

# Modelling Ageing of Optocoupler

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## Abstract

Model and studies indicate that degradation of optocoupler is due to mainly LED degradation. The best signature is the CTR degradation which depends on ageing and temperature, ageing LED current and measurement LED current.

**Keywords:** CTR and LED degradation, ageing, modelling and noise.

## References:

- [1] T. I. Băjenescu, “Le C.N.E.T. et les tests de fiabilité des photocoupleurs,” *L’Indicateur Industriel*, No. 4, 1982, pp. 23–27.
- [2] T. I. Băjenescu, “Degradation and Reliability Problems of Optocouplers,” *Proceedings of Annual Semiconductor Conference CAS ‘93, Sinaia (Romania)*, 1993; T. I. Băjenescu, “Ageing Problem of Optocouplers,” *Proceedings of the Mediteranean Electrotechnical Conference MELECON ‘94, Antalya (Turkey)*, April 12–14, 1994; T. I. Băjenescu, “CTR Degradation and Ageing Problem of Optocouplers,” *Proceedings of the Fourth International Conference on Solid-State and Integrated-Circuit Technology, Beijing (China)*, October 24–28, 1995, pp. 173–175; T. I. Băjenescu, *Reliability of Electronic Components*, Bucharest, Tehnica Publishers, 1996; T. I. Băjenescu, *Problèmes de la fiabilité des composants électroniques actifs actuels*, Paris: Masson, 1980; L. Lipson, “Guiding, Modulating, and Emitting Light on Silicon – Challenges and Opportunities,” *J. Lightw. Technol.*, 23(12), 4222–4238 (2005).
- [3] CNET: Spécifications STC 968-3521/1 et 2, édition. 2b, Fascicules I et II.
- [4] W. H. Sahn, *General Electric Optoelectronics Manual*, New York: General Electric, Syracuse (USA), 1976.
- [5] O. Ueda, *Reliability and Degradation of III-V optical devices*, Norwood, MA: Artech House, Inc., 1996.
- [6] T. I. Băjenescu, “Zuverlässigkeit von LED- und FK-Anzeigen,” *Elektronik-Applikation*, Vol. 16, No. 8/9, pp. 26–31.
- [7] S. I. Gage, *HP Optoelectronics Applications Manual Supplement*, Hewlett-Packard; *Optoelectronics Applications Manual*, Hewlett-Packard, 1979.
- [8] M. J. Howes, and D. V. Morgan, *Reliability and Degradation*, Chichester: Wiley & Sons, 1981.
- [9] T. I. Băjenescu, *Zuverlässigkeit elektronischer Komponenten*, Berlin, (West-Germany): VDE Verlag, 1985; B. Jalali, M. Paniccia, and G. Reed, “Silicon Photonics,” *IEEE Microwave Magazine*, 7(3), June 2006, pp. 58–68.
- [10] T. I. Băjenescu, and M. Băzu, *Reliability of Electronic Components. A Practical Guide to Electronic Systems Manufacturing*, Berlin and New York: Springer, 1999.
- [11] J. B. H. Slama, et al., “Study and Modelling of Optocouplers Ageing,” *Journal of Automation and Systems Engineering*, 2008, [jase.esrgroups.org/2\\_3\\_3\\_08%20proof.pdf](http://jase.esrgroups.org/2_3_3_08%20proof.pdf). [http://hal.archives-ouvertes.fr/view\\_by\\_stamp.php?&halsid=9h1geticqql58vnbm9oqh0lij1&](http://hal.archives-ouvertes.fr/view_by_stamp.php?&halsid=9h1geticqql58vnbm9oqh0lij1&)

label=AMPERE&langue=fr&action\_todo=view&id=hal-00372865&version=1&view=extended  
\_view.

- [12] A. Thaduri, “Reliability Analysis of Optocouplers Using Physics of Failure Approach,” SRESA Newsletter, June 2011, Issue No. 3.
- [13] Y. Guo, and S. Liu, “Development in Optical Methods for Reliability Analysis in Electronic Packaging Applications,” Journal of Electronic Packaging, Vol. 120, Issue 2, 1998, pp. 186-193.
- [14] B. Stawarz-Graczyk, et al., “The Noise Macromodel of an Optocoupler Including  $1/f$ -Noise Source,” Bulletin of the Polish Academy of Sciences Technical Sciences, Vol. 56, No. 1, 2008.
- [15] M. M. Jevtic, “Low Frequency Noise as a Tool to Study Optocouplers with Phototransistors,” Microelectronics and Reliability, Vol. 44, Issue 7, 2004, pp. 1123-1129.
- [16] S. Elliott, J. Gordon, and P. Plourde, “Indium Tin Oxide (ITO) Film Removal Technique for Failure Analysis on Packaged Optoelectronic Devices,” Proceedings of the 29th International Symposium for Testing and Failure Analysis, 2-6 November 2003, Santa Clara, CA, pp. 431-435.
- [17] A. H. Johnston, and T. F. Miyahira, “LED Technologies for Optocouplers: Fundamental Issues and Hardness Assurance,” IEEE Trans. On Nuclear Science, Vol. 54, Issue 6, 2007, pp. 2450-2456.
- [18] B. G. Rax, et al., “Total Dose Effects and Hardness Assurance for Optocouplers,” <http://hdl.handle.net/2014/26068>.
- [19] A. H. Johnston, “Radiation Effects on Optoelectronic Devices in Space Missions,” Government Microcircuit Applications and Critical Technology Conference, San Diego, CA, March 20-23, 2006.
- [20] M. G. Rajesh, et al., “A Study of Failure Mechanisms in CMOS & BJT ICs and their Effect on Device Reliability,” Proceedings of 2nd Int. Conf. on Reliability, Safety and Hazard (ICRESH), 14-16 Dec. 2010, pp. 425-430.