



Reliability Report

Reliability Data for Form A Low Voltage Relay Phenitec Foundry
(Low Voltage 30V – 150V)

**Report Title: Reliability Data for Form A Low Voltage Relay
Phenitec Foundry (Low Voltage 30V – 150V)**

Report Number: 2013-003

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**Reliability Report-Form A Low Voltage Relay Phenitec Foundry (Low Voltage 30V – 150V)
Qualification No: 2013-003**

Introduction:

This report summarizes the Reliability data of IXYS Integrated Circuits Division. The Reliability data presented here were collected during IXYS IC Division product qualification. The purpose of this qualification was to verify the IXYS IC Division Quality and Reliability requirements as outlined in IXYS IC Division internal specifications. The MOSFET wafers used to manufacture IXYS IC Division devices CPC1019N/CPC1020N/LCA720/LCA717 were foundered at Phenitec’s fabrication site in Okayama, Japan and assembled at ATEC in the Philippines.

Reliability Tests:

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

Table 1: Form A Low Voltage Relay Phenitec Foundry Reliability Tests

Stress Test	Applicable Specs	Stress Conditions	Product/ Package	Number of Lots	Sample Size (SS)	Total SS
HTRB	JESD22-A108	125°C, 80%	CPC1019N CPC1020N 4 Pin SOP LCA720 LCA717 6 Pin DIP	4	129,77, 129, 77, 126	538
Thermal Shock (T/S)	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells, 15 cycles	CPC1019N CPC1020N 4 Pin SOP LCA720 LCA717 6 Pin DIP	4	55	220
Temp Cycle (T/C)	Mil-Std-883, N1010, “B”	-55 to 125°C, 10/10 dwells, 300 cycles	CPC1019N CPC1020N 4 Pin SOP LCA720 LCA717 6 Pin DIP	4	55	220
THB	JESD22, A101	85°C, 85% 1000hrs	CPC1019N CPC1020N 4 Pin SOP LCA720 LCA717 6 Pin DIP	4	96, 94, 105, 76	371

**Reliability Report-Form A Low Voltage Relay Phenitec Foundry (Low Voltage 30V – 150V)
Qualification No: 2013-003**

Stress Test	Applicable Specs	Stress Conditions	Product/Package	Number of Lots	Sample Size (SS)	Total SS
Electrical Characterization		-40 to 85C	CPC1019N CPC1020N 4 Pin SOP LCA720 6 Pin DIP	3	25	75
ESD HBM	JESD22, A114-E	1.5kΩ, 100pF	CPC1019N CPC1020N 4 Pin SOP LCA720 6 Pin DIP	3	10	30

Reliability Test Results:

The stress tests and associated results for the Form A Low Voltage Relay Phenitec Foundry 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: Form A Low Voltage Relay Phenitec Foundry Reliability Test Results

Stress Test	Product/Kit Number	Readpoint / (Reject/ SS)	Comments
HTRB	CPC1019N TE2815 CPC1020N TE2718, TE2773, TE2799 LCA720 TE2717 LCA717 TE2801	1000 hrs. 3/538	Qual Lot#1, 2, 3, 4 Data

**Reliability Report-Form A Low Voltage Relay Phenitec Foundry (Low Voltage 30V – 150V)
Qualification No: 2013-003**

Stress Test	Product/Kit Number	Readpoint / (Reject/ SS)	Comments
Thermal Shock	CPC1019N TE2815 CPC1020N TE2718, TE2773, TE2799 LCA720 TE2717 LCA717 TE2801	15 Cycles	Qual Lot#1, 2, 3, 4 Data
		0/220	
Temp Cycle	CPC1019N TE2815 CPC1020N TE2718, TE2773, TE2799 LCA720 TE2717 LCA717 TE2801	300 Cycles	Qual Lot#1, 2, 3, 4 Data
		0/220	
THB	CPC1019N TE2815 CPC1020N TE2718, TE2773, TE2799 LCA720 TE2717 LCA717 TE2801	1000 hrs.	Qual Lot#1, 2, 3, 4 Data
		0/371	
Electrical Characterization	CPC1019N TE2815 CPC1020N TE2718, TE2773, TE2799 LCA720 TE2717	-40 to 85C	Qual Lot#1, 2, 3 Data
		0/75	

**Reliability Report-Form A Low Voltage Relay Phenitec Foundry (Low Voltage 30V – 150V)
Qualification No: 2013-003**

ESD Testing Results:

As part of this qualification, the Form A Low Voltage Relay Phenitec Foundry was subjected to Human Body Model (HBM) ESD Sensitivity Classification testing using a KeyTek Zapmaster 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 after +/-8000V testing.

Table3: Form A Low Voltage Relay Phenitec Foundry ESD Characterization Results

ESD Model	Product/Kit Number	Package	ESD Test Spec	RC Network	Highest Passed	Class
HBM	CPC1019N TE2815 CPC1020N TE2773 LCA720 TE2717	i4-PAC	JESD22, A114-E	1.5kΩ, 100pF	8000V	3B

FIT (Failure in Time) Rate on the Form A Low Voltage Relay Phenitec Foundry:

Table 4 summarizes the number of devices used for the Form A Low Voltage Relay Phenitec Foundry reliability stress with associated failures. Using the HTRB data, FITs were calculated based on the Acceleration Factor (AF) and equivalent device hours at 0.7eV of activation energy for 125°C test temperature and 40°C use temperatures. For THB stress, FITs were calculated based on the 85°C /85% RH test condition with 40°C/60% RH ambient use conditions at the activation energy of 0.7eV. The calculated FITs from the reliability stress came out to be 30.42 and 37.08 for HTRB and THB, respectively.

**Reliability Report-Form A Low Voltage Relay Phenitec Foundry (Low Voltage 30V – 150V)
Qualification No: 2013-003**

Table 4: Form A Low Voltage Relay Phenitec Foundry FIT Rate Summary

Qual#	Stress	Product/Kit Number	# of Devices	# of Fails	Hours Tested	Act. Energy	Acc. Factor	Equivalent Dev. Hours	FIT Rate @ 60% CL
1 - 4	HTRB	CPC1019N TE2815 CPC1020N TE2718, TE2773, TE2799 LCA720 TE2717 LCA717 TE2801	538	3	1000	0.7	255.41	137,408,409	30.42
1 - 4	THB	CPC1019N TE2815 CPC1020N TE2799 LCA720 TE2717 LCA717 TE2801	371	0	1000	0.7	1.1363E +02	24,808,811	37.08

Conclusion:

The qualification of the Form A Low Voltage Relay Phenitec Foundry has been successfully completed for the production release.