FRAM RELIABILITY SUMMARY

Product: FRAM 4K AND 16K SERIAL MEMORY
Foundry: ROHM
Packaging: HANA - SOIC, CHIPPAC - PDIP

Test Description	Applied Stress	Device Stress Hrs	Sample Size	Number of Failures	Failure Mechanism	Equivalent Hrs 55°C	Activation Engery	FITS (55°C)
HTOL (168hr)	125°C, Dynam.	168	4257	12 3/	1/	3.7E+07	0.70	323
HTOL (total hr)	Vcc = 5.5V	1000	4257	15 3/	1/	4.1E+08	0.70	37
RETN, 150C bake	SS & OS RETN No elect. bias	1000	3036	53 4/	2/	2.3E+09	0.94	1
HAST	120°C, Vcc=5.5V 2 ATM, 85% RH	100	3537	0	N/A			
Thermal Shock	100 cycles -55 to 125°C	N/A	2961	2 5/	Cracked die 5/			

NOTES:

1/ HTOL Single bit Failures are the result of the following mechanisms:
Particles causing shorts between conductive layers.
Foreign material in contact window causing resistive connection.
Defective gate oxide of cell transistors.

2/ Memory data retention failures are the result of the following mechanisms:
Residual particles from the capacitor stack processing.
Top electrode stringers.
Bottom electrode and top electrode hillocks.

3/ 12 failures detected at 168 HTOL hours, 3 Failures at the 500 hours and no failures at the 1,000 hour readpoint.

4/ 53 failures detected after accumulating a total of 5.65E+06 RETN hours (equivalent to 9.90E+09 hours at 55°C).

5/ Both failures occurred in the same lot (1 out of 36 lots).
This mechanism was not repeatable after extensive follow on thermal stressing.

8/9/00