# Military Program Overview

## Corporate Philosophy

Lattice Semiconductor Corporation (LSC) is committed to leadership in device performance and quality. Our family of military ispLSI® and GAL® devices is a reflection of this philosophy. LSC manufactures all devices under strict Quality Assurance guidelines. All grades, Commercial through Military 883, are monitored under a quality program conformant to MIL-I-38535 Appendix C with inspections conformant to MIL-I-45208.

## Quality and Testability

Lattice Semiconductor processes its devices to strict conformance with MIL-STD-883 Class B. In conjunction with the military flow, the inherent testability of $E^2$CMOS® technology allows LSC to achieve a quality level superior to other PLD technologies.

All devices are patterned and tested dozens of times throughout the manufacturing flow. Every device is tested under worst case configurations to assure customers achieve 100% yields. Tests are performed using the same $E^2$ cell array that will be used for the final patterning of the devices. This 100% "actual test" philosophy does away with the correlated and simulated testing that is necessary with bipolar and UV (EPROM) based PLD devices.

## Reliability

Lattice Semiconductor performs extensive reliability testing prior to product release. This testing continues in the form of Reliability Monitors that are run on an ongoing basis to assure continued process integrity.

The reliability testing performed includes extensive analysis of fundamental design and process integrity. The reprogrammable nature of LSC devices allows an inherently more thorough reliability evaluation than with other programmable alternatives.

## MIL-STD-883 Compliance

MIL-STD-883 defines a uniform and precise method for environmental, mechanical and electrical testing which ensures the suitability of microelectronic devices for use in military and aerospace systems. Table I summarizes the MIL-STD-883, Method 5004 Class B flow. Table II summarizes the conformance testing required by MIL-STD-883, Method 5005, for quality conformance testing of LSC military microcircuits.

## MIL-I-38535

MIL-I-38535 Appendix A and C, when used in conjunction with MIL-STD-883, define design, packaging, material, marking, sampling, qualification and quality system requirements for LSC military devices.

## Group Data

Group A and B data is taken on every inspection lot per MIL-STD-883, Class B requirements. This data, along with Generic Group C and D data can be supplied, upon written request, with your device shipment. Your LSC sales representative can advise you of charges and leadtime necessary for providing this data.

## Standard Military Drawings

LSC actively supports the DESC Standard Military Drawing (SMD) Program. The SMD Program offers a cost effective alternative to source control drawings and provides standardized MIL-STD-883 product specifications to simplify military procurement.

A list of currently available SMD qualified devices is provided (see Military Ordering Information).

# Military Program Overview

## Military Screening Flow (Table I)

| Screen | Method | Requirement |
|---|---|---|
| Internal Visual | 2010 Cond. B | 100% |
| Temp. Cycling | 1010 Cond. C | 100% |
| Constant Acceleration | 2001 Cond. E | 100% |
| Hermeticity<br>Fine<br>Gross | 1014<br>Cond. A or B<br>Cond. C | 100% |
| Endurance Test | 1033 | 100% |
| Retention Test | Unbiased Bake<br>24 HRS.<br>$T_A$ = 180°C | 100% |
| Pre Burn-In Electrical | Applicable Device Specification<br>Tc = 25°C | 100% |
| Dynamic Burn-In | 1015 Cond. D | 100% |
| Post Burn-In Electrical | Applicable Device Specification<br>Tc = 25°C<br>PDA = 5% | 100% |
| Final Electrical Test | Applicable Device Specification<br>Tc = 125°C | 100% |
| Final Electrical Test | Applicable Device Specification<br>Tc = - 55°C | 100% |
| Final Electrical Test | Applicable Device Specification<br>Tc = 25°C | 100% |
| External Visual | 2009 | 100% |
| QCI Sample Selection | MIL-M-38535, Appendix A Sec. 4.5 and MIL-STD-883 Sec. 1.2 | Sample |

## Military Quality Conformance Inspections (Table II)

| Subgroup | Method | Sample |
|---|---|---|
| **GROUP A: Electrical Tests** | | |
| *Subgroups 1, 7, 9* | Applicable Device Spec. | LTPD = 2 |
| Electrical Test | 25°C | |
| *Subgroups 2, 8A, 10* | Applicable Device Spec. | LTPD = 2 |
| Electrical Test | Max. Operating Temp. | |
| *Subgroups 3, 8B, 11* | Applicable Device Spec. | LTPD = 2 |
| Electrical Test | Min. Operating Temp. | |
| **GROUP B: Mechanical Tests** | | |
| *Subgroup 2* | | 4(0) |
| Solvent Resistance | 2015 | |
| *Subgroup 3* | | LTPD = 10 |
| Solderability | 2003 | |
| *Subgroup 5* | | LTPD = 15 |
| Bond Strength | 2011 | |
| **GROUP C: Chip Integrity Tests** | | |
| *Subgroup 1* | | LTPD = 5 |
| Dynamic Life Test | 1005, 1,000 HRS. 125°C | |
| End Point Electrical | Applicable Device Spec. | |
| *Subgroup 2* | | LTPD = 5 |
| Unbiased Retention | Applicable Device Spec. | |
| End Point Electrical | Applicable Device Spec. | |
| **GROUP D: Environmental Integrity** | | |
| *Subgroup 1* | | LTPD = 15 |
| Physical Dimensions | 2016 | |
| *Subgroup 2* | | LTPD = 5 |
| Lead Integrity | 2004, Cond. B | |
| Hermeticity | 1014 | |
| *Subgroup 3* | | LTPD = 15 |
| Thermal Shock | 1011, Cond. B, 15 Cycles | |
| Temp. Cycle | 1010, Cond. C, 100 Cycles | |
| Moisture Resistance | 1004 | |
| Endpoint Electrical | Applicable Device Spec. | |
| Hermeticity | 1014 | |
| Visual Examination | 1004, 1010 | |
| *Subgroup 4* | | LTPD = 15 |
| Mechanical Shock | 2002, Cond. B | |
| Vibration | 2007, Cond. A | |
| Constant Acceleration | 2001, Cond. E | |
| Hermeticity | 1014 | |
| Visual Examination | 1010, 1011 | |
| Endpoint Electrical | Applicable Device Spec. | |
| *Subgroup 5* | | LTPD = 15 |
| Salt Atmosphere | 1009, Cond. A | |
| Hermeticity | 1014 | |
| Visual Examination | 1009 | |
| *Subgroup 6* | | 3(0) |
| Internal Water Vapor | 1018 < 5,000 PPM, 100°C | |
| *Subgroup 7* | | LTPD = 15 |
| Lead Finish Adhesion | 2025 | |
| *Subgroup 8* | | 5(0) |
| Lid Torque | 2024 | |