



Reliability Report

Report Title: ADATE334 Die Revision 4.0
Qualification

Report Number: 21695

Revision: A

Date: 17 October 2023

Summary

This report documents the successful completion of the reliability qualification requirements for the release of the ADATE334 product in a 121-CSP_BGA package. The ADATE334 is a complete dual-channel automatic test equipment (ATE) solution that performs the pin electronics functions of a driver, comparator, and active load (DCL), and a four-quadrant per pin parametric measurement unit (PPMU).

Die/Fab Product Characteristics

Table 1.1: Die/Fab Product Characteristics – 0.18μm CMOS

| Product Characteristics | Product to be qualified | Product used for Substitution Data |
|---------------------------|-----------------------------------|------------------------------------|
| Generic/Root Part # | ADATE334 | ADATE330 |
| Die Id | TMIR79 A/8YR66 A | TMIR79 A/8YR66 A |
| Die Size (mm) | 4.16 x 2.28 | 4.16 x 2.28 |
| Wafer Fabrication Site | TSMC Fab 8B/ADLK Fab 3 | TSMC Fab 8B/ADLK Fab 3 |
| Wafer Fabrication Process | 0.18μm CMOS | 0.18μm CMOS |
| Die Substrate | Si | Si |
| Metallization / # Layers | AlCu/6 | AlCu/6 |
| Polyimide | No | No |
| Passivation | HDP undoped oxide/oxide & nitride | HDP undoped oxide/oxide & nitride |

Table 1.2: Die/Fab Product Characteristics – 0.18μm SiGe BiCMOS

| Product Characteristics | Product to be qualified | Products used for Substitution Data | |
|---------------------------|-------------------------|-------------------------------------|--------------------|
| Generic/Root Part # | ADATE334 | ADATE330 | ADATE330 |
| Die Id | TMSG41 A | TMMU37 B | TMSG41 A |
| Die Size (mm) | 6.08 x 3.66 | 6.08 x 3.66 | 6.08 x 3.66 |
| Wafer Fabrication Site | TSMC Fab 4 | TSMC Fab 4 | TSMC Fab 4 |
| Wafer Fabrication Process | 0.18μm SiGe BiCMOS | 0.18μm SiGe BiCMOS | 0.18μm SiGe BiCMOS |
| Die Substrate | Si | Si | Si |
| Metallization / # Layers | AlCu/5 & Cu/1 | AlCu/5 & Cu/1 | AlCu/5 & Cu/1 |
| Polyimide | No | No | No |
| Passivation | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN |

Die/Fab Test Results
Table 2.1: Die/Fab Test Results – 0.18µm CMOS at TSMC Fab 8B/ADLK Fab 3

| Test Name | Spec | Conditions | Generic/Root Part # | Lot # | Fail/SS |
|---|-----------------------|--|---------------------|-----------|---------|
| Early Life Failure Rate (ELFR) | MIL-STD-883, M1015 | T _j = 125°C, 168 Hours | ADATE330 | Q16724.47 | 0/100 |
| | | | | Q16724.48 | 0/100 |
| | | | | Q16724.19 | 0/65 |
| | | | | Q16724.21 | 0/100 |
| | | | | Q16724.29 | 0/70 |
| | | | | Q16724.30 | 0/70 |
| | | | | Q16724.31 | 0/32 |
| | | | | Q16724.32 | 0/70 |
| | | T _j = 125°C, 48 Hours | | Q16724.33 | 0/70 |
| | | | | Q16724.35 | 0/30 |
| | | | | Q16724.36 | 0/70 |
| | | | | Q16724.37 | 0/70 |
| | | | | Q16724.38 | 0/60 |
| | | | | Q16724.39 | 0/100 |
| | | | | Q16724.40 | 0/100 |
| | | | | Q16724.41 | 0/100 |
| High Temperature Operating Life (HTOL) ¹ | JESD22-A108 | 125°C<T _j <135°C, Biased, 1,000 Hours | ADATE330 | Q16724.5 | 0/32 |
| | | | | Q16724.50 | 0/32 |
| | | | | Q16724.6 | 0/32 |
| High Temperature Storage Life (HTSL) | JESD22-A103 | 150°C, 1,000 Hours | ADATE330 | Q16724.16 | 0/32 |
| Temperature Humidity Bias (THB) ¹ | JESD22-A101 | 85°C, 85%RH, Biased, 1,000 Hours | ADATE330 | Q16724.7 | 0/32 |
| | | | | Q16724.8 | 0/32 |
| | | | | Q16724.9 | 0/32 |

¹ These samples were subjected to preconditioning at MSL 3 with 3x reflow peak temp of 260°C prior to the start of the stress test.

