# AEC-Q100G Qual Results

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|---|---|---|
| Objective: **Leopard (SPC5643) ATMC to TSMC14 Fab Transfer & Cu Wire Qualification** | | |
| Freescale PN: SPC5643<br>Part Name: Leopard | Customer Name(s): "Varies"<br>PN(s): "Varies" | Plan or Results: See revision history<br>Revision # & Date: |
| Technology: CMOS90FG (H009FHX6)<br>Package: LQFP 144 20SQ1.4P0.5 C90 (8286) | Design Engr: Not applicable | QUARTZ Tracking #: 225694 |
| Fab / Assembly / Final Test Sites: TSMC14 / FSL-KLM-FM / FSL-KLM-FM | Product Engr: Ismail Ikmal-B25204 | (Signature/Date shown below may be electronic) |
| Maskset#: N18H<br>Rev#: 0 | GAO(Global Assembly Aperation) Engr: Jasmine Lim-B18239 | GAO Approval (for DIM/BOM results) Signature & Date: Jasmine Lim-B18239<br>4-June-2014 |
| Die Size (in mm) W x L: 6.297 x 6.052 | NPI PRQE: Chew Kim Seong-B36347 | NPI PRQE Approval Signature & Date: Chew Kim Seong-B36347<br>4-June-2014 |
| Part Operating Temp. Grade: Grade 1 - 40°C to + 125°C | Trace/DateCode: LOT A 8EMHA22XNC00 · LOT B NA · LOT C NA | CAB Approval Signature & Date: 12321935M<br>5-June-2014 |
| | | Customer Approval Signature & Date: 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°C, +5/-0°C | 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>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Lot A: 0/231<br>Lot B: 0/231<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Lot A: 0/231<br>Lot B: 0/231 |
| HAST | JESD22-A101<br>A110 | **Highly Accelerated Stress Test (HAST):**<br>PC before HAST (for SMDs only): Required<br>HAST = 110°C/85%RH for 264 hrs.<br>Bias = Max Vdd<br><br>*Timed RO of 48hrs. MAX* | TEST @ RH | 77 | 1 | 77 | Lot A: 0/77 | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Condition 110°C/85%RH for 264 hrs<br>Lot A: 0/77<br>Condition 130°C/85%RH for 96 hrs<br>Lot B: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Condition 110°C/85%RH for 264 hrs<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°C/85%RH for 264 hrs.<br><br>*Timed RO of 2-48hrs. MAX* | TEST @ R | 77 | 1 | 77 | Lot A: 0/77 | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Condition 110°C/85%RH for 264 hrs<br>Lot A: 0/77<br>Condition 130°C/85%RH for 96 hrs<br>Lot B: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Condition 110°C/85%RH for 264 hrs<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°C to 150°C for 500 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 | 1 | 77 | Lot A: 0/77<br>WP: 0/5, min > 3.0grams | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Lot A: 0/77<br>Lot B: 0/77<br>WP: 0/5, min > 3.0grams<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Lot A: 0/77<br>Lot B: 0/77<br>WP: 0/5, min > 3.0grams |
| HTSL | JESD22-A103 | **High Temperature Storage Life (HTSL):**<br>150°C for 1008 hrs<br><br>*Timed RO = 96hrs. MAX* | TEST @ RH | 77 | 1 | 77 | Lot A: 0/77 | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972<br>Lot A: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Lot A: 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>Ta = 125°C<br>Bias = 1.6V (Core), 4.0V (DGO), 5.8V (HV)<br>125°C for 1008 hrs<br><br>Precondition @ HOT with 1K and 100K write/erase cycles for large and small blocks respectevely. Full functional testing including NVM at RH after 100K W/E preconditioning cycles.<br><br>*Timed RO of 96hrs. MAX* | TEST @ RHC | 77 | 1 | 77 | Lot A: 0/77 | **Generic Data**<br>Cobra90_SPC5676, (N23A, TSMC14), 516 TePBGA 27x27,<br>Q213667: 0/231<br><br>Fado_SPC5668, (N61C, TSMC14), MAPBGA 208 17x17,<br>Q212483: 0/308<br><br>Bolero1M_SPC5606, (0N13E, TSMC14), 176LQFP , Q215921: 0/231 |
| ELFR | AEC Q100-008 | **Early Life Failure Rate (ELFR):**<br>Ta = 125°C for 48 hrs;<br>Bias = 1.6V (Core), 4.0V (DGO), 5.8V (HV)<br><br>*Timed RO of 48 hrs MAX* | TEST @ RH | 800 | 1 | 800 | Lot A: 0/800 | **Generic Data**<br>Generic Data<br>Cobra90_SPC5676, (N23A, TSMC14), 516 TePBGA 27*27<br>Q213667: 0/1498<br><br>Fado_SPC5668, (N61C, TSMC14), MAPBGA 208 17*17,<br>Q212483: 0/1619<br><br>Bolero1M_SPC5606, (0N13E, TSMC14), 176LQFP , Q215921: 0/2400 |
| EDR | AEC Q100-005 | **NVM Endurance, Data Retention, and Operational Life (EDR):**<br><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 | Pass | **Generic Data**<br>Fado_SPC5668, (N61C, TSMC14), MAPBGA 208 17x17,<br>Q212483<br>EDR @150C 1008 hrs: 0/336 |

