

CERTIFICATE OF ACCREDITATION

QRT Inc.

Accreditation No. : KT218

Corporation Registration No. : 134411-0059857

Address of Laboratory : (Branch site)2091, Gyeongchung-daero, Bubal-eup, Icheon-si, Gyeonggi-do, Korea

(Branch site-1)215 Daesinro Heungdeokgu Cheongjusi
Chungcheongbuk-do, Korea

(Branch site-2)109, Gwanggyo-ro, Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea

Date of Initial Accreditation : April 19, 2004

Validity of Accreditation : July 02, 2020 ~ July 01, 2024

Scope of Accreditation : Attached Annex

Date of issue : July 02, 2020

This testing laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025 : 2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to Joint ISO-ILAC-IAF Communiqué).



LEE Seung Woo

Head

Korea Laboratory Accreditation Scheme

Korea Laboratory Accreditation Scheme

No. KT218

03. Electrical Testing

03.014 Environmental and Reliability Test

Test method	Standard designation	Test range	delegate	Field testing
AEC-Q100-005-REV-D1:2012	NON-VOLATILE MEMORY PROGRAM/ERASE ENDURANCE, DATA RETENTION, AND OPERATIONAL LIFE TEST (Exception) 3.6 Measurements 4 Failure criteria	Temperature : (55 ~ 150) °C	BS, BS-1	N
AEC-Q100-008-REV-A:2003	EARLY LIFE FAILURE RATE (ELFR) (Exception) 3.3 Acceptance Criteria 3.4 Sample Disposition	Temperature : (55 ~ 150) °C	BS, BS-1	N
IPC/JEDEC J-STD-020E:2014	MOISTURE/REFLOW SENSITIVITY CLASSIFICATION FOR NONHERMETIC SOLID STATE SURFACE MOUNT DEVICES (Exception) 3.6 Electrical test 5.2 Initial electrical test 5.8 Final electrical test	Bake Temperature : 125 °C Moisture Soak Temperature: (30 ~ 85) °C Humidity : (60 ~ 85) % R.H Reflow Peak Temperature : Max. 260 °C	BS, BS-1	N
JESD22-A101D:2015	STEADY STATE TEMPERATURE HUMIDITY BIAS LIFE TEST (Exception) 5 Failure criteria	Temperature : 85 °C Humidity : 85 % R.H.	BS, BS-1	N
JESD22-A102E:2015	ACCELERATED MOISTURE RESISTANCE UNBIASED AUTOCLAVE (Exception) 5 Failure criteria	Temperature : 121 °C Humidity : 100 % R.H. Vapor Pressure : 205 kPa	BS, BS-1	N
JESD22-A103E:2015	HIGH TEMPERATURE STORAGE LIFE (Exception) 4.2 Measurements 4.3 Failure criteria	Temperature : (125 ~ 300) °C	BS, BS-1	N
JESD22-A104E:2014	TEMPERATURE CYCLING (Exception) 5.9 Measurements 6 Failure criteria	Temperature : (-65 ~ 150) °C	BS, BS-1	N

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Test method	Standard designation	Test range	delegate	Field testing
JESD22-A105D:2020	POWER AND TEMPERATURE CYCLING (Exception) 4.4 Measurements 5 Failure criteria	Temperature : (-40 ~ 125) °C	BS, BS-1	N
JESD22-A106B.01:2016	THERMAL SHOCK (Exception) 4.2 Measurements 4.3 Failure criteria	Temperature : (-65 ~ 150) °C	BS	N
JESD22-A108F:2017	TEMPERATURE, BIAS, AND OPERATING LIFE (Exception) 6 Measurements 7 Failure criteria	Temperature : (-40 ~ 200) °C	BS, BS-1	N
JESD22-A110E:2015	HIGHLY ACCELERATED TEMPERATURE AND HUMIDITY STRESS TEST (HAST) (Exception) 5 Failure criteria	Temperature: (110 ~ 130) °C Humidity : 85 % R.H. Vapor Pressure : (122 ~ 230) kPa	BS, BS-1	N
JESD22-A113H:2016	PRECONDITIONING OF NONHERMETIC SURFACE MOUNT DEVICES PRIOR TO RELIABILITY TESTING (Exception) 4.1 Initial electrical test 4.10 Final electrical test	Temperature Cycling Temperature : (-40 ~ 150) °C Bake out Temperature : 125 °C Moisture Soak Temperature: (30 ~ 85) °C Humidity: (60 ~ 85) % R.H Reflow Peak Temperature.: Max. 260 °C	BS, BS-1	N
JESD22-A117E:2018	ELECTRICALLY ERASABLE PROGRAMMABLE ROM (EEPROM) PROGRAM/ERASE ENDURANCE AND DATA RETENTION TEST (Exception) 4.1.3 Electrical test verification 4.4 Measurements 5 Failure criteria and calculation	Temperature : (55 ~ 150) °C	BS, BS-1	N

