
| **HBM** | AEC-Q100-002 / JESD22-A114E Jan 2007 | **ElectroStatic Discharge/**<br>**Human Body Model Classification (HBM):**<br>Test @ 500/1000/1500/2000 Volts<br>For AEC, see AEC-Q100-002 for classification levels. | TEST @ RH<br>2KV min. | 3 units per Voltage level | 0 | 0 | Not required | |
| **MM** | AEC-Q100-003 or JESD22 | **ElectroStatic Discharge/**<br>**Machine Model Classification m(MM):**<br>Test @ 50/100/200 Volts<br>For AEC, see AEC-Q100-003 for classification levels. | TEST @ RH<br>200V min. | 3 units per Voltage level | 0 | 0 | Not required | |
| **CDM** | AEC-Q100-011 | **ElectroStatic Discharge/**<br>**Charged Device Model Classification (CDM):**<br>Test @ 250/500/750 Volts<br>For AEC, see AEC-Q100-011 for classification levels.<br>***Timed RO of 96hrs MAX.*** | TEST @ RH<br>All pins =/> 500V<br>For AEC, Corner pins =/> 750V; | 3 units per Voltage level | 0 | 0 | Not required | |
| **LU** | JESD78 plus AEC-Q100-004 for AEC | **Latch-up (LU):**<br>Test per JEDEC JESD78 with the AEC-Q100-004 requirements for AEC.<br>Ta= Maximum operating temperature<br>Vsupply = Maximum operating voltage | TEST @ RH | 6 | 0 | 0 | Not required | |
| **ED** | AEC-Q100-009, Freescale 48A spec | **Electrical Distribution (ED)** | TEST @ RHC<br><br>For AEC,<br>Cpk target > 1.67 | 30 | 1 | 30 | Pass; Cpk>1.67 | Comparison between Cu wire and Au wire at T0 |
| **FG** | For AEC, AEC-Q100-007 | **Fault Grading (FG)** | FG shall be = or > 90% for qual units | | | | FG%= No change | |
| **CHAR** | For AEC, AEC-Q003 | **Characterization (CHAR):**<br>Ony performed on new technologies and part families per AEC Q003. | | | | | Not required | |
| **GL (for information only)** | For AEC, AEC-Q100-006 | **Electro-Thermally Induced Gate Leakage (GL):**<br>155°C, 2.0 min, +400/-400 V<br>Per AEC Q100 Rev G, this test is performed for information only.<br>*Timed RO of 96 hrs MAX.*<br>*For all failures, perform unbiased bake (4hrs/125°C, or 2hrs/150°C) and retest; recovered units are GL failures.* | TEST @ R | 6 | 0 | 0 | Not required | Freescale does not plan Gate Leakage testing in alignment with the expected revision to AEC Q100 that will eliminate this "for information only" stress. |
| **EMC** | SAE J1752/3 - Radiated Emissions | **Electromagnetic Compatibility (EMC)**<br>(see AEC Q100 Appendix 5 for test applicability; done on case-by-case basis per customer/Freescale agreement) | <40dBuV<br>150kHz - 1GHz | 1 | 0 | 0 | Not required | |

Product Information

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| Q224661 | TSMC14 / 0N23A / CMOS90FG | Cobra90 / SPC5676 | 8.722 X 9.190 | FSL-KLM-FM | PBGA-PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

Die Generic Data List:

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| Q223225 | TSMC14 / N31E / CMOS90FG | Mamba / SPC5674 | 7.814 X 8.316 | FSL-KLM-FM | PBGA-PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

Package Generic Data List:

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| Q224151 | FSL-ATMC-FAB / 3M17W / CMOS90FG | Mamba / SPC5674 | 7.814 X 8.316 | FSL-KLM-FM | PBGA-PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

Devices Qualified By Similarity

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| NA | FSL-ATMC-FAB / N29D / CMOS90FG | Rainbow / SPC5645 | 7.469 X 8.850 | FSL-KLM-FM | PBGA 416 27*27 (5252) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |
| NA | TSMC14 / N23A / CMOS90FG | Cobra90 / SPC5676 | 8.722 X 9.190 | FSL-KLM-FM | PBGA 416 27*27 (5252) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

| Revision | Date | Comments | Author |
|---|---|---|---|
| Rev O | 10-May-14 | Qualfiication result update. | Chew Kim Seong |