| 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: Cpk > 1.67 | **Generic Data**<br>Leopard_SPC5643, (3N89D_ATMC), 144LQFP 20*20, FSL-KLM-FM<br>Lot A: 0/5; Cpk>1.67<br><br>Bolero1M5_SPC5607, (0N69H_TSMC14), 144LQFP 20*20, 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: Cpk > 1.67 | **Generic Data**<br>Leopard_SPC5643, (3N89D_ATMC), 144LQFP 20*20, FSL-KLM-FM<br>Lot A: 0/5; Cpk>1.67<br><br>Bolero1M5_SPC5607, (0N69H_TSMC14), 144LQFP 20*20, 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 required<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/ Human Body Model Classification (HBM):**<br><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 | 1 | 12 | Lot A:<br>500V: 0/3<br>1000V: 0/3<br>1500V: 0/3<br>2000V: 0/3 | |
| **MM** | AEC-Q100-003 or JESD22 | **ElectroStatic Discharge/ 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. | 30 | 0 | 0 | Not required | |
| **CDM** | AEC-Q100-011 | **ElectroStatic Discharge/ 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 | 1 | 9 | Lot A:<br>250V: 0/3<br>500V: 0/3<br>750V: 0/3 (Corner pins) | |
| **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 | 1 | 6 | Lot A: 0/6 | |

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| **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 | T0 comparison between Cu and Au wire test at room, hot & cold.<br>Pre & post HTOL comparison between ATMC and TSMC14 fab tested at hot & cold. |
| **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 |
|---|---|---|---|---|---|---|---|---|
| Q225694 | TSMC14 / 0N18H / CMOS90FG | Leopard / SPC5643 | 6.297X x 6.052 | FSL-KLM-FM | LQFP 144 20SQ1.4P0.5 C90 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 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 |
|---|---|---|---|---|---|---|---|---|
| Q213667 | TSMC14 / N23A / CMOS90FG | Cobra90 / SPC5676 | 8.722 X 9.190 | FSL-KLM-FM | TEPBGA PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 23um Au |
| Q212483 | TSMC14 / N61C / CMOS90FG | Fado / SPC5668 | 6.850 X 6.850 | FSL-TJN-FM | MAPBGA 208 17*17 (5253) | ABLEBOND 2025D | SUMITOMO G770SFL | 23um Au |
| Q215921 | TSMC14 / N13E/ CMOS90FG | Bolero1M / SPC5606 | 4.792 x 4.669 | ASECL | LQFP 176 24*24 (8271) | EN-4900G EPOXY | CEL9200THF-U-AK (low alpha) | 23um Au |

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 |
|---|---|---|---|---|---|---|---|---|
| Q223972 | FSL-ATMC-FAB / 3N89D / CMOS90FG | Leopard, SPC5643 | 6.052 x 6.297 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um Pd Cu |
| Q220192 | FSL-ATMC-FAB / 3N89D / CMOS90FG | Leopard, SPC5643 | 6.052 x 6.297 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um Pd Cu |
| Q222607 | TSMC14 / 0N69H / CMOS90FG | Bolero1.5M / SPC5607 | 5.112 x 5.331 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700LS | 20um Pd Cu |

| Revision | Date | Comments | Author |
|---|---|---|---|
| Rev O | 3-Jun-14 | Qualification result update. | Chew Kim Seong |

