



# AEC (Automotive Electronics Council)

## Q101 TEST REPORT

Report No : <K170316019>

Log-in Date : 2017/03/22

Report Date : 2017/06/15

Prepared by :

**Sirius Liu**

Engineer, Reliability Analysis Division

+886-3-6116678 ext. 6521

E-mail : [ra@ma-tek.com](mailto:ra@ma-tek.com)

Reviewed by:

**Hsin Chang**

Leader, Reliability Analysis Division

+886-3-6116678 ext. 6502

E-mail: [hsinchang@ma-tek.com](mailto:hsinchang@ma-tek.com)

Approved by :

**Nily Chung**

Manager, Reliability Analysis Division

+886-3-6116678 ext. 6535

E-mail : [nilychung@ma-tek.com](mailto:nilychung@ma-tek.com)





# Contents

<b>1</b>	<b>Background Information .....</b>	<b>5</b>
1.1	Customer Information .....	5
1.2	Test Item And Summary .....	5
1.3	Testing Inquiry .....	6
1.4	Lab Accreditation and Certificates .....	6
<b>2</b>	<b>Precondition (PC) .....</b>	<b>7</b>
2.1	Test System .....	7
2.2	Test Flow .....	7
2.3	Test Method and Condition .....	7
2.4	Test Result .....	8
<b>3</b>	<b>Temperature Cycling Test (TC) .....</b>	<b>10</b>
3.1	Test System .....	10
3.2	Test Flow .....	10
3.3	Test Method and Condition .....	10
3.4	Test Result .....	10
<b>4</b>	<b>High Temperature Forward Bias(HTFB) .....</b>	<b>13</b>
4.1	Test System .....	13
4.2	Test Flow .....	13
4.3	Test Method and Condition .....	13
4.4	Test Result .....	14
<b>5</b>	<b>Resistance to Solder Heat (RSH) .....</b>	<b>15</b>
5.1	Test System .....	15
5.2	Test Flow .....	15
5.3	Test Method and Condition .....	15
5.4	Test Result .....	16
<b>6</b>	<b>Solderability (SD).....</b>	<b>24</b>
6.1	Test System .....	24
6.2	Test Flow .....	24
6.3	Test Method and Condition .....	24





Report No. : K170316019

Version : 1

6.4	Test Result .....	25
7	Tin Whisker (WSR) .....	27
7.1	Test System.....	27
7.2	Test Flow .....	27
7.3	Test Method and Condition .....	27
7.4	Test Result .....	27
8	Thermal Resistance (TR) .....	30
8.1	Test System.....	30
8.2	Test Flow .....	30
8.3	Test Method and Condition .....	30
8.4	Test Result .....	30
9	Intermittent Operational Life Test (IOL).....	32
9.1	Test System.....	32
9.2	Test Flow .....	32
9.3	Test Method and Condition .....	32
9.4	Test Result .....	33
10	Wire Bond Integrity Test (WBI).....	34
10.1	Test System.....	34
10.2	Test Flow .....	34
10.3	Test Method and Condition .....	34
10.4	Test Results .....	36
11	Bond Shear Test (BS).....	37
11.1	Test System.....	37
11.2	Test Flow .....	37
11.3	Test Method and Condition .....	37
11.4	Test Results .....	39
12	Human-Body Model (HBM) .....	40
12.1	Test System.....	40
12.2	Test Flow .....	40
12.3	Test Method and Condition .....	40
12.4	Test Results .....	40





Report No. : K170316019

Version : 1

<b>13</b>	<b>Charged-Device Model (CDM)</b> .....	<b>41</b>
13.1	Test System.....	41
13.2	Test Flow .....	41
13.3	Test Method and Condition .....	41
13.4	Test Results .....	41
<b>14</b>	<b>Physical Dimension (PD)</b> .....	<b>42</b>
14.1	Test System.....	42
14.2	Test Flow .....	42
14.3	Test Method and Condition .....	42
14.4	Test Results .....	42





## 1 Background Information

### 1.1 Customer Information

Client : WUHU ANRUI OPTOELECTRONICIS CO.,LTD

### 1.2 Test Item And Summary

Failure criteria: Parts not remaining within  $\pm 20\%$  of the initial reading of each test (with the exception of leakage limits which are not to exceed 10 times the initial value for moisture tests and 5 times the initial value for all others)

Test#	Test Description	ABV	# Lots	S.S.	Fail
1	Preconditioning	PC	Include #3 and #8		0
2	Temperature Cycling Test	TC	3	77	0
3	High Temperature Forward Bias	HTFB	3	77	0
4	Resistance to Solder Heat	RSH	1	30	0
5	Solderability	SD	1	10	0
6	Tin Whisker	WSR	1	5	0
7	Thermal Resistance	TR	1	10	0
8	Intermittent Operational Life	IOL	3	77	0
9	Wire Bond Integrity	WBI	3	5	0
10	Bond Shear	BS	1	10	0
11	ESD-HBM	HBM	1	30	0
12	ESD-CDM	CDM	1	30	0
13	Physical Dimension	PD	1	30	N/A



Report No. : K170316019

Version : 1

### 1.3 Testing Inquiry

Sample Name : AR-3528-110-RL-080

### 1.4 Lab Accreditation and Certificates

Certificated under ISO 9001 : 2008

Accredited under ISO/IECQ 17025 : 2005

IECQ Certificate No : IECQ-L ULTW 09.0002



## 2 Precondition (PC)

### 2.1 Test System

Brand	Model No,	Calibration Valid Date
TERCHY	CK-290-A-1	2017/12/11
TERCHY	MHG-80-2	2017/12/11
TANGTECK	SMD-10-M16HAO	2017/10/04

### 2.2 Test Flow



### 2.3 Test Method and Condition

#### 2.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 2.3.2 Bake condition

Temperature : 125°C

Duration : 24 hours

Reference spec. : JESD22-A113

#### 2.3.3 Soak condition

Temperature : 30°C

Humidity : 60% R.H.

Duration : 192 hours

Reference spec. : JESD22-A113

#### 2.3.4 Reflow condition

Peak temp. : 260°C

Time within 5 °C of the peak temp : at least 30 sec

Duration : 3 times



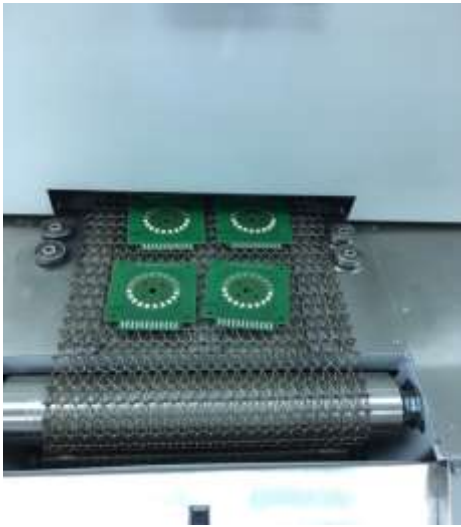
Reference spec. : JESD22-A113

## 2.4 Test Result

Precondition was conducted on 462ea(6 lots) samples.

Visual inspection after tests shows no defects.

### 2.4.1 Setup Photo

	
<p><b>Bake</b></p>	<p><b>Soak</b></p>
	
<p><b>Reflow</b></p>	

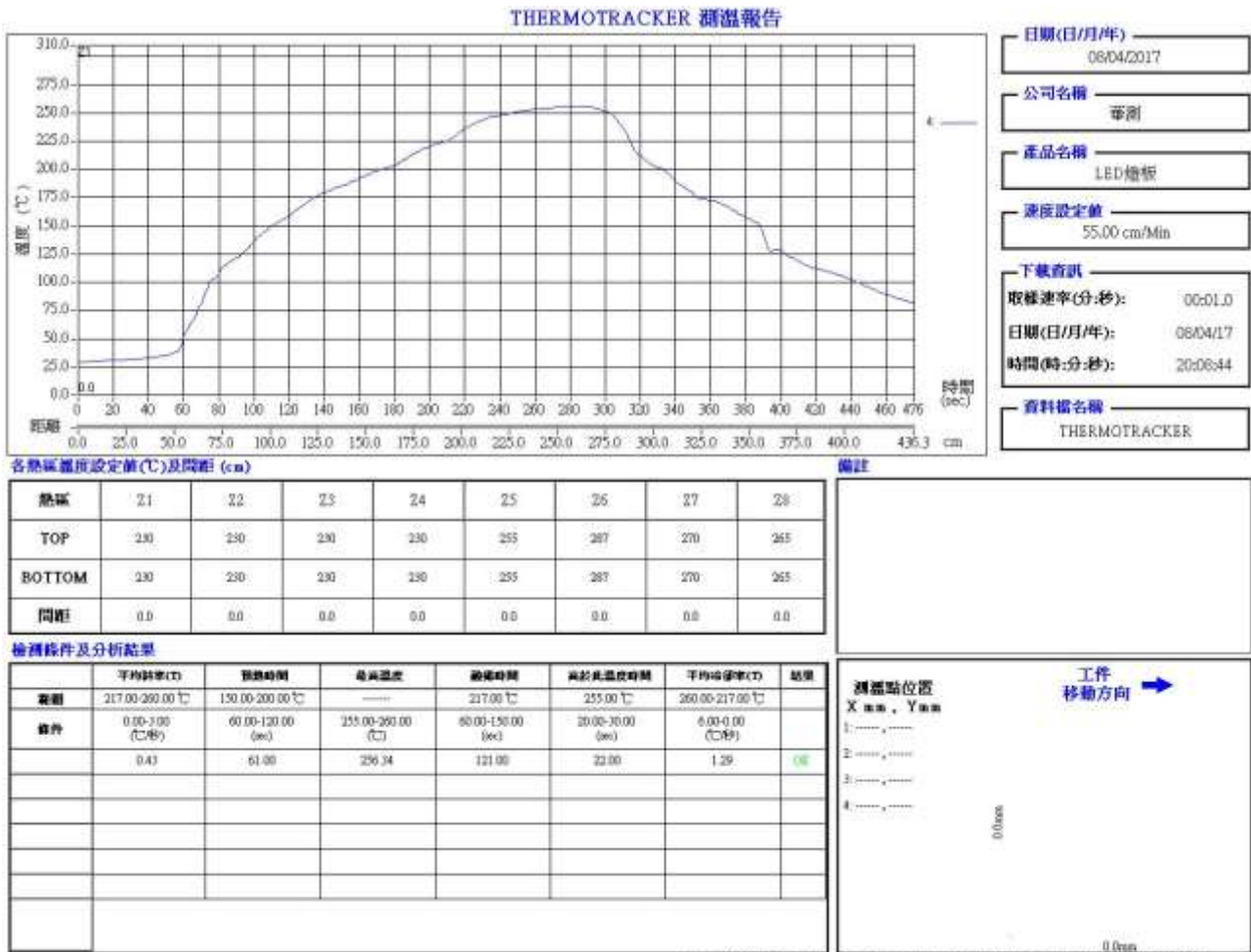




Report No. : K170316019

Version : 1

## 2.4.2 Reflow Profile



Copyright 2007 Tongtech Equipment Incorporated. http://www.tongtech.com.tw PCBNO: 2002084





