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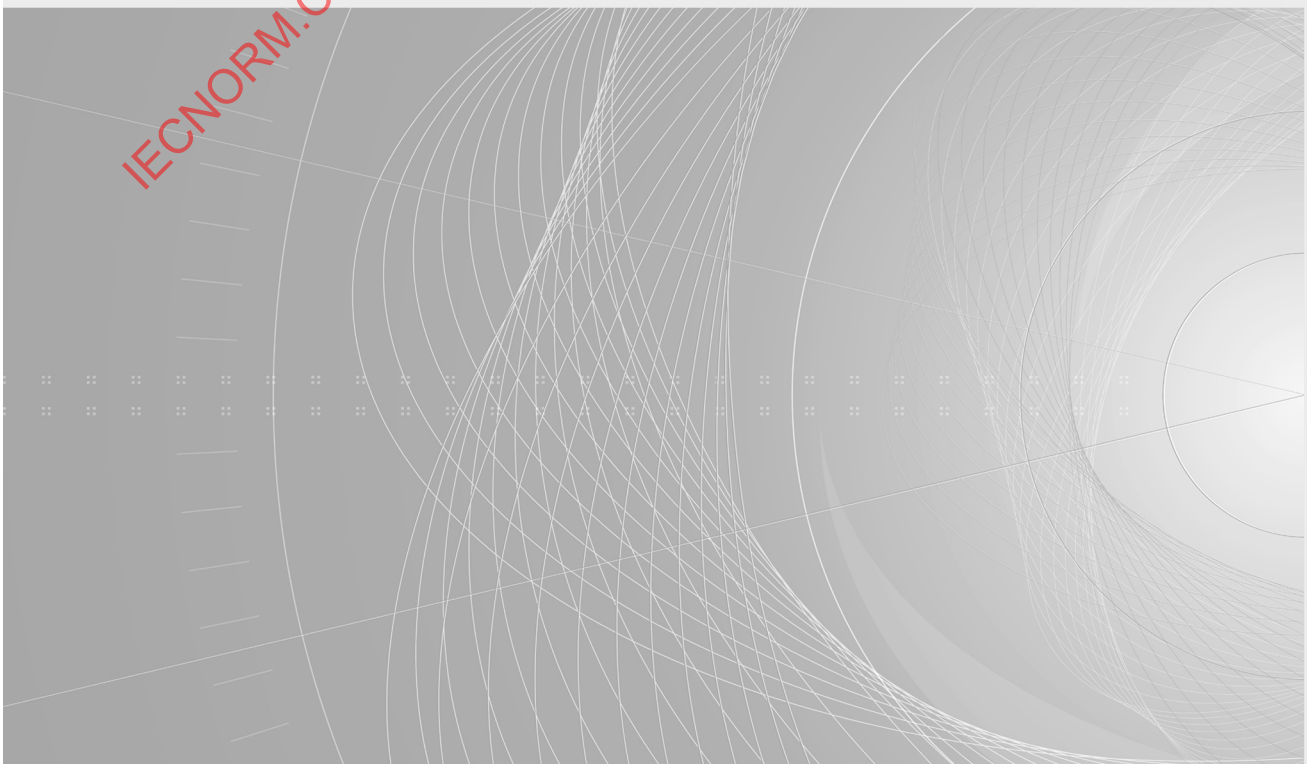
Fibre optic active components and devices – Package and interface standards – Part 15: Discrete vertical cavity surface emitting laser packages



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Fibre optic active components and devices – Package and interface standards – Part 15: Discrete vertical cavity surface emitting laser packages

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CONTENTS

FOREWORD 5
INTRODUCTION 2
1 Scope 8
2 Normative references 8
3 Terms, definitions and abbreviated terms 9
3.1 Terms and definitions 9
3.2 Abbreviated terms 9
4 Classification 9
5 Specification of the optical interface 9
5.1 General 9
5.2 Optical connector interface ~~(type 1)~~ 9
5.3 Pigtail interface ~~(type 3)~~ 10
6 Specifications of electrical interfaces 10
6.1 General 10
6.2 Electrical interface specifications for VCSEL TO CAN packages 10
6.2.1 General 10
6.2.2 Numbering of electrical terminals 10
6.2.3 Electrical terminal assignment 10
6.3 Electrical interface specifications for VCSEL TOSA package with an LC connector 11
6.3.1 General 11
6.3.2 Numbering of electrical terminals 11
6.3.3 Electrical terminal assignment 12
6.4 Electrical interface specifications for VCSEL TOSA package with an SC connector 12
6.4.1 General 12
6.4.2 Numbering of electrical terminals 12
6.4.3 Electrical terminal assignment 12
7 Outline 12
7.1 General 12
7.2 Outline of VCSEL TO CAN packages 12
7.2.1 Drawings of case outline 12
7.2.2 Dimensions of VCSEL TO CAN packages 13
7.3 Outlines of VCSEL TOSA package with an LC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 14
7.3.1 Drawings of case outline 14
7.3.2 Dimensions of VCSEL TOSA package with an LC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 15
7.3.3 Optical receptacle LC style 15
7.4 Outlines of VCSEL TOSA package with an SC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 15
7.4.1 Drawings of case outline 15
7.4.2 Dimensions of VCSEL TOSA package with an SC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 16
7.4.3 Optical receptacle SC style 16
7.5 Outlines of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 16

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7.5.1 Drawings of case outline 16
7.5.2 Dimensions of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 18
7.6 Outlines of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 18
7.6.1 Drawings of case outline 18
7.6.2 Dimensions of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 19
7.7 Electrical terminals of high-speed (≥ 8 ~~Gbps~~ Gbit/s) VCSEL TOSA packages for both cases with LC and SC connectors 20
7.7.1 Pin out terminals 20
7.7.2 Pad terminals 21
7.8 Outlines of VCSEL pigtail package 21
7.8.1 Drawings of case outline 21
7.8.2 Dimensions of VCSEL pigtail package 22
7.8.3 Optical connectors 22
Bibliography 23

Figure 1 – Electrical terminal numbering assignments of 3-pin and 4-pin type TO CAN packages with optional colour code C for pin configuration 10
Figure 2 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with LC connector and with optional colour code C 11
Figure 3 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with SC connector and with optional colour code C 12
Figure 4 – Schematic diagrams and pin-out of VCSEL TO CANs with flat window, with ball lens, and with tilted window with optional colour code C on the bottom 13
Figure 5 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C on the bottom for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 14
Figure 6 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C on the bottom for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 16
Figure 7 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 17
Figure 8 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 19
Figure 9 – Schematic diagram and pin-out of VCSEL pigtail package with optional colour code C 22

Table 1 – Pin-function definitions of 4-pin type VCSEL TO CAN packages 11
Table 2 – Pin-function definitions of 3-pin type VCSEL TO CAN packages 11
Table 3 – Dimension of VCSEL TO CANs with flat window, ball lens and tilted window 14
Table 4 – Dimensions of VCSEL TOSA package with LC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 15
Table 5 – Dimension of VCSEL TOSA package with SC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s) 16
Table 6 – Dimension of VCSEL TOSA package with LC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 18
Table 7 – Dimension of VCSEL TOSA package with SC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 20
Table 8 – Pin out terminals of VCSEL TOSA package with LC and SC connectors for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 21

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Table 9 – Pad terminals of VCSEL TOSA package with LC and SC connectors and with flexible printed circuit board for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s) 21
Table 10 – Dimensions of VCSEL pigtail package 22

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PACKAGE AND INTERFACE STANDARDS –

Part 15: Discrete vertical cavity surface emitting laser packages

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IEC 62148-15 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

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

a) the classification of optical/electrical interface types is generalized and referred to IEC 62148-1;
b) a new pin mode is added to Table 1;
c) several dimensions of the VCSEL TO CAN package are changed in Table 3 to reflect the current state of technology;
d) Figure 7 is updated to show the complete details of the VCSEL TOSA package.

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

FDIS	Report on voting
86C/1709/FDIS	86C/1712/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.

A list of all parts of the IEC 62148 series, published under the general title *Fibre optic active components and devices – Package and interface standards*, can be found on the IEC website.

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

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INTRODUCTION

Fibre optic laser devices are used to convert electrical signals into optical signals. This document covers the physical dimension and interface for discrete vertical cavity surface emitting laser (VCSEL) packages.

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PACKAGE AND INTERFACE STANDARDS –

Part 15: Discrete vertical cavity surface emitting laser packages

1 Scope

This part of IEC 62148 covers the physical dimension and interface specifications for discrete vertical cavity surface emitting laser (VCSEL) devices in optical telecommunication and optical data transmission applications.

The intent of this document is to adequately specify the physical requirements of VCSEL devices that will enable mechanical interchangeability of laser devices or transmitters complying with this document both at the printed circuit wiring board and for any panel-mounting requirement

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 60793-2 (all parts), *Optical fibres – Part 2: Product specifications*~~

IEC 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60874 (all parts), *Fibre optic interconnecting devices and passive components – Connectors for optical fibres and cables*

IEC 61754 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces*

~~IEC 61754-4-1, *Fibre optic connector interfaces – Part 4-1: Type SC connector family – Simplified receptacle SC-PC connector interfaces*~~

IEC 61754-4-100, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 4-100: Type SC connector family – Simplified receptacle SC-PC connector interfaces*

IEC 61754-20, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 20: Type LC connector family*

IEC 62148-1, *Fibre optic active components and devices – Package and interface standards – Part 1: General and guidance*

ITU-T Recommendation G.652, *Characteristics of a single-mode optical fibre and cable*

ASTM B-652.B, *Standard Specification for Niobium-Hafnium Alloy Ingots*

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3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviated terms apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and definitions

3.1.1
pigtail package
package type of photonic devices which has a length of fibre attachment for both optical input and output ports

3.2 Abbreviated terms

CAN	airtight sealed metal container (see IEC 60747-1)
PD	photodiode
TO	transistor outline
TOSA	transmitter optical subassembly
VCSEL	vertical cavity surface emitting laser

4 Classification

~~This part of IEC 62148, which gives the physical dimension and interface specifications for the discrete vertical cavity surface emitting laser devices, specifies the interface of types 1 and 3 modules with direct solderable type electrical terminals.~~

Fibre optic transceiver modules are classified into ~~five~~ several types of forms according to the combination of mating types of electrical and optical interfaces. The classifications provided in IEC 62148-1 apply. ~~Details are described in IEC 62148-1. The five types are as follows:~~

~~Type 1: fibre optic connector interface with direct solderable type electrical terminals.~~

~~Type 2: fibre optic connector interface with plug-in type electrical terminals.~~

~~Type 3: fibre optic pigtail interface with direct solderable type electrical terminals.~~

~~Type 4: fibre optic pigtail interface with plug-in type electrical terminals.~~

~~Type 5: modules are not classified into type 1 – type 4. (A typical example is a module that has both electrical connectors and non-connector type terminals as an electrical interface, such as a coaxial connector for signal and lead terminals for the power supply.)~~

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5 Specification of the optical interface

5.1 General

The intent of this document is to adequately specify the physical requirements of a VCSEL device that will enable mechanical interchangeability of laser devices or transmitters to this document both at the printed circuit board and for any panel mounting requirement.

5.2 Optical connector interface ~~(type 1)~~

This document applies to the LC and SC optical connector interfaces. Detailed dimensions of the optical receptacle are specified in IEC 61754-20 and ~~IEC 61754-4-1~~ IEC 61754-4-100.

5.3 Pigtail interface ~~(type 3)~~

All optical fibres defined in ~~the IEC 60793-2 series~~ IEC 60793-2-50, ASTM B-652.B and ITU-T Recommendation G.652 are applicable.

All optical connectors defined in IEC 60874 (all parts) and IEC 61754 (all parts) are applicable, if a pigtail ~~has to be~~ is terminated with an optical connector.

6 Specifications of electrical interfaces

6.1 General

Specifications for the electrical interface of VCSEL TO CAN, TOSA and VCSEL pigtail packages are described in 6.2.

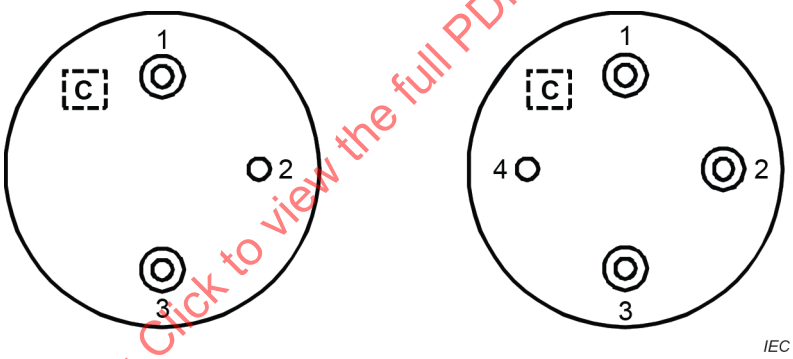
6.2 Electrical interface specifications for VCSEL TO CAN packages

6.2.1 General

The electrical interface in this document defines only the basic functionality of each pin.

6.2.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 1.



NOTE The electrical terminals as viewed from the bottom of the package module with pins underneath.

Figure 1 – Electrical terminal numbering assignments of 3-pin and 4-pin type TO CAN packages with optional colour code C for pin configuration

6.2.3 Electrical terminal assignment

Electrical terminal assignments are defined in Table 1 and Table 2.

