

ChemOptics

1 channel Variable Optical Attenuator

(Reliability test data)

1. Reliability Test Items

1) Damp Heat

(1) This test is based on the procedures stated in MIL-STD-883 Method 103

(2) Conditions

- Temperature : 85 (± 2)
- Humidity: 85%($\pm 5\%$) RH
- Test Duration: 500 hrs for CO, 2000 hrs for UNC
- Devices have the entire assembly (device package, leads and connectors)

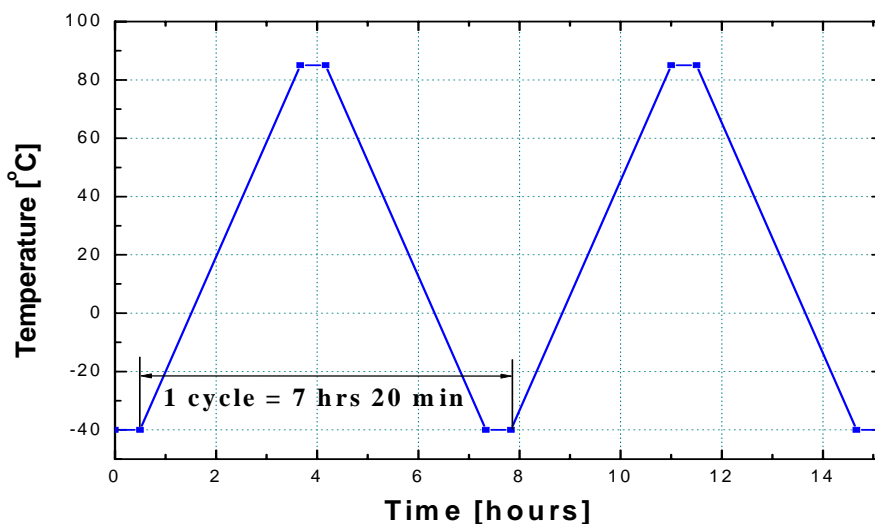
2) Temperature cycling

(1) This test is based on the procedures stated in MIL-STD-883, Method 1010

(2) Conditions

- Temperature : -40 to 85 (± 2)
- Dwell Time at Extremes: > 15 minutes
- Number of Cycles: 100 for CO, 500 for UNC

(3) Cycling profile



3) High Temperature storage

(1) This test is based on the procedures stated in EIA/TIA-455-4A

(2) Conditions

- Temperature : 85 (± 2) or the maximum storage temperature
- Humidity: <40% RH
- Test Duration: 2,000 hrs for qualification and 5,000 hrs for information

4) Low Temperature storage

(1) This test is based on the procedures stated in EIA/TIA-455-4A

(2) Conditions

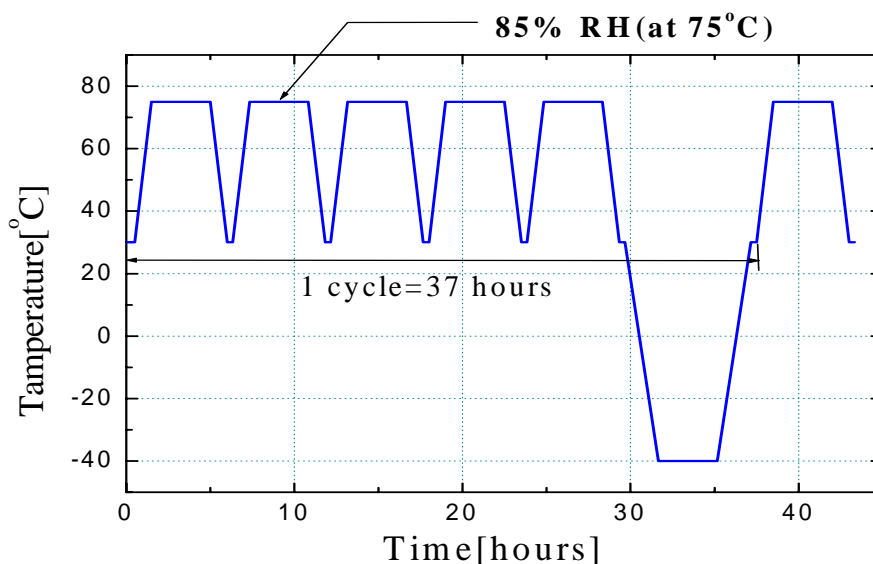
- Temperature : -40 (± 5)
- Humidity: Uncontrolled
- Test Duration: 2,000 hrs for qualification and $\geq 5,000$ hrs for information

