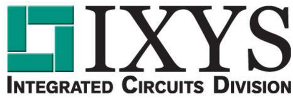

Reliability Report

Reliability Data for IX2113 and P32 Process

Report Title: IX2113 and P32 Process Qualification Report

Report Number: 2012-014

Date: 6/26/13

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Introduction:

This report summarizes the Reliability data of IXYS Integrated Circuits Division IX2113. The Reliability data presented here were collected during IXYS IC Division product qualification. The purpose of this qualification was to verify IXYS IC Division Quality and Reliability requirements as outlined in IXYS IC Division internal specifications. The IX2113 is manufactured at IXYS Integrated Circuits Division and assembled at ATEC in the Philippines. The process is IXYS IC Division P32 and IX2113 is available in a 16L SOIC and 14 Pin DIP package type.

Reliability Tests:

Table 1 below provides the qualification tests that were performed. The stress tests and sample size are chosen based on IXYS IC Division internal specification and with the approval of the product development team and quality assurance.

Table 1: IX2113 Reliability Tests Plan

Product/ Package	Stress Test	Applicable Specs	Conditions	# of Lots	Sample Size (SS)	Total SS
IX2113/ 16L SOIC	HTRB	Mil-Std-883 M1005 JESD22-A-108	125°C, 80% WVDC, 1000 hrs	3	110	330
IX2113/ 16L SOIC	HAST	JESD22-A110-C	130°C, 85% 18.8PSI, 96hrs	3	78	234
IX2113G/ 14 Pin DIP	HAST	JESD22-A110-C	130°C, 85% 18.8PSI, 96hrs	1	100	100
IX2113/ 16L SOIC	MSL	J-STD-020D.1	IR Reflow, Level 1	1	50	50
IX2113G/ 14 Pin DIP	MSL	J-STD-020D.1	IR Reflow, Level 1	1	50	50
IX2113/ 16L SOIC	Thermal Shock (T/S)	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells, 15 cycles	1	55	55
IX2113G/ 14 Pin DIP	Thermal Shock (T/S)	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells, 15 cycles	1	55	55
IX2113/ 16L SOIC	Temp Cycle (T/C)	Mil-Std-883, N1010, "B"	-55 to 125°C, 10/10 dwells 300 cycles	1	55	55
IX2113G/ 14 Pin DIP	Temp Cycle (T/C)	Mil-Std-883, N1010, "B"	-55 to 125°C, 10/10 dwells 300 cycles	1	55	55
IX2113/ 16L SOIC	Hot Storage	JESD22-A103-C	125C, 1000 hrs	1	50	50
IX2113G/ 14 Pin DIP	Hot Storage	JESD22-A103-C	125C, 1000 hrs	1	50	50
IX2113/ 16L SOIC	ESD	JESD22-A114-E	All Pins, 1.5kΩ, 100pF	1	15	15

Reliability Test Results:

The stress tests and associated results for IX2113 qualification are summarized in Table 2. The devices chosen for the qualification were from standard material manufactured through normal production test flow and electrically tested to datasheet limits prior to stressing. Then reliability stresses were conducted and electrically tested to datasheet limit at each interval and final readpoints.

Table 2: IX2113 Reliability Tests Results

Product/ Package	Stress/ Kits	Readpoint Final / Reject/ SS
IX2113/ 16L SOIC	HTRB/ TE3237	1000 hrs. 0/110
IX2113/ 16L SOIC	HTRB/ TE3256	1000 hrs. 0/110
IX2113/ 16L SOIC	HTRB/ TE3275	1000 hrs. 0/110
IX2113/ 16L SOIC	HAST/ TE3199	96hrs. 0/78
IX2113/ 16L SOIC	HAST/ TE3237	96hrs. 0/78
IX2113/ 16L SOIC	HAST/ TE3242	96hrs. 0/78
IX2113G/ 14 Pin DIP	HAST/ GGE0028	96hrs 0/100
IX2113/ 16L SOIC	MSL/ TE3275	IR Reflow Level 1 0/50
IX2113G/ 14 Pin DIP	MSL/ GGE0028	IR Reflow Level 1 0/50
IX2113/ 16L SOIC	TS/ TE3275	15 Cycles 0/55
IX2113G/ 14 Pin DIP	TS/ GGE0028	15 Cycles 0/55
IX2113/ 16L SOIC	TC/ TE3275	300 Cycles 0/55
IX2113G/ 14 Pin DIP	TC/ GGE0028	300 Cycles 0/55
IX2113/ 16L SOIC	Hot Storage/ TE3275	1000 hrs 0/50
IX2113G/ 14 Pin DIP	Hot Storage/ GGE0028	1000 hrs 0/50

ESD Testing Results:

As part of this qualification, IX2113 was subjected to Human Body Model (HBM) ESD Sensitivity Classification testing using the KeyTek Zapmaster test system. The results are summarized in Table 3. All samples were electrically tested to data sheet limits before and after ESD stressing and they passed up to +/-350V of HBM.

Table 3: IX2113 ESD Results

ESD Model	Product/ Kit	Package	ESD Test Spec	RC Network	Highest Passed	Class
HBM	IX2113/ TE3312	16L SOIC	JESD22, A114-E	1.5kΩ, 100pF	+/- 350 V	1A

FIT (Failure in Time) Rate of IX2113:

Table 4 provides sample size with testing summary for HTRB stress from this qualification. For HTRB, FIT rates were calculated based on the Acceleration Factor (AF) and equivalent device hours at 0.7eV of activation energy at 125°C test temperature and 40°C ambient use temperatures. Using the HAST data, FITs were calculated based on the Acceleration Factor (AF) and equivalent device hours at 0.7eV of activation energy for 130°C test temperature and 40°C use temperatures. The FIT rates came out to be 10.92 and 20.04 FITs for HTRB and HAST, respectively.

Table 4: IX2113 FIT Rate Summary

Qual Lot #	Stress Test	Product/ Kits #	# of Devices	# of Fail	Hours Tested	Equivalent Dev. Hours	FIT Rate @ 60% CL
1	HTRB	IX2113/ TE3237 TE3256 TE3275	330	0	1000	84,283,969	10.92
1	HAST	IX2113/ TE3199 TE3237 TE3242 GGE0028	334	0	96	45,908,773	20.04

Conclusion:

The qualification of the mask set IX2113 and P32 has completed and has met the FITs rate requirement for release.

Approval:

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