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Table 1 – Pin-function definitions of 4-pin type VCSEL TO CAN packages

Pin number	Function (VCSEL with a monitor photodiode)				
	Common cathode	Common anode	Float (type K)	Float (type A)	Float (type D)
1	VCSEL anode	VCSEL cathode	VCSEL anode	VCSEL cathode	VCSEL cathode
2	VCSEL cathode/PD anode	VCSEL anode/PD cathode	VCSEL cathode	VCSEL anode	PD anode
3	PD cathode	PD anode	PD cathode	PD cathode	VCSEL anode/PD cathode
4	Ground/case (option)	Ground/case (option)	PD anode/case	PD anode/case	case
Optional colour code (C)	Blue	Red	Green	Black	Yellow

Table 2 – Pin-function definitions of 3-pin type VCSEL TO CAN packages

Pin number	Function (VCSEL with a monitor photodiode)	
	Common anode	Common cathode
1	VCSEL cathode	VCSEL anode
2	VCSEL anode/PD cathode	VCSEL cathode/PD anode
3	PD anode	PD cathode
Optional colour code (C)	Red	Blue

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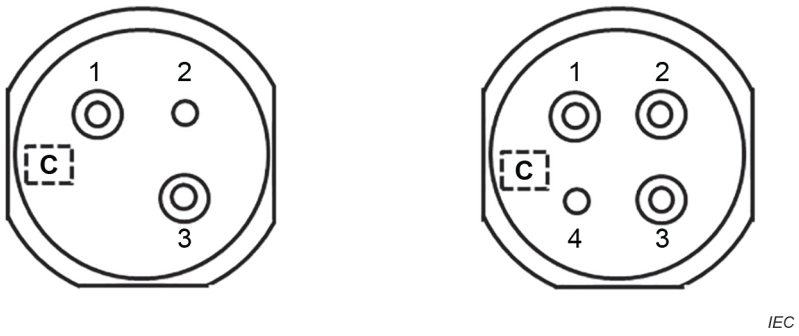
6.3 Electrical interface specifications for VCSEL TOSA package with an LC connector

6.3.1 General

The electrical interface in this document defines only the basic functionality of each pin.

6.3.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 2.



NOTE The electrical terminals as viewed from the bottom of the package module with pins underneath.

Figure 2 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with LC connector and with optional colour code C

6.3.3 Electrical terminal assignment

The pin-function definitions of the 3-pin and 4-pin type VCSEL TOSA packages with an LC connector are the same as those of the VCSEL TO CAN packages as specified in Table 1 and Table 2.

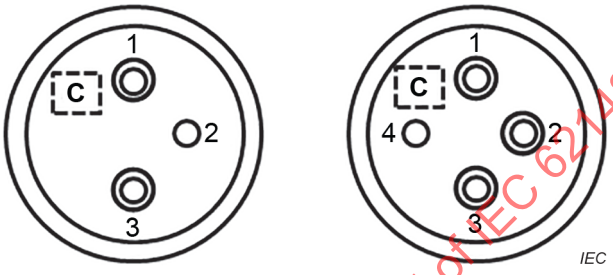
6.4 Electrical interface specifications for VCSEL TOSA package with an SC connector

6.4.1 General

The electrical interface in this document defines only the basic functionality of each pin.

6.4.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 3.



NOTE The electrical terminals as viewed from the bottom of the package module with pins underneath.

Figure 3 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with SC connector and with optional colour code C

6.4.3 Electrical terminal assignment

The pin-function definitions of the 3-pin and 4-pin type VCSEL TOSA packages with an SC connector are the same as those of the VCSEL TO CAN packages as specified in Table 1 and Table 2.

7 Outline

7.1 General

The outline, dimensions and electrical interface of VCSEL TO CAN, TOSA and VCSEL pigtail packages are described ~~as follows~~ in 7.2 to 7.8.

7.2 Outline of VCSEL TO CAN packages

7.2.1 Drawings of case outline

~~Case outline Drawings of VCSEL TO CAN packages are shown in Figure 4.~~ Drawings of case outlines for various VCSEL TO CAN packages are shown in Figure 4 a) to Figure 4 e).

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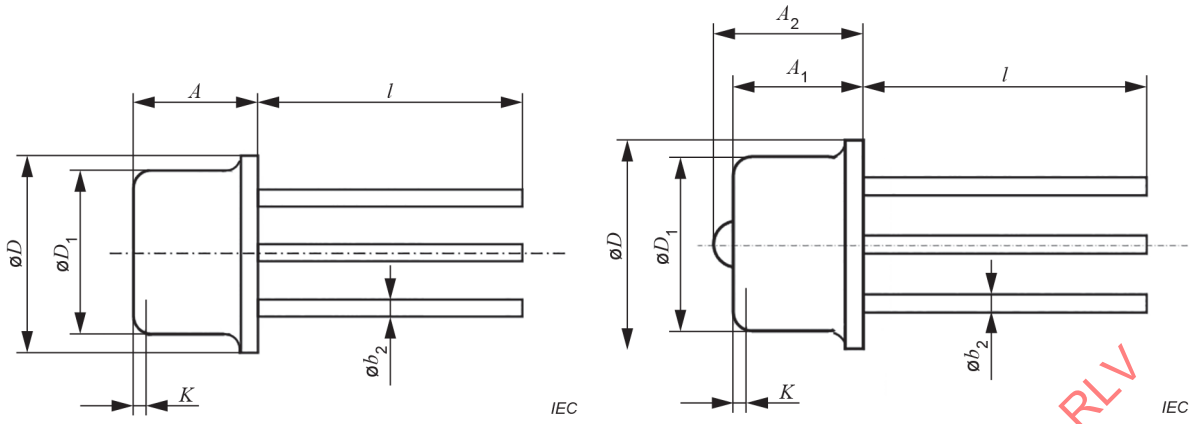
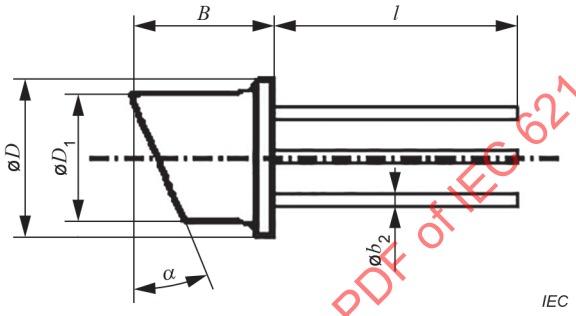
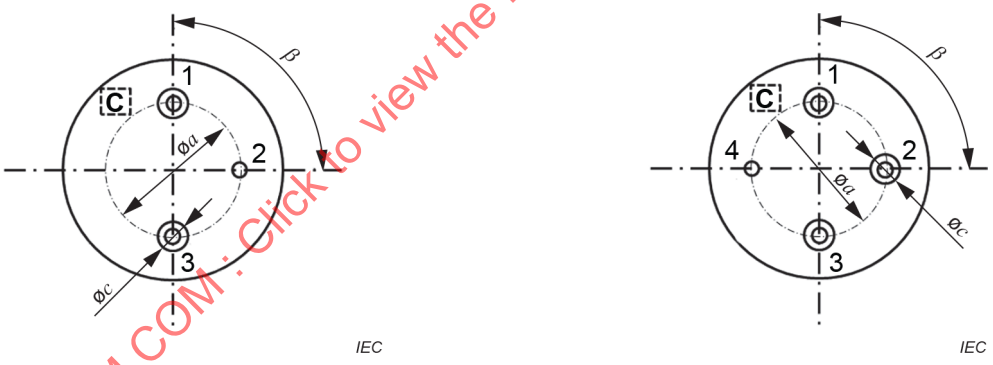


a) Outside drawing of TO CAN with flat window

b) Outside drawing of TO CAN with ball lens



c) Outside drawing of TO CAN with tilted window



d) 3-pin type TO CAN pin configuration

e) 4-pin type TO CAN pin configuration

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Figure 4 – Schematic diagrams and pin-out of VCSEL TO CANs with flat window, with ball lens, and with tilted window with optional colour code C on the bottom

7.2.2 Dimensions of VCSEL TO CAN packages

Dimensions of VCSEL TO CANs are specified in Table 3.

Table 3 – Dimension of VCSEL TO CANs with flat window, ball lens and tilted window

Reference	Dimensions		Notes
	Minimum	Maximum	
ϕD		5,84 mm	
ϕD_1	3,54 mm	4,95 mm	
A	2,65 mm	3,75 mm	TO 46
A_1	~~3,40~~ 2,60 mm	3,85 mm	Only for ball lens types
A_2	~~4,10~~ 3,20 mm	4,70 mm	
B	~~3,30~~ 3,20 mm	4,27 mm	Tilted window type only
K	–	1,0 mm	
l	12,0 mm	14,5 mm	
ϕb_2	0,40 mm	0,50 mm	
α	14°	30°	Degree (tilted window type only)
β	89°	91°	Degree
ϕa	2,50 mm	2,60 mm	
ϕc	0,4 mm	1,3 mm	

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7.3 Outlines of VCSEL TOSA package with an LC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

7.3.1 Drawings of case outline

~~Case outline drawings of VCSEL TOSA packages are shown in Figure 5.~~ Figure 5 is a drawing of the case outline.

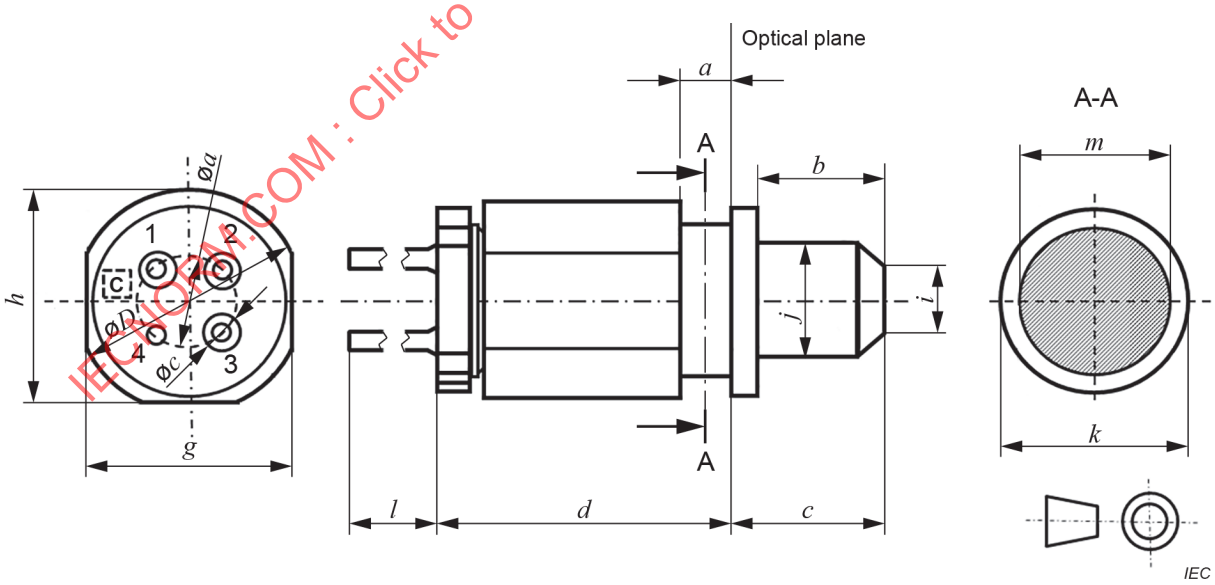

Figure 5 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C on the bottom for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

7.3.2 Dimensions of VCSEL TOSA package with an LC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

The dimensions of the low speed (< 8 ~~Gbps~~ Gbit/s) VCSEL TOSA package with an LC connector are specified in Table 4.

Table 4 – Dimensions of VCSEL TOSA package with LC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

Reference	Dimensions mm		Notes
	Minimum	Maximum	
a	1,24	1,30	
b	3,33	3,43	
c	3,99	4,09	
d		7,24	
g	5,87	6,01	
h	6,12	6,34	
ϕD	6,55	6,65	
ϕa	2,50	2,60	
ϕc	0,4	1,3	
i	2,44	2,60	Pedestal diameter
j	2,89	2,95	
k	5,03	5,13	
l	12,5	14,5	
m	4,12	4,22	

7.3.3 Optical receptacle LC style

~~Refer to~~ IEC 61754-20 shall apply.

7.4 Outlines of VCSEL TOSA package with an SC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

7.4.1 Drawings of case outline

~~Case outline drawings of VCSEL TOSA packages are shown in Figure 6.~~ Figure 6 is a drawing of the case outline.

