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Semiconductor devices –
Part 5-6: Optoelectronic devices – Light emitting diodes

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CONTENTS

FOREWORD 8
1 Scope 10
2 Normative references 10
3 Terms, definitions and abbreviations 11
3.1 General terms and definitions 11
3.2 Terms and definitions relating to the measurement of the quantity of radiation 14
3.3 Terms and definitions relating to the measurement of the photometric quantity 18
3.4 Terms and definitions relating to the measurement of the thermal quantity 23
3.5 Abbreviations 24
4 Absolute maximum ratings 11
5 Electrical and optical characteristics 26
6 Measuring method 27
6.1 Basic requirements 27
6.1.1 Measuring conditions 27
6.1.2 Measuring instruments and equipment 28
6.1.3 Essential requirements 29
6.1.4 General precautions 30
6.2 Forward voltage (V_F) measurement 30
6.2.1 Purpose 30
6.2.2 Circuit diagram 30
6.2.3 Requirements 30
6.2.4 Measurement procedure 32
6.2.5 Precautions to be observed 32
6.2.6 Specified conditions 32
6.3 Reverse voltage (V_R) measurement 32
6.3.1 Purpose 32
6.3.2 Circuit diagram 32
6.3.3 Measurement procedure 32
6.3.4 Precautions to be observed 33
6.3.5 Specified conditions 33
6.4 Differential resistance (r_f) measurement 33
6.4.1 Purpose 33
6.4.2 Circuit diagram 33
6.4.3 Requirements 33
6.4.4 Measurement procedure 33
6.4.5 Precautions to be observed 34
6.4.6 Specified conditions 34
6.5 Reverse current (I_R) measurement 34
6.5.1 Purpose 34
6.5.2 Circuit diagram 34
6.5.3 Provisions 35
6.5.4 Measurement procedure 35
6.5.5 Precautions to be observed 35

6.5.6 Specified conditions 35
6.6 Measurement of capacitance between terminals (C_t) 35
6.6.1 General 35
6.6.2 Measurement using LCR meter 36
6.6.3 Measurement using AC bridge 36
6.7 Measurement of junction temperature (T_j) and thermal resistance ($R_{th(j-X)el}$, $R_{th(j-X)real}$) 38
6.7.1 Purpose 38
6.7.2 Measurement principle 38
6.7.3 Measurement procedure 38
6.7.4 Precautions to be observed 47
6.7.5 Specified conditions 49
6.8 Response time measurement 49
6.8.1 Purpose 49
6.8.2 Circuit diagram 49
6.8.3 Provisions 50
6.8.4 Measurement procedure 50
6.8.5 Precautions to be observed 51
6.8.6 Specified conditions 51
6.9 Frequency response and cut-off frequency (f_c) measurement 52
6.9.1 Purpose 52
6.9.2 Circuit diagram 52
6.9.3 Provisions 53
6.9.4 Measurement procedure 53
6.9.5 Precautions to be observed 54
6.9.6 Specified conditions 54
6.10 Luminous flux (Φ_v) measurement 54
6.10.1 Purpose 54
6.10.2 Measurement principle 54
6.10.3 Measuring circuit 54
6.10.4 Measurement procedure 55
6.10.5 Precautions to be observed 55
6.10.6 Measurement conditions to be defined 56
6.11 Radiant ~~power~~ flux (Φ_e) measurement 56
6.11.1 Purpose 56
6.11.2 Measurement principle 56
6.11.3 Measuring circuit 57
6.11.4 Measurement procedure 57
6.11.5 Precautions to be observed 57
6.11.6 Measurement conditions to be defined 58
6.12 Luminous intensity (I_V) measurement 58
6.12.1 Purpose 58
6.12.2 Measurement principle 58
6.12.3 Measuring circuit 59
6.12.4 Measurement procedure 60
6.12.5 Precautions to be observed 60
6.12.6 Measurement conditions to be defined 60
6.13 Radiant intensity (I_e) measurement 60

