

RELIABILITY MONITOR REPORT  
FOR

**MQFP Package**

**Dallas Semiconductor**

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Dallas, TX 75244-3292

This Report was prepared by  
Dallas Semiconductor Reliability Engineering

**Summary:**

The data in the tables that follow was generated as the result of an on-going Package Reliability Monitor. The assemblies covered by this package monitor are:

| ASSY SITE            | PINS | PACKAGE        |                      |                    |
|----------------------|------|----------------|----------------------|--------------------|
| ATK (Amkor, K)       | 100  | MQFP           | ATK (Amkor, K)       | 80 MQFP            |
| ATP (Amkor, PI)      | 100  | MQFP           | ATP (Amkor, PI)      | 44 MQFP            |
| ATP (Amkor, PI)      | 80   | MQFP           | ATP (Amkor, PI)      | 100 MQFP (Pb-Free) |
| ATP (Amkor, PI)      | 44   | MQFP (Pb-Free) | ATP (Amkor, PI)      | 80 MQFP (Pb-Free)  |
| Carsem               | 80   | MQFP           | Carsem               | 80 MQFP (Pb-Free)  |
| SCS (Stats Chippac S | 100  | MQFP           | SCS (Stats Chippac S | 80 MQFP            |
| SCS (Stats Chippac S | 100  | MQFP (Pb-Free) | SCS (Stats Chippac S | 80 MQFP (Pb-Free)  |

The calculated failure rate for this assembly is:

**FAILURE RATE: MTTF (YRS): 67917 FITS: 1.7**

The parameters used to calculate this failure rate are as follows:

**Cf: 60% Ea: 0.7 Tu: 25 °C**

The reliability data follows. At the start of this data is a description of the assembly vehicle used to generate this reliability data. The next section is the detailed reliability data for each stress. The reliability data section includes the latest data available. This report covers data between 4/1/2006 and 3/31/2007.

**Assembly Information:**

Package Type: MQFP 14x20x2.7  
 Flammability: UL 94-V0  
 Moisture Sensitivity (JEDEC J-STD20A) Level 4  
 Date Code Range: 0614 to 0705

**OPERATING LIFE**

| DESCRIPTION       | DATE CODE | TEST VEHICLE | CONDITION       | READPOINT | QUANTITY | FAILS    | FA NO |
|-------------------|-----------|--------------|-----------------|-----------|----------|----------|-------|
| HIGH TEMP OP LIFE | 0614      | DS5250       | 125C, 5.5 VOLTS | 1000 HRS  | 77       | 0        |       |
| HIGH TEMP OP LIFE | 0705      | DS5001       | 125C, 5.5 VOLTS | 1000 HRS  | 77       | 0        |       |
| <b>Total:</b>     |           |              |                 |           |          | <b>0</b> |       |

**TEMPERATURE CYCLE**

| DESCRIPTION   | DATE CODE | TEST VEHICLE | CONDITION    | READPOINT | QUANTITY | FAILS    | FA NO |
|---------------|-----------|--------------|--------------|-----------|----------|----------|-------|
| TEMP CYCLE    | 0614      | DS5250       | -55C TO 125C | 1000 CYS  | 77       | 0        |       |
| <b>Total:</b> |           |              |              |           |          | <b>0</b> |       |

**UNBIASED MOISTURE RESISTANCE**

| DESCRIPTION   | DATE CODE | TEST VEHICLE | CONDITION                   | READPOINT | QUANTITY | FAILS    | FA NO |
|---------------|-----------|--------------|-----------------------------|-----------|----------|----------|-------|
| AUTOCLAVE     | 0614      | DS5250       | 121C, 2 ATM STEAM, UNBIASED | 168 HRS   | 77       | 0        |       |
| <b>Total:</b> |           |              |                             |           |          | <b>0</b> |       |

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**Assembly Information:**

Package Type: MQFP (Pb-Free) 14x20x2.7  
Flammability: UL 94-V0  
Moisture Sensitivity (JEDEC J-STD20A) Level 4  
Date Code Range: 0622 to 0651

