



Reliability Report

Reliability Data for Clare SSR- Form-A Relay Family in DIP Style Package (Output Voltage Rating 200V – 450V)

**Report Title: Reliability Data for Clare SSR- Form-A Relay Family
in DIP Style Package
(Output Voltage Rating 200V – 450V)**

Report Number: 2010-009

Date: 5/21/10

Introduction:

This is to summarize the Reliability life-test data for LCA/XCA/LAA110 and 170 series product that was collected on high voltage Form-A Relay products based on Clare wafer fab’s P27 high voltage MOSFET process. The data was collected as part of the qualification for P27 or through Clare’s monthly Reliability Monitor (RMP) program. The IAA110P, LCA110 and XCA170 HTRB data presented here are applicable to all families within the 200-400V MOSFET line. All of these devices share the same design, wafer fabrication processes, assembly processes and assembly location.

Reliability Tests:

Table 1 below outlined Reliability stresses performed on various products that are transferable to Clare SSR-Form-A Relay Family Products.

Table 1: Clare SSR-Form-A Relay Family Products Reliability Tests

Product/ Package	Stress	Applicable Specs	Stress Conditions	# of Kits	Sample Size (SS)	Total SS
IAA110P/ 16-SOIC	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	120	120
LCA110X/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	129	129
LCA110/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	129	129
LCA110/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	129	129
LCA110/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	129	129
LCA110/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	129	129
LCA110/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	129	129
XCA170X/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	100	100
XCA170X/ 6-DIP	HTRB	JESD22-A108	125C, 80% WVDC, 1000 hrs	1	100	100

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Product/ Package	Stress	Applicable Specs	Stress Conditions	# of Kits	Sample Size (SS)	Total SS
LCA110/ 6-DIP	THB	JESD22-A101	RH=85C/85%, Ids Bias = 1A; if Bias=5mA	1	77	77
LCA110X/ 6-DIP	THB	JESD22-A101	RH=85C/85%, Ids Bias = 1A; if Bias=5mA	1	77	77
LCA110X/ 6-DIP	THB	JESD22-A101	RH=85C/85%, Ids Bias = 1A; if Bias=5mA	1	77	77
XCA170X/ 6-DIP	Thermal Shock (T/S)	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells 15 cycles	1	55	55
XCA170X/ 6-DIP	Temp Cycle (T/C)	Mil-Std-883 M1010, "B"	-55 to 125°C, 10/10 dwells, 300 cycles	1	55	55
PAA110/ 8-DIP	Thermal Shock (T/S)	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells 15 cycles	1	55	55
PAA110/ 8-DIP	Temp Cycle (T/C)	Mil-Std-883 M1010, "B"	-55 to 125°C, 10/10 dwells, 300 cycles	1	55	55
LBB110/ 8-DIP	Thermal Shock (T/S)	Mil-Std-883, M1011	0 to 100°C, 10/10 dwells 15 cycles	1	55	55

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Product/ Package	Stress	Applicable Specs	Stress Conditions	# of Kits	Sample Size (SS)	Total SS
LBB110/ 8-DIP	Temp Cycle (T/C)	Mil-Std-883 M1010, "B"	-55 to 125°C, 10/10 dwells, 300 cycles	1	55	55
XCA170X/ 6-DIP	Construction Analysis	N/A	Die Coat, Bond Quality, Die Attach, Bondline Thk	1	5	5
XCA170X/ 6-DIP	MSL	J-STD-020D.1	24hr Bake, Level 1 Soak 1X Reflow	1	50	50

Reliability Tests Results:

The stress tests data and associated results for the Clare SSR Form-A Relay Family products are summarized in Table 2.

Table 2: Clare SSR Form-A Relay Family Reliability Tests Results

Product/ Package	Stress Test/ Conditions	Kits (lots) Number	Readpoints / (Reject/ SS)	Comments
IAA110P/ 16-SOIC	HTRB 125C, 80% WVDC	T22717	1000 hrs.	Rel Monitor Data
			0/120	
LCA110X/ 6-DIP	HTRB 125C, 80% WVDC	TE2195	1000 hrs.	Qualification Data
			0/129	
LCA110/ 6-DIP	HTRB 125C, 80% WVDC	TE2197	1000 hrs	Qualification Data
			0/129	
LCA110/ 6-DIP	HTRB 125C, 80% WVDC	TE2199	1000 hrs	Qualification Data
			0/129	
LCA110/ 6-DIP	HTRB 125C, 80% WVDC	TE2198	1000 hrs	Qualification Data (1 lkg fail @750 hrs)
			1/129	
LCA110/ 6-DIP	HTRB 125C, 80% WVDC	TE2196	1000 hours	Qualification Data
			0/129	
LCA110/ 6-DIP	HTRB 125C, 80% WVDC	TE2200	1000 hrs	Qualification Data
			0/129	

