

# INTERNATIONAL STANDARD



**Fibre optic active components and devices – Package and interface standards –  
Part 2: SFF 10-pin transceivers**



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IEC Secretariat  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

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# INTERNATIONAL STANDARD



**Fibre optic active components and devices – Package and interface standards –  
Part 2: SFF 10-pin transceivers**

INTERNATIONAL  
ELECTROTECHNICAL  
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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

#### Part 2: SFF 10-pin transceivers

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International Standard IEC 62148-2 has been prepared by subcommittee 86C: Fibre optic systems and active devices, of IEC technical committee 86: Fibre optics.

This standard should be read in conjunction with IEC 62148-1.

This second edition cancels and replaces the first edition published in 2003. It constitutes a technical revision.

With respect to the previous edition, this edition includes 10-pin SFF-LC, and SFF MU devices.

It also cancels and replaces the first edition of IEC 62148-7 and the first edition of IEC 62148-9.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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## INTRODUCTION

Fibre optic transceivers are used to convert electrical signals into optical signals and vice versa. This standard covers the physical interface for a 10-pin small form factor (SFF) transceiver. This transceiver is designed for use with the SFF MU/MT-RJ/LC duplex optical connector and with through-hole printed circuit-board applications.

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

## Part 2: SFF 10-pin transceivers

### 1 Scope

This part of IEC 62148 covers the physical interface specifications for the SFF MT-RJ/LC/MU duplex 10-pin fibre optic transceiver module family.

The intent of this standard is to adequately specify the physical requirements of an optical transceiver that will enable mechanical interchangeability of transceivers complying with this standard both at the printed circuit wiring board and for any panel-mounting requirement.

### 2 Normative references

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IEC 61754-6, *Fibre optic connector interfaces – Part 6: Type MU connector family*

IEC 61754-18, *Fibre optic connector interfaces – Part 18: Type MT-RJ connector family*

IEC 61754-20, *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*

### 3 Terms, definitions and abbreviations

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

#### 3.1 Terms and definitions

##### 3.1.1

##### **small form factor optical transceiver**

a compact optical digital signal transceiver whose package has the same cross sectional outline as the receptacle of an electrical connector compliant with the IEC 60603-7 series

#### 3.2 Abbreviations

SFF    small form factor

### 4 Classification

The transceiver described in this standard is classified as type 1 according to IEC 62148-1.



5 Specification of the optical connector interface

This standard applies to the MT-RJ/LC/MU duplex optical connector interface. Detailed dimensions of the optical receptacle are provided in Clause 7.

Assignment of the optical transmit and receive ports is aligned to the electrical pins. One-half of the module is the transmit side and the other is the receive side. Assignments are shown in Figure 1.