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**MOISTURE SENSITIVITY LEVEL 3**

| DESCRIPTION       | DATE CODE | TEST VEHICLE | CONDITION       | READPOINT | QUANTITY | FAILS    | FA NO |
|-------------------|-----------|--------------|-----------------|-----------|----------|----------|-------|
| ULTRASOUND        | 0622      | DS5002       | J-STD-020       |           | 8        | 0        |       |
| STORAGE LIFE      |           |              | 125C            | 48 HRS    | 8        |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H.    | 192 HRS   | 8        |          |       |
| CONVECTION REFLOW |           |              | 260C +/-5C      | 3 PASS    | 8        | 0        |       |
| EXTERNAL VISUAL   |           |              | J-STD-020, 6.1a |           | 8        | 0        |       |
| PRECONDITION U/S  |           |              | J-STD-020       |           | 8        | 0        |       |
| ULTRASOUND        | 0622      | DS5002       | J-STD-020       |           | 8        | 0        |       |
| STORAGE LIFE      |           |              | 125C            | 48 HRS    | 8        |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H.    | 192 HRS   | 8        |          |       |
| CONVECTION REFLOW |           |              | 260C +/-5C      | 3 PASS    | 8        | 0        |       |
| EXTERNAL VISUAL   |           |              | J-STD-020, 6.1a |           | 8        | 0        |       |
| PRECONDITION U/S  |           |              | J-STD-020       |           | 8        | 0        |       |
| ULTRASOUND        | 0622      | DS5002       | J-STD-020       |           | 8        | 0        |       |
| STORAGE LIFE      |           |              | 125C            | 48 HRS    | 8        |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H.    | 192 HRS   | 8        |          |       |
| CONVECTION REFLOW |           |              | 260C +/-5C      | 3 PASS    | 8        | 0        |       |
| EXTERNAL VISUAL   |           |              | J-STD-020, 6.1a |           | 8        | 0        |       |
| PRECONDITION U/S  |           |              | J-STD-020       |           | 8        | 0        |       |
| ULTRASOUND        | 0626      | DS5250       | J-STD-020       |           | 8        | 0        |       |
| STORAGE LIFE      |           |              | 125C            | 48 HRS    | 8        |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H.    | 192 HRS   | 8        |          |       |
| CONVECTION REFLOW |           |              | 260C +/-5C      | 3 PASS    | 8        | 0        |       |
| EXTERNAL VISUAL   |           |              | J-STD-020, 6.1a |           | 8        | 0        |       |
| PRECONDITION U/S  |           |              | J-STD-020       |           | 8        | 0        |       |
| ULTRASOUND        | 0626      | DS5250       | J-STD-020       |           | 8        | 0        |       |
| STORAGE LIFE      |           |              | 125C            | 48 HRS    | 8        |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H.    | 192 HRS   | 8        |          |       |
| CONVECTION REFLOW |           |              | 260C +/-5C      | 3 PASS    | 8        | 0        |       |
| EXTERNAL VISUAL   |           |              | J-STD-020, 6.1a |           | 8        | 0        |       |
| PRECONDITION U/S  |           |              | J-STD-020       |           | 8        | 0        |       |
| ULTRASOUND        | 0627      | DS5002       | J-STD-020       |           | 8        | 0        |       |
| STORAGE LIFE      |           |              | 125C            | 48 HRS    | 8        |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H.    | 192 HRS   | 8        |          |       |
| CONVECTION REFLOW |           |              | 260C +/-5C      | 3 PASS    | 8        | 0        |       |
| EXTERNAL VISUAL   |           |              | J-STD-020, 6.1a |           | 8        | 0        |       |
| PRECONDITION U/S  |           |              | J-STD-020       |           | 8        | 0        |       |
| <b>Total:</b>     |           |              |                 |           |          | <b>0</b> |       |

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**OPERATING LIFE**

| DESCRIPTION       | DATE CODE | TEST VEHICLE | CONDITION       | READPOINT | QUANTITY | FAILS | FA NO |
|-------------------|-----------|--------------|-----------------|-----------|----------|-------|-------|
| HIGH VOLTAGE LIFE | 0622      | DS5002       | 125C, 5.5 VOLTS | 1000 HRS  | 45       | 0     |       |

|                   |      |        |                 |          |    |          |
|-------------------|------|--------|-----------------|----------|----|----------|
| HIGH VOLTAGE LIFE | 0622 | DS5002 | 125C, 5.5 VOLTS | 1000 HRS | 45 | 0        |
| HIGH VOLTAGE LIFE | 0622 | DS5002 | 125C, 5.5 VOLTS | 1000 HRS | 45 | 0        |
| HIGH VOLTAGE LIFE | 0626 | DS5250 | 125C, 5.5 VOLTS | 1000 HRS | 45 | 0        |
| HIGH VOLTAGE LIFE | 0626 | DS5250 | 125C, 5.5 VOLTS | 1000 HRS | 45 | 0        |
| HIGH VOLTAGE LIFE | 0627 | DS5002 | 125C, 5.5 VOLTS | 1000 HRS | 45 | 0        |
| HIGH TEMP OP LIFE | 0642 | DS5250 | 125C, 5.5 VOLTS | 1000 HRS | 77 | 0        |
| HIGH VOLTAGE LIFE | 0651 | DS5240 | 125C, 5.5 VOLTS | 1000 HRS | 77 | 0        |
| <b>Total:</b>     |      |        |                 |          |    | <b>0</b> |