# AEC-Q100G Qual Results

| | | | |
|---|---|---|---|
| Objective: **TSMC14 & ATMC PBGA Cu Wire Qualification** | | | |
| Freescale PN: SPC5673<br>Part Name: Mamba | Customer Name(s): Varies<br>PN(s): Varies | Plan or Results: See revision history below<br>Revision # & Date: | |
| Technology: CMOS90FG (H009FHX6)<br>Package: PBGAPGE 324 23SQ1.25P1.0 | Design Engr: Not applicable | QUARTZ Tracking #: 224546 | |
| Fab / Assembly / Final Test Sites: TSMC14 / FSL-KLM-FM / FSL-KLM-FM | Product Engr: Mohd Yusof Shahrul-R55167 | | (Signature/Date shown below may be electronic) |
| Maskset#: N31E<br>Rev#: 0 | GAO(Global Assembly Operation) Engr: Chan Weng Hoong-B14777 603-78734888 | GAO Approval (for DIM/BOM results) Signature & Date: Chan Weng Hoong-B14777 15-May-2014 | |
| Die Size (in mm) W x L: 7.814 X 8.316 mm | NPI PRQE: Chew Kim Seong-B36347 603-78732723 | NPI PRQE Approval Signature & Date: Chew Kim Seong-B36347 15-May-2014 | |
| Part Operating Temp. Grade: Grade 1 - 40℃ to + 125℃ | Trace/DateCode: LOT A 8EMHA1Z0J800 / LOT B 8EMHA1Z14Y00 / LOT C | CAB Approval Signature & Date: 13191214M 16-May-2014 | |
| | | Customer Approval Signature & Date: May be N/A | |