### 3 Temperature Cycling Test (TC)

#### 3.1 Test System

Brand	Model No,	Calibration Valid Date
ESPEC	TSA-71H-W-2	2017/11/06

#### 3.2 Test Flow



#### 3.3 Test Method and Condition

##### 3.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

##### 3.3.2 Temperature Cycling Test(TCT) condition

Temperature : -40°C/10min~105°C/10min

Duration : 1000 cycles

Reference spec. : JESD22 A104

##### 3.3.3 Destructive Physical Analysis condition

Measuring microscope : 50X

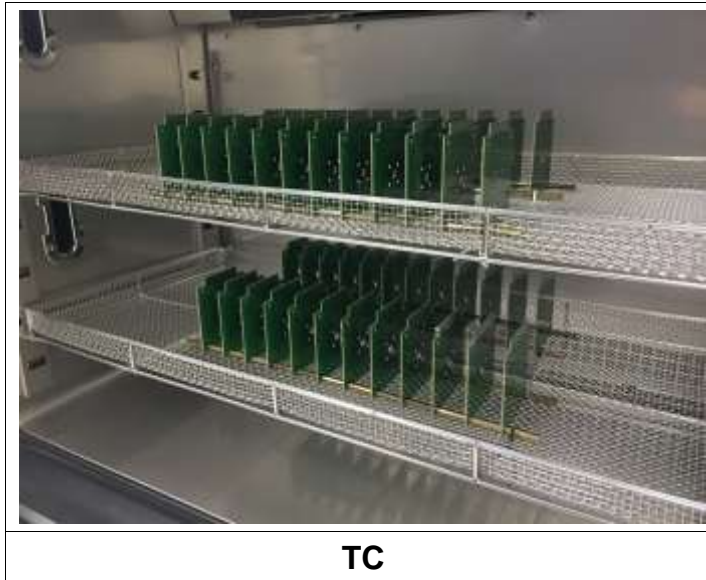
Reference spec. : AEC-Q101-004

#### 3.4 Test Result

Passed in the failure criteria by function test for Vf 、Ir 、CIE 、Luminous Flux.

DPA was not found abnormal of bond of golden wire.

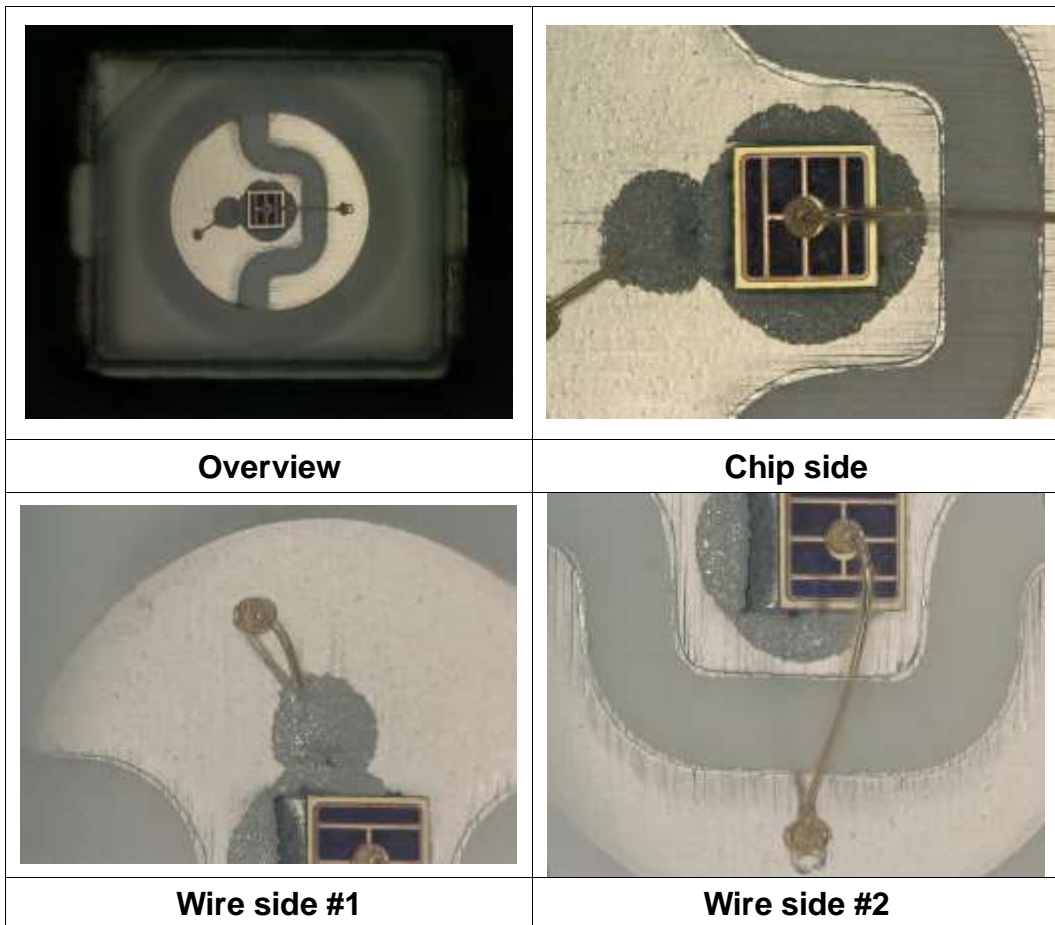
### 3.4.1 Setup Photo



TC

### 3.4.2 Inspection Photo of DPA

#### Sample No. #1

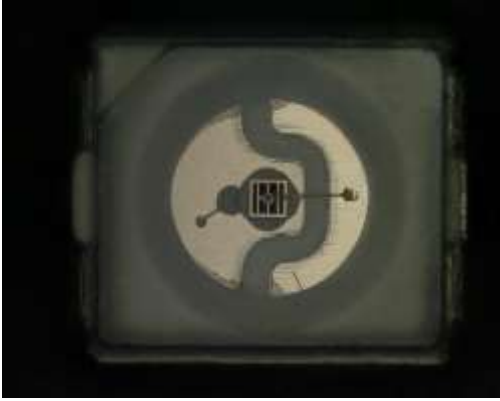







Report No. : K170316019

Version : 1

## Sample No. #2

	
<b>Overview</b>	<b>Chip side</b>
	
<b>Wire side #1</b>	<b>Wire side #2</b>



## 4 High Temperature Forward Bias(HTFB)

### 4.1 Test System

Brand	Model No,	Calibration Valid Date
TERCHY	CK-290-A-6	2017/10/04

### 4.2 Test Flow

NA

### 4.3 Test Method and Condition

#### 4.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 4.3.2 AC (Autoclave) condition

Temperature : 105°C

Voltage : 5V

Duration : 1000 hours

Reference spec. : JESD22 A108

## 4.4 Test Result

Passed in the failure criteria by function test for Vf 、Ir 、CIE 、Luminous Flux.

### 4.4.1 Setup Photo



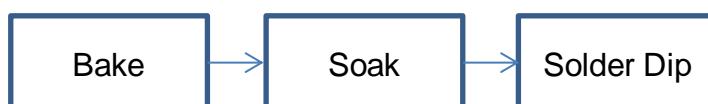
**HTFB**

## 5 Resistance to Solder Heat (RSH)

### 5.1 Test System

Brand	Model No,	Calibration Valid Date
TERCHY	CK290-A-9	2017/06/27
TERCHY	MHG-80-2	2017/12/11
薪誠彬	LF-888	2017/11/07

### 5.2 Test Flow



### 5.3 Test Method and Condition

#### 5.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 5.3.2 Bake condition

Temperature : 125°C

Duration : 24 hours

Reference spec. : JESD22-A111

#### 5.3.3 Soak condition

Temperature : 30°C

Humidity : 60% R.H.