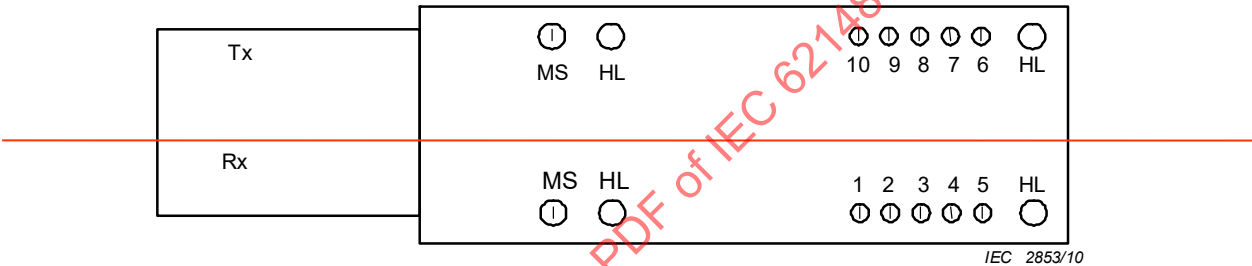
6 Electrical interface

6.1 General

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

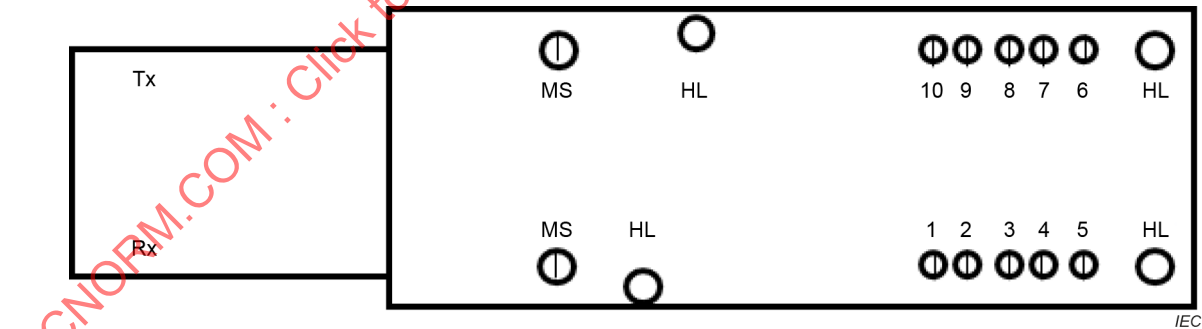
6.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 1 (viewed from the top of the module with pins underneath).



Key

- Rx: receiver section
- Tx: transmitter section



Key

- HL housing leads
- MS mounting studs
- Rx receiver section
- Tx transmitter section

Figure 1 – Electrical terminal numbering assignments (viewed from above with pins underneath)

### 6.3 Electrical terminal assignment

**Table 1 – Transceiver receiver pin-function definitions**

10-pin part	Symbol	Functional description
MS <sup>a</sup>	MS	Mounting studs The mounting studs are provided for transceiver mechanical attachment to the circuit board. They may also provide an optional connection of the transceiver to the equipment chassis ground
HL	HL	Housing leads The optional transceiver housing leads may be provided for additional signal grounding. These additional grounds may improve signal integrity, EMC or EMI performance
1	Vee <sub>r</sub>	Receiver signal ground
2	Vcc <sub>r</sub>	Receiver power supply
3	SD	Signal detect
4	RD-	Received data out bar
5	RD+	Received data out
<sup>a</sup> The holes in the circuit board shall be tied to the chassis ground.		

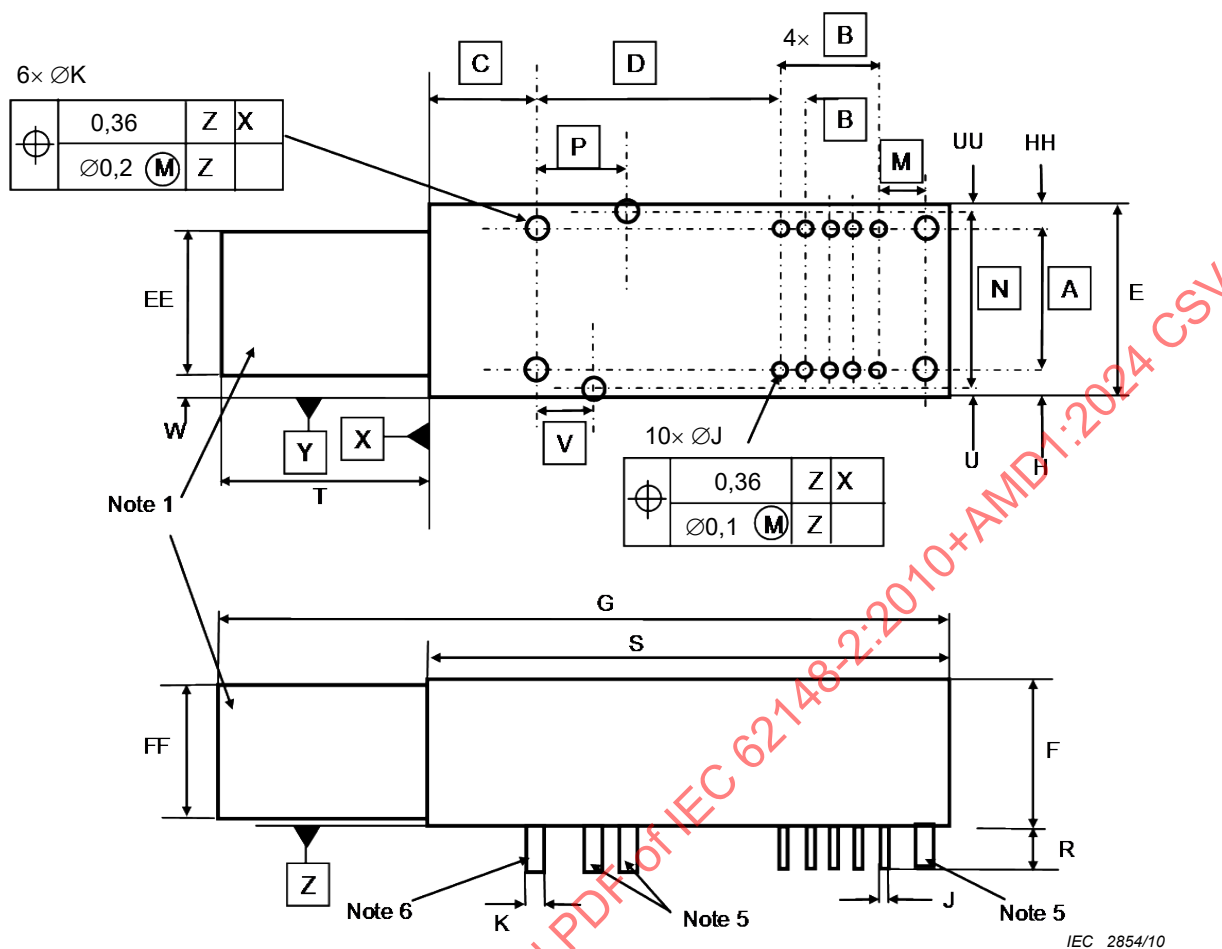
**Table 2 – Transceiver transmitter pin-function definitions**