***TESTS HIGHLIGHTED IN YELLOW WILL BE PERFORMED FOR THIS STUDY***

**This testing is performed by Freescale Reliability Lab (KLM) unless otherwise noted in the Comments.**

**GROUP A - ACCELERATED ENVIRONMENTAL STRESS TESTS**

| Stress Test | Reference | Test Conditions | End Point Requirements | Minimum Sample Size | # of Lots | Total Units including spares | Results Lot ID-(#Rej/SS) NA=Not Applicable | Comments or Generic Data |
|---|---|---|---|---|---|---|---|---|
| **PC** | JESD22-A113<br>J-STD-020 | **Preconditioning (PC) :**<br>PC required for SMDs only.<br>MSL 3 @ 260℃, +5/-0℃ | TEST @ RH | All surface mount devices prior to THB, HAST, AC, UHST, TC and as required per test conditions. | | | Lot A: 0/77<br>Lot B: 0/77 | **Generic Data**<br>Cobra, (N23A), PBGA-PGE516 27*27, FSL-KLM-FM, Q224661:<br>Lot A: 0/231<br><br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/231<br>Lot B: 0/231<br><br>Mamba_SPC5673L, (M17W), PBGAPGE 324 23*23, FSL-KLM-FM, Q224258;<br>Lot A: 0/77<br>Lot B: 0/77 |
| **THB** | JESD22-A101<br>A110 | **Temperature-Humidity-Bias (THB):**<br>PC before THB (for SMDs only): Required<br>THB = 85℃/85%RH for 1008 hrs.<br><br>Bias = Max Vdd<br><br>Timed RO of 48hrs. MAX | TEST @ RH | 77 | 0 | 0 | Pass | **Generic Data**<br>Cobra, (N23A), PBGA-PGE516 27*27, FSL-KLM-FM, Q224661:<br>Lot A: 0/77<br><br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77<br>Lot B: 0/77 |
| **UHST** | JESD22-A102<br>A118 | **Unbiased HAST (UHST):**<br>PC before UHST (for SMDs only): Required<br>UHST = 110℃/85%RH for 264 hrs.<br><br>*Timed RO of 2-48hrs. MAX* | TEST @ R | 77 | 0 | 0 | Pass | **Generic Data**<br>Cobra, (N23A), PBGA-PGE516 27*27, FSL-KLM-FM, Q224661:<br>Lot A: 0/77<br><br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77<br>Lot B: 0/77 |
| **TC** | JESD22-A104<br>AEC Q100-Appendix 3 | **Temperature Cycle (TC):**<br>PC before TC (for SMDs only): Required<br>TC = -50℃ to 150℃ for 1000 cycles.<br><br>WBP after TC on 5 devices from 1 lot; 2 bonds per corner and one mid-bond per side on each device. Record which pins were used. | TEST @ H<br>For AEC: WBP =/> 3 grams | 77 | 2 | 154 | Lot A: 0/77<br>WP: 0/5, min > 3 grams<br>Lot B: 0/77 | **Generic Data**<br>Cobra, (N23A), PBGA-PGE516 27*27, FSL-KLM-FM, Q224661:<br>Lot A: 0/77; WP: 0/5, min > 3 grams<br><br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77; WP: 0/5, min > 3 grams<br>Lot B: 0/77<br><br>Mamba_SPC5673L, (M17W), PBGAPGE 324 23*23, FSL-KLM-FM, Q224258;<br>Lot A: 0/77; WP: 0/5, min > 3 grams<br>Lot B: 0/77 |
| **HTSL** | JESD22-A103 | **High Temperature Storage Life (HTSL):**<br>150℃ for 1008 hrs.<br><br>*Timed RO = 96hrs. MAX* | TEST @ RH | 77 | 0 | 0 | Pass | **Generic Data**<br>Cobra, (N23A), PBGA-PGE516 27*27, FSL-KLM-FM, Q224661:<br>Lot A: 0/77<br><br>Mamba, (M17W), PBGA-PGE516 27*27, FSL-KLM-FM, Q224151:<br>Lot A: 0/77<br>Lot B: 0/77 |

**TEST GROUP B - ACCELERATED LIFETIME SIMULATION TESTS**

| Stress Test | Reference | Test Conditions | End Point Requirements | Minimum Sample Size | # of Lots | Total Units including spares | Results Lot ID-(#Rej/SS) NA=Not Applicable | Comments or Generic Data |
|---|---|---|---|---|---|---|---|---|
| **HTOL** | JESD22-A108 | **High Temperature Operating Life (HTOL):**<br>AEC Ta = 125℃ for 1008 hrs.<br><br>Devices incorporating NVM shall receive 1X 'NVM endurance preconditioning'(W/E cycling). Test R, H, C after W/E cycling.<br>*Timed RO of 96hrs. MAX* | TEST @ RHC | 77 | 0 | 0 | Not required | |
| **ELFR** | AEC Q100-008 | **Early Life Failure Rate (ELFR):**<br>AEC Ta = 125℃ for 48 hrs<br><br>*Timed RO of 48 hrs MAX* | TEST @ RH | 800 | 0 | 0 | Pass | **Generic Data**<br>Mamba_SPC5674, (N31E), 516TePBGA 27x27, TSMC14, Q223225:<br>Result: 0/800 |
| **EDR** | AEC Q100-005 | **NVM Endurance, Data Retention, and Operational Life (EDR):**<br>Devices incorporating NVM shall receive 'NVM endurance preconditioning'(W/E cycling). Test R, H, C after W/E cycling.<br>*Timed RO of 96hrs. MAX* | TEST @ RHC | 77 | 0 | 0 | Not required | |