# AEC-Q100G Qual Results

| Objective: Leopard (SPC5643) ATMC to TSMC14 Fab Transfer & Cu Wire Qualification | | |
|---|---|---|
| Freescale PN: SPC5643<br>Part Name: Leopard | Customer Name(s): "Varies"<br>PN(s): "Varies" | Plan or Results: See revision history<br>Revision # & Date: |
| Technology: CMOS90FG (H009FHX6)<br>Package: LQFP 100 14SQ1.4P0.5 C90 (8285) | Design Engr: Not applicable | QUARTZ Tracking #: NA |
| Fab / Assembly / Final Test Sites: TSMC14 / FSL-KLM-FM / FSL-KLM-FM | Product Engr: Ismail Ikmal-B25204 | (Signature/Date shown below may be electronic) |
| Maskset#: N18H<br>Rev#: 0 | GAO(Global Assembly Aperation) Engr: Jasmine Lim-B18239 | GAO Approval (for DIM/BOM results) Signature & Date: Jasmine Lim-B18239 4-June-2014 |
| Die Size (in mm) W x L: 6.297 x 6.052 | NPI PRQE: Chew Kim Seong-B36347 | NPI PRQE Approval Signature & Date: Chew Kim Seong-B36347 4-June-2014 |
| Part Operating Temp. Grade: Grade 1 - 40°C to + 125°C | Trace/DateCode: LOT A NA; LOT B NA; LOT C NA | CAB Approval Signature & Date: 12321935M 5-June-2014 |
| | | Customer Approval Signature & Date: 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°C, +5/-0°C | TEST @ RH | All surface mount devices prior to THB, HAST, AC, UHST, TC and as required per test conditions. | | | Pass | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Lot A: 0/231<br>Lot B: 0/231<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Lot A: 0/231<br>Lot B: 0/231<br><br>Leopard_SPC5643, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A: 0/231<br><br>Leopard_SPC5643, (3N89D), 100LQFP 14*14, FSL-KLM-FM, Q223969:<br>Lot A: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 100LQFP 14*14, FSL-KLM-FM, Q222605<br>Lot A: 0/77 |
| HAST | JESD22-A101<br>A110 | **Highly Accelerated Stress Test (HAST):**<br>PC before HAST (for SMDs only): Required<br>HAST = 110°C/85%RH for 264 hrs.<br>Bias = Max Vdd<br>*Timed RO of 48hrs. MAX* | TEST @ RH | 77 | 0 | 0 | Pass | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Condition 110°C/85%RH for 264 hrs<br>Lot A: 0/77<br>Condition 130°C/85%RH for 96 hrs<br>Lot B: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Condition 110°C/85%RH for 264 hrs<br>Lot A: 0/77<br>Lot B: 0/77<br><br>Leopard_SPC5643, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A: 0/77 |
| UHST | JESD22-A102<br>A118 | **Unbiased HAST (UHST):**<br>PC before UHST (for SMDs only): Required<br>UHST = 110°C/85%RH for 264 hrs.<br>*Timed RO of 48hrs. MAX* | TEST @ R | 77 | 0 | 0 | Pass | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Condition 110°C/85%RH for 264 hrs<br>Lot A: 0/77<br>Condition 130°C/85%RH for 96 hrs<br>Lot B: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Condition 110°C/85%RH for 264 hrs<br>Lot A: 0/77<br>Lot B: 0/77<br><br>Leopard_SPC5643, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A: 0/77 |
| TC | JESD22-A104<br>AEC Q100-Appendix 3 | **Temperature Cycle (TC):**<br>PC before TC (for SMDs only): Required<br>TC = -65°C to 150°C for 500 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 | 0 | 0 | Pass | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972 & Q220192:<br>Lot A: 0/77; WP: 0/5, min > 3.0grams<br>Lot B: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Lot A: 0/77; WP: 0/5, min > 3.0grams<br>Lot B: 0/77<br><br>Leopard_SPC5643, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A: 0/77; WP: 0/5, min > 3.0grams<br><br>Leopard_SPC5643, (3N89D), 100LQFP 14*14, FSL-KLM-FM, Q223969:<br>Lot A: 0/77; WP: 0/5, min > 3.0grams<br><br>Bolero1M5_SPC5607, (0N69H), 100LQFP 14*14, FSL-KLM-FM, Q222605<br>Lot A: 0/77; WP: 0/5, min > 3.0grams |
| HTSL | JESD22-A103 | **High Temperature Storage Life (HTSL):**<br>150°C for 1008 hrs<br><br>*Timed RO = 96hrs. MAX* | TEST @ RH | 77 | 0 | 0 | Pass | **Generic Data**<br>Leopard_SPC5643, (3N89D), 144LQFP 20*20, FSL-KLM-FM, Q223972<br>Lot A: 0/77<br><br>Bolero1M5_SPC5607, (0N69H), 144LQFP 20*20, FSL-KLM-FM, Q222607:<br>Lot A: 0/77<br><br>Leopard_SPC5643, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694: |