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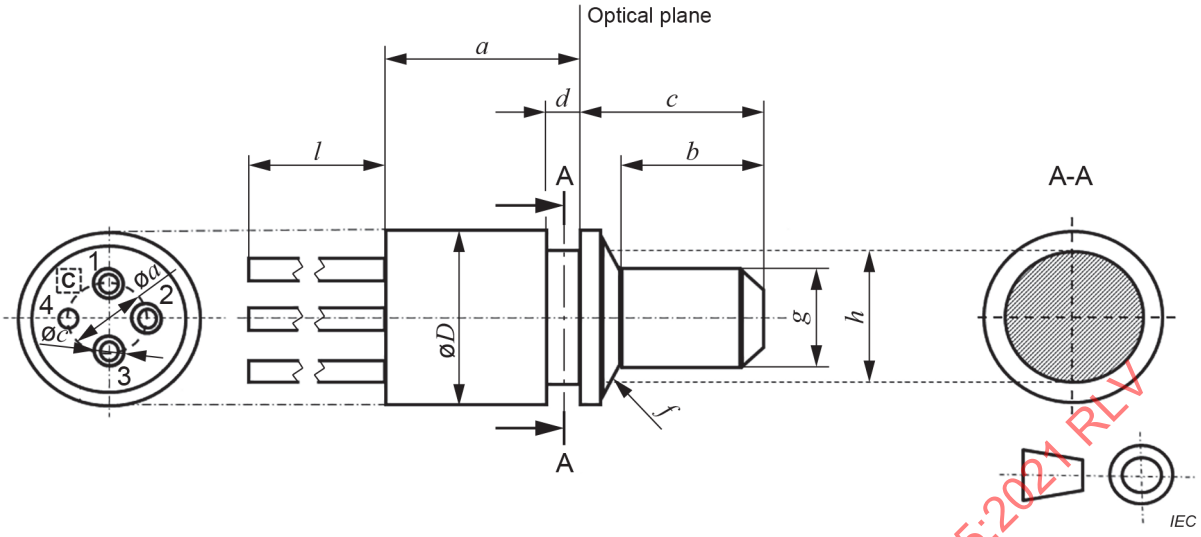

Figure 6 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C on the bottom for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

7.4.2 Dimensions of VCSEL TOSA package with an SC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

The dimensions of the low speed (< 8 ~~Gbps~~ Gbit/s) VCSEL TOSA package with an SC connector are specified in Table 5.

Table 5 – Dimension of VCSEL TOSA package with SC connector for uses at low speed (below 8 ~~Gbps~~ Gbit/s)

Reference	Dimensions mm		Notes
	Minimum	Maximum	
a	5,30	8,56	
b	6,25	6,61	
c	6,68	8,05	
d		1,30	
f	0,1	0,57	25° chamfer
g	4,39	4,79	
h	6,2	6,30	
ϕD	7,30	8,10	
ϕa	2,50	2,60	
ϕc	0,4	1,3	
l	12,0	14,5	

7.4.3 Optical receptacle SC style

~~Refer to IEC 61754-4-1.~~ IEC 61754-4-100 shall apply.

7.5 Outlines of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

7.5.1 Drawings of case outline

~~Case outline drawings of VCSEL TOSA packages with LC connector are shown in Figure 7.~~

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Figure 7 is the drawing of the case outline.

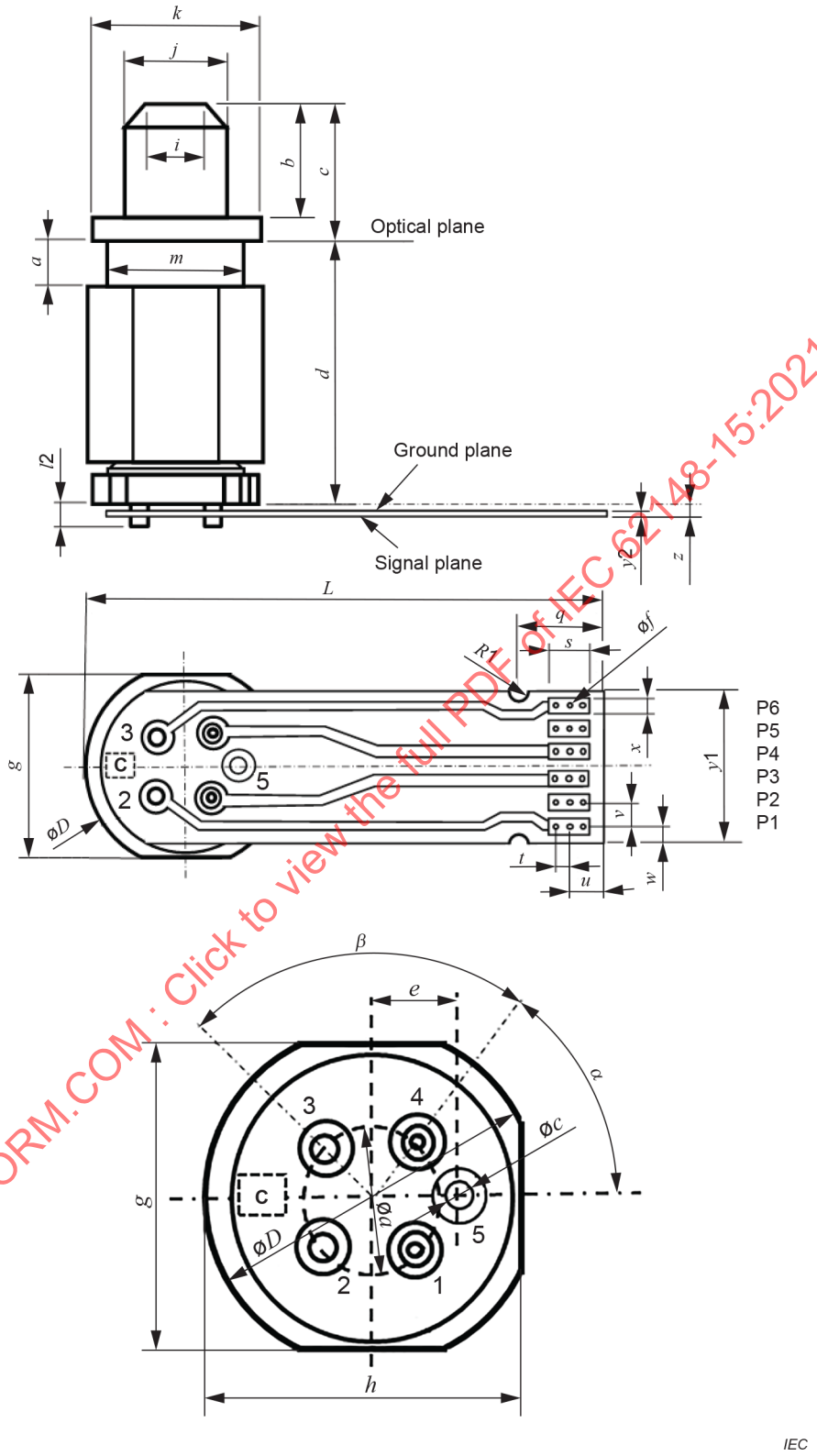

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Figure 7 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

7.5.2 Dimensions of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

The dimensions of the high speed (≥ 8 ~~Gbps~~ Gbit/s) VCSEL TOSA package with an LC connector are specified in Table 6.

Table 6 – Dimension of VCSEL TOSA package with LC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

Reference	Dimensions		Notes
	Minimum	Maximum	
a	1,24 mm	1,30 mm	
b	3,29 mm	3,48 mm	
c	3,99 mm	4,09 mm	
d	6,79 mm	7,52 mm	
g	5,89 mm	5,99 mm	
h	5,89 mm	5,99 mm	
ϕ *D*	6,26 mm	6,65 mm	
ϕ *a*	2,50 mm	2,59 mm	
ϕ *c*	0,20 mm	0,30 mm	
i	1,249 mm	1,256 mm	~~Pedestal~~ Aperture diameter
j	2,88 mm	2,95 mm	
k	5,00 mm	5,12 mm	
*l*2		1,2 mm	
m	4,12 mm	5,10 mm	
*y*2		0,20 mm	
z		0,7 mm	
α	55°	59°	Angle
β	80°	84°	Angle
e	1,35 mm	1,45 mm	
L	13,80 mm	14,26 mm	
q	1,95 mm	2,34 mm	
*R*1	0,45 mm	0,55 mm	
s	0,85 mm	1,01 mm	
t	0,25 mm	0,51 mm	
u	0,63 mm	0,99 mm	
v	0,74 mm	0,84 mm	
w	0,39 mm	0,50 mm	
x	0,35 mm	0,45 mm	
*y*1	4,79 mm	4,89 mm	
ϕ *f*		0,35 mm	3 and 2 holes

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7.6 Outlines of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

7.6.1 Drawings of case outline

~~Case outline drawings of VCSEL TOSA packages with SC connector are shown in Figure 8.~~

Figure 8 is a drawing of the case outline.

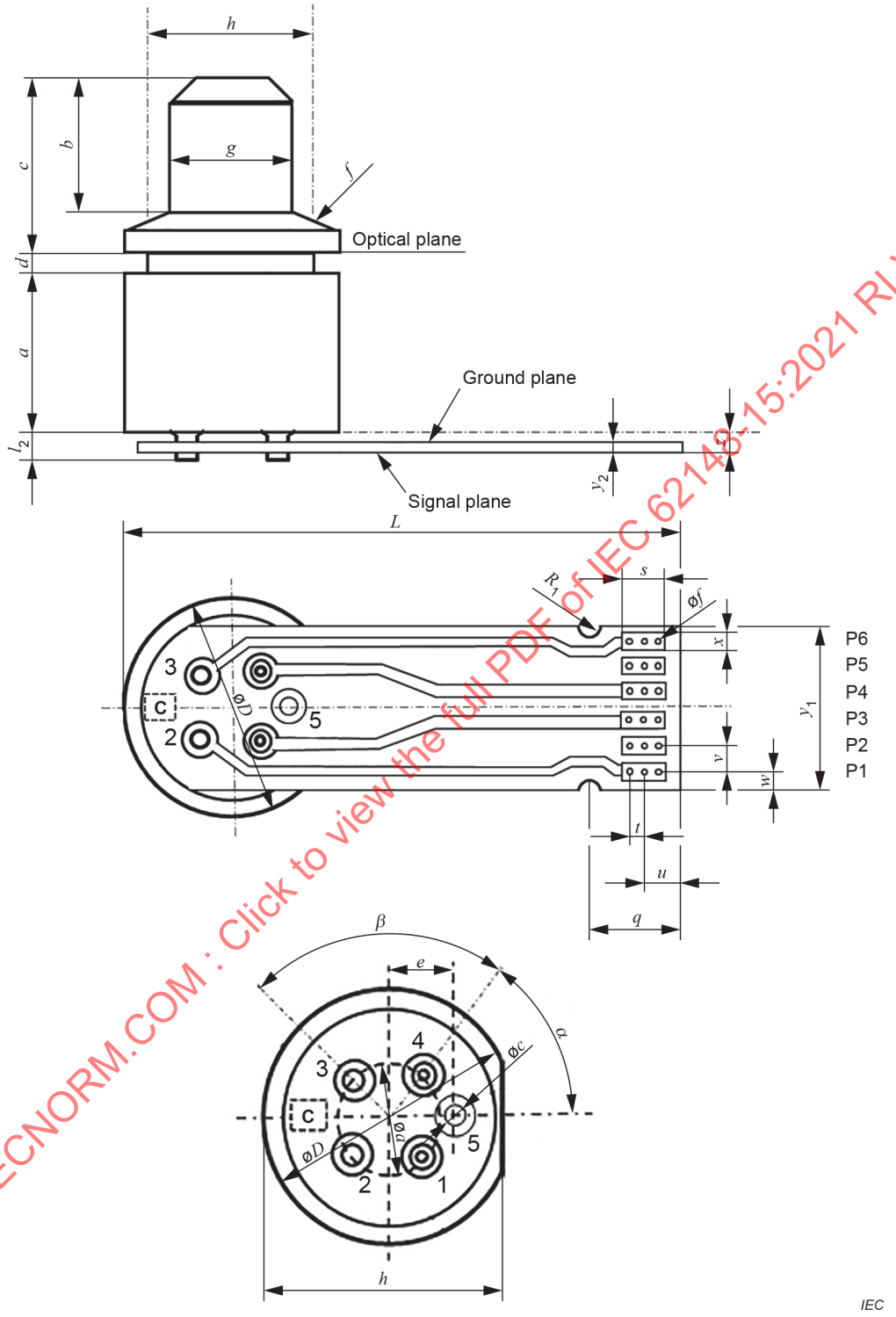

Figure 8 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

7.6.2 Dimensions of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

The dimensions of the high speed (≥ 8 ~~Gbps~~ Gbit/s) VCSEL TOSA package with an SC connector are specified in Table 7.

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Table 7 – Dimension of VCSEL TOSA package with SC connector for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

Reference	Dimensions		Notes
	Minimum	Maximum	
a	5,0 mm	5,64 mm	
b		6,41 mm	
c	6,45 mm	8,05 mm	
d	1,02 mm	1,14 mm	
f			25° chamfer
g	4,59 mm	4,74 mm	
h	6,18 mm	6,30 mm	
ϕ *D*	7,21 mm	8,05 mm	
ϕ *a*	2,50 mm	2,59 mm	
ϕ *c*	0,40 mm	0,50 mm	
*l*2	0,85 mm	1,05 mm	
*y*2	0,11 mm	0,16 mm	
z	0,46 mm	0,56 mm	
α	55°	59°	Angle
β	80°	84°	Angle
e	1,35 mm	1,45 mm	
L	14,35 mm	15,05 mm	
q	1,95 mm	2,34 mm	
R1	0,45 mm	0,55 mm	
s	0,85 mm	1,01 mm	
t	0,25 mm	0,51 mm	
u	0,63 mm	0,99 mm	
v	0,74 mm	0,84 mm	
w	0,39 mm	0,50 mm	
x	0,35 mm	0,45 mm	
y1	4,79 mm	4,89 mm	
ϕ *f*		0,35 mm	3 and 2 holes

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7.7 Electrical terminals of high-speed (≥ 8 ~~Gbps~~ Gbit/s) VCSEL TOSA packages for both cases with LC and SC connectors

7.7.1 Pin out terminals

The pin out terminals of VCSEL TOSA package with LC and SC connectors for uses at high speed (≥ 8 Gbit/s) are specified in Table 8.

