ANSI/IES TM-26-20

Illuminating ENGINEERING SOCIETY

APPROVED METHOD: PROJECTING CATASTROPHIC FAILURE OF LED PACKAGES

AN AMERICAN NATIONAL STANDARD

Approved American National Standard ANSI

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Prepared by the IES Testing Procedures Committee.

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1.1 Introduction

With the completion of *ANSI/IES TM-21-19, Technical Memorandum: Projecting Long Term Maintenance of LED Light Sources*, the LED lighting industry possesses a standard method of obtaining projected long-term luminous flux maintenance information for LED packages.[1] The method is composed of two steps. During the first step, the LED packages shall be tested per *ANSI/IES LM-80-20, Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays and Modules* (and previous versions).[2] The collected measurement data is then used with ANSI/IES TM-21-19 to make luminous flux maintenance projections, including calculations of in-situ temperature interpolations. However, one relevant property is unaddressed by those publications: the catastrophic failure rate for LED packages. Catastrophic failure rate, similar to luminous flux maintenance, is a reliability property that is essential to successfully design LED lamps and luminaires. Combined with luminous flux maintenance, catastrophic LED failure rate information is used by LED lamp and luminaire manufacturers to inform warranty considerations and product application instructions.

In addition to light output decay over time, LED packages experience catastrophic failure, in which no light is produced. These catastrophic failures are typically caused by inadequate product design or process, or improper usage. Catastrophic failure rates for LED packages are much lower than those of other light sources, typically in the range of parts per million hours or parts per billion hours. For practical purposes, LED users, such as LED lamp or luminaire manufacturers, require both luminous flux maintenance life and catastrophic failure rate to adequately assess overall reliability of LED lamps and luminaires.

This document describes three methods for catastrophic-failure rate projections of LED packages.

1.2 Scope

This document describes three methodologies for projecting the catastrophic failure rate of LED packages. This document applies to the LED packages that are defined in *ANSI/IES LS-1-20, Lighting Science: Nomenclature and Definitions for Illuminating Engineering* (see **Section 2.1**). The three methodologies presented are for information only and do not represent a complete set of methodologies in existence; these represent the methodologies that are publicly available, and have been made available, for publication by the IES. The IES does not endorse any of these specific methods, and it is not the intent of this TM to use any of these methods for incorporation into any standards publication.

2.0 Normative References

2.1 ANSI/IES LS-1-20

Illuminating Engineering Society. Lighting Science: Nomenclature and Definitions for Illuminating Engineering. New York: IES; 2020. Online: www.ies.org/definitions. (Accessed 2019 Oct 10).

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2.4 JESD51-51

JEDEC Solid State Technology Association. Implementation of the Electrical Test Method for the Measurement of Real Thermal Resistance and Impedance of Light-Emitting Diodes with Exposed Cooling Surface. Arlington, VA: JEDEC Solid State Technology Association; 2012 Apr.

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