| 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>Ta = 125℃<br>Bias = 1.6V (Core), 4.0V (DGO), 5.8V (HV)<br>125℃ for 1008 hrs<br><br>Precondition @ HOT with 1K and 100K write/erase cycles for large and small blocks respectevely. Full functional testing including NVM at RH after 100K W/E preconditioning cycles.<br><br>*Timed RO of 96hrs. MAX* | TEST @ RHC | 77 | 0 | 0 | Pass | **Generic Data**<br>Cobra90_SPC5676, (N23A, TSMC14), 516 TePBGA 27x27<br>Q213667: 0/231<br><br>Fado_SPC5668, (N61C, TSMC14), MAPBGA 208 17x17<br>Q212483: 0/308<br><br>Bolero1M_SPC5606 , (0N13E, TSMC14), 176LQFP, Q215921: 0/231<br><br>Leopard_SPC5643, (0N18H, TSMC14), 144LQFP 20*20, Q225694: 0/77 |
| **ELFR** | AEC Q100-008 | **Early Life Failure Rate (ELFR):**<br>Ta = 125℃ for 48 hrs;<br>Bias = 1.6V (Core), 4.0V (DGO), 5.8V (HV)<br><br>*Timed RO of 48 hrs MAX* | TEST @ RH | 800 | 0 | 0 | Pass | **Generic Data**<br>Cobra90_SPC5676, (N23A,TSMC14), 516 TePBGA 27*27,<br>Q213667: 0/1498<br><br>Fado_SPC5668, (N61C, TSMC14), MAPBGA 208 17*17, TSMC14<br>Q212483: 0/1619<br><br>Bolero1M_SPC5606 , (0N13E, TSMC14), 176LQFP, Q215921: 0/2400<br><br>Leopard_SPC5643, (0N18H, TSMC14), 144LQFP 20*20, Q225694: 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 | Pass | **Generic Data**<br>Fado_SPC5668, (N61C, TSMC14), MAPBGA 208 17x17,<br>Q212483:<br>EDR @150C 1008 hrs: 0/336 |

