



ELECTROSTATIC DISCHARGE (ESD) TESTING REPORT

Applicant/Department: Nations Technologies Inc.	
Product: N32WB031	LOT:
Case NO: S220223046	Quantity: 18 ea
Test Item: Human Body Model (HBM)	Package/Pin Count: QFN32
Application Date: 2022/2/23	Date Finished: 2022/3/1
Reference: MIL-STD-883K / Method 3015.9	Temperature: 25 ± 5 °C Humidity: 55 ± 5%
Test Instrument: MK2(SN0204336)	Calibration Due Date: 2021/08/19~2022/08/18
Test Voltage: ±2000V	
Failure Criteria: After testing, DUT no longer fulfills requirements of ± 30% voltage drift at ± 1uA reference current and compliance within 10% V+I envelope around REFERENCE I-V curve (pre-zap).	
ESD Testing Result:	Minimum Pass Level = ±2000V

NOTE 1: ESD/latch-up test is employed as one of qualification tests for electronic products. However, the pass / fail results of this test can NOT be taken as go/no-go criteria for IC tape-out and mass production. Before and after ESD/latch-up test(s), complete parametric and functional testing (F/T) are essential for determining pass/fail of the tested products. (References: Page 9, AEC-Q100-003-Rev-E-2003; and Page 15, ESDA-JEDEC JS-001-2017).

NOTE 2: MA-tek sample storage policy is 14 days after the test data delivery. Prolonged storage can be arranged per client's request.

WE HEREBY CERTIFY THAT:

The test(s) was/were conducted according to test conditions provided by customer. Testing was performed on calibrated and JEDEC-ESDA qualified ESD instruments. The quality and comprehensive test(s) were delivered by qualified personnel.

Tested by	Reviewed by	Approved by
<i>Joe_Xu</i>	<i>Fly_Fei</i>	<i>Zhen-Zhu</i>



CERTIFICATE of APPROVAL INDEPENDENT TESTING LABORATORY:

ISO9001:2015 Certificate Registration No. 20001845 QM08, issued by UL DQS Inc.
IEC/IECQ17025 Certificate No. IECQ-L ULTW 09.0009, approved by Certification Body (CB): UL Registered Firm



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1. TEST SUMMARY

[illegible]

* DUT failed at the first level of test condition, defined by client.

NOTE: Red color in raw data indicates failed pins, if any.

**2. Pin ASSIGNMENT**

Pin Group	PAD Pins
PA2	1
PA3	2
RESET	3
PB0	4
PA4	5
PA5	6
PA6	7
VDD_FLASH	8
PB8	9
PB9	10
PB1	11
PB2	12
PB3	13
PB4	14
PB5	15
PB6	16
PB7	17
PB10	18
PB12	19
PB11	20
PB13	21
VCC	22
SWITCH	23
VDCDC	24
RFIOP	25
VDD_PA	26
VDCDC_RF	27
VCCRF	28
XO32MM_OUT	29
XO32MP_IN	30
PA0	31
PA1	32
VSSP	33



3. ESD TEST CONDITIONS

ESD Zap Interval: $\geq 1\text{ S}$

Zap: 3 pulse.

Testing Combinations

All other pins to VSS(+)

All other pins to VSS(-)

All other pins to VCC(+)

All other pins to VCC(-)

IO pins to IO pins(+)

IO pins to IO pins(-)

