CERTIFICATE OF ACCREDITATION

ANSI-ASQ National Accreditation Board

500 Montgomery Street, Suite 625, Alexandria, VA 22314, 877-344-3044

This is to certify that

Innovative Circuits Engineering, Inc.
2310 Lundy Avenue
San Jose, CA 95131

has been assessed by ANAB
and meets the requirements of international standard

ISO/IEC 17025:2005

while demonstrating technical competence in the field(s) of

TESTING

Refer to the accompanying Scope(s) of Accreditation for information regarding the types of tests to which this accreditation applies.

AT-1288

Certificate Number

ANAB Approval

Certificate Valid To: 09/12/2017
Version No. 002 Issued: 09/24/2015

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. 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 dated January 2009*).

ANSI-ASQ National Accreditation Board

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

Innovative Circuits Engineering, Inc.

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TESTING

Valid to: September 12, 2017 Certificate Number: AT - 1288

I. Electrical

FIELD OF TEST	ITEMS, MATERIALS OR PRODUCTS TESTED	SPECIFIC TESTS OR PROPERTIES MEASURED	SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED	*KEY EQUIPMENT OR TECHNOLOGY
Voltage Stress	Integrated Circuits & LEDs	Rise/ Fall Time (per JEDEC, AEC) Voltage Stress Level	JEDEC JESD22-A114 Automotive Electronics Council AEC-Q100-002 Electrostatic Discharge Sensitivity Test – Human Body Model	768 Pin Capacity (MK2) 1728 Pin Capacity (MK4) 50 V to 8 kV Thermo Electron Corp. MK2 HP 54616B 700 ps
Voltage Stress	Integrated Circuits & LEDs	Rise/ Fall Time (per JEDEC, AEC) Voltage Stress Level	JEDEC JESD22-A115 Automotive Electronics Council AEC-Q100-003 Electrostatic Discharge Sensitivity Test – Machine Model	768 Pin Capacity (MK2) 1728 Pin Capacity (MK4) 50 V to 2 kV Thermo Electron Corp. MK2 HP 54616B 700 ps

FIELD OF TEST	ITEMS, MATERIALS OR PRODUCTS TESTED	SPECIFIC TESTS OR PROPERTIES MEASURED	SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED	*KEY EQUIPMENT OR TECHNOLOGY
Voltage Stress	Integrated Circuits & LEDs	Rise/ Fall Time (per JEDEC, AEC, ESDA) Voltage Discharge Level	JEDEC JESD22-C101 Electrostatic Discharge Sensitivity Test – Field Induced Charged Device Model Automotive Electronics Council AEC-Q100-011 Charged Device Model (CDM) Electrostatic Discharge Test ESDA STM 5.3.1 Electrostatic Discharge Sensitivity Test – Field Induced Charged Device Model	50 V to 2 kV Thermo Electron Corp. RCDM 400 ps to 800 ns Tek TDS784A
Current & Voltage Stress	Integrated Circuits	I-Test Overvoltage Latch-up Test	JEDEC JESD78 Automotive Electronics Council AEC-Q100-004 IC Latch-up Test	256k Vectors/ pin 1 MB/ pin 10 MHz Vector Rate 6 Vector Voltage Levels 8 Separate V/I Supplies Latch-up Current Capability >10A 100 V Max Thermo Electron Corp. MK2 & MK4 25°C to 150°C Temptronic Model: TP0412A-2-60

II. Electrical / Environmental

FIELD OF TEST	ITEMS, MATERIALS OR PRODUCTS TESTED	SPECIFIC TESTS OR PROPERTIES MEASURED	SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED	*KEY EQUIPMENT OR TECHNOLOGY
Temperature Stress	Integrated Circuits & LEDs	Hot/ Cold Temperature Level Temperature Transition Time	JEDEC JESD22-A104 Temperature Cycling	Single Zone Chamber (-70°C to +200°C) Temperature Range ESPEC Model: TSA-70H
Electrical Bias Temperature Stress	Integrated Circuits	Hot/ Cold Temperature Level Temperature Transition Time Voltage Level Power On, Power Off Timing	JEDEC JESD22-A105 Power and Temperature Cycling	Single Zone Chamber (-73°C to +177°C) Temperature Range 8 Supply Connections (0 to 40) V (0 to 30) A Envirotronics Model: ET8-2-8-WC-VAC
Power Up Voltage Input Signals Oven Temperature Power Up Voltage Input Signals Oven Temperature	Integrated Circuits	Voltage Levels ---------- VIH/ VIL ---------- Temperature Level Voltage Levels ---------- VIH/ VIL ---------- Temperature Level	JEDEC JESD22-A108 Temperature, Bias, and Operating Life	4 Supply Connections (1 to 20) V Temperature Range (25°C to 150°C) 10 MHz / 16 Meg Vector Depth / 160 Channels Infinity Burn-in Oven Model: PNC 1-80 4 Supply Connections (1 to 20) V Temperature Range (25°C to 150°C) 8 MHz / 4 Meg Vector Depth / 96 Channels Criteria Burn-in Oven Model: CR-V w/ Computer Controller