Duration : 192 hours

Reference spec. : JESD22-A111

#### 5.3.4 Solder Dip

Solder : SAC305

Flux : SM-816 (ROL1)

Temperature : 260 °C

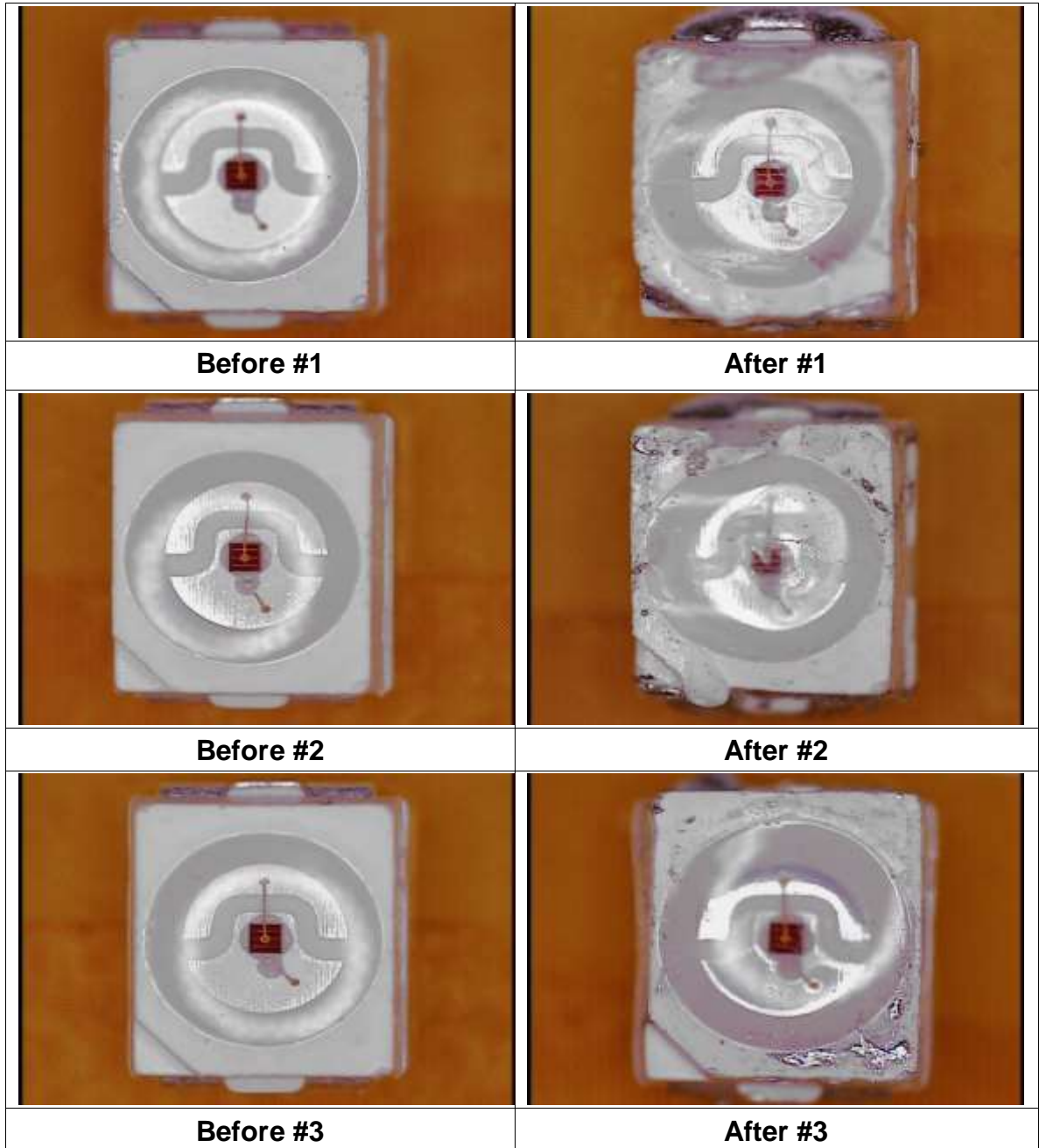
Duration : 10 sec

Reference spec. : JESD22-A111

## 5.4 Test Result

Visual inspection was not found abnormal.

### 5.4.1 Inspection photo of RSH

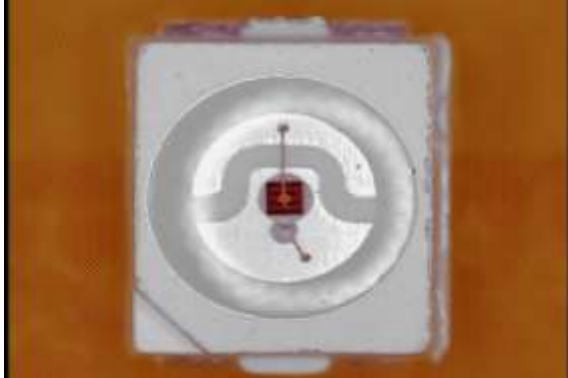
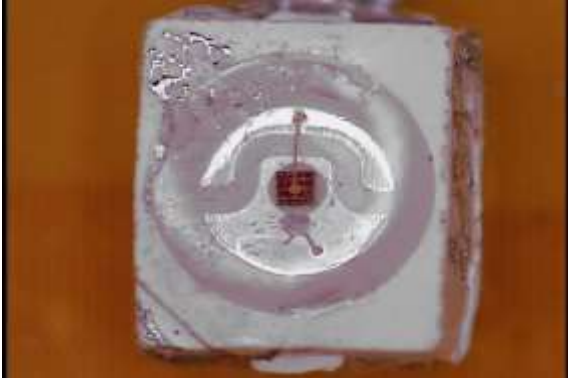
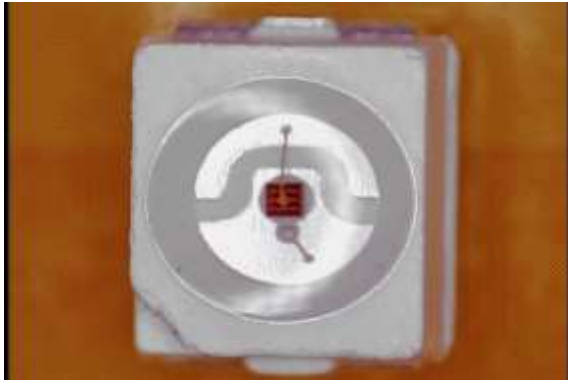




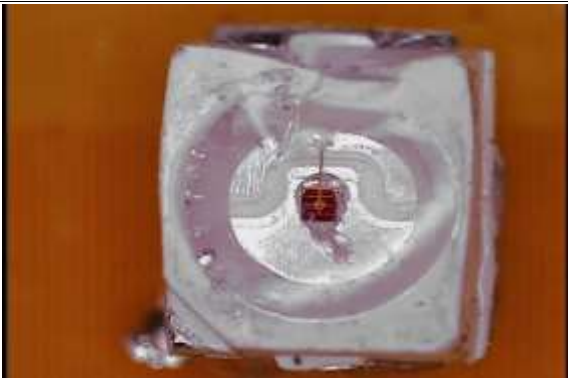






Report No. : K170316019

Version : 1

	
<b>Before #4</b>	<b>After #4</b>
	
<b>Before #5</b>	<b>After #5</b>
	
<b>Before #6</b>	<b>After #6</b>
	
<b>Before #7</b>	<b>After #7</b>



Proprietary. DO NOT COPY WITHOUT PERMISSION

The content of this report is ONLY valid to the case of corresponding report number. Any page, or pages, of this report can not be used separately.

