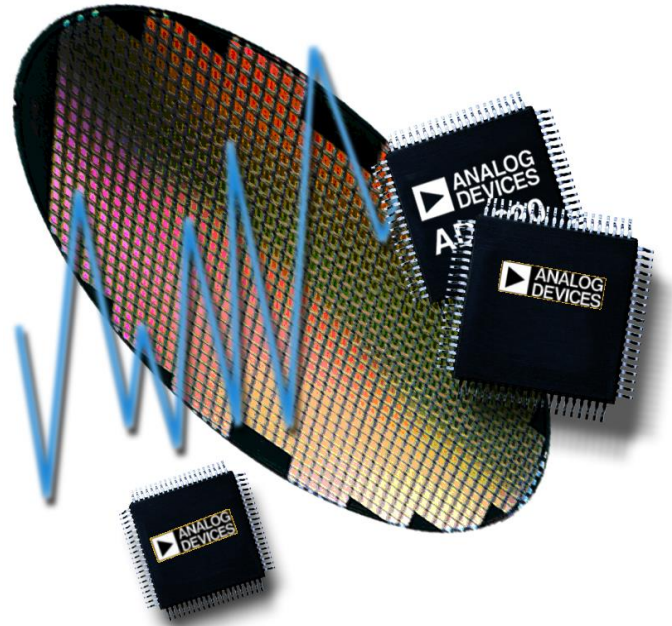




# ***Reliability Report***

**Report Title:** ADXL380/382 New Product Qualification

**Report Number:** 21521

**Revision:** B

**Date:** 07 November 2025

## Summary

This report documents the successful completion of the reliability qualification requirements for the release of the ADXL380, ADXL382 product in a 14-LGA package. Revision B of this document includes an ASIC die revision from TMTA79 A to TMUC07 C per PCN 25\_0025.

The ADXL380 is a low noise density, low power, 3-axis accelerometer with selectable measurement ranges. The ADXL380 supports the  $\pm 4$  g,  $\pm 8$  g, and  $\pm 16$  g range options.

The ADXL382 is a low noise density, low power, 3-axis accelerometer with selectable measurement ranges. The ADXL382 supports  $\pm 15$  g,  $\pm 30$  g, and  $\pm 60$  g range options.

Multiprotocol serial interfaces are supported such as SPI or I2C.

## Die/Fab Product Characteristics

**Table 1.1: Die/Fab Product Characteristics - 0.18um CMOS**

| Product Characteristics   | Product(s) to be qualified | Product(s) used for Substitution Data |                     |                   |                   |                   |                   |
|---------------------------|----------------------------|---------------------------------------|---------------------|-------------------|-------------------|-------------------|-------------------|
| Generic/Root Part #       | ADXL380/<br>ADXL382        | ADXL380/<br>ADXL382                   | ADXL318/<br>ADXL319 | ADUX1050          | ADP1762           | ADPD5000          | ADXL351           |
| Die Id                    | TMUC07 C                   | TMTA79 A                              | TMUC07 C            | TMFU86            | TMHJ03/A          | TMKI91/A          | TMLB22 A          |
| Die Size (mm)             | 2.25 x 2.4                 | 2.25 x 2.4                            | 2.25 x 2.4          | 1.47 x 1.67       | 1.00 x 1.51       | 3.15 x 2.18       | 1.73 x 2.43       |
| Wafer Fabrication Site    | TSMC Fab-11                | TSMC Fab-11                           | TSMC Fab-11         | TSMC Fab-11       | TSMC Fab-11       | TSMC Fab-11       | TSMC Fab-11       |
| Wafer Fabrication Process | 0.18um CMOS                | 0.18um CMOS                           | 0.18um CMOS         | 0.18um CMOS       | 0.18um CMOS       | 0.18um CMOS       | 0.18um CMOS       |
| Die Substrate             | Si                         | Si                                    | Si                  | Si                | Si                | Si                | Si                |
| Metallization / # Layers  | AlCu(0.5%)/5               | AlCu(0.5%)/5                          | AlCu(0.5%)/5        | AlCu(0.5%)/5      | AlCu/5            | AlCu/5            | AlCu(0.5%)/5      |
| Polyimide                 | No                         | No                                    | No                  | No                | No                | No                | No                |
| Passivation               | undoped-oxide/SiN          | undoped-oxide/SiN                     | undoped-oxide/SiN   | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN | undoped-oxide/SiN |