| TEST GROUP C - PACKAGE ASSEMBLY INTEGRITY TESTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Stress Test** | **Reference** | **Test Conditions** | **End Point Requirements** | **Minimum Sample Size** | **# of Lots** | **Total Units including spares** | **Results** Lot ID-(#Rej/SS) NA=Not Applicable | **Comments or Generic Data** |
| **WBS** | AEC Q100-001 | **Wire Bond shear (WBS)** | Cpk = or > 1.67 | 30 bonds from minimum 5 units | 2 | 10 | Lot A: 0/5; Cpk > 1.67<br>Lot B: 0/5; Cpk > 1.67 | |
| **WBP** | MilStd883-2011 | **Wire Bond Pull (WBP):**<br>Cond. C or D | Cpk = or > 1.67 | 30 bonds from minimum 5 units | 2 | 10 | Lot A: 0/5; Cpk > 1.67<br>Lot B: 0/5; Cpk > 1.67 | |
| **SD** | JESD22-B102 | **Solderability (SD):**<br>8hr.(1 hr. for Au-plated leads) Steam age prior to test.<br>If production burn-in is done, samples must also undergo burn-in prior to SD. | >95% lead coverage of critical areas | 15 | 0 | 0 | Not required | |
| **PD** | JESD22-B100 | **Physical Dimensions(PD):**<br>PD per FSL 98A drawing | Cpk = or > 1.67 | 10 | 0 | 0 | Not required | |
| **DIM & BOM** | | **Dimensional (DIM):**<br>GAO to verify PD results against valid 98A drawing.<br>**BOM Verification (BOM):**<br>GAO to verify qual lot ERF BOM is accurate. | | | | | DIM: Not applicable<br>BOM: Approved | |
| **SBS** | AEC-Q100-010 | **Solder Ball Shear (SBS):**<br>Performed on all solder ball mounted packages e.g. PBGA, Chip Scale, Micro Lead Frame (but NOT Flip Chip).<br>Two reflow cycles at MSL reflow temperature before shear. | Cpk = or >1.67 | 10 (5 balls from a min. of 10 devices) | 0 | 0 | Not required | For solder ball mounted packages only; NOT for Flip Chips. |
| **LI** | JESD22-B105 | **Lead Integrity (LI):**<br>Not required for surface mount devices;<br>Only required for through-hole devices. | No lead breakage or cracks | 5 (10 leads from each of 5 parts) | 0 | 0 | Not required | |

| TEST GROUP D - DIE FABRICATION RELIABILITY TESTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Stress Test** | **Reference** | **Test Conditions** | **End Point Requirements** | **Minimum Sample Size** | **# of Lots** | **Total Units including spares** | **Results** Lot ID-(#Rej/SS) NA=Not Applicable | **Comments** |
| **EM** | | **Electro Migration (EM)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **TDDB** | | **Time Dependent Dielectric Breakdown (TDDB)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **HCI** | | **Hot Carrier Injection (HCI)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **SM** | | **Stress Migration (SM)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |
| **NBTI** | | **Negative Bias Temperature Instability (NBTI)** | | | | | | The data, test method, calculations and internal criteria should be available to the customer upon request for new technologies. |