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JESD22-A118B:2015	ACCELERATED MOISTURE RESISTANCE - UNBIASED HAST (Exception) 5 Failure criteria	Temperature: (110 ~ 130) °C Humidity : 85 % R.H. Vapor Pressure : (122 ~ 230) kPa	BS, BS-1	N
JESD22-A119A:2015	LOW TEMPERATURE STORAGE LIFE (Exception) 3.2 Measurements 3.3 Failure criteria	Temperature : (-40 ~ -65) °C	BS, BS-1	N
JESD22-B101C:2015	EXTERNAL VISUAL (Exception) 6 Failure criteria	Magnification : Max. 100 X	BS, BS-1	N
JESD22-B110B.01:2019	MECHANICAL SHOCK - COMPONENT AND SUBASSEMBLY (Exception) 4.3 Measurements 5 Failure criteria	Acceleration Peak: (1 000 ~ 29 000) m/s ²	BS	N
JESD22-B113B:2018	BOARD LEVEL CYCLIC BEND TEST METHOD FOR INTERCONNECT RELIABILITY CHARACTERIZATION OF COMPONENTS FOR HANDHELD ELECTRONIC PRODUCT (Exception) 10 Electrical monitoring requirements and failure criteria	Frequency : (1 ~ 3) Hz Depth : (2 ~ 4) mm	BS	N
JESD74A:2007	EARLY LIFE FAILURE RATE CALCULATION PROCEDURE FOR SEMICONDUCTOR COMPONENTS (Exception) 4.4 Failure analysis	Temperature : (55 ~ 150) °C	BS, BS-1	N

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Test method	Standard designation	Test range	delegate	Field testing
JESD22-B103B.01:2016	VIBRATION, VARIABLE FREQUENCY (Exception) 4.3 Optional stress application - Random vibration test (cont'd) Table 2 - Overall measures of random vibration test levels ; Service condition A, B 4.4 Measurements 5 Failure Criteria	Frequency : (10 ~ 2000) Hz Acceleration : (10 ~ 200) m/s ²	BS	N
MIL-STD-202H:2015	DEPARTMENT OF DEFENSE TEST METHOD STANDARD ELECTRONIC AND ELECTRICAL COMPONENT PARTS 103 Humidity (steady state) 107 Thermal shock (Exception) Table III. Thermal Shock conditions(liquid) 108 Life (at elevated ambient temperature) (Exception) 4.3 Measurements	Conditioning Temperature : 40 °C Exposure Humidity : (90 ~ 95) % R.H. Temperature : 40 °C Temperature : (-65 ~ 150) °C Temperature : (70 ~ 200) °C	BS-1	N
MIL-STD-810H:2019	DEPARTMENT OF DEFENSE TEST METHOD STANDARD ENVIRONMENTAL ENGINEERING CONSIDERATIONS AND LABORATORY TESTS 501.7 High Temperature (Exception) 2.2.2 Procedure III - Tactical-Standby to Operational 502.7 Low Temperature (Exception) 2.2.2 Procedure III - Manipulation 503.7 Temperature Shock 507.6 Humidity Table 507.6-VIII Hot Humid - Natural Cycle B3. Table 507.6-IX Aggravated cycle 509.7 Salt Fog	Temperature : (30 ~ 71) °C Temperature : (-61 ~ -21) °C Temperature : (-61 ~ 71) °C Humidity : (30 ~ 95) % R.H. Temperature : (30 ~ 60) °C Temperature : 35 °C Salt solution : 5 %	BS	N