Page: 17

Date: 2017/6/16

Report No. : K170316019

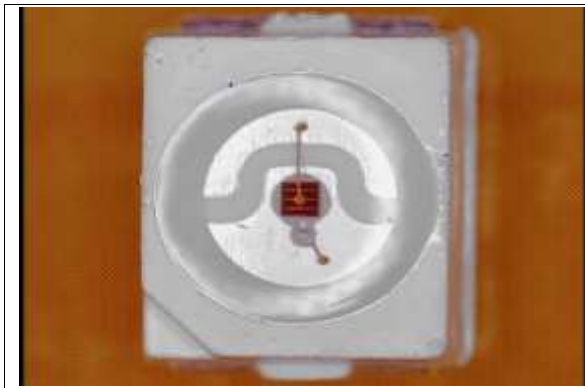

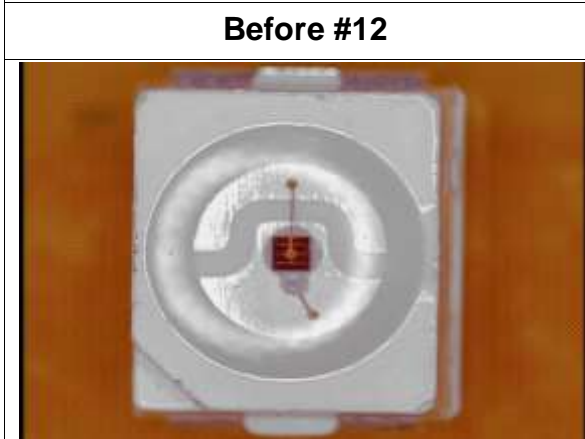

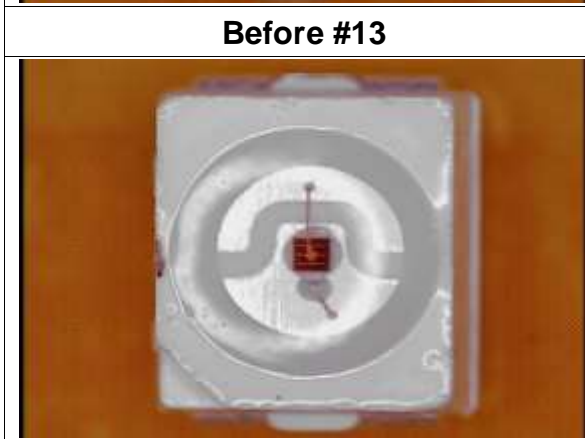
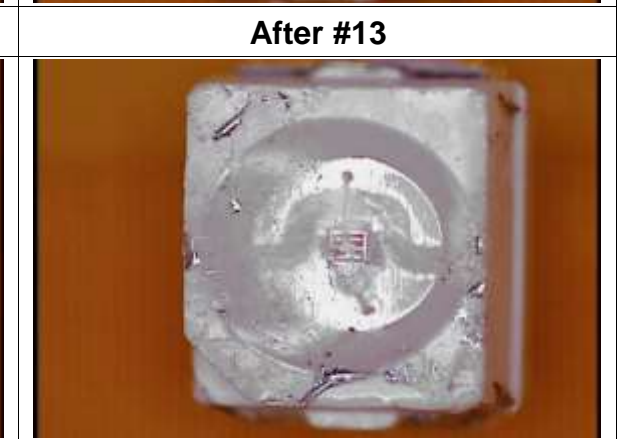
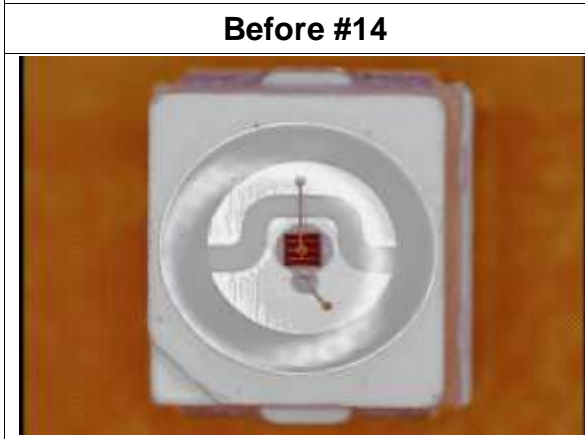
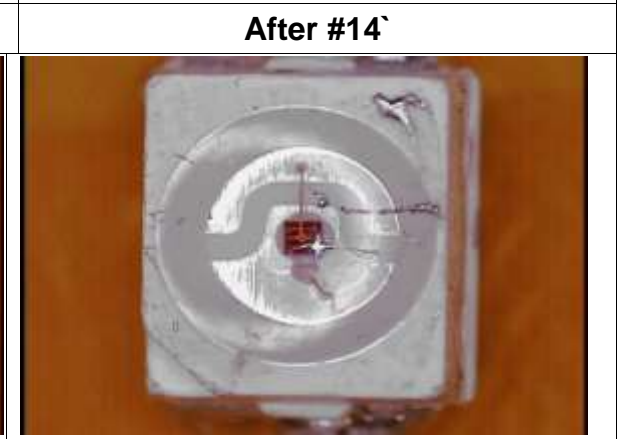
Version : 1

<p align="center"><b>Before #8</b></p>	<p align="center"><b>After #8</b></p>
<p align="center"><b>Before #9</b></p>	<p align="center"><b>After #9</b></p>
<p align="center"><b>Before #10</b></p>	<p align="center"><b>After #10</b></p>
<p align="center"><b>Before #11</b></p>	<p align="center"><b>After #11</b></p>



Report No. : K170316019

Version : 1

	
Before #12	After #12
	
Before #13	After #13
	
Before #14	After #14
	
Before #15	After #15



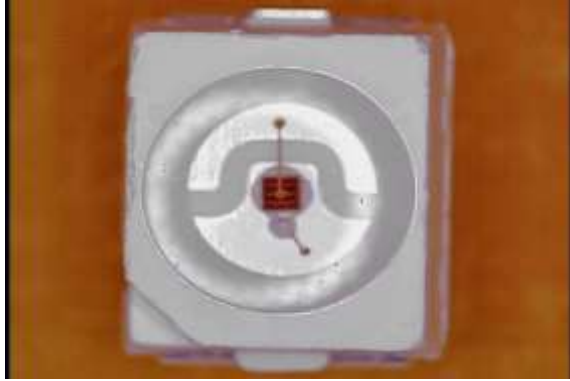
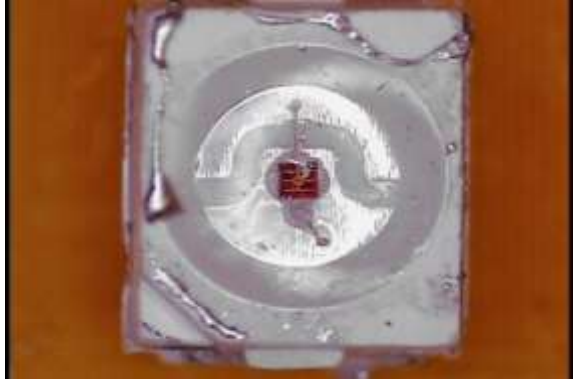
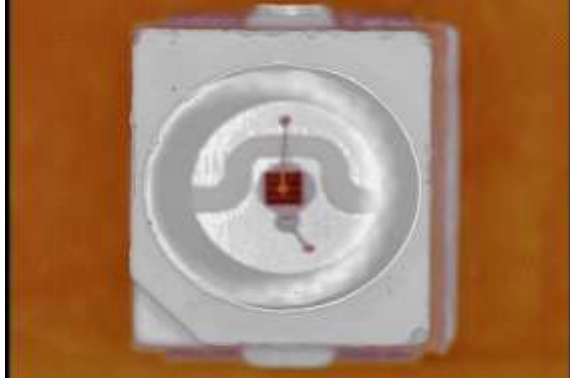

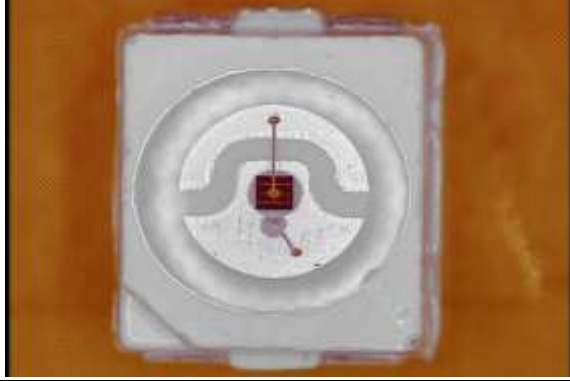



Proprietary, DO NOT COPY WITHOUT PERMISSION

The content of this report is ONLY valid to the case of corresponding report number. Any page, or pages, of this report can not be used separately.



Report No. : K170316019

Version : 1

	
<b>Before #16</b>	<b>After #16</b>
	
<b>Before #17</b>	<b>After #17</b>
	
<b>Before #18</b>	<b>After #18</b>
	
<b>Before #19</b>	<b>After #19</b>



Proprietary. DO NOT COPY WITHOUT PERMISSION

The content of this report is ONLY valid to the case of corresponding report number. Any page, or pages, of this report can not be used separately.


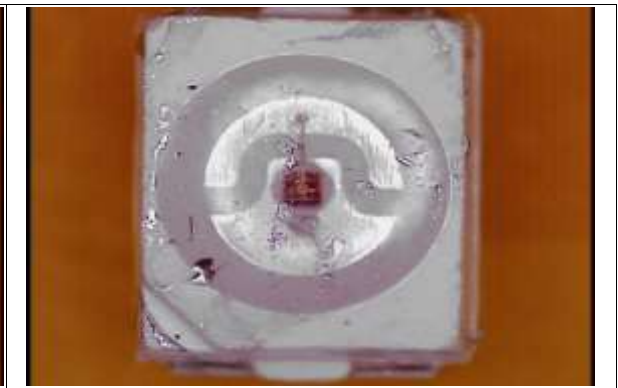
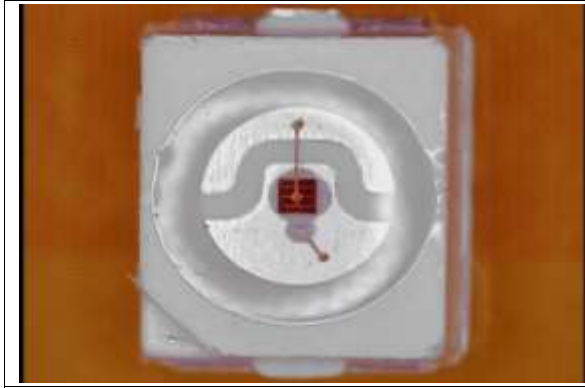
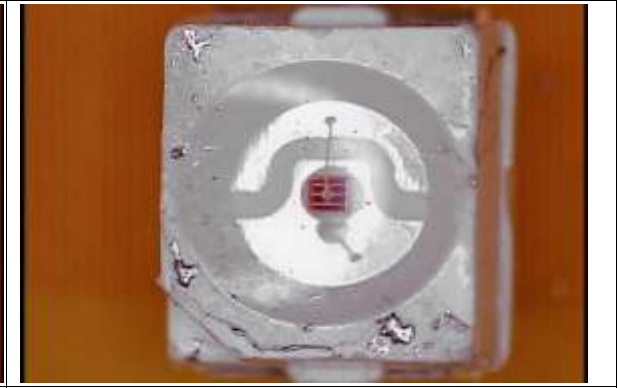
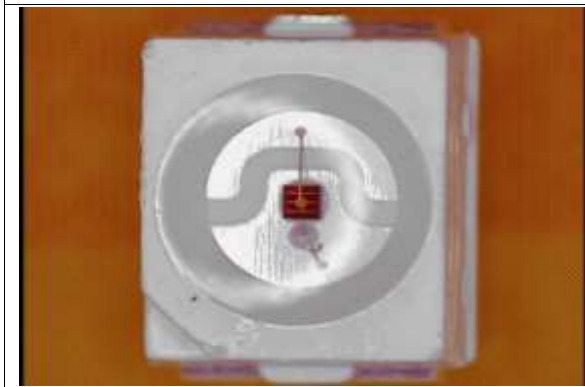
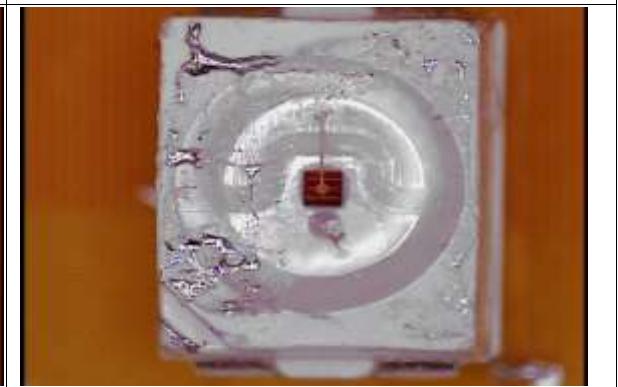
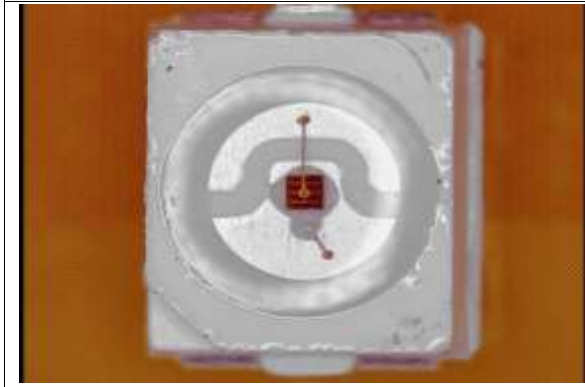

Page: 20

Date: 2017/6/16



Report No. : K170316019

Version : 1

	
<b>Before #20</b>	<b>After #20</b>
	
<b>Before #21</b>	<b>After #21</b>
	
<b>Before #22</b>	<b>After #22</b>
	
<b>Before #23</b>	<b>After #23</b>



Proprietary, DO NOT COPY WITHOUT PERMISSION

The content of this report is ONLY valid to the case of corresponding report number. Any page, or pages, of this report can not be used separately.


