

RELIABILITY REPORT
FOR

DS1647, 32 pin Module with Hi Density SMT

Dallas Semiconductor

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Prepared by:

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Conclusion:

The following qualification successfully meets the quality and reliability standards required of all Dallas Semiconductor products and processes:

DS1647, 32 pin Module with Hi Density SMT

In addition, Dallas Semiconductor's continuous reliability monitor program ensures that all outgoing product will continue to meet Maxim's quality and reliability standards. The current status of the reliability monitor program can be viewed at <http://www.maxim-ic.com/TechSupport/dsreliability.html>.*

Module Description:

A description of this Module can be found in the product data sheet. You can find the product data sheet at http://dbserv.maxim-ic.com/l_datasheet3.cfm.*

Reliability Derating:

A module device consists of one or more IC's in a single, upward integrated, package. This package is assembled to include batteries, crystals, and other piece parts that make up the configuration of the Module. Because of either the complexity of the package or the included piece parts, standard high temperature reliability testing is not possible. Therefore, in order to determine the reliability of module products, the reliability of each of the piece parts is individually determined, then summed to determine the reliability of the integrated module product. If there are "n" significant components in the module then:

$$Fr(\text{module}) = Fr(1) + Fr(2) + Fr(3) + \dots + Fr(n)$$

Fr (module) = Failure rate of module
Fr(n) = Failure rate of the nth component

Failure Rates are reported in FITs (Failures in Time) or MTTF (Mean Time To Failure). The FIT rate is related to MTTF by:

$$MTTF = 1/Fr$$

NOTE: MTTF is frequently used interchangeably with MTBF.

The calculated failure rate for this module/assembly is:

| <u>Module Device:</u> | <u>Module Units:</u> | <u>Quantity:</u> | <u>Fails:</u> | <u>Ea:</u> | <u>MTTF (Yrs):</u> | <u>FITs:</u> |
|-----------------------|----------------------|------------------|---------------|------------|--------------------|--------------|
| 4MEG SRAM 5V | 1 | 1474 | 0 | 0.7 | 173200 | 0.7 |
| BR1632 | 1 | 100 | 1 | 1.0 | 47996 | 2.4 |
| CRYSTAL | 1 | 100 | 0 | 0.7 | 12463 | 9.2 |
| DS1648 | 1 | 1760 | 3 | 0.7 | 30066 | 3.8 |
| Totals: | | | | | <u>7137</u> | <u>16.0</u> |

The parameters used to calculate the module failure rate are as follows:

Cf: 60% Tu: 25 °C

The reliability data follows. At the start of this data is the module assembly information. This is a description of the module. The next section is the detailed reliability data for each stress found in the qualification / monitor. If there are additional processes or assemblies used as part of this report, a description of each will follow which includes the respective reliability data for that process/ assembly. The reliability data section includes the latest data available. Some of this data may be generic with other packages or products.

* Some proprietary products may be excepted from this requirement.

Assembly Information:

Assembly Site: Fastech
 Pin Count: 28
 Package Type: Module w/Hi Density SMT
 Body Size: 720
 Mold Compound: Amicon
 Lead Frame: PCB; FR4
 Lead Finsh:
 Die Attach: ?
 Bond Wire / Size: /
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A)
 Date Code Range: 0104 to 0404

PACKAGE TESTS

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|---------------------|---------|------------------|-----------|-----|----------|-----|
| SOLDERABILITY | 0104 | MIL-STD-883-2003 | 5 DYS | 3 | 0 | |
| PHYSICAL DIMENSIONS | 0104 | MIL-STD-883-2016 | 5 DYS | 6 | 0 | |
| SOLDERABILITY | 0317 | JESD22-B102 | 5 DYS | 3 | 0 | |
| PHYSICAL DIMENSIONS | 0317 | JESD22-B100 | 5 DYS | 6 | 0 | |
| SOLDERABILITY | 0333 | JESD22-B102 | 5 DYS | 3 | 0 | |
| PHYSICAL DIMENSIONS | 0333 | JESD22-B100 | 5 DYS | 6 | 0 | |
| SOLDERABILITY | 0404 | JESD22-B102 | 5 DYS | 3 | 0 | |
| PHYSICAL DIMENSIONS | 0404 | JESD22-B100 | 5 DYS | 6 | 0 | |
| Total: | | | | | 0 | |