Table 8 – Pin out terminals of VCSEL TOSA package with LC and SC connectors for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

Pin number	Function (A-type)	Function (K-type)
1	VCSEL anode	VCSEL cathode
2	PD cathode	PD cathode
3	PD anode	PD anode
4	VCSEL cathode	VCSEL anode
5	Case/ground	Case/ground
Optional colour code (C)	Yellow	Violet

7.7.2 Pad terminals

The pad terminals of VCSEL TOSA package with LC and SC connectors and with flexible printed circuit board for uses at high speed (≥ 8 Gbit/s) are specified in Table 9.

Table 9 – Pad terminals of VCSEL TOSA package with LC and SC connectors and with flexible printed circuit board for uses at high speed (≥ 8 ~~Gbps~~ Gbit/s)

PAD number	Function (A-type)	Function (K-type)
1	PD cathode	PD cathode
2	Case/ground	Case/ground
3	VCSEL anode	VCSEL cathode
4	VCSEL cathode	VCSEL anode
5	Case/ground	Case/ground
6	PD anode	PD anode
Optional colour code (C)	Yellow	Violet

7.8 Outlines of VCSEL pigtail package

7.8.1 Drawings of case outline

~~Case outline drawings of VCSEL pigtail packages are shown in Figure 9.~~ Figure 9 is a drawing of the case outline.

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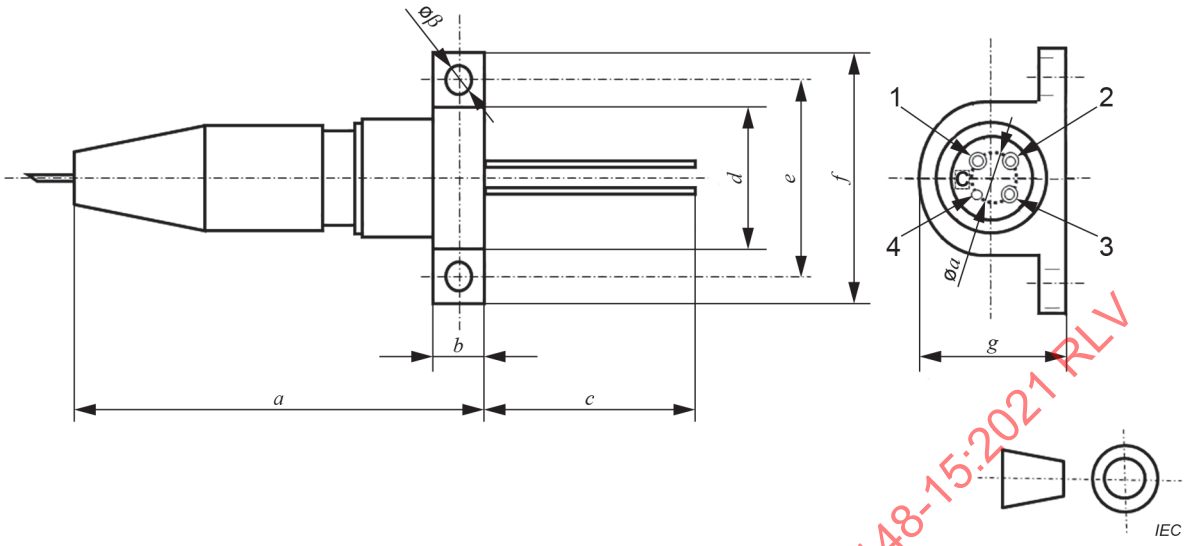

Figure 9 – Schematic diagram and pin-out of VCSEL pigtail package with optional colour code C

7.8.2 Dimensions of VCSEL pigtail package

The dimensions of the VCSEL pigtail package are specified in Table 10.

Table 10 – Dimensions of VCSEL pigtail package

Reference	Dimensions mm		Notes
	Minimum	Maximum	
ϕa	2,5	2,6	Diameter
$\phi \beta$	2,2	2,6	Diameter
a	26,3	26,7	
b	3,3	4,2	
c	12,0	14,5	
d	7,8	8,2	
e	12,5	12,9	
f	16,8	17,2	
g	7,8	8,2	

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7.8.3 Optical connectors

~~Refer to IEC 61754-4-1 and IEC 61754-20.~~ IEC 61754-4-100 and IEC 61754-20 shall apply.

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~~IEC 61754 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces*~~

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IEC 62007-2, *Semiconductor optoelectronic devices for fibre optic system applications – Part 2: Measuring methods*

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IEC 62149-2, *Fibre optic active components and devices – Performance standards – Part 2: 850 nm discrete vertical cavity surface emitting laser devices*

ISO 1101, *Geometrical product specifications (GPS) – Geometrical tolerancing – Tolerances of form, orientation, location and run-out*

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Fibre optic active components and devices – Package and interface standards – Part 15: Discrete vertical cavity surface emitting laser packages

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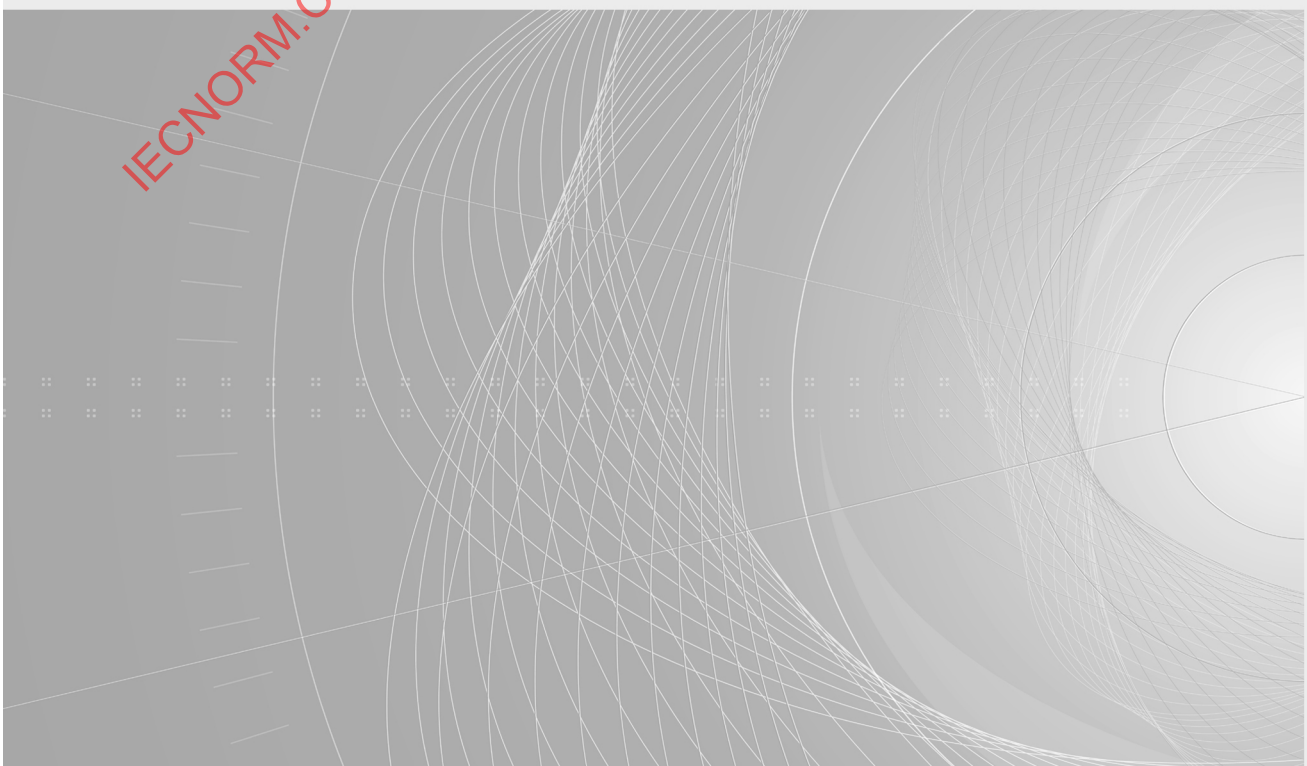

IEC 62148-15:2021-03(en-fr)

CONTENTS

FOREWORD 5
INTRODUCTION 7
1 Scope 8
2 Normative references 8
3 Terms, definitions and abbreviated terms 8
3.1 Terms and definitions 9
3.2 Abbreviated terms 9
4 Classification 9
5 Specification of the optical interface 9
5.1 General 9
5.2 Optical connector interface 9
5.3 Pigtail interface 9
6 Specifications of electrical interfaces 9
6.1 General 9
6.2 Electrical interface specifications for VCSEL TO CAN packages 10
6.2.1 General 10
6.2.2 Numbering of electrical terminals 10
6.2.3 Electrical terminal assignment 10
6.3 Electrical interface specifications for VCSEL TOSA package with an LC connector 11
6.3.1 General 11
6.3.2 Numbering of electrical terminals 11
6.3.3 Electrical terminal assignment 11
6.4 Electrical interface specifications for VCSEL TOSA package with an SC connector 11
6.4.1 General 11
6.4.2 Numbering of electrical terminals 11
6.4.3 Electrical terminal assignment 12
7 Outline 12
7.1 General 12
7.2 Outline of VCSEL TO CAN packages 12
7.2.1 Drawings of case outline 12
7.2.2 Dimensions of VCSEL TO CAN packages 13
7.3 Outlines of VCSEL TOSA package with an LC connector for uses at low speed (below 8 Gbit/s) 14
7.3.1 Drawings of case outline 14
7.3.2 Dimensions of VCSEL TOSA package with an LC connector for uses at low speed (below 8 Gbit/s) 14
7.3.3 Optical receptacle LC style 15
7.4 Outlines of VCSEL TOSA package with an SC connector for uses at low speed (below 8 Gbit/s) 15
7.4.1 Drawings of case outline 15
7.4.2 Dimensions of VCSEL TOSA package with an SC connector for uses at low speed (below 8 Gbit/s) 16
7.4.3 Optical receptacle SC style 16
7.5 Outlines of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 Gbit/s) 16

IECNORM.COM : Click to view the full PDF of IEC 62148-15:2021 RLV

7.5.1 Drawings of case outline 16
7.5.2 Dimensions of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 Gbit/s) 18
7.6 Outlines of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 Gbit/s) 18
7.6.1 Drawings of case outline 18
7.6.2 Dimensions of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 Gbit/s) 19
7.7 Electrical terminals of high-speed (≥ 8 Gbit/s) VCSEL TOSA packages for both cases with LC and SC connectors 20
7.7.1 Pin out terminals 20
7.7.2 Pad terminals 21
7.8 Outlines of VCSEL pigtail package 21
7.8.1 Drawings of case outline 21
7.8.2 Dimensions of VCSEL pigtail package 22
7.8.3 Optical connectors 22
Bibliography 23

Figure 1 – Electrical terminal numbering assignments of 3-pin and 4-pin type TO CAN packages with optional colour code C for pin configuration 10
Figure 2 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with LC connector and with optional colour code C 11
Figure 3 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with SC connector and with optional colour code C 12
Figure 4 – Schematic diagrams and pin-out of VCSEL TO CANs with flat window, with ball lens, and with tilted window with optional colour code C on the bottom 13
Figure 5 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C on the bottom for uses at low speed (below 8 Gbit/s) 14
Figure 6 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C on the bottom for uses at low speed (below 8 Gbit/s) 15
Figure 7 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 Gbit/s) 17
Figure 8 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 Gbit/s) 19
Figure 9 – Schematic diagram and pin-out of VCSEL pigtail package with optional colour code C 22

Table 1 – Pin-function definitions of 4-pin type VCSEL TO CAN packages 10
Table 2 – Pin-function definitions of 3-pin type VCSEL TO CAN packages 11
Table 3 – Dimension of VCSEL TO CANs with flat window, ball lens and tilted window 14
Table 4 – Dimensions of VCSEL TOSA package with LC connector for uses at low speed (below 8 Gbit/s) 15
Table 5 – Dimension of VCSEL TOSA package with SC connector for uses at low speed (below 8 Gbit/s) 16
Table 6 – Dimension of VCSEL TOSA package with LC connector for uses at high speed (≥ 8 Gbit/s) 18
Table 7 – Dimension of VCSEL TOSA package with SC connector for uses at high speed (≥ 8 Gbit/s) 20
Table 8 – Pin out terminals of VCSEL TOSA package with LC and SC connectors for uses at high speed (≥ 8 Gbit/s) 21

IECNORM.COM : Click to view the full PDF of IEC 62148-15:2021 RLV

Table 9 – Pad terminals of VCSEL TOSA package with LC and SC connectors and with flexible printed circuit board for uses at high speed (≥ 8 Gbit/s) 21
Table 10 – Dimensions of VCSEL pigtail package 22

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PACKAGE AND INTERFACE STANDARDS –

Part 15: Discrete vertical cavity surface emitting laser packages

FOREWORD

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IEC 62148-15 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics. It is an International Standard.