6.13.1 Purpose 60
6.13.2 Measurement principle 60
6.13.3 Measuring circuit 61
6.13.4 Measurement procedure 61
6.13.5 Measurement conditions to be defined 61
6.14 Luminance (L_V) measurement 61
6.14.1 Purpose 61
6.14.2 Measuring circuit 62
6.14.3 Measurement procedure 62
6.14.4 Measurement conditions to be defined 62
6.15 Emission spectrum distribution, peak emission wavelength (λ_p), and spectral half bandwidth ($\Delta\lambda$) measurement 63
6.15.1 Purpose 63
6.15.2 Measuring circuit 63
6.15.3 Measurement procedure 64
6.15.4 Measurement conditions to be defined 65
6.16 Chromaticity measurement 65
6.16.1 Purpose 65
6.16.2 Measurement principle 66
6.16.3 Measuring circuit 68
6.16.4 Measurement procedure 68
6.16.5 Measuring conditions to be defined 68
6.17 Directional characteristics and full width half maximum of an intensity measurement 69
6.17.1 Purpose 69
6.17.2 Measuring circuit 69
6.17.3 Measurement procedure 69
6.17.4 Measuring conditions to be defined 70
6.18 Illuminance (E_V) measurement 71
6.18.1 Purpose 71
6.18.2 Measuring circuit 71
6.18.3 Measurement procedure 71
6.18.4 Measuring conditions to be defined 71
7 Items to be indicated on the package 71
8 Quality evaluation 72
8.1 General 72
8.2 Classification of quality evaluations 72
8.2.1 General 72
8.2.2 Classification I 72
8.2.3 Classification II 72
8.2.4 Classification III 72
8.2.5 Precautions to be observed 72
8.3 Quality evaluation test 79
8.3.1 General 79
8.3.2 Specimens 79
8.4 Lot quality inspection 80
8.4.1 General 80
8.4.2 Specimens 80

8.5 Periodical quality inspection 80
8.5.1 General 80
8.5.2 Specimens 80
8.5.3 Inspection period 80
8.6 Easing of the lot quality inspection standards 80
8.7 Periodical evaluation maintenance tests 81
8.7.1 Test items and specimens 81
8.7.2 Test period 81
8.8 Long-term storage products 81
8.9 Continuous current test 81
8.9.1 General 81
8.9.2 Initial measurement 81
8.9.3 Test circuits 81
8.9.4 Test conditions 82
8.9.5 Post-treatment 82
8.9.6 Final measurement 82
Annex A (normative) Standard luminous efficiency 83
Annex B (normative) How to obtain the self-absorption correction factor 86
B.1 Purpose 86
B.2 LED light sources for self-absorption measurement 86
B.3 Method 86
Annex C (normative) How to obtain the colour correction factor 88
C.1 Purpose 88
C.2 Method 88
C.2.1 Luminous flux and luminous intensity measurement 88
C.2.2 Radiant flux and radiant intensity measurement 89
Annex D (normative) Calibration of the luminance meter 90
D.1 Purpose 90
D.2 How to perform the calibration 90
Annex E (normative) Colour-matching function of the XYZ colour system 92
Annex F (normative) Spectral chromaticity coordinates 98
Annex G (normative) ~~Illuminometer~~ Illuminance meter calibration 103
G.1 Purpose 103
G.2 How to perform the calibration 103
Bibliography 104

Figure 1 – Radiant intensity 16
Figure 2 – Radiance 17
Figure 3 – Radiant exitance 18
Figure 4 – Irradiance 18
Figure 5 – Spectral luminous efficiency 19
Figure 6 – Circuit diagram for V_F measurement 30
Figure 7 – Circuit diagram for V_F measurement with a constant voltage source and a current-limiting resistor 31
Figure 8 – Circuit diagram for V_F measurement using an SMU 31
Figure 9 – Circuit diagram for V_R measurement 32

