



Reliability Qualification Report

Interface Product Family

ZT3223E Series

ZT230E Series

ZT232E Series

ZT485E Series

ZT3485E Series

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Reliability Life Test Result

Life Test

Life Testing is performed to determine if device has any fundamental reliability related failure mechanisms, which can be divided into 4 main groups:

- Process or die related failures, such as oxide-related defects, metallization-related defects and diffusion-related defects.
- Assembly-related defects such as wire bonding or package-related failures.
- Design-related defects.
- Miscellaneous, undetermined or application-induced failures.

Life Test Result

Product Family: ZT3223E Low Power 3V to 5.5V RS232 Transceiver
Device Type: ZT3220E/ZT3221E/ZT3222E/ZT3223E/ZT3232E

ZT1385E/ZT3241E/ZT3243E

ZT3220F/ZT3221F/ZT3222F/ZT3223F/ZT3232F

ZT1385F/ZT3241F/ZT3243F

Mask Sets: MS101

Process: Zywyn 2 μ m CMOS SC2 Technology

Package Type: 20L TSSOP

Die Attach Adhesive: 84-1LMISR4

Bond Wire: 1.0 mil AU

Test: HTOL 1,000 hrs, 3.3V Dynamic Burn-In at 125°C

Reference Standard: Mil-Std-883

Pass/Fail Criteria: Electrical QA testing to datasheet limits at 25°C before and after stress.

Device Type	HTOL Test	Lot Number	Date Completed	Burn-In Temperature (°C)	Sample Size	No. of Fails
ZT3223ECY	1,000 hr @ 3.3V	B3609F52V	11/26/04	125	20	0

Life Test Result

Product Family: ZT232E Lower Power 5V RS232 Transceiver
Device Type: ZT202E/ZT232E/ZT310E/ZT312E
ZT202F/ZT232F/ZT310F/ZT312F
Mask Sets: MS143
Process: Zywyn 2 μ m CMOS SC2 Technology
Package Type: 16L TSSOP, 16L nSOIC
Die Attach Adhesive: 84-1LMISR4
Bond Wire: 1.0 mil AU

Test: HTOL 1,000 hrs, 5.0V Dynamic Burn-In at 125°C
Reference Standard: Mil-Std-883

Pass/Fail Criteria: Electrical QA testing to datasheet limits at 25°C before and after stress.

Device Type	HTOL Test	Lot Number	Date Completed	Burn-In Temperature (°C)	Sample Size	No. of Fails
ZT232EEY	1,000 hr @ 5.0V	B4405210C	01/07/05	125	10	0
ZT232ECN	1,000 hr @ 5.0V	B4405210C	01/07/05	125	10	0

Life Test Result

Product Family: ZT230E Lower Power 5V RS232 Transceiver
Device Type: ZT207E/ZT208E/ZT211E/ZT213E
ZT207F/ZT208F/ZT211F/ZT213F
Mask Sets: MS107
Process: Zywyn 2 μ m CMOS SC2 Technology
Package Type: 24L SSOP
Die Attach Adhesive: 84-1LMISR4
Bond Wire: 1.0 mil AU

Test: HTOL 1,000 hrs, 5.0V Dynamic Burn-In at 125°C
Reference Standard: Mil-Std-883

Pass/Fail Criteria: Electrical QA testing to datasheet limits at 25°C before and after stress.

Device Type	HTOL Test	Lot Number	Date Completed	Burn-In Temperature (°C)	Sample Size	No. of Fails
ZT213ECA	1,000 hr @ 5.0V	B3929P08G	01/07/05	125	20	0

Life Test Result

Product Family: ZT485E Lower Power 5V RS485 Transceiver
Device Type: ZT483E/ZT485E/ZT488E/ZT489E/ZT490E/ZT491E/
ZT487E/ZT485ER/ZT488ER/ZT489ER/ZT490ER/
ZT491ER/ZT483H/ZT485H
Mask Sets: MS127
Process: Zywyn 2µm CMOS SC2 Technology
Package Type: 8L PDIP
Die Attach Adhesive: AG03*7
Bond Wire: 1.0 mil AU
Test: HTOL 1,000 hrs, 5.0V Dynamic Burn-In at 125°C
Reference Standard: Mil-Std-883
Pass/Fail Criteria: Electrical QA testing to datasheet limits at 25°C before
and after stress.