10-pin part	Symbol	Functional description
MS <sup>a</sup>	MS	Mounting studs The mounting studs are provided for transceiver mechanical attachment to the circuit board. They may also provide an optional connection of the transceiver to the equipment chassis ground
HL	HL	Housing leads The optional transceiver housing leads may be provided for additional signal grounding. These additional grounds may improve signal integrity, EMC or EMI performance
6	Vcc <sub>t</sub>	Transmitter power supply
7	Vee <sub>t</sub>	Transmitter signal ground
8 <sup>b</sup>	TDis	Transmitter disable: optional feature
9	TD+	Transmitter data in
10	TD-	Transmitter data in bar
<sup>a</sup> The holes in the circuit board shall be tied to the chassis ground.		
<sup>b</sup> Optional use for laser-based products only.		

## 7 Outline and footprint

### 7.1 Drawings of case outline

Drawings of the case outline as well as the dimensions are given in Figures 2, 3 and 4.



**Figure 2 – Case outline of the SFF MT-RJ 10-pin transceiver**

**Table 3 – Key to Figure 2**

Reference	Dimensions mm		Remarks
	Minimum	Maximum	
A	10,16		Basic dimension
B	1,78		Basic dimension
C	7,59		Basic dimension
D	17,78		Basic dimension
E		13,59	
F		9,80	
G		49,56	Reference dimension
H		1,90	See Note 7
J	0,41	0,61	Diameter in case of rod pins (See Note 3)
K	0,97	1,07	Diameter in case of rod pins (See Note 4)
M	3,56		Basic dimension
N	13,34		Basic dimension
P	7,11		Basic dimension
R	2,92		
S		37,56	
T		12,00	
U		0,30	See Note 8
V	4,57		Basic dimension
W	1,70	2,30	
EE		9,60	
FF		9,30	
HH		1,90	See Note 7
UU		0,30	See Note 8

NOTE 1 Defines the space available for the MT-RJ optical receptacle.

NOTE 2 All 16 pins and posts are to be treated as a single pattern.

NOTE 3 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "J".

NOTE 4 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "K".

NOTE 5 Four housing leads are additional signal grounds to enhance the tolerance of Electromagnetic immunity and Electromagnetic compatibility.

NOTE 6 Two mounting studs are recommended to be tied to the chassis ground.

NOTE 7 H+HH is less than 3,63.

NOTE 8 U+UU is less than 0,45.