Figure 10 – Circuit diagram for r_f measurement 33
Figure 11 – Circuit diagram for I_R measurement 35
Figure 12 – Circuit diagram for C_t measurement 36
Figure 13 – Circuit diagram for C_t measurement 37
Figure 14 – An example of the temperature dependence of η_{PE} 39
~~Figure 15 – Waveform of change in V_F .....~~
Figure 15 – Heating time duration dependence of the measured thermal resistance 40
~~Figure 16 – Transient change in thermal resistance (double-logarithmic plots) .....~~
Figure 16 – Cumulative thermal capacitance versus cumulative thermal resistance characteristics (structural function) 40
Figure 17 – Circuit diagram for measurement of change in V_F 42
Figure 18 – Change in V_F during the measurement 43
Figure 19 – Example of the time variation in V_F 44
Figure 20 – Transient vibration waveform immediately after the heating is off 44
Figure 21 – Circuit diagram for response time measurement 50
Figure 22 – Waveform of response time measurement 52
Figure 23 – Circuit diagram for f_c measurement 53
Figure 24 – Circuit diagram for Φ_V measurement 55
Figure 25 – Circuit diagram for Φ_e measurement 57
Figure 26 – Schematic diagram for I_V measurement 59
Figure 27 – Circuit diagram for I_V measurement 59
Figure 28 – Circuit diagram for I_e measurement 61
Figure 29 – Circuit diagram for L_V measurement 62
Figure 30 – Circuit diagram for λ_p measurement 63
Figure 31 – Circuit diagram for λ_p measurement 64
Figure 32 – Schematic diagram of $\Delta\lambda$ measurement 65
Figure 33 – Chromaticity 67
Figure 34 – Circuit diagram for chromaticity measurement 69
Figure 35 – Directional characteristics (example 1) 70
Figure 36 – Directional characteristics (example 2) 70
Figure 37 – Circuit diagram for E_V measurement 71
Figure 38 – Circuit diagram for continuous current test 82
Figure B.1 – Schematic diagram for self-absorption measurement 86
Figure D.1 – Schematic diagrams for calibration 91
Figure G.1 – Schematic diagram for calibration 103

Table 1 – Absolute maximum ratings 25
Table 2 – Electrical and optical characteristics 26
Table 3 – CIE averaged LED intensity measurements 59
Table 4 – Items for the screening test and their conditions(reference) 73

Table 5 – Quality evaluation tests 74
Table 6 – Lot quality inspection 76
Table 7 – Periodical quality inspection 79
Table A.1 – Definitive values of the spectral luminous efficiency function for photopic vision $V(\lambda)$ 83
Table E.1 – Colour-matching function of the XYZ colour system 92
Table F.1 – Spectral chromaticity coordinates 98

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SEMICONDUCTOR DEVICES –

Part 5-6: Optoelectronic devices – Light emitting diodes

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This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 60747-5-6:2016. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 60747-5-6 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) ultraviolet-emitting diodes (UV LED) and their related technical contents were added;
b) power efficiency (η_{PE}) as part of electrical and optical characteristics were added;
c) new measuring methods related to thermal resistance were added;
d) hydrogen sulphide corrosion test was added to quality evaluation;
e) some standards were added to the bibliography.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
47E/745/FDIS	47E/752/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 60747 series, published under the general title *Semiconductor devices*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

SEMICONDUCTOR DEVICES –

Part 5-6: Optoelectronic devices – Light emitting diodes

1 Scope

This part of IEC 60747 specifies the terminology, the essential ratings and characteristics, the measuring methods and the quality evaluations of light emitting diodes (LEDs) for general industrial applications such as signals, controllers, sensors, etc.

LEDs for lighting applications are out of the scope of this part of IEC 60747.

LEDs are classified as follows:

a) LED package;
b) LED flat illuminator;
c) LED numeric display and alpha-numeric display;
d) LED dot-matrix display;
e) ~~I LED (~~infrared-emitting diode (IR LED);
f) ultraviolet-emitting diode (UV LED).

