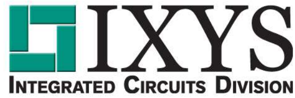

Reliability Report

AEC-Q100-REV G Automotive Qualification for IXDD604SIA, IXDF604SIA, IXDI604SIA, IXDN604SIA VIS Foundry Process CU05UMS12010

Report Title: AEC-Q100-REV G Automotive Qualification for IXDD604SIA, IXDF604SIA, IXDI604SIA, IXDN604SIA VIS Foundry Process CU05UMS12010

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Introduction:

This report summarizes the Reliability data of Clare's IXD_604SIA. The Reliability data presented here were collected by ROOD Microtec in Nodlingen, Germany. The purpose of this qualification was to verify the AEC-Q100-REV G Automotive Qualification criteria. The IXD_604SIA Gate Driver silicon is foundered at Vanguard International Semiconductor, Corp. (VIS) and assembled at Greatek in Taiwan. The VIS process is CU05UMS12010.

Reliability Tests:

Table 1 below provides the qualification tests that were performed. The stress tests and sample size are chosen based on the AEC-Q100-REV G Automotive Qualification.

Table 1: AEC-Q100-REV G Automotive Qualification Product IXD_604SIA Reliability Tests

Stress Test	Applicable Specs	Stress Conditions	Number of Lots	Sample Size (SS)	Total SS
HTOL	JESD22-A108	1000hrs, 150°C	6	80	480
HAST	JESD22-A110-C	130°C, 85% 18.8PSI, 96hrs	6	80	480
Solder-ability	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells, 15 cycles	1	17	17
Temp Cycle (T/C)	JESD22-A104-C	-65 to 150°C, 10/10 dwells, 500 cycles	3	80	240
High Temp Storage	JESD22-A103C	150°C, 1000hrs	2	48	96
Autoclave	J-STD-020D.1, JESD22-A102	T=121°C, RH=100% t=96hrs unbiased	6	80	480
Latch Up	AEC-Q100-004	T=125°C, 35v, 100mA	1	8	8

Stress Test	Applicable Specs	Stress Conditions	Number of Lots	Sample Size (SS)	Total SS
Gate Leakage	RTN-0441-D REV	T=RT	1	8	8
ELFR	AEC-Q100-008-REV A	T=150°C, t=48hrs With bias	3	800	2400
PTC	JESD22-A105-C	T=-40°C/+125°C, 1000 cycles t=45 min	1	48	48
ESD HBM	JESD22-A114-E	1.5kΩ, 100pF	1	38	38

Reliability Test Results:

The stress tests and associated results for the AEC-Q100-REV G Automotive Qualification product IXD_604SIA 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: AEC-Q100-Rev G Automotive Qualification Product IXD_604SIA Reliability Test Results

Stress Test	Readpoint / (Reject/ SS)
HTOL	1000 hrs
	0/480
HAST	96 hrs
	0/480
Solderability	15 Cycles
	0/17
Temp Cycle	500 Cycles
	0/240
High Temp Storage	1000 hrs
	0/96
Autoclave	96 hrs
	0/480

Stress Test	Readpoint / (Reject/ SS)
Latch-Up	Trigger Pulse
	0/8
Gate Leakage	Neg./Pos. Potential
	0/8
ELFR	48 hrs.
	0/2400
PTC	1000 cycles
	0/48

ESD Testing Results:

As part of this qualification, the AEC-Q100-REV G Automotive Qualification product IXD_604SIA was subjected to Human Body Model (HBM) ESD Sensitivity Classification testing using a KeyTek Zapmaster system. Charged Device Model (CDM) testing was subcontracted to Integra Technologies LLC in January 2012. The results are summarized in Table 3.

Table3: AEC-Q100-REV G Automotive Qualification Product IXD_604SIA ESD Characterization Results

ESD Model	Package	ESD Test Spec	RC Network	Highest Passed	Class
CDM	SOIC – 8L EP	AEC- Q100-011	1Ω meas resistor	500V/all pin 750Vcorner pins	C3B
HBM	SOIC – 8L	JESD22, A114-E	1.5kΩ, 100pF	2000V	H2

FIT (Failure in Time) Rate on the AEC-Q100-REV G Automotive Qualification Product IXD_604SIA:

Table 4 summarizes the number of devices used for the AEC-Q100-REV G product IXD_604SIA reliability stress with associated failures. Using the HTOL data, FITs were calculated based on the Acceleration Factor (AF) and equivalent device hours at 0.7eV of activation energy according to Clare's procedure P-04-25-WW for 150°C test temperature and 40°C 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 calculated FITs from the reliability stress came out to be 7.50 for HTOL and 13.94 for HAST

Table 4: AEC-Q100-REV G Automotive Qualification Product IXD_604SIA FIT Rate Summary

Qual#	Stress	# of Devices	# of Fails	Hours Tested	Act. Energy	Acc. Factor	Equivalent Dev. Hours	FIT Rate @ 60% CL
1	HTOL	480	0	1000	0.7	255.41	122,594,864	7.50
1	HAST	480	0	96	0.7	1.4318E +03	65,976,679	13.94

Conclusion:

The qualification of the product IXD_604SIA has been completed according to AEC-Q100-REV G Automotive Qualification criteria.