STORAGE LIFE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|---------------|---------|-----------|-----------|-----|----------|-----|
| STORAGE LIFE | 0104 | 70 C | 1000 HRS | 77 | 0 | |
| STORAGE LIFE | 0317 | 70 C | 1000 HRS | 77 | 0 | |
| STORAGE LIFE | 0333 | 70 C | 1000 HRS | 77 | 0 | |
| STORAGE LIFE | 0404 | 70 C | 1000 HRS | 77 | 0 | |
| Total: | | | | | 0 | |

TEMPERATURE CYCLE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|-------------|---------|-----------|-----------|-----|-------|-----|
| TEMP CYCLE | 0104 | 0C TO 70C | 1000 CYS | 77 | 0 | |

| | | | | | | |
|---------------|------|-----------|------|-----|----|----------|
| TEMP CYCLE | 0317 | 0C TO 70C | 1000 | CYS | 77 | 0 |
| TEMP CYCLE | 0333 | 0C TO 70C | 1000 | CYS | 77 | 0 |
| TEMP CYCLE | 0404 | 0C TO 70C | 1000 | CYS | 77 | 0 |
| Total: | | | | | | 0 |

UNBIASED MOISTURE RESISTANCE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|---------------|---------|--------------|-----------|-----|-------|-------------|
| MOISTURE SOAK | 0317 | 60C/90% R.H. | 1000 HRS | 77 | 0 | |
| MOISTURE SOAK | 0333 | 60C/90% R.H. | 1000 HRS | 77 | 0 | |
| MOISTURE SOAK | 0404 | 60C/90% R.H. | 1000 HRS | 77 | 1 | MODULE TRIM |
| Total: | | | | | | 1 |

Assembly Information:

Assembly Site: Fastech
 Pin Count: 32
 Package Type: Module w/Hi Density SMT
 Body Size: 720
 Mold Compound: Amicon
 Lead Frame: PCB; FR4
 Lead Finsh:
 Die Attach: ?
 Bond Wire / Size: /
 Flammability: UL 94-V0
 Moisture Sensitivity (JEDEC J-STD20A)
 Date Code Range: 0101 to 0422

ELECTRICAL CHARACTERIZATION

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|-----------------|---------|-----------------------------|-----------|-----|-------|----------|
| ESD SENSITIVITY | 0139 | EOS/ESD S5.1 HBM 500 VOLTS | 2 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 0139 | EOS/ESD S5.1 HBM 1000 VOLTS | 2 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 0139 | EOS/ESD S5.1 HBM 2000 VOLTS | 3 PUL'S | 3 | 0 | |
| LATCH-UP | 0139 | JESD78, I-TEST 125C | 2 DYS | 3 | 0 | |
| LATCH-UP | 0139 | JESD78, Vsupply TEST 125C | 2 DYS | 3 | 0 | |
| Total: | | | | | | 0 |

PACKAGE TESTS

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|---------------|---------|-------------|-----------|-----|-------|----------|
| SOLDERABILITY | 0422 | JESD22-B102 | 1 DYS | 3 | 0 | |
| SOLDERABILITY | 0422 | JESD22-B102 | 1 DYS | 3 | 0 | |
| SOLDERABILITY | 0422 | JESD22-B102 | 1 DYS | 3 | 0 | |
| Total: | | | | | | 0 |