LEDs with a heat spreader or having a terminal geometry that performs the function of a heat spreader are within the scope of this part of IEC 60747.

An integration of LEDs and controlgears, integrated LED modules, semi-integrated LED modules, integrated LED lamps or semi-integrated LED lamps, are out of the scope of this part of IEC 60747.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60051 (all parts), *Direct acting indicating analogue electrical measuring instruments and their accessories*

IEC 60068-2-17, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60747-5-13, *Semiconductor devices – Part 5-13: Optoelectronic devices – Hydrogen sulphide corrosion test for LED packages*

IEC 60749-6, *Semiconductor devices – Mechanical and climatic test methods – Part 6: Storage at high temperature*

IEC 60749-10, *Semiconductor devices – Mechanical and climatic test methods – Part 10: Mechanical shock*

IEC 60749-12, *Semiconductor devices – Mechanical and climatic test methods – Part 12: Vibration, variable frequency*

IEC 60749-14, *Semiconductor devices – Mechanical and climatic test methods – Part 14: Robustness of terminations (lead integrity)*

IEC 60749-15, *Semiconductor devices – Mechanical and climatic test methods – Part 15: Resistance to soldering temperature for through-hole mounted devices*

IEC 60749-20, *Semiconductor devices – Mechanical and climatic test methods – Part 20: Resistance of plastic encapsulated SMDs to the combined effect of moisture and soldering heat*

IEC 60749-21, *Semiconductor devices – Mechanical and climatic test methods – Part 21: Solderability*

IEC 60749-24, *Semiconductor devices – Mechanical and climatic test methods – Part 24: Accelerated moisture resistance – Unbiased HAST*

IEC 60749-25, *Semiconductor devices – Mechanical and climatic test methods – Part 25: Temperature cycling*

IEC 60749-36, *Semiconductor devices – Mechanical and climatic test methods – Part 36: Acceleration, steady state*

ISO 2859-1, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

IEC 60747-5-6

Edition 2.0 2021-07

INTERNATIONAL STANDARD

Semiconductor devices –
Part 5-6: Optoelectronic devices – Light emitting diodes



IEC 60747-5-6:2021-07(en)

CONTENTS

FOREWORD 8
1 Scope 10
2 Normative references 10
3 Terms, definitions and abbreviations 11
3.1 General terms and definitions 11
3.2 Terms and definitions relating to the measurement of the quantity of radiation 14
3.3 Terms and definitions relating to the measurement of the photometric quantity 17
3.4 Terms and definitions relating to the measurement of the thermal quantity 21
3.5 Abbreviations 22
4 Absolute maximum ratings 22
5 Electrical and optical characteristics 23
6 Measuring method 24
6.1 Basic requirements 24
6.1.1 Measuring conditions 24
6.1.2 Measuring instruments and equipment 25
6.1.3 Essential requirements 26
6.1.4 General precautions 27
6.2 Forward voltage (V_F) measurement 27
6.2.1 Purpose 27
6.2.2 Circuit diagram 27
6.2.3 Requirements 27
6.2.4 Measurement procedure 29
6.2.5 Precautions to be observed 29
6.2.6 Specified conditions 29
6.3 Reverse voltage (V_R) measurement 29
6.3.1 Purpose 29
6.3.2 Circuit diagram 29
6.3.3 Measurement procedure 29
6.3.4 Precautions to be observed 30
6.3.5 Specified conditions 30
6.4 Differential resistance (r_f) measurement 30
6.4.1 Purpose 30
6.4.2 Circuit diagram 30
6.4.3 Requirements 30
6.4.4 Measurement procedure 30
6.4.5 Precautions to be observed 31
6.4.6 Specified conditions 31
6.5 Reverse current (I_R) measurement 31
6.5.1 Purpose 31
6.5.2 Circuit diagram 31
6.5.3 Provisions 32
6.5.4 Measurement procedure 32
6.5.5 Precautions to be observed 32