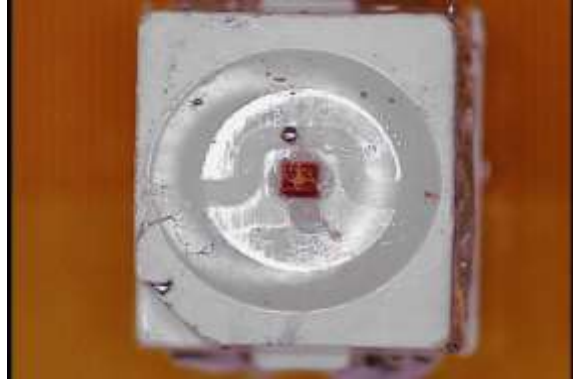
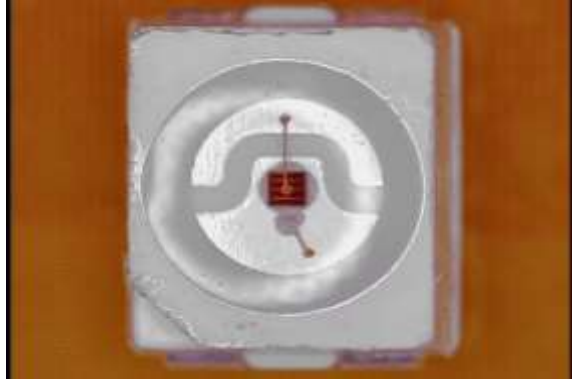
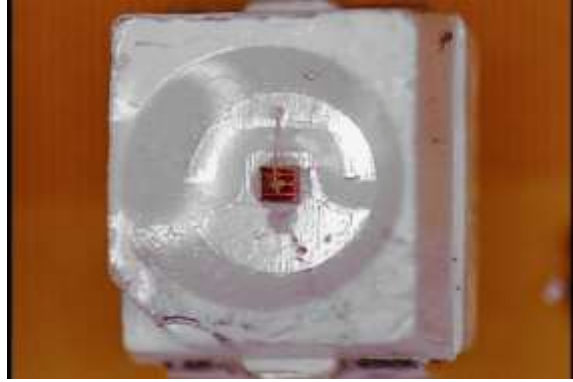
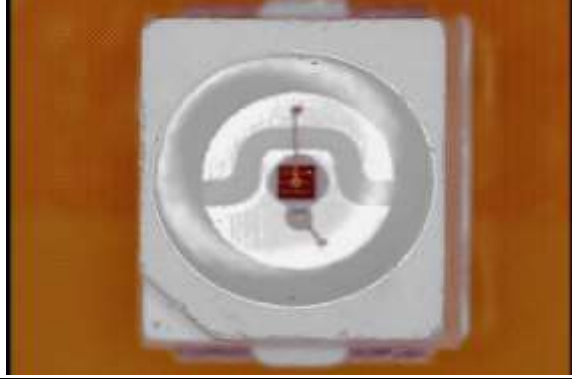



Page: 21

Date: 2017/6/16



Report No. : K170316019

Version : 1

	
Before #24	After #24
	
Before #25	After #25
	
Before #26	After #26
	
Before #27	After #27



Proprietary, DO NOT COPY WITHOUT PERMISSION

The content of this report is ONLY valid to the case of corresponding report number. Any page, or pages, of this report can not be used separately.

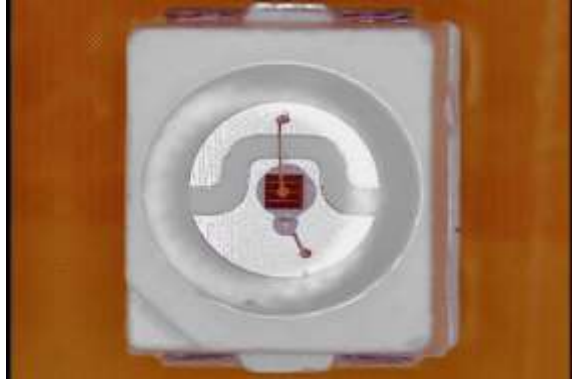
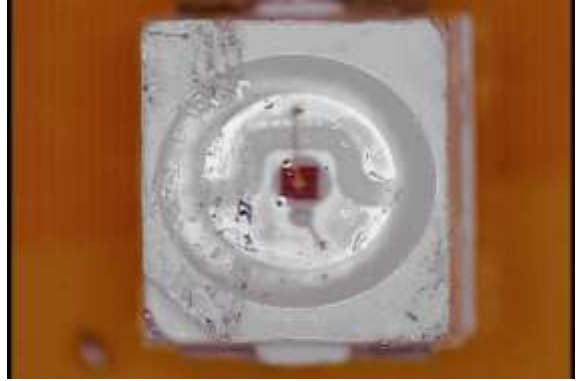
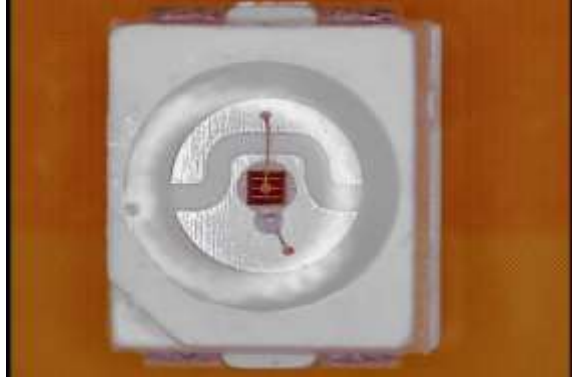
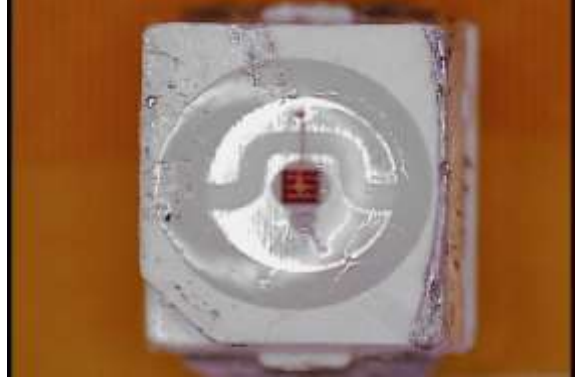
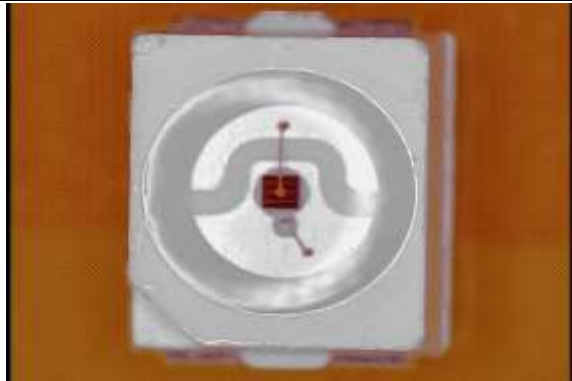
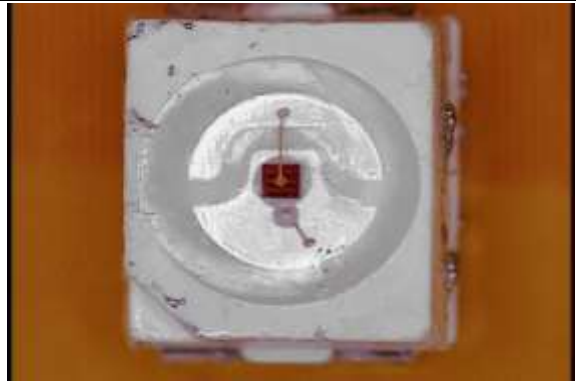
Page: 22

Date: 2017/6/16



Report No. : K170316019

Version : 1

	
<b>Before #28</b>	<b>After #28</b>
	
<b>Before #29</b>	<b>After #29</b>
	
<b>Before #30</b>	<b>After #30</b>



## 6 Solderability (SD)

### 6.1 Test System

Brand	Model No,	Calibration Valid Date
GIANT FORCE	GSAT-025	2017/09/01
薪誠彬	LF-888	2017/11/07

### 6.2 Test Flow



### 6.3 Test Method and Condition

#### 6.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 6.3.2 Steam Aging

Temperature : 93°C /+3 °C,-5 °C

Duration : 8 hours

Reference spec. : J-STD-002D

#### 6.3.3 Solderability

Solder : SAC305

Flux : SM-816 (ROL1)