STORAGE LIFE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|-------------|---------|-----------|-----------|-----|-------|-----|
|-------------|---------|-----------|-----------|-----|-------|-----|

| | | | | | |
|--------------|------|------|----------|---------------|----------|
| STORAGE LIFE | 0139 | 85 C | 1000 HRS | 49 | 0 |
| | | | | Total: | 0 |

TEMPERATURE CYCLE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|-------------|---------|------------|-----------|---------------|----------|-----|
| TEMP CYCLE | 0139 | -40 TO 85C | 1000 CYS | 50 | 0 | |
| | | | | Total: | 0 | |

TEMPERATURE HUMIDITY BIAS

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|-----------------|---------|------------------|-----------|---------------|----------|-----|
| BIASED MOISTURE | 0422 | 85/85, 5.5 VOLTS | 1000 HRS | 77 | 0 | |
| BIASED MOISTURE | 0422 | 85/85, 5.5 VOLTS | 1000 HRS | 77 | 0 | |
| BIASED MOISTURE | 0422 | 85/85, 5.5 VOLTS | 500 HRS | 77 | 0 | |
| | | | | Total: | 0 | |

UNBIASED MOISTURE RESISTANCE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|---------------|---------|--------------|-----------|---------------|----------|-----|
| MOISTURE SOAK | 0101 | 60C/90% R.H. | 576 HRS | 56 | 0 | |
| MOISTURE SOAK | 0139 | 60C/90% R.H. | 960 HRS | 50 | 0 | |
| MOISTURE SOAK | 0422 | 60C/90% R.H. | 1000 HRS | 77 | 0 | |
| MOISTURE SOAK | 0422 | 60C/90% R.H. | 1000 HRS | 77 | 0 | |
| MOISTURE SOAK | 0422 | 60C/90% R.H. | 1000 HRS | 77 | 0 | |
| | | | | Total: | 0 | |

Assembly Information:

| | |
|--|-------------------------|
| Assembly Site: | Fastech |
| Pin Count: | 36 |
| Package Type: | Module w/Hi Density SMT |
| Body Size: | 720 |
| Mold Compound: | Amicon |
| Lead Frame: | PCB; FR4 |
| Lead Finsh: | |
| Die Attach: | ? |
| Bond Wire / Size: | / |
| Flammability: | UL 94-V0 |
| Moisture Sensitivity (JEDEC J-STD20A) | |
| Date Code Range: | 0139 to 0139 |

ELECTRICAL CHARACTERIZATION

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|-----------------|---------|-----------------------------|-----------|-----|-------|-----|
| ESD SENSITIVITY | 0139 | EOS/ESD S5.1 HBM 500 VOLTS | 2 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 0139 | EOS/ESD S5.1 HBM 1000 VOLTS | 2 PUL'S | 3 | 0 | |
| ESD SENSITIVITY | 0139 | EOS/ESD S5.1 HBM 2000 VOLTS | 2 PUL'S | 3 | 0 | |
| LATCH-UP | 0139 | JESD78, I-TEST 125C | 2 DYS | 3 | 0 | |
| LATCH-UP | 0139 | JESD78, Vsupply TEST 125C | 2 DYS | 3 | 0 | |

Total: 0

STORAGE LIFE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|--------------|---------|-----------|-----------|-----|---------------|----------|
| STORAGE LIFE | 0139 | 85 C | 1000 HRS | 77 | 0 | |
| | | | | | Total: | 0 |

TEMPERATURE CYCLE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|-------------|---------|------------|-----------|-----|---------------|----------|
| TEMP CYCLE | 0139 | -40 TO 85C | 1000 CYS | 76 | 0 | |
| | | | | | Total: | 0 |

UNBIASED MOISTURE RESISTANCE

| DESCRIPTION | DATE CD | CONDITION | READPOINT | QTY | FAILS | FA# |
|---------------|---------|--------------|-----------|-----|---------------|----------|
| MOISTURE SOAK | 0139 | 60C/90% R.H. | 960 HRS | 76 | 0 | |
| | | | | | Total: | 0 |