**4. Raw Data - 2**

HBM All other pins to VSS_+2000 (Unit: V)									
Test Pin Fail Voltage		#1	#2	#3	Test Pin Fail Voltage		#1	#2	#3
1	PA2	Pass	Pass	Pass	17	PB7	Pass	Pass	Pass
2	PA3	Pass	Pass	Pass	18	PB10	Pass	Pass	Pass
3	RESET	Pass	Pass	Pass	19	PB12	Pass	Pass	Pass
4	PB0	Pass	Pass	Pass	20	PB11	Pass	Pass	Pass
5	PA4	Pass	Pass	Pass	21	PB13	Pass	Pass	Pass
6	PA5	Pass	Pass	Pass	22	VCC	Pass	Pass	Pass
7	PA6	Pass	Pass	Pass	23	SWITCH	Pass	Pass	Pass
8	VDD_FLASH	Pass	Pass	Pass	24	VDCDC	Pass	Pass	Pass
9	PB8	Pass	Pass	Pass	25	RFIOP	Pass	Pass	Pass
10	PB9	Pass	Pass	Pass	26	VDD_PA	Pass	Pass	Pass
11	PB1	Pass	Pass	Pass	27	VDCDC_RF	Pass	Pass	Pass
12	PB2	Pass	Pass	Pass	28	VCCRF	Pass	Pass	Pass
13	PB3	Pass	Pass	Pass	29	XO32MM_OUT	Pass	Pass	Pass
14	PB4	Pass	Pass	Pass	30	XO32MP_IN	Pass	Pass	Pass
15	PB5	Pass	Pass	Pass	31	PA0	Pass	Pass	Pass
16	PB6	Pass	Pass	Pass	32	PA1	Pass	Pass	Pass
33	VSSP	Pass	Pass	Pass					

HBM All other pins to VSS_-2000 (Unit: V)									
Test Pin Fail Voltage		#4	#5	#6	Test Pin Fail Voltage		#4	#5	#6
1	PA2	Pass	Pass	Pass	17	PB7	Pass	Pass	Pass
2	PA3	Pass	Pass	Pass	18	PB10	Pass	Pass	Pass
3	RESET	Pass	Pass	Pass	19	PB12	Pass	Pass	Pass
4	PB0	Pass	Pass	Pass	20	PB11	Pass	Pass	Pass
5	PA4	Pass	Pass	Pass	21	PB13	Pass	Pass	Pass
6	PA5	Pass	Pass	Pass	22	VCC	Pass	Pass	Pass
7	PA6	Pass	Pass	Pass	23	SWITCH	Pass	Pass	Pass
8	VDD_FLASH	Pass	Pass	Pass	24	VDCDC	Pass	Pass	Pass
9	PB8	Pass	Pass	Pass	25	RFIOP	Pass	Pass	Pass
10	PB9	Pass	Pass	Pass	26	VDD_PA	Pass	Pass	Pass
11	PB1	Pass	Pass	Pass	27	VDCDC_RF	Pass	Pass	Pass
12	PB2	Pass	Pass	Pass	28	VCCRF	Pass	Pass	Pass
13	PB3	Pass	Pass	Pass	29	XO32MM_OUT	Pass	Pass	Pass
14	PB4	Pass	Pass	Pass	30	XO32MP_IN	Pass	Pass	Pass
15	PB5	Pass	Pass	Pass	31	PA0	Pass	Pass	Pass
16	PB6	Pass	Pass	Pass	32	PA1	Pass	Pass	Pass
33	VSSP	Pass	Pass	Pass					

**4. Raw Data - 2**

HBM All other pins to VCC_+2000 (Unit: V)									
Test Pin Fail Voltage		#7	#8	#9	Test Pin Fail Voltage		#7	#8	#9
1	PA2	Pass	Pass	Pass	17	PB7	Pass	Pass	Pass
2	PA3	Pass	Pass	Pass	18	PB10	Pass	Pass	Pass
3	RESET	Pass	Pass	Pass	19	PB12	Pass	Pass	Pass
4	PB0	Pass	Pass	Pass	20	PB11	Pass	Pass	Pass
5	PA4	Pass	Pass	Pass	21	PB13	Pass	Pass	Pass
6	PA5	Pass	Pass	Pass	22	VCC	Pass	Pass	Pass
7	PA6	Pass	Pass	Pass	23	SWITCH	Pass	Pass	Pass
8	VDD_FLASH	Pass	Pass	Pass	24	VDCDC	Pass	Pass	Pass
9	PB8	Pass	Pass	Pass	25	RFIOP	Pass	Pass	Pass
10	PB9	Pass	Pass	Pass	26	VDD_PA	Pass	Pass	Pass
11	PB1	Pass	Pass	Pass	27	VDCDC_RF	Pass	Pass	Pass
12	PB2	Pass	Pass	Pass	28	VCCRF	Pass	Pass	Pass
13	PB3	Pass	Pass	Pass	29	XO32MM_OUT	Pass	Pass	Pass
14	PB4	Pass	Pass	Pass	30	XO32MP_IN	Pass	Pass	Pass
15	PB5	Pass	Pass	Pass	31	PA0	Pass	Pass	Pass
16	PB6	Pass	Pass	Pass	32	PA1	Pass	Pass	Pass
33	VSSP	Pass	Pass	Pass					