**Table 1.2: Die/Fab Product Characteristics- MEMS**

| Product Characteristics   | Product(s) to be qualified |                  |
|---------------------------|----------------------------|------------------|
| Generic/Root Part #       | ADXL380                    | ADXL382          |
| Die Id                    | XSC09 / TMRF94 B           | XSC08 / TMRF93 C |
| Die Size (mm)             | 1.78 x 1.98                | 1.78 x 1.98      |
| Wafer Fabrication Site    | E_TSMC0308                 | E_TSMC0308       |
| Wafer Fabrication Process | MEMS                       | MEMS             |
| Die Substrate             | Si                         | Si               |
| Metallization / # Layers  | AlCu(0.5%)/2               | AlCu(0.5%)/2     |
| Polyimide                 | No                         | No               |
| Passivation               | No                         | No               |

## Die/Fab Test Results

**Table 2.1: Die/Fab Test Results - 0.18um CMOS at TSMC Fab-11**

| Test Name                                                                   | Spec         | Conditions                             | Generic Part # | Lot #       | Fail/SS |
|-----------------------------------------------------------------------------|--------------|----------------------------------------|----------------|-------------|---------|
| Early Life Failure Rate (ELFR)                                              | JESD22-A108  | Ta=125°C, 48 Hours                     | ADUX1050       | Q19068      | 0/2060  |
| Early Life Failure Rate (ELFR) <sup>1</sup>                                 | AEC-Q100-008 | Ta=125°C, 24 Hours                     | ADXL351        | Q14372      | 0/2400  |
|                                                                             |              | Ta=125°C, 48 Hours                     | ADP1762        | Q14221      | 0/2400  |
| High Temperature Operating Life (HTOL) <sup>2</sup>                         | JESD22-A108  | 125°C<Tj<135°C, Biased, 1,000 Hours    | ADXL380        | Q21521.1.15 | 0/77    |
|                                                                             |              |                                        |                | Q21521.2.11 | 0/77    |
|                                                                             |              |                                        |                | Q21521.3.11 | 0/77    |
|                                                                             |              |                                        | ADXL318        | Q23160.1.13 | 0/77    |
|                                                                             |              |                                        | ADXL382        | Q21521.1.1  | 0/77    |
|                                                                             |              |                                        |                | Q21521.2.1  | 0/77    |
|                                                                             |              |                                        |                | Q21521.3.1  | 0/77    |
|                                                                             |              |                                        | ADXL319        | Q23160.1.14 | 0/77    |
| High Temperature Storage Life (HTSL)                                        | JESD22-A103  | 150°C, 1,000 Hours                     | ADXL382        | Q21521.1.6  | 0/77    |
|                                                                             |              |                                        |                | Q21521.2.6  | 0/77    |
|                                                                             |              |                                        |                | Q21521.3.6  | 0/77    |
| Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>2</sup> | JESD22-A110  | 110C 85%RH 17.7 psia, Biased, 264 hrs. | ADXL382        | Q21521.1.4  | 0/77    |
|                                                                             |              |                                        |                | Q21521.2.4  | 0/77    |
|                                                                             |              |                                        |                | Q21521.3.4  | 0/77    |

<sup>1</sup> Pre- and post-stress electrical test was performed at room and hot temperatures.

