

**AEC-Q100-REV G Automotive Qualification-IXDD609SI.IXDI609SI.IXDN609SI VIS Foundry  
Process CU05UMS12010  
Qualification No: 2011-009**



# **Reliability Report**

**AEC-Q100-REV G Automotive Qualification for  
IXDD609SI, IXDI609SI, IXDN609SI  
VIS Foundry Process CU05UMS12010**

**Report Title: AEC-Q100-REV G Automotive Qualification for  
IXDD609SI, IXDI609SI, IXDN609SI  
VIS Foundry Process CU05UMS12010**

**Report Number: 2011-009**

**Date: 7/18/12**

**Introduction:**

This report summarizes the Reliability data of IXYS Integrated Circuits Division IXD\_609SI. The purpose of this qualification was to verify the AEC-Q100-REV G Automotive Qualification criteria. The IXD\_609SI Gate Driver silicon is founded 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\_609SI Reliability Tests**

<b>Stress Test</b>	<b>Applicable Specs</b>	<b>Stress Conditions</b>	<b>Number of Lots</b>	<b>Sample Size (SS)</b>	<b>Total SS</b>
HTOL	JESD22-A108	1000hrs, 150°C	3	80	240
HAST	JESD22-A110-C	130°C, 85% 18.8PSI, 96hrs	3	80	240
Solder-ability	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells, 15 cycles	3	17	51
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	3	50	150
Autoclave	J-STD-020D.1, JESD22-A102	T=121°C, RH=100% t=96hrs unbiased	3	80	240
Latch Up	AEC-Q100-004	T=125°C, 35v, 100mA	3	8	24

**AEC-Q100-REV G Automotive Qualification-IXDD609SI.IXDI609SI.IXDN609SI VIS Foundry  
Process CU5UMS12010  
Qualification No: 2011-009**

<b>Stress Test</b>	<b>Applicable Specs</b>	<b>Stress Conditions</b>	<b>Number of Lots</b>	<b>Sample Size (SS)</b>	<b>Total SS</b>
Gate Leakage	RTN-0441-D REV	T=RT	3	8	24
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	3	80	240
ESD CDM	JESD22-A114-E	1.5kΩ, 100pF	3	50	150
ESD HBM	JESD22-A114-E	1.5kΩ, 100pF	3	50	150

**Reliability Test Results:**

The stress tests and associated results for the AEC-Q100-REV G Automotive Qualification product IXD\_609SI 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\_609SI Reliability Test Results**

<b>Stress Test</b>	<b>Readpoint / (Reject/ SS)</b>
HTOL	1000 hrs
	0/240
HAST	96 hrs
	0/240
Solderability	15 Cycles
	0/51
Temp Cycle	500 Cycles
	0/240
High Temp Storage	1000 hrs
	0/150
Autoclave	96 hrs
	0/240

**AEC-Q100-REV G Automotive Qualification-IXDD609SI.IXDI609SI.IXDN609SI VIS Foundry  
Process CU5UMS12010  
Qualification No: 2011-009**

<b>Stress Test</b>	<b>Readpoint / (Reject/ SS)</b>
Latch-Up	Trigger Pulse
	0/24
Gate Leakage	Neg./Pos. Potential
	0/24
ELFR	48 hrs.
	0/2400
PTC	1000 cycles
	0/240

**ESD Testing Results:**

As part of this qualification, the AEC-Q100-REV G Automotive Qualification the IXD\_609SI product family 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\_609SI ESD Characterization Results**

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

### FIT (Failure in Time) Rate on the AEC-Q100-REV G Automotive Qualification Product IXD\_609SI:

Table 4 summarizes the number of devices used for the AEC-Q100-REV G product IXD\_609SI 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 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 15.01 for HTOL and 27.89 for HAST

**Table 4: AEC-Q100-REV G Automotive Qualification Product IXD\_609SI  
 FIT Rate Summary**

Qual#	Stress	# of Devices	# of Fails	Hours Tested	Act. Energy	Acc. Factor	Equivalent Dev. Hours	FIT Rate @ 60% CL
1	HTOL	240	0	1000	0.7	255.41	61,297,432	15.01
1	HAST	240	0	96	0.7	1.4318E+03	32,988,672	27.89

### Conclusion:

The qualification of the product IXD\_609SI (kit#'s C00156, C00193, C00254) has been successfully completed and satisfies the requirements of the AEC-Q100-REV G Automotive Qualification criteria.

## APPROVAL:

Prepared by: Martha W. Brandt\* 7/18/12  
Martha W. Brandt Date  
Quality Engineer

Approved by: Ronald P. Clark\* 7/18/12  
Ronald P. Clark Date  
Director of Quality

Approved by: James Archibald\* 7/18/12  
James Archibald Date  
Director of Development Engineering

\*Signature on File