INTERNATIONAL STANDARD

IEC 60747-12-3

QC 720103

First edition
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Semiconductor devices –

Part 12-3:
Optoelectronic devices –
Blank detail specification for light-emitting diodes – Display application

Dispositifs à semiconducteurs –

Partie 12-3: Dispositifs optoélectroniques –
Spécification particulière cadre pour les diodes LED destinées à des applications d'affichage

Reference number
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Numéros des publications

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Les versions consolidées de certaines publications de la CEI incorporant les amendements sont disponibles. Par exemple, les numéros d'édition 1.0, 1.1 et 1.2 indiquent respectivement la publication de base, la publication de base incorporant l'amendement 1, et la publication de base incorporant les amendements 1 et 2.

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- **Bulletin de la CEI**
- **Annuaire de la CEI**
  Accès en ligne*
- **Catalogue des publications de la CEI**
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Terminologie, symboles graphiques et littéraux

En ce qui concerne la terminologie générale, le lecteur se reportera à la CEI 60050: *Vocabulaire Electrotechnique International* (VEI).

Pour les symboles graphiques, les symboles littéraux et les signes d'usage général approuvés par la CEI, le lecteur consultera la CEI 60027: *Symboles littéraux à utiliser en électrotechnique,* la CEI 60417: *Symboles graphiques utilisables sur le matériel. Index, relevé et compilation des feuilles individuelles,* et la CEI 60617: *Symboles graphiques pour schémas.*

Publications de la CEI établies par le même comité d'études

L'attention du lecteur est attirée sur les listes figurant à la fin de cette publication, qui énumèrent les publications de la CEI préparées par le comité d'études qui a établi la présente publication.

* Voir adresse «site web» sur la page de titre.

Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

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Consolidated versions of some IEC publications including amendments are available. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Validity of this publication

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology.

Information relating to the date of the reconfirmation of the publication is available in the IEC catalogue.

Information on the revision work, the issue of revised editions and amendments may be obtained from IEC National Committees and from the following IEC sources:

- **IEC Bulletin**
- **IEC Yearbook**
  On-line access*
- **Catalogue of IEC publications**
  Published yearly with regular updates
  (On-line access)*

Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary* (IEV).

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams.*

IEC publications prepared by the same technical committee

The attention of readers is drawn to the end pages of this publication which list the IEC publications issued by the technical committee which has prepared the present publication.

* See web site address on title page.

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SEMICONDUCTOR DEVICES –

Part 12-3: Optoelectronic devices –

Blank detail specification for light-emitting diodes – Display application

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60747-12-3 has been prepared by subcommittee 47C: Opto-electronic display and imaging devices, of IEC technical committee 47: Semiconductor devices.

The text of this standard is based on the following documents:

FDIS	Report on voting
47C/190/FDIS	47C/198/RVD

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

The QC number that appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).

Annex A forms an integral part of this standard.

A bilingual version of this standard may be issued at a later date.

SEMICONDUCTOR DEVICES –

Part 12-3: Optoelectronic devices –

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INTRODUCTION

The IEC quality assessment system for electronic components is operated in accordance with the statutes of the IEC and under the authority of the IEC. The object of this system is to define quality assessment procedures in such a manner that electronic components released by one participating country as conforming with the requirements of an applicable specification are equally acceptable in all other participating countries without the need for further testing.

This blank detail specification is one of a series of blank detail specifications for semiconductor devices and should be used with the following IEC publications:

IEC 60747-10/QC 700000:1991, *Semiconductor devices – Part 10: Generic specification for discrete devices and integrated circuits*

IEC 60747-12/QC 720100:1991, *Semiconductor devices – Part 12: Sectional specification for optoelectronic devices*

Required information

Numbers shown in brackets on this and the following page correspond to the following items of required information, which should be entered in the spaces provided.

Identification of the detail specification

[1] The name of the national standards organization under whose authority the detail specification is issued.

[2] The IECQ number of the detail specification.

[3] The numbers and issue numbers of the generic and sectional specifications.

[4] The national number of the detail specification, data of issue and any further information, if required by the national system.

Identification of the component

[5] Main function and type number.

[6] Information on typical construction (materials, the main technology) and the package. If a device has several kinds of derivative products, those differences shall be indicated, for example feature of characteristics in the comparison table.

If a device is sensitive to electrostatic charges, a caution statement shall be added in the detail specification.

[7] Outline drawing, terminal identification, marking and/or reference to the relevant document for outlines.

[8] Category of assessed quality according to 2.6 of the generic specification.

[9] Reference data.

[The clauses given in square brackets on the next pages of this standard, which form the front page of the detail specification, are intended for guidance to the specification writer and shall not be included in the detail specification.]

[When confusion may arise as to whether a paragraph is only an instruction to the writer or not, the paragraph shall be indicated between square brackets.]

