Product Reliability Report

For

RT9728A

Richtek Technology Corporation

14F, No. 8, Tai Yuen 1st Street, Chupei City,
Hsinchu, Taiwan 30288
TEL: 886-3-5526789
FAX: 886-3-5526611

HTOL Test Report

Purpose

The purpose of this specification is to demonstrate the quality or reliability of device RT9728A subjects to the specified conditions over an extended time period and determines this device is capable of passing the specified stress tests to meet Richtek quality criteria.

Scope

The test report is applicable for qualification products of RT9728A.
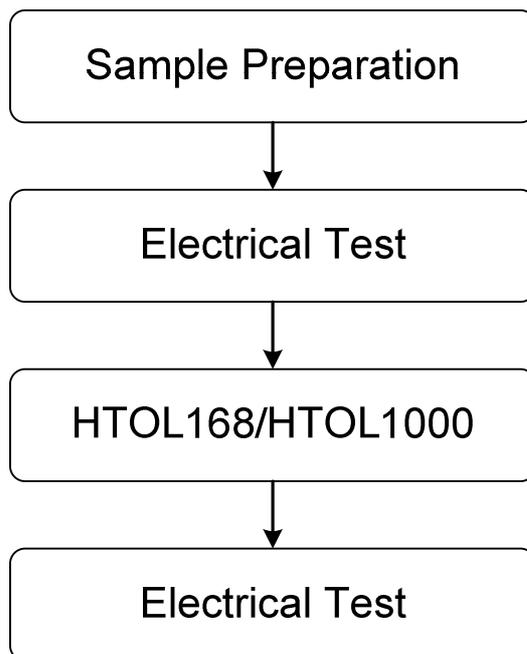
Product Information

- Part No : RT9728A
- Date Code : CCF2Z, 2DL57
- Package Type : WDFN-6L 2X2, SOT-23-6

Test Items and Conditions

High Temperature Operation Life Test (HTOL)

- Reference Standard : JESD22-A108
- Test Condition : T_a=125℃, V_{IN}=6.5V
- Test Time : 1000 hours
- Sample Size : 77 ea

Test Flow

```
┌─────────────────────────┐
│   Sample Preparation    │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│     Electrical Test     │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│   HTOL168/HTOL1000      │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│     Electrical Test     │
└─────────────────────────┘
```

Test Result

Test Item	Test Time	Sample Size	Fail	Failure Rate (λ) FITs, CL 60%	Failure Rate (λ) FITs, CL 90%
HTOL	1000 hrs	77	0	14.14	35.54

FIT and MTTF

Test condition: T_a=125℃, V_{IN}=6.5V

Field application temperature (T_{field}): 50℃

Field application voltage (V_{field}): V_{IN}=5.5V

AF_T = exp[(Ea/K)*(1/T_{field}-1/T_{stress})]
  = 113.89 (Ea is conservative value)

AF_V = exp[C*(V_{stress} - V_{field})] = 7.39

AF = AF_T *AF_V = 841.51

Failure Rate (λ)
  = [χ^2 / (2*N*D*A)]*10^9 FITs
  = 35.54   FITs at 90% confidence level
  = 14.14   FITs at 60% confidence level

MTTF=1/λ= 2.81*10^7 hours= 3,208 years (at 90% confidence level)

MTTF=1/λ= 7.07*10^7 hours= 8,071 years (at 60% confidence level)

AF = Acceleration Factor

Ea = Activation Energy (eV)

K = Boltzman's Constant (8.62 x10^{-5} eV/K)

T = Temperature (K)

V = Voltage (V)

T_{field} = Temperature Field Conditions

T_{stress} = Temperature Stress Conditions

C = Constant of Voltage Acceleration Factor

V_{field} = Voltage Field Conditions

V_{stress} = Voltage Stress Conditions

X^2 = Chi-square Distribution Function

N = Sample Size

D = Device Hours

HTOL Summary

The test results can be applied to all of the products that include RT9728A.

ESD Test Report

Purpose

The ESD tests are used to classify the electrostatic discharge of microcircuits.

Scope

The test report is applicable for qualification products of RT9728A.

Product Information

- Part No : RT9728A
- Date Code : CCF2Z, 2DL57
- Package Type : WDFN-6L 2X2, SOT-23-6

Test Items and Conditions

- Reference Standard : JESD22-A114 (HBM)
  - : JESD22-A115 (MM)
  - : JESD22-C101 (CDM)
- Sample Size : 3ea/voltage
- Failure Criteria : All test samples must pass both diode I-V and function test.

  Diode I-V Test Criteria

Criteria	Pass	Fail (Leak)	Fail (Short)
I-V behavior ΔVref at 1uA	ΔVref < 30%	ΔVref > 30%	No diode curve (I-V turns linear)

- Classification Criteria

Classification	Class 0	Class 1			Class 2	Class 3	
		A	B	C		A	B
HBM	< 250V	250V~500V	500V~1000V	1000V~2000V	2000V~4000V	4000~8000V	>8000V

Classification	Class A	Class B	Class C
MM	< 200V	200V~400V	> 400V

Classification	Class I	Class II	Class III	Class IV
CDM	< 200V	200V~500V	500V~1000V	>=1000V

Test Flow

```
        ┌──────────────────────┐
        │  Sample Preparation  │
        └──────────────────────┘
                   │
        ┌──────────────────────┐
        │    Electrical Test   │
        └──────────────────────┘
           │        │        │
        ┌─────┐  ┌─────┐  ┌─────┐
        │ HBM │  │ MM  │  │ CDM │
        └─────┘  └─────┘  └─────┘
           │        │        │
        ┌──────────────────┐    │
        │   Diode I-V Test │    │
        └──────────────────┘    │
                   │            │
        ┌──────────────────────┐
        │    Electrical Test   │
        └──────────────────────┘
```
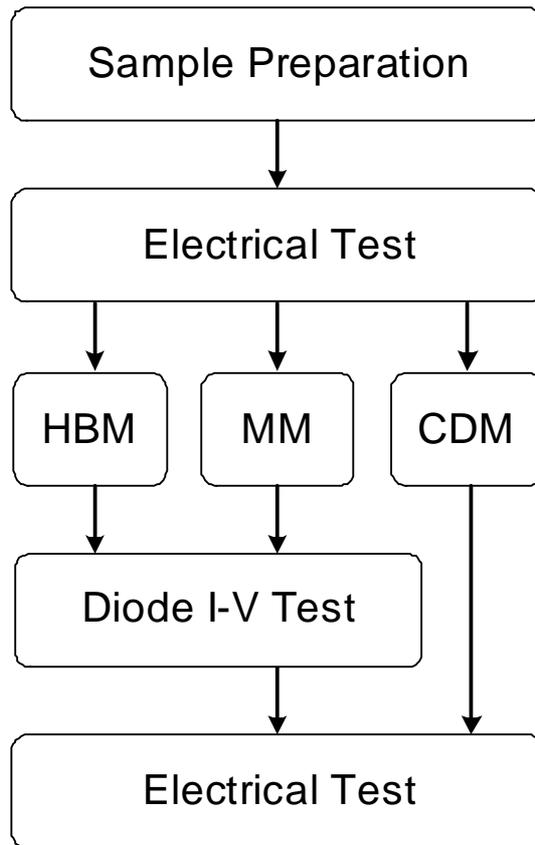
Test Results

HBM: 4000 V   MM: 200 V   CDM: 2000 V

ESD Summary

● Classification: HBM: Class 3A   MM: Class B   CDM: Class IV
● The test results can be applied to all of the products that include RT9728A.

Latch-up Test Report

Purpose

The latch-up test is used to check IC latch-up characteristics.

Scope

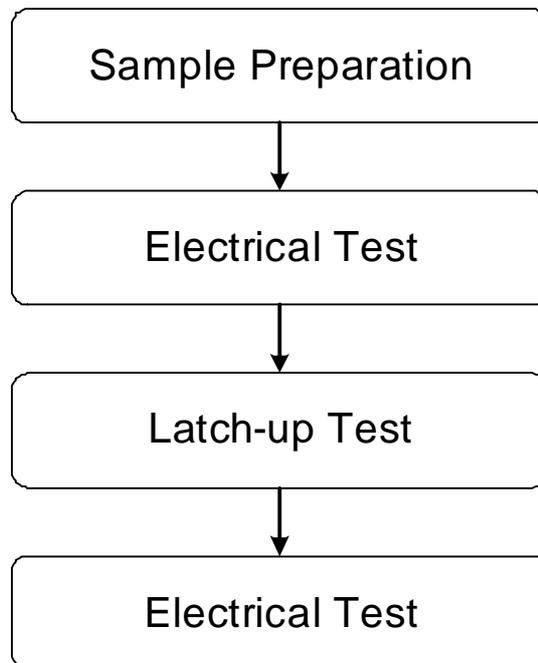The test report is applicable for qualification products of RT9728A.

Product Information

- Part No : RT9728A
- Date Code : CCF2Z, 2DL57
- Package Type : WDFN-6L 2X2, SOT-23-6

Test Items and Conditions

- Reference Standard : JESD78D
- Test Conditions : ±100mA current trigger
  1.5 X max. Vsupply or MSV whichever is less
- Sample Size : 9 ea
- Failure Criteria : If absolute Inom is ≤ 25 mA, absolute Inom +10mA is applied.
  : If absolute Inom is > 25mA, > 1.4 X absolute Inom is applied.

Test Flow

```
┌─────────────────────────┐
│   Sample Preparation    │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│     Electrical Test     │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│      Latch-up Test      │
└─────────────────────────┘
            │
            ▼
┌─────────────────────────┐
│     Electrical Test     │
└─────────────────────────┘
```

Test Result

Test Type	Test Pins	Sample Size	Pass/Fail Result	Failure Criteria
(+) IT	VOUT ILIM /FAULT EN(/EN)	3	Pass	1.4 X Inom or Inom +10mA whichever is greater
(-) IT	VOUT ILIM /FAULT EN(/EN)	3	Pass	
Vsupply Overvoltage Test	VIN	3	Pass	

Latch-up Summary
- The test results can be applied to all of the products that include RT9728A.
- Any questions or inquiries for regarding related products or service of Richtek, you may contact us through our technical support center.
(http://www.richtek.com/contact10.1.jsp)