6.5.6 Specified conditions 32
6.6 Measurement of capacitance between terminals (C_t) 32
6.6.1 General 32
6.6.2 Measurement using LCR meter 33
6.6.3 Measurement using AC bridge 33
6.7 Measurement of junction temperature (T_j) and thermal resistance ($R_{th(j-X)el}$, $R_{th(j-X)real}$) 35
6.7.1 Purpose 35
6.7.2 Measurement principle 35
6.7.3 Measurement procedure 37
6.7.4 Precautions to be observed 42
6.7.5 Specified conditions 42
6.8 Response time measurement 42
6.8.1 Purpose 42
6.8.2 Circuit diagram 42
6.8.3 Provisions 43
6.8.4 Measurement procedure 43
6.8.5 Precautions to be observed 43
6.8.6 Specified conditions 44
6.9 Frequency response and cut-off frequency (f_c) measurement 44
6.9.1 Purpose 44
6.9.2 Circuit diagram 44
6.9.3 Provisions 45
6.9.4 Measurement procedure 45
6.9.5 Precautions to be observed 46
6.9.6 Specified conditions 46
6.10 Luminous flux (Φ_v) measurement 46
6.10.1 Purpose 46
6.10.2 Measurement principle 46
6.10.3 Measuring circuit 46
6.10.4 Measurement procedure 47
6.10.5 Precautions to be observed 47
6.10.6 Measurement conditions to be defined 48
6.11 Radiant flux (Φ_e) measurement 48
6.11.1 Purpose 48
6.11.2 Measurement principle 48
6.11.3 Measuring circuit 49
6.11.4 Measurement procedure 49
6.11.5 Precautions to be observed 49
6.11.6 Measurement conditions to be defined 50
6.12 Luminous intensity (I_v) measurement 50
6.12.1 Purpose 50
6.12.2 Measurement principle 50
6.12.3 Measuring circuit 51
6.12.4 Measurement procedure 52
6.12.5 Precautions to be observed 52
6.12.6 Measurement conditions to be defined 52
6.13 Radiant intensity (I_e) measurement 52

6.13.1 Purpose 52
6.13.2 Measurement principle 52
6.13.3 Measuring circuit 53
6.13.4 Measurement procedure 53
6.13.5 Measurement conditions to be defined 53
6.14 Luminance (L_V) measurement 53
6.14.1 Purpose 53
6.14.2 Measuring circuit 54
6.14.3 Measurement procedure 54
6.14.4 Measurement conditions to be defined 54
6.15 Emission spectrum distribution, peak emission wavelength (λ_p), and spectral half bandwidth ($\Delta\lambda$) measurement 55
6.15.1 Purpose 55
6.15.2 Measuring circuit 55
6.15.3 Measurement procedure 56
6.15.4 Measurement conditions to be defined 57
6.16 Chromaticity measurement 57
6.16.1 Purpose 57
6.16.2 Measurement principle 57
6.16.3 Measuring circuit 60
6.16.4 Measurement procedure 60
6.16.5 Measuring conditions to be defined 60
6.17 Directional characteristics and full width half maximum of an intensity measurement 60
6.17.1 Purpose 60
6.17.2 Measuring circuit 61
6.17.3 Measurement procedure 61
6.17.4 Measuring conditions to be defined 62
6.18 Illuminance (E_V) measurement 63
6.18.1 Purpose 63
6.18.2 Measuring circuit 63
6.18.3 Measurement procedure 63
6.18.4 Measuring conditions to be defined 63
7 Items to be indicated on the package 63
8 Quality evaluation 64
8.1 General 64
8.2 Classification of quality evaluations 64
8.2.1 General 64
8.2.2 Classification I 64
8.2.3 Classification II 64
8.2.4 Classification III 64
8.2.5 Precautions to be observed 64
8.3 Quality evaluation test 70
8.3.1 General 70
8.3.2 Specimens 71
8.4 Lot quality inspection 71
8.4.1 General 71
8.4.2 Specimens 71

