GR551x Reliability Test Report

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Preface

Purpose

This document introduces GR551x family reliability qualification results, to help users know this product's reliability performance.

Audience

This document is intended for:

- GR551x user
- Hardware developer
- Tester

Release Notes

This document is the fourth release of *GR551x Reliability Test Report*, corresponding to GR551x SoC series.

Revision History

Version	Date	Description
1.0	2020-02-19	Initial release
1.1	2023-03-31	Added a test point (1000 h) to the HTOL test and the test passed.
1.2	2023-05-16	Added a test point (1000 h) to the HTST test and the test passed.
1.3	2024-03-27	Added Lot2 and Lot3 test points.

Contents

1 Introduction

The Goodix GR551x family is a single-mode, low-power Bluetooth 5.1 System-on-Chip (SoC). This report aims to provide a detailed description of the methods used to verify that the product under test meets Goodix stringent quality and reliability requirements. Each test is described and the results are presented. The evaluations done for this qualification are included in the following sections.

2 Reliability Test Items and Results

2.1 Electrostatic Discharge: Human Body Model (HBM)

Table 2-1 Test requirements

Reference Standard	ESDA/JEDEC JS-001
Test Parameter	I-V curve / Function test
Model	Human body model
Test Conditions	RP = 1.5 kΩ, C = 100 pF Power to power (+/-) I/O to power (+/-) I/O to I/O (+/-)
Sample Size	3 units per mode
Accept Criteria	0 fail

Table 2-2 Test results

Test Point	**Result**
±2000 V/Class 2	Pass

2.2 Electrostatic Discharge: Charged Device Model (CDM)

Table 2-3 Test requirements

Reference Standard	ESDA/JEDEC JS-002
Test Parameter	I-V curve / Function test
Model	Charged device model
Test Conditions	RP = 0 Ω, C = 0 pF All pins (+/-) to common ground
Sample Size	3 units per mode
Accept Criteria	0 fail

Table 2-4 Test results

Test Point	**Result**
±500 V/ Class C2a	Pass

2.3 Latch Up (LU)

Table 2-5 Test requirements

Reference Standard	JESD-78
Test Parameter	I-V curve / Function test
Model	Current / Voltage trigger
Test Conditions	I trigger / Over voltage (MSV), class I
Sample Size	3 units per mode
Accept Criteria	0 fail

Table 2-6 Test results

Test Point	**Result**
±200 mA	Pass
1.5*VCCmax or MSV	Pass

2.4 High Temperature Operating Life Test (HTOL)

Table 2-7 Test requirements

Reference Standard	JESD22-A108
Test Parameter	Function test
Model	Arrhenius model for temperature acceleration factor and voltage $$\mathrm{AF} = \exp\left[\gamma_v * \left(V_{stress} - V_{op}\right)\right] * \exp\left[\frac{Ea}{K}\left(\frac{1}{T_{op}} - \frac{1}{T_{stress}}\right)\right]$$
Test Conditions	125°C, 1000 hrs., VCCmax
Sample Size	77 units*3 lots
Accept Criteria	0 fail

Table 2-8 Test results

Time Point	**Result**		
	Lot1	**Lot2**	**Lot3**
168 hrs.	Pass	Pass	Pass
500 hrs.	Pass	Pass	Pass
1000 hrs.	Pass	Pass	Pass

2.5 Pre-Conditioning (Pre-Con)

Table 2-9 Test requirements

Reference Standard	JESD22-A113

Test Parameter	Function test / Appearance inspection
Model	None
Test Conditions	3x reflow, 30°C/60% RH, 192 hrs.
Sample Size	75 units*3 lots
Accept Criteria	0 fail

Table 2-10 Test results

Time Point	**Result**		
	Lot1	**Lot2**	**Lot3**
Pre-con Over.	Pass	Pass	Pass

2.6 Temperature Cycling Test (TCT)

Table 2-11 Test requirements

Reference Standard	JESD22-A104
Test Parameter	Function test / Appearance inspection
Model	None
Test Conditions	-65°C to 150°C, 500 cycles
Sample Size	25 units*3 lots
Accept Criteria	0 fail

Table 2-12 Test results

Time Point	**Result**		
	Lot1	**Lot2**	**Lot3**
500 cycles	Pass	Pass	Pass

2.7 Highly Accelerated Temperature and Humidity Stress Test (HAST)

Table 2-13 Test requirements

Reference Standard	JESD22-A110
Test Parameter	Function test / Appearance inspection
Model	None
Test Conditions	130°C, 85% RH, VCCmax, 96 hrs.
Sample Size	25 units*3 lots
Accept Criteria	0 fail

Table 2-14 Test results

Time Point	Result		
	Lot1	Lot2	Lot3
96 hrs.	Pass	Pass	Pass

2.8 Unbiased Highly Accelerated Temperature and Humidity Stress Test (UHAST)

Table 2-15 Test requirements

Reference Standard	JESD22-A118
Test Parameter	Function test / Appearance inspection
Model	None
Test Conditions	130°C, 85% RH, 96 hrs.
Sample Size	25 units*3 lots
Accept Criteria	0 fail

Table 2-16 Test results

Time Point	Result		
	Lot1	Lot2	Lot3
96 hrs.	Pass	Pass	Pass

2.9 High Temperature Storage Test (HTST)

Table 2-17 Test requirements

Reference Standard	JESD22-A103
Test Parameter	Function test / Appearance inspection
Model	None
Test Conditions	150°C, 1000 hrs.
Sample Size	25 units*3 lots
Accept Criteria	0 fail

Table 2-18 Test results

Time Point	Result		
	Lot1	Lot2	Lot3
500 hrs.	Pass	Pass	Pass
1000 hrs.	Pass	Pass	Pass