5) Cyclic Moisture Resistance Test

(1) This test is based on the procedures stated in MIL-STD-883 Method 1004

(2) Conditions

- Temperature Profile :



- Relative Humidity : 85-95% at 75 ; uncontrolled at 25 & -40
- Dwell Times at Extremes : 3 to 16 Hours
- Number of Cycles : 5 complete cycles (each complete cycle has 5 sub-cycles)

6) Thermal Shock Test

(1) This test is based on MIL-STD-883 Method 1011

(2) Conditions

- Temperature Range : $\Delta T=100$ (0 to 100), liquid-to-liquid
- Dwell Times : ≥ 5 minutes at temperature extremes
- Transfer Time : 10 seconds
- Number of Cycles : 15

7) Mechanical Shock (Impact test)

(1) This test is based on MIL-STD-883 Method 2002

(2) Conditions

- Number of Shocks : 5 times per direction for 6 directions (on 3 axes)
- Shock Level : 500 G
- Duration : 1ms

(3) Examination

- External visual examination is performed at a magnification between 10X and 20X

8) Variable Frequency Vibration Test

(1) This test is based on MIL-STD-883 Method 2007

(2) Conditions

- Condition : Condition A
- 20 G maximum acceleration
- Frequency : 20-2,000 Hz
- Duration : 4 min per cycle and 4 cycles per axis

(3) Examination

- External visual examination his performed at a magnification between 10X and 20X

9) Test equipments

Test equipments	Producer	Model
Damp Heat Temp. Cycling Low Temp. Storage High Temp. Storage Cyclic Moisture Resistance	SANYO	MTM-4100T
Thermal Shock	Thermotron Industries	AST-8/RS-16
Mechanical Shock	Lansmont	M-23
Variable Frequency Vibration	Ling Dynamic System	V870-440LPT900C(Vibrator) SPA40/25K(Amplifier) DVC48(Controller)
Examination	ZRISS	STEMI SV8
Optical Power	FiberPRO	PL2000-S-F/P
Multi meter	H.P.	973A

10) Pass/Fail criteria

(1) Endurance

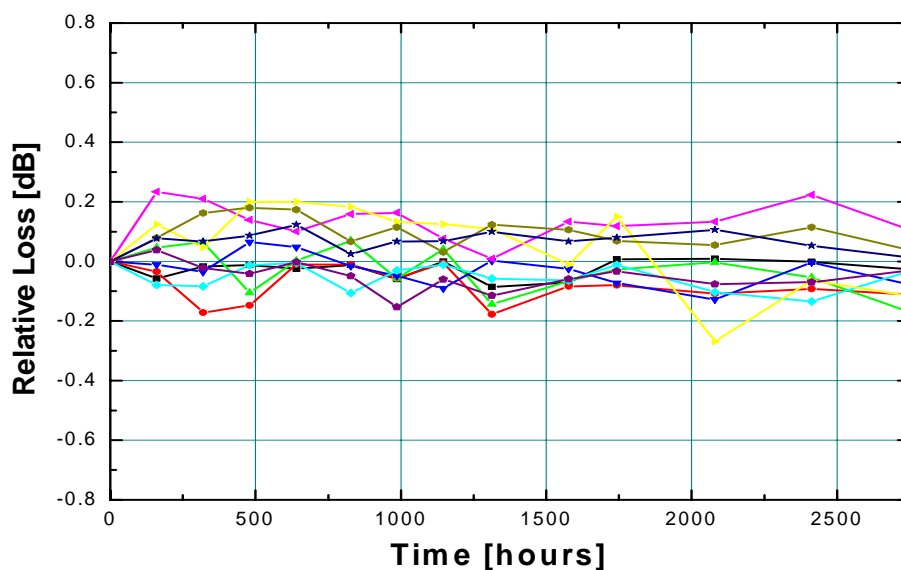
- An Insertion loss change of 10% or 0.5dB (@R.T.)