8.5 Periodical quality inspection 71
8.5.1 General 71
8.5.2 Specimens 71
8.5.3 Inspection period 71
8.6 Easing of the lot quality inspection standards 71
8.7 Periodical evaluation maintenance tests 72
8.7.1 Test items and specimens 72
8.7.2 Test period 72
8.8 Long-term storage products 72
8.9 Continuous current test 72
8.9.1 General 72
8.9.2 Initial measurement 72
8.9.3 Test circuits 72
8.9.4 Test conditions 73
8.9.5 Post-treatment 73
8.9.6 Final measurement 73
Annex A (normative) Standard luminous efficiency 74
Annex B (normative) How to obtain the self-absorption correction factor 77
B.1 Purpose 77
B.2 LED light sources for self-absorption measurement 77
B.3 Method 77
Annex C (normative) How to obtain the colour correction factor 79
C.1 Purpose 79
C.2 Method 79
C.2.1 Luminous flux and luminous intensity measurement 79
C.2.2 Radiant flux and radiant intensity measurement 80
Annex D (normative) Calibration of the luminance meter 81
D.1 Purpose 81
D.2 How to perform the calibration 81
Annex E (normative) Colour-matching function of the XYZ colour system 83
Annex F (normative) Spectral chromaticity coordinates 88
Annex G (normative) Illuminance meter calibration 93
G.1 Purpose 93
G.2 How to perform the calibration 93
Bibliography 94

Figure 1 – Radiant intensity 15
Figure 2 – Radiance 16
Figure 3 – Radiant exitance 16
Figure 4 – Irradiance 17
Figure 5 – Spectral luminous efficiency 18
Figure 6 – Circuit diagram for V_F measurement 27
Figure 7 – Circuit diagram for V_F measurement with a constant voltage source and a current-limiting resistor 28
Figure 8 – Circuit diagram for V_F measurement using an SMU 28
Figure 9 – Circuit diagram for V_R measurement 29

Figure 10 – Circuit diagram for r_f measurement 30
Figure 11 – Circuit diagram for I_R measurement 32
Figure 12 – Circuit diagram for C_t measurement 33
Figure 13 – Circuit diagram for C_t measurement 34
Figure 14 – An example of the temperature dependence of η_{PE} 35
Figure 15 – Heating time duration dependence of the measured thermal resistance 36
Figure 16 – Cumulative thermal capacitance versus cumulative thermal resistance characteristics (structural function) 37
Figure 17 – Circuit diagram for measurement of change in V_F 38
Figure 18 – Change in V_F during the measurement 39
Figure 19 – Example of the time variation in V_F 40
Figure 20 – Transient vibration waveform immediately after the heating is off 40
Figure 21 – Circuit diagram for response time measurement 42
Figure 22 – Waveform of response time measurement 44
Figure 23 – Circuit diagram for f_c measurement 45
Figure 24 – Circuit diagram for Φ_V measurement 47
Figure 25 – Circuit diagram for Φ_e measurement 49
Figure 26 – Schematic diagram for I_V measurement 51
Figure 27 – Circuit diagram for I_V measurement 51
Figure 28 – Circuit diagram for I_e measurement 53
Figure 29 – Circuit diagram for L_v measurement 54
Figure 30 – Circuit diagram for λ_p measurement 55
Figure 31 – Circuit diagram for λ_p measurement 56
Figure 32 – Schematic diagram of $\Delta\lambda$ measurement 57
Figure 33 – Chromaticity 59
Figure 34 – Circuit diagram for chromaticity measurement 61
Figure 35 – Directional characteristics (example 1) 62
Figure 36 – Directional characteristics (example 2) 62
Figure 37 – Circuit diagram for E_v measurement 63
Figure 38 – Circuit diagram for continuous current test 73
Figure B.1 – Schematic diagram for self-absorption measurement 77
Figure D.1 – Schematic diagrams for calibration 82
Figure G.1 – Schematic diagram for calibration 93