Temperature : 245 °C

Duration : 5 sec

Reference spec. : J-STD-002D





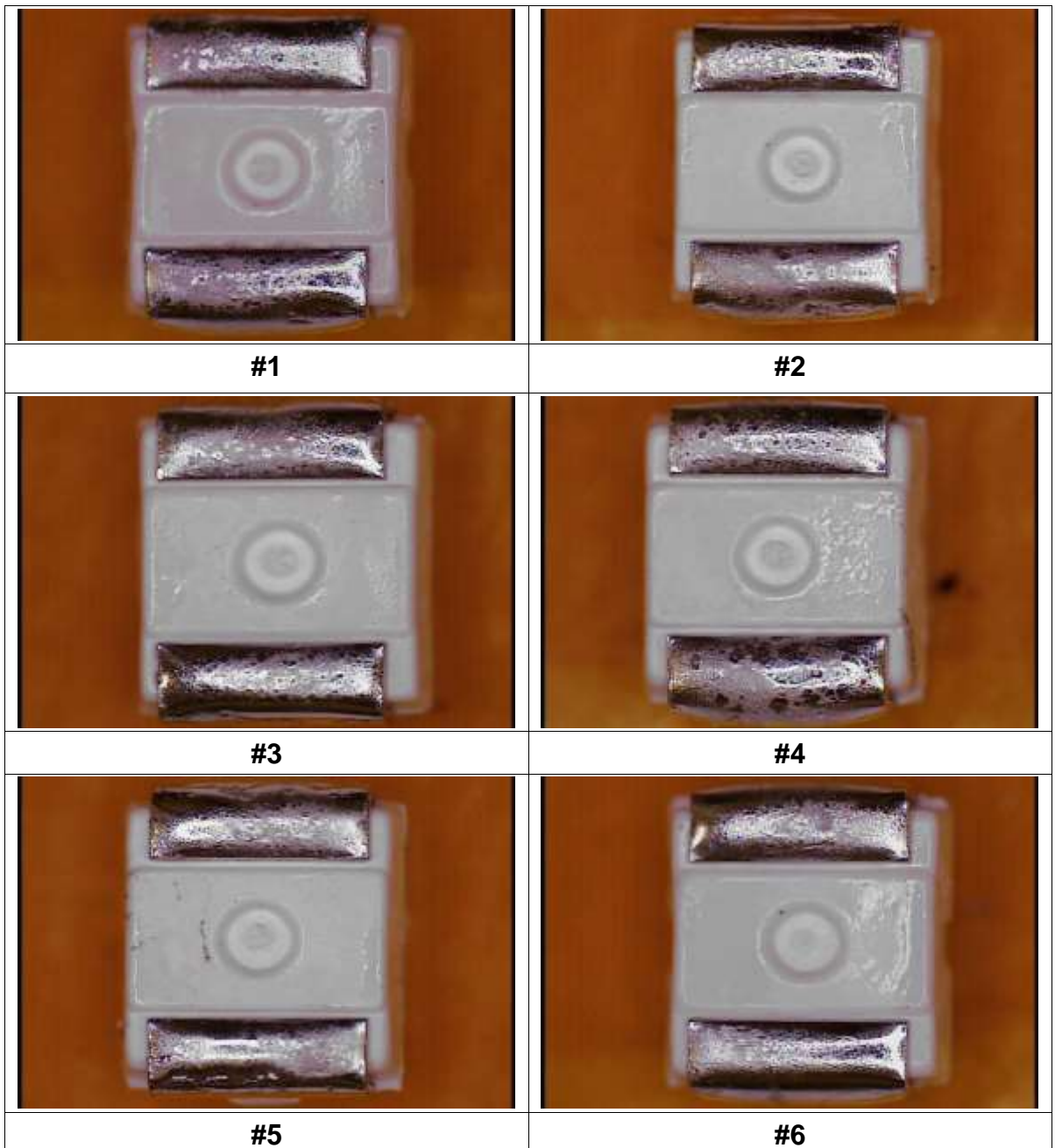
Report No. : K170316019

Version : 1

## 6.4 Test Result

Criteria : Wetting Area > 95%

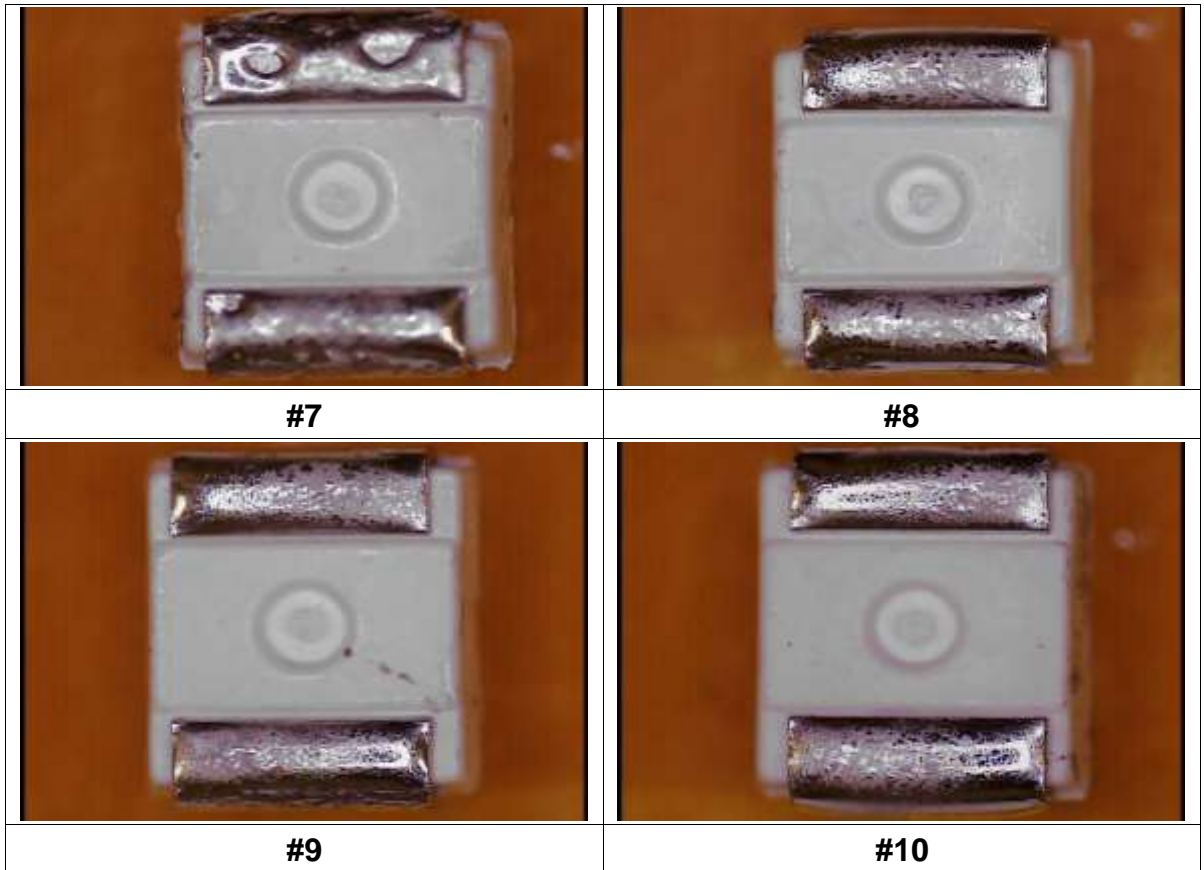
### 6.4.1 Test Records





Report No. : K170316019

Version : 1



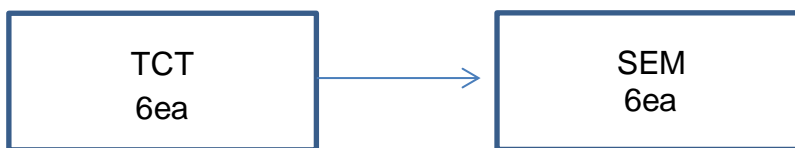


## 7 Tin Whisker (WSR)

### 7.1 Test System

Brand	Model No,	Calibration Valid Date
ESPEC	TSA-71H-W-3 (TCT-03)	2017/11/09

### 7.2 Test Flow



### 7.3 Test Method and Condition

#### 7.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 7.3.2 Temperature Cycling Test (TCT) condition

Temperature : -55°C/10min~85°C/10min

Duration : 1500 cycles

Reference spec. : JESD201A

### 7.4 Test Result

TCT was conducted on 6 samples.

Visual inspection after tests shows no defects.

## Setup Photo



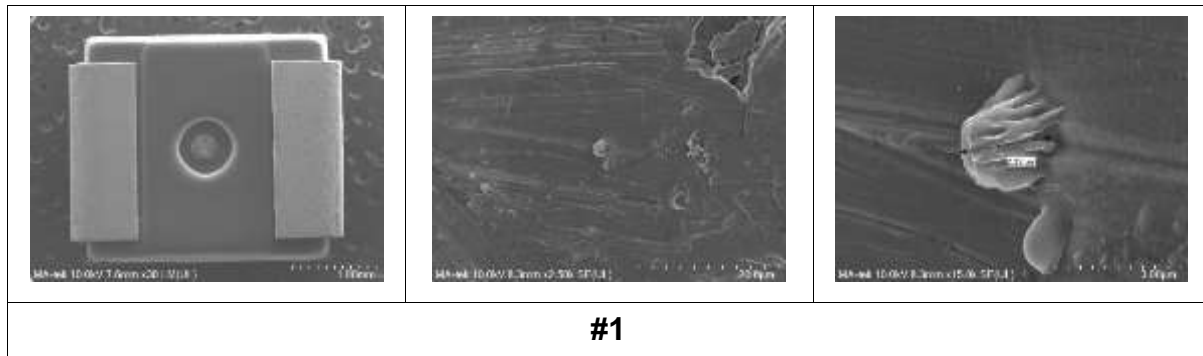
### 7.4.1 Measurements (TCT)