HBM All other pins to VCC_-2000 (Unit: V)									
Test Pin Fail Voltage		#10	#11	#12	Test Pin Fail Voltage		#10	#11	#12
1	PA2	Pass	Pass	Pass	17	PB7	Pass	Pass	Pass
2	PA3	Pass	Pass	Pass	18	PB10	Pass	Pass	Pass
3	RESET	Pass	Pass	Pass	19	PB12	Pass	Pass	Pass
4	PB0	Pass	Pass	Pass	20	PB11	Pass	Pass	Pass
5	PA4	Pass	Pass	Pass	21	PB13	Pass	Pass	Pass
6	PA5	Pass	Pass	Pass	22	VCC	Pass	Pass	Pass
7	PA6	Pass	Pass	Pass	23	SWITCH	Pass	Pass	Pass
8	VDD_FLASH	Pass	Pass	Pass	24	VDCDC	Pass	Pass	Pass
9	PB8	Pass	Pass	Pass	25	RFIOP	Pass	Pass	Pass
10	PB9	Pass	Pass	Pass	26	VDD_PA	Pass	Pass	Pass
11	PB1	Pass	Pass	Pass	27	VDCDC_RF	Pass	Pass	Pass
12	PB2	Pass	Pass	Pass	28	VCCRF	Pass	Pass	Pass
13	PB3	Pass	Pass	Pass	29	XO32MM_OUT	Pass	Pass	Pass
14	PB4	Pass	Pass	Pass	30	XO32MP_IN	Pass	Pass	Pass
15	PB5	Pass	Pass	Pass	31	PA0	Pass	Pass	Pass
16	PB6	Pass	Pass	Pass	32	PA1	Pass	Pass	Pass
33	VSSP	Pass	Pass	Pass					

**4. Raw Data - 2**

HBM IO pins to IO_+2000 (Unit: V)									
Test Pin Fail Voltage		#13	#14	#15	Test Pin Fail Voltage		#13	#14	#15
1	PA2	Pass	Pass	Pass	17	PB7	Pass	Pass	Pass
2	PA3	Pass	Pass	Pass	18	PB10	Pass	Pass	Pass
3	RESET	Pass	Pass	Pass	19	PB12	Pass	Pass	Pass
4	PB0	Pass	Pass	Pass	20	PB11	Pass	Pass	Pass
5	PA4	Pass	Pass	Pass	21	PB13	Pass	Pass	Pass
6	PA5	Pass	Pass	Pass	22	VCC	Pass	Pass	Pass
7	PA6	Pass	Pass	Pass	23	SWITCH	Pass	Pass	Pass
8	VDD_FLASH	Pass	Pass	Pass	24	VDCDC	Pass	Pass	Pass
9	PB8	Pass	Pass	Pass	25	RFIOP	Pass	Pass	Pass
10	PB9	Pass	Pass	Pass	26	VDD_PA	Pass	Pass	Pass
11	PB1	Pass	Pass	Pass	27	VDCDC_RF	Pass	Pass	Pass
12	PB2	Pass	Pass	Pass	28	VCCRF	Pass	Pass	Pass
13	PB3	Pass	Pass	Pass	29	XO32MM_OUT	Pass	Pass	Pass
14	PB4	Pass	Pass	Pass	30	XO32MP_IN	Pass	Pass	Pass
15	PB5	Pass	Pass	Pass	31	PA0	Pass	Pass	Pass
16	PB6	Pass	Pass	Pass	32	PA1	Pass	Pass	Pass
33	VSSP	Pass	Pass	Pass					