## PACKAGE TESTS

| DESCRIPTION             | DATE CODE | TEST VEHICLE | CONDITION                          | READPOINT | QUANTITY | FAILS | FA NO |
|-------------------------|-----------|--------------|------------------------------------|-----------|----------|-------|-------|
| SOLDERABILITY (Sn/Pb)   | 0622      | DS5002       | JESD22-B102, COND C                |           | 3        | 0     |       |
| SOLDERABILITY (Pb-Free) |           |              | JESD22-B102, COND C                |           | 3        | 0     |       |
| X-RAY                   | 0622      | DS5002       | MIL-STD-883-2012 : TOP & SIDE VIEW |           | 6        | 0     |       |
| PHYSICAL DIMENSIONS     |           |              | JESD22-B100                        |           | 6        | 0     |       |
| MARK PERMANENCY         |           |              | JESD22-B107                        |           | 6        | 0     |       |
| LEAD INTEGRITY          |           |              | JESD22-B105, COND B                |           | 6        | 0     |       |
| SOLDERABILITY (Sn/Pb)   | 0622      | DS5002       | JESD22-B102, COND C                |           | 3        | 0     |       |
| SOLDERABILITY (Pb-Free) |           |              | JESD22-B102, COND C                |           | 3        | 0     |       |
| X-RAY                   | 0622      | DS5002       | MIL-STD-883-2012 : TOP & SIDE VIEW |           | 6        | 0     |       |
| PHYSICAL DIMENSIONS     |           |              | JESD22-B100                        |           | 6        | 0     |       |
| MARK PERMANENCY         |           |              | JESD22-B107                        |           | 6        | 0     |       |
| LEAD INTEGRITY          |           |              | JESD22-B105, COND B                |           | 6        | 0     |       |
| SOLDERABILITY (Sn/Pb)   | 0622      | DS5002       | JESD22-B102, COND C                |           | 3        | 0     |       |
| SOLDERABILITY (Pb-Free) |           |              | JESD22-B102, COND C                |           | 3        | 0     |       |
| X-RAY                   | 0622      | DS5002       | MIL-STD-883-2012 : TOP & SIDE VIEW |           | 6        | 0     |       |
| PHYSICAL DIMENSIONS     |           |              | JESD22-B100                        |           | 6        | 0     |       |
| MARK PERMANENCY         |           |              | JESD22-B107                        |           | 6        | 0     |       |
| LEAD INTEGRITY          |           |              | JESD22-B105, COND B                |           | 6        | 0     |       |
| SOLDERABILITY (Sn/Pb)   | 0626      | DS5250       | JESD22-B102, COND C                |           | 3        | 0     |       |
| SOLDERABILITY (Pb-Free) |           |              | JESD22-B102, COND C                |           | 3        | 0     |       |
| X-RAY                   | 0626      | DS5250       | MIL-STD-883-2012 : TOP & SIDE VIEW |           | 6        | 0     |       |
| PHYSICAL DIMENSIONS     |           |              | JESD22-B100                        |           | 6        | 0     |       |
| MARK PERMANENCY         |           |              | JESD22-B107                        |           | 6        | 0     |       |
| LEAD INTEGRITY          |           |              | JESD22-B105, COND B                |           | 6        | 0     |       |
| SOLDERABILITY (Sn/Pb)   | 0626      | DS5250       | JESD22-B102, COND C                |           | 3        | 0     |       |
| SOLDERABILITY (Pb-Free) |           |              | JESD22-B102, COND C                |           | 3        | 0     |       |
| X-RAY                   | 0626      | DS5250       | MIL-STD-883-2012 : TOP & SIDE VIEW |           | 6        | 0     |       |
| PHYSICAL DIMENSIONS     |           |              | JESD22-B100                        |           | 6        | 0     |       |
| MARK PERMANENCY         |           |              | JESD22-B107                        |           | 6        | 0     |       |
| LEAD INTEGRITY          |           |              | JESD22-B105, COND B                |           | 6        | 0     |       |
| SOLDERABILITY (Sn/Pb)   | 0627      | DS5002       | JESD22-B102, COND C                |           | 3        | 0     |       |
| SOLDERABILITY (Pb-Free) |           |              | JESD22-B102, COND C                |           | 3        | 0     |       |