This third edition cancels and replaces the second edition published in 2014. This edition constitutes a technical revision.

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

a) the classification of optical/electrical interface types is generalized and referred to IEC 62148-1;
b) a new pin mode is added to Table 1;
c) several dimensions of the VCSEL TO CAN package are changed in Table 3 to reflect the current state of technology;
d) Figure 7 is updated to show the complete details of the VCSEL TOSA package.

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

FDIS	Report on voting
86C/1709/FDIS	86C/1712/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.

A list of all parts of the IEC 62148 series, published under the general title *Fibre optic active components and devices – Package and interface standards*, can be found on the IEC website.

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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://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.

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INTRODUCTION

Fibre optic laser devices are used to convert electrical signals into optical signals. This document covers the physical dimension and interface for discrete vertical cavity surface emitting laser (VCSEL) packages.

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FIBRE OPTIC ACTIVE COMPONENTS AND DEVICES – PACKAGE AND INTERFACE STANDARDS –

Part 15: Discrete vertical cavity surface emitting laser packages

1 Scope

This part of IEC 62148 covers the physical dimension and interface specifications for discrete vertical cavity surface emitting laser (VCSEL) devices in optical telecommunication and optical data transmission applications.

The intent of this document is to adequately specify the physical requirements of VCSEL devices that will enable mechanical interchangeability of laser devices or transmitters complying with this document both at the printed circuit wiring board and for any panel-mounting requirement

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 60793-2-50, *Optical fibres – Part 2-50: Product specifications – Sectional specification for class B single-mode fibres*

IEC 60874 (all parts), *Fibre optic interconnecting devices and passive components – Connectors for optical fibres and cables*

IEC 61754 (all parts), *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces*

IEC 61754-4-100, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 4-100: Type SC connector family – Simplified receptacle SC-PC connector interfaces*

IEC 61754-20, *Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces – Part 20: Type LC connector family*

IEC 62148-1, *Fibre optic active components and devices – Package and interface standards – Part 1: General and guidance*

ITU-T Recommendation G.652, *Characteristics of a single-mode optical fibre and cable*

ASTM B-652.B, *Standard Specification for Niobium-Hafnium Alloy Ingots*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviated terms apply.

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ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1 Terms and definitions

3.1.1
pigtail package
package type of photonic devices which has a length of fibre attachment for both optical input and output ports

3.2 Abbreviated terms

CAN	airtight sealed metal container (see IEC 60747-1)
PD	photodiode
TO	transistor outline
TOSA	transmitter optical subassembly
VCSEL	vertical cavity surface emitting laser

4 Classification

Fibre optic transceiver modules are classified into several types of forms according to the combination of mating types of electrical and optical interfaces. The classifications provided in IEC 62148-1 apply.

5 Specification of the optical interface

5.1 General

The intent of this document is to adequately specify the physical requirements of a VCSEL device that will enable mechanical interchangeability of laser devices or transmitters to this document both at the printed circuit board and for any panel mounting requirement.

5.2 Optical connector interface

This document applies to the LC and SC optical connector interfaces. Detailed dimensions of the optical receptacle are specified in IEC 61754-20 and IEC 61754-4-100.

5.3 Pigtail interface

All optical fibres defined in IEC 60793-2-50, ASTM B-652.B and ITU-T Recommendation G.652 are applicable.

All optical connectors defined in IEC 60874 (all parts) and IEC 61754 (all parts) are applicable, if a pigtail is terminated with an optical connector.

6 Specifications of electrical interfaces

6.1 General

Specifications for the electrical interface of VCSEL TO CAN, TOSA and VCSEL pigtail packages are described in 6.2.

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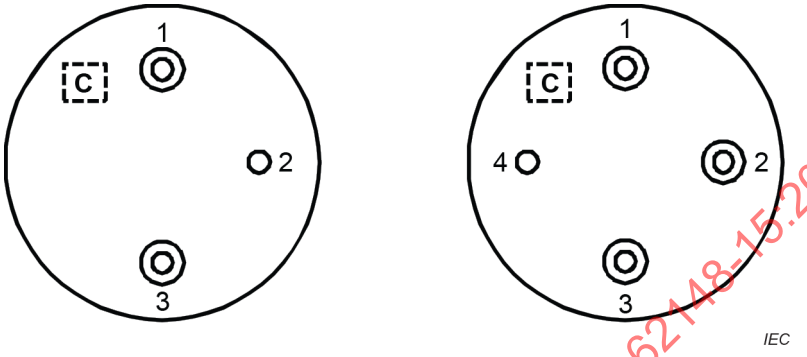
6.2 Electrical interface specifications for VCSEL TO CAN packages

6.2.1 General

The electrical interface in this document defines only the basic functionality of each pin.

6.2.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 1.



NOTE The electrical terminals as viewed from the bottom of the package module with pins underneath.

Figure 1 – Electrical terminal numbering assignments of 3-pin and 4-pin type TO CAN packages with optional colour code C for pin configuration

6.2.3 Electrical terminal assignment

Electrical terminal assignments are defined in Table 1 and Table 2.

Table 1 – Pin-function definitions of 4-pin type VCSEL TO CAN packages

Pin number	Function (VCSEL with a monitor photodiode)				
	Common cathode	Common anode	Float (type K)	Float (type A)	Float (type D)
1	VCSEL anode	VCSEL cathode	VCSEL anode	VCSEL cathode	VCSEL cathode
2	VCSEL cathode/PD anode	VCSEL anode/PD cathode	VCSEL cathode	VCSEL anode	PD anode
3	PD cathode	PD anode	PD cathode	PD cathode	VCSEL anode/PD cathode
4	Ground/case (option)	Ground/case (option)	PD anode/case	PD anode/case	case
Optional colour code (C)	Blue	Red	Green	Black	Yellow

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Table 2 – Pin-function definitions of 3-pin type VCSEL TO CAN packages

Pin number	Function (VCSEL with a monitor photodiode)	
	Common anode	Common cathode
1	VCSEL cathode	VCSEL anode
2	VCSEL anode/PD cathode	VCSEL cathode/PD anode
3	PD anode	PD cathode
Optional colour code (C)	Red	Blue

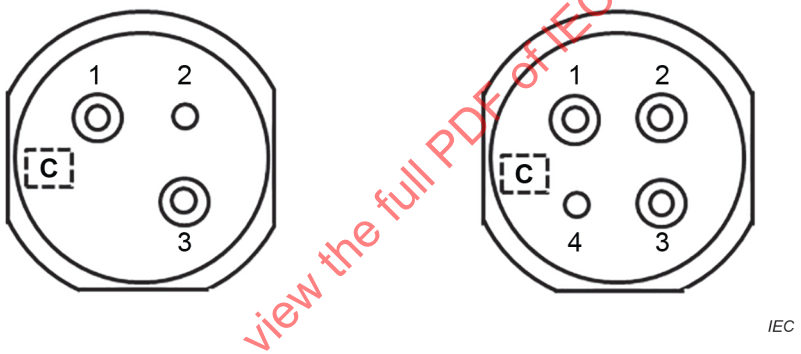
6.3 Electrical interface specifications for VCSEL TOSA package with an LC connector

6.3.1 General

The electrical interface in this document defines only the basic functionality of each pin.

6.3.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 2.



NOTE The electrical terminals as viewed from the bottom of the package module with pins underneath.

Figure 2 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with LC connector and with optional colour code C

6.3.3 Electrical terminal assignment

The pin-function definitions of the 3-pin and 4-pin type VCSEL TOSA packages with an LC connector are the same as those of the VCSEL TO CAN packages as specified in Table 1 and Table 2.

6.4 Electrical interface specifications for VCSEL TOSA package with an SC connector

6.4.1 General

The electrical interface in this document defines only the basic functionality of each pin.

6.4.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 3.

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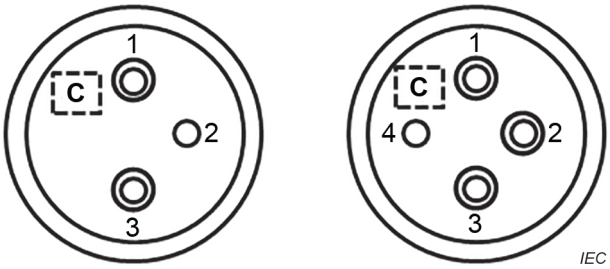

NOTE The electrical terminals as viewed from the bottom of the package module with pins underneath.

Figure 3 – Electrical terminal numbering assignments of 3-pin and 4-pin type TOSA packages with SC connector and with optional colour code C

6.4.3 Electrical terminal assignment

The pin-function definitions of the 3-pin and 4-pin type VCSEL TOSA packages with an SC connector are the same as those of the VCSEL TO CAN packages as specified in Table 1 and Table 2.

7 Outline

7.1 General

The outline, dimensions and electrical interface of VCSEL TO CAN, TOSA and VCSEL pigtail packages are described in 7.2 to 7.8.

7.2 Outline of VCSEL TO CAN packages

7.2.1 Drawings of case outline

Drawings of case outlines for various VCSEL TO CAN packages are shown in Figure 4 a) to Figure 4 e).

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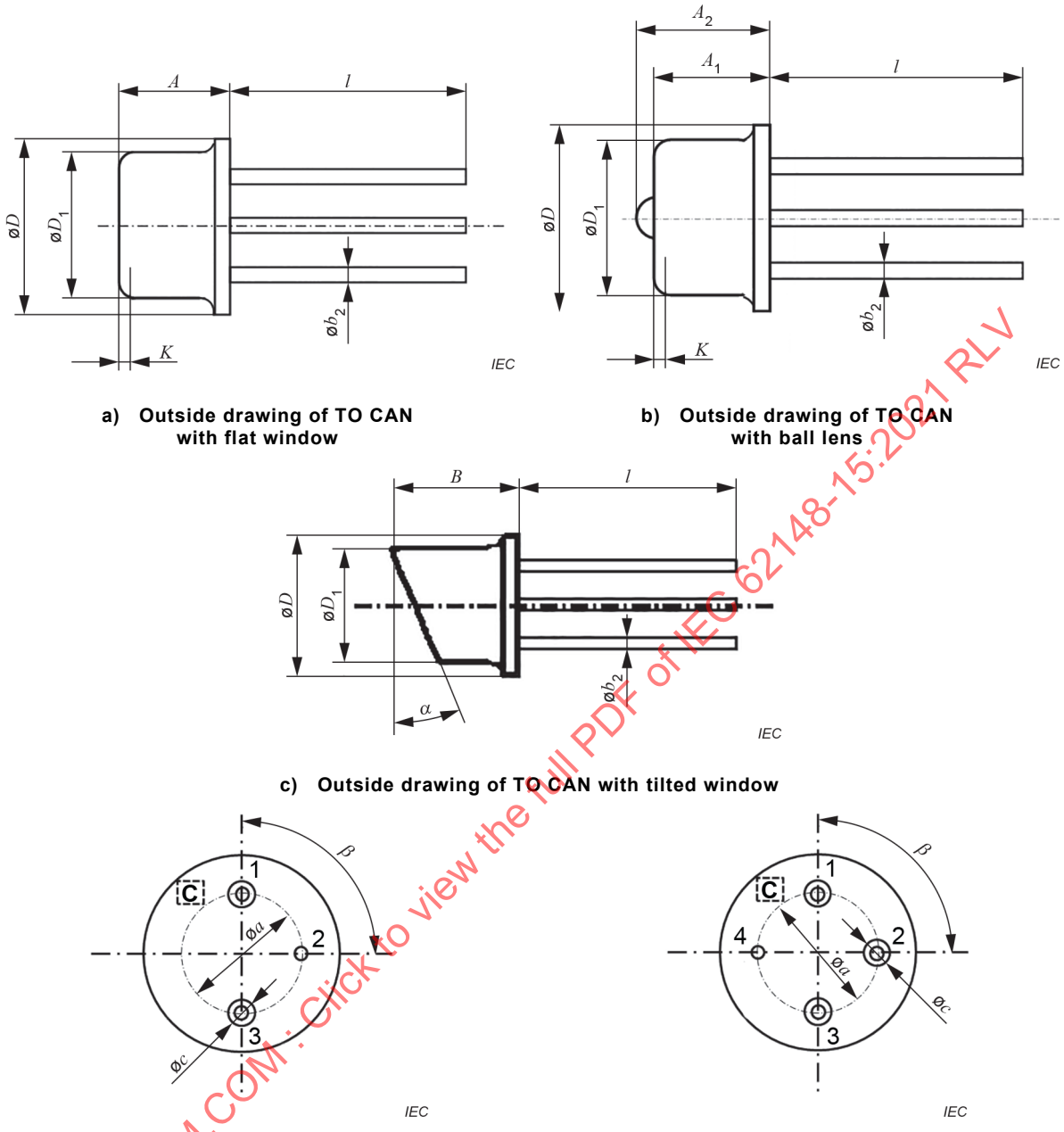

a) Outside drawing of TO CAN with flat window

b) Outside drawing of TO CAN with ball lens

c) Outside drawing of TO CAN with tilted window

d) 3-pin type TO CAN pin configuration

e) 4-pin type TO CAN pin configuration

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Figure 4 – Schematic diagrams and pin-out of VCSEL TO CANs with flat window, with ball lens, and with tilted window with optional colour code C on the bottom

7.2.2 Dimensions of VCSEL TO CAN packages

Dimensions of VCSEL TO CANs are specified in Table 3.