Device Type	HTOL Test	Lot Number	Date Completed	Burn-In Temperature (°C)	Sample Size	No. of Fails
ZT483EEP	1,000 hr @ 5.0V	B3B27H50Q	01/07/05	125	20	0

Life Test Result

Product Family: ZT3485E Lower Power 3V RS485 Transceiver
Device Type: ZT3483E/ZT3485E/ZT3488E/ ZT3490E/ZT3491E/
ZT3070E/ZT3071E/ZT3072E/ZT3073E/ZT3074E/
ZT3075E/ZT3076E/ZT3077E/ZT3078E
Mask Sets: MS157
Process: Zywyn 2µm CMOS SC2 Technology
Package Type: 8L nSOIC
Die Attach Adhesive: AG03*7
Bond Wire: 1.0 mil AU
Test: HTOL 1,000 hrs, 3.3V Dynamic Burn-In at 125°C
Reference Standard: Mil-Std-883
Pass/Fail Criteria: Electrical QA testing to datasheet limits at 25°C before and after stress.

Device Type	HTOL Test	Lot Number	Date Completed	Burn-In Temperature (°C)	Sample Size	No. of Fails
ZT3483E	1,000 hr @ 3.3V	B5711181C	03/29/06	125	10	0

FIT Rate Calculation

The FIT (failures in time) is calculated as follows,

$$FR \text{ (Chi-squared)} = \chi^2_{2n+2} / (2 \times AF \times \text{device-hours}) \times 10^9$$

where AF is the acceleration factor and n is the number of failures. The value is highly dependent on the following:

1. Life test conditions (duration, temperature, sample size and number of failures)
2. Activation energy of the potential failure modes

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The weighted activation energy, E_a , of observed failure mechanisms of Zywyn products has been determined to be 0.8eV.

Based on the above criteria, the FIT rates at 25°C, 55°C, and 70°C operation at both 60% and 90% confidence levels for Zywyn's ZT3223E products have been calculated and are listed below.

ZT3223E/ZT232E/ZT213E/ZT485E

Confidence Level	+25°C	+55°C	+75°C
60%	45.9	792.9	4033.6
90%	18.3	315.6	1605.5

1 FIT = 1 failure per billion device hours

ESD Test Results

Summary:

ZT3223E Series

Device Type	ESD Test	Lot Number	Date Completed	Sample Size	No. of Fails
ZT3223ECY	±15kV Air Gap Discharge	B3609F52V	06/15/04	14	0
ZT3223ECY	±8kV Contact Discharge	B3609F52V	06/15/04	14	0

ZT232E Series

Device Type	ESD Test	Lot Number	Date Completed	Sample Size	No. of Fails
ZT232ECN	±15kV Air Gap Discharge	B4405210C	08/05/04	14	0
ZT232ECN	±8kV Contact Discharge	B4405210C	08/05/04	14	0

ZT230E Series

Device Type	ESD Test	Lot Number	Date Completed	Sample Size	No. of Fails
ZT213ECA	±15kV Air Gap Discharge	B3929P08G	10/11/04	14	0
ZT213ECA	±8kV Contact Discharge	B3929P08G	10/11/04	14	0

