TDK InvenSense	FA-007775 Final Failure Analysis Report	Date: Apr. 21st, 2026

Customer: SAFEWARE	**Customer Contact:**
Product: ICM-42670-P	**Package Type**: LGA
Lot Number: Table 1	**Date Code**: Table 1
Quantity Returned: 1 ea	**Failure Receipt Date**: Apr. 9th, 2026
Project name:	**Final Report Date:** Apr. 21st, 2026

D1. Team Members

Customer Quality Engineer	Leo Park
Product Engineer	Jerry Lai
Failure Analysis Engineer	Alina Lo & Ruby Chen & Sky Lin & Joseph Chuah
Team Leader	Betty Hsieh

D2. Problem Description

SAFEWARE returned one unit for failure analysis. The reported failure symptom was that the gyro output was fixed at -32768. (1F/130) Table 1 summarizes the details of the returned unit.

Table 1: Information of the returned unit

SN#	Lot Number	Date Code	WF	DIEID	Customer reported
#1	GFNP81-AB1	2241	1	12090	Gyro fixed as -32768

D3. Containment Action

Impact lots of production history checks:

To isolate the problem, reviewed assembly lot test history for the returned device and found no abnormalities.
- Completed on Apr. 10th, 2026

D4. Analysis and Root Cause Identification

4.1 Visual/Mechanical Inspection

Visual and X-ray inspections were performed on the returned device, and no abnormalities were found. Figure 1 shows the condition of the returned unit upon receipt.

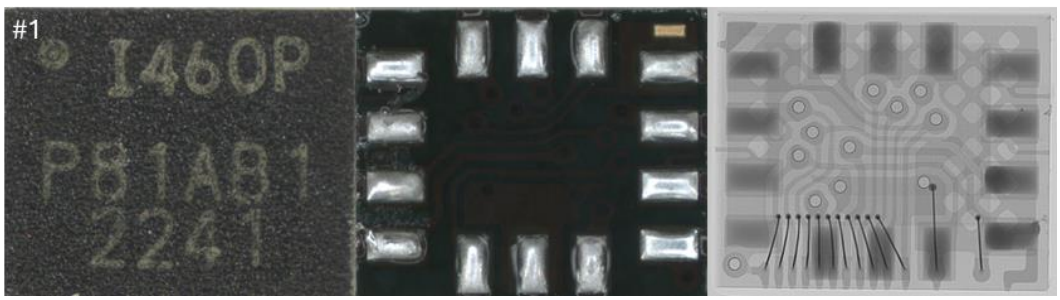

Figure. 1: Visual and X-ray inspection results

4.2 Production Functional and Engineering Tests

The returned device was cleaned to remove excess solder in preparation for functional testing following the QA flow on production and engineering testers. Table 2 summarizes the detailed test results.

Table 2: QA test results

SN	EEID	WFID	Idd [µA]	Cpout [V]	Accel Sensitivity shift [%]			Accel Offset [mgee]			Accel Total Noise [µg/√Hz]		
					X	Y	Z	X	Y	Z	X	Y	Z
	Spec. min				-1.5			-60			-		
			550	1.1	+/-1			+/-25			100		
	Spec max		600		1.5			60			200		
#1	12090	1	410	1.10	0.00	-0.08	0.27	-2.88	0.17	6.88	91	96	98
REF1	5141	11	559	1.10	0.02	0.05	0.06	-6.68	2.68	-10.01	99	88	126
REF2	6607	5	562	1.10	0.01	-0.01	0.09	-4.55	1.71	0.71	98	87	122

SN	GDRIVEFREQ [Hz]	Gyro Sensitivity shift [%]			Gyro Offset [dps]			Gyro Total Noise [dps /√Hz]			Verdict
		X	Y	Z	X	Y	Z	X	Y	Z	
	25600	-1.5			-5			-			
		+/-1			+/-1			0.007			
	29500	1.5			5			0.014			
#1	-999	No Gyro output									Gyro output failed
REF1	27585	-0.27	-0.17	-0.45	-0.12	0.59	0.17	0.007	0.007	0.008	PASS
REF2	28146	-0.24	-0.27	-0.31	-0.65	0.52	0.28	0.005	0.005	0.006	PASS

4.3 Manufacturing Lot Test History

Test history of the assembly lot showed no abnormalities. The returned device passed wafer sort and final test during production. Table 3 summarizes the results.

Table 3: Final Test results prior to shipment

SN	EEID	WFID	Idd [µA]	Cpout [V]	Accel Sensitivity shift [%]			Accel Offset [mgee]			Accel Total Noise [µg/√Hz]		
					X	Y	Z	X	Y	Z	X	Y	Z
#1	12090	1	548	1.10	0.009	-0.015	0.007	0.21	0.10	0.079	89	76	104

SN	GDRIVEFREQ [Hz]	Gyro Sensitivity shift [%]			Gyro Offset [dps]			Gyro Total Noise [dps /√Hz]			Verdict
		X	Y	Z	X	Y	Z	X	Y	Z	

#1	27728	0.05	0.06	0.07	0.001	-0.02	0.02	0.004	0.004	0.005	PASS

4.4 Description of Product Test Results

Table 4: Summary test results

SN#	Failure Description	Test Classification
#1	No Gyro output failure	FAIL

4.5 Physical Analysis

Unit #1 was selected for removal of the molding compound to enable IROM inspection of the MEMS structure. Scattered debris was observed inside the gyro cavity during the IROM inspection, as shown in Figure 2.