<sup>2</sup> 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 - MEMS at TSMC Fab-3**

| Test Name                                                                   | Spec           | Conditions                                       | Generic Part # | Lot #       | Fail/SS |
|-----------------------------------------------------------------------------|----------------|--------------------------------------------------|----------------|-------------|---------|
| High Temperature Storage Life (HTSL)                                        | JESD22-A103    | 150°C, 1,000 Hours                               | ADXL382        | Q21521.1.6  | 0/77    |
|                                                                             |                |                                                  |                | Q21521.2.6  | 0/77    |
|                                                                             |                |                                                  |                | Q21521.3.6  | 0/77    |
| Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1</sup> | JESD22-A110    | 110C 85%RH 17.7 psia, Biased, 264 hrs.           | ADXL382        | Q21521.1.4  | 0/77    |
|                                                                             |                |                                                  |                | Q21521.2.4  | 0/77    |
|                                                                             |                |                                                  |                | Q21521.3.4  | 0/77    |
| Mechanical Shock - Powered                                                  | IEC 60068-2-27 | 10kg, 5 shock pulses per axis orientation, 0.2ms | ADXL380        | Q21521.1.28 | 0/32    |
|                                                                             |                |                                                  |                | Q21521.2.17 | 0/32    |
|                                                                             |                |                                                  |                | Q21521.3.16 | 0/32    |
|                                                                             |                |                                                  | ADXL382        | Q21521.1.26 | 0/32    |
|                                                                             |                |                                                  |                | Q21521.2.15 | 0/32    |
|                                                                             |                |                                                  |                | Q21521.3.14 | 0/32    |

**Table 2.2: Die/Fab Test Results - MEMS at TSMC Fab-3 (Cont.)**

| Test Name                             | Spec               | Conditions                                       | Generic Part # | Lot #       | Fail/SS |
|---------------------------------------|--------------------|--------------------------------------------------|----------------|-------------|---------|
| Mechanical Shock - Un-Powered         | IEC 60068-2-27     | 10kg, 5 shock pulses per axis orientation, 0.2ms | ADXL380        | Q21521.1.27 | 0/32    |
|                                       |                    |                                                  |                | Q21521.2.16 | 0/32    |
|                                       |                    |                                                  |                | Q21521.3.15 | 0/32    |
|                                       |                    |                                                  | ADXL382        | Q21521.1.25 | 0/32    |
|                                       |                    |                                                  |                | Q21521.2.14 | 0/32    |
|                                       |                    |                                                  |                | Q21521.3.13 | 0/32    |
| Guided Drop                           | IEC 60068-2-32     | 1X6 axes- 1.2m concrete                          | ADXL380        | Q21521.1.33 | 0/25    |
|                                       |                    |                                                  |                | Q21521.2.22 | 0/25    |
|                                       |                    |                                                  |                | Q21521.3.22 | 0/25    |
|                                       |                    |                                                  | ADXL382        | Q21521.1.8  | 0/25    |
|                                       |                    |                                                  |                | Q21521.2.8  | 0/25    |
|                                       |                    |                                                  |                | Q21521.3.8  | 0/25    |
| Temperature Cycling (TC) <sup>1</sup> | JESD22-A104        | -55°C/+125°C, 2,000 Cycles                       | ADXL380        | Q21521.3.9  | 0/77    |
|                                       |                    |                                                  |                | Q21521.1.16 | 0/77    |
|                                       |                    |                                                  |                | Q21521.2.9  | 0/77    |
|                                       |                    |                                                  | ADXL382        | Q21521.2.2  | 0/77    |
|                                       |                    |                                                  |                | Q21521.3.2  | 0/77    |
|                                       |                    |                                                  |                | Q21521.1.2  | 0/77    |
|                                       |                    | -65°C/+150°C, 500 Cycles                         | ADXL380        | Q21521.2.10 | 0/77    |
|                                       |                    |                                                  |                | Q21521.3.10 | 0/77    |
|                                       |                    |                                                  |                | Q21521.1.17 | 0/77    |
|                                       |                    |                                                  | ADXL382        | Q21521.1.3  | 0/77    |
|                                       |                    |                                                  |                | Q21521.2.3  | 0/77    |
|                                       |                    |                                                  |                | Q21521.3.3  | 0/77    |
| Group D                               | MIL-STD-883, M5005 | Sub 4, Cent.                                     | ADXL380        | Q21521.1.32 | 0/39    |
|                                       |                    |                                                  |                | Q21521.2.21 | 0/39    |
|                                       |                    |                                                  |                | Q21521.3.21 | 0/39    |
|                                       |                    |                                                  | ADXL382        | Q21521.1.31 | 0/39    |
|                                       |                    |                                                  |                | Q21521.2.23 | 0/39    |
|                                       |                    |                                                  |                | Q21521.3.23 | 0/39    |
|                                       |                    | Sub 4, Shock/Vib                                 | ADXL380        | Q21521.1.30 | 0/39    |
|                                       |                    |                                                  |                | Q21521.2.19 | 0/39    |
|                                       |                    |                                                  |                | Q21521.3.19 | 0/39    |
|                                       |                    |                                                  | ADXL382        | Q21521.1.29 | 0/39    |
|                                       |                    |                                                  |                | Q21521.2.18 | 0/39    |
|                                       |                    |                                                  |                | Q21521.3.18 | 0/39    |