Table 3 – Dimension of VCSEL TO CANs with flat window, ball lens and tilted window

Reference	Dimensions		Notes
	Minimum	Maximum	
ϕD		5,84 mm	
ϕD_1	3,54 mm	4,95 mm	
A	2,65 mm	3,75 mm	TO 46
A_1	2,60 mm	3,85 mm	Only for ball lens types
A_2	3,20 mm	4,70 mm	
B	3,20 mm	4,27 mm	Tilted window type only
K	–	1,0 mm	
l	12,0 mm	14,5 mm	
ϕb_2	0,40 mm	0,50 mm	
α	14°	30°	Degree (tilted window type only)
β	89°	91°	Degree
ϕa	2,50 mm	2,60 mm	
ϕc	0,4 mm	1,3 mm	

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7.3 Outlines of VCSEL TOSA package with an LC connector for uses at low speed (below 8 Gbit/s)

7.3.1 Drawings of case outline

Figure 5 is a drawing of the case outline.

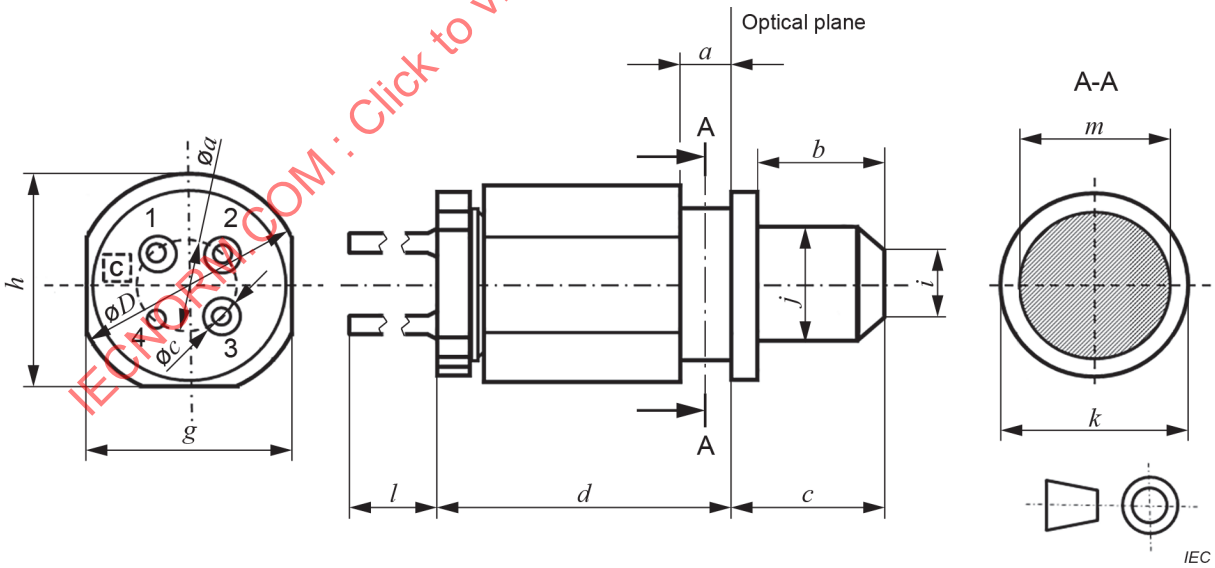

Figure 5 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C on the bottom for uses at low speed (below 8 Gbit/s)

7.3.2 Dimensions of VCSEL TOSA package with an LC connector for uses at low speed (below 8 Gbit/s)

The dimensions of the low speed (< 8 Gbit/s) VCSEL TOSA package with an LC connector are specified in Table 4.

Table 4 – Dimensions of VCSEL TOSA package with LC connector for uses at low speed (below 8 Gbit/s)

Reference	Dimensions mm		Notes
	Minimum	Maximum	
a	1,24	1,30	
b	3,33	3,43	
c	3,99	4,09	
d		7,24	
g	5,87	6,01	
h	6,12	6,34	
ϕD	6,55	6,65	
ϕa	2,50	2,60	
ϕc	0,4	1,3	
i	2,44	2,60	Pedestal diameter
j	2,89	2,95	
k	5,03	5,13	
l	12,5	14,5	
m	4,12	4,22	

7.3.3 Optical receptacle LC style

IEC 61754-20 shall apply.

7.4 Outlines of VCSEL TOSA package with an SC connector for uses at low speed (below 8 Gbit/s)

7.4.1 Drawings of case outline

Figure 6 is a drawing of the case outline.

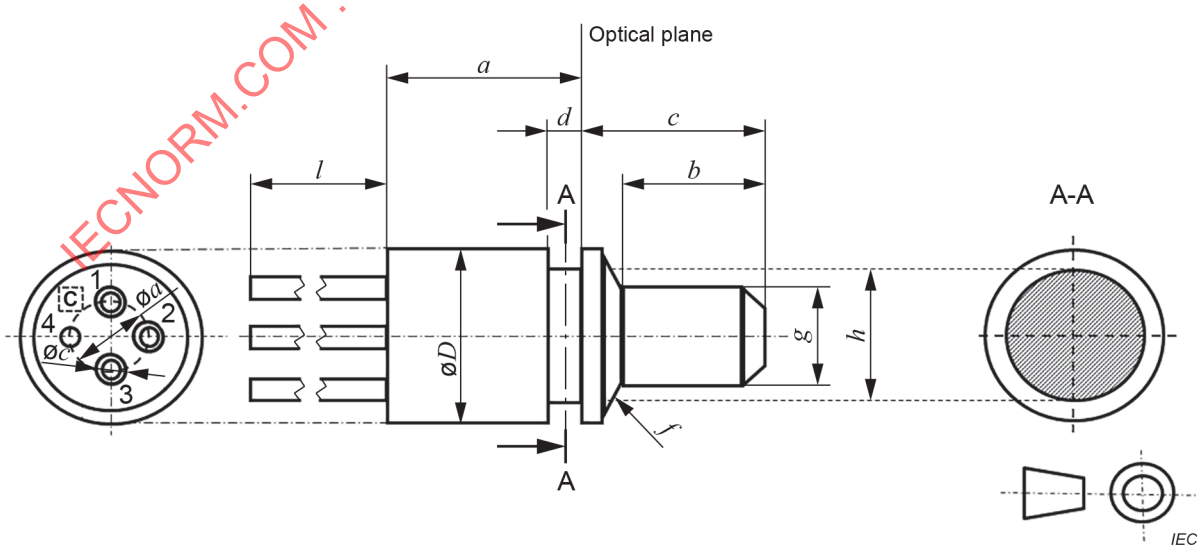

Figure 6 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C on the bottom for uses at low speed (below 8 Gbit/s)

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7.4.2 Dimensions of VCSEL TOSA package with an SC connector for uses at low speed (below 8 Gbit/s)

The dimensions of the low speed (< 8 Gbit/s) VCSEL TOSA package with an SC connector are specified in Table 5.

Table 5 – Dimension of VCSEL TOSA package with SC connector for uses at low speed (below 8 Gbit/s)

Reference	Dimensions mm		Notes
	Minimum	Maximum	
a	5,30	8,56	
b	6,25	6,61	
c	6,68	8,05	
d		1,30	
f	0,1	0,57	25° chamfer
g	4,39	4,79	
h	6,2	6,30	
ϕD	7,30	8,10	
ϕa	2,50	2,60	
ϕc	0,4	1,3	
l	12,0	14,5	

7.4.3 Optical receptacle SC style

IEC 61754-4-100 shall apply.

7.5 Outlines of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 Gbit/s)

7.5.1 Drawings of case outline

Figure 7 is the drawing of the case outline.

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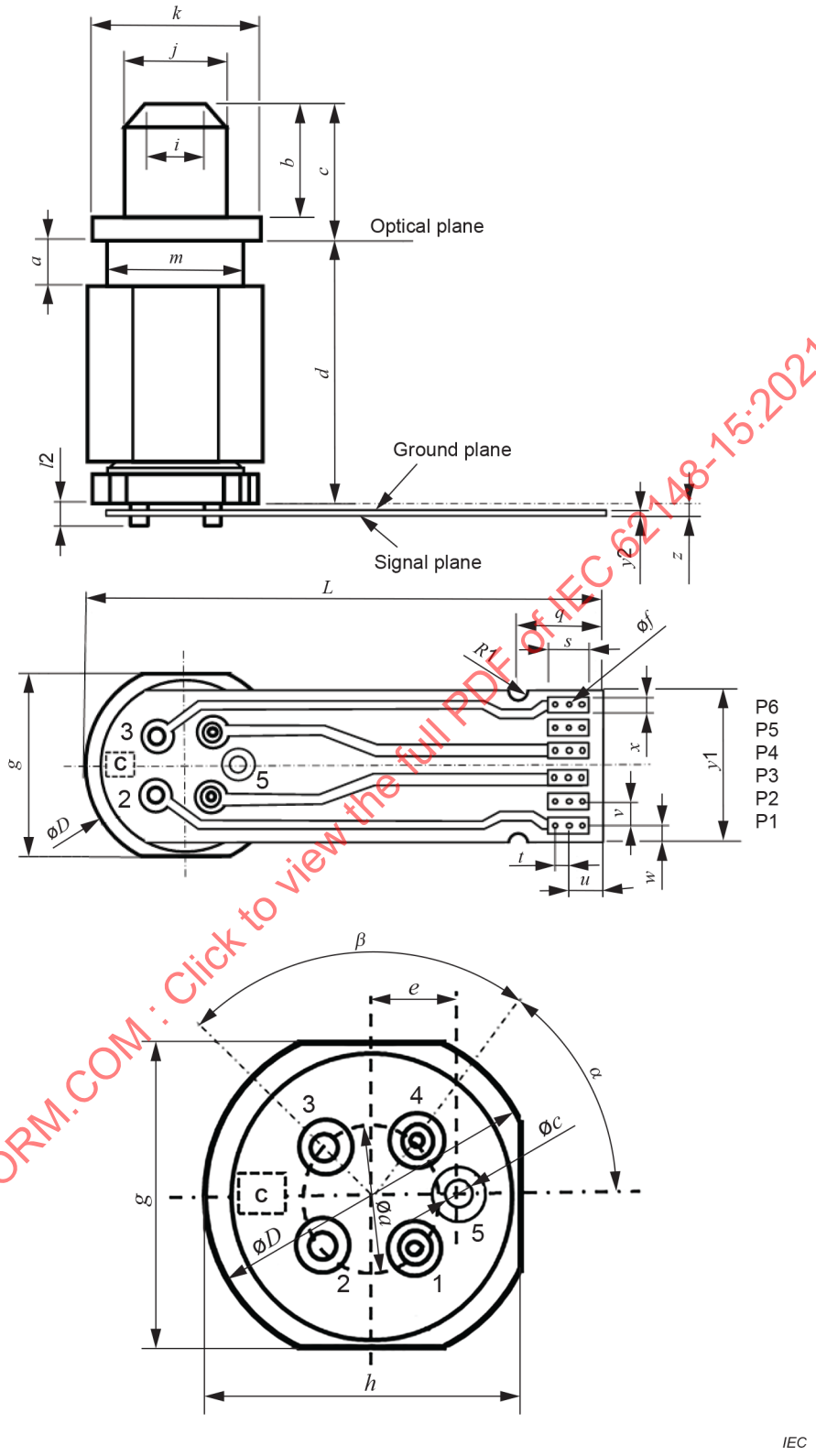

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Figure 7 – Schematic diagram of VCSEL TOSA package with LC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 Gbit/s)

7.5.2 Dimensions of VCSEL TOSA package with an LC connector for uses at high speed (≥ 8 Gbit/s)

The dimensions of the high speed (≥ 8 Gbit/s) VCSEL TOSA package with an LC connector are specified in Table 6.

Table 6 – Dimension of VCSEL TOSA package with LC connector for uses at high speed (≥ 8 Gbit/s)

Reference	Dimensions		Notes
	Minimum	Maximum	
a	1,24 mm	1,30 mm	
b	3,29 mm	3,48 mm	
c	3,99 mm	4,09 mm	
d	6,79 mm	7,52 mm	
g	5,89 mm	5,99 mm	
h	5,89 mm	5,99 mm	
ϕ *D*	6,26 mm	6,65 mm	
ϕ *a*	2,50 mm	2,59 mm	
ϕ *c*	0,20 mm	0,30 mm	
i	1,249 mm	1,256 mm	Aperture diameter
j	2,88 mm	2,95 mm	
k	5,00 mm	5,12 mm	
*l*2		1,2 mm	
m	4,12 mm	5,10 mm	
*y*2		0,20 mm	
z		0,7 mm	
α	55°	59°	Angle
β	80°	84°	Angle
e	1,35 mm	1,45 mm	
L	13,80 mm	14,26 mm	
q	1,95 mm	2,34 mm	
*R*1	0,45 mm	0,55 mm	
s	0,85 mm	1,01 mm	
t	0,25 mm	0,51 mm	
u	0,63 mm	0,99 mm	
v	0,74 mm	0,84 mm	
w	0,39 mm	0,50 mm	
x	0,35 mm	0,45 mm	
*y*1	4,79 mm	4,89 mm	
ϕ *f*		0,35 mm	3 and 2 holes

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7.6 Outlines of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 Gbit/s)

7.6.1 Drawings of case outline

Figure 8 is a drawing of the case outline.