ZT485E Series

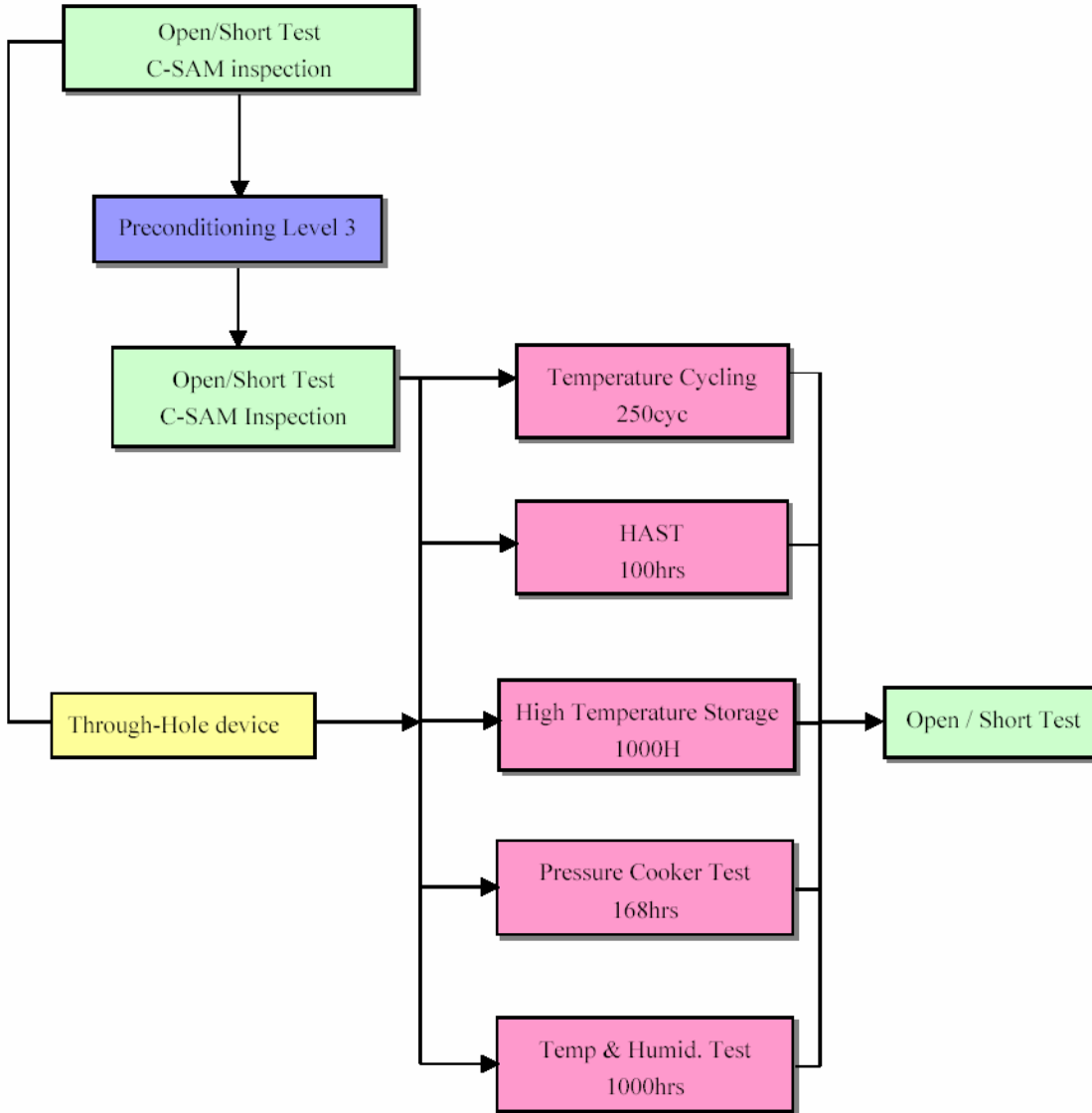
Device Type	ESD Test	Lot Number	Date Completed	Sample Size	No. of Fails
ZT483EEP	±15kV Air Gap Discharge	B3B27H50Q	11/25/04	14	0
ZT483EEP	±8kV Contact Discharge	B3B27H50Q	11/25/04	14	0

ZT3485E Series

Device Type	ESD Test	Lot Number	Date Completed	Sample Size	No. of Fails
ZT3485LEEN	±15kV Air Gap Discharge	B5711181C	02/20/06	14	0
ZT3485LEEN	±8kV Contact Discharge	B5711181C	02/20/06	14	0

2.0 Test Flow

According to Lingsen spec.65-1300, the reliability test flow as the followings,



3.0 Environmental Stress / Mechanical Tests

3.1 Preconditioning

This test is performed for SMDs to simulate the stresses from packing through mounting. It includes several test steps, as the followings :

- Step 1 : Temperature Cycling $-65^{\circ}\text{C} \sim +150^{\circ}\text{C}$, 5 cycles
- Step 2 : Bake 125°C , 24hrs
- Step 3 : Moisture Soak 30°C , 60%RH, 192hrs
- Step 4 : IR Reflow $T_{\text{max}}=235^{\circ}\text{C}$, 3cycles

3.2 Pressure Cooker Test

Evaluating the moisture resistance of non-hermetic packaged IC. It employs severe conditions of pressure, humidity and temperature that accelerate the penetration of moisture. The test conditions as the followings :

- ◆ Temperature : 121°C
- ◆ Relative Humidity : 100%
- ◆ Pressure : 2atm
- ◆ Read-Out Point : 168hrs

3.3 Temperature Cycling

To determine the resistance of a package to extremes of high and low temperature, and to the effect of alternate exposures to these extremes.