<sup>1</sup> 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.

## Package/Assembly Product Characteristics

**Table 3: Package/Assembly Product Characteristics - 14-LGA at ASE (AEK)**

| Product Characteristics            | Product(s) to be qualified             |                                        |
|------------------------------------|----------------------------------------|----------------------------------------|
| Generic/Root Part #                | ADXL380                                | ADXL382                                |
| Package                            | 14-LGA                                 | 14-LGA                                 |
| Body Size (mm)                     | 2.90 x 2.80 x 0.87                     | 2.90 x 2.80 x 0.87                     |
| Assembly Location                  | ASE (AEK)                              | ASE (AEK)                              |
| MSL/Peak Reflow Temperature(°C)    | 3 / 260°C                              | 3 / 260°C                              |
| Mold Compound                      | Nitto GE 100LFCS                       | Nitto GE 100LFCS                       |
| Die Attach/Underfill               | Lintec LE5000 film non-conductive / No | Lintec LE5000 film non-conductive / No |
| Leadframe Material                 | BT                                     | BT                                     |
| Lead Finish                        | Au                                     | Au                                     |
| Wire Bond Material/Diameter (mils) | PdCuAu 4N / 0.70                       | PdCuAu 4N / 0.70                       |

## Package/Assembly Test Results

**Table 4: Package/Assembly Test Results - LGA at ASE (AEK)**

| Test Name                                                                   | Spec               | Conditions                             | Generic Part # | Lot #       | Fail/SS |
|-----------------------------------------------------------------------------|--------------------|----------------------------------------|----------------|-------------|---------|
| Group D                                                                     | MIL-STD-883, M5005 | Sub 4, Cent.                           | ADXL380        | Q21521.1.32 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.2.21 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.3.21 | 0/39    |
|                                                                             |                    |                                        | ADXL382        | Q21521.1.31 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.2.23 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.3.23 | 0/39    |
|                                                                             |                    | Sub 4, Shock/Vib                       | ADXL380        | Q21521.1.30 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.2.19 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.3.19 | 0/39    |
|                                                                             |                    |                                        | ADXL382        | Q21521.1.29 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.2.18 | 0/39    |
|                                                                             |                    |                                        |                | Q21521.3.18 | 0/39    |
| Guided Drop                                                                 | IEC 60068-2-32     | 1X6 axes- 1.2m concrete                | ADXL380        | Q21521.1.33 | 0/25    |
|                                                                             |                    |                                        |                | Q21521.2.22 | 0/25    |
|                                                                             |                    |                                        |                | Q21521.3.22 | 0/25    |
|                                                                             |                    |                                        | ADXL382        | Q21521.1.8  | 0/25    |
|                                                                             |                    |                                        |                | Q21521.2.8  | 0/25    |
|                                                                             |                    |                                        |                | Q21521.3.8  | 0/25    |
| High Temperature Storage Life (HTSL)                                        | JESD22-A103        | 150°C, 1,000 Hours                     | ADXL382        | Q21521.1.6  | 0/77    |
|                                                                             |                    |                                        |                | Q21521.2.6  | 0/77    |