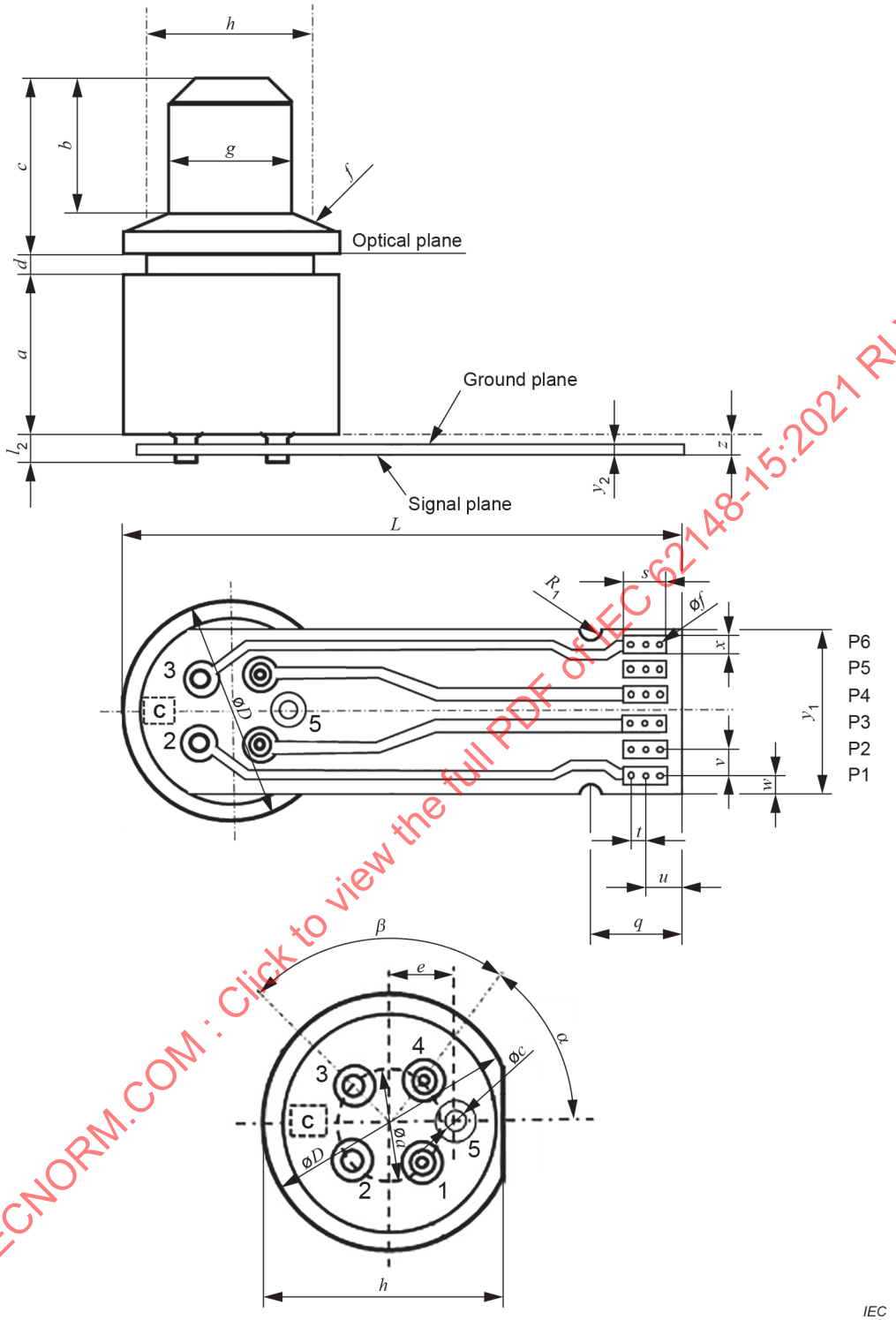

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Figure 8 – Schematic diagram of VCSEL TOSA package with SC connector and with optional colour code C for pin-type notation for uses at high speed (≥ 8 Gbit/s)

7.6.2 Dimensions of VCSEL TOSA package with an SC connector for uses at high speed (≥ 8 Gbit/s)

The dimensions of the high speed (≥ 8 Gbit/s) VCSEL TOSA package with an SC connector are specified in Table 7.

Table 7 – Dimension of VCSEL TOSA package with SC connector for uses at high speed (≥ 8 Gbit/s)

Reference	Dimensions		Notes
	Minimum	Maximum	
a	5,0 mm	5,64 mm	
b		6,41 mm	
c	6,45 mm	8,05 mm	
d	1,02 mm	1,14 mm	
f			25° chamfer
g	4,59 mm	4,74 mm	
h	6,18 mm	6,30 mm	
ϕD	7,21 mm	8,05 mm	
ϕa	2,50 mm	2,59 mm	
ϕc	0,40 mm	0,50 mm	
$l2$	0,85 mm	1,05 mm	
$y2$	0,11 mm	0,16 mm	
z	0,46 mm	0,56 mm	
α	55°	59°	Angle
β	80°	84°	Angle
e	1,35 mm	1,45 mm	
L	14,35 mm	15,05 mm	
q	1,95 mm	2,34 mm	
$R1$	0,45 mm	0,55 mm	
s	0,85 mm	1,01 mm	
t	0,25 mm	0,51 mm	
u	0,63 mm	0,99 mm	
v	0,74 mm	0,84 mm	
w	0,39 mm	0,50 mm	
x	0,35 mm	0,45 mm	
$y1$	4,79 mm	4,89 mm	
ϕf		0,35 mm	3 and 2 holes

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7.7 Electrical terminals of high-speed (≥ 8 Gbit/s) VCSEL TOSA packages for both cases with LC and SC connectors

7.7.1 Pin out terminals

The pin out terminals of VCSEL TOSA package with LC and SC connectors for uses at high speed (≥ 8 Gbit/s) are specified in Table 8.

Table 8 – Pin out terminals of VCSEL TOSA package with LC and SC connectors for uses at high speed (≥ 8 Gbit/s)

Pin number	Function (A-type)	Function (K-type)
1	VCSEL anode	VCSEL cathode
2	PD cathode	PD cathode
3	PD anode	PD anode
4	VCSEL cathode	VCSEL anode
5	Case/ground	Case/ground
Optional colour code (C)	Yellow	Violet

7.7.2 Pad terminals

The pad terminals of VCSEL TOSA package with LC and SC connectors and with flexible printed circuit board for uses at high speed (≥ 8 Gbit/s) are specified in Table 9.

Table 9 – Pad terminals of VCSEL TOSA package with LC and SC connectors and with flexible printed circuit board for uses at high speed (≥ 8 Gbit/s)

PAD number	Function (A-type)	Function (K-type)
1	PD cathode	PD cathode
2	Case/ground	Case/ground
3	VCSEL anode	VCSEL cathode
4	VCSEL cathode	VCSEL anode
5	Case/ground	Case/ground
6	PD anode	PD anode
Optional colour code (C)	Yellow	Violet

7.8 Outlines of VCSEL pigtail package

7.8.1 Drawings of case outline

Figure 9 is a drawing of the case outline.

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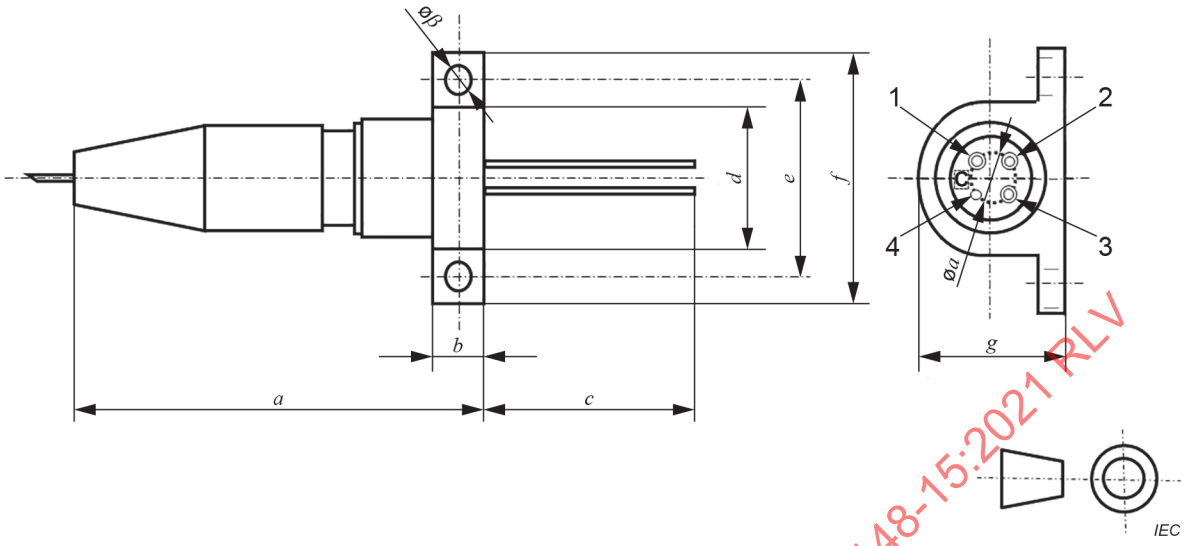

Figure 9 – Schematic diagram and pin-out of VCSEL pigtail package with optional colour code C

7.8.2 Dimensions of VCSEL pigtail package

The dimensions of the VCSEL pigtail package are specified in Table 10.

Table 10 – Dimensions of VCSEL pigtail package

Reference	Dimensions mm		Notes
	Minimum	Maximum	
$\phi\, a$	2,5	2,6	Diameter
$\phi\, \beta$	2,2	2,6	Diameter
a	26,3	26,7	
b	3,3	4,2	
c	12,0	14,5	
d	7,8	8,2	
e	12,5	12,9	
f	16,8	17,2	
g	7,8	8,2	

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7.8.3 Optical connectors

IEC 61754-4-100 and IEC 61754-20 shall apply.

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SOMMAIRE

AVANT-PROPOS 27
INTRODUCTION 29
1 Domaine d'application 30
2 Références normatives 30
3 Termes, définitions et termes abrégés 31
3.1 Termes et définitions 31
3.2 Termes abrégés 31
4 Classification 31
5 Spécification de l'interface optique 31
5.1 Généralités 31
5.2 Interface de connecteurs optiques 31
5.3 Interface des fibres amorces 31
6 Spécifications des interfaces électriques 32
6.1 Généralités 32
6.2 Spécifications de l'interface électrique relative aux boîtiers VCSEL TO CAN 32
6.2.1 Généralités 32
6.2.2 Numérotation des bornes électriques 32
6.2.3 Affectations des bornes électriques 32
6.3 Spécifications de l'interface électrique relative aux boîtiers VCSEL TOSA avec connecteur LC 33
6.3.1 Généralités 33
6.3.2 Numérotation des bornes électriques 33
6.3.3 Affectations des bornes électriques 34
6.4 Spécifications de l'interface électrique relative aux boîtiers VCSEL TOSA avec connecteur SC 34
6.4.1 Généralités 34
6.4.2 Numérotation des bornes électriques 34
6.4.3 Affectations des bornes électriques 34
7 Encombrement 35
7.1 Généralités 35
7.2 Encombrement des boîtiers VCSEL TO CAN 35
7.2.1 Schémas d'encombrement du boîtier 35
7.2.2 Dimensions des boîtiers VCSEL TO CAN 36
7.3 Encombrement des boîtiers VCSEL TOSA avec connecteur LC pour utilisations à faible vitesse (inférieure à 8 Gbit/s) 36
7.3.1 Schémas d'encombrement du boîtier 36
7.3.2 Dimensions des boîtiers VCSEL TOSA avec connecteur LC pour utilisations à faible vitesse (inférieure à 8 Gbit/s) 37
7.3.3 Réceptacle optique de modèle LC 37
7.4 Encombrement des boîtiers VCSEL TOSA avec connecteur SC pour utilisations à faible vitesse (inférieure à 8 Gbit/s) 37
7.4.1 Schémas d'encombrement de boîtier 37
7.4.2 Dimensions des boîtiers VCSEL TOSA avec connecteur SC pour utilisations à faible vitesse (inférieure à 8 Gbit/s) 38
7.4.3 Réceptacle optique de modèle SC 38
7.5 Encombrement des boîtiers VCSEL TOSA avec connecteur LC pour utilisations à grande vitesse (≥ 8 Gbit/s) 39

IECNORM.COM : Click to view the full PDF of IEC 62148-15:2021 RLV

7.5.1 Schémas d'encombrement de boîtier 39
7.5.2 Dimensions des boîtiers VCSEL TOSA avec connecteur LC pour des utilisations à grande vitesse (≥ 8 Gbit/s) 40
7.6 Encombrement des boîtiers VCSEL TOSA avec connecteur SC pour des utilisations à grande vitesse (≥ 8 Gbit/s) 41
7.6.1 Schémas d'encombrement du boîtier 41
7.6.2 Dimensions des boîtiers VCSEL TOSA avec connecteur SC pour des utilisations à grande vitesse (≥ 8 Gbit/s) 42
7.7 Bornes électriques des boîtiers VCSEL TOSA à grande vitesse (≥ 8 Gbit/s) pour les deux boîtiers avec connecteurs LC et SC 43
7.7.1 Terminaisons par broche 43
7.7.2 Terminaisons par plage métallisée 43
7.8 Encombrement des boîtiers VCSEL avec fibres amorces 44
7.8.1 Schémas d'encombrement du boîtier 44
7.8.2 Dimensions des boîtiers VCSEL avec fibres amorces 44
7.8.3 Connecteurs optiques 44
Bibliographie 45