[Name (address) of responsible NAI (and possibly of body from which specification is available).] [1]	[Number of IECQ detail specification, plus issue number and/or date.] [2]
ELECTRONIC COMPONENT OF ASSESSED QUALITY IN ACCORDANCE WITH: Generic specification: IEC 60747-10/QC700000 Sectional specification: IEC 60747-12/QC720100 [and national references if different.] [3]	[National number of detail specification. This box need not be used if national number repeats IECQ number.] [4]
DETAIL SPECIFICATION FOR: LIGHT EMITTING DIODES – DISPLAY APPLICATION [5] [Type number(s) of the relevant device(s)] Ordering information: see clause 7 of this standard.	
1 **Mechanical description** [7] Outline references: IEC 60191-2..... [mandatory if available] and/or national [if there is no IEC outline]. Outline drawing: [May be transferred to, or given with more details in clause 10 of this standard.] Terminal identification: [Drawing showing pin assignments, including graphical symbols.] Marking: [letters and figures] [The detail specification shall prescribe the information to be marked on the device, if any.] [See 2.5 of generic specification and/or clause 6 of this standard.]	2 **Short description** [6] Light emitting diode/IR emitting diode: with/without pigtail Type: surface/edge emitting semiconductor material; GaAs/GaAlAs/InP/InGaAsP/..... Encapsulation: metal/glass/plastic/..... [Some important reference data may be added.] 3 **Categories of assessed quality** [8] [From 2.6 of the generic specification.] **Reference data** [9]
Information about manufacturers who have components qualified to this detail specification is available in the current qualified products list.	

4 Limiting values (absolute maximum rating system)

These values apply over the operating temperature range, unless otherwise stated.

[Repeat only subclause numbers used, with title. Any additional values should be given at the appropriate place, but without clause number(s).]

[Curves should preferably be given in clause 10 of this standard.]

Subclause	Limiting value	Symbol	Requirements		Unit
			Min.	Max.	
4.1	Storage temperature	T_{stg}	x	x	°C
4.2	Operating ambient temperature	T_{amb}	x	x	°C
4.3	Soldering temperature (at maximum soldering time and minimum distance to case specified)	T_{sld}	x x x	x x	°C s mm
4.4	Reverse voltage	V_R		x	V
4.5	Continuous forward current at ambient temperature of 25 °C	I_F		x	mA
4.6	Peak forward current at ambient temperature of 25 °C, under specified pulse conditions (where appropriate)	I_{FM}		x	A
4.7	Power dissipation	P_{tot}		x	W

5 Electrical and optical characteristics

See clause 8 of this standard for inspection requirements.

[Repeat only subclause numbers used, with title. Any additional characteristics shall be given at the appropriate place, but without subclause number(s).]

[When several devices are defined in the same detail specification, the relevant values should be given on successive lines, avoiding identical values.]

[Curves should preferably be given in clause 10 of this standard.]

Subclause	Characteristics	Symbol	Conditions at T_{amb} or T_{case} = 25 °C unless otherwise specified	Requirements		Unit	Tested
				Min.	Max.		
5.1	Forward voltage	V_F	I_F as specified		x	V	A2b
5.2	Reverse current	I_R	V_R as specified		x	µA	A2b
5.3	Luminous intensity	I_V	I_F as specified variant as specified	x		mcd	A2b
5.4	Half-intensity angle (where appropriate)	$\theta_{½}$	I_F as specified	x	x	deg	C2a
5.5	Peak emission wavelength	λ_p	I_F as specified	x	x	nm	A4
5.6	Spectral radiation bandwidth	$\Delta\lambda$	I_F as specified		x	nm	C2a

6 Marking

[Any particular information other than given in box [7] (clause 1) and/or subclause 2.5 of IEC 60747-10, shall be given here.]

7 Ordering information

The following minimum information is necessary to order a specific device, unless otherwise specified:

– precise type reference (and nominal voltage value, if required);
– IECQ reference of detail specification with issue number and/or date when relevant;
– category of assessed quality as defined in 3.7 of the sectional specification and, if required, screening sequence, as defined in 3.6 of the sectional specification;
– any other particulars.

8 Test conditions and inspection requirements

[These are given in the following tables, where the values and exact test conditions to be used shall be specified as required for a given type, and as required by the relevant test in the relevant IEC publication.]

[When several devices are included in the same detail specification, the relevant conditions and/or values should be given on successive lines, where possible avoiding repetition of identical conditions and/or values.]

[The choice between alternative tests or test methods shall be made when a detail specifications is written.]

Throughout the following text, reference to subclause numbers are made with respect to the generic specification, unless otherwise stated, and test methods are quoted from clause 4 of the sectional specification.

[For sampling requirements, either refer to, or reference, values of 3.7 of the sectional specification, according to applicable category(ies) of assessed quality.]

[For group A, the choice between AQL and LTPD system shall be made in the detail specification.]