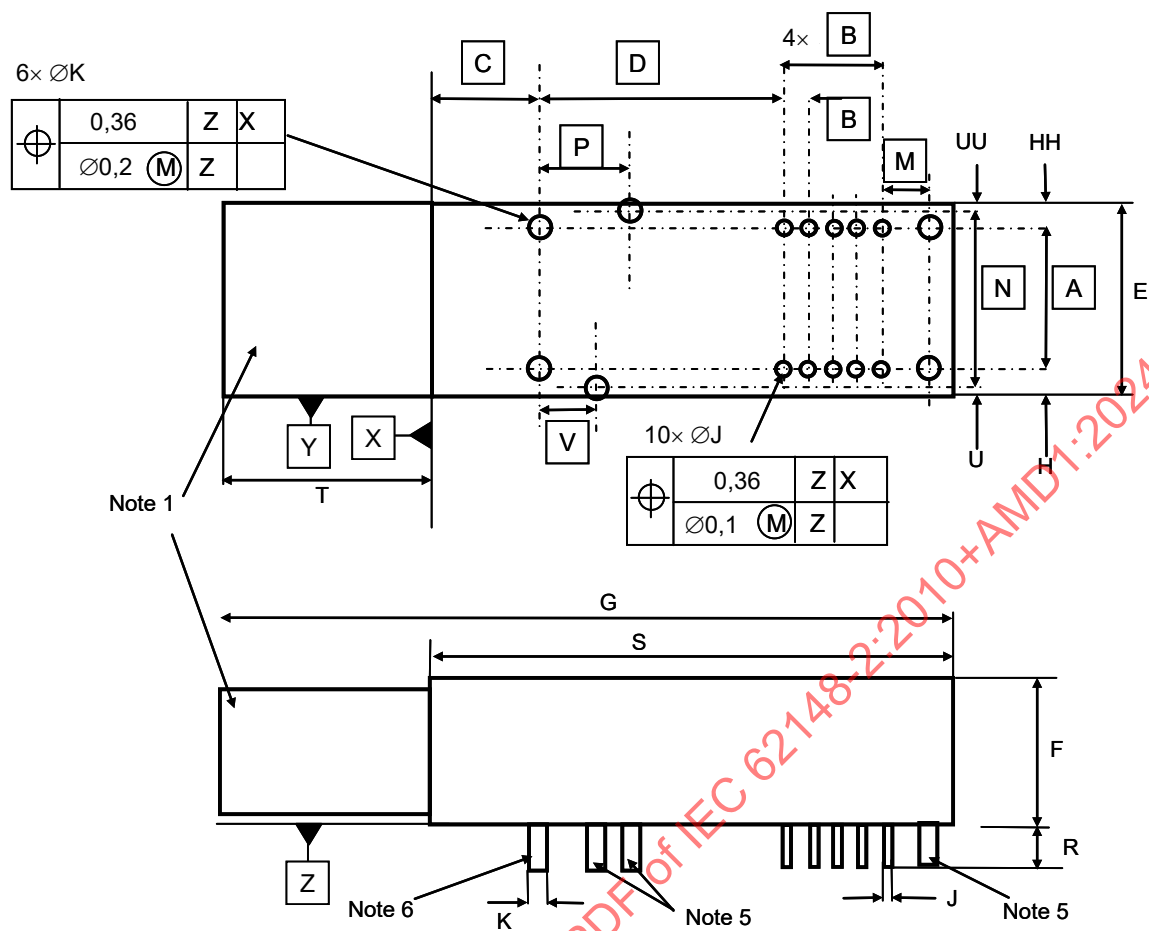


Figure 3 – Case outline of the SFF LC 10-pin transceiver

**Table 4 – Key to Figure 3**

Reference	Dimensions mm		Remarks
	Minimum	Maximum	
A	10,16		Basic dimension
B	1,78		Basic dimension
C	7,59		Basic dimension
D	17,78		Basic dimension
E		13,59	
F		9,80	
G		49,56	Reference dimension
H		1,90	See Note 7
J	0,41	0,61	Diameter in case of rod pins (See Note 3)
K	0,97	1,07	Diameter in case of rod pins (See Note 4)
M	3,56		Basic dimension
N	13,34		Basic dimension
P	7,11		Basic dimension
R	2,92		
S		37,56	
T		12,00	
U		0,30	See Note 8
V	4,57		Basic dimension
HH		1,90	See Note 7
UU		0,30	See Note 8

NOTE 1 Defines the space available for the LC optical receptacle.

NOTE 2 All 16 pins and posts are to be treated as a single pattern.

NOTE 3 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "J".

NOTE 4 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "K".

NOTE 5 Four housing leads are additional signal grounds to enhance the tolerance of Electromagnetic immunity and Electromagnetic compatibility.

NOTE 6 Two mounting studs are recommended to be tied to the chassis ground.

NOTE 7 H+HH is less than 3,63.

NOTE 8 U+UU is less than 0,45.