Figure 1 – Affectation de la numérotation des bornes électriques des boîtiers de type TO CAN à 3 broches et 4 broches avec code C de couleurs facultatif pour la configuration des broches 32
Figure 2 – Affectation de la numérotation des bornes électriques des boîtiers de type TOSA à 3 broches et 4 broches avec connecteur LC et avec code C de couleurs facultatif 34
Figure 3 – Affectation de la numérotation des bornes électriques des boîtiers de type TOSA à 3 broches et 4 broches avec connecteur SC et avec code C de couleurs facultatif 34
Figure 4 – Représentations schématiques et brochage des VCSEL TO CAN avec fenêtre plate, avec lentille sphérique et avec fenêtre inclinée avec code C de couleurs facultatif sur la partie du bas 35
Figure 5 – Représentation schématique de boîtier VCSEL TOSA avec connecteur LC et avec code C de couleurs facultatif sur la partie du bas pour utilisations à faible vitesse (inférieure à 8 Gbit/s) 36
Figure 6 – Représentation schématique de boîtier VCSEL TOSA avec connecteur SC et avec code C de couleurs facultatif sur la partie du bas pour utilisations à faible vitesse (inférieure à 8 Gbit/s) 38
Figure 7 – Représentation schématique de boîtier VCSEL TOSA avec connecteur LC et avec code C de couleurs facultatif pour repérage du type à broches, pour des utilisations à grande vitesse (≥ 8 Gbit/s) 39
Figure 8 – Représentation schématique de boîtier VCSEL TOSA avec connecteur SC et avec code C de couleurs facultatif pour repérage du type à broches, pour des utilisations à grande vitesse (≥ 8 Gbit/s) 41
Figure 9 – Représentation schématique et brochage des boîtiers VCSEL avec fibres amorces avec code C de couleurs facultatif 44

Tableau 1 – Définitions de la fonction des broches des boîtiers VCSEL TO CAN à 4 broches 33
Tableau 2 – Définitions de la fonction des broches des boîtiers VCSEL TO CAN à 3 broches 33
Tableau 3 – Dimensions des VCSEL TO CAN avec fenêtre plate, avec lentille sphérique et avec fenêtre inclinée 36

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Tableau 4 – Dimensions des boîtiers VCSEL TOSA avec connecteur LC pour utilisations à faible vitesse (inférieure à 8 Gbit/s) 37
Tableau 5 – Dimension des boîtiers VCSEL TOSA avec connecteur SC pour utilisations à faible vitesse (inférieure 8 Gbit/s) 38
Tableau 6 – Dimensions des boîtiers VCSEL TOSA avec connecteur LC pour utilisations à grande vitesse (≥ 8 Gbit/s) 40
Tableau 7 – Dimension des boîtiers VCSEL TOSA avec connecteur SC pour des utilisations à grande vitesse (≥ 8 Gbit/s) 42
Tableau 8 – Terminaisons par broche des boîtiers VCSEL TOSA avec connecteurs LC et SC pour des utilisations à grande vitesse (≥ 8 Gbit/s) 43
Tableau 9 – Terminaisons par plage métallisée des boîtiers VCSEL TOSA avec connecteurs LC et SC et avec circuit imprimé souple pour des utilisations à grande vitesse (≥ 8 Gbit/s) 43
Tableau 10 – Dimensions des boîtiers VCSEL avec fibres amorces 44

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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COMPOSANTS ET DISPOSITIFS ACTIFS FIBRONIQUES – NORMES DE BOÎTIER ET D'INTERFACE –

Partie 15: Boîtiers individuels pour laser à cavité verticale émettant par la surface

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Cette troisième édition annule et remplace la deuxième édition parue en 2014. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) la classification des types d'interfaces optiques et électriques est généralisée et fait référence à l'IEC 62148-1;
b) un nouveau mode de broche a été ajouté au Tableau 1;

c) plusieurs dimensions du boîtier VCSEL TO CAN ont été modifiées dans le Tableau 3 afin de refléter l'état actuel de la technique;

d) La Figure 7 a été ajoutée en vue de représenter les détails complets du boîtier VCSEL TOSA.

Le texte de cette Norme internationale est issu des documents suivants:

Projet	Rapport de vote
86C/1709/FDIS	86C/1712/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à son approbation.

La langue employée pour l'élaboration de cette Norme internationale est le français.

Une liste de toutes les parties de la série IEC 62148, publiées sous le titre général *Composants et dispositifs actifs à fibres optiques – Normes de boîtier et d'interface*, est disponible sur le site web de l'IEC.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2, il a été développé selon les Directives ISO/IEC, Partie 1 et les Directives ISO/IEC, Supplément IEC, disponibles sous www.iec.ch/members_experts/refdocs. Les principaux types de documents développés par l'IEC sont décrits plus en détail sous www.iec.ch/standardsdev/publications.

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INTRODUCTION

Les dispositifs laser fibroniques sont utilisés pour transformer les signaux électriques en signaux optiques. Le présent document concerne les dimensions physiques et l'interface des boîtiers individuels pour laser à cavité verticale émettant par la surface (VCSEL).

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COMPOSANTS ET DISPOSITIFS ACTIFS FIBRONIQUES – NORMES DE BOÎTIER ET D'INTERFACE –

Partie 15: Boîtiers individuels pour laser à cavité verticale émettant par la surface

1 Domaine d'application

La présente partie de l'IEC 62148 concerne les dimensions physiques et les spécifications de l'interface des dispositifs individuels à laser à cavité verticale (VCSEL) dans le cadre des applications de télécommunication et de transmissions de données par un moyen optique.

Le présent document vise à spécifier de façon appropriée les exigences physiques des dispositifs VCSEL qui permettront l'interchangeabilité mécanique des dispositifs laser ou des émetteurs-récepteurs conformes au présent document tant au niveau de la carte de circuit imprimé que pour toute exigence de montage sur panneau.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60793-2-50, *Fibres optiques – Partie 2-50: Spécifications de produits – Spécification intermédiaire pour les fibres unimodales de classe B*

IEC 60874 (toutes les parties), *Dispositifs d'interconnexion et composants passifs à fibres optiques – Connecteurs pour câbles et fibres optiques*

IEC 61754 (toutes les parties), *Dispositifs d'interconnexion et composants passifs fibroniques – Interfaces de connecteurs fibroniques*

IEC 61754-4-100, *Dispositifs d'interconnexion et composants passifs à fibres optiques – Interfaces de connecteurs à fibres optiques – Partie 4-100: Famille de connecteurs de type SC – Interfaces de connecteur SC-PC à embase simplifiée*

IEC 61754-20, *Dispositifs d'interconnexion et composants passifs fibroniques – Interfaces de connecteurs à fibres optiques – Partie 20: Famille de connecteurs de type LC*

IEC 62148-1, *Composants et dispositifs actifs fibroniques – Normes de boîtier et d'interface – Partie 1: Généralités et recommandations*

Recommandation UIT-T G.652, *Caractéristiques des câbles et fibres optiques monomodes*

ASTM B-652.B, *Standard Specification for Niobium-Hafnium Alloy Ingots*

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3 Termes, définitions et termes abrégés

Pour les besoins du présent document, les termes, définitions et abréviations qui suivent s'appliquent.

L'ISO et l'IEC tiennent à jour des bases de données terminologiques destinées à être utilisées en normalisation, consultables aux adresses suivantes:

- IEC Electropedia: disponible à l'adresse http://www.electropedia.org/
- ISO Online browsing platform: disponible à l'adresse http://www.iso.org/obp

3.1 Termes et définitions

3.1.1
boîtier à fibres amorces
type de boîtier pour dispositifs photoniques possédant une certaine longueur de fibre reliée aux ports d'entrées et de sorties optiques

3.2 Termes abrégés

CAN	airtight sealed metal container (conteneur métallique scellé hermétique) (voir l'IEC 60747-1)
PD	photodiode
TO	transistor outline (encombrement des transistors)
TOSA	transmitter optical subassembly (sous-ensemble émetteur optique)
VCSEL	vertical cavity surface emitting laser (laser à cavité émettant par la surface)

4 Classification

Les modules émetteurs-récepteurs fibroniques sont classés en plusieurs types de formes selon la combinaison de types d'accouplement des interfaces électriques et optiques. Les classifications figurant dans l'IEC 62148-1 s'appliquent.

5 Spécification de l'interface optique

5.1 Généralités

Le présent document vise à spécifier de façon appropriée les exigences physiques des dispositifs VCSEL qui permettront l'interchangeabilité mécanique des dispositifs laser ou d'émetteurs-récepteurs laser conformes au présent document tant au niveau de la carte de circuit imprimé que pour toute exigence de montage sur panneau.

5.2 Interface de connecteurs optiques

Le présent document s'applique aux interfaces de connecteurs optiques LC et SC. Les dimensions détaillées des réceptacles optiques sont spécifiées dans l'IEC 61754-20 et l'IEC 61754-4-100.

5.3 Interface des fibres amorces

Toutes les fibres optiques définies dans l'IEC 60793-2-50, l'ASTM B-652.B et la Recommandation UIT-T G.652 sont applicables.

Tous les connecteurs optiques définis dans l'IEC 60874 (toutes les parties) et l'IEC 61754 (toutes les parties) sont utilisables si une fibre amorce est reliée à un connecteur optique.

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6 Spécifications des interfaces électriques

6.1 Généralités

Les spécifications des interfaces électriques des boîtiers VCSEL TO CAN, TOSA et VCSEL à fibres amorces sont décrits en 6.2.

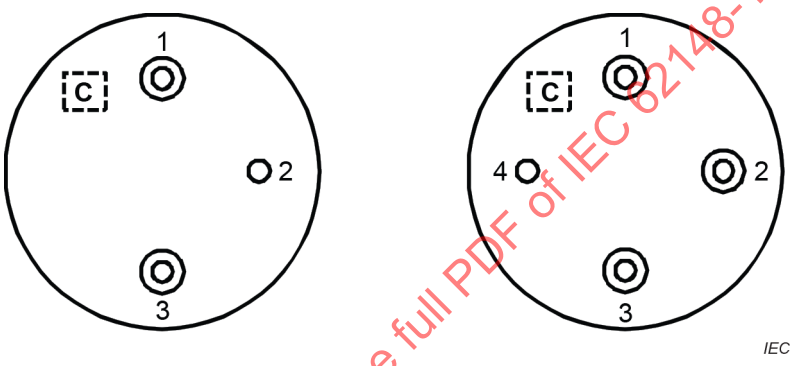
6.2 Spécifications de l'interface électrique relative aux boîtiers VCSEL TO CAN

6.2.1 Généralités

L'interface électrique du présent document définit uniquement la fonctionnalité de base de chaque broche.

6.2.2 Numérotation des bornes électriques

L'affectation de la numérotation des broches est représentée à la Figure 1.



NOTE Les bornes électriques sont vues du dessous du module boîtier avec les broches en dessous.

Figure 1 – Affectation de la numérotation des bornes électriques des boîtiers de type TO CAN à 3 broches et 4 broches avec code C de couleurs facultatif pour la configuration des broches

6.2.3 Affectations des bornes électriques

Les affectations des bornes électriques sont définies dans le Tableau 1 et le Tableau 2.

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Tableau 1 – Définitions de la fonction des broches des boîtiers VCSEL TO CAN à 4 broches

Numéro de broche	Fonction (VCSEL avec photodiode de surveillance)				
	Cathode commune	Anode commune	Flottante (type K)	Flottante (type A)	Flottante (type D)
1	Anode du VCSEL	Cathode du VCSEL	Anode du VCSEL	Cathode du VCSEL	Cathode du VCSEL
2	Cathode du VCSEL/ anode de la PD	Anode du VCSEL/ cathode de la PD	Cathode du VCSEL	Anode du VCSEL	Anode de la PD
3	Cathode de la PD	Anode de la PD	Cathode de la PD	Cathode de la PD	Anode du VCSEL/ cathode de la PD
4	Masse/boîtier (option)	Masse/boîtier (option)	Anode de la PD/masse	Anode de la PD/masse	boîtier
Code (C) de couleurs facultatif	Bleu	Rouge	Vert	Noir	Jaune

Tableau 2 – Définitions de la fonction des broches des boîtiers VCSEL TO CAN à 3 broches

Numéro de broche	Fonction (VCSEL avec photodiode de surveillance)	
	Anode commune	Cathode commune
1	Cathode du VCSEL	Anode du VCSEL
2	Anode du VCSEL/cathode de la PD	Cathode du VCSEL/anode de la PD
3	Anode de la PD	Cathode de la PD
Code (C) de couleurs facultatif	Rouge	Bleu

6.3 Spécifications de l'interface électrique relative aux boîtiers VCSEL TOSA avec connecteur LC

6.3.1 Généralités

L'interface électrique du présent document définit uniquement la fonctionnalité de base de chaque broche.

6.3.2 Numérotation des bornes électriques

L'affectation de la numérotation des broches est représentée à la Figure 2.

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