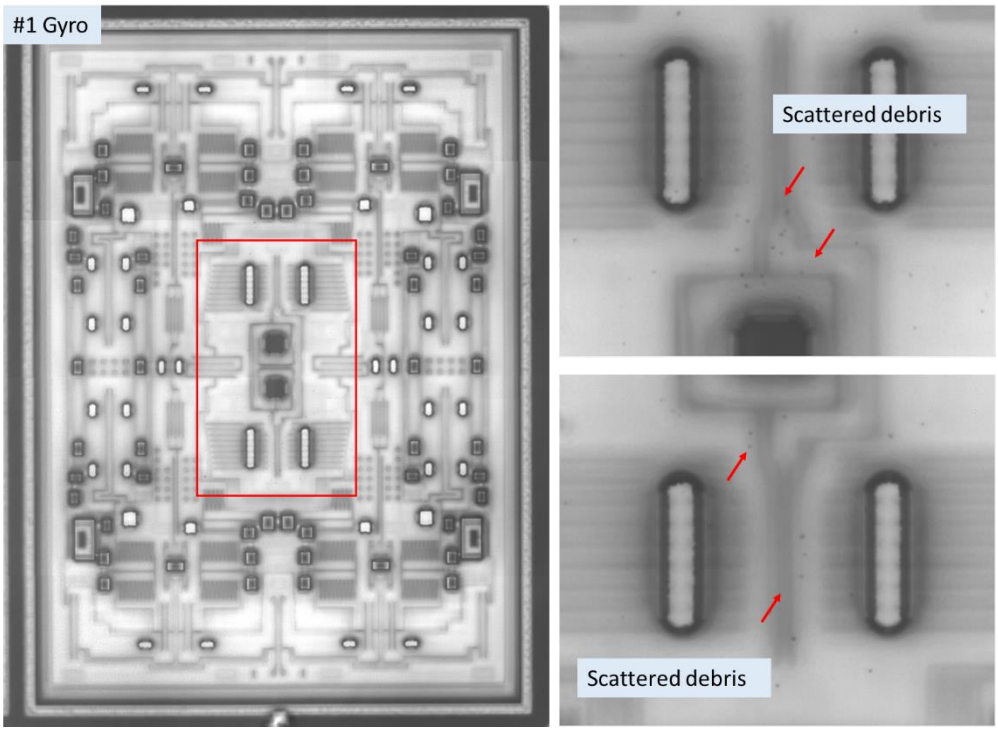

Figure 2: IROM images

Subsequently, Unit #1 underwent separation of MEMS and CMOS for inner structure inspection. Scattered debris and hit marks were observed on both MEMS and CMOS structures during OM and SEM inspections. Based on the physical analysis, the returned device is considered to have experienced mechanical overstress events. (Figures 3 and 4)