|                     |      |        |                                    |          |          |
|---------------------|------|--------|------------------------------------|----------|----------|
| X-RAY               | 0627 | DS5002 | MIL-STD-883-2012 : TOP & SIDE VIEW | 6        | 0        |
| PHYSICAL DIMENSIONS |      |        | JESD22-B100                        | 6        | 0        |
| MARK PERMANENCY     |      |        | JESD22-B107                        | 6        | 0        |
| LEAD INTEGRITY      |      |        | JESD22-B105, COND B                | 6        | 0        |
| <b>Total:</b>       |      |        |                                    | <b>0</b> | <b>0</b> |

### PRECONDITIONING LEVEL 3

| DESCRIPTION       | DATE CODE | TEST VEHICLE | CONDITION    | READPOINT | QUANTITY | FAILS    | FA NO |
|-------------------|-----------|--------------|--------------|-----------|----------|----------|-------|
| STORAGE LIFE      | 0622      | DS5002       | 125C         | 48 HRS    | 321      |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H. | 192 HRS   | 321      |          |       |
| CONVECTION REFLOW |           |              | 260C +0/-5C  | 3 PASS    | 321      | 0        |       |
| STORAGE LIFE      | 0622      | DS5002       | 125C         | 48 HRS    | 321      |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H. | 192 HRS   | 321      |          |       |
| CONVECTION REFLOW |           |              | 260C +0/-5C  | 3 PASS    | 321      | 0        |       |
| STORAGE LIFE      | 0622      | DS5002       | 125C         | 48 HRS    | 321      |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H. | 192 HRS   | 321      |          |       |
| CONVECTION REFLOW |           |              | 260C +0/-5C  | 3 PASS    | 321      | 0        |       |
| STORAGE LIFE      | 0626      | DS5250       | 125C         | 48 HRS    | 321      |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H. | 192 HRS   | 321      |          |       |
| CONVECTION REFLOW |           |              | 260C +0/-5C  | 3 PASS    | 321      | 0        |       |
| STORAGE LIFE      | 0626      | DS5250       | 125C         | 48 HRS    | 321      |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H. | 192 HRS   | 321      |          |       |
| CONVECTION REFLOW |           |              | 260C +0/-5C  | 3 PASS    | 321      | 0        |       |
| STORAGE LIFE      | 0627      | DS5002       | 125C         | 48 HRS    | 321      |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H. | 192 HRS   | 321      |          |       |
| CONVECTION REFLOW |           |              | 260C +0/-5C  | 3 PASS    | 321      | 0        |       |
| STORAGE LIFE      | 0651      | DS5240       | 125C         | 48 HRS    | 231      |          |       |
| MOISTURE SOAK     |           |              | 30C/60% R.H. | 192 HRS   | 231      |          |       |
| CONVECTION REFLOW |           |              | 260C +0/-5C  | 3 PASS    | 231      | 0        |       |
| <b>Total:</b>     |           |              |              |           | <b>0</b> | <b>0</b> |       |

### STORAGE LIFE

| DESCRIPTION   | DATE CODE | TEST VEHICLE | CONDITION | READPOINT | QUANTITY | FAILS    | FA NO |
|---------------|-----------|--------------|-----------|-----------|----------|----------|-------|
| STORAGE LIFE  | 0622      | DS5002       | 150C      | 1000 HRS  | 77       | 0        |       |
| STORAGE LIFE  | 0622      | DS5002       | 150C      | 1000 HRS  | 77       | 0        |       |
| STORAGE LIFE  | 0622      | DS5002       | 150C      | 1000 HRS  | 77       | 0        |       |
| STORAGE LIFE  | 0626      | DS5250       | 150C      | 1000 HRS  | 77       | 0        |       |
| STORAGE LIFE  | 0626      | DS5250       | 150C      | 1000 HRS  | 77       | 0        |       |
| STORAGE LIFE  | 0627      | DS5002       | 150C      | 1000 HRS  | 77       | 0        |       |
| STORAGE LIFE  | 0651      | DS5240       | 150C      | 1000 HRS  | 77       | 0        |       |
| <b>Total:</b> |           |              |           |           | <b>0</b> | <b>0</b> |       |

