![ABRACON logo] **ABRACON** LLC *The Power of Linking Together*	**RMA No.: 2644**	**[Final] 8D Report**	**Completed Report** **Date: 08/13/18**
5101 Hidden Creek Lane **Spicewood, TX 78669 USA**	**Customer:**	**Open Source Instruments**	
Product:	**MEMS Oscillator**	**Customer Contact:**	**Kevan Hashemi**
Part Number:	**ASTMTXK-32.768KHZ-NG-T**	**Qty. Delivered:**	**4 units**
Affected D/C	**1529**	**Qty. Rejected:**	
Affected PO:		**Qty. Returned for Analysis:**	**4 units**
Date Reported:	**06/26/18**	**Distributor/Contract Manufacturer/Other:**	**Digikey**

D1 Establishing the Team	D2 Problem/Defect Description
Quality Assurance Manager: Team Members:	**Reuben Quintanilla** **Stephanie Jones – Quality Coordinator**	**Customer Statement:** **"FA units had no output (did not oscillate), but consumed 30 to 300 uA and some units had variable frequency (4-8 kHz) and consumed 300 uA. The reported failure rate was 1.15 % (23/2000)"**

D3 Containment Action(s)	Responsibility	Date Completed
➤ Approve and conduct failure analysis of suspected failing parts.	Stephanie Jones	06/26/18

D4 Root Cause – <u>Failure Analysis Data</u>	Responsibility	Date Completed
➤ Based off of all testing and analysis, most likely the cause of reported no output and unstable frequency, is the damage to CMOS die. ➤ This could be caused by handling or manual mouting related stress. ➤ **Please review below for further analysis results.**	Stephanie Jones	08/12/18

D5 Corrective Action(s)	Responsibility	Date Completed
➤		

D6 Corrective Action Implementation and Validation	Responsibility	Date Completed
➤		

D7 Preventive Action(s)	Responsibility	Date Completed
➤		

D8 Verification of Effectiveness	Responsibility	Date Completed
➤		

Supporting Documents (PFMEA, Control Plan, Sample Test Data, Inspection Record, etc)

Follow-up Required/Remarks

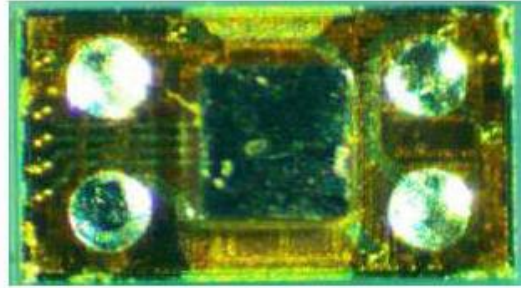## Failure Analysis Data:

Visual Inspection:

Visual inspection:
Top and bottom view inspection was done for all units. No obvious anomalies were found. The units were demounted units. Figure-1 and Figure-2 show the Incoming Inspection images for SN2, as an example.

Figure 1: Incoming Inspection SN2- Top View	Figure 2: Incoming Inspection SN2- Bottom View

Function Test:

Bench Testing:
The units were tested on bench using socketed evaluation board. One unit (SN2) passed bench test with proper frequency output and Idd current. Other three units showed unstable frequency output. MEMS Q was measured for two units which had stable frequency enough to measure MEMS Q, and both units showed proper MEMS Q.

ATE Testing:
All units were tested on production automatic test equipment (ATE) tester with units loaded in socket. SN2 passed and three units (SN1, SN3, and SN4) failed ATE test.

Physical Failure Analysis (PFA)
Chosen as a representative unit, SN4, which showed high current, was subjected to backside OBIRCH analysis and IR inspection. Obvious damage to CMOS die was observed in the area under the solder bumps of Vdd and GND . Figure-3-5 showed OBIRCH and IR images of the chipped/cracked silicon.

	Customer Reported Failure	Bench Test				Results
LOT #		CURRENT*	PPM	OUTPUT Freq.	MEMS Q**	
COAXH		1 uA	-23006	31.947kHZ	44.778k	fail
COAXH	300uA with no output and 4-8khz frequency	8 uA	-4.669	32.76784Khz	44.980k	pass
COAXH		1 uA	-490009	546Hz to 621Hz	unreadable	fail
COAXH		150 uA	-895546	3.466k to 3.750khz	unreadable	fail

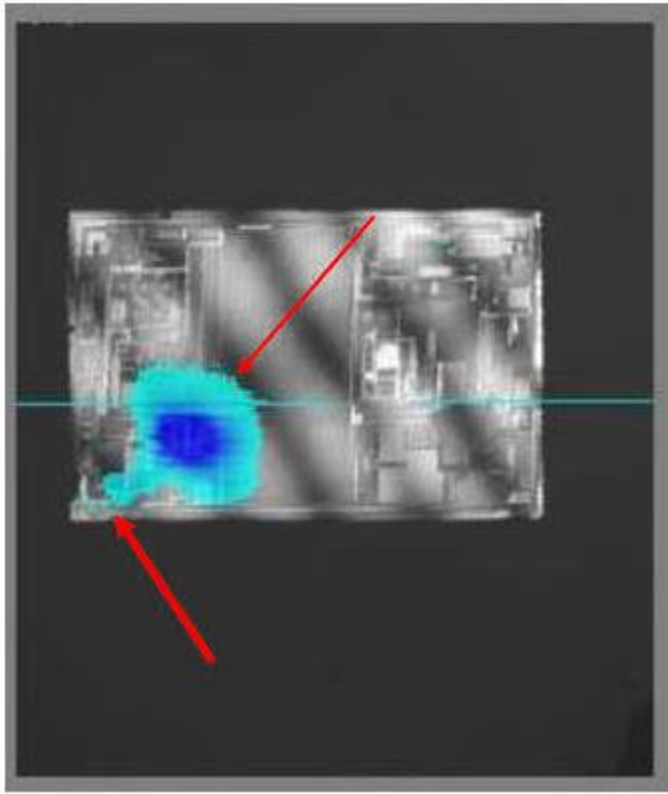Figure 3: SN4, OBIRCH hot spot indicated by the arrows