Failure Criteria : any tin whisker >45μm

No.	Measure Value
1	2.23μm
2	1.28μm
3	NA
4	NA
5	1.64μm
6	NA

N.D. stands for Not Detected

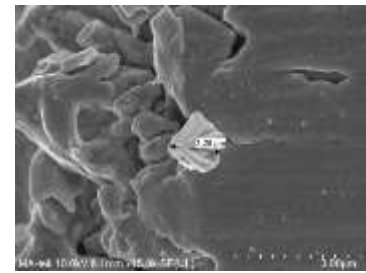
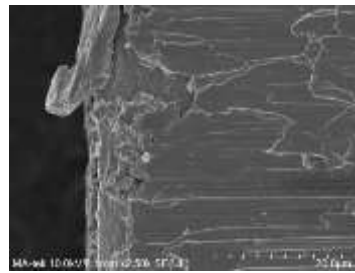
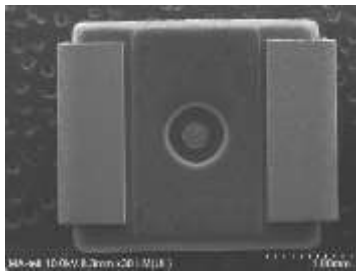
### 7.4.2 SEM(TCT) Photo



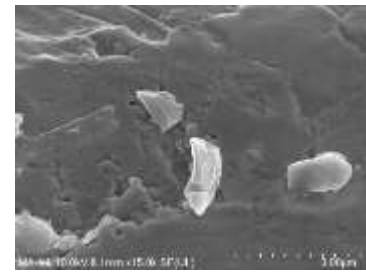
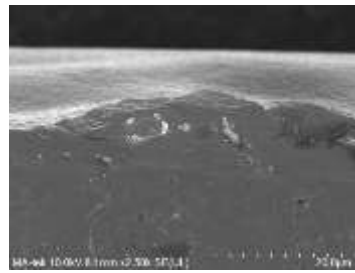
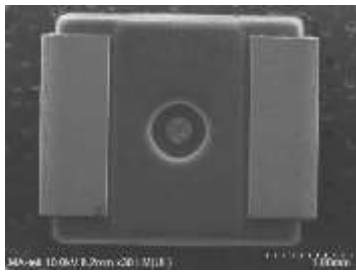


Report No. : K170316019

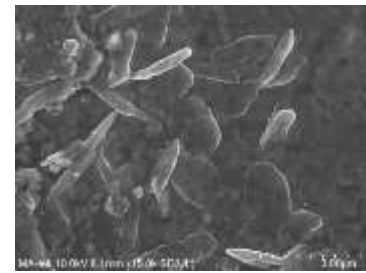
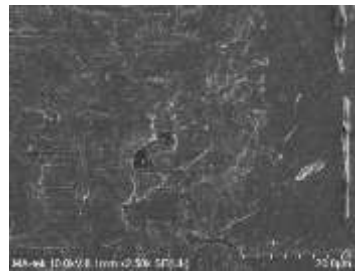
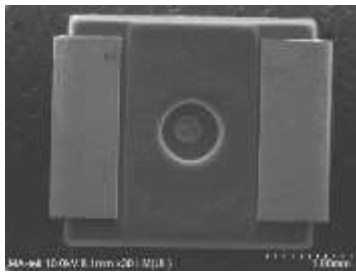
Version : 1



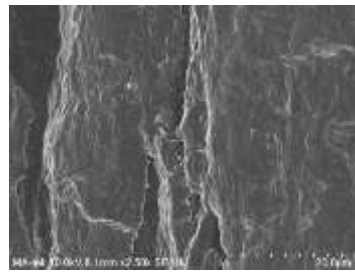
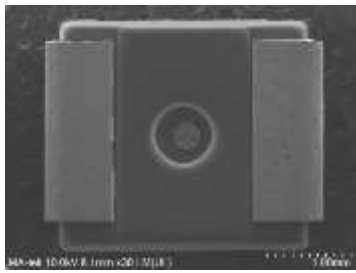
#2



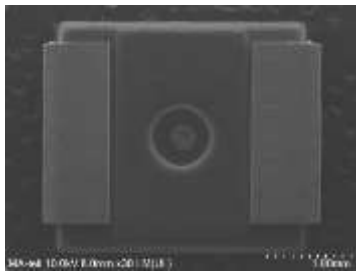
#3



#4



#5



#6



Proprietary. DO NOT COPY WITHOUT PERMISSION

The content of this report is ONLY valid to the case of corresponding report number. Any page, or pages, of this report can not be used separately.

## 8 Thermal Resistance (TR)

### 8.1 Test System

Brand	Model No,	Calibration Valid Date
T3Ster	2000/100	2017/09/13

### 8.2 Test Flow

NA

### 8.3 Test Method and Condition

#### 8.3.1 Laboratory Environmental

Temperature :  $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$

Humidity :  $55\% \text{R.H} \pm 15\%$

#### 8.3.2 Thermal Resistance condition

$I_f: 25\text{mA}$

$V_f: 5\text{V}$

Power:  $0.048\text{W}$

Reference spec. : JESD24-3

### 8.4 Test Result

#### 8.4.1 Setup Photo



TR



Report No. : K170316019

Version : 1

### 8.4.2 Measurement result

Sample No.	Ta (°C)	Rthjc (K/W)
WLED-1	25	33.61
WLED-2	25	36.73
WLED-3	25	35.83
WLED-4	25	33.76
WLED-5	25	36.35
WLED-6	25	35.96
WLED-7	25	31.05
WLED-8	25	35.38
WLED-9	25	32.37
WLED-10	25	33.01

## 9 Intermittent Operational Life Test (IOL)

### 9.1 Test System

Brand	Model No,	Calibration Valid Date
TERCHY	CK-290-A-7	2017/08/29

### 9.2 Test Flow



### 9.3 Test Method and Condition

#### 9.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 9.3.2 15 Intermittent Operational Life Test (IOL)condition

Temperature : 25 °C

I<sub>f</sub> : 25 mA

V<sub>f</sub> : 5 V

On / Off time : 2 min. / 2 min.

Duration : 15,000 cycles

Reference spec. : MIL-STD-750 Method 1037



## 9.4 Test Result

Passed in the failure criteria by function test for Vf 、 Ir 、 CIE 、 Luminous Flux.

### 9.4.1 Setup Photo



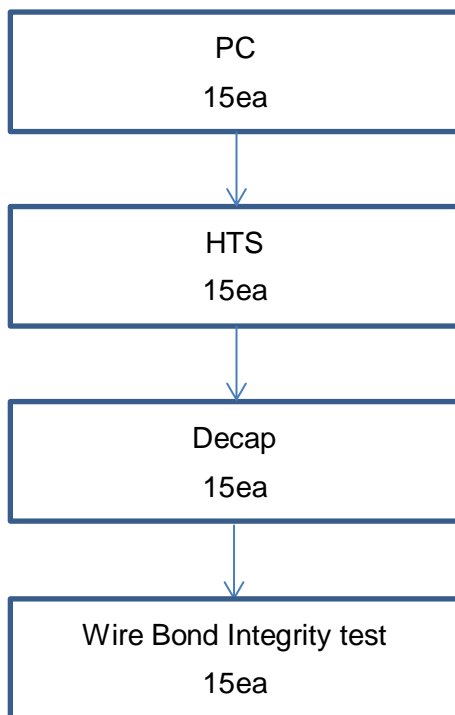


## 10 Wire Bond Integrity Test (WBI)

### 10.1 Test System

Brand	Model No,	Calibration Valid Date
XYZTEC	XYZTEC Condor sigma	2017/05/09
TERCHY	CK-290-A6	2017/10/04

### 10.2 Test Flow



### 10.3 Test Method and Condition

#### 10.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 10.3.2 High Temperature Storage Test (HTS)

Temperature : 105°C

Duration : 500 hours

Reference spec. : JEDS22 A103

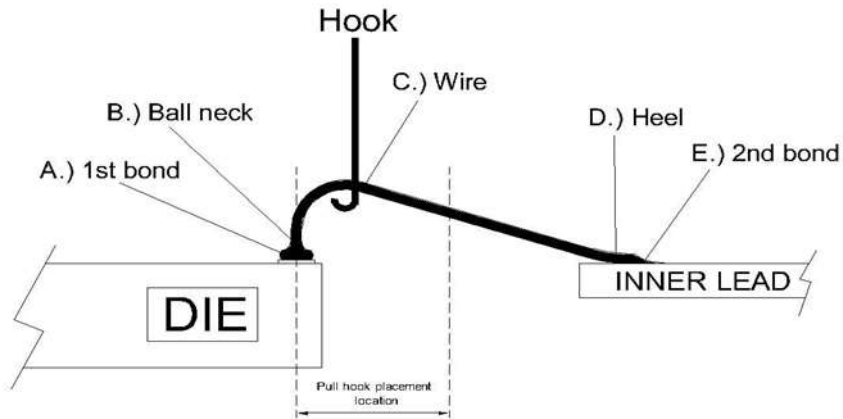
### 10.3.3 Wire Bond Integrity test

Test speed : 300 um/s

Test load : 50 g

Reference spec : MIL-STD-750 Method 2037

Break position





Report No. : K170316019

Version : 1

## 10.4 Test Results

The Wire pull test result was found as below:

Sample no.	Shear mode	Value(g)
RL #1	Neck (position. B)	9.95
RL #2	Neck (position. B)	10.92
RL #3	Neck (position. B)	11.38
RL #4	Neck (position. B)	11.24
RL #5	Neck (position. B)	9.95
RL #6	Neck (position. B)	10.43
RL #7	Neck (position. B)	10.24
RL #8	Neck (position. B)	10.7
RL #9	Neck (position. B)	10.35
RL #10	Neck (position. B)	11.03
RL #11	Neck (position. B)	10.77
RL #12	Neck (position. B)	10.32
RL #13	Neck (position. B)	10.06
RL #14	Neck (position. B)	10.95
RL #15	Neck (position. B)	10.24
Calculation item	Test value	
<b>Minimum</b>	<b>9.95</b>	
<b>Maximum</b>	<b>11.38</b>	
<b>Mean</b>	<b>10.57</b>	
<b>Range</b>	<b>1.43</b>	
<b>Sigma</b>	<b>0.46</b>	
<b>CPK</b>	<b>5.43</b>	