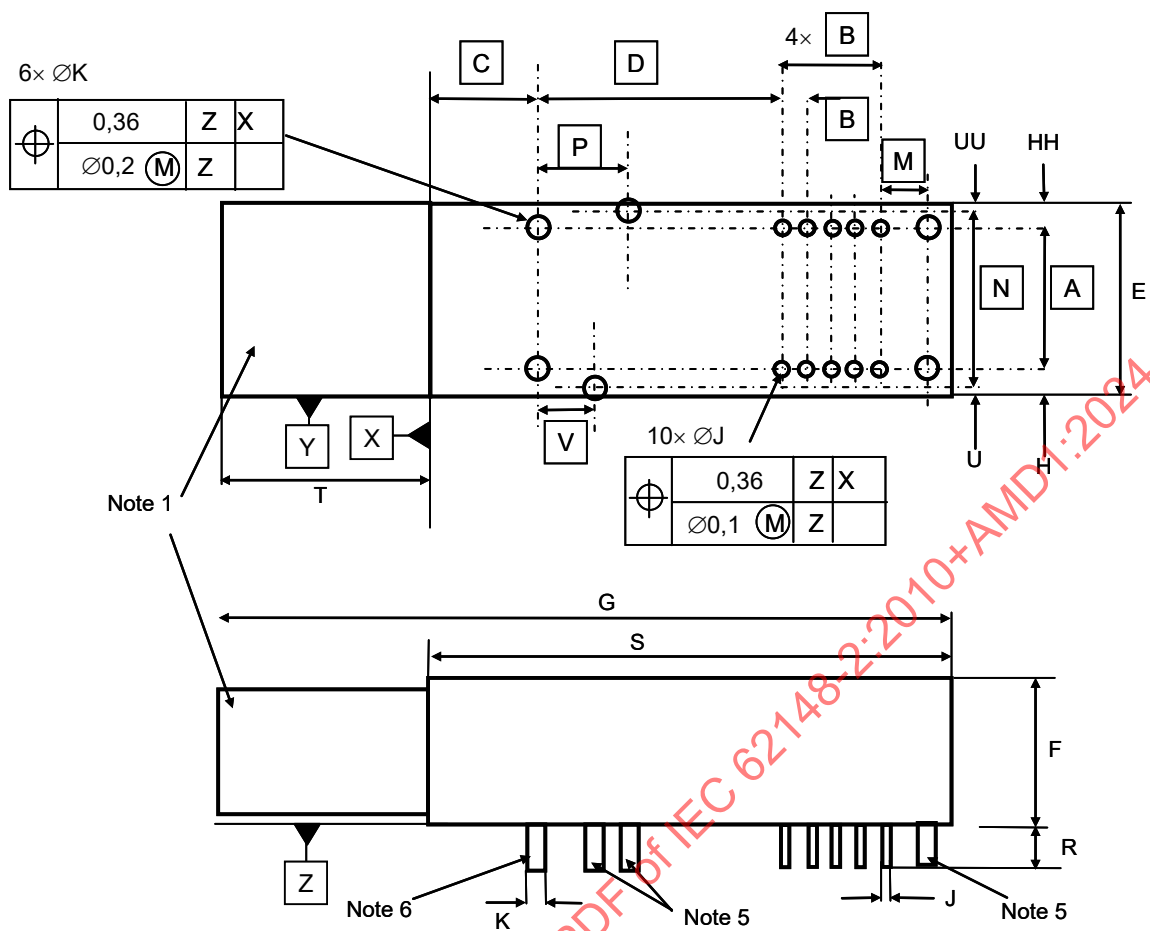


Figure 4 – Case outline of the SFF MU duplex 10-pin transceiver

**Table 5 – Key to Figure 4**

Reference	Dimensions mm		Remarks
	Minimum	Maximum	
A	10,16		Basic dimension
B	1,78		Basic dimension
C	7,59		Basic dimension
D	17,78		Basic dimension
E		13,59	
F		9,80	
G		49,56	Reference dimension
H		1,90	See Note 7
J	0,41	0,61	Diameter in case of rod pins (See Note 3)
K	0,97	1,07	Diameter in case of rod pins (See Note 4)
M	3,56		Basic dimension
N	13,34		Basic dimension
P	7,11		Basic dimension
R	2,92		
S		37,56	
T		12,00	
U		0,30	See Note 8
V	4,57		Basic dimension
HH		1,90	See Note 7
UU		0,30	See Note 8

NOTE 1 Defines the space available for the MU optical receptacle.

NOTE 2 All 16 pins and posts are to be treated as a single pattern.

NOTE 3 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "J".

NOTE 4 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "K".

NOTE 5 Four housing leads are additional signal grounds to enhance the tolerance of Electromagnetic immunity and Electromagnetic compatibility.

NOTE 6 Two mounting studs are recommended to be tied to the chassis ground.

NOTE 7 H+HH is less than 3,63.

NOTE 8 U+UU is less than 0,45.

## 7.2 Optical receptacle

Refer to IEC 61754-18 for MT-RJ style.