(2) Mechanical Integrity

- An Insertion loss change of 10% or 0.5dB (@R.T.)
- Evidence of defects or damage to the case, leads, or seals, or illegible markings shall be considered a failure

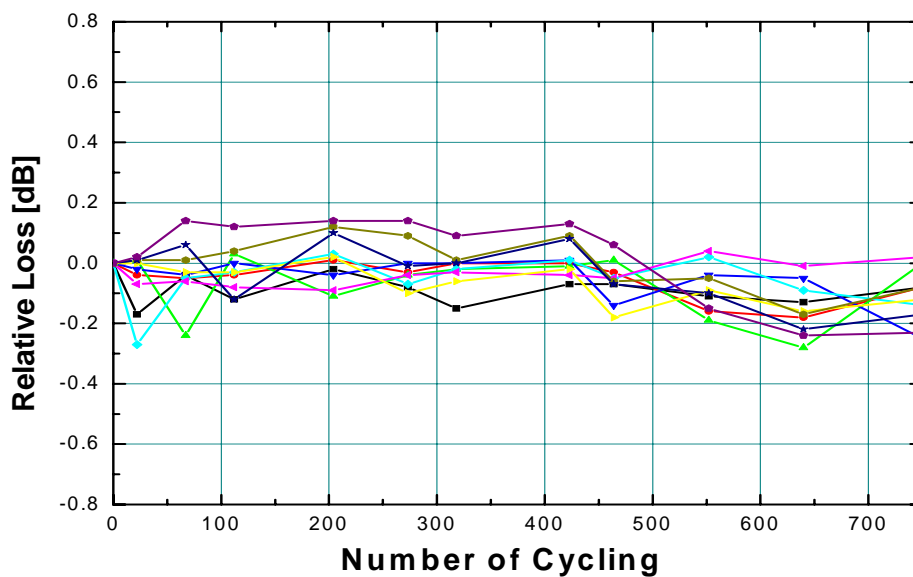
2. The measured values of Reliability test

1) Damp heat



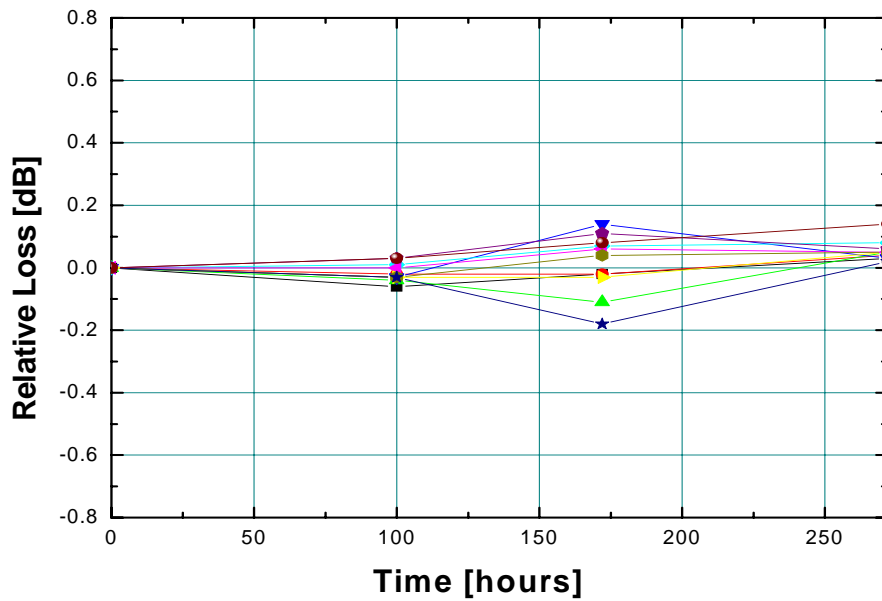
- Relative loss [dB]: Initial IL – measured IL
- About 0.2 dB uncertainty is remained in the measurement due to the fiber connectors.
So the relative loss changes is almost within 0.3 dB for the all samples.

