NEMA SSL 3

High-Power White LED Binning for General Illumination
NOTICE AND DISCLAIMER

The information in this publication was considered technically sound by the consensus of persons engaged in the development and approval of the document at the time it was developed. Consensus does not necessarily mean that there is unanimous agreement among every person participating in the development of this document.

The National Electrical Manufacturers Association (NEMA) standards and guideline publications, of which the document contained herein is one, are developed through a voluntary consensus standards development process. This process brings together volunteers and/or seeks out the views of persons who have an interest in the topic covered by this publication. While NEMA administers the process and establishes rules to promote fairness in the development of consensus, it does not write the document and it does not independently test, evaluate, or verify the accuracy or completeness of any information or the soundness of any judgments contained in its standards and guideline publications.

NEMA disclaims liability for any personal injury, property, or other damages of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, application, or reliance on this document. NEMA disclaims and makes no guaranty or warranty, expressed or implied, as to the accuracy or completeness of any information published herein, and disclaims and makes no warranty that the information in this document will fulfill any of your particular purposes or needs. NEMA does not undertake to guarantee the performance of any individual manufacturer or seller’s products or services by virtue of this standard or guide.

In publishing and making this document available, NEMA is not undertaking to render professional or other services for or on behalf of any person or entity, nor is NEMA undertaking to perform any duty owed by any person or entity to someone else. Anyone using this document should rely on his or her own independent judgment or, as appropriate, seek the advice of a competent professional in determining the exercise of reasonable care in any given circumstances. Information and other standards on the topic covered by this publication may be available from other sources, which the user may wish to consult for additional views or information not covered by this publication.

NEMA has no power, nor does it undertake to police or enforce compliance with the contents of this document. NEMA does not certify, test, or inspect products, designs, or installations for safety or health purposes. Any certification or other statement of compliance with any health or safety–related information in this document shall not be attributable to NEMA and is solely the responsibility of the certifier or maker of the statement.
CONTENTS

Foreword ................................................................................................................................................. ii
Introduction ............................................................................................................................................. 1
1 Scope ...................................................................................................................................................... 1
2 Normative References ............................................................................................................................ 1
3 Terms and Definitions ............................................................................................................................. 1
4 Color Binning .......................................................................................................................................... 2
   4.1 Color Binning of White LEDs ........................................................................................................ 2
   4.2 Bin Labeling of White LEDs .......................................................................................................... 6
5 Luminous Flux and Luminous Intensity Binning ..................................................................................... 6
   5.1 Bin Labeling by Luminous Flux ..................................................................................................... 6
6 Color Rendering Binning ........................................................................................................................ 7
7 Forward Voltage Binning ........................................................................................................................ 7
   7.1 Bin Labeling by Forward Voltage .................................................................................................. 7

Figures

Figure 4-1 White LED Color Binning Pictorial Representation ............................................................... 2
Figure 4-2 White LED Color Binning 4500K–6500K Coordinate Representation ..................................... 3
Figure 4-3 White LED Color Binning 2700K–4000K Coordinate Representation ........................................ 4
Figure 5-1 Luminous Flux Binning Ranges ............................................................................................ 6
Figure 7-1 Forward Voltage Binning ....................................................................................................... 7
Foreword

The NEMA Solid State Lighting Section has prepared this standards publication, based on discussions among numerous LED and SSL manufacturers and integrators.

In the preparation of this standards publication, input of users and other interested parties has been sought and evaluated. Inquiries, comments, and proposed or recommended revisions should be submitted to the concerned NEMA product subdivision by contacting:

Vice President, Technical Services
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, Virginia 22209

Section approval of the standard does not necessarily imply that all section members voted for its approval or participated in its development. At the time the standard was approved, the Solid State Lighting Section was composed of the following members:

Amerlux Global Lighting Solutions
Atlas Lighting Products, Inc.
Cooper Industries plc
Cree, Inc.
Dialight Corporation
EiKO, Ltd.
EYE Lighting International of N.A., Inc.
GE
Hatch Transformers, Inc.
Hubbell Incorporated
LEDnovation, Inc.
Leviton Manufacturing Co., Inc.
Luminus Devices, Inc.
Lutron Electronics Company, Inc.
MaxLite
Nichia America Corporation
Osram Sylvania Inc.
Philips Lighting Company
Ruud Lighting Inc.
Schneider Electric
Soraa Inc.
Technical Consumer Products, Inc.
TerraLUX Inc.
Toshiba International Corporation
Universal Lighting Technologies
Introduction

The binning of LEDs is a practice used by LED manufacturers to manage the variation of LED performance in mass production processes. The inefficiencies of binning may create structural vulnerability in the supply chain for the market. To reduce the risk and at the same time protect product yields, LED manufacturers often choose binning schemes in accordance with their specific or unique mass production process. As a result, the LED components or packages produced by the manufacturers maintain structured variations for their performance characteristics.

Because of the uniqueness of the mass production and quality control process used by each LED manufacturer, the LED products supplied to LED system integrators or assemblers (module makers, luminaire makers, etc.) with similar performance characteristics produced by different manufacturers are binned and labeled differently. The binning structures and labeling (marking) used varies from manufacturer to manufacturer.

Binning structure inconsistency, as a result, requires more effort on the part of LED system integrators and assemblers. More unnecessary testing, verifications, qualification, and validations processes have to take place. As a result, overall solid state lighting (SSL) industry productivity may be negatively influenced. With a rapidly growing SSL market, more LED products will be manufactured and more manufacturers will be participating in the market. This makes it necessary and important to establish industry agreed-upon guidelines to ensure product consistency.

1 Scope

This standard applies to LEDs emitting incoherent, visible radiation in solid state lighting applications. It specifies bins and bin codes for LEDs for the following characteristics:

- Color
- Lumens
- Forward Voltage