### TEMPERATURE CYCLE

| DESCRIPTION | DATE CODE | TEST VEHICLE | CONDITION    | READPOINT | QUANTITY | FAILS | FA NO |
|-------------|-----------|--------------|--------------|-----------|----------|-------|-------|
| TEMP CYCLE  | 0622      | DS5002       | -55C TO 125C | 1000 CYS  | 77       | 0     |       |
| TEMP CYCLE  | 0622      | DS5002       | -55C TO 125C | 1000 CYS  | 77       | 0     |       |

|               |      |        |              |      |     |    |          |
|---------------|------|--------|--------------|------|-----|----|----------|
| TEMP CYCLE    | 0622 | DS5002 | -55C TO 125C | 1000 | CYS | 77 | 0        |
| TEMP CYCLE    | 0626 | DS5250 | -55C TO 125C | 1000 | CYS | 77 | 0        |
| TEMP CYCLE    | 0626 | DS5250 | -55C TO 125C | 1000 | CYS | 77 | 0        |
| TEMP CYCLE    | 0627 | DS5002 | -55C TO 125C | 1000 | CYS | 77 | 0        |
| TEMP CYCLE    | 0642 | DS5250 | -55C TO 125C | 1000 | CYS | 77 | 0        |
| TEMP CYCLE    | 0651 | DS5240 | -55C TO 125C | 1000 | CYS | 77 | 0        |
| <b>Total:</b> |      |        |              |      |     |    | <b>0</b> |

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**TEMPERATURE HUMIDITY BIAS**

| DESCRIPTION     | DATE CODE | TEST VEHICLE | CONDITION        | READPOINT | QUANTITY | FAILS | FA NO    |
|-----------------|-----------|--------------|------------------|-----------|----------|-------|----------|
| BIASED MOISTURE | 0622      | DS5002       | 85/85, 5.5 VOLTS | 1000      | HRS      | 45    | 0        |
| BIASED MOISTURE | 0622      | DS5002       | 85/85, 5.5 VOLTS | 1000      | HRS      | 45    | 0        |
| BIASED MOISTURE | 0622      | DS5002       | 85/85, 5.5 VOLTS | 1000      | HRS      | 454   | 0        |
| BIASED MOISTURE | 0626      | DS5250       | 85/85, 5.5 VOLTS | 1000      | HRS      | 45    | 0        |
| BIASED MOISTURE | 0626      | DS5250       | 85/85, 5.5 VOLTS | 1000      | HRS      | 45    | 0        |
| BIASED MOISTURE | 0627      | DS5002       | 85/85, 5.5 VOLTS | 1000      | HRS      | 45    | 0        |
| BIASED MOISTURE | 0642      | DS5250       | 85/85, 5.5 VOLTS | 1000      | HRS      | 45    | 0        |
| BIASED MOISTURE | 0651      | DS5240       | 85/85, 5.5 VOLTS | 1000      | HRS      | 77    | 0        |
| <b>Total:</b>   |           |              |                  |           |          |       | <b>0</b> |

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**UNBIASED MOISTURE RESISTANCE**

| DESCRIPTION   | DATE CODE | TEST VEHICLE | CONDITION                   | READPOINT | QUANTITY | FAILS | FA NO    |
|---------------|-----------|--------------|-----------------------------|-----------|----------|-------|----------|
| AUTOCLAVE     | 0622      | DS5002       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 75    | 0        |
| AUTOCLAVE     | 0622      | DS5002       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 75    | 0        |
| AUTOCLAVE     | 0622      | DS5002       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 77    | 0        |
| AUTOCLAVE     | 0626      | DS5250       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 77    | 0        |
| AUTOCLAVE     | 0626      | DS5250       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 77    | 0        |
| AUTOCLAVE     | 0627      | DS5002       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 77    | 0        |
| AUTOCLAVE     | 0642      | DS5250       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 77    | 0        |
| AUTOCLAVE     | 0651      | DS5240       | 121C, 2 ATM STEAM, UNBIASED | 168       | HRS      | 77    | 0        |
| <b>Total:</b> |           |              |                             |           |          |       | <b>0</b> |

**FAILURE RATE: MTTF (YRS): 67917 FITS: 1.7**