



Reliability Report

Reliability Data for AC Relay/SCR Based with Optical Driver Circuit

Report Title: Reliability Data for AC Relay/SCR Based with Optical Driver Circuit

Report Number: 2013-006

Date: 2/26/13

**Reliability Report-AC Relay/SCR Based with Optical Driver Circuit
Qualification No: 2013-006**

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 AC Relay/SCR Based with Optical Driver Circuit silicon is manufactured at IXYS Silicon FAB in Lampertheim, Germany and assembled at ATEC and PSI 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: Product AC Relay/SCR Based with Optical Driver Circuit
Reliability Tests**

Stress Test	Applicable Specs	Stress Conditions	Product/ Package	Number of Lots	Sample Size (SS)	Total SS
HTRB/ HTOL	Mil-Std-883	125°C, 80%	CPC1709J ISOPLUS-264 CPC1976Y Power SIP CPC1966Y Power SIP CPC1998J i4-PAC	4	25, 129, 78, 76, 76, 78, 77	539
Thermal Shock (T/S)	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells, 15 cycles	CPC1976Y Power SIP CPC1966Y Power SIP CPC1998J i4-PAC	3	55	165
Temp Cycle (T/C)	Mil-Std-883, N1010, "B"	-55 to 125°C, 10/10 dwells, 300 cycles	CPC1976Y Power SIP CPC1966Y Power SIP CPC1998J i4-PAC	3	55	165
High Temp Storage	JESD22- A103C	125°C, 1000hrs	CPC1998J i4-PAC	1	50	50

**Reliability Report-AC Relay/SCR Based with Optical Driver Circuit
Qualification No: 2013-006**

Stress Test	Applicable Specs	Stress Conditions	Product/Package	Number of Lots	Sample Size (SS)	Total SS
MSL	J-STD-020D.1	IR Reflow, Level 1	CPC1998J i4-PAC	1	25	25
ESD HBM	JESD22, A114-E	1.5kΩ, 100pF	CPC1998J i4-PAC	1	3	3

Reliability Test Results:

The stress tests and associated results for the product AC Relay/SCR Based with Optical Driver Circuit 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: Product AC Relay/SCR Based with Optical Driver Circuit
Reliability Test Results**

Stress Test	Product/Kit Number	Readpoint / (Reject/ SS)	Comments
HTRB	CPC1709J PE0009	1000 hrs	Qual Lot#1 Data
		0/25	
HTRB	CPC1998J PE0031	1000 hrs	Qual Lot#1 Data
		0/77	
HTRB	CPC1976Y T57324	1000 hrs	Qual Lot#1 Data
		0/129	
HTOL	CPC1976Y TE2960	1000 hrs	Qual Lot#1 Data
		0/78	
HTOL	CPC1976Y TE3050	1000 hrs	Qual Lot#2 Data
		0/76	
HTOL	CPC1976Y TE3061	1000 hrs	Qual Lot#3 Data
		0/76	
HTOL	CPC1966Y T53397	1000 hrs.	Qual Lot#1 Data
		0/78	

**Reliability Report-AC Relay/SCR Based with Optical Driver Circuit
Qualification No: 2013-006**

Stress Test	Product/Kit Number	Readpoint / (Reject/ SS)	Comments
Thermal Shock	CPC1998J PE0031	15 Cycles	Qual Lot#1 Data
		0/55	
Temp Cycle	CPC1998J PE0031	300 Cycles	Qual Lot#1 Data
		0/55	
Thermal Shock	CPC1976Y T57324	15 Cycles	Qual Lot#1 Data
		0/55	
Temp Cycle	CPC1976Y T57324	300 Cycles	Qual Lot#1 Data
		0/55	
Thermal Shock	CPC1966Y T53397	15 Cycles	Qual Lot#1 Data
		0/55	
Temp Cycle	CPC1966Y T53397	300 Cycles	Qual Lot#1 Data
		0/55	
High Temp Storage	CPC1998J PE0031	1000 hrs.	Qual Lot#1 Data
		0/50	
MSL	CPC1998J PE0031	IR Reflow Level 1 0/25	Qual Lot#1 Data

ESD Testing Results:

As part of this qualification, the product AC Relay/SCR Based with Optical Driver Circuit 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: Product AC Relay/SCR Based with Optical Driver Circuit ESD
Characterization Results**

ESD Model	Product/Kit Number	Package	ESD Test Spec	RC Network	Highest Passed	Class
HBM	CPC1998J PE0031	i4-PAC	JESD22, A114-E	1.5kΩ, 100pF	8000V	3B

**Reliability Report-AC Relay/SCR Based with Optical Driver Circuit
Qualification No: 2013-006**

FIT (Failure in Time) Rate on the Product AC Relay/SCR Based with Optical Driver Circuit :

Table 4 summarizes the number of devices used for the product AC Relay/SCR Based with Optical Driver Circuit 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. The calculated FITs from the reliability stress came out to be 15.59/11.70 for HTRB/HTOL.

Table 4: Product AC Relay/SCR Based with Optical Driver Circuit 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	HTRB	CPC1709J PE0009 CPC1976Y T57324 CPC1998J PE0031	231	0	1000	0.7	255.41	58,998,778	15.59
1	HTOL	CPC1976Y TE2960 TE3050 TE3061 CPC1966Y T53397	308	0	1000	0.7	255.41	78,665,038	11.70

Conclusion:

The qualification of the product AC Relay/SCR Based with Optical Driver Circuit has been successfully completed for the production release.



**Reliability Report
(Q2021-011)**

**CPC1998J Product Qualification for ATEC
Assembly**

September 24, 2021

IXYS Integrated Circuits Division (a Littelfuse Technology)

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Summary

The CPC1998J product transfer to ATEC assembly has successfully passed IXYS ICD's requirements for product qualification.

Table 1: Device Information

Product Number	CPC1998J
Package Type	i4PAC
Assembly Site	ATEC, Philippines
Test Site	IXYS ICD BEV, Beverly, MA, USA

Table 2: Reliability Test Result

Stress Test	Stress Conditions	Applicable Specs	Product/ Package	Sample Size (SS)	# of Failures
HTRB	125°C, 10 mA, 1000 hrs	JESD22-A-108	CPC1998J TE3864 TE3865 TE3866	150	0*
Hot Storage	125C, 1000 hrs	JESD22-A103-C	CPC1998J TE3864 TE3865 TE3866	150	0

*Note: One failure was in TE3866 for LED_VF and was not associated with the subcon site change

Table 3: FIT Rate Summary

Qual Lot #	Stress Test	# of Devices	# of Fail	Hours Tested	Equivalent Dev. Hours	FIT Rate @ 60% CL
1	HTRB	150	0	1000	38,310,895	24.01*

* HTRB FIT Rate was 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 use temperature.

Approvals

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