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Product/ Package	Stress Test/ Conditions	Kits (lots) Number	Readpoints / (Reject/ SS)	Comments
XCA170X/ 6-DIP	HTRB 125C, 80% WVDC	TE2189	1000 hrs	Qualification Data
			0/100	
XCA170X/ 6-DIP	HTRB 125C, 80% WVDC	TE2278	1000 hrs	Qualification Data
			0/100	
LCA110/ 6-DIP	THB RH=85C/85%, Ids Bias=1A: if Bias=5mA	TE2841	1000 hrs	Qualification Data
			0/77	
LCA110X/ 6-DIP	THB RH=85C/85%, Ids Bias=1A: if Bias=5mA	TE2840	1000 hrs	Qualification Data
			0/77	
LCA110X/ 6-DIP	THB RH=85C/85%, Ids Bias=1A: if Bias=5mA	TE2840	1000 hrs	Qualification Data
			0/77	
XCA170X/ 6-DIP	Thermal Shock 0 to 100C, 10/10 Dwell	TE2189	15 cycles	Qualification Data
			0/55	
LBB110/ 8-DIP	Thermal Shock 0 to 100C, 10/10 Dwell	T20571	15 cycles	Qualification Data
			0/55	
PAA110/ 8-DIP	Thermal Shock 0 to 100C, 10/10 Dwell	T24426	15 cycles	Qualification Data
			0/55	
XCA170X/ 6-DIP	Temp Cycles -55 to 125C, 10/10 Dwell	TE2189	300 cycles	Qualification Data
			0/55	
LBB110/ 8-DIP	Temp Cycles -55 to 125C, 10/10 Dwell	T20571	300 cycles	Qualification Data
			0/55	
PAA110/ 8-DIP	Temp Cycles -55 to 125C, 10/10 Dwell	T24426	300 cycles	Qualification Data
			0/55	
XCA170X/ 6-DIP	Construction Analysis Die Coat, Bond Quality, Die Attach, Bondline Thk	TE2189	All Tests	Qualification Data
			0/5	
XCA170X 6-DIP	MSL, 24hr Bake, Level 1 Soak, 1X Reflow	TE2189	MSL 1	Qualification Data
			0/50	

ESD Testing Results:

As a part of this qualification, LV04A and IAA110P parts were 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 all of them passed 8000V zapping.

Table 3: Clare SSR-Form-A Relay Family Products ESD Characterization Results

ESD Model	Product	Package	ESD Test Spec	RC Network	Highest Passed	ESD Class
HBM	CPC1008N/ TE2228	4 pin-SOP	JESD22-A114	1.5kΩ, 100pF	+/- 8000V	3B
HBM	XCA170X/ TE2189	6-DIP	JESD22-A114	1.5kΩ, 100pF	+/- 8000V	3B
HBM	IAA110P	16-SOIC	JESD22-A114	1.5kΩ, 100pF	+/- 8000V	3B

FIT (Failure in Time) Rate on Clare SSR-Form-A Relay Family Products:

Table 4 below summarizes the FITs rate from the HTRB data. FITs rate was calculated using the life-test HTRB data based on the equivalent device hours at use condition of 40°C and stressed condition of 125°C according to Clare’s procedure P-04-25-WW. To calculate equivalent device hours, Acceleration Factor (AF) was calculated at 0.7eV of activation energy @60% CL. 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 FITs rate came out to be 8.48 FITs (HTRB) and 52.58 FITs (THB).

Table 4: Clare SSR-Form-A Relay Family Products FIT Rate Summary

Product/ Stress	# of Devices	# of Fails.	Hours Tested	Test Temp (°C)	Eq. Dev. Hours	FITs @ 60% CL
IAA110P/ HTRB	120	0	1000	125	492,933,516	8.48
LCA110/ HTRB	774	1	1000	125		
CPC1030N/ HTRB	200	0	1000	125		
IAA110P/ HTRB	120	1	1000	125		
LCA110/ HTRB	387	0	1000	125		
XCA170X/ HTRB	200	0	1000	125		
PLA140/ HTRB	129	1	1000	125	17,498,403	52.58
LCA110/ THB	77	0	1000	85		
LCA110X/ THB	77	0	1000	85		