| 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 | 0 | 0 | Pass | **Generic Data**<br>Leopard_SPC5643, (3N89D), 100LQFP 14*14, FSL-KLM-FM:<br>Lot A: Cpk>1.67<br><br>Bolero1M5_SPC5607, (0N69H), 100LQFP 14*14, FSL-KLM-FM<br>Lot A: 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 | 0 | 0 | Pass | **Generic Data**<br>Leopard_SPC5643, (3N89D), 100LQFP 14*14, FSL-KLM-FM:<br>Lot A: Cpk>1.67<br><br>Bolero1M5_SPC5607, (0N69H), 100LQFP 14*14, FSL-KLM-FM<br>Lot A: Cpk>1.67 |
| **SD** | JESD22-B102 | **Solderability (SD):**<br>8hr.(1 hr. for Au-plated leads) Steam age prior to test. 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 required<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**<br>Lot ID-(#Rej/SS)<br>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 | Pass | **Generic Data**<br>Leopard_SPC5643LFK0MLQ1, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A:<br>500V: 0/3<br>1000V: 0/3<br>1500V: 0/3<br>2000V: 0/3 |
| **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 | Pass | **Generic Data**<br>Leopard_SPC5643LFK0MLQ1, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A:<br>250V: 0/3<br>500V: 0/3<br>750V: 0/3 (corner pins) |
| **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 | Pass | **Generic Data**<br>Leopard_SPC5643LFK0MLQ1, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A: 0/6 |
| **ED** | AEC-Q100-009, Freescale 48A spec | **Electrical Distribution (ED)** | TEST @ RHC<br><br>For AEC,<br>Cpk target > 1.67 | 30 | 0 | 0 | Pass | **Generic Data**<br>Leopard_SPC5643LFK0MLQ1, (0N18H), 144LQFP 20*20, FSL-KLM-FM, Q225694:<br>Lot A: Cpk > 1.67<br><br>T0 comparison between Cu and Au wire test at room, hot & cold.<br>Pre & post HTOL comparison between ATMC and TSMC14 fab tested at hot & cold. |
| **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 |
|---|---|---|---|---|---|---|---|---|
| NA | TSMC14 / 0N18H / C90FG | Leopard / SPC5643 | 6.297X x 6.052 mm | FSL-KLM-FM | LQFP 100 14*14 (8285) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um Pd Cu |

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 |
|---|---|---|---|---|---|---|---|---|
| Q213667 | TSMC14 / N23A / CMOS90FG | Cobra90 / SPC5676 | 8.722 X 9.190 | FSL-KLM-FM | TEPBGA PGE 516 27*27 (5193) | CRM-1525 | SUMITOMO G770SFL | 23um Au |
| Q212483 | TSMC14 / N61C / CMOS90FG | Fado / SPC5668 | 6.850 X 6.850 | FSL-TJN-FM | MAPBGA 208 17*17 (5253) | ABLEBOND 2025D | SUMITOMO G770SFL | 23um Au |
| Q215921 | TSMC14 / N13E/ CMOS90FG | Bolero1M / SPC5606 | 4.792 x 4.669 | ASECL | LQFP 176 24*24 (8271) | EN-4900G EPOXY | CEL9200THF-U-AK (low alpha) | 23um Au |
| Q225694 | TSMC14 / 0N18H / CMOS90FG | Leopard / SPC5643 | 6.297X x 6.052 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um PdCu |

Package Generic Data

| Quartz# | Fab/Mask Set/Tech | Product-Qual Description/Part Number (s) | Die Area (mm) | Assembly Site | Package (Code) | Die Attach | Mold Compound | Wire Description |
|---|---|---|---|---|---|---|---|---|
| Q225694 | TSMC14 / 0N18H / CMOS90FG | Leopard / SPC5643 | 6.297X x 6.052 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um PdCu |
| Q223972 | FSL-ATMC-FAB / 3N89D / CMOS90FG | Leopard / SPC5643 | 6.297X x 6.052 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um Pd Cu |
| Q220192 | FSL-ATMC-FAB / 3N89D / CMOS90FG | Leopard / SPC5643 | 6.297X x 6.052 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um Pd Cu |
| Q222607 | TSMC14 / 0N69H / CMOS90FG | Bolero1.5M / SPC5607 | 5.112 x 5.331 | FSL-KLM-FM | 144LQFP 20*20 (8286) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700LS | 20um Pd Cu |
| Q223969 | FSL-ATMC / 3N89D / CMOS90FG | Leopard / SPC5643 | 6.052 x 6.297 | FSL-KLM-FM | LQFP 100 14*14 (8285) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700SLS | 20um Pd Cu |
| Q222605 | TSMC14 / 0N69H / CMOS90FG | Bolero1M5 / SPC5607 | 5.112 x 5.331 | FSL-KLM-FM | LQFP 100 14*14 (8285) | ABLEBOND 3230 EPOXY | SUMITOMO EME-G700LS | 20um PdCu |

| Revision | Date | Comments | Author |
|---|---|---|---|
| Rev O | 3-Jun-14 | Qualification result update. | Chew Kim Seong |