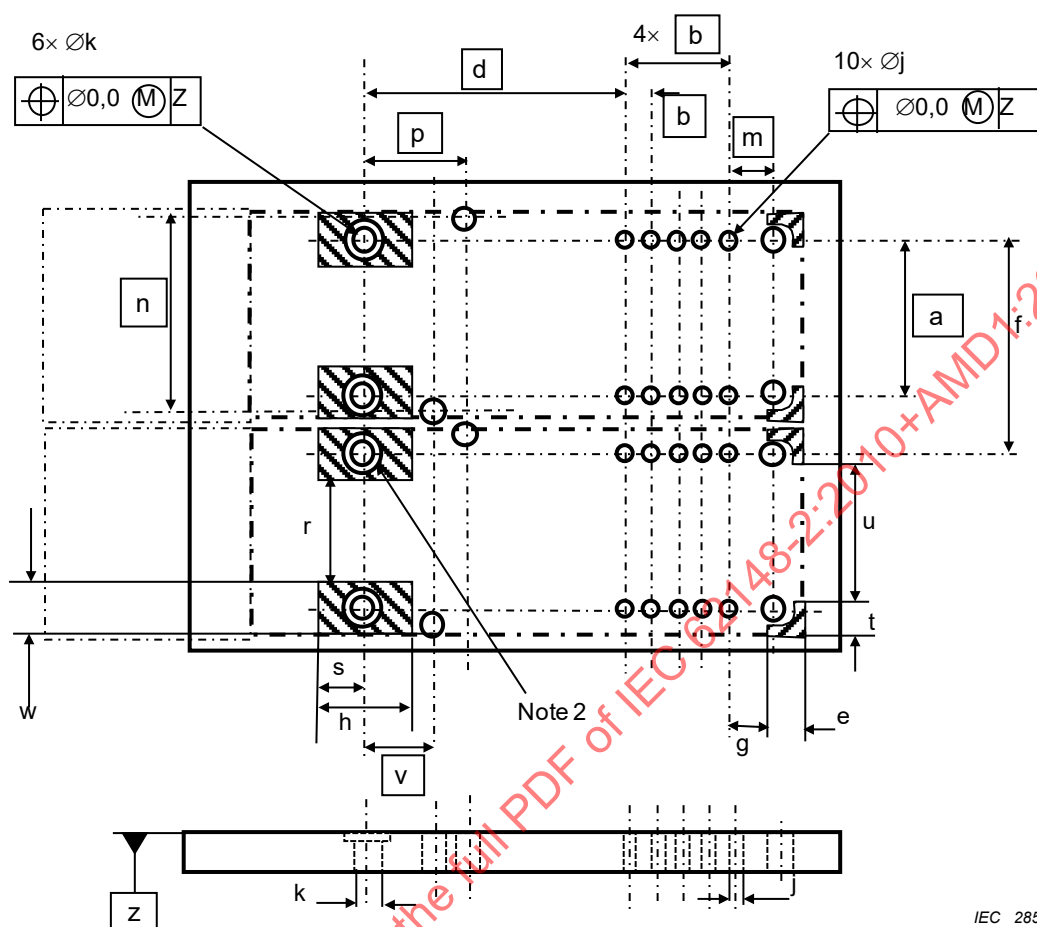
Refer to IEC 61754-20 for LC style.

Refer to IEC 61754-6 for MU duplex style.



### 7.3 Drawings of case footprint

A drawing of the case footprint as well as the dimensions are given in Figure 5



### Figure 5 – Case footprint

**Table 6 – Key to Figure 5**

Reference	Dimensions mm		Notes
	Minimum	Maximum	
<i>a</i>	10,16		Basic dimension
<i>b</i>	1,78		Basic dimension
<i>d</i>	8,89		Basic dimension
<i>e</i>	1,90	2,10	
<i>f</i>	13,97		Minimum interval between two transceivers
<i>g</i>	3,08		
<i>h</i>	5,90	6,10	
<i>j</i>	0,71	0,91	
<i>k</i>	1,30	1,50	
<i>m</i>	3,56		Basic dimension
<i>n</i>	13,34		Basic dimension
<i>p</i>	7,11		Basic dimension
<i>r</i>	7,49	7,69	
<i>s</i>	2,90	3,10	
<i>t</i>	1,90	2,10	
<i>u</i>	9,49	9,96	
<i>v</i>	4,57		Basic dimension
<i>w</i>	2,90	3,10	

NOTE 1 The hatched areas are keep-out areas reserved for housing stand-offs. No metal traces or ground connection in keep-out areas.

NOTE 2 Maximum diameter area of 2 × 2,29 mm for mounting eyelets.