2) Temperature cycling



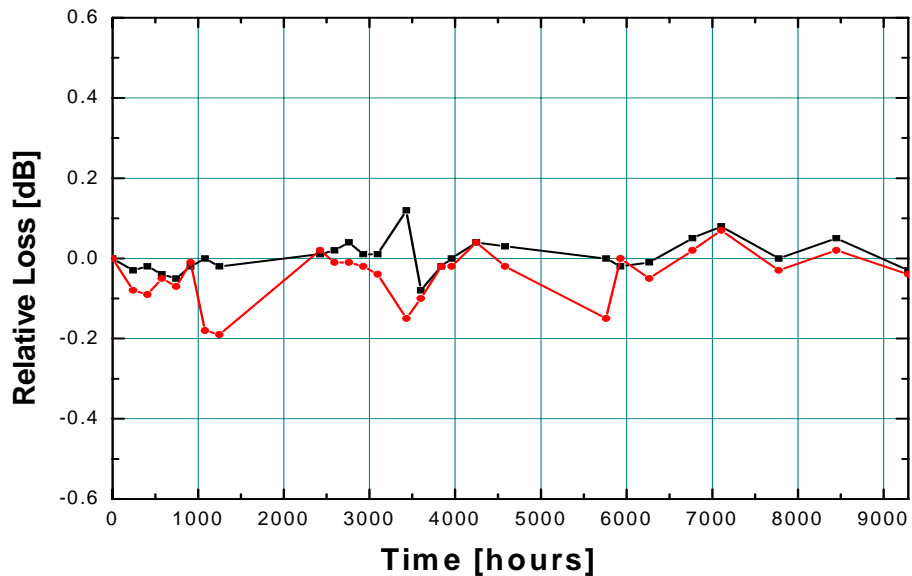
- Relative loss [dB]: Initial IL – measured IL
- About 0.2 dB uncertainty is remained in the measurement due to the fiber connectors.
So the relative loss changes is almost within 0.3 dB for the all samples.

3) Low Temperature storage



- Relative loss [dB]: Initial IL – measured IL
- About 0.2 dB uncertainty is remained in the measurement due to the fiber connectors.
So the relative loss changes is almost within 0.3 dB for the all samples.

4) High Temperature storage



- Relative loss [dB]: Initial IL – measured IL
- About 0.2 dB uncertainty is remained in the measurement due to the fiber connectors.
So the relative loss changes is almost within 0.3 dB for the all samples.

5) Cyclic Moisture Resistance Test

Sample Number	Initial Loss [dB]	After Test [dB]
VA-AU0211-007-406	1.13	1.02
VA-AU0211-007-410	1.13	1.10
VA-AU0211-007-420	1.16	0.94
VA-AU0211-007-503	1.12	0.94
VA-AU0211-007-504	1.18	1.08
VA-AU0211-007-505	1.17	1.17
VA-AU0211-007-609	1.01	1.07
VA-AU0211-007-611	1.14	1.02
VA-AU0211-007-613	1.34	1.20
VA-AU0211-007-614	1.29	1.09
VA-AU0211-007-616	1.11	1.04

6) Thermal Shock Test

Sample Number	Initial Loss [dB]	After Test [dB]
VA-AU0211-005-217	0.82	0.97
VA-AU0211-005-320	0.82	1.17
VA-AU0211-005-405	0.84	1
VA-AU0211-005-407	0.87	0.89
VA-AU0211-005-408	0.98	0.99
VA-AU0211-007-504	0.9	1.04
VA-AU0211-007-505	0.98	0.97
VA-AU0211-007-609	0.93	0.91
VA-AU0211-007-611	0.98	0.97
VA-AU0211-007-614	0.99	1.03
VA-AU0211-007-616	0.95	0.99

7) Mechanical Shock Test

(1) Change of Insertion Loss

Sample Number	Initial Loss [dB]	After Test [dB]
VA-AU0211-004-208	1.11	1.09
VA-AU0211-004-209	1.18	1.23
VA-AU0211-004-213	1.14	1.18
VA-AU0211-004-220	1.06	1.00
VA-AU0211-004-416	1.12	1.10
VA-AU0211-004-417	1.07	1.13
VA-AU0211-004-418	1.64	1.52
VA-AU0211-004-503	0.98	1.00
VA-AU0211-004-505	1.12	1.12
VA-AU0211-004-506	1.14	1.09
VA-AU0211-004-513	0.96	1.16

(2) External visual examination

- No evidence of defects or damage to the case, leads, or seals, or, illegible markings

8) Variable Frequency Vibration Test

(1) Change of Insertion Loss

Sample Number	Initial Loss [dB]	After Test [dB]
VA-AU0211-004-601	1.31	1.28
VA-AU0211-004-515	0.98	0.98
VA-AU0211-004-516	1.15	1.19
VA-AU0211-004-510	1.05	1.05
VA-AU0211-004-517	1.14	1.20
VA-AU0211-004-215	1.23	1.27
VA-AU0211-004-512	1.09	1.03
VA-AU0211-004-511	1.06	1.10
VA-AU0211-004-508	1.33	1.22
VA-AU0211-004-518	1.00	1.14
VA-AU0211-004-519	1.12	1.04

(2) External visual examination

- No evidence of defects or damage to the case, leads, or seals, or, illegible markings