Table 1 – Absolute maximum ratings 22
Table 2 – Electrical and optical characteristics 23
Table 3 – CIE averaged LED intensity measurements 51
Table 4 – Items for the screening test and their conditions(reference) 64
Table 5 – Quality evaluation tests 65
Table 6 – Lot quality inspection 67

Table 7 – Periodical quality inspection 70
Table A.1 – Definitive values of the spectral luminous efficiency function for photopic vision $V(\lambda)$ 74
Table E.1 – Colour-matching function of the XYZ colour system 83
Table F.1 – Spectral chromaticity coordinates 88

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SEMICONDUCTOR DEVICES –

Part 5-6: Optoelectronic devices – Light emitting diodes

FOREWORD

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IEC 60747-5-6 has been prepared by subcommittee 47E: Discrete semiconductor devices, of IEC technical committee 47: Semiconductor devices. It is an International Standard.

This second edition cancels and replaces the first edition published in 2016. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) ultraviolet-emitting diodes (UV LED) and their related technical contents were added;
b) power efficiency (η_{PE}) as part of electrical and optical characteristics were added;
c) new measuring methods related to thermal resistance were added;
d) hydrogen sulphide corrosion test was added to quality evaluation;
e) some standards were added to the bibliography.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
47E/745/FDIS	47E/752/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

A list of all parts in the IEC 60747 series, published under the general title *Semiconductor devices*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

SEMICONDUCTOR DEVICES –

Part 5-6: Optoelectronic devices – Light emitting diodes

1 Scope

This part of IEC 60747 specifies the terminology, the essential ratings and characteristics, the measuring methods and the quality evaluations of light emitting diodes (LEDs) for general industrial applications such as signals, controllers, sensors, etc.

LEDs for lighting applications are out of the scope of this part of IEC 60747.

LEDs are classified as follows:

a) LED package;
b) LED flat illuminator;
c) LED numeric display and alpha-numeric display;
d) LED dot-matrix display;
e) infrared-emitting diode (IR LED);
f) ultraviolet-emitting diode (UV LED).

LEDs with a heat spreader or having a terminal geometry that performs the function of a heat spreader are within the scope of this part of IEC 60747.

An integration of LEDs and controlgears, integrated LED modules, semi-integrated LED modules, integrated LED lamps or semi-integrated LED lamps, are out of the scope of this part of IEC 60747.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60051 (all parts), *Direct acting indicating analogue electrical measuring instruments and their accessories*

IEC 60068-2-17, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-30, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60747-5-13, *Semiconductor devices – Part 5-13: Optoelectronic devices – Hydrogen sulphide corrosion test for LED packages*

IEC 60749-6, *Semiconductor devices – Mechanical and climatic test methods – Part 6: Storage at high temperature*

IEC 60749-10, *Semiconductor devices – Mechanical and climatic test methods – Part 10: Mechanical shock*

IEC 60749-12, *Semiconductor devices – Mechanical and climatic test methods – Part 12: Vibration, variable frequency*

IEC 60749-14, *Semiconductor devices – Mechanical and climatic test methods – Part 14: Robustness of terminations (lead integrity)*

IEC 60749-15, *Semiconductor devices – Mechanical and climatic test methods – Part 15: Resistance to soldering temperature for through-hole mounted devices*

IEC 60749-20, *Semiconductor devices – Mechanical and climatic test methods – Part 20: Resistance of plastic encapsulated SMDs to the combined effect of moisture and soldering heat*

IEC 60749-21, *Semiconductor devices – Mechanical and climatic test methods – Part 21: Solderability*

IEC 60749-24, *Semiconductor devices – Mechanical and climatic test methods – Part 24: Accelerated moisture resistance – Unbiased HAST*

IEC 60749-25, *Semiconductor devices – Mechanical and climatic test methods – Part 25: Temperature cycling*

IEC 60749-36, *Semiconductor devices – Mechanical and climatic test methods – Part 36: Acceleration, steady state*

ISO 2859-1, *Sampling procedures for inspection by attributes – Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*