HBM IO pins to IO_-2000 (Unit: V)									
Test Pin Fail Voltage		#16	#17	#18	Test Pin Fail Voltage		#16	#17	#18
1	PA2	Pass	Pass	Pass	17	PB7	Pass	Pass	Pass
2	PA3	Pass	Pass	Pass	18	PB10	Pass	Pass	Pass
3	RESET	Pass	Pass	Pass	19	PB12	Pass	Pass	Pass
4	PB0	Pass	Pass	Pass	20	PB11	Pass	Pass	Pass
5	PA4	Pass	Pass	Pass	21	PB13	Pass	Pass	Pass
6	PA5	Pass	Pass	Pass	22	VCC	Pass	Pass	Pass
7	PA6	Pass	Pass	Pass	23	SWITCH	Pass	Pass	Pass
8	VDD_FLASH	Pass	Pass	Pass	24	VDCDC	Pass	Pass	Pass
9	PB8	Pass	Pass	Pass	25	RFIOP	Pass	Pass	Pass
10	PB9	Pass	Pass	Pass	26	VDD_PA	Pass	Pass	Pass
11	PB1	Pass	Pass	Pass	27	VDCDC_RF	Pass	Pass	Pass
12	PB2	Pass	Pass	Pass	28	VCCRF	Pass	Pass	Pass
13	PB3	Pass	Pass	Pass	29	XO32MM_OUT	Pass	Pass	Pass
14	PB4	Pass	Pass	Pass	30	XO32MP_IN	Pass	Pass	Pass
15	PB5	Pass	Pass	Pass	31	PA0	Pass	Pass	Pass
16	PB6	Pass	Pass	Pass	32	PA1	Pass	Pass	Pass
33	VSSP	Pass	Pass	Pass					

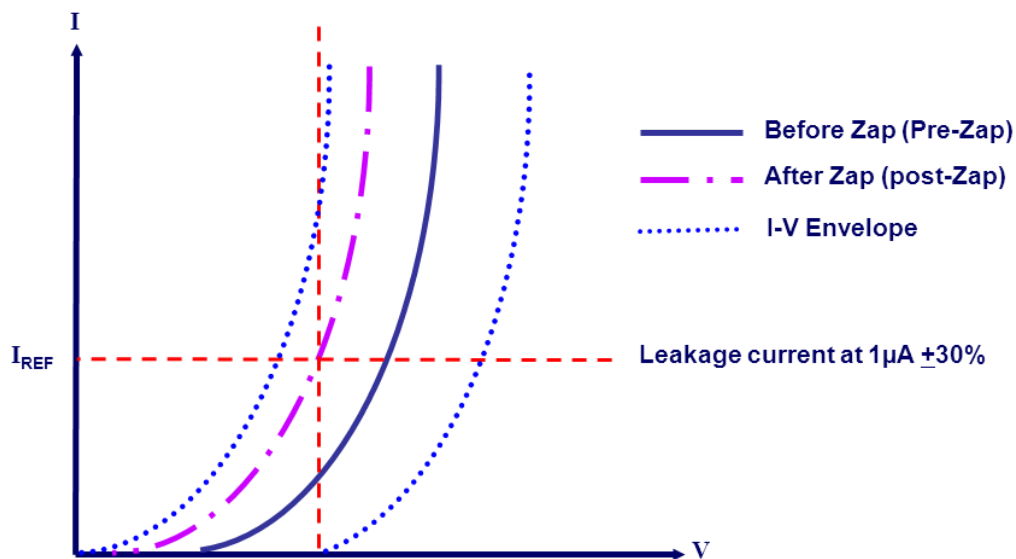
5. APPENDIX-1 (PASS/FAIL CRITERIA)

FAILURE CRITERIA

After testing, DUT no longer fulfills requirements of $\pm 30\%$ voltage drift at $\pm 1\mu\text{A}$ reference current and compliance within 10% V+I envelope around REFERENCE I-V curve (pre-zap).

Note

For custom designed ESD testing customers may select variation in I_{dd} and leakage current as criteria to determine pass/fail results of ESD testing.