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## Part 2: SFF 10-pin transceivers

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SFF    small form factor

### 4 Classification

The transceiver described in this standard is classified as type 1 according to IEC 62148-1.



## 5 Specification of the optical connector interface

This standard applies to the MT-RJ/LC/MU duplex optical connector interface. Detailed dimensions of the optical receptacle are provided in Clause 7.

Assignment of the optical transmit and receive ports is aligned to the electrical pins. One-half of the module is the transmit side and the other is the receive side. Assignments are shown in Figure 1.

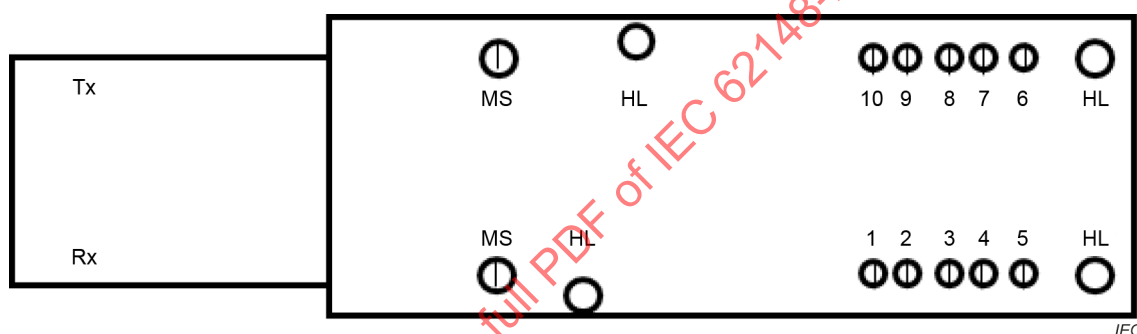
## 6 Electrical interface

### 6.1 General

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

### 6.2 Numbering of electrical terminals

Pin numbering assignments are shown in Figure 1 (viewed from the top of the module with pins underneath).



#### Key

HL	housing leads
MS	mounting studs
Rx	receiver section
Tx	transmitter section

**Figure 1 – Electrical terminal numbering assignments  
(viewed from above with pins underneath)**

### 6.3 Electrical terminal assignment

**Table 1 – Transceiver receiver pin-function definitions**

10-pin part	Symbol	Functional description
MS <sup>a</sup>	MS	Mounting studs The mounting studs are provided for transceiver mechanical attachment to the circuit board. They may also provide an optional connection of the transceiver to the equipment chassis ground
HL	HL	Housing leads The optional transceiver housing leads may be provided for additional signal grounding. These additional grounds may improve signal integrity, EMC or EMI performance
1	Vee <sub>r</sub>	Receiver signal ground
2	Vcc <sub>r</sub>	Receiver power supply
3	SD	Signal detect

4	RD-	Received data out bar
5	RD+	Received data out
<sup>a</sup> The holes in the circuit board shall be tied to the chassis ground.		