FIELD OF TEST	ITEMS, MATERIALS OR PRODUCTS TESTED	SPECIFIC TESTS OR PROPERTIES MEASURED	SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED	*KEY EQUIPMENT OR TECHNOLOGY
Electrical Bias Temperature Humidity Pressure	Integrated Circuits	Voltage Levels Dry Bulb Wet Bulb Pressure Gage	JEDEC JESD22-A110 Highly-Accelerated Temperature and Humidity Stress Test (HAST)	2 Supply Connections (1 to 20) V (105°C to 148.2°C) (65 to 85) % RH 121.6 kPa to 243.2 kPa Hirayama HAST Chamber Model: PC-422R8 w/ Power Supply Computer Controller
Current Levels Temperature	LEDs	Current Levels Temperature Levels	Energy Star IESNA LM-80-08 "Measuring Lumen Maintenance of LED Light Sources"2	Current: 100 mA to 7 A Temperature Range (55°C to 105°C) ICE LM80 Chiller System
Oven Temperature	Integrated Circuits	Temperature Profile	JEDEC IPC/JEDEC J-STD-020 "Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices" (Preconditioning)	9 Zone Chamber (25°C to 350°C) Temperature Range Heller Model: 1809 MK III
Electrical Bias Temperature Humidity	Integrated Circuits	Voltage Levels Dry Bulb Wet Bulb	JEDEC JESD22-A101 Steady State Temperature Humidity Bias Life Test (THB)	Temperature / Humidity Chamber (Bias Supplied Separately) (-70°C to 190°C) Temperature Range (10% RH to 95% RH) Humidity Range Cincinnati Sub Zero Model: ZH-8-1-1-H/AC

FIELD OF TEST	ITEMS, MATERIALS OR PRODUCTS TESTED	SPECIFIC TESTS OR PROPERTIES MEASURED	SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED	*KEY EQUIPMENT OR TECHNOLOGY
Temperature Humidity Pressure	Integrated Circuits	Dry Bulb Wet Bulb Pressure Gage	JEDEC JESD22-A102 Accelerated Moisture Resistance - Unbiased Autoclave (PP)	Temperature / Humidity / Pressure Chamber (Bias Supplied Separately) (118°C to 150°C) Temperature Range (65%RH to 100%RH) Relative Humidity Range Pressure 121.6 kPa to 243.2 kPa Hirayama Model: PC-422R8
Temperature Humidity Pressure	Integrated Circuits	Dry Bulb Wet Bulb Pressure Gage	JEDEC JESD22-A118 Accelerated Moisture Resistance - Unbiased HAST (UHST)	Temperature / Humidity / Pressure Chamber (Bias Supplied Separately) (118°C to 150°C) Temperature Range (65% RH to 100% RH) Relative Humidity Range Pressure 121.6 kPa to 243.2 kPa Hirayama Model: PC-422R8
Temperature Stress (Liquid-to-liquid)	Integrated Circuits	Hot/ Cold Temperature Level Temperature Transition Time	JEDEC JESD22-A106 Thermal Shock (liquid-to-liquid)	Dual-Bath Chamber (-65°C to 150°C) Temperature Range) Espec Model: TSB-5

III. Physical

FIELD OF TEST	ITEMS, MATERIALS OR PRODUCTS TESTED	SPECIFIC TESTS OR PROPERTIES MEASURED	SPECIFICATION, STANDARD METHOD OR TECHNIQUE USED	*KEY EQUIPMENT OR TECHNOLOGY
Shear Force	Integrated Circuits	Solder Ball Shear Test	Automotive Electronics Council AEC-Q100-010 Solder Ball Shear Test (SBS)	Solder Ball Shear Equipment Dage Series 4000 Shearing Cartridge (0 to 5) kg of Force Model: BS5KG
Shear Force	Integrated Circuits	Wire Bond Shear Test	Automotive Electronics Council AEC-Q100-001 Wire Bond Shear Test (WBS)	Wire Bond Shear Equipment Dage Series 4000 Shearing Cartridge (0 to 5) kg of Force Model: BS5KG
Shear Force	Integrated Circuits	Wire Bond Pull Test	Automotive Electronics Council MIL-STD-883H Method 2011.8, 3.1.2 Wire Bond Pull Test (WBP)	Wire Bond Pull Equipment Dage Series 4000 Wire Pull Cartridge (0 to 100) g of Force Model: WP100

Notes:

1. ** = As Applicable*
2. *This scope is formatted as part of a single document including the Certificate of Accreditation No. AT-1288*

Vice President

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