|                                                                             |                    |                                        |                | Q21521.3.6  | 0/77    |
| Highly Accelerated Temperature and Humidity Stress Test (HAST) <sup>1</sup> | JESD22-A110        | 110C 85%RH 17.7 psia, Biased, 264 hrs. | ADXL382        | Q21521.1.4  | 0/77    |
|                                                                             |                    |                                        |                | Q21521.2.4  | 0/77    |
|                                                                             |                    |                                        |                | Q21521.3.4  | 0/77    |
| Solder Heat Resistance (SHR) <sup>1</sup>                                   | J-STD-020          | MSL-3                                  | ADXL382        | Q21521.1.7  | 0/11    |
|                                                                             |                    |                                        |                | Q21521.2.7  | 0/11    |
|                                                                             |                    |                                        |                | Q21521.3.7  | 0/11    |
|                                                                             |                    |                                        | ADXL382        | Q21521.1.24 | 0/11    |
|                                                                             |                    |                                        |                | Q21521.2.12 | 0/11    |
|                                                                             |                    |                                        |                | Q21521.3.12 | 0/11    |
| Unbiased HAST (UHST) <sup>1</sup>                                           | JESD22-A118        | 110C 85%RH 17.7 psia, 264hrs.          | ADXL382        | Q21521.1.5  | 0/77    |
|                                                                             |                    |                                        |                | Q21521.2.5  | 0/77    |
|                                                                             |                    |                                        |                | Q21521.3.5  | 0/77    |

**Table 4: Package/Assembly Test Results - LGA at ASE (AEK) (Cont.)**

| Test Name                             | Spec        | Conditions                    | Generic Part # | Lot #       | Fail/SS |
|---------------------------------------|-------------|-------------------------------|----------------|-------------|---------|
| Temperature Cycling (TC) <sup>1</sup> | JESD22-A104 | -55°C/+125°C,<br>2,000 Cycles | ADXL380        | Q21521.3.9  | 0/77    |
|                                       |             |                               |                | Q21521.1.16 | 0/77    |
|                                       |             |                               |                | Q21521.2.9  | 0/77    |
|                                       |             |                               | ADXL382        | Q21521.2.2  | 0/77    |
|                                       |             |                               |                | Q21521.3.2  | 0/77    |
|                                       |             |                               |                | Q21521.1.2  | 0/77    |
|                                       |             | -65°C/+150°C,<br>500 Cycles   | ADXL380        | Q21521.2.10 | 0/77    |
|                                       |             |                               |                | Q21521.3.10 | 0/77    |
|                                       |             |                               |                | Q21521.1.17 | 0/77    |
|                                       |             |                               | ADXL382        | Q21521.1.3  | 0/77    |
|                                       |             |                               |                | Q21521.2.3  | 0/77    |
|                                       |             |                               |                | Q21521.3.3  | 0/77    |

<sup>1</sup> 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 | Package | ESD Test Spec | RC Network   | Highest Pass Level | Class |
|-----------|---------|---------------|--------------|--------------------|-------|
| FICDM     | 14-LGA  | JS-002        | 1Ω, Cpkg     | ±1250V             | C3    |
| HBM       | 14-LGA  | JS-001        | 1.5kΩ, 100pF | ±3000V             | 2     |

**Table 6: Latch Up Test Result**

| LU Test Spec | Passing Current | Passing Over-Voltage | Temperature (T <sub>A</sub> ) | Class |
|--------------|-----------------|----------------------|-------------------------------|-------|
| JESD78       | +200mA, -200mA  | +2.97V, 5.4V         | 125°C                         | II    |

## Approvals

Reliability Engineer: Michael Walornyj, Mike Aldrich