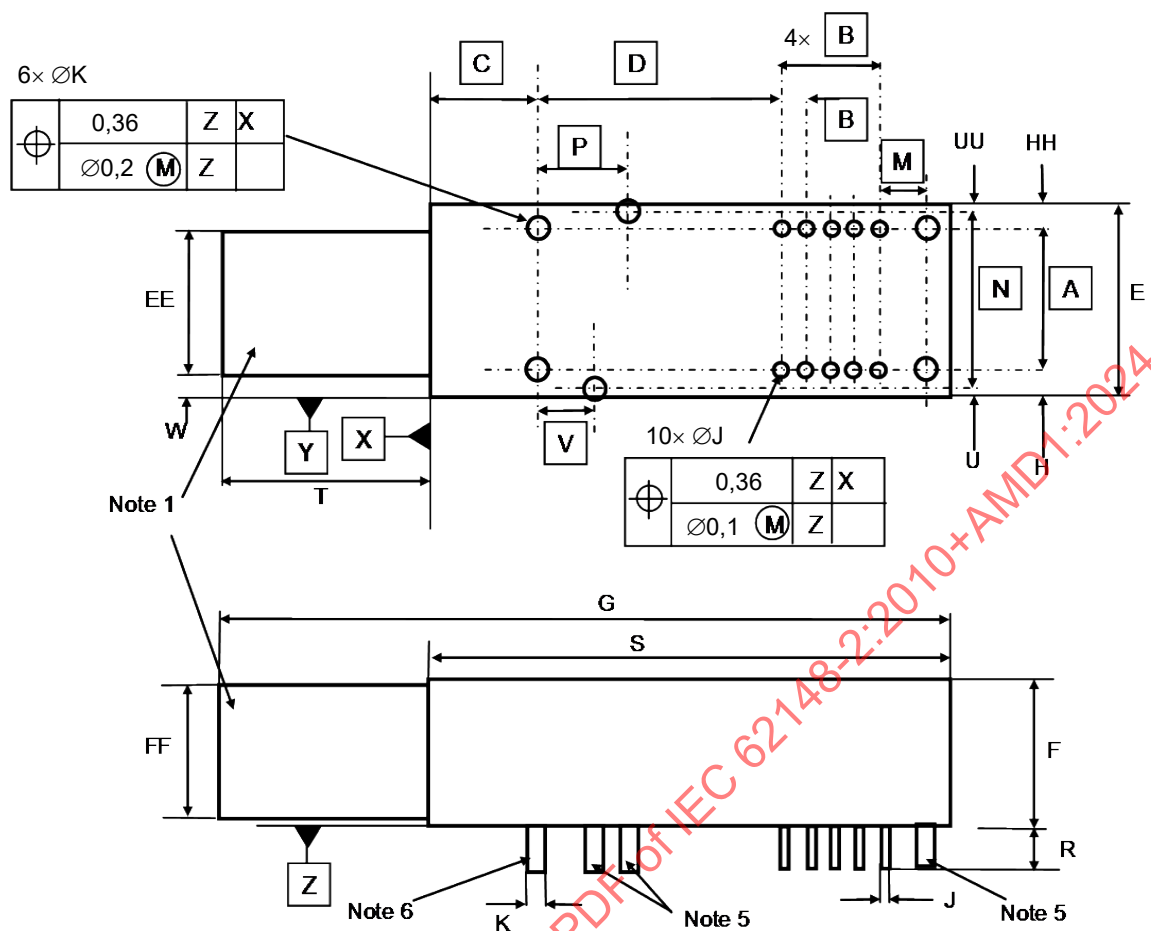
**Table 2 – Transceiver transmitter pin-function definitions**

10-pin part	Symbol	Functional description
MS <sup>a</sup>	MS	Mounting studs The mounting studs are provided for transceiver mechanical attachment to the circuit board. They may also provide an optional connection of the transceiver to the equipment chassis ground
HL	HL	Housing leads The optional transceiver housing leads may be provided for additional signal grounding. These additional grounds may improve signal integrity, EMC or EMI performance
6	Vcc <sub>t</sub>	Transmitter power supply
7	Vee <sub>t</sub>	Transmitter signal ground
8 <sup>b</sup>	TDis	Transmitter disable: optional feature
9	TD+	Transmitter data in
10	TD-	Transmitter data in bar
<sup>a</sup> The holes in the circuit board shall be tied to the chassis ground.		
<sup>b</sup> Optional use for laser-based products only.		

## 7 Outline and footprint

### 7.1 Drawings of case outline

Drawings of the case outline as well as the dimensions are given in Figures 2, 3 and 4.



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**Figure 2 – Case outline of the SFF MT-RJ 10-pin transceiver**

**Table 3 – Key to Figure 2**

Reference	Dimensions mm		Remarks
	Minimum	Maximum	
A	10,16		Basic dimension
B	1,78		Basic dimension
C	7,59		Basic dimension
D	17,78		Basic dimension
E		13,59	
F		9,80	
G		49,56	Reference dimension
H		1,90	See Note 7
J	0,41	0,61	Diameter in case of rod pins (See Note 3)
K	0,97	1,07	Diameter in case of rod pins (See Note 4)
M	3,56		Basic dimension
N	13,34		Basic dimension
P	7,11		Basic dimension
R	2,92		
S		37,56	
T		12,00	
U		0,30	See Note 8
V	4,57		Basic dimension
W	1,70	2,30	
EE		9,60	
FF		9,30	
HH		1,90	See Note 7
UU		0,30	See Note 8

NOTE 1 Defines the space available for the MT-RJ optical receptacle.

NOTE 2 All 16 pins and posts are to be treated as a single pattern.

NOTE 3 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "J".

NOTE 4 Quadratic prism whose cross section is less than the quadrangle inscribed in the circle which diameter is "K".

NOTE 5 Four housing leads are additional signal grounds to enhance the tolerance of Electromagnetic immunity and Electromagnetic compatibility.

NOTE 6 Two mounting studs are recommended to be tied to the chassis ground.

NOTE 7 H+HH is less than 3,63.

NOTE 8 U+UU is less than 0,45.