- ◆ Temperature : $-65^{\circ}\text{C}/15\text{min}$ to $+150^{\circ}\text{C}/15\text{min}$
- ◆ Read-Out Point : 250 cycles

3.4 High Temperature Storage

To determine the effect on solid-state electronic devices of storage at high temperature without electrical stress applied.

- ◆ Temperature : 150°C
- ◆ Test Time : 1000hrs

3.5 Highly-Accelerated Temperature and Humidity Stress Test

Evaluate the reliability of non-hermetic packaged devices in humid environments. It employs two conditions of temperature and humidity which accelerated the penetration of moisture.

- ◆ Test Conditions : 130°C , 85%R.H.
- ◆ Read-Out Point : 100hrs

4.0 Sample Information and Reliability Test Data

Package	EMC	Pas Size	Run No.	Precon	Reliability
SOP 8L	6600CSP	80X80	421804	L3+240°C	PASS
SOP 20L	6600CSP	140X165	342695	L3+240°C	PASS
SOP 24L	6300H	165X200	352153	L3+240°C	PASS
SOP 28L	6300HS	163X200	440592	L3+240°C	PASS
TSSOP 8L	KMC-184	2.59X2.25	310626	L3+240°C	PASS
TSSOP 28L	EME-7372	283X120	440686	L3+240°C	PASS
MSOP 8L	KMC184	69X94	492453	L3+240°C	PASS
DIP 8L	6300H	140X170	440555	N/A	PASS

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Lead-Free Package & Green Package

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Pin #	Package Type	Plating	Lead Frame	Silver Epoxy	Gold Wire	Molding Compound
28L	TSSOP	Sn/Bi 98/2	5.0X2.9, C7025AG	8340	NI-5 1.0 mil	EME-7372
28L	SSOP	Sn/Bi 98/2	84X19, C151AG	8340	NL-5 1.2 mil	EME-6600CS-P
28L	SSOP	Sn/Bi 98/2	84X19	8340	NL-5 1.2 mil	EME-G600
28L	SOP	Sn/Bi 98/2	163X200, C194AG	8340	NL-5 1.2 mil	EME-G600
28L	SOP	N/A	116X90, C194AG	8340A	NL-5 1.0 mil	EME-6600CS-P
20L	TSSOP	N/A	165X118, C7025AG	CRM-1033BF-IMP	SGL-2 1.0 mil	EME-G6700
16L	SSOP	Sn/Bi 98/2	90X90, C194AG	CRM-1033BF-IMP	NL-5 1.2 mil	EME-G600
8L	SOP	Sn/Bi 98/2	80X80, C194AG	8340	NL-5 1.2 mil	EME-6600CS-P
8L	SOP	Pb-free	80X80, C194AG	8340	NL-5 1.2 mil	EME-G600



Green Package BOM for Interface Products

Bill Of Material	Standard Sn-Pb Package					Pb-free Package					Green Package	
Package Types	SSOP/SOIC	TSSOP	MSOP	PDIP	SOT	SSOP/SOIC	TSSOP	MSOP	PDIP	SOT	SSOP, SOIC, PDIP, SOT	TSSOP, MSOP
Lead Frame	Per device bonding diagram drawing					Per device bonding diagram drawing					Per device bonding diagram drawing	
Au Wire	1.0 mil Au Wire					1.0 mil Au Wire					1.0 mil Au Wire	
Silver Paste	84-1LMISR4		AG03*7	84-1LMISR4		CRM-1033BF					CRM-1033BF	
Molding Compound	EME-6600C SP	EME-7372	KMC-184	EME-1100K	EME-6300H	EME-6600C SP	EME-7372	EME-7372	EME-6600C SP	EME-6300H	EME-G600	EME-G700
Lead Finish	Sn 85 / Pb 15					Sn 98 / Bi 2					Sn 98 / Bi 2	
Ink	4408R White					4408R White					4408R White	
Tube/Tray	Standard Tube					Standard Tube					Standard Tube	
Inner/External Box	Standard Box					Standard Box					Standard Box with Green Label	

Zywyn Green Packages Are Ready



For Interface Products: All package types from Lingsen Taiwan

IR Reflow Profile Conditions		
Program Name	JESD Sn-Pb Eutectic Assembly (small packages)	JESD Pb-free Assembly (small packages)
Peak temperature	235~240°C	245~250°C
Pre-heat range/time	100~150°C, 60~120 sec.	150~200°C, 60~180 sec.
Time within 5°C of peak temperature	10~30 sec.	20~40 sec.
Time maintained above temperature/time	183°C, 60~150 sec.	217°C, 60~150 sec.
Time 25°C to peak temperature	6 min. max.	8 min. max.
Ramp-up rate	3°C/sec. max.	3°C/sec. max.
Ramp-down rate	6°C/sec. max.	6°C/sec. max.