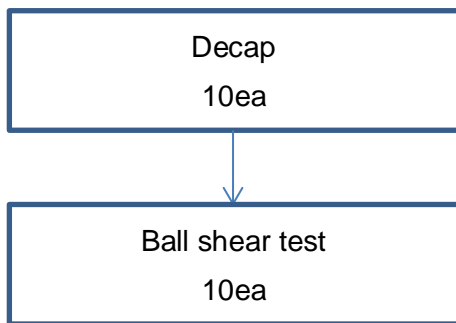


## 11 Bond Shear Test (BS)

### 11.1 Test System

Brand	Model No,	Calibration Valid Date
XYZTEC	XYZTEC Condor sigma	2017/05/09

### 11.2 Test Flow



### 11.3 Test Method and Condition

Specification : AEC-Q101-003

Environmental Temperature / Humidity : 25°C±5°C / 55%RH ± 10 %RH

Test Condition :

Item	Condition
1. Machine type.	XYZTEC Condor sigma
2. Test speed.	350 um/s
3. Test load.	500 g
4. Land speed.	500 um/s
5. Shear height.	25 um
6. Overtiavel.	0 um
7. Shear tool.	12 mil

Shear mode : refer to AEC-Q101-003 figure 3

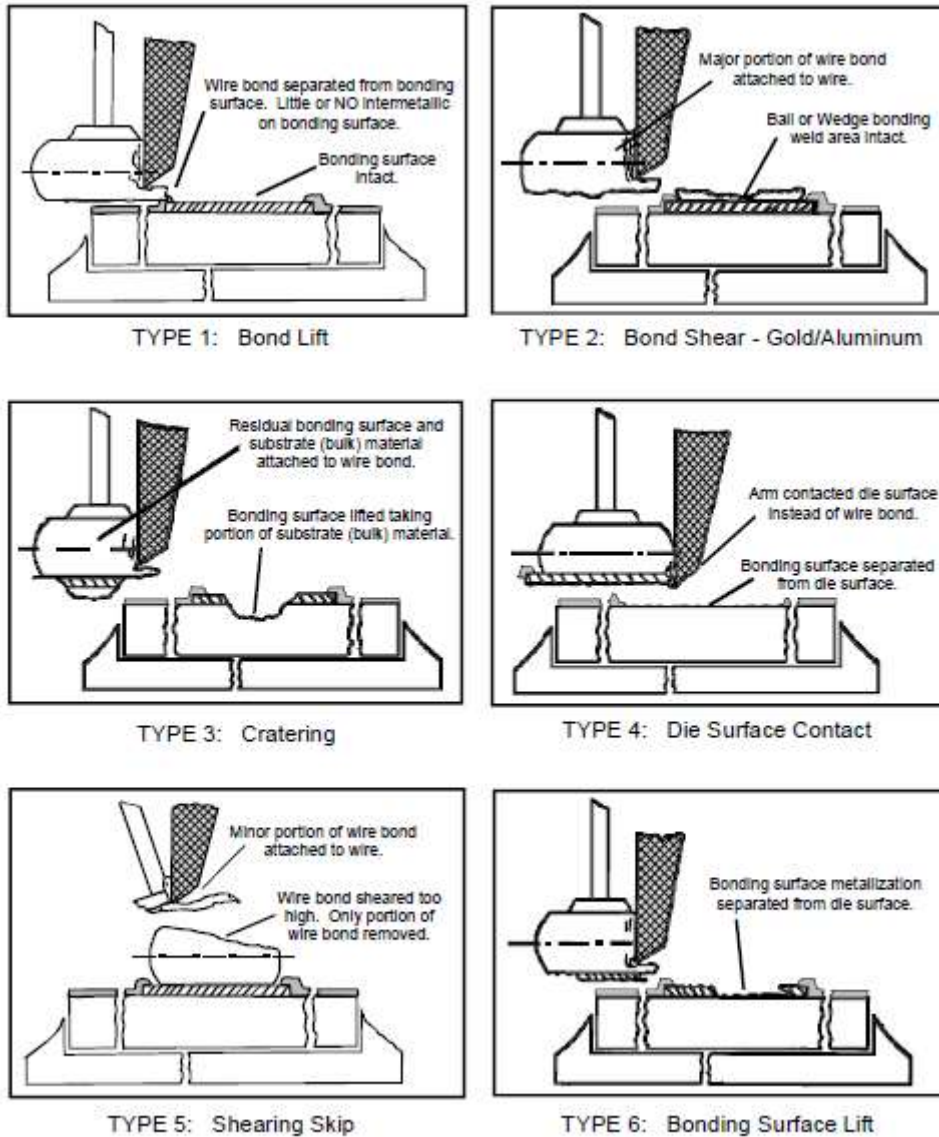


Figure 3: Wire Bond Shear Types \*



Report No. : K170316019

Version : 1

## 11.4 Test Results

The Shear test result was found as below:

Sample no.	Shear mode	Value(kg)
RL #1	1	0.268
RL #2	1	0.214
RL #3	1	0.323
RL #4	1	0.143
RL #5	1	0.253
RL #6	1	0.211
RL #7	1	0.325
RL #8	1	0.321
RL #9	1	0.165
RL #10	1	0.112
Calculation item	Test value	
Minimum	0.112	
Maximum	0.342	
Mean	0.26	
Range	0.23	
Sigma	0.07	
CPK	0.83	



Report No. : K170316019

Version : 1

## 12 Human-Body Model (HBM)

### 12.1 Test System

Brand	Model No,	Calibration Valid Date
Thermo Fisher	Zap Master MK.2	2018/02/05

### 12.2 Test Flow

NA

### 12.3 Test Method and Condition

#### 12.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 12.3.2 ESD Test Condition

Interval : &gt; 0.5S

Zap : 3 pulse

Testing Combinations : All to Base , All to Collector , All to Emitter

Reference spec. : AEC-Q101-001 Rev.A

### 12.4 Test Results

Sensitivity Pass: <a href="#">±8000V</a>  <a href="#">Class-H3A</a>  <a href="#">AEC_Q101-001-Rev-A</a> H0 : ≤ 250 H1A: >250 to ≤ 500 H1B: >500 to ≤ 1000 H1C: >1000 to ≤ 2000 H2: >2000 to ≤ 4000 H3A: >4000 to ≤ 8000 H3B: >8000	Pin Combination	Sample	Pass Level
	Anode(+)-Cathode (±2000V)	10	±2000V
	Anode(+)-Cathode (±6000V)	10	±6000V
	Anode(+)-Cathode (±8000V)	10	±8000V

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







## 13 Charged-Device Model (CDM)

### 13.1 Test System

Brand	Model No,	Calibration Valid Date
Thermo Fisher	Orion	2018/01/23

### 13.2 Test Flow

NA

### 13.3 Test Method and Condition

#### 13.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 13.3.2 ESD Test Condition

Interval : &gt; 1S

Zap : 3 pulse

Test Humidity : &lt; 30%R.H

Test Pin : Base , Collector , Emitter

Reference spec. : AEC-Q101-005

### 13.4 Test Results

<b>Sensitivity Pass: ±1000V</b>  <b>Class-C4</b>  <b>AEC-Q101-005</b>  Class-C0 : ≤125V Class-C1 : >125V to ≤250V Class-C2 : >250V to ≤500V Class-C3 : >500V to ≤750V Class-C4 : >750V to ≤1000V Class-C5 : >1000V	Pin Combination	Sample	Pass Level
	All pins_±500V	10	±500V
	All pins_±750V	10	±750V
	All pins_±1000V	10	±1000V

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





## 14 Physical Dimension (PD)

### 14.1 Test System

Brand	Model No,	Calibration Valid Date
Nikon	MM-60	NA

### 14.2 Test Flow

NA

### 14.3 Test Method and Condition

#### 14.3.1 Laboratory Environmental

Temperature : 25°C ± 10 °C

Humidity : 55%R.H ± 15%

#### 14.3.2 Test Method

I Verify physical dimensions to the applicable user part packaging specification for dimensions and tolerances.

Reference spec. : JEDS22 B100

### 14.4 Test Results

Sample No.	AR-3528-110-RL-080		Unit: cm
	Length	Width	Height
RL1	2.752	3.451	1.753
RL2	2.761	3.428	1.784
RL3	2.751	3.404	1.754
RL4	2.753	3.440	1.759
RL5	2.750	3.433	1.768
RL6	2.771	3.435	1.756
RL7	2.770	3.437	1.797
RL8	2.762	3.435	1.764
RL9	2.767	3.437	1.761
RL10	2.766	3.438	1.762
RL11	2.767	3.435	1.762
RL12	2.754	3.421	1.759



Report No. : K170316019

Version : 1

Sample No.	AR-3528-110-RL-080		Unit: cm
	Length	Width	Height
RL13	2.771	3.433	1.776
RL14	2.758	3.454	1.787
RL15	2.762	3.464	1.801
RL16	2.754	3.436	1.791
RL17	2.751	3.436	1.868
RL18	2.754	3.459	1.763
RL19	2.764	3.476	1.768
RL20	2.773	3.472	1.778
RL21	2.754	3.474	1.786
RL22	2.772	3.464	1.771
RL23	2.763	3.464	1.772
RL24	2.753	3.461	1.781
RL25	2.756	3.449	1.777
RL26	2.761	3.433	1.779
RL27	2.753	3.435	1.779
RL28	2.771	3.434	1.767
RL29	2.755	3.446	1.763
RL30	2.754	3.436	1.761