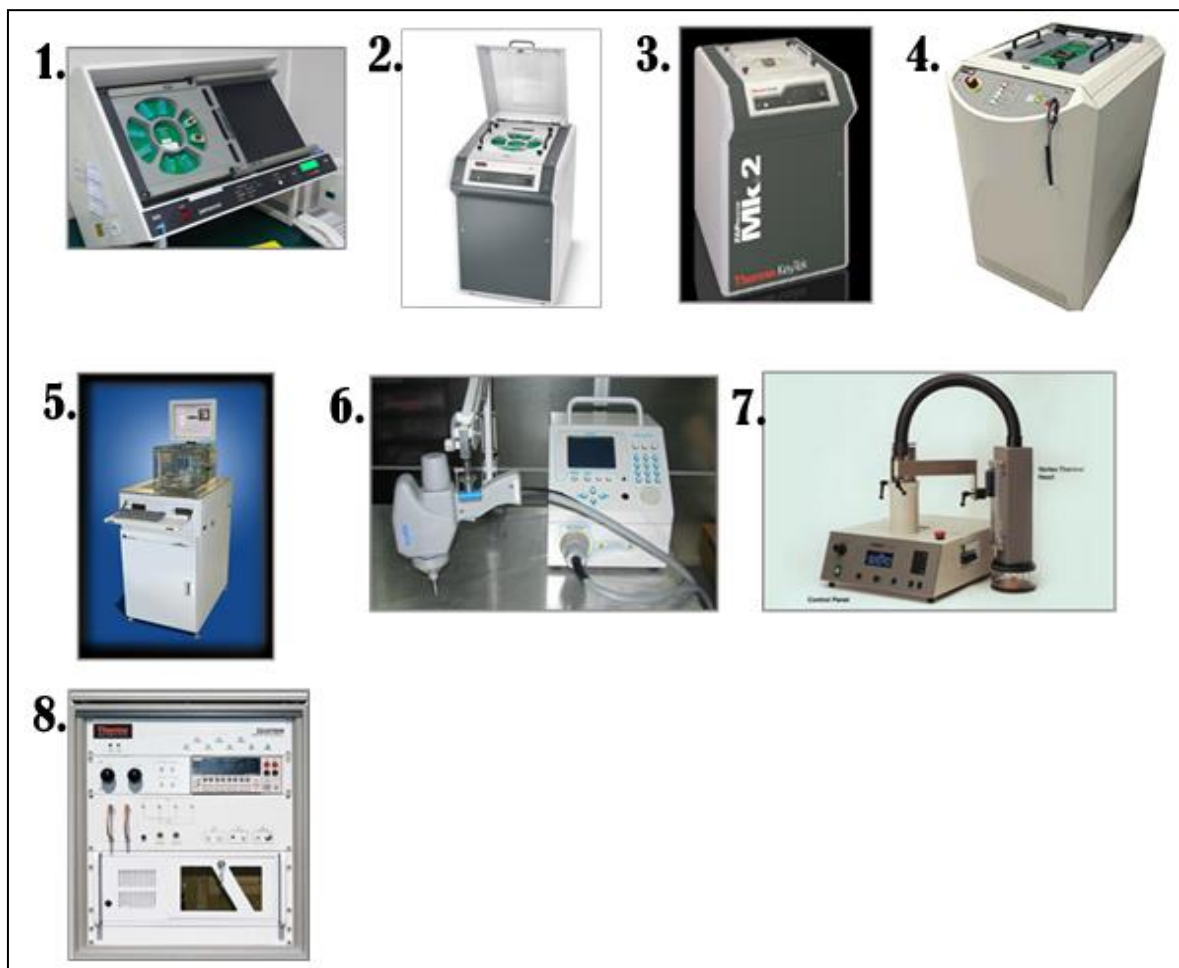


Pass/Fail Criteria:

Variation of Leakage Current and I-V Shift in Pre-Zap and Post-Zap curves

6. APPENDIX-2 (ESD INSTRUMENTATION AT MA-TEK)

No.	Test Tools	Vendors	System Specification
1	Zapmaster	Thermo Keytek	256 Pin Count, ESD Pulse 50 V to 8 KV
2	MK1	Thermo Scientific	256 Pin Count, ESD Pulse 10 V to 8 KV
3	MK2	Thermo Keytek	768 Pin Count, ESD Pulse 10 V to 8 KV
4	MK4	Thermo Scientific	2304 Pin Count, ESD Pulse 10 V to 8 KV
5	CDM Tester	Oryx Orion	100 V to 2 KV
6	ESD Gun	Noiseken	Voltage = 1 KV to 30 KV
7	High Temp. Test Module	Thermonics	Maximum temperature = 150°C.
8	TLP Tester	Thermo Scientific	Voltage = 1 V to 2 KV, Current = 10 nA to 40 A





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