GROUP A

Lot-by-lot tests

LSL = lower specification limit
USL = upper specification limit
} from group A

All tests are non-destructive (3.6.6 of the generic specification)

Inspection or test	Symbol	Reference	Conditions at T_{amb} or T_{case} = 25 °C, unless otherwise stated (see clause 4 of the generic specification)	Inspection or test requirement/limits	
				Min.	Max.
Subgroup A1 External visual inspection			4.2.1.1 of the generic specification		
Subgroup A2a Inoperative devices Polarity Luminous intensity Forward voltage Reverse current	 I_V V_F I_R	 IEC 60747-5, IV, 1.1 IEC 60747-3, IV IEC 60747-3, IV	 I_F as specified Variant as specified V_R as specified	Inverted polarity I_V < = 0,1 LSL Short circuit: V_F < = 0,1 USL Open circuit: V_F > = 5 USL I_R > = 50 USL	
Subgroup A2b Optical and electrical characteristics - Luminous intensity - Forward voltage - Reverse current	 I_V V_F I_R	 IEC 60747-5, IV, 1.1 IEC 60747-3, IV IEC 60747-3, IV	 I_F as specified Variant as specified I_F as specified V_R as specified	 LSL	 LSL LSL
Subgroup A4 - Peak emission wavelength	λ_p	IEC 60747-5, IV, 1.4	I_F as specified	LSL	USL

GROUP B

Lot-by-lot tests

(In the case of category I, see 2.6 of the generic specification)

LSL = lower specification limit from group A

USL = upper specification limit from group A

Only tests marked (D) are destructive (see 3.6.6 of the generic specification)

Inspection or test	Symbol	Reference	Conditions at T_{amb} or T_{case} = 25 °C, unless otherwise stated (see clause 4 of the generic specification)	Inspection or test requirement/limits	
				Min.	Max.
Subgroup B1 Dimensions		IEC 60747-10, 4.2.2 and appendix B		(see clause 1 of this standard)	
Subgroup B3 (D) Lead bending		IEC 60749, II, 1.2	As specified	No damage	
Subgroup B4 Solderability		IEC 60749, II, 2.1	As specified	Good wetting	
Subgroup B5 (D) Rapid change of temperature followed by: either - damp heat, cyclic (D) (for non-cavity devices only) with final measurements, - reverse current - forward voltage - luminous intensity; or - sealing (for cavity devices only)	 I_R V_F I_V	 IEC 60749, III, 1 IEC 60749, III, 4 IEC 60747-3, IV IEC 60747-3, IV IEC 60747-5, IV, 1.1 IEC 60749, III, 5	 V_R as specified I_F as specified I_F as specified Variant as specified	 LSL	 USL USL
Subgroup B8 Electrical endurance with final measurements, - reverse current - forward voltage - luminous intensity	 I_R V_F I_V	 IEC 60747-3, V IEC 60747-3, IV IEC 60747-3, IV IEC 60747-5, IV, 1.1	 I_F as specified as in 4.5, 168 h. V_R as specified I_F as specified I_F as specified Variant as specified	 0,5 LSL	 2 USL 1,2 USL
Subgroup CRRL			Attributes information for B3, B4, and B5. Measurement information before and after B8.		

GROUP C

Periodic tests

LSL = lower specification limit from group A

USL = upper specification limit from group A

Only tests marked (D) are destructive (see 3.6.6 of the generic specification)

Inspection or test	Symbol	Reference	Conditions at T_{amb} or T_{case} = 25 °C, unless otherwise stated (see clause 4 of the generic specification)	Inspection or test requirement/limits	
				Min.	Max.
Subgroup C1 Dimensions		IEC 60747-10, 4.2.2 and appendix B		(see clause 1 of this standard)	
Subgroup C2a Spectral radiation bandwidth	$\Delta\lambda$	IEC 60747-5, IV, 1.4	I_F as specified		USL
Half-intensity angle (where appropriate)	$\theta_{1/2}$	IEC 60747-5, IV, 1.11	I_F as specified	LSL	USL
Subgroup C3 Robustness of terminations: - tensile (D)		IEC 60749, II, 1.1	As specified	No damage	
Subgroup C4 Resistance to soldering heat (D)		IEC 60749, II, 2.2	Method 1A		
with final measurements: - reverse current - forward voltage - luminous intensity	I_R V_F I_V	IEC 60743, IV IEC 60747-3, IV IEC 60747-5, IV, 1.1	V_R as specified I_F as specified I_F as specified Variant as specified	LSL	USL USL
Subgroup C6 (for cavity devices only) Vibration or shock followed by acceler-ation, steady-state with final measurements: as in subgroup C4		IEC 60749, II, 3, 4, 5	As specified		

(continued)

GROUP C

Periodic tests *(concluded)*

Inspection or test	Symbol	Reference	Conditions at T_{amb} or T_{case} = 25 °C, unless otherwise stated (see clause 4 of the generic specification)	Inspection or test requirement/limits	
				Min.	Max.
Subgroup C7 (for non-cavity devices only) Damp heat, steady-state (D) or Damp heat, cyclic (D) with final measurements: as in subgroup B8		IEC 60749, III, 5 IEC 60749, III, 4	As specified As specified		
Subgroup C8 Electrical endurance with final measurements: as in subgroup B8		Annex A of this standard	Operation life: I_F specified as in 4.5 of this standard		1 000 h min.
Subgroup C9 (D) Storage at high temperature with final measurements: as in subgroup B8		IEC 60749, III, 2	1 000 h min., at $T = T_{stg}$,max		
Subgroup CRRL			Attributes information for: C3, C4, and C8. Measurement information before and after C7, C8 and C9.		