Figure 4: SN4, Zoom-in image of Figure 3. Chipped/cracked silicon was found at the area identified by OBIRCH hot spot indicated by the circle and the arrows.

The damage was found in the area under the Vdd bump indicated by the broken circle.

This image was taken from the backside of the CMOS as such the solder bump at the front side was not visible.
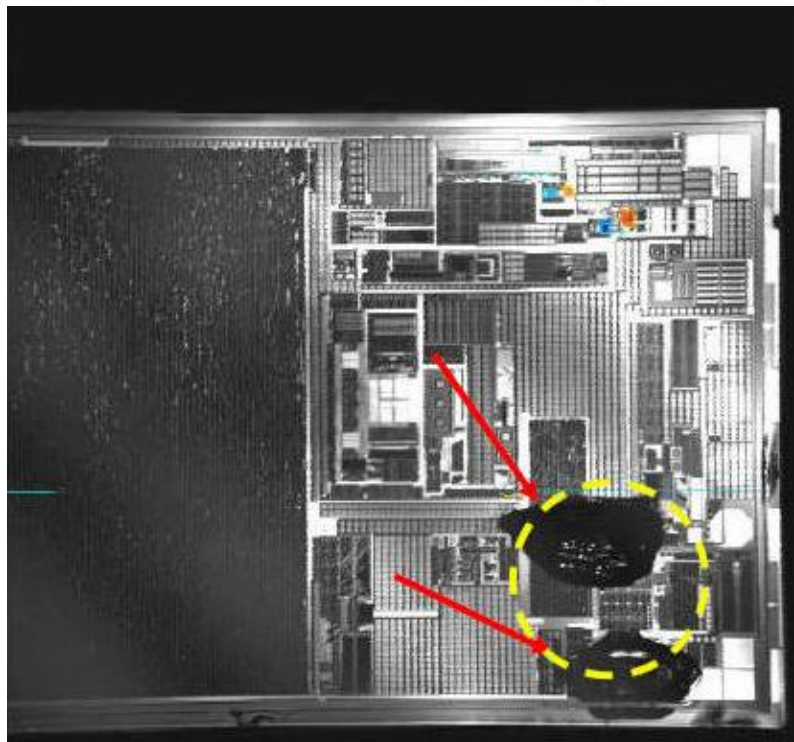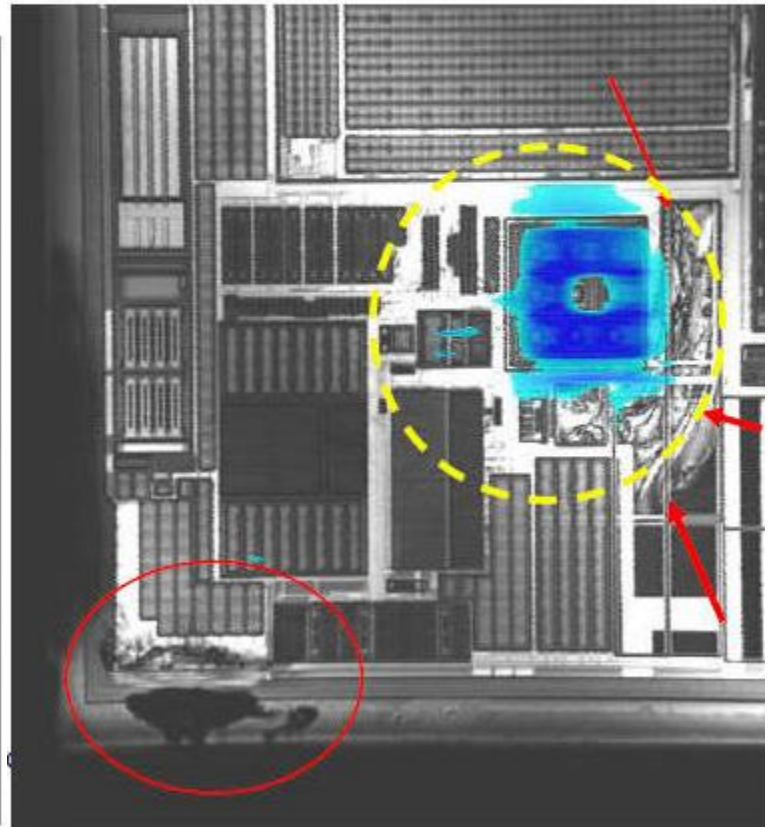

Figure 5: Cracked/chipped silicon was also observed in the area under the GND solder bump indicated by the arrows.

This image was taken from the back of the CMOS. The solder bump is in the front side of the CMOS which is not visible.

The broken circle indicated the location of the solder bump on the front side of the CMOS.

Preventive Action Implementation:	Date Implemented: