

RTEN-2010

RELIABILITY DATA

| DWG.No.SC-575-RTEN-2010-001 | | | |
|-----------------------------|---------------------------|-------------------------|--------------------------|
| QA | R & D | | |
| APPROVED BY | APPROVED BY | CHECKED BY | DRAWN BY |
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The following data are typical values. As all units have nearly the same characteristics, the data to be considered as ability values.

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1. Calculated Values of MTBF

MODEL : RTEN-2010

(1) Calculating Method

Calculated Based on parts stress Reliability projection of MIL-HDBK-217F NOTICE2.

Individual failure rates λ_G is given to each part and MTBF is Calculated by the count of each part.

$$MTBF = \frac{1}{\lambda_{equip}} = \frac{1}{\sum_{i=1}^n N_i (\lambda_G \pi_Q)_i} \times 10^6 \text{ (hours)}$$

λ_{equip} : Total equipment failure rate (Failure / 10^6 Hours)

λ_G : Generic failure rate for the i th generic part (Failure/ 10^6 Hours)

N_i : Quantity of i th generic part

N : Number of different generic part categories

π_Q : Generic quality factor for the i th generic part ($\pi_Q=1$)

(2) MTBF Values

GF : Ground, Fixed

$$\underline{MTBF = 4,784,231 \text{ (Hours)}}$$

RTEN-2010**2. Vibration Test**

MODEL: RTEN-2010 (Representation Product : RSEN-2030)

(1) Vibration Test Class

Frequency Variable Endurance Test

(2) Equipment Used

Controller VS-1000-6, Vibrator 905-FN (IMV CORP.)

(3) The Number of D.U.T (Device Under Test)

5 units

(4) Test Conditions

Frequency : 10~55Hz

Amplitude : 1.5mm, Sweep for 1 min.

Dimension and times : X, Y and Z Directions for 2 hours each.

(5) The Method

Fix the D.U.T on the fitting-stage

(6) Test Results

PASS

Typical Sample Data

| Check item | Spec. | | Before Test | After Test |
|--------------------------|-------------------------------|---------|-----------------------|-----------------------|
| Attenuation(dB) | Differential Mode : 25dB min. | 0.4 MHz | 39.72 | 40.02 |
| | | 30 MHz | 58.84 | 55.92 |
| | Common Mode : 25dB min. | 2 MHz | 36.32 | 36.44 |
| | | 30 MHz | 38.26 | 38.08 |
| Leakage Current (mA) | 1mA max. (250V, 60Hz) | Line1 | 0.42 | 0.41 |
| | | Line2 | 0.43 | 0.42 |
| DC Resistance (mΩ) | 6mΩ max. | | 3.84 | 3.72 |
| Test Voltage | L-L : 1768Vdc 60sec. | | OK | OK |
| | L-E : 2500Vac 60sec. | | | |
| Isolation Resistance(MΩ) | 100MΩ min.(500Vdc 60sec.) | | 4.1 x 10 ⁶ | 4.3 x 10 ⁶ |

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3. Heat Cycle Test

MODEL: RTEN-2010 (Representation Product : RSEN-2030)

(1)Equipment Used

TEMPERATURE CHAMBER TSA-71H-W (ESPEC CORP.)

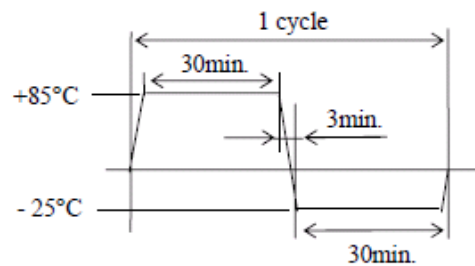
(2)The Number of D.U.T (Device Under Test)

5 units

(3)Test Conditions

Ambient Temperature : -25~+85°C

Test Cycles: 100 cycles



(4)The Method

Before the test check if there is no abnormal characteristics and put the D.U.T in the testing chamber. Then test it in the above cycles, After the test is completed leave it for 1 hour at room temperature and check it if there is no abnormal each characteristics.

(5)Test Results

PASS

Typical Sample Data

| Check item | Spec. | Before Test | After Test | |
|--------------------------|-------------------------------|-----------------------|-----------------------|-------|
| Attenuation(dB) | Differential Mode : 25dB min. | 0.4 MHz | 40.06 | 40.06 |
| | | 30 MHz | 55.64 | 57.12 |
| | Common Mode : 25dB min. | 2 MHz | 35.40 | 36.74 |
| | | 30 MHz | 37.70 | 37.36 |
| Leakage Current (mA) | 1mA max. (250V, 60Hz) | Line1 | 0.41 | 0.49 |
| | | Line2 | 0.42 | 0.48 |
| DC Resistance (mΩ) | 6mΩ max | 3.48 | 3.22 | |
| Test Voltage | L-L : 1768Vdc 60sec | OK | OK | |
| | L-E : 2500Vac 60sec | | | |
| Isolation Resistance(MΩ) | 100MΩ min.(500Vdc 60sec.) | 9.5 x 10 ⁵ | 9.4 x 10 ⁵ | |

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4. Humidity Test

MODEL: RTEN-2010 (Representation Product : RSEN-2030)

(1)Equipment Used

TEMP. & HUMID. CHAMBER PR-4KT (ESPEC CORP.)

(2)The Number of D.U.T (Device Under Test)

5 units

(3)Test Conditions

Ambient Temperature : +40°C

Test Times: 500 hours

Ambient Humidity: 90~95%RH No Dewdrop

(4)The Method

Before the test check if there is no abnormal characteristics and put the D.U.T in the testing chamber. Then test it in the above conditions. After the test is completed leave it for 1 hour at room temperature and check it if there is no abnormal each characteristics.

(5)Test Results

PASS

Typical Sample Data

| Check item | Spec. | | Before Test | After Test |
|--------------------------|-------------------------------|---------|-----------------------|-----------------------|
| Attenuation(dB) | Differential Mode : 25dB min. | 0.4 MHz | 40.92 | 39.42 |
| | | 30 MHz | 57.38 | 55.62 |
| | Common Mode : 25dB min. | 2MHz | 36.16 | 36.22 |
| | | 30 MHz | 37.34 | 37.92 |
| Leakage Current (mA) | 1mA max. (250V, 60Hz) | Line1 | 0.42 | 0.41 |
| | | Line2 | 0.42 | 0.43 |
| DC Resistance (mΩ) | 6mΩ max. | | 3.62 | 3.58 |
| Test Voltage | L-L : 1768Vdc 60sec. | | OK | OK |
| | L-E : 2500Vac 60sec. | | | |
| Isolation Resistance(MΩ) | 100MΩ min.(500Vdc 60sec.) | | 3.6 x 10 ⁶ | 4.5 x 10 ⁶ |

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5. High Temperature Resistance Test

MODEL: RTEN-2010 (Representation Product : RSEN-2060)

(1)Equipment Used

TEMPERATURE CHAMBER PHH-300 (ESPEC CORP.)

(2)The Number of D.U.T (Device Under Test)

5 units

(3)Test Conditions

Ambient Temperature : +55°C

Test Times: 500 hours

Operating: DC 60A

(4)The Method

Before the test check if there is no abnormal characteristics and put the D.U.T in the testing chamber. Then test it in the above conditions. After the test is completed leave it for 1 hour at room temperature and check it if there is no abnormal each characteristics.

(5)Test Results

PASS

Typical Sample Data

| Check item | Spec. | | Before Test | After Test |
|--------------------------|--|---------|-----------------------|-----------------------|
| Attenuation(dB) | Differential Mode : 25dB min. | 0.2 MHz | 57.86 | 58.52 |
| | | 30 MHz | 52.04 | 51.94 |
| | Common Mode : 25dB min. | 2 MHz | 35.90 | 36.04 |
| | | 30 MHz | 26.60 | 27.62 |
| Leakage Current (mA) | 1mA max. (250V, 60Hz) | Line1 | 0.45 | 0.46 |
| | | Line2 | 0.46 | 0.46 |
| DC Resistance (mΩ) | 3mΩ max. | | 2.22 | 2.24 |
| Test Voltage | L-L : 1768Vdc 60sec. L-E : 2500Vac 60sec. | | OK | OK |
| Isolation Resistance(MΩ) | 100MΩ min.(500Vdc 60sec.) | | 4.1 x 10 ⁶ | 4.6 x 10 ⁶ |

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6. Low Temperature Storage Test

MODEL: RTEN-2010 (Representation Product : RSEN-2030)

(1)Equipment Used

TEMPERATURE CHAMBER PG-2FT (ESPEC CORP.)

(2)The Number of D.U.T (Device Under Test)

5 units

(3)Test Conditions

Ambient Temperature : -25°C

Test Times: 500 hours

(4)The Method

Before the test check if there is no abnormal characteristics and put the D.U.T in the testing chamber. Then test it in the above conditions. After the test is completed leave it for 1 hour at room temperature and check it if there is no abnormal each characteristics.

(5)Test Results

PASS

Typical Sample Data

| Check item | Spec. | | Before Test | After Test |
|-----------------------------------|--|---------|-------------------|-------------------|
| Attenuation(dB) | Differential Mode : 25dB min. | 0.4 MHz | 40.00 | 39.82 |
| | | 30 MHz | 59.40 | 55.52 |
| | Common Mode : 25dB min. | 2 MHz | 36.14 | 35.90 |
| | | 30 MHz | 38.24 | 38.48 |
| Leakage Current (mA) | 1mA max. (250V, 60Hz) | Line1 | 0.42 | 0.41 |
| | | Line2 | 0.43 | 0.42 |
| DC Resistance (m Ω) | 6m Ω max. | | 3.88 | 3.88 |
| Test Voltage | L-L : 1768Vdc 60sec. L-E : 2500Vac 60sec. | | OK | OK |
| Isolation Resistance(M Ω) | 100M Ω min.(500Vdc 60sec.) | | 4.1×10^6 | 3.4×10^6 |