Table 2.2: Die/Fab Test Results – 0.18µm SiGe BiCMOS at TSMC Fab 4

| Test Name | Spec | Conditions | Generic/Root Part # | Lot # | Fail/SS |
|---|-----------------------|--|---------------------|-----------|---------|
| Early Life Failure Rate (ELFR) | MIL-STD-883, M1015 | T _j = 125°C, 168 Hours | ADATE330 | Q16724.47 | 0/100 |
| | | T _j = 125°C, 48 Hours | | Q16724.48 | 0/100 |
| | | | | Q16724.19 | 0/65 |
| | | | | Q16724.21 | 0/100 |
| | | | | Q16724.29 | 0/70 |
| | | | | Q16724.30 | 0/70 |
| | | | | Q16724.31 | 0/32 |
| | | | | Q16724.32 | 0/70 |
| | | | | Q16724.33 | 0/70 |
| | | | | Q16724.35 | 0/30 |
| | | | | Q16724.36 | 0/70 |
| | | | | Q16724.37 | 0/70 |
| | | | | Q16724.38 | 0/60 |
| | | | | Q16724.39 | 0/100 |
| | | | | Q16724.40 | 0/100 |
| | | Q16724.41 | | 0/100 | |
| | | Q16724.42 | | 0/100 | |
| Q16724.43 | 0/99 | | | | |
| Q16724.44 | 0/99 | | | | |
| Q16724.45 | 0/100 | | | | |
| High Temperature Operating Life (HTOL) ¹ | JESD22-A108 | 125°C<T _j <135°C, Biased, 1,000 Hours | ADATE330 | Q16724.5 | 0/32 |
| | | | | Q16724.50 | 0/32 |
| | | | | Q16724.6 | 0/32 |
| High Temperature Storage Life (HTSL) | JESD22-A103 | 150°C, 1,000 Hours | ADATE330 | Q16724.16 | 0/32 |
| Temperature Humidity Bias (THB) ¹ | JESD22-A101 | 85°C, 85%RH, Biased, 1,000 Hours | ADATE330 | Q16724.7 | 0/32 |
| | | | | Q16724.8 | 0/32 |
| | | | | Q16724.9 | 0/32 |

¹These samples were subjected to preconditioning at MSL 3 with 3x reflow peak temp of 260°C prior to the start of the stress test.

Package/Assembly Product Characteristics

Table 3: Package/Assembly Product Characteristics – 121-CSP_BGA at STATS ChipPAC Korea 3 (SK3)

| Product Characteristics | Product to be qualified | Product used for Substitution Data |
|--------------------------------------|-----------------------------|------------------------------------|
| Generic/Root Part # | ADATE334 | ADATE330 |
| Package | 121-CSP_BGA | 121-CSP_BGA |
| Body Size (mm) | 9.00 x 9.00 x 1.08 | 9.00 x 9.00 x 1.08 |
| Assembly Location | STATS ChipPAC Korea 3 (SK3) | STATS ChipPAC Korea 3 (SK3) |
| MSL/Peak Reflow Temperature(°C) | 3/260 | 3/260 |
| Mold Compound | N/A | N/A |
| Underfill | Namics U8410-73C | Namics U8410-73C |
| Terminal Finish | 96.5Sn_3.0Ag_0.5Cu | 96.5Sn_3.0Ag_0.5Cu |
| Solder Ball Pitch (mm)/Diameter (mm) | 0.80/0.45 | 0.80/0.45 |
| Laminate Stack | 6 Layer Laminate | 6 Layer Laminate |

Package/Assembly Test Results

Table 4: Package/Assembly Test Results – CSP_BGA at STATS ChipPAC Korea 3 (SK3)

| Test Name | Spec | Conditions | Generic/Root Part # | Lot # | Fail/SS |
|--|-------------|----------------------------------|---------------------|-----------|---------|
| High Temperature Storage Life (HTSL) | JESD22-A103 | 150°C, 1,000 Hours | ADATE330 | Q16724.16 | 0/32 |
| Solder Heat Resistance (SHR) ¹ | J-STD-020 | MSL-3 | ADATE330 | Q16724.13 | 0/11 |
| | | | | Q16724.14 | 0/11 |
| | | | | Q16724.15 | 0/11 |
| Temperature Cycling (TC) ¹ | JESD22-A104 | -55°C/+125°C, 1,000 Cycles | ADATE330 | Q16724.1 | 0/32 |
| | | | | Q16724.2 | 0/32 |
| | | | | Q16724.3 | 0/32 |
| Temperature Humidity Bias (THB) ¹ | JESD22-A101 | 85°C, 85%RH, Biased, 1,000 Hours | ADATE330 | Q16724.7 | 0/32 |
| | | | | Q16724.8 | 0/32 |
| | | | | Q16724.9 | 0/32 |
| Unbiased HAST (UHST) ¹ | JESD22-A118 | 130°C 85%RH 33.3 psia, 96 Hours | ADATE330 | Q16724.10 | 0/32 |
| | | | | Q16724.11 | 0/32 |
| | | | | Q16724.12 | 0/32 |

¹ These samples were subjected to preconditioning at MSL 3 with 3x reflow peak temp of 260°C prior to the start of the stress test.

ESD and Latch-Up Test Results
Table 5: ESD Test Result

| ESD Model | Generic/Root Part # | Package | ESD Test Spec | RC Network | Highest Pass Level | Class |
|-----------|---------------------|-------------|---------------|--------------|--------------------|-------|
| FICDM | ADATE330 | 121-CSP_BGA | JS-002 | 1Ω, Cpkg | ±1000V | C3 |
| HBM | ADATE330 | 121-CSP_BGA | JS-001 | 1.5kΩ, 100pF | ±2000V | 2 |

Table 6: Latch Up Test Result

| LU Test Spec | Generic/Root Part # | Passing Current | Passing Over-Voltage | Temperature (T _A) | Class |
|--------------|---------------------|-----------------|-------------------------------|-------------------------------|-------|
| JESD78 | ADATE330 | +200mA, -200mA | 15.75V, 2.85V, 7.875V, -8.25V | 25°C | I |

Approvals

Reliability Engineer: Eric Marks