| TEST GROUP E - ELECTRICAL VERIFICATION TESTS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Stress Test** | **Reference** | **Test Conditions** | **End Point Requirements** | **Minimum Sample Size** | **# of Lots** | **Total Units including spares** | **Results** Lot ID-(#Rej/SS) NA=Not Applicable | **Comments or Generic Data** |
| **TEST** | Freescale 48A | **Pre- and Post Functional / Parametrics (TEST):**<br>For AEC, test software shall meet requirements of AEC-Q100-007.<br>Testing performed to the limits of device specification in temperature and limit value. | 0 Fails | All | All | All | See Results Summary | This action refers to Final Testing of all qualification units. |
| **HBM** | AEC-Q100-002 / JESD22-A114E Jan 2007 | **ElectroStatic Discharge/**<br>**Human Body Model Classification (HBM):**<br>Test @ 500/1000/1500/2000 Volts<br>For AEC, see AEC-Q100-002 for classification levels. | TEST @ RH<br>2KV min. | 3 units per Voltage level | 0 | 0 | Not required | |
| **MM** | AEC-Q100-003 or JESD22 | **ElectroStatic Discharge/**<br>**Machine Model Classification m(MM):**<br>Test @ 50/100/200 Volts<br>For AEC, see AEC-Q100-003 for classification levels. | TEST @ RH<br>200V min. | 3 units per Voltage level | 0 | 0 | Not required | |
| **CDM** | AEC-Q100-011 | **ElectroStatic Discharge/**<br>**Charged Device Model Classification (CDM):**<br>Test @ 250/500/750 Volts<br>For AEC, see AEC-Q100-011 for classification levels.<br>***Timed RO of 96hrs MAX.*** | TEST @ RH<br>All pins =/> 500V<br>For AEC, Corner pins =/> 750V; | 3 units per Voltage level | 0 | 0 | Not required | |
| **LU** | JESD78 plus AEC-Q100-004 for AEC | **Latch-up (LU):**<br>Test per JEDEC JESD78 with the AEC-Q100-004 requirements for AEC.<br>Ta= Maximum operating temperature<br>Vsupply = Maximum operating voltage | TEST @ RH | 6 | 0 | 0 | Not required | |
| **ED** | AEC-Q100-009, Freescale 48A spec | **Electrical Distribution (ED)** | TEST @ HC<br>For AEC,<br>Cpk target > 1.67 | 30 | 0 | 0 | Pass | Comparison between Cu wire and Au wire at T0. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **FG** | For AEC, AEC-Q100-007 | **Fault Grading (FG)** | FG shall be = or > 90% for qual units | | | | FG%= No change | |
| **CHAR** | For AEC, AEC-Q003 | **Characterization (CHAR):**<br>Ony performed on new technologies and part families per AEC Q003. | | | | | Not required | |
| **GL (for information only)** | For AEC, AEC-Q100-006 | **Electro-Thermally Induced Gate Leakage (GL):**<br>155℃, 2.0 min, +400/-400 V<br>Per AEC Q100 Rev G, this test is performed for information only.<br>*Timed RO of 96 hrs MAX.*<br>*For all failures, perform unbiased bake (4hrs/125℃, or 2hrs/150℃) and retest; recovered units are GL failures.* | TEST @ R | 6 | 0 | 0 | Not required | Freescale does not plan Gate Leakage testing in alignment with the expected revision to AEC Q100 that will eliminate this "for information only" stress. |
| **EMC** | SAE J1752/3 - Radiated Emissions | **Electromagnetic Compatibility (EMC)**<br>(see AEC Q100 Appendix 5 for test applicability; done on case-by-case basis per customer/Freescale agreement) | <40dBuV<br>150kHz - 1GHz | 1 | 0 | 0 | Not required | |

Production Information

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| Q224546 | TSMC14 / N31E / CMOS90FG | Mamba / SPC5673 | 8.722 X 9.190 | FSL-KLM-FM | PBGAPGE 324 23*23 (5366) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

Die Generic Data List:

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| Q223225 | TSMC14 / N31E / CMOS90FG | Mamba / SPC5674 | 7.814 X 8.316 | FSL-KLM-FM | PBGA-PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

Package Generic Data List:

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| Q224661 | TSMC14 / 0N23A / CMOS90FG | Cobra90 / SPC5676 | 8.722 X 9.190 | FSL-KLM-FM | PBGA-PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |
| Q224151 | FSL-ATMC-FAB / 3M17W / CMOS90FG | Mamba / SPC5674 | 7.814 X 8.316 | FSL-KLM-FM | PBGA-PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |
| Q224258 | FSL-ATMC-FAB / 3M17W / CMOS90FG | Mamba / SPC5673 | 7.814 X 8.316 | FSL-KLM-FM | PBGAPGE 324 23*23 (5366) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

Devices Qualified By Similarity

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| NA | FSL-ATMC-FAB / 2N60C / CMOS90FG | Andorra2M / SPC5642 | 6.154 x 6.915 | FSL-KLM-FM | PBGA 324 23*23 (5241) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |
| NA | FSL-ATMC-FAB / 0M14X / CMOS90FG | Andorra4M / SPC5644 | 7.238 x 8.375 | FSL-KLM-FM | PBGAPGE 324 23*23 (5366) | CRM-1525 | SUMITOMO G770SFL | 20um PdCu |

| Revision | Date | Comments | Author |
|---|---|---|---|
| Rev O | 10-May-14 | Qualfiication result update. | Chew Kim Seong |