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MIL-STD-202H:2015	DEPARTMENT OF DEFENSE TEST METHOD STANDARD ELECTRONIC AND ELECTRICAL COMPONENT PARTS 101 Salt atmosphere (corrosion) (Exception) 4.2 Preparation of specimen 5.2 Measurement 103 Humidity (steady state) 107 Thermal shock 108 Life (at elevated ambient temperature) (Exception) 4.3 Measurements 201 Vibration (Exception) 5.1 Measurements 204 Vibration, high frequency (Exception) 4.7 Test condition F (3 000 Hz) 4.9 Test condition H (80g peak) 4.10 Alternate procedure for use of linear in place of logarithmic change of frequency 5.1 Measurements	Temperature : 35 °C Salt solution : 5 % Conditioning Temperature : 40 °C Exposure Humidity : (90 ~ 95) % R.H. Temperature : 40 °C Temperature : (-65 ~ 150) °C Temperature : (70 ~ 200) °C Frequency : (10 ~ 55) Hz Displacement max : 1.5 mm Frequency : (10 ~ 2 000) Hz Acceleration : (100 ~ 500) m/s ²	BS	N

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Test method	Standard designation	Test range	delegate	Field testing
MIL-STD-810H:2019	DEPARTMENT OF DEFENSE TEST METHOD STANDARD ENVIRONMENTAL ENGINEERING CONSIDERATIONS AND LABORATORY TESTS 501.7 High Temperature (Exception) 2.2.2 Procedure III - Tactical-Standby to Operational 502.7 Low Temperature (Exception) 2.2.2 Procedure III - Manipulation 503.7 Temperature Shock 507.6 Humidity Table 507.6-VIII Hot Humid - Natural Cycle B3. Table 507.6-IX Aggravated cycle	Temperature : (30 ~ 71) °C Temperature : (-61 ~ -21) °C Temperature : (-61 ~ 71) °C Humidity : (30 ~ 95) % R.H. Temperature : (30 ~ 60) °C	BS-1	N
AEC-Q100-002-REV-E:2013	HUMAN BODY MODEL (HBM) ELECTROSTATIC DISCHARGE TEST	Voltage : (50 ~ 8 000) V	BS-2	N
AEC-Q100-004-REV-D:2012	IC LATCH-UP TEST (Exception) 5. Failure criteria	Current : Max. 2 A Voltage : Max. 100 V	BS-2	N
AEC-Q100-011-REV-D:2019	CHARGED DEVICE MODEL (CDM) ELECTROSTATIC DISCHARGE TEST (Exception) 2.2 Measurements 2.9 Failure criteria	Voltage : (50 ~ 2 000) V	BS-2	N
AEC-Q101-001-REV-A:2005	HUMAN BODY MODEL (HBM) ELECTROSTATIC DISCHARGE(ESD) TEST (Exception) 3.4 Measurements 4 Failure criteria	Voltage : (50 ~ 8 000) V	BS-2	N
AEC-Q101-005-REV-A:2019	CHARGED DEVICE MODEL (CDM) ELECTROSTATIC DISCHARGE(ESD) TEST (Exception) 2.2 Measurements 2.8 Failure criteria	Voltage : (50 ~ 2 000) V	BS-2	N

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Test method	Standard designation	Test range	delegate	Field testing
ANSI/ESDA/JEDEC JS-001-2017	ELECTROSTATIC DISCHARGE (ESD) SENSITIVITY TESTING HUMAN BODY MODEL (HBM) - COMPONENT LEVEL (Exception) 6.1 Parametric and Functional Testing 6.7 Testing After Stressing 7.0 Failure criteria	Voltage : (50 ~ 8 000) V	BS-2	N
JESD22-A115C:2010	ELECTROSTATIC DISCHARGE (ESD) SENSITIVITY TESTING MACHINE MODEL (MM) (Exception) 5 Failure criteria	Voltage : (50 ~ 1 500) V	BS-2	N
JESD22-C101F:2013	FIELD-INDUCED CHARGED-DEVICE MODEL TEST METHOD FOR ELECTROSTATIC DISCHARGE WITHSTAND THRESHOLDS OF MICRO ELECTRONIC COMPONENTS (Exception) 11 Failure criteria	Voltage : (50 ~ 3 000) V	BS-2	N
JESD78E:2017	IC LATCH-UP TEST (Exception) 5 Latch-up detection criteria	Current : Max. 2 A Voltage : Max. 100 V	BS-2	N
ANSI/ESDA/JEDEC JS-002-2018	ELECTROSTATIC DISCHARGE SENSITIVITY TESTING CHARGED DEVICE MODEL (CDM) - DEVICE LEVEL (Exception) 7.7.2 Device Test 7.2.2.1 Pre-Stress Testing 7.2.2.2 Failure criteria	Voltage : (50 ~ 2 000) V	BS-2	N

End.