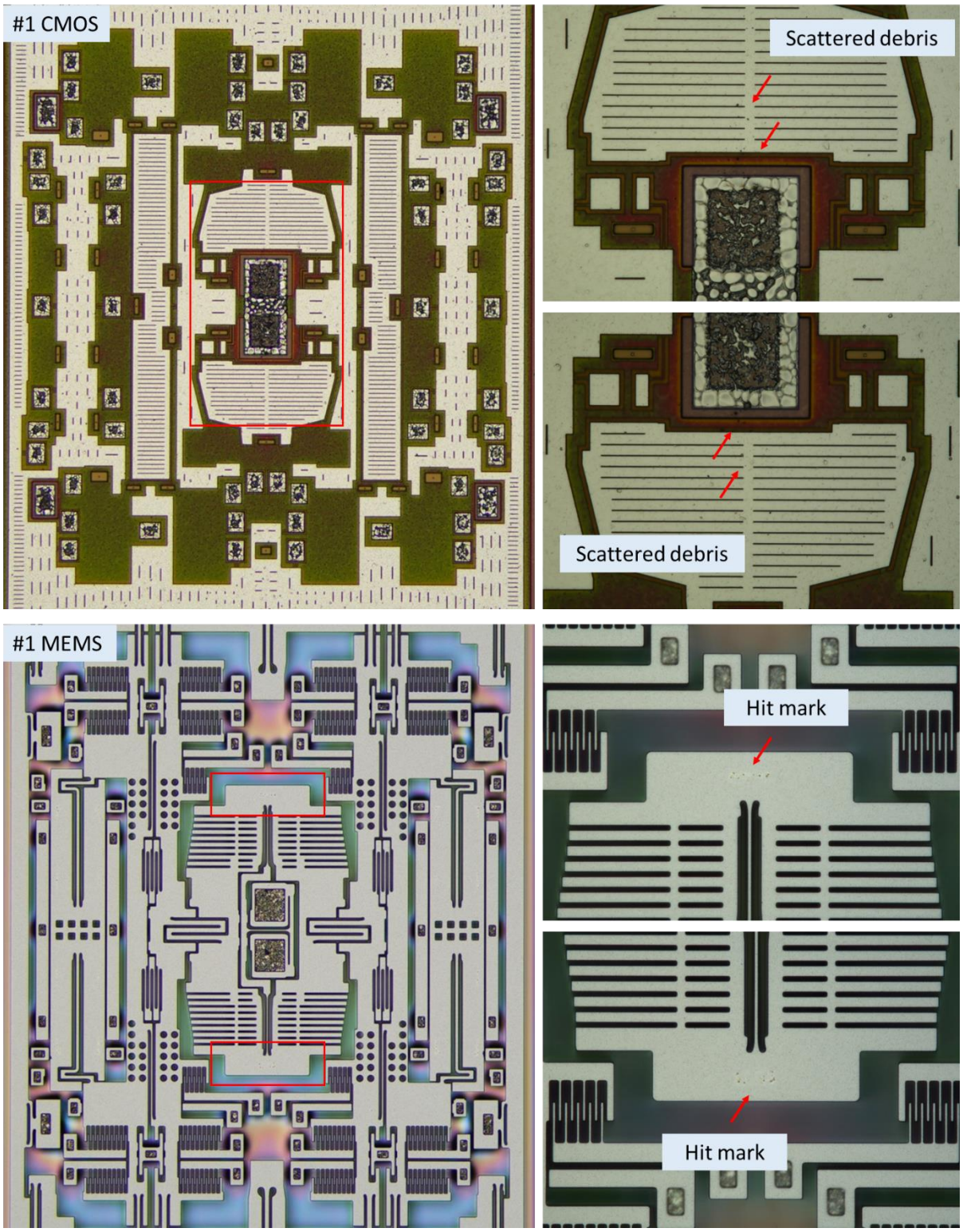

Figure 3: OM images

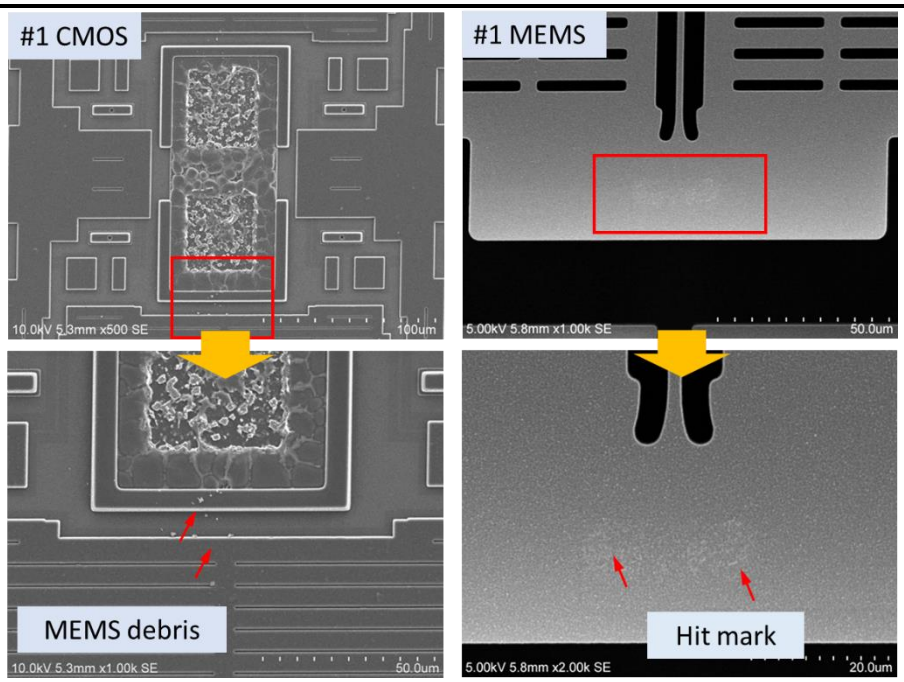

Figure 4: SEM images

4.6 Findings, Summary, and Conclusions

a) SAFEWARE returned one unit for failure analysis. The reported failure symptom was that the gyro output was fixed at -32768. (1F/130)

b) Visual and X-ray inspections performed on the returned device found no abnormalities.

c) Test history of the assembly lot showed no abnormalities. The returned device passed wafer sort and final test during production.

d) Upon receipt, the unit was tested using production test programs. Based on the test results, returned unit #1 showed no Gyro output failure.

e) After removal of the molding compound, scattered silicon debris was observed inside the gyro cavity during IROM inspection. Scattered debris and hit marks were observed during OM and SEM inspections as well.

f) Based on analysis conducted above, the returned device is considered to have experienced mechanical overstress events. TDK-InvenSense would like to recommend that the customer avoid any unexpected stress that may damage the part.

D5. Corrective Action Development & Validation

Not applicable

D6. Corrective Action Implementation
Not applicable
D7. Prevent Recurrence
Not applicable
D8. Congratulate the Team

Thanks to all team members who resolved this customer issue	Date: Apr. 21st, 2026