Product Environmental Material Declaration Datasheets By Package:

Package Type	Datasheet
PDIP-08	PDIP-08_MaterialDeclaration.pdf
PDIP-16	PDIP-16_MaterialDeclaration.pdf
nSOIC-14	nSOIC-14_MaterialDeclaration.pdf
nSOIC-16	nSOIC-16_MaterialDeclaration.pdf
nSOIC-8	nSOIC-8_Interface_MaterialDeclaration.pdf
SSOP-16	SSOP-16_MaterialDeclaration.pdf
SSOP-20	SSOP-20_MaterialDeclaration.pdf
SSOP-24	SSOP-16_MaterialDeclaration.pdf
SSOP-28	SSOP-28_MaterialDeclaration.pdf
TSSOP-16	TSSOP-16_MaterialDeclaration.pdf
TSSOP-20	TSSOP-20_MaterialDeclaration.pdf
TSSOP-28	TSSOP-28_MaterialDeclaration.pdf
wSOIC-16	wSOIC-16_MaterialDeclaration.pdf
wSOIC-24	wSOIC-24_MaterialDeclaration.pdf

All Product Environmental Material Declaration Datasheets for the Interface Products can be found and downloaded from Zywyn website at www.zywyn.com under “Products”, “Technical Reference”, “Green Packaging Information” in pdf file format.



Green Partner Certificate

Certificate Green Partner

Presented To:

Lingsen Percision Industries.,Ltd.

This is to certify that you have successfully established
an environmental management system
that has met the requirements of the Sony Green Partner Program

Term of Validity : 2003/5/14 ~ 2005/5/13

Issued on : 2003/6/19

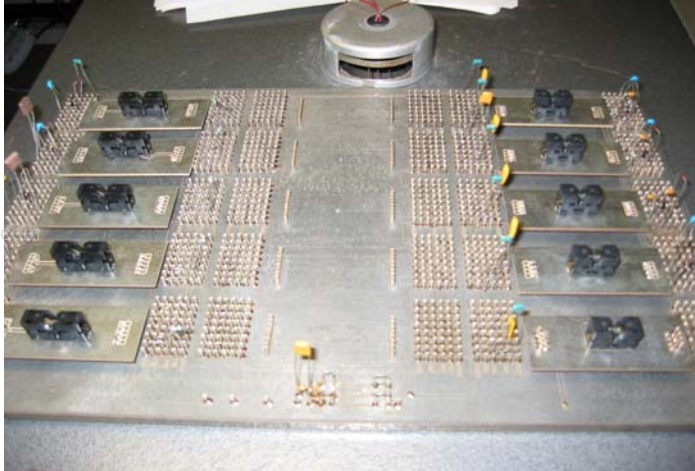
Approved and Issued by : Procurement Global Head Office,
Sony Corporation

Shigeki Nomoto

Head of Procurement Global Head Office, Global Professional Solutions, Sony Corporation

Appendix 1

Burn-in Board and Burn-in Equipment:



Burn-in Board used for Dynamic Life Test



Burn-in oven used for Dynamic Life and Humidity Test

Appendix 2

ESD Tester Equipment:



Front view of the iMCS model#700



Front view of the iMCS model#700
ESD tester with lid open



Back view of the ESD tester with
Machine model/Pulse model being used

Appendix 3

The Reliability Test Reports for the following PB-Free/Green Packages are available upon request:

- TSSOP 28L PB-Free Package
- TSSOP 20L Green Package
- SSOP 28L Lead-Free Package
- SSOP 16L Lead-Free Package
- SSOP 28L Green Package
- SOP 8L Lead-Free Package
- SOP 28L Green Package
- SOP 28L Lead-Free Package
- SOP 8L Green Package

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